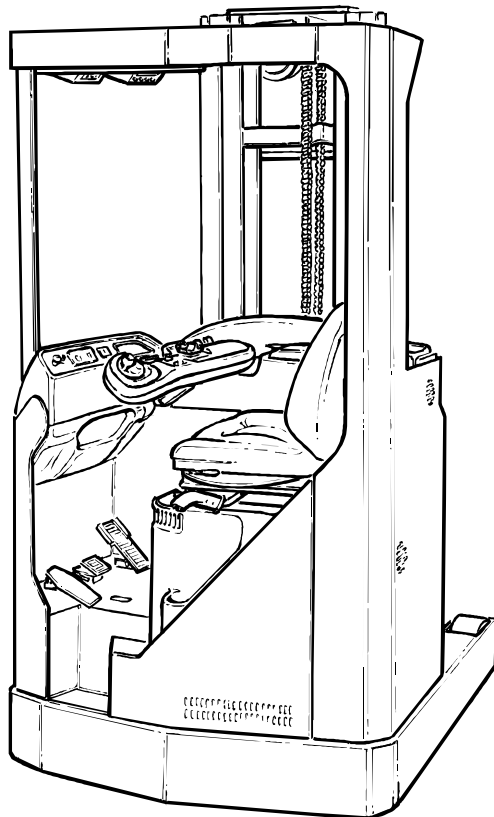




Master Service Manual (MSM) Product family RT





Introduction to BT's Service Manual

This Service manual contains product information regarding the current trucks including the technical data and instructions for maintenance and service. It includes the operator's Instruction Manual, Spare Part Handbook and oil and grease specifications:

- M Machine information
- P Preventive maintenance
- S Service instructions
- O Options

At the top of each page you can find information on which section the page belongs to: **Section** M 5.0 means that it is Product improvements; **F-code** means it deals with this specific truck family; **T-code** means specific products; **Date** and **Version number** give information on when the page was issued and which version.

It is our ambition to send modification notifications concerning improvements to you as soon as possible. It's stated on the notifications which section/s in the binder should be replaced; note that the **entire** section should be replaced! Notifications should be inserted immediately so that the binder always contains current service information.

When contacting BT's technical support always have the actual Service Manual close at hand. If you have any views regarding the Service Manual, please contact your training officer at BT who will forward your views to the technical documentation department.

This document can be available on different media and will have different part numbers. Please see the following example:

123456-040=An English document on paper

123456-04F=The same document but on fiche

F-code

Section

C-code

RT

76876

Introduction to BT's Service Manual

Version no

T-code

001

**Contents Master Service Manual (MSM)**Issued by
SSDApproved by
Jessica ForsgardVersion no
001T-code
268, 301-307, 400-414

Contents Master Service Manual (MSM)

Part number: 146575-040
Revised edition 1998-01-28

Valid from serial number:

T-code	Model	Serial No
268	RR 1.0	265200AA-
301	RR N1-N3, N1C-N3C/14	265200AA-
302	RR B1-B3, B1C-B3C/14	265200AA-
303	RR B4-B6, B4C-B6C/14	265200AA-
304	RR B7-B8, B7C-B8C/14	265200AA-
305	RR E1-E3, E1C-E3C/14	265200AA-
306	RR E4-E6, E4C-E6C/14	265200AA-
307	RR E7-E8, E7C-E8C/14	265200AA-
400	RR Cold store cabin	265200AA-
401	RR N1-3/15	301518AA-
402	RR N1-3C/15	301518AA-
403	RR B1-3/15	301518AA-
404	RR B1-3C/15	301518AA-
405	RR B5-6/15	301518AA-
406	RR B5-6C/15	301518AA-
407	RR B7-8/15	301518AA-
408	RR B7-8C/15	301518AA-
409	RR E1-3/15	301518AA-
410	RR E1-3C/15	301518AA-
411	RR E5-6/15	301518AA-
412	RR E5-6C/15	301518AA-
413	RR E7-8/15	301518AA-
414	RR E7-8C/15	301518AA-

Contents Master Service Manual (MSM)

1 Document list

Section	C-code	T-kod	Document	Issued
			Introduction	1996-05-09
M			Contents M	1994-11-28
M1		268, 301-307, 400-414	Operators manual	1999-05-20
M2		301-307, 400 401-414	General product information (vers.1) General product information (vers. 2)	1997-09-22 1997-10-02
M4		301-307, 400 401-414	Technical service data (vers. 1) Technical service data (vers. 2)	1997-09-22 1997-10-02
M6			Ordering Spare Parts	1994-11-28
M7			Quality Parts	1999-05-20
M8			Recommended Spare Parts	1999-05-20
P			Contents P	1994-11-28
P1			Introduction, maintenance	1997-10-02
P2		301-307, 400 401-414	Service schedule Service schedule	1997-10-10 1997-10-02
P3		301-307, 400 401-414	Oil and grease specification Oil and grease specification	1997-10-10 1997-10-02
P4		401-414	Tools	1997-12-16
S			Contents S	1994-01-21
S0	0510	305-307, 400	Cab attachment	1997-01-21
	0840	301-307, 400-414	Driver protection	1997-10-22
S1	1700	401-414	Drive motor	1997-10-14
S2	2550.1	301-307, 400	Transmission, gear	1997-02-21
	2550.2	401-414	Transmission, gear	1997-10-28
S3	3000	301-307, 400	Brakes	1997-04-14
	3100.1	401-406, 409-412	Brake system, without support arm brakes	1997-10-01
	3100.2	401-414	Brake system, with support arm brakes	1997-10-01



Section	C-code	T-kod	Document	Issued
	3120	301-307, 400	Main cylinder	1997-05-13
	3140	301-307, 400	Distributing valve	1996-11-13
	3160	301-307, 400	Drum brake, disc brake	1996-11-13
	3530.1	301-307, 400	Drive wheel	1997-05-13
	3530.2	301-307, 401-414	Drive wheel	1997-10-01
	3550	301-307, 401-414	Support arm wheel	1997-10-01
S4	4100	301-307, 401-414	Steering system	1997-10-29
S5	5000	301-307, 400	Electrical system	1997-01-21
	5000	401-414	Electrical system	1999-05-20
	5460	301-307, 400	Transistor regulator	1997-02-06
	5710	301-307, 400	Electronic card/control card	1997-01-23
	5710	401-414	Electronic card/control card	1999-05-20
	5810	401-414	Pump motor	1997-10-16
	5830	301-307, 400-414	Steering motor	1997-04-01
S6	6000	301-307, 400	Hydraulics	1996-09-26
	6140	301-307, 400	Hydraulic pump	1996-11-13
	6140	401-414	Hydraulic pump	1998-03-23
	6270	301-307, 401-414	Hose reel	1998-04-02
S7	7000	301-307, 401-414	Mast/cylinders	1997-04-06
	7100	301-306	Mast	1997-10-09
	7190	301-307, 400	Mast fixation points	1997-05-26
	7310.1	301-307, 400	Lift cylinder	1997-03-17
	7310.2	301-306, 400	Lift cylinder	1997-03-17
	7320	301-307, 401-414	Tilt cylinder	1998-03-23
	7330	301-307, 401-414	Reach cylinder	1998-03-23
	7340	301-307, 401-414	Free lift cylinder	1998-03-23
S9	9390	301-307, 400-414	Position sensors	1997-02-17

F-code Section C-code

RT

Contents Master Service Manual (MSM)

Version no

T-code

001

268, 301-307, 400-414



F-code
RT

Section
M

C-code

Contents, M

Issued by
Parts

Approved by
H Forsman

Version no
001

T-code

Contents, M

1. Truck information

- M 1.0 Operators Manual
- M 2.0 Product information
- M 3.0 Product sheet
- M 4.0 Technical service data
- M 5.0 Product improvements
- M 6.0 Spare Part ordering
- M 7.0 Spare Part Handbook
- M 8.0 Recommended Spare Parts

F-code Section C-code
RT **M**

Contents, M

Version no T-code
001 **301-307,400**



Operator's manual

Valid from serial number:

T-code	Model/Serial	Machine N°	Note
268	RR 1.0/	257696AA-	
301	RR N1-N3, N1C-N3C/14	265200AA-326472AA	
302	RR B1-B3, B1C-B3C/14	265200AA-326472AA	
303	RR B4-B6, B4C-B6C/14	265200AA-326472AA	
304	RR B7-B8, B7C-B8C/14	265200AA-326472AA	
305	RR E1-E3, E1C-E3C/14	265200AA-326472AA	
306	RR E4-E6, E4C-E6C/14	265200AA-326472AA	
307	RR E7-E8, E7C-E8C/14	265200AA-326472AA	
400	RR Cold store cabin	265200AA-	
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

Operator's manual

1 General

An Operator's Manual is supplied with every truck. If, for any reason, the customer does not obtain an Operator's Manual, they can be ordered from BT. In the table below, you can see which Operator's Manuals are available for this machine series.

1.1 Issued operator's manuals

T-code	Model	Serial number	Order number	Date of issue
268	RR 1.0	277525AA-	148603	1996-01-10
301-307	RR B/E1-8, N1-3(C) AC/ACi	262063AA-277458AA	143713	1994-12-01
301-307	RR B/E1-8, N1-3(C) AC/ACi	277459AA-326472AA	150313	1995-10-30
301-307	RR B/E1-8, N1-3(C) AC/ACi	277459AA-326472AA	155487	1996-08-28
301-307	RR B/E1-8, N1-3(C) AC/ACi	277459AA-356472AA	164179	1998-03-02
400	RR E2C-E8C	277459AA-307243AA	150255	1995-11-29
400	RR E2C-E8C	277459AA-307243AA	155488	1996-08-28
400	RR E2C-E8C AC/ACi	301518AA-	158713	1997-11-14
400	RR E2C-E8C AC/ACi	301518AA-	164180	1998-03-02
401-414	RR B/E1-8, N1-3(C) AC/ACi	301518AA-	158712	1997-07-07
401-414	RR B/E1-8, N1-3(C) AC/ACi	301518AA-	164181	1998-02-27

In this Master Service Manual can be found a typical Operator's Manual for the machine series. We have chosen this for your own safety when working with the truck.



2 Year of introduction

Truck type	Machine number	Serial number	Year of introduction
RTS	750–1099	5	1965
RTS 1350	143267–	8	1983/84
RR N1-N3 ⁽¹⁾	265202–	14	1995
RR N1-N3 ⁽¹⁾	391518–	15	1997
RT 12	750–1099	5	1965
RT 1250	1100–1649	6	1971
RT 1350	1650–84531	7	1974
RT 1350	84532–97572	8	1976
RT 1350	97573–116392	9	1978
RT 1350	116393–137246	10	1980
RT 1350 E	137247–155799	11	1983
RT 1350 E	155800–226099	12	1985
RT 1350 E	226100–229367	13	1991
RT 1350 E, SEC	229368–265201	13	1991
RT 1600	101–93852	1	1972
RT 1600	93853–116392	2	1978
RT 1600	116393–137461	3	1980
RT 1600 E	137462–155799	4	1983
RT 1600	155800–226099	5	1985
RT 1600 SE	226100–229367	13	1991
RT 1600 SE, SEC	229368–265201	13	1991
RR B1-B8, E1-E8 ⁽¹⁾	265202–326472	14	1995–1998
RR B1-B8, E1-E8 ⁽¹⁾	301518–	15	1997
RT 1800 E	144866–155799	1	1984

Operator's manual

Truck type	Machine number	Serial number	Year of introduction
RT 1800 E	155800–226099	2	1985
RT 1800 SE	226100–265201	13	1991
RT 2000	101–93852	1	1972
RT 2000	93853–118243	2	1978
RT 2000	118244–137471	3	1980
RT 2000	137472–155472	4	1983
RT 2000 E	155800–226099	5	1985
RT 2000 SE	226100–229367	13	1991
RT 2000 SE, SEC	229368–265201	13	1991
RR B1-B8, E1-E8 ⁽¹⁾	265202–326472	14	1995–1998
RR B1-B8, E1-E8 ⁽¹⁾	301518–	15	1997
RT 2500 E	165332–226099	1	1988
RT 2500 SE	226100–265201	13	1991
RR B1-B8, E1-E8 ⁽¹⁾	265202–326472	14	1995–1998
RR B7-B8, E7-E8 ⁽¹⁾	301518–	15	1997
RR 1.0	257696–		1994

DC/AC machines were made during the same period of time.

**General product information**

General product information

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	

1. Presentation of BT's reach trucks

BT's reach truck program is intended for handling pallets indoors or alternatively other types of loads using other load carriers. The trucks are operated with the driver seated in a protected and ergonomic operator position. They are available in different size classes and have as standard a lifting capacity of up to 2500 kg and a lifting height of up to 10.8 m.

The trucks are equipped with a 48 V electrical system. The travel and lifting speeds are transistor controlled to provide smooth operation. In addition, the travel function and the different hydraulic functions have additional controls which further enhance these features. Different speeds, steering and cab tilt (optional) can be set using parameters to give the best possible individual setting for the functions

1.1. Application areas for BT's reach trucks

BT's reach trucks are solely designed and manufactured to handle goods. The trucks should be fitted with the appropriate accessories relevant to the application.

General product information

1.2. Prohibited applications for BT's reach trucks

BT's reach trucks are designed for handling goods indoors. It is not permitted to use the trucks for other purposes including the following:

- In areas that contain gases which can cause fires or explosions
- As a towing truck for trailers
- To tow other trucks
- To transport/lift passengers
- To drive on gravel or grass

2. Truck data

The table provides information regarding some technical data, which is of value with daily use of the truck.

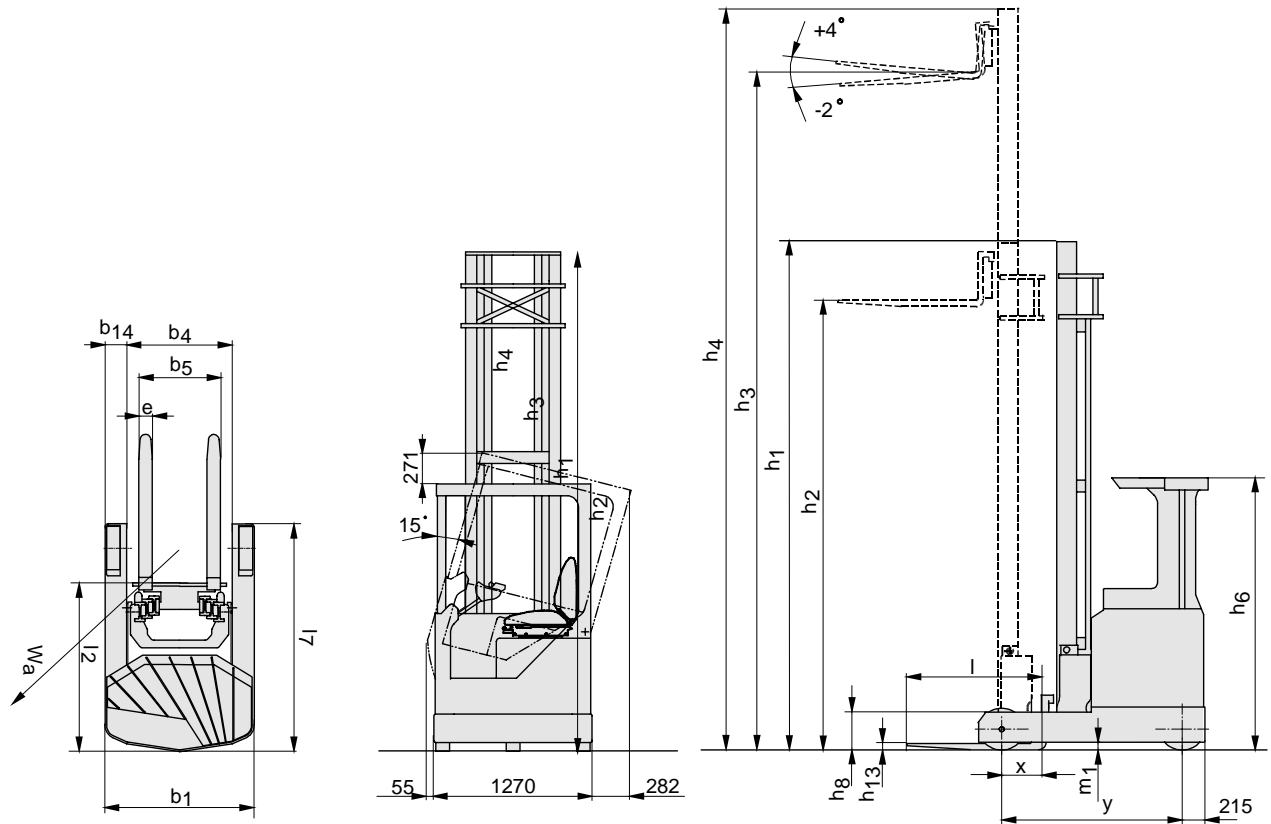
Truck type	RR B1-3
Operating speed without load, m/s	3.0
Operating speed with classified load, m/s	2.8
Max. operating gradient with load,%	10
Continuous noise level, dB A	
Vibration level, m/s ²	

The truck's lifting capacity, lifting height and weight can be found on the truck's type plate.



3. Truck dimensions

The diagram shows the external dimensions of the truck.

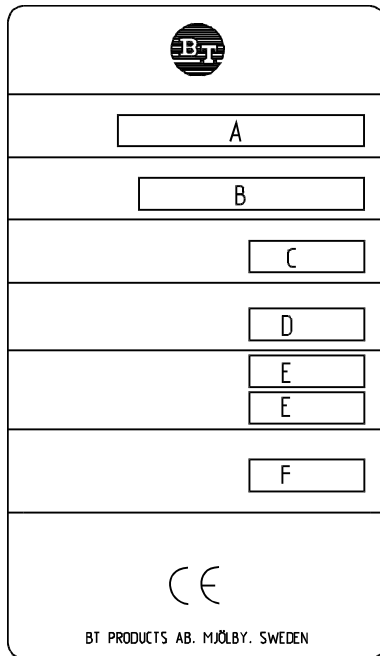


Dimensions	RR B1-3	RR E1-3	RR B4-6/E4-6	RR B7-8/E7-8
b1 Chassis width	1270/1470	1270/1470	1270/1470	1270/1470
h6 Height above protective roof	2166	2216	2266	2266
l1 Truck length excl, forks	1812	1812	1887	2012
Wa Turning radius	1640	1640	1685	1806

General product information

4. Identification plate, truck

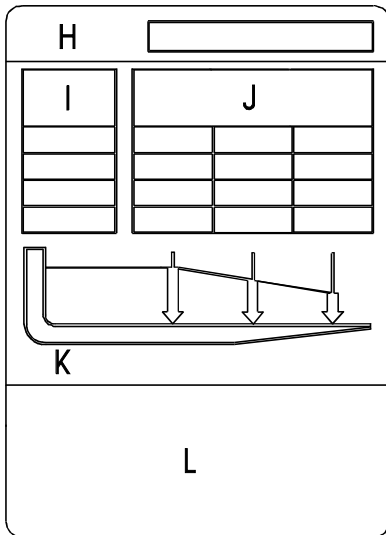
The diagram shows the type plate for RR B1-B8, E1-E8, N1-N3.



Item	Text	Unit
A	MODEL	
B	NO	
C	RATED CAPACITY	kg
D	WEIGHT WITHOUT BATTERY	kg
E	BATTERY WEIGHT	MAX MIN kg
F	BATTERY VOLTAGE	V

5. Capacity plate

The diagram shows the capacity plate used on the truck.



Tecken	Text	Unit
H	NO	
I	LIFT HEIGHT	mm
J	ACTUAL CAPACITY	kg
K	LOAD CENTRE	mm
L	THE TRUCK MUST ALWAYS BE DRIVEN WITH LOWERED FORKS AND RETRACTED MAST EXCEPT WHEN PLACING OR REMOVING LOAD	



6. Modification plate

The picture shows the modification plate which is found on the truck if it is supplied as non-standard or if it has been modified after leaving the manufacturer. The plate includes information according to the table below.

M-PLATE
A

TYPE

S/NO

CODE NO		DATE
E	F	G
<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>

Item	Text
A	Modification plate
B	Type
C	Serial number
D	Place of manufacture
E	Place of manufacture
F	Modification number
G	Date

7. Identification plate, mast

The picture shows the mast number plate located on the side of the mast. The plate includes information according to the table below.

Type: A

Serial No: B

Manufactured: C

BT Products AB, Mjölby Sweden

Item	Text
A	Type
B	Serial number
C	Date

F-code Section C-code

RT M2

General product information

Version no T-code
001 301-307,400

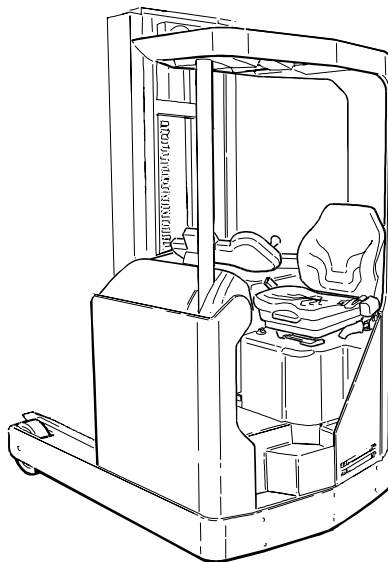


General product information

Valid from machine number:

T-code	Model	Machine number	Notes
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

1. Presentation of BT's reach trucks



BT's reach truck program is intended for handling pallets indoors or alternatively other types of loads using other load carriers. The trucks are operated with the driver seated in a protected and ergonomic operator position. BT's reach trucks are available in different size classes and have as standard a lifting capacity of up to 2500 kg and a lifting height of up to 10.8 m.

The trucks are equipped with a 48 V electrical system. The travel and lifting speeds are transistor controlled to provide smooth operations. In addition, the travel function and the different hydraulic functions have additional controls which further enhance these features. Different speeds, steering and cab tilt (optional) can be set using parameters to give the best possible individual setting for the functions.

General product information

1.1. Application areas for BT's reach trucks

BT's reach trucks are solely designed and manufactured to handle goods. The trucks should be fitted with the appropriate accessories relevant to the application.

1.2. Prohibited applications for BT's reach trucks

BT's reach trucks are designed for handling goods indoors. Unless the truck is specially equipped, it is not permitted to use the truck for other purposes including the following applications:

- In areas that contain gases or dust which can cause fires or explosions
- As a tow-truck for trailers
- To tow other trucks
- To transport/lift passengers
- To drive on gravel or grass

2. Truck data

The table provides information regarding some technical data, which is of value with daily use of the truck.

Truck type	B1-B3 E1-E3	B5-B6 E5-E6	B7-B8 E7-E8	N1	N2-N3
Lifting capacity rated load, kg	1600	2000	2500	1600	1600
Operating speed without load, without support arm brake m/s	3.1	2.9	-	3.1	3.1
Operating speed with rated load, without support arm brake m/s	2.8	2.7	-	2.8	2.8
Operating speed without load, with support arm brake m/s	3.3	3.3	3.3	3.3	3.3
Operating speed with rated load, with support arm brake m/s	3.3	3.3	3.3	3.3	3.3
Max. operating gradient with rated load, %	10	10	7	10	10
Rate of lifting, without load, m/s	0.5	0.48	0.5	0.5	0.5

**General product information**

Truck type	B1-B3 E1-E3	B5-B6 E5-E6	B7-B8 E7-E8	N1	N2-N3
Rate of lifting, with rated load, m/s	0.33	0.30	0.27	0.33	0.33
Rate of lowering, without load, m/s	0.46	0.46	0.44	0.46	0.46
Rate of lowering, with rated load, m/s	0.50	0.49	0.47	0.50	0.50
Weight without battery, kg	2315 ¹	2995 ²	3885 ³	2215 ¹	2215 ¹
Battery (5h discharge)	360/ 480	480/ 600	600/ 800	292/ 360/ 480	292/ 360/ 480
Weight of battery (min.), kg	700/ 865	865/ 1075	1075/ 1270	510/ 610/ 780	510/ 610/ 780
Continuous noise level, dB (A)	< 70	< 70	< 70	< 70	< 70
Vibration level m/s ²	0.5	0.5	0.5	0.5	0.5

1) $h_3 = 5700$ mm

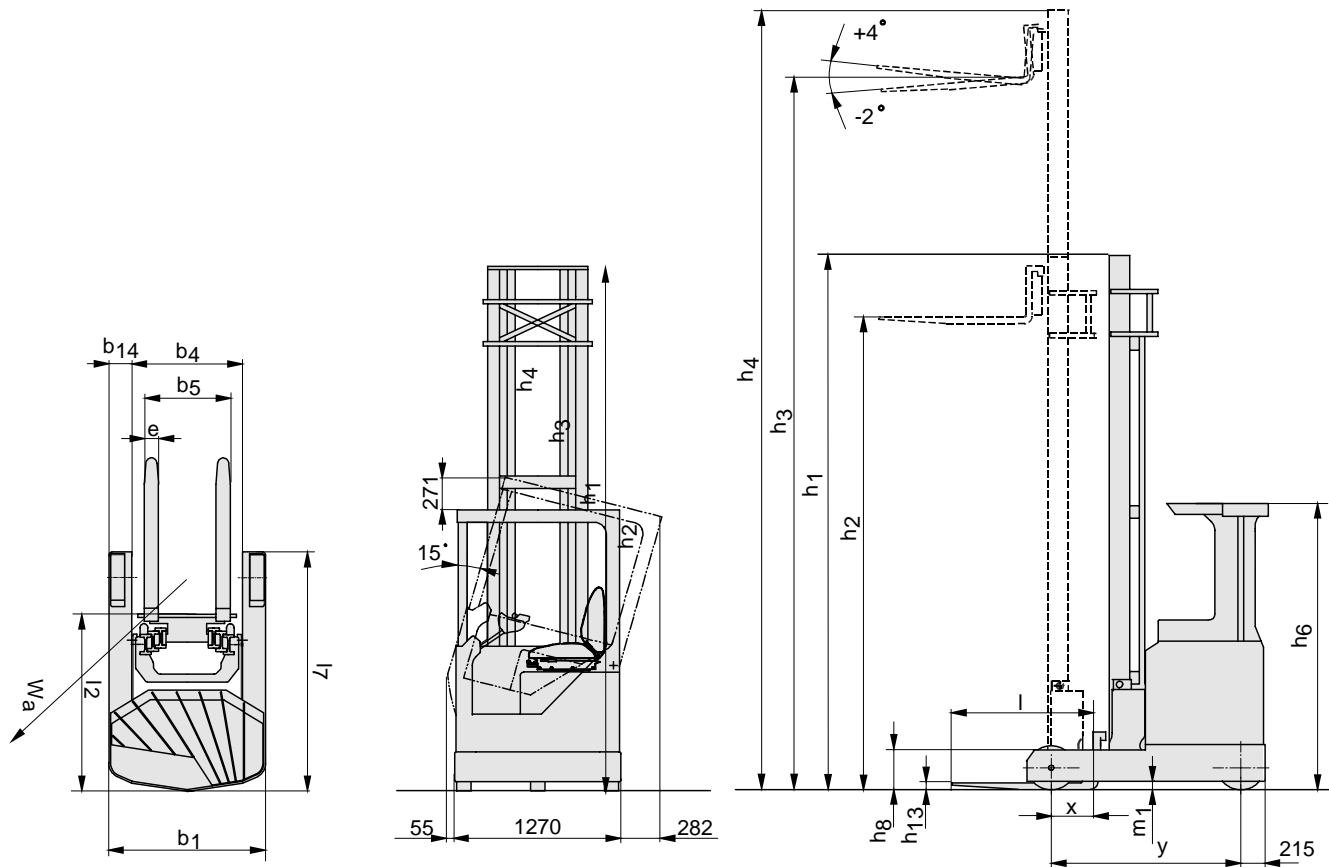
2) $h_3 = 7000$ mm

3) $h_3 = 9000$ mm

The truck's lifting capacity, lift height and weight can be found on the truck's type plate.

General product information**3. Truck dimensions**

The diagrams show external dimensions for RR B1-8, E1-E8, N1-N3.



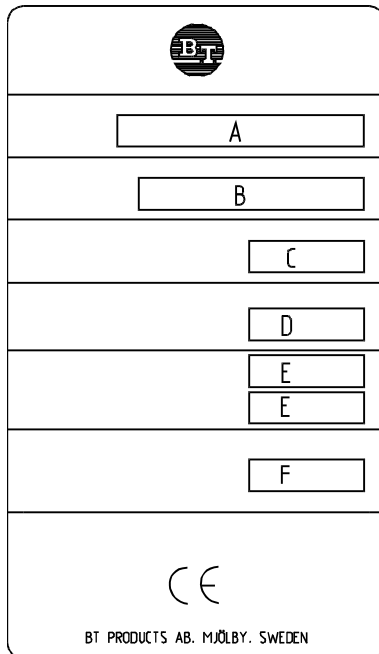
Dimensions (mm)	B1-B3	E1-E3	B5-B6/ E5-E6	B7-B8/ E7-E8	N1	N2	N3
b ₁ Chassis width	1270/ 1470/ 1670	1270/ 1470/ 1670	1270/ 1470/ 1670	1270/ 1470/ 1670	1100	1100	1100
b ₄ Width between support arms	900/ 1100/ 1300	900/ 1100/ 1300	900/ 1100/ 1300	900/ 1100/ 1300	730	730	730
b ₅ Width across forks	250- 775	250- 775	270-795	275-800	250- 720	250- 720	250- 720
e Fork width	100	100	120	125	100	100	100
h ₁ Mast height, min.	2012- 3708	2012- 3708	2012- 3708	2271- 4271	2012- 2445	2707- 3039	3206- 3539
h ₂ Free lift	1506- 3140	1506- 3140	1506- 3140	1691- 3691	1506- 1939	2141- 2473	2460- 2973



Dimensions (mm)	B1-B3	E1-E3	B5-B6/ E5-E6	B7-B8/ E7-E8	N1	N2	N3
h ₃ Lift height	4400-9000	4400-9000	4400-9000	4800-10800	4400-5700	6300-7000	7500-8500
h ₄ Mast height, max	4905-9565	4905-9565	4905-9565	5381-11381	4905-6205	6865-7565	3065-9065
h ₆ Height over cab	2166	2216	2266	2266	2166	2166	2166
l Fork length	1150	1150	1150	1150	1150	1150	1150
l ₇ Truck length excl. forks	1812	1812	1887	2012	1812	1812	1812
m ₁ Floor clearance	70	70	70	70	70	70	70
Wa Turning radius	1640	1640	1685	1806	1640	1640	1640

4. Identification plate, truck

The diagram shows the type plate used on RR B1-B8, E1-E8, N1-N3.

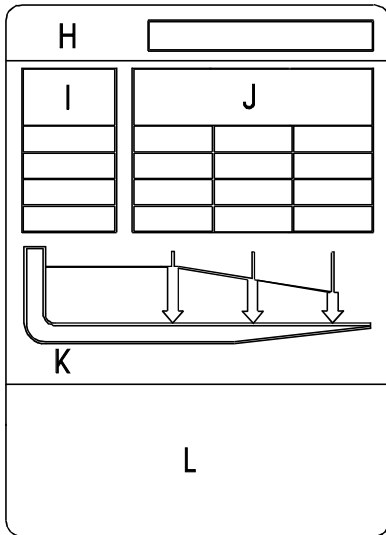


Item	Text	Unit
A	MODEL	
B	NO	
C	RATED CAPACITY	kg
D	WEIGHT WITHOUT BATTERY	kg
E	BATTERY WEIGHT	MAX MIN
		kg kg
F	BATTERY VOLTAGE	V

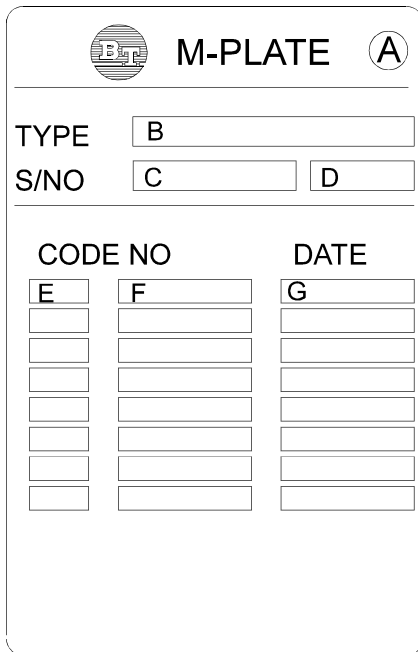
General product information

5. Capacity plate

The illustration shows the capacity plate used on the truck.



Item	Text	Unit
H	NO	
I	LIFT HEIGHT	mm
J	ACTUAL CAPACITY	kg
K	LOAD CENTRE	mm
L	THE TRUCK MUST ALWAYS BE DRIVEN WITH LOWERED FORKS AND RETRACTED MAST EXCEPT WHEN PLACING OR REMOVING LOAD.	




6. Modification plate

The picture shows the modification plate which is found on the truck if it is supplied as non-standard or if it has been modified after leaving the manufacturer. The plate includes information according to the table below.

Item	Text
A	Modification plate
B	Type
C	Serial number
D	Place of manufacture
E	Place of manufacture
F	Modification number
G	Date



	
Type:	A
Serial No:	B
Manufactured:	C
<small>BT Products AB, Mjölby Sweden</small>	

7. Identification plate, mast

The illustration shows the mast identification plate which can be found on the side of the mast. The plate shows information according to the table below.

Item	Text
A	Type
B	Serial number
C	Date

F-code Section C-code

RT **M2**

General product information

Version no T-code
002 **401-414**



Technical service data

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	

	RR B1 - B3 RR E1 - E3 RR N1 - N3	RR B4 - B6 RR E4 - E6	RR B7 - B8 RR E7 - E8
Drive motor			
Type	D41	D51	D51
Power	5 kw	6,5 kw	6,5 kw
Intermittence	60%	60%	60%
Min. carbon brush length	14 mm	14 mm	14 mm
Min. commutator diameter	73 mm	73 mm	73 mm
Transmission/gear			
Type	2-step angle gear		
Gear ratio	16.13:1	17.57:1	17.57:1
Oil volume	2.5 litres	3.75 litres	3.75 litres
Oil type at normal temperature at temperatures < -15° C:	Hypoid oil SAE 80W90 SAE 75W	Hypoid oil SAE 80W90 SAE 75W	Hypoid oil SAE 80W90 SAE 75W

Technical service data

	RR B1 - B3 RR E1 - E3 RR N1 - N3	RR B4 - B6 RR E4 - E6	RR B7 - B8 RR E7 - E8
Wheels			
Drive wheel	diameter 310x110	diameter 310x110	diameter 350x130
Wheel pressure without load			
Wheel pressure with classified load			
Wheel bolts' tightening torque	90 Nm	90 Nm	90 Nm
Support arm wheels	diameter 265x108 diameter 300x100	diameter 350x108	diameter 350x108
Axle pressure with classified load			
Hydraulic system			
Type	PM 1	PM 1	PM 8
Power	10 kW	10 kW	14 kW
Intermittence	15 %	15 %	15 %
Min. carbon brush length	14 mm	14 mm	14 mm
Min. commutator diameter	73 mm	73 mm	73 mm
Pressure with rated load			
Overflow pressure			
Pump flow	19 cm ²	19 cm ²	22 cm ²
Tank volume	30/38 litres	38 litres	38 litres
Oil type: at normal temperature at temperature <-15°	ISO-L-HM32 ISO-L-HV32	ISO-L-HM32 ISO-L-HV32	ISO-L-HM32 ISO-L-HV32
Steering motor			
Power	240 W	240 W	240 W
Intermittence	Continually		
Min. carbon brush length	9 mm	9 mm	9 mm
Min. commutator diameter	22,9 mm	22,9 mm	22,9 mm



	RR B1 - B3 RR E1 - E3 RR N1 - N3	RR B4 - B6 RR E4 - E6	RR B7 - B8 RR E7 - E8
Fuses			
Control circuits	10 A/122308-100	10 A/122308-100	10 A/122308-100
Steering motor	30 A/122308-300	30 A/122308-300	30 A/122308-300
Drive motor	160 A/29223	160 A/29223	160 A/29223
Pump motor	200 A/29673	200 A/29673	300 A/29674
Battery			
Dimensions WxLxH			
Capacity			
Weight			
Driving speed			
Without load			
With 1000 kg load			
With classified load			
Lifting/lowering speed			
Lifting without load			
Lifting with 1000 kg			
Lifting with classified load			
Lowering without load			
Lowering with 1000 kg load			
Lowering with classified load			
Power consumption			
Driving without load			
Driving with 1000 kg load			
Driving with classified load			

Technical service data

	RR B1 - B3 RR E1 - E3 RR N1 - N3	RR B4 - B6 RR E4 - E6	RR B7 - B8 RR E7 - E8
Free lift			
Lifting without load			
Lifting with 1000 kg load			
Lifting with rated load			
Main lift			
Lifting without load			
Lifting with 1000 kg load			
Lifting with classified load			
Tilting without load			
Tilting with 1000 kg load			
Tilting with classified load			
Mast in/out without load			
Mast in/out with 1000 kg load			
Mast in/out with classified load			
Side shift without load			
Side shift with 1000 kg load			
Side shift with classified load			
Travel brake			
Type of fluid	DOT 3-4	DOT 3-4	DOT 3-4
Amount of fluid (truck without support arm brakes)	0,4 litres	0,4 litres	0,4 litres
Amount of fluid (truck with support arm brakes)	0,8 litres	0,8 litres	0,8 litres



Technical Service Data

Valid from serial number:

T-code	Model	Machine N°	Note
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RRE5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

	RR B1 - B3 RR E1 - E3 RR N1 - N3	RR B5 - B6 RR E5 - E6	RR B7 - B8 RR E7 - E8
Drive motor			
Type			TSP 112/4-165-t
Power	5.5 kW	7.5 kW	7.5 kW
Intermittence	60%	60%	60%
Insulation class	F	F	F
Transmission/gear			
Type	2-step angle gear		
Gear ratio	19.2:1	20.89:1	20.89:1
Oil volume	2.8 litres	3.3 litres	3.3 litres
Oil type	Hypoid oil	Hypoid oil	Hypoid oil
At normal temperature	SAE 80W90	SAE 80W90	SAE 80W90
< -15° C:	SAE 75W	SAE 75W	SAE 75W

Technical Service Data

	RR B1 - B3 RR E1 - E3 RR N1 - N3	RR B5 - B6 RR E5 - E6	RR B7 - B8 RR E7 - E8
Wheels			
Drive wheel	diameter 310x120	diameter 310x120	diameter 350x130
Wheel pressure without load			
Wheel pressure with rated load			
Wheel bolts' tightening torque	130	130	130
Support arm wheels	diameter 265x108 diameter 300x100	diameter 350x108	diameter 350x108
Axle pressure with rated load			
Hydraulic system			
Pump motor, Type			TSP 112/4-195-t
Power	10.1 kW	10.0 kW	14.0 kW
Intermittence	15%	15%	15%
Insulation class	F	F	F
Pressure with rated load, bar	150	180	185
Overflow pressure, bar	165	195	200
Pump flow	30 litres/min.	26 litres/min.	35 litres/min.
Tank volume	30/38 litres	38 litres	38 litres
Oil type:			
At normal temperature	ISO-L-HM32	ISO-L-HM32	ISO-L-HM32
<-15°	ISO-L-HV32	ISO-L-HV32	ISO-L-HV32
Steering motor			
Type	36-4830312J	36-4830312J	36-4830312J
Power	0,20	0,20	0,20
Intermittence	100%	100%	100%
Min. carbon brush length	9 mm	9 mm	9 mm
Min. commutator diameter	22.9 mm	22.9 mm	22.9 mm
Insulation class	B	B	B



	RR B1 - B3 RR E1 - E3 RR N1 - N3	RR B5 - B6 RR E5 - E6	RR B7 - B8 RR E7 - E8
Fuses			
F1, Drive motor	125 A/29584	160 A/29223	160 A/29223
F3, Pump motor	200 A/29673	250 A/29221	300 A/29674
F60, Supply voltage A5	10 A/122308-100	10 A/122308-100	10 A/122308-100
F61, Steering servo	30 A/122308-300	30 A/122308-300	30 A/122308-300
F62, Input from main contactor	10 A/122308-100	10 A/122308-100	10 A/122308-100
F63, Extra equipment	10 A/122308-100	10 A/122308-100	10 A/122308-100
Battery			
Dimensions WxLxH			
Capacity			
Weight			
Driving speed			
Without load, without support arm brake	3.1 m/s	2.9 m/s	---
With rated load, without support arm brake	2.8 m/s	2.7 m/s	---
Without load, with support arm brake	3.3 m/s	3.3 m/s	3.3 m/s
With rated load, with support arm brake	3.3 m/s	3.3 m/s	3.3 m/s
Lifting/lowering speed			
Lifting without load	0.50 m/s	0.48 m/s	0.50 m/s
Lifting with 1000 kg	0.37 m/s	0.35 m/s	0.37 m/s
Lifting with classified load	0.33 m/s	0.30 m/s	0.27 m/s
Lowering without load	0.46 m/s	0.46 m/s	0.44 m/s
Lowering with 1000 kg load	0.53 m/s	0.53 m/s	0.47 m/s
Lowering with classified load	0.50 m/s	0.50 m/s	0.53 m/s
Power consumption, driving			
Driving without load, A			
Driving with rated load, A			

Technical Service Data

	RR B1 - B3 RR E1 - E3 RR N1 - N3	RR B5 - B6 RR E5 - E6	RR B7 - B8 RR E7 - E8
Power consumption, free lift			
Lifting without load, A	120	110	150
Lifting with rated load, A	260	290	345
Power consumption, main lift			
Lifting without load, A			
Lifting with rated load, A			
Tilting without load			
Tilting with rated load			
Mast in/out without load			
Mast in/out with rated load			
Side shift, forks, without load			
Side shift, forks, with rated load			

NOTE:

Data may be missing in the table due to uncompleted tests or insufficient information being available.



Ordering Spare Parts

- Localise the fault on the truck.
- Find out the machine type and machine number.
- Find the machine type and machine number in the spare part catalogue's list of contents.
- Look up the page with the exploded diagram and locate the position number for the part you require.
- Look up the position number in the table. Select the column with regard to the actual machine type and machine number.
- Note the article number.
- Call the Truck Centre and state the article number.

The Truck Centre will now order the actual article via computer from BT Parts. The article is delivered by DDD during the night and the next day you will have the part. (If you place the order after 4.30 pm the delivery will be delayed.)

If you cannot find the machine type, machine number or the article number call the Truck Centre and they will help you.

F-code

Section

C-code

RT

M6

Ordering Spare Parts

Version no

T-code

001



Quality Parts

Valid from serial number:

T-code	Model	Serial No	Notes
268	RR 1.0	257696AA–	
301	RR N1-N3, N1C-N3C/14	265200AA–326472AA	
302	RR B1-B3, B1C-B3C/14	265200AA–326472AA	
303	RR B4-B6, B4C-B6C/14	265200AA–326472AA	
304	RR B7-B8, B7C-B8C/14	265200AA–326472AA	
305	RR E1-E3, E1C-E3C/14	265200AA–326472AA	
306	RR E4-E6, E4C-E6C/14	265200AA–326472AA	
307	RR E7-E8, E7C-E8C/14	265200AA–326472AA	
400	RR Cold store cabin	265200AA–	
401	RR N1-3/15	301518AA–	AC/ACi
402	RR N1-3C/15	301518AA–	AC/ACi
403	RR B1-3/15	301518AA–	AC/ACi
404	RR B1-3C/15	301518AA–	AC/ACi
405	RR B5-6/15	301518AA–	AC/ACi
406	RR B5-6C/15	301518AA–	AC/ACi
407	RR B7-8/15	301518AA–	ACi
408	RR B7-8C/15	301518AA–	ACi
409	RR E1-3/15	301518AA–	AC/ACi
410	RR E1-3C/15	301518AA–	AC/ACi
411	RR E5-6/15	301518AA–	AC/ACi
412	RR E5-6C/15	301518AA–	AC/ACi
413	RR E7-8/15	301518AA–	ACi
414	RR E7-8C/15	301518AA–	ACi

Quality Parts

1. Issued Quality Parts

Model	Serial No	Order number	Issued
RR B/E1-3(C)/15 AC/ACi	316983AA-	165144	1998-04-06
RR B/E1-3(C)/15 AC/ACi	301518AA-	159152	1998-01-29
RR B/E5-6(C)/15 AC/ACi	316983AA-	165145	1998-04-06
RR B/E5-6(C)/15 AC/ACi	301518AA-	159154	1998-01-29
RR N1-3(C)/15 AC/ACi	316983AA-	165143	1998-04-06
RR N1-3(C)/15 AC/ACi	301518AA-	159663	1998-01-29
RR B/E7-8(C)/15 AC/ACi	316983AA-	165042	1998-04-06
RR B/E7-8(C)/15 AC/ACi	301518AA-	158416	1997-12-10
RR N1-3(C)/14	316983AA-	164953	1998-04-06
RR N1-3(C)/14	306401AA-	161846	1997-09-19
RR N1-3(C)/14	301926AA-	157303	1997-06-11
RR N1-3(C)/14	293892AA-	156648	1996-12-13
RR N1-3(C)/14	285734AA-	153096	1996-05-11
RR N1-3(C)/14	277518AA-	150694	1996-02-05
RR N1-3(C)/14	265200AA-	146897	1995-09-22
RR B/E1-3(C)/14	316983AA-	164954	1998-04-06
RR B/E1-3(C)/14	306401AA-	161844	1997-09-19
RR B/E1-3(C)/14	301926AA-	157301	1997-06-11
RR B/E1-3(C)/14	293892AA-	156649	1996-12-13
RR B/E1-3(C)/14	285688AA-	153097	1996-05-11
RR B/E1-3(C)/14	277459AA-	150691	1996-01-03
RR B/E1-3/14	265200AA-	146898	1995-09-13
RR B/E5-6(C)/14	316983AA-	164955	1998-04-06
RR B/E5-6(C)/14	306401AA-	161845	1997-09-19
RR B/E5-6(C)/14	301926AA-	157302	1997-06-11
RR B/E5-6(C)/14	293892AA-	156650	1996-12-13



F-code
RT

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C-code

Quality Parts

Version no
001

T-code
268, 301-307, 400-414

Model	Serial No	Order number	Issued
RR B/E4-6(C)/14	285726AA-	153098	1996-05-11
RR B/E4-6(C)/14	277506AA-	150692	1996-01-09
RR B/E4-6(C)/14	265200AA-	146899	1995-09-22
RR B/E7-8(C)/14	316983AA-	164956	1998-04-06
RR B/E7-8(C)/14	306401AA-	159585	1997-09-19
RR B/E7-8(C)/14	301926AA-	160213	1997-06-11
RR B/E7-8(C)/14	293892AA-	155522	1996-11-30
RR B/E7-8(C)/14	285732AA-	153099	1996-05-11
RR B/E7-8(C)/14	277512AA-	150693	1995-02-05
RR B/E7-8(C)/14	265200AA-	146900	1995-09-22
RR 1.0	277525AA-	150697	1996-10-01
RR 1.0	257696AA-	142345	1995-03-28
RR E1-8(C), Cold Store Cabin	306401AA-	161131	1998-03-09
RR E1-8(C)/14, Cold Store Cabin	301926AA-	160396	1997-06-25
RR E1-8(C)/14, Cold Store Cabin	265200AA-	156821	1996-11-25

F-code Section C-code

RT **M7**

Quality Parts

Version no T-code
001 **268, 301-307, 400-414**



Recommended Spare Parts (RSP)

Valid from serial number:

T-code	Model	Serial No	Notes
268	RR 1.0	257696AA–	
301	RR N1-N3, N1C-N3C/14	265200AA–326472AA	
302	RR B1-B3, B1C-B3C/14	265200AA–326472AA	
303	RR B4-B6, B4C-B6C/14	265200AA–326472AA	
304	RR B7-B8, B7C-B8C/14	265200AA–326472AA	
305	RR E1-E3, E1C-E3C/14	265200AA–326472AA	
306	RR E4-E6, E4C-E6C/14	265200AA–326472AA	
307	RR E7-E8, E7C-E8C/14	265200AA–326472AA	
400	RR Cold store cabin	265200AA–	
401	RR N1-3/15	301518AA–	AC/ACi
402	RR N1-3C/15	301518AA–	AC/ACi
403	RR B1-3/15	301518AA–	AC/ACi
404	RR B1-3C/15	301518AA–	AC/ACi
405	RR B5-6/15	301518AA–	AC/ACi
406	RR B5-6C/15	301518AA–	AC/ACi
407	RR B7-8/15	301518AA–	ACi
408	RR B7-8C/15	301518AA–	ACi
409	RR E1-3/15	301518AA–	AC/ACi
410	RR E1-3C/15	301518AA–	AC/ACi
411	RR E5-6/15	301518AA–	AC/ACi
412	RR E5-6C/15	301518AA–	AC/ACi
413	RR E7-8/15	301518AA–	ACi
414	RR E7-8C/15	301518AA–	ACi

Recommended Spare Parts (RSP)**1. Issued RSP**

T-code	Model	Serial No	Issued
268	RR 1.0	257696AA-277524AA	1996-12-04
268	RR 1.0	277525AA-	1996-12-04
301	RR N1-N3(C)/14	265200AA-290082AA	1997-07-10
301	RR N1-N3(C)/14	290083AA-301925AA	1997-07-08
301	RR N1-N3(C)/14	301926AA-306400AA	1997-10-15
301	RR N1-N3(C)/14	306401AA-	1997-10-15
302	RR B1-B3(C)/14	265200AA-290082AA	1997-07-10
302	RR B1-B3(C)/14	290083AA-301925AA	1997-07-10
302	RR B1-B3(C)/14	301926AA-306400AA	1997-10-15
302	RR B1-B3(C)/14	306401AA-	1997-10-15
303	RR B4-B6(C)/14	265200AA-290082AA	1997-07-10
303	RR B5-B6(C)/14	290083AA-301925AA	1997-07-10
303	RR B5-B6(C)/14	301926AA-306400AA	1997-10-15
303	RR B5-B6(C)/14	306401AA-	1997-10-15
304	RR B7-B8(C)/14	265200AA-286270AA	1997-07-10
304	RR B7-B8(C)/14	286271AA-301925AA	1997-07-10
304	RR B7-B8(C)/14	301926AA-306400AA	1997-10-15
304	RR B7-B8(C)/14	306401AA-	1997-10-15
305	RR E1-E3(C)/14	265200AA-290082AA	1997-10-15
305	RR E1-E3(C)/14	290083AA-301925AA	1997-10-15
305	RR E1-E3(C)/14	301926AA-306400AA	1997-10-15
305	RR E1-E3(C)/14	306401AA-	1997-10-15
306	RR E4-E6(C)/14	265200AA-290082AA	1997-10-15
306	RR E5-E6(C)/14	290083AA-301925AA	1997-10-15
306	RR E5-E6(C)/14	301926AA-306400AA	1997-10-15
306	RR E5-E6(C)/14	306401AA-	1997-10-15
307	RR E7-E8(C)/14	265200AA-286270AA	1997-10-15
307	RR E7-E8(C)/14	286271AA-301925AA	1997-10-15



T-code	Model	Serial No	Issued
307	RR E7-E8(C)14	301926AA-306400AA	1997-10-15
307	RR E7-E8(C)/14	306401AA-	1997-10-15
401	RR N1-N3(C) AC/ACi	301518AA-	1998-04-24
403	RR B1-B3(C) AC/ACi	301518AA-	1998-04-22
405	RR B5-B6(C) AC/ACi	301518AA-	1998-04-26
407	RR B7-B8(C)/15 AC/ACi	301518AA-	1997-12-08
409	RR E1-E3(C)/15 AC/ACi	301518AA-	1998-04-22
411	RR E5-E6(C)/15 AC/ACi	301518AA-	1998-04-26
413	RR E7-E8(C)/15 AC/ACi	301518AA-	1997-12-08

F-code

Section

C-code

RT

M8

Recommended Spare Parts (RSP)

Version no

T-code

001

268, 301-307, 400-414



F-code
RT

Section
P

C-code

Content, P

Issued by
Parts

Approved by
K-G Andersson

Version no
001

T-code

Content, P

1. Preventive Maintenance

- P 1 Introduction
- P 2 Maintenance chart, Lubrication chart
- P 3 Oil and grease specification
- P 4 Tools

F-code

RT

Section

P

C-code

Content, P

Version no

001

T-code



Introduction, maintenance

All points in the service program should be carried out to attain the highest safety and the least possible downtime. The service intervals are only a guide and do not need to be followed to the letter. The operator may adapt them to local conditions, but it is important that the intervals comply with BT's minimum requirements.

The service intervals are based on the running times and can be adapted to most normal 8 hour shifts. The service interval may be shortened if the truck is used more frequently or in more demanding situations, e.g cold store, dusty or corrosive situations. The following running times have been used when calculating the intervals:

- Day time: 08.00-17.00 (20 hr./week)
- 2-shifts: 06.00-14.00, 14.00-22.00 (40 hr./week)
- 3-shifts: 06.00-14.00, 14.00-22.00, 22.00-06.00 (60 hr./week)

Ensure the truck is given a regular maintenance service after every 500 driving hours. The truck's safety, efficiency and service life is dependent on the service and maintenance it is given.

Only use BT approved spare parts when service and repair work are carried out.

1. Safety regulations with maintenance work

Only personnel that have been trained in the service and repair of this type of truck are authorised to carry out service and repair work.

- Do not carry out any maintenance work on the truck unless you have the correct training and knowledge to do so
- Keep the area where you carry out the service clean. Oil or water makes the floor slippery
- Never wear loose objects or jewellery when working on the truck



WARNING!

Short-circuiting/Burns.

When working with the truck's electrical system, short-circuiting/burns can occur if a metal object comes into contact with live electrical connections.

Remove watches, rings or other types of metal jewellery.

Introduction, maintenance

- Always disconnect the battery by pulling out the battery isolator when carrying out maintenance work on the truck unless otherwise stated in this Service Manual
- Always switch off the truck's power supply before opening the covers on the drive unit or electrical system
- Relieve the system pressure slowly before starting work on the truck's hydraulic system
- Use paper or a rigid sheet of cardboard when checking for oil leakage. **Never** use your hand
- Bear in mind that the oil in the transmission or the hydraulic system can be hot

**WARNING!**

Risk of burns.

Hot transmission and hydraulic oil.

Let the truck cool before changing the oil.

- Only fill the hydraulic system with new and clean oil

**WARNING!**

The hydraulic system can be damaged.

If the oil is contaminated hydraulic components can be damaged.

Always use new and clean oil in the hydraulic system.

- Store and dispose of changed oil in accordance with local directives
- Do not release solvents and the like, which are used for cleaning/washing, into drains that are not intended for this purpose. Follow the local directives that apply for disposal
- Disconnect the battery when welding on the truck

NOTE!

The battery can be damaged.

When welding using an electric power source the welding current can enter the battery.

The battery should therefore be disconnected.

- Remove at least 100 mm of paint around the welding/grinding area through sand-blasting or the use of a paint stripper when welding or grinding on painted surfaces

**CAUTION!**

Harmful gases.

Paint that is heated gives off harmful gases.

Remove 100 mm of paint from the work area.



2. Cleaning and washing

Cleaning and washing of the truck is important to ensure the truck's reliability.

- Carry out general cleaning and washing weekly

NOTE!

Risk of short-circuiting.

The electrical system can be damaged

Disconnect the battery before washing by pulling out the battery connector.

2.1. External cleaning

- Remove rubbish, etc. from the wheels daily
- Use a well-known degreasing agent, diluted to a suitable concentration
- Rinse off loose grime using tepid water

NOTE!

Jamming, corrosion.

Mechanical components can be damaged.

After washing, the truck should be lubricated as set out in the chapter Maintenance and lubrication chart.

2.2. Cleaning the motor compartment

- Cover the electric motors, connections and valves before washing

NOTE!

Risk of short-circuiting.

The electrical system can be damaged.

Electrical components must not be cleaned with a high pressure washing unit.

- Clean the motor compartment using a well-known degreasing agent, diluted to a suitable concentration
- Rinse off loose grime using tepid water

Introduction, maintenance

2.3. Electrical components

- Blow electric motors down using compressed air
- Clean the electrical panels, electronic boards, contactors, connections, solenoid valves, etc. using a damp cloth and a cleaning agent

NOTE!

Risk of short-circuiting.

Electrical components can be damaged.

Do not break the guarantee seal on the electronic board.

3. Safe lifting

All lifting must be carried out on a flat, non-slip and firm surface. Avoid new laid asphalt or asphalt on a hot summer's day.

- Activate the parking brake to prevent the truck from moving during the lift. If the lift applies to the brake wheel, chock the other wheels so that the truck stands still
- Select a lifting point so that the lift is as easy as possible (one corner at a time). If the truck has marked lifting points on the under side of the chassis these can be used to obtain a well balanced lift
- Ensure that the surface under the jack is clean and free from oil and grease
- Ensure that your hands and the jack's lever are free from oil and grease
- Use the lever that belongs to the jack. A lever that is too short requires more force than is necessary. If the lever is too long there is a risk of the jack being overloaded
- Support the truck:
 - as close to the part of the chassis that is lifted as possible to reduce the falling height if the truck tips over
 - so that the truck cannot roll
- **Never** lift up the jack in order to lift higher
- **Never** work under a lifted truck unless it is well supported

**WARNING!**

Risk of crushing.

A badly supported truck can fall.

Never work under a truck that is not supported on trestle-blocks and secured by a lifting device.



4. Tilting the cab

Make sure there is sufficient room for the tilted cab before you start work. Also make sure there is no risk of the cab accidentally being tilted back during the service.



WARNING!

Risk of crushing.

The risk of personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back.

Ensure no one is in the motor compartment when tilting the cab.

When you carry out a service in the motor compartment you should tilt the cab fully. While tilted, only the cab's lift/lower functions are operational and then only at crawl speed.

- Press the switch for cab lowering at the same time as the key is turned. The display shows 6 lines
- Move the hydraulic lever for fork lift backwards
- When the cab stops (at 15°), loosen the catch that releases the cab
- Continue to move the lever backwards until the cab stops (at 45°)



WARNING!

Falling cab!

The cab can fall without dampening when tilted over 45°.

The cab is heavy so make sure the person receiving the cab controls the situation. Use a crane if possible.

- Take hold of the protective roof and tilt the cab fully
- Insert the pin in the cylinder piston



WARNING!

Risk of crushing.

The risk of personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back.

The pin must always be inserted in the cylinder piston during service.

Ensure no one is in the motor compartment when the cab is tilted back.



WARNING!

Risk of crushing.

The risk of personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back.

Ensure no one is in the motor compartment when tilting the cab.

Introduction, maintenance

- Take hold of the protective roof and tilt the cab back to the 45° position
- Move the hydraulic lever for fork lift forwards until the cab comes to rest in the lowered position

**WARNING!**

Risk of tipping.

The truck can tip if the battery is removed when the truck is tilted in the service position.

Never remove the battery from the truck.



Service schedule

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	

Check the following (Placement according to C-code; Intervals in hours regard running hours, b on the display).

Pos. No.	Work to carry out							
	Interval in hours	5	20	80	250	500	1000	3000
	Interval in days/weeks/months	1 d	1 w	1 m	3 m	6 m	12 m	36 m
0300	Chassis							
0300.1	Check the machine and load capacity signs					X		
0300.2	Check for crack formation or damage					X		
0300.3	Check the machine housing's mounting on the support arm					X		
0300.4	Check the door locks					X		
0300.5	Check for wear to the battery lock					X		
0500	Operator's cab/area							
0500.1	Check the hinges on the cab tilt					X		
0500.2	Check the operation of the emergency door					X		

Service schedule

Pos. No.	Work to carry out							
	Interval in hours	5	20	80	250	500	1000	3000
	Interval in days/weeks/months	1 d	1 w	1 m	3 m	6 m	12 m	36 m
0600	Cab area							
0600.1	Check the seat mounting and the setting functions					X		
0600.2	Check the operation of the foot pedals	X						
0800	Safety equipment							
0800.1	Check the finger guard							
0800.2	Check for wear to the anti-slip guard							
1700	Drive motor							
1700.1	Check for loose connections					X		
1700.2	Check the carbon brushes					X		
1700.3	Clean the motor					X		
1700.4	Tighten the mounting bolts				X			
1700.5	Check for abnormal bearing noise					X		
1700.6	Check the speed sensor							
2550	Drive unit							
2550.1	Check for leakage					X		
2550.2	Check the oil level					X		
2550.3	Check for noise					X		
2550.4	Check the mounting on the support arm				X			
3100	Travel brake							
3100.1	Clean the brake					X		
3100.2	Check for wear on the brake discs					X		
3100.3	Check for play in the released position					X		
3100.4	Check the brake fluid level					X		
3100.5	Check for wear to the brake pipes					X		
3100.6	Check for leakage					X		



Pos. No.	Work to carry out							
	Interval in hours	5	20	80	250	500	1000	3000
	Interval in days/weeks/months	1 d	1 w	1 m	3 m	6 m	12 m	36 m
3300	Parking brake							
3300.1	Check for wear to the wires					X		
3300.2	Check for leakage					X		
3500	Wheels							
3500.1	Remove string and other rubbish	X						
3500.2	Check for wear to the drive wheel and bolts					X		
3500.3	Check that the support arm wheels rotate and that the axles are fitted correctly					X		
3500.4	Check for wear to the support arm wheels					X		
3500.5	Dismantle and grease the support arm wheels' bearings							X
4100	Steering system							
4100.1	Check the mounting of the steering wheel					X		
4100.2	Check the control panel's mounting and locking mechanism					X		
4100.3	Check the gas cartridge's capacity and locking mechanism					X		
5100	Battery							
5100.1	Check the electrolyte level (10-15 mm above the cell plate)		X					
5100.2	Check the connections on the battery, truck and charger		X					
5100.3	Check the cell and pole guard		X					
5100.4	Check the fluid density and temperature			X				
5100.5	Check the contactor point's on the main contactor					X		
5100.6	Check the contactor's movement					X		

Service schedule

Pos. No.	Work to carry out							
	Interval in hours	5	20	80	250	500	1000	3000
	Interval in days/weeks/months	1 d	1 w	1 m	3 m	6 m	12 m	36 m
5200	Instrument panel							
5200.1	Read off and note the running time and logged error codes.					X		
5200.2	Check that the display works					X		
5300	Control system driving							
5300.1	Check the emergency stop					X		
5300.2	Check the ignition key					X		
5300.3	Check the push buttons for extra functions					X		
5300.4	Check the parking brake					X		
5300.5	Check the microswitches and hydraulic levers					X		
5300.6	Check the travel direction sensor					X		
5400	Power system driving							
5400.1	Clean and check mountings					X		
5400.2	Tighten cable connections					X		
5400.3	Check the contactor points for the travel direction					X		
5400.4	Check the contactor's movement					X		
5400.5	Check the transistor unit's safety circuits					X		
5500	Control system works section							
5500.1	Check the operation of the electrical limiter					X		
5700	Electronic card							
5700.1	Clean the electronic card: blow clean with air and dry with a cloth					X		
5700.2	Check contacts and cables					X		
5700.3	Check the LEDs					X		



Pos. No.	Work to carry out								
		Interval in hours	5	20	80	250	500	1000	3000
		Interval in days/weeks/months	1 d	1 w	1 m	3 m	6 m	12 m	36 m
5800	Electric motor								
5800.1	Check for play on connections					X			
5800.2	Check the carbon brushes								
5800.3	Clean the motor					X			
5800.4	Check the mounting bolts				X				
5800.5	Check for abnormal bearing noise					X			
5800.6	Check the fan motor					X			
6100	Hydraulic unit								
6100.1	Check hoses and couplings for leakage					X			
6100.2	Check for wear to hoses and pipes					X			
6100.3	Check the tank for leakage					X			
6100.4	Check the oil level					X			
6100.5	Change the oil						X		
6100.6	Change the filter						X		
6100.7	Check the max. pressure					X			
6200	Control system								
6200.1	Check valves for leakage					X			
6200.2	Check the spring tension on the hose reel					X			
7100	Mast and reach carriage								
7100.1	Check for crack formation or damage					X			
7100.2	Check the mast mountings					X			
7100.3	Check for play on the rollers					X			
7100.4	Check for wear to the lifting chains and chain sprockets					X			
7100.5	Adjust the lifting chains					X			
7100.6	Check hoses and couplings					X			

Service schedule

Pos. No.	Work to carry out							
	Interval in hours	5	20	80	250	500	1000	3000
	Interval in days/weeks/months	1 d	1 w	1 m	3 m	6 m	12 m	36 m
7300	Cylinders							
7300.1	Check for leakage					X		
7300.2	Check mountings					X		
7400	Lift and turning tools							
7400.1	Check for wear to forks and other lifting devices					X		
9300	Extra electrical equipment							
9300.1	Check the heater seat/screen					X		
9300.2	Check the height-indication-pre-set and TV					X		
9559	Other extra equipment							
9550.1	Check the roller bed and the locking of the battery					X		



F-code
RT

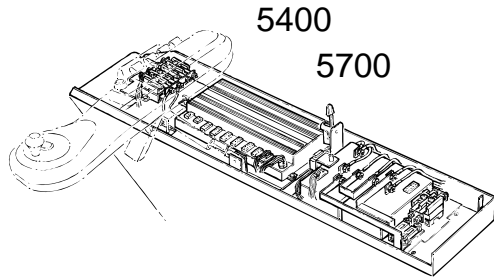
Section
P2

C-code

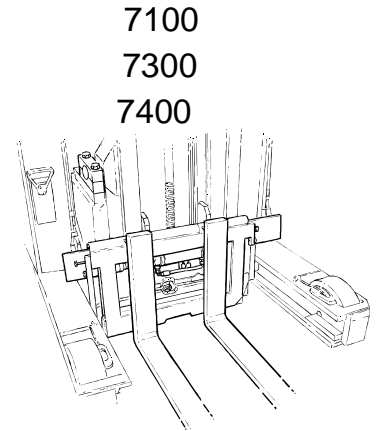
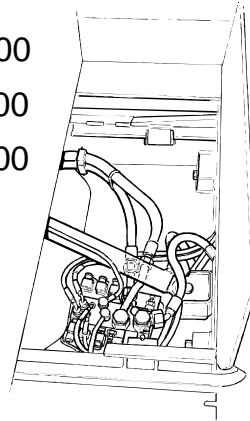
Service schedule

Version no
001

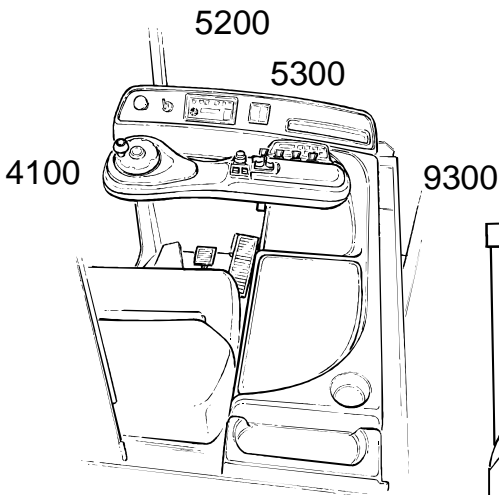
T-code
301-307,400



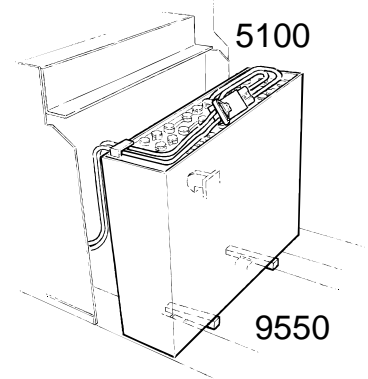
5500
6100
6200



7100
7300
7400

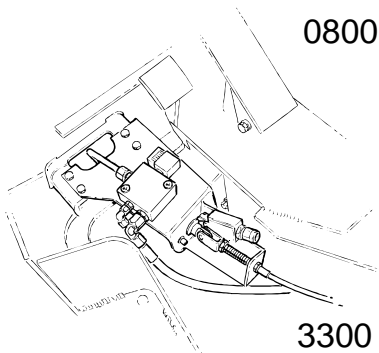


0600
0500
0300



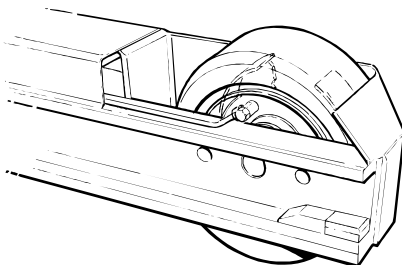
5100

9550



0800

3300

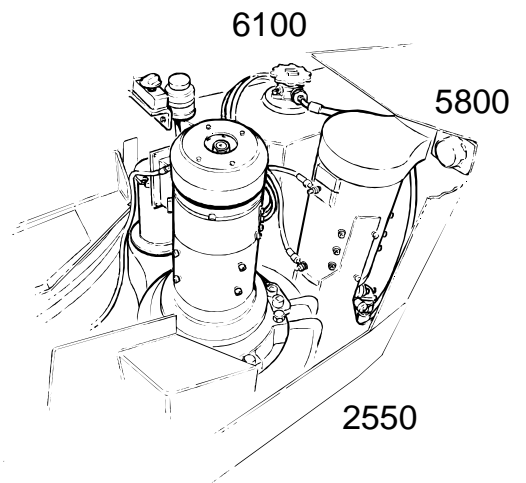


3100

5800

1700

3500



6100

5800

2550

Service schedule

1. Lubrication chart

A description of the different types of oil can be found in the chapter Oil and grease specification.

Pos. no.	Service point	Interval/Running hours			Lubricant	Volume
		500h	1000h	3000h		
3500	Wheel bearings			L	A	
7100	Mast beam	L			F	
0300	Reach rails	L			F	
7100	Lifting chains	L			D	
7200	Side shift		L		F	
6100	Hydraulic system	C	O		B	30/38 litres
3100	Travel brake	C		O	E	0,4/0,8 litres
2500	Drive gear	C		O	C	2,5/3,75 litres
0300	Hinges		L		A	
4100	Steering bearings		L		G	
4100	Gear ring	L			H	

L = Lubrication; C = Check; O = Oil change



F-code
RT

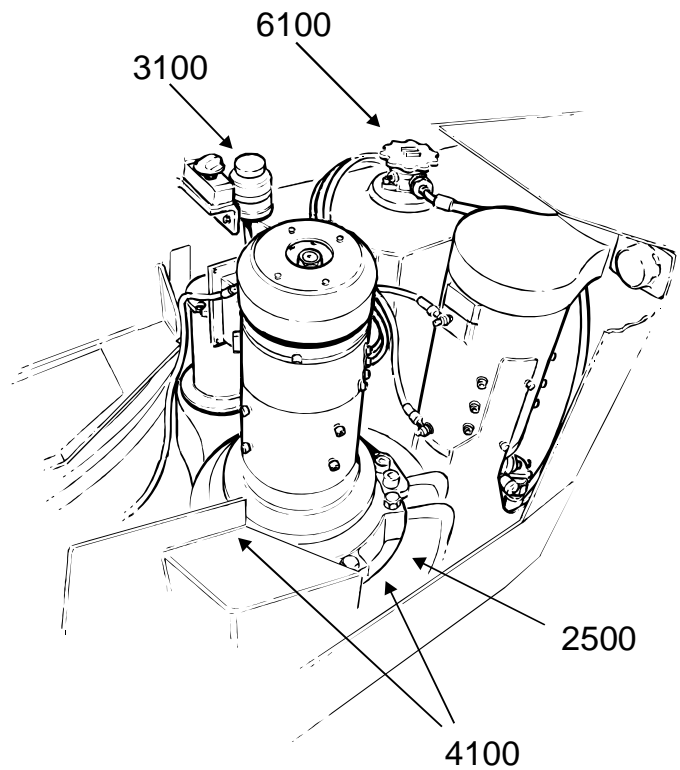
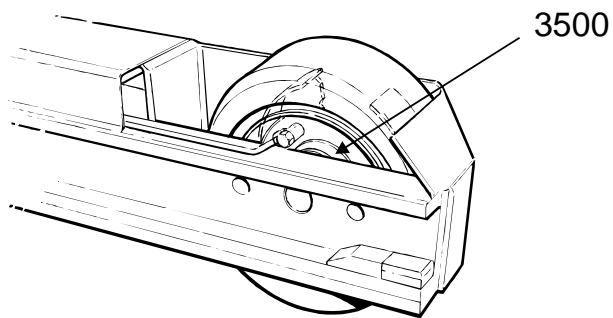
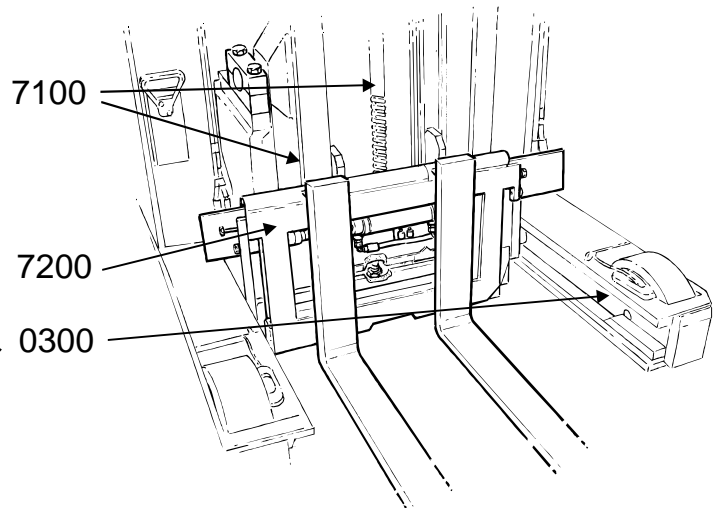
Section
P2

C-code

Service schedule

Version no
001

T-code
301-307,400



F-code Section C-code

RT **P2**

Service schedule

Version no T-code
001 **301-307,400**



Preventive maintenance

Valid from serial number:

T-code	Model	Serial No	Notes
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

Preventive maintenance

1. Maintenance schedule

Pos. no.	Work to carry out							
	Intervals in hours	5	20	80	250	500	1000	3000
	Intervals in Days/Weeks/Months	1D	1W	1M	3M	6M	12M	36 M
0000	Chassis							
0000.1	Check for damage and crack formation	U				X		
0340.1	Check the door lock						X	
0390.1	Check wear and tear on battery lock	U				X		
0510.1	Check the cab hinges and controls						A	
0620.1	Check the seat mounting and the setting devices						X	
0810.1	Check the machine housing and protective roof mounting						X	
0820.1	Check the crushing protection						X	
1700	Drive motor							
1700.1	Check for loose connections						X	
1700.2	Check the mounting bolts						X	
1700.3	Check for abnormal bearing noise						X	
2550	Drive unit							
2550.1	Check the oil level					X		
2550.2	Change the oil			C ²				C
2550.3	Check for abnormal noise and leakage	U				X		
2550.4	Check the mounting on the support arm						X	
2550.5	Lubricate the gear ring						H	
3370	Brakes							
3370.1	Check the brake disc for wear							X
3370.2	Check for play in the released position						X	
3370.3	Check the brake torque						X	



Pos. no.	Work to carry out								
		Intervals in hours	5	20	80	250	500	1000	3000
		Intervals in Days/Weeks/Months	1D	1W	1M	3M	6M	12M	36 M
3500	Wheels								
3530.1	Remove string and other rubbish	U				X			
3530.2	Check for drive wheel wear and the bolts	U				X			
3550.1	Remove string and other rubbish	U				X			
3550.2	Check the support arm wheels' rotation and mounting	U				X			
3550.3	Check support arm wheel for wear	U				X			
4100	Control console								
4100.1	Check the mounting and control console locking mechanism.	U				X			
4100.2	Check the gas cartridge's capacity and locking mechanism	U				X			
5000	Electrical panel								
5000.1	Clean and check the mounting							X	
5000.2	Tighten cable connections			X ⁴		X			
5000.3	Check driver control function	U				X			
5000.4	Check emergency driving function						X		
5000.5	Check error code register and running time	U				X			
5000.6	Check accessory functions	U				X			
5190.1	Check contactor points							X	
5190.2	Check the contactor's movement							X	
5280.1	Check electrical limiting functions						X		

Preventive maintenance

Pos. no.	Work to carry out							
	Intervals in hours	5	20	80	250	500	1000	3000
	Intervals in Days/Weeks/Months	1D	1W	1M	3M	6M	12M	36 M
5110	Battery							
5110.1	Check the electrolyte level (10-15 mm above the cell plates)		X					
5110.2	Check the connections on the battery, truck and charger		X					
5110.3	Check the cell and pole guard		X					
5110.4	Check the fluid density	U		X				
5110.5	Check the temperature					X		
5110.6	Check the locking catch for wear					X		
5110.7	Check the roll bed lock					X		
5110.8	Extract excess fluid from the battery tray			X				
5810	Pump motor							
5810.1	Check for loose connections						X	
5810.2	Check the mounting bolts						X	
5810.3	Check for abnormal bearing noise						X	
5830	Steering motor							
5830.1	Check the mounting bolts						X	
5830.2	Check for abnormal bearing noise						X	
5830.3	Check the steering motor carbon brushes						X	
6000	Hydraulic system							
6110.1	Check the tank for leakage and its mountings						X	
6110.2	Check the oil level					X		
6110.3	Clean or change oil							B
6120.1	Check hoses, pipes and couplings	U				X		
6130.1	Change air and return oil filter			X ¹			X	
6170.1	Check overflow pressure						X	
6170.2	Check lowering speed						X	



Pos. no.	Work to carry out							
	Intervals in hours	5	20	80	250	500	1000	3000
	Intervals in Days/Weeks/Months	1D	1W	1M	3M	6M	12M	36 M
7100	Mast and reach carriage							
7100.1	Check for damage and crack formation						X	
7110.1	Lubricate mast beams on runners and rails in the reach carriage					F		
7120.1	Check for wear on the lifting chains and sprockets					X		
7120.2	Lubricate the lift chains					D		
7150.1	Check for play on the rollers						X	
7190.1	Tighten the mast mounting			X ³			X	
7200.1	Check extra functions					F		
7400.1	Check for wear to the forks and other lifting devices	U				X		
7300	Cylinders							
7300.1	Check for leakage.	U				X		
7300.2	Check the mountings.						X	

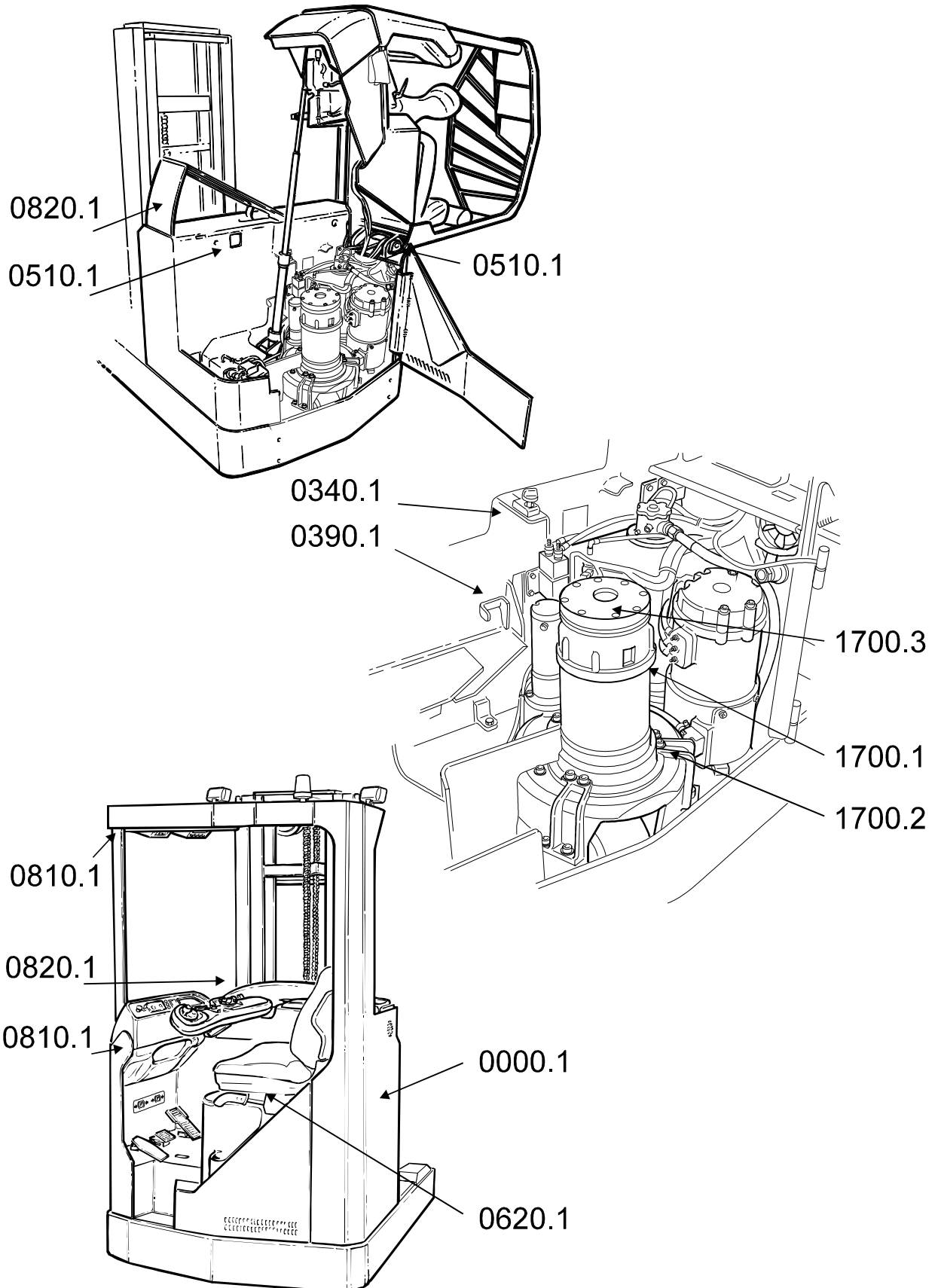
- 1) Change filter after 50 - 100 hrs., and then every 1000 hrs.
- 2) Change oil after 50 -100 hrs., and then every 3000 hrs.
- 3) Check after 50 -100 hrs., and then every 1000 hrs.
- 4) Check after 50 -100 hrs., and then every 500 hrs.

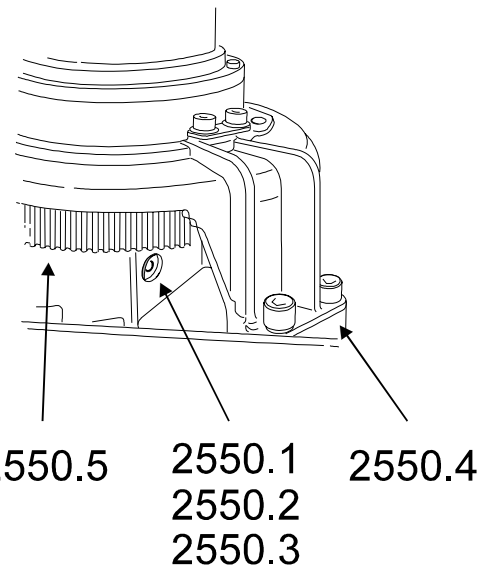
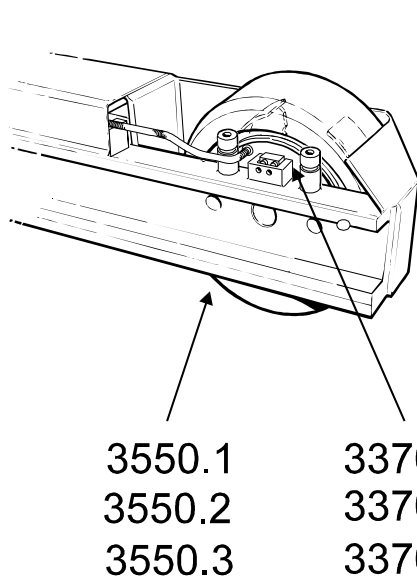
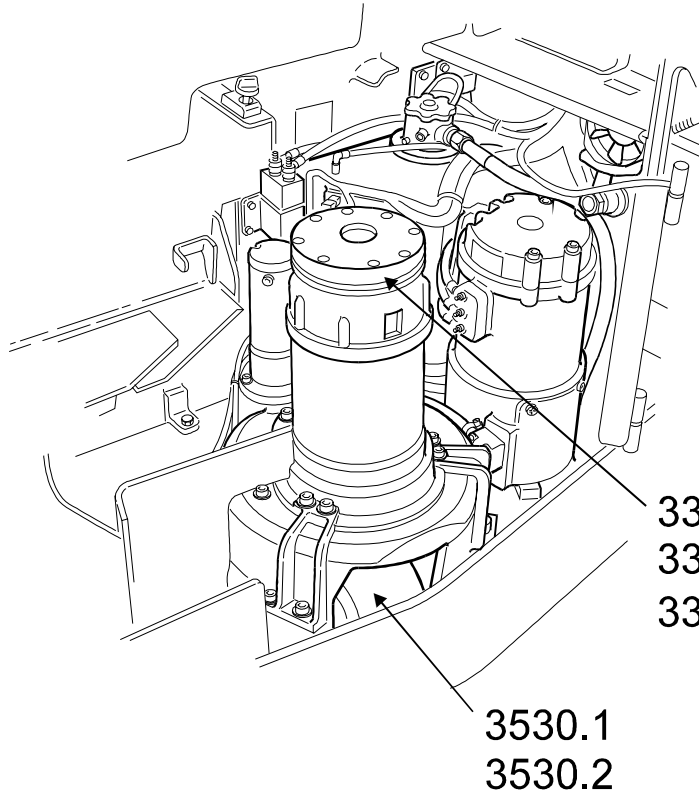
U represents what is found in the chapter "Daily service and function checks" in the Operator's manual and is to be carried out at the 500 hour service.

X shows what is to be done upon the different service occasions. Other letters show grade of oil or grease.

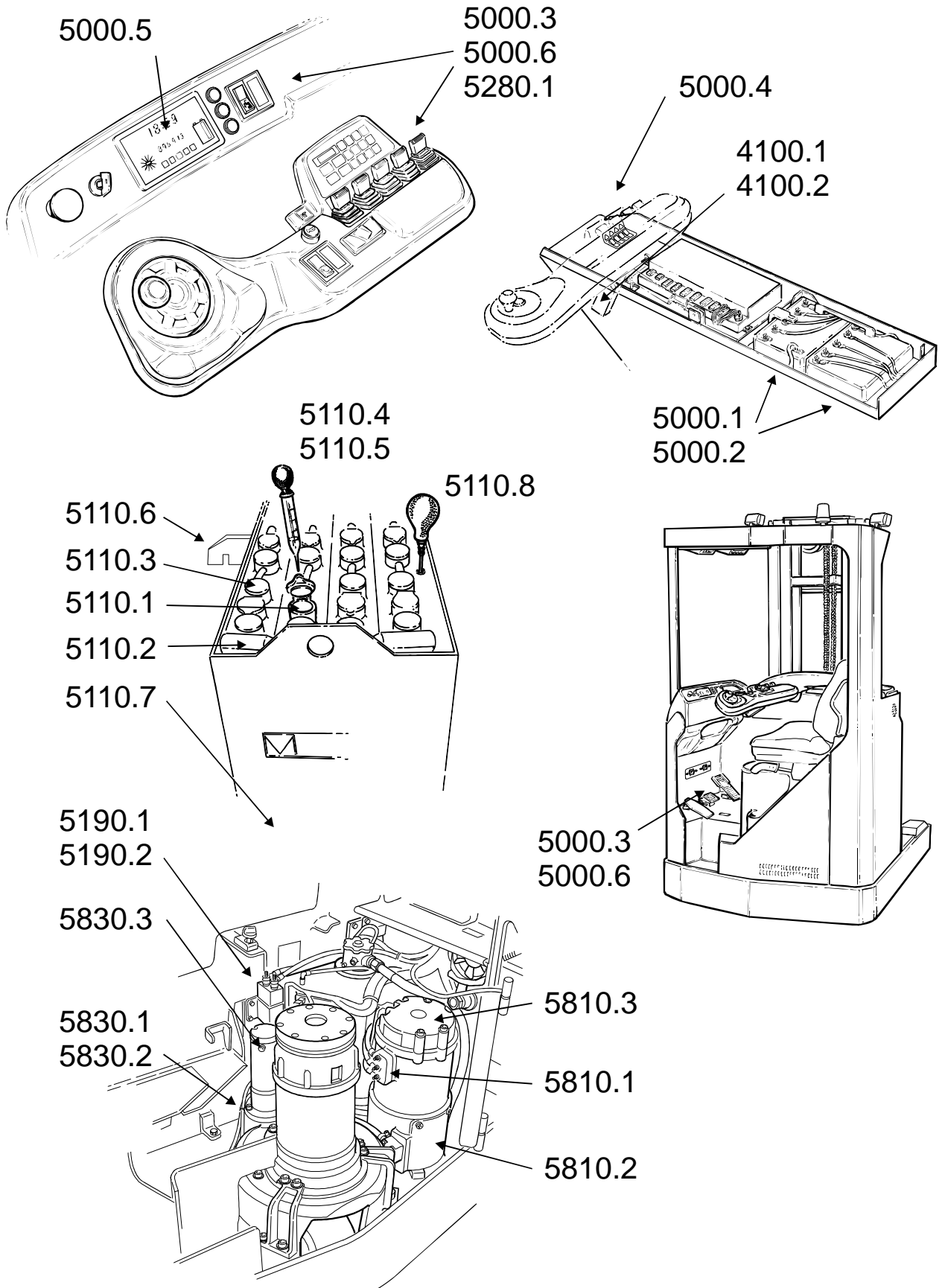
When points are carried out according to higher hour intervals, even the points at lower time intervals are to be carried out, unless otherwise stated above.

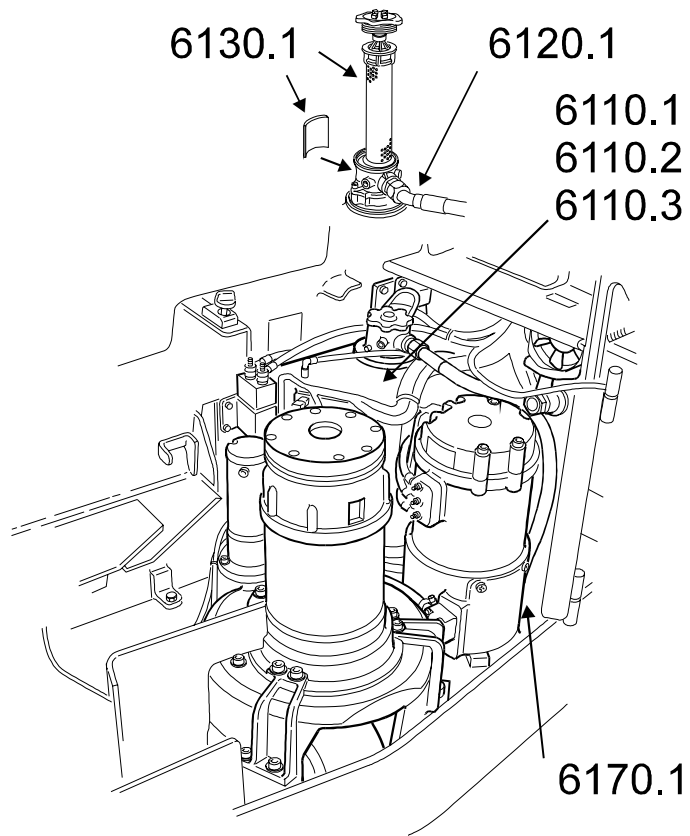
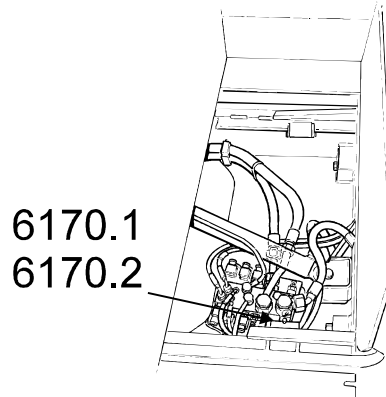
Preventive maintenance



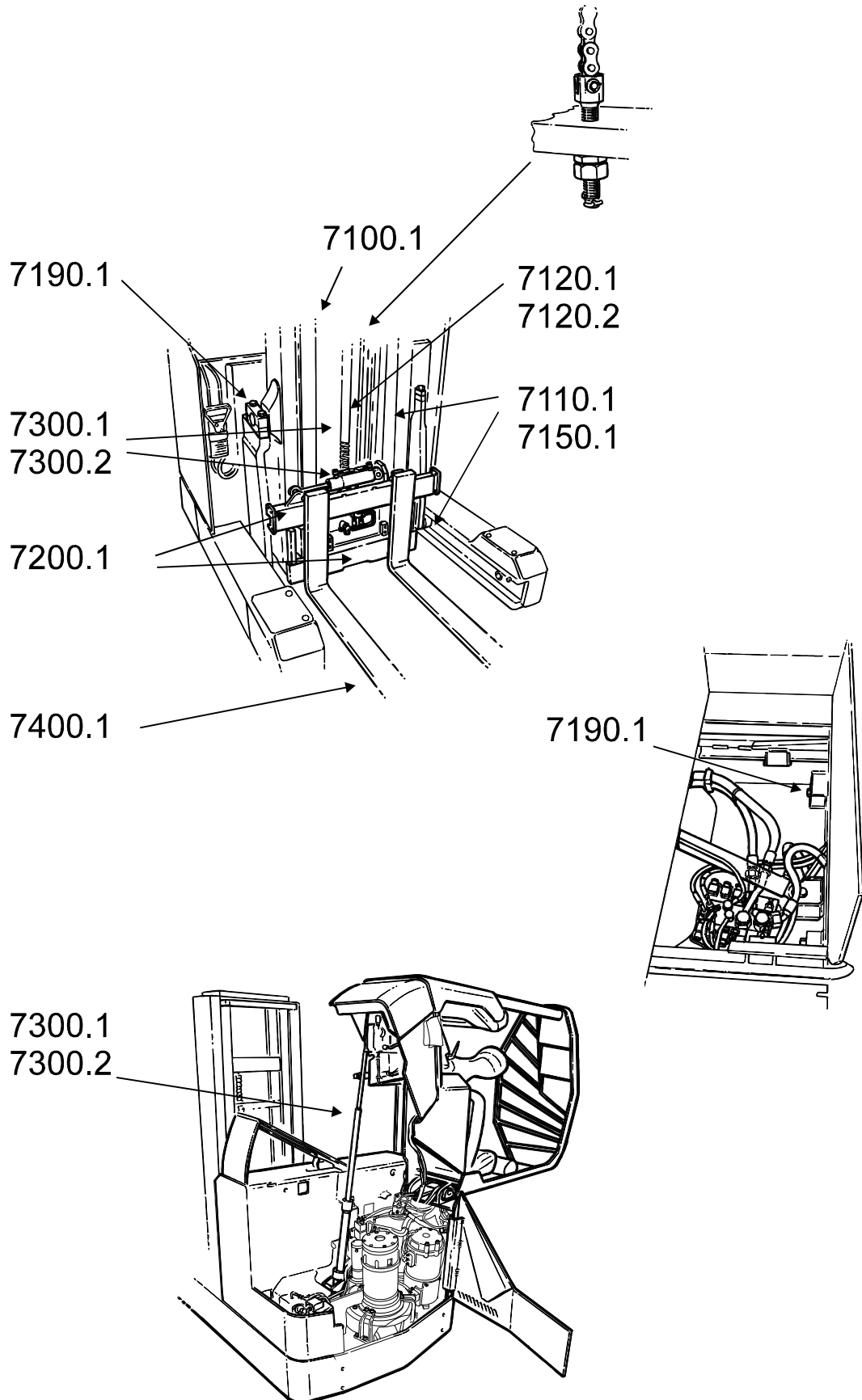


Preventive maintenance





Preventive maintenance



**Oil and grease specification**

Oil and grease specification

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	

Pos.	Lubricant	Specification		Application area
		> - 15°C	< - 15°C	
A	Grease	BT 26777 (Spray)	BT 26777 (Spray)	Bearings and bushings
B	Hydraulic oil	ISO-L-HM32	ISO-L-HV32	Hydraulic system
C	Transmission oil	Hypoid oil SAE 80W/90	Hypoid oil SAE 75W	Gears
D	Grease	BT 26778 (Spray)	BT 26778 (Spray)	Chains and wires
E	Fluid	DOT 3 - 4	DOT 3 - 4	Travel brake
F	Grease	BT 055-70111	BT 055-74320	Side shift forks
G	Grease	Staburags NBU 8EP	Staburags NBU 8EP	Steering bearings
H	Grease	Grafloscan A-G1 (Klüber)	Grafloscan A-G1 (Klüber)	Gear ring

F-code Section C-code

RT P3

Oil and grease specification

Version no T-code
001 301-307,400



Oil and grease specification

Oil and grease specification

Valid from serial number:

T-code	Model	Serial No	Notes
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

Pos.	Lubricant	Specification		Application area
		> - 15°C	< - 15°C	
A	Grease	BT 26777 (Spray)	BT 26777 (Spray)	Bearings and bushings
B	Hydraulic oil	ISO-L-HM32	ISO-L-HV32	Hydraulic system
C	Transmission oil	Hypoid oil SAE 80W/90	Hypoid oil SAE 75W	Gears
D	Grease	BT 26778 (Spray)	BT 26778 (Spray)	Chains and wires
E	Fluid	DOT 3 - 4	DOT 3-4	Travel brake
F	Grease	BT 055-70111	BT 055-74320	Side shift forks
G	Grease	Topas NB 52	Topas NB 52	Steering motor gear
H	Grease	Grafloscan A-G1 (Klüber)	Grafloscan A-G1 (Klüber)	Gear ring

F-code Section C-code

RT P3

Oil and grease specification

Version no T-code
002 401-414



Tools

Valid from serial number:

T-code	Model	Serial No	Notes
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RRE5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

Tools

Version no

001

T-code

401-414

1. Super Seal

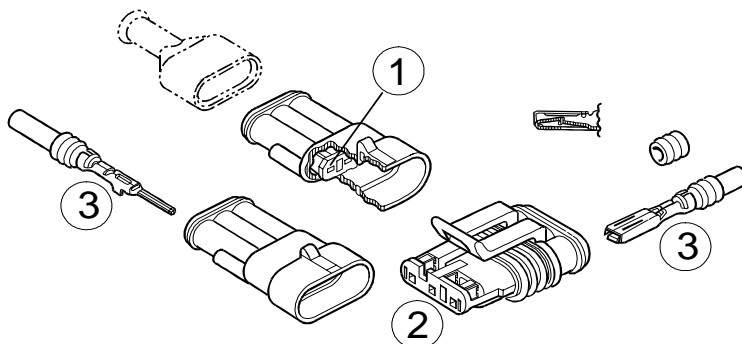
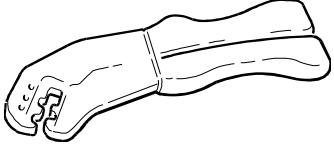
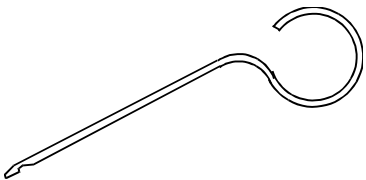
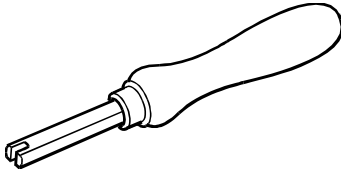
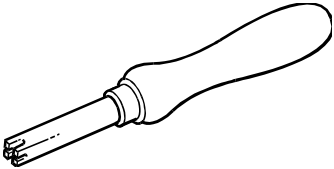
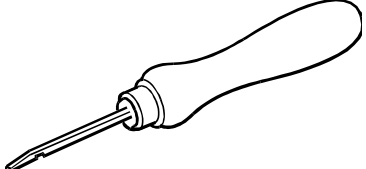


Illustration	Number	Application
	159232	Crimping of pins/sleeves
	159229	Removal of lock (1)
	159230	Insertion of secondary lock, 2 pin (2)
	159231	Insertion of secondary lock, 4 pin (2)
	159228	Removal of pins/sleeves (3)



AMP contacts

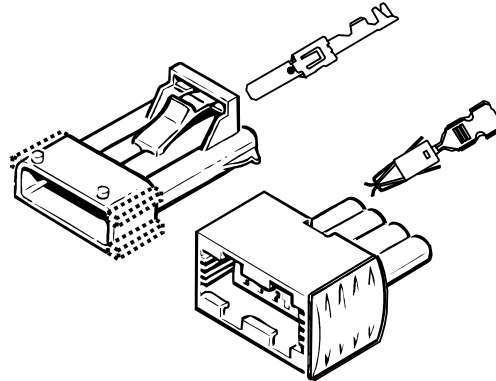
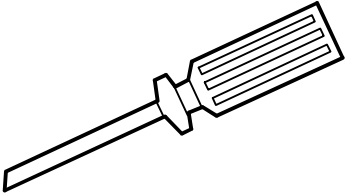
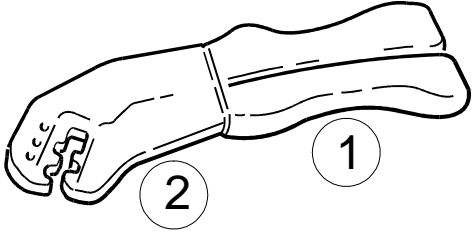
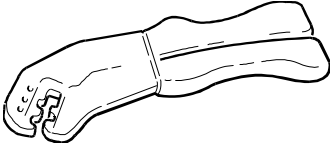


Illustration	Number	Application
	31-151080	Removal of pins/sleeves
	1=163787 2=163788	Crimping of sleeves
	1=163789 2=163790 3=163791	Crimping of pins 1: For 0.2-0.5 mm ² 2: For 0.5-1.0 mm ² 3: For 1.5-2.5 mm ²

Tools

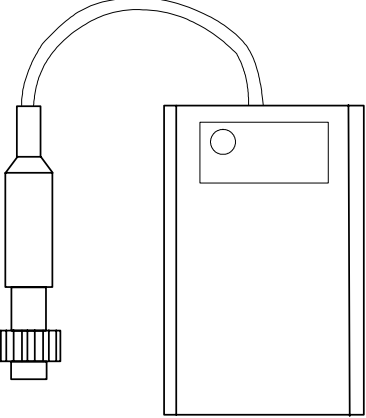
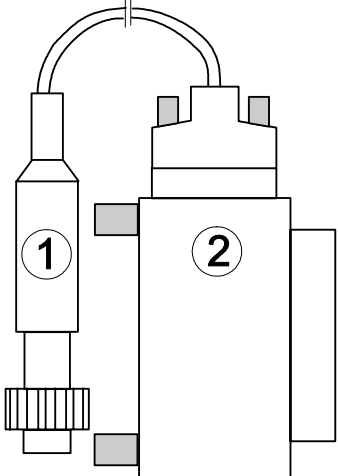
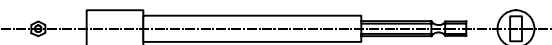
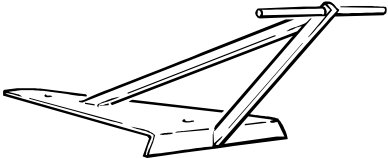
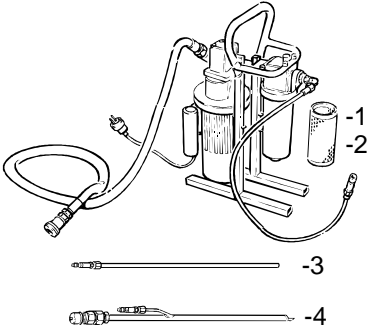
Version no

001

T-code

401-414

Diverse tools

Illustration	Number	Application
	156263	Service instrument (CAN)
	1=163793 2=163792	Service instrument for program alteration
	08-15444	Drive motor/Pump motor
	31-150030	Cab tilt tool
	Kpl=V1015191 1=V10-15191-1 2=V10-15191-2 3=V10-15191-3 4=V10-15191-4	Oil cleaning 1=Filter for cleaning 2=Filter for removal of water 3=Pipe 4=Pipe



F-code
RT

Section
S

C-code

Content, S

Issued by
Parts

Approved by
K Hallman

Version no
001

T-code

Content, S

1. Service instructions

		C-code
S 0.0	Chassis	0000
S 1.0	Primary motor	1000
S 2.0	Transmission/Drive gear	2000
S 3.0	Brakes/Wheels/Band	3000
S 4.0	Steering	4000
S 5.0	Electrical functions	5000
S 6.0	Hydraulics/Pneumatics	6000
S 7.0	Working functions, lift mast/Cylinders	7000
S 8.0	Peripheral equipment	8000
S 9.0	Accessories/Extra equipment	9000

F-code

RT

Section

S

C-code

Content, S

Version no

001

T-code



F-code
RT

Section
S0

C-code
0510

Cab attachment

Issued by
Parts

Approved by
H Forsman

Version no
001

T-code
305-307,400

Cab attachment

Valid from serial number:

T-code	Model	Serial No	Notes
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	

1. General

Trucks with a tilting cab are fitted with a cab tilt cylinder. The cylinder is located behind the drive unit. It is attached to the battery compartment wall and the under side of the cab.

Cab attachment

2. Dismantling

Make sure there is sufficient room to tilt the cab before starting work.

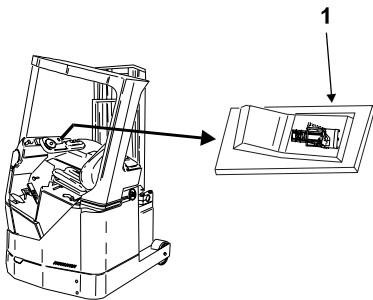


WARNING!

Risk of crushing.

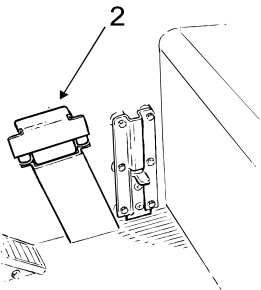
The risk for personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back.

Ensure that no one is in the motor compartment when tilting the cab.



The cab must be tilted 90 degrees for service in the motor compartment. While tilted, only the cabs lift/lower function is operational and then only at crawl speed.

- Press switch (1) to lower the cab while at the same time turning the key. The display shows 6 lines
- Move the fork lifts hydraulic lever backwards
- When the cab stops (at 15 degrees), loosen the catch (2) to release the cab
- Continue pulling the lever backwards until the cab stops (at 45 degrees)



WARNING!

Falling cab!

The cab can fall without dampening when tilted over 45 degrees.

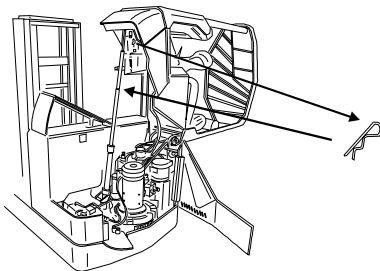
The cab is heavy so make sure the person receiving the cab is in control of the situation. Use crane if possible.

- Take hold of the protective roof and tilt the cab to 90 degrees

NOTE!

Falling cab!

Insert the pin (which is located under the seat) in the cylinder piston to avoid the cab accidentally falling backwards during service.



- Unlock and swing open the door
- Unscrew the return hose from the tank
- Plug the return hose at the tank
- Place the cab on blocks (e.g. pallets) or use a crane to prevent the cab from hanging on the cylinder
- Undo the nuts holding the cylinder in place on the cab
- Unscrew and remove the cylinder console from the battery compartment wall



- Pull out the cylinder in order to reach the hose connection
- Undo the hydraulic hose
- Remove the console from the cylinder

2.1. Dismantling the cylinder

- Place the lower stop in a vice, allowing the upper part to rest against a yoke so that the cylinder is lying in a horizontal position
- Knock the piston rod housing carefully with a rubber hammer
- Unscrew the piston rod housing using a pipe wrench
- Carefully remove the piston rod from the cylinder making sure not to damage the thread. Place the piston rod on a clean soft surface
- Knock out the top sleeve with a rubber hammer

2.2. Dismantling the piston rod seal and support ring

- Force a screw driver into the seal without marking the piston in any way

NOTE!

If the piston is scratched at all it must be replaced to avoid leakage.

- Lift the piston rod seal very carefully
- Carefully cut away the piston rod seal with a knife, making sure not to damage the piston
- Remove the support ring

2.3. Assembling the piston rod seal and support ring

- Fit the support ring and the piston rod seal on the piston

Cab attachment

2.4. Dismantling the piston

- Remove the piston rod seal plus the support ring
- Knock and, if necessary, heat the piston
- Unscrew the piston using pipe wrench 08-15393
- Brush away the old sealant

2.5. Assembling the piston

- Apply **OMNI 230** to the thread
- Screw the piston in place using a hook wrench
- Be sure to wipe away all excess adhesive

2.6. Assembling the cylinder

- Place the piston rod in the cylinder
- Fit the top sleeve on the piston rod using a rubber hammer
- Screw the top sleeve to the cylinder a few turns
- Apply sealant **FD 1042** to the thread
- Tighten using a hook wrench

NOTE!

The drying time for the sealant is four hours, before which the cylinder must not be used.



3. Assembly

- Fit the console on the cylinder
- Attach the hydraulic hose
- Screw the cylinder console in place on the battery compartment wall
- Remove the plug from the return hose
- Attach the return hose to the tank
- Press switch (1) to lower the cab while at the same time turning the key. The display shows 6 lines
- Move the fork lifts hydraulic lever backwards until the cylinder is fully extended
- Attach the cylinder to the cab
- Swing the door shut and lock it



WARNING!

Risk for crushing!

The risk for personal injury is very great if the cab tilt cylinder does not have full oil pressure when the cab is tilted back. Check the oil pressure in the tilt cylinder.

Ensure that no one is in the motor compartment when tilting the cab.



WARNING!

Risk for crushing!

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab. Ensure no one is in the motor compartment when tilting the cab.

- Remove the pin from the cylinder piston
- Take hold of the protective roof and tilt the cab to the 45 degree position
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position

F-code Section C-code
RT **S0** **0510**

Cab attachment

Version no T-code
001 **305-307,400**



Driver protection

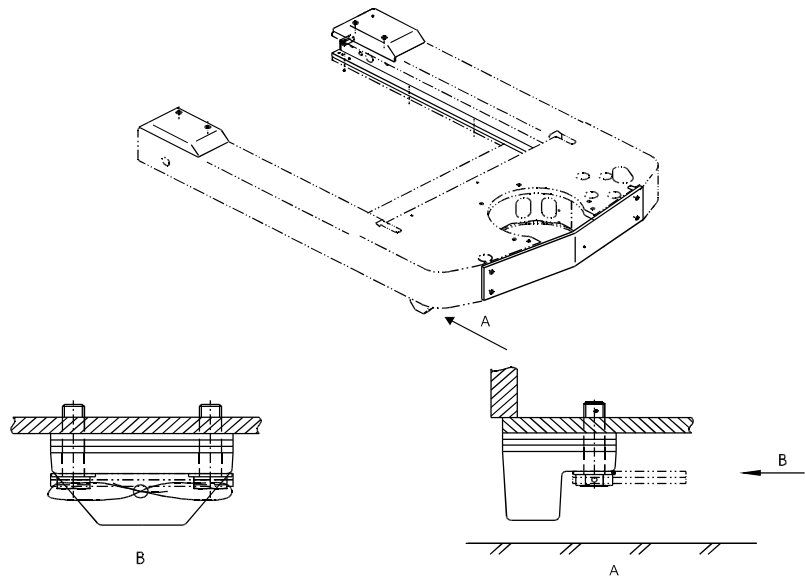
Valid from serial number:

T-code	Model	Serial No	Notes
301	N1-N3, N1C-N3C/14	265200AA-	
302	B1-B3, B1C-B3C/14	265200AA-	
303	B4-B6, B4C-B6C/14	265200AA-	
304	B7-B8, B7C-B8C/14	265200AA-	
305	E1-E3, E1C-E3C/14	265200AA-	
306	E4-E6, E4C-E6C/14	265200AA-	
307	E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA	
401	RR N1-N3/15	301518AA-	AC/ACi
402	RR N1C-N3C/15	301518AA-	AC/ACi
403	RR B1-B3/15	301518AA-	AC/ACi
404	RR B1C-B3C/15	301518AA-	AC/ACi
405	RR B5-B6/15	301518AA-	AC/ACi
406	RR B5C-B6C/15	301518AA-	AC/ACi
407	RR B7-B8/15	301518AA-	ACi
408	RR B7C-B8C/15	301518AA-	ACi
409	RR E1-E3/15	301518AA-	AC/ACi
410	RR E1C-E3C/15	301518AA-	AC/ACi
411	RR E4-E6/15	301518AA-	AC/ACi
412	RR E4C-E6C/15	301518AA-	AC/ACi
413	RR E7-E8/15	301518AA-	ACi
414	RR E7C-E8C/15	301518AA-	ACi

Driver protection

1. General

Tilt stops are standard on certain trucks, and optional extras on others in order to increase their capacity. Tilt stops are located on the rear corners of the support arms and consist of lugs, shims, bolts, washers and sealing.

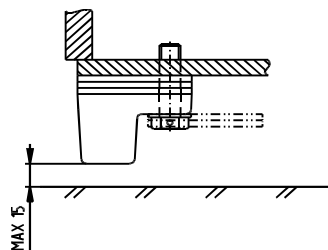


2. Tilt stops

2.1. Maintenance

To ensure the proper functioning of the truck it is important that the distance between the tilt stops and the floor is checked regularly.

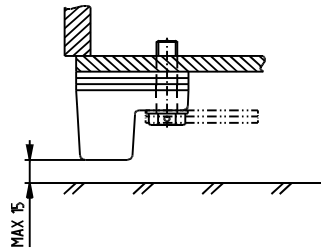
- Park the truck on a flat surface
- Measure the distance between the tilt stop and the floor (max. 15 mm)



- If the tilt stop scrapes the floor or has a greater distance from the floor than 15 mm it must be adjusted



- Lift the back edge of the support arm using a jack and place a block or similar under to prevent tipping
- Break the sealing
- Remove the bolts and washers
- Re-shim so that the distance between the floor and the tilt stop is as close to 15 mm as possible. This distance must not be greater than 15 mm



- Fit any unused shims between the support lug and the bolt's washer.
- Fit the bolts and washers
- Seal

2.2. Removal of tilt stops

Certain tilt stops may be removed. Make careful note of the table below.

Truck	Lift height	Notes
RR N1	-5700 mm= max	Tilt stops may be removed
RR N2	-6300 mm= max Over 6300 mm	Tilt stops may be removed Tilt stops must not be removed
RR N3	-7000 mm= max Over 7000 mm	Tilt stops may be removed Tilt stops must not be removed
RR BE3		Tilt stops must not be removed
RR B/E7	-7000 mm	Tilt stops may be removed
RR B/E8	-8000 mm	Tilt stops may be removed

F-code Section C-code
RT S 0.0 0840S 0

Driver protection

Version no T-code
001 301-307,400301-



F-code
RT

Section
S1

C-code
1700

Drive motor

Issued by
Parts

Approved by
K-G Andersson

Version no
001

T-code
401-414

Drive motor

Valid from serial number:

T-code	Model	Serial No	Notes
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

Drive motor

Version no

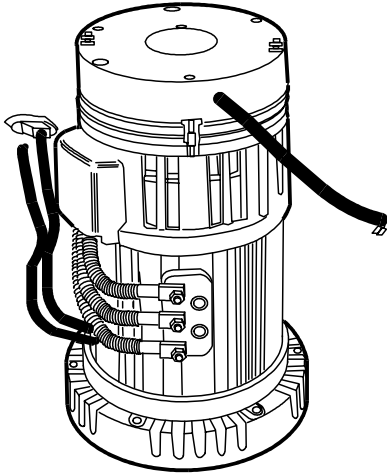
001

T-code

401-414

1. General

The drive motor is a three phase AC motor. The motor contains a thermoelement which measures the motors temperature, plus a bearing with an integrated measuring unit to measure the direction and speed of rotation.

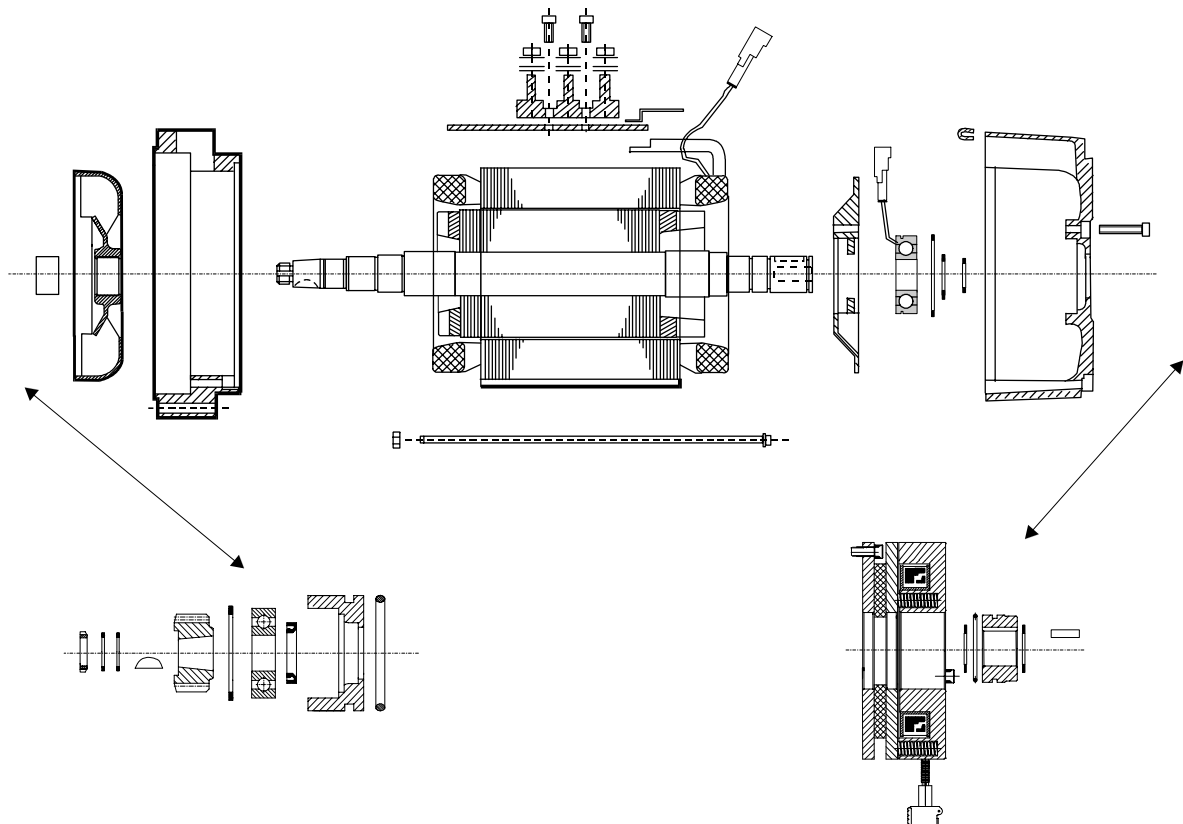


There are two sizes of drive motor on the truck.

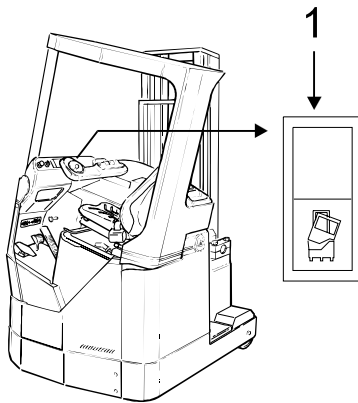
On N1-3 and B/N1-3 model D112 - 130 is used.

On B/N5-8 model D112 - 165 is used.

2. Drive motor dismantled



3. Dismantling/assembling drive motor



Trucks without tilting cab

- Undo the knob to the side of the drivers seat and open the door.

Trucks with tilting cab

Make sure there is sufficient room to tilt the cab before starting work

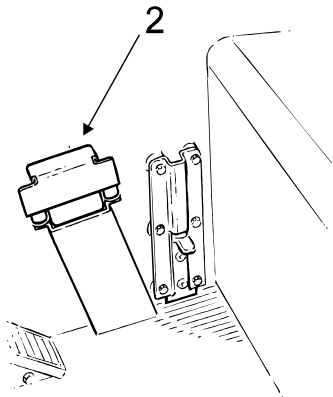


WARNING!

Risk of crushing.

The risk for personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back.

Ensure that no one is in the motor compartment when tilting the cab.



During service in the motor compartment the cab must be fully tilted back.

While tilted, only the cabs lift/lower function is operational and then only at crawl speed.

- Press switch (1) to lower the cab while at the same time turning the key. The display shows 6 lines.
- Move the fork lifts hydraulic lever backwards.
- When the cab stops (at 15 degrees), loosen the catch (2) to release the cab.
- Continue pulling the lever backwards until the cab stops (at 45 degrees).



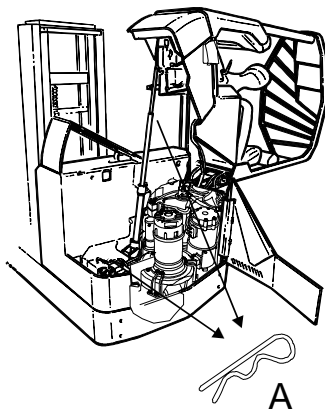
WARNING!

Falling cab!

The cab can fall without dampening when tilted over 45 degrees.

The cab is heavy so make sure the person receiving the cab is in control of the situation. Use crane if possible.

- Take hold of the protective roof and tilt the cab fully back.



NOTE!

Falling cab!

Insert the pin (which is located under the seat) in the cylinder piston to avoid the cab accidentally falling backwards during service.

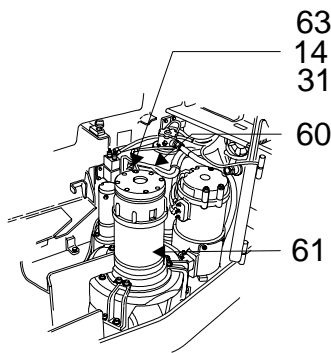
Drive motor

Version no

001

T-code

401-414



3.1. Dismantling the drive motor

- Cut the voltage by turning the key off and removing the battery plug.
- Disconnect the temperature, brake and speedometer cables (14, 31, 63), and power cables (60) from the motor 61
- Attach a lifting eye bolt to the motor.
- Undo the screws (62) holding the motor in place.
- Lift out the motor with the help of a crane and place on a clean surface.

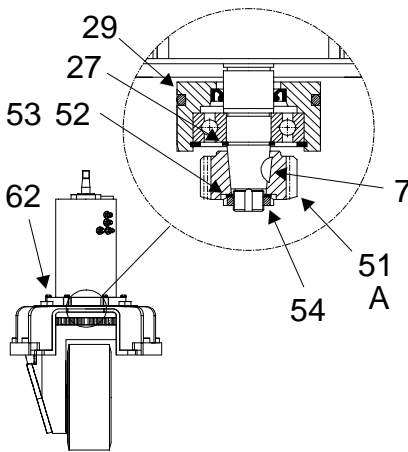
NOTE!

Risk of damaging the gear wheel (A).

The gear wheel on the end of the motor can be damaged.

Lift the motor out with care.

- Cover the hole in the gear when the motor has been removed so that foreign objects cannot fall in.

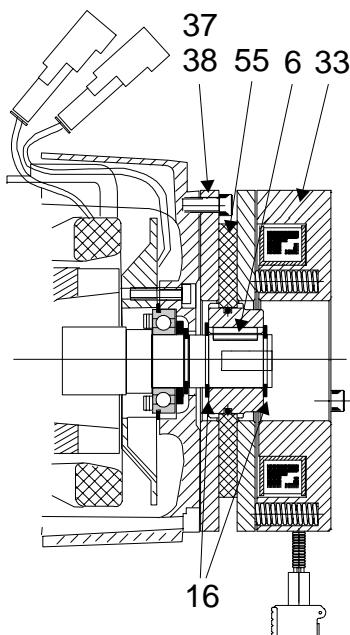


Dismantling the gear wheel

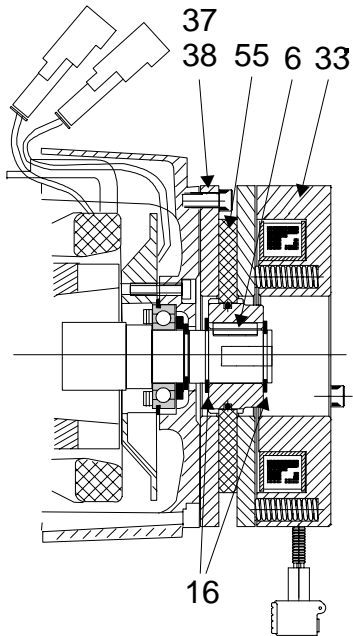
- Bend the locking wing on the locking washer (53) on the end of the motor and undo the nut (54) and remove the washer (52).
- Dismantle the gear wheel (51) with the help of a gear puller.
- Remove the key (7) holding the gear wheel (51) in place.
- Remove the locking ring (27) holding the bearing cage (29) in place.
- Remove the bearing cage (29) with the help of a gear puller.

Dismantling the brake

- Undo and remove the screws (37), washers (38) and remove the brake (33).
- Remove the outer locking ring (16) from the crank shaft.
- Remove the brake hub, key (6) and inner locking ring (16)



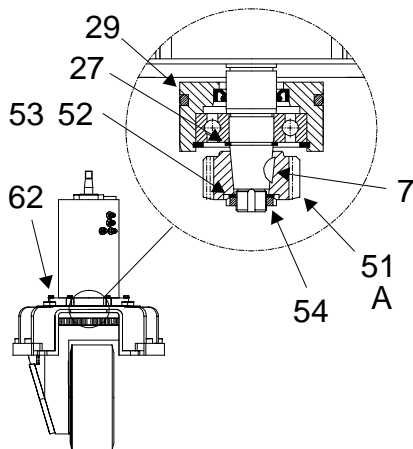
3.2. Assembling the drive motor



Assembling the brake

- Fit the inner locking ring (16) and key (6).
- If the O-ring is damaged it must be replaced.
- Make sure the friction disc (55) is centred in relation to the magnet house before trying to fit the brake. It may be necessary to charge the magnet coil with 48 V D.C. in order to position the brake disc.
- Fit the brake unit to the motor. Check that the splines on the friction disc are not damaged during assembly.
- Tighten the screws (37) and washers (38) holding the brake unit in place.
- Fit the outer locking ring (16)

Assembling the gear wheel



- Fit the gear cage (29) to the crank shaft.
- Fit the locking ring (27)
- Fit the key (7)
- Fit the gear wheel (51).
- Fit the washer (52) and a new locking washer (53) and the nut (54).
- Tighten with a torque of 60 Nm
- Bend one of the locking wings on the locking washer.
- Attach a lifting eye bolt to the crank shaft and lift it into the gear with the help of a crane.

NOTE!

Risk of damaging the gear wheel (A).
The gear wheel on the motor can be damaged.
Lift the motor out with care.

- Screw the motor (61) to the gear with a torque of 20 Nm
- Connect the temperature, brake and speedometer cables (14, 31) and the power cables (60) to the motor.
- Remove the lifting eye bolt.

Drive motor

Version no

001

T-code

401-414

Truck with tilting cab

Ensure that no one is in the motor compartment when tilting the cab.

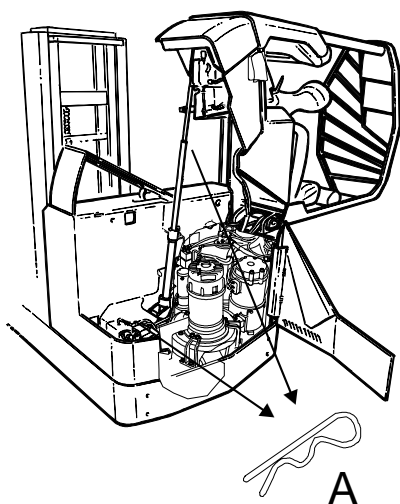


WARNING!

Risk for crushing!

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.

Ensure no one is in the motor compartment when tilting the cab.

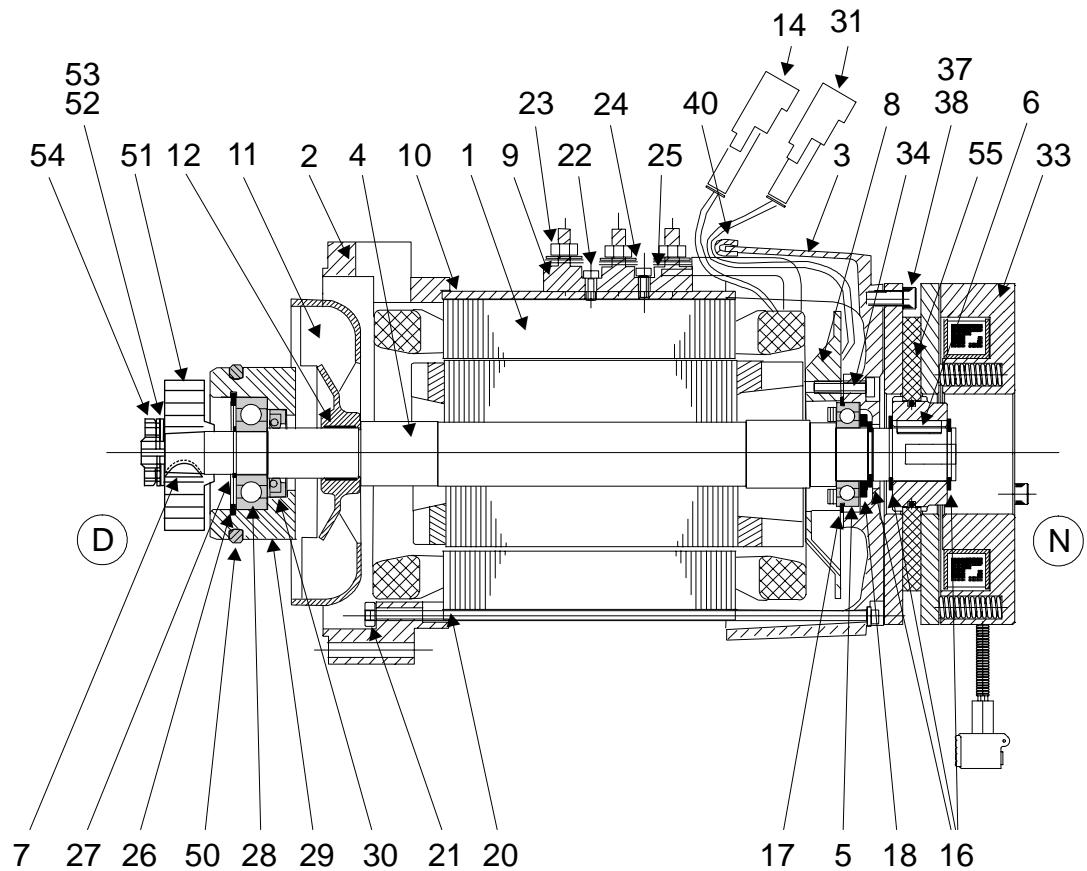


- Remove the pin from the cylinder piston
- Take hold of the protective roof and tilt the cab to the 45 degree position
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position

Truck without tilting cab

- Close the door and tighten the knob
- For adjustment of brakes, see chapter 3100

4. Replacing the bearing



4.1. Dismantling

N-side

- Remove the stud screws (20) using tool 08-15444
- Remove the screws (34)
- Remove the shield (3)
- Remove the locking ring (16) and support ring (18)
- Remove the bearing (5) with a claw puller
- Remove the bearing cap (8)

D-side

- Remove the locking ring (26) from the bearing housing
- Remove the sealing washer and remove the bearing (28) using a Kukko ball bearing puller
- If the seal (30) is leaky it should be removed

Drive motor

4.2. Assembling

Before assembling, make sure that all parts are clean and whole.

N-side

- Fit the bearing cap (8) on the crank shaft
- Press the bearing (5) onto the rotor axle
- Fit the axle collar (17) using assembly sleeve XXXX
- Fit the washer (18) and locking ring (16)
- Assemble the bearing cap (8) and shield (3) using the screws (34) and a torque of 6 Nm
- Fit the stud screws (20) with a torque of 5 Nm

D-side

- Fit the seal (30) to the bearing housing (29)
- Press the bearing (28) into the bearing housing
- Fit the locking ring (26)



Transmission, Gear

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C	265200AA-	
302	RR B1-B3, B1C-B3C	265200AA-	
303	RR B4-B6, B4C-B6C	265200AA-	
304	RR B7-B8, B7C-B8C	265200AA-	
305	RR E1-E3, E1C-E3C	265200AA-	
306	RR E4-E6, E4C-E6C	265200AA-	
307	RR E7-E8, E7C-E8C	265200AA-	
400	RR Cold store	265200AA-	

1. General

There are two types of drive units fitted to this range of trucks. These units are each attached to the chassis by 6 bolts.

The drive shaft, together with motor, brake and transmitter for measuring speed, steering wheel direction and travel direction make up a complete drive unit.

The drive unit is equipped with 360° steering.

The gear in this truck is a 2-step angular gear with conical roller bearings for the drive shaft and pinion. The bearings are pre-tensioned approx. 5/100 of a millimeter to minimize the risk of play in the bearings.

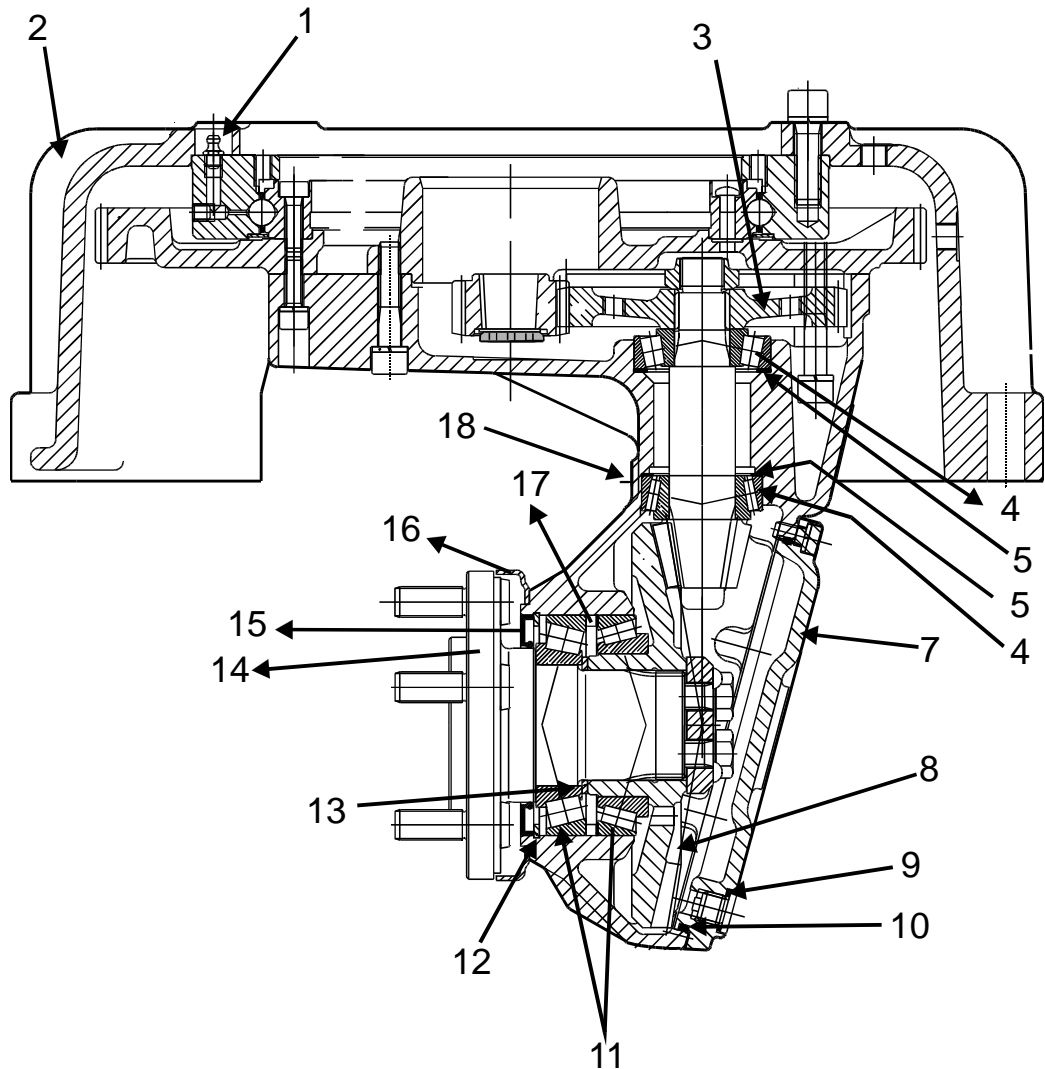
This service instruction covers descriptions for dismantling the gear from the truck and re-fitting the gear, filling/exchanging of oil and measures, in case of leakage. A complete overhaul of the gear is such an extensive job that it should only be done in a workshop by specially trained personnel.

Transmission, Gear

2. Gear components/data

The main components and data of the gear are shown in the picture and tables below.

2.1. Component identification



Pos No.	Component
1	Nipple, ventilation
2	Upper cover
3	Gear wheels, primary step
4	Pinion bearings
6	Shims, pinion bearings



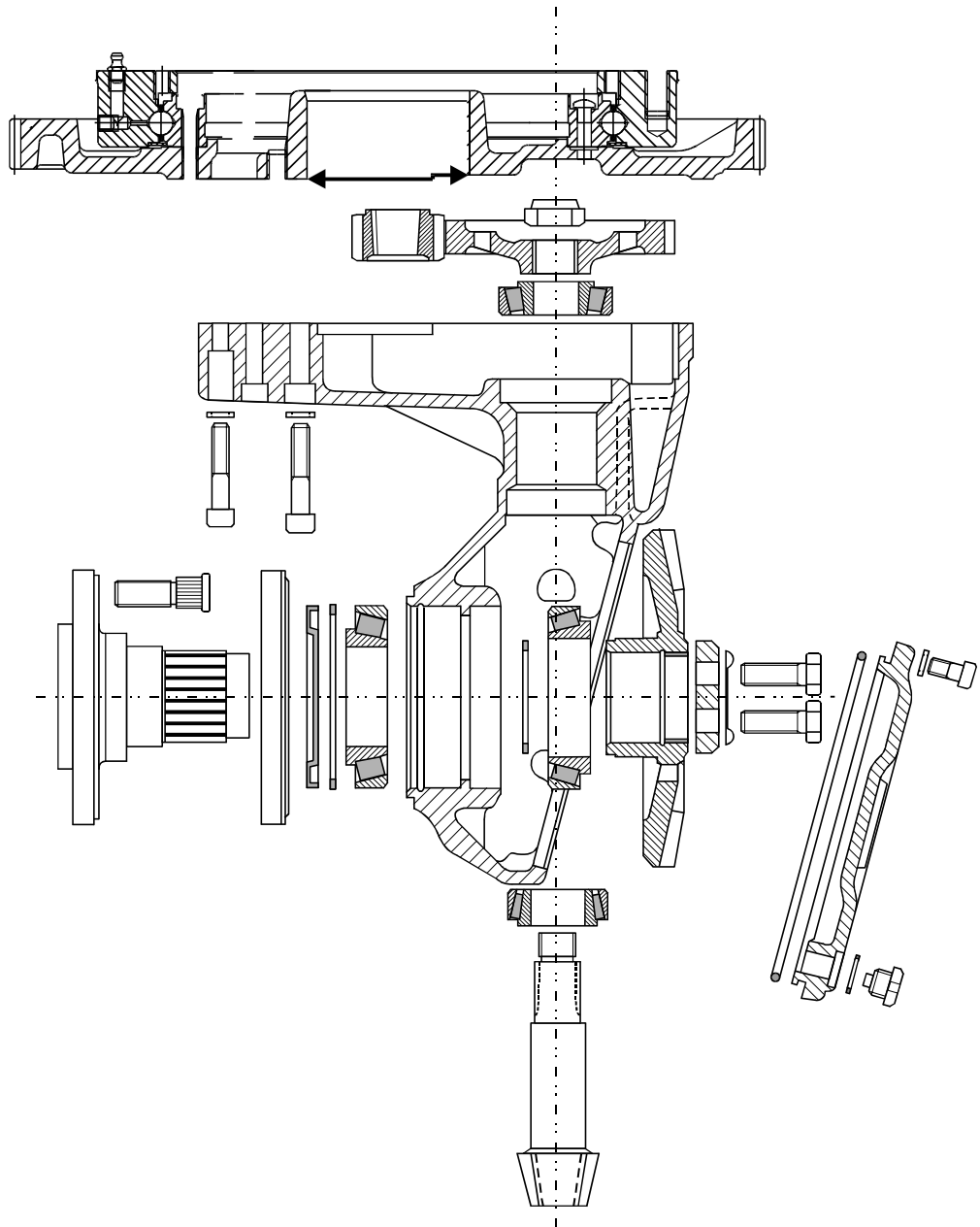
Pos No.	Component
6	Pinion
7	Lower cover
8	Crown wheel
9	Drainage plug
10	O-ring
11	Drive shaft bearings
12	Locking ring
13	Spacer
14	Drive shaft
15	Drive shaft sealing
16	Seal protection
17	Shims, drive shaft bearings
18	Gear housing

2.2. Technical gear data

Truck type	RT
Gear, type	2-step angular
Gear ratio	16,13:1
Oil volume	Se chapter 4.1
Oil type	Hypoid oil
Oil	SAE W/90

Transmission, Gear

2.3. Dismantled gear



3. Replacement of drive motor/driving gear

Trucks without tilting cab

- Undo the knob to the side of the drivers seat and open the door

Trucks with tilting cab

Make sure there is sufficient room to tilt the cab before starting work

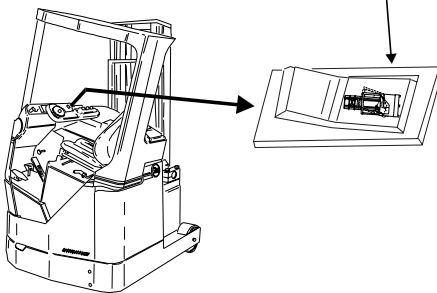
WARNING!

Risk of crushing.

The risk for personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back. Ensure that no one is in the motor compartment when tilting the cab.

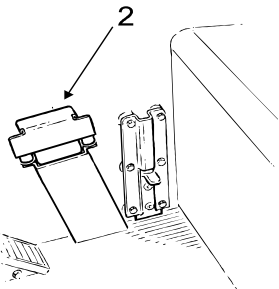


1



The cab must be tilted 90 degrees for service in the motor compartment. While tilted, only the cabs lift/lower function is operational and then only at crawl speed

- Press switch (1) to lower the cab while at the same time turning the key. The display shows 6 lines
- Move the fork lifts hydraulic lever backwards
- When the cab stops (at 15 degrees), loosen the catch (2) to release the cab
- Continue pulling the lever backwards until the cab stops (at 45 degrees)



WARNING!

Falling cab!

The cab can fall without dampening when tilted over 45 degrees.

The cab is heavy so make sure the person receiving the cab is in control of the situation. Use crane if possible.

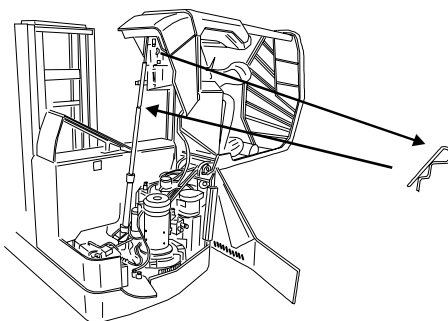


- Take hold of the protective roof and tilt the cab to 90 degrees

NOTE!

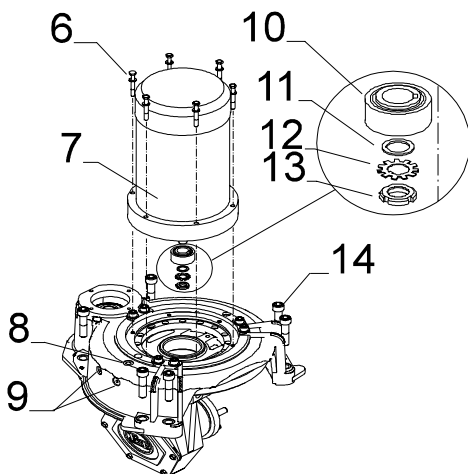
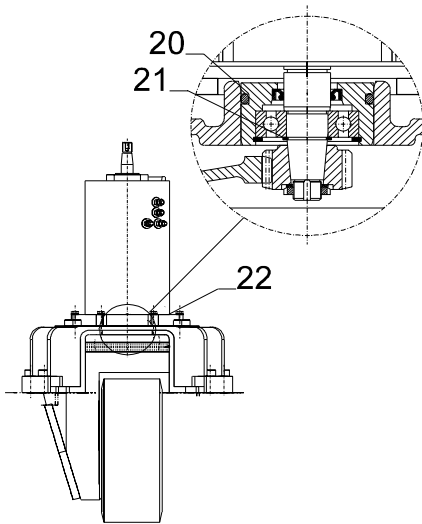
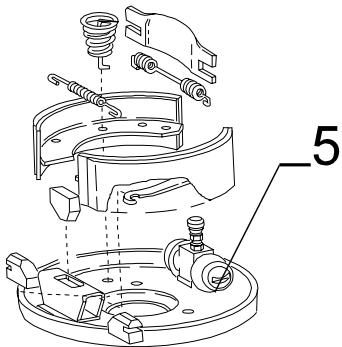
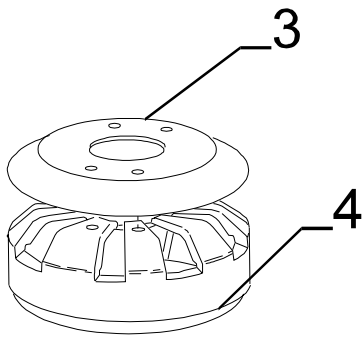
Falling cab!

Insert the pin (which is located under the seat) in the cylinder piston to avoid the cab accidentally falling backwards during service.



Transmission, Gear

3.1. Dismantling the drive motor



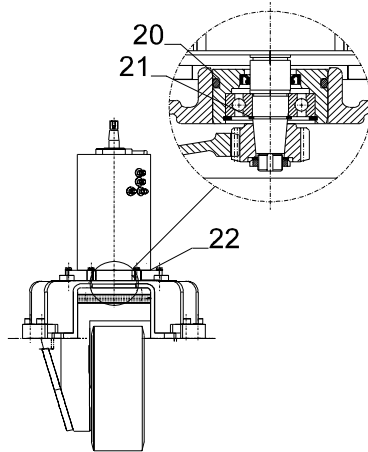
- Disconnect the seat switch under the seat and secure it with a jumper (159747). You can now work on the truck without having to sit in the drivers seat
- Remove the four screws holding the cover plate (3) over the brake drum (4) plus the locking nuts on the crankshaft
- Turn on the power using the key then press the button for the parking brake to loosen the brake
- Remove the brake drum (4) with tool no. 08-11780
- Unscrew the 4 screws holding the brake shield (5) in place and lift it off
- Switch off the power with the key and disconnect the battery connector
- Remove the motor, carbon brush, fan and sensing device cables from the drive motor (7)
- Remove the sensing device (22) from the drive motor (7)
- Remove the motor's fixing screws (6) and attach a lifting eye bolt to the end of the crank shaft
- Lift out the motor with the help of a crane

NOTE!

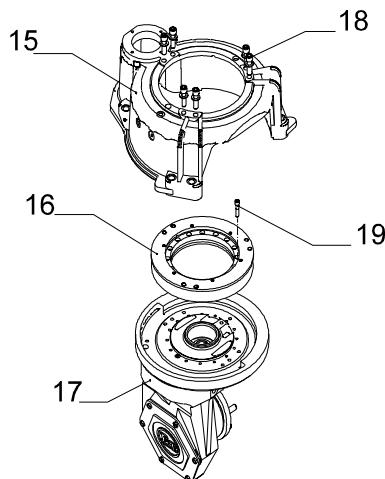
*Risk of damage to gear wheel.
The gear wheel in the motor end can be damaged.
Lift out the motor with care.*

- Cover the hole in the driving gear when the drive motor has been removed to prevent any foreign matter from falling in
- Bend up the locking tab on the locking washing (12) on the end of the steering motor and unscrew the nut (13) holding the gear wheel (10) in place
- Remove the gear wheel (10) using a puller
- Remove the key which holds the gear wheel in place
- Remove the locking ring (21) which holds the bearing bracket (20) in place
- Remove the bearing bracket (20) with the help of a puller

3.2. Dismantling the driving gear



- Remove the four screws holding the fender in place and lift it off
- Lift the machine using a jack and place it on blocks
- For trucks equipped with a steerwheel indicator: disconnect the indicator for the steerwheel's centre (8) and steerwheel direction (9)
- Disconnect the steering motor's contact and remove the contact from its socket on the tank plate
- Undo the screws on the steering motor and remove it from the driving gear
- Remove the six bolts (14) which hold the driving gear cover (15) to the support arm
- Remove the driving gear (17) and the cover (15) from the truck
- Unscrew and remove the drive wheel
- Undo the six bolts (18) holding the driving gear to the cover (15) and remove the cover (15)
- Replacement of steering bearing (16): Undo the fifteen socket head bolts (19) and remove the steering bearing (16) from the driving gear (17)



3.3. Assembling the driving gear

- Replacement of steering bearing (16): Fit the new steering bearing (16) in place in the driving gear (17) with the fifteen socket head bolts (19) using LOCTITE 242 and a torque of 23 Nm
- Screw the new driving gear (17) in place on the cover (15)
- Screw the drive wheel in place with a torque of 130 NM
- Put the driving gear (17) in position in the truck
- Screw the driving gear (17) in place on the support arm together with the cover (15) using the six bolts (14) and a torque of 222 Nm
- Fit new O-rings and, if necessary, a new seal on the steering motor
- Screw the steering motor in place on the driving gear cover and reconnect the contacts

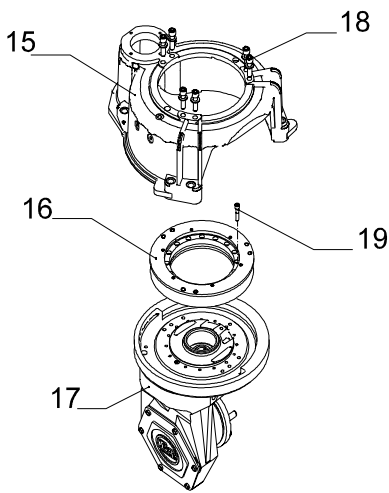
Transmission, Gear

Version no

001

T-code

301-307,400



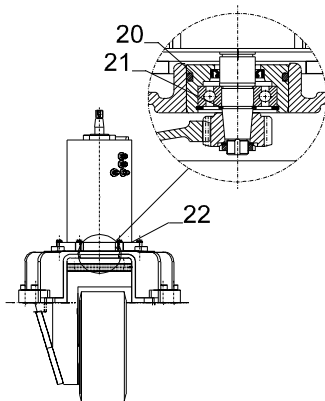
- For trucks equipped with a steering indicator: Turn the steering wheel until an edge is visible through the hole for the indicator for the steering wheel's centre (8)
- Screw the indicator for the steering wheel's centre (18) in place so that it reaches bottom against the edge. It must then be unscrewed 1 1/2 turns and locked in place with the locking nut
- Screw the steering wheel's direction indicators (19) (blue contact in the hole nearest the fender and grey contact nearest the battery) in place so that they reach bottom. Then turn them back 1 1/4 turns and lock them in place with the locking nut

Lubricate the entire steering bearing (16) with Grafloscon A-G1

3.4. Assembling the drive motor

If you have replaced the driving gear (17), you must also replace the gear wheel (10) on the drive motor.

If you have replaced the drive motor, use the old gear wheel for the new motor.



- Fit the bearing bracket (20) to the crankshaft
- Fit the locking ring (21)
- Knock in the key
- Fit the gear wheel (10)
- Fit a washer (11) and a new locking washer (12) and nut (13)
- Tighten to 60 Nm
- Remove any protection from the hole for the drive motor on the driving gear
- Top up with oil, see chapter 4.1
- Screw in a lifting eye bolt on the drive motor (7) and lift it into the driving gear (17) with the help of a crane

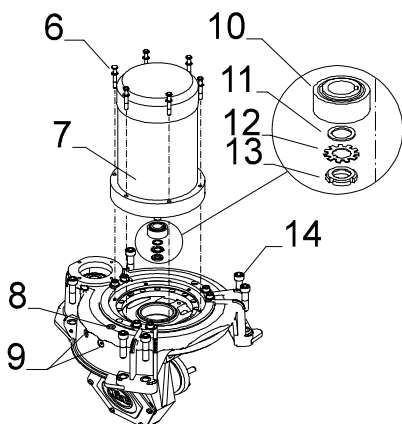
NOTE!

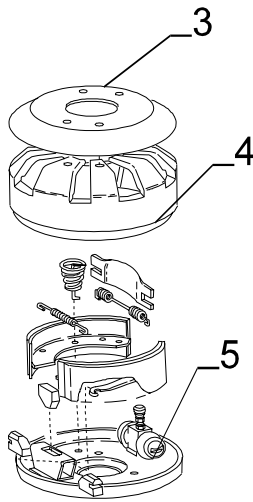
Risk of damage to gear wheel (17).

The gear wheel (10) in the motor end can be damaged.

Fit the motor with care.

- Screw the drive motor (7) in place in the driving gear (17) with a torque of 20 Nm
- Fit the motor speed transmitter (22) into the drive motor





- Connect the motor, carbon brush indicator, fan and sensing device cables to the drive motor
- Screw the brake shield (5) in place on the drive motor using new locking washers and a torque of 25 Nm
- Plug in the battery connector and switch on the power with the key
- Press the parking brake button to release the brake
- Place the brake drum (4) back in position and fix in place with a new locking nut. Tighten with a torque of 60 Nm
- Fit the cover plate (3) on the brake drum (4)

Truck with tilting cab:

Ensure that no one is in the motor compartment when tilting the cab.



WARNING!

Risk for crushing!

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.

Ensure no one is in the motor compartment when tilting the cab.

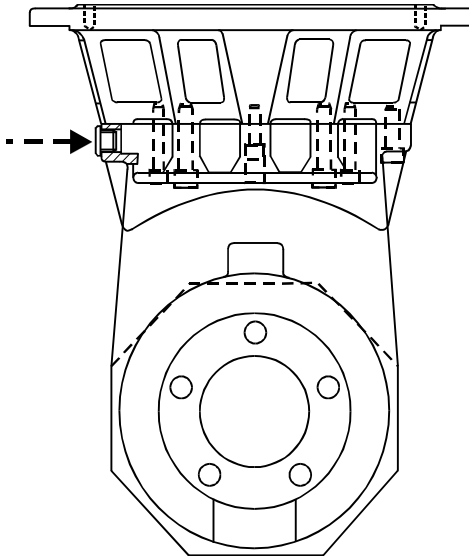
- Remove the jumper (159747) and reconnect the seat switch
- Remove the pin from the cylinder piston
- Take hold of the protective roof and tilt the cab to the 45 degree position
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position

Truck without tilting cab:

- Remove the sliding bow (159747) and reconnect the seat switch
- Close the door and tighten the knob

Transmission, Gear

4. Oil level check/replacing



4.1. Check/filling of oil

- The oil level in the gear should be checked every 250 working hours
- Check the oil level by removing the oil filling plug on the upper part of the gear housing
- Fill oil up to the hole to get the correct oil level.
Hypoid oil MP SAE (=W/90) in driving gear

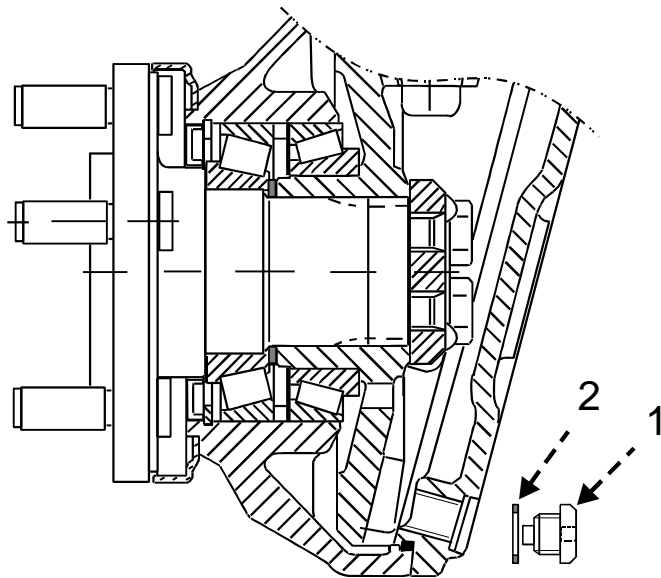
B1-B3: approx. 2.5 litre

B4-B8: approx. 3.8 litre

N1-N3: approx. 2.5 litre

4.2. Oil replacement

The oil should be replaced after every 1000 working hours or a minimum of once a year.



1. Drain off the old oil by removing the drainage plug (1)
2. Use a new copper seal (2) when the drainage plug is refitted
3. Fill up oil in accordance with filling instructions
4. Check that no leakage occurs from the drainage plug



5. Repairs

5.1. Exchange of drive shaft sealing ring

It is easiest to replace the drive shaft sealing rings when the drive unit is dismantled from the truck.

In the case of oil leakage from the drive shaft follow the procedure below:

5.1.1. Dismantling:

1. Drain the gear of oil
2. Dismantle the drive unit from the truck as set out below:
 - Disconnect the seat switch under the seat and secure it with a jumper (159747). You can now work on the truck without having to sit in the drivers seat
 - Remove the four screws holding the cover plate (3) over the brake drum (4) plus the locking nuts on the crankshaft
 - Turn on the power using the key then press the button for the parking brake to loosen the brake
 - Remove the brake drum (4) with tool no. 08-11780
 - Unscrew the 4 screws holding the brake shield (5) in place and lift it off
 - Switch off the power with the key and disconnect the battery plug
 - Remove the motor, carbon brush, fan and sensing device cables from the drive motor (7)
 - Remove the four screws holding the fender in place and lift it off
 - Lift the machine using a jack and place it on blocks
 - For trucks equipped with a steerwheel indicator: disconnect the indicator for the steerwheel's centre (8) and steerwheel direction (9)
 - Disconnect the steering motor's contact and remove the contact from its socket on the tank plate
 - Undo the screws on the steering motor and remove it from the driving gear
 - Remove the six bolts (14) which hold the driving gear cover (15) to the support arm
 - Remove the driving gear (17)

Transmission, Gear

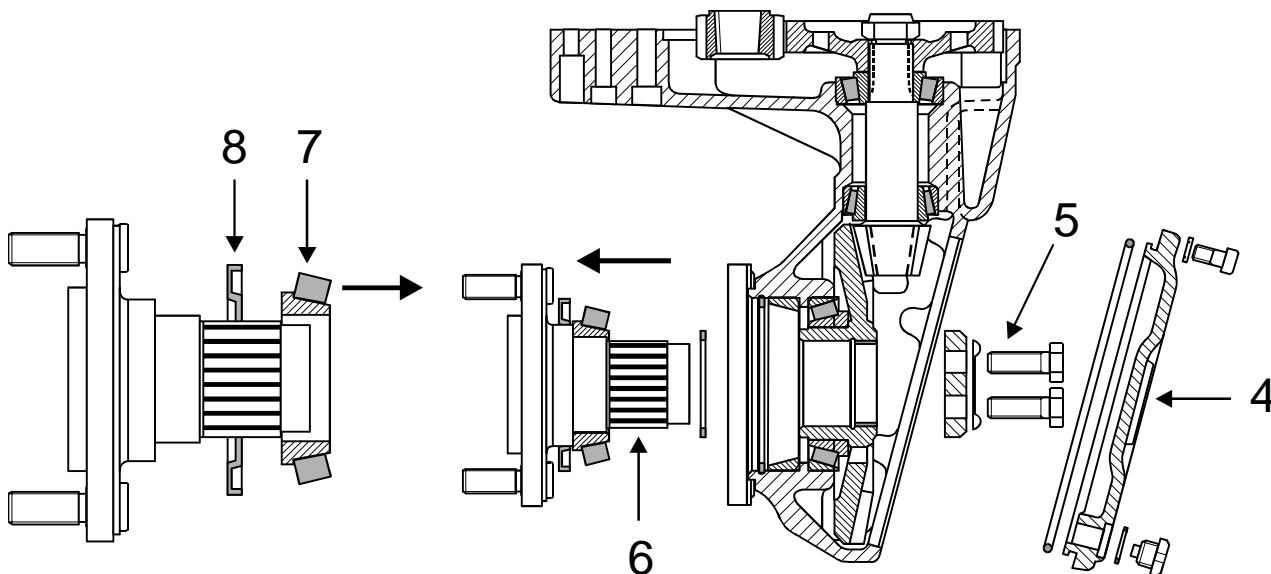
3. Remove the drive wheel from the gear
4. Remove the lower gear cover
5. Loosen the drive shaft nuts. Remove the nuts, locking washers and spacer ring
6. Knock out the drive shaft using a brass punch and a hammer
7. Pull off the bearing from the drive shaft using a bearing puller

NOTE!

A normal clamp puller cannot be used to pull off the bearing.

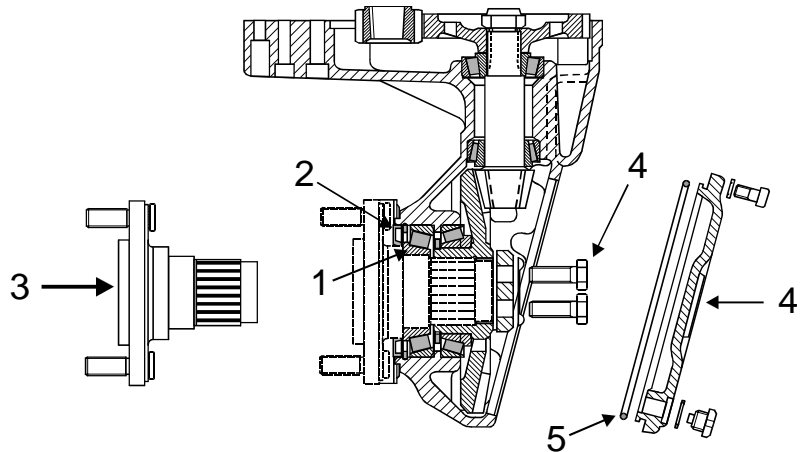
Using a KUKKO bearing puller.

8. Remove the seal ring from the drive shaft



5.1.2. Assembly:

When assembling the gear after replacing the drive shaft seal, follow the procedure described below.

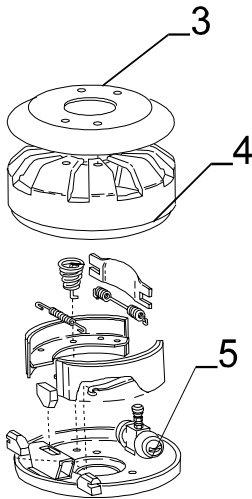


1. Place the drive shafts outer bearing in the gear housing.
2. Press the new seal ring in place in the gear housing. Be careful when pressing it in place so that the seal is seated correctly in the gear housing
3. Press the drive shaft into the gear housing. Check that the splines on the drive shaft are aligned with the splines on the crown wheel
4. Place the spacer ring and locking washer onto the drive shaft end and screw in the shaft bolts.
Always use new bolts. The drive shaft nut must be lubricated prior to being fitted to the shaft.
Tighten the shaft bolts with a torque of 110 Nm.
Lock the shaft bolt by bending up the locking washer
5. Before fitting the lower cover, change the O-ring. Fit the cover and tighten the bolts to 25 Nm. Make sure that the O-ring is not damaged when fitted. The bolts should be greased prior to assembly
6. Fill up oil in accordance with filling instructions, section 4.1
7. Fit the drive wheel and tighten the wheel nut with a torque of 88 Nm. The wheel nuts should be greased prior to being fitted
8. Fit the drive unit in the truck as set out below
 - Screw in a lifting eye bolt on the drive motor (7) and lift it into the driving gear (17) with the help of a crane
 - Connect the motor, carbon brush indicator, fan and sensing device cables to the drive motor

Transmission, Gear

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- Screw the brake shield (5) in place on the drive motor using new locking washers and a torque of 25 Nm
- Plug in the battery connector and switch on the power with the key
- Press the parking brake button to release the brake
- Place the brake drum (4) back in position and fix in place with a new locking nut. Tighten with a torque of 60 Nm
- Fit the cover plate (3) on the brake drum (4)

Truck with tilting cab:

- Ensure that no one is in the motor compartment when tilting the cab

**WARNING!*****Risk for crushing!******The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.******Ensure no one is in the motor compartment when tilting the cab.***

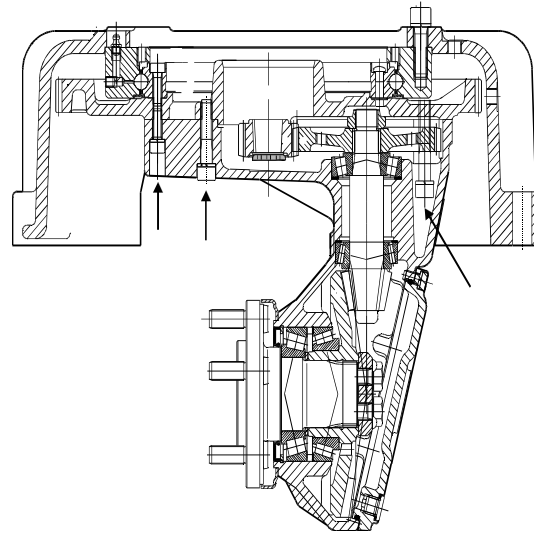
- Remove the jumper (159747) and reconnect the seat switch
- Remove the pin from the cylinder piston
- Take hold of the protective roof and tilt the cab to the 45 degree position
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position

Truck without tilting cab:

- Remove the sliding bow (159747) and reconnect the seat switch
- Close the door and tighten the knob

5.2. Leakage from the top cover

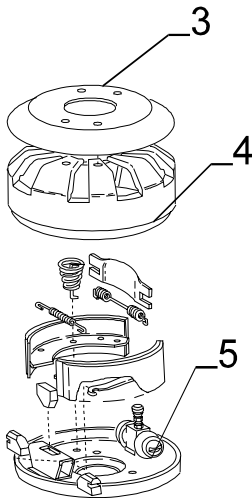
When there is leakage from the gear's top cover follow the procedure described below:



1. Dismantle the gear from the truck as set out below:
 - Disconnect the seat switch under the seat and secure it with a jumper (159747). You can now work on the truck without having to sit in the drivers seat
 - Remove the four screws holding the cover plate (3) over the brake drum (4) plus the locking nuts on the crankshaft
 - Turn on the power using the key then press the button for the parking brake to loosen the brake
 - Remove the brake drum (4) with tool no. 08-11780.
 - Unscrew the 4 screws holding the brake shield (5) in place and lift it off
 - Switch off the power with the key and disconnect the battery plug
 - Remove the motor, carbon brush, fan and sensing device cables from the drive motor (7)
 - Remove the four screws holding the fender in place and lift it off
 - Lift the machine using a jack and place it on blocks
 - For trucks equipped with a steerwheel indicator: disconnect the indicator for the steerwheel's centre (8) and steerwheel direction (9)
 - Disconnect the steering motor's contact and remove the contact from its socket on the tank plate
 - Undo the screws on the steering motor and remove it from the driving gear

Transmission, Gear

- Remove the six bolts (14) which hold the driving gear cover (15) to the support arm
 - Remove the driving gear (17)
2. Loosen all bolts holding the top cover to the gear housing
 3. Remove the cover from the gear housing and clean the sealing surfaces of the cover and gear housing carefully
 4. Apply sealant type **Curil K2** to the surfaces. Follow the instructions given on the container
 5. Fit the cover bolts and tighten with a torque of 25 Nm. The bolts should be greased prior to assembly
 6. Fill up oil in accordance with filling instructions, section 4.1
 7. Fit together the drive gear and the drive motor and fit the drive unit in the truck as set out below:
 - Screw in a lifting eye bolt on the drive motor (7) and lift it into the driving gear (17) with the help of a crane
 - Connect the motor, carbon brush indicator, fan and sensing device cables to the drive motor
 - Screw the brake shield (5) in place on the drive motor using new locking washers and a torque of 25 Nm
 - Plug in the battery connector and switch on the power with the key
 - Press the parking brake button to release the brake
 - Place the brake drum (4) back in position and fix in place with a new locking nut. Tighten with a torque of 60 Nm
 - Fit the cover plate (3) on the brake drum (4)

**Truck with tilting cab:**

- Ensure that no one is in the motor compartment when tilting the cab

WARNING!***Risk for crushing!***

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.

Ensure no one is in the motor compartment when tilting the cab.

- Remove the jumper (159747) and reconnect the seat switch
- Remove the pin from the cylinder piston
- Take hold of the protective roof and tilt the cab to the 45 degree position
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position

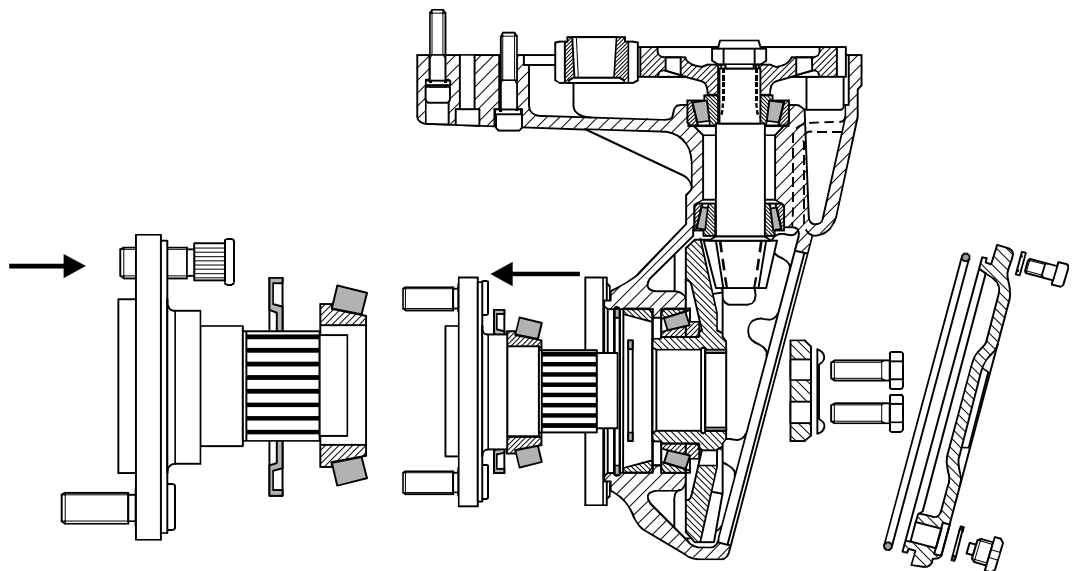
Truck without tilting cab:

- Remove the sliding bow (159747) and reconnect the seat switch
- Close the door and tighten the knob

5.3. Leakage from the lower cover

1. Drain out the remaining oil from the drive gear
2. Dismantle the cover from the drive gear
3. Replace the seal on the drain plug and the O-ring on the cover
4. Fit the cover and tighten the bolts to a torque of 25 Nm. Ensure the O-ring is not damaged. The bolts should be greased before fitting

5.4. Replacing the wheel bolt



1. Dismantle the drive gear from the truck as set out below:
 - Disconnect the seat switch under the seat and secure it with a jumper (159747). You can now work on the truck without having to sit in the drivers seat
 - Remove the four screws holding the cover plate (3) over the brake drum (4) plus the locking nuts on the crankshaft
 - Turn on the power using the key then press the button for the parking brake to loosen the brake
 - Remove the brake drum (4) with tool no. 08-11780
 - Unscrew the 4 screws holding the brake shield (5) in place and lift it off

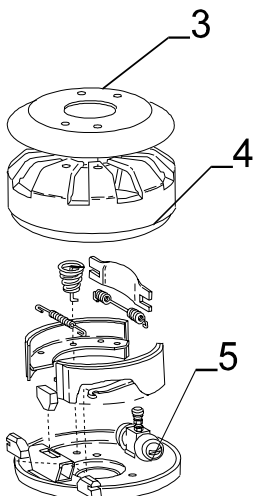
Transmission, Gear

- Switch off the power with the key and disconnect the battery plug
 - Remove the motor, carbon brush, fan and sensing device cables from the drive motor (7)
 - Remove the four screws holding the fender in place and lift it off
 - Lift the machine using a jack and place it on blocks
 - For trucks equipped with a steerwheel indicator: disconnect the indicator for the steerwheel's centre (8) and steerwheel direction (9)
 - Disconnect the steering motor's contact and remove the contact from its socket on the tank plate
 - Undo the screws on the steering motor and remove it from the driving gear
 - Remove the six bolts (14) which hold the driving gear cover (15) to the support arm
 - Remove the driving gear (17)
2. Dismantle the drive shaft from the gear as described under "Dismantling" in chapter "Repairs"
 3. Press or knock out the damaged bolt from the drive shaft rim
 4. Smooth away any burring around the bolt hole and press or knock the new bolt into place
 5. Fit the drive shaft into the gear as described under "Assembly" in chapter "Repairs"

NOTE!

Always use a new drive shaft seal when fitting drive shaft.

6. Fit the drive gear/drive unit in the truck as set out below:
 - Screw in a lifting eye bolt on the drive motor (7) and lift it into the driving gear (17) with the help of a crane
 - Connect the motor, carbon brush indicator, fan and sensing device cables to the drive motor
 - Screw the brake shield (5) in place on the drive motor using new locking washers and a torque of 25 Nm
 - Plug in the battery connector and switch on the power with the key
 - Press the parking brake button to release the brake
 - Place the brake drum (4) back in position and fix in place with a new locking nut. Tighten with a torque of 60 Nm
 - Fit the cover plate (3) on the brake drum (4)





Truck with tilting cab:

- Ensure that no one is in the motor compartment when tilting the cab



WARNING!

Risk for crushing!

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.

Ensure no one is in the motor compartment when tilting the cab.

- Remove the jumper (159747) and reconnect the seat switch
- Remove the pin from the cylinder piston
- Take hold of the protective roof and tilt the cab to the 45 degree position
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position

Truck without tilting cab:

- Remove the jumper (159747) and reconnect the seat switch
- Close the door and tighten the knob

F-code Section C-code
RT **S2** **2550**

Transmission, Gear

Version no T-code
001 **301-307,400**



Transmission/gear

Valid from serial number:

T-code	Model	Serial No	Notes
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

1. General

There are two types of drive units fitted to this range of trucks. These units are each attached to the chassis by 6 bolts.

The drive shaft, together with motor, brake and transmitter for measuring speed, steering wheel direction and travel direction make up a complete drive unit.

The drive unit is equipped with 360° steering.

The gear in this truck is a 2-step angular gear with conical roller bearings for the drive shaft and pinion. The bearings are pre-tensioned approx. 5/100 of a millimetre to minimize the risk of play in the bearings.

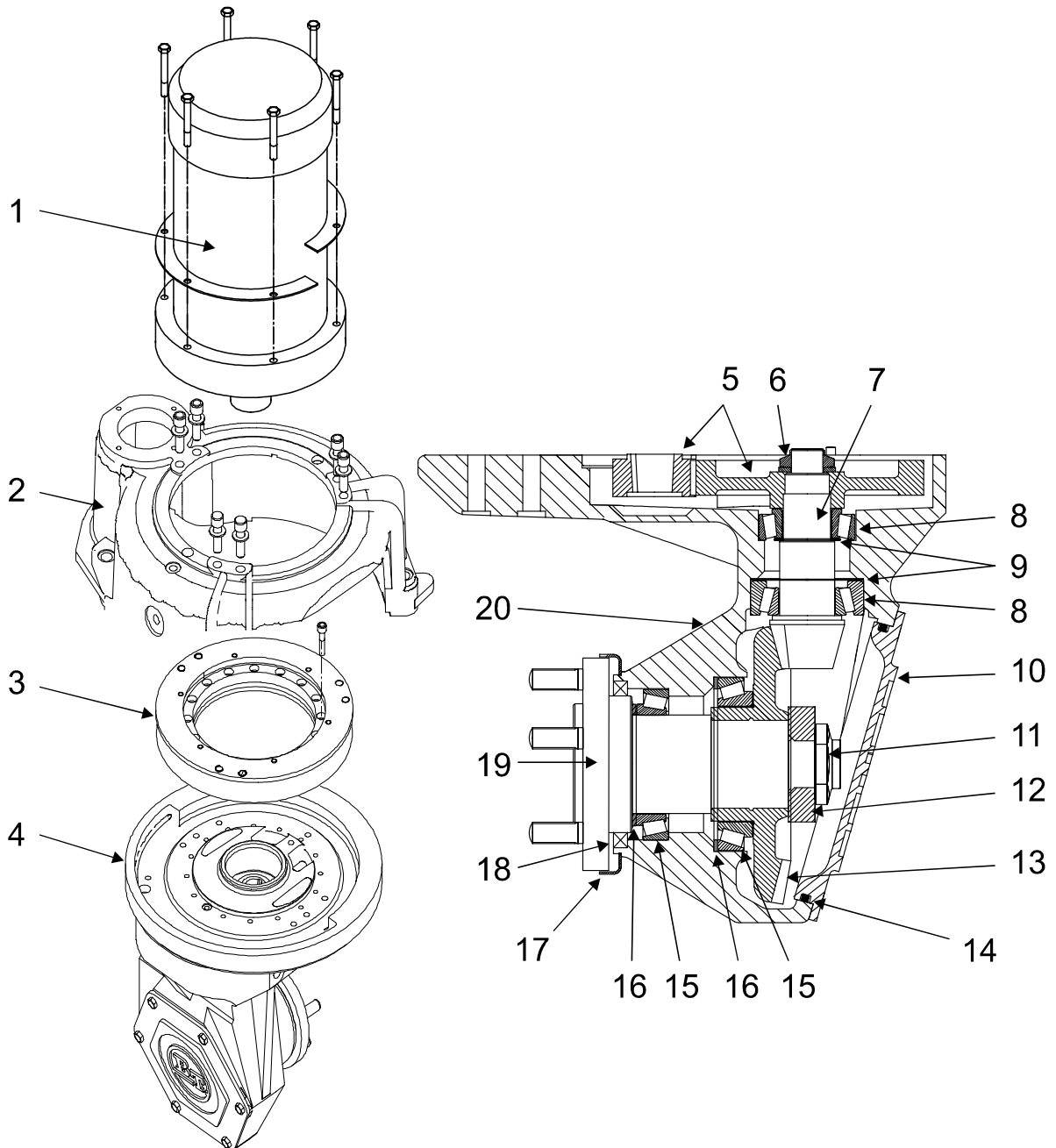
This service instruction covers descriptions for dismantling the gear from the truck and re-fitting the gear, filling/exchanging of oil and measures, in case of leakage. A complete overhaul of the gear is such an extensive job that it should only be done in a workshop by specially trained personnel.

Transmission/gear

2. Drive unit/gear components/data

The main components and data of the gear are shown in the picture and tables below.

2.1. Component identification





F-code
RT

Section
S2
Transmission/gear

C-code
2550

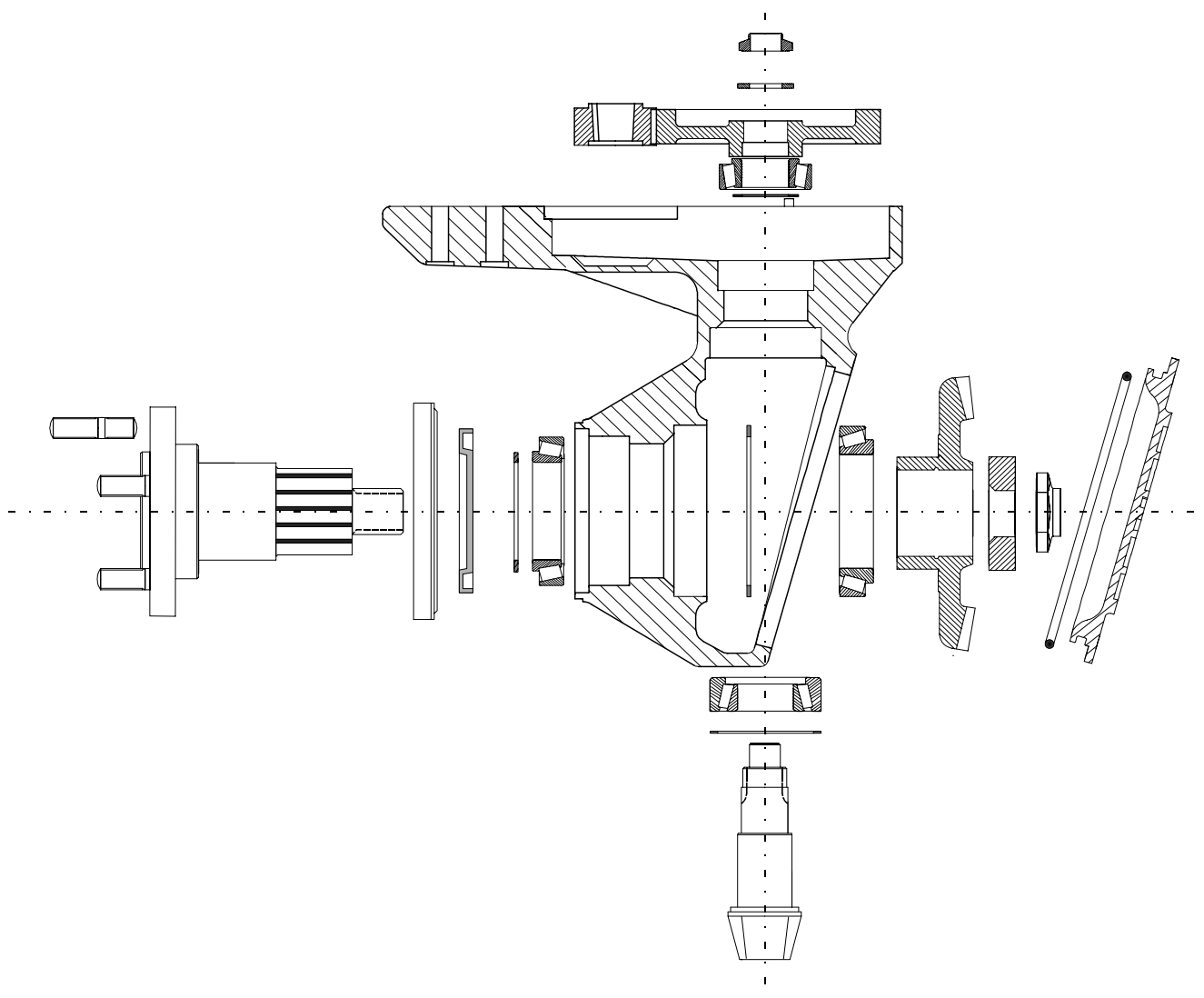
Version no
002

T-code
401-414

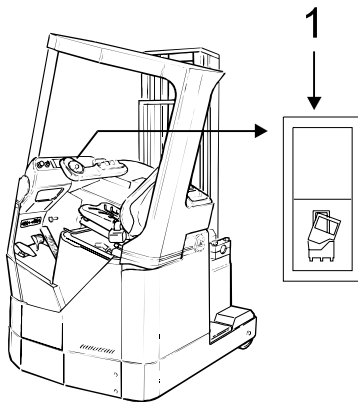
Pos No.	Component
1	Drive motor
2	Drive unit cover
3	Guide bearing
4	Upper gear cover with gear ring
5	Gear wheels, primary step
6	Pinion nut
7	Pinion
8	Pinion bearings
9	Shims, pinion bearing
10	Lower gear cover
11	Drive shaft nut
12	Washer
13	Crown wheel
14	O-ring
15	Drive shaft bearings
16	Shims, drive shaft bearings
17	Seal protection
18	Drive shaft sealing
19	Drive shaft
20	Gear housing

Transmission/gear**2.2. Technical gear data**

Truck type	RR 1-3	RR 5-8
Gear, type	2-step angular	2-step angular
Gear ratio	19.20:1	20.89:1
Oil volume, litre	2.8	3.3
Oil type	Hypoid oil	Hypoid oil
Viscosity, normal temperature	SAE 80W/90	SAE 80W/90
Viscosity, < -15° C	SAE 75W	SAE 75W

2.3. Dismantled gear

3. Replacement of drive motor/driving gear



Trucks without tilting cab

- Undo the knob to the side of the driver's seat and open the door

Trucks with tilting cab

Make sure there is sufficient room to tilt the cab before starting work

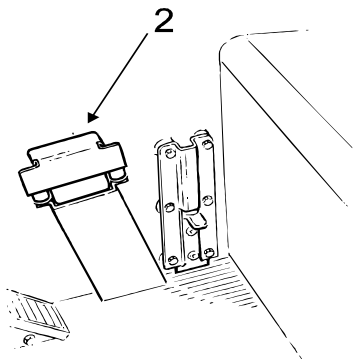
WARNING!



Risk of crushing.

The risk for personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back.

Ensure that no one is in the motor compartment when tilting the cab.



During service in the motor compartment the cab must be fully tilted back. While tilted, only the cabs lift/lower function is operational and then only at crawl speed

- Press switch (1) to lower the cab while at the same time turning the key. The display shows 6 lines
- Move the fork lifts hydraulic lever backwards
- When the cab stops (at 15 degrees), loosen the catch (2) to release the cab
- Continue pulling the lever backwards until the cab stops (at 45 degrees)

WARNING!



Falling cab!

The cab can fall without dampening when tilted over 45 degrees.

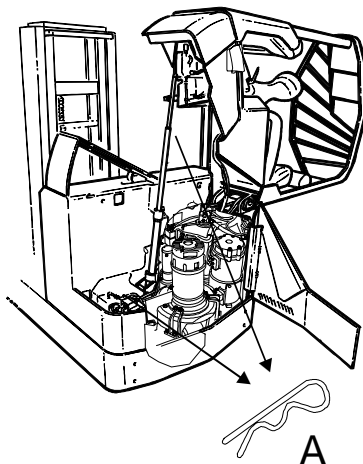
The cab is heavy so make sure the person receiving the cab is in control of the situation. Use crane if possible.

- Take hold of the protective roof and tilt the cab fully back.

NOTE!

Falling cab!

Insert the pin (which is located under the seat) in the cylinder piston to avoid the cab accidentally falling backwards during service.



Transmission/gear

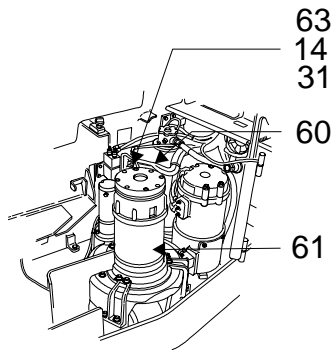
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3.1. Dismantling the drive motor



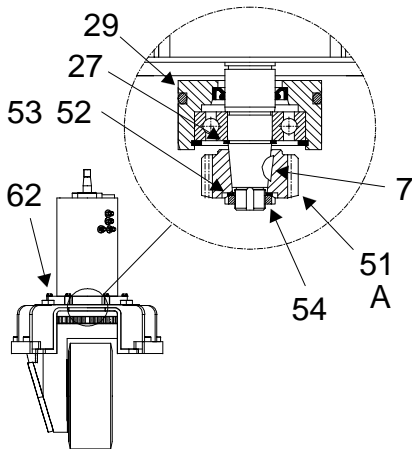
- Switch off the power with the key and disconnect the battery connector
- Disconnect the temperature, brake and speedometer contacts (14, 31, 63), and the power cables (60) from the motor (61)
- Attach a lifting eye bolt to the crank shaft
- Remove the motor's fixing screws
- Lift out the motor with the help of a crane and place it on a clean surface

NOTE!

Risk of damage to gear wheel.

The gear wheel in the motor end can be damaged.

Lift out the motor with care.

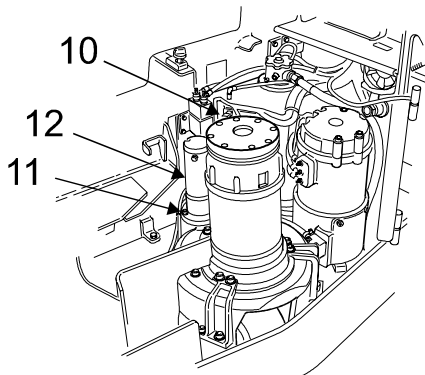


- Cover the hole in the gear where the motor was removed to prevent foreign objects from falling into the gear

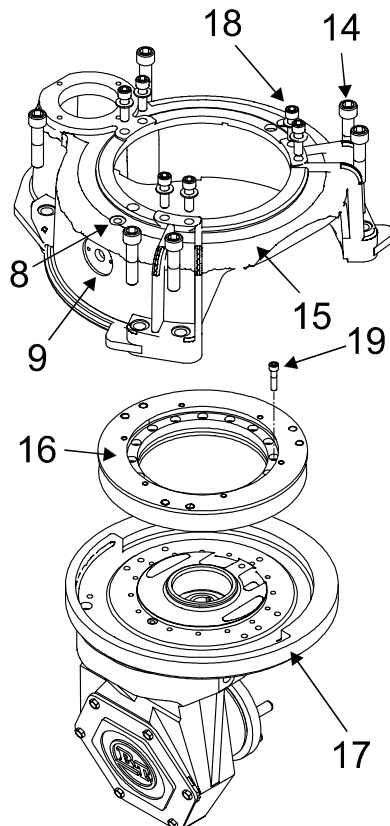
Dismantling the gear wheel

- Bend out the locking wing on the locking washer (53) on the end of the motor and remove the nut (54) and the washer (52)
- Remove the gear wheel (51) using a puller
- Remove the key (7) which holds the gear wheel in place
- Remove the locking ring (27) which holds the bearing bracket (29) in place
- Remove the bearing bracket (29) with the help of a puller

3.2. Dismantling the driving gear



- Remove the four screws holding the fender in place and lift it off
- Lift the machine using a jack and place it on blocks
- For trucks equipped with a steer wheel indicator: disconnect the indicator for the steer wheel's centre (8) and steer wheel direction (9)
- Disconnect the steering motor's contact and remove the contact from its socket on the tank plate
- Undo the screws on the steering motor and remove it from the driving gear
- Remove the six bolts (14) which hold the driving gear cover (15) to the chassis
- Remove the driving gear (17) and the cover (15) from the truck
- Unscrew and remove the drive wheel
- Undo the six bolts (18) holding the driving gear (17) to the cover (15) and remove the cover (15)
- **Dismantling the steering bearing (16):** Undo the fifteen socket head bolts (19) and remove the steering bearing (16) from the driving gear (17)



3.3. Assembling the driving gear

- **Assembling the steering bearing (16):** Fit the steering bearing (16) in place in the driving gear (17) with the fifteen socket head bolts (19) using LOCTITE 242 and a torque of 25 Nm
- Screw the new driving gear (17) in place on the cover (15). Lubricate the bolts (18) and screw in place with a torque of 80 Nm
- Screw the drive wheel in place with a torque of 130 Nm
- Put the driving gear (17) in position in the truck
- Screw the driving gear (17) in place in the chassis together with the cover (15) using the six bolts (14) and a torque of 222 Nm
- Fit new O-rings and, if necessary, a new seal on the steering motor

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- Fit the steering motor in place on the driving gear cover. The screws should be tightened with a torque of 40 Nm
- Connect the steering motor's contacts (10)
- **For trucks equipped with a steer wheel indicator:** Turn the steer wheel until an edge is visible through the hole for the indicator for the steer wheel's centre (8)
- Screw the indicator for the steer wheel's centre (8) in place so that it reaches bottom against the edge. It must then be unscrewed 1 1/2 turns and locked in place with the locking nut
- Screw the steer wheel's direction indicator (9) (Red LED against the battery compartment) so that it reaches bottom and then unscrew it 1 1/4 turns and lock it in place with the locking nut

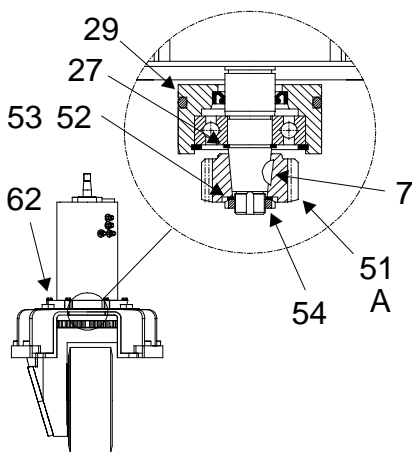
3.4. Assembling the drive motor

If you have replaced the driving gear (17), you must also replace the gear wheel (51) on the drive motor.

If you have replaced the drive motor, use the old gear wheel for the new motor.

3.4.1. Assembling the gear wheel

- Fit the bearing bracket (29) to the crankshaft
- Fit the locking ring (27)
- Knock in the key (7)
- Fit the gear wheel (51)
- Fit a washer (52) and a new locking washer (53) and nut (54)
- Tighten to 60 Nm
- Bend a wing on the locking washer
- Fit a lifting eye bolt to the crank shaft and lift it into the gear with the help of a crane



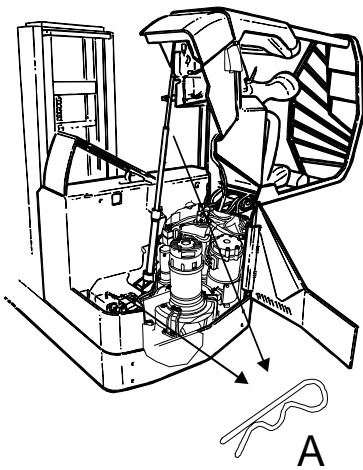
NOTE!

Risk of damage to gear wheel (A).

The gear wheel in the motor end can be damaged.

Fit the motor with care.

- Screw the motor (61) in place in the gear with a torque of 20 Nm
- Connect the temperature, brake and speedometer contacts (14, 31) and the power cables (60) to the motor
- Remove the lifting eye bolt



Truck with tilting cab:

Ensure that no one is in the motor compartment when tilting the cab.

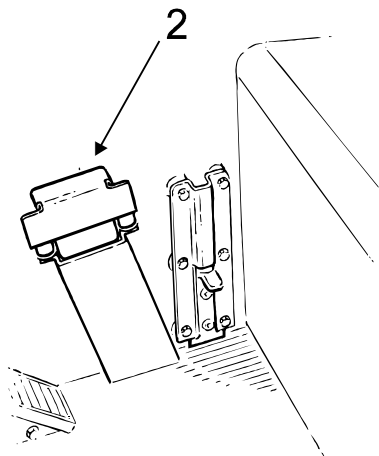
WARNING!

Risk for crushing!

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.

Ensure no one is in the motor compartment when tilting the cab.

- Remove the pin from the cylinder piston
- Take hold of the protective roof and tilt the cab to the 45 degree position
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position

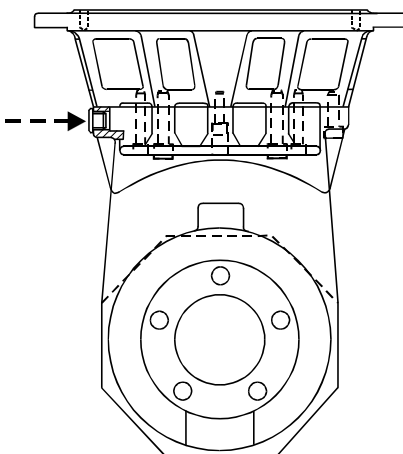


Truck without tilting cab:

- Close the door and tighten the knob
- To adjust the brake, see chapter 3100

4. Oil level check/replacing

4.1. Check/filling of oil

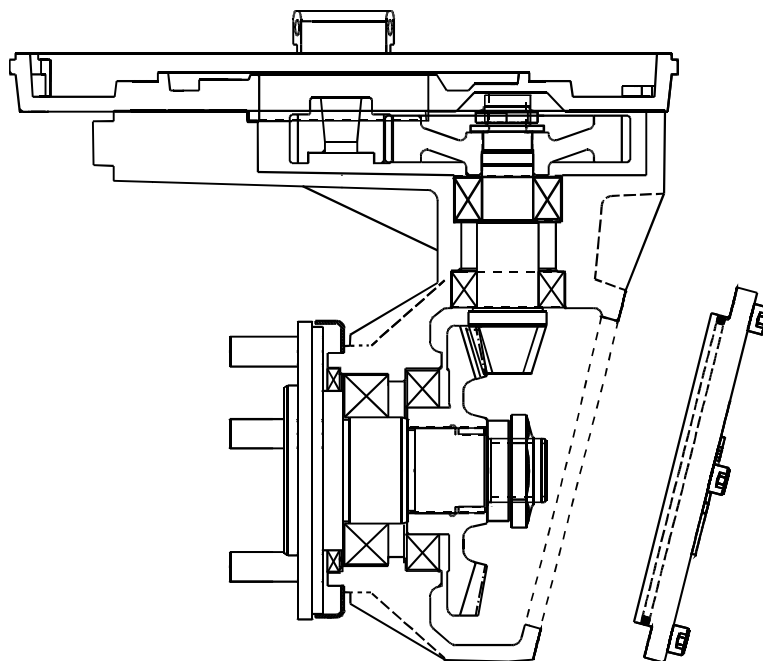


- The oil level in the gear should be checked every 250 working hours
- Check the oil level by removing the oil filling plug on the upper part of the gear housing
- Fill oil up to the hole to get the correct oil level.
Hypoid oil MP in driving gear
- SAE 80W/90 for operation at normal temperature
SAE 75W for operation in cold store, <-15° C
- Oil volume:
B1-B3: approx.2.8 litres
B4-B8: approx.3.3 litres
N1-N3: approx. 2.8 litres

Transmission/gear

4.2. Oil replacement

The oil should be changed in the gear after the first 50-100 hours running time and then after every 3000 hours running time



- Draining the old oil out of the gear is done by removing the lower gear cover completely
- Change the O-ring seal at every oil change. Make sure that the new O-ring isn't damaged when assembled
- Fit the cover and tighten the bolts 25 Nm. The bolts shall be lubricated prior to assembly
- Fill up oil in accordance with filling instructions

5. Repairs

5.1. Exchange of drive shaft sealing ring

It is easiest to replace the drive shaft sealing rings when the drive unit is dismantled from the truck.

In the case of oil leakage from the drive shaft follow the procedure below:

5.1.1. Dismantling:

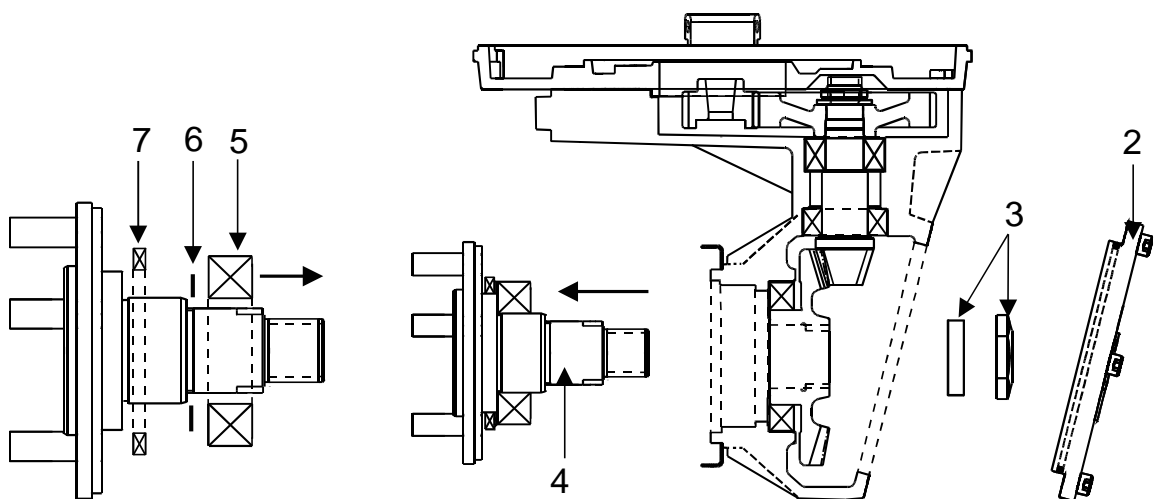
- Dismantle the drive unit from the truck as set out in chapter "Replacement drive motor/driving gear"
- Remove the lower gear cover and drain the gear from oil
- Loosen the drive shaft nut. Remove the nut and spacer ring
- Knock the drive shaft out gently with a brass drift and a hammer
- Pull the bearing off the drive shaft

NOTE!

A normal clamp puller cannot be used to pull off the bearing.

Using a KUKKO bearing puller.

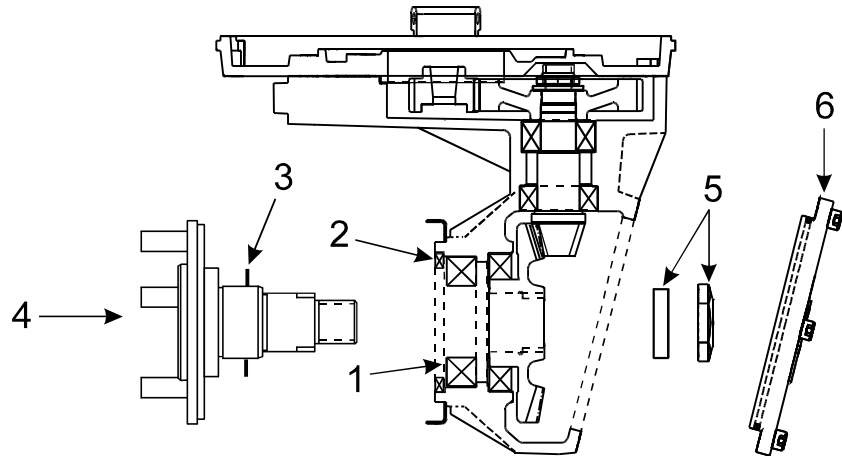
- Make sure that the gear's spacer washers are not damaged. If they have been damaged, measure their total thickness and replace them before assembly
- Remove the seal ring from the drive shaft



Transmission/gear

5.1.2. Assembly

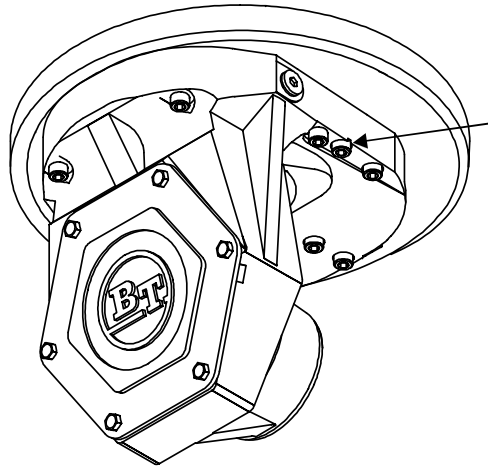
When assembling the gear after replacing the drive shaft seal, follow the procedure described below.



- Place the drive shaft's outer bearing in the gear housing
- Press the new seal ring in place in the gear housing. Be careful when pressing it in place so that the seal is seated correctly in the gear housing
- Fit the axle bearing's spacers onto the drive shaft, with the same total thickness as the original spacers. Make sure that only undamaged spacers are used
- Press the drive shaft, with spacers, into the gear housing. Check that the splines on the drive shaft are aligned with the splines on the crown wheel
- Place the spacer ring on to the drive shaft end and fit the shaft nut.
Always use a new nut. The drive shaft nut must be lubricated before being fitted to the axle. Tighten the nut with a torque of 700 Nm and lock it using a centre punch in the groove on the axle
- Before fitting the lower cover, change the O-ring. Make sure that it is not damaged when fitted. Fit the cover and tighten the bolts 25 Nm. The bolts must be lubricated prior to assembly
- Fill up oil in accordance with filling instructions

5.2. Leakage from the top cover

When there is leakage from the gear's top cover follow the procedure described below:



- Dismantle the gear from the truck as set out in chapter “Replacement drive motor/driving gear”
- Loosen all bolts holding the top cover to the gear housing
- Remove the cover from the gear housing and clean the sealing surfaces of the cover and gear housing carefully
- Apply sealant type **Curil K2** to the surfaces. Follow the instructions given on the container
- Fit the cover bolts and tighten with a torque of 46 Nm. The bolts should be greased prior to assembly
- Fill up oil in accordance with filling instructions
- Fit together the drive gear and the drive motor and fit the drive unit in the truck as set out in chapter “Replacement drive motor/driving gear”

5.3. Leakage from the lower cover

1. Drain out the remaining oil from the drive gear
 2. Dismantle the cover from the drive gear
 3. Replace the seal on the drain plug and the O-ring on the cover
- Fit the cover and tighten the bolts to a torque of 25 Nm. Ensure the O-ring is not damaged. The bolts should be greased before fitting

Transmission/gear

Version no

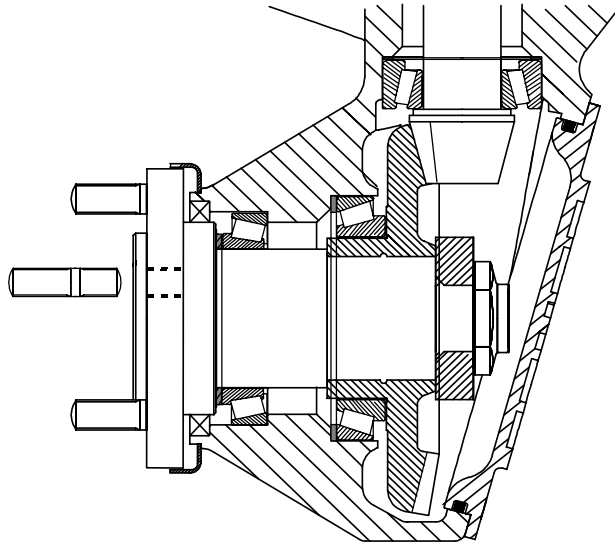
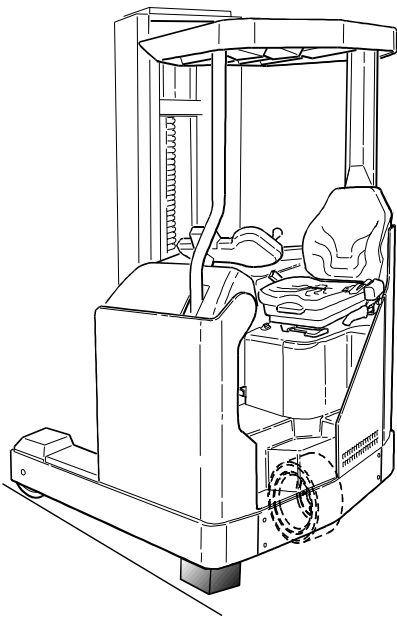
002

T-code

401-414

5.4. Replacing the wheel bolt

The wheel bolts on the gear are stud bolts. Replace the wheel bolts as follows:



- Disconnect the battery's emergency disconnecter
- Remove the fender by the drive wheel from the chassis
- Lift the machine using a jack and place on blocks
- Dismantle the drive wheel
- Wheel bolts with damaged threads:
Should be removed with the help of a stud bolt tool
- Broken bolts:
- **Method 1:** Drill a hole in the centre of the bolt and unscrew with the help of a screw extractor for M14-bolts
- **Method 2:** If it is not possible to remove the bolt with a screw extractor, it must be drilled out
 - Punch the bolt making sure the punch is centred accurately
 - Drill a start hole in the bolt using a 5 mm drill. Drill through the bolt using a 11.5 mm drill
 - Try to remove the rest of the bolt using pliers for example. If this does not work, clear the hole using a M14x 1.5 thread tap
- Apply LOCTITE 270 to the wheel bolt's thread. Fit the new wheel bolt using the stud bolt tool. Tightening torque: 80 Nm
- Fit the drive wheel. Tighten the wheel nuts with a torque of 130 Nm
- Remove the blocks and lower the truck
- Fit the fender
- Connect the emergency battery disconnecter



Brakes

Valid for serial no

T-kod	Modell	Serial No	Anm.
301	RR N1-N3, N1C-N3C/14	296949AA-	
302	RR B1-B3, B1C-B3C/14	296949AA-	
303	RR B4-B6, B4C-B6C/14	296949AA-	
304	RR B7-B8, B7C-B8C/14	296949AA-	
305	RR E1-E3, E1C-E3C/14	296949AA-	
306	RR E4-E6, E4C-E6C/14	296949AA-	
307	RR E7-E8, E7C-E8C/14	296949AA-	
400	RR Cold store cabin	296949AA-	

1. General

The brake system consists of service brake and parking brake. The truck may also be fitted with support arm brakes.

Service brake

The service brake is a manually controlled hydraulic brake. When the brake pedal is pressed, the piston in the main cylinder is forced out, increasing the pressure and, in turn, pushing out the pistons in the drive-unit brakes. This causes the brake lining to press against the brake drum. Where there are support arm brakes, these will receive the same pressure increase and help to stop the truck.

Parking brake

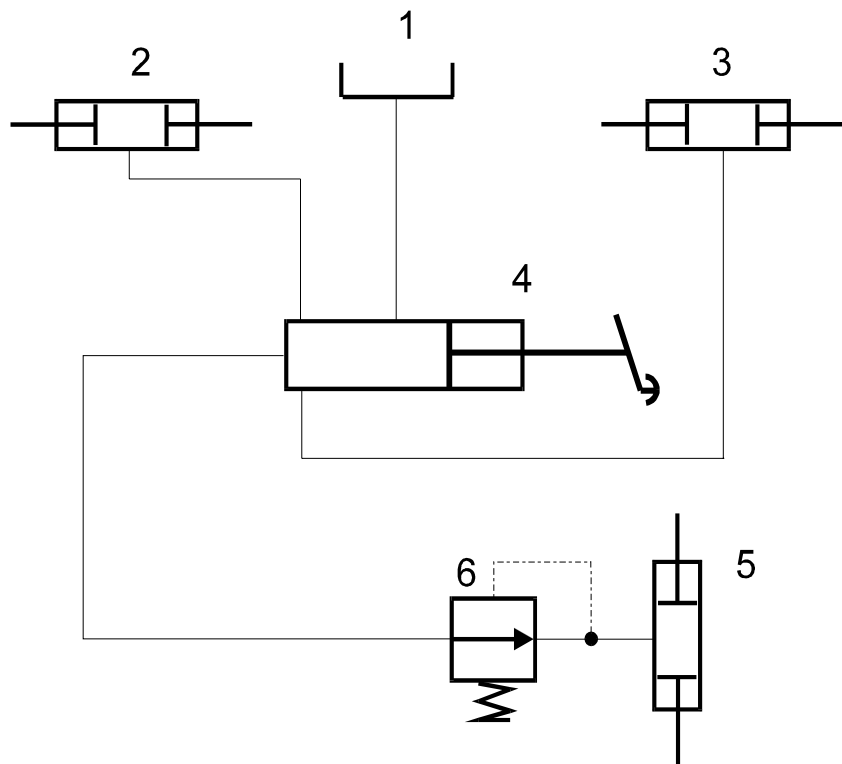
When the parking brake switch is pressed, both connectors to the electronic circuit are inactivated. The valve will then open and drain the oil from the brake cylinder with the help of the return spring. The return spring stretches the brake cable which in turn presses the brake shoe against the brake drum. See chapter 5000.

Brakes

2. Symbols

Symbol	Description	Function	Remark
1	Tank	Brake fluid reservoir	DOT 3-4
2	Cylinder	Left support arm brake	
3	Cylinder	Right support arm brake	
4	Cylinder	Main brake cylinder	
5	Cylinder	Driving motor brake	
6	Valve	Pressure reduction valve	preset to 55 bar

3. Hydraulic diagram



**Brake system, without support arm brake**

Issued by

Parts

Approved by

K Hallman

Version no

001

T-code

401-406,409-412

Brake system, without support arm brake

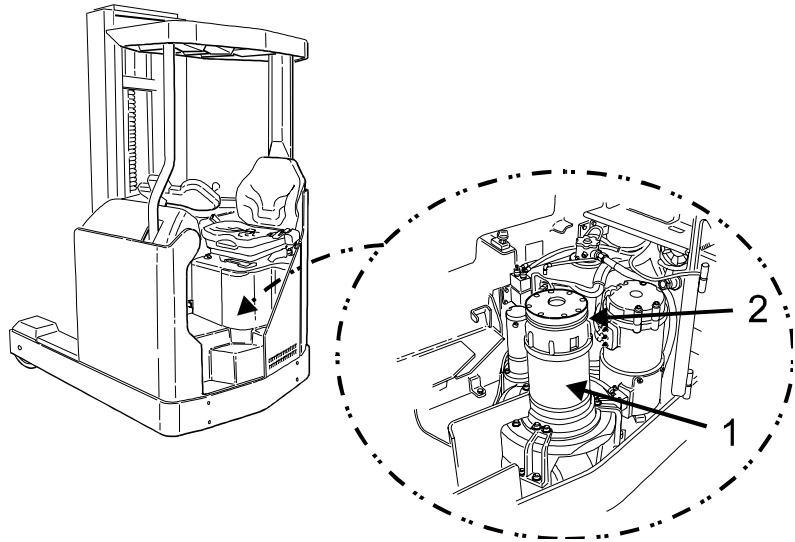
Valid from serial number:

T-code	Model	Serial No	Notes
401	RR N1-3/15	301518AA-	AC
402	RR N1-3C/15	301518AA-	AC
403	RR B1-3/15	301518AA-	AC
404	RR B1-3C/15	301518AA-	AC
405	RR B5-6/15	301518AA-	AC
406	RR B5-6C/15	301518AA-	AC
409	RR E1-3/15	301518AA-	AC
410	RR E1-3C/15	301518AA-	AC
411	RR E5-6/15	301518AA-	AC
412	RR E5-6C/15	301518AA-	AC

1. General

The truck's travel brake system is made up of two different sub-systems.

1. Regenerative motor braking with the drive motor.
2. A one-step electromechanical disc brake mounted on the motor. This is also the truck's parking brake.

Brake system, without support arm brake

2. Description of function

The travel brake system's primary function is the regenerative motor braking from the drive motor. Braking can take place in three different ways:

- When the accelerator is released
- By changing direction with the travel direction control, normal motor braking
- By pressing the brake pedal

2.1. Releasing the accelerator

The regenerative motor brake is activated automatically when the accelerator is released.

The braking force can be set, via a parameter, by the operator. See C-code 5710.

The force of the motor brake is regulated progressively in relation to the current speed of the truck and how far the accelerator pedal is released. This works as follows:

- Braking at high speed, accelerator released fully, results in a high braking force.
- Braking at low speed, accelerator released fully, results in a low braking force.
- Braking at high speed, accelerator released half way, gives a medium braking force.



2.2. Changing travel direction

The braking force is regulated by the position of the accelerator pedal, i.e. the more the pedal is pressed the greater the braking force.

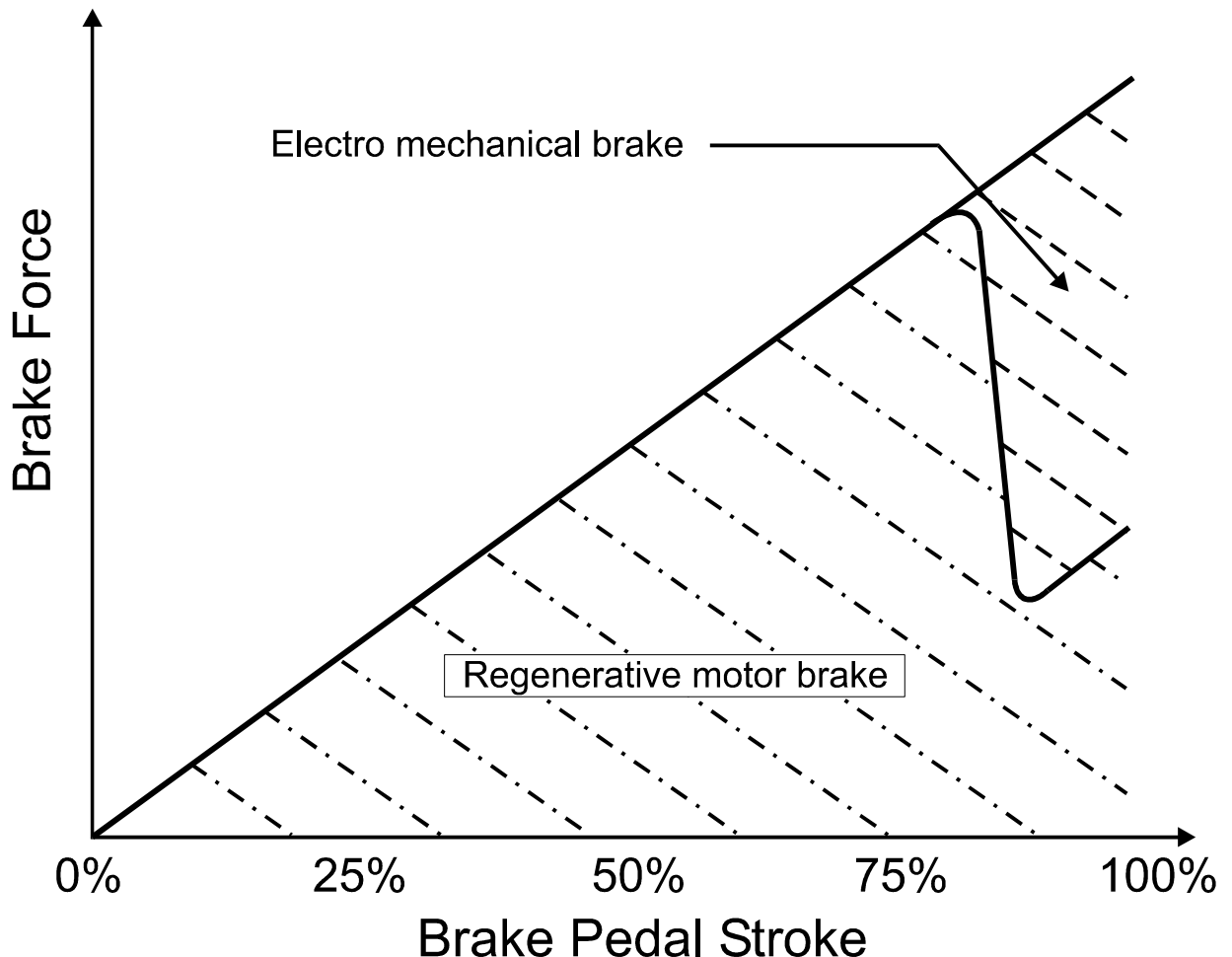
2.3. Pressing the brake pedal

When the brake pedal is pressed down approx. 80% of it's stroke length, full regenerative braking is achieved.

If the brake pedal is pressed between 80 - 100%, further braking force is added due to the electro-magnetic disc brake on the drive motor being activated.

On the border line of 80%, the motor braking is reduced in proportion to the disc brake's braking force in order to avoid jerking or locking the wheels, see illustration.

Brake performance without support arm brakes



Brake system, without support arm brake

2.4. Parking brake

The parking brake is activated/active as follows:

- The parking brake is activated automatically when the truck stops, when driving and the truck is brought to a stop with the help of the brake pedal.
The brake is released when the accelerator is pressed.
- The parking brake is activated automatically when the operator gets out of the truck, a few seconds delay.
- The parking brake remains activated after the key switch has been turned on.

2.5. Emergency braking

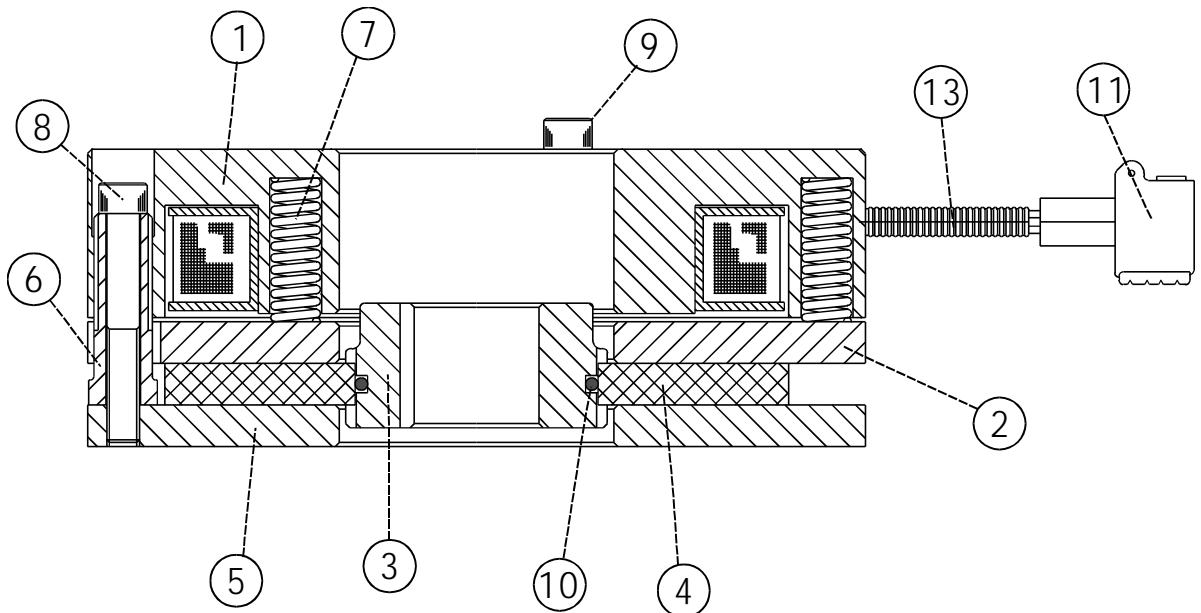
Emergency braking of the truck can occur in the event of a system error or a serious fault in the electrical system.

- The electromechanical disc brake on the drive motor is the primary emergency brake.
- The motor brake can function during emergency braking provided that the power supply is functioning.

3. Electromechanical disc brake, drive motor

The brake is a one-step electromechanical spring action brake which is released by charging the magnet coil. The brake acts as a parking brake, emergency brake and a secondary travel brake at the end of the brake pedals stroke.

3.1. Assembling



- Fit the hub (3) on the crank shaft.
- Fit the O-ring (10) in the recess on the hub.
- Make sure that the friction disc (4) is centred in relation to the magnet house before assembling the brake. It may be necessary to charge the magnet coil with 48 V D.C. in order to position the brake disc.
- Fit the brake unit in the motor. Make sure that the friction disc's splines are not damaged during assembly.
- Fit and tighten the four screws holding the brake unit in place.
- Remove the screws (9) for manual release.
- Check the play between the magnet house and the pressure plate with the brake fitted. The play should be 0.20-0.35 mm. This may need adjusting, see section on adjustment.
- Connect the brake's cable harness (11) to the truck's electrical system.

Brake system, without support arm brake

- Turn the ignition key on and release the parking brake. Check that the friction disc rotates freely. Cut the voltage and check that the pressure plate locks the friction disc and that there is the correct amount of play (0.20-0.35 mm).

NOTE!

The seat switch must be closed.

Use jumper 159747 to secure the switch in order to work without sitting in the driver's seat.

Safety first! Bear in mind that the system is live.

3.2. Dismantling

- Dismantle the brake in the reverse order to which it was assembled.
- Place the brake on a clean, dry work surface with the magnet house (1) uppermost.
- Unscrew the 3 adjusting screws (8) gradually in order to reduce the spring tension gradually and evenly.
- The brake unit can now be completely dismantled for inspection of its components.

3.2.1. Inspection

Examine parts for damage and/or wear.

- Examine the brake disc with particular care (4) and the working surface of the pressure plate (2).
- Examine the springs (7) and spacers (6) for damage.

NOTE!

Bear in mind that the distance nut is made of brass.

- Inspect the splines on the hub (3) and the friction disc (4) for damage.
- Examine the magnet (1) and pressure plate (2) for signs of swelling or damage.

3.2.2. Assembling

- Clean all parts thoroughly.
- Assemble the brake in the reverse order to which it was dismantled.
- Bear in mind the following:
 - a: That the holes in the pressure plate (2) are centred over the corresponding holes in the magnet house.
 - b: That the correct number of springs have been fitted.
 - c: That the amount of play (0.20-0.35 mm) is correct, adjust if necessary.

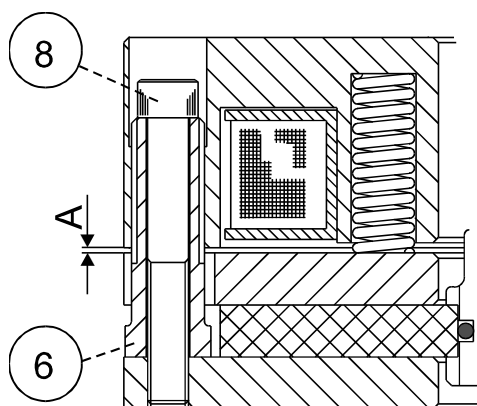
3.3. Maintenance

The brakes are included in the maintenance schedule for the truck. See section P2.0 for service intervals.

Maintenance includes checking and adjusting the amount of play between the pressure plate and the magnet house, checking wear and braking force.

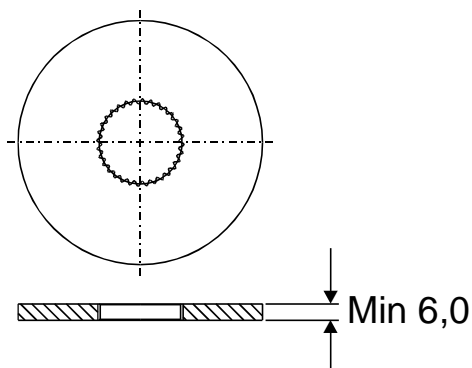
NOTE!

Friction surfaces must not come in contact with oil or grease as this will seriously reduce the braking force of the brakes.



3.3.1. Adjustment of play

- The amount of play must be checked after every 1000 hours running time.
- The amount of play (A) is measured between the magnet house and the pressure plate in three places, next to the adjustment sleeves (6), with the brake engaged.
- The nominal amount of play when correctly adjusted is 0.20-0.35 mm.
- The maximum play permitted before adjustment becomes necessary is 0.45 mm.
- **Tools:**
Thickness gauge, 14 mm spanner and a 6 mm Allen key.
- Undo the three screws (8).
- Adjust the amount of play between the three adjustment sleeves (6) to 0.20-0.35 mm. Use a thickness gauge at the side of the sleeve while adjusting.
Turn anticlockwise to reduce and clockwise to increase the amount of play.
- Tighten the screws with a torque of 20 Nm
- Re-check the amount of play after tightening the screws. Repeat the adjustment if necessary until the correct amount of play is achieved.
- Check the amount of play all the way round the pressure plate. The maximum deviation allowed is 0.075 mm.



3.3.2. Wear

- Check the friction disc for signs of wear after every 3000 hours running time.
- Dismantle the brake according to the dismantling instructions.
- Measure the thickness of the friction disc.
Minimum thickness = 6.0 mm

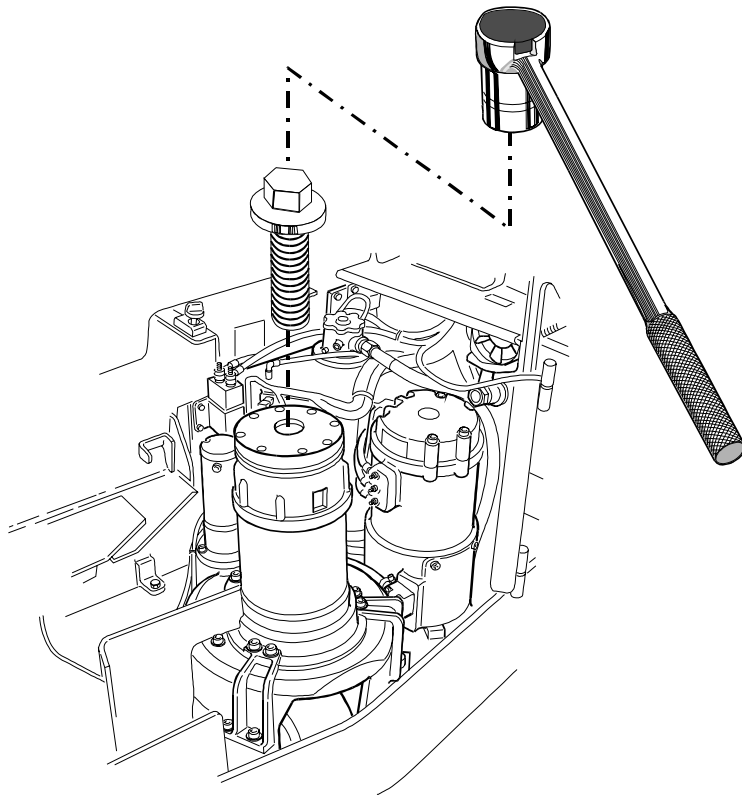
Brake system, without support arm brake**3.3.3. Checking the braking force**

The braking force must be checked after every 1000 hours running time.

- Lift the truck so that the drive wheel is off the floor.
- Open the motor compartment cover.
- **Tools:**
Torque wrench set to **90 Nm** and an M12 flanged bolt, or a normal bolt and flat washer.

NOTE!

The quality of the bolt must be at least 10.9



- Screw the M12 bolt in the hole (for lifting eye bolt) in the crank shaft.
- Rotate the crank shaft using the torque wrench until the brake releases.
- If the brake releases before the correct torque has been reached, the braking force is too low.
- Adjust the amount of play in the brake to the correct value, see Adjustment of play.
- Re-check the braking force using the torque wrench.

**Brake system with support arm brakes**Issued by
PartsApproved by
K HallmanVersion no
002T-code
401-414

Brake system with support arm brakes

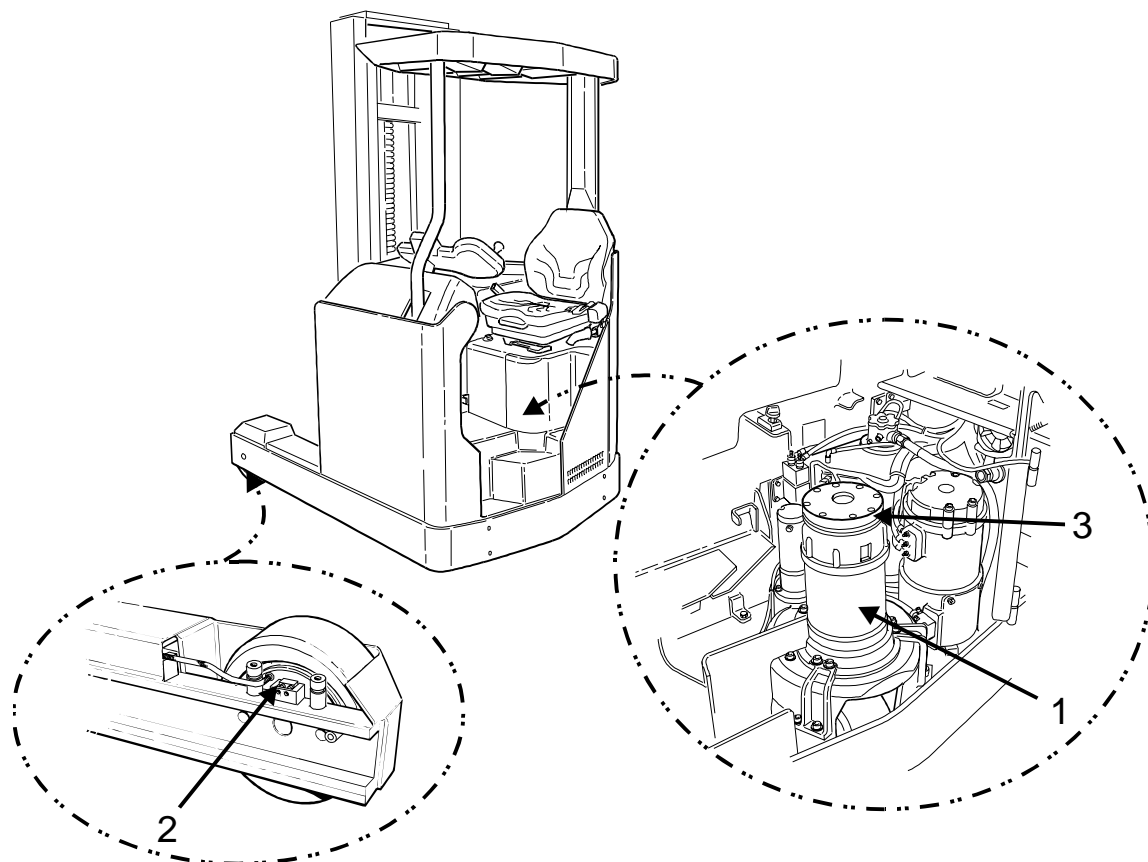
Valid from serial number:

T-code	Model	Serial number	Notes
401	RR N1-3/15	301518AA-	ACi
402	RR N1-3C/15	301518AA-	ACi
403	RR B1-3/15	301518AA-	ACi
404	RR B1-3C/15	301518AA-	ACi
405	RR B5-6/15	301518AA-	ACi
406	RR B5-6C/15	301518AA-	ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	ACi
410	RR E1-3C/15	301518AA-	ACi
411	RR E5-6/15	301518AA-	ACi
412	RR E5-6C/15	301518AA-	ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

1. General

The truck's travel brake system is made up of three different sub-systems.

1. Regenerative motor braking with the drive motor.
2. Two analogue electromechanical multiple disc brakes fitted in the support arm wheels.
3. A one-step electromechanical disc brake fitted to the motor.

Brake system with support arm brakes

2. Description of function

The primary braking function of the travel brake system is the regenerative motor brake from the drive motor. Braking can be carried out in three ways:

- By releasing the accelerator.
- By changing travel direction with the travel direction control, normal motor braking.
- By pressing the brake pedal.



2.1. Releasing the accelerator

The regenerative motor brake is activated automatically when the accelerator is released.

The braking force can be set, via a parameter, by the operator. See C-code 5710.

The force of the motor brake is regulated progressively in relation to the current speed of the truck and how far the accelerator pedal is released. This works as follows:

- Braking at high speed, accelerator released fully, results in a high braking force.
- Braking at low speed, accelerator released fully, results in a low braking force.
- Braking at high speed, accelerator released half way, gives a medium braking force.

2.2. Changing travel direction

The braking force is regulated by the position of the accelerator pedal, i.e. the more the pedal is pressed the greater the braking force.

Brake system with support arm brakes

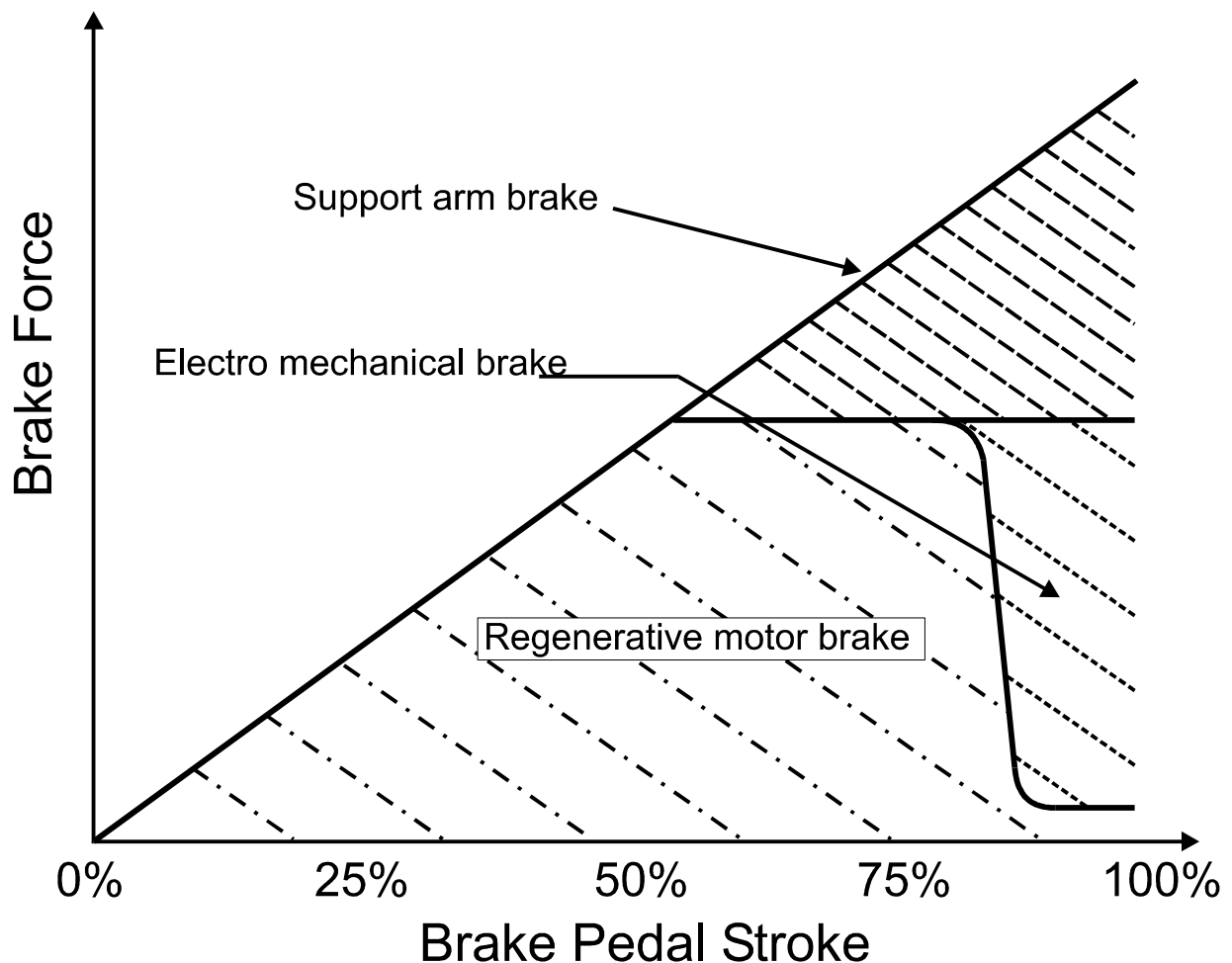
2.3. Pressing the brake pedal

When the brake pedal is pressed down approx. 80% of it's stroke length, full regenerative braking is achieved.

If the brake pedal is pressed between 80 - 90%, further braking force is added due to the electromechanical disc brake on the drive motor being activated.

On the border line of 80%, the braking torque of the motor brakes disc brake is reduced in order to avoid jerking or locking the wheels, see illustration.

Brake performance with support arm brakes





2.4. Parking brake

The parking brake is activated/active as follows:

- The parking brake is activated automatically when the truck stops, when driving and the truck is brought to a stop with the help of the brake pedal.
The brake is released when the accelerator is pressed.
- The parking brake is activated automatically when the operator gets out of the truck, a few seconds delay.
- The parking brake remains activated after the key switch has been turned on.

2.5. Emergency braking

Emergency braking of the truck can occur in the event of a system error or a serious fault in the electrical system.

- The electromechanical disc brake on the drive motor is the primary emergency brake.
- The motor brake can function during emergency braking provided that the power supply is functioning.

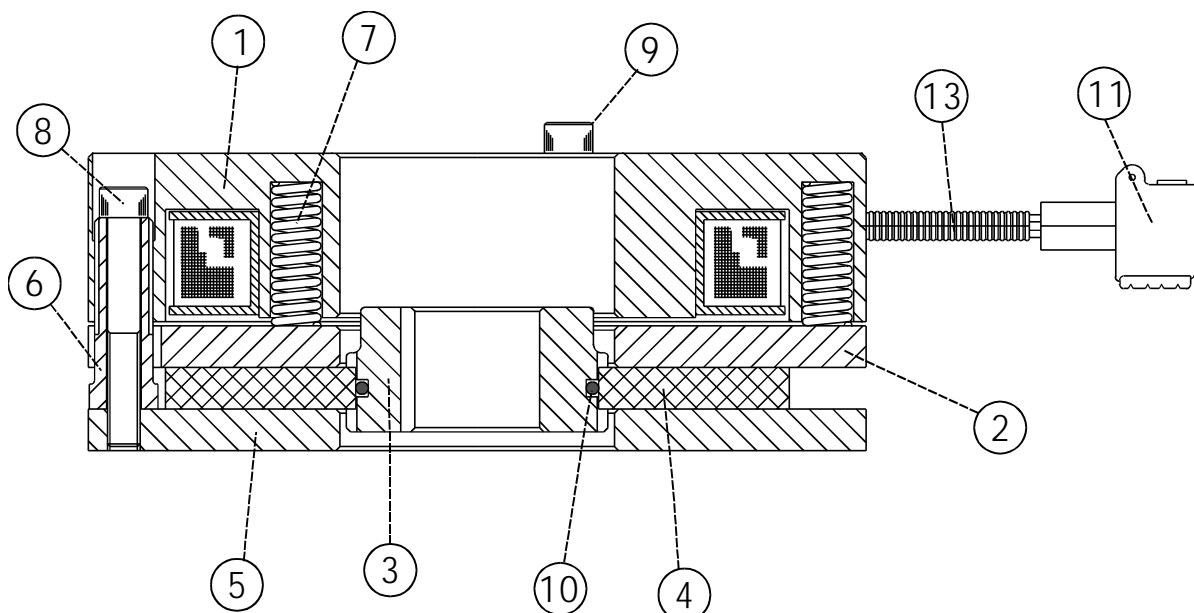
Brake system with support arm brakes

3. Electromechanical disc brake, drive motor

The brake is a one-step electromechanical spring action brake which is released by charging the magnet coil.

The brake acts as a parking brake, emergency brake and a secondary travel brake at the end of the brake pedals stroke.

3.1. Assembly



- Fit the hub (3) on the crank shaft.
- Fit the O-ring (10) in the recess on the hub.
- Make sure that the friction disc (4) is centred in relation to the magnet house before assembling the brake. It may be necessary to charge the magnet coil with 48 V D.C. in order to position the brake disc.
- Fit the brake unit in the motor. Make sure that the friction disc's splines are not damaged during assembly.
- Fit and tighten the four screws holding the brake unit in place.
- Remove the screws (9) for manual release.
- Check the play between the magnet house and the pressure plate with the brake fitted. The play should be 0.20-0.35 mm. This may need adjusting, see section on adjustment.
- Connect the brake's cable harness (11) to the truck's electrical system.

**Brake system with support arm brakes**

- Turn the ignition key on and release the parking brake. Check that the friction disc rotates freely. Cut the voltage and check that the pressure plate locks the friction disc and that there is the correct amount of play (0.20-0.35 mm).

NOTE!

The seat switch must be closed.

Use jumper 159747 to secure the switch in order to work without sitting in the driver's seat.

Safety first! Bear in mind that the system is live.

3.2. Dismantling

- Dismantle the brake in the reverse order.
- Place the brake on a clean, dry work surface with the magnet house (1) uppermost.
- Unscrew the 3 adjusting screws (8) gradually in order to reduce the spring tension gradually and evenly.
- The brake unit can now be completely dismantled for inspection of its components.

3.2.1. Inspection

Examine parts for damage and/or wear.

- Examine the brake disc with particular care (4) and the working surface of the pressure plate (2).
- Examine the springs (7) and spacers (6) for damage.

NOTE!

Bear in mind that the distance nut is made of brass.

- Inspect the splines on the hub (3) and the friction disc (4) for damage.
- Examine the magnet (1) and pressure plate (2) for signs of swelling or damage.

3.2.2. Assembling

- Clean all parts thoroughly.
- Assemble the brake in the reverse order to which it was dismantled.
- Bear in mind the following:
 - a: That the holes in the pressure plate (2) are centred over the corresponding holes in the magnet house.
 - b: That the correct number of springs have been fitted.
 - c: That the amount of play (0.20-0.35 mm) is correct, adjust if necessary.

Brake system with support arm brakes

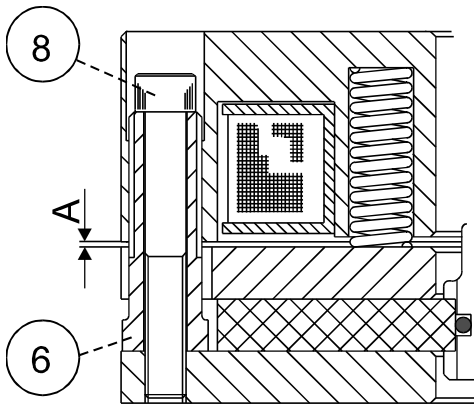
3.3. Maintenance

The brakes are included in the maintenance schedule for the truck. See section P2.0 for service interval.

Maintenance includes checking and adjusting the amount of play between the pressure plate and the magnet house, checking wear and braking force.

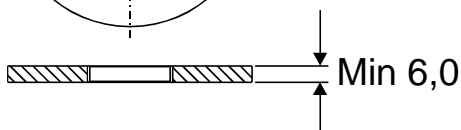
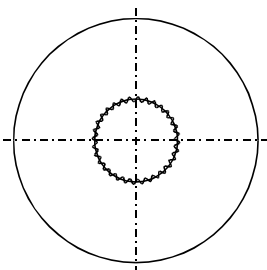
NOTE!

Friction surfaces must not come in contact with oil or grease as this will seriously reduce the braking force of the brakes.



3.3.1. Adjustment of play

- The amount of play must be checked after every 1000 hours running time.
- The amount of play (A) is measured between the magnet house and the pressure plate in three places, next to the adjustment sleeves (6), with the brake engaged.
- The nominal amount of play when correctly adjusted is 0.20-0.35 mm.
- The maximum play permitted before adjustment becomes necessary, is 0.45 mm.
- **Tools:**
Thickness gauge, 14 mm spanner and a 6 mm Allen key.
- Undo the three screws (8).
- Adjust the amount of play between the three adjustment sleeves (6) to 0.20-0.35 mm. Use a thickness gauge at the side of the sleeve while adjusting.
Turn anticlockwise to reduce and clockwise to increase the amount of play.
- Tighten the screws with a torque of 20 Nm
- Re-check the amount of play after tightening the screws. Repeat the adjustment if necessary until the correct amount of play is achieved.
- Check the amount of play all the way round the pressure plate. The maximum deviation allowed is 0.075 mm.



3.3.2. Wear

- Check the friction disc for signs of wear after every 3000 hours running time.
- Dismantle the brake according to the dismantling instructions.
- Measure the thickness of the friction disc.
Minimum thickness = 6.0 mm

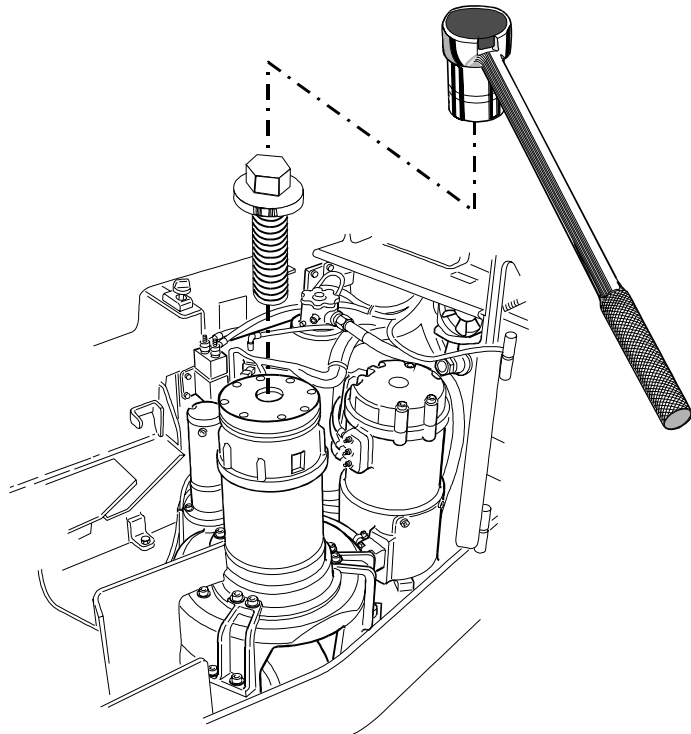
3.3.3. Checking the braking force

The braking force must be checked after every 1000 hours running time.

- Lift the truck so that the drive wheel is off the floor.
- Open the motor compartment cover.
- **Tools:**
Torque wrench set to **90 Nm** and an M12 flanged bolt, or a normal bolt and flat washer.

NOTE!

The quality of the bolt must be at least 10.9



- Screw the M12 bolt in the hole (for lifting eye bolt) in the crank shaft.
- Rotate the crank shaft using the torque wrench until the brake releases.
- If the brake releases before the correct torque has been reached, the braking force is too low.
- Adjust the amount of play in the brake to the correct value, see Adjustment of play.
- Re-check the braking force using the torque wrench.

Brake system with support arm brakes

4. Multiple disc brake, support arm

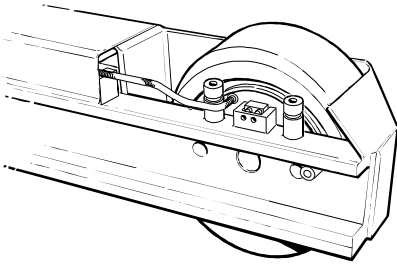
The brake is an analogue electromagnetic multiple disc brake, i.e. the brake is engaged by charging the magnet coil. The voltage in the magnet coil is regulated by a potentiometer in the brake pedal and thereby regulates the braking force.

The multiple discs are made of steel.

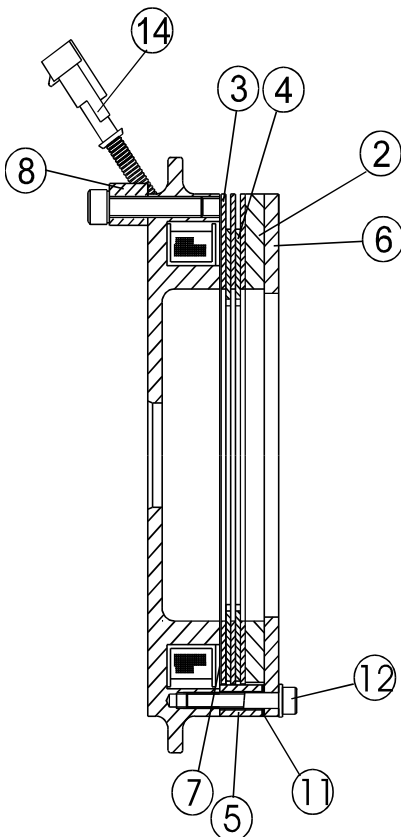
The brake functions as a secondary travel brake and is used when the operator needs to brake hard, >50% of the maximum available braking force.

The brake is fitted in the support arm on a hub with splines and a locking heel which takes up the braking force.

The support arm wheel must be removed from the truck in order to check and service the brake, see C-code 3550. The magnet coil, however, can be checked with the wheel in place. All instructions given here require that the wheel be removed first.



4.1. Assembly



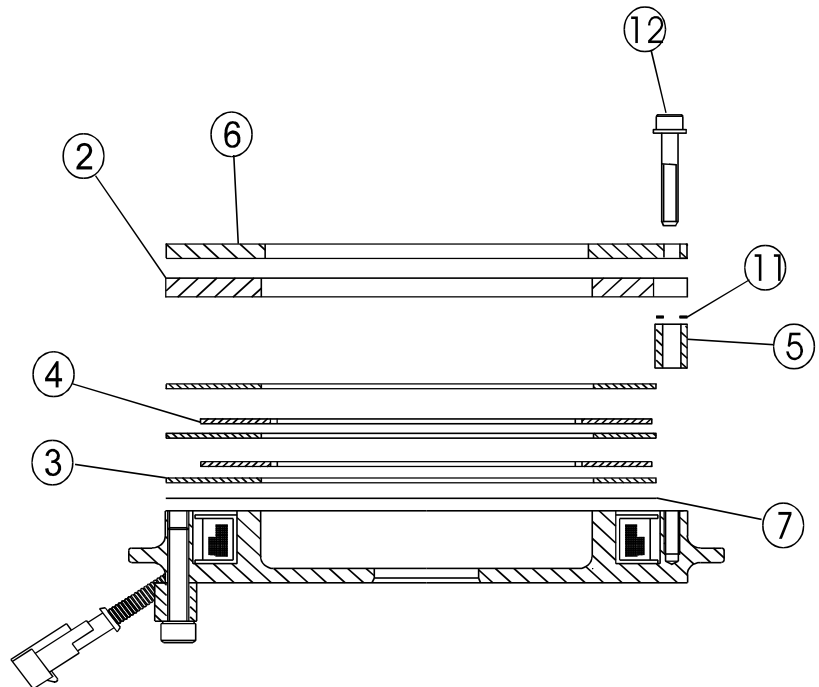
- Make sure that the brake engages and releases when intended.
Connect the brake to 48 V D.C. Turn the current off and on.
- Check that the amount of play between the end plate (6) and the pressure plate (2) is 1.0-1.25 mm with the current on (brake engaged).
It may be necessary to adjust the amount of play, see section on adjusting.

NOTE!

Check the amount of play at two points simultaneously with 180° between check points.

- Fit the brake into the support arm wheel, making sure that the inner disc's splines are positioned correctly so that they reach the wheel hub without being obstructed.
- Fit the wheel in the support arm according to instructions C-code 3550.
Make sure that the locking heel (8) is positioned correctly in its recess in the support arm.
- Connect the brake cable harness (14) and check the braking function by pressing the brake pedal fully down.

4.2. Dismantling



- Remove the brake from the support arm wheel.
- Place the brake on a clean, dry work surface with the end plate (6) uppermost.

NOTE!

Take care that the components and cable harness are not damaged during this and following operations.

- Undo and remove the six M6x40 socket head screws (12) and their washers.
- Remove the aluminium end plate (6).

NOTE!

Make note of the number of shims (11) on every spacer (5).

- Lift off the pressure plate (2) and the disc unit which consists of 3 outer discs (3) and two inner discs (4).
- Remove the brass plate (7).

Brake system with support arm brakes**4.2.1. Inspection**

- Check the thickness of the discs.
The nominal thickness of a new disc = 2.0 mm.
Limit for wear = 1.4 mm
- When replacing discs:
Replace all inner and outer discs at the same time. **Never** individually.
- Check that the discs are flat and that there is no damage to the splines or the recess.
- Check the electrical resistance of the magnet coil. Nominally 47.7 Ohm at 20°C.

NOTE!

The resistance measurement can be made with the brake/wheel fitted in the truck.

4.2.2. Assembling

- Clean all parts thoroughly.

NOTE!

Use only a wire brush and water for cleaning.

- Assemble the brake in the reverse order to which it was dismantled.
- Connect the brake to 48 V D.C.
- Check the amount of play between the end plate and the pressure plate (brake engaged). Adjust if necessary.

4.3. Maintenance

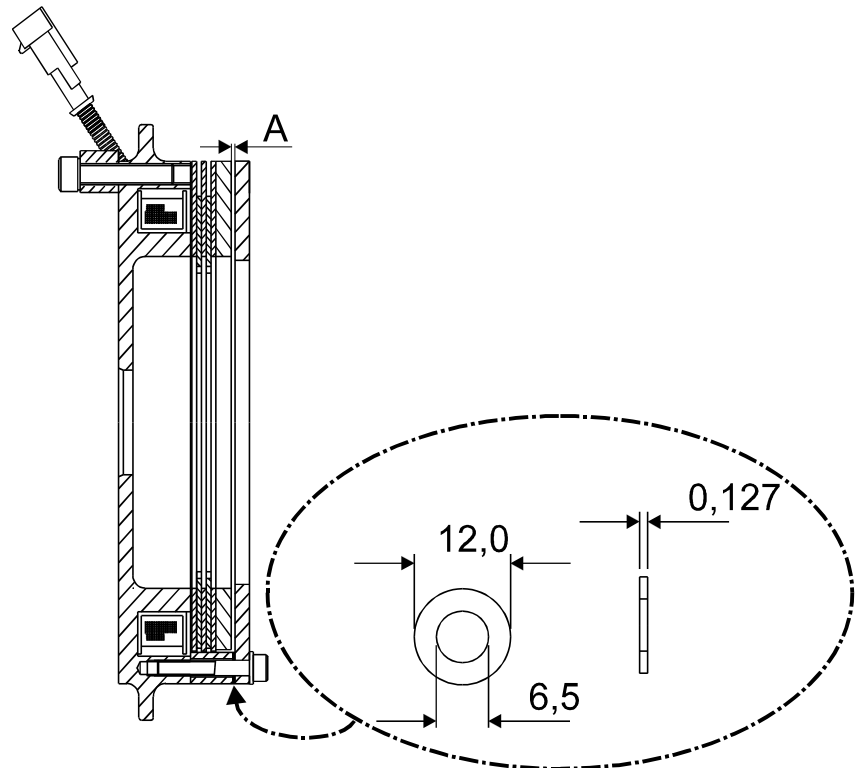
The brake is included in the maintenance schedule. For service intervals see Maintenance schedule section P2.

Maintenance includes checking and adjusting the amount of play between the pressure plate and the end plate, checking for wear and the magnet coil's resistance as well as cleaning.

- Cleaning and checking/adjustment of play must be carried out after every 1000 hours running time.
- Checking for wear and checking the magnet coil's resistance must be carried out after every 3000 hours running time.

4.3.1. Adjusting the amount of play

- Dismantle the support arm wheel from the truck and remove the brake.
- Connect the brake to 48 V D.C.



- Check the amount of play, measurement A, with the brake engaged.

NOTE!

Check the amount of play at two points simultaneously with 180° between check points.

- Maximum permitted play = 2.25 mm
- The nominal amount of play on a newly adjusted brake is 1.0-1.25 mm.
- Remove the aluminium end plate before adjusting.
- Remove the shims when adjusting due to wear, or add shims when replacing with new discs. Each shim has a thickness of 0.127 mm.
- Fit the aluminium end plate, connect to 48 V D.C. and check the amount of play.
- When the amount of play is within the nominal permitted limits, assemble the brake in the wheel and the wheel in the truck.

F-code

Section

C-code

RT

S3

3100

Brake system with support arm brakes

Version no

T-code

002

401-414



Main cylinder

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	

1. General

The main brake cylinder is a spring-loaded cylinder with two piston rod seals.

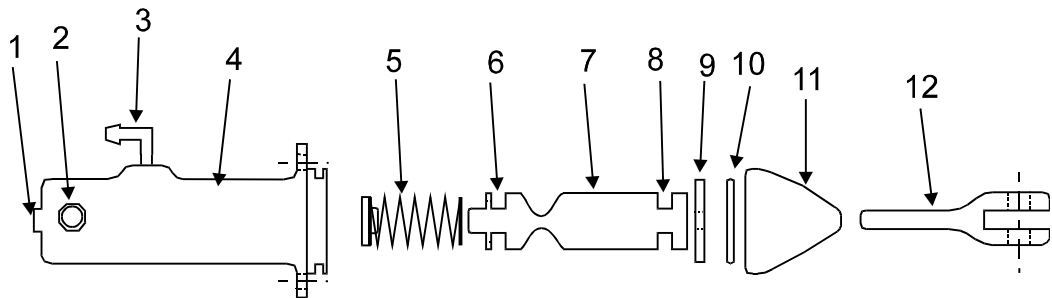
The fork link is attached to the brake pedal by a fork pin. When the brake pedal is pressed the fork link pushes the piston in, forcing out the oil to each of the brakes. When the brake pedal is released a spring in the cylinder draws back the piston and oil reducing the pressure in the brakes.

The brake pedal should have 1-2 mm play so that the pressure in the brake cylinder can be fully released.

Main cylinder

2. Dismantling

- Remove the brake hose (1) and, if necessary, the brake pipe (2) from the main cylinder (4)
- Remove the filler hose (3) from the main cylinder (4)
- Unscrew the accelerator and remove it from the truck
- Remove the pin from the fork link (12)
- Remove the two screws which attach the cylinder to the accelerator



3. Replacing the piston rod seal and spring

- Remove the rubber gaiter (11) from the cylinder (4)
- Remove the locking spring (10) and washer (9)
- Remove the piston (7) from the cylinder (4)
- Remove the spring (5) from the cylinder (4)
- Lift the piston rod seals (6, 8) and carefully cut them off with a knife
- Fit the new piston rod seals (6, 8) to the piston (7)
- Fit the new spring (5) in the cylinder (4)
- Fit the piston (7) into the cylinder (4)
- Fit the washer (9) and locking spring (10) onto the piston (7). Press the piston down with the help of the fork link (12) and fit the locking spring (10) using long nosed pliers
- Fit the rubber gaiter (11) onto the cylinder (4)
- Fit the fork link (12) into the rubber gaiter (11)



4. Assembly

- Screw the cylinder in place on the accelerator
- Fit the pin in the fork link
- Fit the accelerator into the truck
- Reconnect the brake hose and, where necessary, the brake pipe to the cylinder
- Adjust the fork link allowing approximately 2 mm play before the pin strikes the piston
- Bleed the brakes, see chapter "Bleeding the brake system"

5. Bleeding the brake system

You must bleed the brake system when you replace the cylinder or if, for some reason, there is air in the system

- Check the level of brake fluid in the reservoir. If necessary, top up with more brake fluid
- Connect a hose to the bleeder nipple having first loosened it a little. Place the other end of the hose in a bottle
- Press the brake pedal repeatedly until no more air bubbles appear
- Tighten bleeder nipple
- Pump up the pedal pressure by pressing the brake pedal
- Loosen the bleeder nipple
- Depress the brake pedal fully and check that no air bubbles appear
- Tighten the bleeder nipple and release the pedal. Remove the hose
- Check the brake fluid level in the reservoir. If necessary, top up with more brake fluid

F-code Section C-code
RT **S3** **3120**

Main cylinder

Version no T-code
001 **301-307,400**



F-code
RT

Section
S3

C-code
3140

Distributing valve

Issued by
Parts

Approved by
H Forsman

Version no
001

T-code
301-307,400

Distributing valve

Valid from machine number:

T-kod	Modell	Serial Nr	Anm.
301	RR N1-N3, N1C-N3C/14	296949 AA-	
302	RR B1-B3, B1C-B3C/14	296949 AA-	
303	RR B4-B6, B4C-B6C/14	296949 AA-	
304	RR B7-B8, B7C-B8C/14	296949 AA-	
305	RR E1-E3, E1C-E3C/14	296949 AA-	
306	RR E4-E6, E4C-E6C/14	296949 AA-	
307	RR E7-E8, E7C-E8C/14	296949 AA-	
400	RR Cold store cabin	296949 AA-	

1. General

In order to reduce the brake pressure on the driving motor brake a pressure limiting valve is fitted. This valve is preset to 55 bar.

Distributing valve

Version no

001

T-code

301-307,400

2. Description of function

Truck without tilting cab

- Undo the knob to the side of the drivers seat and open the door.

Truck with tilting cab

Make sure there is sufficient room to tilt the cab before starting work.

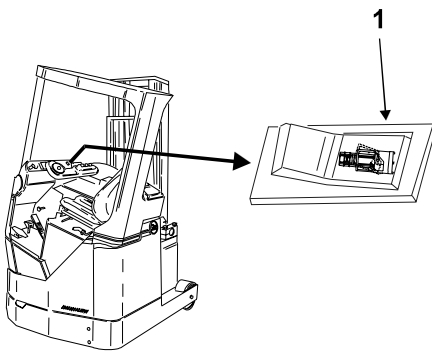


WARNING!

Risk of crushing.

The risk for personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back.

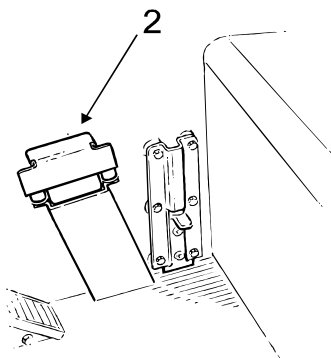
Ensure that no one is in the motor compartment when tilting the cab.



The cab must be tilted 90 degrees for service in the motor compartment.

While tilted, only the cabs lift/lower function is operational and then only at crawl speed.

- Press switch (1) to lower the cab while at the same time turning the key. The display now shows 6 lines.
- Move the fork lifts hydraulic lever backwards.
- When the cab stops (at 15 degrees), loosen the catch (2) to release the cab.
- Continue pulling the hydraulic lever backwards until the cab stops (at 45 degrees).



WARNING!

Falling cab!

The cab can fall without dampening when tilted over 45 degrees.

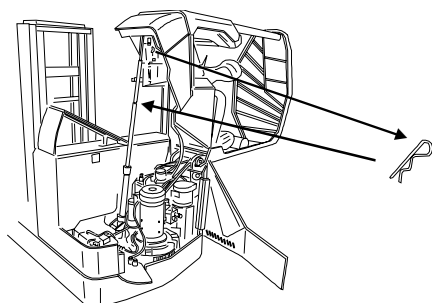
The cab is heavy so make sure the person receiving the cab is in control of the situation. Use crane if possible.

- Take hold of the protective roof and tilt the cab 90 degrees.

NOTE!

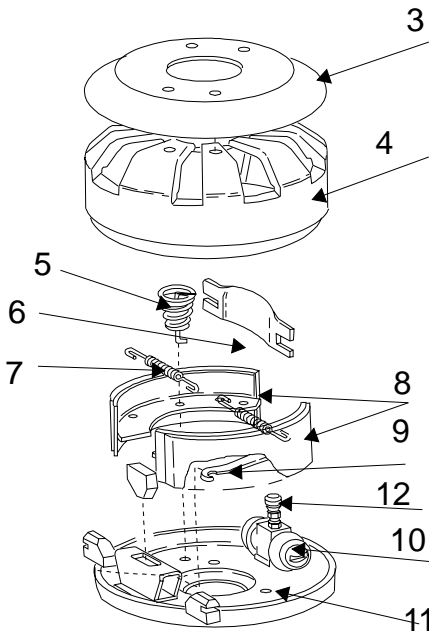
Falling cab!

Insert the pin (which is located under the seat) in the cylinder piston to avoid the cab accidentally falling backwards during service.





3. Dismantling



- Disconnect the seat switch under the seat and secure it with a jumper (159747). You can now work on the truck without having to sit in the drivers seat.
- Remove the four screws holding the cover plate (3) over the brake drum (4) plus the locking nuts on the crankshaft.
- Turn on the power using the key then press the button for the parking brake to loosen the brake.
- Adjust the brake shoes to their innermost position with the adjustment screw.
- Remove the brake drum (4) with tool no. 08-11780
- Remove the brakes two springs (5) by pressing them down and moving them sideways.
- Loosen the ends of the other two springs (6,7) from the holes and remove them.
- Remove both brake shoes (8) from the shield plus the parking brakes wire from the loop (9) in the arm.
- Remove the four screws on the bottom of the shield (11) and remove the shield from the crankshaft.
- Loosen the brake hoses banjo coupling on the underside of the brake and make sure the oil doesn't leak out.

Distributing valve

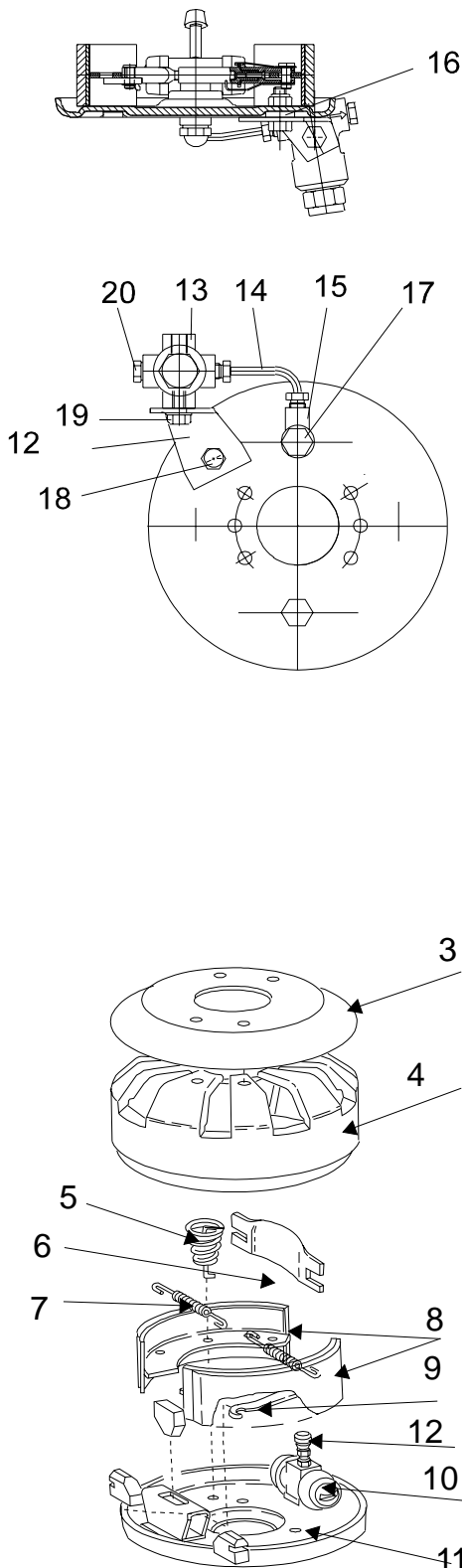
Version no

001

T-code

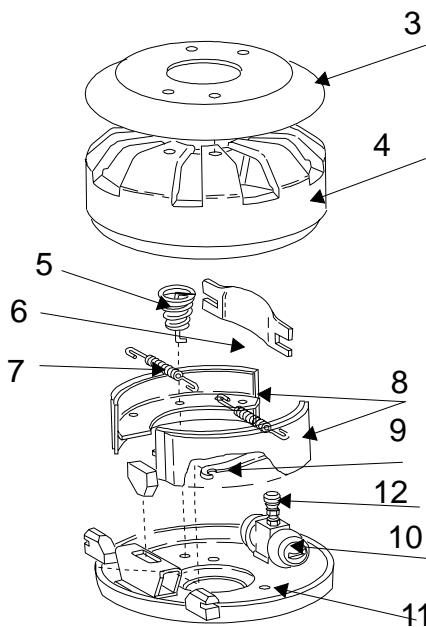
301-307,400

4. Assembly



- Screw together loosely, bracket (12), pressure limiting valve (13), pipe (14), and banjo coupling (15), leaving room for adjustment.
- Fix the bracket (12) to the brake shield (11) with spacer (16) in between.
- Connect the banjo coupling (15) to the cylinder (10) with the hollow screw (17).
- Tighten screws (18, 19), the hollow screw (17) and the pipe (14).
- Remove the plug (20) and connect the brake hose in its place.
- Refit the brake shield (11) using new washers. Tighten with a torque of 24 Nm.
- Attach the parking brake wire to the loop in the arm (9).
- Position the brake shoes (8) on the shield (11).
- Refit the springs (6,7). Attach spring (6) to the upper side of the brake shoe and spring (7) to the underside.
- Refit springs (5) by pushing them through the holes in both the brake shoe and the shield and move them sideways into position.
- Refit the brake drum (4) and fix into place using new locking nuts. Tighten with a torque of 60 Nm.
- If you have replaced the cylinder, bleed the brake system according to chapter “**Bleeding the brake system**”.
- Press the brake pedal to centre the brake shoes.
- Tighten the adjustment screw under the brake shield (11) so that the brake shoes lock the brake drum.
- Release the screw so that the brake shoes no longer touch the drum. The amount of play between the brake drum and brake shoes should be approx. 0.3-0.5 mm.
- Refit the cover plate (3).

5. Bleeding the brake system



You must bleed the brake system when you replace the cylinder or if, for some reason, there is air in the system

- Check the level of brake fluid in the reservoir. If necessary, top up with more brake fluid
- Connect a hose to the bleeder nipple (12) having first loosened it a little. Place the other end of the hose in a bottle
- Press the brake pedal repeatedly until no more air bubbles appear
- Tighten bleeder nipple (12)
- Pump up the pedal pressure by pressing the brake pedal
- Depress the brake pedal fully and check that no air bubbles appear
- Tighten the bleeder nipple (12) and release the pedal. Remove the hose
- Check the brake fluid level in the reservoir. If necessary, top up with more brake fluid

Truck with tilting cab

Ensure that no one is in the motor compartment when tilting the cab.



WARNING!

Risk for crushing!

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.

Ensure no one is in the motor compartment when tilting the cab.

- Remove the jumper (159747) and reconnect the seat switch
- Remove the pin from the cylinder piston
- Take hold of the protective roof and return the cab to the 45 degree position
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position

Truck without tilting cab

- Remove the jumper (159747) and reconnect the seat switch
- Close the door and tighten the knob

F-code Section C-code
RT **S 3.0** **3140**

Distributing valve

Version no T-code
001 **301-307,400**



F-code
RT

Section
S 3.0

C-code
3160

Drum brake, disc brake

Issued by
Parts

Approved by
H Forsman

Version no
001

T-code
301-307,400

Drum brake, disc brake

Valid from machine number:

T-code	Model	Serial No.	Comments
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	

1. General

The trucks service brake is a drum brake. The driving motor brake has a separate brake drum located above the driving motor brake. On the support arm brake it is the support arm wheel which constitutes the brake drum. The support arm brake is situated in the support arm wheel. Carry out dismantling and assembly as follows.

Drum brake, disc brake

2. Description of function

Trucks without tilting cab

- Undo the knob to the side of the drivers seat and open the door.

Trucks with tilting cab

Make sure there is sufficient room to tilt the cab before starting work

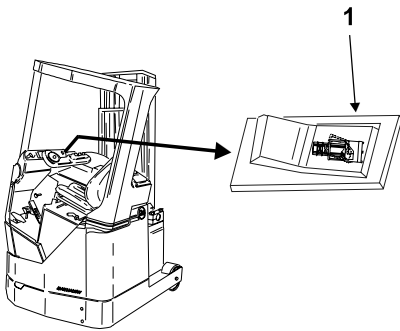


WARNING!

Risk of crushing.

The risk for personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back.

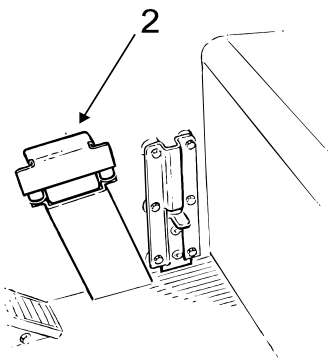
Ensure that no one is in the motor compartment when tilting the cab.



The cab must be tilted 90 degrees for service in the motor compartment.

While tilted, only the cabs lift/lower function is operational and then only at crawl speed.

- Press switch (1) to lower the cab while at the same time turning the key. The display shows 6 lines.
- Move the fork lifts hydraulic lever backwards.
- When the cab stops (at 15 degrees), loosen the catch (2) to release the cab.
- Continue pulling the lever backwards until the cab stops (at 45 degrees).



WARNING!

Falling cab!

The cab can fall without dampening when tilted over 45 degrees.

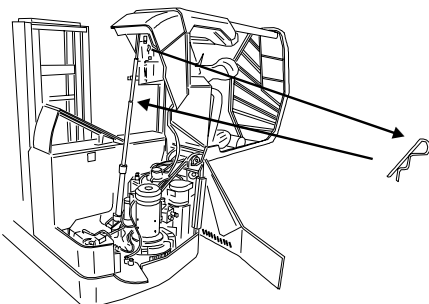
The cab is heavy so make sure the person receiving the cab is in control of the situation. Use crane if possible.

- Take hold of the protective roof and tilt the cab to 90 degrees

NOTE!

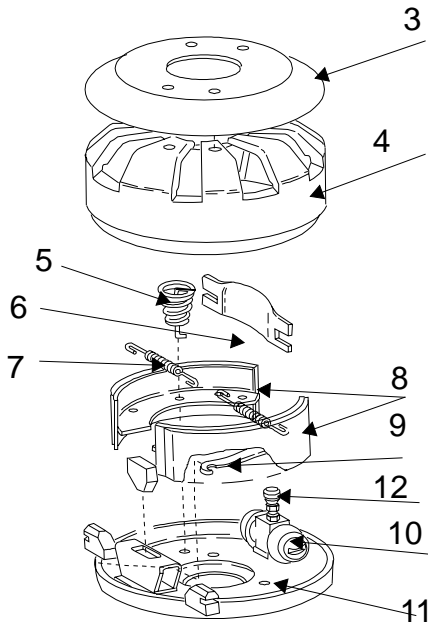
Falling cab!

Insert the pin (which is located under the seat) in the cylinder piston to avoid the cab accidentally falling backwards during service.





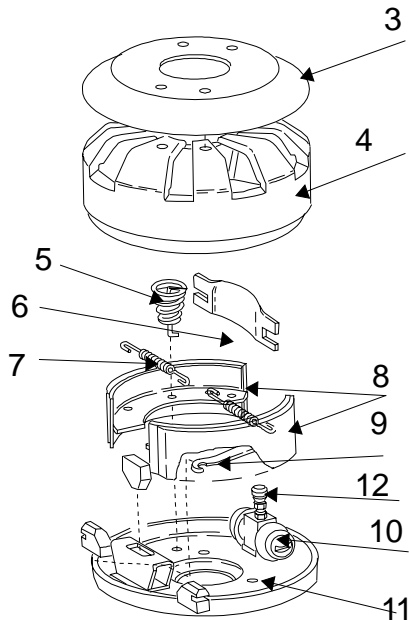
3. Dismantling



- Disconnect the seat switch under the seat and secure it with a jumper (159747). You can now work on the truck without having to sit in the drivers seat.
- Remove the four screws holding the cover plate (3) over the brake drum (4) plus the locking nuts on the crankshaft.
- Turn on the power using the key then press the button for the parking brake to loosen the brake.
- Adjust the brake shoes to their innermost position with the adjustment screw.
- Remove the brake drum (4) with tool no. 08-11780.
- Remove the brakes two springs (5) by pressing them down and moving them sideways.
- Loosen the ends of the other two springs (6,7) from the holes and remove them.
- Remove both brake shoes (8) from the shield.
- Remove the four screws on the bottom of the shield (11) and remove the shield from the crankshaft.
- Loosen the brake hoses banjo coupling on the underside of the brake and make sure the oil doesn't leak out.
- Remove the cylinder (10) by loosening the screws on the back side of the brake shield (11).
- Remove the cylinder (10) and fasten the new one in place.
- Connect the banjo coupling to the cylinder (10).
- Replace the brake shield (11) using new washers. Tighten with a torque of 24 Nm.

Drum brake, disc brake

4. Assembly



- Attach the parking brake wire to the loop in the arm (9).
- Position the new brake shoes (8) on the brake shield (11).
- Refit the springs (6, 7). Attach spring (6) to the upper side of the brake shoe and spring (7) to the underside.
- Refit springs (5) by pushing them through the holes in both the brake shoe and the shield and move them sideways into position.
- Refit the brake drum (4) and fix into place using new locking nuts. Tighten with a torque of 60 Nm.
- If you have replaced the cylinder, bleed the brake system according to chapter “**Bleeding the brake system**”.
- Press the brake pedal to centre the brake shoes.
- Tighten the adjustment screw under the brake shield (11) so that the brake shoes lock the brake drum.
- Release the screw so that the brake shoes no longer touch the drum. The amount of play between the brake drum and brake shoes should be approx. 0.3-0.5 mm.
- Refit the cover plate (3).

5. Bleeding the brake system

You must bleed the brake system when you replace the cylinder or if, for some reason, there is air in the system.

- Check the level of brake fluid in the reservoir. If necessary, top up with more brake fluid.
- Connect a hose to the bleeder nipple (12) having first loosened it a little. Place the other end of the hose in a bottle.
- Press the brake pedal repeatedly until no more air bubbles appear.
- Tighten bleeder nipple (12).
- Pump up the pedal pressure by pressing the brake pedal.
- Depress the brake pedal fully and check that no air bubbles appear.
- Tighten the bleeder nipple (12) and release the pedal. Remove the hose.
- Check the brake fluid level in the reservoir. If necessary, top up with more brake fluid.



Truck with tilting cab

Ensure that no one is in the motor compartment when tilting the cab back.

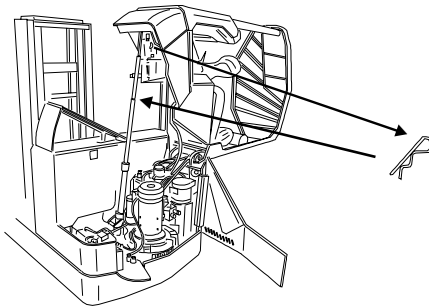


WARNING!

Risk for crushing!

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.

Ensure no one is in the motor compartment when tilting the cab.



- Remove the jumper (159747) and reconnect the seat switch.
- Remove the pin from the cylinder piston.
- Take hold of the protective roof and tilt the cab to the 45 degree position.
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position.

Truck without tilting cab

- Remove the sliding bow (159747) and reconnect the seat switch.
- Close the door and tighten the knob.

6. Dismantling the support arm brake

- Place the support arm on blocks so that the wheel hangs loose.
- Remove the cover plate from the support arm wheel.
- Undo the socket head screws from the inside of the support arm which hold the brake shield in place.
- Unscrew the brake pipe from the banjo coupling.
- Knock out the wheel axle from the support arm.
- Lift out the wheel.
- Lift out the brake shield from the wheel.
- Pull down the brake shoes towards the brake cylinder so that you can remove the clamp from the top of the brake shoes.
- Remove the springs which hold the brake shoes in place.

Drum brake, disc brake

7. Dismantling the brake cylinder

- Unscrew the banjo coupling from the brake cylinder.
- Unscrew the brake cylinder.

8. Assembling the brake cylinder

- Screw the brake cylinder onto the brake shield.
- Screw on the banjo coupling at the same angle it had earlier.

9. Assembling the support arm brake

- Refit the springs that hold the brake shoes in place.
- Refit the clamp on top of the brake shoes.
- refit the brake shield in the support arm wheel.
- Lift the wheel back into the support arm and knock the axle back in place.
- Screw the brake pipe back onto the banjo coupling.
- Apply LOCTITE 243 to the socket head screws.
- Tighten the socket head screws with a torque of 79 Nm.
- Tighten the brake adjusting screw until the wheel locks. Then release the screw a quarter turn.
- Bleed the brakes, Follow the procedure in chapter: **“Bleeding the brake system”**
- Screw the cover plate back in place on the support arm wheel.
- Remove the blocks from under the support arm.



Drive wheel

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	301
302	RR B1-B3, B1C-B3C/14	265200AA-	302
303	RR B4-B6, B4C-B6C/14	265200AA-	303
304	RR B7-B8, B7C-B8C/14	265200AA-	304
305	RR E1-E3, E1C-E3C/14	265200AA-	305
306	RR E4-E6, E4C-E6C/14	265200AA-	306
307	RR E7-E8, E7C-E8C/14	265200AA-	307
400	RR Cold store cabin	265200AA-	

1. General

The drive wheel is made up of a cast rim with a vulcanized tread. When replacing the drive wheel it is important that the wheel nuts are tightened with the correct torque.

Two different wheel sizes have been used on the Reflex truck.

One with five holes for the wheel bolts and one with seven holes.

The smaller wheel (5 holes) is used on models N/B/E1- N/B/E3.

The larger wheel (7 holes) is used on models B/E5-B/E8.

Drive wheel

2. Dismantling the drive wheel

- Lift the truck and place on blocks so that the drive wheel is hanging free
- Undo the four screws holding the cover plate in place
- Remove the cover plate
- Undo the nuts holding the drive wheel in place
- Remove the drive wheel

3. Assembling the drive wheel

- Lift the new drive wheel into position
- Apply molykote grease BT number 055-73040 to the wheel bolts
- Fit the spherical washers in place on the wheel bolts
- Screw on the wheel nuts and tighten with a torque of 130 Nm
- Fit the cover plate
- Remove the blocks from under the truck

F-code
RTSection
S3C-code
3530**Drive wheel**Issued by
PartsApproved by
K HallmanVersion no
002T-code
301-307,401-414

Drive wheel

Valid from serial number:

T-code	Model	Serial n°	Note
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
401	RR N1-N3/15/15	301518AA-	AC/ACi
402	RR N1C-N3C/15	301518AA-	AC/ACi
403	RR B1-B3/15	301518AA-	AC/ACi
404	RR B1C-B3C/15	301518AA-	AC/ACi
405	RR B5-B6/15	301518AA-	AC/ACi
406	RR B5C-B6C/15	301518AA-	AC/ACi
407	RR B7-B8/15	301518AA-	ACi
408	RR B7C-B8C/15	301518AA-	ACi
409	RR E1-E3/15	301518AA-	AC/ACi
410	RR E1C-E3C/15	301518AA-	AC/ACi
411	RR E4-E6/15	301518AA-	AC/ACi
412	RR E4C-E6C/15	301518AA-	AC/ACi
413	RR E7-E8/15	301518AA-	ACi
414	RR E7C-E8C/15	301518AA-	ACi

Drive wheel

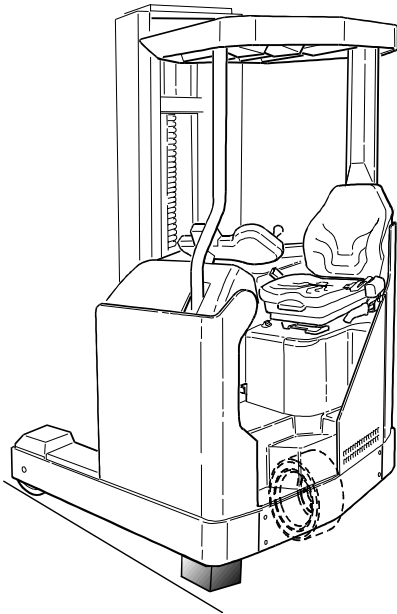
1. General

The drive wheel is made up of a cast rim with a vulcanized tread. When replacing the drive wheel it is important that the wheel nuts are tightened with the correct torque.

Two different wheel sizes have been used on the Reflex truck. One with the dimensions diam. 310x120 mm and the other 350x130 mm.

The smaller wheel (310 mm) is used on models N/B/E1- N/B/E3.

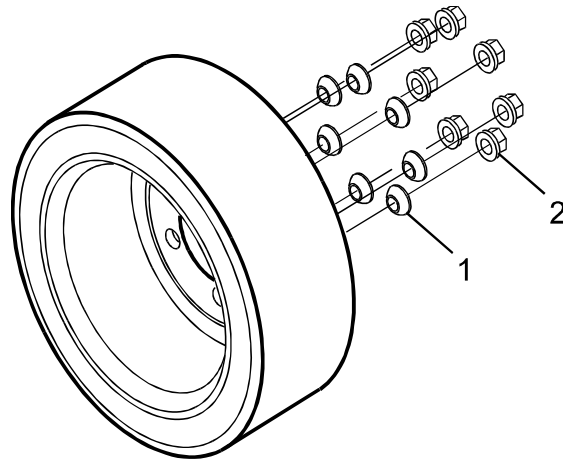
The larger wheel (350 mm) is used on models B/E5-B/E8.



2. Dismantling the drive wheel

- Lift the truck and place on blocks so that the drive wheel is hanging free
- Undo the four screws holding the cover plate in place
- Remove the cover plate
- Undo the nuts holding the drive wheel in place
- Remove the drive wheel

3. Assembling the drive wheel



- Lift the new drive wheel into position
- Apply molykote grease BT number 055-73040 to the wheel bolts
- Fit the spherical washers in place on the wheel bolts
- Screw on the wheel nuts and tighten with a torque of 130 Nm
- Fit the cover plate
- Remove the blocks from under the truck



Support arm wheel

Valid from serial number:

T-code	Model	Serial no.	Notes.
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
401	RR N1-N3/15	301518AA-	AC/ACi
402	RR N1C-N3C/15	301518AA-	AC/ACi
403	RR B1-B3/15	301518AA-	AC/ACi
404	RR B1C-B3C/15	301518AA-	AC/ACi
405	RR B5-B6/15	301518AA-	AC/ACi
406	RR B5C-B6C/15	301518AA-	AC/ACi
407	RR B7-B8/15	301518AA-	ACi
408	RR B7C-B8C/15	301518AA-	ACi
409	RR E1-E3/15	301518AA-	AC/ACi
410	RR E1C-E3C/15	301518AA-	AC/ACi
411	RR E4-E6/15	301518AA-	AC/ACi
412	RR E4C-E6C/15	301518AA-	AC/ACi
413	RR E7-E8/15	301518AA-	ACi
414	RR E7C-E8C/15	301518AA-	ACi

1. General

Five different types of wheel are used on reach trucks. Each wheel is fitted in the support arm with a one-piece axle and an adapter sleeve. The axle has a threaded hole to be used when dismantling and assembling.

Support arm wheel

Truck type	Wheel diameter, mm	Brake/No brake
N1-3, B1-3, E1-3	265	No
N1-3, B1-3, E1-3	300	No
N1-3, B1-3, E1-3	300	Yes
B5-6, E5-6	350	No
B5-6, E5-6, B7-8, E7-8	350	Yes

2. Dismantling the wheel

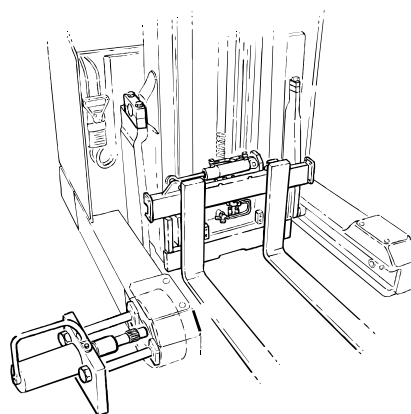
- Lift the truck and place on blocks so that the support arm wheel is hanging free
- Undo the two screws holding the cover plate in place over the wheel
- Remove the cover plate

For wheel with brakes:

- Disconnect the contactor/cable harness from the support arm brake

For wheel with brakes:

- Undo the locking screw on the brake lock
- Remove the axle using tool 08-13585. Use the short insert tool



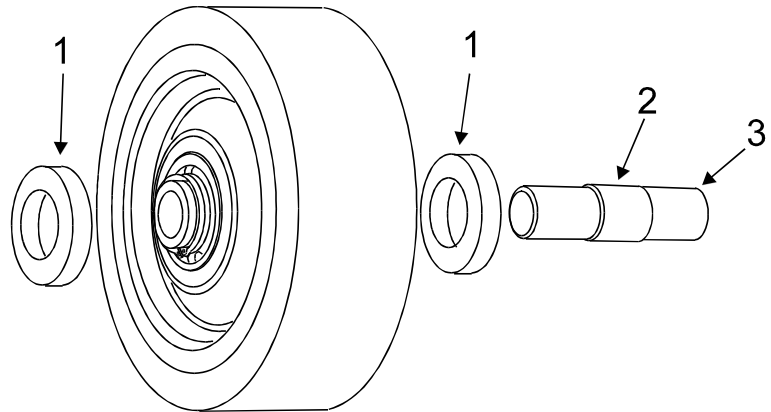
- Lift out the wheel

For wheel with brakes:

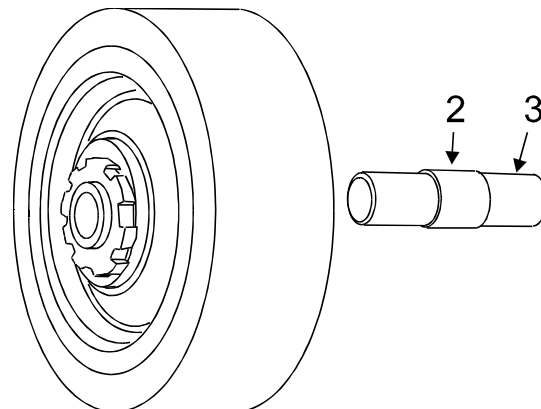
- Remove the brake unit from the wheel

3. Assembling the wheel

265 mm och 300 mm wheel without brake



300 mm wheel with brake and 350 mm wheel



For wheel with brakes:

- Position the brake unit in the wheel.
- 265 mm wheel and 300 mm wheel without brakes:
Fit the spacers (1) in place on the hub.
- Position the wheel in the support arm.

NOTE!

For wheels with brakes, guide the brake lock into its recess in the support arm.

- In order to centre the wheel vertically, use a jack to adjust the height of the support arm.
- Check that the axle (3) is not damaged. Minor lengthwise scratches can be accepted.
If the ends of the axel are punched the axle should be ground or replaced.

Support arm wheel

- Fit a new adapter sleeve (2) on the axle (3).

WARNING!

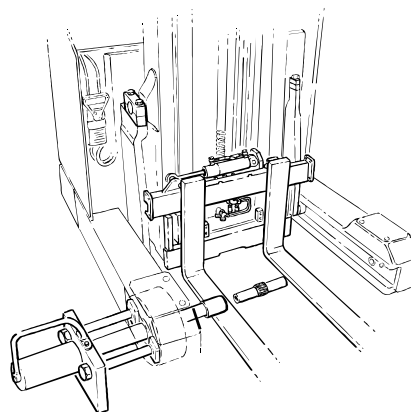


Loose wheels.

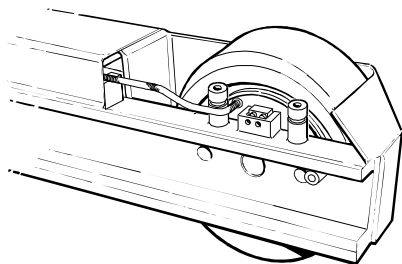
If the wheel is reassembled using the old adapter sleeve the wheel can come loose when driving.

Always use a new adapter sleeve when fitting the wheel on the axle.

- Fit the extension sleeve on the tool 08-13585 and insert it through the wheel into the support arm.



- Fit the axle to the insert tool and insert the axle carefully. Be careful not to insert the axle too far. When the axle has been correctly inserted it must be centered in the support arm's wheel clamp.



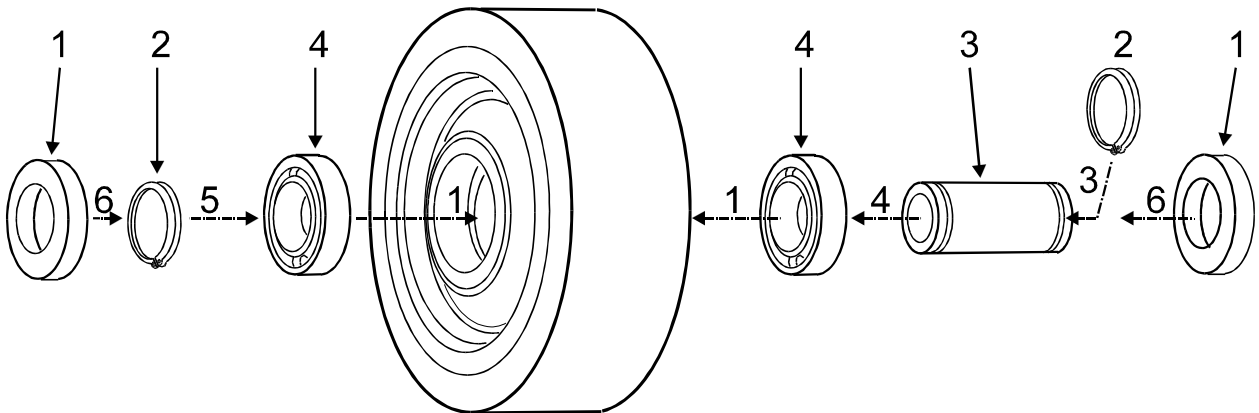
- Lower the truck.
- **For wheel with brakes:**
Tighten the locking screw on the brake lock and reconnect the brake's cable harness. Secure the cable harness to the bracket for the cover plate with a strap so that it cannot rub against and be damaged by the wheel.
- Fit the cover plate.

4. Dismantling/assembling the wheel bearing

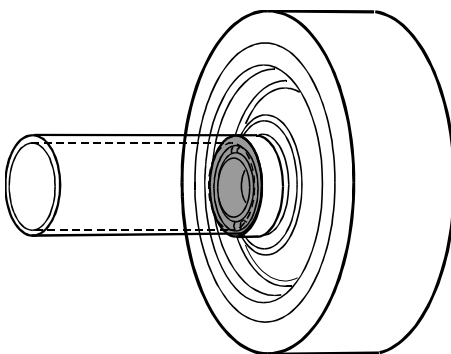
4.1. 265 mm wheel and 300 mm wheel without brakes

4.1.1. Dismantling the bearing

- Remove the spacer (1).
- Remove the circlips (2).
- Press out the sleeve (3).
- Use a “soft” tool of brass or similar to knock out the bearing (4).



4.1.2. Assembling the bearing



- Press in the bearing (4). Use an assembly sleeve with the same diameter as the bearing's outer ring, 90 mm.
- Make sure that the sleeve (3) is not damaged.
- Fit one of the circlips (2) on the sleeve.
- Press in the sleeve until the circlip is stopped by the bearing.
- Fit the other circlip.
- Fit the spacers (1) in place on the hub.

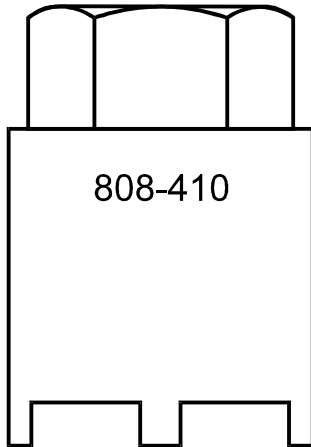
Support arm wheel

Version no

001

T-code

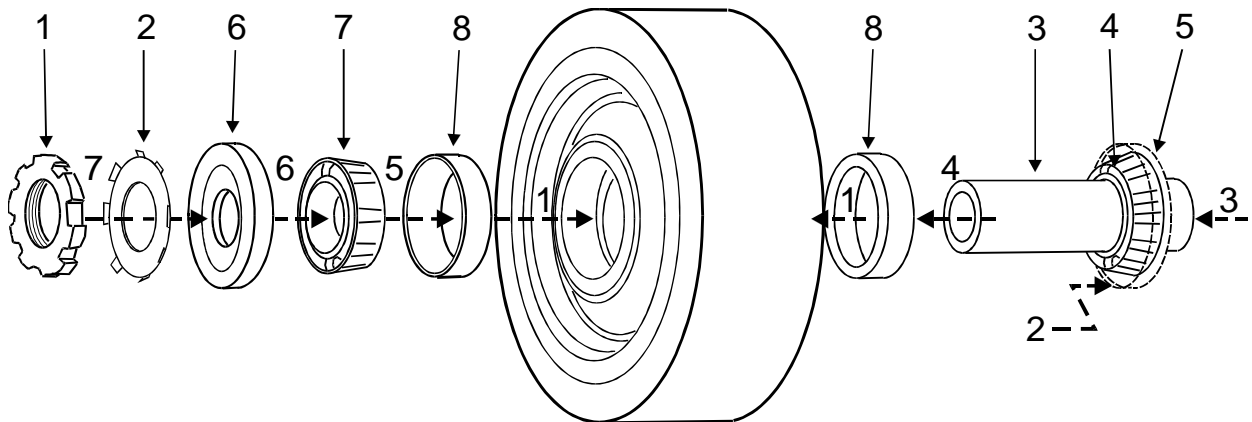
301-307,401-414



4.2. 300 mm wheel with brake and 350 mm wheel

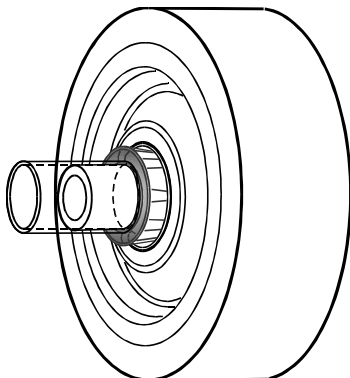
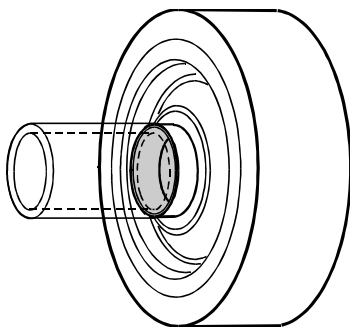
4.2.1. Dismantling the bearing

- Undo the assembly nut (1). Tool: Socket no. 808-410
- Remove the locking washer (2)
- Press out the sleeve (3)
- Pull the bearing off the sleeve (4) and remove the seal (5)
- Remove the seal (6) and the bearing (7)
- Use a "soft" tool of brass or similar to knock the bearing cup (8) from the hub



4.2.2. Assembling the bearing

- Fit the bearing cup in the hub.
Use an assembly tool with the same outer diameter as the bearing cup 80 mm.
- Place the sealing ring (5) on the sleeve.
- Press the sleeve into the bearing (4).
- Apply bearing grease to the bearing and place the sleeve with the bearing in the wheel. Guide the sealing ring into position in the hub.
- Press the bearing (7) on the other side of the wheel.
- Fit the sealing ring (6) in the hub.
- Fit the locking washer (2) and the barrel nut (1).
- Tighten the nut with a torque of 50 Nm.
Tool 808-410 and torque wrench.
The threads must be lubricated before assembly.
- Lock the nut by bending down at least one of the wings on the washer.





Steering system

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

1. General

The **steering generator** is located in the steering panel and has direct contact with the steering wheel. When the steering wheel is turned impulses are sent from the steering generator to the steering motor via the logic box.

Steering system

Version no

001

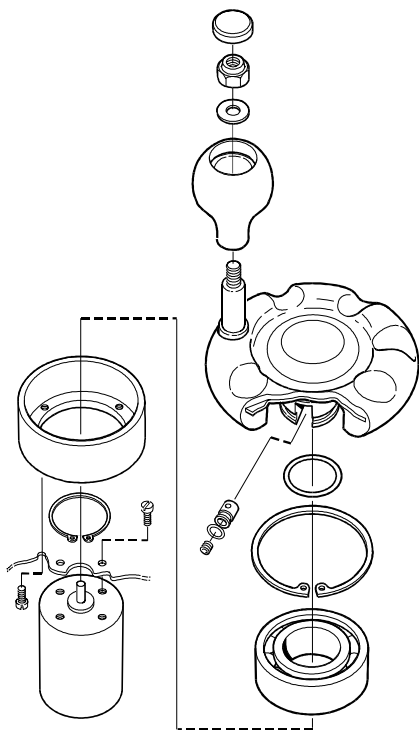
T-code

301-307, 400-414

2. Replacement of the steering generator

2.1. Dismantling

- Undo the 11 screws on the lower panel and remove it
- Disconnect the contactor on the steering motor
- Dismantle the steering wheel by removing the 4 screws round the steering motor
- Undo the screws on the carrier and remove it from the steering motor
- Undo the 4 screws holding the steering motor to the steel console



2.2. Assembly

- Fit the steering motor to the steel console with the 4 screws
- Screw the carrier to the steering motor's axle
- Replace the O-rings on the carrier, if necessary
- Screw the steering wheel in place on the steel console
- Connect the steering motor's electrical contactor
- Fit the lower panel in place with the 11 screws

F-code
RTSection
S 5.0C-code
5000**Electrical system**Issued by
PartsApproved by
H.ForsmanVersion no
001T-code
301-307,400

Electrical system

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C	265200AA-	
302	RR B1-B3, B1C-B3C	265200AA-	
303	RR B4-B6, B4C-B6C	265200AA-	
304	RR B7-B8, B7C-B8C	265200AA-	
305	RR E1-E3, E1C-E3C	265200AA-	
306	RR E4-E6, E4C-E6C	265200AA-	
307	RR E7-E8, E7C-E8C	265200AA-	
400	RR Cold store cabin	265200AA-	

1. General

The trucks electronic system is built up around the electronic card (see chapter 5710) which is powered by 48 VDC from the battery. The electronic card receives signals from the switches, transducers and potentiometers and sends them to the transistor panels (see chapter 5460), displays, horn and proportional valves.

The transistor panels provide the pump and drive unit with power.



2. Symbols and circuit diagrams

2.1. List of symbols

Symbol	Description	Symbol	Description
	Battery		Brake (coil)
	Contactor		Diode
	Emergency stop		Fuse
	Horn		Inductive sensor
	Inductive sensor (normally closed)		Inductive sensor (normally open)
	Magnet switch (normally closed)		Magnet switch (normally open)
	Motor		Potentiometer
	Push-button switch (normally closed)		Push-button switch (normally open)



F-code
RT






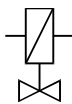
Section
S 5.0

C-code
5000

Version no
001

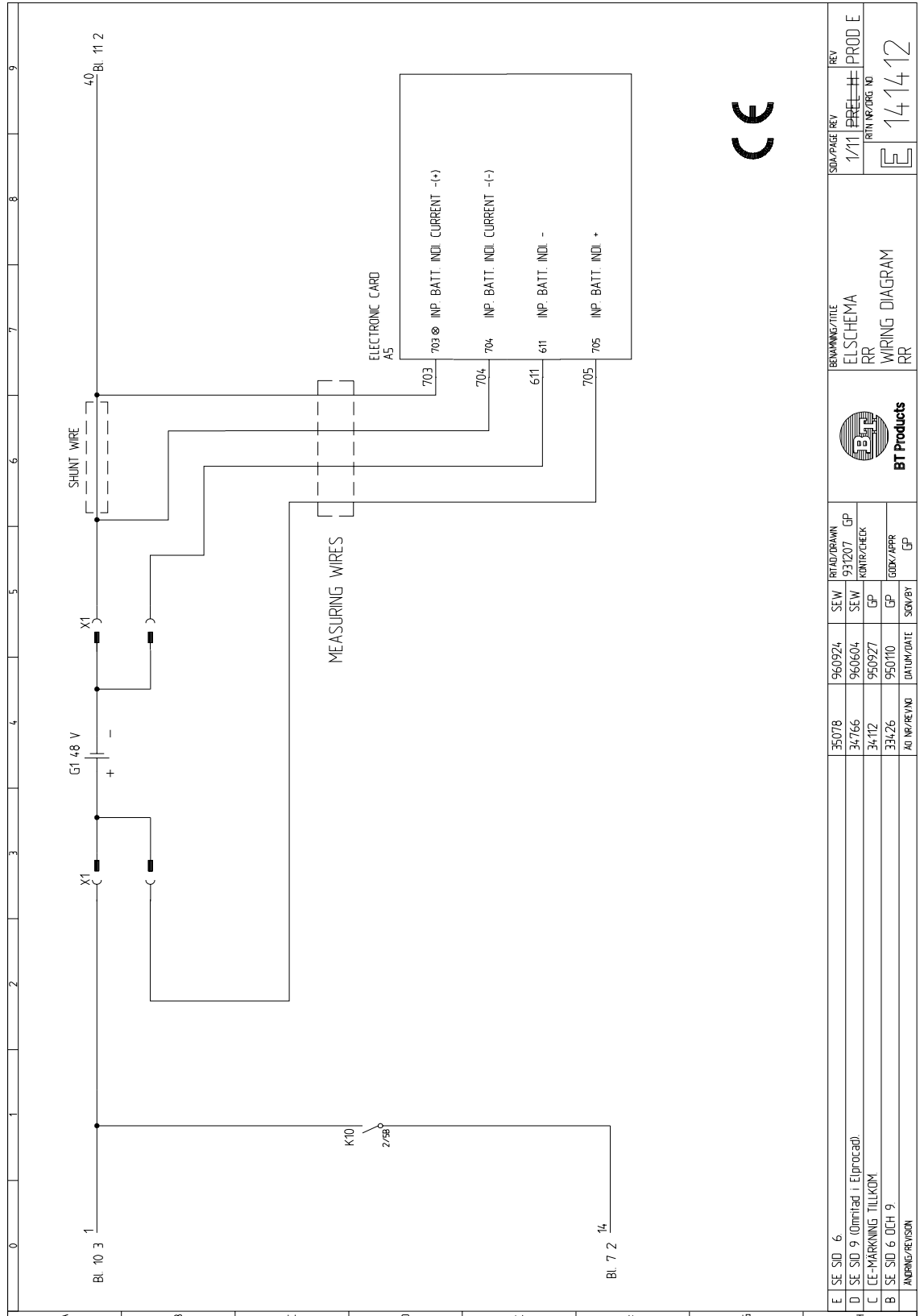
T-code
301-307,400

Electrical system

Symbol	Description	Symbol	Description
	Resistance		Switch
	Key switch		Switch (normally closed)
	Switch (normally open)		Valve



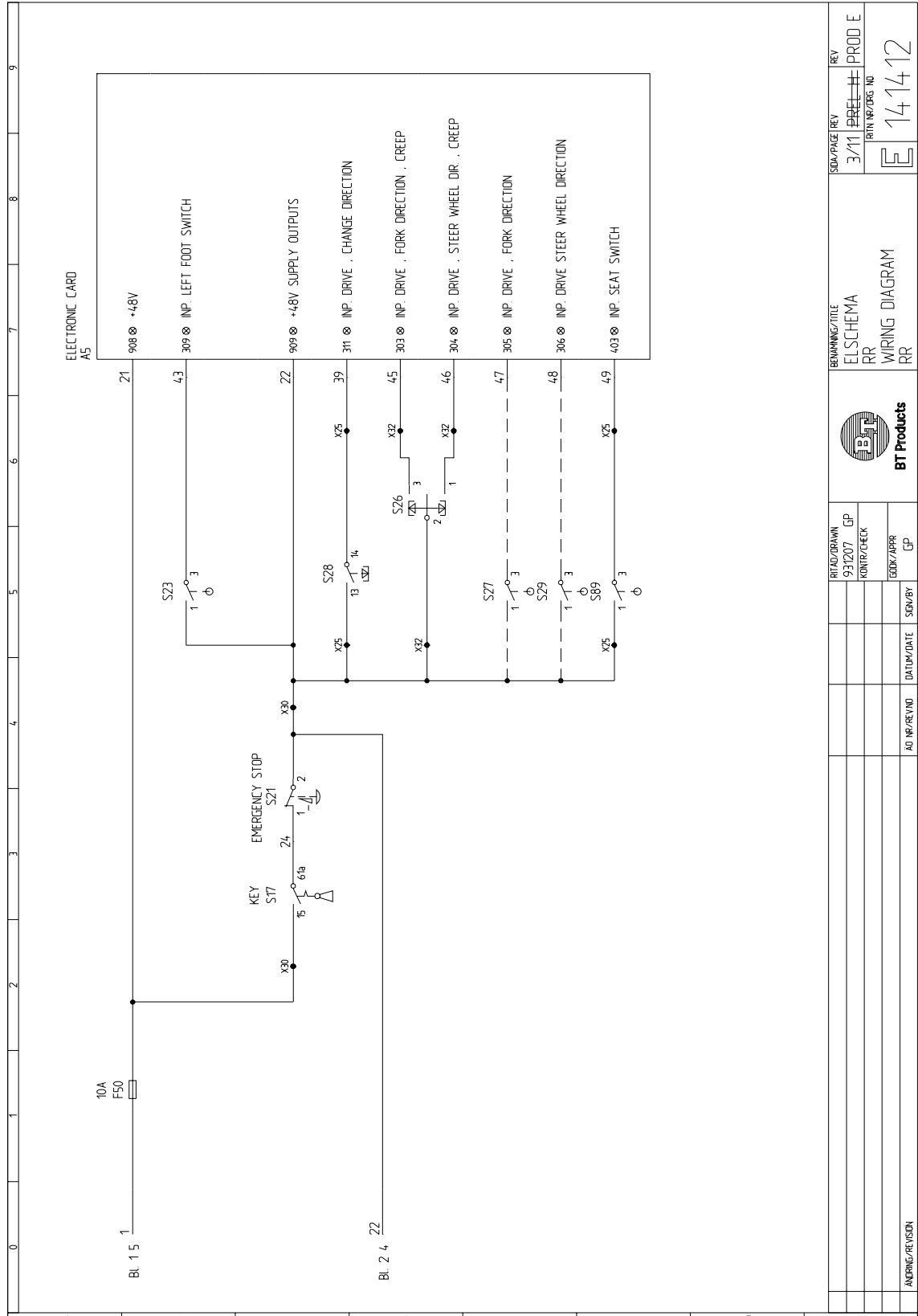
2.2. Circuit diagram (1/11)



E	SE	SID	6	35078	960924	SEW	RTAD/DRAWN	931207	GP	1/11	PREP	REV	PROD E
D	SE	SID	9 (Omtråd i Elprocad)	34766	960604	SEW	KONTR/CHEK	950927	GP	RITN NR/ORG NO			
C	CE	MÄRKNING	TILLKÖM	34712	950927	GP	GEK/APP	95010	GP	E 141412			
B	SE	SID	6	0CH 9	33426	95010	DATUM/DATE		SCVBY	RR			
ANDRING/REVISION										RR			
BT Products										WIRING DIAGRAM			
ELSCHEMA										RR			

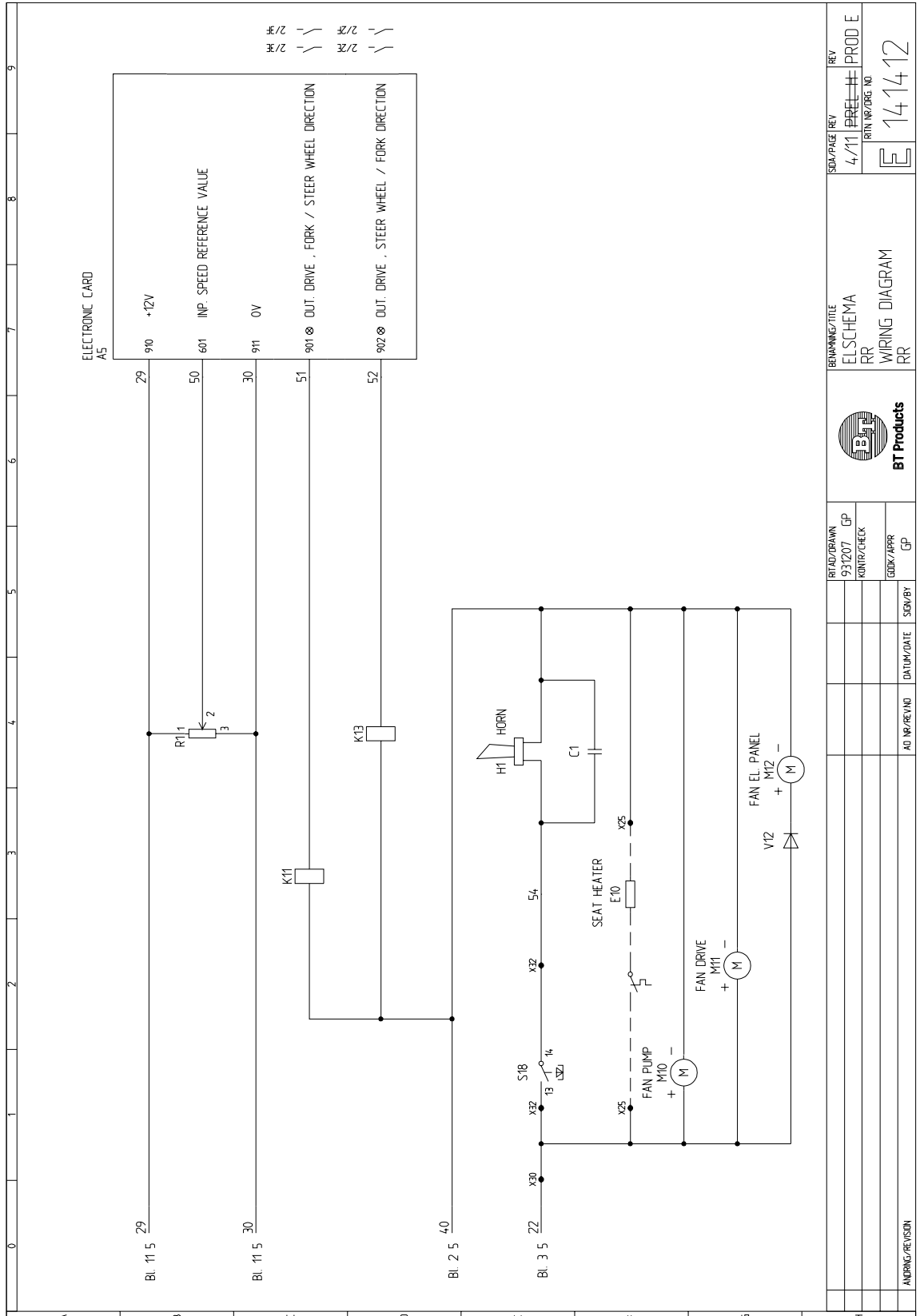


2.4. Circuit diagram (3/11)



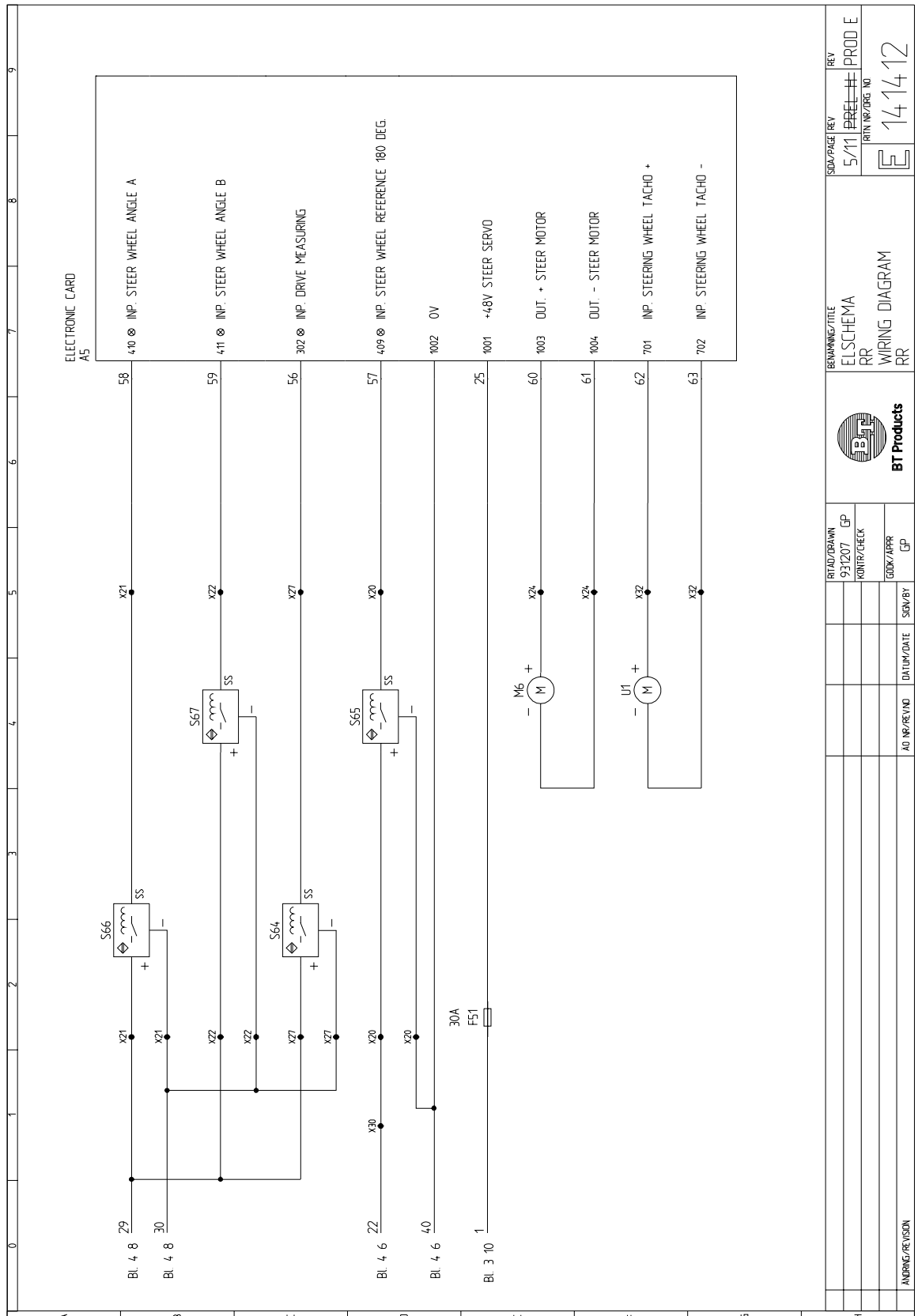


2.5. Circuit diagram (4/11)





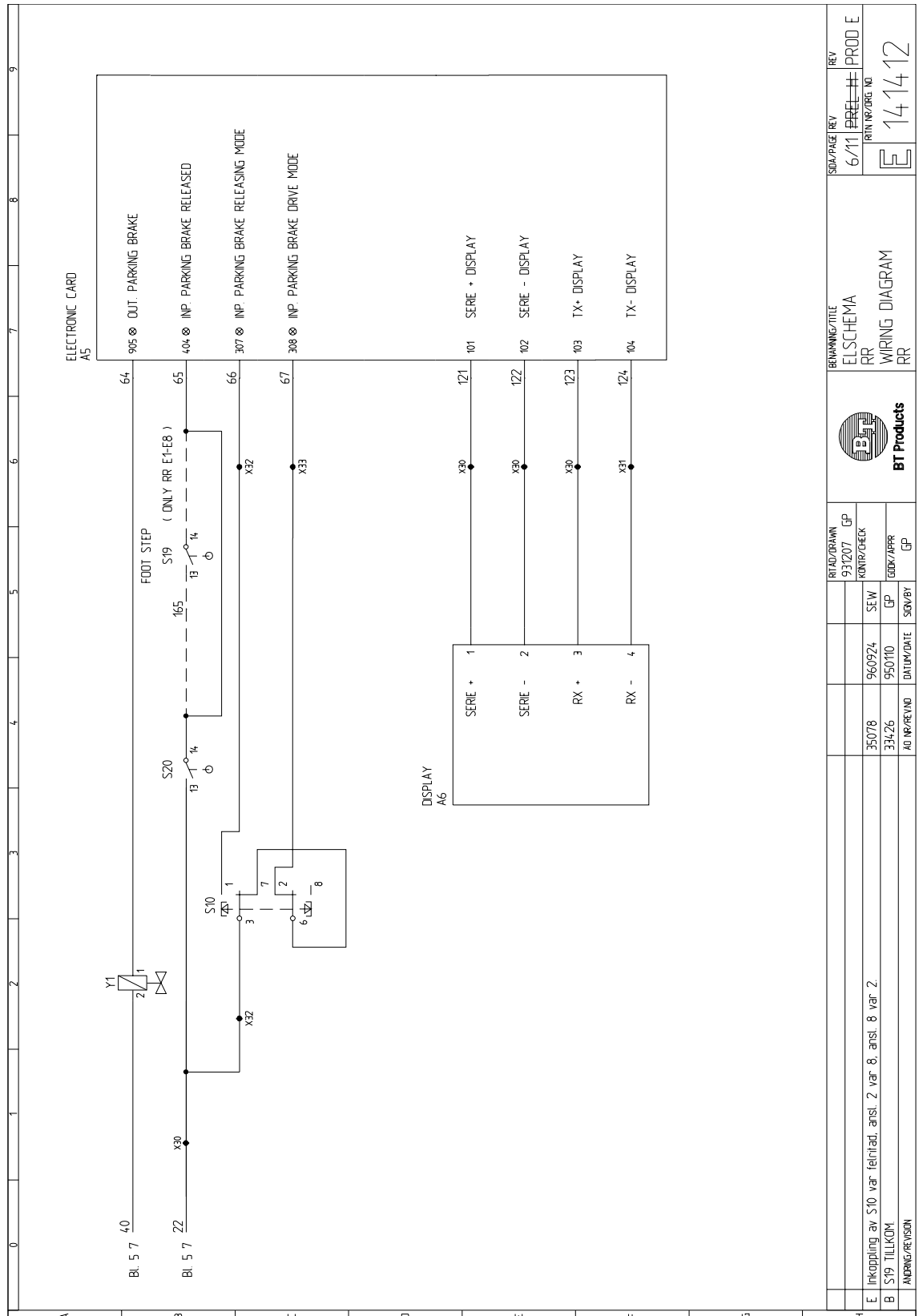
2.6. Circuit diagram (5/11)



ELECTRONIC CARD A5		SCHEMATIC REV		REV
		5/11 PRELIM		PROD E
		RTN NO/ORG NO		
		E		141412
BT Products		REVISION/TITLE		
		ELSCHEMA		
		RR		
		WIRING DIAGRAM		
		RR		
RTAD/DRAWN	GP	931207	GP	
FORNIP/CHECK				
GBX/APPR	GP			
NO/REV/NO		DATE/DATE	SGN/BY	
DRAWING/REVISION				



2.7. Circuit diagram (6/11)

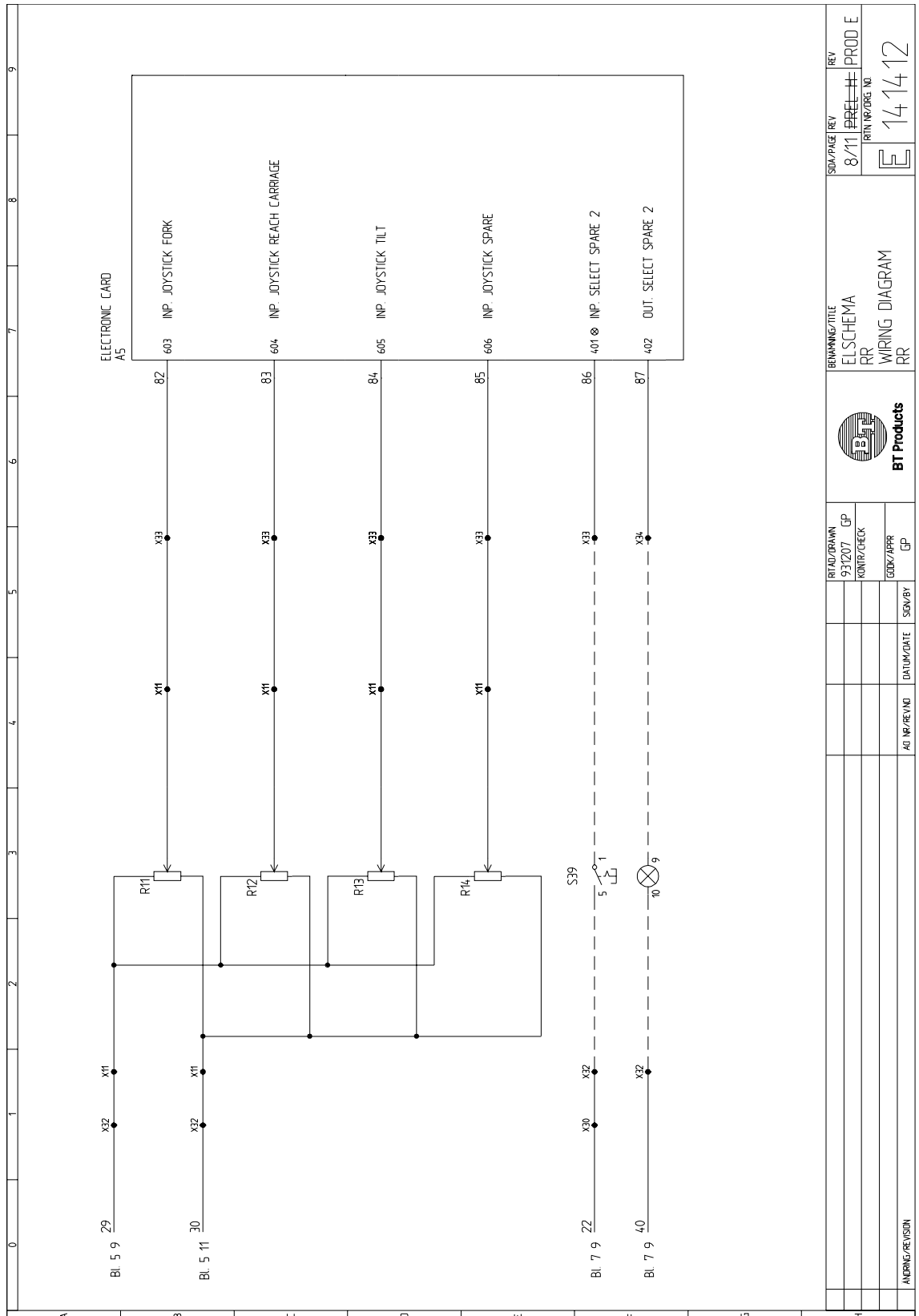


REV	PROD E
6/11	6/11
IRIN NO/REV NO	141412

BRUKNING/TITEL	BT Products
ELSCHEMA	
RR	
WIRING DIAGRAM	
RR	

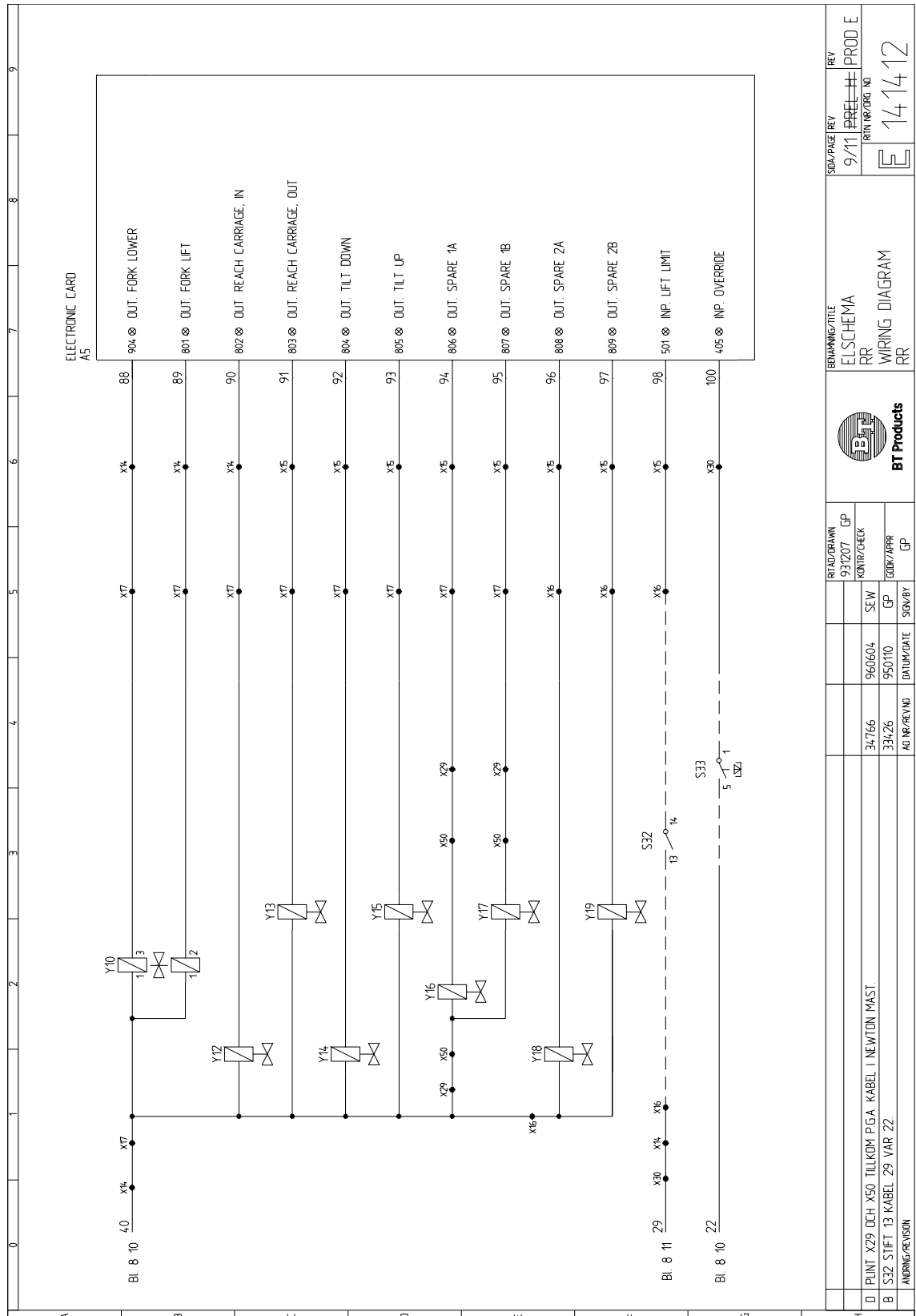


2.9. Circuit diagram (8/11)





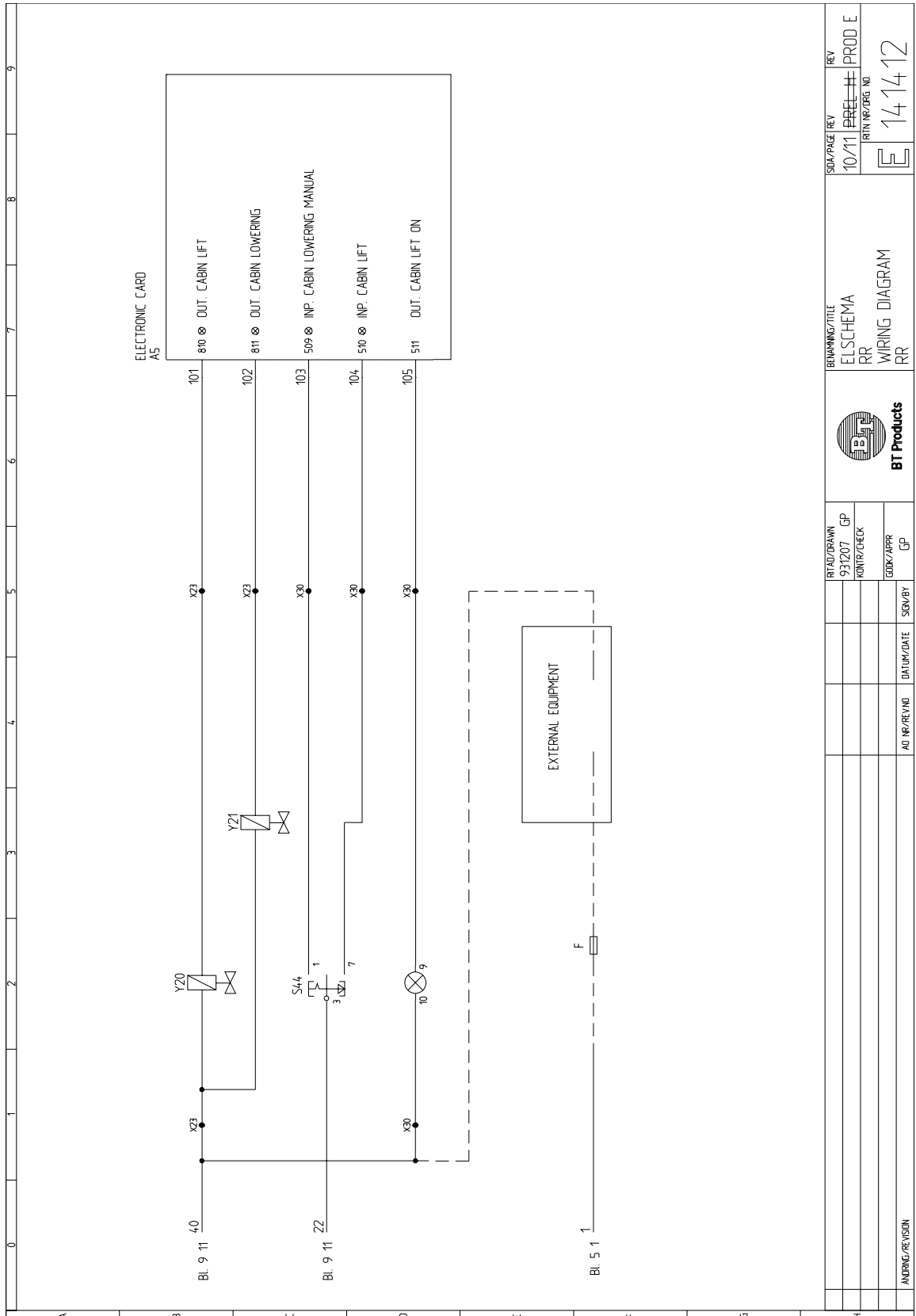
2.10. Circuit diagram (9/11)



REVISION		DATE		BY	
NO	DESCRIPTION	DATE	BY	NO	DESCRIPTION
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3	REVISED				
4	REVISED				
5	REVISED				
6	REVISED				
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100	REVISED				



2.11. Circuit diagram (10/11)



RT/AD/DRAWN	93/207	GP
KONTROL/CHECK		
GODK/APPR		GP
AD NR/REVNO		
DATUM/DATE		
SEGN/BY		
SIGNATURE		
REVISION		
SDA/PAGE	REV	REV
10/11	PREL	# I PROD E
	RTN NR/DRG NO	
		141412
BENÄMNING/TITEL		
ELSCHEMA		
RR		
WIRING DIAGRAM		
RR		
BT Products		



2.13. List of components

Symbol	Designation	Function	Diagram
A1	Transistor regulator	Drive motor	1
A2	Transistor regulator	Pump motor	1
A5	Electronic card	Main card	1
A6	Elektronic unit	Display	3
A7	Electronic unit	Height selector	2
A8	Electronic unit	Height indication	7
BT	Battery	+48 V	
C1	Capacitor	Noise suppression H1	
E10	Heater	Seat warmer	
F1	Fuse 160A	Drive motor	1
F3	Fuse 200/300A	Pump motor	1
F50	Fuse 10A	Control current	1
F51	Fuse 30A	Steering motor	1
H1	Horn		1
K10	Contactor	Main contactor	1
K11	Contactor	Driving in fork direction	1
K13	Contactor	Driving in drive wheel direction	1
M1	Motor	Drive motor	1
M3	Motor	Pump motor	1
M6	Motor	Steering motor	1
M10	Fan	Pump motor	1



Symbol	Designation	Function	Diagram
M11	Fan	Drive motor	1
M12	Fan	Electronics	1
R1	Potentiometer	Speed control, driving	1
R11	Potentiometer	Speed control, fork lift	2
R12	Potentiometer	Speed control, mast in/out	2
R13	Potentiometer	Speed control, tilt	2
R14	Potentiometer	Speed control, extra functions	2
S10	Switch	Parking brake, manoeuvring	2
S17	Switch	Ignition	3
S18	Switch	Horn	2
S19	Switch	Foot step	
S20	Switch	Parking brake position	1
S21	Switch	Emergency stop	3
S23	Switch	Safety pedal, left-foot switch	4
S26	Switch	Travel direction selector, changing	2
S27	Switch	Travel direction selector, driving in fork direction, foot	4
S28	Switch	Travel direction selector, switching	5
S29	Switch	Travel direction selector, driving in steer wheel direction, foot	4
S31	Switch	Speed reduction, driving	
S32	Switch	Lift height limit	
S33	Switch	Lift height limit, bypass coupling	3
S39	Switch	Extra hydraulic function 2, hydraulics	2
S44	Switch	Option cab tilt , manual lowering	3
S45	Switch	Reference height	7



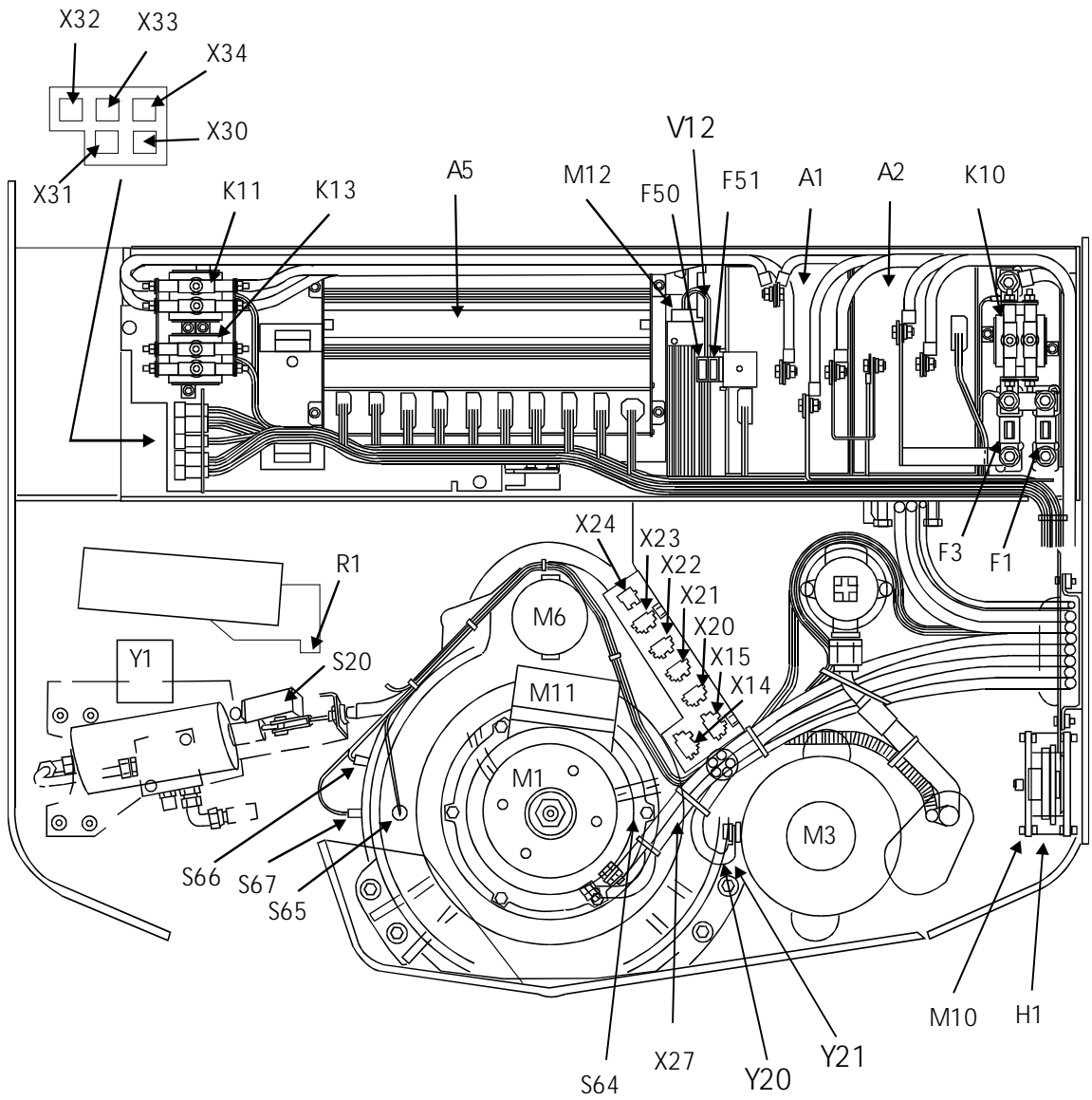
Symbol	Designation	Function	Diagram
S46	Inductive sensor	Lowering lift/lower	6
S55	Inductive sensor	Extending mast, low speed	6
S56	Inductive sensor	Retracting mast, low speed	6
S64	Inductive sensor	Drive motor speed	1
S65	Inductive sensor	Steer wheel sensor, 180°	1
S66	Inductive sensor	Steer wheel sensor, channel A	1
S67	Inductive sensor	Steer wheel sensor, channel B	1
S89	Switch	Seat breaker	5
SA1	Switch	Carbon brush indicator, drive/ pump motor (-)	
SA2	Switch	Carbon brush indicator, drive/ pump motor (+)	
U1	Tachometer	Steering sensor	2
U10	Pulse sensor	Height meter	7
V12	Diode	Fan, electric panel	1
X8	Connection		7
X11	Connection		2
X14	Connection		1
X15	Connection		1
X16	Connection		6
X17	Connection		6
X18	Connection		6
X19	Connection		6
X20	Connection		1
X21	Connection		1
X22	Connection		1
X23	Connection		1



Symbol	Designation	Function	Diagram
X24	Connection		1
X25	Connection		5
X27	Connection		1
X28	Connection		7
X29	Connection		6
X30	Connection		1
X31	Connection		1
X32	Connection		1
X33	Connection		1
X34	Connection		1
X50	Connection		
Y1	Magnet valve	Parking brake	1
Y10/2	Magnet valve	Lifting of forks	6
Y10/3	Magnet valve	Proportional valve, lowering of forks	6
Y12	Magnet valve	Retracting mast	6
Y13	Magnet valve	Extending mast	6
Y14	Magnet valve	Tilting of forks, down	6
Y15	Magnet valve	Tilting of forks, up	6
Y16	Magnet valve	Extra function 1-1A	6/8
Y17	Magnet valve	Extra function 1-1B	6/8
Y18	Magnet valve	Extra function 2-2A	
Y19	Magnet valve	Extra function 2-2B	
Y20	Magnet valve	Cab tilt, up	1
Y21	Magnet valve	Cab tilt, down	1

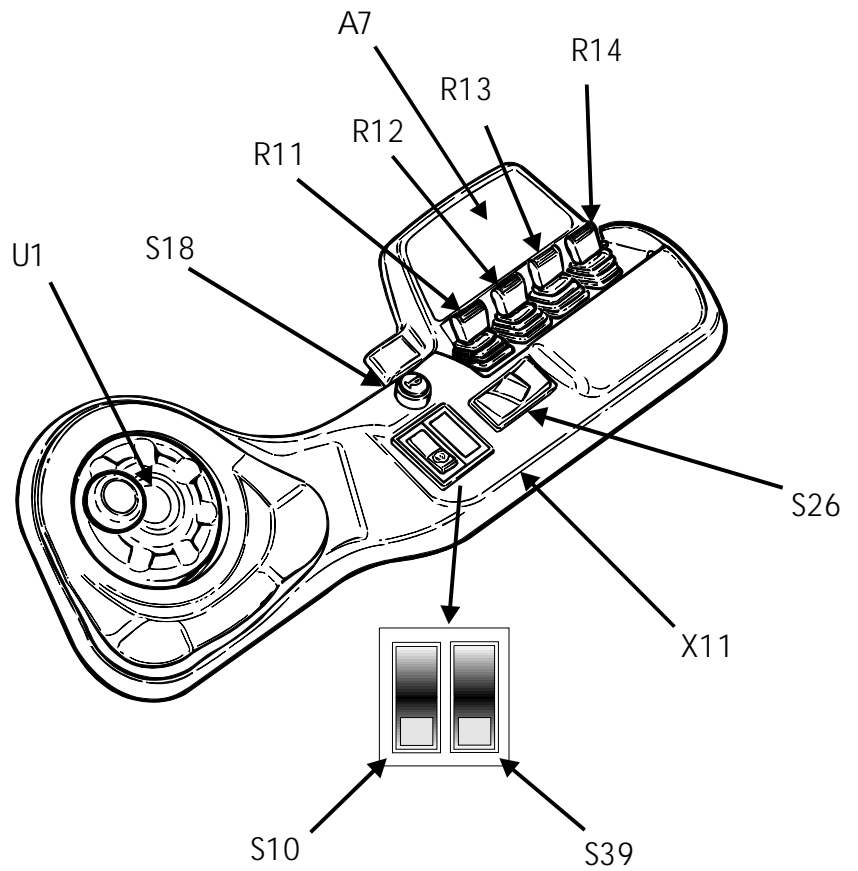


2.14. Diagram 1

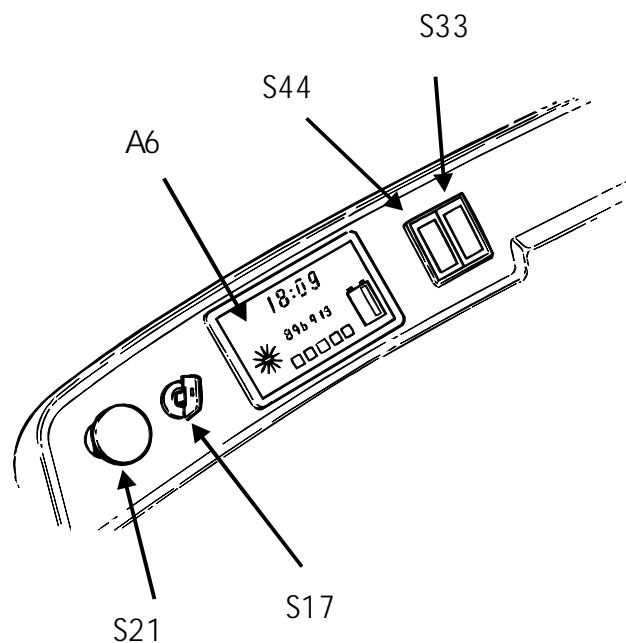




2.15. Diagram 2

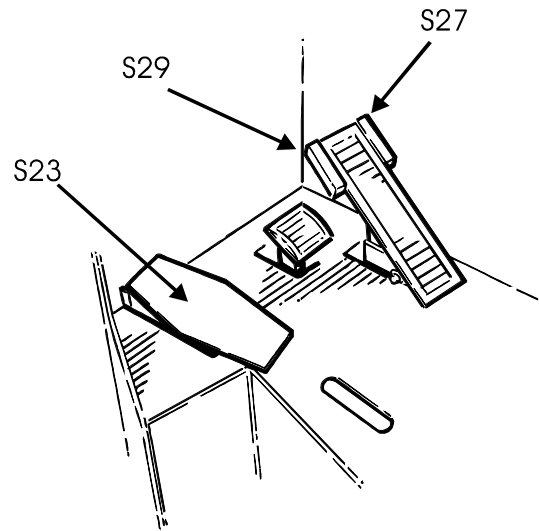


2.16. Diagram 3

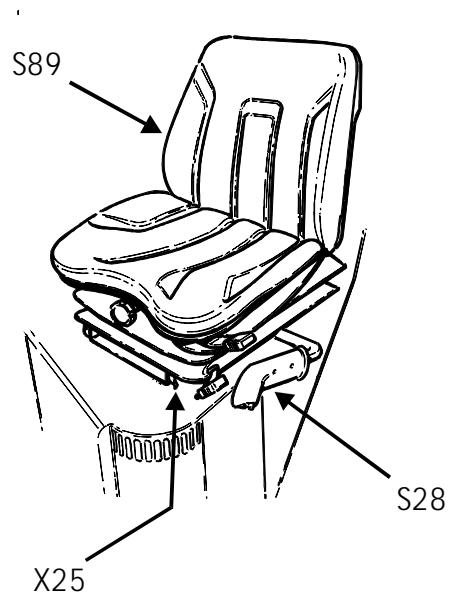




2.17. Diagram 4

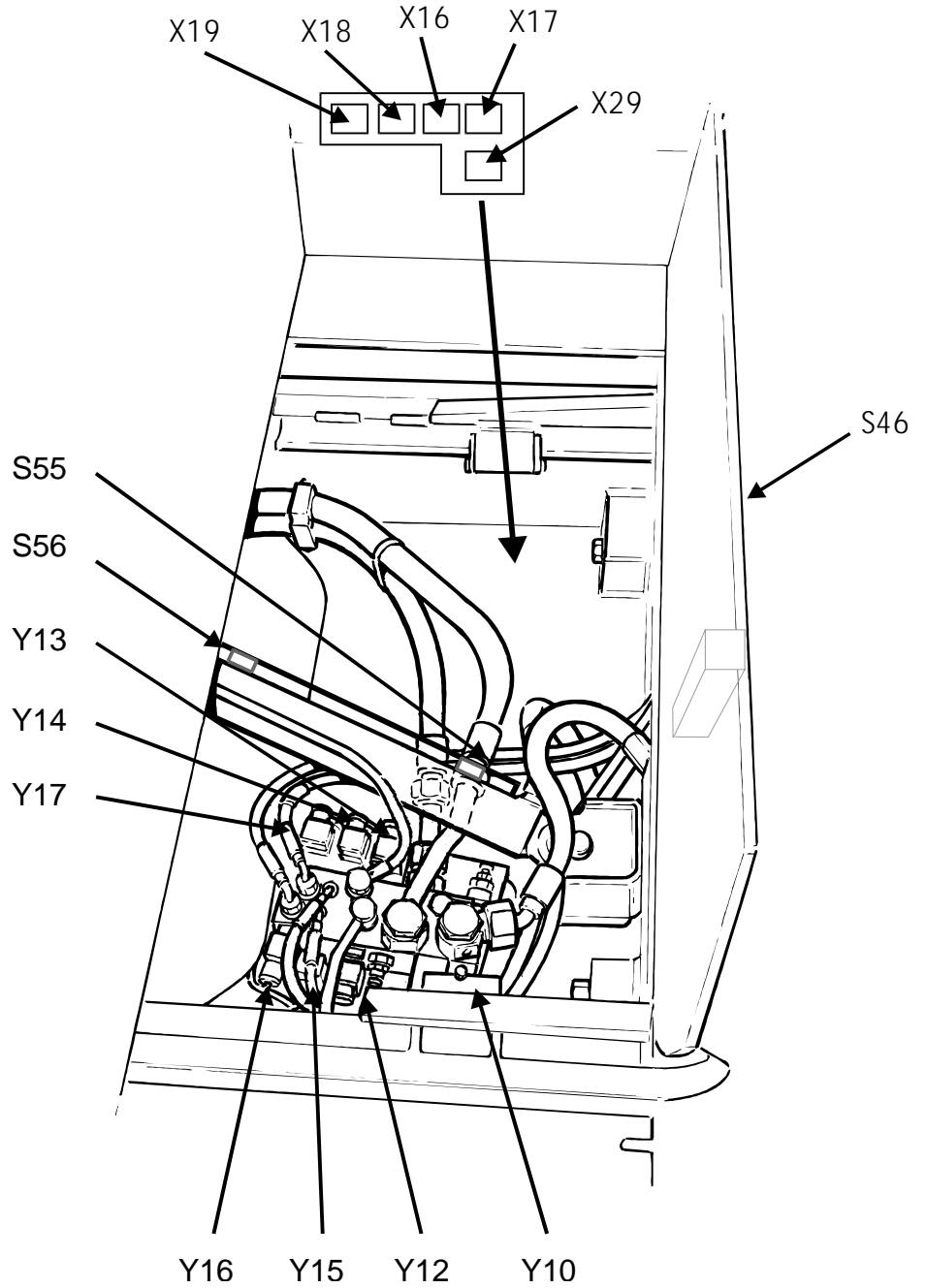


2.18. Diagram 5



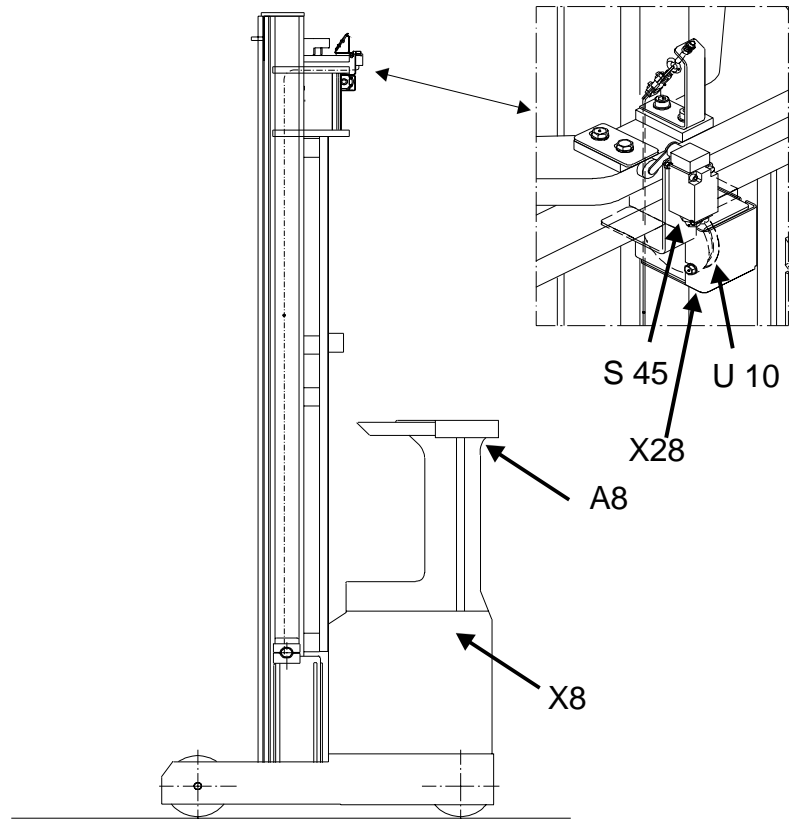


2.19. Diagram 6

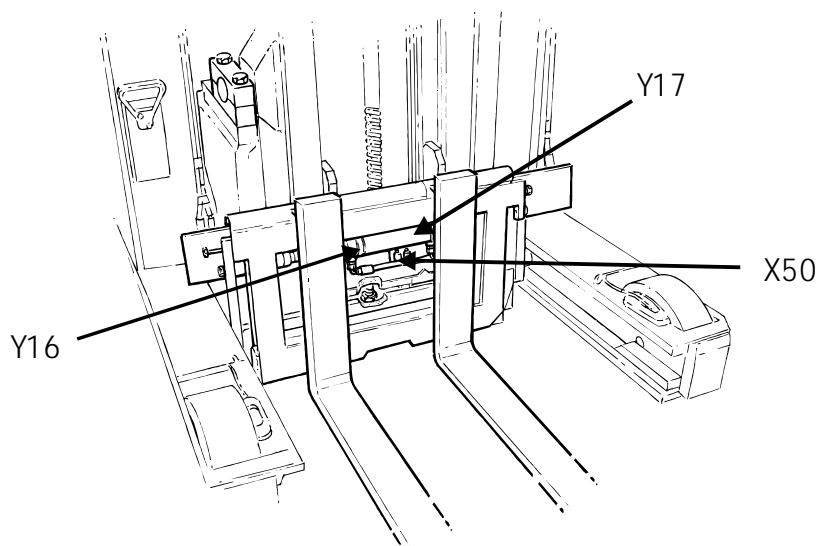




2.20. Diagram 7



2.21. Diagram 8





3. Description of function RR B/E1-B/E8

The logic card on RR holds the microprocessor which senses switches, steering voltage, etc. and gives instructions to the external electronics, contactors and valves etc.

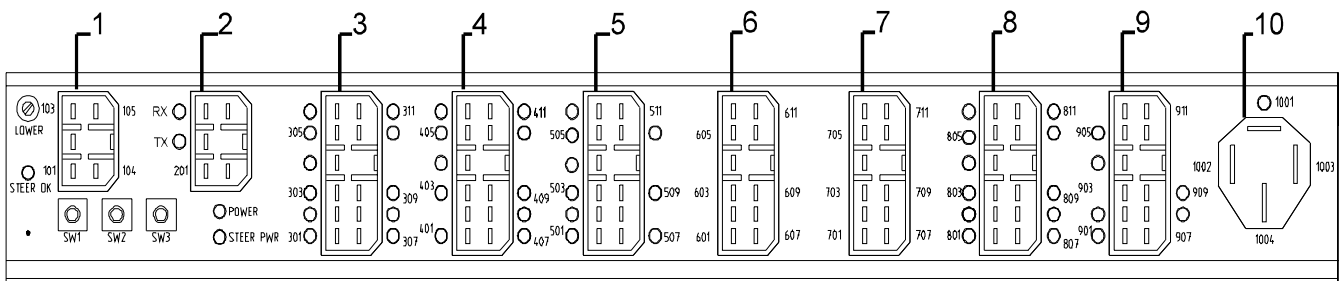
To hold the preprogrammed information in the electronic unit when the battery is disconnected, the unit receives its power from an internal battery. Any faults registered by the microprocessor are shown on the display. The error codes are explained in connection with the electronic card. The electronic card's inputs and outputs are marked with the connection number and can easily be connected/disconnected using the contactors. The inputs and outputs, which have two fixed positions, have LEDs as indicators, **green for input** and **red for output**.

The description follows the operating sequence. For each operation a LED pattern is shown on the electronic card. A detailed description of the main components can be found in each chapter. The tables plus the following information show which diodes should be lit:

Outputs which are **not** standard to the truck but which are included as optional extras are active on the card.

If, for example, you have a B1, diodes 810 and 811 for cabin lift and Cabin lowering will be lit.

Signal name	Diode number
The name given to the input/output on the card according to the circuit diagram	The diode showing which input/output is active on the card
When the display shows 304/901 for example, the first number is the input and the second is the output	





3.1. Ignition key in the 0 position

When the battery is connected to the truck via the charger plug the electronic card (A5) is fed with 48 V current and the LEDs are lit according to the table.

Signal name	Diode number
	POWER
+48 V POWER STEERING	1001
STEER WHEEL ANGLE	410/411
+48 V	908



3.2. Ignition key in 1 position

The truck receives voltage when the operator turns the key to the 1 position. The driver must stand on the safety pedal to be able to use the travel direction selector and hydraulics. The voltage flows through the control fuse (F50), ignition lock (S17) and the emergency stop /S21) to the electronic card (A5), the transistor regulator (A1 and A2) and the height electronics (A7 and A8). The transistor regulator for the drive motor (A1) checks that the internal safety function works and makes the main contactor (K10) which provides voltage to the drive and pump motors as well as information to A5. The electronic card (A5) starts communications with the height electronics (A7 and A8).

The stabilised voltage (+12 V) comes from A5 to potentiometer (R1) in the speed control and the hydraulic control (R11-R14). A5 checks that the voltage from the hydraulic control is 1-11 V and sends control pulses to the tachometer (U1) and the control motor (M6). If the seat has a built-in heater, voltage will also be sent to the thermostat and the seat warmer (E10).

All lamps on the display come on to show the lamps in normal mode: time, running time, battery status, any error codes and the software's version number.

The time the truck has the key in position 1 is measured and stored in the electronic unit.

Signal name	Diode number
	POWER
	STEER PWR
	STEER OK
SEAT SWITCH	403
+48 V SUPPLY OUTPUTS	909
LEFT FOOT SWITCH	309



3.3. Selection of travel direction

There are three ways of selecting the direction of travel:

With the steering console

When control (S26) is pressed down the voltage is sent from the switch to A5. If the control is held down for at least three seconds the truck will travel at creep speed.

With the left-hand handle

When control (S28) is pressed the voltage goes from the switch to A5 which results in the truck changing travel direction. This control can only be used to change the direction of travel after the choice has been made on the steering console. It is not possible to activate the creep speed function with this control.

With the speed control

When the right-foot pedal (in direction of forks) is pressed the voltage goes from the switch (S27) to A5. The truck changes direction by pressing the left-foot pedal. The pedals can not be used to activate the creep speed function.

The display shows the direction of travel.

Signal name	Diode number
	POWER
	STEER PWR
	STEER OK
FORK DIRECTION, CREEP	303
STEER WHEEL DIRECTION, CREEP	304
FORK DIRECTION	305
STEER WHEEL DIRECTION	306
CHANGE DIRECTION	311



3.4. Driving

When the switch (S10), which releases the parking brake is pressed the voltage goes to A5. The pump motor (M3) is activated and oil goes via valve (Y1) to the parking brake cylinder. The cylinder compresses the return spring, the wire slackens and the brake shoes release the brake drum. When the cylinder is in the outermost position the switch (S20) is active and voltage goes to A5 which stops the pump motor (M3). If the safety switch (S23) is not active when the parking brake is released a buzzer is sounded from the display.

If the operator presses the speed control when the key is turned to position 1 the control must be returned to the neutral position before the truck can be driven.

When the speed control is pressed down the potentiometer (R1) is activated and the selected travel direction contactor receives voltage from A5 and makes. The more the speed control is pressed down the greater the voltage that flows from R1 to A5. A1 governs the drive motor's speed by means of the information from A5. The current flows through the fuse (F1), M1's rotor, K11/K13, M1's series windings to A1's transistor connection (M).

If the switch for speed reduction (S31) is active so that there is voltage on A5's input, the preprogrammed max. speed will apply. The speed is measured with the help of a sensor (S64) which measures the speed of the drive motor.

If the travel direction control on the steering console is pressed down for at least three seconds the truck will travel at creep speed.

If the driver leaves the seat for more than three seconds the voltage from A5 to Y1 is discontinued and the parking brake is activated.

The drive motor's running time is measured and recorded in the electronic unit.

Signal name	Diode number
	POWER
	STEER PWR
	STEER OK
PARKING BRAKE, RELEASING MODE	307
PARKING BRAKE, DRIVE MODE	308
PARKING BRAKE	905



3.5. Steering

When the steering is turned the voltage goes from the tachometer (U1) to A5 which progressively supplies current to the steering motor (M6). The result of this is that the faster steering movement the quicker the steering motor rotates. This progressivity also means that the higher the driving speed, the lower the steering speed. The speed is measured with the help of sensor (S64) which measures the speed of the drive motor.

When the steering is turned the steering wheel sensor (S65) is activated and voltage flows to A5. The opposite travel direction is shown on the display. The electronics automatically show the correct travel direction through switch (S65) giving a signal during 180° of the 360 possible. The (S65) must pass one of the reference points so that the electronics knows the direction of the steering wheel and shows the travel direction. The function is initiated by turning the steering. This must be done at the first start and after servicing.

Signal name	Diode number
	POWER
	STEER PWR
	STEER OK
STEER WHEEL REFERENCE 180 DEGREES	409

3.6. Steering wheel indicator (optional)

When the steering is turned (S66 and S67) signal to A5 which shows the travel direction on the display. The sensor (S65) must pass one of the reference points so that the electronics knows the direction of the steering wheel and shows the travel direction. The function is initiated by turning the steering. This must be done at first start and after servicing. When the travel direction is changed by means of the switch the arrows change on the display.

Signal name	Diode number
	POWER
	STEER PWR
	STEER OK
STEER WHEEL ANGLE	410, 411



3.7. Braking

There are three ways to brake:

Motor brake (electric)

When the operator changes the travel direction by means of the switch the travel direction contactors (K11 and K13) switch. The electronic card (A5) receives information from A1 that motor braking is taking place and changes the regulation of A1. The drive motor functions during braking as a generator and current goes through the brake diode to the transistor regulator's connection (A).

Foot brake

When the operator presses the brake pedal the main brake cylinder is activated and the pressure increases in the brake cylinder on the drive motor which presses the brake shoes against the brake drum. On trucks with support arm brakes these will receive the same increase in pressure and assist in stopping the truck.

Parking brake

When switch (S10) is pressed down so that both connections to A5 are without voltage, valve (Y1) opens and drains the oil from the parking brake cylinder with the help of the return spring. The return spring pulls the brake wire which press the brake shoes against the brake drum. Switch (S20) changes position and the parking symbol appears on the display.

Signal name	Diode number
	POWER
	STEER PWR
	STEER OK
FORK DIRECTION	303/902
STEER WHEEL DIRECTION	304/901
PARKING BRAKE RELEASING MODE	307
PARKING BRAKE DRIVE MODE	308



3.8. Fork lift

When the operator activates the potentiometer (R11) A5 receives a voltage on the input, the proportional valve (Y10) opens and sends a signal to transistor regulator (A1). The pump motor (M3) starts and gives oil to the lift cylinders.

If the battery guard measures a remaining capacity of 20% or lower in the battery the lift speed is reduced.

The lift speed is reduced during the change over from free lift to main lift.

Signal name	Diode number
FORKLIFT	801

3.9. Max. height switch (optional)

When the forks reach the height switch (S32) and A5 receives a signal, the lift will be stopped. If the forks are to be lifted above this height the switch (S33) should be pressed down, which gives a signal to A5 and the lift continues. The start must take place within five seconds.

Signal name	Diode number
HEIGHT COUNTER	501

3.10. Pulse counter (optional)

When the forks reach the main lift zone A5 receives a signal from switch (S45) to start counting pulses from transmitter (U10). The forks stop when the preprogrammed height is reached. If the forks are to be raised above this height switch (S33) must be pressed down which sends a signal to A5 and the lift can continue. The start must take place within five seconds.

Signal name	Diode number
HEIGHT COUNTER	501
HEIGHT COUNTER	502
HEIGHT REFERENCE	503



3.11. Fork lowering

When the operator activates the potentiometer (R11) voltage goes to A5 which opens the proportional valve (Y10) and the operator can lower the forks at a variable speed.

If the truck is fitted with a pulse counter, the lowering speed is reduced during change over from main lift to free lift.

Signal name	Diode number
FORK LOWER	904

3.12. Mast out/in

When the operator activates the potentiometer (R12) voltage goes to A5 which opens proportional valve (Y12/Y13) and sends a signal to transistor regulator (A1). The pump motor (M3) starts and gives oil to the reach cylinder. Before the reach carriage reaches the end position transmitters (S55 and S56) are activated and a signal goes to A5 and A2. The pump motor speed is reduced.

Signal name	Diode number
REACH CARRIAGE, LOW SPEED OUT	407
REACH CARRIAGE, LOW SPEED IN	408
REACH CARRIAGE IN	802
REACH CARRIAGE OUT	803

3.13. Fork tilt up/down

When the operator activates the potentiometer (R13) voltage goes to A5 which opens proportional valve (Y14/Y15) and sends a signal to transistor regulator (A1). The pump motor (M3) starts and gives oil to the tilt cylinder.

Signal name	Diode number
TILT DOWN	804
TILT UP	805



3.14. Hydraulic functions 4 and 5

When the operator activates the potentiometer (R14) voltage goes to A5 which opens proportional valve (Y16/Y17) and sends a signal to transistor regulator (A1). The pump motor (M3) starts and gives oil to the extra function.

On trucks with a fifth function there is a change over between switch (S39) and indicator lamp (39) lights up when in use. When the operator presses switch (S39) voltage goes to A5 which lights up the lamp and gives voltage to the proportional valves (Y18 and Y19) and the fifth function's cylinder receives oil.

Signal name	Diode number
TILT DOWN	804
TILT UP	805
SPARE 1A	806
SPARE 1B	807

3.15. Cabin tilt

The operator selects the function by pressing down switch (S44) which sends a signal to A5 and lamp (44) is lit. When the forks are raised to the main lift zone switch (S45) makes and a signal is sent to A5. Proportional valve (Y20) receives voltage from A5 and the cabin tilts. The potentiometer R11 must be activated more than 50%. The cab can be tilted up to approx. 15 degrees.

If the truck is fitted with a pulse counter (U10), A5 will receive information on the position of the forks. The cabin will begin to tilt when the programmed height has been reached.

When the forks have been lowered and then raised once more to the programmed height or return to the free lift zone, the cabin will be tilted back by A5 signalling proportional valve (Y21) to open. Even when lowering, the potentiometer must be activated more than 50%.

As soon as the operator releases the potentiometer both tilting and fork lifting / lowering stop.



The cabin can be lowered manually by the operator pressing switch (S44). A5 receives voltage and holds proportional valve (Y21) open as long as the switch is pressed down.

Signal name	Diode number
HEIGHT COUNTER	501
HEIGHT REFERENCE	503
CABIN LOWERING MANUAL	509
CABIN LIFT	810
CABIN LOWERING	811

3.16. Height indication

The measurement starts in the main lift zone when the reference switch (S45) is activated and gives a signal to A5. The pulse sensor (U10) sends pulses to A5 which starts by showing the programmed free lift height on the display (A8).

Signal name	Diode number
HEIGHT COUNTER	501
HEIGHT COUNTER	502
HEIGHT REFERENCE	503

3.17. Height selection

Measurement begins in the main lift zone when the reference switch (S45) is activated and sends a signal to A5. The pulse sensor (U10) sends pulses to A5 which starts by showing the programmed free lift height on the displays (A7 and A8). The forks stop at the first programmed height when A5, via the pulse sensor (U10), has reached the right height. The forks are stopped by A5 which regulates the speed of the pump motor with A2 and valves for lifting/lowering of the forks. The operator picks up/puts down loads manually. When the operator once again activates the potentiometer for lifting/lowering the forks continue to the next programmed level.

Signal name	Diode number
HEIGHT COUNTER	501
HEIGHT COUNTER	502
HEIGHT REFERENCE	503



F-code
RT

Section
S5

C-code
5000

Electrical system

Issued by
SSD

Approved by
K-G Andersson

Version no
001

T-code
401-414

Electrical system

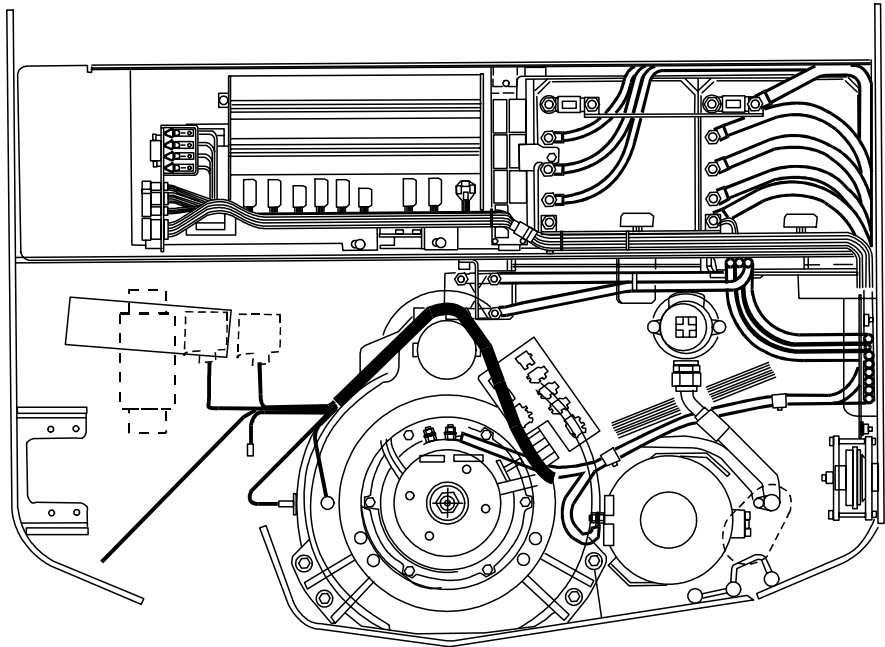
Valid from serial number:

T-code	Model	Serial No	Notes
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402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

Electrical system

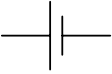
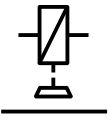
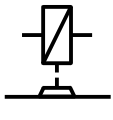
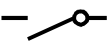
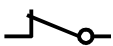
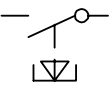
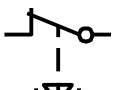
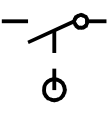
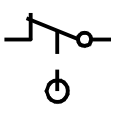
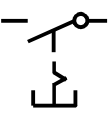
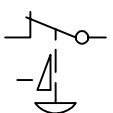
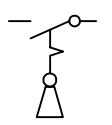
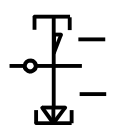
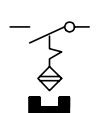
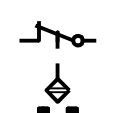
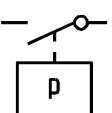
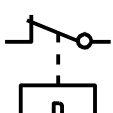
1 General

1.1 Electrical panel



2 Symbols and electrical diagrams

2.1 List of symbols

Symbol	Description	Symbol	Description
	Battery		
	Brake coil, normally released		Brake coil, normally engaged
	Switch, normally open		Switch, normally closed
	Push-button switch normally open		Push-button switch, normally closed
	Switch non locking, normally open		Switch non locking, normally closed
	Push-button switch lock- ing, normally open		Emergency switch
	Key switch, normally open		Push-button switch, locking and non locking
	Magnet proximity switch, normally open		Magnet proximity switch, normally closed
	Pressure sensor switch, normally open		Pressure sensor switch, normally closed





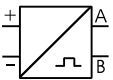
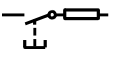





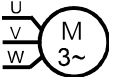
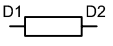

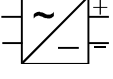
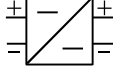
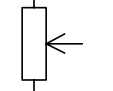

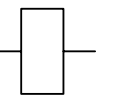


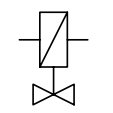
Electrical system

Version no

001

T-code

401-414

Symbol	Description	Symbol	Description
	Capacitive sensor, normally open		Capacitive sensor, normally closed
	Inductive sensor, normally open		Inductive sensor, normally closed
	Pulse sensor		
	Seat warmer with thermostat		Temperature sensor
	Motor, general		D.C. series motor, armature winding
	D.C. series motor		Motor, permanent magnet
	Three phase motor, (AC)		
	Series winding		Shunt winding
	Transducer, AC/DC		Transducer, DC/DC
	Variable resistor (potentiometer)		Fixed resistor
	Contactor		Horn
	Lamp		Valve



F-code
RT

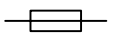


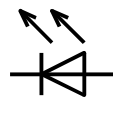
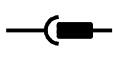
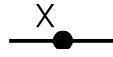

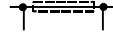
Section
S5

C-code
5000

Electrical system

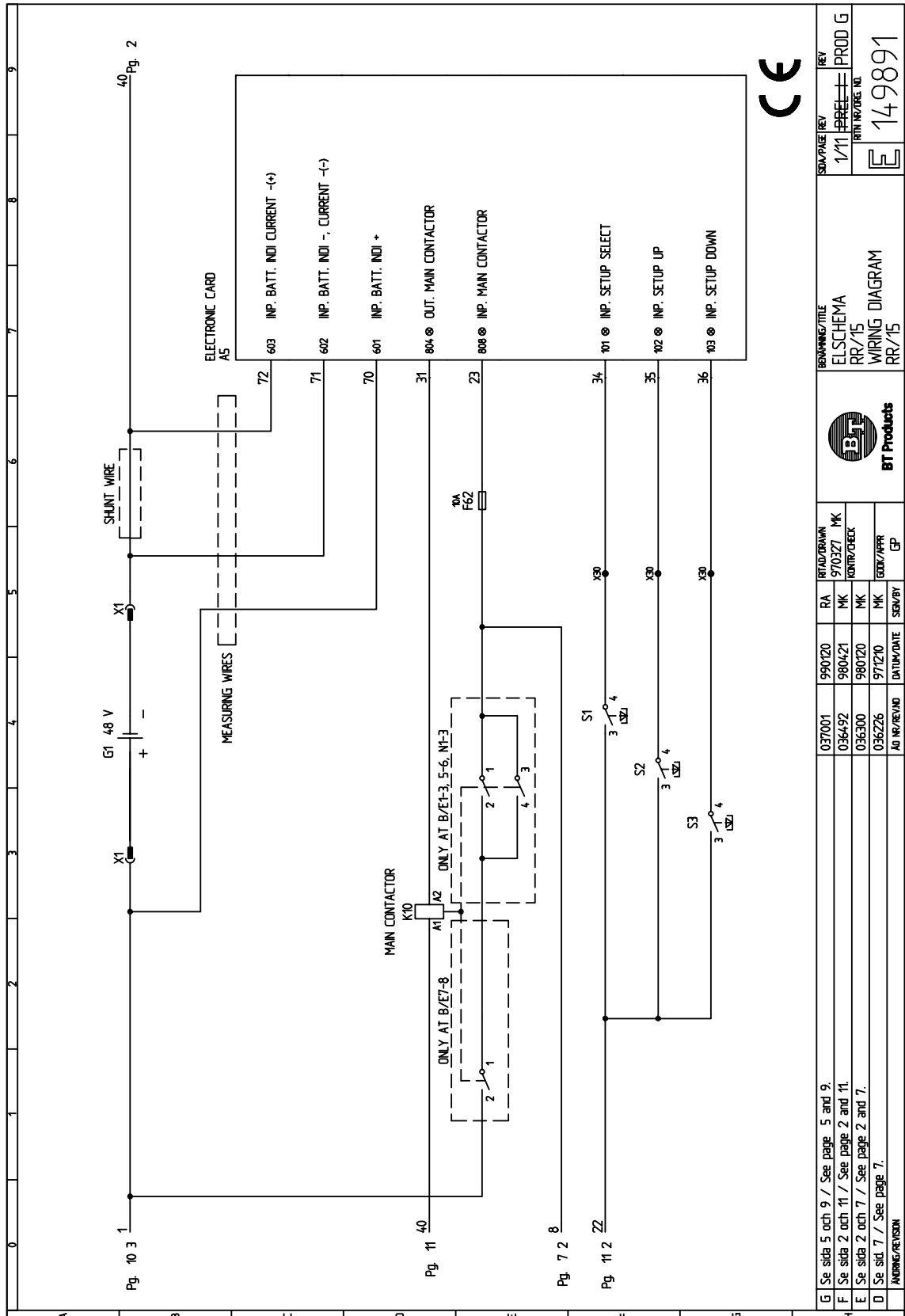
Version no
001

T-code
401-414

Symbol	Description	Symbol	Description
	Fuse		Diode
	Zener diode		Light emitting diode (LED)
	Contact		Contact, multi polar
	Capacitor		Measuring cable

Electrical system

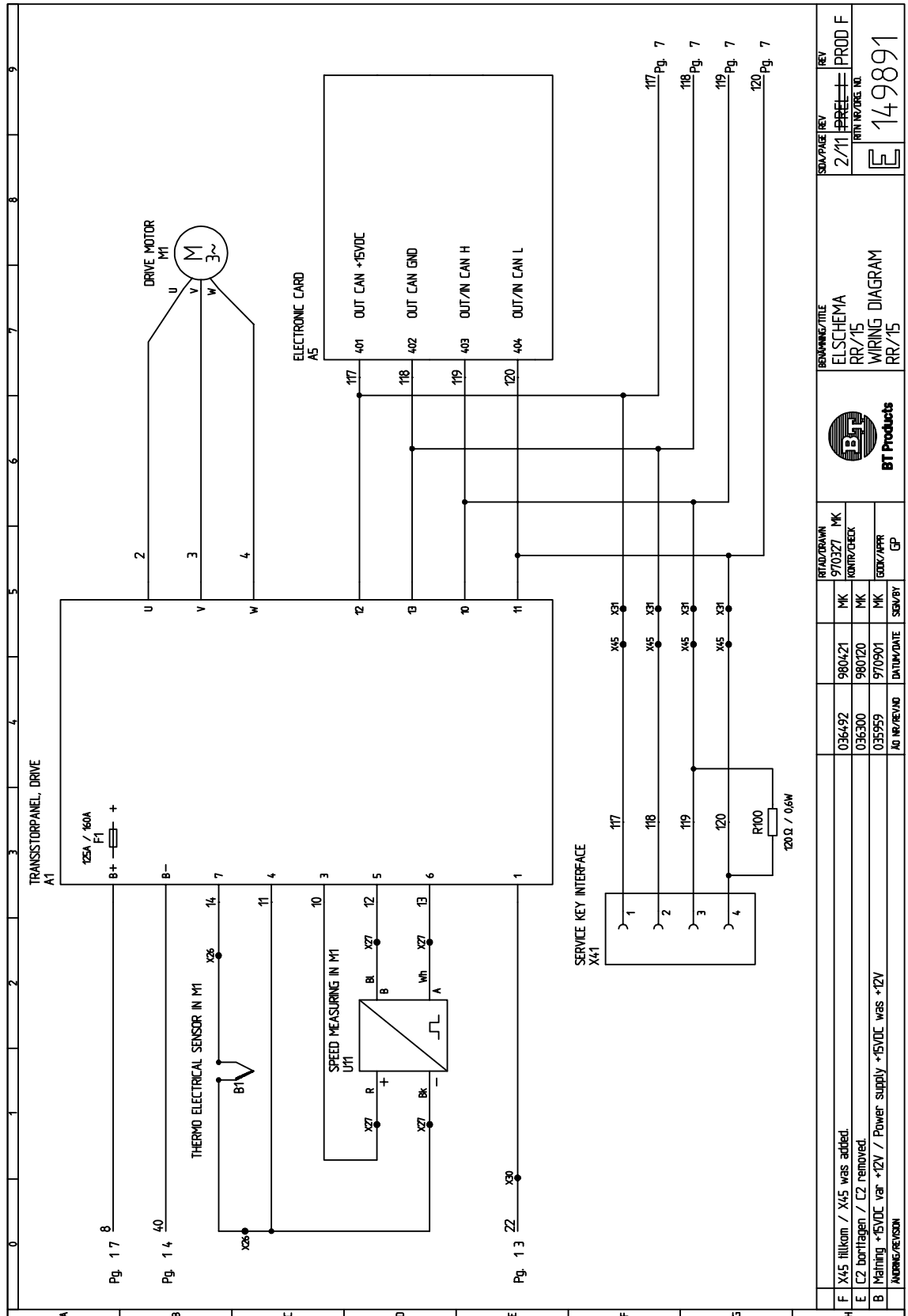
2.2 Electrical diagram 1/11



G Se sida 5 och 9 / See page 5 and 9.		037001		990720	RA	BT/AD/DA/VA	REVISION/TITLE		1/11	1/11	PROD G
H F Se sida 2 och 11 / See page 2 and 11.		036492		980421	MK	970327	ELSHEMA		RR/15	RR/15	RR/15
E Se sida 2 och 7 / See page 2 and 7.		036300		980720	MK	KOM/PRO/CEK	WIRING DIAGRAM		RR/15	RR/15	RR/15
D Se sida 7 / See page 7.		036226		971270	MK	GGK/AFR	BT Products		149891		
A/INDR/REVISION		AD IN/REVNO		DATE/TIME		SERV/RY		CP			



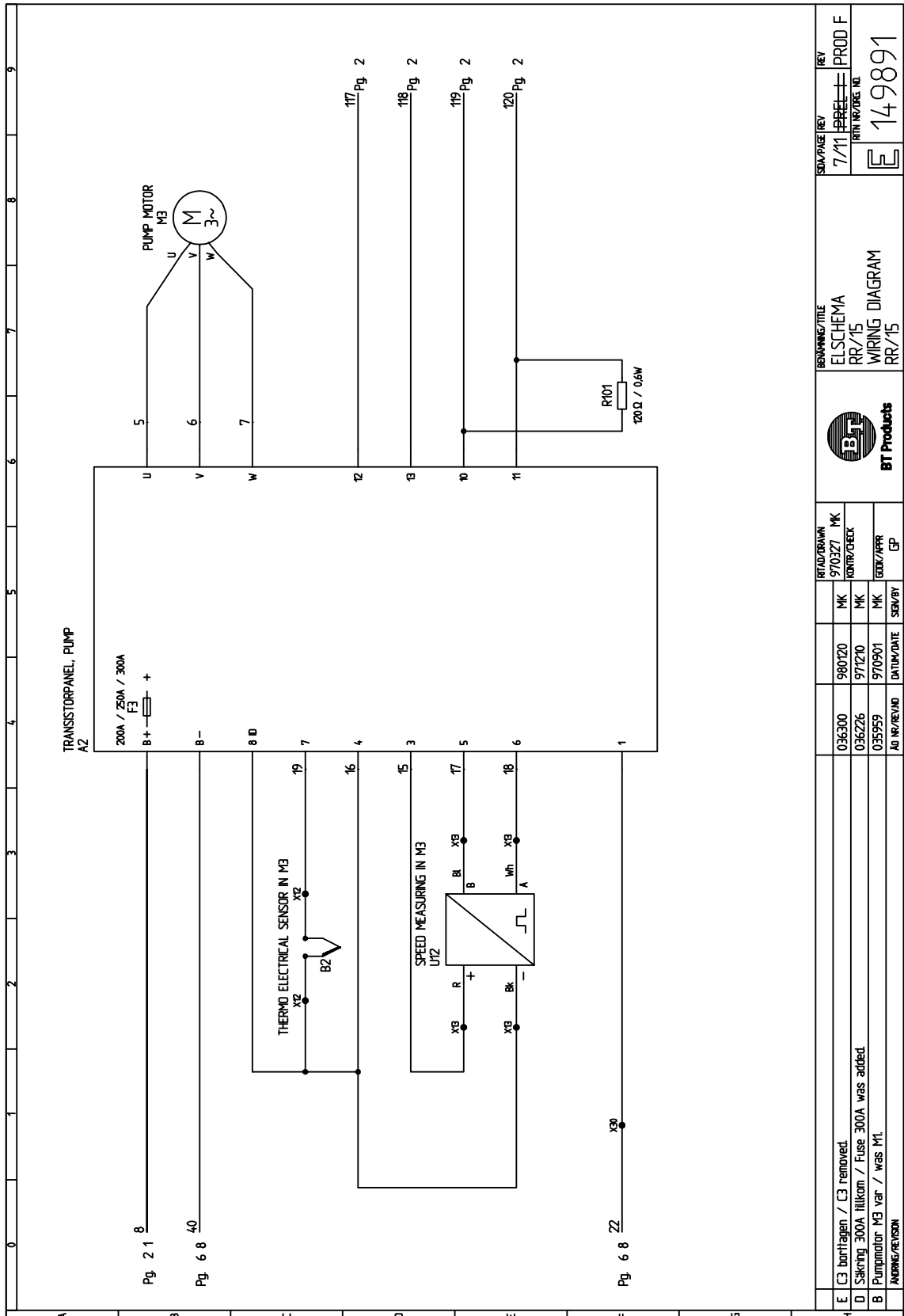
2.3 Electrical diagram 2/11



REVISION/TITLE		REV	
ELSCHEMA		PROD F	
RR/15		REV NO/REV NO	
WIRING DIAGRAM		149891	
RR/15			
BT Products			
REF/NO/DATE	CHK	DATE/DATE	CP
970327	MK		
980421	MK		
036492	MK		
036300	MK		
035959	MK		
AD. NO/REV. NO	DATE/DATE	DATE/DATE	CP
F X45 fillkom / X45 was added. E C2 borttagen / C2 removed. B Mätning +5VDC var +12V / Power supply +5VDC was +12V ANDRE/REVISION			

Electrical system

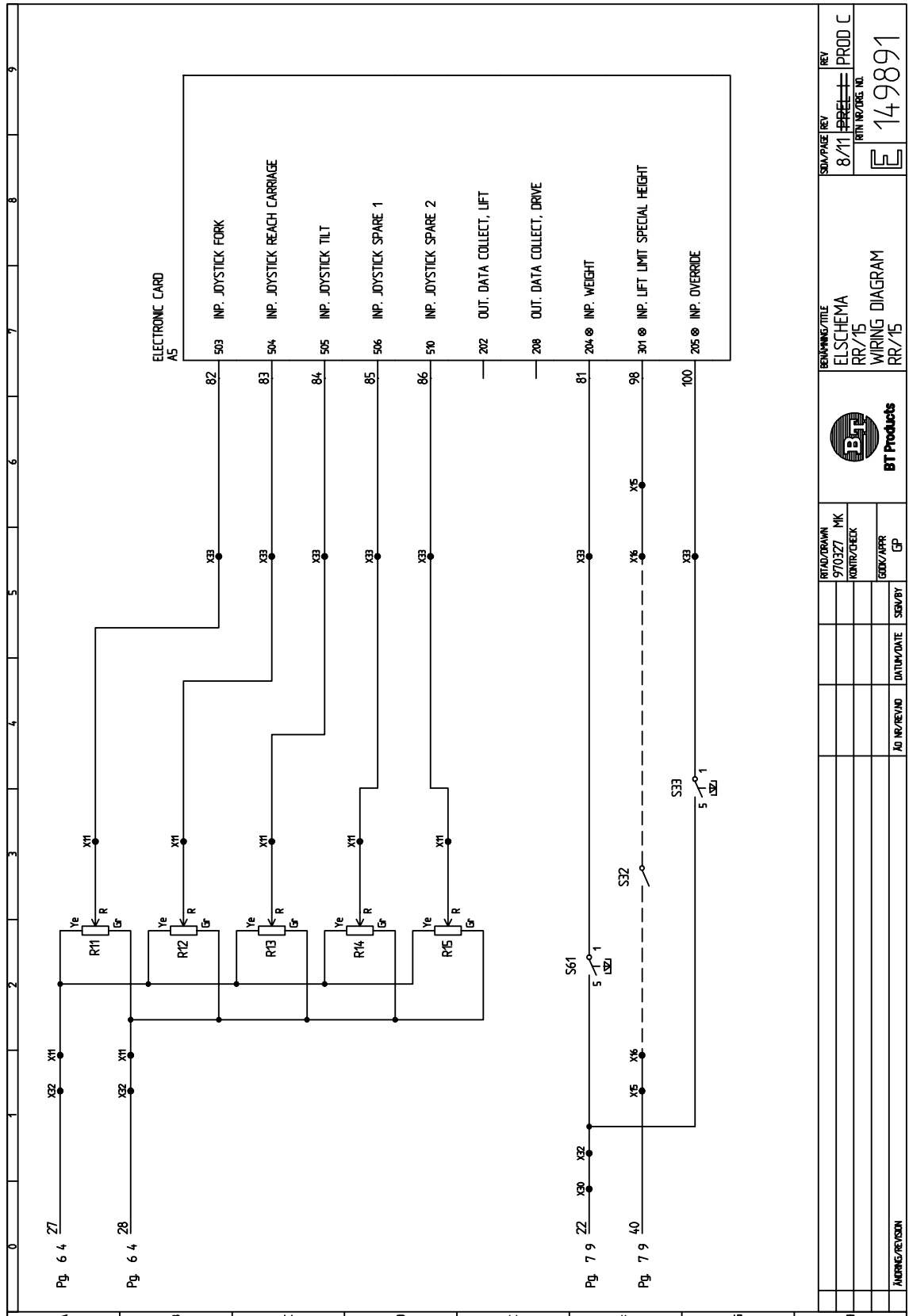
2.8 Electrical diagram 7/11



REVISION/TITLE		REV	PROD F
ELSCHEMA		7/11	PROD F
RR/15		RR/15	RR/15
WIRING DIAGRAM		149891	
RR/15			
BT Products			
RT/AD/DR/AVN	970327	MK	CP
	980120	MK	
	971210	MK	
	970901	MK	
AD IN/REV/NO	036300	980120	970327
	036226	971210	970327
	035959	970901	970327
AD IN/REV/NO	980120	971210	970901
	971210	970901	970327
	970901	970327	970327
	970327	970327	970327
H E C3 borttagen / C3 removed. D Säkning 300A tillkom / Fuse 300A was added. B Pumpmotor M3 var / was M1. AÄNDNING/REVISION			



2.9 Electrical diagram 8/11



NO	REV	DATE	BY	CHK	APP	DESCRIPTION
8/11	1					PROD C
8/11	1					149891

REV	DATE	BY	CHK	APP	DESCRIPTION

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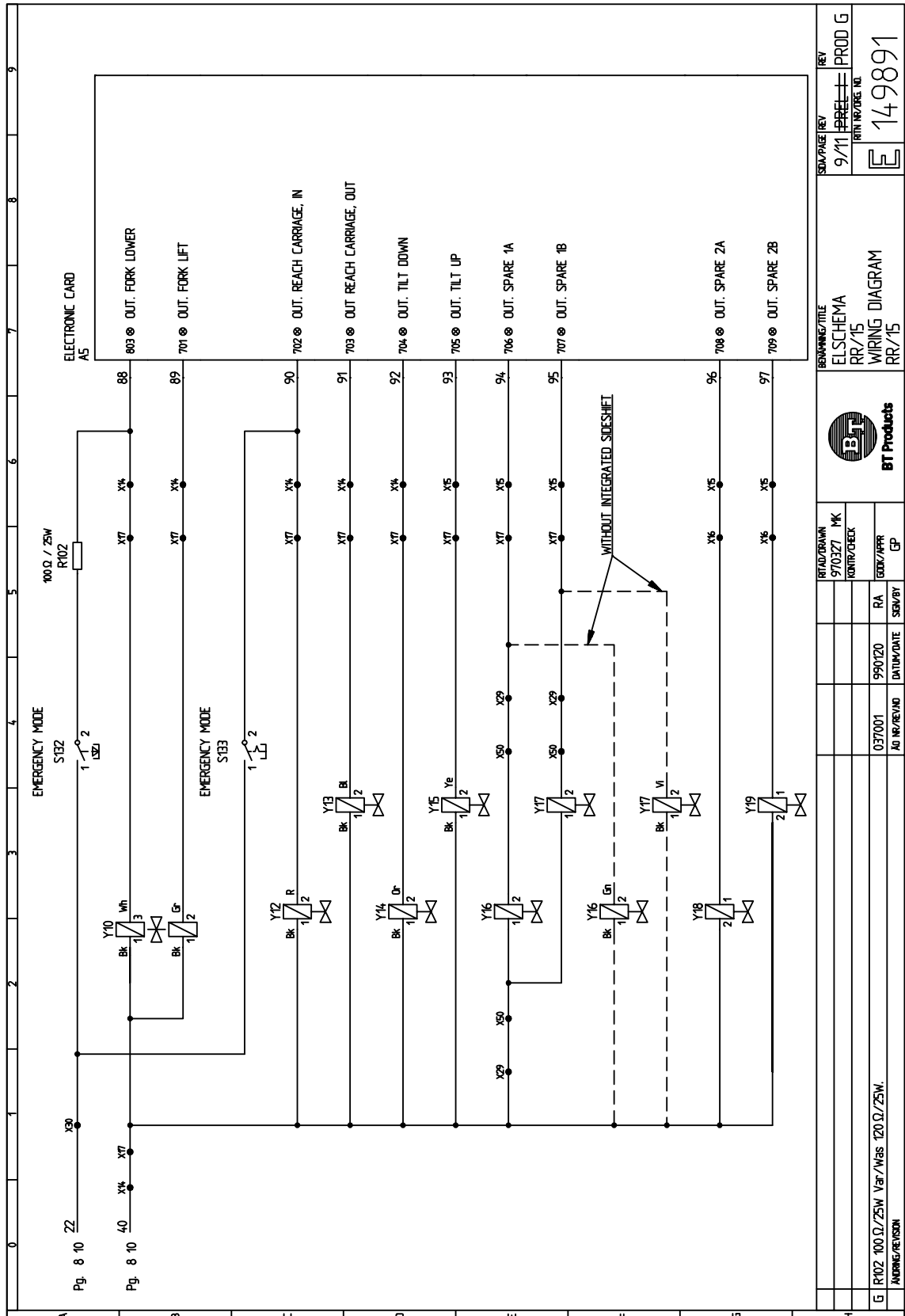
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Electrical system

2.10 Electrical diagram 9/11





2.13 List of components

Symbol	Designation - Function	Diagram
A1	Frequency converter, M1	5
A2	Frequency converter, M3	5
A5	Electronic card	5
A6	Display	1
A7	Height selector	2
A8	Height indication display	8
B1	Temperature sensor, M1	5
B2	Temperature sensor, M3	5
C1	Capacitor – noise suppression, H	5
E10	Seat warmer	4
E3, E4	Working light	8
F1	Fuse – drive motor, 125/160 A	5
F3	Fuse – pump motor, 200/250/300 A	5
F60	Fuse – control current for A5 card, 10 A	5
F61	Fuse – steering motor, 30 A	5
F62	Fuse – control current for K10, 10 A	5
F63	Fuse – control current for extra equipment, 10/16 A	5
G1	Battery 48 V	8
H1	Horn	5

Electrical system

Symbol	Designation - Function	Diagram
K10	Main contactor	5
M1	Drive motor	5
M3	Pump motor	5
M6	Steering motor	5
M10	Fan for pump motor	5
M12	Fan for electrical panel	5
R1	Potentiometer, driving	5
R2	Potentiometer, brake	5
R11	Potentiometer, fork lift/fork lowering	2
R12	Potentiometer, reach carriage	2
R13	Potentiometer, tilt	2
R14	Potentiometer, extra hydraulic function	2
R15	Potentiometer, extra hydraulic function	2
R100	Resistance, service key	8
R101	Resistance, service key	5
R102	Resistance, emergency lowering, forks	5
S1	Micro switch, operator number/programming	1
S2	Micro switch, operator number/stepping up	1
S3	Micro switch, operator number/stepping down	1
S17	Key switch	1
S18	Micro switch, horn	2
S21	Emergency switch	1
S23	Safety switch, left foot pedal	3



Symbol	Designation - Function	Diagram
S26	Micro switch, travel direction with crawl speed	2
S27	Micro switch, travel direction (foot), fork direction	3
S28	Micro switch, travel direction (hand)	4
S29	Micro switch travel direction (foot), steering wheel direction	3
S31	Micro switch, speed reduction, driving	8
S32	Micro switch, max lifting height	8
S33	Micro switch, max lifting height, bypass coupling	1
S44	Micro switch, cab tilt	1
S45	Micro switch, height indication	7
S46	Magnet switch, lowering between free lift and main lift	7
S61	Micro switch, load weight	2
S65	Pulse sensor, steer wheel centre	5
S66	Pulse sensor, steer wheel direction	5
S89	Micro switch, seat	4
S99	Micro switch, working light	1
S131	Micro switch, release parking brake	5
S132	Micro switch, emergency lowering, forks	5
S133	Micro switch, emergency retraction of mast	5
S134	Micro switch, emergency lowering of cab	5
U1	Tachometer, steering	2
U10	Pulse sensor, height meter	7

Electrical system

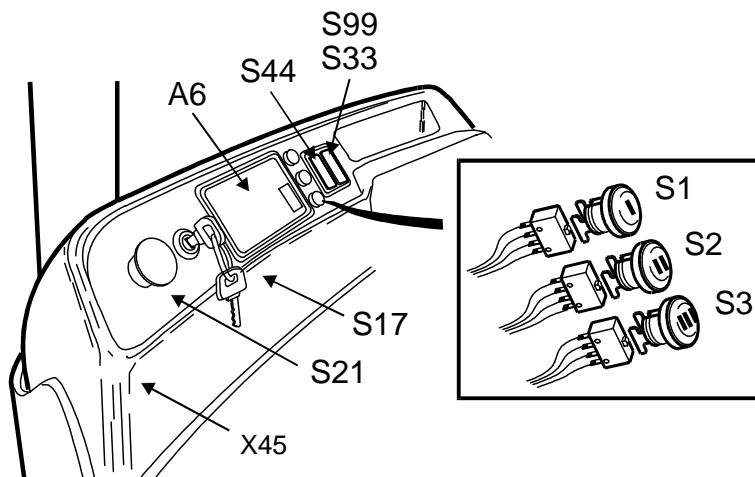
Symbol	Designation - Function	Diagram
U11	Pulse sensor, drive motor	5
U12	Pulse sensor, pump motor	5
X1	Contact	8
X8	Contact	8
X11	Contact	2
X12	Contact	5
X13	Contact	5
X14	Contact	5
X15	Contact	5
X16	Contact	6
X17	Contact	6
X18	Contact	5
X19	Contact	5
X20	Contact	5
X21	Contact	5
X23	Contact	5
X24	Contact	5
X25	Contact	4
X26	Contact	5
X27	Contact	5
X28	Contact	7
X29	Contact	6
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X33	Contact	5
X34	Contact	5
X35	Contact	5
X36	Contact	5



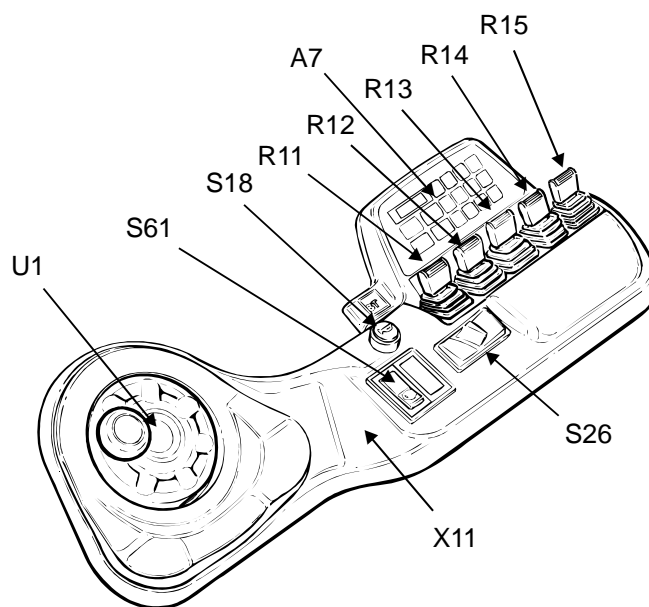
Symbol	Designation - Function	Diagram
X37	Contact	5
X38	Contact	5
X39	Contact	8
X40	Contact	8
X41	Contact	8
X42	Contact	5
X43	Contact	6
X45	Contact	1
X50	Contact	8
X52	Contact	6
Y1	Magnet, parking brake	5
Y5	Magnet, support arm brake	8
Y6	Magnet, support arm brake	8
Y10	Magnet valve, lifting/lowering	6
Y12	Magnet valve, reach carriage in	6
Y13	Magnet valve, reach carriage out	6
Y14	Magnet valve, tilt down	6
Y15	Magnet valve, tilt up	6
Y16	Magnet valve, extra hydraulic function 1A	6
Y17	Magnet valve, extra hydraulic function 1B	6
Y18	Magnet valve, extra hydraulic function 2A	6
Y19	Magnet valve, extra hydraulic function 2B	6
Y20	Magnet valve, cab tilt up	5
Y21	Magnet valve, cab tilt down	5

Electrical system

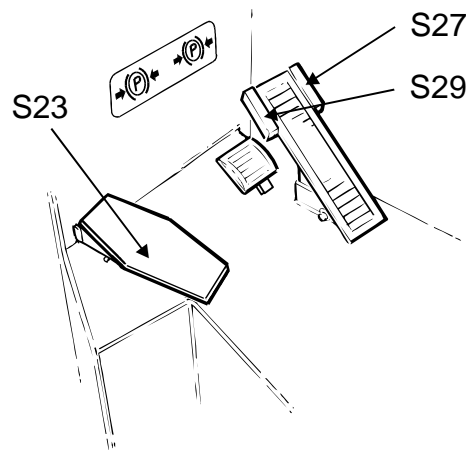
2.14 Diagram 1



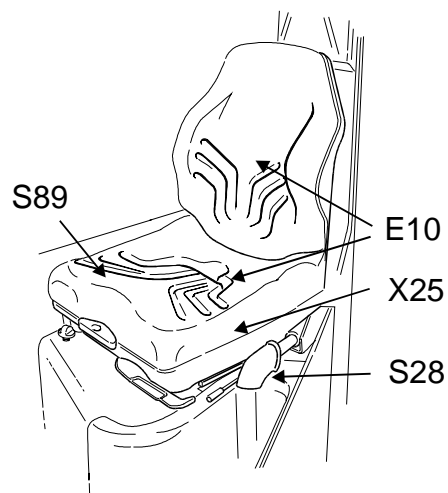
2.15 Diagram 2



2.16 Diagram 3

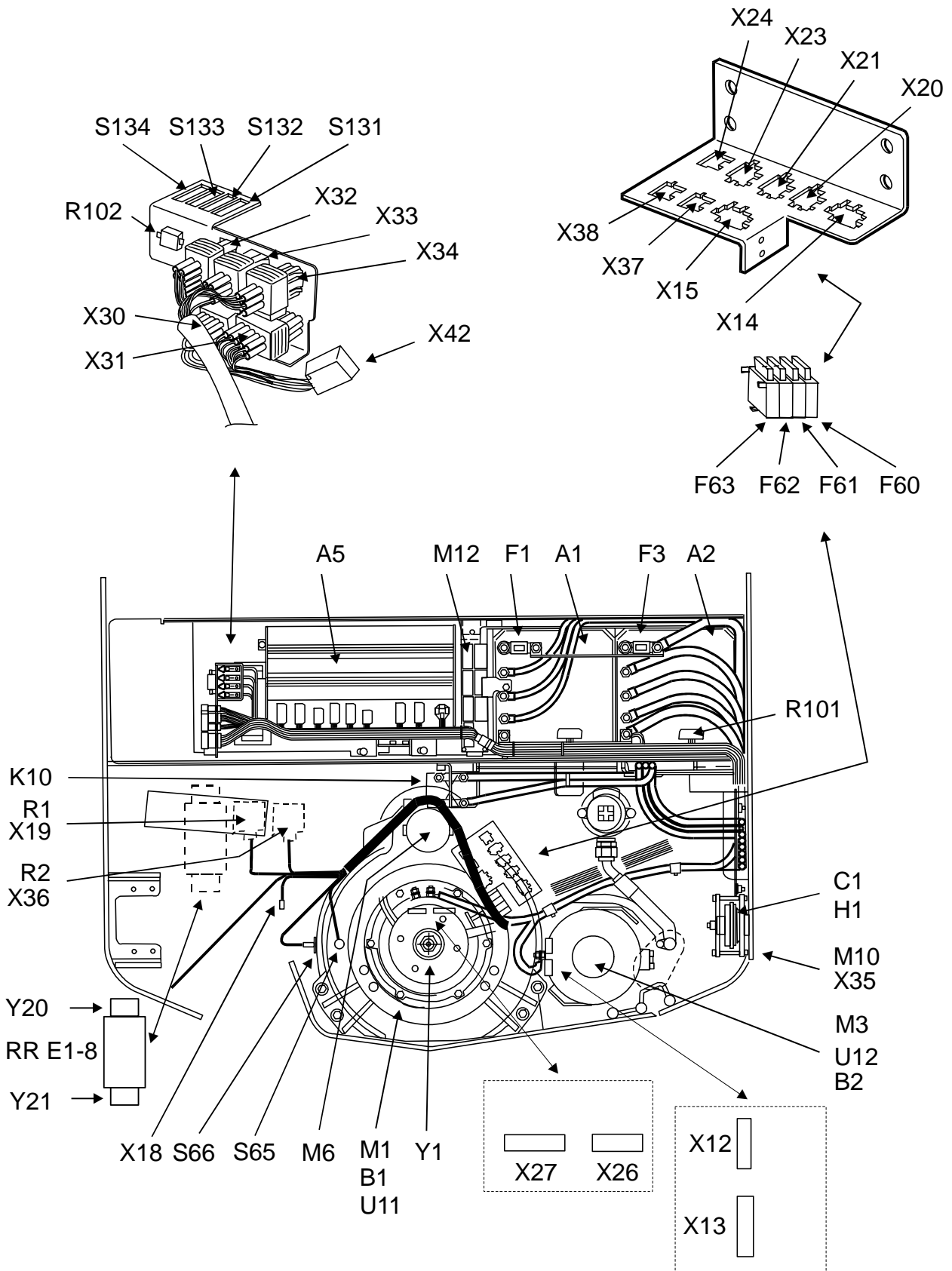


2.17 Diagram 4

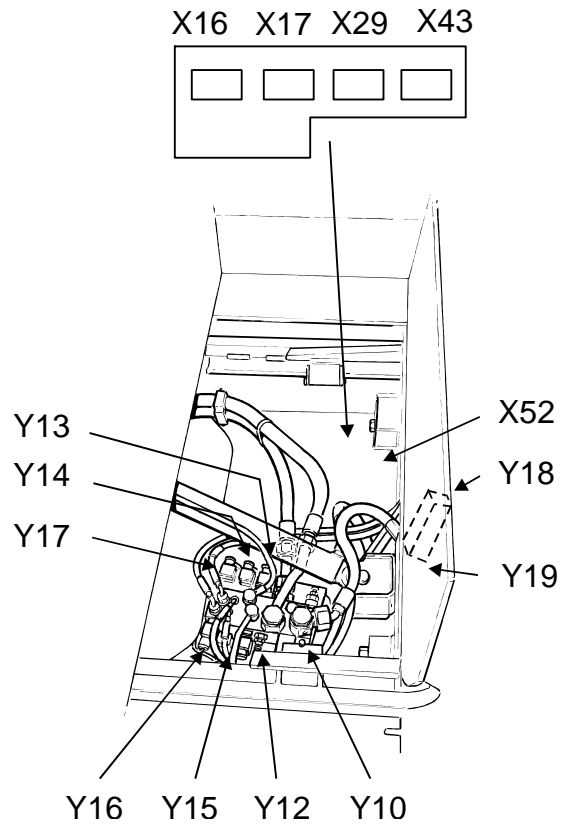


Electrical system

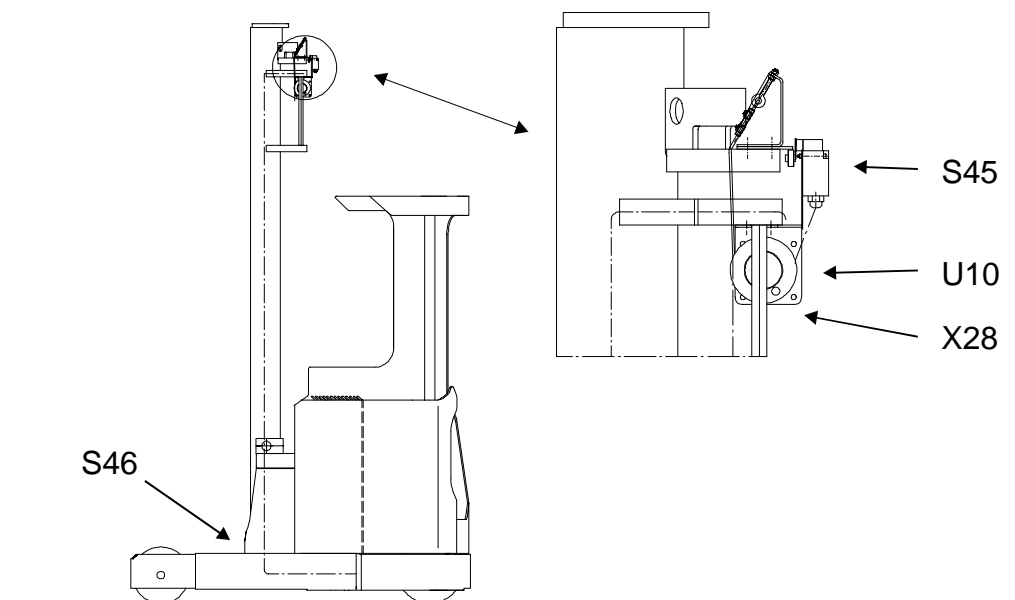
2.18 Diagram 5



2.19 Diagram 6

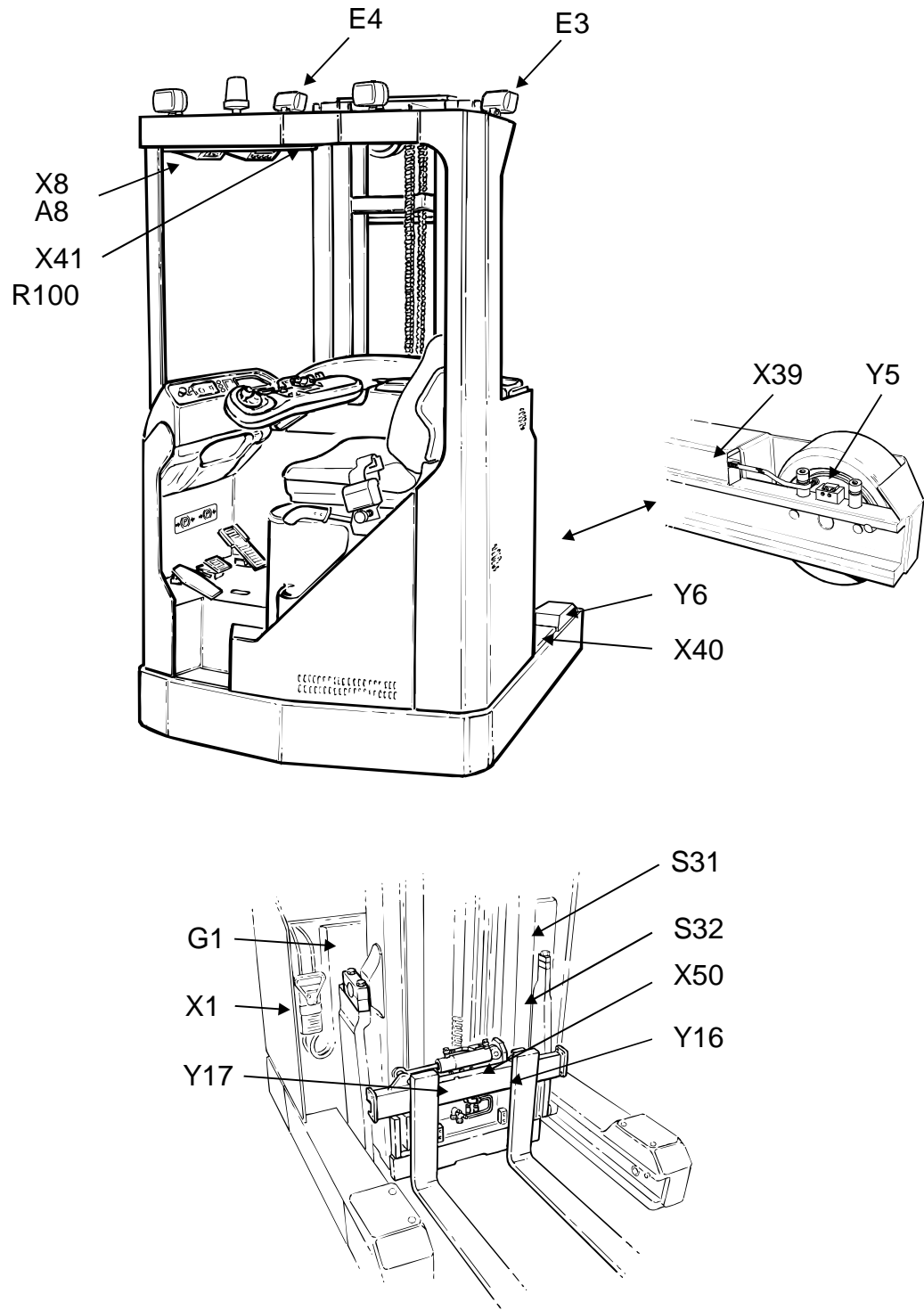


2.20 Diagram 7



Electrical system

2.21 Diagram 8



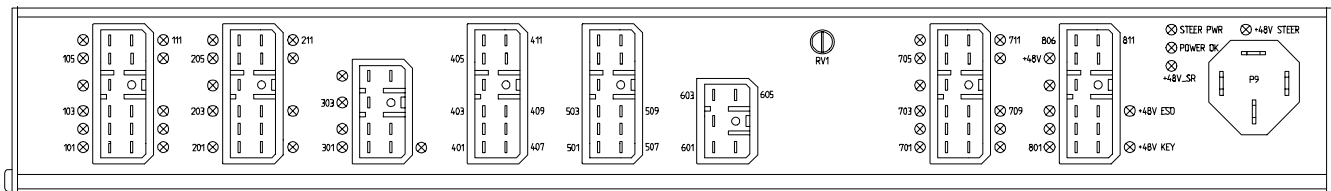


3 Description of function

The electronic card on RR AC/ACi holds the microprocessor which senses switches, steering voltage, etc. and gives instructions to the external electronics, contactors and valves etc.

To hold the preprogrammed information in the electronic unit when the battery is disconnected, the unit receives its power from an internal battery. Any faults registered by the microprocessor are shown on the display. The error codes are explained in connection with the electronic card. The electronic card's inputs and outputs are marked with the connection number and can easily be connected/disconnected using the contactors. The inputs and outputs, which have two fixed positions, have LEDs as indicators, **green** for **input** and **red** for **output**, the rest are **yellow**.

Signal name	Diode number
The name given to the input/output on the card according to the circuit diagram	The diode showing which input/output is active on the card



Electrical system

3.1 Ignition key in the 0 position

When the battery is connected to the truck via the charger plug the electronic card (A5) is fed with 48 V current and the LEDs are lit according to the table. LEDs 210, 211, 301 and 302 light depending on whether the sensor is activated or not. Voltage +7.35 V goes from A5 to potentiometer R1 in the accelerator, brake control R2 and hydraulic controls R11-R15.

Signal name	Diode number
STEER WHEEL ANGLE	210, 211
HEIGHT COUNTER	301, 302
+48 V	805
	STEER PWR
	POWER OK
	+48 V STEER

3.2 Ignition key in 1 position

The truck receives voltage when the operator turns the key to the **1** position. In order to use the travel direction selector and the hydraulics, the driver must be seated in the truck so that the switch S89 closes. Voltage goes through the control fuse F60, ignition switch S17 and emergency switch S21 to electronic card A5, frequency converters A1 and A2, height electronics A7 and A8 plus fan M10 which then starts. Electronic card A5 checks that the internal safety function works and closes the main contactor K10 which provides voltage to the drive and pump motors. The electronic card A5 begins communicating with A7 and A8 and sends voltage 32 V to fan M12 which then rotates at half speed.

A5 checks that the voltage from the potentiometers is 3.65 V and sends check pulses to tachometer U1 and steering motor M6. If the seat has a built in warmer, voltage +48 V is also sent to the thermostat and seat warmer E10.

The display comes on and presents the software's version number and then switches to its normal mode: time, running time, battery status and any error codes.

The time the truck has the key in position **1** is measured and stored in the electronic unit.



The LEDs will light according to the table.

- No. 706–711 comes on if the valves are not fitted to the truck.
- No. 110, 203 and 301 come on if the switches are actuated.

LEDs on the frequency converter will light.

Signal name	Diode number
LEFT FOOT SWITCH	110
SEAT SWITCH	203
CABIN LIFT	301
SPARE 1A, 1B	706, 707
SPARE 2A, 2B	708, 709
CABIN LIFT	710
CABIN LOWER	711
SUPPORT ARM BRAKE	801 (dimly lit)
FORK LOWER	803 (dimly lit)
MAIN CONTACTOR	804
	+48 V KEY
	+48 V ESO
	+48 V_SR

3.3 Selection of travel direction

There are three ways to select the travel direction.

3.3.1 With the steering console

When control S26 is pressed down the voltage is sent from the switch to A5. If the control is held down for at least three seconds the truck will travel at creep speed.

Signal name	Diode number
DRIVE, FORK DIRECTION	104
DRIVE, STEER WHEEL DIRECTION	105

Electrical system**3.3.2 With the left-hand handle**

When control S28 is pressed the voltage goes from the switch to A5 which results in the truck changing travel direction. This control can only be used to change the direction of travel after the choice has been made on the steering console. It is not possible to activate the creep speed function with this control.

Signal name	Diode number
DRIVE, CHANGE DIRECTION	111

3.3.3 With the speed control

When the right-hand pedal (in direction of forks) is pressed the voltage goes from the switch S27 to A5. The truck changes direction by pressing the left-foot pedal. The pedals can not be used to activate the creep speed function.

Signal name	Diode number
DRIVE, FORK DIRECTION	106
DRIVE, STEER WHEEL DIRECTION	107

The display shows the direction of travel.

3.4 Driving

When the accelerator R1 is activated the drive motor brake will be released. If the safety switch S23 is not active when the parking brake is released a buzzer is sounded from the display.

If the operator presses the speed control when the key is turned to position **1** the control must be returned to the neutral position before the truck can be driven.

When the accelerator pedal is pressed the potentiometer R1 is activated and the more the pedal is pressed the lower the voltage which is sent from R1 to A5. The voltage decreases from 3.7 to 1.7 V which gives 0–100% speed. A1 regulates the drive motor's revolutions with the help of information from A5. Voltage goes via A1's fuse F1 and is converted to 3 phase AC which is then sent to M1.

If the switch for speed reduction S31 is active so that there is voltage on A5's input, the preprogrammed max. speed will apply. The speed is measured on the drive motor by means of sensor U11.



If the travel direction control on the steering console is pressed down for at least three seconds the truck will travel at creep speed.

If the driver leaves the seat for more than three seconds the voltage from A5 to Y1 is discontinued and the parking brake is activated.

The drive motor's running time is measured and recorded in the electronic unit.

Signal name	Diode number
PARKING BRAKE	802

3.5 Steering

When the steering wheel is turned the voltage goes from the tachometer (U1) to A5 which progressively supplies current to the steering motor (M6). The result of this is that the faster steering movement the quicker the steering motor rotates. This progressivity also means that the higher the driving speed, the lower the steering speed. The speed is measured on the drive motor by means of sensor U11.

When the steering is turned the steering wheel sensor S65 is activated and voltage flows to A5. The opposite travel direction is shown on the display. The electronics automatically show the correct travel direction through switch S65 giving a signal during 180° of the 360 possible. The S65 must pass one of the reference points so that the electronics knows the direction of the steering wheel and shows the travel direction. The function is initiated by turning the steering. This must be done at the first start and after servicing.

LEDs 209, 210 and 211 light depending on whether the sensor is activated or not.

Signal name	Diode number
STEER WHEEL REF. 180°	209
STEER WHEEL ANGLE A	210
STEER WHEEL ANGLE B	211

Electrical system

3.6 Steering wheel indicator

When the steering wheel is turned, S66 signals to A5 which shows the travel direction on the display. The sensor S65 must pass one of the reference points so that the electronics knows the direction of the steering wheel and shows the travel direction. The function is initiated by turning the steering. This must be done at first start and after servicing. When the travel direction is changed by means of the switch the arrows change on the display.

LEDs 209, 210 and 211 light depending on whether the sensor is activated or not.

Signal name	Diode number
STEER WHEEL REF. 180°	209
STEER WHEEL ANGLE A	210
STEER WHEEL ANGLE B	211

3.7 Braking

Braking can be done in different ways.

3.7.1 Auto plug braking

When the operator releases the accelerator the drive motor will automatically slow the truck to the desired speed. The auto plug braking function and braking force can be selected using parameters.

3.7.2 Motor brake (electric)

When the operator changes travel direction with the use of the controls, the drive motor acts as a generator/brake and feeds the voltage back to the battery. The braking force is determined with the help of the accelerator pedal. The electronic card A5 receives information from A1 as to whether braking has occurred and regulates A1.



3.7.3 Foot brake

When the operator presses the brake pedal the potentiometer R2 is activated. The voltage increases from 1.7 V to 4.1 V which gives 0–100% braking force. When the pedal is pressed up to half way the truck is slowed down by the drive motor. On trucks with support arm brakes, these will begin to slow the truck down further as the brake pedal is pressed further down. When the brake pedal is fully depressed the parking brake will also be activated. LED 801 will be dimly lit at first and fully lit when full braking force is reached.

Signal name	Diode number
SUPPORT ARM BRAKE	801

3.7.4 Parking brake

If the truck is standing still when the brake pedal is pressed the parking brake will be activated.

If the driver leaves the seat for more than three seconds the voltage from A5 to Y1 is discontinued and the parking brake is activated.

3.8 Fork lift

When the operator activates the potentiometer R11 A5 receives a voltage 3,7–6,6 V on the input, the proportional valve Y10 opens and sends a signal to transistor regulator A2. The pump motor M3 starts and gives oil to the lift cylinders.

If the battery guard measures a remaining capacity of 20% or lower in the battery the lift speed is reduced.

The lift speed is reduced during the change over from free lift to main lift. The speed of M3 is measured by sensor U12.

Signal name	Diode number
FORKLIFT	701

Electrical system

3.9 Maximum height

Truck with maximum height switch.

When the forks reach the height switch S32 and A5 receives a signal, the lift will be stopped. If the forks are to be lifted above this height the switch S33 should be pressed down, which gives a signal to A5 and the lift continues. The start must take place within fifteen seconds.

Signal name	Diode number
LIFT LIMIT SPECIAL HEIGHT	301
OVERRIDE	205

3.10 Maximum height

Truck with pulse counter.

When the forks reach the main lift zone A5 receives a signal from switch S45 to start counting pulses from transmitter U10. The forks will stop when the preprogrammed heights (2 heights) are reached. If the forks are to be lifted above this height, switch S33 must be pressed which sends a signal to A5 and the lift continues. The start must take place within fifteen seconds.

LEDs 301, 302 and 303 light depending on whether the sensor is activated or not.

Signal name	Diode number
HEIGHT COUNTER	301
HEIGHT COUNTER	302
HEIGHT REFERENCE	303



3.11 Fork lowering

When the operator activates the potentiometer R11 voltage goes 3.7–0.66 V to A5 which opens the proportional valve Y10 and the operator can lower the forks at a variable speed.

If the truck is fitted with a pulse counter, the lifting speed is reduced during change over from main lift to free lift.

The LED is dimly lit in neutral and increases in strength to be fully lit when lowering begins.

Without the transmitter the speed will be reduced when S46 is activated.

Signal name	Diode number
FORK LOWER	803

3.12 Mast out/in

When the operator activates the hydraulic lever R12 voltage (out = 3.7–0.77 V or in = 3.7–6.6 V) goes to A5 which opens the directional valve Y12/Y13 and sends a signal to the frequency converter A1. The pump motor M3 starts and sends oil to the reach cylinder. The speed of the pump motor is reduced before the mast reaches the end position.

Signal name	Diode number
REACH CARRIAGE IN	702
REACH CARRIAGE OUT	703

3.13 Fork tilt up/down

When the operator activates the hydraulic lever R13 voltage (up = 3.7–6.6 V or down = 3.7–0.66 V) goes to A5 which opens the directional valve Y14/Y15 and sends a signal to the frequency converter A1. The pump motor M3 starts and gives oil to the tilt cylinder.

Signal name	Diode number
TILT DOWN	704
TILT UP	705

Electrical system

3.14 Hydraulic function 4

When the operator activates the hydraulic lever R14 voltage (3.7–6.7 V or 3.7–0.66 V) goes to A5 which opens the directional valve Y16/Y17 and sends a signal to the frequency converter A1. The pump motor M3 starts and gives oil to the extra function.

Signal name	Diode number
SPARE 1A	706
SPARE 1B	707

3.15 Hydraulic function 5

When the operator activates the hydraulic lever R15 voltage (3.7–6.7 V or 3.7–0.66 V) goes to A5 which opens the directional valve Y16/Y17 and sends a signal to the frequency converter A1. The pump motor M3 starts and gives oil to the extra function.

Signal name	Diode number
SPARE 2A	708
SPARE 2B	709

3.16 Cabin tilt

The operator selects the function by pressing down switch S44 which sends a signal to A5 and lamp 44 is lit. When the forks are raised to the main lift zone switch S45 makes and a signal is sent to A5. Proportional valve Y20 receives voltage from A5 and the cabin tilts. The potentiometer must be activated more than 50%. The cab can be tilted up to approx. 15 degrees.

If the truck is fitted with a pulse counter U10, A5 will receive information on the position of the forks. The cabin will begin to tilt when the programmed height has been reached.

When the forks have been lowered and then raised once more to the programmed height or return to the free lift zone, the cabin will be tilted back by A5 signalling proportional valve Y21 to open. Even when lowering, the potentiometer must be activated more than 50%.



As soon as the operator releases the potentiometer both tilting and fork lifting/lowering stop.

The cabin can be lowered manually by the operator pressing switch S44. A5 receives voltage and holds proportional valve Y21 open as long as the switch is pressed down.

Signal name	Diode number
HEIGHT COUNTER	301
HEIGHT REFERENCE	302
CABIN LOWERING MANUAL	304
CABIN LIFT	305
CABIN LIFT	710
CABIN LOWERING	711

3.17 Height indication

The measurement starts in the main lift zone when the reference switch S45 is activated and gives a signal to A5. The pulse sensor U10 sends pulses to A5 which starts by showing the programmed free lift height on the display A8.

Signal name	Diode number
HEIGHT COUNTER	301
HEIGHT COUNTER	302
HEIGHT REFERENCE	303

Electrical system

3.18 Height selection

Measurement begins in the main lift zone when the reference switch (S45) is activated and sends a signal to A5. The pulse sensor (U10) sends pulses to A5 which starts by showing the programmed free lift height on the displays (A7 and A8). The forks stop at the first programmed height when A5, via the pulse sensor (U10), has reached the right height. The forks are stopped by A5 which regulates the speed of the pump motor with A2 and valves for lifting/lowering of the forks. The operator picks up/puts down loads manually. When the operator once again activates the potentiometer for lifting/lowering the forks continue to the next programmed level. See C-code 9000.

Signal name	Diode number
HEIGHT COUNTER	301
HEIGHT COUNTER	302
HEIGHT REFERENCE	303

3.19 Weight measurement

- Place the load on the forks.
- Lift the forks free from the ground.
- Press the weight measurement button.
- ---- will be shown in the "time" window.
- Lift the load.

The weight of the load will be shown on the display in increments of 50 kg with a tolerance of +- 25 kg. The display will automatically return to the running meter after 10 sec. Calibration, see C-code 5710.



3.20 Operator - ID

Logging in can be done in two different ways.

3.20.1 With pin code

- Press one of the switches **I**, **II**, or **III** to select operator 1 to 3.

3.20.2 With pin code

- Press switches **I**, **II**, and **III** the 4-digit combination (e.g. **I**, **II**, **III** and **III**) to select driver 1 to 10.

To program operator combination, see C-code 5710.

Signal name	Diode number
SETUP SELECT	101
SETUP UP	102
SETUP DOWN	103

F-code

RT

Section

S5

C-code

5000

Electrical system

Version no

001

T-code

401-414



Transistor regulator

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	

1. General

The truck is fitted with two transistor regulators. One which controls the hydraulics and one which controls the driving.

Transistor regulator for driving on N/B/E1-N/B/E3/C
PUB 48 280 CD 3

Transistor regulator for driving on B/E4-B/E8/C
PUB 48 350 CD 3

Transistor regulator for hydraulics on N1-N3 and B/E1-B/E6/C
PUB 48 400 CD 2

Transistor regulator for hydraulics on B/E7-B/E8/C
PUB 48 500 CD 2

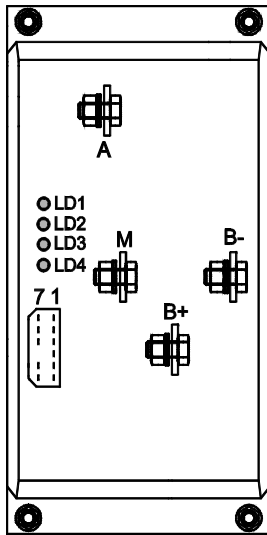
Transistor regulator

Version no

001

T-code

301-307,400

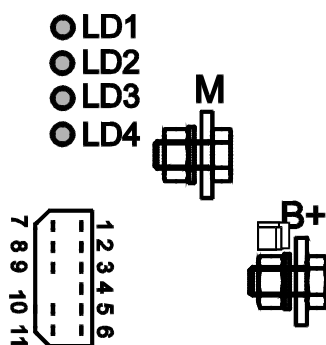


2. Motor circuit

The transistor regulator has four terminals for the high current cables according to the table below.

Terminal number	Function
A	Brake diode to motor series field and armature
B-	Battery minus
B+	Battery plus
M	Minus connection to motor's series field

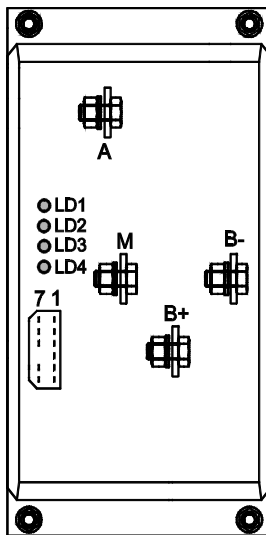
3. Contactor for control voltage



Terminal number	Con.	Function
1	I	Supply voltage
2	I	Safety test
3		Not used
4	I	Common connection B-
5	I	Common connection B-
6	I	Minus for terminals 10 and 11
7	O	Safety signal for main contactor (48 V)
8	O	Electrical motor brake (48 V)
9	O	Stabilised voltage 13,5 V
10	I	Reference value 0 - 5 V
11	I	Current limit (0 - 5 V)

I = Input

O = Output



LED no.	Colour	Function
1	Green	OK
2	Yellow	Over temperature/under temperature
3	Red	Fault in electronic power components
4	Red	Fault in reference value circuit

4. Safety check

4.1. Checking the safety circuit for the transistor regulator for driving

This check applies to all BT-trucks fitted with transistor regulator type:

PUB 48 280 CD 3 and PUB 48 350 CD 3.

- Lift the truck by those points marked with lifting eye bolts.
- Place supports under the chassis, one on each side of the drive wheel.
- Lower the truck onto the supports.

Warning!



The truck can overturn.

Risk of great personal injury and damage to property.

Ensure the truck is stable and that the drive wheel does not have contact with the ground.

- Remove the arm rest.
- Loosen the wing nuts holding the arm rest panel.
- Remove the arm rest panel
- Turn the ignition key so that the electronic card is voltage fed.
- Connect a 0.7 mm² cable between the battery minus (B-) and the contact for the control current (pin number 2, see diagram) on the transistor regulator. The main contactor K10 should now release to indicate that the transistor regulator's safety system functions. If K10 does not release, replace the entire transistor regulator.
- Return the truck to it's original condition after the check.
- Reset the safety circuits by turning the ignition key to the **0** position.

F-code

RT

Section

S 5.0

C-code

5460

Transistor regulator

Version no

001

T-code

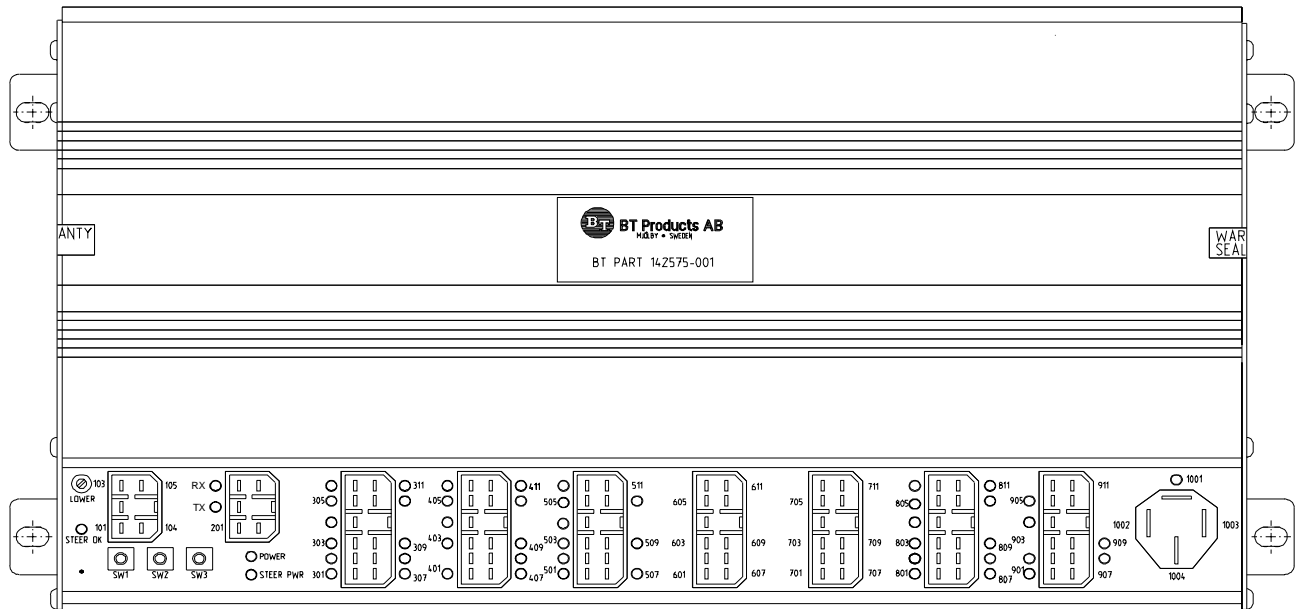
301-307,400



Electronic card/control card

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	Cold store cabin	265200AA-	



1. General

The electronic card for RR B/E1-B/E8 is equipped with **green** LEDs on the inputs from microswitches and sensors and **red** LEDs on the outputs to the contactors and valves.

The LEDs are lit when the signal is high.

Electronic card/control card

I=Input O=output

2. Input/output signals

Terminal number	LED no.	Connection	Function	Active
101			Display — Series (+)	42 V
102			Display — Series(-)	0 V
103			Display — TX (+), transmit data	2.9 V
104			Display — TX (-), transmit data	0.9 V
105				

Terminal number	LED no.	Connection	Function	Active
201				
202			Height indicator/height preset — TX (-), transmit data	0.9 V
203			Height preset— RX (+), receive data	2.4 V
204			Height preset — RX (-), receive data	0 V
205			Height indicator/height preset — TX (+), transmit data	2.9 V

LED no.	Colour	Function
TX	Yellow	Height indicator/height preset— TX, transmit data
RX	Yellow	Height preset — RX, receive data



Terminal number	LED no.	Connection	Function	Active
301	301	I	Transistor regulator, safety signal	48 V
302	302	I	Drive motor, speedometer	0-8.2 V
303	303	I	Travel direction selector, fork direction, with creep speed	48 V
304	304	I	Travel direction selector, steer wheel direction, with creep speed	48 V
305	305	I	Travel direction selector, fork direction	48 V
306	306	I	Travel direction selector, steer wheel direction	48 V
307	307	I	Parking brake, released	48 V
308	308	I	Parking brake, released/applied	48 V
309	309	I	Safety pedal (left foot)	48 V
310	310	I	Electrical drive motor brake	48 V
311	311	I	Travel direction switching	48 V

Terminal number	LED no.	Connection	Function	Active
401	401	I	Hydraulic extra function 2	48 V
402		O	Hydraulic extra function 2	24 V
403	403	I	Seat switch	48 V
404	404	I	Parking brake, released	48 V
405	405	I	Lift height limit, bypass	48 V
406	406	I	Speed reduction, driving	48 V
407	407	I	Extending mast, low speed	48 V
408	408	I	Retracting mast, low speed	48 V
409	409	I	Steering wheel sensor, 180°	48 V
410	410	I	Steering wheel sensor, channel A	12 V
411	411	I	Steering wheel sensor, channel B	12 V

Electronic card/control card

Terminal number	LED no.	Connection	Function	Active
501	501	I	Lift height limiter, channel A	0-10 V
502	502	I	Height meter, channel B	0-10 V
503	503	I	Reference height sensor	48 V
504	504	I	Carbon brush indicator, drive motor (-)	48 V
505	505	I	Carbon brush indicator, drive motor (+)	48 V
506	506	I	Carbon brush indicator, pump motor (-)	48 V
507	507	I	Carbon brush indicator, pump motor (+)	48 V
508				
509	509	I	Cab lowering, manual	48 V
510	510	I	Cab tilt, selected	48 V
511		O	Cab tilt, selected	24 V

Terminal number	LED no.	Connection	Function	Active
601		I	Potentiometer driving, reference value	1-11 V
602				
603		I	Potentiometer fork movement, reference value	1-11 V
604		I	Potentiometer mast, extending/retracting, reference value	1-11 V
605		I	Potentiometer tilting of forks, reference value	1-11 V
606		I	Potentiometer extra hydraulic function, reference value	1-11 V
607		I	Minus for terminals 608 - 610	0 V
608		I	Transistor regulator lift, temperature	0.9-2.2 V
609		I	Transistor regulator lift, voltage return supply	5-0 V
610		I	Transistor regulator lift, current return supply	0-0.7 V
611		I	Battery guard, voltage supply(-)	0 V



Terminal number	LED no.	Connection	Function	Active
701		I	Steering tachometer (+)	0-3.5 V
702		I	Steering tachometer (-)	0 V
703		I	Battery guard, current supply (+)	
704		I	Battery guard, current supply (-)	
705		I	Battery guard, voltage supply (+)	48 V
706		O	Minus for terminals 707, 708	0 V
707		O	Transistor regulator driving, reference value	0.5-5 V
708		O	Transistor regulator driving, current limit	0.5-5 V
709		O	Minus for terminals 710, 711	0 V
710		O	Transistor regulator hydraulic, reference value	2-5 V
711		O	Transistor regulator hydraulic, current limit	0-5 V

Terminal number	LED no.	Connection	Function	Active
801	801	O	Valve, lifting of forks	0.5-48 V
802	802	O	Valve, retracting mast	0.5-48 V
803	803	O	Valve, extending mast	0.5-48 V
804	804	O	Valve, tilting forks down	0.5-48 V
805	805	O	Valve, tilting forks up	0.5-48 V
806	806	O	Valve, extra hydraulic function 1 A	0.5-48 V
807	807	O	Valve, extra hydraulic function 1 B	0.5-48 V
808	808	O	Valve, extra hydraulic function 2 A	0.5-48 V
809	809	O	Valve, extra hydraulic function 2 B	0.5-48 V
810	810	O	Valve, cab tilt up	0.5-48 V
811	811	O	Valve, cab tilt down	0.5-48 V

Electronic card/control card

Terminal number	LED no.	Connection	Function	Active
901	901	O	Contactor, driving in direction of forks	48 V
902	902	O	Contactor, driving in direction of steering wheel	48 V
903		O	Electrical motor brake	
904	904	O	Valve, lift of forks	0.2-17 V
905	905	O	Valve, parking brake	0.8-48 V
906				
907				
908	908	I	Battery voltage, (+) 48 V	48 V
909	909	I	Battery voltage, (+) 48 V	48 V
910			Potentiometer supply, (+) 12 V	12 V
911			Potentiometer supply, minus	0 V

Terminal number	LED no.	Connection	Function	Active
1001	301	I	Battery voltage, (+) 48 V	48 V
1002	302		Battery voltage, minus	0 V
1003	303		Steering motor(+)	24 V
1004	304		Steering motor, (-)	24 V

LED	Colour	Function
POWER	Green	Indicates that all voltage is fed to electronic card
STEER PWR	Green	Voltage fed to control electronics
STEER OK	Green	Steering OK

Switch	Function
SW 1	Switch to program parameters and error codes
SW 2	Switch to program parameters and error codes
SW 3	Switch to program parameters and error codes

Potentiometer	Function
Lower	Trimming of the proportional valve's opening position



3. Display

It is possible to look at the machine specific register and program the clock for, e.g. summer or winter time. The truck cannot be driven with any functions while in the programming mode.

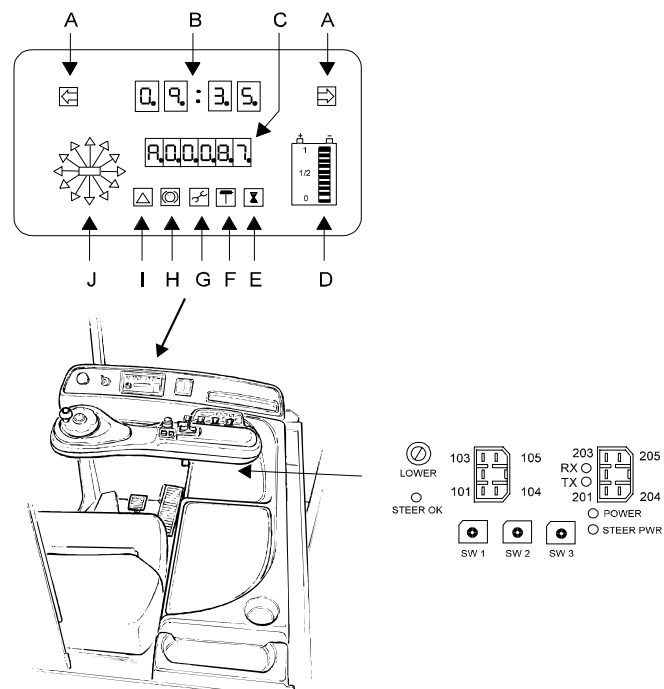
Proceed as follows to look at the machine specific register:

- Remove the arm rest cushion
- Remove the screw and lever that lock the steering panel
- Remove the arm rest panel
- Turn the ignition key so that the electronic card is voltage fed
- Press button SW1 on the electronic card
- Press SW1 once again to step to the next function

The character window (C) will present the different functions:

- Time
- Warning and error codes
- Parameters
- Running time

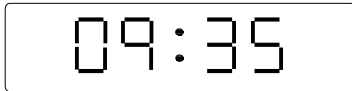
The address register will be shown in the left-hand section and the value in the right-hand section for the “Warning/Error codes” and “Parameters”.



Electronic card/control card

4. Time

When it is possible to program the clock the character window for hours will flash and after pressing SW1 the minutes will flash.



- Change by stepping up using SW2 and stepping down using SW3
- Save the values and display the function by pressing SW1

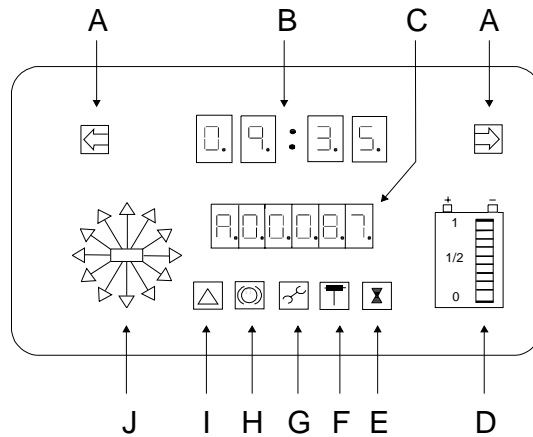
Function	Value
Hours	09 = 9h
Minutes	35 = 35 min

When error codes are displayed in the character window (C) the character box (G) will light. When the parameters are displayed in character window (C) the character box (F) will light. However, it is not possible to reprogram the parameters in this mode. To change to the programming mode, see “Programming parameters”.

Complete programming by turning the ignition key off and on once. Programming mode will quit if you do not press a key during a ten second period.



5. Warning codes



Character	Error
[Warning

When an error has occurred a signal sounds and a code is displayed for ten seconds in the right-hand section of the character window (C). The error is also shown in the character box (G). If the error remains after 1 min. the warning and signal will be activated again for a two second period. This happens as long as the error is not rectified. The truck can still be driven with all functions as set out in the table.

WARNING!



**Ignoring error indications.
 The safety of the truck is jeopardised.
 Always check the operation of the truck before use.**

Electronic card/control card

5.1. Warning codes without registering

Code no.	Type of error	Probable cause	Effect on the truck
11	The steering servo electronics have overheated	Steering jamming	Lower speed when steering and driving
12	The steering angle sensor gives no signal when steering	Faulty steering angle sensor or broken cable	None
13	The height pulse sensor gives no signal when lowering the forks above the fork reference switch	Faulty pulse sensor or broken cable	None
14	The seat breaker is activated more than 20 minutes without the truck being touched	Faulty switch or broken cable	None
15	The safety switch is activated more than 20 minutes without the truck being touched	Faulty switch or broken cable	None
16	The carbon brushes on the pump motor have worn down to the min. length	Worn carbon brushes	None
17	The carbon brushes on the drive motor have worn down to the min. length	Worn carbon brushes	None
18	The battery in the logic box has reached it's lowest voltage	The battery has too low voltage	Data stored in memory will be lost
21	The potentiometer for fork lift gives too high voltage when ignition is switched on	Faulty potentiometer or broken cable	Lifting/lowering of forks will stop
22	The potentiometer for tilting gives too high voltage when ignition is switched on	Faulty potentiometer or broken cable	Tilting will stop



Code no.	Type of error	Probable cause	Effect on the truck
23	The potentiometer for mast retracting/extending gives too high voltage when ignition is switched on	Faulty potentiometer or broken cable	Retracting/extending will stop
24	The potentiometer for extra functions "1" and "2" gives too high voltage when ignition is switched on	Faulty potentiometer or broken cable	Extra functions will stop
25	No power to the valve/contact or a short circuit	Faulty valve/contact or broken cable. See code number 50 - 65	Function stop depending on the cause of the fault
26	No power to the potentiometer for hydraulic functions	Faulty potentiometer or broken cable. See code number 90-93	Function stop depending on the cause of the fault
27	Incorrect voltage measurement from battery	Intermittent contact or broken cables	No effect on truck. Flashing battery indicator

5.2. Warning codes with registering

Code no.	Type of error	Code no.	Type of error
50	Valve Y20 for cab tilt, lift	60	Valve Y13 for mast's extension
51	Valve Y20 for cab tilt, lower	61	Proportional Valve Y10 for fork lowering
52	Valve Y10 for fork lift	62	Valve Y1 for parking brake
53	Valve Y14 for fork lift, up	64	Contact or K11 for driving in direction of forks
54	Valve Y14 for fork lift, down	65	Contact or K13 for driving in direction of steering wheel
55	Valve for extra function "1"	90	Potentiometer R11 for fork lift
56	Valve for extra function "1"	91	Potentiometer R13 for tilt
57	Valve for extra function "2"	92	Potentiometer R12 for retraction/extension of mast

Electronic card/control card

Code no.	Type of error	Code no.	Type of error
58	Valve for extra function "2"	93	Potentiometer R14 for extra function "1" and "2"
59	Valve Y12 mast's retraction		

When the warning code is displayed it is automatically registered. Registration takes places in the first of the 80 possible positions and moves the previous error one step downward.

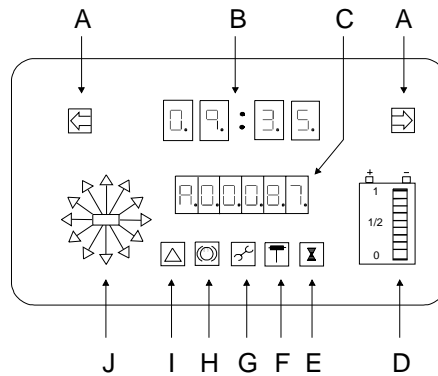
With warning codes 50-62 the valve, contactor or cables are either broken or short circuited.

With warning codes 90-93 the potentiometer or cables are broken.

Only the actual function is disabled; other functions are not affected.



6. Error codes

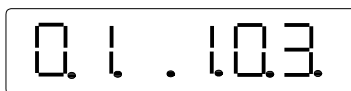


Character	Error
E	Error

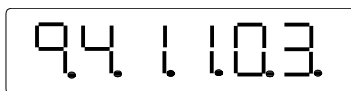
When an error has occurred a buzzer sounds at the same time as an error code is displayed in the right-hand section of the character window (C). (The error is also shown in the character box (G)). The buzzer sounds until the ignition is switched off and the voltage to the truck is cut.

If the error remains when the ignition key is switched on again the code will be shown and the buzzer will sound again.

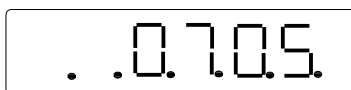
The truck can still be used with the hydraulic functions listed in the table.



When an error code is shown it is automatically registered in the error register. (The meaning of the error is shown in the table). Registration takes place in the first of the 80 possible positions and moves the previous error one step downward.



When the register is shown in the character window the latest error is shown first with the error code.



To see the date when the error occurred press SW3 once and to see the time press SW3 once again.

To see more of the registered errors press SW2.

WARNING!



Ignoring error indications.

The safety of the truck is jeopardised.

Always check the operation of the truck before use.

Electronic card/control card

6.1. Error codes with registering

Code no.	Type or error	Probable cause
102	Error signal from servo electronics	Faulty servo unit or the emergency stop has been activated
110	Error signal from parking brake cylinder's microswitch	Faulty switch or broken cables
111	Parking brake cylinder's microswitch gives a signal as released despite the valve being open	Faulty switch or broken cables
120	Fault in the electronic unit	Faulty electronic unit
121	Communication error between the electronic units on the card	Faulty electronic unit
122	Steering servo electronics too hot	Faulty electronic unit
123	Communication error between the electronic units on the card	Faulty electronic unit
125	Fault on steering generator	Faulty generator or broken cable
126	Fault on steering motor	Faulty motor or broken cable
127	Communication error between the electronic units on the card	Faulty electronic unit
130	Communication error between the electronic units on the card	Faulty electronic unit
131	Electronics do not start	Faulty electronic unit
132	Fault in the electronic unit	Faulty electronic unit or broken cable
133	Fault in the electronic unit	Faulty electronic unit
140	Fault in the electronic unit	Faulty electronic unit

Effect on the truck

All hydraulic functions except fork lowering are stopped.



7. Parameters

The significance of the different parameters is shown in the table in section "Programming parameters". To see the different parameters press SW1 or SW2.

8. Running time

When the time meter reading is shown the **character box (E)** is illuminated. The time is shown as follows:

Character	Time
A	Ignition time
b	Total movement time
c	Drive motor time
d	Pump motor time

Electronic card/control card

9. Programming parameters

Only applies to electronic card no. 142575-005

- Press SW1 on the electronic card while at the same time turning the ignition key
- Step using SW2 (up) and SW3 (down) to the parameter you wish to change
- Press SW1 (the character window flashes)
- Change the value using SW2/SW3
- Press SW1 to accept the value (character window stops flashing)

If you wish to change more parameters, step using SW2/SW3 to the parameter you wish to change and repeat from "Press SW1 (the character window flashes).

NOTE!

Truck handling.

Modifying specific truck parameters will change the driving characteristics of the truck.

Do not change any parameters without the necessary know-how.

No.	Parameter type	Unit	Min/Max	Std. value	Remarks
01	Steering sensitivity		1 - 6	3	1 = Little sensitivity 5 = Great sensitivity 6 = no progressivity In steps of one
02	Steering wheel size		0 . 1	0	0 = Small wheel 1 = Large wheel
03	Drive motor, max. speed	%	10 - 100	100	Percentage of max. speed In steps of 5
04	Drive motor, speed reduction	%	10 - 100	100	Percentage of max. speed In steps of 5
05	Drive motor, acceleration	%	10 - 100	100	Percentage of max. acceleration In steps of 5
06	Mast's retraction/extension, speed	%	10 - 100	80	Percentage of max. speed In steps of 5
07	Extra function 1, speed	%	10 - 100	20	Percentage of max. oil flow In steps of 5



No.	Parameter type	Unit	Min/Max	Std. value	Remarks
08	Extra function 2 speed	%	10 - 100	20	Percentage of max. oil flow In steps of 5
09	Connection of extra hydraulic function 1, current limit	%	0 - 100	0	0 = not connected > 0 = connected 1 step om 5
10	Connection of extra function 2, current limit	%	0 - 100	0	0 = not connected > 0 = connected In steps of 5
11	Lifting height limiter	m	0 - 13.5	0.00	0 =not connected > 0 = connected In steps of 0.05
12	Fork's free lift height	m	1.5 - 4.5	2.2	Upper side of fork to floor when inner guide is at the top In steps of 0.01
13	Cabin tilt start	m	0 - 7	0.00	0 = not connected > 0 = distance above ref. height where cab tilt starts In steps of 0.5
14	Cabin lowering start	m	0.5 - 7	0.5	Distance from last fork lift stop, where cab lowering starts In steps of 0.5
15	Indicator for drive wheel direction, steering angle		0.1	0	0 = not connected 1 = connected
16	Time display		1 - 4	2	1 = Ignition time 2 = total movement time 3 = drive motor time 4 = pump motor time
17	Battery size		0 - 5	0	0 - 5
18	Pump motor size		0.1	0	0 = small 1 = large
19	Clock, year	Year	0 - 99		In steps of 1
20	Clock , day	Day	1 - 31		In steps of 1
21	Clock, month	Month	1 - 12		In steps of 1

Electronic card/control card

Only applies to electronic card no. 142575-006

- Press SW1 on the electronic card while at the same time turning the ignition key
- Step using SW2 (up) and SW3 (down) to the parameter you wish to change
- Press SW1 (the character window flashes)
- Change the value using SW2/SW3
- Press SW1 to accept the value (character window stops flashing)

If you wish to change more parameters, step using SW2/SW3 to the parameter you wish to change and repeat from "Press SW1 (the character window flashes).

NOTE!

Truck handling.

Modifying specific truck parameters will change the driving characteristics of the truck.

Do not change any parameters without the necessary know-how.

No	Parameter type	Unit	Min/Max	Std. value	Remarks
01	Steering sensitivity		1 - 6	3	1 = Little sensitivity 5 = Great sensitivity 6 = No progressivity In steps of 1
02	Mast type		0.1	0	0 = Older mast 1 = With valve in fork yoke
03	Drive motor, max. speed	%	10 - 100	100	Percentage of max. speed In steps of 5
04	Drive motor, speed reduction	%	10 - 100	100	Percentage of max. speed In steps of 5
05	Drive motor, acceleration	%	10 - 100	100	Percentage max. acceleration In steps of 5
06	Mast extension/retraction, speed	%	10 - 100	80	Percentage of max. speed In steps of 5
07	Extra function 1, speed	%	10 - 100	10 20	1350-2000 mast with integrated side shift B/E7-B/E8
08	Extra function 2, speed	%	10 - 100	20	Percentage of max. oil flow In steps of 5



No	Parameter type	Unit	Min/Max	Std. value	Remarks
09	Connection of extra function 1, current limit	%	0 - 100	100	0 = not connected > 0 = connected In steps of 5
10	Connection of extra function 2, current limit	%	0 - 100	0	0 = not connected > 0 = connected In steps of 5
11	Lifting height limiter	m	0 - 13.5	0.00	0 = not connected > 0 = connected In steps of 0.05
12	Fork's free lift height	m	1.5 - 4.5	See table below	Upper side of fork to floor when inner guide is at the top In steps of 0.01
13	Cabin tilt start	m	0 - 7	0.00	0= not connected >0= Distance from ref. height where cab tilt starts In steps of 0.5
14	Cabin lowering start	m	0.5 - 7	1 0.5	B and N machines Ergo and Cold store
15	Indicator for drive wheel direction, steering angle		0.1	0	0 = not connected 1 = connected
16	Time display		1 - 4	2	1 = ignition time 2 = total movement time 3 = drive motor time 4 = pump motor time
17	Battery size		1-20	See table below	See table below
18	Pump motor size		0.1	0	0 = small 1 = large
19	Clock, year	Year	0 - 99		In steps of 1
20	Clock, day	Day	1 - 31		In steps of 1
21	Clock, month	Month	1 - 12		In steps of 1

Electronic card/control card

10. Parameter 12

Lift height	Approx. setting 1350-2000 mast with integrated side shift	Approx. setting B/E7-B/E8
4400	1.42	
4600	1.50	
4800	1.56	1.65
5400	1.75	1.84
5700	1.85	
6300	2.07	2.14
6750	2.22	2.38
7000	2.42	2.48
7500	2.56	
8000	2.74	2.83
8500	2.93	3.01
9000	3.09	3.14
9500	3.19	3.27
10000		3.43
10500		3.58
10800		3.70



11. Parameter 17

Value	Function	Battery (Ah)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11	Lower discharge	900
12		730, 700, 580
13	Greater discharge	600
14		
15		480, 450
16		
17		360
18		
19		
20		



WARNING!

***Correct parameter setting.
The battery can be destroyed.
If the parameter setting is higher than recommended the
battery can be over-discharged which can destroy the
battery.***

Electronic card/control card

Only applies to electronic card no. 142575-007

- Press SW1 on the electronic card while at the same time turning the ignition key
- Step using SW2 (up) and SW3 (down) to the parameter you wish to change
- Press SW1 (the character window flashes)
- Change the value using SW2/SW3
- Press SW1 to accept the value (character window stops flashing)

If you wish to change more parameters, step using SW2/SW3 to the parameter you wish to change and repeat from "Press SW1 (the character window flashes).

NOTE!

*Truck handling.
 Modifying specific truck parameters will change the driving characteristics of the truck.
 Do not change any parameters without the necessary know-how.*

No.	Parameter type	Unit	Min/Max	Std. value	Remarks
01	Steering sensitivity		1 - 6	3	1 = Little sensitivity 5 = Great sensitivity 6 = No progressivity In steps of 1
02	Mast type		0.1	0	0 = Older mast 1 = With valve in fork yoke
03	Drive motor, max. speed	%	10 - 100	100	Percentage of max. speed In steps of 5
04	Drive motor, speed reduction	%	10 - 100	100	Percentage of max. speed In steps of 5
05	Drive motor, acceleration	%	10 - 100	100	Percentage of max. acceleration In steps of 5
06	Mast's extension/retraction, speed	%	10 - 100	80	Percentage of max. speed In steps of 5
07	Extra function 1 speed	%	10 - 100	10 20	1350-2000 mast with integrated side shift B/E7-B/E8
08	Extra function 2 speed	%	10 - 100	20	Percentage of max. oil flow In steps of 5



No.	Parameter type	Unit	Min/Max	Std. value	Remarks
09	Connection of hydraulic extra function 1, current limit	%	0 - 100	100	0 = not connected > 0 = connected In steps of 5
10	Connection of extra function 2, current limit	%	0 - 100	0	0 = not connected > 0 = connected In steps of 5
11	Lifting height limiter	m	0 - 13.5	0.00	0 = not connected > 0 = connected In steps of 0.05
12	Fork's free lift height	m	1.0 - 4.5	See table below	Upper side of forks to floor when inner guide is at the top In steps of 0.01
13	Cabin tilt start	m	0 - 7	0.00	0 = not connected > 0 = Distance above ref. height where cab tilt starts In steps of 0.5
14	Cabin lowering start	m	0.5 - 7	1 0.5	B and N machines Ergo and cold store cabin
15	Indicator for drive wheel direction and steering angle		0.1	0	0 = not connected 1 = connected
16	Time display		1 - 4	2	1 = ignition time 2 = total movement time 3 = drive motor time 4 = pump motor time
17	Battery size		1-20	See table below	See table below
18	Pump motor size		0.1	0	0 = small 1 = large
19	Clock, year	Year	0 - 99		In steps of 1
20	Clock, day	Day	1 - 31		In steps of 1
21	Clock, month	Month	1 - 12		In steps of 1
22	Priority of lift		0-1		0 = Fork lift has priority 1 = Fork lift has no priority

Electronic card/control card

12. Parameter 12

Lift height	Approx. setting 1350-2000 mast with integrated side shift	Approx. set- ting B/E7-B/E8
4400	1.42	
4600	1.50	
4800	1.56	1.65
5400	1.75	1.84
5700	1.85	
6300	2.07	2.14
6750	2.22	2.38
7000	2.42	2.48
7500	2.56	
8000	2.74	2.83
8500	2.93	3.01
9000	3.09	3.14
9500	3.19	3.27
10000		3.43
10500		3.58
10800		3.70



13. Parameter 17

Value	Function	Battery (Ah)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11	Lower discharge	900
12		730, 700, 580
13	Greater discharge	600
14		
15		480, 450
16		
17		360
18		
19		
20		



WARNING!

*Correct parameter setting.
The battery can be destroyed.
If the parameter setting is higher than recommended the
battery can be over-discharged which can destroy the
battery.*

F-code Section C-code
RT S5 5710

Electronic card/control card

Version no T-code
001 301-307,400



Electronic card

Valid from serial number:

T-code	Model	Serial No	Notes
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi



2 Terminals and voltages on A5

The terminal's LEDs are designated as follows:

- I = Input, green LED
- O = Output, red LED
- Other = Yellow LED

2.1 10X

Con- nection	Cable	Designation	Active (V)	LED
101	34	Selected operator/parameter setting	+48	I
102	35	Selected operator/stepping up	+48	I
103	36	Selected operator/stepping down	+48	I
104	45	Travel direction selector, fork direction, with creep speed	+48	I
105	46	Travel direction selector, steer wheel direction, with creep speed	+48	I
106	47	Travel direction selector, fork direction	+48	I
107	48	Travel direction selector, steer wheel direction	+48	I
108	-	Spare		I
109	-	Spare		I
110	43	Safety pedal (left foot)	+48	I
111	39	Travel direction switching	+48	I

Electronic card**2.2 20X**

Con- nection	Cable	Designation	Active (V)	LED
201	-	Spare		
202	-	Indicator signal, lift	+5	
203	49	Seat switch	+48	
204	81	Weight indicator	+48	
205	100	Lift height limit, bypass	+48	
206	79	Speed reduction, driving	+48	
207	-	Spare		
208	-	Indicator signal, driving	+5	
209	57	Steering wheel sensor, 180°	+48	
210	58	Steering wheel sensor, channel A	+15	
211	59	Steering wheel sensor, channel B	+15	

2.3 30X

Con- nection	Cable	Designation	Active (V)	LED
301	98	Lift height limiter/height meter, channel A	0-(+)10	
302	99	Height meter, channel B	0-(+)10	
303	106	Reference height sensor	+48	
304	103	Cab lowering, manual	+48	
305	104	Cab tilt, selected	+48	
306	105	Cab tilt, selected	+48	
307	107	Electronic fan	+32/48	



2.4 40X

Con- nection	Cable	Designation	Active (V)	LED
401	117	CAN – Series (+)	+15	
402	118	CAN – Series (-)	0	
403	119	CANH		
404	120	CANL		
405	121	RS485 – Series (+)		
406	122	RS485 – Series (-)		
407	125	RS485 – TX (+), transmit data		
408	126	RS485 – TX (-) transmit data		
409	127	RS485 – RX (+), receive data		
410	127	RS485 – RX (-) receive data		
411	-	Spare		

Electronic card**2.5 50X**

Con- nection	Cable	Designation	Active (V)	LED
501	50	Potentiometer driving, reference value	+3.7–1.7	
502	51	Potentiometer brake, reference value	+1.7–4.1	
503	82	Potentiometer fork movement, reference value	+0.66– 3.7–6.6	
504	83	Potentiometer mast, extending/retracting, reference value	+0.77– 3.7–6.6	
505	84	Potentiometer tilting of forks, reference value	+0.66– 3.7–6.6	
506	85	Potentiometer extra (1) hydraulic function, reference value	+0.66– 3.7–6.6	
507	27	Potentiometer supply	+7.35	
508	28	Minus to 501–506, 510	0	
509	62	Steering tachometer (+)	±3	
510	86	Potentiometer extra (2) hydraulic function, reference value	+0.66– 3.7–6.6	
511	129	Steering tachometer (-)	0	

2.6 60X

Con- nection	Cable	Designation	Active (V)	LED
601	70	Battery guard, voltage measurement (+)	+48	
602	71	Battery guard, voltage/current measurement (-)	0	
603	72	Battery guard, current measurement (+)		
604	-	Spare		
605	-	Spare		



2.7 70X

Con- nection	Cable	Designation	Active (V)	LED
701	89	Valve, lifting of forks	+0.5-48	O
702	90	Valve, retracting mast	+0.5-48	O
703	91	Valve, extending mast	+0.5-48	O
704	92	Valve, tilting forks down	+0.5-48	O
705	93	Valve, tilting forks up	+0.5-48	O
706	94	Valve, extra hydraulic function 1 A	+0.5-48	O
707	95	Valve, extra hydraulic function 1 B	+0.5-48	O
708	96	Valve, extra hydraulic function 2 A	+0.5-48	O
709	97	Valve, extra hydraulic function 2 B	+0.5-48	O
710	101	Valve, cab tilt up	+0.5-48	O
711	102	Valve, cab tilt down	+0.5-48	O

Electronic card**2.8 80X**

Con- nection	Cable	Designation	Active (V)	LED
801	63	Support arm brake, active	0.2 – (+)48	O
802	64	Motor brake, released	1.5–(+)48	O
803	88	Valve, lowering forks	0.2–(+)24	O
804	31	Main contactor	+48	O
805	21	Battery voltage, (+) 48 V	+48	+48 V
806		Battery voltage, minus	0	
807	24	Battery voltage, (+) 48 V after key	+48	+48 V KEY
808	23	Battery voltage, (+) 48 V after main contac- tor	+48	
809	22	Battery voltage, (+) 48 V after emergency breaking	+48	+48 V ESO
810	29	Potentiometer supply, (+) 15 V	+15	
811	30	Potentiometersupply, minus	0	

2.9 90X

Con- nection	Cable	Designation	Active (V)	LED
901	25	Battery voltage, (+) 48 V	+48	
902	40	Battery voltage, minus	0	
903	60	Steering motor, (+)	+48	
904	61	Steering motor, (-)	+48	



LED	Colour	Function
+ 48 V STEER	Yellow	Voltage fed to control electronics
+ 48 V_SR	Yellow	Steering OK
STEER PWR	Yellow	Steering OK
POWER OK	Yellow	Indicates that all voltage is fed to electronic card

Potentiometer	Function
RV 1	Trimming of the proportional valve's opening position

3 Adjustment of lowering speed

To adjust the lowering speed, see C-code 6000.

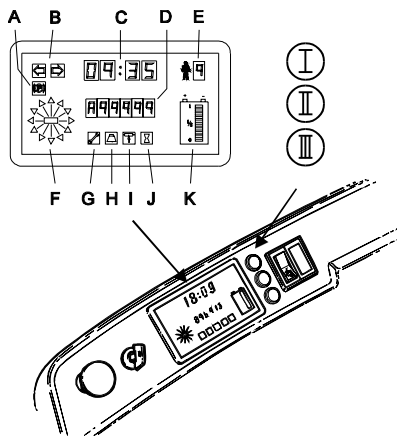
Electronic card

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4 Display

The display function provides the possibility of examining the operator/machine specific register but does not permit reprogramming. You can, however, reset the clock.

For reprogramming of operator/machine parameters, see "Parameter setting".

Proceed as follows to look the registers:

- Turn the ignition key so that the electronic card receives voltage.
- Enter operator number using buttons **I–III**.
- Hold button **I** down until the clock starts to blink, approx. 5 seconds.
- Press **I** once again to step to the next function.

The character window will present the different functions:

- Time (C).
- Warning and error codes (D).
- Parameters (D).
- Running time and service time (D).

The address register will be shown in the left-hand section and the value in the right-hand section for the "Warning/Error codes" and "Parameters".



5 Programming

5.1 Clock

When it is possible to program the clock the character window for hours will flash and after pressing **I** the minutes will flash.

- Change by scrolling up with switch **II** and down with switch **III**.
- Store the programmed value and show the function by pressing switch **I**.

09:35

Function	Value
Hours	09 = 9h
Minutes	35 = 35 min.

When error codes are displayed in the character window (D) the character box (G) will light and when the parameters are displayed in character window (D) the character box (I) will light. However, it is not possible to reprogram the parameters in this mode. To change see chapter "Parameter setting".

Complete programming by turning the ignition key off and on once. Programming mode will quit if you do not press a key during a twenty second period.

NOTE!

Truck handling.

Modifying specific truck parameters will change the driving characteristics of the truck.

Do not change any parameters without the necessary know-how.

5.2 Operator parameters (n° 1-7)

To re-programme the operator parameters (if the change is permitted), carry out the following:

- Switch on the ignition key to feed voltage to the electronics.
- Using the switches (**I-III**), enter the number of the operator for whom you wish to change the parameters.
- Turn off the ignition key so that the electronic board is dead.

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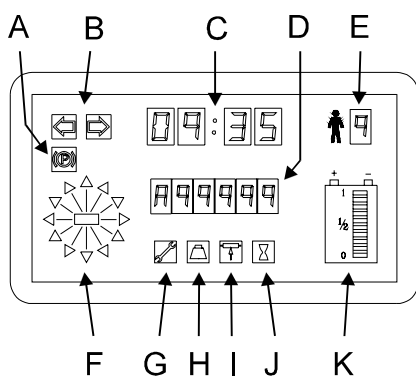
- Press switch **I** at the same time as you turn the ignition key. The operator number will be shown in the indicator window (E).
- Scroll using switch **II** (up) and switch **III** (down) to the parameter you want to change.
- Press down switch **I** (the parameter number flashes).
- Change the value using switches **II** and **III**.
- Press down switch **I** to set the value (the parameter number stops flashing).

If you want to change several parameters, scroll with switches **II** and **III** to the parameter you want to change and repeat from “Press switch **I** (the parameter number flashes)”.

Conclude the programming by turning the ignition key off and on.

The common truck parameters can only be reprogrammed using a service instrument see chapter “Parameter setting”.

6 Warning codes



Character	Error
[Warning

When an error has occurred a signal sounds and a code is displayed for ten seconds in the right-hand section of the character window (D). The error is also shown in the character box (G). If the error remains after 1 min. the warning and signal will be activated again for a two second period.

This happens as long as the error is not rectified. The truck can still be driven with all functions as set out in the table.

WARNING!



Ignoring error indications.

The safety of the truck is jeopardised.

Always check the operation of the truck before use.



7 Error codes

7.1 Error mode

Error mode	Description/measures
Start up error	The truck does not start the drive and hydraulic functions.
Critical error	Steering safety relay releases. Main contactor opens. Parking brake activated.
General error	Actual function stopped.
Height error	Forks lifted at low speed.
Emergency stop on	Main contacts open Parking brake activated.
Steering error	Steering safety relay releases. Drive motor reverses to a standstill.
Travel regulator error	Main contactors open. Lift regulator error. Steering possible. When braking the parking brake is activated
Lift regulator error	Hydraulics stopped. Values close.

Warning codes 11–99 give a 2 Hz warning signal.

Error codes 100– give a 4 Hz warning signal.

Electronic card

7.2 Safety logic

The following functions give these results.

X = Action -- = Function not possible

Action: Function:	K10 opens	Y1 activates	Reversing with M1	Steering not possible	A5 ceases to function
Emergency switch off	X	X	--		--
Ignition key	X	X	--	X	--
Steering fault			X	X	
Error in A1	X		--		--
Error in A2					X (+ electrical valves off)
Error in A5	X	X	--	X	--

7.3 Warning code without registering

Code	11
Description	High heatsink temperature on the electronic card
Error mode	Maximum current to the steering motor reduced
Reason for error	Seized steering/gear
	Seized steering bearing
	Faulty steering motor
	Faulty electronic card A5
Remarks	Cool and check motor/gear



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Code	13
Description	No or too little pulses from the height measuring sensor with fork lifting and fork lowering.
Error mode	No action
Reason for error	Incorrectly adjusted potentiometer RV1 on electronic card A5
	Faulty sensor/cables
	Incorrect oil quantity
	Too light fork carriage (no forks)
	Faulty electronic card A5
Remarks	

Code	14
Description	Seat switch actuated more than 20 min without the truck moving
Error mode	No action
Reason for error	Bridged switch
	Faulty switch/cables
	Faulty electronic card A5
Remarks	

Code	15
Description	Safety switch actuated more than 20 min without the truck moving
Error mode	No action
Reason for error	Bridged switch
	Faulty switch/cables
	Faulty electronic card A5
Remarks	

Electronic card

Code	16
Description	The voltage from the accelerator's potentiometer R1 is outside the calibrated value on start up (+/-0.2V).
Error mode	Start up error
Reason for error	Actuated pedal during start up
	Faulty potentiometer/bracket/cables
	Incorrect calibration
	Faulty electronic card A5
Remarks	Move to neutral position

Code	17
Description	The voltage from the brake pedal's potentiometer R2 is outside the calibrated value on start up (+/-0.2V).
Error mode	Start up error
Reason for error	Actuated pedal during start up
	Faulty potentiometer/bracket/cables
	Incorrect calibration
	Faulty electronic card A5
Remarks	Move to neutral position

Code	18
Description	The battery on the electronic card has reached its lowest voltage
Error mode	Internal clock stops
Reason for error	The battery voltage is too low
Remarks	



Code	19
Description	Programmed parameter values lost
Error mode	Standard values have been loaded
Reason for error	Dislodged electronic card A5
Remarks	Program the card A5

Code	21
Description	Potentiometer R11 for lifting/lowering the forks gives the wrong voltage when the ignition is switched on (+/-0.6V).
Error mode	Start up error
Reason for error	Actuated joystick during start up
	Faulty potentiometer/bracket/cables
	Faulty electronic card A5
Remarks	Move to neutral position

Code	22
Description	Potentiometer R13 for the tilt gives the wrong voltage when the ignition is switched on (+/-0.6V).
Error mode	Start up error
Reason for error	Actuated joystick during start up
	Faulty potentiometer/bracket/cables
	Faulty electronic card A5
Remarks	

Electronic card

Code	23
Description	Potentiometer R12 for the mast's in/out shifting movement gives the wrong voltage when the ignition is switched on (+/-0.6V).
Error Mode	Start up error
Reason for the error	Actuated joystick during start up
	Faulty potentiometer/bracket/cables
	Faulty electronic card A5
Remarks	

Code	24
Description	Potentiometer R14 or R15 for the extra functions "1" and "2" gives the wrong voltage when the ignition is switched on (+/-0.6V).
Error Mode	Start up error
Reason for the error	Actuated joystick during start up
	Faulty potentiometer/bracket/cables
	Faulty electronic card A5
Remarks	Move to the neutral position

Code	25
Description	Error in one of the output stages
Error Mode	General error
Reason for the error	See codes 50-62 for more information
	Emergency driving switch for Y12 activated
Remarks	



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Code	26
Description	Error in one of the output stages
Error Mode	General error
Reason for the error	See codes 90-94 for more information
Remarks	

Code	27
Description	Incorrect battery supply
Error Mode	Battery display flashes
Reason for the error	Bad contact on the battery supply cables
	Faulty electronic card A5
	Faulty battery
Remarks	

Code	28
Description	Emergency switch activated
Error Mode	Emergency disconnecter on
Reason for the error	Driver action
	Faulty switch/cable
	Faulty electronic card A5
Remarks	Reset S21 and switch S17 off/on

Code	29
Description	Service time (S) is on zero
Error Mode	No action
Reason for the error	
Remarks	Reset with parameter

Electronic card

Code	40
Description	Warning temperature for travel motor
Error Mode	Maximum current reduced
Reason for the error	High temperature in travel motor
	Faulty temperature sensor/cables
	Faulty frequency converter
	Faulty electronic card A5
Remarks	

Code	41
Description	Warning temperature in drive motor's frequency converter
Error Mode	Maximum current reduced
Reason for the error	High temperature in frequency converter
	Fault fan
	Faulty frequency converter
	Faulty electronic card A5
Remarks	

Code	42
Description	Current calibration error in the drive motor's frequency converter
Error Mode	No action
Reason for the error	Faulty frequency converter
Remarks	



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Code	45
Description	Warning temperature for lift motor
Error Mode	Maximum current reduced
Reason for the error	High temperature in the lift motor
	Faulty temperature sensor/cable
	Faulty frequency converter
	Faulty electronic card A5
Remarks	

Code	46
Description	Warning temperature in the pump motor's frequency converter
Error Mode	Maximum current reduced
Reason for the error	High temperature in the frequency converter
	Faulty fan
	Faulty frequency converter
	Faulty electronic card A5
Remarks	

Code	47
Description	Current calibration error in the pump motor's frequency converter
Error Mode	No action
Reason for the error	Faulty frequency converter
Remarks	

Electronic card

8 Warning code with registration

When warning codes are displayed the codes are automatically registered. Registration takes place in the first of the 50 possible places, and move the previous errors one step downwards.

With warning codes 50–62 the valve, support arm brakes or cables are broken or short circuited.

With warning codes 90–94 the potentiometers or cables are broken.

Only the actual function is disconnected, other functions are not affected.

Code	50
Description	Output 710 short circuited/broken
Error Mode	General error
Reason for the error	Faulty cables/valve Y20
	Faulty electronic card A5
Remarks	

Code	51
Description	Output 711 short circuited/broken
Error Mode	General error
Reason for the error	Emergency driving brake for Y1 actuated
	Faulty cables/valve Y21
	Faulty electronic card A5
Remarks	

Code	52
Description	Output 701 short circuited/broken
Error Mode	General error
Reason for the error	Faulty cables/valve Y10
	Faulty electronic card A5
Remarks	



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Code	53
Description	Output 705 short circuited/broken
Error Mode	General error
Reason for the error	Faulty cables/valve Y15
	Faulty electronic card A5
Remarks	

Code	54
Description	Output 704 short circuited/broken
Error Mode	General error
Reason for the error	Faulty cables/valve Y14
	Faulty electronic card A5
Remarks	

Code	55
Description	Output 706 short circuited/broken
Error Mode	General error
Reason for the error	Parameter 15 >0, no valve connected
	Faulty cables/valve Y16
	Faulty electronic card A5
Remarks	

Code	56
Description	Output 707 short circuited/broken
Error Mode	General error
Reason for the error	Parameter 15 >0, no valve connected
	Faulty cables/valve Y17
	Faulty electronic card A5
Remarks	

Electronic card

Code	57
Description	Output 708 short circuited/broken
Error Mode	General error
Reason for the error	Parameter 16 >0, no valve connected
	Faulty electronic card A5
	Faulty electronic card A5
Remarks	

Code	58
Description	Output 709 short circuited/broken
Error Mode	General error
Reason for the error	Parameter 16 >0, no valve connected
	Faulty cables/valve Y19
	Faulty electronic card A5
Remarks	

Code	59
Description	Output 702 short circuited/broken
Error Mode	General error
Reason for the error	Emergency driving switch for Y1 actuated
	Faulty cables/valve Y12
	Faulty electronic card A5
Remarks	

Code	60
Description	Output 703 short circuited/broken
Error Mode	General error
Reason for the error	Faulty cables/valve Y13
	Faulty electronic card A5
Remarks	



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Code	61
Description	Output 803 short circuited/broken
Error Mode	General error
Reason for the error	Faulty cables/valve Y10
	Faulty electronic card A5
Remarks	

Code	62
Description	Output 801 short circuited/broken
Error Mode	Error in both support arm brakes gives 9 km max. speed
Reason for the error	Faulty cables/valve Y5/Y6
	Faulty electronic card A5
Remarks	

Code	90
Description	Potentiometer R11 for lifting/lowering the forks gives wrong voltage (<0.3 or >7.0V)
Error Mode	General error
Reason for the error	Faulty potentiometer/cables
	Activated input without the potentiometer being connected
	Faulty electronic card A5
Remarks	

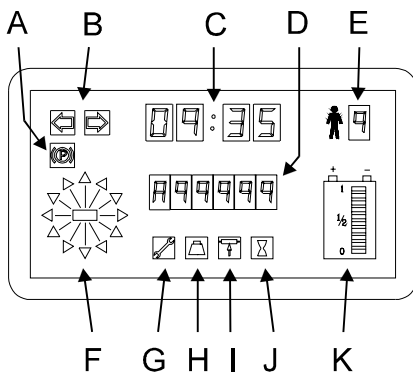
Electronic card

Code	91
Description	Potentiometer R13 for tilt gives wrong voltage (<0.3 or >7.0V)
Error Mode	General error
Reason for the error	Faulty potentiometer/cables
	Activated input without the potentiometer being connected
	Faulty electronic card A5
Remarks	

Code	92
Description	Potentiometer R12 for the mast's in/out shifting movement give the wrong voltage (<0.3 or >7.0V).
Error Mode	General error
Reason for the error	Faulty potentiometer/cables
	Activated input without the potentiometer being connected
	Faulty electronic card A5
Remarks	

Code	93
Description	Potentiometer R14 or R15 for the extra function "1" and "2" give the wrong voltage (<0.3 or >7.0V).
Error Mode	General error
Reason for the error	Parameter 15/16 >0, no potentiometer connected
	Faulty potentiometer/cables
	Faulty electronic card A5
Remarks	

Code	94
Description	Potentiometer R1 for the accelerator gives the wrong voltage (<0.4 or >4.6V).
Error Mode	General error
Reason for the error	Faulty potentiometer/cables
	Faulty electronic card A5
Remarks	



9 Error codes

Character	Error
E	Error

When an error has occurred a buzzer sounds at the same time as an error code is displayed in the right-hand section of the character window (D). (The error is also shown in the character box (G). The buzzer sounds until the ignition is switched off and the voltage to the truck is cut.

If the error remains when the ignition key is switched on again the code will be shown and the buzzer will sound again.

The truck can still be used with the hydraulic functions listed in the table.

When an error code is shown it is automatically registered in the error register. (The meaning of the error is shown in the table). Registration takes place in the first of the 50 possible positions and moves the previous error one step downward.

When the register is shown in the character window the latest error is shown first with the error code.

To see the date when the error occurred press switch **III** once and to see the time press switch **III** once again.

To see more of the registered errors press switch **II**.

0.1 . 1.0.3.

94 1. 1.0.3.

. .0.7.0.5.



WARNING!

Ignoring error indications.

The safety of the truck is jeopardised.

Always check the operation of the truck before use.

Electronic card**9.1 Error codes with registration**

Code	104
Description	Output 802 short circuited/broken
Error Mode	Critical error
Reason for the error	Emergency driving switch for Y1 activated
	Faulty cables/valve Y1
	Faulty electronic card A5
Remarks	

Code	106
Description	Output 804 short circuited/broken
Error Mode	Critical error
Reason for the error	Faulty cables/connector K10
	Faulty electronic card A5
Remarks	

Code	107
Description	Main contactor K10 does not make when the ignition key and the emergency switch are not activated
Error Mode	Critical error
Reason for the error	Faulty contactor K10
	Faulty electronic card A5
Remarks	



Code	108
Description	The main contactors do not open with the ignition switched off and emergency switch deactivated
Error Mode	Critical error
Reason for the error	Faulty contactor K10
	Faulty electronic card A5
Remarks	

Code	111
Description	Potentiometer R1 for the brake pedal gives the wrong voltage (<0.4 or >4.6V)
Error Mode	Critical error
Reason for the error	Faulty potentiometer/cables
	Faulty electronic card A5
Remarks	

Code	112
Description	Error when testing the brake input
Error Mode	Critical error
Reason for the error	Faulty electronic card A5
Remarks	

Code	120
Description	Memory cell for the steering set value contains an incorrect value
Error Mode	Steering error
Reason for the error	Dislodged electronic card A5
	Faulty electronic card A5
Remarks	Restart can reset the error

Electronic card

Code	121
Description	Steering safety relay deactivated due to the incorrect voltage in the drive stage or communication error with the master processor
Error Mode	Steering error
Reason for the error	Dislodged electronic card A5
	Faulty electronic card A5
Remarks	Restart can reset the error

Code	122
Description	Warning temperature in steering servo
Error Mode	Steering error
Reason for the error	High ambient temperature
	Seized steering
	Faulty steering motor
	Faulty cables to steering motor
	Faulty electronic card A5
Remarks	

Code	123
Description	Output voltage to the steering motor does not correspond with the requested steering
Error Mode	Steering error
Reason for the error	Faulty steering motor
	Faulty cables to the steering motor
	Faulty electronic card A5
Remarks	



Code	125
Description	Steering generator error during test
Error Mode	Steering error
Reason for the error	Faulty generator/carbon brushes
	Faulty cables
	Faulty electronic card A5
Remarks	

Code	126
Description	Steering error during test
Error Mode	Steering error
Reason for the error	Faulty fuse F61
	Faulty Steering/carbon brushes
	Faulty cables
	Faulty electronic card A5
Remarks	

Code	127
Description	Communication error between the steering processor and master processor
Error Mode	Steering error
Reason for the error	External interference (static electricity)
	Defective electronic card A5
Remarks	Restart can reset the error

Electronic card

Code	128
Description	Memory cell for the steering set value contains an incorrect value.
Error Mode	Critical error
Reason for the error	External interference (static electricity)
	Defective electronic card A5
Remarks	Restart can reset the error

Code	130
Description	Communication error between I/O processor and master processor
Error Mode	Critical error
Reason for the error	External interference (static electricity)
	Defective electronic card A5
Remarks	Restart can reset the error

Code	131
Description	Error during test of safety relay (steering) during start up
Error Mode	Steering error
Reason for the error	Faulty fuse F61
	Faulty cables to F61
	Faulty electronic card A5
Remarks	

Code	133
Description	Error during test of safety relay (steering) during start up
Error Mode	Steering error
Reason for the error	Faulty electronic card A5
Remarks	



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Code	134
Description	Safety relay (steering) has opened
Error Mode	Steering error
Reason for the error	Electronic card A5 exposed to mechanical impact
	Faulty electronic card A5
Remarks	

Code	135
Description	Error during test of safety relay (main circuit) during start up
Error Mode	Critical error
Reason for the error	Faulty electronic card A5
Remarks	

Code	136
Description	Error during test of safety relay (main circuit) during start up
Error Mode	Critical error
Reason for the error	Faulty electronic card A5
Remarks	

Code	137
Description	Safety relay (main circuit) has opened
Error Mode	Critical error
Reason for the error	Electronic card A5 exposed to mechanical impact
	Faulty electronic card A5
Remarks	Restart can reset error

Electronic card

Code	140
Description	Incorrect checksum in parameter memory during start up
Error Mode	Critical error
Reason for the error	Dislodged electronic card A5
	Faulty electronic card A5
Remarks	Restart can reset error. Change a parameter and restart. Download a new program.

Code	141
Description	Incorrect checksum for current program
Error Mode	Critical error
Reason for the error	Incorrect downloading of program from PC
	Faulty electronic card A5
Remarks	

Code	150
Description	No communications with the frequency converter during start up
Error Mode	Drive regulator error and lift regulator error
Reason for the error	Faulty CAN-cables/resistance
	15 V missing
	Faulty frequency converter
	Faulty electronic card A5
Remarks	



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Code	151
Description	No communications with the drive motor's frequency converter during start up
Error Mode	Drive regulator error
Reason for the error	Faulty CAN-cables/resistance
	Faulty frequency converter
Remarks	

Code	152
Description	No communications with the drive motor's frequency converter during operations
Error Mode	Drive regulator error
Reason for the error	Faulty CAN-cables/resistance
	Faulty frequency converter
Remarks	

Code	153
Description	No communications with the pump motor's frequency converter during start up
Error Mode	Lift regulator error
Reason for the error	Faulty CAN-cables/resistance
	Faulty frequency converter
Remarks	

Code	154
Description	No communications with the pump motor's frequency converter during operations
Error Mode	Lift regulator error
Reason for the error	Faulty CAN-cables/resistance
	Faulty frequency converter
Remarks	

Electronic card

Code	155 - 163
Description	General communications error
Error Mode	Drive regulator error
Reason for the error	Faulty CAN-cables/resistance
	External CAN-unit connected incorrectly
	Dislodged electronic card A5
	Faulty electronic card A5
Remarks	

Code	200-203
Description	CPU or memory error in the drive motor's frequency converter
Error Mode	Drive regulator error
Reason for the error	Faulty frequency converter
Remarks	

Code	205
Description	Too high temperature in the drive motor
Error Mode	Drive regulator error
Reason for the error	Motor has heavy load
	Faulty cables/temperature sensor
Remarks	Restart possible

Code	206 - 207
Description	Too high temperature in the drive motor's frequency converter
Error Mode	Drive regulator error
Reason for the error	Faulty cooling fan
	Faulty motor
	Faulty frequency converter
Remarks	Restart possible



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Code	208
Description	Too high current in the drive motor's frequency converter
Error Mode	Drive regulator error
Reason for the error	Incorrectly connected motor cables
	Faulty frequency converter
Remarks	

Code	209 - 210
Description	Too high voltage in the drive motor's frequency converter
Error Mode	Drive regulator error
Reason for the error	Faulty battery
	Faulty motor
	Faulty frequency converter
Remarks	

Code	211 - 212
Description	Too low voltage in the drive motor's frequency converter
Error Mode	Drive regulator error
Reason for the error	Faulty cables/fuse F62
	External consumer connected incorrectly
	Faulty electronic card A5
	Faulty frequency converter
Remarks	

Electronic card

Code	213 - 214
Description	CAN error drive motor's frequency converter
Error Mode	Drive regulator error
Reason for the error	Faulty frequency converter
Remarks	

Code	220-223
Description	CPU or memory error in pump motor's frequency converter
Error Mode	Lift regulator error
Reason for the error	Faulty frequency converter
Remarks	

Code	225
Description	Too high temperature in pump motor
Error Mode	Lift regulator error
Reason for the error	Motor has heavy load Faulty cable/temperature sensor
Remarks	Restart possible

Code	226 - 227
Description	Too high temperature in pump motor's frequency converter
Error Mode	Lift regulator error
Reason for the error	Faulty cooling fan Faulty motor Faulty frequency converter
Remarks	Restart possible



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Code	228
Description	Too high current in pump motor's frequency converter
Error Mode	Lift regulator error
Reason for the error	Motor cables connected incorrectly
	Faulty frequency converter
Remarks	

Code	229 - 230
Description	Too high voltage in pump motor's frequency converter
Error Mode	Lift regulator error
Reason for the error	Faulty battery
	Bad contact on K10's contact points
	Faulty frequency converter
Remarks	

Code	231 - 232
Description	Too low voltage in pump motor's frequency converter
Error Mode	Lift regulator error
Reason for the error	Faulty cables/fuse F62
	External consumer connected incorrectly
	Faulty electronic card A5
	Faulty frequency converter
Remarks	

Electronic card

Code	233 - 234
Description	CAN error in pump motor's frequency converter
Error Mode	Lift regulator error
Reason for the error	Faulty CAN-cables/resistance
	Faulty frequency converter
Remarks	

10 Running time

When the time meter reading is shown the **character box (E)** is illuminated. The time is shown as follows:

Character	Time
a	Ignition time
b	Total movement time
c	Drive motor time
d	Pump motor time
e	Service time



11 Parameter setting

- Connect the service key to the truck.
- Press switch **I** while at the same time turning the ignition key.
- Step using switch **II** (up) and switch **III** (down) to the parameter you wish to change.
- Press switch **I** (the character window flashes).
- Change the value using switches **II / III**.
- Press switch **I** to accept the value (character window stops flashing).

If you wish to change more parameters, step using switches II/III to the parameter you wish to change and repeat from "Press switch **I** (the character window flashes)".

NOTE!

Truck handling.

Modifying specific truck parameters will change the driving characteristics of the truck.

Do not change any parameters without the necessary know-how.

No.	Parameter type	Unit	Min/Max	Std. value	Remarks
01	Steering sensitivity		1–6	3	1 = Little sensitivity 5 = Great sensitivity 6 = No progressivity In steps of one
02	Drive motor, max. speed	%	10–100	100	Percentage of max. speed In steps of 5
03	Drive motor, acceleration	%	10–100	100	Percentage of max. acceleration In steps of 5
04	Drive motor, speed retardation	%	0–100	20 50 Note 1	Percentage of max. speed retardation > 0 = no speed retardation In steps of 5
05	Drive motor, retardation when reversing	%	35–100	80	Percentage of max. retardation. In steps of 5

Electronic card

No.	Parameter type	Unit	Min/Max	Std. value	Remarks
06	Cabin tilt start	m	0.5–7	1	Distance above ref. height where cab tilt lift starts In steps of 0.5
07	Cabin lowering starts	m	0.5–7	1	Distance above ref. height where cab tilt lowering starts In steps of 0.5
10	PIN-code for selection of operator		0000–3333	0000	0000 = PIN-code not used > 0 = PIN-code used
11	Drive motor, speed reduction	%	10–100	100	Percentage of max. speed In steps of 5
12	Mast's retraction/extension, speed	%	10–100	80	Percentage of max. speed In steps of 5
13	Extra function 1, speed	%	10–100	10 20	B/N/E 1-6 mast with integrated side shift B/E7-B/E8
14	Extra function 2, speed	%	10–100	20	Percentage of max. oil flow In steps of 5
15	Connection of hydraulic extra function 1, current limit	%	0–100	100	0 = not connected > 0 = connected In steps of 5
16	Connection of extra function 2, current limit	%	0–100	0	0 = not connected > 0 = connected In steps of 5
17	Lifting height limiter, level 1	m	0–13.5	13.5	0 = not connected > 0 = connected In steps of 0.05
18	Lifting height limiter, level 2	m	0–13.5	13.5	0 = not connected > 0 = connected In steps of 0.05 Set higher or equal to limit 1
19	Fork's free lift height	m	1.0–4.5	See table below	Upper side of forks to floor when inner guide is at the top In steps of 0.01



No.	Parameter type	Unit	Min/Max	Std. value	Remarks
20	Time display		1–5	2	1 = ignition time (A) 2 = total movement time (b) 3 = drive motor time (c) 4 = pump motor time (d) 5 = service time (S)
21	Battery size		1–20	See table	See table
22	Truck type		1–5		1 = N/B/E1-3 with support arm brakes 2 = N/B/E1-3 without support arm brakes 3 = B/E4-6 with support arm brakes 4 = B/E4-6 without support arm brakes 5 = B/E7-8
23	Mast type		0/1	1	0 = Older mast 1 = With valve in fork yoke
24	Left foot pedal		1/0	0	0 = Activates buzzer 1 = Also interrupts drive motor
25	Service interval	h	0–2000	1	0 = No service counter In steps of 100h
26	Cabin tilt		0/1	1	0 = B/N1-8 1 = E1-8
27	Lift has priority		0/1	1	0 = Fork lift has priority 1 = Fork lift does not have priority
37	Calibrating of weight measurement	kg	100–5000	1000	In steps of 10
38	Calibrating of accelerator/brake pedal and reach carriage		1	0	Set to 1 for calibrating See instructions
39	Operator accessibility		1–4	1	1 = no PIN-code, open 2 = no PIN-code, locked 3 = PIN-code, open 4 = PIN-code, locked
40	Clock, year	Year	0–99		In steps of 1

Electronic card

No.	Parameter type	Unit	Min/Max	Std. value	Remarks
41	Clock, day	Day	1–31		In steps of 1
42	Clock, month	Month	1–12		In steps of 1

Note 1: Driver 1 = 20
 Drivers 2–10 = 50

11.1 Parameter 1

The higher the number entered the fewer turns of the steering wheel are required to turn the drive wheel. Number 6 gives steering with no progressiveness (less sensitive at higher speed).

11.2 Parameter 2

This parameter is used to set the max. permitted speed.

11.3 Parameter 3

The lower the number entered the longer it will take for the truck to reach max. speed.

11.4 Parameter 4

This parameter is used to set the force with which the truck is stopped when the accelerator is released.

Note 1: Driver 1 has 20%, drivers 2-10 have 50% as standard values.

11.5 Parameter 5

This parameter is used to set the force with which the truck is stopped, when the direction is changed and the drive motor reduces the truck's speed.



11.6 Parameters 6 and 7

These parameters are used to set the height at which the cab (RR E1-8) will tilt up/down. Both have reference heights as starting points.

11.7 Parameter 10

Value 0000 means that three operators are selected. The table below shows combinations of the first six PIN-codes. These values are displayed by stepping up/down with switches **I** and **II**.

Value	Operator's number
0000	No PIN-code. Max three operators selected
1111	First PIN-code where max. 10 operators selected
1112	Second PIN-code where max. 10 operators selected
1113	Third PIN-code where max. 10 operators selected
1121	Fourth PIN-code where max. 10 operators selected
1122	Fifth PIN-code where max. 10 operators selected
1123	Sixth PIN-code where max. 10 operators selected
etc.	etc.

11.8 Parameter 11

This parameter is used to set the max. permitted speed when switch S31 is activated.

11.9 Parameter 12

This parameter is used to adjust the speed of the mast's retraction/extension.

Electronic card

11.10 Parameter 13 to 14

These parameters are used to adjust the oil flow to the two extra functions.

11.11 Parameters 15 and 16

When these parameters are set to a value of >0 you activate the control of the potentiometer and valves for the two extra functions. You can also set the pressure you want with the help of the values.

11.12 Parameters 17 and 18

On trucks with height meters you can use these parameters to set two different maximum lift heights. The second max. lift height must be equal to or greater than the first. The last activated height is normally used as max. height before the mast reaches the top.



11.13 Parameter 19

Lift height	Approximate setting B/N/E 1-6 mast with integrated side shift	Approximate setting B/E7-8
4400	1.42	
4600	1.50	
4800	1.56	1.65
5400	1.75	1.84
5700	1.85	
6300	2.07	2.14
6750	2.22	2.38
7000	2.42	2.48
7500	2.56	
8000	2.74	2.83
8500	2.93	3.01
9000	3.09	3.14
9500	3.19	3.27
10000		3.43
10500		3.58
10800		3.70

11.14 Parameter 20

This parameter is used to set which time (A-d or S) is to be shown.

11.15 Parameter 21

This parameter is used to set which battery the truck is fitted with. You can also compensate for different driving methods.

When setting the battery guard's cut out point, measure as follows:

- The acid density of the fully charged battery. This is in order to check the status of the battery.
- When the battery indicator is showing 80% discharged battery (min. acid density 1.14).

Electronic card

The acid density may vary according to battery type.

Value	Function	Battery (Ah)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10	↑	
11	Lesser discharge	900
12		730, 700, 580 CSM
13	Greater discharge	600
14	↓	
15		480, 450
16		
17		360
18		
19		
20		

**WARNING!**

Correct parameter setting.

The battery can be destroyed.

If the parameters are set higher than recommended the battery can be over-discharged and thereby destroyed.



11.16 Parameter 22

This parameter is used to activate the function and checking of the brakes coils and obtain a higher maximum speed for the truck.

11.17 Parameter 23

When this parameter is set to 1 it shows that a valve is fitted on the forks and is used as a shift valve between two functions. The direction is regulated by a valve in the larger valve block.

11.18 Parameter 24

When this parameter is set to 1 you will be able to stop the truck with the help of the drive motor but not continue driving, as the safety pedal is not activated.

11.19 Parameter 25

This parameter is used to set the service intervals for the truck. The buzzer will sound and C029 appears on the display when the service counter reaches zero. The counter will show the amount of time that has passed since the last truck service.

If the previous service interval is to be used only the parameters are activated without changing the time.

11.20 Parameter 26

When this parameter is set to 1 you activate the functions and checks for the valves for cabin tilting (E 1-8).

11.21 Parameter 27

When this parameter is set to 1 you remove the lift functions priority, i.e. the hydraulic function currently in use will continue even if you activate the lift function.

Electronic card

11.22 Parameter 37

- Set the parameter to the weight with which the truck is to be calibrated.
- Finish programming in the normal manner.
- Press down the weight measurement switch while at the same time turning the ignition key on. 0000 will appear in the “time” window.
- Raise the empty forks to the free lift zone until the weight set on the parameter appears in the “time” window.
- Load the calibrating weight onto the forks and lift approx. 100 mm.
- Press the weight measurement switch and lift until the time is once again shown in the window.

The weight measurement is now calibrated.

11.23 Parameter 38

- Set the parameter to 1.
- Turn the key off and on once.

The speed and brake potentiometers can now be calibrated.

NOTE!

Incorrect calibration.

Incorrect calibration values.

Do not activate the controls once calibration has begun.

- Retract the reach carriage to the inner stop.
- Extend the reach carriage to the outer stop.

The reach cylinder's end positions and lowering limits are now calibrated.

During calibration the reach carriage will move at reduced speed.

11.24 Parameter 39

Set the parameter to 1 or 2 if only three drivers/truck handling are to be programmed. If up to ten drivers/truck handling are to be programmed the value 3 or 4 should be programmed. In the case of the latter, the value must be programmed for each driver, see parameter 10.



Display/programming possibilities with parameter 39.

Para- meter P39-	Key S17 on then switch I			Switch I on at the same time as key S17		
	Clock	Parameter	Operator	Clock	Parameter	Operator
-1 U. CAN	Reprog.	Look	Look at chosen	Not reprog.	Reprog.	Chosen reprogrammable.
-1 M. CAN	Reprog.	Look	Look at chosen	Not reprog.	Reprog.	All reprog.
-2 U. CAN	Reprog.	Look	Look at chosen	Not reprog.	Not reprog.	Look at chosen
-2 M. CAN	Reprog.	Look	Look at chosen	Not reprog.	Reprog.	All reprog.
-3 U. CAN	Reprog.	Look	Look at chosen	Not reprog.	Reprog.	Chosen reprogrammable.
-3 M. CAN	Reprog.	Look	Look at chosen	Not reprog.	Reprog.	All reprog.
-4 U. CAN	Reprog.	Look	Look at chosen	Not reprog.	Not reprog.	Look at chosen
-4 M. CAN	Reprog.	Look	Look at chosen	Not reprog.	Reprog.	All reprog.

11.25 Parameter 40 to 42

These parameters can be used to set the year, day and month which will be used by the error code register.

11.26 Installing a new card in the truck

The electronic card A5 supplied by BT Parts has all parameters set to default values.

When installing a new card in the truck some parameters must be reprogrammed so that the truck can be used safely.

Potentiometer R1 on the electronic card must be adjusted according to C-code 6xxx-

F-code Section C-code
RT **S5** **5710**

Electronic card

Version no T-code
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Pump motor

Issued by
Parts

Approved by
K-G Andersson

Version no
001

T-code
401-414

Pump motor

Valid from serial number:

T-code	Model	Serial No	Notes
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

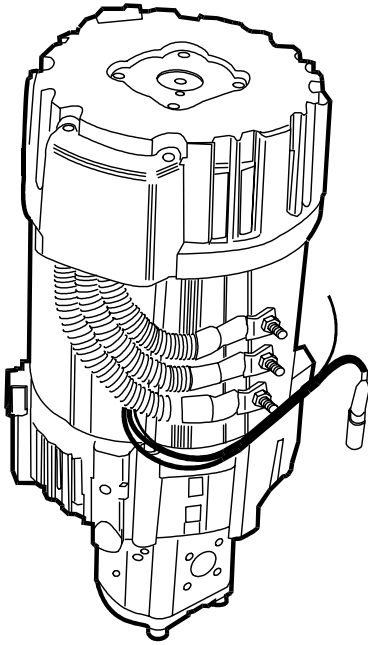
Pump motor

Version no

001

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1. General

The drive motor is a three phase AC motor. The motor contains a thermoelement which measures the motors temperature, plus a bearing with an integrated measuring unit to measure the direction and speed of rotation.

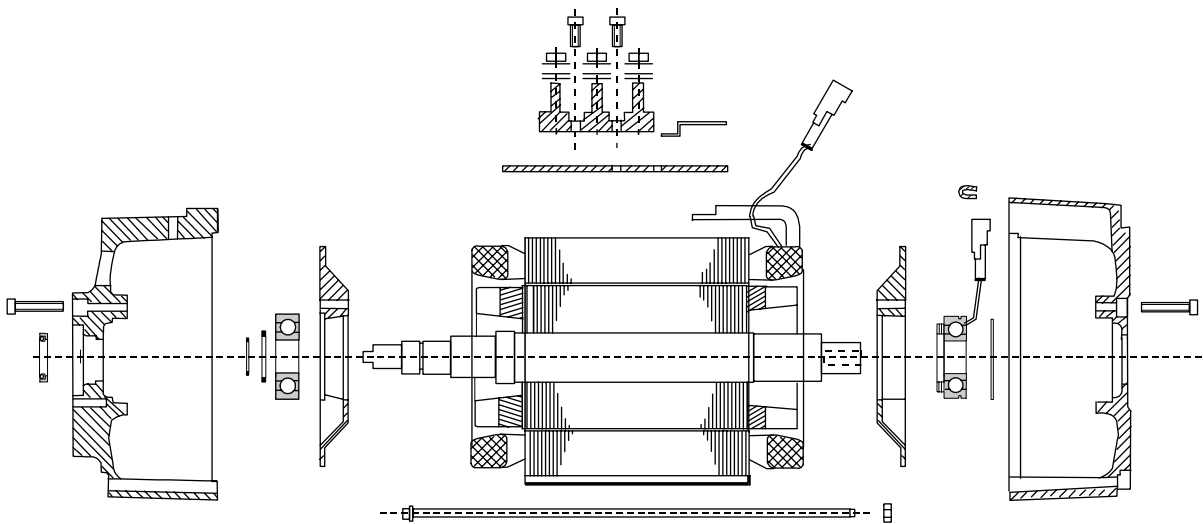
There are two sizes of pump motor on the truck.

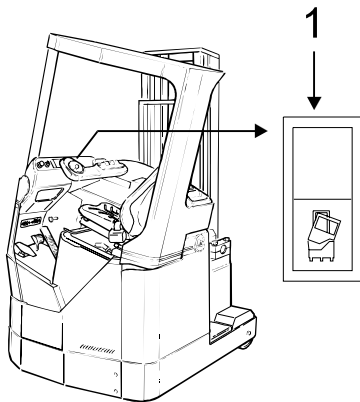
On N1-N3 and B/E1-B/E6 model P112 - 150 is used.

On B/E7-B/E8 model P112 - 195 is used.

This service instruction describes the replacement of the bearing and the axle seal.

2. Pump motor dismantled





3. Dismantling/assembling the pump motor

Truck without tilting cab

- Undo the knob to the side of the drivers seat and open the door

Truck with tilting cab

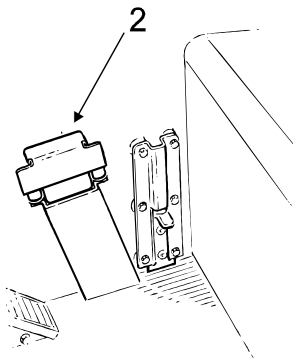
Make sure there is sufficient room to tilt the cab before starting work



WARNING!

Risk of crushing.

The risk for personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back. Ensure that no one is in the motor compartment when tilting the cab.



During service in the motor compartment the cab must be fully tilted back.

While tilted, only the cabs lift/lower function is operational and then only at crawl speed.

- Press switch (1) to lower the cab while at the same time turning the key. The display shows 6 lines
- Move the fork lifts hydraulic lever backwards
- When the cab stops (at 15 degrees), loosen the catch (2) to release the cab
- Continue pulling the lever backwards until the cab stops (at 45 degrees)



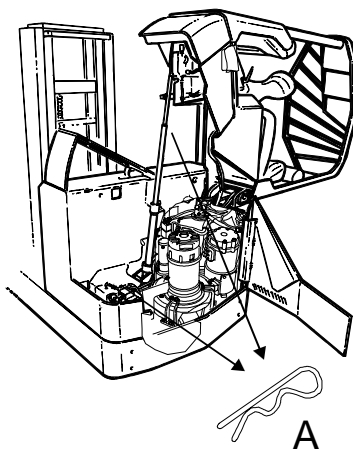
WARNING!

Falling cab!

The cab can fall without dampening when tilted over 45 degrees.

The cab is heavy so make sure the person receiving the cab is in control of the situation. Use crane if possible.

- Take hold of the protective roof and tilt the cab fully back



NOTE!

Falling cab!

Insert the pin (which is located under the seat) in the cylinder piston to avoid the cab accidentally falling backwards during service.

Pump motor

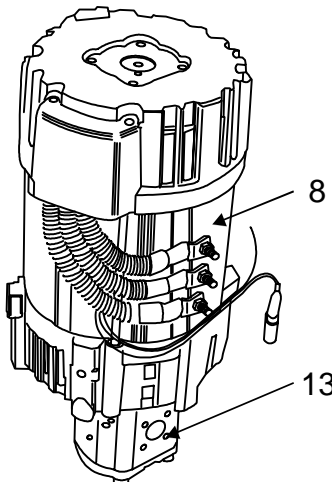
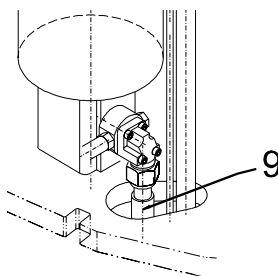
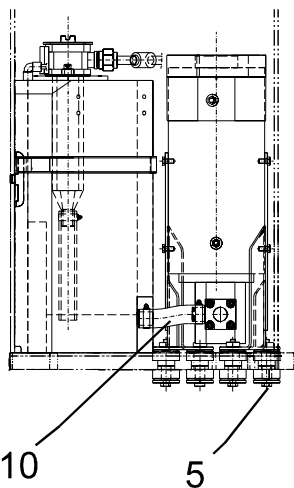
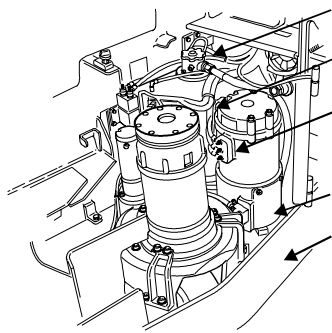
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3.1. Dismantling



- Disconnect the battery plug

- Lower the forks fully to reduce the pressure in the hoses and pump

- Pump out the oil in the hydraulic tank (3) using filter pump V10-15191

- Remove the fender (4) so that the bolts (5) on the pump bracket (12) are accessible

- Disconnect the temperature/speedometer contactors (6) and the power cables (7) from the motor (8)

- Disconnect the hydraulic hose (9) and undo the hose clamp for the hydraulic hose (10) which is located on the tank

- Fit a lifting eye bolt to the crank shaft

- Remove the bolts (5) holding the pump bracket (12) to the chassis

- Lift out the hydraulic pump and place it on a clean surface

- Remove both brackets (12) from the pump motor (8)

- Undo the screws and dismantle the pump (13)

- Remove the drive dog

3.2. Assembling

- Fit the drive dog between the pump and the pump motor (8)

- Fit the pump unit (13) to the pump motor (8)

- Fit both brackets (12) to the pump motor (8)

- Fit a lifting eye bolt to the crank shaft and attach to a crane

- Lift the hydraulic pump into the truck and manoeuvre the hydraulic hose (10) to the tank (3)

- Attach the hose clamp

- Fit the two pump brackets (12) to the chassis using the bolts (5)

- Remove the lifting eye bolt

- Connect the hydraulic hose (9) and the temperature/speedometer contactors (6) and power cables (7)

- Fill the hydraulic tank (3) with 48 litres of new oil



Truck with tilting cab

Ensure that no one is in the motor compartment when tilting the cab back.



WARNING!

Risk for crushing!

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.

Ensure no one is in the motor compartment when tilting the cab.

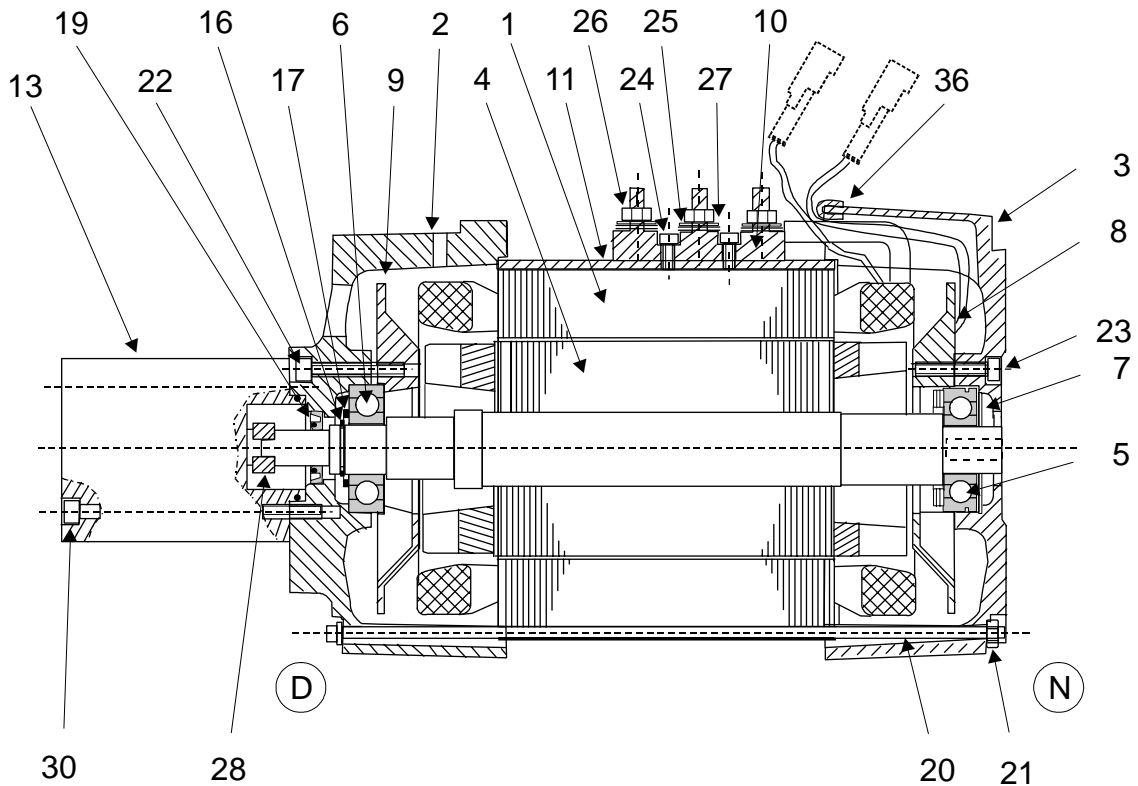
- Remove the pin from the cylinder piston
- Take hold of the protective roof and tilt the cab to the 45 degree position
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position

Truck without tilting cab

- Close the door and tighten the knob

Pump motor

4. Replacing the bearing



4.1. Dismantling

- Remove the stud screws (20) using tool 08-15444
- Remove the screws (23) and the shield (3)
- Remove the bearing cap (8) and washer (7)
- Remove the rotor (4) from the starter (1)

If both bearing are to be replaced, do so according to the following instructions. If only the pulse transducer bearing is to be replaced, go to step A.

- Remove the screws (22)
- Remove the shield (2) and radial seal (19)
- Remove the locking ring (16) and support ring (17)
- Remove the sealing washer(6) from the bearing and remove the bearing with a Kukko ball bearing puller.

A)

- Remove the bearing (5) with a claw puller



4.2. Assembly

Before assembling, make sure that all parts are clean and whole.

If both bearings have been replaced follow the entire instruction:

- Fit the bearing cap (9) to the rotor axle's D-side
- Press the bearing (6) onto the rotor axle

If only the pulse transducer bearing has been replaced:

- Press the bearing (5) onto the rotor axle's N-side
- Fit the support ring (17) and the locking ring (16)
- Fit the seal (19) with an insert tool

NOTE

A new seal must always be used when assembling the rotor axle.

- Fit the rotor axle in the bearing shield (2)
- Screw the bearing cap in place (9) using screws (22) and a torque of 6 Nm
- Fit the rotor (4) in the starter (1)
- Fit the bearing cap (8) to the rotor axle's N-side
- Fit the washer (7) to the bearing (5)

Make sure that cable connection bracket 11 is positioned correctly

- Fit the bearing shield (3)
- Assemble the bearing cap (8) and shield (3) using the screws (23) and a torque of 6 Nm
- Fit the stud screws (20) with a torque of 5 Nm

F-code Section C-code
RT **S5** **5810**

Pump motor

Version no T-code
001 **401-414**



Steering motor

Valid from serial number:

T-code	Model	Truck no.	Note.
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

1. General

The **steering motor** is fitted to the drive unit's housing. It receives signals from the steering generator located in the steering panel. The steering motor is fitted with a pinion which acts directly on the driving gear unit's crown wheel. It is also fitted with two carbon brushes.

Steering motor

Version no

001

T-code

301-307,400

2. Replacement of steering motor

Trucks without tilting cab

- Undo the knob to the side of the drivers seat and open the door

Trucks with tilting cab

Make sure there is sufficient room to tilt the cab before starting work.

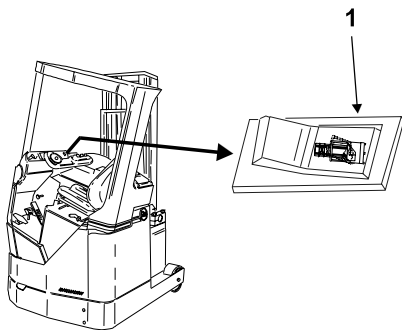


WARNING!

Risk of crushing.

The risk for personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back.

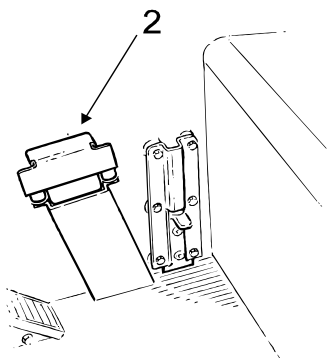
Ensure that no one is in the motor compartment when tilting the cab.



The cab must be tilted 90 degrees for service in the motor compartment.

While tilted, only the cabs lift/lower function is operational and then only at crawl speed.

- Press switch (1) to lower the cab while at the same time turning the key. The display shows 6 lines
- Move the fork lift's hydraulic lever backwards
- When the cab stops (at 15 degrees), loosen the catch (2) to release the cab
- Continue pulling the lever backwards until the cab stops (at 45 degrees)



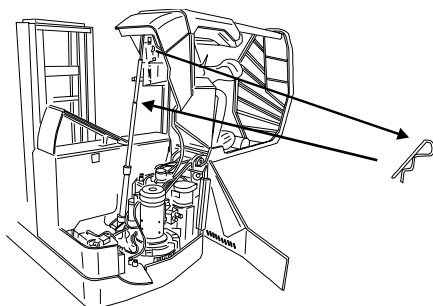
WARNING!

Falling cab!

The cab can fall without dampening when tilted over 45 degrees.

The cab is heavy so make sure the person receiving the cab is in control of the situation. Use crane if possible.

- Take hold of the protective roof and tilt the cab to 90 degrees



NOTE!

Falling cab!

Insert the pin (which is located under the seat) in the cylinder piston to avoid the cab accidentally falling backwards during service.



2.1. Dismantling

- Turn off the truck using the ignition key
- Disconnect the steering servo's electrical contactor from the tank console
- Undo the four screws holding the steering servo in place
- Remove the steering servo
- Undo the screws holding the gear wheel
- Remove the gear wheel using a gear puller

2.2. Assembly

- Replace O-rings if necessary
- Tap the gear wheel in place on the steering servo
- Tighten the screws on the gear wheel with a torque of 10 Nm
- Fit the steering servo in the truck
- Tighten the screws on the steering servo with a torque of 40 Nm
- Connect the contactor

Steering motor

Version no

001

T-code

301-307,400

3. Dismantling and assembling the carbon brushes

- Unscrew the plastic plugs on the upper part of the steering servo
- Remove and inspect for damage
- Replace carbon brushes if necessary
- Fit carbon brushes and screw in the plastic plugs

Truck with tilting cab

Ensure that no one is in the motor compartment when tilting the cab.

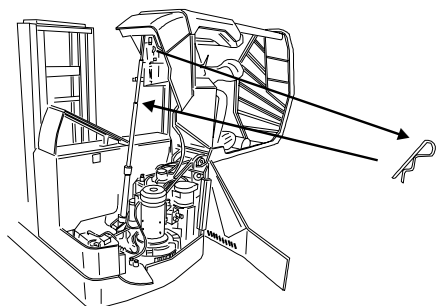


WARNING!

Risk for crushing!

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.

Ensure no one is in the motor compartment when tilting the cab.



- Remove the pin from the cylinder piston
- Take hold of the protective roof and tilt the cab to the 45 degree position
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position

Truck without tilting cab

- Close the door and tighten the knob



Hydraulics

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	

1. General

The truck's hydraulics consist of a pump which draws up oil from the tank and transports it to the parking brake and main valve located in the reach carriage.

The main valve distributes the oil to the reach cylinder and mast.

Return oil from the reach cylinder and mast is transported via the main valve through the filter to the tank.

Return oil from the reach carriage goes directly through the filter to the tank.

Hydraulics

2. List of symbols

Symbol	Name	Function	Remarks
1-2	Cylinder	Main lift, forks	
3	Cylinder	Free lift, forks	
4	Cylinder	Extension/retraction, reach carriage	
5	Cylinder	Tilting, forks	
6	Cylinder	Extra function 1	
7	Cylinder	Extra function 2	
8	Cylinder	Parking brake	
9	Cylinder	Foot step	Only E1-E8
10	Cylinder	Cabin tilt	Only E1-E8
11-12	Valve	Restriction valve, main cylinder	
13	Valve	Restriction valve, free lift cylinder	
14	Valve	Load holding valve	
15	Valve	Restriction/non-return valve, reach cylinder	
16	Valve	Non-return valve	
17	Valve	Shock valve, reach cylinder	
18	Valve	Pressure restriction valve, overflow pressure	
19	Valve	Flow control valve, fork lowering	
20	Valve	Shock valve, cab tilt	Only E1-E8
21	Valve	Pressure reduction valve, cab tilt	Only E1-E8
22	Valve	Back pressure valve, foot step	Only E1-E8
23	Valve	Back pressure valve, cab tilt	Only cold store



Symbol	Name	Function	Remarks
24	Valve	Restriction/non-return valve, M3	
25	Output	Output for pressure measurement	
26	Lung	Breathing bag	Only B/E1C-B/E8C
F	Filter	Oil filter for return flow	
M	Motor	Pump motor	
P	Pump	Hydraulic pump	
Y1	Valve	Parking brake	
Y10/2	Valve	Lifting, forks	
Y10/3	Valve	Proportional valve lowering, forks	
Y12	Valve	Retraction, mast	
Y13	Valve	Extension, mast	
Y14	Valve	Tilting down, forks	
Y15	Valve	Tilting up, forks	
Y16	Valve	Extra function 1	
Y17	Valve	Extra function 1	
Y18	Valve	Extra function 2	
Y19	Valve	Extra function 2	
Y20	Valve	Cabin tilt, up	Only E1-E8
Y21	Valve	Cabin tilt, down	Only E1-E8

Hydraulics**3. Hydraulics diagram**

No.	Model	Remarks
1/16	B1 - B6 without Side Shift B7 - B8 with Side Shift N1 - N3 without Side Shift	
2/16	B1 - B6 with Side Shift N1 - N3 with Side Shift	With valve in fork yoke
3/16	E1 - E6 without Side Shift E7 - E8 with Side Shift	Lh < = 7 m, No. 23 in use Lh > 7 m, No. 23 not in use
4/16	E1 - E6 without Side Shift E7 - E8 with Side Shift Valid from machine no.293905 AA	Without hydraulic foot step
5/16	E1 - E6 with Side Shift	Lh < = 7 m, No. 23 in use Lh > 7 m, No. 23 not in use With valve in fork yoke
6/16	E1 - E6 with Side Shift Valid from machine no. 293905 AA	Without hydraulic foot step With valve in fork yoke
7/16	B1C - B6C without Side Shift B7C - B8C with Side Shift N1C - N3C without Side Shift	
8/16	B1C - B6C with Side Shift N1C - N3C with Side Shift	With valve in fork yoke
9/16	E1C - E6C without Side Shift E7C - E8C with Side Shift	Lh < = 7 m, No. 23 in use Lh > 7 m, No. 23 not in use
10/16	E1C - E6C without Side Shift E7C - E8C with Side Shift Valid from machine no. 293905 AA	Without hydraulic foot step
11/16	E1C - E6C with Side Shift	Lh < = 7 m, No. 23 in use Lh > 7 m, No. 23 not in use With valve in fork yoke
12/16	E1C - E6C with Side Shift Valid from machine no. 293905 AA	Without hydraulic foot step With valve in fork yoke
13/16	Cold store E1C - E6C without Side Shift E7C - E8C with Side Shift	



F-code
RT

Section
S6

C-code
6000

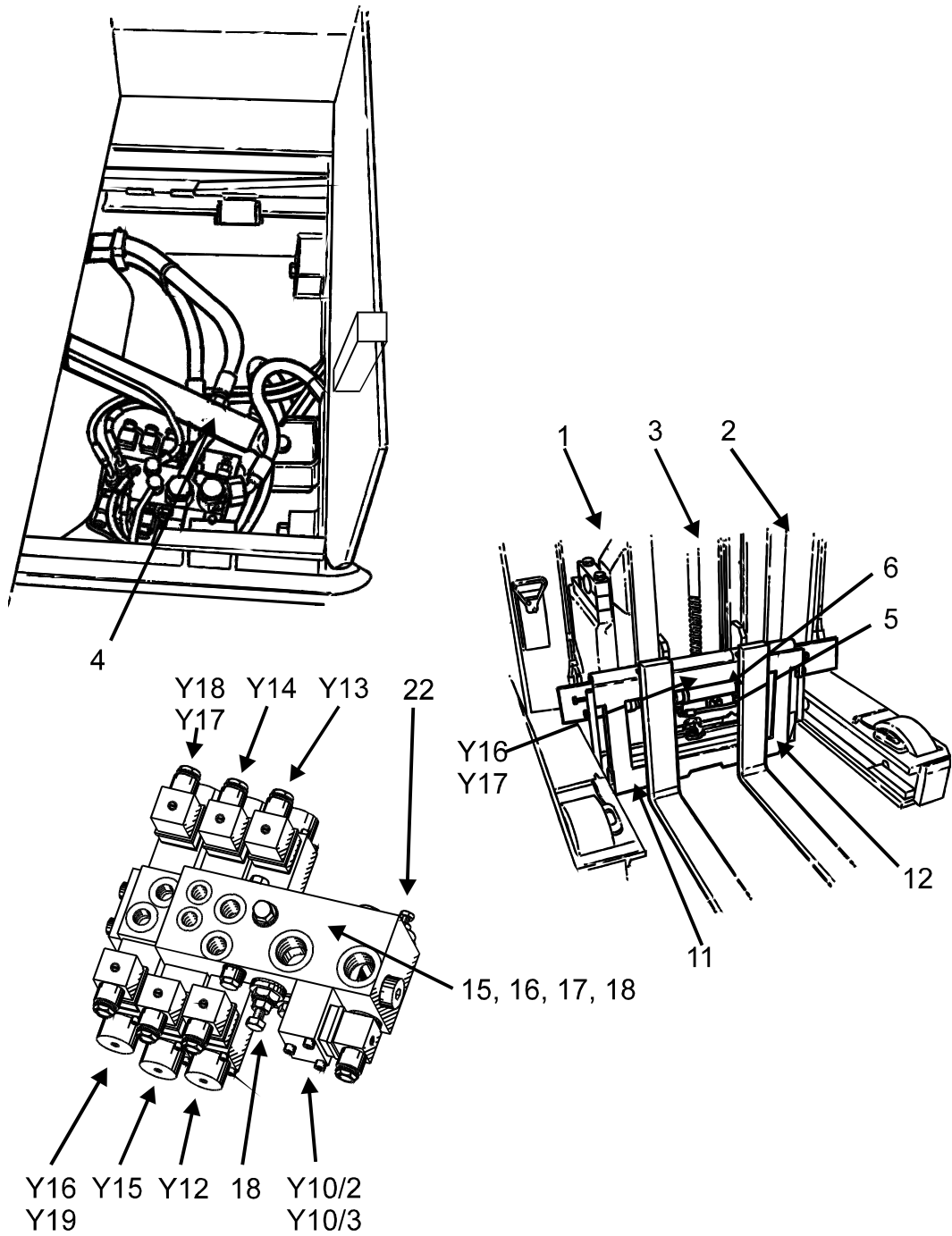
Hydraulics

Version no
001

T-code
301-307,400

No.	Model	Remarks
14/16	Cold store E1C - E6C without Side Shift E7C - E8C with Side Shift	Without hydraulic foot step With valve in fork yoke
15/16	Cold store E1C - E6C with Side Shift	With valve in fork yoke
16/16	Cold store E1C - E6C with Side Shift	Without hydraulic foot step

Hydraulics





F-code
RT

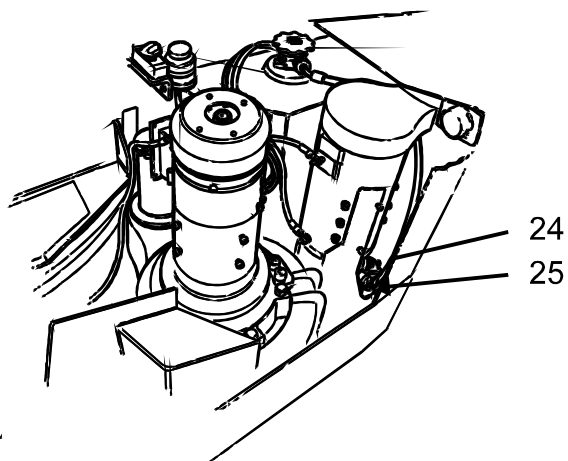
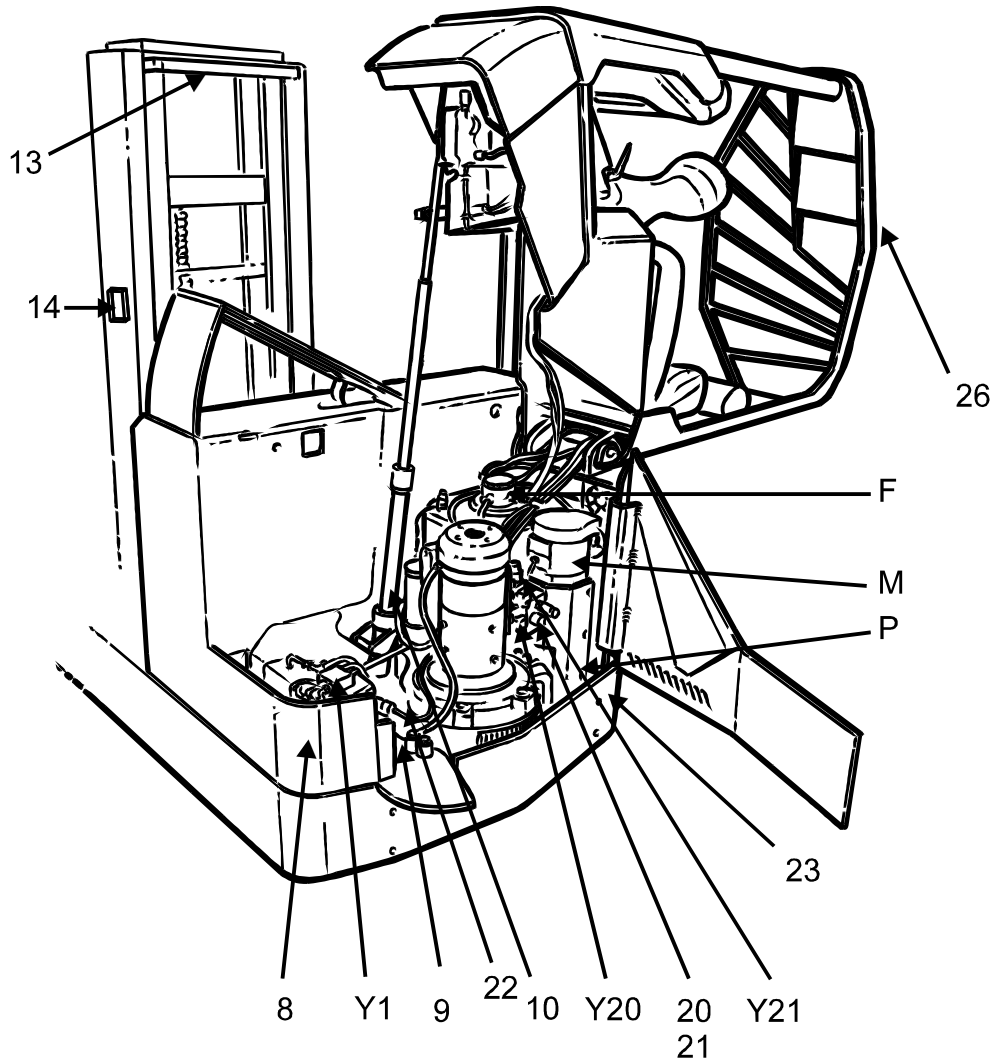
Section
S6

C-code
6000

Hydraulics

Version no
001

T-code
301-307,400

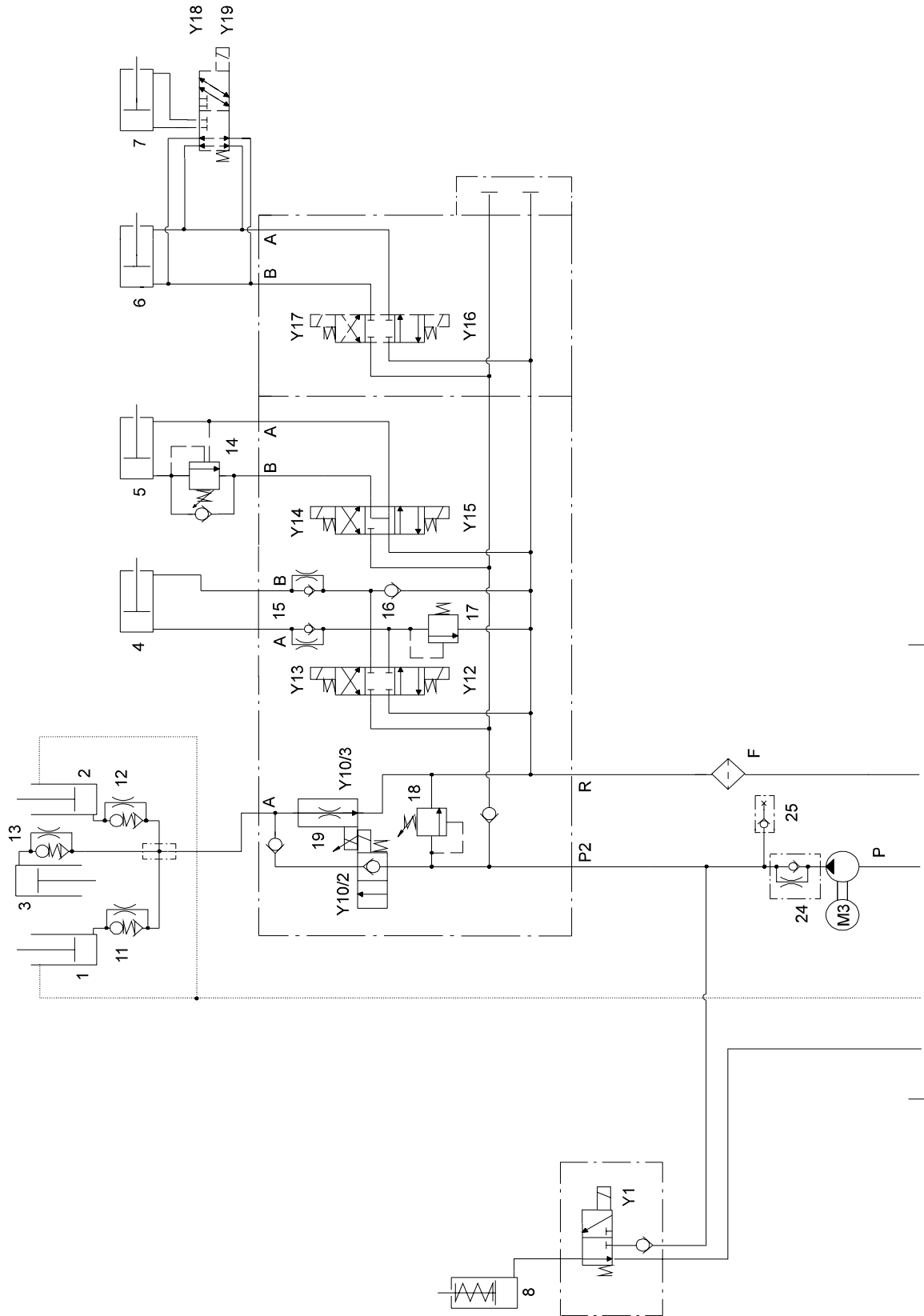


Hydraulics

Version no
001

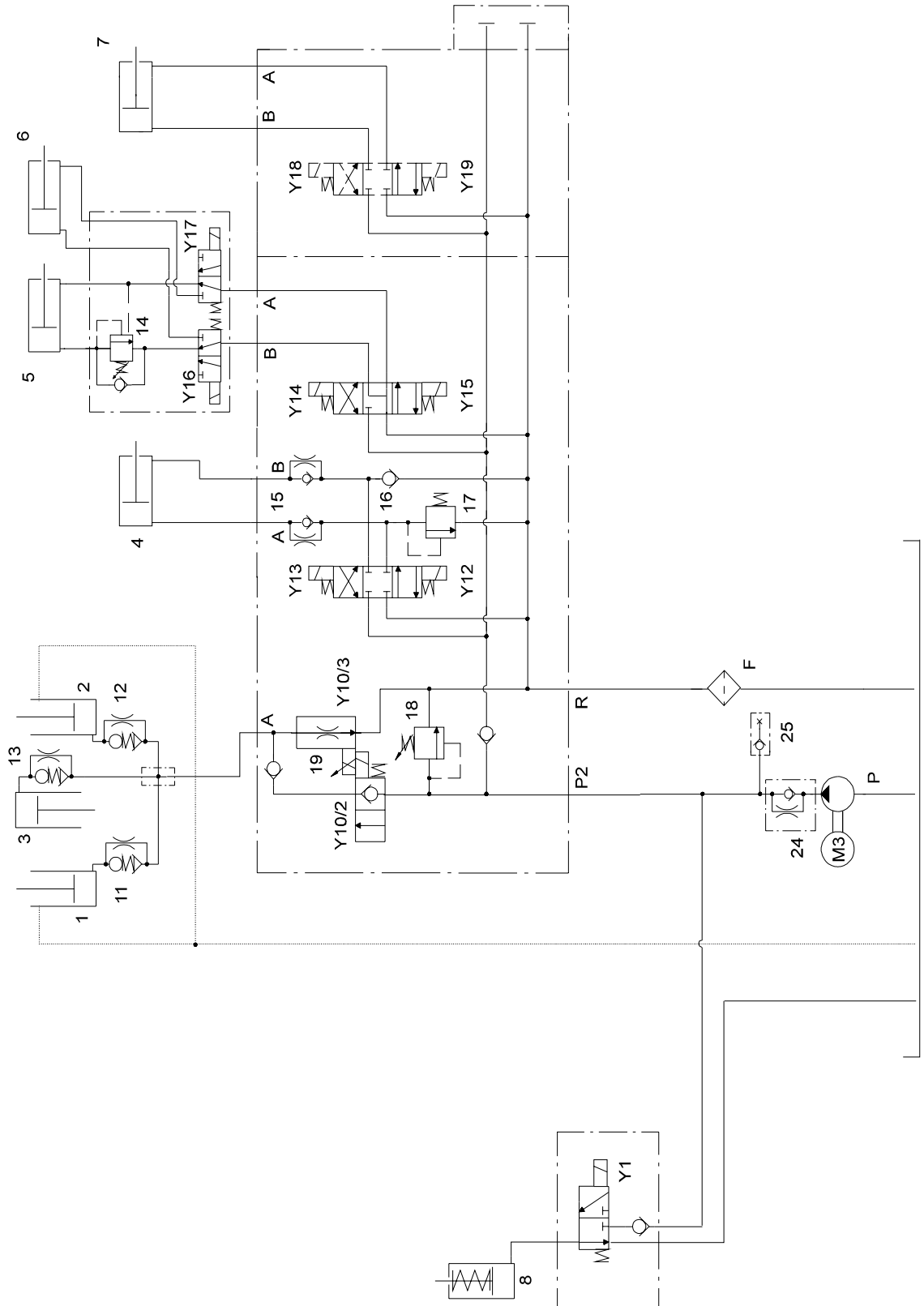
T-code
301-307,400

3.1. Hydraulics diagram 1/16



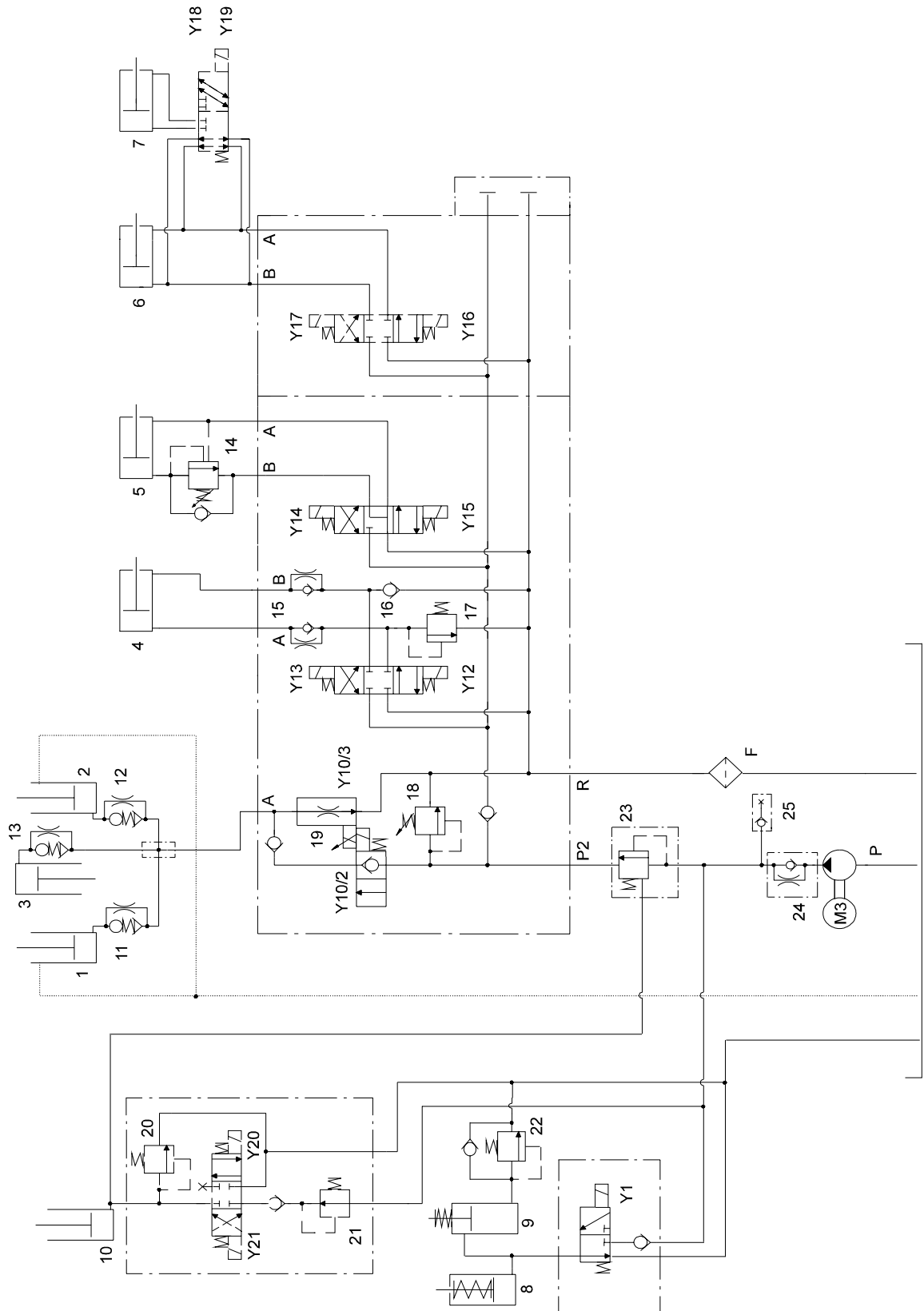


3.2. Hydraulics diagram 2/16



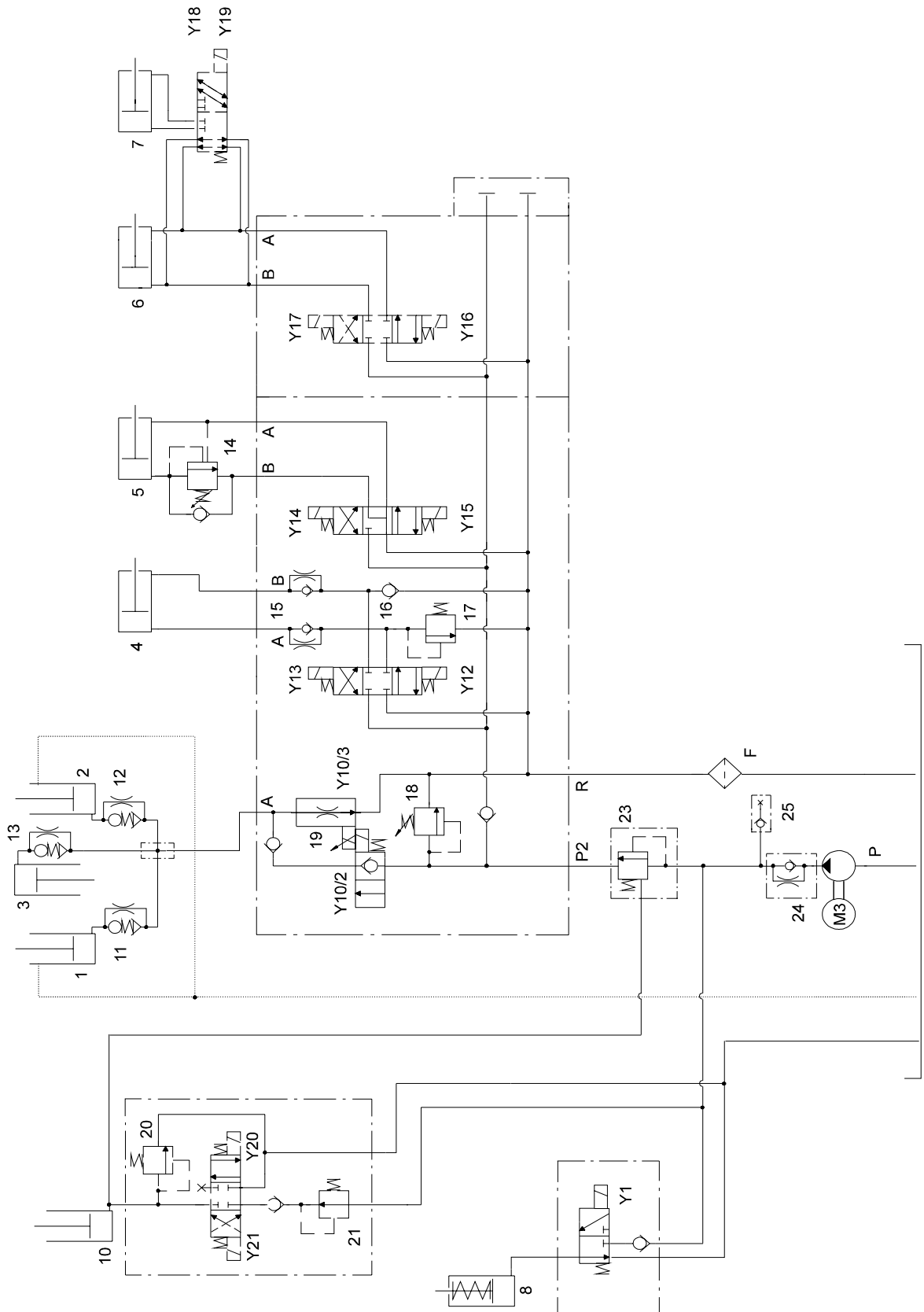
Hydraulics

3.3. Hydraulics diagram 3/16



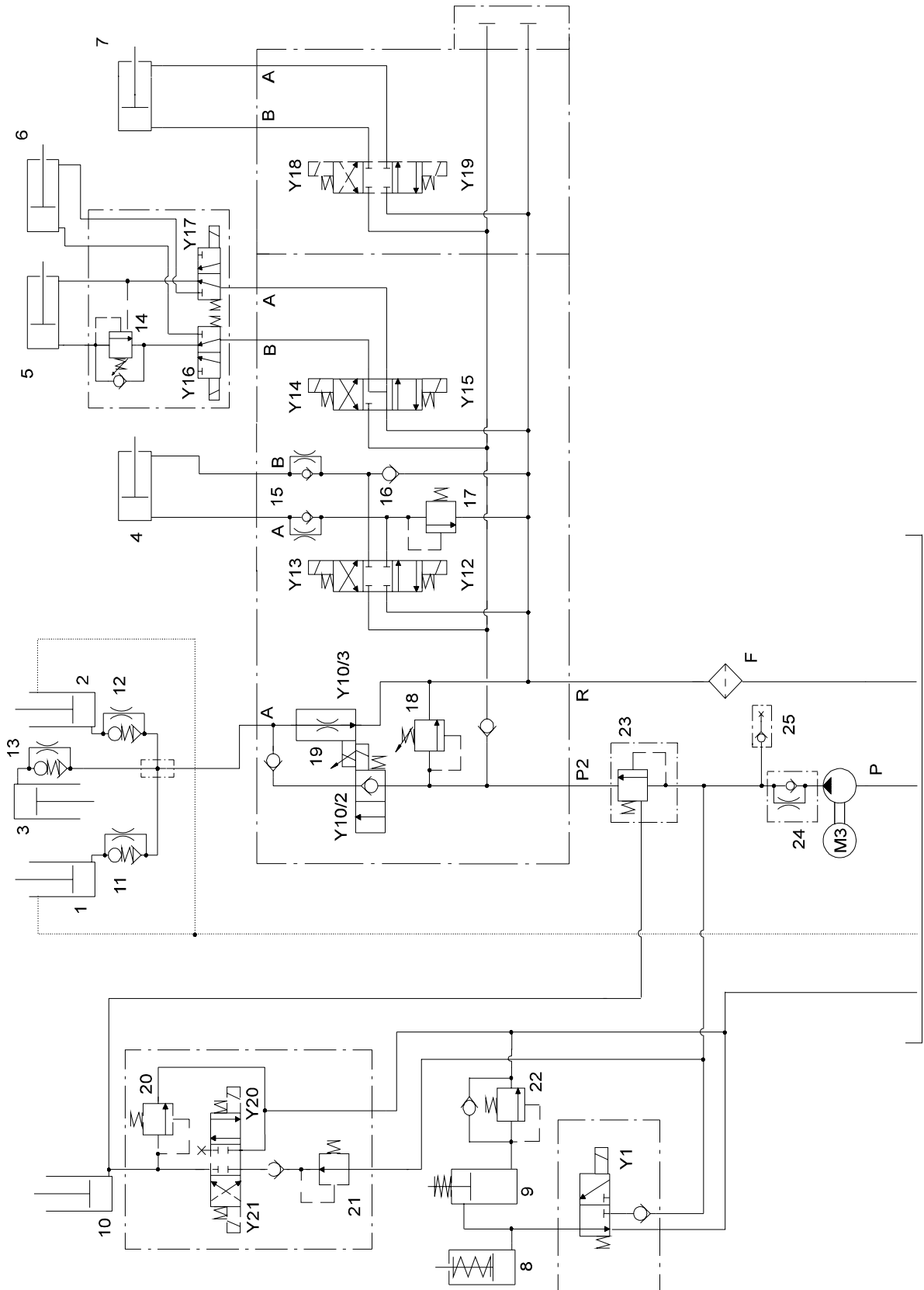


3.4. Hydraulics diagram 4/16



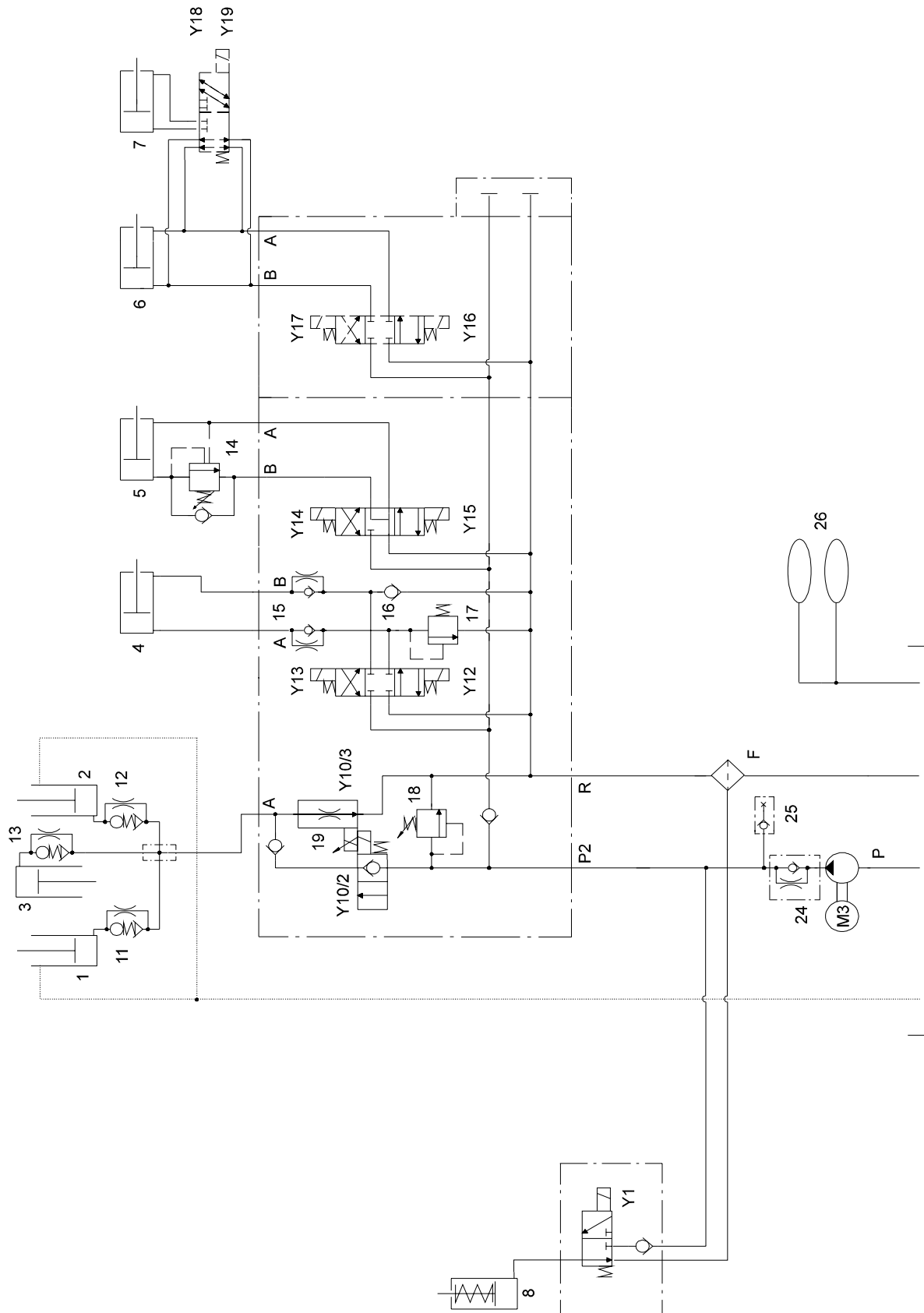
Hydraulics

3.5. Hydraulics diagram 5/16



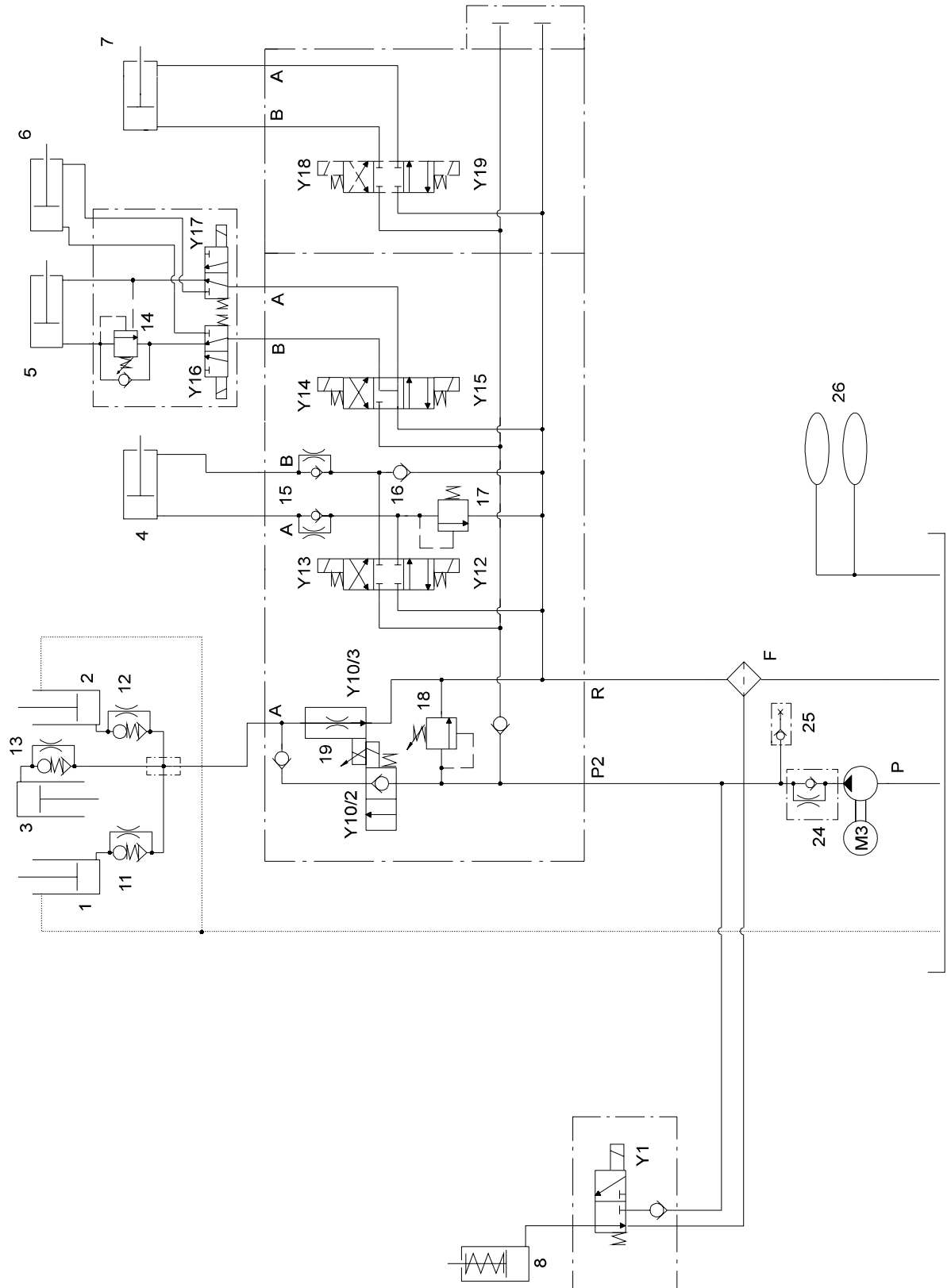
Hydraulics

3.7. Hydraulics diagram 7/16



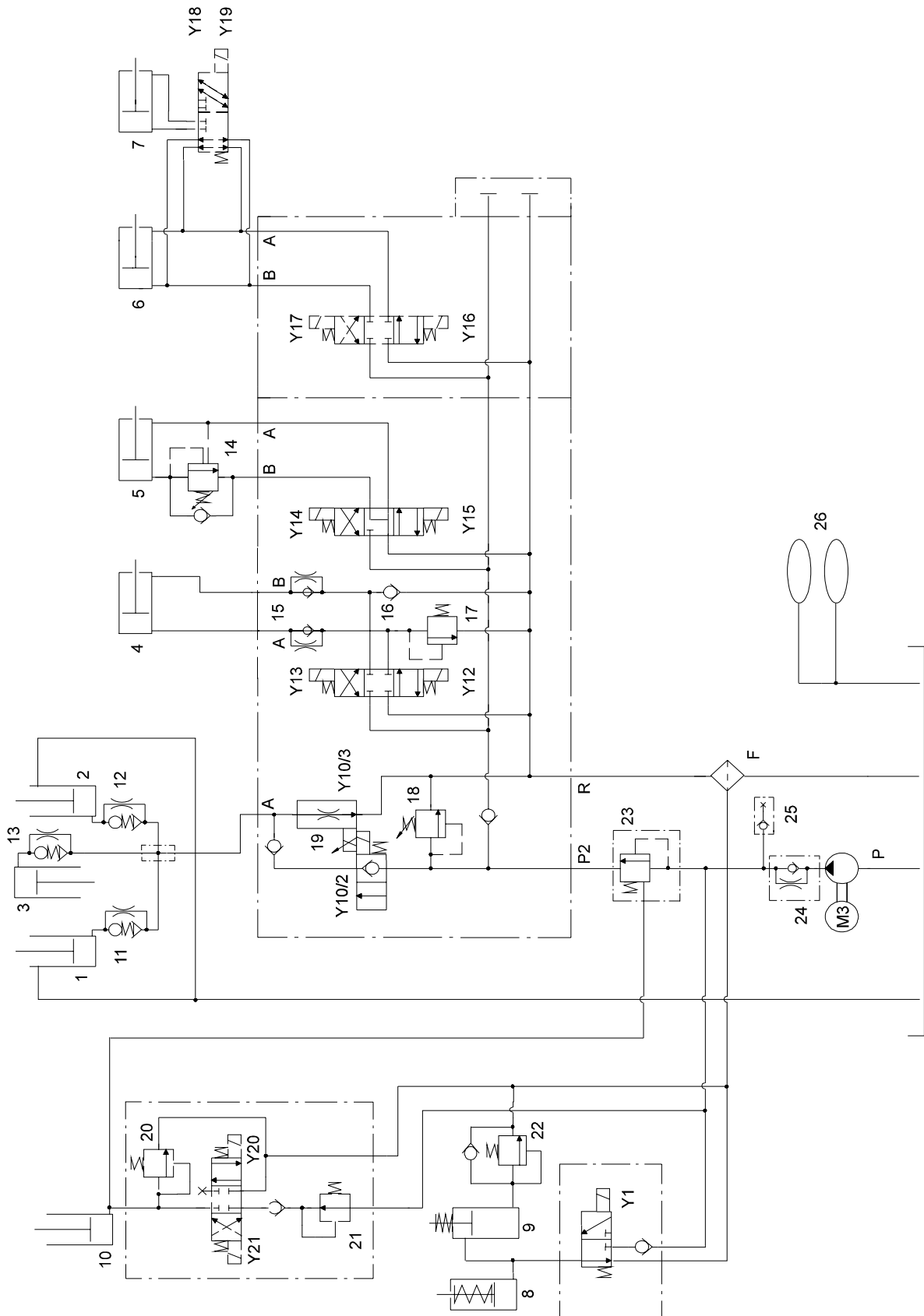


3.8. Hydraulics diagram 8/16



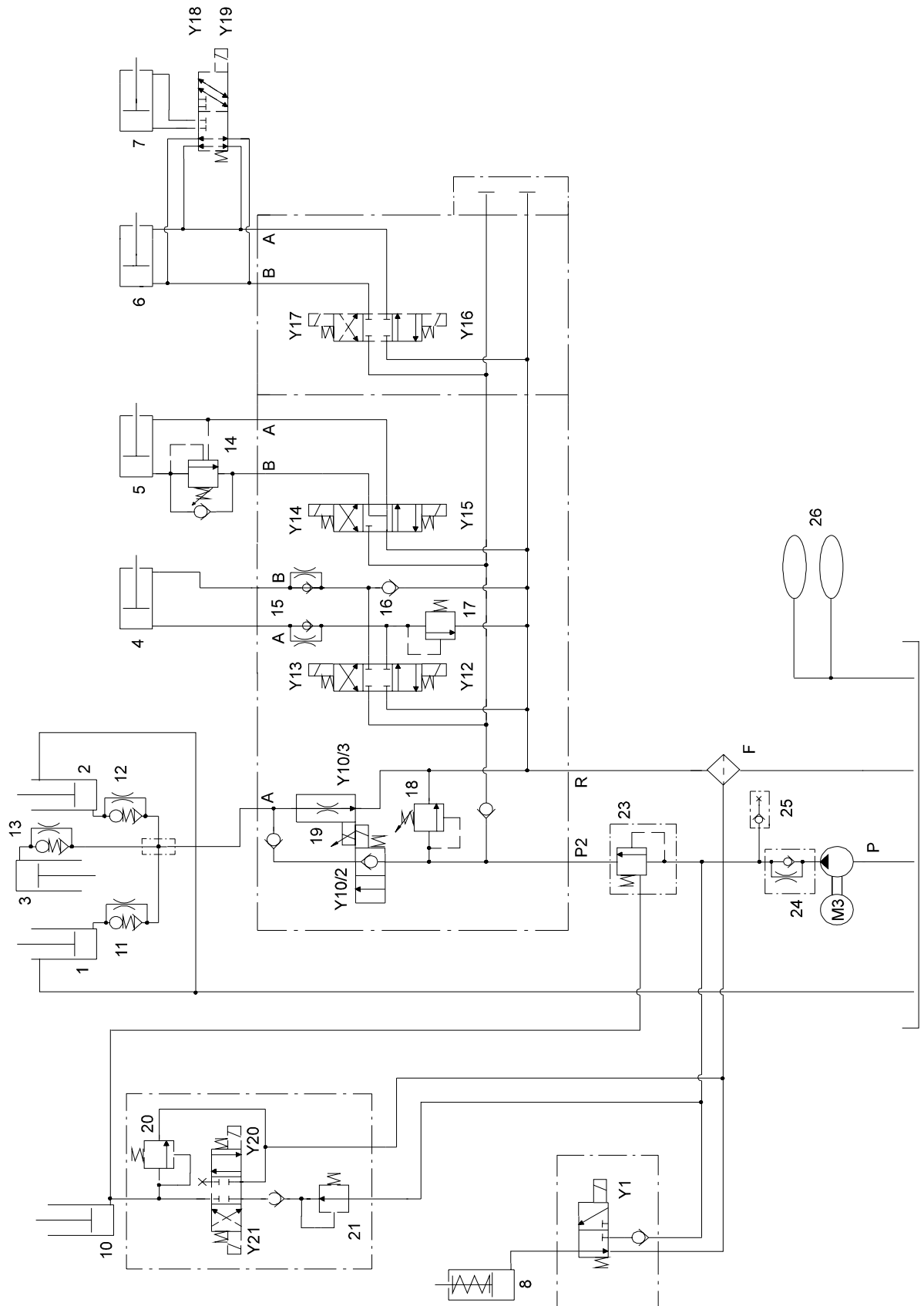
Hydraulics

3.9. Hydraulics diagram 9/16



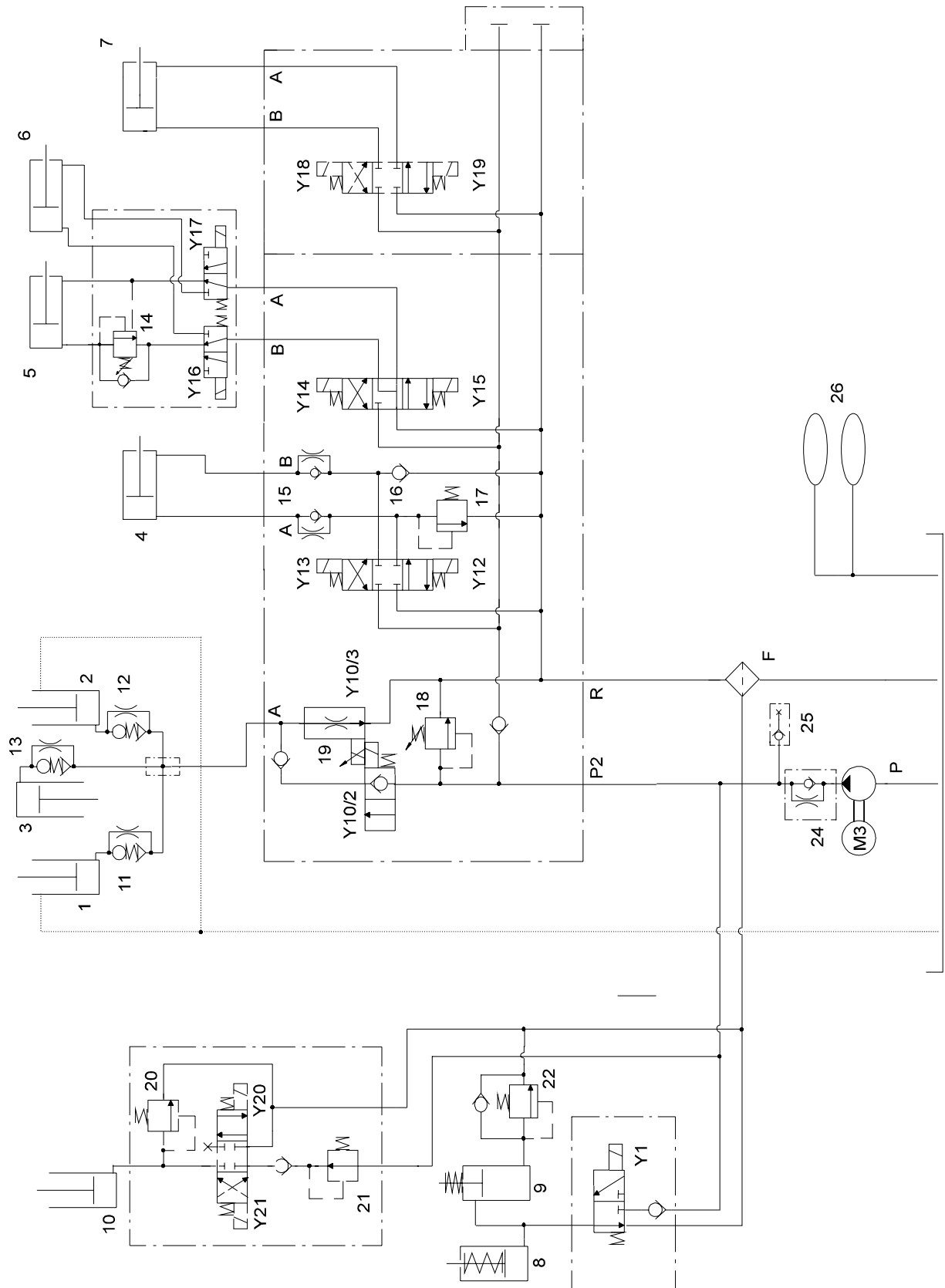


3.10. Hydraulics diagram 10/16



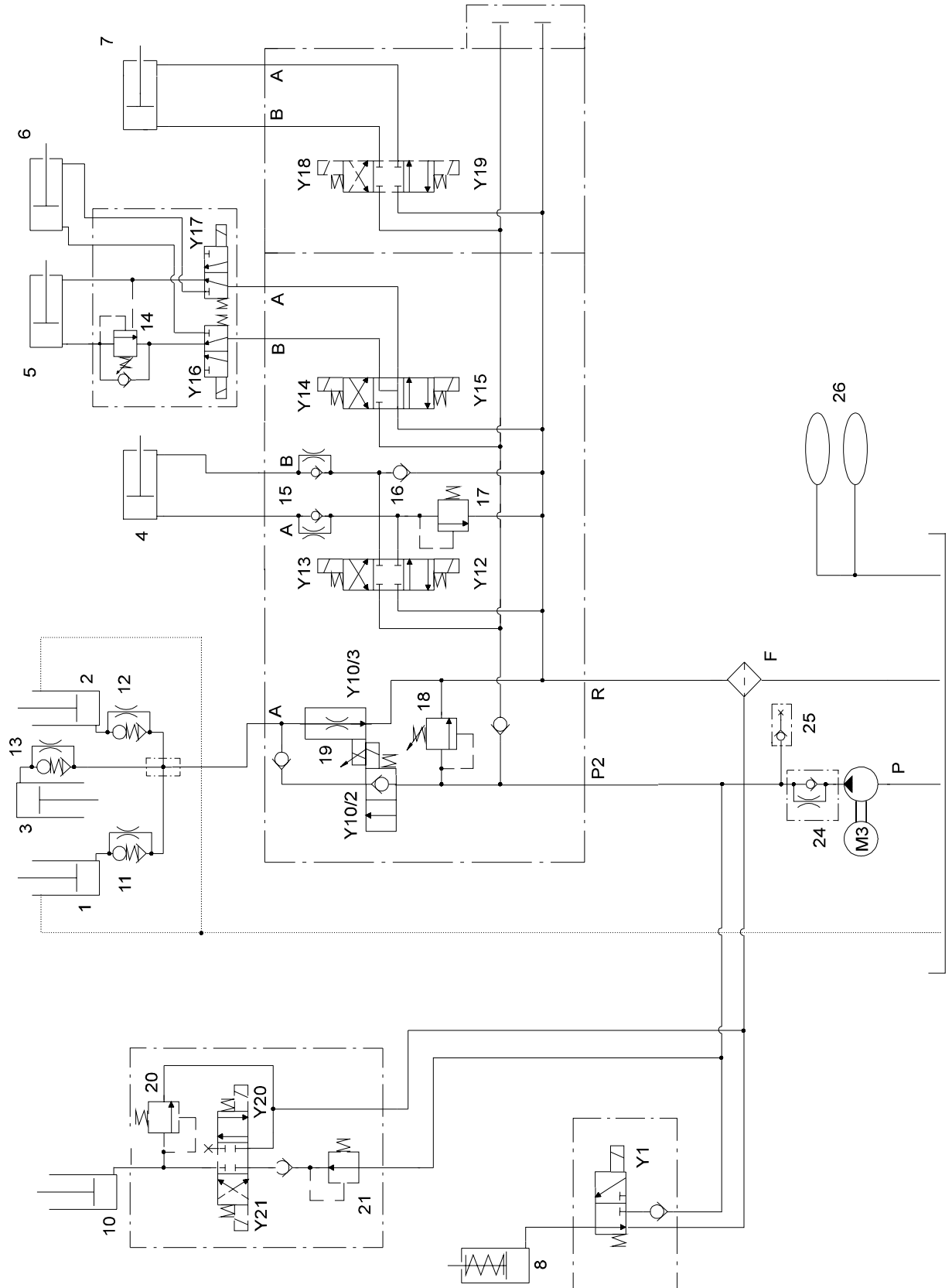
Hydraulics

3.11. Hydraulics diagram 11/16



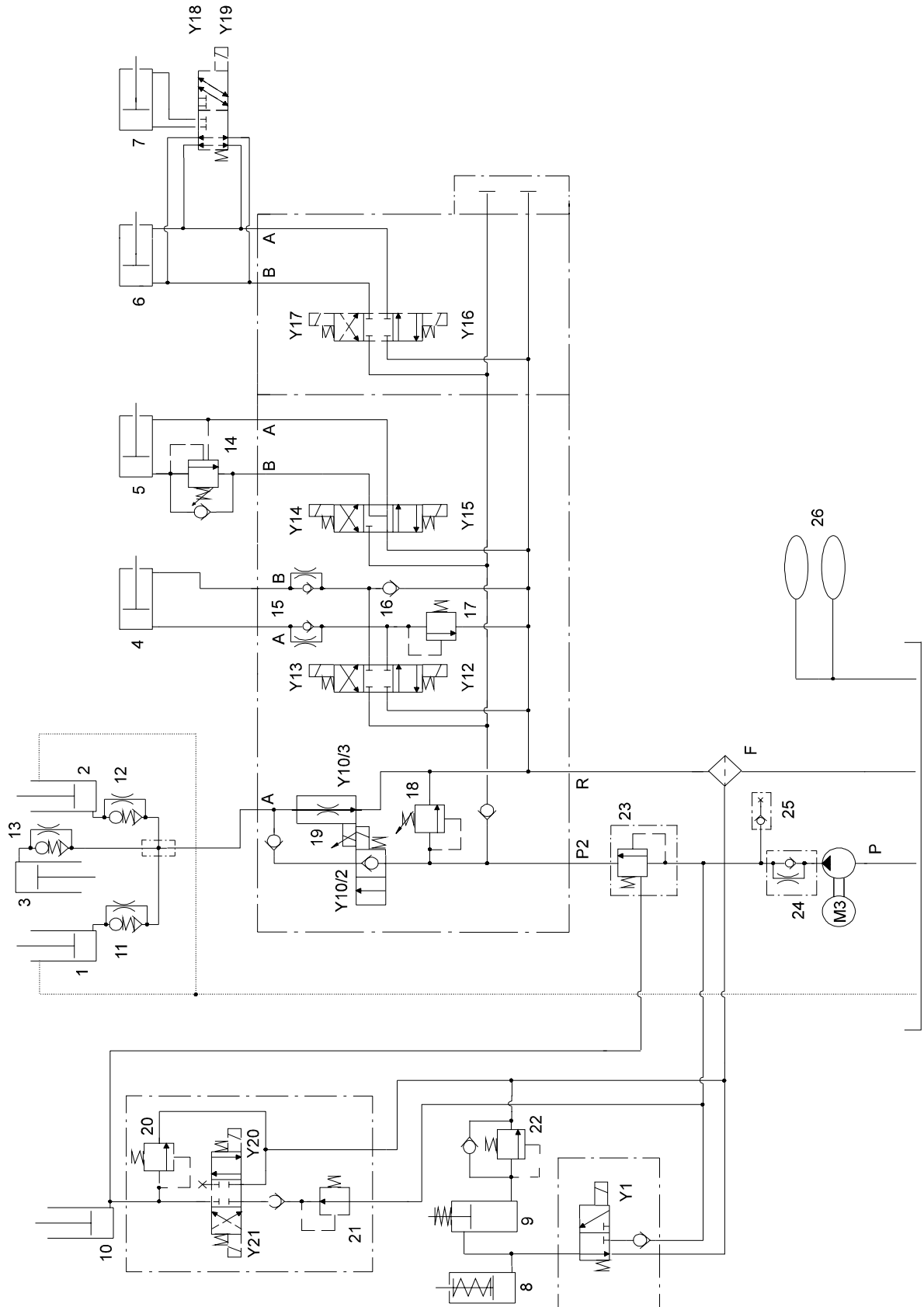


3.12. Hydraulics diagram 12/16



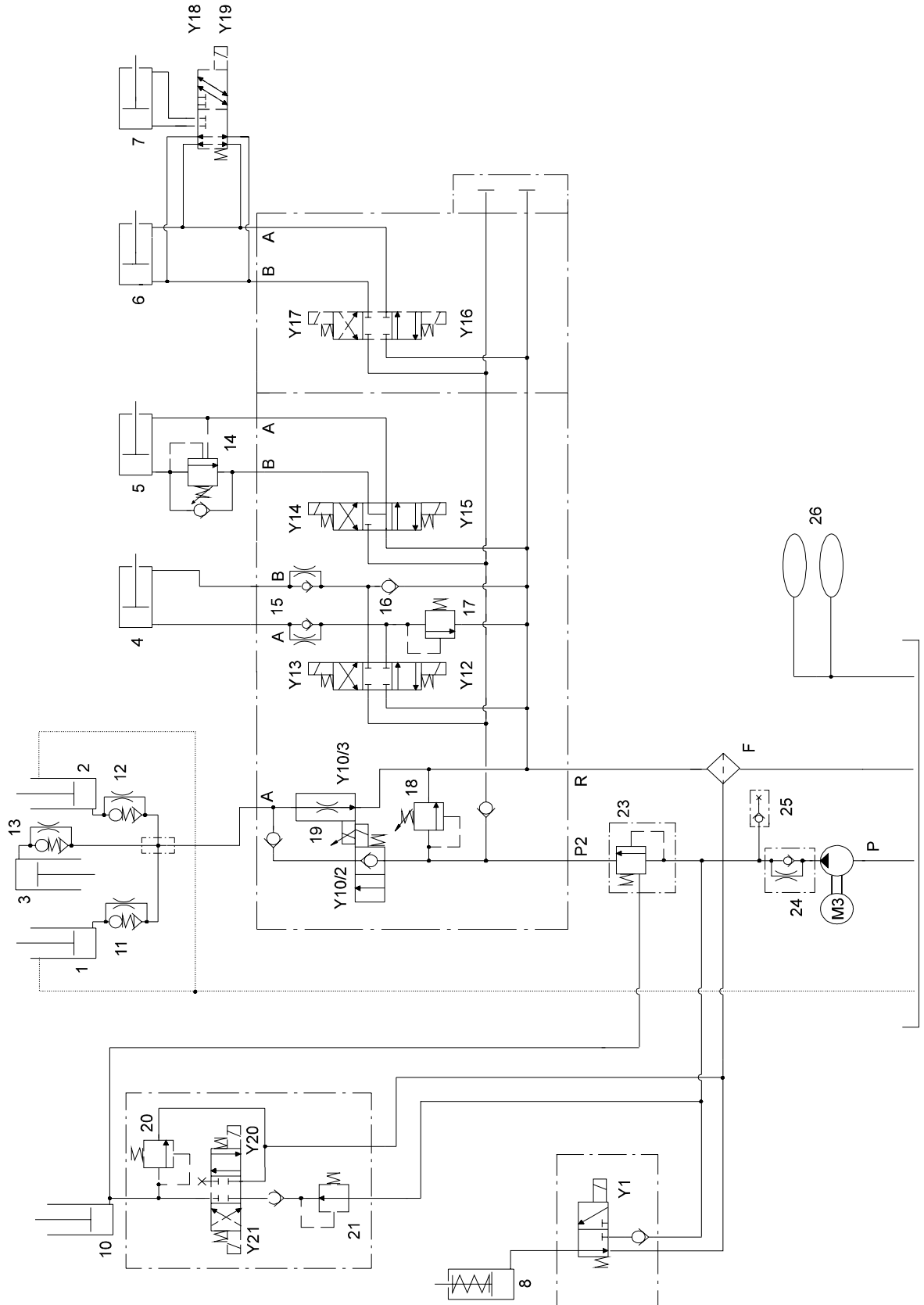
Hydraulics

3.13. Hydraulics diagram 13/16



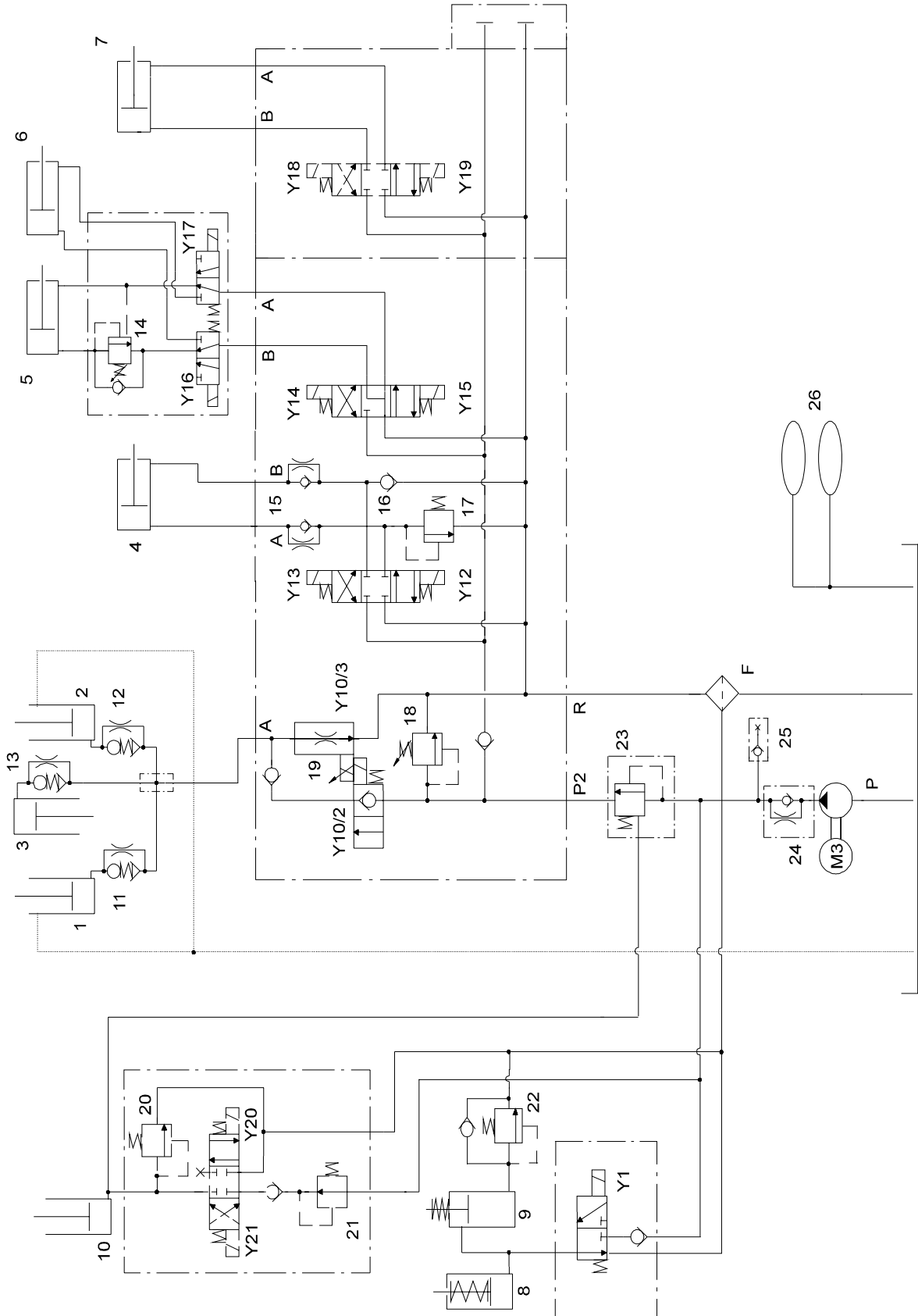


3.14. Hydraulics diagram 14/16



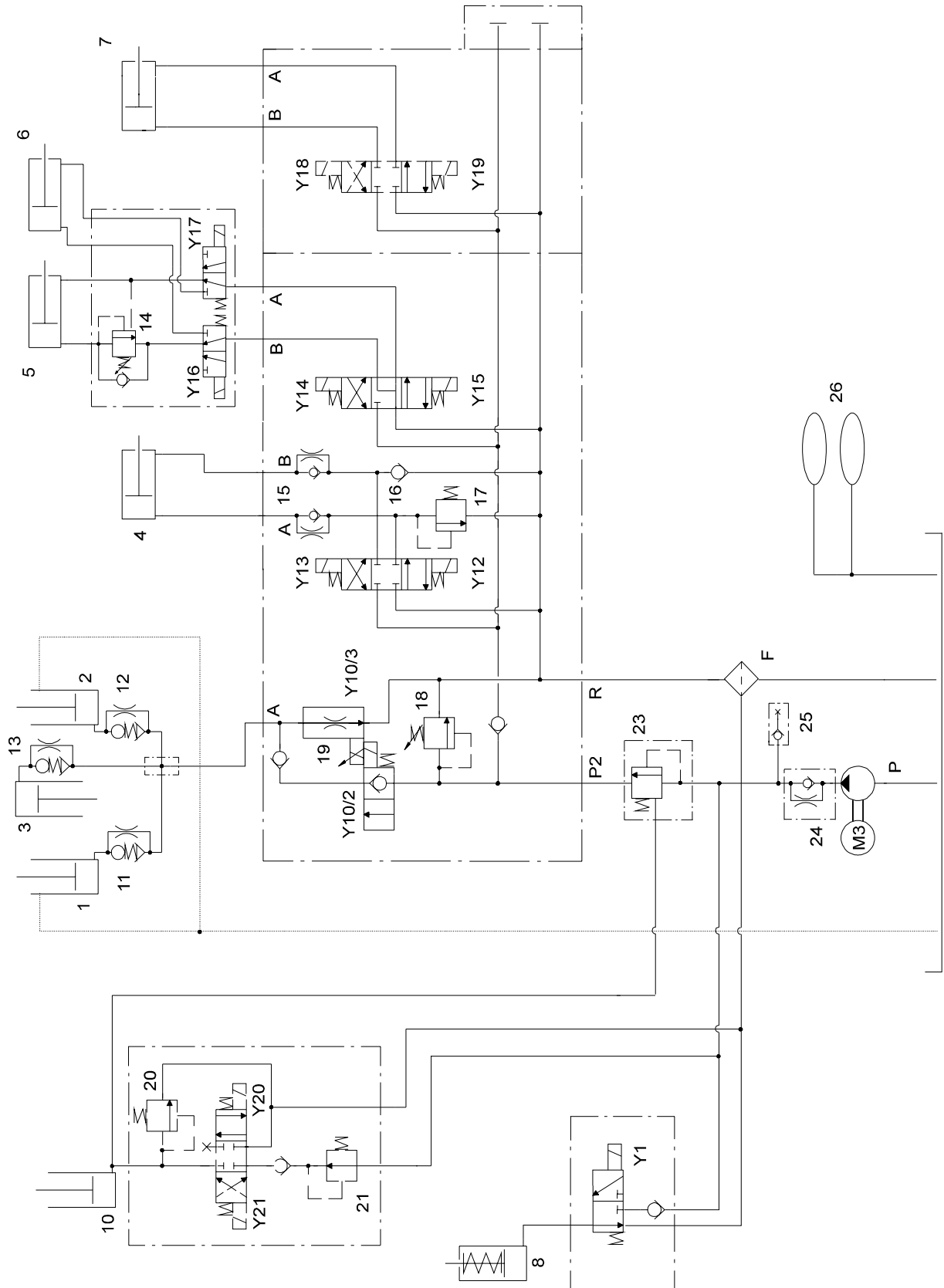
Hydraulics

3.15. Hydraulics diagram 15/16



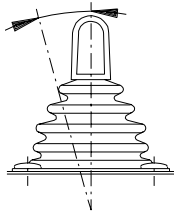


3.16. Hydraulics diagram 16/16

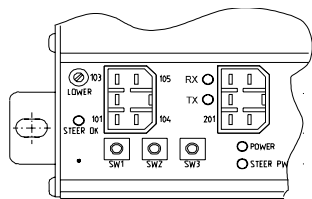


Hydraulics

4. Adjustment of fork lowering rate



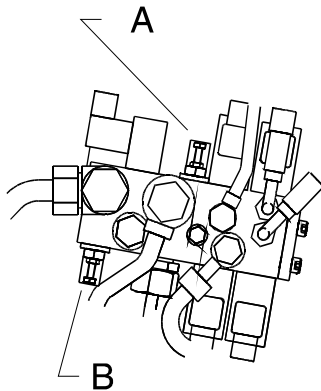
Before adjusting the fork lowering rate, make sure the hydraulic system has been warmed up for at least 10 minutes in order to achieve the correct readings.



- Raise the forks, unloaded, to eye level
- Push the lowering potentiometer 2-2.5 mm forwards
- Adjust the LOWER potentiometer on the electronic card A5 until the forks start to lower slowly
- Raise the forks, unloaded, to the max. height
- Adjust the valve to the correct lowering speed
- Check that lowering from free lift to main lift functions correctly
- Seal the valve and potentiometer

A = Flow control for fork lifting

B = Flow control for fork lowering



Lowering speed above free lift , unloaded (m/s)

Model	Min	Nom	Max
RR N1	0.49	0.52	0.55
RR B/E1-B/E3, N2-N3	0.49	0.52	0.55
RR B/E4-B/E6	0.49	0.52	0.55
RR B/E7-B/E8	0.53	0.56	0.59

Error code 0 13

If the error code 0 13 is displayed turn the potentiometer LOWER on the electronic card A5 anti-clockwise and increase the flow from the valve until the correct speed is reached.

NOTE!

If error code 0 13 is displayed on a truck without a height indicator, check that parameter 11 is set at 0. See chapter 5710 Programming parameters.

5. Adjusting the max. lifting capacity

Before adjusting the lifting capacity make sure the hydraulic system has been warmed up for at least 10 minutes in order to achieve the correct readings.

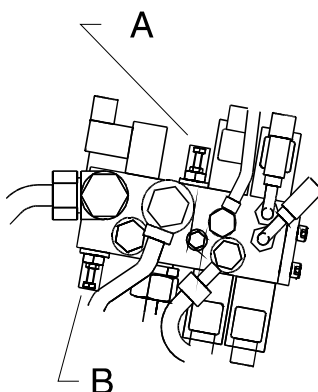
- Extend the reach carriage
- Lower the forks to floor level
- Remove the seal on the adjustment screw (A)
- Load the forks with the max. weight

Model	Min (kg)	Max (kg)
RR N1	1350	1620
RR N1 Side-shift	1225	1470
RR B/E1-B/E3, N2-N3	1600	1920
RR B/E1-B/E2, N2 Side-shift	1475	1770
RR B/E/N3 (Side-shift standard)	1475	1770
RR B/E4-B/E6	2000	2400
RR B/E4-B/E6 Side-shift	1875	2250
RR B7-B8 (side shift standard)	2500	3000

The correct lift capacity has been reached when the inner guide stops just above the free lift (approx. 10 mm).

- Lower the forks to floor level

Adjust the lifting capacity with the adjustment screw (A) on the main valve.



A = Flow control for fork lifting

B = Flow control for fork lowering

- Loosen the locking nut

Turn adjustment screw (A) outwards to increase flow.

Turn adjustment screw (A) inwards to decrease flow.

- Tighten the locking nut

Seal the adjustment screw (A).

F-code

RT

Section

S6

C-code

6000

Hydraulics

Version no

001

T-code

301-307,400



F-code
RT

Section
S6

C-code
6140

Hydraulic pump

Issued by
Parts

Approved by
H.Forsman

Version no
001

T-code
301-307,400

Hydraulic pump

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	

1. General

The truck is fitted with two different sized pumps.

Models N1-N3 and B/E1- B/E6 are fitted with Eckerle GF 2-19 with a max. flow of 48 litres per minute.

Models B/E7-B/E8 are fitted with Eckerle GF 2-22 with a max. flow of 60 litres per minute.

Hydraulic pump

Version no

T-code

001

301-307,400

2. Replacing the hydraulic pump/ pump motor

Trucks without tilting cab

- Undo the knob to the side of the drivers seat and open the door.

Trucks with tilting cab

Make sure there is sufficient room to tilt the cab before starting work

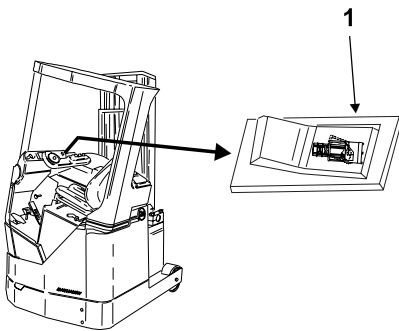


WARNING!

Risk of crushing.

The risk for personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back.

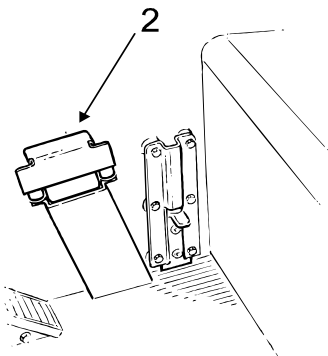
Ensure that no one is in the motor compartment when tilting the cab.



The cab must be tilted 90 degrees for service in the motor compartment.

While tilted, only the cabs lift/lower function is operational and then only at crawl speed.

- Press switch (1) to lower the cab while at the same time turning the key. The display shows 6 lines.
- Move the fork lifts hydraulic lever backwards.
- When the cab stops (at 15 degrees), loosen the catch (2) to release the cab.
- Continue pulling the lever backwards until the cab stops (at 45 degrees).



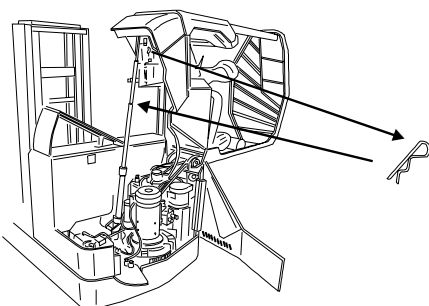
WARNING!

Falling cab!

The cab can fall without dampening when tilted over 45 degrees.

The cab is heavy so make sure the person receiving the cab is in control of the situation. Use crane if possible.

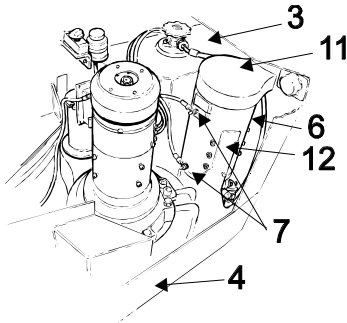
- Take hold of the protective roof and tilt the cab to 90 degrees



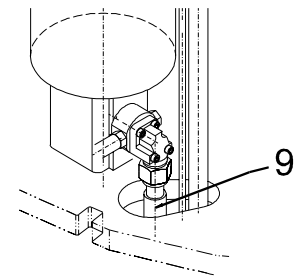
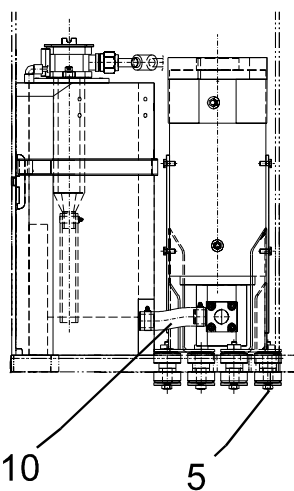
NOTE!

Falling cab!

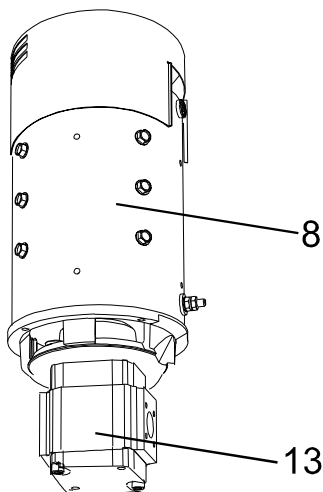
Insert the pin (which is located under the seat) in the cylinder piston to avoid the cab accidentally falling backwards during service.



2.1. Dismantling



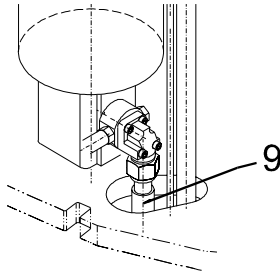
- Disconnect the battery plug
- Lower the forks fully to reduce the pressure in the hoses and pump
- Pump out the oil in the hydraulic tank using, e.g. pump SHT/A Cpl No. 100
- Remove the fender (4) in order to reach the bolts (5) on the pump bracket (12)
- Disconnect the carbon brush indicator cables (6) and the power cables (7) from the pump motor (8)
- Remove the hydraulic hose (9) and loosen the hose clip on hydraulic hose (10) attached to the tank
- Remove the fan cover (11) and attach a lifting eye bolt to the crank shaft
- **Truck with tilting cab:** Remove the valve unit located on the pump bracket (12)
- Remove the bolts (5) holding the pump bracket (12) to the chassis
- Remove the hydraulic pump
- Remove both brackets (12) from the pump motor (8)
- When replacing the hydraulic pump: Remove the hose connection from the pump unit (13)
- When replacing the pump motor: Remove the pump unit (13) together with the hose connection from the pump motor (8)



2.2. Assembly

Assembly time: approx. 1 hour.

- If the pump motor (8) has been replaced: Fit the pump unit (13) to the pump motor (8)
- If the hydraulic pump has been replaced: Connect the hose connection to the pump unit (13)
- Fit both brackets (12) on the pump motor (8)
- Screw a lifting eye bolt to the crank shaft and attach to a crane

Hydraulic pump

- Lift the hydraulic pump into the truck and move the hydraulic hoses (10) to the tank (3)
- Screw on the hose clip
- Screw the two pump brackets (12) to the chassis using the bolts (5)
- On trucks with tilting cab: Tighten the valve unit on the bracket (12) on the pump motor
- Remove the lifting eye bolt and refit the fan cover (11)
- Reconnect the hydraulic hose (9), the carbon brush indicator cables (6) and the power cables (7)
- Fill the hydraulic tank (3) with 48 litres new oil

Truck with tilting cab

Ensure that no one is in the motor compartment when tilting the cab.

**WARNING!**

Risk for crushing!

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.

Ensure no one is in the motor compartment when tilting the cab.

- Remove the pin from the cylinder piston.
- Take hold of the protective roof and tilt the cab to the 45 degree position.
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position.

Truck without tilting cab

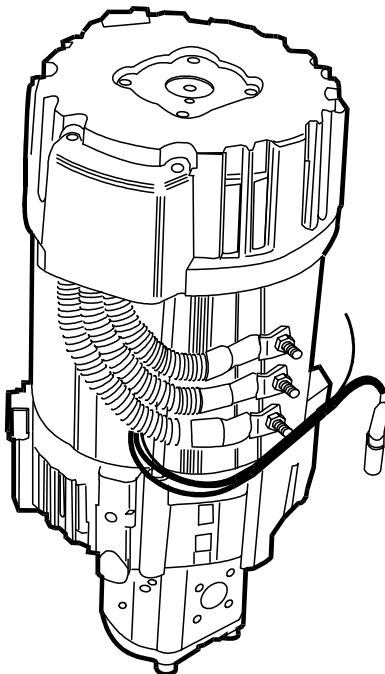
- Close the door and tighten the knob.



Hydraulic pump

Valid from serial number:

T-code	Model	Serial No	Notes
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi



1. General

There is only one size of pump in the truck and this has a maximum flow of 60 litres per minute.

There are two different sized pump motors.

Models N1-N3 and B/E1-B/E6 are fitted with P150.

Models B/E7-B/E8 are fitted with P195.

This service instruction describes the replacement of the hydraulic pump.

Hydraulic pump

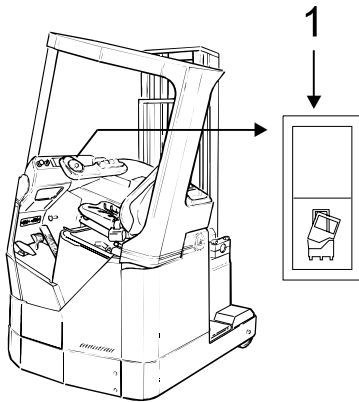
Version no

001

T-code

401-414

2. Replacing the hydraulic pump/ pump motor



Trucks without tilting cab

- Undo the knob to the side of the drivers seat and open the door.

Trucks with tilting cab

Make sure there is sufficient room to tilt the cab before starting work.

WARNING!

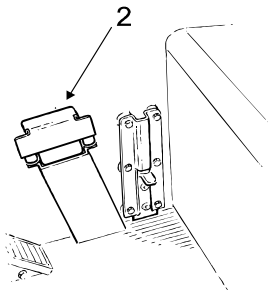


Risk of crushing.

The risk for personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back.

Ensure that no one is in the motor compartment when tilting the cab.

When you carry out a service in the motor compartment you should tilt the cab fully. While tilted, only the cab's lift/lower functions are operational and then only at crawl speed.



- Press the switch (1) for cab lowering at the same time as the key is turned. The display shows 6 lines.
- Move the hydraulic lever for fork lift backwards.
- When the cab stops (at 15°), loosen the catch (2) that releases the cab.
- Continue to move the lever backwards until the cab stops (at 45°).



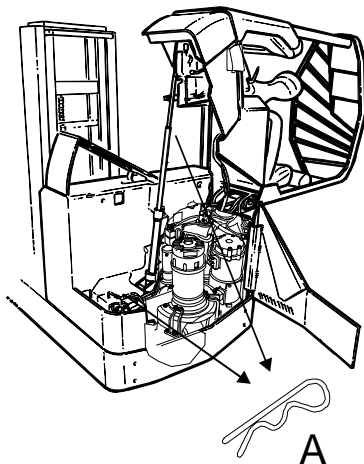
WARNING!

Falling cab!

The cab can fall without dampening when tilted over 45°.

The cab is heavy so make sure the person receiving the cab controls the situation. Use a crane if possible.

- Take hold of the protective roof and tilt the cab fully.



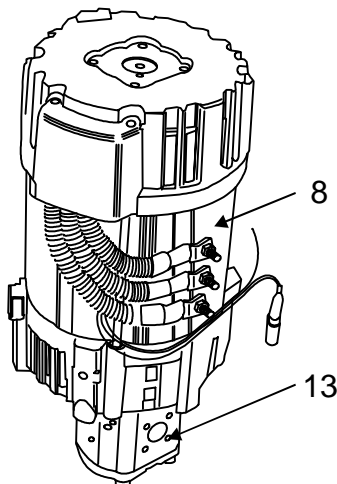
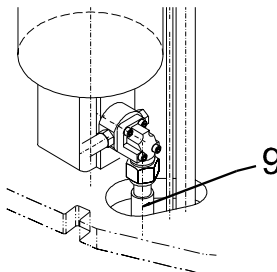
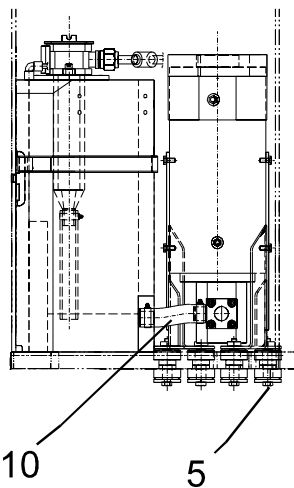
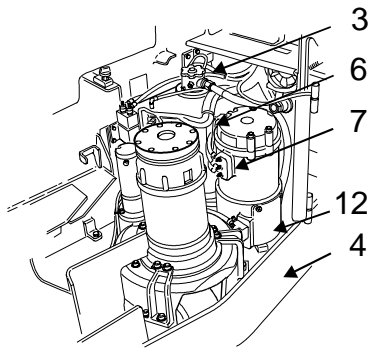
NOTE!

Falling cab!

Insert the pin (which is located under the seat) in the cylinder piston to avoid the cab accidentally falling backwards during service.



2.1. Dismantling



- Disconnect the battery plug.
- Lower the forks fully to reduce the pressure in the hoses and pump.
- Pump out the oil in the hydraulic tank using filter pump V10-15191.
- Remove the fender (4) in order to reach the bolts (5) on the pump bracket (12).
- Undo the temperature/speedometer contactors (6) and power cables (7) from the pump motor (8).
- Remove the hydraulic hose (9) and loosen the hose clip on hydraulic hose (10) attached to the tank.
- Attach a lifting eye bolt to the crank shaft.
- Remove the bolts (5) holding the pump bracket (12) to the chassis.
- Remove the hydraulic pump and place it on a clean surface.
- Remove both brackets (12) from the pump motor (8).
- Remove the hose connection from the pump unit (13).
- Undo the screws and dismantle the pump (13).
- Remove the carrier.

Hydraulic pump

2.2. Assembly

- Fit the hose coupling to the pump unit (13).
- Fit the carrier between the pump and pump motor (8).
- Fit the pump unit (13) to the pump motor (8).
- Fit both brackets (12) on the pump motor (8).
- Screw a lifting eye bolt to the crank shaft and attach to a crane.
- Lift the hydraulic pump into the truck and move the hydraulic hoses (10) to the tank (3).
- Screw on the hose clip.
- Screw the two pump brackets (12) to the chassis using the bolts (5).
- Remove the lifting eye bolt.
- Reconnect the hydraulic hose (9) and the temperature/speedometer contactors (6) and the power cables (7).
- Fill the hydraulic tank (3) with 48 litres new oil.

Truck with tilting cab

Ensure that no one is in the motor compartment when tilting the cab.



WARNING!

Risk for crushing!

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.

Ensure no one is in the motor compartment when tilting the cab.

- Remove the pin from the cylinder piston.
- Take hold of the protective roof and tilt the cab to the 45 degree position.
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position.

Truck without tilting cab

- Close the door and tighten the knob.



Hose reel

Applies to machine numbers:

T-code	Model	Machine No.	Not.
301	RR N1-N3, N1C-N3C	265200AA-	
302	RR B1-B3, B1C-B3C	265200AA-	
303	RR B4-B6, B4C-B6C	265200AA-	
304	RR B7-B8, B7C-B8C	265200AA-	
305	RR E1-E3, E1C-E3C	265200AA-	
306	RR E4-E6, E4C-E6C	265200AA-	
307	RR E7-E8, E7C-E8C	265200AA-	
401	RR N1-N3/15	301518AA-	AC/ACi
402	RR N1C-N3C/15	301518AA-	AC/ACi
403	RR B1-B3/15	301518AA-	AC/ACi
404	RR B1C-B3C/15	301518AA-	AC/ACi
405	RR B5-B6/15	301518AA-	AC/ACi
406	RR B5C-B6C/15	301518AA-	AC/ACi
407	RR B7-B8/15	301518AA-	ACi
408	RR B7C-B8C/15	301518AA-	ACi
409	RR E1-E3/15	301518AA-	AC/ACi
410	RR E1C-E3C/15	301518AA-	AC/ACi
411	RR E5-E6/15	301518AA-	AC/ACi
412	RR E5C-E6C/15	301518AA-	AC/ACi
413	RR E7-E8/15	301518AA-	ACi
414	RR E7C-E8C/15	301518AA-	ACi

Hose reel

1. General

This assembly instruction contains essential information for trouble-free installation and operation. The enclosed instruction contains directions as well as information about inspection and maintenance.

2. Assembly

Assemble the hose reel or the spring as per the illustration.

To pretighten the spring turn the hose reel with completely unwound reel in extractable direction.

Pretightening of the hose drum:

- Right extraction clockwise.
- Left extraction anticlockwise.

**WARNING!**

Tightened spring.

The hose can cause injury.

Always handle the hose reel with care.

The number of revolutions is dependant on the length and diameter of the hose, see table. The stated values apply as guidelines.

Spring pretightening (revolutions).

Hose diameter (mm)	Hose length (m)						
	2.7	3	3.3	5	6	7	8.5
6.3	-	-	4	3	3	3	1.5-2
8	4	4	-	3	3	-	-

Only after the correct pretightening has been achieved is the hose pulled out of the drum.

3. Inspection after assembly

On start-up, lift the forks to the maximum lift height. Check that hose and hose drums function correctly and count the number of revolutions that the hose drum turns.

The maximum sum of the total revolutions made by hand on pretightening and the number of revolutions on the maximum extraction is 10.

Revolutions on pretightening + revolutions in operation = max 10

NOTE

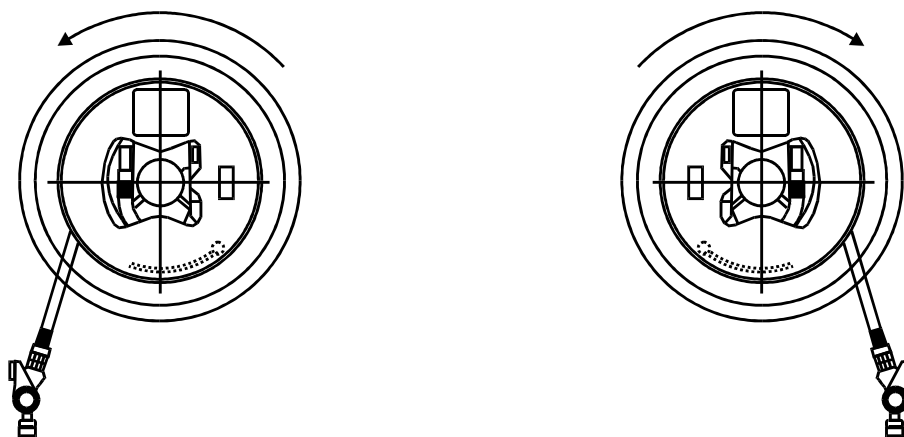
During maximum lift height, the hose must not be completely unwound from the hose drum. At least $\frac{1}{4}$ revolution of hose must be left on the hose drum.

Test with maximum extracted hose that further turning can be done by hand. The hose drum must not lock itself.

Check that the hose is correctly rolled up when sinking the forks, the hose must be taut the whole time. It must always be taut otherwise there is a risk that the hose will slip over the side plates. In the event of this, adjust the pretightening.

NOTE

The loop of the spring must be turned towards the unwinding direction of the hose.



Reserve parts must correspond to technical specifications laid down by the manufacturer. This requirement is always fulfilled when using original parts.

F-code

RT

Section

S 7

C-code

6270

Hose reel

Version no

001

T-code

301-307,401-414



Mast/cylinders

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

Mast/cylinders

1. General

The truck has many different types of cylinder.

The parking brake cylinder is a single action cylinder which is spring loaded. It is pushed out by oil pressure and pulled back by a spring.

The cab tilting cylinder, lift cylinders and free lift cylinder are all single action cylinders. These cylinders are pushed out by oil pressure but pushed back by the weight of the cab or the forks.

The reach cylinder, tilt cylinder and the side-shift cylinder are double action cylinders. They are pushed both in and out by oil pressure.

2. Assembly tools

2.1. For lift cylinder on mast with valve in fork yoke (1600 and 2000 kg mast)

Tool no.	Comment
08-15364	To protect the piston rod seal from damage by the cylinder thread
08-15366	Assembly of piston rod seal on 08-15367
08-15367	Assembly of piston rod seal on piston
08-15368	Assembly of stop ring on 08-15369
08-15369	Assembly of stop ring on 08-15370
08-15370	Assembly of stop ring on piston rod
08-15391	Hook wrench 60-90 with 5 mm stud
08-15393	Pipe wrench
08-15400	Assembly of restriction valve



F-code
RT

Section
S 7.0

C-code
7000

Mast/cylinders

Version no
001

T-code
301-307, 400

2.2. For free lift cylinder on mast with valve in fork yoke (1600 and 2000 kg mast)

Tool no	Comment
08-15365	To protect the piston rod seal from damage by the cylinder thread
08-15418	Insert tool to be used together with tool 08-15419
08-15419	Assembly of piston rod seal on piston
08-15391	Hook wrench 60-90 with 5 mm stud
08-15393	Pipe wrench
08-15417	Assembly of restriction valve

F-code Section C-code
RT **S 7.0** **7000**

Mast/cylinders

Version no T-code
001 **301-307, 400**



Mast

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	290109AA-	
302	RR B1-B3, B1C-B3C/14	290109AA-	
303	RR B4-B6, B4C-B6C/14	290109AA-	
305	RR E1-E3, E1C-E3C/14	290109AA-	
306	RR E4-E6, E4C-E6C/14	2290109AA-	
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi

1. General

This section describes how you adjust play in the mast.

A mast has three guides, the inner, middle and outer guide.

The inner and middle guides have four rollers each.

The fork carriage also has four rollers.

These rollers must be adjusted with shims in order to allow as little play as possible.

Mast

2. Dismantling

- Dismantling the mast from the truck

NOTE!

Oil leakage.

Risk for valve and cylinder damage if dirt enters the hydraulic connections.

Plug all hydraulic connections.

- Place the mast horizontally on pallets or similar.
- Dismantle the triple hose and contactor X50 from the fork carriage.
- Dismantle the triple hose roller from the free lift cylinder.
- Remove the triple hose from the mast but let it remain in place in the outer guide.
- Remove the distribution block with the main hose from the pipe to the main lift cylinders
- Dismantle the supply hose bracket from the inner guide.
- Dismantle the free lift chain.
- Dismantle the main lift cylinders.
- Dismantle the main lift chains but let them remain in place in the outer guide.
- Dismantle the main chain rollers and the triple hose roller in the base of the mast.
- Remove the fork carriage from the mast.
- Remove the inner guide from the mast using the following lifting yokes:

For 1600 kg mast use lifting yoke BT 11-1020

For 2000 kg mast use lifting yoke BT011-1021



Shimming the mast

- Use a dial test indicator and a crow bar to measure the amount of play.
- Measure the mast when extended and retracted

NOTE: Maximum play at lower edge is 1 mm
Maximum play at upper edge is 0,4 mm

- Dismantle the guide from the mast.
- Remove the rollers that require shimming.
- Fit the shims to the roller studs.
- Fit the rollers.
- Fit the guide in the mast.
- Check the amount of play.

- Fasten the middle and outer guides to each other.
- Fit the inner guide in the mast.
- Measure and fit shims according to the instructions above.
- Fit the fork carriage in the mast.
- Measure and fit shims according to the instructions above.

3. Assembly

- Fit the free lift chain.
- Fit the main lift cylinder.
- Fit the main lift chain roller.
- Fit the main lift chains.
- Fit the triple hose and contactor X50 in the fork carriage.
- Fit the triple hose roller on the free lift cylinder.
- Fit the distribution block with supply hose to the pipe for the main lift cylinders.
- Fit the supply hose bracket on the inner guide.

NOTE!

The triple hose can separate.
Risk of the triple hose breaking.
Make sure that the triple hose rollers are in line.

- Fit the mast to the truck.

F-code Section C-code
RT **S7** **7100**

Mast

Version no T-code
001 **301-303,305,306,401-**



Mast fixation points

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	

1. General

This is an assembly guide for the mast. Also included in this document is a list of tools and instructions on transport of the truck.

Mast fixation points

2. Tools

- Crane with minimum 2500 kg capacity
- 1/2" catch
- 13 mm socket
- 24 mm socket
- 30 mm socket
- 4 mm Allen key
- 5 mm Allen key
- 1/2" torque wrench 0 - 270 Nm
- 3/4" torque wrench 0 - 500 Nm
- Crow bar
- Large screwdriver
- 17 mm wrench
- 19 mm wrench
- 27 mm wrench
- 32 mm wrench
- 36 mm wrench
- Rags
- Absorbent
- Cable ties



3. Transport of truck

There are two methods of transporting the truck once the battery has been removed.

Method 1

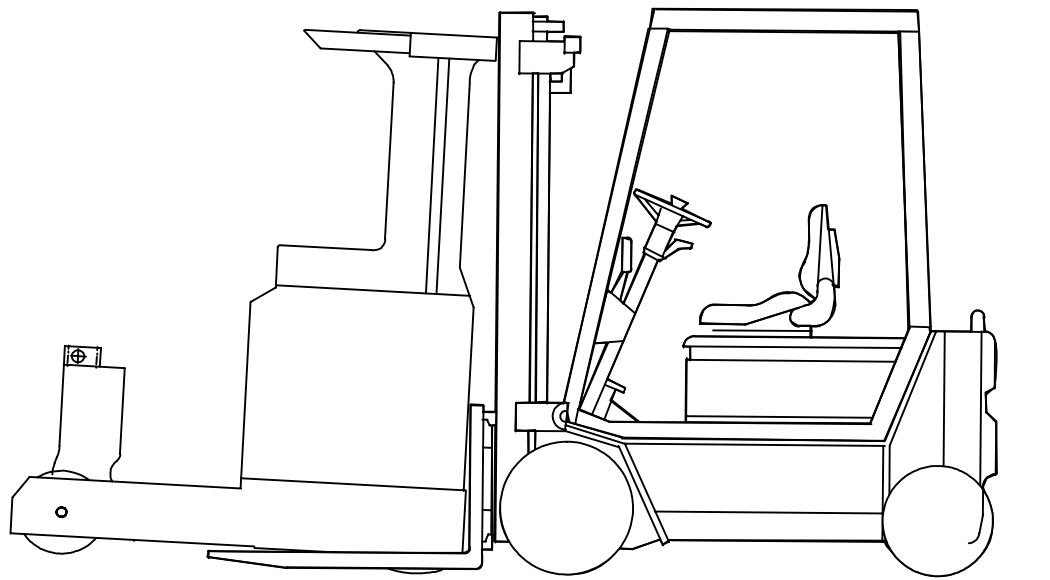
If the truck is to be transported over a longer distance a fork lift with the following capacity should be used.

Load	N1	N2-N3	B/E1-B/E3	B/E4-B/E6	B/E7-B/E8
Load centre distance (Tp)	950	950	950	1000	1000
Weight without battery	1700	1700	1800	2250	2850

- Slide the forks in under the support arms as illustrated

Method 2

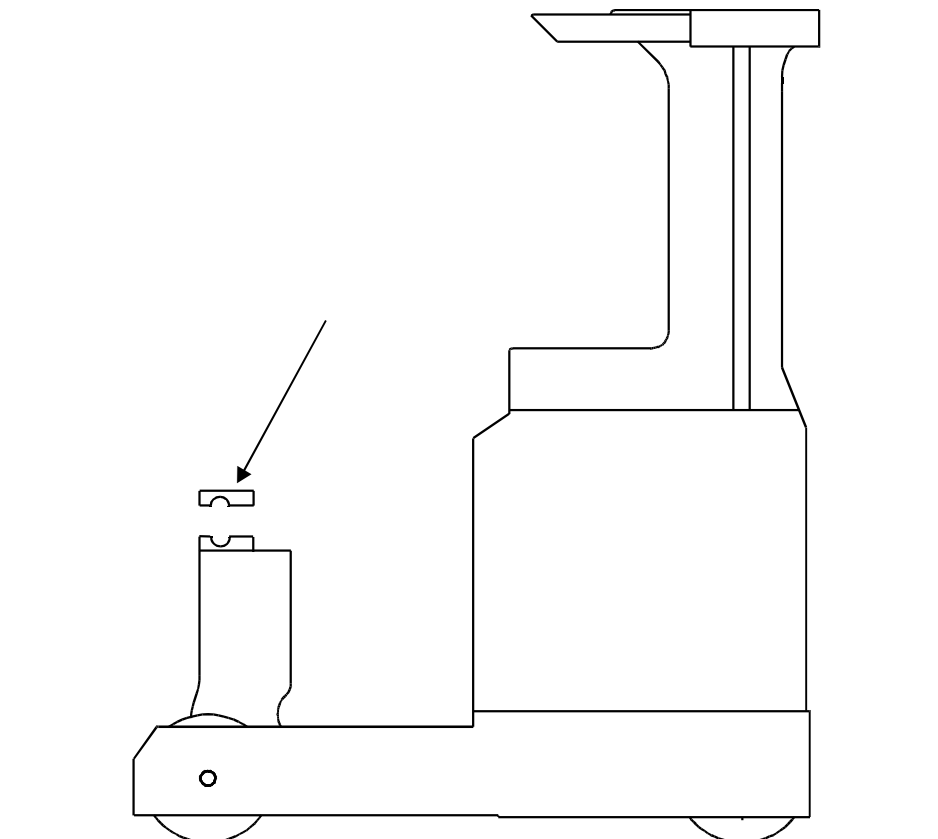
An extension cable from a nearby battery may be used to move the truck over a shorter distance.



Mast fixation points

4. Assembly

- Transport the truck to an assembly area using a crane
- Clip off the steel bands from around the support arms
- Lift off the forks
- Connect the truck to 48 VDC
- Move the reach carriage out approximately 200 mm
- Remove the load support
- Extend the reach carriage fully
- Switch off the current using the key and disconnect 48 VDC
- Remove the cover plate from the reach carriage
- Loosen the 4 M16 bolts and remove the upper part of the pin bracket (see illustration)



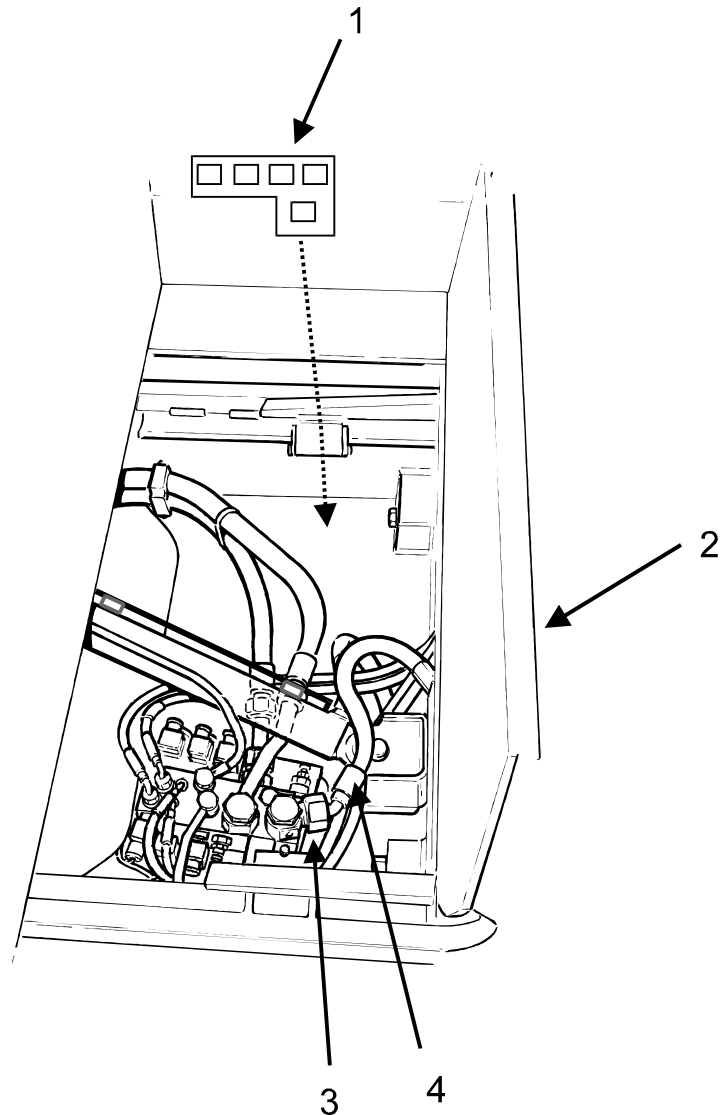


Mast fixation points

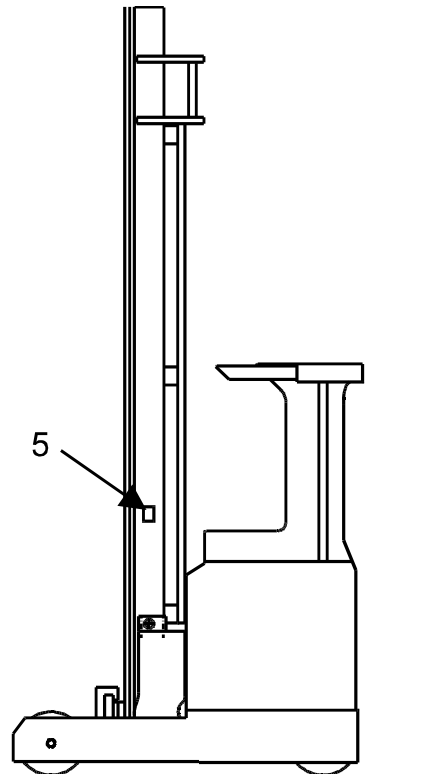
- Use the mast assembly kit which contains the following items:
 - 2 bolts and 2 washers for securing the mast to the reach carriage's lower bracket.
 - 2 socket head screws which attach the two halves of the cover plate to the reach carriage.
 - 6 bolts for fastening the load support.
 - 4 washers for the pins on the mast.
 - 0 - 6 shims for adaptation of mast angle forwards and backwards. The mast angle should be $90^\circ \pm 6$.
 - 1 two part hose clip for the feed hose on the mast.
- Cut away the the steel bands on the mast except for the topmost band
- Lift the mast with the help of a crane and tools 11-1091 for N/B/E1-N/B/E3, B/E4-B/E6 and 11-1133 for B/E7-B/E8
- Place the washers on the pins
- Move the mast carefully towards the reach carriage
- Stop approximately 100 mm from the reach carriage
- Fit the feed hose in the reach carriage
- Move the mast in fully and lower it so that it rest on the pins
- Put the upper pin brackets in place and screw down loosely
- Screw in the bolts which secure the mast to the reach carriage's lower bracket, leaving room for the shims
- Fit the shims and move the crane in the direction of the forks so they are held firmly against the mast
- Tighten the bolts with the following torques

	N1-N3	B/E1-B/E8
Pin bracket bolts	222 Nm	222 Nm
Lower bolts	222 Nm	434 Nm

Mast fixation points



- Screw the distribution block in place on the wall of the reach carriage
- Assemble the mast's feed hose using the hose clips on the wall of the reach carriage (2)
- Remove the plugs from the feed hose (4) and the main valve (3)
- Fit the feed hose (4) to the valve (3)
- Connect the side shift cable to the socket bracket (1) on the reach carriage
- Connect the height indicator cable to the bracket (1) on the reach carriage



- Remove the plugs from the tilt hoses
- Fit the tilt hoses to the side of the mast (5)
- Cut away the upper steel band on the mast
- Connect the truck to 48 VDC and raise the forks approximately 1000 mm
- Fit the forks on the fork yoke
- Place the load support on the forks and screw down the lower screws
- Turn up the load support and screw down the remaining screws
- Tighten the load support's screws with a torque of 45 Nm
- Screw down the cover plate over the main valve on the reach carriage
- Gather together all the cables and hoses so that they cannot be damaged
- Wash or wipe away any oil on the truck

F-code	Section	C-code
RT	S7.0	7190

Mast fixation points

Version no	T-code
001	301-307,400



Lift cylinder

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-290109AA	
302	RR B1-B3, B1C-B3C/14	265200AA-290109AA	
303	RR B4-B6, B4C-B6C/14	265200AA-290109AA	
304	RR B7-B8, B7C-B8C/14	265200AA-290109AA	
305	RR E1-E3, E1C-E3C/14	265200AA-290109AA	
306	RR E4-E6, E4C-E6C/14	265200AA-290109AA	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	

1. General

There are two different types of lift cylinder. One on masts **without** a valve on the fork carriage and one on masts **with** a valve on the fork carriage.

Instructions for masts **without** a valve on the fork carriage are given in version 001 of service document S7310.

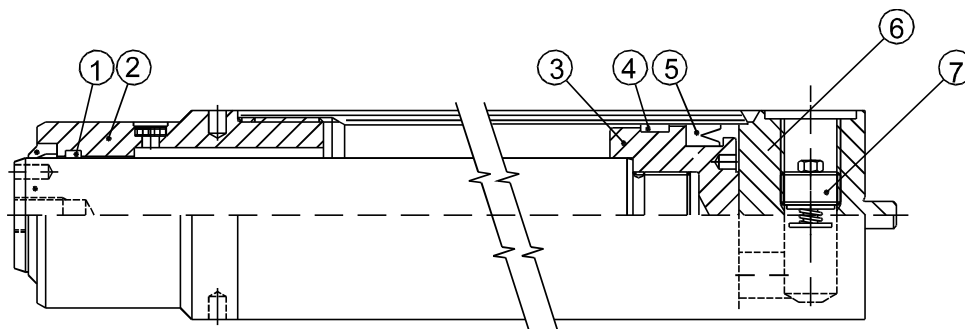
Instructions for masts **with** a valve on the fork carriage are given in version 002 of service document S7310.

Each mast has two lift cylinders. Each cylinder is fitted with a restriction valve which prevents the forks from falling in the case of a break in the hydraulics.

Lift cylinder

2. Masts without a valve on the fork carriage

2.1. Dismantling the cylinder



- Remove the cylinder from the mast.
- Place the lower stop (6) in a vice, allowing the upper part to rest against a yoke so that the cylinder is lying in a horizontal position.
- Tap the top sleeve (2) carefully with a rubber hammer. Heat may be carefully applied, if necessary.
- Unscrew the top sleeve (2) using a pipe wrench 08-15393.
- Carefully remove the piston rod from the cylinder making sure not to damage the thread. Place the piston rod on a clean soft surface.
- Knock out the top sleeve (2) with a rubber hammer.

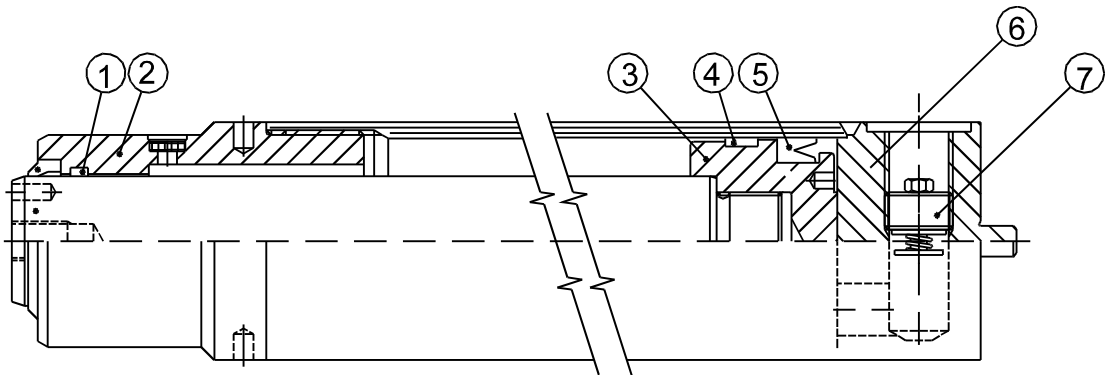
2.2. Dismantling the piston rod seal and support ring on the lift cylinder

- Force a screw driver into the seal (5) without marking the piston (3) in any way.

NOTE!

If the piston is scratched at all it must be replaced to avoid leakage.

- Lift the piston rod seal (5) very carefully
- Carefully cut away the piston rod seal (5) with a knife, making sure not to damage the piston (3)
- Remove the support ring (4)



2.3. Assembling the piston rod seal and support ring on the lift cylinder

- Fit the support ring (4) and the piston rod seal (5) on the piston

2.4. Removing the piston from the lift cylinder

- Remove the piston rod seal (5) plus the support ring (4)
- Knock and, if necessary, heat the piston (3)
- Unscrew the piston (3) using a pipe wrench 08-15393
- Brush away the old seal

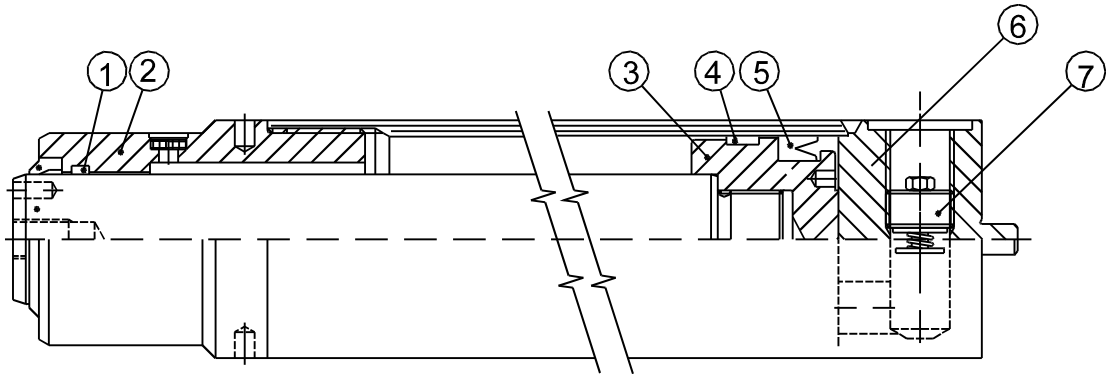
Lift cylinder

Version no

001

T-code

301-307,400



2.5. Fitting the piston in the lift cylinder

- Apply **OMNI 230** to the thread
- Screw the piston (3) in place using tool 08-15390
- Be sure to wipe away all excess adhesive

2.6. Dismantling and assembly of restriction valve

- Unscrew and remove the restriction valve (7) using tool 08-15400
- Assemble the restriction valve (7) using tool 08-15400

2.7. Assembling the cylinder

- Use tool 08-15364 when fitting the piston rod in the cylinder
- Remove the assembly sleeve 08-15364
- Fit the top sleeve to the piston rod using a rubber hammer
- Screw down the top sleeve on the cylinder a few turns
- On 2500 kg lift cylinders the bleeding hole and the hole for the restriction valve are on the same side of the cylinder
- On 1350 - 2000 kg lift cylinders the bleeding hole and the hole for the restriction valve are on opposite sides of the cylinder
- Apply sealant **FD 1042** to the thread
- Tighten with a hook spanner

NOTE!

The drying time for the sealant is four hours, before which the cylinder must not be used.



Lift cylinder

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	290109AA-	
302	RR B1-B3, B1C-B3C/14	290109AA-	
303	RR B4-B6, B4C-B6C/14	290109AA-	
304	RR B7-B8, B7C-B8C/14	290109AA-	
305	RR E1-E3, E1C-E3C/14	290109AA-	
306	RR E4-E6, E4C-E6C/14	290109AA-	
400	RR Cold store cabin	290109AA-	

1. General

There are two different types of lift cylinder. One on masts **with** a valve on the fork carriage and one on masts **without** a valve on the fork carriage.

Instructions for masts **with** a valve on the fork carriage are given here in version 002 of service document S7310.

Instructions for masts **without** a valve on the fork carriage are given in version 001 of service document S7310.

Each mast has two lift cylinders. Each cylinder is fitted with a restriction valve which prevents the forks from falling in the case of a break in the hydraulics.

Lift cylinder

Version no

002

T-code

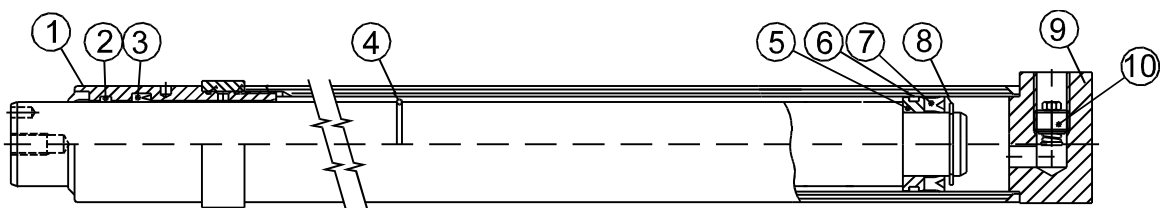
301-306,400

2. Masts with a valve on the fork carriage

2.1. Dismantling the lift cylinder from the mast

- Detach the top of the lifting chain nearest the cylinder and lay it on the floor over the reach carriage
- Remove the lifting chain wheel
- Place the inner guide on blocks approximately 50 cm above the floor
- Lower the free lift cylinder fully
- Detach the connecting pipe from the lift cylinder and the main valve. The cylinder can now be removed
- Plug the connection on the main valve
- Make sure the lifting chain can neither cause damage nor be damaged while the mast is raised fully
- Undo the cylinder from the lower stop
- Undo the upper cylinder support
- Remove the cylinder from the mast

2.2. Dismantling the cylinder



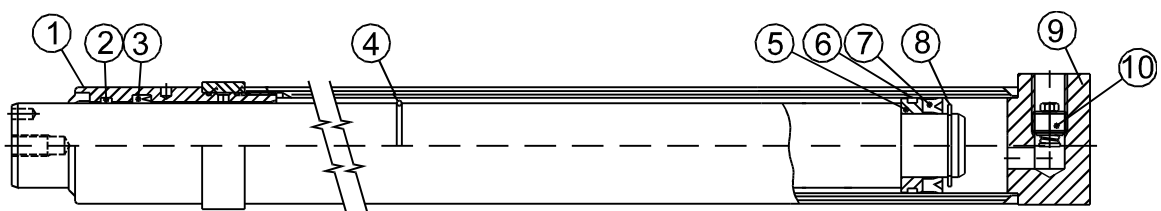
- Remove the cylinder from the mast
- Place the lower stop (9) in a vice, allowing the upper part to rest against a yoke so that the cylinder is lying in a horizontal position
- Tap the top sleeve and the cylinder carefully with a rubber hammer. Heat may be carefully applied, if necessary.
- Unscrew the top sleeve (1) using a pipe wrench 08-15393
- Carefully remove the piston rod from the cylinder making sure not to damage the thread. Place the piston rod on a clean soft surface
- Knock out the top sleeve (1) with a rubber hammer

2.3. Dismantling the piston rod seal, guide ring, guide ring bracket and locking ring from the lift cylinder

- Remove the circlip (8)
- Remove the piston rod seal (7)
- Dismantle the guide ring bracket (5)
- Remove the guide ring (6) from the bracket (5)
- Remove the locking ring (4)

2.4. Assembling the piston rod seal, guide ring, guide ring bracket and locking ring in the lift cylinder

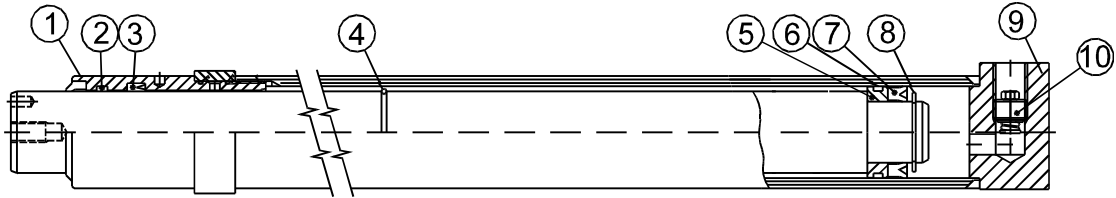
- Fit the locking ring (4) on the piston rod using tool 08-15368, 08-15369 and 08-15370
- Fit the guide ring (6) in the guide ring bracket (5)
- Fit the guide ring bracket (5) on the piston rod
- Place tool 08-15367 in position on the piston rod
- Place the piston rod seal (7) in position on tool 08-15366
- Fit the piston rod seal (7) on the piston rod
- Fit the circlip (8)



2.5. Dismantling and assembly of the restriction valve

Both dismantling and assembly of the restriction valve (10) is done using tool 08-15400.

Lift cylinder



2.6. Assembling the cylinder

- Use tool 08-15364 To fit the piston rod into the cylinder
- Remove assembly sleeve 08-15364
- Fit the top sleeve (1) on the piston rod using a rubber hammer
- Screw the top sleeve (1) to the cylinder a few turns
- Apply sealant **FD 1042** to the thread
- Tighten using tool 08-15391
- On 1350 - 2000 kg lift cylinders the bleeder hole and the hole for the restriction valve are on opposite sides
- Assemble the cylinder in the mast

NOTE! *The drying time for the sealant is four hours, before which the cylinder must not be used.*

2.7. Assembling the cylinder in the mast

- Place the cylinder in the mast
- Screw the cylinder to the lower stop
- Fit the cylinder support
- Place the inner guide on blocks approximately 50 cm above the floor
- Lower the mast
- Remove the plug from the main valve
- Attach the connecting pipe to the cylinder and the main valve
- Raise the forks until the lift cylinder reaches the top beam
- Screw the cylinder to the top beam
- Lower the forks fully
- Assemble the chain wheel and the lifting chain
- Adjust the chain so that it doesn't pull unevenly



Tilt cylinder

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
401	RR N1-N3/15	301518AA-	AC/ACi
402	RR N1C-N3C/15	301518AA-	AC/ACi
403	RR B1-B3/15	301518AA-	AC/ACi
404	RR B1C-B3C/15	301518AA-	AC/ACi
405	RR B5-B6/15	301518AA-	AC/ACi
406	RR B5C-B6C/15	301518AA-	AC/ACi
407	RR B7-B8/15	301518AA-	ACi
408	RR B7C-B8C/15	301518AA-	ACi
409	RR E1-E3/15	301518AA-	AC/ACi
410	RR E1C-E3C/15	301518AA-	AC/ACi
411	RR E5-E6/15	301518AA-	AC/ACi
412	RR E5C-E6C/15	301518AA-	AC/ACi
413	RR E7-E8/15	301518AA-	ACi
414	RR E7C-E8C/15	301518AA-	ACi

Tilt cylinder

1. General

The fork tilt cylinder is situated on the mast behind the fork yokes lower edge.

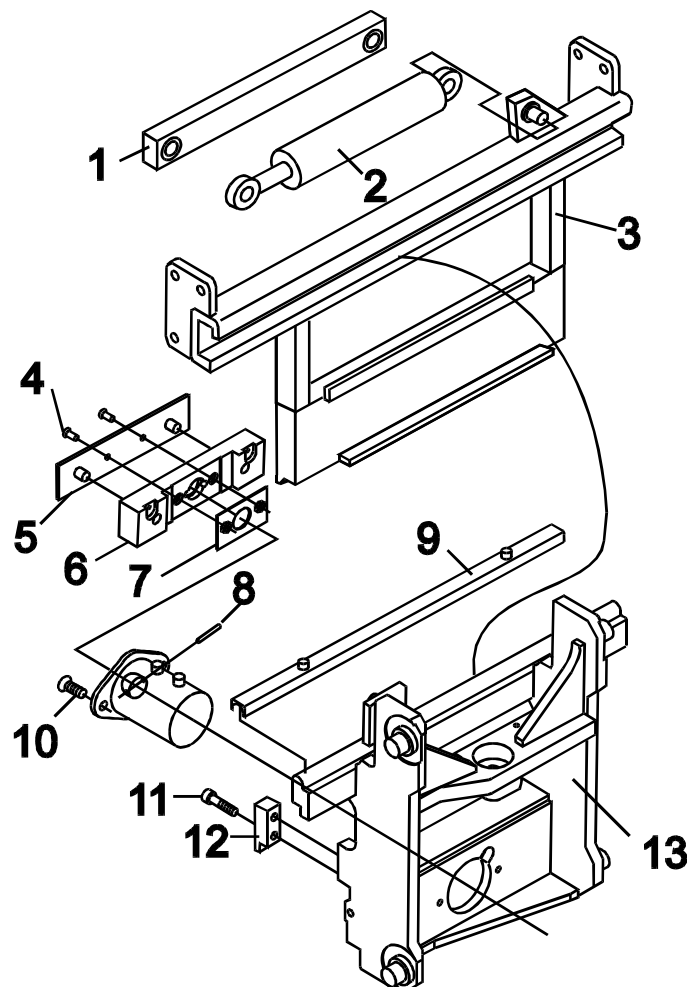
This is a double action cylinder, which means that the piston is moved both in and out by oil pressure. When the piston moves out the fork yokes lower edge moves outwards and tilts the forks upwards.

This document is divided into two sections:
Masts **with** a valve on the fork carriage and
Masts **without** a valve on the fork carriage.

2. Masts with a valve on the fork carriage

2.1. Dismantling the fork carriage

- Raise the fork carriage to a suitable working height
- Remove the forks
- Remove the circlip to dismantle the side-shift (2) or stay (1)
- Undo the screws (11) and remove the stop lugs (12)
- Fasten a cable around the fork yoke (3) and lift it off using a crane
- Undo the screws (4) to remove the plate (5) plus the slide plate (6)
- Undo the screws (10) on the fork carriage (13)
- Remove the tilt cylinder
- Knock out the roll pin (8) and remove the plate (7)



Tilt cylinder

Version no

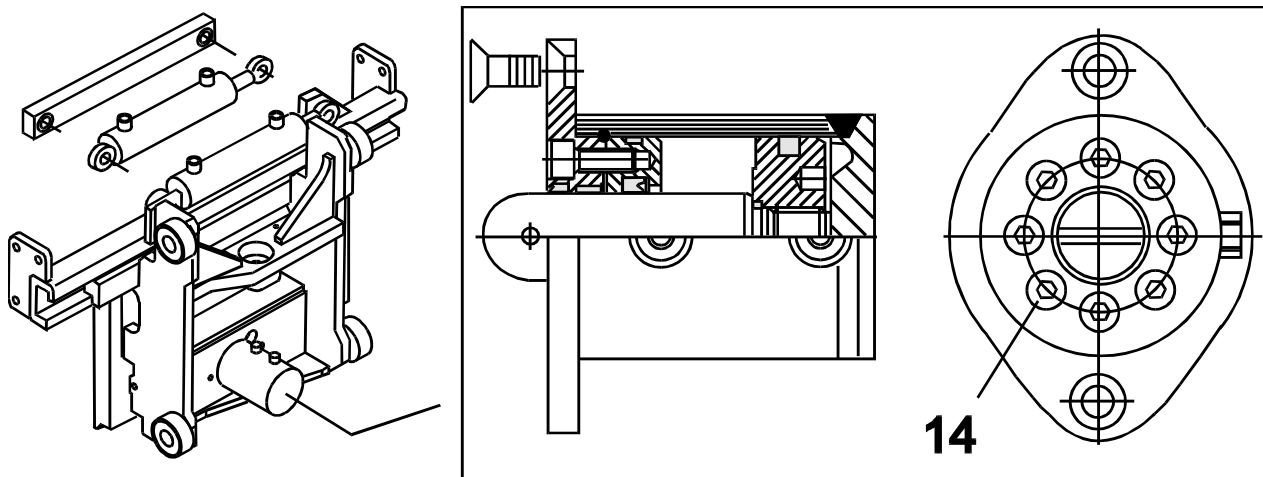
001

T-code

301-307,401-414

2.2. Dismantling the cylinder

- Undo the 8 screws (14)
- Remove the piston rod very carefully from the cylinder so as not to damage the thread. Place the piston rod on a clean soft surface to prevent it being damaged.



2.3. Removing the piston rod seal

- Force a screw driver into the seal without marking the piston in any way

NOTE!

If the piston is scratched at all it must be replaced to avoid leakage.

- Lift the piston rod seal very carefully
- Carefully cut away the piston rod seal with a knife, making sure not to damage the piston

2.4. Dismantling the piston

- Remove the piston rod seal
- Knock and, if necessary, heat the piston
- Unscrew the piston using a pipe wrench 08-15393
- Brush away the old seal

2.5. Assembling the piston

- Apply **OMNI 230** to the thread
- Screw the piston in place using a hook spanner
- Be sure to wipe away all excess adhesive

2.6. Fitting the piston rod seal

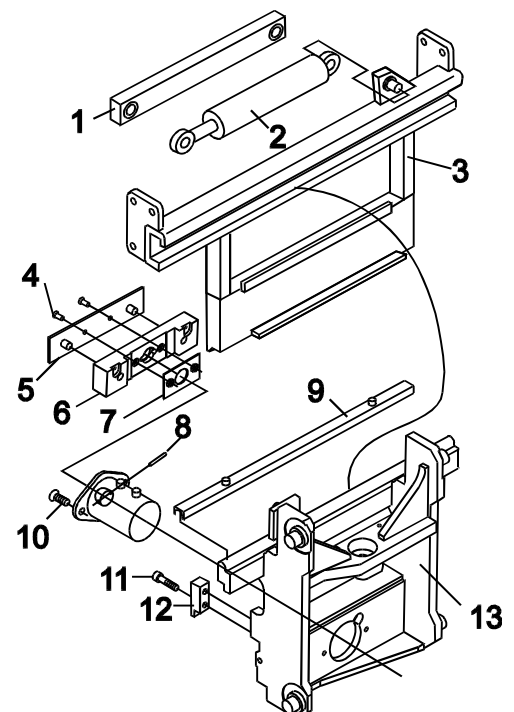
- Fit the piston rod seal carefully

2.7. Assembling the cylinder

- Place the piston rod in the cylinder
- Screw in place with the 8 screws

2.8. Assembling the fork carriage

- Fit the plate (7) and lock in place with the roll pin (8)
- Fit the tilt cylinder with the screws (10)
- Fit the sliding plate (6) and the plate (5) with the screws (4)
- Lift the fork yoke (3) into place using a crane
- Fit the stop lugs (12) with the screws (11)
- Fit the side shift (2) or stay (1)
- Fit the forks



Tilt cylinder

Version no

001

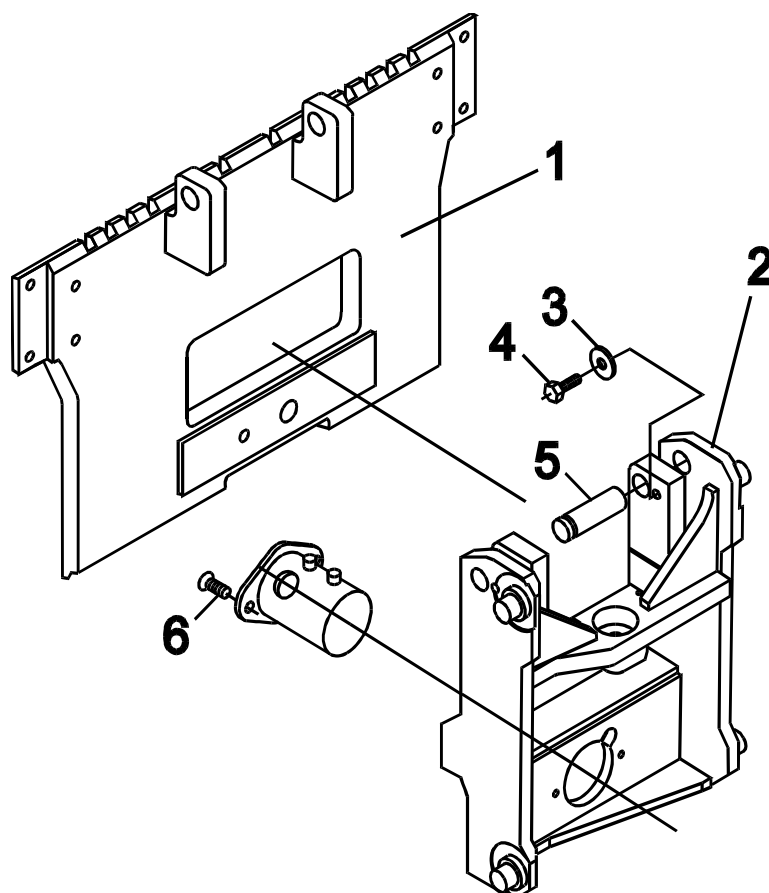
T-code

301-307,401-414

3. Masts without a valve on the fork carriage

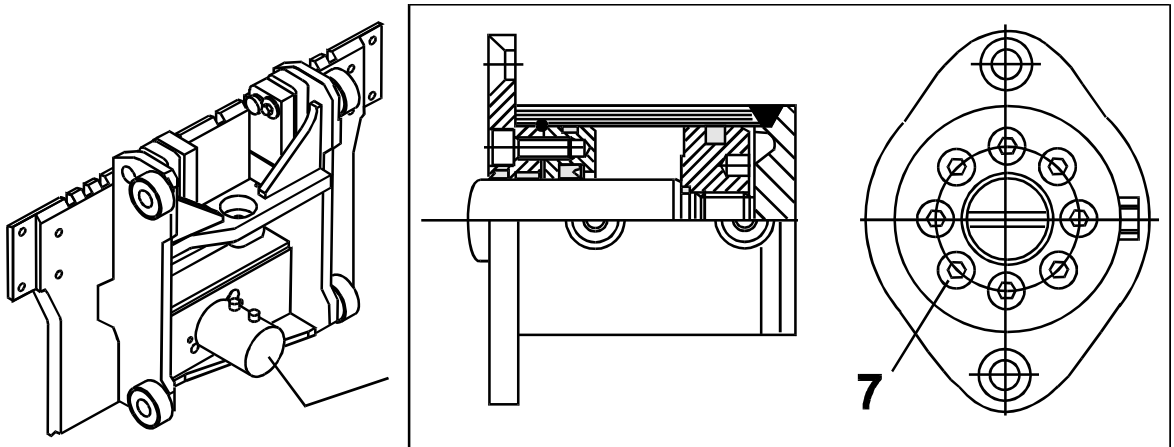
3.1. Dismantling the fork carriage

- Raise the fork carriage to a suitable working height
- Remove the forks
- Lift the fork yoke using a crane
- Remove the screws (4) and washers (3)
- Knock out the axles (5)
- Remove the fork yoke
- Undo the screws (6) and remove the tilt cylinder



3.2. Dismantling the cylinder

- Undo the 8 screws (7)
- Carefully remove the piston rod from the cylinder making sure not to damage the thread. Place the piston rod on a clean soft surface.



3.3. Dismantling the piston rod seal

- Force a screw driver into the seal without marking the piston in any way.

NOTE!

If the piston is scratched at all it must be replaced to avoid leakage.

- Lift the piston rod seal very carefully
- Carefully cut away the piston rod seal with a knife, making sure not to damage the piston

3.4. Dismantling the piston

- Remove the piston rod seal
- Knock and, if necessary, heat the piston
- Unscrew the piston using a pipe wrench 08-15393
- Brush away the old seal

Tilt cylinder

Version no

001

T-code

301-307,401-414

3.5. Assembling the piston

- Apply **OMNI 230** to the thread
- Screw the piston in place using a hook spanner
- Be sure to wipe away all excess adhesive

3.6. Fitting the piston rod seal

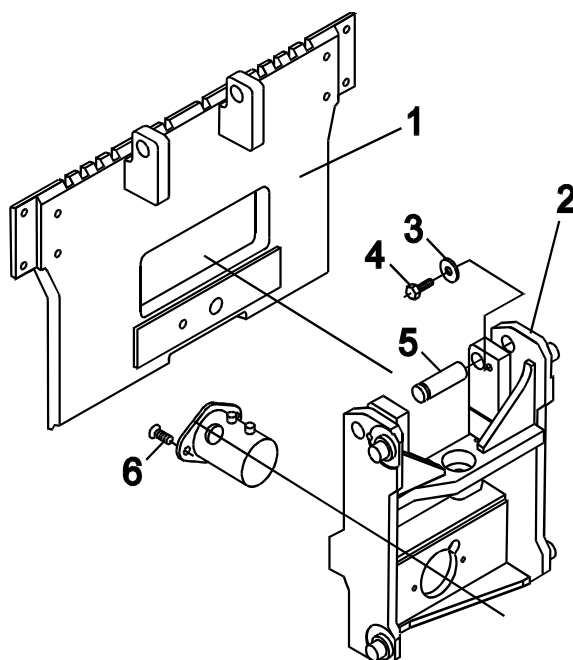
- Fit the piston rod seal carefully

3.7. Assembling the cylinder

- Place the piston rod in the cylinder
- Screw in place with the 8 screws

3.8. Assembling the fork carriage

- Fit the tilt cylinder using the screws (6)
- Lift the fork yoke into place
- Knock the axles (5) into place
- Screw the axles in position using the screws (4) and washers (3)
- Assemble the forks





Reach cylinder

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
401	RR N1-N3/15	301518AA-	AC/ACi
402	RR N1C-N3C/15	301518AA-	AC/ACi
403	RR B1-B3/15	301518AA-	AC/ACi
404	RR B1C-B3C/15	301518AA-	AC/ACi
405	RR B5-B6/15	301518AA-	AC/ACi
406	RR B5C-B6C/15	301518AA-	AC/ACi
407	RR B7-B8/15	301518AA-	ACi
408	RR B7C-B8C/15	301518AA-	ACi
409	RR E1-E3/15	301518AA-	AC/ACi
410	RR E1C-E3C/15	301518AA-	AC/ACi
411	RR E5-E6/15	301518AA-	AC/ACi
412	RR E5C-E6C/15	301518AA-	AC/ACi
413	RR E7-E8/15	301518AA-	ACi
414	RR E7C-E8C/15	301518AA-	ACi

1. General

The reach cylinder is located in the reach carriage.

The reach cylinder is a double action cylinder.

It is the main valve which determines in which direction the cylinder shall move.

Reach cylinder

Version no

T-code

001

301-307,401-414

2. Assembling and dismantling the reach cylinder

Trucks without tilting cab

- Undo the knob to the side of the drivers seat and open the door.
- Unscrew and remove the foot step.

Trucks with tilting cab

Make sure there is sufficient room to tilt the cab before starting work

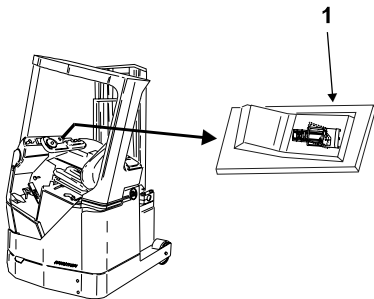


WARNING!

Risk of crushing.

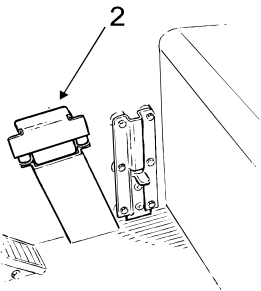
The risk for personal injury is extremely great if anyone is in the motor compartment when the cab is tilted back.

Ensure that no one is in the motor compartment when tilting the cab.



The cab must be tilted 90 degrees for service in the motor compartment. While tilted, only the cabs lift/lower function is operational and then only at crawl speed.

- Press switch (1) to lower the cab while at the same time turning the key. The display shows 6 lines.
- Move the fork lifts hydraulic lever backwards.
- When the cab stops (at 15 degrees), loosen the catch (2) to release the cab.
- Continue pulling the lever backwards until the cab stops (at 45 degrees).



WARNING!

Falling cab!

The cab can fall without dampening when tilted over 45 degrees.

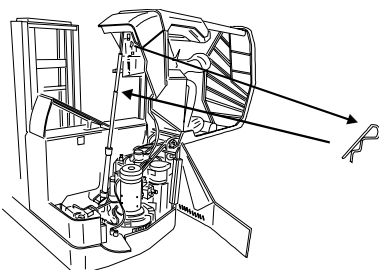
The cab is heavy so make sure the person receiving the cab is in control of the situation. Use crane if possible.

- Take hold of the protective roof and tilt the cab to 90 degrees

NOTE!

Falling cab!

Insert the pin (which is located under the seat) in the cylinder piston to avoid the cab accidentally falling backwards during service.





3. Dismantling

- Swing open the door
- Detach the foot step from the foot step cylinder
- Unscrew the return hose from the tank
- Plug the return hose at the tank
- Remove contacts X18 and X19 from the contact plate
- Unscrew and remove the hoses from the reach cylinder
- Unscrew and remove the upper left screw on the cover plate
- Unscrew and remove the screws holding the pins
- Fasten a lifting eye bolt or similar to the pins
- Pull out the pins
- Remove the reach cylinder
- Remove the bracket for the magnet and rod from the piston
- Unscrew and remove the aluminium profile from the cylinder

3.1. Dismantling the cylinder

- Place the lower stop in a vice, allowing the upper part to rest against a yoke so that the cylinder is lying in a horizontal position.
- Knock the piston rod housing carefully with a rubber hammer
- Unscrew the piston rod housing using a pipe wrench
- Carefully remove the piston rod from the cylinder making sure not to damage the thread. Place the piston rod on a clean soft surface
- Knock out the top sleeve with a rubber hammer.

3.2. Dismantling the piston rod seal and support ring

- Force a screw driver into the seal without marking the piston in any way

NOTE!

If the piston is scratched at all it must be replaced to avoid leakage.

Reach cylinder

- Lift the piston rod seal very carefully
- Carefully cut away the piston rod seal with a knife, making sure not to damage the piston
- Remove the support ring

3.3. Assembling the piston rod seal and support ring

- Fit the support ring and the piston rod seal on the piston

3.4. Dismantling the piston

- Remove the piston rod seal plus the support ring
- Knock and, if necessary, heat the piston
- Unscrew the piston using a pipe wrench
- Brush away the old sealant

3.5. Assembling the piston

- Apply **OMNI 230** to the thread
- Screw the piston in place using a hook wrench
- Be sure to wipe away all excess adhesive

3.6. Assembling the cylinder

- Place the piston rod in the cylinder
- Fit the top sleeve on the piston rod using a rubber hammer
- Screw the top sleeve to the cylinder a few turns
- Apply sealant **FD 1042** to the thread
- Tighten using tool a hook wrench
- Fit the cylinder in the truck

NOTE!

The drying time for the sealant is four hours, before which the cylinder must not be used.



4. Assembly

- Fit the aluminium profile on the cylinder
- Fit the magnet and rod on the piston
- Assemble the reach cylinder
- Knock in the pins
- Screw in the screws holding the pins in place
- Screw on the cover plate
- Attach contacts X18 and X19 to the contact plate
- Fit the hoses to the cylinder
- Fit the return hose to the tank

Truck with tilting cab

Ensure that no one is in the motor compartment when tilting the cab.



WARNING!

Risk for crushing!

The risk for personal injury is extremely great if anyone is in the motor compartment when tilting the cab.

Ensure no one is in the motor compartment when tilting the cab.

- Remove the pin from the cylinder piston.
- Take hold of the protective roof and tilt the cab to the 45 degree position.
- Move the fork lifts hydraulic lever forwards until the cab comes to rest in the lower position.

Truck without tilting cab

- Screw the foot step in place
- Close the door and tighten the knob

F-code Section C-code
RT **S7** **7330**

Reach cylinder

Version no T-code
001 **301-307,401-414**



Free lift cylinder

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
401	RR N1-N3/15	301518AA-	AC/ACi
402	RR N1C-N3C/15	301518AA-	AC/ACi
403	RR B1-B3/15	301518AA-	AC/ACi
404	RR B1C-B3C/15	301518AA-	AC/ACi
405	RR B5-B6/15	301518AA-	AC/ACi
406	RR B5C-B6C/15	301518AA-	AC/ACi
407	RR B7-B8/15	301518AA-	ACi
408	RR B7C-B8C/15	301518AA-	ACi
409	RR E1-E3/15	301518AA-	AC/ACi
410	RR E1C-E3C/15	301518AA-	AC/ACi
411	RR E5-E6/15	301518AA-	AC/ACi
412	RR E5C-E6C/15	301518AA-	AC/ACi
413	RR E7-E8/15	301518AA-	ACi
414	RR E7C-E8C/15	301518AA-	ACi

1. General

The free lift cylinder is the centre most cylinder on the mast.

The free lift cylinder is fitted with a restriction valve which prevents the load from falling in the case of a break in the hydraulics.

Free lift cylinder

Version no

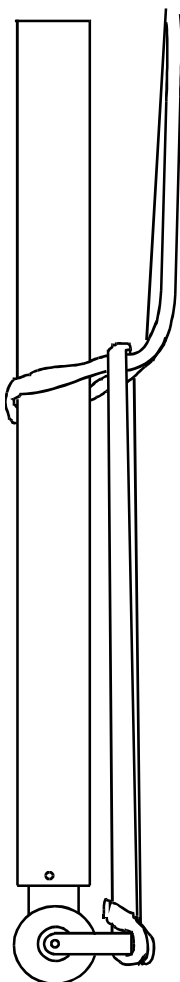
001

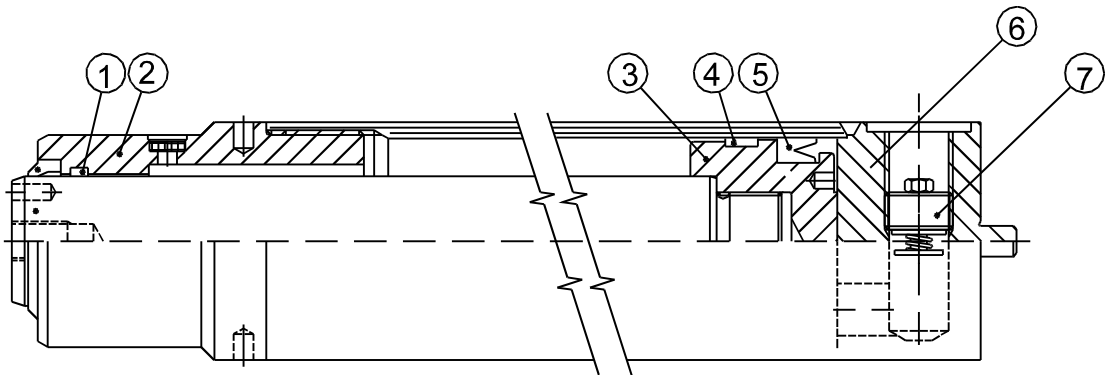
T-code

301-307,401-414

2. Dismantling

- Remove the feeder pipe from the free lift cylinder
- Plug the free lift cylinder
- Loosen the screws holding the free lift cylinder on it's upper side
- Lift the inner guide with the help of a crane so that the double/triple hoses slacken
- Remove the double/triple hoses from the hose reel on the free lift cylinder
- Place blocks under the fork yoke
- Lower the crane so that the fork yoke is resting on the blocks and the free lift chain slackens
- Tie up the chains so that they cannot slide out of the upper chain wheels
- Remove the inner cotter pin on the free lift chain cotter
- Remove the free lift chain cotter
- Remove the free lift chain from the free lift cylinder
- Remove the chain stretcher from the free lift cylinder
- Attach the cable to a crane
- Remove the screws holding the free lift cylinder on it's upper side
- Lift the free lift cylinder down





2.1. Dismantling the cylinder

- Place the lower stop (6) in a vice, allowing the upper part to rest against a yoke so that the cylinder is lying in a horizontal position
- Tap the top sleeve (2) carefully with a rubber hammer. Heat may be carefully applied, if necessary
- Unscrew the top sleeve (2) using a pipe wrench 08-15393
- Carefully remove the piston rod from the cylinder making sure not to damage the thread. Place the piston rod on a clean soft surface
- Knock out the top sleeve (2) with a rubber hammer

3. Dismantling the piston rod seal and support ring

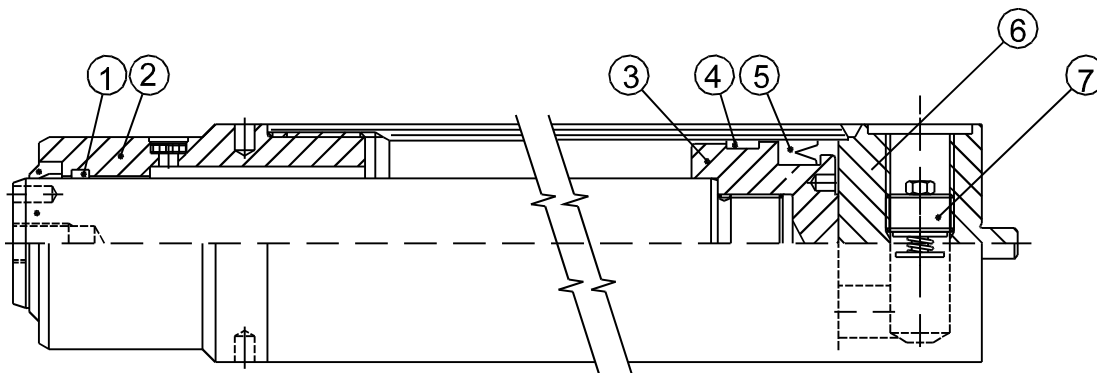
- Force a screw driver into the seal (5) without marking the piston (3) in any way

NOTE!

If the piston is scratched at all it must be replaced to avoid leakage.

- Lift the piston rod seal (5) very carefully
- Carefully cut away the piston rod seal (5) with a knife, making sure not to damage the piston (3)
- Remove the support ring (4)

Free lift cylinder



3.1. Assembling the piston rod seal and support ring

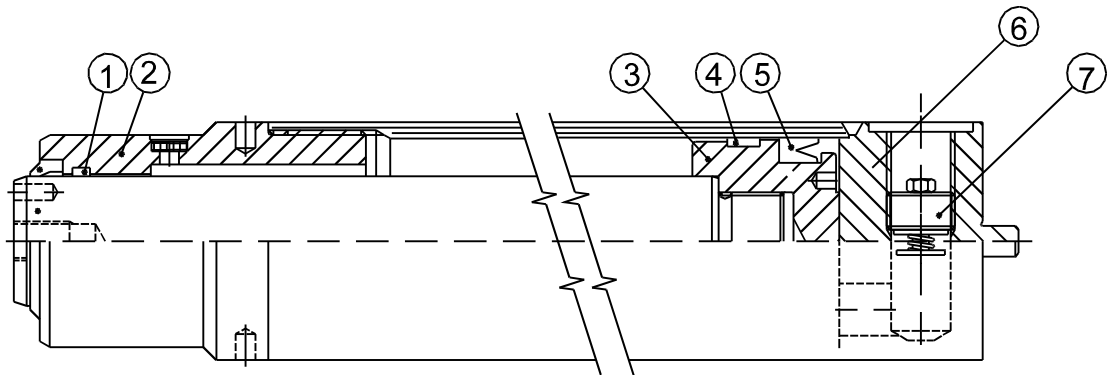
- Fit the support ring (4) on the piston (3)
- Fit the piston rod seal (5) on the piston (3) using tools 08-15418 and 08-15419

4. Dismantling the piston

- Remove the piston rod seal (5) plus the support ring (4)
- Knock and, if necessary, heat the piston (3)
- Unscrew the piston (3) using a pipe wrench 08-15393
- Brush away the old sealant

4.1. Assembling the piston in the free lift cylinder

- Apply **OMNI 230** to the thread
- Screw the piston (3) in place using assembly tool 08-15390
- Be sure to wipe away all excess adhesive



5. Dismantling and assembling the restriction valve

- Dismantle the restriction valve (7) using tool 08-15417
- Assemble the restriction valve (7) using tool 08-15417

6. Assembling the cylinder

- Position the assembly sleeve 08-15365 on the cylinder
- Place the piston rod in the cylinder
- Remove the assembly sleeve
- Fit the top sleeve (2) on the piston rod using a rubber hammer
- Screw the top sleeve (2) to the cylinder a few turns
- Apply sealant **FD 1042** to the thread
- Tighten using hook wrench 08-15391

NOTE! *The drying time for the sealant is four hours, before which the cylinder must not be used.*

Free lift cylinder

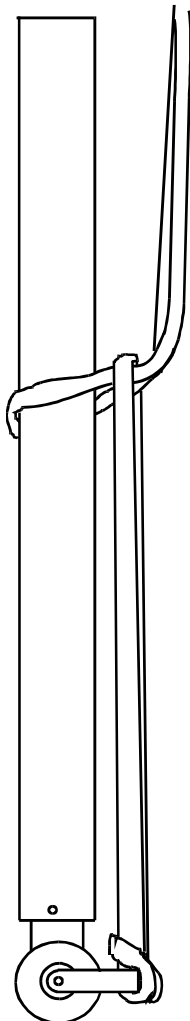
Version no

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T-code

301-307,401-414

7. Assembly



- Attach a cable to the free lift chain console at the free lift cylinder end plus a cable around the free lift cylinder (see illustration)
- Lift the free lift cylinder to it's correct position
- Screw the free lift cylinder in place
- Remove the crane
- Fit the chain stretcher
- Assemble the free lift chain and cotter
- Fit the cotter pin
- Untie the straps holding the free lift chain
- Lift the inner guide using a crane
- Assemble the double/triple hoses on the free lift cylinders hose reel
- Remove the crane
- Remove the plug from the free lift cylinder
- Attach the feeder pipe to the free lift cylinder

F-code
RTSection
S9C-code
9390**Position sensors**Issued by
PartsApproved by
H.ForsmanVersion no
001T-code
301-307,400-414

Position sensors

Valid from serial number:

T-code	Model	Serial No	Notes
301	RR N1-N3, N1C-N3C/14	265200AA-	
302	RR B1-B3, B1C-B3C/14	265200AA-	
303	RR B4-B6, B4C-B6C/14	265200AA-	
304	RR B7-B8, B7C-B8C/14	265200AA-	
305	RR E1-E3, E1C-E3C/14	265200AA-	
306	RR E4-E6, E4C-E6C/14	265200AA-	
307	RR E7-E8, E7C-E8C/14	265200AA-	
400	RR Cold store cabin	265200AA-	
401	RR N1-3/15	301518AA-	AC/ACi
402	RR N1-3C/15	301518AA-	AC/ACi
403	RR B1-3/15	301518AA-	AC/ACi
404	RR B1-3C/15	301518AA-	AC/ACi
405	RR B5-6/15	301518AA-	AC/ACi
406	RR B5-6C/15	301518AA-	AC/ACi
407	RR B7-8/15	301518AA-	ACi
408	RR B7-8C/15	301518AA-	ACi
409	RR E1-3/15	301518AA-	AC/ACi
410	RR E1-3C/15	301518AA-	AC/ACi
411	RR E5-6/15	301518AA-	AC/ACi
412	RR E5-6C/15	301518AA-	AC/ACi
413	RR E7-8/15	301518AA-	ACi
414	RR E7-8C/15	301518AA-	ACi

Position sensors

1. General

This chapter deals with height indication and height selection.

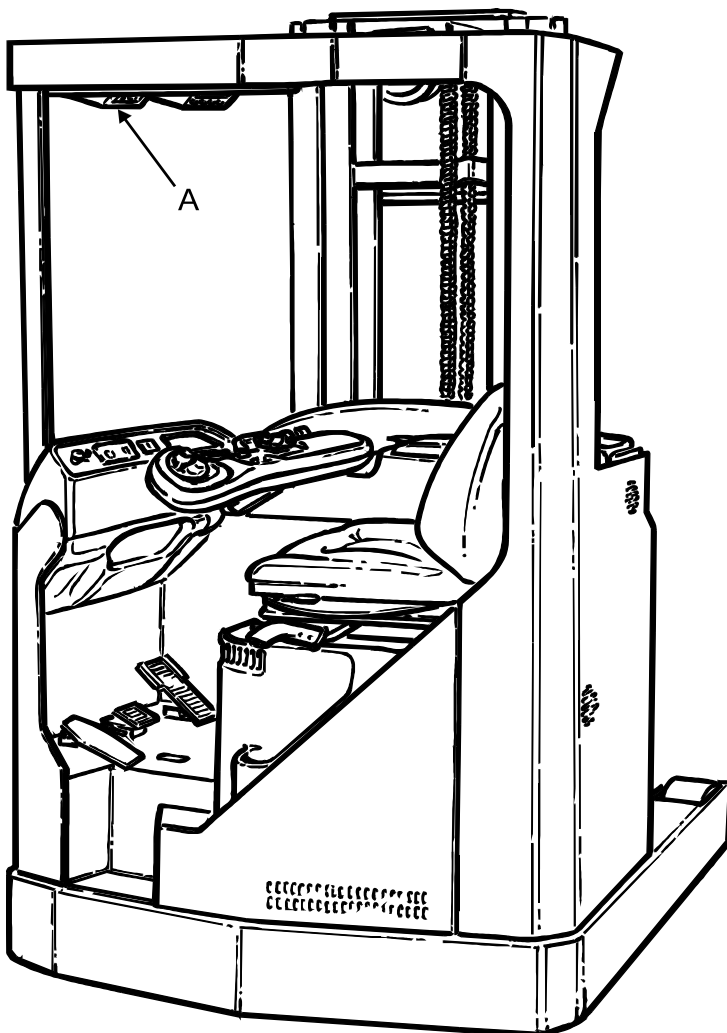
The height indication system consists of a tachometer which measures impulses on a wire and transmits them to the electronic card. The electronic card sends the signals to a display showing the height of the forks.

The height selector receives impulses from the height indicator. The height selector can be programmed for the height at which the forks shall stop when collecting or depositing a load.

2. Height indication

Trucks with high lifting heights are equipped with a height indicator which shows the current height of the forks within the main lifting zone.

Character window (A) displays the fork height, based on information from the height meter.



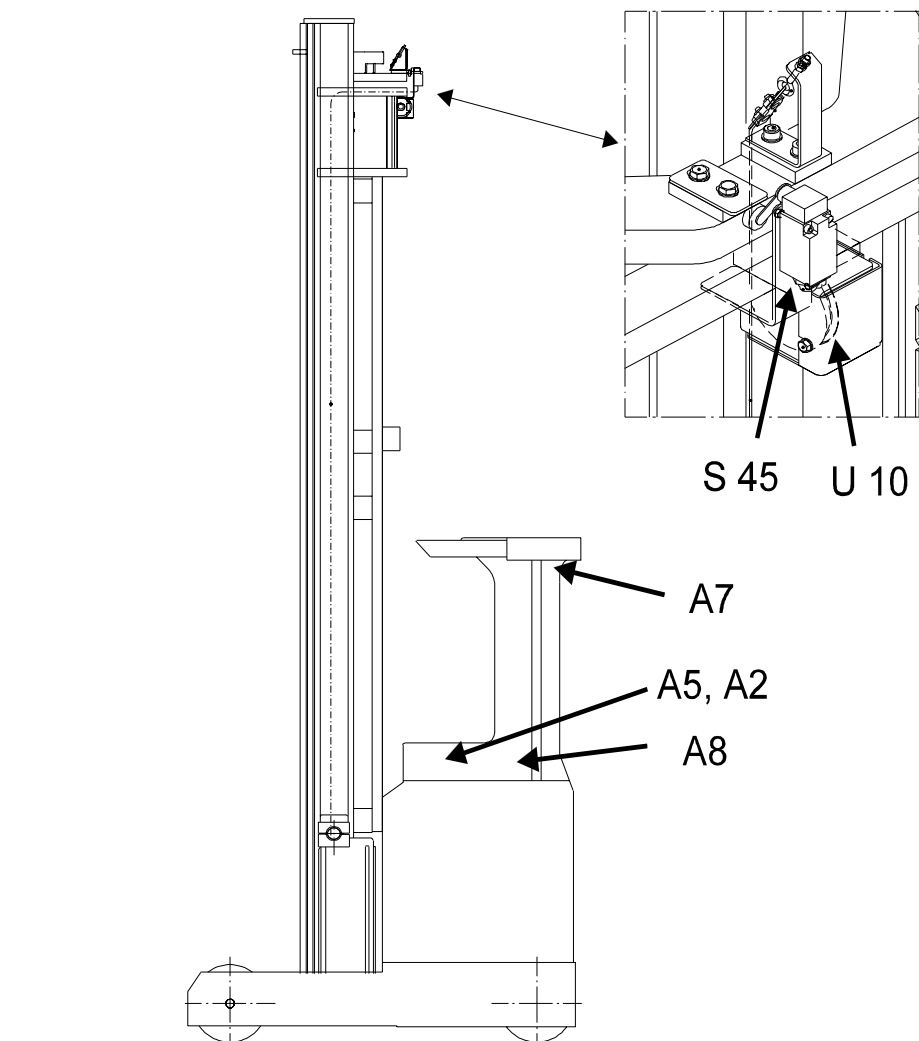


3. Operation

Measurement begins in the main lifting zone when reference switch (S45) is activated and sends a signal to the electronic card (A5). The pulse sensor (U10) sends pulses to A5 which starts by indicating the preprogrammed free lift height on the display (A8). The pulse transmitter has two channels, A and B, which give signals at 90° to each other. This gives information to A5 on whether the forks are up or down. For connecting, see chapter 5000 "Electrical diagrams".

For programming the free lift height, see chapter 5710 "Programming parameters".

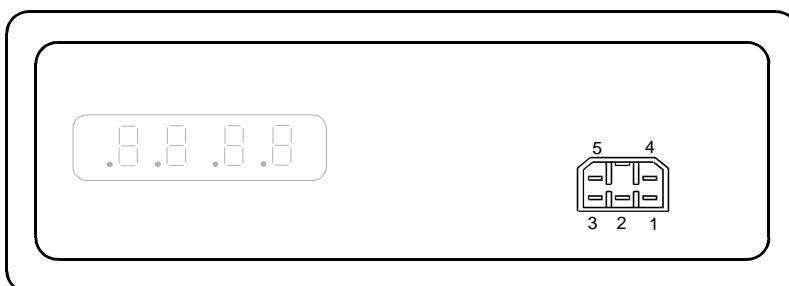
The steel wire should be wound once around the measurement wheel and stretched so that it does not slip.



Position sensors

4. Display

The diagram shows the rear of the display for height indication and the table describes the contactor's terminal number where **I stands for Input**.



Terminal Number	Connector	Function
1		
2	I	RX (-) receives data
3	I	+ 48 V
4	I	Minus
5	I	RX (+) receives data

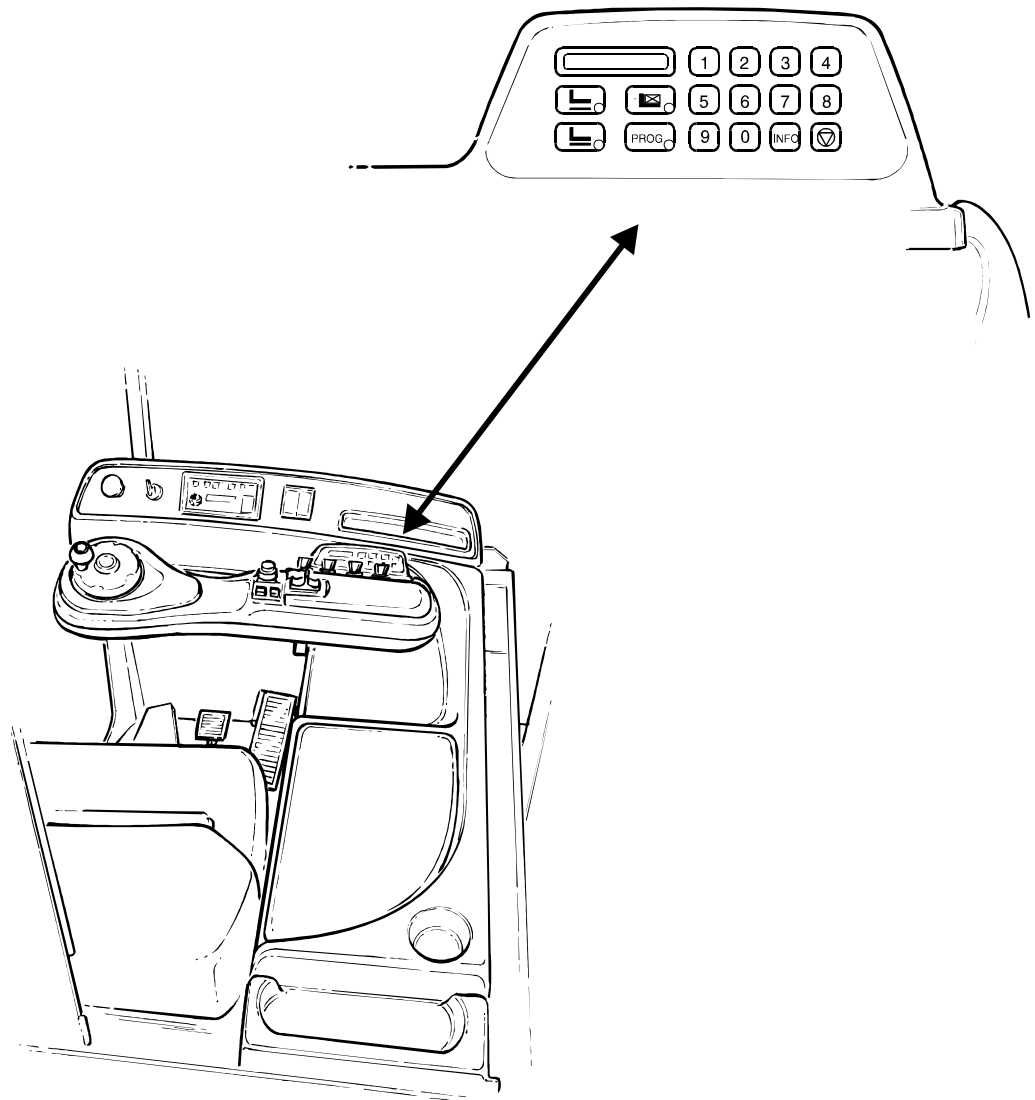


5. Preset height

By using the preset height the operator can lift and lower the forks to a maximum of 99 different programmable levels within the main lifting zone.

Based on height information obtained from the height meter, the lift and lowering mechanism is controlled to stop at the required level. Depositing or collecting the load takes place manually.

The correct height for collecting or depositing the load is programmed via the keyboard. The selected level can be read from the display which also indicates any error codes.



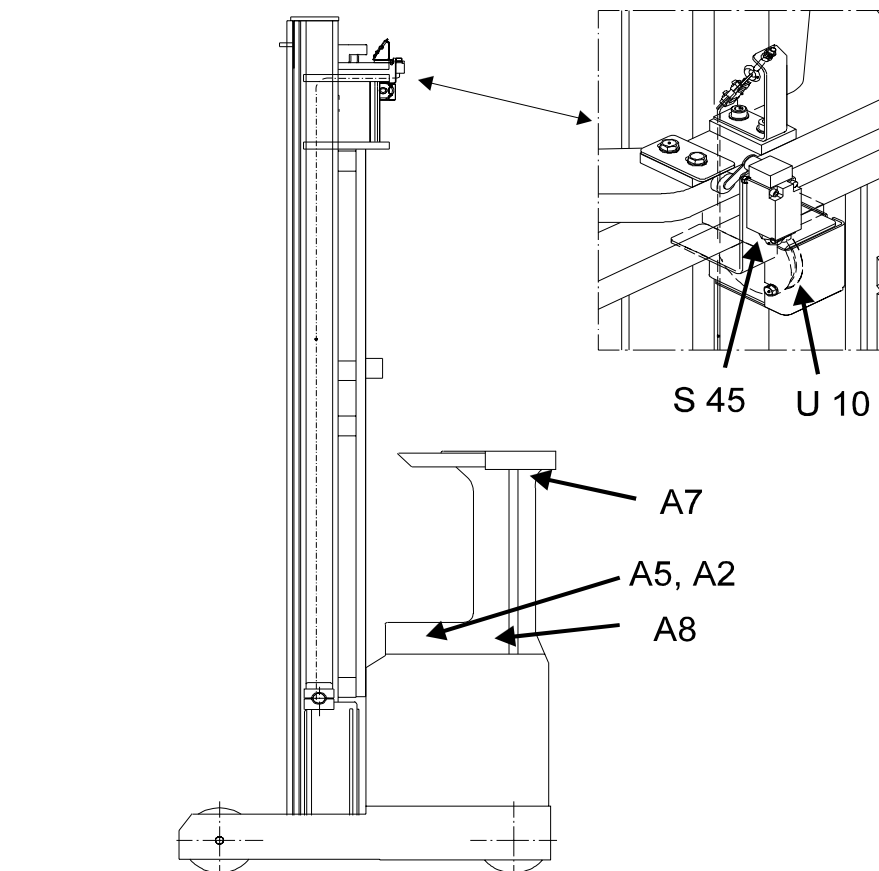
Position sensors

6. Operation

Measurement starts in the main lifting zone when the reference switch (S45) is activated and sends a signal to electronic card (A5). The pulse sensor (U10) sends pulses to A5 which starts by indicating the preprogrammed free lift height on displays (A7 and A8). The forks stop at the first preprogrammed height when A5, via the pulse sensor (U10) receives the right height. Stopping occurs through A5 controlling the speed of the pump motor with A2 and the valves for lifting/lowering the forks. The operator collects/deposits the load manually. When the operator once again presses the hydraulic control for lifting/lowering, the forks move to the next preprogrammed level. The pulse sensor has two channels, A and B, which give signals at 90° to each other. This gives information to A5 on whether the forks are moved up or down. For connection, see chapter 5000 Electrical diagrams.

For programming the free lift height, see chapter 5710 Programming parameters.

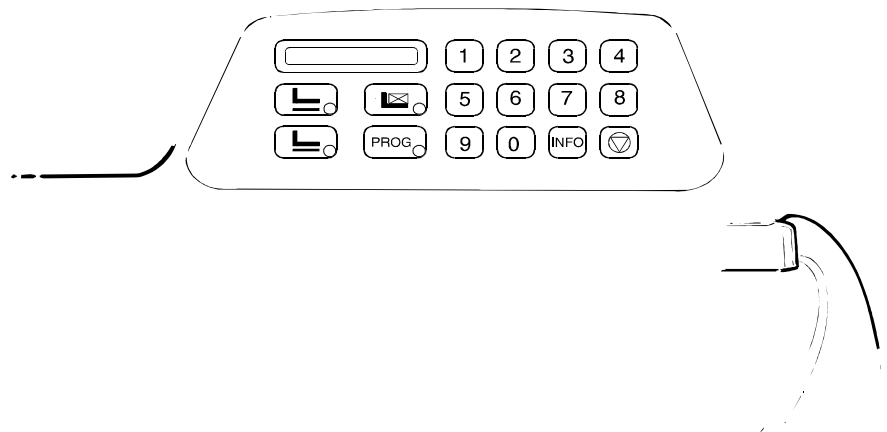
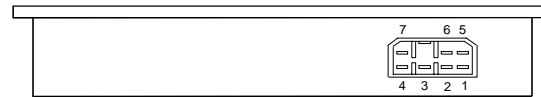
The steel wire should be wound once around the measurement wheel and stretched so that it does not slip.





7. Display

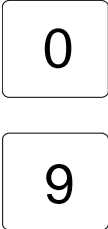






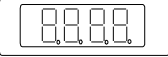
The diagram shows the rear of the display for preset height and the table describes the contactor's terminal number where **I** stands for **Input** and **O** stands for **output**.



Terminal Number	Connector	Function
1	O	TX (+) transmits data
2		
3	I	RX (+) receives data
4	I	+ 48V
5	O	TX (-) transmits data
6	I	Minus
7	I	RX (+) receives data

Position sensors

7.1. Description of the display symbols

Symbol	Function
	Numerical push-buttons for setting height levels
	To control the required height level while driving
	STOP Deletes incorrectly entered height levels in automatic mode, stops programming and removes stops due to error
	Save "LEAVE level" when programming
	Save "COLLECT level" when programming
	LOAD Push-button to indicate that there is a load on the forks when starting
	Push-button to access programming routines
	Display to indicate height levels and error codes

8. Assembly of height preset

- Undo the 11 screws holding the lower panel in place and remove it
- Remove the plastic plugs and remove the plastic console from the cavity for the height preset
- Screw the height preset in place
- Connect the contactor
- Screw the lower panel back in place with the 11 screws

9. Programming

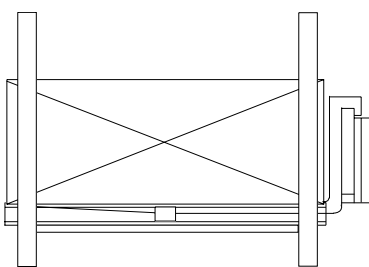
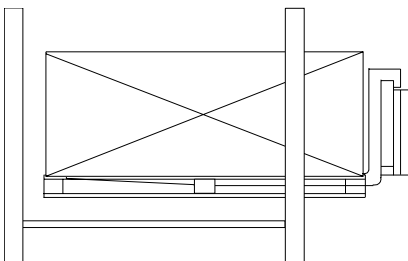
Press the PROG button briefly to enter the programming mode. The LED in the button comes on and the display shows PL00 when the programming routine has been started. You can now program new lifting heights, modify or delete programmed values.

9.1. Programming a level

Programming of lift heights can only take place within the main lifting zone.

NOTE!

***Forks not horizontal.
The load can slide off the forks or catch on the rack.
When the load is deposited or collected the forks must always be horizontal.***

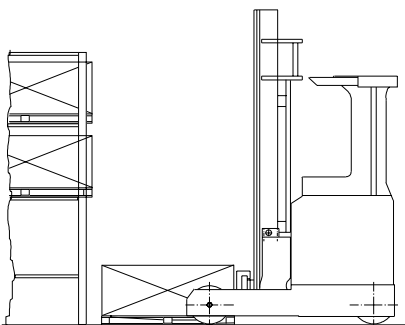


9.1.1. Collection level

- Enter programming mode and state the required level (e.g. 1+5= level 15). The numbers are shown on the display
- Lift the forks to the required level and press the button COLLECT. The LED flashes

9.1.2. Leaving level

- Pick up the load and wait three seconds. Lift the forks just enough so that the pallet can be removed from the rack. Ensure that there is sufficient space for safe handling
- Now press the LEAVE button and both LEDs for collecting and leaving will start to flash
- Press the PROG button until both LEDs go out and the display indicates PL00, to save the information
- Repeat from "LEAVE " level to program more levels
- Press STOP to return to display mode



Position sensors

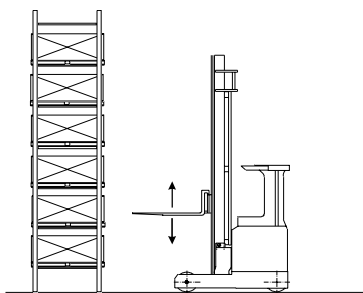
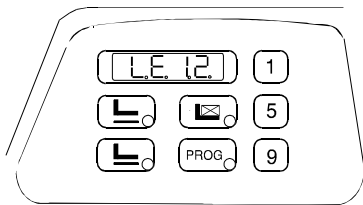
9.2. Erasing programmed levels

Lower the forks to the free lift zone when deleting lifting heights.

- Enter the programming mode and state the required level (e.g. 1+5= level 15). The numbers are shown on the display
- Press the COLLECT button (the LED flashes) and then press the LEAVE button (both LEDs start to flash)
- Press the PROG button until both LEDs (COLLECT and LEAVE) stop flashing and the display shows PL00 to erase the memory
- Press the STOP button to return to the display mode

10. Automatic operations

There are two different automatic operating modes. One where the forks are raised/lowered to the required level without a load and the other, with a load.



10.0.1. Collect load

- State the required height level using buttons 0-9, (e.g. 1+2= level 12). The display will show LE12
- Raise/lower the forks until they are automatically stopped by the electronics. If the wrong direction is chosen no "raise/lower movement" will take place. The electronics expect the correct direction to be selected
- When the forks stop and the LED, COLLECT comes on, the forks can be manoeuvred under the load

NOTE!

Forks not horizontal.

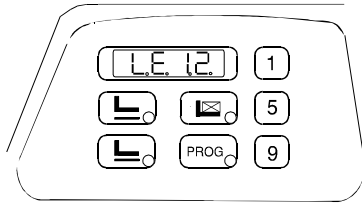
The load can slide off the forks or catch on the rack.

When the load is deposited or collected the forks must always be horizontal.

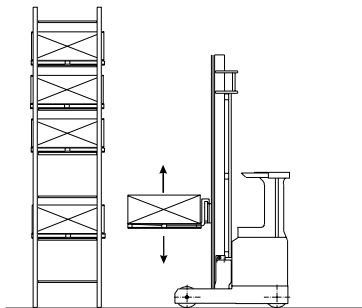
- Raise the forks until they are automatically stopped by the electronics and the LED, LEAVE, comes on
- Move the load from the rack. When the work cycle has been completed the LEDs will go out



10.0.2. Leaving a load



- Press the load button (the LED now comes on)
- State the required height level using buttons 0-9, (e.g. 5=level 5. The display will show LE05)
- Raise/lower the forks until they are automatically stopped by the electronics. If the wrong direction is chosen no “raise/lower movement” will take place. The electronics expect the correct direction to be selected
- When the forks stop and the LED, LEAVE comes on, the forks can be slid out from under the load



NOTE!

Forks not horizontal.

The load can slide off the forks or catch on the rack.

When the load is deposited or collected the forks must always be horizontal.

- Lower the forks until they are automatically stopped by the electronics and the LED, COLLECT comes on
- Remove the forks from the rack. When the work cycle has been completed the LEDs will go out

10.0.3. Control

- Press the button INFO to check the required “collect/leave level”. The value will be shown for three seconds on the display

Position sensors

11. Parameters

There are a number of parameters that can be modified in the preset height program.

- Press the button PROG for three seconds to start programming routines. The LED comes on and the display shows P _ _ _
- Enter code 852 using the numerical keys and the display will now show P _
- State the required parameter 1-9 and then press the LOAD button. The display shows the factory settings. These can be changed to any of the max/min. values shown in the table “Programming parameters”

NOTE!

If a value outside the max/min. range is programmed in, this will be replaced by the max/min. factory setting.

- Press the STOP button to complete programming

P1

Select the unit of measurement you wish to use (metres or inches). Press the PROG button to save the unit you selected. The display shows P _

P2

If the distance between lifting heights is equal on all levels, you can make a common program:

- State parameter 2 and press the LOAD button. The display shows P 00 and you now enter the number of levels. Press the LOAD button and the display shows P000
- Enter the “collect height” for the first level, in steps of 10 mm. Press the LOAD button, the display shows P000
- The next value to be entered is the distance between the collect and leave levels, in steps of 10 mm. Press the LOAD button, the display shows P000
- The last value to be entered is the distance between each level in steps of 10 mm. Press the PROG button to save the programmed values. The display shows P _



P3

Programming the crawling speed for braking distances:

- State parameter 3 and press the LOAD button. The display shows the previously programmed value for the crawling speed **lower**. Enter the new value using the numerical keys. The permitted max/min. values are shown in the table “Programming parameters”
- Press the LOAD button to change the crawling speed **lift**. The display shows the value for the crawling speed. Enter the new value using the numerical keys
- Press the PROG button to save the new values. The display shows P_

P4

Programming the crawling distance when lifting and lowering.

- State parameter 4 and press LOAD button. The display shows the previous value for crawling distance **lower**. Enter the new value using the numerical keys. The permitted max/min. values are shown in table “Programming parameters”
- Press the LOAD button to change the crawling distance **lift**. The display shows the value for the crawling distance. Enter the new value using the numerical keys
- Press the PROG button to save the new values. The display shows P_

P5

Programming the tolerance for the “stop levels”.

- State parameter 5 and press LOAD button. The display shows the previous value for tolerance. Enter the new value using the numerical keys. The permitted max/min. values are shown in table “Programming parameters”
- Press the PROG button to save the new values. The display shows P_

Position sensors

P7

Programming the largest and smallest permitted programming distance between the levels collect and leave.

- State parameter 7. The display shows the previously programmed value for the minimum distance. Enter the new value using the numerical keys, (e.g. 030 = 30 mm). The permitted max/min. values are shown in table "Programming parameters"
- Press the LOAD button. The display shows the previously programmed value for the maximum distance. Enter the new value using the numerical keys (e.g. 150 = 150 mm)
- Press the PROG button to save the new values. The display shows P_

P8

Reset all the parameters to the factory settings.

NOTE!

Reset all factory settings after upgrading to a new program version.

- State parameter 8 and press the LOAD button. The display shows no value
- Press the PROG button until the display stops showing PP. Turn the ignition key on and off to start the new program

P9

- Programming the "leave/collect level's" braking distance
- State parameter 9 and press the LOAD button. The display shows the braking distance for **lower**. Enter the new value using the numerical keys, (e.g. 050 = 500 mm)
- Press the LOAD button. The display shows the braking distance for **lift**
- Enter the new value using the numerical keys, (e.g. 030 = 300 mm)
- Press the PROG button to save. The display shows P_

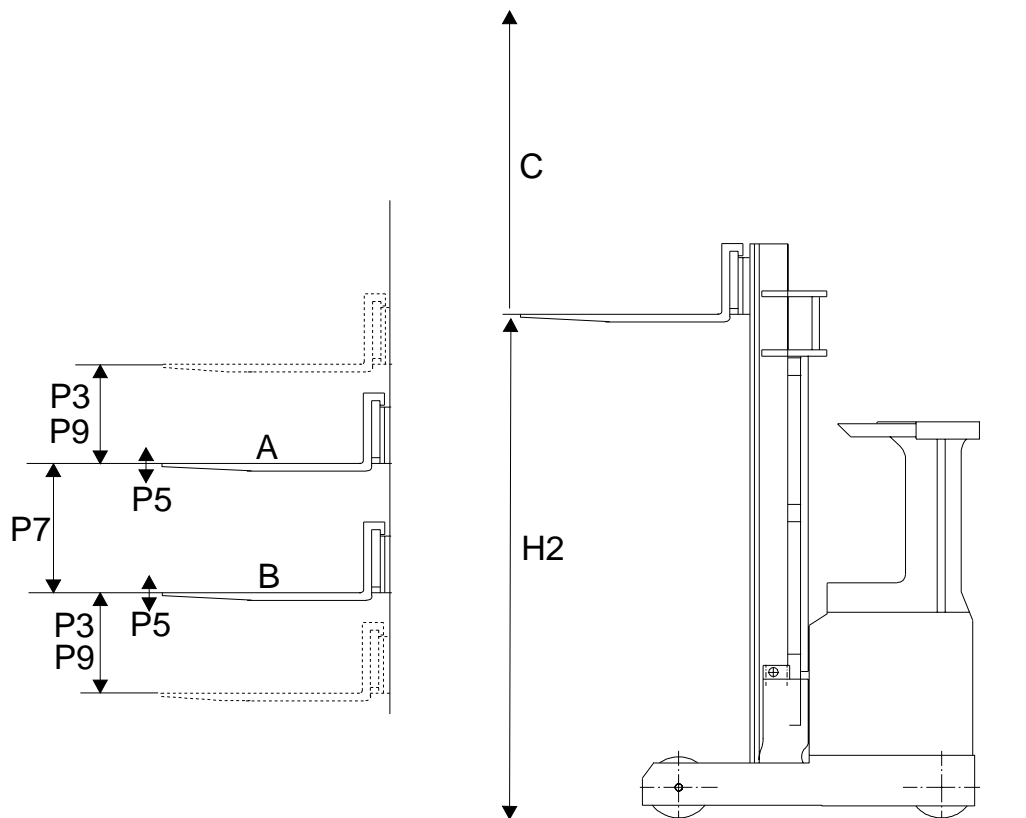


12. Programming parameters

Parameter Number	Max/min value	Factory value	Unit	Function
P1	001 002		m - 10 mm inch - 10ths of an inch	Unit of measurement
P2	1 - 99 0 - 999 0 - 255 0 - 999		10 mm 10 mm 10 mm	Programming of several levels at equal collect/leave distances. Number of levels Distance first "collect level" Distance collect-leave Distance between "leave levels"
P3	0 - 127 0 - 127	030 010	% of max speed	Crawling speed before stop Lower Lift
P4		010 005	mm	Crawling speed before stop Lower Lift
P5	0 - 255	010	mm	Permitted error tolerance in stop position
P7	0 - 255 0 - 255	030 150	mm	Min/max distance between leave/collect
P8				Resetting of all values to factory settings
P9	0 - 255 0 - 255	050 030	10 mm 10 mm	Braking distance before stop Lower Lift

Position sensors

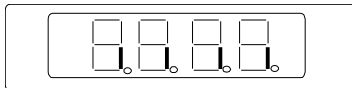
Position	Function
A	Leave level
B	Collect level
C	Main lifting zone
H2	Free lifting zone



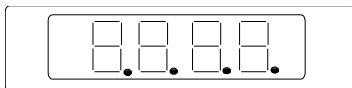


13. Error codes

Error code	Remarks
Err 1	Requested height level not programmed or incorrect
Err 2	Forks have stopped outside the tolerance zone (P5)
Err 9	Incorrect value entered when programming
Err flashing	Fault in communication between height preset and truck computer



- Four lines appear first. This shows that there has been no communication between the height preset and the main electronics. The lines will disappear when communication is restored between the units



- Four dots appear on the display when the forks are in the free lift zone
- If the dots are flashing it is an indication that the reference switch was activated when the truck was started (e.g. the forks were above the free lift zone). If the dots continue to flash after the forks have been lowered a fault may have occurred in the wiring harness or the height reference switch

F-code Section C-code
RT **S9** **9390**

Position sensors

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001 **301-307,400-414**
