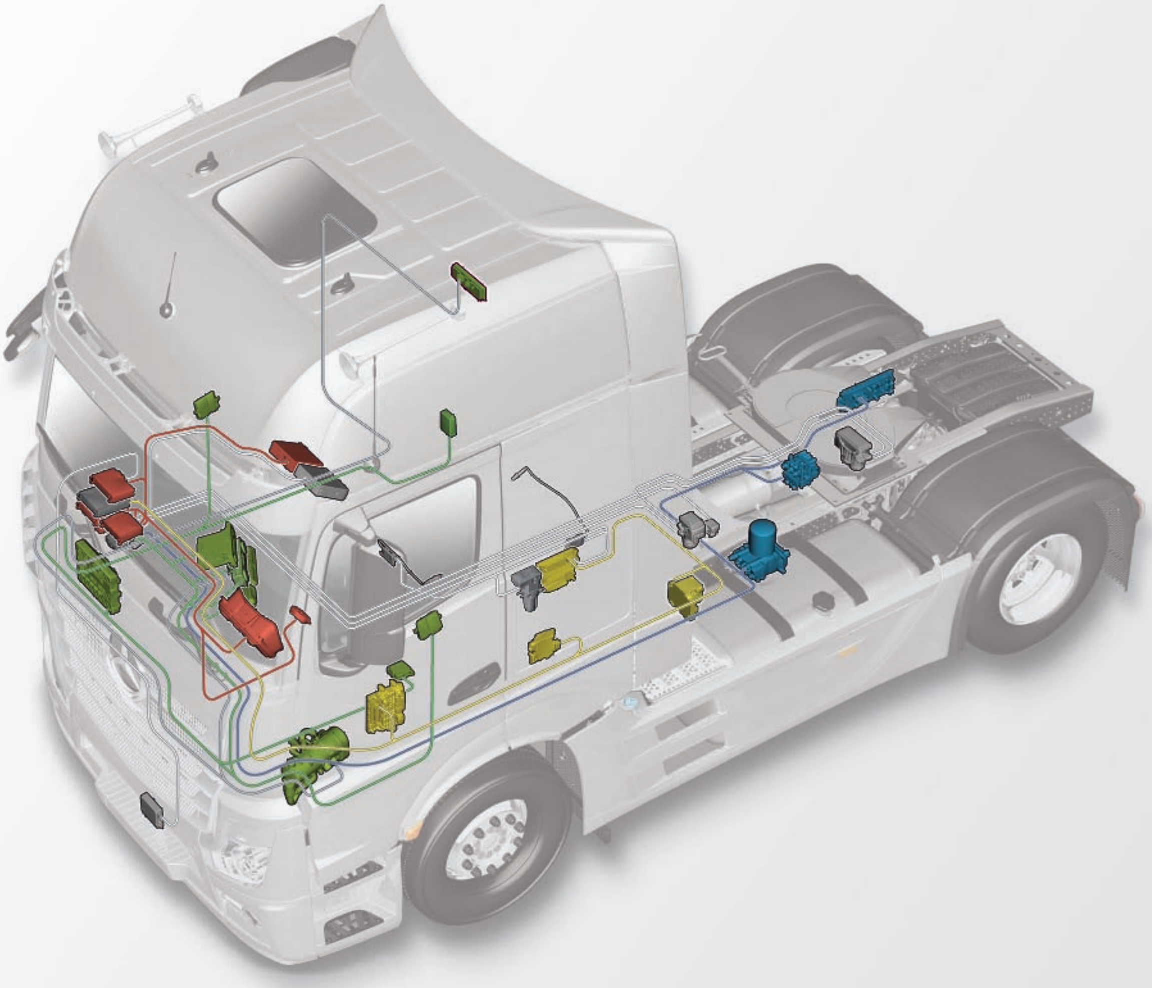


Electronic systems, Actros, model 963

Functional description

Mercedes-Benz

Mercedes-Benz Service

Electronic systems, Actros, model 963

Technical status 09.11

Daimler AG · Technical Information and Workshop Equipment(GSP/OI)
D–70546 Stuttgart

Product portfolio

You can also find comprehensive information about our complete product portfolio on our Internet portal:
Link: http://aftersales.mercedes-benz.com

Questions and suggestions

If you have any questions or suggestions concerning this product, please write to us.

E-Mail: customer.support@daimler.com
Telefax: +49-(0)18 05/0 10-79 78

or alternatively
Address: Daimler AG
GSP/OIS,
HPC R822, W002
D-70546 Stuttgart
(Germany)

Image no. of title image: W00.01-1016-00

Order no. of this publication: 6517 1261 02 - HLI 000 000 02 89

09/11

SN00.00-W-0001-01HA	Preface		

This brochure

Actros electronic systems, model 963

is intended for the technical personnel responsible for service and maintenance of Mercedes-Benz trucks.

The content of this brochure is split up into:
- **function descriptions**
- **component descriptions**
- **Description of locations of electrical connectors, sockets and ground points**

All the data listed in this brochure correspond with the technical status as per September 2011.
Any changes or supplements hereto will be published in the Workshop Information System (WIS) only.

Additional documents for model 963, such as maintenance and repair instructions or wiring diagrams are also available in the Workshop Information System (WIS).

Mercedes-Benz
Wörth plant, GSP/TTM

September 2011

Contents

SN00.00-W-0110H	Overview of as-built configuration and function descriptions	2.8.11

MODEL 963

Function descriptions

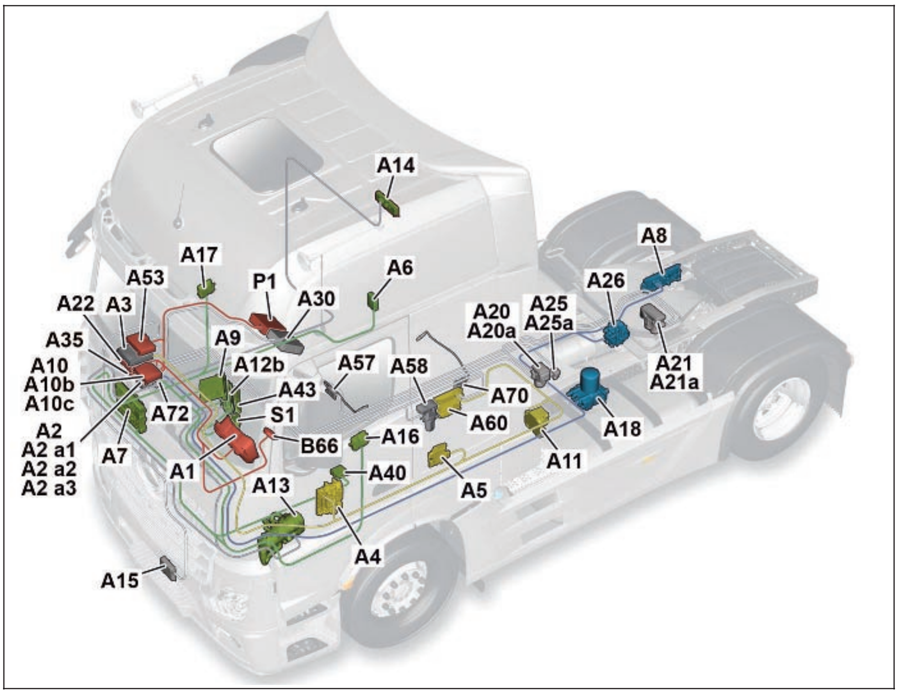
Contents

Contents

Contents

SN00.19-W-0001-02H	Complete networking		

Illustrated on model 963.4

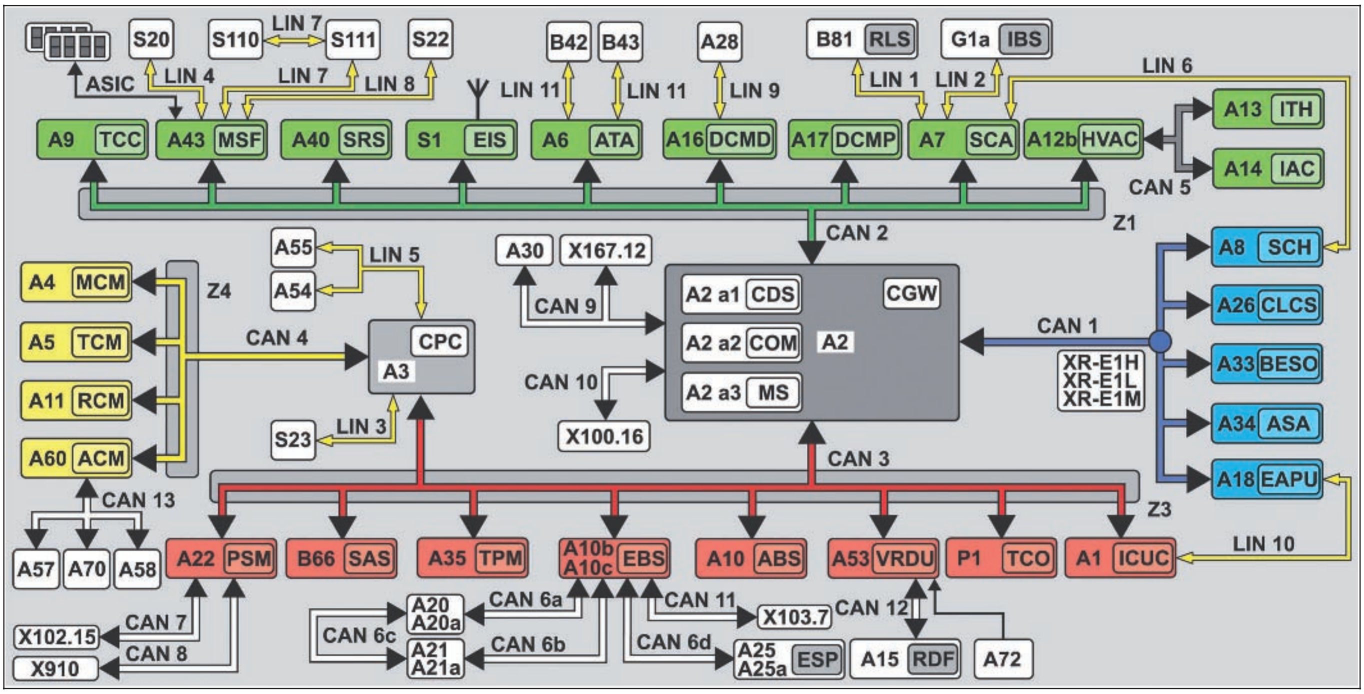


W00.19-1065-76

A1 *Instrument cluster (ICUC) control unit*
A2 *Central gateway control unit (CGW)*
A2 a1 *Central data memory (CDS)*
A2 a2 *Communications interface (COM) control unit*
A2 a3 *Maintenance system (MS) control unit*
A3 *Drive control (CPC) control unit*
A4 *Engine management control unit (MCM)*
A5 *Transmission control (TCM) control unit*
A6 *Anti-theft alarm system (ATA) control unit*
A7 *Cab signal acquisition and actuation module control unit (SCA)*
A8 *Frame signal acquisition and actuation module control unit (SCH)*
A9 *Truck Control Center (TCC)*
A10 *Antilock brake system (ABS) control unit, 4-channel*
A10b *Electronic brake control (EBS) control unit (Wabco)*
A10c *Electronic brake control (EBS) control unit (Knorr)*
A11 *Retarder control (RCM) control unit*
A12b *Heating, ventilation and air conditioning control unit (HVAC)*
A13 *Truck auxiliary heater (ITH) control unit*
A14 *Stationary air conditioning (IAC) control unit*
A15 *Front radar sensor (RDF) control unit*
A16 *Driver door module (DCMD) control unit*
A17 *Front passenger door module (DCMP) control unit*
A18 *Electronic Air Processing Unit (EAPU) control unit*
A20 *Front axle axle modulator (Wabco)*
A20a *Front axle axle modulator (Knorr)*
A21 *Rear axle axle modulator (Wabco)*
A21a *Rear axle axle modulator (Knorr)*
A22 *Parameterizable special module (PSM) control unit*
A25 *Electronic Stability Program (ESP®) control unit (Wabco)*
A25a *Electronic Stability Program (ESP®) control unit (Knorr)*
A26 *Level control (CLCS) control unit*
A30 *FleetBoard® control unit*
A35 *Tire pressure monitor (TPM) control unit*
A40 *Supplemental restraint system (SRS) control unit*
A43 *Modular switch panel (MSF) control unit*
A53 *Driver assistance system (VRDU) control unit*
A57 *EATU output NOx sensor control unit*
A58 *SCR control unit*
A60 *Exhaust aftertreatment (ACM) control unit*
A70 *EATU input NOx sensor control unit*
A72 *Lane Assistant camera*
B66 *Steering wheel angle sensor (SAS)*
P1 *Tachograph (TCO)*
S1 *Electronic ignition lock (EIS)*

GF00.19-W-0004H	Overall network, function	2.8.11

MODEL 963



W00.19-1079-79

A1 *Instrument cluster (ICUC) control unit*
A2 *Central gateway control unit (CGW)*
A2 a1 *Central data memory (CDS)*
A2 a2 *Communications interface (COM) control unit*
A2 a3 *Maintenance system (MS) control unit*
A3 *Drive control (CPC) control unit*
A4 *Engine management control unit (MCM)*
A5 *Transmission control (TCM) control unit*
A6 *Antitheft alarm system (ATA) control unit*
A7 *Cab signal acquisition and actuation module control unit (SCA)*
A8 *Frame signal acquisition and actuation module control unit (SCH)*
A9 *Truck Control Center (TCC)*
A10 *Antilock brake system (ABS) control unit, 4-channel*
A10b *Electronic Brake Control (EBS) control unit (Wabco)*
A10c *Electronic Brake Control (EBS) control unit (Knorr)*
A11 *Retarder control (RCM) control unit*
A12b *Heating, ventilation and air conditioning control unit (HVAC)*
A13 *Truck auxiliary heater (ITH) control unit*
A14 *Stationary air conditioning (IAC) control unit*
A15 *Front radar sensor (RDF) control unit*
A16 *Driver door module (DCMD) control unit*
A17 *Front passenger door module (DCMP) control unit*
A18 *Electronic Air Processing Unit (EAPU) control unit*
A20 *Front axle modulator (Wabco)*
A20a *Front axle modulator (Knorr)*
A21 *Rear axle axle modulator (Wabco)*
A21a *Rear axle axle modulator (Knorr)*
A22 *Parameterizable special module (PSM) control unit*
A25 *Electronic Stability Program (ESP®) control unit (Wabco)*
A25a *Electronic Stability Program (ESP®) control unit (Knorr)*
A26 *Level control (CLCS) control unit*
A28 *Driver switch group*
A30 *FleetBoard® control unit*
A33 *Battery disconnect switch control unit (BESO)*
A34 *Additional steering axle (ASA) control unit*
A35 *Tire pressure monitor (TPM) control unit*
A40 *Supplemental restraint system (SRS) control unit*
A43 *Modular switch panel (MSF) control unit*
A53 *Driver assistance system (VRDU) control unit*
A54 *Lower radiator shutters controller unit*
A55 *Upper radiator shutters controller unit*
A57 *EATU output NOx sensor control unit*
A58 *SCR control unit*
A60 *Exhaust aftertreatment (ACM) control unit*
A70 *EATU input NOx sensor control unit*
A72 *Lane Assistant camera*

B42 *Alarm siren*
B43 *Interior protection sensor*
B66 *Steering wheel angle sensor (SAS)*
B81 *Rain and light sensor (RLS)*

CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
CAN 4	*Drive train CAN*
CAN 5	*Climate control CAN*
CAN 6a	*Front axle brakes CAN*
CAN 6b	*Rear axle brakes CAN*
CAN 6c	*Redundant brakes CAN*
CAN 6d	*ESP® brakes CAN*
CAN 7	*Trailer CAN (PSM)*
CAN 8	*Body manufacturer CAN (PSM)*
CAN 9	*Telematics CAN*
CAN 10	*Diagnostic CAN*
CAN 11	*Trailer CAN (EBS)*
CAN 12	*Radar CAN*
CAN 13	*NOx-CAN*
G1a	*Battery sensor (IBS)*
LIN 1	*Rain/light sensor LIN*
LIN 2	*Battery sensor LIN*
LIN 3	*Right multifunction control lever-LIN*
LIN 4	*Left multifunction control lever LIN*
LIN 5	*Radiator shutters LIN*
LIN 6	*LIN SCA/SCH redundancy*
LIN 7	*Button group LIN*
LIN 8	*Level control LIN*
LIN 9	*Driver switch panel LIN*
LIN 10	*EAPU-LIN*
LIN 11	*ATA-LIN*
P1	*Tachograph (TCO)*
S1	*Electronic ignition lock (EIS)*
S20	*Left multifunction control lever*
S22	*Level control operating unit*
S23	*Right multifunction control lever*
S110	*Left multifunction steering wheel button group*
S111	*Right multifunction steering wheel button group*
X100.16	*Diagnostic socket*
X102.15	*Trailer socket , 15-pin*
X103.7	*ABS trailer socket 7-pin*
X167.12	*Fleet management system electrical connector*
X910	*Electrical connector for body manufacturers*
XR-E1H	*CAN-H exterior cable weld point 1*
XR-E1L	*CAN-L exterior cable weld point 1*
XR-E1M	*CAN-ground exterior cable weld point 1*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*
Z4	*Drive CAN bus star point*
ASIC	*ASIC data bus (Application System Integrated Circuit)*

1 General

The increase in electronic systems in the new Actros means that more and more signals now have to be made available across all the systems. This primarily has an impact on the networking, which has also gained in complexity. Alongside the familiar CAN and ASIC data bus systems the LIN data bus is now increasingly being used. The new Actros alone has 11 LIN data buses, which connect the various control units, switches or other electronic components to each other. The number of CAN data buses by contrast has only risen slightly.

2 CAN data bus system

The CAN data bus system enables information to be exchanged quickly and reliably between control units over only a few lines. The information is sent or received successively (serial). The exchange is bidirectional, i.e. each control unit operates as both a transmitter and a receiver.

2.1 Transfer rates

In the new Actros up to 13 different CAN data buses are used. The majority of these CAN data buses have a transfer rate of >250 kBaud and this classes them as high-speed CAN data buses. The reasons for the increase in high-speed CAN data buses are:

- Increase in data rate (number of messages that are sent)
- Almost identical manufacturing costs as for low-speed CAN data buses
- Greater use of LIN data bus in non-critical safety areas
- Shortening of flash or parameterization times, in particular through increase in transfer rate for diagnostic CAN (CAN 10)

The following CAN data buses have a transfer rate of 500 kBaud:

- Exterior CAN (CAN 1)
- Interior CAN (CAN 2)
- Frame CAN (CAN 3)
- Climate control CAN (CAN 5)
- Front axle brake CAN (CAN 6a)
- Rear axle brake CAN (CAN 6b)
- Redundancy brake CAN (CAN 6c)
- Brake CAN ESP® (CAN 6d)
- Diagnostic CAN (CAN 10)
- Radar CAN (CAN 12)

The transfer rate of the drive train CAN (CAN 4) was increased to 667 kBaud, because the high number of messages had significantly increased the bus operating rate. If the data rate was not increased, then there is the risk that some messages with low priority could no longer be sent due to the bus operating rate.

To ensure that freight forwarders, for example for fleet management, can continue to call up specific information on vehicle location, current speed, etc. the transfer rate of the telematics CAN (CAN 9) has been retained at 250 kBaud.

The transfer rates have also been retained on the trailer CAN (PSM) (CAN 7), the body manufacturer CAN (PSM) (CAN 8) and the trailer CAN (EBS) (CAN 11). They are 125 kBaud, whereby they are still classified as low-speed CAN data buses.

The transfer rate for the NOx-CAN (CAN 13) has not been changed either and is - as before - 250 kBaud.

2.2 Gateways

To compensate for the different transfer speeds, some control units also act as a gateway:

- The central gateway control unit (CGW) (A2) routes the respective messages from the exterior, interior, frame, telematics and diagnostic CAN (CAN 1, 2, 3, 9 and 10).
- The modular switch panel (MSF) control unit (A43) acts as a gateway between the interior CAN (CAN 2), the ASIC data bus (ASIC) and the three LIN data buses to the button groups on the multifunction steering wheel, the left multifunction control lever and the level control operating unit.
- The Electronic Brake Control (EBS) control unit (A10b) or (A10c), depending on the version, sends the messages from the frame CAN (CAN 3) to the front axle brake CAN (CAN 6a), the rear axle brake CAN (CAN 6b), the brake CAN ESP® (CAN 6d) as well as, where applicable, the trailer CAN (EBS) (CAN 11) and vice versa.
- The drive control (CPC) control unit (A3) acts as an interface between the frame CAN (CAN 3) and the drive train CAN (CAN 4).

2.3 CAN neutral points and bus terminating resistors

Because of the high transfer rates on high-speed CAN data buses, there may be some reflections in the lines. Bus termination resistors are used to avoid reflections that would lead to the falsification of actual information. The characteristic impedance of the electrical line is important for the bus termination resistor. The total bus terminating resistor on a high-speed CAN data bus is 60 Ω.
In the neutral points for the cab instrument panel CAN bus (Z1) and frame CAN bus (Z3) the bus terminating resistors are integrated into the neutral points. The drive CAN bus neutral point (Z4) only includes those ferrite elements that are also installed in the neutral points for interference suppression of high-frequency interference pulses.

The bus terminator on the exterior CAN (CAN 1) is realized by using bus terminating resistors within the central gateway control unit (CGW) (A2) and the Electronic Air-Processing Unit (EAPU) control unit (A18). Located in both control units is a 120 Ω resistor each. The parallel connection then yields a total bus terminating resistance of 60 Ω.

In the diagnostic CAN (CAN 10) the bus terminator is realized by a 60 Ω resistor in the central gateway control unit (CGW) (A2).

3 LIN data bus

The LIN data bus is an inexpensive serial subbus, which replaces the CAN data bus in the area of uncritical data transfer. The voltage supply for the LIN data bus is 12 V. This is realized internally in the control units through voltage dividers. Signals are transmitted through a single-wire line. The max. data rate is 20 kBaud. Communication refers to ID-based communication. All subscribers connected to the LIN data bus receive the message, but only one subscriber responds to it.
A LIN data bus subscriber never sends information by itself, as is the case, for example with a CAN data bus subscriber. Subscribers of the LIN data bus only ever respond to a query.

4 ASIC data bus system

The previously familiar ASIC data bus system is also used in the new Actros.
The ASIC data bus (ASIC) belongs to the so-called subbuses. In contrast to conventional switches which switch via their own contacts and are connected to their components via separate electrical lines (e.g. motors, solenoid valves, switch inputs, lighting devices), the ASIC data bus performs these tasks.
The electronics installed in the ASIC signal switches notifies the modular switch panel (MSF) control unit (A43) the following via the ASIC data bus (ASIC):

- switch position (open, closed, operated, not operated)
- Functionality (normally closed contact, normally open contact, changeover contact)
- System affiliation (e.g. headlamp cleaning system button, power take-off 1 button, etc.)

Each ASIC signal switch is connected over three contacts (pins) to the ASIC data bus (ASIC), and it is evaluated by the modular switch panel (MSF) control unit (A43). It is thus possible to install each ASIC signal switch at any arbitrary point on the individual switch modules.
For currents up to a maximum of 20 A there continues to be load switches which as before switch via their own contacts and are connected to their components through electrical lines.
These load switches are only connected to the switch panel via the ASIC contacts for separate background lighting.

5 Virtual control units

Virtual control units are not equipped with their own housing. They are integrated into the hardware and software of other control units. In Star Diagnosis and the instrument cluster control unit (ICUC) (A1) they appear as independent control units.
Among the virtual control units are the central data memory (CDS) (A2 a1), the communications interface (COM) control unit (A2 a2) and the maintenance system (MS) control unit (A2 a3), which are all integrated into the central gateway control unit (CGW) (A2).

With the aid of the central data memory (CDS) (A2 a1) the parameters for the electronic control units can be reset to manufacturer default settings.

6 Safety strategy

Several control units have a redundant connection over LIN or CAN data buses. The redundant connection serves as an emergency communication, if the actual CAN connection malfunctions. The use of redundant LIN or CAN data buses is dependent on the safety relevance of each system.
The service brake system, for example has a redundant CAN data bus connection between the axle modulators.
LIN data buses serve as redundancies between the sensor and actuator module, cab (SCA) control unit (A7) and the sensor and actuator module, chassis (SCH) control unit (A8) as well as between the instrument cluster control unit (ICUC) (A1) and the Electronic Air-Processing Unit (EAPU) control unit (A18).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Component description drive control (CPC) control unit	A3	**Page 334**
	Component description for engine management (MCM) control unit	A4	**Page 335**
	Transmission control (TCM) control unit. component description	A5	**Page 337**
	Antitheft alarm system control unit (ATA), component description	A6	**Page 338**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**
	Electronic Brake Control (EBS) control unit, component description	A10b, A10c	**Page 341**
	Retarder control unit (RCM), component description	A11 i Only in vehicles with code (B3H) Secondary water retarder.	**Page 342**

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Auxiliary heater control unit, component description	A13 Only in vehicles with code (D6M) Cab auxiliary water heater or with code (D6N) Cab and engine auxiliary water heater.	**Page 346**
	Stationary air conditioner control unit, component description	A14	**Page 347**
	Front radar sensor (RDF) control unit, component description	A15	**Page 348**
	Driver door control unit (DCMD), component description	A16	**Page 349**
	Passenger door module control unit (DCMP), component description	A17	**Page 350**
	Electronic Air-Processing Unit (EAPU), component description	A18 The Electronic Air-Processing Unit (EAPU) control unit (A18) forms a module together with the Electronic Air-Processing Unit (EAPU).	**Page 351**
	Front axle axle modulator, component description	A20, A20a	**Page 509**
	Rear axle axle modulator, component description	A21, A21a	**Page 511**
	Parameterizable special module (PSM) control unit component description	A22	**Page 356**
	Electronic Stability Program (ESP) control unit, component description	A25, A25a	**Page 357**
	Level control (CLCS) control unit, component description	A26	**Page 358**
	FleetBoard control unit, component description	A30	**Page 361**
	Battery disconnect switch control unit, component description	A33 Only in vehicles with one of the following codes: • Code (E5T) ADR model class EX/II, including AT • Code (E5U) ADR model class EX/III, including EX/II and AT • Code (E5V) ADR model class FL, including EX/II, EX/III and AT • Code (E5X) ADR model class AT • Code (E5Z) Accessories, ADR • Code (E9D) Preinstallation, for bipolar battery circuit breaker • Code (E9E) ADR preinstallation, without chassis shielding	**Page 362**
	Additional steering axle (ASA) control unit, component description	A34	**Page 364**
	Tire pressure monitor (TPM) control unit, component description	A35	**Page 365**

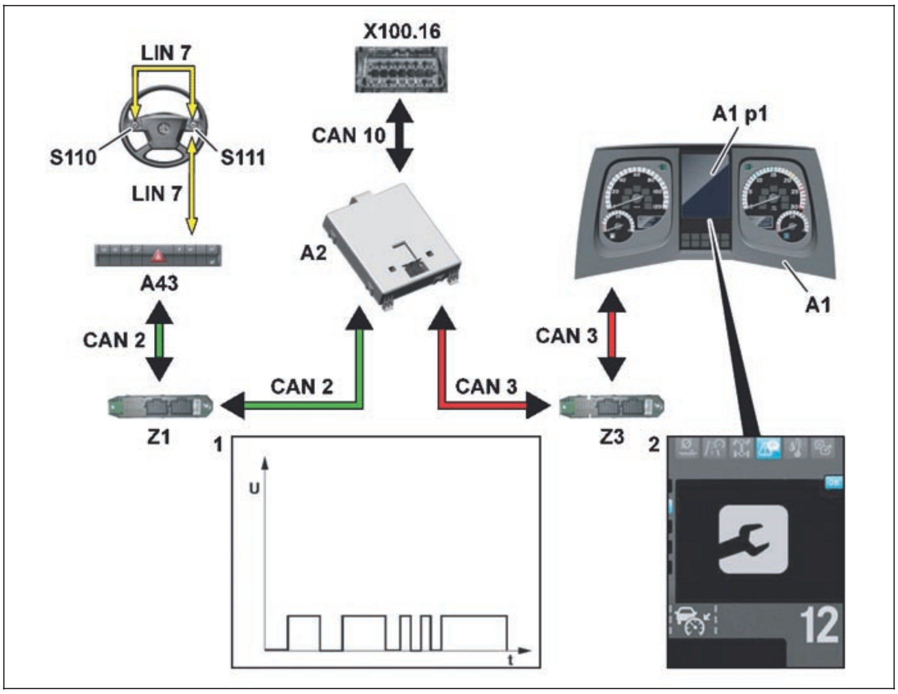
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Driver assistance system control unit (VRDU), component description	A53	**Page 378**
	EATU output NOx sensor, component description	A57 ℹ The EATU output NOx sensor control unit (A57) together with the EATU output NOx sensor (A57 b1) forms a unit. Vehicles with code (M5R) EEV engine version and vehicles with code (M5Y) Euro V engine version Vehicles with code (M5Z) Euro VI engine version	**Page 379** **Page 381**
	Pump module, component description	A58 ℹ The SCR control unit (A58) together with the pump module forms a unit.	**Page 384**
	Exhaust aftertreatment (ACM) control unit, component description	A60 Vehicles with code (M5R) EEV engine version and vehicles with code (M5Y) Euro V engine version Vehicles with code (M5Z) Euro VI engine version	**Page 386** **Page 388**
	EATU input NOx sensor, component description	A70 ℹ The EATU input NOx sensor control unit (A70) together with the EATU input NOx sensor (A70 b1) forms a unit. Vehicles with code (M5R) EEV engine version and vehicles with code (M5Y) Euro V engine version Vehicles with code (M5Z) Euro VI engine version	**Page 390** **Page 392**
	Lane Assistant (SPA) camera, component description	A72	**Page 395**
	Steering wheel angle sensor (SAS), component description	B66	**Page 424**
	Tachograph (TCO) component description	P1	**Page 459**
	Electronic ignition lock (EIS), component description	S1	**Page 460**

GF00.20-W-0005H	Maintenance system, function	2.8.11

MODEL 963

1 *CAN messages*
2 *"Maintenance" menu*

A1 *Instrument cluster (ICUC) control unit*
A1 p1 *Multifunction display*
A2 *Central gateway control unit (CGW)*
A43 *Modular switch panel (MSF) control unit*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
CAN 10 *Diagnostic CAN*
LIN 7 *Button group LIN*
S110 *Left multifunction steering wheel button group*



W00.20-1076-76

S111 *Right multifunction steering wheel button group*
Z1 *Cab instrument panel CAN bus star point*
Z3 *Frame CAN bus star point*
X100.16 *Diagnostic socket*

General information

The maintenance system (WS):

- Is a software which is integrated as a virtual control unit into the central gateway control unit (CGW) (A2),
- records all the required measurement data as CAN messages (1) using the CAN data bus system and
- calculates the load-dependent service life and forecast data for each maintenance item in order to determine the service dates.

i Load-dependent forecasting is used to carry out the following:

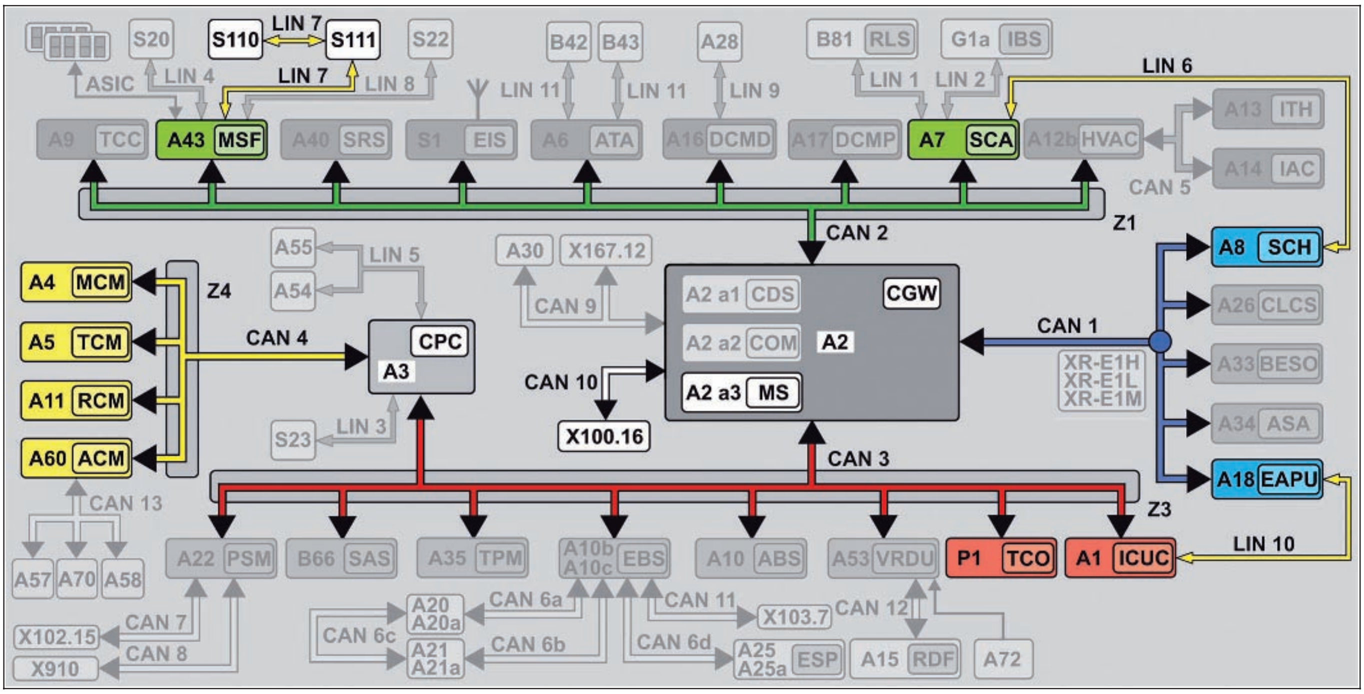
- Individual determination of the service dates for each maintenance item and they can be called up in the "Maintenance" (2) menu of the instrument cluster control unit (ICUC) (A1).
- Display of pending maintenance items as a message in the multifunction display (A1 p1) when the ignition is switched on.

The menu is operated using the left multifunction steering wheel button group (S110) and the right multifunction steering wheel button group (S111).
Maintenance information is shown in the multifunction display (A1 p1) of the instrument cluster control unit (ICUC) (A1). The instrument cluster control unit (ICUC) (A1) acts as a display unit.

A maintenance item is reset using the left multifunction steering wheel button group (S110) and the right multifunction steering wheel button group (S111) or with the aid of Star Diagnosis through the diagnostic socket (X100.16).

	Maintenance system overall network		**Page 23**
	Data acquisition function		**Page 24**
	Data storage function		**Page 29**
	Life cycle consumption calculation, function		**Page 35**
	Forecast calculation, function		**Page 34**
	Normal mode displays function		**Page 30**
	Reset service item function		**Page 32**

GF00.20-W-0005-02H	Maintenance system overall network		

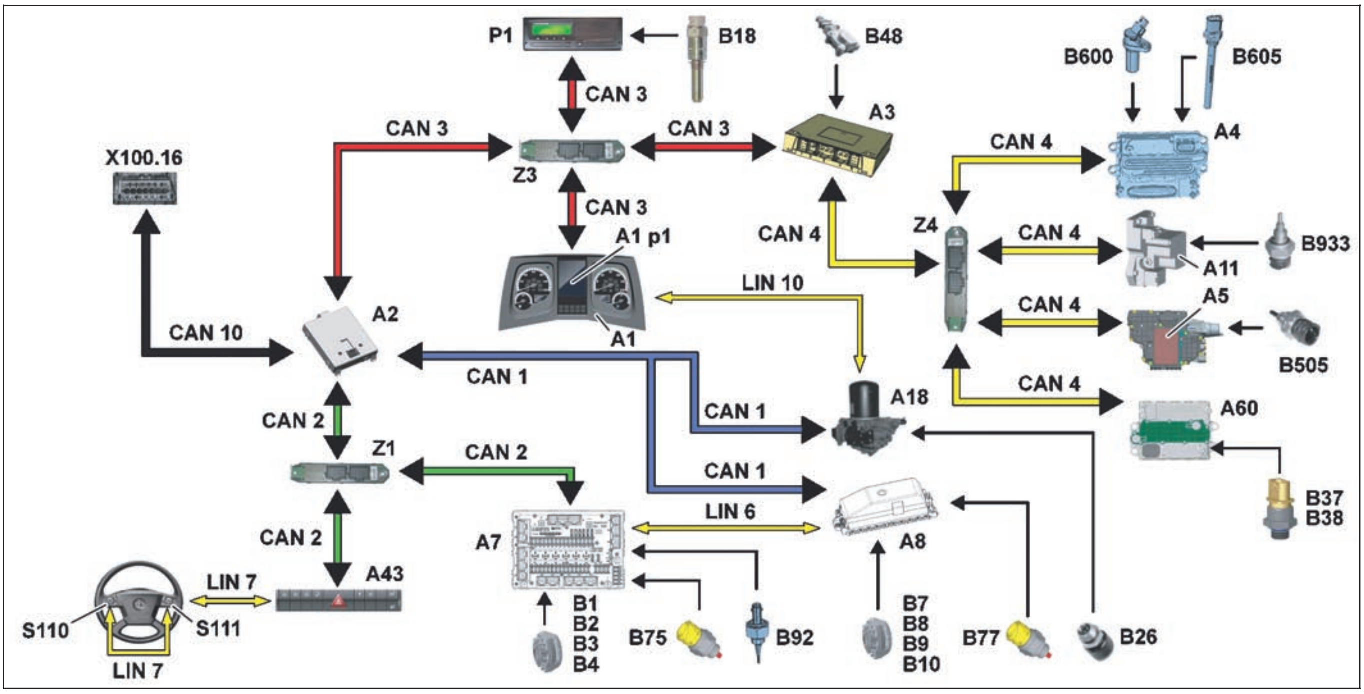


W00.20-1079-79

A1	*Instrument cluster (ICUC) control unit*
A2	*Central gateway control unit (CGW)*
A2a3	*Maintenance system (MS) control unit*
A3	*Drive control (CPC) control unit*
A4	*Engine management control unit (MCM)*
A5	*Transmission control (TCM) control unit*
A7	*Cab signal acquisition and actuation module control unit (SCA)*
A8	*Frame signal acquisition and actuation module control unit (SCH)*
A11	*Retarder control (RCM) control unit*
A18	*Electronic Air Processing Unit (EAPU) control unit*
A43	*Modular switch panel (MSF) control unit*
A60	*Exhaust aftertreatment (ACM) control unit*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
CAN 4	*Drive train CAN*
CAN 10	*Diagnostic CAN*
LIN 6	*LIN SCA/SCH redundancy*
LIN 7	*Button group LIN*
LIN 10	*EAPU-LIN*
P1	*Tachograph (TCO)*
S110	*Left multifunction steering wheel button group*
S111	*Right multifunction steering wheel button group*
X100.16	*Diagnostic socket*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*
Z4	*Drive CAN bus star point*

GF00.20-W-3000H	Data acquisition function	2.8.11

MODEL 963



W00.20-1078-79

A1	Instrument cluster (ICUC) control unit
A1p1	Multifunction display
A2	Central gateway control unit (CGW)
A3	Drive control (CPC) control unit
A4	Engine management control unit (MCM)
A5	Transmission control (TCM) control unit
A7	Cab signal acquisition and actuation module control unit (SCA)
A8	Frame signal acquisition and actuation module control unit (SCH)
A11	Retarder control unit (RCM) (in vehicle with code (B3H) Secondary water retarder)
A18	Electronic Air Processing Unit (EAPU) control unit
A43	Modular switch panel (MSF) control unit
A60	Exhaust aftertreatment (ACM) control unit (in vehicles with code (M5Z) Euro VI engine version)
B1	Left 1st front axle brake wear sensor
B2	Right 1st front axle brake wear sensor
B3	Left 2nd front axle brake wear sensor
B4	Right 2nd front axle brake wear sensor
B7	Left 1st rear axle brake wear sensor
B8	Right 1st rear axle brake wear sensor
B9	Left 2nd rear axle brake wear sensor
B10	Right 2nd rear axle brake wear sensor
B18	Travel and speed sensor
B26	Condensation sensor
B37	Exhaust pressure sensor upstream of diesel oxidation catalytic converter (in vehicles with code (M5Z) Euro VI engine version)
B38	Exhaust pressure sensor downstream of diesel particulate filter (in vehicles with code (M5Z) Euro VI engine version)
B48	Air filter sensor
B75	1st front axle temperature sensor
B77	1st rear axle temperature sensor
B92	Outside temperature sensor
B505	Transmission oil temperature sensor
B600	Crankshaft position sensor
B605	Engine oil fill level sensor
B933	Coolant temperature sensor (in vehicles with code (B3H) Secondary water retarder)
CAN 1	Exterior-CAN
CAN 2	Interior CAN
CAN 3	Frame CAN
CAN 4	Drive train CAN
CAN 10	Diagnostic CAN
LIN 6	LIN SCA/SCH redundancy
LIN 7	Button group LIN
LIN 10	EAPU-LIN
P1	Tachograph (TCO)
S110	Left multifunction steering wheel button group
S111	Right multifunction steering wheel button group
Z1	Cab instrument panel CAN bus star point
Z3	Frame CAN bus star point
Z4	Drive CAN bus star point
X100.16	Diagnostic socket

General information

The recording of data function enables the maintenance system (WS) to receive two different types of input factors for calculating the load-specific maintenance intervals:

- Basic data, which are determined unchangeable at first in the form of a parameterization and
- measured values, which are sensed continuously.

Thus, two functions are differentiated:

- Acquiring the basic data
- Acquiring the measured values

Acquiring the basic data

The maintenance system (WS) requires certain basic data (parameters), which:

- are a prerequisite for the general function and
- which are used to adapt the maintenance system (WS) to the vehicle and the operating fluids.

The basic data are acquired in the form of the following parameterizations:

- Basic parameterization
- Vehicle-specific parameterization
- Subsequent parameterization
- Parameterization of operating fluids

Basic parameterization

The basic parameterization (base parameterization):

- includes the pre-assignment of certain parameters with values and is a prerequisite for the function of the maintenance system (WS) and
- is made at the manufacturer of the central gateway control unit (CGW) (A2).

Vehicle-specific parameterization

The vehicle-specific parameterization:

- is used to adapt the maintenance system (WS) to the vehicle model and the vehicle equipment, or to the special features of the individual maintenance items, such as their cut-in or cutout and
- is carried out in the Mercedes-Benz production plant.

Subsequent parameterization

Subsequent parameterization:

- makes it possible to change parameters, which are connected to constructional vehicle changes for instance or special customer's requests, such as the "time-based servicing scheme grid" parameter and
- may only be carried out in workshops authorized by Mercedes-Benz.

i Querying and operation are conducted using the left multifunction steering wheel button group (S110) and right multifunction steering wheel button group (S111) or using Star Diagnosis through the diagnostic socket (X100.16).

Parameterization of operating fluids

Parameterization of operating fluids:

- makes it possible to change parameters with regard to the properties of fuels and lubricants, which can change during the operation of the vehicle, such as engine oil quality, engine oil viscosity, transmission oil quality, or sulfur content of the fuel and
- may also be carried out by other workshops.

i The parameters can be checked and changed if necessary through the "Fuels and Lubricants" submenu in the "Adjustments" menu of the menu system. Querying and operation are conducted using the left multifunction steering wheel button group (S110) and right multifunction steering wheel button group (S111) or using Star Diagnosis through the diagnostic socket (X100.16).

Acquiring the measured values

The measurement values are recorded using different sensors, which are connected to the system-specific control units or the locally best suited modules, e.g. on the sensor and actuator module, cab (SCA) control unit (A7).

The analog measured values are turned into corresponding CAN messages by the particular control units or modules; these CAN messages are transmitted with the aid of the CAN data bus system to the maintenance system (WS).

The maintenance system (WS):

- processes the recorded measured values converting them to input data for the life cycle consumption and forecast calculation, whereby the quality of processed measured values is of major significance in terms of the forecast calculation result and
- monitors the acquired measured values for errors, exceeding limit values, and plausibility.

Drive control (CPC) control unit (A3)

The drive control (CPC) control unit (A3):

- acquires the measured value for air filter contamination by the air filter sensor (B48) and
- sends a corresponding CAN message over the frame CAN (CAN 3) and over the frame CAN bus neutral point (Z3) to the central gateway control unit (CGW) (A2).

Engine management (MCM) control unit (A4)

The engine management (MCM) control unit (A4):

- acquires the measured "crankshaft rpm" value from the crankshaft position sensor (B600),
- acquires the measured "engine oil temperature" value from the engine oil fill level sensor (B605),
- sends corresponding CAN messages over the drive train CAN (CAN 4) and over the drive train CAN bus neutral point (Z4) to the drive control (CPC) control unit (A3) and from there over the frame CAN (CAN 3) and over the frame CAN bus neutral point (Z3) to the central gateway control unit (CGW) (A2).

Transmission (TCM) control unit (A5)

The transmission control unit (TCM) (A5):

- acquires the measured "transmission oil temperature" value from the transmission oil temperature sensor (B505) and
- sends a corresponding CAN message over the drive train CAN (CAN 4) and over the drive train CAN bus neutral point (Z4) to the drive control (CPC) control unit (A3) and from there over the frame CAN (CAN 3) and over the frame CAN bus neutral point (Z3) to the central gateway control unit (CGW) (A2).

Retarder control (RCM) control unit (A11)

i Only in vehicles with code (B3H) Secondary water retarder.

The retarder control unit (RCM) (A11):

- acquires the measured "coolant temperature" value from the coolant temperature sensor (B933) and
- sends a corresponding CAN message over the drive train CAN (CAN 4) and over the drive train CAN bus neutral point (Z4) to the drive control (CPC) control unit (A3) and from there over the frame CAN (CAN 3) and over the frame CAN bus neutral point (Z3) to the central gateway control unit (CGW) (A2).

Cab signal acquisition and actuation module (SCA) control unit (A7)
The sensor and actuator module, cab (SCA) control unit (A7):

- acquires the measured "brake wear" value at the installed front axles from the following brake wear sensors:
- Left 1st front axle brake wear sensor (B1)
- Right 1st front axle brake wear sensor (B2)
- Left 2nd front axle brake wear sensor (B3)
- Right 2nd front axle brake wear sensor (B4)
- acquires the measured "front axle oil temperature" value from the front axle temperature sensor (B75) at the first front axle,
- acquires the measured "outside temperature" value from the outside temperature sensor (B92) and
- sends a corresponding CAN message over the interior CAN (CAN 2) and over the cab instrument panel CAN bus neutral point (Z1) to the central gateway control unit (CGW) (A2).

Sensor and actuator module, chassis (SCH) control unit (A8)
The sensor and actuator module, chassis (SCH) control unit (A8):

- acquires the measured "brake wear" value at the installed rear axles from the following brake wear sensors:
  - Left 1st rear axle brake wear sensor (B7)
  - Right 1st rear axle brake wear sensor (B8)
  - Left 2nd rear axle brake wear sensor (B9)
  - Right 2nd rear axle brake wear sensor (B10)
- records the "rear axle oil temperature" value at the first rear axle from the 1st rear axle temperature sensor (B77),
- sends corresponding CAN messages over the exterior CAN (CAN 1) to the central gateway control unit (CGW) (A2).

ℹ In the event of any data transfer interference between the central gateway control unit (CGW) (A2) and the sensor and actuator module, cab (SCA) control unit (A7) or the sensor and actuator module, chassis (SCH) control unit (A8) the data can be sent as LIN messages redundantly over the redundancy LIN SCA/SCH (LIN 6).

Electronic Air-Processing Unit (EAPU) control unit (A18)
ℹ Only in vehicles with code (B1C, B1D, B1E) Electronic Air-Processing Unit (EAPU).

The Electronic Air-Processing Unit (EAPU) control unit (A18)

- records the measured "condensation water level" value from the condensation sensor (B26),
- delivers the "reservoir pressure for brake circuit 1 and 2" measurement value from the integrated reservoir pressure sensors for brake circuit 1 and 2,
- sends corresponding CAN messages over the exterior CAN (CAN 1) to the central gateway control unit (CGW) (A2),
- sends corresponding LIN messages over the redundant EAPU-LIN (LIN 10) to the instrument cluster control unit (ICUC) (A1).

Exhaust aftertreatment (ACM) control unit (A60)
ℹ Only for vehicles with code (M5Z) Engine version Euro VI.

The exhaust aftertreatment (ACM) control unit (A60)

- acquires the exhaust pressure measurement values on the diesel oxidation catalytic converter/diesel particulate filter from the following pressure sensors:
  - exhaust pressure sensor upstream of diesel oxidation catalytic converter (B37)
  - exhaust pressure sensor downstream of diesel particulate filter (B38)
- sends a corresponding CAN message over the drive train CAN (CAN 4) and over the drive train CAN bus neutral point (Z4) to the drive control (CPC) control unit (A3) and from there over the frame CAN (CAN 3) and over the frame CAN bus neutral point (Z3) to the central gateway control unit (CGW) (A2).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Component description drive control (CPC) control unit	A3	**Page 334**
	Component description for engine management (MCM) control unit	A4	**Page 335**
	Transmission control (TCM) control unit. component description	A5	**Page 337**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**

	Retarder control unit (RCM), component description	A11 ℹ Only in vehicles with code (B3H) Secondary water retarder.	**Page 342**
	Electronic Air-Processing Unit (EAPU), component description	A18 ℹ Only in vehicles with code (B1C) Electronic Air-Processing Unit (EAPU) low or with code (B1D) Electronic Air-Processing Unit (EAPU) mid or with code (B1E) Electronic Air-Processing Unit (EAPU) high.	**Page 351**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Exhaust aftertreatment (ACM) control unit, component description	A60 Vehicles with code (M5R) EEV engine version and vehicles with code (M5Y) Euro V engine version Vehicles with code (M5Z) Euro VI engine version	 **Page 386** **Page 388**
	Brake wear sensor, component description	B1, B2, B3, B4, B7, B8, B9, B10	**Page 404**
	Travel and speed sensor, component description	B18	**Page 408**
	Condensation sensor, component description	B26	**Page 412**
	Exhaust pressure sensor upstream of diesel oxidation catalytic converter, component description	B37 ℹ Only for vehicles with code (M5Z) Engine version Euro VI.	**Page 416**
	Exhaust pressure sensor downstream of diesel particulate filter, component description	B38 ℹ Only for vehicles with code (M5Z) Engine version Euro VI.	**Page 417**
	Outside temperature sensor, component description	B92	**Page 430**
	Transmission oil temperature sensor, component description	B505	**Page 435**
	Component description for crankshaft position sensor	B600	**Page 436**
	Component description for engine oil fill level sensor	B605	**Page 438**
	Retarder, component description	B933 ℹ Only in vehicles with code (B3H) Secondary water retarder. The coolant temperature sensor (B933) is located on the retarder.	**Page 514**
	Tachograph (TCO) component description	P1	**Page 459**
	Multifunction steering wheel, component description	S110, S111	**Page 469**
	Diagnostic socket, component description	X100.16	**Page 477**

GF00.20-W-3002H	Data storage function	2.8.11

MODEL 963

The maintenance system (WS) is equipped with different data memories:

- Maintenance memory
- Service messages memory
- Internal memory
- Mirror memory
- Fault memory

Saving maintenance data in the maintenance memory
The maintenance memory:

- is a ring memory, in which the entries are stored in ascending sequence based on the date and time and
- is used to save the basic maintenance data when a maintenance item is reset.

It is possible to save data of consecutive inspections for each maintenance item, afterwards the oldest entry is overwritten.

Saving service messages in the service messages memory
The service messages memory:

- is a ring memory, in which the data of up to 30 consecutive service messages can be stored,

  i Here, the next service message with the highest urgency is then stored. If the data memory capacity has been reached, then the oldest entries are deleted first.

- documents the first-time occurrence of a service message and
- saves the urgency level of the service message, the date, the maintenance interval travel distance, the kilometer reading of the speedometer and the relative life cycle consumption.
- saves the major assembly designation and
- documents whether a service message was confirmed.

Saving service life data, forecast data, maintenance memory data and parameters in internal memory:
In the internal memory:

- the service life and forecast data are always saved after switching off the ignition or after every operating hour,
- the data are preserved after the ignition is switched off,
- the maintenance memory data are stored after a maintenance operation was reset for a maintenance item,
- the service memory data are saved when a message appears or is confirmed,
- parameters are saved again after a change is made and the Parameterization mode is exited and
- the new parameters are also stored in the mirror memory of the instrument cluster control unit (ICUC) (A1) to enable parameterization to be conducted when a control unit is replaced.

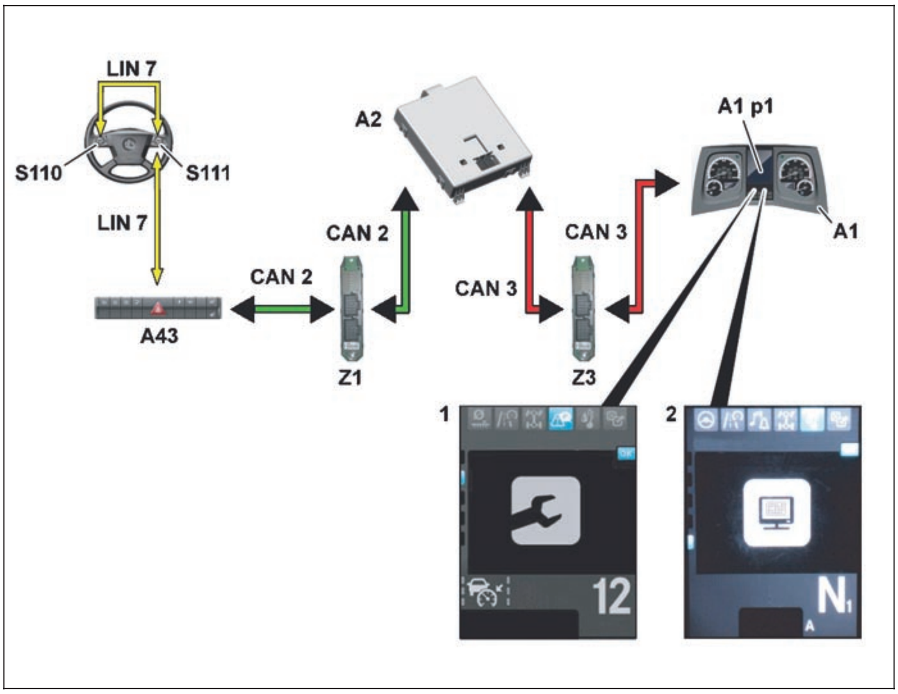
Saving service life data, forecast data, maintenance memory data and parameters in mirror memory:
The mirror memory is a nonvolatile memory in the instrument cluster (ICUC) (A1), in which all the important service life data and parameters are saved every 5 operating hours.
If the central gateway control unit (CGW) (A2) has to be replaced, then the data from the mirror memory in the instrument cluster control unit (ICUC) (A1) can be copied into the new central gateway control unit (CGW) (A2). The parameterization of the central gateway control unit (CGW) (A2) is restored separately through the central data memory (CDS) in the instrument cluster (ICUC) (A1).

Storing faults and text messages in the diagnostic trouble code memory
The diagnostic trouble code memory stores any fault or text message that appears for the first time.
Consecutive new entries are stored one after the other.

	Instrument cluster control unit (ICUC), component description	A1	Page 331
	Central gateway control unit (CGW), component description	A2	Page 333

GF00.20-W-3003H	Normal mode displays function	2.8.11

MODEL 963



W00.20-1077-76

1 "Maintenance" menu
2 "Diagnosis" menu

A1 Instrument cluster (ICUC) control unit
A1p1 Multifunction display
A2 Central gateway control unit (CGW)
A43 Modular switch panel (MSF) control unit
CAN 2 Interior CAN
CAN 3 Frame CAN
LIN 7 Button group LIN
S110 Left multifunction steering wheel button group
S111 Right multifunction steering wheel button group
Z1 Cab instrument panel CAN bus star point
Z3 Frame CAN bus star point

General information
The central gateway control unit (CGW) (A2) sends the CAN messages with the display information over the frame CAN (CAN 3) and over the frame CAN bus neutral point (Z3) to the instrument cluster control unit (ICUC) (A1).

The maintenance information display is generated in the instrument cluster control unit (ICUC) (A1) and shown on the multifunction display (A1 p1).

The following service information is shown:
- Service messages
- Service information

Service messages
Service messages are text warnings that indicate upcoming maintenance operations. They contain the "service date" and "remaining driving distance" forecast data for the listed maintenance item or its urgency status (e.g. Service due). They are automatically generated by the maintenance system (WS) as per their urgency status and shown on the multifunction display (A1 p1).

If there are any service messages pending, they are shown each time the ignition is switched on along with any other pending messages. Service messages can only be canceled by acknowledging them.

Five urgency levels of service messages are differentiated:

- No message
- Early warning
- Service due
- Service now (can be acknowledged)
- Service now (cannot be acknowledged)

i Any acknowledgeable service messages has to be acknowledged. The associated service dates have to be observed and the maintenance operations have to be carried out.

If service messages are skipped, the operational and road safety of the vehicle can be jeopardized. If a maintenance operation is carried out late or not at all, the wear at the vehicle or at the major assemblies will increase at any rate.

Advance warning
This is information on the maintenance item and the remaining driving distance until the service is due.
The life cycle consumption is still below 100%.
Service will be due within the next days and the life cycle consumption will then be
100%.
When acknowledging the service message, the next pending service message, where applicable, is then shown.

Service due
The life cycle consumption is 100%.
The due service date was reached or exceeded.
If the service message is acknowledged, the next service message of the "Service due" urgency level is displayed if applicable.

Service immediately
The life cycle consumption has reached the exceeding limit.
The due service date was significantly exceeded.
A highlighted text information is displayed in yellow.
When acknowledging the service message, the next pending service message, where applicable, is then shown.

Service now (cannot be acknowledged)
The life cycle consumption has extended far beyond the overrun limit. The Service due date was exceeded to an extreme extent. A text information highlighted in yellow is shown and the yellow indicator lamp with the wrench symbol. When the maximum brake wear is reached, the indicator lamp also appears with the brake symbol.
When acknowledging the service message, the next pending service message, where applicable, is then shown.

Service information
Service information can be called up at any given time in the "Maintenance" menu in the instrument cluster and shown on the multifunction display (A1 p1). The system is operated using the left multifunction steering wheel button group (S110) and the right multifunction steering wheel button group (S111).
The service information listed in the "Maintenance" menu on a maintenance item contains the same information as the service messages. The interval number is also shown on the multifunction display (A1 p1).
If the "Reset?" prompt is shown in the multifunction display (A1 p1), the maintenance item above the left multifunction steering wheel button group (S110) and the right multifunction steering wheel button group (S111) can be reset.
If the multifunction display (A1 p1) shows a display without any forecast data under the maintenance item text, there are no forecast data available for the maintenance item.
Example: **Transmission**

- -.- -.- -

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Multifunction steering wheel, component description	S110, S111	**Page 469**

GF00.20-W-3005H	Reset service item function	2.8.11

MODEL 963

Reset maintenance items

Requirements:
- Maintenance operation was conducted
- Vehicle at rest
- Ignition switched on
- Hand brake applied

Execution:
- Confirm the "Reset?" selection internally through the multifunction display (A1 p1) in the instrument cluster control unit (ICUC) (A1) in the respective maintenance item in the Maintenance menu by pressing the left multifunction steering wheel button group (S110) and the right multifunction steering wheel button group (S111)
- Confirm externally through the diagnostic socket (X100.16) using Star Diagnosis

Directly measured maintenance items
(e.g. brake linings)
- Manual reset

Accumulating maintenance items
(operation oils)
- Manual reset

Time-based servicing scheme
(e.g. lubrication of steering knuckles)
- Manual reset

- Possible adjustment of the new operating fluid

General information
If a maintenance operation was carried out, the associated maintenance item has to be reset.
For safety reasons the reset of maintenance items is only possible, if the vehicle's hand brake is tightened and the ignition is switched on. When driving, the instrument cluster control unit (ICUC) (A1) blocks this function.

A differentiation is made between three functions:
- Reset maintenance items for directly measured maintenance items
- Reset maintenance items for accumulated maintenance items
- Reset maintenance items with a time-based servicing scheme

All maintenance items, including the time-based servicing scheme, are reset manually.

Reset maintenance items for directly measured maintenance items

Manual reset
The maintenance system (WS):
- recognizes, after the maintenance was carried out, that the currently valid measured wear value lies below the value for the calculation start and
- permits a reset.

After a manual reset:
- the entire service life data (with the exception of the operating time and the total travel distance) is reset to the initialization values,
- the interval number is incremented,
- bars are shown in the forecast data,
- then the service messages memory is deleted and
- basic maintenance data that have accrued so far are taken over into the maintenance memory.

A reset for the "brake" maintenance item is only possible, if the currently valid measured values for both brakes on one axle are below the brake wear value of 18%.

Reset maintenance items for accumulated maintenance items

Manual reset
After a manual reset:
- the service life data are reset to their initialization values,
- then the service messages memory is deleted,
- the basic maintenance data that have incurred this far are transferred to the maintenance memory,
- the interval number is incremented,
- bars are shown in the forecast data, and
- where fuels and lubricants are used, that differentiate from the previous fuel and lubricants, then these are to be set in the Fuels and Lubricants menu below the corresponding major assembly.

Reset maintenance items with a time-based servicing scheme

i A reset is only possible after 50 h operating time in the current maintenance interval.

Manual reset
After a reset:
- the entire life cycle data are reset and their initialization values are taken over again,
- then the service messages memory is deleted,
- basic maintenance data that have incurred this far are transferred to the maintenance memory,
- the interval number is incremented, and
- a new forecast date without remaining driving distance is shown.

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Multifunction steering wheel, component description	S110, S111	**Page 469**
	Diagnostic socket, component description	X100.16	**Page 477**

GF00.20-W-3011H	Forecast calculation, function	2.8.11

MODEL 963

General information
A forecast is used to schedule the vehicle's visit to the workshop beforehand.

The maintenance system (WS) calculates the individual forecast data for each maintenance item during each calculation cycle:
- Remaining total time
- Remaining driving distance
- Maintenance date

The prognosis calculation is based on the following input parameters:
- Total time
- Operating time
- Distance
- Life cycle consumption

The service date of the time-based servicing scheme is exclusively specified via the parameterizable time maintenance grid. The forecast data are issued on the multifunction display (A1 p1) in the instrument cluster (ICUC) (A1).

Forecasting start
As long as the life cycle consumption is still below the forecasting start, no forecast data are calculated. There is not yet a sufficient amount of information below the forecasting start to be able to calculate reliable forecast data.
After each reset the forecast data are marked "not predictable" by the base parameterization. After exceeding the forecasting start, the predictions are calculated based on the current life cycle consumption values.
The forecasting start for accumulated, directly measured maintenance items and for time-based servicing schemes lies at 50 h operating time.

Forecasting
The forecast data are calculated individually for each maintenance item. As a result, the service dates of the individual maintenance items do not have a fixed time interval between one another.

Thus, the workshop equipment is optimally utilized.
The forecast data for the remaining total time and the remaining driving distance apply exactly to each service date of a maintenance item and represent the remainder values until the due date.
The individual service date for each maintenance item is the point in time at which the next maintenance is due.

i This applies provided the workshop equipment is used with a constant load.

If maintenance items are close to each other, then a decision should be reached in consultation with the customer as to whether they can be conducted together during a maintenance visit to the workshop.

Time-based servicing
The life cycle consumption increases irrespective of the load of the maintenance item in proportion to the elapsed time.
The service date depends exclusively on the calculated remaining total time. The remaining total time is calculated beginning with the start of the total time calculation.

After confirmation of a conducted time-based servicing scheme, the new service date is displayed in the multifunction display (A1 p1).
The remaining distance is shown after 50 operating hours for the first time in the multifunction display (A1 p1).

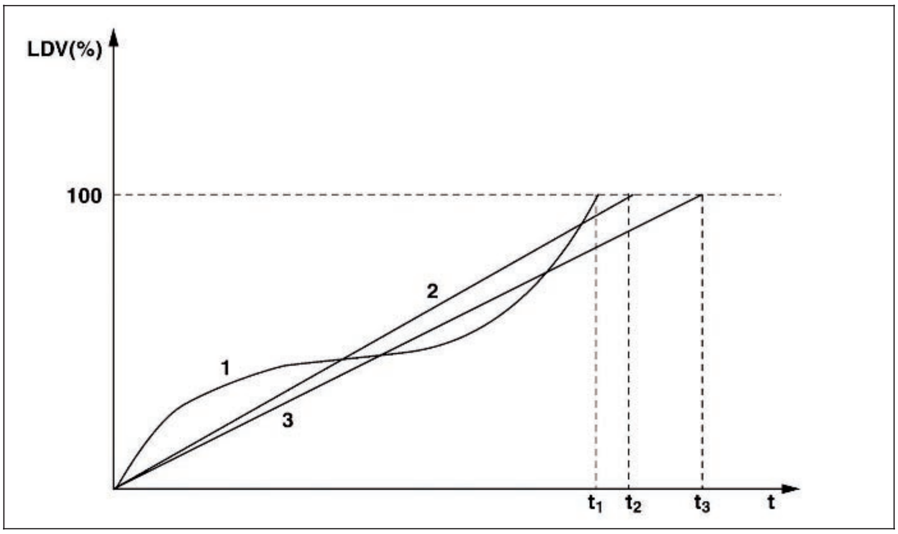
	Central gateway control unit (CGW), component description	A2	**Page 333**

GF00.20-W-3012H	Life cycle consumption calculation, function	2.8.11

MODEL 963

Life cycle consumption of a maintenance item

1	*Life cycle consumption after loading*
2	*Life cycle consumption according to driving time limit*
3	*Life cycle consumption after travel distance limitation*
LDV (%)	*Life cycle consumption*
t	*Time*
t_1	*Time "100% LDV according to load"*
t_2	*Time "100% LDV according to driving time limit"*
t_3	*Time "100% LDV according to distance limit"*



W00.20-1040-05

INPUT DATA
- Operating oil temperatures of major assemblies
- Brake lining thickness of front and rear axle
- Air filter contamination
- Air drier condensation level
- Brake wear ratio
- Operating time
- Total time
- Distance
- Number of crankshaft revolutions
- Engine speed
- Moderate engine speed
- Average major assemblies temperature
- Average outside air temperature
- Diesel particulate filter soiling
- Vehicle speed

→

Calculation of life cycle consumption
- Life cycle consumption based on the vehicle load for
  A. directly measured maintenance items (brake linings, air filter)
  Calculation with linear or nonlinear calculation instruction as a function of the wear variable.
  B. Accumulating maintenance items (operation oils)
  Calculation with empirical calculation instructions dependent on:
  - Correction factors for temperature, load, rotational speed, cold start increment
  - Quality factors for oil, fuel, mechanical components
- Time-based servicing scheme (e.g. lubrication of steering knuckles)
- Life cycle consumption based on the drive time limit
- Life cycle consumption based on the travel distance limitation
- Life cycle consumption based on operating time

→

OUTPUT DATA
- Life cycle consumption based on the load
- Life cycle consumption based on the time limitation
- Life cycle consumption based on the travel distance limitation
- Life cycle consumption based on operating time

→ **for forecasting**
Forecasting uses the highest value.

Functions

General information
The life cycle consumption calculation provides information on the degree to which the workshop equipment is worn out, and which one should be replaced or repaired during maintenance.

The life cycle consumption calculation determines 4 life cycle consumption values, which are calculated anew during each calculation cycle:

- Life cycle consumption based on vehicle load, based on calculation method for:
  - directly measured maintenance items and
  - accumulating maintenance items.

- Life cycle consumption based on the drive time limit,
- Life cycle consumption based on the travel distance limitation,
- Life cycle consumption based on operating time,

The workshop equipment is worn out if a life cycle consumption of 100% is reached.
An exception is the time-based servicing scheme, which has fixed maintenance intervals that are independent from loads and driving distance.
The life cycle consumption is the basis for forecasting.

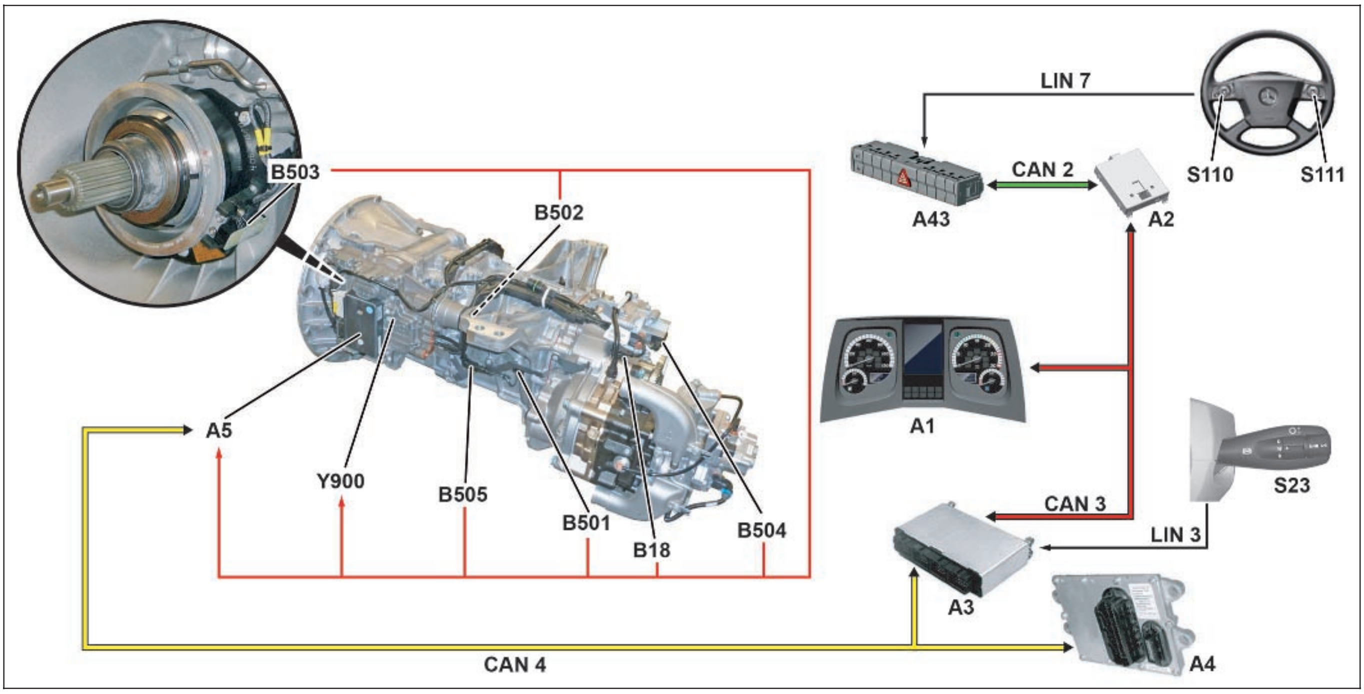
i Very precise, earlier prognoses are possible in the event of regular operations in regard to loads and driving distance over a long period of time. If operations vary greatly, the prognosis variation is higher. The forecasts become increasingly more accurate as total vehicle operating time increases.

Once the four life cycle consumption values have been evaluated, the maintenance system (WS) provides the highest value as a forecasting life cycle parameter.

	Central gateway control unit (CGW), component description	A2	**Page 333**

GF26.21-W-0002H	Transmission automation, function	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3



W26.21-1121-79

A1	*Instrument cluster (ICUC) control unit*	*B18*	*Travel and speed sensor*	*LIN 3*	*Multifunction control lever-LIN on the right*
A2	*Central gateway control unit (CGW)*	*B501*	*Main shaft rpm sensor*	*LIN 7*	*Button group LIN*
A3	*Drive control (CPC) control unit*	*B502*	*Countershaft rpm sensor*	*S23*	*Right multifunction control lever*
A4	*Engine management control unit (MCM)*	*B503*	*Clutch travel sensor*	*S110*	*Left multifunction steering wheel button group*
A5	*Transmission control (TCM) control unit*	*B504*	*Range group travel sensor*	*S111*	*Right multifunction steering wheel button group*
A43	*Modular switch panel (MSF) control unit*	*B505*	*Transmission oil temperature sensor*	*Y900*	*Transmission positioner*
		CAN 2	*Interior CAN*		
		CAN 3	*Frame CAN*		
		CAN 4	*Drive train CAN*		

1 General

With transmission automation there a convenience shifting system available over which gear selection as well as declutching and engaging of the clutch take place automatically. It contains a fully automated manual transmission, based on a constant-mesh transmission, with automated clutch operating system. The clutch operation takes place over a pneumatically actuated centrally located clutch operator.
Synchronization does not take place via a blocking synchronization as on a synchromesh transmission but is realized instead by braking or accelerating the countershaft in a controlled manner. As a result can be widened for the same dimensions of the transmission gears and thus higher torques and outputs transmitted. Passive safety is also increased due to reducing the burden for the driver.

Optimum gear selection supports an economic and fuel-saving driving style. All the shift operations take place in the optimum rpm range, minimizing wear on the transmission and engine. Faults during shifting are ruled out and it is no longer possible to over rev the engine. After switching on the ignition the automatic mode of transmission automation is always activated irrespective of which mode was last selected (manual or automatic). The option of activating a manual or automatic shift mode with the transmission mode button (M/A) (S23 s3) on the RH multifunction control lever (S23) has been retained. 12 forwards gears, 4 reverse gears and neutral can be engaged.

2 Changes compared with the previous transmission generation

- The transmission positioner (Y900) includes:
  - all solenoid valves for controlling the clutch, gear, gate, split, countershaft brake and range group
  - travel sensors for gear, gate and split
- a pressed down clutch operation due to the pneumatic central clutch release bearing

---

3 Transmission modes and driving functions

Transmission automation offers the following operating modes:

- Automatic transmission mode with a driving specific shift program (automatic operation)
- Manual transmission mode (manual operation)
- Back-up mode (backup drive mode) includes the additional function "Towing".

Further driving functions include:

- **Eco-roll mode**, in certain driving situations for supporting a fuel-saving driving style through automatic shifting into the transmission neutral position when the accelerator is not actuated
- **Crawl function,** for automatic starting moving when releasing the service brake and freewheeling without actuating the accelerator pedal
- **Rocking mode,** for rocking the vehicle out of an off-road recess

---

4 Components of the transmission automation

4.1 Transmission (TCM) control unit (A5)

The transmission (TCM) control unit (A5) is the central control unit for the transmission and the clutch. It contains the software modules for controlling the transmission and clutch actors.
The following sensor signals are read in directly amongst others:

- Countershaft rpm sensor (B502)
- Transmission oil temperature sensor (B505)
- Main shaft rpm sensor (B501)

4.2 Transmission positioner (Y900)

The transmission positioner (Y900) combines the following components into one unit:

- Gear cylinder
- Gear cylinder travel sensor (Y900 b2)
- Retract gear cylinder solenoid valve (Y900 y9)
- Extend gear cylinder solenoid valve (Y900 y8)
- Gate cylinder
- Gate cylinder travel sensor (Y900 b3)
- Retract gate cylinder solenoid valve (Y900 y11)
- Extend gate cylinder solenoid valve (Y900 y10)
- Retract splitter group solenoid valve (Y900 y7)
- Extend splitter group solenoid valve (Y900 y6)
- Slowly close clutch solenoid valve (Y900 y1)
- Slowly open clutch solenoid valve (Y900 y2)
- Quickly close clutch solenoid valve (Y900 y3)
- Quickly open clutch solenoid valve (Y900 y4)
- Retract range group solenoid valve (Y900 y12)
- Extend range group solenoid valve (Y900 y13)
- Countershaft brake solenoid valve (Y900 y5)
- Splitter group travel sensor (Y900 b1)

4.3 Splitter group shift cylinder

The splitter group shift cylinder is integrated into the front part of the transmission housing.

4.4 Range group module

The range group module combines the following components into a unit:

- Range group shift cylinder
- Range group travel sensor (B504)

4.5 Pneumatic central clutch release bearing

The pneumatic central clutch release bearing directly actuates the mechanical clutch components, takes on disengaging the clutch and engaging the clutch and contains the clutch travel sensor (B503).

4.6 Right multifunction control lever (S23)

The RH multifunction control lever (S23) transmits the shift commands to the drive control (CPC) control unit (A3).

---

5 The following components support during transmission automation

5.1 Engine management (MCM) control unit (A4)
The engine management (MCM) control unit (A4) includes the software module for torque and rotational speed actuation of the engine and therefore also implements requests from other control units on the rotational speed and torques for switching, starting off and stopping.

5.2 Drive control (CPC) control unit (A3)
The drive control (CPC) control unit (A3) is modular in design and it contains the following software modules:
- Software module for drive control; it comes with extended functions (e.g. cruise control etc.)
- Software module for automatic gear selection

5.3 Modular switch panel (MSF) control unit (A43)
The modular switch panel (MSF) control unit (A43) reads in the operation of the back-up mode via the left multifunction steering wheel button group (S110) or the right multifunction steering wheel button group (S111).

5.4 Tachograph (TCO) (P1)
The tachograph (TCO) (P1) reads in the way and speed sensor (B18) and evaluates its signal.

5.5 IC control unit (ICUC) (A1)
The IC (ICUC) control unit (A1) shows the driver information over the multifunction display (A1 p1).

6 Transmission cooling (for code N6Z)
A thermostatically regulated transmission cooling with the following components is used as special equipment:
- Transmission cooler with a transmission cooling fan (M19) (located in the direction of travel on the right, next to the cooling module)
- Transmission oil lines
- Thermostat element with spring from the shape memory alloy (FGL)

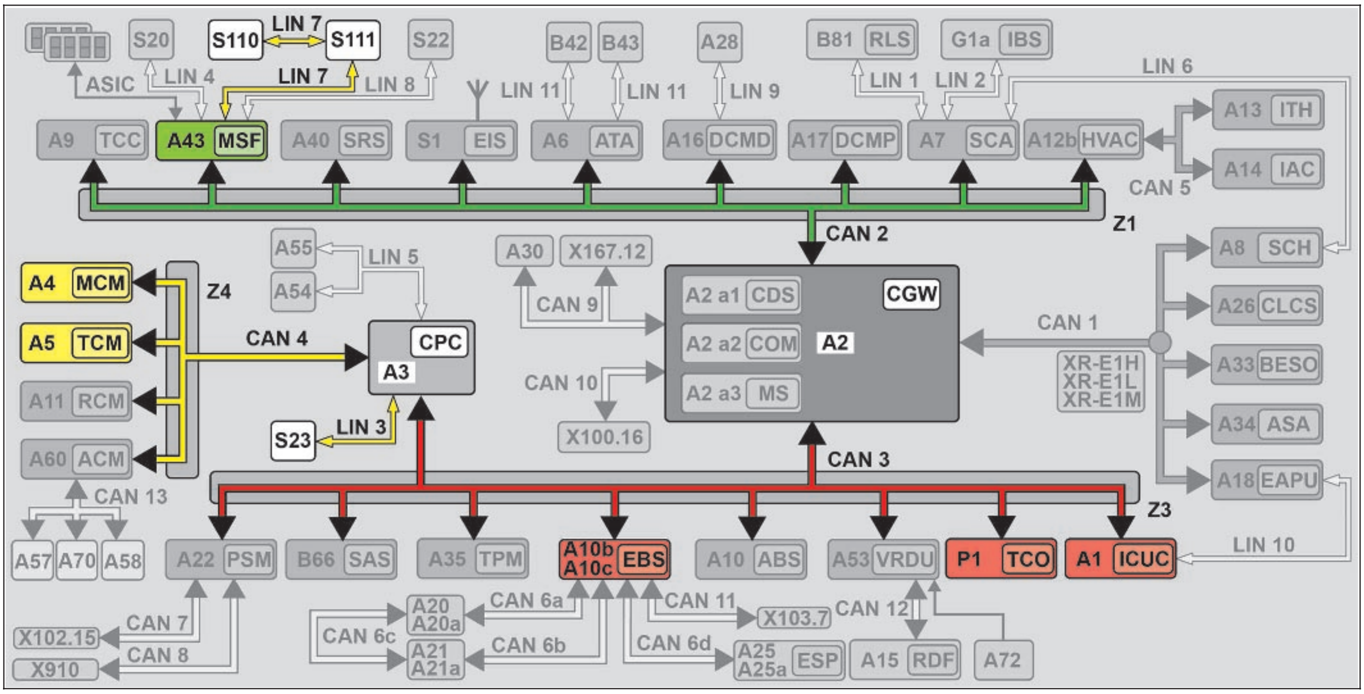
For transmission oil temperatures above 80°C the spring force of the spring closes the cooler protection valve (bypass). The transmission oil flows through the transmission cooler and is cooled by the airstream.

If the transmission oil temperature increases further, the transmission cooling fan (M19) located on the transmission cooler is switched on from 90°C over the SCA (SCA) control unit (A7).
For transmission oil temperatures below 80°C the spring opens the cooler protection valve. The transmission oil flows uncooled over the bypass back into the transmission.

i In the case of an excessively high transmission oil pressure the cooler and the transmission protection valve open and allow the oil to flow uncooled over a bypass back into the transmission.

	Overall network for transmission automation		**Page 40**
	Operation, function		**Page 41**
	Driver information, function		**Page 44**
	Transmission mode, function		**Page 45**
	Shifting the transmission, function		**Page 46**
	Controlling the clutch, function		**Page 52**
	Countershaft brake, function		**Page 54**

GF26.21-W-0002-01H	Overall network for transmission automation		



W26.00-1032-79

A1 *Instrument cluster (ICUC) control unit*

A2 *Central gateway control unit (CGW)*

A3 *Drive control (CPC) control unit*

A4 *Engine management control unit (MCM)*

A5 *Transmission control (TCM) control unit*

A10b *Electronic brake system (EBS) control unit*

A10c *Electronic brake system (EBS) control unit*

A43 *Modular switch panel (MSF) control unit*

CAN 2 *Interior CAN*

CAN 3 *Frame CAN*

CAN 4 *Drive train CAN*

LIN 3 *Multifunction control lever-LIN on the right*

LIN 7 *Button group LIN*

P1 *Tachograph (TCO)*

S23 *Right multifunction control lever*

S110 *Left multifunction steering wheel button group*

S111 *Right multifunction steering wheel button group*

Z1 *Cab instrument panel CAN bus star point*

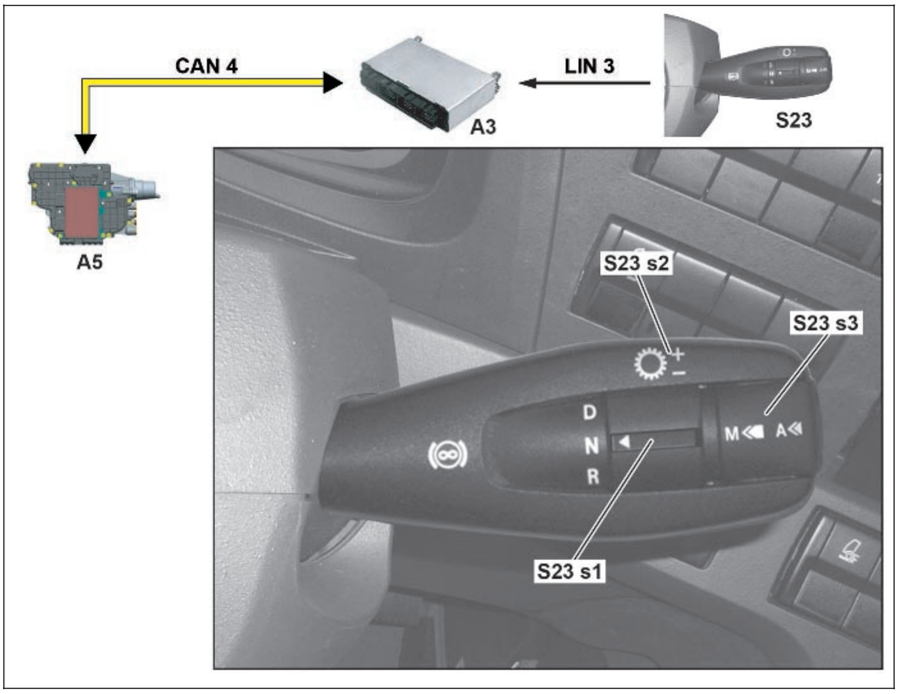
Z3 *Frame CAN bus star point*

Z4 *Drive CAN bus star point*

GF26.21-W-3003H	Operation, function	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3

A3	*Drive control (CPC) control unit*
A5	*Transmission control (TCM) control unit*
CAN 4	*Drive train CAN*
LIN 3	*Multifunction control lever-LIN on the right*
S23	*Right multifunction control lever*
S23s1	*Transmission position switch (D/N/R)*
S23s2	*Gearshift paddle (+/-)*
S23 s3	*Transmission mode (M/A) button*



W26.21-1119-06

Normal operation
The shift commands are recorded over in the integral controls in the RH multifunction control lever (S23):

- Transmission position (D/N/R) switch (S23 s1)
- Gearshift paddle (+/-) (S23 s2)
- Transmission mode (M/A) button (S23 s3)

The drive control (CPC) control unit (A3) reads in the shift signals from the RH multifunction control lever (S23) via the RH multifunction control lever LIN (LIN 3), evaluates them and sends appropriate CAN messages to the transmission (TCM) control unit (A5) via the drive train CAN (CAN 4).

Twelve forwards gears, 4 reverse gears and neutral can be engaged.

Automatic operation
(the optimal gear (the required gear specification) is determined by the drive control (CPC) control unit (A3))
Gear selection is dependent on the following influencing variables:

- Ground speed (only relevant for the start-off gear)
- Accelerator pedal position (specified torque)
- Load condition of engine
- Operating point of the target gear
- Starting speed of the transmission
- Operation of the permanent brake
- Load condition of the vehicle
- Shift program
- Lay of the land for the driving lane

Manual mode
Difference to automatic mode:

- The shifting operations must be initiated by the driver, that is the driver determines the shift point and shift direction.
- The kickdown function is not available.

Operation of the driving functions
The driving functions assist the driver in daily driving to drive with a more fuel economy. They increase the ride comfort and support him in difficult situations.

Selectable driving functions are:
- **EcoRoll mode**, in certain driving situations for supporting a fuel-saving driving style through automatic shifting into the transmission neutral position "N" when the accelerator is not actuated
- **Rocking mode,** for rocking the vehicle out of an off-road recess
- **Crawl mode,** for automatic starting moving when releasing the service brake and continued crawling without actuating the accelerator pedal.

EcoRoll mode
Preconditions
- EcoRoll function activated
- Ground speed was > 35 km/h and is > 25 km/h (hysteresis)
- Accelerator not operated
- Service brake or permanent brake not actuated
- Driver assistance systems not in control mode
- Brake assistant systems not in control mode
- Power take-off switched off
- Variable speed limiter maximum speed not exceeded
- CC speed tolerance not exceeded

Function sequence
If the pre-conditions are fulfilled then the drive control (CPC) control unit (A3) requests the neutral position from the transmission (TCM) control unit (A5) via the drive train CAN (CAN 4). The transmission (TCM) control unit (A5) actuates the transmission positioner (Y900) to open the clutch. After successful opening of the clutch, read in over the clutch position sensor (B503), the transmission positioner (Y900) is actuated to engage neutral. After ending the switching the transmission (TCM) control unit (A5) transmits the engaged neutral to the drive control (CPC) control unit (A3) via the drive train CAN (CAN 4).

i Based on the reduced engine speed a somewhat lower steering assist can occur and therefore greater steering forces in certain driving situations, for example on slightly curved downslopes. The operation or road safety is not endangered by this.

Crawl mode
The crawl function is always switched on after an engine start and is activated after first moving off.
The crawl function is deactivated under the following conditions:
- The crawl function is switched off over the IC (ICUC) control unit (A1)
- The transmission in neutral for longer than 2 s
- The parking brake is tightened
- The rocking mode is activated
- Driver assistance systems switch into control mode
- Idle speed > 700 rpm
- Threat of clutch overloading
- An excessively high air drag and rolling resistance
- An excessively high tire grip

i The crawl function is similar in its behavior to an automatic torque converter. Since the function is realized over the clutch the function is not wear-free and the vehicle in the slip range of the clutch is not capable of permanently crawling.

Function sequence
The crawl function consists of 2 parts:
- In gears 1 to 6, R1 and R2, self-actuated starting crawling by releasing the service brake (only for an active crawl function)
- In gears 1 to 6, R1 and R2 further crawling (=freewheeling) for a non-actuated accelerator pedal

The driving off dosing occurs for first driving off over the accelerator pedal. The system is taught in in the process to the torque prescribed by the driver. After the first "real" driving determination of the crawling torque depends on the determined vehicle mass and incline in the driving lane.

i If driving with a trailer is recognized over the trailer recognition the mass and incline dependent crawling torque is reset in the drive control (CPC) control unit (A3) and teaching in occurs again during first driving off.

Rocking mode
Function sequence
Rocking mode is activated over the rocking mode button (S938). If rocking mode has been activated the transmission control changes from automatic into manual mode.
Accelerator pedal requests are implemented more directly and the clutch is opened more rapidly for a non-actuated accelerator pedal. The clutch is closed quickly again as soon as the accelerator pedal is actuated again. Through repeated actuation and release of the accelerator pedal can put the vehicle into a rocking mode condition and in this way can rock the vehicle free out if a hollow.

Back-up mode

Back-up mode represents a last emergency function for engaging gears for a vehicle standstill. The operating commands for navigation are entered in the menu tree multifunction display (A1 p1) in the IC (ICUC) control unit (A1) over the LH multifunction steering wheel button group (S110) and the RH multifunction steering wheel button group (S111).
The modular switch panel (MSF) control unit (A43) reads in the switching commands from the LH multifunction steering wheel button group (S110) and the RH multifunction steering wheel button group (S111), evaluates them and transmits appropriate CAN messages via the interior CAN (CAN 2), the central gateway (CGW) control unit (A2) and the frame CAN (CAN 3) to the drive control (CPC) control unit (A3).

The drive control (CPC) control unit (A3) evaluates the switching request from the driver, determines the targeted gear to be switched and, for release, transmits appropriate CAN messages via the drive train CAN (CAN 4) to the transmission (TCM) control unit (A5).

The following switching positions can be selected in back-up mode:

- R (for reverse gear)
- N (for neutral)
- D1 (for 2nd gear)
- D2 (for 6th gear)
- Towing (for the towing mode)

The actuation of the clutch is controlled automatically as long as no malfunction is present. A malfunction would result in automatic clutch operation being disabled.

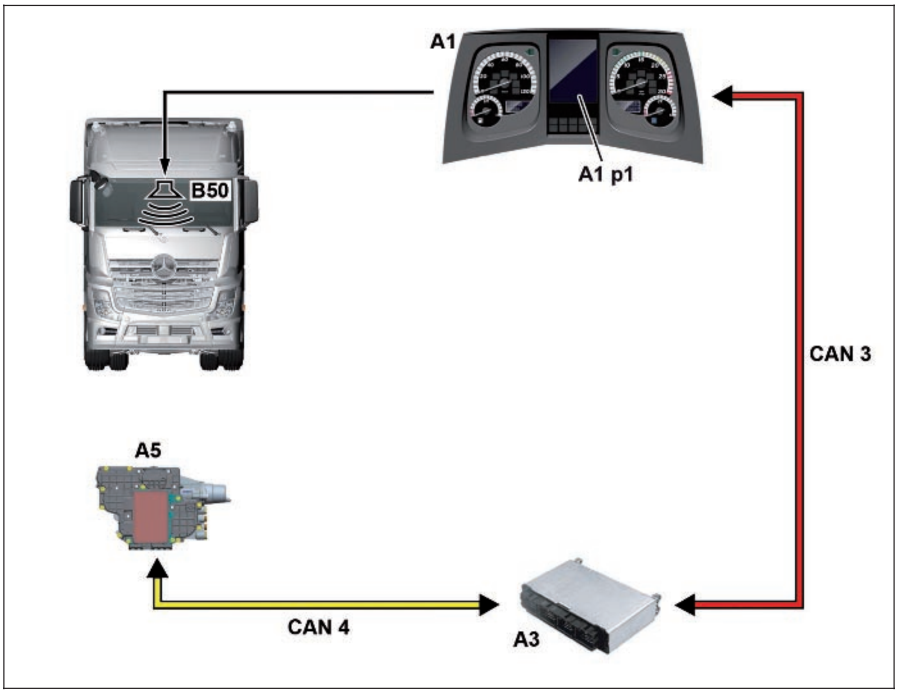
i If gear selection was not enabled, a shift to "neutral" is always enabled.

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Component description for central gateway control unit (CGW)	A2	**Page 333**
	Component description for drive control (CPC) control unit	A3	**Page 334**
	Component description for transmission control (TCM) control unit	A5	**Page 337**
	Component description for modular switch panel control unit (MSF)	A43	**Page 370**
	Component description for right multifunction control lever	S23	**Page 463**
	Component description for multifunction steering wheel	S110, S111	**Page 469**

GF26.21-W-3005H	Driver information, function	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3

A1 Instrument cluster (ICUC) control unit
A1 p1 Multifunction display
A3 Drive control (CPC) control unit
A5 Transmission control (TCM) control unit
B50 Center speaker
CAN 3 Frame CAN
CAN 4 Drive train CAN



W26.21-1118-76

Displaying shift status
The drive control (CPC) control unit (A3) transmits the information for indication of the switching condition to the IC (ICUC) control unit (A1) via the frame CAN (CAN 3).

To do this the transmission (TCM) control unit (A5) permanently transmits the CAN messages with information about the condition of the transmission (for example the engaged gear, the possible gear) to the drive control (CPC) control unit (A3) via the drive train CAN (CAN 4). Before execution of the shift operation the drive control (CPC) control unit (A3) transmits the targeted gear request (determined from the automatic gear selection or the gear selected by the driver) to the transmission (TCM) control unit (A5). The transmission (TCM) control unit (A5) transmits the confirmed targeted gear and the engaged current gear to the drive control (CPC) control unit (A3) .

The IC (ICUC) control unit (A1) receives the CAN messages and generates the following displays in the multifunction display (A1 p1):

- display of the direction of travel and / or the engaged gear
- display of the gearshift recommendation or to engaged gear
- display of the transmission mode

The previous display is retained during the shift operation. The current display only takes place when the shift operation is concluded.

i During the teach-in process appropriate CAN messages are transmitted with information for display of the active teach-in process. Also in back-up mode all CAN messages are transmitted, as in normal mode, via the drive control (CPC) control unit (A3) and the frame CAN (CAN 3) to the IC (ICUC) control unit (A1).

Emit warning tones acoustically
The transmission (TCM) control unit (A5) transmits CAN messages with information concerning the condition of the transmission (for example on the switched gear, the possible gear, temperature of the transmission oil) to the drive control (CPC) control unit (A3) via the drive train CAN (CAN 4).

The drive control (CPC) control unit (A3) decides over a warning emission to the driver. If a warning emission is necessary, the drive control (CPC) control unit (A3) transmits an appropriate CAN message with the information for output of warning tones to the IC (ICUC) control unit (A1) via the frame CAN (CAN 3).
The IC (ICUC) control unit (A1) receives the CAN messages from the drive control (CPC) control unit (A3) and generates acoustic messages whose output takes place over the center speaker (B50).

	Component description for instrument cluster control unit (ICUC)	A1	**Page 331**
	Component description drive control (CPC) control unit	A3	**Page 334**
	Component description for transmission control (TCM) control unit	A5	**Page 337**

GF26.21-W-3007H	Transmission mode, function	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3

General information
One can select between a manual transmission mode (manual operation) or an automatic transmission mode (automatic operation). In automatic operation there is a standard switching program (A) and either the shift program (A power) or the shift program
(A economy) available depending on the vehicle and transmission design.

Automatic transmission mode
The transmission automation is fitted with a standard shift program:

- **A**, with kickdown, accelerator pedal curve standard, CC standard, maximum speed of 89.8 km/h, function EcoRoll which can be switched off

The driving specific shift programs have the following significant properties:

- **A power**, switchings take place at an about 100 rpm higher rotational speed in comparison with a standard shift program and dynamic clutch matching for driving off
- **A economy**, no kickdown possible, EcoRoll cannot be switched off, maximum speed of 85 km/h, accelerator pedal curve and max. engine torque lowered, CC Softcruise

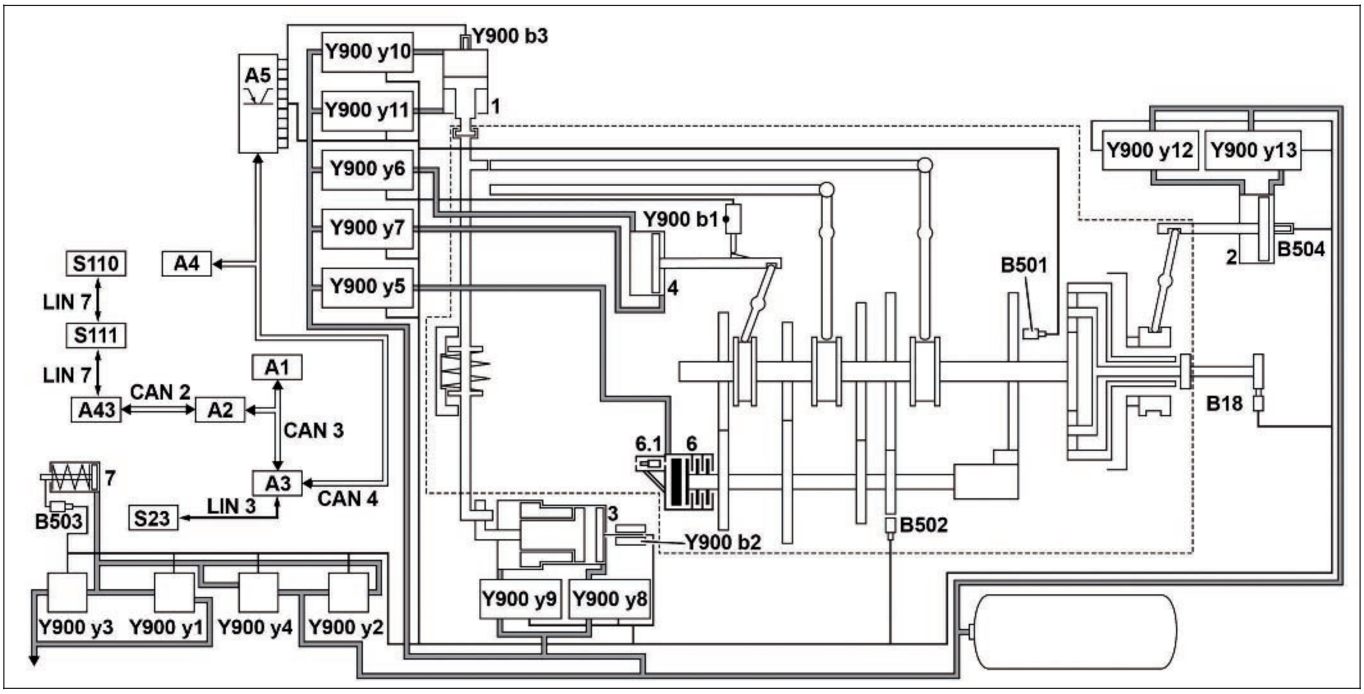
i Selection of the automatic transmission mode takes place over the transmission mode button (M/A) (S23 s3) on the RH multifunction control lever (S23).

Manual transmission mode
In manual transmission mode the shift operations are initiated by the driver over it. This means that the driver determines the shift point and the switching direction. The kickdown function is not available.

	Component description for right multifunction control lever	S23	**Page 463**

GF26.20-W-3007H	Shifting the transmission, function	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3



W26.21-1123-09

Schematic representation

1 *Gate cylinder*
2 *Range group shift cylinder*
3 *Gear cylinder*
4 *Splitter group shift cylinder*
6 *Countershaft brake*
6.1 *Mechanical vent valve*
7 *Pneumatic central clutch release bearing*

A1 *Instrument cluster (ICUC) control unit*
A2 *Central gateway control unit (CGW)*
A3 *Drive control (CPC) control unit*
A4 *Engine management (MCM) control unit*
A5 *Transmission control (TCM) control unit*
A43 *Modular switch panel (MSF) control unit*
B18 *Travel and speed sensor*
B501 *Main shaft rpm sensor*
B502 *Countershaft rpm sensor*
B503 *Clutch travel sensor*
B504 *Range group travel sensor*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
CAN 4 *Drive train CAN*
LIN 3 *Multifunction control lever-LIN on the right*
LIN 7 *Button group LIN*
S23 *Right multifunction control lever*
S110 *Left multifunction steering wheel button group*
S111 *Right multifunction steering wheel button group*

Y900 b1 *Splitter group travel sensor*
Y900 b2 *Gear cylinder travel sensor*
Y900 b3 *Gate cylinder travel sensor*
Y900 y1 *Clutch slow closing solenoid valve*
Y900 y2 *Clutch slow opening solenoid valve*
Y900 y3 *Clutch quick closing solenoid valve*
Y900 y4 *Clutch quick opening solenoid valve*
Y900 y5 *Countershaft brake solenoid valve*
Y900 y6 *'Extend' splitter group solenoid valve*
Y900 y7 *'Retract' splitter group solenoid valve*
Y900 y8 *'Extend' gear cylinder solenoid valve*
Y900 y9 *'Retract' gear cylinder solenoid valve*
Y900 y10 *'Extend' gate cylinder solenoid valve*
Y900 y11 *'Retract' gate cylinder solenoid valve*
Y900 y12 *'Retract' range group solenoid valve*
Y900 y13 *'Extend' range group solenoid valve*

1 General

The transmission control (TCM) control unit (A5) is, as the interface to the transmission, the central control electronics for shift operation of a gear and actuation of the clutch.
It controls the entire shift operation and in the process performs the following tasks:

- Switching the switching groups of the transmission
- Measuring and evaluating the shift status and operating condition of the transmission
- Measuring and evaluating the shift status and operating condition of the clutch
- Regulation and positioning of the clutch

2 CAN communication

The transmission control (TCM) control unit (A5) which is located above the overall network is in constant data exchange with other control units which provide switching relevant data.
It is in direct connection with the drive control (CPC) control unit (A3) and the engine management (MCM) control unit (A4) via the drive train CAN (CAN 4). Also requests from the transmission control (TCM) control unit (A5) to other control units (e.g. rotational speed requests to the engine) are transmitted via the drive train CAN (CAN 4).

3 Shifting the transmission

Actuation of the components cylinder valve gear extend solenoid (Y900 y8), gear cylinder retract solenoid valve (Y900 y9), splitter group extend solenoid valve (Y900 y6), splitter group retract solenoid valve (Y900 y7), range group retract solenoid valve (Y900 y12), range group extend solenoid valve (Y900 y13), gate cylinder extend solenoid valve (Y900 y10), gate cylinder retract solenoid valve (Y900 y11) takes place over electrical shift signals from the transmission control (TCM) control unit (A5).
The sequence of actuation is carried out as per a specified sequence corresponding to the gear to be shifted. The solenoid valves control the admission and release of air into/out of the working spaces of the associated gate shift cylinder (1), range group shift cylinder (2), gear cylinder (3) and splitter group shift cylinder (4). In the process their piston rods assume a defined position and operate the associated shift mechanism for shifting the splitter, range group, gear and gate.

3.1 Controlling the clutch

Actuation of the components clutch slow close solenoid valve (Y900 y1), clutch slow open solenoid valve (Y900 y2), clutch rapid close solenoid valve (Y900 y3), clutch rapid open solenoid valve (Y900 y4) occurs over electrical shift signals from the transmission control (TCM) control unit (A5).
The solenoid valves control the aeration and ventilation of the pneumatic central clutch release bearing (7). The pneumatic central clutch release bearing (7) opens or closes the clutch or regulates the clutch at a particular position.

3.2 Switch the range group

Condition: the neutral position of gear cylinder (3) was detected.
The range group is switched through actuation of the range group retract solenoid valve (Y900 y12) or the range group extend solenoid valve (Y900 y13).

3.3 Shifting the splitter group

The splitter group is switched through actuation of the splitter group extend solenoid valve (Y900 y6) or splitter group retract solenoid valve (Y900 y7).

3.4 Shifting the gate

The gate is switched through actuation of the gate cylinder retract solenoid valve (Y900 y11).

i There is a spring in the shift mechanism to reset the transmission shift rod. This ensures that there is the necessary return force present for a non- actuated gate cylinder retract solenoid valve (Y900 y11). The return force of the spring is also supported as required through actuation of the gate cylinder extended solenoid valve (Y900 y10).

3.5 Switch the gear

The gears are switched through actuation of the gate cylinder extend solenoid valve (Y900 y8) or the gate cylinder retract solenoid valve (Y900 y9). The shift operation starts from the neutral position.

i The rotational speed of the countershaft must be aligned with the rotational speed of the main shaft before switching the gear. This occurs for upshifting through actuation of the countershaft brake solenoid valve (Y900 y5) as well as for downshifting through raising the engine speed for a closed clutch.

3.6 Shifting gears in towing mode

Towing mode is only possible in back-up mode and if the electrical and pneumatic components are functioning correctly. Towing mode comprises automatic shifting of the high-speed range group and of the neutral position.

4 Detecting the shift status and operating condition of the transmission

To monitor the shift status and operating condition of the transmission, the following sensors are read in by the transmission (TCM) control unit (A5):

- Travel and speed sensor (B18)
- Main shaft rpm sensor (B501)
- Countershaft rpm sensor (B502)
- Clutch travel sensor (B503)
- Range group travel sensor (B504)
- Transmission oil temperature sensor (B505)
- Splitter group travel sensor (Y900 b1)
- Gear cylinder travel sensor (Y900 b2)
- Gate cylinder travel sensor (Y900 b3)

The travel and speed sensor (B18) detects the rotational speed of the transmission output shaft over Hall sensors.
The main shaft rpm sensor (B501) detects the rotational speed and the direction of rotation of the main shaft over Hall sensors.
The countershaft rpm sensor (B502) detects the rotational speed of the countershaft over Hall sensors.
The clutch travel sensor (B503) detects the release travel of the clutch.
The range group travel sensor (B504) detects the position of the range group shift cylinder (2) over a tappet.
The transmission oil temperature sensor (B505) records the temperature of the transmission oil.
The splitter group travel sensor (Y900 b1) indirectly detects the position of the splitter group shift cylinder (4) over a bias attached to the side on the shift fork.
The gear cylinder travel sensor (Y900 b2) and gate cylinder (Y900 b3) detects the position of the piston rods for the shift cylinder for the switching groups and internally generates a pulse width modulated (PWM) signal, which is proportional to the release travel of the piston rod of the shift cylinder.

4.1 Evaluating the shift status and operating condition of the transmission

The transmission (TCM) control unit (A5) determines the shift status and operating condition of the transmission from the sensor signals.
Together with other data relevant to shifts it performs further evaluations, such as monitoring the shiftability of the desired gear. This information is transmitted via the drive train CAN (CAN 4) to the drive control (CPC) control unit (A3) which requests a targeted gear from the transmission (TCM) control unit (A5). The transmission (TCM) control unit (A5) ensures rapid synchronization of the rotational speeds and engaging of the desired gear through actuation of the solenoid valves for the respective cylinder. The engaged current gear is transmitted by the transmission (TCM) control unit (A5) to the drive control (CPC) control unit (A3).
The drive control (CPC) control unit (A3) makes the CAN message available on the frame CAN (CAN 3) or evaluates this itself.

---

5 Measuring and evaluating the shift status and operating condition of the clutch

The clutch travel sensor (B503) detects the position of the pneumatic central clutch release bearing (7) and internally generates a pulse width modulation signal for further evaluation.
The transmission (TCM) control unit (A5) reads in the signal of the clutch travel sensor (B503), evaluates this and therefore continuously detects the switching and operating condition of the clutch.
An integral clutch regulation in the transmission (TCM) control unit (A5) determines the optimal clutch position according to this information. Through actuation of the solenoid valves for the clutch operation the clutch position is set and reports back the drive control (CPC) control unit (A3). Requests to the engine to set the rotational speed and torque is transmitted fitting to the clutch position.

---

6 Upshift gear change sequence

6.1 From an odd gear after an even gear (for example 1st to 2nd gear)

1. Reduction of the engine torque
2. Open clutch and relax drivetrain
3. Splitter group switches over
4. Close clutch
5. Build up the engine torque again

6.2 From an even gear after an odd gear (for example 2nd to 3rd gear)

1. Reduction of the engine torque
2. Open clutch and relax drivetrain
3. Take out of gear (neutral)
4. Splitter group switches over
5. Actuate countershaft brake (braking the countershaft for speed compensation between the reduction gearbox shaft and main shaft)
6. Engage gear
7. Close clutch
8. Build up the engine torque again

---

i For upshifting from 6th to 7th gear the range group is engaged in addition to switching of the speed gear and the splitter group.

7 Downshift gear change sequence

7.1 From an even gear after an odd gear (for example 3rd to 2nd gear)

1. Reduction of the engine torque
2. Open clutch and relax drivetrain
3. Take out of gear (neutral)
4. Splitter group switches over
5. Actaute countershaft brake (braking the countershaft for speed compensation between the reduction gearbox shaft and main shaft)
7. Engage gear
8. Close clutch
6. Build up the engine torque again

i For downshifting from 7th to 6th gear the range group is engaged in addition to switching of the speed gear and the splitter group.

7.2 From an odd gear after an even gear (for example 8th to 7th gear)

1. Reduction of the engine torque
2. Open clutch and relax drivetrain
3. Splitter group switches over
4. Close clutch
5. Build up the engine torque again

8 Starting off

To start off the transmission (TCM) control unit (A5) receives information from the drive control (CPC) control unit (A3) about the accelerator pedal position and appropriately controls the closing process of the clutch. The engine is loaded through a closing process of the clutch and this builds up a respective engine torque. The transmission (TCM) control unit (A5) also monitors at the same time to ensure that the engine is not overloaded.

If there is threat of overloading the transmission (TCM) control unit (A5) opens the clutch slightly.

In the case of difficult startoffs, for example for high weights and when on a slope the transmission (TCM) control unit (A5) makes the request to the engine management (MCM) control unit (A4) to increase the engine speed to make it possible to start off.

9 Engine torque adaptation for switching

The engine torque must be reduced or built up again before and after the switching. In this process the transmission (TCM) control unit (A5) ensures a rapid but vibration suppressing reduction and build up on the basis of information from the drive control (CPC) control unit (A3) and the engine management (MCM) control unit (A4). This reduction and build up of the torque takes place adapted to the situation and sometimes sounds like "revving up".

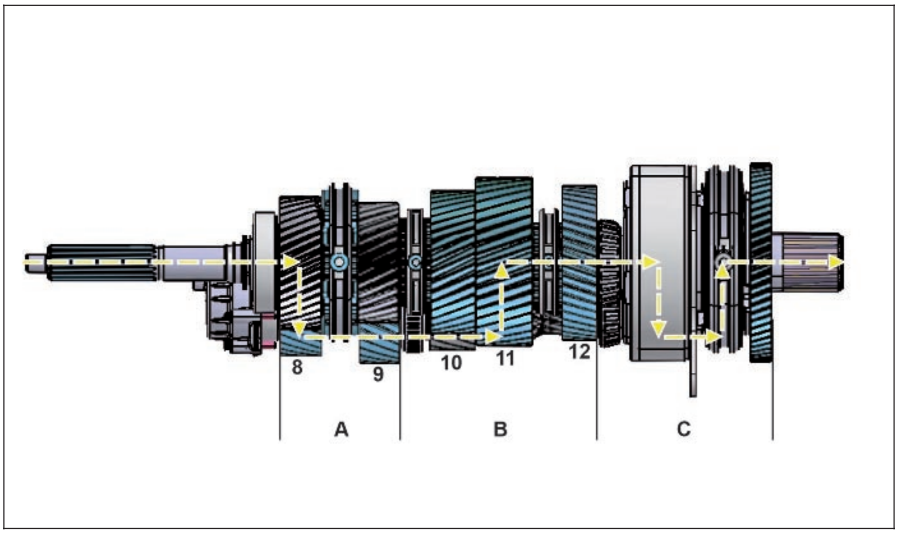
10 Torque curves

Shown: Torque curve for 1st gear on transmission 715.352/371

8 Constants 1
9 Constants 2
10 2nd speed gear
11 1st speed gear
12 Reverse gear wheel

A Splitter group (splitter group)
B Main group
C Range group (range group)

The torque of the engine is transmitted by the drive shaft over constants 1 (8) of the splitter group (A) onto the countershaft.
It is transmitted further over the engaged 1st speed gear (11) onto the main shaft and further over the planetary gear of the range group (C) on the transmission output shaft.



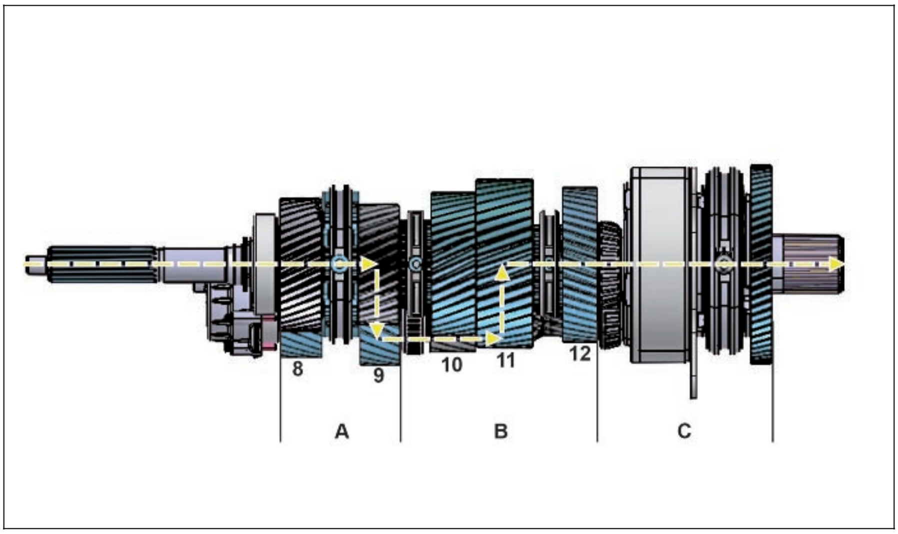
W26.60-1296-75

Shown: torque curve for 8th gear on transmission 715.352/371

8 Constants 1
9 Constants 2
10 2nd speed gear
11 1st speed gear
12 Reverse gear wheel

A Splitter group (splitter group)
B Main group
C Range group (range group)

The torque of the engine is transmitted by the drive shaft over constants 2 (9) of the splitter group (A) onto the countershaft.
It is transmitted further over the engaged 1st speed gear (11) onto the main shaft and directly further onto the transmission output shaft.



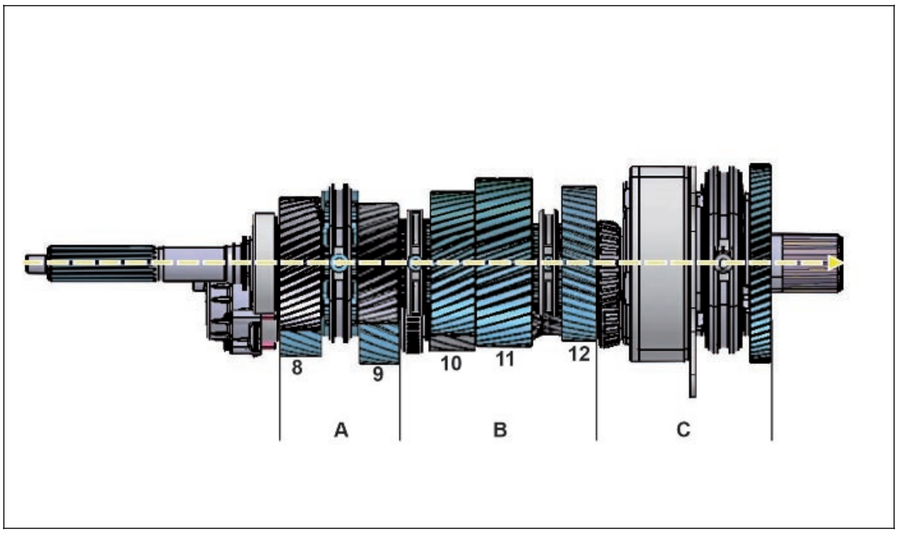
W26.60-1298-75

Shown: Torque curve for 12th gear on transmission 715.352/371

8 Constants 1
9 Constants 2
10 2nd speed gear
11 1st speed gear
12 Reverse gear wheel

A Splitter group (splitter group)
B Main group
C Range group (range group)

The engine torque is transmitted from the drive shaft directly onto the main shaft and directly further onto the transmission output shaft.
No gear ratio takes place between the transmission input shaft and the transmission output shaft.



W26.60-1297-75

11 Assignment of the actuated solenoid valves (MV) to the engaged gear during the switching (G211, G281)

Transmission 715.352 (G 211)					Transmission 715.371 (G 281)				
Indication in the multi-function display (A1 p1)	**mV Splitter group**	**mV Gear cylinder**	**mV Gates cylinder**	**MV range group**	**Indication in the multi-function display (A1 p1)**	**mV Splitter group**	**mV Gear cylinder**	**mV Gates cylinder**	**MV range group**
1	Y900 y6	Y900	-	Y900 y12	1	Y900 y6	Y900 y9	-	Y900 y12
2	Y900 y7	Y900 y9	-	Y900 y12	2	Y900 y7	Y900 y9	-	Y900 y12
3	Y900 y6	Y900 y8	Y900 y11	Y900 y12	3	Y900 y6	Y900 y8	Y900 y11	Y900 y12
4	Y900 y7	Y900 y8	Y900 y11	Y900 y12	4	Y900 y7	Y900 y8	Y900 y11	Y900 y12
5	Y900 y6	Y900 y9	Y900 y11	Y900 y12	5	Y900 y6	Y900 y9	Y900 y11	Y900 y12
6	Y900 y7	Y900 y9	Y900 y11	Y900 y12	6	Y900 y7	Y900 y9	Y900 y11	Y900 y12
7	Y900 y6	Y900 y9	-	Y900 y13	7	Y900 y6	Y900 y9	-	Y900 y13
8	Y900 y7	Y900 y9	-	Y900 y13	8	Y900 y7	Y900 y9	-	Y900 y13
9	Y900 y6	Y900 y9	Y900 y11	Y900 y13	9	Y900 y6	Y900 y9	Y900 y11	Y900 y13
10	Y900 y7	Y900 y8	Y900 y11	Y900 y13	10	Y900 y7	Y900 y8	Y900 y11	Y900 y13
11	Y900 y6	Y900 y9	Y900 y11	Y900 y13	11	Y900 y6	Y900 y9	Y900 y11	Y900 y13
12	Y900 y7	Y900 y9	Y900 y11	Y900 y13	12	Y900 y7	Y900 y9	Y900 y11	Y900 y13
R1	Y900 y6	Y900 y8	-	Y900 y12	R1	Y900 y6	Y900 y8	-	Y900 y12
R2	Y900 y7	Y900 y8	-	Y900 y12	R2	Y900 y7	Y900 y8	-	Y900 y12
R3	Y900 y6	Y900 y8	-	Y900 y13	R3	Y900 y6	Y900 y8	-	Y900 y13
R4	Y900 y7	Y900 y8	-	Y900 y13	R4	Y900 y7	Y900 y8	-	Y900 y13
N1	-	Y900 y8, Y900 y9	-	Y900 y12	N1	-	Y900 y8, Y900 y9	-	Y900 y12
N2	-	Y900 y8, Y900 y9	-	Y900 y13	N2	-	Y900 y8, Y900 y9	-	Y900 y13

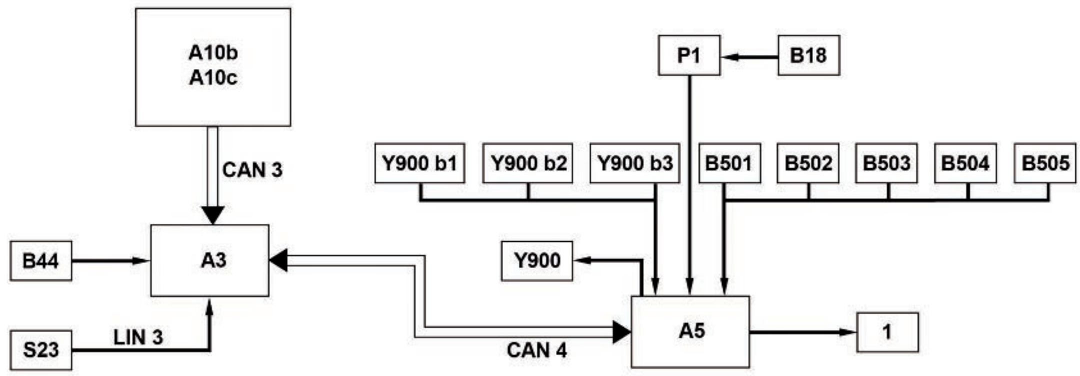
12 **Assignment of the actuated solenoid valves (MV) to the engaged gear during the switching (G330)**

Transmission 715.381 (G330)				
Indication in the multi-function display (A1 p1)	**mV Splitter group**	**mV Gear cylinder**	**mV Gates cylinder**	**MV range group**
1	Y900 y7	Y900 y9	-	Y900 y12
2	Y900 y6	Y900 y9	-	Y900 y12
3	Y900 y7	Y900 y8	Y900 y11	Y900 y12
4	Y900 y6	Y900 y8	Y900 y11	Y900 y12
5	Y900 y7	Y900 y9	Y900 y11	Y900 y12
6	Y900 y6	Y900 y9	Y900 y11	Y900 y12
7	Y900 y7	Y900 y9	-	Y900 y13
8	Y900 y6	Y900 y9	-	Y900 y13
9	Y900 y7	Y900 y9	Y900 y11	Y900 y13
10	Y900 y6	Y900 y8	Y900 y11	Y900 y13
11	Y900 y7	Y900 y9	Y900 y11	Y900 y13
12	Y900 y6	Y900 y9	Y900 y11	Y900 y13
R1	Y900 y7	Y900 y8	-	Y900 y12
R2	Y900 y6	Y900 y8	-	Y900 y12
R3	Y900 y7	Y900 y8	-	Y900 y13
R4	Y900 y6	Y900 y8	-	Y900 y13
N1	-	Y900 y8, Y900 y9	-	Y900 y12
N2	-	Y900 y8, Y900 y9	-	Y900 y13

	Component description for instrument cluster control unit (ICUC)	A1	**Page 331**
	Component description drive control (CPC) control unit	A3	**Page 334**
	Component description for engine management (MCM) control unit	A4	**Page 335**
	Component description for transmission control (TCM) control unit	A5	**Page 337**
	Component description for travel and speed sensor	B18	**Page 408**
	Component description for main shaft rpm sensor	B501	**Page 431**
	Component description for countershaft rpm sensor	B502	**Page 432**
	Component description for clutch travel sensor	B503	**Page 433**
	Component description for range group travel sensor	B504	**Page 434**
	Component description for transmission oil temperature sensor	B505	**Page 435**
	Component description for transmission positioner	Y900	**Page 492**
	Component description for pneumatic central clutch release bearing		**Page 499**
	Component description for range group module		**Page 501**

GF26.21-W-3010H	Controlling the clutch, function	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3



W26.21-1122-09

1	*Pneumatic central clutch release bearing*	*B18*	*Travel and speed sensor*	*CAN 4*	*Drive train CAN*
A3	*Drive control (CPC) control unit*	*B44*	*Accelerator pedal sensor*	*LIN 3*	*Multifunction control lever-LIN on the right*
A5	*Transmission control (TCM) control unit*	*B501*	*Main shaft rpm sensor*	*P1*	*Tachograph (TCO)*
A10b	*Electronic Brake Control (EBS) control unit (Wabco)*	*B502*	*Countershaft rpm sensor*	*S23*	*Right multifunction control lever*
A10c	*Electronic Brake Control (EBS) control unit (Knorr)*	*B503*	*Clutch travel sensor*	*Y900*	*Transmission positioner*
		B504	*Range group travel sensor*	*Y900 b1*	*Splitter group travel sensor*
		B505	*Transmission oil temperature sensor*	*Y900 b2*	*Gear cylinder travel sensor*
		CAN 3	*Frame CAN*	*Y900 b3*	*Gate cylinder travel sensor*

General information
For transmission automation the clutch is controlled automatically. This control is integrated in the transmission (TCM) control unit (A5). In this process detection, processing and passing on of all necessary data for the clutch control is realized. The following functions are contained in the clutch control:

- Driving off, driving and stopping function: here all processes are calculated and controlled which are needed for reducing and building up the torque of the clutch.
- Crawl function: here all processes are calculated and controlled which concerns regulation of the clutch and crawling from a standstill and freewheeling.
- Anti Jerking Control: here all processes are calculated and controlled based on drivetrain model which realizes the building up and reduction of the engine before and after shift operation as smoothly and as quickly as possible.
- Clutch properties: here all data concerning the properties of the clutch are gathered, evaluated and made available to other software functions. To do this the characteristic of the transferable torque is relevant about the actuation travel of the clutch, as well as the engagement point and the temperature behavior of the clutch.
- Clutch operation: here the determined clutch position specified values are implemented in the solenoid actuations and regulates on the basis of the measured clutch sensor values.

i The function of the automated clutch control is achieved for the given conditions, also in back-up mode.

Information from other control units and sensors is also read in and processed in the transmission (TCM) control unit (A5):

These include:

- Electronic Brake Control (EBS) control unit (A10b, A10c): speed and activity information, for example: brake regulating system, wheel speeds on the front and rear axle, brake actuation
- Transmission (TCM) control unit (A3): for example accelerator pedal sensor (B44), multifunction control lever on the right (S23)

- Main shaft rpm sensor (B501)
- Countershaft rpm sensor (B502)
- Clutch travel sensor (B503)
- Range group travel sensor (B504)
- Transmission oil temperature sensor (B505)
- Splitter group travel sensor (Y900 b1)
- Gear cylinder travel sensor (Y900 b2)
- Gate cylinder travel sensor (Y900 b3)
- Travel and speed sensor (B18)

Actuation of the clutch

The clutch operator takes over calculation of the set variables for actuating the clutch.
The transmission (TCM) control unit (A5) directly actuates the solenoid valves for operation of the clutch over integral output stages:

- Slowly close clutch solenoid valve (Y900 y1)
- Slowly open clutch solenoid valve (Y900 y2)
- Quickly close clutch solenoid valve (Y900 y3)
- Quickly open clutch solenoid valve (Y900 y4)

i The solenoid valves for operation of the pneumatic central clutch release bearing (1) are integrated in the transmission positioner (Y900).

If clutch solenoid valve open slowly (Y900 y2) or clutch solenoid valve open quickly (Y900 y4) is actuated the pneumatic central clutch release bearing (1) has compressed air applied to it over the transmission positioner (Y900) and the clutch opens.

i The pneumatic central clutch release bearing is located concentrically around the transmission input shaft.

The clutch regulation monitors opening and closing of the clutch over the sensor connector position (B503) directly read in by the transmission (TCM) control unit (A5).

	Component description drive control (CPC) control unit	A3	**Page 334**
	Component description for transmission control (TCM) control unit	A5	**Page 337**
	Component description for Electronic Brake Control control unit (EBS)	A10b, A10c	**Page 341**
	Component description for travel and speed sensor	B18	**Page 408**
	Component description for main shaft rpm sensor	B501	**Page 431**
	Component description for countershaft rpm sensor	B502	**Page 432**
	Component description for clutch travel sensor	B503	**Page 433**
	Component description for range group travel sensor	B504	**Page 434**
	Component description for transmission oil temperature sensor	B505	**Page 435**
	Component description for tachograph (TCO)	P1	**Page 459**
	Component description for transmission positioner	Y900	**Page 492**
	Component description for pneumatic central clutch release bearing		**Page 499**

GF26.50-W-3010H	Countershaft brake, function	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3

General information

For upshifting the countershaft must be braked for rpm compensation between the countershaft and main shaft. The rotational speeds are reported over the countershaft rpm sensor (B502) and the main shaft rpm sensor (B501) to the transmission (TCM) control unit (A5) so that the brake application can be exactly regulated by the transmission (TCM) control unit (A5). For regulation the countershaft brake solenoid valve (Y900 y5) is actuated appropriately.

That is it is possible to change several times between a brake position and release position during a brake application until the rpm between the countershaft and main shaft is compensated.

A distinction is made between two function positions of the countershaft brake:

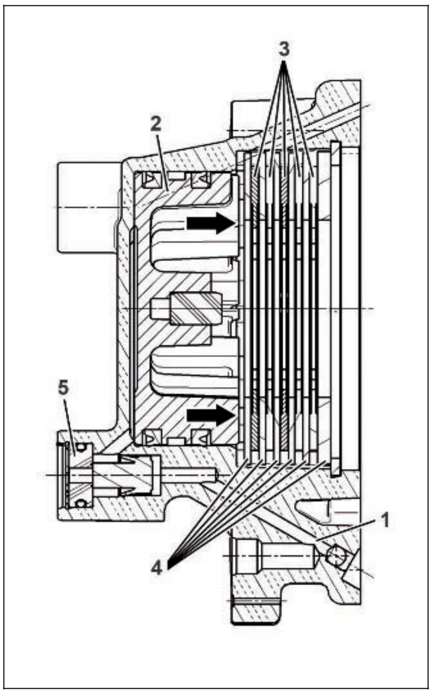
- Brake position
- Release position

Brake position of countershaft brake

1 *Compressed air duct*
2 *Piston*
3 *Internally toothed plates*
4 *Externally toothed plates*
5 *Rapid exhaust valve*

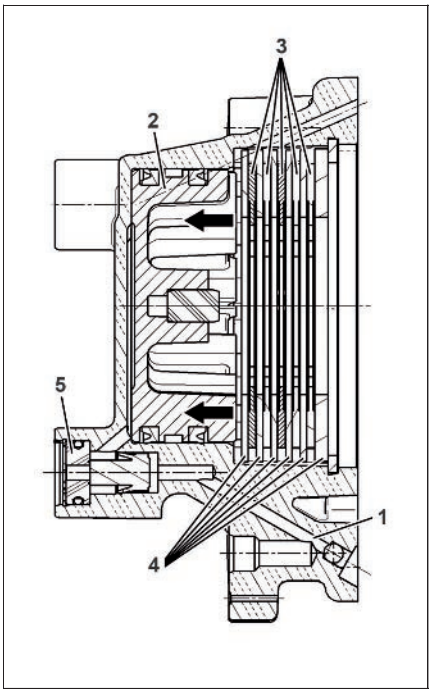
Arrow *Brake position*

If during upshifting rpm reduction of the countershaft is requested by the transmission (TCM) control unit (A5) the countershaft brake solenoid valve (Y900 y5) is actuated. The compressed air is controlled over a line from the transmission positioner (Y900) to the transmission housing front section and from there through the compressed air duct (1) into the cover on the front side of the piston (2); the mechanical quick vent valve (5) also closes. The air pressure operates on the piston (2) which presses together the internal plates (3) and the external plates (4) and thus brakes the countershaft.



W26.60-1299-03

Release position of countershaft brake



W26.60-1300-03

1 *Compressed air duct*
2 *Piston*
3 *Internally toothed plates*
4 *Externally toothed plates*
5 *Rapid exhaust valve*

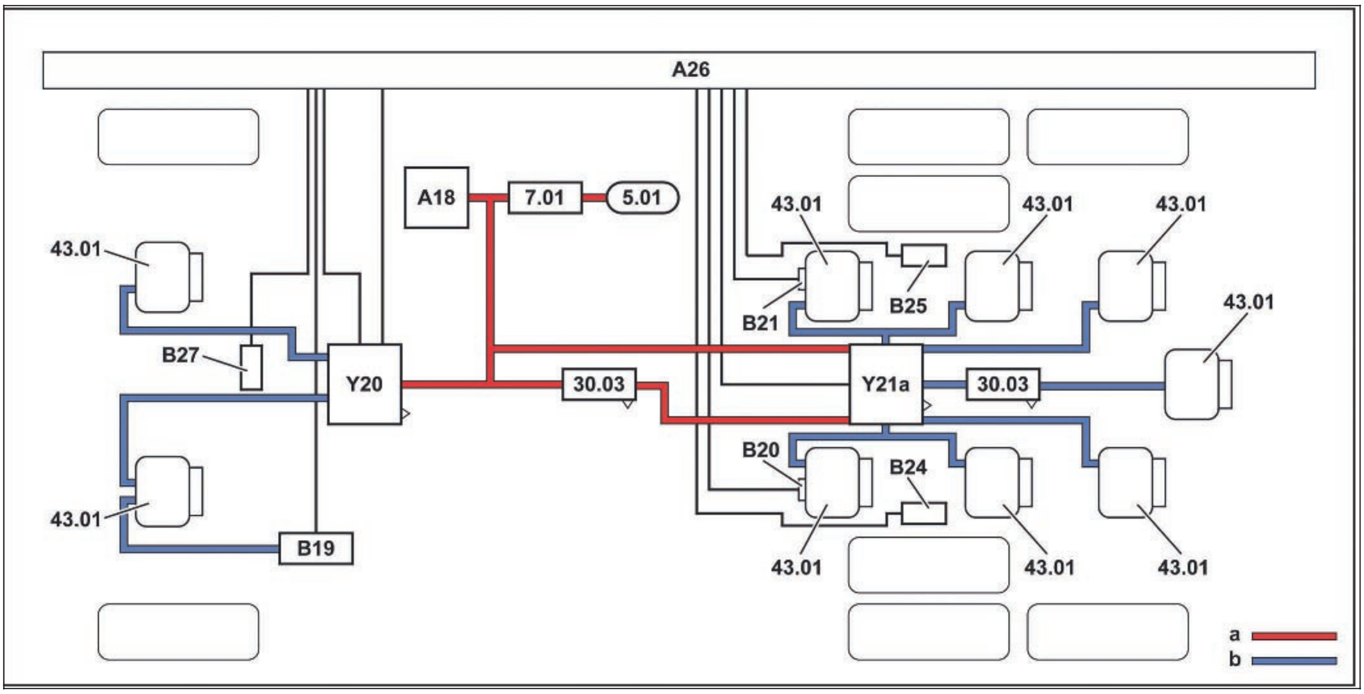
Arrow Release position

If the rpm between the countershaft and main shaft is compensated or the rpm of the countershaft drop too severely, the countershaft brake solenoid valve (Y900 y5) is no longer actuated.
After the countershaft brake solenoid valve (Y900 y5) is switched off the space upstream of the piston (2) is ventilated compressed air duct (1) and as a result the opens the mechanical quick vent valve (5) and ventilates the space upstream of the piston (2) suddenly.
The centrally located spring-loaded reset pin pushes the piston (2) into the rest position. The internal plates (3) and the external plates (4) are relieved of load. The countershaft can turn again freely.

	Component description for transmission control (TCM) control unit	A5	**Page 337**
	Component description for main shaft rpm sensor	B501	**Page 431**
	Component description for countershaft rpm sensor	B502	**Page 432**
	Component description for transmission positioner	Y900	**Page 492**

GF32.33-W-0006H	Level control function	2.8.11

MODEL 963



W32.33-2039-79

Shown: wheel configuration 6x2 with a single-tired trailing axle

5.01	*Compressed air reservoir*	*A26*	*Level control (CLCS) control unit*	*Y20*	*Front axle level control valve unit*
7.01	*Overflow valve with return flow*	*B19*	*Front axle pressure sensor*	*Y21a*	*Level control valve unit, 3-axle vehicles*
30.03	*Pressure limiting valve with vent*	*B20*	*Left driven axle pressure sensor*		
43.01	*Sleeve air spring*	*B21*	*Right driven axle pressure sensor*		
		B24	*Left driven axle position sensor*	*a*	*System pressure*
A18	*Electronic Air Processing Unit (EAPU) control unit*	*B25*	*Right driven axle position sensor*	*b*	*Air spring bellows pressure*
		B27	*Front axle position sensor*		

General information

For air-sprung vehicles in driving mode the level control (CLCS) monitors the frame height and holds this constant at a parameterized specified level. For stationary vehicles the frame height can be held constant during loading or unloading of the vehicle.

The level control (CLCS) primarily consists of the following major components:

- Level control (CLCS) control unit (A26)
- Front axle level control valve unit (Y20) (for full air suspension)
- Level control valve unit for 2-axle vehicles (Y21) or level control valve unit for 3-axle vehicles (Y21a)
- Level control operating unit (S22)
- Front axle pressure sensor (B19) (for full air suspension)
- Left drive axle pressure sensor (B20)
- Right drive axle pressure sensor (B21)
- Left drive axle position sensor (B24)
- Right drive axle position sensor (B25)
- Front axle position sensor (B27) (for full air suspension)

Using the level control operating unit (S22) the vehicle frame at the rear and full air suspension at the front can be individually adjusted for height for example for loading and unloading processes. One further operating unit which is mounted in the body of the vehicle is offered as special equipment. Furthermore the functions of the level control can be actuated over the transmitter key (S953) version Multi-Function.

The level control operating unit (S22) is fitted with two memory keys over which any desired number of frame heights can be stored.

A height of the vehicle frame individually set through manual lifting or lowering or according to selection of a stored frame height is held for a maximum of 60 min for a switched off ignition.

Function

Level regulation (CLCS) is calibrated ex works to a frame height (driving level) established according to vehicle type.
For vehicles with a low frame height (vehicles with a low jounce travel due to the construction) a second level (level 2) can be selected manually apart from the normal level (level 1).

The LH drive axle position sensor (B24) and the RH drive axle position sensor (B25), as well as full air suspension the front axle position sensor (B27) permanently report the distance between the frame and axle on the level control (CLCS) control unit (A26).

The level control (CLCS) control unit (A26) evaluates these signals and actuates the level control valve unit for 2-axle vehicles (Y21) or the level control valve unit for 3-axle vehicles (Y21a) on the drive axle as well as the front axle level control valve unit (Y20) for full air suspension to maintain the specified level. The valve units ventilate or aerate the air spring bellows on the axles.

If the level control (CLCS) control unit (A26) recognizes reaching of the specified level base on signals from the LH drive axle position sensor (B24) and the LH drive axle position sensor (B25) as well as the front axle position sensor (B27) for full air suspension recognizes reaching of the specified level it actuates the level control valve unit for 2-axle vehicles (Y21) or the level control valve unit for 3-axle vehicles (Y21a) at the drive axle as well as the front axle level control valve unit (Y20) for full air suspension. The air spring bellows for the axles are no longer aerated or ventilated.

Additional functions

The level control (CLCS) control unit (A26) also takes over the following additional functions:

- roll control
- axle load measuring device
- monitoring the fifth-wheel coupling
- starting-off aid
- the 2nd driving level
- external activation (2nd operating unit)

Functions

Roll control
The roll control (WR) serves to adapt the chassis damping in a targeted manner to the respective driving situation and is only available for air-sprung vehicles since the functionality is stored in the level control (CLCS) control unit (A26).

Axle load measuring device
The level control (CLCS) control unit (A26) determines the axle load in combination with the special equipment the axle the load measuring device and allows calling up of the single axle loads and the total vehicle weight in the multifunction display (A1 p1) of the IC (ICUC) control unit (A1).

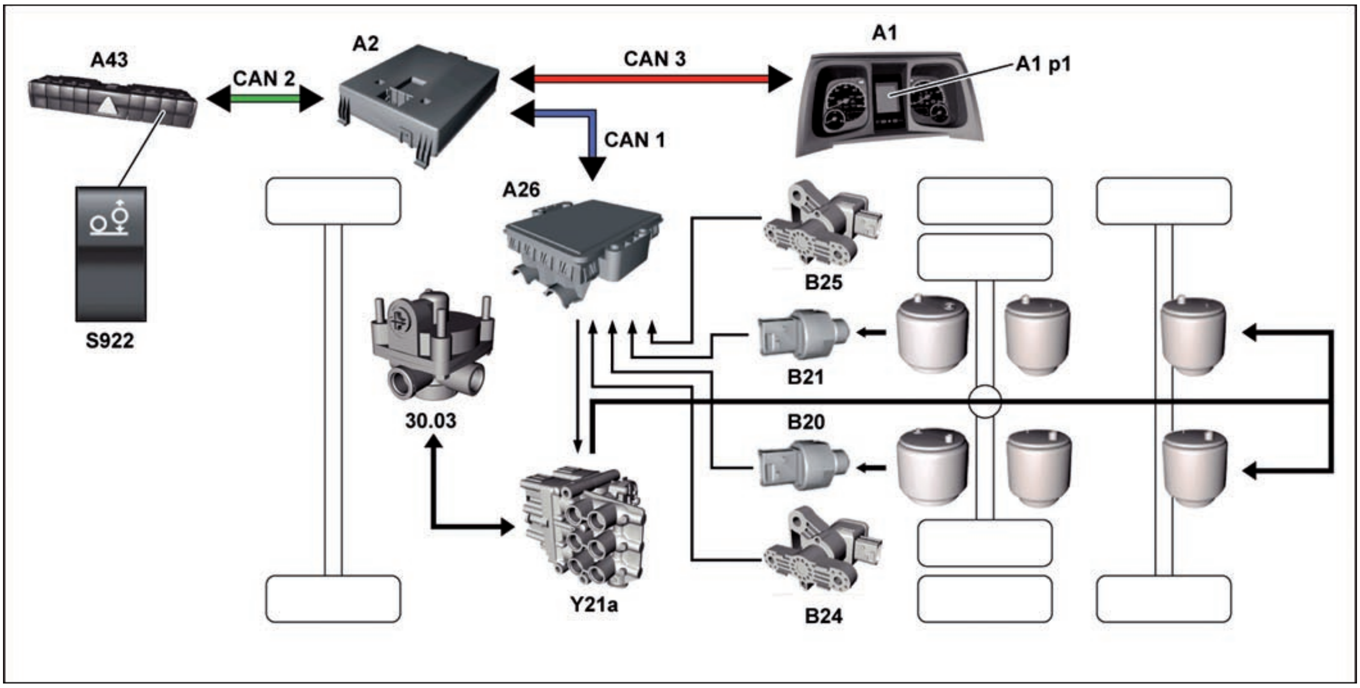
Monitoring of the fifth wheel coupling
A sensor in the fifth wheel coupling determines the distance to the kingpin or the semitrailer plate with the aid of proximity switches which react to changes in magnetic flow due to approaching of metal. The level control (CLCS) control unit (A26) also checks the connection condition over a dry reed contact.

Starting-off aid
The starting-off aid is a legally permissible traction aid, with which the axle load of the drive axle may be exceeded by a set value. The switching on period of the starting-off aid is, however, temporally dependent on the country or speed-dependent.

2nd driving level
For vehicles with a lower frame height the driver can select between two frame heights to improve the suspension comfort.

External activation
One further operating unit which is mounted in the body of the vehicle is offered as special equipment. It is also possible to use this to operate for a switched off ignition (activation over operation of the stop button for more than 2 s). Furthermore the functions of the level control can be actuated over the transmitter key (S953) version Multi-Function.

GF32.33-W-0006-02H	Overall network level control		

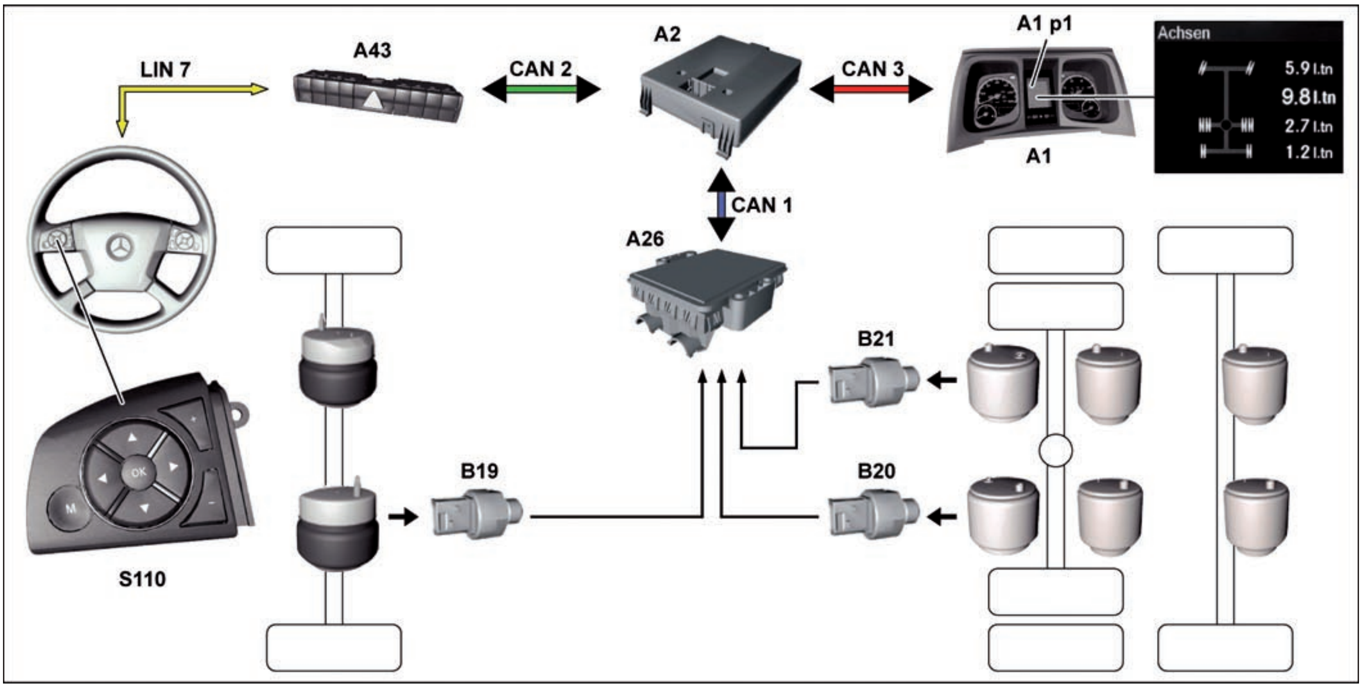


W32.33-2040-79

A1	*Instrument cluster (ICUC) control unit*
A2	*Central gateway control unit (CGW)*
A10b	*Electronic Brake Control (EBS) control unit (Wabco)*
A10c	*Electronic Brake Control (EBS) control unit (Knorr)*
A18	*Electronic Air Processing Unit (EAPU) control unit*
A25	*Electronic Stability Program (control unit (ESP®) (Wabco)*
A25a	*Electronic Stability Program (control unit (ESP®) (Knorr)*
A26	*Level control (CLCS) control unit*
A43	*Modular switch panel (MSF) control unit*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
CAN 6d	*ESP® brakes CAN*
LIN 8	*Level control LIN*
LIN 7	*Button group LIN*
LIN 10	*EAPU-LIN*
S22	*Level control operating unit*
S110	*Left multifunction steering wheel button group*
S111	*Right multifunction steering wheel button group*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*

GF32.33-W-2003H	Axle load measuring system, function	2.8.11

MODEL 963 with CODE (J3Z) Axle load measuring device



W32.33-2044-79

Shown: wheel configuration 6x2 with a single-tired trailing axle

A1	*Instrument cluster (ICUC) control unit*
A1 p1	*Multifunction display*
A2	*Central gateway control unit (CGW)*
A26	*Level control (CLCS) control unit*
A43	*Modular switch panel (MSF) control unit*
B19	*Front axle pressure sensor*
B20	*Left driven axle pressure sensor*
B21	*Right driven axle pressure sensor*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
LIN 7	*Button group LIN*
S110	*Left multifunction steering wheel button group*

General information

The axle load measuring system for full air suspension measures the current axle load over pressure sensors in the air spring bellows on the front and drive axle .

Using the axle load measuring device the load on every axle can be called up individually and the total weight of the vehicle called up in the multifunction display (A1 p1) of the IC (ICUC) control unit (A1). The vehicle must be at driving level to do this.

For 3-axle vehicles with a front axle or trailing axle no measurement for the additional axle is planned. The axle load of the additional axle is determined through computation using the measurements obtained on the measured axles.

Requirements

- Circuit 15 ON
- Vehicle at rest
- Vehicle is at driving level (normal level 1 or normal level 2)
- Lift axle is lowered
- Function starting-off aid is switched off
- Function traction aid is switched off (for a leading axle)

Function sequence

The front axle pressure sensor (B19), the LH drive axle pressure sensor (B20) and the RH drive axle pressure sensor (B21) permanently report to the level control (CLCS) control unit (A26) about the current pressure values in the air spring bellows.

The level control (CLCS) control unit (A26) calculates the current loading of the front axle, the drive axle as well as the total vehicle based on the signals of the pressure sensor using parameterized characteristics.

If the level control (CLCS) control unit (A26) has determined all values it transmits them to the IC (ICUC) control unit (A1) via the central gateway control unit (CGW) (A2).

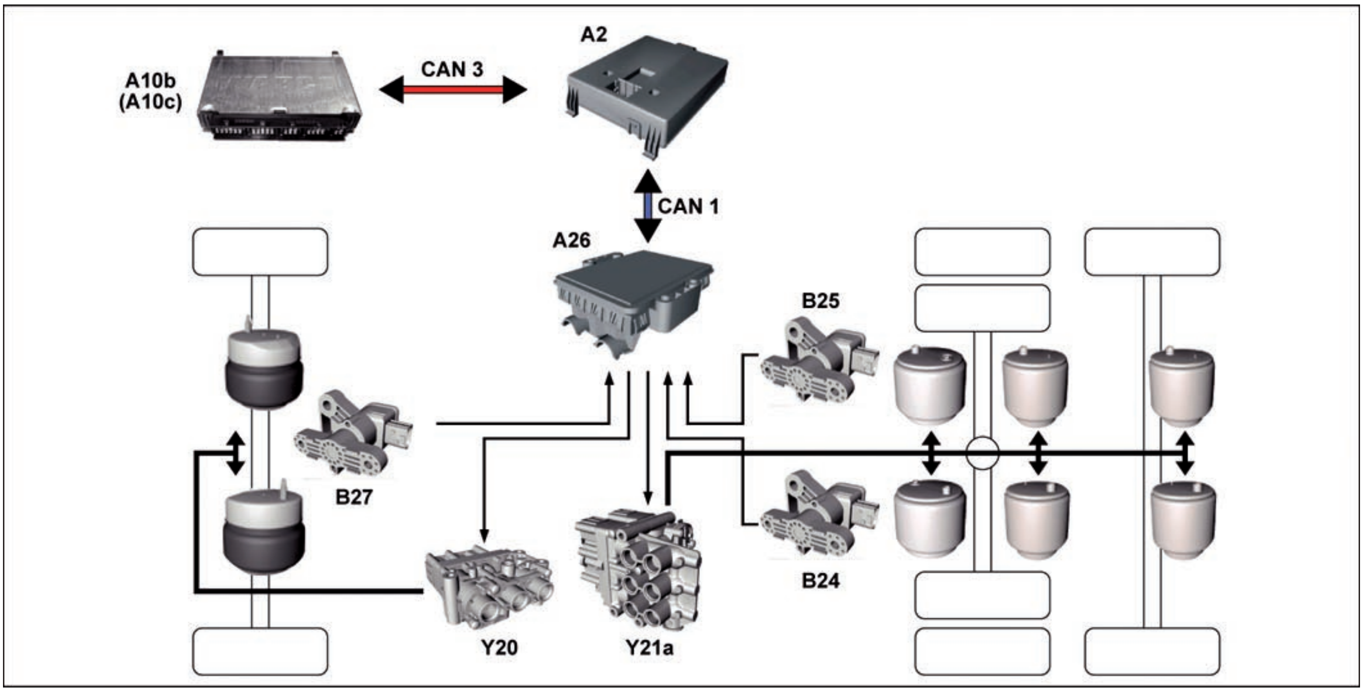
Through pressing on the steering wheel button for the LH MFL button group (S110) the level control menu can be called up in the multifunction display (A1 p1) of the IC. The axle loads can be called up there over the menu item "Axles" .

i Indication of the axle loads is always associated with a certain degree of imprecision and can therefore be manually recalibrated. To do this the axle load must be determined using a weighing machine and entered over the IC (ICUC) control unit (A1) with the aid of the LH MFL button group (S110).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Component description for central gateway control unit (CGW)	A2	**Page 333**
	Component description for level control (CLCS) control unit	A26	**Page 358**
	Component description for modular switch panel control unit (MSF)	A43	**Page 370**
	Component description for level control pressure sensor	B20, B21	**Page 409**
	Component description for multifunction steering wheel	S110	**Page 469**

GF32.33-W-3000H	Monitoring/controlling the specified level, function	2.8.11

MODEL 963



W32.33-2042-79

Shown: wheel configuration 6x2 with a single-tired trailing axle

A2 *Central gateway control unit (CGW)*
A10b *Electronic Brake Control (EBS) control unit (Wabco)*
A10c *Electronic Brake Control (EBS) control unit (Knorr)*
A26 *Level control (CLCS) control unit*
B24 *Left driven axle position sensor*
B25 *Right driven axle position sensor*
B27 *Front axle position sensor*
CAN 1 *Exterior-CAN*
CAN 3 *Frame CAN*
Y20 *Front axle level control valve unit*
Y21a *Level control valve unit, 3-axle vehicles*

Prerequisites

- Vehicle in motion

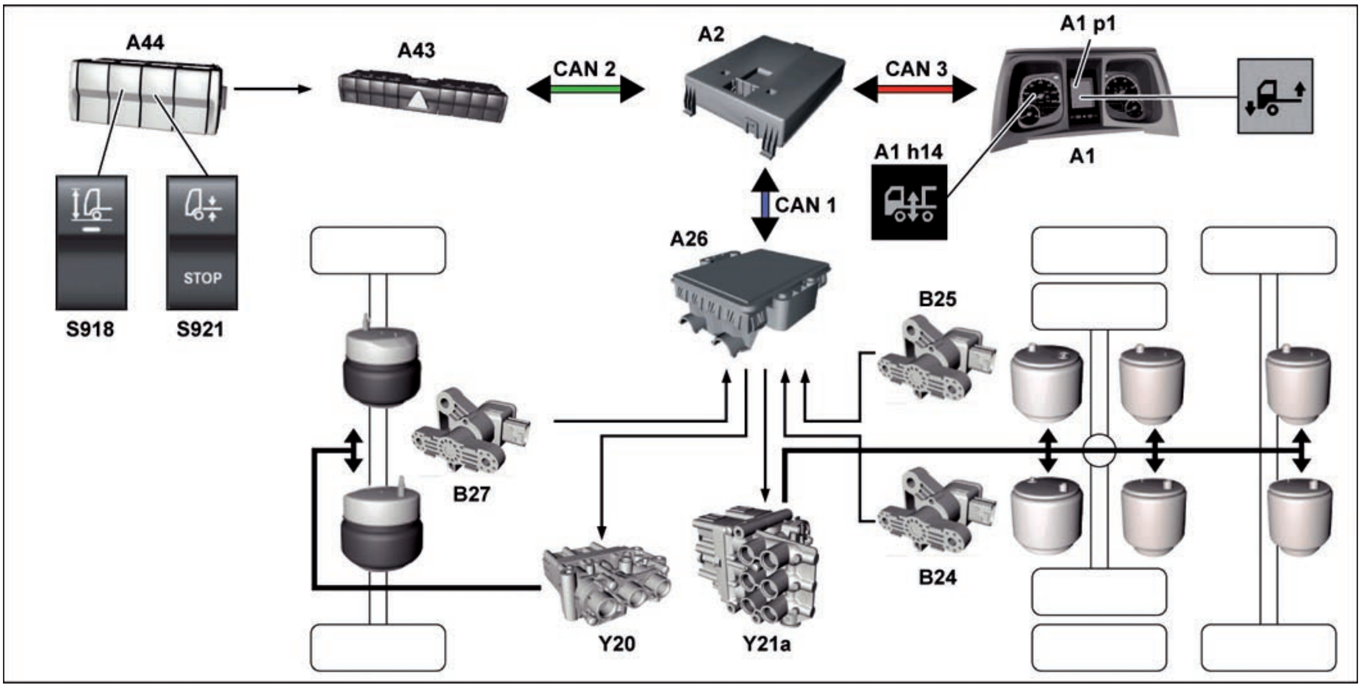
Function sequence

The LH drive axle position sensor (B24) and the RH drive axle position sensor (B25), as well the front axle position sensor (B27) for full air suspension permanently send the distance between the frame and axle on the level control (CLCS) control unit (A26).
The level control (CLCS) control unit (A26) evaluates the signals from the LH drive axle position sensor (B24), the RH drive axle position sensor (B25) as well as the front axle position sensor (B27) for full air suspension and initiates an independent control procedure as soon as there is any deviation from the specified level.
In order to provide protection before a control procedure for cornering the level control (CLCS) control unit (A26) queries the central gateway control unit (CGW) (A2) via the exterior CAN (CAN 1) and the frame CAN (CAN 3) information from the Electronic Brake Control (EBS) control unit (A10b or A10c) about the difference in speed of the front wheels.
If there is no cornering the level control (CLCS) control unit (A26) actuates the level control for 2-axle vehicles valve unit (Y21) or the level control for 3-axle vehicles valve unit (Y21a) at the drive axle as well as the front axle level control valve unit (Y20) for full air suspension according to the deviations in the specified level. The respective air spring bellows are aerated or ventilated until the LH drive axle position sensor (B24), the RH drive axle position sensor (B25) as well the front axle position sensor (B27) for full air suspension report reaching of the specified level.
Actuation of the valve units takes place for standstill of the vehicle immediately and in driving mode with a delay of 60 s.
A control procedure which was initiated at standstill of the vehicle will be completed of the vehicle begins to move.
Every individually initiated control procedure will be interrupted by actuating the service brake.

	Component description for central gateway control unit (CGW)	A2	**Page 333**
	Component description for Electronic Brake Control control unit (EBS)	A10b, A10c	**Page 341**
	Component description for level control (CLCS) control unit	A26	**Page 358**
	Component description for position sensor	B24, B25, B27	**Page 410**
	Component description for front axle level control valve unit	Y20	**Page 483**
	Component description for level control for 2-axle vehicles valve unit	Y21	**Page 485**
	Component description for level control for 3-axle vehicles valve unit	Y21a	**Page 487**

GF32.33-W-3001H	Changeover from level 1 to level 2, function	2.8.11

MODEL 963



W32.33-2043-79

Shown: wheel configuration 6x2 with a single-tired trailing axle

A1	*Instrument cluster (ICUC) control unit*
A1 h14	*Level control indicator lamp*
A1 p1	*Multifunction display*
A2	*Central gateway control unit (CGW)*
A26	*Level control (CLCS) control unit*
A43	*Modular switch panel (MSF) control unit*
A44	*Instrument panel switch module 1*
B24	*Left driven axle position sensor*
B25	*Right driven axle position sensor*
B27	*Front axle position sensor*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
S918	*Driving level switch*
S921	*Driving level/Stop button*
Y20	*Front axle level control valve unit*
Y21a	*Level control valve unit for 3-axle vehicles*

i Triggering factors for switchover to "level 2" can be poor road surfaces. The switchover to "level 2" prevents the frame from hitting the emergency rubbers on the axle for rocking of vehicle to settle the suspension. The vehicle speed is not important for the switchover.

Requirements

- Circuit 15 ON
- Driving level button (S918) activated
- Vehicle stationary or while driving

Function sequence

The preselected driving level (for an activated driving level button (S918) driving level 2) is activated by pressing the button driving level/stop (S921).

In the multifunction display (A1 p1) of the IC (ICUC) control unit (A1) the message "Towing vehicle outside driving level" is indicated as well as the level control indicator lamp (A1 h14) of the IC (ICUC) control unit (A1) being actuated.

The level control (CLCS) control unit (A26) receives the signal from the button on the modular switch panel (MSF) (A43) and via the central gateway control unit (CGW) (A2) and actuates level control for 2-axle vehicles valve unit (Y21) or the level control for 3-axle vehicles valve unit (Y21a) at the drive axle as well as the front axle level control valve unit (Y20) for full air suspension . All air spring bellows are aerated.

The LH drive axle position sensor (B24) and the RH drive axle position sensor (B25), as well as the front axle position sensor (B27) for full air suspension permanently send the distance between the frame and axle on the level control (CLCS) control unit (A26) during the filling process.

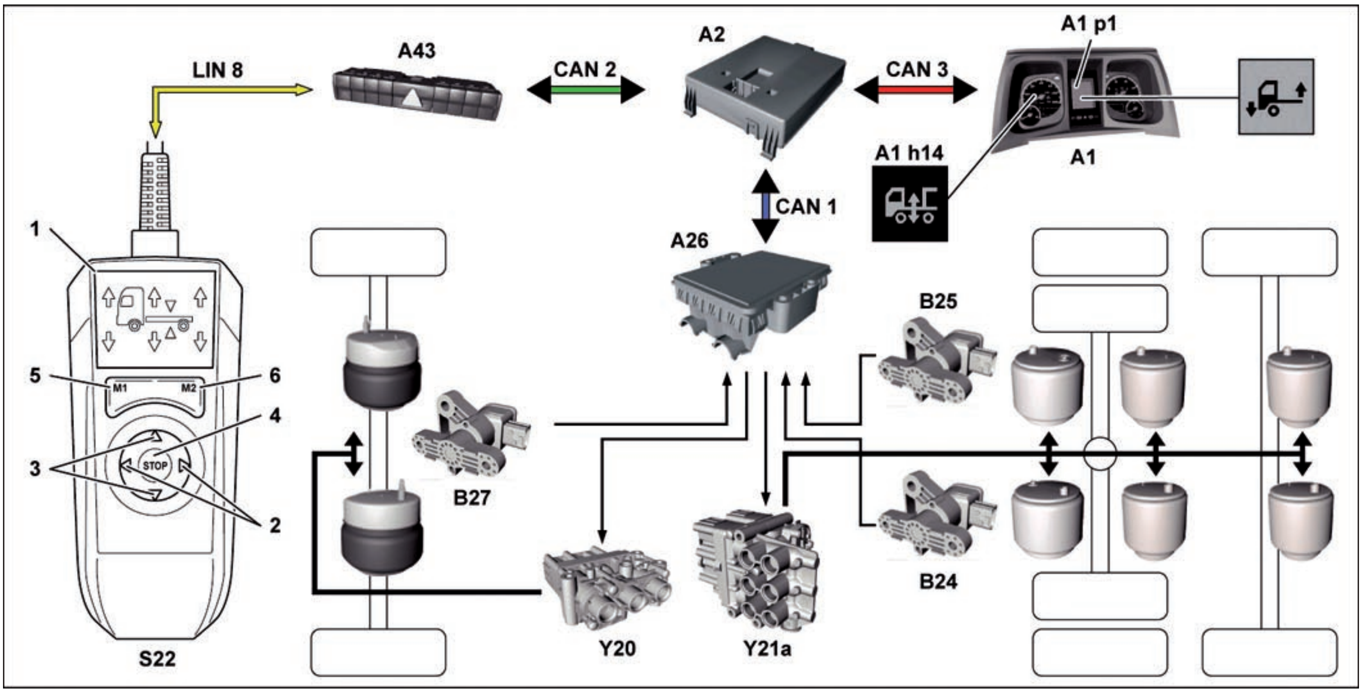
As soon as the level control (CLCS) control unit (A26) recognizes reaching of Level 2 from the signals from the LH drive axle position sensor (B24), the RH drive axle position sensor (B25) as well as the front axle position sensor (B27) for full air suspension is appropriately actuates the level control for 2-axle vehicles valve unit (Y21) or the level control for 3-axle vehicles valve unit (Y21a) as well as the front axle level control valve unit (Y20) for full air suspension. The air spring bellows are no longer aerated.

The level control (CLCS) control unit (A26) now monitors specified level 2 with the aid of the travel sensors.

	Component description for instrument cluster control unit (ICUC)	A1	**Page 331**
	Component description for central gateway control unit (CGW)	A2	**Page 333**
	Component description for level control (CLCS) control unit	A26	**Page 358**
	Component description for modular switch panel control unit (MSF)	A43	**Page 370**
	Component description for position sensor	B24, B25, B27	**Page 410**
	Component description for front axle level control valve unit	Y20	**Page 483**
	Component description for level control for 2-axle vehicles valve unit	Y21	**Page 485**
	Component description for level control for 3-axle vehicles valve unit	Y21a	**Page 487**

GF32.33-W-3002H	Raise/lower vehicle frame manually, function	2.8.11

MODEL 963



W32.33-2041-79

Shown: wheel configuration 6x2 with a single-tired trailing axle

1	*Function display*
2	*Axle pre/mode selection*
3	*Activation of raise/lower*
4	*'Stop' button*
5	*Memory button M1*
6	*Memory button M2*
A1	*Instrument cluster (ICUC) control unit*
A1 h14	*Level control indicator lamp*
A1 p1	*Multifunction display*
A2	*Central gateway control unit (CGW)*
A26	*Level control (CLCS) control unit*
A43	*Modular switch panel (MSF) control unit*
B24	*Left driven axle position sensor*
B25	*Right driven axle position sensor*
B27	*Front axle position sensor*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
LIN 8	*Level control LIN*
S22	*Level control operating unit*
Y20	*Front axle level control valve unit*
Y21a	*Level control valve unit for 3-axle vehicles*

Requirements

- Circuit 15 ON
- Vehicle speed <30 km/h

Function sequence for vehicle frame raise or lower over level control operating unit (S22)
Activate level control operating unit (S22) by pressing any button.

The level control operating unit (S22) shows the readiness to operate by illuminating the function indicator (1).

Select the function raise/lower front axle, raise/lower the overall vehicle, raise/lower rear axle by pressing the axle pre/mode selection buttons (2).

The function lift or lower is activated by pressing the activation of raise/lower buttons (3).

The level control (CLCS) control unit (A26) receives the signals from the level control operating unit (S22) connected to the modular switch panel (MSF) (A43) via the central gateway control unit (CGW) (A2) and actuates the level control for 2-axle vehicles valve unit (Y21) or the level control for 3-axle vehicles valve unit (Y21a) on the drive axle as well as the front axle level control valve unit (Y20) for full air suspension.

The level control for 2-axle vehicles valve unit (Y21) or the level control for 3-axle vehicles valve unit (Y21a) and the front axle level control valve unit (Y20) aerate or purge the air spring bellows on the drive axle or front axle depending on the selected function. The chassis frame is raised or lowered.

In the multifunction display (A1 p1) of the (ICUC) IC the message "Towing vehicle outside driving level" is indicated as well as the level control indicator lamp (A1 h14) of the IC (ICUC) control unit (A1) being actuated.

i The functions messages for level control are not displayed if the driver is in the menu for level control.

The LH drive axle position sensor (B24), the LH drive axle position sensor (B25) or the front axle position sensor (B27) send the change in frame height to the level control (CLCS) control unit (A26).
As soon as the level control (CLCS) control unit (A26) recognizes the signals from the LH drive axle position sensor (B24), the RH drive axle position sensor (B25) or the front axle position sensor (B27) that the upper or lower frame height limit has been reached then it independently interrupts raising or lowering of the vehicle frame.

The vehicle frame therefore remains in the uppermost or lowest maximum position. If the desired vehicle frame height is reached raising or lowering of the vehicle by actuation of the stop button (4) ends.

The level control (CLCS) control unit (A26) receives the stop signal from the level control operating unit (S22) connected to the modular switch panel (MSF) (A43) via the central gateway control unit (CGW) (A2) and actuates the level control for 2-axle vehicles valve unit (Y21) or the level control for 3-axle vehicles valve unit (Y21a) on the drive axle as well as the front axle level control valve unit (Y20) for full air suspension according to the stop signal. The air spring bellows are no longer aerated or ventilated.

The existing frame height of the vehicle is taken by the level control (CLCS) control unit (A26) as the new specified level with a delay of 4 s.

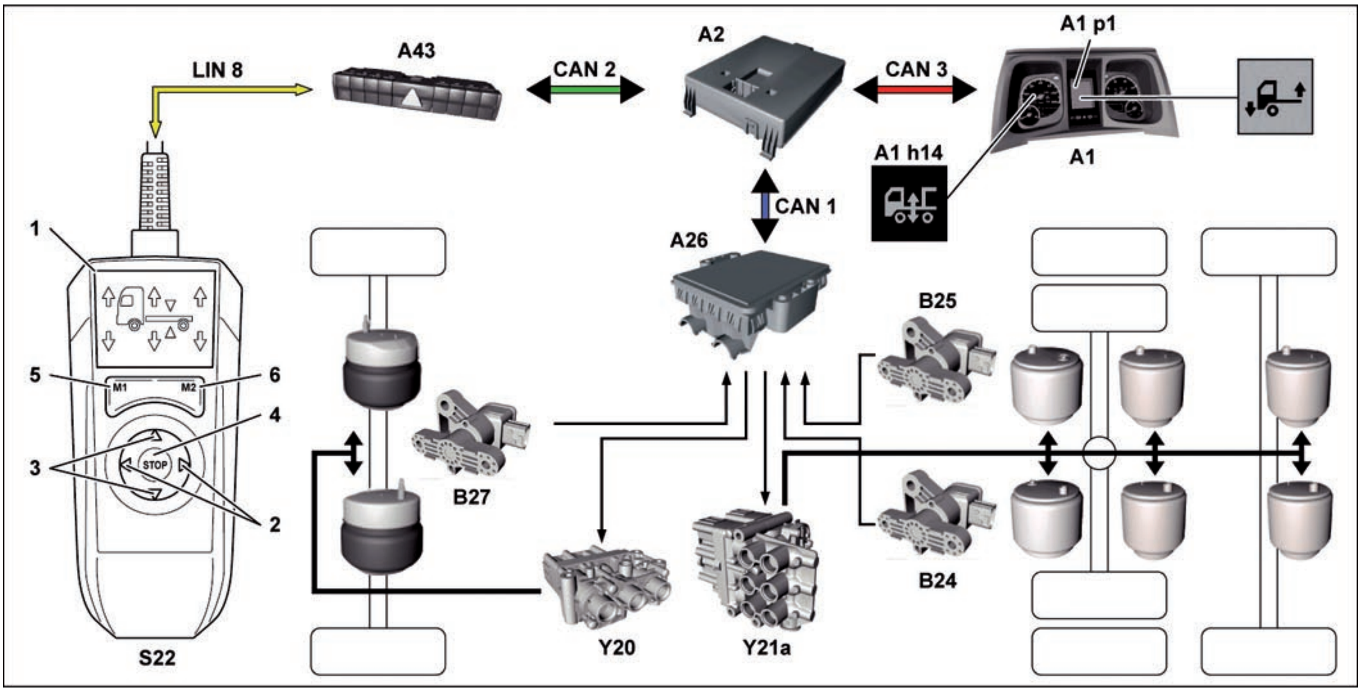
Function sequence for return to driving level
The vehicle frame is standing at any height.
Select the function driving level over the axle pre/mode selection (2) buttons.
The function is activated by pressing the activation of raising/lowering buttons (3) and the level control operating unit (S22) is deactivated. The function indicator (1) for the level control operating unit (S22) goes out.
The level control (CLCS) control unit (A26) initiates aeration or purging of the air spring bellows, dependent on the position of the vehicle frame, over the level control for 2-axle vehicles valve unit (Y21) or the level control for 3-axle vehicles valve unit (Y21a) as well as the front axle level control valve unit (Y20) for full air suspension.
The LH drive axle position sensor (B24), the LH drive axle position sensor (B25) or the front axle position sensor (B27) send the change in frame height to the level control (CLCS) control unit (A26).

As soon as the level control (CLCS) control unit (A26) recognizes reaching of the driving level (normal level) from the signals from the LH drive axle position sensor (B24), the RH drive axle position sensor (B25) as well as the front axle position sensor (B27) for full air suspension appropriately actuates the level control for 2-axle vehicles valve unit (Y21) or the level control for 3-axle vehicles valve unit (Y21a) as well as the front axle level control valve unit (Y20) for full air suspension. The air spring bellows are no longer aerated or ventilated.
The message "Towing vehicle outside driving level" in the multifunction display (A1 p1) of the IC (ICUC) control unit (A1) as well as the level control indicator lamp (A1 h14) of the IC (ICUC) control unit (A1) go out.

	Component description for instrument cluster control unit (ICUC)	A1	**Page 331**
	Component description for central gateway control unit (CGW)	A2	**Page 333**
	Component description for level control (CLCS) control unit	A26	**Page 358**
	Component description for modular switch panel control unit (MSF)	A43	**Page 370**
	Component description for position sensor	B24, B25, B27	**Page 410**
	Component description for level control operating unit	S22	**Page 461**
	Component description for front axle level control valve unit	Y20	**Page 483**
	Component description for level control for 2-axle vehicles valve unit	Y21	**Page 485**
	Component description for level control for 3-axle vehicles valve unit	Y21a	**Page 487**

GF32.33-W-3003H	Store frame height, function	2.8.11

MODEL 963



W32.33-2041-79

Shown: wheel configuration 6x2 with a single-tired trailing axle

1	*Function display*
2	*Axle pre/mode selection*
3	*Activation of raise/lower*
4	*'Stop' button*
5	*Memory button M1*
6	*Memory button M2*
A1	*Instrument cluster (ICUC) control unit*
A1 h14	*Level control indicator lamp*
A1 p1	*Multifunction display*
A2	*Central gateway control unit (CGW)*
A26	*Level control (CLCS) control unit*
A43	*Modular switch panel (MSF) control unit*
B24	*Left driven axle position sensor*
B25	*Right driven axle position sensor*
B27	*Front axle position sensor*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
LIN 8	*Level control LIN*
S22	*Level control operating unit*
Y20	*Front axle level control valve unit*
Y21a	*Level control valve unit for 3-axle vehicles*

Requirements

- Vehicle at rest
- Level control operating unit (S22) is activated
- Function raise/lower overall vehicle is selected or lights up

Function sequence

The function lift or lower is activated by pressing the activation of raise/lower buttons (3).

The level control (CLCS) control unit (A26) receives the signals from the level control operating unit (S22) connected to the modular switch panel (MSF) (A43) via the central gateway control unit (CGW) (A2) and actuates the level control for 2-axle vehicles valve unit (Y21) or the level control for 3-axle vehicles valve unit (Y21a) on the drive axle as well as the front axle level control valve unit (Y20) for full air suspension.

The level control for 2-axle vehicles valve unit (Y21) or the level control for 3-axle vehicles valve unit (Y21a) and the front axle level control valve unit (Y20) aerate or purge the air spring bellows on the drive axle or front axle depending on the selected function. The chassis frame is raised or lowered.

In the multifunction display (A1 p1) of the IC (ICUC) control unit (A1) the message "Towing vehicle outside driving level" is indicated as well as the level control indicator lamp (A1 h14) of the IC (ICUC) control unit (A1) being actuated.

i The functions messages for level control are not displayed if the driver is in the menu for level control.

The LH drive axle position sensor (B24), the LH drive axle position sensor (B25) or the front axle position sensor (B27) send the change in frame height to the level control (CLCS) control unit (A26).

i As soon as the level control (CLCS) control unit (A26) recognizes the signals from the LH drive axle position sensor (B24), the RH drive axle position sensor (B25) or the front axle position sensor (B27) that the upper or lower frame height limit has been reached then it independently interrupts raising or lowering of the vehicle frame. The vehicle frame therefore remains in the uppermost or lowest maximum position.

If the vehicle frame, and therefore also the cargo area, has reached the desired height, raising or lowering of the vehicle through actuation of the stop button (4) ends.

The level control (CLCS) control unit (A26) receives the stop signal from the level control operating unit (S22) connected to the modular switch panel (MSF) (A43) via the central gateway control unit (CGW) (A2) and actuates the level control for 2-axle vehicles valve unit (Y21) or the level control for 3-axle vehicles valve unit (Y21a) on the drive axle as well as the front axle level control valve unit (Y20) for full air suspension according to the stop signal. The air spring bellows are no longer aerated or ventilated.

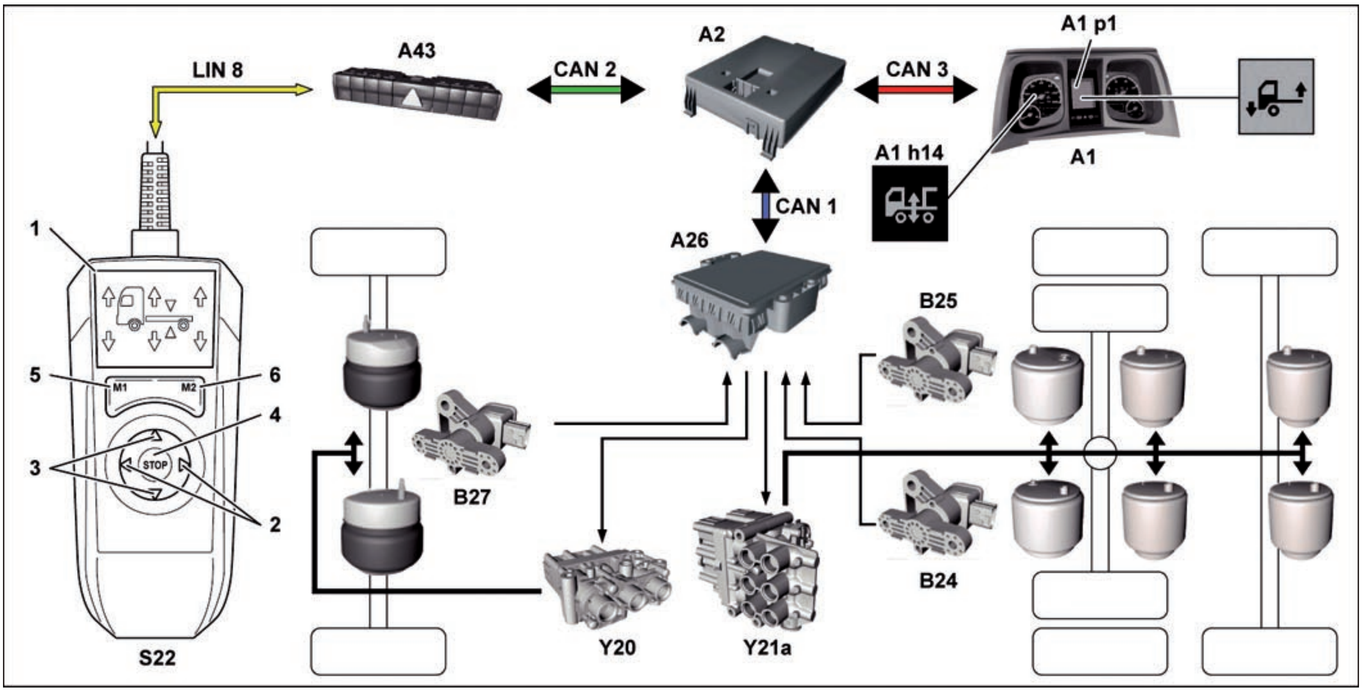
The frame height is stored through holding down the memory button M1 (5) or the memory button M2 (6).

The level control operating unit (S22) confirms saving of the frame height by flashing all arrows in the function indicator.

	Component description for instrument cluster control unit (ICUC)	A1	**Page 331**
	Component description for central gateway control unit (CGW)	A2	**Page 333**
	Component description for level control (CLCS) control unit	A26	**Page 358**
	Component description for modular switch panel control unit (MSF)	A43	**Page 370**
	Component description for position sensor	B24, B25, B27	**Page 410**
	Component description for level control operating unit	S22	**Page 461**
	Component description for front axle level control valve unit	Y20	**Page 483**
	Component description for level control for 2-axle vehicles valve unit	Y21	**Page 485**
	Component description for level control for 3-axle vehicles valve unit	Y21a	**Page 487**

GF32.33-W-3004H	Constant frame height when loading/unloading, function	2.8.11

MODEL 963



W32.33-2041-79

Illustration shows wheel configuration 6x2 with trailing axle with single tires

1	*Function display*
2	*Axle preselection/mode selection*
3	*Raise/lower activation*
4	*Stop button*
5	*Memory button M1*
6	*Memory button M2*
A1	*Instrument cluster (ICUC) control unit*
A1 h14	*Level control indicator lamp*
A1 p1	*Multifunction display*
A2	*Central gateway (CGW) control unit*
A26	*Level control (CLCS) control unit*
A43	*Modular switch panel (MSF) control unit*
B24	*Left drive axle position sensor*
B25	*Right drive axle position sensor*
B27	*Front axle position sensor*
CAN 1	*Exterior CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
LIN 8	*Level control LIN*
S22	*Level control operating unit*
Y20	*Front axle level control valve unit*
Y21a	*3-axle vehicle level control valve unit*

Requirements
- Vehicle at rest
- Compressed air system completely full
- Leading/trailing axle loaded or lift axle lowered
- Level control operating unit (S22) activated
- "Raise/lower overall vehicle" function is selected and is lit

Function sequence
Pressing the "raise/lower activation" buttons (3) activates the "raise/lower" function.

The level control (CLCS) control unit (A26) receives via the central gateway (CGW) control unit (A2) the signals from the level control operating unit (S22) connected to the modular switch panel (MSF) (A43) and actuates the 2-axle vehicle level control valve unit (Y21) or the 3-axle vehicle level control valve unit (Y21a) at the drive axle and, with full air suspension, also actuates the front axle level control valve unit (Y20). Air is admitted into or vented from the air spring bellows.

The left drive axle position sensor (B24), right drive axle position sensor (B25) and front axle position sensor (B27) transmit the change in frame height to the level control (CLCS) control unit (A26).

In the multifunction display (A1 p1) of the instrument cluster (ICUC) control unit (A1), the message "tractor vehicle not at driving level" is shown and the level control indicator lamp (A1 h14) of the instrument cluster (ICUC) control unit (A1) is actuated.

i The function messages from the level control system are not displayed if the driver is in the level control menu.

If the vehicle frame and therefore the cargo area has reached the height of the loading ramp, the stop button (4) must be pressed and held down to maintain the frame height. If the ignition is now switched off with the stop button (4) still pressed, the level control function remains active after the stop button (4) is released.

i For the frame height to be maintained with the ignition switched off, an adequate air supply must be available in the compressed air system for the entire duration. If this is the case, the required frame height can be held for a maximum of 60 minutes.

During the loading/unloading procedure, the left drive axle position sensor (B24), right drive axle position sensor (B25) and front axle position sensor (B27) transmit the change in frame height to the level control (CLCS) control unit (A26).

As soon as the level control (CLCS) control unit (A26) detects on the basis of the signals from the left drive axle position sensor (B24), right drive axle position sensor (B25) and front axle position sensor (B27) that a deviation from the specified level exists, it actuates the 2-axle vehicle level control valve unit (Y21) or 3-axle vehicle level control valve unit (Y21a) and, with full air suspension, the front axle level control valve unit (Y20) accordingly. Air is admitted into or vented from the air spring bellows.

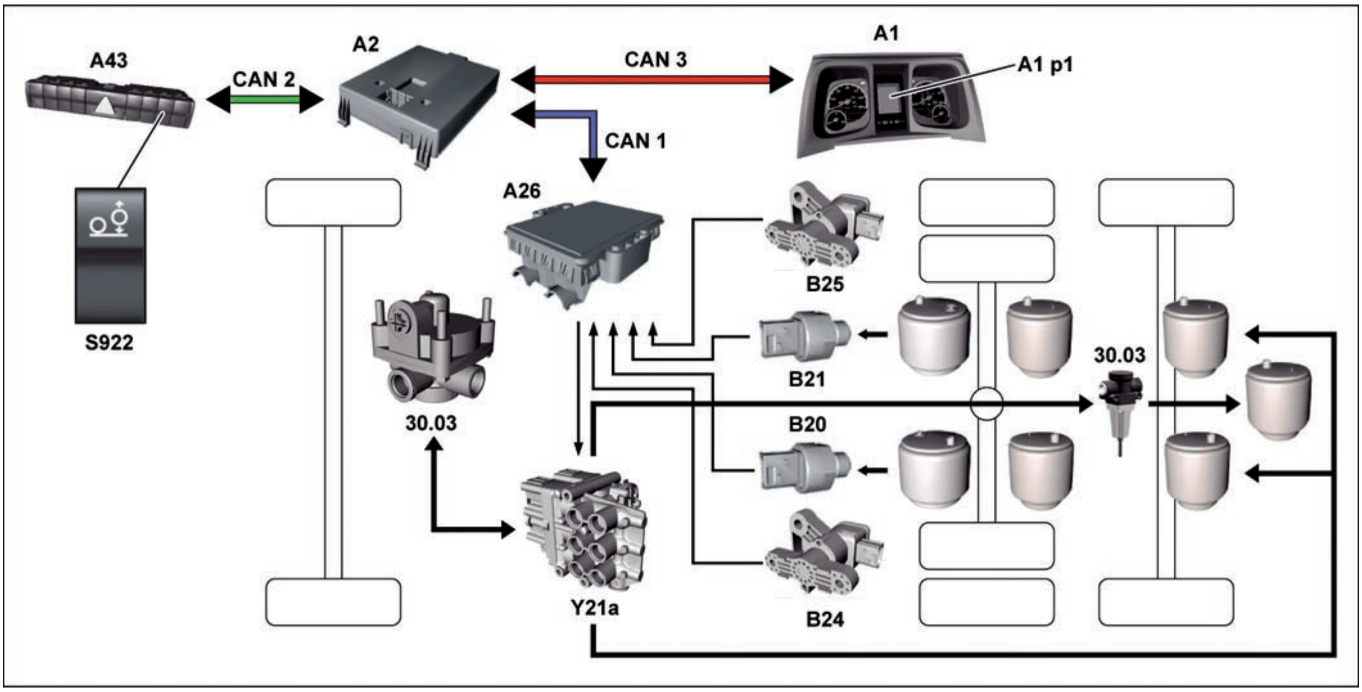
	Instrument cluster (ICUC) control unit, component description	A1	**Page 331**
	Central gateway (CGW) control unit, component description	A2	**Page 333**
	Level control (CLCS) control unit, component description	A26	**Page 358**
	Modular switch panel (MSF) control unit, component description	A43	**Page 370**
	Position sensor, component description	B24, B25, B27	**Page 410**
	Level control operating unit, component description	S22	**Page 461**
	Front axle level control valve unit, component description	Y20	**Page 483**

	2-axle vehicle level control valve unit, component description	Y21	**Page 485**
	3-axle vehicle level control valve unit, component description	Y21a	**Page 487**

GF32.33-W-3005H	Raise/lower lift axle, function	2.8.11

MODEL 963

Valid for vehicles with liftable trailing/leading axle

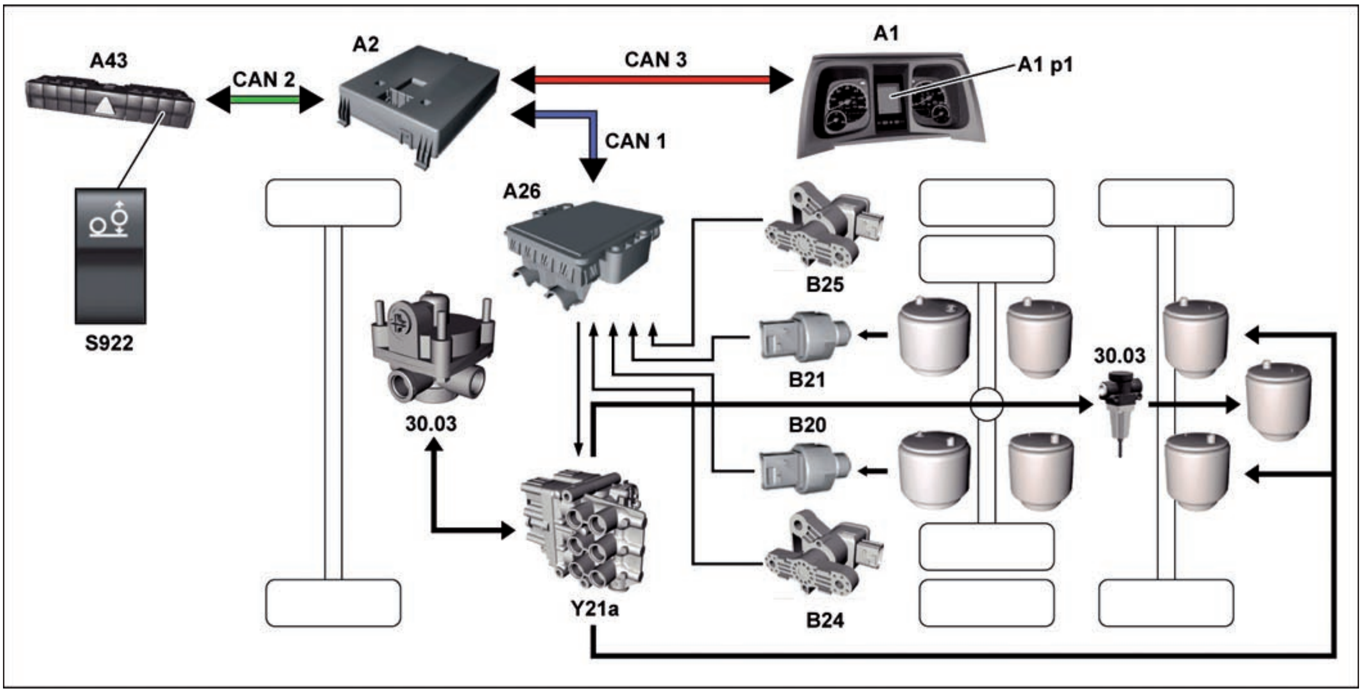


W32.33-2045-79

Illustration shows wheel configuration 6x2 with trailing axle with single tires

30.03 *Pressure limiting valve with vent*

A1 *Instrument cluster (ICUC) control unit*
A1 p1 *Multifunction display*
A2 *Central gateway (CGW) control unit*
A26 *Level control (CLCS) control unit*
A43 *Modular switch panel (MSF) control unit*
B20 *Left drive axle pressure sensor*
B21 *Right drive axle pressure sensor*
B24 *Left drive axle position sensor*
B25 *Right drive axle position sensor*
CAN 1 *Exterior CAN*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
S922 *Leading/trailing axle button*
Y21a *3-axle vehicle level control valve unit*



W32.33-2046-79

Illustration shows wheel configuration 6x2 with leading axle with single tires

30.03	*Pressure limiting valve with vent*	*A26*	*Level control (CLCS) control unit*	*CAN 1*	*Exterior CAN*
		A43	*Modular switch panel (MSF) control unit*	*CAN 2*	*Interior CAN*
A1	*Instrument cluster (ICUC) control unit*			*CAN 3*	*Frame CAN*
A1 p1	*Multifunction display*	*B20*	*Left drive axle pressure sensor*	*S922*	*Leading/trailing axle button*
A2	*Central gateway (CGW) control unit*	*B21*	*Right drive axle pressure sensor*	*Y21a*	*3-axle vehicle level control valve unit*
		B24	*Left drive axle position sensor*		
		B25	*Right drive axle position sensor*		

i The vehicle speed is irrelevant for raising and lowering the leading/trailing axle. The leading/trailing axle lowers automatically if during loading the left drive axle pressure sensor (B20) and right drive axle pressure sensor (B21) signal to the level control (CLCS) control unit (A26) that the permissible axle load has been reached.

Requirements

- Circuit 15 ON

Raise leading/trailing axle, function sequence

Pressing the leading/trailing axle button (S922) in the modular switch panel (MSF) (A43) triggers the "raise leading/trailing axle" function.

The level control (CLCS) control unit (A26) receives via the central gateway (CGW) control unit (A2) the signals from the button connected to the modular switch panel (MSF) (A43) and, to prevent overloading of the drive axle, checks the values from the right drive axle pressure sensor (B21) and left drive axle pressure sensor (B20).

If the permissible axle load is not exceeded, the level control (CLCS) control unit (A26) actuates the 3-axle vehicle level control valve unit (Y21a) with the appropriate commands.

Air is admitted into the lift bellows of the leading/trailing axle up to max. 8.0 bar via the pressure limiting valve with vent (30.03) connected to connection 25 of the 3-axle vehicle level control valve unit (Y21a). The leading/trailing axle is raised.

During the raising procedure, on vehicles with trailing axle the air spring bellows of the trailing axle are vented to a residual pressure of 0.5 bar via the 3-axle vehicle level control valve unit (Y21a) and the pressure limiting valve with vent (30.03). On vehicles with leading axle, the air spring bellows of the leading axle are fully vented via the 3-axle vehicle level control valve unit (Y21a).

A message in the multifunction display (A1 p1) indicates the raised leading/trailing axle.

---

i On vehicles with partial air suspension, raising the trailing axle relieves the load on the front axle considerably (approx. 30 to 40 mm above normal level). As a result, there is a risk that the raised trailing axle could make contact with the ground during driving as a result of the heavy weight at the rear. The level control (CLCS) control unit (A26) prevents this by compensating the level at the drive axle during the raising procedure by admitting air to the air spring bellows.

Lower leading/trailing axle, function sequence
The "lower leading/trailing axle" function is triggered manually by pressing the leading/trailing axle button (S922) in the modular switch panel (MSF) (A43) or when the permissible drive axle load is reached.
If the level control (CLCS) control unit (A26) receives via the central gateway (CGW) control unit (A2) the signals from the button connected to the modular switch panel (MSF) (A43) or it detects on the basis of the signals from the right drive axle pressure sensor (B21) and left drive axle pressure sensor (B20) that the permissible axle load has been exceeded, it actuates the 3-axle vehicle level control valve unit (Y21a) with the appropriate commands.

The lift bellows connected to connection 25 of the 3-axle vehicle level control valve unit (Y21a) on vehicles with trailing axle is vented to a residual pressure of 0.5 bar via the pressure limiting valve with vent (30.03) connected to connection 32. The trailing axle is lowered.

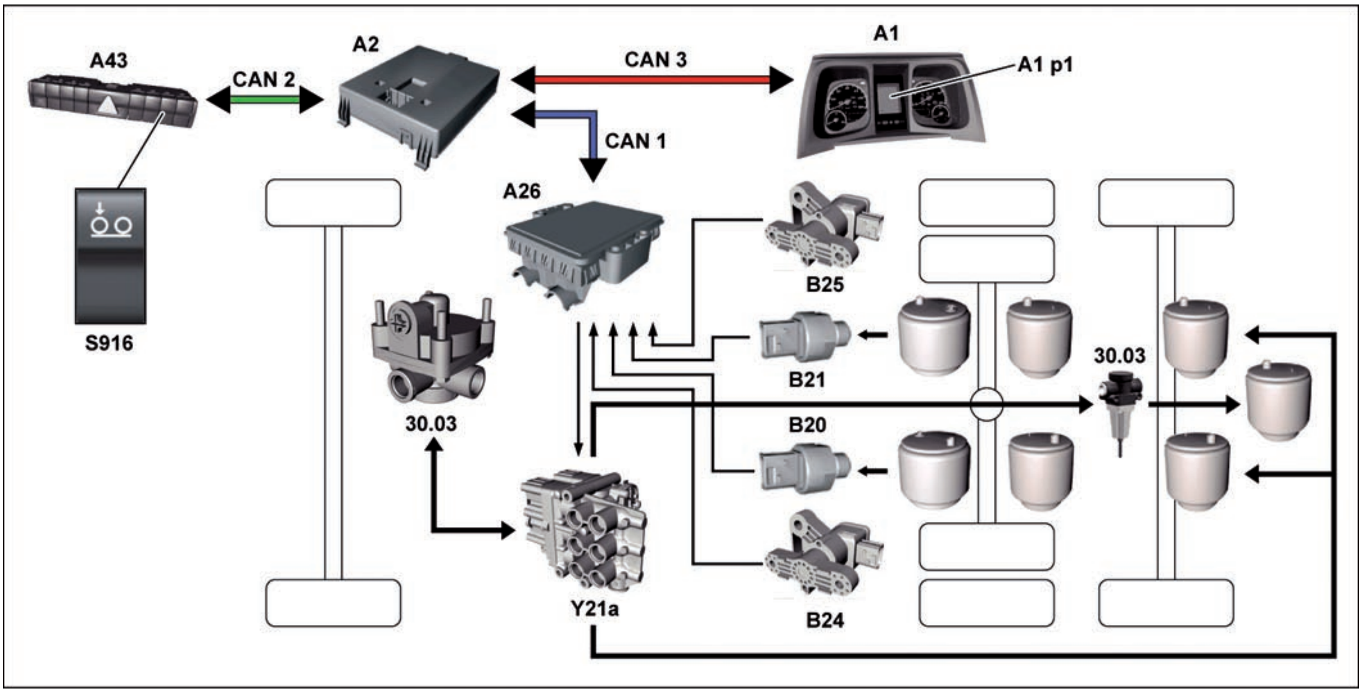
The lift bellows connected to connection 25 of the 3-axle vehicle level control valve unit (Y21a) on vehicles with leading axle is vented via the muffler connected to connection 32 of the 3-axle vehicle level control valve unit (Y21a). The leading axle is lowered.

The air pressure in the air spring bellows of the leading/trailing axle adjusts to that of the drive axle.
A message in the multifunction display (A1 p1) indicates the lowered leading/trailing axle.

	Pressure limiting valve with ventilation, component description	30.03	**Page 496**
	Instrument cluster (ICUC) control unit, component description	A1	**Page 331**
	Central gateway (CGW) control unit, component description	A2	**Page 333**
	Level control (CLCS) control unit, component description	A26	**Page 358**
	Modular switch panel (MSF) control unit, component description	A43	**Page 370**
	Level control pressure sensor, component description	B20, B21	**Page 409**
	Position sensor, component description	B24, B25	**Page 410**
	3-axle vehicle level control valve unit, component description	Y21a	**Page 487**

GF32.33-W-3007H	Starting-off aid, function	2.8.11

MODEL 963
Valid for vehicles with trailing/leading axle



W32.33-2047-79

Illustration shows wheel configuration 6x2 with trailing axle with single tires

30.03	*Pressure limiting valve with vent*
A1	*Instrument cluster (ICUC) control unit*
A1 p1	*Multifunction display*
A2	*Central gateway (CGW) control unit*
A26	*Level control (CLCS) control unit*
A43	*Modular switch panel (MSF) control unit*
B20	*Left drive axle pressure sensor*
B21	*Right drive axle pressure sensor*
B24	*Left drive axle position sensor*
B25	*Right drive axle position sensor*
CAN 1	*Exterior CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
S916	*Starting-off aid button for Europe*
Y21a	*3-axle vehicle level control valve unit*

General information

The starting-off aid is a legally permissible traction aid, with which the axle load of the drive axle may be exceeded by a set value. It is installed in vehicles with leading axle or trailing axle and may always only be used with spinning drive wheels on a slippery surface, such as iced up or snow-covered roads.

The duty cycle of the starting-off aid can be limited by time or limited according to speed (country-specific).

- **EC countries:**
  - only at speeds < 30 km/h
  - max. operating time 20 min
  - no limited reactivation time

Depending on the national regulations, other starting-off aids are permitted in the respective countries:

- **Starting-off aid with time limit**

Operating time limited to 90 s:

- Limited reactivation lockout of 50 s
- No speed-dependent reclosing lockout.

Operating time limited to 120 s:

- No time limit for reactivation lockout
- No speed-dependent reclosing lockout.

- **Starting-off aid without time limit**
  - Starting-off aid with locking push-button switch without time limit
  - No speed-dependent reactivation lockout

Requirements
- Engine running
- Vehicle stationary or moving

Function sequence
Pressing the Europe starting-off aid button (S916) in the modular switch panel (MSF) (A43) activates the starting-off aid.

i The level control (CLCS) control unit (A26) interrupts the starting-off aid if, from the signal from the left drive axle pressure sensor (B20) and right drive axle pressure sensor (B21), it detects that the permissible, increased axle load has been exceeded.

The level control (CLCS) control unit (A26) receives via the central gateway (CGW) control unit (A2) the signals from the button connected to the modular switch panel (MSF) (A43) and actuates the 3-axle vehicle level control valve unit (Y21a) with the appropriate commands.

Air is admitted into the lift bellows of the leading/trailing axle up to max. 8.0 bar via the pressure limiting valve with vent (30.03) connected to connection 25 of the 3-axle vehicle level control valve unit (Y21a). The leading/trailing axle is raised.

During the raising procedure, on vehicles with trailing axle the air spring bellows of the trailing axle are vented to a residual pressure of 0.5 bar via the 3-axle vehicle level control valve unit (Y21a) and the pressure limiting valve with vent (30.03). On vehicles with leading axle, the air spring bellows of the leading axle are fully vented via the 3-axle vehicle level control valve unit (Y21a).

The left drive axle pressure sensor (B20) and right drive axle pressure sensor (B21) continuously send the current pressure values in the air spring bellows to the level control (CLCS) control unit (A26).

A message indicating activation of the starting-off aid is shown in the multifunction display (A1 p1) of the instrument cluster (ICUC) control unit (A1).

At a speed ≥30 km, after expiry of the time limit or after deactivation of the starting-off aid the level control (CLCS) control unit (A26) actuates the 3-axle vehicle level control valve unit (Y21a) with the appropriate commands.

The lift bellows connected to connection 25 of the 3-axle vehicle level control valve unit (Y21a) on vehicles with trailing axle is vented to a residual pressure of 0.5 bar via the pressure limiting valve with vent (30.03) connected to connection 32. The trailing axle is lowered.

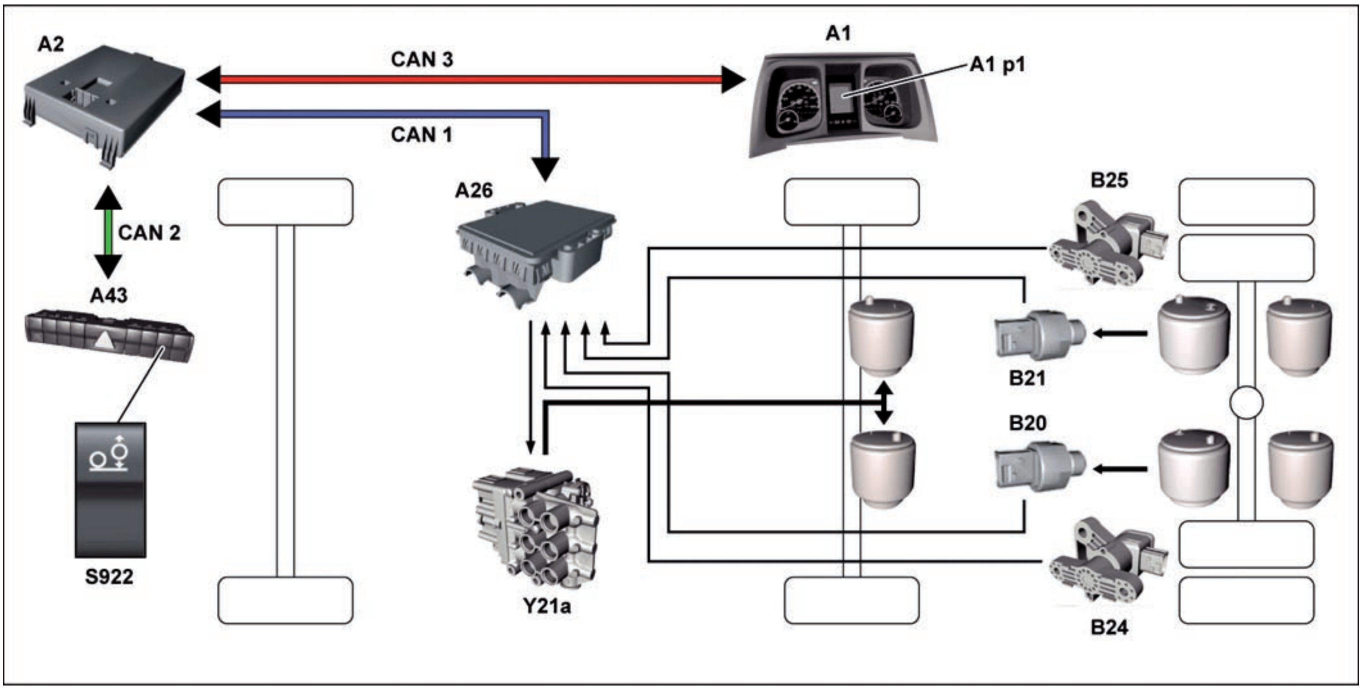
The lift bellows connected to connection 25 of the 3-axle vehicle level control valve unit (Y21a) on vehicles with leading axle is vented via the muffler connected to connection 32 of the 3-axle vehicle level control valve unit (Y21a). The leading axle is lowered.

The message indicating activation of the starting-off aid in the multifunction display (A1 p1) disappears.

	Pressure limiting valve with ventilation, component description	30.03	**Page 496**
	Instrument cluster (ICUC) control unit, component description	A1	**Page 331**
	Central gateway (CGW) control unit, component description	A2	**Page 333**
	Level control (CLCS) control unit, component description	A26	**Page 358**
	Modular switch panel (MSF) control unit, component description	A43	**Page 370**
	Level control pressure sensor, component description	B20, B21	**Page 409**
	Position sensor, component description	B24, B25	**Page 410**
	3-axle vehicle level control valve unit, component description	Y21a	**Page 487**

GF32.33-W-3011H	Relieve/load additional axles, function	2.8.11

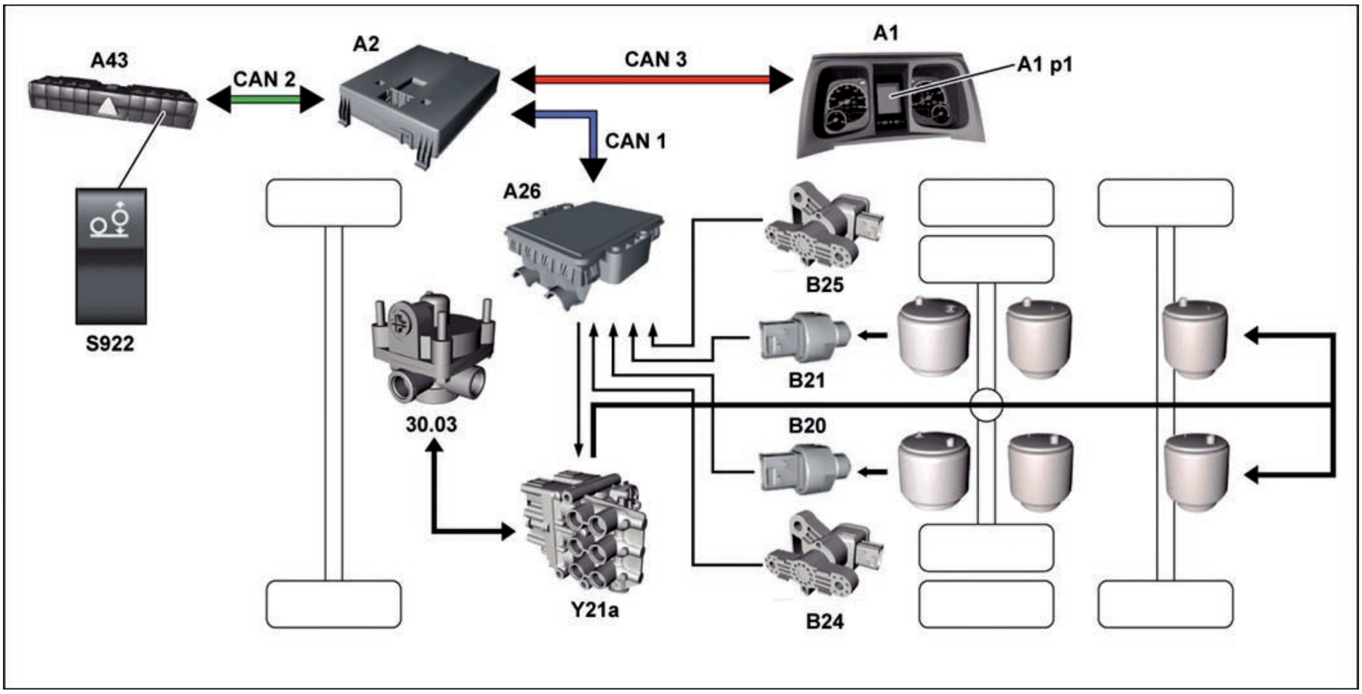
MODEL 963
Valid for vehicles with load-relievable trailing/leading axle



W32.33-2048-79

Illustration shows wheel configuration 6x2/2 with leading axle with single tires

A1	*Instrument cluster (ICUC) control unit*
A1 p1	*Multifunction display*
A2	*Central gateway (CGW) control unit*
A26	*Level control (CLCS) control unit*
A43	*Modular switch panel (MSF) control unit*
B20	*Left drive axle pressure sensor*
B21	*Right drive axle pressure sensor*
B24	*Left drive axle position sensor*
B25	*Right drive axle position sensor*
CAN 1	*Exterior CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
S922	*Leading/trailing axle button*
Y21a	*3-axle vehicle level control valve unit*



W32.33-2049-79

Illustration shows wheel configuration 6x2 with trailing axle with single tires

30.03	*Pressure limiting valve with vent*	*A26*	*Level control (CLCS) control unit*	*CAN 1*	*Exterior CAN*
A1	*Instrument cluster (ICUC) control unit*	*A43*	*Modular switch panel (MSF) control unit*	*CAN 2*	*Interior CAN*
A1 p1	*Multifunction display*	*B20*	*Left drive axle pressure sensor*	*CAN 3*	*Frame CAN*
A2	*Central gateway (CGW) control unit*	*B21*	*Right drive axle pressure sensor*	*S922*	*Leading/trailing axle button*
		B24	*Left drive axle position sensor*	*Y21a*	*3-axle vehicle level control valve unit*
		B25	*Right drive axle position sensor*		

Requirements

- Circuit 15 ON
- Vehicle fully or partially unloaded

i The vehicle speed is irrelevant for loading/relieving the leading/trailing axle. The leading/trailing axle is loaded automatically if during loading the pressure sensors of the drive axle signal to the level control (CLCS) control unit (A26) that the permissible axle load has been reached.

Relieve leading/trailing axle, function sequence

Pressing the leading/trailing axle button (S922) in the modular switch panel (MSF) (A43) triggers the "relieve leading/trailing axle" function.
The level control (CLCS) control unit (A26) receives via the central gateway (CGW) control unit (A2) the signals from the button connected to the modular switch panel (MSF) (A43) and, to prevent overloading of the drive axle, checks the values from the right drive axle pressure sensor (B21) and left drive axle pressure sensor (B20).

If the permissible axle load is not exceeded, the level control control unit actuates the 3-axle vehicle level control valve unit (Y21a) with the appropriate commands.
The air spring bellows of the leading/trailing axle are vented to a residual pressure of 0.5 bar via the 3-axle vehicle level control valve unit (Y21a) and the pressure limiting valve with vent (30.03).

i While the leading/trailing axle is being relieved of load, the left drive axle position sensor (B24) and right drive axle position sensor (B25) continuously report the distance between the frame and axle to the level control (CLCS) control unit (A26). The level control (CLCS) control unit (A26) interrupts the load-relieving procedure as soon as a deviation from the specified level occurs. Air is admitted to the air spring bellows of the drive axle until the specified level is restored. After this the unloading process is continued.

A message indicating the load-relieved leading/trailing axle is shown in the multifunction display (A1 p1) of the instrument cluster (ICUC) control unit (A1).

Load leading/trailing axle, function sequence

The "load leading/trailing axle" function is triggered by pressing the leading/trailing axle button (S922) in the modular switch panel (MSF) (A43) or when the permissible drive axle load is reached.

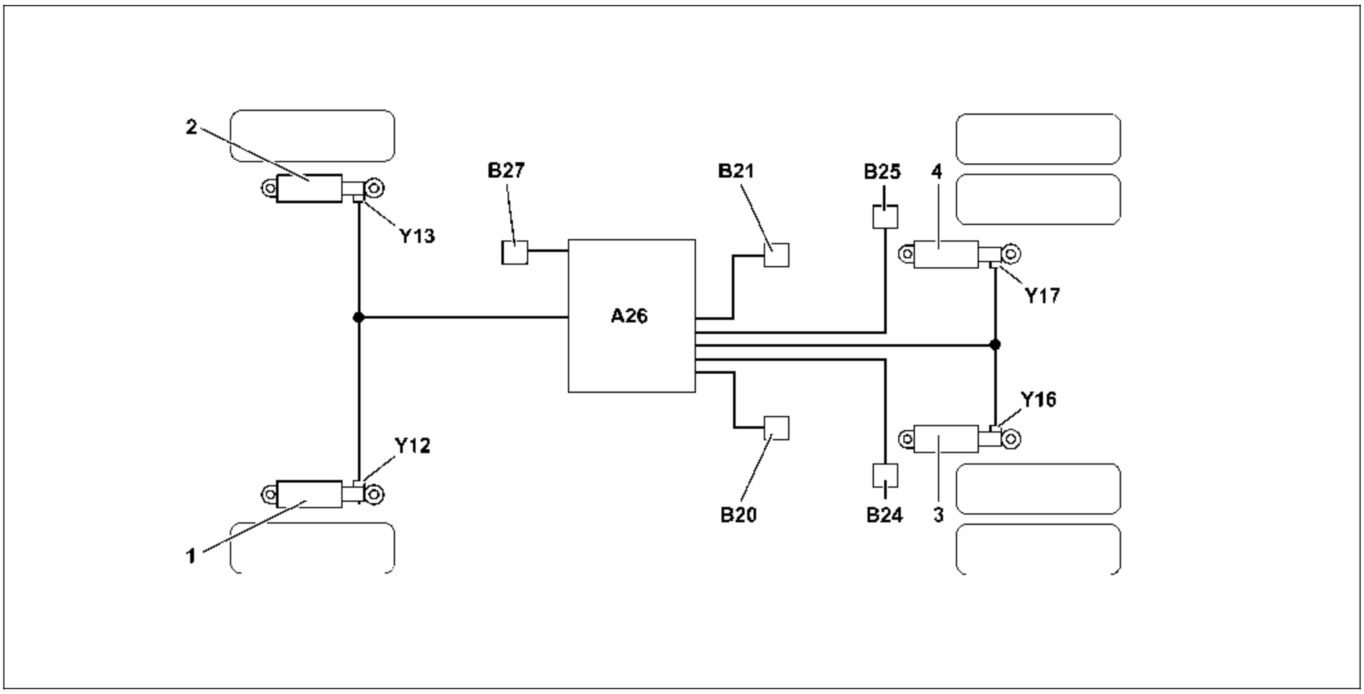
If the level control (CLCS) control unit (A26) receives via the central gateway (CGW) control unit (A2) the signals from the button connected to the modular switch panel (MSF) (A43) or it detects on the basis of the signal from the right drive axle pressure sensor (B21) and left drive axle pressure sensor (B20) that the permissible axle load has been exceeded, it actuates the 3-axle vehicle level control valve unit (Y21a) with the appropriate commands.

The 3-axle vehicle level control valve unit (Y21a) admits air to the air spring bellows of the leading/trailing axle up to the air pressure of the air spring bellows of the drive axle. The leading/trailing axle is loaded.

	Pressure limiting valve with ventilation, component description	30.03	**Page 496**
	Instrument cluster (ICUC) control unit, component description	A1	**Page 331**
	Central gateway (CGW) control unit, component description	A2	**Page 333**
	Level control (CLCS) control unit, component description	A26	**Page 358**
	Modular switch panel (MSF) control unit, component description	A43	**Page 370**
	Level control pressure sensor, component description	B20, B21	**Page 409**
	Position sensor, component description	B24, B25	**Page 410**
	3-axle vehicle level control valve unit, component description	Y21a	**Page 487**

GF32.34-W-0006H	Roll control, function	2.8.11

MODEL 963, 964 with CODE (S1F)



W32.34-1016-09

Shown on model 963.403

1 Left front axle shock absorber
2 Right front axle shock absorber
3 Left rear axle shock absorber
4 Right rear axle shock absorber

A26 Level control (CLCS) control unit
B20 Left drive axle pressure sensor
B21 Right drive axle pressure sensor
B24 Left drive axle position sensor
B25 Right drive axle position sensor
B27 Front axle position sensor
Y12 Left 1st front axle proportional valve
Y13 Right 1st front axle proportional valve
Y16 Left 1st rear axle proportional valve
Y17 Right 1st rear axle proportional valve

Functions

i This description is based on a 2-axle vehicle of model 963.403 (wheel configuration 4x2) with code (A1A) Front axle air suspension. All functions and control situations/control states are identical on the other vehicle models. Only the number of controlled shock absorbers differs depending on vehicle model and equipment.

General information

Roll control (WR) is an electronic shock absorber control system that is used to precisely adapt the damping characteristics to the respective load, current driving situation and road surface conditions.

The roll control (WR) function is integrated in the level control (CLCS) control unit (A26). This means that the existing sensors of and information from the level control system (CLCS) can also be used for roll control (WR).

i On vehicles with roll control (WR), the full version of the level control (CLCS) control unit (A26) is always installed.

The control logic of the roll control (WR) function collects the variables occurring during the current driving operation, uses them to calculate the optimum damping requirements and adjusts the shock absorber characteristics on the basis of this information.
The functions of the roll control (WR) are enabled using parameters for each individual axle. Up to four axles can be actuated.
Two shock absorbers, each with an electrically actuated proportional valve, are always fitted at each axle. They are actuated steplessly at each axle. On vehicles with roll control but without code (A1A) Front axle air suspension, shock absorbers with proportional damping valves are also fitted at the steel-sprung front axles.

Function

The level control (CLCS) control unit (A26) receives signals:

- from the left drive axle position sensor (B24) regarding the left rear spring travel,
- from the right drive axle position sensor (B25) regarding the right rear spring travel,
- from the front axle position sensor (B27) regarding the left and right front spring travel,
- from the left drive axle pressure sensor (B20) regarding the left rear bellows pressure,
- from the right drive axle pressure sensor (B21) regarding the right rear bellows pressure,
- from the tachograph (TCO) (P1) regarding the vehicle speed,
- from the Electronic Brake Control (EBS) control unit (A10b, A10c) regarding vehicle speed, deceleration values, front wheel rotational speed and possible ABS/ASR intervention,
- from the Electronic Stability Program (ESP®) control unit (A25, A25a) regarding the steering wheel angle and possible ESP intervention,
- and from the transmission control unit (TCM) (A5) regarding the clutch status.

From these signals, the level control (CLCS) control unit (A26) calculates the damping requirements of the shock absorbers within a few milliseconds.

The left 1st front axle proportional valve (Y12), right 1st front axle proportional valve (Y13), left 1st rear axle proportional valve (Y16) and right 1st rear axle proportional valve (Y17) are actuated at the appropriate shock absorbers, taking handling characteristics, vehicle condition, outside interference and vehicle response into consideration.

i Depending on actuation, the proportional valves steplessly adjust the oil flow rate for the rebound and compression stage in the shock absorbers.

In order to actuate, the proportional valves must first be energized with their maximum current of 2 A (pushing). There will be no adjustment of the shock absorber behavior if energization occurs without prior pushing.

Control situations/control states

- **Load condition**
  The load condition is detected using the bellows pressures at the rear axle. Damping is increased as the load increases.
- **Vehicle speed**
  Damping is increased as the vehicle speed increases.
- **Level control**
  If level control occurs while the vehicle is stationary, the shock absorbers are set to the lowest level in order to reduce friction during the raising and lowering procedure.
- **Change in roll angle**
  Roll behavior is assessed using the left and right rear jounce and rebound travel. Appropriate adjustment is performed especially when vehicles with a high center of gravity perform lane-changing maneuvers, .
- **Pitch angle**
  The pitch angle is determined by means of the rear position sensors. Sprung mass vibrations, especially when braking and driving off and also on uneven road surfaces, are reduced by increasing damping.
- **Lateral acceleration**
  Lateral acceleration is determined using the difference in rotational speed and the average speed of the front wheels. If lateral acceleration is detected, damping is increased slightly.
- **Change in lateral acceleration**
  Examples of this criterion are lane changes and sudden evasive maneuvers. The greater the change in acceleration is, the higher the damping requirement will be. This is intended to harden the shock absorbers even more quickly in the case of rapid steering movements than is possible by only changing the roll angle.
- **Longitudinal acceleration**
  If the engine specified torque increases, damping is increased in order to counter a squatting motion of the vehicle.
- **Deceleration**
  When the service brake is actuated, damping is increased in order to counter the expected pitching of the front axle.

- **Deviation from pitching response time**
  If the vehicle is subjected to the natural pitching frequency (e.g. resulting from surface undulations), increasing damping will counter jerking of the body.

- **Road surface conditions**
  The frequency and travel of axle motion are detected by the position sensors. If a "poor road surface" is detected, damping is reduced in order to improve ride comfort. Here, it is the high-frequency axle vibrations that are taken into consideration in particular.

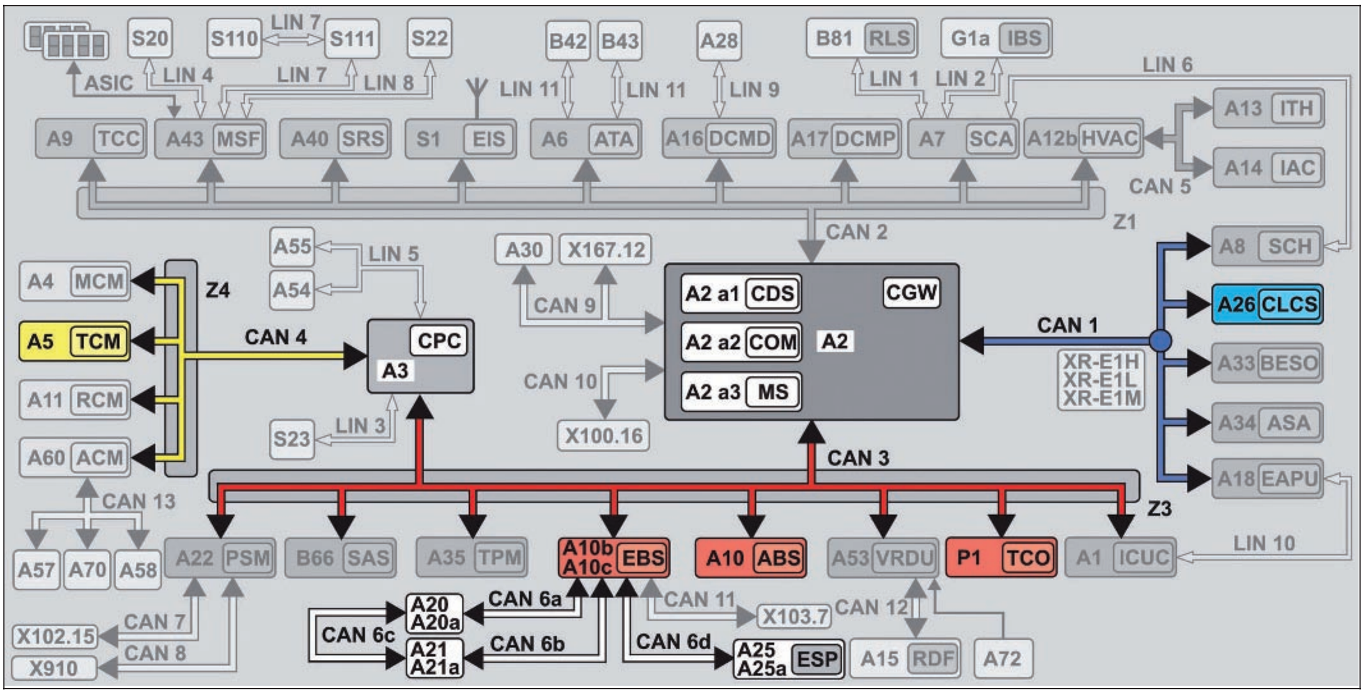
  i Usually, several criteria occur simultaneously when the vehicle is in motion. The highest calculated damping requirement is output as the damping value for the shock absorbers.

- **Fail-safe condition**
  If the proportional valves are not energized (if the vehicle is stationary or there is a system failure) or if the current drops below the minimum current of 700 mA, damping corresponding to the series ID is applied (fail-safe condition).

  i If a shock absorber fails, only the shock absorbers of the axle concerned are switched to the fail-safe condition.

	Roll control - overall network		**Page 84**
	Level control (CLCS) control unit, component description		**Page 358**
	Proportional valve, component description		**Page 480**
	Position sensor, component description		**Page 410**
	Level control pressure sensor, component description		**Page 409**

GF32.34-W-0006-01H	Roll control - overall network		

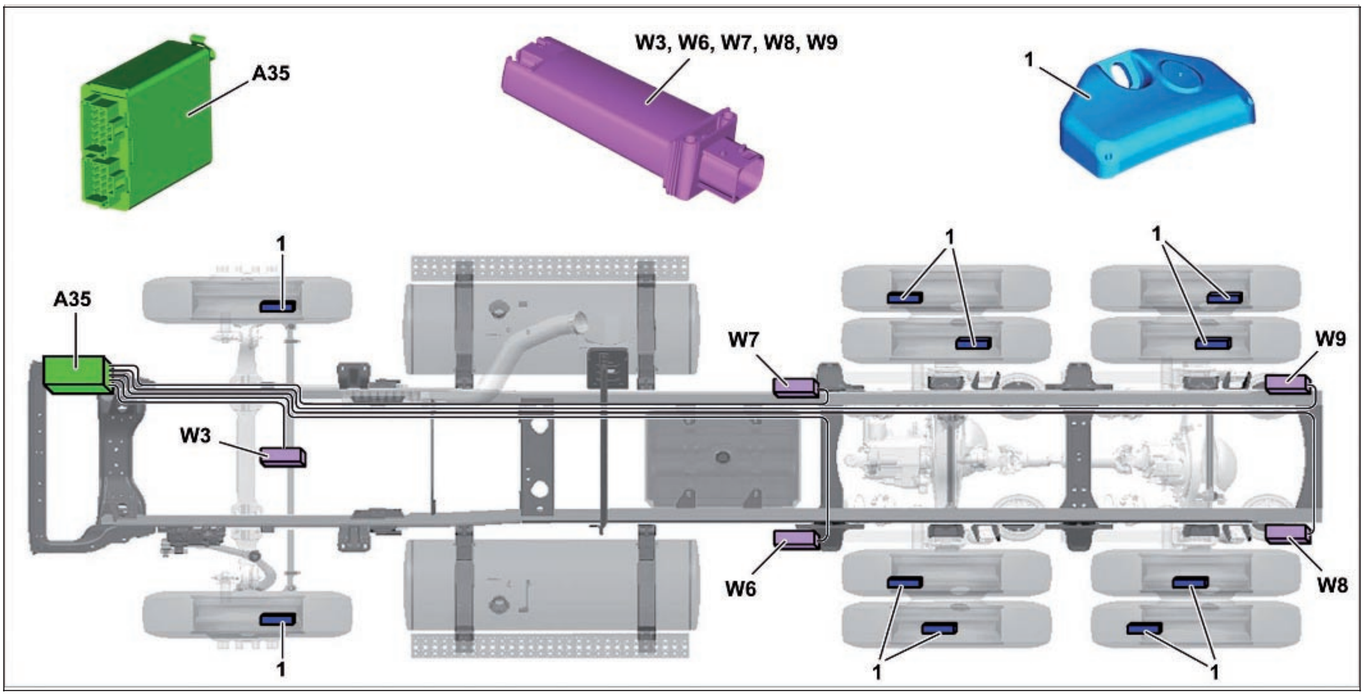


W32.34-1024-79

A2	*Central gateway (CGW) control unit*
A3	*Drive control (CPC) control unit*
A5	*Transmission control (TCM) control unit*
A10	*Antilock brake system (ABS) control unit, 4-channel*
A10b	*Electronic Brake Control (EBS) control unit (Wabco)*
A10c	*Electronic Brake Control (EBS) control unit (Knorr)*
A20	*Front axle modulator (Wabco)*
A20a	*Front axle modulator (Knorr)*
A21	*Rear axle modulator (Wabco)*
A21a	*Rear axle modulator (Knorr)*
A25	*Electronic Stability Program (ESP®) control unit (Wabco)*
A25a	*Electronic Stability Program (ESP®) control unit (Knorr)*
A26	*Level control (CLCS) control unit*
CAN 1	*Exterior CAN*
CAN 3	*Frame CAN*
CAN 4	*Drive train CAN*
CAN 6a	*Front axle brakes CAN*
CAN 6b	*Rear axle brakes CAN*
CAN 6c	*Redundant brakes CAN*
CAN 6d	*ESP® brakes CAN*
P1	*Tachograph (TCO)*
Z3	*Frame CAN bus star point*
Z4	*Drive CAN bus star point*

GF40.15-W-0001H	Tire pressure monitor, function	2.8.11

MODEL 963, 964 with CODE (S1Y) Tire pressure monitor



W40.15-1026-79

1 Wheel sensor

A35 Tire pressure monitor (TPM) control unit

W3 Antenna on 1st front axle

W6 Left antenna on 1st driven rear axle

W7 Right antenna on 1st driven rear axle

W8 Left antenna on 2nd driven rear axle

W9 Right antenna on 2nd driven rear axle

The task of the tire pressure monitoring system is to monitor the tire pressure and tire air temperature. The system consists of the following components:

- Tire pressure monitor (TPM) control unit (A35)
- Wheel sensors (1)
- Antenna on 1st front axle (W3)
- Left antenna on 1st driven rear axle (W6)
- Right antenna on 1st driven rear axle (W7)

and depending on the vehicle model:

- Left antenna on 2nd driven rear axle (W8)
- Right antenna on 2nd driven rear axle (W9)

The wheel sensors (1), which are screwed into the filling valve on the rim shoulder in each wheel, detect the tire pressure, the rotational direction of the wheel and also the tire air temperature and send this information via a wireless connection to the antennas.

The tire pressure monitor (TPM) control unit (A35) evaluates the information sent from the wheel sensors (1) and received via the antennas and sends it as a CAN message via the frame CAN (CAN 3) to the instrument cluster (ICUC) control unit (A1).

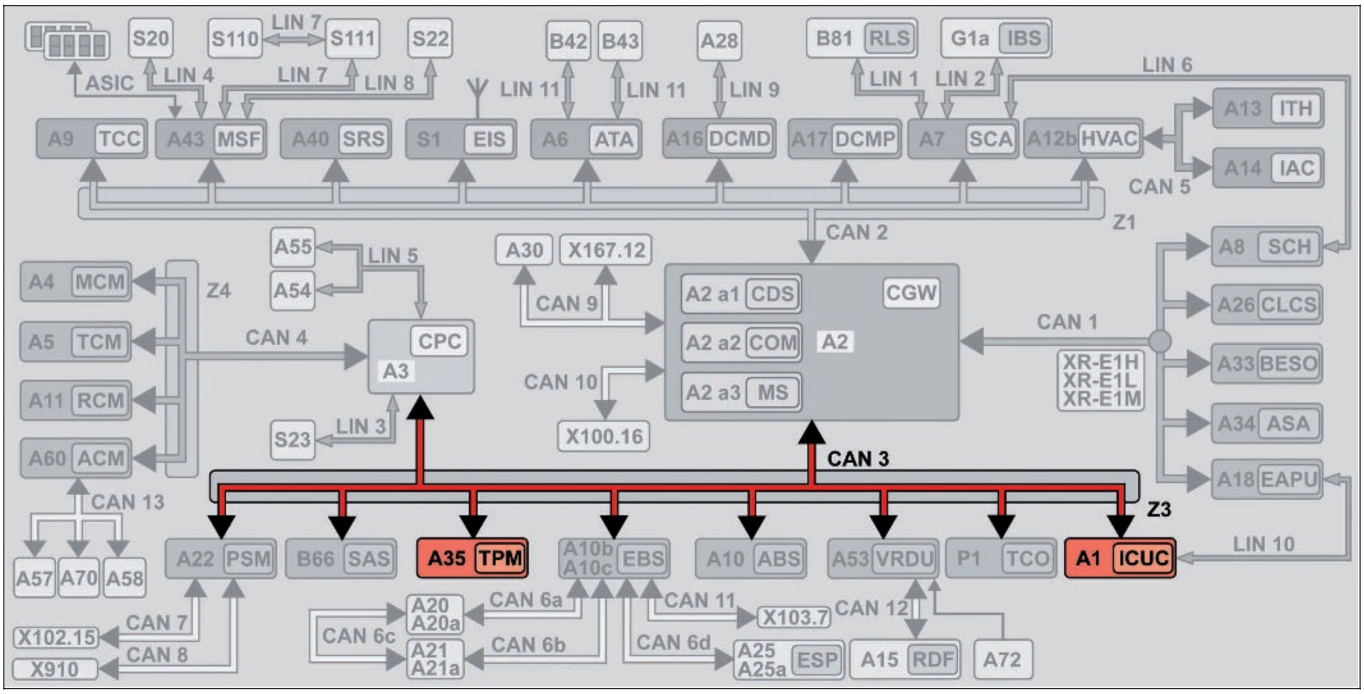
The instrument cluster (ICUC) control unit (A1) evaluates the information and outputs a warning message under the following conditions:

- Underpressure/overpressure at a tire
- Rapid pressure loss at a tire
- Increased tire air temperature
- Exhausted battery capacity at a wheel sensor (1)

i The connections of the antennas have a fixed assignment at the tire pressure monitor (TPM) control unit (A35) and must not be changed over, otherwise it will not be possible to display and assign the tires correctly.

	Tire pressure monitor - overall network		**Page 86**
	Tire pressure monitor, driver information		**Page 87**
	Instrument cluster (ICUC) control unit, component description	A1	**Page 331**
	Tire pressure monitor (TPM) control unit, component description	A35	**Page 365**
	Antenna, component description	W3, W6, W7, W8, W9	**Page 476**
	Wheel sensor, component description		**Page 502**

GF40.15-W-0001-01H	Tire pressure monitor - overall network		



W40.15-1040-79

A1	*Instrument cluster (ICUC) control unit*	*A35*	*Tire pressure monitor (TPM) control unit*	*CAN 3*	*Frame CAN*
				Z3	*Frame CAN bus star point*

GF40.15-W-0001-09H	Tire pressure monitor, driver information		

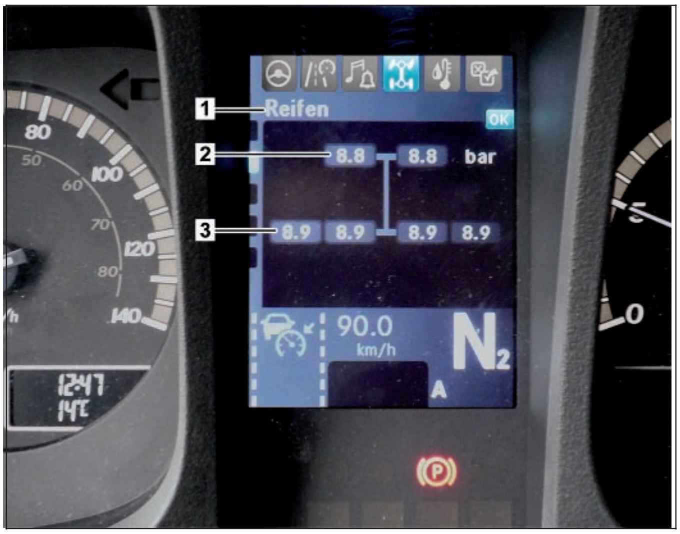
Main menu display

1 Main menu

2 Front axle with tire pressure

3 Rear axle with tire pressure

The main menu (1) displays an overview of the axle configuration and also shows the tires fitted on the vehicle.



W40.15-1033-81

Front axle submenu display

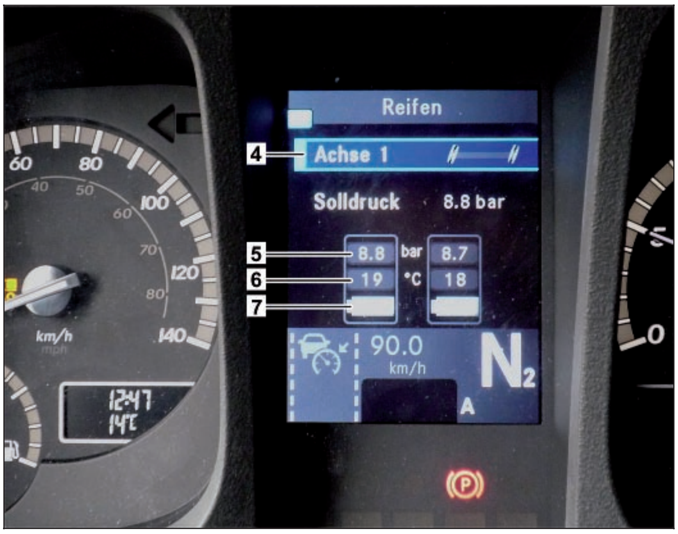
4 Front axle submenu

5 Actual tire pressure

6 Tire air temperature

7 Capacity of battery in wheel sensor

The front axle submenu (4) provides detailed information concerning the tire conditions of each front axle. The actual tire pressure (5), the tire air temperature (6), the capacity of the batteries in the wheel sensor (7) and also the specified pressures of the tires at 20 °C are shown here.



W40.15-1034-81

Rear axle submenu display

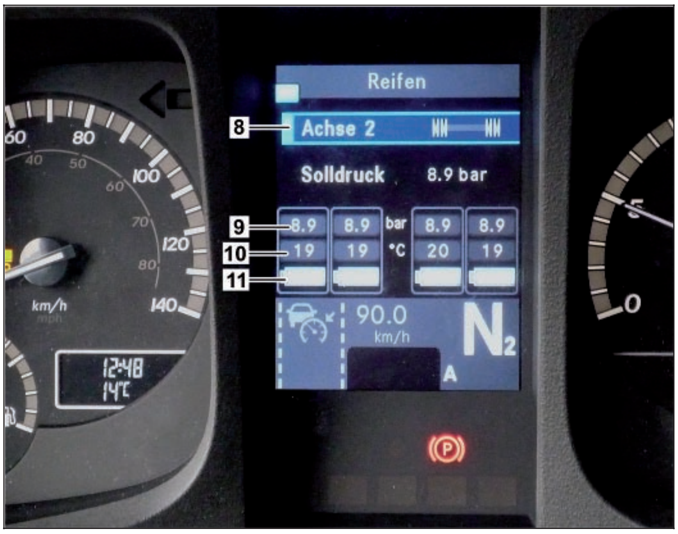
8 Rear axle submenu

9 Actual tire pressure

10 Tire air temperature

11 Capacity of battery in wheel sensor

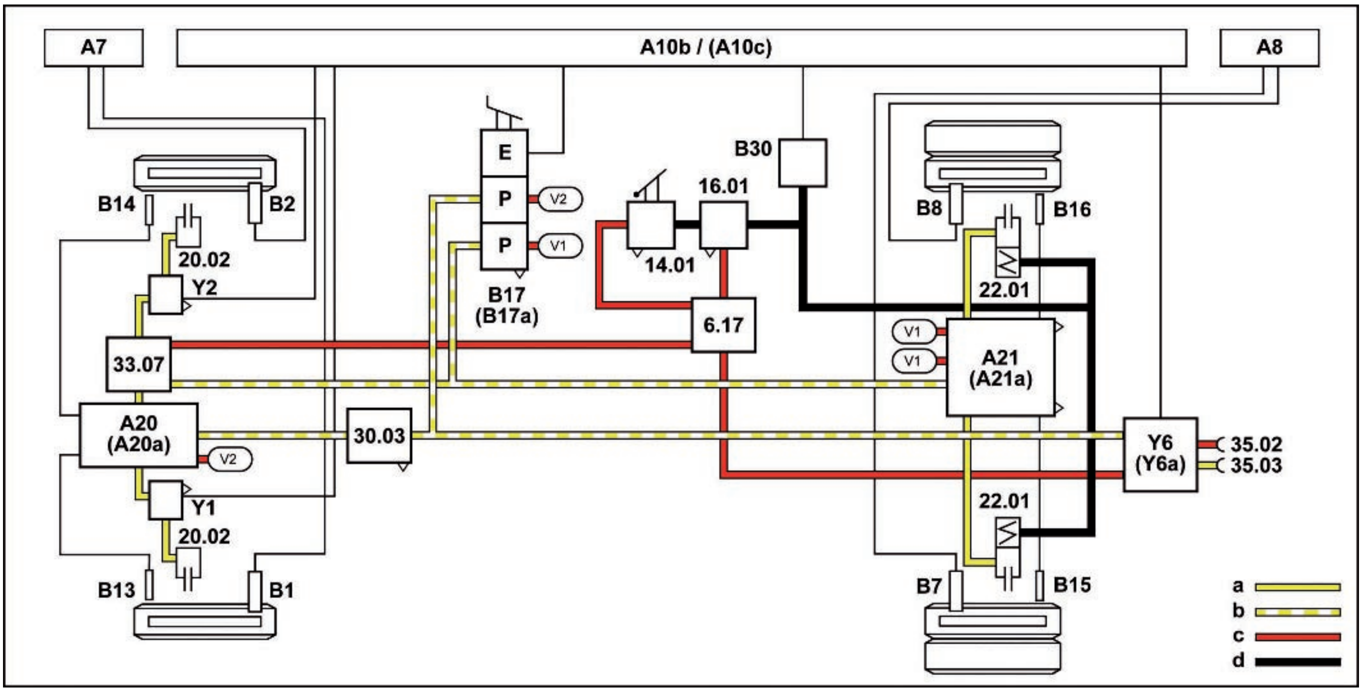
The rear axle submenu (8) provides detailed information concerning the tire conditions of each rear axle. The actual tire pressure (9), the tire air temperature (10), the capacity of the batteries in the wheel sensor (11) and also the specified pressures of the tires at 20 °C are shown here.



W40.15-1035-81

GF42.25-W-0005H	Electronic Brake Control, function	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr



W42.25-1255-79

6.17	Electronic Air Processing Unit (EAPU)
14.01	Parking brake valve without trailer control
16.01	Air admission relay valve
20.02	Diaphragm brake cylinder
22.01	Combination brake cylinder
30.03	Pressure limiting valve with ventilation (only with model 963.403)
33.07	3/2-way valve for auxiliary braking (only with model 963.403/404/405)
35.02	Coupling head for compressed air supply
35.03	Coupling head for brake
A7	Cab signal acquisition and actuation module control unit (SCA)
A8	Frame signal acquisition and actuation module control unit (SCH)
A10b	Electronic Brake Control control unit (EBS) (Wabco)
A10c	Electronic Brake Control control unit (EBS) (Knorr)
A20	Front axle axle modulator (Wabco)
A20a	Front axle axle modulator (Knorr)
A21	Rear axle axle modulator (Wabco)
A21a	Rear axle axle modulator (Knorr)
B1	Left 1st front axle brake wear sensor
B2	Right 1st front axle brake wear sensor
B7	Left 1st rear axle brake wear sensor
B8	Right 1st rear axle brake wear sensor
B13	Left front axle speed sensor
B14	Right front axle speed sensor
B15	Left rear axle speed sensor
B16	Right rear axle speed sensor
B17	Brake value sensor (Wabco)
B17a	Brake value sensor (Knorr)
B30	Parking brake pressure switch
V1	Rear axle service brake system reservoir pressure
V2	Front axle service brake system reservoir pressure
Y1	Left front axle ABS solenoid valve
Y2	Right front axle ABS solenoid valve
Y6	Trailer control valve, WABCO
Y6a	Trailer control valve, Knorr
E	Electrical component
P	Pneumatic component
a	Brake pressure
b	Redundant brake pressure
c	System pressure
d	Parking brake pressure

General information
The Electronic Brake Control (EBS) system is based on a purely pneumatic dual-circuit brake system, which is overlaid by an Electronic Brake Control system. The pneumatic dual-circuit brake system is divided into the redundant front axle brake circuit and the redundant rear axle brake circuit.
In the event of a partial or total failure of the electronic brake control system, the wheel brakes are actuated with the relevant redundant brake pressure (b) by purely pneumatic means.
The trailer control valve (Y6 or Y6a) is equipped with its own electropneumatic brake circuit and is connected to the redundant front-axle brake circuit for the redundancy case.

The Electronic Brake Control (EBS) primarily consists of the following major components:
- Electronic Brake Control control unit (EBS) (A10b or A10c)
- Front axle axle modulator (A20 or A20a)
- Rear axle axle modulator (A21 or A21a)
- Trailer control valve (Y6 or Y6a)
- Brake wear sensors (B1, B2, B7, B8)
- Brake value sensor (B17 or B17a)
- Rpm sensors (B14, B14, B15, B16)
- Pressure limiting valve with ventilation (30.03)
  i only with model 963.403.
- ABS solenoid valve (Y1, Y2)
- 3/2-way valve for auxiliary braking (33.07)
  i only with model 963.403/404/405.

There are two variants of Electronic Brake Control (EBS):
- Code (Z1H) Electronic Brake Control (EBS) Wabco
- Code (Z1G) Electronic Brake Control (EBS) Knorr

Knorr and Wabco's EBS system components are not compatible with each other.
Only the following components may be used in both systems:
- ABS solenoid valves (Y1, Y2)
- 3/2-way valve for auxiliary braking effect (33.07)
- Rpm sensors (B13, B14, B15, B16)

Function
The pedal travel of the brake pedal is electronically recorded by the brake value sensor (B17 or B17a) and forwarded to the Electronic Brake Control control unit (EBS) (A10b or A10c) .
The Electronic Brake Control control unit (EBS) (A10b or A10c) uses the values to compute the specified deceleration and the brake pressure (a) required for this.
The braking pressure (a) required to fulfill the specified deceleration is transmitted via the front axle brake CAN (CAN 6a) to the front axle axle modulator (A20 or A20a) and via the rear axle brake CAN (CAN 6b) to the rear axle axle modulator (A21 or A21a), which then regulates brake pressure (a) on the axles. The Electronic Brake Control control unit (EBS) (A10b or A10c) directly applies the brake pressure (a) required at the trailer control valve (Y6 or Y6a).

During the entire regulating process, the pressure sensors in the front axle axle modulator (A20 or A20a), rear axle axle modulator (A21 or A21a) and the trailer control valve (Y6 or Y6a) monitor the applied brake pressure (a) and report this to the Electronic Brake Control control unit (EBS) (A10b or A10c).
The Electronic Brake Control control unit (EBS) (A10b or A10c) uses the signals from the rpm sensors (B13, B14, B15, B16) to compute the rpm change of the wheels. The Electronic Brake Control control unit (EBS) (A10b or A10c) uses the rpm change to detect the actual deceleration of the vehicle. If there is a difference between the actual deceleration and the specified deceleration, braking is adjusted by an appropriate control command.

Additional control and adjustment functions
The Electronic Brake Control control unit (EBS) (A10b or A10c) performs the following additional control and adjustment functions:
- Rpm sensing and tire matching
- Differential slip control
- Antilock brake system (ABS)
- Acceleration slip regulation (ASR)
- Engine braking regulation
- Electronic Stability Program (ESP®)
- Stability optimization
- Hill holder
- Comfort frequent stop brake
- Reversing lock

Rpm sensing and tire matching
Automatic tire matching continuously compensates for differences between the actual tire sizes and thus between the rolling circumferences of the rpm-sensed wheels. The wheel speeds are matched to the calibrated vehicle speeds of the instrument cluster control unit (ICUC) (A1). If impermissible tire pairings are used or if the speed signals vary significantly, an error message is generated.

Differential slip control
The differential slip control is comprised of the following subfunctions:
- The deceleration control adjusts the brake pressure level to achieve the driver's specified deceleration command.
- Depending on the wheel slip, the brake force distribution ensures the distribution of brake force between the front and rear axles.
- The trailer control ensures that the trailer's braking ratio is both physically sound and legally complies with EU braking specifications.
- The lining wear equalization adjusts the brake distribution between the front and rear axles during uncritical brake applications in order to prevent differences in wear.
- The permanent brake integration activates the permanent brakes installed in the vehicle when the service brakes are actuated via the CAN bus

  i In driving situations with critical adhesion (high wheel slip), the permanent brake integration is disabled because the permanent brakes cannot control highly dynamically.

- The Brake Assist System detects an emergency braking situation via the operating speed and travel of the brake pedal and supports the driver by increasing the specified braking pressure.
- The wheel brake temperature model uses the brake pressures, vehicle speed and time to calculate the wheel brake temperatures, and warns about overheating.
- The learning function for the brake factor acquires information about the effectiveness of the wheel brakes during driving mode and uses this information to optimize the control functions, particularly the trailer control.
- The vehicle mass determination uses the engine torque and the acceleration values calculated from the wheel speeds to determine the vehicle mass and makes this available to other systems via the CAN Bus.

Antilock brake system (ABS)
The control logic uses the wheel speed behavior to detect whether one or more wheels are displaying lock-up tendencies and decides whether the associated brake pressure should be lowered, held or raised.

Acceleration slip regulation (ASR)
The ASR function detects whether the drive wheels have a tendency to spin and counteracts this using the following controls:
- ASR engine intervention
  If both drive wheels tend to lose traction, the drive control reduces engine torque via the CAN bus in order to reduce the drive slip.
- Selective ASR brake intervention
  If an individual drive wheel tends to have an increased drive slip, a selective brake intervention occurs over the rear axle axle modulator (A21 or A21a)
- ASR shutoff
  To improve traction off-road or in deep snow, the acceleration skid control can be switched off via the acceleration skid control button (S45).

Engine braking regulation
Drag torques occur in the drivetrain when the driver abruptly releases the accelerator pedal or engages the clutch too quickly when shifting down gears. If a defined slip condition is exceeded, the engine torque is temporarily increased depending on the wheel speeds of the drive wheels. This prevents the drive wheels from locking up or slipping on the road.

Electronic Stability Program (ESP®)
Due to their high center of gravity and large mass, commercial vehicles tend to tilt and over or understeer when changing lanes, carrying out evasive maneuvers and cornering. If there is a threat that the vehicle may oversteer, i.e. the rear end of the vehicle tends to skid outwards in a curve, the Electronic Stability Program (ESP®) brakes the outside front wheel. The Electronic Stability Program (ESP®) counters against understeering of the vehicle by braking the rear wheel on the inside of the curve and partly by reducing engine power.

Stability optimization
Solo semitrailer tractors generally exhibit a very low rear axle load as a percentage of the whole. In order to guarantee the stability of the rear end when braking, the deceleration at the front axle is limited by software measures in certain models. If an EBS semitrailer is detected, the stability optimization automatically remains inactive.

Hill holder
The hill holder supports the driver by keeping the vehicle stationary and, particularly, by not having to operate the parking brake when starting off on a hill.
The activated hill holder stops the vehicle from rolling away. When the brake pedal is released while the vehicle is stationary, the hill holder automatically maintains the brake pressure last applied at the front and rear axle until the vehicle is driven off with a gear engaged.

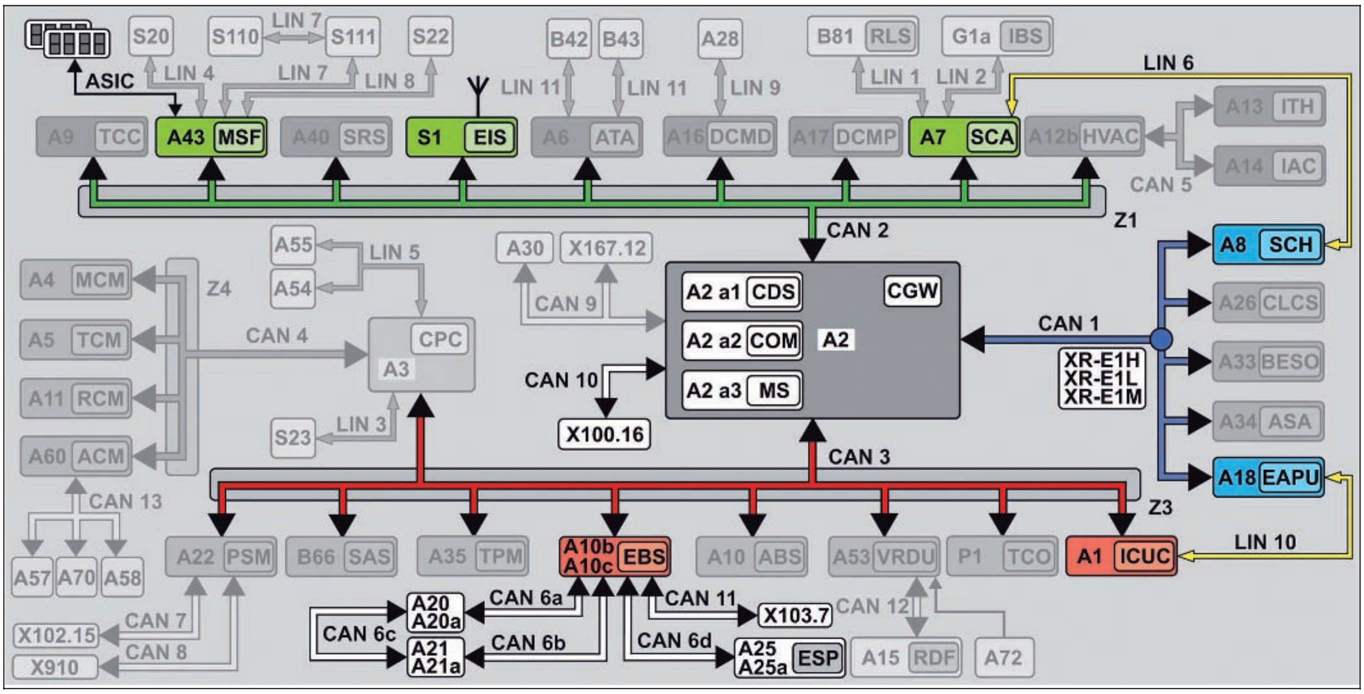
To ensure that the hill holder cannot be used as a substitute for the parking brake, the driver must confirm his presence by applying slight pressure to the brake, accelerator or clutch pedal when the hill holder is activated. If the Electronic Brake Control control unit (EBS) (A10b or A10c) does not receive any feedback, it triggers a warning buzzer and then deactivates the hill holder by releasing the brake pressure.

Comfort - frequent-stop brake
The comfort frequent-stop brake operates in a similar way to the hill holder and is intended, e.g. for vehicles in municipal use. The comfort frequent-stop brake automatically releases when starting-off, when engaging the parking brake or by turning off the function by switch. In contrast to the hill holder, with an active comfort frequency-stop brake, a minimum brake pressure of 3.5 bar is applied at all axles.

Reversing lock
An automatic reverse gear lock is required by law for refuse vehicles. The parameterizable special module control unit (PSM) (A22) uses signals from the step plate at the rear of the vehicle to determine whether it is necessary to activate the reverse gear lock function.

At the same time, a brake request (3.5 bar on all axles) is provided to the Electronic Brake Control (EBS) (A10b or A10c) by the parameterizable special module control unit (PSM) (A22).

GF42.25-W-0005-01H	Electronic Brake Control, overall network		



W00.19-1055-79

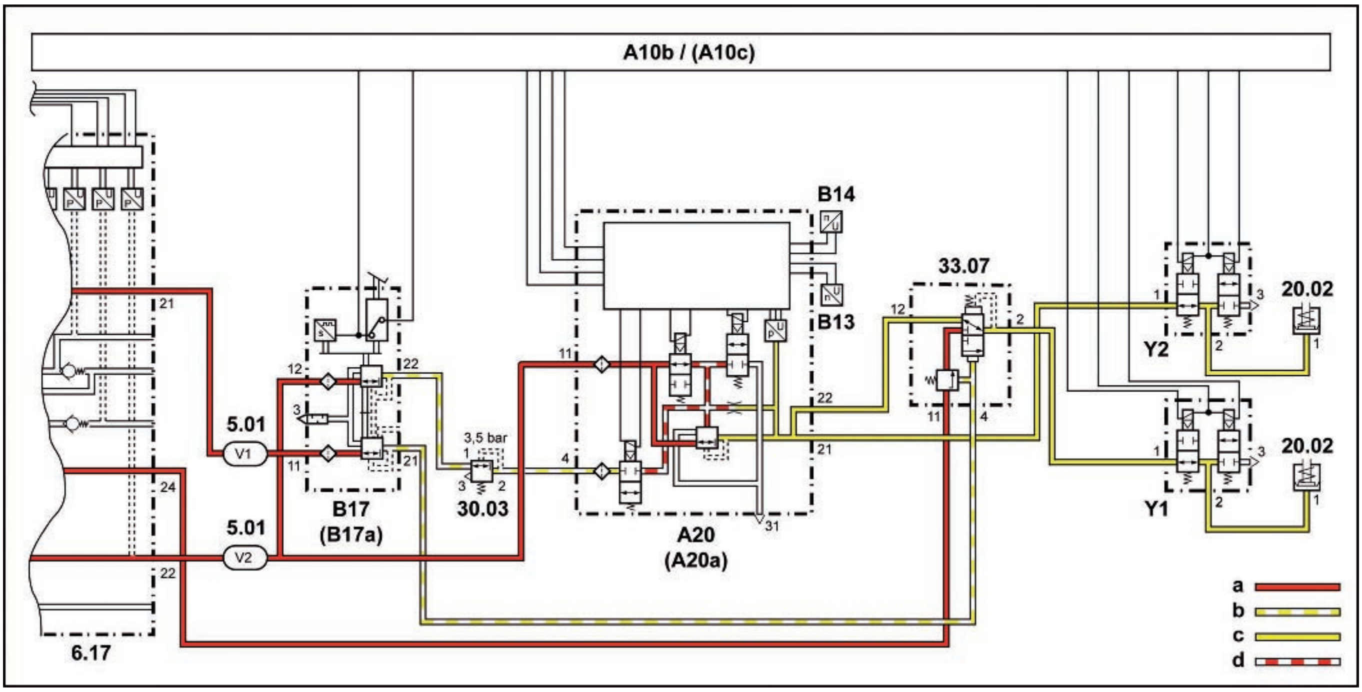
- A1 — Instrument cluster (ICUC) control unit
- A2 — Central gateway control unit (CGW)
- A2 a1 — Central data memory (CDS)
- A2 a2 — Communications interface (COM) control unit
- A2 a3 — Maintenance system (MS) control unit
- A7 — Cab signal acquisition and actuation module control unit (SCA)
- A8 — Frame signal acquisition and actuation module control unit (SCH)
- A10b — Electronic Brake Control control unit (EBS) (Wabco)
- A10c — Electronic Brake Control control unit (EBS) (Knorr)
- A18 — Electronic Air Processing Unit (EAPU) control unit
- A20 — Front axle axle modulator (Wabco)
- A20a — Front axle axle modulator
- A21 — Rear axle axle modulator (Wabco)
- A21a — Rear axle axle modulator (Knorr)
- A25 — Electronic Stability Program control unit (ESP®) (Wabco)
- A25a — Electronic Stability Program control unit (ESP®) (Knorr)
- A43 — Modular switch panel (MSF) control unit
- S1 — Electronic ignition lock (EIS)
- XR-E1H — CAN-H exterior cable weld point 1
- XR-E1L — CAN-L exterior cable weld point 1
- XR-E1M — CAN-ground exterior cable weld point 1
- X100.16 — Diagnostic socket
- X103.7 — ABS trailer socket 7-pin
- Z1 — Cab instrument panel CAN bus star point
- Z3 — Frame CAN bus star point

- CAN 1 — Exterior-CAN
- CAN 2 — Interior CAN
- CAN 3 — Frame CAN
- CAN 6a — Front axle brakes CAN
- CAN 6b — Rear axle brakes CAN
- CAN 6c — Redundant brakes CAN
- CAN 6d — ESP brakes CAN
- CAN 10 — Diagnostic CAN
- CAN 11 — Trailer CAN (EBS)

- LIN 6 — Redundant-LIN SCA/SCH
- LIN 10 — EAPU-LIN

GF42.25-W-3007H	Brake application on front axle with Electronic Brake Control, function	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr



W42.25-1284-79

5.01	*Compressed air reservoir*
6.17	*Electronic Air Processing Unit (EAPU)*
20.02	*Diaphragm brake cylinder*
30.03	*Pressure limiting valve with ventilation (only with model 963.403)*
33.07	*3/2-way valve for auxiliary braking (only with model 963.403/404/405)*
A10b	*Electronic Brake Control control unit (EBS) (Wabco)*
A10c	*Electronic Brake Control control unit (EBS) (Knorr)*
A20	*Front axle axle modulator (Wabco)*
A20a	*Front axle axle modulator (Knorr)*
B13	*Left front axle speed sensor*
B14	*Right front axle speed sensor*
B17	*Brake value sensor (Wabco)*
B17a	*Brake value sensor (Knorr)*
Y1	*Left front axle ABS solenoid valve*
Y2	*Right front axle ABS solenoid valve*
V1	*Rear axle service brake system reservoir pressure*
V2	*Front axle service brake system reservoir pressure*
a	*System pressure*
b	*Redundant brake pressure*
c	*Brake pressure*
d	*Control pressure*

Requirements
- Vehicle moves.
- Max. reservoir pressure in the compressed air reservoirs (5.01).
- No faults indicated in the multifunction display (A1p1) of the instrument cluster control unit (ICUC) (A1).
- Electronic Brake Control electronics (EBS) operational.

Function sequence
When the brake pedal is operated, the sensors in the brake value sensor (B17 or B17a) record the driver's brake command for the Electronic Brake Control control unit (EBS) (A10b or A10c).
The pneumatic part of the brake value sensor (B17 or B17a) applies a redundant brake pressure (b) that corresponds to the pedal travel to the pressure limiting valve with ventilation (30.03) via connection 22.

ℹ With tractors, the pressure limiting valve with ventilation (30.03) limits redundant brake pressure (b) in the front axle for stability reasons. As long as the redundant brake pressure (b) coming from connection 22 does not exceed 3.5 bar, it can freely flow through the pressure limiting valve with ventilation (30.03).

The redundancy path switching valve integrated into the front axle axle modulator (A20 or A20a) blocks the redundant brake pressure (b) from the pressure limiting valve with ventilation (30.03).
At the same time, the electronics of the Electronic Brake Control control unit (EBS) (A10b or A10c) uses the electric signals from the brake value sensor to calculate the specified deceleration for the front and rear axle.

The Electronic Brake Control control unit (EBS) (A10b or A10c) actuates the front axle axle modulator (A20 or A20a) using the specified deceleration signal and uses this to apply brake pressure (c) to connections 22 and 21.

The brake pressure (c) reaches the right-hand single circuit diaphragm brake cylinder (20.02) via the opened ABS solenoid valve (Y2), whereby the right wheel is braked.
At the same time, the brake pressure (c) is applied to the left single-circuit diaphragm brake cylinder (20.02) of the front axle to brake the left-hand wheel via the 3/2-way valve for auxiliary braking (33.07) and the opened ABS solenoid valve (Y1).

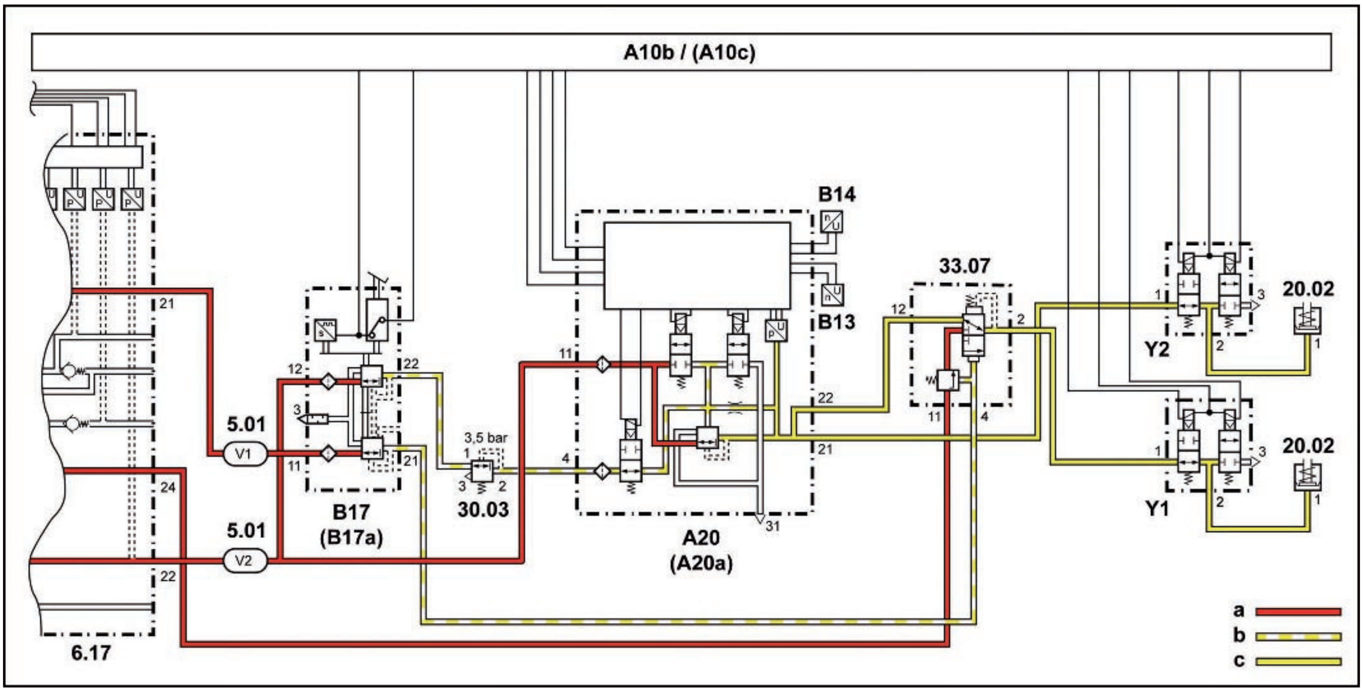
ℹ If the front-axle brake circuit fails, the 3/2-way valve for auxiliary braking (33.07) supports the braking effect at the rear axle. As long as brake pressure (c) from the front axle axle modulator (A20 or A20a) is available at connection 12 of the 3/2-way valve for auxiliary braking (33.07) during brake application, the valve will remain in the basic position and the brake pressure can flow through freely.

To calculate the actual deceleration and wheel slip, the Electronic Brake Control control unit (EBS) (A10b or A10c) evaluates the signals from the rpm sensors (B13, B14) on the wheels and the pressure sensor in the front axle axle modulator (A20 or A20a) during the entire brake application.
If the actual deceleration deviates from the specified deceleration, the Electronic Brake Control control unit (EBS) (A10b or A10c) causes the front axle axle modulator (A20 or A20a) to reduce or increase brake pressure (c).

	Pressure limiting valve with ventilation, component description	30.03 (only with model 963.403)	**Page 497**
	3/2-way valve for auxiliary braking effect, component description	33.07 (only with model 963.403/404/405)	**Page 507**
	Front axle axle modulator, component description	A20, A20a	**Page 509**
	Brake value sensor, component description	B17, B17a	**Page 406**
	Electronic Brake Control control unit (EBS), component description	A10b, A10c	**Page 341**
	ABS solenoid valve, component description	Y1, Y2	**Page 479**
	Component description for the rpm sensor	B13, B14, B15, B16	**Page 405**

GF42.25-W-3008H	Brake application on front axle without Electronic Brake Control, function	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr



W42.25-1285-79

5.01	*Compressed air reservoir*	*A10b*	*Electronic Brake Control control unit (EBS) (Wabco)*	*Y1*	*Left front axle ABS solenoid valve*
6.17	*Electronic Air Processing Unit (EAPU)*	*A10c*	*Electronic Brake Control control unit (EBS) (Knorr)*	*Y2*	*Right front axle ABS solenoid valve*
20.02	*Diaphragm brake cylinder*	*A20*	*Front axle axle modulator (Wabco)*	*V1*	*Rear axle service brake system reservoir pressure*
30.03	*Pressure limiting valve with ventilation (only with model 963.403)*	*A20a*	*Front axle axle modulator (Knorr)*	*V2*	*Front axle service brake system reservoir pressure*
33.07	*3/2-way valve for auxiliary braking (only with model 963.403/404/405)*	*B13*	*Left front axle speed sensor*	*a*	*System pressure*
		B14	*Right front axle speed sensor*	*b*	*Redundant brake pressure*
		B17	*Brake value sensor (Wabco)*	*c*	*Brake pressure*
		B17a	*Brake value sensor (Knorr)*		

ℹ The braking operation occurs without electronic monitoring and electronic regulation. The brake pressure is applied relative to the travel of the brake pedal by purely pneumatic means.

Requirements

- Vehicle moves.
- Max. reservoir pressure in the compressed air reservoirs (5.01).
- The Electronic Brake Control is not operational, the electrical connections between the Electronic Brake Control control unit (EBS) (A10b or A10c) and the brake system components are interrupted.
- The redundancy path switching valve in the front axle axle modulator (A20 or A20a) is de-energized and in flow-through position.
- The instrument cluster control unit's (ICUC) (A1) multifunction display (A1p1) indicates a fault in the Electronic Brake Control (EBS).

Function sequence
When the brake pedal is actuated, the pneumatic part of the brake valve sensor (B17 or B17a) actuates the pressure limiting valve with ventilation (30.03) via connection 22 with a redundant brake pressure (b) that corresponds to the pedal travel.

The opened pressure limiting valve with ventilation (30.03) directs the redundant brake pressure (b) to connection 4 of the front axle axle modulator (A20 or A20a).

ℹ With tractors, the pressure limiting valve with ventilation (30.03) limits the redundant brake pressure (b) of the front axle for stability reasons. As long as the redundant brake pressure (b) from connection 22 does not exceed 3.5 bar, it can freely flow through the pressure limiting valve with ventilation (30.03).

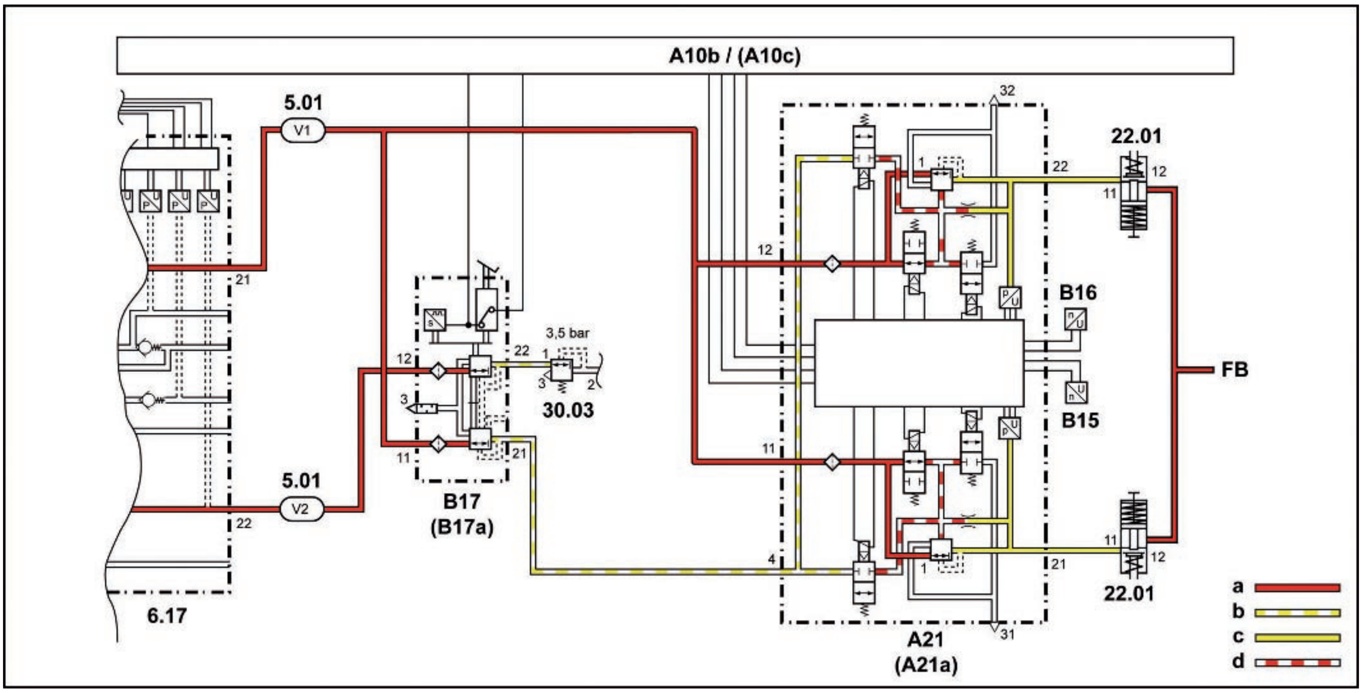
The relay valve integrated in the front axle axle modulator (A20 or A20a) is opened by the redundant brake pressure (b) coming from the redundancy path switching valve (b) and applies the reservoir pressure (a) present at connection 11 as brake pressure (c) to connections 21 and 22.
The brake pressure (c) reaches the right-hand single circuit diaphragm brake cylinder (20.02) of the front axle via the opened ABS solenoid valve (Y2), and the right wheel brakes.
At the same time, the brake pressure (c) reaches the left-hand single-circuit diaphragm brake cylinder (20.02) of the front axle via the 3/2-way valve for auxiliary braking (33.07) and the opened ABS solenoid valve (Y1) to brake the left-hand wheel.

i If the front-axle brake circuit fails, the 3/2-way valve for auxiliary braking (33.07) supports the braking effect at the rear axle. As long as brake pressure (c) from the front axle axle modulator (A20 or A20a) is available at connection 12 of the 3/2-way valve for auxiliary braking (33.07), the valve will remain inoperative and the brake pressure can flow through freely.

	Pressure limiting valve with ventilation, component description	30.03 (only with model 963.403)	**Page 497**
	3/2-way valve for auxiliary braking effect, component description	33.07 (only with model 963.403/404/405)	**Page 507**
	Front axle axle modulator, component description	A20, A20a	**Page 509**
	Brake value sensor, component description	B17, B17a	**Page 406**
	Electronic Brake Control control unit (EBS), component description	A10b, A10c	**Page 341**
	ABS solenoid valve, component description	Y1, Y2	**Page 479**
	Component description for the rpm sensor	B13, B14, B15, B16	**Page 405**

GF42.25-W-3009H	Brake application on rear axle with Electronic Brake Control, function	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr



W42.25-1286-79

5.01 *Compressed air reservoir*
6.17 *Electronic Air Processing Unit (EAPU)*
22.01 *Combination brake cylinder*
30.03 *Pressure limiting valve with ventilation (only with model 963.403)*

A10b *Electronic Brake Control control unit (EBS) (Wabco)*
A10c *Electronic Brake Control control unit (EBS) (Knorr)*
A21 *Rear axle axle modulator (Wabco)*
A21a *Rear axle axle modulator (Knorr)*
B15 *Left rear axle speed sensor*
B16 *Right rear axle speed sensor*
B17 *Brake value sensor (Wabco)*
B17a *Brake value sensor (Knorr)*
FB *Parking brake*
V1 *Rear axle service brake system reservoir pressure*
V2 *Front axle service brake system reservoir pressure*

a *System pressure*
b *Redundant brake pressure*
c *Brake pressure*
d *Control pressure*

Requirements

- Vehicle moves.
- Max. reservoir pressure in the compressed air reservoirs (5.01).
- No faults indicated in the multifunction display (A1 p1) of the instrument cluster control unit (ICUC) (A1).
- Electronic Brake Control electronics (EBS) operational.

Function sequence

When the brake pedal is operated, the sensors in the brake value sensor (B17 or B17a) record the driver's brake command for the Electronic Brake Control control unit (EBS) (A10b or A10c).
The pneumatic part of the brake value sensor (B17 or B17a) sends a redundant brake pressure (b) corresponding to the pedal travel to connection 4 of the rear axle axle modulator (A21 or A21a) via connection 21.

i The redundant brake pressure for the rear axle is reduced to a ratio of 1:1.5 in the brake value sensor (B17 or B17a).

If the actual deceleration deviates from the specified deceleration, the Electronic Brake Control control unit (EBS) (A10b or A10c) causes the rear axle axle modulator (A21 or A21a) to reduce or increase brake pressure (c).

The redundancy path switching valves integrated into the rear axle axle modulator (A21 or A21a) block the redundant brake pressure (b) coming from the brake value sensor (B17 or B17a).
The electronics of the Electronic Brake Control control unit (EBS) (A10b or A10c) evaluates the specified deceleration for the front and rear axle from the electrical signals of the brake value sensor (B17 or B17a).
The Electronic Brake Control control unit (EBS) (A10b or A10c) actuates the rear axle axle modulator (A21 or A21a) using the specified deceleration signal and uses this to apply brake pressure (c) at connections 22 and 21.
The brake pressure (c) passes from connections 21 and 22 of the rear axle axle modulator (A21 or A21a) into the combination brake cylinders (22.01) of the rear wheel brakes, and the wheels are braked.
During the entire brake application, the electronics of the rear axle axle modulator (A21 or A21a) record the values from the internal pressure sensors and the signals from the rpm sensors (B15, B16) and transmits these to the Electronic Brake Control control unit (EBS) (A10b or A10c), which evaluates them.

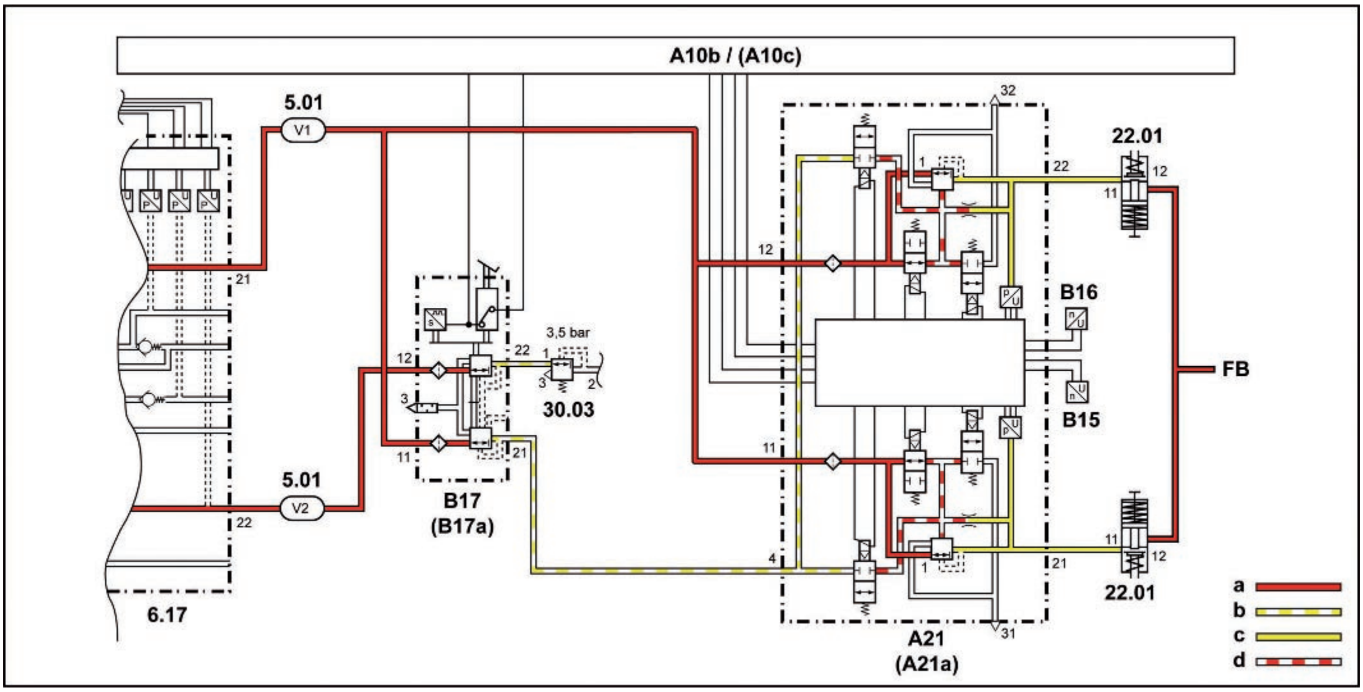
---

i In the case of ABS control, the internal valves of the rear axle axle modulator (A21 or A21a) perform the "pressure buildup", "pressure hold" and "pressure release" functions in the same way as the ABS solenoid valves (Y1, Y2) on the front axle.

	Rear axle axle modulator, component description	A21, A21a	**Page 511**
	Brake value sensor, component description	B17, B17a	**Page 406**
	Electronic Brake Control control unit (EBS), component description	A10b, A10c	**Page 341**
	Component description for the rpm sensor	B13, B14, B15, B16	**Page 405**

GF42.25-W-3010H	Brake application on rear axle without Electronic Brake Control, function	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr



W42.25-1287-79

5.01 *Compressed air reservoir*
6.17 *Electronic Air Processing Unit (EAPU)*
22.01 *Combination brake cylinder*
30.03 *Pressure limiting valve with ventilation (only with model 963.403)*

A10b *Electronic Brake Control control unit (EBS) (Wabco)*
A10c *Electronic Brake Control control unit (EBS) (Knorr)*

A21 *Rear axle axle modulator (Wabco)*
A21a *Rear axle axle modulator (Knorr)*
B15 *Left rear axle speed sensor*
B16 *Right rear axle speed sensor*
B17 *Brake value sensor (Wabco)*
B17a *Brake value sensor (Knorr)*
FB *Parking brake*

V1 *Rear axle service brake system reservoir pressure*
V2 *Front axle service brake system reservoir pressure*

a *System pressure*
b *Redundant brake pressure*
c *Brake pressure*

ℹ The braking operation occurs without electronic monitoring and electronic actuation. The brake pressure is applied relative to the travel of the brake pedal by purely pneumatic means.

Requirements

- Vehicle moves.
- Max. reservoir pressure in the compressed air reservoirs (5.01).
- The Electronic Brake Control is not operational, the electrical connections between the Electronic Brake Control control unit (EBS) (A10b or A10c) and the brake system components are interrupted.
- The redundancy path switching valves in the rear axle axle modulator (A21 or A21a) are de-energized and in flow-through position.
- The instrument cluster control unit's (ICUC) (A1) multifunction display (A1p1) indicates a fault in the Electronic Brake Control (EBS).

Function sequence

When the brake pedal is actuated, the pneumatic part of the brake value sensor (B17 or B17a) sends a redundant brake pressure (b) corresponding to the pedal travel to connection 4 of the rear axle axle modulator (A21 or A21a) via connection 21.

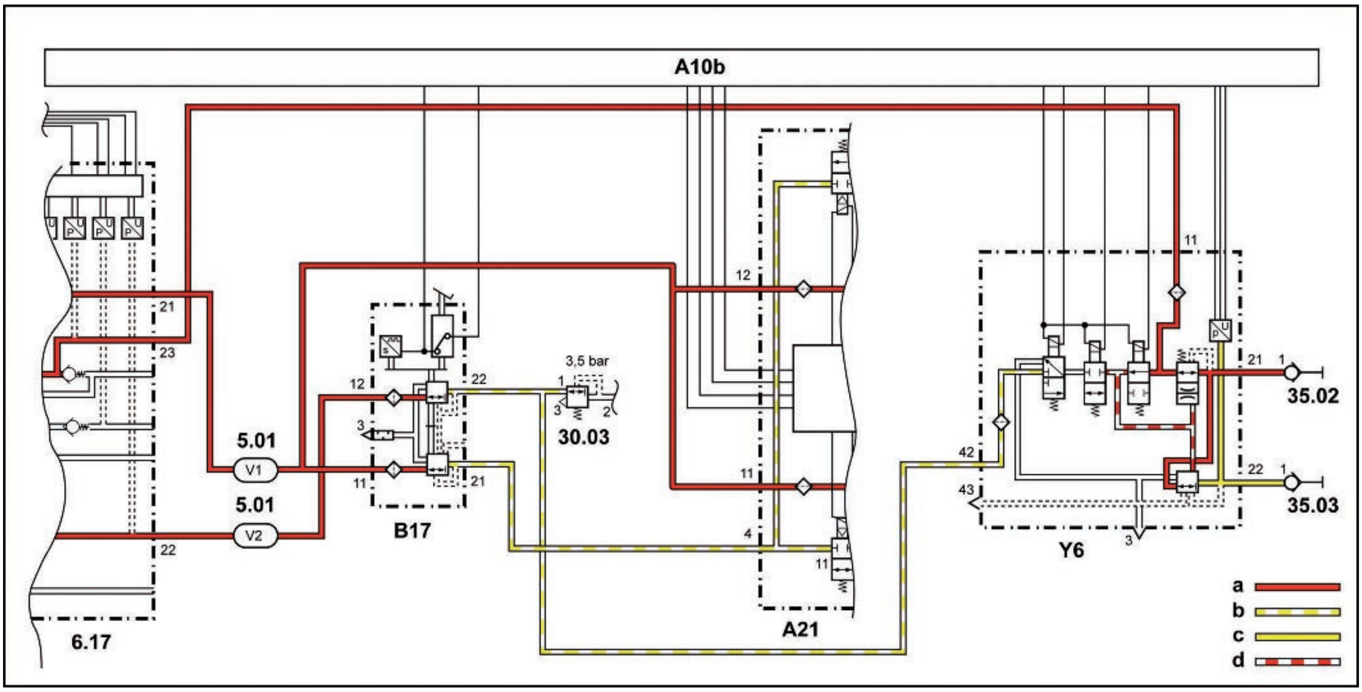
ℹ The redundant brake pressure for the rear axle is reduced to a ratio of 1:1.5 in the brake value sensor (B17 or B17a).

The relay valves integrated in the rear axle axle modulator (A21 or A21a) are opened by the redundant brake pressure (b) coming from connection 4 and the redundancy path switching valves and apply the reservoir pressure (a) at connections 11 and 12 as brake pressure (c) to connections 21 and 22.
The brake pressure (c) passes from connections 21 and 22 of the rear axle axle modulator (A21 or A21a) into the combination brake cylinders (22.01) of the rear wheel brakes, and the wheels brake.

	Rear axle axle modulator, component description	A21, A21a	**Page 511**
	Brake value sensor, component description	B17, B17a	**Page 406**
	Electronic Brake Control control unit (EBS), component description	A10b, A10c	**Page 341**
	Component description for the rpm sensor	B13, B14, B15, B16	**Page 405**

GF42.25-W-3011H	Trailer control with Electronic Brake Control, function	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr



W42.25-1288-79

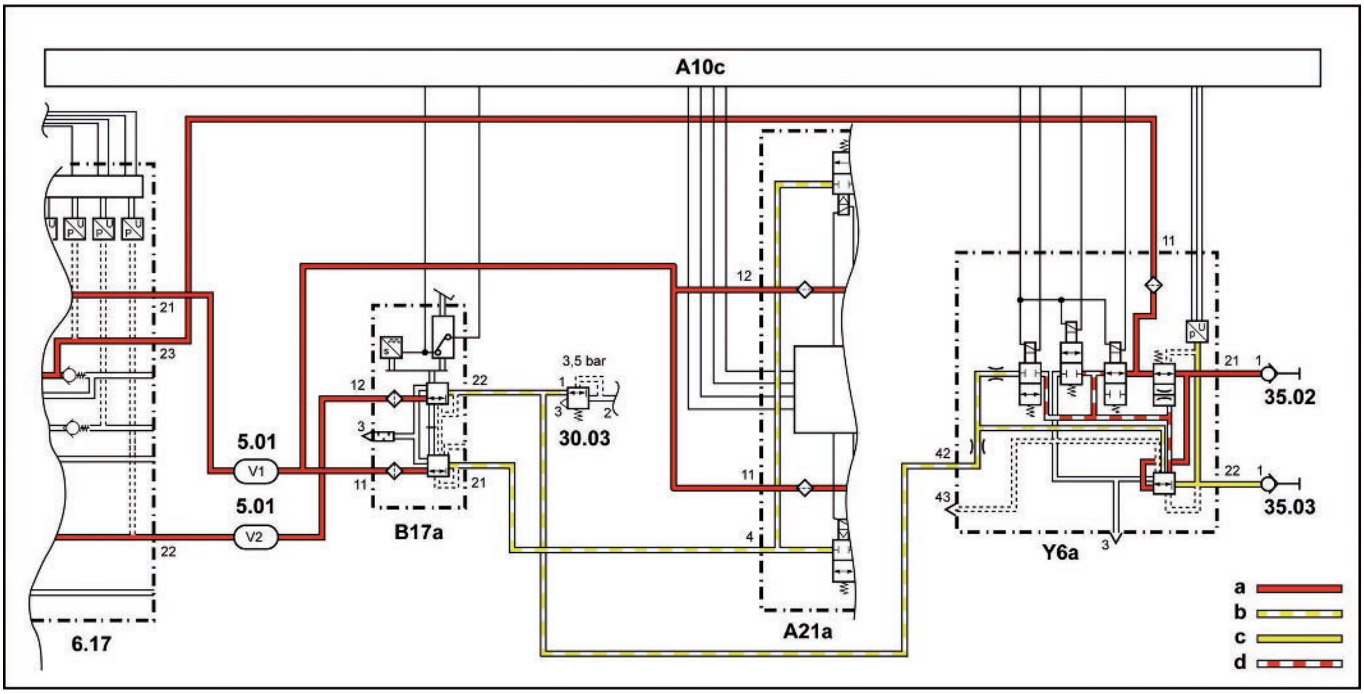
Vehicle with code (Z1H) Electronic Brake Control (EBS) Wabco

5.01 Compressed air reservoir
6.17 Electronic Air Processing Unit (EAPU)
30.03 Pressure limiting valve with ventilation (only with model 963.403)
35.02 Coupling head for compressed air supply
35.03 Coupling head for brake

A10b Electronic Brake Control control unit (EBS) (Wabco)
A21 Rear axle axle modulator (Wabco)
B17 Brake value sensor (Wabco)
Y6 Trailer control valve, WABCO
V1 Rear axle service brake system reservoir pressure

V2 Front axle service brake system reservoir pressure

a System pressure
b Redundant brake pressure
c Brake pressure
d Control pressure



W42.25-1289-79

Vehicle with code (Z1G) Electronic Brake Control (EBS) Knorr

5.01	*Compressed air reservoir*
6.17	*Electronic Air Processing Unit (EAPU)*
30.03	*Pressure limiting valve with ventilation (only with model 963.403)*
35.02	*Coupling head for compressed air supply*
35.03	*Coupling head for brake*
A10c	*Electronic Brake Control control unit (EBS) (Knorr)*
A21a	*Rear axle axle modulator (Knorr)*
B17a	*Brake value sensor (Knorr)*
Y6a	*Trailer control valve, Knorr*
V1	*Rear axle service brake system reservoir pressure*
V2	*Front axle service brake system reservoir pressure*
a	*System pressure*
b	*Redundant brake pressure*
c	*Brake pressure*
d	*Control pressure*

Requirements

- Vehicle with trailer is in motion.
- Max. reservoir pressure in the compressed air reservoirs (5.01).
- Max. reservoir pressure at connection 23 of the Electronic Air-Processing Unit (EAPU) (6.17).
- No faults indicated in the multifunction display (A1 p1) of the instrument cluster control unit (ICUC) (A1).
- Electronic Brake Control electronics (EBS) operational.

Function sequence

When the brake pedal is operated, the sensors in the brake value sensor (B17 or B17a) record the driver's brake command for the Electronic Brake Control control unit (EBS) (A10b or A10c).
The pneumatic part of the brake value sensor (B17 or B17a) applies a redundant brake pressure (b) corresponding to the pedal travel via connection 22 to connection 42 of the trailer control valve (Y6 or Y6a).

The electronics of the Electronic Brake Control control unit (EBS) (A10b or A10c) use the electrical signals of the brake value sensor to compute the specified deceleration for the front and rear axle and the trailer.
The Electronic Brake Control control unit (EBS) (A10b or A10c) routes the reservoir pressure present at connection 11 to the trailer control valve's relay valve (Y6 or Y6a) as brake pressure with the help of the intake valve integrated in the trailer control valve (Y6 or Y6a).

i For vehicles with code (Z1G) Electronic Brake Control (EBS) Knorr the redundant brake pressure (b) and control pressure (d) are applied to the trailer control valve's relay valve (Y6a) at the same time during a brake application with electronic brake control. The control pressure (d) is preferred because of the different force/area ratios in the relay valve.

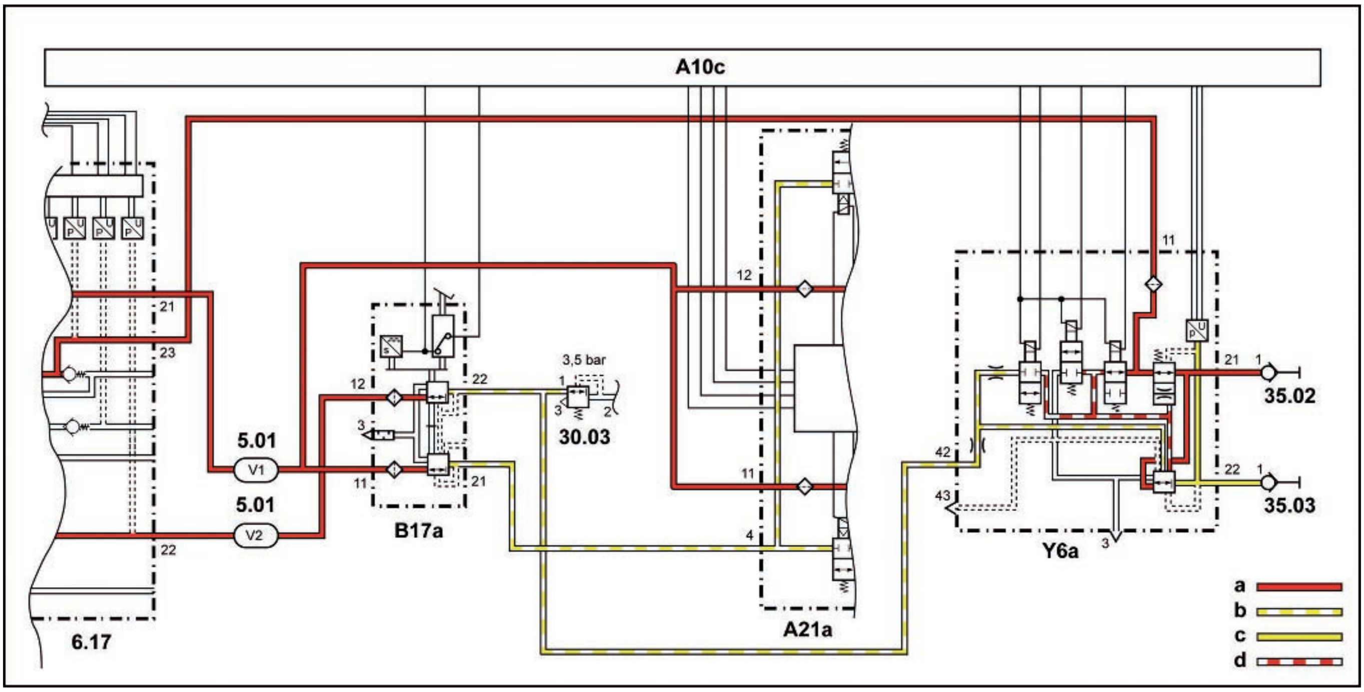
The reservoir pressure (a) present at connection 11 flows in accordance with the control pressure (d) at the trailer control valve relay valve (Y6 or Y6a) to the brake coupling head (35.03) as brake pressure (c).
The pressure sensor integrated in the trailer control valve (Y6 or Y6a) reports the brake pressure applied by the trailer control valve (Y6 or Y6a) to the Electronic Brake Control control unit (EBS) (A10b or A10c).

If the actual deceleration deviates from the specified deceleration, the Electronic Brake Control control unit (EBS) (A10b or A10c) corrects the brake pressure with the help of the valves integrated in the relay valve.

	Trailer control valve, component description	Y6, Y6a	**Page 503**
	Brake value sensor, component description	B17, B17a	**Page 406**
	Electronic Brake Control control unit (EBS), component description	A10b, A10c	**Page 341**
	Coupling head for compressed air supply/brake, component description	25.02, 25.03	**Page 498**

GF42.25-W-3012H	Trailer control without Electronic Brake Control, function	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr



W42.25-1290-79

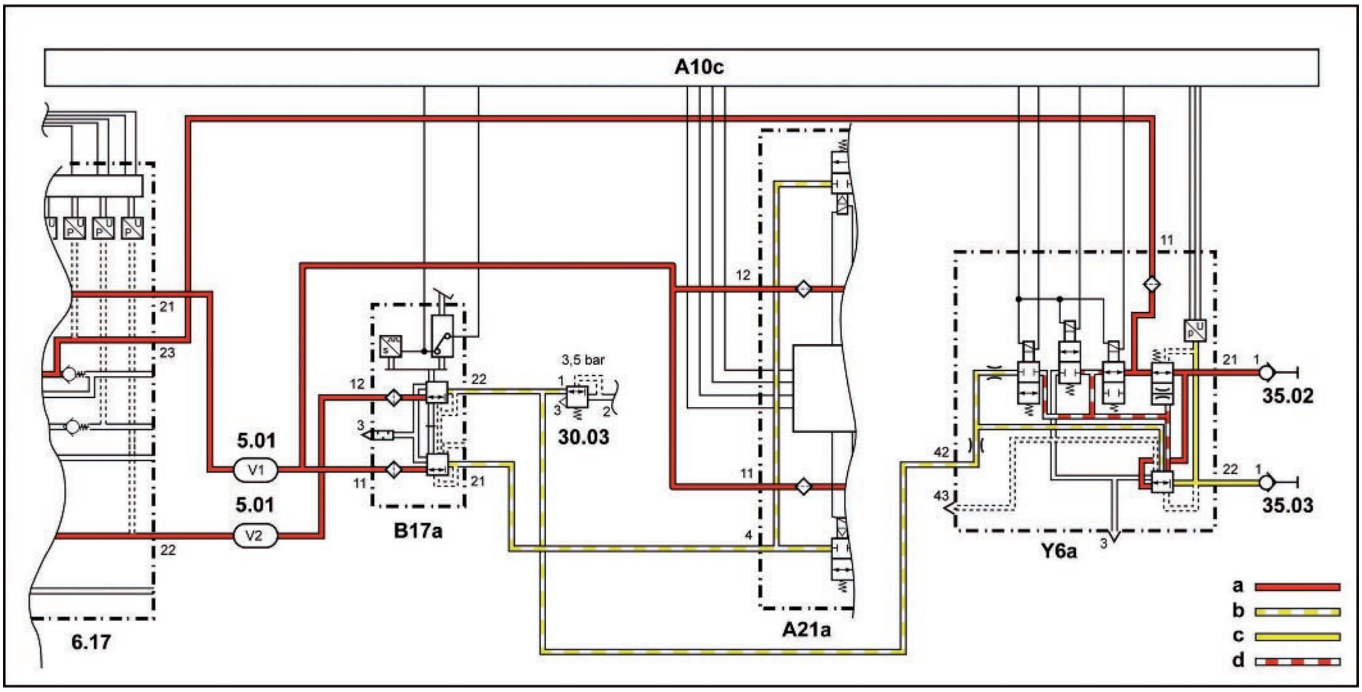
Vehicle with code (Z1H) Electronic Brake Control (EBS) Wabco

5.01 Compressed air reservoir
6.17 Electronic Air Processing Unit (EAPU)
30.03 Pressure limiting valve with ventilation (only with model 963.403)
35.02 Coupling head for compressed air supply
35.03 Coupling head for brake

A10b Electronic Brake Control control unit (EBS) (Wabco)
B17 Brake value sensor (Wabco)
A21 Rear axle axle modulator (Wabco)
Y6 Trailer control valve (Wabco)
V1 Rear axle service brake system reservoir pressure

V2 Front axle service brake system reservoir pressure

a System pressure
b Redundant brake pressure
c Brake pressure



W42.25-1291-79

Vehicle with code (Z1G) Electronic Brake Control (EBS) Knorr

5.01	*Compressed air reservoir*
6.17	*Electronic Air Processing Unit (EAPU)*
30.03	*Pressure limiting valve with ventilation (only with model 963.403)*
35.02	*Coupling head for compressed air supply*
35.03	*Coupling head for brake*
A10c	*Electronic Brake Control control unit (EBS) (Knorr)*
B17a	*Brake value sensor (Knorr)*
A21a	*Rear axle axle modulator (Knorr)*
Y6a	*Trailer control valve (Knorr)*
V1	*Rear axle service brake system reservoir pressure*
V2	*Front axle service brake system reservoir pressure*
a	*System pressure*
b	*Redundant brake pressure*
c	*Brake pressure*

i The braking operation occurs without electronic monitoring and electronic actuation. The brake pressure is applied relative to the travel of the brake pedal by purely pneumatic means.

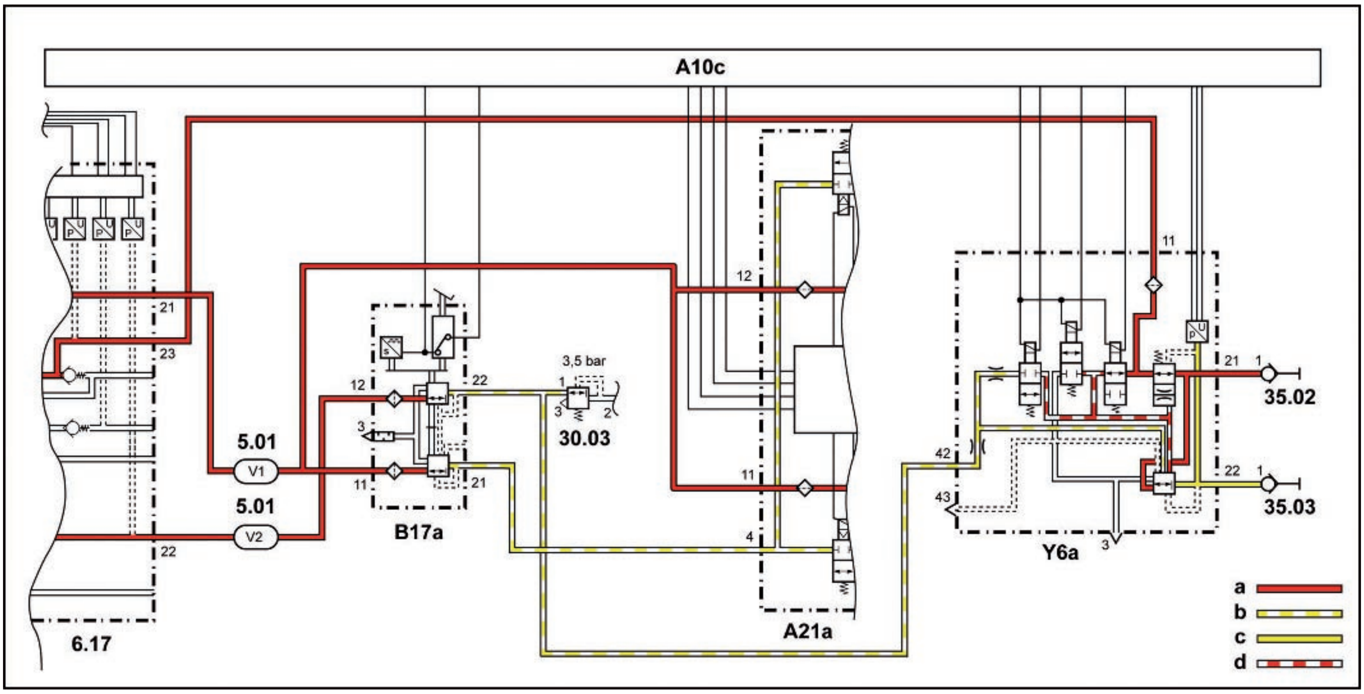
Requirements
- Vehicle with trailer is in motion.
- Max. reservoir pressure in the compressed air reservoirs (5.01).
- Max. reservoir pressure at connection 23 of the Electronic Air-Processing Unit (EAPU) (6.17).
- The instrument cluster control unit's (ICUC) (A1) multifunction display (A1p1) indicates a fault in the Electronic Brake Control (EBS).
- The Electronic Brake Control (EBS) (A10b or A10c) is not operational; electric actuation of the valves of the trailer control valve (Y6 or Y6a) is not possible.
- The redundancy path switching solenoid valve in the trailer control valve (Y6 or Y6a) is de-energized and in the flow-through position.

Function sequence
When the brake pedal is actuated, the pneumatic part of the brake value sensor (B17 or B17a) routes a redundant brake pressure (b) via connection 22 that corresponds to the pedal travel to connection 42 of the trailer control valve (Y6 or Y6a).
The relay valve integrated in the trailer control valve (Y6 or Y6a) is pressurized by the redundant brake pressure (b) coming from connection 42 and the reservoir pressure (a) present at connection 11 flows, in accordance with the redundant brake pressure (b) at the relay valve, to the brake coupling head (35.03) as brake pressure (c).

	Trailer control valve, component description	Y6, Y6a	**Page 503**
	Brake value sensor, component description	B17, B17a	**Page 406**
	Electronic Brake Control control unit (EBS), component description	A10b, A10c	**Page 341**
	Coupling head for compressed air supply/brake, component description	25.02, 25.03	**Page 498**

GF42.25-W-3013H	Auxiliary braking effect, function	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr



W42.25-1292-79

5.01	*Compressed air reservoir*
6.17	*Electronic Air Processing Unit (EAPU)*
20.02	*Diaphragm brake cylinder*
30.03	*Pressure limiting valve with ventilation (only with model 963.403)*
33.07	*3/2-way valve for auxiliary braking (only with model 963.403/404/405)*
A10b	*Electronic Brake Control control unit (EBS) (Wabco)*
A10c	*Electronic Brake Control control unit (EBS) (Knorr)*
A20	*Front axle axle modulator (Wabco)*
A20a	*Front axle axle modulator (Knorr)*
B13	*Left front axle speed sensor*
B14	*Right front axle speed sensor*
B17	*Brake value sensor (Wabco)*
B17a	*Brake value sensor (Knorr)*
Y1	*Left front axle ABS solenoid valve*
V1	*Rear axle service brake system reservoir pressure*
V2	*Front axle service brake system reservoir pressure*
a	*System pressure*
b	*Redundant brake pressure*
c	*Brake pressure*

ⓘ The 3/2-way valve for auxiliary braking (33.07) satisfies the legal requirements for auxiliary braking should the front-axle brake circuit fail. It is located on the steering-side outlet of the front axle axle modulator (A20 or A20a), so that if the front-axle brake circuit fails, the vehicle will be pulled to the middle of the road rather than the edge during emergency braking.

Requirements

- Vehicle moves.
- Max. reservoir pressure at connection 24 of the Electronic Air-Processing Unit (EAPU) (6.17).
- Max. reservoir pressure in the compressed air reservoirs (5.01).
- The instrument cluster control unit's (ICUC) (A1) multifunction display (A1p1) indicates a fault in the front-axle brake circuit.
- Connection 12 of the 3/2-way valve for auxiliary braking (33.07) is unpressurized.

The reservoir pressure (a) present at connection 11 of the 3/2-way valve for auxiliary braking (33.07) is routed, in accordance with the redundant brake pressure (b) at the pressure limiting valve, to connection 2 of the 3/2-way valve for auxiliary braking (33.07) as brake pressure (c) .

ⓘ The pressure limiting valve integrated in the 3/2-way valve for auxiliary braking (33.07) applies the reservoir pressure present at connection 11 up to a maximum value of 2.2 bar.

Function sequence

When actuating the brake pedal, the pneumatic part of the brake value sensor (B17 or B17a) routes a redundant brake pressure (b) via connection 21 that corresponds to the pedal travel to the 3/2-way valve for auxiliary braking (33.07).

In normal mode (brake pressure is present at connection 12 of the 3/2-way control valve for auxiliary braking) the brake pressure applied from the front axle axle modulator (A20 or A20a) flows freely through the 3/2-way valve for auxiliary braking (33.07) to the front axle single-circuit diaphragm brake cylinder (20.02).

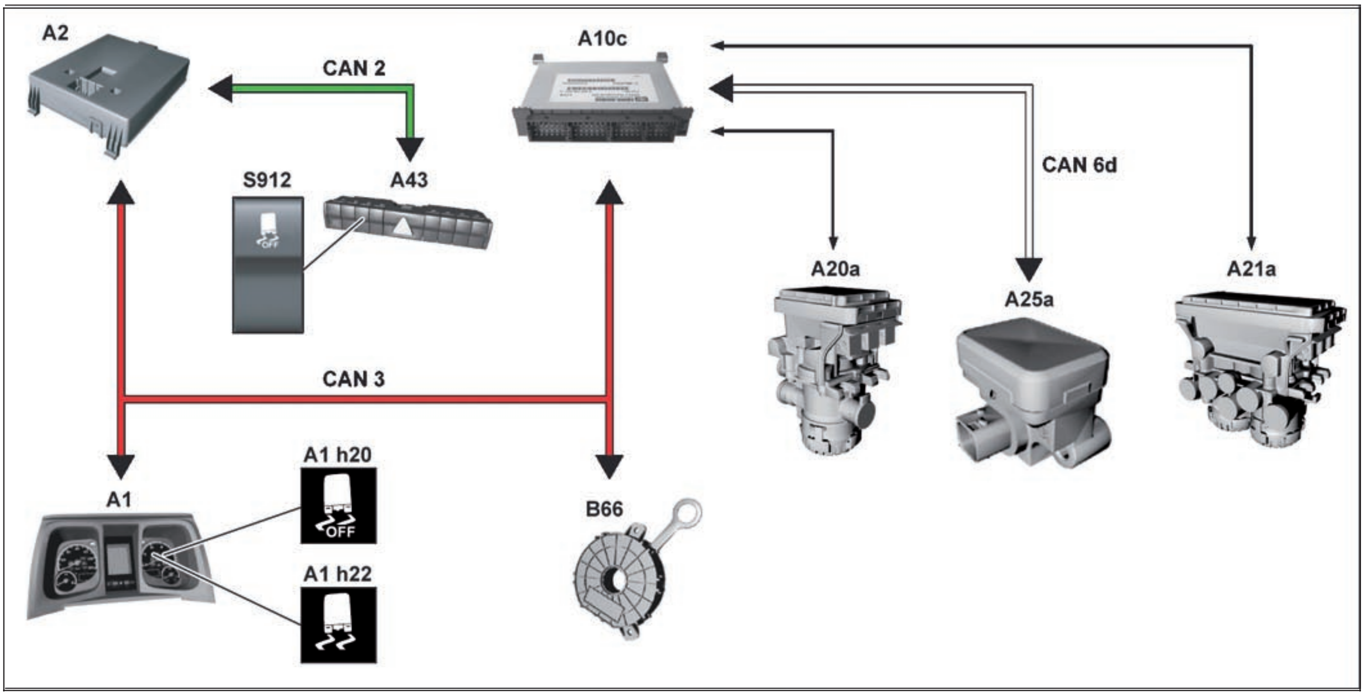
Should the front-axle brake circuit then fail (connection 12 of the 3/2-way valve for auxiliary braking (33.07) is unpressurized), the redundant brake pressure (b) applied by the brake value sensor (B17 or B17a) switches over the 3/2-way valve for auxiliary braking (33.07).

The brake pressure (c) flows to the driver-side single circuit diaphragm brake cylinder (20.02) of the front axle via the opened ABS solenoid valve (Y1), and the wheel is braked.

	3/2-way valve for auxiliary braking effect, component description	33.07 (only with model 963.403/404/405)	**Page 507**
	Front axle axle modulator, component description	A20, A20a	**Page 509**
	Brake value sensor, component description	B17, B17a	**Page 406**
	Electronic Brake Control control unit (EBS), component description	A10b, A10c	**Page 341**
	ABS solenoid valve, component description	Y1, Y2	**Page 479**

GF42.45-W-0003H	Electronic Stability Program, function	2.8.11

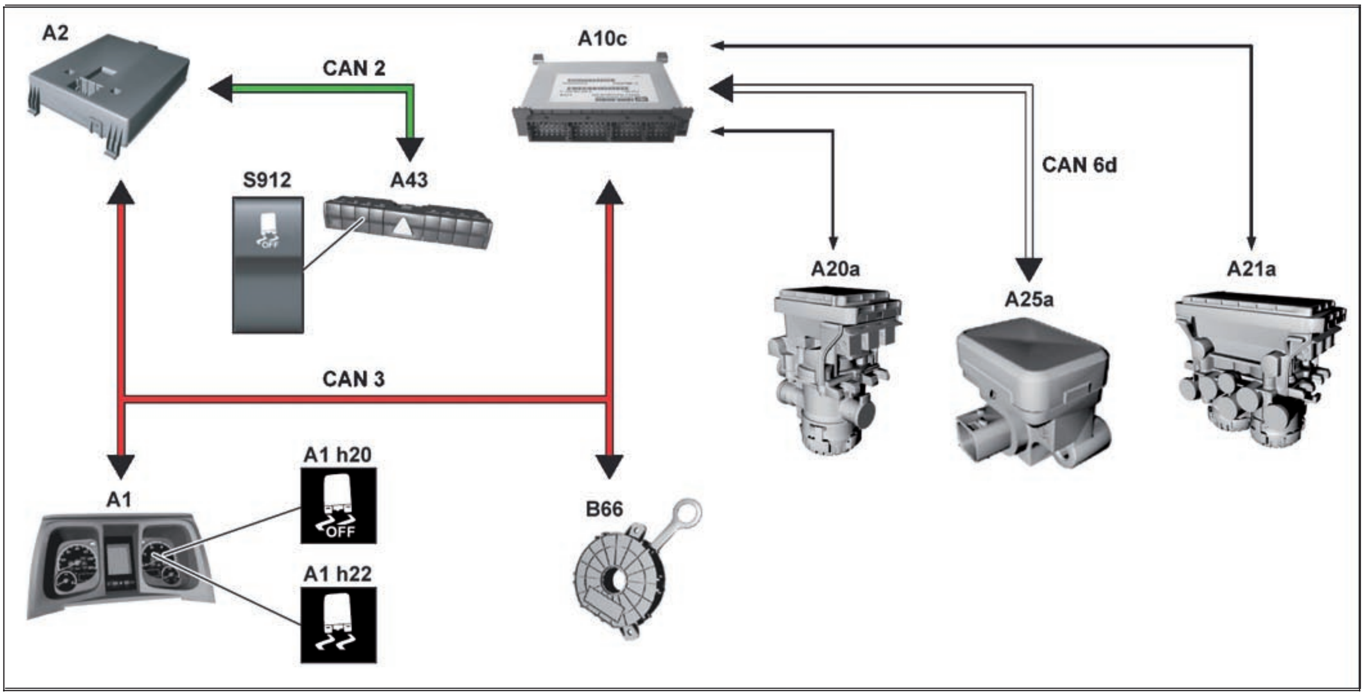
MODEL 963



W42.45-1025-79

Shown on Knorr version

A1	*Instrument cluster (ICUC) control unit*
A1 h20	*ESP® OFF indicator lamp*
A1 h22	*ESP® indicator lamp*
A2	*Central gateway (CGW) control unit*
A10c	*Electronic Brake Control (EBS) control unit (Knorr)*
A20a	*Front axle modulator (Knorr)*
A21a	*Rear axle modulator (Knorr)*
A25a	*Electronic Stability Program (ESP®) control unit (Knorr)*
A43	*Modular switch panel (MSF) control unit*
B66	*Steering wheel angle sensor (SAS)*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
CAN 6d	*ESP® brakes CAN*
S912	*Antilock braking system (ABS) /Electronic Stability Program (ESP®) button*



W42.45-1026-79

Shown on Wabco version

A1	*Instrument cluster (ICUC) control unit*	*A20*	*Front axle modulator (Wabco)*	*CAN 2*	*Interior CAN*
A1 h20	*ESP® OFF indicator lamp*	*A21*	*Rear axle modulator (Wabco)*	*CAN 3*	*Frame CAN*
A1 h22	*ESP® indicator lamp*	*A25*	*Electronic Stability Program (ESP®) control unit (Wabco)*	*CAN 6d*	*ESP® brakes CAN*
A2	*Central gateway (CGW) control unit*	*A43*	*Modular switch panel (MSF) control unit*	*S912*	*Antilock braking system (ABS) /Electronic Stability Program (ESP®) button*
A10b	*Electronic Brake Control (EBS) control unit (Wabco)*	*B66*	*Steering wheel angle sensor (SAS)*		

Functions

General information
The Electronic Stability Program (ESP®) reduces the risk of skidding, jackknifing or overturning of the vehicle in critical situations, e.g. in the case of sudden evasive maneuvers or increased cornering speed.

The Electronic Stability Program (ESP®) is a subsystem of the Electronic Brake Control (EBS). ESP® control intervention is calculated in the Electronic Brake Control (EBS) control unit (A10b, A10c).
If the Electronic Brake Control (EBS) control unit (A10b, A10c) detects a critical driving situation, it counters this situation by means of the following control intervention functions:

- Braking of specific wheels on the tractor vehicle
- Bedding in of the brakes of the entire tractor/trailer combination
- Influencing of the engine torque

The ESP® is only activated at speeds of approx. 20 km/h and higher. There is no control intervention in the case of reverse travel or if the Electronic Brake Control (EBS) is defective.

The Electronic Stability Program (ESP®) consists of the following major components in addition to the Electronic Brake Control (EBS) control unit (A10b, A10c):

- Electronic Stability Program (ESP®) control unit (A25, A25a)
- Steering wheel angle sensor (SAS) (B66)

A distinction is made between two Electronic Stability Program (ESP®) variants:

- Wabco version
- Knorr version

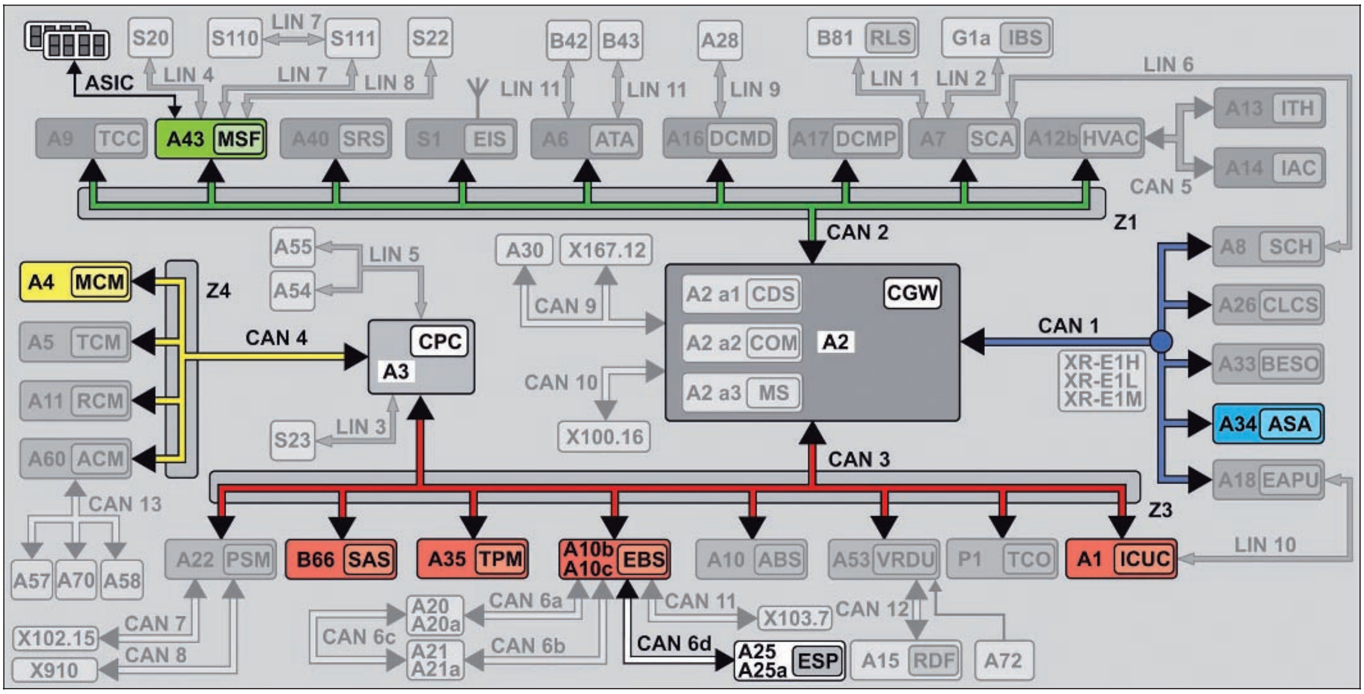
i Like the EBS components from the system suppliers Knorr and Wabco, the Electronic Stability Program (ESP®) control units (A25, A25a) from these suppliers are also not compatible with the EBS components of other manufacturers. Mixed installation is therefore not possible.

The anti-lock braking system (ABS)/Electronic Stability Program (ESP®) button (S912) is used to switch the Electronic Stability Program (ESP®) function off and on manually.
If the Electronic Stability Program (ESP®) is switched off manually, the ESP® OFF indicator lamp (A1 h20) lights up in the instrument cluster (ICUC) control unit (A1).

During a control intervention function, the ESP® indicator lamp (A1 h22) in the instrument cluster (ICUC) control unit (A1) flashes.

i If the ESP® indicator lamp (A1 h22) remains lit, the system has been deactivated due to a detected fault.

GF42.45-W-0003-01H	Electronic Stability Program - overall network		



W42.45-1027-79

A1	*Instrument cluster (ICUC) control unit*	
A2	*Central gateway (CGW) control unit*	
A3	*Drive control (CPC) control unit*	
A4	*Engine management (MCM) control unit*	
A10b	*Electronic Brake Control (EBS) control unit (Wabco)*	
A10c	*Electronic Brake Control (EBS) control unit (Knorr)*	
A25	*Electronic Stability Program (ESP®) control unit (Wabco)*	
A25a	*Electronic Stability Program (ESP®) control unit (Knorr)*	
A34	*Additional steering axle (ASA) control unit*	
A35	*Tire pressure monitor (TPM) control unit*	
A43	*Modular switch panel (MSF) control unit*	
B66	*Steering wheel angle sensor (SAS)*	
CAN 1	*Exterior CAN*	
CAN 2	*Interior CAN*	
CAN 3	*Frame CAN*	
CAN 4	*Drive train CAN*	
CAN 6d	*ESP® brakes CAN*	
Z1	*Cab instrument panel CAN bus star point*	
Z3	*Frame CAN bus star point*	
Z4	*Drive CAN bus star point*	

GF42.45-W-2003H	Electronic Stability Program intervention with understeering or oversteering, function	2.8.11

MODEL 963

Requirements

- Vehicle speed ≥20 km/h
- The Electronic Stability Program (ESP®) is switched on, and the ESP® OFF indicator lamp (A1 h20) and the ESP® indicator lamp (A1 h22) in the instrument cluster (ICUC) control unit (A1) are not lit.

Function

During driving, the Electronic Brake Control (EBS) control unit (A10b, A10c) uses the signals:

- from the steering wheel angle sensor (SAS) (B66)
- from the left front axle rpm sensor (B13)
- from the right front axle rpm sensor (B14)
- from the left rear axle rpm sensor (B15) and
- from the right rear axle rpm sensor (B16)

to continuously monitor the nominal course specified by the driver and compares this course with the actual course.

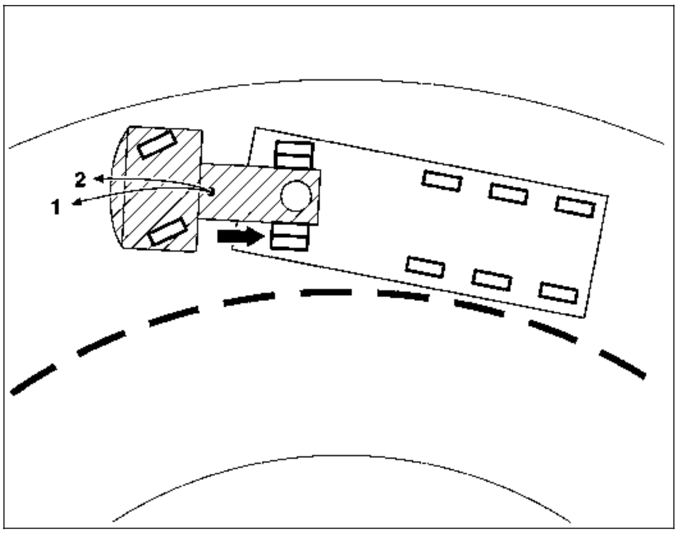
The Electronic Brake Control (EBS) control unit (A10b, A10c) calculates the actual course from the signals supplied by the yaw rate and lateral acceleration sensors integrated in the Electronic Stability Program (ESP®) control unit (A25, A25a), taking the vehicle speed into consideration.
As soon as the Electronic Brake Control (EBS) control unit (A10b, A10c) detects a deviation between the nominal course and the actual course, it triggers brake intervention at the individual wheels in order to correct the course.

i On vehicles with code (A4X) Load-relievable, steered trailing axle (7.5 t) or with code (A4Y) Liftable, load-relievable, steered trailing axle (7.5 t):
If the additional steering axle (ASA) control unit (A34) reports a fault, the control intervention procedure is deactivated by the Electronic Brake Control (EBS) control unit (A10b, A10c) and the ESP® indicator lamp (A1 h22) in the instrument cluster (ICUC) control unit (A1) lights up.

Intervention by the brake system when understeering

If the tractor vehicle brakes away above the front axle, a yawing moment is built up by selective braking of the rear wheel on the inside of the curve, which turns the tractor vehicle into the curve so as stabilize it.

During automatic intervention by the brake system, the ESP® indicator lamp (A1 h22) in the instrument cluster (ICUC) control unit (A1) lights up.



W42.45-1004-11

1 Nominal course
2 Actual course

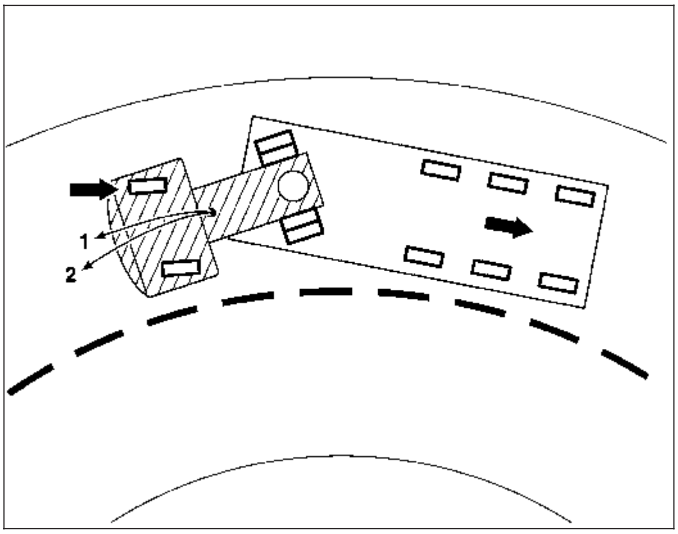
Arrow Brake system intervention

Intervention by the brake system when oversteering
If the tractor vehicle brakes away above the rear axle, the oversteering handling is counteracted by specific braking of the front wheel on the outside of the curve. Simultaneously the semitrailer is braked via the trailer control valve and jackknifing of the semitrailer/tractor combination by straightening the semitrailer/tractor combination.

During automatic intervention by the brake system, the ESP® indicator lamp (A1 h22) in the instrument cluster (ICUC) control unit (A1) lights up.

1 Nominal course
2 Actual course

Arrow Brake system intervention

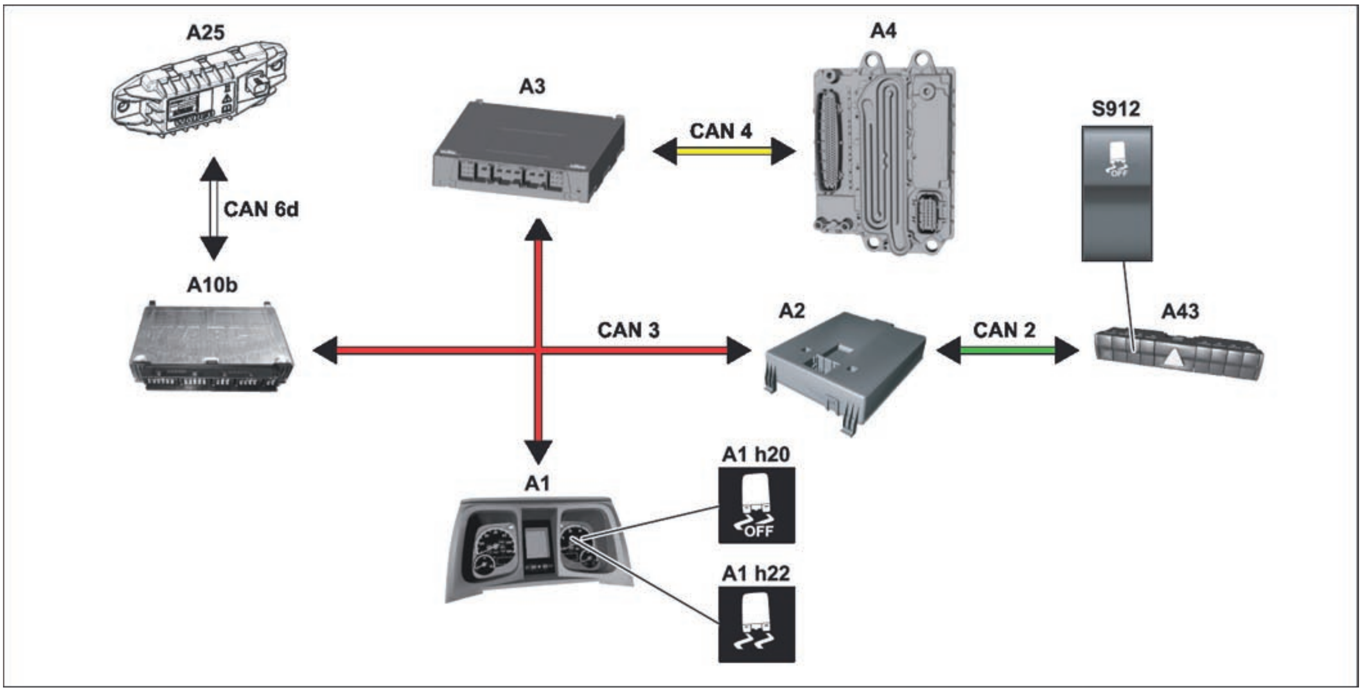


W42.45-1005-11

	Instrument cluster (ICUC) control unit, component description	A1	**Page 331**
	Electronic Brake Control (EBS) control unit, component description	A10b, A10c	**Page 341**
	Electronic Stability Program (ESP) control unit, component description	A25, A25a	**Page 357**
	Additional steering axle (ASA) control unit, component description	A34	**Page 364**
	Rpm sensor, component description	B13, B14, B15, B16	**Page 405**
	Steering wheel angle sensor (SAS), component description	B66	**Page 424**

GF42.45-W-2004H	Electronic Stability Program intervention with risk of overturning, function	2.8.11

MODEL 963



W42.45-1028-79

Illustration shows Wabco version

A1	*Instrument cluster (ICUC) control unit*
A1 h20	*ESP® OFF indicator lamp*
A1 h22	*ESP® indicator lamp*
A2	*Central gateway (CGW) control unit*
A3	*Drive control (CPC) control unit*
A4	*Engine management (MCM) control unit*
A10b	*Electronic Brake Control (EBS) control unit (Wabco)*
A25	*Electronic Stability Program (ESP®) control unit (Wabco)*
A43	*Modular switch panel (MSF) control unit*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
CAN 4	*Drive train CAN*
CAN 6d	*ESP® brakes CAN*
S912	*Antilock braking system (ABS) /Electronic Stability Program (ESP®) button*

Requirements

- Vehicle speed ≥20 km/h
- The Electronic Stability Program (ESP®) is switched on, and the ESP® OFF indicator lamp (A1 h20) and the ESP® indicator lamp (A1 h22) in the instrument cluster (ICUC) control unit (A1) are not lit.

Function

The Electronic Brake Control (EBS) control unit (A10b, A10c) monitors the course of the tractor vehicle and, to detect the vehicle's tendency to overturn, also monitors the lateral acceleration on corners. For this purpose, the Electronic Stability Program (ESP®) control unit (A25, A25a) supplies the signals from the integrated lateral acceleration sensor to the Electronic Brake Control (EBS) control unit (A10b, A10c).

The Electronic Brake Control (EBS) control unit (A10b, A10c) triggers a reduction in vehicle speed via the drive control (CPC) control unit (A3) or the engine management (MCM) control unit (A4) as soon as, due to inappropriate cornering speed, exceeding of the permissible lateral acceleration with increased risk of overturning is detected.

i If at the same time the tire pressure monitor (TPM) control unit (A35) detects a drop in pressure owing to a tire blowout, the Electronic Brake Control (EBS) control unit (A10b, A10c) lowers the control intervention threshold.

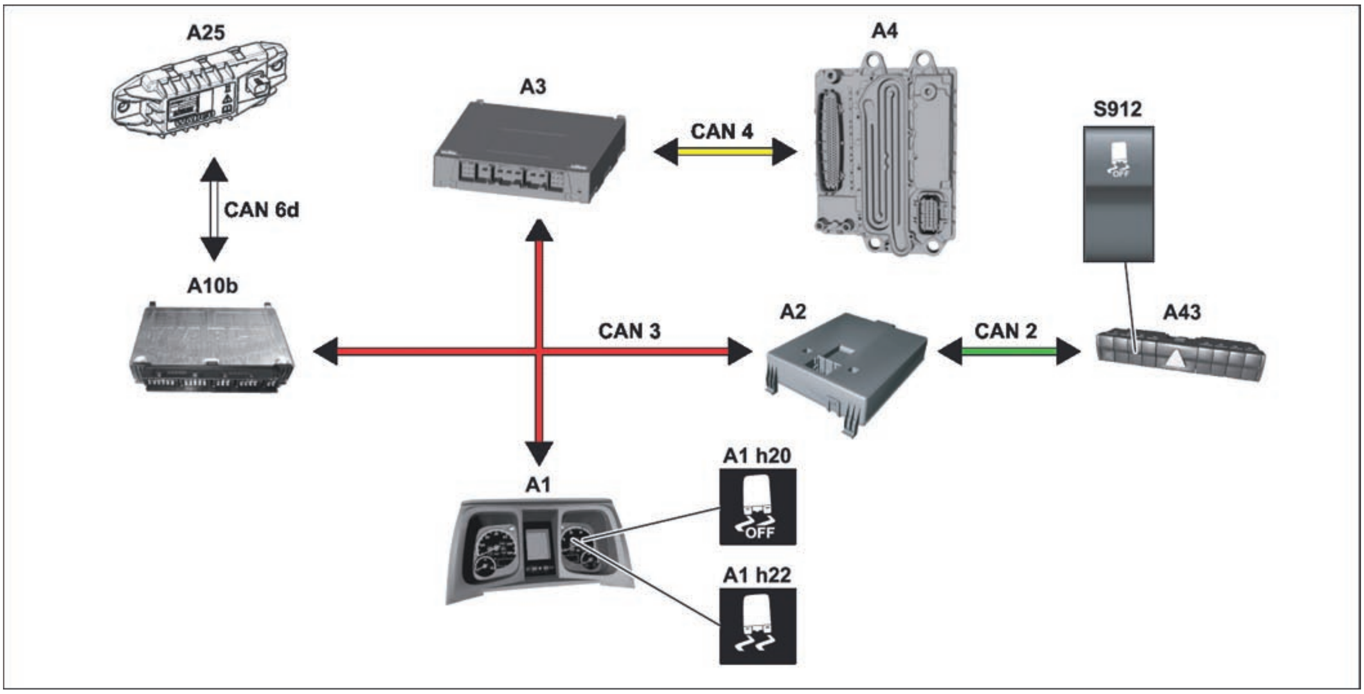
If despite reduced vehicle speed it is not possible to stabilize the vehicle during cornering, the Electronic Brake Control (EBS) control unit (A10b, A10c) initiates automatic braking of the vehicle.

The ESP® indicator lamp (A1 h22) in the instrument cluster (ICUC) control unit (A1) flashes while the vehicle speed is being reduced or the vehicle is being braked.

	Instrument cluster (ICUC) control unit, component description	A1	**Page 331**
	Central gateway (CGW) control unit, component description	A2	**Page 333**
	Drive control (CPC) control unit, component description	A3	**Page 334**
	Engine management (MCM) control unit, component description	A4	**Page 335**
	Electronic Brake Control (EBS) control unit, component description	A10b, A10c	**Page 341**
	Electronic Stability Program (ESP) control unit, component description	A25, A25a	**Page 357**
	Tire pressure monitor (TPM) control unit, component description	A35	**Page 365**
	Modular switch panel (MSF) control unit, component description	A43	**Page 370**

GF42.60-W-0009H	Compressed air supply system, function	2.8.11

MODEL 963, 964



W42.60-1224-09

Illustration shows code (B1C) Electronic Air-Processing Unit (EAPU) (low) with dual compressor, switchable

1.10 Dual compressor, switchable
6.16 Electronic Air-Processing Unit (EAPU) (low)
30.01 Safety valve
38.02 Test connection M16×1.5
A18 Electronic Air Processing Unit (EAPU) control unit
B26 Condensation sensor (only with code (B4A) Condensation sensor for compressed air system)
B97 Temperature sensor (EAPU)

Pneumatic connections

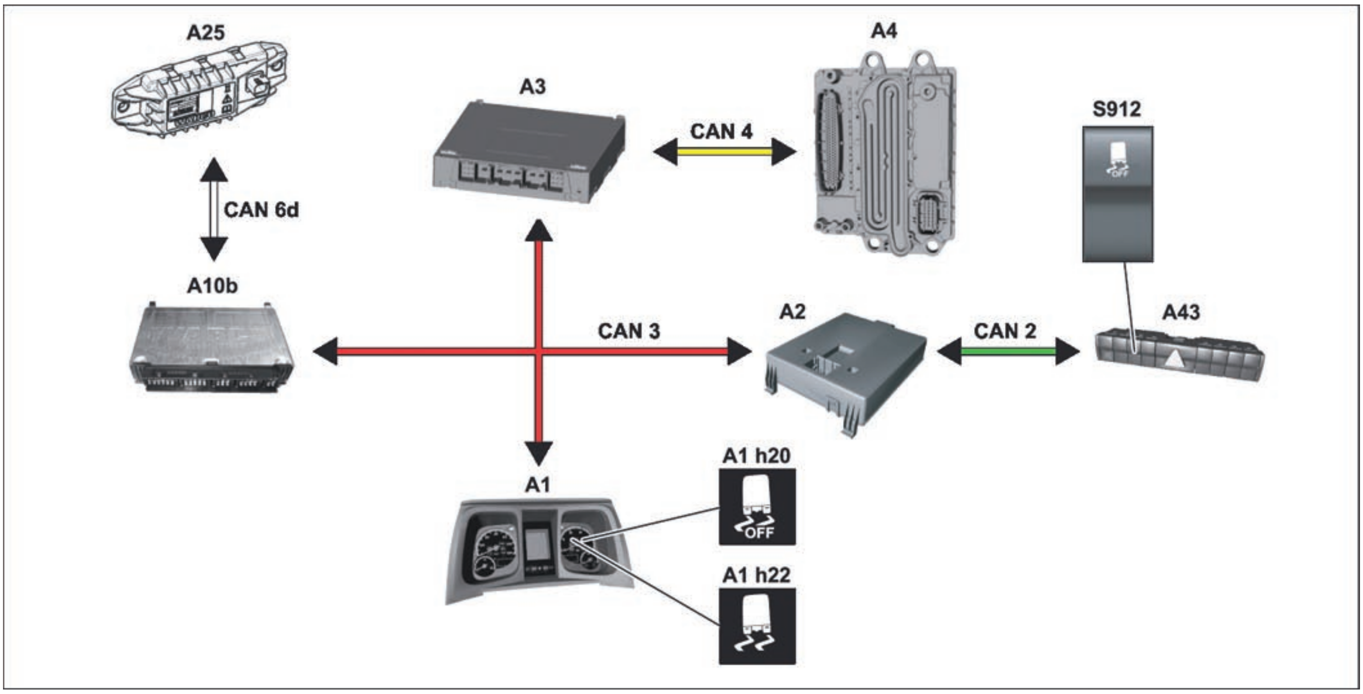
11 Compressed air supply (from compressor)
21 Compressed air release (rear axle brake circuit supply)
22 Compressed air release (front axle brake circuit supply)
23 Compressed air release (trailer control)
24 Compressed air release (ancillary consumers)
25 Compressed air release (parking brake)
26 Compressed air release (transmission control and clutch operation supply)
27 Compressed air release (air suspension)

Compressed air reservoir

5.01 Compressed air reservoir (rear axle brake circuit supply) (V1)
5.01 Compressed air reservoir (front axle brake circuit supply) (V2)
5.01 Compressed air reservoir (trailer control brake circuit supply) (V3)
5.01 Compressed air reservoir (transmission control and automatic clutch operation supply) (V6)

Compressed air circuits

AS Trailer control
FB Parking brake
GS Transmission control
RA Rear axle brake circuit
KB Clutch operator
NV Auxiliary consumers
RB Pipe fracture protection
VA Front axle brake circuit
W Cab air suspension
X Chassis air suspension



W42.60-1225-09

Illustration shows code (B1D) Electronic Air-Processing Unit (EAPU) (mid) with dual compressor, switchable

1.10	*Dual compressor, switchable*
6.17	*Electronic Air-Processing Unit (EAPU) (mid)*
30.01	*Safety valve*
38.02	*Test connection M16×1.5*
A18	*Electronic Air Processing Unit (EAPU) control unit*
B26	*Condensation sensor (only with code (B4A) Condensation sensor for compressed air system)*
B97	*Temperature sensor (EAPU)*

Pneumatic connections

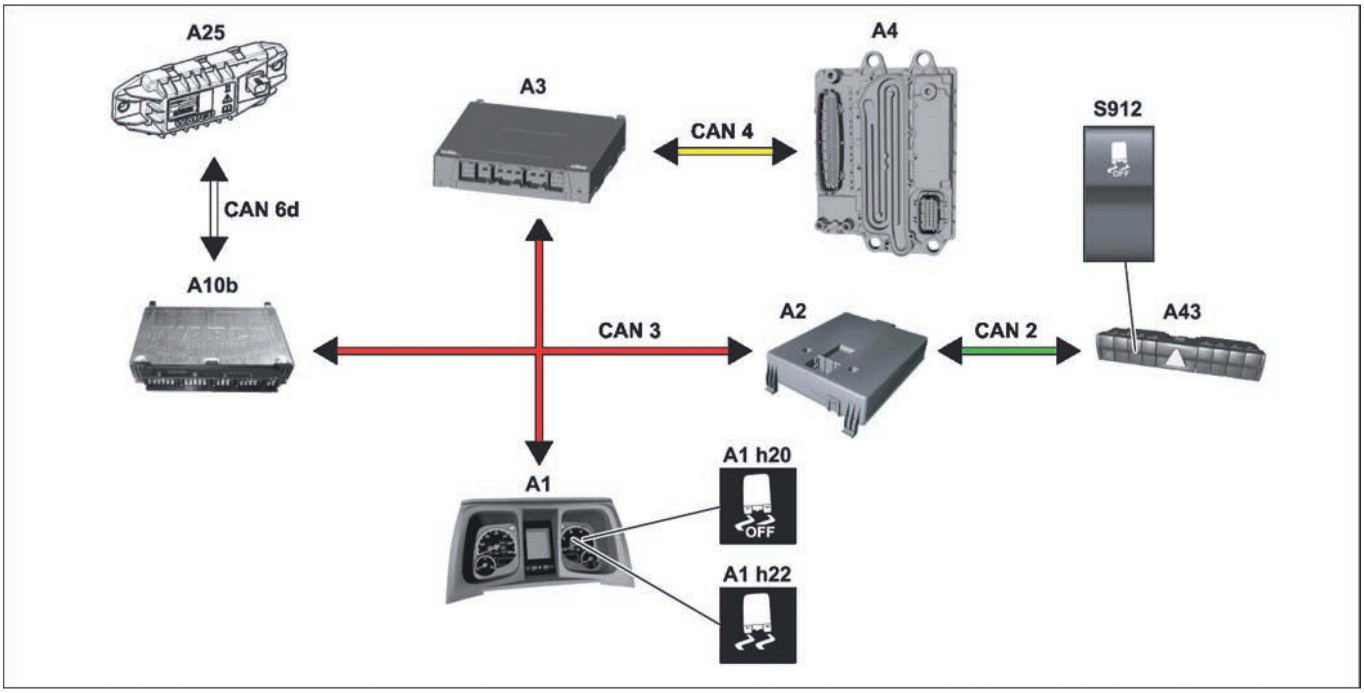
11	*Compressed air supply (from compressor)*
21	*Compressed air release (rear axle brake circuit supply)*
22	*Compressed air release (front axle brake circuit supply)*
23	*Compressed air release (trailer control)*
24	*Compressed air release (ancillary consumers)*
25	*Compressed air release (parking brake)*
26	*Compressed air release (transmission control and clutch operation supply)*
27	*Compressed air release (air suspension)*

Compressed air reservoir

5.01	*Compressed air reservoir (rear axle brake circuit supply) (V1)*
5.01	*Compressed air reservoir (front axle brake circuit supply) (V2)*
5.01	*Compressed air reservoir (transmission control and automatic clutch operation supply) (V6)*

Compressed air circuits

AS	*Trailer control*
FB	*Parking brake*
GS	*Transmission control*
RA	*Rear axle brake circuit*
KB	*Clutch operator*
NV	*Auxiliary consumers*
RB	*Pipe fracture protection*
VA	*Front axle brake circuit*
W	*Cab air suspension*
X	*Chassis air suspension*



W42.60-1226-09

Illustration shows code (B1E) Electronic Air-Processing Unit (EAPU) (high) with dual compressor, switchable

1.10	*Dual compressor, switchable*
6.18	*Electronic Air-Processing Unit (EAPU) (high)*
7.01	*Overflow valve with return flow*
30.01	*Safety valve*
38.02	*Test connection M16×1.5*
A18	*Electronic Air Processing Unit (EAPU) control unit*
B26	*Condensation sensor (only with code (B4A) Condensation sensor for compressed air system)*
B97	*Temperature sensor (EAPU)*

Pneumatic connections

11	*Compressed air supply (from compressor)*
21	*Compressed air release (rear axle brake circuit supply)*
22	*Compressed air release (front axle brake circuit supply)*
23	*Compressed air release (trailer control)*
24	*Compressed air release (ancillary consumers)*
25	*Compressed air release (parking brake)*
26	*Compressed air release (transmission control and clutch operation supply)*
27	*Compressed air release (air suspension)*

Compressed air reservoir

5.01	*Compressed air reservoir (rear axle brake circuit supply) (V1)*
5.01	*Compressed air reservoir (front axle brake circuit supply) (V2)*
5.01	*Compressed air reservoir (transmission control and automatic clutch operation supply) (V6)*
5.01	*Compressed air reservoir (air suspension supply) (V7)*

Compressed air circuits

AS	*Trailer control*
FB	*Parking brake*
GS	*Transmission control*
RA	*Rear axle brake circuit*
KB	*Clutch operator*
NV	*Auxiliary consumers*
RB	*Pipe fracture protection*
VA	*Front axle brake circuit*
W	*Cab air suspension*
X	*Chassis air suspension*

General information
The compressed air supply system consists primarily of the Electronic Air-Processing Unit (EAPU) and the associated compressed air reservoirs. The EAPU is a compact mechatronic unit containing the compressed air dehumidification unit, pressure regulation, protection of the compressed air circuits and the control electronics. Owing to its dynamic and energy-saving pressure regulation, the EAPU provides the following benefits:

- Reduction in number of compressed air reservoirs
- Intelligent regeneration management
- Increased compressed air availability for clutch and transmission control
- Improvement of air suspension lifting times
- Improved compressed-air drying
- Deceleration phase control
- Diagnosis capability

Reduction in number of compressed air reservoirs
The pressure level of 12.5 bar in the compressed air reservoirs provides a high air volume, thereby reducing the number of compressed air reservoirs (depending on the vehicle variant).

i Despite this, a pressure of max. 10.0 bar is applied at the brake cylinders. This pressure is limited by the Electronic Brake Control (EBS). The configuration and dimensioning of the brake are therefore unchanged.

Intelligent regeneration management
Owing to the intelligent regeneration management, no regeneration compressed air reservoirs are required. The compressed air required for regeneration is drawn from the compressed air reservoirs of the brake circuits.

i The pressure in the compressed air reservoirs of the brake circuits is reduced slightly by the regeneration process. This is not a malfunction or an indication of leakage.

Increased compressed air availability for clutch and transmission control
The compressed air supply is protected and monitored separately from other auxiliary consumers. A separate compressed air reservoir provided for clutch and transmission control and integrated as a tubular crossmember in the frame ensures high compressed air availability for shift operations.

Improvement of air suspension lifting times
The pressure level of 12.5 bar in the compressed air reservoirs provides a large air volume. EAPU high, which has a separate compressed air reservoir with a pressure level of 15.0 bar in the air suspension circuit, is installed on vehicles with high air consumption.

Improved compressed-air drying
The intelligent regeneration management system optimizes air dehumidification. Depending on the operating state, regeneration is possible even with the ignition switched off. Furthermore, the new cartridge technology with replaceable insert used for the "high" variant improves oil separation.

Deceleration phase control
In engine deceleration mode (downhill driving), the EAPU switches to the delivery phase, even if the cut-in pressure has not yet been reached.

Diagnosis capability
The EAPU is integrated in the vehicle network via the Controller Area Network (CAN) and has diagnosis capability. The part number, measurement values, binary values and fault memory can be read out. The compressor version is also stored so that the delivery characteristics of the compressor can also be assessed. To be able to display safety-critical messages in the event of faults in the CAN, the EAPU is directly connected to the instrument cluster (ICUC) control unit (A1) via the EAPU-LIN (LIN 10) functioning as a redundant communication interface.

i The EAPU-LIN (LIN 10) does not have diagnosis capability.

The EAPU is connected to the following components in the overall network:

- Engine management (MCM) control unit (A4)
- Transmission (TCM) control unit (A5)
- Drive control (CPC) control unit (A3)
- Electronic Brake Control (EBS) control unit (A10b, A10c)
- Level control (CLCS) control unit (A26)
- Instrument cluster (ICUC) control unit (A1)
- Central gateway (CGW) (A2)

Equipment variants

The EAPU is installed in three variants depending on the vehicle model and equipment.

- Code (B1C) Electronic Air-Processing Unit (EAPU) low
- Code (B1D) Electronic Air-Processing Unit (EAPU) mid
- Code (B1E) Electronic Air-Processing Unit (EAPU) high

Functional distinguishing features

EAPU low is intended for vehicles which have normal air consumption, which are not intended for operation with a trailer or which, owing to their brake configuration, require a separate compressed air reservoir in the trailer control circuit. Apart from the absence of an internal control unit for the trailer control circuit, this variant is essentially the same as the EAPU previously installed in the Actros (model 934), i.e. the "mid" variant. If, however, a trailer control unit is installed, a separate compressed air reservoir in the trailer control circuit is always required for this variant.

i EAPU low is only available from Haldex.

EAPU mid is intended for vehicles with normal air consumption and is the same as the EAPU previously installed in the Actros (model 934). Owing to the presence of an internal control unit, a separate compressed air reservoir is not required for the trailer control circuit.

i EAPU mid is available from Haldex and Knorr and can be installed in the case of repair.

EAPU high is intended for vehicles with high air consumption and, unlike the "mid" variant, has an additional internal control unit for the air suspension circuit. A separate compressed air reservoir with a pressure level of 15.0 bar in the air suspension circuit provides a large air volume. An additional solenoid valve regulates filling of this compressed air reservoir and the circuit is monitored by an additional pressure sensor.

i EAPU high is only available from Haldex.

Function

The compressor driven by the engine generates the compressed air. The compressed air first flows through the compressor line where it is cooled and then enters the EAPU. The compressed air is filtered and dehumidified by the compressed air desiccant cartridge. It is then distributed between the brake circuits and auxiliary consumer circuits and, if necessary, the air suspension circuit. The pressures in the compressed air circuits are monitored by pressure sensors and faults are signaled to the driver via the instrument cluster (ICUC) control unit (A1). In the case of a defective compressed air circuit, the EAPU protects the intact compressed air circuits against the defective circuit. The EAPU controls and regulates all functions on the basis of their preset specifications and using the information provided by the internal pressure sensors, the temperature sensor (EAPU) (B97) and the networked components.

If, owing to faults, individual items of information are not available, the Electronic Air-Processing Unit (EAPU) control unit (A18) uses, depending on the fault type, either a predefined substitute value or the last valid value.

The compressed air flows into the compressed air reservoirs (5.01) or directly into the various compressed air circuits via the compressed air releases (21 to 27).

If compressed air reservoirs with a test pressure <15.5 bar are used, a safety valve (30.01) protects the compressed air system against overpressure.

i Only with code (B4L) Aluminum compressed air reservoir.

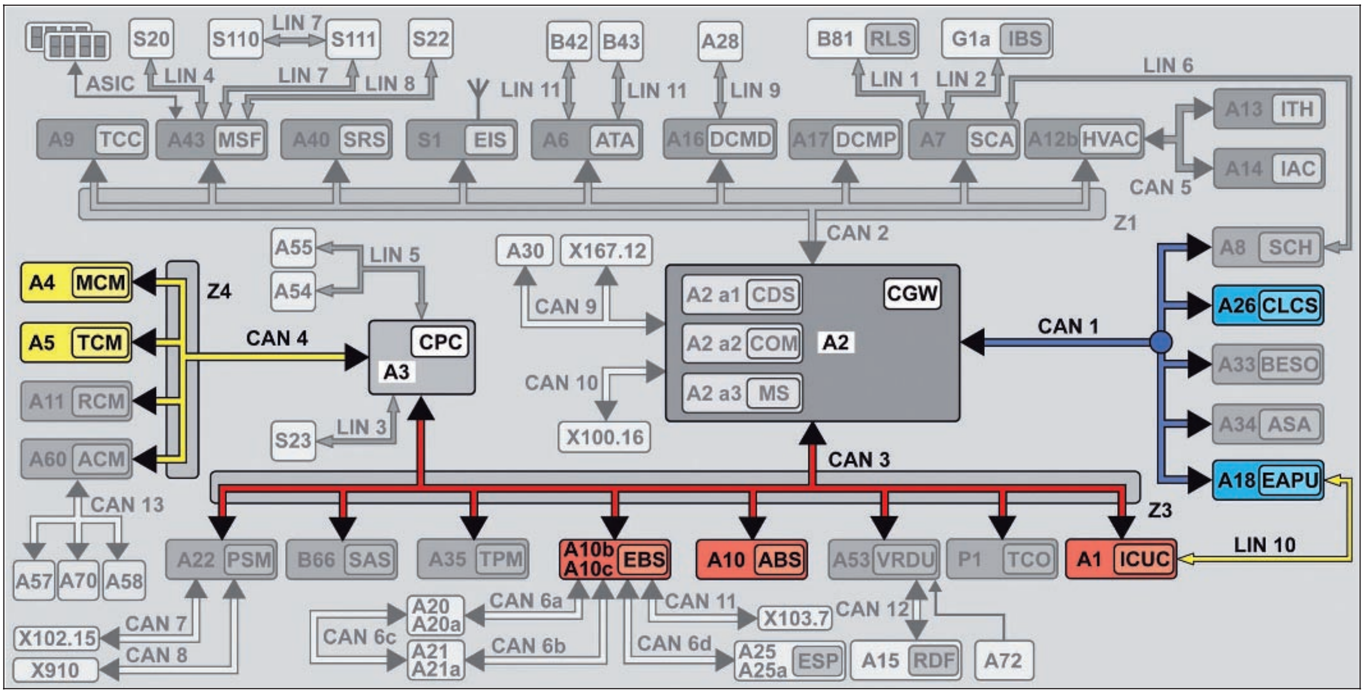
If code (B4A) Condensation sensor for compressed air system is installed, the driver is alerted to the presence of condensation in the compressed air system via the multifunction display (A1p1). For this purpose, the output voltage of the condensation sensor (B26) is first read in by the Electronic Air-Processing Unit (EAPU) control unit (A18) and the resulting status (water/no water/fault) is sent to the maintenance system (MS). In the maintenance system (MS), the length of time that the respective status was received is measured by a counter.

In the case of "water", the counter increases; with "no water", the counter decreases. If the counter exceeds the value of 8 h, a yellow "condensation in compressed air reservoir" message is displayed in the multifunction display (A1p1).

If the electronics system fails, the EAPU has a purely mechanical fallback level (redundancy function) with minimum functions to ensure safe operation.

	Compressed air supply system - overall network		**Page 122**
	Instrument cluster (ICUC) control unit, component description	A1	**Page 331**
	Central gateway (CGW) control unit, component description	A2	**Page 333**
	Drive control (CPC) control unit, component description	A3	**Page 334**
	Engine management (MCM) control unit, component description	A4	**Page 335**
	Transmission control (TCM) control unit. component description	A5	**Page 337**
	Electronic Brake Control (EBS) control unit, component description	A10b, A10c	**Page 341**
	Electronic Air-Processing Unit (EAPU), component description	A18, 6.16, 6.17, 6.18	**Page 351**
	Level control (CLCS) control unit, component description	A26	**Page 358**
	Condensation sensor, component description	B26 i Only with code (B4A) Condensation sensor for compressed air system	**Page 412**

GF42.60-W-0009-03H	Compressed air supply system - overall network		



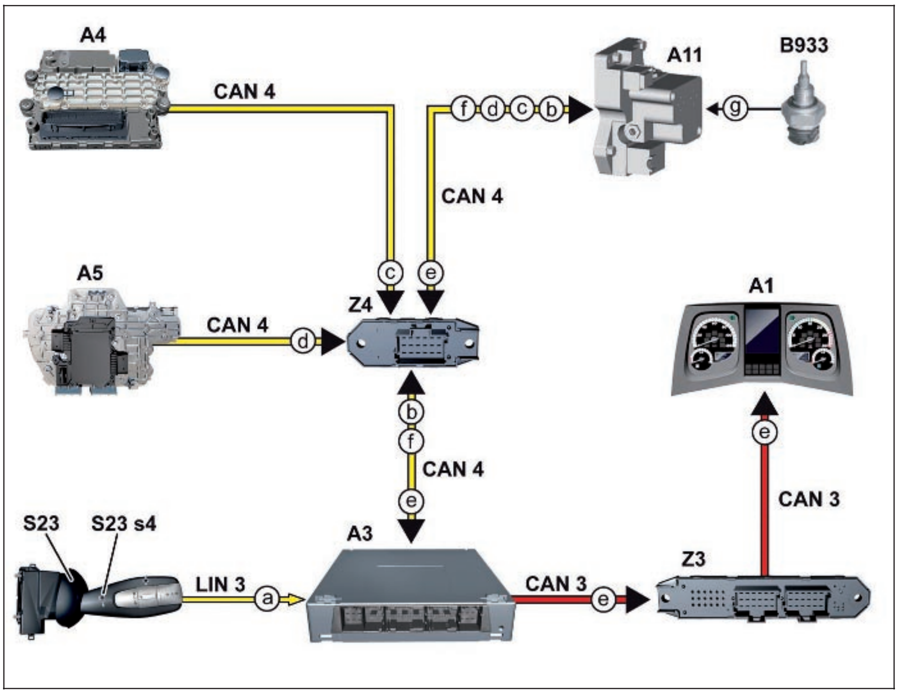
W42.60-1223-79

A1	*Instrument cluster (ICUC) control unit*
A2	*Central gateway (CGW) control unit*
A3	*Drive control (CPC) control unit*
A4	*Engine management (MCM) control unit*
A5	*Transmission control (TCM) control unit*
A10	*Antilock brake system (ABS) control unit, 4-channel*
A10b	*Electronic Brake Control (EBS) control unit (Wabco)*
A10c	*Electronic Brake Control (EBS) control unit (Knorr)*
A18	*Electronic Air Processing Unit (EAPU) control unit*
A26	*Level control (CLCS) control unit*
CAN 1	*Exterior CAN*
CAN 3	*Frame CAN*
CAN 4	*Drive train CAN*
LIN 10	*EAPU-LIN*
Z3	*Frame CAN bus star point*
Z4	*Drive CAN bus star point*

GF43.30-W-0001H	Hydraulic retarder, function	20.7.11

MODEL 963 with CODE (B3H) Secondary water retarder

A1	Instrument cluster (ICUC) control unit
A3	Drive control (CPC) control unit
A4	Engine management control unit (MCM)
A5	Transmission control (TCM) control unit
A11	Retarder control (RCM) control unit
B933	Coolant temperature sensor
CAN 3	Frame CAN
CAN 4	Drive train CAN
LIN 3	Right multifunction control lever LIN
S23	Right multifunction control lever
S23 s4	Permanent brake switch
Z3	Frame CAN bus star point
Z4	Drive CAN bus star point



W43.30-1319-76

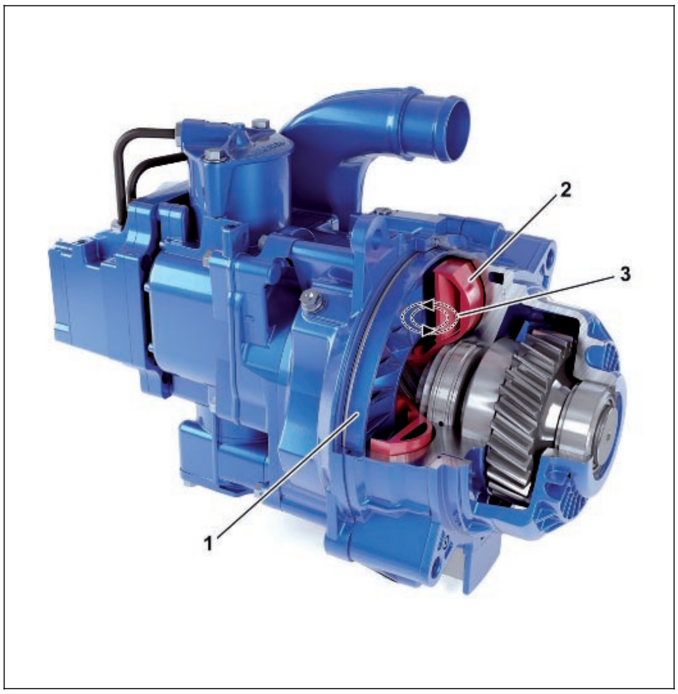
a	Right multifunction control lever (S23), signal
b	Vehicle speed, signal
c	Coolant pump rpm, signal
d	Transmission output speed, signal
e	Display of system messages, request
f	Retarder braking torque, request
g	Coolant temperature, signal

Secondary water retarder, general
The secondary water retarder is a wear-free hydrodynamic permanent brake whereby the flow energy of a fluid medium is used to brake the vehicle.

The functional principle (rotor, stator) is the same as for the retarder (VR 115 HV).
However, on the secondary water retarder the engine coolant from the engine is used as the braking medium instead of retarder oil.

Functions

Functional principle
The stator (1) is secured against turning relative to the rotor and stator frame. The rotor (2) is connected to the drivetrain and acts on the output side of the vehicle transmission via a gear pair. The engine coolant (3) circulates between the turning rotor (2) and the fixed stator (1). This generates a braking torque on the rotor (2). Due to its gear ratio (i = 2.13), the secondary water retarder achieves high braking torques right down to the lower rpm ranges.



W43.30-1300-81

Function requirements of secondary water retarder

- Vehicle speed > 8 km/h and
  retarder speed > 200 rpm
- Anti-lock braking system (ABS), acceleration skid control (ASR) and Electronic Stability Program (ESP®) are not in control mode
- Coolant temperature ≤ 108 °C (for 100 % braking power)

Function sequence of secondary water retarder
The secondary water retarder can be actuated both by the driver via the permanent brake switch (S23 s4) and by the following driving assistance systems:

- Cruise control
- Proximity Control Assist (with code (S1I) Proximity Control Assist)

The secondary water retarder is also automatically actuated when the brake pedal is operated.
The driver can preselect the braking intensity of the secondary water retarder via the permanent brake switch (S23 s4). Both driver-initiated and system-initiated braking torque requests are evaluated by the drive control (CPC) control unit (A3).

This results in the following operating states of the secondary water retarder:

- Idle operation
- Brake operation

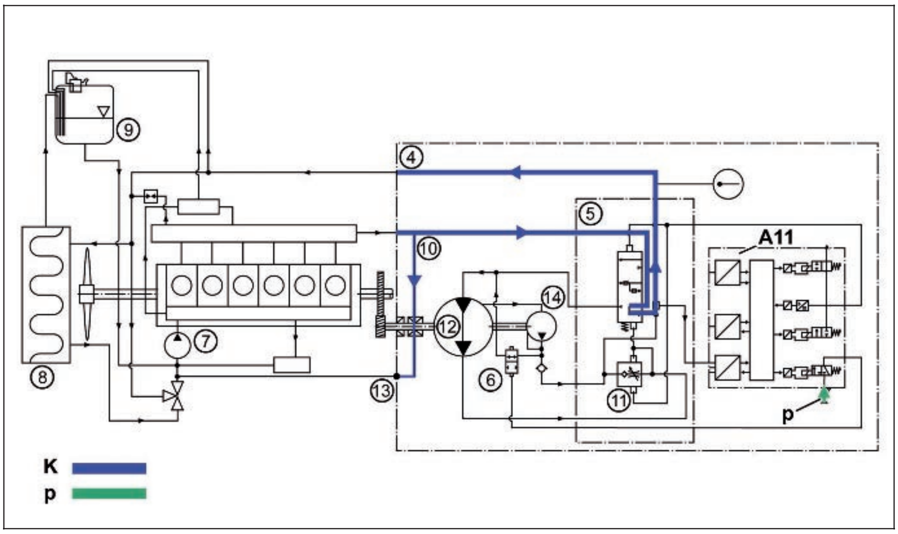
Idle operation

Control schematic

4 Secondary water retarder
5 Valve block
6 Relief valve
7 Coolant pump
8 Radiator
9 Expansion reservoir
10 Shutoff pressure line, feed
11 Control valve
12 Working chamber
13 Shutoff pressure line, return
14 Side channel pump

A11 Retarder control (RCM) control unit

K Coolant flow direction
p System pressure

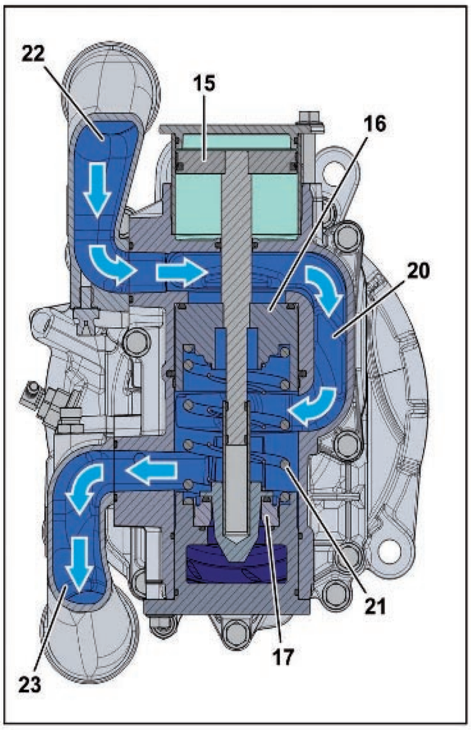


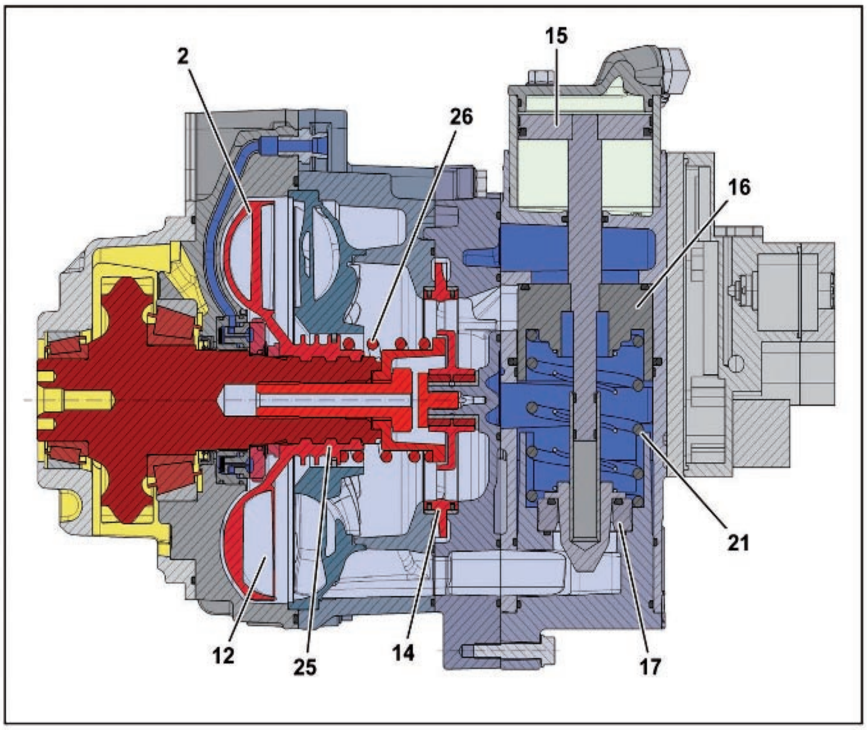
W43.30-1302-75

In idle mode, there is reservoir pressure (p) applied to the compressed air connection of the retarder control unit (RCM) (A11). The valve block (5) is in the rest position. The engine coolant flows through the valve block (5) and flows via a bypass back into coolant circuit of the engine and on to the engine radiator (8) and coolant pump (7).
At the same time, the engine coolant flows via the shutoff pressure line, feed (10) (for lubrication and sealing of the slide ring seal) and via the shutoff pressure line, return (13) back to the coolant pump (7).

The control valve (11) thus performs the function of a check valve. This prevents engine coolant flowing via the return line into the working chamber (12).

i During idle mode, the relief valve (6) is periodically actuated by the retarder control unit (RCM) (A11). This process causes activation of the side channel pump (14), which pumps off the engine coolant in the working chamber (12).





W43.30-1291-79

Sectional view of secondary water retarder

2	*Rotor*	
12	*Working chamber*	
14	*Side channel pump*	
15	*Actuator*	
16	*Switching valve*	
17	*Control valve*	
20	*Bypass*	
21	*Control valve compression spring*	
22	*Coolant manifold, feed*	
23	*Coolant manifold, return*	
25	*Twisted teeth*	
26	*Compression spring for sliding rotor*	

Function in idle mode

In idle mode, the cylinder of the actuator (15) is pressurized with atmospheric pressure. The switching valve (16) and the control valve (17) are in the idle position, the bypass (20) is open.
At the same time, the control valve (17) performs the function of a check valve and seals the bypass (20) to the working chamber (12) via the spring force of the control valve compression spring (21).
In the process, the engine coolant flows via the coolant manifold, feed (22) through the bypass (20) and past the working chamber (12) and is returned to the cooling system via the coolant manifold, return (23).

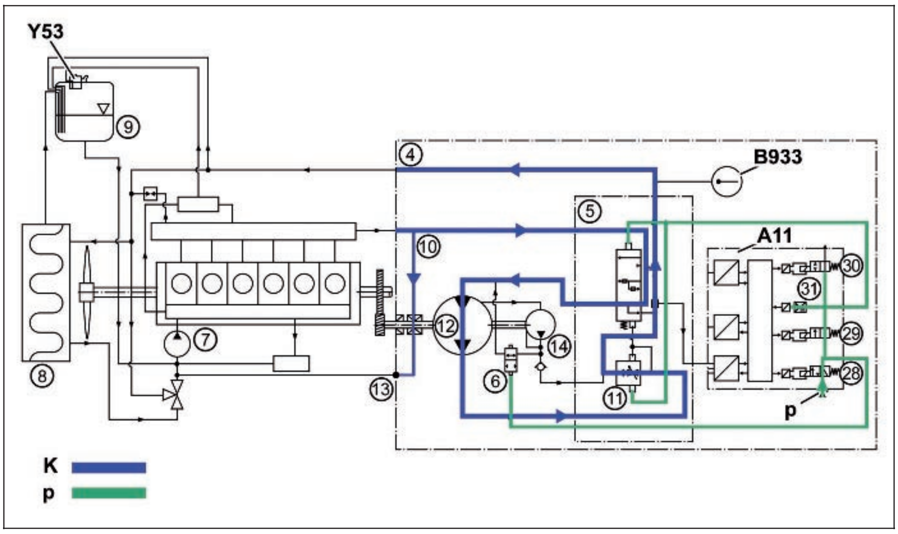
The rotor (2) turns continuously in idle mode.
Any coolant remaining in the working chamber (12) which could not be pumped off via the side channel pump (14) would result in friction losses and thus cause braking of the rotor (2). To counteract this, the rotor (2) is pressed over the twisted teeth (25) into the idle position in idle mode by the compression spring for rotor sliding (26).

i When the engine is switched off, the working chamber (12) is flooded with coolant. This allows the minimum coolant level to be referenced. To activate this function, the speed of the vehicle must be min. v = 3 km/h before the engine is switched off.

Brake operation

Control schematic

4 Secondary water retarder
5 Valve block
6 Relief valve
7 Coolant pump
8 Radiator
9 Expansion reservoir
10 Shutoff pressure line, feed
11 Control valve
12 Working chamber
13 Shutoff pressure line, return
14 Side channel pump
28 Solenoid valve 1 (intake valve)
29 Solenoid valve 2
30 Solenoid valve 3 (exhaust valve)
31 Pneumatic pressure sensor



W43.30-1301-75

A11 Retarder control (RCM) control unit
B933 Coolant temperature sensor
Y53 Coolant pressure control solenoid valve
K Coolant flow direction
p System pressure

If a braking torque request is issued by the driver or system, the drive control (CPC) control unit (A3) calculates the required braking intensity of the secondary water retarder (4), taking the engine braking power into account.
The drive control (CPC) control unit (A3) then transmits a corresponding request via drivetrain CAN (CAN 4) to the retarder control unit (RCM) (A11).

In addition, the retarder control unit (RCM) (A11) evaluates the following information:

- Vehicle speed
- Coolant pump rpm
- Coolant temperature
- Transmission output speed
- Engine speed

The retarder control unit (RCM) (A11) compares this information against a stored characteristics map.
This provides the control variables for pneumatic actuating pressure control of the following components integrated in the retarder control unit (RCM) (A11):

- Solenoid valve 1 (intake valve) (28)
- Solenoid valve 2 (29)
- Solenoid valve 3 (exhaust valve) (30)
- Pneumatic pressure sensor (31)

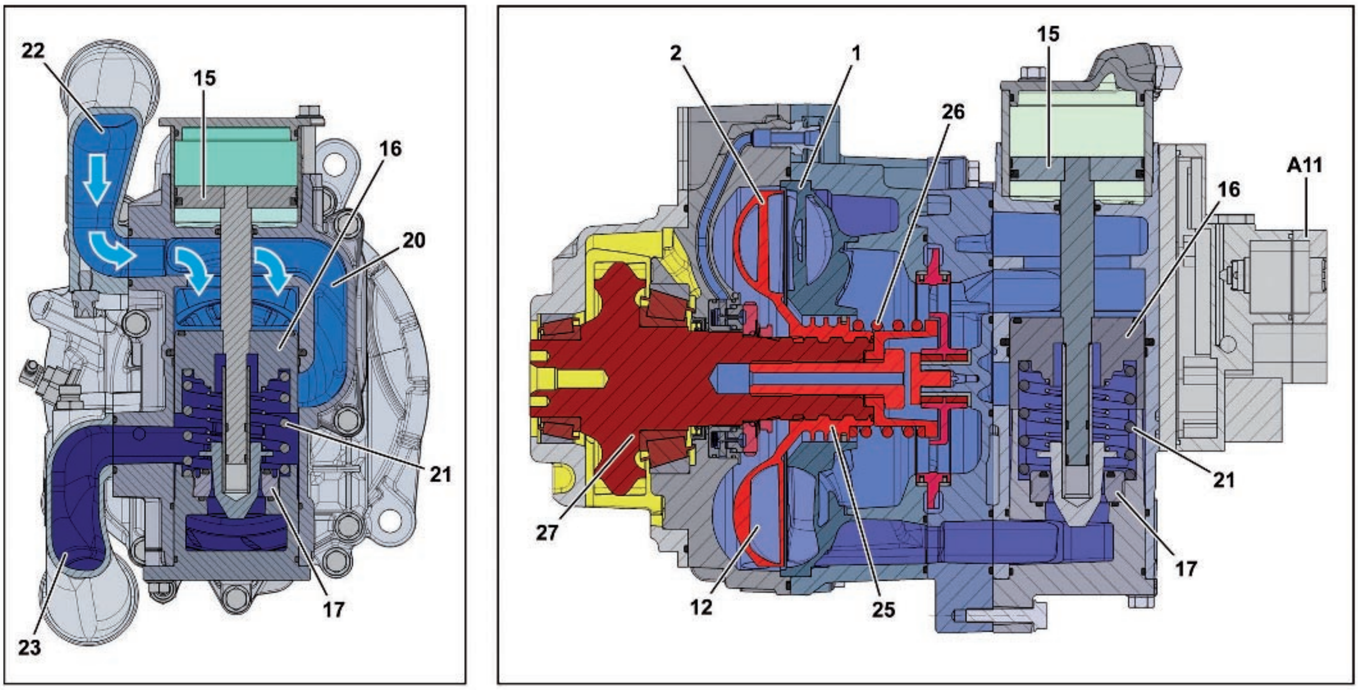
According to the characteristics map, pneumatic pressure is applied in the valve block (5) via solenoid valve 1 (intake valve) (28) and solenoid valve 2 (29).
The actuator in the valve block (5) is moved to the braking position in accordance with the intensity of the applied pneumatic pressure. This causes diversion of the engine coolant via the filling duct into the working chamber (12) of the secondary water retarder (4).

---

i At the same time, the retarder control unit (RCM) (A11) applies pneumatic pressure (reservoir pressure p) to the coolant circuit via the coolant pressure control solenoid valve (Y53). This compensates for the pressure drop in the coolant circuit resulting from filling of the secondary water retarder (4).

In the working chamber (12) of the secondary water retarder (4), the engine coolant flowing in via the coolant manifold, feed, comes into contact with the turning rotor (2) via the filling slot of the stator (1). The rotor (2) takes in the engine coolant with its rotational movement and accelerates it.
At the same time, the hydraulic pressure between the rotor (2) and stator (1) increases. This causes the rotor (2) to slide on the twisted teeth from position "Idle mode" towards direction "Braking mode". In the stator (1), the engine coolant is diverted and fed back to the rotor (2) along the inside diameter of the working chamber (12).

This builds up a dynamic pressure which generates braking torque. If the braking torque request from the driver or a driving assistance system is canceled, the valve block (5) is ventilated via solenoid valve 3 (exhaust valve) (30). The engine coolant then no longer flows into the working chamber (12), but back to the engine radiator (8) and coolant pump (7).
At the same time, pneumatic pressure is applied to the relief valve (6) for several seconds by the retarder control unit (RCM) (A11).
This process causes activation of the side channel pump (14), which then empties the working chamber (12) down to a defined residual quantity of engine coolant.



W43.30-1294-79

Sectional view of secondary water retarder

1	*Stator*	*17*	*Control valve*	*25*	*Twisted teeth*
2	*Rotor*	*20*	*Bypass*	*26*	*Compression spring for sliding rotor*
12	*Working chamber*	*21*	*Switching valve compression spring*	*27*	*Retarder shaft*
15	*Actuator*	*22*	*Coolant manifold, feed*		
16	*Switching valve*	*23*	*Coolant manifold, return*	*A11*	*Retarder control (RCM) control unit*

Function in braking mode

If a braking request is received, the retarder control unit (RCM) (A11) applies pneumatic pressure to the cylinder of the actuator (15). Depending on the intensity of the pneumatic pressure, the actuator (15) is pressed downwards (retracted) against the spring force of the switching valve compression spring (21). Retraction of the actuator (15) causes the switching valve (16) to slide and close the bypass (20) to the coolant manifold, return (23).

i If the braking request is low enough, the bypass (20) is not fully closed to reduce the braking power. The engine coolant which is not required is fed back to the coolant circuit via the coolant manifold, return (23).

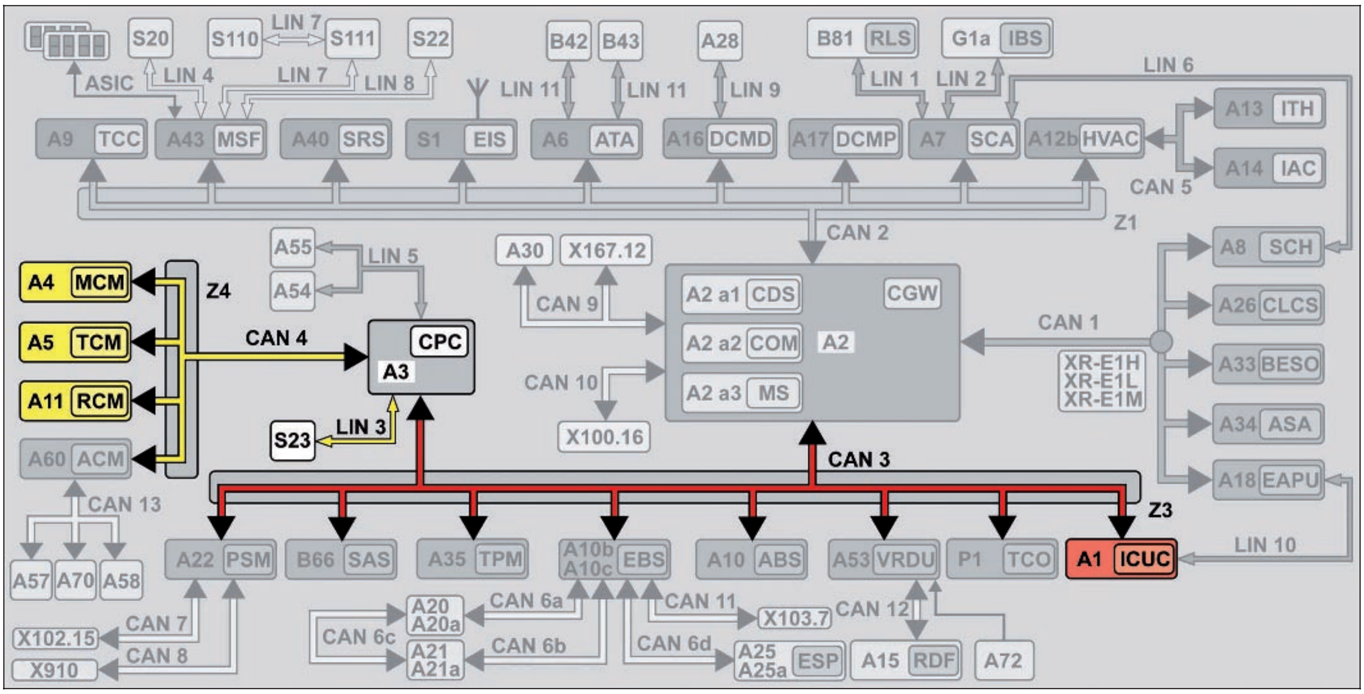
The engine coolant flows via the filling slot of the stator (1) into the working chamber (12) where it meets the turning rotor (2), which transports the engine coolant to the stator (18).
The turning rotor (2) takes in the coolant and accelerates it. This produces a braking torque which pulls the rotor (2) over the twisted teeth (25) towards the stator (1) against the force of the compression spring for rotor sliding (26).
This increases the braking power of the secondary water retarder (4). As a result, hydraulic pressure is built up in the working chamber (12), which brakes the rotor (2) and thus the retarder shaft (27).

Thermal overload protection

In braking mode, thermal energy is produced by the hydraulic friction of the engine coolant between the rotor (2) and stator (1). This necessitates temperature monitoring of the engine coolant, which is performed with the coolant temperature sensor (B933). The retarder control unit (RCM) (A11) evaluates the signal of the coolant temperature sensor (B933) and compares the coolant temperature value with the defined limit of 128 °C stored in the retarder control unit (RCM) (A11). Based on this limit value, the maximum braking torque is adjusted in order to harmonize the ratio between the braking energy generated and the heat which can be dissipated via the engine cooling system.
If the coolant temperature exceeds 108 °C, the retarder control unit (RCM) (A11) reduces the pneumatic actuating pressure at valve block (5).
This means that the engine coolant feed into the working chamber (12) is reduced. At the same time, the engine coolant is fed back to the engine cooling system via the bypass (20). If the thermal load cannot be compensated for in this way, the valve block (5) is fully ventilated via solenoid valve 3 (exhaust valve) (30).
The secondary water retarder (4) is now in idle mode again. The engine coolant flows past the working chamber (12) and back to the engine radiator (8) and coolant pump (7).
In this case, the retarder control unit (RCM) (A11) transmits a request to output a visual notification message to the instrument cluster control unit (ICUC) (A1).

	Overall hydraulic network of retarder		**Page 129**
	Instrument cluster (ICUC) control unit, component description	A1	**Page 331**
	Drive control (CPC) control unit, component description	A3	**Page 334**
	Engine management control unit (MCM), component description	A4	**Page 335**
	Transmission control (TCM) control unit. component description	A5	**Page 337**
	Retarder control unit (RCM), component description	A11	**Page 342**
	Right multifunction control lever, component description	S23	**Page 463**
	Retarder, component description		**Page 514**

GF43.30-W-0001-02H	Overall network of hydraulic retarder		



W43.30-1292-79

A1	*Instrument cluster (ICUC) control unit*	*A11*	*Retarder control (RCM) control unit*	*LIN 3*	*Right multifunction control lever LIN*
A3	*Drive control (CPC) control unit*	*CAN 3*	*Frame CAN*	*S23*	*Right multifunction control lever*
A4	*Engine management control unit (MCM)*	*CAN 4*	*Drive train CAN*	*Z3*	*Frame CAN bus star point*
A5	*Transmission control (TCM) control unit*			*Z4*	*Drive CAN bus star point*

Functions

GF46.25-W-0003H	Single-circuit power steering, function	2.8.11

MODEL 963, 964

General information

Single-circuit power steering, model ZF Servocom 8098, components

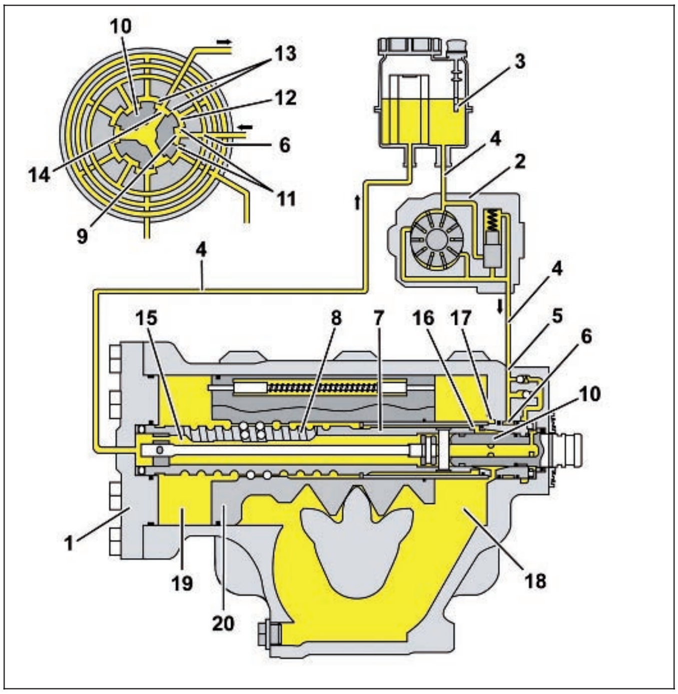
1 Steering gear
2 Power steering pump
3 Steering oil reservoir
4 Hydraulic lines

W46.25-1023-82

Straight-ahead driving, function sequence

Control schematic for straight-ahead driving

1 Steering gear
2 Power steering pump
3 Steering oil reservoir
4 Hydraulic lines
5 Connection hole
6 Feed radial groove
7 Valve part
8 Worm
9 Feed control grooves
10 Valve actuator
11 Feed control edges
12 Axial grooves
13 Return control edges
14 Return control grooves
15 Return chamber
16 Radial groove
17 Radial groove
18 Right working cylinder
19 Left working cylinder
20 Operating piston



W46.20-1041-82

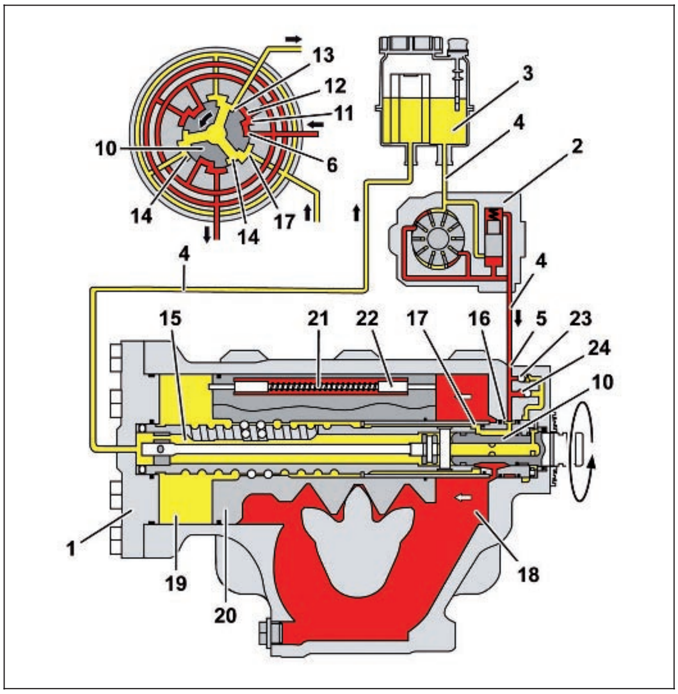
The power steering pump (2) draws the power steering fluid out of the power steering fluid reservoir (3) and pumps it through the connection hole (5) in the steering gear via the feed radial groove (6) and the cross holes at the valve part (7) of the worm (8) to the three feed control grooves (9) of the valve actuator (10).
From the valve actuator (10), the power steering fluid flows via the open feed control edges (11) into all axial grooves (12) of the worm head. From there, the power steering fluid flows via the open return control edges (13) into the return control grooves (14) of the valve actuator (10).

From these return control grooves (14), the power steering fluid flows via holes to the return chamber (15) on the inside of the worm (8) and back to the power steering fluid reservoir (3).
At the same time, the radial grooves (16 and 17) connect the assigned connections of the right working cylinder (18) to the left working cylinder (19). The pressure compensation in the two working cylinders has a pressure-neutral effect on the working piston (20) so that the working piston (20) remains in the rest position during straight-ahead driving.

Left steer, function sequence

Control schematic for left steer

1 *Steering gear*
2 *Power steering pump*
3 *Steering oil reservoir*
4 *Hydraulic lines*
5 *Connection hole*
6 *Feed radial groove*
10 *Valve actuator*
11 *Feed control edges*
12 *Axial grooves*
13 *Return control edges*
14 *Return control grooves*
15 *Return chamber*
16 *Radial groove*
17 *Radial groove*
18 *Right working cylinder*
19 *Left working cylinder*
20 *Operating piston*
21 *Hydraulic steering limiter*
22 *Pressure reduction valve*
23 *Pressure limiting valve*
24 *Suction valve*



W46.20-1043-82

The power steering pump (2) draws the power steering fluid out of the power steering fluid reservoir (3) and pumps it through a connection hole (5) in the steering gear (1) via the feed radial groove (6).
When the steering wheel is turned to the left, the working piston (20) moves to the left.
The simultaneous counterclockwise rotation of the valve actuator (10) causes the power steering fluid to flow via the more widely opened feed control edges (11) into the three assigned axial grooves (12), via holes into the radial groove (16) and via a connection to the right working cylinder (18), thereby hydraulically assisting the piston movement. The pressure buildup is achieved by a connection between the pressurized oil feed and the return control grooves (14), which are connected to the radial groove (17), being restricted or prevented by means of the partially or completely closed return control edges (13).

At the same time, the outflow of pressurized oil into the pressure-actuated axial grooves (12) is restricted or prevented by the closing return control edges (13).
The power steering fluid displaced in the left working cylinder (19) by the working piston (20) first flows via a connection into the radial groove (17) and via cross holes into the corresponding axial grooves (12) and via the more widely opened return control edges (11) into the return control grooves (14). From here, the power steering fluid flows back to the power steering fluid reservoir (3) via the connection holes leading to the return chamber (15).
Just before the maximum steering angle is reached, the hydraulic steering limiter (21) (protective device) limits the power steering fluid pressure in the right working cylinder (18).
The protective device integrated in the working piston (20) is closed during the steering movement.

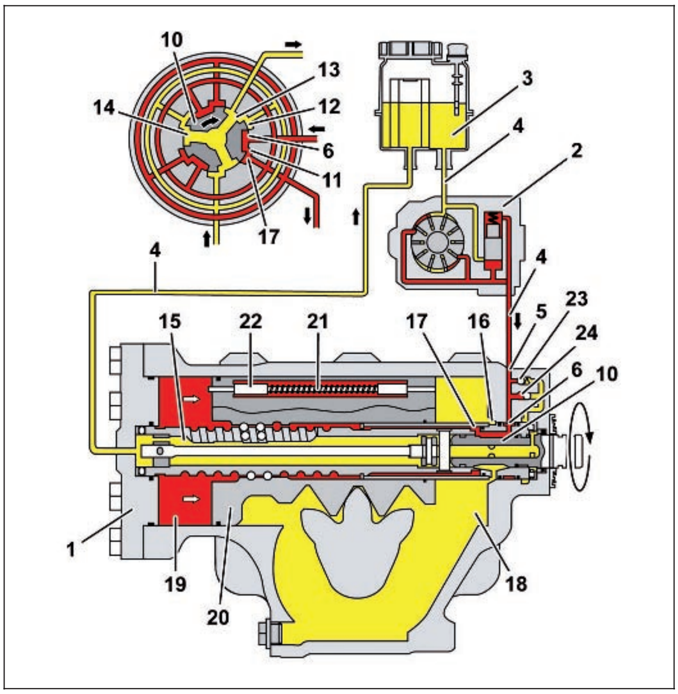
If the working piston (20) moves toward the left working cylinder (19), the pressure reduction valve (22) is actuated according to the setting of the adjustment screw (limit stop) so that the power steering fluid can flow from the right working cylinder (18) into the left working cylinder (19) and is channeled via the valve actuator (10) into the return flow.
The oil pressure in the right working cylinder (18) is reduced accordingly.

Turning the steering wheel to the left as far as the steering lock is now only possible by applying increased force. Furthermore, the steering gear (1) is equipped with a pressure limiting valve (23) which limits the delivery pressure of the power steering pump (2) to the predefined maximum pressure. The replenishing valve (24) allows power steering fluid to be drawn out of the return flow if steering without hydraulic assistance is necessary (e.g. if the vehicle is being towed).

Right steer, function sequence

Control schematic for right steer

1 Steering gear
2 Power steering pump
3 Steering oil reservoir
4 Hydraulic lines
5 Connection hole
6 Feed radial groove
10 Valve actuator
11 Feed control edges
12 Axial grooves
13 Return control edges
14 Return control grooves
15 Return chamber
16 Radial groove
17 Radial groove
18 Right working cylinder
19 Left working cylinder
20 Operating piston
21 Hydraulic steering limiter
22 Pressure reduction valve
23 Pressure limiting valve
24 Suction valve



W46.20-1042-82

The power steering pump (2) draws the power steering fluid out of the power steering fluid reservoir (3) and pumps it through a connection hole (5) in the steering gear (1) via the feed radial groove (6).
When the steering wheel is turned to the right, the working piston (20) moves to the right.
The simultaneous clockwise rotation of the valve actuator (10) causes the power steering fluid to flow via the more widely opened feed control edges (11) into the three assigned axial grooves (12), via holes into the radial groove (17) and via a connection to the left working cylinder (19), thereby hydraulically assisting the piston movement. The pressure buildup is achieved by a connection between the pressurized oil feed and the other three return control grooves (14), which are connected to the radial groove (16), being restricted or prevented by means of the partially or completely closed return control edges (13).

At the same time, the outflow of pressurized oil into the pressure-actuated axial grooves (12) is restricted or prevented by the closing return control edges (13).
The power steering fluid displaced in the right working cylinder (18) by the working piston (20) first flows via a connection into the radial groove (16) and via cross holes into the corresponding axial grooves (12) and via the more widely opened return control edges (13) into the return control grooves (14). From here, the power steering fluid flows back to the power steering fluid reservoir (3) via the connection holes leading to the return chamber (15).
Just before the maximum steering angle is reached, the hydraulic steering limiter (21) (protective device) limits the power steering fluid pressure in the left working cylinder (19).
The protective device integrated in the working piston (20) is closed during the steering movement.

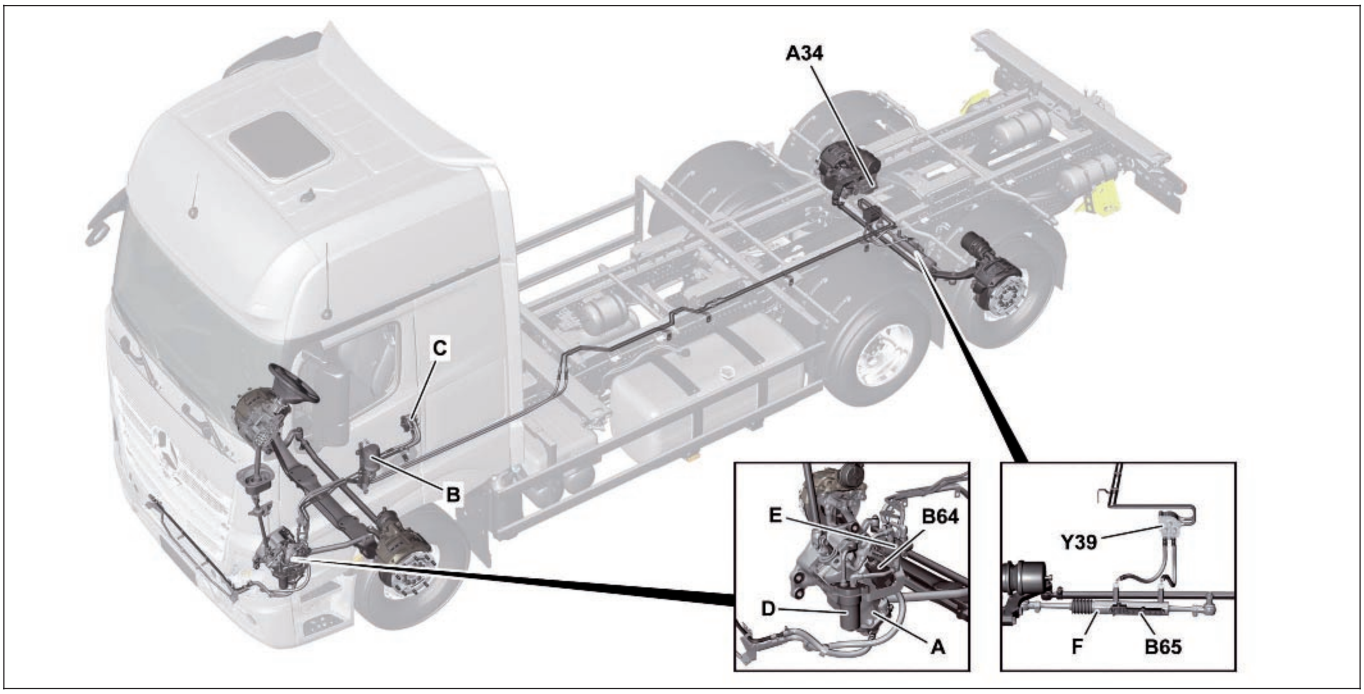
If the working piston (20) moves toward the right working cylinder (18), the pressure reduction valve (22) is actuated according to the setting of the adjustment screw (limit stop) so that the power steering fluid can flow from the left working cylinder (19) into the right working cylinder (18) and is channeled via the valve actuator (10) into the return flow.
The oil pressure in the left working cylinder (19) is reduced accordingly.

Turning the steering wheel to the left as far as the steering stop is now only possible by applying increased force. Furthermore, the steering gear is equipped with a pressure limiting valve (23) which limits the delivery pressure of the steering pump to the predefined maximum pressure. The replenishing valve (24) allows power steering fluid to be drawn out of the return flow if steering without hydraulic assistance is necessary (e.g. if the vehicle is being towed).

	Steering gear, component description		**Page 520**
	Power steering fluid reservoir, component description		**Page 521**
	Power steering pump, component description		**Page 522**

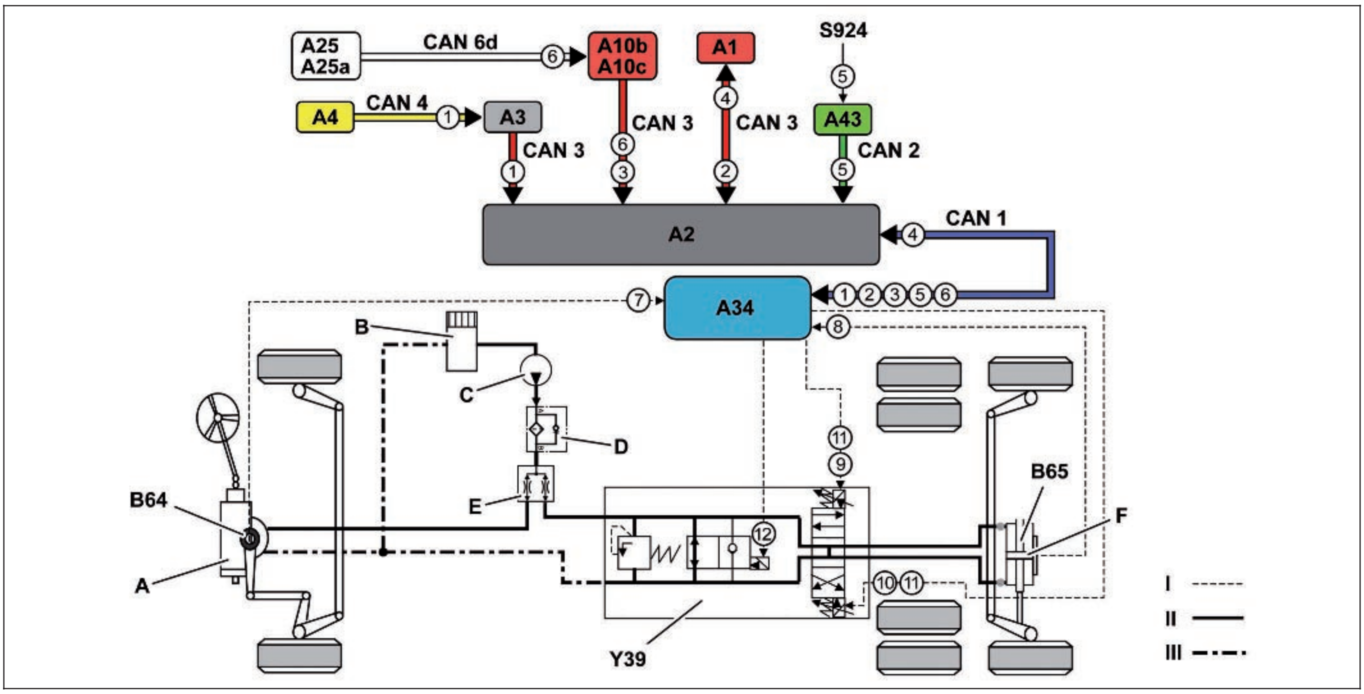
GF46.80-W-0004H	Additional steering axle, function	2.8.11

MODEL 963, 964



W46.80-1147-79

A34	*Additional steering axle (ASA) control unit*	*Y39*	*Additional axle valve unit*	*C*	*Power steering pump*
B64	*Front axle steering angle sensor*	*A*	*Front axle steering gear*	*D*	*High pressure filter*
B65	*Additional axle steering angle sensor*	*B*	*Steering oil reservoir*	*E*	*Flow dividing valve*
				F	*Additional steering axle steering cylinder*



W46.80-1135-79

1 *Engine speed, signal*
2 *Vehicle speed, signal*
3 *Wheel speed, signal*
4 *Additional steering axle warning message, requirement*
5 *Centering auxiliary steering button (S924), status*
6 *Stability Control Assist, status (with code (S1D) Stability Control Assist)*
7 *Front axle steering angle sensor (B64), signal*
8 *Additional axle steering angle sensor (B65), signal*
9 *Additional right steer steering axle steering cylinder, actuation*
10 *Additional left steer steering axle steering cylinder, actuation*
11 *Additional steering axle shutoff valve, actuation*
12 *Centering additional steering axle, actuation*

A1 *Instrument cluster (ICUC) control unit*
A2 *Central gateway control unit (CGW)*
A3 *Drive control (CPC) control unit*
A4 *Engine management control unit (MCM)*
A10b *Electronic brake control (EBS) control unit (Wabco)*
A10c *Electronic brake control (EBS) control unit (Knorr)*
A25 *Electronic Stability Program (ESP®) control unit (Wabco) (with code (S1D) Stability Control Assist)*
A25a *Electronic Stability Program (ESP®) control unit (Knorr) (with code (S1D) Stability Control Assist)*
A34 *Additional steering axle (ASA) control unit*
A43 *Modular switch panel (MSF) control unit*
B64 *Front axle steering angle sensor*
B65 *Additional axle steering angle sensor*

CAN 1 *Exterior-CAN*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
CAN 4 *Drive train CAN*
CAN 6d *ESP® brakes CAN*

Y39 *Additional axle valve unit*
S924 *Center auxiliary steering button*

I *Electrical line*
II *Hydraulic line (high pressure)*
III *Hydraulic line (return)*

A *Front axle steering gear*
B *Steering oil reservoir*
C *Power steering pump*
D *High pressure filter*
E *Flow dividing valve*
F *Additional steering axle steering cylinder*

Requirement
- Vehicle speed <45 km/h

Function
The additional steering axle allows the trailing axle to self-steer depending on the steering angle of the front axle up to a vehicle speed of 45 km/h.
As a result, the steering point on the steering line is displaced. The possible curve radius and therefore the turning circle are reduced, thus making maneuvering significantly easier.
At vehicle speeds > 45 km/h, the trailing axle's self-steering behavior would have a negative effect on the vehicle dynamics and/or the driving stability of the vehicle. This is why the trailing axle is locked automatically starting at a vehicle speed of 45 km/h in the "straight-ahead position" (centered).
Additionally, the driver has the opportunity to manually center the trailing axle via the Centering auxiliary steering button (S924).

In vehicles where the trailing axle can be raised, the trailing axle is automatically centered when it is raised.
The additional steering axle is based on the concept of the known electrohydraulic auxiliary steering (EHZ), but has a more compact design.
The additional steering axle is controlled by the additional steering axle (ASA) control unit (A34), which evaluates the following input factors for this purpose:
- Engine speed
- Vehicle speed
- Wheel speed
- Front axle steering angle
- Additional steering axle steering angle
- Centering of additional steering axle, status

The additional steering axle (ASA) control unit (A34) uses the above input factors to compute the corresponding initial parameters for steering angle control.

Steering of the trailing axle takes place by means of hydraulic actuation via the additional steering axle steering cylinder (F).
The power steering pump (C) delivers the power steering fluid via the high pressure filter (D) to the flow dividing valve (E), which separates the hydraulic circuit of the front axle from the hydraulic circuit of the additional steering axle. Power steering fluid flows to the additional axle valve unit (Y39) via the flow dividing valve (E).
The power steering fluid pressure in the additional axle valve unit (Y39) is limited via a pressure limiting valve.
If the front axle is steered now (for example to the left) at a vehicle speed < 45 km/h, the additional steering axle (ASA) control unit (A34) evaluates the data of the front axle steering angle sensor (B64) as well as additional data. The additional steering axle (ASA) control unit (A34) actuates the proportional valve in the additional axle valve unit (Y39) corresponding to the steering angle on the front axle. Hydraulic pressure is then built up in the additional steering axle steering cylinder (F). The piston moves to the right during the process.

The hydraulic actuation of the piston is converted into a steering movement to the right via the steering linkage.
The movement of the piston is permanently recorded during the process by the additional axle steering angle sensor (B65). The additional steering axle (ASA) control unit (A34) evaluates the data of the additional axle steering angle sensor (B65) accordingly.

i If the front axle is steered to the right, the additional axle valve unit (Y39) and thus the additional steering axle steering cylinder (F) are actuated accordingly in the opposite direction.

When driving straight-ahead, power steering fluid pressure is applied to both sides of the piston. This generates a pressure compensation in the additional steering axle steering cylinder (F), which causes the piston to be exactly centered. If the vehicle speed of 45 km/h is exceeded, the trailing axle is lifted, or the trailing axle is centered manually, the additional steering axle (ASA) control unit (A34) actuates the shutoff valve of the additional axle valve unit (Y39).

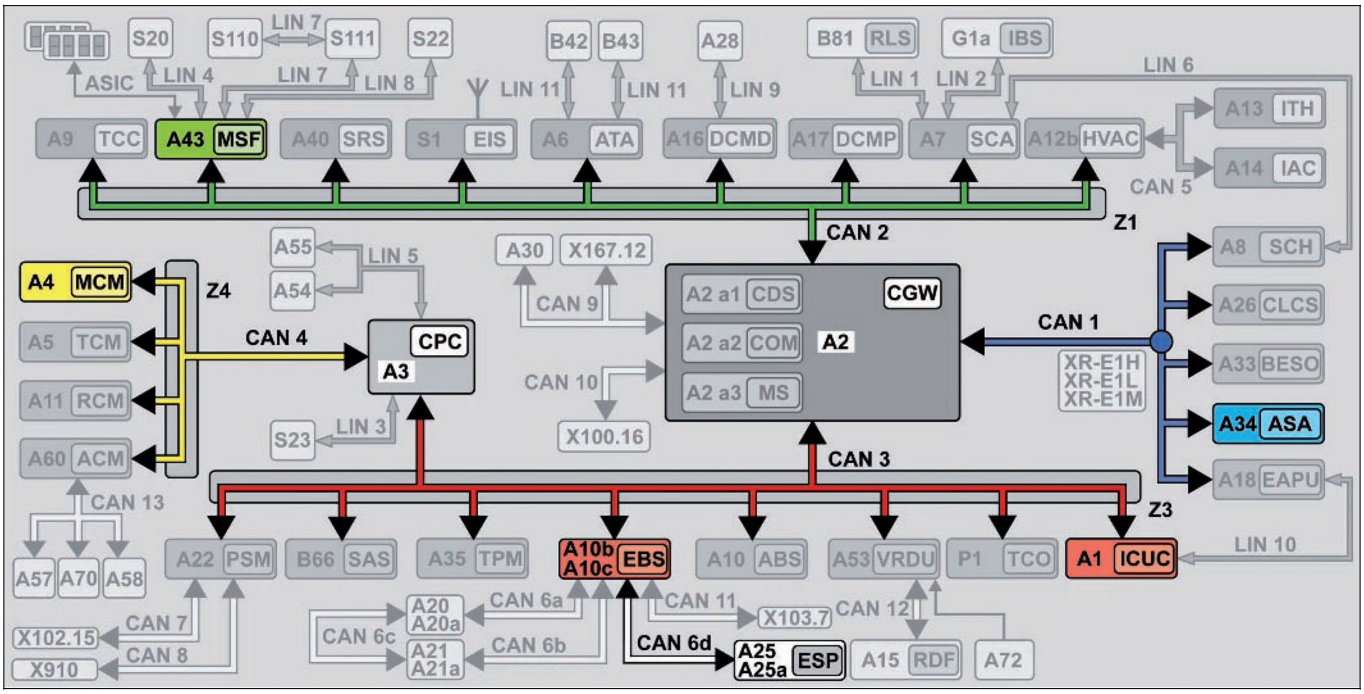
As a result, the hydraulic circuit of the additional steering axle steering cylinder (F) is separated from the hydraulic circuit of the front axle.
The pressure within the hydraulic circuit of the additional steering axle is kept constant during the process by the shutoff valve of the additional axle valve unit (Y39) and the piston in the additional steering axle steering cylinder (F) is centered.

i Due to the high production precision of the additional axle valve unit (Y39), it is possible to omit a hydraulic pressure reservoir.

	Additional steering axle, overall network		**Page 137**

	Additional steering axle, hydraulics diagram		**Page 138**
	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Component description drive control (CPC) control unit	A3	**Page 334**
	Component description for engine management (MCM) control unit	A4	**Page 335**
	Electronic Brake Control control unit (EBS), component description	A10b, A10c	**Page 341**
	Electronic Stability Program (ESP) control unit, component description	A25, A25a i Only in vehicles with code (S1D) Stability Control Assist	**Page 357**
	Additional steering axle (ASA) control unit, component description	A34	**Page 364**
	Modular switch panel control unit (MSF), component description	A43, S924	**Page 370**
	Front axle steering angle sensor, component description	B64	**Page 422**
	Additional steering axle steering angle sensor, component description	B65	**Page 423**
	Additional steering axle valve unit, component description	Y39	**Page 491**
	Steering gear, component description		**Page 520**
	Power steering pump, component description		**Page 522**
	Power steering fluid reservoir, component description		**Page 521**
	Additional steering axle steering cylinder, component description		**Page 523**
	Additional steering axle flow dividing valve, component description		**Page 524**
	Additional steering axle high pressure filter, component description		**Page 525**

GF46.80-W-0004-02H	Additional steering axle, overall network		



W46.80-1134-79

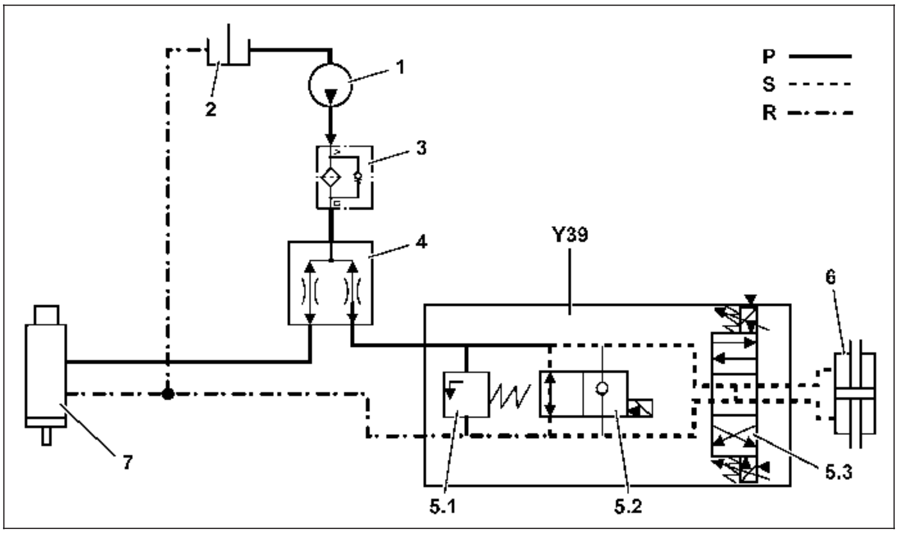
A1	Instrument cluster (ICUC) control unit
A2	Central gateway control unit (CGW)
A3	Drive control (CPC) control unit
A4	Engine management control unit (MCM)
A10b	Electronic brake control (EBS) control unit (Wabco)
A10c	Electronic brake control (EBS) control unit (Knorr)
A25	Electronic Stability Program (ESP®) control unit (Wabco) (with code (S1D) Stability Control Assist)
A25a	Electronic Stability Program (ESP®) control unit (Knorr) (with code (S1D) Stability Control Assist)
A34	Additional steering axle (ASA) control unit
A43	Modular switch panel (MSF) control unit
CAN 1	Exterior-CAN
CAN 2	Interior CAN
CAN 3	Frame CAN
CAN 4	Drive train CAN
CAN 6d	ESP® brakes CAN
Z1	Cab instrument panel CAN bus star point
Z3	Frame CAN bus star point
Z4	Drive CAN bus star point

GF46.80-W-0004-03H	Additional steering axle, hydraulics diagram		

1 Power steering pump
2 Steering oil reservoir
3 High pressure filter
4 Flow dividing valve
5.1 Pressure limiting valve
5.2 Shutoff valve
5.3 Proportioning valve
6 Additional steering axle steering cylinder
7 Steering gear

Y39 Additional axle valve unit

P Primary circuit (high pressure)
R Return line (low pressure)
H Secondary circuit (high pressure)



W46.80-1137-05

GF54.00-W-0002H	Driving assistance systems, function	2.8.11

MODEL 963, 964 with CODE (S1H)
MODEL 963, 964 with CODE (S1C) Active Brake Assist 2
MODEL 963, 964 with CODE (S1I)

General information

The driving assistance systems support the driver in various situations in accordance with their configuration either actively or passively.

In both cases, the Drive Assist systems contribute to driving safety. This helps to reduce the frequency of accidents and to possibly minimize their consequences. Ride comfort is also enhanced.

i The driving assistance systems do not provide protection against inattentiveness or driving mistakes. They merely serve as an aid for the driver.

The driving assistance systems are integrated into a joint driver assistance system (VRDU) control unit (A53). It reads out and evaluates the information of the front radar sensor (RDF) control unit (A15) and the Lane Assistant (A72) camera, controls the corresponding functions and issues system and warning messages.

The following driving assistance systems are offered and are described here in general and in further detail in separate documents:

- Lane Keeping Assist
- Proximity Control Assist
- Active Brake Assist 2

Lane Keeping Assist

The Lane Keeping Assist is an optical system, which warns the driver acoustically and visually in the event of an undesired deviation from the lane.
The system warns in the event of driving faults, e.g., in the event of fatigue, inattentiveness or distraction, and can therefore prevent accidents.
The system does not warn or does not react properly in the event of:

- missing or poorly visible road markings
- contradictory markings on the road (traffic zone)

i In certain situations, it is not desirable that the Lane Keeping Assist issues a warning. For this purpose, it is possible to completely suppress the warning output (acoustically and visually). It is also possible to only permit a visual warning output. The warning can be suppressed both before and during a warning output.

Proximity Control Assist

The Proximity Control Assist is an extension of the cruise control installed as standard. With the aid of the front radar sensor (RDF) control unit (A15), the Proximity Control Assist registers the traffic range up to 200 m in front of the own vehicle and automatically regulates the speed and the distance to the vehicle in front as specified by the driver.

With the stop-and-go function, the Proximity Control Assist automatically regulates driving and stopping in a traffic jam. If the stop time in stop-and-go traffic is less than 2 s, the vehicle starts driving again without the accelerator pedal being operated. The driver stays in control of the vehicle at any time during the process.

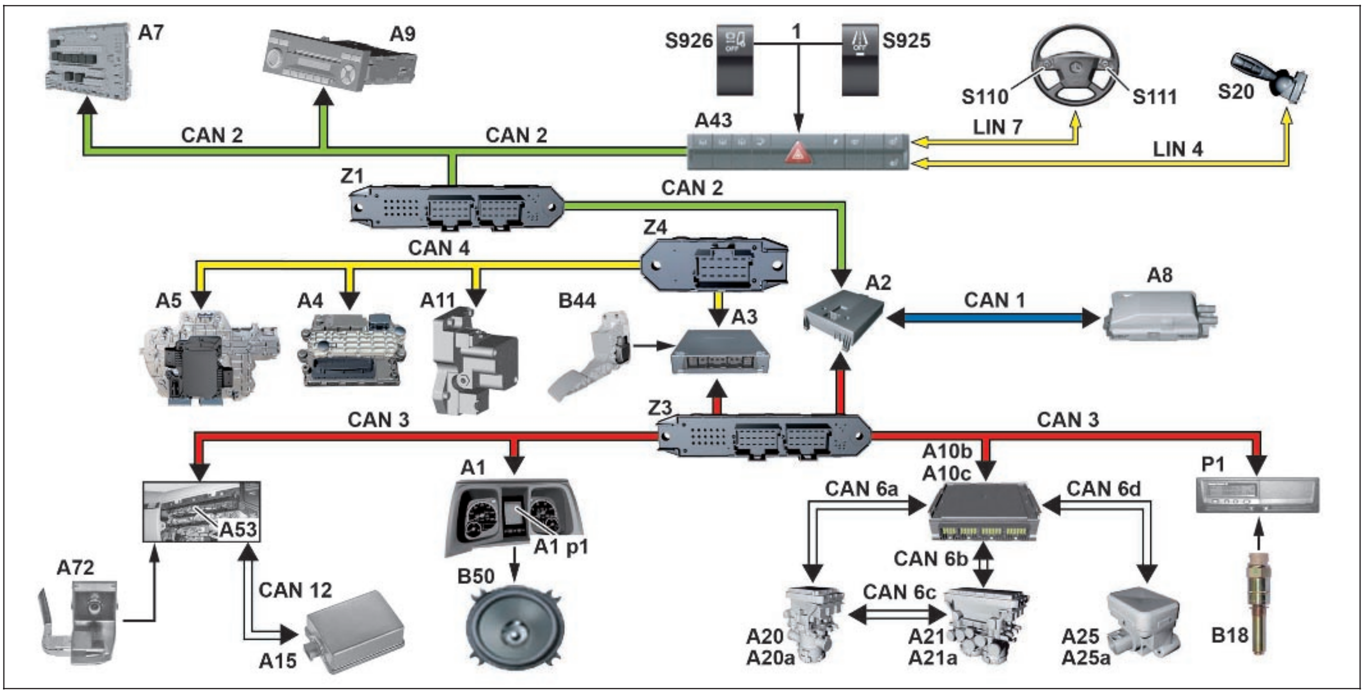
The system relieves the driver in particular during long convoy driving. Used in combination with the brake system, it supplements the standard integral permanent braking function.

Active Brake Assist 2

The Active Brake Assist 2 is a proximity warning system that notifies the driver when the distance to the vehicle in front is too short. The system also warns (visually and acoustically) of possible collisions with vehicles or standing obstacles on the lane.
If the Active Brake Assist 2 does not recognize any corresponding driver activities, then:

- for vehicles in front, and using the electronic brake control (EBS), emergency braking (full braking) is performed until the vehicle comes to a standstill.
- for stationary obstacles, and using the electronic brake control (EBS), partial braking is performed, but not emergency braking (full braking).

The system significantly increases driving safety while leaving the driver in control.



W54.00-1232-79

1 *ASIC data bus (Application System Integrated Circuit)*

A1 *Instrument cluster (ICUC) control unit*
A1 p1 *Multifunction display*
A2 *Central gateway control unit (CGW)*
A3 *Drive control (CPC) control unit*
A4 *Engine management control unit (MCM)*
A5 *Transmission control (TCM) control unit*
A7 *Cab signal acquisition and actuation module control unit (SCA)*
A8 *Frame signal acquisition and actuation module control unit (SCH)*
A9 *Truck Control Center (TCC)*
A10b *Electronic brake control (EBS) control unit (Wabco)*
A10c *Electronic brake control (EBS) control unit (Knorr)*
A11 *Retarder control (RCM) control unit*
A15 *Front radar sensor (RDF) control unit*
A20 *Front axle axle modulator (Wabco)*
A20a *Front axle axle modulator (Knorr)*
A21 *Rear axle axle modulator (Wabco)*
A21a *Rear axle axle modulator (Knorr)*
A25 *Electronic Stability Program (ESP®) control unit (Wabco)*
A25a *Electronic Stability Program (ESP®) control unit (Knorr)*
A43 *Modular switch panel (MSF) control unit*
A53 *Driver assistance system (VRDU) control unit*
A72 *Lane Assistant camera*
B18 *Travel and speed sensor*
B44 *Accelerator pedal sensor*
B50 *Center speaker*
CAN 1 *Exterior-CAN*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
CAN 4 *Drive train CAN*
CAN 6a *Front axle brakes CAN*
CAN 6b *Rear axle brakes CAN*
CAN 6c *Redundant brakes CAN*
CAN 6d *ESP® brakes CAN*
CAN 12 *Radar CAN*
LIN 4 *Left multifunction control lever LIN*
LIN 7 *Button group LIN*
P1 *Tachograph (TCO)*
S20 *Left multifunction control lever*
S110 *Left multifunction steering wheel button group*
S111 *Right multifunction steering wheel button group*
S925 *Lane Assistant OFF button*
S926 *Active Brake Assist (ABA) button*
Z1 *Cab instrument panel CAN bus star point*
Z3 *Frame CAN bus star point*
Z4 *Drive CAN bus star point*

Function

1 General

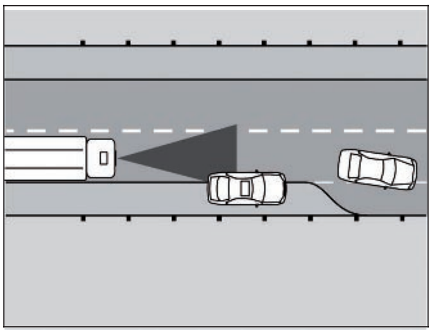
To register the traffic situation in front one's own vehicle, the front radar sensor (RDF) control unit (A15) transmits signals and in turn receives the signals reflected by the obstacles. Using the signals and/or the signal propagation times, the front radar sensor (RDF) control unit (A15) measures the distance and the relative speed to the vehicle in front and/or a standing object. Via the radar CAN (CAN 12), the front radar sensor (RDF) control unit (A15) transmits this information to the driver assistance system (VRDU) control unit (A53).
The driver assistance system (VRDU) control unit (A53) receives additional information from the Lane Assistant (A72) camera, which records the traffic lane 6 to 35 m in front of the vehicle.

2 System limits

System limits are driving situations, which have an adverse effect on the distance measurement of the front radar sensor (RDF) control unit (A15) and the Proximity Control Assist and Active Brake Assist 2 functions of the driver assistance system (VRDU) control unit (A53)

ℹ The Proximity Control Assist uses only vehicles in front for control, not standing obstacles on the road, such as a breakdown vehicle or the end of a traffic jam.

2.1 Driving situations during which there is no warning or brake application at all



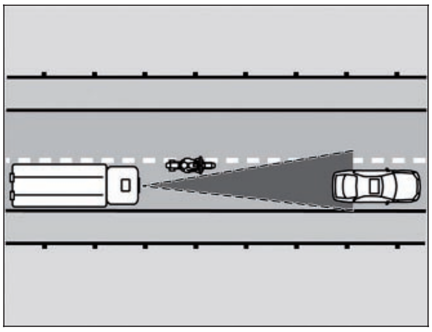
W30.30-1057-01

2.1.1 Vehicles in front driving in an off-center lane position

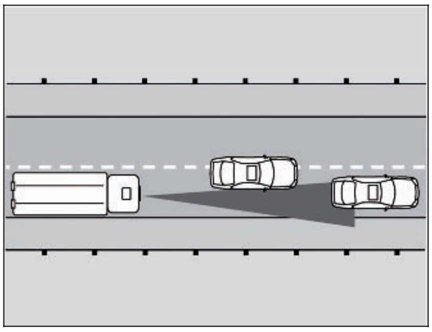
Vehicles in front which have an off-center lane position may cause detection problems because they may be located outside the detection zone of the front radar sensor (RDF) control unit (A15). As a result, the distance from you may become too close, because the Proximity Control Assist only controls the distance from a single vehicle located in the detection zone of the front radar sensor (RDF) control unit (A15). The Active Brake Assist 2 can therefore issue a warning unexpectedly or with a delay or brake the vehicle (partial braking).

2.1.2 Lane changes by other vehicles

Vehicles changing to their own lane with a short distance can only be recognized when they are in the detection zone of the front radar sensor (RDF) control unit (A15). The consequence of this is that the distance to the vehicle which is changing lane may become too small.



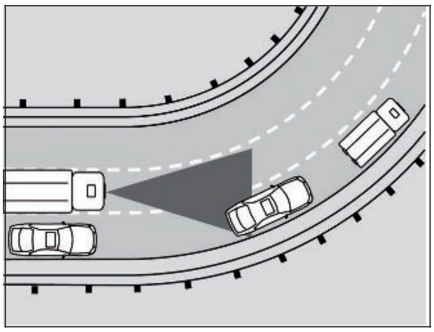
W30.30-1017-01



W30.30-1016-01

ℹ The driver must therefore increase the distance to the vehicle driving in front by braking.
The Proximity Control Assist and the Active Brake Assist 2 can issue a warning or brake the vehicle with a delay (partial braking).

2.2 Driving situations during which an unexpected warning can be issued or where there can be an unexpected brake application

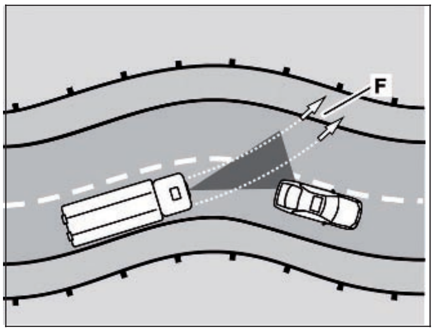


W30.30-1015-01

2.2.1 Vehicles driving in front in the area of curves

The Proximity Control Assist and the Active Brake Assist 2 have only restricted recognition capability with regard to vehicles in front in the area of curves and when driving into and out of curves.
The Proximity Control Assist and the Active Brake Assist 2 can therefore issue a warning unexpectedly or brake the vehicle (partial braking).

2.2.2 Vehicles driving in front in opposite curve



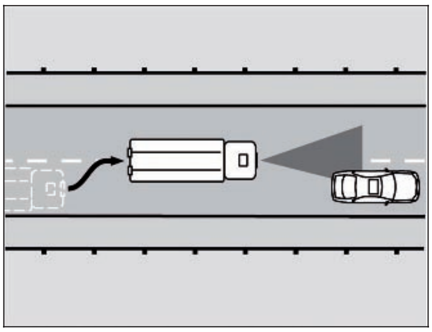
W30.30-1065-01

f Theoretically continuing own lane

In opposite curves, the Proximity Control Assist and the Active Brake Assist 2 are unable to detect the lane on which the vehicle in front is driving.
The Proximity Control Assist and the Active Brake Assist 2 can therefore issue a warning unexpectedly or brake the vehicle (partial braking).

2.2.3 Passing maneuvers

During passing maneuvers, both the Proximity Control Assist as well as the Active Brake Assist 2 can issue a distance warning or initiate a brake application of the vehicle, if the passing maneuver of the driver is too tight. The cause is brief tailgating shortly before and/or during the pulling out process.



W30.30-1063-01

Possible effects if the passing maneuver is too tight

- **Visual warning output without acoustic warning**

The Proximity Control Assist only issues a visual warning (no braking) when the turn signal indicator is set or the driver presses the accelerator pedal noticeably. The Active Brake Assist 2 only issues a visual warning (no braking) when the driver presses the accelerator pedal noticeably (the Active Brake Assist 2 does not react to the turn signal indicator).

- **Visual warning output with acoustic warning**

When neither the turn signal indicator is set nor the accelerator pedal has been pressed noticeably, the Active Brake Assist 2 provides an acoustic and visual warning during very tight passing maneuvers.

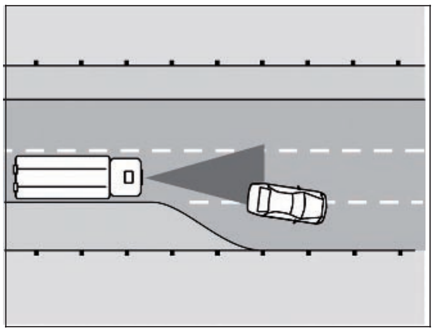
ℹ The Proximity Control Assist and the Active Brake Assist 2 issue a visual warning with a warning sound in very critical situations, even when they are switched off (no braking).

- **Visual warning with warning tone and braking**

When the accelerator pedal is not pressed noticeably, the Proximity Control Assist can brake the vehicle gently during very tight overtaking processes and draw the driver's attention to the situation with an acoustic and visual warning. In these situations Active Brake Assist 2 does not typically brake, but only issues a warning as the situation is always nearly defused during the minimum warning time of the Active Brake Assist 2 or one's own vehicle has pulled out.

2.2.4 Vehicles turning off or swinging-out

When the vehicle driving in front pulls out, it frequently reduces its speed before it changes to the adjoining lane. As a result, the distance is reduced and the difference in speed increases. This can cause the Proximity Control Assist to issue a warning. As the Proximity Control Assist reacts very quickly and in good time with a deceleration of one's own vehicle, the situation is defused in a timely manner so that the Active Brake Assist 2 no longer has to intervene. Exiting maneuvers or pulling out processes in curves can increase this effect. In curves or curve transitions the vehicles which have pulled out can continue to be recorded by the front radar sensor (RDF) control unit (A15) for a quite short time although these vehicles are already in the adjoining lane.
The Active Brake Assist 2 and the Proximity Control Assist can therefore issue a warning unexpectedly or brake the vehicle (partial braking).



W30.30-1064-01

Possible effects if vehicles are turning and/or pulling out

- **Output of a visual warning**

The visual warning is only output when the driver presses noticeably on the accelerator pedal and simultaneously drives his own vehicle very close behind the vehicle pulling out. The warning typically comes from the Proximity Control Assist, in rare and very critical situations this warning can also be output by the Active Brake Assist 2.

ℹ The Proximity Control Assist and the Active Brake Assist 2 issue a visual warning in very critical situations, even when they are switched off (no braking).

- **Visual warning output with acoustic warning**

The visual warning with acoustic warning occurs when the Proximity Control Assist is switched off, simultaneously one's own vehicle drives very close behind the vehicle pulling out and the accelerator pedal is not pressed or is held in the same position. The warning typically comes from the Proximity Control Assist, in rare and very critical situations this warning can also be output by the Active Brake Assist 2.

ℹ The Proximity Control Assist and the Active Brake Assist 2 issue a visual warning with a warning sound in very critical situations, even when they are switched off (no braking).

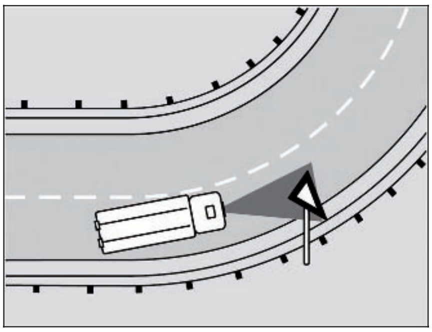
- **Visual warning with warning tone and braking**

If the accelerator pedal is pressed only slightly, the Proximity Control Assist can brake the vehicle gently during very short pulling out processes and draw the driver's attention to the situation with an acoustic and visual warning. In these situations, the Active Brake Assist 2 does not brake but only warns (visual and acoustic), as during the minimum Active Brake Assist 2 warning time the situation has almost always been defused or the vehicle driving in front has completed the pulling out process

2.2.5 Stationary objects

The Active Brake Assist 2 can also issue a warning of standing obstacles such as breakdown vehicles, traffic signs or bridges or brake the vehicle (partial braking).

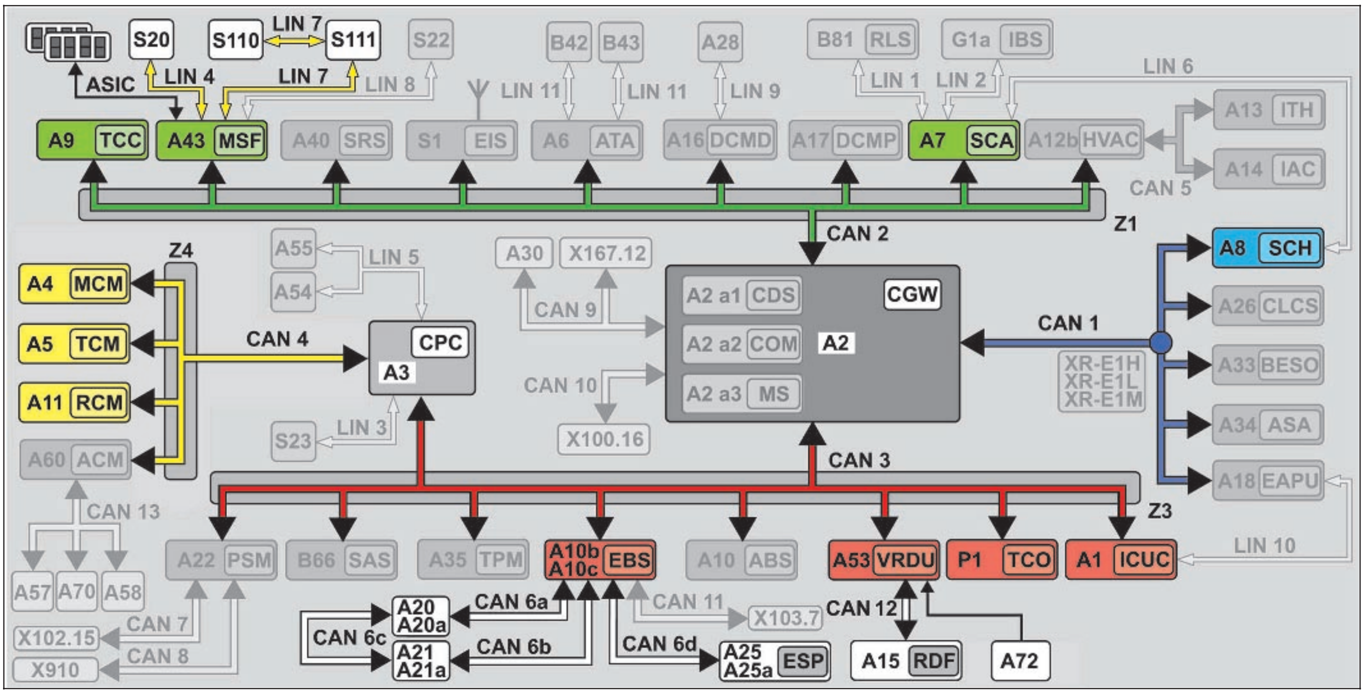
ℹ The reason why very frequent warnings about standing obstacles are issued can be that the height of the front radar sensor (RDF) control unit (A15) is not properly adjusted.



W30.30-1062-01

	Driving assistance systems, overall network		**Page 144**
	Proximity Control Assist function		**Page 145**
	Active Brake Assist function		**Page 149**
	Lane Keeping Assist function		**Page 154**

GF54.00-W-0002-01H	Driving assistance systems, overall network		

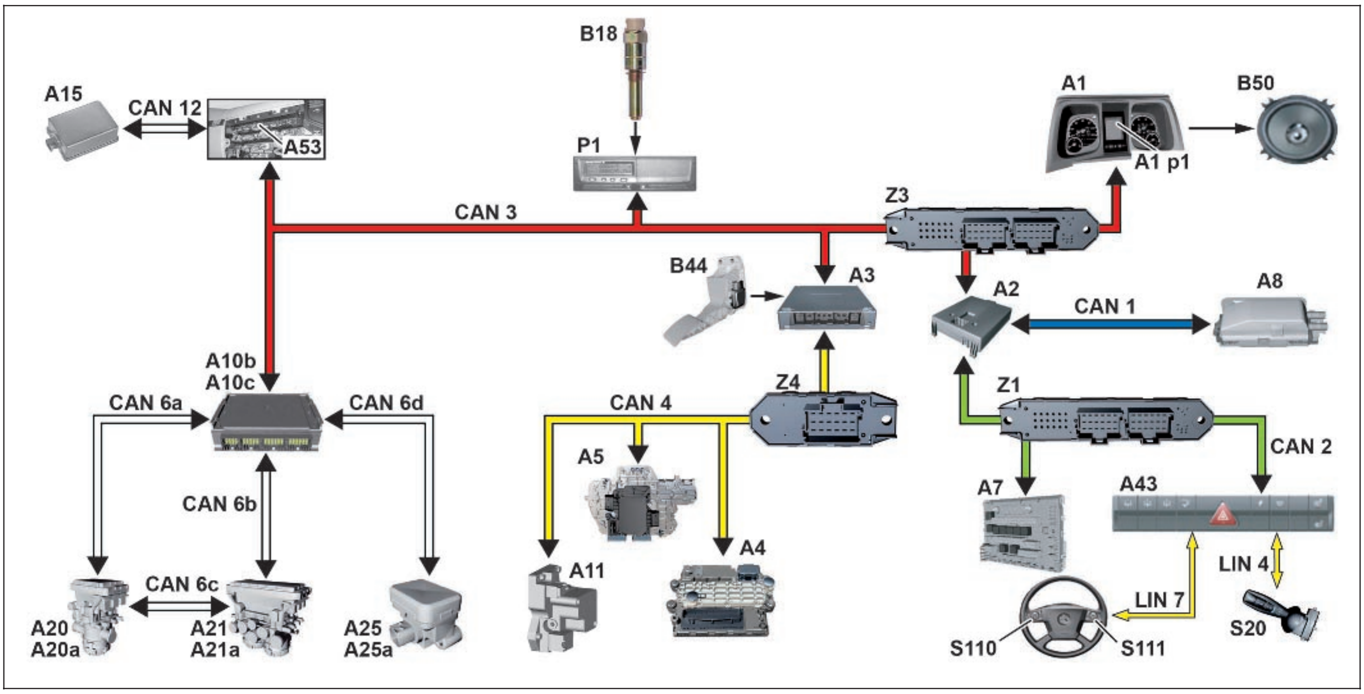


W54.00-1256-79

A1	*Instrument cluster (ICUC) control unit*
A2	*Central gateway control unit (CGW)*
A3	*Drive control (CPC) control unit*
A4	*Engine management control unit (MCM)*
A5	*Transmission control (TCM) control unit*
A7	*Cab signal acquisition and actuation module control unit (SCA)*
A8	*Frame signal acquisition and actuation module control unit (SCH)*
A9	*Truck Control Center (TCC)*
A10b	*Electronic brake control (EBS) control unit (Wabco)*
A10c	*Electronic brake control (EBS) control unit (Knorr)*
A11	*Retarder control (RCM) control unit*
A15	*Front radar sensor (RDF) control unit*
A20	*Front axle axle modulator (Wabco)*
A20a	*Front axle axle modulator (Knorr)*
A21	*Rear axle axle modulator (Wabco)*
A21a	*Rear axle axle modulator (Knorr)*
A25	*Electronic Stability Program (ESP®) control unit (Wabco)*
A25a	*Electronic Stability Program (ESP®) control unit (Knorr)*
A43	*Modular switch panel (MSF) control unit*
A53	*Driver assistance system (VRDU) control unit*
A72	*Lane Assistant camera*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
CAN 4	*Drive train CAN*
CAN 6a	*Front axle brakes CAN*
CAN 6b	*Rear axle brakes CAN*
CAN 6c	*Redundant brakes CAN*
CAN 6d	*ESP® brakes CAN*
CAN 12	*Radar CAN*
LIN 4	*Left multifunction control lever LIN*
LIN 7	*Button group LIN*
P1	*Tachograph (TCO)*
S20	*Left multifunction control lever*
S110	*Left multifunction steering wheel button group*
S111	*Right multifunction steering wheel button group*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*
Z4	*Drive CAN bus star point*
ASIC	*ASIC data bus (Application System Integrated Circuit)*

GF30.30-W-0011H	Proximity Control Assist function	2.8.11

MODEL 963, 964



W30.30-1090-79

A1 *Instrument cluster (ICUC) control unit*
A1 p1 *Multifunction display*
A2 *Central gateway control unit (CGW)*
A3 *Drive control (CPC) control unit*
A4 *Engine management control unit (MCM)*
A5 *Transmission control (TCM) control unit*
A7 *Cab signal acquisition and actuation module control unit (SCA)*
A8 *Frame signal acquisition and actuation module control unit (SCH)*
A10b *Electronic Brake Control (EBS) control unit (Wabco)*
A10c *Electronic Brake Control (EBS) control unit (Knorr)*
A11 *Retarder control (RCM) control unit (only for vehicles with code (B3H) Secondary water retarder)*
A15 *Front radar sensor (RDF) control unit*
A20 *Front axle axle modulator (Wabco)*
A20a *Front axle axle modulator (Knorr)*
A21 *Rear axle axle modulator (Wabco)*
A21a *Rear axle axle modulator (Knorr)*
A25 *Electronic Stability Program (control unit (ESP®) (Wabco)*
A25a *Electronic Stability Program (control unit (ESP®) (Knorr)*
A43 *Modular switch panel (MSF) control unit*
A53 *Driver assistance system (VRDU) control unit*
B18 *Travel and speed sensor*
B44 *Accelerator pedal sensor*
B50 *Center speaker*
CAN 1 *Exterior-CAN*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
CAN 4 *Drive train CAN*
CAN 6a *Front axle brakes CAN*
CAN 6b *Rear axle brakes CAN*
CAN 6c *Redundant brakes CAN*
CAN 6d *ESP® brakes CAN*
CAN 12 *Radar CAN*
LIN 4 *Left multifunction control lever LIN*
LIN 7 *Button group LIN*
P1 *Tachograph (TCO)*
S20 *Left multifunction control lever*
S110 *Left multifunction steering wheel button group*
S111 *Right multifunction steering wheel button group*
Z1 *Cab instrument panel CAN bus star point*
Z3 *Frame CAN bus star point*
Z4 *Drive CAN bus star point*

General information

The constantly increasing traffic density and the associated often changing road speeds make the cruise control virtually unusable. The set desired speed has to be constantly overridden manually or reactivated after brake application.

In order to relieve the driver, particularly for long convoy driving, the Proximity Control Assist is used. Used in combination with the brake system it supplements the standard integral permanent braking function.

The Proximity Control Assist detects the traffic area up to 200 m in front of one's own vehicle with the aid of the front radar sensor (RDF) control unit (A15). The distances between vehicles and the differential speeds are recorded and their changes analyzed.

There is a control automat coupled with the overall network of the vehicle which adapts the distance to the vehicle driving immediately ahead through deceleration or acceleration of the vehicle speed, without any action on the part of the driver.

Using the Stop-and-Go function the Proximity Control Assist automatically controls starting off and stopping in a traffic jam. If the holding time in stop-and-go traffic is less than 2 s, the vehicle starts to roll without operation of the accelerator pedal.

Deceleration of the vehicle takes place over the engine brake according to the vehicle equipment, the retarder and/or over the service brake. The clearance is oriented on the basic setting which is dependent on the respective speed and from the legally prescribed minimum distances to the vehicle directly ahead. Furthermore, the distance can be altered from the driver over the LH multifunction steering wheel button group (S110) and the RH multifunction steering wheel button group (S111).

i The responsibility for the speed driven at and the distance to the vehicle directly ahead always lies with the driver. The Proximity Control Assist does not automatically adjust the clearance to the vehicle directly ahead according to road and visibility conditions.

Function

The Proximity Control Assist can be activated using the RH multifunction steering wheel button group (S111) between 0 km/h and 90 km/h. Upon activation it regulates the set speed like a conventional cruise control for a free lane and deviations caused by driving up and down steep hills/mountains.
When the vehicle directly ahead comes too close, the speed is reduced and the vehicle directly ahead followed at the set specified distance. This is achieved through automatic intervention on the engine, permanent brake and service brake. The set speed will be regulated again, if the traffic situation allows this, for example because the vehicle directly ahead changes lane.

If vehicles come in front suddenly (e.g. due to a lane change) the Proximity Control Assist will try to regulate this situation. The intervention by the brake system is however limited to a maximum of 3 m/s^2 on safety grounds for a speed between 0 km/h and 15 km/h and to a maximum of 2 m/s^2 for a speed above 15 km/h. This represents about 30% of the maximum possible brake power of the vehicle. A clearance warning also occurs if more brake power is required or there is danger of a collision.
To do this the IC (ICUC) control unit (A1) shows an appropriate warning symbol. A double signal tone (takeover tone) is also emitted over the central loudspeaker (B50).

Complex driving situations can not always be clearly recognized by the Proximity Control Assist. False distance warnings may be issued or none at all.

The clearance warning function is also active for a switched off Proximity Control Assist as long as there is no fault present.

If the active distance control switches itself off due to a fault or due to going below the minimum speed then the driver will be informed about this acoustically. This occurs by means of a so-called "switch off tone" which is a single tone in contrast with the double warning tone (takeover tone).

Prerequisites for switching on of the Proximity Control Assist

- Vehicle speed above 15 km/h or there has already been a vehicle detected driving directly ahead
- The seat occupation sensor transmits an appropriate signal
- Transmission position not in "R" or "N".
- Chassis frame within the driving level (for vehicles with air suspension)
- Anti-lock braking system (ABS), acceleration skid control (ASR) and Electronic Stability Program (ESP®) are not in control mode
- Initialization and self test phase completed (about 2 min after engine start).

Switch on Proximity Control Assist

Switching on takes place through operation of the RH multifunction steering wheel button group (S111).

The modular switch panel (MSF) control unit (A43) detects the signal over the button group LIN (LIN 7) and transmits it over the overall network to the drive control (CPC) control unit (A3).

The drive control (CPC) control unit (A3) checks whether all prerequisites are fulfilled. To do this it evaluates the following information which is provided differently based on the overall network:

- **Position of parking brake**

The SCH (SCH) control unit (A8) evaluates the signal from the parking brake pressure switch (B30) and transmits an appropriate message to the central gateway (CGW) control unit (A2) via the vehicle CAN (CAN 1).
The central gateway (CGW) control unit (A2) receives the message and passes it on by means of the Gateway function to the drive control (CPC) control unit (A3) via the frame CAN (CAN 3).

- **The current condition of the ABS (ABS), the acceleration skid control (ASR) and the Electronic Stability Program (ESP®)**

The Electronic Brake Control (EBS) control unit (A10b, A10c) transmits an appropriate message to the drive control (CPC) control unit (A3) via the frame CAN (CAN 3) if the ABS (ABS), the acceleration skid control (ASR) and the Electronic Stability Program (ESP®) are in control mode.

- **Vehicle speed**

In order to compute the vehicle speed, information from the travel and speed sensor (B18) is evaluated which passes over the tachograph (TCO) (P1) to the drive control (CPC) control unit (A3).

- **Transmission setting**

The current switching position in the transmission is determined by the transmission (TCM) control unit (A5). To do this it evaluates information from the transmission positioner (Y900), converts this into an appropriate message and transmits it to the drive control (CPC) control unit (A3) via the drive train CAN (CAN 4).

- **Distance to vehicle immediately ahead**

The driver assistance system (VRDU) control unit (A53) evaluates the information recorded by the front radar sensor (RDF) control unit (A15) and transmits this to the drive control (CPC) control unit (A3).

Function

If all preconditions are fulfilled then the distance control is activated. The drive control (CPC) control unit (A3) transmits appropriate messages such as "Symbol Proximity Control Assist active ON", "currently desired speed 15...89 km/h" and "current actual clearance 0...125 m" to the IC (ICUC) (A1) control unit via the frame CAN (CAN 3). The multifunction display (A1 p1) shows the current actual clearance to the vehicle immediately ahead, the symbol "Proximity Control Assist active" and the currently set desired speed.

i If all preconditions are not fulfilled and one nevertheless still tries to activate the Proximity Control Assist an invalid activation attempt will be registered. "--,-km/h" appears for about 3 seconds in the multifunction display (A1 p1).

If the Proximity Control Assist cannot be activated, if for example the level control is outside the driving level or if a Proximity Control Assist system error occurs, then only the normal CC will be activated and a simple signal tone sounds from the middle speaker (B50).

Function sequence for alter the desired speed

The drive control (CPC) control unit (A3) detects data entry over the RH multifunction steering wheel button group (S111) and transmits appropriate information about the now set desired speed via the overall network to the IC (ICUC) control unit (A1). During change of the desired speed the currently set desired speed is displayed both in the middle and at the bottom edge of the multifunction display (A1 p1).

After releasing the RH multifunction steering wheel button group (S111) the currently set desired speed is stored in the drive control (CPC) control unit (A3).

i The display of the currently set desired speed is displayed both in the middle of the multifunction display (A1 p1) disappears after about 5 s.

Function sequence for change specified distance to the vehicle immediately ahead

i Upon switching on the ignition a time interval of about 2 s is automatically set to the vehicle immediately ahead (basic setting). A minimum distance to the vehicle immediately ahead of 15 m cannot be undershot.
The setting range of the specified distance can be set between 30% and 100% of the speedometer indicator in meters and in 7 stages.

The drive control (CPC) control unit (A3) detects data entry over the LH multifunction steering wheel button group (S110) and the RH multifunction steering wheel button group (S111) and transmits appropriate information to the IC (ICUC) control unit (A1) via the desired specified distance.
The currently set specified distance is displayed marked in the multifunction display (A1 p1) during change of clearance.
The newly set specified distance is stored in the drive control (CPC) control unit (A3) after the change of clearance.

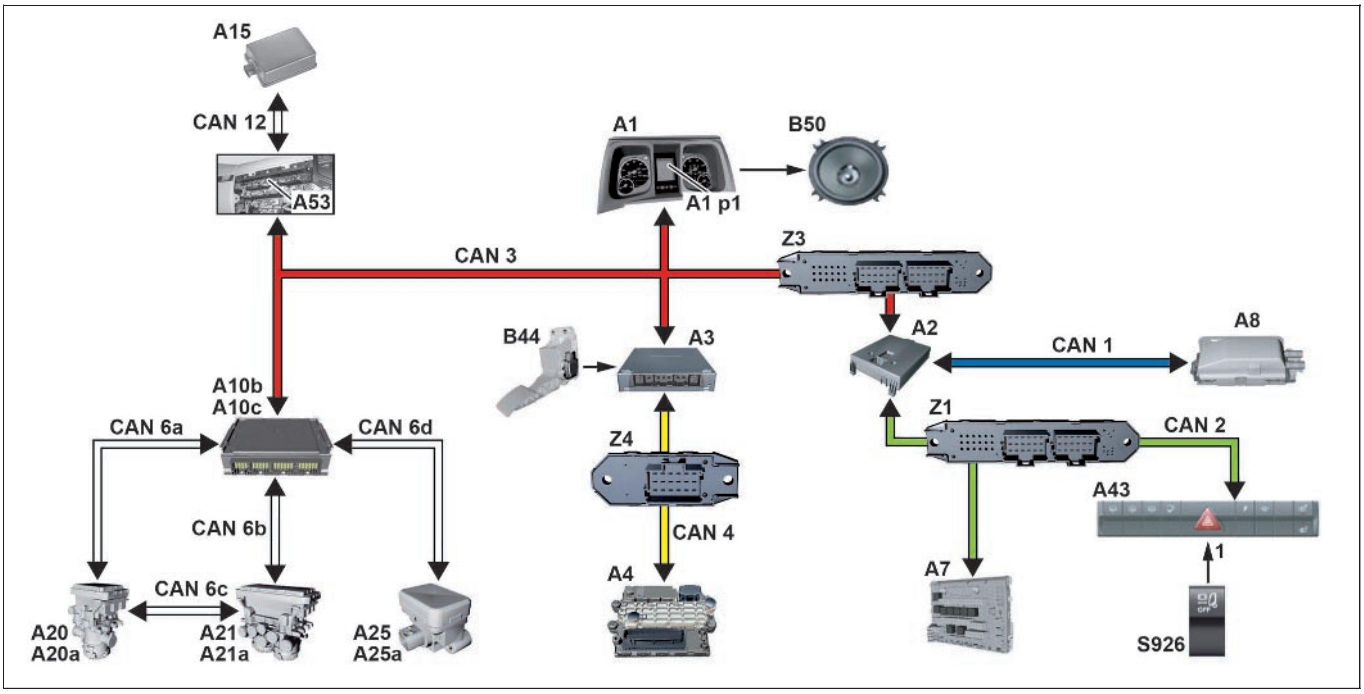
i The information in the multifunction display (A1 p1) about the set specified distance goes out after about 5 s.

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Component description for central gateway control unit (CGW)	A2	**Page 333**
	Component description drive control (CPC) control unit	A3	**Page 334**

	Component description for engine management (MCM) control unit	A4	**Page 335**
	Component description for transmission control (TCM) control unit.	A5	**Page 337**
	Component description for cab signal acquisition and actuation module control unit (SCA)	A7	**Page 339**
	Component description for signal acquisition and actuation module control unit, frame (SCH)	A8	**Page 340**
	Component description for Electronic Brake Control control unit (EBS)	A10b, A10c	**Page 341**
	Component description for retarder control unit (RCM)	A11 i Only on vehicles with code (B3H) Secondary water retarder.	**Page 342**
	Front radar sensor (RDF) control unit	A15	**Page 348**
	Component description for front axle axle modulator	A20, A20a	**Page 509**
	Component description for rear axle axle modulator	A21, A21a	**Page 511**
	Component description for Electronic Stability Program (ESP) control unit	A25, A25a	**Page 357**
	Component description for modular switch panel control unit (MSF)	A43	**Page 370**
	Component description for driver assistance system (VRDU) control unit	A53	**Page 378**
	Component description for travel and speed sensor	B18	**Page 408**
	Component description for accelerator pedal sensor	B44	**Page 420**
	Component description for tachograph (TCO)	P1	**Page 459**
	Component description for multifunction steering wheel	S110, S111	**Page 469**

GF42.32-W-0002H	Active Brake Assist, function	2.8.11

MODEL 963, 964



W42.32-1016-79

1	*ASIC data bus (Application System Integrated Circuit)*
A1	*Instrument cluster (ICUC) control unit*
A1 p1	*Multifunction display*
A2	*Central gateway (CGW) control unit*
A3	*Drive control (CPC) control unit*
A4	*Engine management (MCM) control unit*
A7	*Cab sensor and actuator module (SCA) control unit*
A8	*Chassis sensor and actuator module (SCH) control unit*
A10b	*Electronic Brake Control (EBS) control unit (Wabco)*
A10c	*Electronic Brake Control (EBS) control unit (Knorr)*
A15	*Front radar sensor (RDF) control unit*
A20	*Front axle modulator (Wabco)*
A20a	*Front axle modulator (Knorr)*
A21	*Rear axle modulator (Wabco)*
A21a	*Rear axle modulator (Knorr)*
A25	*Electronic Stability Program (ESP®) control unit (Wabco)*
A25a	*Electronic Stability Program (ESP®) control unit (Knorr)*
A43	*Modular switch panel (MSF) control unit*
A53	*Driver assistance system (VRDU) control unit*
B44	*Accelerator pedal sensor*
B50	*Center speaker*
CAN 1	*Exterior CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
CAN 4	*Drive train CAN*
CAN 6a	*Front axle brakes CAN*
CAN 6b	*Rear axle brakes CAN*
CAN 6c	*Redundant brakes CAN*
CAN 6d	*ESP® brakes CAN*
CAN 12	*Radar CAN*
S926	*Active Brake Assist (ABA) button*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*
Z4	*Drive CAN bus star point*

General information

Active Brake Assist 2 is a further development of the previous Active Brake Assist system. A major innovation of Active Brake Assist 2 is that it now reacts to stationary objects such as the end of a traffic jam or a recovery vehicle. This was made possible by - among other things - the use of a new front radar sensor (RDF) control unit (A15).

Active Brake Assist 2 permanently assesses the traffic situation in front of the vehicle. The vehicle distances and difference in speed to the vehicles in front or to stationary vehicles in the same traffic lane are recorded and evaluated with regard to an imminent rear-end collision. Evaluation becomes more critical the less time the driver has to react to the situation.

ℹ Active Brake Assist 2 does not provide protection against inattentiveness or driving mistakes. It is intended solely as an aid to support the driver.

A vehicle in front or a stationary obstacle is included in the evaluation if:

- it is detected for min. 1 s
- the relative speed is $<$0 Km/h (distance decreasing)
- the distance is $>$ 0.25 m

To ensure correct evaluation, the front radar sensor (RDF) control unit (A15) must be correctly adjusted, otherwise it may not be possible to correctly recognize the traffic situation in front of the vehicle.

Active Brake Assist 2 is designed in such a way that in a critical situation the driver is initially warned in several warning stages. These are issued dynamically to match the time remaining with regard to an imminent rear-end collision.

This gives the driver the option of defusing a given critical situation himself by braking or swerving. To do this, Active Brake Assist 2 evaluates all relevant driver activities which the driver can initiate to suit the situation. This ensures that the driver can keep control of his vehicle at all times.

If Active Brake Assist 2 does not detect any appropriate driver activities:

- vehicles in front: emergency braking (full braking) is performed with the aid of the Electronic Brake Control (EBS) until the vehicle comes to a standstill
- stationary obstacles: partial braking (but not emergency braking (full braking)) is performed with the aid of the Electronic Brake Control (EBS)

ℹ To ensure that even under the most unfavorable conditions (traffic signs, traffic beacons in building sites, advertising signs, bridges etc.) there is no unwanted emergency braking (full braking), this is not the case for stationary objects.

Function

Activation

After the ignition is switched on, the driver assistance system (FAS) control unit (A53) starts the initialization and self-test phase.

If Active Brake Assist 2 is active, the light-emitting diode in the Active Brake Assist (ABA) button (S926) is not lit. The status of Active Brake Assist 2 is indicated in the multifunction display (A1 p1) of the instrument cluster (ICUC) control unit (A1).

The driver can use the Active Brake Assist (ABA) button (S926) at any time to deactivate or activate Active Brake Assist 2 (even during intervention by the brake system). However, the visual warning in the multifunction display (A1 p1) remains active even with the system switched off.

The following conditions must be met for Active Brake Assist 2 to function:

- One's own vehicle speed $\geq$ 10 km/h
- Anti-lock braking system (ABS) is switched on
- Electronic Brake Control (EBS) is functioning correctly (no faults detected)
- There are no system faults in Active Brake Assist 2
- Chassis frame is within the driving level (on vehicles with air suspension)

ℹ If on the basis of the information from the chassis sensor and actuator module (SCH) control unit (A8) the front radar sensor (RDF) control unit (A15) detects that the vehicle is not at driving level and, as a result, the transmit/receive cones of the front radar sensor (RDF) control unit (A15) are not correctly aligned, Active Brake Assist 2 is deactivated.

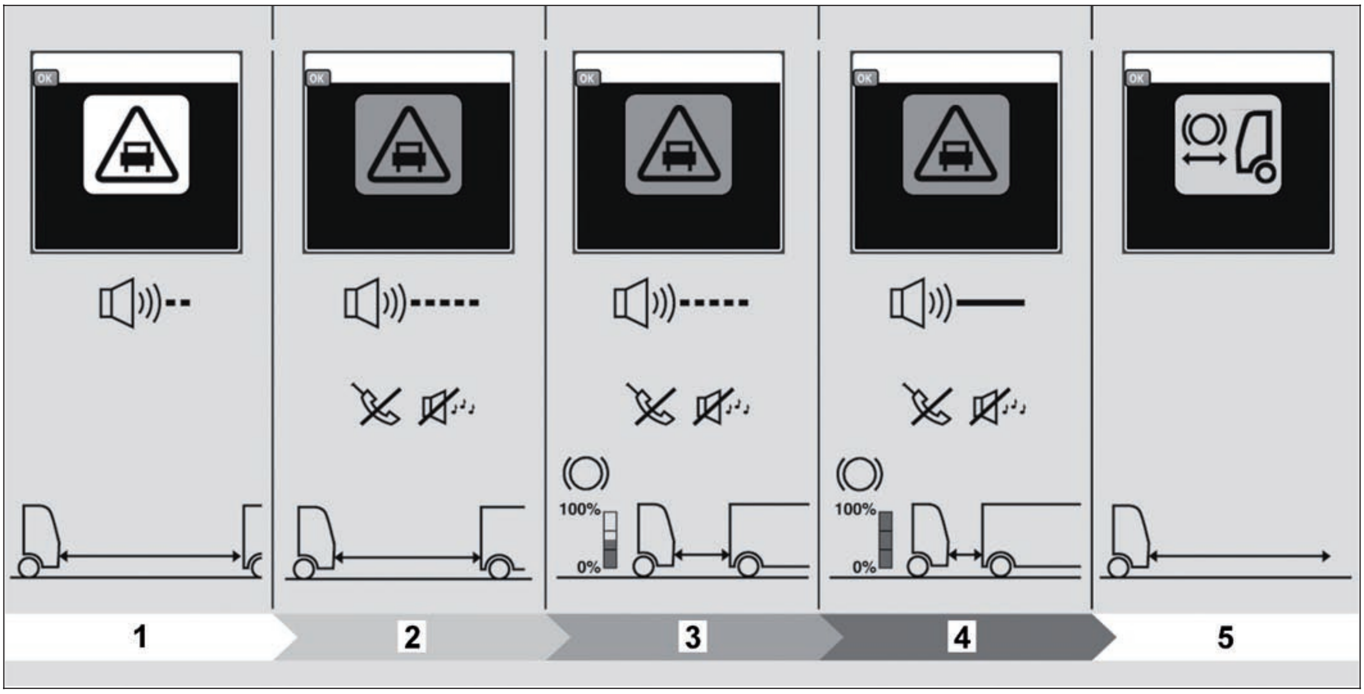
Warning stages

If there is a risk of a rear-end collision with the vehicle in front, the driver is initially warned of this in two warning stages before Active Brake Assist 2 automatically initiates emergency braking. The two warning stages are always run through first before an emergency stop. A distance warning from the Proximity Control Assist may already have been issued, provided that the Proximity Control Assist is installed and has been activated.

i The duration of the respective warning stage depends on the time reserve which the driver has available in the event of a threatening rear-end collision, it is however min. 1 s for each warning stage.

The distance warnings from the Proximity Control Assist and from Active Brake Assist 2 can be distinguished as follows:

- A Proximity Control Assist distance warning can be recognized by a single dual tone. The vehicle is first braked as per the control logic of the Proximity Control Assist, then a warning is given or in the event of sudden critical situations a warning is given and the vehicle is braked simultaneously. Or braking occurs without warning (up to 30% of max. deceleration).
- An Active Brake Assist 2 distance warning can be recognized by an intermittent warning tone or a continuous warning tone. In accordance with the control logic of Active Brake Assist 2, a warning is issued first (min. 1 s) and then braking occurs.



W54.32-1028-09

Display in multifunction display (A1 p1)

1 *Prewarning stage (Proximity Control Assist)*
2 *Active Brake Assist 2 - warning stage 1*
3 *Active Brake Assist 2 - warning stage 2 (partial braking)*
4 *Active Brake Assist 2 - emergency braking (full braking)*
5 *Active Brake Assist 2 - emergency braking completed*

Prewarning stage (Proximity Control Assist) (1)
The Proximity Control Assist only issues a warning for vehicles that it has detected as a moving vehicle at least once. It does not issue a warning for stationary objects.
The warning symbol appears in the yellow event window in the multifunction display (A1 p1) and a dual warning tone is output at the center speaker (B50).

Active Brake Assist 2 - warning stage 1 (2)
In the event of a critical situation, the warning symbol appears in the red event window in the multifunction display (A1 p1) and an intermittent warning tone is output at the center speaker (B50).
At the same time, the radio and hands-free system are muted so that the driver can fully concentrate on the traffic.

Active Brake Assist 2 - warning stage 2 (3)
In the event of an extremely critical situation, the warning symbol appears in the red event window in the multifunction display (A1 p1) and an intermittent warning tone is output at the center speaker (B50) and the radio and hands-free system remain muted.

Active Brake Assist 2 brakes the vehicle with up to 50% of the maximum braking power of the vehicle (partial braking). The brake light is additionally actuated.

During Active Brake Assist 2 warning stages 1 or 2, intervention by the brake system can be suppressed if Active Brake Assist 2 detects one of the following driver activities:

- Actuation of the brake pedal - the driver has recognized the situation and has reacted accordingly.
- Actuation of the turn signal - actuation of the turn signal (max. 20 s) indicates a lane change; the driver has caused the situation intentionally and has reacted accordingly.
- Heavy acceleration or kickdown - heavy acceleration or kickdown indicates the driver’s wish to accelerate quickly; in this case, it is assumed that the driver is aware of and has caused the situation intentionally (e.g. by overtaking).
- Target loss - performing an obstacle avoidance maneuver with target loss indicates that the driver has recognized the situation and has reacted accordingly.
- Deactivation of Active Brake Assist 2 by pressing the Active Brake Assist (ABA) button (S926).

i The displays in the multifunction display (A1 p1) remain active.

Active Brake Assist 2 - emergency braking (full braking) (4)
If no driver activity is detected and there continues to be a threat of collision, Active Brake Assist 2 initiates emergency braking (full braking) until the vehicle comes to a standstill.

i Emergency braking is only performed in the case of a vehicle in front and not for a stationary obstacle.

The messages required for emergency braking are sent from the driver assistance system (VRDU) control unit (A53) to the Electronic Brake Control (EBS) control unit (A10b, A10c) via the frame CAN (CAN 3).
During the triggered emergency braking operation, the warning symbol continues to be displayed in the red event window in the multifunction display (A1 p1) and a continuous warning tone is output at the center speaker (B50).

An initiated emergency stop can only be terminated by one of the following driver activities:

- Kickdown
- Deactivation of Active Brake Assist 2 using the Active Brake Assist (ABA) button (S926)

Once initiated, emergency braking cannot be canceled by any other activities. This prevents unintended cancellation of the emergency braking operation by inadvertent activation of, for example, the turn signal.

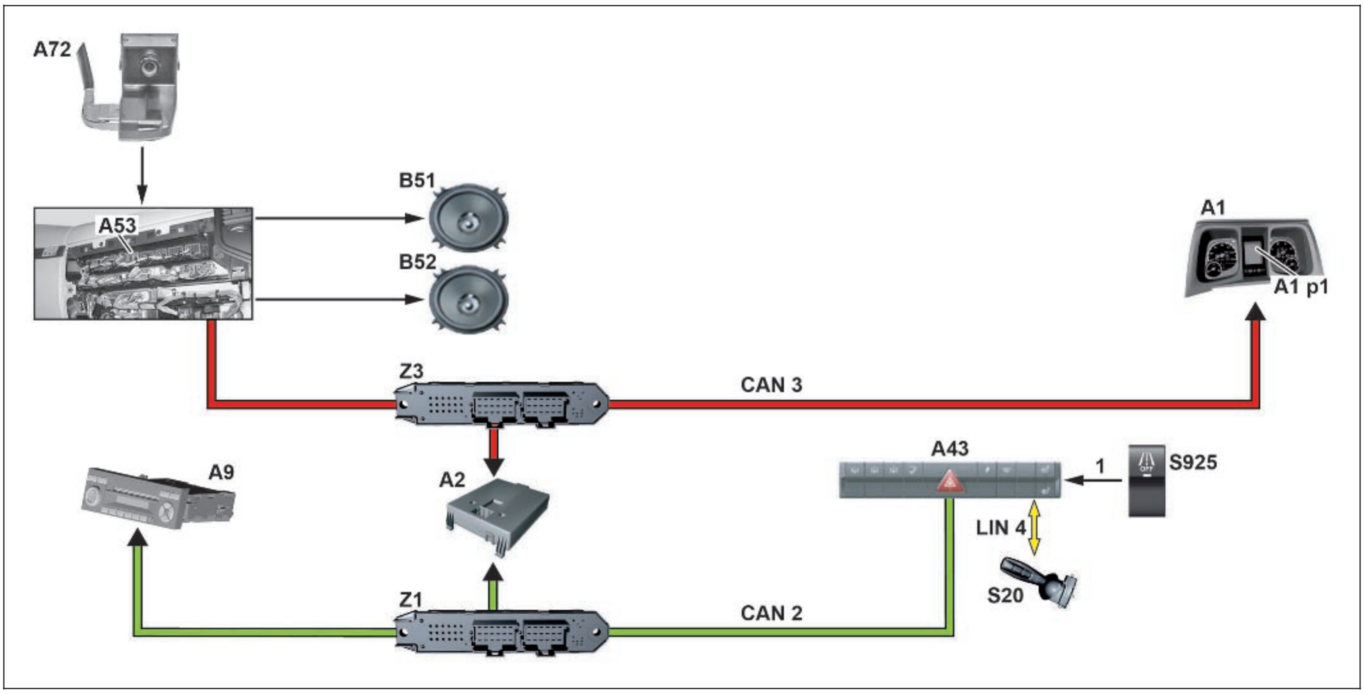
i Following an emergency braking operation, the vehicle continues to be braked by Active Brake Assist 2 for max. 5 s after the vehicle has come to a standstill. The "emergency braking completed" symbol is displayed in the multifunction display (A1 p1).

	Instrument cluster (ICUC) control unit, component description	A1	**Page 331**
	Central gateway (CGW) control unit, component description	A2	**Page 333**
	Drive control (CPC) control unit, component description	A3	**Page 334**
	Engine management (MCM) control unit, component description	A4	**Page 335**

	Cab sensor and actuator module (SCA) control unit, component description	A7	**Page 339**
	Chassis sensor and actuator module (SCH) control unit, component description	A8	**Page 340**
	Electronic Brake Control (EBS) control unit, component description	A10b, A10c	**Page 341**
	Front radar sensor (RDF) control unit, component description	A15	**Page 348**
	Front axle axle modulator, component description	A20, A20a	**Page 509**
	Rear axle axle modulator, component description	A21, A21a	**Page 511**
	Electronic Stability Program (ESP) control unit, component description	A25, A25a	**Page 357**
	Modular switch panel (MSF) control unit, component description	A43	**Page 370**
	Driver assistance system (VRDU) control unit, component description	A53	**Page 378**
	Accelerator pedal sensor, component description	B44	**Page 420**

GF54.71-W-0005H	Lane Keeping Assist function	2.8.11

MODEL 963, 964



W54.71-1075-79

1	*ASIC data bus (Application System Integrated Circuit)*
A1	*Instrument cluster (ICUC) control unit*
A1 p1	*Multifunction display*
A2	*Central gateway control unit (CGW)*
A9	*Truck Control Center (TCC)*
A43	*Modular switch panel (MSF) control unit*
A53	*Driver assistance system (VRDU) control unit*
A72	*Lane Assistant camera*
B51	*Driver speaker*
B52	*Front passenger speaker*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
LIN 4	*Left multifunction control lever LIN*
S20	*Left multifunction control lever*
S925	*Lane Assistant OFF button*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*

General information

The Lane Keeping Assist is a visual system, which warns the driver acoustically in the event of an undesired deviation from the lane by means of speakers and visually via the indication in the multifunction display (A1 p1).
The Lane Assistant camera (A72) records the traffic lane 6 m to 35 m in front of the vehicle. The driver assistance system (VRDU) control unit (A53) evaluates the image of the Lane Assistant camera (A72) using bright road markings and investigates whether these correspond to the specified pattern of a symmetrical lane boundary.

After the driver assistance system (VRDU) control unit (A53) has detected a symmetrical lane boundary, it monitors it constantly for symmetry and triggers an acoustic and visual warning as soon as there is a deviation from the lane. A deviation from the lane is present as soon as a wheel of the front axle drives over the edge of the recognized lane marking.

Requirements
- Lane boundary marking recognized
- Vehicle speed greater than 60 km/h
- Lane Assistant camera (A72) parameterized correctly

ℹ The Lane Keeping Assist is unavailable, as long as an invalid camera height is parameterized in the driver assistance system (VRDU) control unit (A53). A fault entry is stored in the driver assistance system (VRDU) control unit (A53).

Output of a warning
The point in time for initiating an acoustic warning signal depends on the closing speed to the road marking and the width of the lane. In a narrow lane the warning signal is initiated later than in the case of a wide one, as unintentional, harmless lateral deviations occur more frequently in narrow lanes.

The acoustic warning signal, a familiar noise emitted from rumble strips on construction sites, is output corresponding to the deviation via the driver speaker (B51) or front passenger speaker (B52).
For this purpose, the speakers are equipped with a second coil. The volume of the radio is reduced for better perception of the warning signal during the warning process. The visual warning output is indicated in the multifunction display (A1 p1).

Minimum warning time and warning break
The minimum warning time is 1.5 s and lasts approx. 4 s.
A new warning can only be output after a warning break of 3 s. If there is another deviation from the lane during the warning break, the warning output is suspended for the duration of this deviation from the lane.

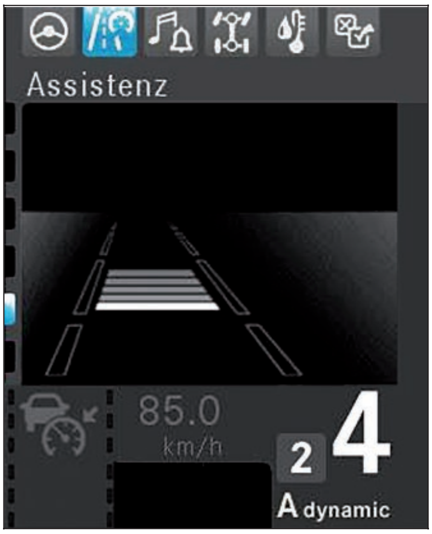
Warning suppression
In certain situations, it is not desirable that the Lane Keeping Assist issues a warning. There are prerequisites here for completely suppressing the warning output (acoustically and visually). Under certain prerequisites, a continued visual warning output is permitted. The warning can be suppressed both before and during a warning output.

The activated system suppresses/interrupts the acoustic and visual warning output in the following cases:
- vehicle speeds below 60 km/h
- driving over the lane marking with more than half of the vehicle's width
- correcting steering intervention by the driver (steering back into the lane while a warning is output)
- missing or poorly visible road markings
- contradictory markings on the road (traffic zone)
- width of lane below 3 m
- radius of curve less than 125 m
- a set turn signal indicator
- switching the Lane Assistant button off (S925)

The activated system suppresses the acoustic warning output (visual warning output continues to be output) in the following cases:
- Kickdown
- brake application with brake pedal position of more than 30%
- control intervention function of the Electronic Stability Program (ESP®)
- distance warning by the Active Brake Assist 2 or the Proximity Control Assist

Activation/deactivation of the Lane Keeping Assist
The function of the Lane Keeping Assist is activated when the ignition is switched on and can be deactivated via the Lane Assistant off (S925) button. When the Lane Keeping Assist is deactivated, the indicator lamp in the Lane Assistant off (S925) button is on.
The road markings in the multifunction display (A1 p1) are shown in gray.

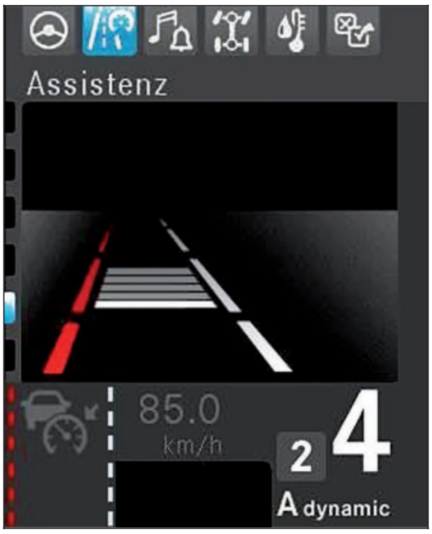
Lane Keeping Assist indication deactivated



W54.71-1082-72

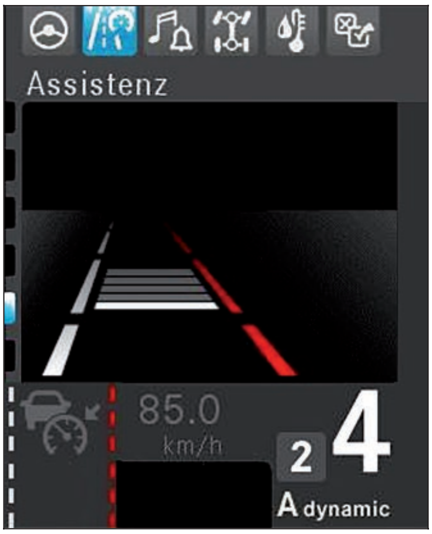
Warning output of the Lane Keeping Assist
The warning is output in the multifunction display (A1 p1). The deviation from the lane is indicated by a red road marking.

Indication of deviation from the lane on the left, when the lane marking is interrupted



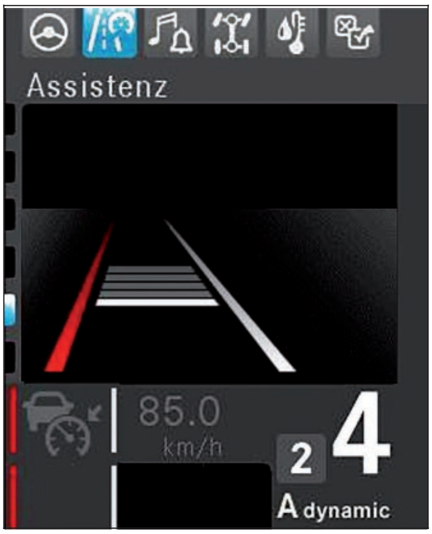
W54.71-1083-72

Indication of deviation from the lane on the right, when the lane marking is interrupted



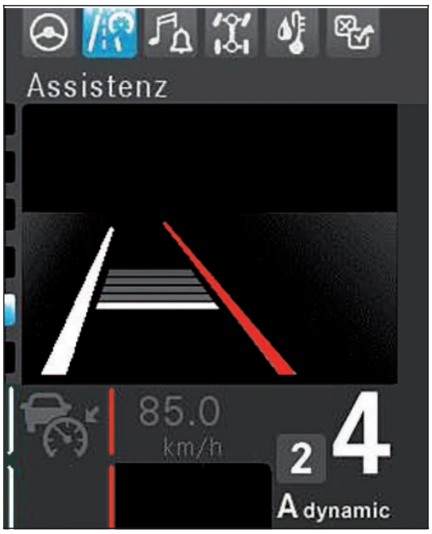
W54.71-1084-72

Indication of deviation from the lane on the left, when the lane marking is continuous



W54.71-1085-72

Indication of deviation from the lane on the right, when the lane marking is continuous



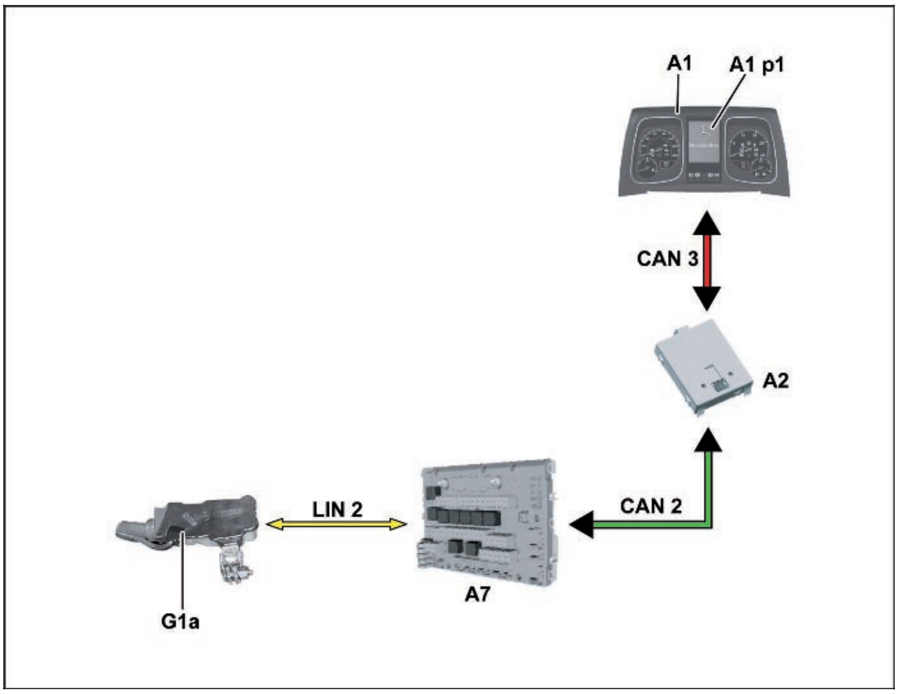
W54.71-1086-72

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Driver assistance system (VRDU) control unit, component description	A53	**Page 378**
	Lane Assistant camera (SPA), component description	A72	**Page 395**

GF54.10-W-0007H	Battery sensor function	6.7.11

MODEL 963, 964

A1 Instrument cluster (ICUC) control unit
A1 p1 Multifunction display
A2 Central gateway control unit (CGW)
A7 Cab signal acquisition and actuation module control unit (SCA)
CAN 2 Interior CAN
CAN 3 Frame CAN
G1a Battery sensor (IBS)
LIN 2 Battery sensor LIN



W54.10-1141-76

Requirements

- Ignition: "Terminal 15 ON".
- The battery capacity is correctly parameterized in the instrument cluster control unit (ICUC) (A1) and in the sensor and actuator module, cab (SCA) control unit (A7).
- Battery sensor (IBS) (G1a) has not been reconnected.

i In the multifunction display (A1 p1) a correct battery charge level (G1) value is only shown after approx. starting procedures.

Function

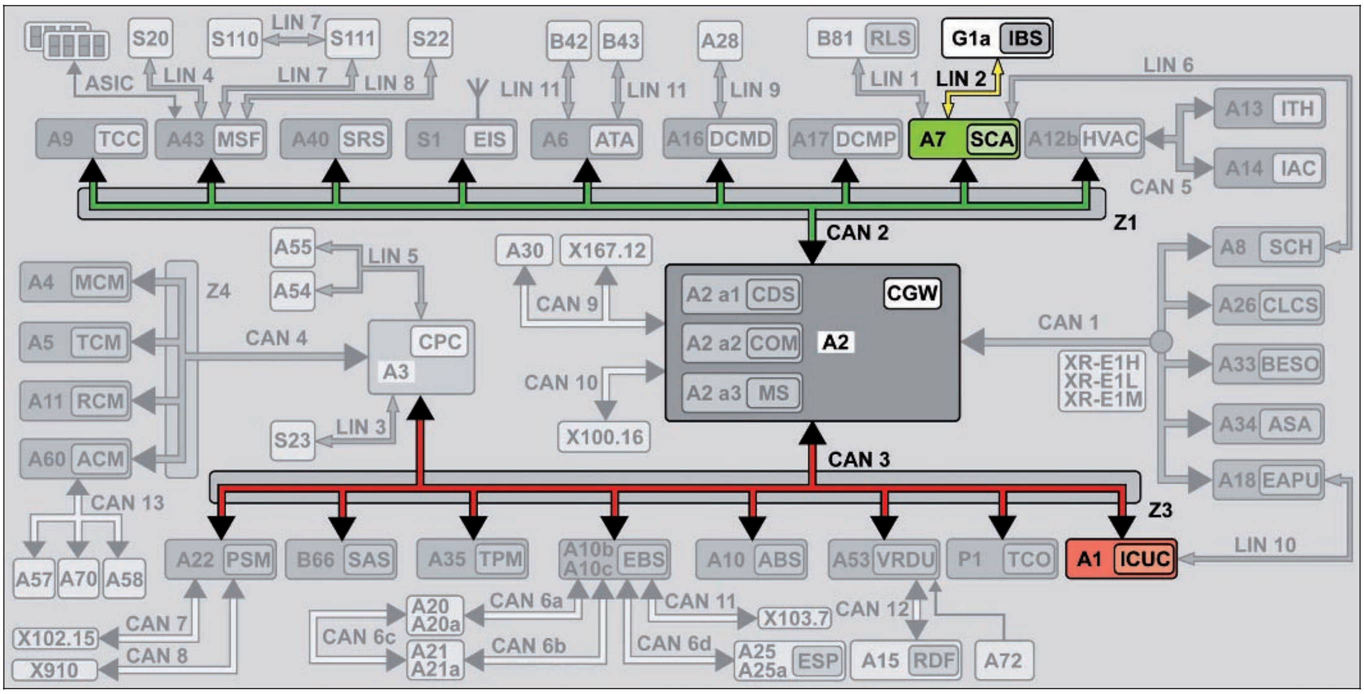
The battery sensor (IBS) (G1a) detects the voltage, the temperature of the batteries (G1) and, with the aid of a precision resistor, the current via the measuring lines at the battery clamps.

These signals are used by the microcontroller in the battery sensor (IBS) (G1a) to calculate the charge level of the batteries (G1). The result of the calculation is sent over the battery sensor LIN (LIN 2) to the sensor and actuator module, cab (SCA) control unit (A7).

In the sensor and actuator module, cab (SCA) control unit (A7) the data are processed and sent over the interior CAN (CAN 2) to the central gateway control unit (CGW) (A2) and forwarded from there over the frame-CAN (CAN 3) to the instrument cluster control unit (ICUC) (A1), so that the data can then be shown on the multifunction display (A1 p1).

	Instrument cluster (ICUC) control unit, component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Sensor and actuator module, cab (SCA) control unit, component description	A7	**Page 339**
	Component description for battery sensor	G1a	**Page 447**

GF54.10-W-0007-01H	Overall network battery sensor		

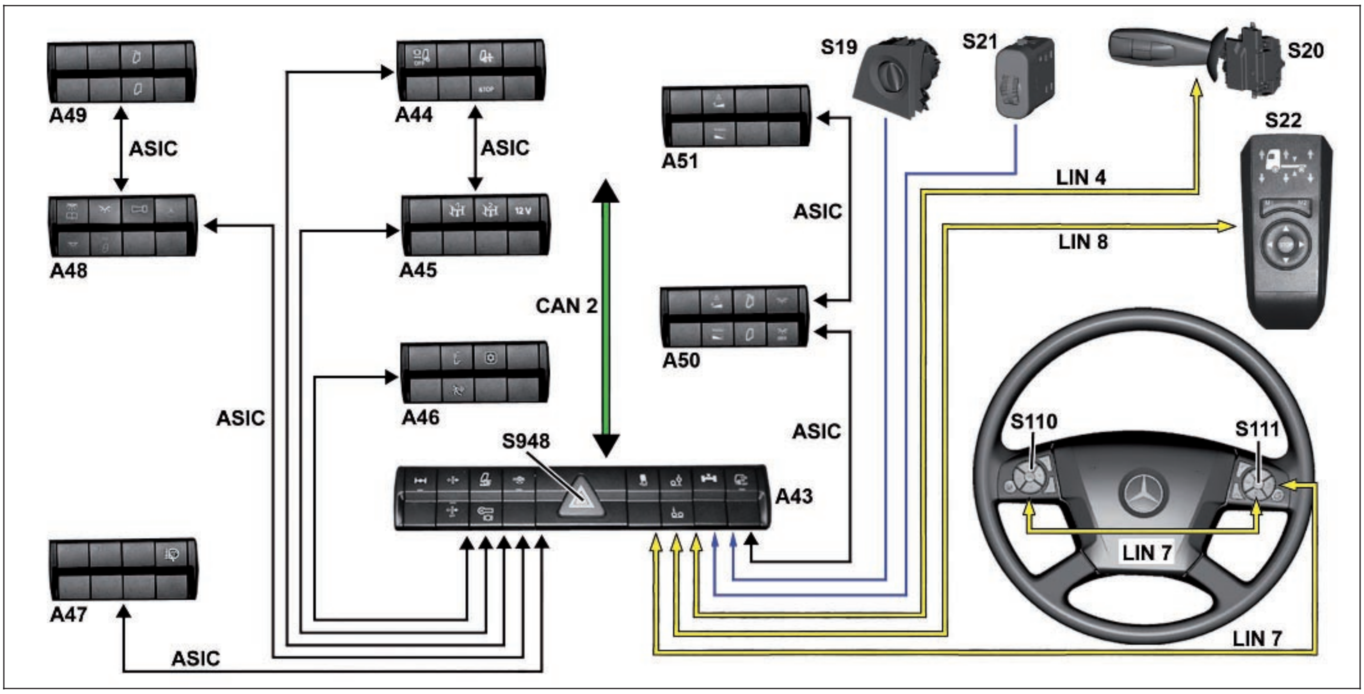


W54.10-1140-79

A1	*Instrument cluster (ICUC) control unit*	*CAN 2*	*Interior CAN*	*Z1*	*Cab instrument panel CAN bus star point*
A2	*Central gateway control unit (CGW)*	*CAN 3*	*Frame CAN*	*Z3*	*Frame CAN bus star point*
A7	*Cab signal acquisition and actuation module control unit (SCA)*	*G1a*	*Battery sensor (IBS)*		
		LIN 2	*Battery sensor LIN*		

GF54.25-W-0002H	Modular switch panel function	6.7.11

MODEL 963, 964



W54.25-1156-79

A43	*Modular switch panel (MSF) control unit*	*A51*	*Upper driver bunk switch module*	*S110*	*Left multifunction steering wheel button group*
A44	*Instrument panel switch module 1*	*CAN 2*	*Interior CAN*	*S111*	*Right multifunction steering wheel button group*
A45	*Instrument panel switch module 2*	*LIN 4*	*Left multifunction control lever-LIN*	*S948*	*Hazard warning system switch*
A46	*Instrument panel switch module 3*	*LIN 7*	*Button group LIN*	*ASIC*	*ASIC data bus (Application System Integrated Circuit)*
A47	*Switch module special equipment*	*LIN 8*	*Level control LIN*		
A48	*Roof switch module 1*	*S19*	*Exterior lights switch*		
A49	*Roof switch module 2*	*S20*	*Left multifunction control lever*		
A50	*Lower driver bunk switch module*	*S21*	*Headlamp range adjustment switch*		
		S22	*Level control operating unit*		

General information

The modular switch panel (MSF) is an advanced development of the familiar MFS in the ACTROS MP III.
The modular switch panel (MSF) control unit (A43) remains the master module to which the switch module and the other switches are connected. The connection to the interior CAN (CAN 2) connects it to all the other electronic systems.

The following two different type of data bus are used:

- ASIC data bus (ASIC)
- LIN data bus (LIN), split up into:
  - Left multifunction control lever-LIN (LIN 4)
  - Button group-LIN (LIN 7)
  - Level control-LIN (LIN 8)

Connected to the ASIC data bus (ASIC) are the switch modules with the signal and load switches.
Connected to the left multifunction control lever-LIN (LIN 4) is the left multifunction control lever (S20).
The button group-LIN (LIN 7) is equipped with the left and right multifunction steering wheel button groups (S110, S111).
Connected to the level control-LIN (LIN 8) is the level control operating unit (S22).

Conventional electrical lines are used to connect the following switches to the modular switch panel (MSF) control unit (A43):

- of the exterior lights switch (S19)
- of the headlamp range adjustment switch (S21)
- of the hazard warning system switch (S948)

Function

The modular switch panel (MSF) control unit (A43) is responsible for the master function when recording and transmitting the various control functions.
The other components are responsible for the slave function. They are used solely for recording the control functions when operated by the driver or they respond to corresponding request issued by the modular
switch panel (MSF) control unit (A43). The modular switch panel (MSF) control unit (A43) is also responsible for the voltage supply, monitoring and, where applicable,, the background illumination of the connected system components.

The control functions are recorded when the following switches are operated:

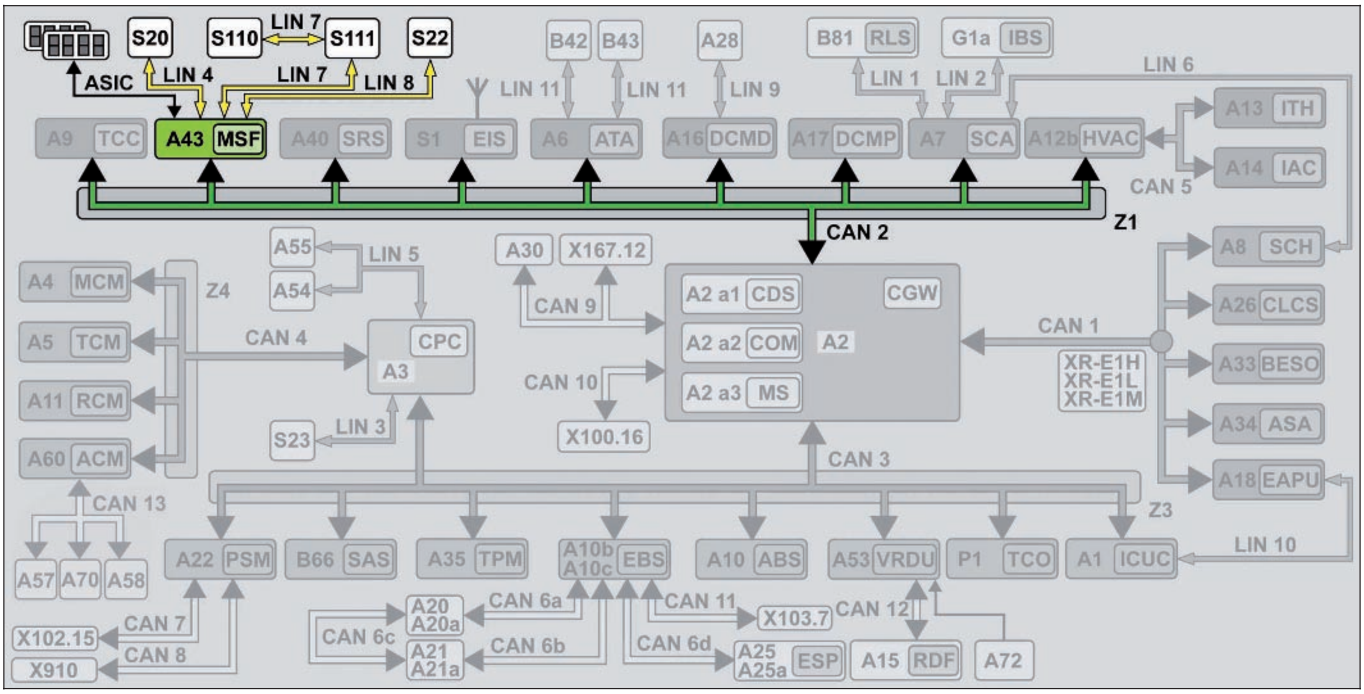
- Signal switches in the switch modules
- Load switches in the switch modules
- Left multifunction steering wheel button group (S110)
- Right multifunction steering wheel button group (S111)
- Level control operating unit (S22)
- Left multifunction control lever (S20)
- Exterior lights switch (S19)
- Headlamp range adjustment switch (S21)
- Hazard warning system switch (S948)

Electrical data exchange varies to match the connection of the operating components to the modular switch panel control unit (A43):

- Signal switches generate a message and send it to the ASIC data bus (ASIC).
- Load switches do not generate a message, they only switch the voltage supply through to the relevant consumers.
- The left and right multifunction steering wheel button groups (S110, S111), the level control operating unit (S22) and the left multifunction control lever (S20) generate a message and send it to the respective LIN data bus.
- The remaining switches switch electrical shift signals.
- The modular switch panel (MSF) control unit (A43) uses the information read in to generate corresponding CAN messages that are then sent to the interior CAN (CAN 2). Therefore, within the overall network the control units of the other electronic systems have access to the data.

	Overall network modular switch panel		**Page 162**
	Modular switch panel (MSF) control unit component description	A43	**Page 370**
	Instrument panel switch modules, component description	A44, A45, A46	**Page 372**
	Switch module special equipment, component description	A47	**Page 374**
	Roof switch modules, component description	A48, A49	**Page 375**
	Bunk switch modules, component description	A50, A51	**Page 376**
	Multifunction steering wheel, component description		**Page 469**

GF54.25-W-0001-01H	Overall network modular switch panel		



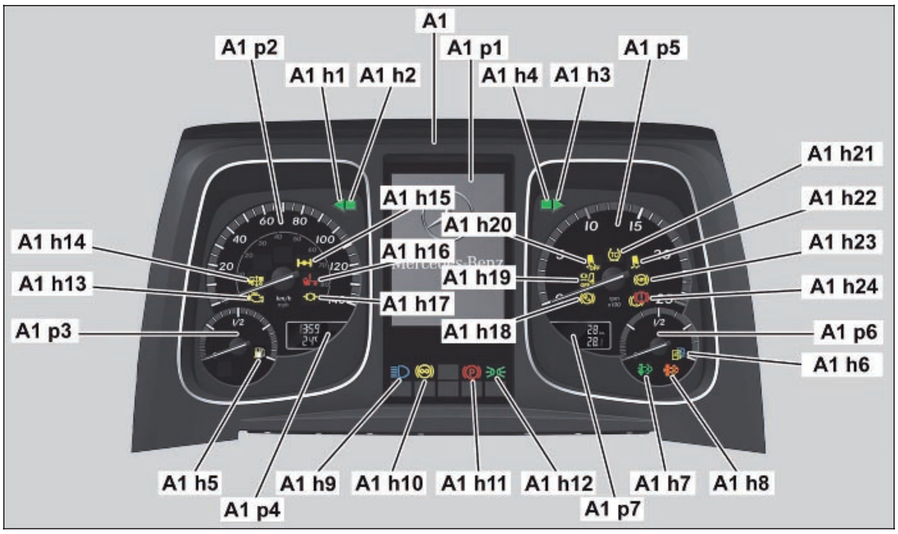
W54.25-1184-79

A43	*Modular switch panel (MSF) control unit*
CAN 2	*Interior CAN*
LIN 4	*Left multifunction control lever-LIN*
LIN 7	*Button group LIN*
LIN 8	*Level control LIN*
S20	*Left multifunction control lever*
S22	*Level control operating unit*
S110	*Left multifunction steering wheel button group*
S111	*Right multifunction steering wheel button group*
Z1	*Cab instrument panel CAN bus star point*
ASIC	*ASIC data bus (Application System Integrated Circuit)*

GF54.30-W-0008H	Instrument cluster, function	2.8.11

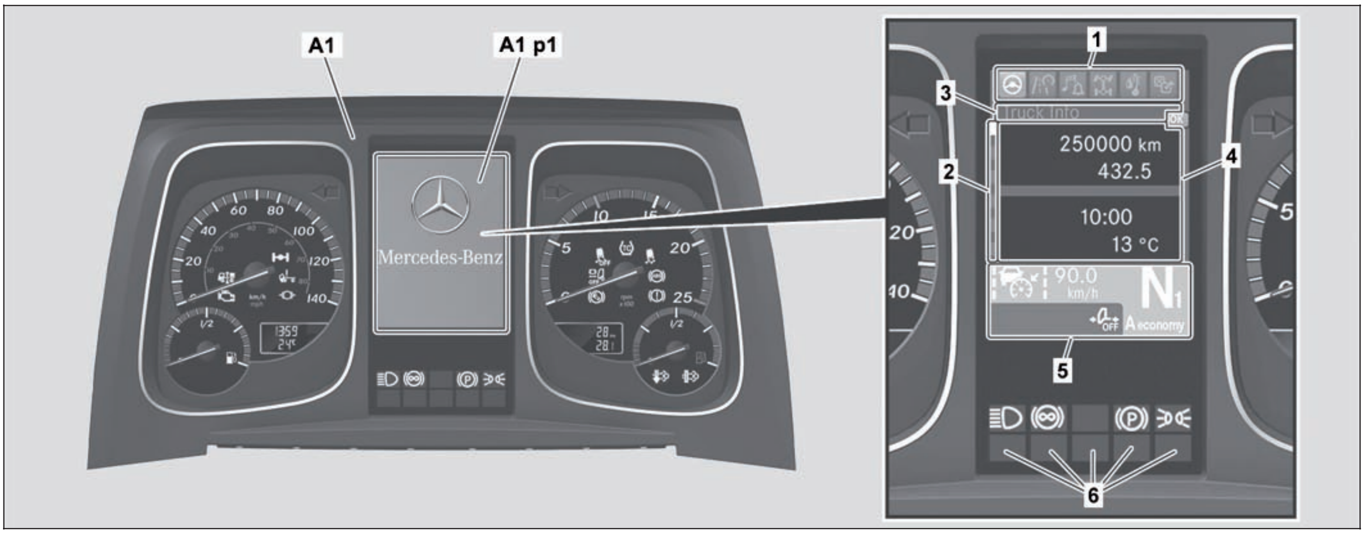
MODEL 963, 964

A1 Instrument cluster (ICUC) control unit
A1 h1 Turn signal light indicator lamp, left trailer
A1 h2 Turn signal light indicator lamp, left side of vehicle
A1 h3 Turn signal light indicator lamp, right trailer
A1 h4 Turn signal light indicator lamp, right side of vehicle
A1 h5 Fuel supply indicator lamp
A1 h6 AdBlue® level indicator lamp



W54.30-1354-75

A1 h7 Diesel particulate filter indicator lamp, automatic regeneration
A1 h8 Diesel particulate filter warning lamp, malfunction
A1 h9 High beam indicator lamp
A1 h10 Permanent brake indicator lamp
A1 h11 Parking brake indicator lamp
A1 h12 Standing lamps indicator lamp
A1 h13 MIL indicator lamp
A1 h14 Level control indicator lamp
A1 h15 Differential lock indicator lamp
A1 h16 Cab release warning lamp
A1 h17 Brake request indicator lamp
A1 h18 Hill holder indicator lamp
A1 h19 Active Brake Assist shutoff indicator lamp
A1 h20 ESP® shutoff indicator lamp
A1 h21 ASR indicator lamp
A1 h22 ESP® indicator lamp
A1 h23 ABS indicator lamp
A1 h24 Brake pressure level warning lamp
A1 p1 Multifunction display
A1 p2 Vehicle speed display
A1 p3 Fuel level indicator
A1 p4 Time and outside temperature indicator
A1 p5 Rpm display
A1 p6 AdBlue® level gauge
A1 p7 Trip and total distance display



W54.30-1355-08

1 Main menu menu bar
2 Submenu menu bar
3 Text bar
4 Menu and event window
5 Status area
6 Installation locations (for additional indicator lamps)
A1 Instrument cluster (ICUC) control unit
A1 p1 Multifunction display

Functions

General information

The instrument cluster (ICUC) (A1) notifies the driver of all dynamic and static driving conditions as well as about the current condition of the systems installed in the vehicle.

In the event of faulty vehicle functions or functions relevant to safety, corresponding warnings are issued via the IC.

The following displays are incorporated into the instrument cluster in order to be able to convey information to the driver:

- Permanent displays
  (e.g. vehicle speed, rotational speed, tank contents)
- Indicator lamps (blue, green, yellow)
  (e.g. high beams, turn signal light, permanent brake)
- Warning lamps (red)
  (e.g. brake pressure level, cab release)
- Multifunction display (A1 p1)
  ((e.g. event messages, status of driving assistance systems, gear indicator, additional indicator and warning lamps)

---

1 Multifunction display (A1 p1)

- The symbols of the possible main menus are displayed in the main menu menu bar (1). The symbol of the active main menu has a light background.
- The number of submenus is displayed in the submenu menu bar (2). The position of the active submenu has a light background.
- The active menu is displayed as text in the text bar (3).
- The active menu or events are displayed in the menu and event window (4).

  i Events are displayed automatically and e.g. contain information or messages on malfunctions. When an event is acknowledged with the "OK" button, a message or malfunction symbol continues to be displayed in the status area (5).

- In the status area (5), the gear indicator, information on active driving assistance systems and gray, yellow or red symbols are displayed as a supplement for the menu and event window (4).

Overview of available main menus

- Tour data
- Driving mode
- Audio and communication
- Operation and maintenance
- Control information
- Settings

i When the ignition is switched on, the "Truck info" submenu in the "Tour data" menu is displayed automatically.

---

2 Memory function

The instrument cluster (ICUC) control unit (A1) is equipped with a so-called "Mirror memory".
It contains a copy of the parameterization data of all control units present in the central gateway control unit (CGW) (A2) units, as well as the service life data of the maintenance system (MS) control unit (A2 a3).

i When the central gateway (CGW) control unit (A2) is exchanged, it becomes easier to restore the original parameterization state.

3 Monitoring function

The instrument cluster (ICUC) control unit (A1) monitors the central gateway (CGW) control unit (A2) and the electronic brake control (EBS) control unit (A10b/A10c) for failure. Monitoring takes place based on the CAN messages transmitted by the control units and the control unit IDs they contain. If no CAN message is received by one of the two control units over a specified period of time, then the instrument cluster (ICUC) control unit (A1) assumes that the corresponding control unit has failed. A fault message is then displayed in the multifunction display (A1 p1).

---

4 Automatic dimming of background illumination

The background illumination of the instrument cluster is dimmed by a photo diode integrated into the instrument cluster.
There are different dimming curves that depend on the light switch position and the light intensity sensed by the photo diode.

5 Video function

With code (J1C) Instrument cluster 12.7 cm with video function, the instrument cluster is equipped with a video signal input and the corresponding software application in order to process the signal of a camera (e.g. reversing camera) and to display it in the multifunction display (A1 p1).

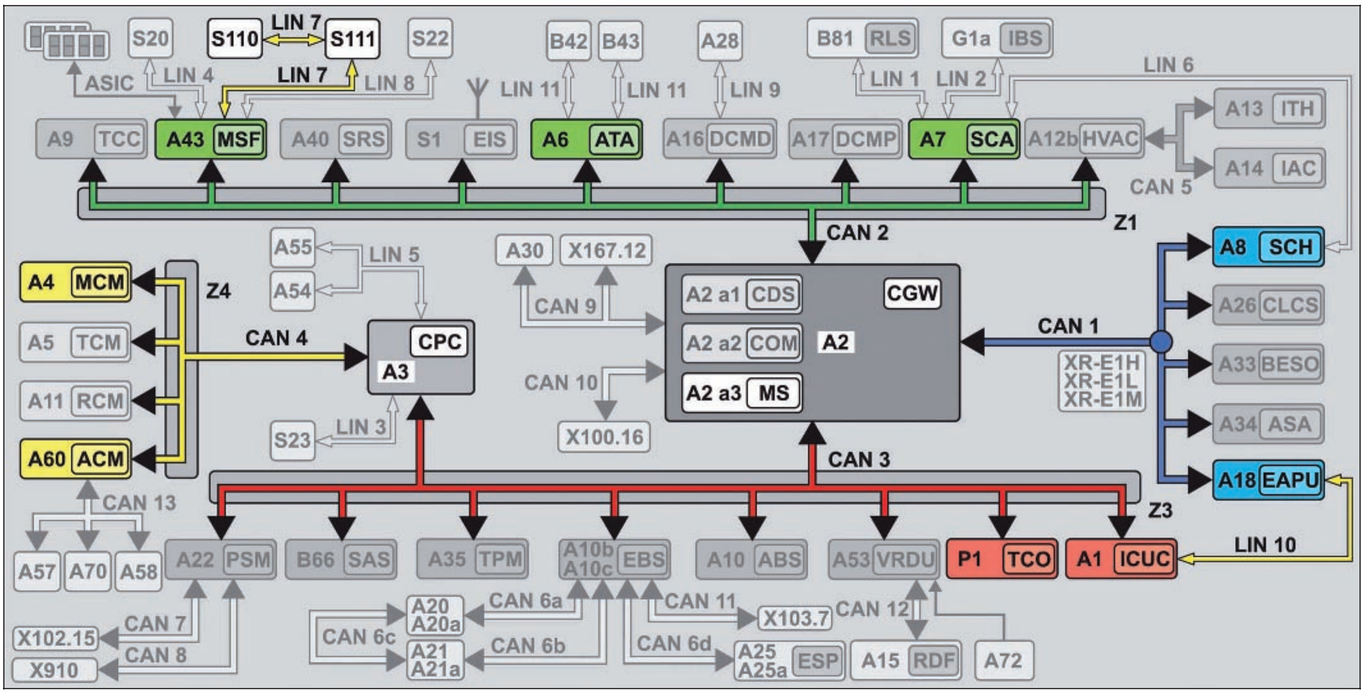
If code (J2D) Bluetooth radio navigation system, comfort is installed, the video function is carried out by the Truck Control Center (TCC) (A9). Code (J1C) Instrument cluster 12.7 cm with video function then only serves as a control code. In this case, code (J1E) Instrument cluster 12.7 cm with additional displays is installed.
With code (J9J) Preinstallation for reversing camera, the camera is connected to the instrument cluster (ICUC) control unit (A1) or to the Truck Control Center (TCC) (A9) via a coaxial video signal line, which leads to the cab/chassis connector. Further wiring and the camera are available through Mercedes-Benz Accessories.

---

6 Actuation of additional indicator lamps
Additional indicator lamps, e.g. for body manufacturers can be installed into the installation locations (6). Power is supplied to these indicator lamps via a special, continuously actuated output that can be loaded with 10 watts (connector A1X1.18/1) on the instrument cluster (ICUC) control unit (A1). To dim the indicator lamps, they are actuated by a pulse width modulated signal (PWM). In order to operate the indicator lamps, terminal 31 must be connected.

	Instrument cluster, overall network		**Page 166**
	Instrument cluster operating notes		**Page 167**
	Display fuel quantity, function		**Page 168**
	Display outside temperature, function		**Page 169**
	Display engine speed, function		**Page 170**
	Display speed and travel distance, function		**Page 171**
	Display AdBlue level, function		**Page 173**
	Redundancy operation of Electronic Air-Processing Unit (EAPU), function		**Page 174**

GF54.30-W-0008-01H	Instrument cluster, overall network		

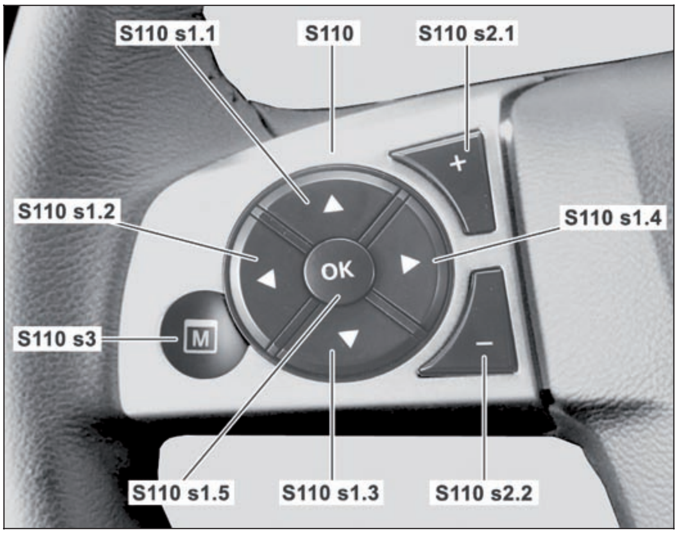


W54.30-1356-79

A1 *Instrument cluster (ICUC) control unit*
A2 *Central gateway control unit (CGW)*
A2 a3 *Maintenance system (MS) control unit*
A3 *Drive control (CPC) control unit*
A4 *Engine management control unit (MCM)*
A6 *Anti-theft alarm system (ATA) control unit*
A7 *Cab signal acquisition and actuation module control unit (SCA)*
A8 *Frame signal acquisition and actuation module control unit (SCH)*
A18 *Electronic Air Processing Unit (EAPU) control unit*
A43 *Modular switch panel (MSF) control unit*
A60 *Exhaust aftertreatment (ACM) control unit*
CAN 1 *Exterior-CAN*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
CAN 4 *Drive train CAN*
LIN 7 *Button group LIN*
LIN 10 *EAPU-LIN*
P1 *Tachograph (TCO)*
S110 *Left multifunction steering wheel button group*
S111 *Right multifunction steering wheel button group*
Z1 *Cab instrument panel CAN bus star point*
Z3 *Frame CAN bus star point*
Z4 *Drive CAN bus star point*

GF54.30-W-0008-02H	Instrument cluster operating notes		

S110	*Left multifunction steering wheel button group*
S110 s1.1	*"Up" button*
S110 s1.2	*"Left" button*
S110 s1.3	*"Down" button*
S110 s1.4	*"Right" button*
S110 s1.5	*Button "O. K."*
S110 s2.1	*"+" button*
S110 s2.2	*"-" button*
S110 s3	*"Memory" button*



W82.90-1001-11

The instrument cluster is operated solely using the left multifunction steering wheel button group (S110).
The different menus and submenus in the multifunction display (A1 p1) of the instrument cluster can be operated via the button groups.

- The "Left" (S110 s1.2) and "Right" (S110 s1.4) buttons can be used to scroll between the main menus.
- The "Up" (S110 s1.1) and "Down" (S110 s1.3) buttons can be used to scroll within a main menu and in the submenus.
- Button "O.K." (S110 s1.5) can be used to acknowledge and hide events displayed in the event window of the multifunction display (A1 p1).
- The "Memory" button (S110 s3) can be used to save a menu and/or submenu as a favorite.

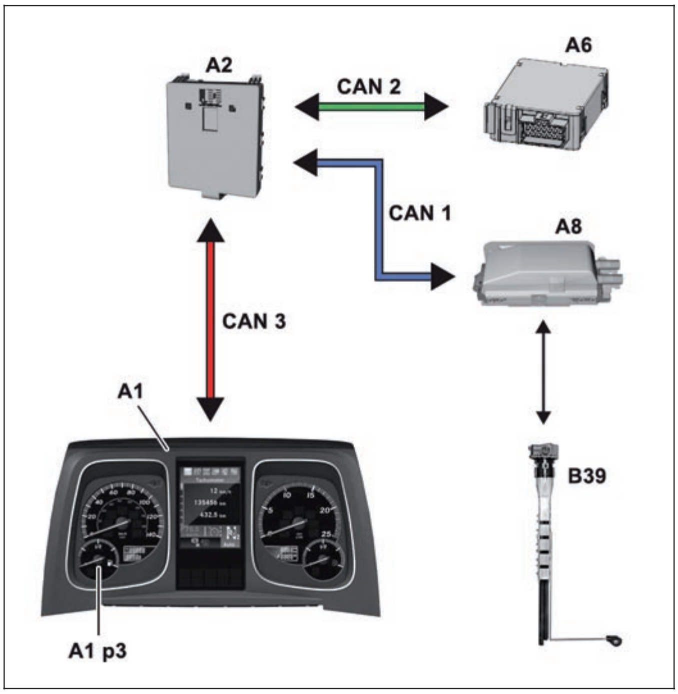
i To save a menu as a favorite, the "Memory" button (S110 s3) must be pressed for more than 3 s while the menu and/or submenu is displayed. When it is pressed again, the saved page is displayed again.

- It is also possible, if "OK" is additionally displayed in a submenu in the event window, to open and close additional input windows by pressing the button "O. K." (S110 s1.5).

GF54.30-W-3018H	Display fuel quantity, function	2.8.11

MODEL 963, 964

A1 Instrument cluster (ICUC) control unit
A1 p3 Fuel level indicator
A2 Central gateway control unit (CGW)
A6 Anti-theft alarm system (ATA) control unit
A8 Frame signal acquisition and actuation module control unit (SCH)
B39 Fuel level sensor
CAN 1 Exterior-CAN
CAN 2 Interior CAN
CAN 3 Frame CAN



W54.30-1362-82

The signal of the fuel level sensor (B39) is evaluated by the sensor and actuator module, chassis (SCH) (A8) and output as a CAN message on the exterior CAN (CAN 1). The central gateway (CGW) control unit (A2) takes over the messages and places it on the interior CAN (CAN 2), from where it is picked up by the anti-theft alarm system (ATA) control unit (A6) in order to monitor the fuel level.

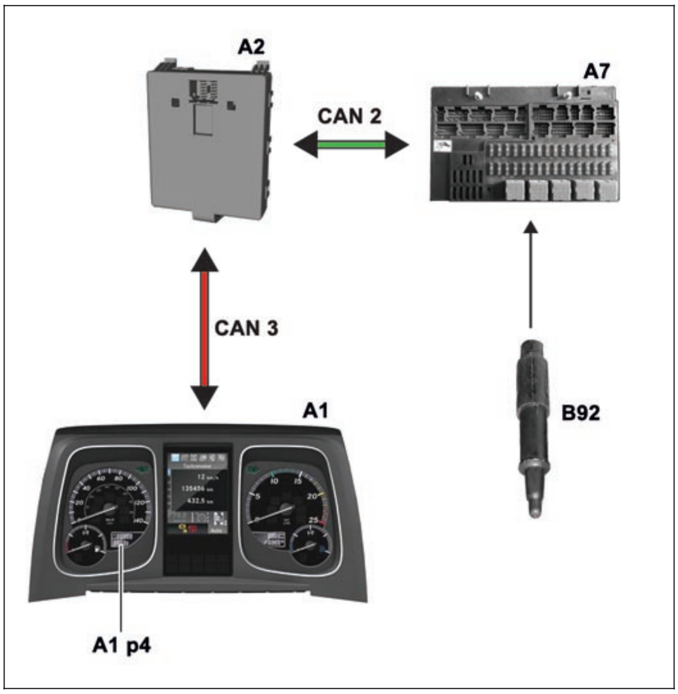
The central gateway (CGW) control unit (A2) also places the message on the frame CAN (CAN 3), from where it is picked up by the instrument cluster (ICUC) control unit (A1) in order to display the fuel level in the fuel level indicator (A1 p3).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Anti-theft alarm system control unit (ATA), component description	A6	**Page 338**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**

GF54.30-W-3019H	Display outside temperature, function	2.8.11

MODEL 963, 964

A1 Instrument cluster (ICUC) control unit
A1 p4 Time and outside temperature indicator
A2 Central gateway control unit (CGW)
A7 Cab signal acquisition and actuation module control unit (SCA)
B92 Outside temperature sensor
CAN 2 Interior CAN
CAN 3 Frame CAN



W54.30-1367-82

There is a temperature-dependent resistance with a negative temperature coefficient (NTC) in the outside temperature sensor (B92), i.e. an electrical resistance which decreases as the temperature increases. The sensor and actuator module, cab (SCA) control unit (A7) reads in the resistance of the outside temperature sensor (B92). The sensor and actuator module, cab (SCA) control unit (A7) translates the resistance signal of the outside temperature sensor (B92) into a CAN message.

It is transmitted via the interior CAN (CAN 2) to the instrument cluster (ICUC) control unit (A1). The instrument cluster (ICUC) control unit (A1) evaluates the CAN message and the outside temperature is displayed in the time and outside temperature indicator (A1 p4).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Outside temperature sensor, component description	B92	**Page 430**

GF54.30-W-3021H	Display engine speed, function	2.8.11

MODEL 963, 964

A1 Instrument cluster (ICUC) control unit
A1 p5 Rpm display
A3 Drive control (CPC) control unit
A4 Engine management control unit (MCM)
B600 Crankshaft position sensor
B601 Camshaft position sensor
CAN 3 Frame CAN
CAN 4 Drive train CAN

W54.30-1366-82

Function in normal operation
The crankshaft position sensor (B600) measures the rpm of the crankshaft inductively. It then provides a corresponding voltage signal, which is read in by the engine management (MCM) control unit (A4).
The engine management (MCM) control unit (A4) converts the voltage signal into a CAN message, which is transmitted via the drive train CAN (CAN 4) to the drive control (CPC) control unit (A3).
The drive control (CPC) control unit (A3) then places the CAN message on the frame CAN (CAN 3) for pick-up by the instrument cluster (ICUC) control unit (A1).
The instrument cluster (ICUC) control unit (A1) evaluates the CAN message and the rpm indicator (A1 p5) is actuated.

Function in event of faults
If the crankshaft position sensor (B600) fails, the engine management (MCM) control unit (A4) uses the signal of the camshaft position sensor (B601) as a replacement.

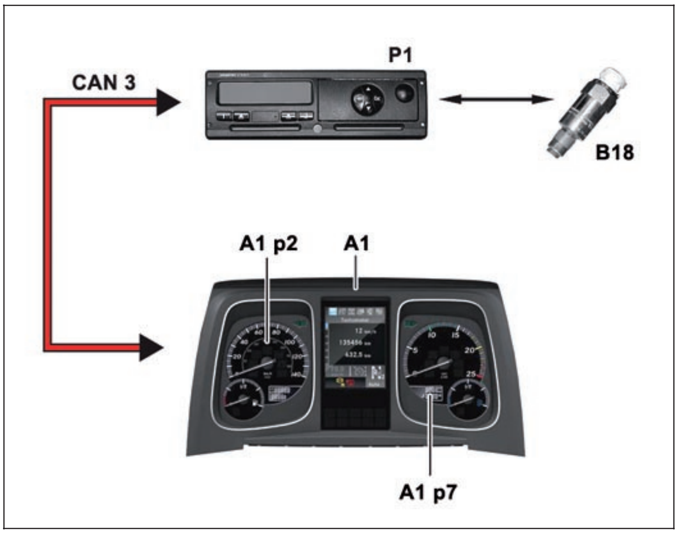
	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Component description drive control (CPC) control unit	A3	**Page 334**
	Component description for engine management (MCM) control unit	A4	**Page 335**
	Component description for crankshaft position sensor	B600	**Page 436**
	Component description for camshaft position sensor	B601	**Page 437**

GF54.30-W-3045H	Display speed and travel distance, function	2.8.11

MODEL 963, 964

Vehicle with digital tachograph

A1 Instrument cluster (ICUC) control unit
A1 p2 Vehicle speed display
A1 p7 Trip and total distance display
B18 Travel and speed sensor
P1 Tachograph (TCO)
CAN 3 Frame CAN



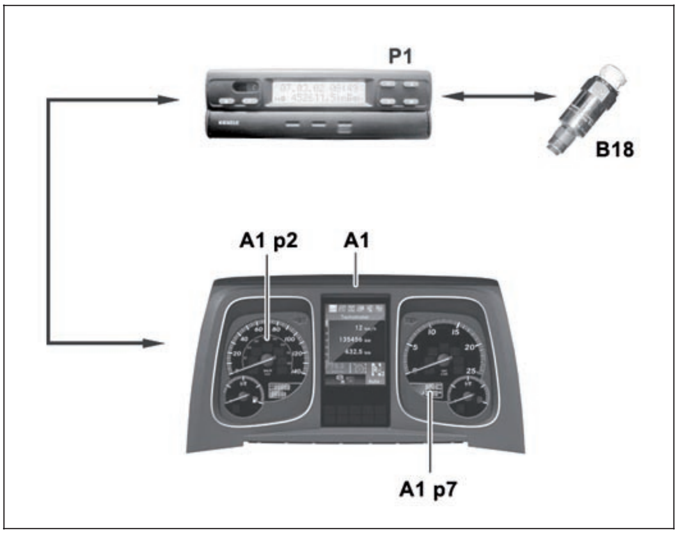
W54.30-1357-81

Function for digital tachograph
The travel and speed sensor (B18) measures the transmission output speed. It forwards this information in the form of a square wave signal to the digital tachograph (TCO) (P1). The digital tachograph (TCO) (P1) uses it to determine, based on the stored number of pulses, the current driving speed and the travel distance covered. It places the determined values as a message, which can only be received and processed by the instrument cluster (ICUC) control unit (A1), on the frame CAN (CAN 3).

The received values are displayed by the instrument cluster (ICUC) control unit (A1) on the speedometer
(A1 p2) and the trip distance and total distance display (A1 p7).
The instrument cluster (ICUC) control unit (A1) in turn places the values for speed and travel distance as a CAN message on the frame CAN (CAN 3) so that they can be picked up by other systems.

Vehicle with modular tachograph

A1 Instrument cluster (ICUC) control unit
A1 p2 Vehicle speed display
A1 p7 Trip and total distance display
B18 Travel and speed sensor
P1 Tachograph (TCO)



W54.30-1358-11

Function for modular tachograph
The travel and speed sensor (B18) measures the transmission output speed. It forwards this information in the form of a square wave signal to the modular tachograph (TCO) (P1). The modular tachograph (TCO) (P1) uses it to calculate, based on the stored number of pulses, the current driving speed and the travel distance covered. At the same time, the modular tachograph (TCO) (P1) transmits the signal coming from the travel and speed sensor (B18) to the instrument cluster (ICUC) control unit (A1) via a direct line.

The vehicle-specific number of pulses is also stored in the instrument cluster (ICUC) control unit (A1). It also uses the current driving speed and the travel distance covered, which can then be displayed on the speedometer (A1 p2) and the trip distance and total distance display (A1 p7).
The speed signal (C3 signal) and the travel distance signal (C4 signal) are distributed for other systems by the modular tachograph (TCO) (P1) via direct lines.

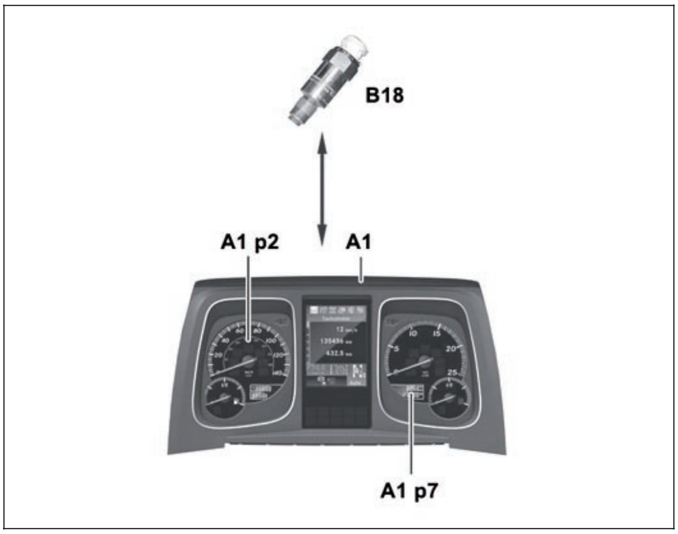
Vehicles with code (J1Z) Speedometer, tachograph omitted

A1 Instrument cluster (ICUC) control unit

A1 p2 Vehicle speed display

A1 p7 Trip and total distance display

B18 Travel and speed sensor



W54.30-1359-11

Function for tachograph omitted

The travel and speed sensor (B18) measures the transmission output speed. It forwards this information in the form of a square wave signal to the instrument cluster (ICUC) control unit (A1). The instrument cluster (ICUC) control unit (A1) uses it to calculate, based on the stored number of pulses, the current driving speed and the travel distance covered.

These are then displayed on the speedometer (A1 p2) and the trip distance and total distance display (A1 p7).

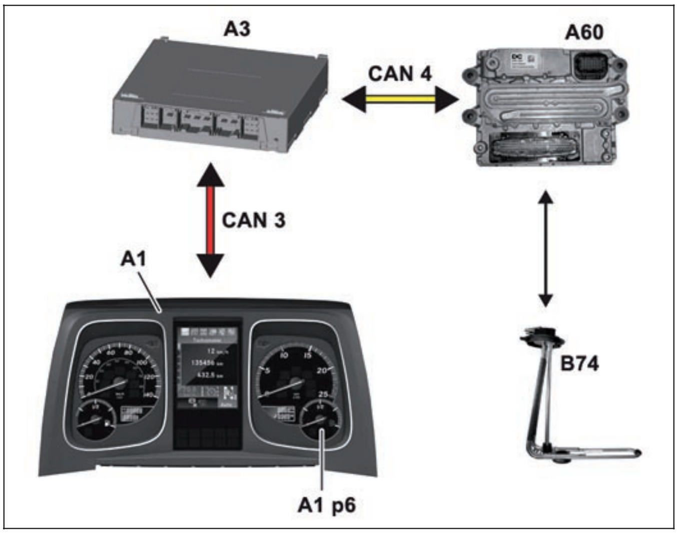
The instrument cluster (ICUC) control unit (A1) then places the values for speed and travel distance as a CAN message on the frame CAN (CAN 3) so that they can be picked up by other systems.

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Travel and speed sensor, component description	B18	**Page 408**
	Tachograph (TCO) component description	P1	**Page 459**

GF54.30-W-3046H	Display AdBlue level, function	2.8.11

MODEL 963, 964

A1 *Instrument cluster (ICUC) control unit*
A1 p6 *AdBlue® level gauge*
A3 *Drive control (CPC) control unit*
A60 *Exhaust aftertreatment (ACM) control unit*
B74 *AdBlue® fill level sensor/temperature sensor*
CAN 3 *Frame CAN*
CAN 4 *Drive train CAN*



W54.30-1363-81

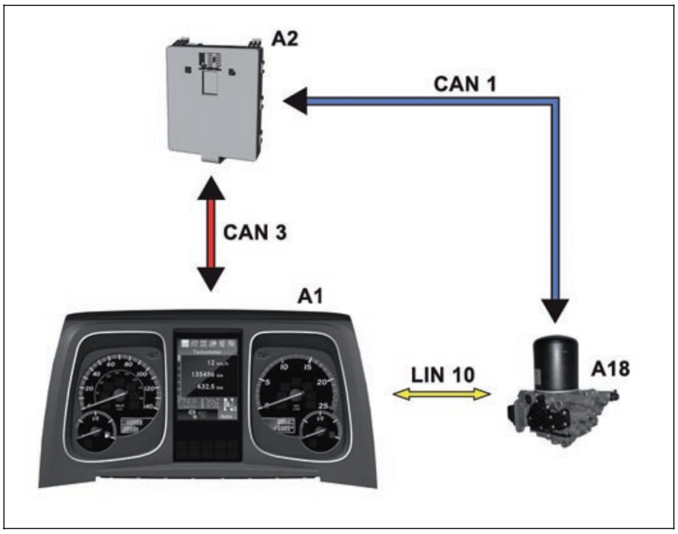
The signal of the AdBlue® fill level sensor/temperature sensor (B74) is read in by the exhaust aftertreatment (ACM) control unit (A60) and placed as a CAN message on the drive train CAN (CAN 4). The drive control (CPC) control unit (A3) picks up this message and places it on the frame CAN (CAN 3), from where it is picked up by the instrument cluster (ICUC) control unit (A1) in order to display the AdBlue® level in the AdBlue® level gauge (A1 p6).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Component description drive control (CPC) control unit	A3	**Page 334**
	Exhaust aftertreatment (ACM) control unit, component description	A60	**Page 388**
	AdBlue fill level sensor/temperature sensor, component description	B74	**Page 426**

GF54.30-W-3047H	Redundancy operation of Electronic Air-Processing Unit (EAPU), function	2.8.11

MODEL 963, 964

A1 Instrument cluster (ICUC) control unit
A2 Central gateway control unit (CGW)
A18 Electronic Air Processing Unit (EAPU) control unit
CAN 1 Exterior-CAN
CAN 3 Frame CAN
LIN 10 EAPU-LIN



W54.30-1361-81

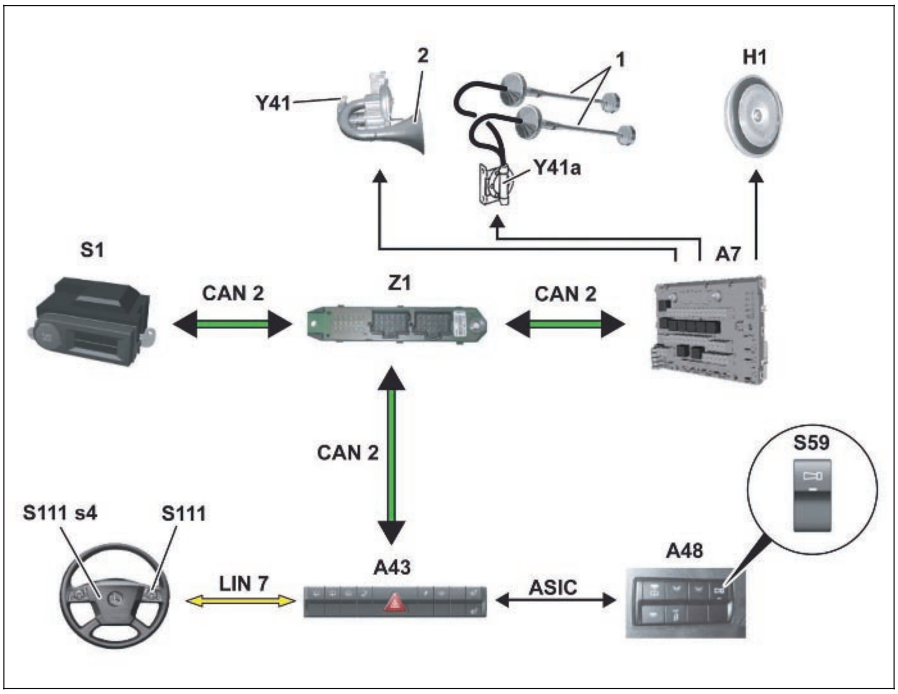
In order to ensure, in the event of a failure of the frame CAN (CAN 3) connection, that the instrument cluster (ICUC) control unit (A1) displays the legally required indication of the brake pressure level, there is a redundant connection between the instrument cluster (ICUC) control unit (A1) and the Electronic Air-Processing Unit (EAPU) control unit (A18).
The values measured by the Electronic Air-Processing Unit (EAPU) are at the same time transmitted via the overall vehicle network and via the EAPU LIN (LIN10) to the instrument cluster (ICUC) control unit (A1).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Electronic Air-Processing Unit (EAPU), component description	6.16, 6.17	**Page 351**

GF54.35-W-0002H	Signaling system, function	20.7.11

MODEL 963

1	*Air horns (cab roof)*
2	*Air horn (entrance area)*
A7	*Cab signal acquisition and actuation module control unit (SCA)*
A43	*Modular switch panel (MSF) control unit*
A48	*Roof switch module 1*
CAN 2	*Interior CAN*
H1	*Audible warning device*
LIN 7	*Button group LIN*
S1	*Electronic ignition lock (EIS)*
S59	*Horn/air horn button (with code (F6Q) Air horn or with code (F6R) Air horns on cab roof)*



W54.35-1003-76

S111	*Right multifunction steering wheel button group*
S111 s4	*"Horn/air horn" button*
Y41	*Entrance area air horn solenoid valve (with code (F6Q) Air horn)*
Y41a	*Roof air horn solenoid valve (with code (F6R) Air horns on cab roof)*
Z1	*Cab instrument panel CAN bus star point*
ASIC	*ASIC data bus (Application System Integrated Circuit)*

General information

The signaling system is available in three different versions:

- Simple horn (H1) (horn)
- Horn (H1) and additional air horn (2) in entrance area with code (F6Q) Air horn
- Horn (H1) and two additional air horns (1) on roof with code (F6R) Air horns on cab roof

Requirement

- Electronic ignition lock (EIS) (S1) is in driving position (terminal 15 "ON")

Signaling with the horn (H1)

Pressing the "Horn/air horn" button (S111 s4) operates the signaling system. The button is read in by the right multifunction steering wheel button group (S111) over a direct line. The right multifunction steering wheel button group (S111) forwards this information over the button group LIN (LIN 7) to the modular switch panel control unit (MSF) (A43). The modular switch panel control unit (MSF) (A43) transmits the message "Horn switch operated" via the interior CAN (CAN 2) and via the cab instrument panel CAN bus star point (Z1) to the sensor and actuator module, cab (SCA) (A7). The sensor and actuator module, cab (SCA) (A7) then actuates the horn (H1) over a direct line.

Signaling with air horn (with code (F6Q) Air horn or with code (F6R) Air horns on cab roof)
On vehicles with additional air horn, the horn/air horn button (S59), which is designed as a signaling switch, is located in roof switch module 1 (A48). If the horn/air horn button (S59) is actuated, it transmits this information as a signal via ASIC data bus (ASIC) to the modular switch panel control unit (MSF) (A43). The modular switch panel control unit (MSF) (A43) transmits the message "Air horn switch operated" on the interior CAN (CAN 2). The sensor and actuator module, cab (SCA) (A7) reads in this information and actuates the entrance area air horn solenoid valve (Y41) instead of the horn (H1) when the "Horn/air horn" button (S111 s4) is pressed (with code (F6Q) Air horn). On vehicles with code (F6R) Air horns on cab roof, the roof air horn solenoid valve (Y41a) is actuated by the sensor and actuator module, cab (SCA) (A7) instead of the horn (H1).

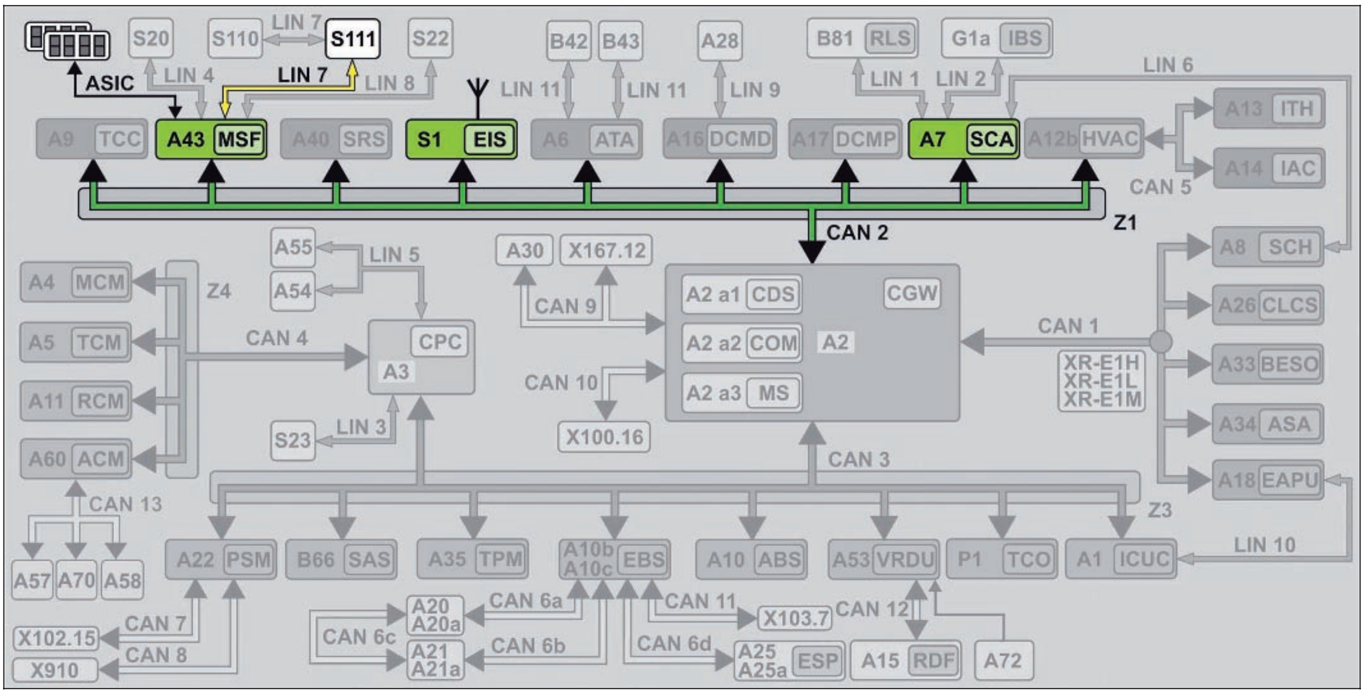
With code (F6Q) Air horn
When the entrance area air horn solenoid valve (Y41) is actuated, it is opened and the compressed air present at the entrance area air horn solenoid valve (Y41) flows through the diaphragms and sound emitting components of the entrance area air horn (2).

With code (F6R) Air horns on cab roof
When the roof air horn solenoid valve (Y41a) is actuated, it is opened and the compressed air present at the roof air horn solenoid valve (Y41a) flows through the diaphragms and sound emitting components of the roof air horns (1).

i The roof air horn solenoid valve (Y41a) is located on the driver side in the area of the B-pillar behind the interior trim.

	Overall network of signaling system		**Page 177**
	Sensor and actuator module, cab (SCA) control unit, component description	A7	**Page 339**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Roof switch modules, component description	A48	**Page 375**
	Electronic ignition lock (EIS), component description	S1	**Page 460**
	Multifunction steering wheel, component description	S111	**Page 469**

GF54.35-W-0002-01H	Overall network of signaling system		

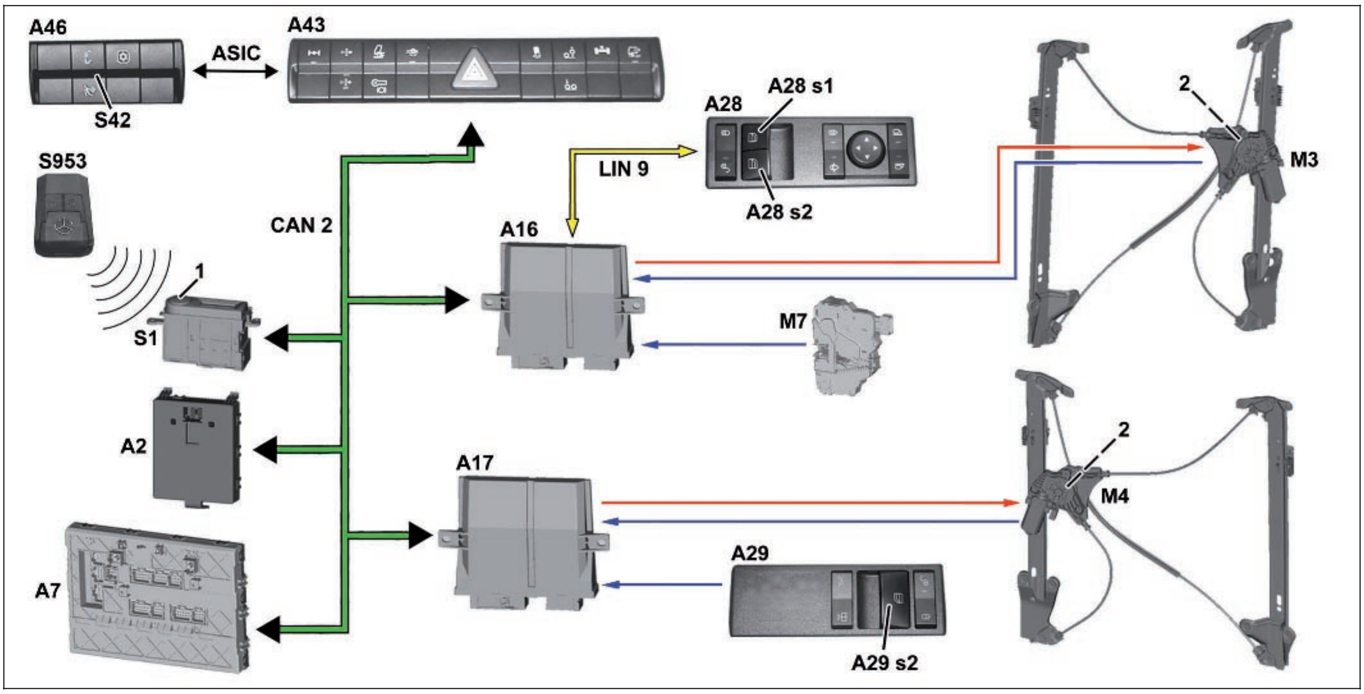


W54.35-1007-79

A7 *Cab signal acquisition and actuation module control unit (SCA)*
A43 *Modular switch panel (MSF) control unit*
CAN 2 *Interior CAN*
LIN 7 *Button group LIN*
S1 *Electronic ignition lock (EIS)*
S111 *Right multifunction steering wheel button group*
Z1 *Cab instrument panel CAN bus star point*
ASIC *ASIC data bus (Application System Integrated Circuit)*

GF72.29-W-0001H	Power windows, function	6.7.11

MODEL 963, 964



W72.29-1039-79

1	*Start/stop button*	A28 s1	*Driver door power window button*	M7	*Driver door central locking motor*
2	*Hall sensor (only with code (F8F) Comfort locking system)*	A28s2	*Passenger power window button*	S1	*Electronic ignition lock (EIS)*
A2	*Central gateway control unit (CGW)*	A29	*Front passenger switch group*	S42	*interior protection/panic alarm button (only with code (F8F) Comfort locking system and code (F8Z) Alarm system with interior protection)*
A7	*Cab signal acquisition and actuation module control unit (SCA)*	A29s2	*Passenger power window button*	S953	*Transmitter key*
A16	*Driver door module (DCMD) control unit*	A43	*Modular switch panel (MSF) control unit*	ASIC	*ASIC data bus (Application System Integrated Circuit)*
A17	*Front passenger door module (DCMP) control unit*	A46	*Instrument panel switch module 3*		
A28	*Driver switch group*	CAN 2	*Interior CAN*		
		LIN 9	*Driver switch panel LIN*		
		M3	*Driver door power window motor*		
		M4	*Front passenger door power window motor*		

General information

The power window system electronically controls opening and closing the driver and passenger side windows. On vehicles without code (F8F) Comfort locking system, the raising or lowering function of the side window can only be actuated manually.

Control can be selected via:

- driver door power window button (A28 s1) and front passenger door power window button (A28 s2) in driver switch group (A28)
- front passenger door power window button (A29 s2) in passenger switch group (A29)

On vehicles with code (F8F) Comfort locking system, the raising or lowering function of the side windows can be actuated automatically in addition.

Function

Enabling power windows
When the start/stop button (1) is pressed several times to the first switch stage, ignition stage "Circuit 15 R" is switched on the electronic ignition lock (EIS) (S1).
The electronic ignition lock (EIS) (S1) transmits the corresponding CAN message via the interior CAN (CAN 2) to the central gateway control unit (CGW) (A2), which relays the CAN message to the cab signal acquisition and actuation module control unit (SCA) (A7).
The cab signal acquisition and actuation module control unit (SCA) (A7) has the master function regarding the distribution of the CAN message and transmits it via the interior CAN (CAN 2) to all other interlined control units for evaluation.
The driver door control unit (DCMD) (A16) evaluates the CAN message, enables the power window system and transmits a CAN message to the interior CAN (CAN 2) to inform the passenger door module control unit (DCMP) (A17)

Opening and closing the passenger and driver door side windows with the driver door power window button (A28 s1) or front passenger door power window button (A28 s2)

When the driver door power window button (A28 s1) or front passenger door power window button (A28 s2) is pressed and pulled to the first actuation point, the manually controlled lowering and raising feature is actuated and remains activated as long as the corresponding button is held in this position.

On vehicles with code (F8F) Comfort locking system, a complete lowering or raising function can be actuated, when the driver door power window button (A28 s1) or front passenger door power window button (A28 s2) is actuated to the first actuation point, whereby it is not necessary to hold down the button. When the button is pressed or pulled again, the raising or lowering function is stopped.

The electronic circuit in the driver switch group (A28) generates a CAN message regarding the actuation, which is received by the driver door control unit (DCMD) (A16) via the driver LIN switch panel (LIN 9).
If the front passenger door side window should be opened or closed, the driver door module control unit (DCMD) (A16) transmits a corresponding CAN message to the passenger door module control unit (DCMP) (A17).

Now the driver door power window motor (M3) or front passenger door power window motor (M4) is actuated by an electrical signal and the latter confirms the window lifter mechanism of the associated side window.

Opening and closing side window in passenger door with passenger door power window button (A29 s2)

When the front passenger door power window button (A29 s2) is pressed and pulled to the first actuation point, the manually controlled lowering and raising feature is actuated and remains activated as long as the corresponding button is held in this position.
On vehicles with code (F8F) Comfort locking system, a complete raising or lowering function can be actuated by actuating the front passenger door power window button (A29 s2) to the second actuation point, whereby it is not necessary to hold down the button.

When the button is pressed or pulled again, the raising or lowering function is stopped.
The electronic circuit in the front passenger switch group (A29) transmits a corresponding electrical signal to the passenger door module control unit (DCMP) (A17), which then actuates the front passenger door power window motor (M4) with an electrical signal. The passenger door power window motor (M4) now opens and closes the passenger door side window.

Opening and closing both side windows with the mechanical vehicle key or lock/unlock button on the transmitter key (S953)

ℹ This function is only present on vehicles with code (F8F) Comfort locking system.

The driver door control unit (DVMD) (A16) receives information to activate the comfort closing or comfort opening

- via an electrical signal from the driver door central locking motor (M7), if the mechanical vehicle key is held in the lock/unlock position for longer than 2 s or
- via CAN message by the electronic ignition lock (EIS) (S1), when the lock/unlock button the transmitter key (S953) is pressed for longer than 2 s

The driver door control unit (DCMD) (A16) transmits the information via the interior CAN (CAN 2) to the passenger door module control unit (DCMP) (A17) and both sides windows are closed or opened as long as the vehicle key is held in the opening position or the unlock button is pressed.

Closing both sides with the interior protection/panic alarm button (S42)

ℹ This function is only present on vehicles with code (F8F) Comfort locking system and code (F8Z) Alarm system with interior protection.

If open, the side windows are closed when the panic alarm is triggered.
The panic alarm is actuated by the actuating the interior protection/panic alarm button (S42).

The electronic circuit integrated into the interior protection/panic alarm button (S42) generates a corresponding message, which is received by the modular switch panel control unit (MSF) (A43) via the
ASIC data bus (ASIC) and transmitted to the
interior CAN (CAN 2)

Via the interior CAN (CAN 2) the CAN message is provided to the driver door control unit (DCMD) (A16), which transmits the information to the front passenger door module control unit (DCMP) (A17). If open, the side windows are closed.

Anti-pinch protection when closing both side windows

ℹ This function is only present on vehicles with code (F8F) Comfort locking system.

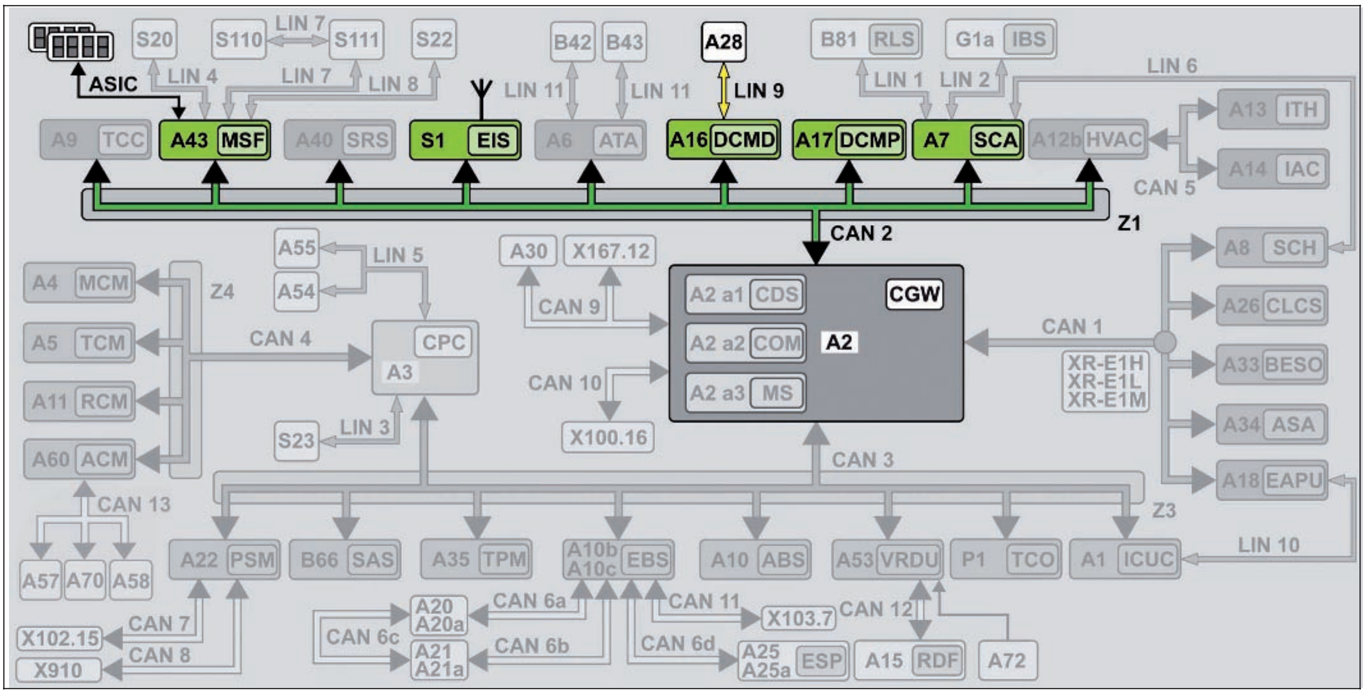
If during raising (comfort closing) a side window is locked up by an obstacle, the power consumption of the driver door power window motor (M3) or front passenger door power window motor (M4) increased.

Hall sensor (2) integrated in the driver door power window motor (M3) or front passenger door power window motor (M4), detects the position of the side window.

The driver door control unit (DCMD) (A16) or passenger door module control unit (DCMP) (A17) recognizes increases power consumption. If the side window does not reach its end position at the same time, the raising function is stopped and it is lowered for approx. 10 cm.

	Power windows, overall network		**Page 181**
	Central gateway control unit (CGW) , component description	A2	**Page 333**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Driver door control unit (DCMD), component description	A16	**Page 349**
	Passenger door module control unit (DCMP), component description	A17	**Page 350**
	Driver switch group, component description	A28	**Page 359**
	Front passenger switch group, component description	A29	**Page 360**
	Modular switch panel (MSF) control unit component description	A43	**Page 370**
	Instrument panel switch modules, component description	A46	**Page 372**
	Power window motor, component description	M3, M4	**Page 449**
	Door central locking motor, component description	M7	**Page 450**
	Electronic ignition lock (EIS), component description	S1	**Page 460**

GF72.29-W-0001-01H	Power windows, overall network		

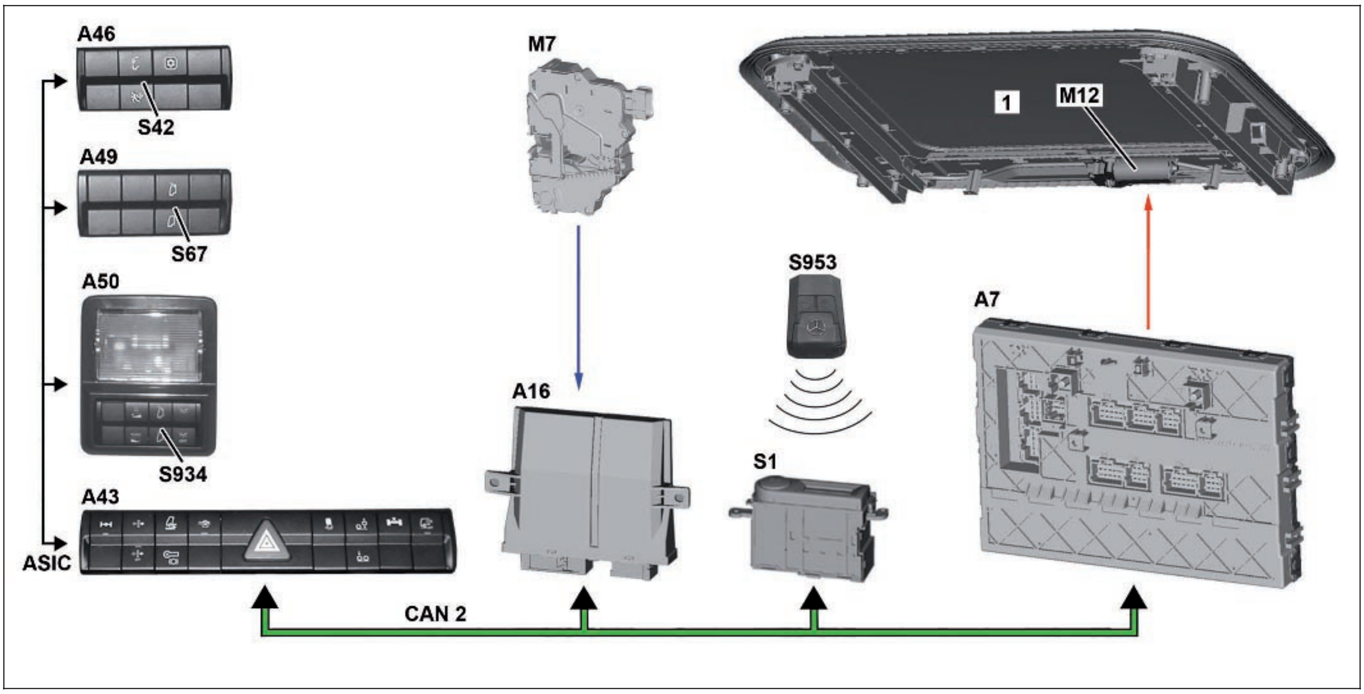


W72.29-1043-79

A2 — *Central gateway control unit (CGW)*
A7 — *Cab signal acquisition and actuation module control unit (SCA)*
A16 — *Driver door module (DCMD) control unit*
A17 — *Front passenger door module (DCMP) control unit*
A28 — *Driver switch group*
A43 — *Modular switch panel (MSF) control unit*
CAN 2 — *Interior CAN*
LIN 9 — *Driver switch panel LIN*
S1 — *Electronic ignition lock (EIS)*
Z1 — *Cab instrument panel CAN bus star point*
ASIC — *ASIC data bus (Application System Integrated Circuit)*

GF77.20-W-0007H	Electric power sliding roof, function	6.7.11

MODEL 963, 964 with CODE (D8M) Sliding roof



W77.20-1015-79

1 Sliding roof

A7 Cab signal acquisition and actuation module control unit (SCA)
A16 Driver door module (DCMD) control unit
A43 Modular switch panel (MSF) control unit
A46 Instrument panel switch module 3
A49 Roof switch module 2
A50 Lower driver bunk switch module
CAN 2 Interior CAN
M7 Driver door central locking motor
M12 Sliding roof motor
S1 Electronic ignition lock (EIS)
S42 Interior protection/panic alarm button (only with code (F8F) Comfort locking system and code (F8Z) Alarm system with interior compartment protection)
S67 Sliding roof/pop-up roof button
S934 Sliding roof/pop-up roof button on lower bunk
S953 Transmitter key

ASIC ASIC data bus (Application System Integrated Circuit)

General information

The electric sliding roof (1) allows rapid air exchange in the cab and improves the well-being of the driver.
The sliding roof (1) can be opened as wide as desired.
An insect and roller sun blind is installed in the sliding roof frame in addition.

Function

Opening and closing sliding roof (1) with sliding roof/pop-up roof button (S67) or sliding roof/pop-up roof button on lower bunk (S934)

By actuating the sliding roof/pop-up roof button (S67) or sliding roof/pop-up roof button on lower bunk (S934) in the opening direction, the sliding roof (1) is raised. It is not necessary to hold down the button.
After releasing and reactuating the button, the sliding roof opens (1) as long as the button is actuated.
When the sliding roof/pop-up roof button (S67) or sliding roof/pop-up roof button on lower bunk (S934) is actuated to the closing position when the sliding roof (1) is popped up or opened, the sliding roof closes completely (1), whereby it is not necessary to hold the button.

The electronic circuit integrated into the buttons, generates a message corresponding to the specific actuation which is received by the modular switch panel control unit (MSF) (A43) over the ASIC data bus (ASIC) and transmitted to the interior CAN (CAN 2). The CAN message is provided to the cab signal acquisition and actuation module control unit (SCA) (A7) over the interior CAN (CAN 2) and electronically actuates the sliding door motor (M12), causing the sliding roof (1) to open and close in the desired manner.

Opening and closing sliding roof (1) with the mechanical vehicle key or lock/unlock button on the transmitter key (S953)

i This function is only present on vehicles with code (F8F) Comfort locking system.

The driver door control unit (DVMD) (A16) receives information to activate the comfort closing or comfort opening

- via an electrical signal from the driver door central locking motor (M7), if the vehicle key is held in the lock/unlock position for longer than 2 s or
- via CAN message by the electronic ignition lock (EIS) (S1), when the lock/unlock button the transmitter key (S953) is pressed for longer than 2 s

The driver door control unit (DCMD) (A16) transmits the information via the interior CAN (CAN 2) to the cab signal acquisition and actuation module control unit (SCA) (A7) and the sliding roof (1) is completely closed and or raised.

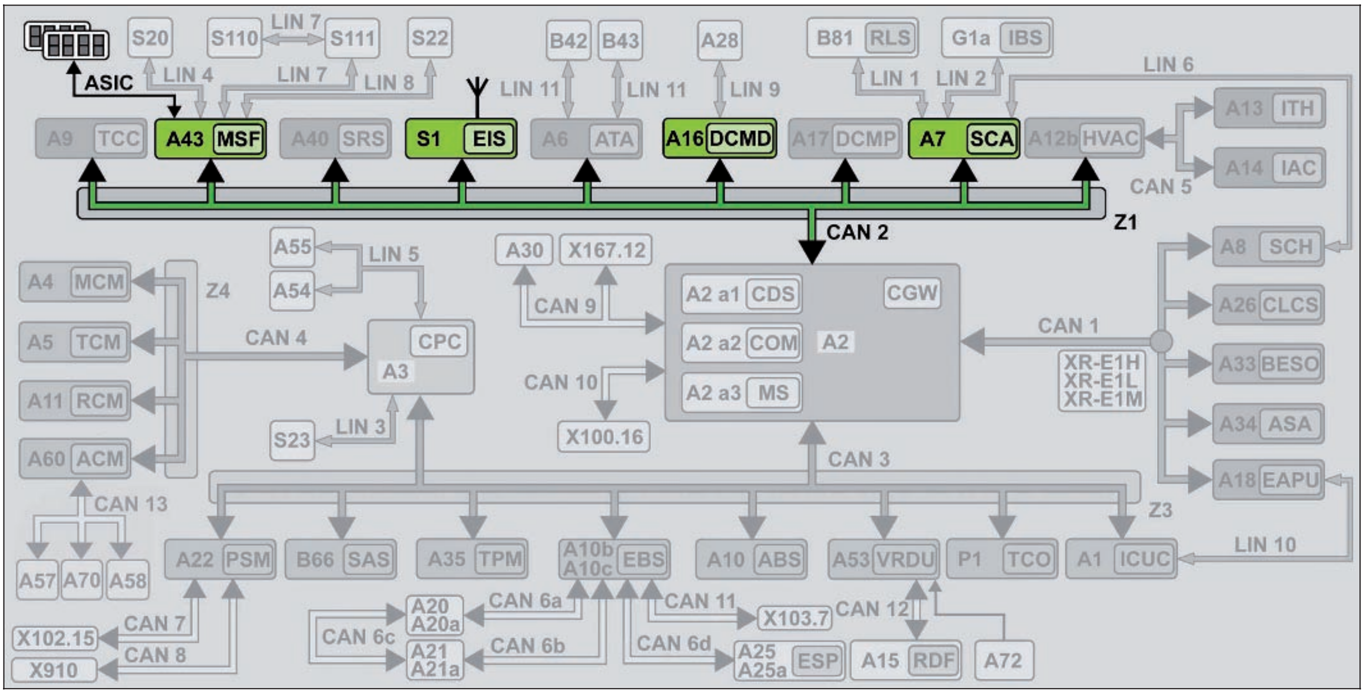
Closing sliding roof (1) with interior protection/panic alarm button (S42)

i This function is only present on vehicles with code (F8F) Comfort locking system and code (F8Z) Alarm system with interior protection.

When the panic alarm is actuated, the open sliding roof (1) is closed, if applicable.
The panic alarm is actuated by the actuating the interior protection/panic alarm button (S42).
The electronic circuit integrated into the interior protection/panic alarm button (S42) generates a corresponding message, which is received by the modular switch panel control unit (MSF) (A43) via the ASIC data bus (ASIC) and transmitted to the interior CAN (CAN 2) . The CAN message is provided to the cab signal acquisition and actuation module control unit (SCA) (A7) via the interior CAN (CAN 2).
If open, the sliding roof (1) is now closed.

	Electric power sliding rood, overall network		**Page 184**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Driver door control unit (DCMD), component description	A16	**Page 349**
	Modular switch panel (MSF) control unit component description	A43	**Page 370**
	Instrument panel switch modules, component description	A46	**Page 372**
	Roof switch module, component description	A49	**Page 375**
	Bunk switch module, component description	A50	**Page 376**
	Door central locking motor, component description	M7	**Page 450**
	Sliding roof motor, component description	M12	**Page 451**
	Electronic ignition lock (EIS), component description	S1	**Page 460**

GF77.20-W-0007-01H	Electric power sliding rood, overall network		



W77.20-1023-79

A7 *Cab signal acquisition and actuation module control unit (SCA)*

A16 *Driver door module (DCMD) control unit*

A43 *Modular switch panel (MSF) control unit*

CAN 2 *Interior CAN*

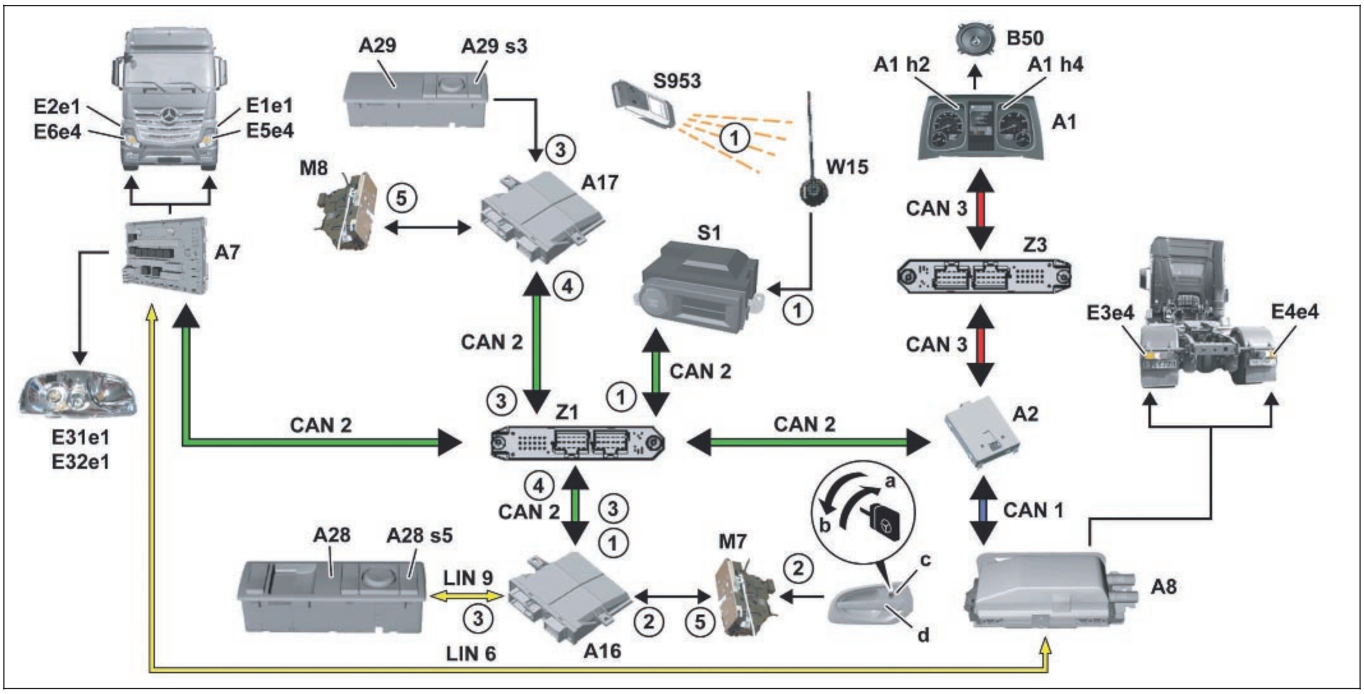
S1 *Electronic ignition lock (EIS)*

Z1 *Cab instrument panel CAN bus star point*

ASIC *ASIC data bus (Application System Integrated Circuit)*

GF80.20-W-0004H	Central locking, function	6.7.11

MODEL 963



W80.20-1030-79

Shown on vehicles with code (F8C) Multifunction and remote control key and with without code (F8Z) Alarm system with interior protection

1 Unlocking/locking remote control key
2 Unlocking/locking via key on door lock cylinder (shown on driver door)
3 Unlocking/locking via buttons in interior compartment
4 Unlocking/locking request for front passenger door from driver door module
5 Actuating central locking motor to unlock/lock

A1 Instrument cluster control unit (ICUC)
A1H2 Turn signal light indicator lamp, left side of vehicle
A1h4 Turn signal light indicator lamp, right side of vehicle
A2 Central gateway control unit (CGW)
A7 Cab signal acquisition and actuation module control unit (SCA)
A8 Frame signal acquisition and actuation module control unit (SCH)
A16 Driver door module (DCMD) control unit
A17 Front passenger door module (DCMP) control unit
A28 Driver switch group
A28 s5 Unlock/lock button
A29 Front passenger switch group
A29 s3 Unlock/lock button
B50 Center speaker
CAN 1 Exterior-CAN
CAN 2 Interior CAN
CAN 3 Frame CAN

E1e1 Left side turn signal light
E2e1 Right side turn signal light
E3e4 Left turn signal lamp
E4e4 Right turn signal lamp
E5e4 Left turn signal lamp
E6e4 Right turn signal lamp
E31e1 Interior light
E32e1 Interior light
LIN 6 LIN SCA/SCH redundance
LIN 9 Driver switch panel LIN
M7 Driver door central locking motor
M8 Front passenger door central locking motor
S1 Electronic ignition lock (EIS)
S953 Transmitter key
W15 Multifunction antenna
Z1 Cab instrument panel CAN bus star point
Z3 Frame CAN bus star point

a Lock position
b Unlock position
c Door lock
d Door handle

General information
The vehicle can be locked or unlocked from outside with the key on the door lock (c) (lock cylinder) via the door handle (d). The vehicle can be locked or unlocked from inside with the lock/unlock button (A28 s5) in the driver switch group (A28) and the lock/unlock button (A29 s3) in the front passenger switch group (A29). On vehicles with code (F8B) 2 transmitter key or with code (F8C) Multifunction and remote control key, the vehicle can unlocked or locked via the remote control on the transmitter key (S953). The vehicle is relocked automatically when it unlocked via the transmitter key (S953) and none of the doors are opened within 25 s. On vehicles with code (F8Z) Alarm system with interior protection, the vehicle is locked automatically when a panic alarm is triggered; the vehicle is also locked when the antitheft alarm system (ATA) is activated from inside.

The vehicle is unlocked automatically in the event of an accident. On vehicles with code (F8B) 2 remote control keys or code (F8C) Multifunction or remote control key in combination with code (F8F) Comfort locking system, the turn signals are actuated in parallel when unlocking or locking via the transmitter key (S953) or from outside with the key on the door lock (c). When circuit 15 R or circuit 15 R is switched on, this is confirmed by flashing. When the vehicle is locked/unlocked from inside with the lock/unlock button (A28 s5) and lock/unlock button (A29 s3), this is confirmed by flashing.

Prerequisites, general
- No on-board electrical system limp-home mode
- Central locking operating properly
- Driver door and passenger door closed.

1 Vehicle unlocked or locked with transmitter key (S953), on vehicles with code (F8B) 2 remote control key or code (F8C) Multifunction and remote control key in combination with code (F8F) Comfort locking system

1.1 Unlocking/locking via transmitter key (S953) general
If the lock/unlock button the radio remote control of the transmitter key (S953) is pressed, the transmitter key (S953) transmits radio signals. The radio signals from the transmitter key (S953) are received by the electronic ignition lock (EIS) (S1) via the antenna (EIS) (W1) (with code (F8B) 2 remote control keys) or combination antenna (W15) (with code (F8C) Multifunction and remote control key). It then transmits the request from the transmitter key (S953) to the interior CAN (CAN 2). Then the driver door control unit (DCMD) (A16) actuates the unlocking/locking procedure via the interior CAN (CAN 2).

Then the driver door is unlocked by the driver door control unit (DCMD) (A16) by actuation from the driver door central locking motor (M7). Via switching contact in the driver door central locking motor (M7), the driver door control unit (DCMD) (A16) when the driver door is unlocked and transmits a corresponding message to the interior CAN (CAN 2). Simultaneously the driver door control unit (DCMD) (A16) transmits the request "Unlock front passenger door" to the interior CAN (CAN 2). The passenger door module control unit (DCMP) (A17) then unlocks the passenger door by actuating the front passenger door central locking motor (M8). The passenger door module control unit (DCMP) (A17) recognizes via the switching contact in the front passenger door central locking motor (M8), that the front passenger door is unlocked and outputs a corresponding message to the interior CAN (CAN 2). For status feedback, the status LED in the lock/unlock button (A28 s5) in the driver switch group (A28) is actuated by the driver door control unit (DCMD) (A16).

i If the message "Global unlocking" or "Selective unlocking" is transmitted by the electronic ignition lock (EIS) (S1) to the interior CAN (CAN 2), depends on whether global unlocking or selective unlocking (only unlocking driver door) is adjusted on the transmitter key (S953). The transmitter key (S953) can be readjusted by simultaneously pressing (min. 5 s) the unlock or lock button.

1.2 Vehicle via transmitter key (S953) Global unlocking
Pressing the release button on the remote control transmitter key (S953) wakes up the electronic ignition lock (EIS) (S1). The access authorization in the radio signal of the transmitter key (S953) is checked by the electronic ignition lock (EIS) (S1). If the access authorization is valid, the message "Global unlocking" is transmitted to the interior CAN (CAN 2). The driver door control unit (DCMD) (A16) and passenger door module control unit (DCMP) (A17)are woken up by the activities on the interior CAN (CAN 2) and receive the message "Global unlocking".

Simultaneously the passenger door module control unit (DCMP) (A17) actuates the status LED in the lock/unlock button (A29 s3) on the front passenger switch group (A29). The cab signal acquisition and actuation module control unit (SCA) (A7) also switches on the left interior lights (E31e1) and right interior lights (E32e1) for approx. 30 (parameterizable). After the vehicle is unlocked successfully, the driver door control unit (DCMD) (A16) transmits the message "Vehicle unlocked" and the request "Activating turn signal for unlocking" to the interior CAN (CAN 2). Unlocking is acknowledged visually by the turn signal flashing once (vehicles without code (F8Z) Alarm system with interior protection). On vehicles with code (F8Z) Alarm system with interior protection, the turn signals are actuated by the antitheft alarm system (ATA) to indicate successful deactivation of the antitheft alarm system control unit (ATA) (A6).

ℹ The actuation time for the interior lights is parameterizable. The maximum actuation time of 5 minutes. The interior light is actuated only automatically when circuit 15 R is switched off.

1.3 Vehicle via transmitter key (S953) Selective unlocking
If the transmitter key (S953) is set to selective unlocking, the electronic ignition lock (EIS) (S1) transmits the message "Selective unlocking" to the interior CAN (CAN 2) when the radio signal is received by the transmitter key (S953). Then the driver door is unlocked by the driver door control unit (DCMD) (A16) by actuation from the driver door central locking motor (M7). The passenger door is not unlocked initially. When the unlock button is actuated again, the vehicle unlocked globally including the front passenger door. The remaining procedure corresponds to the global unlocking procedure.

1.4 Vehicle via transmitter key (S953) Global locking
When the lock button the transmitter key (S953) is pressed the electronic ignition lock (EIS) (S1) transmits, after successfully checking the access authorization, the message "Global locking" to the interior CAN (CAN 2). The driver door control unit (DCMD) (A16) and passenger door module control unit (DCMP) (A17) are woken up by the activities on the interior CAN (CAN 2) and receive the message "Global locking". Then the driver door is locked by the driver door control unit (DCMD) (A16) by actuation from the driver door central locking motor (M7). Simultaneously the driver door control unit (DCMD) (A16) transmits the request "Lock front passenger door" to the interior CAN (CAN 2) to the passenger door module control unit (DCMP) (A17). Then the front passenger door is locked by actuating the front passenger door central locking motor (M8) by the passenger door module control unit (DCMP) (A17). Via switching contact in the driver door central locking motor (M7), the driver door control unit (DCMD) (A16) when the driver door is locked and transmits a corresponding message to the interior CAN (CAN 2).

The passenger door module control unit (DCMP) (A17) recognizes via the switching contact in the front passenger door central locking motor (M8), that the front passenger door is locked and outputs a corresponding message to the interior CAN (CAN 2). After successfully locking, the driver door control unit (DCMD) (A16) transmits the message "Vehicle locked" and the request "Activating turn signal for locking" to the interior CAN (CAN 2) and locking is acknowledged visually by the turn signal flashing three times. The status LED in the lock/unlock button (A28 s5) in the driver switch group (A28) and lock/unlock button (A29 s3) in the font passenger switch group (A29) go out.

ℹ On vehicles with code (F8Z) Alarm system with interior protection, actuation of the turn signal for acknowledgment is actuated only after successful arming of the antitheft alarm system (ATA) by the antitheft alarm system control unit (ATA) (A6).

1.5 Automatic relocking function
If the vehicle is locked with the transmitter key (S953) and no door is opened within 25 s parameterizable), the vehicle locks automatically. The driver door control unit (DCMD) (A16) then transmits the message "Vehicle locked" and the request "Turn signal activated for locking" to the interior CAN (CAN 2). Locking the vehicle is acknowledged visually by the turn signal flashing three times.

2. Lock/unlock vehicle from inside

2.1 Lock/unlock vehicle from inside, general
The vehicle be locked or unlocked globally via the lock/unlock button (A28 s5) in the driver door or via the lock/unlock button (A29 s3) in the passenger door. Then the driver door control unit (DCMD) (A16) actuates the unlocking/locking procedure via the interior CAN (CAN 2). If the antitheft alarm system (ATA) is activated from inside, the vehicle is locked automatically (only on vehicles with (F8Z) Alarm system with interior protection).

2.2 Locking driver door via lock/unlock button (A28 s5)
If the lock/unlock button (A28 s5) in the driver switch group (A28) is actuated to lock, the driver door control unit (DCMD) (A16) receives a message via the switch panel LIN driver (LIN 9) and then actuates via direct line the driver door central locking motor (M7) to lock. It also transmits the message "Driver door locked" to the interior CAN (CAN 2). Almost simultaneously the driver door control unit (DCMD) (A16) transmits the request "Lock front passenger door" to the interior CAN (CAN 2). The passenger door module control unit (DCMP) (A17) receives the request "Passenger door locked" and then locks the passenger door by actuating the front passenger door central locking motor (M8). It also transmits the message "Passenger door locked" for feedback to the driver door control unit (DCMD) (A16) to the interior CAN (CAN 2). After the vehicle is locked successfully, the driver door control unit (DCMD) (A16) transmits the message "Vehicle locked" to the interior CAN (CAN 2). The status LED in the lock/unlock button (A28 s5) and lock/unlock button (A29 s3) go out.

2.3 Locking front passenger door via lock/unlock button (A29 s3)
If the lock/unlock button (A29 s3) in the front passenger switch group (A29) is actuated to lock, the passenger door module control unit (DCMP) (A17) receives an electrical switch signal via a direct line and then actuates the front passenger door central locking motor (M8) to lock. It also transmits the message "Front passenger door lock switch actuated" and the message "Status passenger door locked" to the interior CAN (CAN 2). The driver door control unit (DCMD) (A16) receives via interior CAN (CAN 2) the status of the front passenger door and the lock/unlock button (A29 s3) and then locks almost simultaneously the driver door by actuating the driver door central locking motor (M7). After the vehicle is locked successfully, the driver door control unit (DCMD) (A16) transmits the message "Vehicle locked" to the interior CAN (CAN 2). The status LED in the lock/unlock button (A28 s5) and lock/unlock button (A29 s3) go out.

2.4 Unlocking driver door via lock/unlock button (A28 s5)

If the lock/unlock button (A28 s5) in the driver switch group (A28) is actuated to lock, the driver door control unit (DCMD) (A16) receives a message via the switch panel LIN, driver (LIN 9). it then actuates via a direct line the driver door central locking motor (M7) to unlock. It also transmits the message "Driver door unlocked" and the request "Unlock passenger door" to the interior CAN (CAN 2). The passenger door module control unit (DCMP) (A17) receives the request "Unlock passenger door" and then unlocks the passenger door by actuating the front passenger door central locking motor (M8). After successfully unlocking it transmits the message "Status front passenger door unlocked" to the interior CAN (CAN 2). If the vehicle is completely unlocked, the driver door control unit (DCMD) (A16) transmits the message "Vehicle unlocked" to the interior CAN (CAN 2). For status feedback, the driver door control unit (DCMD) (A16) actuates the status LED in the lock/unlock button (A28 s5).

After the vehicle is unlocked successfully, the driver door control unit (DCMD) (A16) transmits the message "Vehicle unlocked" to the interior CAN (CAN 2). For status feedback, the driver door control unit (DCMD) (A16) actuates the status LED in the lock/unlock button (A28 s5). The passenger door module control unit (DCMP) (A17) actuates the status LED in the lock/unlock button (A29 s3) an.

2.6 Automatic locking when activating antitheft alarm system (ATA) from inside

If the upper rocker on the interior protection/panic alarm button (S42) is pressed for 3 s or longer, the antitheft alarm system control unit (ATA) (A6) activates the antitheft alarm system (ATA) and transmits the request "Close vehicle" to the interior CAN (CAN 2). The vehicle is then locked by the driver door control unit (DCMD) (A16) and passenger door module control unit (DCMP) (A17). Activation of the antitheft alarm system (ATA) is acknowledge visually by the turn signal flashing.

The passenger door module control unit (DCMP) (A17) receives the request "Passenger door locked" and then locks the passenger door by actuating the front passenger door central locking motor (M8). It also transmits the message "Front passenger door locked" to the interior CAN (CAN 2). After the vehicle is locked successfully, the driver door control unit (DCMD) (A16) transmits the message "Vehicle locked" to the interior CAN (CAN 2). The status LED in the lock/unlock button (A28 s5) and lock/unlock button (A29 s3) go out.

i Confirmation by flashing is used only on vehicles with code (F8F) Comfort locking system or on vehicles with code (F8Z) Alarm system with interior protection after successfully arming antitheft alarm system (ATA)

The passenger door module control unit (DCMP) (A17) simultaneously actuates the status LED in the lock/unlock button (A29 s3) an. The status LED then flashes.

2.5 Unlocking front passenger door via lock/unlock button (A29 s3)

If the lock/unlock button (A29 s3) in the front passenger switch group (A29) is actuated in the lock direction, the passenger door module control unit (DCMP) (A17) receives an electrical switching signal via a direct line causing the font passenger door central locking motor (M8) to unlock. It also transmits the message "Front passenger door lock switch actuated and confirmed" and the message "Passenger door status: unlocked" to the interior CAN (CAN 2). The driver door control unit (DCMD) (A16) receives via interior CAN (CAN 2) the status of the front passenger door and the status of the lock/unlock button (A29 s3) and then unlocks almost simultaneously the driver door by actuating the driver door central locking motor (M7).

---

3 Lock/unlock vehicle on door lock of driver/front passenger door

3.1 Locking driver and passenger door with vehicle key in lock in driver door

If the vehicle key in the door lock (c) (lock cylinder) above the door handle (d) in the driver door is turned to the right stop to the locking position (a), the driver door central locking motor (M7) is actuated mechanically via a linkage and the driver door is locked. The locking operation is sensed by the driver door control unit (DCMD) (A16) via a driver door central locking motor switch (M7), actuating it electronically causing the engine drive of the driver door central locking motor (M7) to also move the lock position where the tappet is already located. This is made possible by mechanically decoupling the motor drive and tappet. After successfully locking, the driver door transmits the driver door control unit (DCMD) (A16) transmits the message "Driver door locked" and the request "Lock passenger door" to the interior CAN (CAN 2).

3.2 Locking driver and passenger door with vehicle key in lock in front passenger door

If the vehicle key in the front passenger door lock is turned to the right stop to the locking position (a), the front passenger door central locking motor (M8) is actuated mechanically via a linkage and the driver door is locked. The locking operation is sensed by the passenger door module control unit (DCMP) (A17) via driver door central locking motor switch (M7). Then it electronically actuates the front passenger door central locking motor (M8) actuating it electronically causing the engine drive of the driver door central locking motor (M8)) to also move the lock position where the tappet is already located. This is made possible by mechanically decoupling the motor drive and tappet. After the front passenger door is locked successfully, the front passenger door module control unit (DCMP) (A17) transmits the message "Passenger door locked" to the interior CAN (CAN 2).

The driver door control unit (DCMD) (A16) receives via interior CAN (CAN 2) the status of the front passenger door and then locks almost simultaneously the driver door by actuating the driver door central locking motor (M7). After the vehicle is locked successfully, the driver door control unit (DCMD) (A16) transmits the message "Vehicle locked" to the interior CAN (CAN 2). The status LED in the lock/unlock button (A28 s5) and lock/unlock button (A29 s3) go out. Confirmation by flashing used only on vehicles with code (F8F) Comfort locking system.

3.3 Unlocking driver or front passenger door with vehicle key in door lock on driver and front passenger door

If the vehicle key is turned to the left stop to the release position (b) in the driver door lock (c), the driver door central locking motor (M7) is actuated mechanically via a linkage and the driver door is unlocked.

The unlocking operation is sensed by the driver door module control unit (DCMD) (A16) via a driver door central locking motor switch (M7), actuating it electronically causing the engine drive of the driver door central locking motor (M7)) to also move the lock position where the tappet is already located. After successful unlocking the driver door module control unit (DCMD) (A16) outputs a corresponding CAN message to the interior CAN (CAN 2). A CAN message to unlock the passenger door is not transmitted to the interior CAN (CAN 2), so that they remain locked. Confirmation flashing is only used on vehicles with code (F8F) Comfort locking system and without code (F8Z) Alarm system with interior protection.

ℹ The function is the same unlocking with the vehicle key in the passenger door lock.

---

4 Emergency opening in event of crash, function

The emergency opening function unlocks the doors of the vehicle after an accident. the supplement restraint system control unit (SRS) (A40) transmits in the event of a crash the message "Crash" to the interior CAN (CAN 2). The driver door control unit (DCMD) (A16) and passenger door module control unit (DCMP) (A17) receive the message via the interior CAN (CAN 2) and unlock automatically the driver and front passenger door after a waiting time of several seconds.

---

5 Locking in event of panic alarm (only on vehicles with (F8Z) Alarm system with interior protection)

If the panic alarm is triggered on vehicles with antitheft alarm system (ATA), the antitheft alarm system control unit (ATA) (A6) transmits the request "Close vehicle" to the interior CAN (CAN 2). After receiving this message, the driver door control unit (DCMD) (A16) actuates the driver door central locking motor (M7) and passenger door module control unit (DCMP) (A17) to the front passenger door central locking motor (M8) to lock.

---

6 Visual acknowledgment after unlocking/locking function (only on vehicles with (F8F) Comfort locking system or with code (F8Z) Alarm system with interior protection)

Additional prerequisite:

- Circuit 15 R "OFF"

ℹ When the vehicle is locked/unlocked from inside with the lock/unlock button (A28 s5) and lock/unlock button (A29 s3), this is confirmed by flashing.

6.1 Starting visual acknowledgment

6.1.1 Vehicles with code (F8Z) Alarm system with interior protection

On vehicles with code (F8Z) Alarm system with interior protection, unlocking the vehicle is acknowledged via the radio remote control in the transmitter key (S953) by the turn signal flashing once.

Locking the driver door via the radio remote control of the transmitter key (S953) or the door lock (c) is acknowledged by the turn signal flashing three times. Confirmation flashing when locking/unlocking is only started by the antitheft alarm system control unit (ATA) (A6) when all warning circuits are closed and the antitheft alarm system (ATA) is activated or deactivated successfully. For this purpose the antitheft alarm system control unit (ATA) (A6) transmits the message "Turn signal for ATA activation ON" or "Turn signal for ATA deactivation OFF" via the interior CAN (CAN 2) and via the cab instrument panel CAN Bus star point (Z1) to the cab signal acquisition and actuation module (SCA) (A7). The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blinkmaster and then generates the flashing frequency.

ℹ Locking the driver door via the door lock (c) is confirmed by flashing. Unlocking via the door lock (c) is not confirmed by flashing, since the antitheft alarm system (ATA) cannot be deactivated via the door lock (c). Locking the driver door via the door lock is not confirmed by flashing, since the antitheft alarm system (ATA) cannot be activated via the door lock.

6.1.2 Vehicles without code (F8Z) Alarm system with interior protection

After successfully locking or unlocking via the radio remote control in the transmitter key (S953) or door lock (c), confirmation flashing is started by the driver door control unit (DCMD) (A16). For this purpose the driver door control unit (DCMD) (A16) transmits the request "Activating turn signal to unlock" or "Activating turn signal to lock" via the interior CAN (CAN 2) to the cab signal acquisition and actuation module control unit (SCA) (A7). The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blinkmaster and then generates the flashing frequency.

6.2 Actuation and output of visual acknowledgment

The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blinkmaster and generates, after receiving the corresponding message from the driver door control unit (DCMD) (A16) or antitheft alarm system control unit (ATA) (A6), the flashing frequency for further processing for the signal acquisition and actuation module control unit, frame (SCH) (A8) and Instrument cluster control unit (ICUC) (A1). For this purpose it transmits alternately at a defined frequency the messages "Left turn signal ON", right turn signal ON" and "Left turn signal OFF, right turn signal OFF" to the interior CAN (CAN 2). The cab signal acquisition and actuation module control unit (SCA) (A7) actuates the front vehicle lamps. For this purpose the cab signal acquisition and actuation module control unit (SCA) (A7) directly actuates the following lamps:

- Left side turn signal light (E1e1)
- Right side turn signal light (E2e1)
- Left turn signal (E5e4) in left headlamp (E5)
- Right turn signal (E6e4) in right headlamp (E6)

Moreover, the flashing frequency is routed via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) by the central gateway control unit (CGW) (A2) to the exterior CAN (CAN 1). Via the exterior CAN (CAN 1) the signal acquisition and actuation module control unit, frame (SCH) (A8) receives flashing frequency routed by the central gateway control unit (CGW) (A2) and then actuates the following lamps simultaneously:

- Left turn signal light (E3e4)
- Right turn signal light (E4e4)

i In addition to the CAN message, the signal acquisition and actuation module control unit, frame (SCH) (A8) also receives the message "Flashing frequency" via the redundant LIN SCA/SCH (LIN 6) from the cab signal acquisition and actuation module control unit (SCA) (A7).

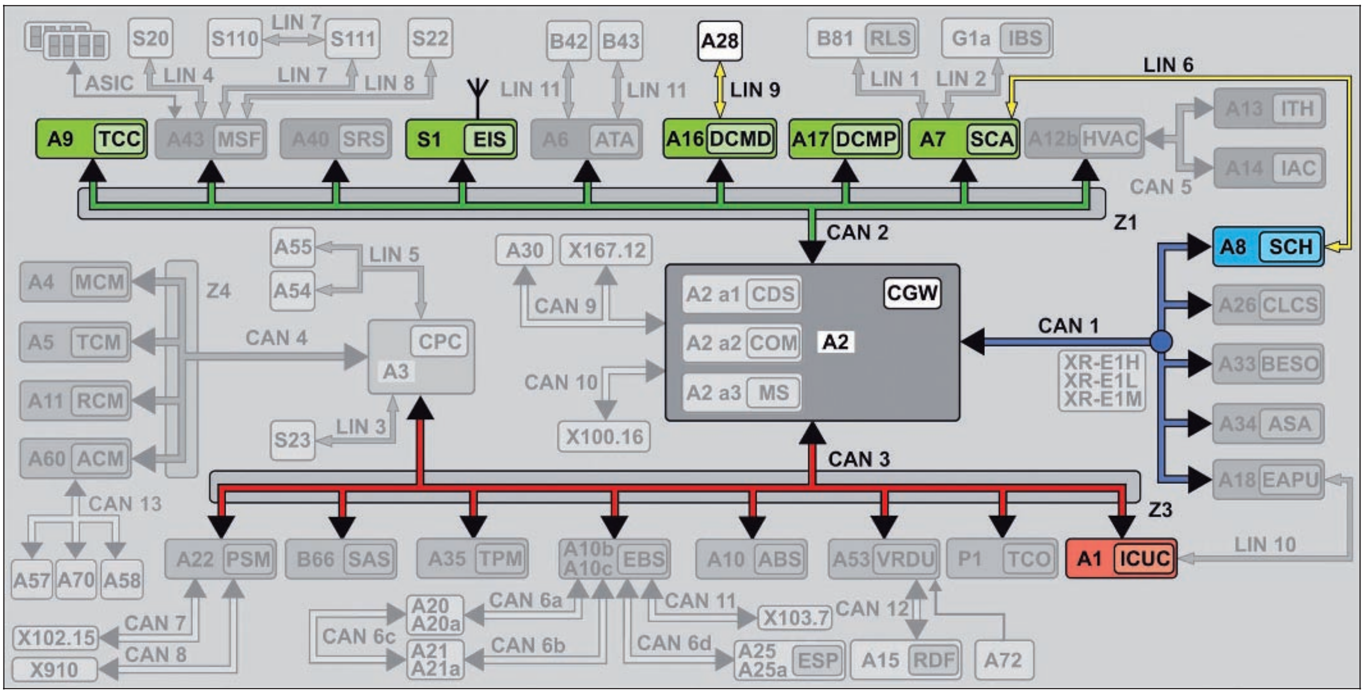
Simultaneously, the instrument cluster control unit (ICUC) (A1) receives the flashing frequency via the frame CAN (CAN 3) and CAN bus frame star point (Z3) routed by the central gateway control unit (CGW) (A2) and then actuates the following indicator lamps:

- Turn signal indicator lamp, vehicle, left (A1 h2)
- Turn signal indicator lamp, vehicle, right (A1 h4)

The flashing noises generated in the instrument cluster control unit (ICUC) are output via the center speaker (B50) A1

	Central locking, overall network		**Page 191**
	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**
	Driver door control unit (DCMD), component description	A16	**Page 349**
	Passenger door module control unit (DCMP), component description	A17	**Page 350**
	Driver switch group, component description	A28	**Page 359**
	Front passenger switch group, component description	A29	**Page 360**
	Headlamp, component description	E5, E6	**Page 446**
	Door central locking motor, component description	M7, M8	**Page 450**
	Electronic ignition lock (EIS), component description	S1	**Page 460**
	Transmitter key, component description	S953	**Page 473**
	Multifunction antenna, component description	W15	**Page 478**

GF80.20-W-0001-05H	Central locking, overall network		GF

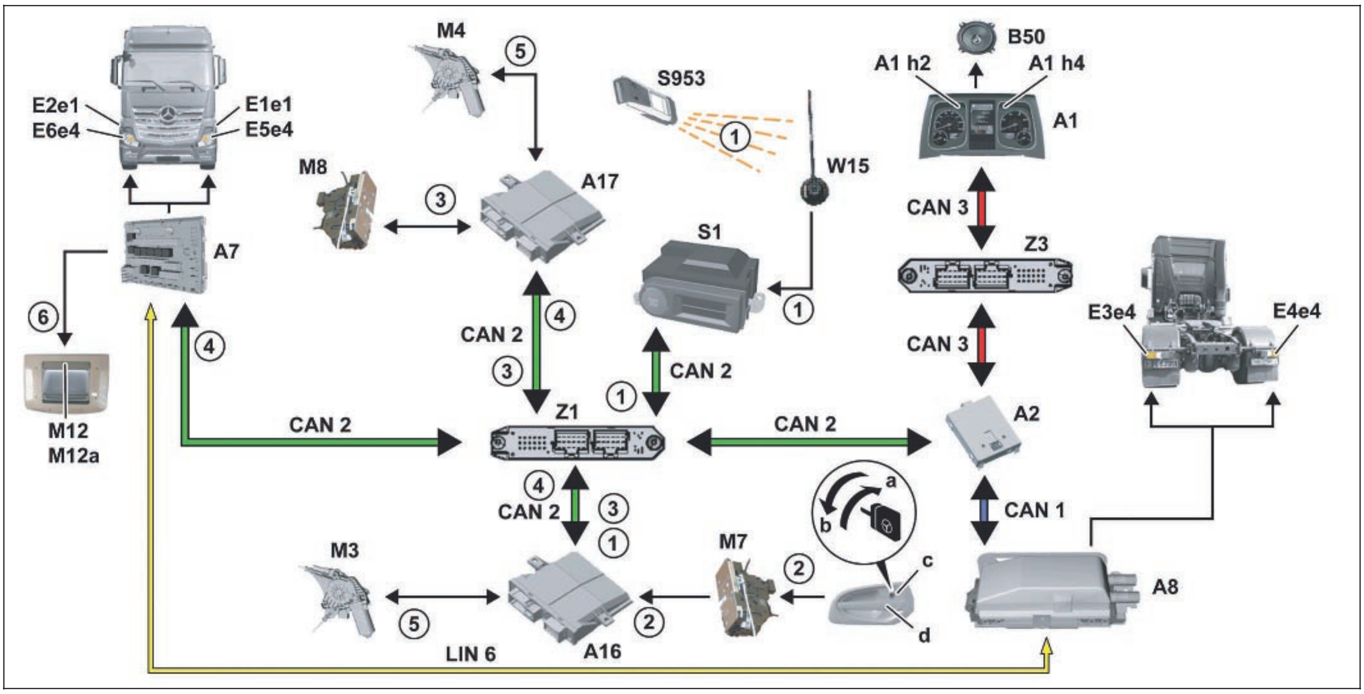


W80.20-1031-79

A1 *Instrument cluster (ICUC) control unit*
A2 *Central gateway control unit (CGW)*
A7 *Cab signal acquisition and actuation module control unit (SCA)*
A8 *Frame signal acquisition and actuation module control unit (SCH)*
A16 *Driver door module (DCMD) control unit*
A17 *Front passenger door module (DCMP) control unit*
A28 *Driver switch group*
CAN 1 *Exterior-CAN*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
LIN 6 *LIN SCA/SCH redundance*
LIN 9 *Driver switch panel LIN*
S1 *Electronic ignition lock (EIS)*
Z1 *Cab instrument panel CAN bus star point*
Z3 *Frame CAN bus star point*

GF80.45-W-0004H	Comfort locking system function	6.7.11

MODEL 963 with CODE (F8F) Convenience locking system



W80.45-1095-79

Vehicle comfort opening/closing Shown on vehicles with code (F8C) Multifunction and remote control key

1	*Convenience closing/opening with transmitter key*
2	*Comfort closing/opening via transmitter key on door lock cylinder (shown on driver door)*
3	*Comfort closing/opening request via passenger door lock switch*
4	*Comfort closing/opening power window/sliding roof request from driver door module*
5	*Power window motor actuation for closing/opening*
6	*Sliding roof/pop-up roof motor actuation for opening/closing*
A1	*Instrument cluster (ICUC) control unit*
A1H2	*Turn signal light indicator lamp, left side of vehicle*
A1h4	*Turn signal light indicator lamp, right side of vehicle*
A2	*Central gateway control unit (CGW)*
A7	*Cab signal acquisition and actuation module control unit (SCA)*
A8	*Frame signal acquisition and actuation module control unit (SCH)*
A16	*Driver door module (DCMD) control unit*
A17	*Front passenger door module (DCMP) control unit*
B50	*Center speaker*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
E1e1	*Left side turn signal light*
E2e1	*Right side turn signal light*
E3e4	*Left turn signal lamp*
E4e4	*Right turn signal lamp*
E5e4	*Left turn signal lamp*
E6e4	*Right turn signal lamp*
LIN 6	*LIN SCA/SCH redundance*
M3	*Driver door power window motor*
M4	*Front passenger door power window motor*
M7	*Driver door central locking motor*
M8	*Front passenger door central locking motor*
M12	*Sliding roof motor (with code (D8M) Sliding roof)*
M12a	*Pop-up roof motor (with code(D8N) Electric pop-up roof)*
S1	*Electronic ignition lock (EIS)*
S953	*Transmitter key*
W15	*Multifunction antenna*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*
a	*Lock position*
b	*Unlock position*
c	*Door lock*
d	*Door handle*

1 General

The comfort locking system is an expanded version of the central locking system. The comfort locking system is not an autonomous accessory; it can only be ordered in combination with code (F8B) 2 remote control keys or with code (F8C) Multifunction and remote control key. The driver door control unit (DCMD) (A16) is the master function for the control of the comfort closing system. Comfort closing or openings includes centrally closing or opening the power windows or the sliding roof (on vehicles with code (D8M) Sliding roof) or pop-up roof (on vehicles with code (D8N) Electric pop-up roof) when locking or unlocking the vehicle. Comfort closing/opening can be actuated via the radio remote control in the transmitter key (S953) or with the key on the door lock (c) (lock cylinder) via the door handle (c) on the driver and front passenger door.

The window lifters on vehicles with comfort locking system are also equipped with anti-pinch protection. During comfort closing/opening the turn signals are actuated in parallel for visual indication after locking or unlocking the vehicle.

Prerequisites, general

- No on-board electrical system limp-home mode
- Central locking operating properly
- Driver door and passenger door closed.
- Circuit 15 R and circuit 15 (ignition) OFF
- Power windows learned in (normalized)
- Tilting/sliding roof learned in (normalized) (vehicles with code (D8M) Sliding roof)

2 Vehicle comfort opening/closing with transmitter key (S953)

2.1 Vehicle comfort opening/closing with transmitter key (S953) general

If the lock/unlock button the radio remote control of the transmitter key (S953) is pressed, the transmitter key (S953) transmits radio signals. The radio signals from the transmitter key (S953) are received by the electronic ignition lock (EIS) (S1) via the antenna (EIS) (W1) (with code (F8B) 2 remote control keys) or combination antenna (W15) (with code (F8C) Multifunction and remote control key). The access authorization in the radio signal of the transmitter key (S953) is checked by the electronic ignition lock (EIS) (S1).
If the access authorization is valid and the vehicle is unlocked, the request from the transmitter key (S953) is transmitted in the message "Request for radio remote control, global unlocking" or "Request for radio remote control, selective unlocking" to the interior CAN (CAN 2). When the vehicle is locked, the message "Request for radio remote control, global unlocking" is transmitted to the interior CAN (CAN 2).

The electronic ignition lock (EIS) (S1) then transmits the request from the transmitter key (S953) to the interior CAN (CAN 2). Then the driver door control unit (DCMD) (A16) actuates locking and unlocking via the interior CAN
(CAN 2). If the lock or unlock button on the radio remote control on transmitter key (S953) is pressed for longer than 2 s, the electronic ignition lock (EIS) (S1) additionally starts the comfort opening or comfort closing function to lock or unlock.

i If the message "Request for radio remote control, global unlocking" or "Request for radio remote control, selective unlocking" is transmitted by the electronic ignition lock (EIS) (S1) to the interior CAN (CAN 2), depends on whether "global unlocking" or "selective unlocking" (only unlock driver door) is set on the transmitter key (S953).

The transmitter key (S953) can be readjusted by simultaneously pressing
the unlock or lock button for longer than 5 s. It is necessary to hold the release button the transmitter key (S953) during the entire opening procedure during comfort opening. When the release button is released, comfort opening is interrupted immediately.

2.1.1 Comfort opening for vehicles via transmitter key (S953)

If the signals from the transmitter key (S953) are received for longer than 2 s when unlocking, the electronic ignition lock (EIS) (S1) transmits the message "Request for radio remote control comfort opening" to the interior CAN (CAN 2). The driver door control unit (DCMD) (A16) and passenger door module control unit (DCMP) (A17) are woken up by the activities on the interior CAN (CAN 2) and receive the message "Request for radio remote control comfort opening".
Then, in addition to unlocking the driver door, is opened by the driver door control unit (DCMD) (A16) when the driver door power window motor (M3) is actuated.

Simultaneously the driver door control unit (DCMD) (A16) transmits the request "Passenger side power window comfort opening" to the interior CAN (CAN 2).
The passenger door module control unit (DCMP) (A17) then unlocks the passenger door side window by actuating the front passenger door power window motor (M4).
Simultaneously, to open the side windows, the driver door control unit (DCMD) (A16) transmits the request "Open sliding roof" via the interior CAN (CAN 2) to the cab signal acquisition and actuation module control unit (SCA) (A7). The cab signal acquisition and actuation module control unit (SCA) (A7) then actuates the sliding roof motor (M12) (with code (D8M) Sliding roof) or pop-up roof motor (M12a) (with code (D8N) Electric pop-up roof) to pop up. If the sliding roof or pop-up roof is popped up, this is recognized by the cab signal acquisition and actuation module control unit (SCA) (A7) via a Hall sensor in the sliding roof motor (M12) or power consumption of the pop-up roof motor (M12a) which transmits the message "Sliding roof status popped up" to the interior CAN (CAN 2).

The passenger door module control unit (DCMP) (A17) recognizes the position of the side window in the front passenger door power window motor (M4) via a Hall sensor and terminates the actuation automatically as soon as the side window is open.
If the side window is open, the passenger door module control unit (DCMP) (A17) transmits the message "Status of passenger side power window completely opened" to the interior CAN (CAN 2). The driver door control unit (DCMD) (A16) also recognizes via a Hall sensor in the driver door power window motor (M3) the position of the side window and completes the actuation automatically as soon as the side window is open. During this entire operation, the driver door control unit (DCMD) (A16) transmits the message "Comfort closing system active" to other control units for further processing to the interior CAN (CAN 2).

If the driver door control unit (DCMD) (A16) receives the messages "Status of front passenger side power window completely open" and "Sliding roof status popped up", receives the message "Comfort closing system active" from the interior CAN (CAN 2).
After unlocking successfully and during comfort opening, the driver door control unit (DCMD) (A16) transmits the message "Vehicle unlocked" to the interior CAN (CAN 2). Unlocking is acknowledged visually by the turn signal flashing once.
Parallel to the unlocking procedure, the cab signal acquisition and actuation module control unit (SCA) (A7) switches on the left interior lights (E31e1) and the right interior light (E32e1) for approx. 30 s (parameterizable). The maximum actuation time is 5 minutes.

2.1.2 Comfort closing for vehicle via transmitter key (S953)

If the signals from the transmitter key (S953) are received for longer than 2 s when locking, the electronic ignition lock (EIS) (S1) transmits the message "Request for radio remote control comfort closing" to the interior CAN (CAN 2). The remaining procedure for comfort closing via the transmitter key (S953) corresponds in the broadest sense to comfort opening via the transmitter key (S953), only the lock button the transmitter key (S953) however, it is not necessary to hold down to the lock button on the transmitter key for the entire comfort closing operation. For this reason the side windows and tilting/sliding roof with code (D8M) Sliding roof or pop-up roof with code (D8N) Electric pop-up roof or the electric pop-up roof with code are closed automatically. The message "Front passenger side power window comfort closing" is transmitted by the driver door control unit (DCMD) (A16) to the interior CAN (CAN 2) instead of the message "Front passenger power window comfort opening". The message "Close sliding roof" is transmitted by the driver door control unit (DCMD) (A16) to the interior CAN (CAN 2) instead of "Open sliding roof".

The power windows and the tilting/sliding roof (with code (D8M) Sliding roof) or the pop-up roof (with code (D8N) Electric pop-up roof), are closed rather than opened. After successfully locking the vehicle and during comfort closing, the driver door control unit (DCMD) (A16) transmits the message "Vehicle locked" to the interior CAN (CAN 2). It also transmits the request "Activate turn signal for locking" to the interior CAN (CAN 2) (vehicles without code (F8Z) Alarm system with interior protection). Locking is acknowledged visually by the turn signal flashing three times.

i On vehicles with code (F8Z) Alarm system with interior protection, actuation of the turn signal for acknowledgment is actuated only after successful arming of the antitheft alarm system (ATA) by the antitheft alarm system control unit (ATA) (A6).

3 Comfort opening/closing vehicle driver door lock

3.1 Comfort closing with vehicle key in driver door lock

If the vehicle key in the door lock (c) (lock cylinder) in the driver door is turned to the right stop to the locking position (a), the driver door central locking motor (M7) is actuated mechanically via a linkage and the driver door is locked. The locking operation is sensed by the driver door control unit (DCMD) (A16) via a driver door central locking motor switch (M7). When the vehicle key is held in the lock position for longer than 2 s, the driver door control unit (DCMD) (A16) starts the comfort closing operation in addition to the locking the vehicle. It is not necessary to hold the vehicle key in the locking position to continue the comfort closing function.

The driver door control unit (DCMD) (A16) closes the side windows on the driver side by itself by actuating the driver door power window motor (M3). The driver door control unit (DCMD) (A16) also transmits the messages "Comfort closing system active" and "Driver door lock switch in locking position" to the interior CAN (CAN 2). Almost simultaneously it transmits the request "Front passenger power window comfort closing" and the request "Close sliding roof" to the interior CAN (CAN 2). The passenger door module control unit (DCMP) (A17) and cab signal acquisition and actuation module control unit (SCA) (A7) are woken up by activities on the interior CAN (CAN 2) and receive the corresponding messages. The passenger door module control unit (DCMP) (A17) closes the front passenger door side window by actuating the front passenger door power window motor (M4) after receiving the request "Front passenger power window comfort closing".

Simultaneously for closing the side window with the comfort closing feature, the cab signal acquisition and actuation module control unit (SCA) (A7) receives the request "Close sliding roof" via the interior CAN (CAN 2) and then actuates the sliding roof motor (M12) (with code (D8M) Sliding roof) or pop-up roof motor (M12a) (with code (D8N) Electric pop-up roof) to close. Closing the tilting/sliding roof or pop-up roof is recognized by the cab signal acquisition and actuation module control unit (SCA) (A7) via the Hall sensor in the sliding roof motor (M12) (with code (D8M) Sliding roof) or power consumption of the pop-up roof motor (M12a) (with code (D8N) Electric pop-up roof) and transmits then the message "Sliding roof status completely closed" to the interior CAN (CAN 2). The passenger door module control unit (DCMP) (A17) recognizes the position of the side window in the front passenger door power window motor (M4) via a Hall sensor and terminates the actuation automatically as soon as the side window is closed.

If the side window is completely closed, the passenger door module control unit (DCMP) (A17) transmits the message "Status of passenger side power window completely closed" to the interior CAN (CAN 2). The driver door control unit (DCMD) (A16) also recognizes via a Hall sensor in the driver door power window motor (M3) the position of the side window and completes the actuation automatically as soon as the side window is closed. If the driver door control unit (DCMD) (A16) receives the messages "Status of front passenger side power window completely closed" and "Sliding roof status completely closed", receives the message "Comfort closing system active" from the interior CAN (CAN 2). After successfully locking the vehicle and during comfort closing, the driver door control unit (DCMD) (A16) transmits the message "Vehicle locked" to the interior CAN (CAN 2). Locking is acknowledged visually by the turn signal flashing three times.

3.2 Comfort opening with vehicle key in driver door lock

If the vehicle key is turned to the left stop to the release position (b) in the driver door lock (c), the driver door central locking motor (M7) is actuated mechanically via a linkage and the driver door is unlocked. The unlocking operation is sensed by the driver door control unit (DCMD) (A16) via a driver door central locking motor switch (M7). When the vehicle key is held in the unlock position for longer than
2 s, the driver door control unit (DCMD) (A16) starts the comfort opening procedure in addition to unlocking the vehicle door. The driver door control unit (DCMD) (A16) also transmits the messages "Comfort closing system active" and "Driver door lock switch in unlocking position" to the interior CAN (CAN 2). To continue comfort opening, vehicle key must be held in the unlock position. When the key is released, the driver door control unit (DCMD) (A16) interrupts comfort opening. The remaining procedure corresponds to comfort opening via transmitter key (S953).

4 Comfort opening/closing vehicle front passenger door lock

i The function "Comfort closing/opening via front passenger door" is parameterized to "OFF" at the factory and must be activated with Star Diagnosis on customer request.

Additional prerequisite:

- Parameter for function "Comfort closing/opening via front passenger door" ON set

4.1 Comfort closing with vehicle key in front passenger door lock

If the vehicle key in the front passenger door lock is turned to the right stop to the locking position (a), the front passenger door central locking motor (M8) is actuated mechanically via a linkage and the front passenger door is locked. The locking operation is sensed by the passenger door module control unit (DCMP) (A17) via a switch in the front passenger door central locking motor (M8).

The passenger door module control unit (DCMP) (A17) then transmits the messages "Wake-up for comfort closing activity" and "Front passenger door lock switch in locking position" to the interior CAN (CAN 2). When the driver door control unit (DCMD) (A16) receives the message "Front passenger door lock switch in locking position" for longer than 2 s (vehicle key held in locking position for longer than 2 s), the driver door control unit (DCMD) (A16) starts comfort closing in addition to locking the vehicle. It is not necessary to hold the vehicle key in the locking position to continue the comfort closing function. For this reason the side windows are closed automatically or the tilting/sliding roof code (D8M) Sliding roof or pop-up roof with code (D8N) Electric pop-up roof are closed automatically. The further procedure corresponds to comfort closing with the vehicle key in the driver door lock.

4.2 Comfort opening with vehicle key in front passenger door lock

If the vehicle key in the front passenger door lock is turned to the left stop to the unlocking position (a), the front passenger door central locking motor (M8) is actuated mechanically via a linkage and the front passenger door is unlocked. The unlocking operation is sensed by the passenger door module control unit (DCMP) (A17) via a switch in the front passenger door central locking motor (M8). The passenger door module control unit (DCMP) (A17) then transmits the messages "Wake-up for comfort closing activity" and "Front passenger door lock switch in unlocking position" to the interior CAN (CAN 2). When the driver door control unit (DCMD) (A16) receives the message "Front passenger door lock switch in unlocking position" for longer than 2 s (vehicle key held in locking position for longer than 2 s), the driver door control unit (DCMD) (A16) starts comfort opening in addition to locking the vehicle. To continue comfort opening, vehicle key must be held in the unlock position. The remaining procedure corresponds to comfort opening via transmitter key (S953).

5 Anti-pinch protection during comfort closing

One Hall sensor each is integrated into the driver door power window motor (M3) and front passenger door power window motor (M4). If the driver door control unit (DCMD) (A16) or passenger door module control unit (DCMP) (A17) does not sense a change in the Hall sensor signals while the side window is being raised and has already reached the center to upper position, this is evaluated as pinching. Raising is stopped immediately and the side window opens approx. s = 20 mm (reversing). When a new is request is received immediately thereafter, the operation is terminated again and the window then reversed, etc. If a new request received immediately after the 3rd request, only manual closing is possible.

The excess force limiter function is activated depending on the type of raising (automatic/manual). The power consumption of the driver door power window motor (M3) is evaluated by the driver door control unit (DCMD) (A16) and the power consumption of the front passenger door power window motor (M4) is evaluated by the passenger door module control unit (DCMP) (A17); if the power consumption increases a certain value, the raising operation is also interrupted and the power window must be normalized (learned in).

ℹ The side window must reverse before reaching a pinching force of F > 100 N.

6 Visual acknowledgment during comfort opening/closing

Comfort opening or unlocking the vehicle is acknowledged by flashing once. Comfort closing or locking is acknowledged by the turn signal flashing three times. For this reason, the request "Activate turn signal to unlock" or "Activate turn signal to lock" is transmitted simultaneously by the driver door control unit (DCMD) (A16) to the interior CAN (CAN 2) for comfort closing or comfort opening after successful locking or unlocking (vehicles without code (F8Z) Alarm system with interior protection). On vehicles with code (F8Z) Alarm system with interior protection, the turn signals are actuated for acknowledgment only when the antitheft alarm system (ATA) is activated or deactivated successfully. In this case the antitheft alarm system control unit (ATA) (A6) starts acknowledgment flashing by transmitting the corresponding request to the interior CAN (CAN 2)

The cab signal acquisition and actuation module control unit (SCA) (A7) receives this message via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1). The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blinkmaster and generates the flashing frequency for further processing for the signal acquisition and actuation module control unit, frame (SCH) (A8) and instrument cluster control unit (ICUC) (A1). For this purpose it transmits alternately at a defined frequency the messages "Left turn signal ON", right turn signal ON" and "Left turn signal OFF, right turn signal OFF" to the interior CAN (CAN 2). The cab signal acquisition and actuation module control unit (SCA) (A7) actuates the front vehicle lights. For this purpose the cab signal acquisition and actuation module control unit (SCA) (A7) directly actuates the following lamps:

- Left side turn signal light (E1e1)
- Right side turn signal light (E2e1)
- Left turn signal (E5e4) in left headlamp (E5)
- Right turn signal (E6e4) in right headlamp (E6)

Moreover, the flashing frequency is routed via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) by the central gateway control unit (CGW) (A2) to the exterior CAN (CAN 1).
Via the exterior CAN (CAN 1) the signal acquisition and actuation module control unit, frame (SCH) (A8) receives flashing frequency routed by the central gateway control unit (CGW) (A2) and then actuates the following lamps simultaneously:

- Left turn signal light (E3e4)
- Right turn signal light (E4e4)

The signal acquisition and actuation module control unit, frame (SCH) (A8) also receives the message "Flashing frequency" via the redundant LIN SCA/SCH (LIN 6) by the cab signal acquisition and actuation module control unit (SCA) (A7). XXX

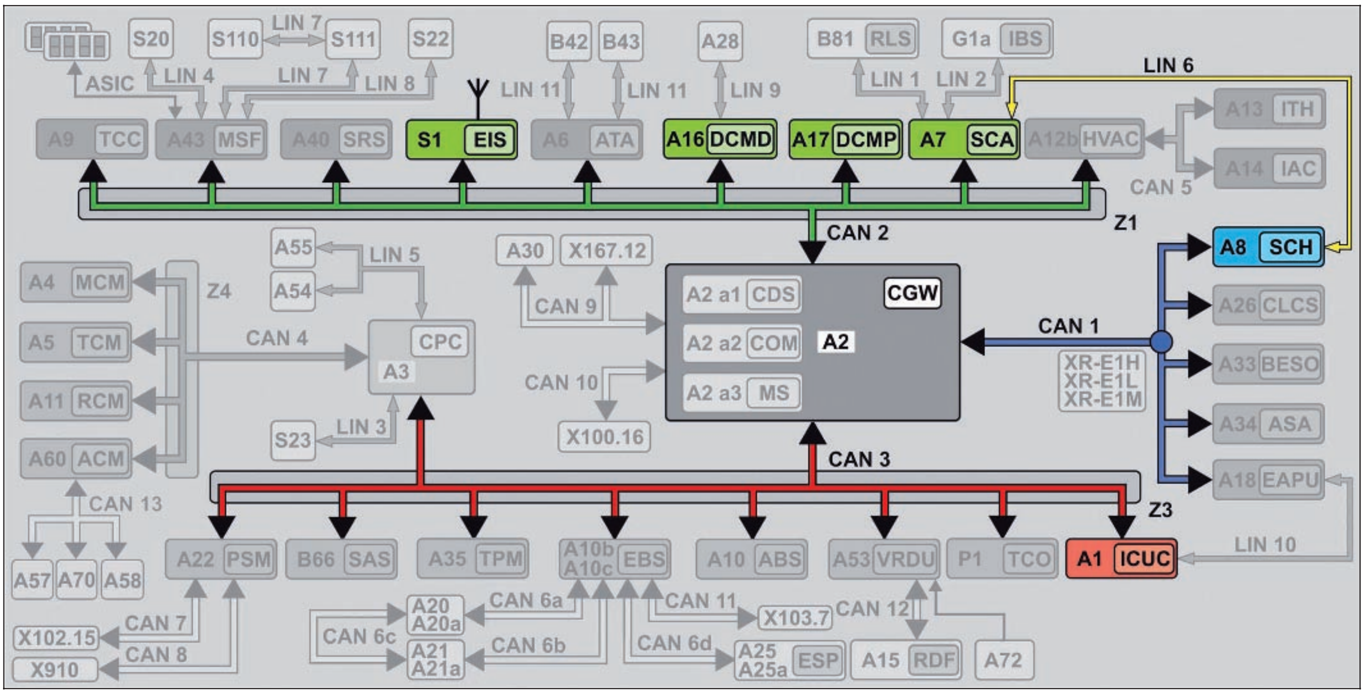
At the same time, the instrument cluster control unit (ICUC) (A1) receives the flashing frequency via the frame CAN (CAN 3) and CAN bus frame star point (Z3) routed by the central gateway control unit (CGW) (A2) and then actuates the following indicator lamps:

- Turn signal indicator lamp, vehicle, left (A1 h2)
- Turn signal indicator lamp, vehicle, right (A1 h4)

The flashing noises generated in the instrument cluster control unit (ICUC) are output via the center speaker (B50) A1

	Comfort locking system overall network		**Page 198**
	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**
	Driver door control unit (DCMD), component description	A16	**Page 349**
	Passenger door module control unit (DCMP), component description	A17	**Page 350**
	Headlamp, component description	E5, E6	**Page 446**
	Power window motor, component description	M3, M4	**Page 449**
	Door central locking motor, component description	M7, M8	**Page 450**
	Sliding roof motor, component description	M12 i Only on vehicles with (D8M) Sliding roof	**Page 451**
	Electronic ignition lock (EIS), component description	S1	**Page 460**
	Transmitter key, component description	S953	**Page 473**
	Multifunction antenna, component description	W15	**Page 478**

GF80.45-W-0001-02H	Comfort locking system overall network		☞GF



W80.45-1097-79

A1	*Instrument cluster (ICUC) control unit*
A2	*Central gateway control unit (CGW)*
A7	*Cab signal acquisition and actuation module control unit (SCA)*
A8	*Frame signal acquisition and actuation module control unit (SCH)*
A16	*Driver door module (DCMD) control unit*
A17	*Front passenger door module (DCMP) control unit*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
LIN 6	*LIN SCA/SCH redundance*
S1	*Electronic ignition lock (EIS)*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*

GF80.50-W-0003H	Anti-theft alarm system, function	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection

General information

After locking the vehicle the antitheft alarm system (ATA) monitors all relevant inputs and interface inlets with the central locking (CL) for its non-actuated state. If it detects a change of state in one of the monitored inputs, it triggers a country-specific acoustic and visual alarm. The acoustic alarm signals are output by the alarm siren (B42). Visual alarm signals are output via the turn signals and the high beams on the headlamps. The antitheft alarm system (ATA) is controlled by the antitheft alarm system control unit (ATA) (A6).

When armed, the antitheft alarm system (ATA) has the following tasks:

- Securing cab against unauthorized access from outside by monitoring doors and stowage box
- Securing the cab against unauthorized unlocking and tilting
- Securing vehicle systems against manipulation by monitoring maintenance flap and cab tilting
- Monitoring unauthorized disconnection of battery (circuit 30)
- Monitoring communication and supply voltage to alarm siren (B42)
- Monitoring motions in interior compartment (interior protection)
- Disconnection monitor for trailer or semitrailer and box body monitor for protection of cargo
- Monitoring fuel supply reservoir against manipulation on tank system

A further function of the antitheft alarm system (ATA) is alarm triggering by vehicle occupants (panic alarm).

Alarm actuation

Different conditions can lead to triggering of the antitheft alarm (ATA).

However, a prerequisite for actuating an alarm is, that the corresponding warning circuit is closed when the antitheft alarm system (ATA) is activated, i.e. is in the basic position at the time of the activation. With the exception of the panic alarm, which can be triggered at any time with the interior protection/panic alarm button (S42), an alarm can only be triggered in the activated or armed state.

The following conditions can trigger an alarm:

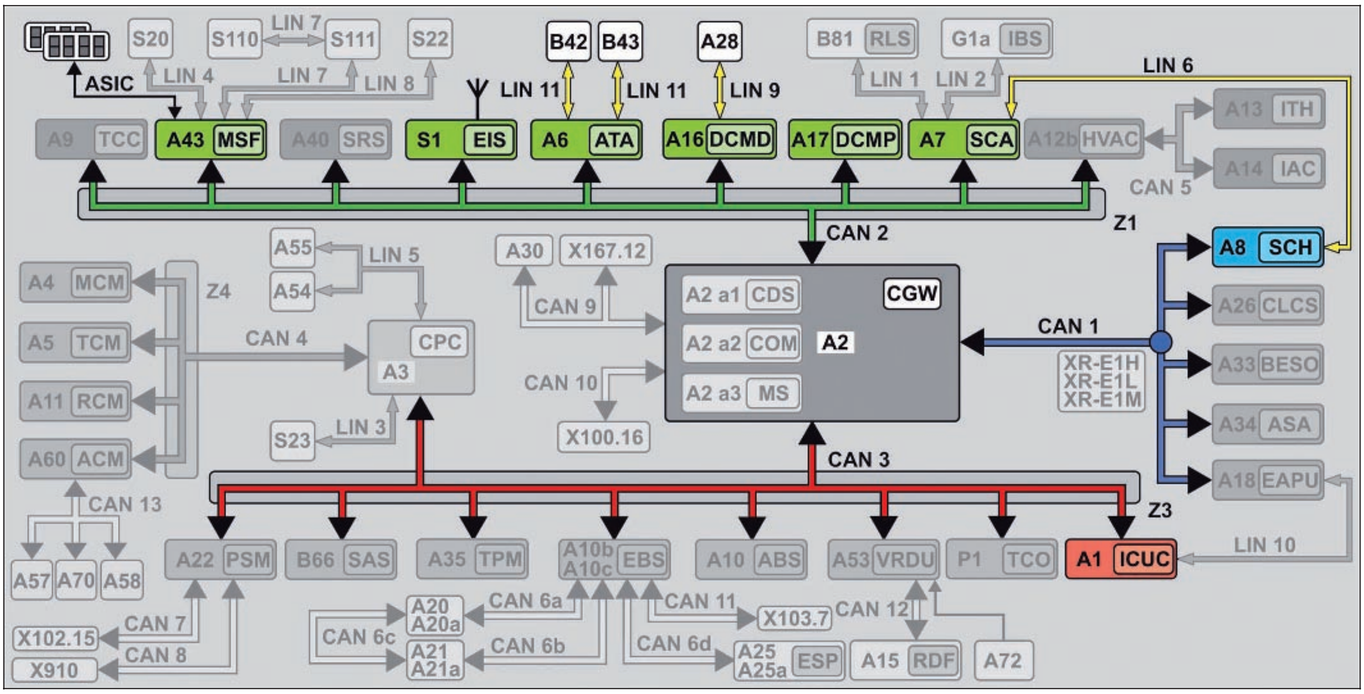
- Interruption of one of the subharnesses to the vehicle doors
- Unlocking vehicle via lock/unlock button (A28 s5) in driver switch group (A28) or via lock/unlock button (A29 s3) in front passenger switch group (A29)
- Unlocking or opening one of the vehicle doors
- Opening a stowage compartment
- Opening the front hatch
- Disconnecting the battery
- Interruption of communication to alarm siren (B42)
- Manipulation at supply voltage to alarm siren (B42)
- Unlocking or tilting the cab
- Opening a door on the box body
- Steeling fuel
- Motion in interior compartment with activated interior protection
- Unhitching of a trailer or semitrailer

i The function of the signal inputs can be set in the parameter settings. Here, the individual signals input can be used for alarm triggering or not. The alarm output function when decoupling the trailer or semitrailer, is parameterized to "OFF" at the factory and must be activated on customer request at the workshop with Star Diagnosis.

When the alarm is interrupted, the antitheft alarm system (ATA) remains armed and the vehicle doors locked.
The vehicle doors are unlocked only when the antitheft alarm system (ATA) is disarmed or deactivated.

i The alarm signals depend on the corresponding national version regarding type and duration. When the battery is disconnected only an acoustic alarm is triggered via the alarm signal siren.B42 For this purpose the alarm signal siren (B42) is equipped with its own rechargeable battery.

GF80.50-W-0003-01H	Anti-theft alarm system, overall network		☞GF



W80.50-1087-79

A1 *Instrument cluster (ICUC) control unit*
A2 *Central gateway control unit (CGW)*
A6 *Anti-theft alarm system (ATA) control unit*
A7 *Cab signal acquisition and actuation module control unit (SCA)*
A8 *Frame signal acquisition and actuation module control unit (SCH)*
A16 *Driver door module (DCMD) control unit*
A17 *Front passenger door module (DCMP) control unit*
A28 *Driver switch group*
A43 *Modular switch panel (MSF) control unit*
B42 *Alarm siren*
B43 *Interior protection sensor*
CAN 1 *Exterior-CAN*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
LIN 6 *LIN SCA/SCH redundance*
LIN 9 *Driver switch panel LIN*
LIN 11 *ATA-LIN*
S1 *Electronic ignition lock (EIS)*
Z1 *Cab instrument panel CAN bus star point*
Z3 *Frame CAN bus star point*

ASIC *ASIC data bus (Application System Integrated Circuit)*

GF80.50-W-0003-02H	Anti-theft alarm system, status messages		

General information
On the antitheft alarm system (ATA) different statuses can lead to a message in the multifunction display (A1 p1) of the instrument cluster control unit (ICUC) (A1). The messages are transmitted by the antitheft alarm system control unit (ATA) (A6) via the interior CAN (CAN 2) to the central gateway control unit (CGW) (A2), and from there, via the frame CAN (CAN 3) to the instrument cluster control unit (ICUC) (A1)
Basically two different categories of messages can be subdivided:

- Status feedback when activating (arming) antitheft alarm system (ATA)
- Status messages after alarm triggering

Status feedback when activating (arming) antitheft alarm system (ATA)
Status messages after triggering antitheft alarm system (ATA) are output, when the antitheft alarm system control unit (ATA) (A6) recognized, that one or more warning circuits are not closed. In many cases the driver receives a corresponding message to the alarm source(s) (warning circuits) to be checked in the instrument cluster control unit (ICUC) (A1). The driver now has approx. 30 s to close the open warning circuit. If the affected warning circuit is closed within this parameterizable time, it is monitored and the antitheft alarm system (ATA) acknowledges this by the turn signal is confirmed by flashing. If the open warning circuit is not closed, the status is not confirmed by flashing.

i The antitheft alarm system (ATA) is activated even if an acknowledgment signal is not output. However, only the functional alarm inputs are evaluated for alarm sensing.

Status messages after alarm triggering
Status messages after alarm actuation are indicated as soon as the driver switches on the ignition (c. 15) or the engine and an alarm is triggered during the absence of the driver.

Here it is not important, whether the antitheft alarm system (ATA) via disarmed by the driver during an active alarm or whether the antitheft alarm system (ATA) terminated the alarm output by itself after expiration of a parameterizable time. Status messages after an alarm actuation include information on the time (date, time) and the cause for the triggered alarm and must be acknowledged by the driver. If a number of events have lead to triggering the alarm, the status messages are listed chronologically one after another.

i The status messages in the following table are described as an example on the left-hand drive vehicle

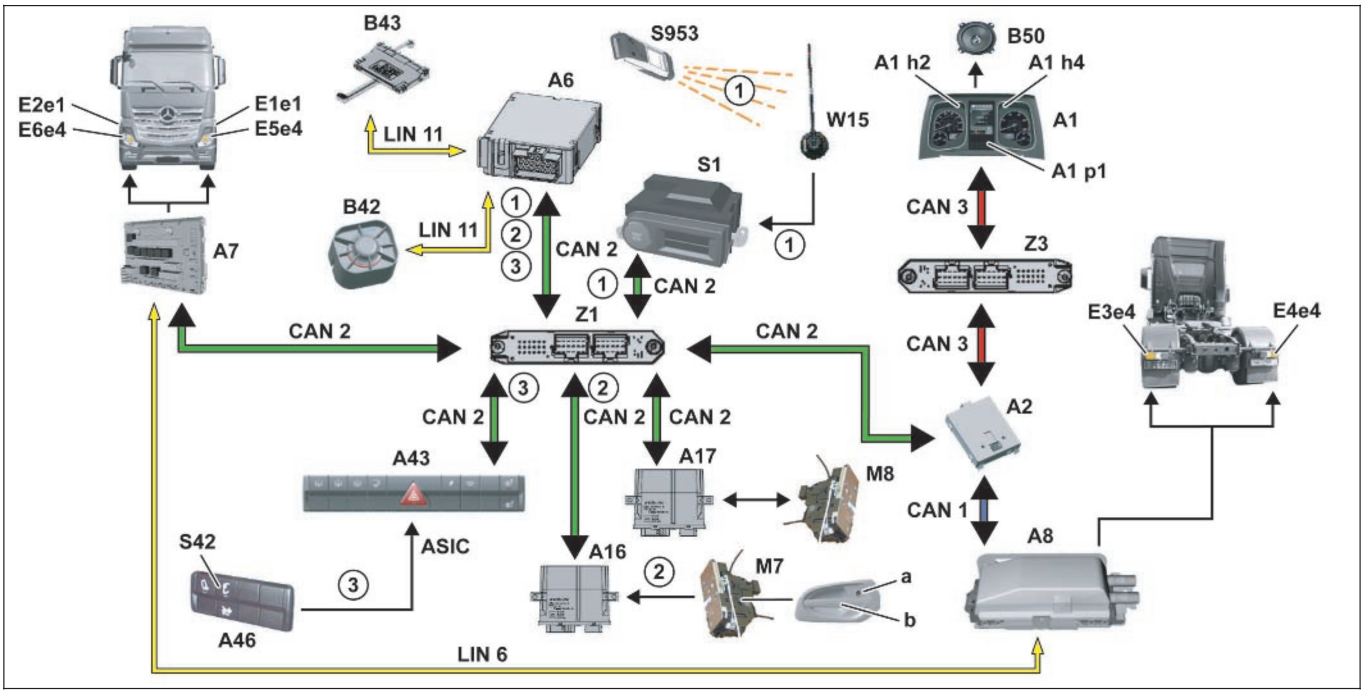
Type of message	Display of heading in display	Display text	Error/Malfunction
Status indication	Anti-theft alarm system	Please wait... ATA checks	After the antitheft alarm system (ATA) is activated, the antitheft alarm system control unit (ATA) (A6) checks whether the individual warning circuits are closed (duration approx. 30 s, parameterizable)
Status indication	Anti-theft alarm system	No trailer monitoring possible	During the check of the warning circuits, the antitheft alarm system control unit (ATA) (A6) recognizes a trailer or semitrailer, which is not equipped correspondingly for monitoring or monitoring the trailer or semitrailer is not possible due to malfunction.
Status indication	Anti-theft alarm system	Stowage box Driver side open Please check	The warning circuit on the left stowage box switch (S82) is not closed, thus the left stowage box was not closed correctly and the electrical lines are interrupted.
Status indication	Anti-theft alarm system	Stowage box Passenger side open Please check	The warning circuit on the right stowage box switch (S83) is not closed, thus the right stowage box was not closed correctly and the electrical lines are interrupted.

Type of message	Display of heading in display	Display text	Error/Malfunction
Status indication	Anti-theft alarm system	Maintenance flap Open Please check	The warning circuit to the maintenance flap button (S81) is not closed, thus the maintenance flap was not close correctly or the electrical line is interrupted.
Status indication	Anti-theft alarm system	Monitoring Cab locking Please check	The warning circuit to the driver side cab unlock switch (S36) or front passenger side cab unlock switch (S37) is not closed, or this reason the cab cannot be locked correctly or is tilted.
Status message after alarm triggering	Break-in attempt	Monitoring Interior compartment Time Date	Before switching on the ignition, an alarm is triggered due to interior protection actuated by the interior protection sensor (B43)
Status message after alarm triggering	Break-in attempt	Driver's door UNLOCKED Time Date	Before switching on the ignition, an alarm is triggered actuated by unlocking the cab from inside via the lock/unlock button (A28 s5),.
Status message after alarm triggering	Break-in attempt	Passenger door UNLOCKED Time Date	Before switching on the ignition, an alarm is triggered actuated by unlocking the front passenger door from inside via the lock/unlock button (A29 s3),.
Status message after alarm triggering	Break-in attempt	Monitoring Door unlocking Time Date	Before switching on the ignition, an alarm was triggered actuated by unlocking the driver or front passenger door with the mechanical key on the door lock or by forceful opening.
Status message after alarm triggering	Break-in attempt	Driver's door Open Time Date	Before switching on the ignition, an alarm was triggered actuated by the rotary tumbler switch in the driver door central locking motor switch (M7) due to opening the driver door or via the release lever on the interior door, by opening the driver door from outside by previously unlocking with the mechanical key on the door lock or by forceful opening.
Status message after alarm triggering	Break-in attempt	Passenger door Open Time Date	Before switching on the ignition, an alarm was triggered actuated by the rotary tumbler switch in the front passenger door central locking motor switch (M8) due to opening the driver door or via the release lever on the interior door, by opening the front passenger door from outside by previously unlocking with the mechanical key on the door lock or by forceful opening.
Status message after alarm triggering	Break-in attempt	Maintenance flap Open Time Date	Before switching on the ignition, an alarm was triggered actuated by the maintenance flap button (S81), due to an open maintenance flap.
Status message after alarm triggering	Break-in attempt	Stowage box Driver side open Time Date	Before switching on the ignition, an alarm was triggered actuated by the left stowage box switch (S82), due to an open left stowage box flap.
Status message after alarm triggering	Break-in attempt	Stowage box Passenger side open Time Date	Before switching on the ignition, an alarm was triggered actuated by the right stowage box switch (S83), due to an open right stowage box flap

Type of message	Display of heading in display	Display text	Error/Malfunction
Status message after alarm triggering	Break-in attempt	Monitoring Cab locking Time Date	Before switching on the ignition, an alarm was triggered actuated by the driver side cab unlock switch (S36) or front passenger side cab unlock switch (S37).
Status message after alarm triggering	Break-in attempt	Monitoring Trailer Time Date	Before switching on the ignition, an alarm is triggered actuated by decoupling the trailer sockets (trailer socket, 15-pin (X102.15), trailer socket 24S (X104.7), trailer socket 24N (X105.7)) or interruption of the subharnesses to the flasher or back-up lamp on the trailer or semitrailer.
Status message after alarm triggering	Break-in attempt	Monitoring Fuel tank level Time Date	Before switching on the ignition, an alarm is triggered actuated by removing fuel of $\geq$ 6 % or by interrupting the subharnesses to the fuel level sensor (B39) or fuel level sensor 2 (B39a).
Status message after alarm triggering	Break-in attempt	Panic alarm Time Date	Before switching on the ignition, an alarm is triggered actuated by the interior protection/panic alarm button (S42).

GF80.50-W-2002H	Activate antitheft alarm system, function	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection



W80.50-1075-79

Shown on vehicles with code (F8C) Multifunction and remote control key

1 *Activation via transmitter key*
2 *Activation via driver door lock switch*
3 *Activation via interior protection/panic alarm button*

A1 *Instrument cluster (ICUC) control unit*
A1H2 *Turn signal light indicator lamp, left side of vehicle*
A1h4 *Turn signal light indicator lamp, right side of vehicle*
A1 p1 *Multifunction display*
A2 *Central gateway control unit (CGW)*
A6 *Anti-theft alarm system (ATA) control unit*
A7 *Cab signal acquisition and actuation module control unit (SCA)*
A8 *Frame signal acquisition and actuation module control unit (SCH)*
A16 *Driver door module (DCMD) control unit*
A17 *Front passenger door module (DCMP) control unit*
A43 *Modular switch panel (MSF) control unit*
A46 *Instrument panel switch module 3*
B42 *Alarm siren*
B43 *Interior protection sensor*
B50 *Center speaker*
CAN 1 *Exterior-CAN*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
E1e1 *Left side turn signal light*
E2e1 *Right side turn signal light*
E3e4 *Left turn signal lamp*
E4e4 *Right turn signal lamp*
E5e4 *Left turn signal lamp*
E6e4 *Right turn signal lamp*
LIN 6 *LIN SCA/SCH redundance*
LIN11 *ATA-LIN*
M7 *Driver door central locking motor*
M8 *Front passenger door central locking motor*
S1 *Electronic ignition lock (EIS)*
S42 *Interior protection/panic alarm button*
S953 *Transmitter key*
W15 *Multifunction antenna*
Z1 *Cab instrument panel CAN bus star point*
Z3 *Frame CAN bus star point*

ASIC *ASIC data bus (Application System Integrated Circuit)*
a *Lock cylinder*
b *Door handle*

General
The antitheft alarm (ATA) can be activated or armed as follows:
- With the radio remote control on the transmitter key (S953)
- Manually from outside on the driver door or front passenger door lock with the key
- Manually from inside with the interior protection/panic alarm button (S42)
- With activated interior protection function
- With deselected (deactivated) interior protection function

Moreover, the antitheft alarm system (ATA) activates itself, when the vehicle is relocked automatically. Depending the parameterization, self-activation is possible when::
- the vehicle is locked from inside, without arming the ATA previously with the interior protection/panic alarm button (S42)
- the vehicle is locked manually from outside with the key without arming the ATA

After arming the antitheft alarm (ATA), all relevant switches, sensors and interface inputs are monitored as a matter of principle.

Requirements
The following basic conditions must be fulfilled for complete activation of the antitheft alarm (ATA):
- Power supply present for all affected control units and networking intact
- Ignition (circuit 15) switched off
- Driver and passenger door closed
- Voltage not exceptionally high or low
- Panic alarm switched off

In addition, the individual warning circuits in the antitheft alarm system (ATA) must be closed (basic position), to be monitored the next time the system is armed
- Both vehicle doors closed and locked
- Front hatch closed
- Stowage compartments closed
- Cab tilted back and locked
- Power supply to alarm siren (B42) intact
- Communication to alarm siren (B42) possible
- Communication to interior protection sensor (B43) possible

When all warning circuits are closed, activation of the antitheft alarm system (ATA) is acknowledged visually by momentarily actuating the turn signal lamps (flashing 3 times).
Moreover, the status LED in the interior protection/panic alarm button is actuated for the entire period of time the antitheft alarm system (ATA) is activated. This LED indicates the status by flashing continuously. S42

i The antitheft alarm (ATA) is active even when acknowledgment is not accomplished. However, only the functional alarm inputs are evaluated for alarm sensing. If the open alarm source is closed within a certain time, it is monitored as well and the status is flashed.

Activating ATA with radio remote control on transmitter key (S953)
The radio signals from the transmitter key (S953) are received by the electronic ignition lock (EIS) (S1) via the antenna (EIS) (W1) (with code (F8B) 2 remote control keys) or combination antenna (W15) (with code (F8C) Multifunction and remote control key).
When the lock button the radio remote control on the transmitter key (S953) is actuated, the electronic ignition lock (EIS) (S1) is woken up and the access authorization of the transmitter key (S953) is checked by the electronic ignition lock (EIS) (S1). If the access authorization is valid, the message "Global unlocking" is transmitted by the electronic ignition lock (EIS) (S1) to the interior CAN (CAN 2). The driver door module control unit (A16) is woken up by the CAN activities on the interior CAN bus (CAN 2) and, after receiving the message, actuates the driver door central locking motor (M7). As soon as the locking operation of the door is completed, the driver door module control unit (DCMD) (A16) sends the message "Driver door locked" to the interior CAN (CAN 2).

The front passenger door module control unit (DCMP) (A17) is woken up by the CAN activities on the interior CAN bus (CAN 2) and, after receiving the message "Global locking", actuates the front passenger door locking motor (M8). After successful completion of the locking operation, the message "Passenger door locked" is sent via the passenger compartment CAN bus (CAN 2). The antitheft alarm system control unit (ATA) (A6) is also woken up by the CAN activities on the interior CAN (CAN 2) and receives the messages "Global locking", "Vehicle door locked" and "Passenger door locked". Due to the message "Global locking" is arms the ATA. From the message "Driver door locked" and "Front passenger door locked", it recognizes that these alarm circuits are closed.
If all warning circuits are closed, activation of the antitheft alarm system (ATA) is indicated by the status LED flashing and acknowledged visually.

Manual activation of ATA with key on door lock
If the vehicle is locked with the vehicle key on the door lock cylinder (a) above the door handle (b), a door lock switch integrated into the driver door central locking motor (M7), authorized to wake up, signals "Close vehicle" to the driver door control unit (DCMD) (A16). The driver door control unit (DCMD) (A16) then changes from CAN SLEEP or POWER-DOWN-MODE to NORMAL-MODE and transmits the switching information as message "Driver side door lock switch in locking position" to the interior CAN (CAN 2). In addition, it transmits the request "Lock front passenger door" to the interior CAN (CAN 2).
Simultaneously, it actuates the driver door central locking motor (M7) and also sends the message "Driver door locked" to the interior CAN bus (CAN 2) after successful locking.

After receiving this message, the driver door control unit (DCMD) (A16) transmits the message "Vehicle locked" to the interior CAN (CAN 2). The Anti-theft alarm system control unit (ATA) (A6) is woken up by the activities on the interior CAN (CAN 2) and receives the messages "Driver side door lock switch in locking position", "Driver door locked", "Passenger door locked" and "Vehicle locked". If the message "Driver side door lock switch in locking position" is received for longer than 1.5 s, the antitheft alarm system control unit (ATA) (A6), recognizes, that the vehicle key is still in the locking position and activates (arms) the antitheft alarm system (ATA).

ATA activation when relocking
If the vehicle is unlocked with the transmitter key (S953) and none of the doors are opened within 25 s, the vehicle locks automatically. The driver door control unit (DCMD) (A16) then transmits the message "Vehicle locked" via the interior CAN (CAN 2) to the antitheft alarm system control unit (ATA) (A6) and the antitheft alarm system (ATA) is armed. Activation of the antitheft alarm system (ATA) is displayed the status LED flashing and acknowledged visually.

Activating interior protection function
The interior protection is activated (if not previously deselected for the next closing operation) t = 10 s after the last door is closed. The interior protection is ready for an alarm after another t = 10 s, because it is first necessary to calibrate the interior protection sensor to the vehicle interior.B43

When the interior protection/panic alarm button (S42) is pressed momentarily for < 3 s, the ATA is activated without interior protection the next time is activated (vehicle locked) Momentary actuation is conformed by the status LED permanently flashing in the interior protection/panic alarm button (S42). Since the interior protection/panic alarm button (S42) is authorized to wake up, the modular switch panel control unit (MSF) (A43) changes from CAN-SLEEP or POWER-DOWN-MODE to NORMAL-MODE and transmits the message "Interior compartment ATA activation pressed" to the interior CAN (CAN 2).
The antitheft alarm system control unit (ATA) (A6) receives the message "Interior compartment ATA activation pressed" and deactivates for the following ATA activation the interior protection For this reason the interior compartment is not monitored the next time the ATA is activated. If all alarm circuits are closed, activation of the antitheft alarm (ATA) is indicated visually.

The CAN activities on the interior CAN (CAN 2) wake up the front passenger door module control unit (DCMP) (A17) which receives the request "Lock front passenger door" from the driver door module control unit (DCMD) (A16) and actuates the front passenger door locking motor (M8).
As soon as the locking operation of the front passenger door is completed, the front passenger door module control unit (DCMP) (A17) sends the message "Front passenger door locked" to the interior CAN (CAN 2). This switching information is obtained in the same manner as the driver door control unit (DCMD) (A16) by the contact switch installed in the front passenger door central locking motor.

From the message "Driver door locked", "Front passenger door locked" and "Vehicle locked", it recognizes that these alarm circuits are closed. Activation of the antitheft alarm system (ATA) is displayed the status LED flashing and acknowledged visually.

i On vehicles with code (F8F) Comfort locking system, the left side window is closed simultaneously by the driver door control unit (DCMD) (A16) and the right side window by the passenger door module control unit (DCMP) (A17). The tilting/sliding roof is also closed by the cab signal acquisition and actuation module control unit (SCA) (A7).

Activating ATA with deselected interior protection
The antitheft alarm system (ATA) can be activated, for example, with the driver in the cab by actuating the interior protection/panic alarm button (S42) with deselected (deactivated) interior protection function.

The interior protection/panic alarm button (S42) is a signal switch. This means, the interior protection/panic alarm button (S42) contains an electronic circuit which reads actuation of the switch and converts it to a message. If the upper rocker on the interior protection/panic alarm button (S42) in the instrument panel switch module 3 (A46) is actuated, the installed electronic circuit transmits the message "Interior compartment ATA activation pressed" to the modular switch panel control unit (MSF) (A43) via the ASIC data bus (ASIC).

Manually activating ATA with interior protection/panic alarm button (S42) function
If the upper rocker on the interior protection/panic alarm button (S42) is actuated for longer than 3 s and the message " "Interior ATA activation pressed" is received for longer than min. 3 s by the antitheft alarm system control unit (ATA) (A6), the antitheft alarm system control unit (ATA) (A6) activates antitheft alarm system (ATA) automatically with deactivated interior protection. The antitheft alarm system control unit (ATA) (A6) also transmits the request "Close vehicle" to the interior CAN (CAN 2). The vehicle is then locked by the driver door control unit (DCMD) (A16) and passenger door module control unit (DCMP) (A17). Activation of the antitheft alarm system (ATA) is displayed the status LED flashing and acknowledged visually.

Self-activation of ATA
Additional prerequisite:

- Parameter for function "Self-arming of ATA" set to "YES" (standard parameterization on vehicles with code (513L) Belgium, code (517L) Denmark, code (555L) Norway, code (569L) Sweden and code (675L) South-African Republic)

The antitheft alarm system (ATA) can activate itself when:

- the vehicle is locked from inside with the lock/unlock button (A28 s5) or lock/unlock button (A29 s3) without arming the ATA with the interior protection/panic alarm button (S42) and the time for self-arming is expired
- the vehicle is locked manually from the outside with the key without arming the ATA and the time for automatic arming has expired,

The driver door control unit (DCMD) (A16) reads in via driver switch panel LIN (LIN 9) the signals from the lock/unlock button (A28 s5) in the driver switch group (A28) as well as the switch position of the door lock switch and the rotary tumbler switch in the driver door central locking motor (M7) via direct lines. If the status changes, for example, when the driver door is locked or the unlock/lock button (A28 s5) is actuated, the driver door module control unit (DCMD) (A16) transmits a corresponding message to the antitheft alarm system control unit (ATA) (A6) via the interior CAN (CAN 2). Parallel to this, the signals from the lock/unlock button (A29 s3) in the front passenger switch group (A29) and switch position of the door lock switch and rotary tumbler switch in the front passenger door central locking motor (M8) are sensed by the passenger door module control unit (DCMP) (A17) via direct lines. The passenger door module control unit (DCMP) (A17) processes the information and transmits it also within corresponding messages via the interior CAN (CAN 2) to the antitheft alarm system control unit (ATA) (A6).

The antitheft alarm system control unit (ATA) (A6) receives the messages and evaluates them. If the antitheft alarm system control unit (ATA) (A6) recognizes that the vehicle doors have been opened and then locked manually from the outside with the key without arming the ATA (door lock switch actuated for less than 1.5 s), and the ignition (circuit 15) is "OFF" or that the vehicle has been locked from the inside with the lock/unlock button (A28 s5) or the lock/unlock button (A29 s3), without arming the ATA with the interior protection/panic alarm button (S42), the ATA arms itself after expiration of the time for automatic arming (set to 60 s at factory) and then monitors all connected warning circuits.

The self-activation of the antitheft alarm system (ATA) is acknowledged visually.

Status feedback and visual acknowledgment after activation

i If acknowledgment is not accomplished, check vehicle doors, stowage compartment, front hatch and cab for proper locking. In the event of a sensor malfunction, acknowledgment is also not accomplished. In many cases the driver receives a corresponding message to the alarm source(s) in the multifunction display to be checked in the instrument cluster control unit (ICUC) (A1).

Status feedback
The activated ATA is displayed by the ATA function display flashing permanently in the interior protection/panic alarm button (S42). The status LED in the interior protection/panic alarm button (S42) is actuated directly by the antitheft alarm system control unit (ATA) (A6).

Visual acknowledgment

i It is possible to set which lights are to be actuated for visual indication. However, as a standard feature, all listed lamps are actuated at a frequency of 2 Hz.

Successful arming is also acknowledged by the turn signal flashing three times.
For this purpose the antitheft alarm system control unit (ATA) (A6) simultaneously transmits the message "Turn signal for ATA activation ON" via the interior CAN (CAN 2) and via the cab instrument panel CAN Bus star point (Z1) to the cab signal acquisition and actuation module (SCA) (A7). The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blinkmaster and generates the flashing frequency for further processing for the signal acquisition and actuation module control unit, frame (SCH) (A8) and instrument cluster control unit (ICUC) (A1).

For this purpose it transmits alternately at a defined frequency the messages "Left turn signal ON", right turn signal ON" and "Left turn signal OFF, right turn signal OFF" to the interior CAN (CAN 2). The cab signal acquisition and actuation module control unit (SCA) (A7) actuates the vehicle lamps and the following lamps for acknowledgment flashing:

- Left side turn signal light (E1e1)
- Right side turn signal light (E2e1)
- Left turn signal (E5e4) in left headlamp (E5)
- Right turn signal (E6e4) in right headlamp (E6)

Moreover, the flashing frequency is routed via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) by the central gateway control unit (CGW) (A2) to the exterior CAN (CAN 1).

Via the exterior CAN (CAN 1) the signal acquisition and actuation module control unit, frame (SCH) (A8) receives flashing frequency routed by the central gateway control unit (CGW) (A2) and then actuates the following lamps simultaneously:

- Left turn signal light (E3e4)
- Right turn signal light (E4e4)

In addition to the CAN message, the signal acquisition and actuation module control unit, frame (SCH) (A8) receives the flashing frequency via the redundant LIN SCA/SCH (LIN 6) from cab signal acquisition and actuation module control unit (SCA) (A7).

Simultaneously the instrument cluster control unit (ICUC) (A1) receives via frame CAN (CAN 3) and CAN bus frame star point (Z3) the flashing frequency routed by the central gateway control unit (CGW) (A2) and then actuates the following indicator lamps:

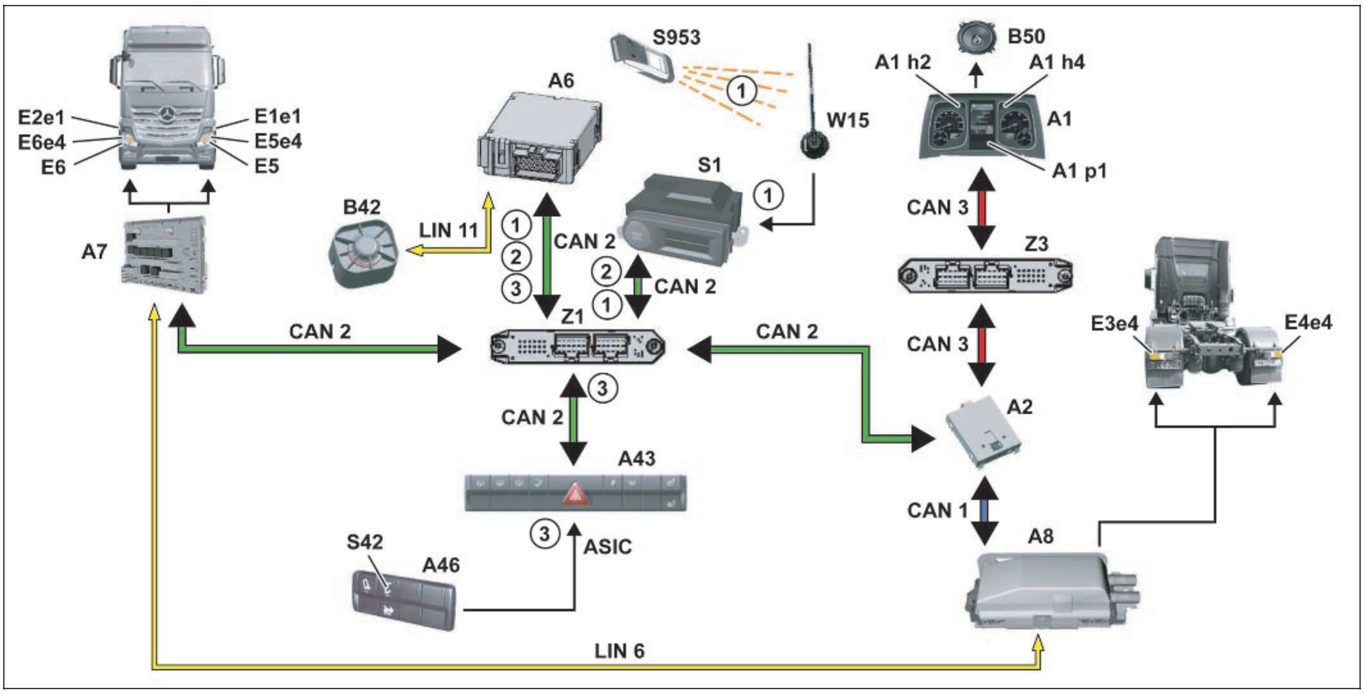
- Turn signal indicator lamp, vehicle, left (A1 h2)
- Turn signal indicator lamp, vehicle, right (A1 h4)

The flashing noises generated in the instrument cluster control unit (ICUC) are output via the center speaker (B50) A1

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Anti-theft alarm system control unit (ATA), component description	A6	**Page 338**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**
	Driver door control unit (DCMD), component description	A16	**Page 349**
	Passenger door module control unit (DCMP), component description	A17	**Page 350**
	Driver switch group, component description	A28	**Page 359**
	Front passenger switch group, component description	A29	**Page 360**
	Modular switch panel (MSF) control unit component description	A43	**Page 370**
	Instrument panel switch modules, component description	A46	**Page 372**
	Alarm siren, component description	B42	**Page 418**
	Interior protection, component description	B43	**Page 419**
	Headlamp, component description	E5, E6	**Page 446**
	Door central locking motor, component description	M7, M8	**Page 450**
	Electronic ignition lock (EIS), component description	S1	**Page 460**
	Transmitter key, component description	S953	**Page 473**
	Multifunction antenna, component description	W15	**Page 478**

GF80.50-W-2003H	Deactivate antitheft alarm system, function	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection



W80.50-1079-79

Shown on vehicles with code (F8C)
Multifunction and remote control key

1	*Deactivation via transmitter key*
2	*Deactivation via ignition lock*
3	*Deactivation via interior protection/panic alarm button*
A1	*Instrument cluster (ICUC) control unit*
A1 h2	*Turn signal light indicator lamp, left side of vehicle*
A1h4	*Turn signal light indicator lamp, right side of vehicle*
A1 p1	*Multifunction display*
A2	*Central gateway control unit (CGW)*
A6	*Anti-theft alarm system (ATA) control unit*
A7	*Cab signal acquisition and actuation module control unit (SCA)*
A8	*Frame signal acquisition and actuation module control unit (SCH)*
A43	*Modular switch panel (MSF) control unit*
A46	*Instrument panel switch module 3*
B42	*Alarm siren*
B50	*Center speaker*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
E1e1	*Left side turn signal light*
E2e1	*Right side turn signal light*
E3e4	*Left turn signal lamp*
E4e4	*Right turn signal lamp*
E5	*Left headlamp*
E5e4	*Left turn signal lamp*
E6	*Right headlamp*
E6e4	*Right turn signal lamp*
LIN 6	*LIN SCA/SCH redundance*
LIN 11	*ATA-LIN*
S1	*Electronic ignition lock (EIS)*
S42	*Interior protection/panic alarm button*
S953	*Transmitter key*
W15	*Multifunction antenna*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*
ASIC	*ASIC data bus (Application System Integrated Circuit)*

General information
The antitheft alarm (ATA) can be deactivated or disarmed as follows:
- With radio frequency remote control
- via the ignition lock
- Manually from inside with interior protection/panic alarm button (S42) (only if antitheft alarm system (ATA) is activated previously via interior protection/panic alarm button (S42) or to complete panic alarm)

A triggered alarm can be terminated in the same manner. However, when an alarm is terminated, the antitheft alarm (ATA) remains armed and the vehicle doors remain locked.

Status feedbacks
After deactivating or disarming the antitheft alarm system (ATA) the turn signals are acknowledged visually by actuation.

Alarm information
If an alarm is triggered during the absence of the driver, the driver is informed after switching on the ignition (circuit 15) via the multifunction display (A1 p1) by the instrument cluster control unit (ICUC) (A1) with a corresponding message.
This message contains information on the time (date, time) and cause of the alarm given and must be acknowledged by the driver.

Preconditions
- Power supply present for all affected control units and networking intact
- Anti-theft alarm system (ATA) activated

Deactivating ATA with radio remote control on transmitter key (S953)
The radio signals from the transmitter key (S953) are received by the electronic ignition lock (EIS) (S1) via the antenna (EIS) (W1) (with code (F8B) 2 remote control keys) or combination antenna (W15) (with code (F8C) Multifunction and remote control key).
When the unlock button the radio remote control on the transmitter key (S953) is actuated, the electronic ignition lock (EIS) (S1) is woken up and the access authorization of the transmitter key (S953) is checked by the electronic ignition lock (EIS) (S1). If the access authorization is valid, the message "Global unlocking" or "Selective unlocking" is transmitted to the interior CAN (CAN 2). The antitheft alarm system control unit (ATA) (A6) is woken up by CAN activities on the interior CAN (CAN 2), receives the message "Global unlocking" or "Selective unlocking" and then disarms (deactivates) the antitheft alarm system (ATA).
Deactivation of the antitheft alarm system (ATA) is acknowledged visually.

An alarm output by the antitheft alarm system control unit (ATA) (A6) is also discontinued, when the antitheft alarm system (ATA) has actuated an alarm. Simultaneously the driver door control unit (DCMD) (A16) and passenger door module control unit (DCMP) (A17) are woken up by the activities on the interior CAN (CAN 2). The driver door is unlocked on request by the messages "Global unlocking" or "Selective unlocking" by the driver door control unit (DCMD) (A16) by actuation from the driver door central locking motor (M7). When the message "Global unlocking" is received, the front passenger door is unlocked in addition by the passenger door module control unit (DCMP) (A17) via the front passenger door central locking motor (M8).

i If the message "Global unlocking" or "Selective unlocking" is transmitted by the electronic ignition lock (EIS) (S1) to the interior CAN (CAN 2), depends on whether global unlocking or selective unlocking (only unlocking driver door) is adjusted on the transmitter key (S953).

Deactivating ATA via ignition lock, function
Additional prerequisite:
- Parameter "Deactivation via ignition lock" set to yes

If the transmitter key (S953) or multifunction key is inserted into the electronic ignition lock (EIS) (S1) and ignition (circuit 15) is switched on, the electronic ignition lock (EIS) (S1) transmits the message "Ignition ON (circuit 15)" to the interior CAN (CAN 2).

The antitheft alarm system control unit (ATA) (A6) is woken up by the CAN activities on the interior CAN (CAN 2) and receives this message.
Then it disarms (deactivates the antitheft alarm system (ATA).
Deactivation of the antitheft alarm system (ATA) is acknowledged visually. An interrupted alarm from the antitheft alarm system control unit (ATA) (A6) is also interrupted, when the antitheft alarm system (ATA) is in alarm triggering. XXX

Manually deactivating ATA with interior protection/panic alarm button (S42), function
Additional prerequisite:
- ATA activated previously via interior protection/panic alarm button (S42)

If the antitheft alarm system (ATA) is activated by actuating the interior protection/panic alarm button (S42), it can be deactivated by a reactuating the interior protection/panic alarm button (S42).
The interior protection/panic alarm button (S42) is a signal switch. This means, the interior protection/panic alarm button (S42) has an electronic circuit which reads in the switch actuation and converts it to a message.

If the upper rocker on the interior protection/panic alarm button (S42) in the instrument panel switch module 3 (A46) is actuated again after previous activation for 3 s or longer, the installed electronic circuit transmits via ASIC data bus (ASIC) the message "Interior ATA activation pressed" to the modular switch panel control unit (MSF) (A43).
The modular switch panel control unit (MSF) (A43) then transmits this message via the interior CAN (CAN 2) to the antitheft alarm system control unit (ATA) (A6). The antitheft alarm system control unit (ATA) (A6) disarms the antitheft alarm system (ATA) or interrupt an alarm output.

Manually deactivating panic alarm of ATA with interior protection/panic alarm button (S42), function
If the panic alarm is activated, it can be deactivated only by reactuating the interior protection/panic alarm button (S42).
If the lower rocker on the interior protection/panic alarm button (S42) in the instrument panel switch panel 3 (A46) actuated again after triggering the panic alarm, the installed electronic circuit of the interior protection/panic alarm button (S42) via the ASIC data bus (ASIC) the message "Panic alarm button pressed" to the modular switch panel control unit (MSF) (A43).
The modular switch panel control unit (MSF) (A43) relays this message then via the interior CAN (CAN 2) to the antitheft alarm system control unit (ATA) (A6),which interrupts the panic alarm.

Terminating acoustic alarm
The terminate the acoustic alarm, the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone OFF" via the ATA-LIN (LIN 11) to the alarm siren (B42). The alarm siren then interrupts immediately the acoustic alarm.

Terminating visual alarm
To terminate the visual alarm, the antitheft alarm system control unit (ATA) (A6) receives the messages "Activate high beams for alarm signal" and "Activate turn signals for alarm signal" from the interior CAN (CAN 2).
Then the cab signal acquisition and actuation module control unit (SCA) (A7) terminates the last started flashing period and receives the flashing frequency from the interior CAN (CAN 2) and redundance LIN SCA/SCH (LIN 6). The signal acquisition and actuation module control unit, frame (SCH) (A8) then terminates the actuation of the rear turn signals and the instrument cluster control unit (ICUC) (A1) the actuation of the turn signal indicator lamps.

Visual acknowledgment after deactivation, function
If all systems are okay and all prerequisites fulfilled, deactivation of the alarm system is acknowledged by the turn signal flashing once.
For this purpose, the message "Flashing signal for ATA deactivation ON" is sent to the cab signal acquisition and actuation module control unit (SCA) (A7) via the interior CAN (CAN 2) and cab instrument CAN bus star point (Z1) at the same time the antitheft (ATA) is disarmed by the alarm system control unit (ATA) (A6).
The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blink master and generates the flashing frequency for further processing for the signal acquisition and actuation module control unit, frame (SCH) (A8) and instrument cluster control unit (ICUC) (A1). For this purpose it transmits alternately at a defined frequency the messages "Left turn signal ON", right turn signal ON" and "Left turn signal OFF, right turn signal OFF" to the interior CAN (CAN 2).

The cab signal acquisition and actuation module control unit (SCA) (A7) actuates the front vehicle lamps and actuates the following lamps:

- Left side turn signal light (E1e1)
- Right side turn signal light (E2e1)
- Left turn signal (E5e4) in left headlamp (E5)
- Right turn signal (E6e4) in right headlamp (E6)

i It is possible to set the lights to be actuated. However, as a standard feature, all listed lamps are actuated at a frequency of 2 Hz.

Moreover, the flashing frequency is routed via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) by the central gateway control unit (CGW) (A2) to the exterior CAN (CAN 1).

Via the exterior CAN (CAN 1) the signal acquisition and actuation module control unit, frame (SCH) (A8) receives flashing frequency routed by the central gateway control unit (CGW) (A2) and then actuates the following lamps simultaneously:

- Left turn signal light (E3e4)
- Right turn signal light (E4e4)

i In addition to the CAN message, the signal acquisition and actuation module control unit, frame (SCH) (A8) receives the flashing frequency via the redundant LIN SCA/SCH (LIN 6) from the cab signal acquisition and actuation module control unit (SCA) (A7).

Simultaneously, the instrument cluster control unit (ICUC) (A1) receives the flashing frequency via the frame CAN (CAN 3) and CAN bus frame star point (Z3) routed by the central gateway control unit (CGW) (A2) and then actuates the following indicator lamps:

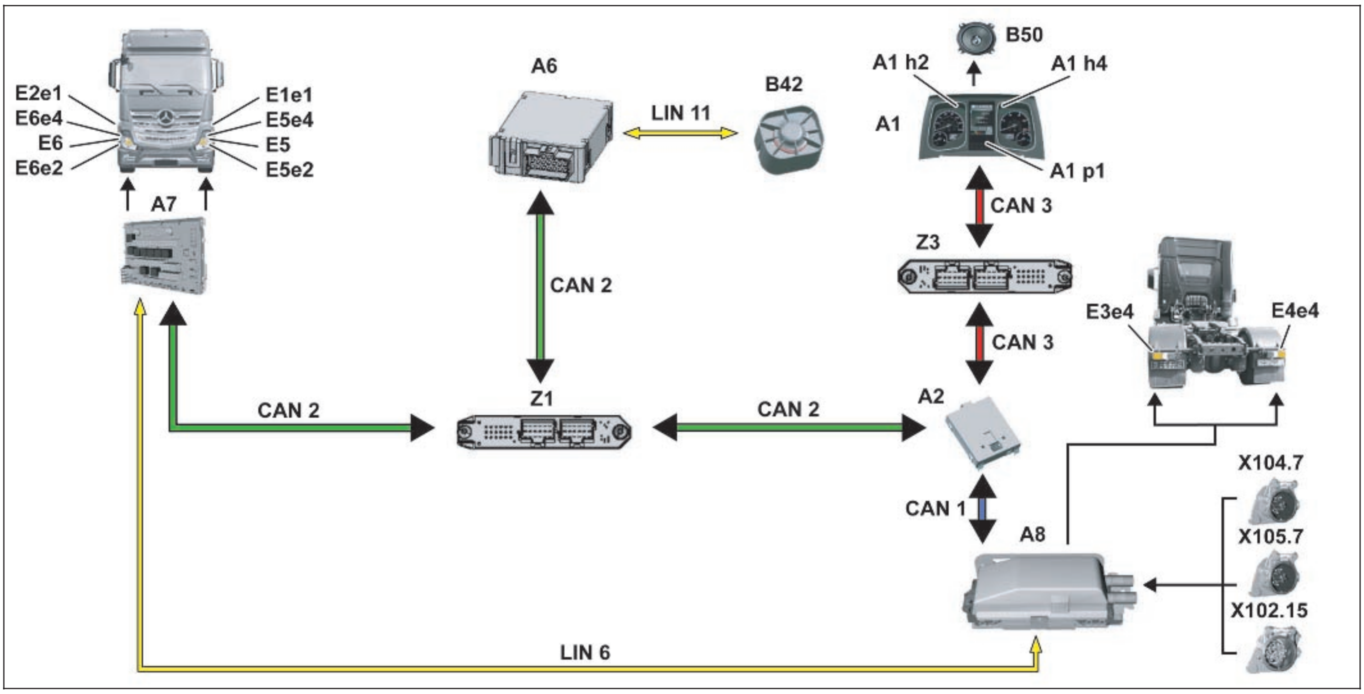
- Turn signal indicator lamp, vehicle, left (A1 h2)
- Turn signal indicator lamp, vehicle, right (A1 h4)

The flashing noises generated in the instrument cluster control unit (ICUC) (A1) are output via the center speaker (B50).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Anti-theft alarm system control unit (ATA), component description	A6	**Page 338**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**
	Modular switch panel (MSF) control unit component description	A43	**Page 370**
	Instrument panel switch modules, component description	A46	**Page 372**
	Alarm siren, component description	B42	**Page 418**
	Headlamp, component description	E5, E6	**Page 446**
	Electronic ignition lock (EIS), component description	S1	**Page 460**
	Transmitter key, component description	S953	**Page 473**
	Multifunction antenna, component description	W15	**Page 478**

GF80.50-W-3011H	Triggering alarm by disconnecting trailer or semitrailer, function	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection



W80.50-1073-79

A1 *Instrument cluster (ICUC) control unit*
A1H2 *Turn signal light indicator lamp, left side of vehicle*
A1h4 *Turn signal light indicator lamp, right side of vehicle*
A1 p1 *Multifunction display*
A2 *Central gateway control unit (CGW)*
A6 *Anti-theft alarm system (ATA) control unit*
A7 *Cab signal acquisition and actuation module control unit (SCA)*
A8 *Frame signal acquisition and actuation module control unit (SCH)*
B42 *Alarm siren*
B50 *Center speaker*
CAN 1 *Exterior-CAN*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
E1e1 *Left side turn signal light*
E2e1 *Right side turn signal light*
E3e4 *Left turn signal lamp*
E4e4 *Right turn signal lamp*
E5 *Left headlamp*
E5e2 *Left main beam*
E5e4 *Left turn signal lamp*
E6 *Right headlamp*
E6e2 *Right main beam*
E6e4 *Right turn signal lamp*
LIN6 *LIN SCA/SCH redundance*
LIN 11 *ATA-LIN*
X102.15 *Trailer socket (15-pin)*
X104.7 *Trailer socket 24S*
X105.7 *Trailer socket 24N*
Z1 *Cab instrument panel CAN bus star point*
Z3 *Frame CAN bus star point*

General information
The following statuses can trigger an alarm regarding a manipulation of the trailer or semitrailer:
- Interruption of one of the subharnesses to the trailer sockets
- Decoupling couplings from trailer sockets
- Removing lamp units from trailer or semitrailer

If one of these circumstances occurs, a country-specific visual and acoustic alarm is output.

i The alarm output function when decoupling the trailer or semitrailer, is parameterized to "OFF" at the factory and must be activated on customer request at the workshop with Star Diagnosis.

Once tripped, the alarm can be terminated by:
- the release command via the radio remote control on the transmitter key (S953)
- by switching on ignition (circuit 15 ON), when the function "Disarming via ignition lock" is parameterized
- by the interior protection/panic alarm button (S42), only when the antitheft alarm system (ATA) is activated previously via the interior protection/panic alarm button (S42)

Requirements
- Warning circuit for trailer monitoring parameterized
- The warning circuit was closed (electrical connections okay) when the antitheft alarm system (ATA) was activated or armed.
- When the antitheft alarm (ATA) is activated or armed, a trailer or semitrailer is recognized.

Function

i The function is described on vehicles with trailer as an example and applies analogously for semitrailer trucks.

The trailer is monitored via electrical lines to the turn signals and back-up in the trailer. They are not illuminated in this case. The signal acquisition and actuation module control unit, frame (SCH) (A8) flashes the turn signals after receiving the message "Activate trailer monitor". The back-up lamp is also monitored by resistance measurement. If the electrical line to trailer is interrupted when the antitheft alarm system (ATA) is activated, for example by disconnecting one of the trailer sockets (trailer socket, 15-pin (X102.15), trailer socket 24S (X104.7), trailer socket 24N (X105.7)), the signal acquisition and actuation module control unit, frame (SCH) (A8) transmits the message "Trailer monitor alarm" via the exterior CAN (CAN 1).

This message is routed by the central gateway control unit (CGW) (A2) to the interior CAN (CAN 2) and from there received via the cab instrument panel CAN Bus star point (Z1) by the antitheft alarm system control unit (ATA) (A6). The antitheft alarm system control unit (ATA) (A6) then immediately triggers an acoustic and visual alarm.

i A triggered alarm is indicated to the driver when the ignition is switched on via the multifunction display (A1 p1) in the instrument cluster control unit (ICUC) (A1).

Alarm output function

Acoustic alarm
If an alarm is recognized by the antitheft alarm system control unit (ATA) (A6), the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone ON" via the ATA-LIN (LIN 11) to the alarm siren (B42). From this time on, the acoustic alarm is controlled completely by the alarm siren (B42). The entire duration of the acoustic alarm is approx. 30 s, however, can be set to meet various legal regulations. To terminate the acoustic alarm, the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone OFF" to the alarm siren (B42).

Visual alarm
Moreover, simultaneously the antitheft alarm system control unit (ATA) (A6) transmits via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) the messages "Activate high beams for alarm signal" and "Activate turn signals for alarm signal" to the cab signal acquisition and actuation module control unit (SCA) (A7). The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blink master and generates the flashing frequency for further processing for the signal acquisition and actuation module control unit, frame (SCH) (A8) and instrument cluster control unit (ICUC) (A1). For this purpose it transmits alternately at a defined frequency the messages "Left turn signal ON", right turn signal ON" and "Left turn signal OFF, right turn signal OFF" to the interior CAN (CAN 2). The cab signal acquisition and actuation module control unit (SCA) (A7) takes over actuates of the front vehicle lamps.

For this purpose, the cab signal acquisition and actuation module control unit (SCA) (A7) directly actuates the following alarm by itself when a visual alarm is triggered:

- Left side turn signal light (E1e1)
- Right side turn signal light (E2e1)
- Left high beam (E5e2) in left headlamp (E5)
- Right high beam (E6e2) in right headlamp (E6)
- Left turn signal (E5e4) in left headlamp (E5)
- Right turn signal (E6e4) in right headlamp (E6)

If the high beams are already switched on at the time the alarm is triggered, they are not used for the visual alarm and only the turn signals flash.

i It is possible to set the lights to be actuated. However, as a standard feature, all listed lamps are actuated at a frequency of 2 Hz.

Moreover, the flashing frequency is routed via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) by the central gateway control unit (CGW) (A2) to the exterior CAN (CAN 1). The signal acquisition and actuation module control unit, frame (SCH) (A8) receives the flashing frequency via the exterior CAN (CAN 1) and then actuates the following lamps simultaneously:

- Left turn signal light (E3e4)
- Right turn signal light (E4e4)

Redundantly the signal acquisition and actuation module control unit, frame (SCH) (A8) also receives the messages for the flashing frequency via the redundant LIN SCA/SCH (LIN 6).

i The flashing frequency and the total flashing duration can be set to meet the various legal regulations in the individual countries. The flashing duration is set to approx. 5 min. at the factory, however, should correspond at least to the duration of the acoustic alarm.

At the same time the instrument cluster control unit (ICUC) (A1) receives the flashing frequency via the frame CAN (CAN 3) and CAN bus frame star point (Z3) routed by the central gateway control unit (CGW) (A2) and then actuates the following indicator lamps:

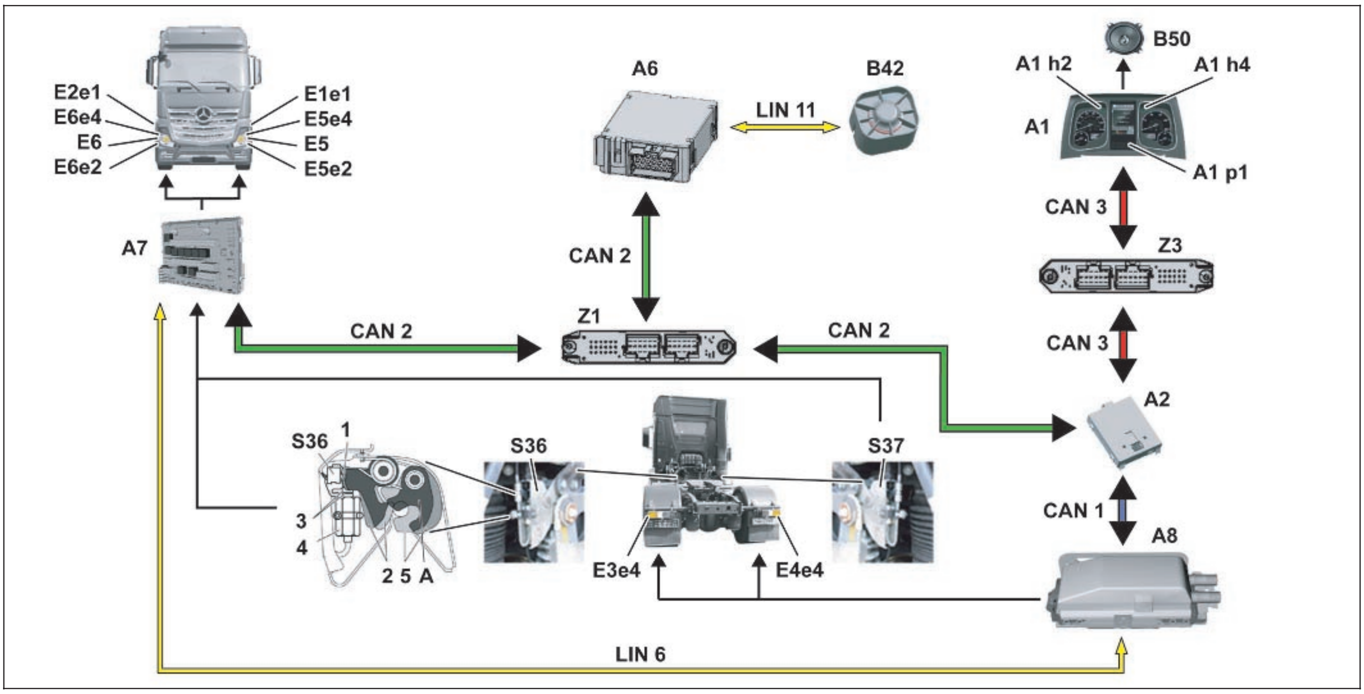
- Turn signal indicator lamp, vehicle, left (A1 h2)
- Turn signal indicator lamp, vehicle, right (A1 h4)

The flashing noises generated in the instrument cluster control unit (ICUC) (A1) are output via the center speaker (B50).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Anti-theft alarm system control unit (ATA), component description	A6	**Page 338**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**
	Alarm siren, component description	B42	**Page 418**
	Headlamp, component description	E5, E6	**Page 446**

GF80.50-W-3013H	Alarm actuation by unlocking cab, function	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection



W80.50-1076-79

Illustrated on the left cab lock

1	*Rocker*
2	*Locking pawl*
3	*Piston*
4	*Hydraulic cylinder*
5	*Rotary tumbler*
A1	*Instrument cluster (ICUC) control unit*
A1 h2	*Turn signal light indicator lamp, left side of vehicle*
A1h4	*Turn signal light indicator lamp, right side of vehicle*
A1 p1	*Multifunction display*
A2	*Central gateway control unit (CGW)*
A6	*Anti-theft alarm system (ATA) control unit*
A7	*Cab signal acquisition and actuation module control unit (SCA)*
A8	*Frame signal acquisition and actuation module control unit (SCH)*
B42	*Alarm siren*
B50	*Center speaker*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
E1e1	*Left side turn signal light*
E2e1	*Right side turn signal light*
E3e4	*Left turn signal lamp*
E4e4	*Right turn signal lamp*
E5	*Left headlamp*
E5e2	*Left main beam*
E5e4	*Left turn signal lamp*
E6	*Right headlamp*
E6e2	*Right main beam*
E6e4	*Right turn signal lamp*
LIN 6	*LIN SCA/SCH redundance*
LIN 11	*ATA-LIN*
S36	*Driver-side cab unlock switch*
S37	*Passenger cab unlock switch*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*
A	*Release position*

Functions

General information
The antitheft alarm system control unit (ATA) (A6) monitors via the cab signal acquisition and actuation module control unit (SCA) (A7) the positions of the driver cab unlock switch (S36) and front passenger cab unlock switch (S37). In the event an attempt is made to release the cab either by force or with the tilting system, the antitheft alarm (ATA) integrated into the base module immediately triggers acoustic and visual alarm corresponding to the national settings.A6

Once triggered, the alarm can only be terminated by:
- the release command via the radio remote control on the transmitter key (S953)
- by switching on ignition (when the function "Disarming via ignition lock" is parameterized)
- by actuating the interior protection/panic alarm button (S42), only if the antitheft alarm system (ATA) is previously activated via the interior protection/panic alarm button (S42)

i A triggered alarm is indicated to the driver when the ignition is switched on via the multifunction display (A1 p1) in the instrument cluster control unit (ICUC) (A1).

Requirements
- Warning circuit (sensor input) parameterized
- When the antitheft alarm (ATA) was activated or armed, the alarm circuit was closed and therefore monitored.

Alarm triggering, function
The driver cab unlock switch (S36) and front passenger cab unlock switch (S37) is installed permanently in the corresponding lock in the cab lock and monitors cab locking in the corresponding cab mounting. The driver cab unlock switch (S36) and front passenger cab unlock switch (S37) is connected in the corresponding lock on the cab release via a rocker (1) with lock pawl (2). If cab tilt pump is actuated to tilt, the cab locks are unlocked hydraulically. The lock pawl (2) is pressed into the release position (A) by the piston (3) on the hydraulic cylinder (4) if sufficient pressure is present in the tilting pump during the tilting procedure.

In this position, the rotary tumbler (5), which is under tension, is released and the driver cab unlock switch (S36) or front passenger cab unlock switch (S37) is actuated. The cab signal acquisition and actuation module control unit (SCA) (A7) recognizes unlocking by the incoming ground signals from the cab unlock switch, which is actuated first by the unlocking procedure. Then the cab signal acquisition and actuation module control unit (SCA) (A7) transmits the message "Cab unlocked" to the antitheft alarm system control unit (ATA) (A6), whereby it triggers an acoustic and visual alarm.

Alarm output function

Acoustic alarm
If an alarm is recognized by the antitheft alarm system control unit (ATA) (A6), the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone ON" via the ATA-LIN (LIN 11) to the alarm siren (B42). From this time on, the acoustic alarm is controlled completely by the alarm siren (B42). The entire duration of the acoustic alarm is approx. 30 s, however, can be set to meet various legal regulations. To terminate the acoustic alarm, the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone OFF" to the alarm siren (B42).

Visual alarm
Moreover, simultaneously the antitheft alarm system control unit (ATA) (A6) transmits via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) the messages "Activate high beams for alarm signal" and "Activate turn signals for alarm signal" to the cab signal acquisition and actuation module control unit (SCA) (A7). The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blink master and generates the flashing frequency for further processing for the signal acquisition and actuation module control unit, frame (SCH) (A8) and instrument cluster control unit (ICUC) (A1). For this purpose it transmits alternately at a defined frequency the messages "Left turn signal ON", right turn signal ON" and "Left turn signal OFF, right turn signal OFF" to the interior CAN (CAN 2). The cab signal acquisition and actuation module control unit (SCA) (A7) actuates the front vehicle lamps.

For this purpose the cab signal acquisition and actuation module control unit (SCA) (A7) directly actuates the following lamps by itself in event of visual alarm:

- Left side turn signal light (E1e1)
- Right side turn signal light (E2e1)
- Left high beam (E5e2) in left headlamp (E5)
- Right high beam (E6e2) in right headlamp (E6)
- Left turn signal (E5e4) in left headlamp (E5)
- Right turn signal (E6e4) in right headlamp (E6)

If the high beams are already switched on at the time the alarm is triggered, they are not used for the visual alarm and only the turn signals flash.

i It is possible to set the lights to be actuated. However, as a standard feature, all listed lamps are actuated at a frequency of 2 Hz.

Moreover, the flashing frequency is routed via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) by the central gateway control unit (CGW) (A2) to the exterior CAN (CAN 1). The signal acquisition and actuation module control unit, frame (SCH) (A8) receives the flashing frequency via the exterior CAN (CAN 1) and then actuates simultaneously the following lamps:

- Left turn signal light (E3e4)
- Right turn signal light (E4e4)

Redundantly the signal acquisition and actuation module control unit, frame (SCH) (A8) receives the message for the flashing frequency also via the redundant LIN SCA/SCH (LIN 6).

i The flashing frequency and the total flashing duration can be set to meet the various legal regulations in the individual countries. The flashing duration is set to approx. 5 min. at the factory, however, should correspond at least to the duration of the acoustic alarm.

At the same time the instrument cluster control unit (ICUC) (A1) receives the flashing frequency via the frame CAN (CAN 3) and CAN bus frame star point (Z3) routed by the central gateway control unit (CGW) (A2) and then actuates the following indicator lamps:

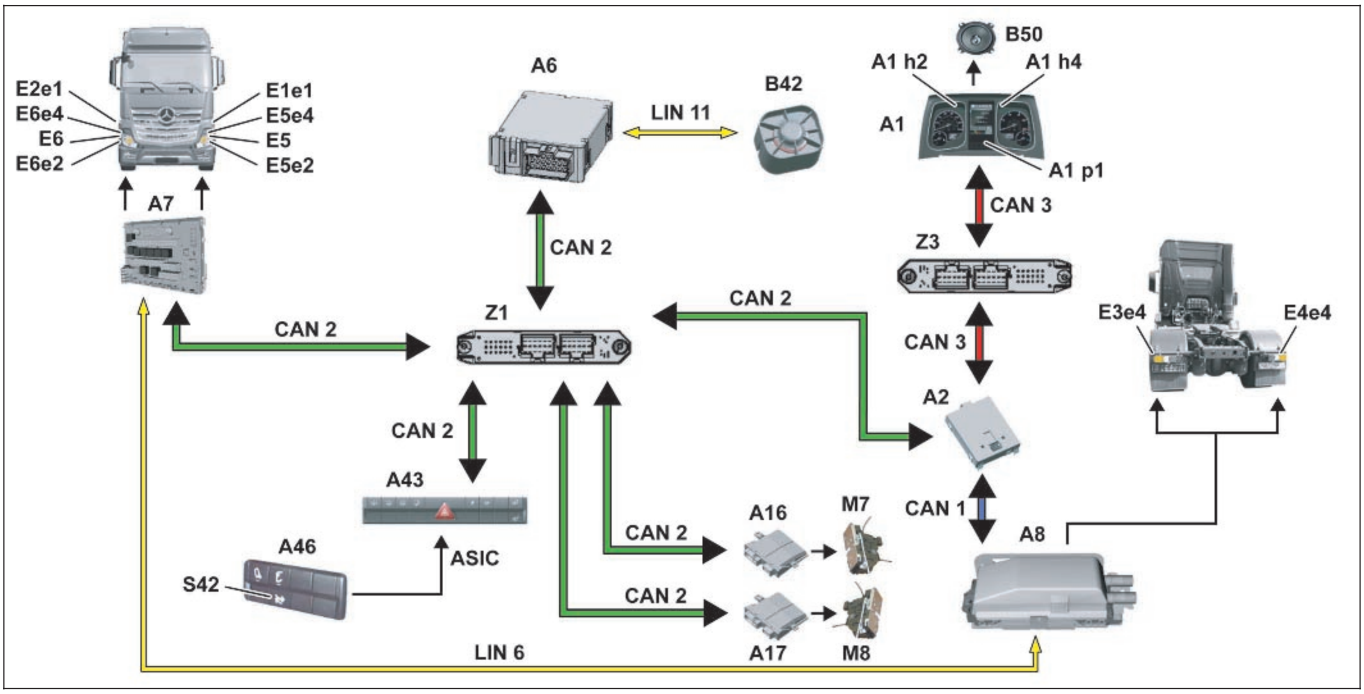
- Turn signal indicator lamp, vehicle, left (A1 h2)
- Turn signal indicator lamp, vehicle, right (A1 h4)

Flashing noises generated in the instrument cluster control unit (ICUC) (A1)are output via the center speaker (B50).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Anti-theft alarm system control unit (ATA), component description	A6	**Page 338**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**
	Alarm siren, component description	B42	**Page 418**
	Interior protection, component description	B43	**Page 419**
	Headlamp, component description	E5, E6	**Page 446**
	Cab unlock switch, component description	S36, S37	**Page 466**

GF80.50-W-3014H	Triggering alarm with panic switch, function	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection



W80.50-1074-79

A1	Instrument cluster (ICUC) control unit
A1H2	Turn signal light indicator lamp, left side of vehicle
A1h4	Turn signal light indicator lamp, right side of vehicle
A1 p1	Multifunction display
A2	Central gateway control unit (CGW)
A6	Anti-theft alarm system (ATA) control unit
A7	Cab signal acquisition and actuation module control unit (SCA)
A8	Frame signal acquisition and actuation module control unit (SCH)
A16	Driver door module (DCMD) control unit
A17	Front passenger door module (DCMP) control unit
A43	Modular switch panel (MSF) control unit
A46	Instrument panel switch module 3
B42	Alarm siren
B50	Center speaker
CAN 1	Exterior-CAN
CAN 2	Interior CAN
CAN 3	Frame CAN
E1e1	Left side turn signal light
E2e1	Right side turn signal light
E3e4	Left turn signal lamp
E4e4	Right turn signal lamp
E5	Left headlamp
E5e2	Left main beam
E5e4	Left turn signal lamp
E6	Right headlamp
E6e2	Right main beam
E6e4	Right turn signal lamp
LIN 6	LIN SCA/SCH redundance
LIN 11	ATA-LIN
M7	Driver door central locking motor
M8	Front passenger door central locking motor
S42	Interior protection/panic alarm button
Z1	Cab instrument panel CAN bus star point
Z3	Frame CAN bus star point
ASIC	ASIC data bus (Application System Integrated Circuit)

General information
With the panic alarm it is possible to trigger the visual and acoustic alarm of the antitheft alarm system (ATA) via the interior protection/panic alarm button (S42) (e.g. in emergency situation).

i Function sequence for simultaneous panic and ATA alarm: The panic alarm has a higher priority than the ATA alarm. If both alarms are actuated the alarm with the higher priority is output and the ATA alarm is suppressed. This alarm is still actuated in the background. If one of the two alarms is terminated or is interrupted, the other is still actuated.

Requirements
- Power supply present for all affected control units and networking intact
- Warning circuit for panic alarm parameterized

Alarm triggering, function
The interior protection/panic alarm button (S42) in the instrument panel switch panel 3 (A46) is a signal switch. This means, the interior protection/panic alarm button (S42) has an electronic circuit which reads in the switch actuation and converts it to a message If the lower rocker on the interior protection/panic alarm button (S42) is actuated, the installed electronic circuit transmits via the ASIC data bus (ASIC) the message "Panic alarm switched on" to the modular switch panel control unit (MSF) (A43). Since the interior protection/panic alarm button (S42) is authorized to wake up, the modular switch panel control unit (MSF) (A43) changes from CAN-SLEEP or POWER-DOWN-MODE to NORMAL-MODE and transmits the message "Panic alarm switched on" to the interior CAN (CAN 2).
The antitheft alarm system control unit (ATA) (A6) is woken up by the CAN activities on the interior CAN (CAN 2), receives the message via the cab instrument panel CAN Bus star point (Z1) and then triggers an acoustic and visual alarm.

Simultaneously the antitheft alarm system control unit (ATA) (A6) also transmits the request "Close vehicle" to the interior CAN (CAN 2). After receiving this message, the driver door control unit (DCMD) (A16) actuates the driver door central locking motor (M7) and passenger door module control unit (DCMP) (A17) to the front passenger door central locking motor (M8) to lock.

Alarm output function

Acoustic alarm
If an alarm is recognized by the panic alarm via the antitheft alarm system control unit (ATA) (A6), the antitheft alarm system control unit (ATA) (A6) transmits the command "Panic alarm ON" via the ATA-LIN (LIN 11) to the alarm siren (B42). From this time on, the acoustic alarm is controlled completely by the alarm siren (B42). The entire duration of the acoustic alarm with panic alarm is approx. 30 s, however, can be set to meet various legal regulations. To terminate the acoustic alarm, the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone OFF" to the alarm siren (B42).

Visual alarm
Moreover, simultaneously the antitheft alarm system control unit (ATA) (A6) transmits via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) the messages "Activate high beams for alarm signal" and "Activate turn signals for alarm signal" to the cab signal acquisition and actuation module control unit (SCA) (A7). The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blink master and generates the flashing frequency for further processing for the signal acquisition and actuation module control unit, frame (SCH) (A8) and instrument cluster control unit (ICUC) (A1). For this purpose it transmits alternately at a defined frequency the messages "Left turn signal ON", right turn signal ON" and "Left turn signal OFF, right turn signal OFF" to the interior CAN (CAN 2).
The cab signal acquisition and actuation module control unit (SCA) (A7) actuates the front vehicle lamps.

For this purpose the cab signal acquisition and actuation module control unit (SCA) (A7) directly actuates the following lamps in event of visual alarm:
- Left side turn signal light (E1e1)
- Right side turn signal light (E2e1)
- Left high beam (E5e2) in left headlamp (E5)
- Right high beam (E6e2) in right headlamp (E6)
- Left turn signal (E5e4) in left headlamp (E5)
- Right turn signal (E6e4) in right headlamp (E6)

If the high beams are already switched on at the time the alarm is triggered, they are not used for the visual alarm and only the turn signals flash.

i It is possible to set the lights to be actuated. However, as a standard feature, all listed lamps are actuated at a frequency of 2 Hz.

At the same time,, the flashing frequency is also routed via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) by the central gateway control unit (CGW) (A2) to the exterior CAN (CAN 1). The signal acquisition and actuation module control unit, frame (SCH) (A8) receives the flashing frequency via the exterior CAN (CAN 1) and then actuates the following lamps simultaneously:
- Left turn signal light (E3e4)
- Right turn signal light (E4e4)

Redundantly the signal acquisition and actuation module control unit, frame (SCH) (A8) also receives the message for the flashing frequency via redundant LIN SCA/SCH (LIN 6).

i The flashing frequency and the total flashing duration can be set to meet the various legal regulations in the individual countries. The flashing duration of the panic alarm is determined to 30 s at the factory.

At the same time, the instrument cluster control unit (ICUC) (A1) receives via frame CAN (CAN 3) and CAN bus frame star point (Z3) the flashing frequency routed by the central gateway control unit (CGW) (A2) and then actuates the following indicator lamps:

- Turn signal indicator lamp, vehicle, left (A1 h2)
- Turn signal indicator lamp, vehicle, right (A1 h4)

Flashing noises generated in the instrument cluster control unit (ICUC) (A1)are output via the center speaker (B50).

Switching off manually

The function sequence for switching off the panic alarm corresponds to the greatest extent to the function sequence for switching on the panic alarm. However, the vehicle doors remain locked.

When the interior protection/panic alarm button (S42) is actuated again, the modular switch panel control unit (MSF) (A43) transmits the message "Panic alarm switched off " to the interior CAN (CAN 2) and then the antitheft alarm system (ATA) transmits the command "Warning tone OFF" via the ATA-LIN (LIN 11) to the alarm siren (B42), which then immediately interrupts the acoustic alarm. Simultaneously the cab signal acquisition and actuation module control unit (SCA) (A7) terminates transmission of the messages "Activate high beams for alarm signal" and "Activate turn signals for alarm signal" to the interior CAN (CAN 2) and immediately retracts the request.

Switching off panic alarm

Automatic switch off

Here, it is necessary to differentiate between the visual and acoustic panic alarm. On the other hand, the acoustic panic alarm is switched off automatically by the alarm siren (B42) after approx. 30 minutes. The switch-on time for the visual panic alarm can be set to between 30 s and 5 minutes. The visual panic alarm is switched off after 30 s set at the factory. Moreover, the visual panic alarm is switched off when a turn signal or the hazard warning flasher is switched on. The visual panic alarm is continued at the earliest 2.5 s after completing direction of travel or warning signaling.

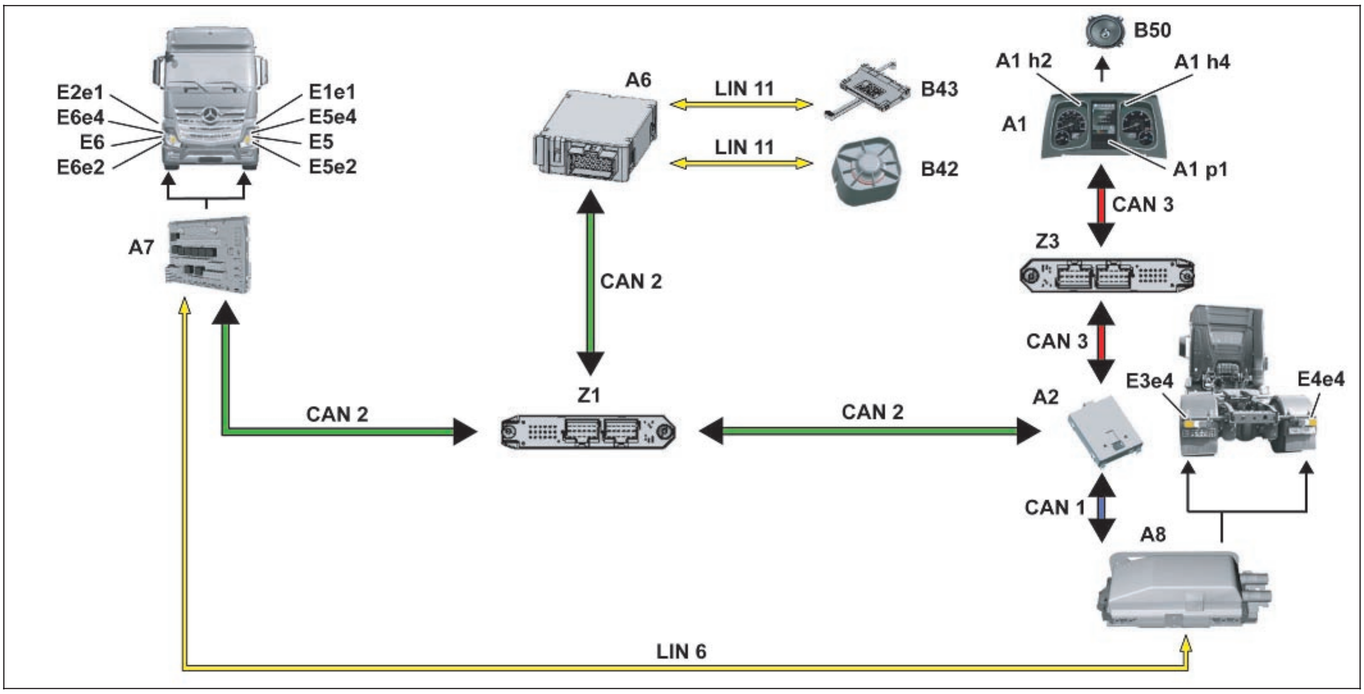
Then the cab signal acquisition and actuation module control unit (SCA) (A7) terminates the last started flashing period and receives the flashing frequency from the interior CAN (CAN 2) and redundant LIN SCA/SCH (LIN 6). The signal acquisition and actuation module control unit, frame (SCH) (A8) and the instrument cluster control unit (ICUC) (A1) then also terminate the actuation of the rear turn signals and the turn signal indicator lamps.

i A triggered panic alarm is indicated to the driver when the ignition is switched on via the multifunction display (A1 p1) in the instrument cluster control unit (ICUC) (A1).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Anti-theft alarm system control unit (ATA), component description	A6	**Page 338**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**
	Driver door control unit (DCMD), component description	A16	**Page 349**
	Passenger door module control unit (DCMP), component description	A17	**Page 350**
	Modular switch panel (MSF) control unit component description	A43	**Page 370**
	Instrument panel switch modules, component description	A46	**Page 372**
	Alarm siren, component description	B42	**Page 418**
	Headlamp, component description	E5, E6	**Page 446**
	Door central locking motor, component description	M7, M8	**Page 450**

GF80.50-W-3022H	Alarm triggering with interior protection, function	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection



W80.50-1072-79

A1	Instrument cluster (ICUC) control unit
A1 h2	Turn signal light indicator lamp, left side of vehicle
A1h4	Turn signal light indicator lamp, right side of vehicle
A1 p1	Multifunction display
A2	Central gateway control unit (CGW)
A6	Anti-theft alarm system (ATA) control unit
A7	Cab signal acquisition and actuation module control unit (SCA)
A8	Frame signal acquisition and actuation module control unit (SCH)
B42	Alarm siren
B43	Interior protection sensor
B50	Center speaker
CAN 1	Exterior-CAN
CAN 2	Interior CAN
CAN 3	Frame CAN
E1e1	Left side turn signal light
E2e1	Right side turn signal light
E3e4	Left turn signal lamp
E4e4	Right turn signal lamp
E5	Left headlamp
E5e2	Left main beam
E5e4	Left turn signal lamp
E6	Right headlamp
E6e2	Right main beam
E6e4	Right turn signal lamp
LIN 6	LIN SCA/SCH redundance
LIN 11	ATA-LIN
Z1	Cab instrument panel CAN bus star point
Z3	Frame CAN bus star point

General information

Once tripped, the alarm can be terminated by:

- the release command via the radio remote control on the transmitter key (S953)
- by switching on ignition (when the function "Disarming via ignition lock" is parameterized)

Preconditions

- Anti-theft alarm system (ATA) activated
- Interior protection not deactivated

Alarm triggering, function

The interior protection sensor (B43) consists of a micro-controller and ultrasonic sensor, which consists of two ultrasonic speakers and an ultrasonic microphone. The two ultrasonic speakers of the interior protection sensor (B43) transmit the ultrasonic signals into the cab interior compartment. The ultrasonic signals are received by the ultrasonic microphone on the interior protection sensor (B43).

The running times of the ultrasonic sensors are evaluated by the internal microcontroller for the interior protection sensor (B43), which communicates with the antitheft alarm system control unit (ATA) (A6) via the ATA-LIN (LIN 11) If a motion is detected in the passenger compartment and evaluated as alarm-relevant, a message is transmitted to the antitheft alarm system control unit (ATA) (A6) via ATA-LIN (LIN 11). Then the antitheft alarm system control unit (ATA) (A6) triggers an acoustic and visual alarm. An inclination sensor is also integrated into the interior protection sensor (B43). During operation, it reacts to cab movements such as and triggers an alarm. Tolerances are stored in the antitheft alarm system control unit (ATA) (A6) to prevent false alarms. The values of the inclination sensor simultaneously serve as correction factor for the ultrasonic sensor to prevent false alarm.

i A triggered alarm is indicated to the driver when the ignition is switched on via the multifunction display (A1 p1) in the instrument cluster control unit (ICUC) (A1).

The antitheft alarm system control unit (ATA) (A6) can reduce the intensity of the interior compartment protection in 4 stages to prevent false alarm. For the following operations, the antitheft alarm system control unit (ATA) (A6) switches to a lower stage (mode):

- When the side window or the tilting/sliding roof (on vehicles with code (D8M) Sliding roof) is open
- During active rain closing of tilting/sliding roof (Vehicles with code (D8M) Sliding roof) or pop-up roof (vehicles with code (D8N) Electric pop-up roof)
- During activated radio remote control of side windows via transmitter key (S953) (on vehicles with code (F8C) Multifunction and remote control key)
- During activated radio remote control of tilting/sliding roof via transmitter key (S953) (on vehicles with code (F8C) Multifunction and remote control key and Code (D8M) Sliding roof or code (D8N) Electric pop-up roof)
- With stationary air conditioning (with code (D6H) Stationary air conditioning)
- With stationary heater switched on (with code (D6M) Hot water auxiliary heater, cab or code (D6N) Hot water auxiliary heater, cab and engine)
- With residual heat utilization switched on (with code (D6I) Residual heat utilization

Alarm output function

Acoustic alarm

If an alarm is recognized by the antitheft alarm system control unit (ATA) (A6), the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone ON" via the ATA-LIN (LIN 11) to the alarm siren (B42). From this time on, the acoustic alarm is controlled completely by the alarm siren (B42). The entire duration of the acoustic alarm is approx. 30 s, however, can be set to meet various legal regulations. To terminate the acoustic alarm, the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone OFF" to the alarm siren (B42).

Visual alarm

Moreover, simultaneously the antitheft alarm system control unit (ATA) (A6) transmits via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) the messages "Activate high beams for alarm signal" and "Activate turn signals for alarm signal" to the cab signal acquisition and actuation module control unit (SCA) (A7). The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blink master and generates the flashing frequency for further processing for the signal acquisition and actuation module control unit, frame (SCH) (A8) and instrument cluster control unit (ICUC) (A1). For this purpose it transmits alternately at a defined frequency the messages "Left turn signal ON", right turn signal ON" and "Left turn signal OFF, right turn signal OFF" to the interior CAN (CAN 2). The cab signal acquisition and actuation module control unit (SCA) (A7) actuates the front vehicle lamps.

For this purpose the cab signal acquisition and actuation module control unit (SCA) (A7) directly actuates the following lamps by itself in event of visual alarm:

- Left side turn signal light (E1e1)
- Right side turn signal light (E2e1)
- Left high beam (E5e2) in left headlamp (E5)
- Right high beam (E6e2) in right headlamp (E6)
- Left turn signal (E5e4) in left headlamp (E5)
- Right turn signal (E6e4) in right headlamp (E6)

If the high beams are already switched on at the time the alarm is triggered, they are not used for the visual alarm and only the turn signals flash.

i It is possible to set the lights to be actuated. However, as a standard feature, all listed lamps are actuated at a frequency of 2 Hz.

At the same time the instrument cluster control unit (ICUC) (A1) receives the flashing frequency via frame CAN (CAN 3) and CAN bus frame star point (Z3) routed by the central gateway control unit (CGW) (A2) and then actuates the following indicator lamps::

- Turn signal indicator lamp, vehicle, left (A1 h2)
- Turn signal indicator lamp, vehicle, right (A1 h4)

Moreover, the flashing frequency is routed via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) by the central gateway control unit (CGW) (A2) to the exterior CAN (CAN 1). The signal acquisition and actuation module control unit, frame (SCH) (A8) receives the flashing frequency via the exterior CAN (CAN 1) and then actuates the following lamps simultaneously:

- Left turn signal light (E3e4)
- Right turn signal light (E4e4)

Redundantly the signal acquisition and actuation module control unit, frame (SCH) (A8) also receives the flashing frequency via redundant LIN SCA/SCH (LIN 6).

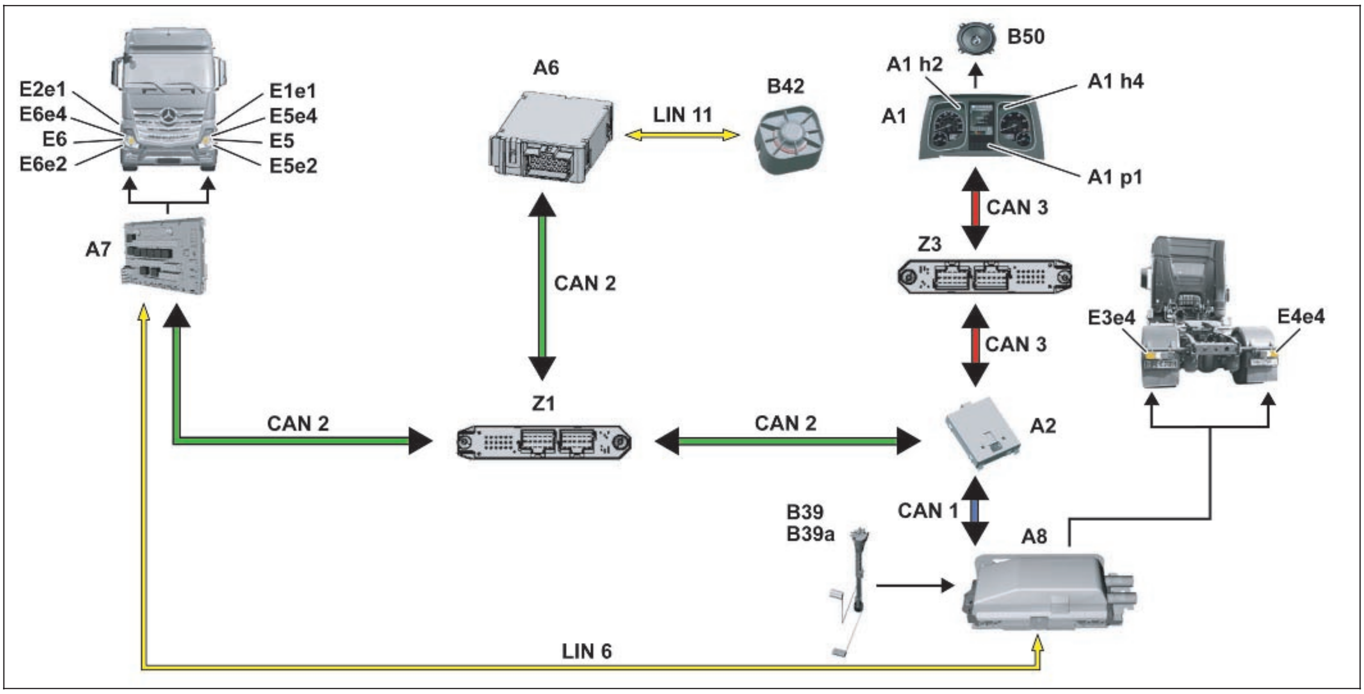
i The flashing frequency and the total flashing duration can be set to meet the various legal regulations in the individual countries. The flashing duration is set to approx. 5 min. at the factory, however, should correspond at least to the duration of the acoustic alarm.

Flashing noises generated in the instrument cluster control unit (ICUC) are output via the center speaker (B50) A1

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Anti-theft alarm system control unit (ATA), component description	A6	**Page 338**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**
	Alarm siren, component description	B42	**Page 418**
	Interior protection, component description	B43	**Page 419**
	Headlamp, component description	E5, E6	**Page 446**

GF80.50-W-3028H	Alarm triggering by steeling fuel, function	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection



W80.50-1077-79

A1	*Instrument cluster (ICUC) control unit*
A1H2	*Turn signal light indicator lamp, left side of vehicle*
A1h4	*Turn signal light indicator lamp, right side of vehicle*
A1 p1	*Multifunction display*
A2	*Central gateway control unit (CGW)*
A6	*Anti-theft alarm system (ATA) control unit*
A7	*Cab signal acquisition and actuation module control unit (SCA)*
A8	*Frame signal acquisition and actuation module control unit (SCH)*
B39	*Fuel level sensor*
B39a	*Fuel level sensor 2*
B42	*Alarm siren*
B50	*Center speaker*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
E1e1	*Left side turn signal light*
E2e1	*Right side turn signal light*
E3e4	*Left turn signal lamp*
E4e4	*Right turn signal lamp*
E5	*Left headlamp*
E5e2	*Left main beam*
E5e4	*Left turn signal lamp*
E6	*Right headlamp*
E6e2	*Right main beam*
E6e4	*Right turn signal lamp*
LIN 6	*LIN SCA/SCH redundance*
LIN 11	*ATA-LIN*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*

General information
The following statuses can trigger an alarm regarding a manipulation of the fuel tank:
- Interruption of subharness to fuel level sensor (B39) or fuel level sensor 2 (B39a)
- Steeling fuel quantity of ≥ 6 %

If one of these circumstances occurs, a country-specific visual and acoustic alarm is output.

Once tripped, the alarm can be terminated by:
- the release command via the radio remote control on the transmitter key (S953)
- by switching on ignition (when the function "Disarming via ignition lock" is parameterized)
- by the interior protection/panic alarm button (S42), only when the antitheft alarm system (ATA) is activated previously via the interior protection/panic alarm button (S42)

Requirements
- Warning circuit for fuel level indicator activated via parameterization
- Warning circuit okay when activating or arming antitheft alarm system (ATA) (electrical connections to sensor system okay)

ℹ The function of the signal inputs can be set in the parameter settings. Functions "Use" or "Do not use" can be selected.

Alarm triggering, function
The cab signal acquisition and actuation module control unit (SCA) (A7) monitors, after receiving the message "Activate fill level sensor" from the antitheft alarm system control unit (ATA) (A6) the fill level of the fuel tank via the fuel level sensor (B39) and fuel level sensor 2 (B39a). If more than 6 % of the fuel is removed from the fuel tanks or the signal acquisition and actuation module control unit, frame (SCH) (A8) recognizes an open circuit to the fuel level sensors, the signal acquisition and actuation module control unit, frame (SCA) (A8) transmits the message "Fuel level sensor alarm" to the exterior CAN (CAN 1). This message is transmitted by the central gateway control unit (CGW) (A2) to the interior CAN (CAN 2) and received from there via the cab instrument panel CAN Bus star point (Z1) by the antitheft alarm system control unit (ATA) (A6). The antitheft alarm system control unit (ATA) (A6) then actuates an acoustic and visual alarm:

ℹ A triggered alarm is indicated to the driver when the ignition is switched on via the multifunction display (A1 p1) in the instrument cluster control unit (ICUC) (A1).

Alarm output function
Acoustic alarm
If an alarm is recognized by the antitheft alarm system control unit (ATA) (A6), the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone ON" via the ATA-LIN (LIN 11) to the alarm siren (B42). From this time on, the acoustic alarm is controlled completely by the alarm siren (B42). The entire duration of the acoustic alarm is approx. 30 s, however, can be set to meet various legal regulations. To terminate the acoustic alarm, the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone OFF" to the alarm siren (B42).

Visual alarm
Moreover, simultaneously the antitheft alarm system control unit (ATA) (A6) transmits via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) the messages "Activate high beams for alarm signal" and "Activate turn signals for alarm signal" to the cab signal acquisition and actuation module control unit (SCA) (A7). The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blink master and generates the flashing frequency for further processing for the signal acquisition and actuation module control unit, frame (SCH) (A8) and instrument cluster control unit (ICUC) (A1). For this purpose it transmits alternately at a defined frequency the messages "Left turn signal ON", right turn signal ON" and "Left turn signal OFF, right turn signal OFF" to the interior CAN (CAN 2). The cab signal acquisition and actuation module control unit (SCA) (A7) actuates the front vehicle lamps.

For this purpose the cab signal acquisition and actuation module control unit (SCA) (A7) directly actuates the following lamps by itself in event of visual alarm:
- Left side turn signal light (E1e1)
- Right side turn signal light (E2e1)
- Left high beam (E5e2) in left headlamp (E5)
- Right high beam (E6e2) in right headlamp (E6)
- Left turn signal (E5e4) in left headlamp (E5)
- Right turn signal (E6e4) in right headlamp (E6)

If the high beams are already switched on at the time the alarm is triggered, they are not used for the visual alarm and only the turn signals flash.

ℹ It is possible to set the lights to be actuated. However, as a standard feature, all listed lamps are actuated at a frequency of 2 Hz.

Moreover, the flashing frequency is routed via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) by the central gateway control unit (CGW) (A2) to the exterior CAN (CAN 1). The signal acquisition and actuation module control unit, frame (SCH) (A8) receives the flashing frequency via the exterior CAN (CAN 1) and then actuates the following lamps simultaneously:

- Left turn signal light (E3e4)
- Right turn signal light (E4e4)

Redundantly the signal acquisition and actuation module control unit, frame (SCH) (A8) also receives the flashing frequency via redundant LIN SCA/SCH (LIN 6).

i The flashing frequency and the total flashing duration can be set to meet the various legal regulations in the individual countries. The flashing duration is set to approx. 5 min. at the factory, however, should correspond at least to the duration of the acoustic alarm.

At the same time the instrument cluster control unit (ICUC) (A1) receives the flashing frequency via frame CAN (CAN 3) and CAN bus frame star point (Z3) routed by the central gateway control unit (CGW) (A2) and then actuates the following indicator lamps::

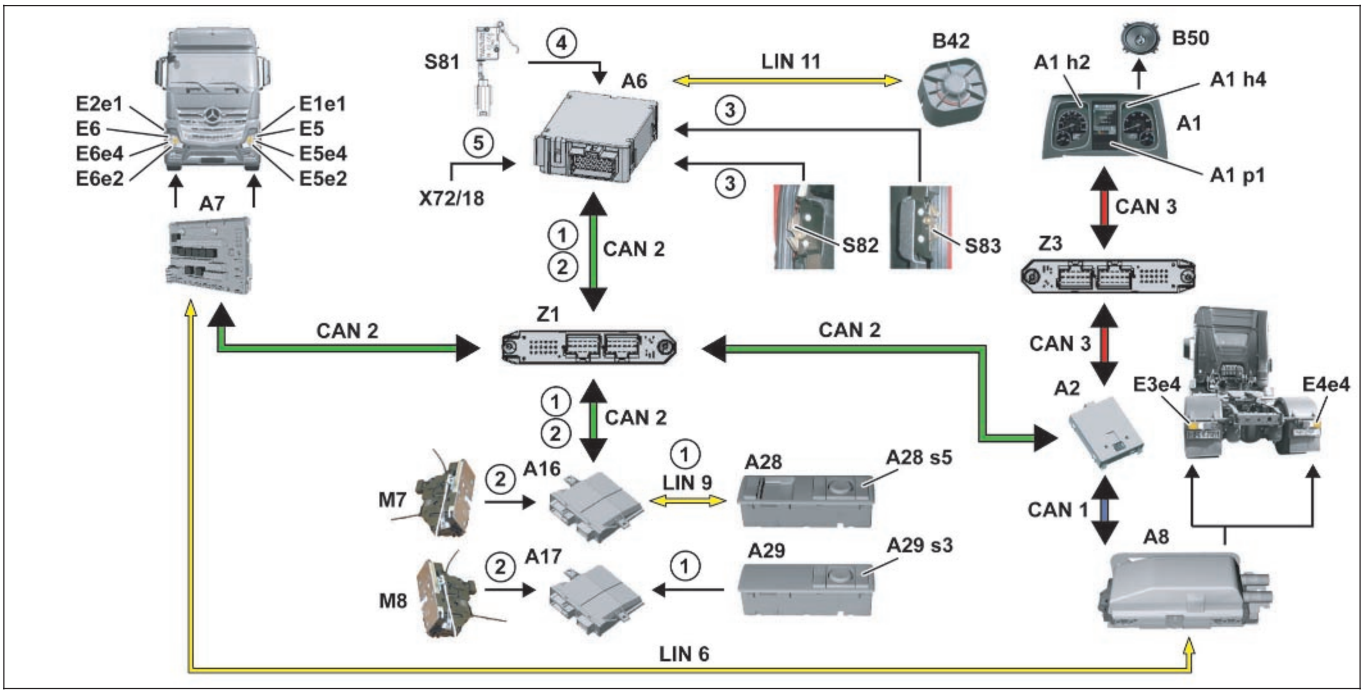
- Turn signal indicator lamp, vehicle, left (A1 h2)
- Turn signal indicator lamp, vehicle, right (A1 h4)

Flashing noises generated in the instrument cluster control unit (ICUC) are output via the center speaker (B50) A1

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Anti-theft alarm system control unit (ATA), component description	A6	**Page 338**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**
	Alarm siren, component description	B42	**Page 418**
	Headlamp, component description	E5, E6	**Page 446**

GF80.50-W-3031H	Alarm triggering by unlocking/opening a door/flap, function	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection



W80.50-1070-79

1	*Alarm triggering by unlocking*
2	*Alarm triggering by opening door*
3	*Alarm triggering by opening stowage box*
4	*Alarm triggering by opening maintenance flap*
5	*Alarm triggering by opening door in box body*
A1	*Instrument cluster (ICUC) control unit*
A1 h2	*Turn signal light indicator lamp, left side of vehicle*
A1h4	*Turn signal light indicator lamp, right side of vehicle*
A1 p1	*Multifunction display*
A2	*Central gateway control unit (CGW)*
A6	*Anti-theft alarm system (ATA) control unit*
A7	*Cab signal acquisition and actuation module control unit (SCA)*
A8	*Frame signal acquisition and actuation module control unit (SCH)*
A16	*Driver door module (DCMD) control unit*
A17	*Front passenger door module (DCMP) control unit*
A28	*Driver switch group*
A28 s5	*Unlock/lock button*
A29	*Front passenger switch group*
A29 s3	*Unlock/lock button*
B42	*Alarm siren*
B50	*Center speaker*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
E1e1	*Left side turn signal light*
E2e1	*Right side turn signal light*
E3e4	*Left turn signal lamp*
E4e4	*Right turn signal lamp*
E5	*Left headlamp*
E5e2	*Left main beam*
E5e4	*Left turn signal lamp*
E6	*Right headlamp*
E6e2	*Right main beam*
E6e4	*Right turn signal lamp*
LIN6	*LIN SCA/SCH redundance*
LIN 9	*Driver switch panel LIN*
LIN 11	*ATA-LIN*
M7	*Driver door central locking motor*
M8	*Front passenger door central locking motor*
S81	*Maintenance flap button*
S82	*Left stowage box switch*
S83	*Right stowage box switch*
X72/18	*Body cab-chassis electrical connector*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*

General information
The following statuses can trigger can alarm when unlocking/opening a door/flap:
- Unlocking or opening one of the vehicle doors
- Unlocking vehicle via lock/unlock button (A28 s5) or lock/unlock button (A29 s3) in interior compartment
- Opening stowage box
- Opening of service flap
- Opening a door on the box body
- Discontinuity in wiring to vehicle doors or contact switches for corresponding flap

If one of these circumstances occurs, a country-specific visual and acoustic alarm is output.

i A triggered alarm is indicated to the driver when the ignition is switched on via the multifunction display (A1 p1) in the instrument cluster control unit (ICUC) (A1).

Once tripped, the alarm can be terminated by:
- the release command via the radio remote control on the transmitter key (S953)
- by switching on ignition (when the function "Disarming via ignition lock" is parameterized)
- by the interior protection/panic alarm button (S42), only when the antitheft alarm system (ATA) is activated previously via the interior protection/panic alarm button (S42)

i When the alarm is interrupted, the antitheft alarm system (ATA) remains armed and the vehicle doors locked. The vehicle doors are unlocked only when the antitheft alarm system (ATA) is disarmed or deactivated.

Requirements
- The corresponding warning circuit (sensor inlet) is activated via parameterization
- When activating or arming the antitheft alarm system (ATA) the corresponding warning circuit is closed and thereby monitored (corresponding warning circuit in basic position).

i The function of the signal inputs can be set in the parameter settings. Here, the functions "Normally closed", "Normally open" or "Not used" can be selected.
The procedures for alarm triggering by unlocking/opening a door, are described as an example on the driver door for vehicle left-hand drive vehicle; this applies analogously for the passenger door and right-hand drive vehicles.

Alarm triggering by unlocking a door, function
If the lock/unlock button (A28 s5) in the driver switch group (A28) is actuated, the signal from the lock/unlock button (A28 s5) actuates WAKE UP in the driver door control unit (DCMD) (A16). The driver door control unit (DCMD) (A16) changes from CAN-SLEEP or POWER-DOWN-MODE to NORMAL-MODE and transmits the message "Driver door locking switch while unlocking" to the interior CAN (CAN 2). The antitheft alarm system control unit (ATA) (A6) is woken up by CAN activities on the interior CAN (CAN 2) and receives this message. After receiving these messages, the antitheft alarm system control unit (ATA) (A6) immediately triggers an acoustic and visual alarm.

Alarm triggering by opening a door, function
Via a rotary tumbler contact switch in the driver door central locking motor switch (M7) (door lock), the driver door control unit (DCMD) (A16) recognizes whether the driver door is open or closed.
If the driver door is opened from outside improperly or with force or is opened from the inside with the opening handle, the switch signal actuates a WAKE-UP in the driver door module control unit (DCMD) (A16). The driver door module control unit (DCMD) (A16) changes from CAN SLEEP or POWER DOWN MODE to NORMAL MODE and places the message "Driver door rotary tumbler switch status open" on the interior CAN bus (CAN 2).

The antitheft alarm system control unit (ATA) (A6), which monitors the switch positions in the driver door central locking motor switch (M7) and front passenger door central locking motor (M8), immediately triggers an acoustic and visual alarm. As a redundant signal the antitheft alarm system control unit (ATA) (A6) receives a ground signal via a direct line from the driver door control unit (DCMD) (A16). If, for example, the wiring harness to the door is cut, the antitheft alarm system control unit (ATA) (A6) recognizes by the absence of the ground signals a manipulation of the wiring harness and triggers an alarm.

Alarm actuation by opening stowage flap, function
The antitheft alarm system control unit (ATA) (A6) monitors the positions of the left stowage box switch (S82) and right stowage box switch (S83). When the stowage box is opened, the corresponding ground signal to the antitheft alarm system control unit (ATA) (A6) is interrupted. The antitheft alarm system control unit (ATA) (A6) then triggers an acoustic and visual alarm.

Alarm triggering by opening maintenance flap, function
The antitheft alarm system control unit (ATA) (A6) monitors the position of maintenance flap button (S81). The maintenance flap button (S81) interrupts, when opening the maintenance flap, the ground signal to the antitheft alarm system control unit (ATA) (A6). The antitheft alarm system control unit (ATA) (A6) then triggers an acoustic and visual alarm.

Alarm triggering by opening door in box body, function
Via the cab/chassis body electrical connector (X72/18) the antitheft alarm system control unit (ATA) (A6) is connected with the contact switch on the door on the box body. If the door on the box body is opened, the ground signal to the antitheft alarm system control unit (ATA) (A6) is interrupted. The antitheft alarm system control unit (ATA) (A6) then triggers an acoustic and visual alarm.

Alarm output function
Acoustic alarm
If an alarm is recognized by the antitheft alarm system control unit (ATA) (A6), the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone ON" via the ATA-LIN (LIN 11) to the alarm siren (B42). From this time on, the acoustic alarm is controlled completely by the alarm siren (B42).

The entire duration of the acoustic alarm is approx. 30 s, however, can be set to meet various legal regulations. To terminate the acoustic alarm, the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone OFF" to the alarm siren (B42).

Visual alarm
Moreover, simultaneously the antitheft alarm system control unit (ATA) (A6) transmits via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) the messages "Activate high beams for alarm signal" and "Activate turn signals for alarm signal" to the cab signal acquisition and actuation module control unit (SCA) (A7). The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blink master and generates the flashing frequency for further processing for the signal acquisition and actuation module control unit, frame (SCH) (A8) and instrument cluster control unit (ICUC) (A1). For this purpose it transmits alternately at a defined frequency the messages "Left turn signal ON", right turn signal ON" and "Left turn signal OFF, right turn signal OFF" to the interior CAN (CAN 2).

The cab signal acquisition and actuation module control unit (SCA) (A7) actuates the front vehicle lamps. For this reason the cab signal acquisition and actuation module control unit (SCA) (A7) directly actuates the following lamps by itself in event of visual alarm:

- Left side turn signal light (E1e1)
- Right side turn signal light (E2e1)
- Left high beam (E5e2) in left headlamp (E5)
- Right high beam (E6e2) in right headlamp (E6)
- Left turn signal (E5e4) in left headlamp (E5)
- Right turn signal (E6e4) in right headlamp (E6)

If the high beams are already switched on at the time the alarm is triggered, they are not used for the visual alarm and only the turn signals flash.

i It is possible to set the lights to be actuated. However, as a standard feature, all listed lamps are actuated at a frequency of 2 Hz.

Moreover, the flashing frequency is routed via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) by the central gateway control unit (CGW) (A2) to the exterior CAN (CAN 1). The signal acquisition and actuation module control unit, frame (SCH) (A8) receives the flashing frequency via the exterior CAN (CAN 1) and then actuates the following lamps simultaneously:

- Left turn signal light (E3e4)
- Right turn signal light (E4e4)

Redundantly the signal acquisition and actuation module control unit, frame (SCH) (A8) also receives the flashing frequency via redundant LIN SCA/SCH (LIN 6).

i The flashing frequency and the total flashing duration can be set to meet the various legal regulations in the individual countries. The flashing duration is set to approx. 5 min. at the factory, however, should correspond at least to the duration of the acoustic alarm.

At the same time the instrument cluster control unit (ICUC) (A1) receives the flashing frequency via frame CAN (CAN 3) and CAN bus frame star point (Z3) routed by the central gateway control unit (CGW) (A2) and then actuates the following indicator lamps::

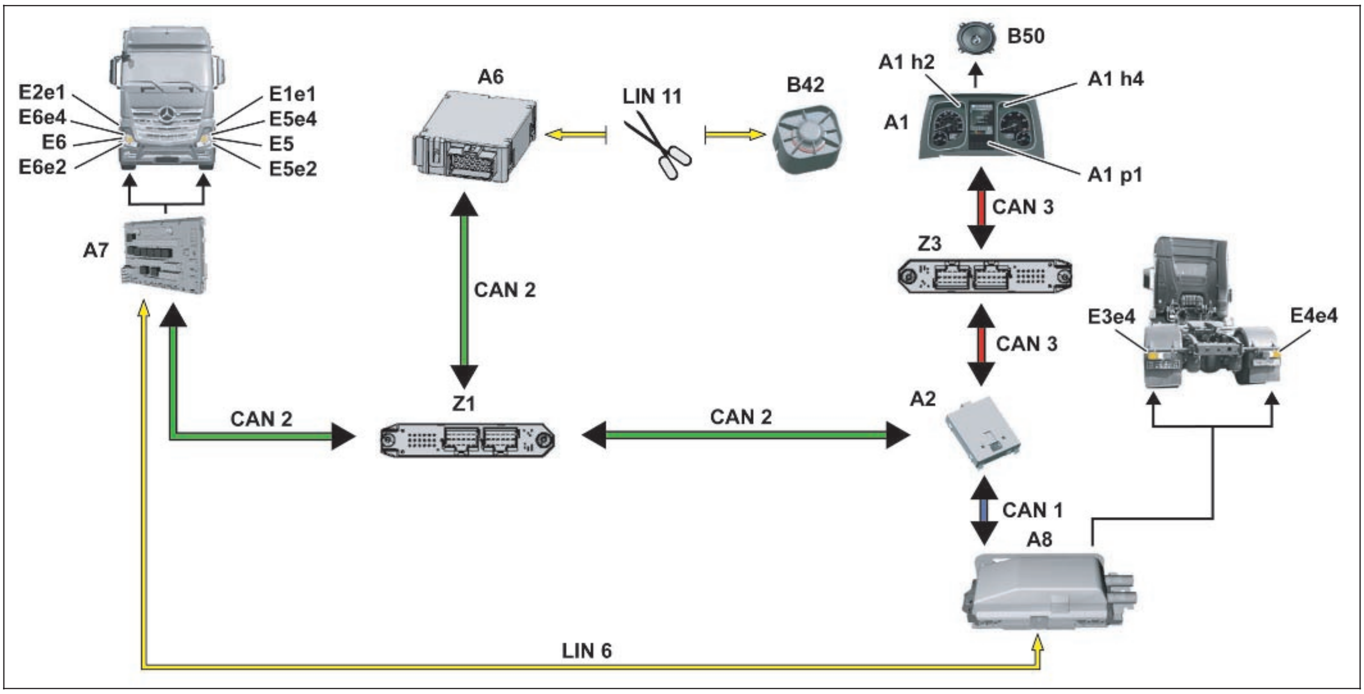
- Turn signal indicator lamp, vehicle, left (A1 h2)
- Turn signal indicator lamp, vehicle, right (A1 h4)

Via the center speaker (B50) the flashing noises are output generated in the instrument cluster control unit (ICUC) (A1).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Anti-theft alarm system control unit (ATA), component description	A6	**Page 338**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**
	Driver door control unit (DCMD), component description	A16	**Page 349**
	Passenger door module control unit (DCMP), component description	A17	**Page 350**
	Driver switch group, component description	A28	**Page 359**
	Front passenger switch group, component description	A29	**Page 360**
	Alarm siren, component description	B42	**Page 418**
	Headlamp, component description	E5, E6	**Page 446**
	Door central locking motor, component description	M7, M8	**Page 450**
	Maintenance flap button, component description	S81	**Page 467**
	Stowage box switch, component description	S82, S83	**Page 468**

GF80.50-W-3032H	Alarm triggering by alarm siren, function	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection



W80.50-1078-79

Shown on alarm triggering from communication loss to alarm siren

A1	*Instrument cluster (ICUC) control unit*
A1 h2	*Turn signal light indicator lamp, left side of vehicle*
A1h4	*Turn signal light indicator lamp, right side of vehicle*
A1 p1	*Multifunction display*
A2	*Central gateway control unit (CGW)*
A6	*Anti-theft alarm system (ATA) control unit*
A7	*Cab signal acquisition and actuation module control unit (SCA)*
A8	*Frame signal acquisition and actuation module control unit (SCH)*
B42	*Alarm siren*
B50	*Center speaker*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
E1e1	*Left side turn signal light*
E2e1	*Right side turn signal light*
E3e4	*Left turn signal lamp*
E4e4	*Right turn signal lamp*
E5	*Left headlamp*
E5e2	*Left main beam*
E5e4	*Left turn signal lamp*
E6	*Right headlamp*
E6e2	*Right main beam*
E6e4	*Right turn signal lamp*
LIN6	*LIN SCA/SCH redundance*
LIN 11	*ATA-LIN*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*

General information
The alarm siren (B42) can trigger an alarm by itself. This happens if, with the ATA activated

- the connecting cables to the horn are cut,
- the vehicle battery is disconnected.

i A triggered alarm is indicated to the driver when the ignition is switched on via the multifunction display (A1 p1) in the instrument cluster control unit (ICUC) (A1).

Requirements

- Voltage supply present at all the control units in question and interlinkage intact.

Alarm actuation by disconnecting battery, function
The antitheft alarm system (ATA) alarm siren (B42) continuously monitors the connection communication with the antitheft alarm system control unit (ATA) (A6) and power supply. If manipulation to the power supply is detected, for example, disconnection of the battery terminals, the antitheft alarm system (ATA) immediately triggers an alarm.
Due to the absence of the power supply, only the acoustic alarm is possible via the alarm siren (B42) with its own power supply. In this case the power is supplied via the rechargeable battery (back-up battery) integrated into the alarm siren (B42)

Alarm triggering by communication loss to alarm siren (B42) function
The alarm siren (B42) is addressed cyclically every 700 ms by the antitheft alarm system control unit (ATA) (A6) via the ATA-LIN (LIN11) and a response requested. If loss of communication is detected between the alarm siren (B42) and antitheft alarm system control unit (ATA) (A6), or the power supply is disconnected, the acoustic alarm is controlled completely by the alarm siren from this time on. The entire duration of the acoustic alarm is approx. 30 s, however, can be set to meet various legal regulations. The antitheft alarm system control unit (ATA) (A6) also recognizes the loss of communication to the alarm siren if it does not receive a reply by the alarm siren (B42) within approx. 1 s (no communication, for example when electrical lines are interrupted) and then triggers a visual alarm.

Alarm output in event of communication loss to alarm siren, function
In the event of communication loss to the alarm siren, the antitheft alarm system control unit (ATA) (A6) transmits via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) the messages "Activate high beams for alarm signal" and "Activate turn signals for alarm signal" to the cab signal acquisition and actuation module control unit (SCA) (A7).
The cab signal acquisition and actuation module control unit (SCA) (A7) acts as blink master and generates the flashing frequency for further processing for the signal acquisition and actuation module control unit, frame (SCH) (A8) and instrument cluster control unit (ICUC) (A1). For this purpose it transmits alternately at a defined frequency the messages "Left turn signal ON", right turn signal ON" and "Left turn signal OFF, right turn signal OFF" to the interior CAN (CAN 2). The cab signal acquisition and actuation module control unit (SCA) (A7) actuates the front vehicle lamps.

For this reason the signal acquisition and actuation module control unit (SCA) (A7) directly actuates the following lamps by itself in event of visual alarm:

- Left side turn signal light (E1e1)
- Right side turn signal light (E2e1)
- Left high beam (E5e2) in left headlamp (E5)
- Right high beam (E6e2) in right headlamp (E6)
- Left turn signal (E5e4) in left headlamp (E5)
- Right turn signal (E6e4) in right headlamp (E6)

If the high beams are already switched on at the time the alarm is triggered, they are not used for the visual alarm and only the turn signals flash.

ℹ It is possible to set the lights to be actuated. However, as a standard feature, all listed lamps are actuated at a frequency of 2 Hz.

Moreover, the flashing frequency is routed via the interior CAN (CAN 2) and cab instrument panel CAN Bus star point (Z1) by the central gateway control unit (CGW) (A2) to the exterior CAN (CAN 1). The signal acquisition and actuation module control unit, frame (SCH) (A8) receives the flashing frequency via the exterior CAN (CAN 1) and actuates the following lamps simultaneously:

- Left turn signal light (E3e4)
- Right turn signal light (E4e4)

Redundantly the signal acquisition and actuation module control unit, frame (SCH) (A8) also receives the flashing frequency via redundant LIN SCA/SCH (LIN 6).

ℹ The flashing frequency and the total flashing duration can be set to meet the various legal regulations in the individual countries. The flashing duration is set to approx. 5 min. at the factory, however, should correspond at least to the duration of the acoustic alarm.

At the same time the instrument cluster control unit (ICUC) (A1) receives the flashing frequency via frame CAN (CAN 3) and CAN bus frame star point (Z3) routed by the central gateway control unit (CGW) (A2) and then actuates the following indicator lamps::

- Turn signal indicator lamp, vehicle, left (A1 h2)
- Turn signal indicator lamp, vehicle, right (A1 h4)

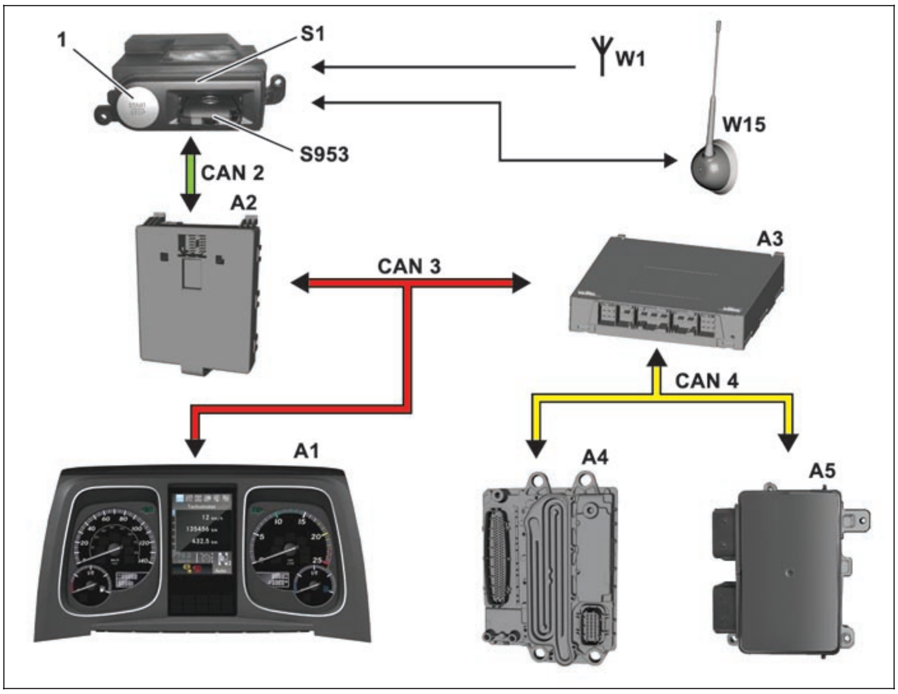
Flashing noises generated in the instrument cluster control unit (ICUC) (A1) are output via the center speaker (B50).

	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Anti-theft alarm system control unit (ATA), component description	A6	**Page 338**
	Cab signal acquisition and actuation module control unit (SCA), component description	A7	**Page 339**
	Signal acquisition and actuation module control unit, frame (SCH), component description	A8	**Page 340**
	Alarm siren, component description	B42	**Page 418**
	Headlamp, component description	E5, E6	**Page 446**

GF80.57-W-0006H	Drive authorization system, function	1.7.11

MODEL 963, 964

1	*Start stop button*
A1	*Instrument cluster (ICUC) control unit*
A2	*Central gateway control unit (CGW)*
A3	*Drive control (CPC) control unit*
A4	*Engine management control unit (MCM)*
A5	*Transmission control (TCM) control unit*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
CAN 4	*Drive train CAN*
S1	*Electronic ignition lock (EIS)*
S953	*Transmitter key*
W1	*Antenna (EIS)*
W15	*Multifunction antenna*



W80.57-1021-76

General information
The drive authorization system is a system network of control units in which the electronic ignition lock (EIS) (S1) in combination with the transmitter key (S953) is the central controller unit.

The drive authorization system is realized by the following control units:
- Electronic ignition lock (EIS) (S1)
- Engine management (MCM) control unit (A4)
- Transmission control unit (TCM) (A5)

Function
When the transmitter key (S953) is inserted into the electronic ignition lock (EIS) (S1) this switches on the inductive power transmission to the voltage supply of the transmitter key (S953). At the same time, a coded data exchange takes place through infrared between the transmitter key (S953) and the electronic ignition lock (EIS) (S1) for identification of the transmitter key (S953).
After successful identification terminal 15 R and terminal 15 are switched and the engine is started.

i If an invalid transmitter key (S953) is inserted into the electronic ignition lock (EIS) (S1), "Key invalid" appears briefly in the multifunction display (A1 p1) and then "Remove key" is shown.
If the transmitter key (S953) battery is spent the vehicle can be started because the transmitter key (S953) is inductively powered as soon as it is inserted into the electronic ignition lock (EIS) (S1).

Stages on electronic ignition lock (EIS) (S1)
The start-stop button (1) on the electronic ignition lock (EIS) (S1) has two stages. To initiate stage 1 the start-stop button (1) is pressed until a point of mechanical resistance is felt (actuation point). Stage 2 is reached when the point of mechanical resistance is overcome.

Switch terminal 15 R (radio position)
Pressing the start-stop button (1) to stage 1 actuates terminal 15 R. The status of terminal 15 R is sent over the interior CAN (CAN 2).

Switch terminal 15 (ignition)
Pressing the start-stop button (1) again to stage 1 actuates terminal 15. The status of terminal 15 is sent straight to the sensor and actuator module, cab (SCA) control unit (A7) and the interior CAN (CAN 2).

Switch off terminals 15 and 15 R
When terminal 15 is actuated the pressing of the start-stop button (1) to stage 1 shuts off terminals 15 and 15 R.

Switch terminal 50 (start procedure)
Terminal 50 is actuated by pressing the start-stop button (1) to stage 2. The status of terminal 50 here is sent to the interior CAN (CAN 2). The starter (M1) is then actuated through the engine management (MCM) control unit (A4).
After the engine has been started the transmitter key is mechanically locked in the electronic ignition lock (EIS) (S1).

Engine stop
At vehicle standstill a brief press of the start-stop button (1) to stage 1 is enough to switch off the engine. Terminal 15 and terminal 15 R are then also switched off.
An engine stop (EMERGENCY OFF function) during a trip is also possible. To do so, the start-stop button (1) must be pressed to stage 2 and held for 3 seconds. The driver is notified of this by a message in the multifunction display (A1 p1).

Depending on the vehicle equipment a warning tone is also issued through the center speaker (B50) or through a speaker integrated in the instrument cluster. Terminal 15 R and terminal 15 remain active after the engine has been switched off.

Removal of transmitter key (S953) with engine running
After starting the engine, the transmitter key (S953) is mechanically locked in the electronic ignition lock (EIS) (S1).
A special mode enables the vehicle to be locked using the transmitter key (S953) even when the engine is running. To do so, the start-stop button (1) must be pressed to stage 1 and held with the engine running. The transmitter key (S953) can then be removed.
The multifunction display (A1 p1) then shows the message: "Maneuvering speed only available".

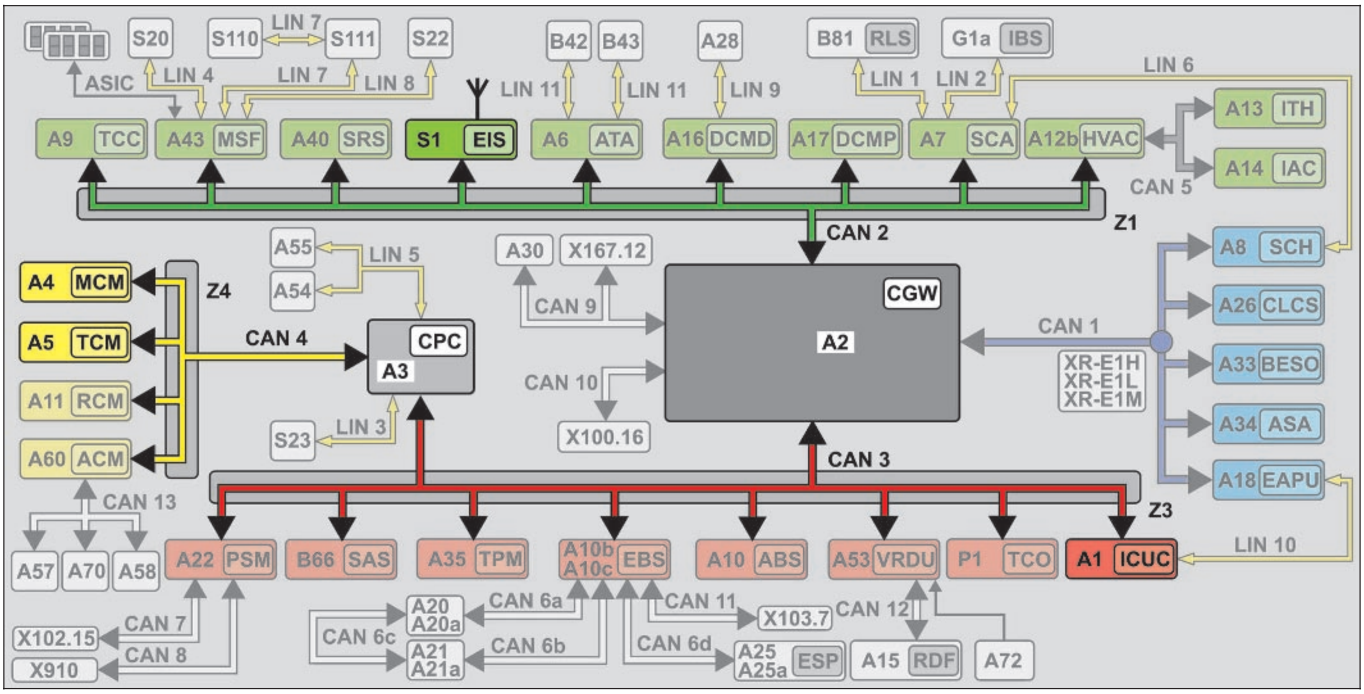
Transmitter key (S953)
The following transmitter key (S953) versions are available:
- **LOW** Code (F8A) 2 vehicle keys, - no radio transmitter
- **Default** Code (F8B) 2 remote control keys, - with unidirectional radio signal receiver
- **Multifunction** Code (F8C) 1 Multifunction and 1 remote control key, - with bidirectional radio signal receiver/transmitter

In the "Standard" version, the radio signals emitted by the transmitter key (S953) are received by the electronic ignition lock (EIS) (S1) over the 30 cm long antenna (EIS) (W1) integrated into the cab wiring harness.

In the "Multifunction" version, the radio signals are sent between the transmitter key (S953) and the multifunction antenna (W15) that is located on the cab roof.

	Drive authorization system overall network		**Page 238**
	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Drive control (CPC) control unit, component description	A3	**Page 334**
	Engine management control unit (MCM), component description	A4	**Page 335**
	Transmission control (TCM) control unit. component description	A5	**Page 337**
	Electronic ignition lock (EIS), component description	S1	**Page 460**
	Transmitter key, component description	S953	**Page 473**
	Multifunction antenna, component description	W15	**Page 478**

GF80.57-W-0003-03H	Drive authorization system overall network		

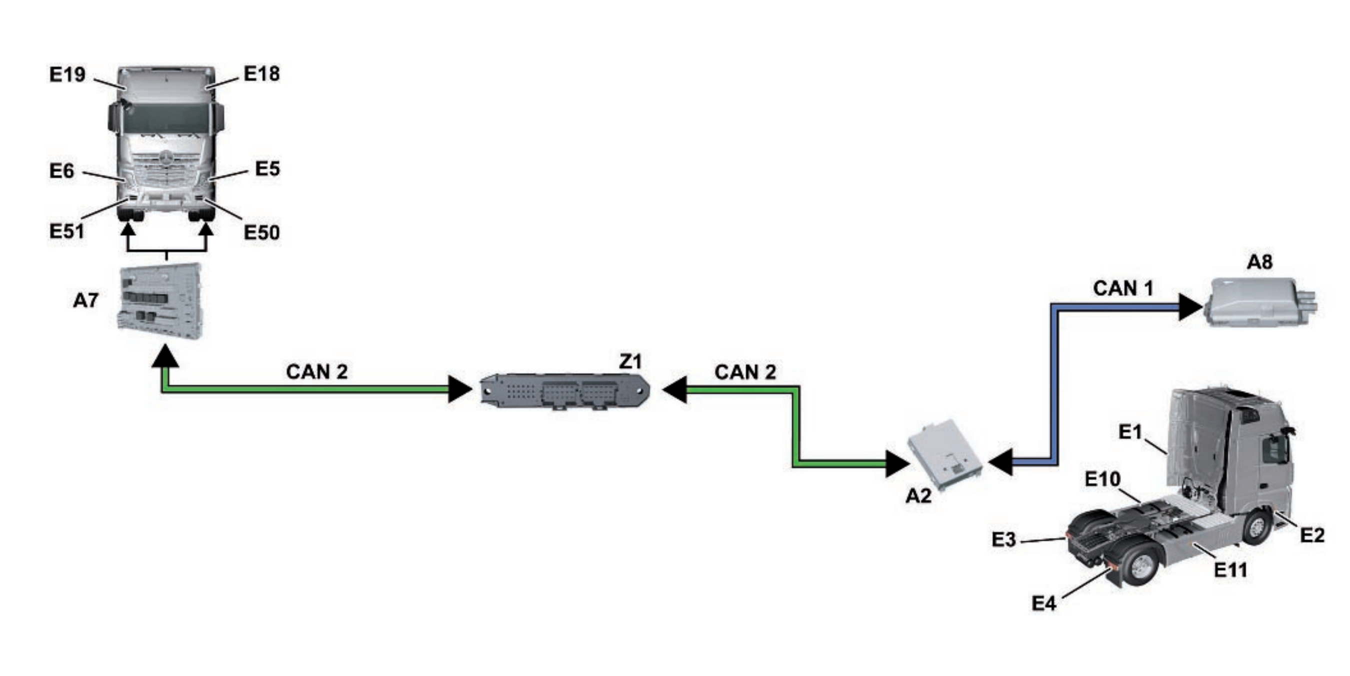


W80.57-1019-79

A1	Instrument cluster (ICUC) control unit
A2	Central gateway control unit (CGW)
A3	Drive control (CPC) control unit
A4	Engine management control unit (MCM)
A5	Transmission control (TCM) control unit
CAN 2	Interior CAN
CAN 3	Frame CAN
CAN 4	Drive train CAN
S1	Electronic ignition lock (EIS)
Z1	Cab instrument panel CAN bus star point
Z3	Frame CAN bus star point
Z4	Drive CAN bus star point

GF82.10-W-0003H	Exterior lights, function	20.7.11

MODEL 963



W82.10-1116-79

A2 *Central gateway control unit (CGW)*
A7 *SCA sensor and actuator module, cab control unit*
A8 *SCH sensor and actuator module, chassis control unit*
CAN 1 *Exterior-CAN*
CAN 2 *Interior CAN*
E1 *Left turn signal lamp and side marker lamp*
E2 *Right turn signal lamp and side marker lamp*
E3 *Left rear lamp unit*
E4 *Right rear lamp unit*
E5 *Left headlamp*
E6 *Right headlamp*
E10 *Left side marker lamp 1*
E11 *Right side marker lamp 1*
E18 *Left front clearance lamp*
E19 *Right front clearance lamp*
E50 *Left front fog lamp and daytime running lamp*
E51 *Right front fog lamp and daytime running lamp*
Z1 *Cab instrument panel CAN bus star point*

General

The standard configuration includes the following lighting equipment:

- Stationary lights, low beam and high beam, with additional function "ambient illumination"
- Turn signals and hazard warning system, with additional function "touch turn signals"
- Front fog lamps
- Rear fog lights, reversing light and brake lights

The following can be ordered as special equipment:

- Code (L1I) Front fog lamps, LED daytime running lights
- Code (L1N) Front fog lamps, LED daytime running lights, corner-illuminating fog lamps
- Code (L3A) Work lamp, bottom
- Code (L3C) Work lamp cab rear panel, top
- Code (F0T) Illuminated Mercedes star

The lighting equipment of the exterior lights are actuated and monitored by the SCA sensor and actuator module, cab control unit (A7) and the SCH sensor and actuator module, chassis control unit (A8).

SCA sensor and actuator module, cab control unit (A7)
The SCA sensor and actuator module, cab control unit (A7) looks after the switching logic for the lighting equipment in the front area of the vehicle, controls and monitors the trailer lighting and generates the flashing frequency of the turn signal system.
The following lighting equipment is connected to the SCA sensor and actuator module, cab control unit (A7):

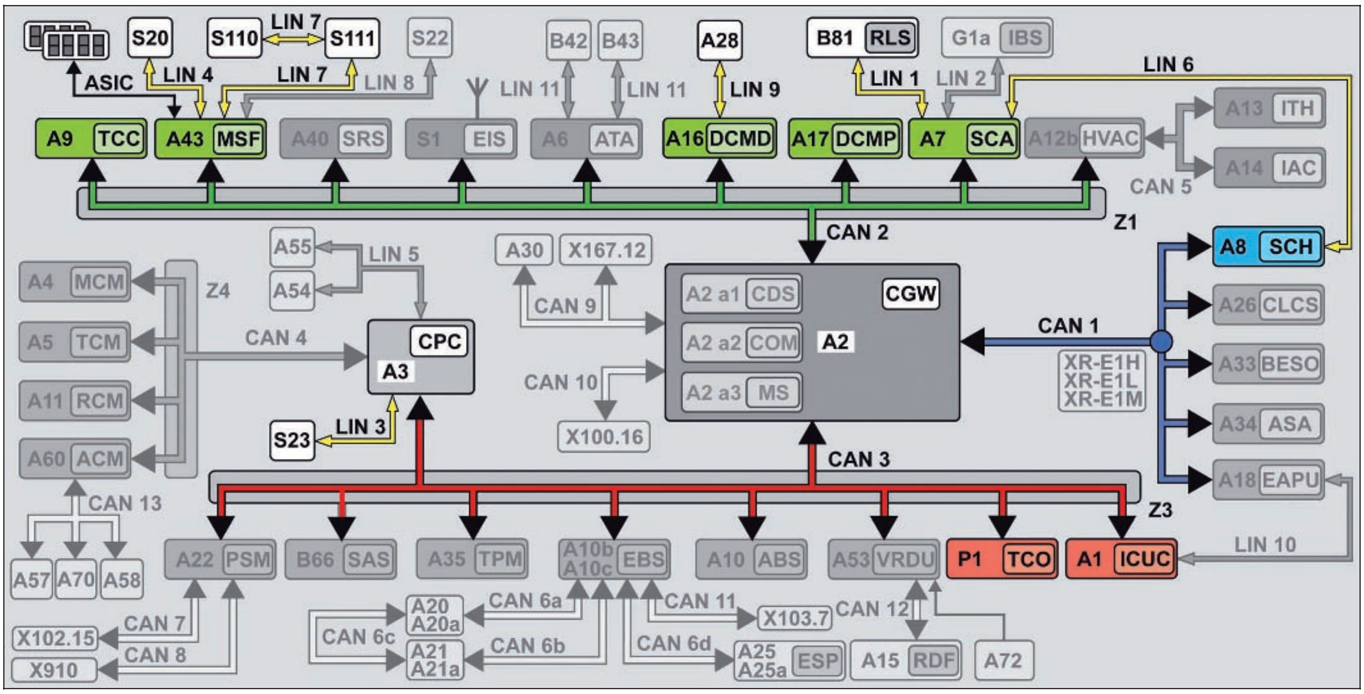
- Left turn signal lamp and side marker lamp (E1)
- Right turn signal lamp and side marker lamp (E2)
- Left headlamp (E5)
- Right headlamp (E6)
- Left front clearance lamp (E18)
- Right front clearance lamp (E19)
- Left front fog lamp and daytime running lamp (E50)
- Right front fog lamp and daytime running lamp (E51)

In vehicles with code (F0T) Illuminated Mercedes star, the lighting of the Mercedes star is actuated and monitored, and in vehicles with code (L3A) Work lamp, lower or code (L3C) Cab rear panel work lamp, upper the swiveling work lamp is actuated and monitored.

SCH sensor and actuator module, chassis control unit (A8)
The SCH sensor and actuator module, chassis control unit (A8) looks after the actuation and monitoring of the lighting equipment in the rear area of the vehicle. These include:

- Left rear lamp unit (E3)
- Right rear lamp unit (E4)
- Left side marker lamp 1 (E10)
- Right side marker lamp 1 (E11)

GF82.10-W-0003-05H	Exterior lights overall network		

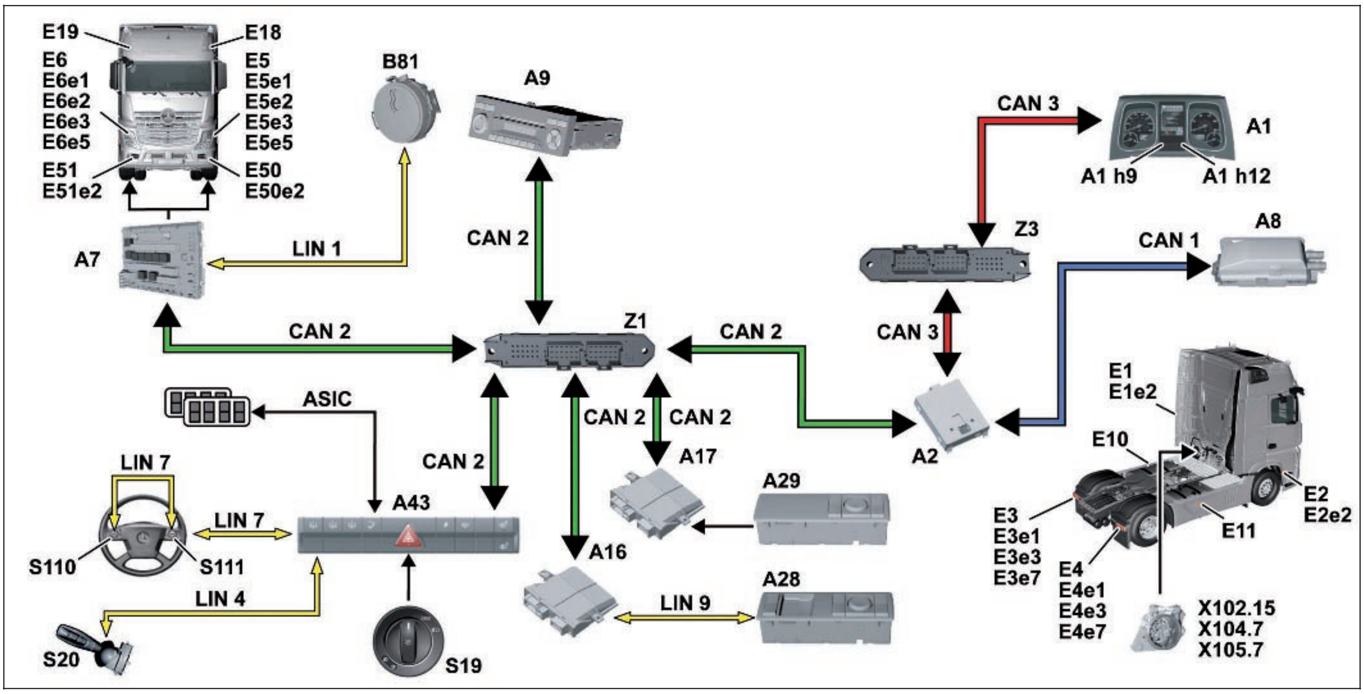


W82.10-1114-79

A1 *Instrument cluster (ICUC) control unit*
A2 *Central gateway control unit (CGW)*
A3 *Drive control (CPC) control unit*
A7 *SCA sensor and actuator module, cab control unit*
A8 *SCH sensor and actuator module, chassis control unit*
A9 *Truck Control Center (TCC)*
A16 *Driver door module (DCMD) control unit*
A17 *Front passenger door module (DCMP) control unit*
A28 *Driver switch group*
A43 *Modular switch panel (MSF) control unit*
B81 *Rain and light sensor (RLS)*
CAN 1 *Exterior-CAN*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
LIN 1 *Rain/light sensor LIN*
LIN 3 *Right multifunction control lever LIN*
LIN 4 *Left multifunction control lever LIN*
LIN 6 *SCA/SCH redundancy LIN*
LIN 7 *Button group LIN*
LIN 9 *Driver switch panel LIN*
P1 *Tachograph (TCO)*
S20 *Left multifunction control lever*
S23 *Right multifunction control lever*
S110 *Left multifunction steering wheel button group*
S111 *Right multifunction steering wheel button group*
Z1 *Cab instrument panel CAN bus star point*
Z3 *Frame CAN bus star point*
ASIC *ASIC data bus (Application System Integrated Circuit)*

GF82.10-W-2009H	Headlamp control, function	20.7.11

MODEL 963



W82.10-1117-79

A1	*Instrument cluster (ICUC) control unit*
A1 h9	*High beam indicator lamp*
A1 h12	*Standing lamps indicator lamp*
A2	*Central gateway control unit (CGW)*
A7	*SCA sensor and actuator module, cab control unit*
A8	*SCH sensor and actuator module, chassis control unit*
A9	*Truck Control Center (TCC)*
A16	*Driver door module (DCMD) control unit*
A17	*Front passenger door module (DCMP) control unit*
A28	*Driver switch group*
A29	*Front passenger switch group*
A43	*Modular switch panel (MSF) control unit*
B81	*Rain and light sensor (RLS)*
CAN 1	*Exterior-CAN*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
E1	*Left turn signal lamp and side marker lamp*
E1e2	*Left-side side marker lamp*
E2	*Right turn signal lamp and side marker lamp*
E2e2	*Right-side side marker lamp*
E3	*Left rear lamp unit*
E3e1	*Left tail light*
E3e3	*Left side marker lamp*
E3e7	*Left license plate lamp*
E4	*Right rear lamp unit*
E4e1	*Right tail light*
E4e3	*Right side marker lamp*
E4e7	*Right license plate lamp*
E5	*Left headlamp*
E5e1	*Left low beam*
E5e2	*Left main beam*
E5e3	*Left side light*
E5e5	*Left daytime running light*
E6	*Right headlamp*
E6e1	*Right low beam*
E6e2	*Right main beam*
E6e3	*Right side light*
E6e5	*Right daytime running light*
E10	*Left side marker lamp 1*
E11	*Right side marker lamp 1*
E18	*Left front clearance lamp*
E19	*Right front clearance lamp*
E50	*Left front fog lamp and daytime running lamp*
E50e2	*Left daytime running light*
E51	*Right front fog lamp and daytime running lamp*
E51e2	*Right daytime running light*

LIN 1	*Rain/light sensor LIN*
LIN 4	*Left multifunction control lever LIN*
LIN 7	*Button group LIN*
LIN 9	*Driver switch panel LIN*
S19	*Exterior lights switch*
S20	*Left multifunction control lever*
S110	*Left multifunction steering wheel button group*
S111	*Right multifunction steering wheel button group*
X102.15	*Trailer socket , 15-pin*
X104.7	*Trailer socket 24S*
X105.7	*Trailer socket 24N*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*
ASIC	*ASIC data bus (Application System Integrated Circuit)*

General information
The driving lights actuation provides optimum lighting of the road when driving.
The standing lights are active during driving lights actuation.

1 Standing lights actuation

Preconditions
- Voltage supply present at all the control units in question and interlinkage intact.

Function sequence

1.1 If the exterior lights switch (S19) is in the "Standing lights ON" position, it signals "Standing lights ON" to the modular switch panel control unit (MSF) (A43).

1.2 The modular switch panel control unit (MSF) (A43) converts the incoming signal into a message and sends this to the interior CAN (CAN 2), where it can be received by the
- Central gateway control unit (CGW) (A2),
- SCA sensor and actuator module, cab control unit (A7),
- Driver door module (DCMD) (A16) and front passenger door module (DCMP) (A17).

1.3 The central gateway control unit (CGW) (A2) transmits the message "Standing light ON" via the exterior CAN (CAN 1) to the SCH sensor and actuator module, chassis control unit (A8) and via the frame CAN (CAN 3) to the instrument cluster control unit (ICUC) (A1). The SCH sensor and actuator module, chassis control unit (A8) then actuates the following lamps:
- Left taillight (E3e1),
- Right taillight (E4e1),
- Left side-marker lamp (E3e3),
- Right side-marker lamp (E4e3),
- With left-hand drive vehicles the left license plate lamp (E3e7) or
  with right-hand drive vehicles the right license plate lamp (E4e7)
- Side marker lamp(s) (E10 to E17), depending on wheelbase.
- the relevant contacts of the trailer sockets

The instrument cluster control unit (ICUC) (A1) then actuates the instrument illumination and the standing lights indicator lamp (A1 h12) on the basis of the "Standing lights ON" message.

1.4 The SCA sensor and actuator module, cab control unit (A7) also converts the incoming message and actuates the following lamps:
- Left-side side marker light (E1e2)
- Right-side side marker light (E2e2),
- Left standing light (E5e3),
- Right standing light (E6e3),
- Left front clearance lamp (E18),
- Right front clearance lamp (E19).

1.5 At the same time, the ASIC data bus (ASIC) actuates the switch and controls illumination of the switches installed in the modular switch panels.
The switch and controls illumination of the switches in the driver switch group (A28) and the front passenger switch group (A29) is actuated by the respective driver door module control unit (DCMD) (A16) and front passenger door module control unit (DCMP) (A17).
The modular switch panel control unit (MSF) (A43) also actuates the switch and controls illumination of the left multifunction steering wheel button group (S110), the right multifunction steering wheel button group (S111) and the lighting of the Truck Control Center (TCC) (A9).

2 Low beam actuation in vehicles without code (F8X) Rain/light sensor

Preconditions
- Voltage supply present at all the control units in question and interlinkage intact.

Function sequence

2.1 If the exterior lights switch (S19) is in the "Low beams ON" position, it signals "Low beams ON" to the modular switch panel control unit (MSF) (A43).

2.2 The modular switch panel control unit (MSF) (A43) converts the incoming signal into a message and sends this to the interior CAN (CAN 2), where it can be received by the SCA sensor and actuator module, cab control unit (A7).
The SCA sensor and actuator module, cab control unit (A7) then also actuates the following lamps in addition to "Standing lights ON":
- Left low beam (E5e1) and
- Right low beam (E6e1).

3 Low beam actuation in vehicle with code (F8X) Rain and light sensor

Preconditions
- Voltage supply present at all the control units in question and interlinkage intact.

Function sequence

3.1 If the exterior lights switch (S19) is in position "A", it signals to the modular switch panel control unit (MSF) (A43) that the light sensor function is being activated. The modular switch panel control unit (MSF) (A43) converts the incoming signal into a message and sends this to the interior CAN (CAN 2), where it can be received by the SCA sensor and actuator module, cab control unit (A7).

3.2 Because of the signaled activation of the light sensor, the SCA sensor and actuator module, cab control unit (A7) cyclically transmits a query via the rain/light sensor LIN (LIN 1) to the rain and light sensor (RLS) (B81) as to which request for actuating the standing lights and the low beams is currently present.

As a result of this query, the rain and light sensor (RLS) (B81) transmits either the message "Standing lights and low beams on" or "Standing lights and low beams off" back to the SCA sensor and actuator module, cab control unit (A7). The SCA sensor and actuator module, cab control unit (A7) actuates the following lamps in accordance with the request:

- Left-side side marker light (E1e2)
- Right-side side marker light (E2e2),
- Left standing light (E5e3),
- Right standing light (E6e3),
- Left front clearance lamp (E18),
- Right front clearance lamp (E19),
- Left low beam (E5e1) and
- Right low beam (E6e1).

3.3 At the same time, the central gateway control unit (CGW) (A2) receives the request "Standing lights and low beams on" via the interior CAN (CAN 2) and transmits this via the exterior CAN (CAN 1) to the SCH sensor and actuator module, chassis control unit (A8). The SCH sensor and actuator module, chassis control unit (A8) then actuates the following lamps:

- Left taillight (E3e1),
- Right taillight (E4e1),
- Left side-marker lamp (E3e3),
- Right side-marker lamp (E4e3),
- With left-hand drive vehicles the left license plate lamp (E3e7) or
  with right-hand drive vehicles the right license plate lamp (E4e7)
- Side marker lamp(s) (E10 to E17), depending on wheelbase.

---

4 High-beams actuation

Preconditions

- Voltage supply present at all the control units in question and networking intact.
- Terminal 15 "ON"
- For the high beams function: exterior lights switch (S19) to position "Low beams ON"
- For the headlamp flasher function: exterior lights (S19) to position "0", "Standing lights ON" or "Low beams ON"

Function sequence

4.1 The high beams or the headlamp flasher is switched on and off again using the left multifunction control lever (S20).

4.2 The left multifunction control lever (S20) is connected via the left multifunction control lever LIN (LIN 4) to the modular switch panel control unit (MSF) (A43). The modular switch panel control unit (MSF) (A43) cyclically obtains the current position of the left multifunction control lever (S20).

If it detects that the driver has switched on the high beams or the headlamp flasher, it transmits an appropriate message via the interior CAN (CAN 2) to the SCA sensor and actuator module, cab control unit (A7) and to the central gateway control unit (CGW) (A2).

4.3 The message is forwarded by the central gateway control unit (CGW) (A2) via the frame CAN (CAN 3) to the instrument cluster control unit (ICUC) (A1).

4.4 The SCA sensor and actuator module, cab control unit (A7) then actuates the following lamps:

- Left high beam (E5e2) in the left headlamp (E5) and
- Right high beam (E6e2) in the right headlamp (E6).

4.5 At the same time, the instrument cluster control unit (ICUC) (A1) actuates the high beams indicator lamp (A1 h9).

---

5 Daytime running lamps actuation

Preconditions

- Power supply present for all affected control units and networking intact
- Terminal 15 "ON" and engine "Running"
- Exterior lights switch (S19) "OFF"
- Parking brake is released

Function sequence

5.1 The function sequence corresponds to "Low beam actuation in vehicles without code (F8X) Rain and light sensor".

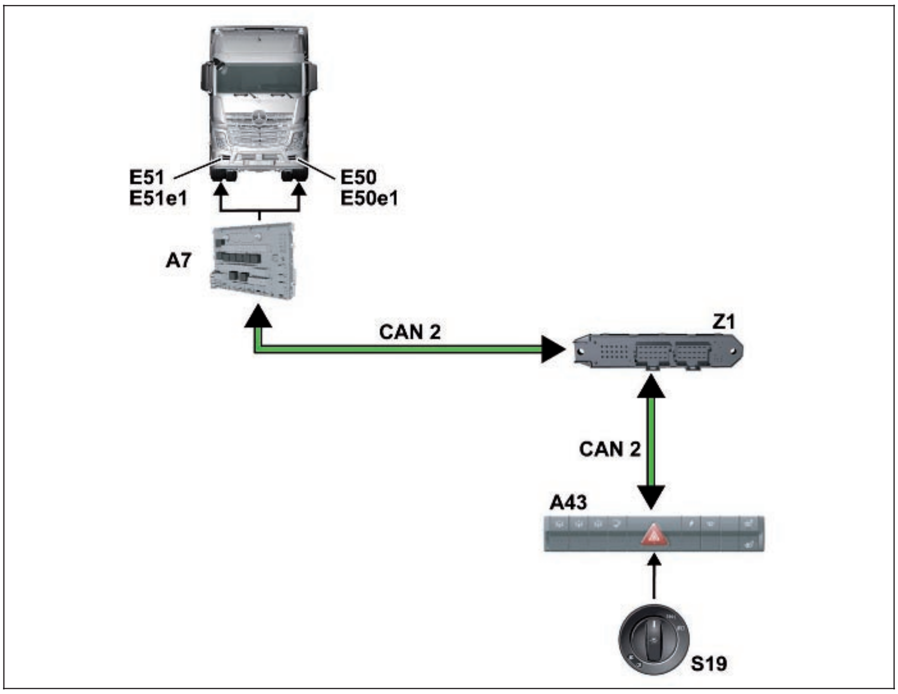
Depending on the equipment, the following lamps can also be actuated for the "Daytime running lights" function via the SCA sensor and actuator module, cab control unit (A7):

- The daytime running lights (E5e5, E6e5) in the headlamps (E5, E6)
- The daytime running lights (E50e2, E51e2) in the front fog lamps and the daytime running lamps (E50, E51)
  (in vehicles with code (L1I) Front fog lamps, LED daytime running lights or with code (L1N) Front fog lamps, LED daytime running lights, corner-illuminating fog lamps)

GF82.10-W-3006H	Fog lamp actuation, function	20.7.11

MODEL 963

A7	*SCA sensor and actuator module, cab control unit*
A43	*Modular switch panel (MSF) control unit*
CAN 2	*Interior CAN*
E50	*Left front fog lamp and daytime running lamp*
E50e1	*Left fog light*
E51	*Right front fog lamp and daytime running lamp*
E51e1	*Right fog light*
S19	*Exterior lights switch*
Z1	*Cab instrument panel CAN bus star point*



W82.10-1118-76

Requirement
- Voltage supply present at all the control units in question and interlinkage intact.
- The exterior lights switch (S19) is in position "Standing lights ON" or "Low beams ON".

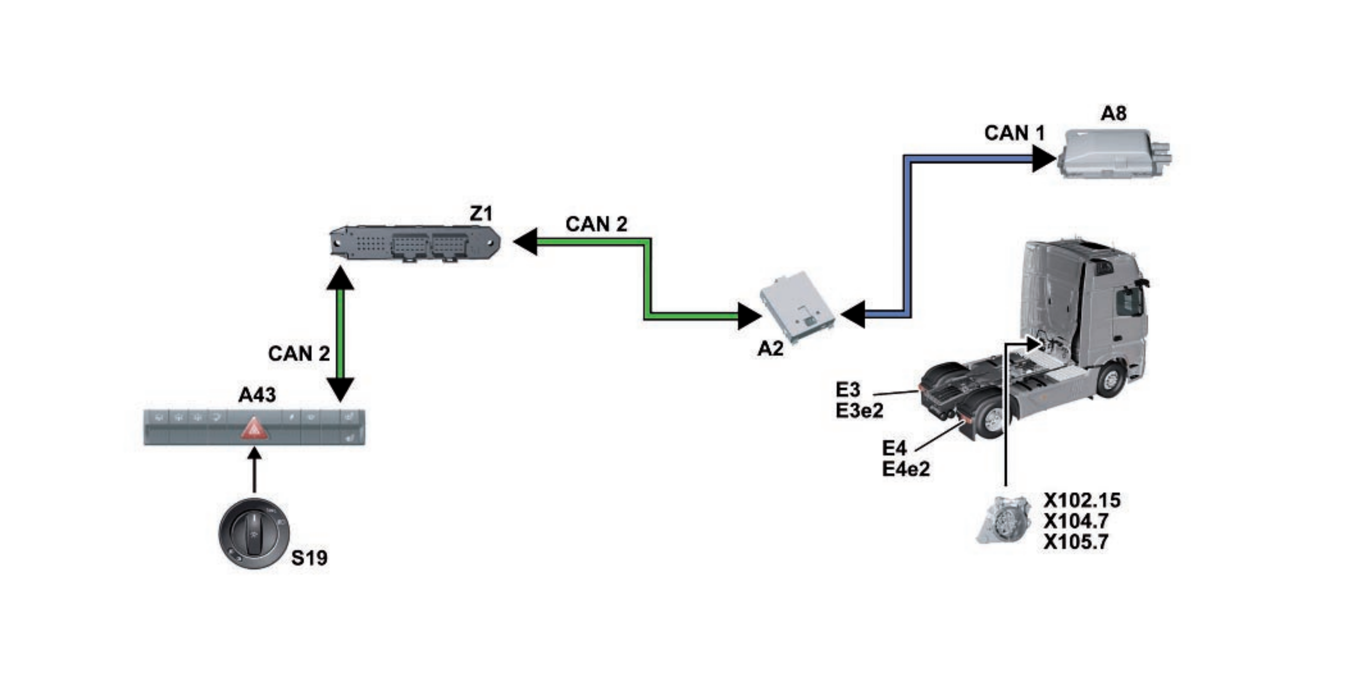
Function sequence
The "Front fog lamps ON" request is signaled to the modular switch panel control unit (MAF) (A43) by pulling out the exterior lights switch (S19) to the 1st detent, and therefore to position "Front fog lamps ON". The modular switch panel control unit (MSF) (A43) now sends the "Front fog lamps ON" message onto the interior CAN (CAN 2) in addition to the previous "Standing lights ON" or "Low beams ON" message.

The SCA sensor and actuator module, cab control unit (A7) receives the incoming messages from the interior CAN (CAN 2), depending on the position of the exterior lights switch (S19), "Standing lights ON" or"Low beams ON" and "Front fog lamps ON". The lamps for the left front fog lights (E50e1) and the front fog lights (E51e1) are also actuated.
The green "Fog lamp indicator lamp" in the external light switch (S19) comes on.

	Sensor and actuator module, cab (SCA) control unit, component description	A7	**Page 339**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**

GF82.10-W-3007H	Rear fog light actuation, function	20.7.11

MODEL 963



W82.10-1119-79

A2 Central gateway control unit (CGW)
A8 SCH sensor and actuator module, chassis control unit
A43 Modular switch panel (MSF) control unit
CAN 1 Exterior-CAN
CAN 2 Interior CAN
E3 Left rear lamp unit
E3e2 Left rear fog light
E4 Right rear lamp unit
E4e2 Right rear fog light
S19 Exterior lights switch
X102.15 Trailer socket , 15-pin
X104.7 Trailer socket 24S
X105.7 Trailer socket 24N
Z1 Cab instrument panel CAN bus star point

Requirement

- Voltage supply present at all the control units in question and interlinkage intact.
- The exterior lights switch (S19) is in position "Standing lights ON" or "Low beams ON" and has been pulled out to position "Front fog lamps ON" (1st detent).

Function sequence

The "Front fog lamps ON" request is signaled to the modular switch panel control unit (MAF) (A43) by pulling out the exterior lights switch (S19) to the 2nd detent, and therefore to position "Rear fog light ON". The modular switch panel control unit (MSF) (A43) now sends the "Rear fog light ON" message to the interior CAN (CAN 2) in addition to the previous "Standing lights ON", "Low beams ON" or "Front fog lamps ON" message.

The central gateway control unit (CGW) (A2) sends the incoming messages to the exterior CAN (CAN 1), where they are received by the SCH sensor and actuator module, chassis control unit (A8).

The following lamps are then actuated:

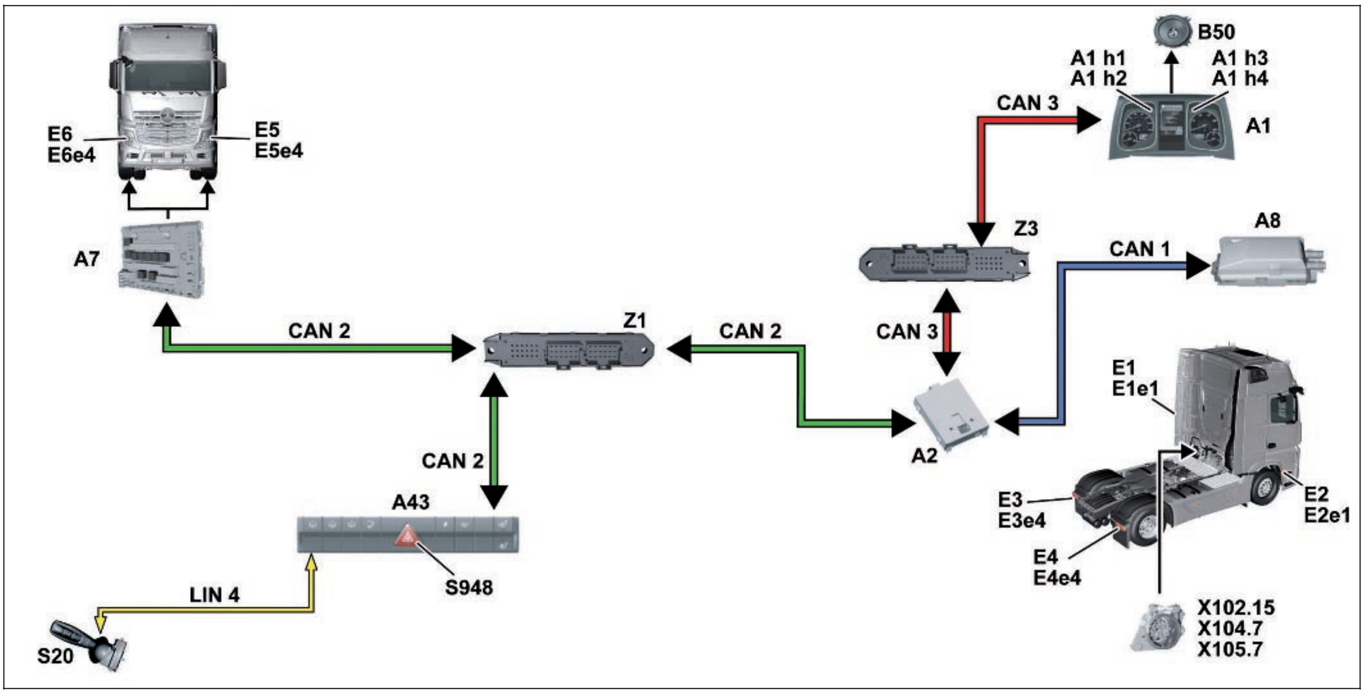
- Left rear fog light (E3e2),
- Right rear fog light (E4e2) and
- the relevant contacts of the trailer socket for the rear fog lights when driving with a trailer.

The yellow "Rear fog lights indicator lamp" in the exterior lights switch (S19) illuminates.

	Central gateway control unit (CGW), component description	A2	**Page 333**
	SCH sensor and actuator module, chassis control unit, component description	A8	**Page 340**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Rear lamp unit, component description	E3, E4	**Page 445**

GF82.10-W-3008H	Turn signal light actuation, function	20.7.11

MODEL 963



W82.10-1120-79

A1	*Instrument cluster (ICUC) control unit*	*A43*	*Modular switch panel (MSF) control unit*	*E5*	*Left headlamp*
A1 h1	*Left trailer turn signal indicator light*	*B50*	*Center speaker*	*E5e4*	*Left turn signal lamp*
A1 h2	*Left vehicle turn signal indicator light*	*CAN 1*	*Exterior-CAN*	*E6*	*Right headlamp*
A1 h3	*Right trailer turn signal indicator light*	*CAN 2*	*Interior CAN*	*E6e4*	*Right turn signal lamp*
A1 h4	*Right vehicle turn signal indicator light*	*CAN 3*	*Frame CAN*	*LIN 4*	*Left multifunction control lever LIN*
A2	*Central gateway control unit (CGW)*	*E1*	*Left turn signal lamp and side marker lamp*	*S20*	*Left multifunction control lever*
A7	*SCA sensor and actuator module, cab control unit*	*E1e1*	*Left side turn signal light*	*S948*	*Hazard warning system switch*
A8	*SCH sensor and actuator module, chassis control unit*	*E2*	*Right turn signal lamp and side marker lamp*	*X102.15*	*Trailer socket , 15-pin*
		E2e1	*Right side turn signal light*	*X104.7*	*Trailer socket 24S*
		E3	*Left rear lamp unit*	*X105.7*	*Trailer socket 24N*
		E3e4	*Left turn signal lamp*	*Z1*	*Cab instrument panel CAN bus star point*
		E4	*Right rear lamp unit*	*Z3*	*Frame CAN bus star point*
		E4e4	*Right turn signal lamp*		

1 Turn signal light actuation

Preconditions

- Power supply present for all affected control units and networking intact
- Terminal 15 ON or
- Engine "running"

Function

1.1 "Left turn signal lights ON" or "Right turn signal lights ON" is signaled to the modular switch panel control unit (MSF) (A43) via the left multifunction control lever LIN (LIN 4) with the switches of the left multifunction control lever (S20) in position "Left turn signal lights" or "Right turn signal lights". The modular switch panel control unit (A43) converts the signal into the relevant message "Left turn signal light ON" or "Right turn signal light ON" and places it on the interior CAN (CAN 2). Here the message is received by the:

- SCA sensor and actuator module, cab control unit (A7)
- Central gateway control unit (CGW) (A2).

1.2 The SCA sensor and actuator module, cab control unit (A7) generates the flashing frequency and makes this available to all other control units via the CAN data bus system, so that the indicator lamps in the instrument cluster flash at the same frequency, for example.
The flashing frequency has a duty cycle of 50±2% as standard, with a frequency of 1.5 Hz, which corresponds to 90 flashes/min.
The SCA sensor and actuator module, cab control unit (A7) also actuates the following depending on the request:

- left side turn signal lamp (E1e1),
- right side turn signal lamp (E2e1)
- left turn signal lamp (E5e4),
- right turn signal lamp (E6e4).

If the modular switch panel control unit (MSF) (A43) transmits "Turn signal lights OFF", the SCA sensor and actuator module, cab control unit (A7) first completes the previously started flashing light period before actuation is interrupted.

1.3 The central gateway control unit (CGW) (A2) transmits the messages via the exterior CAN (CAN 1) to the SCH sensor and actuator module, chassis control unit (A8) and via the frame CAN (CAN 3) to the instrument cluster control unit (ICUC) (A1).

1.4 The SCH sensor and actuator module, chassis control unit (A8) actuates the following depending on the request:
- The left turn signal light (E3e4) in the left rear taillamp (E3) or,
- the right turn signal light (E4e4) in the right rear taillamp (E4) and
- the relevant contacts in the trailer socket.

1.5 The instrument cluster control unit (ICUC) (A1) actuates:
- with "Left turn signal light ON" the left vehicle turn signal light indicator lamp (A1 h2) and with additional trailer operation the left trailer turn signal light indicator lamp (A1 h1),
- with "Right turn signal light ON" the right vehicle turn signal light indicator lamp (A1 h4) and with additional trailer operation the right trailer turn signal light indicator lamp (A1 h3).

Also, the flashing noises generated in the instrument cluster control unit (ICUC) (A1) are output via the internal speaker of the instrument cluster control unit (ICUC) (A1) or via the center roof speaker (B50).

1.6 If the instrument cluster control unit (ICUC) (A1) receives "Turn signal light bulb defective", the flashing frequency is doubled at the relevant side.

---

2 Hazard warning flasher actuation

Preconditions
- Voltage supply present at all the control units in question and interlinkage intact.

Function

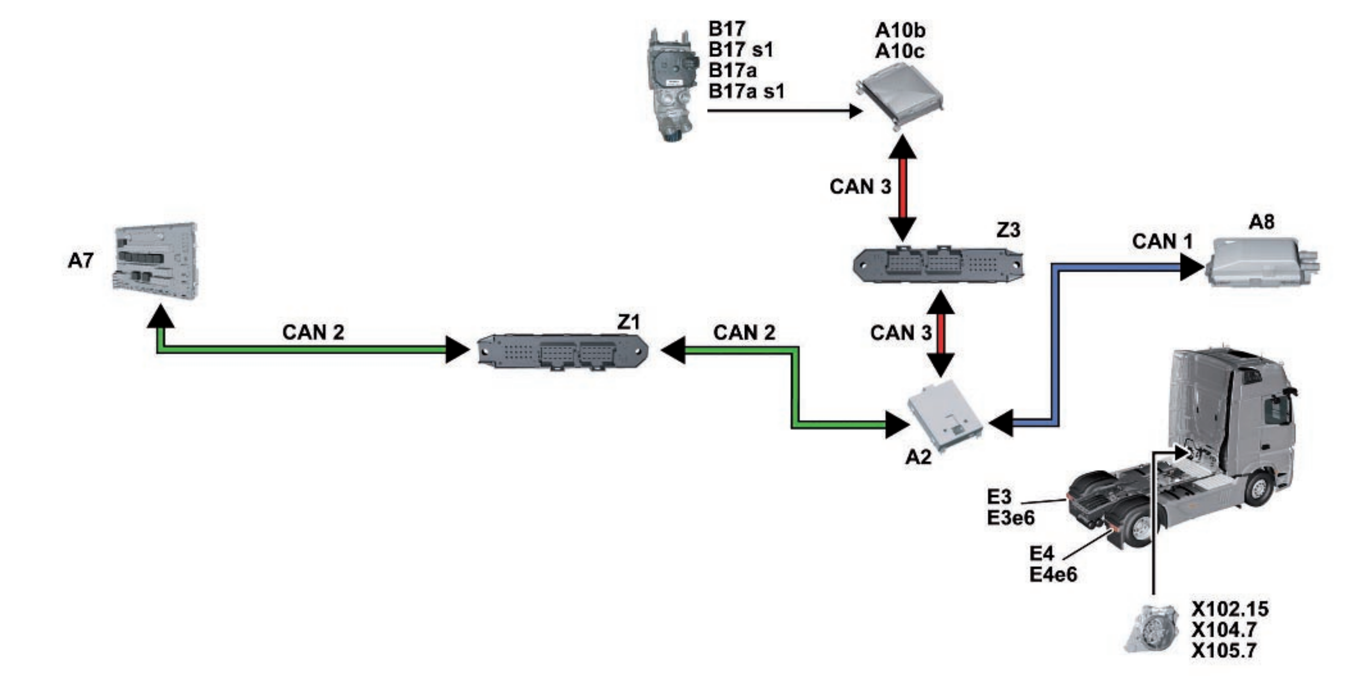
2.1 The function sequence "Hazard warning light actuation" is based on the "Turn signal light actuation" function sequence. It only differs in terms of the way it is actuated / requested.

2.2 Hazard warning light actuation is requested if:
- The hazard warning system (S948) switch is activated,
- the Active Brake Assist (ABA) actively intervenes in the traffic situation and requests hazard warning light actuation or
- the anti-theft alarm system (ATA) activates or an alarm is triggered.

	Instrument cluster (ICUC) control unit, component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	SCA sensor and actuator module, cab control unit, component description	A7	**Page 339**
	SCH sensor and actuator module, chassis control unit, component description	A8	**Page 340**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Rear lamp unit, component description	E3, E4	**Page 445**
	Headlamp, component description	E5, E6	**Page 446**

GF82.10-W-3010H	Brake lights actuation, function	20.7.11

MODEL 963



W82.10-1121-79

A2	*Central gateway control unit (CGW)*	*B17*	*Brake value sensor*	*E4*	*Right rear lamp unit*
A7	*SCA sensor and actuator module, cab control unit*	*B17a*	*Brake value sensor*	*E4e6*	*Right stop light*
A8	*SCH sensor and actuator module, chassis control unit*	*B17 s1*	*Stop lamp switch*	*X102.15*	*Trailer socket , 15-pin*
A10b	*Electronic brake control control unit (EBS) (Wabco)*	*B17as1*	*Brake light switch*	*X104.7*	*Trailer socket 24S*
A10c	*Electronic brake control control unit (EBS) (Knorr)*	*CAN 1*	*Exterior-CAN*	*X105.7*	*Trailer socket 24N*
		CAN 2	*Interior CAN*	*Z1*	*Cab instrument panel CAN bus star point*
		CAN 3	*Frame CAN*	*Z3*	*Frame CAN bus star point*
		E3	*Left rear lamp unit*		
		E3e6	*Left stop light*		

Requirement

- Voltage supply present at all the control units in question and interlinkage intact.
- Circuit 15 "ON"

Function

If the brake light switch (B17 s1 or B17a s1) in the brake value sensor (B17 or B17a) is activated via the brake pedal, it signals "Brake lights ON" to the electronic brake control control unit (EBS) (A10b or A10c).

The electronic brake control control unit (EBS) (A10b or A10c) converts the incoming signal into a message and sends this to the frame CAN (CAN 3), where it can be received by the central gateway control unit (CGW) (A2).

The central gateway control unit (CGW) (A2) forwards this message via the interior CAN (CAN 2) to the SCA sensor and actuator module, cab control unit (A7) and via the exterior CAN (CAN 1) to the SCH sensor and actuator module, chassis control unit (A8).
The SCH sensor and actuator module, chassis control unit (A8) then actuates the following lamps:

- Left brake light (E3e6)
  in the left rear lamp unit (E3)
- Right brake light (E4e6)
  in the right rear lamp unit (E4).

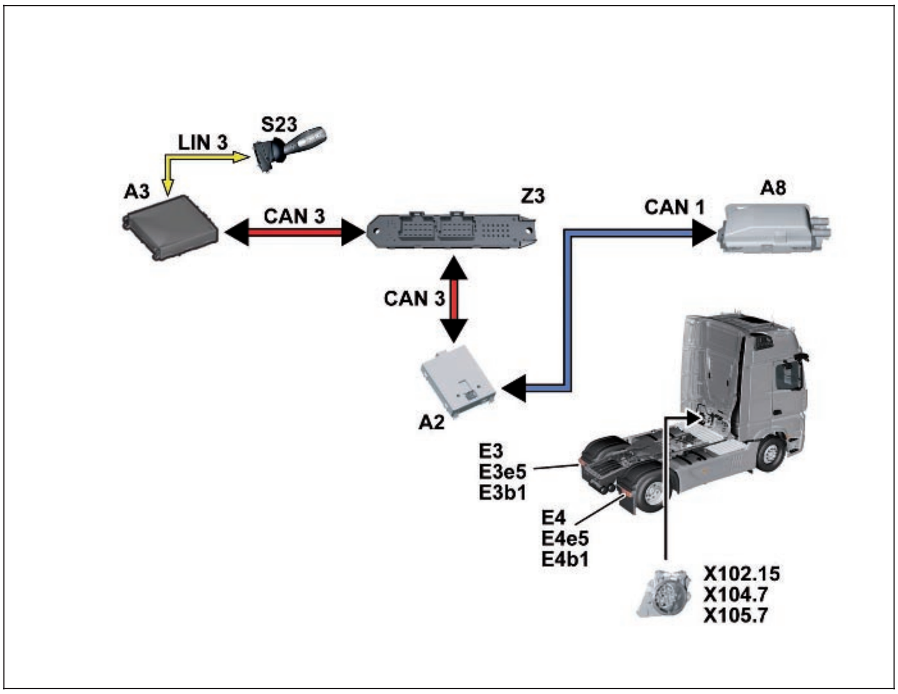
Depending on the equipment, the SCA sensor and actuator module, cab control unit (A7) actuates the relevant contacts in the respective trailer socket for the brake lamps during trailer operation.

	Central gateway control unit (CGW), component description	A2	**Page 333**
	SCA sensor and actuator module, cab control unit, component description	A7	**Page 339**
	SCH sensor and actuator module, chassis control unit, component description	A8	**Page 340**
	Electronic Brake Control control unit (EBS), component description	A10b, A10c	**Page 341**
	Brake value sensor, component description	B17, B17a	**Page 406**
	Rear lamp unit, component description	E3, E4	**Page 445**

GF82.10-W-3011H	Backup light actuation, function	20.7.11

MODEL 963

A2	*Central gateway control unit (CGW)*
A3	*Drive control (CPC) control unit*
A8	*SCH sensor and actuator module, chassis control unit*
CAN 1	*Exterior-CAN*
CAN 3	*Frame CAN*
E3	*Left rear lamp unit*
E3e5	*Left backup lamp*
E3b1	*Left backup warning system*
E4	*Right rear lamp unit*
E4e5	*Right backup lamp*
E4b1	*Right backup warning system*
LIN 3	*Right multifunction control lever LIN*
S23	*Right multifunction control lever*
X102.15	*Trailer socket, 15-pin*
X104.7	*Trailer socket 24S*
X105.7	*Trailer socket 24N*
Z3	*Frame CAN bus star point*



W82.10-1122-76

Requirement
- Voltage supply present at all the control units in question and interlinkage intact.
- Circuit 15 "ON"

Backup lamp actuation function sequence

1 The right multifunction control lever (S23) is connected to the drive control control unit (CPC) (A3) via the right multifunction control lever LIN (3).
The backup lamp is switched on and off again via the right multifunction control lever (S23).

2 The drive control control unit (CPC) (A3) cyclically gathers information on the current position of the right multifunction control lever (S23). If it detects that the driver has selected reverse gear, it transmits an appropriate message to the central gateway control unit (CGW) (A2) via the frame CAN (CAN 3).

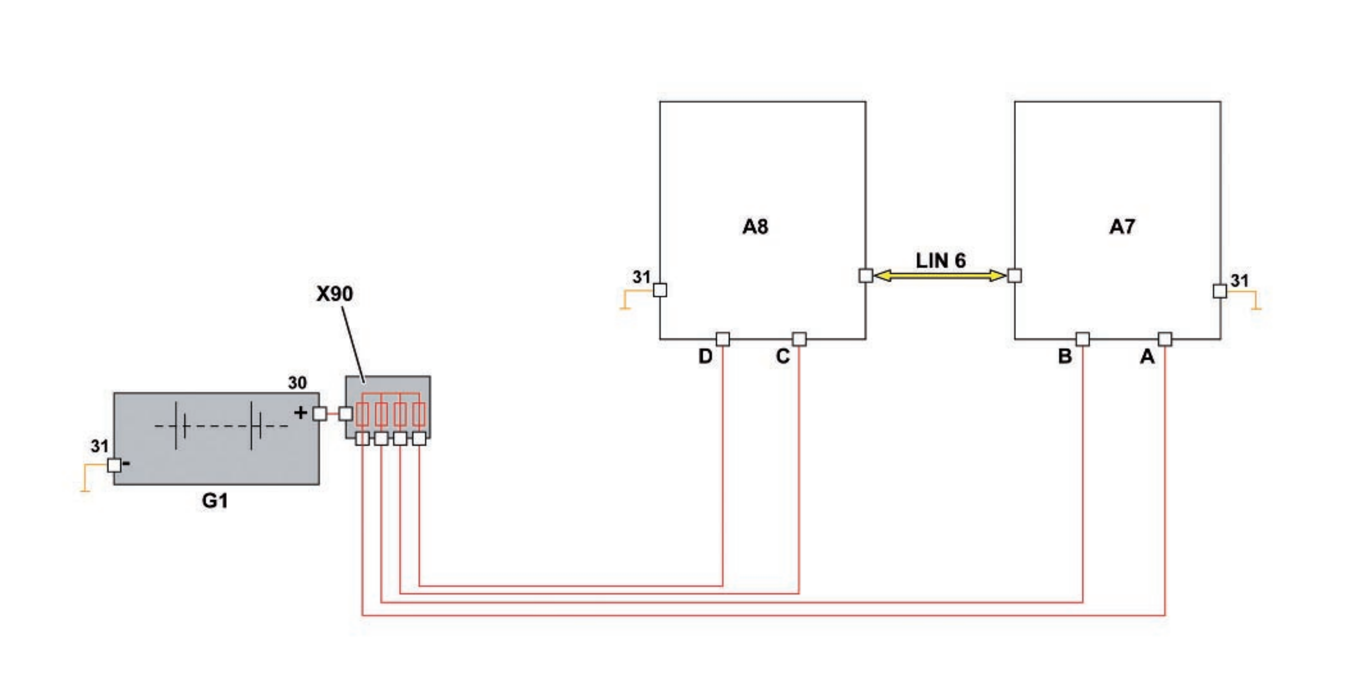
3 Here, the message is forwarded by the exterior CAN (CAN 1) to the SCH sensor and actuator module, chassis control unit (A8).
The SCH sensor and actuator module, chassis control unit (A8) then actuates the following lamps:
- Left backup lamp (E3e5) in the left rear lamp unit (E3) and
- the right backup lamp (E4e5) in the right rear lamp unit (E4) and
- the relevant contacts of the trailer socket for the backup lamps if towing a trailer.

4 The SCH sensor and actuator module, chassis control unit (A8) also actuates
the right backup warning system (E4b1) in left-hand drive vehicles or
the left backup warning system (E3b1) in right-hand drive vehicles.

	Central gateway control unit (CGW), component description	A2	**Page 333**
	Drive control (CPC) control unit, component description	A3	**Page 334**
	SCH sensor and actuator module, chassis control unit, component description	A8	**Page 340**
	Rear lamp unit, component description	E3, E4	**Page 445**
	Right multifunction control lever, component description	S23	**Page 463**

GF82.10-W-3013H	Emergency light actuation, function	20.7.11

MODEL 963



W82.10-1124-79

30	*Terminal 30*	*A8*	*SCH sensor and actuator module, chassis control unit*	*A*	*Main power supply*
31	*Terminal 31*	*G1*	*Battery*	*B*	*Redundant power supply*
A7	*SCA sensor and actuator module, cab control unit*	*LIN 6*	*Redundancy LIN SCA/SCH*	*C*	*Main power supply*
		X90	*Power distributor*	*D*	*Redundant power supply*

i The emergency light actuation is intended to avoid complete failure of the exterior lights cause by a single fault, e.g. discontinuity of terminal 30 (30) supply line at SCA sensor and actuator module, cab control unit (A7) or SCH sensor and actuator module, chassis control unit (A8).

Supply with terminal 30 (30)
The SCA sensor and actuator module, cab control unit (A7) and the SCH sensor and actuator module, chassis control unit (A8) each have two power supply lines. If one of these lines fails, some of the lighting equipment is still functional.

If the main power supply fails, the following functions are still available:

On the tractor vehicle
- Left low beam
- Left and right turn signal lamps
- Right side marker lamps
- Right stop light
- Left taillight

On the trailer or semi-trailer
- Left and right turn signal lamps
- Right stop light
- Left taillight

If the redundant power supply fails, the following functions are still available:

On the tractor vehicle
- Left and right high beams
- Right low beam
- Left and right turn signal lamps
- Left side marker lamps
- Reversing lamp
- License plate lamp
- Rear foglight
- Left stop light
- Left taillight

On the trailer or semi-trailer
- Left and right turn signal lamps
- Right taillight

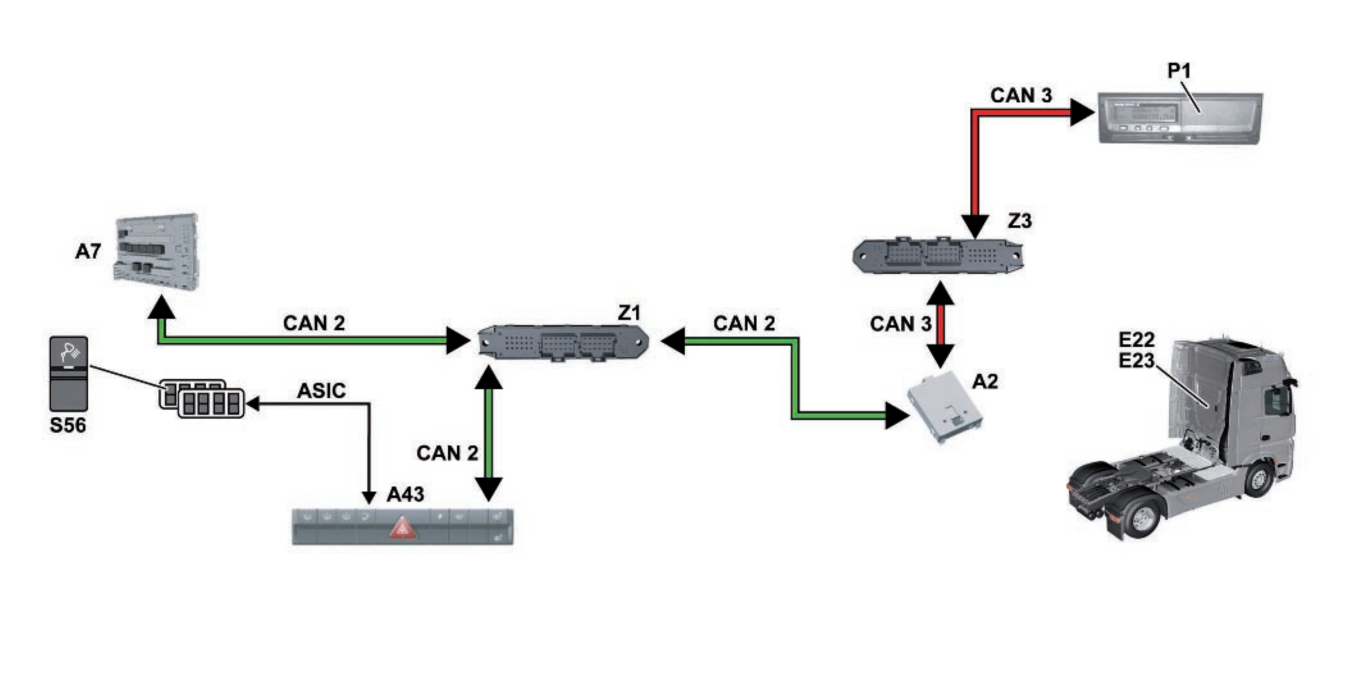
Supply with terminal 31 (31)
No redundant supply is provided with terminal 31 (31). The terminal 31 (31) supply line is monitored and discontinuity is detected.

CAN redundancy
The SCA/SCH redundancy LIN (LIN 6) acts as CAN redundancy between the SCA sensor and actuator module, cab control unit (A7) and the SCH sensor and actuator module, chassis control unit (A8).

	SCA sensor and actuator module, cab control unit, component description	A7	**Page 339**
	SCH sensor and actuator module, chassis control unit,component description	A8	**Page 340**

GF82.10-W-3018H	Floodlight actuation, function	20.7.11

MODEL 963



W82.10-1123-79

A2	*Central gateway control unit (CGW)*	*CAN 2*	*Interior CAN*	*Z1*	*Cab instrument panel CAN bus star point*
A7	*SCA sensor and actuator module, cab control unit*	*CAN 3*	*Frame CAN*	*Z3*	*Frame CAN bus star point*
A43	*Modular switch panel (MSF) control unit*	*E22*	*Lower work lamp*	*ASIC*	*ASIC data bus (Application System Integrated Circuit)*
		E23	*Upper work lamp*		
		P1	*Tachograph (TCO)*		
		S56	*Work lamp button*		

Requirement

- Voltage supply present at all the control units in question and interlinkage intact.

Function sequence

The modular switch panel control unit (MSF) (A43) continuously monitors the switch positions of all ASIC signal switches in the switch panels.
If the work lamp button (S56) is pressed, the modular switch panel control unit (MSF) (A43) detects the message "work lamp ON". Since the "work lamp" function has wake-up authorization, the "work lamp ON" signal triggers a WAKE UP.
The modular switch panel control unit (MSF) (A43) switches from CAN-SLEEP-MODE or POWER-DOWN-MODE to NORMAL-MODE. In this operating condition, it can now convert the incoming message from the work lamp button (S56) and put it onto the interior CAN (CAN 2).

The SCA sensor and actuator module, cab control unit (A7) is woken up by the CAN activity on the interior CAN (CAN 2). Only then can it receive and evaluate the message from the modular switch panel control unit (MSF) (A43).
Following evaluation, the SCA sensor and actuator module, cab control unit (A7) checks whether the drive control control unit (CPC) (A3) is transmitting the current vehicle speed, and if so, how fast it is. If the vehicle speed is below a parameterized threshold or no information pertaining to this is being received, the SCA sensor and actuator module, cab control unit (A7) uses an internal output stage to actuate the lower work lamp (E22), or a relay circuit to actuate

- the upper work lamp (E23),
- the work lamp at the fully-enclosed swap body or
- the work lamp at the cab rear panel.

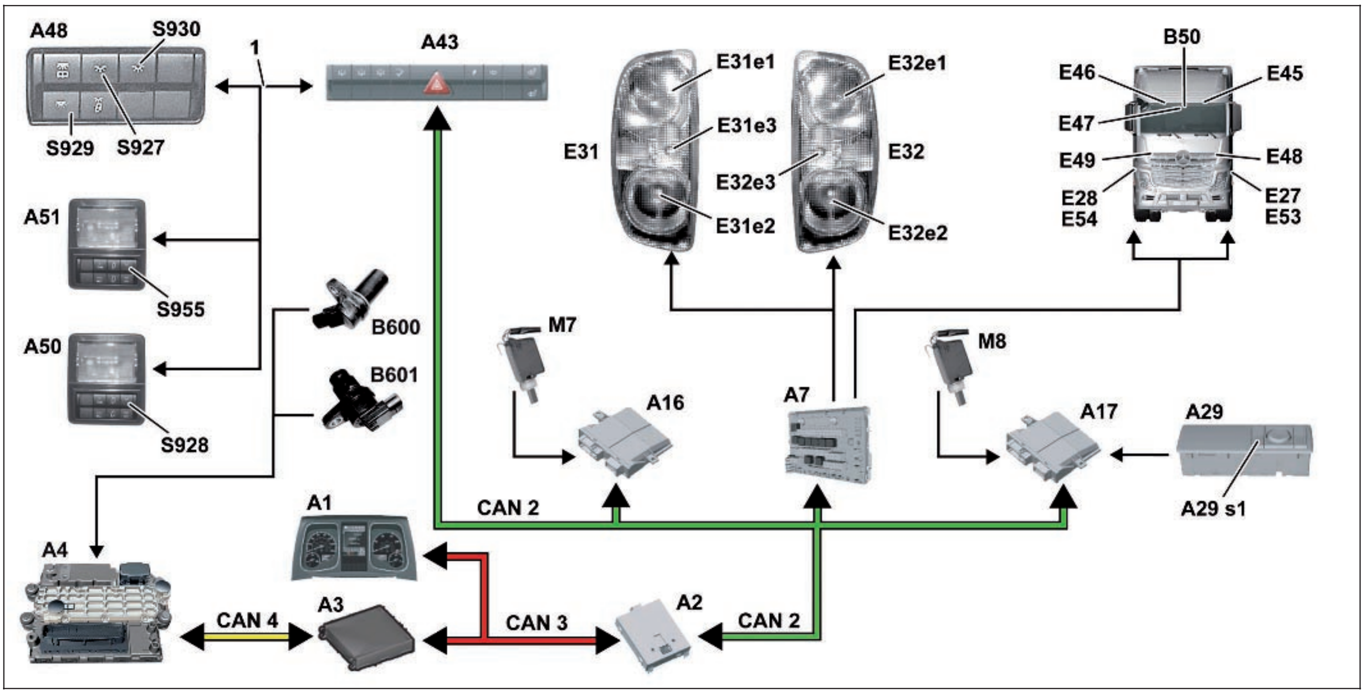
Automatic work lamp switch-off
As it is not permitted by law to operate the work lamps while driving, they must be switched off automatically when driving. In order to do this, the vehicle speed is calculated from the signal of the distance and speed sensor (B18), which reaches the drive control control unit (CPC) (A3) via the tachograph (TCO) (P1) and the frame CAN (CAN 3), and sent out to the frame CAN (CAN 3) again as a message. From there it is forwarded via the central gateway control unit (A2) (CGW) and the interior CAN (CAN 2) to the SCA sensor and actuator module, cab control unit (A7). As soon as the speed is greater than 30 km/h, the SCA sensor and actuator module, cab control unit (A7) switches the work lamps "OFF".

Manual work lamp switch-off
The function sequence for switching off the work lamps corresponds to the function sequence for switching on the work lamps.
Since the work lamps also remain switched on when all control units go back to CAN-SLEEP-MODE or POWER-DOWN-MODE, all control units that are needed for operation are woken up again when the work lamp button is pressed (S56) and the work lamps are switched off accordingly.

	Central gateway control unit (CGW), component description	A2	**Page 333**
	Drive control (CPC) control unit, component description	A3	**Page 334**
	Sensor and actuator module, cab (SCA) control unit, component description	A7	**Page 339**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Switch module special equipment, component description	A47	**Page 374**
	Travel and speed sensor, component description	B18	**Page 408**
	Tachograph (TCO) component description	P1	**Page 459**

GF82.20-W-0001H	Interior illumination, function	20.7.11

MODEL 963



W82.20-1038-79

1	*ASIC data bus (Application System Integrated Circuit)*
A1	*Instrument cluster (ICUC) control unit*
A2	*Central gateway control unit (CGW)*
A3	*Drive control (CPC) control unit*
A4	*Engine management control unit (MCM)*
A7	*SCA sensor and actuator module, cab control unit*
A16	*Driver door module (DCMD) control unit*
A17	*Front passenger door module (DCMP) control unit*
A29	*Front passenger switch group*
A29 s1	*Reading lamp/interior illumination button*
A43	*Modular switch panel (MSF) control unit*
A48	*Roof switch module 1*
A50	*Lower driver bunk switch module*
A51	*Upper driver bunk switch module*
B50	*Center speaker*
B600	*Crankshaft position sensor*
B601	*Camshaft position sensor*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
CAN 4	*Drive train CAN*
E27	*Driver door exit lamp*
E28	*Front passenger door exit lamp*
E31	*Left interior lamp, high roof*
E31e1	*Interior light*
E31e2	*Reading light*
E31e3	*Night light*
E32	*Right interior lamp, high roof*
E32e1	*Interior light*
E32e2	*Reading light*
E32e3	*Night light*
E45	*Left overhead ambiance illumination**
E46	*Right overhead ambiance illumination**
E47	*Stowage compartment ambiance illumination**
E48	*Left footwell ambiance illumination**
E49	*Right footwell ambiance illumination**
E53	*Left exit lamp*
E54	*Right exit lamp*
M7	*Driver door central locking motor*
M8	*Front passenger door central locking motor*
S927	*Roof interior illumination button*
S928	*Lower bunk interior illumination button*
S929	*Reading lamp/night light button*
S930	*Ambiance illumination button*
S955	*Upper bunk interior illumination button*
*	*Only on vehicles with code (D5B) Ambiance illumination*

Functions

Most of the interior illumination lighting equipment is not directly actuated by the controls and actuators, but indirectly by the SCA sensor and actuator module, cab control unit (A7).

Included in the lighting devices actuated indirectly are:

- Interior illumination
- Reading lamps
- Night light
- Ambiance illumination
- Load compartment illumination
- The switch and controls illumination in the switches, the switch panels and the ashtray
- Exit illumination
- Step illumination

In comparison directly actuated lighting devices are:

- Upper and lower bunk lighting
- Stowage space lamps

In the case of the directly actuated lighting devices the switches and lamps mostly form one unit.

Power supply
The power supply for the interior illumination is provided by the SCA sensor and actuator module, cab control unit (A7).
If the battery voltage drops below 22 V, the entire interior illumination is automatically switched off by the SCA sensor and actuator module, cab control unit (A7).
It us thus ensured that the engine can still be started at least once, if the user of the vehicle had not switched off lights which had been switched on manually.
The last switch condition is not stored, in other words all the lights are off after the battery voltage has risen.

Light dimming
The following lighting devices can be dimmed separately:

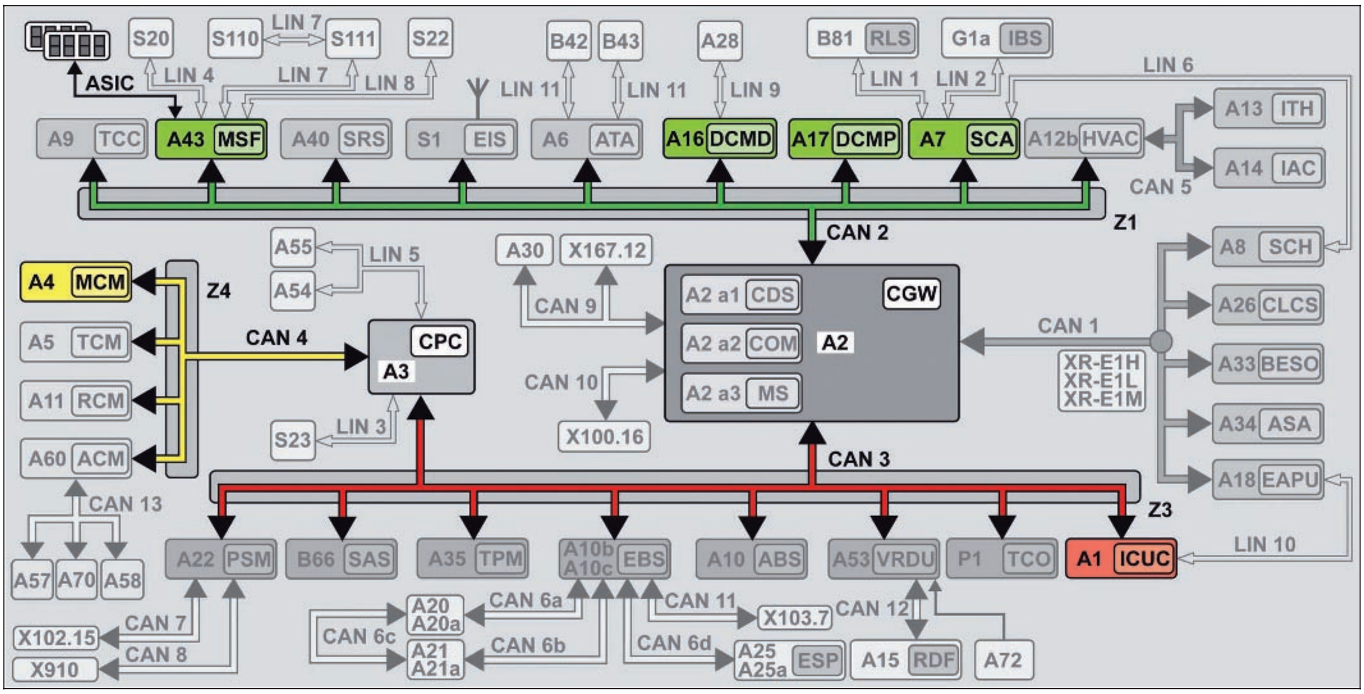
- Interior lighting,
- ambiance illumination,
- reading light and
- switch and controls illumination.

The interior illumination, the ambiance illumination and the reading light are dimmed by pressing the relevant button for a longer period, and is "rolling".

This means if the relevant button is pressed for a long period, the brightness of the respective illumination is regulated from a dimming value of 0% (illumination "OFF") to a dimming value of 100% (illumination "ON") and, after a pause, is regulated again to a dimming value of 0%. This procedure is repeated until the button is released again.
The dimming of the switch and controls illumination in the switches, the switch panels and the ashtray takes place via the relevant main menu "Settings" in the instrument cluster control unit (ICUC) (A1).

	Interior illumination, overall network		**Page 259**
	Ambient lighting actuation, function	i Only on vehicles with code (D5B) Ambiance illumination	**Page 260**
	Interior lights actuation function		**Page 261**
	Reading light actuation function		**Page 264**
	Night light actuation function		**Page 266**
	Exit light actuation function		**Page 267**

GF82.20-W-0001-02H	Interior illumination, overall network		



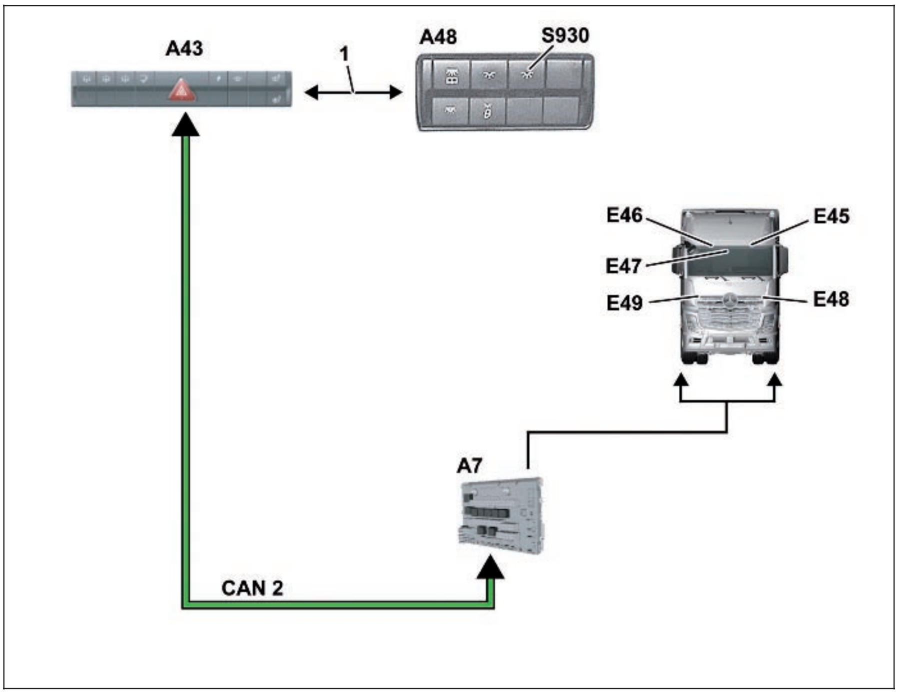
W82.20-1037-79

A1 *Instrument cluster (ICUC) control unit*
A2 *Central gateway control unit (CGW)*
A3 *Drive control (CPC) control unit*
A4 *Engine management control unit (MCM)*
A7 *SCA sensor and actuator module, cab control unit*
A16 *Driver door module (DCMD) control unit*
A17 *Front passenger door module (DCMP) control unit*
A43 *Modular switch panel (MSF) control unit*
CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
CAN 4 *Drive train CAN*
Z1 *Cab instrument panel CAN bus star point*
Z3 *Frame CAN bus star point*
Z4 *Drive CAN bus star point*
ASIC *ASIC data bus (Application System Integrated Circuit)*

GF82.20-W-3009H	Ambient lighting actuation, function	20.7.11

MODEL 963, 964 with CODE (D5B) Ambiance illumination

1	*ASIC data bus (Application System Integrated Circuit)*
A7	*SCA sensor and actuator module, cab control unit*
A43	*Modular switch panel (MSF) control unit*
A48	*Roof switch module 1*
CAN 2	*Interior CAN*
E45	*Left overhead ambiance illumination*
E46	*Right overhead ambiance illumination*
E47	*Stowage compartment ambiance illumination*
E48	*Left footwell ambiance illumination*
E49	*Right footwell ambiance illumination*
S930	*Ambiance illumination button*



W82.20-1039-76

Function
The ambiance illumination button (S930) is a signal switch. This means an electronic circuit is located in it which reads in the switch operation and converts it into a message. If the upper rocker of the ambiance illumination button (S930) in the overhead switch module 1 (A48) is operated, the built-in electronics transmit the "ambiance illumination ON" message to the modular switch panel (MSF) (A43) control unit via the ASIC databus (1).

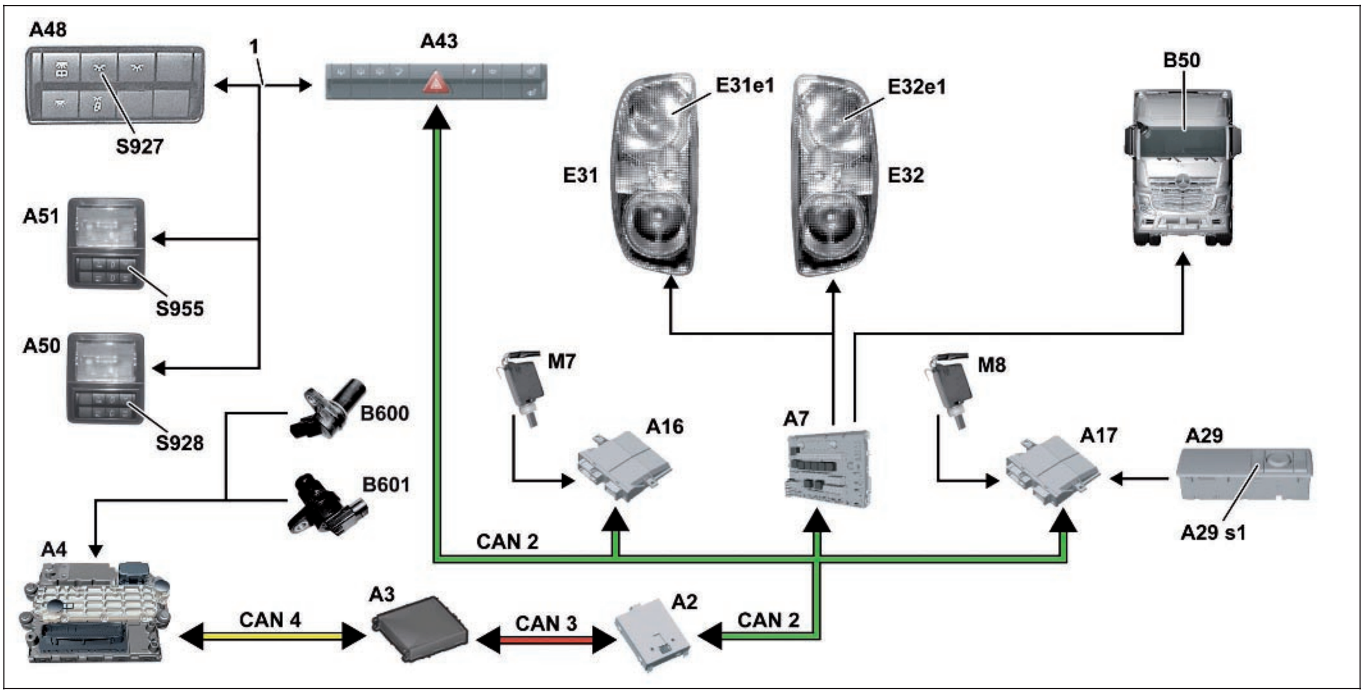
The modular switch panel (MSF) (A43) control unit sends the "ambiance illumination ON" message to the interior CAN (CAN 2). The SCA sensor and actuator module, cab control unit (A7) actuates the following LEDs after receiving the "ambiance illumination ON" message:

- Left overhead ambiance illumination (E45)*
- Right overhead ambiance illumination (E46)*
- Stowage compartment ambiance illumination (E47)*
- Left footwell ambiance illumination (E48)*
- Right footwell ambiance illumination (E49)*

	SCA sensor and actuator module, cab control unit, component description	A7	**Page 339**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Roof switch modules, component description	A48	**Page 375**

GF82.20-W-3026H	Interior lights actuation function	20.7.11

MODEL 963



W82.20-1040-79

1 ASIC data bus (Application System Integrated Circuit)

A2 Central gateway control unit (CGW)
A3 Drive control (CPC) control unit
A4 Engine management control unit (MCM)
A7 SCA sensor and actuator module, cab control unit
A16 Driver door module (DCMD) control unit
A17 Front passenger door module (DCMP) control unit
A29 Front passenger switch group
A29 s1 Reading lamp/interior illumination button
A43 Modular switch panel (MSF) control unit
A48 Roof switch module 1
A50 Lower driver bunk switch module
A51 Upper driver bunk switch module
B50 Center speaker
B600 Crankshaft position sensor
B601 Camshaft position sensor
CAN 2 Interior CAN
CAN 3 Frame CAN
CAN 4 Drive train CAN
E31 Left interior lamp, high roof
E31e1 Interior light
E32 Right interior lamp, high roof
E32e1 Interior light
M7 Driver door central locking motor
M8 Front passenger door central locking motor
S927 Roof interior illumination button
S928 Lower bunk interior illumination button
S955 Upper bunk interior illumination button

ℹ The interior illumination can be actuated both automatically and manually.

Automatic actuation
With automatic actuation the interior light is switched on and off when unlocking or locking the vehicle or by opening or closing the driver's or front passenger's door.
For this the function "Actuation of interior lights when a vehicle door is opened" must be activated.
The system can be activated or deactivated by pressing the lower rocker of the overhead interior lights button (S927) in overhead switch module 1 (A48). If the lower rocker in the overhead interior lights button (S927) is pressed for more than 2 seconds, an acknowledgment tone sounds from the center speaker (B50).

If a long acknowledgment tone is heard, the function "Actuation of interior lights when a vehicle door is opened" is activated.
If a short acknowledgment tone is heard, the function "Actuation of interior lights when a vehicle door is opened" is deactivated.

Manual actuation
The interior illumination can be switched on/off and dimmed manually from the front passenger seat using the reading lamp/interior illumination button (A29 s1) in the front passenger switch group (A29) and from the driver seat using the overhead interior illumination button (S927) in overhead switch module 1 (A48).
Depending on the layout of the vehicle, additional buttons may be installed for switching the interior illumination on/off and dimming.

Function

1 Switch on interior lights actuation

1.1 When the driver or front passenger doors is opened or unlocked

There are two switches in the driver side door central locking motor (M7).
Via one switch the driver side door module control unit (DCMD) (A16) recognizes whether the driver door is open or closed and via the other switch it recognizes the locking status. If the driver door is opened or unlocked, the driver side door module control unit (DCMD) (A16) sends the "Driver door opened" or "Driver door unlocked" message to the interior CAN (CAN 2). Similarly, the front passenger side door module control unit (DCMP) (A17) detects opening or unlocking of the front passenger door via the switch in the front passenger door central locking motor (M8,) and then sends the message "Front passenger door open" or "Front passenger door unlocked" to the interior CAN (CAN 2).

ℹ When a vehicle door is opened the switch and controls illumination in the switches and the entrance lamps in the respective door and in both entrances are actuated in parallel with the interior illumination.

1.2 If the overhead interior illumination button (S927), the lower bunk interior illumination button (S928) or the upper bunk interior illumination button (S955) is pressed manually.

The overhead interior illumination button (S927), the lower bunk interior illumination button (S928) and the upper bunk interior illumination button (S955) are signal switches. This means an electronic circuit is located in the button which reads in the switch operation and converts it into a message.
If the upper rocker of the overhead interior illumination button (S927), the upper lower bunk interior illumination button (S928) or the upper upper bunk interior illumination button (S955) is pressed, the built-in electronics transmit the "Interior illumination ON" message to the modular switch panel (MSF) (A43) control unit via the ASIC data bus (1).

ℹ If the button is pressed for more than 0.5 seconds rolling dimming of the interior illumination starts.

The modular switch panel (MSF) (A43) control unit sends the "Interior illumination ON" message to the interior CAN (CAN 2).

1.3 If the reading lamp/interior illumination button (A29 s1) is pressed

If the rear rocker of the reading lamp/interior illumination button (A29 s1) is pressed, the front passenger door module control unit (DCMP) (A17) receives a signal and sends the "Interior illumination ON" message to the interior CAN (CAN 2). The SCA sensor and actuator module, cab control unit (A7) receives the message on the interior CAN (CAN2) and then actuates

- the interior lights (E31e1) in the left interior lamp, high roof (E31) and
- the interior lights (E32e1) in the right interior lamp, high roof (E32)

as the power increases from the dimming value of 0 % (lighting "OFF") to the dimming value of 100 % (lighting "ON")

2 Switch off interior lights actuation

2.1 when closing the driver's or front passenger's door

After the last vehicle door is closed the interior lighting is dimmed down after a delay of
10 seconds.

This means the interior lighting is actuated with reducing power in the time of 2 seconds fixed for the switching on and off process until the dimming value of 0 % (lighting "OFF").
If an engine speed of more than 650 rpm is recognized before this delay of more than 1 second has elapsed, the interior illumination is adjusted to a dimming value of
0% after approx. 2 seconds. However, this only applies if automatic interior illumination actuation was active.
The engine speed is sent to the drive train CAN (CAN 4) as a message by the engine management (MCM) control unit (A4), which evaluates the signals from the crankshaft position sensor (B600) and the camshaft position sensor (B601).
The drive control control unit (CPC) (A3) receives the message pertaining to this via the drive train CAN (CAN 4) and forwards it via the frame CAN (CAN 3) to the central gateway control unit (CGW) (A2).
From here, the message is forwarded via the interior CAN (CAN 2) to the SCA sensor and actuator module, cab control unit (A7), which then switches off the interior illumination.

2.2 Immediate switch-off

The interior illumination is immediately set to a dimming value of 0% (illumination "OFF"), if:

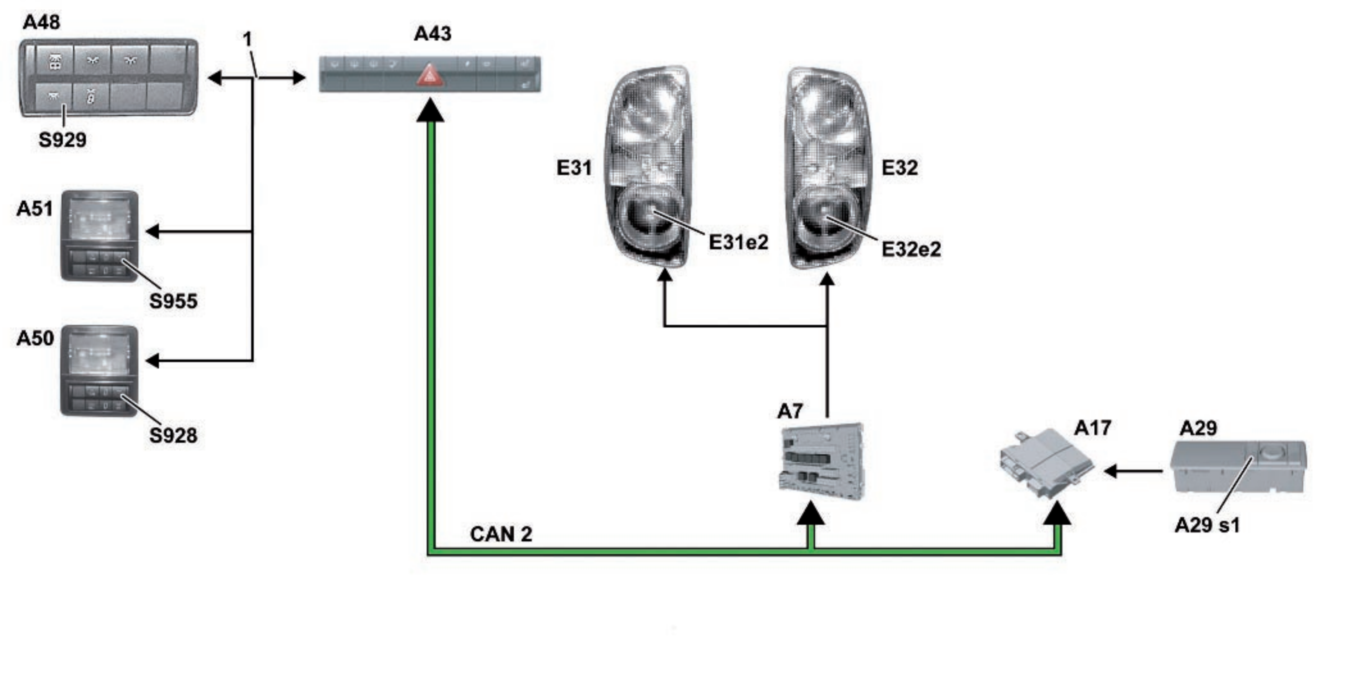
- the driver or front passenger door is locked,
- the upper rocker of the overhead interior illumination button (S927) in overhead switch module 1 (A48) is operated
- the upper or lower rocker of the lower bunk interior illumination button (S928) in the driver bunk switch module (A50) is pressed
- the upper or lower rocker of the upper bunk interior illumination button (S955) in the overhead driver bunk switch module (A51) is pressed
- the rear rocker of the reading lamp/interior illumination button (A29 s1) in front passenger switch group (A29) is pressed for a short time
- a vehicle door is open for more than 15 min

i In addition to the interior illumination the switch and controls illumination and the entrance lamps are also switched off.

	Central gateway control unit (CGW), component description	A2	**Page 333**
	Drive control (CPC) control unit, component description	A3	**Page 334**
	Engine management control unit (MCM), component description	A4	**Page 335**
	SCA sensor and actuator module, cab control unit, component description	A7	**Page 339**
	Driver door module (DCMD) control unit, component description	A16	**Page 349**
	Front passenger door module (DCMP) control unit, component description	A17	**Page 350**
	Front passenger switch group, component description	A29	**Page 360**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Roof switch modules, component description	A48	**Page 375**
	Bunk switch modules, component description	A50, A51	**Page 376**
	Component description for crankshaft position sensor	B600	**Page 436**
	Component description for camshaft position sensor	B601	**Page 437**
	Door central locking motor, component description	M7, M8	**Page 450**

GF82.20-W-3027H	Read light actuation function	20.7.11

MODEL 963, 964



W82.20-1041-79

1	*ASIC data bus (Application System Integrated Circuit)*
A7	*SCA sensor and actuator module, cab control unit*
A17	*Front passenger door module (DCMP) control unit*
A29	*Front passenger switch group*
A29 s1	*Reading lamp/interior illumination button*
A43	*Modular switch panel (MSF) control unit*
A48	*Roof switch module 1*
A50	*Lower driver bunk switch module*
A51	*Upper driver bunk switch module*
CAN 2	*Interior CAN*
E31	*Left interior lamp, high roof*
E31e2	*Reading light*
E32	*Right interior lamp, high roof*
E32e2	*Reading light*
S928	*Lower bunk interior illumination button*
S929	*Reading lamp/night light button*
S955	*Upper bunk interior illumination button*

Function

Switch on driver side reading lights actuation

The reading lamp/night light (S929) button is a signal switch. This means an electronic circuit is located in it which reads in the switch operation and converts it into a message.
If the upper rocker of the reading lamp/night light button (S929) is operated, the built-in electronics transmit the "Driver side reading lights ON" message to the modular switch panel (MSF) (A43) control unit via the ASIC data bus (1). The modular switch panel (MSF) (A43) control unit sends the "Driver side reading lights ON" message to the interior CAN (CAN 2).

Switch on front passenger reading lights actuation

If the front rocker of the reading lamp/interior illumination button (A29 s1) in the front passenger switch group (A29) is pressed, the front passenger door module control unit (DCMP) (A17) receives a signal and sends the "Front passenger reading lamp ON" message to the interior CAN (CAN 2).

i The driver and front passenger reading lights can be dimmed separately. If the reading lamp/night light button (S929) or the reading lamp/interior illumination button (A29 s1) in the front passenger switch group (A29) is operated for longer than 0.5 s, rolling dimming of the respective work area illumination starts.

The SCA sensor and actuator module, cab control unit (A7) receives the message on the interior CAN (CAN 2) and then actuates

- the reading light (E31e2) in the left interior lamp, high roof (E31) and
- the reading light (E32e2) in the right interior lamp, high roof (E32)

with increasing power.
This means that the respective reading light is adjusted within 2 seconds and rising linearly from the dimming value of 0 % (lighting "OFF") to the dimming value of 100 % (lighting "ON").

Switch reading light actuation off
The driver side reading light can be switched off by operating the upper rocker of the reading lamp/night light button (S929) in roof switch module 1 (A48) again, and the front passenger reading light by operating the front rocker of the reading lamp/interior illumination button (A29 s1) in the front passenger switch group (A29) again.

Switching off takes place over a period of about 2 s. When this occurs, the respective work area illumination is automatically dimmed to a dimming value of 0 % (illumination "OFF"). It is still possible to switch off both reading lights by operating the lower rocker of the lower bunk interior illumination button (S928) in the lower driver bunk switch module (A50) or the lower rocker of the upper bunk interior illumination button (S955) in the upper driver bunk switch module (A51).
However, the ambient lighting, the interior lighting and the night light are also switched off if they are on at the time.

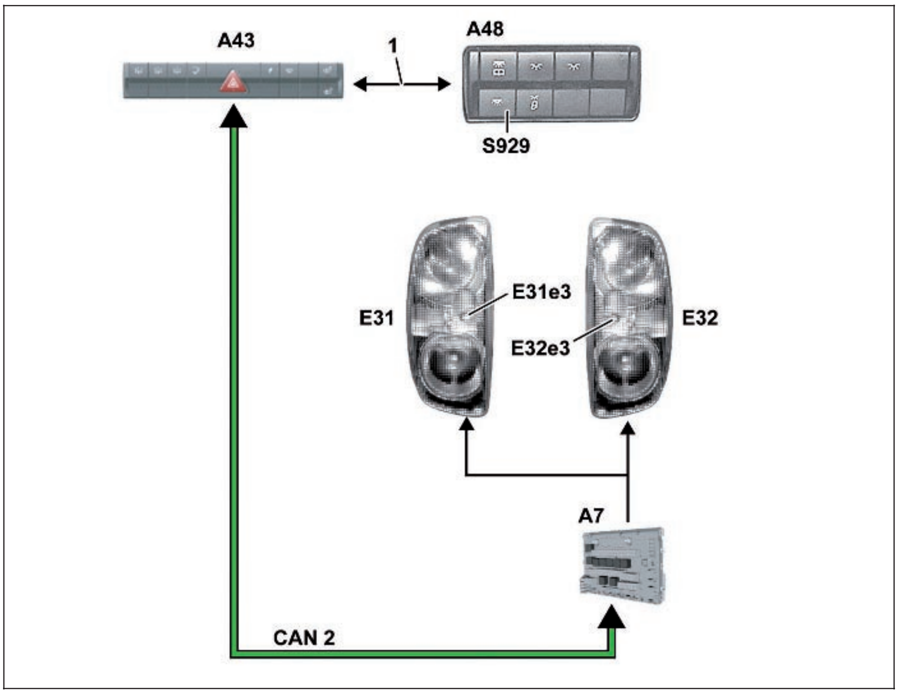
	SCA sensor and actuator module, cab control unit, component description	A7	**Page 339**
	Front passenger door module (DCMP) control unit, component description	A17	**Page 350**
	Front passenger switch group, component description	A29	**Page 360**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Roof switch modules, component description	A48	**Page 375**
	Bunk switch modules, component description	A50, A51	**Page 376**

GF82.20-W-3028H	Night light actuation function	20.7.11

MODEL 963, 964

1 ASIC data bus (Application System Integrated Circuit)

A7 SCA sensor and actuator module, cab control unit
A43 Modular switch panel (MSF) control unit
A48 Roof switch module 1
CAN 2 Interior CAN
E31 Left interior lamp, high roof
E31e3 Night light
E32 Right interior lamp, high roof
E32e3 Night light
S929 Reading lamp/night light button



W82.20-1042-76

Switch on night light actuation
The reading lamp/night light (S929) button is a signal switch. This means an electronic circuit is located in it which reads in the switch operation and converts it into a message. If the lower rocker of the reading lamp/night light button (S929) is operated, the built-in electronics transmit the "Night light ON" message via the ASIC data bus (1) to the modular switch panel (MSF) (A43) control unit, which forwards this message to the interior CAN (CAN 2). The SCA sensor and actuator module, cab control unit (A7) is woken up by the CAN activity on the interior CAN (CAN 2) and actuates the following lamps after receiving the "Night light ON" message:

- the night light (E31e3) in the left interior lamp, high roof (E31) and
- the night light (E32e3) in the right interior lamp, high roof (E32).

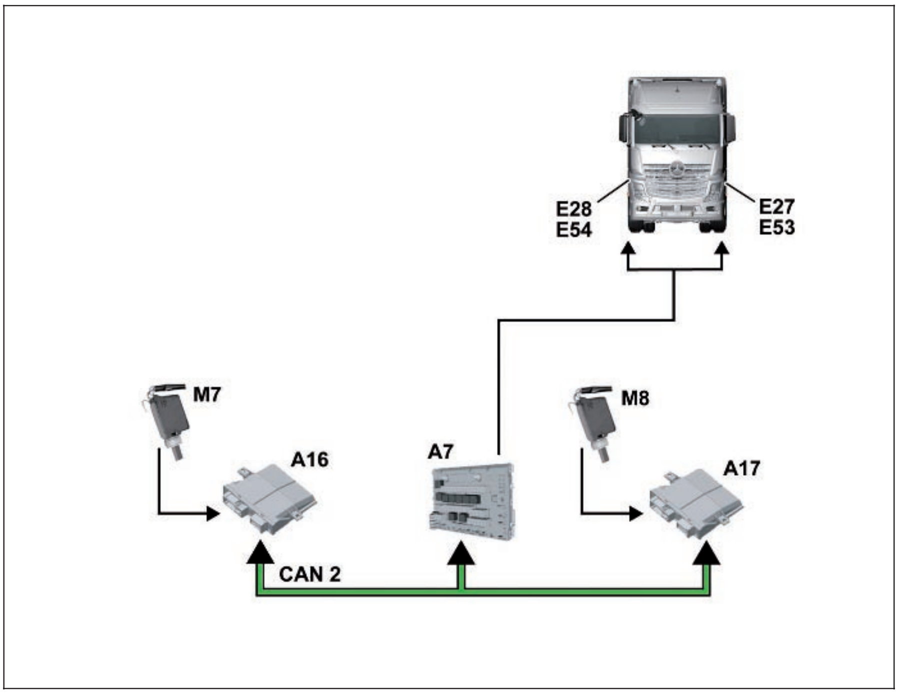
Switch off night light actuation
The night light can be switched off by operating the lower rocker of the reading lamp/night light button (S929) in overhead switch module 1 (A48), operating the lower rocker of the lower bunk interior illumination button (S928) in the lower driver bunk switch module (A50) or by operating the lower rocker of the upper bunk interior illumination button (S955) in the lower driver bunk switch module (A51) a second time. However, if they are already switched on, the ambiance illumination, the interior illumination and the night light will also be switched off if the lower bunk interior illumination button (S928) or the upper bunk interior illumination button (S955) is pressed.

	SCA sensor and actuator module, cab control unit, component description	A7	**Page 339**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Roof switch modules, component description	A48	**Page 375**
	Bunk switch modules, component description	A50, A51	**Page 376**

GF82.20-W-3029H	Exit light actuation function	20.7.11

MODEL 963, 964

A7 SCA sensor and actuator module, cab control unit
A16 Driver door module (DCMD) control unit
A17 Front passenger door module (DCMP) control unit
CAN 2 Interior CAN
E27 Driver door exit lamp
E28 Front passenger door exit lamp
E53 Left exit lamp
E54 Right exit lamp
M7 Driver door central locking motor
M8 Front passenger door central locking motor



W82.20-1043-76

Requirement

- The driver door and front passenger's door are closed.

Function

Open driver door

Via a switch in the driver door central locking motor (M7), the driver door module control unit (DCMD) (A16) recognizes whether the driver door is open or closed. If the driver door is opened, the driver door module control unit (DCMD) (A16) receives a signal and actuates the driver door exit lamp (E27). In addition there is the message "driver door open" on the interior compartment CAN (CAN 2).

Open front passenger door

Similarly, opening the front passenger door is recorded via a switch in the front passenger side door central locking motor (M8).
The front passenger door module control unit (DCMP) (A17) actuates the front passenger door entrance lamp (E28) and sends the message "Front passenger door open" to the interior CAN (CAN 2).

The SCA sensor and actuator module, cab control unit (A7), which is woken up by the CAN activity on the interior CAN (CAN 2), evaluates the respective message and actuates the left exit lamp (E53) and the right exit lamp (E54) via an internal end stage after receiving the message(s).
Depending on the parameters of the function "switch and controls illumination ON when opening a vehicle door and interior lighting deactivated" or activating or deactivating the function "actuation of interior lighting when opening a vehicle door", in addition the illumination in the switches and the interior lighting can be actuated.

Switching off the exit lamps

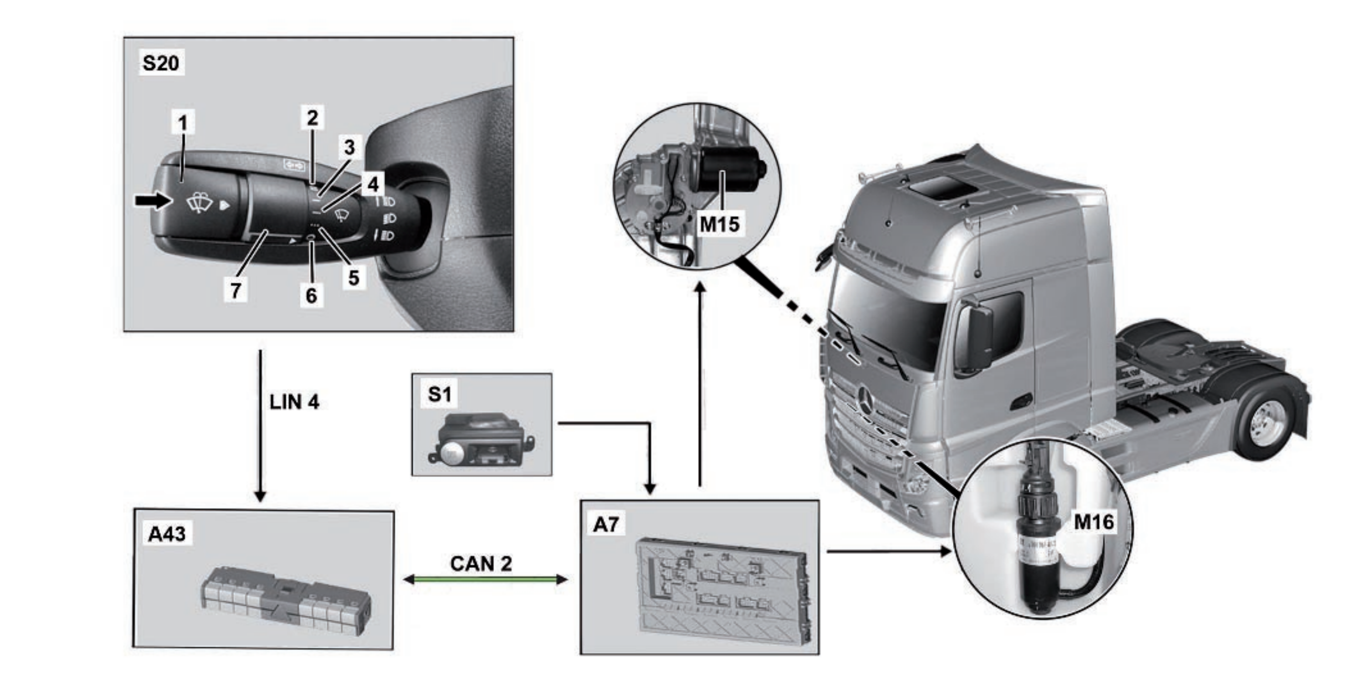
The exit lamps are switched off,

- when the respective vehicle door is closed or,
- together with the interior lighting, if the vehicle doors remain open.

	SCA sensor and actuator module, cab control unit, component description	A7	**Page 339**
	Driver door module (DCMD) control unit, component description	A16	**Page 349**
	Front passenger door module (DCMP) control unit, component description	A17	**Page 350**
	Door central locking motor, component description	M7, M8	**Page 450**

GF82.30-W-0001H	Windshield wiper system, function	6.7.11

MODEL 963, 964 except CODE (F8X) Rain/light sensor



W82.30-1019-79

1	*Pushbutton*
2	*Position "Wiping stage 2"*
3	*Position "Wiping stage 1"*
4	*Position "Intermittent wiping stage 2"*
5	*Position "Intermittent wiping stage 1"*
6	*Position "Wiper OFF"*
7	*Rotary switch*
A7	*Cab signal acquisition and actuation module control unit (SCA)*
A43	*Modular switch panel (MSF) control unit*
CAN 2	*Interior CAN*
LIN 4	*Left multifunction control lever LIN*
M15	*Wiper motor*
M16	*Window washer fluid pump*
S1	*Electronic ignition lock (EIS)*
S20	*Left multifunction control lever*
Arrow	*Position "Windshield wiping" or "wiping and washing"*

Requirements

- Voltage supply present at all the control units in question and interlinkage intact.
- The electronic ignition lock (EIS) (S1) is located in drive position "Ignition ON" (terminal 15).

---

i All switching positions of the left multifunction control lever (S20) are read in via the left multifunction control lever LIN (LIN 4) by the modular switch panel (MSF) control unit (A43), converted into a CAN message and sent via interior CAN (CAN 2) to the sensor and actuator module, cab (SCA) control unit (A7).
The sensor and actuator module, cab (SCA) control unit (A7) receives the message, evaluates it and correspondingly actuates the wiper motor (M15) or the windshield washer fluid pump (M16) and the wiper motor (M15).

---

1 One-touch wiping

If the button (1) of the left multifunction control lever (S20) is pressed to the position "Windshield wiping or wiping and washing" (arrow), the sensor and actuator module, cab (SCA) control unit (A7) actuates the wiper motor (M15).
As soon as the button (1) of the left multifunction control lever (S20) is released again, the sensor and actuator module, cab (SCA) control unit (A7) no longer actuates the wiper motor (M15).

i With a brief actuation of the button (1), the windshield washer fluid pump (M16) is not actuated. This means if the "Windshield wiping OFF" message is received directly after the "Windshield wiping or wiping and washing ON" message, the sensor and actuator module, cab (SCA) control unit (A7) only actuates the wiper motor (M15) for one wiping period.

---

2 Intermittent wipe

For the function "Intermittent wiping", the rotary switch (7) must be turned to the position "Intermittent wiping stage 1" (5), or "Intermittent wiping stage 2" (4). As soon as the rotary switch (7) is in one of these positions, the sensor and actuator module, cab (SCA) control unit (A7) actuates the wiper motor (M15).

i The "Intermittent wiping" can be set in two stages.
The wipe interval for "Intermittent wiping stage 1" (5) is approx. 10 s and for "Intermittent wiping stage 2" (4) it is approx. 5 s.

A switch in the wiper motor (M15) helps the sensor and actuator module, cab (SCA) control unit (A7) to recognize whether the wiping procedure is finished and the wiper motor (M15) is once again in the end position, following which the sensor and actuator module, cab (SCA) control unit (A7) correspondingly interrupts the actuation of the wiper motor (M15).

---

3 Wiping

If the rotary switch (7) of the left multifunction control lever (S20) is turned to the position "Wiping stage 1" (3) or "Wiping stage 2" (2), the sensor and actuator module, cab (SCA) control unit (A7) permanently actuates the wiper motor (M15).

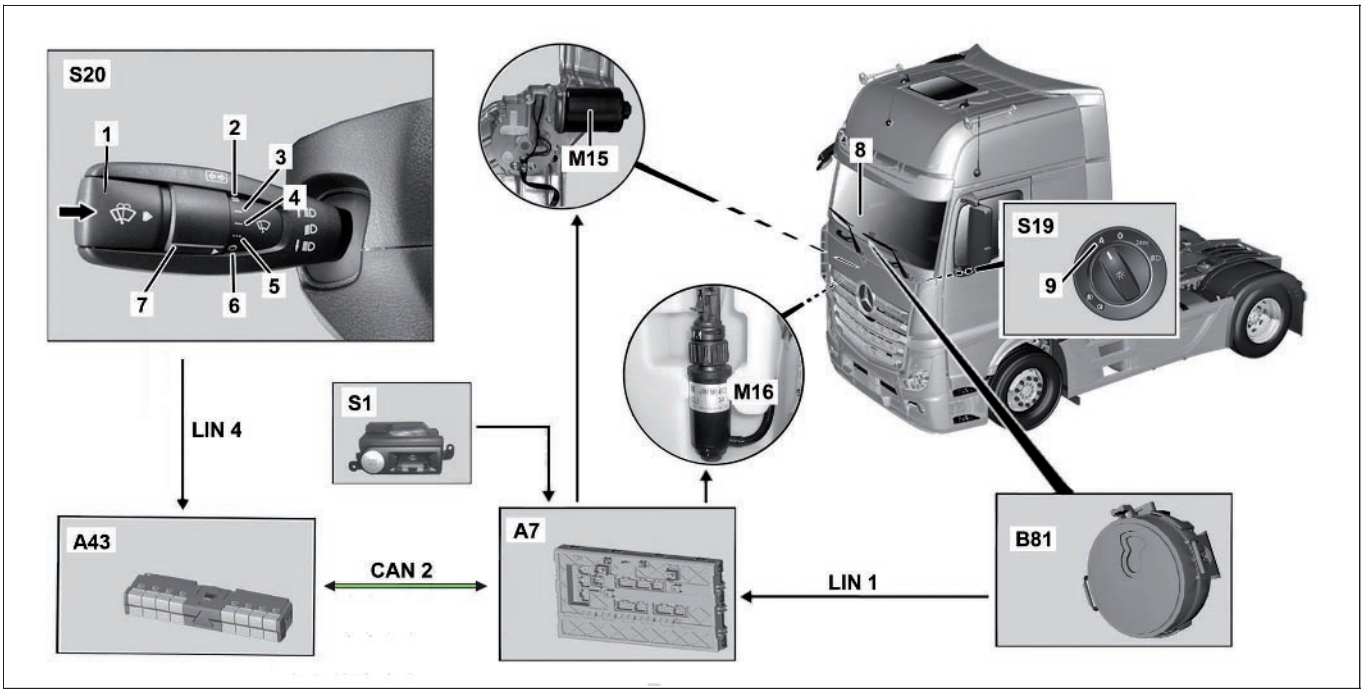
4 Switch off wipers

As soon as the rotary switch (7) of the left multifunction control lever (S20) is again turned to the position "Wiper OFF" (6), the sensor and actuator module, cab (SCA) control unit (A7) checks whether the wiper motor (M15) is in the end position. If this is not the case, the wiping period is first completed before it interrupts the actuation.

	Windshield wiper system overall network		**Page 272**
	Sensor and actuator module, cab (SCA) control unit, component description	A7	**Page 339**
	Modular switch panel (MSF) control unit component description	A43	**Page 370**
	Electronic ignition lock (EIS), component description	S1	**Page 460**

GF82.30-W-0001HH	Windshield wiper system, function	6.7.11

MODEL 963, 964 with CODE (F8X) Rain/light sensor



W82.30-1023-79

1	Pushbutton
2	Position "Wiping stage 2"
3	Position "Wiping stage 1"
4	Position "Intermittent wiping stage 2"
5	Position "Intermittent wiping stage 1"
6	Position "Wiper OFF"
7	Rotary switch
8	Windshield
9	Position "Auto" (A)
A7	Cab signal acquisition and actuation module control unit (SCA)
A43	Modular switch panel (MSF) control unit
B81	Rain and light sensor (RLS)
CAN 2	Interior CAN
LIN 1	Rain/light sensor LIN
LIN 4	Left multifunction control lever LIN
M15	Wiper motor
M16	Window washer fluid pump
S1	Electronic ignition lock (EIS)
S19	Exterior lights switch
S20	Left multifunction control lever
Arrow	Position "Windshield wiping" or "Windshield wiping and washing"

Requirements

- Voltage supply present at all the control units in question and interlinkage intact.
- The electronic ignition lock (EIS) (S1) is located in drive position "Ignition ON" (terminal 15).
- Exterior lights switch (S19) is in the position "Auto" (A) (9).
- The rotary switch (7) of the left multifunction control lever (S20) is located in the position "Intermittent wiping stage 1" (5)
  or "Intermittent wiping stage 2" (4).

---

i All switching positions of the left multifunction control lever (S20) are read in via the left multifunction control lever LIN (LIN 4) by the modular switch panel (MSF) control unit (A43), converted into a CAN message and sent via interior CAN (CAN 2) to the sensor and actuator module, cab (SCA) control unit (A7). At the same time, the rain/light sensor (RLS) (B81) constantly checks the degree of wetness of the windshield (8) and sends this information via rain/light sensor LIN (LIN 1) to the sensor and actuator module, cab (SCA) control unit (A7).

---

1 One-touch wiping
If the button (1) of the left multifunction control lever (S20) is pressed to the position "Windshield wiping or Windshield wiping and washing" (arrow), the sensor and actuator module, cab (SCA) control unit (A7) actuates the wiper motor (M15). As soon as the button (1) of the multifunction control lever (S20) is released again, the sensor and actuator module, cab (SCA) control unit (A7) no longer actuates the wiper motor (M15).

i With a brief actuation of the button (1), the windshield washer fluid pump (M16) is not actuated. This means if the "Windshield wiping OFF" message is received directly after the "Windshield wiping or wiping and washing ON" message, the sensor and actuator module, cab (SCA) control unit (A7) only actuates the wiper motor (M15) for one wiping period.

---

2 Wiping with rain/light sensor (RLS) (B81)
The rotary switch (7) of the left multifunction control lever (S20) is in the position"Intermittent wiping stage 1" (5) or in the position "Interval stage 2" (4). The sensor and actuator module, cab (SCA) control unit (A7) receives the message on the degree of wetness of the windshield (8) from the rain/light sensor (RLS) (B81). The sensor and actuator module, cab (SCA) control unit (A7) then actuates the wiper motor (M15). If the rain/light sensor (RLS) (B81) sends no wetness of the windshield (8) via rain/light sensor LIN (LIN 1), the sensor and actuator module, cab (SCA) control unit (A7) no longer actuates the wiper motor (M15).

i The rain/light sensor (RLS) (B81) constantly checks the degree of wetness of the windshield (8). Depending on the intensity of the degree of wetness of the windshield (8), the sensor and actuator module, cab (SCA) control unit (A7) actuates the wiper motor (M15).

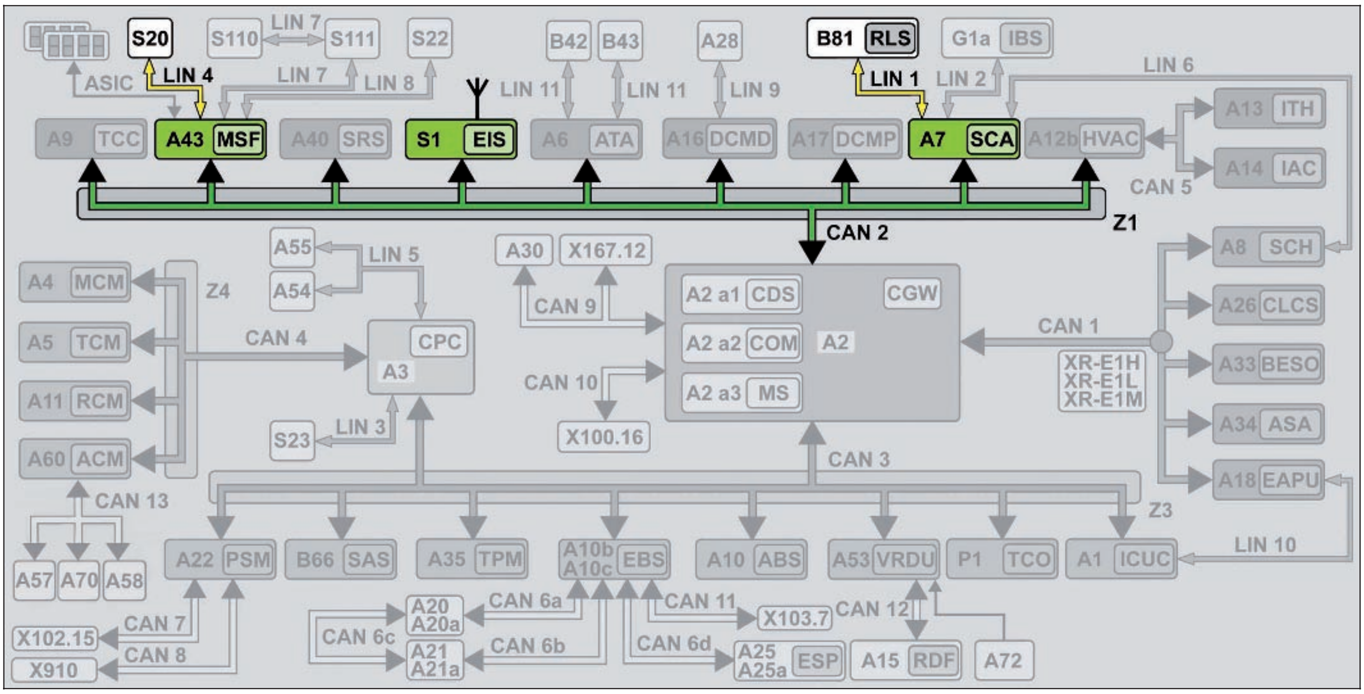
---

3 Wiping without rain/light sensor (RLS) (B81)
If the rotary switch (7) of the left multifunction control lever (S20) is turned to the position "Wiping stage 1" (3) or "Wiping stage 2" (2), the sensor and actuator module, cab (SCA) control unit (A7) permanently actuates the wiper motor (M15).

4 Switch off wipers
As soon as the rotary switch (7) of the left multifunction control lever (S20) is again turned to the position "Wiper OFF" (6), the sensor and actuator module, cab (SCA) control unit (A7) checks whether the wiper motor (M15) is in the end position. If this is not the case, the wiping period is first completed before it interrupts the actuation.

	Windshield wiper system overall network		**Page 272**
	Sensor and actuator module, cab (SCA) control unit, component description	A7	**Page 339**
	Modular switch panel (MSF) control unit component description	A43	**Page 370**
	Rain/light sensor, component description	B81	**Page 428**
	Electronic ignition lock (EIS), component description	S1	**Page 460**

GF82.30-W-0001-01H	Windshield wiper system overall network		



W82.30-1014-79

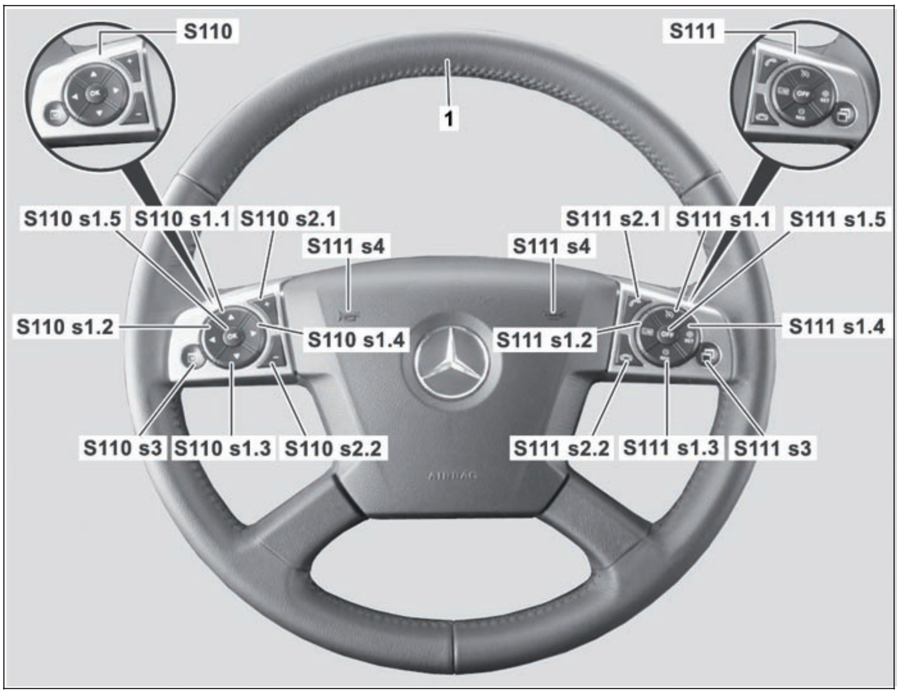
A7 *Cab signal acquisition and actuation module control unit (SCA)*
A43 *Modular switch panel (MSF) control unit*
B81 *Rain and light sensor (RLS)*
CAN 2 *Interior CAN*
LIN 1 *Rain/light sensor LIN*
LIN 4 *Left multifunction control lever LIN*
S1 *Electronic ignition lock (EIS)*
S20 *Left multifunction control lever*
Z1 *Cab instrument panel CAN bus star point*

GF82.90-W-0001H	Multifunction steering wheel, function	6.7.11

MODEL 963, 964

1 Multifunction steering wheel

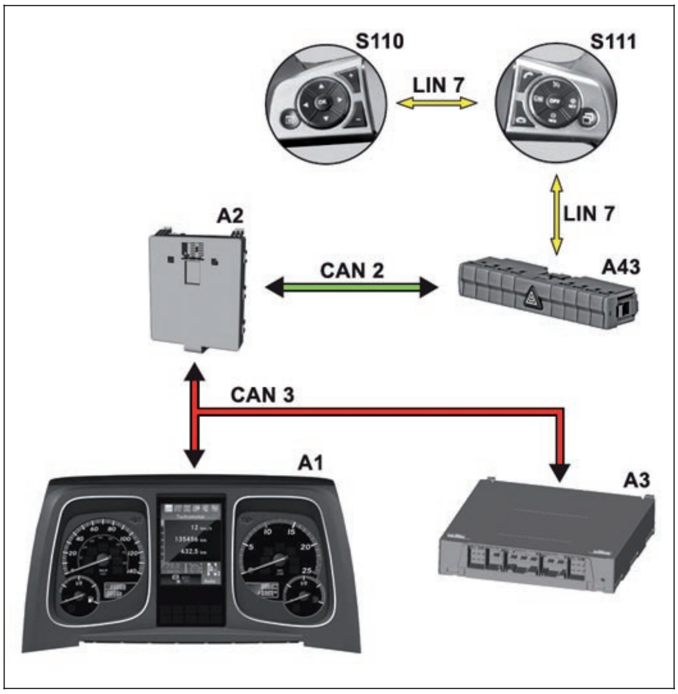
S110 Left multifunction steering wheel button group
S110 s1.1 "Up" button
S110 s1.2 "Left" button
S110 s1.3 "Down" button
S110 s1.4 "Right" button
S110 s1.5 Button "O. K."
S110 s2.1 "+" button
S110 s2.2 "-" button
S110 s3 "Memory" button



W82.90-1002-06

S111 Right multifunction steering wheel button group
S111 s1.1 "Resume speed" button
S111 s1.2 "Variable speed limiter" button
S111 s1.3 "Reduce speed" button
S111 s1.4 "Increase speed" button
S111 s1.5 "OFF" button
S111 s2.1 "Accept phone call" button
S111 s2.2 "Terminate phone call" button
S111 s3 "Driver assistance system functions" button
S111 s4 "Horn/air horn" button

A1 Instrument cluster (ICUC) control unit
A2 Central gateway control unit (CGW)
A3 Drive control (CPC) control unit
A43 Modular switch panel (MSF) control unit
CAN 2 Interior CAN
CAN 3 Frame CAN
LIN 7 Button group LIN
S110 Left multifunction steering wheel button group
S111 Right multifunction steering wheel button group



W82.90-1004-82

Networking

The multifunction steering wheel (1) with the left multifunction steering wheel button group (S110) and right multifunction steering wheel button group (S111) is connected via button group LIN (LIN 10) to the modular switch panel (MSF) control unit (A43). The modular switch panel (MSF) control unit (A43) in turn is connected via interior CAN (CAN 2) to the overall network of the vehicle.

Left multifunction steering wheel button group (S110)

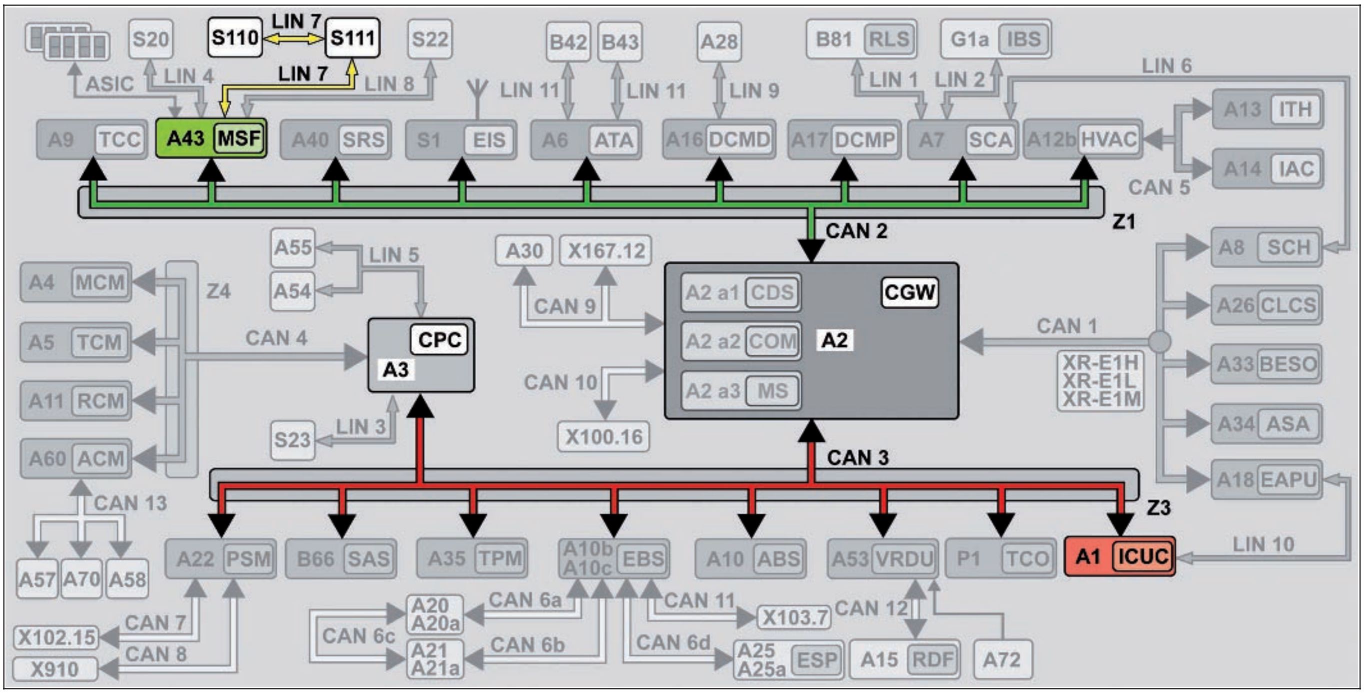
The various menus and menu levels in the multifunction display (A1 p1) of the instrument cluster control unit (ICUC) (A1) can be called up and operated via the left multifunction steering wheel button group (S110). In addition, the "+" button (S110 s2.1) and "-" button (S110 s2.2) can be used to control the volume of the Truck Control Center (TCC) (A9).

Right multifunction steering wheel button group (S111)

With the right multifunction steering wheel button group (S111), the driver assistance systems present in the vehicle (e.g. variable speed limiter, cruise control, Proximity Control Assist) can be activated, operated and deactivated via the drive control (CPC) control unit (A3). In addition, the buttons "Accept phone call" (S111 s2.1) and "Terminate phone call" (S111 s2.2) can be used to accept and terminate phone calls, among other things.

	Multifunction steering wheel overall network		**Page 275**
	Instrument cluster control unit (ICUC), component description	A1	**Page 331**
	Central gateway control unit (CGW), component description	A2	**Page 333**
	Drive control (CPC) control unit, component description	A3	**Page 334**
	Modular switch panel (MSF) control unit component description	A43	**Page 370**
	Multifunction steering wheel, component description		**Page 469**

GF82.90-W-0001-05H	Multifunction steering wheel overall network		



W82.90-1006-79

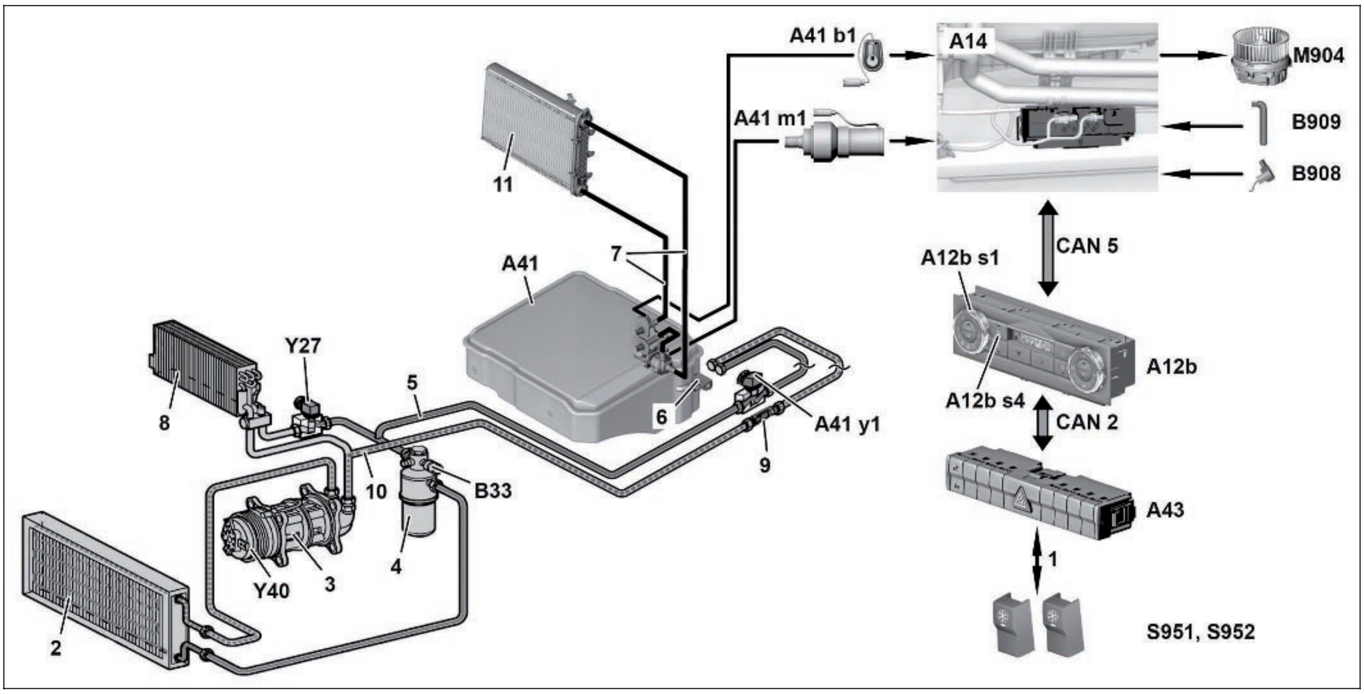
A1 *Instrument cluster (ICUC) control unit*
A2 *Central gateway control unit (CGW)*
A3 *Drive control (CPC) control unit*
A43 *Modular switch panel (MSF) control unit*

CAN 2 *Interior CAN*
CAN 3 *Frame CAN*
LIN 7 *Button group LIN*
S110 *Left multifunction steering wheel button group*

S111 *Right multifunction steering wheel button group*
Z1 *Cab instrument panel CAN bus star point*
Z3 *Frame CAN bus star point*

GF83.30-W-0004H	Stationary air conditioning, function	20.7.11

MODEL 963, 964 with CODE (D6H) Stationary air conditioner



W83.30-1204-09

Overall network
Shown on vehicle without code (D6M) Hot water auxiliary heater, cab or code (D6N) Hot water auxiliary heater, cab and engine

1	*ASIC data bus (Application System Integrated Circuit)*
2	*Capacitor*
3	*AC compressor*
4	*Fluid reservoir*
5	*High pressure pipe*
6	*Stationary air conditioner expansion valve*
7	*Coolant lines*
8	*Evaporator*
9	*Stationary air conditioner check valve*
10	*Low pressure pipe*
11	*Stationary air conditioner heat exchanger*
A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A12bs1	*Blower regulator*
A12b s4	*Stationary air conditioning button*
A14	*Stationary air conditioning (IAC) control unit*
A41	*Stationary air conditioning cold reservoir*
A41 b1	*Stationary air conditioning cold reservoir temperature sensor*
A41 m1	*Coolant pump*
A41 y1	*Stationary air conditioning cold reservoir solenoid valve*
A43	*Modular switch panel (MSF) control unit*
B33	*Air conditioning pressure sensor*
B908	*Stationary air conditioning air inlet temperature sensor*
B909	*Stationary air conditioning air outlet temperature sensor*
CAN 2	*Interior CAN*
CAN 5	*Climate control CAN*
M904	*Stationary air conditioning blower motor*
S951	*Lower bunk stationary air conditioner button*
S952	*Upper bunk stationary air conditioner button*
Y27	*Stationary air conditioner solenoid valve*
Y40	*Refrigerant compressor magnetic clutch*

General information

The stationary air conditioner is an extension of the conventional air conditioning system. The stationary air conditioner cold reservoir (A41) is located on the left-hand side under the cab. It is charged when the system is active while driving. The blower unit with the stationary air conditioner heat exchanger (11) is located in the interior, at the top of the cab rear panel.The stationary air conditioner is used before starting a journey when the engine is switched off to pre-cool the vehicle interior or to maintain a comfortable temperature during breaks or rest periods.
The stationary air conditioner also dehumidifies the air flowing into the cab.

The amount of cold air output can be adjusted in 10 stages with the blower regulator (A12b s1).

- Stationary air conditioner check valve (9)
  - which separates the stationary air conditioner's refrigerant return from the conventional air conditioning's refrigerant return.
- Stationary air conditioner solenoid valve (Y27)
  - which allows the refrigerant to flow into the evaporator (8) of the conventional air conditioning system when de-energized.
- Two separate refrigerant lines
  - which route the refrigerant to the stationary air conditioner cold reservoir (A41) and back again into the refrigeration circuit of the conventional air conditioning system.

In addition to the refrigerant circuit, the stationary air conditioner also has its own coolant circuit. The stationary air conditioner cold reservoir (A41) and stationary air conditioner heat exchanger (11) components are connected to each other by this coolant circuit, which is filled with a water-glycol mixture.The coolant circuit has the following components:

The stationary air conditioner is controlled by the following electronic components:

- Blower regulator (A12b s1) or heating, ventilation and air conditioning control unit (HVAC) (A12b)
  - controls the speed of the stationary air conditioner blower motor (M904) during operation of the stationary air conditioner.
- Stationary air conditioner button (A12b s4)
  - to initiate charging and discharging process.
- Lower bunk stationary air conditioner button (S951) or lower bunk auxiliary heater and stationary air conditioner button (S941) and upper bunk stationary air conditioner button (S952) or upper bunk auxiliary heater and stationary air conditioner button (S942).
  - to initiate discharging process.
- Stationary air conditioner control unit (IAC) (A14)
  - which controls and monitors the charging and discharging process.

Design

The stationary air conditioner is connected to the refrigerant circuit of the conventional air conditioning. The refrigerant circuit of the conventional air conditioning is extended to include the following components:

- Stationary air conditioner cold reservoir(A41)
  - which stores the cold energy resulting from charging or delivers the cold energy stored during discharge via the stationary air conditioner heat exchanger (11) into the ambient air in the cab.
- Stationary air conditioner cold reservoir solenoid valve (A41 y1)
  - which, when de-energized, blocks the flow of refrigerant into the refrigerant circuit to the stationary air conditioner cold reservoir (A41).
- Stationary air conditioner expansion valve (6)
  - which injects the liquid refrigerant into the refrigerant pipes of the stationary air conditioner cold reservoir (A41)

- Two coolant lines (7)
  - which lead the water-glycol mixture from the stationary air conditioner cold reservoir (A41) to the stationary air conditioner heat exchanger (11) and back to the stationary air conditioner cold reservoir (A41).
- Coolant pump (A41 m1)
  - which circulates the water-glycol mixture in the coolant circuit of the stationary air conditioner.
- Stationary air conditioner heat exchanger (11)
  - which cools the air that is flowing through.
- Stationary air conditioner cold reservoir temperature sensor (A41 b1)
  - which determines the coolant temperature in the feed line of the stationary air conditioner cold reservoir (A41).
- Service valve
  - for filling the system

- Stationary air conditioner blower motor (M904)
  - which draws in warm air from the vehicle interior, directs it through the stationary air conditioner heat exchanger (11) and guides the cooled air back into the vehicle interior.
- Stationary air conditioning air inlet temperature sensor (B908)
  - which determines the temperature of the air that has been drawn in.
- Stationary air conditioner air outlet temperature sensor (B909)
  - which determines the temperature of the air flowing back into the vehicle interior.
- Control LED in the components:
  - lower bunk stationary air conditioner button (S951) or lower bunk auxiliary heating and stationary air conditioner button (S941),
  - upper bunk stationary air conditioner button (S952) or upper bunk auxiliary heating and stationary air conditioner button (S942) and
  - stationary air conditioner button (A12b s4), which displays the on/off status of the stationary air conditioner during charging and discharging.

Function

ℹ The stationary air conditioner (IAC) is only operational when the stationary air conditioner cold reservoir (A41) is charged. The charging process takes place while the engine is running and may last for several hours depending on the outside temperature. The stationary air conditioner (IAC) is charged quickly when the conventional air conditioning is switched off (deactivated residual heat utilization/air conditioning button (A12b s5)) and the charging process for the stationary air conditioner (IAC) is enabled.

Charging process
The stationary air conditioner refrigerant circuit (IAC) is connected to the refrigerant circuit of the conventional air conditioning via the stationary air conditioner cold reservoir solenoid valve (A41 y1) and via the stationary air conditioner check valve (9).
Another solenoid valve (stationary air conditioner solenoid valve (Y27)) is located in the high-pressure line between the evaporator (8) of the conventional air conditioning and the fluid reservoir (4).

If the "charge cold reservoir" function is active and the automatic air conditioning system is not in cooling mode, then the stationary air conditioner cold reservoir (A41) is charged.
In charge mode the stationary air conditioner solenoid valve (Y27) and the stationary air conditioner cold reservoir solenoid valve (A41 y1) are energized, whereupon the refrigerant circuit is blocked off to the evaporator (8) of the conventional air conditioning system and the refrigerant circuit to the stationary air conditioner cold reservoir (A41) is opened.
As such, the stationary air conditioner cold reservoir (A41) function is based on the evaporator function (8).
Whereas in the conventional air conditioning the cold energy generated in the evaporator (8) is immediately dissipated into the air as it flows through, the cold energy generated in the stationary air conditioner cold reservoir (A41) is dissipated to a water-glycol mix.
The latent cold energy is made available to the driver to control the temperature of the vehicle interior during breaks or rest periods.

ℹ As soon as the automatic air conditioning switches back to cooling mode, the "charge cold reservoir" function is interrupted and the full cooling output is made available to the conventional air conditioning.
If the stationary air conditioner cold reservoir (A41) is charged and the automatic air conditioning no longer requires cooling output, then the refrigerant compressor (3) is switched off until cooling output is required again.

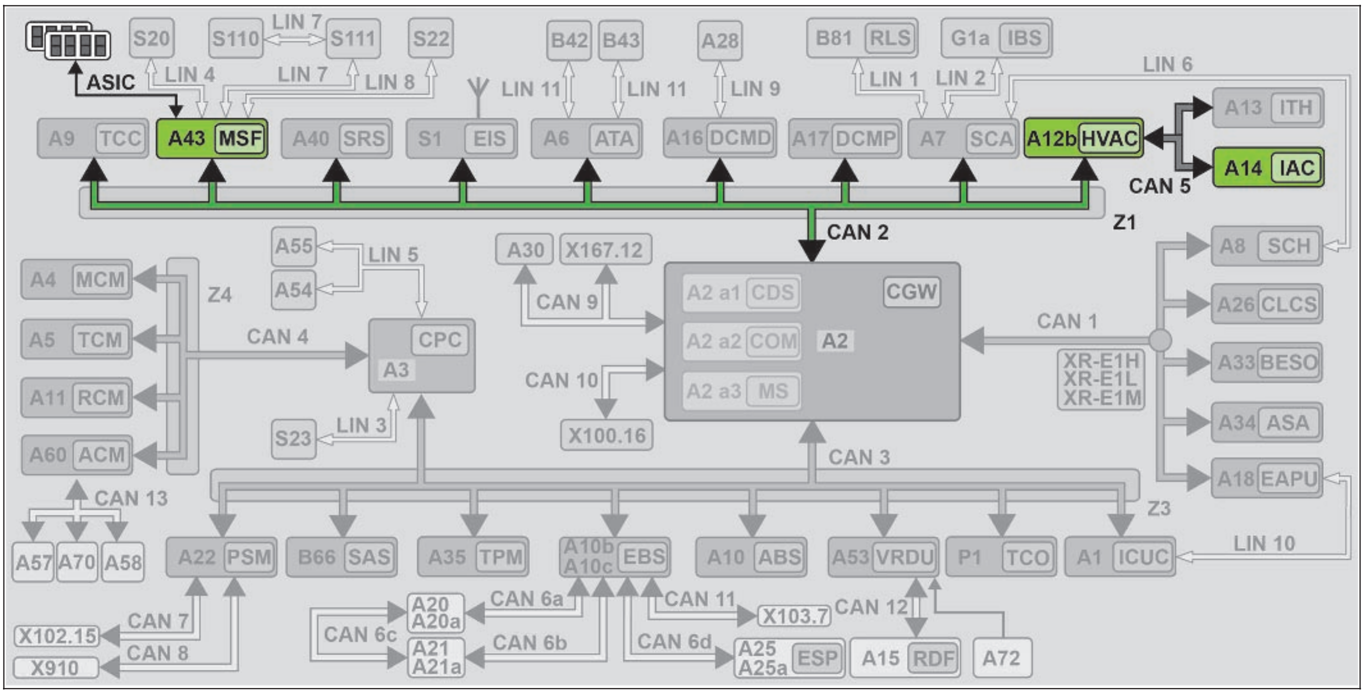
Discharging process
To call up the latent cold energy from the stationary air conditioner cold reservoir (A41) or to discharge the stationary air conditioner cold reservoir (A41), the stationary air conditioner button (A12b s4) or one of the following components in the vicinity of the bunks must be operated when the ignition is switched off or in the radio position.

- Lower bunk stationary air conditioner button (S951) or lower bunk auxiliary heating and stationary air conditioner button (S941),
- Upper bunk stationary air conditioner button (S952) or upper bunk auxiliary heating and stationary air conditioner button (S942).

The stationary air conditioner control unit (IAC) (A14) actuates the stationary air conditioner blower motor (M904) with the appropriate output depending on the switch position.
The stationary air conditioner blower motor (M904) draws in warm air from the vehicle interior and directs it to the stationary air conditioner (11) via the heat exchanger cooled by the water-glycol mix.
The air now cooled and dried flows via the air outlets on the cab rear panel back into the vehicle interior.

	Stationary air conditioner, overall network		**Page 279**
	Load cold reservoir, function		**Page 280**
	Discharge cold reservoir function		**Page 284**

GF83.30-W-0004-02H	Stationary air conditioner, overall network		



W83.00-1009-79

A12b Heating, ventilation and air conditioning control unit (HVAC)

A14 Stationary air conditioning control unit (IAC)

A43 Modular switch panel (MSF) control unit

CAN 2 Interior CAN

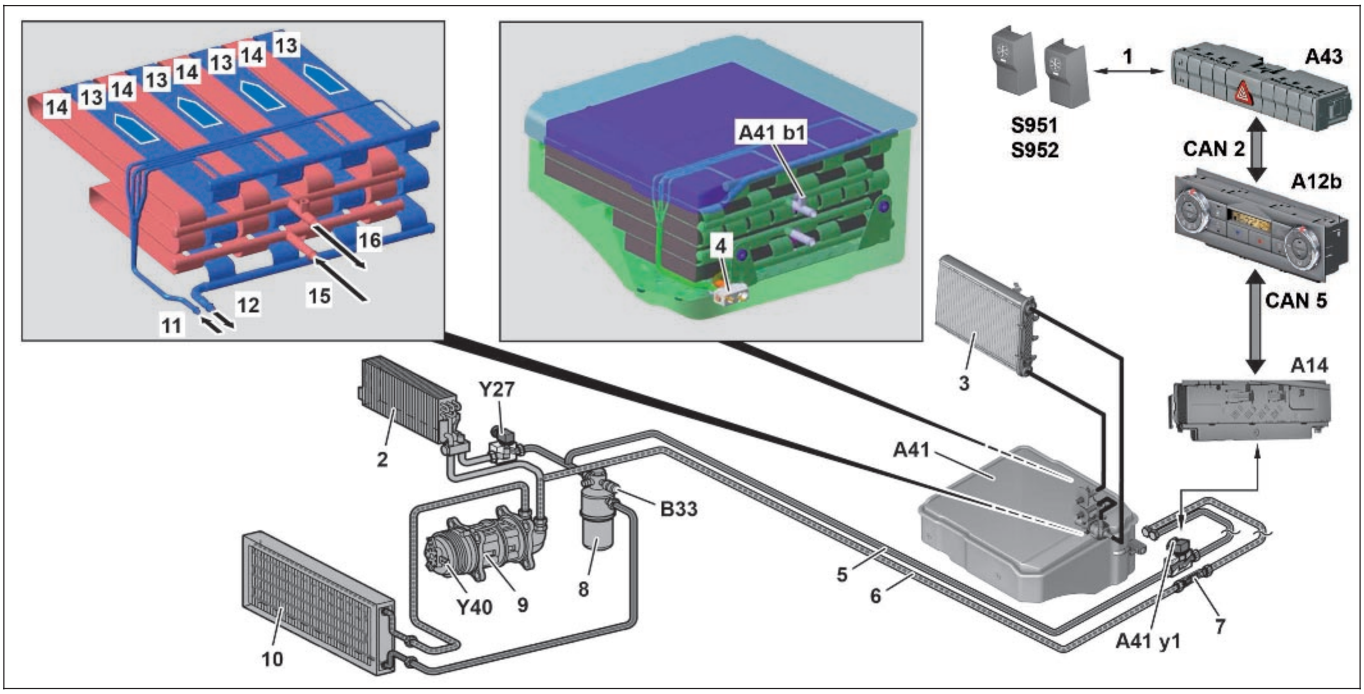
CAN 5 Climate control CAN

Z1 Cab instrument panel CAN bus star point

ASIC ASIC data bus (Application System Integrated Circuit)

GF83.30-W-3000H	Load cold reservoir, function	20.7.11

MODEL 963, 964 with CODE (D6H) Stationary air conditioner



W83.30-1225-79

Shown on vehicle without code (D6M) Hot water auxiliary heater, cab or code (D6N) Hot water auxiliary heater, cab and engine

1	*ASIC data bus (Application System Integrated Circuit)*
2	*Evaporator (conventional air conditioning)*
3	*Stationary air conditioner heat exchanger*
4	*Stationary air conditioner expansion valve*
5	*High pressure pipe*
6	*Low pressure pipe*
7	*Stationary air conditioner check valve*
8	*Fluid reservoir*
9	*AC compressor*
10	*Capacitor*
11	*High-pressure line connection*
12	*Low-pressure line connection*
13	*Cooling loop (charge cold reservoir)*
14	*Water-glycol loop (discharge cold reservoir)*
15	*Water-glycol mix return line*
16	*Water-glycol mix feed line*
A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A14	*Stationary air conditioning (IAC) control unit*
A41	*Stationary air conditioning cold reservoir*
A41 b1	*Stationary air conditioning cold reservoir temperature sensor*
A41 y1	*Stationary air conditioning cold reservoir solenoid valve*
A43	*Modular switch panel (MSF) control unit*
B33	*Air conditioning pressure sensor*
CAN 2	*Interior CAN*
CAN 5	*Climate control CAN*
S951	*Lower bunk stationary air conditioner button*
S952	*Upper bunk stationary air conditioner button*
Y27	*Stationary air conditioner solenoid valve*
Y40	*Refrigerant compressor magnetic clutch*

Preconditions

- Engine running
- Voltage supply present at all the control units in question and interlinkage intact.

Function

If the stationary air conditioner button (A12b s4) or one of the following components

- lower bunk stationary air conditioner button (S951) or lower bunk auxiliary heating and stationary air conditioner button (S941),
- upper bunk stationary air conditioner button (S952) or upper bunk auxiliary heating and stationary air conditioner button (S942).

Is operated, the heating, ventilation and air conditioning control unit (HVAC) (A12b) transmits the "air conditioning system active and cold reservoir charging ON" via the air conditioning CAN (CAN 5) to the stationary air conditioner control unit (IAC) (A14). The control LED of the stationary air conditioner button (A12b s4) illuminates.

The message about the stationary air conditioner's (IAC) new status is received by the modular switch panel control unit (MSF) (A43) and forwarded to the lower bunk stationary air conditioner button (S951) or the lower bunk auxiliary heating and stationary air conditioner button (S941) or the upper bunk stationary air conditioner button (S952) or the upper bunk auxiliary heating and stationary air conditioner button (S942) via the ASIC data bus (1). The button LEDs are switched on and from now on illuminate for the period of time during which the "charge stationary air conditioner cold reservoir" function is active.

The stationary air conditioner temperature sensor (A41 b1) is located in the stationary air conditioner cold reservoir (A41). It records the temperature of the cooling medium. If the cooling medium has reached a temperature of approx. -12 °C, the stationary air conditioning cold reservoir (A41) has been charged. The stationary air conditioner control unit (IAC) (A14) sends the "open magnetic clutch" request to the heating, ventilation and air conditioning control unit (HVAC) (A12b), and the magnetic clutch is opened. The charging process does not occur.
If the stationary air conditioner cold reservoir (A41) is still not charged, the heating, ventilation and air conditioning control unit (HVAC) (A12b) closes the control circuit of the refrigerant compressor's magnetic clutch (Y40).

The heating, ventilation and air conditioning control unit (HVAC) (A12b) closes the stationary air conditioner magnetic clutch (Y27) and opens the stationary air conditioner cold reservoir solenoid valve (A41 y1).
This ensures that the refrigerant circuit upstream of the evaporator (2) of the conventional air conditioning system is interrupted and the stationary air conditioner refrigerant circuit (IAC) is open. If the air conditioning pressure sensor (B33) detects excessive or insufficient pressure in the refrigerant circuit, the heating, ventilation and air conditioning control unit (HVAC) (A12b) interrupts the electric circuit to the refrigerant compressor's magnetic clutch (Y40) until the pressure is in operating range again.

If the automatic air conditioning system is now in cooling mode or it needs to switch on the refrigerant compressor (9) to increase the cooling output, the refrigerant compressor magnetic clutch (Y40) is actuated, independently of the cold reservoir temperature.
By switching the stationary air conditioner solenoid valve (Y27) and stationary air conditioner cold reservoir solenoid valve (A41 y1) components, the line to the evaporator (2) of the conventional air conditioning system is opened and the line to the stationary air conditioner cold reservoir (A41) is interrupted so that the system is switched from reservoir charge mode to air conditioning mode.
In other words, the refrigerant compressor (9) actuation is solely dependent on the evaporator temperature or the cooling requirement of the automatic air conditioning system.

When de-energized, the stationary air conditioner solenoid valve (Y27) is open and the stationary air conditioner cold reservoir solenoid valve (A41 y1) is closed. This in turn means that all refrigerant is delivered to the evaporator (2) of the conventional air conditioning. The stationary air conditioner cold reservoir (A41) is not charged.

If the automatic air conditioning system is not or no longer in cooling mode and if the stationary air conditioner cold reservoir (A41) is not yet charged, then the stationary air conditioner solenoid valve (Y27) and the stationary air conditioner cold reservoir solenoid valve (A41 y1) are actuated. The stationary air conditioner solenoid valve (Y27) blocks the refrigerant circuit to the evaporator (2) of the conventional air conditioning system, whereas the stationary air conditioner cold reservoir solenoid valve (A41 y1) opens the refrigerant circuit to the stationary air conditioner cold reservoir (A41).

The engine-driven refrigerant compressor (9) draws in the gaseous refrigerant stored under low pressure and compresses it.

The gaseous and heated refrigerant stored under high pressure through the compression process is routed into the condenser (10), the large surface of which enables it to cool down to liquified form (10).

Then the now liquid refrigerant (C) flows to the fluid reservoir (8).
When the refrigerant flows through the fluid reservoir (8), it is cleansed of any chemical and mechanical contamination. Residual quantities of water are also removed from the refrigerant.
Because the stationary air conditioner solenoid valve (Y27) is closed and the stationary air conditioner cold reservoir solenoid valve
(A41 y1) is open, the liquid refrigerant is routed over the high-pressure line (5) to the stationary air conditioner expansion valve (4).
The liquid refrigerant is injected in metered quantities by the stationary air conditioner expansion valve (4) into the refrigerant pipes of the stationary air conditioner cold reservoir (A41) where it is then evaporated.
This in turn cools down the refrigerant pipes and thus the cooling medium located in the stationary air conditioner cold reservoir (A41)

The cooling medium is then cooled until it either freezes and the stationary air conditioner control unit (IAC) (A14) ends the charging process on the basis of the measured temperature or until the automatic air conditioning system switches to cooling mode and interrupts the charging process.

i The automatic air conditioning system cooling mode and the stationary air conditioning cold reservoir charging process (A41) constantly alternate between each other until neither of them requires any more cooling output.
Here the cooling mode of the automatic air conditioning system always has a higher priority than the stationary air conditioning cold reservoir charging process (A41).

The refrigerant stored under low pressure which has become gaseous again due to the collection of heat is drawn in by the refrigerant compressor (9) via the low-pressure line (6) and the cycle starts again from the beginning.

i If the charging process is complete and the automatic air conditioning system is not longer requesting cooling power, the stationary air conditioning check valve (7) in the low-pressure line (6) closes off the return branch of the stationary air conditioning cold reservoir (A41) to the return line of the conventional air conditioning system and therefore prevents displacement of the refrigerant and the refrigeration oil.

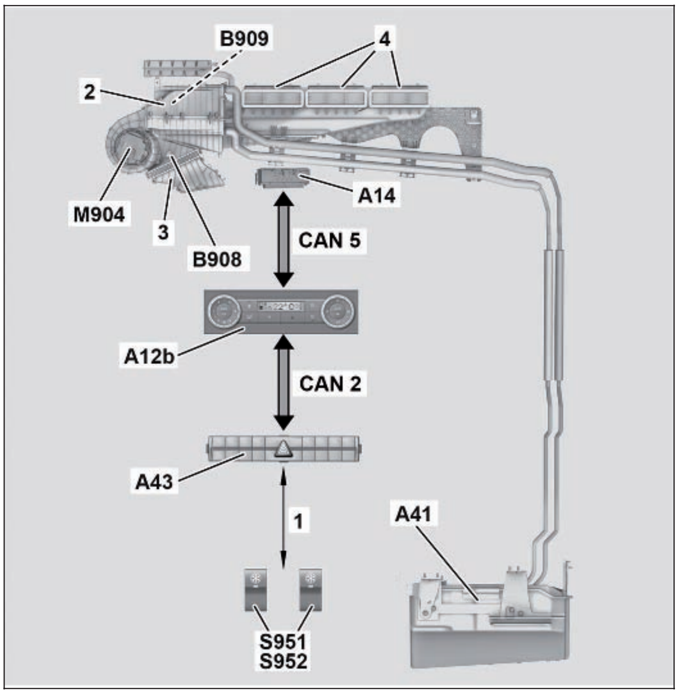
The refrigeration circuit is monitored by the air conditioning pressure sensor (B33).
As soon as the pressure drops below 2 bar or climbs above 30 bar, the air conditioning system is switched off by interrupting the electric circuit to the magnetic clutch (Y40) of the refrigerant compressor (9).
This may be caused by a pressure loss in the system or a defect in the evaporator temperature sensor (B929).

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Stationary air conditioner control unit, component description	A14	**Page 347**
	Stationary air conditioner cold reservoir, component description	A41	**Page 366**
	Stationary air conditioner cold reservoir temperature sensor, component description	A41 b1	**Page 367**
	Stationary air conditioner cold reservoir solenoid valve, component description	A41 b1	**Page 369**
	Modular switch panel control unit, component description	A43	**Page 370**
	Air conditioning pressure sensor, component description	B33	**Page 415**
	Evaporator temperature sensor, component description	B929	**Page 442**
	Bunk auxiliary heater and stationary air conditioning button, component description	S941, S942	**Page 471**
	Bunk stationary air conditioner button, component description	S951, S952	**Page 472**
	Stationary air conditioner solenoid valve, component description	Y27	**Page 482**
	Refrigerant compressor magnetic clutch, component description	Y40	**Page 489**
	Evaporator, component description		**Page 531**
	Stationary air conditioner heat exchanger, component description		**Page 527**
	Stationary air conditioner expansion valve, component description		**Page 529**
	Stationary air conditioner check valve, component description		**Page 528**
	Fluid reservoir, component description		**Page 533**
	A/C compressor, component description		**Page 534**
	Condenser, component description		**Page 530**

GF83.30-W-3001H	Discharge cold reservoir function	20.7.11

MODEL 963, 964 with CODE (D6H) Stationary air conditioner

1	*ASIC data bus (Application System Integrated Circuit)*
2	*Stationary air conditioner heat exchanger*
3	*Air intake duct*
4	*Air outlet vents*
A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A14	*Stationary air conditioning (IAC) control unit*
A41	*Stationary air conditioning cold reservoir*
A43	*Modular switch panel (MSF) control unit*
B908	*Stationary air conditioning air inlet temperature sensor*
B909	*Stationary air conditioning air outlet temperature sensor*
CAN 2	*Interior CAN*
CAN 5	*Climate control CAN*
M904	*Stationary air conditioning blower motor*
S951	*Lower bunk stationary air conditioner button*
S952	*Upper bunk stationary air conditioner button*



W83.30-1210-12

Requirement
- Engine off (no signal from circuit D+).
- Voltage supply present at all the control units in question and interlinkage intact.

Function
The stored cold energy can be retrieved independently of the charge level of the stationary air conditioning cold reservoir (A41) via the stationary air conditioner button (A12b s4) or one of the following components
- Lower bunk stationary air conditioner button (S951) or lower bunk auxiliary heating and stationary air conditioner button (S941),
- Upper bunk stationary air conditioner button (S952) or upper bunk auxiliary heating and stationary air conditioner button (S942).

The blower regulation is in automatic mode at the beginning of the discharging process. The blower regulation can be manually altered using the blower regulator (A12b s1).
The heating, ventilation and air conditioning control unit (HVAC) (A12b) sends a message via the climate control CAN (CAN 5) to the stationary air conditioner control unit (IAC) (A14), which then actuates the stationary air conditioner blower motor (M904). The stationary air conditioner blower motor (M904) is actuated using a pulse width modulated signal. If the automatic blower regulation button (A12b s2) is active, the blower speed is automatically controlled by the heating, ventilation and air conditioning control unit (HVAC) (A12b). The automatic air conditioning only distributes air via the middle and side vents when the stationary air conditioner (IAC) is in operation, regardless of the position of the air distribution controller (A12b s12).

In order that the latent cold energy received in the cooling medium or stationary air conditioner cold reservoir (A41) can be discharged, the water-glycol mix cooled in the stationary air conditioner cold reservoir (A41) is transported through the coolant pump (A41 m1) to the stationary air conditioner heat exchanger (2).

The stationary air conditioner blower motor (M904) draws in the warm air from the vehicle interior via the air intake duct (3) and delivers it along the air intake duct (3) to the stationary air conditioner heat exchanger (2).

The air flowing through the air intake duct (3) cools down in the stationary air conditioner heat exchanger (2).

Finally, the cooled air is routed via the air outlet vents (4) in the rear wall paneling back into the vehicle interior.

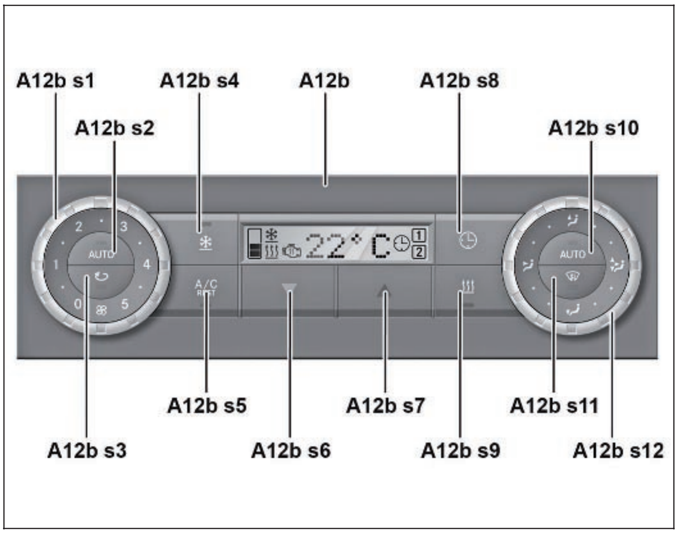
The discharging process ends when there is no measurable temperature difference between the stationary air conditioner air intake temperature sensor (B908) and the stationary air conditioner air outlet temperature sensor (B909).

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Stationary air conditioner control unit, component description	A14	**Page 347**
	Stationary air conditioner cold reservoir, component description	A41	**Page 366**
	Stationary air conditioner cold reservoir coolant pump, component description	A41	**Page 368**
	Modular switch panel control unit, component description	A43	**Page 370**
	Stationary air conditioning air outlet temperature sensor, component description	B908	**Page 439**
	Stationary air conditioning air outlet temperature sensor, component description	B909	**Page 440**
	Stationary air conditioner blower motor, component description	M904	**Page 457**
	Bunk auxiliary heater and stationary air conditioning button, component description	S941, S942	**Page 471**
	Bunk stationary air conditioner button, component description	S951, S952	**Page 472**
	Stationary air conditioner heat exchanger, component description		**Page 527**

GF83.40-W-0005H	Automatic air conditioning, function	20.7.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning

A12b *Heating, ventilation and air conditioning control unit (HVAC)*
A12bs1 *Blower regulator*
A12bs2 *Automatic blower control button*
A12b s3 *Air recirculation mode button*
A12b s4 *Stationary air conditioning button*
A12b s5 *A/C/residual-heat utilization button*
A12b s6 *Reduce/minus temperature button*
A12b s7 *Increase/plus temperature button*
A12b s8 *Timer button*
A12b s9 *Auxiliary heater button*
A12b s10 *Automatic air distribution button*
A12b s11 *Defrost mode button*
A12b s12 *Air distribution control*



W83.30-1215-11

The automatic air conditioning system can be actuated both automatically and manually.

-Manual mode
In manual mode, i.e. the automatic blower control button (A12b s2) and the automatic air distribution button (A12b s10) are not activated (control LED in both buttons is off), all functions can be controlled manually.
The electronically controlled cooling, heating and ventilation system of the automatic air conditioning system regulates the required interior temperature and keeps it constant, but without automatically adjusting the blower output or the air distribution.

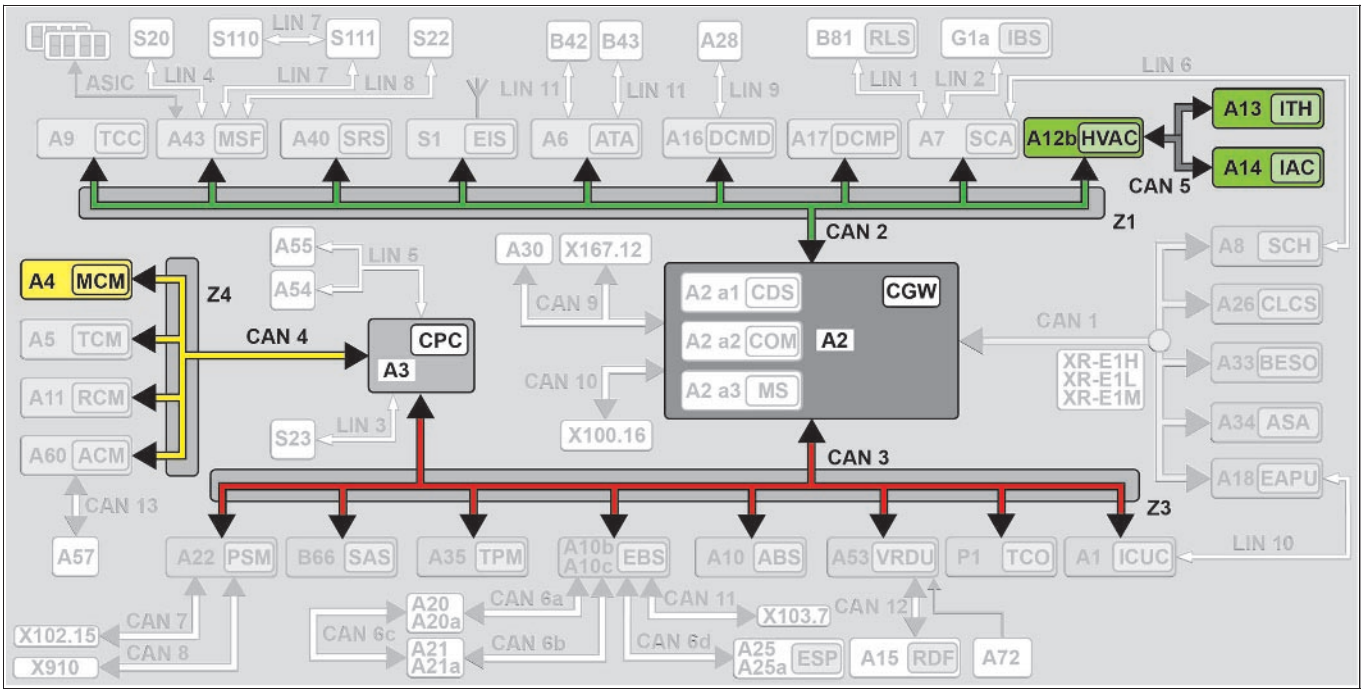
Automatic mode
Automatic mode starts as soon as the automatic blower control button (A12b s2) or the automatic air distribution button (A12b s10) is activated (control LEDs in the buttons illuminate).
In this operating mode, the electronically controlled cooling, heating and ventilation system of the automatic air conditioning system regulates the required interior temperature as quickly as possible and keeps it constant. If the automatic blower control button (A12b s2) has been activated, the blower output is adjusted, and if the automatic air distribution button (A12b s10) has been activated the air distribution is automatically adjusted.

If the automatic air conditioning system detects that the vehicle is equipped with an auxiliary heater (ITH), if the coolant temperature for heating the cab is insufficient, it automatically triggers the heating mode of the auxiliary heater (not in hazardous material transporters).

The automatic air conditioning system is controlled by the heating, ventilation and air conditioning control unit (HVAC) (A12b).
It reads in the information that is required for controlling either directly or via the interior CAN (CAN 2) and actuates the various actuators in the heater blower unit.

	Automatic air conditioning system, overall network		**Page 287**
	Ventilation function		**Page 288**
	Temperature control function		**Page 294**

GF83.40-W-0005-03H	Automatic air conditioning system, overall network		



W83.00-1008-79

A2	*Central gateway control unit (CGW)*
A3	*Drive control (CPC) control unit*
A4	*Engine management control unit (MCM)*
A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A13	*Truck auxiliary heater (ITH) control unit*
A14	*Stationary air conditioning (IAC) control unit*
CAN 2	*Interior CAN*
CAN 3	*Frame CAN*
CAN 4	*Drive train CAN*
CAN 5	*Climate control CAN*
Z1	*Cab instrument panel CAN bus star point*
Z3	*Frame CAN bus star point*
Z4	*Drive CAN bus star point*

GF83.10-W-2003H	Ventilation function	20.7.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning

The ventilation system ensures that
- the windows are fog-free
- the vehicle occupants have a fresh air supply
- constant and pleasant temperatures are quickly achieved in the cab

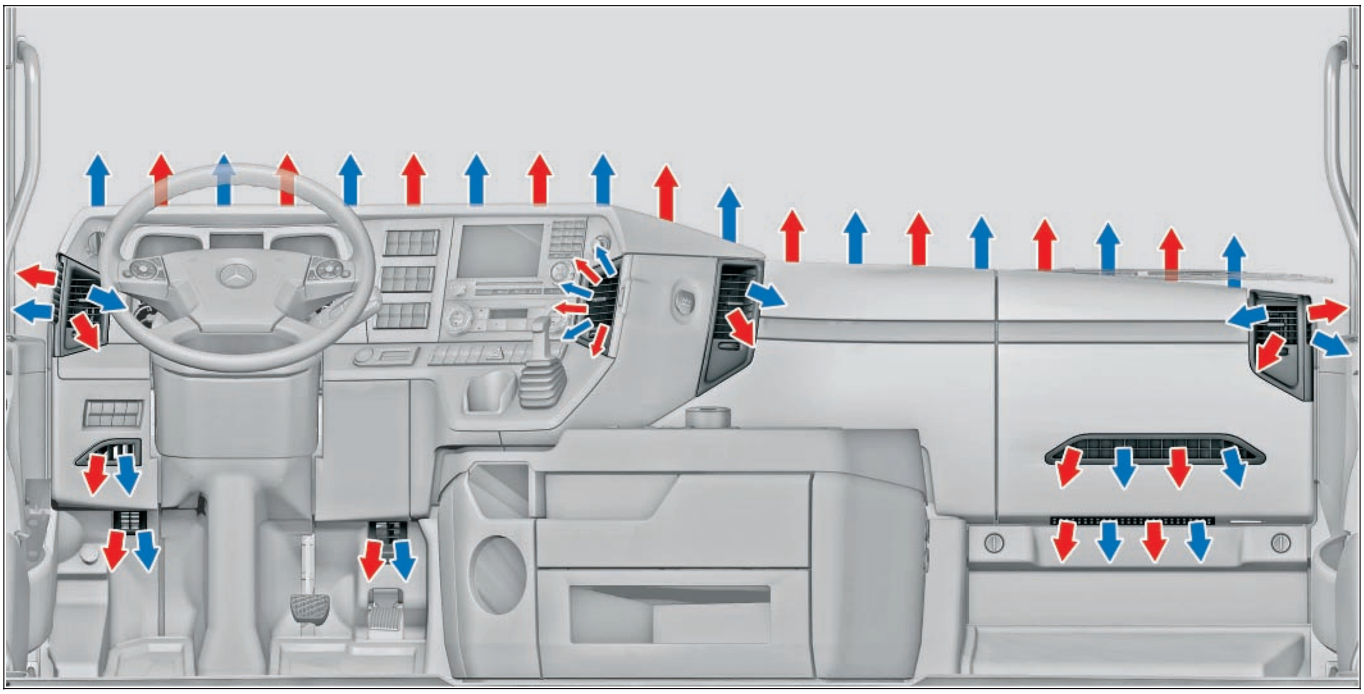
Air supply
Depending on whether air recirculation mode or fresh air mode is active, the air is drawn in out of the vehicle interior (air recirculation mode) or via the fresh air intake opening (fresh air mode) and transported through the air ducts to the selected air outlets.
If fresh air mode is enabled, the automatic air conditioning automatically switches from fresh air mode to air recirculation mode if an increased amount of pollutant emission is detected by the air quality sensor (B928).

When this occurs, the fresh air/recirculation flap is operated by the fresh air/recirculation flap actuator motor (M900), which is actuated by the heating, ventilation and air conditioning control unit (HVAC) (A12b).

Blower
Depending on the operating mode, the blower draws in air from the vehicle interior or fresh air via the fresh air intake opening and transports it to the air ducts through the heating blower unit. The air that is drawn in is led to the air outlets via the air ducts.
The blower speed and therefore the blower output can be manually influenced using the blower regulator (A12b s1).
If the automatic blower control button (A12b s2) has been activated (control LED in the button is illuminated), the blower output is automatically adapted to the heating or cooling conditions.

The blower is actuated by the heating, ventilation and air conditioning (HVAC) (A12b) control unit using pulse width modulation (PWM) signals. This makes continuous adaptation of the blower output possible.

i In vehicles with code (D6M) Auxiliary hot water heater, cab or code (D6N) Auxiliary hot water heater, cab and engine, the blower can be actuated independently of the position of the blower regulator (A12b s1).
Actuation takes place if the auxiliary heater is in heating mode.



W83.30-1208-79

Air distribution
The arrows represent the air distribution and the air outlets that are available for ventilating the cab.
Temperature-controlled air (red/blue arrows) flows from all air outlet openings (red/blue arrows).

The air distribution of the electronic cooling, heating and ventilation system of the automatic air conditioning includes:

- a defroster duct with exhaust vents along the windshield
- two center air vents that can be adjusted and locked in all directions in the center part of the instrument panel, one of which has a diffusion adjusting facility
- air ducting at the driver and front passenger doors
  – a general purpose corner vent at each side window makes it possible to direct air at the window
- two air vents for the driver footwell on the left, located next to the steering column
- one ventilation vent for the driver footwell, on the right next to the steering column
- one air duct for the front passenger footwell

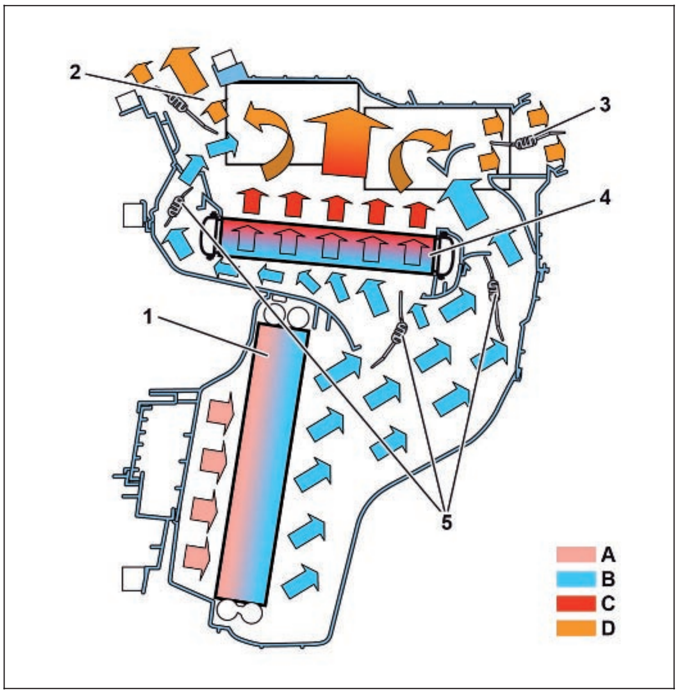
The air is distributed to the various air ducts through the air distribution flap, which is operated by the air distribution flap actuator motor (M905). The air distribution flap actuator motor (M905) is actuated by the heating, ventilation and air conditioning control unit (HVAC) (A12b) depending on the position of the air distribution controller (A12b s12). If the automatic air distribution button (A12b s10) has been activated (control LED in the button illuminates), the air distribution flap is adjusted in accordance with the characteristic stored in the heating, ventilation and air conditioning control unit (HVAC) (A12b), depending on whether the automatic air conditioning is in heating or cooling mode.

	Air supply in normal operation, function		**Page 290**
	Air supply in recirculated air mode, function		**Page 292**

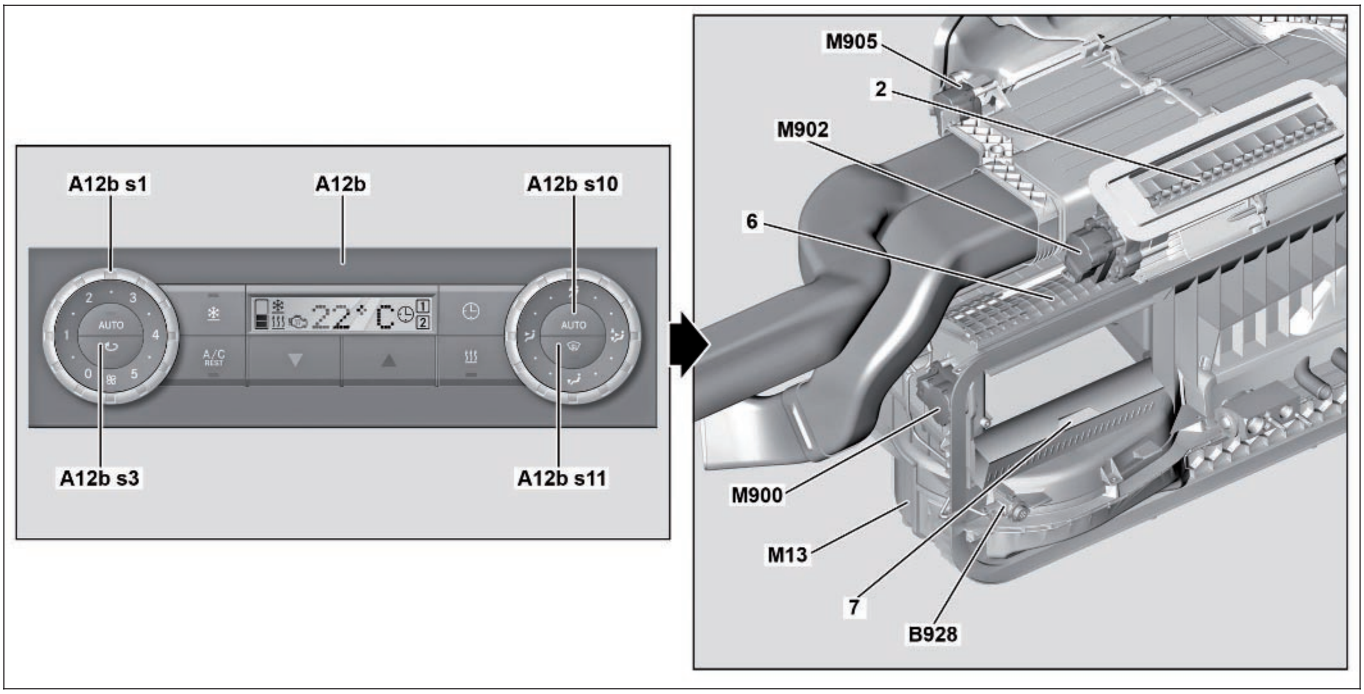
GF83.10-W-3000H	Air supply in normal operation, function	20.7.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning

1	*Evaporator*
2	*Defroster flap*
3	*Air distribution flap*
4	*Heating system heat exchanger*
5	*Temperature control flaps*
A	*Fresh air*
B	*Cooled air*
C	*Heated air*
D	*Blend air*



W83.57-1017-82



W83.10-1032-09

2	*Defroster flap*
6	*Fresh air/recirculated air flap*
7	*Particulate filter*
A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A12bs1	*Blower regulator*
A12b s3	*Air recirculation mode button*
A12b s10	*Automatic air distribution button*
A12b s11	*Defrost mode button*
B928	*Air quality sensor*
M13	*Blower motor*
M900	*Fresh air/recirculated air flap actuator motor*
M902	*Defroster vent flap actuator motor*
M905	*Air distribution flap actuator motor*

Preconditions

- Air recirculation mode switched off, i.e. the fresh air/recirculation flap is in "Fresh air" position.

In the following circumstances, air recirculation mode is switched off and normal operation is switched on:

- the defrost mode button (A12b s11) is activated
- the air recirculation mode button (A12b s3) is switched off
- the air quality sensor (B928) is not signaling increased pollutant emissions

----

The air that has been cleaned by the particulate filter (7) is then led through the evaporator (1).
If the air conditioning system has been activated, the air flowing through the evaporator (1) is dried and cooled.
After this, part of the dried and cooled air (B) is heated up again in the heated heater heat exchanger (4) as a result of the position of the temperature control flaps.
The other part of the dried and cooled air (B) is diverted past the heater heat exchanger (4) and is blended with the heated air (C) to form blended air (D) downstream of the heater heat exchanger (4).

Function

Since the fresh air/recirculation flap actuator motor (M900) is in the "Fresh air" position, fresh air (A) is drawn in via the particulate filter (7) by the blower motor (M13) via the fresh air intake opening. If the defrost mode button (A12b s11) is activated, the blower motor (M13), is actuated at maximum output if the internal combustion engine is running, and at 25% of its maximum output if the internal combustion engine is not running, independently of all characteristics. Otherwise the blower output is determined by the position of the blower regulator (A12b s1).

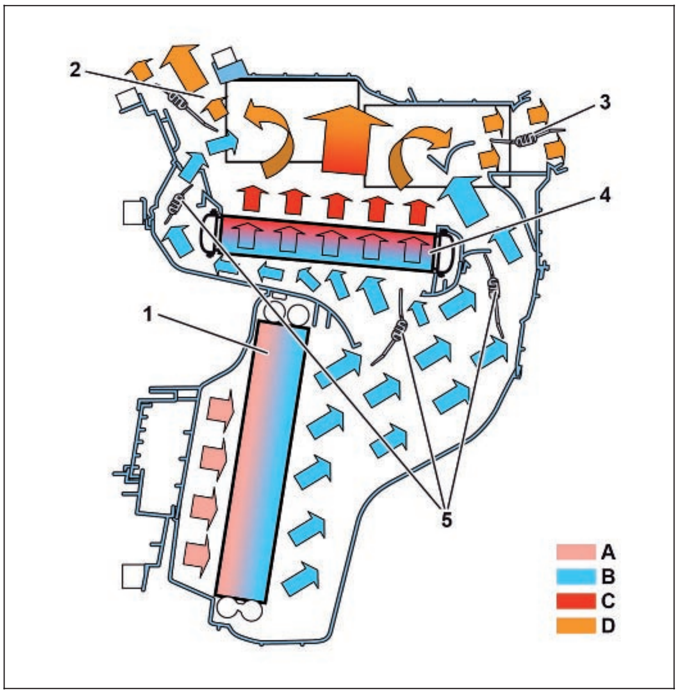
Depending on the position of the air distribution flap actuator motor (M905), which operates the air distribution flap, the blended air (D) is diverted to the various air outlets.
The air distribution flap actuator motor (M905) is actuated by the heating, ventilation and air conditioning control unit (HVAC) (A12b). If the automatic air distribution button (A12b s10) has been activated, the air distribution flap is adjusted in accordance with a characteristic that is stored in the heating, ventilation and air conditioning control unit (HVAC) (A12b).

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Air quality sensor, component description	B928	**Page 441**
	Blower motor, component description	M13	**Page 452**
	Fresh air/air recirculation flap actuator motor, component description	M900	**Page 454**
	Temperature regulation actuator motor, component description	M901	**Page 455**
	Air distribution flap actuator motor, component description	M905	**Page 458**
	Heating system heat exchanger, component description		**Page 526**
	Evaporator, component description		**Page 531**

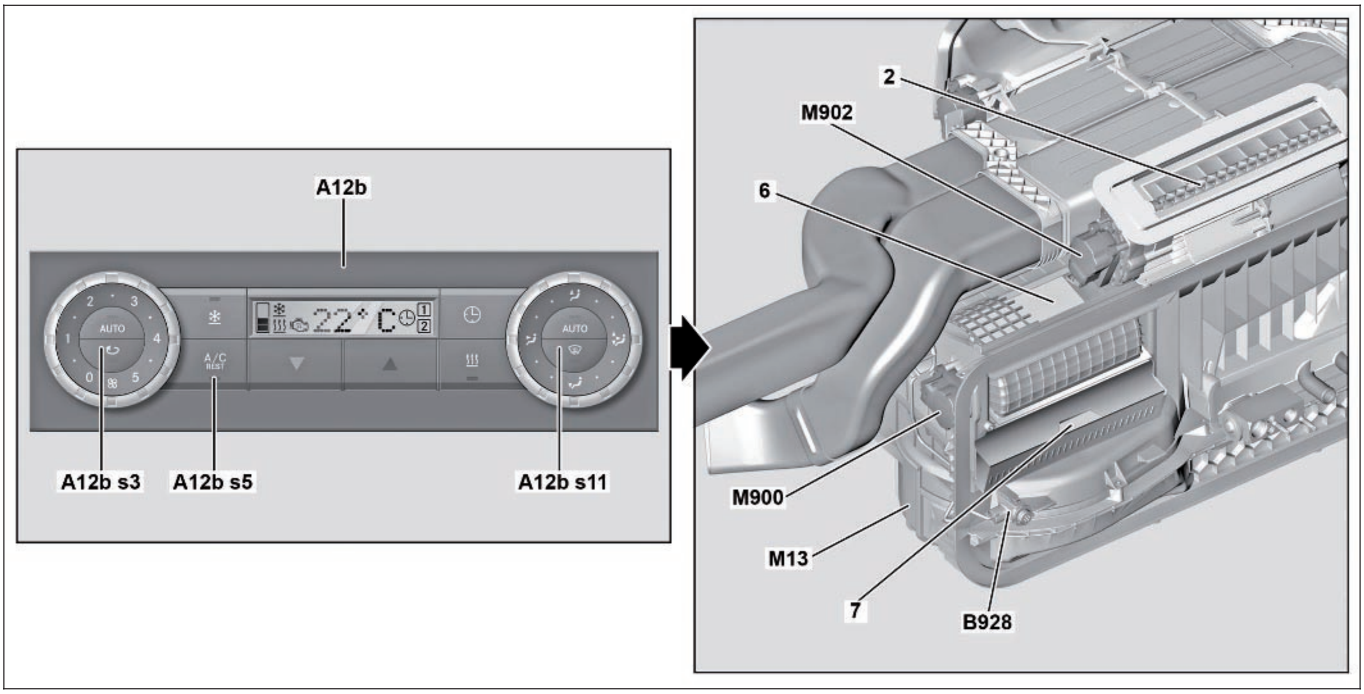
GF83.10-W-3001H	Air supply in recirculated air mode, function	20.7.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning

1	*Evaporator*
2	*Defroster flap*
3	*Air distribution flap*
4	*Heating system heat exchanger*
5	*Temperature control flaps*
A	*Air from the vehicle interior*
B	*Cooled air*
C	*Heated air*
D	*Blend air*



W83.57-1017-82



W83.10-1033-09

2	*Defroster flap*
6	*Fresh air/recirculated air flap*
7	*Particulate filter*
A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A12b s3	*Air recirculation mode button*
A12b s5	*Air conditioning system/ Residual heat utilization button*
A12b s11	*Defrost mode button*
B928	*Air quality sensor*
M13	*Blower motor*
M900	*Fresh air/recirculated air flap actuator motor*
M902	*Defroster vent flap actuator motor*

Preconditions

- Air recirculation mode switched on, i.e. the fresh air/recirculation flap is in "Recirculated air" position.

Air recirculation mode is or is being switched on,

- if the control LED in the air recirculation mode button (A12b s3) is illuminated, or
- if the air recirculation mode button (A12b s3) is switched off, but the air quality sensor (B928) is notifying the heating, ventilation and air conditioning control unit (HVAC) (A12b) about increased pollutant emissions.

Part of the dried and cooled air (B) is then heated up again in the heated heater heat exchanger (4) as a result of the position of the temperature control actuator motor (M901).

The other part of the dried and cooled air (B) is diverted past the heater heat exchanger (4) and is blended with the heated air (C) to form blended air (D) downstream of the heater heat exchanger (4).

Function

Since the fresh air/recirculation flap is in the "Recirculated air" position, air is drawn in from the vehicle interior (A) by the blower motor (M13) via the recirculated air opening and led through the particulate filter (7) and the evaporator (1).

If the automatic air conditioning system cut in has been activated, which is evident from the illuminated control LED in the air conditioning system/residual heat utilization button (A12b s5), the air flowing through the evaporator (1) is dried and cooled.

Depending on the position of the air distribution flap actuator motor (M905), which operates the air distribution flap, the blended air (D) is diverted to the various air outlets. The air distribution flap actuator motor (M905) is actuated by the heating, ventilation and air conditioning control unit (HVAC) (A12b). If the automatic air distribution button (A12b s10) has been activated, the air distribution flap is adjusted in accordance with a characteristic that is stored in the heating, ventilation and air conditioning control unit (HVAC) (A12b).

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Air quality sensor, component description	B928	**Page 441**
	Blower motor, component description	M13	**Page 452**
	Fresh air/air recirculation flap actuator motor, component description	M900	**Page 454**
	Temperature regulation actuator motor, component description	M901	**Page 455**
	Air distribution flap actuator motor, component description	M905	**Page 458**
	Heating system heat exchanger, component description		**Page 526**
	Evaporator, component description		**Page 531**

GF83.57-W-2000H	Temperature control function	20.7.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning

The electronically controlled cooling, heating and ventilation system of the automatic air conditioning system achieves the desired interior temperature or keeps it constant by:

- the evaporator cooling the air
- the heating system heat exchanger heating the air

It operates using the so-called "Reheat" principle when doing this.
This means:
The refrigerant compressor always runs if the outside temperature is greater than 5.5 °C, provided that automatic cut-in of the air conditioning system has been activated. This means that old fresh air is also cooled. This effect is primarily for comfort reasons, because cooling also simultaneously causes air dehumidification which, in turn, is an important prerequisite for a pleasant interior climate.

After the cooling process, the dried air is led through or past the heater heat exchanger, depending on the position of the temperature control flaps.
This has the advantage that the required interior temperature can be achieved more quickly and accurately.

The position of the temperature control flaps is modified via the temperature control actuator motor (M901), which is actuated by the heating, ventilation and air conditioning control unit (HVAC) (A12b).
Depending on whether the required interior temperature is higher or lower than the current interior temperature, the automatic air conditioning system goes into heating or cooling mode.

If the required interior temperature is exactly as high as the current interior temperature or the automatic air conditioning system has reached the set interior temperature, it keeps the setting constant. If the automatic blower control (A12b s2) button has been activated, the blower output is reduced and adapted to the ambient conditions.
Furthermore, the automatic air conditioning system automatically adapts the air distribution and the cooling output of the air conditioning system if the automatic air distribution (A12b s10) button and the air conditioning system have been activated.

If a setpoint change is made, i.e. a higher or lower interior temperature is selected, and the automatic air conditioning system has already achieved the previously selected interior temperature, the position of the temperature control flaps is adjusted and the blower output is briefly increased until the temperature is reached. Then the blower output is continuously reduced again.

	Refrigerant circuit, function		**Page 295**
	Heater circuit function		**Page 297**
	Temperature control during heater operation, function		**Page 299**
	Temperature control during AC operation, function		**Page 302**

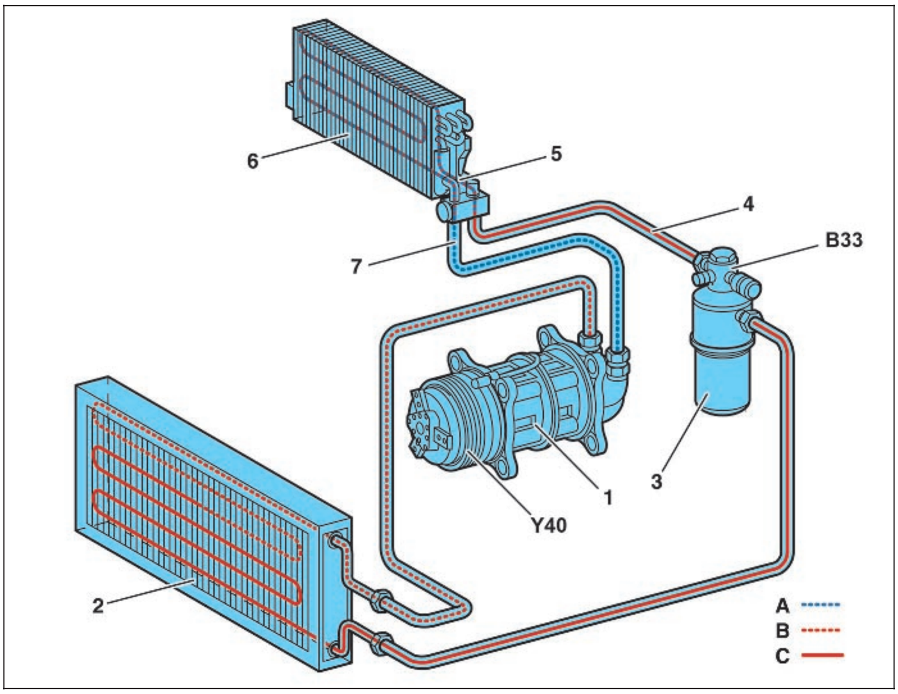
GF83.40-W-2008H	Refrigerant circuit, function	20.7.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning

1 *AC compressor*
2 *Capacitor*
3 *Fluid reservoir*
4 *High pressure pipe*
5 *Expansion valve*
6 *Evaporator*
7 *Low pressure pipe*

B33 *Air conditioning pressure sensor*
Y40 *Refrigerant compressor magnetic clutch*

A *Gaseous refrigerant stored under low pressure*
B *Gaseous and heated refrigerant stored under high pressure*
C *Liquid refrigerant*



W83.40-1025-76

The refrigerant compressor (1) that is powered by the engine draws in the gaseous refrigerant (A) that is stored under low pressure and compresses it.

The heated gaseous refrigerant stored under high pressure through the compression process (B) is routed into the condenser (2), the expansive surface of which allows it to cool down to liquid form.

Following this the liquid refrigerant (C) flows to the fluid reservoir (3).
When the liquid refrigerant (C) flows through the fluid reservoir (3), it is cleansed of any chemical or mechanical contamination. Residual quantities of water are also removed from the liquid refrigerant (C).

The high-pressure line (4) is used to route the liquid refrigerant (C) finally to the expansion valve (5), which controls its metered injection into the evaporator (6) where it is then evaporated.

Heat is dissipated from the air as it blows by the surface of the evaporator (6), thus cooling the air.
The humidity borne on the air is converted to condensation water, which is then routed into the open via a hose. The air is thus dried.

The refrigerant which has become gaseous again due to the collection of heat is drawn in by the refrigerant compressor (1) via the low-pressure line (7) and the cycle starts again from the beginning.

The refrigeration circuit is monitored by the air conditioning pressure sensor (B33).
As soon as the pressure drops below 2 bar or climbs above 30 bar, the air conditioning system is switched off by interrupting the electric circuit to the magnetic clutch (Y40) of the refrigerant compressor (1).
The cause may be a loss of pressure in the system, a soiled condenser, a defective cooling fan or a defect in the evaporator temperature sensor (B929).

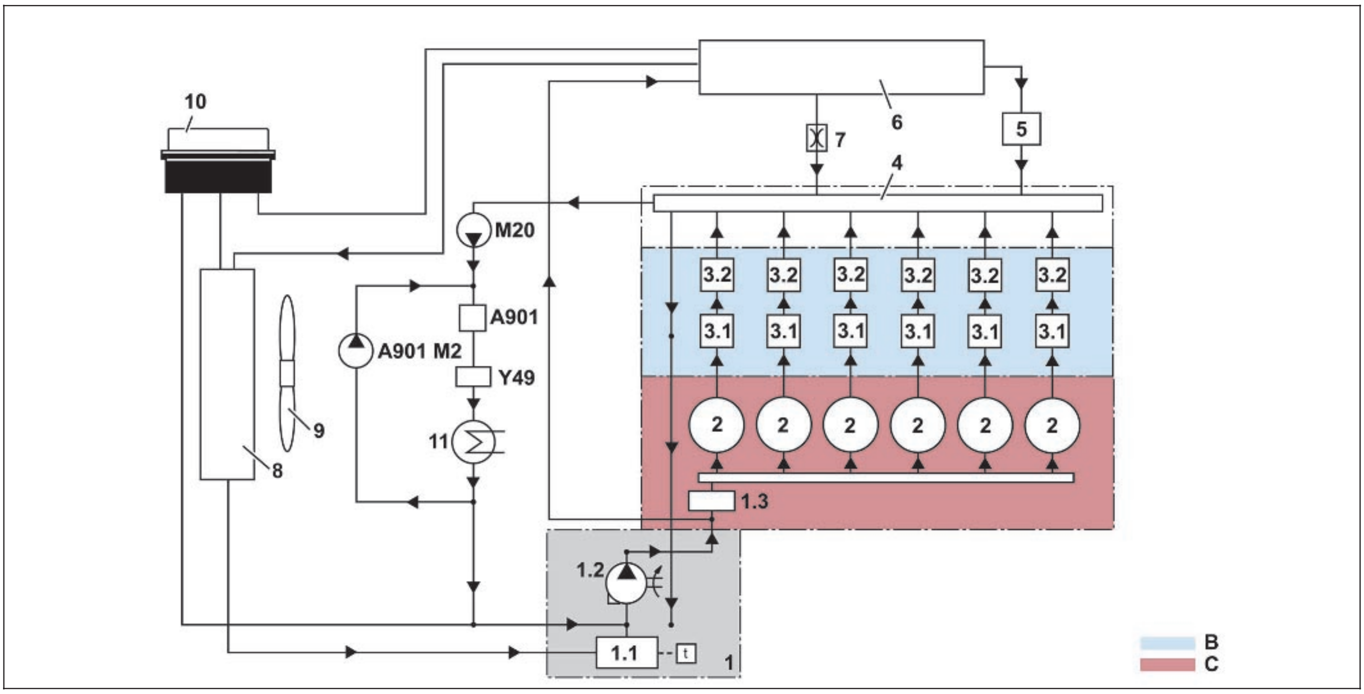
Icing of the air conditioning system hinders the evaporator temperature sensor (B929), which is located in the vicinity of the evaporator (6).

If there is a risk of the evaporator icing up (6) (evaporator temperature below 4 °C) the current supply to the refrigerant compressor magnetic clutch (Y40) is interrupted by the heating, ventilation and air conditioning control unit (HVAC) (A12b).

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Air conditioning pressure sensor, component description	B33	**Page 415**
	Evaporator temperature sensor, component description	B929	**Page 442**
	Refrigerant compressor magnetic clutch, component description	Y40	**Page 489**
	Component description for expansion valve		**Page 532**
	Fluid reservoir, component description		**Page 533**
	A/C compressor, component description		**Page 534**
	Condenser, component description		**Page 530**
	Evaporator, component description		**Page 531**

GF83.20-W-2003H	Heater circuit function	20.7.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning



W83.20-1118-79

1	*Oil/coolant module*	*6*	*Exhaust gas recirculation cooler*	*A901 M2*	*Circulation pump (only with code (D6M) Cab auxiliary water heater or code (D6N) Auxiliary water heater, cab and engine)*
1.1	*Coolant thermostat*	*7*	*Throttle*	*M20*	*Residual heat pump (only with code (D6I) Residual heat utilization)*
1.2	*Coolant pump*	*8*	*Radiator*	*Y49*	*Heater shutoff valve*
1.3	*Oil/water heat exchanger*	*9*	*Fan*	*B*	*Cylinder head*
2	*Cylinder liners*	*10*	*Coolant expansion reservoir*	*C*	*Crankcase*
3.1	*Lower coolant level*	*11*	*Heating system heat exchanger*		
3.2	*Upper coolant level*	*A901*	*Auxiliary water heater (only with code (D6M) Cab auxiliary water heater or code (D6N) Auxiliary water heater, cab and engine)*		
4	*Coolant manifold*				
5	*Vent unit for regenerating the diesel particulate filter (only with code (M5Z) Engine version Euro VI)*				

The coolant pump (1.2) delivers "cold" coolant through the oil-water heat exchanger (1.3), from where it goes into the engine, absorbs the engine heat and is heated up. The coolant is divided up, flows around the individual cylinder liners (2) and ends up in the lower coolant level (3.1). The coolant is then transported to the upper coolant level (3.2). The coolant is then collected again in the coolant manifold (4).

---

i The heater shutoff valve (Y49) is closed by the heating, ventilation and air conditioning control unit (HVAC) (A12b) if no heat output is required. This prevents unwanted heating of the air at the heat exchanger.

The auxiliary heater that is installed in vehicles with code (D6M) Auxiliary water heater, cab or with code (D6N) Auxiliary water heater, cab and engine is integrated in the heating circuit with an additional short circuit line in such a way that the coolant only circulates within the heating circuit with the aid of the additional circulation pump (A901 M2), and therefore does not have to be led through the entire engine.

In vehicles with code (D6I) Residual heat utilization, the coolant flows through the residual heat pump (M20), and in vehicles with code (D6M) Auxiliary water heater, cab or code (D6N) Auxiliary water heater, cab and engine the coolant flows through the heater of the auxiliary water heater (A901). The heated coolant is then led through the heated shutoff valve (Y49), from where it flows through the heater heat exchanger (11), which gives off the heat to the passing flow of air.

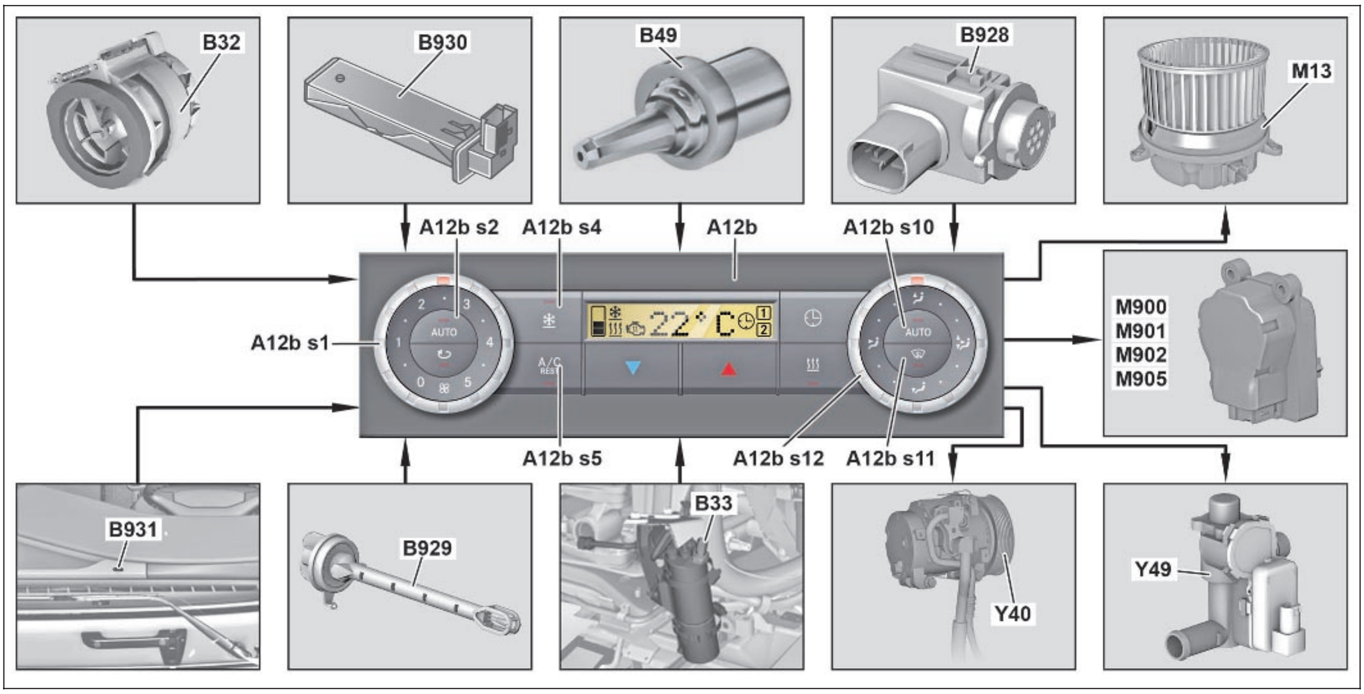
The coolant returns back to the coolant pump (1.2) via the heater return. Before it arrives at the coolant pump (1.2), it mixes with the coolant from the radiator (8) if the coolant thermostat (1.1) is open.

i Depending on the position of the coolant thermostat (1.1), more or less coolant flows through the coolant short-circuit line to the coolant pump (1.2). The temperature of the coolant in the coolant circuit is regulated in this way. The cooling output of the vehicle radiator is increased with the aid of the fan (9).

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Auxiliary heater heating unit, component description	A901 i Only in vehicles with code (D6M) Hot water auxiliary heater, cab or code (D6N) Hot water auxiliary heater, cab and engine	**Page 396**
	Auxiliary heater coolant circulation pump, component description	A901 M2 i Only in vehicles with code (D6M) Hot water auxiliary heater, cab or code (D6N) Hot water auxiliary heater, cab and engine	**Page 403**
	Residual heat pump, component description	M20 i Only in vehicles with code (D6I) Residual heat utilization	**Page 453**
	Temperature control actuator motor, component description	M901	**Page 455**
	Heating shutoff valve, component description	Y49	**Page 490**
	Heating system heat exchanger, component description		**Page 526**

GF83.57-W-3000H	Temperature control during heater operation, function	20.7.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning



W83.57-1016-79

A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A12bs1	*Blower regulator*
A12bs2	*Automatic blower control button*
A12b s4	*Stationary air conditioning button (Only with code (D6H) Stationary air conditioning system)*
A12b s5	*A/C/residual-heat utilization button*
A12bs10	*Automatic air distribution button*
A12b s11	*Defrost mode button*
A12b s12	*Air distribution control*
B32	*Vehicle interior temperature sensor*
B33	*Air conditioning pressure sensor*
B49	*Outside temperature sensor*
B928	*Air quality sensor*
B929	*Evaporator temperature sensor*
B930	*Air outlet temperature sensor*
B931	*Dual sun sensor*
M13	*Blower motor*
M900	*Fresh air/recirculated air flap actuator motor*
M901	*Temperature regulation actuator motor*
M902	*Defroster vent flap actuator motor*
M905	*Air distribution flap actuator motor*
Y40	*Refrigerant compressor magnetic clutch*
Y49	*Heater shutoff valve*

Preconditions

- The automatic blower control button (A12b s2) has been activated (control LED in button illuminated):
  – Only required for automatic adjustment of the blower output of the blower motor (M13).
- The automatic air distribution button (A12b s10) has been activated (control LED in button illuminated):
  – Only necessary for automatic adjustment of the air distribution.
- The air conditioning system/residual heat utilization button (A12b s5) has been activated (control LED in button illuminated):
  – Only necessary for automatic adjustment of the cooling output.

Function sequence, automatic mode and automatic cut-in of the air conditioning system:

The heating, ventilation and air conditioning control unit (HVAC) (A12b) continuously compares the target temperature setting with the measurements that are being directly received from the

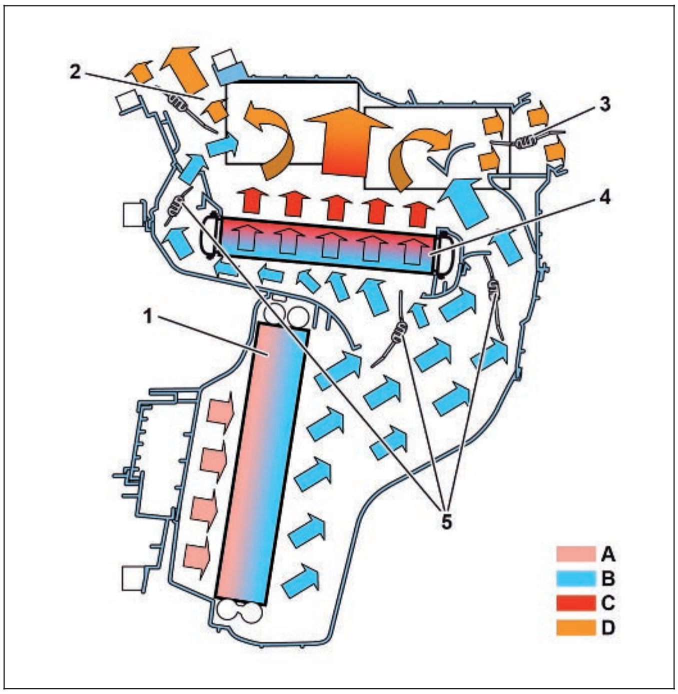
- Dual sun sensor (B931)
- Air outlet temperature sensor (B930)
- Evaporator temperature sensor (B929)
- Outside temperature sensor (B49)
- Vehicle interior temperature sensor (B32)

The following additional signal is obtained indirectly:

- Coolant temperature, which is required for temperature control and is requested via the interior CAN (CAN 2).

1 Evaporator
2 Defroster flap
3 Air distribution flap
4 Heating system heat exchanger
5 Temperature control flaps

A Fresh air or air from vehicle interior
B Cooled air
C Heated air
D Blend air



W83.57-1017-82

If the automatic air conditioning system detects that the interior temperature setting of the heating, ventilation and air conditioning control unit (HVAC) (A12b) is higher than the currently prevailing interior temperature, it automatically initiates heating mode:

If the automatic blower control button (A12b s2) has been activated, the blower output is determined using a blower characteristic that is stored in the heating, ventilation and air conditioning control unit (HVAC) (A12b).

The blower characteristic is dependent on:

- the interior temperature,
- the specified temperature setting of the heating, ventilation and air conditioning control unit (HVAC) A12b)
- the outside temperature,
- the solar intensity.

If the automatic blower control button (A12b s2) has been deactivated, the blower output is controlled in accordance with the blower setting selected at the blower regulator (A12b s1).

The blower motor (M13) draws in either fresh air or air from the vehicle interior (A) depending on the setting of the air distribution flap, and leads it through the evaporator (1). Provided that the air conditioning system is switched on and active, the air is then cooled and dried.

At the same time, the heating, ventilation and air conditioning control unit (HVAC) (A12b) actuates the temperature control actuator motor (M901) and the heater shutoff valve (Y49). The temperature control actuator motor activates the temperature control flaps (5).

In order to avoid unnecessary cab cooling, the blower motor (M13) is initially actuated at low power. If the coolant temperature is sufficient for heating the cab, it is actuated at maximum output.
The output of the blower motor (M13) is controlled using pulse width modulation (PWM) signals by the heating, ventilation and air conditioning control unit (HVAC) (A12b).

In vehicles with code (D6M) Warm water auxiliary heater, cab or code (D6N) Warm water auxiliary heater, cab and engine, the automatic air conditioning system automatically initiates auxiliary heater heating mode if the coolant temperature is not yet adequate for heating the cab.

The heater shutoff valve (Y49) is opened as soon as a heating request is made, and the coolant that has been heated by the engine can flow through the heater heat exchanger (4).
Because of the new position of the temperature control flaps (5), the air (B) that has been dried and cooled by the evaporator (1) flows through the heater heat exchanger (4) and is heated up.

By means of a physiology correction, the control properties are adapted to match a person’s perception, because at cold outside temperatures, a higher temperature is perceived as comfortable, and at warm outside temperatures, a slightly colder temperature. Correspondingly, the position of the temperature control flap is also set depending on the prevailing outside temperature.

The heated air (C) is now led to the selected air outlets depending on the position of the air distribution flap.
If the automatic air distribution button (A12b s10) has been activated (control LED in button illuminated), the air distribution is controlled automatically.
In other words, the air distribution flap is set in accordance with a characteristic that is stored in the heating, ventilation and air conditioning control unit (HVAC) (A12b).
The characteristic is dependent on:

- the interior temperature,
- the specified temperature setting of the heating, ventilation and air conditioning control unit (HVAC) (A12b)
- the outside temperature,
- the solar intensity,
- the outlet air temperature at the air outlet.

At low outlet air temperatures (cooling operation) the footwell flap is closed, and opened again with increasing outlet air temperatures from about 30 °C.

If the defrost mode button (A12b s11) has been activated (control LED in button illuminated), the air distribution flap actuator motor (M905) is actuated in such a way that all air is led to the defroster outlets along the windshield.
At the same time, the temperature control flaps are moved into a position by the temperature control actuator motor (M901) in which all air is led through the heater heat exchanger (4). The heater shutoff valve (Y49) is opened.

During heating operation, the temperature control flaps are slowly moved into the position that has been determined for the heat requirement. The blower output is continually reduced if the automatic blower control button (A12b s2) has been activated (control LED in button illuminated).

When the automatic air conditioning system has reached the required interior temperature, it keeps this constant by continuously re-determining the position of the temperature control flaps depending on the heat or cooling requirement.

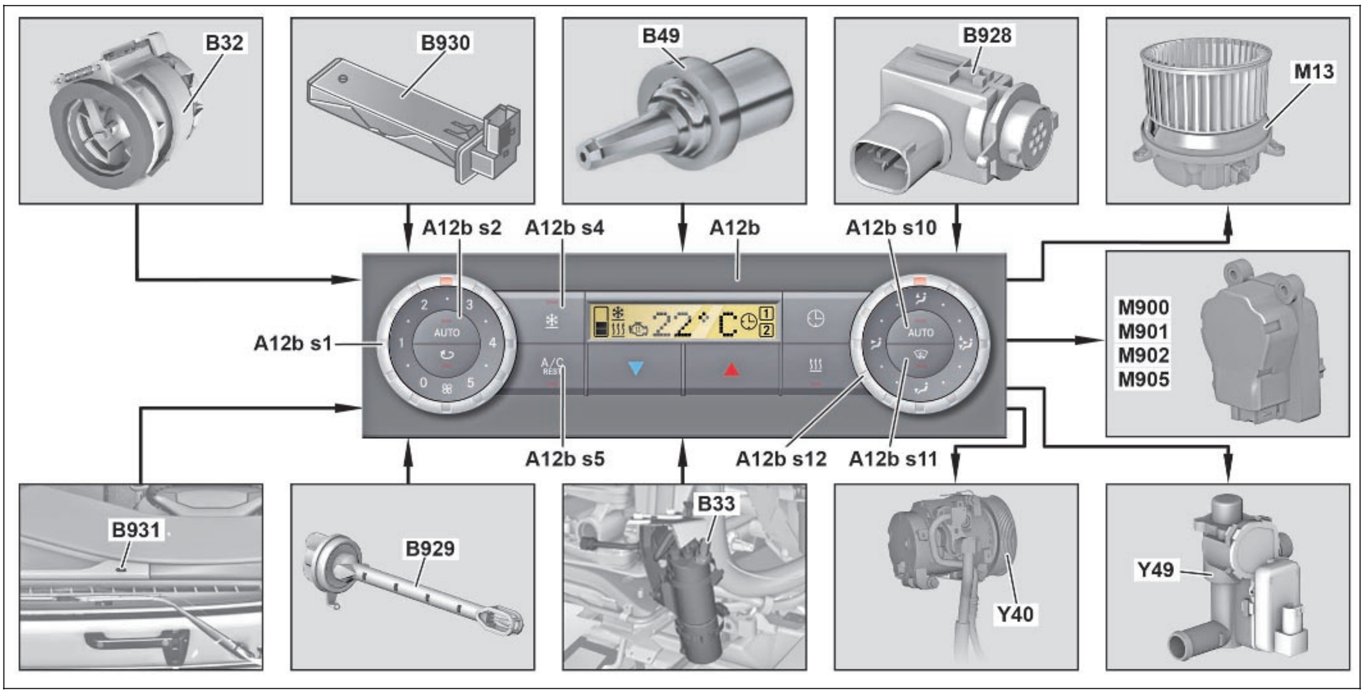
In this position, some of the dried and cooled air (B) is heated up in the heater heat exchanger (4) and the rest of the dried and cooled air (B) is routed past the heater heat exchanger (4).

Downstream of the heater heat exchanger (4), the heated air (C) blends with the cooled air (B) to form mixed air (D), whereupon it is then routed to the air vents at an even temperature.

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Vehicle interior temperature sensor, component description	B32	**Page 414**
	Outside air sensor, component description	B49	**Page 421**
	Evaporator temperature sensor, component description	B929	**Page 442**
	Air outlet temperature sensor, component description	B930	**Page 443**
	Dual sun sensor, component description	B931	**Page 444**
	Blower motor, component description	M13	**Page 452**
	Fresh air/air recirculation flap actuator motor, component description	M900	**Page 454**
	Temperature regulation actuator motor, component description	M901	**Page 455**
	Air distribution flap actuator motor, component description	M905	**Page 458**
	Heating shutoff valve, component description	Y49	**Page 490**
	Heating system heat exchanger, component description		**Page 526**
	Evaporator, component description		**Page 531**

GF83.70-W-0004H	Temperature control during AC operation, function	20.7.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning

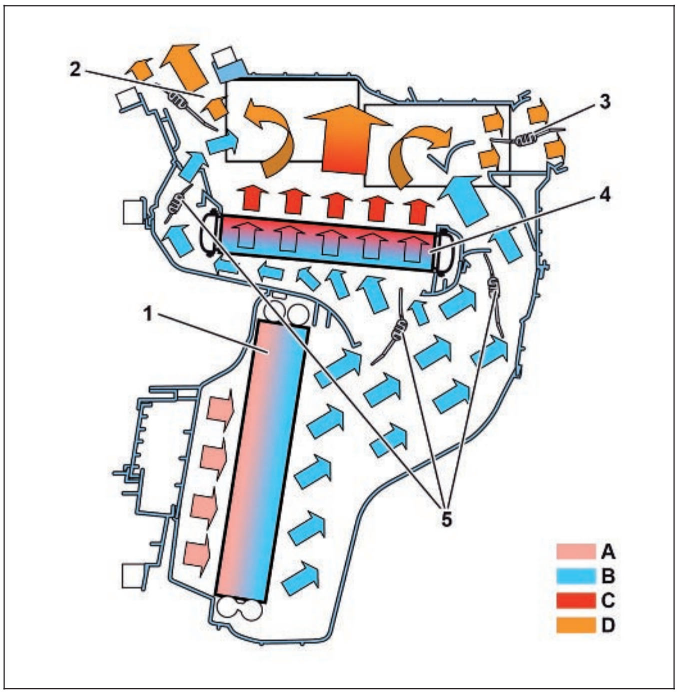


W83.57-1016-79

A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A12bs1	*Blower regulator*
A12bs2	*Automatic blower control button*
A12b s4	*Stationary air conditioning button (only with code D6H)*
A12b s5	*A/C/residual-heat utilization button*
A12b s10	*Automatic air distribution button*
A12b s11	*Defrost mode button*
A12b s12	*Air distribution control*
B32	*Vehicle interior temperature sensor*
B33	*Air conditioning pressure sensor*
B49	*Outside temperature sensor*
B928	*Air quality sensor*
B929	*Evaporator temperature sensor*
B930	*Air outlet temperature sensor*
B931	*Dual sun sensor*
M13	*Blower motor*
M900	*Fresh air/recirculated air flap actuator motor*
M901	*Temperature regulation actuator motor*
M902	*Defroster vent flap actuator motor*
M905	*Air distribution flap actuator motor*
Y40	*Refrigerant compressor magnetic clutch*
Y49	*Heater shutoff valve*

1 Evaporator
2 Defroster flap
3 Air distribution flap
4 Heating system heat exchanger
5 Temperature control flaps

A Fresh air or air from vehicle interior
B Cooled air
C Heated air
D Blend air



W83.57-1017-82

Preconditions

- The automatic blower control button (A12b s2) has been activated (control LED in button illuminated):
  – Only required for automatic adjustment of the blower output of the blower motor (M13).
- The automatic air distribution button (A12b s10) has been activated (control LED in button illuminated):
  – Only necessary for automatic adjustment of the air distribution.
- The air conditioning system/residual heat utilization button (A12b s5) has been activated (control LED in button illuminated):
  – Only necessary for automatic adjustment of the cooling output.

Function sequence

The heating, ventilation and air conditioning control unit (HVAC) (A12b) continuously compares the target temperature setting with the measurements that are being directly received from the:

- Dual sun sensor (B931)
- Air outlet temperature sensor (B930)
- Evaporator temperature sensor (B929)
- Outside temperature sensor (B49)
- Vehicle interior temperature sensor (B32)

The following signals are also obtained indirectly:

- Coolant temperature, which is required for temperature control
  and is requested via the interior CAN (CAN 2).

If the automatic air conditioning system detects that the interior temperature setting of the heating, ventilation and air conditioning control unit (HVAC) (A12b) is lower than the currently prevailing interior temperature, it automatically initiates cooling mode:

The heating, ventilation and air conditioning control unit (HVAC) (A12b) actuates the refrigerant compressor magnetic clutch (Y40) and monitors the evaporator temperature via the evaporator temperature sensor (B929).

If the automatic blower control button (A12b s2) has been activated, the blower output is determined using a blower characteristic that is stored in the heating, ventilation and air conditioning control unit (HVAC) (A12b).
The blower characteristic is dependent on:

- the interior temperature,
- the specified temperature setting of the heating, ventilation and air conditioning control unit (HVAC) (A12b)
- the outside temperature,
- the solar intensity.

In order to avoid unnecessary cab heating, the heating, ventilation and air conditioning control unit (HVAC) (A12b) initially actuates the blower motor (M13) at low power. If the evaporator temperature is sufficient for cooling the cab, it actuates the blower motor (M13) at maximum output.
The output of the blower motor (M13) is controlled using pulse width modulation (PWM) signals by the heating, ventilation and air conditioning control unit (HVAC) (A12b).
If the automatic air distribution button (A12b s10) is activated (control LED in button illuminates), the blower output is reduced to a minimum at extremely low outlet air temperatures to avoid unpleasant cold in the footwell.

The blower motor (M13) draws in either fresh air or air from the vehicle interior (A) depending on the setting of the fresh air/recirculation flap, and leads it through the evaporator (1). The air is then cooled and dried there.

At the same time, the heating, ventilation and air conditioning control unit (HVAC) (A12b) actuates the temperature control actuator motor (M901) and the heater shutoff valve (Y49). The temperature control actuator motor (M901) activates the temperature control flaps (5).
The heater shut-off valve (Y49) is closed and the coolant supply to the heater heat exchanger (4) is therefore interrupted.
The new position of the temperature control flaps (5) enables the air (B) that has been dried and cooled by the evaporator (4) to flow past the heater heat exchanger (4) and as a result it is not heated.
The control properties are adapted to match a person's perception, because at cold outside temperatures, one perceives a higher temperature as comfortable, and at warmer outside temperatures, a slightly colder temperature.
Correspondingly, the position of the temperature control flaps (5) is also set depending on the prevailing outside temperature.

The cooled air (B) is then routed to the selected air outlets depending on the position of the air distribution flap.
If the automatic air distribution button (A12b s10) has been activated (control LED in the button illuminates), the air distribution is automatically controlled by the air distribution flap actuator motor (M905) in such a way that evenly blended cooled air is available at all air outlets in the first 2 minutes Only then is the flap set in accordance with a characteristic stored in the heating, ventilation and air conditioning control unit (HVAC) (A12b).

The characteristic is dependent on:
- the interior temperature,
- the specified temperature setting of the heating, ventilation and air conditioning control unit (HVAC) (A12b)
- the outside temperature,
- the solar intensity,
- the outlet air temperature at the air outlet.

With low outlet air temperatures, as is the case in cooling mode, the footwell flap is closed and only opened again if the outlet air temperatures increase from roughly 30 °C.

During cooling operation, the temperature control flaps (5) are slowly moved into the positions determined for the cooling requirement. The blower output is also continually reduced if the automatic blower control button (A12b s2) has been activated (control LED in button illuminated).

When the automatic air conditioning system has reached the required interior temperature, it keeps this constant by continuously re-determining the position of the temperature control flaps (5) depending on the heat or cooling requirement.

At the same time, the heater shut-off valve (Y49) is operated to heat up the heater heat exchanger (4).

In this position, some of the dried and cooled air (B) is heated up in the heater heat exchanger (4) and the rest of the dried and cooled air (B) is routed past the heater heat exchanger (4).

Downstream of the heater heat exchanger (4), the heated air (C) blends with the cooled air (B) to form mixed air (D), whereupon it is then routed, equally tempered, to the air vents.

In order to maintain as pleasant an interior temperature as possible, even under increased solar exposure, the heating, ventilation and air conditioning control unit (A12b) uses the measurements from the dual sun sensor (B931) to determine the current solar radiation intensity.
If the solar radiation intensity increases, the heating, ventilation and air conditioning control unit (HVAC) (A12b) automatically adjusts the cooling output of the air conditioning system by increasing the blower output.

If the defrost mode button (A12b s11) has been activated (control LED in button illuminated), the air distribution flap actuator motor (M905) is actuated in such a way that all air is led to the defroster outlets along the windshield.If the heater shutoff valve (Y49) is closed, it is opened.
At the same time, the temperature control flaps (5) are moved to a position in which all of the air is routed though the heater heat exchanger (4).

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Vehicle interior temperature sensor, component description	B32	**Page 414**
	Outside air sensor, component description	B49	**Page 421**
	Evaporator temperature sensor, component description	B929	**Page 442**
	Air outlet temperature sensor, component description	B930	**Page 443**
	Dual sun sensor, component description	B931	**Page 444**

	Blower motor, component description	M13	**Page 452**
	Fresh air/air recirculation flap actuator motor, component description	M900	**Page 454**
	Temperature regulation actuator motor, component description	M901	**Page 455**
	Air distribution flap actuator motor, component description	M905	**Page 458**
	Refrigerant compressor magnetic clutch, component description	Y40	**Page 489**
	Heating shutoff valve, component description	Y49	**Page 490**
	Heating system heat exchanger, component description		**Page 526**
	A/C compressor, component description		**Page 534**
	Evaporator, component description		**Page 531**

GF83.70-W-0004H	Auxiliary heater function	20.7.11

MODEL 963, 964 with CODE (D6M) Warm water auxiliary heater, cab
MODEL 963, 964 with CODE (D6N) Warm water auxiliary heater, cab and engine

Auxiliary heater tasks:
The primary tasks of the auxiliary heater are:
- Preheating
- Continuous heating
- Stationary heating
- Auxiliary heating

Preheating
Preheating does the following:
- the windows are free of ice and condensation
- the interior compartment is preheated
- the engine is preheated

Having the engine warmed up before starting to drive reduces the wear on the engine considerably and also reduces exhaust emissions compared to starting to drive with a cold engine.
The average time taken for preheating is about 1 to 2 hours.

Heat boosting
Heat boosting is used to supplement the vehicle heating while the engine is in the start-up or warm-up phase. During this time the heat output of the heater heat exchanger is normally insufficient.

Function
The operation of the auxiliary heater can be triggered by pressing one of the following buttons (depending on the equipment variant):
- Auxiliary heater button (A12b s9)
- Lower bunk auxiliary heater button (S914)
- Upper bunk auxiliary heater button (S915)
- Lower bunk auxiliary heater and stationary air conditioning button (S941)
- Upper bunk auxiliary heater and stationary air conditioning button (S942)

Continuous heating
When continuous heating takes place, the interior temperature is maintained for
- long stationary or period of rest and
- overnight

In this case, heating takes place for approx. 11 hours.

Stationary heating
Stationary heating is used to maintain the interior temperature in the event of
- Stop periods for making deliveries
- Stop periods for loading
- Break times
- Traffic jams

In these cases the typical auxiliary heating time is several hours.

Heating can also take place by means of manual programming of programmed heating operation or automatically in vehicles with code (D6G) Automatic air conditioning.
Once the TRUCK auxiliary heater control unit (ITH) (A13) has received the relevant message for switching on the auxiliary heater, it starts heating operation.

The combustion air blower (A901 M1) is switched on and transports the combustion air that is needed for combustion into the burner tube of the auxiliary water heater (A901).
At the same time, the fuel metering pump (M2) removes fuel from the vehicle fuel tank and transports it to the burner insert of the auxiliary water heater (A901).
The fuel evaporates and combines with the combustion air to form an ignitable mixture, which ignites at the glow plug (A901 E) and combusts.
During combustion, the circulation pump (A901 M2) transports coolant from the cooling circuit of the engine through the heat exchanger of the auxiliary water heater (A901).

The heat exchanger gives off the heat that is generated by the combustion into the coolant, which is then led through the heater heat exchanger and then into the cooling circuit of the engine. In order to ensure that the coolant flows through the heater heat exchanger, the heating, ventilation and air conditioning control unit (HVAC) (A12b) opens the heater shutoff valve (Y49).
At the same time, the temperature control actuator motor (M901) is actuated until the predetermined position of the temperature flaps has been reached.

When the coolant has been adequately heated, the TRUCK auxiliary heater control unit (ITH) (A13) causes the blower to be switched on. The blower is actuated directly via the heating, ventilation and air conditioning control unit (HVAC) (A12b).

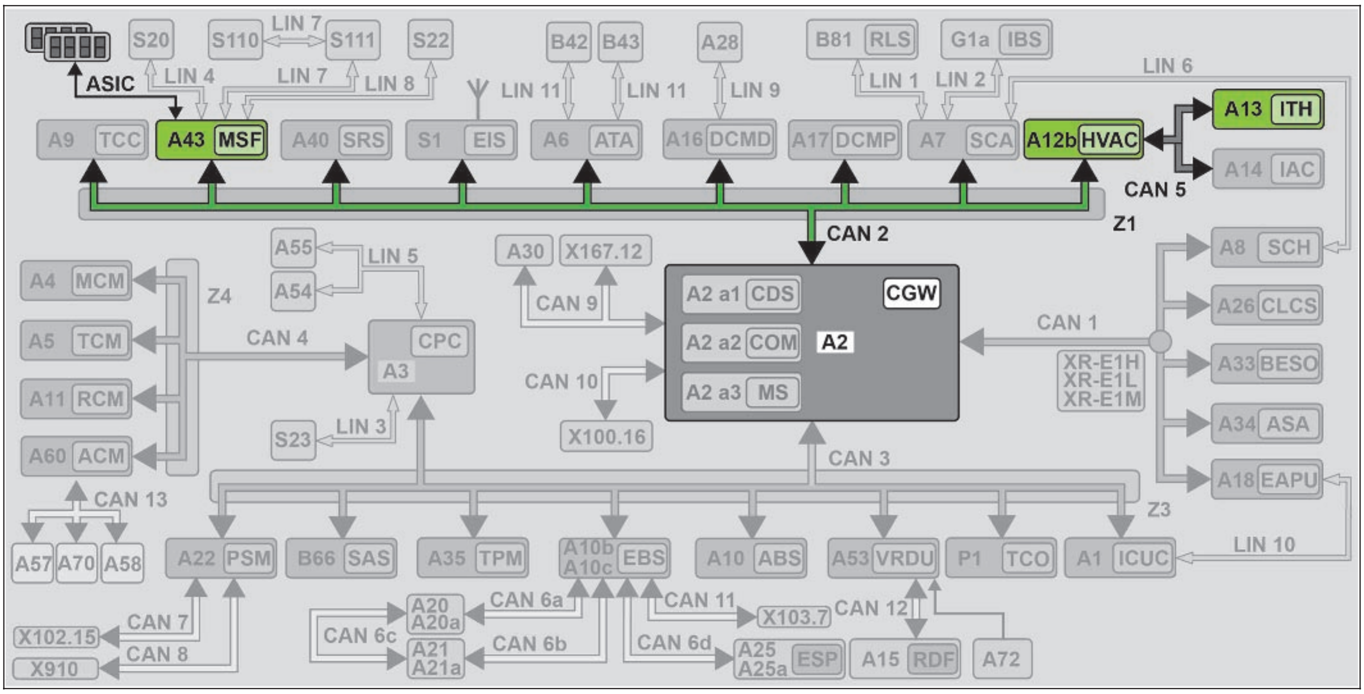
In vehicles with code (D6G) Automatic air conditioning system, the blower output is independent of the position of the fan switch. The blower output is controlled automatically.

In vehicles without code (D6G) Automatic air conditioning system, the blower speed remains at the value that is set on the blower regulator (A12b s1).

If the auxiliary heater has started heating, the electronically controlled heating and ventilation system of the Heatmatic or automatic air conditioning system regulates the interior temperature to the value set on the heating, ventilation and air conditioning control unit (HVAC) (A12b) and keeps it constant.

	Auxiliary heater, overall network		**Page 307**
	Trigger heating mode, function		**Page 315**
	Heater operation, function		**Page 308**
	Terminate heater operation, function		**Page 309**

GF83.70-W-0004-01H	Auxiliary heater, overall network		



W83.00-1010-79

A2	*Central gateway control unit (CGW)*
A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A13	*Truck auxiliary heater (ITH) control unit*
A43	*Modular switch panel (MSF) control unit*
CAN 2	*Interior CAN*
CAN 5	*Climate control CAN*
Z1	*Cab instrument panel CAN bus star point*
ASIC	*ASIC data bus (Application System Integrated Circuit)*

GF83.70-W-2001H	Heater mode, function	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

The heating mode of the auxiliary heater is divided up into:
- Starting mode
- Combustion mode
- Control interval

Starting mode
Starting mode is initiated when
- the heating mode of the auxiliary heater is activated by a button,
- the control interval is over and a return is to be made to the heating mode.

the starting mode is completed, when combustion is stable.

Combustion mode
When the stabilization mode is completed, the auxiliary heater is in combustion mode.
In combustion mode, the TRUCK (ITH) auxiliary heater control unit (A13) authorizes activation of the blower motor (M13). If the engine preheating has been activated, the heater shutoff valve (Y49), if closed, is opened. Engine preheating is only possible for vehicles with code (D6N) Cab and engine hot water auxiliary heater.
The TRUCK (ITH) auxiliary heater control unit (A13) continuously regulates the heat output.
If the maximum heat output has been reached, then it is maintained until the coolant has reached the specified temperature. After this the heat output is gradually lowered.

Control interval
As soon as the heat output can no longer be reduced, the combustion mode is set and the auxiliary water heater unit (A901) switches to the run-on phase.
In the run-on phase the auxiliary water heater unit (A901) is cooled and flushed by the combustion air blower (A901 M1) and the circulation pump (A901 M2).

After the auxiliary water heater unit (A901) has passed through the run-on phase, it is then in the control interval.
In the control interval the combustion air blower (A901 M1) and the circulation pump (A901 M2) continue to run until the specified temperature is dropped below.
The TRUCK (ITH) auxiliary heater control unit (A13) initiates the starting mode and the heating mode starts again.

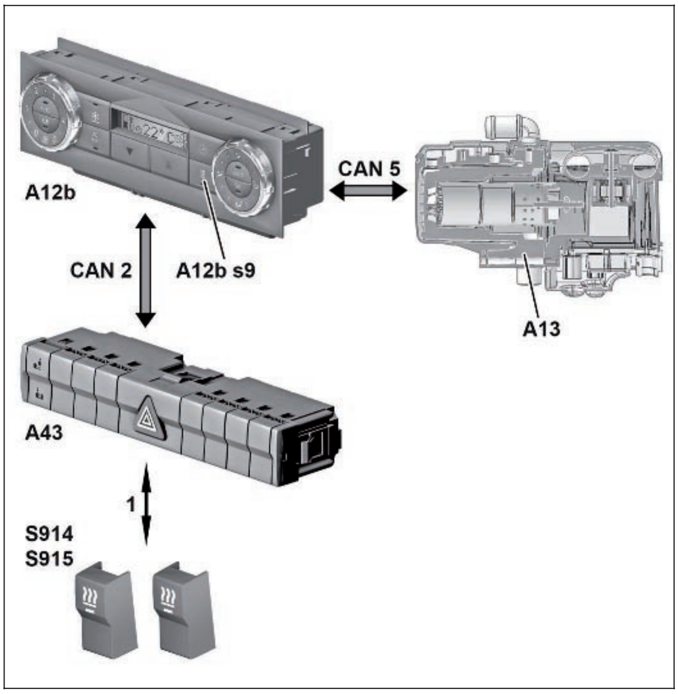
	Starting operation, function		**Page 322**
	Combustion mode, function		**Page 325**
	Control interval, function		**Page 327**

GF83.70-W-2002H	Terminate heater operation, function	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

Shown on vehicle with code (D6M) Cab hot water auxiliary heater,
without code (D6H) Stationary air conditioner

1	*ASIC data bus (Application Specific Integrated Circuit)*
A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A12b s9	*Auxiliary heater button*
A13	*Truck auxiliary heater (ITH) control unit*
A43	*Modular switch panel (MSF) control unit*
CAN 2	*Interior CAN*
CAN 5	*Climate control CAN*
S914	*Lower bunk auxiliary heater button*
S915	*Upper bunk auxiliary heater button*



W83.70-1461-12

ℹ The auxiliary heater heating mode can

- be ended by pressing a button on the auxiliary heater or
- by the TRUCK (ITH) auxiliary heater control unit (A13).

If the auxiliary heater heating mode for vehicles with code (D6G) Automatic air conditioning is automatically activated, then it is automatically ended when the engine's coolant has reached a temperature of 60 °C or the requirements for automatic activation are no longer fulfilled.

The heating mode can be ended in different ways. If the auxiliary water heater unit (A901) is in the control interval, the heating mode is immediately ended. If however, it is still in combustion mode, the TRUCK (ITH) auxiliary heater control unit (A13) initiates the run-on mode first, before the auxiliary water heater unit (A901) is completely switched off.
With the end of the heating mode the TRUCK (ITH) auxiliary heater control unit (A13) authorizes deactivation of the blower motor (M13) and the indicator LED in the auxiliary heater buttons.

1 End heating mode by the heating, ventilation and climate control (HVAC) control unit (A12b)

Depending on whether the auxiliary heater is in continuous or heater preselect mode, the heating, ventilation and climate control (HVAC) control unit (A12b) ends the heating mode, when:

- the time for the run-on period
- the remaining time

has expired.

1.1 Function sequence

If the auxiliary heater is in continuous heating mode, it changes to the run-on mode, when the maximum heating duration of 11 h is reached or when one of the auxiliary heater buttons is pressed. From this point on, the auxiliary heater only remains switched on for the run-on time, because the heating, ventilation and climate control (HVAC) control unit (A12b) issues the "Auxiliary heater OFF" message on the climate control-CAN (CAN 5) after the run-on time has expired.

If the auxiliary heater is in the heater preselect mode, the heating, ventilation and climate control (HVAC) control unit (A12b) issues the message "Auxiliary heater OFF" on the climate control-CAN (CAN 5) after expiry of the remaining time.

The TRUCK (ITH) auxiliary heater control unit (A13) is woken up by the CAN activities on the climate control-CAN (CAN 5).
After receiving the message, it either ends the heating mode immediately or it initiates the run-on mode.
At the same time it issues the messages "Auxiliary heating mode inactive" and "Blower OFF" on the climate control-CAN (CAN 5) and authorizes the blower to be switched off. The heating, ventilation and climate control (HVAC) control unit (A12b) receives this message and interrupts actuation of the blower motor (M13).
The "Auxiliary heating mode inactive" message activates the modular switch panel (MSF) control unit (A43), which forwards the information contained there over the ASIC data bus (1) to the auxiliary heater buttons.

The status LED for the lower bunk auxiliary heater button (S914), upper bunk auxiliary heater button (S915) or depending on the equipment, the lower bunk auxiliary heater and stationary air conditioner button (S941) and the upper bunk auxiliary heater and stationary air conditioner button (S942) components are switched off.

At the same time the heating, ventilation and climate control (HVAC) control unit (A12b) receives the message "Auxiliary heating mode inactive", evaluates it and the "ITH operating lamp" in the display and the status LED in the auxiliary heater button (A12b s9) go out.

2 End the heating mode by pressing an auxiliary heater button

Depending on the cab variant, the heating mode can be ended through the following components at any given time and irrespective of each operating mode:

- the auxiliary heater button (A12b s9)
- the lower bunk auxiliary heater button (S914) or lower bunk auxiliary heating and stationary air conditioner button (S941),
- the upper bunk auxiliary heater button (S915) or upper bunk auxiliary heating and stationary air conditioner button (S942),

2.1 Function sequence

If an auxiliary heater button in the bunk area is pressed, the installed electronics send the "Auxiliary heater OFF" message over the ASIC data bus (1) to the modular switch panel (MSF) control unit (A43).

The modular switch panel (MSF) control unit (A43) receives the message and - once it has been evaluated - it then sends the "Auxiliary heater MSF OFF" signal over the interior CAN (CAN 2) to the heating, ventilation and climate control (HVAC) control unit (A12b).

If the electronic ignition lock (EIS) (S1) is in the terminal 15 R position, then the heating, ventilation and climate control (HVAC) control unit (A12b) is activated through the message over the interior CAN (CAN 2). If the electronic ignition lock (EIS) (S1) is in terminal 15 position, the heating, ventilation and climate control (HVAC) control unit (A12b) is already active and it can evaluate the message straight away. Once the message has been received and evaluated, it sends the "Auxiliary heater OFF" message to the climate control CAN (CAN 5).

The "Auxiliary heater OFF" message is sent over the climate control CAN (CAN 5) to the TRUCK (ITH) auxiliary heater control unit (A13).

Depending on the operating condition of the auxiliary water heater unit (A901), the heating mode is either immediately ended or the run-on mode is initiated after receiving the "Auxiliary heater OFF" message.
At the same time, the TRUCK (ITH) auxiliary heater control unit (A13) sends the "Auxiliary heating mode inactive" and "Blower OFF" messages to the climate control CAN (CAN 5) and authorizes the blower to be switched off. The heating, ventilation and climate control (HVAC) control unit (A12b) receives this message and interrupts actuation of the blower motor (M13).

The "Auxiliary heating mode inactive" message is received by the modular switch panel (MSF) control unit (A43) and forwarded to the ASIC data bus (1).

All the auxiliary heater buttons receive the information on the OFF status of the auxiliary heater over the ASIC data bus (1).

The status LED for the lower bunk auxiliary heater button (S914), upper bunk auxiliary heater button (S915) or depending on the equipment, the lower bunk auxiliary heater and stationary air conditioner button (S941) and the upper bunk auxiliary heater and stationary air conditioner button (S942) components are switched off.

At the same time the heating, ventilation and climate control (HVAC) control unit (A12b) receives the message "Auxiliary heating mode inactive", evaluates it and the "ITH operating lamp" in the display and the status LED in the auxiliary heater button (A12b s9) go out.

3 Ending heating mode through the TRUCK (ITH) auxiliary heater control unit (A13)

The TRUCK (ITH) auxiliary heater control unit (A13) ends the heating mode:

- when the auxiliary water heater unit (A901) overheats
- with undervoltage or overvoltage
- where there is a flame-out or defective auxiliary heater exhaust temperature sensor (A901 B1)
- for hazardous good transporters when the engine is switched off
- when the power take-off is engaged
- when the climate control CAN (CAN 5) is interrupted.

3.1 Function sequence

Cyclical messages are sent and constantly monitored over the climate control CAN (CAN 5). If communication is interrupted, then - depending on the operating condition - it immediately actuates a fault run-on or a fault shutoff.

The TRUCK (ITH) auxiliary heater control unit (A13) also receives information on the vehicle’s equipment (hazardous goods van, power take-off) over the interior CAN (CAN 2). It requires this information to end the heating mode when the vehicle is switched off or when the power take-off is switched on.

The TRUCK (ITH) auxiliary heater control unit (A13) internally monitors the combustion mode and the temperature of the auxiliary water heater unit (A901). If the TRUCK (ITH) auxiliary heater control unit (A13) detects a malfunction in the heating mode, for example, overheating of the auxiliary water heater unit (A901), a flame-out or a defective auxiliary heater exhaust temperature sensor (A901 B1), then - depending on the type of malfunction - it immediately actuates a fault shutoff. After several fault shutoffs in sequence, a fault interlock is authorized. The auxiliary water heater unit (A901) can then no longer be started.

If the heating mode is ended through switching-off the vehicle or through switching on the power take-off, the TRUCK (ITH) auxiliary heater control unit (A13) sends the "Auxiliary heating mode inactive" message to the climate control CAN (CAN 5) and authorizes the blower to be switched off.

If the heating mode is ended because of a malfunction, the TRUCK (ITH) auxiliary heater control unit (A13) sends the "Auxiliary heating mode inactive" message and the "Auxiliary heater not ready" message as well as a message with a corresponding fault message to the climate control CAN (CAN 5). In this instance, the TRUCK (ITH) auxiliary heater control unit (A13) also authorizes the blower to be switched off.

The "Auxiliary heating mode inactive" message activates the modular switch panel (MSF) control unit (A43), which forwards the information contained there over the ASIC data bus (1) to the auxiliary heater buttons.
The status LED for the lower bunk auxiliary heater button (S914), upper bunk auxiliary heater button (S915) or depending on the equipment, the lower bunk auxiliary heater and stationary air conditioner button (S941) and the upper bunk auxiliary heater and stationary air conditioner button (S942) components are switched off.

At the same time, the heating, ventilation and climate control (HVAC) control unit) (A12b) is activated and it receives the corresponding messages, evaluates them and the "ITH operating lamp" in the display and the status LED in the auxiliary heater button (A12b s9) go out.

---

4 End automatic heating mode

i Only for vehicles with code (D6G) Automatic air conditioning, when the heating mode was automatically actuated.

The auxiliary heater's automatically actuated heating mode can be ended when

- the coolant temperature reaches 60 °C,
- the AAC's automatic mode is canceled or
- the defrost mode in the AAC is canceled.

4.1 Function sequence

If the AAC's defrost or automatic mode is canceled, then the heating, ventilation and climate control (HVAC) control unit (A12b) sends the "Automatic cut-in not permitted" message to the TRUCK (ITH) auxiliary heater control unit (A13).

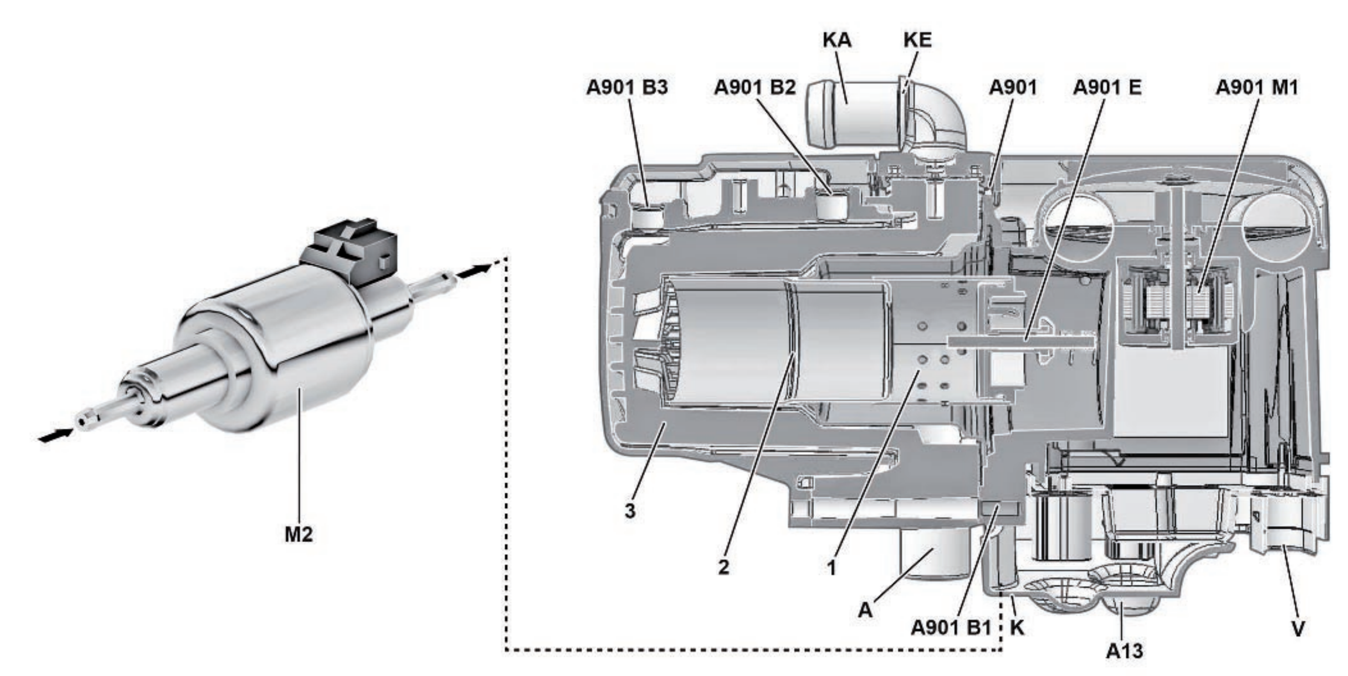
If the TRUCK (ITH) auxiliary heater control unit (A13) receives the "Automatic cut-in not permitted" message or if it detects that the coolant temperature is higher than 60 °C, then it sends the "Do not request auxiliary heater automatic cut-in" message over the climate control CAN (CAN 5) to the heating, ventilation and climate control (HVAC) control unit (A12b).

As soon as the heating, ventilation and climate control (HVAC) control unit (A12b) receives the "Do not request ITH automatic cut-in", it then sends the "Auxiliary heater OFF" message to the TRUCK (ITH) auxiliary heater control unit (A13).

The TRUCK (ITH) auxiliary heater control unit (A13) ends the heating mode or actuates the run-on mode, and sends the "Auxiliary heating mode inactive" message to the climate control CAN (CAN 5).

This message is then received by the modular switch panel (MSF) control unit (A43) and forwarded to the ASIC data bus (1).
All the auxiliary heater buttons receive the information on the OFF status of the auxiliary heater over the ASIC data bus (1). The status LED for the lower bunk auxiliary heater button (S914), upper bunk auxiliary heater button (S915) or depending on the equipment, the lower bunk auxiliary heater and stationary air conditioner button (S941) and the upper bunk auxiliary heater and stationary air conditioner button (S942) components are switched off.

The heating, ventilation and climate control (HVAC) control unit (A12b), which also receives the message "Auxiliary heating mode inactive", evaluates it and the "ITH operating lamp" in the display and the status LED in the auxiliary heater button (A12b s9) go out.



W83.70-1464-09

Shown on vehicle with code (D6M) Cab hot water auxiliary heater

1	*Burner insert*	*A901 B1*	*Auxiliary heater exhaust temperature sensor*	*A*	*Exhaust outlet*
2	*Burner tube*			*K*	*Fuel inlet*
3	*Heat exchanger*	*A901 B2*	*Temperature sensor*	*KA*	*Coolant outlet*
		A901 B3	*Overheating protection*	*KE*	*Coolant inlet*
A13	*Truck auxiliary heater (ITH) control unit*	*A901 E*	*Glow plug*	*V*	*Combustion air inlet*
		A901 M1	*Combustion air blower*		
A901	*Auxiliary water heater unit*	*M2*	*Fuel metering pump*		

5 End heating mode in combustion mode

If the auxiliary heater is in the combustion mode, the TRUCK (ITH) auxiliary heater control unit (A13) starts the run-on mode first after receiving the "Auxiliary heater OFF" message:

The fuel supply is immediately interrupted by switching off the fuel metering pump (M2).

The combustion air blower (A901 M1) runs on briefly at maximum speed, before being run at 1/4 of its output for roughly 35 seconds.
During this period it cools down the combustion chamber and flushes out any combustion gases.

As soon as the auxiliary heater exhaust temperature sensor (A901 B1) detects "Flame OFF", the combustion air blower speed is increased for 60 seconds to maximum speed.

After this, the speed of the combustion air blower (A901 M1) is gradually reduced to "zero" during another 60 seconds, and the circulation pump (A901 M2), which continued to run throughout the entire run-on mode, is switched off.

When the combustion air blower (A901 M1) and the circulation pump (A901 M2) are switched off, the run-on mode is completed and the heating mode ended.

6 End heating mode in control interval

If fuel has not yet been pumped or if the auxiliary water heater unit (A901) is in the control interval, the heating mode is immediately ended, without going into run-on mode first.

GF83.70-W-2008H	Trigger heating mode, function	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

The following operating modes are available for auxiliary heater operation:

- Continuous heating mode
- Preselection heating mode

Only for vehicles with code (D6G) Automatic air conditioning, an automatic heating mode is also available.
In automatic heating mode, the AAC automatically switches on the auxiliary heater to support the vehicle heating.

Vehicles with code (D6G) Automatic air conditioning:
The heater preselect mode can be activated and programmed through the heating, ventilation and climate control (HVAC) control unit (A12b)
All settings are stored and managed in the heating, ventilation and climate control (HVAC) control unit (A12b).

To activate the heating mode now, the heating, ventilation and climate control (HVAC) control unit (A12b) sends a corresponding message over the climate control CAN (CAN 5) to the TRUCK (ITH) auxiliary heater control unit (A13). The TRUCK (ITH) auxiliary heater control unit (A13) starts the heating mode while the indicator LEDs in all the auxiliary heater buttons are switched on.

	Triggering the permanent heater operation, function		**Page 316**
	Triggering the preselection heater operation, function	i Except for vehicles with one of the following codes: • Code (E5T) ADR model class EX/II, inclusive AT • Code (E5U) ADR model class EX/III, inclusive EX/II and AT • Code (E5V) ADR model class FL, inclusive EX/II, EX/III and AT • Code (E5X) ADR model class AT • Code (E5Z) Accessories, ADR • Code (E9D) Preinstallation, double-pole battery circuit breaker • Code (E9E) ADR preinstallation, without chassis shielding	**Page 318**
	Automatically triggering of heater operation, function	i Only for vehicles with code (D6G) Automatic air conditioning except for vehicles with one of the following codes: • Code (E5T) ADR model class EX/II, inclusive AT • Code (E5U) ADR model class EX/III, inclusive EX/II and AT • Code (E5V) ADR model class FL, inclusive EX/II, EX/III and AT • Code (E5X) ADR model class AT • Code (E5Z) Accessories, ADR • Code (E9D) Preinstallation, double-pole battery circuit breaker • Code (E9E) ADR preinstallation, without chassis shielding	**Page 320**

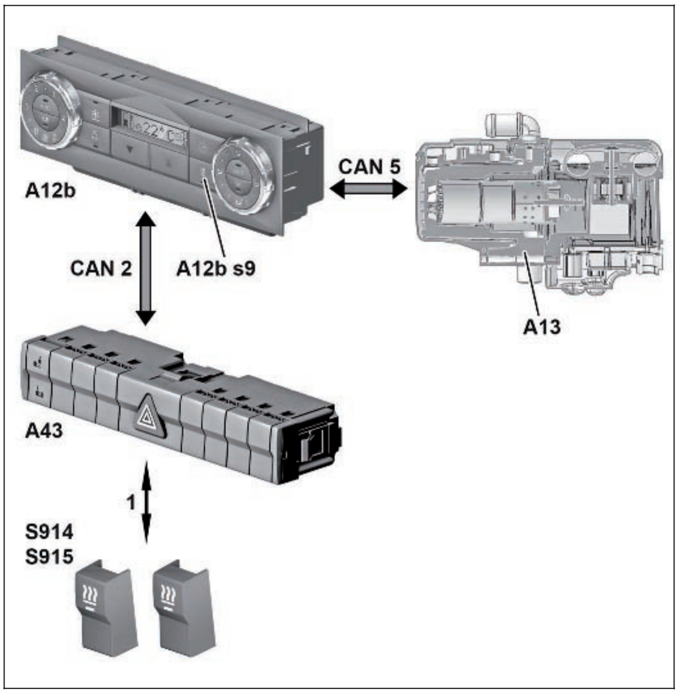
GF83.70-W-3070H	Triggering the permanent heater operation, function	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

Shown on vehicle with code (D6M) Cab hot water auxiliary heater,
without code (D6H) Stationary air conditioner

1 ASIC data bus (Application Specific Integrated Circuit)

A12b Heating, ventilation and air conditioning control unit (HVAC)
A12b s9 Auxiliary heater button
A13 Truck auxiliary heater (ITH) control unit
A43 Modular switch panel (MSF) control unit
CAN 2 Interior CAN
CAN 5 Climate control CAN
S914 Lower bunk auxiliary heater button
S915 Upper bunk auxiliary heater button



W83.70-1461-12

[i] The auxiliary heater's continuous heating mode can be actuated by pressing the auxiliary heater button (A12b s9) or, depending on the equipment variant, by pressing the lower bunk auxiliary heater button (S914), upper bunk auxiliary heater button (S915), lower bunk auxiliary heater and stationary air conditioner button (S941) or the upper bunk auxiliary heater and stationary air conditioner button (S942).
The auxiliary heater continuous heating mode is also available while the vehicle is moving.

Requirements

- Voltage supply present at all the control units in question and interlinkage intact.
- Power take-off not engaged for hazardous goods vans.

1 Function sequence through modular switch panel (MSF) control unit (A43)

The lower bunk auxiliary heater button (S914), upper bunk auxiliary heater button (S915) or depending on the equipment, the lower bunk auxiliary heater and stationary air conditioner button (S941) and the upper bunk auxiliary heater and stationary air conditioner button (S942) components are signal switches. This means an electronic circuit is located in them which reads in the button operation and converts it into a message. If one of the buttons is pressed, the installed electronics send the "Auxiliary heater ON" message over the ASIC data bus (1) to the modular switch panel (MSF) control unit (A43).

The modular switch panel (MSF) control unit (A43) receives the message and evaluates it. It then sends the "Auxiliary heater MSF ON" message over the interior CAN (CAN 2) to the heating, ventilation and climate control (HVAC) control unit (A12b).

The heating, ventilation and climate control (HVAC) control unit (A12b) receives this and evaluates it. The indicator LED in the auxiliary heater button (A12b s9) lights up over the entire period for which the auxiliary heater is switched on.

The "Auxiliary heater ON" message is sent over the climate control CAN (CAN 5) to the TRUCK (ITH) auxiliary heater control unit (A13). After receiving the message, it initiates the auxiliary heater heating mode and sends the "Auxiliary heating mode active" message almost simultaneously to the interior CAN (CAN 2).

This message is then received by the modular switch panel (MSF) control unit (A43) and forwarded to the ASIC data bus (1).

All the auxiliary heater buttons receive the information on the ON status of the auxiliary heater over the ASIC data bus (1). The indicator LED in the lower bunk auxiliary heater button (S914), upper bunk auxiliary heater button (S915) or depending on the equipment, the lower bunk auxiliary heater and stationary air conditioner button (S941) and the upper bunk auxiliary heater and stationary air conditioner button (S942) light up throughout the entire period in which the auxiliary heater is switched on.

---

2. Function sequence through auxiliary heater button (A12b s9)

If the auxiliary heater button (A12b s9) is operated, the indicator LED lights up. At the same time, the heating, ventilation and climate control (HVAC) control unit (A12b) sends the "Auxiliary heater ON" message over the climate control CAN (CAN 5) to the TRUCK (ITH) auxiliary heater control unit (A13).

After receiving the message, it initiates the auxiliary heater heating mode and sends the "Auxiliary heating mode active" message almost simultaneously to the climate control CAN (CAN 5). This message is now received by the heating, ventilation and climate control (HVAC) control unit (A12b) and sent to the interior CAN (CAN 2).

The message is then received by the modular switch panel (MSF) control unit (A43) and forwarded to the ASIC data bus (1).

All the auxiliary heater buttons receive the information on the ON status of the auxiliary heater over the ASIC data bus (1). The indicator LED in the lower bunk auxiliary heater button (S914), upper bunk auxiliary heater button (S915) or depending on the equipment, the lower bunk auxiliary heater and stationary air conditioner button (S941) and the upper bunk auxiliary heater and stationary air conditioner button (S942) light up throughout the entire period in which the auxiliary heater is switched on.

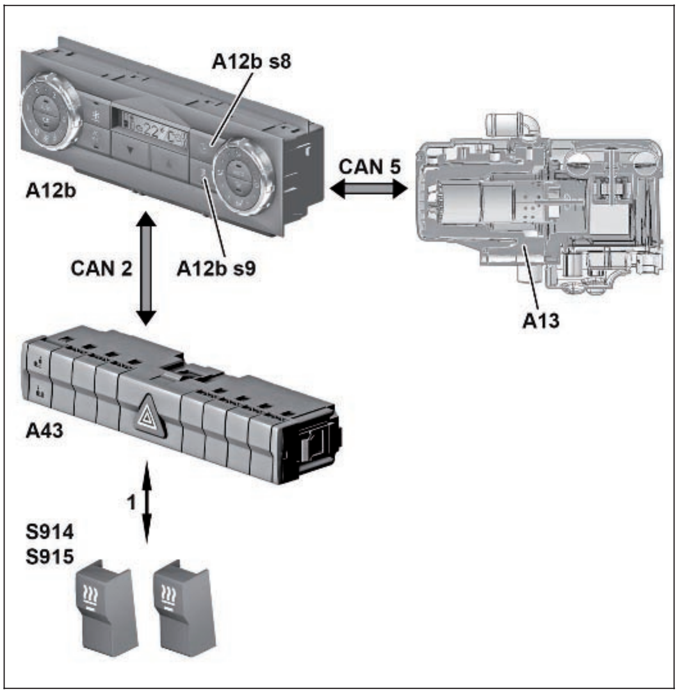
	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Auxiliary heater control unit, component description	A13	**Page 346**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Bunk auxiliary heater button, component description	S914, S915	**Page 470**
	Bunk auxiliary heater and stationary air conditioning button, component description	S941, S942	**Page 471**

GF83.70-W-3072H	Triggering the preselection heater operation, function	20.7.11

MODEL 963, 964
with CODE (D6M) Cab hot water auxiliary heater
except CODE (E5T) ADR model class EX/II, including AT
except CODE (E5U) ADR model class EX/III, including EX/II and AT
except CODE (E5V) ADR model class FL including EX/II, EX/III and AT
except CODE (E5X) ADR model class AT
except CODE (E5Z) Accessories, ADR
except CODE (E9D) Preinstallation, double-pole battery disconnect switch
except CODE (E9E)
MODEL 963, 964
with CODE (D6N) Cab and engine hot water auxiliary heater
except CODE (E5T) ADR model class EX/II, including AT
except CODE (E5U) ADR model class EX/III, including EX/II and AT
except CODE (E5V) ADR model class FL including EX/II, EX/III and AT
except CODE (E5X) ADR model class AT
except CODE (E5Z) Accessories, ADR
except CODE (E9D) Preinstallation, double-pole battery disconnect switch
except CODE (E9E)

Shown on vehicle with code (D6M) Cab hot water auxiliary heater,
without code (D6H) Stationary air conditioner

1	*ASIC data bus (Application Specific Integrated Circuit)*
A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A12b s8	*Timer button*
A12b s9	*Auxiliary heater button*
A13	*Truck auxiliary heater (ITH) control unit*
A43	*Modular switch panel (MSF) control unit*
CAN 2	*Interior CAN*
CAN 5	*Climate control CAN*
S914	*Lower bunk auxiliary heater button (for vehicles without stationary air conditioner)*
S915	*Upper bunk auxiliary heater button (for vehicles without stationary air conditioner)*



W83.70-1462-12

The heater preselect mode enables the auxiliary heater to be switched on even when the driver is not present. The auxiliary heater is switched on at the programmed time and it runs for the defined period of 2 h.

The heater preselect mode enables, e.g. the cab to be heated up before the start of a journey.
To do so, there are 2 preselection memory slots available, in which the time for actuating the auxiliary heater can be configured.

The preselection memory is in the heating, ventilation and climate control (HVAC) control unit (A12b) and it can be programmed using the timer button (A12b s8).
The auxiliary heater's heater preselect mode is actuated solely by the heating, ventilation and climate control (HVAC) control unit (A12b).

i A programmed preselection switches the auxiliary heater on once only.
For a repeated switch-on, the preselection has to be programmed or activated again (adjustment procedure see operator's manual).

Preconditions

- Voltage supply present at all the control units in question and interlinkage intact.
- Heater preselect mode is programmed or activated.

Function sequence

The heating, ventilation and climate control (HVAC) control unit (A12b) constantly compares the programmed time, at which the auxiliary heater is to be switched on with the current time or the current date. Once the time is reached, the heating, ventilation and climate control (HVAC) control unit (A12b) sends the "Auxiliary heater ON" message to the climate control CAN (CAN 5). The indicator LED in the auxiliary heater button (A12b s9) starts to light up.

The CAN activities on the climate control CAN (CAN 5) enable the TRUCK (ITH) auxiliary heater control unit (A13) to be woken up and after receiving the "Auxiliary heater ON" message it initiates the auxiliary heater's heating mode.
At the same time, it sends the "Auxiliary heating mode active" message to the climate control CAN (CAN 5).

The heating, ventilation and climate control (HVAC) control unit (A12b) receives the message and forwards it to the interior CAN (CAN 2).
This message now activates the modular switch panel (MSF) control unit (A43), which forwards the information contained there over the ASIC data bus (1) to the auxiliary heater buttons. The status LED in the lower bunk auxiliary heater button (S914), upper bunk auxiliary heater button (S915) or depending on the equipment, the lower bunk auxiliary heater and stationary air conditioner button (S941) and the upper bunk auxiliary heater and stationary air conditioner button (S942) are switched on and now light up throughout the entire period in which the auxiliary heater is switched on.

The auxiliary heater heating duration is now completely managed by the heating, ventilation and climate control (HVAC) control unit (A12b), i.e. the auxiliary heater remains on until the heating, ventilation and climate control (HVAC) control unit (A12b) sends the "Auxiliary heater OFF" message to the TRUCK (ITH) auxiliary heater control unit (A13).

The auxiliary heater's heating mode can only previously be ended by pressing the lower bunk auxiliary heater button (S914), upper bunk auxiliary heater button (S915) or depending on the equipment, the lower bunk auxiliary heater and stationary air conditioner button (S941) and the upper bunk auxiliary heater and stationary air conditioner button (S942) or the auxiliary heater button (A12b s9) components, because these are treated with priority by the TRUCK (ITH) auxiliary heater control unit (A13).

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Auxiliary heater control unit, component description	A13	**Page 346**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Bunk auxiliary heater button, component description	S914, S915	**Page 470**
	Bunk auxiliary heater and stationary air conditioning button, component description	S941, S942	**Page 471**

GF83.70-W-3073H	Automatic triggering of heat mode, function	20.7.11

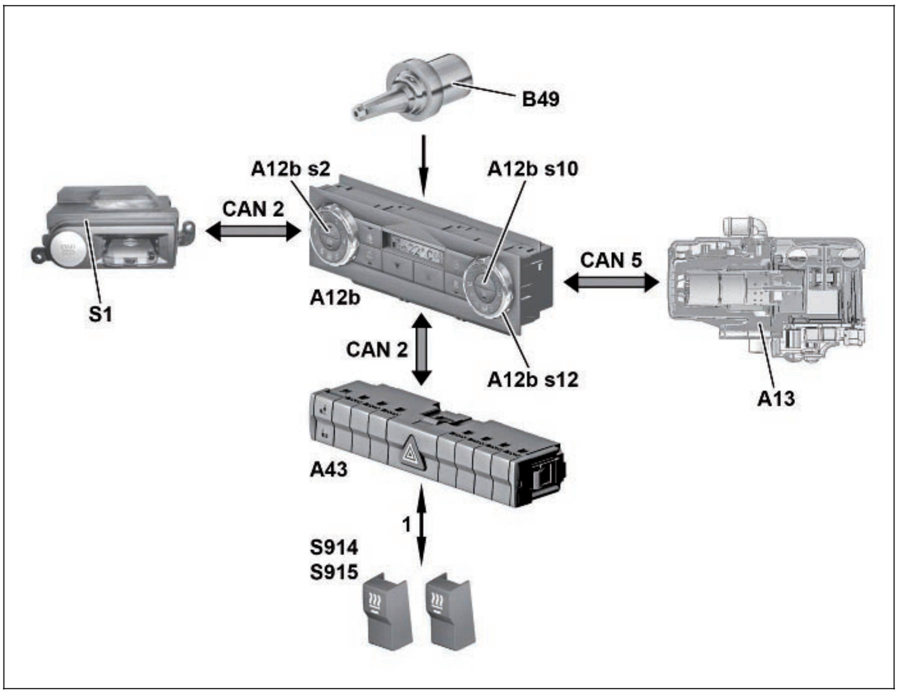
MODEL 963, 964
with CODE (D6G) Automatic air conditioning
with CODE (D6M) Cab hot water auxiliary heater
except CODE (E5T) ADR model class EX/II, including AT
except CODE (E5U) ADR model class EX/III, including EX/II and AT
except CODE (E5V) ADR model class FL including EX/II, EX/III and AT
except CODE (E5X) ADR model class AT
except CODE (E5Z) Accessories, ADR
except CODE (E9D) Preinstallation, double-pole battery disconnect switch
except CODE (E9E)

MODEL 963, 964
with CODE (D6G) Automatic air conditioning
with CODE (D6N) Cab and engine hot water auxiliary heater
except CODE (E5T) ADR model class EX/II, including AT
except CODE (E5U) ADR model class EX/III, including EX/II and AT
except CODE (E5V) ADR model class FL including EX/II, EX/III and AT
except CODE (E5X) ADR model class AT
except CODE (E5Z) Accessories, ADR
except CODE (E9D) Preinstallation, double-pole battery disconnect switch
except CODE (E9E)

Shown on vehicle with code (D6M) Cab hot water auxiliary heater, without code (D6H) Stationary air conditioner

1 *ASIC data bus (Application Specific Integrated Circuit)*

A12b *Heating, ventilation and air conditioning control unit (HVAC)*
A12bs2 *Automatic blower control button*
A12b s10 *Automatic air distribution button*
A12b s12 *Air distribution controller*



W83.70-1463-06

A13 *Truck auxiliary heater (ITH) control unit*
A43 *Modular switch panel (MSF) control unit*
B49 *Outside temperature sensor*
CAN 2 *Interior CAN*
CAN 5 *Climate control CAN*
S1 *Electronic ignition lock (EIS)*
S914 *Lower bunk auxiliary heater button*
S915 *Upper bunk auxiliary heater button*

Requirements

- Voltage supply present at all the control units in question and interlinkage intact.
- The electronic ignition lock (EIS) (S1) is located either in the "terminal 15 R" or "terminal 15" position (ignition ON).
- Coolant temperature below 60 °C.
- Temperature setting not in "Max. cold".
- AAC automatic mode activated or air distribution controller (A12b s12) in Defrost position.

i The AAC automatic mode is activated, when at least one of the two buttons, automatic blower control button (A12b s2) or automatic air distribution button (A12b s10) is activated.

Function sequence

The heating, ventilation and climate control (HVAC) control unit (A12b) uses the measurement values from the outside temperature sensor (B49) to determine the current outside temperature.

At the same time the coolant temperature is also determined and read in over the interior CAN (CAN 2) by the heating, ventilation and climate control (HVAC) control unit (A12b).

If the AAC automatic mode is activated and it detects that to heat up the cab as quickly as possible it will be necessary to also switch on the auxiliary heater, or if the air distribution controller (A12b s12) is in the Defrost position, the heating, ventilation and climate control (HVAC) control unit (A12b) sends the "Automatic cut-in permitted" message over the climate control CAN (CAN 5) to the TRUCK (ITH) auxiliary heater control unit (A13).

If the TRUCK (ITH) auxiliary heater control unit (A13) receives the "Automatic cut-in permitted" message and - using the information received over the interior CAN (CAN 2) - it detects that the currently prevailing outside temperature lies below a specific threshold and the coolant temperature is less than 60 °C, it sends the "Request ITH automatic cut-in" over the interior CAN (CAN 2) to the heating, ventilation and climate control (HVAC) control unit (A12b).

As soon as the heating, ventilation and climate control (HVAC) control unit (A12b) receives the "Request ITH automatic cut-in" message, it actuates the auxiliary heater heating mode by sending the "Auxiliary heater ON" message to the climate control CAN (CAN 5). At the same time the display of the heating, ventilation and climate control (HVAC) control unit (A12b) indicates the auxiliary heater cut-in status by means of the "Auxiliary heater active" symbol and through the indicator LED in the auxiliary heater button (A12b s9).

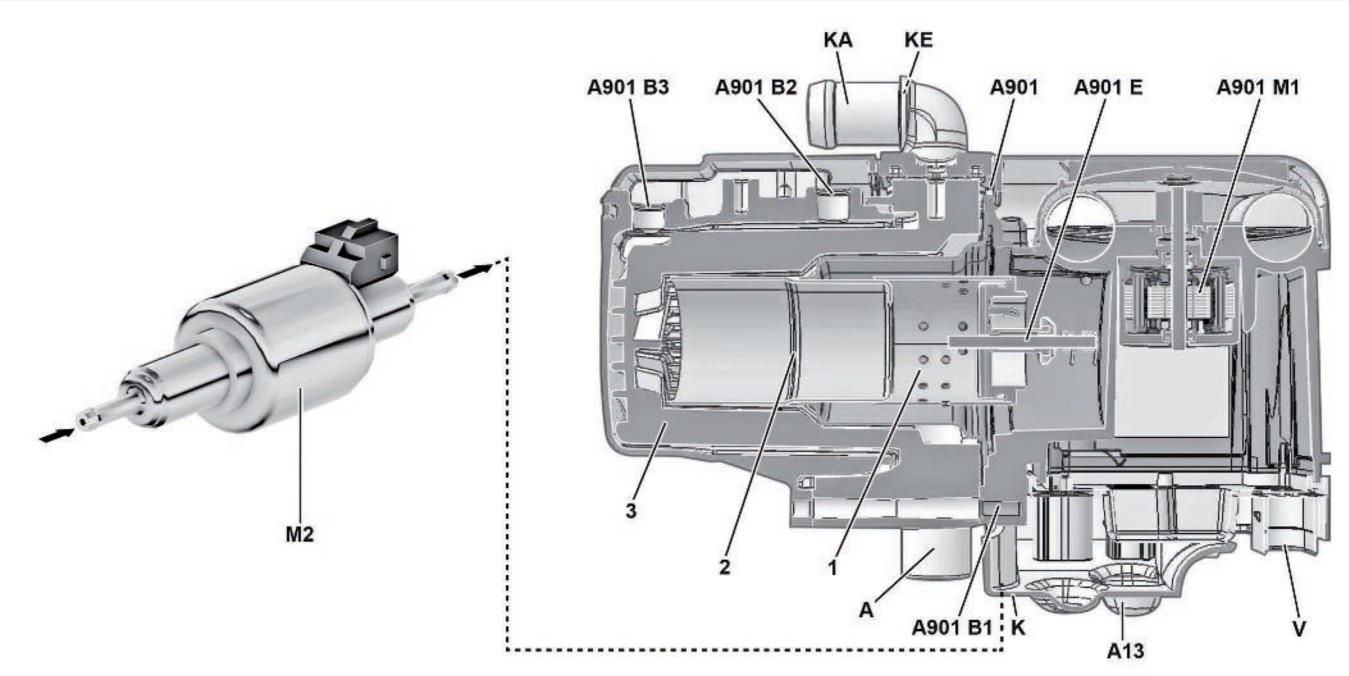
Once the "Auxiliary heater ON" message is received, the TRUCK (ITH) auxiliary heater control unit (A13) initiates the auxiliary heater heating mode.
At almost the same time, it sends the "Auxiliary heating mode active" message to the climate control CAN (CAN 5).
This message is now received by the heating, ventilation and climate control (HVAC) control unit (A12b) and sent to the interior CAN (CAN 2). The message is then received by the modular switch panel (MSF) control unit (A43) and forwarded to the ASIC data bus (1).

All the auxiliary heater buttons receive the information on the ON status of the auxiliary heater over the ASIC data bus (1). The indicator LED in the lower bunk auxiliary heater button (S914), upper bunk auxiliary heater button (S915) or depending on the equipment, the lower bunk auxiliary heater and stationary air conditioner button (S941) and the upper bunk auxiliary heater and stationary air conditioner button (S942) light up throughout the entire period in which the auxiliary heater is switched on.

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Auxiliary heater control unit, component description	A13	**Page 346**
	Modular switch panel control unit (MSF), component description	A43	**Page 370**
	Outside air sensor, component description	B49	**Page 421**
	Electronic ignition lock (EIS)	S1	**Page 460**
	Bunk auxiliary heater button, component description	S914, S915	**Page 470**
	Bunk auxiliary heater and stationary air conditioning button, component description	S941, S942	**Page 471**

GF83.70-W-3077H	Starting operation, function	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater



W83.70-1464-09

Shown on vehicle with code (D6M) Cab hot water auxiliary heater

1	*Burner insert*	*A901 B1*	*Auxiliary heater exhaust temperature sensor*	*A*	*Exhaust outlet*
2	*Burner tube*			*K*	*Fuel inlet*
3	*Heat exchanger*	*A901 B2*	*Temperature sensor*	*KA*	*Coolant outlet*
		A901 B3	*Overheating protection*	*KE*	*Coolant inlet*
A13	*Truck auxiliary heater (ITH) control unit*	*A901 E*	*Glow plug*	*V*	*Combustion air inlet*
		A901 M1	*Combustion air blower*		
A901	*Auxiliary water heater unit*	*M2*	*Fuel metering pump*		

Preconditions

- Continuous heating mode or heater preselect mode, for vehicles with AAC, automatic heating mode actuated, i.e. the TRUCK (ITH) auxiliary heater control unit (A13) receives the "Auxiliary heater ON" message over the climate control CAN (CAN 5).

or

- Control interval for auxiliary heater completed, i.e. combustion took place and the heating mode is started again by the TRUCK (ITH) auxiliary heater control unit (A13) because of an output request.

----

1 Function sequence for initial startup of heating mode

If the TRUCK (ITH) auxiliary heater control unit (A13) receives the "Auxiliary heater ON" message, then the heating mode of the auxiliary water heater unit (A901) is initiated:

The combustion air blower (A901 M1) is started and run with 1/4 of its output.
The combustion air inlet (V) sucks in the fresh air required for combustion and routes it into the burner insert (1).

At the same time, the circulation pump (A901 M2) and the glow plug (A901 E) are actuated.
While the circulation pump (A901 M2) pumps the coolant out of the engine's cooling circuit through the
heat exchanger (3) of the auxiliary heater, the glow plug (A901 E) heats up the burner insert (1) and the fleece in it.

After approx. 20 seconds the fuel metering pump (M2) starts up. It goes into feed mode and pumps the fuel for 5 to 7 seconds at full output and thereafter at 1/4 of the maximum output into the fleece in the burner insert (1).
The high temperature of the fleece causes the fuel to evaporate, and in the burner tube (2) a fuel/air mixture is created, which ignites the glow plug (A901 E).

i The fuel metering pump (M2) and the glow plug (A901 E) are pulse actuated.

---

40 s after the start of operation the glow plug (A901 E) actuation is interrupted.
The TRUCK (ITH) auxiliary heater control unit (A13) then checks whether a flame has been formed using the measurement values of the auxiliary heater exhaust temperature sensor (A901 B1).

If there is no flame, the startup is repeated.

If a flame has formed, the combustion is then stabilized. To this end, after another 20 seconds the speed of the combustion air blower (A901 M1) is moved up to maximum speed and the fuel metering pump (M2) is actuated at full output.

Here too, if the flame extinguishes while adjusting upwards, the start is repeated. If, when adjusting upwards again, combustion still does not take place, then the fault shutoff mode is initiated.

In the fault shutoff mode the glow plug (A901 E) and the fuel metering pump (M2) are switched off.
Only the combustion air blower (A901 M1) is run at maximum speed, to prevent any overheating of the auxiliary water heater unit (A901).
The fault shutoff occurs only after the auxiliary heater exhaust temperature sensor (A901 B1) notifies the TRUCK (ITH) auxiliary heater control unit (A13) that the auxiliary water heater unit (A901) has cooled down.

If combustion is stable, the auxiliary heater operates at maximum output and changes over to the regulated combustion mode.

---

2 Function sequence for renewed start of heating mode following control interval

The TRUCK (ITH) auxiliary heater control unit (A13) receives the information as to whether the engine is running or has been switched off over the climate control CAN (CAN 5). At the same time it uses the measurement values of the temperature sensor (A901 B2) in the auxiliary water heater unit (A901) to determine the current coolant temperature.

If the TRUCK (ITH) auxiliary heater control unit (A13) detects that the engine is running (the central gateway control unit (CGW) (A2) sends the "Terminal D+ ON") message, the heating mode is then started as soon as the coolant temperature has reached 67 °C:

i If the engine is switched off (the central gateway control unit (CGW) (A2) sends the "Terminal D+ OFF") message, then the heating mode is started when the coolant has reached a temperature of 75 °C.

The combustion air blower (A901 M1) is started and actuated with 1/4 of its output.
The combustion air required for combustion enters at the combustion air inlet (V).
At the same time the glow plug (A901 E) is pulse actuated for preglowing, the glow plug (A901 E) then heats the burner insert (1) and the fleece inside it.

After approx. 20 seconds the fuel metering pump (M2) is pulse actuated.
It goes into feed mode and pumps the fuel for 5 to 7 seconds at full output and thereafter at 1/4 of the maximum output into the fleece in the burner insert (1).
The high temperature of the fleece causes the fuel to evaporate, and in the burner tube (2) a fuel/air mixture is created, which ignites the glow plug (A901 E).

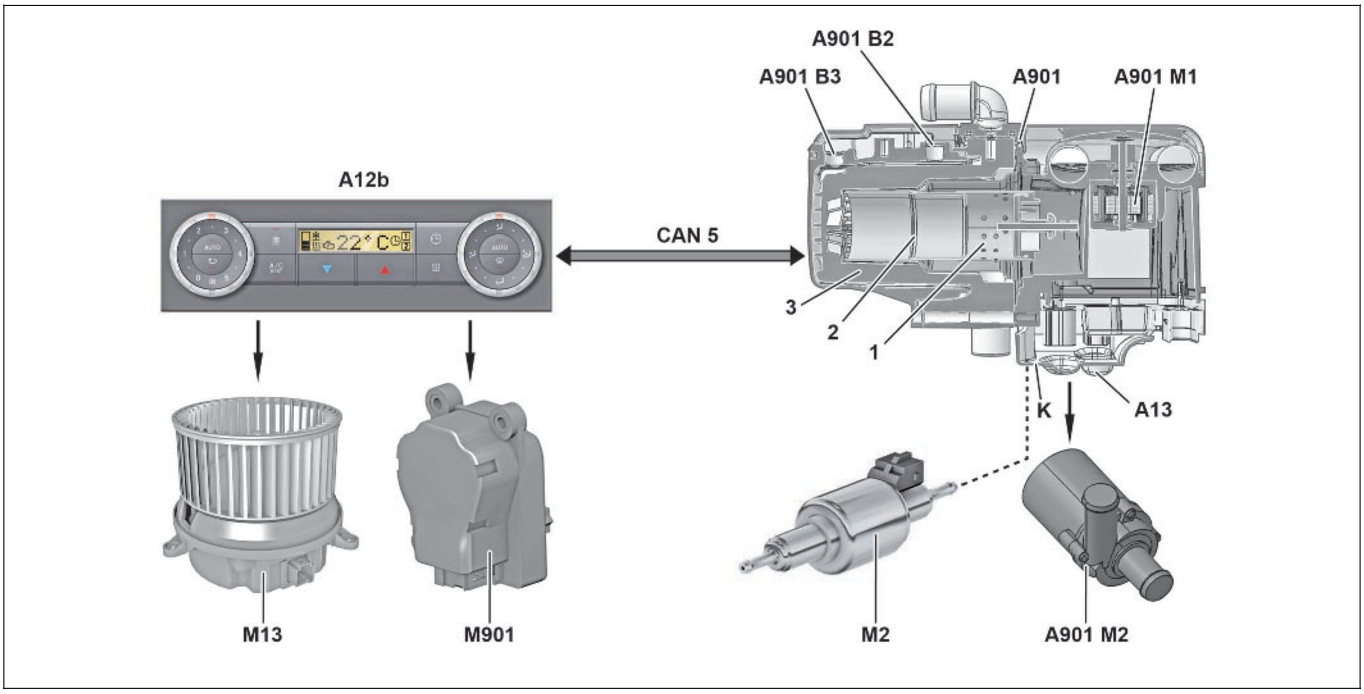
15 to 20 seconds after the start procedure the glow plug (A901 E) actuation is interrupted. The TRUCK (ITH) auxiliary heater control unit (A13) then checks whether a flame has been formed using the measurement values of the auxiliary heater exhaust temperature sensor (A901 B1).
If the TRUCK (ITH) auxiliary heater control unit (A13) detects a flame, then the combustion is stabilized and the auxiliary heater returns to the regulated combustion mode.

i The circulation pump (A901 M2) runs throughout the entire heating mode and therefore does not need to be switched on.

	Central gateway control unit (CGW)	A2	**Page 333**
	Auxiliary heater control unit, component description	A13	**Page 346**
	Auxiliary heater unit, component description	A901	**Page 396**
	Exhaust temperature sensor, component description	A901 B1	**Page 398**
	Component description for coolant temperature sensor	A901 B2	**Page 399**
	Overheating protection, component description	A901 B3	**Page 400**
	Glow plug, component description	A901 E	**Page 401**
	Combustion air blower, component description	A901 M1	**Page 402**
	Auxiliary heater coolant circulation pump, component description	A901 M2	**Page 403**
	Fuel metering pump, component description	M2	**Page 448**
	Heat exchanger auxiliary heater, component description		**Page 535**
	Burner insert with burner tube, component description		**Page 536**

GF83.70-W-3078H	Combustion mode, function	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater



W83.70-1466-79

Shown on vehicle with code (D6M) Cab hot water auxiliary heater

1	*Burner insert*
2	*Burner tube*
3	*Heat exchanger*
A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A13	*Truck auxiliary heater (ITH) control unit*
A901	*Auxiliary water heater unit*
A901 B2	*Temperature sensor*
A901 B3	*Overheating protection*
A901 M1	*Combustion air blower*
A901 M2	*Circulation pump*
CAN 5	*Climate control CAN*
M2	*Fuel metering pump*
M13	*Blower motor*
M901	*Temperature regulation actuator motor*
K	*Fuel inlet*

Requirement

- The auxiliary water heater unit (A901) has passed through the startup phase and is now in combustion mode.

Function sequence

The TRUCK (ITH) auxiliary heater control unit (A13) uses the values from the temperature sensor (A901 B2) to determine the current coolant temperature.
It also receives information over the climate control CAN (CAN 5) as to whether the engine is running or switched off.

If the TRUCK (ITH) auxiliary heater control unit (A13) receives the "Terminal D+ ON" message, then it recognizes that the engine is running. It maintains maximum heat output until the coolant reaches a temperature of 82 °C.

If the engine is switched off (the TRUCK (ITH) auxiliary heater control unit (A13) receives the "Terminal D+ OFF" message), then the threshold for the control interval is increased to 90 °C. In other words, the auxiliary water heater unit (A901) maintains the maximum heat output until the coolant reaches a temperature of 90 °C.

At a coolant temperature of roughly 30 °C, the heating, ventilation and climate control (HVAC) control unit (A12b) authorizes the blower to be switched on. The blower motor (M13) and the temperature control actuator motor (M901) are actuated by the heating, ventilation and climate control (HVAC) control unit (A12b) as soon as it receives the "Blower ON" message over the climate control CAN (CAN 5) from the TRUCK (ITH) auxiliary heater control unit (A13).

If the coolant temperature continues to rise up to the threshold for the control interval, i.e. with the engine running to 82 °C, or with the engine switched off to 90 °C, then the heat output is gradually reduced.
To this end, the speed of the combustion air blower (A901 M1) and the fuel volume delivered by the fuel metering pump (M2) are gradually reduced.

If the auxiliary water heater unit (A901) has reached the lowest load stage, and if it is still generating enough heat for the control interval threshold to be exceeded, the TRUCK (ITH) auxiliary heater control unit (A13) then switches off the fuel metering pump (M2) and ends combustion.

The combustion air blower (A901 M1) and the circulation pump (A901 M2) run for another 155 seconds at maximum speed to cool down and flush the auxiliary water heater unit (A901) (run-on phase).

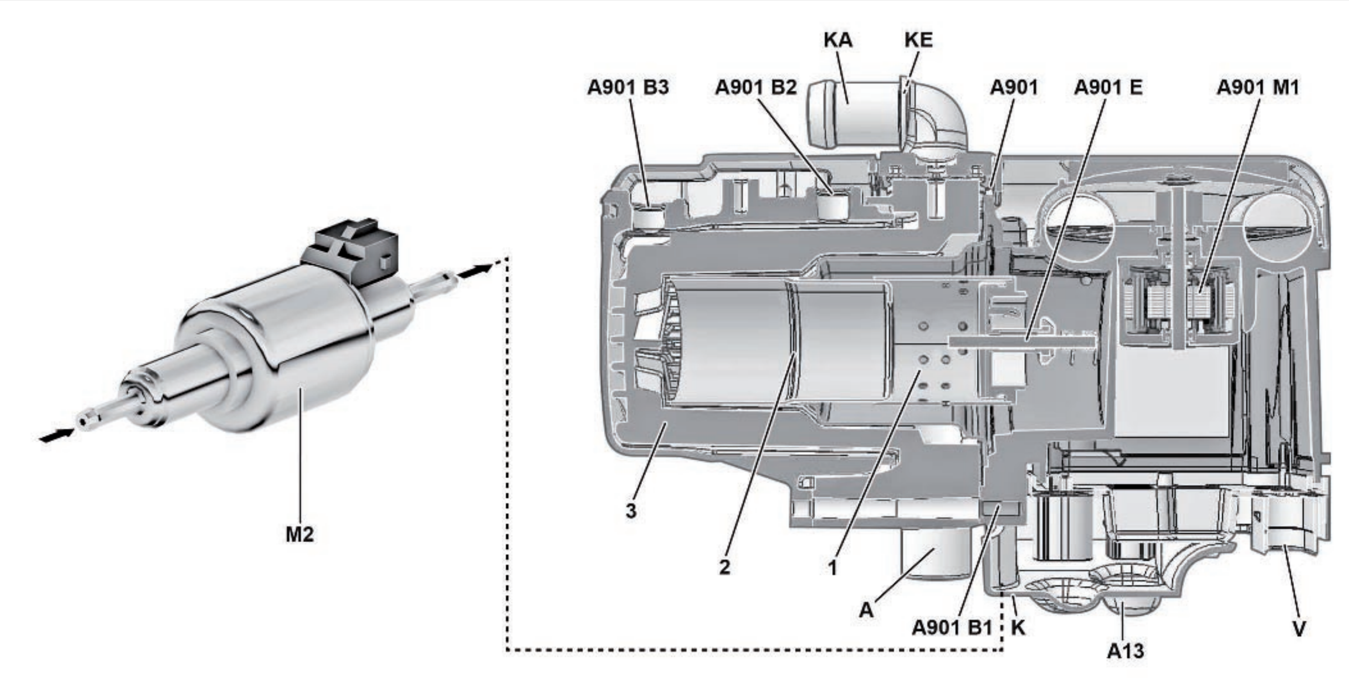
After the auxiliary water heater unit (A901) has passed through the run-on phase, it is then in the control interval.

i To prevent any overheating of the auxiliary water heater unit (A901), an overheating protection (A901 B3) constantly monitors the surface temperature on the heat exchanger (3). The overheating protection (A901 B3) contains a bi-metal switch, which interrupts the voltage supply for the fuel metering pump (M2) and therefore the fuel supply into the auxiliary water heater unit (A901) at a surface temperature of 80 °C.

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Auxiliary heater control unit, component description	A13	**Page 346**
	Auxiliary heater unit, component description	A901	**Page 396**
	Component description for coolant temperature sensor	A901 B2	**Page 399**
	Overheating protection, component description	A901 B3	**Page 400**
	Combustion air blower, component description	A901 M1	**Page 402**
	Auxiliary heater coolant circulation pump, component description	A901 M2	**Page 403**
	Fuel metering pump, component description	M2	**Page 448**
	Blower motor, component description	M13	**Page 452**
	Temperature control actuator motor, component description	M901	**Page 455**
	Heat exchanger auxiliary heater, component description		**Page 535**

GF83.70-W-3079H	Control interval, function	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater



W83.70-1464-09

Shown on vehicle with code (D6M) Cab hot water auxiliary heater

1	*Burner insert*
2	*Burner tube*
3	*Heat exchanger*
A13	*Truck auxiliary heater (ITH) control unit*
A901	*Auxiliary water heater unit*
A901 B1	*Auxiliary heater exhaust temperature sensor*
A901 B2	*Temperature sensor*
A901 B3	*Overheating protection*
A901 E	*Glow plug*
A901 M1	*Combustion air blower*
M2	*Fuel metering pump*
A	*Exhaust outlet*
K	*Fuel inlet*
KA	*Coolant outlet*
KE	*Coolant inlet*
V	*Combustion air inlet*

Preconditions

- After the combustion phase the auxiliary water heater unit (A901) has passed through the run-on phase and is in the control interval.

Function sequence

The TRUCK (ITH) auxiliary heater control unit (A13) receives cyclical information as to whether the engine is running or has been switched off over the climate control CAN (CAN 5). This information is dependent on the duration of the control interval and therefore the time for the renewed start of the heating mode.
If the TRUCK (ITH) auxiliary heater control unit (A13) receives the "Terminal D+ ON" message, then it recognizes that the engine is running and it starts the heating mode only when the coolant has reached a temperature of 67 °C.
If the engine is switched off (the central gateway control unit (CGW) (A2) sends the "Terminal D+ OFF") message, then the heating mode is started as soon as the coolant temperature reaches 75 °C.

As long as the coolant temperature lies above the corresponding value, the circulation pump
(A901 M2) continues to run and pumps the coolant taken from the engine's cooling circuit through the heat exchanger (3) into the heater heat exchanger.

If the coolant temperature drops to 67 °C when the engine is running or to 75 °C when the engine is off, the TRUCK (ITH) auxiliary heater control unit (A13) initiates the start procedure for the auxiliary heater and the heating mode begins again.

i The blower motor (M13) remains switched on for the entire duration of the control interval.

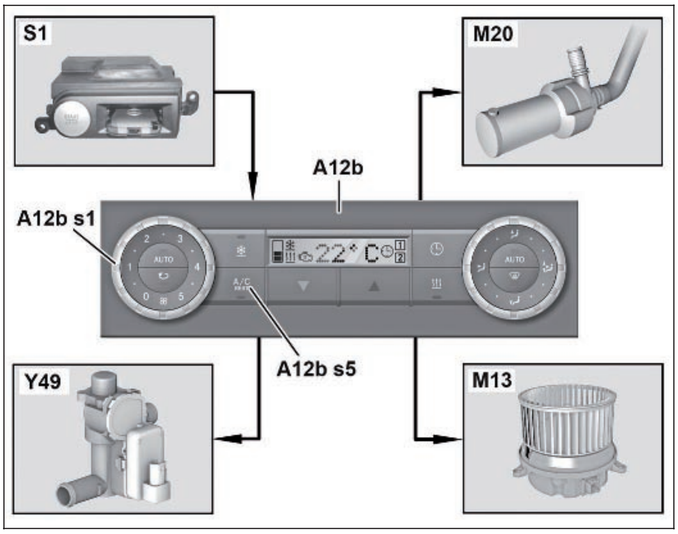
	Central gateway control unit (CGW)	A2	**Page 333**
	Auxiliary heater control unit, component description	A13	**Page 346**
	Auxiliary heater unit, component description	A901	**Page 396**
	Auxiliary heater coolant circulation pump, component description	A901 M2	**Page 403**
	Blower motor, component description	M13	**Page 452**
	Heat exchanger auxiliary heater, component description		**Page 535**

GF83.75-W-0001H	Residual heat system, function	20.7.11

MODEL 963, 964 with CODE (D6I) Residual heat utilization

Shown on vehicle with code (D6G) Automatic air conditioning

A12b Heating, ventilation and air conditioning control unit (HVAC)
A12bs1 Blower regulator
A12b s5 A/C/residual-heat utilization button
M13 Blower motor
M20 Residual heat pump
S1 Electronic ignition lock (EIS)
Y49 Heater shutoff valve



W83.30-1211-11

Preconditions

- Terminal 0 (transmitter key (S953) inserted in electronic ignition lock (EIS) (S1)), terminal 15 R or terminal 15
- Auxiliary heating (ITH) and stationary air conditioner (IAC) switched off

Function

By pressing the air conditioning/residual heat utilization button (A12b s5) at the heating, ventilation and climate control (HVAC) control unit (A12b), the residual heat system is switched on. The residual heat pump (M20) is activated and the heating shutoff valve (Y49) is opened.
The coolant thus circulates in the heating system with the engine turned off. In this manner, the residual heat heats the vehicle interior depending on the temperature set at the heating, ventilation and climate control (HVAC) control unit (A12b) and the ambient temperature.
With the engine switched off, heating can continue for another 2 h in vehicles with automatic air conditioning (AAC) and for another 1 h in vehicles with Heatmatic.

With the ignition switched off (terminal 0), the blower motor (M13) only runs on stage 1. With the ignition switched on (terminal 15 R or terminal 15) and after successfully changing the blower speed at the blower regulator (A12b s1), the blower motor (M13) runs in accordance with the value set in the heating, ventilation and climate control (HVAC) control unit (A12b). In order to prevent excessive battery discharging, the blower speed is limited to maximum stage 2.5.

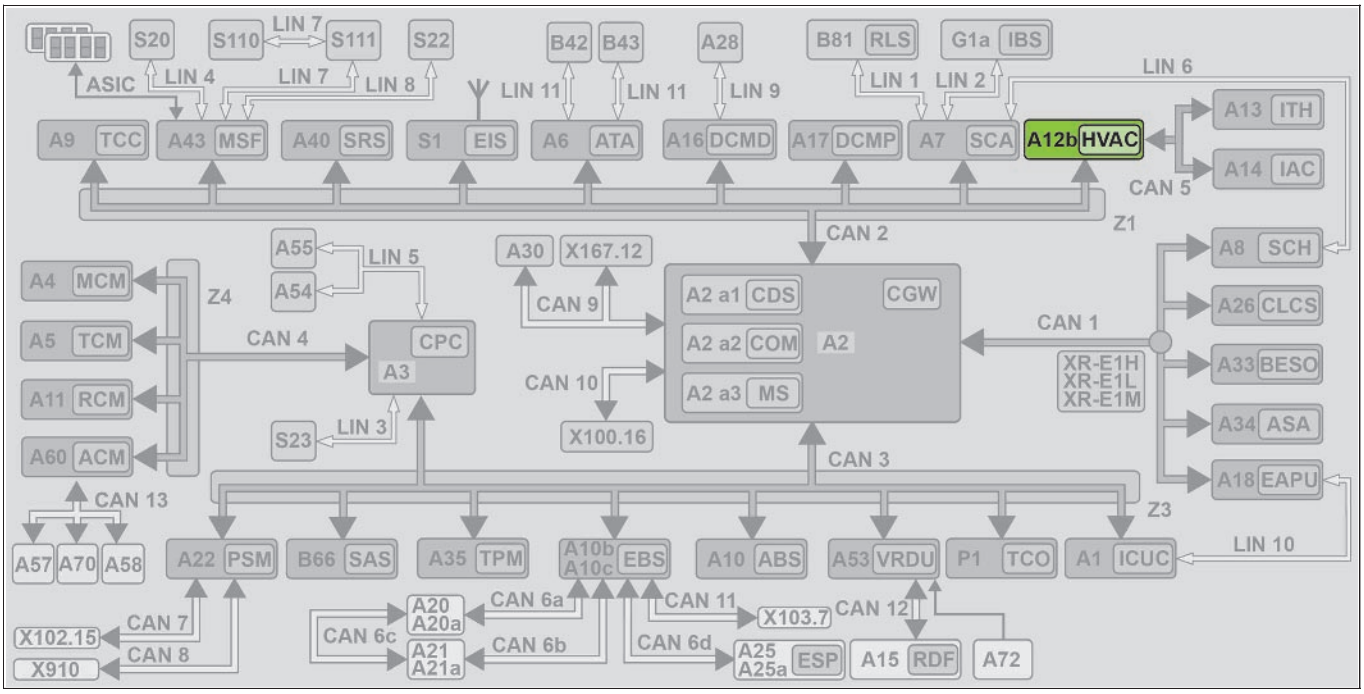
During the operation of the residual heat system, 20 % fresh air is added to the recirculated air. To do so, the fresh air/recirculation flap is moved to a certain position.
If the auxiliary heating is started and the coolant temperature is over 60 °C, the residual heat system is first started in order to save fuel. The auxiliary heating takes over operation at coolant temperatures below 60 °C.

The residual heat system is switched off:

- When the combustion engine is started,
- After approx. 2 h (in vehicles with AAC).
- After approx. 1 h (in vehicles with Heatmatic).

	Component description for automatic air conditioning control unit	A12b	**Page 344**
	Blower motor, component description	M13	**Page 452**
	Residual heat pump, component description	M20	**Page 453**
	Electronic ignition lock (EIS), component description	S1	**Page 460**
	Heating shutoff valve, component description	Y49	**Page 490**
	Residual heat system overall network		**Page 330**

GF83.75-W-0001-01H	Residual heat system overall network		



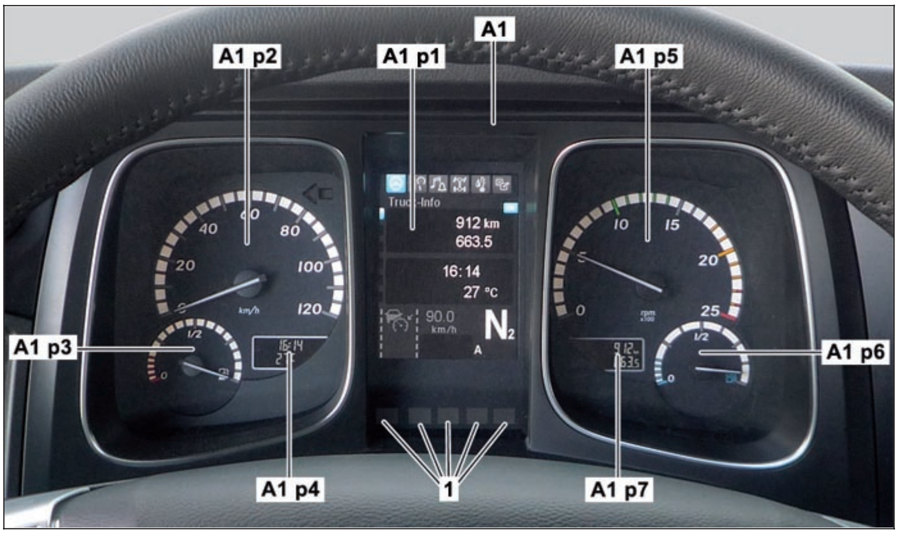
W83.00-1012-79

A12b *Heating, ventilation and air conditioning control unit (HVAC)*

GF54.30-W-6001H	Instrument cluster (ICUC) control unit, component description	1.7.11

MODEL 963, 964

Location



W54.30-1364-75

1	*Installation locations (for additional indicator lamps)*
A1	*Instrument cluster (ICUC) control unit*
A1 p1	*Multifunction display*
A1 p2	*Vehicle speed display*
A1 p3	*Fuel level indicator*
A1 p4	*Time and outside temperature indicator*
A1 p5	*Rpm display*
A1 p6	*AdBlue® level gauge*
A1 p7	*Trip and total distance display*

The instrument cluster control unit (ICUC) (A1) (**I**nstrument **C**luster **U**nit **C**ommon) is located in the instrument panel on the driver-side.

Task

The instrument cluster control unit (ICUC) (A1) serves as a central information and display unit. It notifies the driver about the vehicle's dynamic and static states.

Design

i The instrument cluster control unit (ICUC) (A1) is available in four basic variants.

- **Code (J1A) Instrument cluster 10.4 cm**
  - 4,1" TFT color display
  - Yellow instrument dial backlighting
  - Audio playback through internal speaker

- **Code (J1B) Instrument cluster 10.4 cm with additional displays**
  - 4,1" TFT color display
  - White instrument dial backlighting
  - Display for time/outside temperature and trip/total distance
  - Audio playback through center speaker (B50)

- **Code (J1E) Instrument cluster 12.7 cm with additional displays**
  - 5.0" TFT color display
  - White instrument dial backlighting
  - Display for time/outside temperature and trip/total distance
  - Audio playback through center speaker (B50)

- **Code (J1C) Instrument cluster 12.7 cm with video function**
  - 5.0" TFT color display
  - White instrument dial backlighting
  - Display for time/outside temperature and trip/total distance
  - Audio playback through center speaker (B50)
  - Video interface for camera connection

i There are different versions of the four basic variants listed here, (equipment specific).

Function

An optimization of the readability is achieved through a clearly arranged structure with:

- Two large analog design dial-type gauges for the speed display (A1 p2) and the rpm indicator (A1 p5),
- Two analog displays designed as an arc for the fuel level indicator (A1 p3) and the AdBlue® level gauge (A1 p6),
- Variant independent, two digital display for time and outside temperature indicator (A1 p4) and trip and total distance display (A1 p7),
- Variant independent, two digital display for time and outside temperature indicator (A1 p4) and trip and total distance display (A1 p7),
- A centrally-located multifunction display (A1 p1) for driver information,
- Separate location of indicator and warning lamps, which belong to standard and special equipment, as well as additional installation locations (1) for the indicator lamps on retrofitted systems.

For better legibility of the display it is fitted with a cover frame, which separates the display elements and therefore helps to inhibit reflections, as caused by incidental sunlight.
The instrument cluster control unit (ICUC) (A1) does not have any integrated controls. Operation is conducted solely using the left multifunction steering wheel button group (S110).

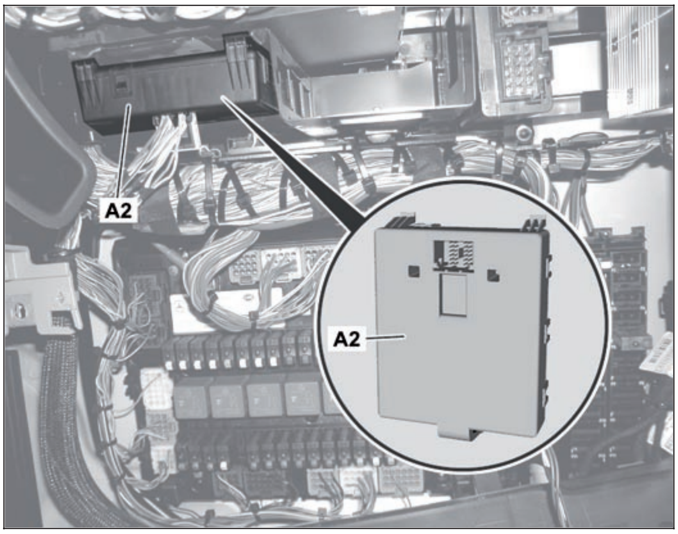
GF54.21-W-0009H	Central gateway control unit (CGW), component description	29.6.11

MODEL 963, 964

Location

A2 Central gateway control unit (CGW)

The central gateway control unit (CGW) (A2) is located in the electronics compartment on the passenger side.



W54.21-1422-11

Task

The central gateway control unit (CGW) (A2) forms the central interface of the vehicle networking and is directly connected to the following 5 high-speed bus systems:
- Vehicle CAN (CAN 1)
- Interior CAN (CAN 2)
- Frame CAN (CAN 3)
- Telematics CAN (CAN 9)
- Diagnostic CAN (CAN 10)

Routing data
The main task of the central gateway control unit (CGW) (A2) is to route individual CAN messages between the connected CAN data bus systems. In other words, e.g. it issues messages from the interior CAN (CAN 2) to the frame CAN (CAN 3).

The central gateway control unit (CGW) (A2) only knows which messages are being routed to which CAN system, and not which control unit must receive the individual messages.

Control unit monitoring
The central gateway control unit (CGW) (A2) monitors all control units for failure except itself and the components of the Electronic Brake Control control unit (EBS).
In the process, it checks whether a control unit actively participates in the bus traffic. If a control unit does not send a message after a long period, it assumes failure and issues a corresponding fault code. In addition, the failure is displayed on the instrument cluster control unit (ICUC) (A1).

Network management
The central gateway control unit (CGW) (A2) is responsible for selectively waking up and putting asleep the connected control units. All control units are awakened if a message is sent to a bus system.
Sleep is initiated only when all control units have signaled sleep readiness. As a result, synchronization occurs at sleep time.

Bus termination resistors
Bus termination resistors are used to avoid reflections that would lead to the falsification of actual information. The characteristic impedance of the electrical line is important for the bus termination resistor.
Bus termination resistors are installed for the following data bus systems in the central gateway control unit (CGW) (A2):
- Frame CAN (CAN 3)
- Telematics CAN (CAN 9)
- Diagnostic CAN (CAN 10)

Virtual control units
Virtual control units are not equipped with their own housing. They are integrated into the hardware and software of other control units. However, they do appear as individual control units in the Star Diagnosis.

The following control units are realized as virtual control units in the central gateway control unit (CGW) (A2):
- The central data memory (CDS) (A2 a1)
- The communications interface control unit (COM) (A2 a2)
- The maintenance system control unit (MS) (A2 a3)

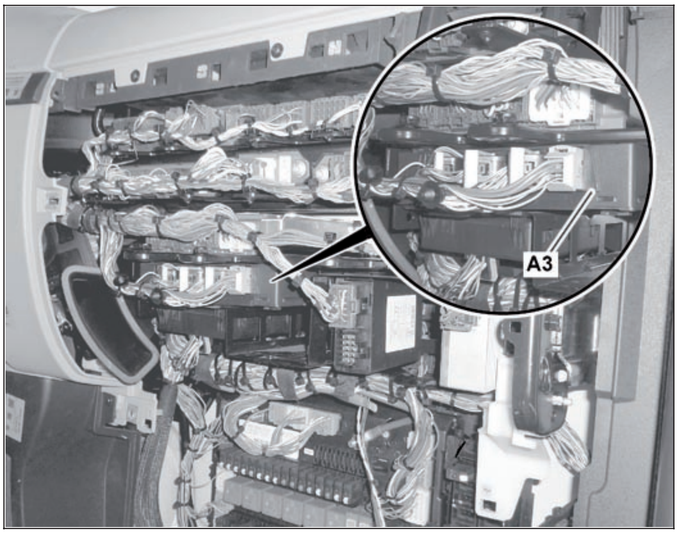
GF30.35-W-4105H	Component description drive control (CPC) control unit	1.7.11

MODEL 963, 964

Location

A3 Drive control (CPC) control unit

The drive control (CPC) control unit (A3) is located on the passenger-side in the electronics compartment.



W30.35-1237-11

Task

The drive control (CPC) control unit (A3) calculates various control factors relevant for the driving cycle for the following functions dependent on the current transmission mode:

- Cruise control
- Limiter
- Proximity Control Assist
  (for code (S1l) Proximity Control Assist)
- Engine brake (computation of braking torque)
- Coolant temperature management
- Automatic gear detection
- Monitoring of the coolant level
- Monitoring of the charging current
- Monitoring of the air filter
- Legal vehicle speed limit
- Diesel particulate filter (DPF) regeneration
- Computation/correction of the engine specified torque
- Retarder control
  (for code (B3H) Secondary water retarder)

According to the tasks performed the drive control (CPC) control unit (A3) is positioned in the Control Area Network (CAN) as the central interface (Gateway) between the frame CAN (CAN 3) and the drive train CAN (CAN 4).

The drive control (CPC) control unit communicates via CAN with the following control units:

- IC control unit (ICUC) (A1)
- Central gateway (CGW) control unit (A2)
- Engine management (MCM) control unit (A4)
- Transmission (TCM) control unit (A5)
- Cab signal acquisition and actuation module (SCA) control unit (A7)
- Antilock brake system (ABS) control unit, 4-channel (A10)
- Electronic Brake Control (EBS) control unit (A10b)
  (Wabco)
- Electronic Brake Control (EBS) control unit (A10c)
  (Knorr)
- Retarder control (RCM) control unit (A11)
- Parameterizable special module (PSM) control unit (A22)
- Exhaust aftertreatment (ACM) control unit (A60)
- Tachograph (P1)

Function

To record and evaluate electric sensor signals and switch signals

- Accelerator pedal sensor (B44)
- Coolant level switch (B47)
- Air filter sensor (B48)
- Coolant pressure regulation sensor (B87)
  (for code (B3H) Secondary water retarder)
- Alternator (G2)
  (determination of status of circuit 50 and charge current monitoring)
- Right multifunction control lever (S23)

Electrical actuation of components

- Coolant pressure regulation solenoid (Y53)
  (for code (B3H) Secondary water retarder)
- Controller unit for lower radiator shutters (A54)
  (for code (M7K) Radiator shutters)
- Controller unit for upper radiator shutters (A55)
  (for code (M7K) Radiator shutters)

Records, evaluates and transmits CAN messages

CAN messages are made available via frame CAN (CAN 3) and drive train CAN (CAN 4) which are relevant for the respective functions from other control unit and are also vise versa sent to these.

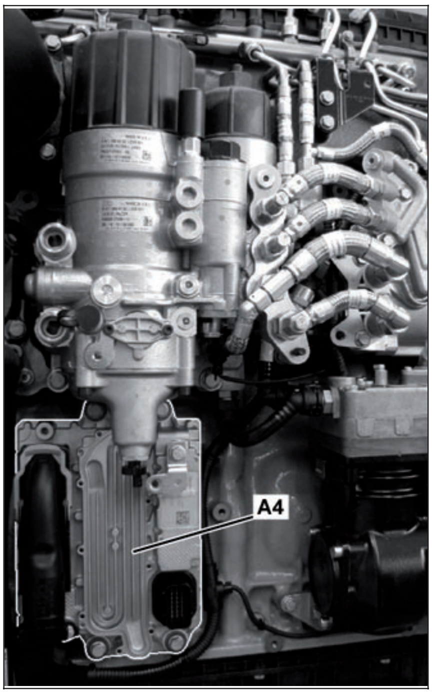
GF07.08-W-4110H	Component description for engine management (MCM) control unit	2.8.11

ENGINE 471.9 in MODEL 963

Location

A4 Engine management control unit (MCM)

The engine management (MCM) control unit (A4) is located on the left side of crankcase.



W07.08-1006-03

Task

The engine management (MCM) control unit (A4) services primarily as an interface between the electrical or electronic components located on the engine side and drive control (CPC) control unit (A3) on the vehicle side.
Both control units are networked together via the drive train CAN (CAN 4) and the CAN bus drive neutral point (Z4).
The engine management (MCM) control unit (A4) takes on a number of tasks.

On the one hand it takes on the controlling and regulating processes, e.g. for systems such as the engine management or the exhaust gas recirculation (AGR) while, on the other hand, it serves in turn just to pass on information such as the oil level in the engine.

The following is an overview of the tasks of the engine management (MCM) control unit (A4):

Engine management for the Amplified Pressure Common Rail System (APCRS)
The main task of the engine management (MCM) control unit (A4) is to regulate injection of the Amplified Pressure Common Rail System (APCRS).
All required data such as the output, diverse performance maps or data which serves to protect the engine is stored in the engine management (MCM) control unit (A4).
In order to regulate the injection which takes place through appropriate actuation of the fuel injectors for cylinder 1 to 6 (Y608 to Y613) and the quantity control valve (Y642), the engine management (MCM) control unit (A4) reads in signals from virtually all sensors connected to it. This means: all information except that from the engine oil fill level sensor (B605) is used in the computations.

Exhaust gas recirculation (EGR)
The fact that exhaust gas recirculation is active over the whole rotational speed range means that the ratio between recycled exhaust gas masses and suctioned in or supercharged fresh air mass must be matched exactly and thus exactly regulated.
This relationship, the so-called exhaust gas recirculation rate, is regulated by the engine management (MCM) control unit (A4) through appropriate actuation of the exhaust gas recirculation positioner (Y621).
The EGR rate value here is determined by the information from the charge air pressure and temperature sensor in the charge air pipe (B608), by the exhaust gas recirculation (EGR) differential pressure sensor (B621) and by the charge air temperature sensor in the charge air housing (B617), taking the data stored in a corresponding characteristics map into account.

Diesel particulate filter (DPF) - only for code (M5Z) Engine version Euro VI
During the regeneration phase of the diesel particulate filter (DPF) the engine management (MCM) control unit (A4) actuates the fuel shutoff valve (Y629) and (in intervals) the fuel metering valve (Y628).
The fuel shutoff valve (Y629) and the fuel metering valve (Y628) are located together with the fuel pressure sensor (inlet) (B625) and the fuel pressure sensor (outlet) (B626), in one metering device. This ensures that diesel fuel is metered over a line to the injection nozzle in the nozzle unit for DPF regeneration which is located on the exhaust pipe upstream of the diesel particulate filter (DPF).
The injection nozzle injects specific fuel amounts into the hot exhaust flow. During the resulting reaction in the exhaust aftertreatment unit, a great deal of heat is generated, in which the soot deposited in the diesel particulate filter (DPF) is burnt to form ash.

IC control unit (ICUC) (A1)
To display this in the instrument cluster control unit (ICUC) (A1) the engine management (MCM) control unit (A4) records the engine oil level, the engine oil temperature, the engine oil pressure, the coolant temperature and the engine rpm.

It also uses values from the following sensors:
- Engine oil fill level sensor (B605)
- Oil pressure sensor (B604)
- Intake coolant temperature sensor (B607) or exhaust (B606)
- Crankshaft position sensor (B600)

Fan control
For fan regulation purposes the engine management (MCM) control unit (A4) uses information from the coolant inlet temperature sensor (B607) and the coolant outlet temperature sensor (B606).

Engine brake
According to a request from the drive control (CPC) control unit (A3), the engine management (MCM) control unit (A4) actuates the engine brake solenoid valve, stage 1 (Y624), the engine brake solenoid valve, stage 2 (Y625) or both solenoid valves together.
Actuation of solenoid valves causes the engine oil to be fed to the respective rocker arms with hydroelement. This means that the respective brake rocker arms operate via the respective rocker arm with hydroelement on an exhaust valve, whereby the engine brake is active.

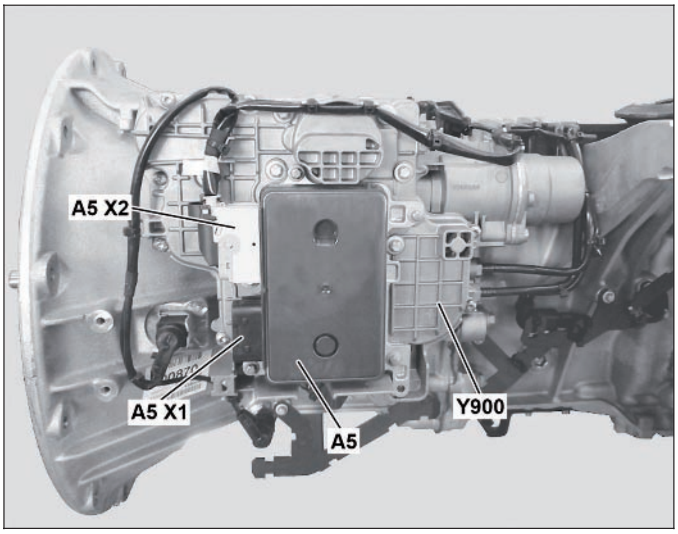
Tasks covering a number of systems
These tasks include engine or system diagnosis, since almost all electrical or electronic components which are attached to the engine management (MCM) control unit (A4) can be diagnosed.

GF26.21-W-3002H	Component description for transmission control (TCM) control unit	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3

Location

A5 Transmission control (TCM) control unit
A5 X1 Connector (electrical connection to vehicle)
A5 X2 Connector (electrical connection to transmission)
Y900 Transmission positioner



W26.00-1033-11

The transmission control control unit (TCM) (A5) is mounted to the transmission positioner (Y900) on the left side on the transmission housing.

Task

The transmission control control unit (TCM) (A5) is the interface between the transmission and the drive control (CPC) control unit (A3).
The electrical connection is set up through the drive train CAN (CAN 4) for exchanging shifting-relevant information with other systems.

Recording and evaluating electrical sensor signals
The electrical signals from the following sensors are measured and evaluated directly:
- Main shaft rpm sensor (B501)
- Countershaft rpm sensor (B502)
- Clutch travel sensor (B503)
- Range group travel sensor (B504)
- Transmission oil temperature sensor (B505)
- Splitter group travel sensor (Y900 b1)
- Gear cylinder travel sensor (Y900 b2)
- Gate cylinder travel sensor (Y900 b3)
- Supply pressure pressure sensor (in transmission positioner (Y900))

Information from other control units and sensors are also read in and processed in the transmission (TCM) control unit (A5), for example from:
- Electronic Brake Control (EBS) control unit (A10b, A10c): speed and activity information, for example: brake regulating system status, wheel speeds on the front and rear axle, brake actuation
- Drive control (CPC) control unit (A3): status information, for example over the selected transmission mode
- Travel and speed sensor (B18)
- Accelerator pedal sensor (B44)

Actuation of solenoid valves for clutch control
The following solenoid valves of the clutch control are directly actuated by the transmission control control unit (TCM) (A5) output stages:
- Slowly close clutch solenoid valve (Y900 y1)
- Slowly open clutch solenoid valve (Y900 y2)
- Quickly close clutch solenoid valve (Y900 y3)
- Quickly open clutch solenoid valve (Y900 y4)

Actuation of solenoid valves for transmission control
The following solenoid valves of the transmission control are directly actuated by the transmission control control unit (TCM) (A5) output stages:
- Countershaft brake solenoid valve (Y900 y5)
- Extend splitter group solenoid valve (Y900 y6)
- Retract splitter group solenoid valve (Y900 y7)
- Extend gear cylinder solenoid valve (Y900 y8)
- Retract gear cylinder solenoid valve (Y900 y9)
- Extend gate cylinder solenoid valve (Y900 y10)
- Retract gate cylinder solenoid valve (Y900 y11)
- Retract range group solenoid valve (Y900 y12)
- Extend range group solenoid valve (Y900 y13)

Inclination sensor
The inclination sensor is integrated into the transmission control (TCM) control unit (A5). It records the vehicle inclination in the longitudinal direction. A positive and a negative vehicle inclination can be recognized.
The tilt signal is made available via the drive train CAN (CAN 4) to the drive control (CPC) control unit (A3). The drive control (CPC) control unit (A3) determines a filtered tilt signal out of the tilt signal while taking account of "signal falsifying" vehicle accelerations. This is further used both by the drive control (CPC) control unit (A3) and also by other control units, also including by transmission (TCM) control unit (A5).

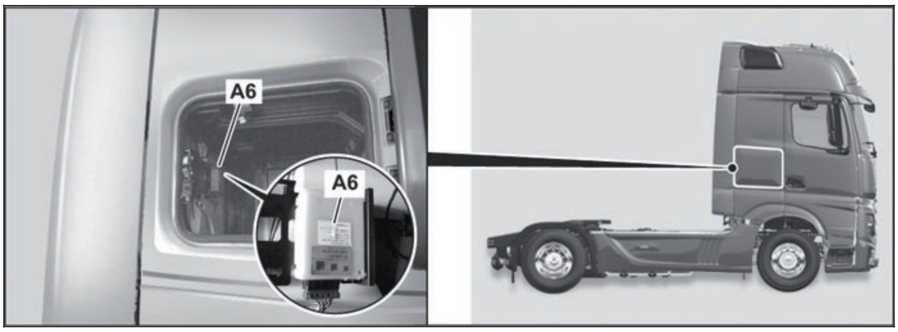
GF80.50-W-6001H	Anti-theft alarm system control unit (ATA), component description	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection

Location

A6 *Anti-theft alarm system (ATA) control unit*

The antitheft alarm system control unit (ATA) (A6) is located in the right stowage box of the cab behind the cab rear wall paneling



W80.50-1080-04

Task

The antitheft alarm system control unit (ATA) (A6) has the following purposes:

- Control of antitheft alarm system (ATA) by reading in various warning circuits and alarm output when alarm triggering is recognized
- Monitoring vehicle interior via interior protection sensor (B43) with activated interior protection of antitheft alarm system (ATA)
- Monitoring cab, stowage boxes and maintenance flap against unauthorized opening
- Monitoring fuel tank
- Monitoring trailer or semitrailer
- Monitoring box body
- Control of alarm siren (B42) for acoustic alarm
- Control of visual alarm
- Monitoring vehicle interior via interior protection sensor (B43)

GF54.21-W-0007H	Cab sensor and actuator module (SCA), component description	29.6.11

MODEL 963, 964

Location

A7 Cab signal acquisition and actuation module control unit (SCA)

The cab sensor and actuator module (SCA) (A7) is located in the electronics compartment on the passenger side.

W54.21-1433-11

General

The cab sensor and actuator module (SCA) (A7) is connected
- to the interior CAN (CAN 2) and redundantly via the
- SCA/SCH redundancy LIN (LIN 6) to the
- frame sensor and actuator module (SCH) (A8)

It performs subfunctions of the familiar base module from model 930 to 934.
However, in model 963 and 964, the central role of the networking is moved to the central gateway control unit (CGW) (A2).

Task

The main tasks of the cab sensor and actuator module (SCA) (A7) are the actuation and monitoring of the:
- Turn signal lamps
- Headlamps
- Body outline lights
- Fog lights
- Daytime running lamps

Emergency mode
The cab sensor and actuator module (SCA) (A7) is connected to the frame sensor and actuator module (SCH) (A8) via the redundancy LIN SCA/SCH (LIN 6).

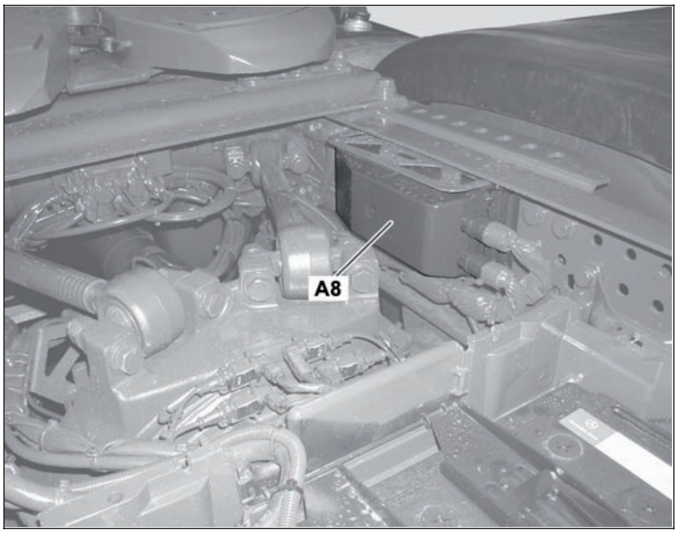
GF54.21-W-0008H	Frame sensor and actuator module (SCH), component description	29.6.11

MODEL 963, 964

Location

A8 Frame sensor and actuator module (SCH)

The frame sensor and actuator module (SCH) (A8) in right rear vehicle frame.



W54.21-1417-11

General

The frame sensor and actuator module (SCH) (A8) is directly connected to the

- vehicle CAN (CAN 1) and redundantly connected to the
- Redundancy LIN SCA/SCH (LIN 6)

. It performs subfunctions of the familiar rear module from model 930 to 934.

Task

The frame sensor and actuator module (SCH) (A8) essentially performs the following tasks:

- Actuation and monitoring of the
  - taillamps
  - license plate lamps
  - position lamps
  - side marker lamps
  - 7 and 15-pin trailer sockets

- Reading in signals of
  - the brake wear sensors
  - the parking brake switch
  - the rear axle temperature sensor
  - the dumper indicator pressure switch
  - the fuel level sensor
  - the interaxle and interwheel differential lock switches

Emergency mode

The frame sensor and actuator module (SCH) (A8) is connected to the cab sensor and actuator module (SCH) (A7) via the redundancy LIN SCA/SCH (LIN 6).

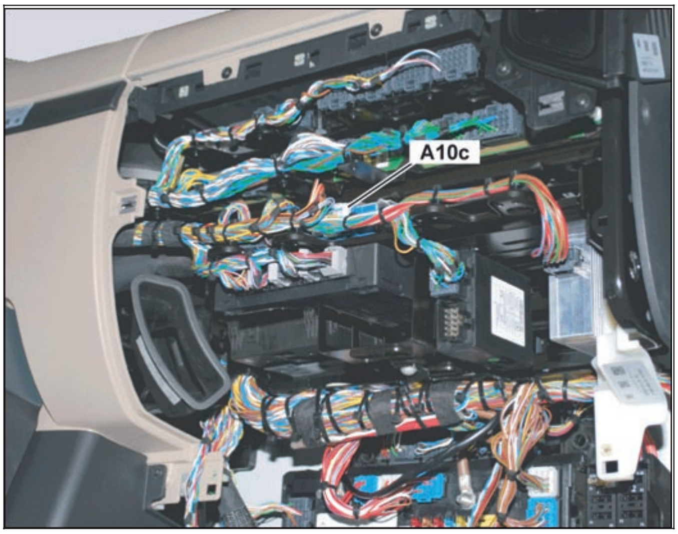
GF42.25-W-3135H	Electronic Brake Control control unit (EBS), component description	20.7.11

MODEL 963

Location

Shown on model 963.4, Knorr version
A10c Electronic brake system (EBS) control unit

The Electronic Brake Control control unit (EBS) (A10c) is installed in the electronics compartment on the front passenger side.



W42.25-1270-81

Task

The Electronic Brake Control control unit (EBS) (A10b or A10c) is the central component of the electronic brake system (EBS) and has the following tasks:

- Record the driver's brake command via the electrical signals of the brake value sensor (B17 or B17a).
- Calculate the specified brake pressures of the individual axles or the semi-trailer/trailer depending on the sensor data and taking into account the brake force distribution and wear harmonization.
- Actuation of the front axle axle modulator (A20 or A20a), the rear axle axle modulator (A21 or A21a), the ABS solenoid valves (Y1, Y2) and the trailer control valve (Y6 or Y6a) with the corresponding electrical signals to apply the specified brake pressures.
- Evaluate the feedback from the brake components during the entire brake application and readjust the brake pressure if necessary.
- Control the ABS or ASR interventions.
- Communication with other systems/control units in the vehicle via the frame CAN (CAN 3).
- Actuation of electronically braked trailers via the ISO 11992 interface (X103.7).
- Actuation of the air admission 3/2-way valve (Y5) or the ASR solenoid valve 2 (Y5a) for ASR suppression on the leading axle/trailing axle on vehicles with 3 axles.
- Control the function of the hill holder.
- Performing system diagnosis.
- Storage of system errors for diagnosis.
- Report major faults via the display field in the instrument cluster control unit (ICUC) (A1).

GF43.30-W-3201H	Retarder control unit (RCM), component description	20.7.11

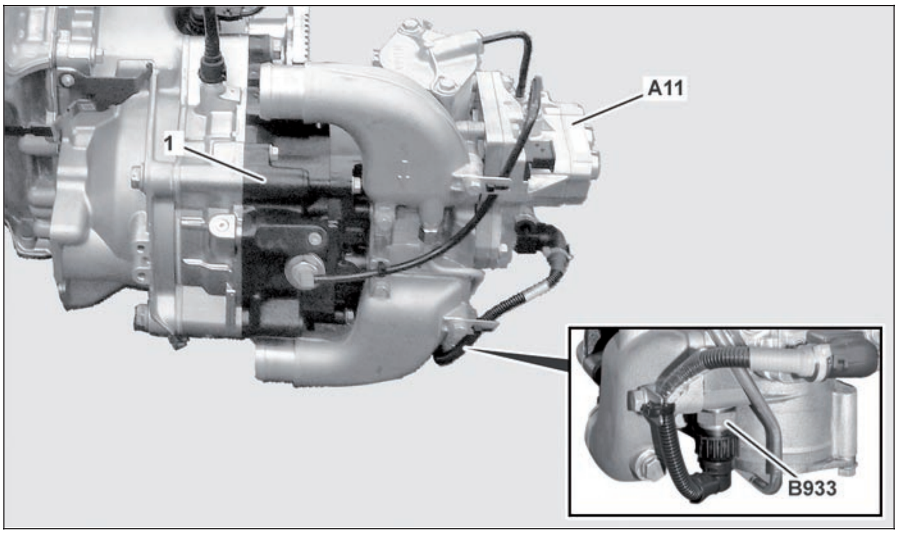
MODEL 963, 964 with CODE (B3H) Secondary water retarder

Location

1 Secondary water retarder

A11 Retarder control (RCM) control unit
B933 Coolant temperature sensor

The retarder control unit (RCM) (A11) is located on the rear of the secondary water retarder (1).



W43.30-1297-05

Task

1 General
The retarder control unit (RCM) (A11) processes braking torque requests from the drive control (CPC) control unit (A3). Based on these braking torque requests, the retarder control unit (RCM) (A11) calculates the corresponding pneumatic control variables for actuating the solenoid valves integrated in the retarder control unit (RCM) (A11).

2 To record and evaluate electric sensor signals and switch signals
- Coolant temperature sensor (B933)

3 Electrical actuation of components
- Solenoid valve 1 (intake valve)
- Solenoid valve 2
- Solenoid valve 3 (exhaust valve)

4 Records, evaluates and transmits CAN messages
The retarder control unit (RCM) (A11) communicates with the drive control (CPC) control unit (A3) via drivetrain CAN (CAN 4).

Body

The retarder control unit (RCM) (A11) is a mechatronic module consisting of the following components:
- Control electronics
- Solenoid valve 1 (intake valve)
- Solenoid valve 2
- Solenoid valve 3 (exhaust valve)
- Pneumatic pressure sensor

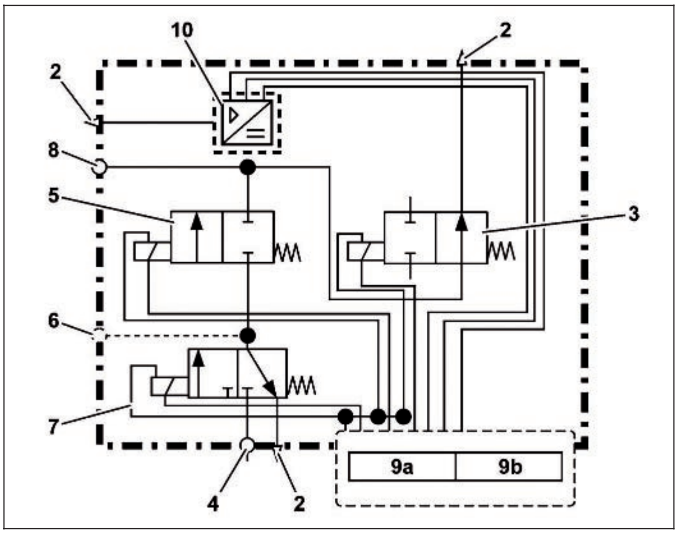
Function

Solenoid valve 1 (intake valve) of the retarder control unit (RCM) (A11) is pressurized with reservoir pressure from the auxiliary consumer circuit. In accordance with the current braking torque request, compressed air is applied to the valve block of the secondary water retarder (1) via solenoid valve 2. If the braking torque request is reduced, the valve block of the secondary water retarder is ventilated accordingly via solenoid valve 3 (exhaust valve).

If the braking torque request is canceled, compressed air is briefly output via solenoid valve 2 to actuate the side channel pump. The pneumatic pressure which is output via solenoid valve 2 is monitored by the retarder control unit (RCM) (A11) via the pneumatic pressure sensor.

Control schematic of retarder control unit (RCM) (A11)

2 Bleeding
3 Solenoid valve 3 (exhaust valve)
4 Compressed air connection (intake)
5 Solenoid valve 1 (intake valve)
6 Actuation of pump relief valve (exhaust)
7 Solenoid valve 2
8 Actuation of valve block (exhaust)
9a Electrical connector 1
9b Electrical connector 2
10 Pneumatic pressure sensor



W43.30-1293-11

GF83.40-W-3012H	**Component description for automatic air conditioning control unit**	20.7.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning
MODEL 963, 964 with CODE (D6H) Stationary air conditioner
MODEL 963, 964 with CODE (D6M) Warm water auxiliary heater, cab
MODEL 963, 964 with CODE (D6N) Warm water auxiliary heater, cab and engine
MODEL 963, 964 with CODE (D6I) Residual heat utilization

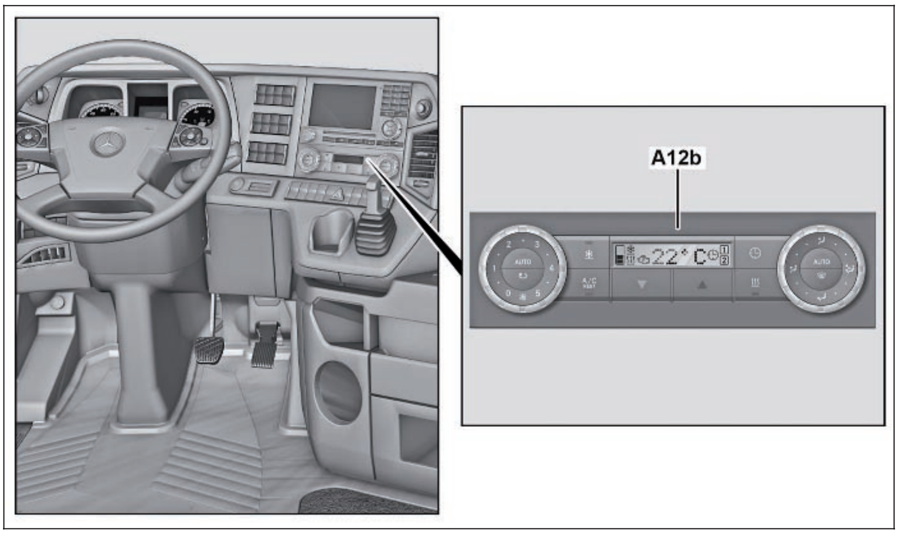
Location

A12b *Heating, ventilation and air conditioning control unit (HVAC)*

The heating, ventilation and air conditioning control unit (HVAC) (A12b) is located in the instrument panel at the right of the steering wheel.

Task

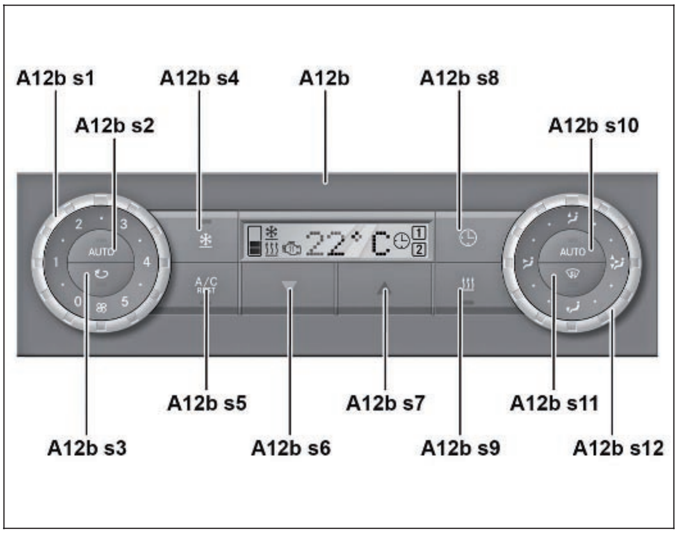
The heating, ventilation and air conditioning control unit (HVAC) (A12b) controls all the functions of the automatic air conditioning system.



W83.40-1019-05

Regulation of air volume, air supply, air distribution and air temperature

A12b	*Heating, ventilation and air conditioning control unit (HVAC)*
A12bs1	*Blower regulator*
A12bs2	*Automatic blower control button*
A12b s3	*Air recirculation mode button*
A12b s4	*Stationary air conditioning button*
A12b s5	*A/C/residual-heat utilization button*
A12b s6	*Reduce/minus temperature button*
A12b s7	*Increase/plus temperature button*
A12b s8	*Timer button*
A12b s9	*Auxiliary heater button*
A12b s10	*Automatic air distribution button*
A12b s11	*Defrost mode button*
A12b s12	*Air distribution control*



W83.30-1215-11

The heating, ventilation and air conditioning control unit (HVAC) (A12b) enables manual adjustment of the air volume, air supply (fresh air, recirculated air), air distribution and air temperature as well as activation of the automatic air conditioning.
A manually activated air recirculation mode is displayed via the "air recirculation mode" button indicator lamp (A12b s3)
To implement the driver commands, the heating, ventilation and air conditioning control unit (HVAC) (A12b) reads in the positions of the blower regulator (A12b s1), the air distributor control (A12b s12) and the temperature set on the heating, ventilation and air conditioning control unit (HVAC) (A12b).
The heating, ventilation and air conditioning control unit (HVAC) (A12b) reads in the measurements from the following sensors directly:

- Dual sun sensor (B931)
- Air outlet temperature sensor (B930)
- Evaporator temperature sensor (B929)
- Air quality sensor (B928)
- Outside temperature sensor (B49)
- Vehicle interior temperature sensor (B32)

The following signals are also read in indirectly:

- Coolant temperature
  The coolant temperature required for temperature control is requested via the
  interior CAN (CAN 2).
- Terminal 15, 15 R and D+
- Charge state of battery:
  the signal from the battery sensor (IBS) (G1a) is evaluated for reducing the blower output when the battery charge is low.

These values are then used to calculate the required blower output, the position of the fresh air/recirculation flap, the position of the air distribution flaps and the position of the temperature control flaps.

After calculating the blower output and the various flap positions, the heating, ventilation and air conditioning (HVAC) control unit (A12b) actuates the blower motor (M13), the fresh air/recirculation flap actuator motor (M900), the air distribution flap actuator motor (M905) and the temperature control actuator motor (M901) with the corresponding signals.

i Actuation of the blower motor (M13) is conducted directly by the heating, ventilation and air conditioning control unit (HVAC) (A12b) through pulse width modulated signals.

Illumination and digits
With terminal 0 the numbers in the display of the heating, ventilation and air conditioning control unit (HVAC) (A12b) and the lighting are inactive.
For terminal 15 R the digits are active, when the heating, ventilation and air conditioning control unit (HVAC) (A12b) is activated by pressing a button.
With terminal 15 and D+ (engine running) the lighting of the heating, ventilation and air conditioning control unit (HVAC) (A12b) and the numbers in the display are permanently active.

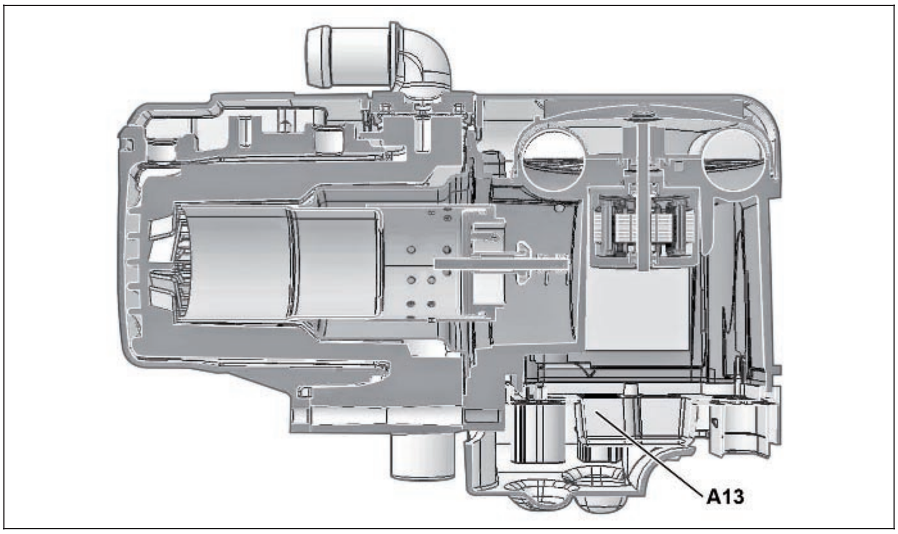
GF83.70-W-4030H	Auxiliary heater control unit, component description	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

Location

Auxiliary heater, code (D6M) Cab hot water auxiliary heater
A13 Truck auxiliary heater (ITH) control unit

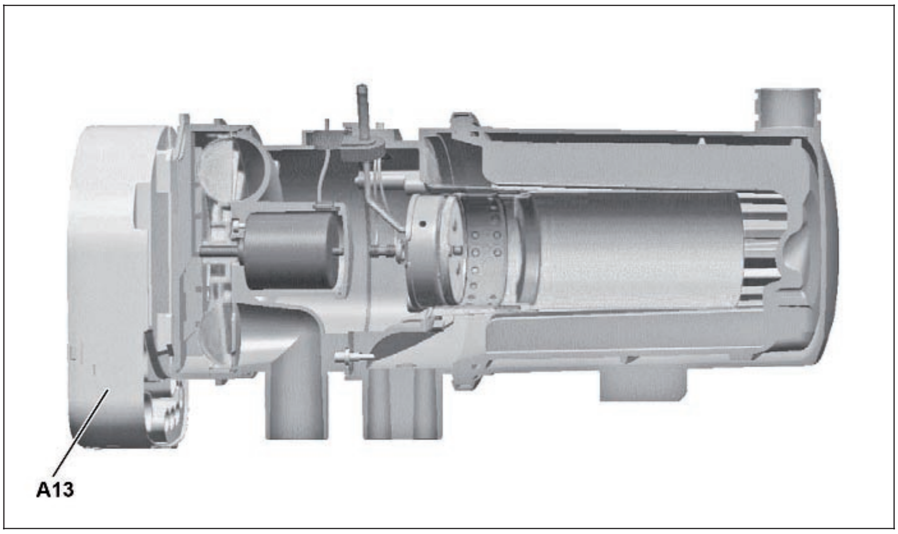
The TRUCK (ITH) auxiliary heater control unit (A13) is located outside on the housing of the auxiliary water heater unit (A901).



W83.70-1455-05

Auxiliary heater, code (D6N) Cab and engine hot water auxiliary heater
A13 Truck auxiliary heater (ITH) control unit

The TRUCK (ITH) auxiliary heater control unit (A13) is located outside on the housing of the auxiliary water heater unit (A901).



W83.70-1454-05

Task

The TRUCK (ITH) auxiliary heater control unit (A13) actuates the auxiliary heating mode:

The TRUCK (ITH) auxiliary heater control unit (A13) receives the following information over the climate control CAN (CAN 5)
- to switch on the heating mode,
- to switch off the heating mode,
- about the specified temperature set by the driver on the heating, ventilation and climate control (HVAC) control unit (A12b),
- about the current interior temperature and
- for vehicles with AAC, information on whether the AAC is in automatic mode.

This information is used by the TRUCK (ITH) auxiliary heater control unit (A13) to initiate the heating mode and regulates or monitors it by actuating or evaluating the following components:
- Temperature sensor (A901 B2)
- Auxiliary heater exhaust temperature sensor (A901 B1)
- Glow plug (A901 E)
- Overheating protection (A901 B3)
- Combustion air blower (A901 M1)
- Circulation pump (A901 M2)
- Fuel metering pump (M2)

Following several fault shutoffs, the fault interlock is activated. Due to the following faults, the TRUCK (ITH) auxiliary heater control unit (A13) triggers a fault shutoff:
- interruption to the climate control CAN (CAN 5)
- overheating of auxiliary water heater unit (A901)
- Flame-out
- Undervoltage or overvoltage

The auxiliary heater is switched off if a component is defective. A back-up mode is not actuated.

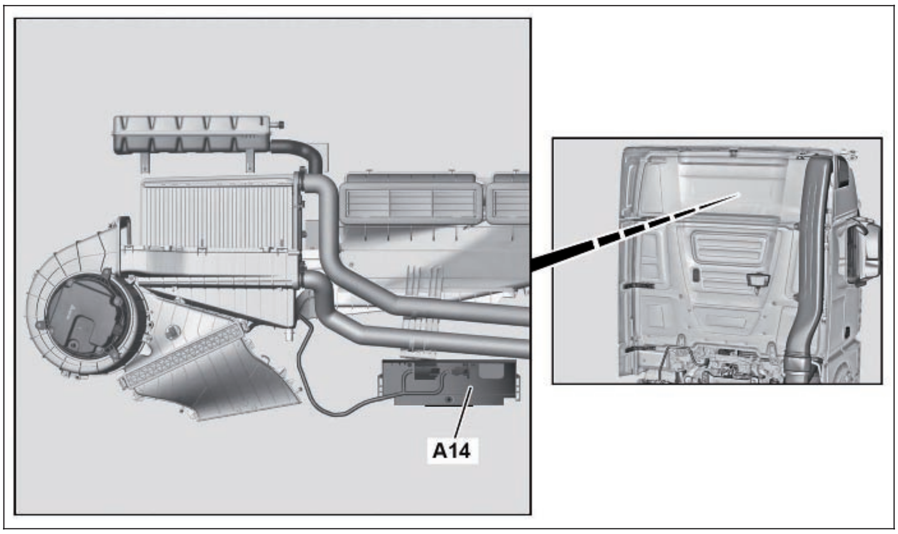
GF83.30-W-2206H	Stationary air conditioner control unit, component description	29.6.11

MODEL 963, 964 with CODE (D6H) Stationary air conditioner

Location

A14 Stationary air conditioning (IAC) control unit

The stationary air conditioner control unit (IAC) (A14) is located behind the rear wall paneling, above the air inlet grille on the air duct.



W83.30-1185-05

Task

The stationary air conditioner (IAC) (A14) actuates the charging and discharging process of the stationary air conditioner cold reservoir. (A41).

GF30.30-W-3111H	Front radar sensor (RDF) control unit	2.8.11

MODEL 963, 964

Location

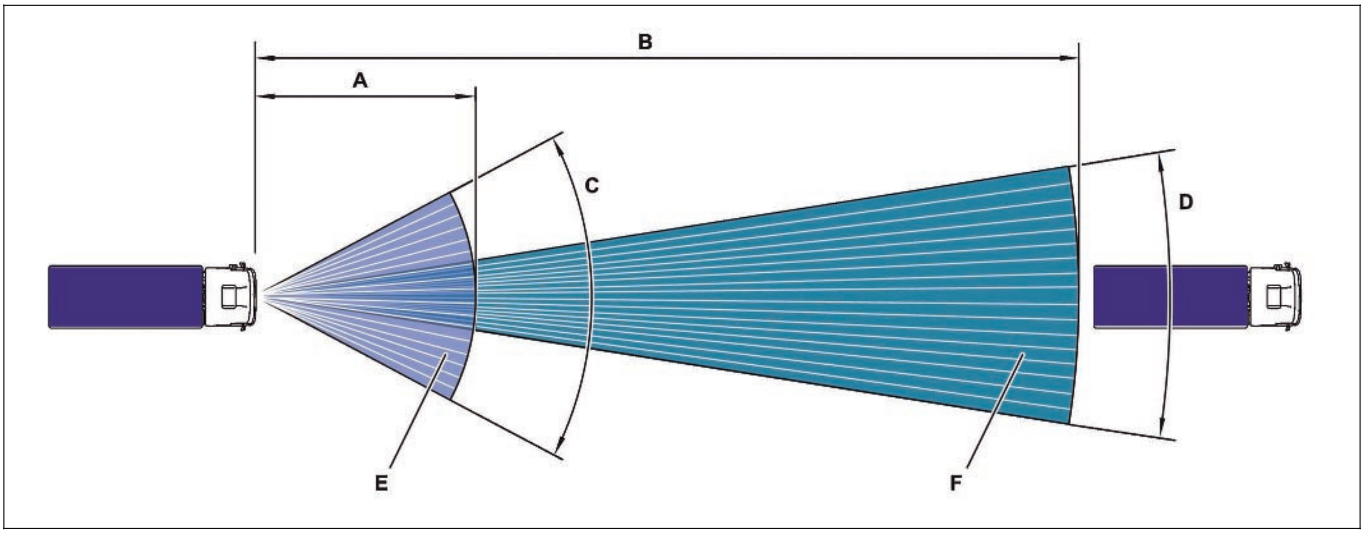
A15 Front radar sensor (RDF) control unit

The front radar sensor (RDF) control unit (A15) is located in the center of the front bumper under a plastic cover.

Task

The front radar sensor (RDF) control unit (A15) transmits out radar signals for distance measurement and receives the radar signals again reflected off the obstacles. The clearances and the relative speeds to the target objects ahead are recognized from the received signals are recognized over the signal running times and is transmitted with respective messages to the driver assistance system (VRDU) control unit (A53). The range is 50...200 m.

W30.30-1091-12



W30.00-1002-78

A *50 M*
B *200 M*
C *56° (opening angle)*
D *18° (opening angle)*
E *Transmit/reception lobes for the short range*
F *Transmit/reception lobes for the long range*

Function

In order to detect the traffic situation in front of one's own vehicle, the front radar sensor (RDF) control unit (A15) sends out signals and receives the signals reflected on the obstacles. To do this the front radar sensor (RDF) control unit (A15) works with 17 transmit/reception lobes for the long range (F) with an opening angle of a total of 18° (D), with the help of which it can detect the traffic situation up to 200 m (B) infront of one's own vehicle and with 17 transmit/reception lobes for the close range (E) with an opening angle of 56° (C), the help of which it can detect the traffic situation up to 50 m (A) infront of one's own vehicle.

Switching takes place between the long range and short range 30 times per second.
The front radar sensor (RDF) control unit (A15) determines the clearance and the relative speed to the vehicle ahead or to a stationary object out of the received signals or the signal running times.
The clearance and the relative speed are transmitted by the front radar sensor (RDF) control unit (A15) to the driver assistance system (VRDU) control unit (A53) via the radar CAN (CAN 12). This assesses the current driving situation based on this information and information about one's own vehicle condition.

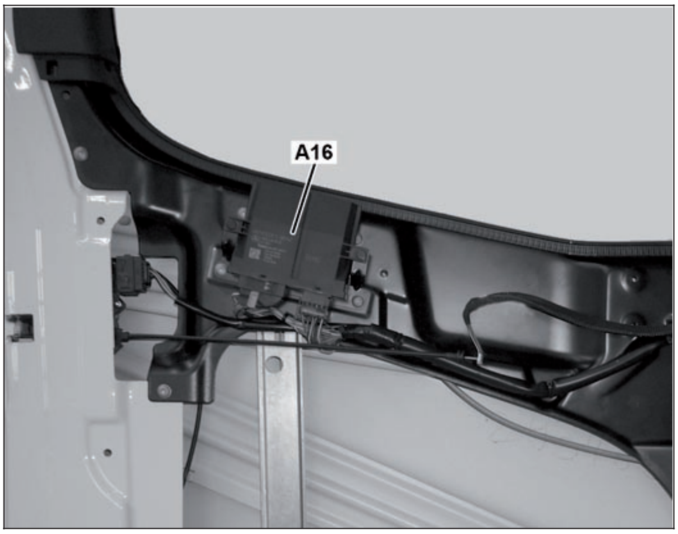
GF72.29-W-4150H	driver door control unit (DCMD), component description	6.7.11

MODEL 963, 964

Location

A16 Driver door module (DCMD) control unit

The driver door control unit (DCMD) (A16) is fastened at the inside of the driver door.



W72.29-1034-11

Task

- Reading in and evaluating electrical signals from following components:
  - Driver door central locking motor switch (M7)
  - Driver door power window motor Hall sensor (M3) (only on vehicles with code (F8F) Comfort locking system)

- Reading in and evaluating messages via driver LIN switch panel (LIN 9) on switch group (control commands).

- Electrically actuating following components:
  - Driver door power window motor (M3)
  - Driver outside mirror adjustment motor (M9)
  - Driver door exit lamp (E27)
  - Driver mirror heater (R904)
  - Driver door central locking motor (M7)

- Transmitting messages via driver LIN switch panel (LIN 9) to driver switch group (A28) (background illumination and indicator lamp).

- Transmitting CAN messages via interior CAN (CAN 2) to following components:
  - Passenger door module control unit (DCMP) (A17)
  ℹ Information for actuating front passenger door power window motor (M4), front passenger outside mirror adjustment motor (M10), passenger mirror heater (R905) and to enable front passenger power window (M4a).

  - Anti-theft alarm system control unit (ATA) (A6)
  ℹ Information on vehicle locking status

  - Cab signal acquisition and actuation module control unit (SCA) (A7)
  ℹ Information on vehicle locking status.

- Receiving and evaluating CAN messages via interior CAN (CAN 2) of following components:
  - Cab signal acquisition and actuation module control unit (SCA) (A7)
  ℹ Information on enabling power window after actuating start/stop button on electronic ignition lock (EIS) (S1) once.

  - Electronic ignition lock (EIS) (S1)
  ℹ On vehicles with code (F8F) Comfort locking, information on comfort closing and opening activated by the radio remote control.

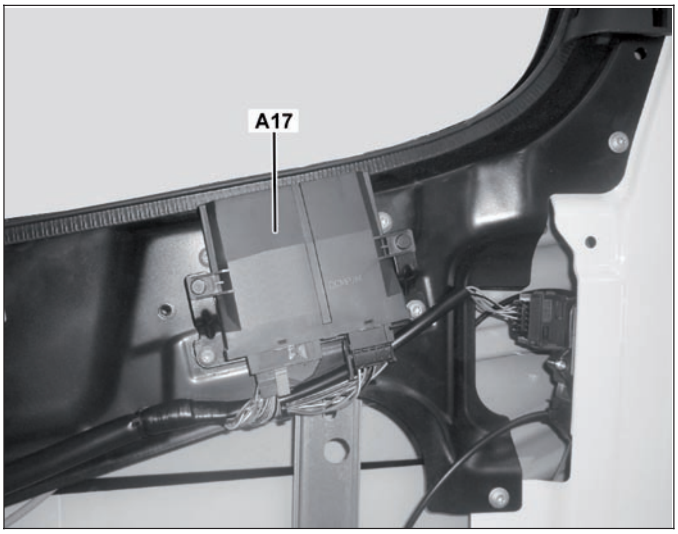
GF72.29-W-4151H	Passenger door module control unit (DCMP), component description	6.7.11

MODEL 963, 964

Location

A17 Front passenger door module (DCMP) control unit

The passenger door module control unit (DCMP) (A17) is fastened at the inside of the passenger door.



W72.29-1035-11

Task

- Reading in and evaluating electrical signals from following components:
  - Front passenger door central locking motor switch
  - Front passenger switch group (control commands an analog switch signals)
  - Front passenger door power window motor Hall sensor
  i Only on vehicles with code (F8F) Comfort locking system.

- Electrical actuation of following components:
  - Front passenger door power window motor
  - Front passenger door outside mirror adjustment motor
  - Front passenger door exit lamp
  - Front passenger mirror heater
  - Front passenger door central locking motor
  - Front passenger switch group (background illumination)

- Transmitting CAN messages via interior CAN to antitheft alarm system control unit (ATA).
  i Information on vehicle locking status

- Receiving and evaluating CAN messages from driver door control unit (DCMD) via interior CAN.
  i Information on actuation of front passenger door power window motor, front passenger outside mirror adjustment motor, front passenger mirror heater and enable of power window

GF42.60-W-6000H	Electronic Air-Processing Unit (EAPU), component description	2.8.11

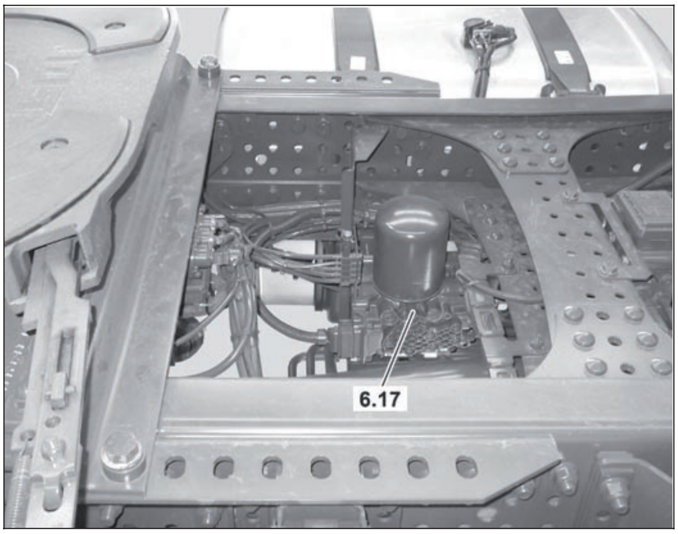
MODEL 963, 964

Location

Illustration shows code (B1D) Electronic Air-Processing Unit (EAPU) mid (Knorr) in model 963.4

6.17 Electronic Air Processing Unit (EAPU)

The Electronic Air-Processing Unit (EAPU) (6.17) is on the inside of the left longitudinal frame member near the fuel tank.



W42.60-1232-11

Task

The Electronic Air-Processing Unit (EAPU) (6.17) has the following tasks:

- Regulation of cut-in and shutoff phases of the pressure regulator
- Drying of the compressed air
- Distribution of the compressed air delivered by the compressor to the brake circuits and auxiliary consumer circuits
- Limitation of the operating pressures in the pressure circuits
- Maintaining the reservoir pressures of all compressed air circuits at the specified level
- Protection of the intact compressed air circuits against a possible defective compressed air circuit
- Regulation of compressed air desiccant cartridge regeneration
- Acquisition and forwarding of the measurement value for the condensation level (only with code (B4A) Condensation sensor for compressed air system)

Design

Version with code (B1C) Electronic Air-Processing Unit (EAPU) low

6.16 Electronic Air>Processing Unit (EAPU) low

A18 Electronic Air Processing Unit (EAPU) control unit

A18 b1 Rear axle brake circuit pressure sensor

A18 b2 Front axle brake circuit pressure sensor

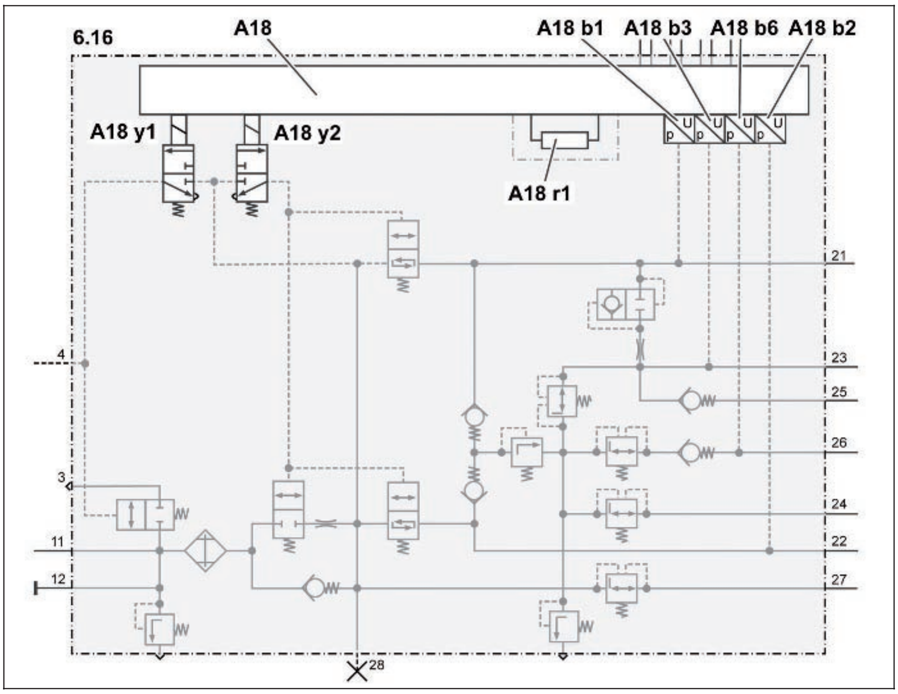
A18 b3 Trailer control pressure sensor

A18 b6 Transmission control/automatic clutch operation pressure sensor

A18 r1 Heating element

A18 y1 Pre-control solenoid valve

A18 y2 Regeneration solenoid valve



W42.60-1227-06

3 Bleeding

4 Control connection (to compressor)

11 Compressed air supply (from compressor)

12 Compressed air supply (external filling)

21 Compressed air release (rear axle brake circuit supply)

22 Compressed air release (front axle brake circuit supply)

23 Compressed air release (trailer control)

24 Compressed air release (ancillary consumers)

25 Compressed air release (parking brake)

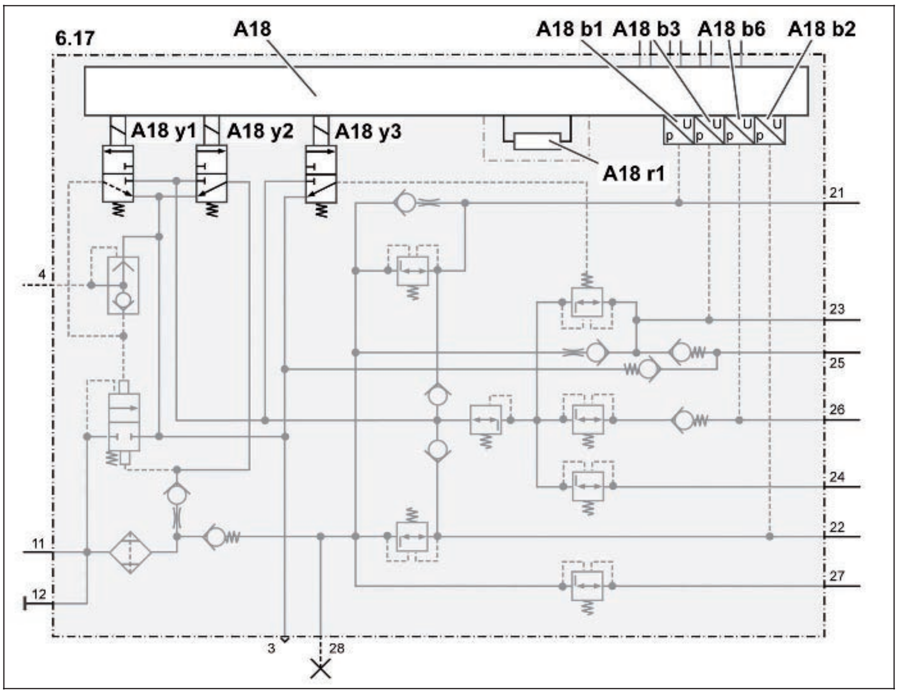
26 Compressed air release (transmission control and automatic clutch operation supply)

27 Compressed air release (air suspension)

28 Tire inflation connection

Version with code (B1D) Electronic Air-Processing Unit (EAPU) mid (Knorr)

6.17	*Electronic Air>Processing Unit (EAPU) mid*
A18	*Electronic Air Processing Unit (EAPU) control unit*
A18 b1	*Rear axle brake circuit pressure sensor*
A18 b2	*Front axle brake circuit pressure sensor*
A18 b3	*Trailer control pressure sensor*
A18 b6	*Transmission control/automatic clutch operation pressure sensor*
A18 r1	*Heating element*
A18 y1	*Pre-control solenoid valve*
A18 y2	*Regeneration solenoid valve*
A18 y3	*Trailer control solenoid valve*



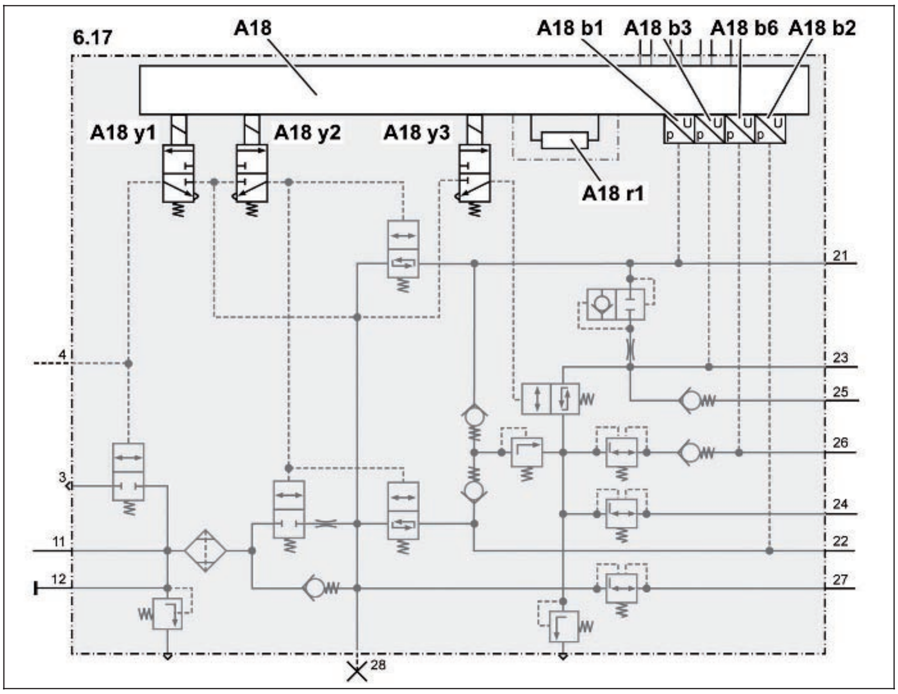
W42.60-1228-06

3	*Bleeding*
4	*Control connection (to compressor)*
11	*Compressed air supply (from compressor)*
12	*Compressed air supply (external filling)*
21	*Compressed air release (rear axle brake circuit supply)*
22	*Compressed air release (front axle brake circuit supply)*
23	*Compressed air release (trailer control)*
24	*Compressed air release (ancillary consumers)*
25	*Compressed air release (parking brake)*
26	*Compressed air release (transmission control and automatic clutch operation supply)*
27	*Compressed air release (air suspension)*
28	*Tire inflation connection*

Version with code (B1D) Electronic Air-Processing Unit (EAPU) mid (Haldex)

6.17 *Electronic Air>Processing Unit (EAPU) mid*

A18 *Electronic Air Processing Unit (EAPU) control unit*
A18 b1 *Rear axle brake circuit pressure sensor*
A18 b2 *Front axle brake circuit pressure sensor*
A18 b3 *Trailer control pressure sensor*
A18 b6 *Transmission control/automatic clutch operation pressure sensor*
A18 r1 *Heating element*
A18 y1 *Pre-control solenoid valve*
A18 y2 *Regeneration solenoid valve*
A18 y3 *Trailer control solenoid valve*



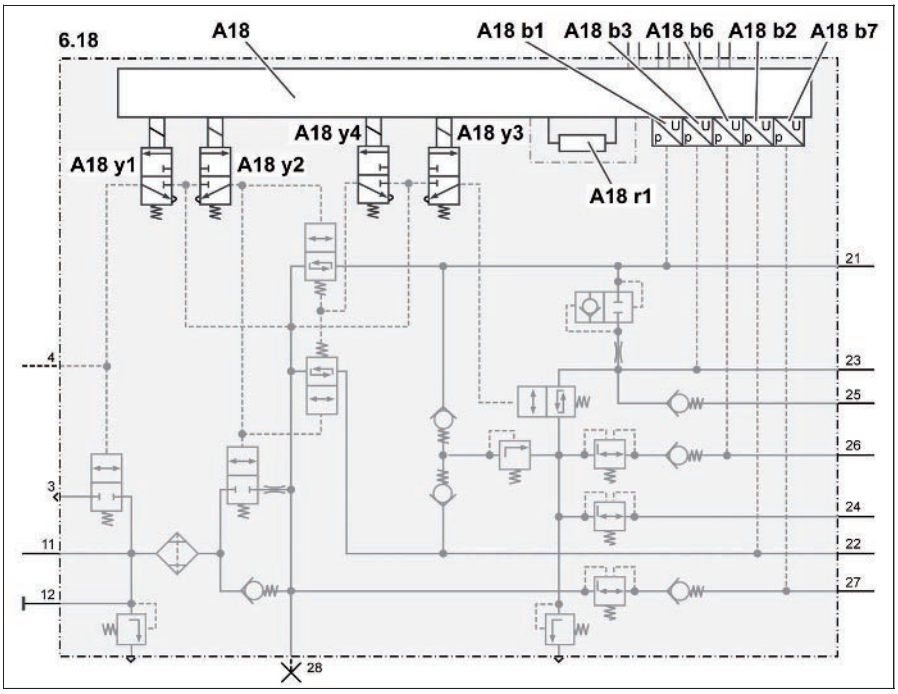
W42.60-1229-06

3 *Bleeding*
4 *Control connection (to compressor)*
11 *Compressed air supply (from compressor)*
12 *Compressed air supply (external filling)*
21 *Compressed air release (rear axle brake circuit supply)*
22 *Compressed air release (front axle brake circuit supply)*
23 *Compressed air release (trailer control)*
24 *Compressed air release (ancillary consumers)*
25 *Compressed air release (parking brake)*
26 *Compressed air release (transmission control and automatic clutch operation supply)*
27 *Compressed air release (air suspension)*
28 *Tire inflation connection*

Version with code (B1E) Electronic Air-Processing Unit (EAPU) high

6.18 Electronic Air>Processing Unit (EAPU) high

A18 Electronic Air Processing Unit (EAPU) control unit
A18 b1 Rear axle brake circuit pressure sensor
A18 b2 Front axle brake circuit pressure sensor
A18 b3 Trailer control pressure sensor
A18 b6 Transmission control/automatic clutch operation pressure sensor
A18 b7 Air suspension pressure sensor
A18 r1 Heating element
A18 y1 Pre-control solenoid valve
A18 y2 Regeneration solenoid valve
A18 y3 Trailer control solenoid valve
A18 y4 Air suspension solenoid valve



W42.60-1230-06

3 Bleeding
4 Control connection (to compressor)
11 Compressed air supply (from compressor)
12 Compressed air supply (external filling)
21 Compressed air release (rear axle brake circuit supply)
22 Compressed air release (front axle brake circuit supply)
23 Compressed air release (trailer control)
24 Compressed air release (ancillary consumers)
25 Compressed air release (parking brake)
26 Compressed air release (transmission control and automatic clutch operation supply)
27 Compressed air release (air suspension)
28 Tire inflation connection

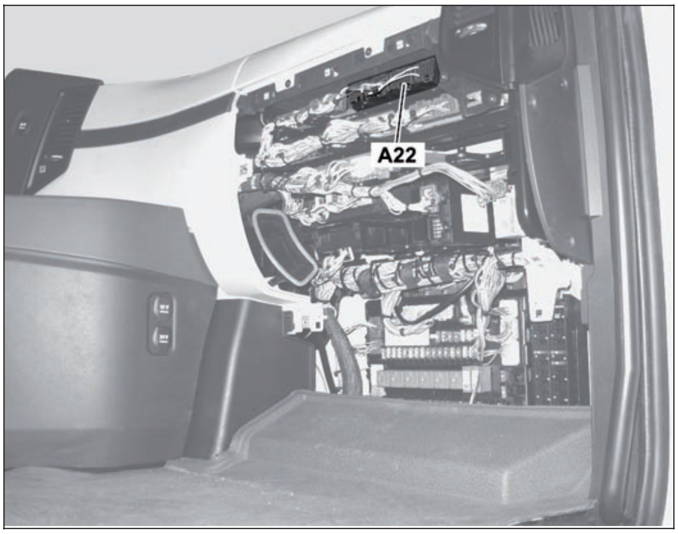
GF54.21-W-5005H	Parameterizable special module (PSM) control unit, component description	29.6.11

MODEL 963, 964

Location

A22 Parameterizable special module (PSM) control unit

The parameterizable special module (PSM) (A22) control unit is located on the passenger side in the electronics compartment.



W54.21-1432-11

Task

The parameterizable special module control unit (PSM) (A22) is integrated in the overall network on the vehicle side via the frame CAN (CAN 3). The trailer CAN (PSM) (CAN 7) and the body CAN (PSM) (CAN 8) serve as external interfaces.
The parameterizable special module control unit (PSM) (A22) allows for the implementation of complex controls and functions.

Full access to data from the entire vehicle CAN enables multiple applications to be carried out with a minimum of additional hardware components. Several functions are performed entirely without additional parts. They only need to be parameterized. 42 equations are available at the factory as preinstalled applications. These can be individually adapted (parameterization) to their respective use in the vehicle.

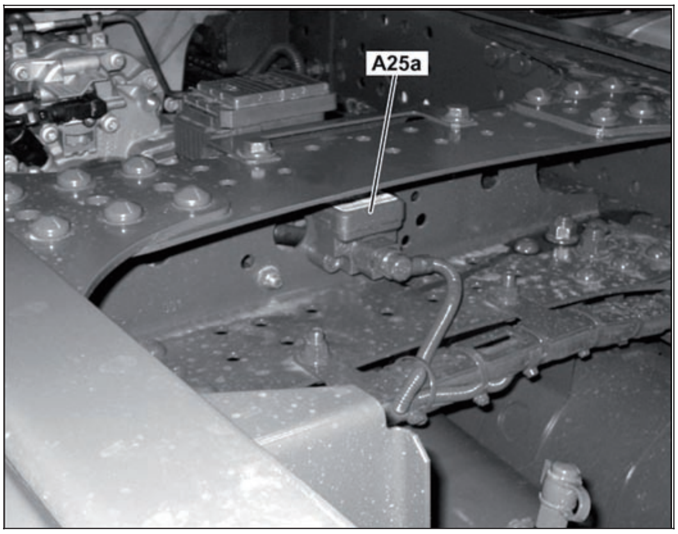
GF42.45-W-3005H	Electronic Stability Program (ESP) control unit, component description	2.8.11

MODEL 963

Location

Knorr version, shown on model 963.4
A25a Electronic Stability Program (ESP®) control unit (Knorr)

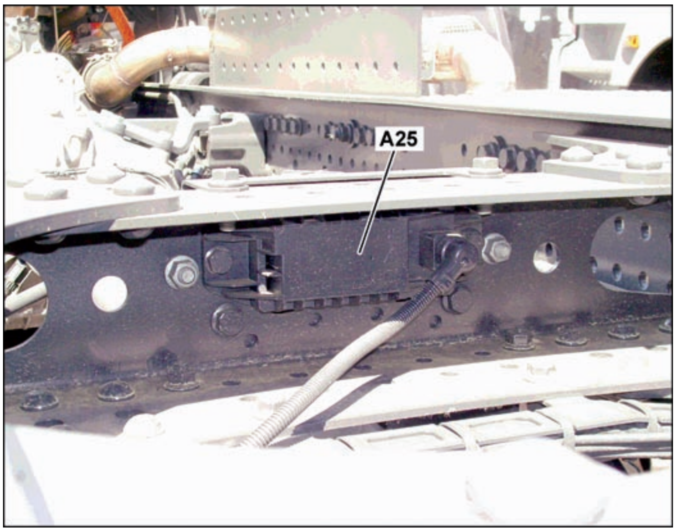
The Electronic Stability Program (ESP®) control unit (Knorr) (A25a) is attached at the center of the frame crossmember near the fuel tank.



W42.45-1031-11

Wabco version, shown on model 963.4
A25 Electronic Stability Program (ESP®) control unit (Wabco)

The Electronic Stability Program (ESP®) control unit (Wabco) (A25) is attached at the center of the frame crossmember near the fuel tank.



W42.45-1035-81

Task

The Electronic Stability Program (ESP®) control unit (A25, A25a) has the following tasks:

- Acquisition of all rotary motion about the vehicle's vertical axis.
- Monitoring of all acceleration along the vehicle's lateral axis.

Design

The Electronic Stability Program (ESP®) control unit (A25, A25a) contains a lateral acceleration sensor and a yaw rate sensor to detect the lateral dynamics of the vehicle. Power supply and connection to the brake CAN ESP® (CAN 6d) is via a 4-pin plug.

GF32.33-W-3126H	Level control (CLCS) control unit, component description	2.8.11

MODEL 963

Location

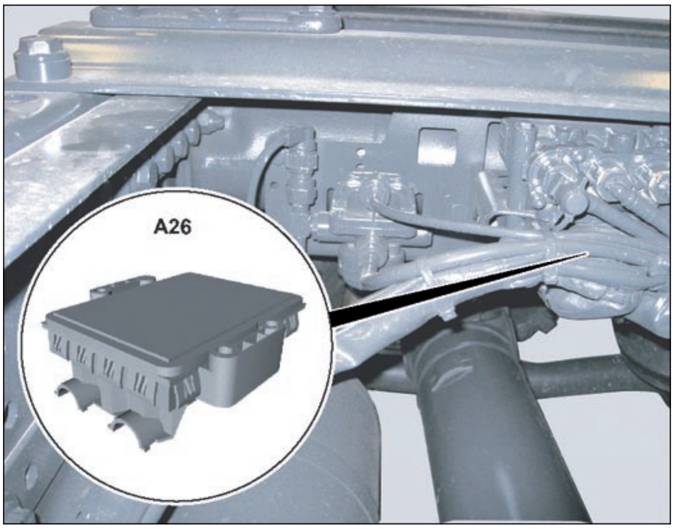
Illustrated on model 963.4
A26 Level control (CLCS) control unit

The level control (CLCS) control unit (A26) is attached at the center of a bracket on the tubular crossmember below the fifth wheel coupling.

i The installation location may vary depending on the vehicle model.

Task

The level control (CLCS) control unit (A26) is the central component of the level and roll control system.



W32.33-2075-81

The level control (CLCS) control unit (A26)

- evaluates the signals from the left drive axle position sensor (B24), right drive axle position sensor (B25) and, with full air suspension, the signals from the front axle position sensor (B27),
- compares the actual values with the specified values and, in the case of level deviations, actuates the 2-axle vehicle level control valve unit (Y21) or 3-axle vehicle level control valve unit (Y21a) and, with full air suspension, the front axle level control valve unit (Y20) to admit air to or vent air from the air spring bellows,
- controls the functions triggered manually using the level control operating unit (S22),
- monitors functions dependent on vehicle speed using the vehicle speed signal,
- on 3-axle vehicles with trailing or leading axle, takes over control of the starting-off aid, lift axle (raise/lower) and load transfer in the case of empty runs,
- with axle load measuring device, evaluates the signals from the left drive axle pressure sensor (B20), right drive axle pressure sensor (B21) and front axle pressure sensor (B19),
- calculates the load on the individual axles and, with full air suspension, the gross weight of the vehicle,
- monitors the fifth wheel coupling,
- evaluates the signals from the CAN bus concerning vehicle speed, specified brake pressure value, differential speed of the front wheels and the engine specified torque,
- on vehicles with roll control, determines the current damping requirement and actuates the proportional valves at the shock absorbers accordingly.

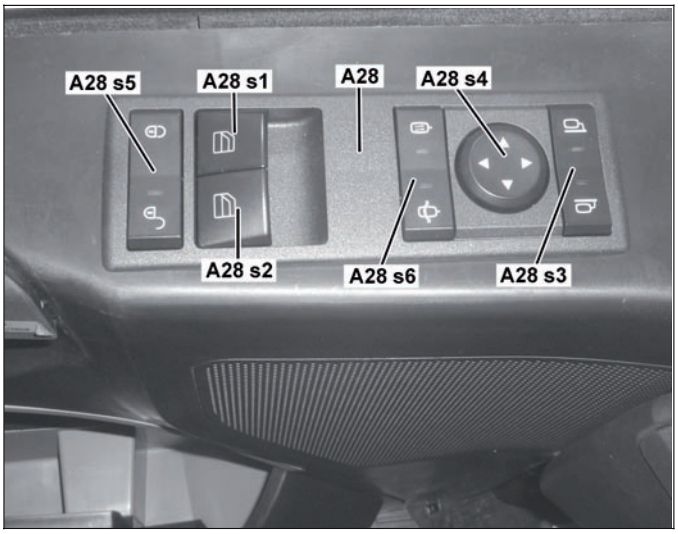
GF72.29-W-4152H	Driver switch group, component description	6.7.11

MODEL 963, 964

Location

A28 *Driver switch group*
A28s1 *Driver door power window button*
A28s2 *Passenger power window button*
A28 s3 *Mirror selection button*
A28 s4 *Outside mirror adjustment button*
A28 s5 *Unlock/lock button*
A28 s6 *Outside mirror heater/maneuvering mode button*

The driver switch group (A28) is located at the top of the driver door module.



W72.29-1036-11

Task

The driver switch group (A28) allows control of the following components:

- Raise/lower driver window
- Raise/low passenger window
- Select and adjust outside mirror
- Lock or unlock driver and passenger door
- Heat outside mirror
- Adjust outside mirror on passenger side to maneuvering position

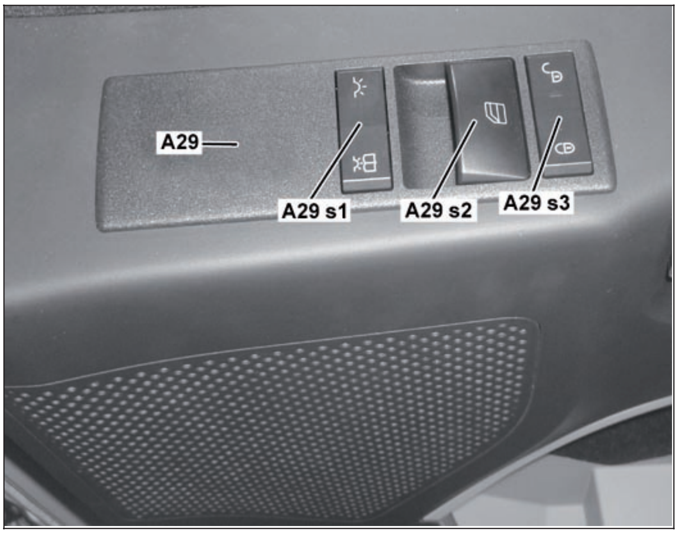
GF72.29-W-4153H	Front passenger switch group, component description	6.7.11

MODEL 963, 964

Location

A29 Front passenger switch group
A29s1 Reading lamp/interior illumination button
A29 s2 Passenger power window button
A29 s3 Unlock/lock button

The front passenger switch group (A29) is located at the top of the passenger door module.



W72.29-1037-11

Task

The front passenger switch group (A29) allows control of the following functions:
- Switching on/off reading lamp and interior illumination
- Raise/low passenger window
- Lock or unlock driver and passenger door

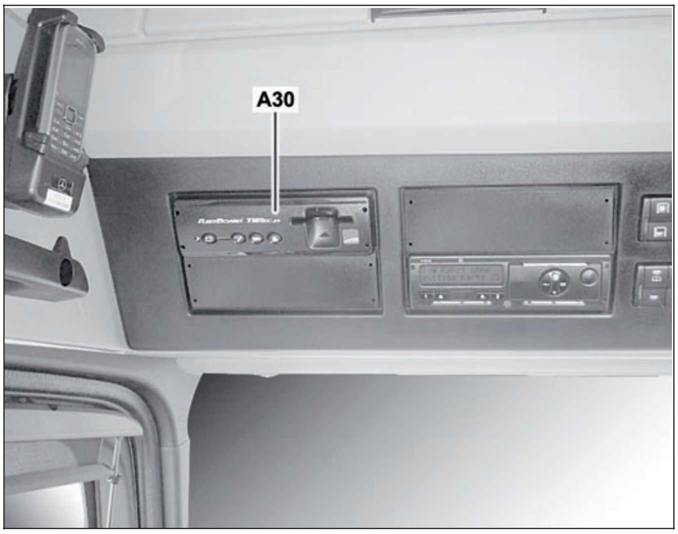
GF82.85-W-1000A	FleetBoard control unit, component description	1.7.11

MODEL 963, 964

Location

A30 FleetBoard control unit

The FleetBoard control unit (A30) is installed on the driver side above the windshield. It is constructed with regard to the dimensions such that it fits in a DIN-standard installation opening.



W82.85-1687-11

Task

The FleetBoard control unit (A30) is the vehicle-side unit for the FleetBoard® vehicle management. It is connected via the telematics CAN (CAN 9) to the overall vehicle network in order to call up vehicle and driver data. It uses an integrated GPS (global positioning system) receiver for positioning of the vehicle and a GSM (Global System for Mobile Communication) modem for exchanging data between the vehicle and the FleetBoard® Service Center.

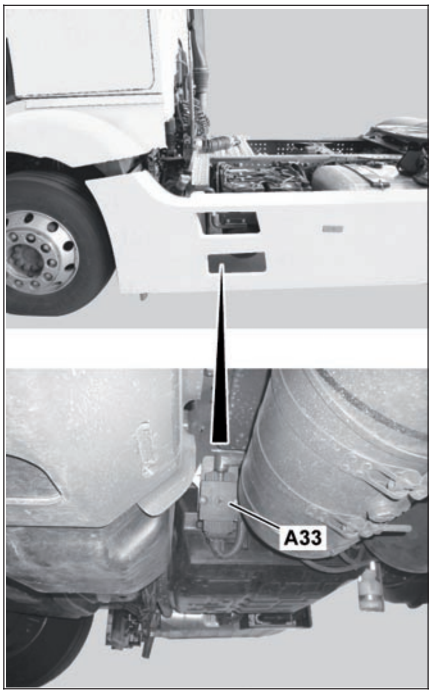
GF54.25-W-6000H	Battery disconnect switch control unit, component description	2.8.11

MODEL 963 with CODE (E5T) ADR model class EX/II, including AT
MODEL 963 with CODE (E5U) ADR model class EX/III, including EX/II and AT
MODEL 963 with CODE (E5V) ADR model class FL including EX/II, EX/III and AT
MODEL 963 with CODE (E5X) ADR model class AT
MODEL 963 with CODE (E5Z) Accessories, ADR
MODEL 963 with CODE (E9D) Preinstallation, double-pole battery disconnect switch
MODEL 963 with CODE (E9E)

Location

In vehicles without code (C7T) Integral rear end
A33 Battery disconnect switch control unit (BESO)

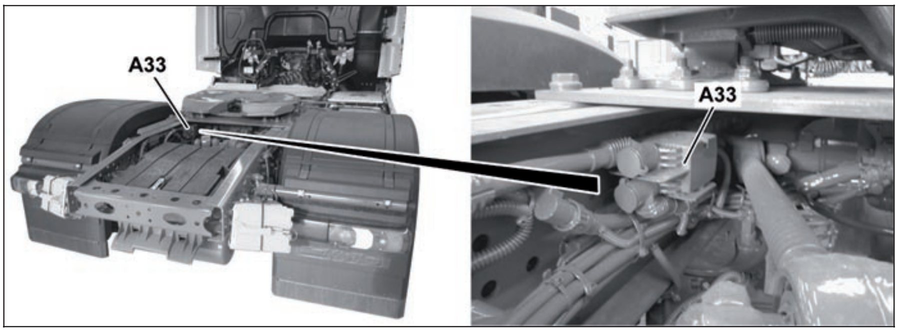
In vehicles with standard rear end, the battery disconnect switch (BESO) control unit (A33) is installed below the vehicle battery in the direction of travel in front of the compressed air reservoirs of the brake system.



W54.21-1431-03

In vehicles with code (C7T) Integral rear end
A33 Battery disconnect switch control unit (BESO)

In vehicles with integral rear end, the battery disconnect switch (BESO) control unit (A33) is installed on the inside of the left longitudinal frame member above the rear axle.



W54.21-1430-04

Tasks

- Evaluating the positions of the EMERGENCY OFF switch (S30) and the frame EMERGENCY OFF frame (S31)
- Disconnecting the on-board electrical system from the battery, when the EMERGENCY OFF switch (S30) or the frame EMERGENCY OFF switch (S31) is pressed

Design

- Control electronics
- Bistable relay for disconnecting the on-board electrical system from the battery

Function

The battery disconnect switch (BESO) control unit (A33) evaluates the positions of the EMERGENCY OFF switch (S30) and the frame EMERGENCY OFF switch (S31) via the input signal.

ℹ As a redundant message on the exterior CAN (CAN 1), the battery disconnect switch (BESO) control unit (A33) also transmits a pulse width modulated signal (PWM signal) via a direct line to the sensor and actuator module, cab (SCA) control unit (A7). If the battery disconnect switch (BESO) control unit (A33) recognizes that the EMERGENCY OFF switch (S30) or the frame EMERGENCY OFF switch (S31) was pressed, it changes the duty cycle of the PWM signal from 50% to 75%, whereupon the sensor and actuator module, cab (SCA) control unit (A7) recognizes that the on-board electrical system starts being disconnected.

When the EMERGENCY OFF switch (S30) or the frame EMERGENCY OFF switch (S31) are pressed, the battery disconnect switch (BESO) control unit (A33) disconnects the on-board electrical system from the battery. Even before the on-board electrical system is disconnected from the battery, it sends a message to the exterior CAN (CAN 1) for further processing, announcing that the on-board electrical system will be disconnected from the battery. Among other things, the engine management (MCM) control unit (A4) initiates the switching-off of the engine due to this message. The on-board electrical system is disconnected by a bistable relay integrated into the battery disconnect switch (BESO) control unit (A33). The bistable relay is actuated 800 ms after the battery disconnect switch (BESO) control unit (A33) has recognized that the EMERGENCY OFF switch (S30) or the frame EMERGENCY OFF switch (S31) was pressed. The tachograph (TCO) (P1) continues to be supplied with voltage by the battery disconnect switch (BESO) control unit (A33) via a separate pin.

GF46.80-W-1100H	Additional steering axle (ASA) control unit, component description	2.8.11

MODEL 963, 964

Location

Shown on model 963

A34 Additional steering axle (ASA) control unit

The additional steering axle (ASA) control unit (A34) is located on the right of the frame (inside) at the level of the additional steering axle steering cylinder.

W46.80-1145-11

Task

General

The additional steering axle (ASA) control unit (A34) computes the variables for the control of the additional steering axle depending on the steering angle of the front axle.

To record and evaluate electric sensor signals and switch signals

- Front axle steering angle sensor (B64)
- Additional axle steering angle sensor (B65)

Electrical actuation of components

- Additional axle valve unit (Y39)

Records, evaluates and transmits CAN messages

Via the exterior CAN (CAN 1), CAN messages that are relevant to the corresponding functions are made available from other control units and vice versa are also conveyed to them.

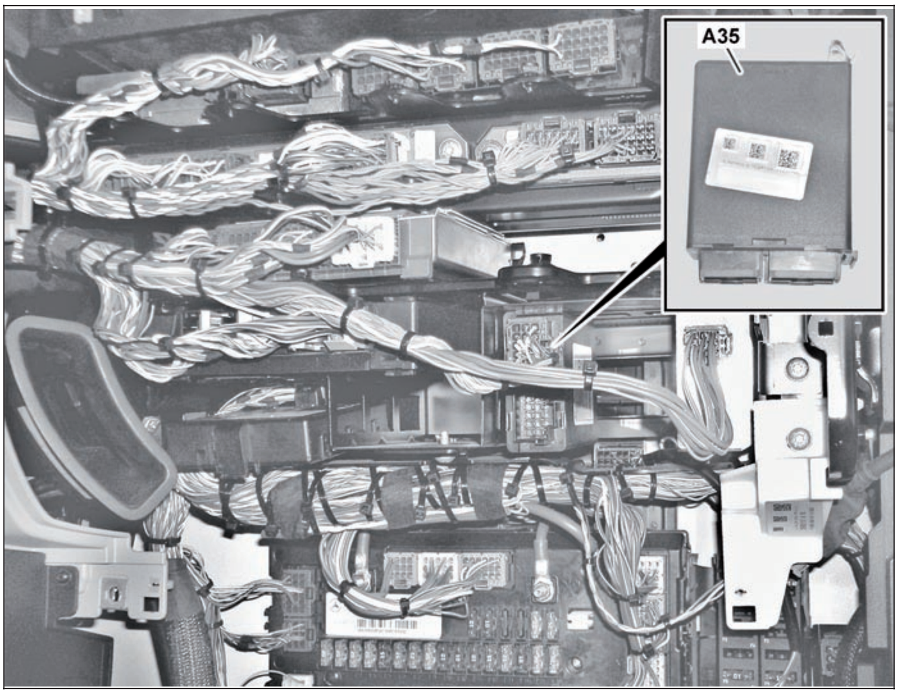
GF40.15-W-3003H	Tire pressure monitor (TPM) control unit, component description	2.8.11

MODEL 963, 964 with CODE (S1Y) Tire pressure monitor

Location

A35 Tire pressure monitor (TPM) control unit

The tire pressure monitor (TPM) control unit (A35) is installed in the electronics compartment on the passenger side.



W40.15-1032-06

Task

The tire pressure monitor (TPM) control unit (A35) evaluates the information sent from the wheel sensors and received via the antennas and sends it as a CAN message via the frame CAN (CAN 3) to the instrument cluster (ICUC) control unit (A1).

Depending on the axle configuration, the antennas are connected to the tire pressure monitor (TPM) control unit (A35) at specifically assigned connectors and must not be changed over, otherwise it will not be possible to display and assign the tires correctly.
A distinction is made between the inner and outer tires by means of the rotational direction of the wheels.

GF83.30-W-2211H	Stationary air conditioner cold reservoir, component description	20.7.11

MODEL 963, 964 with CODE (D6H) Stationary air conditioner

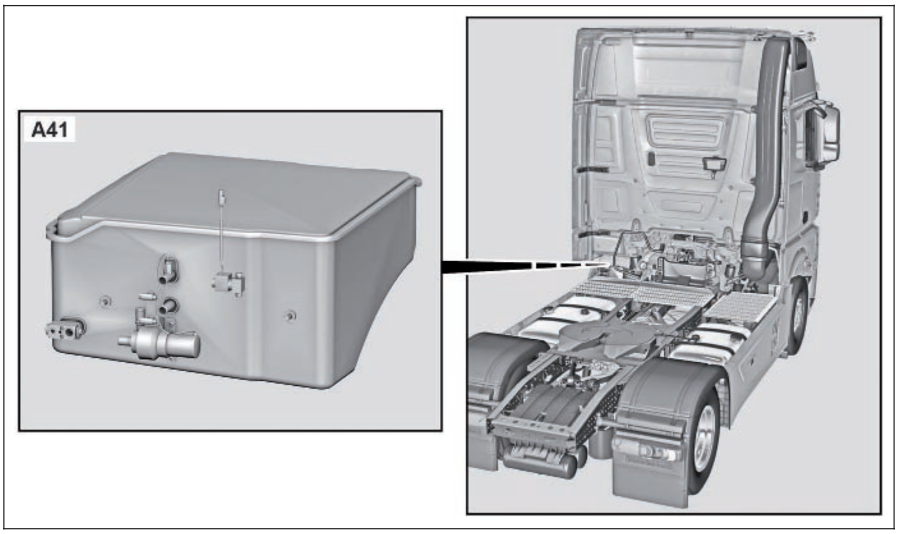
Location

A41 Stationary air conditioning cold reservoir

The stationary air conditioner cold reservoir (A41) is installed at the left rear under the cab.

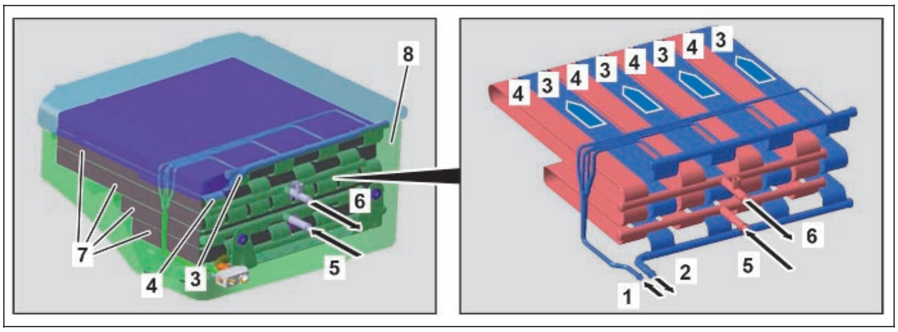
Task

The stationary air conditioner cold reservoir (A41) stores the cold energy resulting from charging and, when discharging, delivers this into the ambient air in the cab via the stationary air conditioner heat exchanger.



W83.30-1179-05

1 *High-pressure line connection*
2 *Low-pressure line connection*
3 *Cooling loop (charge cold reservoir)*
4 *Water-glycol loop (discharge cold reservoir)*
5 *Water-glycol mix return line*
6 *Water-glycol mix feed line*
7 *Graphite layers*
8 *Housing with insulation*



W83.30-1226-74

Design

The stationary air conditioning cold reservoir (A41) is comprised of several layers of porous graphite.
Cooling loops (3) and water-glycol loops (4) are installed between the graphite layers (7) for charging the stationary air conditioner cold reservoir (A41) and discharging the stationary air conditioner cold reservoir (A41) respectively. The graphite stores water, which freezes during the stationary air conditioner's charging process.
The stationary air conditioner cold reservoir temperature sensor (A41 b1) measures the temperature in the water-glycol feed line (6) during the charging process of the stationary air conditioner cold reservoir (A41). When the defined temperature has been reached, the stationary air conditioner control unit (IAC) (A14) ends the charging process.

The stationary air conditioner cold reservoir (A41) is charged and the discharge process can be started. The water-glycol mix circulates in the coolant circuit of the stationary air conditioner during the discharge process. The water-glycol mix is cooled in the stationary air conditioner cold reservoir (A41) and transported to the stationary air conditioner heat exchanger, where the mix dissipates coldness into the air flowing through. During the discharging process, the stationary air conditioner control unit (IAC) (A14) compares the measurement values of both the stationary air conditioner air intake temperature sensor (B908) and stationary air conditioner air outlet temperature sensor (B909). If there is no difference between the measurements, the stationary air conditioner control unit (IAC) (A14) ends the discharge process.

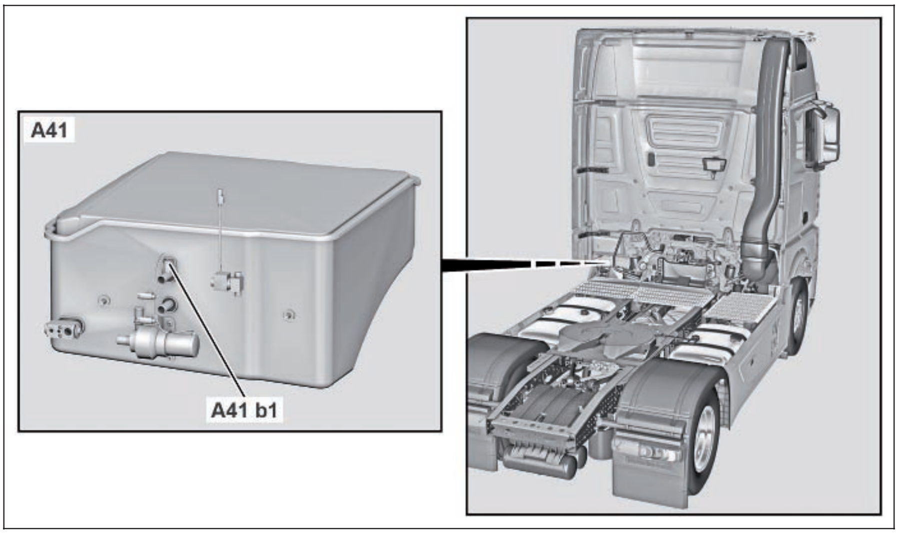
GF83.30-W-2212H	Stationary air conditioner cold reservoir temperature sensor, component description	29.6.11

MODEL 963, 964 with CODE (D6H) Stationary air conditioner

Location

A41 *Stationary air conditioning cold reservoir*
A41 b1 *Stationary air conditioning cold reservoir temperature sensor*

The stationary air conditioner cold reservoir temperature sensor (A41 b1) is located at the rear of the stationary air conditioner cold reservoir (A41) in the coolant circuit of the stationary air conditioner.



W83.30-1180-05

Task

The stationary air conditioner control unit (IAC) (A14) measures the temperature of the water-glycol mix flowing out the stationary air conditioner cold reservoir (A41) via the stationary air conditioner cold reservoir temperature sensor (A41 b1).

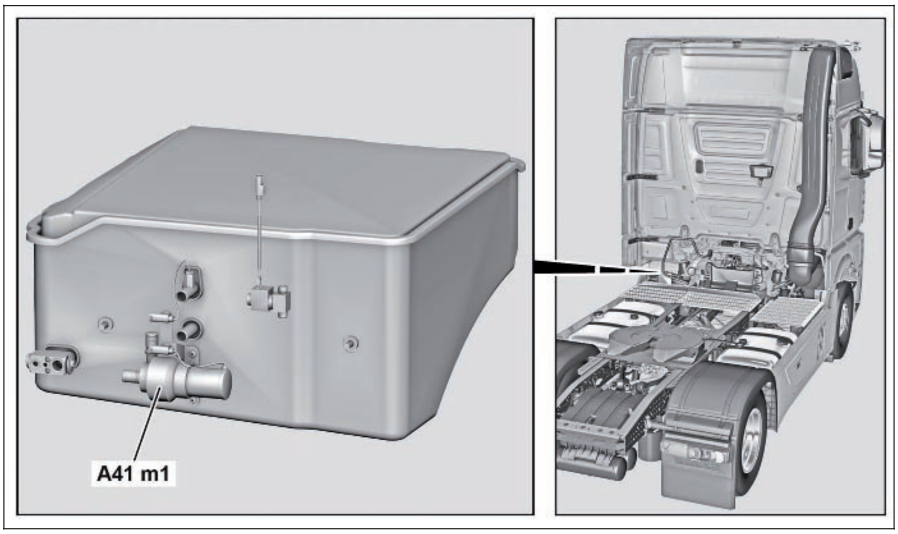
GF83.30-W-2220H	Stationary air conditioner cold reservoir coolant pump, component description	29.6.11

MODEL 963, 964 with CODE (D6H) Stationary air conditioner

Location

A41 Coolant pump

The coolant pump (A41 m1) is located at the rear below the stationary air conditioner cold reservoir (A41).



W83.30-1202-05

Task

The coolant pump (A41 m1) delivers the cooled water-glycol mix from the stationary air conditioner cold reservoir (A41) to the stationary air conditioner heat exchanger and back to the stationary air conditioner cold reservoir (A41) again.

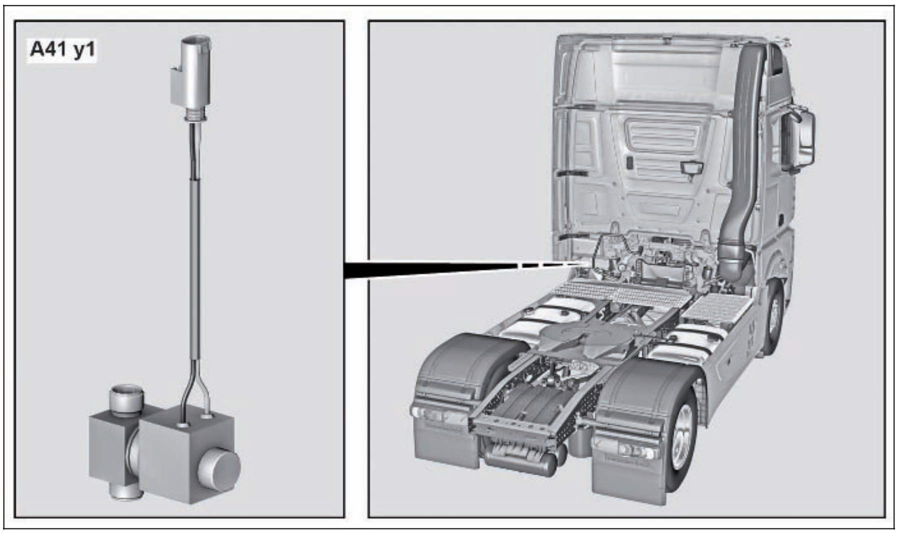
GF83.30-W-2213H	Stationary air conditioner cold reservoir solenoid valve, component description	29.6.11

MODEL 963, 964 with CODE (D6H) Stationary air conditioner

Location

A41 y1 Cold reservoir solenoid valve

The cold reservoir solenoid valve (A41 y1) is located at the rear on the stationary air conditioner cold reservoir (A41) below the cab.



W83.30-1177-05

Task

The cold reservoir solenoid valve (A41 y1) separates the stationary air conditioner's refrigerant circuit from the refrigerant circuit of the conventional air conditioning. When de-energized, it blocks the flow of the refrigerant into the stationary air conditioner cold reservoir.(A41).

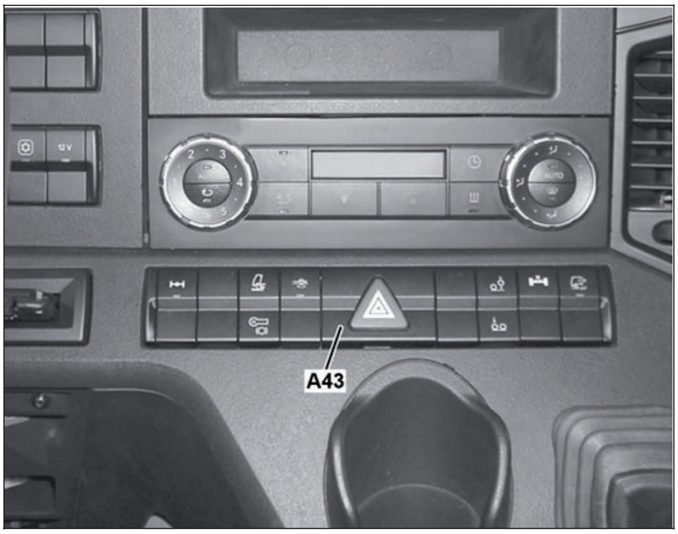
GF54.25-W-4119H	Modular switch panel control unit (MSF), component description	29.6.11

MODEL 963, 964

Location

A43 Modular switch panel (MSF) control unit

The modular switch panel control unit (MSF) (A43) is located in the center of the instrument panel.



W54.25-1161-11

Task

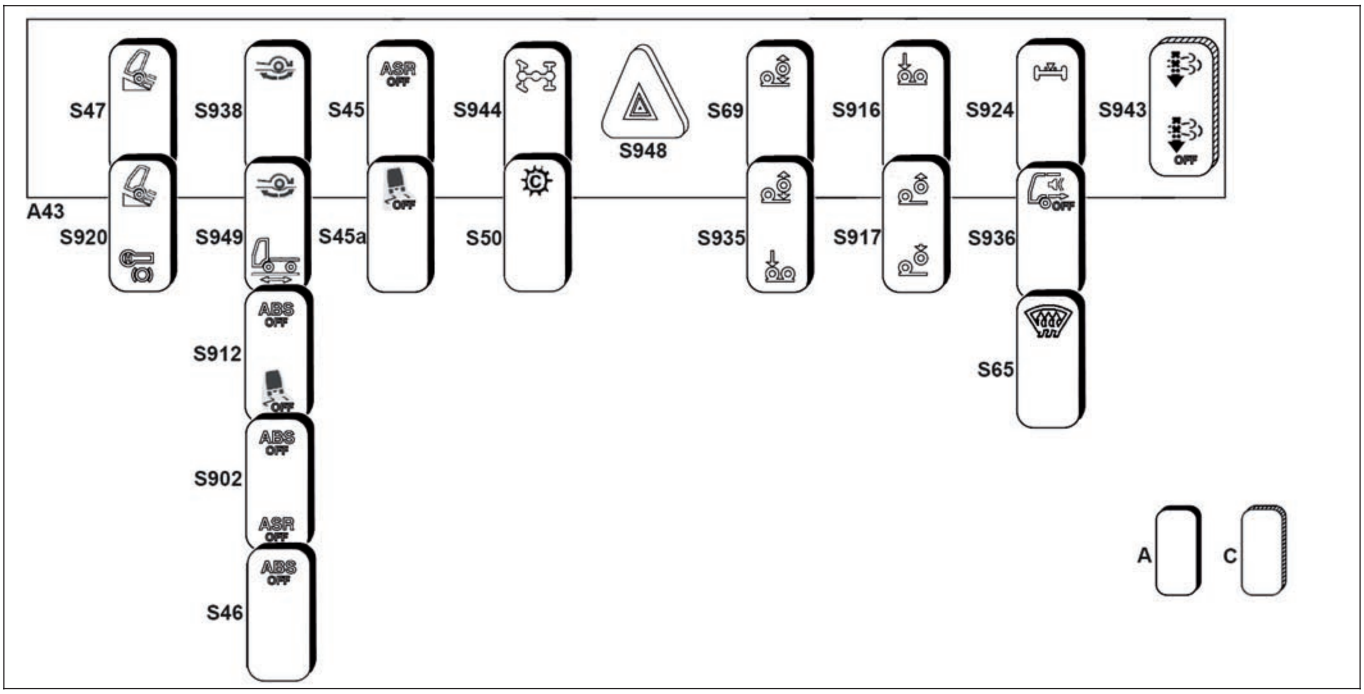
The modular switch panel control unit (MSF) (A43) has the master function when determining and transmitting various operating functions, resulting in the following tasks:

- Read in switching signals from exterior lights switch, headlamp range adjustment switch and hazard warning system switch.
- Read in messages from the signal switches with information about switch position, functionality and system affiliation via the ASIC data bus.
- Transmit messages to the signal switches with information about the actuation of the background illumination via the ASIC data bus.
- Read in messages from the left multifunction control lever, the level control operating unit and the left and right multifunction steering wheel button groups with information about switch position, functionality and system affiliation via the associated LIN data bus.
- Transmit messages via the interior CAN so they are available to the corresponding system components for carrying out the read-in functions.
- Power supply for all connected components.

Design

The modular switch panel control unit (MSF) (A43) is equipped with:

- eight slots for holding the signal switches
- the integrated hazard warning flasher switch
- the interfaces for connecting to the LIN data bus, the ASIC data bus and the interior CAN
- The plug connectors for connecting the exterior light switch and headlamp range adjustment switch
- The electronic controller unit



W54.25-1177-09

Factory switch assignment

A43 Modular switch panel (MSF) control unit

Signal switches

S45 Acceleration skid control button (ASR)

S45a Electronic Stability Program button (ESP)

S46 Anti-lock braking system button (ABS)

S47 Hill holder switch

S50 Transfer case switch

S65 Windshield heater button

S69 Additional axle button

S902 Antilock braking system (ABS) /acceleration skid control (ASR) button

S912 Anti-lock braking system (ABS)/Electronic Stability Program (ESP) button

S916 Starting-off aid button for Europe

S917 Starting-off aid switch for Nordic countries

S920 Hill holder/frequent-stop brake switch

S924 Center auxiliary steering button

S935 Raise/lower additional axle combined with starting-off aid button

S936 Backup warning system button

S938 Rocking mode button

S943 Regeneration lock/manual regeneration button

S944 Longitudinal, rear axle and front axle interwheel differential lock button

S948 Hazard warning system switch

S949 Rocking mode/maneuvering mode button

A Signal switch, transferable

C Signal switch, not transferable

GF54.25-W-4116H	Instrument panel switch modules, component description	6.7.11

MODEL 963, 964

Location

A44 Instrument panel switch module 1
A45 Instrument panel switch module 2
A46 Instrument panel switch module 3

The instrument panel switch modules 1, 2, 3 (A44, A45, A46) are located in the instrument panel.

W54.25-1158-11

Task

The instrument panel switch modules 1, 2, 3 (A44, A45, A46):
- enable a simple electrical connection to be made between the ASIC switch and the ASIC data bus
- record the driver commands through the ASIC switches
- enable, where applicable, a variable arrangement of the ASIC switches

Design

The instrument panel switch modules 1, 2, 3 (A44, A45, A46) are each equipped with:
- four slots for accommodating four ASIC switches
- one ASIC plug connection for connecting to the modular switch panel (MSF) control unit (A43)
- one ASIC plug connection for mutual connection between two switch modules (only instrument panel switch modules 1, 2 (A44, A45))

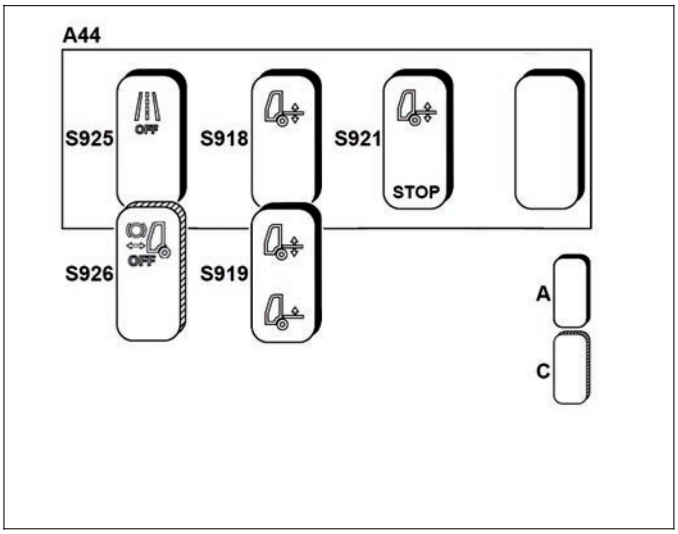
The load and signal switches are specifically assigned to the instrument panel switch modules 1, 2, 3 (A44, A45, A46).
Movable switches can be located individually or as a block in other switch modules.
Non-movable switches cannot be located in other switch modules.

Factory switch assignment on the instrument panel 1 switch module

A44 Instrument panel switch module 1

Signal switches
S918 Driving level switch
S919 Driving level/maneuvering mode button
S921 Driving level/Stop button
S925 Lane Assistant OFF button
S926 Active Brake Assist (ABA) button

A Signal switches, moveable
C Signal switches, non-moveable



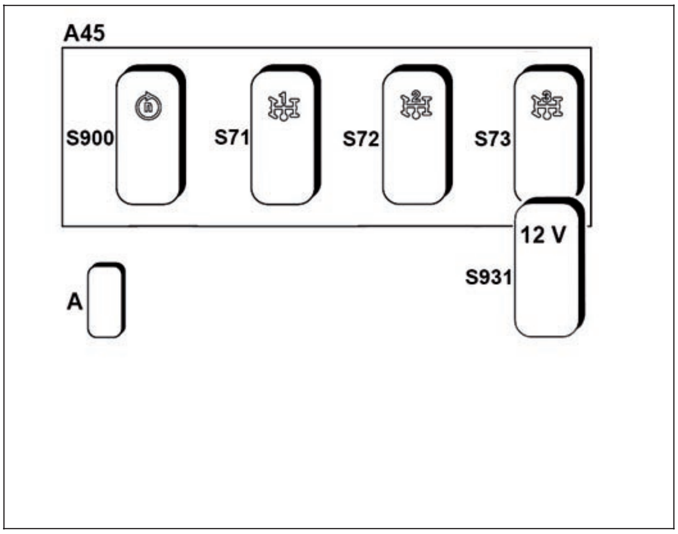
W54.25-1164-11

__Factory switch assignment on the instrument panel 2 switch module__

A45 Instrument panel switch module 2

__Signal switches__
S71 Power takeoff 1 switch
S72 Power takeoff 2 switch
S73 Power takeoff 3 switch
S900 Idle speed switch
S931 Voltage converter button

A Signal switches, moveable



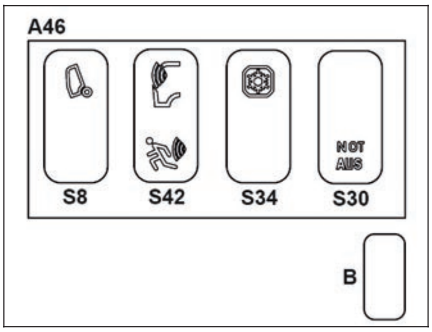
W54.25-1165-11

__Factory switch assignment on the instrument panel 3 switch module__

A46 Instrument panel switch module 3

__Load switches__
S8 Cab tilt system switch approval
S30 EMERGENCY STOP switch
S34 Refrigerator switch
S42 Interior protection/panic alarm button

B Load switches, non-moveable



W54.25-1166-01

GF54.25-W-4113H	Switch module special equipment, component description	6.7.11

MODEL 963, 964

Location

A47 Switch module special equipment

The switch module special equipment (A47) is located at the left of the steering column in the lower area of the instrument panel.

W54.25-1163-11

Task

The switch module special equipment (A47):

- enables a simple electrical connection to be made between the ASIC switch and the ASIC data bus
- records the driver commands through the ASIC switches
- enable, where applicable, a variable arrangement of the ASIC switches

Design

The switch module special equipment (A47) has more than four slots for accommodating four ASIC switches and one ASIC plug connection for connection to the modular switch panel (MSF) control unit (A43).
The load and signal switches are assigned at the factory in a specified manner to the switch module special equipment (A47).

Movable switches can be located individually or as a block in other switch modules.
Non-movable switches cannot be located in other switch modules.

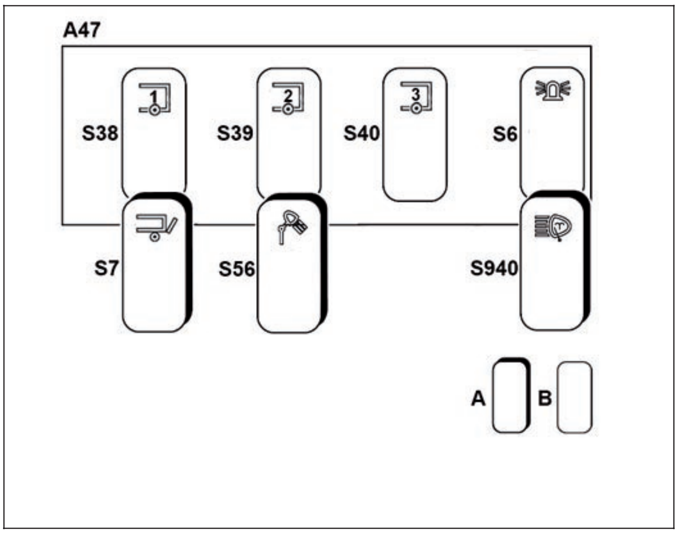
Factory location of switches and buttons

A47 Switch module special equipment

Signal switches
S7 Cargo liftgate button
S56 Work lamp button
S940 Headlamp cleaning system button

Load switches
S6 Rotating beacon switch
S38 Body manufacturer switch 1
S39 Body manufacturer switch 2
S40 Body manufacturer switch 3

A Signal switches, moveable
B Load switches, non-moveable



W54.25-1167-11

GF54.25-W-4117H	Roof switch modules, component description	6.7.11

MODEL 963, 964

Location

A48 Roof switch module 1
A49 Roof switch module 2

The roof switch modules 1, 2 (A48, A49) are located on the equipment carrier below the roof on the driver-side.

W54.25-1159-11

Task

The roof switch modules 1, 2 (A48, A49):
- enable a simple electrical connection to be made between the ASIC switch and the ASIC data bus
- record the driver commands through the ASIC switches
- enable, where applicable, a variable arrangement of the ASIC switches

Design

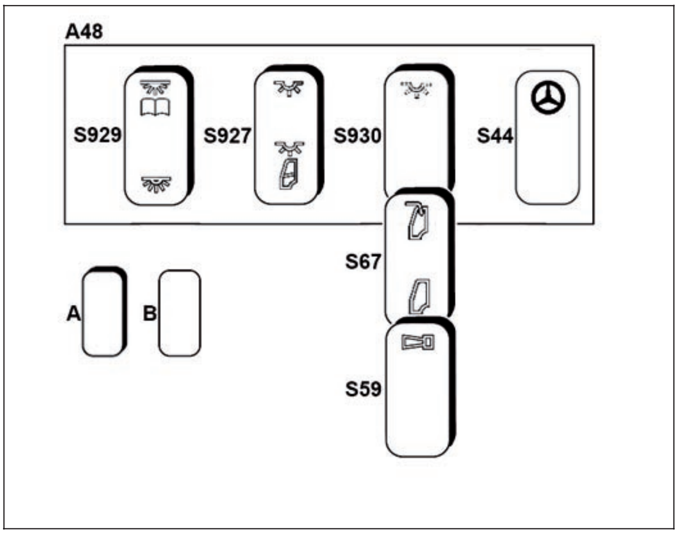
The roof switch modules 1, 2 (A48, A49) are each equipped with:
- four slots for accommodating four ASIC switches
- one ASIC plug connection for connecting to the modular switch panel (MSF) control unit (A43)
- one ASIC plug connection for mutual connection between two switch modules (only roof switch module 1 (A48))

The load and signal switches are specifically assigned to the roof switch modules 1, 2 (A48, A49).
Movable switches can be located individually or as a block in other switch modules.
Non-movable switches cannot be located in other switch modules.

Factory switch assignment on the roof 1 switch module
A48 Roof switch module 1

Signal switches
S59 Horn/air horn button
S67 Sliding roof/pop-up roof button
S927 Roof interior illumination button
S929 Reading lamp/night light button
S930 Ambiance illumination button
Load switches
S44 Illumination switch for Mercedes Stern

A Signal switches, moveable
B Load switches, non-moveable

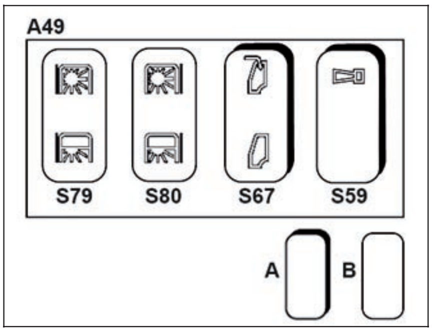


W54.25-1168-11

Factory switch assignment on the roof 2 switch module
A49 Roof switch module 2

Signal switch
S59 Horn/air horn button
S67 Sliding roof/pop-up roof button
Load switches
S79 Driver roller sun blind button
S80 Front passenger roller sun blind button

A Signal switches, moveable
B Load switches, non-moveable



W54.25-1169-01

GF54.25-W-4118H	Bunk switch modules, component description	6.7.11

MODEL 963, 964

Location

A50 Lower driver bunk switch module
A51 Upper driver bunk switch module

The lower driver bunk switch module (A50) is located above the lower bunk on the driver-side.
The upper driver bunk switch module (A51) is located above the upper bunk on the driver-side.

W54.25-1160-02

W54.25-1162-02

Task

The lower and upper driver bunk switch modules (A50, A51):

- enable a simple electrical connection to be made between the ASIC switch and the ASIC data bus
- record the driver commands through the ASIC switches
- enable, where applicable, a variable arrangement of the ASIC switches

Design

The lower and upper driver bunk switch modules (A50, A51) are each equipped with:

- four slots for accommodating four ASIC switches
- one ASIC plug connection for connecting to the modular switch panel (MSF) control unit (A43)
- one ASIC plug connection for mutual connection between two switch modules (only lower bunk switch module (A50))

The signal switches are assigned specifically at the factory to the lower and upper driver bunk switch modules (A50, A51).
The movable switches can be located individually or as a block in other switch modules.

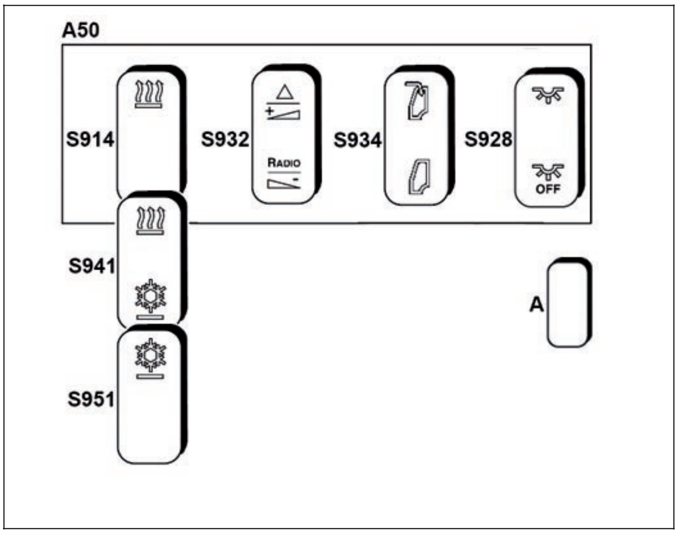
Factory switch assignment on lower driver bunk switch module

A50 Lower driver bunk switch module

Signal switches

S914 Lower bunk auxiliary heater button
S928 Lower bunk interior illumination button
S932 Lower bunk radio button
S934 Sliding roof/pop-up roof, lower bunk button
S941 Auxiliary heater and stationary air conditioning for lower bunk button
S951 Lower bunk stationary air conditioning button

A Signal switches, moveable



W54.25-1170-11

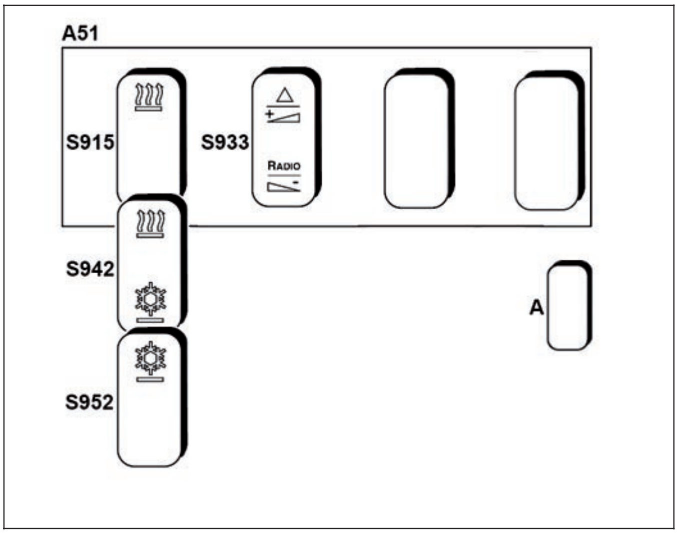
Factory switch assignment on upper driver bunk switch module

A51 Upper driver bunk switch module

Signal switches

S915 Upper bunk auxiliary heater button
S933 Upper bunk radio button
S942 Auxiliary heater and stationary air conditioning for upper bunk button
S952 Upper bunk stationary air conditioning button

A Signal switches, moveable



W54.25-1171-11

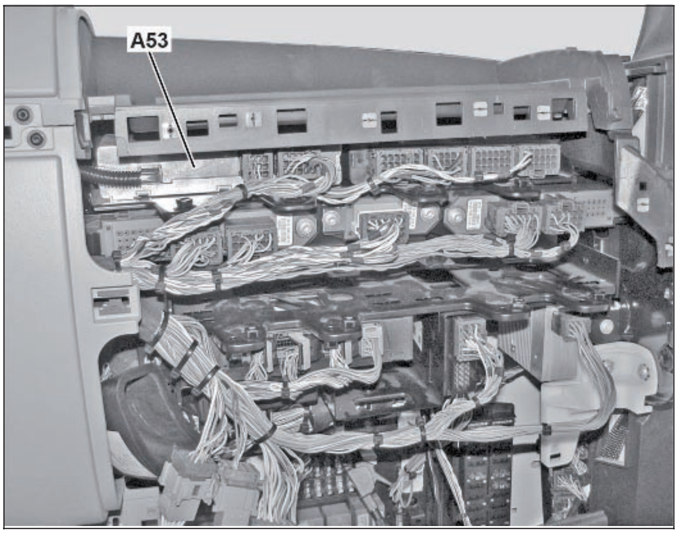
GF30.30-W-3112H	Component description for driver assistance system (VRDU) control unit	2.8.11

MODEL 963, 964

Location

A53 Driver assistance system (VRDU) control unit

The driver assistance system (VRDU) control unit (A53) is located in the electronics compartment on the front passenger side.



W30.30-1092-11

Task

Reading in of information
The driver assistance system (VRDU) control unit (A53) receives the following information:

- Image data for the Lane Assistant camera (A72) over a low voltage differential signal line
- Radar data from the front radar sensor (RDF) control unit (A15)
- Status of travel and speed sensor (B18)
- Status of accelerator pedal sensor (B44)
- Status of left multifunction control lever (S20)
- Status of left multifunction steering wheel button group (S110)
- Status of right multifunction steering wheel button group (S111)
- Status of Lane Assistant OFF button (S925)
- Status of Active Brake Assist (ABA) button (S926)
- Status of Electronic Stability Program (ESP®)
- Status of Electronic Brake Control (EBS)
- Status of transmission automation
- Status of engine management
- Status of front axle axle modulator
- Status of rear axle axle modulator
- Parking brake status
- Vehicle level status

Evaluation of input factors
The input information is evaluated by the integrated microprocessors and the relevant components are then actuated.

Transmission of requests
The driver assistance system (VRDU) control unit (VRDU) (A53) transmits the following requests:

- Reducing the radio volume
- Radio muting
- Brake torque
- Warning indicator and warning tones
- Reducing the specified engine torque
- Permanent brake
- Gear stage limitation

GF49.20-W-3009HA	EATU output NOx sensor, component description	2.8.11

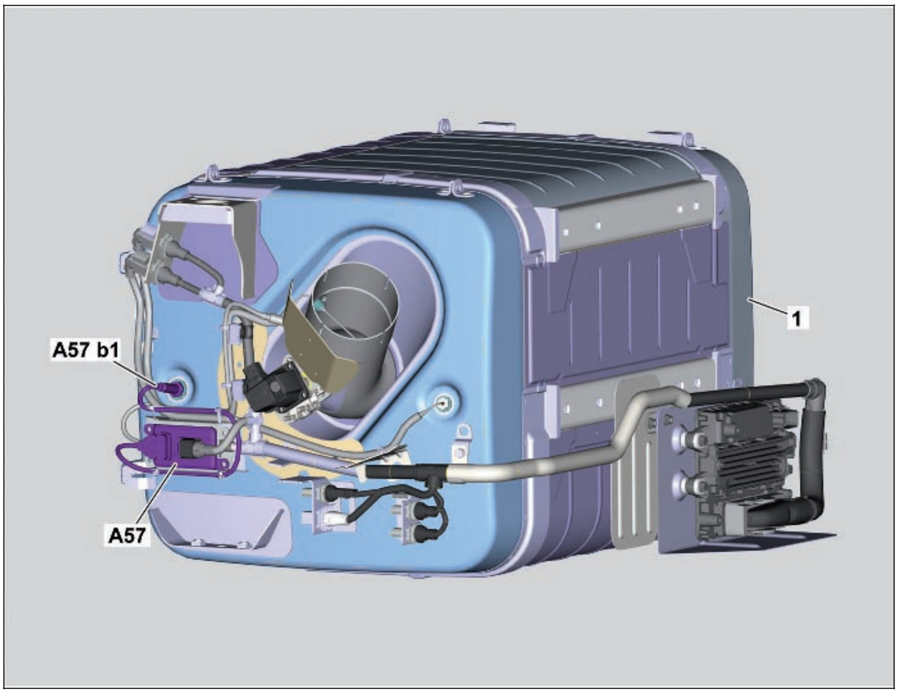
ENGINES 471.9 in MODEL 963, 964 with CODE (M5Y) Engine version Euro V
ENGINES 471.9 in MODEL 963, 964 with CODE (M5R) Engine version EEV

Location

1 Exhaust aftertreatment unit

A57 EATU output NOx sensor control unit
A57 b1 EATU output NOx sensor

The EATU output NOx sensor (A57 b1) is screwed into the inlet tube of the exhaust aftertreatment unit (1) from the outside and forms one unit together with the EATU output NOx sensor control unit (A57).



W14.40-1595-76

Task

The EATU output NOx sensor (A57 b1) represents the actual measurement sensor, whereas the EATU output NOx sensor electronic control unit (A57) is used to compute the NOx raw concentration in the exhaust before exhaust aftertreatment by the SCR catalytic converter and ammonia slip catalytic converter.

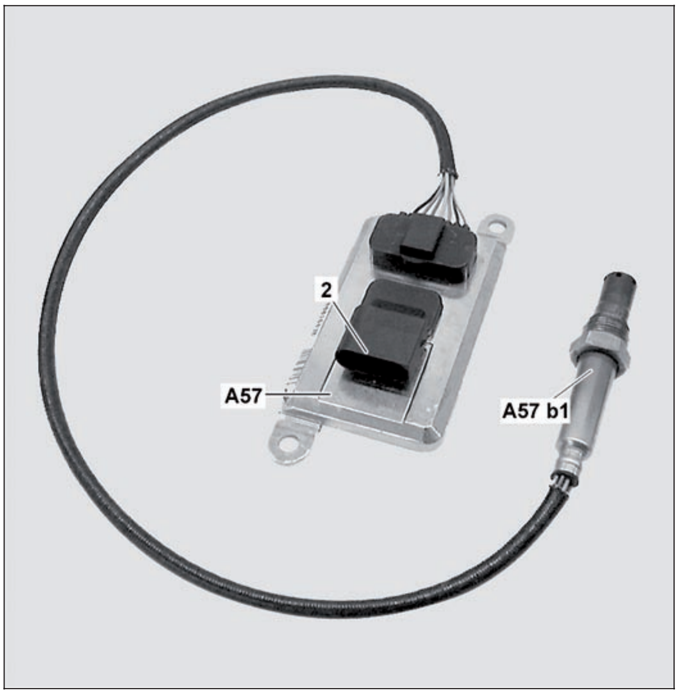
Design

2 Electrical connection

A57 EATU output NOx sensor control unit
A57 b1 EATU output NOx sensor

The EATU output NOx sensor control unit (A57) and the EATU output NOx sensor (A57 b1) are connected to each other via a non-separable electrical line and form one unit.

The EATU output NOx sensor (A57 b1) is similar in design to a wide-band oxygen sensor. It is fitted with its basic elements such as the so-called Nernst cell and the oxygen pump cell.
Its front part in the measuring probe which projects out into the exhaust consists of a metal housing with openings and a gas-permeable ceramic body inside made out of zirconium dioxide.



W14.40-1586-12

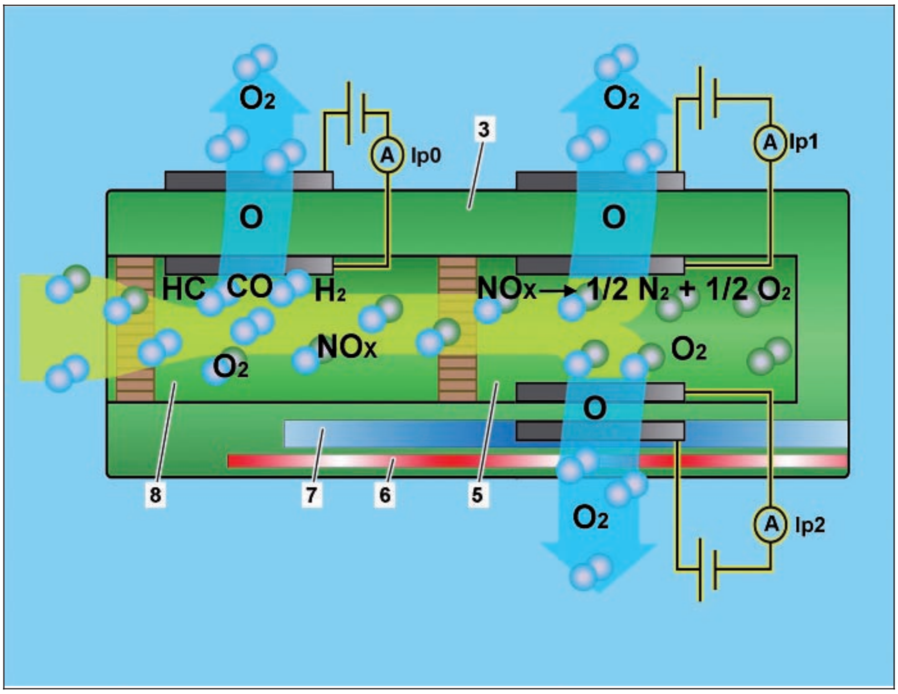
The surfaces of the ceramic body are fitted on both sides with electrodes made out of a thin platinum layer. The measuring probe is in contact with outside air via a reference air duct.
The metal housing protects the ceramic body inside against mechanical stress and sudden increases in temperature.

The EATU output NOx sensor (A57 b1) is fitted with an integral heating element which serves to rapidly achieve the required operating temperature of about 800 °C for the chemical processes taking place therein.
The electrical line between the EATU output NOx sensor (A57 b1) and the EATU output NOx sensor control unit (A57) has a defined length of approx. 60 mm.

Function

3 Measuring probe (ceramic body)
5 Chamber
6 Heating element
7 Reference air duct
8 Chamber

Ip0 Pump current (main pump electrode)
Ip1 Pump current (auxiliary pump electrode)
Ip2 Pump current (measuring electrode)



W14.40-1350-76

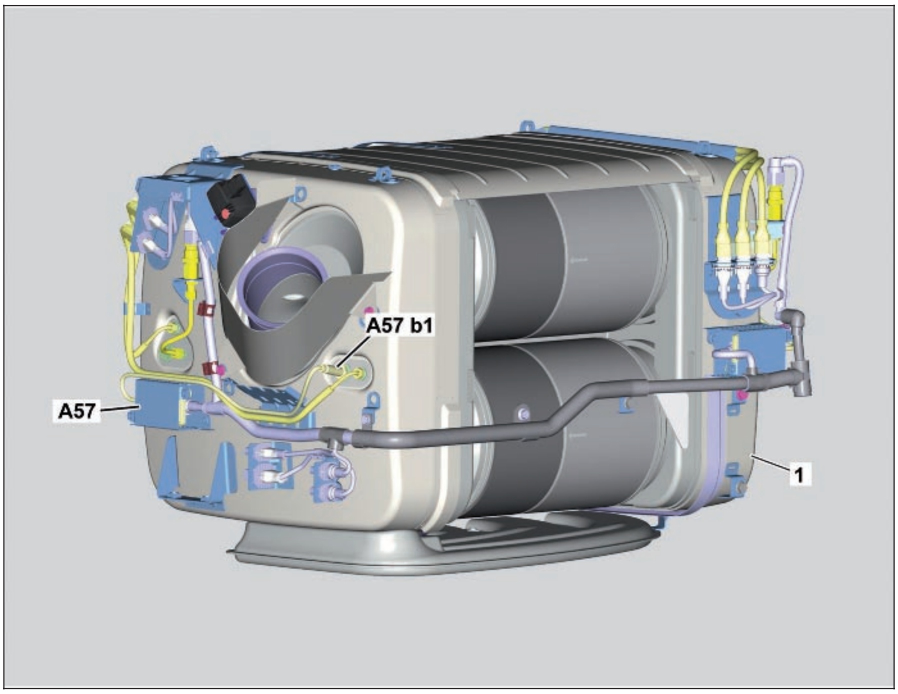
The EATU output NOx sensor (A57 b1) functions according to the principle of the so-called oxygen ions line according to which the wide-band oxygen sensor also functions.
Part of the exhaust flowing past the measuring probe (3) passes through a diffusion barrier into the first chamber (8).
In this case, the O_2 concentration is regulated at a defined value by means of the so-called pump voltage applied to an electrode until the oxygen content differs on either side of the ceramic body.
The special properties of the ceramic body create the signal voltage (Nernst voltage) at its friction planes. This is the measure for the residual oxygen content in the exhaust.
The traces of HC, CO and H_2 in the exhaust oxygenate at the electrode made out of platinum. The gas then passes over a further diffusion barrier and arrives in the second chamber (5) where it is broken down with the aid of a second NOx electrode into NO and O_2.

The O_2 concentration is also regulated to close to zero at the same time with the aid of a further electrode. The nitrous oxide concentration is deduced from the size of the pump current (Ip2) required.
The EATU output NOx sensor control unit (A57) is used to compute the required pump voltages, to regulate the complex system and to compute the NOx raw values. It receives the analog signals from the EATU output NOx sensor (A57 b1) and digitizes them. It then forwards them as digital CAN messages to the exhaust aftertreatment (ACM) control unit (A60) at a defined transfer rate, which then evaluates them.

GF49.20-W-3009H	Exhaust aftertreatment unit outlet NOx sensor, component description	20.7.11

ENGINES 471.9 in MODEL 963, 964 with CODE (M5Z) Engine version Euro VI

Location



W14.40-1585-76

1 Exhaust aftertreatment unit:

A57 Exhaust aftertreatment unit outlet NOx sensor control unit
A57 b1 Exhaust aftertreatment unit outlet NOx sensor

The exhaust aftertreatment unit outlet NOx sensor (A57 b1) is screwed in from the outside in the deflection chamber upstream of the diesel oxidation catalytic converter (DOC).
The exhaust aftertreatment unit outlet NOx sensor (A57) is attached to a bracket at the exhaust aftertreatment unit (1). Both components form a single unit.

Task

The exhaust aftertreatment unit outlet NOx sensor (A57 b1) represents the actual measuring probe, whereas the exhaust aftertreatment unit outlet NOx sensor electronic control unit (A57) is used to calculate the raw NOx concentration in the exhaust upstream of the exhaust aftertreatment by the diesel oxidation catalytic converter (DOC), the diesel particulate filter (DPF) and the SCR catalytic converter.

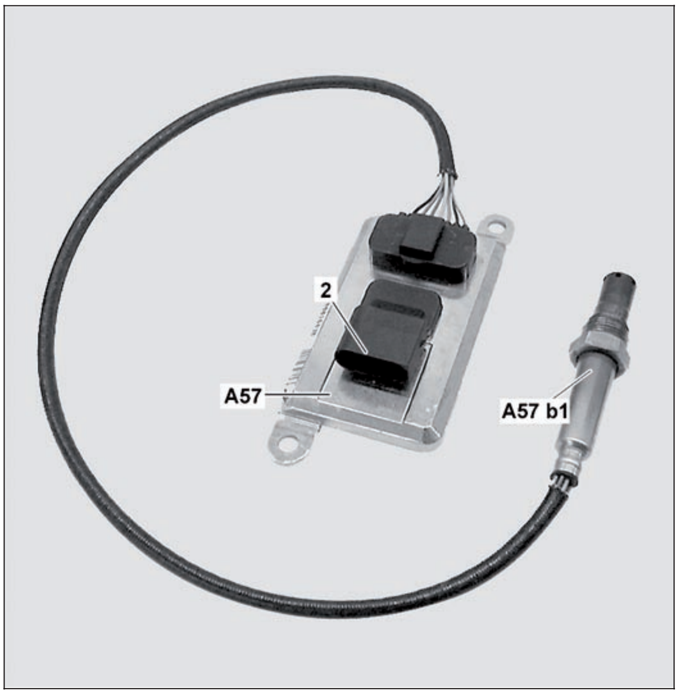
Design

2 *Electrical connection*

A57 *Exhaust aftertreatment unit outlet NOx sensor control unit*
A57 b1 *Exhaust aftertreatment unit outlet NOx sensor*

The exhaust aftertreatment unit outlet NOx sensor control unit (A57) and the exhaust aftertreatment unit outlet NOx sensor (A57 b1) are interconnected via an electrical line that cannot be disconnected, and form a single unit.

The exhaust aftertreatment unit outlet NOx sensor (A57 b1) has a similar design to a wide-band oxygen sensor. It is fitted with its basic elements such as the so-called Nernst cell and the oxygen pump cell.
Its front part in the measuring probe which projects out into the exhaust consists of a metal housing with openings and a gas-permeable ceramic body inside made out of zirconium dioxide.



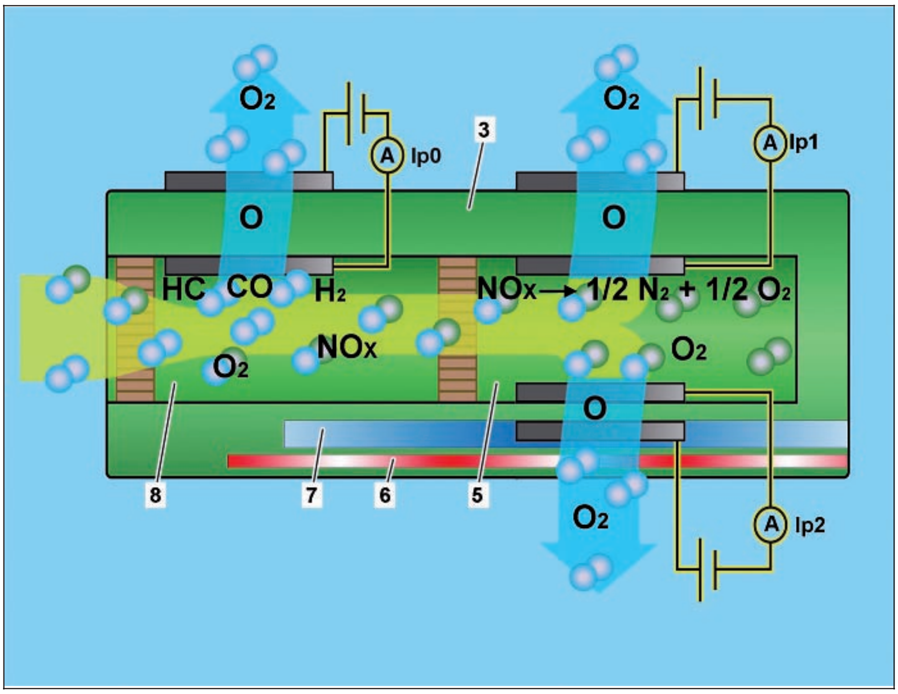
W14.40-1586-12

The surfaces of the ceramic body are fitted on both sides with electrodes made out of a thin platinum layer. The measuring probe is in contact with outside air via a reference air duct.
The metal housing protects the ceramic body inside against mechanical stress and sudden increases in temperature.

The exhaust aftertreatment unit outlet NOx sensor (A57 b1) is fitted with an integral heating element which serves to rapidly achieve the operating temperature of about 800 °C that is required for the chemical processes taking place therein.
The electrical line between the exhaust aftertreatment unit outlet NOx sensor (A57 b1) and the exhaust aftertreatment unit outlet NOx sensor control unit (A57) has a defined length of approx. 60 mm.

Function

3	*Measuring probe (ceramic body)*
5	*Chamber*
6	*Heating element*
7	*Reference air duct*
8	*Chamber*
Ip0	*Pump current (main pump electrode)*
Ip1	*Pump current (auxiliary pump electrode)*
Ip2	*Pump current (measuring electrode)*



W14.40-1350-76

The exhaust aftertreatment unit outlet NOx sensor (A57 b1) functions according to the principle of the so-called oxygen ions line, according to which the wideband oxygen sensor also functions.
Part of the exhaust flowing past the measuring probe (3) passes through a diffusion barrier into the first chamber (8).
In this case the O_2 concentration is regulated at a defined value by means of the so-called pump voltage applied to an electrode until the oxygen content differs at both sides of the ceramic body.
The special properties of the ceramic body create the signal voltage (Nernst voltage) at its boundary surfaces. This is the measure for the residual oxygen content in the exhaust.
The traces of HC, CO and H_2 in the exhaust oxygenate at the electrode made out of platinum.

The gas then passes over a further diffusion barrier and arrives in the second chamber (5) where it is broken down with the aid of a second NOx electrode into NO and O_2. The O_2 concentration is also regulated to close to zero at the same time with the aid of a further electrode. The nitrous oxide concentration is deduced from the size of the pump current (Ip2) required.
The exhaust aftertreatment unit outlet NOx sensor (A57) serves to compute the required pump voltages, to regulate the complex system and to compute the NOx raw values.It receives the analog signal from the exhaust aftertreatment unit outlet NOx sensor (A57 b1) and digitalizes it. It forwards these as digital CAN signals at a defined transfer rate to the exhaust aftertreatment control unit (ACM) (A60), which then evaluates them.

GF14.40-W-3003H	Pump module, component description	20.7.11

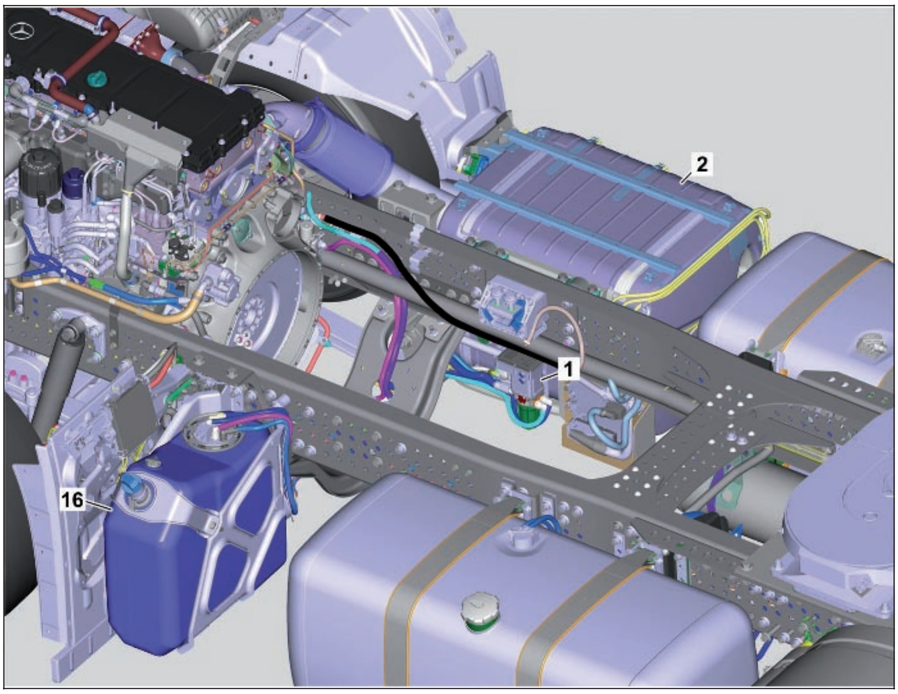
ENGINE 471.9 in MODEL 963, 964

Location

Shown on model 963 with code (M5Z)
Engine version Euro VI

1 Pump module
2 EATU
16 AdBlue® tank

The pump module (1) which contains the SCR control unit (A58) and SCR delivery pump (M25) is fastened to a bracket on the inside of the right longitudinal frame member behind the EATU (2).



W14.40-1562-76

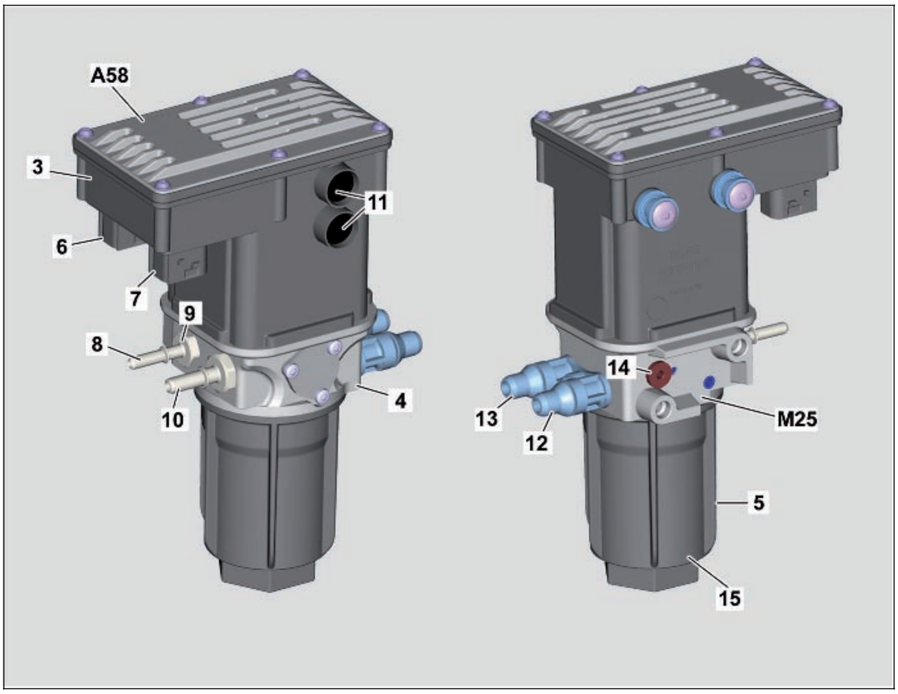
Task

The pump module (1) sucks in AdBlue® from the AdBlue® container (16), filters it and pumps it to the AdBlue® metering device (A67). The SCR control unit (A58) calculates the injection period and the injection quantity.

Design

3 Electronics housing
4 Connecting body
5 Filter housing
6 Electrical connection (communication to AdBlue® metering device)
7 Electrical connection (communication to exhaust aftertreatment (ACM) control unit)
8 AdBlue® inlet
9 Intake filter (mesh size 190 μm)
10 AdBlue outlet
11 Vent valves
12 Coolant inlet
13 Coolant outlet
14 Pressure limiting valve
15 Main filter (mesh size 20 to 30 μm)

A58 SCR control unit
M25 SCR delivery pump

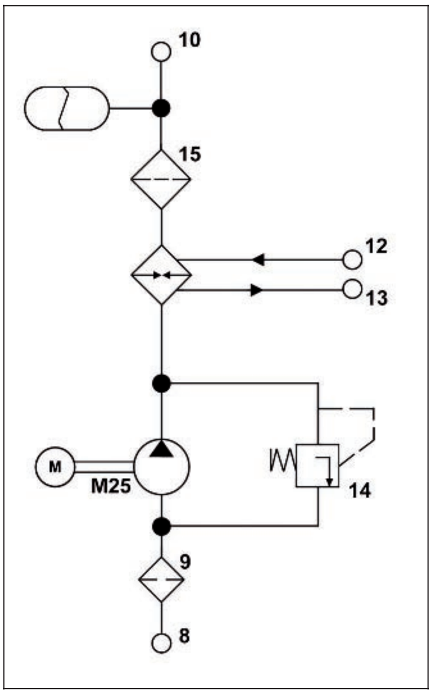


W14.40-1570-76

Function

8 AdBlue® inlet
9 Intake filter
10 AdBlue® outlet
12 Coolant inlet
13 Coolant outlet
14 Pressure limiting valve
15 Main filter

M25 SCR delivery pump



W14.40-1560-03

After the engine starts, the exhaust aftertreatment (ACM) control unit (A60) actuates the pump module (1) or more accurately, the SCR control unit (A58) integrated into it. This switches the SCR delivery pump (M25), so that AdBlue® is sucked in from the AdBlue® container and pumped at an operating pressure of approx. 10 bar towards the AdBlue® metering device (A67).

Because the AdBlue® metering device (A67) is cooled be circulation through circulating AdBlue®, AdBlue® is pumped continuously, irrespective of whether injection is necessary or not. The AdBlue® that is not required or not injected flows back through the return line to the AdBlue® container.

Heating
A duct inside the connecting body (4) enables the pump module (1) to have engine coolant flow through it for heating or defrosting. The coolant inflow is regulated by an engine mounted solenoid valve as a function of the temperature by the engine management (MCM) control unit (A60).

Delayed-off running
To avoid any damage through overheating on the AdBlue® metering device (A67), the pump module (1) continues to pump AdBlue® for some time after the engine stops so that the cooling can be maintained for a longer period.

GF14.40-W-3020HA	Exhaust aftertreatment (ACM) control unit, component description	20.7.11

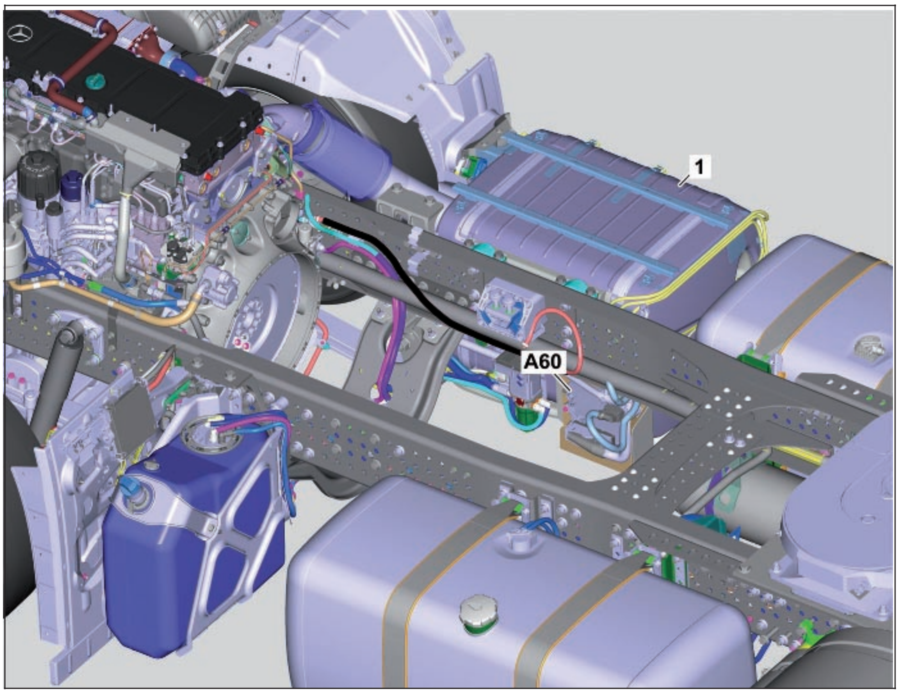
ENGINE 471.9 in MODEL 963, 964 with CODE (M5Y) Engine version Euro V
ENGINE 471.9 in MODEL 963, 964 with CODE (M5R) Engine version EEV

Location

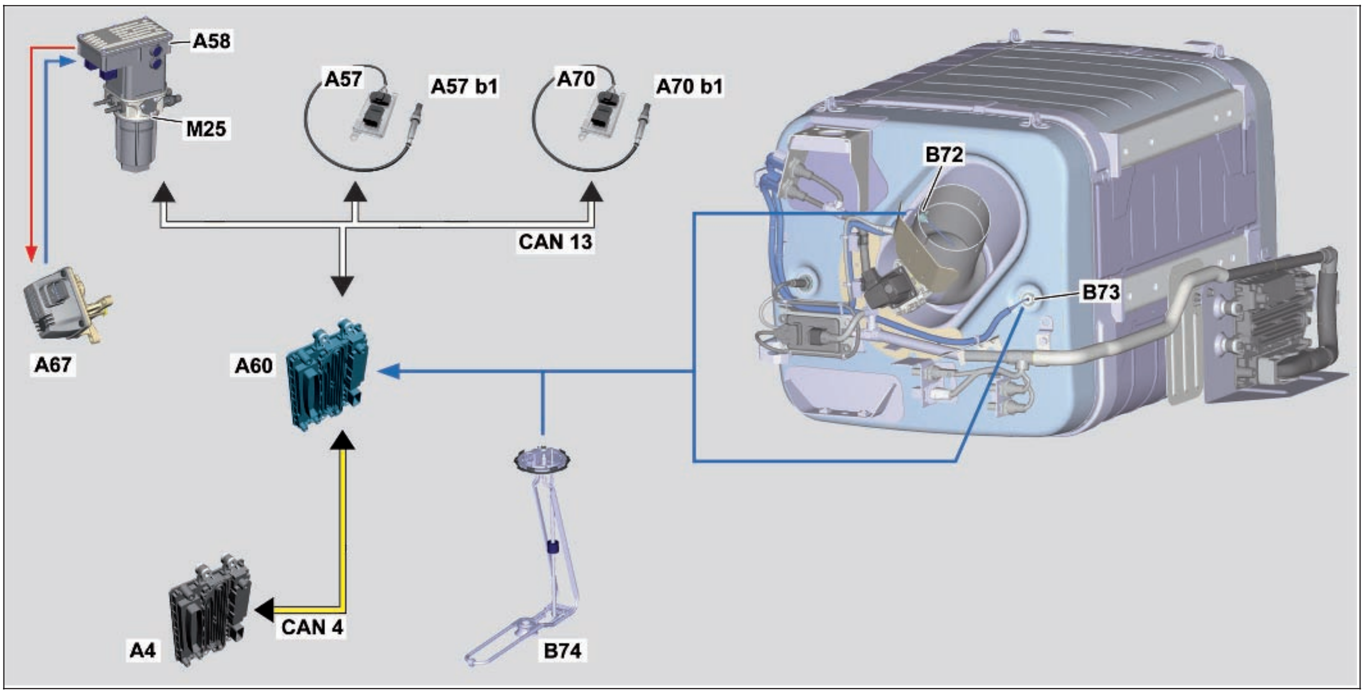
1 *Exhaust aftertreatment unit*

A60 *Exhaust aftertreatment (ACM) control unit*

The exhaust aftertreatment (ACM) control unit (A60) is fastened to a bracket on the inside of the EATU (1).



W14.40-1568-76



W14.40-1598-79

A4	*Engine management control unit (MCM)*
A57	*NOx sensor control unit output for exhaust aftertreatment unit*
A57 b1	*NOx sensor output for exhaust aftertreatment unit*
A58	*SCR control unit (in pump module)*
A60	*Exhaust aftertreatment (ACM) control unit*
A67	*AdBlue® metering device*
A70	*NOx sensor control unit input for exhaust aftertreatment unit*
A70 b1	*NOx sensor input for exhaust aftertreatment unit*
B72	*Exhaust temperature sensor upstream of SCR catalytic converter*
B73	*Exhaust temperature sensor downstream of SCR catalytic converter*
B74	*AdBlue® fill level sensor/ temperature sensor*
CAN 4	*Drive train CAN*
CAN 13	*NOx-CAN*
M25	*SCR delivery pump (in pump module)*

Task

The exhaust aftertreatment (ACM) control unit (A60) regulates and controls practically all the exhaust aftertreatment system functions.
The exhaust aftertreatment (ACM) control unit (A60) receives the analog signals from the directly connected sensors. It receives the NOx sensor signals over CAN connections and communicates with the SCR control unit (A58) and the engine management (MCM) control unit (A4).

AdBlue® injection
It uses the data supplied by the SCR control unit (A58) and the engine management (MCM) control unit (A4) to calculate the required AdBlue® quantity, which is then sent over the SCR control unit (A58) to the AdBlue® metering device (A67).

GF14.40-W-3020H	Exhaust aftertreatment (ACM) control unit, component description	20.7.11

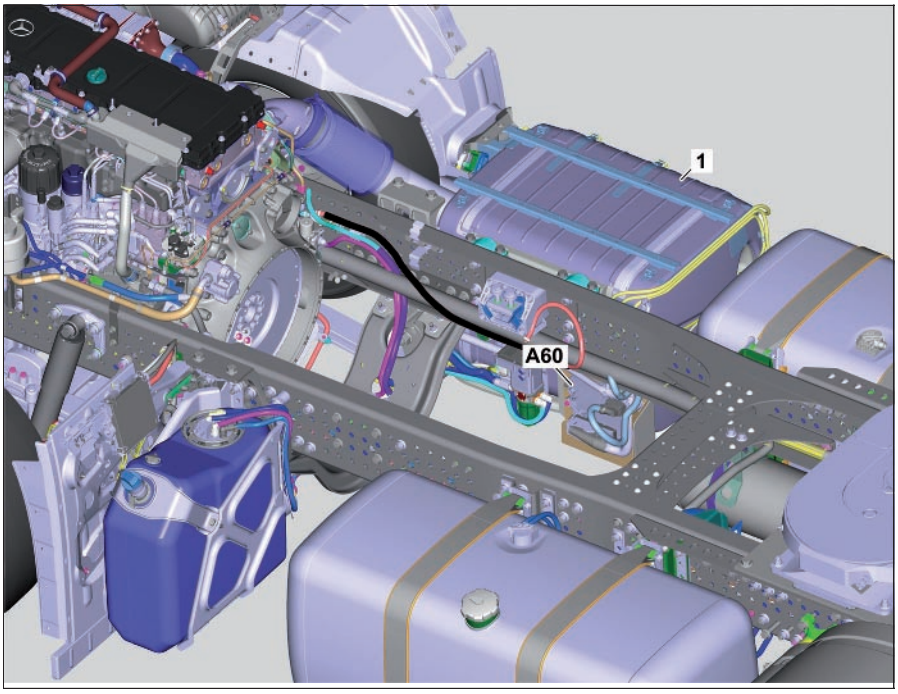
ENGINE 471.9 in MODEL 963 with CODE (M5Z) Engine version Euro VI

Location

1 *Exhaust aftertreatment unit*

A60 *Exhaust aftertreatment (ACM) control unit*

The exhaust aftertreatment (ACM) control unit (A60) is fastened to a bracket on the inside of the EATU (1).

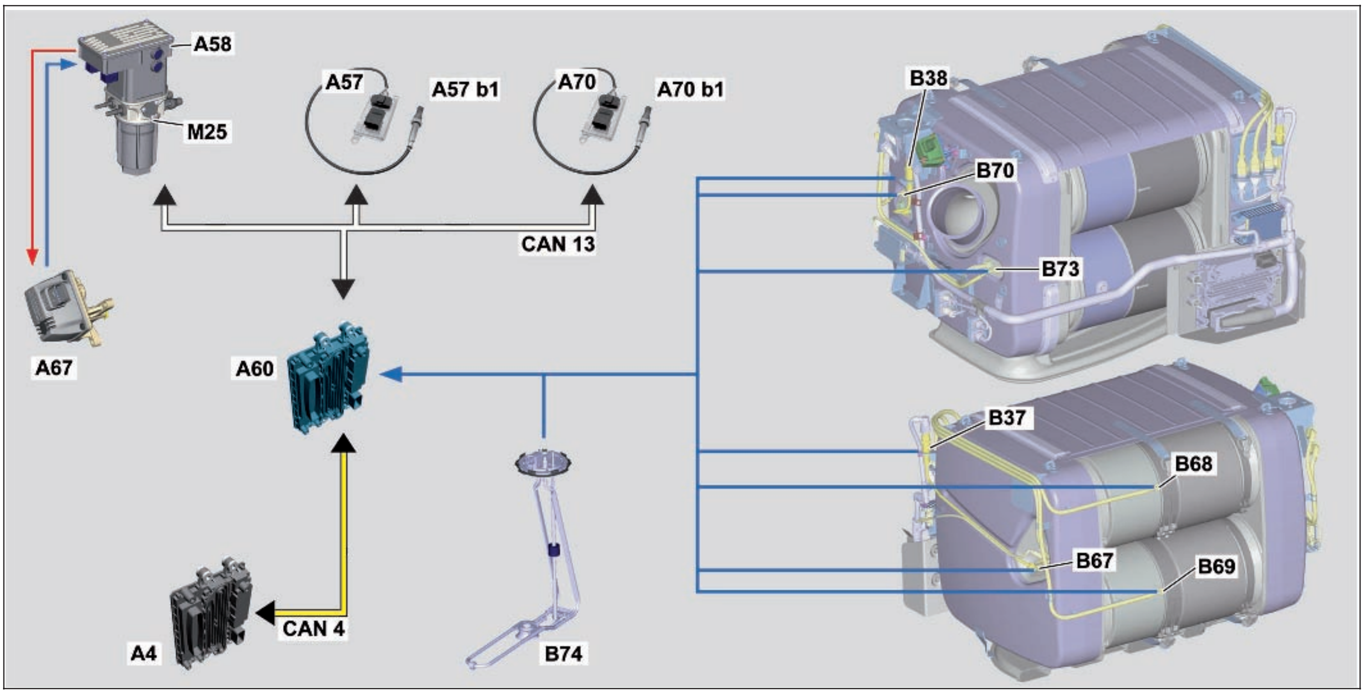


W14.40-1568-76

Task

The exhaust aftertreatment (ACM) control unit (A60) regulates and controls practically all the exhaust aftertreatment system functions.

It also processes the incoming digital and analog signals of the connected sensor system and communicates over CAN connections with the connected control units.



W14.40-1597-79

A4	*Engine management control unit (MCM)*
A57	*NOx sensor control unit output for exhaust aftertreatment unit*
A57 b1	*NOx sensor output for exhaust aftertreatment unit*
A58	*SCR control unit*
A60	*Exhaust aftertreatment unit (ACM) control unit*
A67	*AdBlue® metering device*
A70	*NOx sensor control unit input for exhaust aftertreatment unit*
A70 b1	*NOx sensor input for exhaust aftertreatment unit*
B37	*Exhaust pressure sensor upstream of diesel oxidation catalytic converter*
B38	*Exhaust pressure sensor downstream of diesel particulate filter*
B67	*Exhaust temperature sensor upstream of diesel oxidation catalytic converter*
B68	*Exhaust temperature sensor downstream of upper diesel oxidation catalytic converter*
B69	*Exhaust temperature sensor downstream of lower diesel oxidation catalytic converter*
B70	*Exhaust temperature sensor downstream of diesel particulate filter*
B73	*Exhaust temperature sensor downstream of SCR catalytic converter*
B74	*AdBlue® fill level sensor/temperature sensor*
CAN 4	*Drive train CAN*
CAN 13	*NOx-CAN*
M25	*SCR delivery pump*

The exhaust aftertreatment (ACM) control unit (A60) receives the analog signals from the directly connected sensors. It receives the NOx sensor signals over CAN connections and communicates with the SCR control unit (A58) and the engine management (MCM) control unit (A4).

AdBlue® injection
It uses the data supplied by the SCR control unit (A58) and the engine management (MCM) control unit (A4) to calculate the required AdBlue® quantity, which is then forwarded over the SCR control unit (A58) to the AdBlue® metering device (A67).

Diesel particulate filter regeneration
The diesel particulate filter load status is monitored by the temperature and pressure sensors. If active regeneration is required, it is requested by the engine management (MCM) control unit (A4).

GF49.20-W-3008HA	EATU input NOx sensor, component description	2.8.11

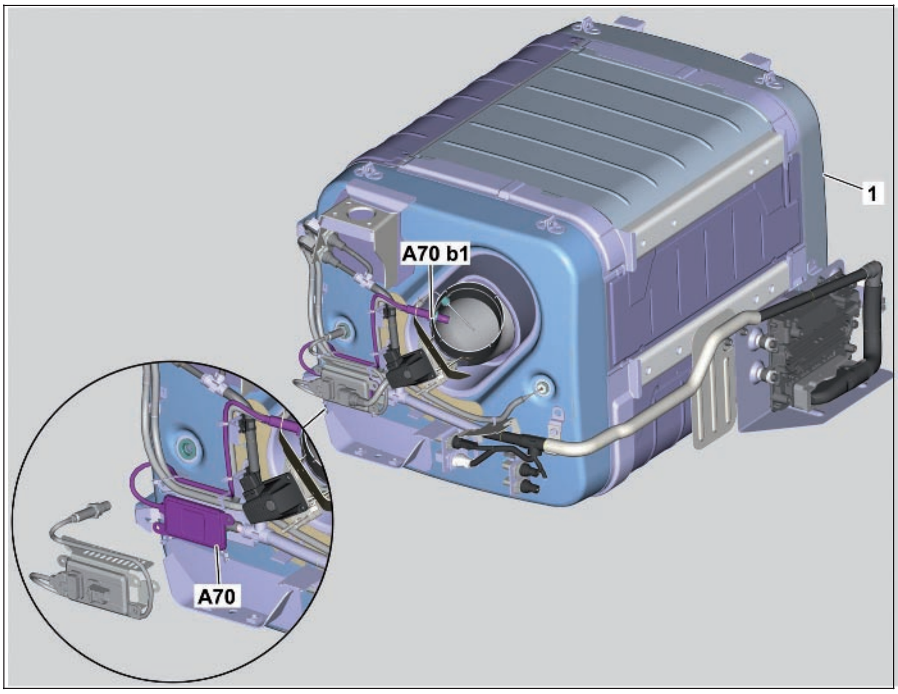
ENGINES 471.9 in MODEL 963, 964 with CODE (M5Y) Engine version Euro V
ENGINES 471.9 in MODEL 963, 964 with CODE (M5R) Engine version EEV

Location

1 Exhaust aftertreatment unit

A70 EATU input NOx sensor control unit
A70 b1 EATU input NOx sensor

The EATU input NOx sensor (A70 b1) is screwed into the chamber downstream of the SCR catalytic converter and ammonia slip catalytic converter from the outside and forms one unit together with the EATU input NOx sensor control unit (A70).



W14.40-1596-76

Task

The EATU input NOx sensor (A70 b1) represents the actual measurement sensor, whereas the EATU input NOx sensor electronic control unit (A70) is used to compute the NOx concentration in the exhaust after exhaust aftertreatment by the SCR catalytic converter and ammonia slip catalytic converter.

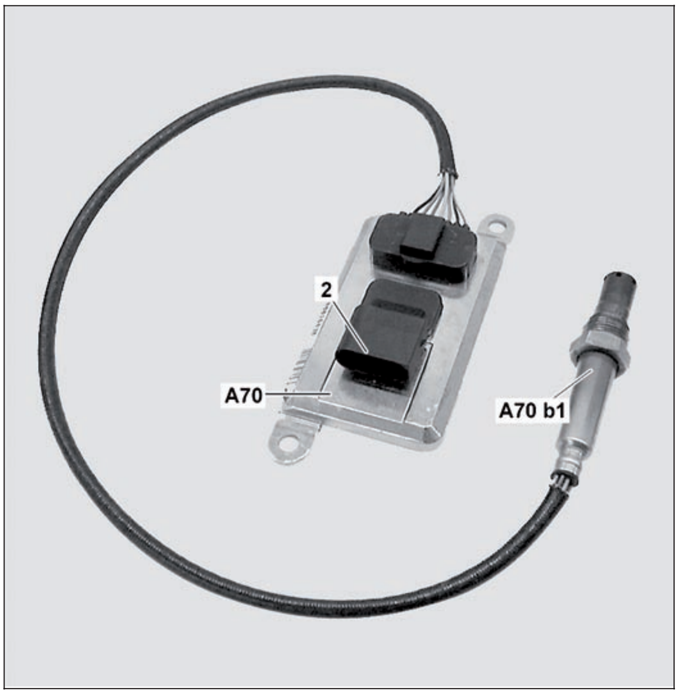
Design

2 Electrical connection

A70 EATU input NOx sensor control unit
A70 b1 EATU input NOx sensor

The EATU input NOx sensor control unit (A70) and the EATU input NOx sensor (A70 b1) are connected to each other via a non-separable electrical line and form one unit.

The EATU input NOx sensor (A70 b1) is similar in design to a wide-band oxygen sensor. It is fitted with its basic elements such as the so-called Nernst cell and the oxygen pump cell.
Its front part in the measuring probe which projects out into the exhaust consists of a metal housing with openings and a gas-permeable ceramic body inside made out of zirconium dioxide.



W14.40-1587-12

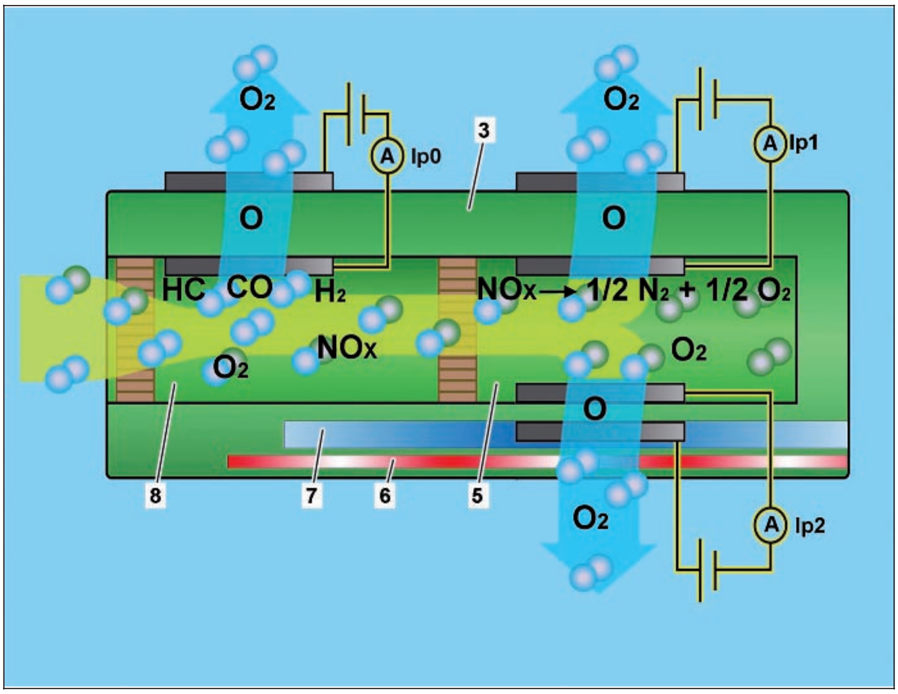
The surfaces of the ceramic body are fitted on both sides with electrodes made out of a thin platinum layer. The measuring probe is in contact with outside air via a reference air duct.
The metal housing protects the ceramic body inside against mechanical stress and sudden increases in temperature.

The EATU input NOx sensor (A70 b1) is fitted with an integral heating element which serves to rapidly achieve the required operating temperature of about 800 °C for the chemical processes taking place therein.
The electrical line between the EATU input NOx sensor (A70 b1) and the EATU input NOx sensor control unit (A70) has a defined length of approx. 60 mm.

Function

3 Measuring probe (ceramic body)
5 Chamber
6 Heating element
7 Reference air duct
8 Chamber

Ip0 Pump current (main pump electrode)
Ip1 Pump current (auxiliary pump electrode)
Ip2 Pump current (measuring electrode)



W14.40-1350-76

The EATU input NOx sensor (A70 b1) functions according to the principle of the so-called oxygen ions line according to which the wide-band oxygen sensor also functions.
Part of the exhaust flowing past the measuring probe (3) passes through a diffusion barrier into the first chamber (8).
In this case, the O_2 concentration is regulated at a defined value by means of the so-called pump voltage applied to an electrode until the oxygen content differs on either side of the ceramic body.
The special properties of the ceramic body create the signal voltage (Nernst voltage) at its friction planes. This is the measure for the residual oxygen content in the exhaust.
The traces of HC, CO and H_2 in the exhaust oxygenate at the electrode made out of platinum.

The gas then passes over a further diffusion barrier and arrives in the second chamber (5) where it is broken down with the aid of a second NOx electrode into NO and O_2. The O_2 concentration is also regulated to close to zero at the same time with the aid of a further electrode. The nitrous oxide concentration is deduced from the size of the pump current (Ip2) required. The EATU input NOx sensor control unit (A70) is used to compute the required pump voltages, to regulate the complex system and to compute the NOx raw values. It receives the analog signals from the EATU input NOx sensor (A70 b1) and digitizes them. It then forwards them as digital CAN signals to the exhaust aftertreatment (ACM) control unit (A60) at a defined transfer rate, which then evaluates them.

GF49.20-W-3008H	Exhaust aftertreatment unit inlet NOx sensor, component description	20.7.11

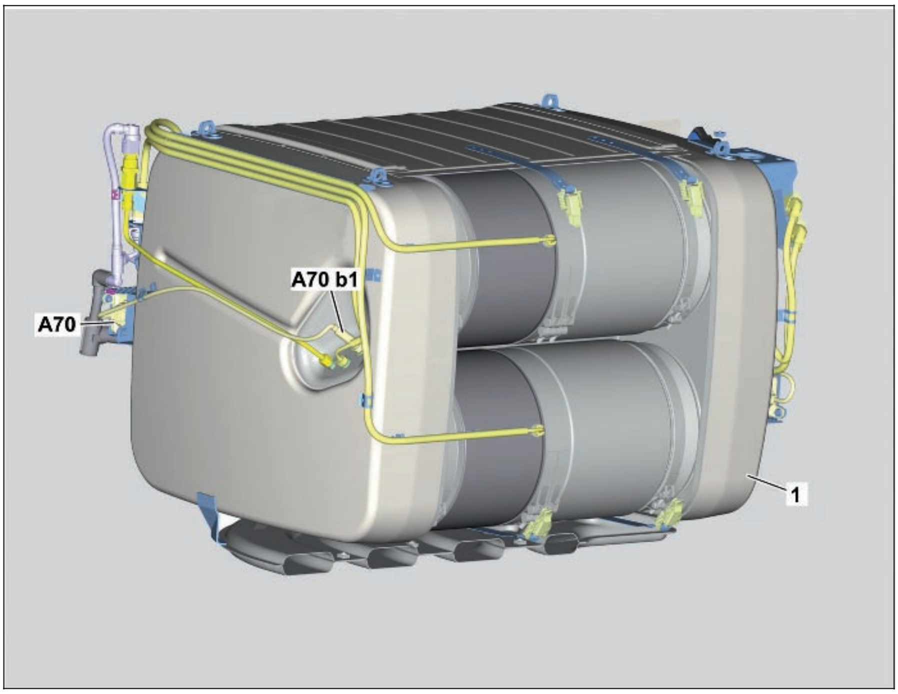
ENGINES 471.9 in MODEL 963, 964 with CODE (M5Z) Engine version Euro VI

Location

1 *Exhaust aftertreatment unit:*

A70 *Exhaust aftertreatment unit inlet NOx sensor control unit*
A70 b1 *Exhaust aftertreatment unit inlet NOx sensor*

The exhaust aftertreatment unit inlet NOx sensor (A70 b1) is screwed in from the outside in the chamber downstream of the SCR catalytic converter and the ammonia blocking catalytic converter.
The exhaust aftertreatment unit inlet NOx sensor (A70) is attached to a bracket at the exhaust aftertreatment unit (1). Both components form a single unit.



W14.40-1582-76

Task

The exhaust aftertreatment unit inlet NOx sensor (A70 b1) represents the actual measuring probe, whereas the exhaust aftertreatment unit inlet NOx sensor control unit (A70) is used to calculate the NOx concentration in the exhaust downstream of the exhaust aftertreatment by the diesel oxidation catalytic converter (DOC), the diesel particulate filter (DPF) and the SCR catalytic converter.

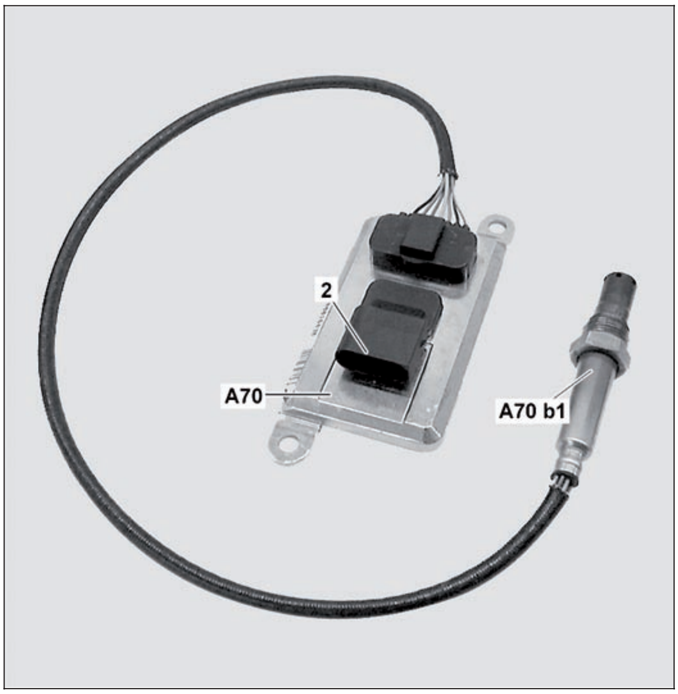
Design

2 *Electrical connection*

A70 *Exhaust aftertreatment unit inlet NOx sensor control unit*
A70 b1 *Exhaust aftertreatment unit inlet NOx sensor*

The exhaust aftertreatment unit inlet NOx sensor control unit (A70) and the exhaust aftertreatment unit inlet NOx sensor (A70 b1) are interconnected via an electrical line that cannot be disconnected, and form a single unit.

The exhaust aftertreatment unit inlet NOx sensor (A70 b1) has a similar design to a wide-band oxygen sensor. It is fitted with its basic elements such as the so-called Nernst cell and the oxygen pump cell.



W14.40-1587-12

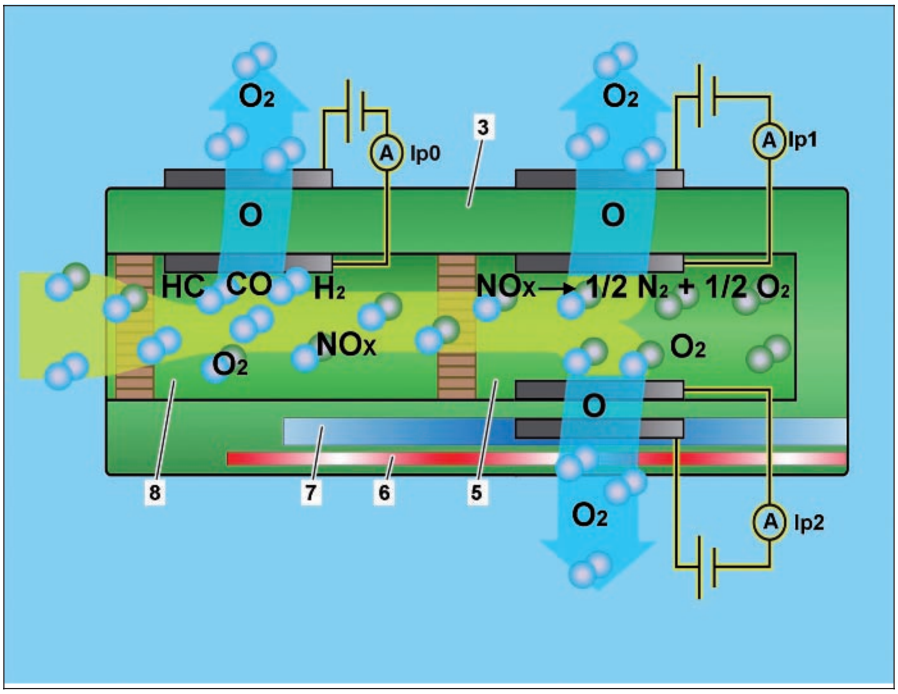
Its front part in the measuring probe which projects out into the exhaust consists of a metal housing with openings and a gas-permeable ceramic body inside made out of zirconium dioxide. The surfaces of the ceramic body are fitted on both sides with electrodes made out of a thin platinum layer. The measuring probe is in contact with outside air via a reference air duct.
The metal housing protects the ceramic body inside against mechanical stress and sudden increases in temperature.

The exhaust aftertreatment unit inlet NOx sensor (A70 b1) is fitted with an integral heating element which serves to rapidly achieve the operating temperature of about 800 °C that is required for the chemical processes taking place therein.
The electrical line between the exhaust aftertreatment unit inlet NOx sensor (A70 b1) and the exhaust aftertreatment unit inlet NOx sensor control unit (A70) has a defined length of approx. 60 mm.

Function

3 Measuring probe (ceramic body)
5 Chamber
6 Heating element
7 Reference air duct
8 Chamber

Ip0 Pump current (main pump electrode)
Ip1 Pump current (auxiliary pump electrode)
Ip2 Pump current (measuring electrode)



W14.40-1350-76

The exhaust aftertreatment unit inlet NOx sensor (A70 b1) functions according to the principle of the so-called oxygen ions line according to which the wideband oxygen sensor also functions.
Part of the exhaust flowing past the measuring probe (3) passes through a diffusion barrier into the first chamber (8).
In this case the O_2 concentration is regulated at a defined value by means of the so-called pump voltage applied to an electrode until the oxygen content differs at both sides of the ceramic body.
The special properties of the ceramic body create the signal voltage (Nernst voltage) at its boundary surfaces. This is the measure for the residual oxygen content in the exhaust.
The traces of HC, CO and H_2 in the exhaust oxygenate at the electrode made out of platinum.

The gas then passes over a further diffusion barrier and arrives in the second chamber (5) where it is broken down with the aid of a second NOx electrode into NO and O_2. The O_2 concentration is also regulated to close to zero at the same time with the aid of a further electrode. The nitrous oxide concentration is deduced from the size of the pump current (Ip2) required.
The exhaust aftertreatment unit inlet NOx sensor control unit (A70) serves to compute the required pump voltages, to regulate the complex system and to compute the NOx raw values.It receives the analogue sensor signals and digitizes them. It forwards these as digital CAN signals at a defined transfer rate to the exhaust aftertreatment control unit (ACM) (A60), which then evaluates them.

GF54.71-W-3005H	Lane Assistant camera (SPA), component description	2.8.11

MODEL 963, 964

Location

A72 Lane Assistant camera

The Lane Assistant camera (A72) is installed on the inside in the center of the windshield.

W54.71-1076-12

Task

The Lane Assistant camera (A72) visually determines the position of the vehicle with respect to the left and right road marking in an area of approx. 6 to 35 m in front of the vehicle and forwards the video image to the driver assistance system (VRDU) control unit (A53).

Body

The Lane Assistant camera (A72) comprises the following main components:

- Camera
- Lane Assistant camera control unit
- Heating element

i After replacing the Lane Assistant camera (A72) or the windshield, the Lane Assistant camera (A72) must be recalibrated.

GF83.70-W-4039H	Auxiliary heater unit, component description	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

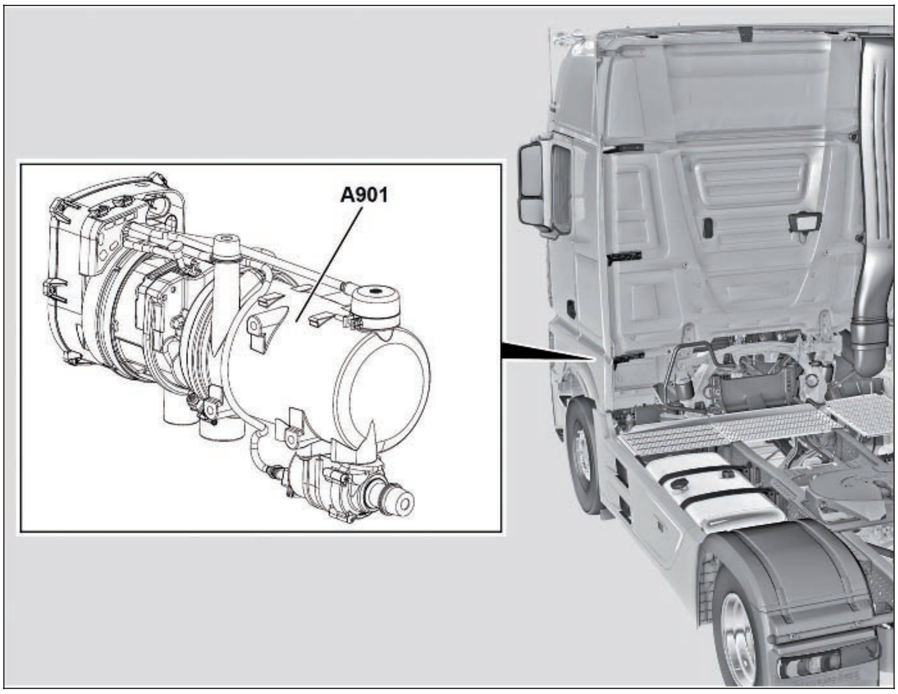
Location

Shown on auxiliary heater, code (D6N) Cab and engine hot water auxiliary heater
A901 Auxiliary water heater unit

The heater (A901) is bolted on behind the left entrance on the cab floor.

Task

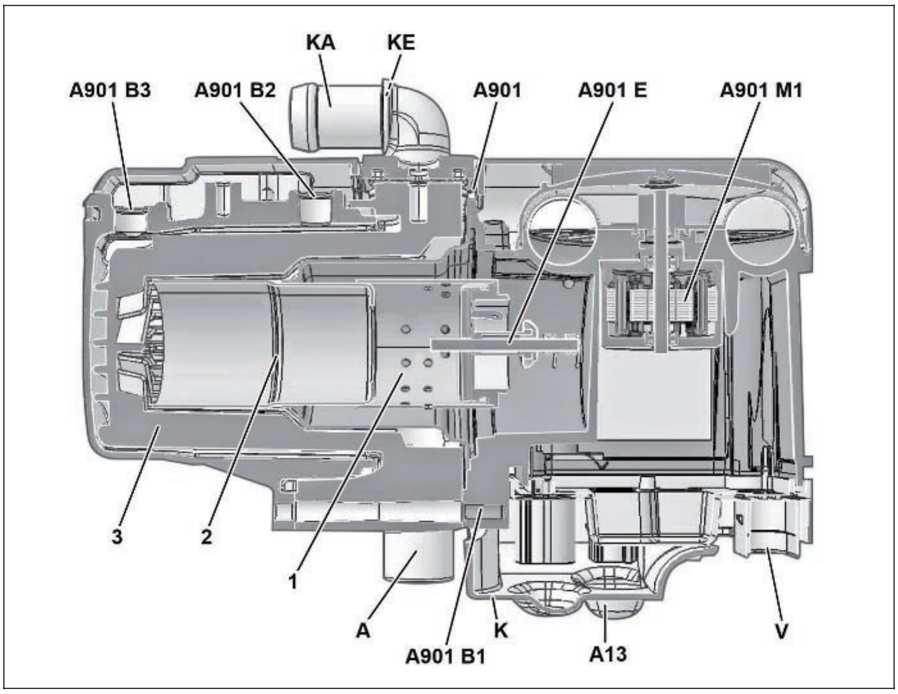
The auxiliary water heater unit (A901) is used for
- preheating,
- continuous heating,
- stationary heating and
- heat boosting.



W83.70-1434-06

Auxiliary heater, code (D6M) Cab hot water auxiliary heater

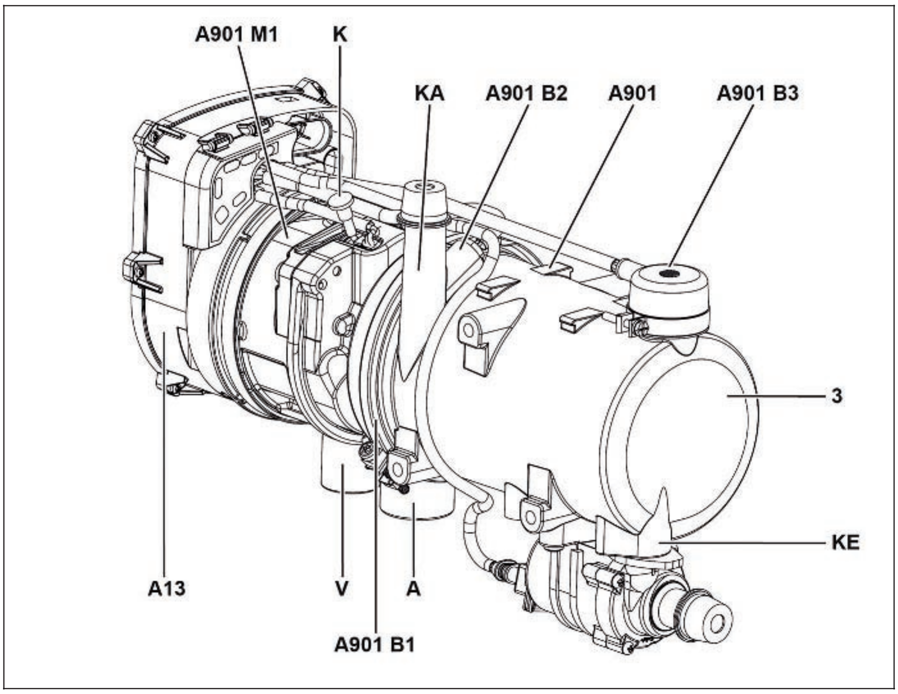
1	*Burner insert*
2	*Burner tube*
3	*Heat exchanger*
A13	*Truck auxiliary heater (ITH) control unit*
A901	*Auxiliary water heater unit*
A901 B1	*Auxiliary heater exhaust temperature sensor*
A901 B2	*Temperature sensor*
A901 B3	*Overheating protection*
A901 E	*Glow plug*
A901 M1	*Combustion air blower*
A	*Exhaust outlet*
K	*Fuel inlet*
KA	*Coolant outlet*
KE	*Coolant inlet*
V	*Combustion air inlet*



W83.70-1457-06

Auxiliary heater, code (D6N) Cab and engine hot water auxiliary heater

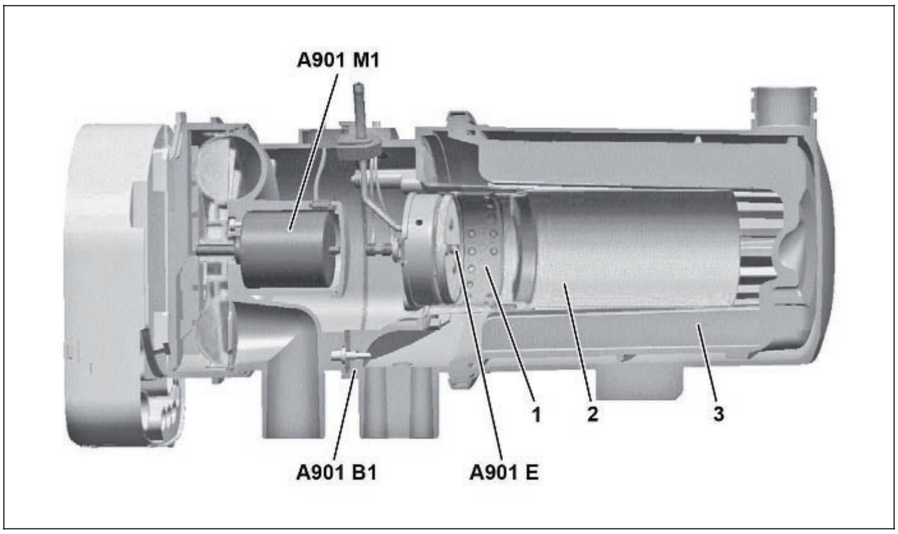
3	*Heat exchanger*
A13	*Truck auxiliary heater (ITH) control unit*
A901	*Auxiliary water heater unit*
A901 B1	*Auxiliary heater exhaust temperature sensor*
A901 B2	*Temperature sensor*
A901 B3	*Overheating protection*
A901 M1	*Combustion air blower*
A	*Exhaust outlet*
K	*Fuel inlet*
KA	*Coolant outlet*
KE	*Coolant inlet*
V	*Combustion air inlet*



W83.70-1458-06

Auxiliary heater, code (D6N) Cab and engine hot water auxiliary heater

1	*Burner insert*
2	*Burner tube*
3	*Heat exchanger*
A901 B1	*Auxiliary heater exhaust temperature sensor*
A901 M1	*Combustion air blower*
A901 E	*Glow plug*



W83.70-1459-05

GF83.70-W-4042H	Exhaust temperature sensor, component description	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

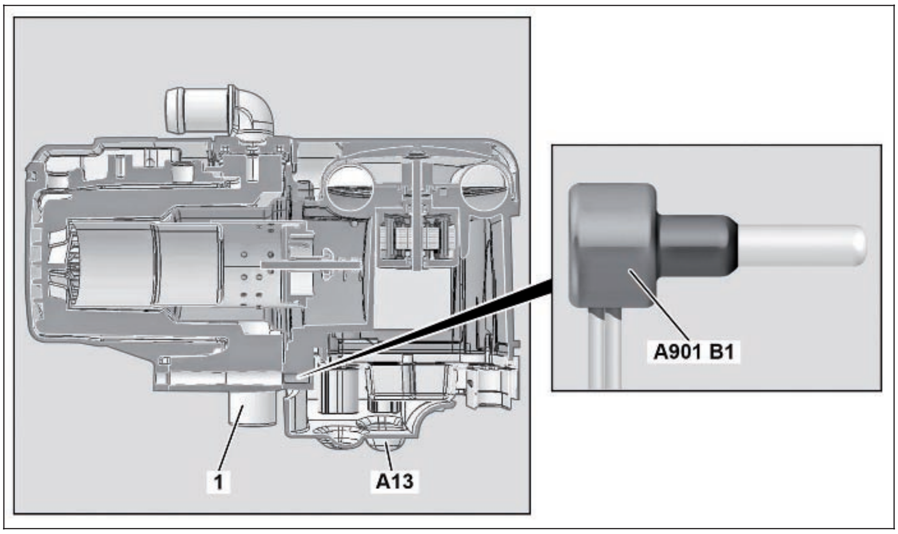
Location

Auxiliary heater, code (D6M) Cab hot water auxiliary heater

1 Exhaust outlet

A13 Truck auxiliary heater (ITH) control unit
A901 B1 Auxiliary heater exhaust temperature sensor

The auxiliary heater exhaust temperature sensor (A901 B1) is installed in the housing of the auxiliary heater in the area of the exhaust outlet (1).



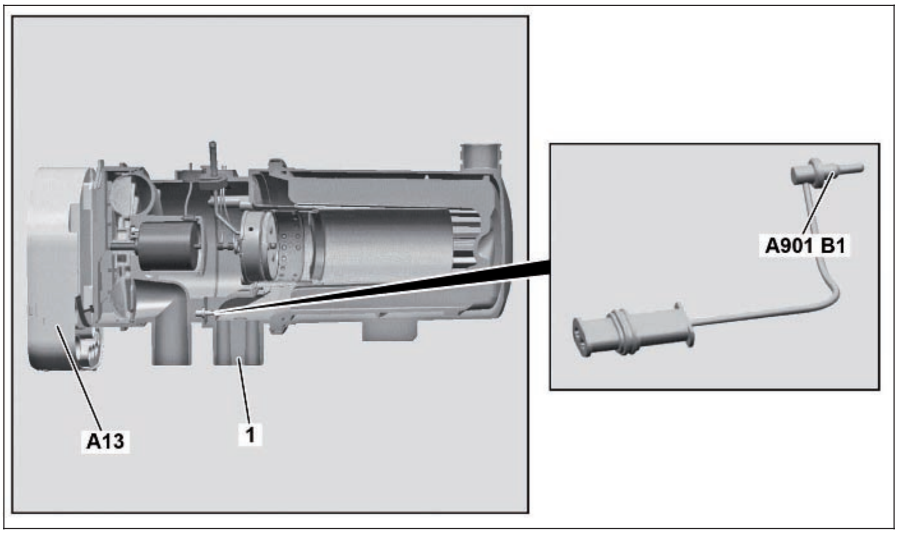
W83.70-1439-05

Auxiliary heater, code (D6N) Cab and engine hot water auxiliary heater

1 Exhaust outlet

A13 Truck auxiliary heater (ITH) control unit
A901 B1 Auxiliary heater exhaust temperature sensor

The auxiliary heater exhaust temperature sensor (A901 B1) is installed in the housing of the auxiliary heater in the area of the exhaust outlet (1).



W83.70-1438-05

Task

The auxiliary heater exhaust temperature sensor (A901 B1) is responsible for monitoring flame formation and the combustion cycle. The resistance enables the TRUCK (ITH) auxiliary heater control unit (A13) to detect whether a flame exists and whether correct combustion is underway.

Design

The auxiliary heater exhaust temperature sensor (A901 B1) consists of various types of ceramic adapted to match the temperature conditions, which contain a temperature-dependent resistance wire with positive temperature coefficient (PTC). Its electrical resistance increases as temperature increases.

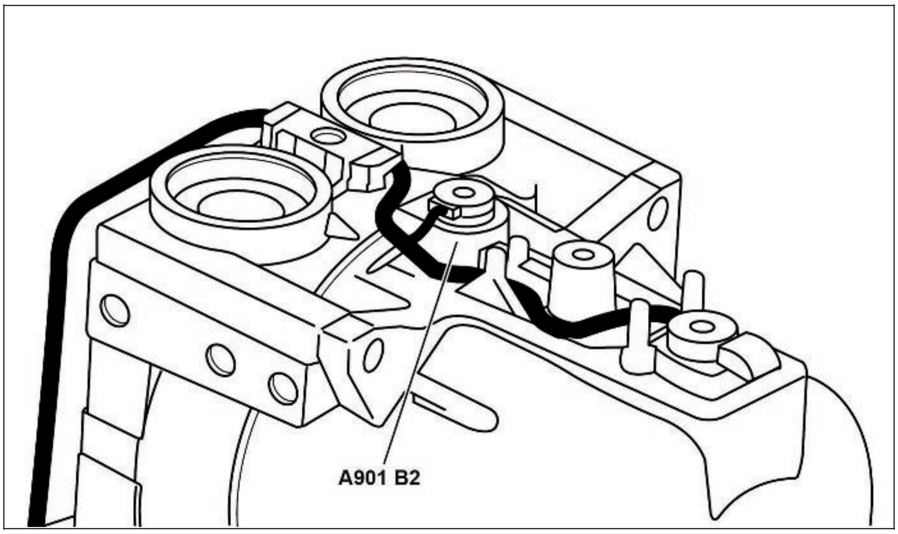
GF83.70-W-4036H	Component description for coolant temperature sensor	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

Location

Auxiliary heater, code (D6M) Cab hot water auxiliary heater
A901 B2 Temperature sensor

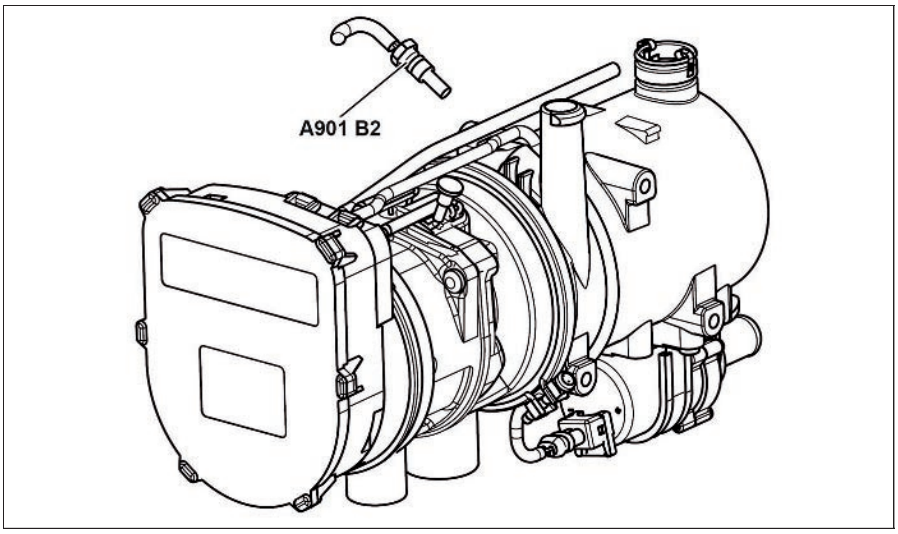
The temperature sensor (A901 B2) is located on the heat exchanger of the auxiliary water heater unit (A901).



W83.70-1440-05

Auxiliary heater, code (D6N) Cab and engine hot water auxiliary heater
A901 B2 Temperature sensor

The temperature sensor (A901 B2) is located on the heat exchanger of the auxiliary water heater unit (A901).



W83.70-1443-05

Task

The temperature sensor (A901 B2) determines the coolant temperature at the coolant outlet, and sends it to the TRUCK (ITH) auxiliary heater control unit (A13).

Design

The temperature sensor (A901 B2) consists of a metallic case, which contains a resistance wire with negative temperature coefficient (NTC). Its electrical resistance decreases as temperature increases.

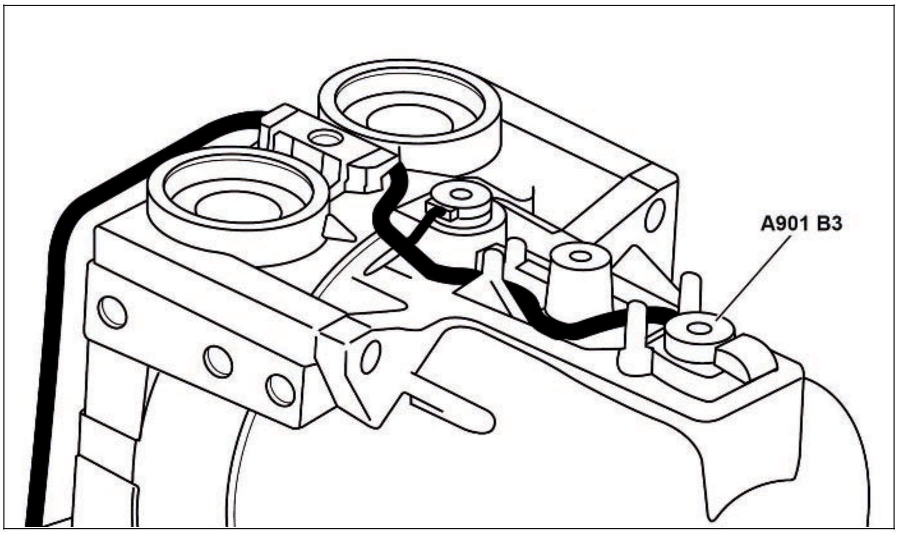
GF83.70-W-4037H	Overheating protection, component description	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

Location

Auxiliary heater, code (D6M) Cab hot water auxiliary heater
A901 B3 Overheating protection

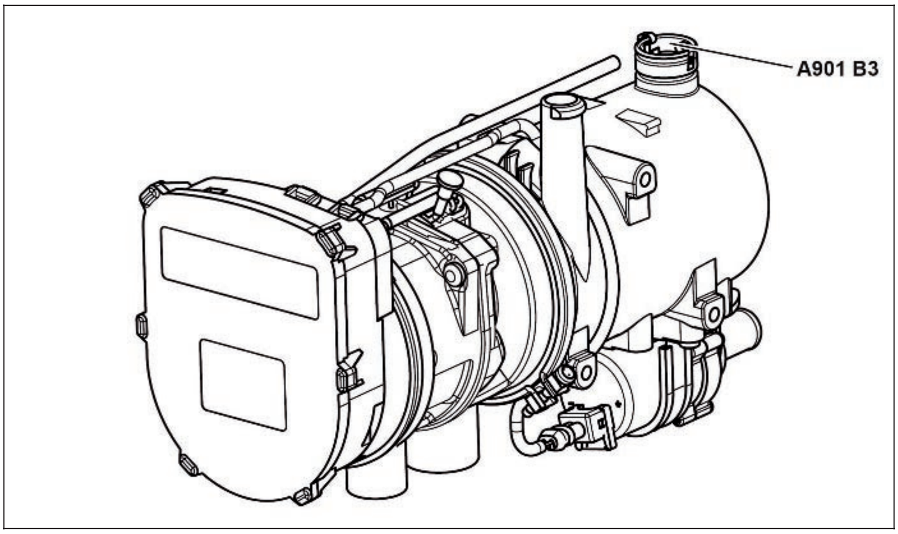
The overheating protection (A901 B3) is located on the heat exchanger.



W83.70-1441-05

Auxiliary heater, code (D6N) Cab and engine hot water auxiliary heater
A901 B3 Overheating protection

The overheating protection (A901 B3) is located on the heat exchanger.



W83.70-1453-05

Task

If the auxiliary water heater unit (A901) overheats, the overheating protection (A901 B3) interrupts the voltage supply for the fuel metering pump (M2) and therefore also the fuel supply into the auxiliary water heater unit (A901).

Design

The overheating protection (A901 B3) includes a bi-metal switch. This automatically restores the voltage supply once the auxiliary water heater unit (A901) has cooled down.

GF83.70-W-4034H	Glow plug, component description	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

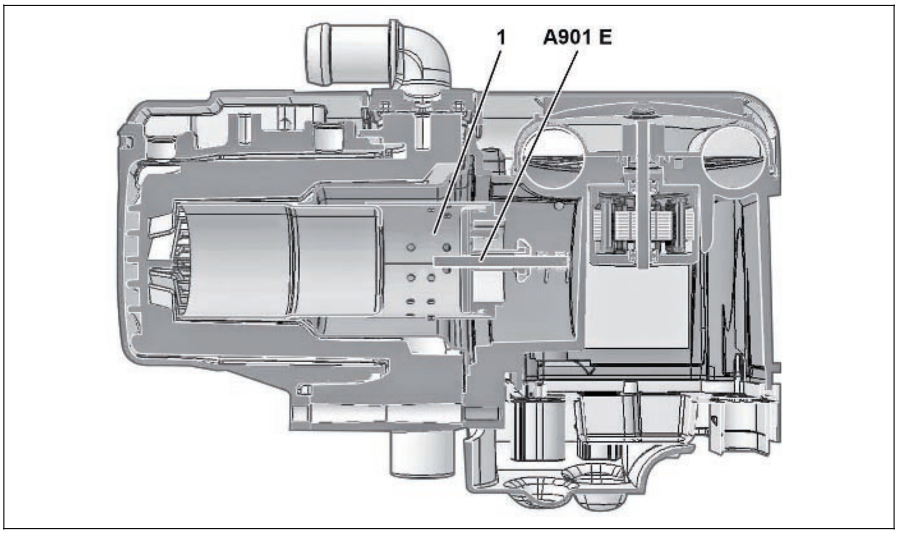
Location

Auxiliary heater, code (D6M) Cab hot water auxiliary heater

1 *Burner insert*

A901 E *Glow plug*

The glow plug (A901 E) is located in the burner insert (1).



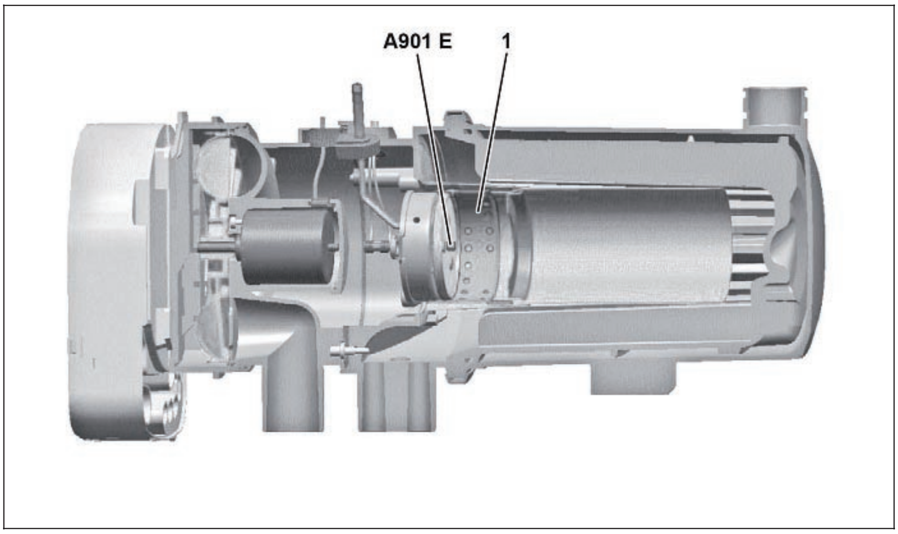
W83.70-1437-05

Auxiliary heater, code (D6N) Cab and engine hot water auxiliary heater

1 *Burner insert*

A901 E *Glow plug*

The glow plug (A901 E) is located in the burner insert (1).



W83.70-1450-05

Task

The glow plug (A901 E) heats the fleece, which is wetted with fuel, during the start phase to enable evaporation of the fuel on it. At the same time, during the start of the heating mode, the glow plug (A901 E) ignites the fuel/air mixture in the combustion chamber of the auxiliary water heater unit (A901).

ℹ The glow plug (A901 E) is pulse actuated.

Design

The glow plug (A901 E) consists of a sintered ceramic base, which contains a resistance wire.

GF83.70-W-4033H	Combustion air blower, component description	20.7.11

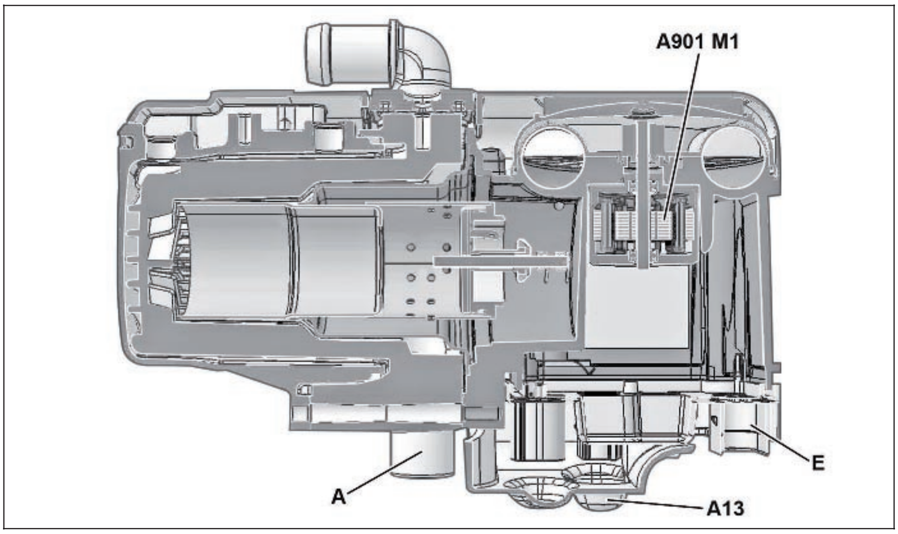
MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

Location

Auxiliary heater, code (D6M) Cab hot water auxiliary heater

A 13	*Truck auxiliary heater (ITH) control unit*
A901 M1	*Combustion air blower*
A	*Exhaust outlet*
E	*Combustion air inlet*

The combustion air blower (A901 M1) is located above the TRUCK (ITH) auxiliary heater control unit (A13).

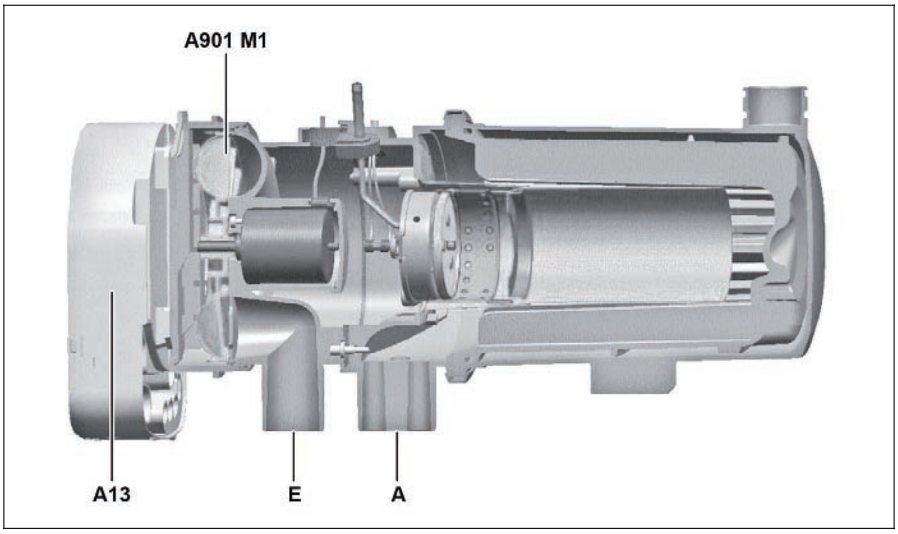


W83.70-1456-05

Auxiliary heater, code (D6N) Cab and engine hot water auxiliary heater

A 13	*Truck auxiliary heater (ITH) control unit*
A901 M1	*Combustion air blower*
A	*Exhaust outlet*
E	*Combustion air inlet*

The combustion air blower (A901 M1) is located next to the TRUCK (ITH) auxiliary heater control unit (A13).



W83.70-1449-05

Task

The combustion air blower (A901 M1) pumps the fresh air sucked in over the combustion air inlet (E) into the burner insert and discharges the exhaust through the exhaust outlet (A) to the air outside. During the run-on phase it also serves to cool and flush the hot combustion chamber.

Design

The combustion air blower (A901 M1) consists of a DC motor, which has a torus member mounted on its shaft.

GF83.70-W-4032H	Auxiliary heater coolant circulation pump, component description	20.7.11

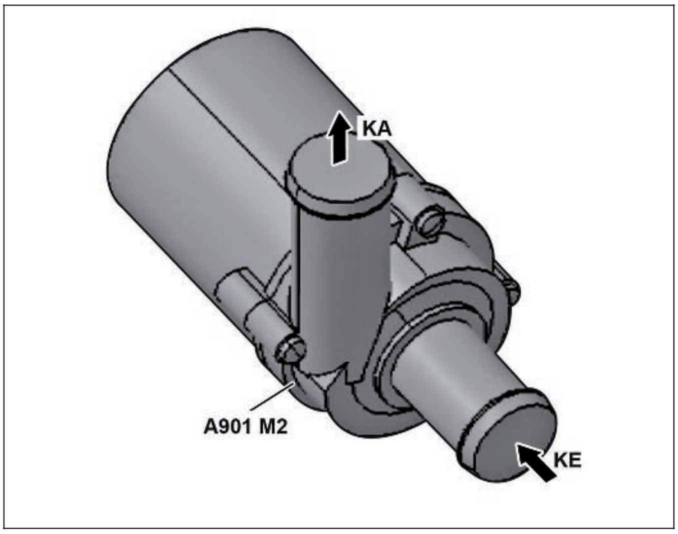
MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

Location

A901 M2 *Circulation pump*

KA *Coolant outlet*
KE *Coolant inlet*

The circulation pump (A901 M2) is connected on the outside to the heater.



W83.70-1436-11

Task

The circulation pump (A901 M2) pumps coolant out of the engine's cooling circuit, through the heater unit's heat exchanger to the heater heat exchanger.

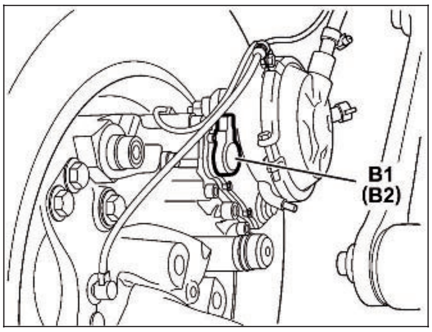
Design

Located in the circulation pump (A901 M2) is a DC motor, which drives an impeller in an external housing. Located on the front side of the circulation pump (A901 M2) is the coolant inlet (KE).

GF42.25-W-3137H	Brake wear sensor, component description	29.6.11

MODEL 963
with disk brakes

Location



W42.25-1294-01

Shown on front axle with disk brakes

B1 Left 1st front axle brake wear sensor

B2 Right 1st front axle brake wear sensor

The brake wear sensor (B1b or B2) is installed in the brake caliper of the disk brake.

Task

The brake wear sensors (B1, B2, etc.) record the wear on the brake pads and the brake disks. The wear values are used in the control of the brake system and for maintenance.

Function

The brake wear sensor (B1, B2, etc.) is a rotary potentiometer which is mechanically connected to the automatic adjustment mechanism in the brake caliper. It converts every change in the adjustment path into a corresponding voltage signal.

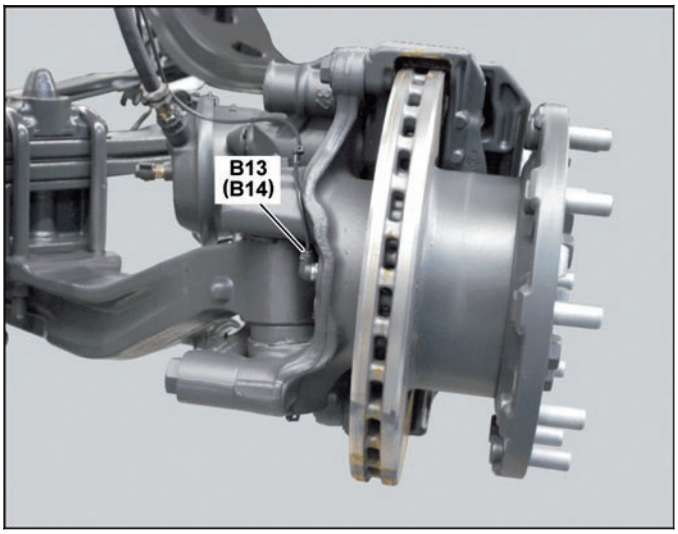
GF42.30-W-4552H	Component description for the rpm sensor	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr

Location

Shown on left front axle with disk brake
B13 Left front axle speed sensor
B14 Right front axle speed sensor

The left front axle (B13) rpm sensor and the right front axle (B14) rpm sensor are installed on the front axle steering knuckles.



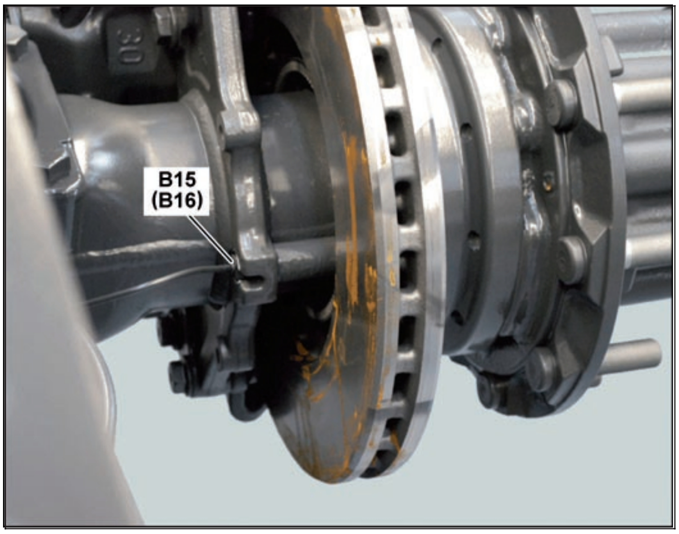
W42.25-1273-81

Shown on left rear axle with disk brake
B15 Left rear axle speed sensor
B16 Right rear axle speed sensor

The left rear axle rpm sensor (B15) and the right rear axle rpm sensor (B16) are installed on the rear axle axle housings.

Task

The rpm sensors (B13, B14, B15, B16) are used for the contactless detection of wheel speed.



W42.25-1274-81

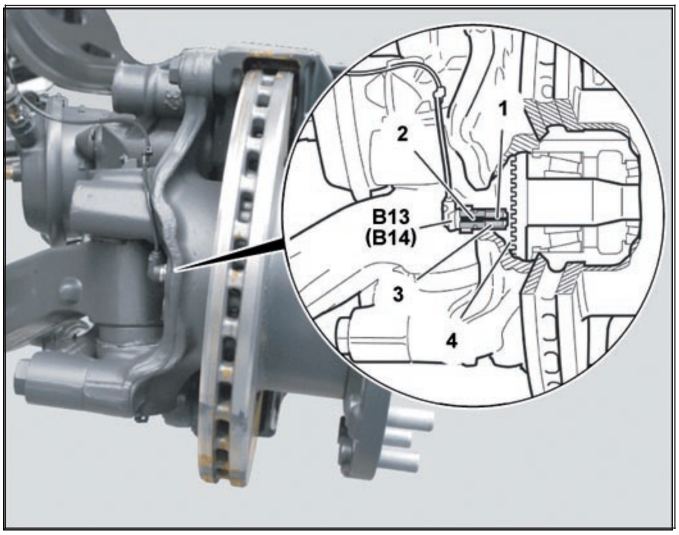
Design

1 Contact pin
2 Permanent magnet
3 Coil
4 Rotor

B13 Left front axle speed sensor
B14 Right front axle speed sensor

Function

The magnetic field generated by the permanent magnet (2) is influenced by the rotational movement of the pole wheel (4). An AC voltage is thereby generated in the coil (3), with a frequency proportional to the rpm.



W42.25-1275-81

GF42.25-W-3134H	Brake value sensor, component description	20.7.11

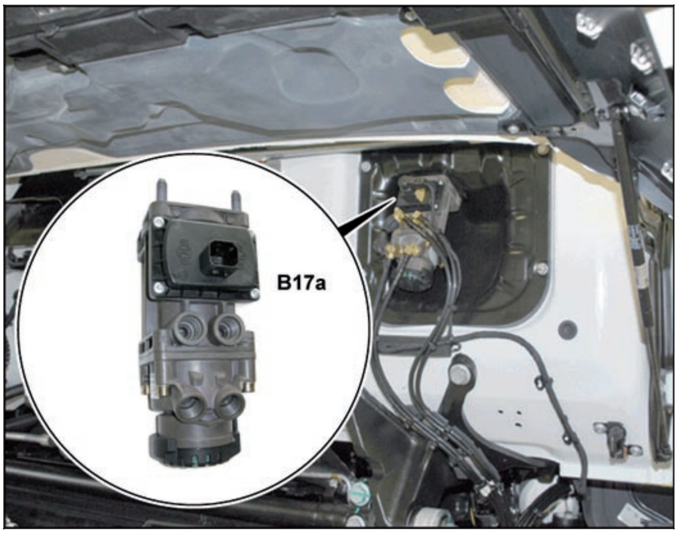
MODEL 963

Location

Knorr version

B17a Brake value sensor (Knorr)

The brake value sensor (Knorr) (B17) is installed on the driver's side below the maintenance flap of the cab.

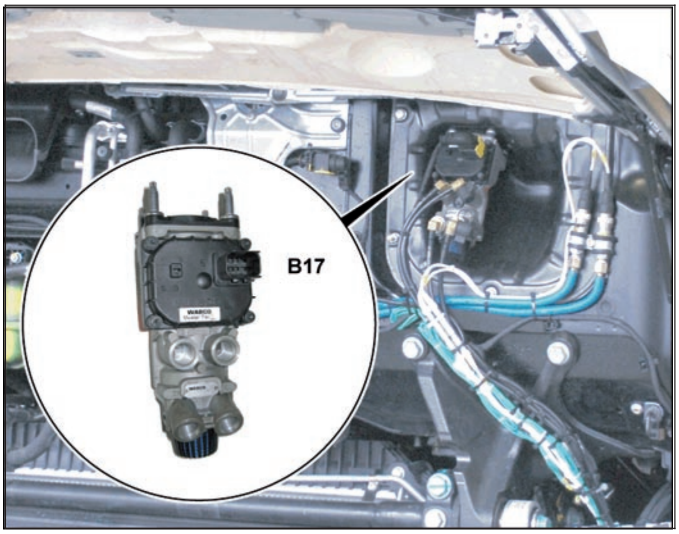


W42.25-1268-81

Wabco version

B17 Brake value sensor (Wabco)

The brake value sensor (Knorr) (B17) is installed on the driver's side below the maintenance flap of the cab.



W42.25-1269-81

Task

The brake value sensor (Wabco) (B17) or the brake value sensor (Knorr) (B17a) has the following tasks:

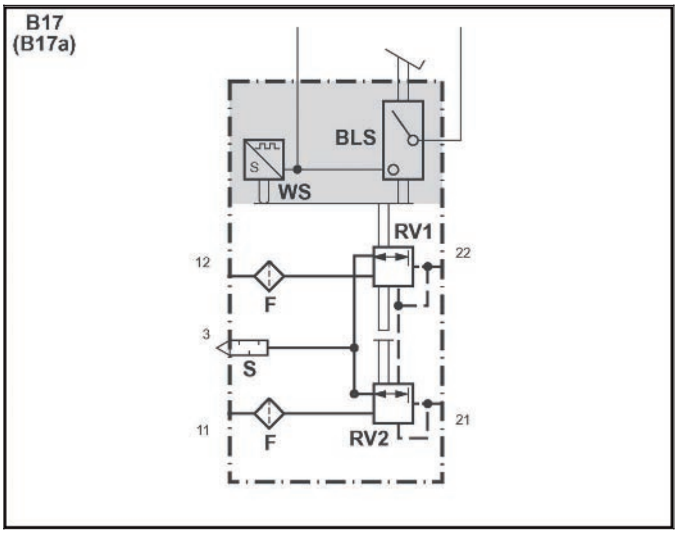
- Record the driver's brake command via the brake pedal travel and convert the brake command into electrical signals for the Electronic Brake Control control unit (EBS) (A10b or A10c).
- Trigger actuation of the brake lights.
- Apply the redundant brake pressure corresponding to the brake pedal travel for the front axle, the rear axle and the trailer.

Design

The brake value sensor (Wabco) (B17) or the brake value sensor (Knorr) (B17a) is comprised of one electrical and one pneumatic part.

B17 Brake value sensor (Wabco)
B17a Brake value sensor (Knorr)

BLS Stop lamp switch
F Filter
RV1 Relay valve with rod actuation (front-axle brake circuit)
RV2 Relay valve with rod actuation (rear-axle brake circuit)
S Muffler
WS Position sensor (for pedal travel sensing)



W42.25-1281-11

Pneumatic connections
3 Atmospheric connection (ventilation)
11 Energy supply (reservoir pressure - rear axle service brake system)
12 Energy supply (reservoir pressure - front axle service brake system)
21 Energy outflow (rear axle redundant brake pressure)
22 Energy outflow (front axle redundant brake pressure)

Function

With the help of the brake light switch (BLS), the brake value sensor (B17 or B17a) initially generates an electrical switching signal, which serves to start the brake application and activate of the brake lights. With the help of the travel sensor (WS), the brake value sensor (B17 or B17a) records the actuating travel of the actuator tappet and issues this as a pulse width modulated or digital signal to the Electronic Brake Control control unit (EBS) (A10b or A10c).
The relay valve with tappet actuation (RV1) of the redundant front-axle brake circuit integrated in the brake value sensor (B17 or B17a) is opened according to the tappet's actuating travel. The reservoir pressure present at connection 12 is routed to connection 22 via the relay valve with tappet actuation (RV1) as redundant brake pressure. The redundant rear-axle brake circuit's relay valve with tappet actuation (RV2) is opened corresponding to the tappet's actuating path and the redundant brake pressure present at connection 22.

The reservoir pressure present at connection 11 flows to connection 21 as redundant brake pressure.

i The redundant brake pressure for the rear axle is reduced to a ratio of 1:1.5 in the brake value sensor (B17 or B17a).

When the tappet reaches full brake position, the redundant front-axle brake circuit's relay valve with tappet actuation (RV1) is completely opened and the reservoir pressure present at connection 12 is fully applied as redundant brake pressure. The redundant rear-axle brake circuit's relay valve with tappet actuation (RV2) is also fully opened. The reservoir pressure at present at connection 11 is fully applied as redundant brake pressure.

i If the upper brake circuit fails, the tappet of the relay valve with tappet actuation (RV2) of the redundant rear axle brake circuit can only be moved mechanically. Graduated braking up until emergency braking is possible when the tappet's actuating travel is increased slightly.

If the brake pedal is no longer actuated, the redundant front-axle brake circuit's relay valve with tappet actuation (RV1) returns to its starting position. Connection 22 is now ventilated via the relay valve with tappet actuation (RV1) and connection 3.

The redundant rear axle brake circuit relay valve with tappet actuation (RV2) also returns to its starting position due to the lack of control pressure and the lack of tappet actuation. Connection 21 is ventilated via connection 3.

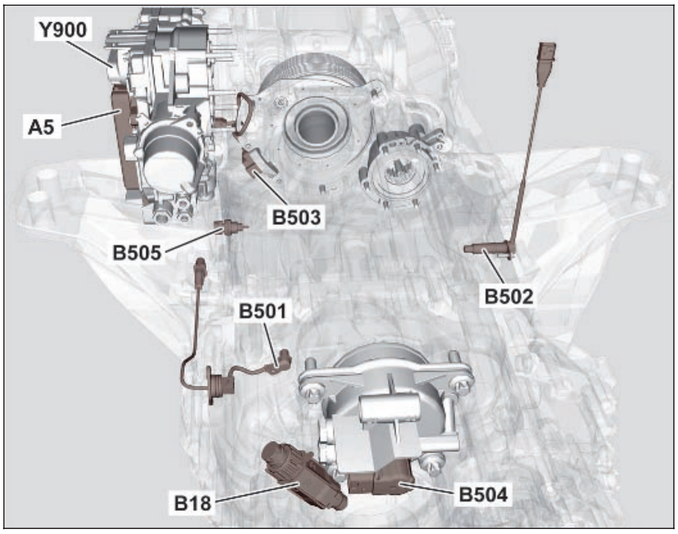
GF26.19-W-3002H	Travel and speed sensor, component description	20.7.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3

Location

B18 Travel and speed sensor

The travel and speed sensor (B18) is screwed into the upper area of the rear transmission cover.



W26.19-1127-81

Task at initialization

- Saves the serial number and the master code.

  i When first put into service, the travel and speed sensor (B18) and the tachograph (TCO) (P1) are harmonized, i.e. a common working code is defined.

Tasks while driving

- Registers the rotational speed of the transmission output shaft as an analog voltage signal.
- Transforms the analog voltage signal into a digital realtime signal.
- Checks the realtime signal for irregularities.
- Transfers real-time signal to tachograph (TCO) (P1).
- Receives data and command signals from the tachograph (TCO) (P1) and provides an "I/O" data signal containing cumulated encrypted information.

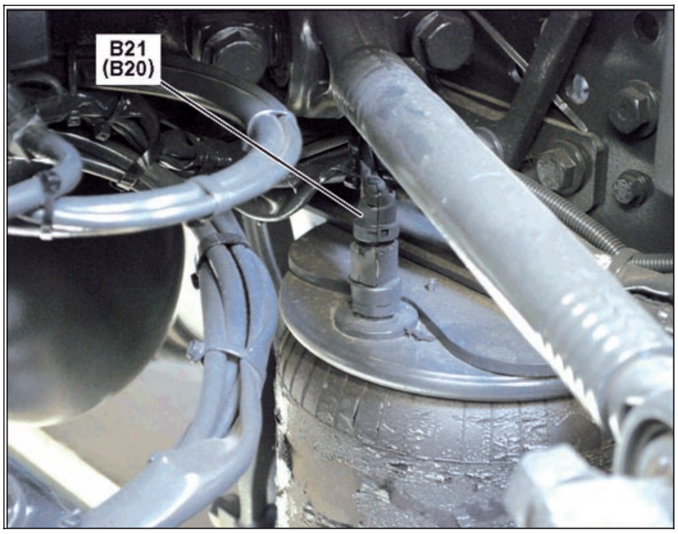
GF32.33-W-3119H	Level control pressure sensor, component description	2.8.11

MODEL 963

Location

Drive axle, shown on model 963.4
B20 Left drive axle pressure sensor
B21 Right drive axle pressure sensor

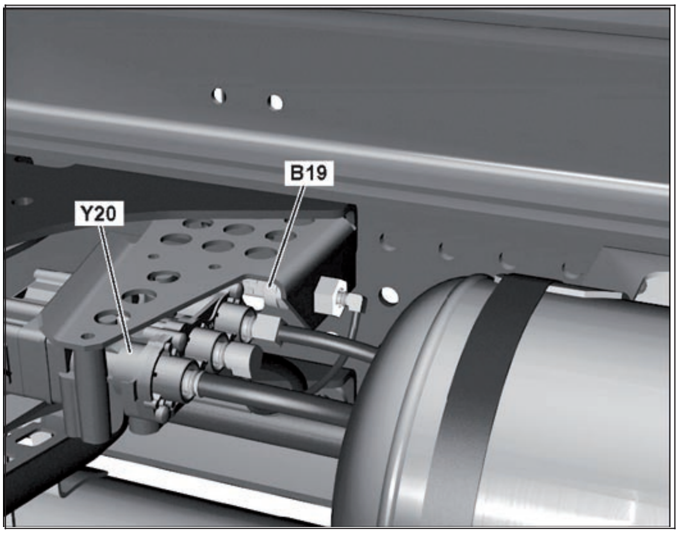
The left drive axle pressure sensor (B20) and right drive axle pressure sensor (B21) are screwed in on the left or right side of the bellows plates of the front air spring bellows of the drive axle.



W32.33-2058-81

Front axle, shown on model 963.0 - only on vehicles with code (A1A) Air-sprung front axle
B19 Front axle pressure sensor
Y20 Front axle level control valve unit

The front axle pressure sensor (B19) is attached near the fuel tank to the bracket for the front axle level control valve unit (Y20).



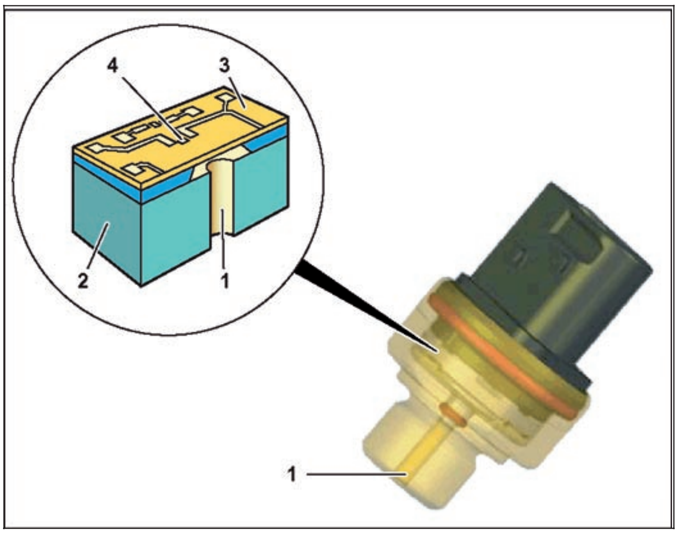
W32.33-2059-11

Task

The left drive axle pressure sensor (B20), right drive axle pressure sensor (B21) and front axle pressure sensor
(B19) detect the air pressure in the air spring bellows and generate a voltage signal proportional to the existing pressure. From this signal, the level control (CLCS) control unit (A26) determines the individual axle loads and the gross weight of the vehicle.

Design

1 Energy supply (air spring bellows pressure)
2 Silicon measuring cell
3 Diaphragm
4 Piezo element



W32.33-2060-81

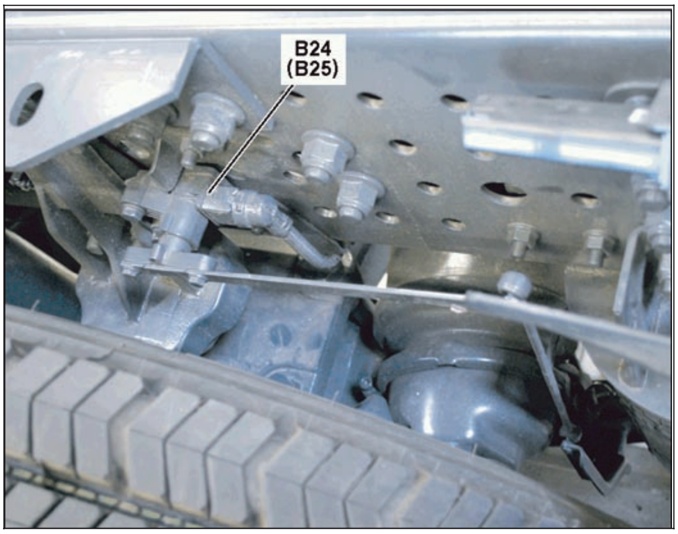
GF32.33-W-3118H	Position sensor, component description	2.8.11

MODEL 963

Location

B24 Left drive axle position sensor
B25 Right drive axle position sensor

The left drive axle position sensor (B24) and right drive axle position sensor (B25) are attached above the drive axle on the outboard side of the left and right longitudinal frame member. They are connected to the axle housing of the drive axle via a measuring linkage.



W32.33-2055-81

Shown on model 963.0 with code (A1A) Air-sprung front axle

B27 Front axle position sensor

The front axle position sensor (B27) is attached behind the front axle at the center of a cross bracing of the vehicle frame. It is connected to the axle housing of the front axle via a measuring linkage.

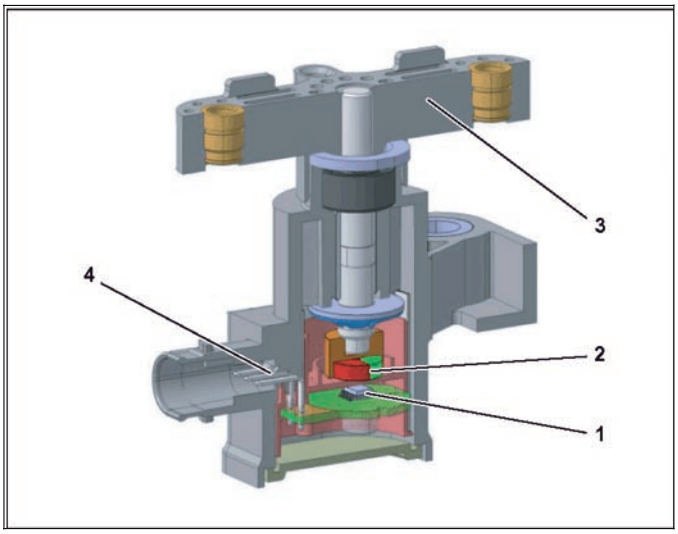
W32.33-2056-06

Task

The left drive axle position sensor (B24), right drive axle position sensor (B25) and front axle position sensor (B27) detect the distance between the vehicle frame and vehicle axles for the level control (CLCS) control unit (A26).

Design

1 *Sensor (with integrated electronic analysis system)*
2 *Permanent magnet*
3 *Measuring linkage attachment element*
4 *Electrical connector*



W32.33-2057-81

Function

The left drive axle position sensor (B24), right drive axle position sensor (B25) and front axle position sensor (B27) are non-contact sensors which function on the basis of a Hall sensor. The change in distance between the frame and axle is transmitted via a measuring linkage in the form of an angular deflection to the permanent magnet (2) of the left drive axle position sensor (B24), right drive axle position sensor (B25) and front axle position sensor (B27).

The angular deflection of the permanent magnet (2) changes the Hall voltage at the Hall sensor pairs on the sensor (1). This change in Hall voltage is detected by the electronic analysis system integrated in the sensor and converted into a pulse width modulated signal for the level control (CLCS) control unit (A26).

GF42.10-W-6003H	Condensation sensor, component description	2.8.11

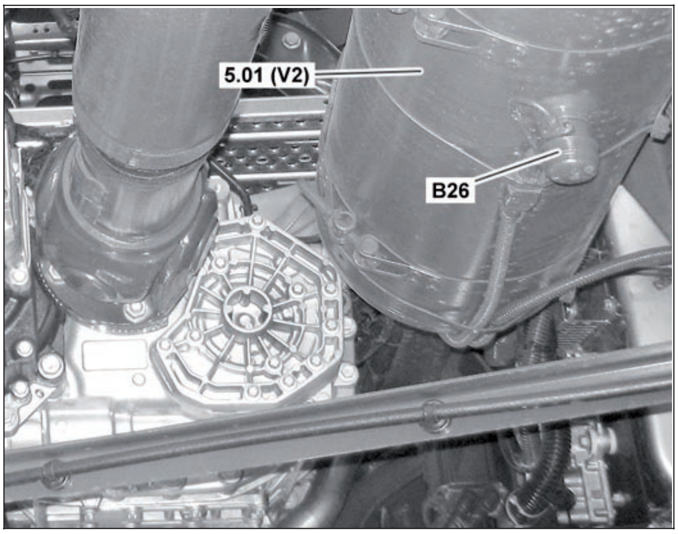
MODEL 963, 964 with CODE (B4A) Condensation sensor for compressed air system

Location

5.01 Compressed air reservoir (front axle brake circuit supply (V2))

B26 Condensation sensor

The condensation sensor (B26) is attached to the compressed air reservoir (5.01) from below.



W42.60-1239-11

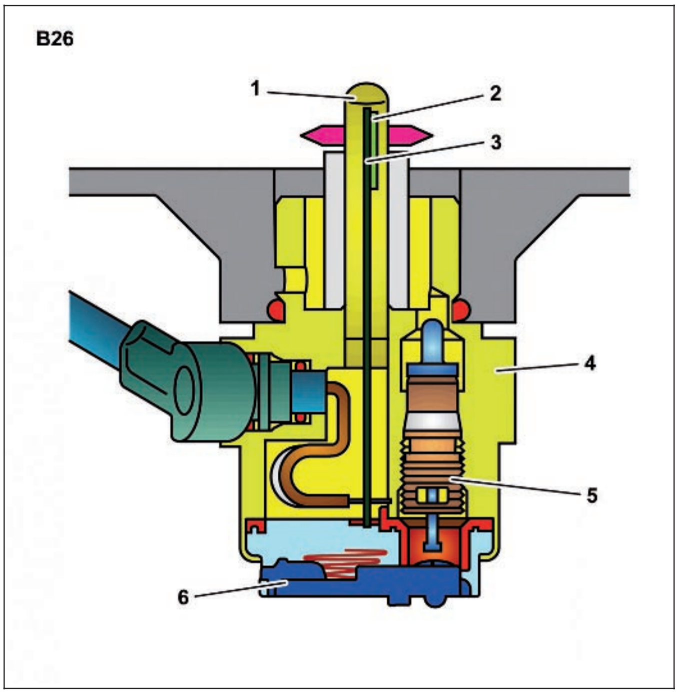
Task

The condensation sensor (B26) detects the accumulation of condensation in the compressed air system.

Design

1 Brass tip
2 Temperature sensor
3 Heating element
4 Brass housing
5 Drain valve
6 Key button

B26 Condensation sensor



W42.60-1240-82

Function

After switching on the ignition the heating element (3) heats up the brass tip (1). The heating element (3) requires approx. 75 s to reach operating temperature. The temperature sensor (2) measures the heat of the brass tip (1) in the air. If the brass tip (1) is surrounded by condensation, the heat of the brass tip (1) will be dissipated due to the high thermal conductivity of water and the operating temperature drops. The reaction time of the temperature sensor (2) in the case of a change in ambient conditions (water / no water) is max. 120 s.

The respective value is passed on to the Electronic Air-Processing Unit (EAPU) control unit (A18) as a voltage signal.
Pressing the button (6) opens the drain valve (5) and the condensation is forced out of the compressed air reservoir (5.01) by the overpressure.

i All other compressed air reservoirs installed in the vehicle must be drained by opening the bottom screw plug.

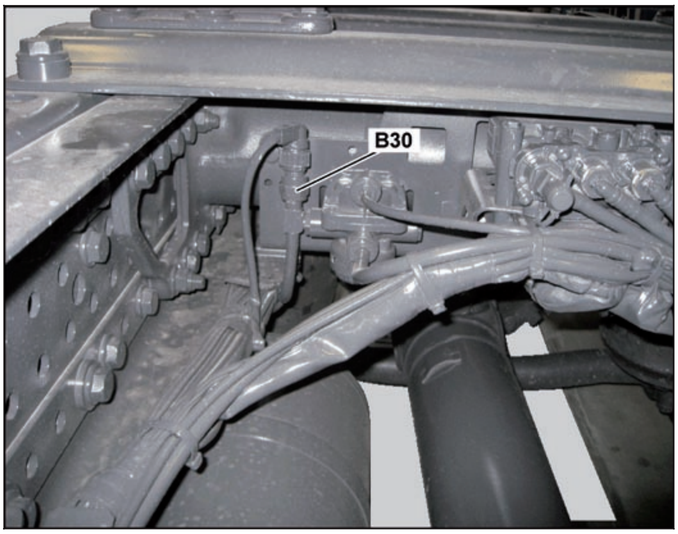
GF42.20-W-3002H	Parking brake pressure switch, component description	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr

Location

Illustrated on model 963.4
B30 Parking brake pressure switch

The parking brake pressure switch (B30) is installed on the tubular crossmember, on the right in the direction of travel, below the fifth wheel coupling.



W42.20-1012-81

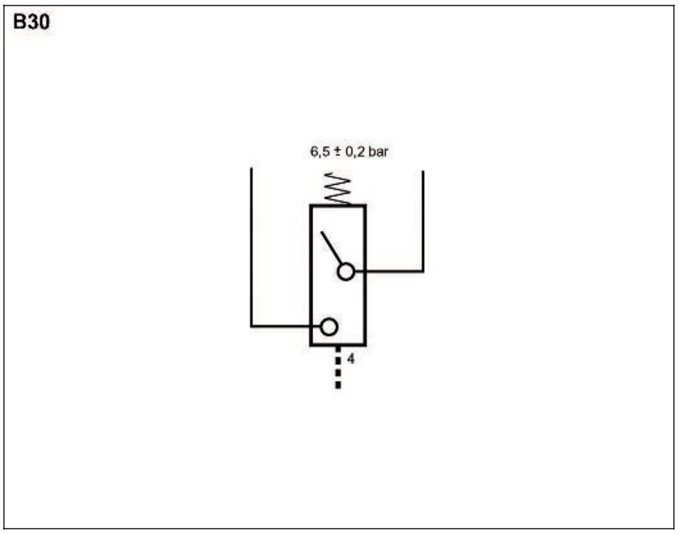
Task

The parking brake pressure switch (B30) records the operating condition of the parking brake.

Design

B30 Parking brake pressure switch

Pneumatic connections
4 Control connection (reservoir pressure - parking brake)



W42.20-1014-11

Function

The parking brake pressure switch (B30) is pressurized with control pressure at connection 4 when the parking brake is released. When the opening pressure of the parking brake pressure switch (B30) has been reached, the switching contact of the parking brake pressure switch (B30) is opened against the force of the compression spring. The signal to the Electronic Brake Control control unit (EBS)
(A10b or A10c) is interrupted.

When the parking brake is engaged, connection 4 of the parking brake pressure switch (B30) is unpressurized. The switching contact of the parking brake pressure switch (B30) is closed by the compression spring and the signal is forwarded to the Electronic Brake Control control unit (EBS) (A10b or A10c).

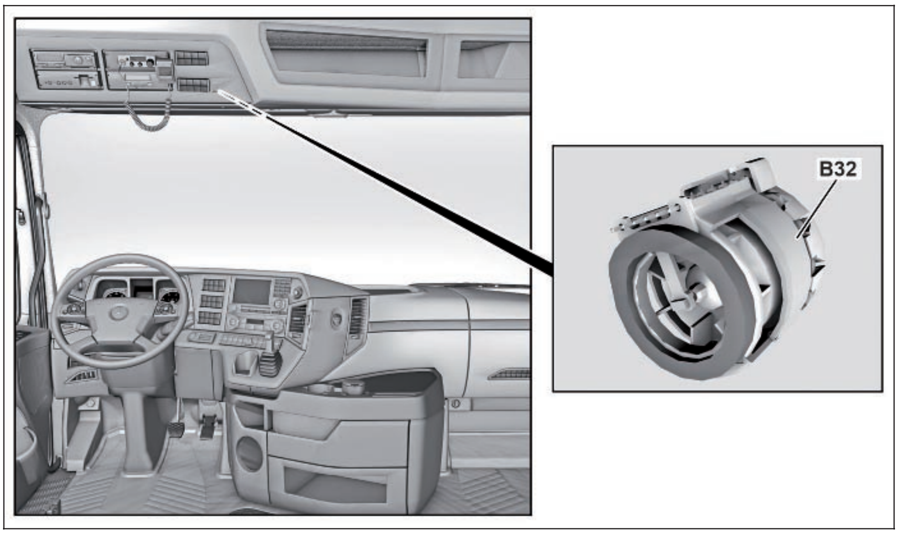
GF83.57-W-2127H	Vehicle interior temperature sensor, component description	20.7.11

MODEL 963, 964

Location

Shown on left-hand drive vehicle
B32 Vehicle interior temperature sensor

The vehicle interior temperature sensor (B32) is below the cover in the upper stowage box/tray next to the switch panel.



W83.57-1010-05

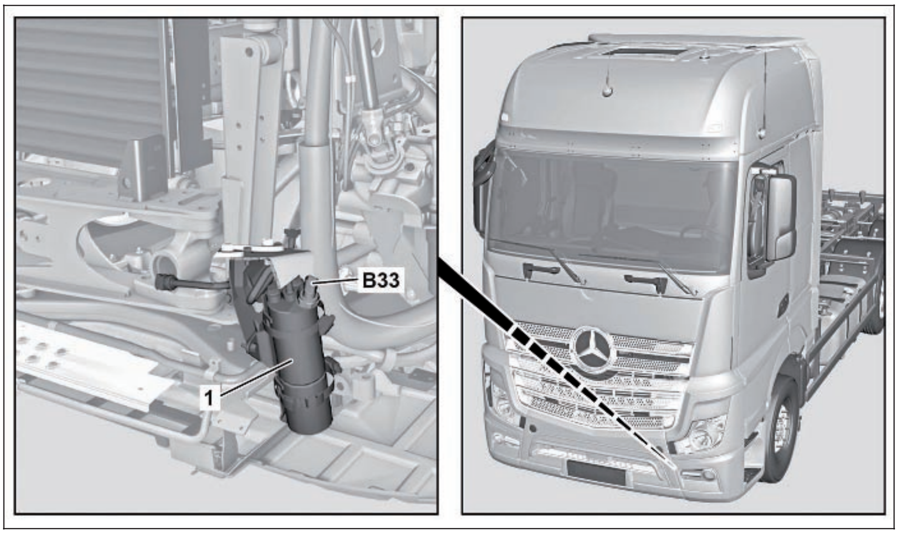
Task

The heating, ventilation and air conditioning control unit (HVAC) (A12b) measures the current interior temperature via the vehicle interior temperature sensor (B32). In order to prevent the measurements from being falsified by accumulated heat, it is equipped with its own fan.

GF83.30-W-2135H	Air conditioning pressure sensor, component description	29.6.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning
MODEL 963, 964 with CODE (D6H) Stationary air conditioner

Location



W83.30-1182-05

1 Fluid reservoir

B33 Air conditioning pressure sensor

The air conditioning pressure sensor (B33) is located behind the bumper on top of the fluid reservoir (1).

Task

The air conditioning pressure sensor (B33) is a safety component. It sends the signal about the pressure ratios in the system to the heating, ventilation and air conditioning control unit (HVAC) (A12b).
The heating, ventilation and air conditioning control unit (HVAC) (A12b) interrupts the current supply to the refrigerant compressor magnetic clutch (Y40) if a certain refrigerant pressure is dropped below or exceeded.

GF49.20-W-3001H	Exhaust pressure sensor upstream of diesel oxidation catalytic converter, component description	20.7.11

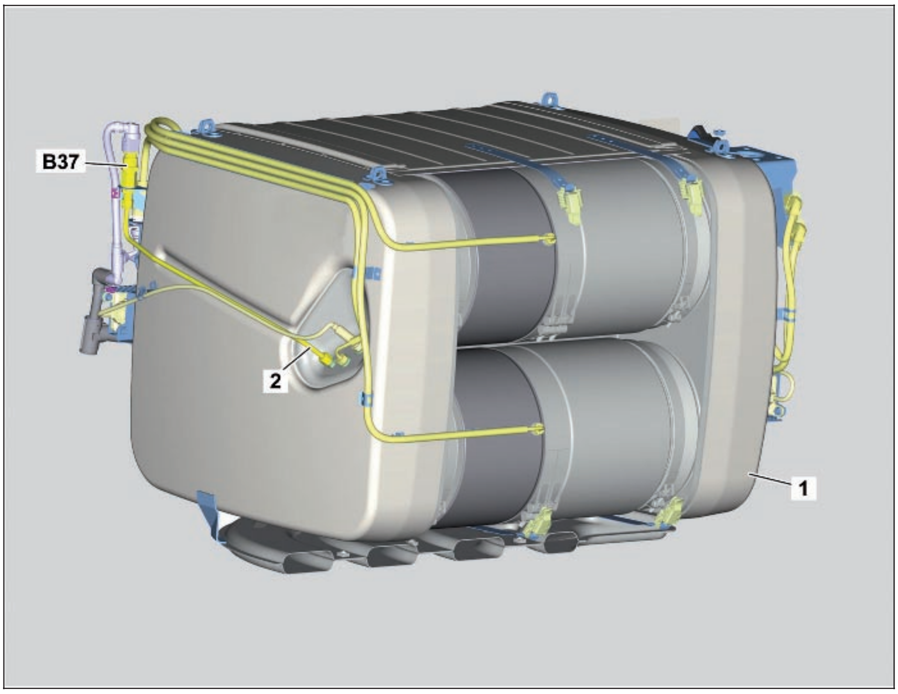
ENGINES 471.9 in MODEL 963, 964 with CODE (M5Z) Engine version Euro VI

Location

1 Exhaust aftertreatment unit:
2 Pressure line

B37 Exhaust pressure sensor, upstream of diesel oxidation catalytic converter

The exhaust pressure sensor upstream of the diesel oxidation catalytic converter (B37) is screwed into the deflection chamber from the outside, upstream of the diesel oxidation catalytic converter (DOC).



W14.40-1577-76

Task

The exhaust pressure sensor upstream of the diesel oxidation catalytic converter (B37) records the pressure at the defined measuring point in the deflection chamber.

Design

Inside the stainless steel sensor housing there is a basic unit to which two electrodes are attached.
The inner electrode is the measuring electrode, and the outer electrode is the reference electrode. Above this, exposed to the exhaust pressure, there is a pressure-sensitive ceramic membrane - the shared counter-electrode.
Together, this configuration constitutes a plate capacitor. Since the measuring principle is based on the capacity change, which is extremely small, the sensor has processing electronics that are extremely sensitive.

Function

The exhaust flowing past the probe deforms the membrane because of its pressure. The deformation changes the distance between the capacitor plates and therefore the capacity of the capacitor. The integrated circuit converts the capacity change signal into a defined voltage, from which the exhaust aftertreatment control unit (ACM) (A60) calculates the exhaust pressure level.

GF49.20-W-3002H	Exhaust pressure sensor downstream of diesel particulate filter, component description	20.7.11

ENGINES 471.9 in MODEL 963, 964 with CODE (M5Z) Engine version Euro VI

Location

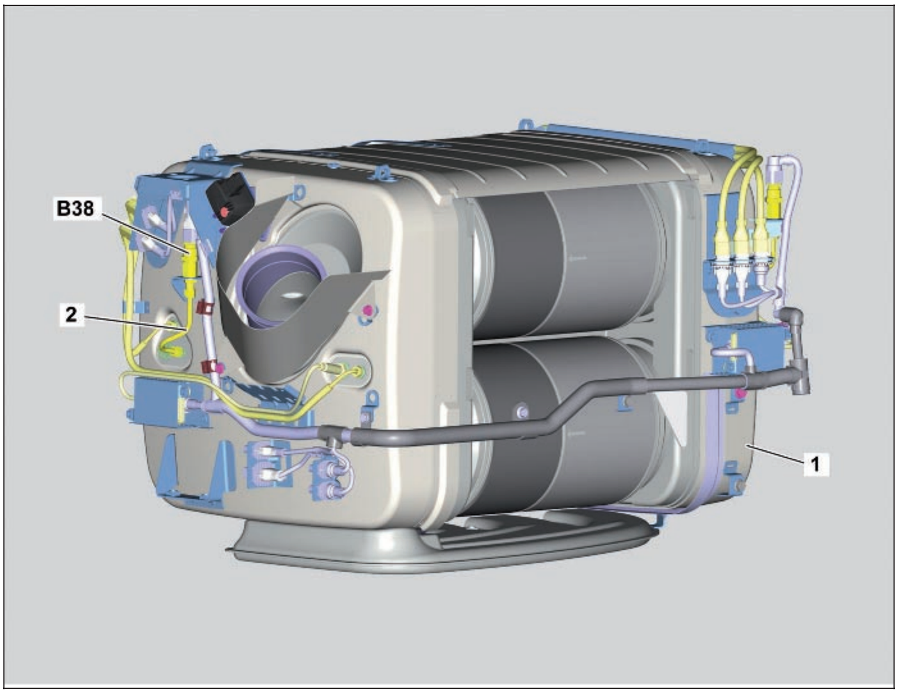
1 *Exhaust aftertreatment unit:*
2 *Pressure line*

B38 *Exhaust pressure sensor downstream of diesel particulate filter*

The exhaust pressure sensor downstream of the diesel particulate filter (B38) is screwed into the deflection chamber from the outside, downstream of the diesel particulate filter (DPF).

Task

The exhaust aftertreatment control unit (ACM) (A60) records the pressure at the defined measuring point in the deflection chamber via the exhaust pressure sensor downstream of the diesel particulate filter (B38).



W14.40-1578-76

Design

Inside the stainless steel sensor housing there is a basic unit to which two electrodes are attached.
The inner electrode is the measuring electrode, and the outer electrode is the reference electrode. Above this, exposed to the exhaust pressure, there is a pressure-sensitive ceramic membrane, the shared counter-electrode.
Together, this configuration constitutes a plate capacitor. Since the measuring principle is based on the capacity change, which is extremely small, the sensor has processing electronics that are extremely sensitive.

Function

The exhaust flowing past the probe deforms the membrane because of its pressure. The deformation changes the distance between the capacitor plates and therefore the capacity of the capacitor. The integrated circuit converts the capacity change signal into a defined voltage, from which the exhaust aftertreatment control unit (ACM) (A60) calculates the exhaust pressure level.

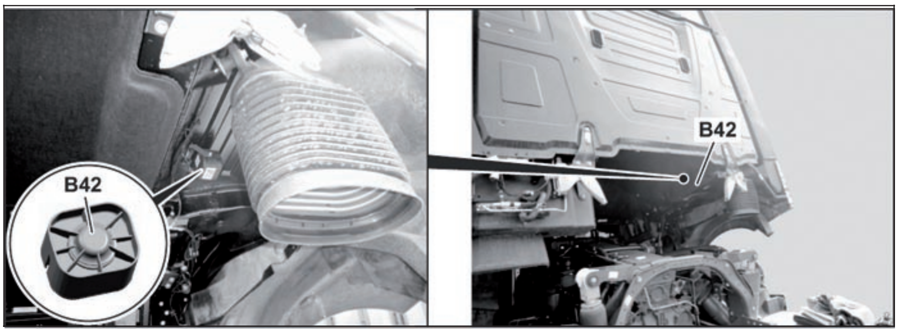
GF80.50-W-6060H	Alarm siren, component description	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection

Location

B42 Alarm siren

The alarm siren (B42) is located on the cab on the right rear in direction of travel.



W80.50-1086-04

Task

The alarm siren (B42) has the following tasks:

- acoustic alarm output for antitheft alarm (ATA)
- autonomic alarm output in the event of loss of supply voltage or communication

Design

The alarm siren (B42) consists of:

- a microcontroller with charging control device for internal control of the siren
- an internal back-up battery (rechargeable battery) for internal power supply when power supply is interrupted
- a tone generator (siren) (Piezo element) for acoustic alarm output

Function

If an alarm is recognized by the antitheft alarm system control unit (ATA) (A6), the antitheft alarm system control unit (ATA) (A6) transmits the command "Warning tone ON" via the ATA-LIN (LIN 11) to the alarm siren (B42). From this time, the acoustic alarm output is completely controlled via the interior microcontroller in the alarm siren (B42). The internal charging control device for the microcontroller monitors the internal back-up battery (rechargeable battery) and initiates charging as required.

The alarm siren (B42) is actuated cyclically every 700 ms by the antitheft alarm system control unit (ATA) (A6) via ATA-LIN (LIN 11) for monitoring the communication. If the signal from the antitheft alarm system control unit (ATA) (A6) fails for 1 s or longer, for example, when the electrical connector is disconnected (loss of data communication or power supply), the alarm siren (B42) outputs an acoustic alarm automatically. If the power supply is disconnected, the voltage is supplied by the internal back-up battery (rechargeable battery).

GF80.50-W-6000H	Interior protection, component description	6.7.11

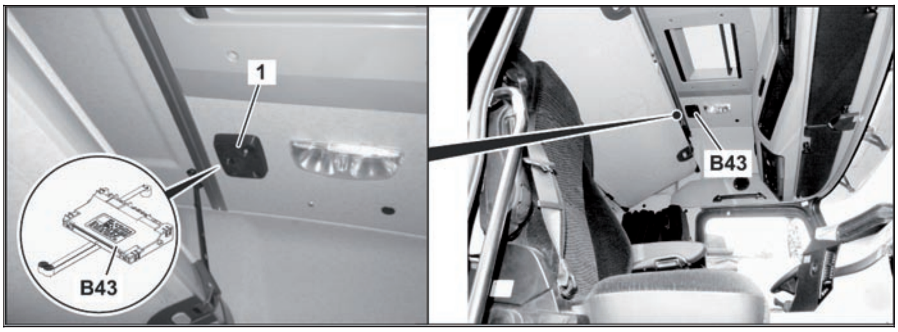
MODEL 963 with CODE (F8Z) Alarm system with interior protection

Location

1 Housing

B43 Interior protection sensor

The interior protection sensor (B43) is installed in the headliner of the cab above the driver seat.



W80.50-1081-04

Task

The interior protection sensor (B43) monitors the interior compartment for motions by transmitting and receiving ultrasonic waves.

Design

The interior protection sensor (B43) consists of a micro-controller and ultrasonic sensor, which consists of two ultrasonic speakers and an ultrasonic microphone. The ultrasonic speakers and the ultrasonic microphone are clipped into the housing (1) of the interior protection sensor (B43). Moreover, the an inclination angle sensor is integrated into the interior protection sensor (B43).

Function

The two ultrasonic speakers of the interior protection sensor (B43) transmit the ultrasonic signals into the cab interior compartment. The ultrasonic signals are received by the ultrasonic microphone on the interior protection sensor (B43). The internal microcontroller of the interior protection sensor (B43) evaluates running times for the ultrasonic signals. If a motion is detected in the passenger compartment and evaluated as alarm-relevant, a message is transmitted to the antitheft alarm system control unit (ATA) (A6) via ATA-LIN (LIN 11).

Then the antitheft alarm system control unit (ATA) (A6) triggers an acoustic and visual alarm. The integrated inclination angle sensor operates as acceleration sensor. During operation, it reacts to any motion in the cab and triggers an alarm if necessary. In Tolerances are stored in the antitheft alarm system control unit (ATA) (A6) to prevent false alarm. The values of the inclination sensor simultaneously serve as correction factor for the ultrasonic sensor to prevent false alarm.

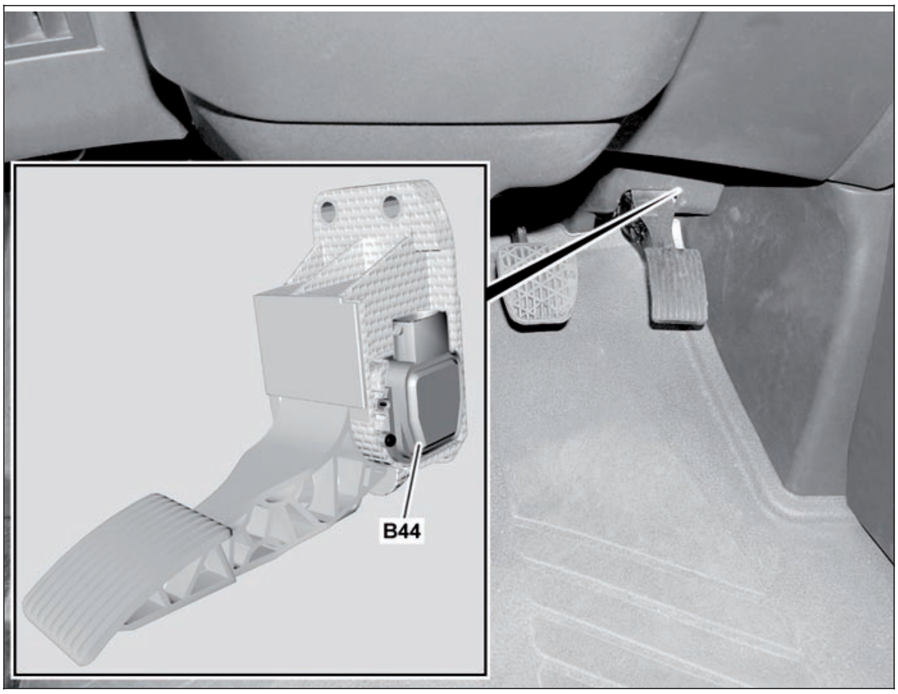
GF30.20-W-2012H	Component description for accelerator pedal sensor	1.7.11

MODEL 963, 964

Location

B44 Accelerator pedal sensor

The accelerator pedal sensor (B44) is located on the accelerator pedal in the driver footwell at the front right.



W30.20-1005-06

Task

The accelerator pedal sensor (B44) detects the accelerator pedal position.

Design

The accelerator pedal sensor (B44) consists of two Hall sensors.

Function

The Hall sensors integrated in the accelerator pedal sensor (B44) transmit a respectively anticyclical signal. In this way perfect position recognition of the accelerator pedal is achieved at any time. This information is read in and appropriately processed by the drive control (CPC) control unit (A3) by means of direct lines as a pulse width modulation signal.

GF83.70-W-4043H	Outside air sensor, component description	20.7.11

MODEL 963, 964

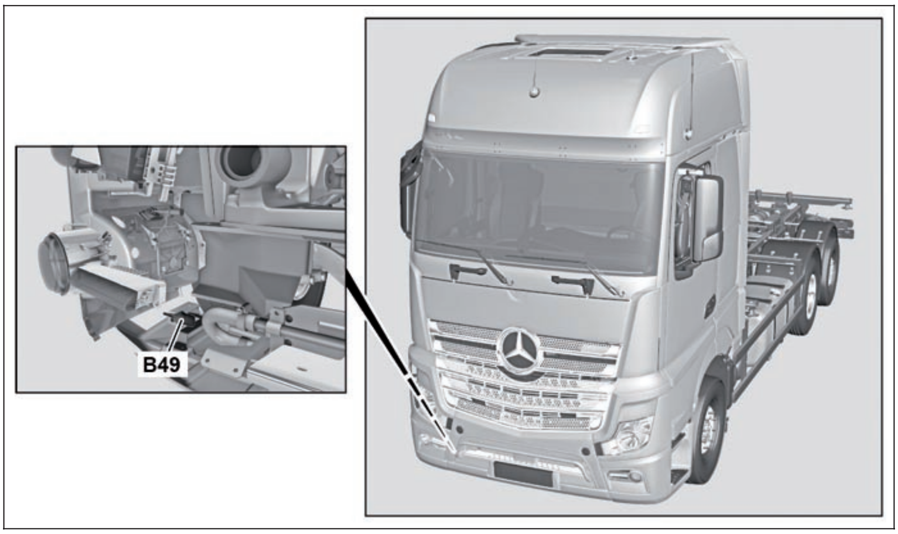
Location

B49 Outside temperature sensor

The outside temperature sensor (B49) is located behind the front fog lamp facing downwards.

Task

The outside temperature sensor (B49) enables the heating, ventilation and air conditioning control unit (HVAC) (A12b) to record the outside temperature.



W83.57-1015-05

GF46.20-W-5150H	Front axle steering angle sensor, component description	2.8.11

MODEL 963, 964

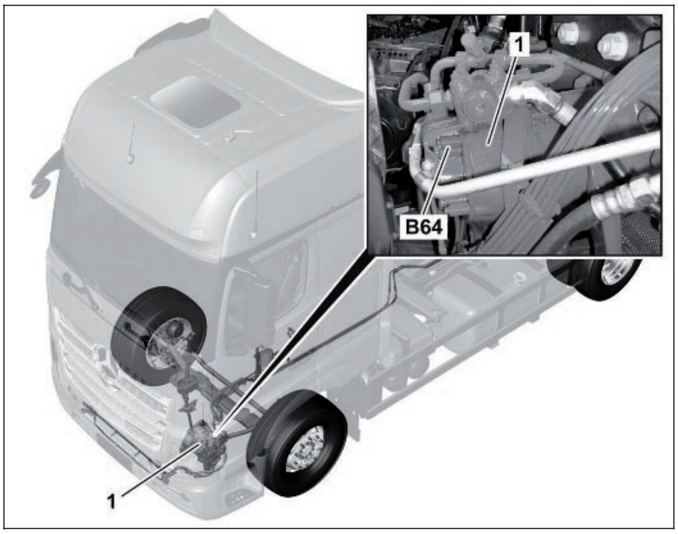
Location

Shown on model 963

1 Steering gear

B64 Front axle steering angle sensor

The front axle steering angle sensor (B64) is directly attached to the steering gear (1).



W46.80-1140-11

Task

The front axle steering angle sensor (B64) detects the steering angle of the front axle. This steering angle is then used to calculate the steering angle for the additional steering axle.

The signals from the front axle steering angle sensor (B64) are read in and processed by the additional steering axle (ASA) control unit (A34).

GF46.80-W-1010H	Additional steering axle steering angle sensor, component description	2.8.11

MODEL 963, 964

Location

Illustrated on model 963
B65 Additional axle steering angle sensor

The additional axle steering angle sensor (B65) is located directly on the additional steering axle steering cylinder.

W46.80-1141-11

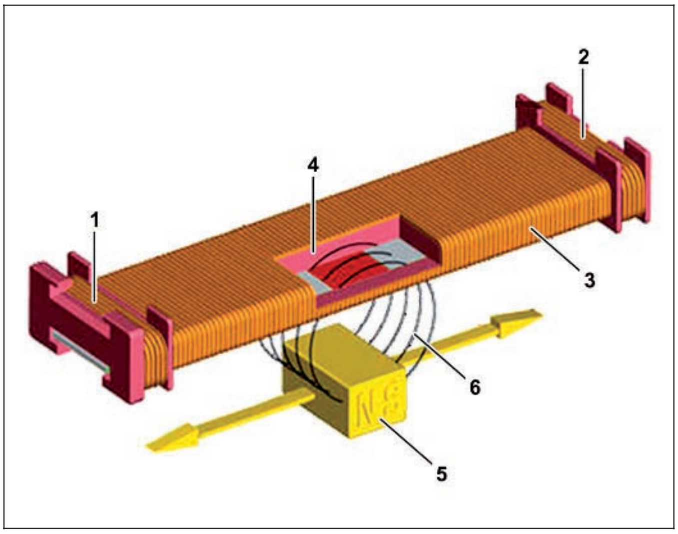
Task

The additional axle steering angle sensor (B65) registers the piston rod position in the additional steering axle steering cylinder, through which the additional steering axle (ASA) control unit (A34) computes the current steering angle.

Design

The additional axle steering angle sensor (B65) is designed as a linear sensor

Illustration of the principle
1 Left secondary coil
2 Right secondary coil
3 Primary coil
4 Soft iron core
5 Permanent magnet
6 Magnetic field



W46.80-1138-81

Function

The primary coil (3) is energized by the additional steering axle (ASA) control unit (A34) with AC voltage. As a result, a magnetic field (6) develops around the soft iron core (4), which induces voltage in the left secondary coil (1) and/or the right secondary coil (2). The permanent magnet (5) located on the piston of the additional axle steering cylinder is located opposite the primary coil (3). If the piston of the additional steering axle steering cylinder and thus the permanent magnet (5) move along the primary coil (3), the flow of the magnetic field (6) is eliminated at the corresponding point.

This process can be measured using the voltage difference between the left secondary coil (1) and the right secondary coil (2). With the help of the voltage difference, the additional steering axle (ASA) control unit (A34) computes the position of the permanent magnet (5) and thus the piston rod of the additional steering axle steering cylinder.

GF42.45-W-3006H	Steering wheel angle sensor (SAS), component description	2.8.11

MODEL 963

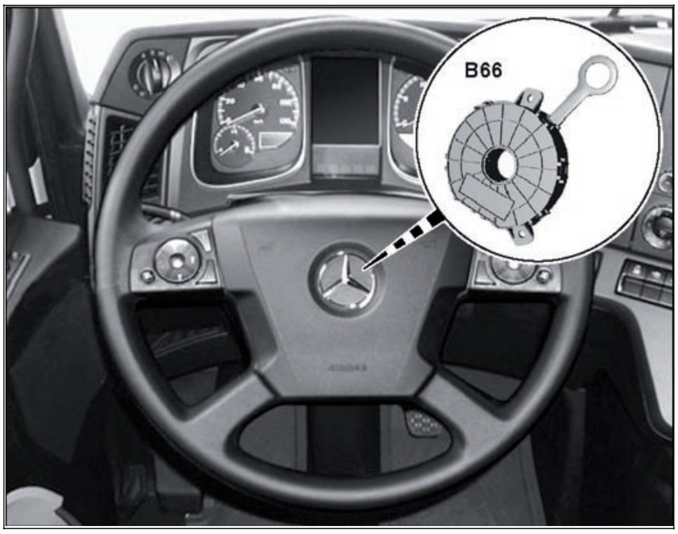
Location

Illustrated on model 963.4
B66 Steering wheel angle sensor (SAS)

The steering wheel angle sensor (SAS) (B66) is located between the steering column tube and the steering wheel.

Task

The steering wheel angle sensor (SAS) (B66) detects the steering wheel angle specified by the driver and makes this available on the frame CAN (CAN 3) as a CAN message.

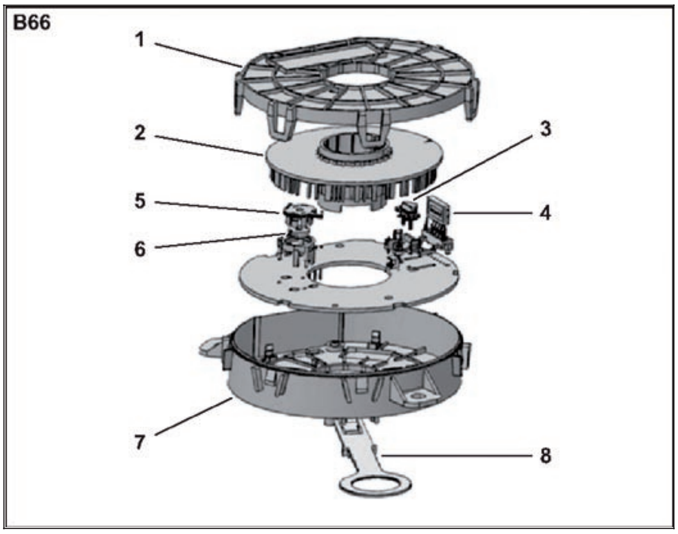


W42.45-1032-11

Design

1 Cover
2 Code ring
3 Optics
4 Charge coupled device sensor (CCD sensor)
5 Lever (only with absolute steering wheel angle sensor)
6 Solenoid (only with absolute steering wheel angle sensor)
7 Housing
8 Security catch

B66 Steering wheel angle sensor (SAS)



W42.45-1033-81

The steering wheel angle sensor (SAS) (B66) is installed in two variants:

- Relative steering wheel angle sensor
- Absolute steering wheel angle sensor (with code (L1N))

These two sensors behave in exactly the same way as far as steering angle and revolution counter are concerned. The relative steering wheel angle sensor, however, is not designed to store the last steering wheel position status or to ensure that the steering wheel position is updated with the operating voltage switched off (terminal 15 OFF). However, this information is required on vehicles with code (L1N) Front fog lamps, LED daytime running lamps, cornering lights.

Function

When the steering wheel is turned, the code ring (2) of the steering wheel angle sensor (SAS) (B66) also turns and the code ring segments and gaps move between the optics (3) and CCD sensor (4). The optics (3) shine a beam of light from an LED onto the CCD sensor (4). If a code ring segment passes between the CCD sensor (4) and the optics (3), it casts a shadow over the CCD sensor (4). The width of the segments and the gap between the segments vary. The different shadows and gap sizes allow the CCD sensor (4) to detect the current steering angle of the steering wheel. An internal counter additionally counts the number of complete revolutions (greater than 360°).

i After the steering wheel angle sensor (SAS) (B66) has received the "wake-up" signal from the central gateway (CGW) control unit (A2) via the frame CAN (CAN 3), it performs a self-test. If no faults are detected during the self-test, the steering wheel angle sensor (SAS) (B66) delivers the current steering wheel position in the form of a CAN message every 10 ms. The steering movements are broken down into steps of 0.2°.

GF14.40-W-3026H	AdBlue® fill level sensor/temperature sensor, component description	20.7.11

ENGINE 471.9 in MODEL 963, 964

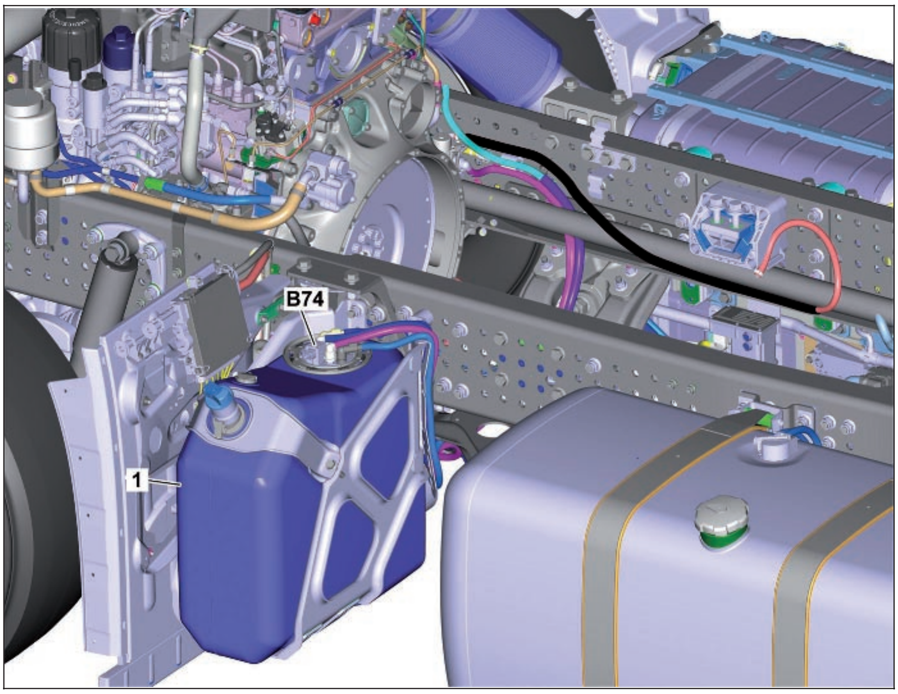
Location

Shown on model 963 with code (M5Z)
Engine version Euro VI

1 AdBlue® tank

B74 AdBlue® fill level sensor/temperature sensor

The AdBlue® fill level sensor/temperature sensor (B74) is screwed in from the outside into the AdBlue® container (1). This is generally located on the left longitudinal frame member.



W14.40-1563-76

Task

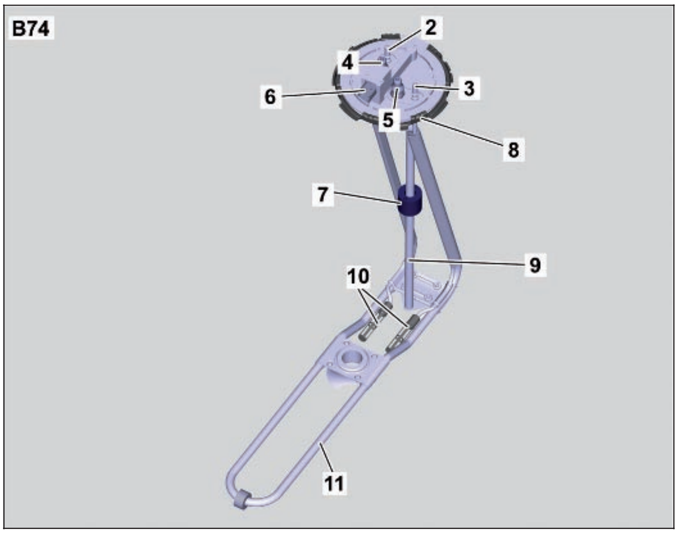
The AdBlue® fill level sensor/temperature sensor (B74) records the fluid level and the temperature of the AdBlue® supply in the AdBlue® container (1).

Design

2 AdBlue® inlet (return from AdBlue® metering device)
3 AdBlue® outlet (feed line to pump module)
4 Coolant outlet (to pump module)
5 Coolant inlet (from engine)
6 Electrical connection
7 Float
8 Bayonet ring
9 Immersion tube
10 AdBlue® filter
11 Coolant duct

B74 AdBlue® fill level sensor/temperature sensor

The AdBlue® fill level sensor/temperature sensor (B74) contains separate components for determining the fill level and the temperature.



W14.40-1571-81

Fill level sensor
The fill level is determined with the aid of the immersion tube (9) with integrated resistance measuring chain made of so-called reed contacts and a float (7), which contains permanent magnets.

Temperature sensor
For the temperature measurement a measuring element based on the NTC resistance (Negative Temperature Coefficient) is located at the lower end of the immersion tube (9).

Function

Determination of the fill level

The sensor to determine the fill level functions according to the float principle with magnetic transfer. A ring magnet fitted in the float (7) actuates tiny reed contacts via its magnetic field through the wall of the immersion tube (9). These reed contacts pick up an uninterrupted measured voltage at a resistor data channel (voltage divider principle), which is proportional to the height of the fill level.
The values of the electrical resistance that changes along with the position of the float (7) are transmitted in defined intervals as an analog signal over the exhaust aftertreatment (ACM) control unit (A60) to the engine management (MCM) control unit (A4). Using the resistance value, this calculates the associated fill level.

Determination of temperature

The AdBlue surrounding the AdBlue® fill level sensor/temperature sensor (B74) influences the inside of the measuring element according to its temperature and therefore the size of the electrical resistance.
The values of the electrical resistance that changes are transmitted in defined intervals as an analog signal over the exhaust aftertreatment (ACM) control unit (A60) to the engine management (MCM) control unit (A4). Based on the resistance value, the MR control unit calculates the associated temperature.

GF54.21-W-6002H	Rain and light sensor, component description	1.7.11

MODEL 963, 964

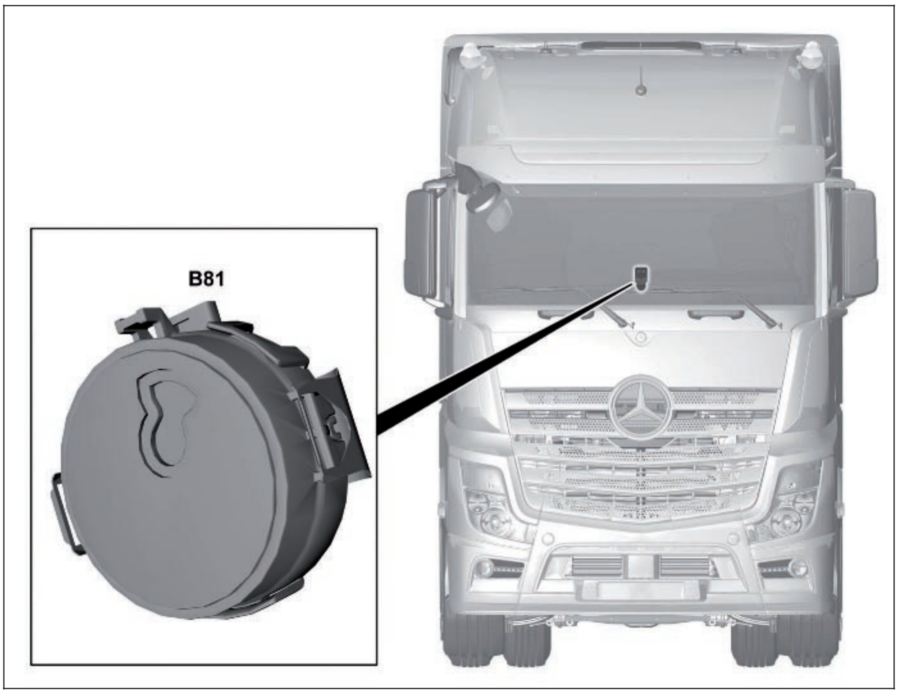
Location

B81 Rain and light sensor (RLS)

The rain and light sensor (RLS) (B81) is located on the inside of the windshield, in the center area at the bottom.
It is pressed and held onto the windshield by a ring.

Task

The rain and light sensor (RLS) (B81) records the degree of wetting on the windshield and the ambient light intensity.

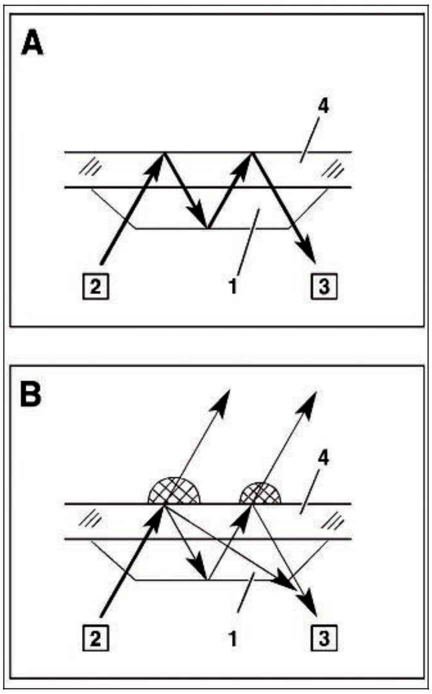


W82.00-1011-06

Function

1 Lens
2 Infrared transmitter unit
3 Infrared receiver unit
4 Windshield

A Windshield (4), dry
B Windshield (4), wet



P82.30-0209-03

Function of rain sensor

Infrared light is radiated from the infrared transmitter unit (2) through the lens (1) to the windshield (4). The intensity of the light reflected at the windshield (4) is measured by the infrared receiver unit (3) which is located at the other end of the lens (1).
If the windshield (4) is dry (A), then the light is almost completely reflected; the infrared receiver unit (3) measures a high light intensity.
If the windshield (4) is wet (B), part of the light of the scattered out of the glass of the windshield (4). As a result the intensity of the reflected light reduces; the infrared receiver unit (3) measures a lower light intensity.

The light intensity measured by the infrared receiver unit (3) represents a measure for the degree of wetting of the windshield (4). The smaller the measured intensity the larger the quantity of water on the windshield (4).
The measurement value recording and evaluation takes place within the rain and light sensor (RLS) (B81). The wiper motor (M15) switch on request is sent with a corresponding message through the rain/light sensor LIN
(LIN 1) to the cab SAM control unit (SCA) (A7).

Function of light sensor

The light sensor consists of two photodiodes which measure the light intensity occurring from outside.
One photodiode is directed forwards onto the road. It measures the light in the foreground and records the light in a narrow cone in front of the vehicle.
The second photodiode is directed upwards and measures the absolute brightness of the ambient light.
If in the process the measured light intensity of the foreground light deviates compared with that of the ambient light, in the following cases auto on/off headlamps is requested via the rain and light sensor (RLS) (B81):

- Dusk
- Darkness
- Driving through tunnels
- Detected sensor fault

The stated request conditions are considered separately. If at least one of the conditions is met, the rain and light sensor (RLS) (B81) transmits the request that the standing lights, the low beams, the clearance lamps and the trailer taillamps should be switched on
The measurement value recording and evaluation takes place within the rain and light sensor (RLS) (B81). The requirements of the rain and light sensor (RLS) (B81) are sent directly over the rain/light sensor-LIN (LIN 1) to the signal acquisition and actuation module control unit (SCA) (A7).

i Detection of fog is not realized. In fog the driving lights must continue to be switched on manually.

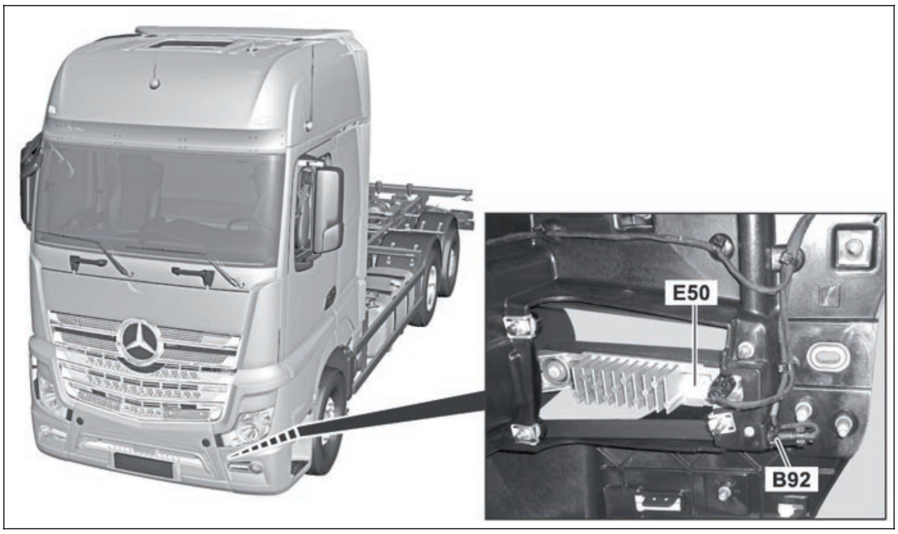
GF83.57-W-4006H	Outside temperature sensor, component description	2.8.11

MODEL 963, 964

Location

B92 Outside temperature sensor
E50 Left front fog lamp and daytime running lamp

The outside temperature sensor (B92) is located on the rear of the bumper next to the front fog lamp and the left daytime running lamp (E50).



W83.57-1018-05

Task

The outside temperature sensor (B92) records the outside temperature and supplies a corresponding voltage value.

Function

The outside temperature sensor (B92) is an NTC resistor, i.e. its electrical resistance increases as the temperature increases.

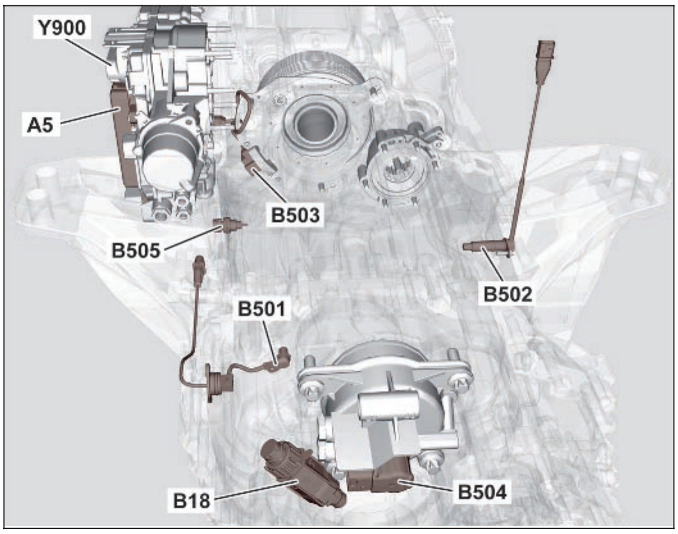
GF26.19-W-3004H	Component description for main shaft rpm sensor	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3

Location

A5 *Transmission control (TCM) control unit*
B18 *Travel and speed sensor*
B501 *Main shaft rpm sensor*
B502 *Countershaft rpm sensor*
B503 *Clutch travel sensor*
B504 *Range group travel sensor*
B505 *Transmission oil temperature sensor*
Y900 *Transmission positioner*

The main shaft rpm sensor (B501) is screwed into the center part of the transmission housing on the left-hand side of the transmission.



W26.19-1127-81

Task

The transmission (TCM) control unit (A5) detects the rotational speed and the direction of rotation of the transmission main shaft over the main shaft rpm sensor (B501).

Design

The main shaft rpm sensor (B501) is an active rpm sensor with integral Hall sensors.

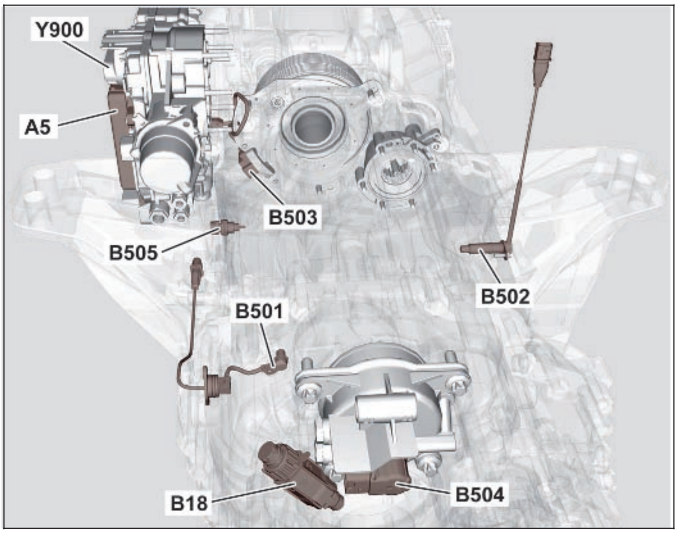
GF26.19-W-3003H	Component description for countershaft rpm sensor	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3

Location

A5 Transmission control (TCM) control unit
B18 Travel and speed sensor
B501 Main shaft rpm sensor
B502 Countershaft rpm sensor
B503 Clutch travel sensor
B504 Range group travel sensor
B505 Transmission oil temperature sensor
Y900 Transmission positioner

The countershaft rpm sensor (B502) is screwed into the center part of the transmission housing on the right-hand side of the transmission.



W26.19-1127-81

Task

The transmission (TCM) control unit (A5) detects the rotational speed of the transmission countershaft over the countershaft rpm sensor (B502).

Design

The countershaft rpm sensor (B502) is an active rpm sensor with integral Hall sensors.

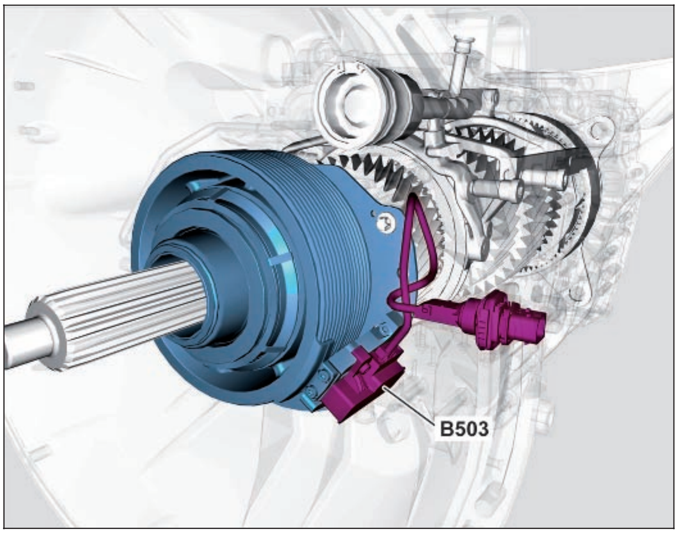
GF25.19-W-3001H	Component description for clutch travel sensor	2.8.11

MODEL 963 with TRANSMISSION 715 with CODE (G5G) Mercedes PowerShift 3
MODEL 964 with TRANSMISSION 715 with CODE (G5G) Mercedes PowerShift 3

Location

B503 Clutch travel sensor

The clutch travel sensor (B503) is screwed onto the pneumatic central clutch release bearing.



W25.20-1118-81

Task

Signals from the clutch travel sensor (B503) allow the transmission (TCM) control unit (A5) to detect the position of the pneumatic central clutch release bearing.

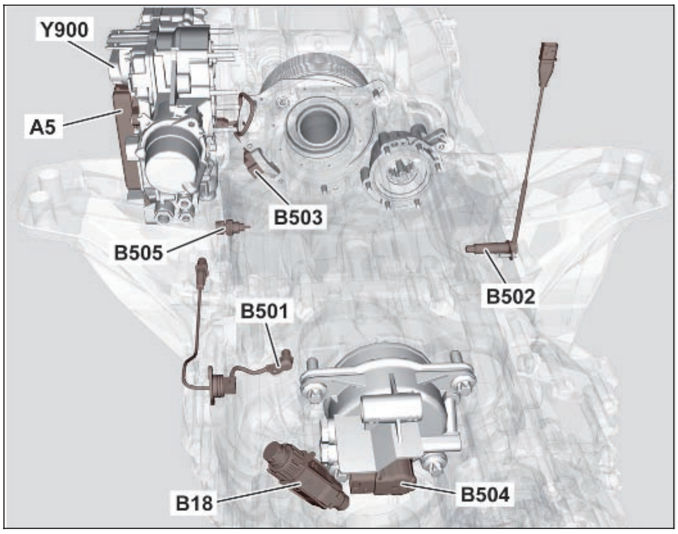
Design

The clutch travel sensor (B503) is a contact-less measuring sensor whose internal coils are excited by a permanent magnet. The clutch travel sensor (B503) internally generates a pulse width modulated (PWM) signal over the integral evaluation electronics which is read in by the transmission (TCM) control unit (A5).

GF26.19-W-3006H	Component description for range group travel sensor	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3

Location



W26.19-1127-81

A5 *Transmission control (TCM) control unit*
B18 *Travel and speed sensor*
B501 *Main shaft rpm sensor*
B502 *Countershaft rpm sensor*
B503 *Clutch travel sensor*
B504 *Range group travel sensor*
B505 *Transmission oil temperature sensor*
Y900 *Transmission positioner*

The range group travel sensor (B504) is mounted on the range group module in the rear area of the transmission.

Task

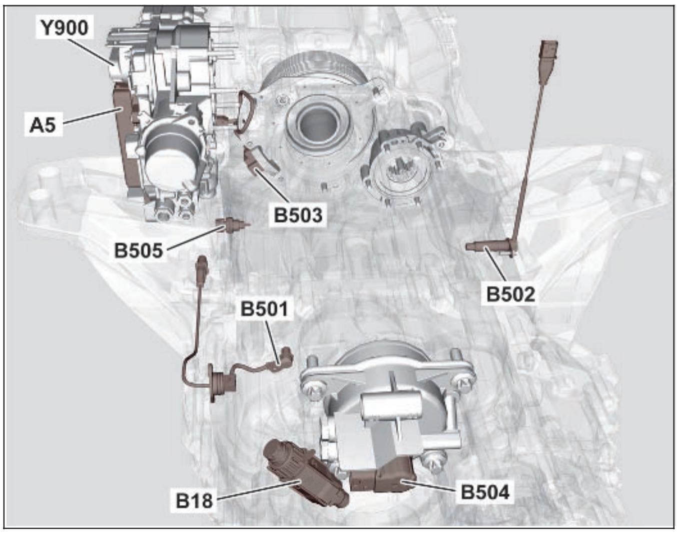
The range group travel sensor(B504) detects the position of the range group shift cylinder (extended or retracted) over a tappet and provides an appropriate signal. This signal is read in transmission (TCM) control unit (A5) and evaluated.

GF26.19-W-3001H	Component description for transmission oil temperature sensor	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3

Location

A5 *Transmission control (TCM) control unit*
B18 *Travel and speed sensor*
B501 *Main shaft rpm sensor*
B502 *Countershaft rpm sensor*
B503 *Clutch travel sensor*
B504 *Range group travel sensor*
B505 *Transmission oil temperature sensor*
Y900 *Transmission positioner*



W26.19-1127-81

The transmission oil temperature sensor (B505) is screwed into the center part of the transmission housing on the left-hand side of the transmission.

Task

The transmission (TCM) control unit (A5) detects the transmission oil temperature over the transmission oil temperature sensor (B505).

Design

The transmission oil temperature sensor (B505) consists of a very rapidly responding NTC resistor and a 3-pin plug connection. The lower section of the housing is made of metal. NTC stands for "Negative Temperature Coefficient", which means that electrical resistance falls as temperature rises.

Function

The NTC resistor integrated in the transmission oil temperature sensor (B505) alters its electrical resistance in line with the transmission oil temperature. The transmission (TCM) control unit (A5) detects the transmission oil temperature over the voltage drop.

GF03.20-W-4100H	Component description for crankshaft position sensor	20.7.11

ENGINES 471.9 in MODEL 963

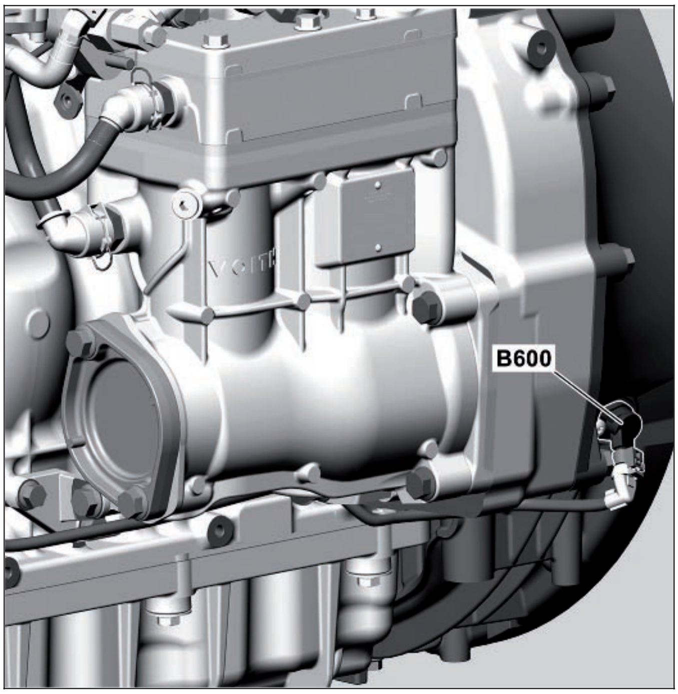
Location

B600 Crankshaft position sensor

The crankshaft position sensor (B600) is located on the left on the timing case.

Task

The crankshaft position sensor (B600) makes electrical voltage signals available to the engine management (MCM) control unit (A4) for a rotating engine from which the rotational speed as well as the position of the crankshaft can be determined.



W07.04-1073-12

Design

The crankshaft position sensor (B600) is an inductive sensor and is fitted with a sensor coil as well as a permanent magnet.

Function

The permanent magnet on the camshaft position sensor (B600) generates a magnetic field. Once the flywheel is rotated, magnetic field fluctuations occur due to grooves in the flywheel which are located, up to a gap of 18°, 6° apart around the flywheel circumference. Inductive voltage signals are generated in this way in the crankshaft position sensor coil (B600) with the aid of which the engine management (MCM) control unit (A4) can determine the engine speed and, by using the gap of 18°, the angular position of the crankshaft.

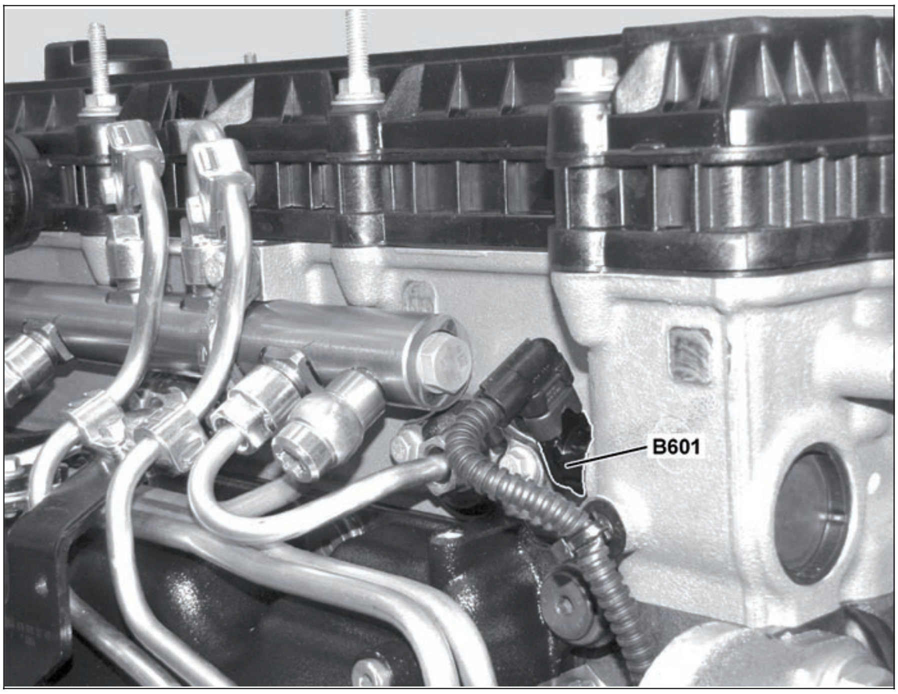
GF05.20-W-4105H	Component description for camshaft position sensor	20.7.11

ENGINES 471.9 in MODEL 963

Location

B601 Camshaft position sensor

The camshaft position sensor (B601) is located on the camshaft frame at the height of cylinder 6 next to the rail.



W05.20-1035-06

Task

The camshaft position sensor (B601) makes a switching signal available to the engine management (MCM) control unit (A4) for rotating engine from which the compression cycle of cylinder 1 and, as required (in limp-home mode, in case of failure of the crankshaft position sensor), the engine speed or crankshaft position can be determined.

Design

The camshaft position sensor (B601) is a Hall sensor and is fitted with a permanent magnet as well as an electronic analysis system.

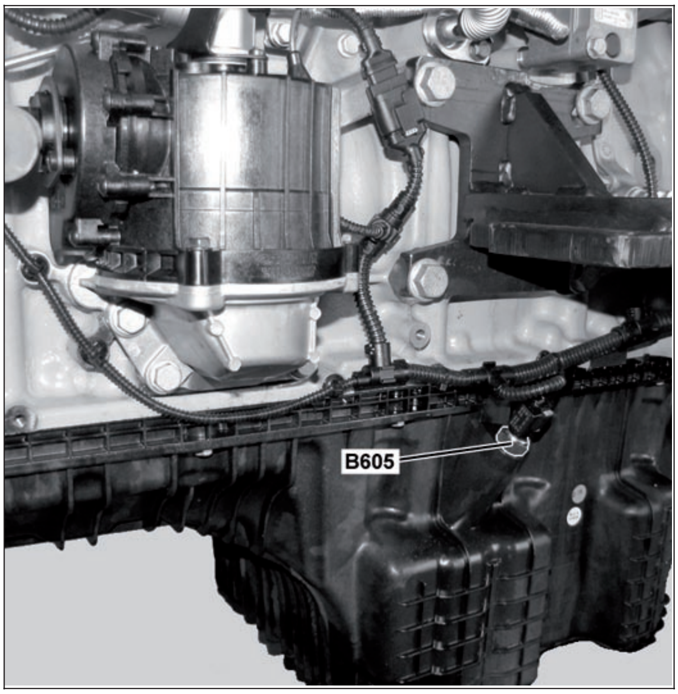
Function

The permanent magnet on the camshaft position sensor (B601) generates a magnetic field. When the camshaft rotates, fluctuations in the magnetic field occur due to the grooves in the camshaft sprocket. These changes in the magnetic field are converted by the electronic analysis system in the camshaft position sensor (B601) into shift signals and passed on to the engine management (MCM) control unit (A4).

GF18.40-W-4117H	Component description for engine oil fill level sensor	20.7.11

ENGINE 471.9 in MODEL 963

Location



W18.40-1033-12

B605 Engine oil fill level sensor

The engine oil fill level sensor (B605) is located onto the right side of the engine and screwed into the oil pan from above.

Task

The engine oil fill level sensor (B605) enables the engine management (MCM) control unit (A4) to determine the instantaneous fill level as well as the engine oil temperature in the oil pan.

Design

Located inside the engine oil fill level sensor (B605) is a series resistor and resistance wire, which are connected in parallel to each other, as well as an NTC resistor, which is connected before them in series. NTC stands for "Negative Temperature Coefficient", which means that electrical resistance falls as temperature rises.

The resistance wire is located in the measuring probe.
The engine oil fill level sensor (B605) is installed in such a way that the measuring probe dips fully into the engine oil when the engine oil level is correct.
The NTC resistor is located at the tip of the sensor.

Function

Determine engine oil level
Engine oil passes via a feed hole into the measuring probe of the engine oil fill level sensor (B605) and thus directly to the resistance wire.
Depending on how far the resistance wire dips into the engine oil the overall resistance at the engine oil fill level sensor (B605) changes and drops with a reducing engine oil level.

After switching on of the ignition, the engine management (MCM) control unit (A4) applies a measurement voltage every 6 s to the engine oil fill level sensor (B605). It checks the electrical overall resistance of the engine oil fill level sensor (B605) and uses it to deduce the current engine oil level in the oil pan.

Measurement of engine oil temperature
The engine oil at the engine oil fill level sensor (B605) influences the temperature measuring element inside the sensor depending on its temperature and therefore the electrical resistance value.
The engine management (MCM) control unit (A4) deduces the associated temperature from the electrical resistance.

GF83.30-W-2136H	Stationary air conditioning air outlet temperature sensor, component description	20.7.11

MODEL 963, 964 with CODE (D6H) Stationary air conditioner

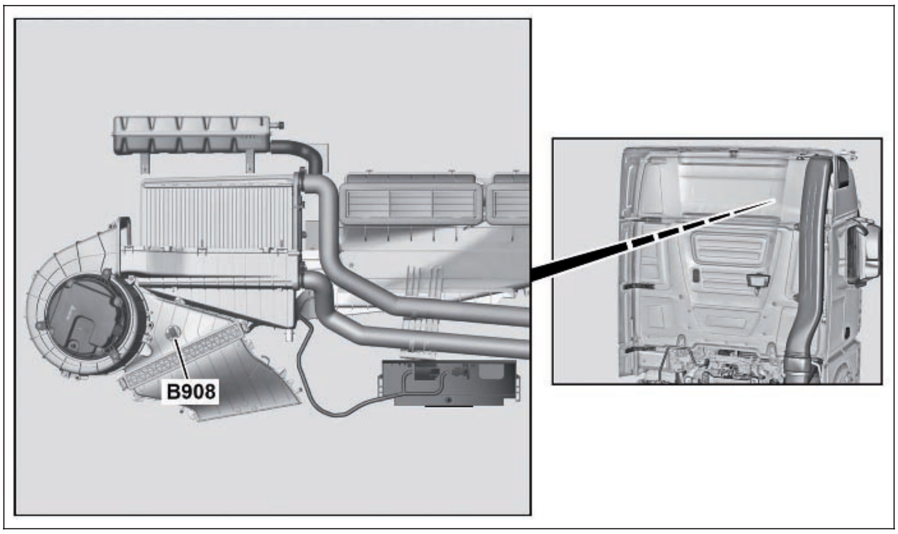
Location

B908 Stationary air conditioning air inlet temperature sensor

The stationary air conditioner air inlet temperature sensor (B908) is located on the cab rear panel in the stationary air conditioner air intake duct.

Task

The stationary air conditioner control unit (IAC) (A14) measures the temperature of the air that is drawn in from the vehicle interior using the stationary air conditioning air intake temperature sensor (B908).



W83.30-1183-05

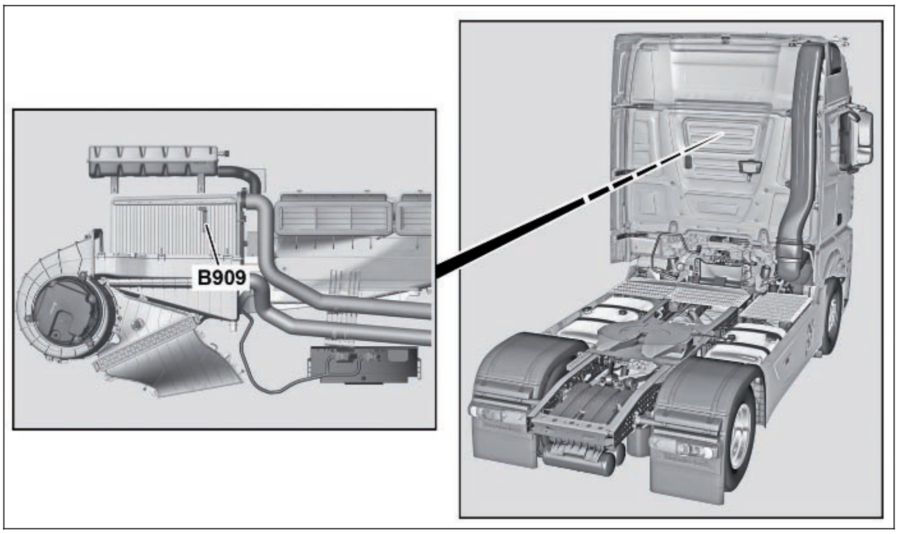
GF83.30-W-2137H	Stationary air conditioning air outlet temperature sensor, component description	20.7.11

MODEL 963, 964 with CODE (D6H) Stationary air conditioner

Location

B909 Stationary air conditioning air outlet temperature sensor

The stationary air conditioner air outlet temperature sensor (B909) is located on the cab rear panel in the stationary air conditioner air outlet duct.



W83.30-1184-05

Task

The stationary air conditioner control unit (IAC) (A14) measures the temperature of the air that is led past the stationary air conditioner heat exchanger using the stationary air conditioning air outlet temperature sensor (B909).

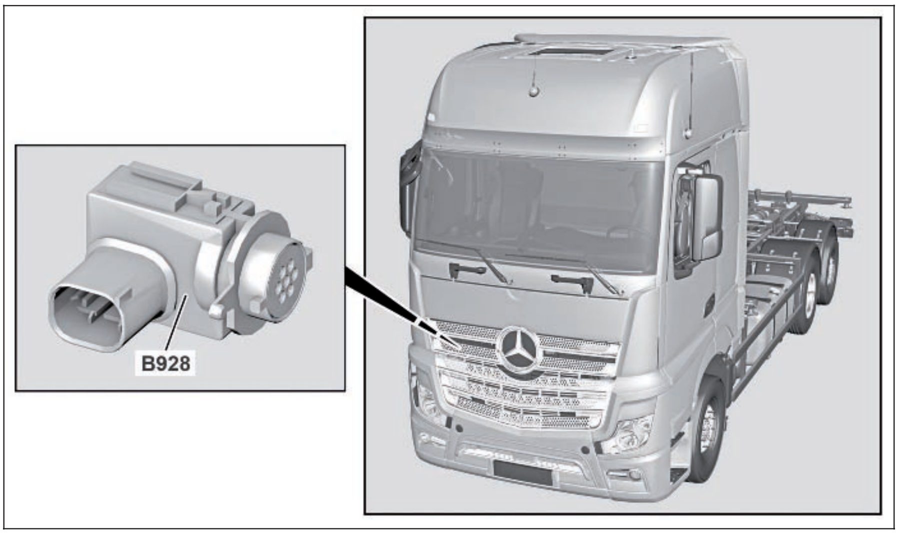
GF83.10-W-2194H	Air quality sensor, component description	20.7.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning

Location

B928 Air quality sensor

The air quality sensor (B928) is attached in the fresh air intake opening, and is in the air flow of the fresh air drawn in by the blower motor (M13).



W83.30-1176-05

Task

The heating, ventilation and air conditioning control unit (HVAC) (A12b) measures the amount of CO, CH, NOx, SO_2, H_2S and CS in the air via the air quality sensor (B928) As of a certain limit value, the fresh air/recirculation flap is closed under the control of the heating, ventilation and air conditioning control unit (HVAC) (A12b).

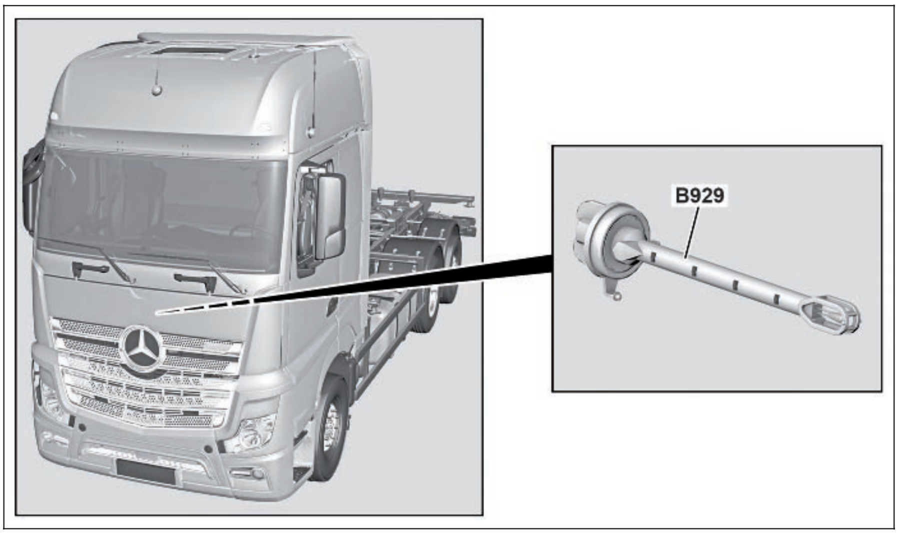
GF83.57-W-2136H	Evaporator temperature sensor, component description	20.7.11

MODEL 963, 964

Location

B929 Evaporator temperature sensor

The evaporator temperature sensor (B929) is located at the left side of the heater blower unit, beneath the evaporator.



W83.57-1013-05

Task

The heating, ventilation and air conditioning control unit (HVAC) (A12b) measures the temperature at the evaporator via the evaporator temperature sensor (B929) .It is used for temperature control and anti-icing protection.

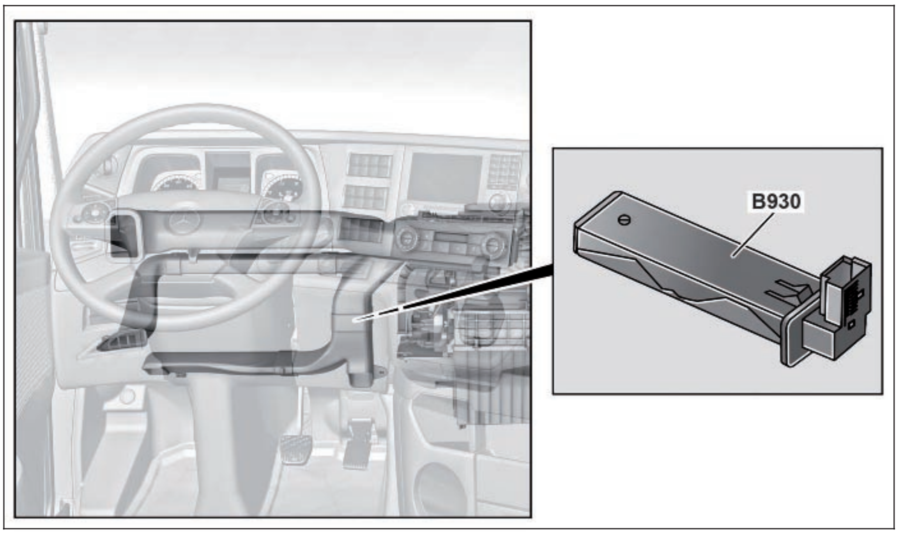
GF83.57-W-2130H	Air outlet temperature sensor, component description	20.7.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning

Location

B930 Air outlet temperature sensor

The air outlet temperature sensor (B930) is located in the air duct of the footwell air outlet.



W83.57-1012-05

Task

The heating, ventilation and air conditioning control unit (HVAC) (A12b) measures the temperature of the air flowing out of the footwell air outlet via the air outlet temperature sensor (B930).

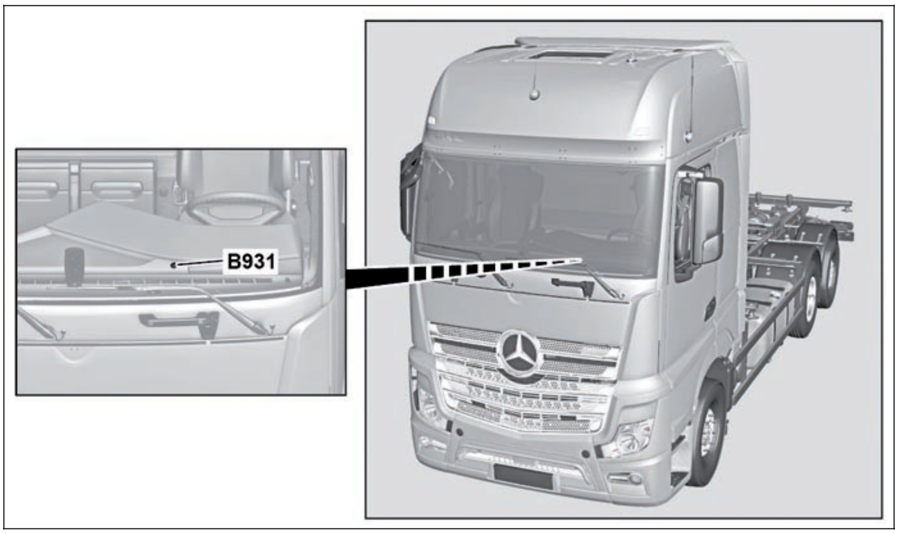
GF83.57-W-2129H	Dual sun sensor, component description	20.7.11

MODEL 963, 964

Location

Shown on left-hand drive vehicle
B931 Dual sun sensor

The dual sun sensor (B931) is installed in the vicinity of the windshield in front of the cover of the instrument cluster control unit (ICUC) (A1) in the instrument panel.



W83.57-1011-05

Task

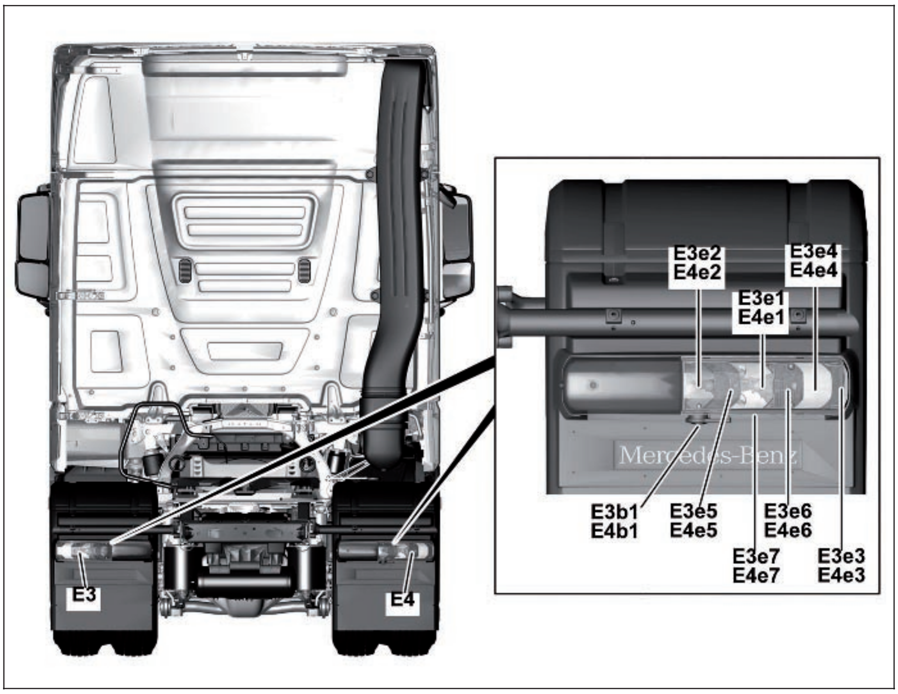
The dual sun sensor (B931) measures the current solar radiation and forwards this value to the heating, ventilation and air conditioning control unit (HVAC) (A12b).

GF82.10-W-2018H	Rear lamp unit, component description	20.7.11

MODEL 963, 964

Location

E3 Left rear lamp unit
E3b1 Left backup warning system
E3e1 Left tail light
E3e2 Left rear fog lamp
E3e3 Left side marker lamp
E3e4 Left turn signal lamp
E3e5 Left backup lamp
E3e6 Left stop light
E3e7 Left license plate lamp
E4 Right rear lamp unit
E4b1 Right backup warning system
E4e1 Right tail light
E4e2 Right rear fog light
E4e3 Right side marker lamp
E4e4 Right turn signal lamp
E4e5 Right backup lamp
E4e6 Right stop light
E4e7 Right license plate lamp



W82.10-1113-06

The rear lamp units are located on the left and right of the vehicle rear.

Task

The rear lamp units are used to output the following functions:

- Standing/parking lights
- Turn signal lamp
- Stop lamp
- Reversing lamp
- Rear fog light
- Reversing lamp
- Backup warning system

The following two variants of rear lamp units are installed.

- Left-hand drive vehicles
  - license plate lamp in the left rear lamp unit (E3)
  - backup warning system in the right rear lamp unit (E4)
- Right-hand drive vehicles
  - license plate lamp in the right rear lamp unit (E4)
  - backup warning system in the left rear lamp unit (E3)

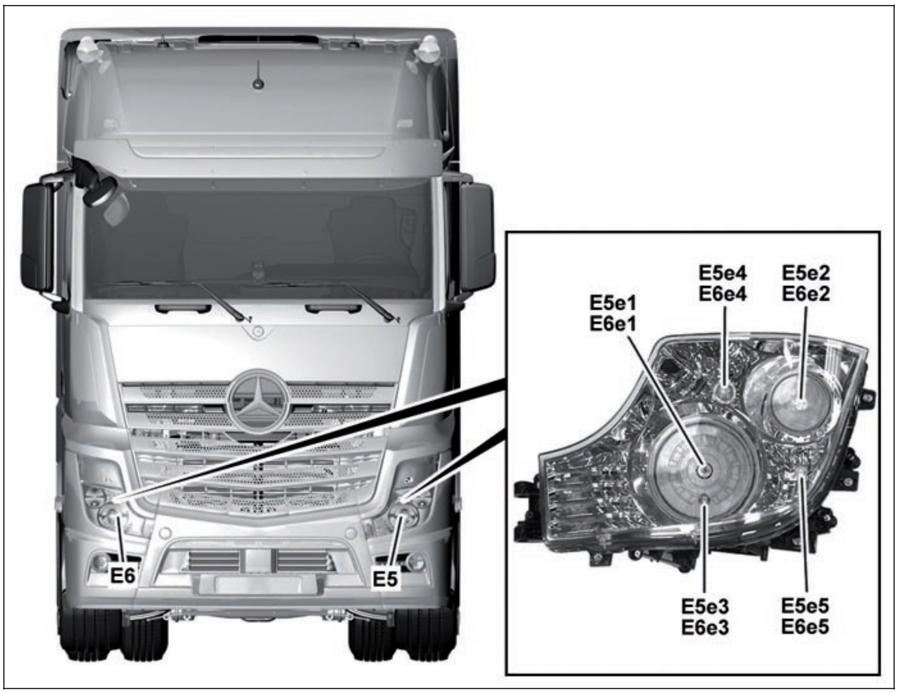
GF82.10-W-2016H	Headlamp, component description	6.7.11

MODEL 963, 964

Location

Shown on vehicle with halogen headlamps

E5 Left headlamp
E5e1 Left low beam
E5e2 Left main beam
E5e3 Left side light
E5e4 Left turn signal lamp
E5e5 Left daytime running light
E6 Right headlamp
E6e1 Right low beam
E6e2 Right main beam
E6e3 Right side light
E6e4 Right turn signal lamp
E6e5 Right daytime running light



W82.10-1112-06

Task

- Illumination of the travel distance for various visibility conditions.
- Indicating the direction of travel to left or right and hazard warning flashing.
- Indicating the position of the vehicle during standstill.

GF54.10-W-2100H	Component description for battery sensor	6.7.11

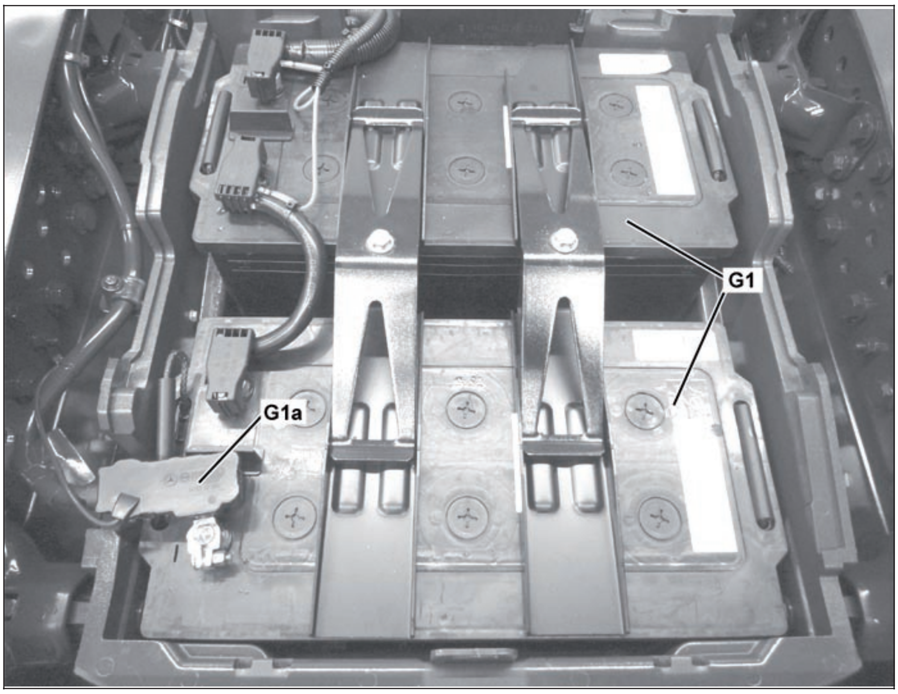
MODEL 963, 964

Location

Shown on vehicle with code (C7T) Integral rear end

G1 Batteries
G1a Battery sensor (IBS)

The battery sensor (IBS) (G1a) is integrated in the battery cable at the terminal of the negative terminal.



W54.10-1139-06

Task

The battery sensor (IBS) (G1a) determines the charge level and startability of the batteries (G1) and, on sends this information when requested over the battery sensor LIN (LIN 2) to the sensor and actuator module, cab (SCA) control unit (A7).

Design

The battery sensor (IBS) (G1a) contains electronics for measurement data acquisition and processing (microcontroller) and a precision resistor.

Function

The battery sensor (IBS) (G1a) calculates the charge level and startability of the batteries (G1) by measuring the voltage of the batteries (G1) at the battery clamps, the temperature of the batteries (G1) at the ground battery clamps and the current on the basis of the voltage drop at the precision resistor.
If a corresponding request is pending, the battery sensor (IBS) (G1a) sends the calculation result over the battery sensor-LIN (LIN 2) to the sensor and actuator module, cab (SCA) control unit (A7).

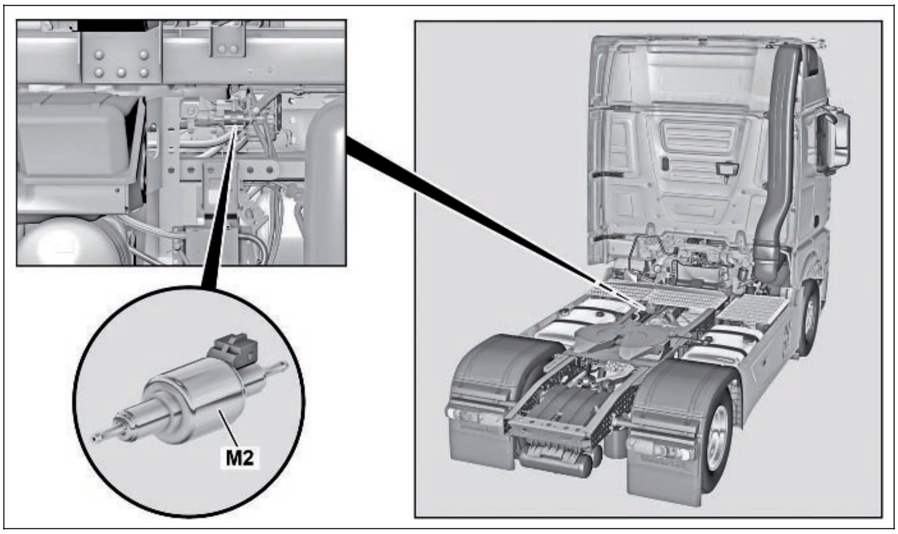
GF83.70-W-4044H	Fuel metering pump, component description	20.7.11

MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

Location

M2 Fuel metering pump

The fuel metering pump (M2) is attached on the inside of the left longitudinal frame member.



W83.70-1446-05

Task

The fuel metering pump (M2) pumps and meters the fuel in the heater's combustion chamber, proportional to the heating output stage on the combustion air blower (A901 M1). It blocks the flow of fuel when idle.

ℹ Actuation is pulsed.

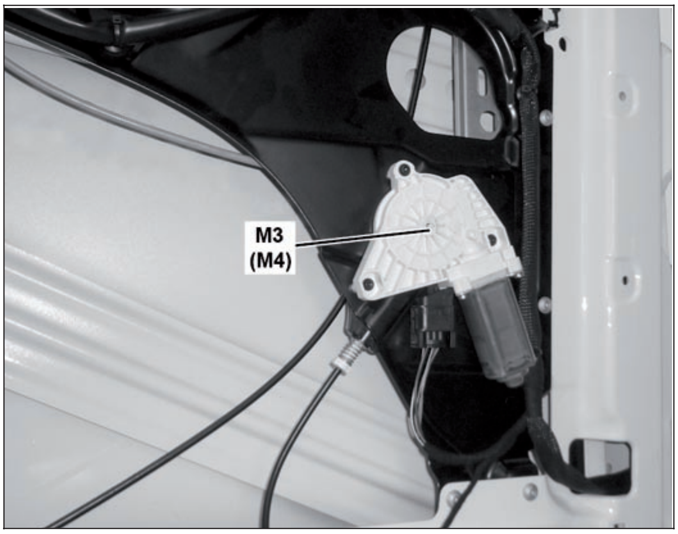
GF72.29-W-6030H	Power window motor, component description	6.7.11

MODEL 963, 964

Location

Shown on driver door

M3 Driver door power window motor
M4 Front passenger door power window motor



W72.29-1038-11

The driver door power window motor (M3) and the passenger door power window motor (M4) are located in the front area of the corresponding vehicle door below the side window.

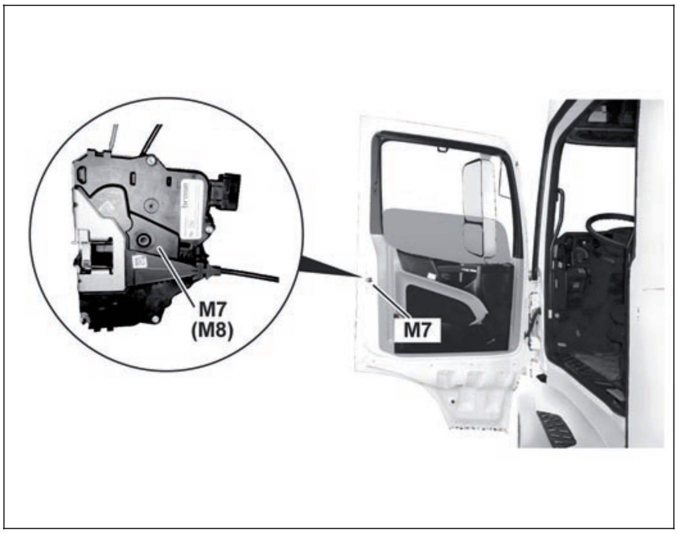
Task

The driver door power window motor (M3) and the passenger door power window motor (M4) open or close the side window in the corresponding vehicle door when actuated electronically.

GF80.20-W-6002H	Door central locking motor, component description	6.7.11

MODEL 963, 964

Location



W80.20-1035-11

Shown on driver door on left-hand drive vehicle
M7 Driver door central locking motor

The driver door central locking motor (M7) or front passenger door central locking motor (M8) s located in the driver or front passenger door.

[i] The task, body and function are described as an example on the driver door central locking motor (M7) for left-hand drive vehicles; this also applies analogously for the front passenger door central locking motor (M8) and right-hand drive vehicles.

Task

- Locking/unlocking corresponding door
- Detecting key position in door lock via switching contact for locking and unlocking position for:
  - Control of comfort closing or comfort opening with code (F8F) Comfort locking system
  - Activating (arming) antitheft alarm system (ATA) with code (F8Z) Alarm system with interior protection
- Detecting rotary tumbler status:
  - to control central locking
  - to control interior illumination when opening and closing doors
  - as alarm source for antitheft alarm system (ATA) with code (F8Z) Alarm system with interior protection

Design

The driver door central locking motor (M7) consists of:

- Electric drive motor (actuator)
- Door lock with rotary tumbler
- The following 3 integrated switching contacts:
  - Rotary tumbler switching contact
  - Switching contact for release position
  - Switching contact for locking position

Function

The electrical motor drive of the driver door central locking motor (M7) (actuator motor) is actuated via a direct line by the driver door control unit (DCMD) (A16) to unlock/lock the driver door, when the vehicle is locked or unlocked from inside or via the transmitter key (S953) via radio remote control.
The driver door is unlocked or locked manually from outside with the key mechanically via a linkage with the driver door central locking motor (M7) to which the door lock cylinder is connected. The electric motor drive (actuator) is actuated mechanically, however, in addition electrically by the driver door control unit (DCMD) (A16).
The driver door control unit (DCMD) (A16) detects whether a door is opened or closed via the rotary tumbler switch contact integrated into the driver door central locking motor (M7).

The unlocking operation as well as the key operation in the door lock when unlocked detects the driver door control unit (DCMD) (A16) via the switching contact integrated into the driver door central locking motor (M7) for the unlocked position, which detects and actuates the position of the mechanical components to the door lock cylinder, as long as the key is held in the unlocking position.

The unlocking operation as well as the key operation in the door lock when locked detects the driver door control unit (DCMD) (A16) via the switching contact integrated into the driver door central locking motor (M7) for the locked position, which detects and actuates the position of the mechanical components to the door lock cylinder, as long as the key is held in the locking position.

GF77.20-W-5209H	Sliding roof motor, component description	6.7.11

MODEL 963, 964 with CODE (D8M) Sliding roof

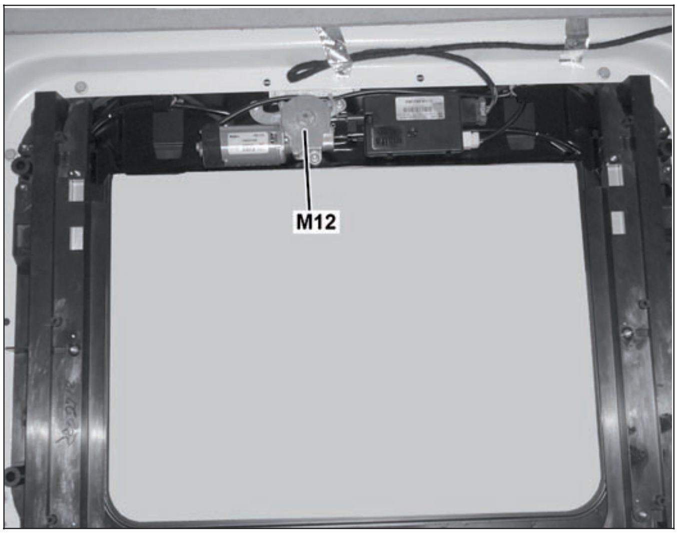
Location

M12 Sliding roof motor

The sliding roof motor (M12) is located on the electric sliding roof.

Task

The sliding roof motor (M12) opens and closes when the sliding roof is actuated electrically.



W77.20-1016-11

GF83.10-W-4125H	Blower motor, component description	20.7.11

MODEL 963, 964

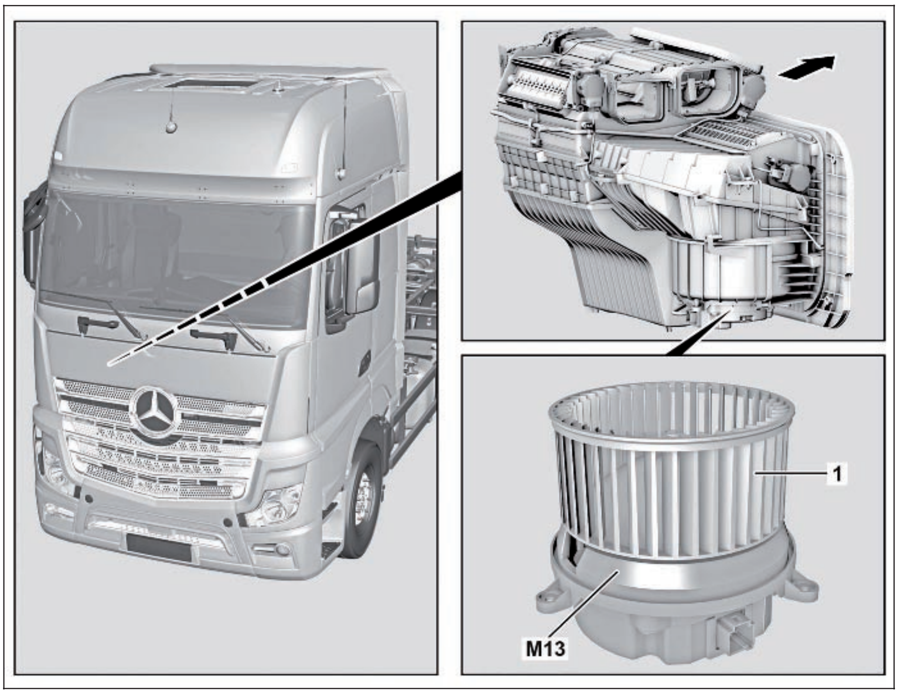
Location

1 Fan wheel

M13 Blower motor

Arrow Direction of travel

The blower motor (M13) is located at the bottom right in the heater blower unit.



W83.10-1016-06

Task

Depending on the position of the fresh air/recirculation flap actuator motor (M900), the blower motor (M13) draws in air from the vehicle interior or fresh air and delivers it to the various air outlets through the heater blower unit and the air ducts.

Controlling

The blower motor (M13) is actuated directly by the heating, ventilation and air conditioning control unit (HVAC) (A12b) via pulse width modulated signals.

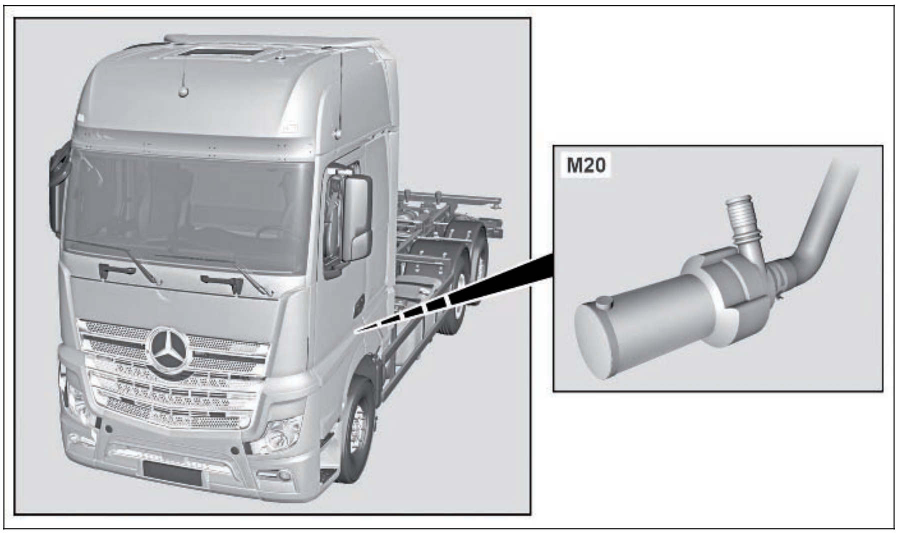
GF83.75-W-0002H	Residual heat pump, component description	6.7.11

MODEL 963, 964 with CODE (D6I) Residual heat utilization

Location

M20 Residual heat pump

The residual heat pump (M20) is located at the left under the cab.



W83.20-1102-05

Task

The residual heat pump (M20) ensures coolant circulation with the engine switched off. The heater core is thus constantly supplied with coolant still warm from the operation of the engine.

GF83.10-W-4135H	Fresh air/air recirculation flap actuator motor, component description	20.7.11

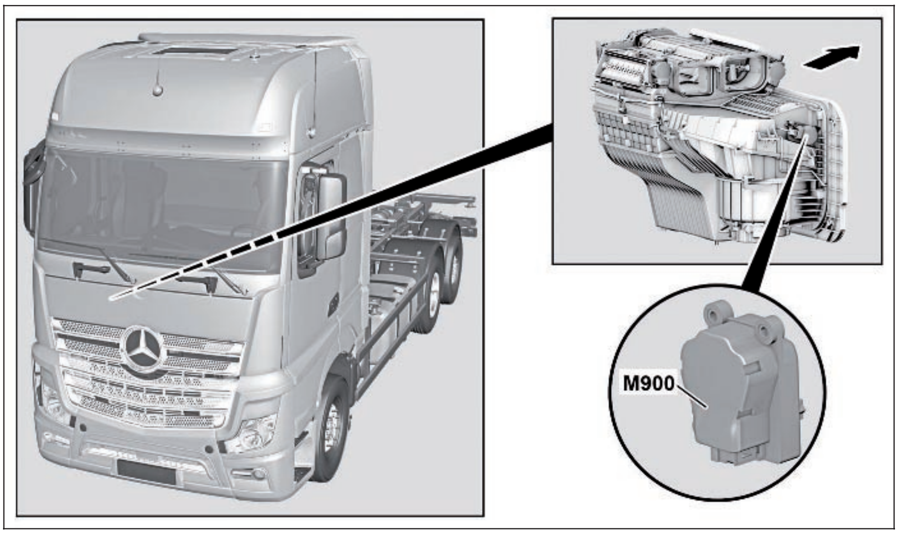
MODEL 963, 964

Location

M900 *Fresh air/recirculated air flap actuator motor*

Arrow *Direction of travel*

The fresh air/recirculation flap actuator motor (M900) is located on the right above the particulate filter, next to the fresh air intake opening.



W83.30-1181-05

Task

The fresh air/recirculation flap actuator motor (M900) operates the fresh air/recirculation flap and therefore controls the air supply.
Depending on the position of the fresh air/recirculation flap, fresh air is drawn in from the outside or air is drawn in from the vehicle interior.

GF83.57-W-2135H	Temperature regulation actuator motor, component description	20.7.11

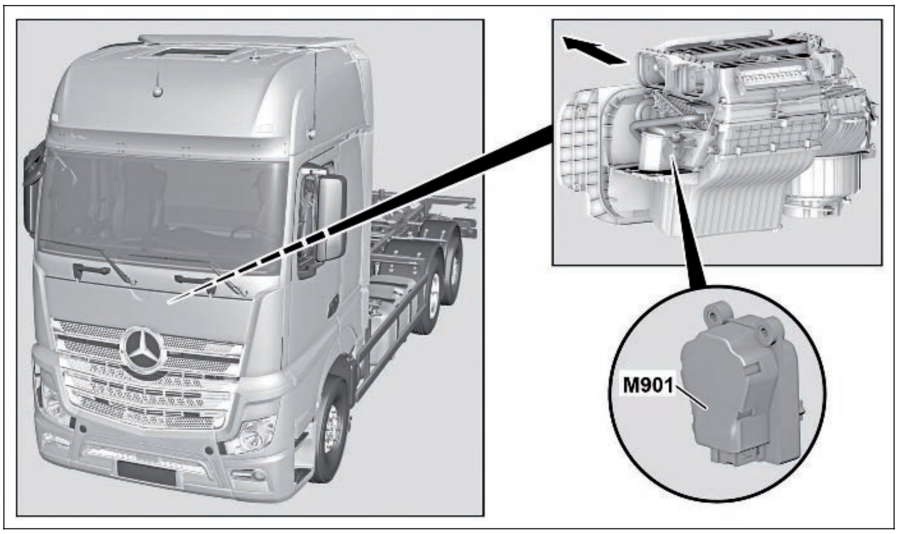
MODEL 963, 964

Location

M901 Temperature regulation actuator motor

Arrow Direction of travel

The temperature regulation actuator motor (M901) is located on the right, next to the heater blower unit.



W83.57-1014-05

Task

The temperature regulation actuator motor (M901) activates the temperature control flaps. Depending on the position of the temperature control flaps, the air is either led through or past the heater heat exchanger.

GF83.10-W-2195H	Defroster vent flap actuator motor, component description	20.7.11

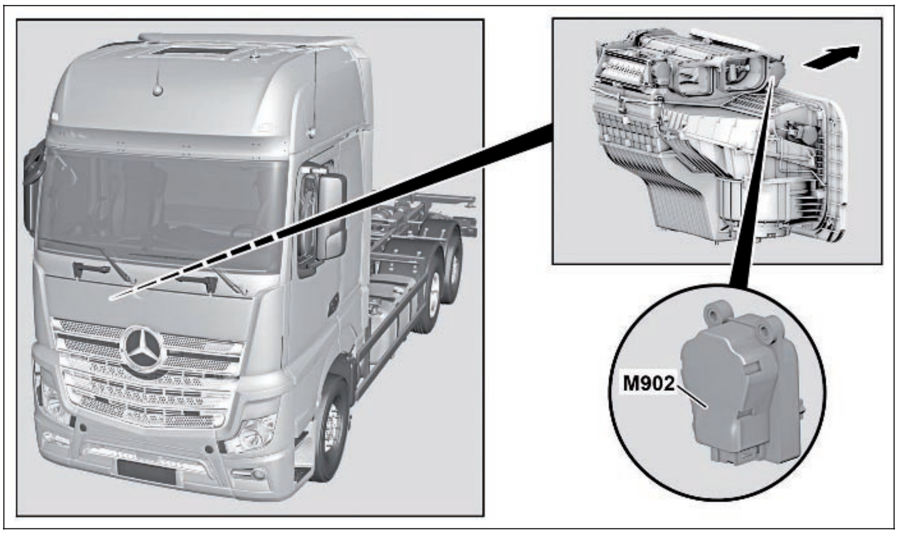
MODEL 963, 964 with CODE (D6G) Automatic air conditioning

Location

M902 Defroster vent flap actuator motor

Arrow Direction of travel

The defroster flap actuator motor (M902) is located at the defroster flap.



W83.10-1017-05

Task

The defroster flap actuator motor (M902) controls the defroster flap. Depending on the position of the defroster flap, the air is led to the windshield or the air distribution vents in the instrument panel and the footwell.

GF83.30-W-2214H	Stationary air conditioner blower motor, component description	29.6.11

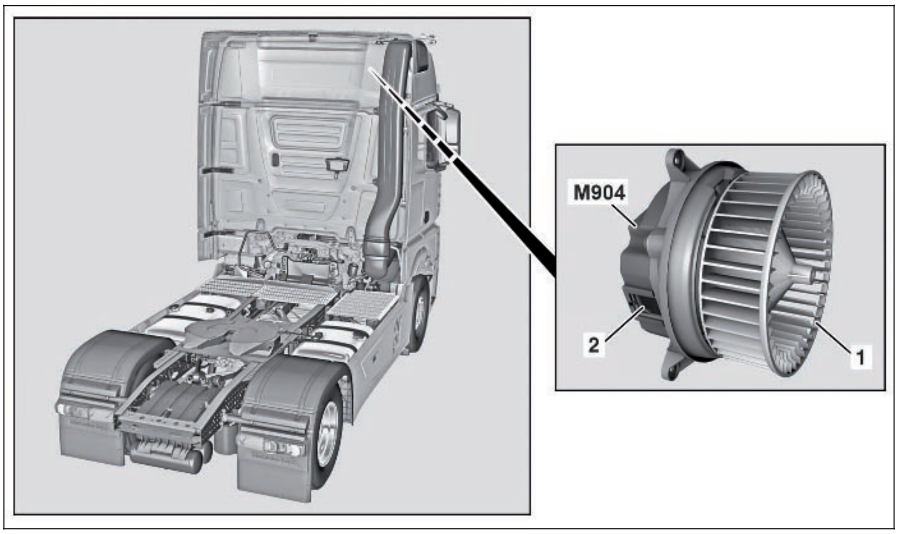
MODEL 963, 964 with CODE (D6H) Stationary air conditioner

Location

1 Fan wheel
2 Electrical connection (3-pin)

M904 Stationary air conditioning blower motor

The stationary air conditioner blower motor (M904) is installed in the air duct housing under the stationary air conditioner heat exchanger.



W83.30-1178-05

Task

The stationary air conditioner blower motor (M904) draws in warm air from the vehicle interior and directs it into the air duct housing via the integrated heat exchanger of the stationary air conditioner. The air is cooled in the process. The cooled air is then directed back into the vehicle interior via the outlet vents.

GF83.10-W-2181H	Air distribution flap actuator motor, component description	20.7.11

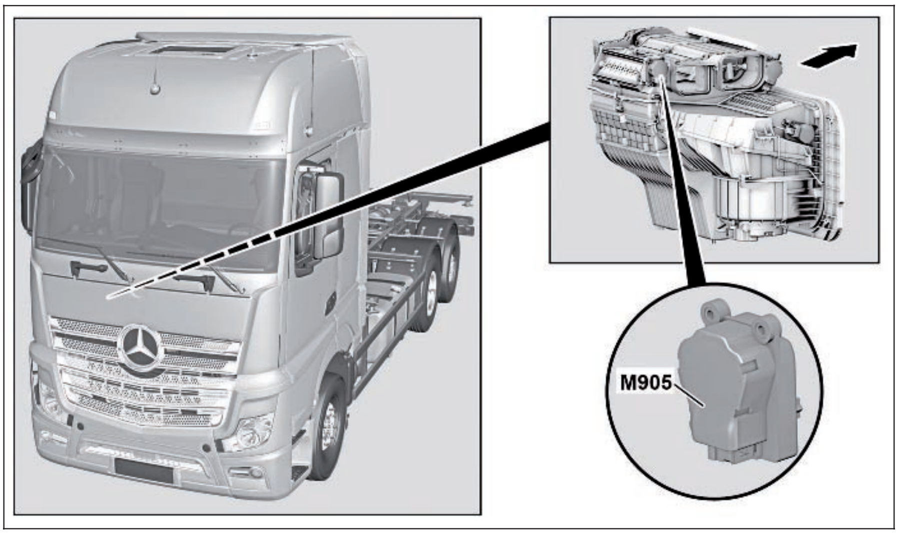
MODEL 963, 964 with CODE (D6G) Automatic air conditioning

Location

M905 *Air distribution flap actuator motor*

Arrow *Direction of travel*

The air distribution flap actuator motor (M905) is at the top, next to the heater blower unit.



W83.10-1015-05

Task

The air distribution flap actuator (M905) operates the air distribution flap for controlling the air flow to the various air outlets of the instrument panel and the footwell.

GF54.61-W-4105H	Tachograph (TCO) component description	1.7.11

MODEL 963, 964

Location

P1 Tachograph (TCO)

The tachograph (TCO) (P1) is installed in the headliner.

W54.61-1089-06

Task

The tachograph (TCO) (P1):

- Records the real-time signal of the travel and speed sensor (B18).
- Sends data and command signals to the travel and speed sensor (B18).
- Calculates the vehicle speed, route and trip mileage covered.
- Transmits the calculated data over the frame-CAN (CAN 3) to the instrument cluster control unit (ICUC) (A1).
- Serves for registration, storage, display, printout and output of driver and vehicle-specific data. Storage on the digital tachograph is in the device memory, as well as on the inserted tachograph cards or - for the modular tachograph - on the tachograph disk.

GF80.57-W-6004H	Electronic ignition lock (EIS), component description	1.7.11

MODEL 963, 964

Location

S1 Electronic ignition lock (EIS)

The electronic ignition lock (EIS) (S1) is located at the right next to the steering column in the instrument panel.

W80.57-1020-11

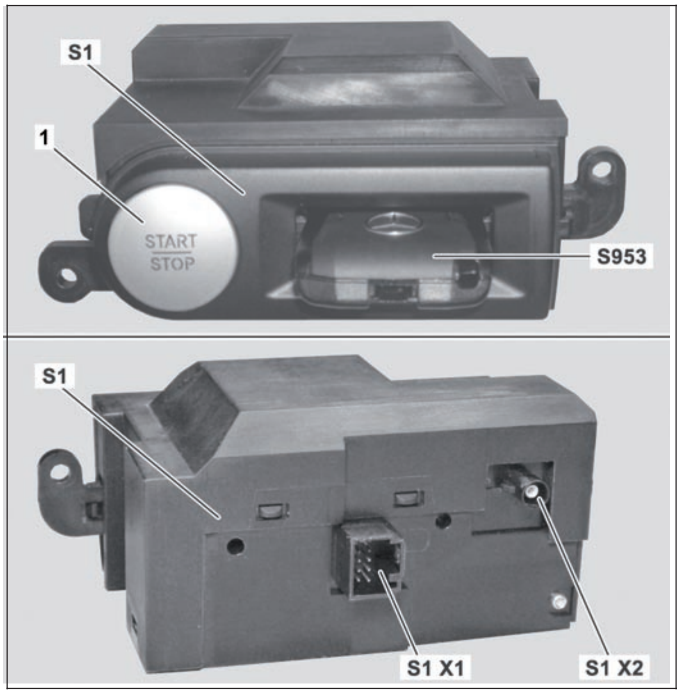
General information

The electronic ignition lock (EIS) (S1) in combination with the transmitter key (S953) is the central controller unit for the DAS. The electronic ignition lock (EIS) (S1) - when the transmitter key (S953) is not inserted - also serves as a communications interface between the transmitter key (S953) and the vehicle network.

Design

1 Start-stop button

S1 Electronic ignition lock (EIS)
S1 X1 Connector
S1 X2 Connector
S953 Transmitter key



W80.57-1009-12

Task

The electronic ignition lock (EIS) (S1) is responsible for the following tasks:

- **Reading in input factors**
  Input factors are red in over the interior CAN (CAN 2).
- **Output of signals**
  Signal output is over the interior CAN (CAN 2) and over a direct line to the sensor and actuator module, cab (SCA) control unit (A7).
- **Transmitter key voltage supply (S953)**
  When the transmitter key (S953) is inserted into the electronic ignition lock (EIS) (S1) this activates the inductive power transmission for the transmitter key (S953) power supply.

Function

Sending and receiving infrared signals with the transmitter key *(S953) inserted*
Data exchange between the electronic ignition lock (EIS) (S1) and the transmitter key (S953) with regard to the DAS over an infrared interface.

Sending and receiving high-frequency signals when the transmitter key (S953) is not inserted
Depending on the transmitter key (S953) version, the electronic ignition lock (EIS) (S1) reads in the high frequency signals of the transmitter key (S953) or it sends them to it.

GF32.33-W-3125H	Level control operating unit, component description	2.8.11

MODEL 963

Location

S22 Level control operating unit

The level control operating unit (S22) is clipped into a holder on the outboard side of the driver seat.

i As a special equipment feature, a second operating unit can be installed in the body of the vehicle.

W32.33-2072-81

Task

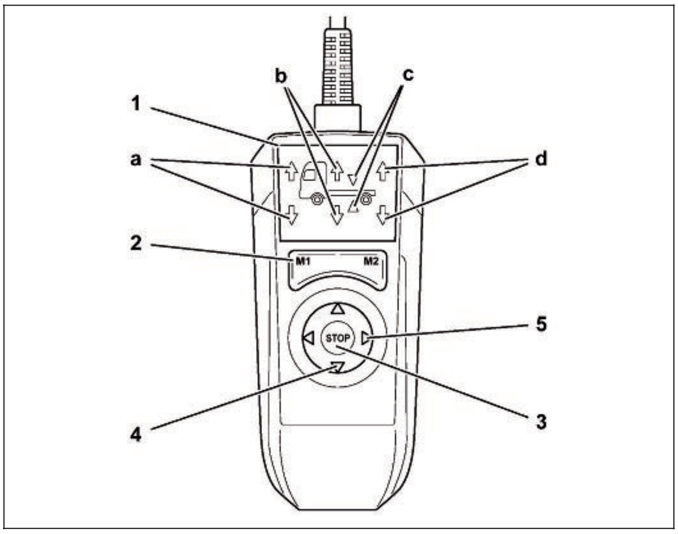
The level control operating unit (S22) is used to adjust the level of the vehicle frame.

Design

Operating unit for vehicles with code (A1A) Air-sprung front axle

1 *Function display*
2 *Memory buttons*
3 *Stop button*
4 *Raise/lower activation*
5 *Axle preselection*

a *"Raise/lower front axle" function*
b *"Raise/lower overall vehicle" function*
c *"Activate driving level" function*
d *"Raise/lower rear axle" function*

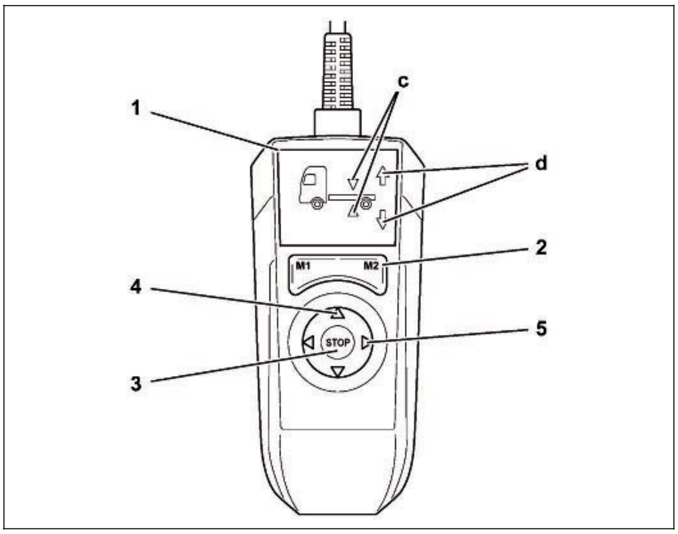


W32.33-2073-11

Operating unit for vehicles without code (A1A) Air-sprung front axle

1 *Function display*
2 *Memory buttons*
3 *Stop button*
4 *Raise/lower activation*
5 *Axle preselection*

c *"Activate driving level" function*
d *"Raise/lower rear axle" function*



W32.33-2074-11

Functions of controls

Memory buttons (2)

- Memory buttons for two different frame heights
- Call up by pressing briefly / store by pressing longer

Stop button (3)

- Stops an activated raising or lowering procedure

Axle preselection (5)

- Depending on the equipment installed, pressing the left or right arrow button preselects the functions "front axle"/"overall vehicle"/"driving level" and "rear axle"

Raise/lower activation (4)

- Pressing the top or bottom arrow button activates the previously selected function

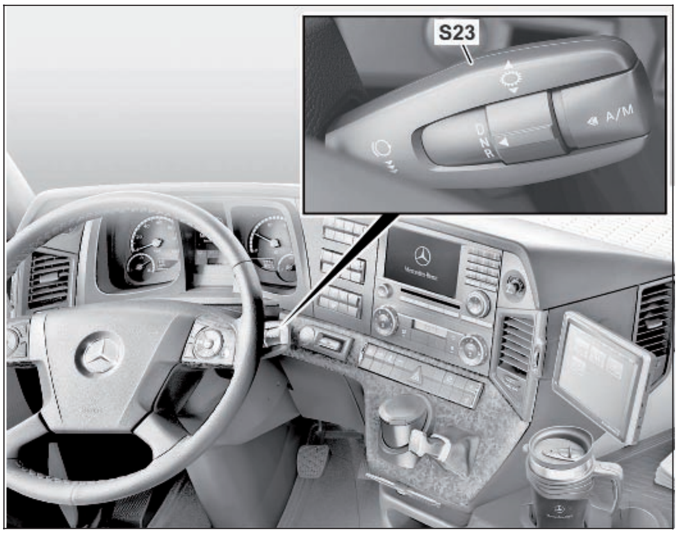
GF54.25-W-3001H	Right multifunction control lever, component description	1.7.11

MODEL 963, 964

Location

S23 Right multifunction control lever

The right multifunction control lever (S23) is located on the steering column at the right.



W54.25-1185-11

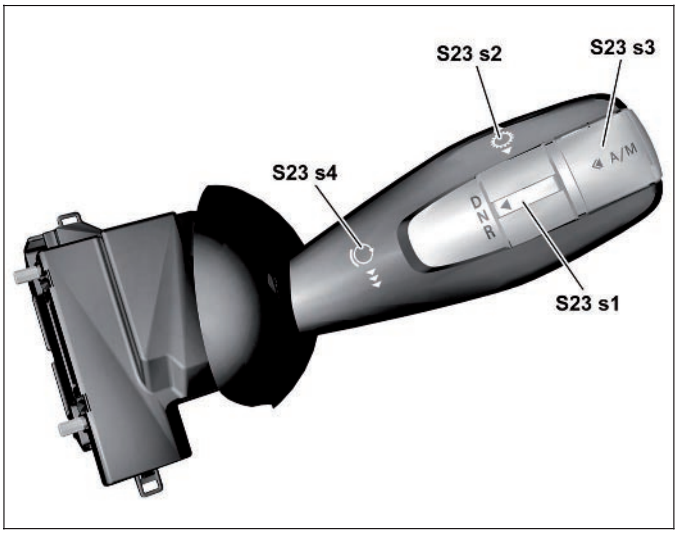
Task

The driver can control the following functions using the right multifunction control lever (S23):

- Permanent brake (engine brake/retarder (with code (B3H) Secondary water retarder))
- Transmission control

Design

S23 s1 Transmission position switch (D/N/R)
S23 s2 Gearshift paddle (+/-)
S23 s3 Transmission mode (M/A) button
S23 s4 Permanent brake switch



W54.25-1186-11

Function

The control signals are sent over the right multifunction control lever LIN (LIN 3) to the drive control (CPC) control unit (A3).

i Six different variants of the right multifunction control lever (S23) are installed to match the vehicle equipment specification.

GF54.25-W-4130H	EMERGENCY OFF switch, component description	2.8.11

MODEL 963 with CODE (E5T) ADR model class EX/II, including AT
MODEL 963 with CODE (E5U) ADR model class EX/III, including EX/II and AT
MODEL 963 with CODE (E5V) ADR model class FL including EX/II, EX/III and AT
MODEL 963 with CODE (E5X) ADR model class AT
MODEL 963 with CODE (E5Z) Accessories, ADR
MODEL 963 with CODE (E9D) Preinstallation, double-pole battery disconnect switch
MODEL 963 with CODE (E9E)

Location

Shown on left-hand drive vehicle
S30 EMERGENCY STOP switch

The EMERGENCY OFF switch (S30) is located in the instrument panel to the right next to the steering wheel in instrument panel switch module 3 (A46).

W54.25-1190-11

Task

The switching positions of the EMERGENCY OFF switch (S30) are evaluated by the battery disconnect switch (BESO) control unit (A33). When the EMERGENCY OFF switch (S30) is pressed, the battery disconnect switch (BESO) control unit (A33) ensures that the engine is switched off and all electrical consumers are disconnected from the on-board electrical system.

Design

Double-throw contact switch with protective cap designed as a flap in order to rule out inadvertent actuation.

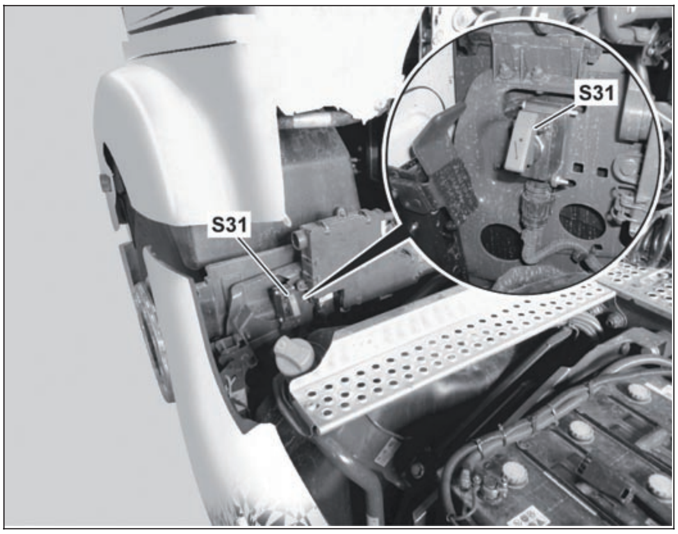
GF54.25-W-4131H	Frame EMERGENCY OFF switch, component description	2.8.11

MODEL 963 with CODE (E5T) ADR model class EX/II, including AT
MODEL 963 with CODE (E5U) ADR model class EX/III, including EX/II and AT
MODEL 963 with CODE (E5V) ADR model class FL including EX/II, EX/III and AT
MODEL 963 with CODE (E5X) ADR model class AT
MODEL 963 with CODE (E5Z) Accessories, ADR
MODEL 963 with CODE (E9D) Preinstallation, double-pole battery disconnect switch
MODEL 963 with CODE (E9E)

Location

Shown on left-hand drive vehicle
S31 Frame EMERGENCY OFF switch

The frame EMERGENCY OFF switch (S31) is located on the driver side behind the cab at the level of the wheel arch.



W54.25-1189-11

Task

The switching positions of the frame EMERGENCY OFF switch (S31) are evaluated by the battery disconnect switch (BESO) control unit (A33). When the frame EMERGENCY OFF switch (S31) is pressed, the battery disconnect switch (BESO) control unit (A33) ensures that the engine is switched off and all electrical consumers are disconnected from the on-board electrical system.

Design

Double-throw contact switch with protective cap designed as a flap in order to rule out inadvertent actuation.

GF80.50-W-6005H	cab unlock switch, component description	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection

Location

Shown on left cab lock on vehicles with left-hand steering

1 Lock

S36 Driver-side cab unlock switch

The driver cab unlock switch (S36) or front passenger cab unlock switch (S37) is located in the corresponding lock (1) in the corresponding cab release.

W80.50-1084-04

Task

The driver cab unlock switch (S36) or front passenger cab unlock switch (S37) detects when the corresponding lock (1) of the cab release is unlocked.

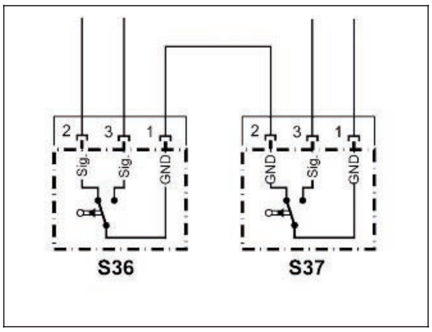
Design

Toggle switch designed as rotary tumbler switch

Function

S36 Driver-side cab unlock switch
S37 Passenger cab unlock switch

The driver cab unlock switch (S36) and front passenger cab unlock switch (S37) have two functions:
- Monitoring cab lock
- Monitoring cab release



W80.50-1085-01

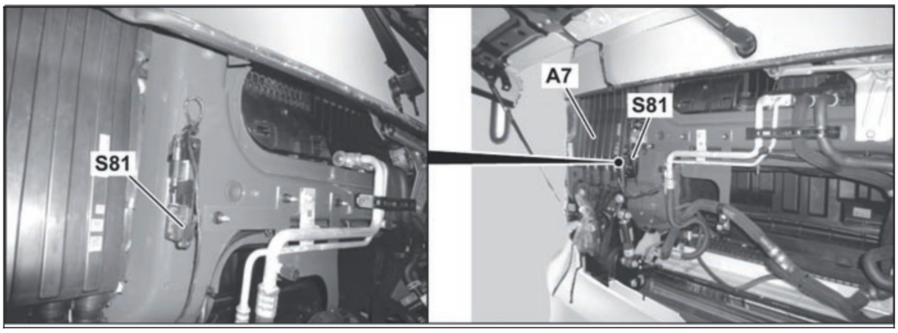
Monitoring cab lock
The driver cab unlock switch (S36) and front passenger cab unlock switch (S37) are connected in series. When the cab is locked the front passenger cab unlock switch (S37) relays a ground signal which it receives from the cab signal acquisition and actuation module control unit (SCA) (A7) on pin 1, from pin 2 to pin 1 on the driver side cab unlock switch (S36). In the locked state this switches the ground signal from pin 2 back to the signal acquisition and actuation module control unit (SCA) (A7), so that the latter recognizes that the cab is locked. This information is required for control of the electrohydraulic tilt mechanism with code (F3Y) Cab tilt mechanism.

Monitoring cab release
When the cab is unlocked, the driver cab unlock switch (S36) or front passenger cab unlock switch (S37) switches the ground signal to pin 3 and not to pin 2. The cab signal acquisition and actuation module control unit (SCA) (A7) recognizes this from the incoming ground signal from the cab unlock switch, which is actuated first by the release function, on a separate inlet pin, to which both cab unlock switches are connected in parallel with pin 3. Then the cab signal acquisition and actuation module control unit (SCA) (A7) transmits the message "Cab unlocked" to the antitheft alarm system control unit (ATA) (A6), whereby it triggers an acoustic and visual alarm.

GF80.50-W-6004H	Maintenance flap button, component description	6.7.11

MODEL 963 with CODE (F8Z) Alarm system with interior protection

Location



W80.50-1083-04

A7 Cab signal acquisition and actuation module control unit (SCA)
S81 Maintenance flap button

The maintenance flap button (S81) is located behind the maintenance flap in direction of travel on the right next to the cab signal acquisition and actuation module control unit (SCA) (A7).

Task

The maintenance flap button (S81) detects when the maintenance flap is opened or closed thereby monitoring the maintenance flap for unauthorized opening.

Design

N.O. contact closed during actuation.

Function

The maintenance flap button (S81) is actuated when the maintenance flap is closed and then switches a ground signal to the antitheft alarm system control unit (ATA) (A6). The antitheft alarm system control unit (ATA) (A6) recognizes when the maintenance flap is opened by interruption of the ground signal.

GF80.50-W-6002H	Stowage box switch, component description	6.7.11

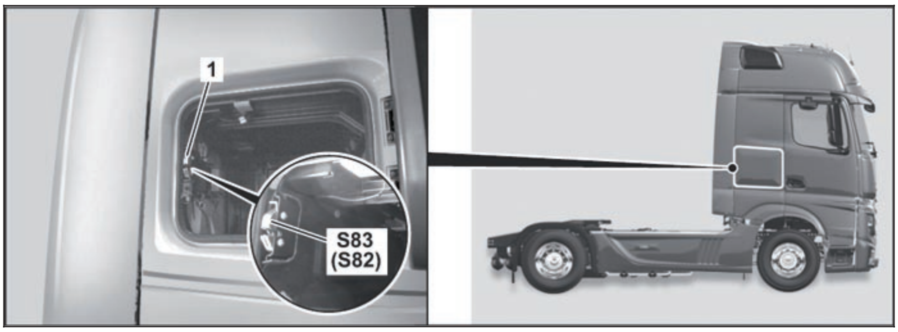
MODEL 963 with CODE (F8Z) Alarm system with interior protection

Location

Shown on right stowage box
1 Lock

S83 Right stowage box switch

The left stowage box switch (S82) and right stowage box switch (S83) is located in the corresponding lock (1) of the corresponding stowage box.



W80.50-1082-04

Task

The left stowage box switch (S82) or right stowage box switch (S83) detects opening and closing the corresponding stowage box via the rotary tumbler in the corresponding lock (1).

Design

Toggle switch designed as rotary tumbler switch

Function

The stowage box switch has the following functions:

- Monitoring stowage box
  The stowage box switch switches a ground signal to the antitheft alarm system control unit (ATA) (A6) when the stowage box is closed. The antitheft alarm system control unit (ATA) (A6) recognizes when the maintenance flap is opened when the ground signal is interrupted.
- Switching stowage box illumination
  When the stowage box is open, the left stowage box switch (S82) or right stowage box switch (S83) switches a ground signal to the interior illumination of the stowage box and thereby controls the stowage box illumination.

GF82.90-W-4005H	Multifunction steering wheel, component description	6.7.11

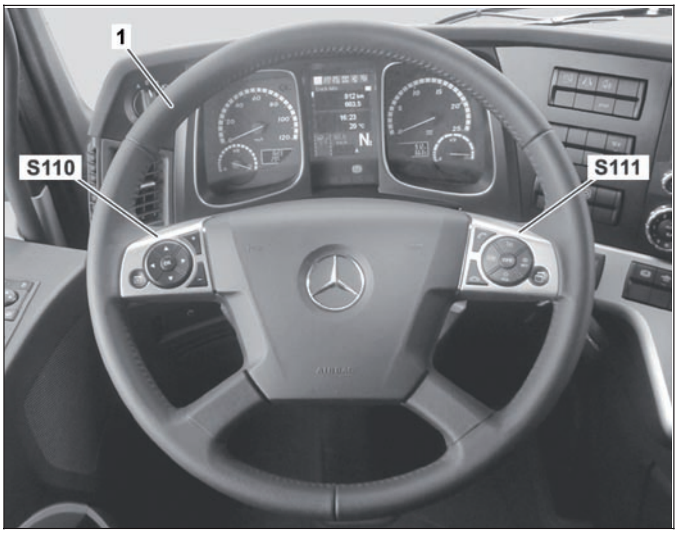
MODEL 963, 964

Location

1 Multifunction steering wheel

S110 Left multifunction steering wheel button group
S111 Right multifunction steering wheel button group

The multifunction steering wheel is located on the driver side and is bolted to the steering column. The left multifunction steering wheel button group (S110) and the right multifunction steering wheel button group (S111) are located to be easily visible and reachable by the driver at the multifunction steering wheel.



W82.90-1008-11

Tasks

The menus and functions of the instrument cluster control unit (ICUC) (A1) can be operated and the volume of the Truck Control Center (TCC) (A8) controlled with the left multifunction steering wheel button group (S110).

With the right multifunction steering wheel button group (S111) the driver assistance systems can be operated and phone calls accepted or terminated

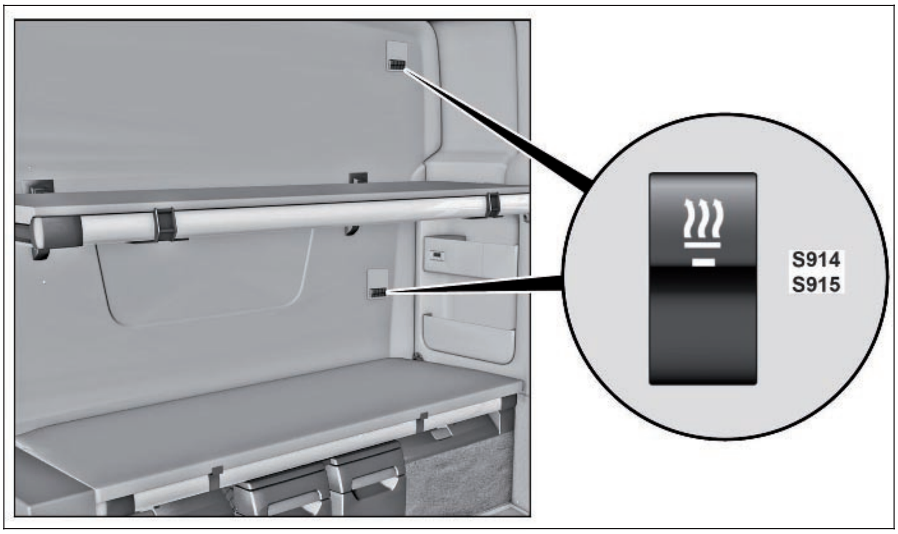
GF83.70-W-4040H	Bunk auxiliary heater button, component description	20.7.11

MODEL 963, 964
with CODE (D6M) Cab hot water auxiliary heater
except CODE (D6H) Stationary air conditioner
MODEL 963, 964
with CODE (D6N) Cab and engine hot water auxiliary heater
except CODE (D6H) Stationary air conditioner

Location

S914 Lower bunk auxiliary heater button
S915 Upper bunk auxiliary heater button

The buttons are integrated in the controls near the bunks (upper and lower).



W83.70-1444-05

Task

The auxiliary heater can be switched on/off using the buttons. The current status is displayed via an integrated control LED.

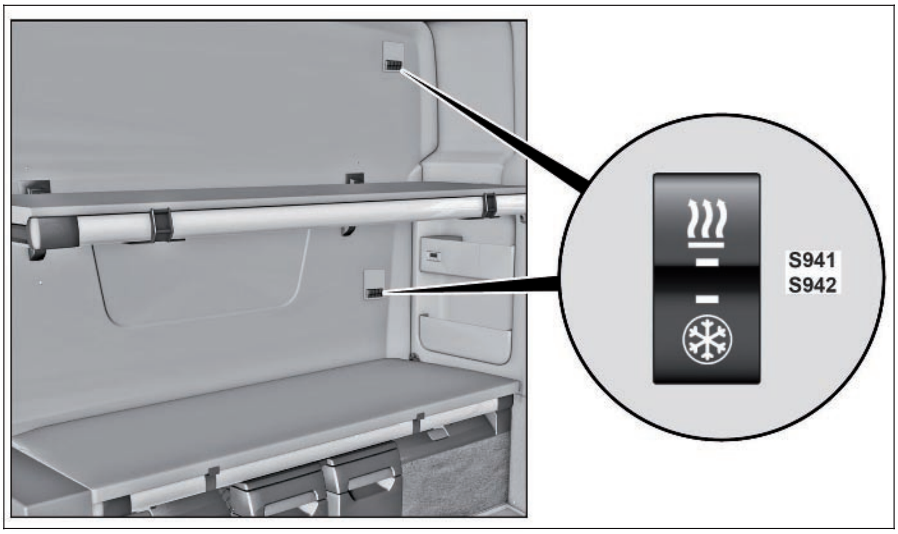
GF83.30-W-2215H	Bunk auxiliary heater and stationary air conditioning button, component description	29.6.11

MODEL 963, 964
with CODE (D6H) Stationary air conditioner
with CODE (D6M) Warm water auxiliary heater, cab
MODEL 963, 964
with CODE (D6H) Stationary air conditioner
with CODE (D6N) Warm water auxiliary heater, cab and engine

Location

S941 Auxiliary heater and stationary air conditioning for lower bunk button
S942 Auxiliary heater and stationary air conditioning for upper bunk button

The buttons are integrated in the controls in the area of the bunks (upper and lower).



W83.30-1186-05

Task

The buttons are used to switch the stationary air conditioner's discharge process or the auxiliary heating operation on and off. The current status is displayed via an integrated control LED.

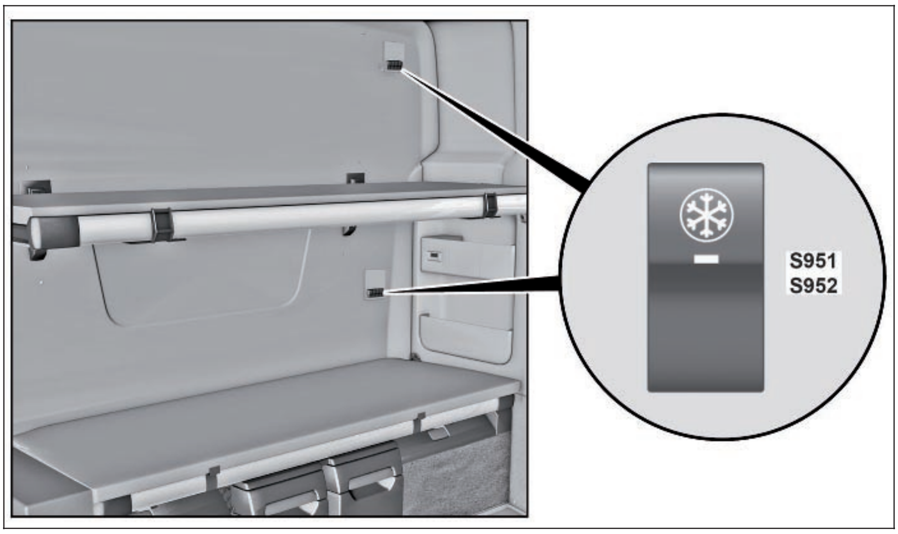
GF83.30-W-2217H	Bunk stationary air conditioner button, component description	29.6.11

MODEL 963, 964
with CODE (D6H) Stationary air conditioner
except CODE (D6M) Warm water auxiliary heater, cab
except CODE (D6N) Warm water auxiliary heater, cab and engine

Location

S951 Lower bunk stationary air conditioner button
S952 Upper bunk stationary air conditioner button

The buttons are integrated in the controls near the bunks (upper and lower).



W83.30-1188-05

Task

The discharging process of the stationary air conditioner is switched on and off with the buttons. The current status is displayed via an integrated control LED.

GF80.57-W-6010H	Transmitter key, component description	1.7.11

MODEL 963, 964

Location

S1 Electronic ignition lock
S953 Transmitter key

Task

The transmitter key (S953) in combination with the electronic ignition lock (EIS) (S1) is the central DAS controller unit.

W80.57-1024-11

Design

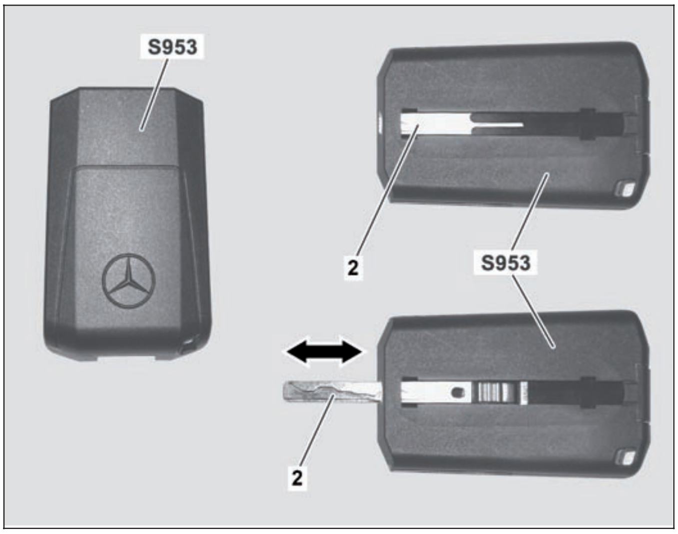
The following transmitter key (S953) versions are available:

- **LOW** Code (F8A) 2 vehicle keys
  - no radio transmitter
- **Default** Code (F8B) 2 remote control keys
  - with unidirectional radio signal receiver
- **Multifunction** Code (F8C) 1 Multifunction and 1 remote control key
  - with bidirectional radio signal receiver/transmitter

i The transmitter key versions "Low" and "Standard" have an integrated, slide-out mechanical key.
The "Multifunction" version has a removable mechanical key.

Low version

- *Infrared interface*
- *Integrated slide-out mechanical key (2) in the transmitter key (S953)*



W80.57-1012-11

Standard version

- *Infrared interface*
- *Integrated slide-out mechanical key*
- *Unidirectional radio transmitter, 433 MHz*
- *Button cell*
- *Battery capacity detection, visualization through multifunction display (A1 p1)*
- *Locking/release button for central locking system, range approx. 30 m*

i The radio signals sent by the transmitter key (S953) are received by the electronic ignition lock (EIS) (S1) over a 30 cm long antenna line integrated into the cab wiring harness.

W80.57-1010-11

Multifunction version

- *Infrared interface*
- *Bidirectional radio transmitter, 433 MHz*
- *Lithium-ion rechargeable battery, inductively chargeable through the electronic ignition lock (EIS) (S1)*
- *Locking/release button for central locking system, range approx. 30 m*
- *Removable mechanical key*
- *TFT color display, 1.8"*
- *4-way positioner with central enter key*
- *Displays and operation of various vehicle functions, range approx. 100 m*

i The radio signals sent or received by the transmitter key (S953) are received or sent using the multifunction antenna (W15) on the cab roof.

W80.57-1011-11

The transmitter key (S953), Multifunction version can operate and display various functions depending on the vehicle equipment.

Controllable functions:

- Level control
- Auxiliary heater
- Stationary air conditioner
- Interior lighting
- Locking and releasing the doors, side windows and sliding or tilting roof
- Working headlamps
- Cargo liftgate release
- Radio

Displayable functions:

- Total kilometer/service hours status
- Lamp status
- Tire pressure monitor status
- Events present on the instrument cluster control unit (ICUC) (A1)
- Fuel and AdBlue® *fill levels*
- Outside temperature and inside temperature
- Axle load
- System pressure
- Status of doors and flaps in combination with the antitheft alarm system
- Battery condition

Function

As soon as the transmitter key (S953) is inserted into the electronic ignition lock (EIS) (S1), an inductive power supply is provided by the electronic ignition lock (EIS) (S1).

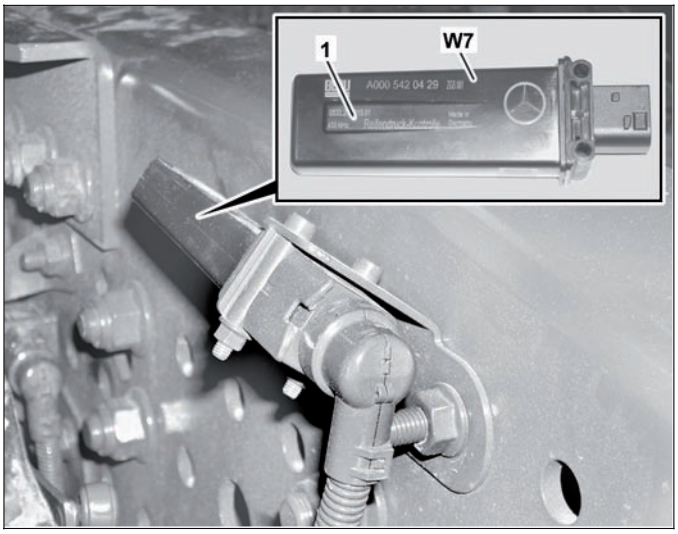
i This serves to ensure that even with a spent transmitter key (S953) battery or rechargeable battery the vehicle can be started again.

Data exchange between the transmitter key (S953) and the electronic ignition lock (EIS) (S1) with regard to the DAS takes place over an infrared interface.

GF40.15-W-3004H	Antenna, component description	2.8.11

MODEL 963, 964 with CODE (S1Y) Tire pressure monitor

Location



W40.15-1029-11

Shown on right antenna on 1st driven rear axle (W7)
1 Plastic lug

W7 Right antenna on 1st driven rear axle

The antennas of the tire pressure monitor (the number of antennas depends on the vehicle model) are positioned extremely precisely on the frame at the wheels or at the wheel pairs.

Task

The task of the antennas is to receive the information sent by the wheel sensors and to pass this information on to the tire pressure monitor (TPM) control unit (A35). The connections of the antennas at the tire pressure monitor (TPM) control unit (A35) have a fixed assignment and must not be changed over, otherwise it will not be possible to display and assign the tires correctly.

i The plastic lug (1) on the antenna housing is intended as an assembly aid and must always point toward the wheel.

GF54.22-W-4101H	Diagnostic socket, component description	2.8.11

MODEL 963

Location

X100.16 Diagnostic socket

The diagnostic socket (X100.16) is fitted into the dashboard on the passenger side in the right side of the footwell.

W54.21-1414-11

Task

The diagnostic socket (X100.16) is the interface to connect Star Diagnosis via the diagnostic CAN (CAN 10) to the central gateway control unit (CGW) (A2).

GF82.62-W-3137H	Multifunction antenna, component description	1.7.11

MODEL 963, 964

Location

W80.57-1022-12

W15 Multifunction antenna

The multifunction antenna (W15) is attached to the front end of the cab roof.

General information

The multifunction antenna (W15) is a triple antenna. It has three separate connections that are mechanically coded and color-coded. It is designed so that it can be installed and removed from the outside of the cab.

Task

The multifunction antenna (W15) is used for the following functions:

- Truck Control Center (TTC) (A9)
- Telephone (GSM) (Global System for Mobile Communication)
- Electronic ignition lock (EZS) (S1) in combination with transmitter key (S953), multi-function design.

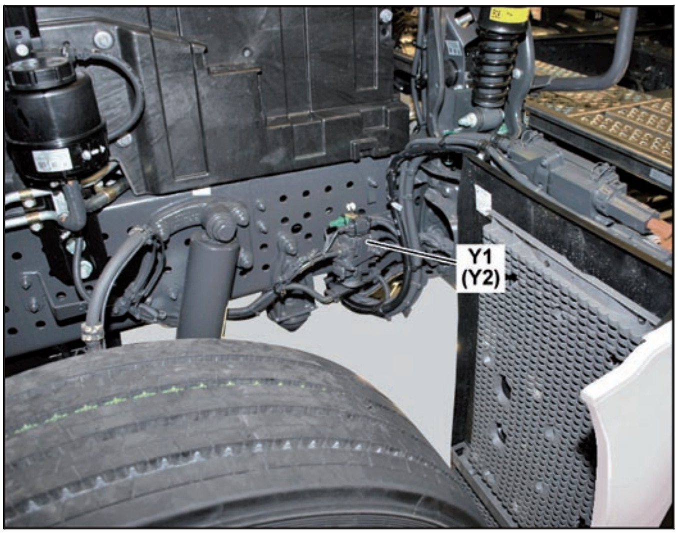
GF42.25-W-3138H	ABS solenoid valve, component description	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr

Location

Y1 Left front axle ABS solenoid valve
Y2 Right front axle ABS solenoid valve

The left front axle ABS solenoid valve (Y1) or the right front axle ABS solenoid valve (Y2) is installed in the area above the left or right front axle on the outside of the longitudinal frame member.



W42.25-1272-81

Task

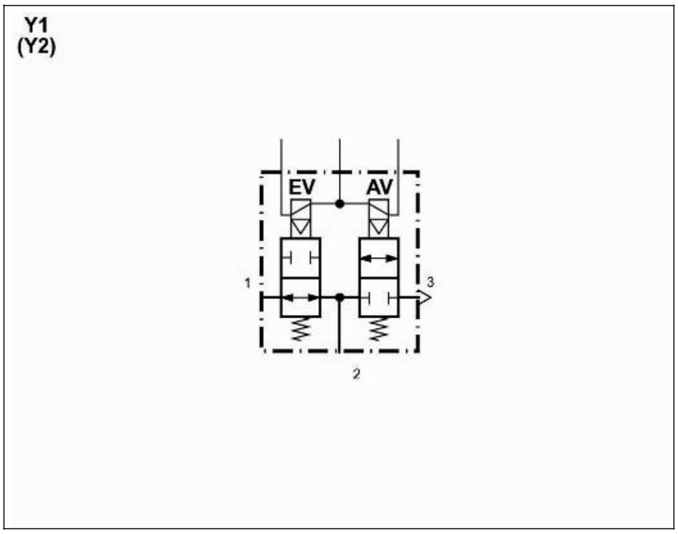
The left front axle ABS solenoid valve (Y1) or the right front axle ABS solenoid valve (Y2) is used o control the brake pressure of the diaphragm cylinder (20.02) or the combination brake cylinder (22.01) of the front axle.

Design

Y1 Left front axle ABS solenoid valve
Y2 Right front axle ABS solenoid valve

EV Intake solenoid valve
AV Outlet solenoid valve

Pneumatic connections
1 Energy outflow (brake pressure from front axle axle modulator)
2 Energy outflow (brake pressure to brake cylinder)
3 Atmospheric connection (ventilation)



W42.25-1283-11

Function

1 Brakes with ABS control

1.1 Lower pressure

The intake solenoid valve (EV) is energized and switches into locking position (pulsed). The outlet solenoid valve (AV) is also energized and switches to flow-through position (pulsed). The brake pressure applied at connection 1 is no longer sent to connection 2 and the brake pressure already applied at connection 2 is ventilated via the outlet solenoid valve (AV) and connection 3.

1.2 PRESSURE HOLD

The intake solenoid valve (AV) is energized and switches into locking position. The outlet solenoid valve (AV) remains in starting position (locking position). The brake pressure present at connection 2 is neither increased nor decreased.

1.3 Increase pressure

The outlet solenoid valve (AV) and the intake solenoid valve (EV) are no longer energized and return to their starting positions. The brake pressure applied at connection 1 flows back to connection 2 via the intake solenoid valve (EV), which is in flow-through position. The brake pressure at connection 2 increases again.

2 Brakes without ABS control

The intake solenoid valve (EV) and the outlet solenoid valve (AV) are no longer energized and remain in their starting positions. The brake pressure applied at connection 1 flows via the intake solenoid valve (EV), which is in flow-through position to connection 2.

GF32.34-W-2200H	Proportional valve, component description	2.8.11

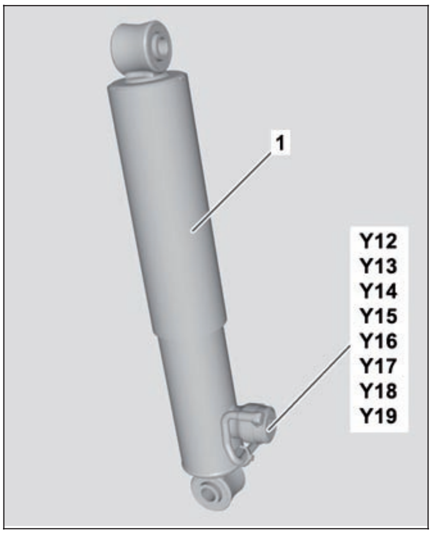
MODEL 963, 964 with CODE (S1F)

Location

1 Shock absorber

Y12 Left 1st front axle proportional valve
Y13 Right 1st front axle proportional valve
Y14 Left 2nd front axle proportional valve
Y15 Right 2nd front axle proportional valve
Y16 Left 1st rear axle proportional valve
Y17 Right 1st rear axle proportional valve
Y18 Left 2nd rear axle proportional valve
Y19 Right 2nd rear axle proportional valve

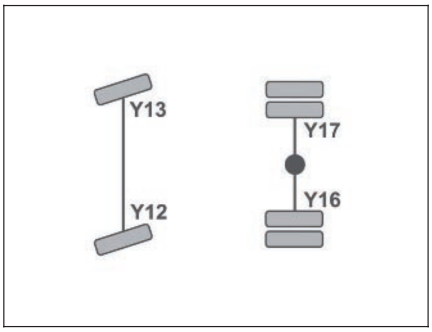
The proportional valve is at the bottom part of each shock absorber (1).



W32.34-1021-02

Wheel configuration 4x4

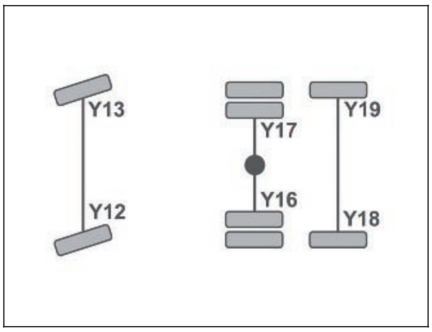
Y12 Left 1st front axle proportional valve
Y13 Right 1st front axle proportional valve
Y16 Left 1st rear axle proportional valve
Y17 Right 1st rear axle proportional valve



W32.34-1017-01

Wheel configuration 6x2 ENA

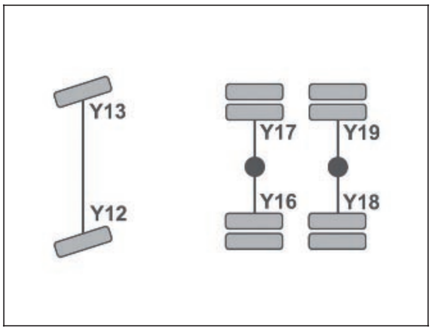
Y12 Left 1st front axle proportional valve
Y13 Right 1st front axle proportional valve
Y16 Left 1st rear axle proportional valve
Y17 Right 1st rear axle proportional valve
Y18 Left 2nd rear axle proportional valve
Y19 Right 2nd rear axle proportional valve



W32.34-1018-01

Wheel configuration 6x4

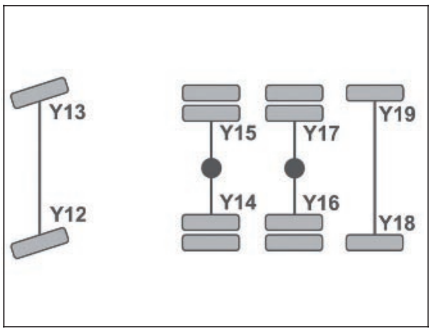
Y12 Left 1st front axle proportional valve
Y13 Right 1st front axle proportional valve
Y16 Left 1st rear axle proportional valve
Y17 Right 1st rear axle proportional valve
Y18 Left 2nd rear axle proportional valve
Y19 Right 2nd rear axle proportional valve



W32.34-1019-01

Wheel configuration 8x4 ENA

Y12 Left 1st front axle proportional valve
Y13 Right 1st front axle proportional valve
Y14 Left 2nd front axle proportional valve
Y15 Right 2nd front axle proportional valve
Y16 Left 1st rear axle proportional valve
Y17 Right 1st rear axle proportional valve
Y18 Left 2nd rear axle proportional valve
Y19 Right 2nd rear axle proportional valve



W32.34-1020-01

Task

The proportional valve steplessly controls the oil flow rate for the rebound and compression stage in the shock absorber according to the voltage signal output by the level control (CLCS) control unit (A26).

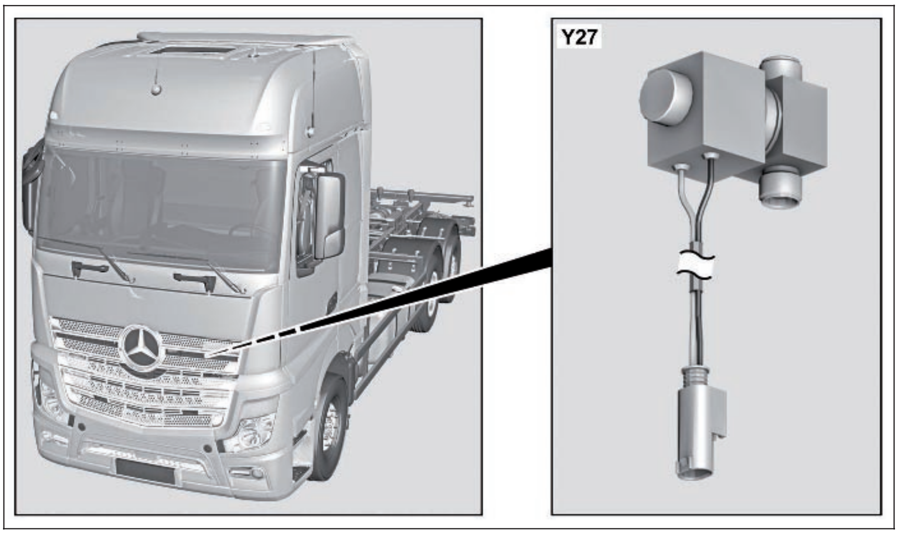
GF83.30-W-3111H	Stationary air conditioner solenoid valve, component description	29.6.11

MODEL 963, 964 with CODE (D6H) Stationary air conditioner

Location

Y27 Stationary air conditioner solenoid valve

The stationary air conditioner solenoid valve (Y27) is located under the front-end flap on the left in the direction of travel below the wiper linkage.



W83.30-1190-05

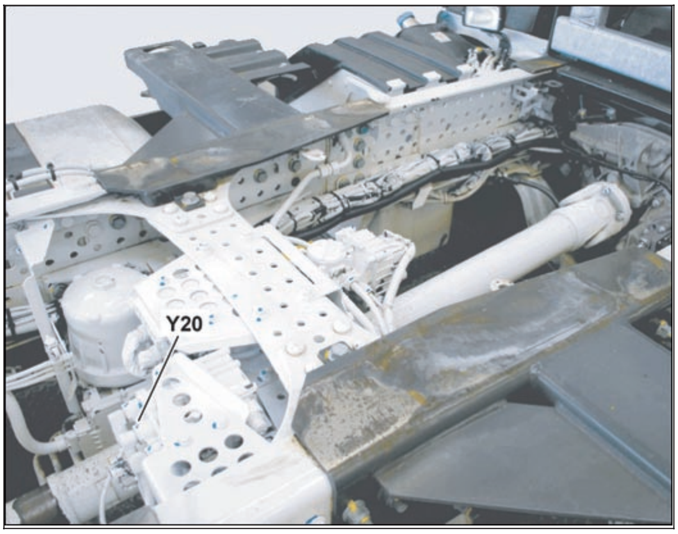
Task

When de-energized, the stationary air conditioner solenoid valve (Y27) enables the refrigerant to flow through to the evaporator. If the solenoid valve is actuated, it blocks the refrigerant circuit to the conventional air conditioning's evaporator.

GF32.33-W-3121H	Front axle level control valve unit, component description	2.8.11

MODEL 963

Location



W32.33-2064-81

Shown on model 963.0 with code (A1A) Air-sprung front axle
Y20 Front axle level control valve unit

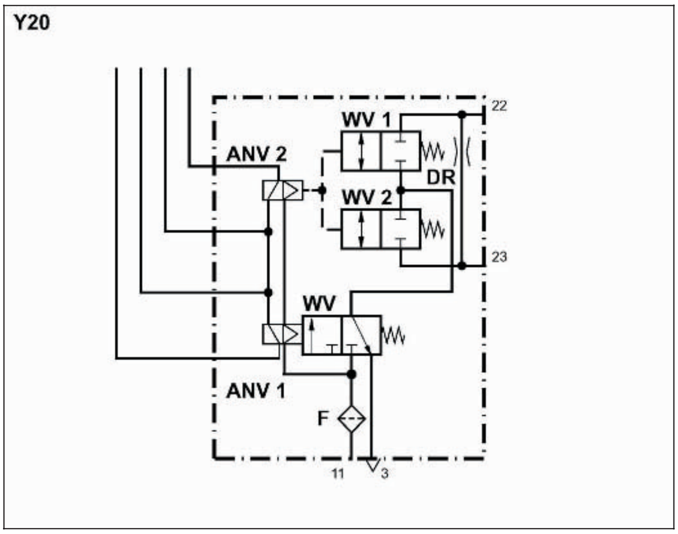
The front axle level control valve unit (Y20) is attached on the right-hand side (relative to the direction of travel) to a bracket on the inside of the longitudinal frame member near the fuel tank .

i The installation location may vary depending on the vehicle model.

Task

The front axle level control valve unit (Y20) converts the control signals from the level control (CLCS) control unit (A26) into air-admission and venting procedures for the air spring bellows of the front axle.

Design



W32.33-2065-11

Y20 Front axle level control valve unit

Pneumatic connections
3 Atmospheric connection (ventilation)
11 Energy supply (air suspension reservoir pressure)
22 Energy outflow (air spring bellows pressure at right sleeve air spring)
23 Energy outflow (air spring bellows pressure at left sleeve air spring)

Components
ANV 1 Pneumatic starting-off valve 1 (electrically actuated)
ANV 2 Pneumatic starting-off valve 2 (electrically actuated)
DR Throttle
F Filter
WV 3/2-way valve
WV 1 2/2-way valve 1
WV 2 2/2-way valve 2

i The pneumatic starting-off valves are directly connected to the level control (CLCS) control unit (A26).

Function

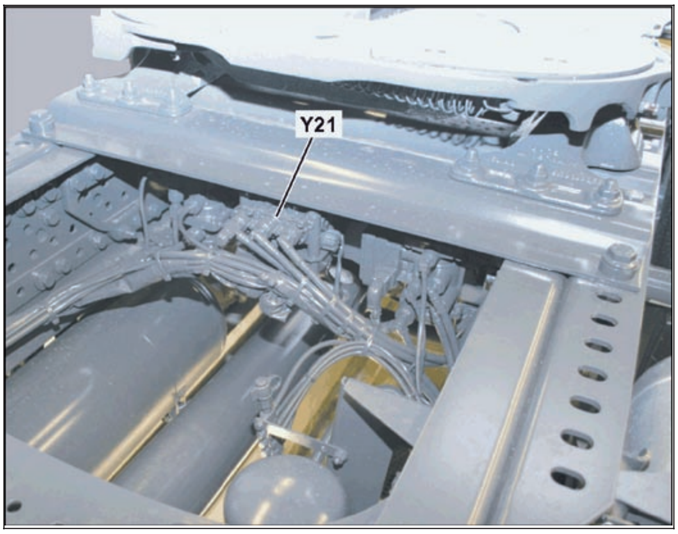
Increase in pressure in sleeve air springs of front axle
Pneumatic starting-off valve 1 (electrically actuated) (ANV 1) of the 3/2-way valve (WV) is energized which causes the 3/2-way valve (WV) to switch to the flow-through position. The reservoir pressure present at the energy supply (11) is fed to the 2/2-way valves (WV 1 and WV2) which are in the closed position.
Pneumatic starting-off valve 2 (electrically actuated) (ANV 2) of the 2/2-way valves (WV 1 and WV2) is then energized and the 2/2-way valves (WV 1 and WV 2) switch to the flow-through position.
The reservoir pressure present at the input of the 2/2-way valves (WV 1 and WV2) is fed as air spring bellows pressure to the energy outflows (22 and 23).
When the required air spring bellows pressure is reached in the sleeve air springs of the front axle, pneumatic starting-off valve 2 (electrically actuated) (ANV 2) is no longer energized and the 2/2-way valves (WV 1 and WV 2) switch back to the closed position.
The air spring bellows pressure present at the energy outflows (22 and 23) is held.

Reduction in pressure in sleeve air springs of front axle
In order to reduce the pressure in the sleeve air springs of the front axle, pneumatic starting-off valve 1 (electrically actuated) (ANV 1) is no longer energized and the 3/2-way valve (WV) switches back to its starting position.
Pneumatic starting-off valve 2 (electrically actuated) (ANV 2) of the 2/2-way valves (WV 1 and WV2) is energized and the 2/2-way valves (WV 1 and WV 2) switch to the flow-through position.
The air spring bellows pressure present at the energy outflows (22 and 23) is then vented via 2/2-way valve 1 (WV 1) or 2/2-way valve 2 (WV 2), the 3/2-way valve (WV) and the atmosphere connection (3).
When the required air spring bellows pressure is reached in the sleeve air springs of the front axle, pneumatic starting-off valve 2 (electrically actuated) (ANV 2) is no longer energized and the 2/2-way valves (WV 1 and WV 2) switch back to the closed position. The air spring bellows pressure present at the energy outflows (22 and 23) is held.

GF32.33-W-3122H	2-axle vehicle level control valve unit, component description	2.8.11

MODEL 963

Location



W32.33-2066-81

Illustrated on model 963.4
Y21 Level control valve unit, 2-axle vehicles

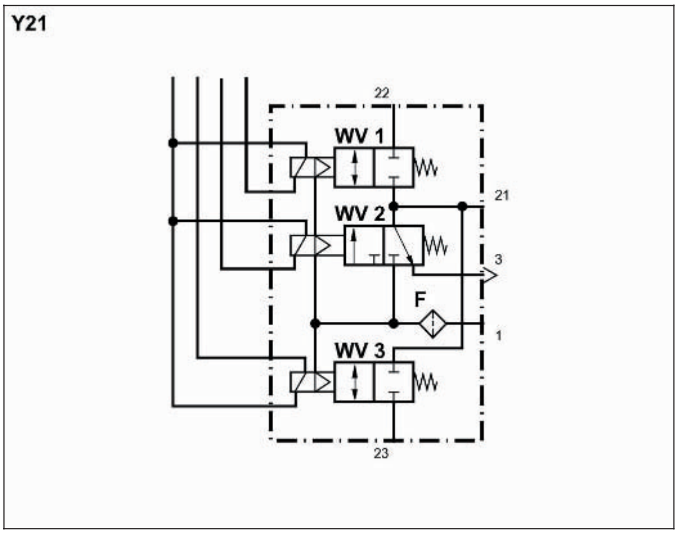
The 2-axle vehicle level control valve unit (Y21) is attached at the center of a bracket on the tubular crossmember below the fifth wheel coupling.

i The installation location may vary depending on the vehicle model.

Task

The 2-axle vehicle level control valve unit (Y21) converts the control signals from the level control (CLCS) control unit (A26) into air-admission and venting procedures for the air spring bellows of the drive axle.

Design



W32.33-2067-11

Y21 2-axle vehicle level control valve unit

Pneumatic connections
1 Energy supply (reservoir pressure - air suspension)
3 Atmospheric connection (ventilation)
21 Energy outflow (not used)
22 Energy outflow (air spring bellows pressure at right sleeve air spring)
23 Energy outflow (air spring bellows pressure at left sleeve air spring)

Components
F Filter
WV 1 2/2-way valve
WV 2 3/2-way valve
WV 3 2/2-way valve

i The pneumatic starting-off valves of the directional control valves are directly connected to the level control (CLCS) control unit (A26).

Function

Increase in pressure in sleeve air springs of drive axle
The 3/2-way valve (WV 2) is energized which causes it to switch to the flow-through position. The reservoir pressure present at the energy supply (1) is fed to the 2/2-way valves (WV 1 and WV 3) which are in the closed position.
The 2/2-way valves (WV 1 and WV 3) are then energized and switch to the flow-through position. The reservoir pressure present at the input of the 2/2-way valves (WV 1 and WV 3) is fed as air spring bellows pressure to the energy outflows (22 and 23). When the required air spring bellows pressure has been reached in the sleeve air springs of the drive axle, the 2/2-way valves (WV 1 and WV 3) are no longer energized and switch back to their starting position (closed position).
The air spring bellows pressure present at the energy outflows (22 and 23) is held.

Reduction in pressure in sleeve air springs of drive axle
In order to reduce the pressure in the sleeve air springs of the drive axle, the 3/2-way valve (WV 2) is no longer energized which causes it to switch back to its starting position (venting position). The 2/2-way valves (WV 1 and WV 3) are energized and switch to the flow-through position.
The air spring bellows pressure present at the energy outflow (22) and energy outflow (23) is then vented via the 2/2-way valve (WV 1) or 2/2-way valve (WV 3), the 3/2-way valve (WV 2) (which is in the starting position) and the atmosphere connection (3). When the required air spring bellows pressure has been reached in the sleeve air springs of the drive axle, the 2/2-way valves (WV 1 and WV 3) are no longer energized and switch back to the closed position. The air spring bellows pressure present at the energy outflows (22 and 23) is held.

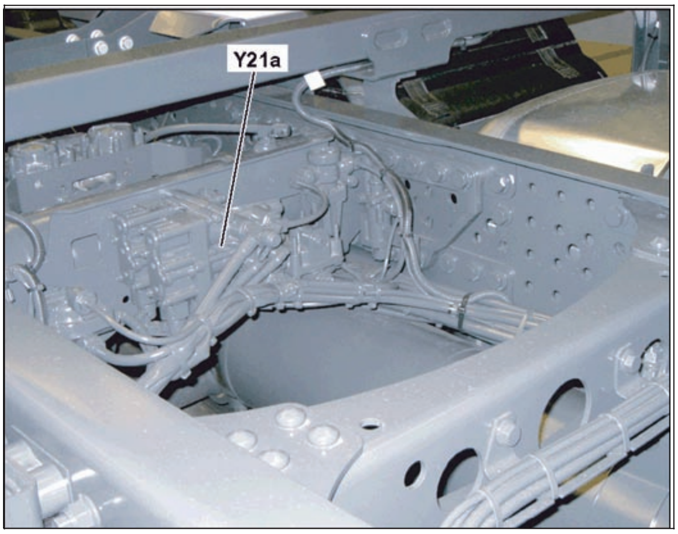
GF32.33-W-3123H	3-axle vehicle level control valve unit, component description	2.8.11

MODEL 963

Location

Illustrated on model 963.0
Y21a 3-axle vehicle level control valve unit

The 3-axle vehicle level control valve unit (Y21a) is attached at the center of a bracket on the tubular crossmember in front of the drive axle.



W32.33-2068-81

i The installation location may vary depending on the vehicle model.

Task

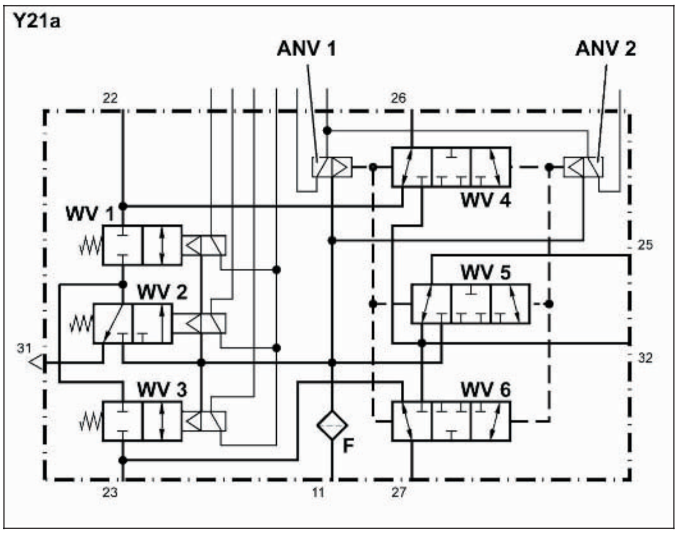
The 3-axle vehicle level control valve unit (Y21a) converts the control signals from the level control (CLCS) control unit (A26) into air-admission and venting procedures for the air spring bellows of the drive axle and additional axle.

If a lift axle is fitted, the 3-axle vehicle level control valve unit (Y21a) also takes over conversion of the control signals from the level control (CLCS) control unit (A26) which are responsible for regulation of the air volume in the lift bellows.

Design

Y21a 3-axle vehicle level control valve unit

Pneumatic connections
11 Energy supply (air suspension reservoir pressure)
22 Energy outflow (air spring bellows pressure for right drive axle sleeve air springs)
23 Energy outflow (air spring bellows pressure for left drive axle sleeve air springs)
25 Energy outflow (air spring bellows pressure for additional axle lift bellows)
26 Energy outflow (air spring bellows pressure for right additional axle sleeve air springs)
27 Energy outflow (air spring bellows pressure for left additional axle sleeve air springs)
31 Atmospheric connection (venting)
32 Atmosphere connection (venting to 0.5 bar)



W32.33-2069-11

Components
ANV 1 Pneumatic starting-off valve 1 (electrically actuated)
ANV 2 Pneumatic starting-off valve 2 (electrically actuated)
F Filter
WV 1 2/2-way valve
WV 2 3/2-way valve
WV 3 2/2-way valve
WV 4 3/3-way valve
WV 5 3/3-way valve
WV 6 3/3-way valve

Function

Increase in pressure in sleeve air springs of drive axle
Pneumatic starting-off valve 2 (electrically actuated) (ANV 2) is energized until the 3/3-way valves (WV 4, WV 5 and WV 6) switch to the closed position (center position).
The 3/2-way valve (WV 2) is then energized which causes it to switch to the flow-through position. The reservoir pressure present at the energy supply (11) is fed to the 2/2-way valves (WV 1 and WV 3) which are in the closed position.
The 2/2-way valves (WV 1 and WV 3) are now energized and switch to the flow-through position. The reservoir pressure present at the input of the 2/2-way valves (WV 1 and WV 2) is fed as air spring bellows pressure to the energy outflow (22) and energy outflow (23).
When the required air spring bellows pressure has been reached in the sleeve air springs of the drive axle, the 2/2-way valves (WV 1 and WV 3) are no longer energized and switch back to their starting position (closed position). The air spring bellows pressure present at the energy outflows (22 and 23) is held.

Reduction in pressure in sleeve air springs of drive axle
In order to reduce the pressure in the sleeve air springs of the drive axle, the 3/2-way valve (WV 2) is no longer energized and switches back to its starting position (venting position). The 3/3-way valves (WV 4, WV 5 and WV 6) remain in the closed position. The 2/2-way valves (WV 1 and WV 3) are energized and switch to the flow-through position.
The air spring bellows pressure present at the energy outflow (22) and energy outflow (23) is then vented via the 2/2-way valve (WV 1) or 2/2-way valve (WV 3), the 3/2-way valve (WV 2) (which is in the starting position) and the atmosphere connection (31).
When the required air spring bellows pressure has been reached in the sleeve air springs of the drive axle, the 2/2-way valves (WV 1 and WV 3) are no longer energized and switch back to the closed position. The air spring bellows pressure present at the energy outflows (22 and 23) is held.

Increase in pressure in sleeve air springs of drive axle and additional axle
The 3/2-way valve (WV 2) is energized which causes it to switch to the flow-through position. The 3/3-way valves (WV 4, WV 5 and WV 6) remain in the starting position and pneumatic starting-off valve 1 (electrically actuated) (ANV 1) is energized until the 3/3-way valves (WV 4, WV 5 and WV 6) switch to the starting position. The reservoir pressure present at the energy supply (11) is now fed to the 2/2-way valves (WV 1 and WV 3) which are in the closed position.
The 2/2-way valves (WV 1 and WV 3) are now energized and switch to the flow-through position.

The reservoir pressure present at the input of the 2/2-way valves (WV 1 and WV 2) is fed as air spring bellows pressure to the energy outflow (22) and energy outflow (23) and also via the 3/3-way valves (WV 4 and WV 6) to the energy outflows (26 and 27). When the required air spring bellows pressure has been reached in the sleeve air springs of the drive axle and additional axle, the 2/2-way valves (WV 1 and WV 3) are no longer energized and switch back to their starting position (closed position). The air spring bellows pressure present at the energy outflows (22, 23, 26 and 27) is held.

Reduction in pressure in sleeve air springs of drive axle and additional axle
The 3/2-way valve (WV 2) is no longer energized and switches back to its starting position (venting position).
The 3/3-way valves (WV 4, WV 5 and WV 6) remain in the starting position. The 2/2-way valves (WV 1 and WV 3) are now energized and switch to the flow-through position. The air spring bellows pressure present at the energy outflow (22) and energy outflow (23) is then vented via the 2/2-way valve (WV 1) and 2/2-way valve (WV 3) and also via the 3/2-way valve (WV 2) (which is in the starting position) and the atmosphere connection (31).

Energy outflows (26 and 27) are vented via the 3/3-way valve (WV 4) (which is in the starting position) or via the 3/3-way valve (WV 6), the 2/2-way valve (WV 1) or the 2/2-way valve (WV 3), the 3/2-way valve (WV 2) (which is in the starting position) and the atmosphere connection (31). When the required air spring bellows pressure has been reached in the sleeve air springs of the drive axle and additional axle, the 2/2-way valves (WV 1 and WV 3) are no longer energized and switch back to their starting position (closed position). The air spring bellows pressure present at the energy outflows (22, 23, 26 and 27) is held.

Raising lift axle
Pneumatic starting-off valve 2 (electrically actuated) (ANV 2) is energized until the 3/3-way valves (WV 4, WV 5 and WV 6) switch to the end position. The 2/2-way valves (WV 1, WV 2 and WV 3) remain in the starting position (venting or closed position). The reservoir pressure present at the energy supply (11) is now fed as air spring bellows pressure via the 3/3-way valve (WV 5) to the energy outflow (25). The lift axle is raised.

Lowering lift axle
In order to lower the lift axle, pneumatic starting-off valve 2 (electrically actuated) (ANV 2) is energized until the 3/3-way valves (WV 4, WV 5 and WV 6) switch to the starting position.

The 2/2-way valves (WV 1, WV 2 and WV 3) continue to remain in the starting position (venting or closed position). The air spring bellows pressure present at the energy outflow (25) is vented via the 3/3-way valve (WV 5) and atmosphere connection (32). The lift axle is lowered.

i The pressure limiting valve with vent (30.03) connected to the atmosphere connection (32) vents to a residual pressure of 0.5 bar. This residual pressure ensures that the lift bellows remains securely attached to the piston when the axle is compressed and rebounds.

When the lift axle is lowered, the pressure in the air spring bellows of the lift axle adjusts to the air pressure of the drive axle.

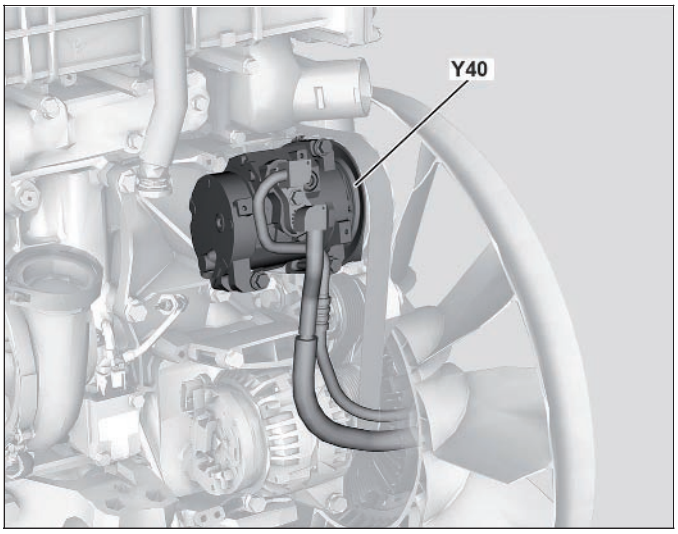
GF83.55-W-4006H	A/C compressor magnetic clutch component description	29.6.11

MODEL 963, 964 with CODE (D6G) Automatic air conditioning
MODEL 963, 964 with CODE (D6H) Stationary air conditioner

Location

Y40 Refrigerant compressor magnetic clutch

The A/C compressor magnetic clutch (Y40) is screwed directly on to the A/C compressor.



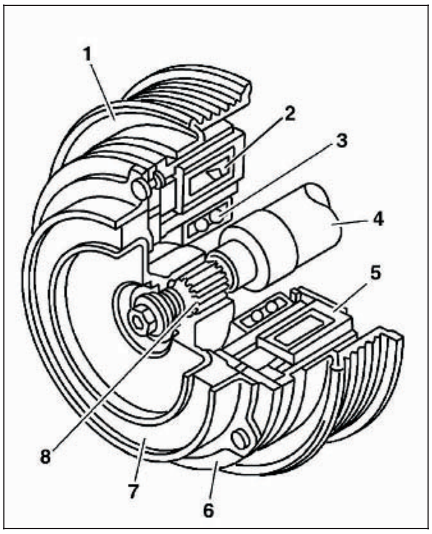
W83.55-1043-11

Task

The A/C compressor magnetic clutch (Y40) sets up the power flow between the spring plate and the belt pulley.

Design

1 Belt pulley
2 Fuse
3 Ball bearing
4 A/C compressor shaft
5 Solenoid
6 Pressure plate
7 Rubber insert
8 Spline



W83.55-1016-02

The belt pulley (1) mounted on the A/C compressor shaft (4) is driven by the poly-V belt. It turns on the ball bearing (3) around the solenoid (5) attached to the A/C compressor housing.
The pressure plate (6) with the rubber insert (7) is connected through splining (8) to the A/C compressor shaft (4) and it can be shifted axially.

Function

To start up the A/C compressor, the solenoid (5) is energized. The magnetic force pulls the pressure plate (6) against the rubber insert (7) and holds it in position. This sets up the frictional connection between the automotive engine and the A/C compressor.
If the solenoid (5) is de-energized, the pressure plate (6) is pushed back by the rubber insert (7) into its rest position and the frictional connection is interrupted. This serves to ensure that the A/C compressor is switched off in the event of a mechanical defect.

A/C compressor safety circuit

To prevent the poly-V belt from slipping off in the event of a mechanical defect of the A/C compressor (Y40), the A/C compressor magnetic clutch automatically disengages.
In the event of a mechanical defect, the A/C compressor turns with greater difficulty or even locks completely. The heat generated at the friction surface causes the fuse (2) in the solenoid (5) to blow. The current supply of the solenoid (5) is interrupted and the frictional connection is released.

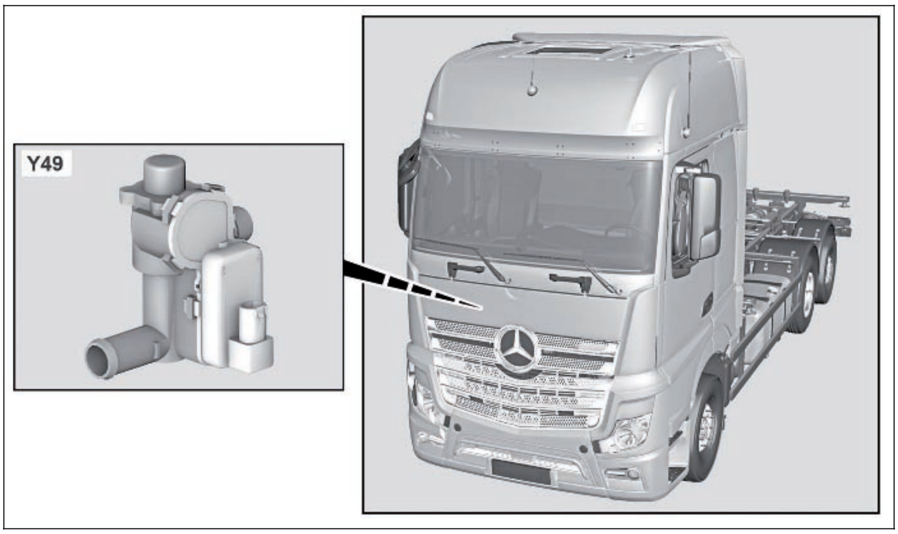
GF83.20-W-3126H	Heating shutoff valve, component description	20.7.11

MODEL 963, 964

Location

Y49 Heater shutoff valve

The heater shutoff valve (Y49) is located on the left next to the fresh air intake on the heater blower unit.



W83.20-1104-05

Task

The heater shutoff valve (Y49) blocks the coolant supply to the heater heat exchanger if heat output is not required (temperature control flaps set to cold).

Function in vehicles with code (D6M) Hot water auxiliary heater, cab or code (D6N) Hot water auxiliary heater, cab and engine

The auxiliary heater only heats the coolant in the cooling circuit of the heater heat exchanger when the heating shutoff valve is closed (Y49). To avoid frequent switching on and off of the auxiliary heater, the heater shutoff valve (Y49) is intermittently opened so that coolant continues to flow from the engine cooling circuit.

GF46.80-W-1020H	Additional steering axle valve unit, component description	2.8.11

MODEL 963, 964

Location

Shown on model 963
Y39 Additional axle valve unit

The additional axle valve unit (Y39) is centrally located in front of the trailing axle.

W46.80-1142-11

Task

The additional axle valve unit (Y39) actuates the power steering fluid flow for the additional steering axle steering cylinder upon request of the additional steering axle (ASA) control unit (A34).

Design

The additional axle valve unit (Y39) comprises the following components:

- Pressure limiting valve
- Shutoff valve
- Proportioning valve

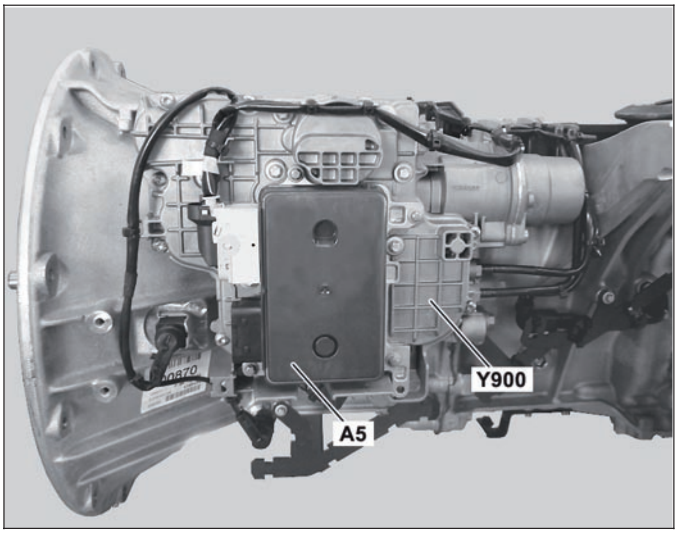
GF26.21-W-3001H	Component description for transmission positioner	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3

Location

A5 *Transmission control (TCM) control unit*
Y900 *Transmission positioner*

The transmission control (TCM) control unit (Y900) is mounted with the transmission positioner (A5) on the left side on the transmission housing.



W26.00-1030-11

Task

The shift mechanism is actuated and the shift position detected over the transmission positioner (Y900). The transmission positioner (Y900) actuates the integral gear cylinder and gate cylinder over solenoid valves.
Furthermore the transmission positioner (Y900) actuates the splitter group shift cylinder, the range group shift cylinder, the pneumatic central clutch release bearing and the countershaft brake over its pneumatic connectors with compressed air and also supplies the power take-off with compressed air.

The transmission (TCM) control unit (A5) detects the position of the piston rod of the gear and gate cylinder or the piston rod of the splitter group shift cylinder over the internal splitter group position sensor (Y900 b1), gear cylinder (Y900 b2) and gate cylinder (Y900 b3) in the transmission positioner (Y900).

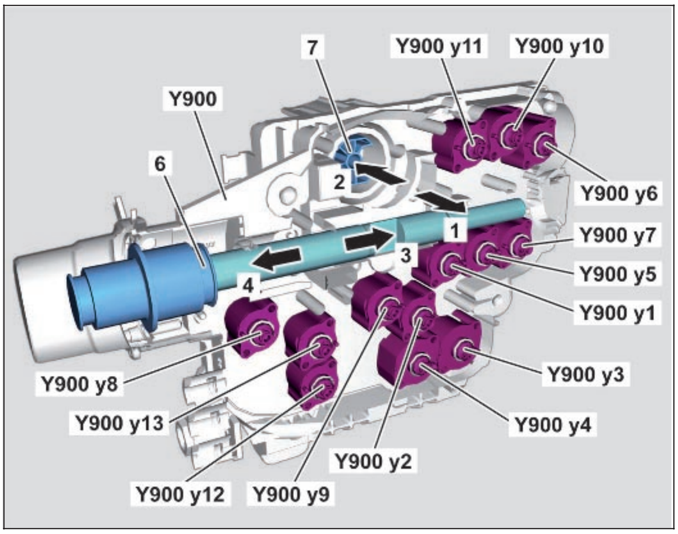
Body

The transmission positioner (Y900) combines the following components into one unit:
- Gear cylinder
- Gear cylinder travel sensor (Y900 b2)
- Retract gear cylinder solenoid valve (Y900 y9)
- Extend gear cylinder solenoid valve (Y900 y8)
- Gate cylinder
- Gate cylinder travel sensor (Y900 b3)
- Retract gate cylinder solenoid valve (Y900 y11)
- Extend gate cylinder solenoid valve (Y900 y10)
- Splitter group travel sensor (Y900 b1)
- Retract splitter group solenoid valve (Y900 y7)
- Extend splitter group solenoid valve (Y900 y6)
- Slowly close clutch solenoid valve (Y900 y1)
- Slowly open clutch solenoid valve (Y900 y2)
- Quickly close clutch solenoid valve (Y900 y3)
- Quickly open clutch solenoid valve (Y900 y4)
- Retract range group solenoid valve (Y900 y12)
- Extend range group solenoid valve (Y900 y13)
- Countershaft brake solenoid valve (Y900 y5)
- Clutch protection valve
- Sieve (followed by the compressed air supply)

The splitter group position sensor (Y900 b1), gear cylinder (Y900 b2) and gate cylinder (Y900 b3), contained in the transmission positioner (Y900) are contact-less measuring sensors whose internal coils are excited by a permanent magnet. The travel sensors internally generate a pulse width modulated (PWM) signal over the integral evaluation electronics which is read in by the transmission (TCM) control unit (A5).

Cross section

1	*Extend gate cylinder*
2	*Extend gate cylinder*
3	*Extend gear cylinder*
4	*Retract gear cylinder*
6	*Gate cylinder*
7	*Gear cylinder*
Y900	*Transmission positioner*



W26.19-1129-81

Y900 y1	*Clutch slow closing solenoid valve*
Y900 y2	*Clutch slow opening solenoid valve*
Y900 y3	*Clutch quick closing solenoid valve*
Y900 y4	*Clutch quick opening solenoid valve*
Y900 y5	*Countershaft brake solenoid valve*
Y900 y6	*'Extend' splitter group solenoid valve*
Y900 y7	*'Retract' splitter group solenoid valve*
Y900 y8	*'Extend' gear cylinder solenoid valve*
Y900 y9	*'Retract' gear cylinder solenoid valve*
Y900 y10	*'Extend' gate cylinder solenoid valve*
Y900 y11	*'Retract' gate cylinder solenoid valve*
Y900 y12	*'Retract' range group solenoid valve*
Y900 y13	*'Extend' range group solenoid valve*

GF32.33-W-3124H	Overflow valve with return flow, component description	2.8.11

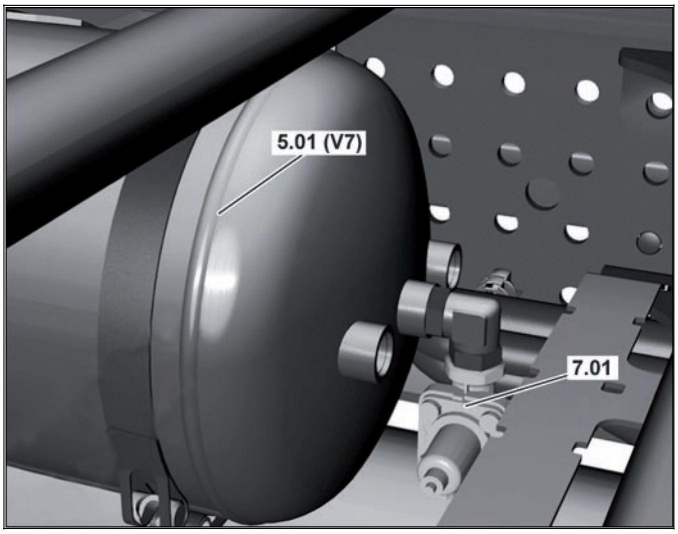
MODEL 963

Location

5.01 Compressed air reservoir (V7)
7.01 Overflow valve with return flow

The overflow valve with return flow (7.01) is attached to the compressed air reservoir (V7) (5.01) near the second fuel tank.

i The installation location may vary depending on the vehicle model.



W32.33-2070-11

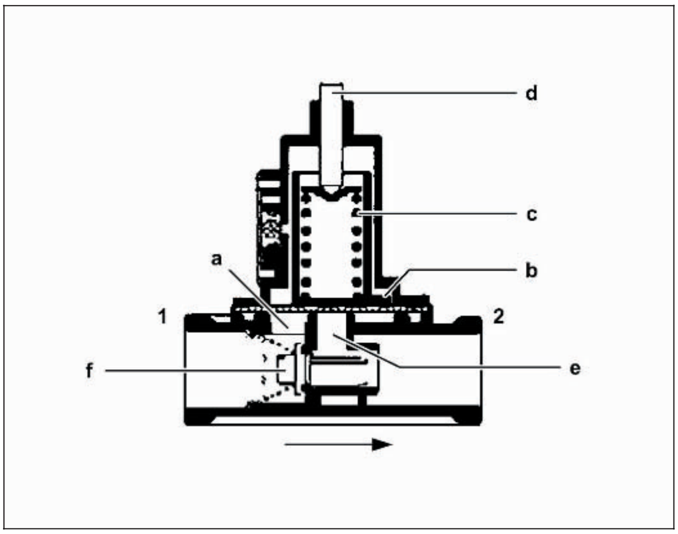
Task

When the design pressure of the air suspension circuit is reached, the overflow valve with return flow (7.01) permits flow-through to the compressed air reservoir (V7) (5.01). If there is a drop in pressure in the air suspension circuit, the overflow valve with return flow (7.01) allows compressed air from the compressed air reservoir (V7) (5.01) to be fed back into the circuit.

Design

a Bore
b Diaphragm
c Adjuster spring
d Piston
e Bore
f Check valve

Pneumatic connections
1 Energy supply
2 Energy outflow



W32.33-2071-11

Function

When compressed air is applied to the overflow valve with return flow (7.01) at the energy supply (1), the compressed air passes through the bore (a) under the diaphragm (b) which is pushed onto its seat by the adjuster spring (c) and piston (d). When the overflow pressure is reached, the force of the adjuster spring (c) is overcome so that the diaphragm (b) is lifted from its seat and the bore (e) is released. The compressed air is fed to the energy outflow (2) and to the consumer connected there.

If the air pressure at the energy supply (1) drops below the overflow pressure, the adjuster spring (c) pushes the diaphragm (b) back onto its seat. The compressed air is now no longer fed from the energy supply (1) to the energy outflow (2). If the air pressure at the energy supply (1) continues to drop, the check valve (f) opens due to the higher pressure at the energy outflow (2) and the compressed air flows from the energy outflow (2) to the energy supply (1).

GF42.20-W-3001H	Parking brake valve, component description	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr

Location

14.01 Parking brake valve without trailer control

The parking brake valve without trailer control (14.01) is installed on the right side of the dashboard next to the driver.

Task

The parking brake valve without trailer control (14.01) is used to operate the parking brake.

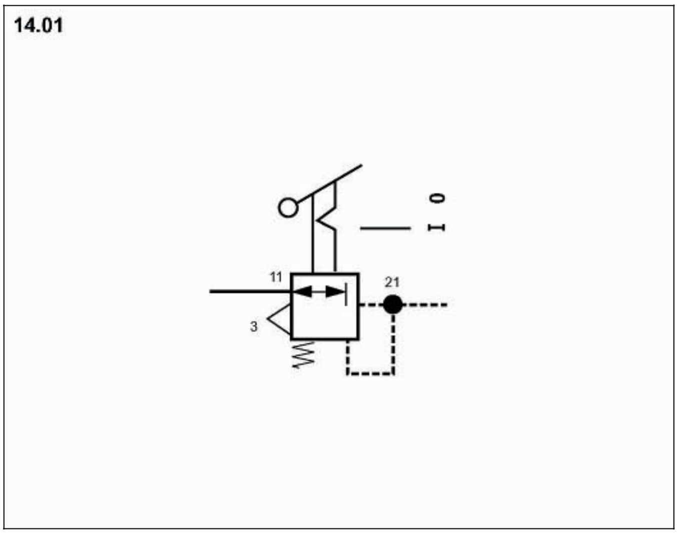
W42.20-1011-81

Design

14.01 Parking brake valve without trailer control

0 Park position
I Vent position

Pneumatic connections
3 Atmospheric connection (ventilation)
11 Energy supply (reservoir pressure - parking brake)
21 Energy outflow (control pressure to the air admission relay valve)



W42.20-1013-11

Function

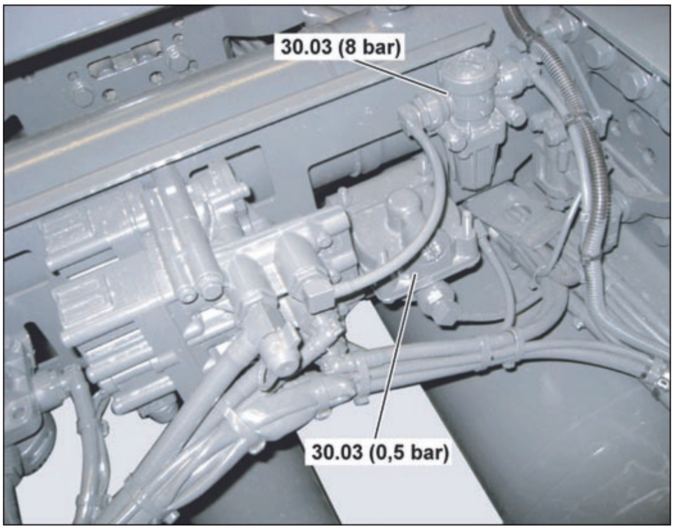
If the parking brake valve without trailer control (14.01) is in rest position (0), the system pressure present at connection 11 is directed through to connection 21 as control pressure. The parking brake is released.

If the parking brake valve without trailer control (14.01) is brought into the vent position (I), connection 21 of the parking brake valve without trailer control (14.01) is ventilated via connection 3 and the parking brake is engaged.

GF32.33-W-3120H	Pressure limiting valve with ventilation, component description	2.8.11

MODEL 963

Location



W32.33-2062-81

Shown on vehicle with liftable trailing axle
30.03 Pressure limiting valve with vent (8 bar)
30.03 Pressure limiting valve with vent (0.5 bar)

The pressure limiting valves with vent (30.03) are attached on the left-hand side (relative to the direction of travel) on the first tubular crossmember at the rear axles.

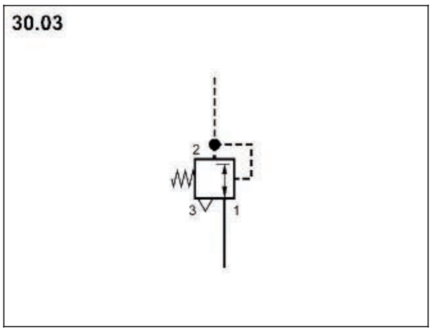
i The installation location may vary depending on the vehicle model.

Task

Version with 0.5 bar pressure limitation
The pressure limiting valve (30.03) limits venting at the 3-axle vehicle level control valve unit (Y21a) to 0.5 bar and thus retains a residual pressure in the air bellows.

Version with 8.0 bar pressure limitation
When the lift axle is raised, the pressure limiting valve (30.03) limits the pressure in the lift bellows to 8.0 bar.

Design



W32.33-2063-01

30.03 Pressure limiting valve with vent

Pneumatic connections
1 *Energy supply (air suspension reservoir pressure)*
2 *Energy outflow (air spring bellows pressure to 3-axle vehicle level control valve unit and to sleeve air spring or boot)*
3 *Atmospheric connection (ventilation)*

Function

When the pressure limiting valve with vent (30.03) is at its rest position, the pressure present at the energy supply (1) is routed to the energy outflow (2).
If the pressure routed to the pressure outflow (2) exceeds 0.5 bar or 8.0 bar, the pressure limiting valve with vent (30.03) moves to the venting position. The pressure present at the energy supply (1) is no longer routed to the energy outflow (2) and the energy outflow (2) is vented via the atmosphere connection (3).

If the pressure present at the pressure outflow (2) reaches a value lower than 0.5 bar or 8.0 bar, the pressure limiting valve with vent (30.03) moves back to the starting position. The pressure present at the energy supply (1) is again routed to the energy outflow (2).

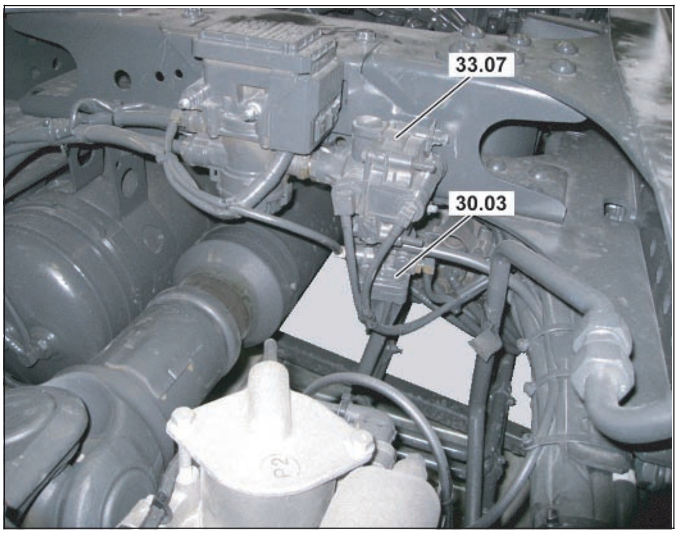
GF42.10-W-3106H	Pressure limiting valve with ventilation, component description	29.6.11

MODEL 963.403
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr

Location

Shown on model 963.403
30.03 Pressure limiting valve with vent
33.07 3/2-way valve for auxiliary braking effect

The pressure limiting valve with ventilation (30.03) is installed on a bracket in the frame crossmember in the vicinity of the fuel tank under the 3/2-way valve for auxiliary braking (33.07).



W42.10-1304-81

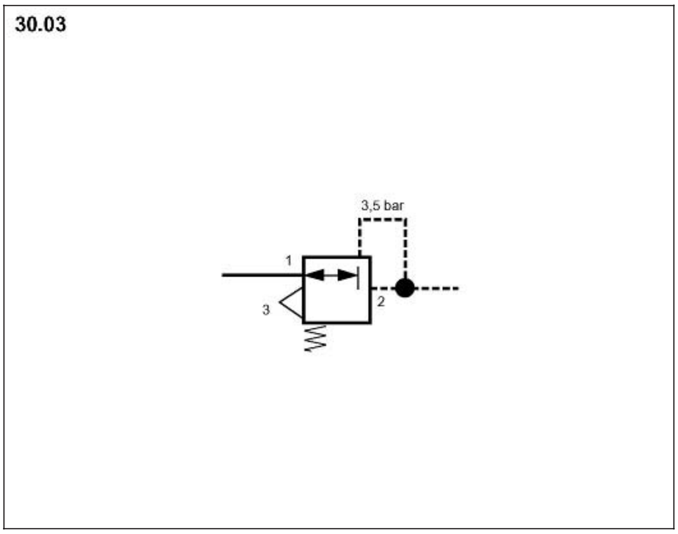
Task

With semitrailer tractors, the pressure limiting valve with ventilation (30.03) limits the redundant front axle brake pressure to 3.5 bar in the event of a brake application without electronic control (redundancy case) for stability reasons.

Design

30.03 Pressure limiting valve with vent

Pneumatic connections
1 Energy supply
2 Energy outflow
3 Atmospheric connection (ventilation)



W42.10-1305-11

Function

The pressure limiting valve with ventilation (30.03) is in the starting position at the beginning of a brake application without electronic control (redundancy case). The redundant brake pressure present at connection 1 is sent to connection 2.
If the redundant brake pressure sent to connection 2 exceeds the 3.5 bar value, the pressure limiting valve (30.03) opens.

The redundant brake pressure present at connection 1 is then no longer forwarded to connection 2 and connection 2 is ventilated via connection 3.
If the redundant brake pressure present at connection 2 reaches a value of less than 3.5 bar, the pressure limiting valve with ventilation (30.03) goes back into the starting position. The redundant brake pressure at connection 1 is sent back to connection 2 again.

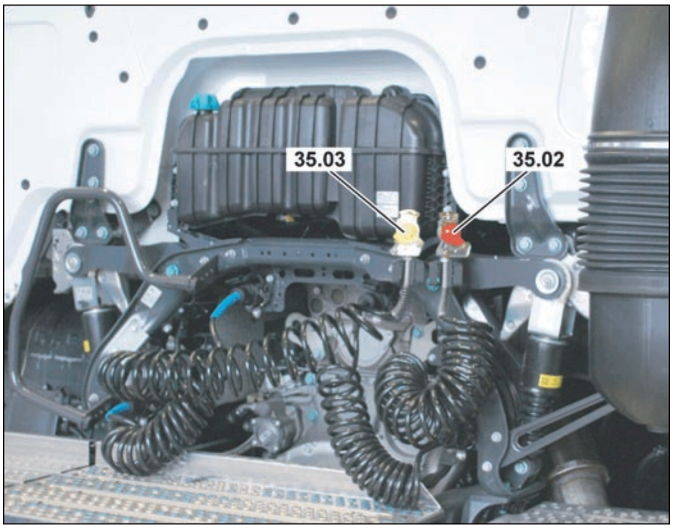
GF42.25-W-3136H	Coupling head for compressed air supply/brake, component description	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr

Location

Shown on model 963.4
35.02 Coupling head for compressed air supply
35.03 Coupling head for brake

The coupling head for compressed air supply (35.02) and the coupling head for brakes (35.03) are installed on a bracket behind the cab.



W42.25-1271-81

Task

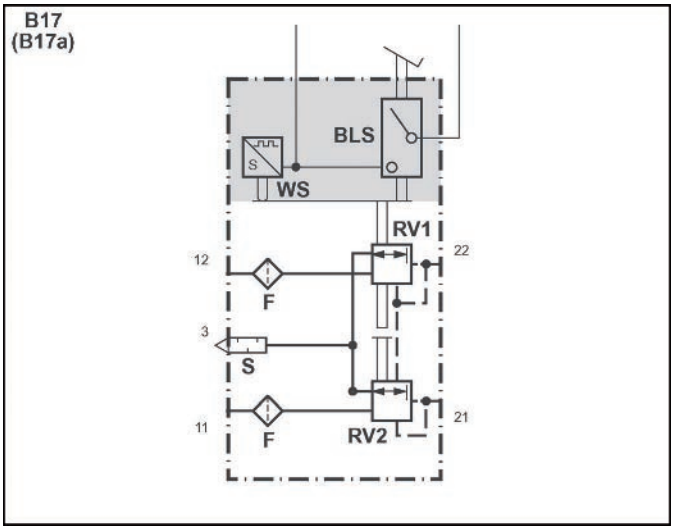
The coupling head for compressed air supply (35.02) and the coupling head for brakes (35.03) connect the brake system of the towing vehicle with the trailer.

Design

35.02 Coupling head for compressed air supply
35.03 Coupling head for brake

RS Check valve

Pneumatic connections
1 Energy supply
2 Energy outflow



W42.25-1282-11

Function

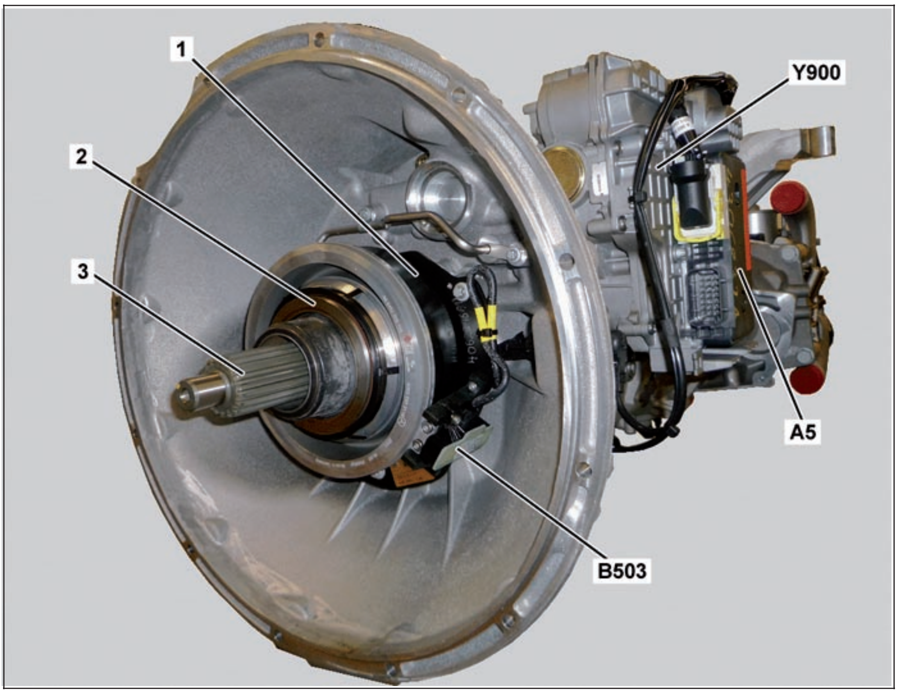
When coupling the coupling head for compressed air supply (35.02) and the coupling head for brakes (35.03) the check valve (RS) is mechanically unlocked and the pressure present at connection 1 is sent to connection 2.

If the coupling head for compressed air supply (35.02) and the coupling head for brakes (35.03) is not connected to the trailer, the check valve prevents the pressure from being sent to connection 2.

GF25.20-W-3002H	Component description for pneumatic central clutch release bearing	2.8.11

MODEL 963 with TRANSMISSION 715 with CODE (G5G) Mercedes PowerShift 3
MODEL 964 with TRANSMISSION 715 with CODE (G5G) Mercedes PowerShift 3

Location



W25.20-1108-76

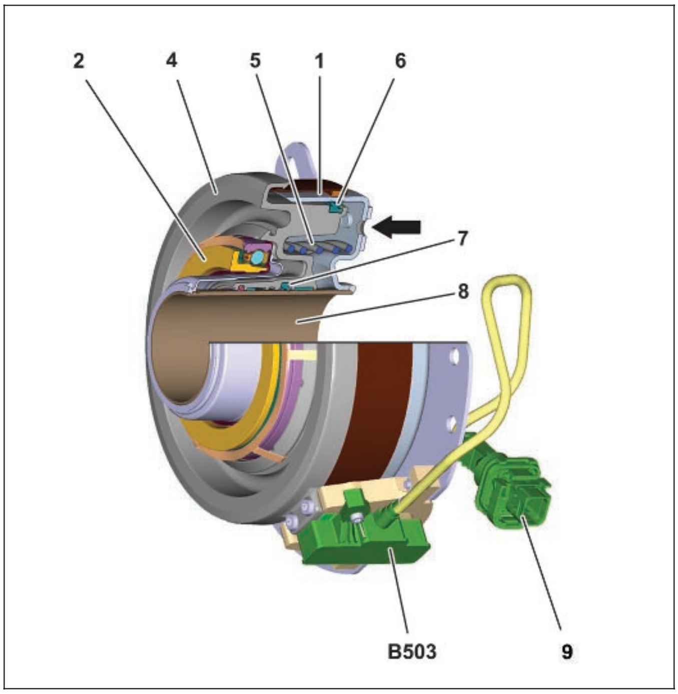
1	*Pneumatic central clutch release bearing*
2	*Release bearing*
3	*Transmission input shaft*
A5	*Transmission control (TCM) control unit*
B503	*Clutch travel sensor*
Y900	*Transmission positioner*

The pneumatic central clutch release bearing (1) is located on the transmission input shaft (3) of the manual transmission and is screwed firmly together with the front transmission housing.

Task

The pneumatic central clutch release bearing (1) actuates the intake reeds of the clutch pressure plate.

Design



W25.20-1109-82

1	*Pneumatic central clutch release bearing*
2	*Release bearing*
4	*Piston*
5	*Preload spring*
6	*Sealing ring*
7	*Sealing ring*
8	*Guide sleeve*
9	*Electrical connector*
B503	*Clutch travel sensor*
Arrow	*Bore (for compressed air supply)*

Function

In order to actuate the clutch the piston (4) of the pneumatic central clutch release bearing (1) has compressed air applied to it over the bore (arrow) and is pushed forwards onto the guide sleeve (8). The clutch release bearing (2) presses against the disk springs of the connector and actuates these. The inner sealing of the pneumatic central clutch release bearing (1) takes place by means of two sealing rings (6 and 7).

The preload spring (5) ensures that the thrust bearing (2) is always subjected to a minimal load when the clutch is not actuated in order to avoid bearing noise. The connector position sensor (B503) attached to the pneumatic central clutch release bearing (1) allows the transmission (TCM) control unit (A5) to inductively detect the position of the pneumatic central clutch release bearing (1).

i The clutch protection valve is integrated in the transmission positioner (Y900). It protects the pneumatic central clutch release bearing (1) against unintended filling with leaked air.

GF26.19-W-3007H	Component description for range group module	2.8.11

TRANSMISSION 715 in MODEL 963 with CODE (G5G) Mercedes PowerShift 3
TRANSMISSION 715 in MODEL 964 with CODE (G5G) Mercedes PowerShift 3

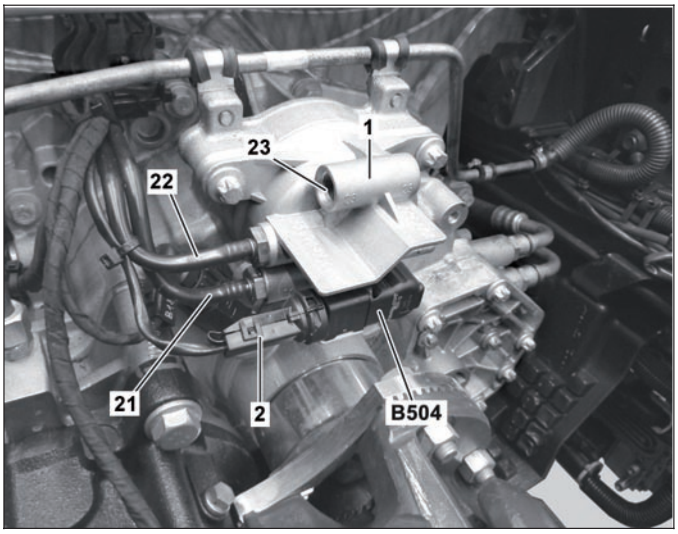
Location

Shown on transmission 715.352

1 Range group module
2 Electrical connector
21 Air line (retract range group shift cylinder)
22 Air line (extend range group shift cylinder)
23 Compressed air connection (power take-off)

B504 Range group travel sensor

The range group module (1) is attached to the transmission in the rear area above the output flange.



W26.18-1017-11

Task

The components in the range group module have the following tasks:

- Range group shift cylinder for shift operation of the range group.
- Range group position sensor (B504) for detecting the piston rod for the range group shift cylinder.

Design

The range group module (1) is a unit in which the following components are integrated:

- Range group shift cylinder
- Range group travel sensor (B504)

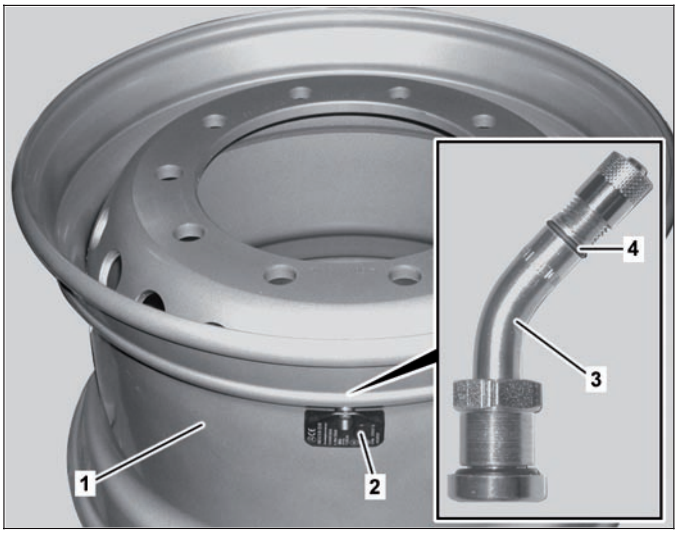
GF40.15-W-5126H	Wheel sensor, component description	2.8.11

MODEL 963, 964 with CODE (S1Y) Tire pressure monitor

Location

1 Rim
2 Wheel sensor
3 Filling valve
4 Ring

The wheel sensors (2) are screwed into the filling valve (3) on the rim (1) at each wheel. Wheels with fitted wheel sensors (2) are identified by a colored ring (4) on the filling valve (3).



W40.15-1030-11

Task

The wheel sensors (2) detect the tire inflation pressure, wheel rotation direction, tire air temperature and the capacity of the installed battery. The information is sent to the antennas via a wireless connection.

Function

When the vehicle is stationary, the wheel sensors (2) are in standby mode. As soon as a wheel sensor (2) detects that the wheel is rotating and the vehicle has reached a speed of 7 km/h, it wakes up from standby mode and repeatedly sends a data telegram containing the following information to the respective antenna:

- ID number of the wheel electronics unit
- Tire temperature
- Current tire inflation pressure
- Charge level of the battery in the wheel sensors (2)
- Fault messages

As a result, the tire pressure monitor (TPM) control unit (A35) can detect whether any modifications to the as-built configuration of the vehicle have been made since the last journey. If the ID numbers of the wheel sensors (2) are detected as unchanged, an increased number of data telegrams are sent in the following 20 operating minutes. If no change in tire condition is detected during this time, the number of data telegrams sent is reduced to one every 60 s.

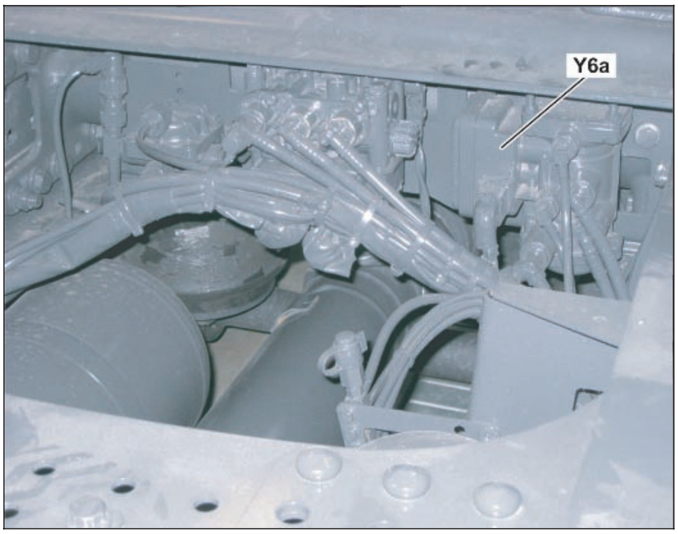
GF42.25-W-3124H	Trailer control valve, component description	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr

Location

Shown on model 963.4, Knorr version
Y6a Trailer control valve, Knorr

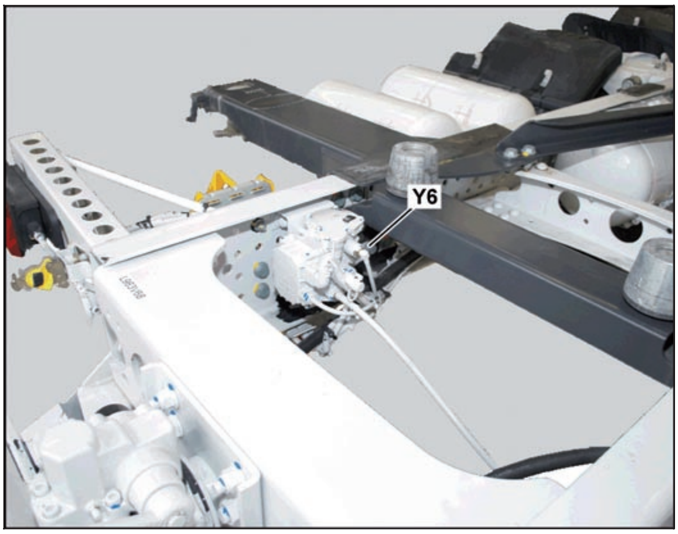
The trailer control valve (Y6a) is installed on the tubular crossmember on the left in the direction of travel below the fifth wheel coupling.



W42.25-1261-81

Shown on model 963.0, Wabco version
Y6 Trailer control valve, WABCO

The trailer control valve (Y6) is installed on the left rear inside the left longitudinal frame member.



W42.25-1262-81

Task

The trailer control valve has the following tasks:

- Supply the trailer's brake system with reservoir pressure via the coupling head of the compressed air supply (35.02).
- Provide brake pressure for the trailer's service brake via the coupling head for brakes (35.03 with Electronic Brake Control intact.
- Report the current actual value of the applied brake pressure at the brake coupling head (35.03) during the electronically controlled brake application.
- Withhold the redundant brake pressure with Electronic Brake Control intact.
- Ensure the EC breakaway function for trailers if there is leakage or a fault in the trailer's brake lines.
- Apply max. brake pressure for the trailer when the parking brake is actuated.

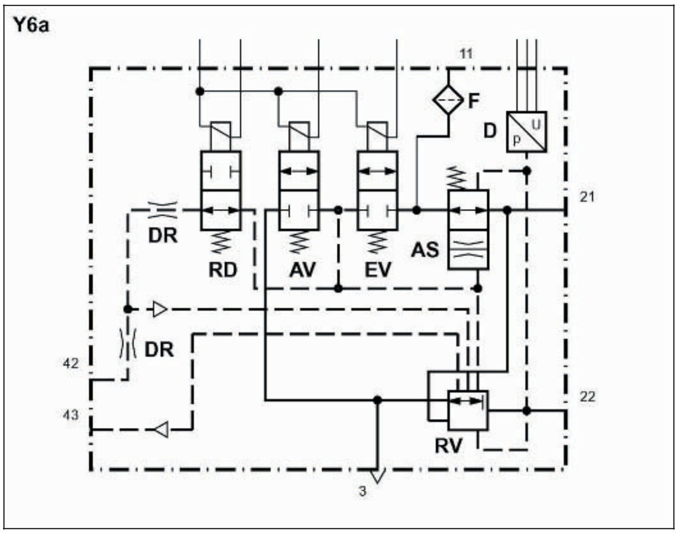
Design

Knorr version
Y6a Trailer control valve, Knorr

AS Breakaway protection valve
AV Outlet solenoid valve
D Brake pressure pressure sensor
DR Throttle valve
EV Intake solenoid valve
F Filter
RD Valve for redundancy path switching
RV Relay valve

Pneumatic connections
3 Atmospheric connection (ventilation)
11 Energy supply (circuit 3 reservoir pressure,)
21 Energy outflow (trailer/semi-trailer reservoir pressure)
22 Energy outflow (trailer/semi-trailer brake pressure)
42 Control connection (redundant brake pressure)
43 Control connection (parking brake)

i The solenoid valves and the pressure sensor are connected directly to the Electronic Brake Control control unit (A10c).



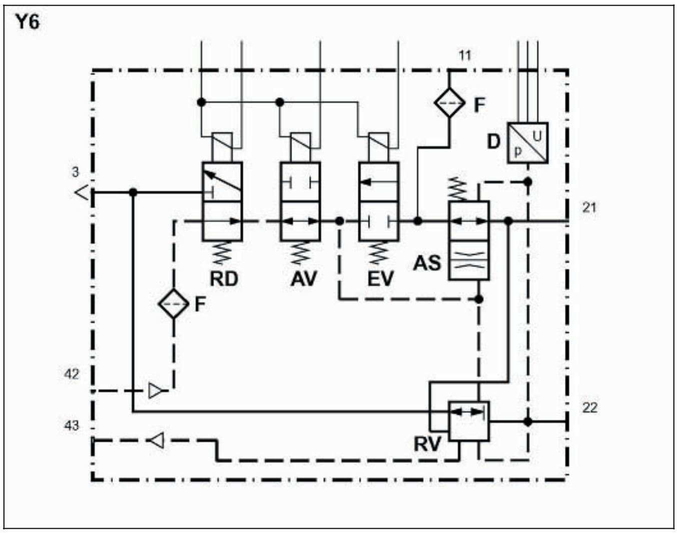
W42.25-1276-11

Wabco version
Y6 Trailer control valve, WABCO

AS Breakaway protection valve
AV Outlet solenoid valve
D Brake pressure pressure sensor
EV Intake solenoid valve
F Filter
RD Valve for redundancy path switching
RV Relay valve

Pneumatic connections
3 Atmospheric connection (ventilation)
11 Energy supply (circuit 3 reservoir pressure,)
21 Energy outflow (trailer/semi-trailer reservoir pressure)
22 Energy outflow (trailer/semi-trailer brake pressure)
42 Control connection (redundant brake pressure)
43 Control connection (parking brake)

i The solenoid valves and the pressure sensor are connected directly to the Electronic Brake Control control unit (A10b).



W42.25-1277-11

Function

1 Knorr version
1.1 Brake application with electronic control
1.1.1 Brake operated (apply pressure)
The intake valve (EV) is energized and switched into flow-through position (pulsed). As a result, the reservoir pressure present at connection 11 flows to the relay valve (RV) as control pressure. The exhaust valve (AV) remains switched off (locking position). The redundancy path switching valve (RD) is also energized and switched into the locking position to prevent the redundant brake pressure present at connection 42 from having an effect on the relay valve (RV) as well. The relay valve (RV) is opened according to the control pressure, and the reservoir pressure present at the relay valve (RV) inlet flows to connection 22 as brake pressure.

The pressure sensor (D) records the brake pressure applied and reports this to the Electronic Brake Control control unit (EBS) (A10c).

i The pulsed actuation of the valves causes creaking noises. These noises do not indicate that the trailer control valve (Y6a) is defective.

1.1.2 Brake operated (hold pressure)
The actuation of the intake valve (EV) is interrupted so that the control pressure to the relay valve (RV) no longer increases. The exhaust valve (AV) remains switched off. The redundancy path switching valve (RD) remains energized.

1.1.3 Brake operated (lower pressure; do not completely release)
The intake valve (EV) remains switched off. The redundancy path switching valve (RD) remains energized. The exhaust valve (AV) is now energized and switches to flow-through position so that the control pressure can be ventilated accordingly via connection 3, and lowered as a result. If the desired brake pressure is reached, the exhaust valve (AV) is switched off again (locking position) and the remaining control pressure is held.

1.1.4 Completely release brake
The intake valve (EV) and the redundancy limit switch valve(RD) are switched off and switch back into their relative starting positions. The exhaust valve (AV) is energized until the control pressure present at the relay valve (RV) is ventilated via the exhaust valve (AV) and connection 3. The relay valve now goes back into its starting position and the brake pressure at connection 22 is also released via connection 3.

1.2 Brake application without electronic control
In the event of an electrical fault (redundancy case), all solenoid valves remain in their starting position. The redundant brake pressure at connection 42 is routed via the redundancy path switching valve (RD) to the relay valve (RV) as control pressure. The relay valve (RV) is opened according to the control pressure, and the reservoir pressure present at the relay valve (RV) inlet flows to connection 22 as brake pressure.

i In the case of redundancy, the control pressure is sent back to connection 42 via the relay valve (RV) and released via the brake value sensor after the brakes are released.

1.3 Brake application with parking brake
When actuating the parking brake, connection 43 is unpressurized and the relay valve (RV) opens fully as a result. The full reservoir pressure present at the relay valve (RV) inlet is routed to connection 22 as brake pressure.

1.4 Procedure for break of the supply line (connection 21) to the trailer
In the event that the supply line breaks, the reservoir pressure escapes out via connection 21 or the break point and the trailer's brake valve initiates emergency braking of the trailer.

1.5 Procedure in the event that the brake line (connection 22) to the trailer breaks
After the brake line has been torn and the subsequent emergency braking, the brake application regulation procedures occur with or without electronic control.
Based on the lack of pressure support on the spring side of the breakaway protection valve (AS) (unpressurized line to connection 22), the breakaway protection valve switches (AS) to the throttle position.
The reservoir pressure from connection 11 is held back by the throttle in the breakaway protection valve (AS) and no longer reaches the relay valve.

Connection 21 is ventilated via the relay valve (RV) which was opened by the control pressure and via connection 22 (break), and the trailer brake valve in the trailer initiates emergency braking of the trailer as a result.

i According to the law, the supply line must drop to min. 1.5 bar of residual pressure within 2 seconds after a break of the brake line and subsequent emergency braking.

2 Wabco version

2.1 Brake application with electronic control

2.1.1 Brake operated (apply pressure)
The intake valve (EV) is energized and switches into flow-through position (pulsed). As a result, the reservoir pressure present at connection 11 flows to the relay valve (RV) as control pressure. The exhaust valve (AV) is energized and switched in locking position. The redundancy path switching valve (RD) is also energized and switched into locking position to prevent the redundant brake pressure present at connection 42 from having an effect on the relay valve (RV) as well. The relay valve (RV) is opened according to the control pressure, and the reservoir pressure present at the relay valve (RV) inlet flows to connection 22 as brake pressure.

The pressure sensor (D) records the applied brake pressure and reports this to the Electronic Brake Control control unit (EBS) (A10b).

i The pulsed actuation of the valves causes creaking noises. These noises do not indicate that the trailer control valve (Y6) is defective.

2.1.2 Brake operated (hold pressure)
The intake valve (EV) is no longer actuated so the control pressure to the relay valve (RV) does not increase further. The exhaust valve (AV) and the redundancy path switching valve(RD) remain energized.

2.1.3 Brake operated (lower pressure; do not completely release)
The intake valve (EV) remains switched off. The redundancy path switching valve (RD) remains energized. The exhaust valve (AV) is switched off so that the control pressure can be ventilated accordingly via connection 3, and lowered as a result. If the desired brake pressure is reached, the exhaust valve (AV) is re-energized and the remaining control pressure is held.

2.1.4 Completely release brake
The intake valve (EV) and the exhaust valve (AV) are switched off and switch back into their respective starting positions. The redundancy path switching valve (RD) remains energized until the control pressure present at the relay valve (RV) is released via the exhaust valve (AV) and the redundancy path switching valve (RD) is ventilated via connection 3. The relay valve (RV) now returns to its starting position and the brake pressure at connection 22 is also ventilated via connection 3.

2.2 Brake application without electronic control

In the event of an electrical fault (redundancy case), all solenoid valves remain in their starting positions. The redundant brake pressure at connection 42 is routed via the redundancy path switching valve(RD) and the exhaust valve (AV) to the relay valve (RV) as control pressure. The relay valve (RV) is opened according to the control pressure, and the reservoir pressure present at the relay valve (RV) inlet flows to connection 22 as brake pressure.

i In the case of redundancy, the control pressure returns to connection 42 via the relay valve (RV) and is ventilated via the brake value sensor after the brakes are released.

2.3 Brake application with parking brake

When the parking brake is actuated, connection 43 is unpressurized and the relay valve (RV) opens fully as a result. The full reservoir pressure present at the relay valve (RV) inlet is routed to connection 22 as brake pressure.

2.4 Procedure for break of the supply line (connection 21) to the trailer

In the event that the supply line breaks, the reservoir pressure escapes out via connection 21 or the break point and the trailer's brake valve initiates emergency braking of the trailer.

2.5 Procedure for break of the brake line (connection 22) to the trailer

After the brake line has been torn and the subsequent emergency braking, the brake application regulation procedures occur with or without electronic control.
Based on the lack of pressure support on the spring side of the breakaway protection valve (AS) (unpressurized line to connection 22), the breakaway protection valve switches (AS) to the throttle position.
The reservoir pressure from connection 11 is held back by the throttle in the breakaway protection valve (AS) and no longer reaches the relay valve.

i According to the law, the supply line must drop to min. 1.5 bar of residual pressure within 2 seconds after a break of the brake line and subsequent emergency braking.

The pressure at connection 21 is ventilated via the relay valve (RV) which was opened by the control pressure and via connection 22 (break), and the trailer brake valve in the trailer initiates emergency braking of the trailer as a result.

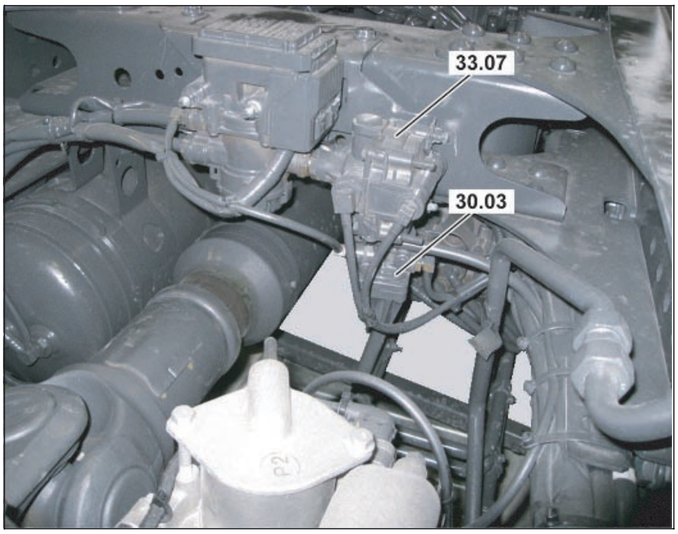
GF42.25-W-3131H	3/2-way valve for auxiliary braking effect, component description	29.6.11

MODEL 963.403 /404 /405
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr

Location

Shown on model 963.4
33.07 3/2-way valve for auxiliary braking effect

The 3/2-way valve for auxiliary braking (33.07) is installed on a holder in the frame crossmember in the vicinity of the fuel tank in the left on the direction of travel.



W42.10-1304-81

Task

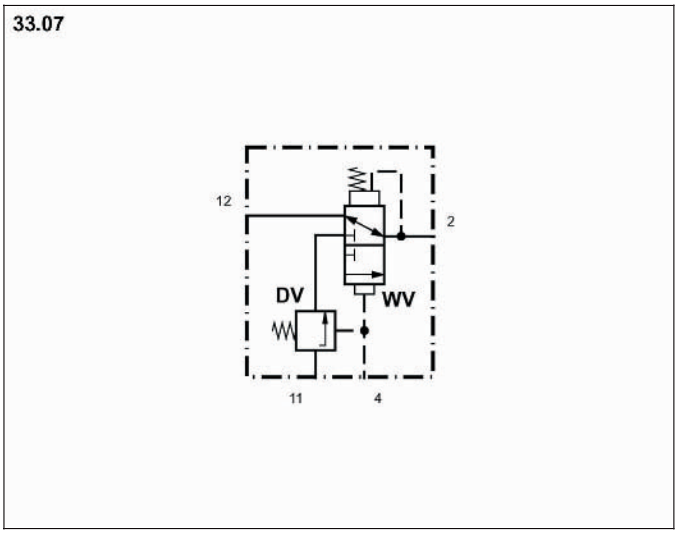
The 3/2-way valve for auxiliary braking (33.07) satisfies the legal requirements for auxiliary braking should the front-axle brake circuit fail. If the front-axle brake circuit fails, it supports the braking effect of the rear axle by actuating a low pressure in the brake cylinder of the front wheel on the driver side during the brake application.

Design

33.07 3/2-way valve for auxiliary braking effect

DV Pressure limiting valve
WV 3/2-way valve

Pneumatic connections
2 Energy outflow (brake pressure to the ABS solenoid valve)
4 Control connection (redundant brake pressure from brake value sensor)
11 Energy supply (reservoir pressure - auxiliary consumer)
12 Energy outflow (brake pressure from front axle axle modulator)



W42.25-1278-11

Function

With an intact front-axle brake circuit
If the 3/2-way valve for auxiliary braking (33.07) at connection 12 is pressurized with brake pressure, this acts as control pressure on the spring side of the 3/2-way valve (WV). Redundant brake pressure present at connection 4 acts as control pressure on the second control connection of the 3/2-way valve (WV). If the forces at the two control inlets balance each other out, the 3/2-way valve (WV) remains in the starting position. The brake pressure present at connection 12 is routed to connection 2.
The pressure limiting valve (DV) opens at the same time due to the redundant brake pressure present at connection 4 and applies the reservoir pressure present at connection 11 up to a maximum value of 2.2 bar as brake pressure. This is held back at the 3/2-way valve (WV).

For failure of the front-axle brake circuit
If connection 12 of the 3/2-way valve for auxiliary braking (33.07) is unpressurized because of a defect in the front-axle brake circuit, the spring force on the first control connection of the 3/2-way valve (WV) and the redundant brake pressure on the second control connection of the 3/2-way valve (WV) do not balance each other out. The 3/2-way valve (WV) switches over. The pressure limiting valve (DV) is opened in accordance with the redundant brake pressure present at connection 4 and applies the reservoir pressure present at connection 11 up to a maximum value of 2.2 bar as brake pressure. It flows from there to connection 2 via the 3/2-way valve (WV).

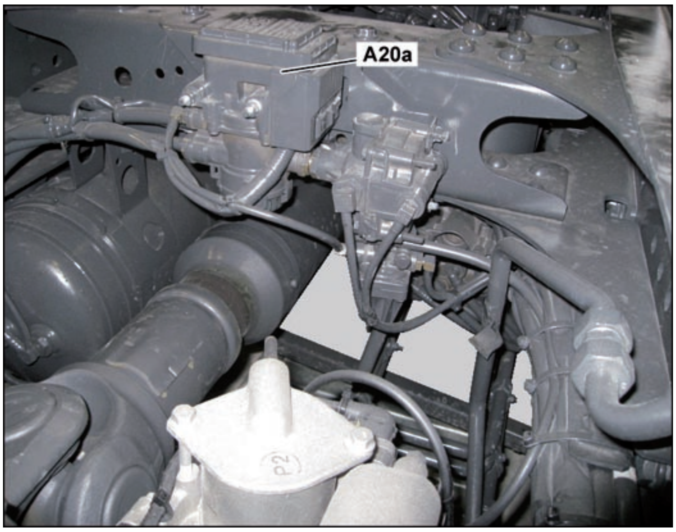
GF42.25-W-3132H	Front axle axle modulator, component description	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr

Location

Shown on model 963.4, Knorr version
A20a Front axle axle modulator (Knorr)

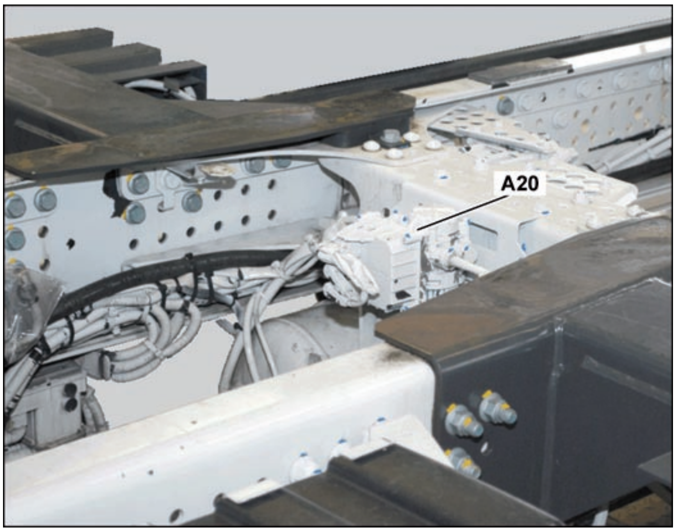
The front axle axle modulator (Knorr) (A20a) is installed centrally on a bracket on the frame crossmember in the vicinity of the fuel tank.



W42.25-1264-81

Shown on model 963.0, Wabco version
A20 Front axle axle modulator (Wabco)

The front axle axle modulator (Wabco) (A20) is installed centrally on a bracket on the frame crossmember in the vicinity of the fuel tank.

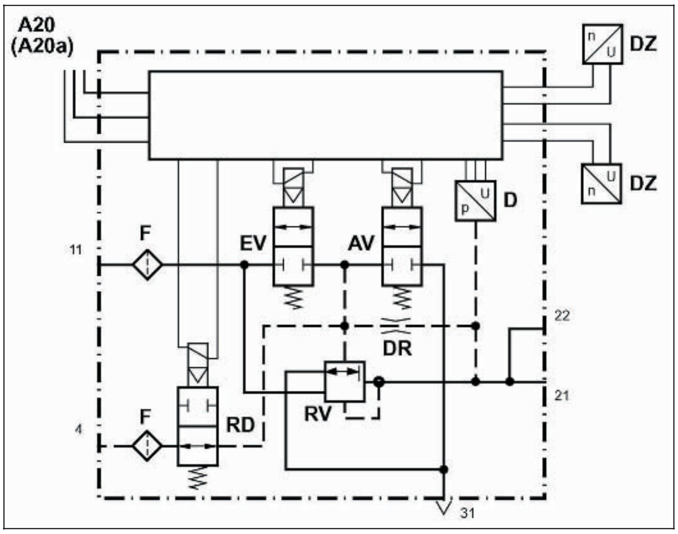


W42.25-1265-81

Task

The front axle axle modulator (Wabco) (A20) or the front axle axle modulator (Knorr) (A20a) has the following tasks:
- Controlling the brake pressure at the front axle.
- Withhold the redundant brake pressure with Electronic Brake Control intact.
- Report the current actual value of the applied brake pressure to the Electronic Brake Control control unit (EBS) (A10b or A10c) during the electronically controlled brake application.
- Performing system diagnosis.
- Communication with the Electronic Brake Control control unit (EBS) (A10b or A10c) via the front axle brake CAN (CAN 6b).
- Communication with the rear axle axle modulator (A21 or A21a) via the redundancy brake CAN (CAN 6c).
- Record signals from the rpm sensors on the front axle wheels with Electronic Brake Control intact and forward to the Electronic Brake Control control unit (EBS) (A10b or A10c).

Design



W42.25-1279-11

A20 *Front axle axle modulator (Wabco)*
A20a *Front axle axle modulator (Knorr)*

AV *Outlet valve*
D *Pressure sensor*
DR *Throttle*
DZ *Rpm sensor*
EV *Inlet valve*
F *Filter*
RD *Valve for redundancy path switching*
RV *Relay valve*

Pneumatic connections
4 *Control connection (redundant brake pressure)*
11 *Energy supply (reservoir pressure - front axle service brake system)*
21 *Energy outflow (brake pressure to 3/2-way valve for auxiliary braking)*
22 *Energy outflow (brake pressure to the ABS solenoid valve)*
31 *Atmospheric connection (ventilation)*

Function

1 Brake application with electronic control

1.1 Brake operated (apply pressure)

The intake valve (EV) is energized and switched into flow-through position (pulsed). The exhaust valve (AV) remains switched off (locking position). The reservoir pressure present at connection 11 flows to the relay valve (RV) as control pressure. The redundancy path switching valve (RD) is also energized and switched into locking position to prevent the redundant brake pressure present at connection 4 from having an effect on the relay valve (RV) as well. The relay valve (RV) is opened in accordance with the control pressure, and the reservoir pressure present at the relay valve (RV) inlet is routed to connections 21 and 22 as brake pressure.

The pressure sensor (D) records the applied brake pressure and reports this to the Electronic Brake Control control unit (EBS) (A10b or A10c).

i The pulsed actuation of the valves causes creaking noises. These noises do not indicate a that the front axle axle modulator (A20 or A20a) is defective.

1.2 Brake operated (hold pressure)

The intake valve (EV) is switched off so the control pressure at the relay valve (RV) does not increase further. The exhaust valve (AV) remains in locking position. Only the redundancy path switching valve (RD) remains energized.

1.3 Brake operated (lower pressure; do not completely release)

The intake valve (AV) and the redundancy path switching valve (RD) remain in locking position. The exhaust valve (AV) is now energized (pulsed) and switches to flow-through position. The control pressure present at the relay valve (RV) is released via connection 31, and thus lowered. If the desired brake pressure is reached, the exhaust valve (AV) is switched off again (locking position) and the control pressure now present at the relay valve (RV) is held.

1.4 Completely release brake

The intake valve (EV) and the redundancy path switching valve (RD) are no longer energized and switch back into their respective starting positions. The exhaust valve (AV) is energized until the control pressure present at the relay valve (RV) is ventilated via the exhaust valve (AV) and connection 31. Based on the now lacking control pressure, the relay valve (RV) switches back into its starting position and the brake pressure present at connections 21 and 22 is ventilated via the relay valves (RV) and connection 31.

2 Brake application without electronic control

In the event of an electrical fault (redundancy case), all solenoid valves remain in their starting position. The redundant brake pressure at connection 4 is routed via the redundancy path switching valve (RD) to the relay valve (RV) as control pressure. The relay valve (RV) is opened according to the control pressure, and the reservoir pressure present at the relay valve (RV) flows to connections 21 and 22 as brake pressure.

Based on the lack of redundant brake pressure at connection 4, the relay valve returns to its starting position after releasing the brakes. The brake pressure present at connections 21 and 22 is then ventilated via the relay valve (RV) and connection 31.

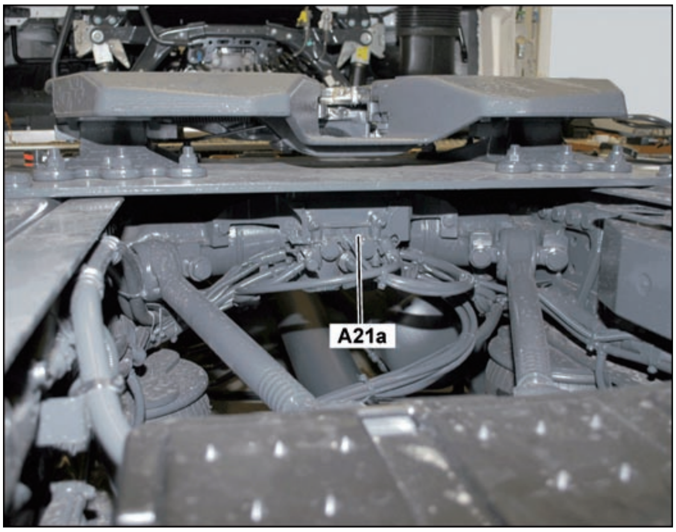
GF42.25-W-3133H	Rear axle axle modulator, component description	29.6.11

MODEL 963
with CODE (Z1H) Electronic brake control (EBS) from Wabco
with CODE (Z1G) Electronic brake control (EBS) from Knorr

Location

Shown on model 963.4, Knorr version
A21a Rear axle axle modulator (Knorr)

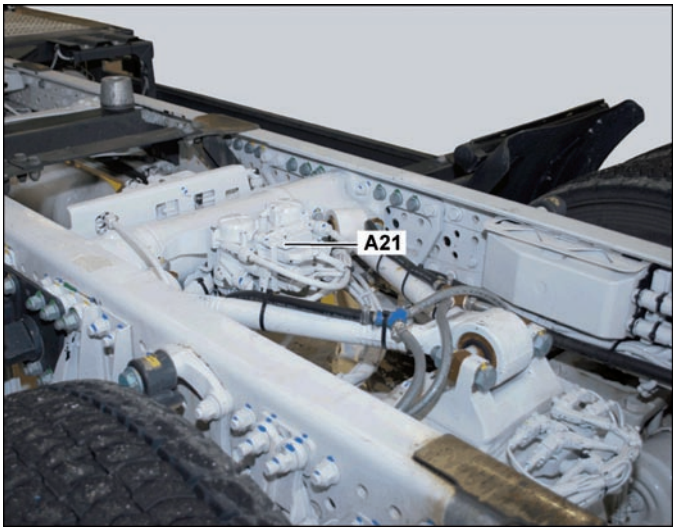
The rear axle axle modulator (Knorr) (A21a) is installed centrally on a bracket on the tubular crossmember below the fifth wheel coupling.



W42.25-1266-81

Shown on model 963.0, Wabco version
A21 Rear axle axle modulator (Wabco)

The rear axle axle modulator (Wabco) (A21) is installed centrally on a bracket on the tubular crossmember in the area above the drive axle.



W42.25-1267-81

Task

The rear axle axle modulator (Wabco) (A21) or the rear axle axle modulator (Knorr) (A21a) has the following tasks:

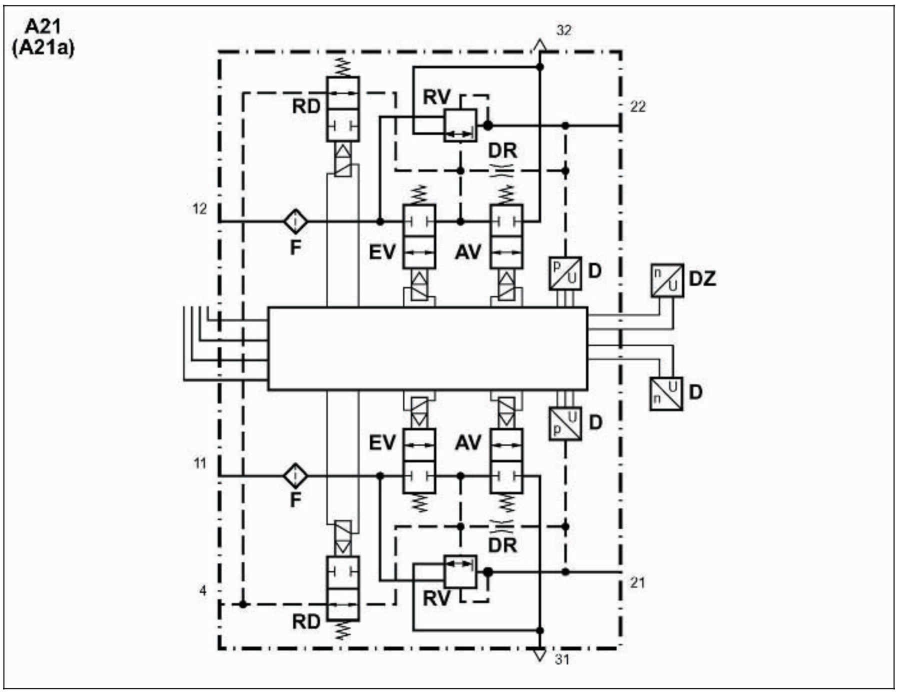
- Controlling the brake pressure at the rear axle.
- Withhold the redundant brake pressure with Electronic Brake Control intact.
- Report the current actual value of the applied brake pressure to the Electronic Brake Control control unit (EBS) (A10b or A10c) during the electronically controlled brake application.
- Performing system diagnosis.
- Communication with the Electronic Brake Control control unit (EBS) (A10b or A10c) via the rear axle brake CAN (CAN 6b).
- Communication with the front axle axle modulator (A20 or A20a) via the redundancy brake CAN (CAN 6c).
- Record signals from the rpm sensors on the rear axle wheels with Electronic Brake Control intact and forward to the Electronic Brake Control control unit (EBS) (A10b or A10c).

Design

In principle, the rear axle axle modulator is designed as a double front axle axle modulator. Both sides of the rear axle are therefore individually controlled by EBS and ABS systems.

A21 Rear axle axle modulator (Wabco)
A21a Rear axle axle modulator (Knorr)

AV Outlet valve
D Pressure sensor
DR Throttle
DZ Rpm sensor
EV Inlet valve
F Filter
RD Redundancy path switching valve
RV Relay valve



W42.25-1280-06

Pneumatic connections

4 Control connection (redundant brake pressure)
11 Energy supply (reservoir pressure - rear axle service brake system)
12 Energy supply (reservoir pressure - rear axle service brake system)
21 Energy outflow (brake pressure to combination cylinder)
22 Energy outflow (brake pressure to combination cylinder)
31 Atmospheric connection (ventilation)
32 Atmospheric connection (ventilation)

Function

1 Brake application with electronic control

1.1 Brake operated (apply pressure)

The intake valves (EV) are energized and switch to flow-through position (pulsed). The exhaust valves (AV) remain switched off (locking position). The reservoir pressure at present at connection 11 or connection 12 flows to the relay valves (RV) as control pressure. The valves for redundancy path switching (RD) are also energized and switch into locking position to prevent the redundant brake pressure present at connection 4 from having an effect on the relay valves (RV) as well. The relay valves (RV) are opened in accordance with the control pressure, and the reservoir pressure present at the inlet of the relay valves (RV) is routed to connection 21 or connection 22 as brake pressure.

The pressure sensors (D) record the applied brake pressure and report this to the Electronic Brake Control control unit (EBS) (A10b or A10c).

[i] The pulsed actuation of the valves causes creaking noises. These noises do not indicate a that the rear axle axle modulator (A21 or A21a) is defective.

1.2 Brake operated (hold pressure)

The intake valves (EV) are switched off so the control pressure at the relay valves (RV) does not increase further. The exhaust valves (AV) remain in locking position. Only the valves for redundancy limit switching (RD) remain energized.

1.3 Brake operated (lower pressure; do not completely release)

The intake valves (AV) and the valves for redundancy limit switching (RD) remain in locking position. The exhaust valves (EV) are now energized (pulsed) and switch to flow-through position. The control pressure present at the relay valves (RV) is released via connection 31 or connection 32, and thus lowered. If the desired brake pressure is reached, the exhaust valves (AV) are switched off again (locking position) and the control pressure now present at the relay valves (RV) is held.

1.4 Completely release brake

The intake valves (EV) and the valves for redundancy limit switching (RD) are no longer energized and switch back into their respective starting positions. The exhaust valves are energized until the control pressure present at the relay valves (RV) is ventilated via the exhaust valves (AV) and connection 31 or connection 32. Based on the now lacking control pressure, the relay valves (RV) switch back into their starting position and the brake pressure present at connections 21 and 22 is ventilated via the relay valves (RV) and connection 31 or connection 32.

2 Brake application without electronic control

In the event of an electrical fault (redundancy case), all solenoid valves remain in their starting position. The redundant brake pressure at connection 4 is routed via the valves for redundancy path switching (RD) to the relay valves (RV) as control pressure. The relay valves (RV) are opened in accordance with the control pressure, and the reservoir pressure present at the inlet of the relay valves (RV) flows to connections 21 and 22 as brake pressure.

Based on the lack of redundant brake pressure at connection 4, the relay valves return to their starting position after releasing the brakes. The brake pressure present at connection 21 or connection 22 is ventilated via the relay valves (RV) and connection 31 or connection 32.

GF43.30-W-3300H	Retarder, component description	20.7.11

MODEL 963, 964 with CODE (B3H) Secondary water retarder

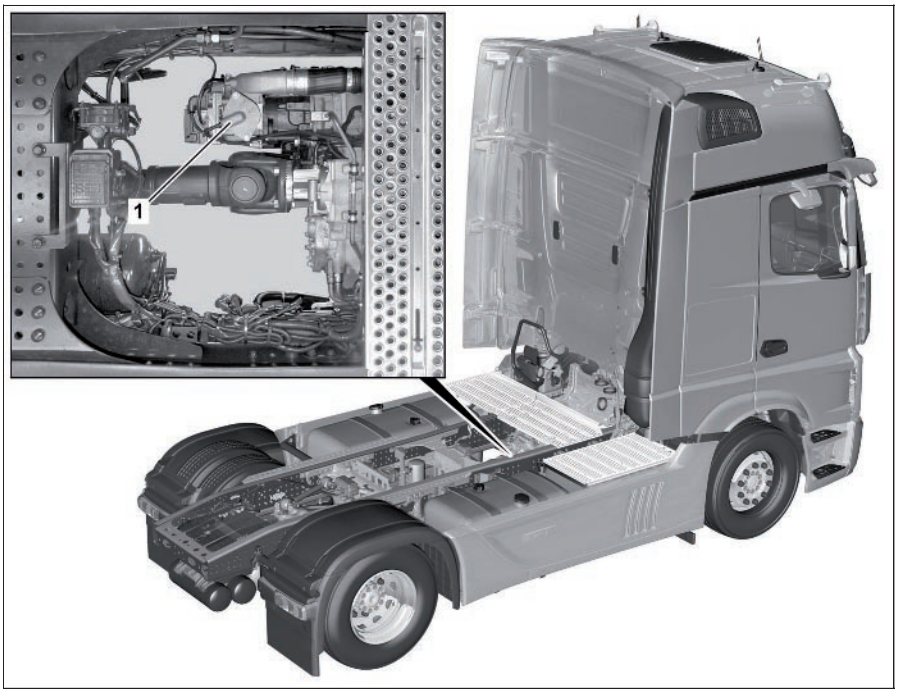
Location

Illustrated on model 963
1 Secondary water retarder

The secondary water retarder (1) is located on the left in the direction of travel next to the transmission output flange.

Task

The task of the secondary water retarder (1) is to convert the flow energy of the engine coolant into mechanical braking energy when requested by the driver or a driving assistance system.



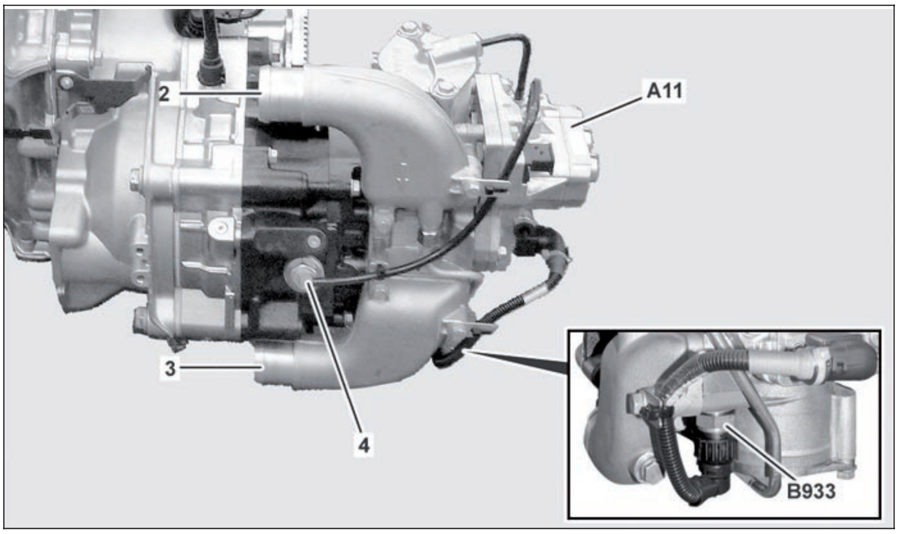
W43.30-1320-06

Design

The secondary water retarder (1) is designed on the principle of hydrodynamic torque conversion.

External view of secondary water retarder
2 Coolant manifold, feed
3 Coolant manifold, return
4 Relief valve

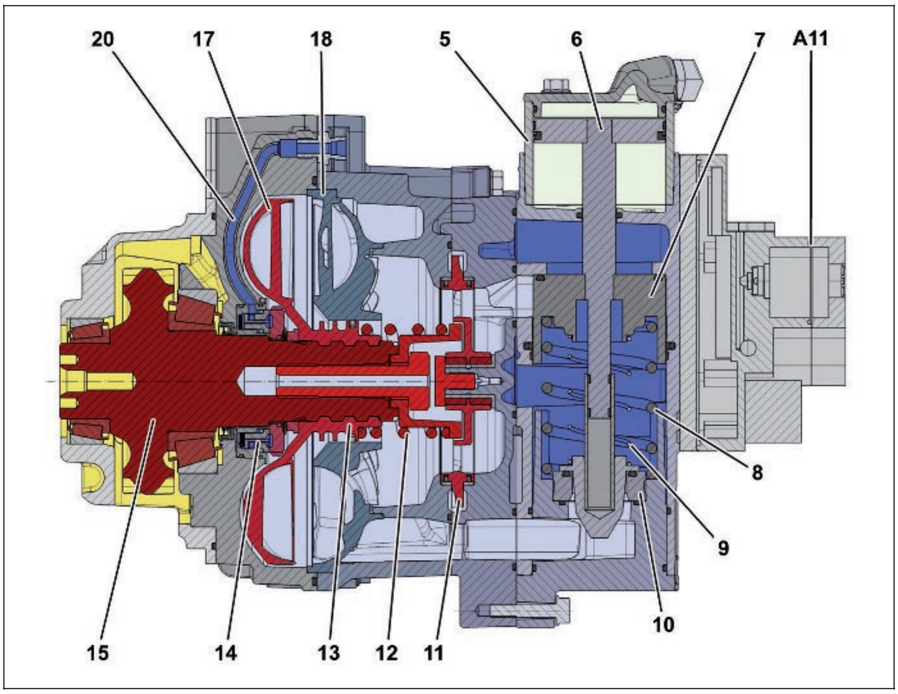
A11 Retarder control (RCM) control unit
B933 Coolant temperature sensor



W43.30-1298-05

Sectional view of secondary water retarder in idle mode

5	*Valve block*
6	*Actuator*
7	*Switching valve*
8	*Switching valve compression spring*
9	*Control valve compression spring*
10	*Control valve*
11	*Side channel pump*
12	*Compression spring for sliding rotor*
13	*Twisted teeth*
14	*Slide ring seal*
15	*Retarder shaft*
17	*Rotor*
18	*Stator*
20	*Shutoff pressure line, return*
A11	*Retarder control (RCM) control unit*

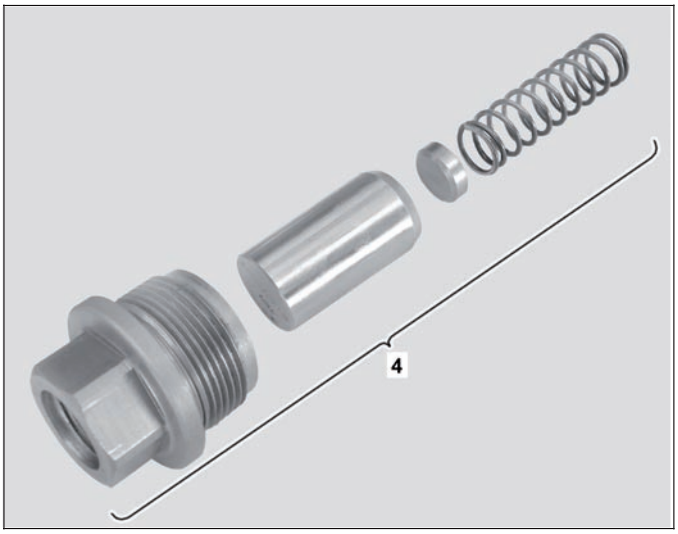


W43.30-1296-76

Function

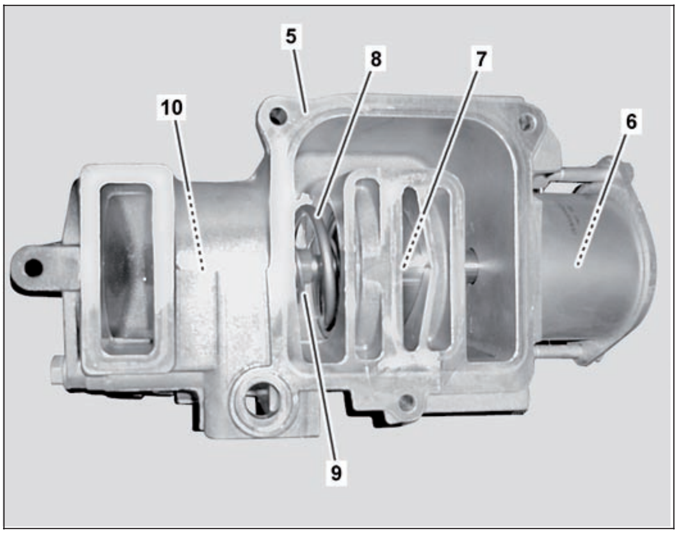
ℹ The individual components shown under Design perform the functions described below.

Relief valve (4)
The relief valve (4) actuates the side channel pump (11) when requested by the retarder control unit (RCM) (A11).



W43.30-1322-11

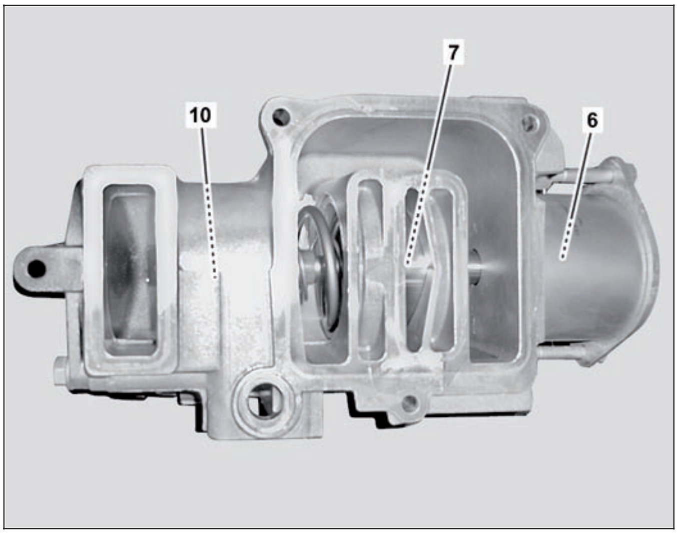
Valve block (5)
The valve block (5) consists of an actuator (6), a switching valve (7), a control valve (10), the switching valve compression spring (8) and the control valve compression spring (9).
If a braking torque is requested, the switching valve (7) directs the engine coolant into the working chamber. If no braking torque is requested, the switching valve (7) separates the working chamber from the coolant circuit. Depending on the pneumatic pressure applied, the control valve (10) controls the coolant feed into the working chamber and thus the intensity of the braking effect. In idle mode, the control valve (10) acts as a check valve and seals the bypass to the working chamber.



W43.30-1324-11

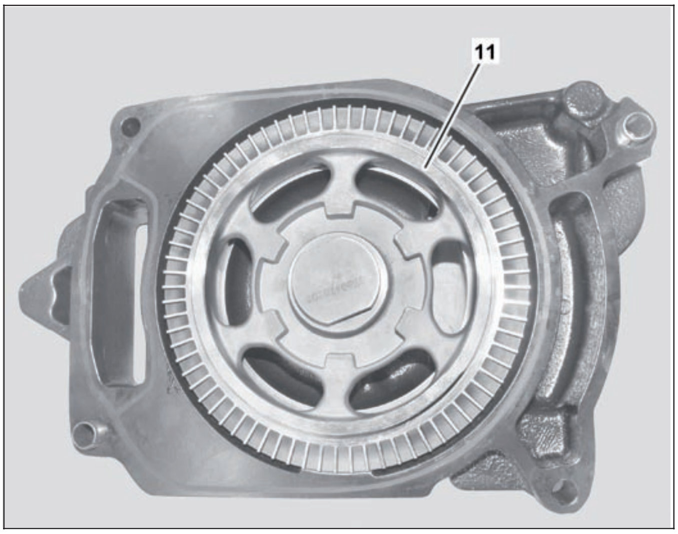
System components

Actuator (6)
The actuator (6) controls the switching valve (7) and the control valve (10) via a piston rod. For this purpose, the actuator (6) is pneumatically actuated by the retarder control unit (RCM) (A11) and the actuator (6) converts the pneumatic pressure into mechanical movement.



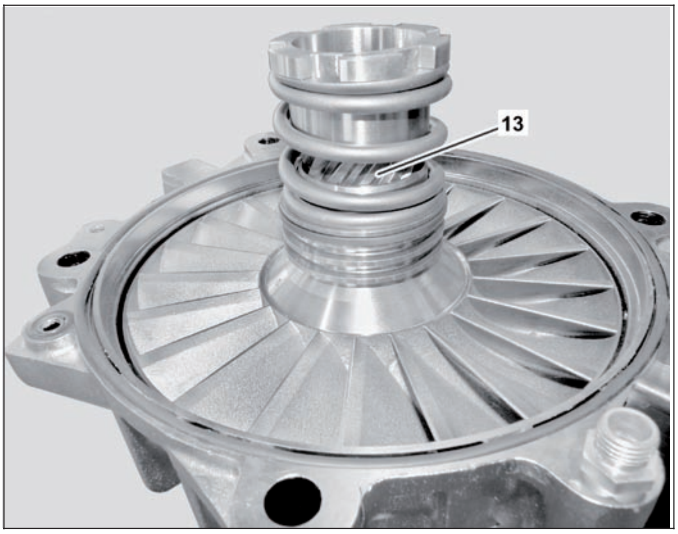
W43.30-1323-11

Side channel pump (11)
When the retarder function is shut off, the side channel pump (11) pumps the engine coolant in the working chamber back into the coolant circuit. The side channel pump (11) is connected directly to the retarder shaft (15) and is actuated via the relief valve (4).



W43.30-1325-11

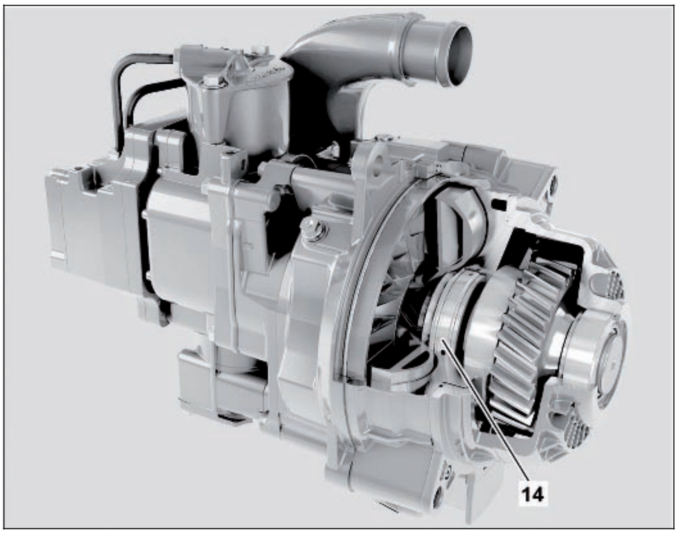
Twisted teeth (13)
The twisted teeth (13), in combination with the compression spring for rotor sliding (12), allows the rotor to be moved, thus regulating the distance between rotor (17) and stator (18).



W43.30-1326-11

Slide ring seal (14)

The slide ring seal (14) seals the working chamber at the transmission end. The slide ring seal (14) consists of two sealing surfaces which engine coolant flows through. The flowing engine coolant causes pressure compensation between the seal and the working chamber and thus a blocking effect. At the same time, the engine coolant reduces the frictional heat produced between the sealing surfaces.

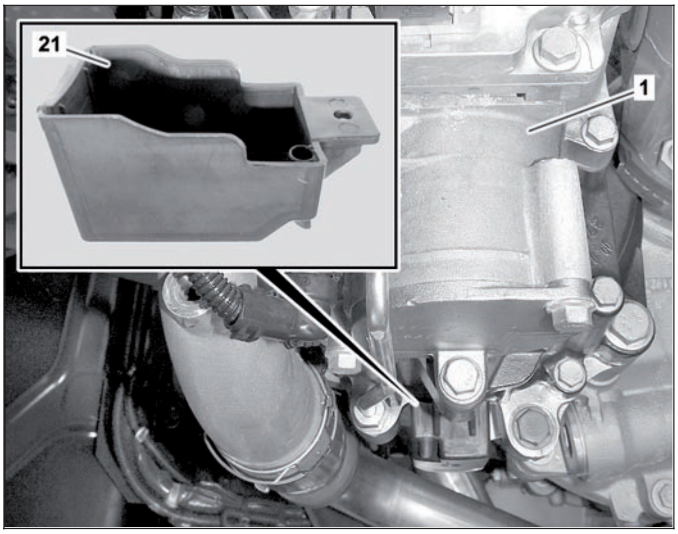


W43.30-1332-11

Evaporation tray (21)

ℹ The slide ring seal (14) must be continuously coated with engine coolant on its sealing surfaces in order to minimize the frictional heat. Accordingly, the possibility of small quantities of engine coolant escaping to the outside via the sealing surfaces cannot be ruled out.

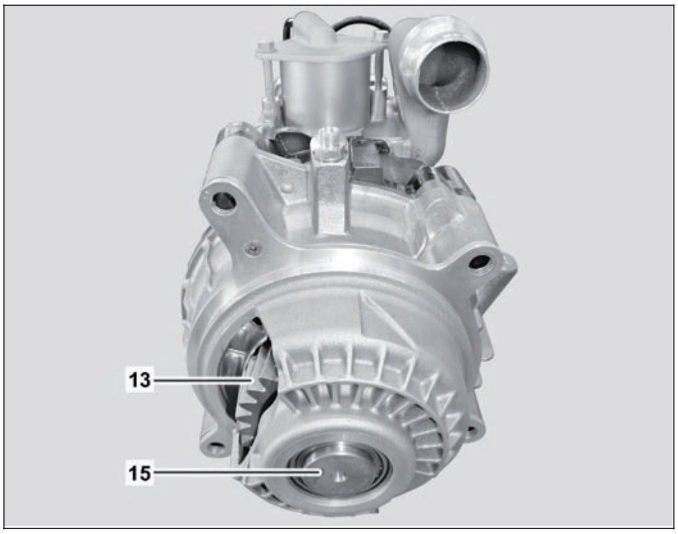
The evaporation tray (21) attached to the housing of the secondary water retarder (1) collects the small quantities of engine coolant which escape and allows them to evaporate.



W43.30-1333-11

Retarder shaft (15)

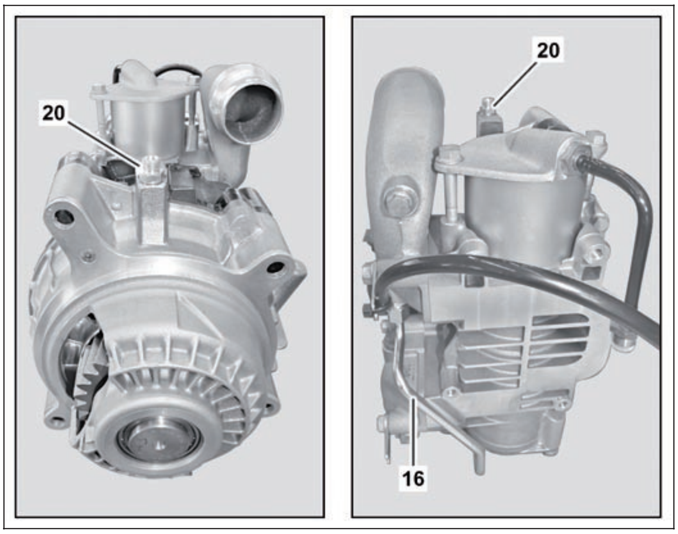
The retarder shaft (15) mechanically connects the rotor (17) to the transmission of the vehicle via the twisted teeth (13). The retarder shaft (15) is driven by the transmission output shaft of the vehicle transmission via a gear pair.



W43.30-1327-11

Shutoff pressure line, feed (16)

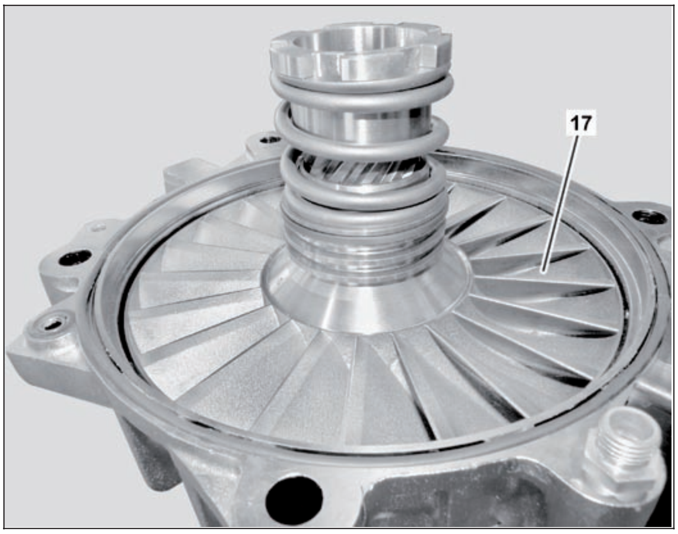
The shutoff pressure line, feed (16) continuously supplies the slide ring seal (14) with engine coolant. The engine coolant is fed back to the cooling circuit of the engine via the connection to the shutoff pressure line, return (20).



W43.30-1331-11

Rotor (17)

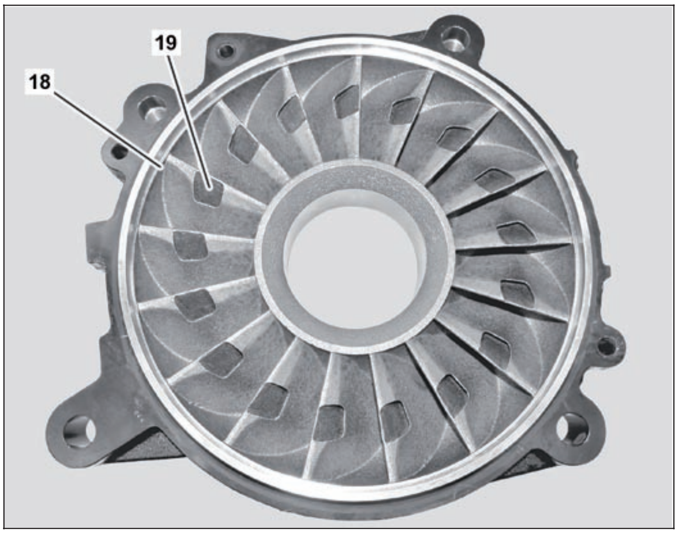
The rotor (17) is driven by the retarder shaft (15) via the twisted teeth (13) and feeds the engine coolant to the stator (18) through the rotational movement of its blades.



W43.30-1328-11

Stator (18)

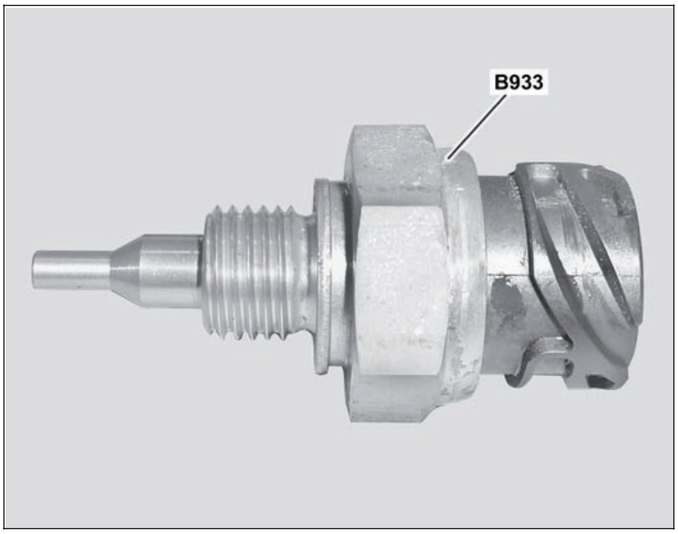
The stator (18), which is fixed to the retarder housing, takes in the rotating engine coolant with its blades through the filling slot (19) and directs it back to the rotor (17). The resulting frictional forces brake the rotor (17).



W43.30-1329-11

Coolant temperature sensor (B933)

The coolant temperature sensor (B933) records the coolant temperature of the coolant which is fed back to the cooling circuit of the engine. The signals from the coolant temperature sensor (B933) are read in directly by the retarder control unit (RCM) (A11).



W43.30-1330-11

GF46.20-W-5140H	Steering gear, component description	2.8.11

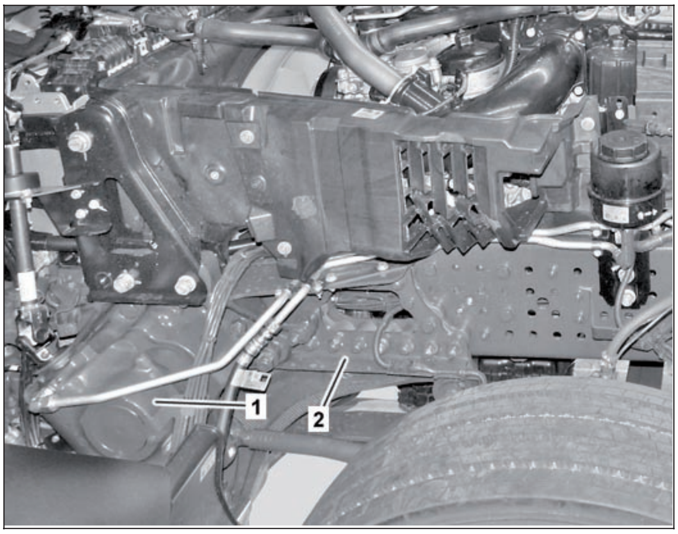
MODEL 963, 964

Location

Shown with code (C6C) Steering, 1-circuit

1 Steering gear
2 Frame

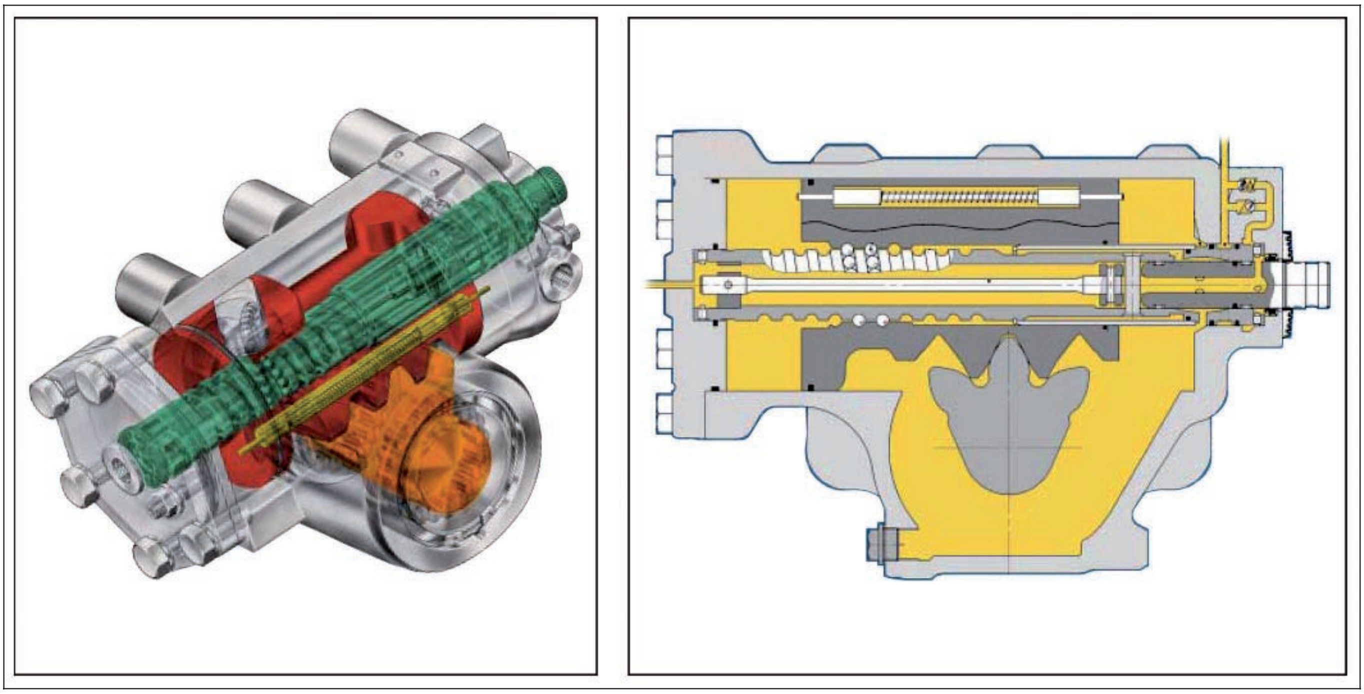
The steering gear (1) is located on the front frame (2) on the left-hand side relative to the direction of travel.



W46.20-1037-11

Task

The task of the steering gear (1) is to convert the rotary motion of the steering wheel into axial motion. Furthermore, the steering forces of the driver are hydraulically assisted.



W46.20-1038-79

Sectional view of steering gear, shown without additional steering axle

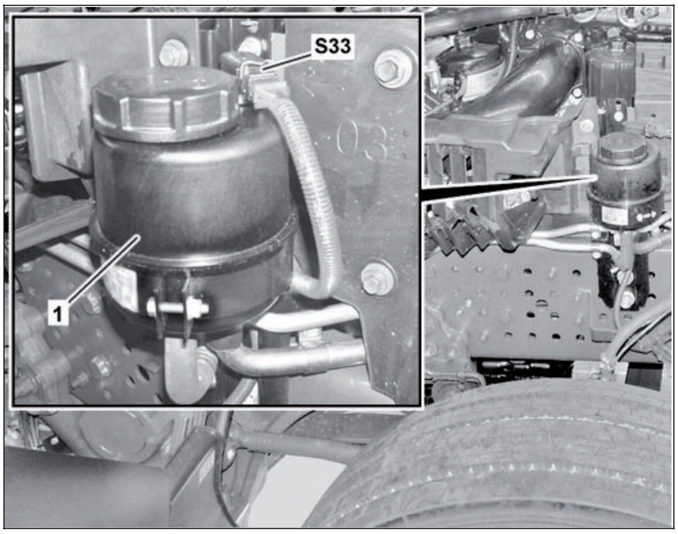
3 Housing
4 Piston
5 Valve actuator
6 Worm
7 Stabilizer bar
8 Steering-sector shaft
9 Ball chain
10 Return chamber
11 Radial grooves
12 Hydraulic steering limiter
13 Pressure limiting valve
14 Suction valve
15 Left working cylinder
16 Right working cylinder
17 Ball circuit in steering nut

i On vehicles with code (A4X) Load-relievable, steered trailing axle (7.5 t) or code (A4Y) Liftable, load-relievable, steered trailing axle (7.5 t), the steering gear (1) is equipped with the front axle steering angle sensor (B64).

GF46.25-W-4000H	Power steering fluid reservoir, component description	2.8.11

MODEL 963, 964

Location



W46.80-1139-11

Shown on model 963
1 Steering oil reservoir

S33 Steering oil level switch

The power steering fluid reservoir (1) is on the frame, level with the left front wheel.

Task

The power steering fluid reservoir (1) compensates fluctuations in power steering fluid volume which are caused by the pressure differential during intake and return of the power steering fluid.

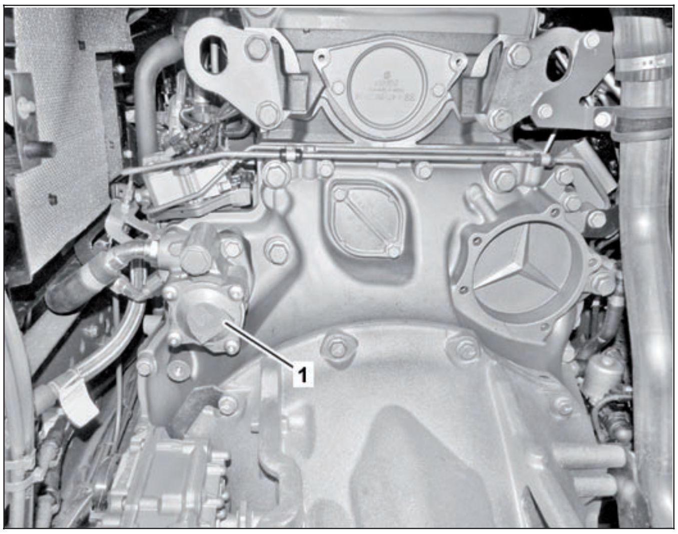
GF46.30-W-5136H	Power steering pump, component description	2.8.11

MODEL 963, 964

Location

1 Power steering pump

The power steering pump (1) is flange-mounted on the left on the transmission side of the engine.



W46.20-1040-11

Task

The power steering pump (1) generates the necessary volumetric flow rate (power steering fluid pressure) for the steering systems of the front axle and additional steering axle.

Design

The power steering pump (1) is designed as a vane-type pump.

GF46.80-W-1000H	Additional steering axle steering cylinder, component description	2.8.11

MODEL 963, 964

Location

W46.80-1146-11

Illustrated on model 963

1 Additional steering axle steering cylinder

The additional steering axle steering cylinder (1) is located in transverse direction in front of the trailing axle.

Task

The additional steering axle steering cylinder (1) converts hydraulic pressure into mechanical movements, which are used to steer the additional steering axle.

Design

The additional steering axle steering cylinder (1) is designed as a dual action hydraulic cylinder and is equipped internally with two damper valves.

Function

It is actuated hydraulically by the additional axle valve unit (Y39) depending on the front axle steering angle.

GF46.80-W-1030H	Additional steering axle flow dividing valve, component description	2.8.11

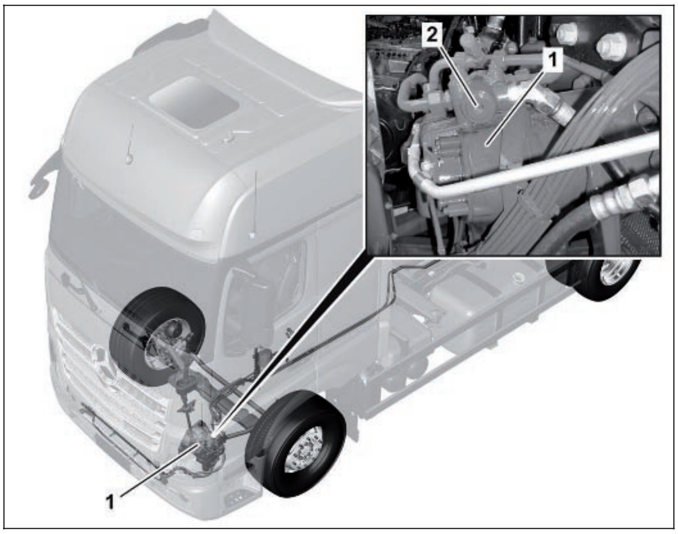
MODEL 963, 964

Location

Illustrated on model 963

1 Steering gear
2 Flow dividing valve

The flow dividing valve (2) is located above the steering gear (1).



W46.80-1144-11

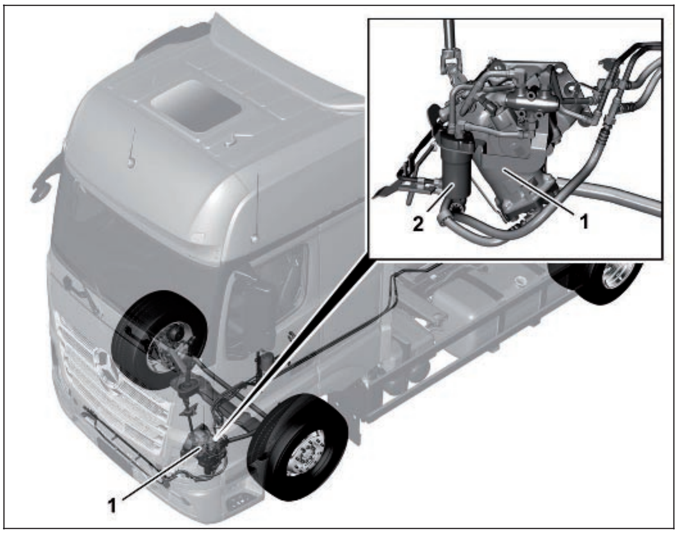
Task

The flow dividing valve (2) evenly divides the power steering fluid flow between the hydraulic circuit of the front axle and that of the additional steering axle.

GF46.80-W-1040H	Additional steering axle high pressure filter, component description	2.8.11

MODEL 963, 964

Location



W46.80-1143-11

Illustrated on model 963

1 *Steering gear*
2 *High pressure filter*

The high pressure filter (2) is located on the left next to the steering gear (1).

Task

The high pressure filter (2) filters the power steering fluid and thus protects the sensitive components of the additional steering axle against soiling.

Design

The high pressure filter (1) comprises the following components:

- Housing
- Filter element (separation area 491 cm^2)
- Wastegate

Function

The power steering fluid flows through the filter element, which can pick up a maximum of 6 g of dirt. In the event that the high pressure filter (2) is clogged, it is equipped with a bypass valve. The bypass valve opens up starting at a pressure differential of $p = 6.5$ bar.

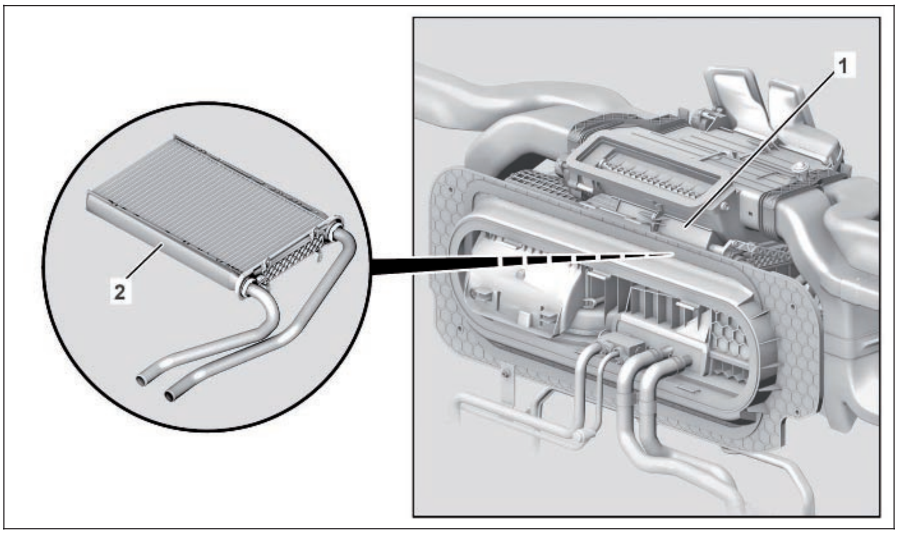
GF83.20-W-3123H	Heating system heat exchanger, component description	20.7.11

MODEL 963, 964

Location

1 Heater blower unit
2 Heating system heat exchanger

The heater heat exchanger (2) is in the heater blower unit (1).



W83.20-1103-05

Task

The heater heat exchanger (2) gives off the heat of the coolant into the air that flows through it.
The temperature of the vehicle interior is therefore controlled

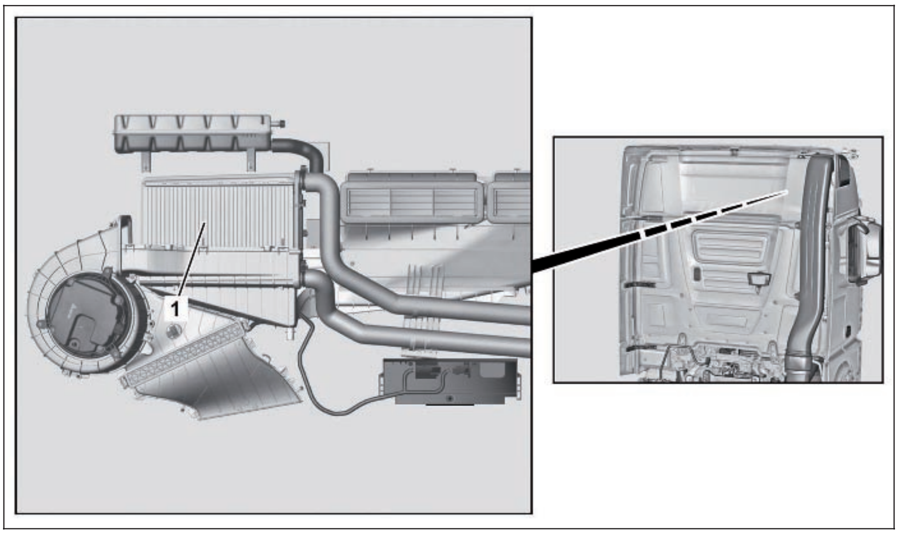
GF83.30-W-2219H	Stationary air conditioner heat exchanger, component description	29.6.11

MODEL 963, 964 with CODE (D6H) Stationary air conditioner

Location

1 Stationary air conditioner heat exchanger

The stationary air conditioner heat exchanger (1) is located on the top of the cab rear panel in the stationary air conditioner air duct housing



W83.30-1203-05

Task

The stationary air conditioner heat exchanger (1) dissipates the cold from the water-glycol mix into the air flowing through it. The vehicle interior is cooled as a result.

GF83.30-W-3122H	Stationary air conditioner check valve, component description	29.6.11

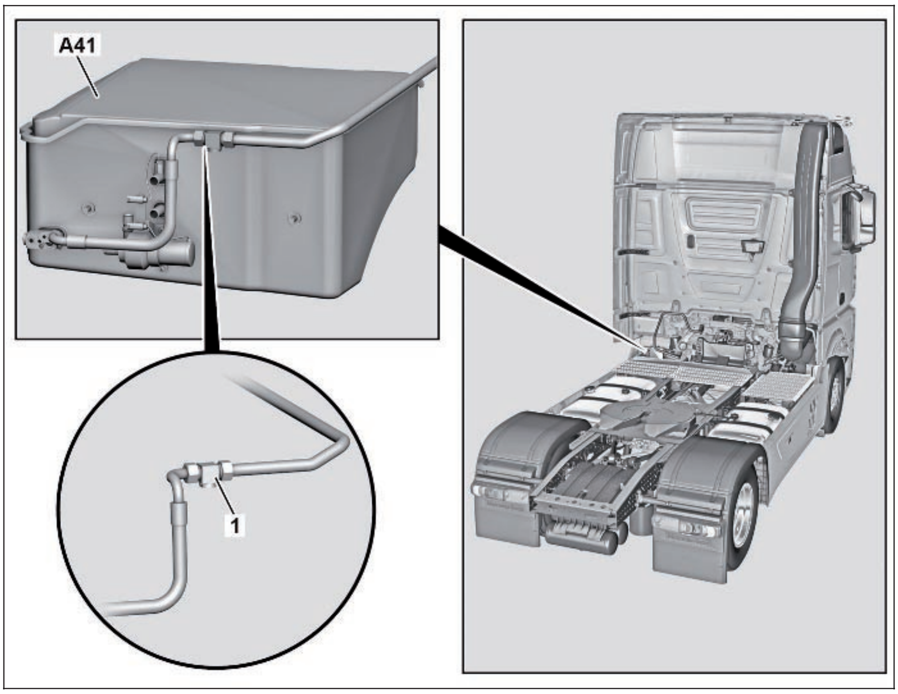
MODEL 963, 964 with CODE (D6H) Stationary air conditioner

Location

1 Stationary air conditioner check valve

A41 Cold reservoir

The stationary air conditioner check valve (1) is located at the left rear under the cab in the vicinity of the stationary air conditioner cold reservoir (A41).



W83.30-1191-06

Task

When the refrigerant compressor is idle, the stationary air conditioner check valve (1) closes the return branch of the stationary air conditioner cold reservoir (A41) to the return line of the conventional air conditioning, and thus prevents the refrigerant and refrigeration oil from moving.

GF83.30-W-3123H	Stationary air conditioning expansion valve component description	29.6.11

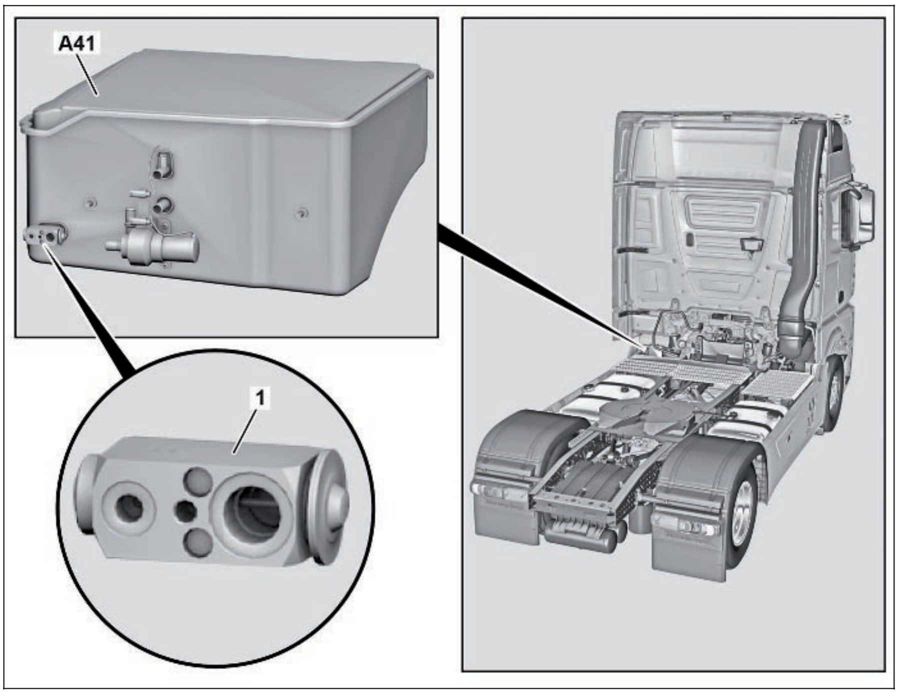
MODEL 963, 964 with CODE (D6H) Stationary air conditioner

Location

1 Stationary air conditioner expansion valve

A41 Stationary air conditioning cold reservoir

The stationary air conditioning expansion valve (1) is mounted at the left below the cab on the stationary air conditioning cold reservoir (A41).



W83.40-1015-06

Task

The stationary air conditioning expansion valve (1) sprays the liquid refrigerant into the stationary air conditioning cold reservoir (A41). Regulation of the refrigerant quantity to be injected is executed here to match the temperature at the cold reservoir output.

GF83.40-W-2188H	Condenser, component description	29.6.11

MODEL 963, 964

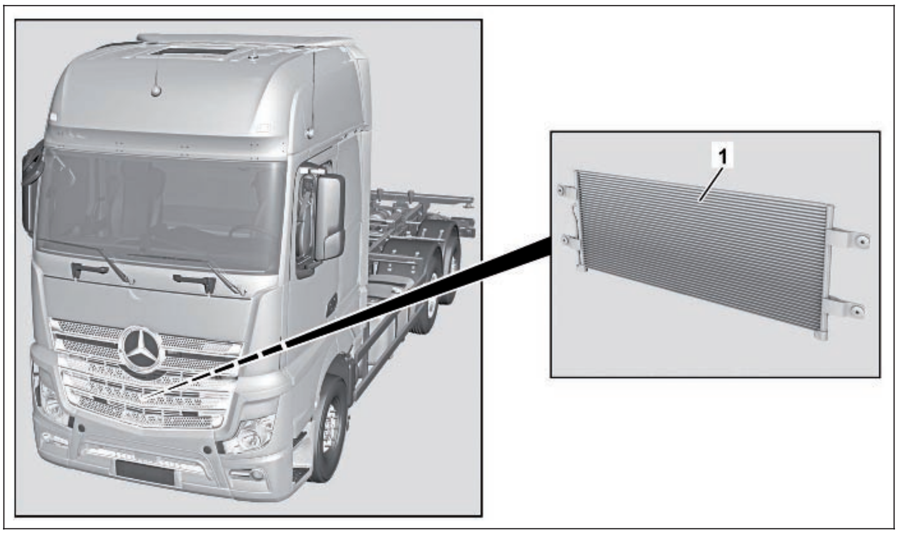
Location

1 Capacitor

The condenser (1) is located in front of the engine radiator.

Task

The condenser (1) removes the heat from the hot gaseous refrigerant as it flows through. The gaseous refrigerant is cooled until it liquifies, in other words it condenses.



W83.40-1016-05

GF83.40-W-2189H	Evaporator, component description	20.7.11

MODEL 963, 964

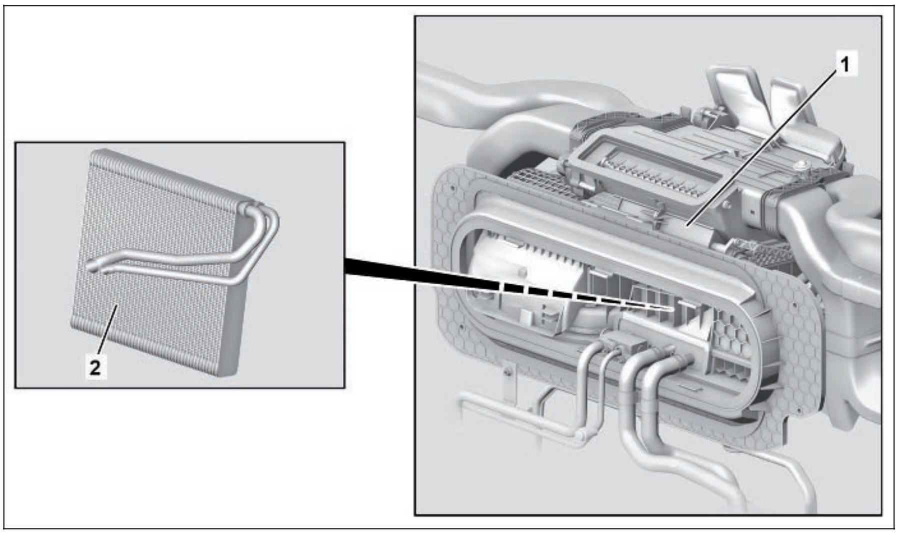
Location

1 Heater blower unit
2 Evaporator

The evaporator (2) is located in the heater blower unit (1).

Task

The evaporator (2) removes the heat from the air as it flows through and dries it.



W83.30-1192-05

GF83.40-W-2190H	Component description for expansion valve	20.7.11

MODEL 963, 964

Location

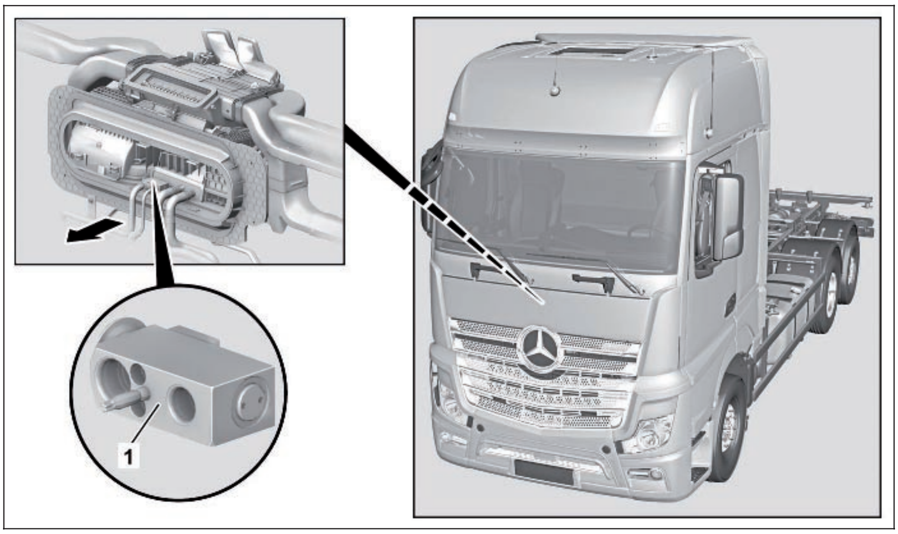
1 Expansion valve

Arrow Direction of travel

The expansion valve (1) is located at the heater blower unit and is flange-mounted on the evaporator.

Task

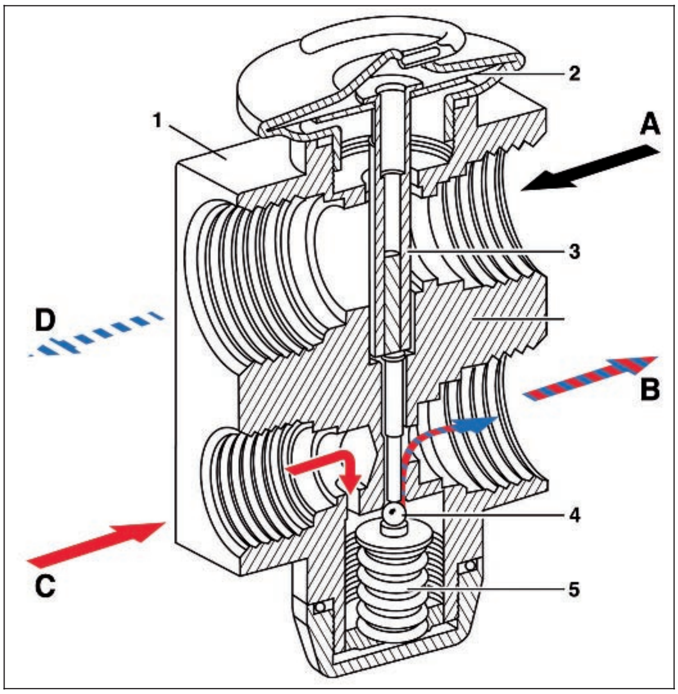
The expansion valve (1) sprays the liquid refrigerant into the evaporator. The amount of refrigerant to inject is controlled as a function of the evaporator pressure and the temperature at the evaporator outlet.



W83.40-1017-05

1 Expansion valve
2 Diaphragm
3 Control valve
4 Valve ball
5 Spring

A Evaporator outlet
B to evaporator
C From accumulator
D To refrigerant compressor



W83.40-1009-82

When the refrigerant compressor is switched on, the pressure drops in the evaporator and therefore at the evaporator outlet (A).
This causes the diaphragm (2) to bulge downwards.
The control valve (3) follows the movement of the diaphragm and pushes the valve ball (4) against the spring (5) out of its seat. The opened expansion valve (1) allows the refrigerant to be sprayed into the evaporator.

Since the movement of the diaphragm (2) is dependent on both the intake pressure and the temperature at the evaporator outlet (A), only the quantity of refrigerant that is required for optimum vaporization is injected.

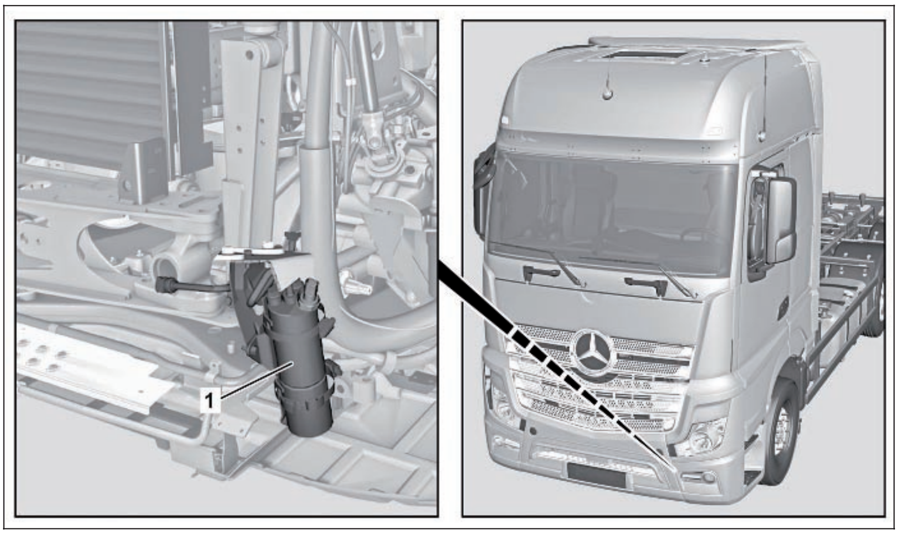
GF83.40-W-2196H	Fluid reservoir, component description	20.7.11

MODEL 963, 964

Location

1 Fluid reservoir

The fluid reservoir (1) is installed at the bottom in the left wheel arch.



W83.40-1018-05

Task

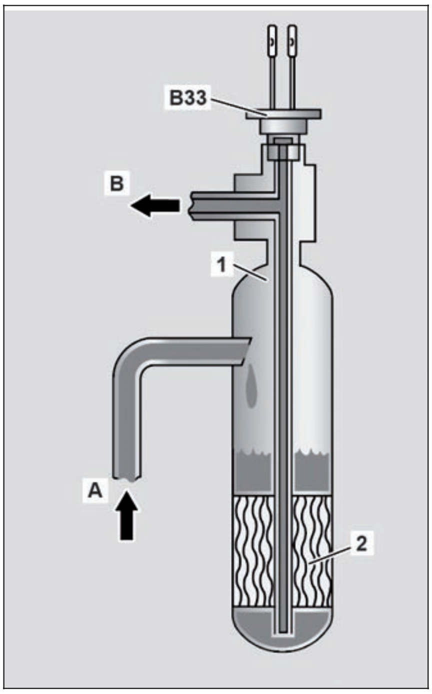
Any chemical or mechanical contamination that is present is removed from the refrigerant flowing through the accumulator (1).Residual quantities of water are also removed from the refrigerant.

Design

1 Fluid reservoir
2 Silica gel and molecular filters

B33 Air conditioning pressure sensor

A from condenser
B to evaporator



W83.40-1022-03

GF83.55-W-2109H	A/C compressor, component description	29.6.11

MODEL 963, 964

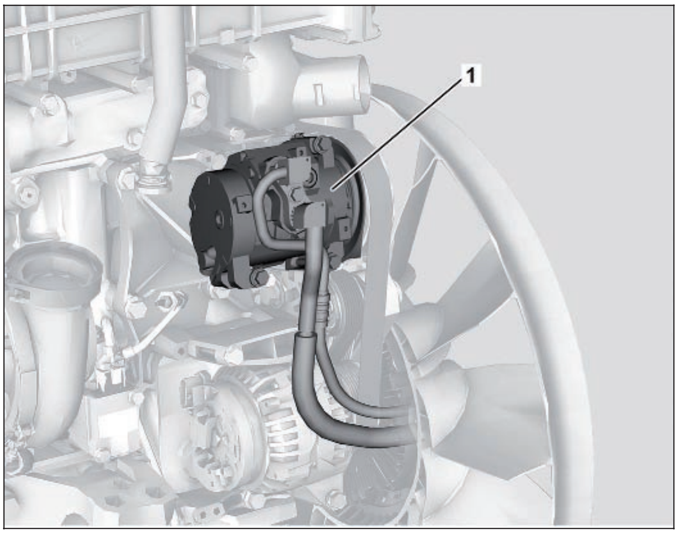
Location

1 *Refrigerant compressor*

The A/C compressor (1) is located at the right front side on the engine.

Task

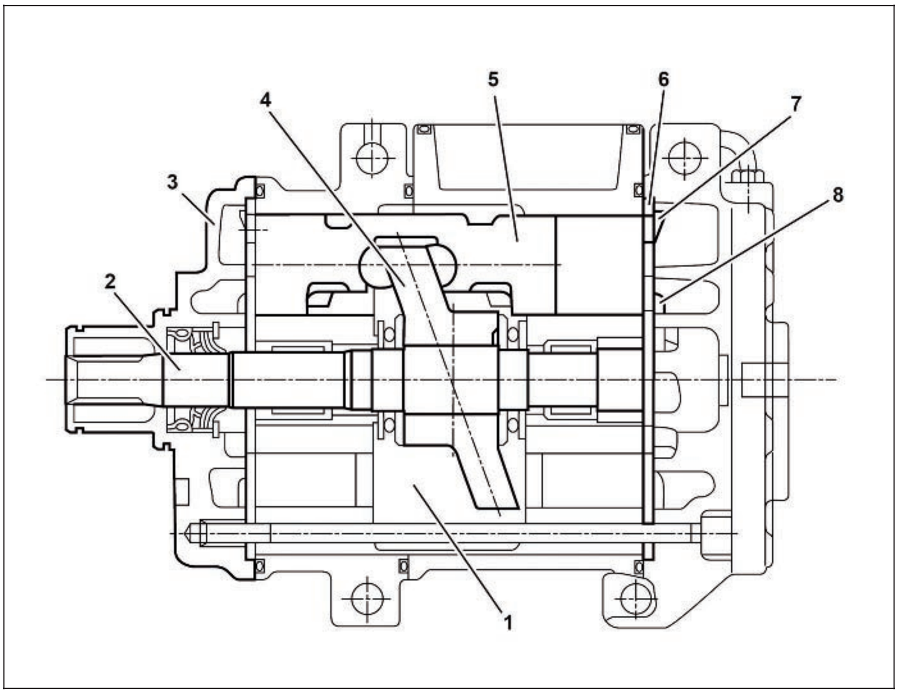
The A/C compressor (1) is responsible for intake and compression of the refrigerant.



W83.55-1042-11

Function

1 *AC compressor*
2 *Drive shaft*
3 *A/C compressor housing*
4 *Swash plate*
5 *Piston*
6 *Valve plate*
7 *Intake valve*
8 *Pressure control valve*



W83.55-1044-06

After the A/C compressor magnetic clutch (Y40) has established the frictional connection between the automotive engine and the A/C compressor (1), the drive shaft (2) drives the swash plate (4). The rotation of the inclined swash plate (4) induces linear travel in the pistons (5).
Gaseous refrigerant is drawn in via the intake valve (7) during the intake stroke.

When the pistons (5) move in the opposite direction, the gaseous refrigerant is fed to the compressor outlet via the pressure valve (8).
The refrigerant is then compressed and heated.

Regulation of the delivery rate is conducted through cycling the A/C compressor magnetic clutch (Y40).

GF83.70-W-4031H	Heat exchanger auxiliary heater, component description	20.7.11

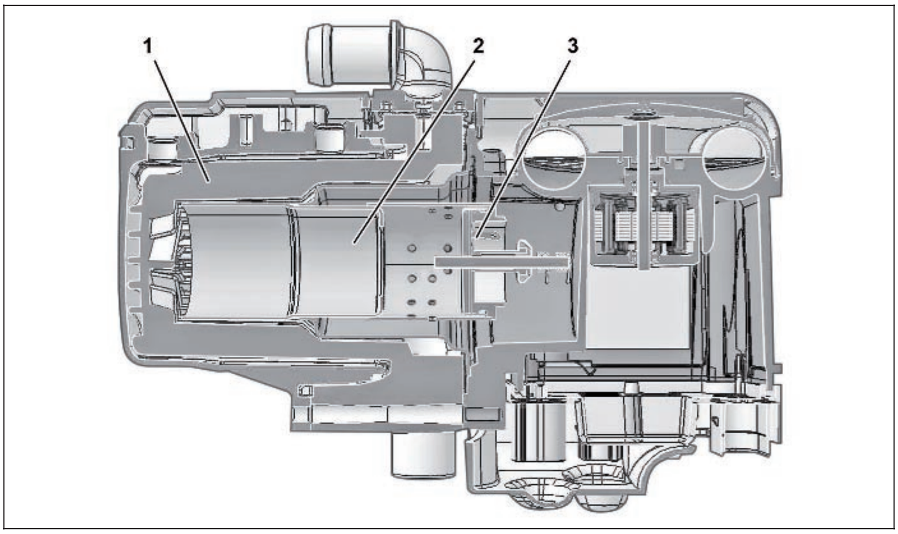
MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

Location

Auxiliary heater, code (D6M) Cab hot water auxiliary heater

1 Heat exchanger
2 Burner tube
3 Burner insert

The heat exchanger (1) is located around the burner tube (2).

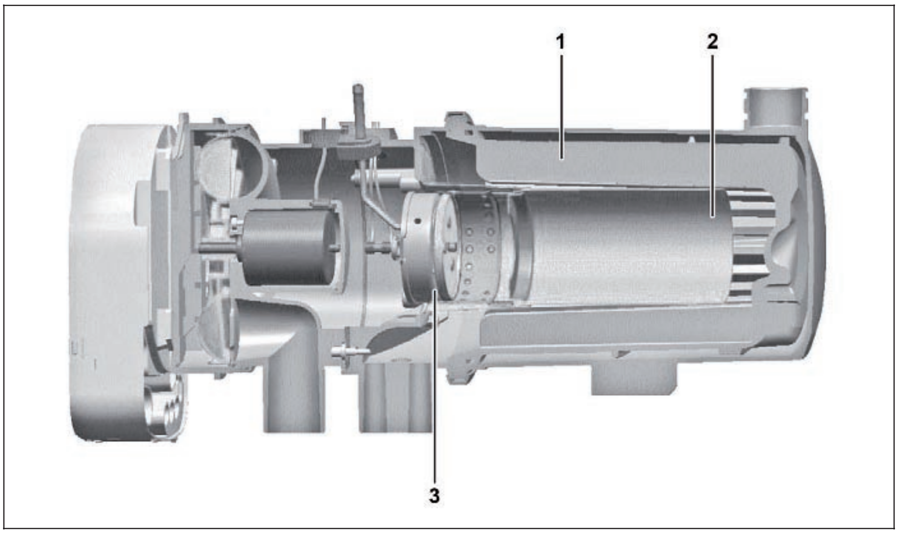


W83.70-1435-05

Auxiliary heater, code (D6N) Cab and engine hot water auxiliary heater

1 Heat exchanger
2 Burner tube
3 Burner insert

The heat exchanger (1) is located around the burner tube (2).



W83.70-1448-05

Task

The heat exchanger (1) enables energy to be exchanged between the hot combustion gases in the combustion chamber and the coolant flowing around the heat exchanger (1).

Design

The heat exchanger (1) consists of a housing that is ribbed on the inside. The burner insert (3) is located on the outside with the burner tube (2). The interior wall together with the burner tube (2) forms the combustion chamber.

GF83.70-W-4038H	Burner insert with burner tube, component description	20.7.11

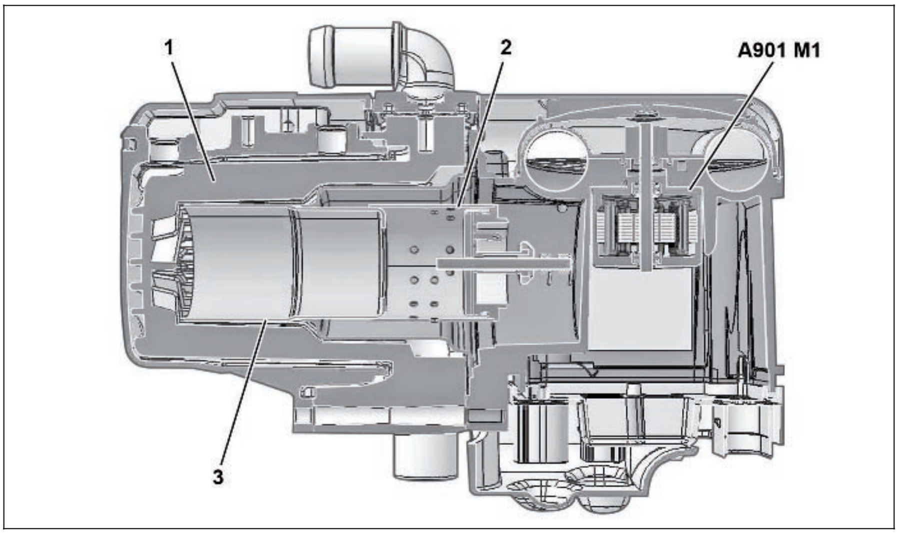
MODEL 963, 964 with CODE (D6M) Cab hot water auxiliary heater
MODEL 963, 964 with CODE (D6N) Cab and engine hot water auxiliary heater

Location

Auxiliary heater, code (D6M) Cab hot water auxiliary heater
1 Heat exchanger
2 Burner insert
3 Burner tube

A901 M1 Combustion air blower

The burner insert (2) and the burner tube (3) are bolted together with the heat exchanger (1) and are located upstream of the combustion air blower (A901 M1).

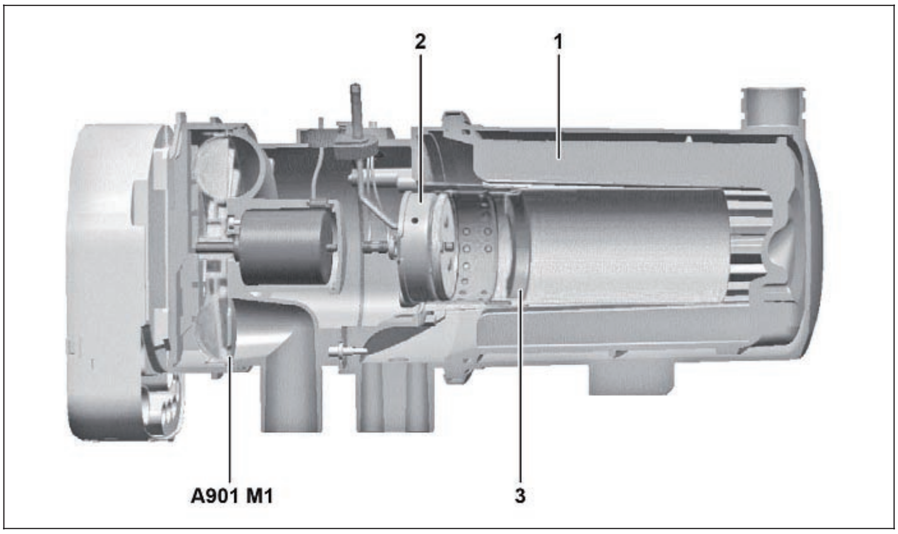


W83.70-1442-05

Auxiliary heater, code (D6N) Cab and engine hot water auxiliary heater
1 Heat exchanger
2 Burner insert
3 Burner tube

A901 M1 Combustion air blower

The burner insert (2) and the burner tube (3) are bolted together with the heat exchanger (1) and are located upstream of the combustion air blower (A901 M1).



W83.70-1451-05

Task

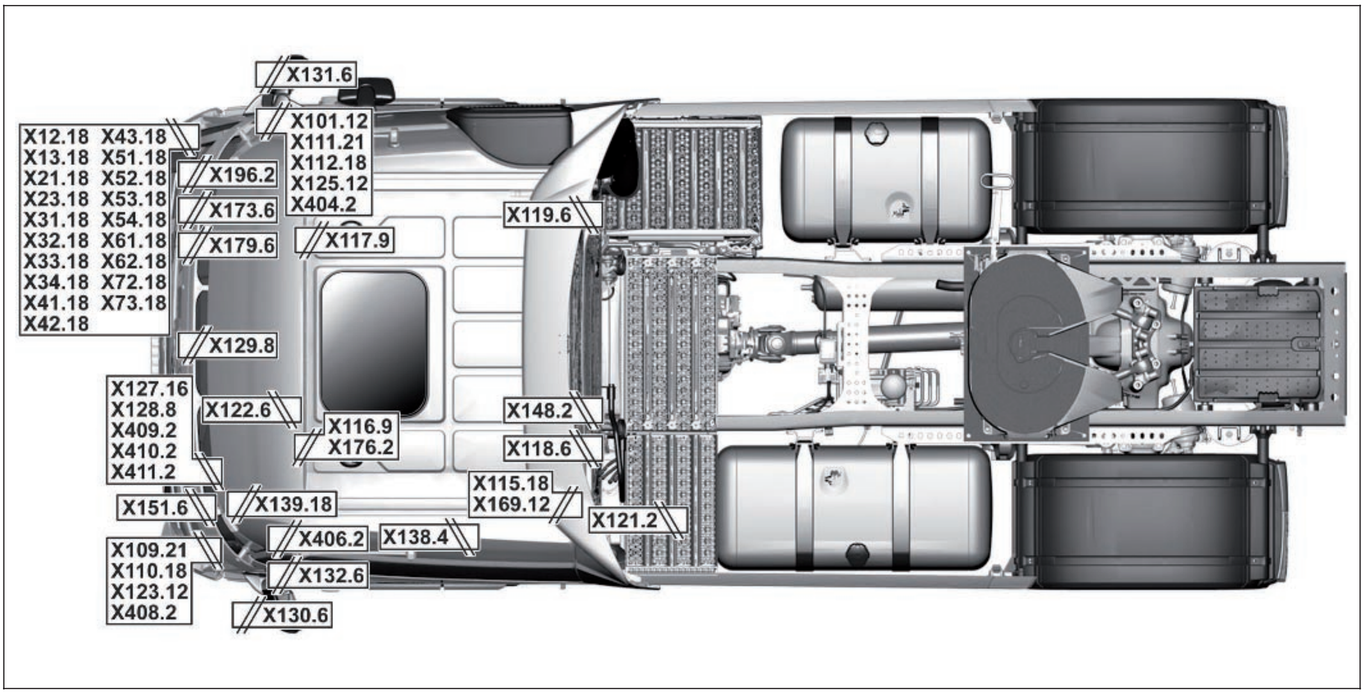
The burner insert (2) distributes the fuel across the burner cross-section in the burner tube (3), in which combustion of the fuel/air mixture takes place. The resulting combustion heat is dissipated to the heat exchanger (1).

Design

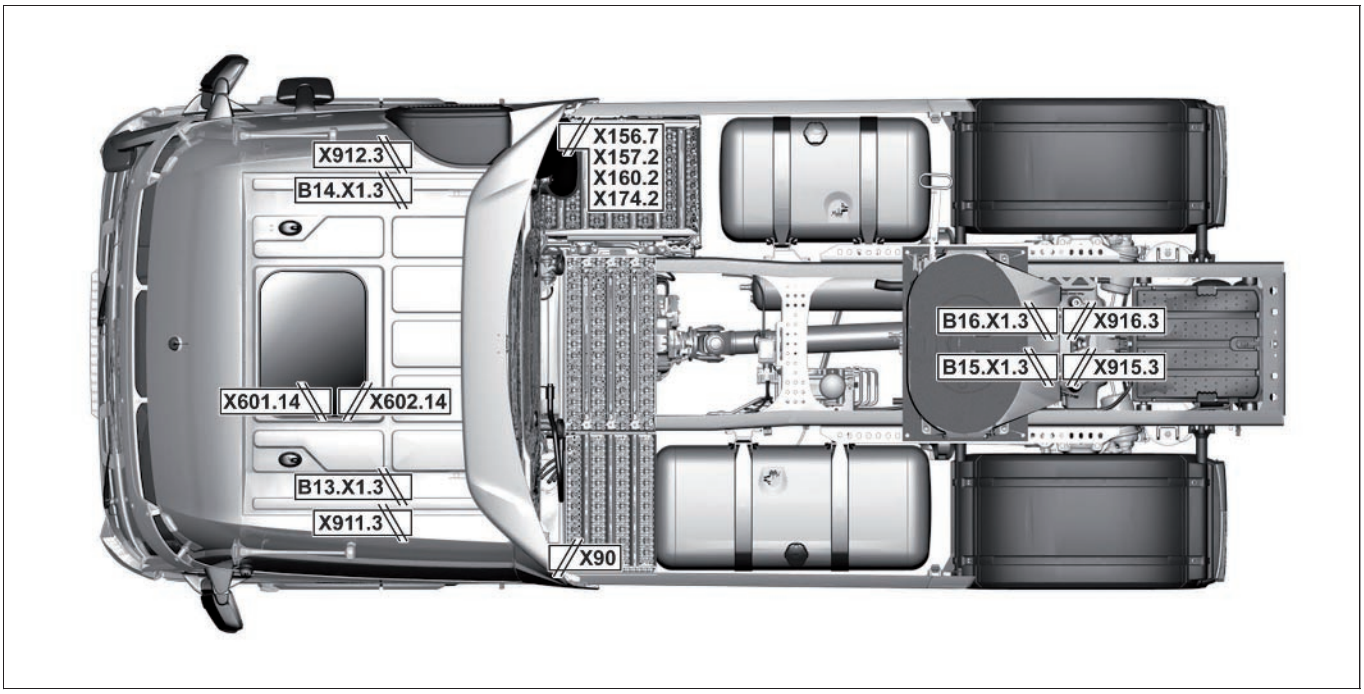
The burner tube (3) forms a unit together with the installed burner insert (2). The burner insert (2) contains a glow plug (A901 E).

GF00.19-W-1001H	Arrangement of cable and plug connections	2.8.11

MODEL 963, 964



W54.18-1101-09



W54.18-1102-09

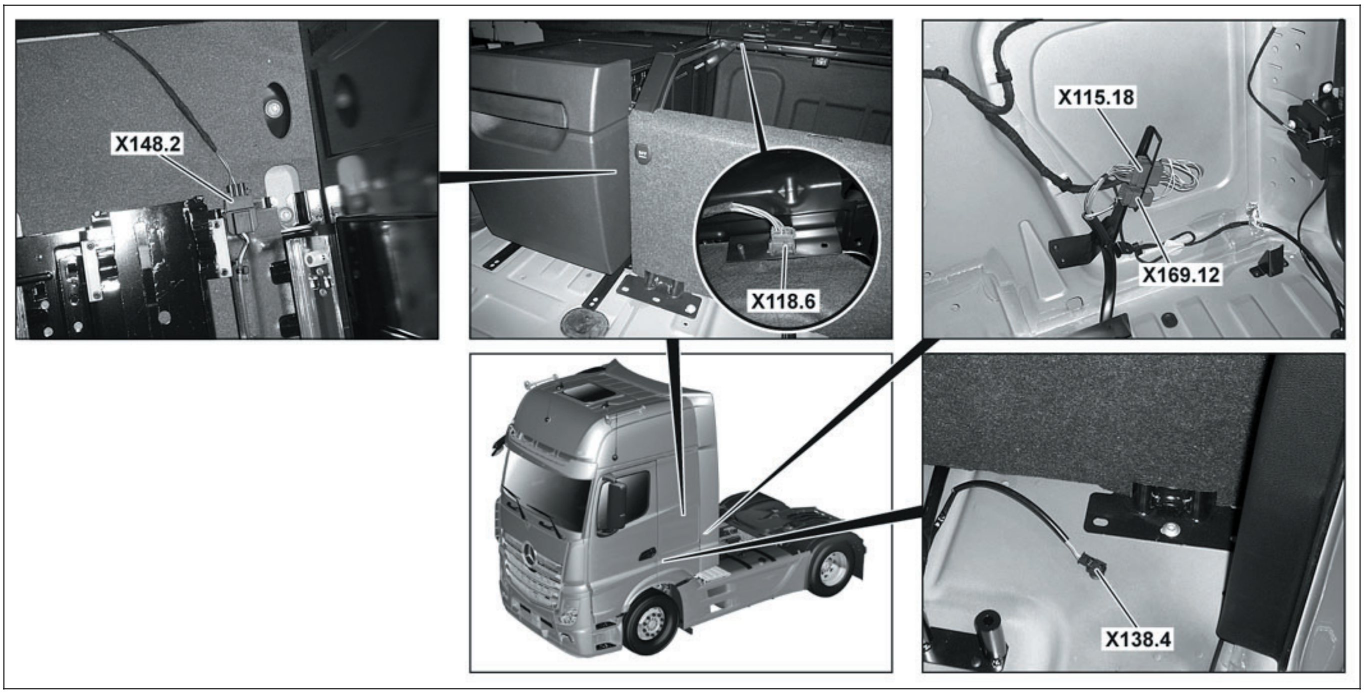
B13.X1.3	Left front axle speed sensor		**Page 543**
B14.X1.3	Right front axle speed sensor		**Page 543**
B15.X1.3	Left rear axle speed sensor		**Page 543**
B16.X1.3	Right rear axle speed sensor		**Page 543**
X12.18	Bumper cab-chassis electrical connector		**Page 547**
X13.18	Front end cab-chassis electrical connector		**Page 547**

X21.18	Front end cab-chassis electrical connector		**Page 547**
X23.18	Engine cab-chassis electrical connector		**Page 547**
X31.18	Engine cab-chassis electrical connector		**Page 547**
X32.18	Engine cab-chassis electrical connector		**Page 547**
X33.18	Longitudinal member cab-chassis electrical connector		**Page 547**
X34.18	Frame crossmember cab-chassis electrical connector		**Page 547**
X41.18	Longitudinal member cab-chassis electrical connector		**Page 547**
X42.18	Engine cab-chassis electrical connector		**Page 547**
X43.18	Longitudinal member cab-chassis electrical connector		**Page 547**
X51.18	Engine cab-chassis electrical connector		**Page 547**
X52.18	Longitudinal member cab-chassis electrical connector		**Page 547**
X53.18	Longitudinal member cab-chassis electrical connector		**Page 547**
X54.18	Longitudinal member cab-chassis electrical connector		**Page 547**
X61.18	Longitudinal member cab-chassis electrical connector		**Page 547**
X62.18	Engine cab-chassis electrical connector		**Page 547**
X72.18	Body cab-chassis electrical connector		**Page 547**
X73.18	Body cab-chassis electrical connector		**Page 547**
X90	Power distributor		**Page 543**
X101.12	DispoPilot electrical connector		**Page 546**
X109.21	Driver-side roof electrical connector		**Page 545**
X110.18	Driver-side roof electrical connector		**Page 545**
X111.21	Passenger-side roof electrical connector		**Page 546**
X112.18	Passenger-side roof electrical connector		**Page 546**
X115.18	Driver rear panel electrical connector		**Page 541**
X116.9	Driver suspension seat electrical connector		**Page 548**
X117.9	Front passenger suspension seat electrical connector		**Page 548**
X118.6	Left load compartment lamp electrical connector		**Page 541**
X119.6	Right load compartment lamp electrical connector		**Page 541**
X121.2	Outer left load compartment lamp electrical connector		**Page 544**
X122.6	Multifunction steering wheel clock spring contact electrical connector		**Page 542**
X123.12	Driver speaker electrical connector		**Page 545**
X125.12	Front passenger speaker electrical connector		**Page 546**

X127.16	Electronic Toll Collection preinstallation electrical connector		**Page 545**
X128.8	Electronic Toll Collection preinstallation electrical connector		**Page 545**
X129.8	Electronic Toll Collection preinstallation electrical connector		**Page 542**
X130.6	Driver outside mirror electrical connector		**Page 544**
X131.6	Front passenger outside mirror electrical connector		**Page 544**
X132.6	Mobile phone cradle electrical connector		**Page 545**
X138.4	Level control (CLCS) electrical connector		**Page 541**
X139.18	Steering column electrical connector		**Page 545**
X148.2	Refrigerator electrical connector		**Page 541**
X151.6	Electrical connector for roller sun blind motor, left		**Page 545**
X156.7	Exhaust aftertreatment system electrical connector		**Page 543**
X157.2	Exhaust aftertreatment system electrical connector		**Page 543**
X160.2	Exhaust aftertreatment system electrical connector		**Page 543**
X169.12	Driver rear panel electrical connector		**Page 541**
X173.6	Electrical connector for roller sun blind motor, right		**Page 545**
X174.2	Exhaust aftertreatment system electrical connector		**Page 543**
X176.2	Emergency tensioning retractor electrical connector		**Page 548**
X179.6	Electrical connector for additional headlamps preinstallation		**Page 545**
X196.2	Mercedes star illumination electrical connector		**Page 544**
X404.2	Radio antenna electrical connector		**Page 546**
X406.2	Mobile phone cradle antenna electrical connector		**Page 545**
X408.2	Navigation antenna electrical connector		**Page 545**
X409.2	CB radio antenna electrical connector		**Page 545**
X410.2	Toll system electrical connector		**Page 545**
X411.2	Toll system electrical connector		**Page 545**
X601.14	Engine management (MCM) electrical connector		**Page 546**
X602.14	Engine management (MCM) electrical connector		**Page 546**
X911.3	Brake wear sensor electrical connector, 1st FA, left		**Page 543**
X912.3	Brake wear sensor electrical connector, 1st FA, right		**Page 543**

X915.3	Brake wear sensor electrical connector, 1st RA, left		**Page 543**
X916.3	Brake wear sensor electrical connector, 1st RA, right		**Page 543**
GF00.19-W-1001-04H	Location of line connections and connectors, interior compartment, left		**Page 541**
GF00.19-W-1001-05H	Location of line connections and connectors, interior compartment, right		**Page 541**
GF00.19-W-1001-08H	Location of line connections and connectors, instrument panel		**Page 542**
GF00.19-W-1001-09H	Location of line connections and connectors, frame		**Page 543**
GF00.19-W-1001-10H	Location of line connections and connectors, cab		**Page 544**
GF00.19-W-1001-11H	Location of line connections and connectors, doors		**Page 544**
GF00.19-W-1001-12H	Location of line connections and connectors, roof		**Page 545**
GF00.19-W-1001-13H	Location of line connections and connectors, left footwell		**Page 545**
GF00.19-W-1001-14H	Location of line connections and connectors, right footwell		**Page 546**
GF00.19-W-1001-15H	Location of line connections and connectors, engine compartment		**Page 546**
GF00.19-W-1001-16H	Location of line connections and connectors, electronic compartment		**Page 547**
GF00.19-W-1001-17H	Location of line connections and connectors, driver seat base		**Page 548**
GF00.19-W-1001-18H	Location of line connections and connectors, front passenger seat base		**Page 548**

GF00.19-W-1001-04H	Location of line connections and connectors, interior compartment, left	Model 963, 964	

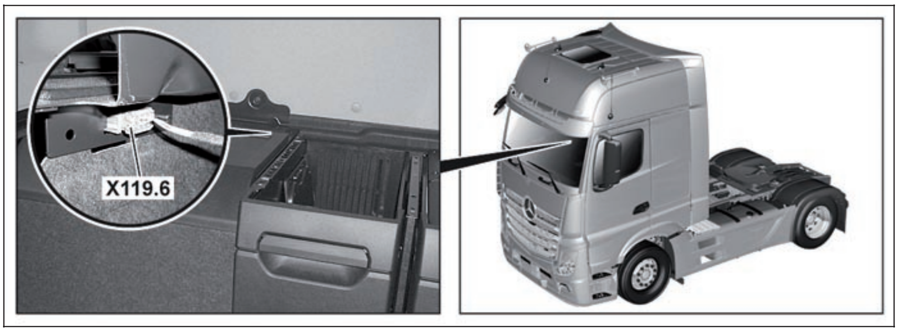


W54.18-1085-09

X115.18 *Driver rear panel electrical connector*
X118.6 *Left load compartment lamp electrical connector*
X138.4 *Level control (CLCS) electrical connector*
X148.2 *Refrigerator electrical connector*
X169.12 *Driver rear panel electrical connector*

GF00.19-W-1001-05H	Location of line connections and connectors, interior compartment, right	Model 963, 964	

X119.6 *Right load compartment lamp electrical connector*

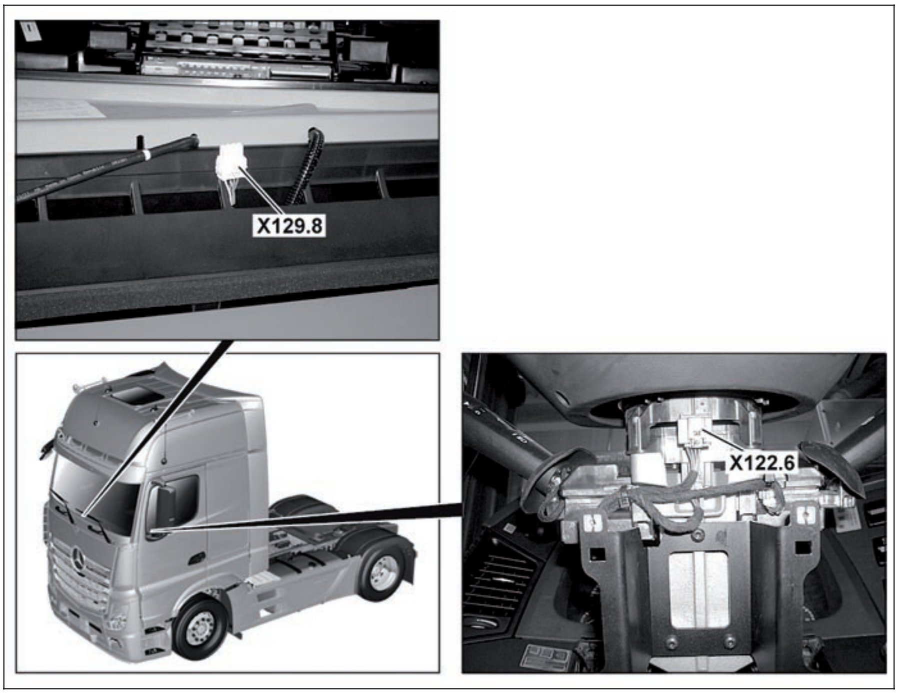


W54.18-1099-04

GF00.19-W-1001-08H	Location of line connections and connectors, instrument panel	Model 963, 964	

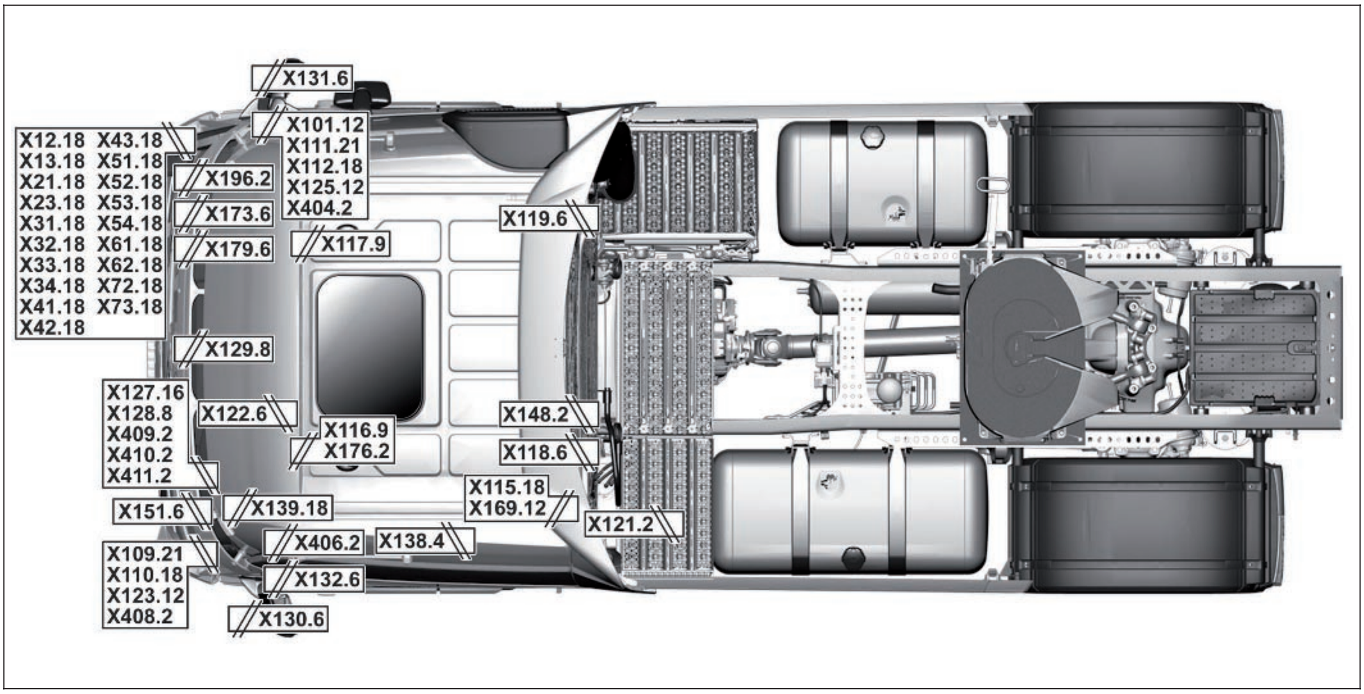
X122.6 *Multifunction steering wheel clock spring contact electrical connector*

X129.8 *Electronic Toll Collection preinstallation electrical connector*



W54.18-1092-06

GF00.19-W-1001-09H	Location of line connections and connectors, frame	Model 963, 964	

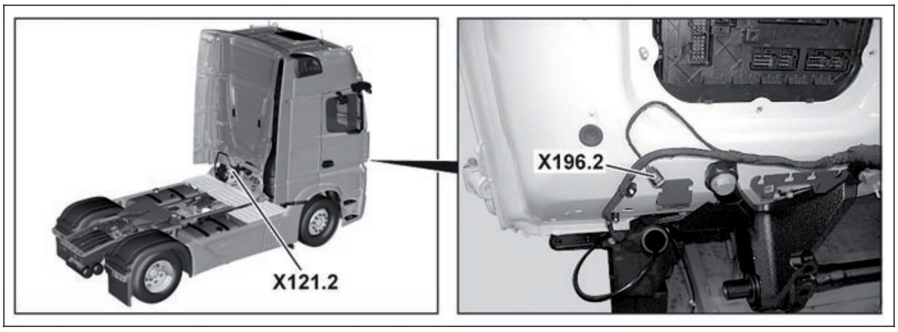


W54.18-1097-09

B13.X1.3	*Left front axle speed sensor*
B14.X1.3	*Right front axle speed sensor*
B15.X1.3	*Left rear axle speed sensor*
B16.X1.3	*Right rear axle speed sensor*
X90	*Power distributor*
X156.7	*Exhaust aftertreatment unit electrical connector*
X157.2	*Exhaust aftertreatment unit electrical connector*
X160.2	*Exhaust aftertreatment unit electrical connector*
X174.2	*Exhaust aftertreatment unit electrical connector*
X911.3	*Brake wear sensor electrical connector 1st FA, left*
X912.3	*Brake wear sensor electrical connector 1st FA, right*
X915.3	*Brake wear sensor electrical connector 1st RA, left*
X916.3	*Brake wear sensor electrical connector 1st RA, right*

GF00.19-W-1001-10H	Location of line connections and connectors, cab	Model 963, 964	

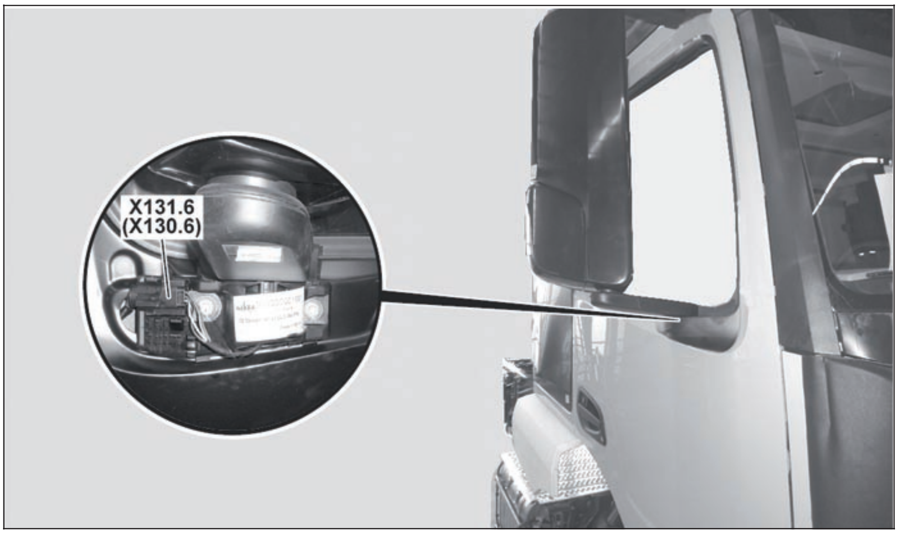
X121.2 *Outer left load compartment lamp electrical connector*
X196.2 *Mercedes star illumination electrical connector*



W54.18-1091-04

GF00.19-W-1001-11H	Location of line connections and connectors, doors	Model 963, 964	

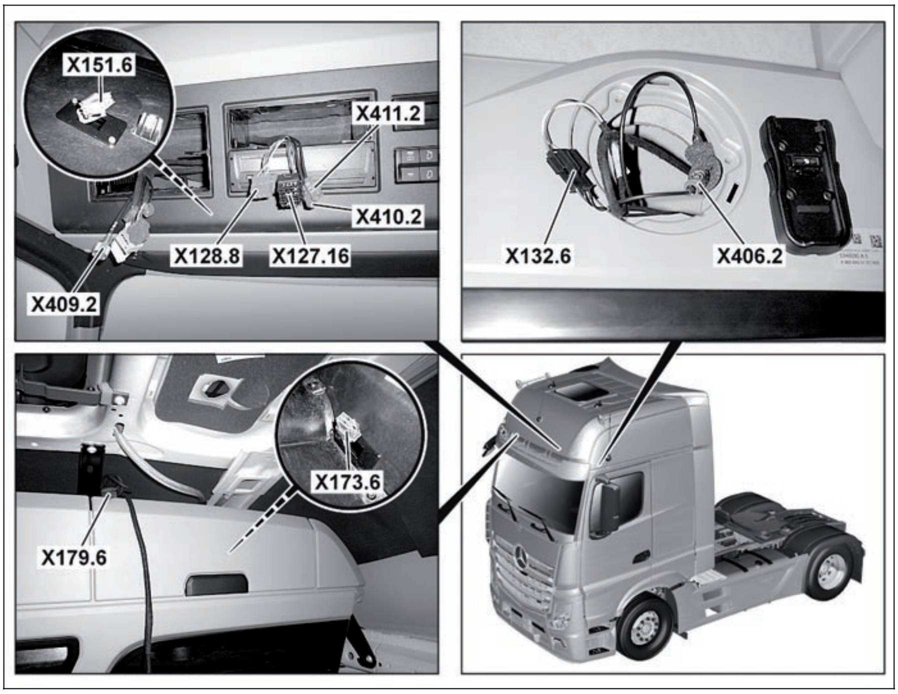
X130.6 *Driver outside mirror electrical connector*
X131.6 *Front passenger outside mirror electrical connector*



W54.18-1100-05

GF00.19-W-1001-12H	Location of line connections and connectors, roof	Model 963, 964	

X127.16 *Electronic Toll Collection preinstallation electrical connector*
X128.8 *Electronic Toll Collection preinstallation electrical connector*
X132.6 *Mobile phone cradle electrical connector*
X151.6 *Electrical connector for roller sun blind motor, left*
X173.6 *Electrical connector for roller sun blind motor, right*
X179.6 *Electrical connector for additional headlamps preinstallation*
X406.2 *Mobile phone cradle antenna electrical connector*

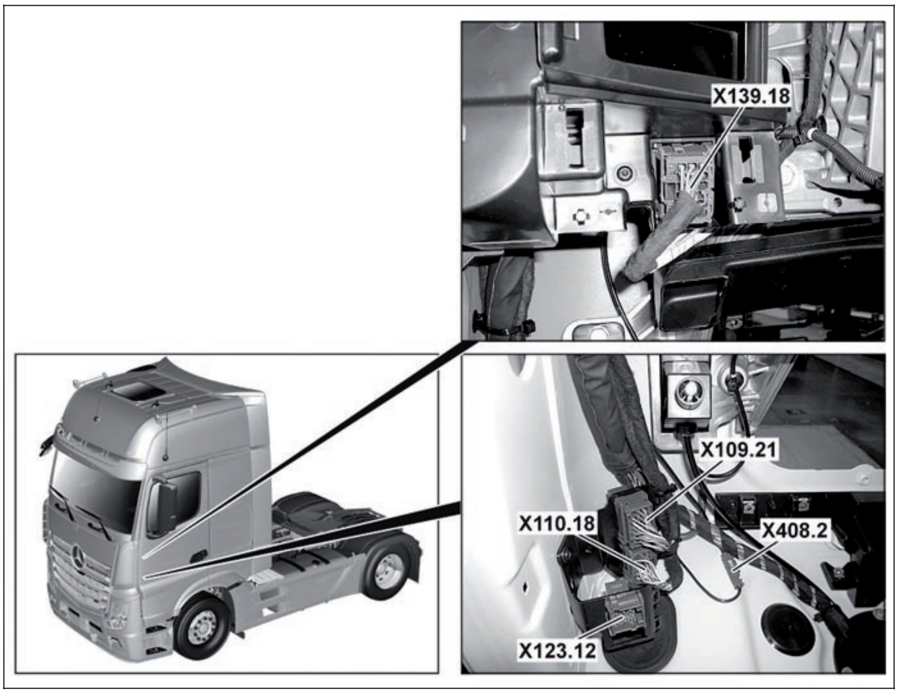


W54.18-1086-06

X409.2 *CB radio antenna electrical connector*
X410.2 *Toll system electrical connector*
X411.2 *Toll system electrical connector*

GF00.19-W-1001-13H	Location of line connections and connectors, left footwell	Model 963, 964	

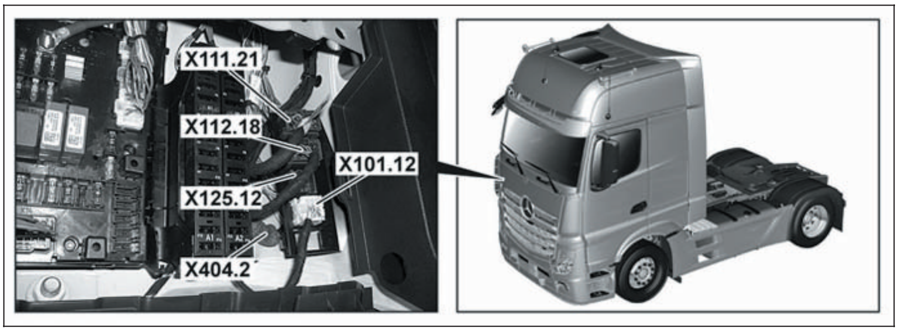
X109.21 *Driver-side roof electrical connector*
X110.18 *Driver-side roof electrical connector*
X123.12 *Driver speaker electrical connector*
X139.18 *Steering column electrical connector*
X408.2 *Navigation antenna electrical connector*



W54.18-1087-06

GF00.19-W-1001-14H	Location of line connections and connectors, right footwell	Model 963, 964	

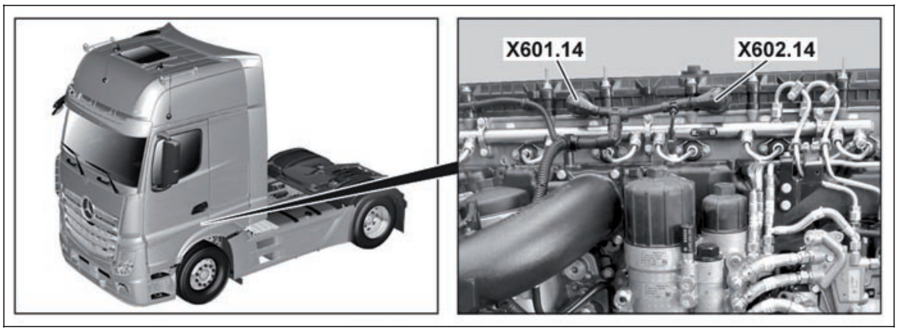
X101.12 *DispoPilot electrical connector*
X111.21 *Passenger-side roof electrical connector*
X112.18 *Passenger-side roof electrical connector*
X125.12 *Front passenger speaker electrical connector*
X404.2 *Radio antenna electrical connector*



W54.18-1089-04

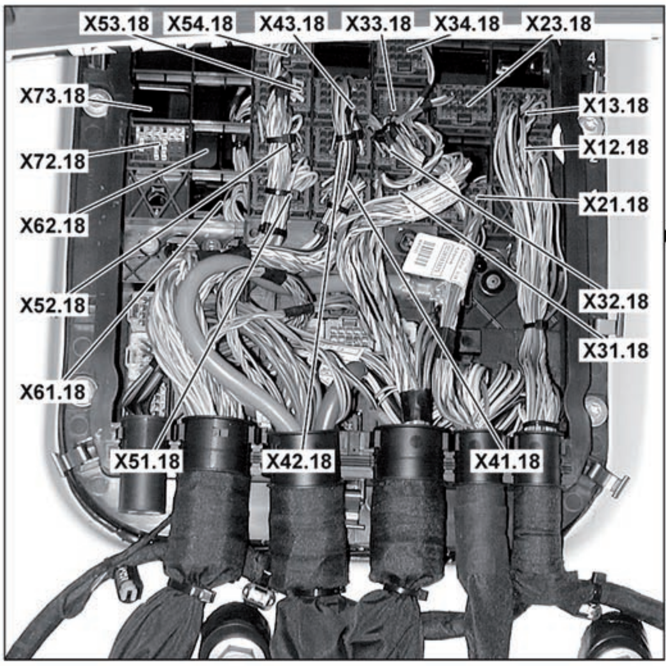
GF00.19-W-1001-15H	Location of line connections and connectors, engine compartment	Model 963, 964	

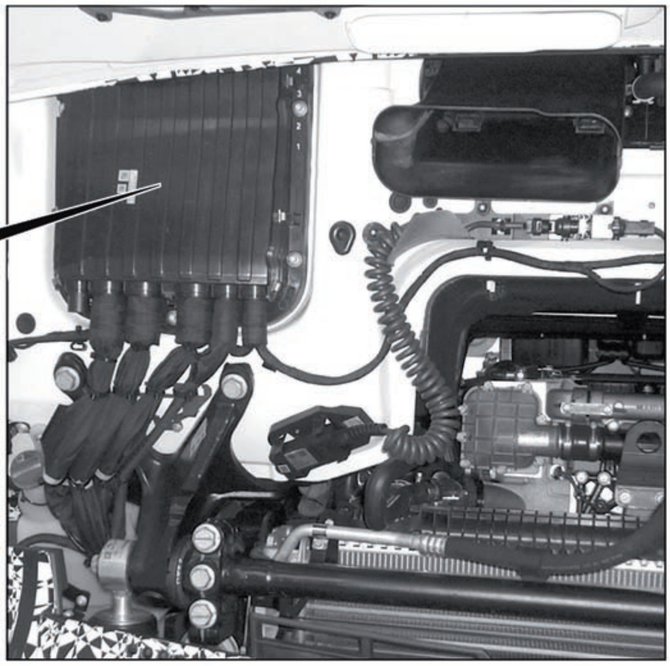
X601.14 *Engine management (MCM) electrical connector*
X602.14 *Engine management (MCM) electrical connector*



W54.18-1090-04

GF00.19-W-1001-16H	Location of line connections and connectors, electronic compartment	Model 963, 964	





W54.18-1084-09

X12.18 *Bumper cab-chassis electrical connector*

X13.18 *Front end cab-chassis electrical connector*

X21.18 *Front end cab-chassis electrical connector*

X23.18 *Engine cab-chassis electrical connector*

X31.18 *Engine cab-chassis electrical connector*

X32.18 *Engine cab-chassis electrical connector*

X33.18 *Longitudinal member cab-chassis electrical connector*

X34.18 *Frame crossmember cab-chassis electrical connector*

X41.18 *Longitudinal member cab-chassis electrical connector*

X42.18 *Engine cab-chassis electrical connector*

X43.18 *Longitudinal member cab-chassis electrical connector*

X51.18 *Engine cab-chassis electrical connector*

X52.18 *Longitudinal member cab-chassis electrical connector*

X53.18 *Longitudinal member cab-chassis electrical connector*

X54.18 *Longitudinal member cab-chassis electrical connector*

X61.18 *Longitudinal member cab-chassis electrical connector*

X62.18 *Engine cab-chassis electrical connector*

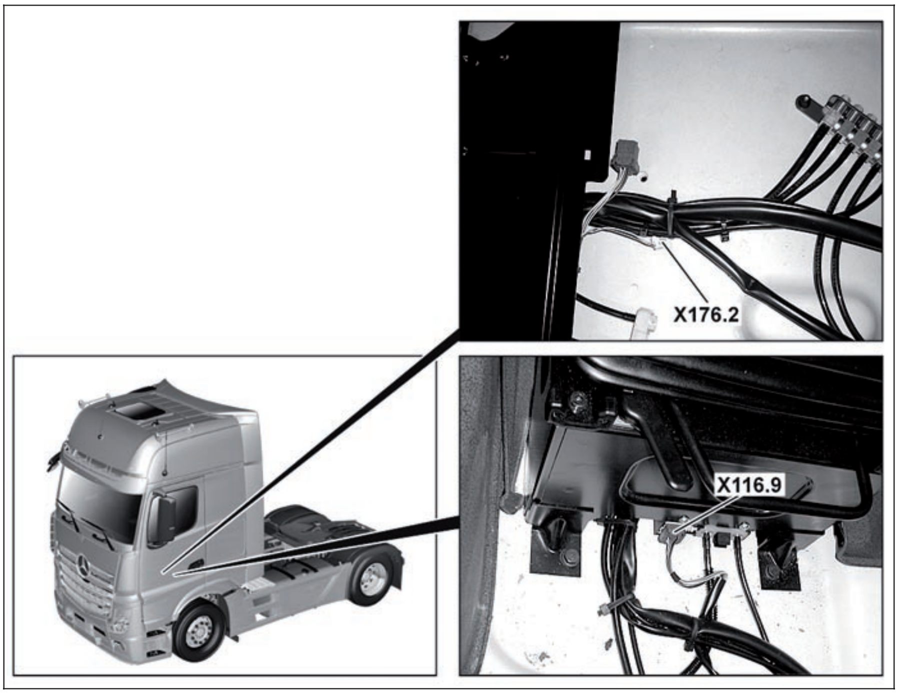
X72.18 *Body cab-chassis electrical connector*

X73.18 *Body cab-chassis electrical connector*

GF00.19-W-1001-17H	Location of line connections and connectors, driver seat base	Model 963, 964	

X116.9 *Driver suspension seat electrical connector*

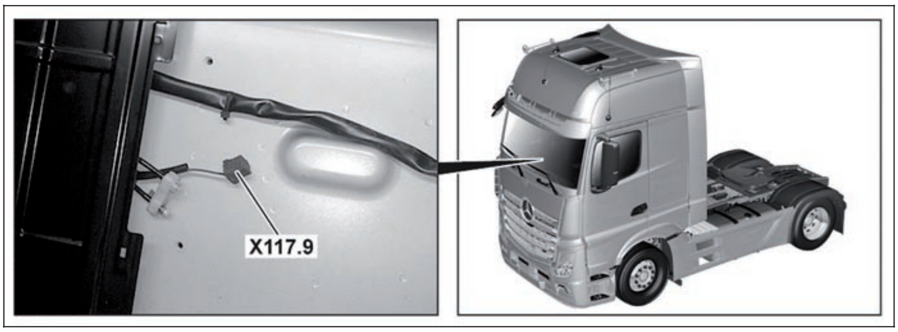
X176.2 *Emergency tensioning retractor electrical connector*



W54.18-1088-06

GF00.19-W-1001-18H	Location of line connections and connectors, front passenger seat base	Model 963, 964	

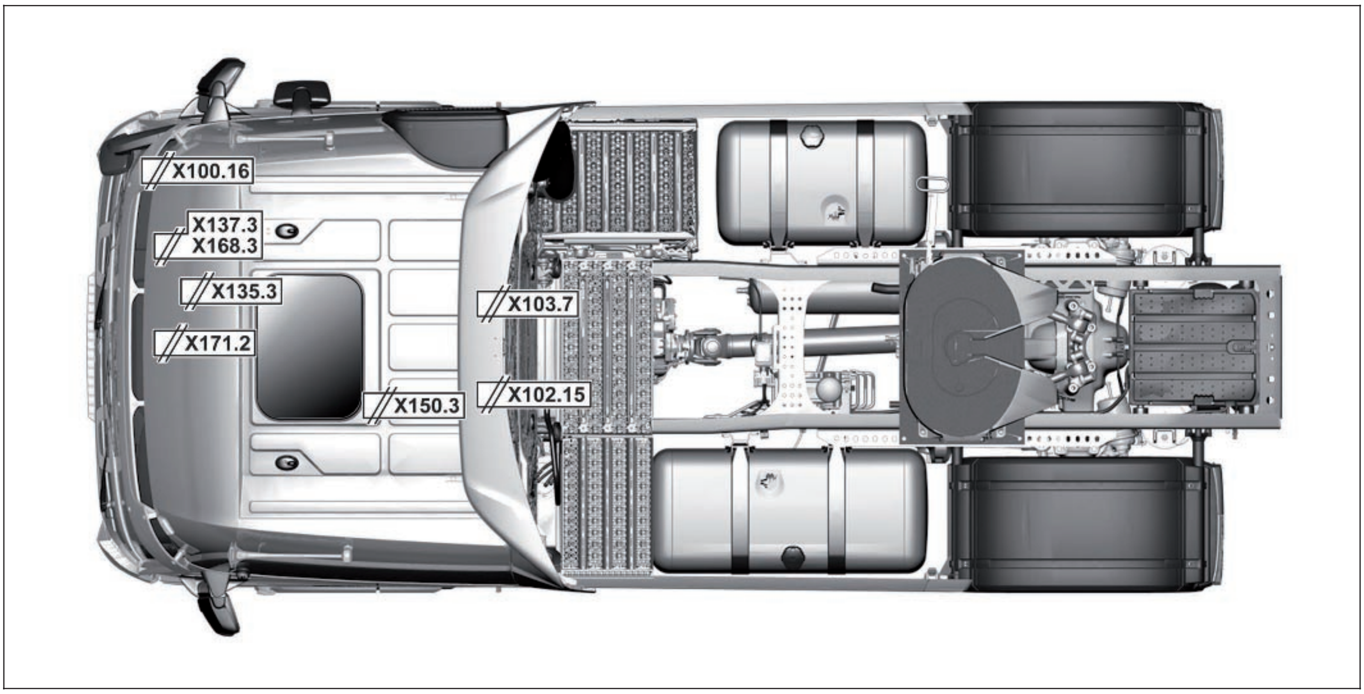
X117.9 *Front passenger suspension seat electrical connector*



W54.18-1098-04

GF00.19-W-1003H	Location of sockets	2.8.11

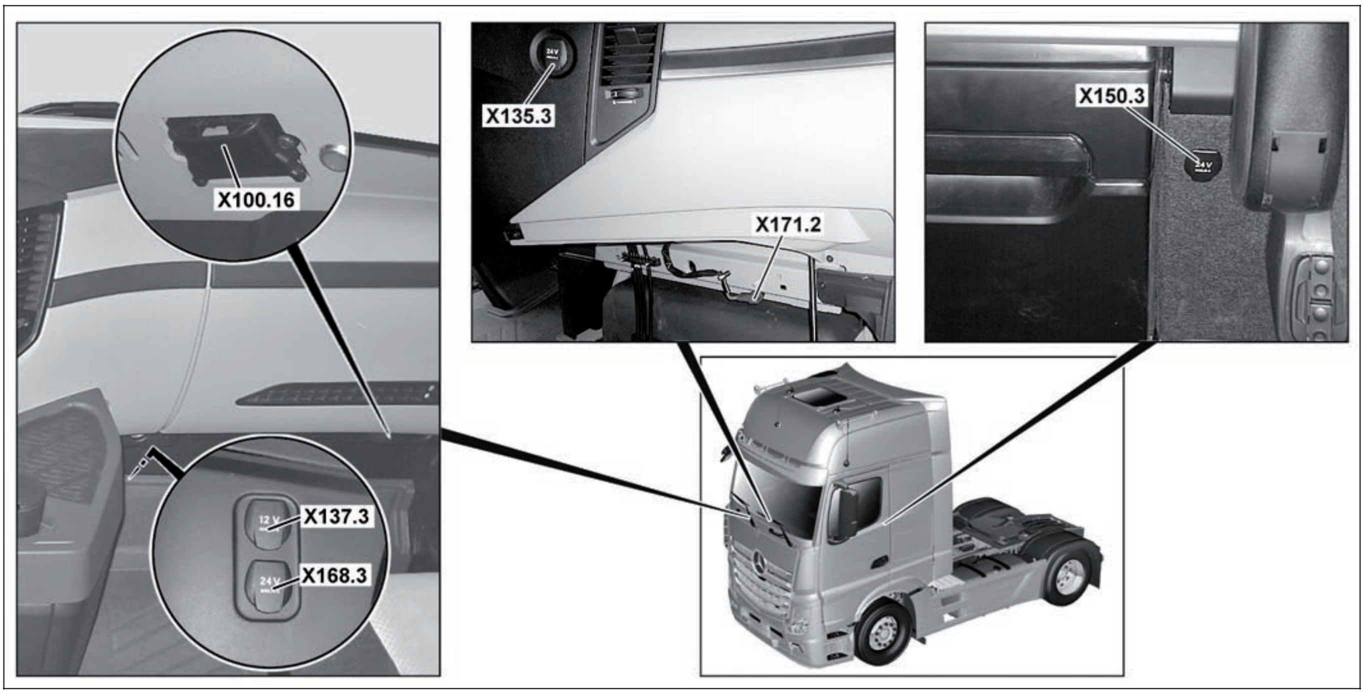
MODEL 963, 964



W54.18-1104-09

X100.16	Diagnostic socket		**Page 550**
X102.15	Trailer socket , 15-pin		**Page 550**
X103.7	ABS trailer socket, 7-pin		**Page 550**
X135.3	Instrument panel socket, 24 V		**Page 550**
X137.3	Footwell socket, 12 V		**Page 550**
X150.3	Left rear stowage compartment socket electrical connector		**Page 550**
X168.3	Footwell socket, 24 V		**Page 550**
X171.2	Footwell socket electrical connector		**Page 550**
GF00.19-W-1003-01H	Location of electrical sockets		**Page 550**

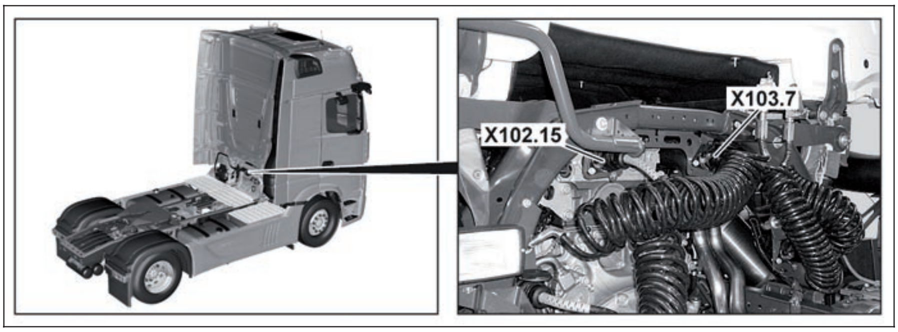
GF00.19-W-1003-01H	Location of electrical sockets	Model 963, 964	



W54.18-1094-09

X100.16 *Diagnostic socket*
X135.3 *Instrument panel socket, 24 V*
X137.3 *Footwell socket, 12 V*
X150.3 *Left rear stowage compartment socket electrical connector*
X168.3 *Footwell socket, 24 V*
X171.2 *Footwell socket electrical connector*

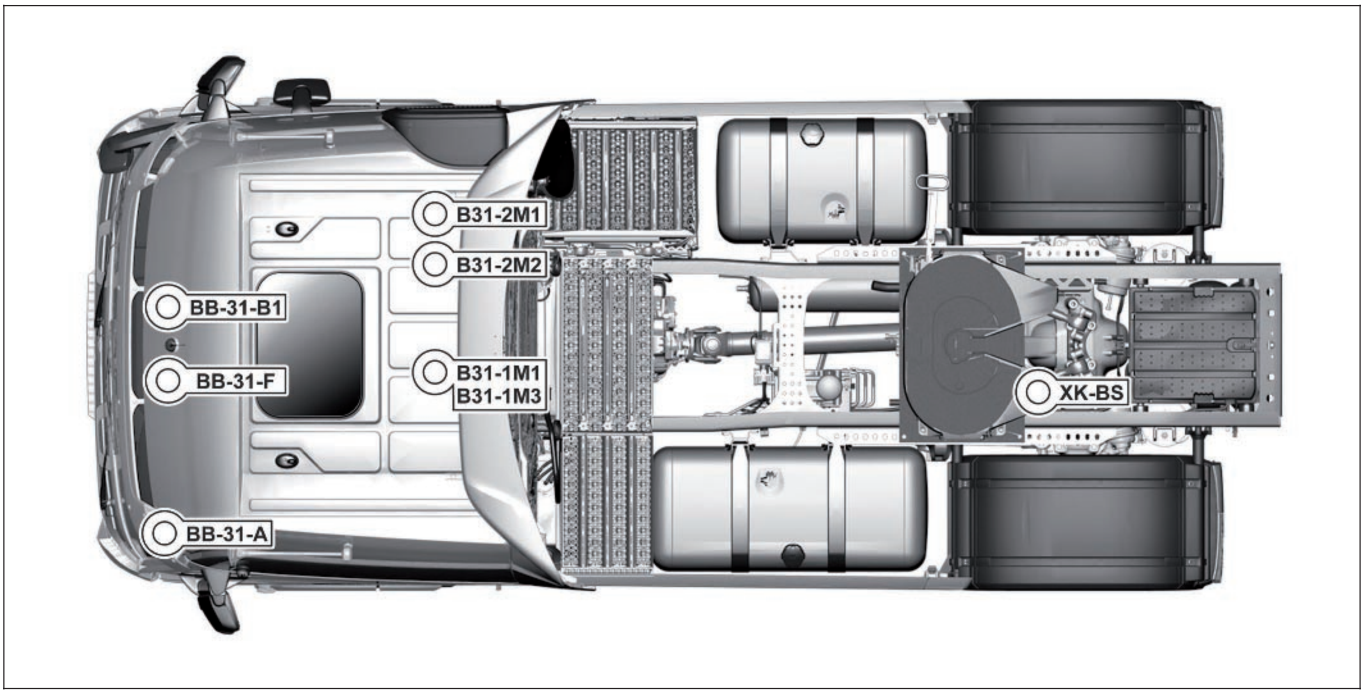
X102.15 *Trailer socket , 15-pin*
X103.7 *ABS trailer socket, 7-pin*



W54.18-1093-04

GF00.19-W-2001H	Location of ground points	2.8.11

MODEL 963, 964

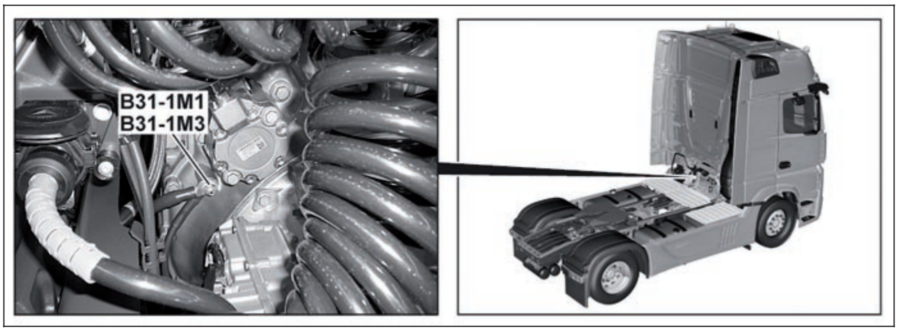


W00.19-1073-09

B31-1M1	Left engine tml. 31 terminal stud		**Page 552**
B31-1M3	Left engine tml. 31 terminal stud		**Page 552**
B31-2M1	Right engine tml. 31 terminal stud		**Page 552**
B31-2M2	Right engine tml. 31 terminal stud		**Page 552**
BB-31-A	A-pillar circuit 31 terminal stud		**Page 552**
BB-31-B1	Front passenger tml. 31 instrument panel terminal stud		**Page 553**
BB-31-F	Driver terminal 31 instrument panel terminal stud		**Page 553**
XK-BS	Terminal stud for battery sensor electrical line		**Page 553**
GF00.19-W-2001-01H	Location of left engine compartment ground points		**Page 552**
GF00.19-W-2001-02H	Location of right engine compartment ground points		**Page 552**
GF00.19-W-2001-04H	Location of left interior compartment ground points		**Page 552**
GF00.19-W-2001-08H	Location of frame ground points		**Page 553**
GF00.19-W-2001-31H	Location of instrument panel ground points		**Page 553**

GF00.19-W-2001-01H	Location of left engine compartment ground points	Model 963, 964	

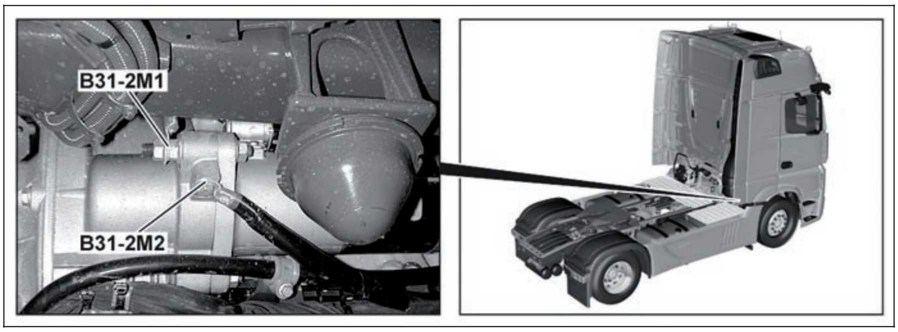
B31-1M1 *Left engine tml. 31 terminal stud*
B31-1M3 *Left engine tml. 31 terminal stud*



W00.19-1068-04

GF00.19-W-2001-02H	Location of right engine compartment ground points	Model 963, 964	

B31-2M1 *Right engine tml. 31 terminal stud*
B31-2M2 *Right engine tml. 31 terminal stud*



W00.19-1069-04

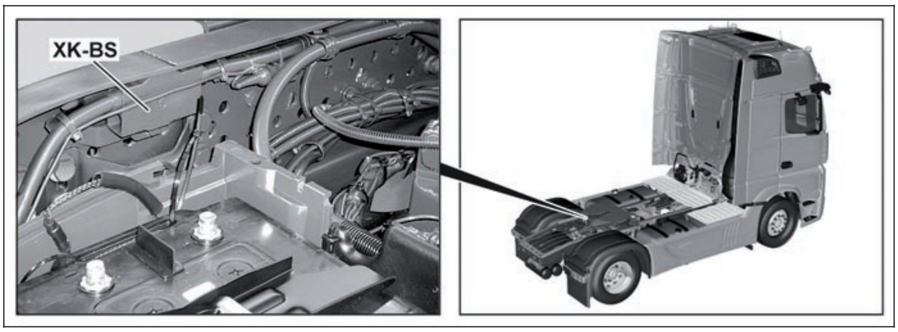
GF00.19-W-2001-04H	Location of left interior compartment ground points	Model 963, 964	

BB-31-A *A-pillar circuit 31 terminal stud*

W00.19-1071-04

GF00.19-W-2001-08H	Location of frame ground points	Model 963, 964	

XK-BS *Terminal stud for battery sensor electrical line*

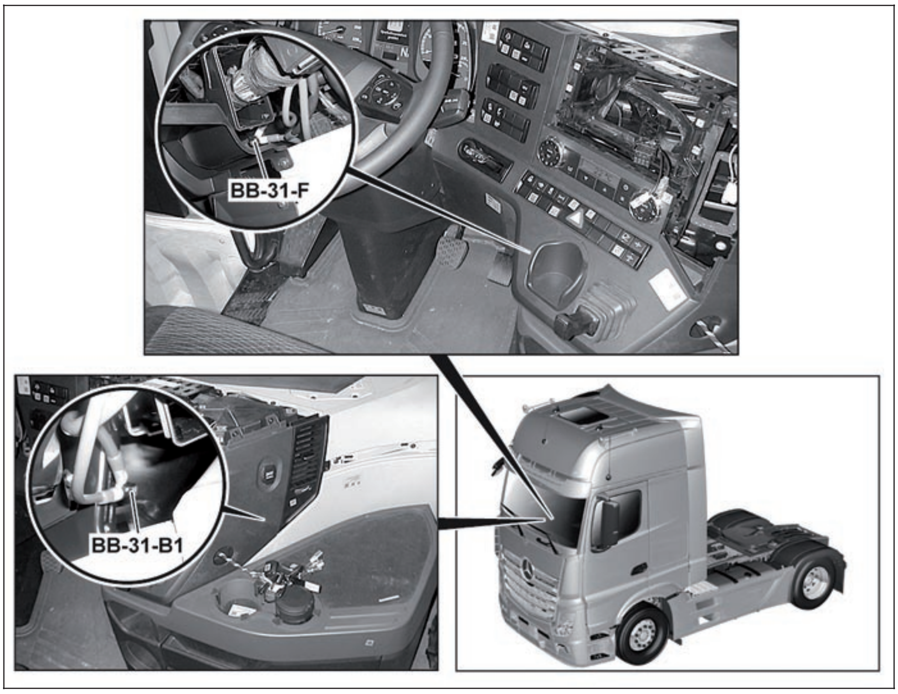


W00.19-1067-04

GF00.19-W-2001-31H	Location of instrument panel ground points	Model 963, 964	

BB-31-B1 *Front passenger tml. 31 instrument panel terminal stud*

BB-31-F *Driver terminal 31 instrument panel terminal stud*



W00.19-1070-06

Daimler AG, GSP/OI, HPC R 822, D-70546 Stuttgart
Bestell-Nr. 6517 1261 02 - HLI 000 000 02 89 – Printed in Germany – 09/11