KNOCKS
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Operating instructions

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KDDM-2.2

Differential Pressure Flow Sensor

with IO-Link communication standard

Disclaimer:
KKDM-2.2 is a state of the art sensing device. Depending on environmental and technical influences, the possibility of an offset drift is given ▶ display value without any flow ▶ please execute offset.

For safety or medical applications we don't assume any responsibility.

After the warranty period of 12 months, a periodical calibration is highly recommended. Please turn to our customer support.

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Contents

The KDDM-2.2 Flow Sensor

The KDDM-2.2 is a differential pressure flow sensor from the FUTURA series with an operating pressure of up to 16 bar. The sensor is available for a flow range of 20 up to 2000 l/min.

The sensor has measuring points for input pressure and output pressure. The differential pressure aperture is located between the measuring points. The flow rate is determined based on the differential pressure between the two measuring points and shown on the display. Various other options are available for the display.

Thanks to its rugged design, the KDDM-2.2 is reliable in operation and immune to interference.

The KDDM-2.2 features two switching outputs - one digital and one analogue.

The device is configured with the aid of the three buttons below the display. If necessary, access to the settings can be code-protected.

Type identification plate

For exact identification, the model designation and serial number can be found on the type identification plate below the display.

Scope of delivery

- KDDM-2.2 differential pressure flow sensor
- Operating instructions

Intended use

The KDDM-2.2 differential pressure flow sensor is used to measure the flow rate or compressed air and neutral gases in industrial applications within the framework of the set limits and operating conditions (see **Technical data**, page 21).

The device is designed for installation in FUTURA series maintenance units or for installation as a standalone unit with wall mounting brackets.

Impermissible use

The sensor must not be used to measure critical fluids. On no account must the device be used to measure potentially explosive, combustible, aggressive or toxic gasses or liquids.

It is prohibited to make any changes/ modifications to the enclosure. Changes/ modifications may adversely affect operational safety, possibly causing personal injury or damage to property.

The KDDM-2.2 is not suitable for consumption invoicing purposes, e.g. air consumption metering in supply systems.

Target group

These operating instructions are intended for technical personnel who are entrusted with the installation, operation and maintenance of the KDDM-2.2 sensor. These persons must be trained in the use of pressure devices and have fundamental knowledge of how to handle such devices.

Only trained electricians familiar with the codes of electrical engineering practice are permitted to make the electrical connections.

Safety information

Danger: sudden escape of pressure!

Depressurise the section of line before carrying out any installation work! The sudden escape of pressure can cause serious injuries.

Accident prevention

Observe the specific accident prevention regulations, UVV/BGV for example in Germany. Observe the operating instructions provided by the system operator!

Contamination hazard!

Ensure conformity with the air quality class specified for the flow medium (see **Technical data**, page 21).

Condensation water, oil mist, foreign particles and other impurities in the compressed air can damage the device and result in measuring errors and malfunctions. As a consequence, signals sent inadvertently to the outputs can cause personal injury or damage to property.

Do not repair!

Do not open the enclosure and do not attempt to perform repairs. The device does not contain any parts that you can repair or replace.

Safety information on other devices

Refer to the documentation of the devices, to which the KDDM-2.2 sensor is connected. Read in particular the information on safety measures and permissible use.

Installation

Requirements

Detailed installation instructions depend on local conditions. Please observe the following general information:

- Depressurise the line prior to installation.
- Check the KDDM-2.2 sensor for damage. Do not install or operate a damaged device.
- Check that the measuring range of the sensor (20 - 2000 l/min) corresponds to the installation location.
- Installation position: horizontal, inclined or vertical.
- Check direction of flow: The device is designed only for the direction of flow from left to right. When looking at the display, the inlet side is on the left, recognisable by the screen structure directly behind the opening.
- Pay attention to the weight of the device and use corresponding wall mounting elements.
- Make sure that the sensor is connected directly to a safety device that prevents the maximum permissible limits (pressure and temperature) being exceeded.

Mounting options

Caution!

Do not install the KDDM-2.2 sensor directly behind a regulator / filter-regulator – this may cause malfunctions.

Ideally install the KDDM-2.2 sensor within a size 2 maintenance unit, e.g. between a shut-off valve and a filter regulator.

Use the corresponding coupling kit, consisting of coupling clips, screws and O-ring, to connect the devices. You can choose between basic coupling kits and coupling kits for wall mounting (see **Accessories**, page 20).

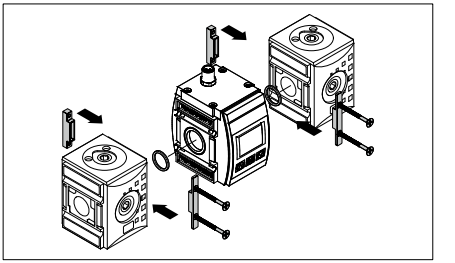
You can combine the KDDM-2.2 with devices of other sizes both on the inlet side as well as on the outlet side. Use a special coupling kit for this purpose (see **Accessories**, page 20).

Alternatively, you can use a wall mounting bracket that you screw on to the back of the device after removing the cover.

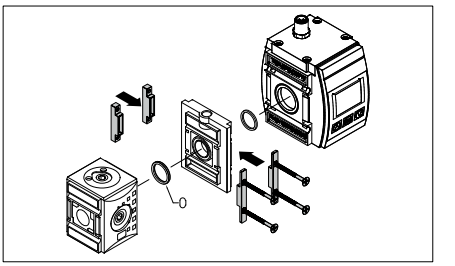
For operation as a standalone unit, you will need to use two wall mounting brackets that also enable line connection. They are available for the connection sizes 3/8", 1/2" and 3/4" (see **Accessories**, page 20).

The following illustrations show the mounting options.

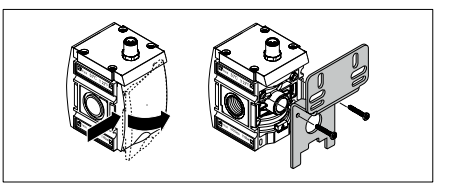
Installation in maintenance unit:



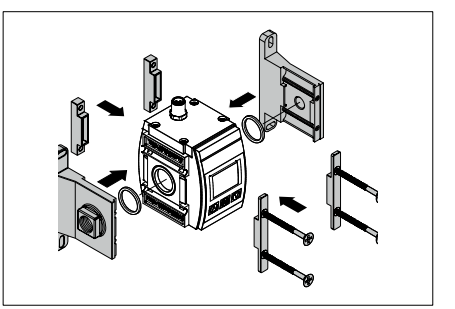
Combination with other sizes:



Installation with mounting bracket:



Installation with wall mounting brackets:



Installation procedure

Danger posed by incorrect installation!

Incorrect installation can cause damage to the KDDM-2.2 and other equipment. The sudden escape of pressure can cause serious injuries. Therefore make sure that all connections are made correctly before start-up.

- Depressurise the section of line.
- Align the KDDM-2.2 according to the direction of flow and connect to the maintenance unit or secure to the wall mounting brackets matching the line.
- When combining with other sizes, fit the wide O-ring on the inlet side of the KDDM-2.2 so that it also fits in the groove of the connecting plate.
- Install device combination or KDDM-2.2 with wall mounting brackets in the line. Make sure the screw connection is tight and the device is positioned horizontally.
- Re-pressurise the section of line, check the installation for leaks and make sure it is operating correctly.

Connection assignments

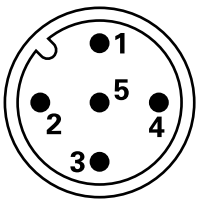
The KDDM-2.2 has a 5-pin M12 connection at the top for the voltage supply and outputs.

Caution!

To maintain the type of protection IP65 of the enclosure when not in use, the connection must be closed off with a suitable screw plug.

Contacts

Connection view:



Contact	Function
1	L+ 24 V
2	DIO
3	L-GND
4	C/Q IO-Link communication
5	Analog OUT

Electrical connection

Danger: electrical current!

Only trained electricians familiar with the codes of electrical engineering practice are permitted to make the electrical connections.

Operate the KDDM-2.2 only with a SELV power supply unit!

The power supply unit for operating the KDDM-2.2 is not included in the scope of delivery. Refer to the technical data of the KDDM-2.2 sensor when selecting the suitable power supply unit.

Pay attention to the connection assignments of the M12 connection (see **Connection assignments**, page 7).

Outputs

The KDDM-2.2 features one digital and one analogue output.

The digital output at contact 2 is freely selectable between PNP and NPN.

For connection assignments, see table **Contacts**, page 7.

See **Technical data**, page 21, for the technical data of the outputs.

Switching on/off

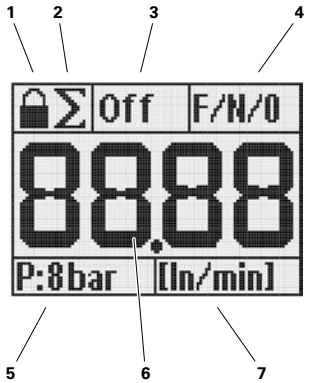
The KDDM-2.2 has no master switch. Once you have connected the device to the power supply unit and the power supply unit to the mains power supply, the KDDM-2.2 is switched on and ready for operation.

To switch off the device, simply disconnect the power supply unit from the power supply.

Operation

Display

The display is normally subdivided into various areas. The measured value is shown with four large digits in the middle. The displays above and below the measured value provide additional information.



1 Lock symbol, shown when safety code is active

2 Summation symbol, shown when summation function is active

3 Switching output OUT 1, shows status and configuration

4 Switching output OUT 2, shows status and configuration

5 Pressure display, can be disabled

6 Measured value, flow

7 Unit of measured value

Operating principle

The KDDM-2.2 has three buttons below the display for using the configuration menu, selecting functions and values and changing the display.

In the default setting, the background lighting is always switched on when a button is pressed for the first time.

The display language is English and cannot be changed.

Buttons

The **Edit** button is used to open the main menu and submenus as well as to confirm selected values.

Access to the menus from the standard display in normal operation always starts by pressing the **Edit** button.

The **arrow buttons** are used to navigate within a menu and to select parameters, options and values.

Active safety code

When the safety code is active, you can select the menus and view their settings but you cannot make any changes. The lock symbol is shown at the top left of the display when the safety code is active.

You must first enter the correct code if you wish to change the settings (see **Entering safety code**, page17).

All menus and functions will then be freely accessible.

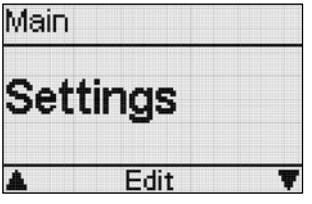
Configuration menu

After connecting the voltage supply to the outputs, you can configure the KDDM-2.2 for operation. You can define the units of measure, display configuration and outputs.

You can then protect access by defining a safety code.

Menu layout

In the configuration menu, the display always shows the name of the current menu at the top, values or options in the middle and the active buttons or possible actions at the bottom.



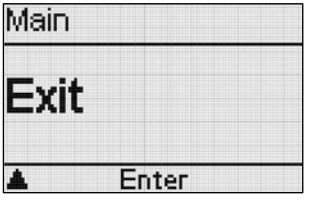
Selection and entries

Generally, the selected options and entered values will become valid immediately. In some cases you will need to conclude the entry by pressing a certain button, e.g. when setting periods of time.

Incorrect entries

You do not need to delete anything if you have selected or entered an incorrect value. Simply select the function again and enter another value or select another option.

Exiting the menu



With the **Exit** function you can exit a menu or submenu and go to the next higher level.

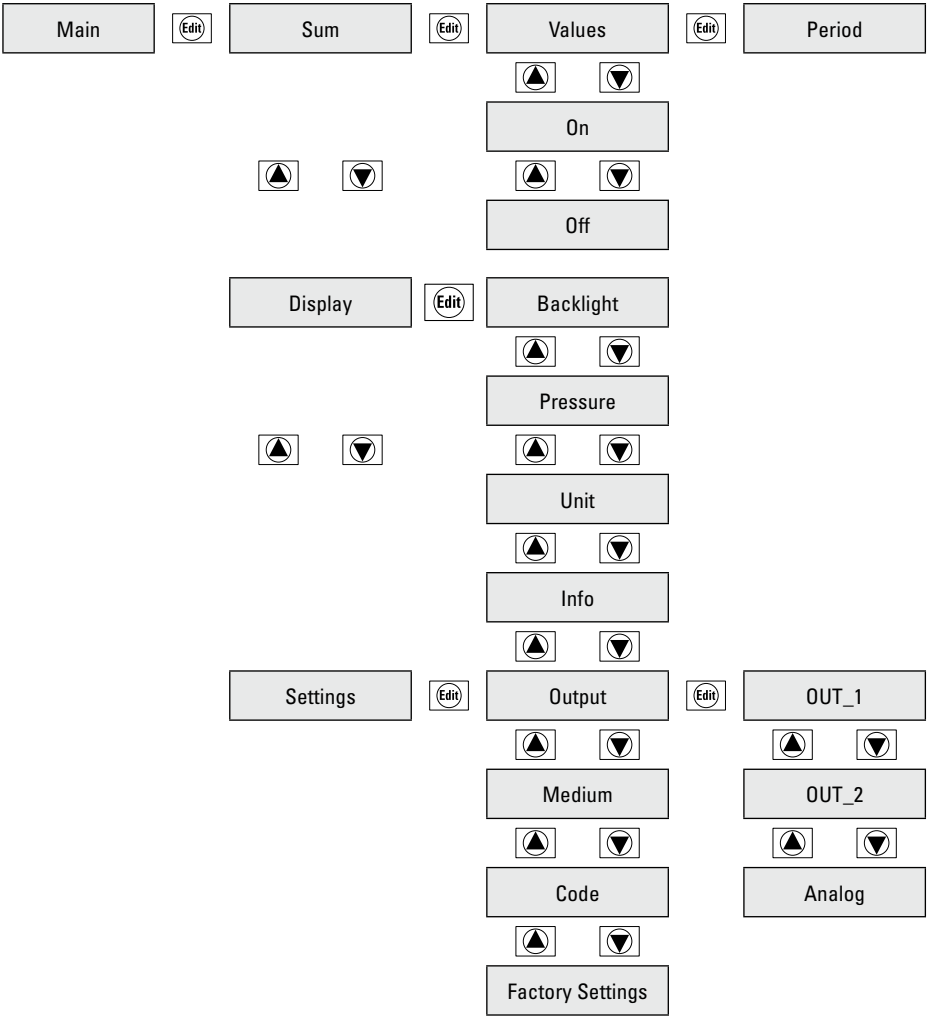
– If necessary, press the right arrow button several times in the menu until the display shows the **Exit** function.

– Press the **Edit** button to go one level higher or return to the standard display.

The display will automatically switch back to the standard display with the measured value if no button is pressed for 15 seconds.

Menu structure

The following overview shows the most important menus of the KDDM-2.2.



Setting parameters

Activating summation function

You can activate one of the summation functions for the measured value display. You can choose between the following functions:

- Sum in [l] Σ
- Maximum value in [l/min]
- Average value in [l/min] Ø

All displays refer to a time period in hours and minutes (hh:mm) that you should also set in this menu.

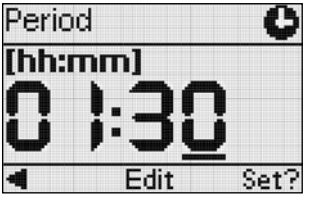
– Open the **Sum** menu and then select the **Values** menu.

– Press the arrow buttons to show the available summation functions one after the other.

– When the required option is shown, press the **Edit** button to select this option. The display automatically reverts to the **Values** selection.

– Press the right arrow button in order to enter the time period.

– When the **On** function is shown, press **Edit** in order to set the period in hours and minutes (hh:mm). The first digit is highlighted by an underscore.



– Press **Edit** to select the highlighted digit.

– Press the arrow buttons to change the value.

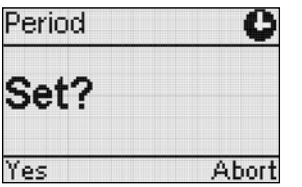
– Press **Edit** to confirm the value.

– Press the left arrow button to go to the next digit.

– Change the value of this digit as required.

– Set the remaining digits in the same way.

– Press the right arrow button to conclude selection of the time period. **Set?** is shown in the display.



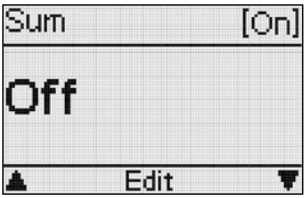
– Press the left arrow button to save the setting

or

press the right arrow button to cancel the selection.

A summation symbol is shown at the top left of the display when the summation function is activated (see **Display**, page 9).

Deactivating summation function



You can deactivate the summation function at any time. The display then shows the current flow rate in the required unit (see **Selecting unit**, page 14).

– Open the **Sum** menu and then select the **Off** function.

– Press **Edit**. The summation function is deactivated.

Backlighting

You can permanently switch on (**On** option) or switch off (**Off** option) the display backlighting. By selecting the **Auto** option, the backlighting will switch on the first time a button is pressed and automatically switch off again after 20 seconds.

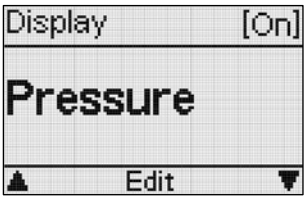
– Open the **Display** menu and then select the **Backlight** menu.

– Press the arrow buttons to show the **On**, **Off** and **Auto** options one after the other.

– When the required option is shown, press the **Edit** button to select this option.

The selected option is shown in square brackets at the top right.

Displaying pressure



You can show (**On** option) or hide (**Off** option) the pressure in the display. The bottom left field in the display will remain blank if you switch off the pressure display,

– Open the **Display** menu and then select the **Pressure** menu.

– Press the arrow buttons to show the **On** and **Off** options one after the other.

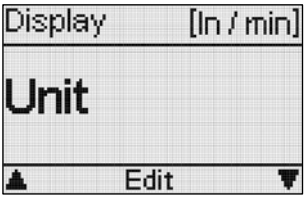
– When the required option is shown, press the **Edit** button to select this option

bar (absolute)
MPa (absolute) } Display for absolute pressure

bar (gauge)
MPa (gauge) } Display for relative pressure

The selected option is shown in square brackets at the top right.

Selecting unit

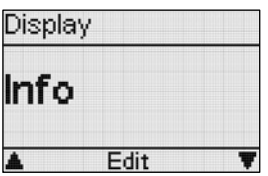


You can select the unit for the displayed measured value: **l/sec**, **l/min**, **l/h**, **m³/h** o **gal/h**.

– Open the **Display** menu and then select the Unit menu.
– Press the arrow buttons to show the possible units one after the other.
– When the required unit is shown, press the **Edit** button to select this unit.

The selected unit is shown in square brackets at the top right.

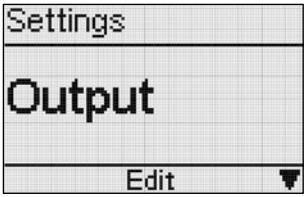
Info for serial number, firmware number and hardware number



You can display the info for the serial number, firmware number and hardware number.

– Switch to the **Display** menue and then to the **Info** menue.
– Press the arrow keys to display the possible numbers one after the other.

Digital- und Analogausgang konfigurieren



You can select the switching characteristic and the actuator for both switching outputs. After selecting the actuator, you have to define the threshold, at which the output changes it status.

The output is deactivated by selecting the **Off** option in the **Actuator** submenu.

Caution!

The configuration of the switching outputs can affect subsequent system functions. Under certain circumstances, incorrect settings can result in personal injury or damage to property.

Please note that changes to the switching characteristic are immediately effective.

Activate the safety code in order to avoid inadvertent or unauthorised tampering with the settings (see **Activating safety code**, page 16).

To configure output 1:

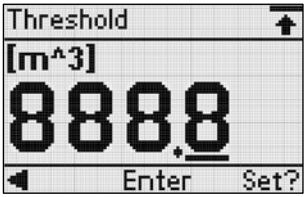
– Open the **Settings** menu and then select the **Output** menu.
– Open the **OUT_1** menu to configure output 1.
– Open the **Type** menu to select the switching characteristic.
– Press the arrow buttons to show the **NPN** and **PNP** options one after the other.
– When the required option is shown, press the **Edit** button to select this option.
– Press the right arrow button and then **Edit** to open the **Actuator** menu.
– Press the arrow buttons to show the **Flow**, **Volume**, **Pressure** and **Off** options one after the other.
– When the required option is shown, press the **Edit** button to select this option.

Switch to the **Analog** menu to configure the analogue outputs.

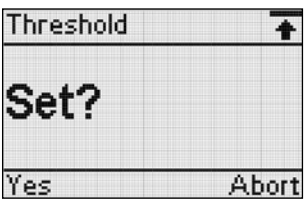
Selectable options:
Analogue output 0 - 5 V
Analogue output 0 - 10 V
Analogue output 4 - 20 V

- Switch to the **Type** menu to select the desired output.
- When the required option is shown, press the **Edit** button to select this option.

After selecting the actuator, the display automatically switches to the threshold setting. The first digit is highlighted by an underscore.



– Press **Edit** to select the highlighted digit.
– Press the arrow buttons to change the value.
– Press **Edit** to confirm the value.
– Press the left arrow button to go to the next digit.
– Change the value of this digit as required.
– Set the remaining digits in the same way.
– Press the right arrow button to conclude selection of the threshold. **Set?** is shown in the display.



– Press the left arrow button to save the setting

or

press the right arrow button to cancel the selection.

You can configure output 2 in the same way. For this purpose, switch to the **OUT_2** menu and carry out the required settings in the corresponding submenus.

The configuration of the switching outputs is shown in the top right and centre fields of the standard display (see **Display**, page 9).

Off Switching output deactivated

F Actuator: Flow
P Actuator: Pressure
V Actuator: Volume
/
N Switching characteristic: NPN
P Switching characteristic: PNP
/
0 Threshold: Not reached
1 Threshold: Exceeded

Notice:

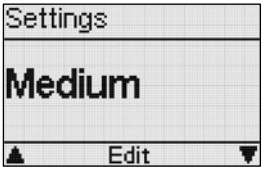
The KDDM-2.2 operates in 2 modes:

(a) IO Link mode:
OUT_1 =C/Q pin (pin 4)

or

b) Analog Mode:
OUT_1= Switching output 1 (Pin2)
OUT_2= Switching output 2 (Pin4)

Select Medium



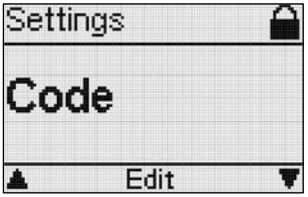
In the menue **Medium** you can select the following media:

– Air
– Argon
– CO_2
– Nitrogen
– Xeon

The selected option is shown in square brackets in the top right-hand corner

– When the desired medium is displayed, press the **Edit** button to select this option.

Activating safety code

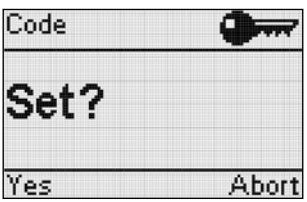


You can enter and activate a three-digit safety code to protect access to the device settings. The parameters and settings will then be visible but can only be changed after entering the correct code.

Caution!

The safety code is immediately effective after entry. If the code is lost, you can cancel the inhibit only by disconnecting the device from the power supply. All data and settings will then be lost.

- Open the **Settings** menu and then select the **Code** menu. The first digit is highlighted by an underscore.
- Press **Edit** to select the highlighted digit.
- Press the arrow buttons to change the value.
- Press **Edit** to confirm the value.
- Press the left arrow button to go to the next digit.
- Change the value of this digit as required.
- Set the remaining digits in the same way.
- Press the right arrow button to conclude selection of the code. **Set?** is shown in the display.

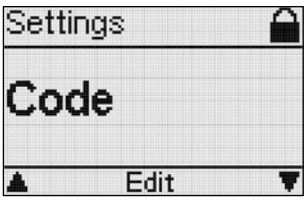


- Press the left arrow button to save the code

  or
  press the right arrow button to cancel the selection.

The safety code is immediately effective after saving. A lock symbol is shown at the top left of the standard display (see **Display**, page 9).

Entering safety code



No settings can be changed after the safety code has been activated.

You must first enter the correct code in order to deactivate the protection function. All menus and functions will then be freely accessible.

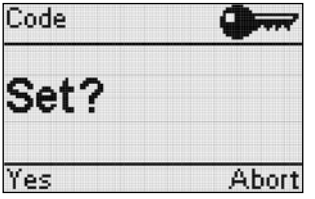
Caution!

Access protection remains deactivated after entering the correct safety code.

If you wish to protect the settings again, you will have to re-enter a safety code. This can be the same code as before or a new one.

- Open the **Settings** menu and then select the **Code** menu. The first digit is highlighted by an underscore.
- Press **Edit** to select the highlighted digit.
- Press the arrow buttons to select the correct digit of the code.
- Press **Edit** to confirm the digit.

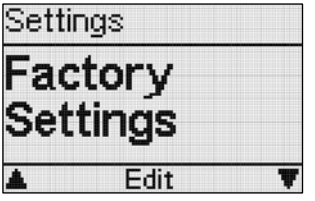
– Press the left arrow button to go to the next digit.
– Select the remaining digits in the same way.
– Press the right arrow button to conclude entry of the code. **Set?** is shown in the display.



– Press the left arrow button to use the code.

Faulty is displayed if the entered code was incorrect.

Resetting to factory settings



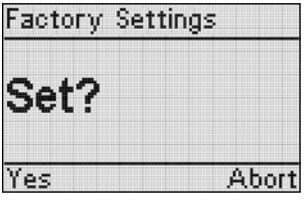
You can reset the device configuration to the factory settings, for example, in order to delete all data and settings simultaneously.

Caution!

Resetting the configuration to the factory settings will deactivate the switching outputs. This can affect subsequent system functions .and under certain circumstances result in personal injury or damage to property.

Please note that the factory settings take immediate effect.

– Open the **Settings** menu and then select the **Factory Settings** menu.
– Press **Edit** to select the factory settings. **Set?** is shown in the display.



– Press the left arrow button to reactivate the factory settings

  or

  press the right arrow button to cancel the selection.

You will have to completely reconfigure the device after resetting to the factory settings.

Troubleshooting

The following table is intended to help you to identify and rectify the causes of faults.

Fault	Possible cause	Corrective measures
Incorrect measured value display	Operation with impermissible medium	Only use permissible media (see **Technical data**, page 26)
	Device soiled	Remove device and clean or replace by new device
No measured value display	No flow	
ERR_01 displayed	Measuring range of differential pressure sensor exceeded	Reduce flow rate or use device with different measuring range
ERR_03 displayed	Error in communication with differential pressure sensor	Disconnect device from power supply and reconnect. If the fault persists, the device is defective.
ERR_04 displayed	Error in communication with absolute pressure sensor	Disconnect device from power supply and reconnect. If the fault persists, the device is defective.
ERR_05 displayed	Device isn´t calibrated or calibration parameter are wrong.	Disconnect device from power supply and reconnect. If the error persists, the calibration parameters are invalid and the device must be recalibrated.
ERR_06 displayed	Error in communication with DAC or DAC	Disconnect device from power supply and reconnect. If the fault persists, the device is defective.
ERR_07 displayed	Measuring range of temperature exceeded	Disconnect device from power supply and reconnect. If the fault persists, the device is defective.
OVR_A displayed	Measuring range of absolute pressure sensor exceeded	Reduce absolute pressure
OVR_F displayed	Measuring range of flow exceeded	Reduce flow rate
Faulty displayed when entering the safety code	Incorrect code	Enter code again
Blocked displayed when resetting to factory settings	Safety code activated	First enter safety code

Fault	Possible cause	Corrective measures
Settings cannot be changed	Safety code activated	First enter safety code
Outputs do not switch corresponding to settings	Short-circuit/overload at corresponding output	Eliminate short-circuit/overload

Cleaning and care

Use a damp cloth to clean the device and accessories. Only clean the device with

- Water
- Mild household detergent

Caution!

Do not use methyl alcohol or solvents otherwise the plastic enclosure can be damaged or become brittle!

Maintenance

The KDDM-2.2 generally requires no maintenance.

Caution!

Repairs may only be performed by Knocks Fluid-Technik GmbH.

Passing on, disposal

Pass on the KDDM-2.2 sensor only together with these operating instructions.

The KDDM-2.2 is made from high-grade materials and components that can be recycled and reused.

This symbol means that used electrical and electronic devices should not be disposed of together with normal household waste.

In the European Union there are various collection systems for used electrical and electronic products. Please dispose of these products at your local collection and recycling centre.

Accessories

Order number	Description
KBW.2-1225	Mounting bracket
KKOP.2	Coupling kit
KKOP.2 W	Coupling kit for wall mounting
ZG.0-251	Angled line socket M12x1
KOP-238K	3/8" mounting kit for wall bracket
KOP-212K	1/2“mounting kit for wall bracket
KOP-234K	3/4“mounting kit for wall bracket

You will find further accessories at www.knocks.de

Technical data

Type	flow sensor with graphical display and backlight
Measuring range	20 - 2000 l/min
Measuring principle	differential pressure
Measured value display	ls/h, ls/min, ls/sec, ln/h, ln/min, ln/sec, m³/h or gal/h (selectable)
Medium	Compressed air, nitrogen, helium, argon, xenon, carbon dioxide
Air quality class	6:4:4- according to DIN ISO 8573-1:2010 (non-condensing)
Inlet pressure P1 max.	16 bar
Temperature range	-10°C to +50°C
Air consumption	No internal air consumption
Accuracy flow value	±1% full scale, ±3% of actual value at 7 bar and 23 °C
Repeatability zero point	±0.2% fullscale resolution ; zero point ±1%.
Repeatability span	±1% fullscale
Protection class	IP65 according to DIN 40050
Operating voltage	24 V (±50%)
No-load current	<75 mA
Reverse polarity protection	Yes, mechanical and electrical
Connection types digital	IO-Link according to IEC 61131-9 and IEC 61131-2 (M12)
analog	4-20 mA, 0-10 V
Protocol version	Device V 1.1
Profile	Smart sensor profile [digital measuring sensors]
Function classes	Binary Data Channel (BDC), Process Data Variable (PDV), Identification, Diagnosis, Teach Channel
Communication mode	COM2 (38.4 kBaud)
SIO mode support	Yes
Port class	A
Process data width IN	4 bytes
Process data content IN	16 bit Flow value 12 bit Pressure 2 bit Switching states
IO-Link, minimum cycle time	4 ms
IO-Link, data memor	< 0.5 kbyte to record flow/pressure for 24 hrs.
Resolution	4 values per second
Shock resistance	DIN EN60068-2-27
Vibration resistance	DIN EN 60068-2-6
Directives	ROHS and REACH Conformity CE marking (according to EU EMC directive) WEEE Directive

EG guidelines

CE

Knocks FLUID-Technik GmbH complies with all applicable rules and regulations. All information is based on the latest known information and is subject to a revision index.

This ensures that Knocks FLUID-Technik GmbH products always meet all applicable requirements.

Most pneumatic products are not regulated by any EC Directives and are not allowed to have a CE marking.

Products with a CE marking are regulated by one or more of the following EC Directives in Europe:

1. EG Machine Directive 2006/42/EG

Knocks FLUID-Technik GmbH products do not fall under the scope of the EC Machinery Directive. Because of this, they must not be labelled with a CE marking as per the Machinery Directive.

2. Electromagnetic Compatibility EC Directive (2004/108/EC), including amendments

This Directive applies to electronic and electronic-pneumatic products. Since 01/01/1996, the corresponding products have been labelled with the CE marking and a declaration of conformity has been available. In other words, these devices meet the basic requirements for industrial zones and guarantee this. These devices must not be used in residential areas unless additional measures have been taken in order to ensure that the Directive's basic requirements for residential areas are met!

Coils are not regulated by the EMC Directive.

3. EC Low Voltage Directive (2006/95/EC), including amendments

Knocks FLUID-Technik GmbH products do not fall under the scope of the EC Low Voltage Directive. Because of this, they must not be labelled with a CE marking as per the Machinery Directive.

4. WEEE Directive

Knocks FLUID-Technik GmbH applies the WEEE directive (Waste of Electrical and Electronic Equipment), which serves the prevention of waste from electrical and electronic equipment and the reduction of such waste through reuse, recycling and other forms of recovery, and thereby commits itself to take back waste equipment from Knocks FLUID-Technik GmbH free of charge.