



Workshop literature

Pallet truck

SXH 20



1609 2367

11548012101 EN - 01/2020

first in intralogistics



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Foreword

Pallet truck with standing ride-on mode



SXH_00-001

The SXH-type SXH-20 pallet truck is intended for transporting pallets in small spaces.

Features	SXH-20
Nominal capacity (in kg)	2000
Number of ground contact points	4
Traction speed (laden/unladen) (in km/h)	10/12
Traction controller	LAC
Traction motor (in kW)	3 (asynchronous)
Steering motor (in kW)	ES30-24 unit: 0.350 (S3-20%) maintenance-free
Brake type	Electromagnetic (without hydraulic assistance)
Control unit	Control module and a steering wheel
Type of platform	Fixed
Pump-motor unit (in kW)	1.2 (S3:10% of use) maintenance-free
Battery removal type	Side

As options:

- Control unit: Steering knob
- Fleet Manager

Maintenance

1000-hour/annual maintenance plan

Depending on the application, environmental conditions and driving style, the following procedures should be carried out every 1000, 2000, 3000, 4000, 6000, 7000, 8000 and 9000 hours
Preparation
Clean the truck
Check the error codes using the diagnostic tool
Chassis and equipment
Check the condition of the forks
Check the electromagnetic brake
Check and lubricate the hinges
Check the pump motor brushes for wear
Wheels
Check the tightness of the wheels
Check the stabilisers
Electrical equipment
Check the condition and correct positioning of the truck and battery cables
Check the electrical insulation between the chassis and the electric components
Check the battery acid level and the electrolyte level
Hydraulics
Check the hydraulic oil level

5000-hour maintenance plan

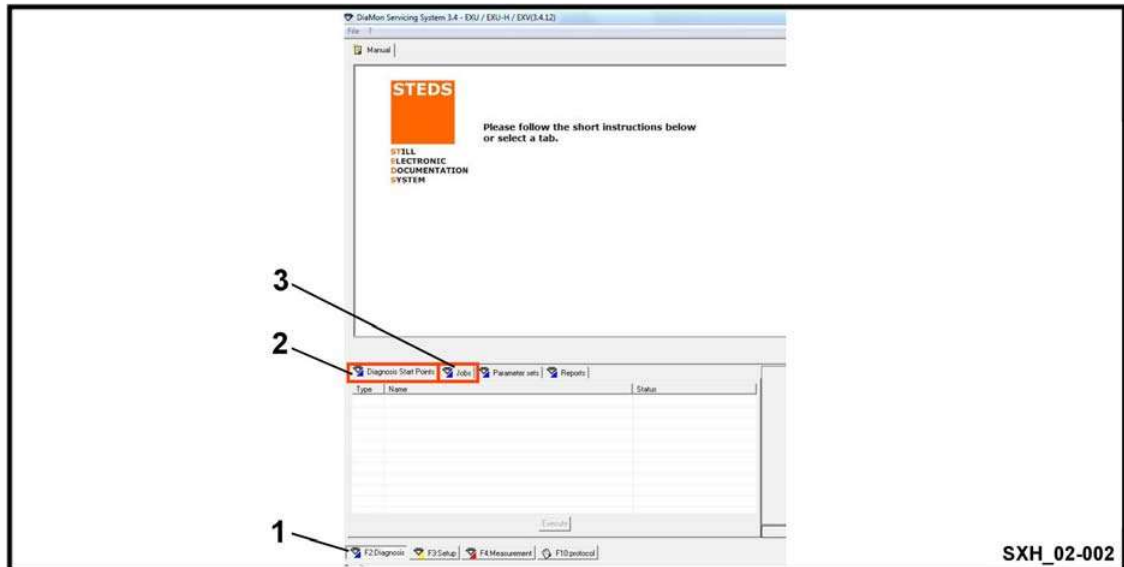
Depending on the application, environmental conditions and driving style, the following procedures should be carried out every 5000 and 10,000 hours
Information
Carry out all 1000-hour maintenance work
Hydraulics
Drain the hydraulic oil

10,000-hour service plan

Depending on the application, environmental conditions and driving style, the following procedures should be carried out every 10,000 hours
Information
Carry out all 1000-hour maintenance work
Carry out all 5000-hour maintenance work
Motor
Drain the transmission gear oil

**NOTE**

After diagnostics are completed, the lid must be screwed back onto the diagnostic connector to prevent moisture from getting in.

Parameterising

1 F2: Diagnostics

2 Start points for the diagnostics

3 Jobs

A guided diagnosis process can be used to individually select and carry out various diagnostic sequences and jobs. The user is continuously guided by the program. Always follow the relevant specifications provided.

- Park the truck safely.
- Lift the truck.
- Start the truck.
- Switch on the laptop and start the diagnostic tools.
- Connect the laptop to the truck.
- Select the desired diagnostics and double-click on it to start.

It may take a while to establish a connection with the truck and to start diagnostics.

Error codes for the lithium-ion battery B1-B2

Reset levels:

— Automatic reset: If required, move the battery to somewhere that is at ambient temperature.

The battery will reset by itself.

— Truck reset: Press the button for **over 1 second**.

— ON/OFF reset (safe mode): Press the button for **over 1 second OR over 10 seconds**.

*BMS: Battery Management System = Unit made up of the BMU and SMU.

*BMU: Battery Monitoring Unit = Battery controller.

*SMU: Safety and Monitoring Unit.

*SOC: State Of Charge.

*IMD: Maximum discharge current allowed.

*IMR: Maximum charging current allowed.

Step	INSTRUCTIONS	YES	NO	NOTE
8	Replace the BMS (see chapter 6: Lithium-ion battery, BMS)			
9	Error resolved (or corrected)	END	END	

Error code 209

Description: Unexpected status of battery contactor (open)

Step	INSTRUCTIONS	YES	NO	NOTE
1	Switch the battery off and on again			Go to step 2
2	Error code 217 appears	Go to step 10	Go to step 3	
3	Error code 209 appears	Go to step 4	Go to step 9	
4	Switch off the battery Disconnect and reconnect the signal connector for the power plate Switch on the battery			Go to step 5
5	Error code 209 appears	Go to step 6	Go to step 9	
6	Replace the contactor (see chapter 6: Lithium-ion battery, power plate)			Go to step 7
7	Error code 209 appears	Go to step 8	Go to step 9	
8	Replace the BMU harness (see chapter 6: Lithium-ion battery, BMS)			
9	Error resolved (or corrected)	END	END	
10	Follow the procedure for error code 217			

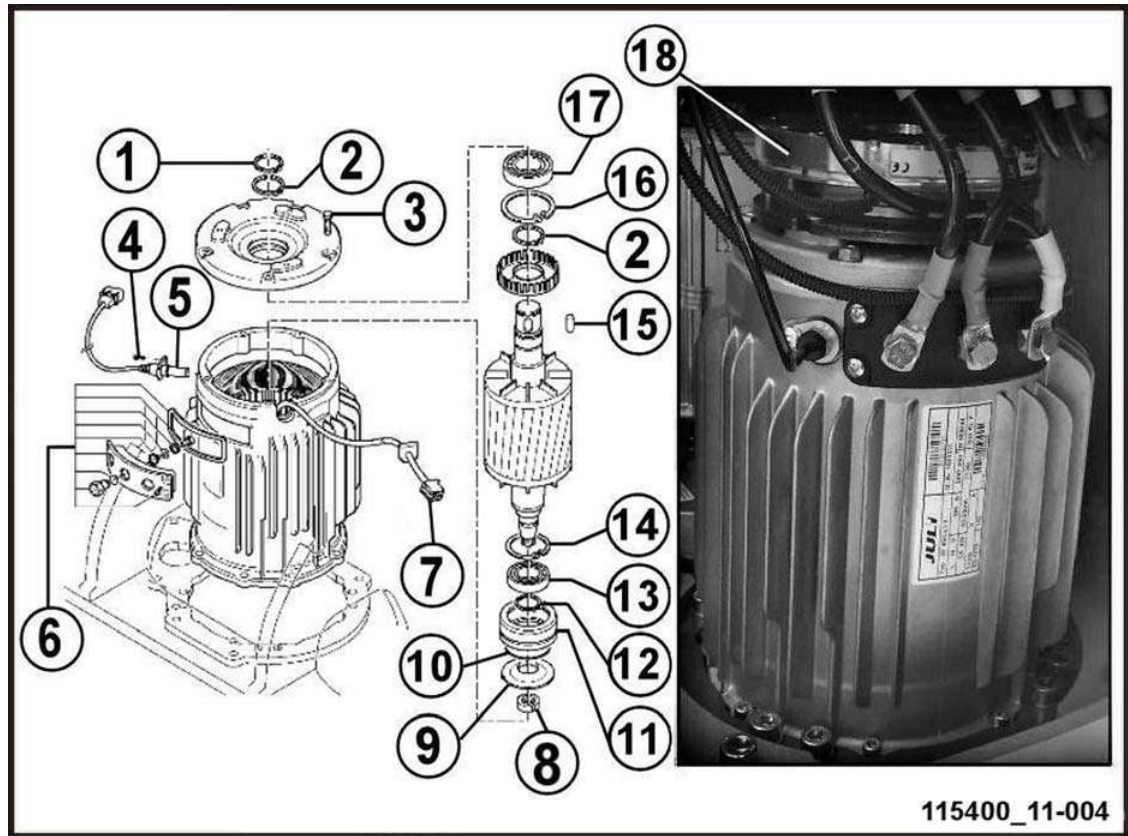
Error code 210

Description: Unexpected status of battery contactor (closed)

Step	INSTRUCTIONS	YES	NO	NOTE
1	Check that the truck is disconnected during the test Press the button to switch off the battery Press the button to switch on the battery			Go to step 2
2	Error code 217 appears	Go to step 10	Go to step 3	
3	Error code 210 appears	Go to step 4	Go to step 9	
4	Switch off the battery Disconnect and reconnect the signal connector for the power plate Switch on the battery			Go to step 5
5	Error code 210 appears	Go to step 6	Go to step 9	
6	Replace the contactor (see chapter 6: Lithium-ion battery, power plate)			Go to step 7
7	Error code 210 appears	Go to step 8	Go to step 9	
8	Replace the BMU harness (see chapter 6: Lithium-ion battery, BMS)			

Description up to 07/2018

Features of the traction motor



115400_11-004

- | | | | |
|----|--------------------------------------|----|--|
| 1 | Lock ring 25x1.2 | 11 | Bearing housing |
| 2 | Lock ring 30x1.5 | 12 | Lock ring 20x1.2 |
| 3 | Hexagon head screw - DE-M6x25-St-A3C | 13 | Grooved ball bearing 6204-2RSH |
| 4 | Button head screw - CE-M6x12-St-A2C | 14 | Lock ring 47x1.75 |
| 5 | Rev sensor (1B2) | 15 | Parallel key |
| 6 | Terminal block | 16 | Lock ring 55x2 |
| 7 | Motor temperature sensor (1B6) | 17 | Grooved ball bearing 6006-2RS |
| 8 | Castellated nut | 18 | Electromagnetic brake without hydraulic assistance |
| 9 | Protective cap | | |
| 10 | O-ring | | |

Sensors from 07/2018

Rev sensor

The rev sensor is an external component that senses the direction of rotation and the revolution speed of the corresponding electric motor.

The sensor is dust-proof and splash-proof and is connected to the power module 1A1 by a connecting cable.

Mounting position

The rev sensor (1B2) is located at the front of the traction motor.

NOTE

The rev sensor can be tested using the diagnostic tool (see Chapter 60 -> Traction -> Checking the operation of the rev sensor).



Temperature sensor

The reference number of the traction motor enables the type of temperature sensor to be identified.

The type is **PT1000**.

The temperature sensor (1B6) is located on the body of the traction motor.

It is connected to the traction motor power module.

It is dust-proof and splash-proof.

The power module controls the temperature and sends this information to the truck control unit via the CAN Bus.

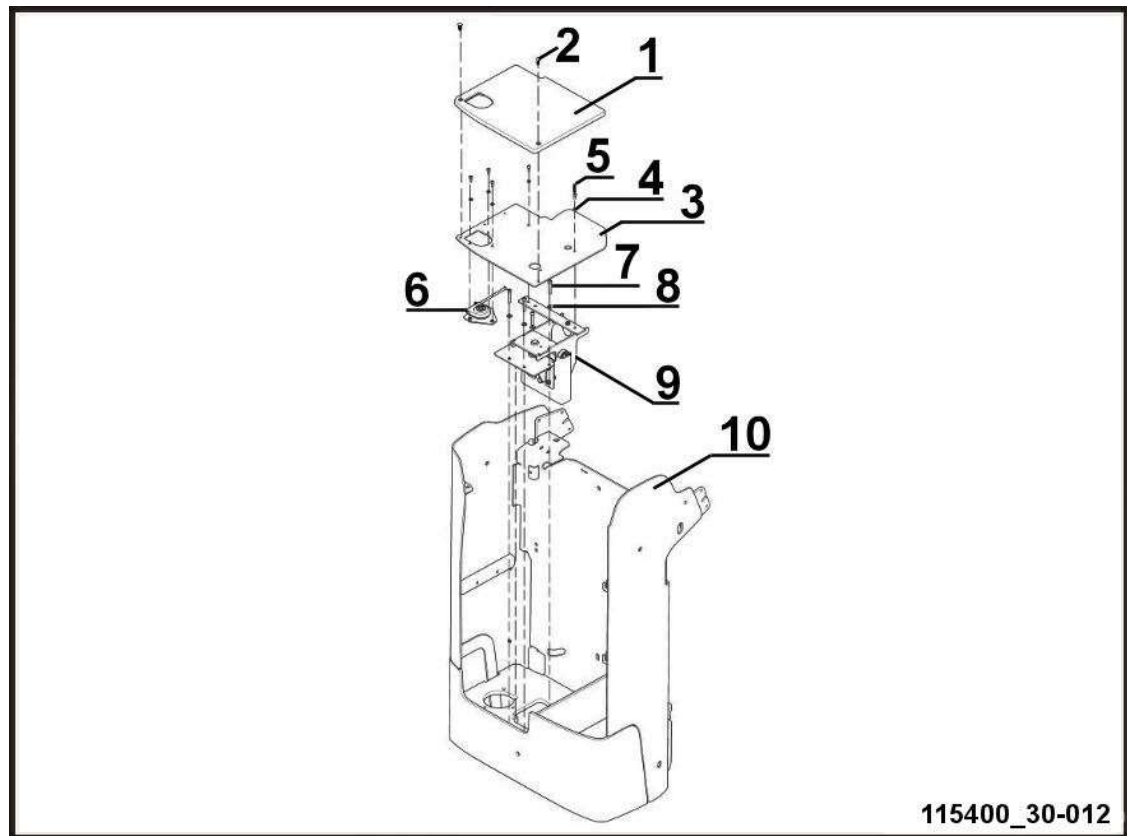
NOTE

The temperature sensor can be configured using the diagnostic tool (see Chapter 60 -> Traction -> Checking the operation of the temperature sensor).



Driver's platform

Description of the fixed platform



1	Rubber mat	6	Pedal
2	Sealing plug	7	Socket head screw M8x45-8.8-A2C
3	Bottom plate	8	Washer
4	Washer	9	Bottom plate
5	Socket head screw M6x16-8.8-A2C	10	Chassis

Driver's compartment equipped with a fixed platform with:

- A flexible rubber non-slip mat
- A platform floor and suspension
- Operator presence detection (pedal)

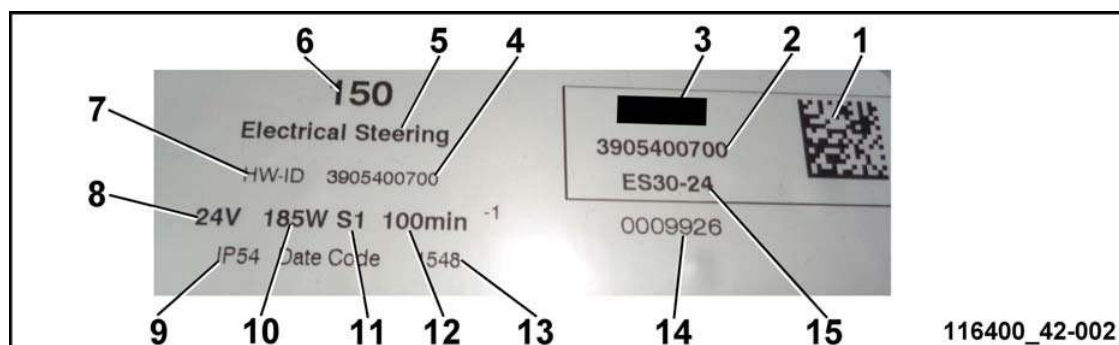
A non-slip grill floor replaces the rubber mat in the cold store version.

Technical data

Type: ES30-24	
Nominal voltage	24 V DC
Nominal capacity	185 W S1
Nominal speed	100 rpm
Maximum torque	110 Nm
Protection type	IP 54
Category of insulating material	F
Weight	7.5 kg

Pinion gear	
Number of teeth	22
Module	2.5
Contact angle	20°
Sideways shift	0
Shorter offset	0

Identification label



- | | | | |
|---|--|----|----------------------------------|
| 1 | Data matrix code | 9 | Protection class |
| 2 | Equipment number | 10 | Nominal power |
| 3 | Customer logo | 11 | Mode of operation |
| 4 | Hardware ID | 12 | Nominal speed |
| 5 | Text: electric steering (fixed) | 13 | Date code (fixed), YYWW schedule |
| 6 | Manufacturer identification: 150 (fixed) | 14 | Serial number |
| 7 | Text: HW-ID (fixed) | 15 | Type designation |
| 8 | Nominal voltage | | |

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Principle of the Hall effect sensor

Description

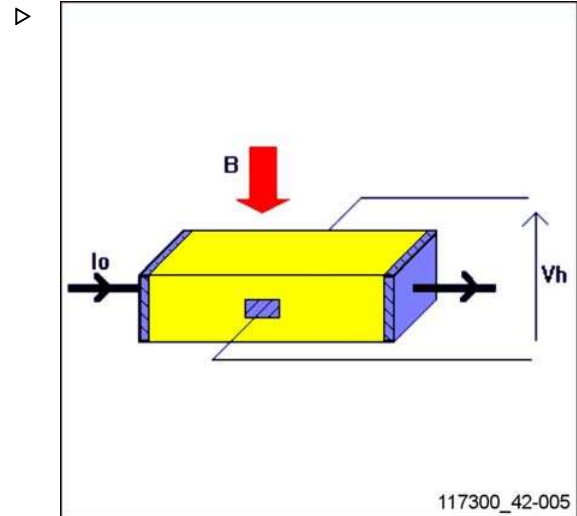
A Hall effect sensor gives a voltage when it detects a magnetic field or a metal part.

The Hall voltage (from the name of the person who observed the phenomenon in 1879) is amplified in the sensor.

If an I_0 current passes through a bar made out of conductive or semi-conductive material, and if an induction magnetic field B is applied perpendicular to the direction of the current flow, a V_h voltage, proportional to the magnetic field and the I_0 current appears on the side faces of the bar.

$V_h = K_h * B * I_0$ with K_h : Hall constant, which depends on the material used.

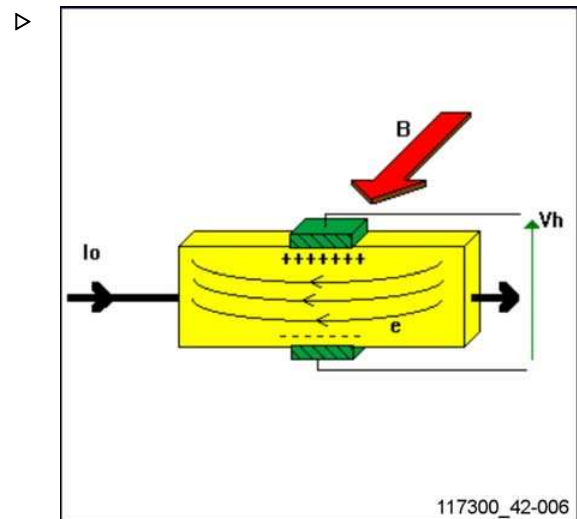
As the Hall constant is inversely proportional to the density of carriers, the Hall voltage is much higher in semi-conductors than in metals.



B Magnetic field
 I_0 Current
 V_h Voltage

Causes of the Hall effect

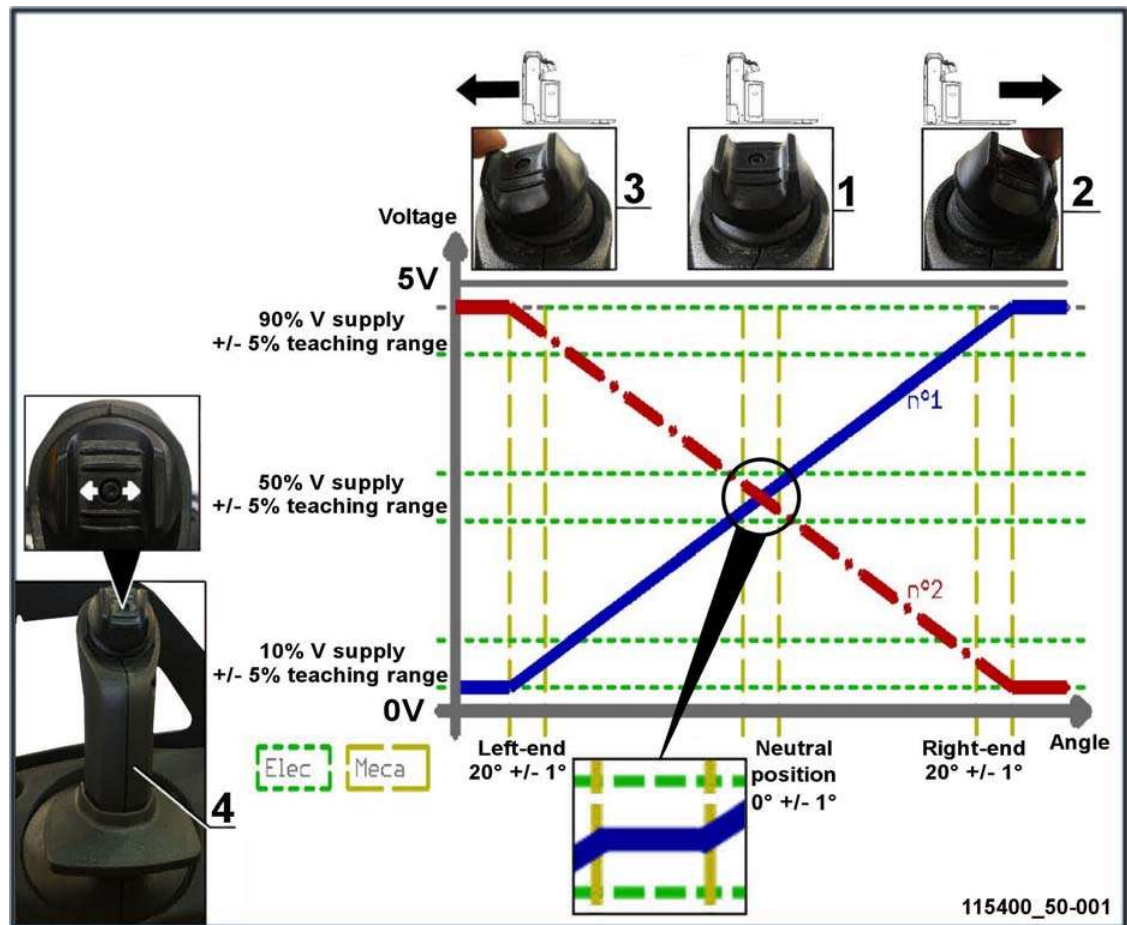
The electrons are deflected by the magnetic field, creating a potential difference called Hall voltage. The magnetic field distorts the trajectory of electrons because it generates a Lorentz (e) force.



B Magnetic field
 I_0 Current
 V_h Voltage
 e Lorentz force

Traction and lift

Traction function on the control module



- 1 Joystick in neutral position
2 Joystick to the right-hand stop

- 3 Joystick to the left-hand stop
4 Control module

When the operator moves the joystick to the right (2) or to the left (3), the truck moves forwards or backwards.

A potentiometer (Hall effect proportional sensor) is integrated into the control module and sends back two output signals.

- Signal no. 1: Reference signal
- Signal no. 2: Control signal

It is supplied by the traction controller with:

- +5 V: (1X1: 27)
- 0 V: (1X1: 42)

Both output signals No. 1 and No. 2 can be tested using the diagnostic tool.

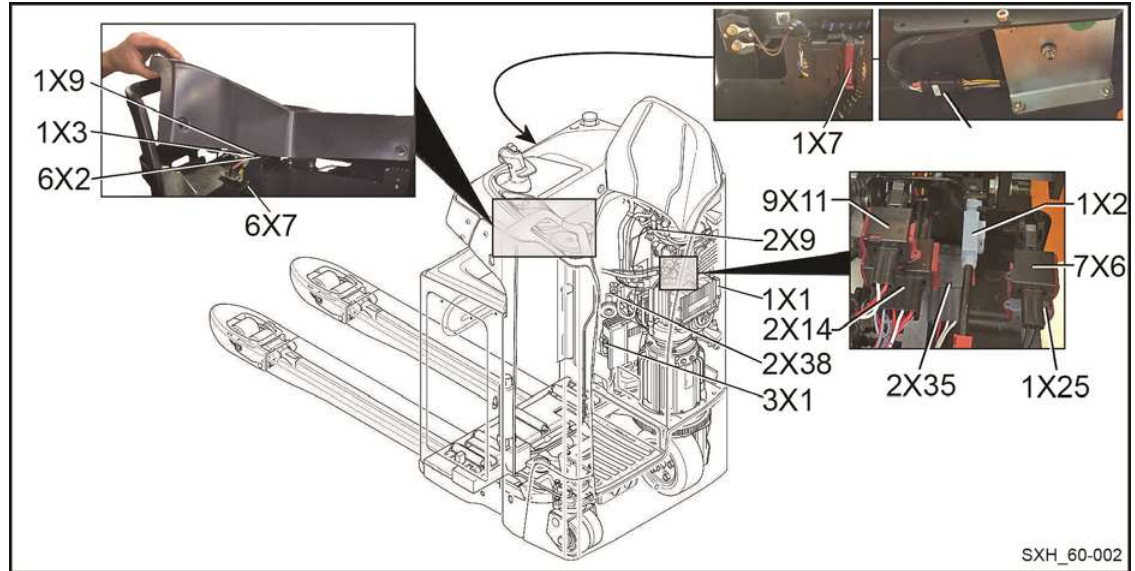
Checking the joystick:

Using a voltmeter, the measurable value of the reference signal must be 2.5 V ($\pm 5\%$) when the operator does not move the joystick (neutral position) (1).

Using a voltmeter, the measurable value of the reference signal must be between 2.5 V and 4.5 V when the operator moves the joystick to the right (2).

Using a voltmeter, the measurable value of the reference signal must be between 0.5 V and 2.5 V when the operator moves the joystick to the left (3).

Location of connectors (until 07/2018)



X13	Braking module connector	2X14	Initial lift upper/lower cut-out connector
1X1	Traction/lift controller connector	2X35	Pump/truck link connector
1X2	Rev sensor connector	2X38	Load Management/technical compartment link connector
1X3	Plate/control unit interface connector	3X1	Electric steering connector
1X5	Control module connector	6X2	Display connector
1X7	Link connector for the driver's compartment/technical compartment	6X7	Diagnostic socket connector
1X9	Driver presence connector	7X6	Electromagnetic brake connector
1X25	Motor temperature connector	9X11	Fan connector
2X9	Lowering solenoid valve connector		

1X1	Function	Signal		Type of signal	Input/Output
		Default value	Active value		
36	Initial lift signal 2B17	5 V	0 V	Digital	Input
37	Not used	Not used	Not used	Not used	Not used
38	Not used	Not used	Not used	Not used	Not used
39	Traction setting no. 2 1B1	-	Variable voltage 0 V/5 V	Analogue	Input
40	Pressure sensor (on SXD 20)	0 V	24 V	Digital	Input
41	Traction motor tem- perature sensor 1B6	-	Variable signal	Analogue	Input
42	0 V power supply to potentiometer 1B1 (and 2B4 on SXD 20)	-	0 V	Supply	Input

PWM* signal: Pulse Width Modulation = variable signal

Parameterising the control module

⚠ WARNING

Considerable risk of injury and/or material damage.

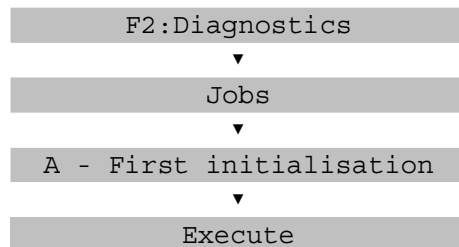
Chock the truck so that the drive wheel does not touch the ground during the control module configuration process.

Before launching the diagnostic tool, the truck must be switched on and connected to the PC.

- Select "Truck Service Base".
- The diagnostic tool connects to the controllers installed on the truck.

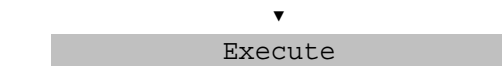
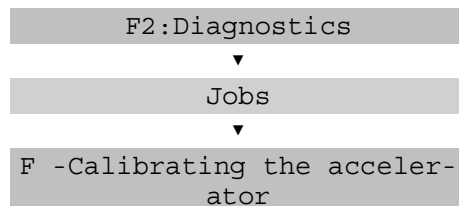
Step one: Truck identification

- Go to the following menu:



- Choose the truck type in the list, then confirm.
- Follow the instructions on the screen in:

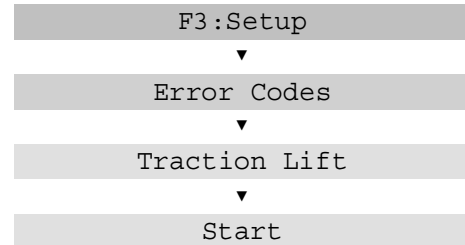
Step two: calibration of the accelerator potentiometer



- Follow the instructions on the display.

The accelerator potentiometer is calibrated.

Step three: Restore factory settings



- Follow the instructions on the screen in:

- In the "Traction" field

- Click on

- In the "Lift" field

- Click on

All settings will be restored to factory values with the exception of the truck type and calibration data.

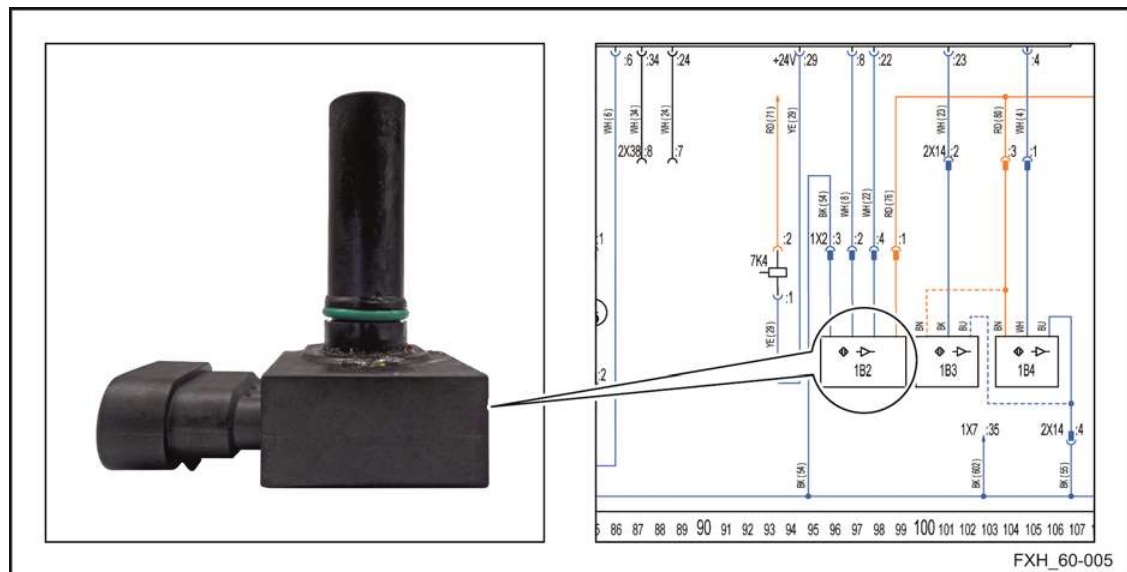
Final step: Initialise the new parameters.

To initialise the new values:

- Switch off the truck power supply and restart it.
- Close the diagnostic tool and relaunch the program.

Operational checks from 07/2018

Rev sensor (1B2)



1B2 Rev sensor
1X1 Traction/lift controller connector

1X2 Rev sensor connector

A sensor (1B2) is fitted to the traction motor.
This sensor monitors a gear fitted on the rotor.

The sensor is supplied with +24 V (pin 1X2:1)
and supplies two 90° out-of-phase impulsion
gaps.

These signals are transmitted to the traction
controller module (input pins 1X1:8 and 22 of the
LAC) as well as to the steering controller where
they are processed to determine the speed and
the direction of rotation of the traction motor.

No adjustment is needed for the rev sensor.

Truck applications:

SXH 20, SXD 20	07/2018
FXH 20 N, FXH 25 N, FXD 20 N, FXV 14 N, FXV 16 N	07/2018
FXH 20, FXH 25, FXD 20, FXV 14, FXV 16	09/2018

⚠ CAUTION

Risk of incorrect use of the traction motor.

If the sensor is improperly fitted or if (1X2) is disconnected, the traction speed will be 0.2 km/h and the effective motor current will increase to the I_{max} current of 270 A (according to standard factory settings for the truck).

Functions of the "inputs/outputs" of the ES30-24

Control connector 3X1

3X1	Function	Signal		Type of signal	Input/output
		Default value	Active value		
A1	Position sensor 3B2 (setpoint), track 2	-	Variable voltage 0 V/5 V	Analogue	Input
A2	Not used	/	/	/	/
A3	Not used	/	/	/	/
A4	Not used	/	/	/	/
A5	0 V sensor	-	0 V	Supply	/
A6	Power supply for the position sensor (setpoint)	-	10 V	Supply	/
A7	Power supply for the control card	-	24 V	Supply	/
A8	Power supply for the control card	-	24 V	Supply	/
B1	Position sensor 3B2 (setpoint), track 1	-	Variable voltage 0 V/5 V	Analogue	Input
B2	Not used	/	/	/	/
B3	Not used	/	/	/	/
B4	Not used	/	/	/	/
B5	0 V CAN A	-	0 V	Supply	/
B6	Power supply for the steering switch 3K1	-	24 V	Supply	Output
B7	Pivot brake 7A5	-	24 V	Supply	Output
B8	Safety loop	-	24 V	Supply	Output
C1	CAN A high	-	Approximately 2.5 V	Digital	Input/output
C2	CAN A low	-	Approximately 2.5 V	Digital	Input/output
C3	CAN B earth	-	0 V	Analogue	Input
C4	CAN B high	-	Approximately 2.5 V	Digital	Input/output
C5	CAN B low	-	Approximately 2.5 V	Digital	Input/output
C6	Pivot brake 7A5	-	PWM* signal	Digital	Input
C7	Steering switch 3K1	-	0 V	Supply	Input
C8	Not used	/	/	/	/

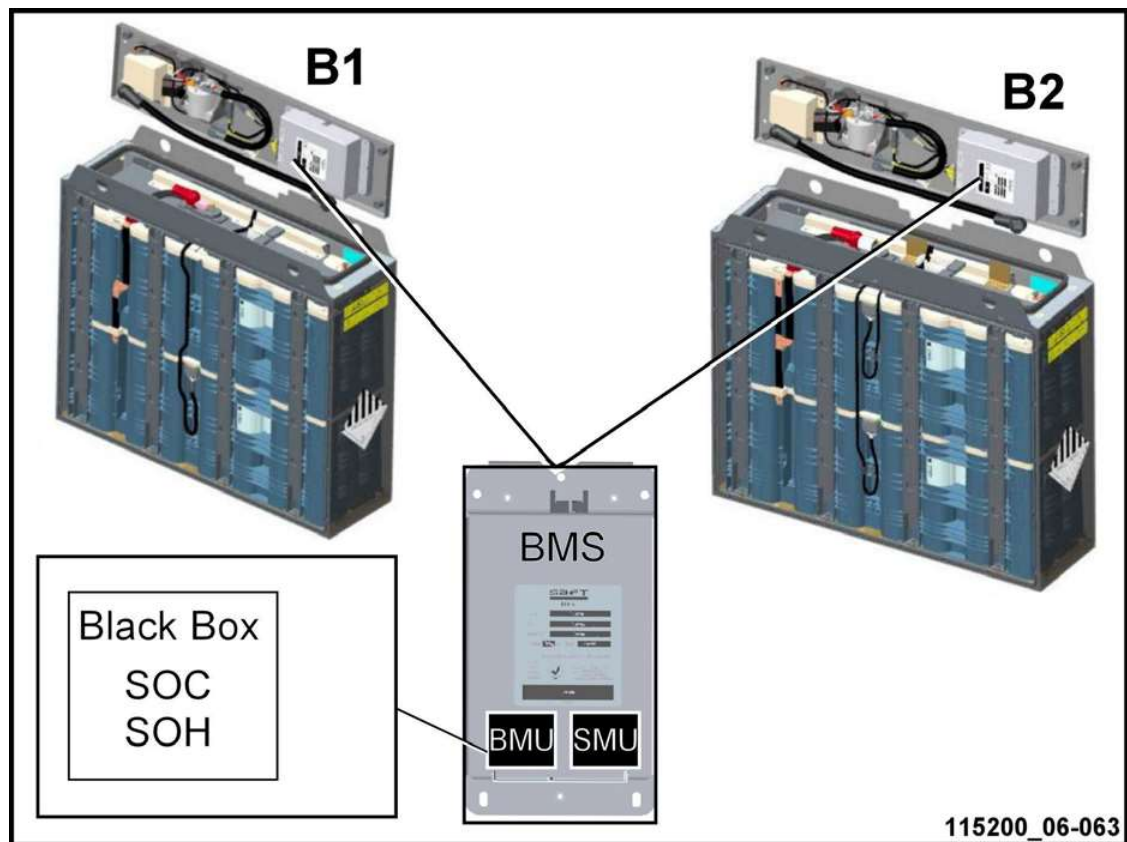
*PWM: Pulse Width Modulation

Power connector 3X8

3X8	Function	Signal		Type of signal	Input/output
		Default value	Active value		
1	Positive after battery	-	24 V	Supply	/
2	Battery negative	-	0 V	Supply	/

BMS

Description



The BMS (Battery Monitoring System) is the control unit for the lithium-ion battery.

It comprises the BMU (Battery Management Unit) and the SMU (Safety and Monitoring Unit) card.

The Black Box is located inside the BMU, with important parameters such as SOC (State Of Charge) and SOH (State Of Health).

The Black Box records the various battery parameters and events.

It monitors and controls the status of the battery with the following functions:

- To supply the SMU card and the BMU (DC)
- To receive data from the SMU card

- To measure the current of the lithium-ion battery module
- To calculate the data
- To communicate with the LAC controller via the CAN bus network

SMU card

The SMU (Safety and Monitoring Unit) card is located inside the BMS.

This enables cell management (balancing, sending information such as end of charge, overheating, overloading, excessive discharge etc.).

If the SMU card is faulty, the entire BMS must be replaced.

**NOTE**

It is also possible to access the BMS directly via the RS485 output of the BMS.

- Screw in the protective cap.

Working on the external charger

The instructions for the following repairs can be accessed:

- Replacing the input cable (AC)
- Replacing the output cable (DC)
- Maintenance manual for the charger

By using the following link:

www.bassi.eu/public/KION/KION_Service_manuals.zip

TDU: Access control



- 1 Reading device with a keypad
 2 RFID reading device ⁽¹⁾
 2A RFID transponder card
 2B RFID transponder

- 3 TDU connector 6X16
 4 Green diode
 5 Red diode

The TDU (Truck Data Unit) access control is available in two versions:

- A reading device with a keypad (1) OR
- A RFID reading device with truck access by:
 - ▶ RFID transponder card, 13.56 MHz (2A)
 - ▶ RFID transponder, 13.56 MHz (2B)

Some of the data is transferred via Bluetooth.

Parameterising is done using the **Service Base** of the After-Sales Service.

⁽¹⁾ RFID: Radio Frequency Identification

**NOTE**

The only way to find out the access control version is by connecting it.

Assignment of connector 6X16	
Pins	Function
6X16: 1	Battery voltage
6X16: 3	0 V
6X16: 5	Analogue 2
6X16: 7	Relay 1
6X16: 8	Relay 1
6X16: 11	CAN 2 High
6X16: 12	CAN 2 Low
6X16: 13	CAN 1 High
6X16: 14	CAN 1 Low

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