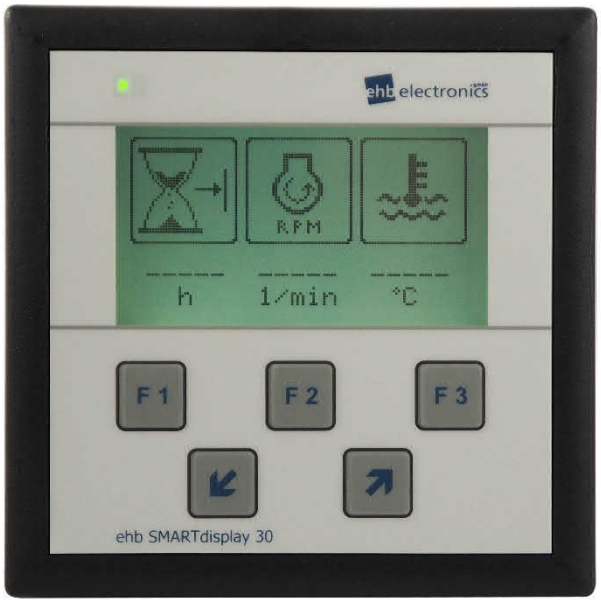
Operating Manual

ehb SMARTdisplay 30



Information for service personnel

Version 1.3

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30851 Langenhagen
Germany

Quick start guide

View

	Explanation
F1 F2 F3	Enlarges the image that is on the left Enlarges the image that is in the centre Enlarges the image that is on the right
↗	Up arrow: In working mode: Display change In programming mode: Ascending digit input
↙	Down arrow: In working mode: Display change In programming mode: Descending digit input
Display	B/W, 3.0″ (7.6 cm)

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1. General information

1.1 Introduction

The ehb SMARTdisplay 30 is used to monitor the most important CANbus measured values of a diesel engine. This also includes CANbus measured values of the exhaust gas treatment systems for different diesel engines. The operating parameters are shown on a 128 x 64 pixel display. DM1 error messages of the CANbus are mapped and assigned to the measured values.

If a regeneration of the diesel particle filter (DPF) is required by the engine controller via the SPN3700, it is shown on the display.

The engine can be started and stopped and the speed can be adjusted using the SMARTdisplay 30.

Further parameters can be displayed within a customer-specific modified software!

1.2 Target group

This documentation is intended for service personnel assigned to work at a system with integrated ehb SMARTdisplay 30.

1.3 Repairing of devices

Should the device require repair work, please return it to:

ehb electronics gmbh
Hans-Böckler-Str. 20
30851 Langenhagen
Germany

Please make sure that you include a written fault description. This will considerably facilitate the fault identification process for the service personnel and thus ensure a quicker turnaround time for the ehb SMARTdisplay 30. Alternatively you can use our online service for the returning of devices:
www.ehbservice.de

1.4 Important information on use

Use

This device is to be operated only in combination with the supplied accessories.

Use only mild cleaning agents.

Do not insert any objects into the device openings not intended for this purpose, since otherwise electronic faults can result.

When operating the device, comply with the general accident prevention regulations.

Safety

Do not operate the device within range of strong electromagnetic fields.

Observe the temperature specifications.

Storage

An ehb SMARTdisplay 30 device that is not in use may only be stored in compliance with the operation specifications.

Shipping

The unit is to be shipped either in its original packaging or in suitable sturdy alternative packaging.

Improper packaging is regarded as *negligence* and results in any claims for repair under guarantee being forfeited.

Maintenance

The device requires no maintenance and no special upkeep over its entire service life.

Installation

During the installation of the device follow the directions of the manufacturers of plugs and wire harnesses.

Opening the device

The ehb SMARTdisplay 30 contains no parts that can be maintained, replaced or repaired by the customer or by third-party maintenance personnel.

The device has a protective seal to prevent it being opened without authorisation. Note that any unauthorised opening of the device will lead to it being irreparably damaged.

ATTENTION!

Never use a high-pressure cleaner to clean the device.

It has to be clearly communicated to personnel that high-pressure cleaning will lead to damage and result in the guarantee being rendered null and void.

NOTE!

ehb electronics GmbH assumes liability only for the proper execution of services and the correct characteristics of the materials used. Any further claims such as for loss of profit and for direct and indirect consequential damages such as loss of data are excluded.

ATTENTION!

Damages arising from improper packaging of the device for shipping and/or unauthorised intervention will invalidate the guarantee.

1.5 Explanation of symbols

The “i” symbol indicates important information in the operating manual that is to be complied with.

The “lightning” symbol indicates a potential danger to your health (such as electric shock)

The “thumb” symbol indicates special information and tips.

2. Operation

2.1 Connection

The ehb SMARTdisplay 30 is attached with the supplied clamping brackets.
To connect the ehb SMARTdisplay 30, use a Deutsch IPD plug of the DT06-12S type.

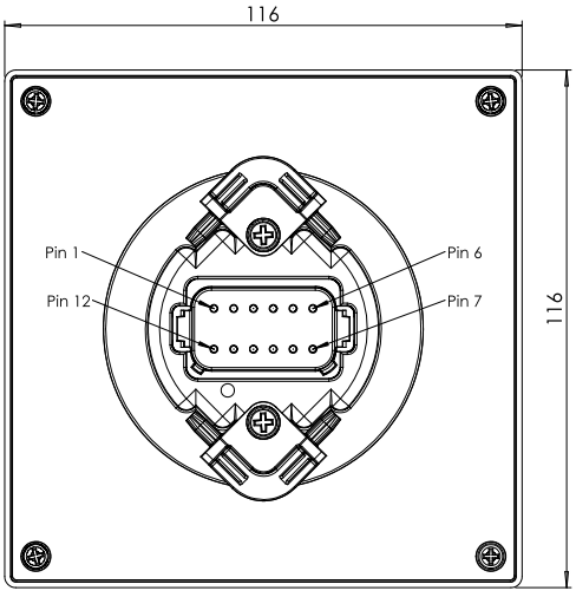


Figure 1: Rear of ehb SMARTdisplay 30 with fitting points for fastening brackets and connector

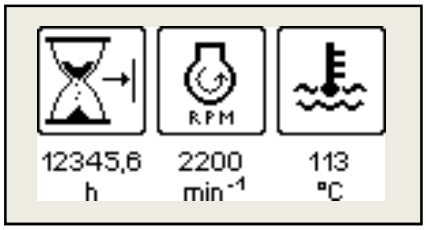
ehb SMARTdisplay 30 pin assignment	
Pin	Function
1	Term. 31 – (battery -)
2	-
3	-
4	CAN H
5	**Input parking brake**
6	-
7	-
8	-
9	CAN L Alternatively 2nd engine frequency input
10	Terminal 15 input of the engine controller
11	-
12	Term. 30, + (battery +)

2.2 Activation and deactivation

The ehb SMARTdisplay 30 is put into operation by applying operating voltage at PIN 1 (battery -) and PIN12 (battery +) via e.g. an ignition-starter switch.

After the operating voltage has been applied, three CANbus measured values appear in the “reduced measured values” view.

Three symbols are displayed next to each other with the value and unit shown separately.



1.8 Menu guidance

Use the arrow keys ↙ and ↗ to scroll between the symbols.

If the last page is reached, the selection automatically jumps to the first page when the arrow key ↗ is pressed.

From the first page, the selection automatically jumps to the last page when with the arrow key ↙ is pressed.

Note:

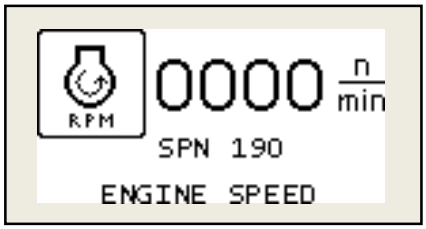
Not only F2 is used to enlarge the view

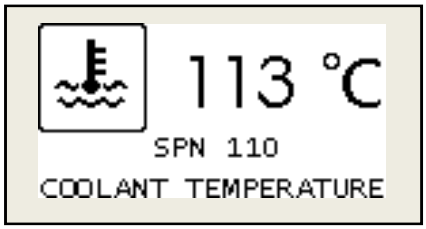
F1	Enlarges the image that is on the left
F2	Enlarges the image that is in the centre
F3	Enlarges the image that is on the right

Press the “F2” key to access the ”detailed measured values” view.

In the “detailed measured values” view, only one symbol, the measured value, that represents the SPN number related to the measured value and the “plain text” in English or German, is shown on the complete display.

“Detailed measured values” examples “- view:





Press the “F2” function key again to return to the “reduced measured value” view.

Values that are not recommended, for example because they are not supported by the engine controller, have dashes “ - - - “ displayed as the value.

The following values are displayed

Pos.	Sym.	SPN	Description	Description	Unit
1.1		247	Operating hours counters	Total Hours	hours
1.2		190	Engine speed	Engine Speed	rpm
1.3		110	Coolant temperature	Coolant Temperature	°C
2.1		100	Oil pressure	Engine Oil Pressure	bar
2.2		98	Oil level	Engine Oil Level	%
2.3		175	Oil temperature	Engine Oil Temperature	°C
3.1		96	Fuel level	Fuel Level	%
3.2		174	Fuel temperature	Engine Fuel Temperature	°C
3.3		94	Fuel pressure	Engine Fuel Pressure	bar
4.1		92	Engine load	Percent Load At Current Speed	%
4.2		106	Charge air pressure	Engine Air Inlet Pressure	bar
4.3		52	Charge air temperature	Engine Intercooler Temperature	°C
5.1		183	Fuel consumption	Engine Fuel Rate	l/h
5.2		158	Battery voltage	Battery Potential	V
5.3		111	Coolant level	Engine Coolant Level	%
6.1		1761	Urea level	Catalyst Tank Level	%

6.2		3031	Urea tank temperature	Catalyst Tank Temperature	°C
6.3		3516	Urea quality	Catalyst Reagent Quality	%
7.1		173	Exhaust gas temperature	Exhaust Gas Temperature	°C
7.2		4765	Temperature of catalyst input mass flow	Catalyst Intake Temperature	°C
7.3		4766	Temperature of catalyst output mass flow	Catalyst Outlet Temperature	°C
8.1		3236	Mass flow rate of the exhaust gas	Exhaust Gas Mass Flow	kg/h
8.2		3216	Inlet NOx concentration	Aftertreatment 1 Intake NOx	ppm
8.3		3226	Outlet NOx concentration	Aftertreatment 1 Outlet NOx	ppm
9.1		4364	SCR catalyst efficiency	Aftertreatment 1 SCR Conversion Efficiency	%
9.2		3720	DPF ash loading	DPF Ash Load	%
9.3		3719	DPF soot load	DPF Soot Load	%
10.1		3251	DPF differential pressure	DPF Differential Pressure	bar
10.2		3721	Time passed since last regeneration	DPF Time Since Last Active Regeneration	hours
11.1		1638	Hydraulic oil temperature	Hydraulic Oil Temperature	°C
11.2		6202	Hydraulic oil level	Hydraulic Oil Level	

3. Programming

Simultaneously press the two arrow keys ↙ and ↗ for about 3 sec to bring up the password entry box.
Enter the correct password “1000” to open the Main menu.
If an incorrect password is entered, the start view appears on the display.

3.1 Four-digit password

Entry of the first digit using the ↙ and ↗ arrow keys.
Confirm by pressing the “F1” function key.
Entry of the second digit, etc.
Upon the entry of a correct password “1000” all items of the Main menu are displayed.

3.2 Menu items

Use the ↙ and ↗ arrow keys to select from:

Parameter/Pin	**Value**
Language	German/English
CAN address	0..255
Error type DM1	0=all,1=red&amb.2=red
Display contrast	(-9 to 9)
Start display	0 to 10
Start regeneration	0 or 1
Request regeneration	-

The CAN address represents the address of the machine.
The CANbus measured values as well as active DM1 and DPF regeneration messages are shown on the display of the ehb SMARTdisplay 30.

Error type DM1:
The red LED lights up for a “DM1 SPN” error message without lamp status (**error type=0)**
The red LED lights up for DM1 SPN error message with the Amber Warning Lamp (**error type=1)**
The red LED flashes for DM1 SPN error message with the Red Stop Lamp.
High priority **(error type=2)**

Start regeneration:
When “Start regeneration” is selected and SPN 3700 was received with value 10 in byte 2.3-2.4 in PGN DPFC1, a request is displayed to either execute regeneration or reject it.

Request regeneration:
The number of regeneration calls SPN3700 = 10 with display, once after a recently switched on device, must be incremented and saved. It is reinitialised if a successful regeneration occurred.

4. Motor selection

4.1 4-digit password input

Enter the first digit using the arrow keys ↙ and ↗ .
Confirm by pressing the function key "F1".
Enter the second digit, etc.
After the correct password "2000" has been entered, all main menu items appear on the display.

4.2 Description of the menu items

The arrow keys ↙ and ↗ can be used to select between:

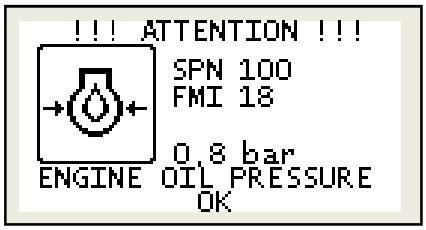
Parameter	Value
Inhibit Status	OFF/ON
Motor selection	KUB/PER/DEU

5. Error messages

Errors that are transferred with the aid of the J1939 protocol (DM1) are shown on the display with the associated symbol in the table.
The red LED and the green LED do not light up for error messages.

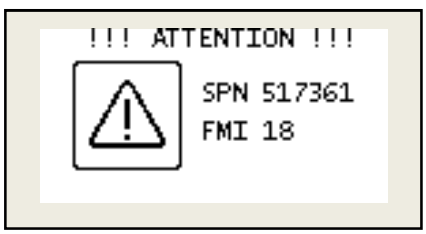
The text and value are displayed for known SPN errors.

Example of known errors:



If no suitable symbol exists for a SPN, the standard attention symbol is used and no text description is displayed.

Example of known errors:



The following can be adjusted in the parameter setup:

- Display all DM1 SPN error messages.
- Display all DM1 SPN error messages with Amber Warning and Red Stop Lamp.
- Only display DM1 SPN error messages with Red Stop Lamp.

5.1 Function of the red error LED in the front film

The red LED lights up for a “DM1 SPN” error message with lamp status
The red LED lights up for a “DM1 SPN” error message with Amber Warning Lamp
The red LED flashes for a DM1 SPN error message with Red Stop Lamp. High priority

5.2 Error inhibit memory

Displayed error messages can be confirmed with the “F2” (OK) function key so that the normal display is visible again. Renewed error messages with the same SPN and FMI are inhibited until the device is switched off and then on again or the error was not received for five seconds.
A maximum of 20 errors are inhibited.

6. Speed adjustment

The speed adjustment can be activated via a separate menu.

6.1 4-digit password input

Enter the first digit using the arrow keys ↙ and ↗.
Confirm by pressing the function key "F1".
Enter the second digit, etc.
After the correct password entry "4000", all speed menu items appear on the display.

6.2 Description of the menu items

The arrow keys ↙ and ↗ can be used to select between:

Parameter	**Value**
Speed ramp	1-99 s
Speed control	ON/OFF/NONE
Working speed	750-3000 rpm
Mini. speed	750-3000 rpm
Maxi. speed	750-3000 rpm

The speed can be adjusted in three different ways.

1) At input ST2-3 IN1_GND a pre-programmed operating speed can be approached via a connected switch.

Pin 3 is connected to a switch to change between idle speed and operating speed.

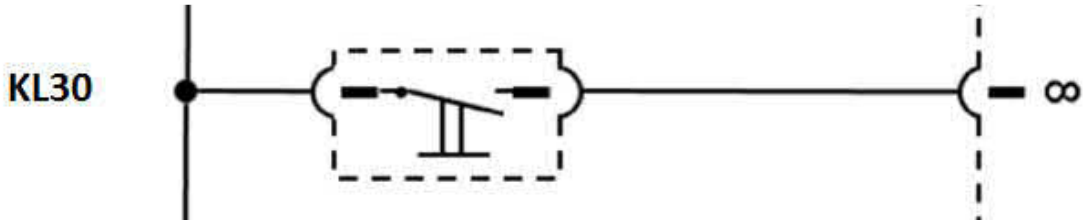


Figure 1: Circuit diagram switch operating speed

2) Alternatively, the operating speed can be called up by pressing the F2 key twice on the first operating page and calling up a special speed adjustment menu. In this menu, a function key is reserved for speed adjustment. If the ↙ or ↗ key is pressed , the speed changes by10.

3) Alternatively, both inputs ST2-7 IN1_DIG / key and ST2-8 IN3_DIG / key for speed adjustment can perform the same function as the arrow keys.

Key	Pin	Function
↙	Pin8	Speed-
↗	Pin7	Speed+

An operating speed is taught-in via a simultaneous signal at the two inputs ST2-7 IN1_DIG / speed- key and ST2-8 IN3_DIG / speed+ key for at least 3 seconds.

Note: In order to be able to adjust the speed manually, the parameter speed control must be set to "ON". "OFF" transmits only the operating speed and "NONE" deactivates the speed setting.

Note: The keys on the SMARTdisplay 30 always have priority over external keys connected to the digital inputs IN1_DIG, IN2_DIG and IN3_DIG.

7. DPF regeneration

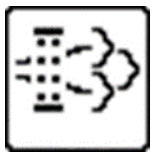
7.1 DPF message 1:

The main impetus for a standstill regeneration is the SPN 3700 with the value 10 in byte 2.3-2.4 in the PGN DPFC1.
The following information message appears on the display and the red LED lights up.

ACHTUNG!
REGENERATION DURCHFÜHREN

ATTENTION!
REGENERATION EXECUTING
JA/YES NEIN/NO

If the “**Reg.Start**” parameter was set to “0” in the menu, the following information message appears on the display and the red LED lights up.



ACHTUNG!
REGENERATION DURCHFÜHREN

ATTENTION!
REGENERATION EXECUTING
OK

When confirming the information message using the “F2” (OK) function key, the window is closed. If the status does not change within 30 seconds (”Nerv” interval), the information message is displayed again until the state changes (to 00 or 01).

When answering the request with “Yes”, the signal DPF Regen Force Switch **(SPN 3696 CM1_6.3)** is set to “01” for four seconds.

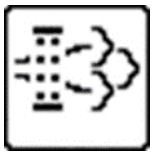
If the regeneration (status 01) is executed, the following information message appears on the display and the red LED lights up.

ACHTUNG!
REGENERATION AKTIV

ATTENTION!
REGENERATION ACTIVE
OK

When confirming the information message using the “F2” (OK) function key, the window is closed. The status does not change within 30 seconds („Nerv” interval). The information message is displayed until the status changes (to 00).

If SPN3700 is received again with the value “00”, the regeneration was successfully executed or is no longer required. In this case, the following information message appears on the display and the green LED lights up.



REGENERATION ERFOLGREICH ✓

REGENERATION SUCCESSFULL ✓
OK

The number of regeneration requests SPN3700 =01 is displayed and reset when the controller is switched on again.

7.2 DPF message 2:

If DPF active Regeneration Inhibit Status =01 (SPN 3702 in DPFC1_3.1) is received, the following information message appears and the red LED lights up.

ACHTUNG!
REGENERATION INHIBIT

ATTENTION!
REGENERATION INHIBIT

OK

When confirming the information message using the “F2” (OK) function key, the window is closed. The status does not change within 30 seconds („Nerv” interval). The information message is displayed until the status changes (to 00).

7.3 DPF message 3:

If DPF active Regeneration High Temp Status =001 (SPN 3698 in DPFC1_7.3) is received, the following information message is displayed and the red LED lights up.

ACHTUNG!
HOHE ABGASTEMPERATUR

ATTENTION!
HIGH EXHAUST TEMPERATURE

OK

When confirming the information message using the “F2” (OK) function key, the window is closed. The status does not change within 30 seconds („Nerv” interval). The information message is displayed until the status changes (to 00).

8. Sent CAN messages

The ehb SMARTdisplay 30 sends the ECU several messages according to the J1939 protocol.

8.1 ETC5 (Neutral Switch)

The following message is sent every 100 ms:

ID	Value							
1CFEC3E4	0xFF	0xF7	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF
	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

The J1939 protocol receives additional information for which every byte is valid.

8.2 CM1 (Force Switch)

The following message is sent every second:

ID	Value							
18E000E4	**0xFF**	**0xFF**	**0xFF**	**0xFF**	**0xFF**	**0xF0**	**0xFF**	**0xFF**
	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

The J1939 protocol receives additional information for which every byte is valid.

If the question from DPF message 1 is answered with “Yes”, then the signal DPF Regen Force Switch (SPN 3696 CM1_6.3) is set to “01” for four seconds.

ID	Value							
18E000E4	**0xFF**	**0xFF**	**0xFF**	**0xFF**	**0xFF**	**0xF4**	**0xFF**	**0xFF**
	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

When input IN2_DIG is opened (regeneration is prevented if PIN 5 is not connected to UB), the following signal is set:
DPF Regen Inhibit Switch (SPN 3695 CM1_6.1) signal to 01

ID	Value							
18E000E4	**0xFF**	**0xFF**	**0xFF**	**0xFF**	**0xFF**	**0xF1**	**0xFF**	**0xFF**
	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

8.3 CCVS (Park Brake/Veh.Speed=0)

The following message is sent every 100 ms:

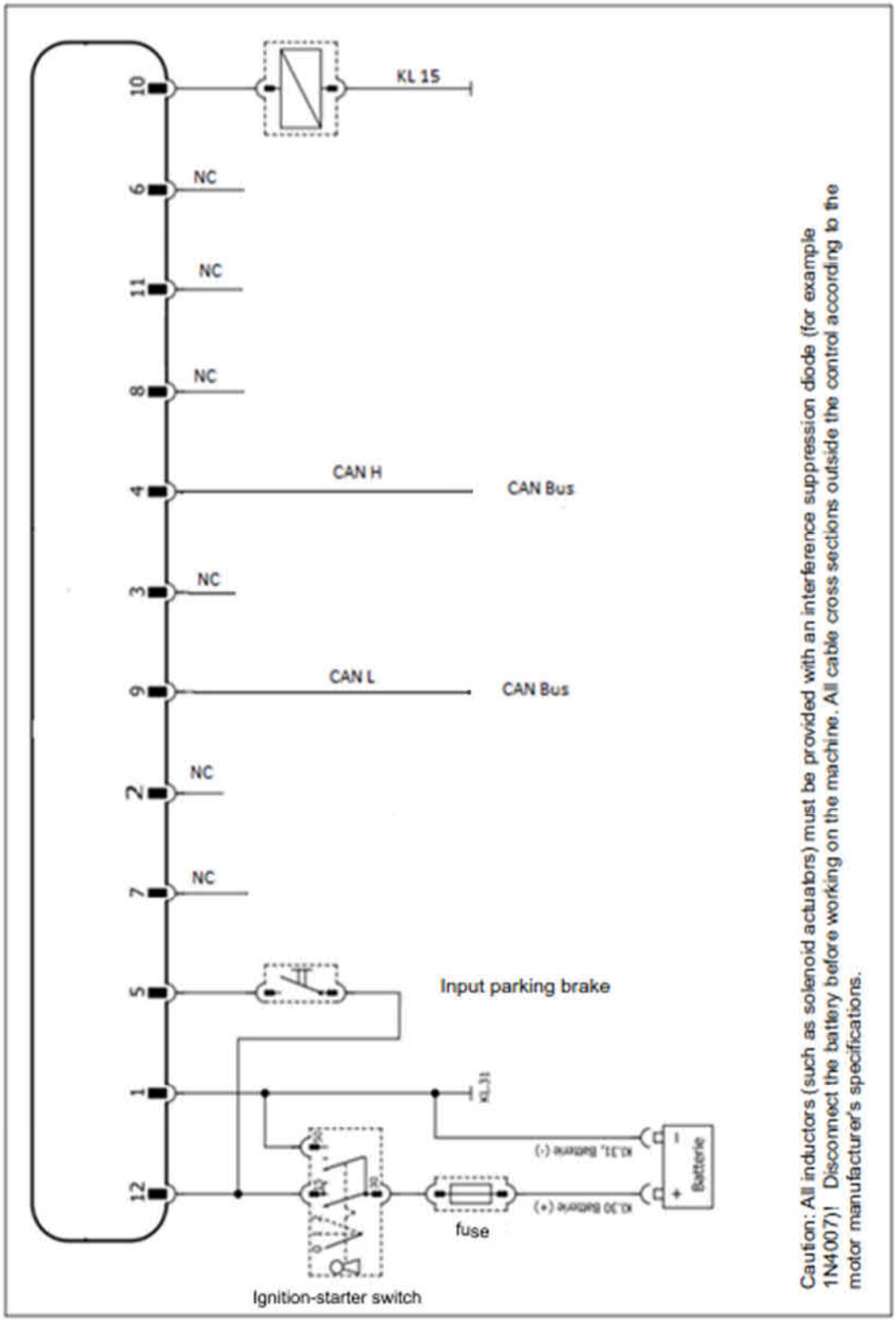
ID	Value							
18FEF1E4	0xF7	0x00	0x00	0xFF	0xFF	0xFF	0xFF	0xFF
	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

The J1939 protocol receives additional information for which every byte is valid

When input IN2_DIG is opened (regeneration is prevented if PIN 5 is not connected to UB), the following signals are set:
Parking Brake Switch (CCVS_1.3) signal to 00

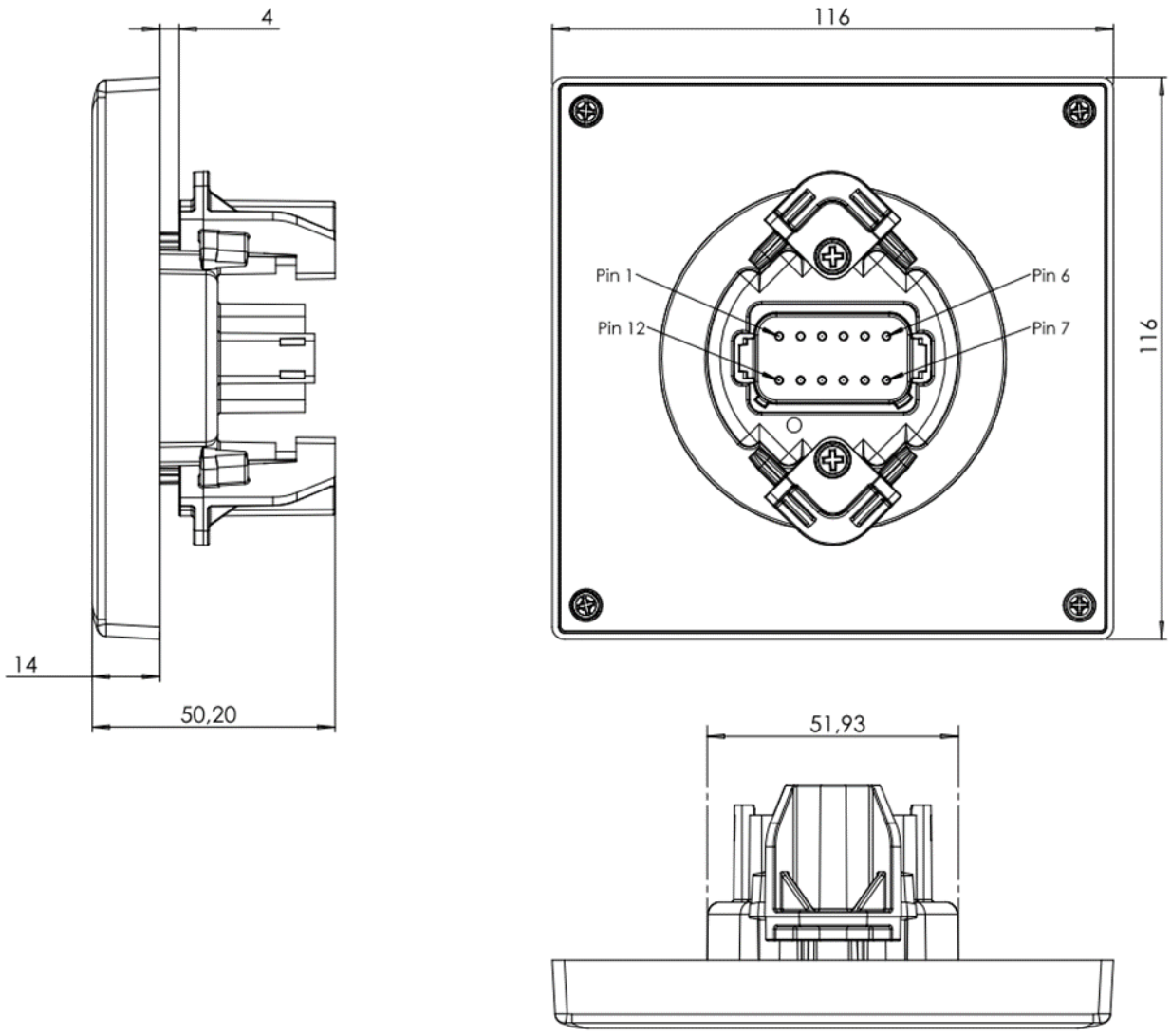
ID	Value							
18FEF1E4	0xF3	0x00	0x00	0xFF	0xFF	0xFF	0xFF	0xFF
	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

9. Connection diagram



10. Dimension drawing for installation

Dimensions in millimetres (mm).



11. Technical data

Electrical data

Voltage range	5-32V (typ. 6-32V)
Current consumption	50-120mA (for UB range 8-24V)
Operating temperature	-20°C to +70°C
Storage temperature	-30°C to +80°C
Input	CAN-Bus-Interface
Output	CAN-Bus-Interface PIN 06 | with customer-specific software, 10 A (maximal 1 s) / 8 A PIN 10 | with customer-specific software, 10 A (maximal 1 s) / 8 A PIN 11 | with customer-specific software, 5 A (maximal 1 s) / 4 A
RAM memory	64kByte
Flash memory	128kByte
CAN bus interface	250kBit/s, CAN 2.0, SAE J1939

Visualisation

Display type	Dot-matrix LCD display (B/W), transflective
Resolution	128 x 64 pixels
Visible screen diagonal	3.0“ (7.6 cm)
Brightness	>30cd/m²
Contrast ratio (CR)	5:1
Background lighting	LED, white

Mechanical data

Housing dimensions (L x W x H)	116 x 116 x 14 mm
Installation depth	47 mm / approx. 70mm with cable
Installation cut-out (W x H)	Ø 52 mm
Housing material	PA 6 30 GB, black, UV-stabilised
Weight	190g
Mounting	Retainers, bolted from the rear
Protection class	IP67 (with plug inserted)
Connection	Deutsch plug type DT04-12PA

Test standards

Humidity	DIN EN 60068-2-3
Vibration	DIN EN 60068-2-6

Shock	DIN EN 60068-2-27
CE marking	According to Directive 2014/30/EU

Accessories

Connection cable, 12-pole, 3m	ehb5362

11.1 Reference to test standards

The product has been tested according to he following norms:

Emission. Measurement of radio radiation according to DIN EN 61000-6-4, DIN EN 61000-4-20
Robustness against electric static discharge (ESD) according to nach DIN EN 61000-4-2
Robustness against high frequency electro magnetic fields according to DIN EN 61000-4-3, DIN EN 61000-4-20, ISO 11451-1
Robustness against quick transient disturbance (burst) according to DIN EN 61000-4-4
Robustness against peak current (surge) according to DIN EN 61000-4-5
Robustness against wire transmitted disturbance induced by high frequency fields according to DIN EN 61000-4-6
Vibration according to DIN EN 60068-2-6

12. Document information, history

Project:	ehb SMARTdisplay 30
Type of document:	Technical document
Version:	1.0
Prepared on:	24.03.2016
Prepared by:	ehb electronics gmbh, Langenhagen

Revisions:

Version:	Preparation/Revisions:	Prep./Rev. date:	Preparer/Reviser(s):
1.0	First version of the documentation	24.03.2016	Ila
1.0	Text edited, formatting	13/6/2017	Hag + JR
1.1	Adaption Pin 5 Adaption Information to use and Reverence to test standards	07.09.2017 22.11.2017	Ila Hag
1.1	Adaption Connection diagram	18.10.2018	Hk/Hag
1.1	Adaption password	14.01.2019	Pop/Hag
1.2	Adaption technical data	14.01.2019	Hk/Hag
1.3	Adjustment cpt. 4 Hydraulic displays, Adjustment cpt. 5, Supplement speed adjustment cpt. 6, Adjustment Supplement motor selection cpt. 4	19.03.2019	Hk/Hag

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