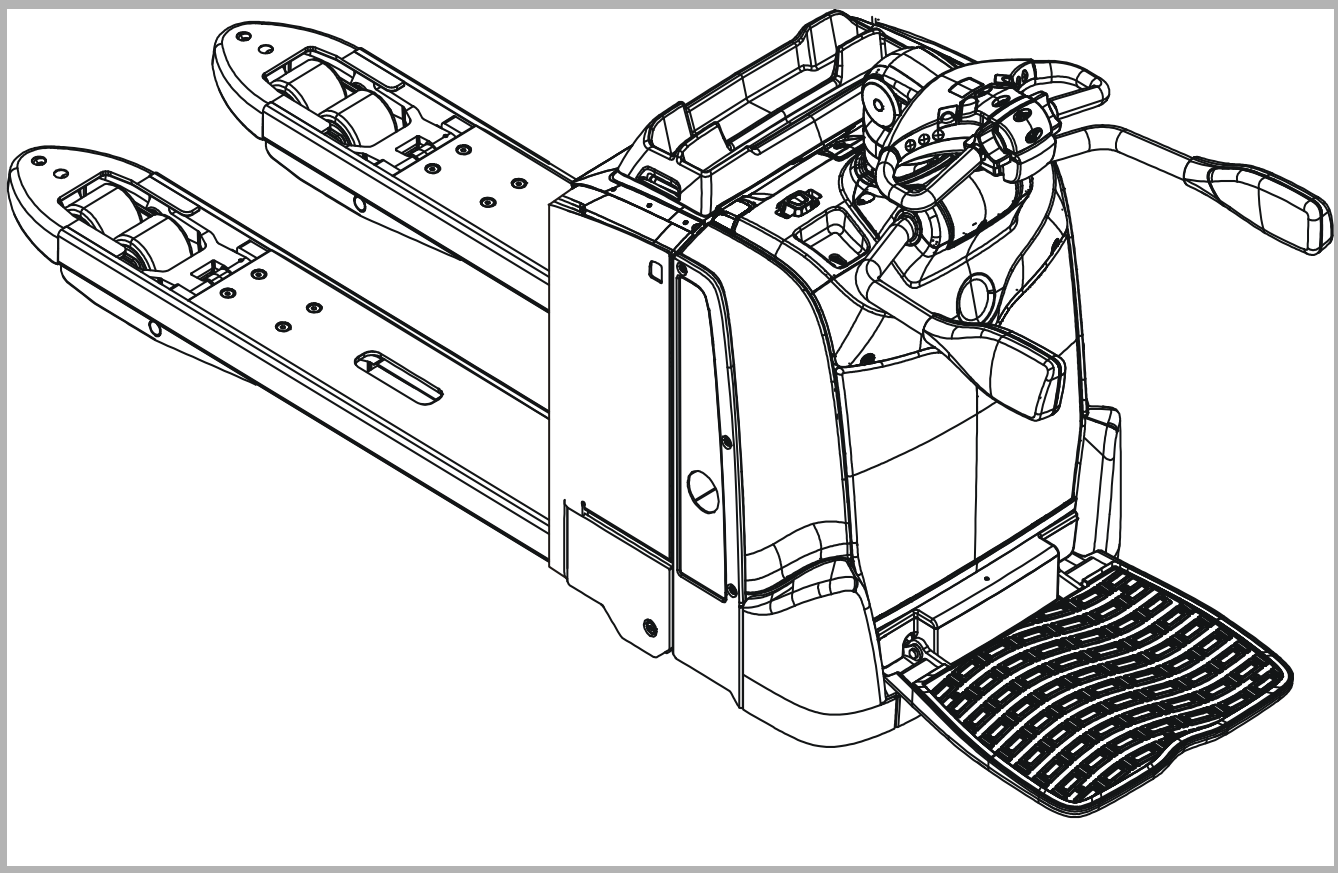
Repair manual 7572516-040

LPE200, LPE220



3.4 Truck modifications

Any modification of the truck must be approved beforehand. No modification of truck may be performed that may influence the capacity, stability and safety of the truck without prior written approval from the manufacturer, its representative or successor.

In the case of the manufacturer no longer being in business and there being no successor, the user of the truck may arrange for modifications on the precondition that the user:

- makes sure that an engineer with expert knowledge of industrial trucks and their safety designs, tests and implements the modification,
- files all documentation of the designs, tests and implementation of the modification,
- approves and makes the applicable changes to the capacity plate, adhesive labels, markings and operator's manual and
- affixes a permanent and well visible sign to the truck stating how the truck has been modified, together with the date of the modification and the name and address of the company that carried out the modification work.

— Slut på avsnittet —

5. Parameters

5.1 General parameters

The truck's control system can store a number of different parameters. These are used to configure the truck according to the task to be performed. The parameters are divided into groups:

- **Operator parameters** – The driver parameters (1-100) are used to adapt the truck’s characteristics to a specific driver or task. Up to 10 operator parameter profiles can be stored.
- **Service parameters** – The service parameters (range 101–1000) are used to adapt the truck's performance/response and cover all other parameters not covered by the operator parameters.
- **Factory parameters** – (range 1001-1250). Truck-specific parameters.
- **Calibration parameters** – (range 1251-1300) store the value generated on the calibration of valves, weight indication, etc. These can be changed manually.

Operator parameters are displayed and changed only for a selected operator, but if a CAN service key is connected, the parameters for all operators can be displayed and changed. Operator parameters can be changed by the operator if the truck's program is set up for this.

The service parameters can be changed once a suitable CAN service key or PDA/PC has been connected to the truck.

Factory parameters can **ONLY** be changed after a specially configured PDA/PC has been connected to the truck.

Parameter 107 – Battery size

Par.	Description	Min.	Default	Max.	Increment	Unit
107	Battery size	1	12	20	1	

 # 107 - Battery size

Specifies what type of battery the truck is equipped with.

The parameter can be used to compensate for different ways of driving by:

- increasing the value to discharge the battery even more.
- reducing the value if the battery is discharged too much.

In order to set the meter for battery charge level, consideration must be given to the following:

- Acid density when the battery is fully charged; to check the quality of the battery. This value should be between 1.27 and 1.29.

  Please note that the acid density may vary between different kinds of battery.
- When the lifting capacity is disabled (battery 80% discharged), the value must be close to (but not below) 1.14.

Refer to the table below for recommended parameter settings.

Parameter 209 - Min. fork lifting height to exit reduced speed via parameter 208

Par.	Description	Min.	Default	Max.	Increment	Unit
209	Min. fork lifting height to exit reduced speed via parameter 208	10	10	50	1	ms

#209 - Min. fork lifting height to exit reduced speed via parameter 208

The required lifting time that the hydraulic pump must be active/lift the forks above the floor (in increments of 20 ms) to exit reduced speed via parameter 208.

Parameter 211 - Automatic speed reduction (built-in)

Par.	Description	Min.	Default	Max.	Increment	Unit
211	Automatic speed reduction (built-in)	25	25	100	5	%

#211 - Automatic speed reduction (built-in)

Specifies automatic speed reduction when the light beam is broken for more than 500 ms. As a percentage of maximum speed reduction for this application.

The light beam must be broken for more than 500 ms in order for the feet to be detected as outside the platform.

If travel speed is 6 km/h or more, the truck does not stop.

Parameter 212 - Automatic braking (built-in)

Par.	Description	Min.	Default	Max.	Increment	Unit
212	Automatic braking (Built-in)	25	25	100	5	%

 # 211 - Automatic braking (built-in)

Automatic braking for trucks with fixed side guards if the light beam is interrupted longer than 500ms. As a percentage of maximum speed reduction for this application.

5.6.2 Description

Parameter 1001 - Type of truck

Par.	Description	Min.	Default	Max.	Increment	Unit
1001	Truck type	0	0	158	1	

Parameter 1001 - Type of truck

This parameter is used to set which truck type the program is to adapt operational data for.

Value	Function
0	Unknown truck type
2	P320
3	P322
4	(Not applicable)
5	(Not applicable)
101	(Not applicable)
102	(Not applicable)
103	(Not applicable)
104	(Not applicable)
105	(Not applicable)
106	(Not applicable)
107	(Not applicable)
108	(Not applicable)
109	(Not applicable)
110	(Not applicable)
111	(Not applicable)
112	(Not applicable)
113	(Not applicable)
114	(Not applicable)
151	(Not applicable)
152	(Not applicable)
153	(Not applicable)
154	(Not applicable)
155	(Not applicable)
156	(Not applicable)
157	(Not applicable)
158	(Not applicable)

Basic option 6 - Lift height limitation by SEU input and override			
Argument #1	Selection of SEU unit 1 or 2		
	Values	Meaning	
	0	option is handled by SEU unit 1 (A36)	
	1	option is handled by SEU unit 2 (the second SEU unit)	
Argument #2	Selection of SEU digital input for limitation switch		
	Values	Meaning	Pin no.
	0	activates digital input 1 (1 mA) on SEU	5
	1	activates digital input 2 (1 mA) on SEU	19
	2	activates digital input 3 (1 mA) on SEU	33
	3	activates digital input 4 (1 mA) on SEU	6
	4	activates digital input 5 (7 mA) on SEU	20
	5	activates digital input 6 (7 mA) on SEU	34
	6	activates digital input 7 (7 mA) on SEU	7
	7	activates digital input 8 (7 mA) on SEU	21
Argument #3	Selection of option button for override function		
	Values	Meaning	
	0	activated by option button 2 or 5	
	1	activated by option button 1	
	2	activated by option button 2	
	3	activated by option button 3	
	4	activated by option button 4	
	5	activated by option button 5	
	6	activated by option button 6	
	7	activated by option button 3 or 4	
	8	no override possible	
Argument #4	Selection of time interval for override function		
	Values	Meaning	
	0	open button must be held depressed for override	
	1-15	value corresponds to time in seconds, e.g. value 1 = 1 second	

Parameter 1103 – Safety gate

Par.	Description	Min.	Default	Max.	Increment	Unit
1103	Safety gate	0	0	1	1	Bool

1103 – Safety gate

Indicates if there is a safety gate on the application.

Value	Function
0	No safety gate
1	Safety gate present

Parameter 1106 - Sensor for top position

Par.	Description	Min.	Default	Max.	Increment	Unit
1106	Sensor for top position	0	0	1	1	

#1106 - Sensor for top position

Indicates whether there is a sensor for fork top position mounted at the top

Value	Function
0	The truck has no sensor for top position
1	The truck has a sensor for fork top position

Parameter 1107 - Steering

Par.	Description	Min.	Default	Max.	Increment	Unit
1107	Steering	0	0	1	1	

Parameter 1107 - Steering

Specifies what type of steering the truck is equipped with.

Value	Function
0	Manual control
1	Power steering

5.8.1 Steering angle calibration “1”

The calibration function is used for calibration of the steering angle (steering angle potentiometer). Calibration sets the centre position of steering (straight ahead). The CAN service key must be connected in order to perform calibration.

The following situations may require this calibration to be done.

- When the steering angle potentiometer has been disconnected or replaced.
- The truck does not steer straight ahead when the steering unit points straight ahead. May also require adjustment of parameter 1253.
- Display of error code 5.582 or 5.586.

Before carrying out this calibration, check that the reference sensor (B17) works and is correctly set.

Method

1. Place the steering unit in the straight-ahead position and maintain this position.
2. Ensure that the truck is switched off. Connect the CAN key.
3. Press and then release the horn button. “Info“ is shown on the display.
4. Turn the speed control several times until “CAL” is shown on the display. The parameter symbol is lit.
5. Press the horn button to select.
6. Turn the speed control to move between the calibration modes.
7. Press the horn button to select steering motor calibration, "1".
8. In calibration mode, “push” will be shown on the display until you press one of the two horn buttons.
9. “Done” is shown on the display. The setting has now been stored.
10. Switch off the truck by pressing the OFF button.

If the actual steering position must be “trimmed” (fine-tuned), see parameter #1253.

The calibration process affects the following parameters:

- Analogue offset (parameter 1251)
- Checksum (parameter 1252)

These parameters must not be adjusted manually after calibration.

5.8.2 Calibration “2” (Not applicable)

6.4.2 Installing the battery

DANGER!

To prevent the battery from falling down when it is released from the lifting device, prepare trestles or other suitable supports of the right height to support it. Check the height of the supporting material before releasing the lifting hook.

The battery to be installed in the truck must be the right size. If the battery is too small in terms of size and weight, it can seriously affect the truck's braking ability and truck stability when lifting goods. See the truck's identification plate for the correct battery data.

1: Park the truck, and open the battery door.

2: Lift the battery into place using an approved lifting device and a suitable battery lifting yoke or lifting loops. Check that the cables are not pinched when the battery is lifted into place. Use a battery changing table if changing the battery from the side.

3: Fit the battery lock.

4: Check the electrolyte level. Top up with deionized water as necessary.

5: Connect the battery cables/battery connector.

DANGER!

Check that the polarity is correct when connecting the battery cables. Compare the markings on the cables with those on the battery terminals. An incorrectly connected battery may cause short-circuiting.

6: Close the battery compartment cover.

7: Check or set the battery parameters. Page 5–11

7.2.5 Cleaning the chain

We recommend you to replace a chain that is very dirty.

Dirty chains should be cleaned before they are lubricated, e.g. by washing with solvent such as diesel or petrol.

The chain should be blown dry using compressed air and lubricated directly after cleaning.

Note:
Exercise care with degreasing agents as these can contain abrasives.

7.2.6 Cleaning the motor compartment

- Cover electric motors, connectors and valves prior to washing.

Note:
Risk of short circuiting.
Risk of damage to the electrical system.
Electrical components must not be washed with high-pressure washers.

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

7.2.7 Electric components

- Clean electric motors using vacuum cleaner or a rag.
- Clean electric panels, logic cards, contactors, connectors, magnetic valves, etc. with a rag moistened with water and a suitable detergent.

Note:
Risk of short circuiting.
Risk of damage to electrical components.
Do not break the warranty seals on the logic cards.

Pos.	Type	Point	Instruction	Procedure	1000 h[1]	3000 h[2]	OK
19		Wheel fork	Check that the bushings in the wheel fork are not worn out	Replace Page 12–26	X		☐
20		Linkage	Inspect the linkage for crack formation and other damage.		X		☐
21		Fork carriage	Inspect the fork carriage for crack formation and other damage.		X		☐
22		Beams, chassis	Lubricate the beams. Lubricant F. Page 7–4			X	☐
23		Tiller arm:	Check that the height adjuster runs freely and the gas spring is able to bear the weight of the tiller arm.	Replace Page 13–54 Page 13–53	X		☐
24		Truck traction	Clean the drive motor. Instructions on Page 10–26		X		☐
25		Brakes	Clean the brakes, wipe with a rag. Instructions on Page 7–1		X		☐
26		Brakes	Check that the brakes are fitted tightly. Instructions on Page 12–8		X		☐
27		Brakes	Clean the inside of the brake. Use compressed air to carefully blow away the brake dust inside the brake. Instructions on Page 7–1		X		☐

Continued...

1. Every 1000 hours
2. Every 3000 hours

Pos.	Type	Point	Instruction	Procedure	1000 h[1]	3000 h[2]	OK
			Subsequent checks				
			DANGER! ***Risk of personal injury and material and property damage. Note: For trucks with power steering, the truck battery must be disconnected when working on the drive gear/ drive wheel. The drive wheel will automatically return to the original position when the truck is started.***				
64		Fork carriage	Check the lateral play of the fork carriage at the rollers		X		☐
65		Tiller arm:	Check the operation of the brake microswitch in the upper and lower brake positions. The lower position means that you have to press down to activate the switch.	Page 13–32	X		☐
66		Tiller arm:	Check the play and return travel in the tiller arm.	Page 13–15	X		☐
67		Operator controls	Check the function of the safety reversing Page 14–21		X		☐
68		Platform	Check for correct operation of the platform switch	Page 9–66	X		☐
69		Gate	Check the function of the gate switch	Page 9–89 Page 9–90	X		☐
70		Fork carriage	Check that the fork lift height limiter functions		X		☐
71		E-bar	Check the locking of the E-bar		X		☐
72		Display	Inspect the error log and operating hours. Page 14–4		X		☐

Continued

1. Every 1000 hours
2. Every 3000 hours

Code	Description	Truck behaviour	Error cause(s)	Measure
2:006	**Saving to memory failed.** Saving to memory failed because low battery voltage. Battery voltage below 15 V at the time of saving	Not influenced	1: Battery connector disconnected from truck that is started 2: Voltage loss on supply to A5 3: The battery is defective 4: Battery parameter #107 has an erroneous value	1: Connect the battery connector. 2: Check battery voltage • Check the voltage using the built-in test procedure and comparing with value from external volt meter • Check connectors, joints and splices for damage or corrosion. • Check fuses F1 and F50 3: Inspect the battery. 4: Check parameters • Check that factory parameters are set according to the truck configuration. • Check that other parameters are set correctly.
2:007	**Internal program error A5**	Not influenced	Internal program error	• Create a truck report. Send a report to the manufacturer. • Update the truck software to the latest version.
2:008	**Internal program error A5**	Not influenced	Internal program error	• Create a truck report. Send a report to the manufacturer. • Update the truck software to the latest version.
2:009	**Internal program error A5**	Not influenced	Internal program error	• Create a truck report. Send a report to the manufacturer. • Update the truck software to the latest version.

Code	Description	Truck behaviour	Error cause(s)	Measure
2:522	Incorrect power supply to the Hall sensors. High (or low) signal from all Hall sensors A5:S300-S318	Plug braking to stop, then the parking brake is activated and the main contactor opens	Incorrect power supply to the Hall sensors.	1: Check the Hall sensors • Check with TruckCom or the built-in test that the Hall sensors work the way they should. • A Hall sensor that is being influenced should give a low signal. • Replace A5 if the Hall sensors have an error function. See section "13.1.6 Replacing the logic card".
2:523	Internal memory (FRAM or RAM) is faulty Reading from or writing to memory failed	Everything is stopped at once, the parking brake is activated, and the main contactor opens	• Corrupt memory circuit	1: Replace A5 • See section "13.1.6 Replacing the logic card".
2:525	A5 does not have any truck software	The truck cannot be started	Software download interrupted	1: Update the truck software. • Update the truck entire software package to the latest available version.
2:540	Contactor points in the main contactor fused High voltage over the capacitor bank internally in the motor control unit on the secondary side of the connector when it is open	Everything is stopped at once, the parking brake is activated, and the main contactor opens	Contactor points in the main contactor are fused. Q10:3, Q10:4	1: Check contactor • Check the function of the main contactor and that there is no connection between the points. • Check that there is no short-circuit that can cause improper power supply. • If this voltage does not increase when the main contactor pulls and the voltage is close to battery voltage (measured via precharge in), it is a sign that the contactor points in the main contactor are fused. • Replace the contactor.

Code	Description	Truck behaviour	Error cause(s)	Measure
3:514	CAN communication problem, A5 cannot send to T1	Everything is stopped at once, the parking brake is activated, and the main contactor opens	1: Error on CAN bus wiring or connection 2: CAN module in A5 defective	1: Check the CAN bus • Check that CAN is intact in terms of wiring harness, resistance and connectors. Disconnect the battery. Check that the resistance between (X41:3) and (X41:4) is 54 - 66 ohms. • Check that the CAN wiring harness is not pinched. Measure resistance between the chassis and CAN contact. Limit value >24 kOhm 2: Replace A5 • See section "13.1.6 Replacing the logic card".
3:520	Signal ground in T1 out of valid range ??V (TBD)	Everything is stopped at once, the parking brake is activated, and the main contactor opens	The ground for speed sensor and temperature sensor is connected to chassis, battery- or battery+	
3:523	The amperage through the output to the brake (Q1) is more than 200mA even though the output is deactivated	Everything is stopped at once, the parking brake is activated, and the main contactor opens	Defective transistor on the output	1: Replace T1 • See section "14.5.2 Replacing the motor control".
3:524	The amperage through the output to the main contactor (Q10) is more than 200mA even though the output is deactivated	Everything is stopped at once, the parking brake is activated, and the main contactor opens	Defective transistor on the output	1: Replace T1 • See section "14.5.2 Replacing the motor control".
3:525	T1 detects to high speed for the motor, more than 6000 rpm	The drive is stopped immediately with the parking brake	• Defective component	1: Check the rotational speed sensor • Disconnect the B11. Check that there are no metal fragments on B11 sensor points. • Check that the toothed wheel on the motor axle is clean, intact and properly mounted.

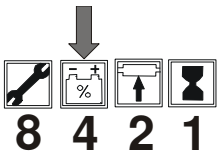
Code	Description	Truck behaviour	Error cause(s)	Measure
3:597	The motor temperature exceeds +180 °C.	The drive is stopped immediately with the parking brake	1: Intensive use of the truck 2: Cooling is reduced or the temperature sensor is defective.	1: Intensive use of the truck. Let the truck cool down. 2: Check the cooling • Check the cooling flanges of the transistor regulator, motor and steering motor as well as the battery charger and fans and filters for accumulations of dirt and dust. Too much dust and dirt cause the cooling not to work properly. • Check that the fans work when the speed control is activated (fans behind T1 and motor fan) • Check that the fan on charger T14 works when the charging begins, i.e. when the mains cable is connected • Check the signal from the temperature sensors for T1 and T13 and from B1 using the built-in test or TruckCom. Determine if the temperature signals are plausible relative to the real temperatures of the components. If not, replace T1,T13 or replace B1 with a repair kit.
3:598	Internal 5V outside of valid range: 4.12V - 5.88V or internal 15V voltage outside valid range: 10.56V - 19V	Everything is stopped at once, the parking brake is activated, and the main contactor opens	1: Defective motor control	1: Replace T1 • See section "14.5.2 Replacing the motor control".

Code	Description	Truck behaviour	Error cause(s)	Measure
5:081	Power supply to reference sensor outside of valid range. It should be 9.8 - 13.5V between the wires 95-97.	Not influenced	1: Defective component	1: Check the reference sensor • Steer slightly to the right so that the gear ring is correctly positioned in relation to the reference sensor. • Cut off power to the truck. • Check the clearance between the sensor and the gear ring elevation using a feeler gauge. Nominal measurement: 1.5 mm ***Note: There is a risk of personal injury if power is restored to the truck while work is performed on the gear ring.*** • Restore power to the truck. • Check if there is any power supply to B17, 9.8 - 13.5V between wires 95 and 97. • If there is a power supply, replace B17. • Check if there is a short circuit between wires 95 and 97, but also between wire 95 and the rest of the electrical system. • If there is no power supply or short circuit, replace the T13

Code	Description	Truck behaviour	Error cause(s)	Measure
5:380	Temperature in steering motor exceeds high temperature	Everything is stopped at once, the parking brake is activated, and the main contactor opens	1: TBD	1: TBD
5:414	CAN communication problems between A5 and T13. T13 does not get any commands from A5	Everything is stopped at once, the parking brake is activated, and the main contactor opens	1: Error on CAN bus wiring or connections	1: Check the CAN bus • Check that CAN is intact in terms of wiring harness, resistance and connectors. Disconnect the battery. Check that the resistance between (X41:3) and (X41:4) is 54 - 66 ohms. • Check that the CAN wiring harness is not pinched. Measure resistance between the chassis and CAN contact. Limit value >24 kOhm
5:415	CAN communication problems between A5 and T13. A5 gets no responses from T13 or answers are corrupted	Everything is stopped at once, the parking brake is activated, and the main contactor opens	1: Error on CAN bus wiring or connections	1: Check the CAN bus • Check that CAN is intact in terms of wiring harness, resistance and connectors. Disconnect the battery. Check that the resistance between (X41:3) and (X41:4) is 54 - 66 ohms. • Check that the CAN wiring harness is not pinched. Measure resistance between the chassis and CAN contact. Limit value >24 kOhm

Code	Description	Truck behaviour	Error cause(s)	Measure
8:020	T14 detects no battery, voltage below valid level: 6V	Not influenced	1: Battery not connected to charger	1: Check the battery charger cables. • Disconnect the battery by disconnecting the connector and power cable from the charger. • Measure the ohms on red and black cable from T14 to X1. Replace the cables in case of breakage.
8:021	T14 detects excessively low battery voltage when charging. Voltage below valid level: 19.8V	Not influenced	1: The battery is defective	1: Inspect the battery.
8:022	T14 detects excessively high battery voltage when charging. Voltage above valid level: 34.8V	Not influenced	1: The battery is defective	1: Inspect the battery.
8:023	T14 detects excessively low temperature when charging.	Not influenced	1: Truck used in cold environments.	1: Inform the client that the truck should be stored in normal ambient temperatures to avoid unnecessary wear and tear of the battery and other components.

8.6 Service information

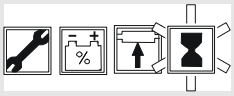
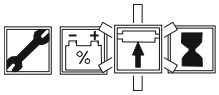
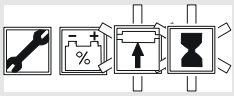
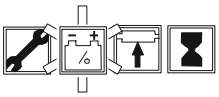
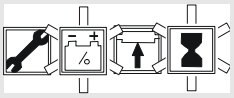
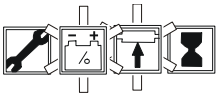
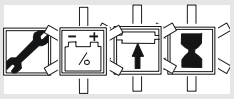


The truck has a service information mode that is a useful aid for troubleshooting. To activate:

1. Connect the CAN service key to [X41] and log in.
2. The battery status symbol lights up.
3. Press the horn button [S18] repeatedly to select the desired mode in the service information mode.

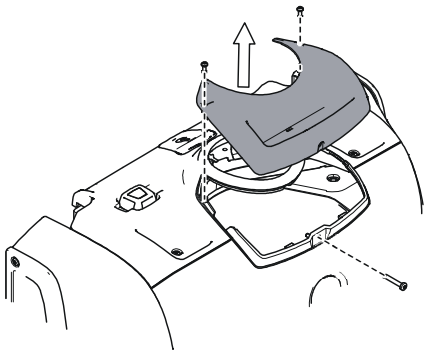
Note

All truck functions work as normal when the service information mode is active. Care should be taken when operating the truck and reading the display at the same time.

Data	Flashing symbol	Description	Resolution	Unit	Standard value
-		BDI	10	%	0-100
1		Battery voltage	0.1	V	Depending on battery type. Compare with the real battery voltage
2		Battery voltage, the value indicated in an approximate value of motor and pump voltages.	1	A	0-450A
3		Set speed sent to [T1] from A5. Positive value in the drive wheel direction. Negative value in the fork direction.	0.1	km/h	-12.5 - 12.5 km/h (depending on truck type)
4		Speed value from the speed sensor. Positive value in the drive wheel direction. Negative value in the fork direction.	0.1	km/h	-12.5 - 12.5 km/h (depending on truck type)
5		Forks or support arms, lifting or lowering command. 100% shown for on/off checked signals	1	%	0-100%
6		Pressure sensor 1 (hydraulic pressure). “nonE” is shown if no pressure sensor exists.	0.001	V	0.5-4.5V
7		Pressure sensor 2 (hydraulic pressure). “nonE” is shown if no pressure sensor exists.	0.001	V	0.5-4.5V

9.1.4 Replacing the cover (without gate)

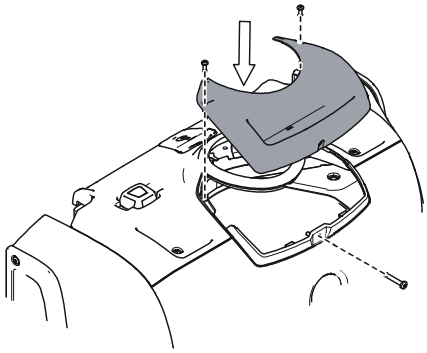
Removing the cover (without gate)



- Remove the rubber seals. Page 9–10

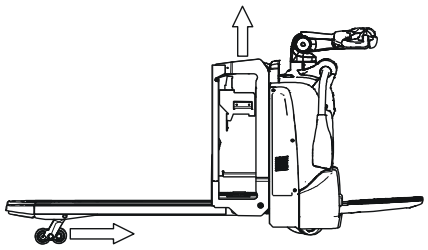
1: Undo the screws and remove the cover.

Fitting the cover (without gate)

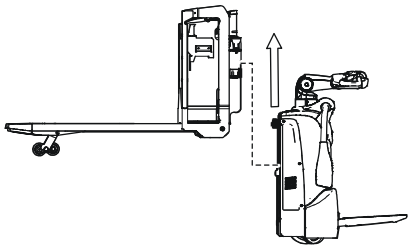


1: Position the cover and screw it in place.

- Fit the rubber seals. Page 9–11



Step 11



Step 12

- Open the motor compartment. Page 9–2
- Remove the battery from the truck. Page 14–7

1: Lift the truck and support it on trestles so that the chassis does not tip over when the fork carriage is removed.

2: Remove the screws of the emergency stop bracket and move it aside so the fork carriage can be lifted out.

3: Remove the hydraulic hose bracket.

4: Remove the fork carriage stop.

5: Lift the fork carriage halfway. Only use a lifting device that is suitable for this work.

6: Remove the lug (lifting height limiter).

7: Remove the battery connector bracket.

8: Remove the bracket of the battery wiring harness in the battery tray.

9: Remove the bracket of the battery wiring harness inside the chassis.

10: Pull the battery wiring harness out of the battery tray.

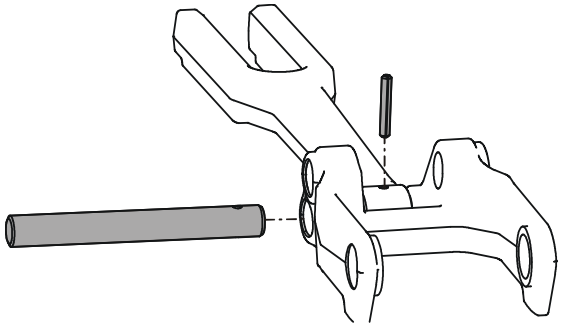
11: Lift the fork carriage until the fork wheels hang freely. Only use a lifting device that is suitable for this work.

Note: Check that the torsion tubes have free clearance under the truck. If not, move the fork wheels backwards so that the torsion tubes have free clearance during the lift.

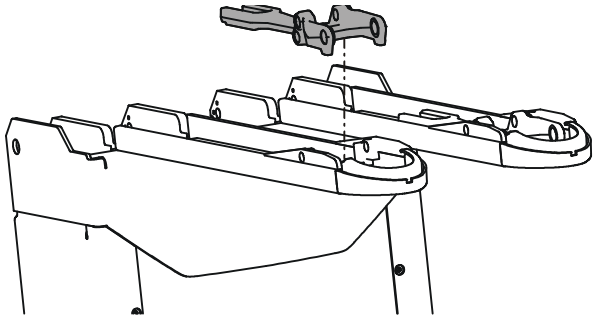
12: Lift away the fork carriage. Only use a lifting device that is suitable for this work.

9.2.7 Weld the push rod

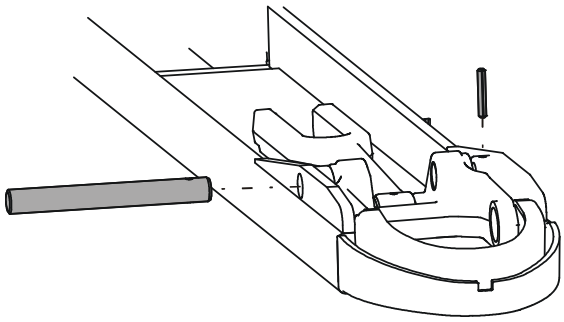
Welding must be carried out in accordance with ISO 5817. Weld class C



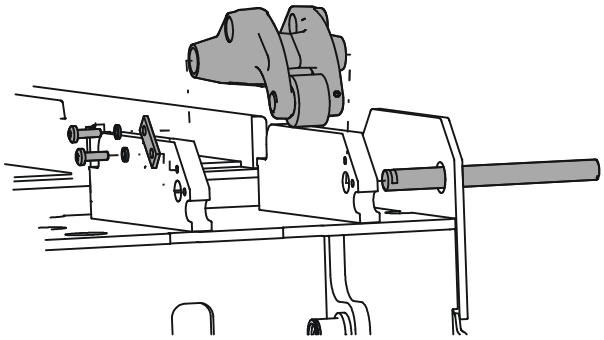
Step 1



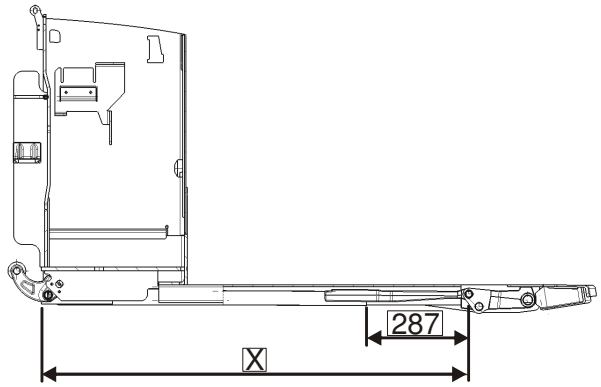
Step 2

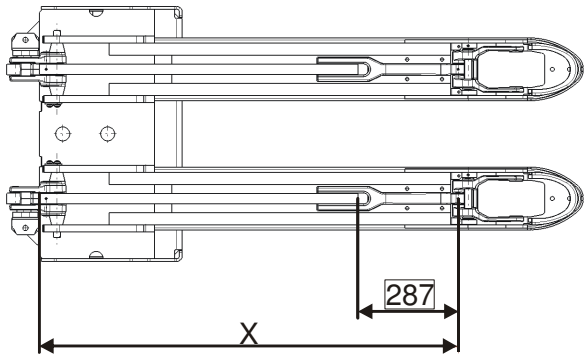


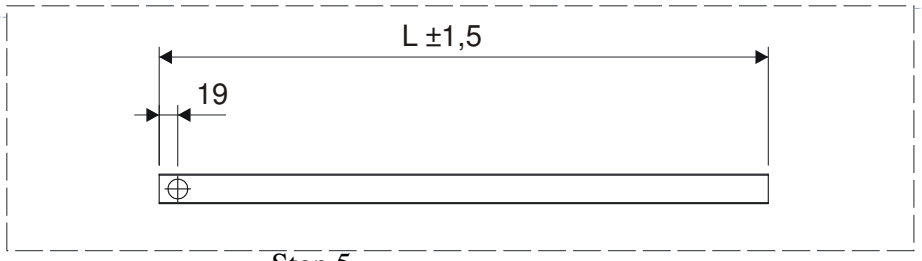
Step 3



Step 4

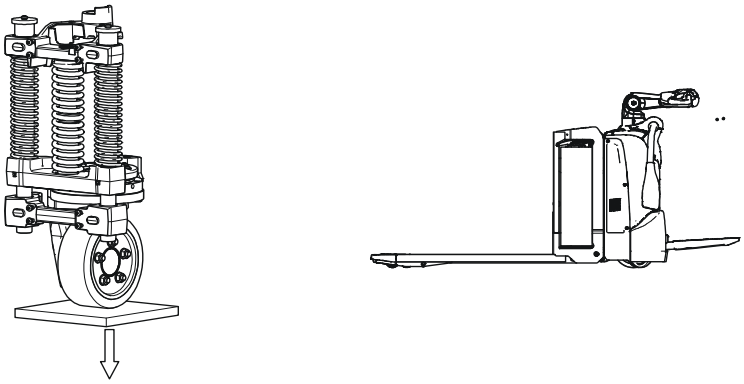




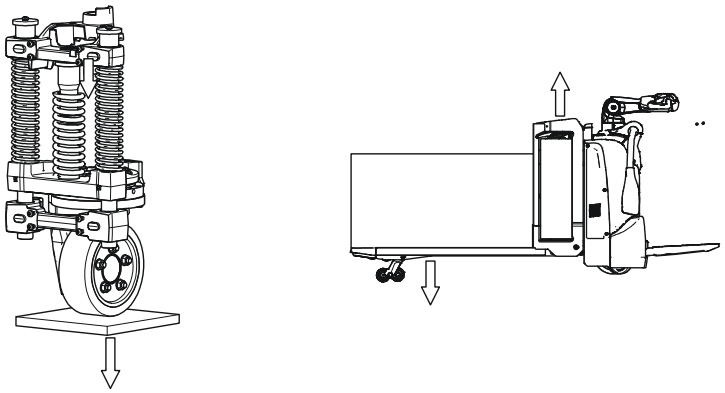


Step 5

Description



L
ower drive wheel pressure without load



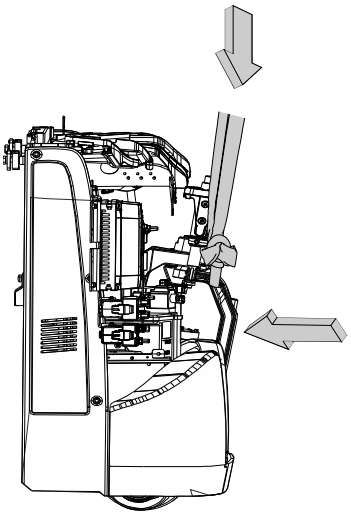
Higher drive wheel pressure with load

The PowerTrak system is a well-proven design used to keep the drive wheel pressure towards the floor at an optimal level regardless of load. The PowerTrak system is mounted linearly on bearings and contains fewer moving parts compared to its predecessor. In addition, tiller arm mounting has been integrated in the upper bracket. With mechanical steering, the vertical movements of the drive unit are absorbed by the bearings between the driver and the steering rod so that the truck operator does not feel these in the tiller arm.

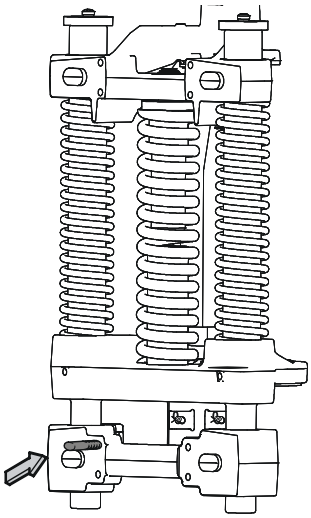
The principle of this system is that hydraulic pressure applied on the fork cylinders is proportional to the fork load when the forks are raised.

When the pressure from the fork lift cylinder increases, the pressure in the PowerTrak cylinder also increases. This increases the downward force on the drive wheel.

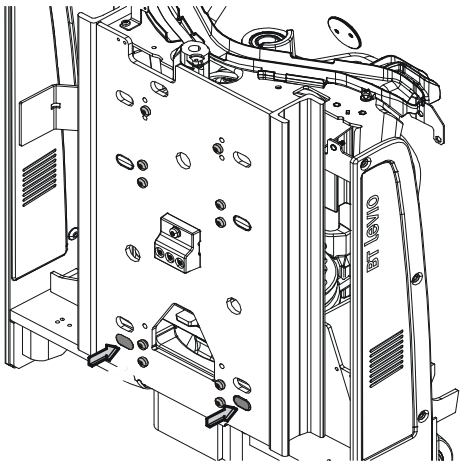
Fitting the large drive unit suspension



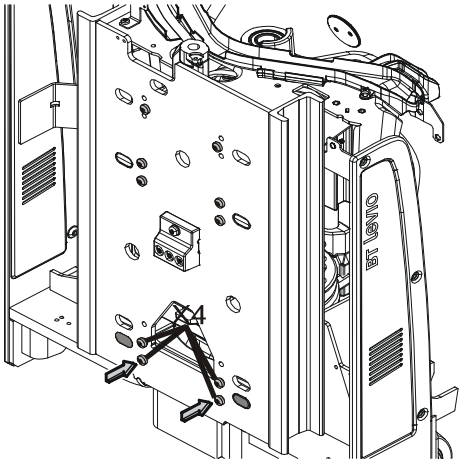
Step 1



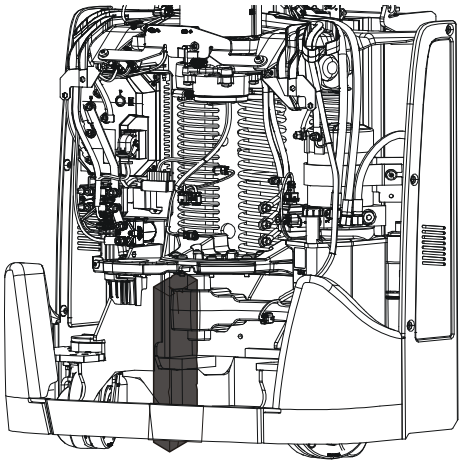
Step 2



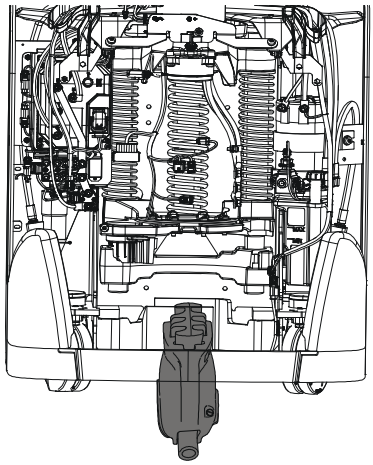
Step 3



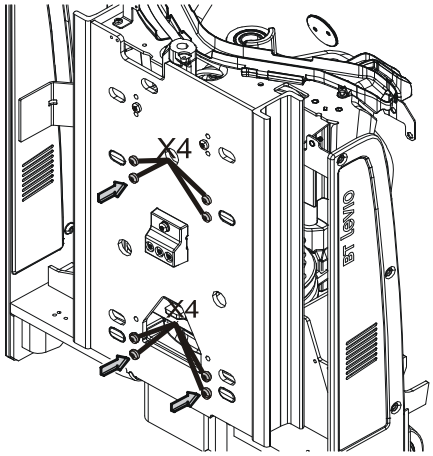
Step 4



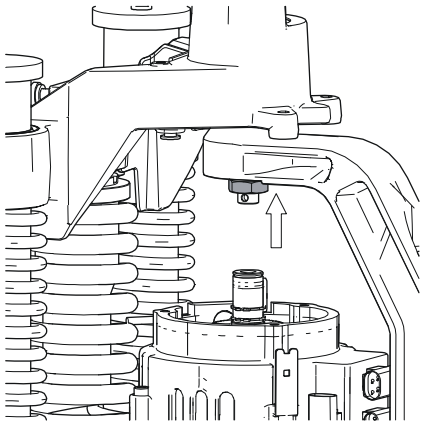
Step 5



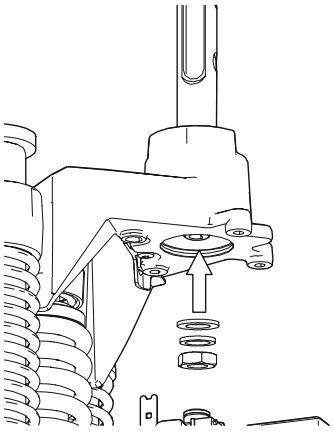
Step 6



Step 7 T=23 Nm



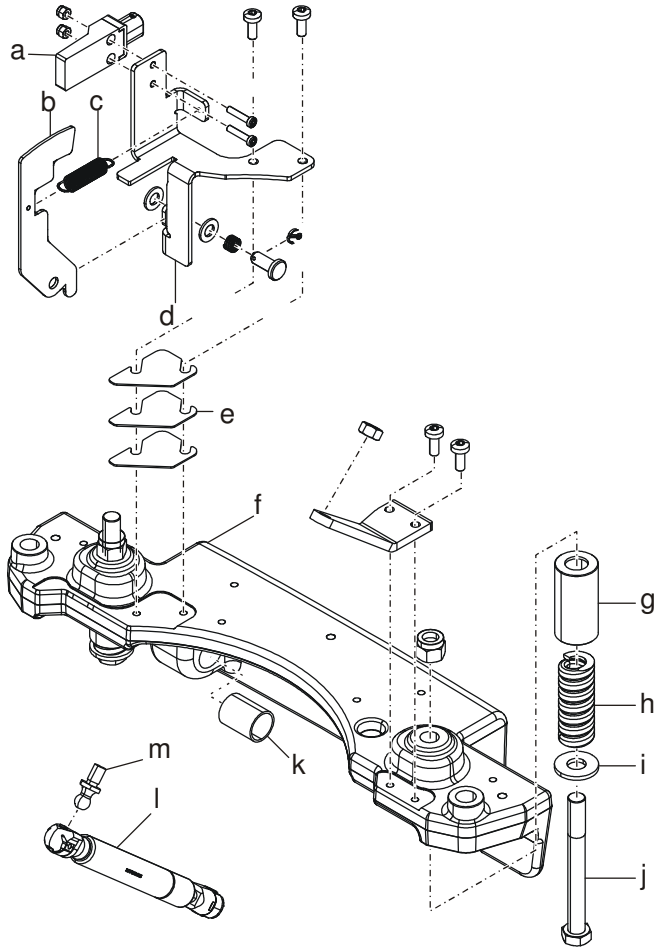
Step 8 Mechanical steering
T=50 Nm



Step 8 Power steering
T=80 Nm

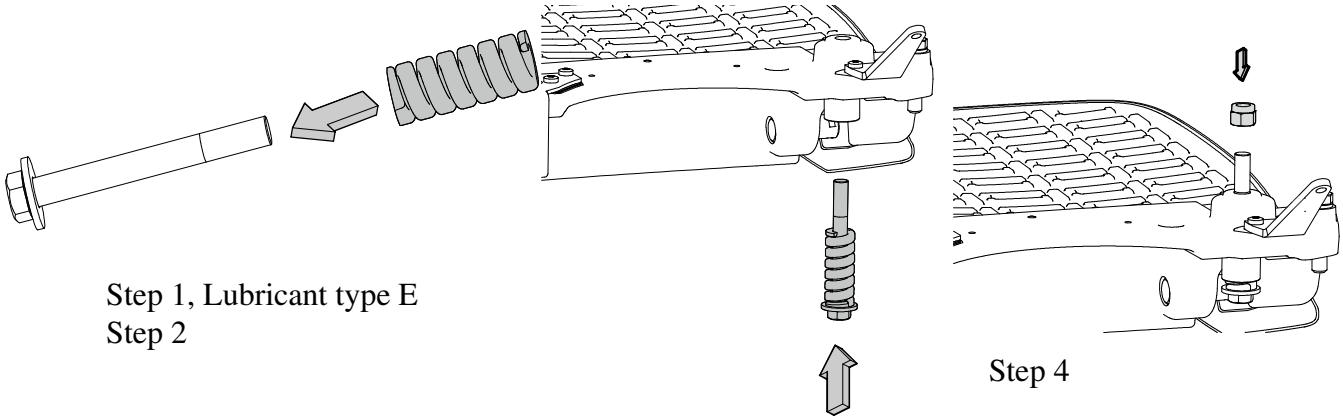
9.5 Platform including fixing points C0560

9.5.1 Overview, Standard and Cold store



Pos.	Component	Notes
a	Inductive sensor	
b	Bracket	
c	Spring	
d	Bracket	
e	Shim	(T=1 mm)
f	Bracket	
g	Tube	
h	Spring	
i	Washer	
j	Screw	
k	Bushing	
l	Damper	
m	Ball screw	

Fitting the platform suspension



Step 1, Lubricant type E
Step 2

Step 3

Step 4

1: Lubricate the bolt with lubricant type E. Page 23–2

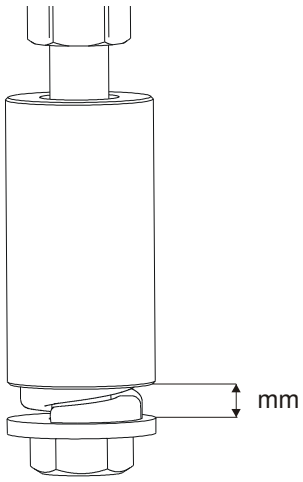
2: Fit the spring on the bolt.

3: Fit the spring and bolt in the platform bracket.

4: Position the nut and screw it in place.

- Fitting the gas spring. Page 9–63

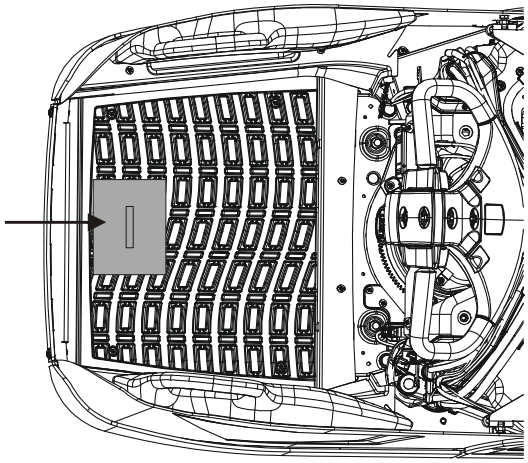
9.5.7 Adjusting the platform suspension



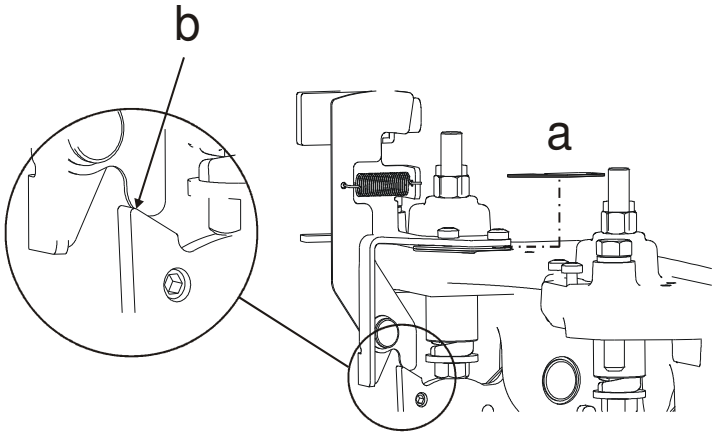
1: Adjust the suspension so that the play between the sleeve and the screw is 7 mm +0.5/-0.2.

9.5.17 Checking the position sensor (B120), fixed side guards

When checking the presence sensor, the weight must be positioned all the way out on the platform. With a load of 20 kg, there should be no detection. With a load of 32 kg, there should be detection.



9.5.18 Adjusting the presence sensor



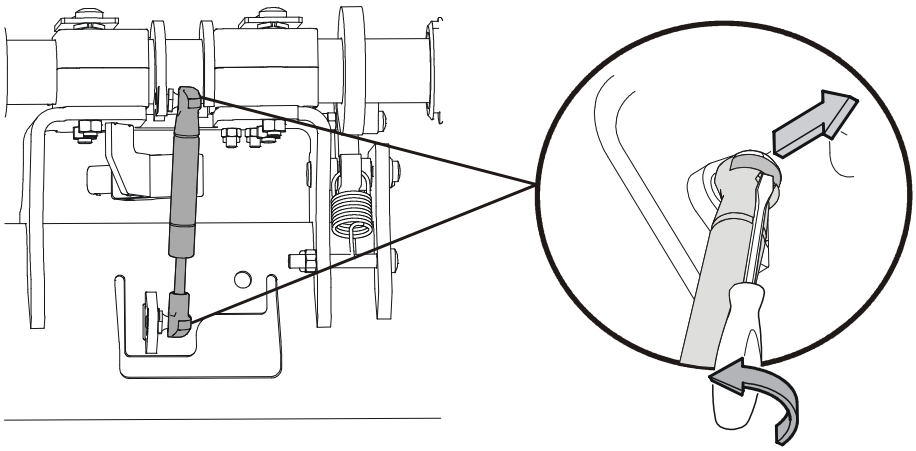
- Check the platform suspension. Page 9–65

1: Use shims (a) to maintain minimal play (b)

9.6.4 Replacing the gate damper

Applies to gate damper with part no. 7577717

Removing the gate damper



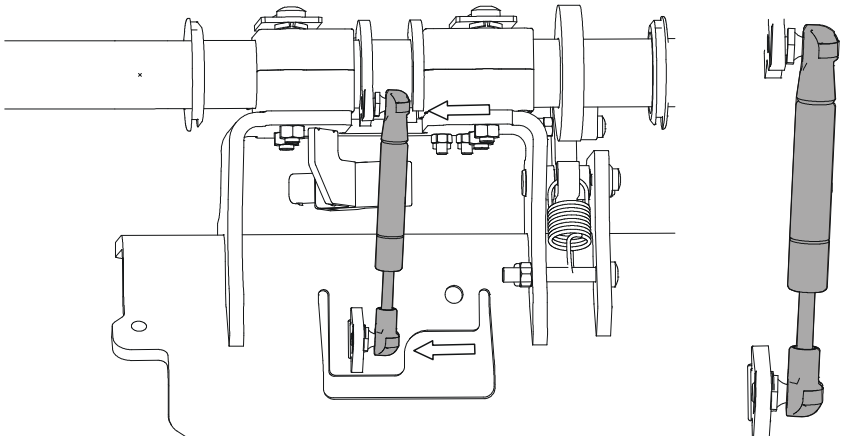
Steps 1, 2

- Open the motor compartment. Page 9–2

1: Use a screwdriver or similar tool to undo the spring lock at each end of the gas strut.

2: Remove the damper.

Fitting the gate damper

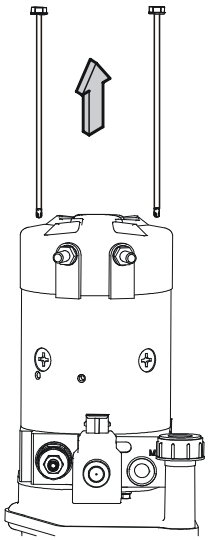


1: Fit the gas spring, making sure it is fitted in the right direction.

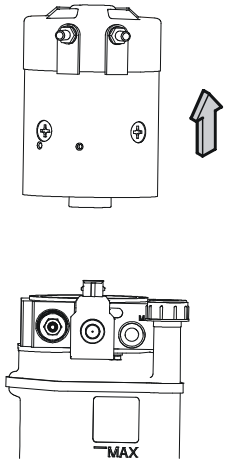
- Close the motor compartment. Page 9–2

10.1.2 Replacing the pump motor

Removing the pump motor



Step 1



Step 2

- Remove the hydraulic unit. Page 15–7

1: Loosen and remove the screws holding the motor in the valve block.

2: Lift the motor straight up.

10.4 Drive motor

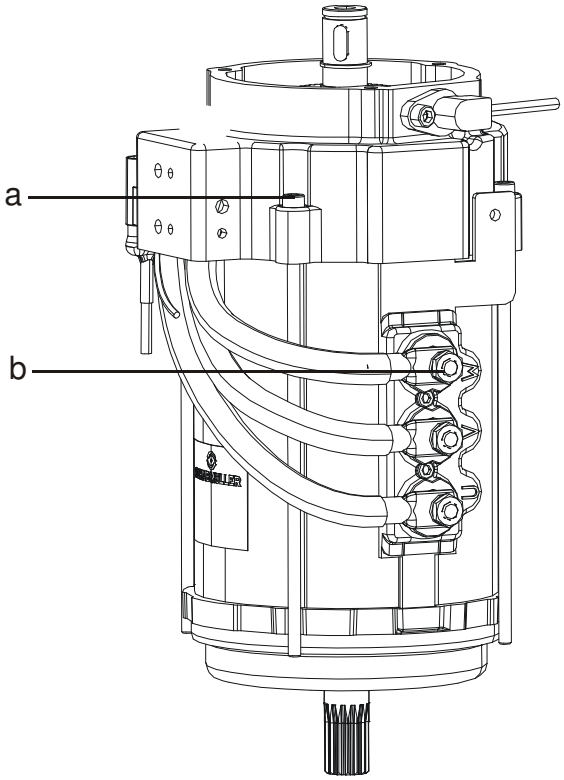
The drive motor is a brushless, short-circuited, three-phase asynchronous motor.

The motor has the following for monitoring:

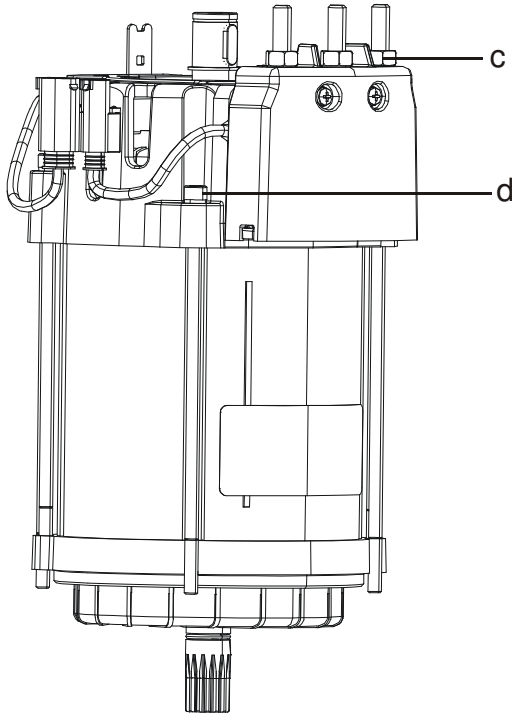
- a thermoelement that measures motor temperature
- a sensor that measures direction of rotation and speed

10.4.1 Tightening torques - Drive motor

The drive motor tightening torques are depicted in the figure below:



2.8 KW

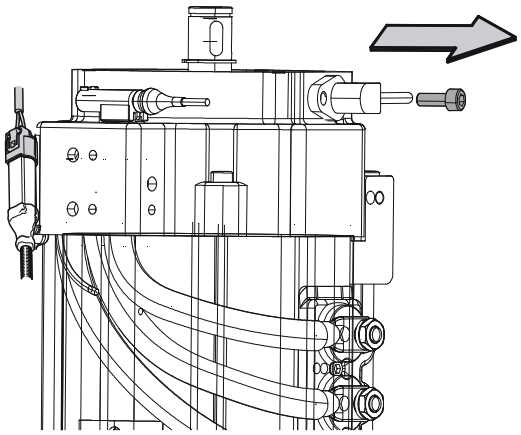


1.8, 2.5 KW

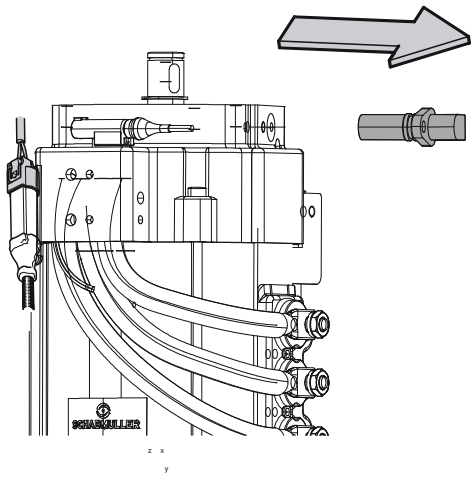
Pos.	Tightening torque	Notes
a	9.5 Nm	Applied in two stages, crosswise
b	13 +2/-1Nm	
c	6 ±1 Nm	
d	7 ± 1 Nm	Applied in two stages, crosswise

10.6.5 Replacing the rpm-sensor

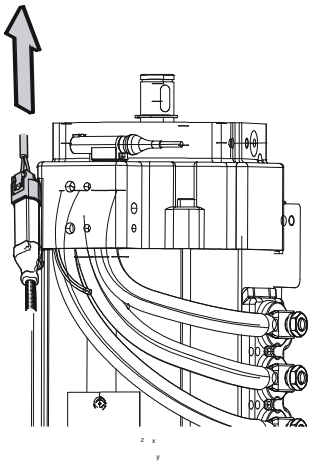
Removing the rpm-sensor



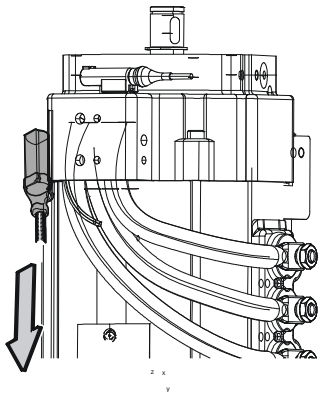
Step 1



Step 2



Step 3



Step 4

- Remove the service cover. Page 9–3

1: Remove the screw.

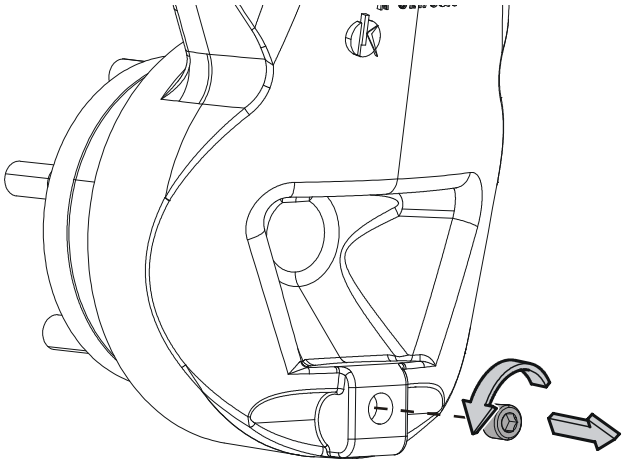
2: Pull out the sensor.

3: Disconnect the connector (B11)

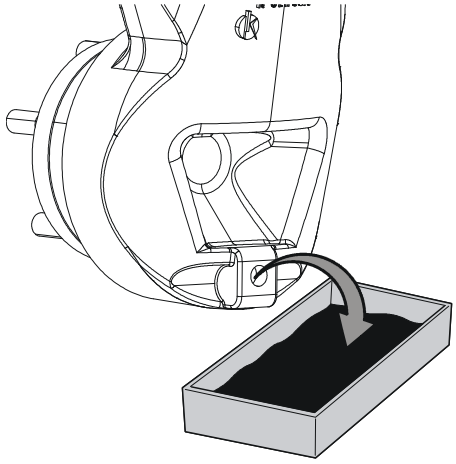
4: Detach the sensor's cable connection from the motor.

11.4 Oil check and oil change, large gear

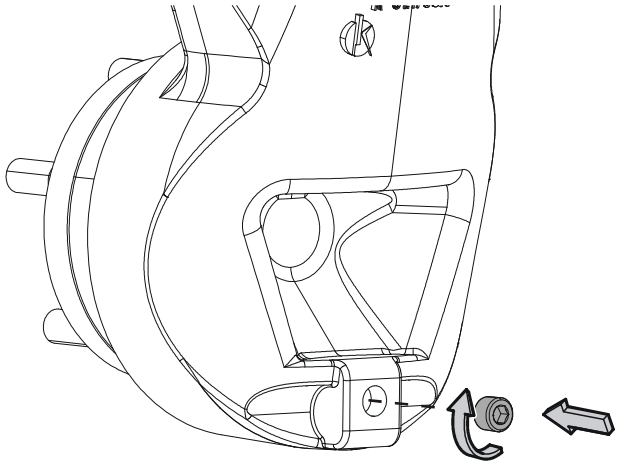
11.4.1 Draining oil



Step 1



Step 2



Step 3 T=20 Nm

- Remove the platform. Page 9–57

1: Undo and remove the oil plug on the lower part of the gear housing.

2: Drain all old oil into a suitable receptacle.

3: Clean away dirt and metal shavings from the oil plug before fitting.

12. Brake system/Wheels C3000

12.1 Brake system C3100

12.1.1 Description

The truck has three different types of brake:

- travel brake,
- parking brake,
- emergency brake.

Travel brake

- Regenerative motor braking using the drive motor.

Parking brake

The brake [Q1] is a single stage electromechanical spring-loaded brake that is released when the magnetic coil is energised. This brake serves as a parking brake and emergency brake.

The parking brake is activated/is active as follows:

- The parking brake is applied automatically when the truck stops during operation. The brake is released when the truck moves off.
- The parking brake remains active after the main power has been switched on.

Emergency brake

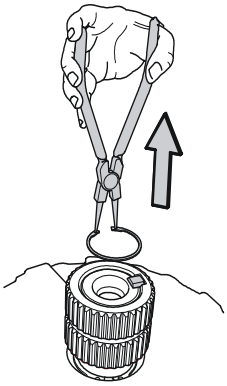
Emergency braking of the truck takes place in the event of a fault with the steering system or a serious fault in the electrical system.

The parking brake on the drive motor is the main emergency brake.

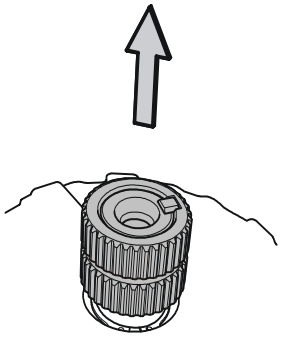
Motor braking can operate during emergency braking provided there is a supply voltage.

12.2.9 Replacing the brake hub

Removing the brake hub



Step 1



Step 2

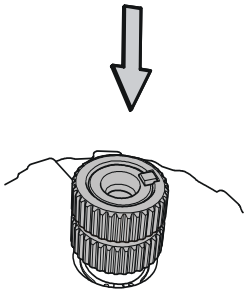
- Remove the brakePage 12–7.

1: Remove the circlip

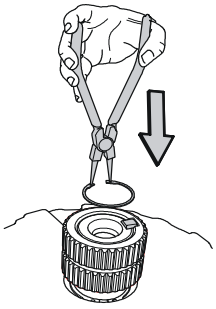
2: Remove the hub

Note: If the hub is stuck, you will need to use a puller to remove it.

Fitting the brake hub



Step 1



Step 2

1: Fit the hub carefully.

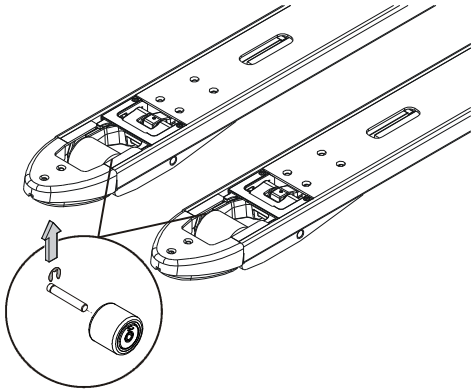
Note: Carefully knock the hub onto the shaft.

2: Fit the circlip

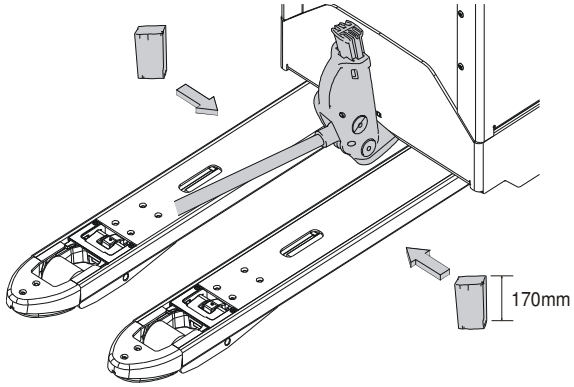
- Mount the brake. Page 12–8

12.5.1 Replacing single wheels

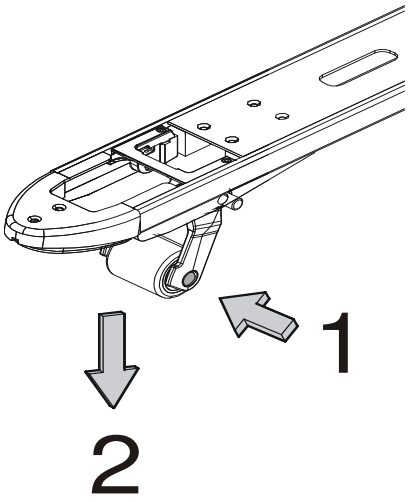
Removing single wheels



Step 1



Step 2



Steps 3, 4

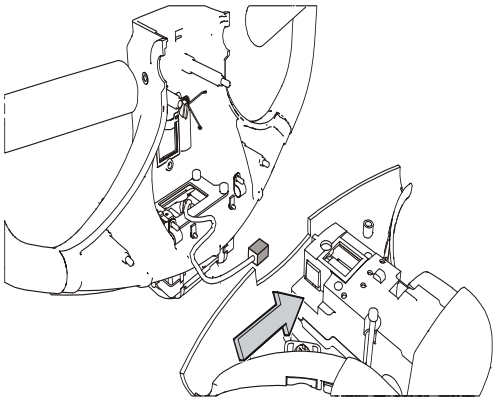
1: Remove the lock on the wheel axle

2: Support the truck with trestles, etc

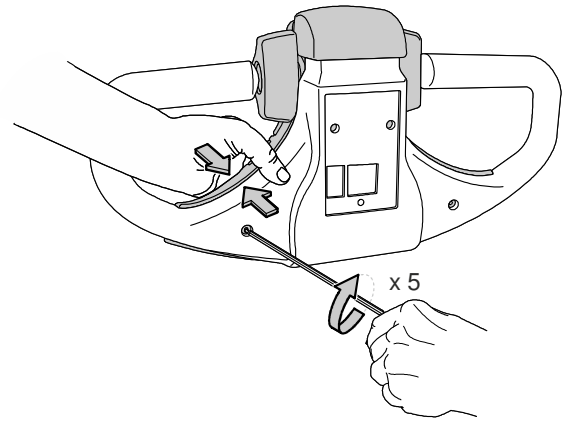
3: Knock out the wheel axle

4: Remove the wheel

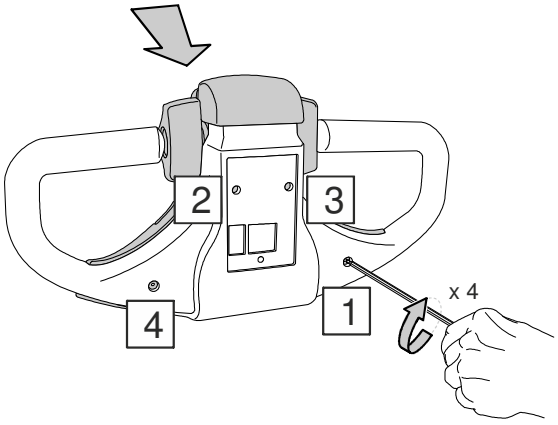
Fitting the upper cover



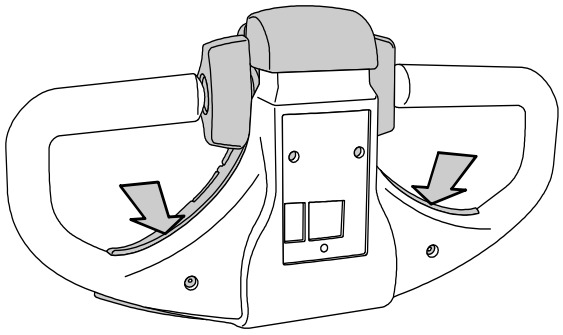
Step 1



Step 2



Step 3



Step 4

1: Connect the CAN bus connection to the logic card

2: Press together the upper and the lower parts, and turn the screws five complete turns. Start with the left side, and then proceed with the right side.

3. Turn the screws crosswise as depicted below a further four complete turns (a total of nine turns, which corresponds to 1 Nm).

4. Check that there is no space between the tiller arm and the steering head.

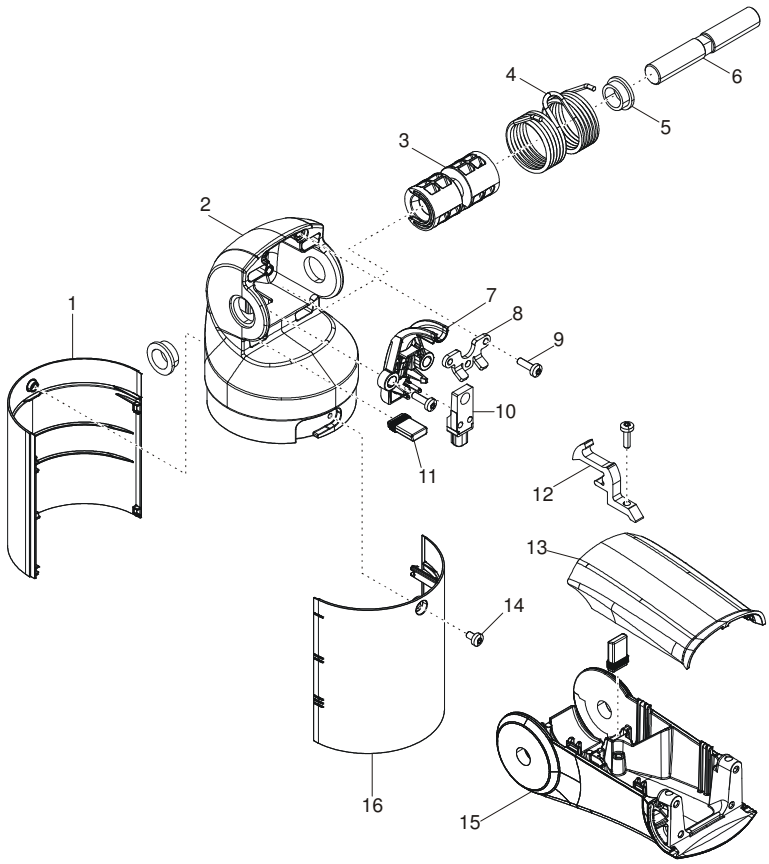
5: Make sure that the control can be moved back and forth without difficulty, and that the control returns to the neutral position.
If the control shows signs of being difficult to move: Re-adjust the screws according to step 3.

6: Fit the cover at the front of the steering arm.

- Fit the keypad. Page 13–2

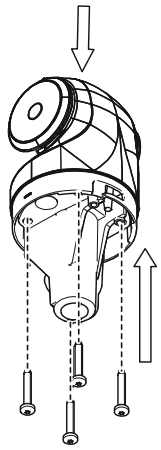
13.2 Steering arm C4110

13.2.1 Overview steering arm manual steering

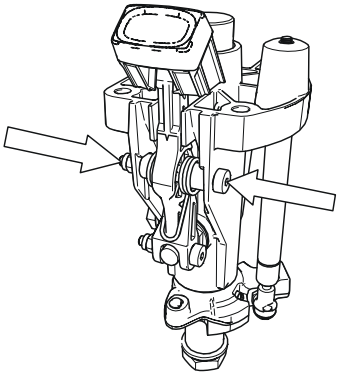


Pos.	Component	Notes
1	Cover	
2	Steering yoke	
3	Roller	
4	Spring	
5	Bushing	
6	Shaft	
7	Bracket	
8	Plate	
9	Screw	
10	Sensor	
11	Damper	
12	Plate	
13	Cover	
14	Screw	
15	Bar	
16	Cover	

Fitting the steering yoke



Step 1 T=30 Nm



Step 2 T=5 Nm

1: Fit and screw on the yoke in the steering adapter.
Note: Be careful with the wiring harness so that it does not get pinched between the yoke and the steering adapter.

2: Fit the height adjustment and screw it in tight

- Fit the safety switch. Page 13–23
- Fit the safety switch (E-man). Page 13–32
- Install the gas spring Page 13–43
- Fit the cover around the steering adapter. Page 9–9

13.4 Power steering

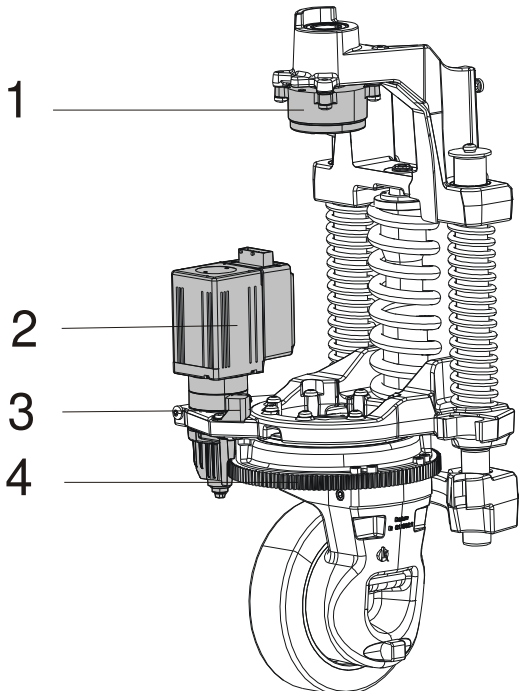
The steering system is electric and uses a "Steer-By-Wire" design. There is no mechanical contact between the handle and the steered drive wheel.

Steering is progressive, which means that when the truck is operated at low speed the steering wheel gearing ratio is higher than at high speeds. This allows the truck to be operated in a safe and efficient manner.

13.4.1 Safety

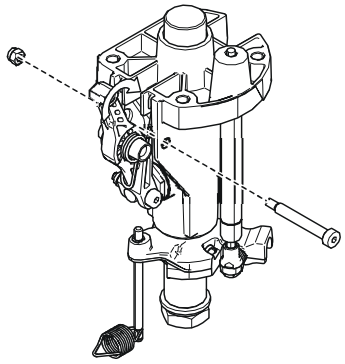
Note: If the drive wheel is not in the home position "straight ahead" 0° when the truck is started, it will return to the home position automatically. This is important to remember when performing service and repairs when cover are removed and when working in the motor compartment.

13.4.2 Overview



Pos.	Component	Notes
1	Steering damper	
2	Servo motor	
3	Steering angle sensor	
4	Gear ring	

Fitting the lock - height adjustment



Step 1, 2 T=5 Nm

1: Push the arm up into the steering adapter and fit the guide pin in the brass sleeve.

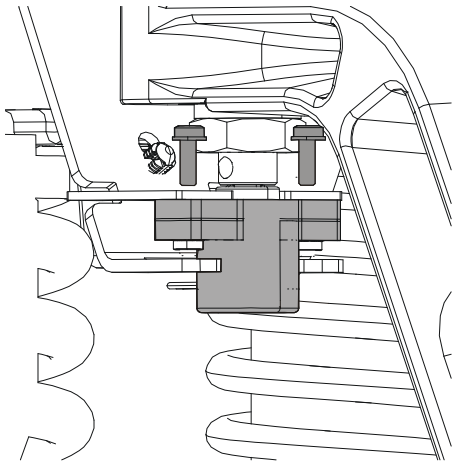
2: Fit the arm and screw it on tight.

- Fit the cover to the steering adapter. Page 9–9

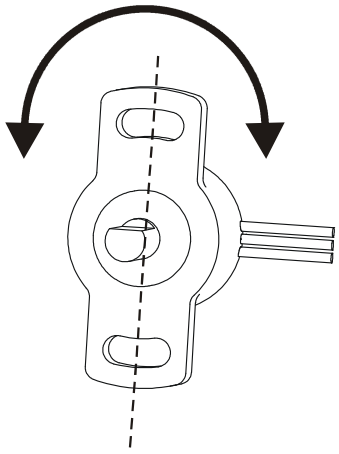
13.5.7 Checking the lock - height adjustment

Check that the tiller arm can be lifted and lowered and that the lock does not seize in the steering adapter.

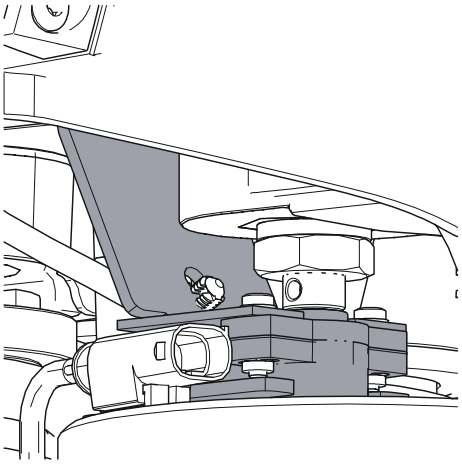
Fitting the steering angle sensor



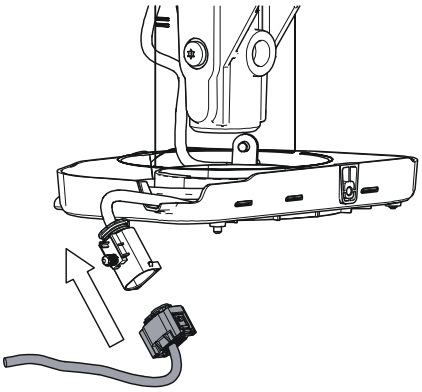
Step 1



Step 1



Steps 2, 3, 4



Step 5

1: Fit and turn the sensor so that the screw is centred in the screw holes.

2: Fit the sensor bracket and the cable clamp in the angled plate

3: Fit and screw on the sensor on to the steering axle.

4: Screw down the angled bracket securely

5: Connect the connector B13

- Refit the service casing. Page 9–3

14.2.5 Show part numbers for software/hardware

1: “Pn” is shown on the display.

2: Press the horn button to select.

3: You can obtain the following information by pressing the speed control repeatedly:
- SPn - Software package
- HPn - Logic card
- no - Machine number
- HSn . Logic card serial number

4: To show a part number, release the speed control when the required part number is shown on the display.

14.2.6 Built-in test A5 (A5)

See section "8.8 Built-in test function for the tiller arm".

14.2.7 Show collisions

If there is an impact sensor installed on the CAN bus, it registers when the truck bumps into something. Information about the collision is stored in the truck's internal memory. The last ten registered collisions can be read directly from the display together with operator identity via the PIN code. Additional information is available via TruckCom, where collision levels and time indications can also be read.

1: “c” is shown on the display.

2: Press the horn button to select.

3: By pressing the speed control repeatedly, you can see the last 10 collisions.

If a 5-digit PIN code is shown, the first digit is shown and then the other 4 digits are shown.

14.2.8 Show/change parameters

1: “Par” is shown on the display.

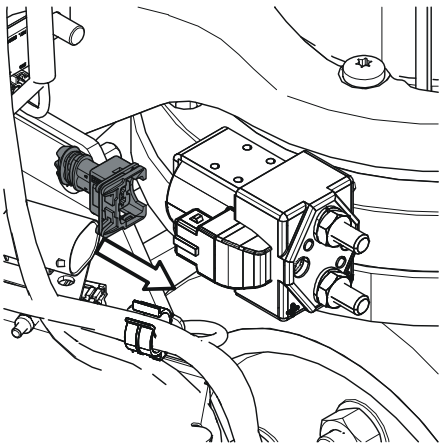
2: Press the horn button to select. The parameter symbol lights up.

3: By pressing the speed control repeatedly, you can move through the parameter list.

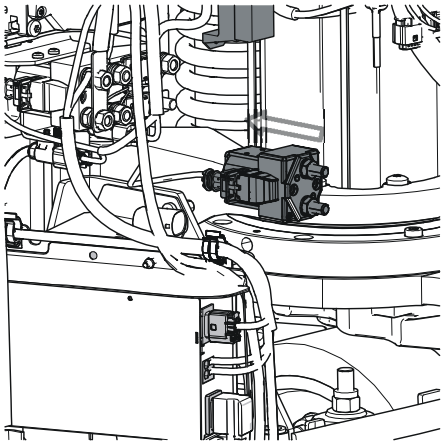
See section "5.1 General parameters".For setting parameters.

To show a parameter, release the speed control when the required parameter is shown on the display. Press the horn button to change the parameter.

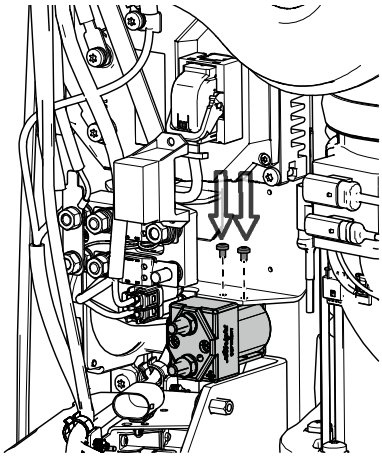
Fitting the pump contactor



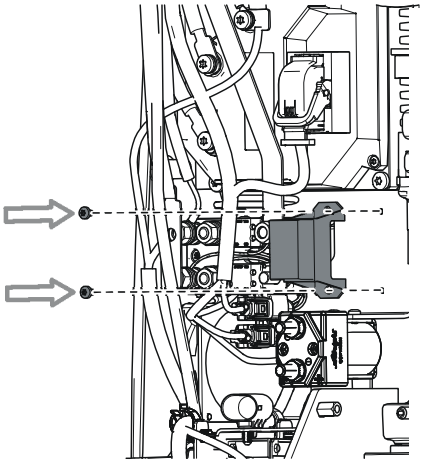
Step 1



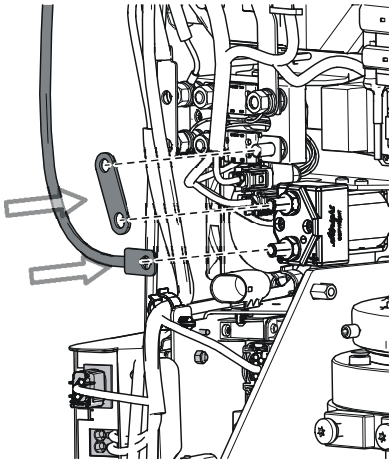
Step 2



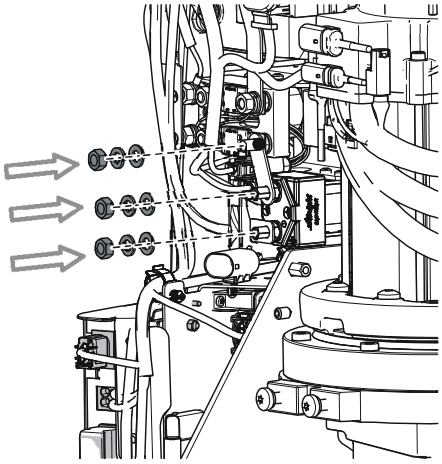
Step 3 T=2.5±0.25 Nm



Step 4



Step 5



Step 6 T = 9 Nm

1: Connect the connector

2: Guide in the pump contactor.

3: Attach the pump contactor in place with the screws. T=2.5±0.25 Nm

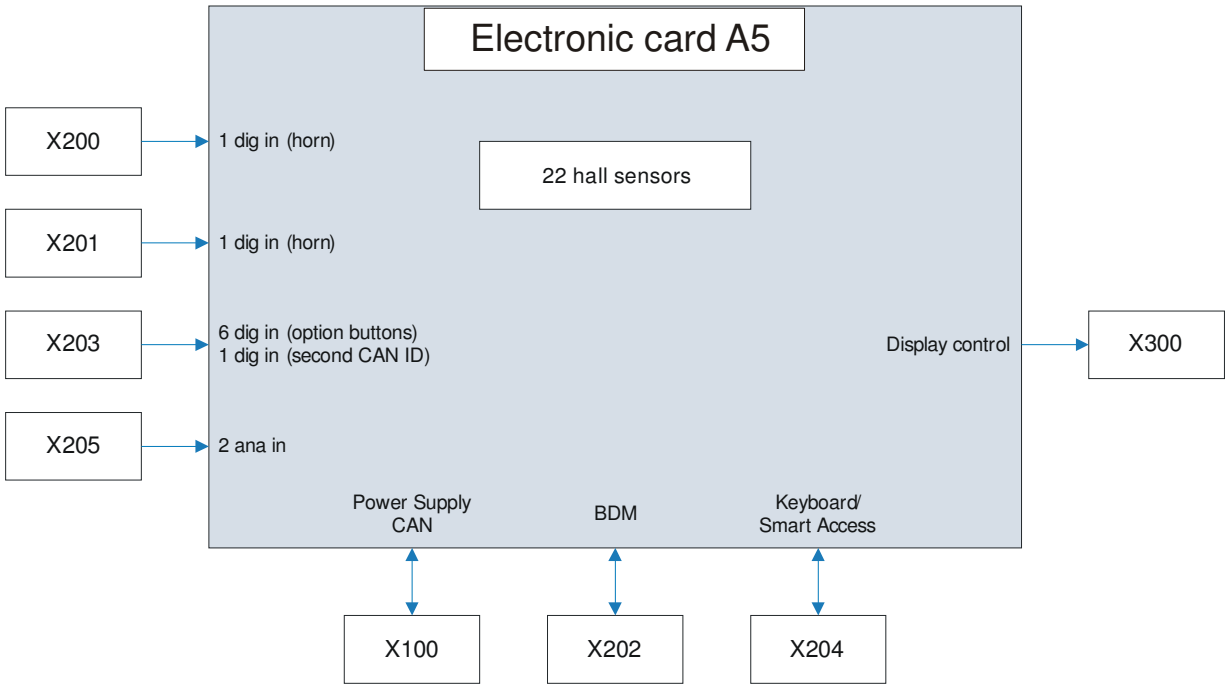
4: Fit the fuse holder.

5: Fit the cable and plate.

6: Tighten the nuts of the connections.

- Fit the service cover. Page 9–3

14.7.12 Logic card (A5)



Connector	Type	Pin	Function
X100	Tyco	MQS 2X4 pin	Supply from truck and CAN
X200, X201	AMP	MTE 1x2 pin	Horn
X202	Tyco-AMP alt. MPE-GARRY	2x3 pin	BDM
X203	AMP	2x8 pin	Option buttons
X204	BERG	1x10 pin	Keypad
X205	AMP	MTE 1x4 pin	
X300	AMP	1x6 pin	Display

15.2.5 Work procedures

When working on the hydraulic system, great cleanliness must be observed so that no impurities can enter the system.

No work that generates particles may be carried out in the same workplace or close to where work is being carried out on the hydraulic system.

The service technician must ensure that the components to be used are carefully deburred and cleaned.

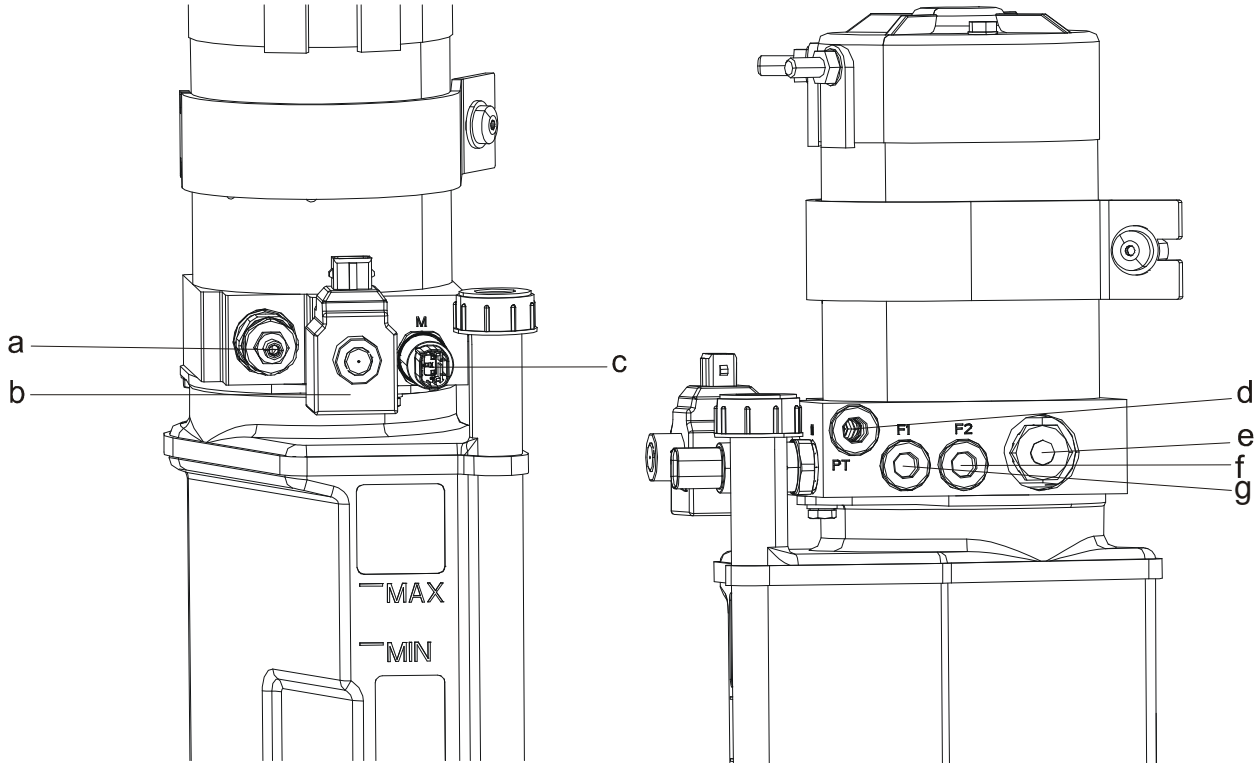
Couplings for pipe ends or other openings must never be removed until the part is to be fitted to the receiving component.

Note:

All hydraulic components that have not been cleaned, e.g. pipe couplings and nipples, must be blown clean before fitting.

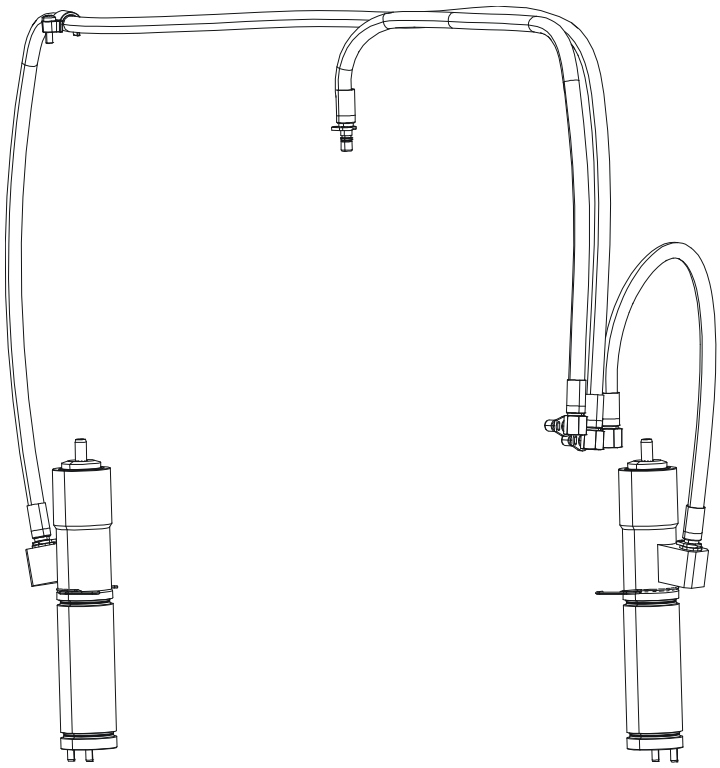
15.3.8 Valve unit

Overview



Pos.	Description	Notes
a	Pressure limiting valve	
b	Lowering valve	
c	Pressure sensor/plug	
d	PowerTrak hose connection	
e	Non-return valve	
f	Air cylinder connection	
g	Lift cylinder	

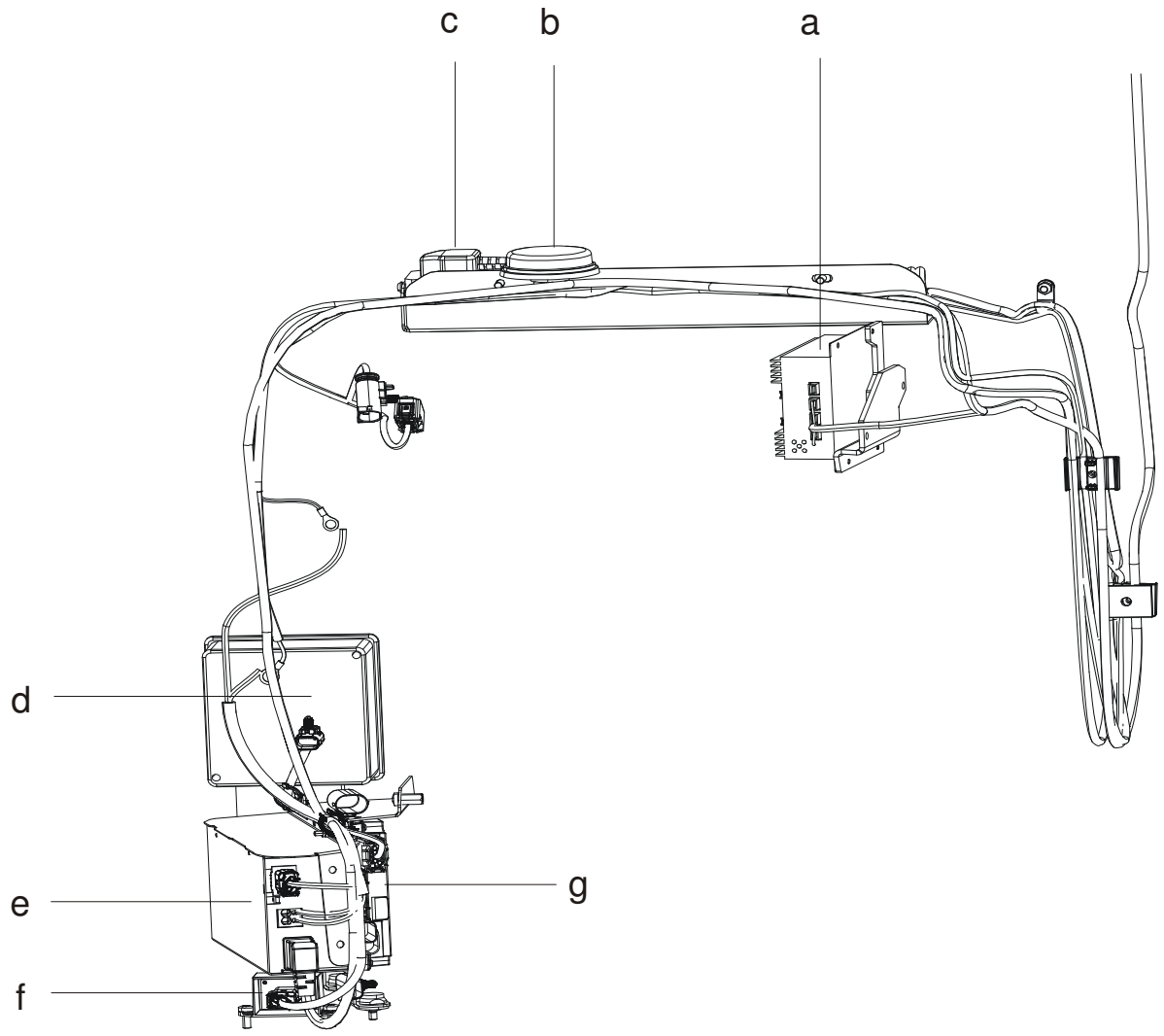
15.3.18 Lift cylinder



Two plunger cylinders are used for fork carriage lifting.

18. Options/Extra equipment C9000

18.1 Overview



Pos.	Description	Notes
a	DC/DC converter, 24V-12V	
c	Power cable BCU	
d	SEU	
e	Built-in charger (BCU)	
f	Impact sensor	

19. Instructions for disposal

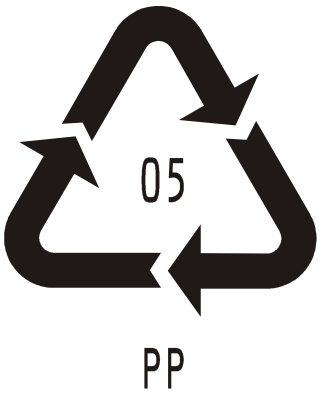
19.1 General

The disposal instructions were developed to support our company's objective of protecting the environment. By recycling materials, resources can be utilised more efficiently, while reducing emissions.

The instructions below indicate the proper sorting category for the materials used in the various truck components. To achieve optimum sorting, all components should be disassembled to a level corresponding to the sorting categories.

19.2 Marking of plastics

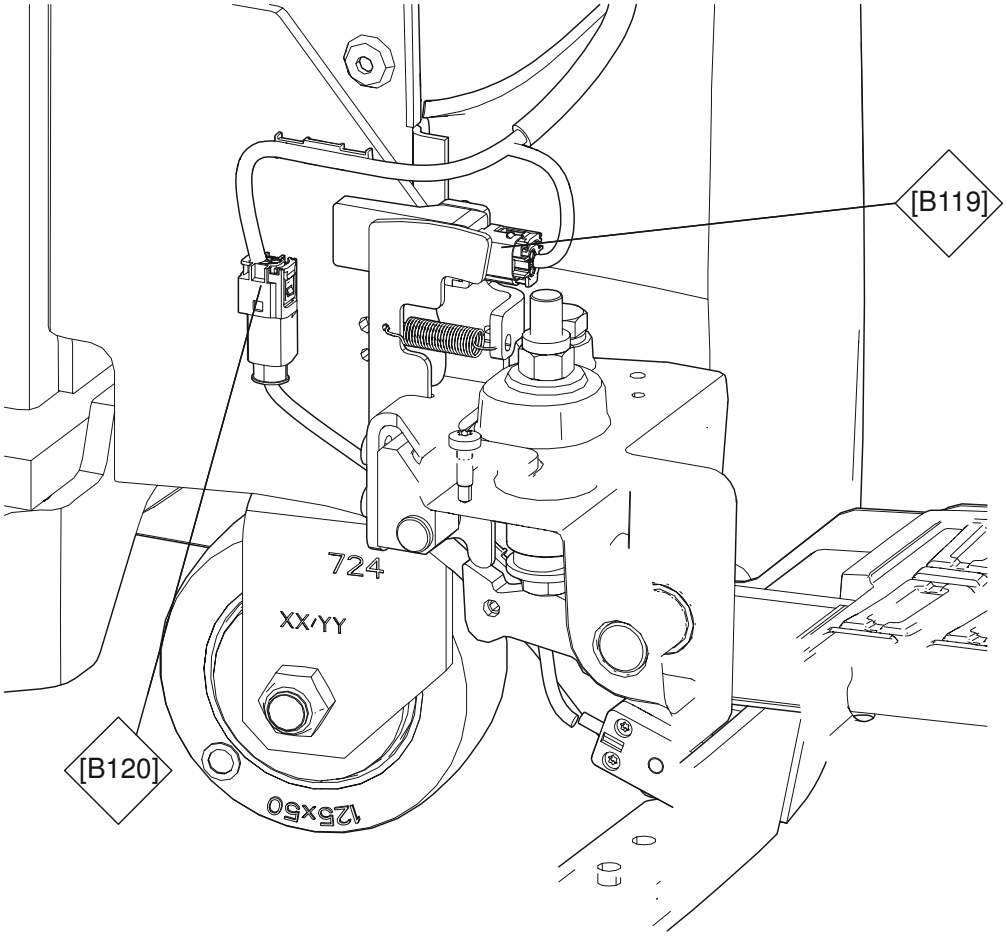
19.2.1 General marking of products and packaging



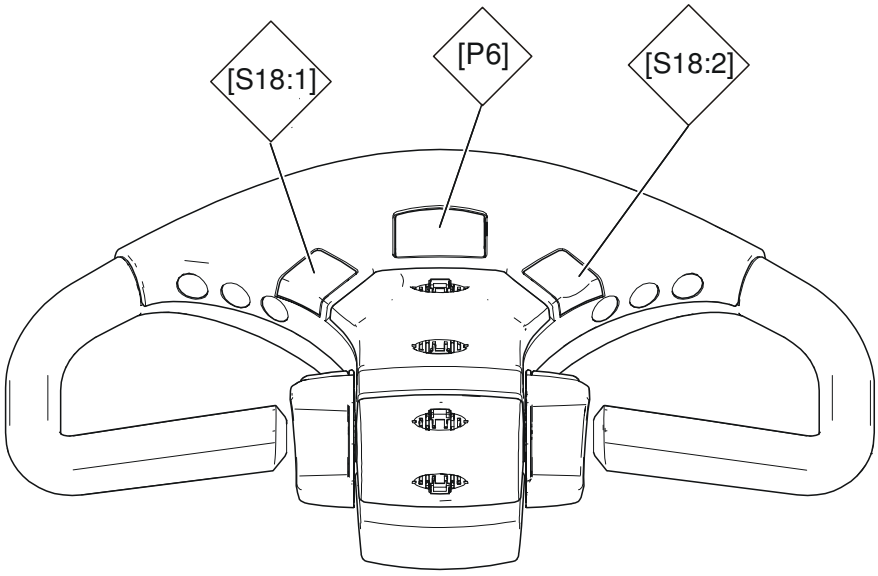
Markings on plastics consist of three arrows, a number and usually also a designation of the plastic material used. This example shows the marking for polypropylene.

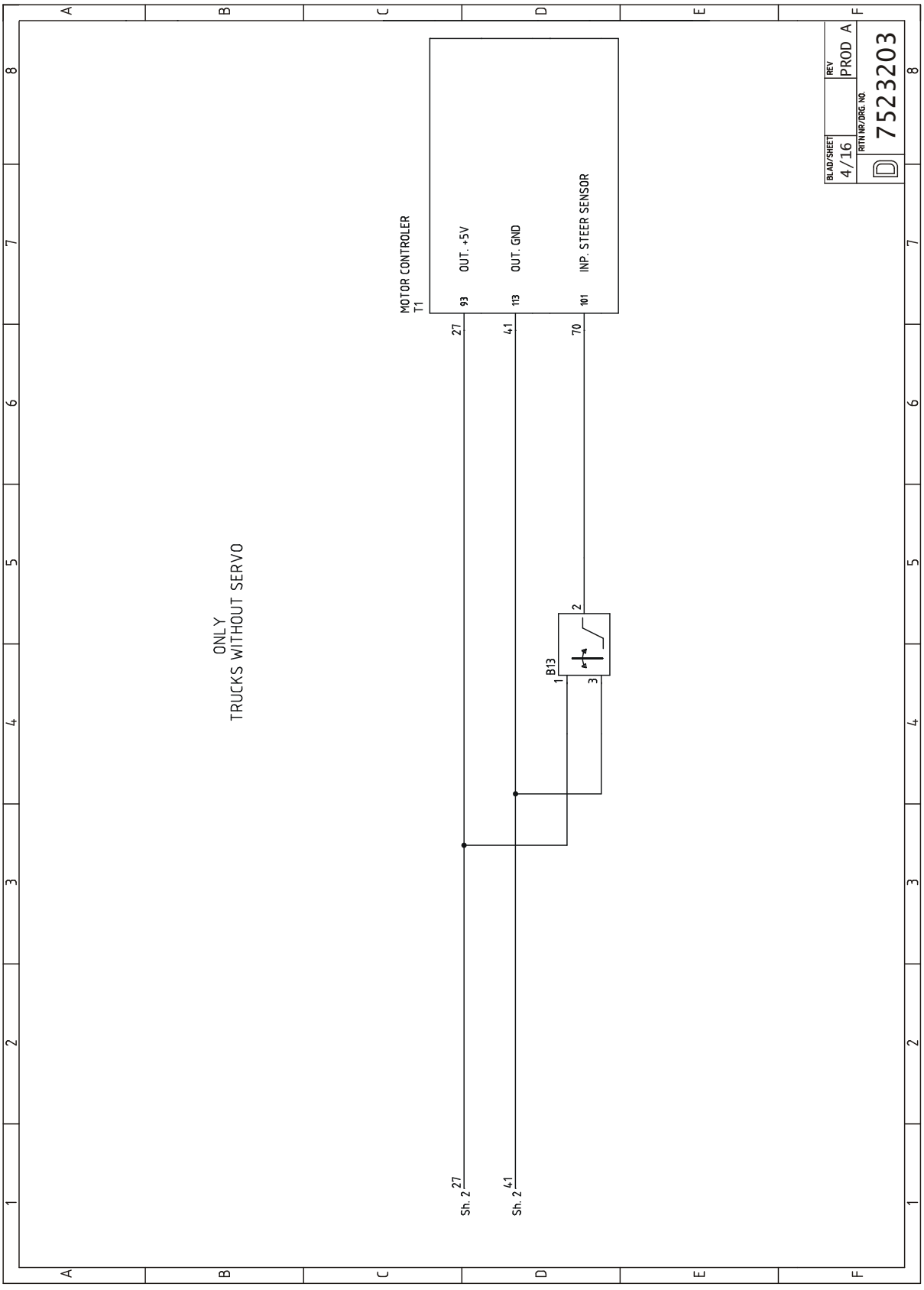
- 01: PET – Polyethylene terephthalate
- 02: PE-HD – Polyethylene with high density
- 03: PVC – Polyvinyl chloride
- 04: PE-LD – Polyethylene with low density
- 05: PP - Polypropylene
- 06: PS – Polystyrene
- 07: O – Other

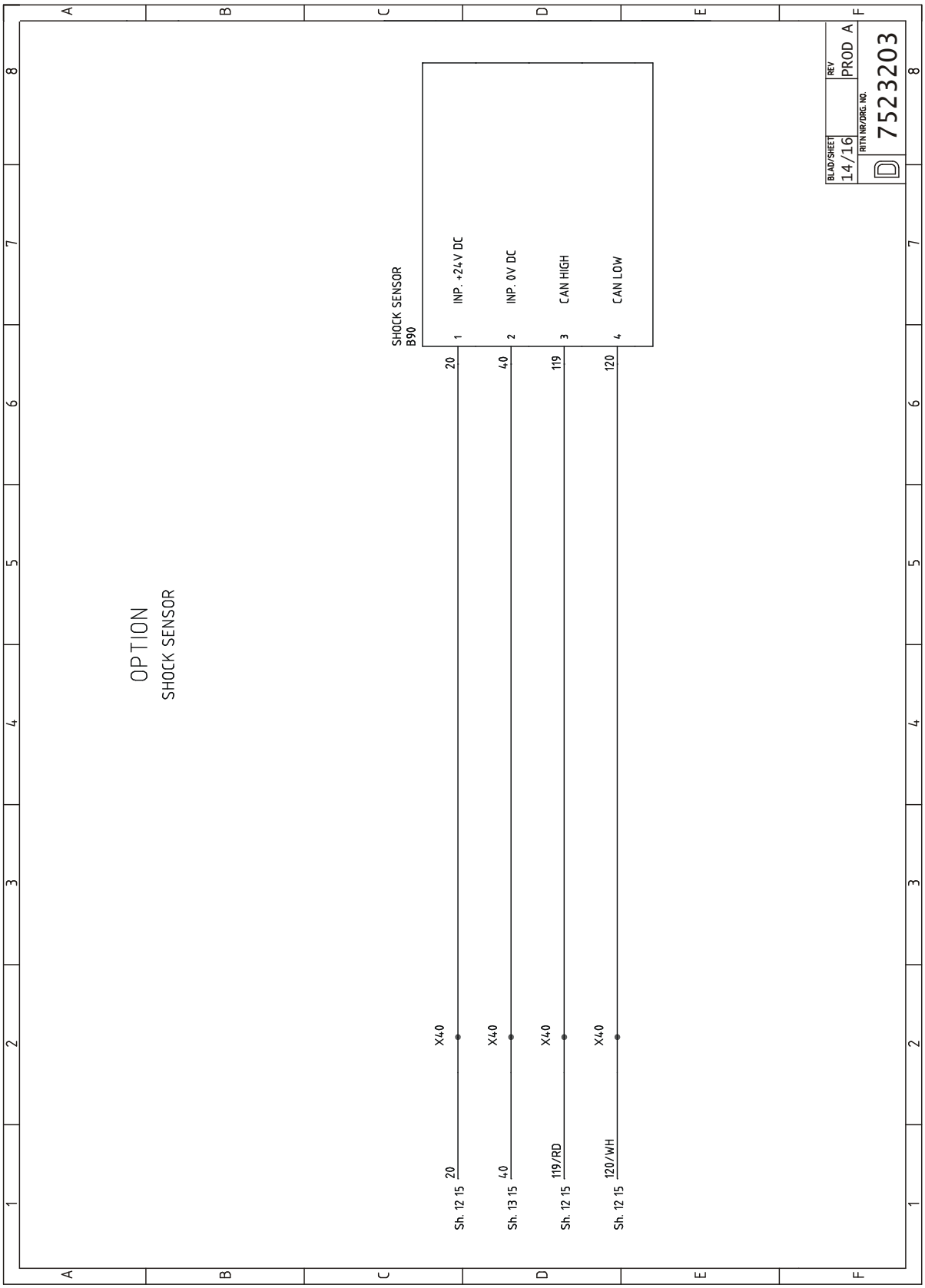
Picture 3



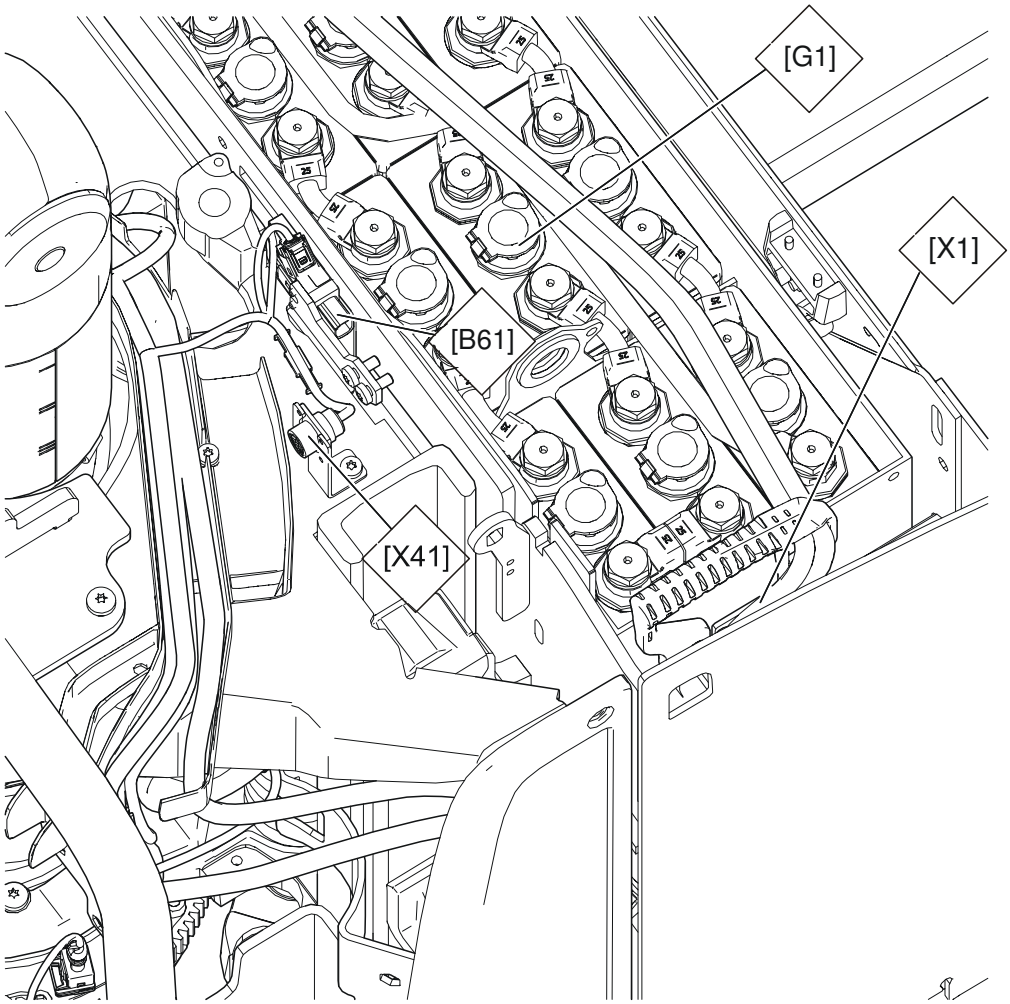
Picture 13




MOTOR CONTROLER
T1
OUT. +5V
OUT. GND
INP. STEER SENSOR
93
113
101
27
41
70
B13
1
2
3
Sh. 2 27
Sh. 2 41
ONLY
TRUCKS WITHOUT SERVO
BLAD/SHEET
4/16
RITN NR/DRG. NO.
7523203
REV
PROD A

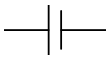
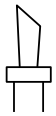
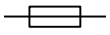
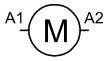
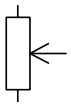
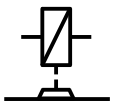
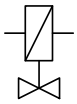
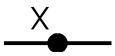
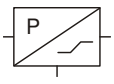

OPTION
SHOCK SENSOR
SHOCK SENSOR
B90
1 INP. +24V DC
2 INP. 0V DC
3 CAN HIGH
4 CAN LOW
20
40
119
120
X40
X40
X40
X40
20
40
119/RD
120/WH
Sh. 12 15
Sh. 13 15
Sh. 12 15
Sh. 12 15
BLAD/SHEET
14/16
REV
PROD A
RITN NR/DRG. NO.
7523203

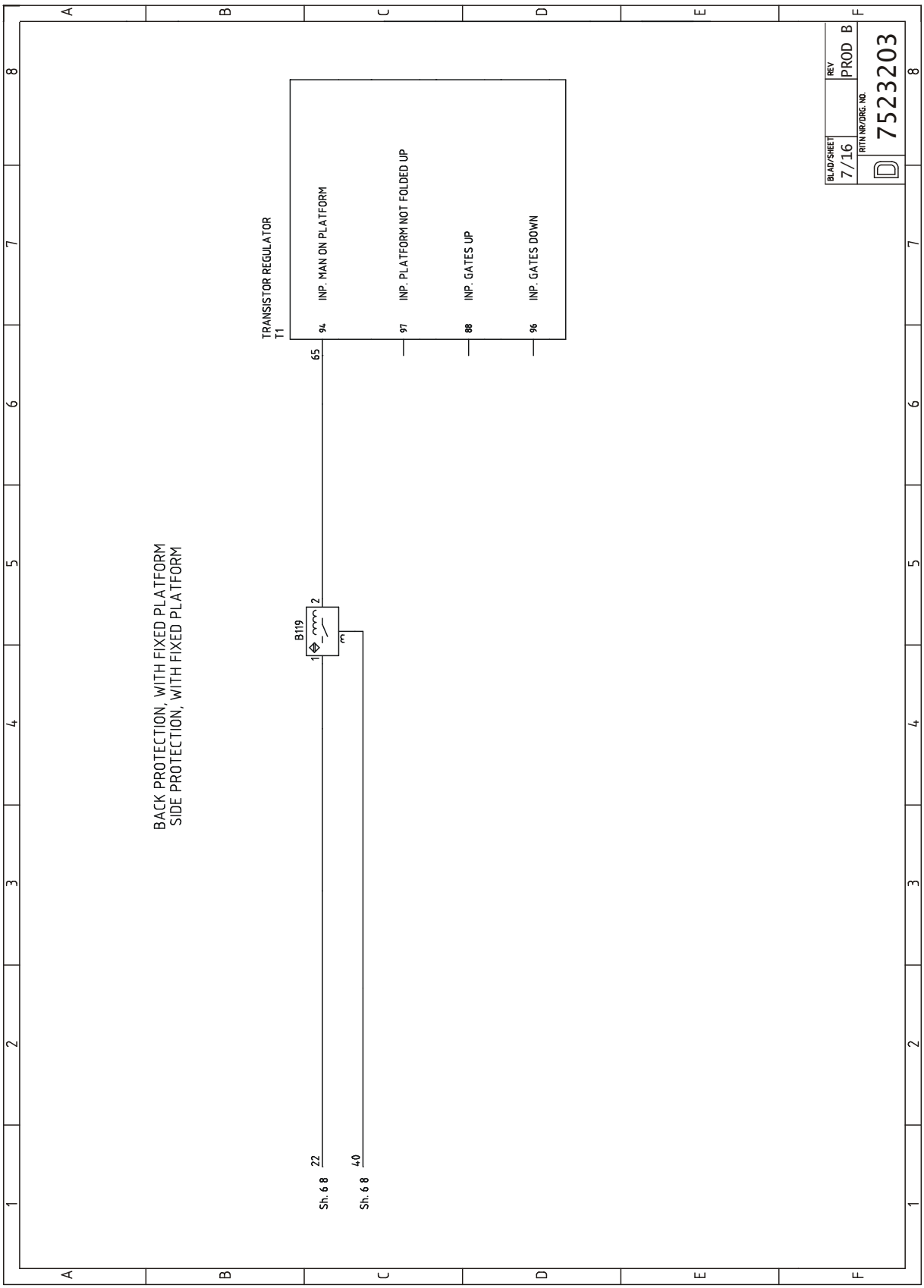
Picture 6



20.7 Wiring diagrams

20.7.1 List of symbols

Symbol	Description	Symbol	Description
	Truck battery.		Horn
	Fuse		Emergency switch off NC
	Sensor, inductive NO		Switch, pressure (weight) operated
	DC motor		Sensor, inductive NC
	Contactor		Variable resistor (potentiometer)
	Brake coil (normally applied)		Pressure switch NO
	Coil for the hydraulic solenoid valve		Multi-pin connector
	Pressure sensor, analogue	NO = Normally open NC = Normally closed	

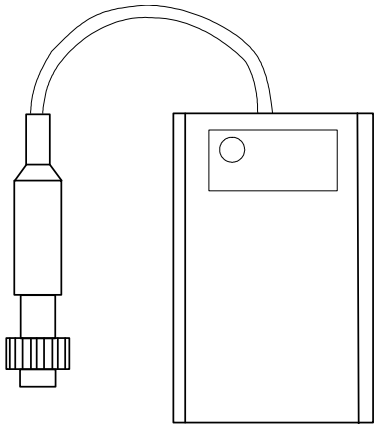
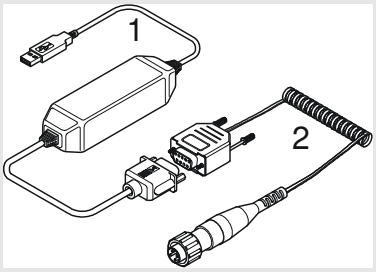
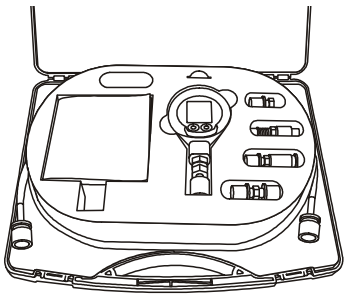
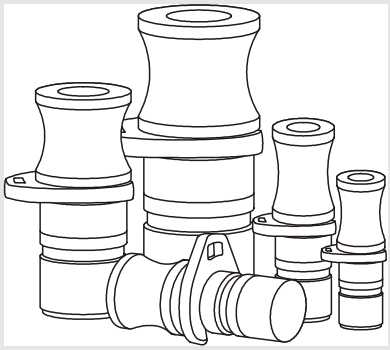

BACK PROTECTION, WITH FIXED PLATFORM
SIDE PROTECTION, WITH FIXED PLATFORM
TRANSISTOR REGULATOR
T1
INP. MAN ON PLATFORM
INP. PLATFORM NOT FOLDED UP
INP. GATES UP
INP. GATES DOWN
94
97
88
96
65
B119
1
2
3
22
40
Sh. 6 8
Sh. 6 8
BLAD/SHEET
7/16
REV
PROD B
RITN NR/DRG. NO.
7523203

21. Hydraulics schematics

21.1 Component list

Pos.	Type of component	Designation	Picture	Remarks
a	Lift cylinder	F1	1	Fork carriage lift
b	Lift cylinder	F2	1	Fork carriage lift
c	PowerTrak cylinder	PT	1	Increases the pulling capacity with a loaded machine
d	Pressure sensor	M (B4)	1	Pressure sensor/Cavity plug
e	Solenoid valve	Q4	1, 2	Solenoid valve, lowering
f	Flow control valve		2	
g	Return filter		2	
h	Suction strainer		2	Coarse filtering of oil, pump suction side
j	Tank		3	
k	Air filter		3	Tank ventilation
l	Pump	M	2	Hydraulic pressure
n	Pressure limiting valve		2	Limitation of max. hydraulic pressure, 250 bar
o	Non-return valve		2	
p	PowerTrak restrictor		2	Ø1.1

22.4 Other tools

Tools		Usage
	7513225	Service instrument (CAN)
	1=7521083 2=163793	Service instrument (CASTOR USB) for programming
	219730	Hydraulic pressure gauge
	1/4" — 254526 3/8" — 254527 1/2" — 254528	Plugs (male part) for valves with WEO type quick change connector