



Manual

KF □□-CRG-(Ex)1.D

UNIVERSAL TRANSMITTER POWER-SUPPLY UNIT



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We at Pepperl+Fuchs feel obligated to contribute to the future;
this publication is, therefore, printed on paper bleached without the use of chlorine.

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Universal transmitter power-supply unit KF□□-CRG-(Ex)1.D

Symbols used in this document

1 Symbols used in this document



Warning

This symbol indicates a warning about a possible danger. In the case of the warning being ignored, the consequences may range from personal injury through to death or from damage to equipment through to destruction.



Attention

This symbol warns of a possible fault. If the instruction given in this warning is not heeded, the device and any plants or systems connected to it could develop a fault or even fail completely.



Note

This symbol brings important information to your attention.

2 Overview

2.1 Application

Pepperl+Fuchs K-System devices are used for transmission of signals between field devices and process control / control systems. Devices that contain the identification "Ex" in their type code are appropriate for connection of field devices from the explosion danger area. The field circuits in these devices are intrinsically safe and galvanically isolated from non-intrinsically safe circuits. In this way, the devices provide electrical isolation of the region of the plant that is safe from that which is exposed to danger of explosion.

The more cost-efficient devices that do not carry the "Ex" identification can be used for transmission of signals between field devices in the secure region and the process control / control system.



Transmitters are measuring units that provide an output signal consisting of a unit current signal (4 mA ... 20 mA, with 3-wire transmitters also 0 mA ... 20 mA). A transmitter power-supply unit provides a transmitter with power and processes the current signal. The K-System universal transmitter power-supply units KF-□□CRG-



(Ex)1.D

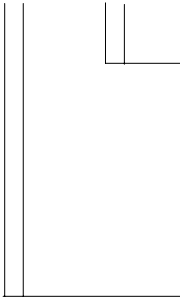
(CRG in short) have an analogue output (0 mA / 4 mA ... 20 mA) and two relay outputs, and can, therefore, be used for a wide range of measurement tasks.

Universal transmitter power-supply unit KF□□-CRG-(Ex)1.D Safety Instructions

2.2 Versions

The following versions of the universal transmitter power-supply unit are available:

KF□□-CRG-□□1.D



Ex = for connection of field devices in areas exposed to danger of explosion

Without identifier letters = for connection of field devices in the secure area

D2 = with a 24 V DC power pack (green shielding on output side); for power supply via power rail with combined fault indication, please see the "DIN-Rail Housing" catalog from Pepperl+Fuchs or the "CD-ROM catalog"

U8 = with an AC/DC power pack providing power supply at 20 V DC ... 90 V DC and 48 V AC ... 253 V AC without selection and without notice of polarity (grey shielding on output side)

2.3 Inputs and Outputs

A Pepperl+Fuchs K-System CRG has

- an **input** for connection of a field device. On the KF□□-CRG-Ex1.D this input is intrinsically safe (blue terminal block). On the KF□□-CRG-1.D this input is non-intrinsically safe (green terminal block). In both cases you can attach a 2-wire transmitter, a 3-wire transmitter or an active source. A CRG also has
- **three outputs**, i.e.:
 - two relay outputs and
 - one current output and
- a serial RS 232 interface for connection to a PC for programming and diagnosis using PACTware.



3 Safety Instructions



Warning

The universal transmitter power-supply units, KF□□-CRG-(Ex)1.D, should only be operated by trained specialist personnel in accordance with the manual.

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Warning

Protection of operating personnel and the plant is only assured if the devices are operated in accordance with the instructions for intended use. Operating the devices in any other manner than that described in this manual will compromise the safety and functionality of the devices and attached systems.



Warning

Devices should only be fitted, connected and configured outside the hazardous area by personnel with the appropriate electrical specialisation.



Warning

When it is not possible to correct faults, the devices must be taken out of service and action taken to protect against accidental use. Devices should only be repaired directly by the manufacturer, Pepperl+Fuchs. Accessing and modifying the inside of the devices constitutes a danger, and is not authorised. Any actions of this kind will nullify all claim to guarantee.



Note

Responsibility for adhering to local safety regulations and directives is held by the operator.

4 Explosion Protection

For matters concerning primary explosion protection, i.e. measures to prevent or restrict formation of a potentially explosive atmosphere, please refer to DIN EN 1127-1 or the corresponding national regulations.



For matters concerning secondary explosion protection, i.e. measures to prevent ignition by electrical apparatus of a potentially explosive atmosphere, Pepperl+Fuchs are happy to provide their "Ex-Protection Manual" free of charge.

In particular, please refer to DIN EN 60079-10, DIN EN 60079-14, DIN EN 50014 and DIN EN 50020 or the corresponding national regulations. The regulations for the USA, for example, are given in section 9 of the Ex-protection manual.

Pepperl+Fuchs also offers a video and seminar on the topic of "Intrinsic Safety".

Universal transmitter power-supply unit KF□□-CRG-(Ex)1.D Explosion Protection

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5 Mounting and Connection

5.1 Mounting



Attention

The universal transmitter power-supply units KF□□-CRG-(Ex)1.D are constructed according to protection class IP20 and must be protected accordingly against unfavourable ambient conditions (water, small foreign bodies).



The Pepperl+Fuchs K-System devices, including the universal transmitter power supply units KF□□-CRG-(Ex)1.D, can be mounted on a 35 mm DIN rail in accordance with DIN EN 50022. The devices should be clipped on perfectly **vertically**, under no circumstances should they be turned or mounted not straight at the side.

Additional possibilities for mounting, e.g. using the "Power Rail", can be found in the "DIN-Rail Housing" catalog from Pepperl+Fuchs or in the "CD-ROM catalog".

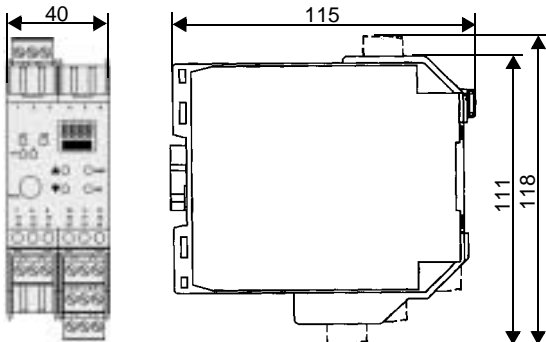


Bild 5.1: KF□□-CRG-(Ex)1.D dimensions (in mm)

5.2 Connection

The removable terminals on the KF line of models simplify connection and switch cabinet construction considerably. In case of service, they enable devices to be swapped in and out whilst the power remains on. The terminals can be screwed, are self opening and provide generous space for connection for conductor cross sections up to 2.5 mm² as well as coded connectors so as to avoid incorrect wiring.



Universal transmitter power-supply unit KF□□-CRG-(Ex)1.D Mounting and Connection

The intrinsically safe field circuit is connected to the **blue** terminals 1 - 3 of the KF□□-CRG-Ex1.D. This can be connected by means of interface cable in accordance with DIN EN 60079-14 to the area exposed to danger of explosion.

The non-intrinsically safe field circuit is connected to the **green** terminals 1 - 3 of the KF□□-CRG-Ex1.D.

In both cases you can connect:

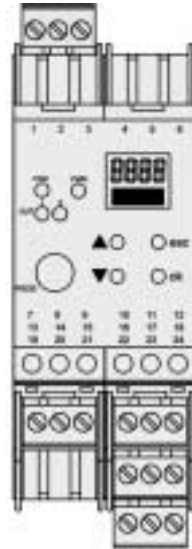
- a 2-wire transmitter
- a 3-wire transmitter
- an active source

Terminals 4- 6, 13 - 15, 19 - 21 do not exist on the CRG.

The **green** terminals provide the following functions:

- Terminals 7-8: Current output (9 free)
- Terminals 10-12: Relay 1
- Terminals 16-18: Relay 2
- Terminals 23-24: Power supply (22 free)

The exact terminal composition can be found in the data sheet.



5.3 Communications with the sensor via HART

To the CRG you can connect sensors that can be configured via the HART communications. For parameterisation you need a hand-held terminal, which must be attached to the sensor leads. It is not possible to transmit the HART signal via the current output of the CRG.



Warning

Use an Ex-hand-held terminal if the sensor leads of the CRG run through the hazardous area.

5.4 Front of the CRG

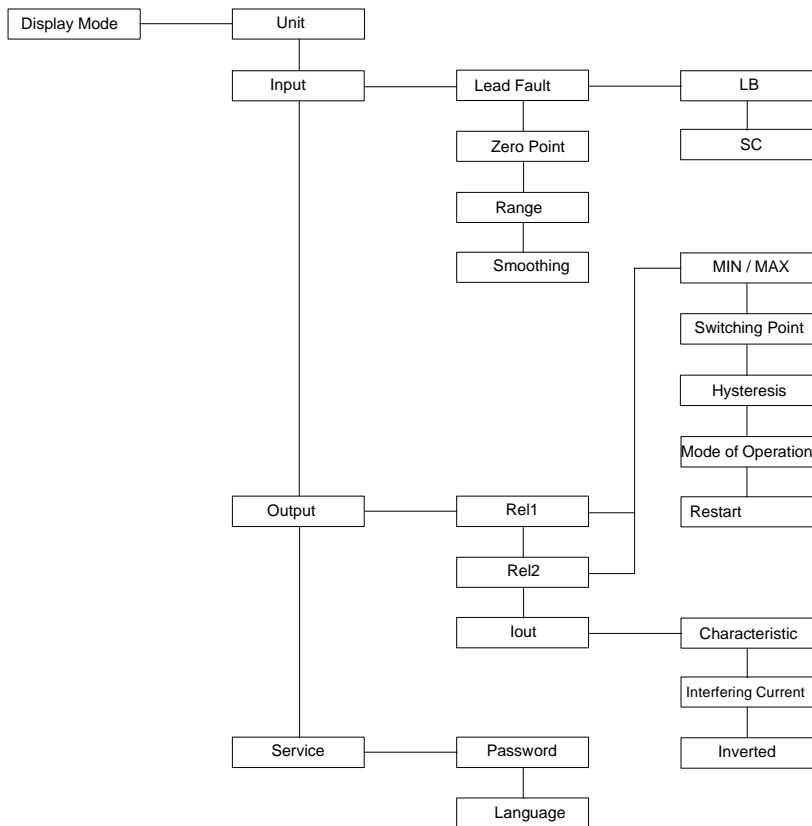
On the front of the CRG you will find (see figure above):

Universal transmitter power-supply unit KF□□-CRG-(Ex)1.D Mounting and Connection

- Red LED, to indicate a fault on the device
- Green PWR LED, to indicate the presence of the supply voltage
- Yellow LED OUT 1, to indicate that relay 1 is active
- Yellow LED OUT 2, to indicate that relay 2 is active
- Serial RS 232 interface for connection to a PC for programming and diagnosis of the CRG using PACTware
- A display to show measurement value or fault indication and information during configuration
- four buttons for parameterisation of the CRG

6 Menu overview - parameterisation

The following figure aims to provide you with a quick means of orientation if you are already familiar with parameterisation via the control panel. A more precise description of its use is to be found in chapter 7.



The CRG can be parameterised easily using a PC. You can order a developer kit comprising a connection cable and a CD containing the PACTware PC programming software and the corresponding manual from Pepperl+Fuchs. PACTware and the manual are also available on the Internet.

7 Work with Device Data

7.1 Display Mode

In normal operations, the current measurement value is indicated in the selected unit in the display. For selection of the unit See also the section on 7.3.

When the restart inhibit (See also the section on 7.6.4) is triggered despite the device continuing to function in normal operating mode, a corresponding message is shown in the second line on the display.

If a **fault** occurs, one of the following messages is displayed until the fault is corrected (as long as this is configured):

- *Err Device error*
- *Err SC* for a lead short circuit
- *Err LB* for lead breakage

For a list of the fault messages See also the section on 7.4.1.

The relays always enter powerless state when a fault occurs.

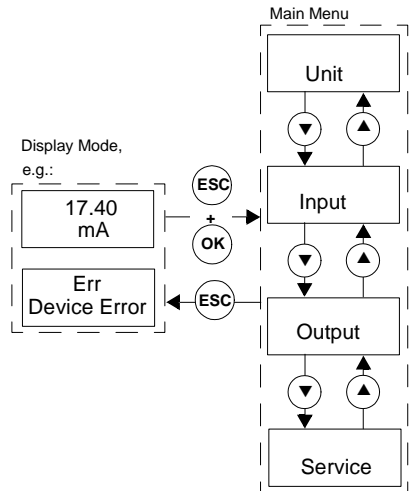
7.2 Main Menu

In order to switch directly from the display mode to the configuration mode main menu, press the **ESC** and **OK** keys **simultaneously**, for around 1 second.

You can protect the parameterisation from unauthorised modification by setting a password (See also the section on 7.8.1). In this case users can view the various settings in configuration mode without entering a password, but cannot make any modifications. When the first attempt is made to change setting, the device immediately requests entry of a password. You must enter the password **once each time** you switch from display to configuration mode. Entry of a password is described in Section 7.8.1.

The main menu consists of 4 menu items (*Unit*, *Input*, *Output* and *Service*), which you can switch between using the s and t keys. You can return from the main menu back to the display mode at any time by pressing the **ESC** key.

If 10 minutes elapse without a key being pressed in configuration mode, the device switches automatically back to display mode.

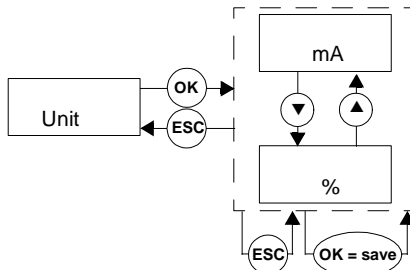


7.3 Unit

From the *unit* menu item in the main menu, you can press the *OK* button to select the unit in which you wish to display the values (*mA* or *%*).

The setting is modified as follows:

- The current selection is indicated by flashing text. The *s* and *t* keys can be used to switch between the available options. As soon as you stop pressing the *s* or *t* keys, the new selected value starts to flash.
- When you press the *ESC* key, the old value flashes again.
- If you press the *ESC* key again, the program will return you to the previous menu, without making any changes.
- If you press the *OK* key when an option is flashing, the corresponding value is stored and the option stops flashing.
- You can then use the *ESC* key to return to the previous menu.

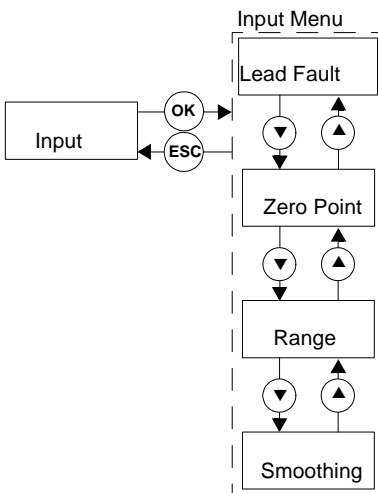


7.4 Input

You can enter the Input menu by pressing *OK* on the *Input* menu item in the main menu.

The Input menu consists of four menu items (*Lead fault*, *zero point*, *range* and *smoothing*) between which you can switch using the *s* and *t* keys.

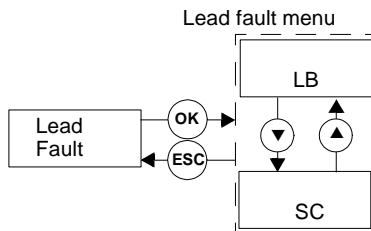
You can return from the input menu back to the main menu at any time by pressing the *ESC* key.



7.4.1 Input: Lead Fault

You can enter the Lead fault menu by pressing *OK* on the *Lead Fault* menu item in the Input menu.

The Lead fault menu consists of two menu items (*LB* for lead breakage and *SC* for short circuit) between which you can switch using the *s* and *t* keys.



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You can return from the Lead fault menu back to the Input menu at any time by pressing the *ESC* key.

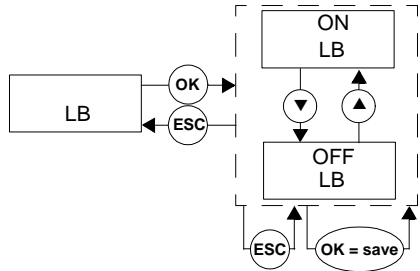
From the *LB* menu item in the Lead fault menu, you can press the *OK* button to switch lead breakage monitoring for the sensor input *ON* or *OFF*.

The method used to modify this setting is described in Section 7.3.

If you turn monitoring on, a lead breakage will be reported when input current is < 0.2 mA.

The short circuit monitoring system is activated and deactivated in exactly the same way.

If you turn monitoring on, a lead short circuit will be reported when input current is > 22 mA.



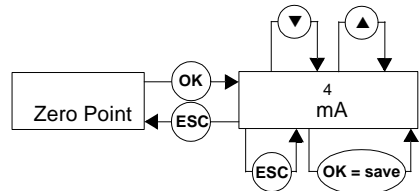
7.4.2 Input: Zero Point

You can set the zero point value by pressing *OK* on the *Zero Point* menu item in the Input menu.

The zero point is the starting point for the measurement range for input current (0% of the input value). You can specify a value between 0 mA and 18 mA. If you set a value of < 0.2 mA, you must switch off lead breakage monitoring (See also the section on 7.4.1), as this would otherwise produce an error within the measurement range. The most common values for the zero point are 0 mA or 4 mA.

The setting is modified as follows:

- The current value is indicated by flashing text. The *s* and *t* keys can be used to change this value. If you tap the *s* or *t* keys, the value changes step by step, if you



keep the s or t keys pressed, the value increases or decreases more rapidly. When you stop pressing the s or t keys, the newly set value starts to flash.

- When you press the *ESC* key, the old value is displayed again.
- If you press the *ESC* key again, the program will return you to the previous menu, without making any changes.
- If you press the *OK* key when an option is flashing, the corresponding value is stored and the option stops flashing.
- You can then use the *ESC* key to return to the previous menu.

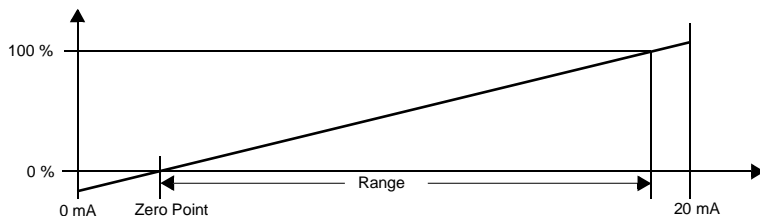
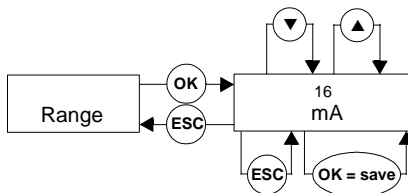
7.4.3 Input: Range

You can set the range value by pressing *OK* on the *Range* menu item in the Input menu.

The range defines the scope of the measurement range for input current (zero point + range = 100 % of the input value). You can specify a value between 2 mA and 20 mA. The following rules apply: Zero point + range ≤ 20 mA. Most common values for the range are 20 mA or 16 mA.

The method used to modify this setting is described in Section 7.4.2.

The following figure shows a systematic view of the zero point and range.

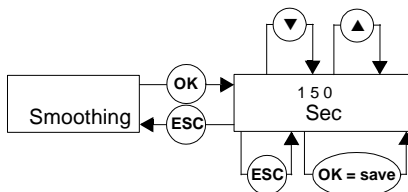


7.4.4 Input: Smoothing

You can set the smoothing value by pressing *OK* on the *Smoothing* menu item in the Input menu.

Smoothing is used with highly fluctuating measurement values to determine how quickly an output reacts to an input value modification. You can select a value between 0 sec (no smoothing) and 255 sec (maximum smoothing).

The method used to modify this setting is described in Section 7.4.2.



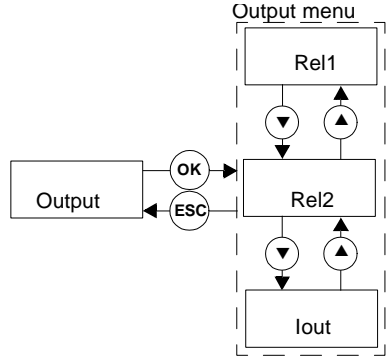
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7.5 Output

You can enter the Output menu by pressing *OK* on the *Output* menu item in the main menu.

The Output menu consists of three menu items (*Rel1*, *Rel2* and *lout*) between which you can switch using the *s* and *t* keys.

You can return from the Output menu back to the main menu at any time by pressing the *ESC* key.

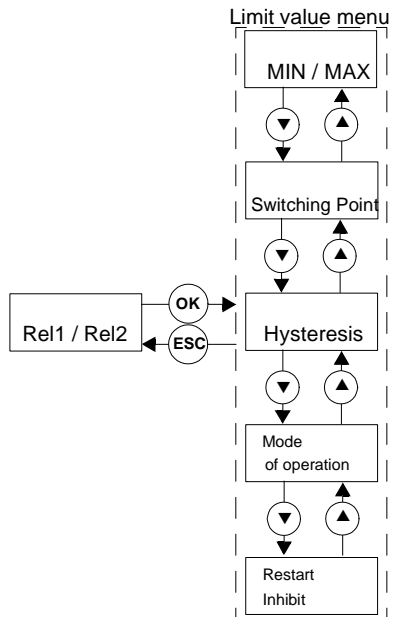


7.6 Output: Switch outputs

You can enter the Limit value menu by pressing *OK* on the *Rel1* and *Rel2* menu items in the Output menu. This action is the same for both relays, and is therefore only described here once.

The Limit value menu consists of 5 menu items (*MIN/MAX*, *Switching Point*, *Hysteresis*, and *Restart inhibit*), which you can switch between using the *s* and *t* keys.

You can return from the Limit value menu back to the Output menu at any time by pressing the *ESC* key.



Operating behaviour:

The switch mode can be set to MIN or MAX (See also the section on 7.6.1), and the mode of operation can be set to active or passive (See also the section on 7.6.3).

Areas of Application:

Universal transmitter power-supply unit KF□□-CRG-(Ex)1.D

Work with Device Data

- Switch mode MAX, mode of operation Active:
Alarm when limit value is exceeded (e.g. horn sounds)
- Switch mode MAX, mode of operation Passive:
Overfill protection, e.g. pump off; during high levels of hysteresis MIN/MAX operation, e.g. pump on/off
- Switch mode MIN, mode of operation Active:
Alarm when lower limit value not attained (e.g. hooter sounds)
- Switch mode MIN, mode of operation Passive:
Overload protection, e.g. pump off, if nothing more to flow

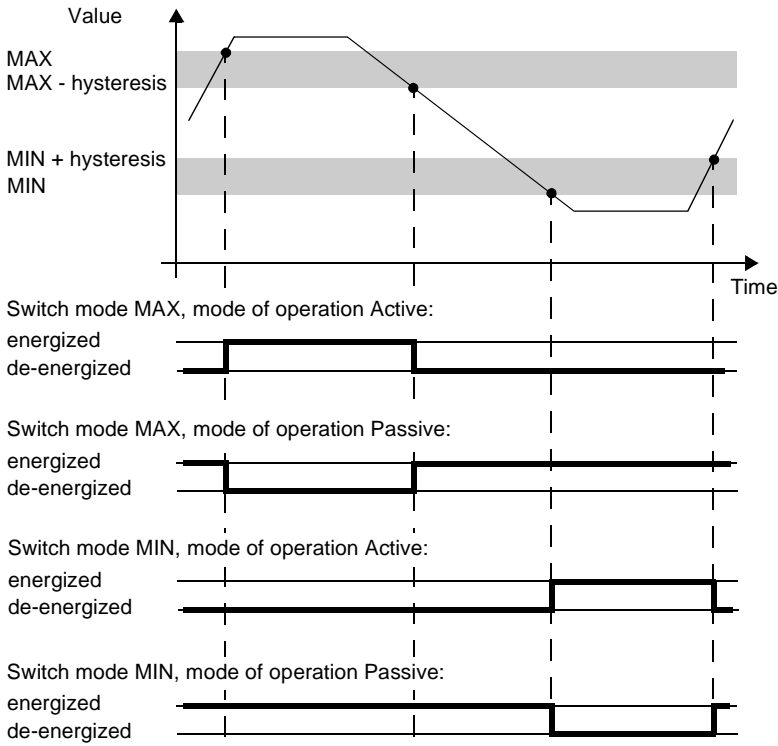


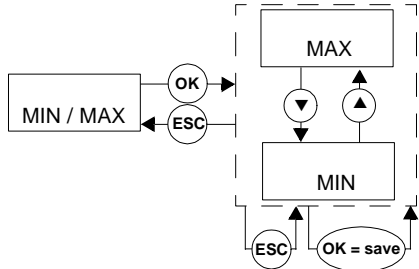
Bild 7.1: Operating behaviour

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7.6.1 Switch output: MIN / MAX

From the *MIN/MAX* menu item in the *Limit value menu*, you can press the *OK* button to change the switch mode for the selected switch output *MIN* or *MAX*.

The method used to modify this setting is described in Section 7.3.



7.6.2 Switch output: Switch point and hysteresis

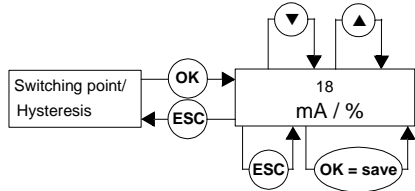
You can set the switch point value for the selected switch output by pressing *OK* on the *Switch Point* menu item in the *Limit value menu*.

You can set the hysteresis value for the selected switch output by pressing *OK* on the *Hysteresis* menu item in the *Limit value menu*.

Both values must be entered in the unit defined in *Unit* (See also the section on 7.3). Values between 0 mA / 4 mA and 20 mA (corresponds to the characteristic of the current output; See also the section on 7.7.1) or between 0 % and 1 0 0% can be entered.

The hysteresis should be > 1 % of the switching point, in order to prevent rapid switching of the relay.

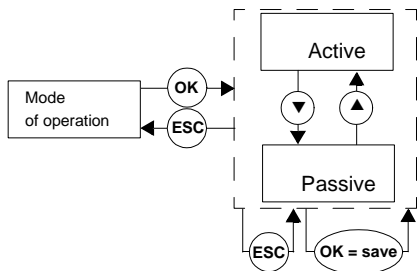
The method used to modify this setting is described in Section 7.4.2.



7.6.3 Switch output: Mode of Operation

From the *mode of operation menu item* in the *Limit value menu*, you can press the *OK* button to change the mode of operation for the selected switch output (*Active* or *Passive*).

The method used to modify this setting is described in Section 7.3.

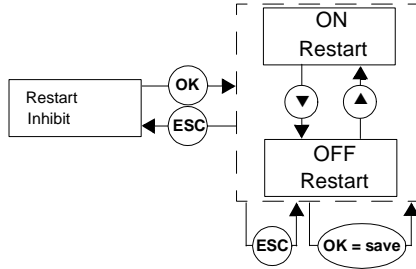


7.6.4 Switch outputs: Restart inhibit

From the *Restart Inhibit* menu item in the *Limit value* menu, you can press the *OK* button to select the restart inhibit switch mode for the selected switch output *ON* or *OFF*.

The method used to modify this setting is described in Section 7.3.

The restart inhibit mode enables you to prevent short periods outside the limit values from not being registered by the operating personnel. If *Restart Inhibit* is set to *ON* then when switching an output, the new status remains until one of the following actions occurs: Restart the device or press *ESC* key. Each of these actions resets the switch output.



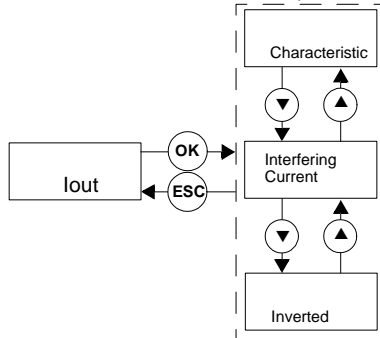
7.7 Output: Current output

You can enter the Current output menu by pressing *OK* on the *IOut* menu item in the output menu.

The Current output menu consists of three menu items (*Characteristic*, *Interference current* and *Inverted*) between which you can switch using the *s* and *t* keys.

You can return from the Current output menu back to the Output menu at any time by pressing the *ESC* key.

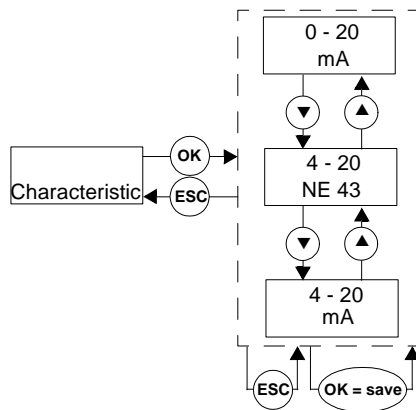
Current output menu



7.7.1 Current output: Characteristic

From the *Characteristic* menu item in the Current output menu, you can press the *OK* button to set the characteristic (*0 - 20 mA*, *4 - 20 NE 43* or *4 - 20 mA*).

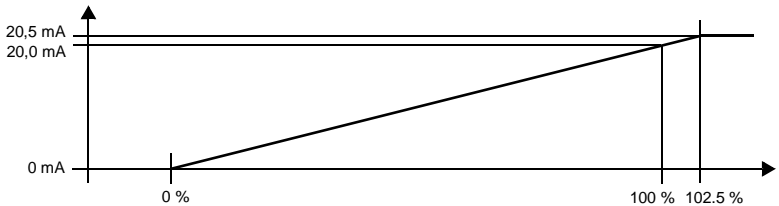
The method used to modify this setting is described in Section 7.3.



The various settings have the following meanings:

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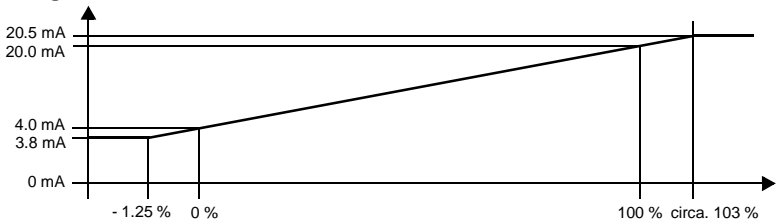
Setting 0 - 20 mA



With this setting, the zero point of the measurement range (0 %; See also the section on 7.4.2) is converted to 0 mA, the value arising from zero point + range (100 %; See also the section on 7.4.3) is converted to 20 mA, and interim values are set accordingly in proportion.

It is not possible to evaluate measurements below the zero point (output: 0 mA). When the value arising from zero point + range is exceeded, the output current increases in a linear fashion to a maximum of 20.5 mA (102.5 % of the measurement range). Further exceeding of the value will not be evaluated (output: 20.5 mA).

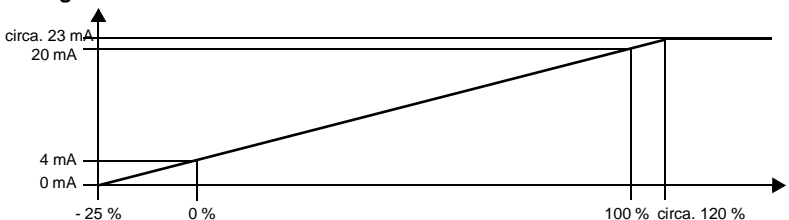
Setting 4 - 20 NE 43



With this setting, the zero point of the measurement range (0 %; See also the section on 7.4.2) is converted to 4 mA, the value arising from zero point + range (100 %; See also the section on 7.4.3) is converted to 20 mA, and interim values are set accordingly in proportion.

When the zero point range is not attained, the output current decreases in a linear fashion to 3.8 mA (- 1.25 % of the measurement range). Further undercutting of the value will not be evaluated (output: 3.8 mA). When the value arising from zero point + range is exceeded, the output current increases in a linear fashion to a maximum of 20.5 mA (around 103 % of the measurement range). Further exceeding of the value will not be evaluated (output: 20.5 mA).

Setting 4 -20 mA



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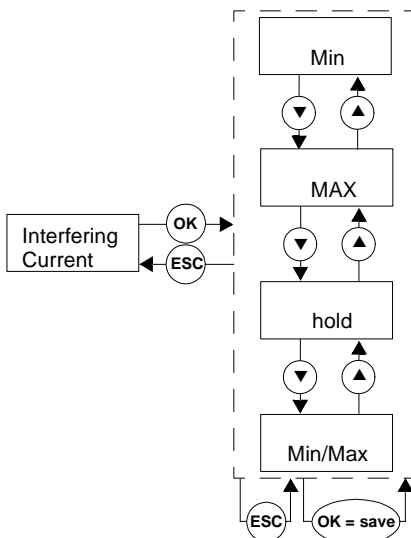
With this setting, the zero point of the measurement range (0 %; See also the section on 7.4.2) is converted to 4 mA, the value arising from zero point + range (100 %; See also the section on 7.4.3) is converted to 20 mA, and interim values are set accordingly in proportion.

When the zero point range is not attained, the output current decreases in a linear fashion to 0 mA (- 25 % of the measurement range). Further undercutting of the value will not be evaluated (output: 0 mA). When the value arising from zero point + range is exceeded, the output current increases in a linear fashion to around 23 mA (around 120 % of the measurement range). Further exceeding of the value will not be evaluated (output: around 23 mA).

7.7.2 Current output: Interfering Current

From the *Current interference* menu item in the Current output menu, you can press the *OK* key to select the current output behaviour when a fault occurs (*Min* for minimum value, *Max* for maximum value, *hold* for hold values, *Min/Max* for different outputs for lead breakage and short circuit).

The method used to modify this setting is described in Section 7.3.



The following table shows what the current output is during a fault, depending on the settings:

Setting	Characteristic 0 - 20 mA	Setting 4 - 20 NE 43	Characteristic 4 - 20 mA
Min (downscale)	0 mA (not to be distinguished from zero point-measurement)	2.0 mA	2.0 mA (not to be distinguished from measurement)
Max (upscale)	circa. 21.5 mA	circa. 21.5 mA	circa. 22.5 mA (not to be distinguished from measurement)
hold	Last value before the fault		

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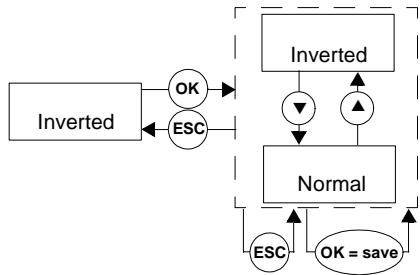
Setting	Characteristic 0 - 20 mA	Setting 4 - 20 NE 43	Characteristic 4 - 20 mA
Min/Max	0 mA on lead breakage and device error (not to be distinguished from zero point- measurement) circa. 21.5 mA on short circuit	2 mA on lead breakage and device error circa. 21.5 mA on short circuit	2 mA on lead breakage and device error (not to be distinguished from measurement) circa. 22.5 mA on short circuit (not to be distinguished from measurement)

7.7.3 Current output: Inverted

From the *Inverted* menu item in the current output menu, you can press the *OK* button to select the inverted characteristic (*inverted* or *normal*).

If you select the inverted characteristic, the conversion from zero point and zero point + range (See also the section on 7.4.2 and Section 7.4.3) is reversed so that the CRG produces on the current output 20 mA ... 0 mA instead of 0 mA ... 20 mA or 20 mA ... 4 mA instead of 4 mA ... 20 mA.

The method used to modify this setting is described in Section 7.3.

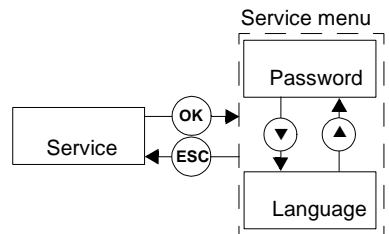


7.8 Service

You can enter the Service menu by pressing *OK* on the *Service* menu item in the main menu.

The Output menu consists of two menu items (*Password* and *Language*) between which you can switch using the *s* and *t* keys.

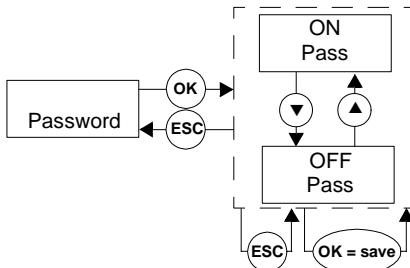
You can return from the Service menu back to the main menu at any time by pressing the *ESC* key.



7.8.1 Service: Password

From the *Password* menu item in the Service menu, you can press the *OK* button to select the password protection (*ON* or *OFF*).

The method used to modify this setting is described in Section 7.3.

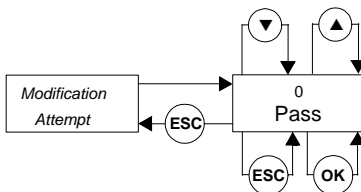


On delivery of the CRG, password protection is deactivated. The password cannot be changed.

The password is 1234.

Password entry:

When the password protection is activated, you must enter the password **once each time** you switch from display to configuration mode. When the first attempt is made to change setting, the device immediately requests entry of a password.



The password is entered as follows:

- The value *0* is shown as flashing text. The *s* and *t* keys can be used to change this value. See also Section 7.4.2. When you stop pressing the *s* or *t* keys, the newly set value starts to flash.
- When you press the *ESC* key, the value *0* is displayed again.
- When you have set the correct password and pressed the *OK* button, you return to the position in which you were trying to modify a setting. If you enter an incorrect password and press the *OK* key, the value *0* is displayed again.

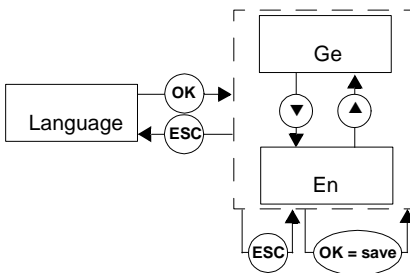
Once you have entered the correct password, you can proceed to make your changes. Otherwise the parameterisation settings remain protected.

7.8.2 Service: Language

You can set the language value by pressing *OK* on the *Language* menu item in the Service menu. *Ge* for German or *En* for English).

The language chosen here is also set in the PACTware configuration software.

The method used to modify this setting is described in Section 7.3.



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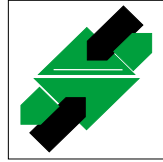
- Digital and analogue sensors
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 - Inductive and capacitive sensors
 - Magnetic sensors
 - Ultrasonic sensors
 - Photoelectric sensors
- Incremental and absolute rotary encoders
- Counters and control equipment
- Identification Systems
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