Workshop literature

STILL
ELECTRONIC
DOCUMENTATION
SYSTEM

Electric forklift truck

RX50-10
RX50-13
RX50-15
RX50-16

CE

5051 5053 5054 5055

164530 EN - 05/2011

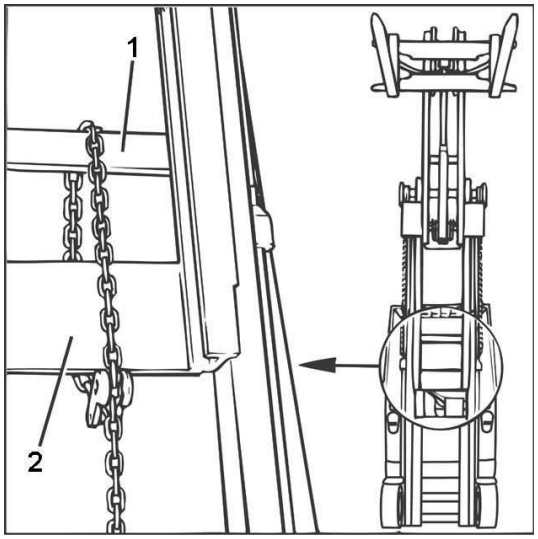
first in intralogistics

Securing the triple lift mast

– Extend the lift mast.
– Route the chain along the cross traverse of the outer mast (1) and connect it underneath the cross traverse of the middle mast (2).
– Lower lift mast until it sttrikes the chain.
– Lower fork carriage down to the stop.

NOTE

Extend the lift mast to slacken the chain.



Technical data

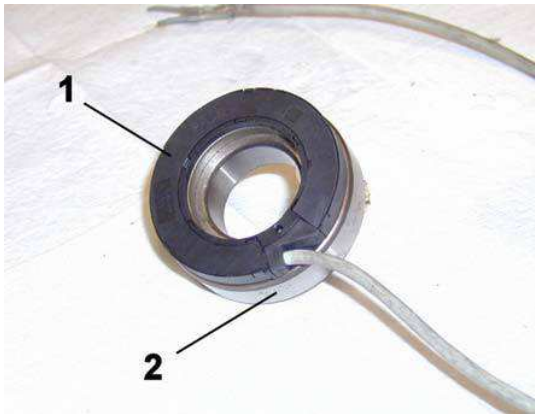
Model: Sensor bearing

64 impulses per revolution.

Phase offset: 90° ± 45°

Temperature range: -30°C to +150°C

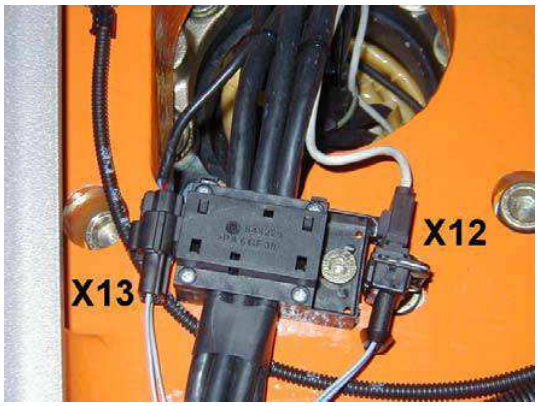
Supply voltage: 12 Volt



1 sensor
2 grooved ball bearing

electrical connections

4-pin JPT plug X12			
Red	X12/1	X151/3	+ 12 Volt
White	X12/4	X151/6	Signal A
Blue	X12/2	X151/5	Signal B
Black	X12/3	X151/4	GND



inspection

- Insert the mark II measurement adapter into the X12 plug connector
- Use a digital multimeter with integrated duty cycle (e.g. Metra Hit 16L)
- Connect digital multimeter:

  Adapter pin 4 - positive
  Adapter pin 3 - negative
- Then connect digital multimeter:

  Adapter pin 2 - positive
  Adapter pin 3 - negative
- Switch on lock switch S1
- Measuring range: duty cycle "V~Hz%"
- At full speed, a duty cycle must be **40–60% (ideally 50%)**.

Performance in case of error

If the sensor bearing does not send any signals to the converter, the traction motor operates in slip mode (creep speed).

Wheel drive

Wheel hub removal

Removal

NOTE

- *Removal of the individual units is described in detail in the corresponding chapters.*
- *Drain the gearbox oil in good time, so that the oil has enough time to drain out.*
- *The workshop hoist can be used to perform tasks at the wheel hub and the gearbox while they are still fitted.*
- *We recommend removing the entire power unit.*

NOTE

– Disconnect the battery male connector.

– Loosen the wheel nuts.

– Jack up the truck onto two square timbers at the counterweight. ▷

– Remove the drive wheel.

– Drain gearbox oil. The drain plug is located in the centre of the gearbox cover.

– Remove the power unit; see chapter entitled "Removing the power unit."

– Loosen the gearbox cover screws and remove the cover. ▷

Driver's seat

seat contact switch

General

The 7S1 seat contact switch is a mechanical switch that is attached to the side of the seat cushion. It switches even with light loads.

As soon as the driver sits on the driver's seat, the seat contact switch is applied and the drive unit is enabled by the controller.

⚠ CAUTION

The seat contact switch is a safety device that switches off the drive unit when there is no load on the seat.

Do not bypass the seat contact switch.

electrical connections

Seat contact switch 7S1 is connected directly to the control computer

6-pin mark II plug			
7S1/3	X108	XXK5	X45/38
7S1/4	X108		X45/37

Seatbelt lock switch

General

NOTE

In the event of a faulty buckle switch in the ISRI 2400 driver's seat, the entire driver's seat must be replaced.

– Connect the key switch plug contacts.
– Screw on the steering column panelling.
– Connect the keypad plug.
– Screw the panelling onto the right and left-hand sides of the front structure.
– Carry out a functional test, steering from stop to stop several times.

diaphragm pressure switch

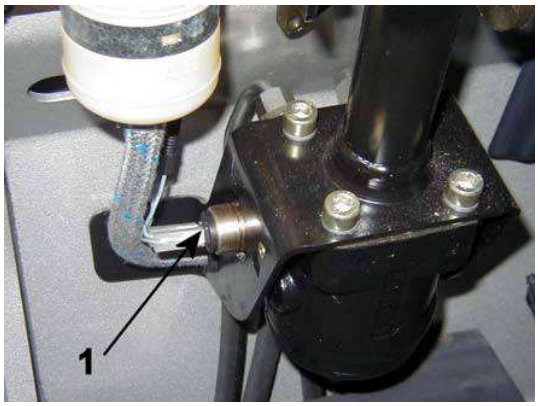
General

The diaphragm pressure switch (1) is screwed to the steering unit. Pressure is built up in the steering unit by turning the steering wheel. When a specific pressure is reached, the pressure switch opens and the pump motor starts running.

For the switching range, see the chapter entitled "General technical data".

NOTE

The factory setting for the switching range must not be changed.



1 diaphragm pressure switch

Removal

– Remove the panelling at the left-hand side of the front structure
– Separate plug to keypad
– Remove the steering column panelling
– Separate plug contacts of lock switch
– Separate plug contacts of membrane pressure switch
– Using a long SW24 nut, screw off membrane pressure switch

ENVIRONMENT NOTE

Hydraulic oil flows out when unscrewing the diaphragm pressure switch. Collect the hydraulic oil and dispose of it in line with regulations.

Installation

– Using a long SW24 nut, screw on membrane pressure switch
– Connect plug contacts of membrane pressure switch (1)
– Connect plug contacts of membrane pressure switch

Complete wheel assembly

General technical data

Wheels	
Front wheels	5 x M14 x 29 spherical collar bolts Tightening torque **195 Nm**
Drive wheel	5 x M14 x 29 spherical collar nuts Tightening torque **195 Nm**
Tyres	
Tyre types	Only approved tyre types may be used.
Tyre pressure in pneumatic tyres	The air pressure specified on the tyre pressure labels must be maintained. In the event that labelling is missing from the truck, the operator must enquire about the air pressure.

Superelastic tyres

Assembly

– Clean wheel rims and, if necessary, remove burrs.

– Lubricate the tyres and rim on the sliding faces with an evaporating parting compound.

⚠ CAUTION

To ensure that the tyres are securely fitted, only certain assembly parting compounds may be used.

– The recommended parting compound is SIPIOL G from Henkel

– solid rubber lubricant No. 5930388 from Tip Top Stahlgruber

– Do not use the usual mounting paste for pneumatic tires!

– Fit rim to the press baseplate using the appropriate support ring.

Regrooving

If the original profile is worn, the tyre has reached the halfway point of its service life.

The tyre can be regrooved in order to continue to guarantee a good ground grip on wet and dirty roadways.

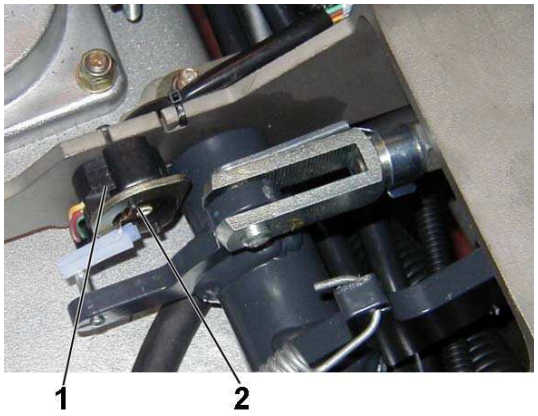
In order to maintain the ability to retread the tyre, you must not fall below the wear and regrooving limits. The profiles can be regrooved to the top edge of the 60-Joule ridge.

Regrooving must only be performed in stages. A second stage of regrooving may only take place once the profile has become worn again.

Brake sensor 1B2

General

Brake sensor 1B2 (1) is screwed into a threaded plate (2) inside the bearing block using two screws. The brake sensor is a potentiometer that is adjusted by a tappet on the brake pedal.



electrical connections

3-pin mark II plug 1B2			
1B2/1	Yellow	X45/40	GND
1B2/2	Red	X45/41	Signal
1B2/3	Green	X45/39	+10 V

Setting

– When the brake pedal is in the inactive position, the brake sensor must be set in such a way that the output signal is within the valid value range:

Truck	Supply voltage	Ideal value	Value range
5051–5055	10 V		1.0–4.0 V

The brake sensor is pretensioned slightly when being mounted onto the bearing block. This ensures that the specified open-circuit voltage is achieved.

A calibration must be carried out in order to finely adjust the potentiometer.

Calibration

A calibration must always take place after the brake sensor has been replaced.

– Connect the notebook to the truck and start the truck diagnostics:

Jobs
▼
Sensor calibration
▼
Execute

Calibration can also be started by changing the parameters in the control processor. To do this, the address A0F2 must be set to the value of 02. The value only triggers the job and is not stored in EEprom.

Once calibration is complete, error messages may be displayed.

Twin-pedal

Two-pedal accelerator

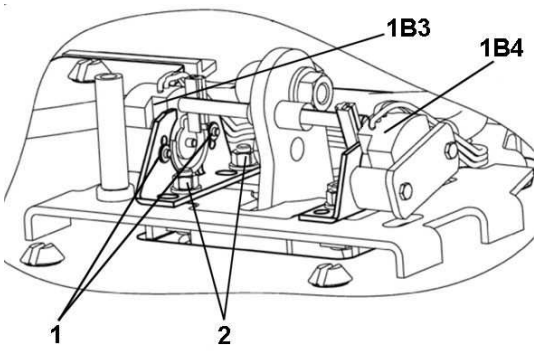
Bottom plate

The dual-pedal bottom plate is equipped with two drive direction-dependent pedals. The pedals are connected to each other mechanically and move in opposing directions. The horn button 4S1 is located in the lift lever in this variant.

Two accelerators are installed underneath the bearing block of the left pedal.

Accelerator

The accelerator consists of two mechanically connected accelerator pedals and two potentiometers 1B3 and 1B4, which work in opposing directions. The driving speed is regulated by the potentiometer when the accelerator pedals are actuated.



1 Potentiometer
2 Support

⚠ CAUTION

Faulty setting and calibration due to incorrect parameterising

The accelerator pedal model must be specified in the parameterising. Only then can calibration be executed correctly.

Parameterisation

The configuration must be parameterised again for all retrofitting and conversions related to the accelerator and drive direction. Parameterising takes place using the truck diagnostics in the notebook.

This affects the following components:

- Single pedal
- Dual pedal
- Joystick, fingertip
- Lift lever
- Mini-console

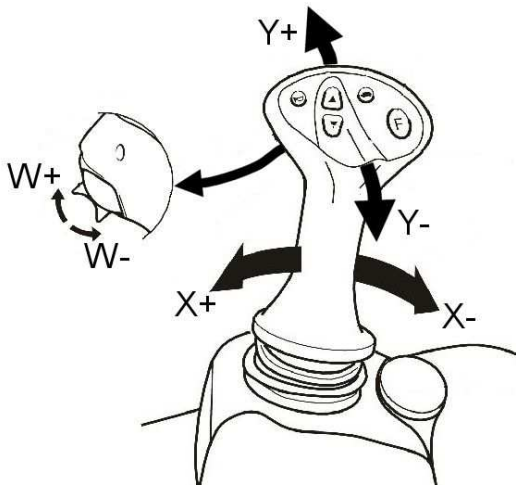
A truck restart must always be carried out after parameterising. Calibration can only be carried out once these processes have been completed.

Calibration

Calibration must always be carried out after the accelerator has been replaced.

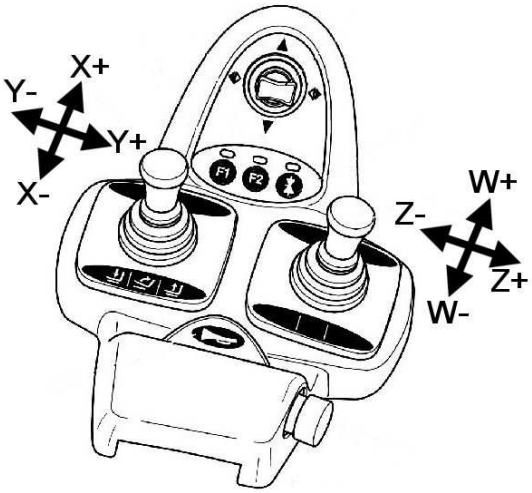
Joystick

Axis	Default	Variant
X +	Auxiliary 1	Lifting
X -	Auxiliary 1	Lowering
Y +	Lowering	Tilt forwards
Y -	Lifting	Tilt backwards
W +	Tilt backwards	Auxiliary 1
W -	Tilt forwards	Auxiliary 1



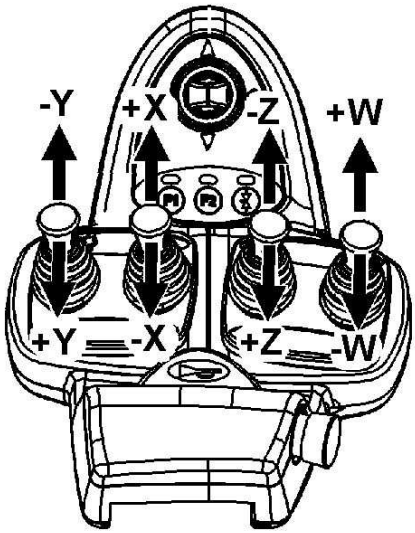
Duplicate mini-lever Generation 2

Left joystick	Default
Y +	Lifting
Y -	Lowering
X -	Tilt backwards
X +	Tilt forwards
Right joystick	**Default**
Z +	Auxiliary hydraulics 1
Z -	Auxiliary hydraulics 1
W -	Auxiliary hydraulics 2
W +	Auxiliary hydraulics 2



Four-way mini-lever Generation 2

Lever	Default
Y +	Lifting
Y -	Lowering
X -	Tilt backwards
X +	Tilt forwards
Z +	Auxiliary hydraulics 1
Z -	Auxiliary hydraulics 1
W -	Auxiliary hydraulics 2
W +	Auxiliary hydraulics 2



- Disconnect the mini-console CAN bus connection from either the relay box or the control processor, depending on the equipment.
- Disconnect the earth wire.
- Remove the three mounting screws (Torx 8 and Phillips) from the cap (6).
- Remove the cap (6) from the switch (5) by pulling it off in an upwards direction.
- Disconnect the plug (3) from the switch (5).
- Remove the switch (5) by pulling it from the support (4) towards the left.
- Unscrew the clip (2) and remove the console (1) from the steering column.

Installation - retrofitting

- Park the truck safely.
- Turn the key switch OFF.
- Disconnect the battery male connector.
- Remove the cover from the steering wheel.
- Loosen nut (SW27).
- Remove washer.
- Remove the steering wheel.
- Place the console (1) on the steering column so that the latch is centred on the steering column.
- Use four screws to clamp the console (1) to the steering column using a clip (3) and support (4). In doing so, the support must be centred above the latch on the console.
- Slide the switch (5) onto the support (4) from the left-hand side.
- Connect the plug (3) to the switch (5).
- Slide the cap (6) downwards onto the switch (5).
- Secure the cap (6) with 4 screws.
- Route the CAN bus wire and connect to either the relay box or the control processor, depending on the equipment.

1 console
2 Clamp
3 Cable connection
4 Holder
5 Wear
6 flap

NOTE

- *If a device or a version is unknown, the hardware or software version* `V???` *is displayed .*
- *For information about device detection and read-out options of the different control units, see the RX50 workshop manual.*

Load measurement

```
LOAD          0kg
```

Load measurement is provided for statistical evaluation only in variants with Fleet Manager. A load weighing mechanism is not fitted!

Truck Reset

```
RESET           -
RESET       NO
```

A complete restart of the electrical system is called Truck Reset. A Truck Reset is necessary in order to activate parameter changes in the control processor.

– Activate field 2 and use the Up button to set the device detection to A.

– Confirm changes with the ENTER button.

– Activate field 4 and use the Up button to set to YES.

– Pressing the ENTER button resets the electrical system.

NOTE

It is only possible to reset the electrical system if the device detection has been set to A.

Changing the password in level 1

```
PASSWORD LEVEL  1
NEW CODE  XXXX
```

NOTE

The password can be changed as often as desired in password level 1. The password can be read only with the aid of the diagnostic system.

Password level 2

Service interval

```
SERVICE IN  990h
F-ID  5051001234
```

i.e. the contacts of the main contactor do not jam.

– After successful safety monitoring, the pump actuator loads the inverter intermediate circuit.
– A safety relay is activated in the pump actuator after this has been enabled by the control processor. Relay click can be heard. 24 V is available at the inverter.

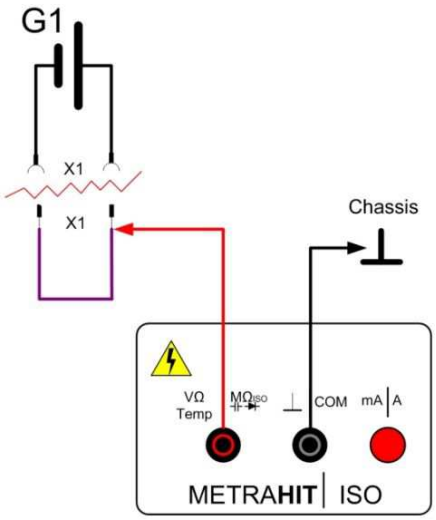
24 V enable	
Control processor	Pump actuator
X45/9	X392/2

– The inverter starts up and carries out a self-check.
– A second safety relay is activated in the pump actuator after this has been enabled by the control processor. Relay click can be heard. 24 V is available at the main contactor.

24 V enable	
Control processor	Pump actuator
X45/10	X392/1

– Only now does the main contactor 1K1 close.
– The drives are ready.
– The drive unit and the hydraulics are now enabled. A prerequisite for this is the status of the handbrake and the seat contact switch.

– Connect the positive wire of the measuring device to the short-circuit bridge on the battery male connector.
– Connect the negative cable to an area of clean metal on the truck chassis.

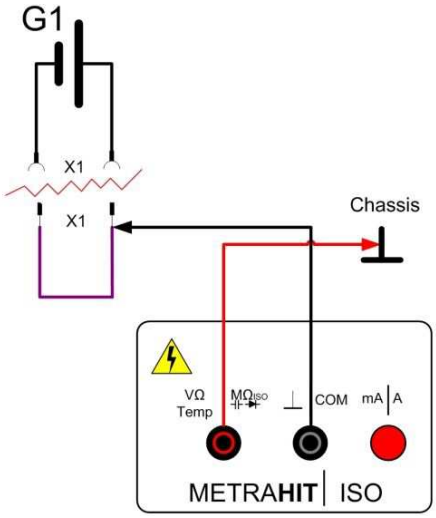


NOTE

The measurement may take a few seconds, as capacities are transferred between the truck chassis and the electronics.

The measurement must be carried out with both polarities, as many electronic building elements are installed with direction-dependent breakdown characteristics in the controllers.

– Connect the negative wire of the measuring device to the short-circuit bridge on the battery male connector.
– Connect the positive wire to a clean area of metal on the truck chassis.



Ideally, both measurements should produce the same value. If the values deviate from one another, the lower value is valid for the truck.

Follow-up work

The measurements have caused capacities to be created in the truck. These must be discharged in a defined manner.

– Leave the measuring device connected until the voltage value at the truck has decreased to < 10 V.
– Remove the discharge circuit from the main contactor.
– Remove the short-circuit bridge from the truck battery male connector.

Component insulation testing

General

If, during insulation testing of the entire truck, the insulation values measured were insufficient, it is a good idea to test the components, drive and pump motor, as well as the battery individually.

Fuses, relays

Desig-nation	Value	Connection
F6	10 A	24 V auxiliary devices, K1
F7	10 A	24 V auxiliary devices, K2
K2	24 V 255 Ω	Front searchlight
K1	24 V 255 Ω	Wiper motor

Activation controlled – not activation controlled

Pulse mode prevents a high inrush current with bulbs, thereby increasing potential service life.

Electrical devices that contain inductors (motors, coils, relays) should never be used in pulse mode.

A parameter change switches from "with pulsing" to "without pulsing".

+ 20 hex — without pulsing
+ 00 hex — with pulsing

Parameterisation

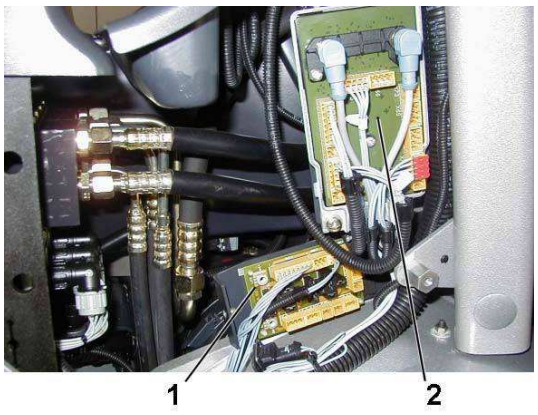
Value	Plug connector	Comment	Pulsing
1C	X375/1, X376/1	(K2) front searchlight	Yes
(1B) 3B	X374	(K1) wiper, attachment solenoid valve (5th hydraulic function)	No

Relay board

General

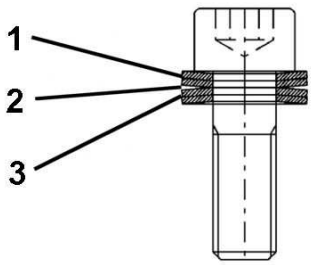
The relay plate (2) is screwed to the right-hand side of the chassis via a support.

▷



1 Distributor plate
2 Relay plate

– Position the pump actuator on the contact surface in the counterweight
– Combine two disc springs (1, 3) in parallel to form a packet, and combine two packets (2) in alternate directions, then tighten with a socket head screw.
– Screw in the power cables evenly, max. screw length **M8 x12**

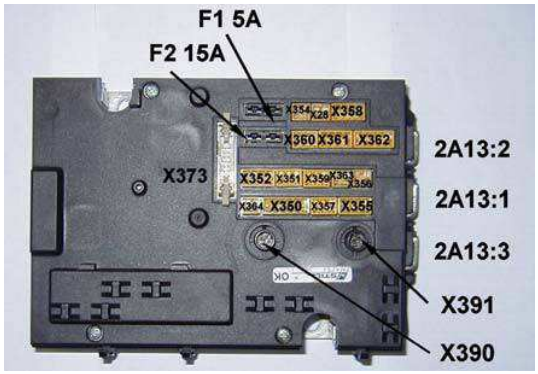


⚠ CAUTION

Install horn ground connection.

Heed the reworking of the horn ground connection!

– If necessary, mount the distributor plate (add-on)
– Connect all plugs



⚠ CAUTION

CAN bus connection can be overwound.

Only tighten the CAN bus connection lightly and do not apply shear forces by tying cable ties too tightly.

– Set lock switch S1 to ON
– The `PLEASE WAIT` message appears on the control computer display
– All of the parameter information from the control processor is transmitted to the pump actuator.
– This is followed by an automatic reset.
– The pump regulator is now ready to operate.

If a pump actuator that already has a valid parameter set has been installed, proceed as follows:

– Set lock switch S1 to ON

The truck parameter set is stored in the control processor. In order to prevent a parameter loss, a copy of this parameter set is available in the pump actuator. If one of the two components is changed, the parameter set must be copied from the remaining component.

– Load the copying parameters; see chapter entitled "Parameter management"
– Load software flash package and start calibration; see chapter entitled "Software compatibility"
– Call up the truck serial number in the display to check that the correct parameters have been loaded
– Delete the error memory.
– Carry out a function test.

The parameter set is not stored in one of the other controllers as a copy. Therefore, parameter adjustment does not start automatically.

Truck-specific parameters must be input manually using the diagnostics in the notebook.

General

General technical data

Hydraulic pump	5051–5055
Model	Gear pump
	Anticlockwise rotation direction
Delivery rate	11 cm^3 per revolution
Tightening torques	
Hydraulic pump	2 x socket head screw 56 $^{+4}$ Nm
Suction flange	2 x socket head screw M6 x 20, 8.8, ISO 4762 2 x socket head screw M6 x 50, 8.8, ISO 4762 10 Nm
Priority valve	4 x socket head screw M6 x 35, 8.8, ISO 4762 10 Nm
	LS: 45 Nm EF: 100 Nm CF: 100 Nm
Hydraulic tank	
Capacity, total filling quantity with auxiliary hydraulics	19.75 litres
Hydraulic oil	Quality as per DIN 51524/Part 2 HVLP 68 or ISO VG 68

Hydraulic speeds

General		
Steering	500rpm	
Auxiliary hydraulics	See the chapter entitled "Auxiliary hydraulics"	
Multi-lever		
Lifting	3200 rpm	
Tilting	with bypass (from week 45/2004)	without bypass (until week 45/2004)
Nominal lift < 3500 mm	600 rpm	550 rpm
Nominal lift 3500–5000 mm	600 rpm	500rpm
Nominal lift > 5000 mm	500rpm	500rpm
Servo hydraulics		
Lifting	3200 rpm	
Tilting		
Nominal lift < 3500 mm	600 rpm	
Nominal lift 3500–5000 mm	500 rpm	
Nominal lift > 5000 mm	500 rpm	

Hydraulic filter

Suction filter	
Degree of filtration	20 µm absolute
Triggering pressure — bypass valve	0.25 ±0.05 bar
Maintenance interval	3000 h or 2 years

High-pressure filter

General

For servo hydraulics, it is a legal requirement (in accordance with VDMA (German Engineering Federation)) that an additional filter is installed in the pressure line upstream of the directional control valve, in addition to the return line filter.

The high-pressure filter is located in the pressure line between the connections (EF) of the priority valve and (P) of the directional control valve.

Technical data

Degree of filtration: 12 µm nominal

Filter material: non-woven plastic mesh

Maintenance interval

- 3000 operating hours or 2 years

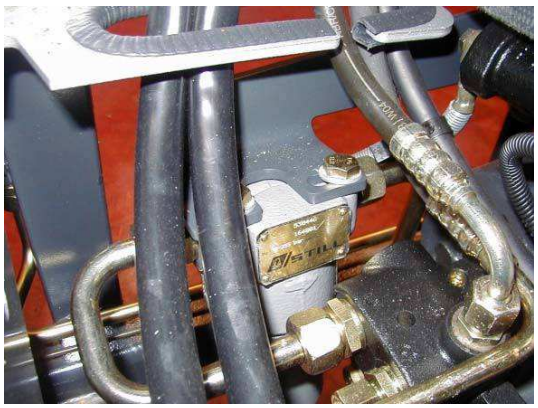
1 High-pressure filter
2 Filter housing
3 Hexagonal

Changing the filter element

ENVIRONMENT NOTE

The filter element and any leaking oil must be disposed of in an environmentally friendly manner.

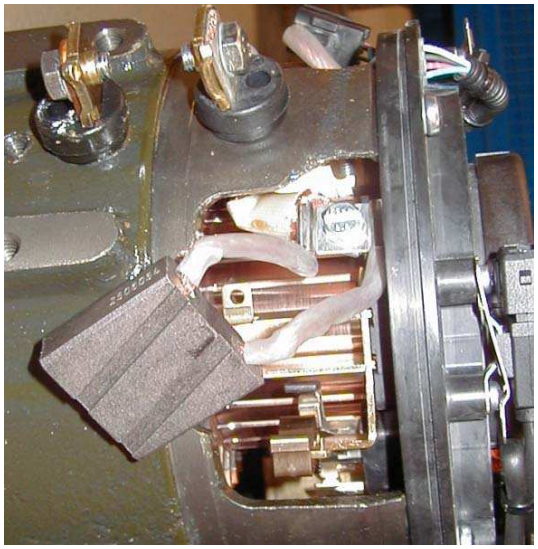
– Place a collection vessel underneath. The oil volume that drains out is approximately 0.2 l (capacity of the filter housing).
– Loosen and unscrew the filter housing at the hexagonal with a SW30 box-end wrench.
– Pull the filter element out in a downward motion.
– Push the new filter element in until it stops.
– Clean the filter housing and screw in by hand.



– Open and remove tensioning band
– Open brush spring and hook on
– Pull out brush from the shaft
– Disconnect plug X15 and connect to test adapter on the engine side.
– Connect digital multimeter to X15/2 and X15/3
– Set digital multimeter to resistance measurement
– Activate switch with the brush spring

Switch not activated:
Low-resistance value: about 0 ?
full continuity

Switch actuates:
High impedance value: MΩ range
No continuity



Error messages

```
A5002
CARBON BRUSHES
```

Warning! The carbon brushes have reached their wear limit and must be replaced.

The truck can remain in use for approx. 10 more hours. After that, the message in the display changes:

```
A5004
CARBON BRUSHES
```

Emergency operation! The carbon brushes must be changed. The truck will then only move at a reduced driving speed.

Once the carbon brushes have been replaced, the error message is automatically reset.

NOTE

- *When assembling a threaded elbow pipe, always use a new one.*
- *Note the location of the threaded elbow pipes.*

– During assembly, bear in mind that the location of the threaded elbow pipes depends on the design of the tilt cylinders.

– Insert the threaded elbow pipe and screw it in by hand up to the TUFLOK coating.

– Then use a tool to screw it in a minimum of 4 turns and a maximum of 5.

⚠ CAUTION

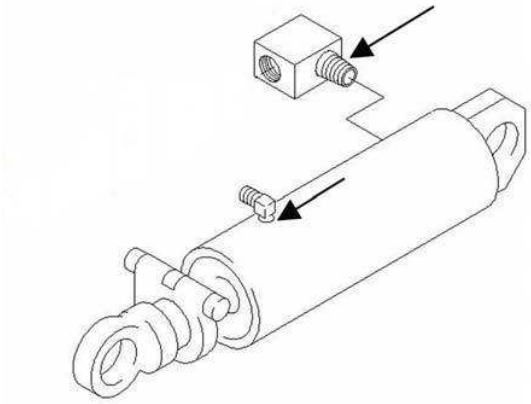
Leakages caused by incorrectly fitted threaded elbow pipes.

If a threaded elbow pipe has been screwed in too far, it must not be unscrewed again. A new threaded elbow pipe must always be used.

Connection screw joints

General

The pipe adaptors are coated in plastic on the thread in the cylinder pipe to act as a seal; see arrow.



Assembly

After inserting the screw joint in the cylinder pipe (max. 1 rotation), the following screw-in depths are permissible:

Min. 3 rotations
Max. 4 rotations

⚠ CAUTION

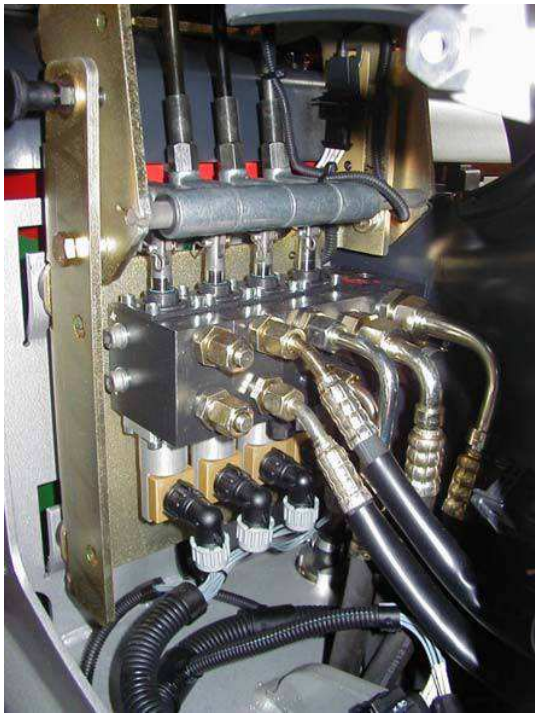
Any unscrewing of the union during or after screwing will result in leaks.

The correct position of the screw joint must be achieved when screwing in.

In the case of leakages, never screw the screw joint in further; always replace it.

Removing and installing the valve block

Removal

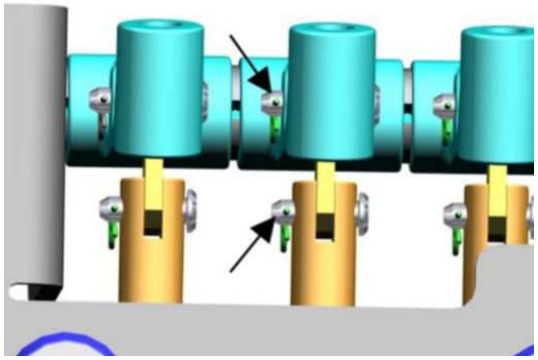


- Park the truck safely.
- Tilt the lift mast forward against the stop.
- Lower the fork carriage fully.
- Release the pressure from the hydraulics.
- Disconnect the battery male connector.
- Remove the bottom plate.
- Remove panelling on the valve block.
- Disconnect plug X23 from the multifunction lever.
- Disconnect the plugs from the displacement transducers.
- Remove earth wire.
- Remove all hydraulic connections from the valve block.

ENVIRONMENT NOTE

Collect any escaping hydraulic oil and dispose of it in an environmentally friendly manner.

- Unscrew the three rubber-mounted screws from the valve support.
- Lift out the valve support with valve block.
- Remove the safety plugs and bolts between the lever and the valve spool.
- Unscrew the three mounting screws on the back of the valve support.
- Disconnect the valve block from the valve support.



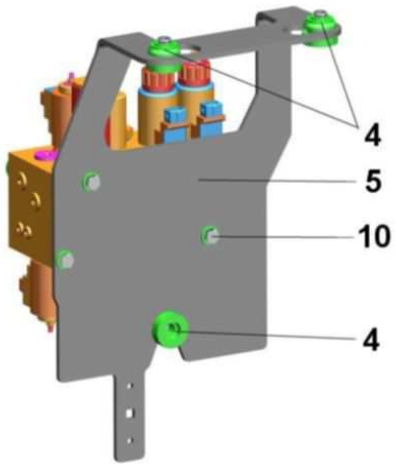
Preparing the valve block

The valve block is supplied without screw joints and with a standard flow control valve (for nominal lifts of 3500 - 5000 mm).

- The tilt orifice must be replaced according to the lift mast nominal lift, see the chapter entitled "General technical data".
- Install all screw joints from the package group in the new valve block; check the tightening torques. See the chapter entitled "General technical data"

The back of the directional control valve is screwed to the valve support (5) with three rubber-mounted screws (10).

Actuation of the hydraulic functions can take place either by joystick, fingertip or mini-lever.



NOTE

The removal and installation of the valve block is performed in the same manner as for the hand lever.

Assembly instructions

- Spare part directional control valve blocks are delivered without screw joints.
- When making repairs on the directional control valve block, proceed with extreme care, as dirt and damage to the sealing surfaces can result in malfunctions and leakages.
- Always observe the tightening torques.
- The valve spools must not be turned.

Manual lowering

General

If the raised load can no longer be lowered due to a valve control failure, the load can be lowered manually.

To do so, proceed as follows:

NOTE

The 4mm Allen wrench is located in the tray to the right of the seat.

– Remove the valve block cover.

Mast installation

Installation

NOTE

- *Check screw quality and tightening torques*
- *For values, see "General technical data" in the chapter entitled "Lift mast"*

– Hook a sufficiently strong chain onto the top of the outer mast crossmember. Then hook the chain on to the forks of the second truck and secure in such a way that it cannot slip off the forks when lifting the lift mast

⚠ CAUTION

Risk of damage to components.

Proceed with care when lifting the lift mast. Ensure that the lift mast does not start to swing and collide with the truck.

– Bring the lift mast into position

– Insert distance plates on mast journal and lubricate mast journal

– Insert the lift mast into the mast bearing bores

– Install the mast bearings with the screw head facing outwards

– Fit hydraulic hose line

– Grease tilt cylinder pin

– Screw the tilt cylinder and the safety hook in tightly at the running axle

– Fit the brake hose line at the main cylinder

– Fit the brake cable pulls

– Remove the safety chain at the fork carriage and lower fork carriage

– Remove the chain or rope from the crane at the outer mast crossmember

– To bleed the lift cylinders, raise the fork carriage by approx. 300 mm

– Unscrew the bleeder screws in the cylinder head by 1 turn at the most

– When oil starts to leak out, retighten the bleeder screw

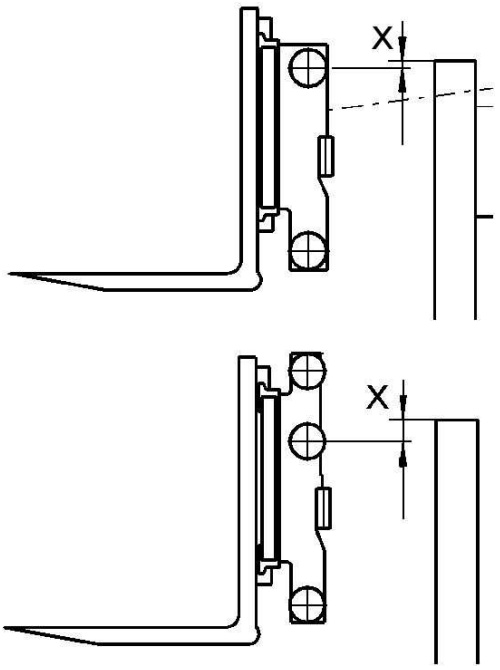
– Repeat this process for every lift cylinder

– Carry out a function test

– Adjusting the parking brake; see the chapter entitled "Parking brake"

– Carry out a functional test.

– With the lift cylinder extended, retighten the load chain at tensioning nut (3) until a measurement of (X) is achieved.



Load capacity [kg]	Measurement X [mm]
1000–1500	20
1600	20
1800	20
2500	15
3000	10
3500	10

– Screw cap (4) on tightly with the mounting screw.

NOTE

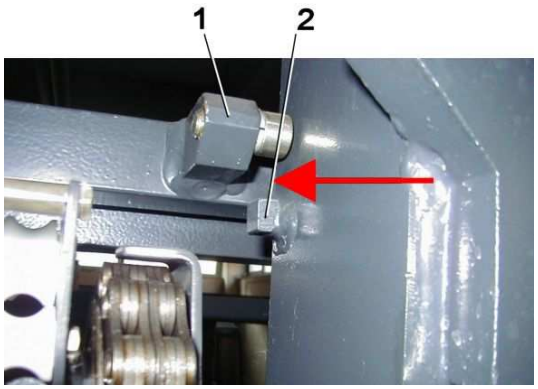
The mounting screw is a Tuflok screw with a thread lock.

- *Use the screw once only.*
- *In an emergency, secure with Loctite.*

Run-out barrier

When adjusting the load chains, make sure that if the lift mast is fully extended, the end stop is in the lift cylinder.

– The air gap between run-out barrier (1) and fork cams (2) must not drop below a measurement of 2 mm. An air gap of 10 - 20 mm is ideal.



– Remove the support rollers at the top of the outer mast and at the bottom of the inner mast

NOTE

The countersunk screw is secured with Loctite 242. If the countersunk screw cannot be unscrewed, heat the Loctite gently.

Installation

NOTE

- *Always use a new countersunk screw*
- *Tightening torque 60 Nm*

– Install the support roller

– Using the hydraulic jack, raise the inner mast until it is high enough for the outer cylinders to be installed

– Mount outer cylinder

– Use jack to lower inner mast

– Mount circlip on outer cylinder

– Mount clamping piece on outer cylinders

– **In auxiliary hydraulics**: Fit the hose guide rails at the middle cylinder

– Mount pipe from left outer cylinder to centre cylinder

Testing

After replacing the support rollers, the lateral and radial play between the mast profile and the support rollers must be checked and adjusted if necessary.

- Lateral play:
  0.3 to 1.8 mm
- Radial play
  0.1 to 1.1 mm