Operating Instructions

HCflex

Service personnel

Version 3.9

Copyright

1. Quick start guide

2. Key functions

	Explanation
F1 F2 F3	Function keys for selecting the various predefined wood types in working mode: F1 for wood type n1 F2 for wood type n2 F3 for wood type n3 F1 = additional use as confirmation switch for engine-cover switch faults and for confirming exceedance of number of service hours In programming mode: F1 = Enter (confirm) F3 = ESC (return)
↑	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, 3.5″ (8.9 cm)

Contents

2. General information

2.1 Introduction

The **HCflex** shredder control system is used to optimise the working capacity of wood reduction machines. The HCflex provides visual information on all important operating parameters at a display. The machine is protected against machine overload and kept in the optimal working range by an automatic controller for the intake rollers during wood chipping operation. A maximum throughput rate is thereby ensured. The integration of a service operating hours counter ensures that the machine operator is always informed about impending servicing tasks. Expensive downtime and costly repairs can thus be avoided.

The HCflex version for electronically regulated engines also provides engine protection and automatically switches off the engine in case of a fault. Information on relevant engine parameters received by the HCflex from the CANbus J1939 protocol is displayed in a clear and visual manner and engine fault messages are indicated and stored.

The HCflex provides visual information concerning the following parameters and features in working mode:

- Speed of driving engine (indicator)
- Speed of cutting disc/drum (indicator)
- Daily and total operating hours counter
- Service intervals
- Malfunctions
- Working ranges
- Prompts for activating specific functions

The following applies to versions for electronically regulated engines only:

- Information on selected engine parameters is visualised
- Information on engine faults (transmitted via the CAN bus) is visualised and stored
- Engine is deactivated in case of a fault.

Information concerning other parameters can be displayed using a customised software!

Up to three wood types are pre-programmed:

- Lightweight wood = brushwood, etc.
- Medium-hard wood = small pines, etc.
- Hard wood = trunk wood, etc.

The HCflex is equipped with an operating hours counter for the total operating duration and a resettable daily operating hours counter. The operating durations are displayed in hours and minutes.

The parameters for the operation of the wood reduction machine and various engine variants can be set individually. The HCflex can be configured for various machine types via stored data records (customer-specific adaptation).

2.2 Target group

This documentation is intended for service personnel assigned to work at a system with integrated **HCflex**.

2.3 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 **HCflex** within range of strong electromagnetic fields.

Note and comply with the temperature specifications given in the “Technical data” section.

Storage

An **HCflex** that is not in use may only be stored in compliance with the operation specifications.

Installation

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

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

Opening of the Hcflex

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

The HCflex has a protective seal to prevent it being opened without authorisation. Please note that any unauthorised opening of the device can lead to it being irreparably damaged.

ATTENTION!

Cleaning the device with a high-pressure cleaner may destroy the device. It has to be clearly communicated to personnel that high-pressure cleaning can lead to damage and thereby result in the guarantee being rendered null and void.

2.4 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 **Hcflex**. Alternatively you can use our online service for the returning of devices: **www.ehbservice.de**

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.

2.5 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.

3. Operation

3.1 Connection

The HCflex is mounted with the supplied clamping brackets.
A Deutsch IPD connector of type DT06-12S is to be used to connect the HCflex.

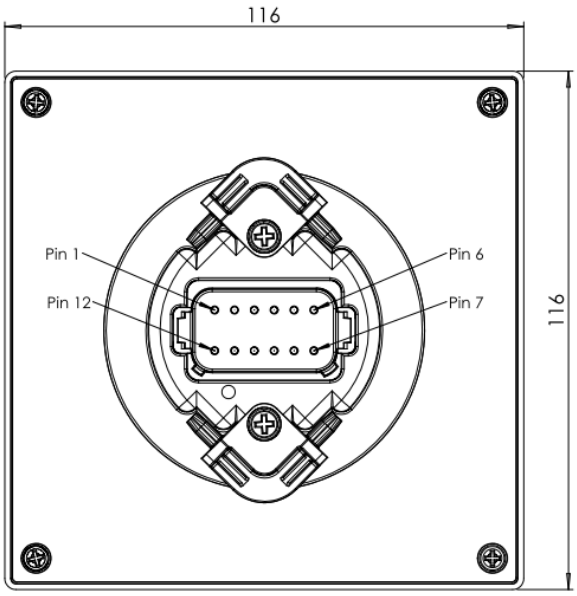

Figure 1 Rear of HCflex with fitting points for fastening brackets and connector

Pin assignment at HCflex for machines with mechanically regulated engines	
Pin	Function
1	Term. 31, battery -
2	Frequency input for cutting disc / rotor
3	Input for engine-cover switch
4	Not assigned (update: CAN high)
5	External “Start” button
6	Output, “Reverse intake movement” solenoid valve
7	External “Stop” button
8	External “Reverse intake movement” button
9	Frequency input for driving engine (update: CAN low)
10	Output, “Forward intake movement” solenoid valve
11	Alarm output
12	Term. 30, battery +

Pin assignment at HCflex for machines with electronically regulated engines	
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1	Term. 31, battery -
2	Frequency input for cutting disc / rotor
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7	External “Stop” button
8	External “Reverse intake movement” button
9	CAN low
10	Output, “Forward intake movement” solenoid valve
11	Alarm output
12	Term. 30, battery +

3.2 Activation and deactivation

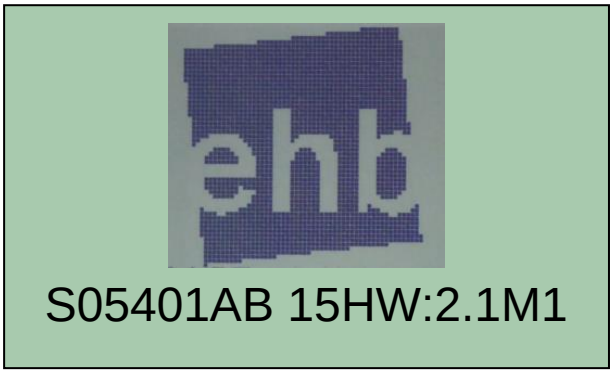
The HCflex is put into operation by applying operating voltage at PIN 1 (battery -) and PIN12 (battery +) via e.g. an ignition-starter switch.

The HCflex does not have its own on/off switch.

After the operating voltage has been applied, the HCflex initially displays a start screen and service information, before automatically switching to the “working mode” menu.

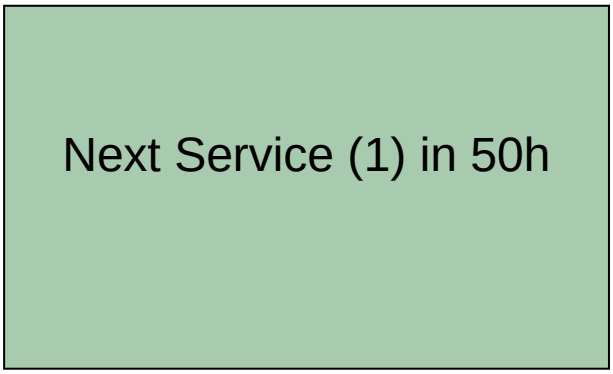
After the machine is started, the “valve test” function is executed at the **HCflex**. Here the “Reverse intake movement” and then the “Forward intake movement” functions are briefly activated, according to the parameterised durations. The operator receives visual information indicating that the valves for the intake are activating properly and material in the intake is being ejected.

Start screen:



The bottom line contains information on the software version used.

Service display:



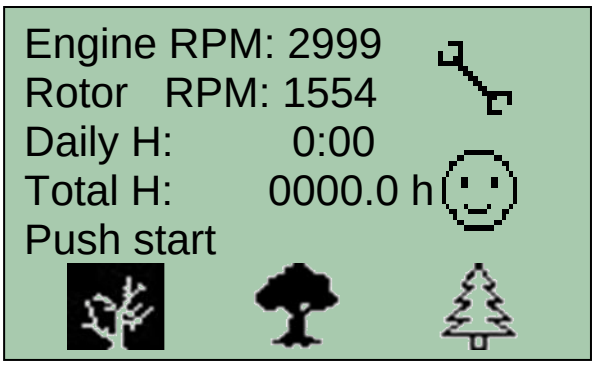
The service display indicates visually when the next service is due or when a missed service was due.

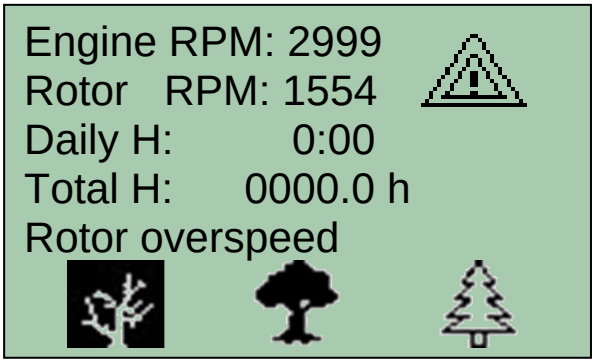
If the service interval has been exceeded, confirmation must be given using the “F1” key, prior to the “working mode” menu being brought up. A corresponding request is indicated on the display.

3.3 Working mode

In the working mode of the HCflex, the machine functions of the wood chipper are monitored. Machine parameter values are displayed and controlled via three or four (for CAN Bus version) screens. The arrow keys can be used to switch between the individual screens during operation.

“Working mode” page 1





Page 1 is the standard page for the working mode. While the machine is in operation, the control functions are selected and the main operating parameter values displayed on this page.

The three “wood type” symbols are used to bring up the respective stored chipping modes. The symbol corresponding to the selected chipping mode is indicated by a dark background. The various wood types can be selected with keys F1 –F3.

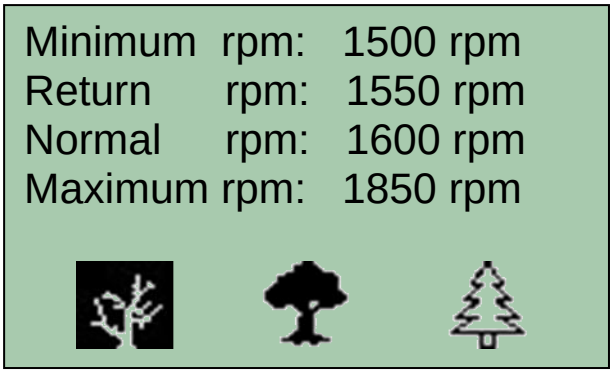
As regards the version for electronically-regulated engines, the speed adjustment of the engine via the TSC1 signal of the CAN bus is also activated via the “wood type” symbols. For this version, a selected “wood type” symbol (thus with a dark background) can be de-selected by pressing the associated function key once more. The driving engine is then run at idle speed.

The “Attention”, “Smiley” and “Spanner” symbols are used to display important information.

Line	Display	Description
1	Engine rpm	Indication of engine speed
2	Rotor rpm	Indication of speed at cutting disc / drum
3	Daily H	Indication of operating duration for the day
4	Total H	Indication of total operating duration
5	User information	On line 5, information for the operator is displayed • **Push start:** The external button for the enabling of the intake must be pressed. The speed of the cutting disc / drum has exceeded the programmed normal speed or return speed. • **Rpm too low:** The speed at the cutting disc / drum is below the set minimum speed, and consequently the intake can no longer be activated. • **Rotor overspeed:** The speed at the cutting disc / drum is above the set maximum speed and the intake remains at a standstill until there is a drop below the normal speed. • **Feeder stop:** The automatic feeder has been stopped; the external stop button has been pressed or the safety bar function activated • **temp. too low:** Warm-up phase (for CAN Bus versions only); the engine remains idling until the coolant temperature has reached the set minimum temperature. The engine will only run up to the required working speed after this temperature has been reached.

Symbol	Meaning
	The “Smiley” symbol indicates that the cutting disc / drum has reached a speed that lies within the working range of the wood chipper appropriate to the selected wood type. The speed of the cutting disc / drum lies between the programmed return speed and overspeed.
	The “Spanner” symbol indicates that a service interval has been exceeded. If the “Spanner” symbol is visible, the machine has to be serviced.
	The “Attention” symbol indicates that there is a fault at the system. The symbol appears in case of the following fault: • Overspeed at the cutting disc / drum

“Working mode” page 2



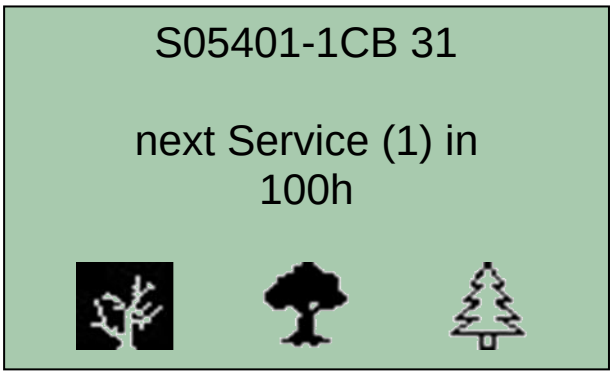
Page 2 for the working mode shows the settings for the selected wood type.

Line	Display	Description
1	Minimum rpm	If the speed falls below the value set for this chipper RPM, the intake is deactivated and the reversing mechanism is briefly activated according to the set reversing duration.
2	Return rpm	If the value set for this chipper RPM is exceeded, the intake is reactivated, in the event that it was previously deactivated due to its speed falling below the set minimum speed.
3	Normal rpm	Once the value set for this chipper RPM has been exceeded following the start-up of the machine, the intake can be activated.
4	Maximum rpm	If the value set for this chipper RPM is exceeded, the intake is deactivated.

For CAN bus version only:

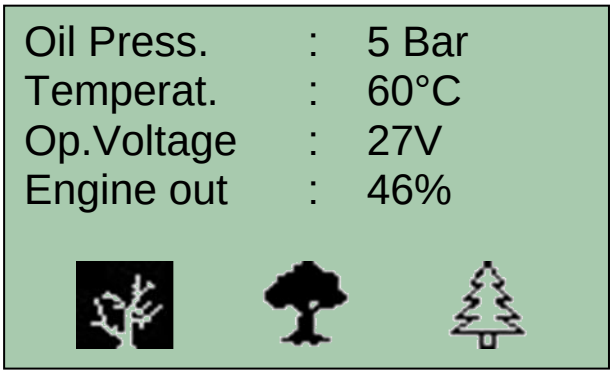
For the CAN bus version, the wood type can be de-selected, in order to bring the engine to the idle state. If no wood type has been selected, page 2 for the working mode is brought up, but with only the “wood type” symbols displayed.

“Working mode” page 3



Page 3 for the working mode indicates the installed software variant and when the next service is due or when a missed service was due. If a service interval has been exceeded, the display flashes.

“Working mode” page 4 (for CAN bus versions only)



Page 4 for the working mode is only available for the HCflex version designed for electronically regulated engines. Visual information on important parameters is given.

Line	Display	Description
1	Oil pressure	Indication of engine oil pressure [bar]
2	Temperat.	Indication of coolant temperature of driving engine [°C]
3	Op. Voltage	Indication of applied operating voltage [V]
4	Engine out	Indication of engine output [%]

“Engine-cover switch” fault screen

1. Close engine cover

2. Press “F1”

3. Press external “Start”

As soon as a safety switch at an engine cover is actuated, the HCflex deactivates the intake and the alarm output is activated. The HCflex indicates on the screen how the fault is to be rectified and the machine is returned to the working mode. After a safety switch at an engine cover has been actuated, confirmation must be given at the HCflex using the “F1” key. To activate the machine intake, the external start button must be pressed.

With regard to the deactivation of the driving engine and stopping of the intake, ehb electronics gmbh recommends a direct wiring of the safety switch. A parallel wiring to the engine-cover-switch input of the HCflex enables the customer to notice by visual means whether there is an active safety switch, and avoids the system being restarted without confirmation being given accordingly.

Deactivating the machine only via the engine-cover-switch input and the alarm output of the HCflex is insufficient for any level of safety. The corresponding inputs and outputs are not designed for safety-related switching operations, but merely as signal inputs and signal outputs!

External buttons

With the HCflex, manual operation of the wood chipper is possible via externally connected control buttons at the intake hopper of the wood chipper.

Stop button: The intake can be switched off at any time by pressing the stop button. Enabling of the intake is prevented by the HCflex until the start button has been pressed.

Start button: After the machine has been started, or after the stop button has been pressed, the start button must be pressed in order to activate the intake. Activation of the intake via the start-button is possible only if the speed of the cutting disc/drum has exceeded the normal speed or the return speed. A corresponding request appears on the fifth line of page 1 for the working mode at the display.

Reversing button: The reversing button can be pressed at any time. This button is used to move the intake in the reverse direction. Material can thus be removed from the intake at any time. After releasing the button, the machine is returned to the state it was in prior to the button being pressed. In other words, if the intake had been stopped, it returns to a stopped state, while if it had been running, it returns to a running state.

For the activation of the valve for the intake, ehb electronics recommends having the safety bar wired directly to the power supply for the solenoid valve via a certified safety switching device. A parallel wiring to the stop button ensures that the intake cannot start up until the HCflex has been enabled via the start button.

Deactivating the intake only via the stop-switch input and the output for the HCflex intake is insufficient for any level of safety. The corresponding inputs and outputs are not designed for safety-related switching operations!

LEDs

The HCflex is equipped with two LEDs, which are used to visually indicate the operating state.

Green: The green LED indicates that pulses at the frequency input for the measurement of the cutting disc/drum speed are being detected. The LED flashes at a frequency corresponding to the measured speed. Consequently for sufficiently high speeds of the cutting disc, a steadily lit LED will be visible. If the cutting disc/drum is stationary, the LED will be unlit.

Since the green LED flashes during a pulse measurement, the function or setting of a pulse generator for the cutting disc can be checked via this LED. If the cutting disc is rotated slowly by hand, the green LED must flash whenever a speed pulse of the inductive transmitter is detected.

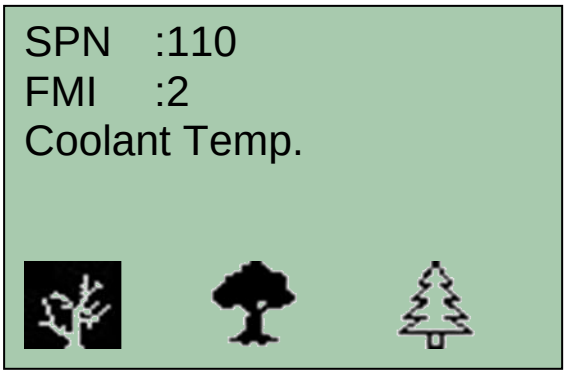
Red: The red LED will be lit if the input for the monitoring of the engine-cover switch has been activated.

For the CAN bus version of the HCflex, additional engine faults are indicated via the red LED. The lamp status indicated by a DM1 error message of the SAE J1939 protocol is evaluated. If the control device of the engine transmits a “red stop lamp” message, the red LED lights up and remains steadily lit, whereas if an “amber warning lamp” message is issued, the LED will flash.

“Engine” fault screen (for CAN bus version only)

If the HCflex receives a fault message via the SAE J1939 protocol (DM1 error message), the fault message is visually indicated both by the LEDs (see “LEDs” section) and the HSflex display.

The selected “working mode” page is displayed alternately with a screen on which the current fault is visually indicated.



The HCflex indicates all active faults with SPNs and FMIs in accordance with the SAE J1939 standard. Selected fault messages are also indicated with a plain-text message. The fault is indicated as long as the fault signal is transmitted by the engine controller. The HCflex additionally evaluates the lamp status of the DM1 error messages. If a “red stop lamp” message is transmitted, the HCflex activates the alarm output. The power supply to the engine can thereby be cut off and the engine deactivated.

The power supply to the driving engine can be activated via the alarm output. A motor protection function in case of a fault can thus be realised with the HCflex.

3.4 DPF (CAN bus version from software S05401A)

There are two types of diesel particulate filter regeneration. An automatic regeneration and a stationary regeneration.

Automatic regeneration

The automatic regeneration is carried out automatically by the engine. The shredder can continue to be used without any restrictions. If an automatic regeneration is active, the following is displayed:

This message can be acknowledged by clicking on F2 (tick). As long as the automatic regeneration is active, the message is displayed again at regular intervals (reminder interval). If a high exhaust gas temperature occurs during an automatic regeneration, the exhaust gas temperature symbol flashes.

Stationary regeneration

Stationary regeneration must be released by the operator. After a stationary regeneration has been released, the shredder intake can no longer be activated. Activation of the shredder intake is possible again after completion of the stationary regeneration.

Stationary regeneration required

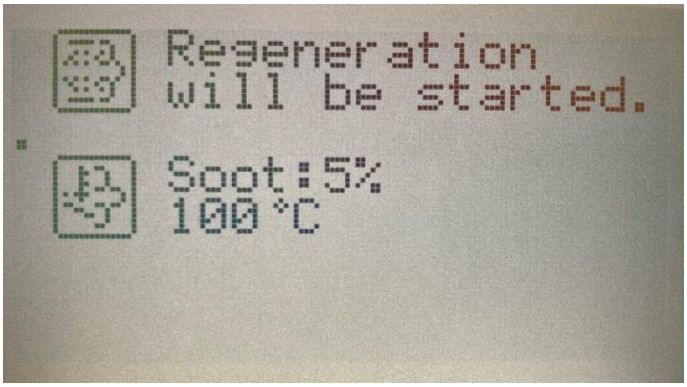
If the particle filter of the engine needs a stationary regeneration, the following message appears on the display and the red LED lights up.

The current soot load of the particle filter is displayed (Soot). The current exhaust gas temperature is also displayed. If the exhaust gas temperature is high, the exhaust gas temperature symbol flashes.

- ***Select cross:*** *The machine can be operated normally. The request for regeneration will be displayed again as an error message after approx. 2 minutes if the request exists.*

- ***Tick selection:*** *Regeneration is initiated. During regeneration the start of the infeed or return stroke is suppressed. Before the regeneration is started, the HCflex performs a short return stroke (0.5 sec) to ensure that the chopping disc / chopping drum can run freely.*

The following message is displayed:

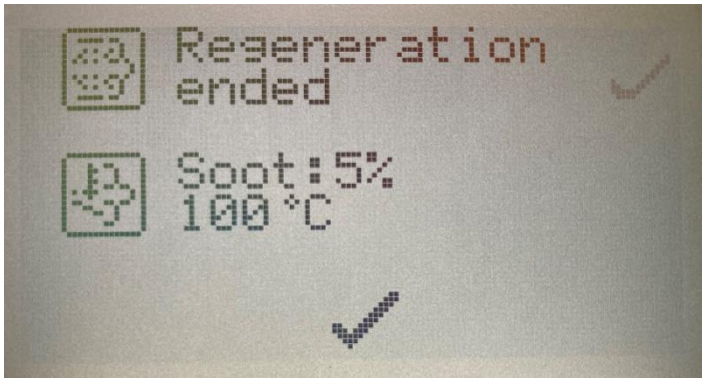


A Regeneration Force Switch is sent on the CAN bus so that the engine starts the regeneration.

If no active stationary regeneration is reported back by the engine within a certain period of time (timeout), the following message is displayed:

If, on the other hand, the engine reports back that a stationary regeneration has been started (is active), the infeed is stopped, the red LED lights up and the following message is displayed:

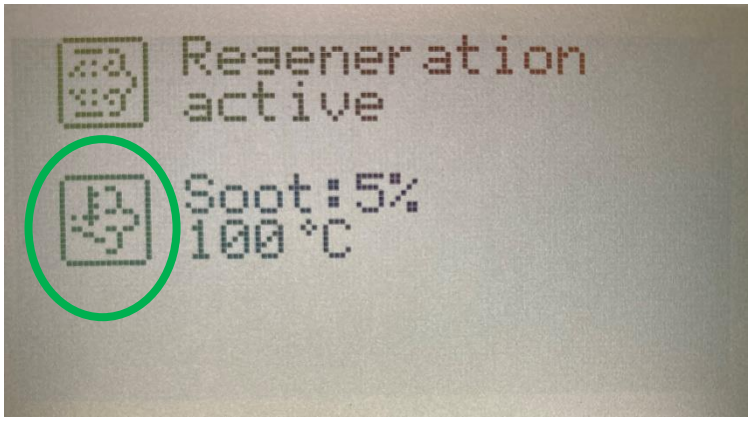
The operator is not able to operate the machine as long as regeneration is active. As soon as the status changes and it is reported that the regeneration was successful, operation is possible



After successful regeneration, the intake can start again.

Exhaust gas temperature too high

If a regeneration is active, high exhaust gas temperature may occur. The red LED then lights up and the exhaust gas temperature symbol starts flashing (see green marking in the photo below).

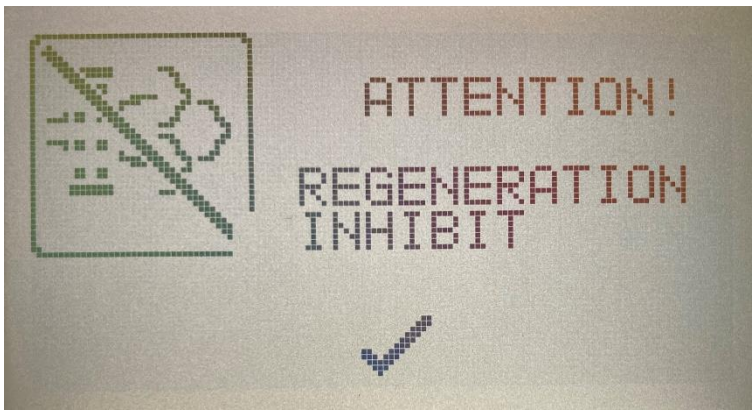


If a high exhaust gas temperature occurs when no regeneration is active, the following is displayed:

If the message is confirmed via the "F2" (tick) function key, the window is closed. If the status does not change within 30 seconds ("reminder" interval), the message is displayed again until the status changes and it is reported that the temperature has dropped.

Inhibit regeneration

When regeneration is inhibited, the following message is displayed.



The setting to inhibit regeneration is set back to OFF each time the HCflex is restarted to remind the user to regenerate.

Additional messages

The following symbols are displayed on additional pages of the HCflex.

1		SPN1761	Urea level	%
2		SPN3720	DPF ash load	%
3		SPN3719	DPF soot load	%
4		SPN173	Exhaust gas temperature	°C
5		SPN3721	Time passed since last regeneration	H
6		SPN4766	Catalytic converter output mass flow temperature	°C
7		SPN3251	DPF differential pressure	bar
8		SPN3695 SPN3702 SPN3703	Status inhibit	ON/OFF

4. Programming

After switching on the HCflex, the programming levels can be brought up from any “working mode” screen.

4.1 Password entry

Simultaneously press the two arrow keys ↑ and ↓ for about 3 sec to bring up the password prompt box.

The HCflex has four programming levels, which are accessed by different passwords.

1. Master (1000)
2. Factory settings (1272)
3. Dealer (2200)
4. User (3003)

If an incorrect password is entered, “Incorrect password” appears at the display and the “working mode” menu is shown.

4.2 Parameterisation for “Master” and “Dealer” menus

After the password has been correctly entered, the main menu items appear on the display.
A menu item can be selected using the arrow keys ↑ ↓.
The “F1” key functions as an “Enter” key and can be used to confirm a selection.
The “F3” key functions as an “Esc” key and can be used to cancel entries.

Pressing the “ESC” key (F3) always results in the previous sub-menu being brought up – one level back.

- General
- Inputs/Outputs
- Wood type
- Service
- End

Enter ESC

4.2.1 “General” menu

Use the arrow keys and the F1 (Enter) key to select “General”.

- Time
- Date
- Engine
- Language
- Password

Enter ESC

The master password can be used to change all passwords.
The “Password” menu is displayed only after entering the master password.

4.2.1.1 Time

Here the system time can be set; this is required for the error logging.
In the “Time” menu, press the “F1” (“Enter”) key and use the ↑ ↓ keys to set the time, digit by digit. Press the “Enter” key to move to the next digit position or the “ESC” key to exit the menu.

4.2.1.2 Date

Here the system date can be set; this is required for the error logging.
In the “Date” menu, press the “Enter” key and use the ↑ ↓ keys to set the date, digit by digit. Press the “Enter” key to move to the next digit position or the “ESC” key to exit the menu.

4.2.1.3 Engine:

Menu for machines with mechanically regulated engines and PTO-shaft operation:

- Engine choice
- Engine reset
- Default Setting

Enter ESC

For CAN bus version only:

- Units
- Engine choice
- Engine reset
- Default Setting

Enter ESC

- **Units (for CAN bus version only)**

  It is possible to change the units for the temperature and pressure parameters.
  Temperature: The temperature can be displayed in °C or °F.
  Pressure: The pressure can be displayed in bar or psi.

- **Engine choice**

  The HCflex automatically loads all parameter values stored under the engine profile. Any of these parameter values can then be manually altered via the various menus.

Up to 21 pre-defined engine profiles can be called up via this menu item.

The programming of different engine profiles (customer-specific adaptation) can only be carried out by ehb.

- **Engine reset**

If “Engine reset” is selected, the original values are applied, some of which may have been altered, e.g. under other menu items.

Any parameters for the current engine, where the values were subsequently changed manually, can be reset here according to the stored engine profiles (see “Engine choice”). The current engine profile is displayed in brackets.

- **Loading of default settings**

All parameters and passwords are reset to the factory settings.
With the selection of “Default setting”, the entire device settings are reset to the original values.

4.2.1.4 Language

German, English, French or Spain can be chosen as the system language.

- German
- Englisch
- French
- Spain

Enter ESC

4.2.1.5 Password

- Master
- Service
- Dealer
- User

Enter ESC

It is possible to change passwords after selecting the parameter for which changes are to be made.

Master Passwort

↑
1000
↓

Enter ESC

Use the ↑ ↓ keys to select the first digit and then press “Enter” (“F1” key) to move to the next digit position; continue in this manner until all digits have been set and the higher-level menu appears. If required, enter a new password (4 digits) and confirm with “Enter”; “Saved...” should briefly appear at the display.

The “Password” menu for changing passwords is accessible only after entering the master password. The “Password” menu cannot be reached by entering the dealer password and is correspondingly not shown!

In case passwords are doubly assigned, one menu is disabled. If the same password is assigned, the descending order of priority is “Master”, “Dealer”, “User” at the display.

4.2.2 “Inputs/Outputs” menu

Use the arrow keys and the F1 (Enter) key at the main selection screen to select the “Inputs/Outputs” menu.

Menu for machines with mechanically regulated engines and PTO-shaft operation:

- Inputs
- Outputs

Enter ESC

For CAN bus version only:

- Inputs
- Outputs
- Engine choice

Enter ESC

4.2.2.1 Inputs

Menu for machines with mechanically regulated engines and PTO-shaft operation:

- Engine cover switch
- Start button (NO)
- Stop button (NC)
- Revers button (NO)
- RPM Engine
- RPM Rotor

Enter ESC

For CAN bus version only:

- Engine cover switch
- Start button (NO)
- Stop button (NC)
- Revers button (NO)
- RPM Rotor

Enter ESC

- **Engine-cover switch**

- Engine cover switch(-)
- Delay (0,2)

Enter ESC

Engine-cover switch:

Choose between NC, NO and NONE.

"NC" – normally closed.
In its non-actuated state, the button is "closed" (break contact).
"NO" – normally open.
In its non-actuated state, the button is "open" (make contact).

"NONE" – the monitoring function of the engine-cover-switch input is inactive

Delay:

A delay duration in seconds can be set for the engine-cover-switch input. This specifies the response duration following button actuation beyond which an alarm and thus a feed stop is triggered, e.g. if the engine-cover switch bounces.

Select “Cut-out delay”, press “Enter” (“F1” key) and then use the ↑ ↓ keys to set each digit, using the “Enter” key to move to the next digit position each time, until the last digit is set and “Enter” is pressed, whereupon “Saved” appears on the display.

If the engine-cover switch is actuated, the engine stop output is activated, the system stops feeding and the red LED lights up. The unit now displays a message with these instructions:

1. Close engine cover (i.e. actuate engine-cover switch)
2. Press “F1” (press the “F1” key)
3. Press external “Start” (press the external start button). If no start button is active (i.e. all start buttons have NONE status), this step is omitted and feeding restarts after the “F1” key is pressed.

With regard to the deactivation of the driving engine and stopping of the intake, ehb electronics gmbh recommends a direct wiring of the safety switch. A parallel wiring to the engine-cover-switch input of the HCflex enables the customer to notice by visual means whether there is an active safety switch, and avoids the system being restarted without confirmation being given accordingly.

Deactivating the machine only via the engine-cover-switch input and the alarm output of the HCflex is insufficient for any level of safety. The corresponding inputs and outputs are not designed for safety-related switching operations, but merely as signal inputs and signal outputs!

- **Start button**

Choose between NC, NO and NONE.

“NC” – normally closed.
In its non-actuated state, the button is “closed” (break contact).
“NO” – normally open.
In its non-actuated state, the button is “open” (make contact).

“NONE” – the monitoring function of the start-button input is inactive.

After the machine has been started, or after the stop button has been pressed, the start button must be pressed in order to activate the intake.

- **Stop button**

  Choose between NC, NO and NONE.

  “NC” – normally closed.
  In its non-actuated state, the button is “closed” (break contact).
  “NO” – normally open.
  In its non-actuated state, the button is “open” (make contact).

  “NONE” – the monitoring function of the stop-button input is inactive.

  The intake can be switched off at any time by pressing the stop button. Enabling of the intake is prevented by the HCflex until the start button has been pressed.

- **Reversing button**

  Choose between NC, NO and NONE.

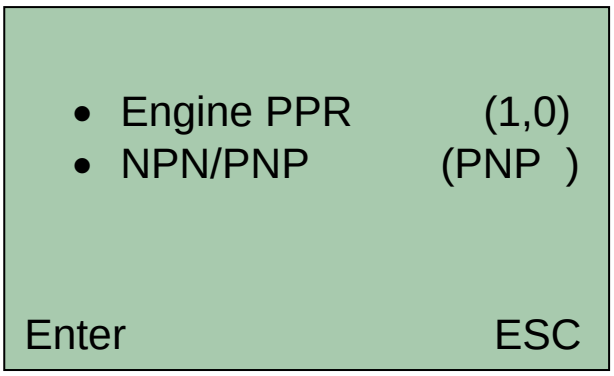
  “NC” – normally closed.
  In its non-actuated state, the button is “closed” (break contact).
  “NO” – normally open.
  In its non-actuated state, the button is “open” (make contact).

  “NONE” – the monitoring function of the reversing-button input is inactive

  The reversing button can be pressed at any time. This button is used to move the intake in the reverse direction. Material can thus be removed from the intake at any time. After releasing the button, the machine is returned to the state it was in prior to the button being pressed. In other words, if the intake had been stopped, it returns to a stopped state, while if it had been running, it returns to a running state.

- **Engine rpm**

(For version where machines have mechanically regulated engine and PTO shaft only)



Engine ppr:
The speed of an engine corresponds to the number of crankshaft rotations per minute.
In diesel engines, the speed, when present, can be taken from the "W" terminal of the generator. There is a potential for inaccuracy due to the V-belt slip.
An initiator (pick up), on the other hand, returns absolute values (comply with the manufacturer's installation instructions).

In both cases, frequency (impulses per second) is used. The frequency of these impulses is proportional to the engine speed.

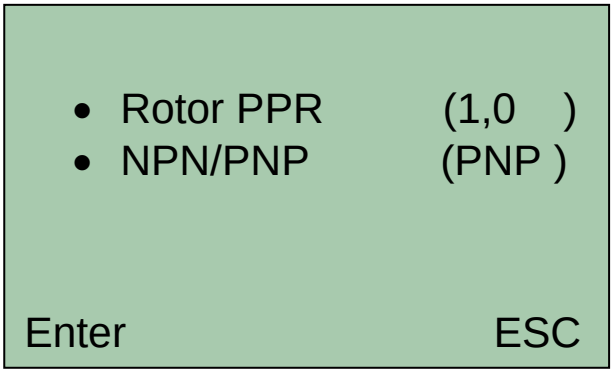
Use the combination ↑ ↓ “Engine rpm” > “Enter” to make the selection, and then use the ↑ ↓ keys to set each digit of the ppr (pulses per revolution) value, using the “Enter” key to move to the next digit position each time, until the last digit is set and “Enter” is pressed, whereupon “Saved” appears on the display.

NPN/PNP:

The frequency input can be configured to the type of input signal by correspondingly selecting “NPN” or “PNP”.

Information concerning speed measurement can be found in the appendix of this manual.

- **Rotor rpm**



Rotor ppr:

The measurement of the cutting disc/drum speed is generally performed via an inductive transmitter. The feed rollers are controlled via the speed of the cutting disc / drum.

NPN/PNP:

The frequency input can be configured to the type of input signal by correspondingly selecting “NPN” or “PNP”.

Information concerning speed measurement can be found in the appendix of this manual.

4.2.2.2 Outputs

- Valve Test
- Forward valve (ETR)
- Backward valve (ETR)
- Engine stop (ETR)
- Backward time (0,05)

Enter ESC

- **Valve test**

After the machine has been started, the “Reverse intake movement” and the “Forward intake movement” functions are activated by the HCflex. The operator receives visual information indicating that the valves for the intake are activating properly and material in the intake is being ejected.

- RMP Valve test (100)
- Forward time (1,00)
- Backward time (1,00)

Enter ESC

Valve test rpm:

Indicates the speed of the cutting disc which has to be reached in order for the valve test function to be activated. Once the parameterised speed has been reached, the HCflex activates the “Reverse intake movement” function and then the “Forward intake movement” function for the respective parameterised durations.

Forward time:

“Forward time” refers to the length of time over which the intake moves in the forward (feeding) direction.

Backward time:

"Backward time" refers to the length of time over which the intake moves in the reverse direction.

Once the valve test routine has finished running, the test is not repeated as long as the HCflex remains on, even if the rotor speed drops below or exceeds the initialisation speed once more.

ehb recommends programming in a longer reversing duration than feed duration, to ensure that when the machine is started, material at the intake is safely removed during execution of the valve test function.

To deactivate the valve test function, the initialisation speed is set to "0 rpm" or a setting of "0 sec" is programmed in for the reversing and feed durations.

- **"Forward" valve**

Use the ↓↑ keys to choose between **ETR**, **ETS** and **NONE**.

"ETR" – energise to run

"ETS" – energise to stop

"NONE" – output is inactive

An ETR (**E**nergise **T**o **R**un) solenoid valve is a solenoid valve that enables flow while voltage is being applied.

An ETS (**E**nergise **T**o **S**top) solenoid valve is a solenoid valve that blocks flow while voltage is being applied.

- **"Backward" valve**

Use the ↓↑ keys to choose between **ETR**, **ETS** and **NONE**.

"ETR" – energise to run

"ETS" – energise to stop

"NONE" – output is inactive

An ETR (**E**nergise **T**o **R**un) solenoid valve is a solenoid valve that enables flow while voltage is being applied.

An ETS (**E**nergise **T**o **S**top) solenoid valve is a solenoid valve that blocks flow while voltage is being applied.

- **Engine stop**

Use the ↓↑ keys to choose between **ETR** and **ETS**.

"ETR" – energise to run

"ETS" – energise to stop

The output of the HCflex can be set for continuous activation (ETR state), if the HCflex is on and there are no active faults.
Alternatively, the output can be activated for 20 sec (ETS state), if the HCflex has detected a fault. With the "engine

stop” function, the driving engine (term.15, supply) of the wood chipper can be deactivated in case of a fault.

The HCflex for machines with a mechanically regulated engine/ PTO shaft activates the “engine stop” input, if an engine-cover-switch fault is active.
The HCflex version with CAN bus also activates the output if a DM1 error message from the engine controller with a “red stop” lamp status is detected by the HCflex.

- **Backward time (reversing duration)**

If there is a drop below the minimum speed for the selected wood type, the “reversing” valve is activated for the set time period, so that the intake runs in reverse briefly and the drawn-in material is freed from the cutting disc or the rotor.

The time period for reversing should be set so that the intake roller turns back by a quarter of a revolution. It can thus be ensure that no drawn-in material slows down the cutting disc while this is being accelerated up to working speed, at the same time, the material does not fall off the intake.

4.2.2.3 Engine selection from “Master” menu (for CAN Bus version only)

The parameter settings for the engine selection have a bearing on the communication between the HCflex and the engine controller. As well as the display of information concerning the operating parameters in the working mode, the entering of values for the engine speed adjustment via the CAN bus (SAE J1939) protocol and the evaluation of error messages must be performed.

The engine controller must be parameterised with respect to engine speed adjustment via a CAN bus TSC1 signal, so that the HCflex functions can be optimally used.

- CAN Address
- Idle Speed
- Minimum RPM
- Maximum RPM
- Warming up time
- Temperature

Enter ESC

- **CAN address**

Engine selection > Enter > _ _ _ CAN address

Specify the physical address for communication via the CAN interface

- **Idle speed**

Target specification for idle speed of engine The HCflex transmits the set speed data as idle speed data for the engine.

- **Minimum rpm**

“Minimum prm” here refers to the minimum permissible speed for the activation of the engine via the HCflex.

- **Maximum rpm**

“Maximum prm” here refers to the maximum permissible speed for the activation of the engine via the HCflex.

- **Temperature**

With the specified temperature value, the speed ramp-up for the engine following the start of the system can be prevented until the temperature of the coolant for the engine (SPN110) exceeds this programmed-in value.
The engine continues to run at the set idle speed.

"Temperature too low" is displayed on "page 1" for the working mode, as long as the coolant temperature is below the set temperature value and the idle speed is specified for the engine.

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- CAN-Address
- Idle Speed
- Minimum RPM
- Maximum RPM
- Warming up time
- Temperature
- DPF

Enter ESC

- **DPF**

The DPF control of supported motor types can be activated via the motor type.

Regeneration can be prevented via the inhibit status.

About regenerate. Start a regeneration can be requested manually. The number of requests is displayed.

4.2.2.4 Engine selection from "Dealer" menu (for CAN Bus version only)

Settings for engine-speed adjustment can be made via the "Engine choice" item of the "Dealer" menu.

The engine controller must be parameterised with respect to speed adjustment via a CAN bus TSC1 signal, so that the HCflex functions can be optimally used.

- Minimum RPM
- Ramp-up time
- Manual RPM

Enter ESC

- **Minimum rpm** — “Minimum prm” here refers to the minimum permissible speed for the activation of the engine via the HCflex.
- **Ramp-up time** — Following an engine start, the HCflex can prevent a ramp-up to the working speed for the engine directly from a cold state.
  The ramp-up duration corresponds to the length of time over which the HCflex can ramp up the speed of the engine to the working speed, after the engine is first started. A ramp is calculated based on the time specification, and the engine speed is adjusted according to this ramp.
  After the initial ramp-up, the ramp function is deactivated and the engine adjusts the speed as quickly as possible.
- **Manual rpm** — The speed adjustment feature allows the engine speed to be adjusted manually. This menu allows a specific speed to be set, e.g. for an emission test.

```
        RPM adj. inactiv
target  RPM :1000 rpm


Enter        On/Off        ESC
```

The “On/Off” function can be used to activate and deactivate the manual engine speed-adjustment feature. The current status (“Active or “Inactive”) is indicated on the screen.

For the “Active” status, the speed specification (via a TSC1 signal) for the engine can be increased or decreased in increments between the minimum and maximum speeds using the arrow keys, with 50possible settings available. The minimum speed can be set via the “Master” and “Dealer” menus, but the maximum speed only via the “Master” menu.

4.2.3 “Wood type” menu

Stored parameter settings can be applied to the three types of wood for configuration purposes via the “Wood type” menu.

```
   -  Speed rotation –

   • Wood type  1
   • Wood type  2
   • Wood type  3
Enter                ESC
```

Menu for machines with mechanically regulated engines and PTO-shaft operation:

- Wood type 1 –
- Minimum RPM (1510)
- Return RPM (1550)
- Normal RPM (1600)
- Maximum RPM (1850)

Enter ESC

For CAN bus version only:

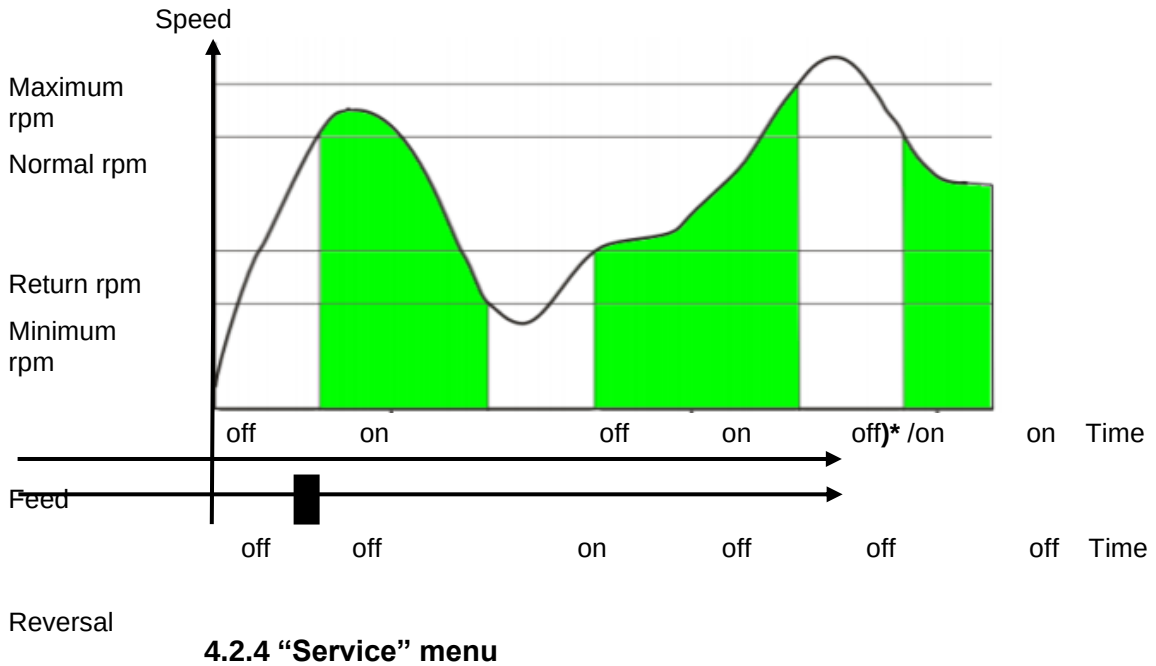
- Wood type 1 –
- Minimum RPM (1510)
- Return RPM (1550)
- Normal RPM (1600)
- Maximum RPM (1850)
- Engine RPM (1800)

Enter ESC

• **Minimum rpm**	Here the lower speed limit is set. If the chipper speed falls below the value set, the feeder is de-activated and the reversing mechanism is briefly activated according to the set reversing duration.
• **Return rpm**	Here the chipper return speed is set. If the value set is exceeded, the feeder is re-activated, in the event that it was previously deactivated due to its speed falling below the set minimum speed.
• **Normal rpm**	Here the chipper normal speed is set. If the value set is exceeded, the automatic system of the chipper is automatically activated.
• **Maximum rpm**	Here the chipper upper speed limit is set If the value set is exceeded, the feeder is deactivated.
• **Engine rpm (for CAN bus version only)**	The programmed-in speed corresponds to the TSC 1 target specification for the respective wood type. When selecting a wood type, the HCflex transmits the respective speed data as target speed data to the engine via the CAN bus.

Illogical entries are detected and not accepted.
The next largest acceptable speed is always displayed.
Example: The minimum speed is 700 rpm – the return speed must be at least 700 rpm.

Graphical information on feed and reverse movements (both programmed to have ETR control)



4.2.4 “Service” menu

The settings for the service intervals can be made and the operating duration set or deleted via the “Service” menu. The error log can be viewed and the self-test functions for the HCflex activated.

- Status
- Daily hour counter
- Error log
- Auto-test

4.2.4.1 Status

- Service interval
- Service status
- Service record
- Service validation

Enter ESC

- **Service interval**

```
-Service Interval-
• 1 - Small      (100 )
• 2 - Medium     (600 )
• 3 - Large      (500 )

Enter                ESC
```

The service intervals can be specified in hours using the “Short”, “Medium” and “Long” menu items. Whenever any of these intervals elapses, the system displays a corresponding message.

Small (short service interval):

Once a short service interval has elapsed, a spanner symbol appears above the smiley symbol and the stopped feeder can be re-activated via the start button.

Medium (medium service interval):

Once a medium service interval has elapsed, a spanner symbol appears above the smiley symbol and the stopped feeder can be re-activated via the start button.

Long (long service interval):

Once a long service interval has elapsed, a spanner symbol appears on the display. The machine must be serviced. The last long service interval is then repeated

- **Service status**

The service status information indicates which service must be carried out next. There is also an indication of when a missed service was due.

- **Service record**

```
Service entries:
Service No.: 1
Service:     Small
14:30:00 Day: 04.07.15
at           TH:205h41m
Enter ↓          ↑ ESC
```

Information on the services carried out is stored under the service record. The two arrow keys can be used to scroll through the list.

- **Service validation**

Validate maintenance

Yes No

A serviced that has been performed can be acknowledged at the HCflex via the “Service acknowledgment” menu item, pressing “Yes” for this purpose.
Information on the performed service is stored in the service record after it has been acknowledged.

Press “No” to exit the screen without acknowledging the service.

4.2.4.2. Operating hours counters

- Daily hour counter
- Total hour counter

Enter ESC

This menu screen is only displayed at the HCflex for mechanically regulated engines, if the “Master” menu has been opened. Under the “Dealer” menu and for the CAN bus version this screen is not displayed and the “Daily operation duration” prompt box is brought up directly.

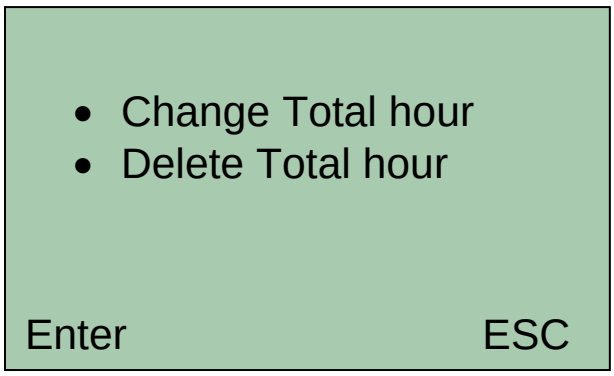
- **Daily operating duration**

Delete daily hour counter
actual: 5:30

Yes No

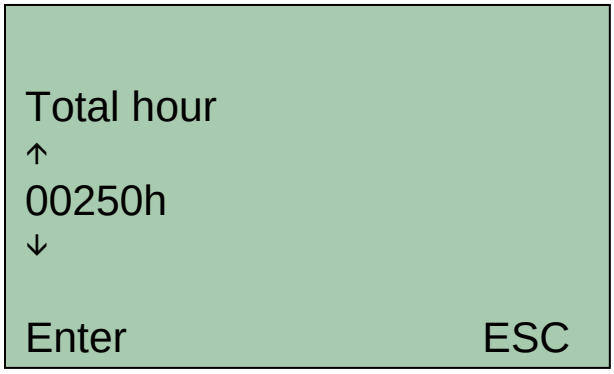
The daily hours counter for operation can be reset.

- **Total operating duration**



The total hours counter for operation can be modified or reset.

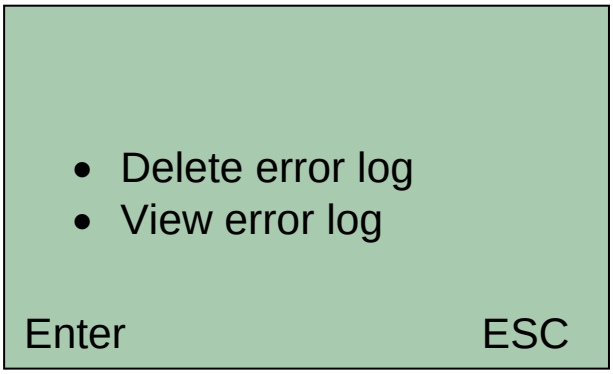
Change total hours (modify total hours counter for operation):



Use the ↑ ↓ keys to select the first digit and then press “Enter” (“F1” key) to move to the next digit position; continue in this manner until all digits have been set and “Saved” appears on the display.

The total operating hours counter can be modified only after entering the master password. The “Change total hours” menu cannot be reached by entering the dealer password and is correspondingly not shown! The CAN bus version of the HCflex receives the operating duration data from the engine controller and only displays the respective information. Hence, there is no “Change total hours counter” menu for the CAN bus version of the HCflex.

4.2.4.3 Error log



- **Delete error log**

```
Delete Error log

Yes                 No
```

The error log cannot be deleted.

This menu is displayed only after the master password has been entered.
If the dealer password is entered, the “Error log” menu item is not displayed.

- **View error log**

```
Error log:
Error No.: 1
Slip error
14:30:00  Day: 04.07.15
at              TH:205h41m
Enter ↓           ↑ ESC
```

The last 100 faults are indicated in the error log. The two arrow keys can be used to scroll through the list.

4.2.4.4 Self-test

- Start auto-test
- Error log
- Load Parameters
- Test with Testbox

Enter ESC

- **Start self-test**

1. Start Test
Test „F1“:
Test „F2“:
Test „F3“:
Test Arrow up
Test Arrow down

Button test

All buttons can be checked for correct functioning by being pressed.

If within a period of 10s nothing is entered, a fault message is issued and the test is continued with the next button. Fault messages are recorded in the error log.

2. LED test
Green LED:
Red LED:

Confirm Error

LED test

The red and the green LEDs must light up in sequence and, if this occurs, confirmation must be given.
Fault messages are recorded in the error log.


```
        2. LED- Test
Green LED:
Red LED:
        3. Clock test
15:30:32 Please wait
```

Clock test

The internal real-time clock is checked for proper functioning.
No action from the user is necessary. Fault messages are recorded in the error log. A flashing “Please wait” message indicates that the test is in progress. The test can last for up to one minute.

Flash memory test

The system tests the internal flash memory by randomly saving, retrieving and comparing data at various memory locations. No action from the user is necessary. Fault messages are recorded in the error log.

Upon conclusion of the self-test, the HCflex automatically returns to the “Test” menu.

Faults that occur during testing are indicated on the display accordingly.

- **View error log**

Faults which occur during self-testing are recorded in the error log. The result of the most-recent self-test is always indicated.

This memory is volatile, i.e. will be deleted if the supply voltage is lost.

- **Load parameters**

This function allows test parameter values that are predefined for a function test to be loaded and then used to execute the test.
All default settings are loaded.

To use the function, apply the combination “Load parameters” > “Enter”, followed by “Yes” or “No”.

This menu is only available with the master password.

- **Test with test box**

Stop button			x
Start button			x
Revers button			x
Engine cover switch			x
In1_F			x
In2_F			x
Out3_S	ok	Out2_S	x
Enter			ESC

By connecting the internal test box from ehb electronics, all HCflex functions, including all input and output functions, can be tested in full automatically.

The test box (ehb 5076) can be obtained as an accessory from ehb.

4.2.5 End

This is used to exit the menu and return to the “working mode” menu.

4.3 “Factory settings” menu

After entering the correct password for the “Factory settings” menu, the main items for this menu are displayed.

A menu item can be selected using the arrow keys ↑ ↓.
The “F1” key functions as an “Enter” key and can be used to confirm a selection.
The “F3” key functions as an “Esc” key and can be used to cancel entries.

The factory settings for the HCflex can be re-applied via the “Factory settings” menu. The factory settings are only ever applied to the currently selected machine.

- End
- Load factory settings

Enter ESC

Before the factory settings for the HCflex can be re-applied, a security prompt with “Yes” or “No” options has to be answered. If confirmation is given or the menu is exited via “End”, the “working mode” menu is brought up.

4.4 “User” menu

After entering the correct password for the “User” menu, the main items for this menu are displayed.
A menu item can be selected using the arrow keys ↑ ↓.
The “F1” key functions as an “Enter” key and can be used to confirm a selection.
The “F3” key functions as an “Esc” key and can be used to cancel entries.

- Language
- Service status
- Daily hour counter
- End

Enter ESC

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- DPF
- Language
- Service status
- Daily hour counter
- End

Enter ESC

4.4.1 DPF

A DPF regeneration can be prevented or requested manually.

4.4.2 Language

German, English, French or Spanish can be chosen as the system language.

- German
- English
- French
- Spain

Enter ESC

4.4.3 Service status

The service status information indicates which service must be carried out next. There is also an indication of when a missed service was due.

Next Service (1) in 100h

Enter ESC

4.4.4 Daily operating duration

The daily hours counter for operation can be reset.

Delete daily hour counter
Actual: 5:30

Yes No

4.4.5 End

This is used to exit the menu and return to the “working mode” menu.

5. Appendix:

5.1 Speed measurement based on the pulses of the “W” terminal.

In order that the frequency (“W” terminal, generator) can be determined, two factors must be known. Firstly, the generator/crankshaft transmission ratio, which can be calculated as follows:

$$\text{Transmission ratio (i)} = \frac{\text{belt-pulley diameter at crankshaft}}{\text{belt-pulley diameter at generator}}$$

Secondly, the number of pole pairs of the generator. At the front end of the generator, alternating claw-shaped north and south pole fingers are visible. The number of pole pairs is determined by halving the number of these poles (see below).

There are
6 pole pairs for G1, K1 and N1 Bosch generators,
8 pole pairs for T1 Bosch generators.

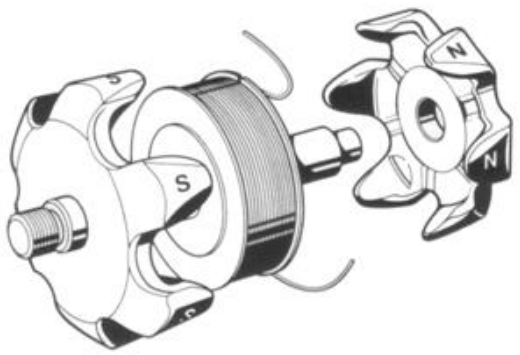


Figure 2 Schematic diagram of a generator

Once the transmission ratio and the number of pole pairs are known, the number of pulses per rotation (PPR) can be calculated using the following formula:

PPR= (transmission ratio) x (number of pole pairs)

5.2 Speed measurement via an initiator (pick-up)

The initiator must be perpendicular to a rotating metallic component which is directly connected to the crankshaft of the engine. This can be a belt pulley or the flywheel of the engine, for example. The system captures bores or protrusions such as screw heads. The distance must be the same and within the detection range of the initiator. When installing the initiator, ensure that multiple pulses (ideally 4 - 16 pulses) are emitted for each engine revolution per crankshaft revolution. The number of pulses should not be too low as this would result in a low resolution.

This method is suitable for applications requiring an accurate measurement of the speed or if the generator does not have a “W” terminal.

PPR input and **“NPN”/“PNP”** selection.

PPR is indicated here. This factor is required for calculating the speed and indicates the number of pulses per rotation (PPR) emitted by the engine. PPR is a divisor by which the calculated speed is divided and must be greater than zero.

It is also possible here to switch between a negatively and a positively switching counter contact (NPN and PNP, respectively) for each pulse generator.

6. 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
Inputs	CAN bus interface (ehb5401-1 only) Rotor speed Engine-cover switch Start button Stop button Reversing button Driving engine speed (ehb5401 only)
Outputs	CAN bus interface (ehb5401-1 only) Reversal 10 A (maximal 1s) / 8 A Feed 10 A (maximal 1s) / 8 A Alarm 5 A (maximal 1s) / 4 A
RAM memory	64 kByte
Flash memory	128 kByte
CAN bus interface	250 kBit/s, CAN 2.0, SAE J1939
Operating hours counter	Integrated
Daily operating hours counter	Integrated

Visualisation

Display type	Dot-matrix LCD display (B/W), transflective
Resolution	128 x 64 pixels
Visible screen diagonal	3“(7.62cm)
Brightness	>30 cd/m²
Contrast ratio (CR)	5:1
Background lighting	LED, white

Mechanical data

Housing dimensions (W x H x D)	116 x 116 x 14mm
Installation depth	47 mm / approx. 70 mm with cable
Installation cut-out diameter	Ø 52 mm
Housing material	Plastic: PA 6 30 GB, black, UV-stabilised
Weight	190g
Mounting means	2 clamping elements, bolted from the rear
Degree of protection:	IP67 (with plug inserted)
Connection components	Deutsch connector (HCflex) :type DT04-12PA Deutsch socket: type DT06-12SA

Test standards

Humidity	DIN EN 60068-2-3 48h in acc. with SAEJ 1378
Vibration	DIN EN 60068-2-6 6h , 10 to 80Hz, 20g in acc.with SAEJ 1378
Shock	DIN EN 60068-2-27 total 44 to 55g, 9 to 13ms in acc.with SAEJ 1378
CE marking	According to Directive 2014/30/EU

Product

HCflex	ehb5401
HCflex (CANbus)	ehb5420

Accessories

Connection cable, 12-pole, 3m	ehb5362
HCflex text device	ehb5076

Reference to test standards

The product has been tested according to the 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 electromagnetic fields according to DIN EN 61000-4-3, DIN EN 61000-4-20, ISO 11451-1

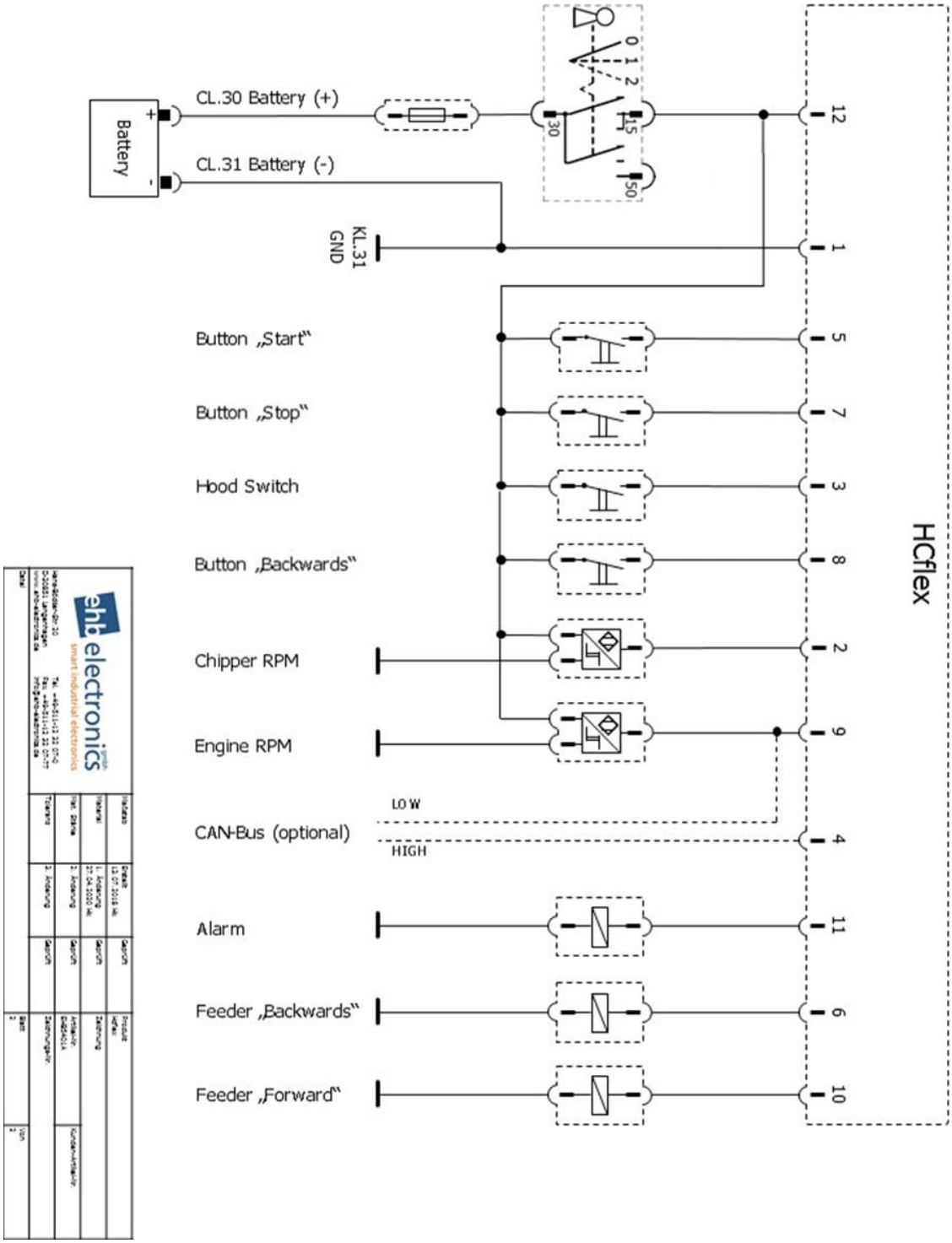
Robustness against quick transient disturbance (burst) according to DIN EN 61000-4-4

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

7. Connection diagram



8. Dimension drawing for installation

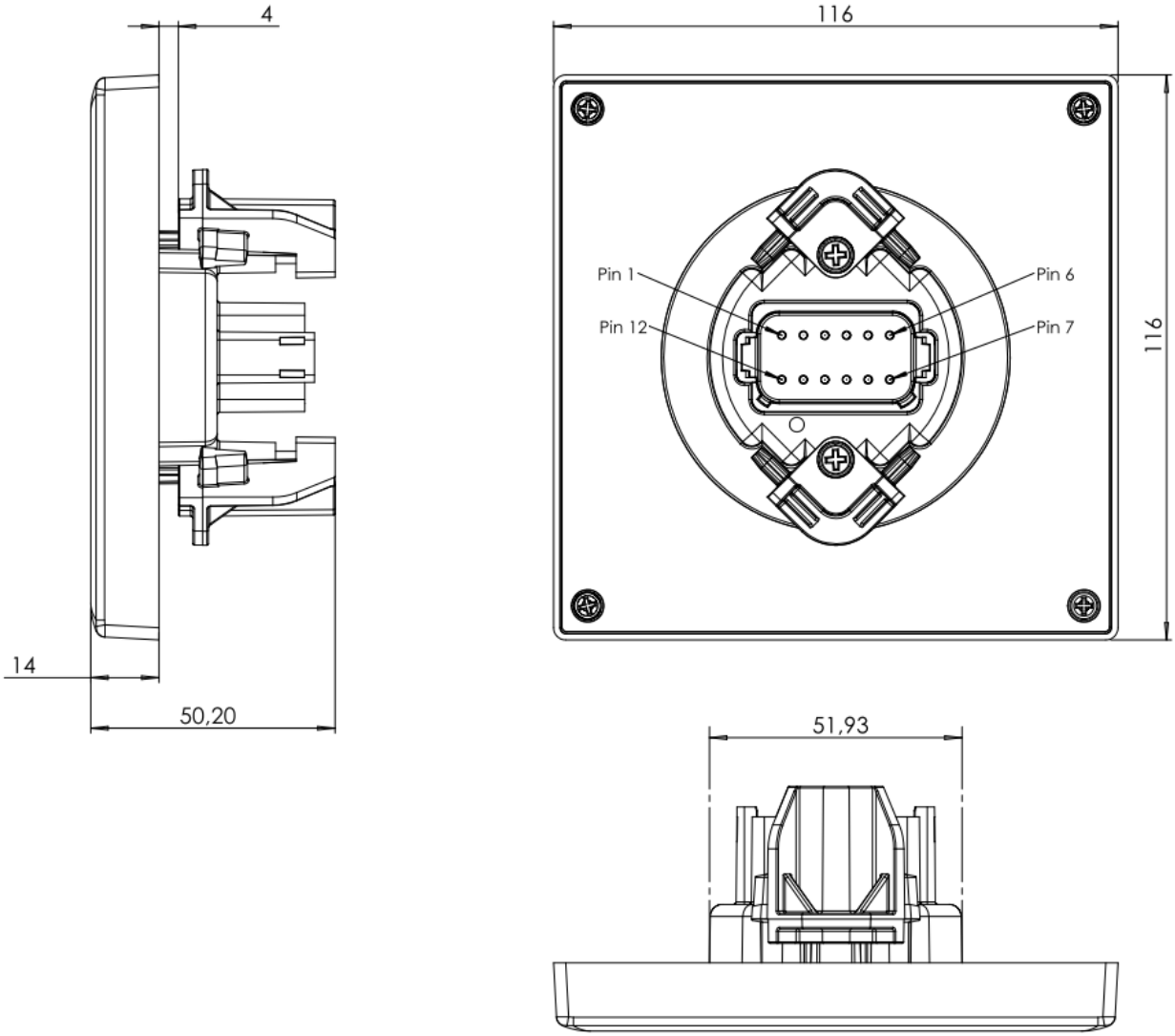


Figure 3 HCflex dimensions (mm)

9. Document information, history

Project:	HCflex
Type of document:	Technical document
Version:	1.1
Prepared on:	9/5/2012
Prepared by:	ehb electronics GmbH, Langenhagen

Revisions:

Version:	Preparation/Revisions	Prep./Rev. date	Preparer/ Reviser(s)
1.1	First version of the documentation	9/5/2012	Hal
1.2	Layout	29/8/2012	hag
1.3 – 1.6	Extensions	4/9/2012	Hal
1.6	Layout	5/9/2012	hag
1.7	Extensions	10/10/2012	hag
1.8	Adaptations	12/12/2012	Hal/hag
1.9	Extensions	25/03/2013	Hal/hag
2.0	Extensions	23/06/2015	Be
2.0	Layout	28/10/2015	hag
3.0	New version of the documentation	10/8/2016	Ap/Be/hag
3.1.	Adaptation of species symbols	11/01/2017	Be/hag
3.2	Adaptation of connection diagram	29.08.2017	Hk/hag
3.3	Correction text page 15,12	26.09.2017	Hk/hag
3.4	Adaptation Important Info. on use, Reference to test standards	04.12.2017	Hk/hag
3.5	Adaptation connection plan	23.07.2018	Hk/hag
3.6	Adaptation techn. data (outputs)	14.01.2019	Hk/hag
3.7	Insert Stage V functions Connection diagram adapted	20.03.2019 28.04.2020	Hk/hag Hk/hag
3.8	New Version: DPF (CAN-Bus-Version from software S05401A)	03.112021	Pop/Kal
3.9	Corrected connection diagram, RPM more precise	20.06.2023	Hk

10. Imprint

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