Workshop literature

High-level order picker

EK-X 2101
EK-X10 2101

CE

EK-X EK-X10

8 054 427 - 03/2018 EN -

first in intralogistics

"Diagnosis" menu

The guided diagnosis operations are organised according to function and should be worked through in sequence. Each point can also be carried out separately and repeated.

⚠ WARNING

In diagnosis mode, various monitoring functions are switched off.

Please note the remarks in the diagnosis menu! If a diagnosis session is aborted or ended, always reset the truck by switching the key switch OFF and then ON again.

– F2:display diagnosis diagnosis menu (1).

– Select the required diagnosis function (2).

– Confirm with Execute (3).

• Instructions appear in the window (4) with the option of making an entry for each diagnosis function.

• Window (5) shows a detailed set of instructions for the selected diagnosis function.

– Carry out the instructions (5) and confirm entries with Done /OK (6).

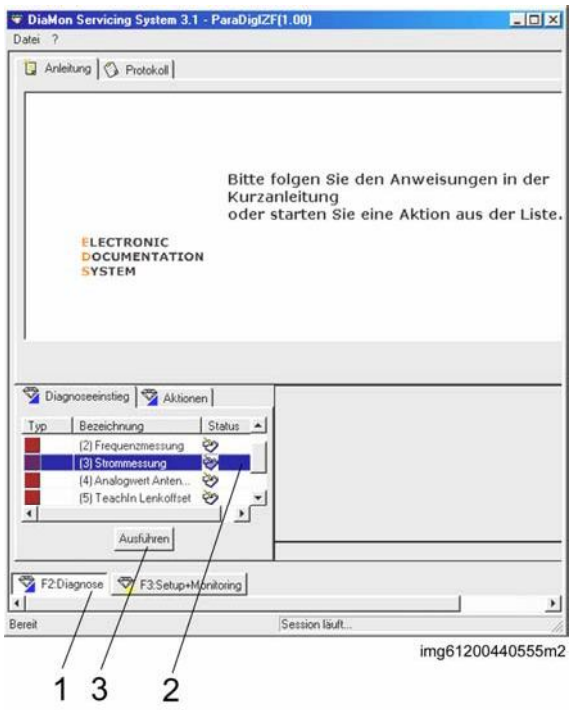
– If appropriate, follow further instructions.

– Acknowledge safety instructions.

– End order/sitting with Reset.

– In the event of **abort or error** in the diagnosis function: End the diagnosis function with `file/reset session` (7) .

– Protocol (8) displays a detailed list of all the operations that have been carried out.



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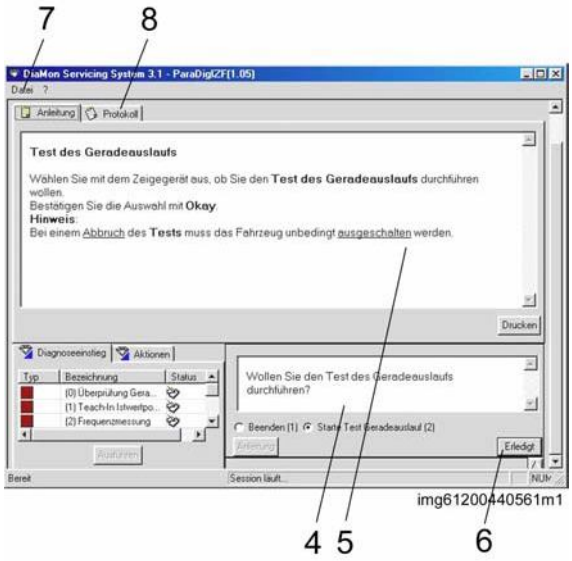

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Selecting a control system

After a truck / truck group has been selected, you must select the control system into which the sofware download is to be carried out.

– Use the mouse pointer to click on the arrow (1).

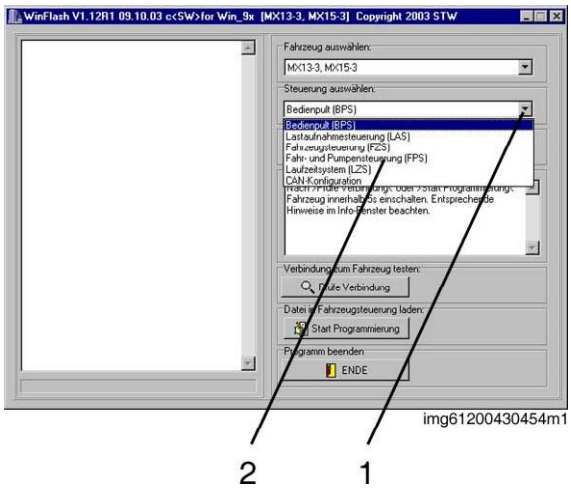
A selection window (2) opens which contains all the control systems for the selected truck / selected truck group to which a software download can be made.

NOTE

Depending on the type of truck / truck group, there may be one (3) or more (2) control systems displayed in the selection window.

– Use the mouse pointer to click on the control system.

The display window closes automatically. Only the selected control system (4) is then displayed. In the "Remark" (5) window, additional information or instructions are displayed for downloading the software into the selected control system.



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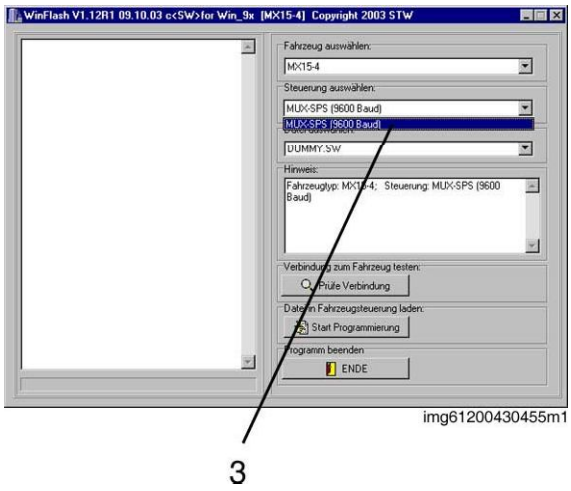

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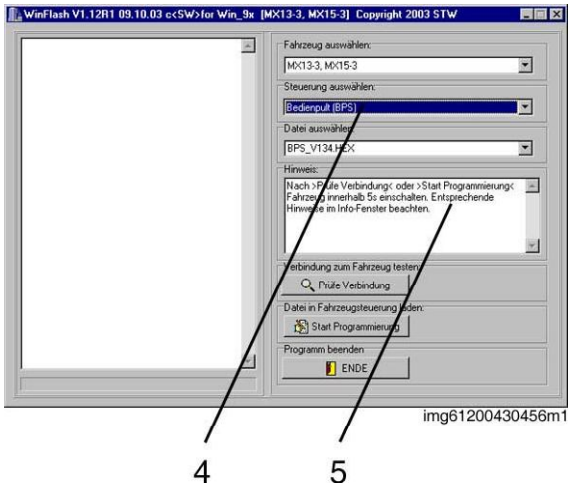

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- Check traction motor.
- Change the controller.

Error: 131

Description:
- Error in the transistor control for the traction motor
  Voltage is too high when moving off.

Response:
- Contactors K1 and K2 open.

Cause:
- Short circuit, traction motor is defective.
- Internal error

Remedy:
- Reset the error by switching off and on again.
- Check traction motor.
- Change the controller.

Error: 132

Description:
- Error in the evaluation of the digital and analogue signals for height measurement

Response:
- Reduction of the driving, lifting and lowering speeds

Cause:
- Measured height is outside the monitoring window for the analogue value.
- Lifting movements and lowering movements occur without being activated.
- Lifting movement or lowering movement is too fast (> 1 m/s).
- No impulses, despite movement activation.
- Maximum lift height from the teach-in was exceeded.

Remedy:
- Reset the error by switching off and on again.
- Carry out height measurement system teach-in.
- Lower cab completely.
- Check height measurement system.
- Check wiring.
- Check IOZ1.

Error: 133

Description:
- Switch statuses for the NC and NO contacts of the foot switch are invalid.

Response:
- Drive stop

Cause:
- Check the 1+24-V power supply. Switch statuses for the foot switch are > 400 ms and therefore invalid.
- Wiring is defective.

Remedy:
- Actuate the correct signal exchange and the foot switch once.
- Reset the error by switching off and on again.
- Check the foot switch and the wiring.

Error: 136

Description:
- ZAG reports a stop to FPS.

Response:
- Drive stop

Cause: - Dependent on the program
Remedy: - Dependent on the program

Error: 193

Description: - 2. Braking stage cannot be switched off.
Response: - Contactors K1 and K2 open.
Cause: - The A10-X1:1 connection is continuously at 0 V.
Remedy: - Check the wiring for the second braking stage.Replace the FPS.

Error: 194

Description: - Automation controller not OK (parameter C60).
Response: -
Cause: -
Remedy: - Reset the error by switching off and on again.

Error: 195

Description: - Automation controller fails to report in at the CAN bus (parameter C60).
Response: -
Cause: -
Remedy: - Reset the error by switching off and on again.

Error: 196

Description: - Internal error
Response: - Contactors K1 and K2 open.
Cause: - Error in the controller
Remedy: - Reset the error by switching off and on again.

Error: 197

Description: - The control processor detects an error at the output for the proportional valve.
Response: - Lift stop and lowering stop
Cause: - Error in the controller
Remedy: - Reset the error by switching off and on again.

Error: 199

Description: - Internal error
Response: - Contactors K1 and K2 open.
Cause: - Error in the controller
Remedy: - Reset the error by switching off and on again.

Cause: - Software update or BPS is faulty.
Remedy: - Reset the error by switching off and on again.
- Reflash the software. Replace the controller.

Error list for operating panel controller (BPS) 8U62, load side (LS)

Error2501

Description: - Evaluation of driving setpoint value.
Response: - Drive stop/lift stop.
Cause: - The driving setpoint devices are calibrated incorrectly. The BPS is faulty.
Remedy: - Reset the error by switching off and on again.
- Replace the setpoint devices or the controller.

Error2502

Description: - Evaluation of lifting setpoint value.
Response: - Drive stop/lift stop.
Cause: - The lifting setpoint devices are calibrated incorrectly. The BPS is faulty.
Remedy: - Reset the error by switching off and on again.
- Replace the setpoint devices or the controller.

Error2510

Description: - Parameter error.
Response: - Drive stop/lift stop.
Cause: - The check sum may have changed after flashing new BPS software.
Remedy: - Reset the error by switching off and on again twice.
- Replace the controller.

Error2511

Description: - CAN bus error.
Response: - Industrial truck stops.
Cause: - CAN bus is malfunctioning.
Remedy: - Reset the error by switching off and on again.
- Check the individual controllers using the diagnostic software.
- Remove the cause of the CAN bus malfunction.

Error2512, Error2513

Description: - Internal error.
Response: - Industrial truck stops.
Cause: - Software update or BPS is faulty.

Cause: - Defective wiring/sensors.
Remedy: - Check all inputs for correct wiring, change IOX if necessary.

FE2946

Description: - Level monitoring of inputs. With a high-active input the input voltage must be >8V for the input signal to be identified as active.
Response: - Drive speed reduction v = 0km/h, after overriding with the Q button the truck can still be driven at 1km/h.
- Raise main lift is deactivated.
Cause: - Defective wiring/sensors.
Remedy: - Check all inputs and outputs for correct wiring, change IOX if necessary.

FE2950

Description: - Internal IOX error.
Response: - Drive speed reduction v = 0km/h, after overriding with the Q button the truck can still be driven at 1km/h.
- Raise main lift is deactivated.
Cause: - Internal hardware fault.
Remedy: - Replace IOX.

FE2960, FE2961, FE2962, FE2963

Description: - IOX is receiving no CAN bus data.
Response: - Drive speed reduction v = 0km/h, after overriding with the Q button the truck can still be driven at 1km/h.
- Raise main lift is deactivated.
Cause: - CAN bus defective.
- CAN controller in IOX module defective.
Remedy: - Check CAN bus or change IOX.

Cause: - Battery voltage is too low
Remedy: - Check the battery, battery male connector X1.

Error: 3451

Description: - Excess voltage (UE)
Response: - The industrial truck stops.
Cause: - Incorrect battery
Remedy: - Check the battery.

Error: 3452

Description: - Excess current at end piece (UE)
Response: - The industrial truck stops.
Cause: - Internal error
Remedy: - Reset the error by switching off and on again.
- Update the software. If the error appears again, replace the steering.

Error: 3453, 3454

Description: - Internal error (UE)
Response: - The industrial truck stops.
Cause: - Steering error
Remedy: - Reset the error by switching off and on again.
- Update the software. If the error appears again, replace the steering.

Error: 3455

Description: - Internal error (UE)
Response: - The industrial truck stops.
Cause: - Incorrect steering software
Remedy: - Check the software version and parameters.

Error: 3500

Description: - Hour meter error (SR)
Response: - The industrial truck stops.
Cause: - Steering error
Remedy: - Reset the error by switching off and on again.
- Update the software. If the error appears again, replace the steering.

Error: 3501

Description: - Internal error (SR)
Response: - The industrial truck stops.
Cause: - Steering error

Error: 3646, 3647, 3648, 3649

Description: - Setpoint device error (UE)
Response: - The industrial truck stops.
Cause: - Short circuit or interruption
Remedy: - Check the wiring and setpoint device.

Error: 3650

Description: - Angle difference between (SR) and (UE) is too great.
Response: - The industrial truck stops.
Cause: - Short circuit or interruption, setpoint device or actual value device is faulty
Remedy: - Reset the error by switching off and on again.
- Check the setpoint device and actual value device.
- Perform steering teach-in.
- Perform the "Load basic parameters" function using the diagnostic software.
- Update the software. If the error appears again, replace the steering.

Error: 3651

Description: - Rotational speed of the setpoint device is too high (UE).
Response: - The industrial truck stops.
Cause: - Rotational speed of the setpoint device is too high.
Remedy: - Check the actual value device.
- Reset the error by switching off and on again.
- Perform the "Load basic parameters" function using the diagnostic software.
- Update the software. If the error appears again, replace the steering.

Error: 3653, 3654, 3655

Description: - Internal error (UE)
Response: - The industrial truck stops.
Cause: - Steering error
Remedy: - Reset the error by switching off and on again.
- Perform the "Load basic parameters" function using the diagnostic software.
- Update the software. If the error appears again, replace the steering.

Error: 3657, 3658

Description: - Difference between the target speed and actual speed is too great (UE).
Response: - The industrial truck stops.
Cause: - Steering is stiff.
Remedy: - Check the steering turntable for ease of movement.
- Reset the error by switching off and on again.
- Perform the "Load basic parameters" function using the diagnostic software.
- Update the software. If the error appears again, replace the steering.

– Check CAN bus and antennas.
– Replace antenna and controller.

Error4310, Error4311, Error4312, Error4313

Description: – Antenna CAN bus error.
Response: – Emergency off.
Cause: – Unknown message from antenna 0–3.
Remedy: – Reset by switching the truck off and then on again.
– Check antenna and software version.
– Update antenna and controller software.

Error4314, Error4315, Error4316, Error4317

Description: – Incorrect antenna signal.
Response: – Emergency off.
Cause: – Antenna mode of antenna 0–3 is invalid for control.
Remedy: – Reset by switching the truck off and then on again.
– Check antenna.
– Replace antenna and controller.

Error4318, Error4319, Error4320, Error4321

Description: – Incorrect antenna mode.
Response: – Emergency off, only in IZF automatic mode of operation.
Cause: – Antenna mode of antenna 0–3 is invalid.
Remedy: – Reset by switching the truck off and then on again.
– Check CAN bus and antenna.
– Replace antenna and controller.

Error4322, Error4323, Error4324, Error4325

Description: – Incorrect antenna channel.
Response: – Emergency off.
Cause: – Antenna 0–3 not active on the selected channel.
Remedy: – Reset by switching the truck off and then on again.
– Check antenna.
– Replace antenna and controller.

Error4326, Error4327, Error4328, Error4329

Description: – Antenna digital distance error.
Response: – Emergency off, only in IZF automatic mode of operation and guided on wire and at a distance of < 10 cm.
Cause: – Redundant antenna evaluation of antenna 0–3 is invalid.
Remedy: – Reset by switching the truck off and then on again.

Error4705

Description: – Internal error.
Response: – Emergency off.
Cause: – Error response must be known for every error.
Remedy: – Reset by switching the truck off and then on again.
– Replace the controller.

Error4706

Description: – IZF does not receive the OK signal from the steering.
Response: – Emergency off, if automatic mode (IZF) is selected.
Cause: – Steering malfunction (ELK), CAN bus error.
Remedy: – Switch to manual operation. Reset by switching the truck off and then on again.
– Check steering, parameters and CAN bus.

Error4707

Description: – When the truck is switched off, the IZF must be correctly shut down. This is checked when the truck is switched on.
Response: – Drive stop.
Cause: – Loss of voltage, controller defective.
Remedy: – Reset by switching the truck off and then on again.
– Replace the controller.

Error4708

Description: – Errors cannot be saved internally.
Response: – Emergency off.
Cause: – Internal error.
Remedy: – Reset by switching the truck off and then on again.
– Replace the controller.

Error4710, Error4711, Error4712, Error4713

Description: – Monitoring of the guide wire current of antenna 0–3 (within the aisle).
Response: – Emergency off, only in IZF automatic mode of operation.
Cause: – In the guided status, the current measured by antenna 0–3 must not be 0.
– Short to earth, no guide wire current.
Remedy: – Reset by switching the truck off and then on again or by deselecting IZF.
– Check antennas, connections and guide wire current.
– Perform field strength teach-in.

Error4714

Description: – Monitoring of the takeover when the IZF takes over the guidance.
Response: – Emergency off, only in IZF automatic mode of operation.

Cause: – Malfunction.
Remedy: – Reset by switching the truck off and then on again.

Error4836, Error4837, Error4838

Description: – Invalid frequency channel for control on LS/DS antenna or auxiliary antenna.
Response: – Emergency off, only in IZF automatic mode of operation.
Cause: – Malfunction.
Remedy: – Reset by switching the truck off and then on again.

Error4839

Description: – Speed limit for cornering exceeded.
Response: – Emergency off, only in IZF automatic mode of operation.
Cause: – Malfunction.
Remedy: – Reset by switching the truck off and then on again.

Error4840

Description: – Error during switchover to cornering.
Response: – Emergency off, only in IZF automatic mode of operation.
Cause: – Switchover to cornering before the antennas were switched over.
Remedy: – Reset by switching the truck off and then on again.

Error4900

Description: – Invalid error message from the monitoring processor.
Response: – Emergency off, immediate.
Cause: – Monitoring processor checking function.
Remedy: – Reset by switching the truck off and then on again.
– If error recurs, replace the controller.

Error4901

Description: – Telegram request not received simultaneously by the main processor and monitoring processor.
Response: Not an error.
Cause: – Monitoring processor checking function.
Remedy: – Reset by switching the truck off and then on again.
– If error recurs, replace the controller.

Error4902, Error4903, Error4904, Error4905, Error4906

Description: – Error when reading/writing data from/to EEPROM.
Response: – Immediate drive stop.
Cause: – Monitoring processor checking function.

Error4990, Error4991

Description:	– Status of the sensor for the steering angle limiter (locked/unlocked) must be the same in the main processor and the monitoring processor.
Response:	– Drive stop.
Cause:	– Monitoring processor checking function.
Remedy:	– Reset by switching the truck off and then on again. – Check sensors. If error recurs, replace the controller.

Error4993

Description:	– Speed setting in the main processor (setpoint value) is higher than in the monitoring processor.
Response:	– Drive stop.
Cause:	– Monitoring processor checking function.
Remedy:	– Reset by switching the truck off and then on again. – If error recurs, replace the controller.

Error4994

Description:	– The aisle detection status must be the same in the main and monitoring processors.
Response:	– Drive stop.
Cause:	– Monitoring processor checking function.
Remedy:	– Reset by switching the truck off and then on again. – If error recurs, replace the controller.

Error4995

Description:	– Changeover between standard and extended antennas must be the same in the main processor and monitoring processor.
Response:	– Emergency off.
Cause:	– Monitoring processor checking function.
Remedy:	– Reset by switching the truck off and then on again. – If error recurs, replace the controller.

Error4996

Description:	– Frequency channel selection must be the same in the main processor and monitoring processor.
Response:	– Emergency off.
Cause:	– Monitoring processor checking function.
Remedy:	– Reset by switching the truck off and then on again. – If error recurs, replace the controller.

FE6174

Description	- Overload at the "10 V power supply" output.
Response:	-
Cause:	- Wiring or IOZ faulty.
Remedy:	- Reset by switching the truck off then on again. - Check wiring or IOZ. - Change the controller.

FE6175

Description	- Overload at the free digital outputs.
Response:	- Free digital outputs are switched off.
Cause:	- The switch-on current, single current or total current is too large.
Remedy:	- Reset by switching the truck off then on again. - Check consumers at the free digital outputs. Modify the external suppressor circuit, e.g. the capacitor. - Change the controller.

FE6176

Description	- Error at the analogue inputs.
Response:	-
Cause:	- Faulty connections, IOZ faulty.
Remedy:	- Reset by switching the truck off then on again. - Check connections or IOZ. - Change the controller.

Testing

Supply voltage

– Switch off the truck.
– Release the connector plug from the rev sensor.
– Connect the voltage measuring device to the connector plug.
– Switch on the truck.
– Perform voltage measurement.

The supply voltage must be approximately 12V.

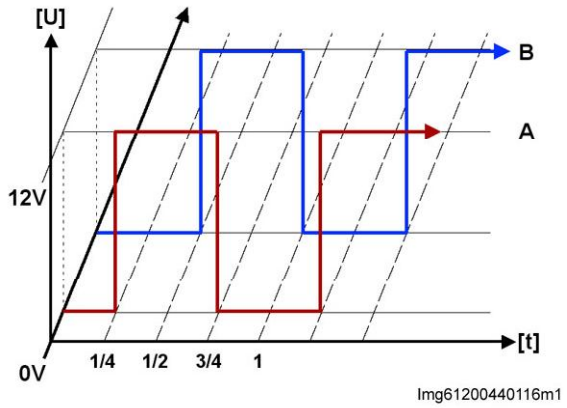
If this is not the case, check the wiring from the rev sensor to the inverter.

Output signals

– Raise the truck and support securely.
– Connect the rev sensor.
– Switch on the truck.
– Connect the voltage measuring device to the rev sensor connector plug between 0V and channel A or B.
– Perform the voltage measurement while the motor is rotating at a low speed. Each channel must have an AC voltage of approximately 0V or 12V.

If no alternating signals can be measured, then measure them with the device removed. It is possible that the sensing distance to the gear is incorrect or the rev sensor is contaminated with metal chips.

If the voltage is significantly less or no voltage is detected, the rev sensor is defective and must be replaced.



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Maintenance

Activities

– **Oil change**: The gearbox oil must be changed for the first time after 1000 operating hours. After that, the gearbox oil must be changed every 2000 operating hours or on a yearly basis.

Gearbox lubricant

Oil grades

The oils used must correspond at least to the following specifications:

Standard:

- Classification according to API GL-5
- SAE class 80W-90

Cold store:

- Classification according to API GL-5
- SAE class 75W-90

Oil filling quantity

Volume: 1.5 l

Repair

Removing the steering unit

NOTE

*It is **not** necessary to remove the collision protection for removal of the steering unit.*

- Jack up the truck and secure it against rolling away.
- Disconnect the battery male connector.
- Mark connection cables U, V, W and disconnect them.
- Unplug the internal incremental transducer and temperature sensor.
- Undo the 4 screws (1) at the motor flange.
- Pull the steering unit upwards to take it out.
- Place the assembly lever (5) on the collision protection (4) and engage it on the shaft end (3) underneath the steering pinion gear (2).
- Push the pinion gear with shaft and flange upwards.

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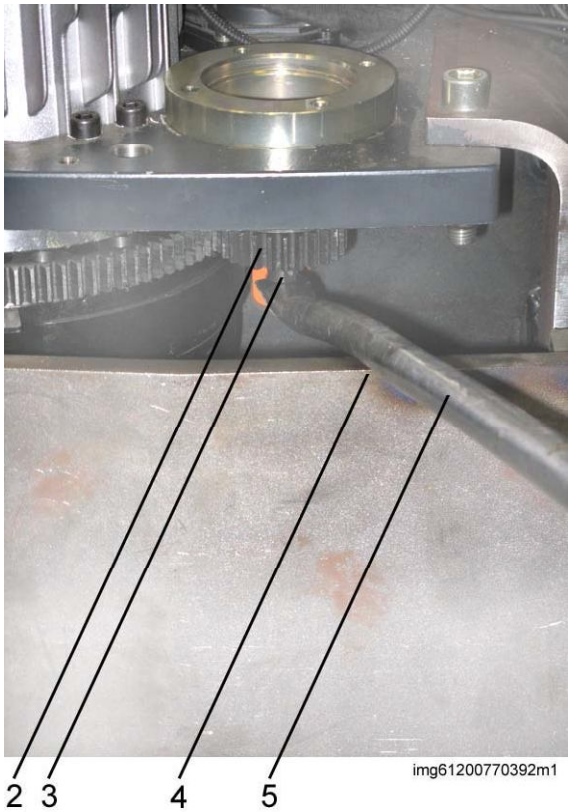

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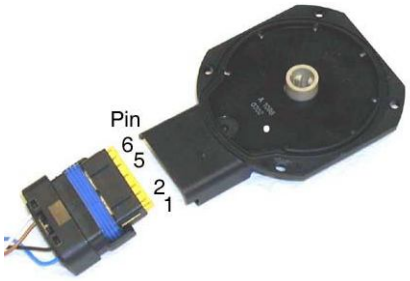
Connections

Connections, 6-pin plug X1

Pin	Signal
1	Main potentiometer actual value, approx. 0.5V - 4.5V
2	5V supply
3	Free
4	Free
5	0V supply
6	Free



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Test

Test procedure

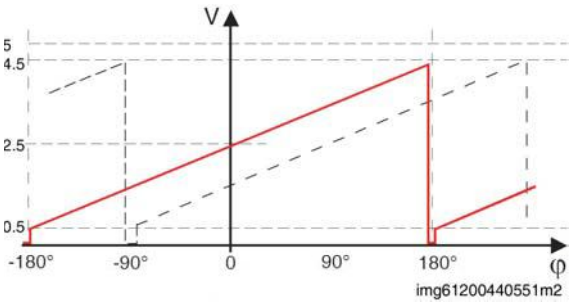
If the actual value potentiometer is defective, an error message appears in the display.

While it is installed, the following values can be checked using the diagnostic software:

- Voltage of the main potentiometer.
- Current draw of the potentiometer

The resistance can be measured with the device removed. Main potentiometer / control potentiometer have a zero transition offset by 90°:

- Total resistance between pins 2 + 5.
- Resistance measuring between pins 1 + 2 or pins 1 + 5 of the main potentiometer.
- Resistance measuring between pins 6 + 2 or pins 6 + 5 of the control potentiometer.
- Measure the resistance of the slider between pins 1 + 2 and pins 1 + 5 with the main potentiometer in the centre position. The resistance is **not linear** due to the parallel connection of the main potentiometer / control potentiometer.



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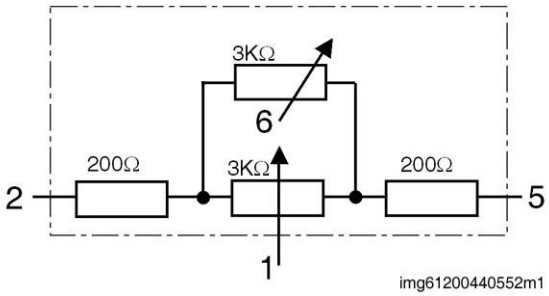

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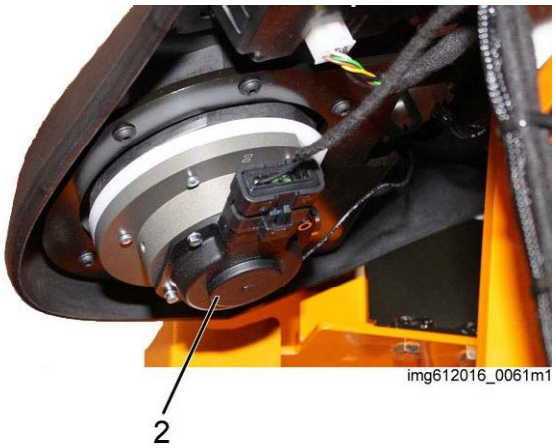
Technical data

Pin 2 power supply	+5V
Pin 5 power supply	0V
Setpoint signal from main potentiometer / control potentiometer	approx. 0.5V - 4.5V
Current draw	approx. 3mA
Total resistance	1900Ω ±15%
Resistance range of the slider of the main potentiometer / control potentiometer	approx. 200Ω - 1700Ω
Resistance of the slider of the main potentiometer in the centre position	approx. 1325Ω (symmetrically arranged, difference max. 50Ω)

Setpoint device

General

Identification



NOTE

From 01/2017 the ES30-24 steering unit is installed, with a Hall sensor for the setpoint device.

The setpoint device (2) can be accessed under the operating panel once the cover has been removed.

Function

The setpoint device specifies the desired steering direction. It generates two setpoint signals—channel A and channel B—both of which are evaluated by the steering unit.

NOTE

Check that the steering wheel and steering knob move easily.

⚠ CAUTION

Only clean the steering wheel and steering knob mechanisms.

Do not use lubricants.

Function of the steering wheel

After switch-on, the drive wheel turns to the straight-ahead position. This is determined by the reference switch and actual value transmitter. The current steering wheel position is adopted as the straight-ahead position.

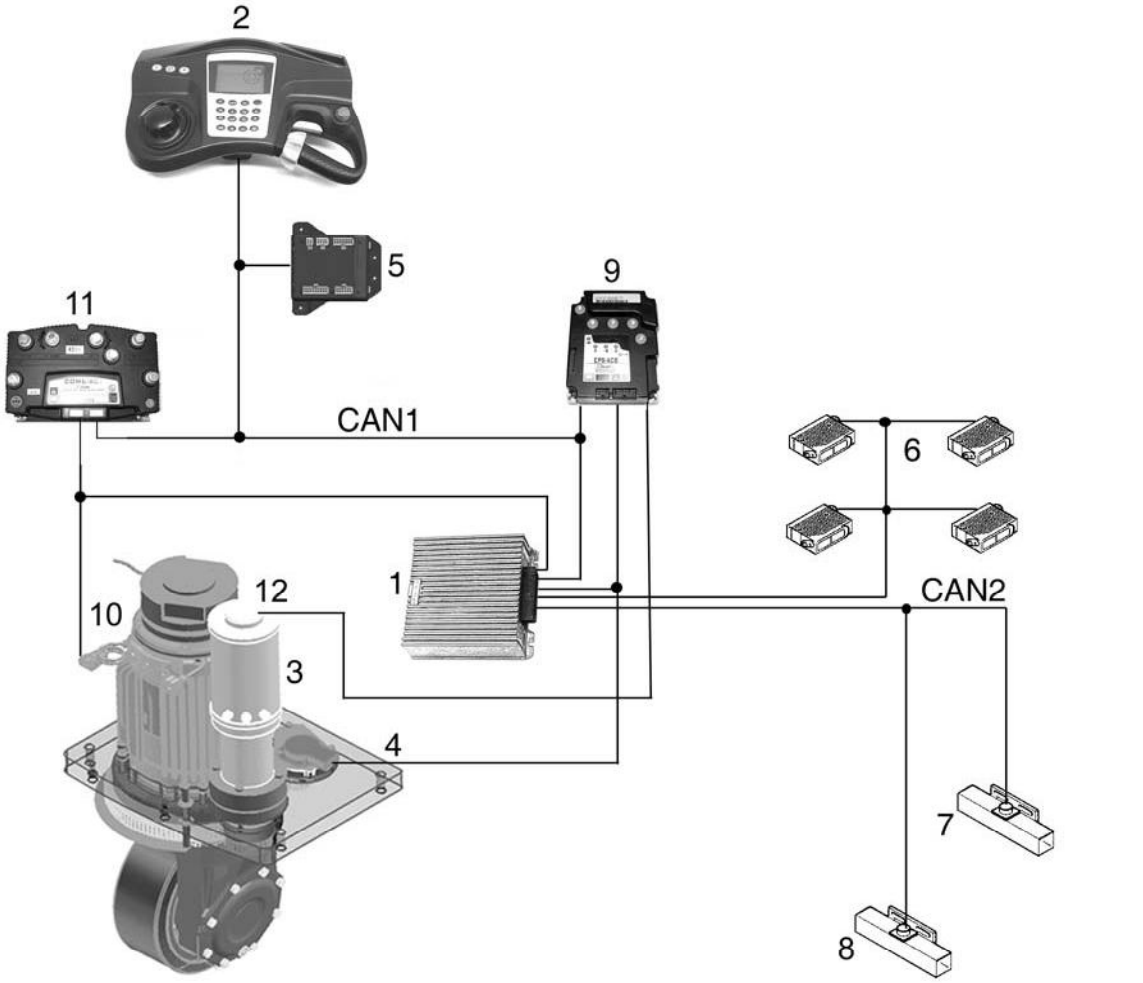
When configuring the "steering wheel", an internal conversion of the setpoint value is calculated in the steering unit, depending on the rotation of the steering wheel.

The drive wheel turns by 30 or 45 degrees (this can be configured via the diagnostic software) according to the rotation of the steering wheel. The steering wheel has no mechanical stop. If the steering wheel is turned further, the maximum steering angle of the steering unit is restricted to ±95°. When the steering wheel is turned back out of an end position, the current steering wheel position is immediately adopted as the setpoint value. There is no dead range.

Inductive guidance

General

Block diagram (for industrial trucks up to 12/2016)



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1	Wire guidance controller (IZF) 3A21	7	Antenna 0 = Antenna load side
2	Display (DIS) 8A12, integrated in the operating panel	8	Antenna 1 = Antenna drive side
3	Steering motor 3M1	9	Steering controller (ELK) 3A20
4	Actual value potentiometer	10	Traction motor rev sensor
5	Operating panel controller (BPS) 8U62	11	Traction controller and pump controller (FPS) A10
6	Light barriers for aisle detection	12	Steering motor incremental transducer

Controller (IZF) 3A21

General

Function

The controller monitors and controls all functions of the IZF.

Technical data

Power supply	+24V DC (16V to 32V)
Operating temperature	-32°C to +70°C
Digital control outputs	24V, 1.5A, short-circuit proof
Digital power outputs	24V, 5A, short-circuit proof with current detection
Digital inputs	+24V
Analogue inputs	0 to 10V
Relay contact	2A, inductive
Protection type	IP64

Identification

Cast aluminium housing (1) with 42-pin connector plug, nameplate with ID number.

Connections

PIN	Signal	Pin	Signal
1	GND, 0V	22	S GND, DS antenna cable screen, free
2	D+, 24V signal "save"	23	Emergency stop relay (NO contact)
3	GND, LS antenna	24	Emergency stop relay (NO contact)
4	Antenna 0 analogue input, LS	25	Aisle detection digital output, 0V = in the aisle
5	+6.5V LS antenna	26	Digital output, free
6	+6.5V DS antenna	27	+10V, free
7	Antenna 1 analogue input, DS	28	+24V supply for outputs
8	GND, DS antenna	29	L GND, 0V supply for outputs

Wheels

Traction wheel

General

Dimensions when new	∅ 250 mm x 100 mm
Wear limit	∅ 225 mm

The drive wheel (1) must be changed if:

- The tread is significantly chipped or irregular, or is cracked.
- The tyre diameter is reduced by a maximum of 10%.

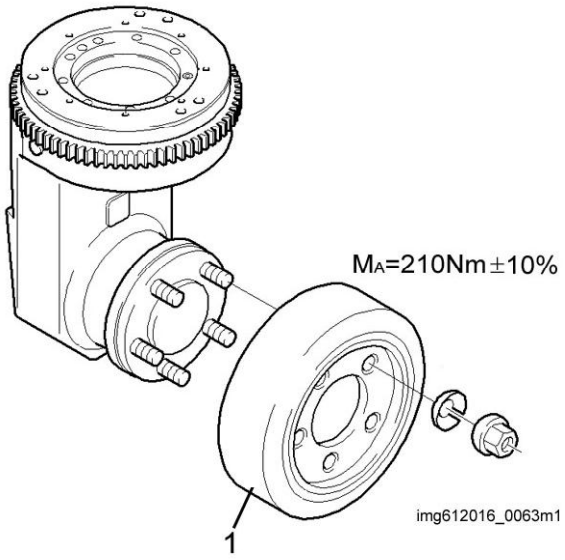
NOTE

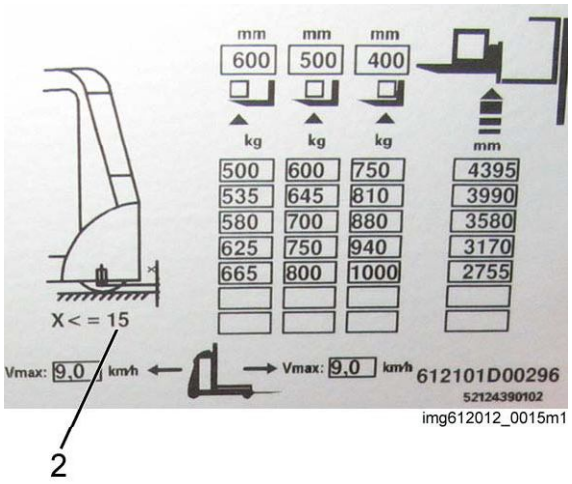
From 07/2013 onwards, skids are no longer used for collision protection. Instead, M16x40 hexagon head screws are usually fitted as anti-tipping supports for chassis widths of 980 mm.

⚠ CAUTION

Risk of truck tipping! After the drive wheel has been exchanged, the distance between the anti-tipping supports and the ground must be checked and adjusted.

The distance is specified individually on the load capacity diagram (2).





Test

Checking the solenoid coils.

– Switch off the truck.
– Disconnect the magnetic brake from connection assembly 1X44.
– Measure the resistance for braking stage 1+2.
– Connect connection assembly 1X44.
– Switch on the truck.
– Measure the voltage for braking stage 1+2.

1-stage brake test values

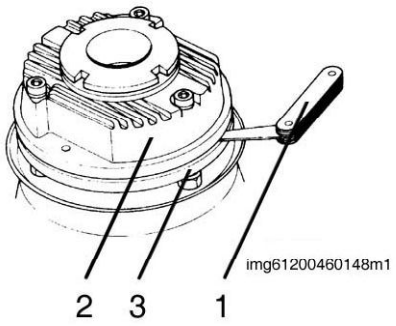
	Braking stage 1
Coil resistance	approx. 10.5Ω
Relay drop-out voltage	approx. 23 V
Rated power	40 W

2-stage brake test values

	Braking stage 1	**Braking stage 2**
Coil resistance	approx. 10.5Ω	approx. 45Ω
Relay drop-out voltage	approx. 23 V	approx. 23 V
Rated power	40 W	12.5 W

Checking the clearance

– Using a feeler gauge (1), test the clearance between the magnet component (2) and the anchor disc (3) at 3 positions near the screw.
– If the clearance **><0.4 mm**, it must be set to the correct value (see Repair).



Testing the brake retardation

The retardation of the magnetic brake must be checked during the regular testing and after any repairs are carried out, so that the truck:

- Does not brake too sharply. The stability of the truck must be ensured at all times
- Does not exceed the maximum permissible braking distance to a standstill

The test must be carried out in the drive direction with the higher maximum speed. If the maximum speed is the same for both drive directions, the test only has to be carried out in the load side direction.

Following this the battery discharge status is displayed continuously. No other display elements can be selected using the arrow buttons.

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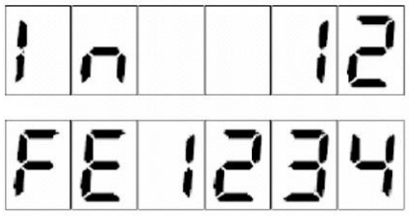
Error display and information display

Information is shown in the 7-segment display. Each information display consists of the two letters In followed by the information number.

Errors are shown in the 7-segment display. Each error display consists of the two letters FE followed by the error number.



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Repair

The display itself cannot be repaired, instead it must be exchanged as a complete unit.

Repair

NOTE

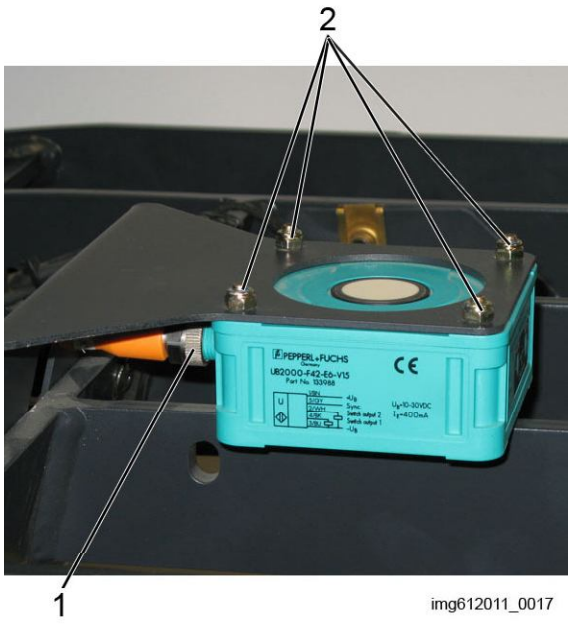
The ultrasonic sensor cannot be repaired. If an error is detected while the sensor is being checked, the entire sensor must be replaced. The settings described here must be applied after replacement or retrofitting.

Removal

– Switch off the truck.

– Loosen the union nut from plug X1 (1) by turning anticlockwise and disconnect the plug.

– Loosen the 4 screws (2) and remove the ultrasonic sensor.



Installation

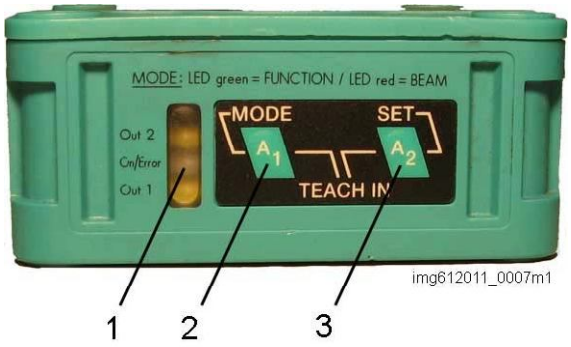
To install, simply follow the removal steps in the reverse order.

Settings

The settings described here must be applied after replacement or retrofitting.

The settings are made via the two buttons "A1" (2) and "A2" (3) on the sensor.

The LED row (1) displays the signal statuses and the set functions.



Starting to make the settings

NOTE

The setting for the overhead guard switch can only be made within the first 5 minutes after switching on the truck or turning on the power supply.

– Press button "A1" and switch on the truck.

The **"On/Error"** LED in the LED row (1) begins to flash green.

Plug X862.2, pin assignment

Pin	Signal for EM	Signal for TE
1	Right/left barrier switch, NC contact	Right/left barrier switch, NC contact
2	Right/left barrier switch, NO contact	Right/left barrier switch, NO contact
3	Barrier switch, load side, NC contact	Barrier switch, load side, NC contact
4	Barrier switch, load side, NO contact	Barrier switch, load side, NO contact
5	1.2 m position switch	Left chain switch, NO contact
6	Lift mast position switch	Right chain switch, NO contact
7	2-hand button, load side	2-hand button, load side
8	Button for lifting auxiliary lift.	Button for lifting auxiliary lift.
9	Button for lowering auxiliary lift.	Auxiliary lift lowering button.
10	Auxiliary lift up limit switch	Auxiliary lift up limit switch
11	Auxiliary lift down limit switch	Auxiliary lift down limit switch
12	Free	Free

Plug X862.3, pin assignment

Pin	Signal
1	1+24 V power supply
2	0 V power supply
3	CAN_H
4	CAN_L
5	Emergency stop button
6	Emergency stop button
7	Detection of the operating panel on both sides
8	+5 V power supply for steering setpoint potentiometer, load side
9	0 V power supply for steering setpoint potentiometer, load side
10	Detection of the operating panel mounting position
11	Free
12	Free
13	Enable hydraulics
14	Enable driving
15	Free
16	Free
17	Slider 1 for steering setpoint potentiometer, load side
18	Slider 2 for steering setpoint potentiometer, load side

Plug support chassis

General

Mounting position

The chassis plug holder (1) is on the right of the control board in the control compartment.

There are 4 chassis plug holder variants:

- **Distributor 1:** industrial trucks with simplex mast without options
- **Distributor 2:** industrial trucks with simplex mast with options
- **Distributor 3:** industrial trucks with telescopic mast without options
- **Distributor 4:** industrial trucks with telescopic mast with options

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Plug	Function	Distributor 1	Distributor 2	Distributor 3	Distributor 4
X1	Trailing cable	X	X	X	X
X70	Emergency off		X	X	X
X71	ZAG emergency off		X		X
X72	External traction cut-out	X	X	X	X
X75	ZAG coding		X		X
X99	MPSE personal protection system		X		X
X140	Pedestrian mode		X	X	X
X320	Right rail switch		X		X
X321	Left rail switch		X		X
X700	ZAG		X		X
X720	ZAG sensors (S1–S4)		X		X
X722	ZAG sensors (S5–S8)		X		X
A	Free, CO	X	X	X	X

Plug X1, pin assignment

Pin	Signal for EM	Signal for TE
1	0 V power supply	0 V power supply
2	+24 V power supply	+24 V power supply
3	1+24 V power supply	1+24 V power supply
4	Emergency stop chain	Emergency stop chain
5	CAN_H	CAN_H
6	CAN_L	CAN_L
7	Enable hydraulics	Enable hydraulics

Drive/pump controller

General

Function

The drive controller and pump controller (1) (FPS) controls an AC traction motor and a DC pump motor. The converters are activated according to the principle of pulse width modulation (PWM) via a logic card with a main processor and a monitoring processor.

The FPS uses the CAN bus to communicate with other controllers.

The FPS contains the following software:

- Truck program
- Truck-specific parameters and options
- CAN configuration
- Error memory

Monitoring

The FPS monitors:

- Battery polarity
- Battery charge
- Inputs and outputs
- Temperature at the heat sink
- Temperature of the motors
- Switch-on sequence
- Switchover if there are operating panels on both sides
- Uncontrolled setting off

The main contactor does not close if the following has occurred:

- Error in the power module
- CAN bus error
- Logic fault
- Incorrect input statuses

NOTE

From 01/2017, a modified drive/pump controller (FPS) is installed. The FPS is not compatible for installation in older industrial trucks.

Diagnostics

The computer is connected to the diagnostic interface in the control compartment, or from 01/2017 to the diagnostic interface in the driver's cab.

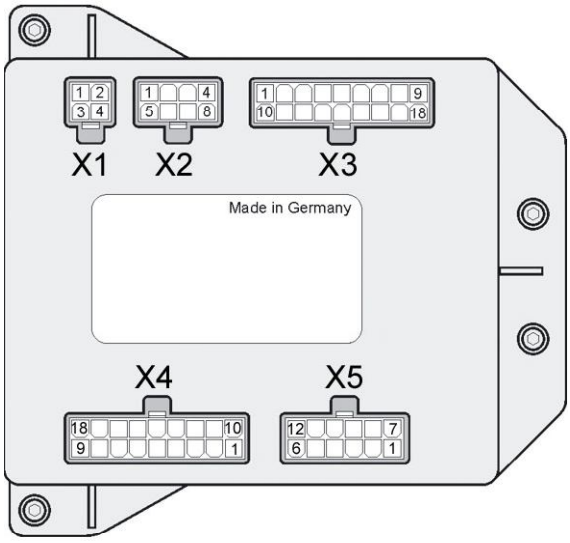
Pin	"IOZ2" cab installation signal	Description of functions
1	1+24V supply	
2	0V supply	
3	Digital output 1	UPA program with digital output
4	Digital output 2	UPA program with digital output
5	Digital output 3	UPA program with digital output
6	+10V supply, 0.15A for analogue connection	
7	0V supply for analogue connection	
8	Free	
9	Free	
10	Analogue input 1	UPA program with analogue input
11	Analogue input 2	UPA program with analogue input
12	Free	
13	Free	
14	Variant 1: free	
14	Variant 2: Linde FleetManager™ input	Enable signal from Linde FleetManager™, PIN was entered correctly

Operating panel controller (BPS) 8U62 up to 12/2016

General

Function

The **operating panel controller (BPS)** actuates all operating devices and is located under the operating panel.



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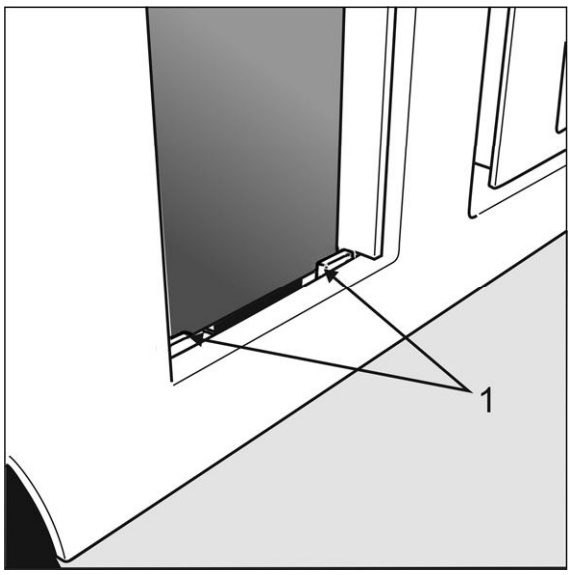
Traction batteries and accessories

Replacing the battery



⚠ CAUTION

Risk of accident

Before the start of each shift, check that the battery is correctly latched in place.

As standard, the battery is installed in a recess in the chassis (1).

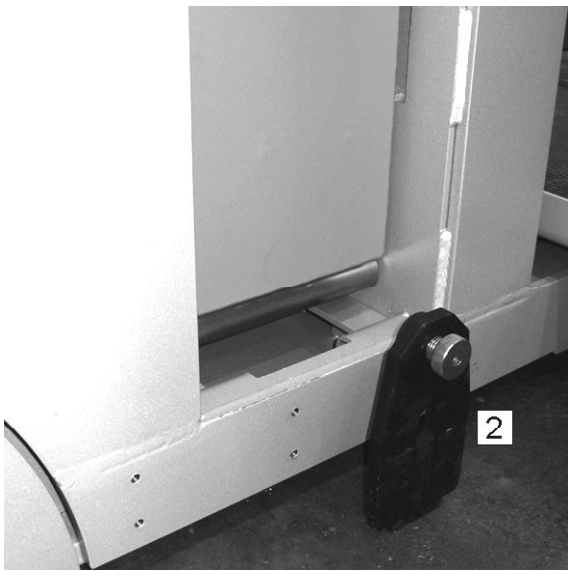
Alternatively, the battery rests on roller channels and can be removed from the side of the truck using a battery change frame. Latches with knurled-head screws secure the battery in place to prevent it rolling out to the side.

Battery replacement up to 12/2016

Removing the battery:

– Release the knurled-head screw and the rubber buffer.

– Remove the latch (2).

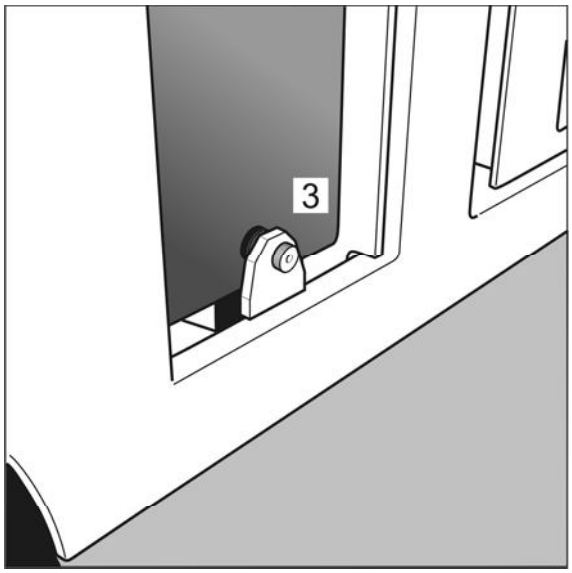


Installing the battery:

– Insert the latch (2) and tighten the knurled-head screw (3).

NOTE

Ensure that the knurled-head screws are tightened symmetrically on both sides. The thread on the rubber buffer must not be screwed to a dead stop.



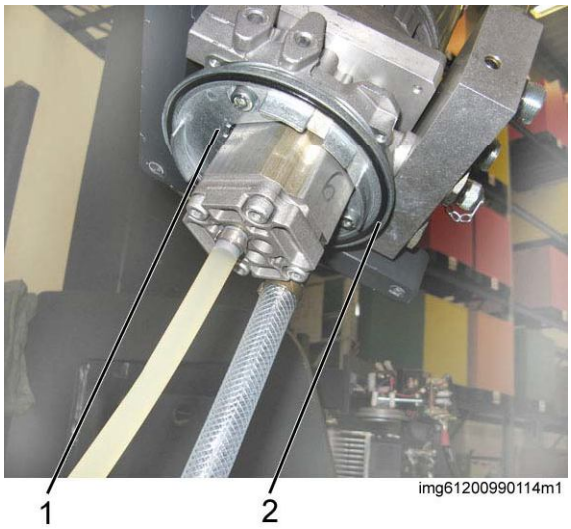
– Fasten the sling (2) under the connections (3) on the pump motor. Lift the complete hydraulic power unit up and out of the control compartment using a lifting system (1).

Pump unit – installation

NOTE

The sealing ring (2) between the pump unit and the tank is located in a groove on the flange (1) of the pump unit. During installation, make sure that the sealing ring remains in the groove.

To install, simply follow the removal steps in the reverse order.



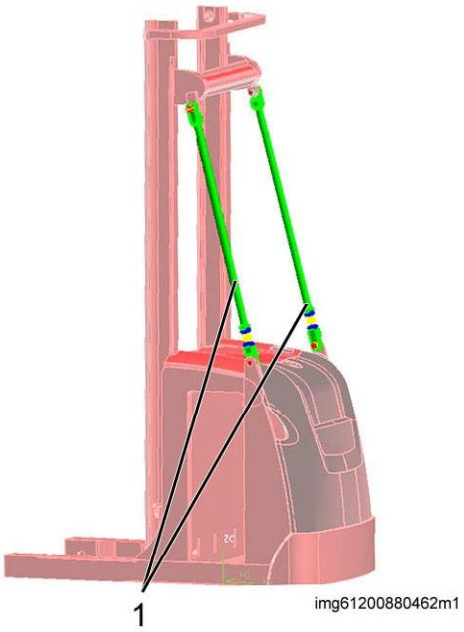
Mast bracing

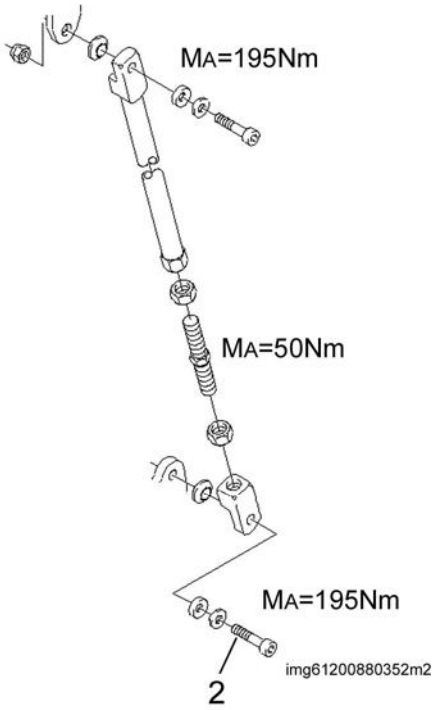
Repair

Assembly instructions

The mast bracing is attached for lift masts with an overall height of 2900mm.

- Screw on the mast bracing at the upper mounting with a screw and self-locking nut.
- Set the length of the mast bracing with threaded rod (1).
- Screw on the mast bracing at the lower mounting. Secure the screw (2) with chemical screw locking of medium strength (e.g. Loctite 243).
- Tighten the connections. Torque **M_A=195Nm.**
- Pre-tighten the mast bracing at the threaded rod (2) with a maximum of 1/4 turn (M_A= 50Nm) and secure with lock nuts.





Repair

According to the lifting tools available (crane, forklift truck, truck hydraulics), a lift cylinder can be removed in various ways.

⚠ DANGER

Risk of fatality when lowering the lift mast / cab.

Support the lift mast / cab securely.

⚠ DANGER

Risk of crushing when lifting the cylinder.

Secure the cylinder with a sling and lift using the crane / forklift truck.

Variant 1

Simplest method.

– Release the piston (1) on both sides and raise the lift mast with a crane.

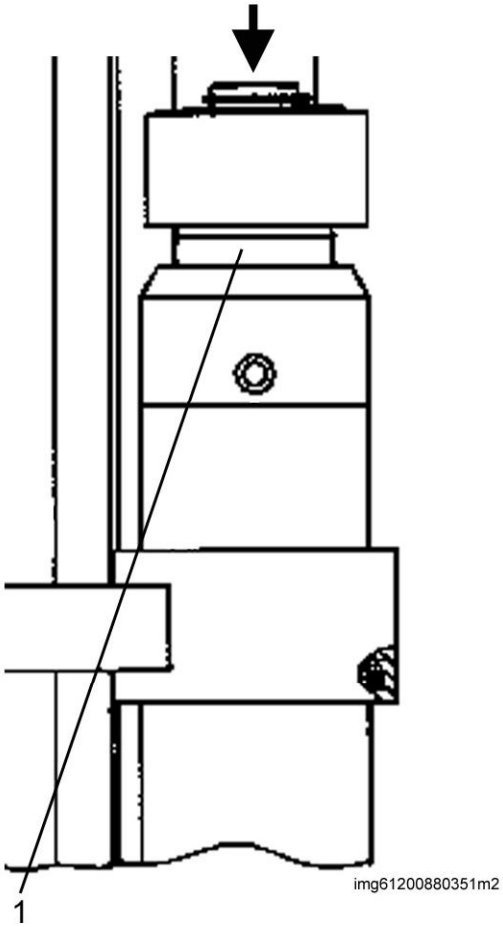
Variant 2

– Raise the lift mast using truck hydraulics.

– Support the lift mast securely and push the pistons back by hand.

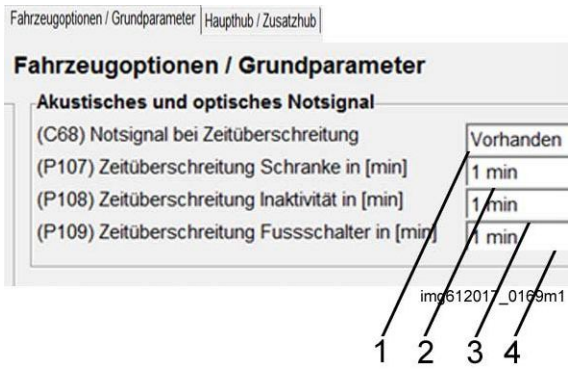
Variant 3

– On one cylinder, release and close the hydraulic line. Release the top of the piston on the cylinder that is not connected. Then raise the lift mast with the other cylinder.



Audible and visual emergency signal

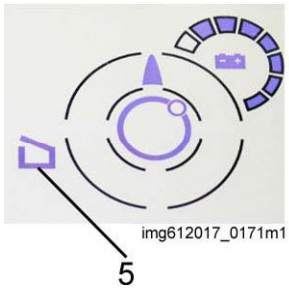
Emergency signal option



NOTE

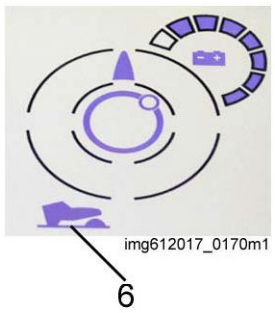
*This option is available for **industrial trucks from 2017 onwards**. If the relevant alarm has been triggered, the barrier (5) or foot switch (6) symbols flash. Software versions V2.30 and later support the flashing display for the drive/pump controller (FPS).*

The "Acoustic and optical emergency signal" purchase option can be deactivated on the "Truck options/default parameters" diagnostics page using parameter C68 (1).



Function

The parameters "(P107) Timeout barrier"(2), "(P108) Timeout inactivity"(3) and "(P109) Time-out foot switch"(4) can be used to set monitoring times of 0.5 minutes to 5 minutes.



NOTE

"(P107) Timeout barrier" is only evaluated if the lift height of the cab is higher than specified in parameter "P31 Maximum height with open barrier".

At the end of the timeout, the buzzer is activated on the display as a warning. A total of 10 cyclical acoustic signals is generated within 15 seconds. If the alarm is not reset, the horn and the direction indicator are activated five times. If the alarm is not reset, the procedure is repeated.

Actuating the following operating devices resets the alarm:

- Foot switch (parameter P107)
- Barrier (parameter P108/P109)

NOTE

The pause function can only be activated below the lift height of the cab at which the barriers may be open.

Pause function

If the ESC button on the display is actuated for approximately 2 seconds, a cyclical acoustic signal sounds 10 times. The pause function is then active and the timeout parameters are no longer evaluated.

LED	Description	Level
GE2-Z2	Rail switch 2, aisle detection	Low active
S1, S3, S5, S7	Sensor inputs for zone recognition	Low active
S2, S4, S6, S8	Inverse signal of the sensor inputs S1, S3, S5, S7	High active

Zone partitioning

	Outside the aisle	Aisle end zone, not an absolute stop	Plate offset zone	Rapid travel zone	Absolute stop
Sensor status					
S1, S3	S1, S3 any	S1=1 **and** S3=1	S1=1 **and** S3=0 **or** S1=0 and S3=1	S1=0 **and** S3=0	S1=1 **and** S3=1
S5, S7	S5, S7 any	S5=0 **and** S7=0	S5=0 **and** S7=0	S5=0 **and** S7=0	S5=1 **or** S7=1
Aisle detection GE1, GE2	GE1=1 **and** GE2=1, ZAG is not active	GE1=0 **and/or** GE2=0, ZAG is active	GE1=0 **and** GE2=0, ZAG is active	GE1=0 **and** GE2=0, ZAG is active	GE1=0 **and** GE2=0, ZAG is active
Speeds	vmax				
Towards the aisle end	-	vRED (2.5 km/h)	vmax	vmax	Braking to STOP, with acknowledgement vRED
Towards the aisle centre	-	vmax	vmax	vmax	vmax
STOP option	vmax				
Towards the aisle end	-	***)** Braking to STOP, then vRED	vmax	vmax	Braking to STOP, with acknowledgement vRED
Towards the aisle centre	-	vmax	vmax	vmax	vmax
After switching on	vmax				
Towards the aisle end	-	vRED	vRED		STOP, with acknowledgement vRED
Towards the aisle end	-	vRED	vRED		STOP, with acknowledgement vRED

Inductive ZAG error list

NOTE

- *In the event of an **error**, the truck will be braked to a (STOP), even if the Q button is pressed. After stopping, the truck can be driven in both directions at crawling speed by holding down the Q button.*
- *On speeding up, ZAG (FE36) error is briefly displayed -> hardware test.*