



OPTISENS MAC 080 Handbook

Digital multiparameter converter

Software version: 3.02

The documentation is only complete when used in combination with the relevant documentation for the sensor.

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1.1 Software history

Release date	Software version	Documentation
05/2008	3.02	MA MAC 080 R01
10/2009	3.02	MA MAC 080 R02

1.2 Intended use

In combination with different OPTISENS 2000 sensors the MAC 080 is used to measure suspended solids, dissolved oxygen, pH, ORP and other parameters in waste water treatment applications.

1.3 Certifications



The device fulfils the statutory requirements of the following EC directives:

- Electromagnetic compatibility (EMC) in accordance with:
EN 61000-6-4:2001: Emission standard for industrial environments;
EN 61000-6-2:2001: Immunity for industrial environments
- Low Voltage Directive:
Safety requirements for electrical equipment for measurement, control and laboratory use
in accordance with EN 61010-1:2001

The manufacturer certifies successful testing of the product by applying the CE marking.

1.4 Safety instructions from the manufacturer

1.4.1 Copyright and data protection

The contents of this document have been created with great care. Nevertheless, we provide no guarantee that the contents are correct, complete or up-to-date.

The contents and works in this document are subject to German copyright. Contributions from third parties are identified as such. Reproduction, processing, dissemination and any type of use beyond what is permitted under copyright requires written authorisation from the respective author and/or the manufacturer.

The manufacturer tries always to observe the copyrights of others, and to draw on works created in-house or works in the public domain.

The collection of personal data (such as names, street addresses or e-mail addresses) in the manufacturer's documents is always on a voluntary basis whenever possible. Whenever feasible, it is always possible to make use of the offerings and services without providing any personal data.

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We hereby expressly prohibit the use of the contact data published as part of our duty to publish an imprint for the purpose of sending us any advertising or informational materials that we have not expressly requested.

1.4.2 Disclaimer

The manufacturer will not be liable for any damage of any kind by using its product, including, but not limited to direct, indirect, incidental, punitive and consequential damages.

This disclaimer does not apply in case the manufacturer has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

1.4.3 Product liability and warranty

The operator shall bear responsibility for the suitability of the device for the specific purpose. The manufacturer accepts no liability for the consequences of misuse by the operator. Improper installation and operation of the devices (systems) will cause the warranty to be void. The respective "Standard Terms and Conditions" which form the basis for the sales contract shall also apply.

1.4.4 Information concerning the documentation

To prevent any injury to the user or damage to the device it is essential that you read the information in this document and observe applicable national standards, safety requirements and accident prevention regulations.

If this document is not in your native language and if you have any problems understanding the text, we advise you to contact your local office for assistance. The manufacturer can not accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device. Special considerations and precautions are also described in the document, which appear in the form of underneath icons.

1.4.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.



DANGER!

This information refers to the immediate danger when working with electricity.



DANGER!

This warning refers to the immediate danger of burns caused by heat or hot surfaces.



DANGER!

This warning refers to the immediate danger when using this device in a hazardous atmosphere.



DANGER!

These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator's plant.



WARNING!

Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.



CAUTION!

Disregarding these instructions can result in damage to the device or to parts of the operator's plant.



INFORMATION!

These instructions contain important information for the handling of the device.



LEGAL NOTICE!

This note contains information on statutory directives and standards.



• **HANDLING**

This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

➔ **RESULT**

This symbol refers to all important consequences of the previous actions.

1.5 Safety instructions for the operator



WARNING!

*In general, devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.
This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.*

2.1 Scope of delivery

**INFORMATION!**

Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

**INFORMATION!**

Check the packing list to check if you received completely all that you ordered.

**INFORMATION!**

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.



Figure 2-1: Scope of delivery

- ① Converter (in the version as ordered)
- ② Product documentation

Optional accessories (if ordered)

- Junction box for connection of up to 4 sensors
- Solenoid valves for automated cleaning of sensors (if ordered incl. Y-splitter)
- Mounting plate with sunshield for converter

2.2 Device description

The converter is enclosed in a plastic enclosure, having a large graphic display and only three buttons to operate it.

The electronics has been designed to achieve the highest reliability and maximum ease of use. Measured values, settings and diagnostic information is transferred to and from up to four sensors using digital communication on a RS485 line.

The converter can be connected to a control or supervision system using standard 4...20 mA analog signaling or (optional) a standardized bus such as Profibus DP.

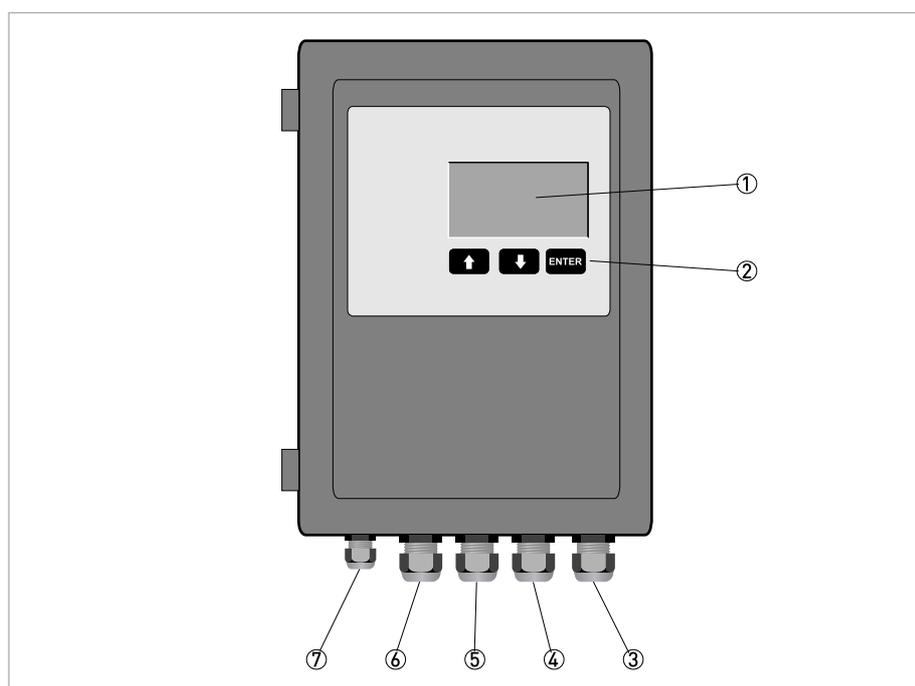


Figure 2-2: Description of the converter

- ① Display
- ② Operation keys
- ③ Power supply
- ④ Relays
- ⑤ 4...20 mA outputs
- ⑥ Digital inputs
- ⑦ One sensor or 2...4 sensors with a junction box

2.3 Nameplate

**INFORMATION!**

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

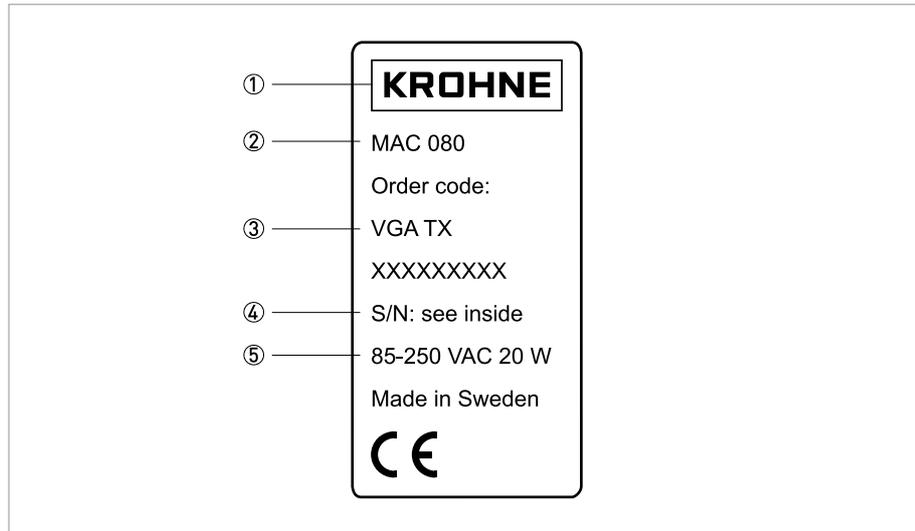


Figure 2-3: Example of nameplate

- ① Manufacturer
- ② Device type
- ③ Order code
- ④ Serial number
- ⑤ Voltage information

3.1 Notes on installation

**INFORMATION!**

Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

**INFORMATION!**

Check the packing list to check if you received completely all that you ordered.

**INFORMATION!**

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

3.2 Storage

- Store the device in a dry, dust-free location.
- Avoid continuous direct sunlight.
- Store the device in its original packing.

3.3 Configuration of a measuring point

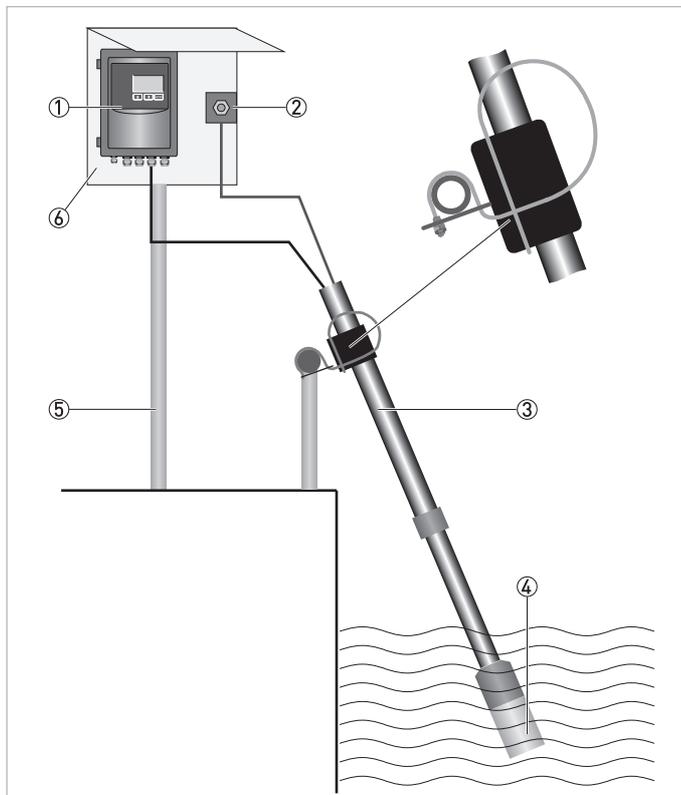
A complete measuring point consists of at least three parts:

- MAC 080 converter
- OPTISENS 2000 sensor (including cable)
- MAA 2000 sensor holder

If automatic flushing is installed, an optional solenoid valve is necessary as well.

Examples of typical measuring points are listed in the following sections.

3.3.1 Single parameter measuring point



- ① Converter
- ② Solenoid valve for flushing (to be ordered with converter)
- ③ Mounting assembly
- ④ Sensor incl. 10 m / 33 ft cable and flush hose
- ⑤ Mounting post
- ⑥ Mounting plate with sun shield

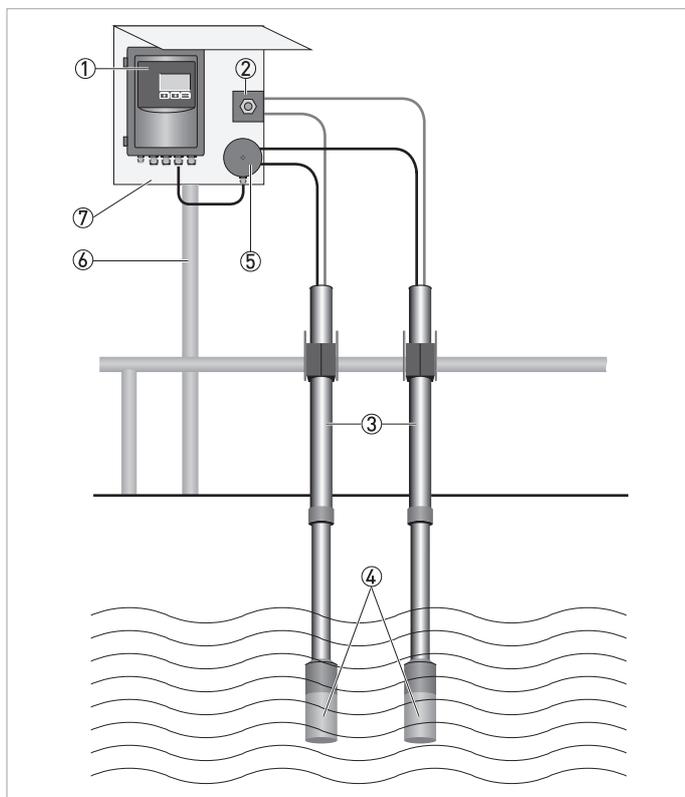
The figure above shows a single parameter measuring point consisting of one converter ①, one sensor ④ with a telescopic rod immersion assembly as sensor holder ③ and one solenoid valve ② for flushing.

The spring loaded mounting bracket for installation of the telescopic rod sensor holder on the handrail is included in the delivery of the holder and can be used for round and square hand rails with a maximum diameter of 50 mm / 2".

The signal cable to the sensor and the flush hose are provided with the sensor.

The mounting plate with sun shield and the mounting post are available optional.

3.3.2 Two parameter measuring point



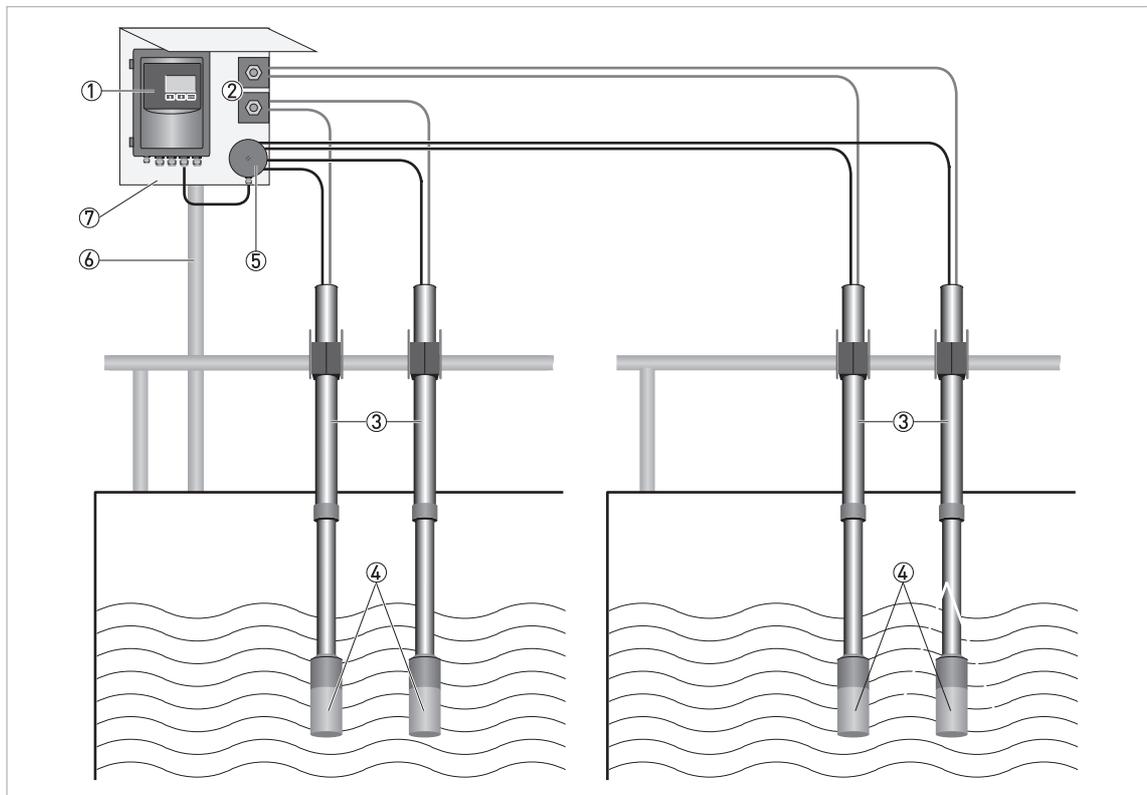
- ① Converter
- ② Solenoid valve for flushing (to be ordered with converter)
- ③ Mounting assembly
- ④ Sensor incl. 10 m / 33 ft cable and flush hose
- ⑤ Junction box for connection of up to 4 sensors (to be ordered with converter)
- ⑥ Mounting post
- ⑦ Mounting plate with sun shield

The figure above shows a two parameter measuring point consisting of one converter ①, two sensors ④ with a telescopic rod immersion assembly as sensor holder ③ and one solenoid valve ② for flushing.

Both sensors are flushed via one solenoid valve using an optional Y-splitter.

For connection of two sensors to the converter an optional junction box is needed.

3.3.3 Four parameter measuring point



- ① Converter
- ② Solenoid valve for flushing (to be ordered with converter)
- ③ Mounting assembly
- ④ Sensor incl. 10 m / 33 ft cable and flush hose
- ⑤ Junction box for connection of up to 4 sensors (to be ordered with converter)
- ⑥ Mounting post
- ⑦ Mounting plate with sun shield

The figure above shows a four parameter measuring point consisting of one converter ①, four sensors ④ with a telescopic rod immersion assembly as sensor holder ③ and two solenoid valves ② for flushing.

Two sensors each are flushed via one solenoid valve using an optional Y-splitter.

For connection of four sensors to the converter an optional junction box is needed.

3.4 Installation order

Installation and start-up of a measuring system is best performed in the order stated below.



INFORMATION!

Different steps may vary in meaning, depending on the particular sensor and the number of sensors that are to be connected to the converter.

Steps

- Mounting of converter
(for detailed information refer to the relevant chapter in the converter manual).
- Mounting of sensor
(for detailed information refer to the relevant chapter in the sensor manual).
- Electrical installation of converter
(for detailed information refer to the relevant chapter in the converter manual)
- Electrical installation of sensor
(for detailed information refer to the relevant chapter in the sensor manual).
- Setup of converter
(for detailed information refer to the relevant chapter in the converter manual).
- Settings and calibration of sensors
(for detailed information refer to the relevant chapter in the sensor manual).

3.5 Mounting of converter

The converter is designed for wall mounting via four predrilled holes suitable for M4 cylindrical head screws (for detailed information refer to *Dimensions & weights* on page 44).

A minimum wall space of 200 x 350 mm / 7.9" x 13.8" is required.

For optional handrail mounting we provide an aluminium mounting plate with predrilled holes for the converter, 2 solenoid valves and the junction box. The whole assembly can be installed at the handrail via two U-bolts (which are provided with the mounting plate). If a handrail is not available, we can provide a suitable mounting post as well.

4.1 Safety instructions

**DANGER!**

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

**DANGER!**

Observe the national regulations for electrical installations!

**DANGER!**

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

**WARNING!**

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

**INFORMATION!**

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

4.2 Wiring connections

The connection block is located inside the converter housing in the lower part of the main board. To access the connection block, the front cover needs to be opened by using a Phillips head screwdriver.

**INFORMATION!**

Start-up of the device takes place as soon as power is supplied, although it may take up to 30 seconds before the sensor has been identified. When the device starts, the type of device is shown in the screen window for 10 seconds.

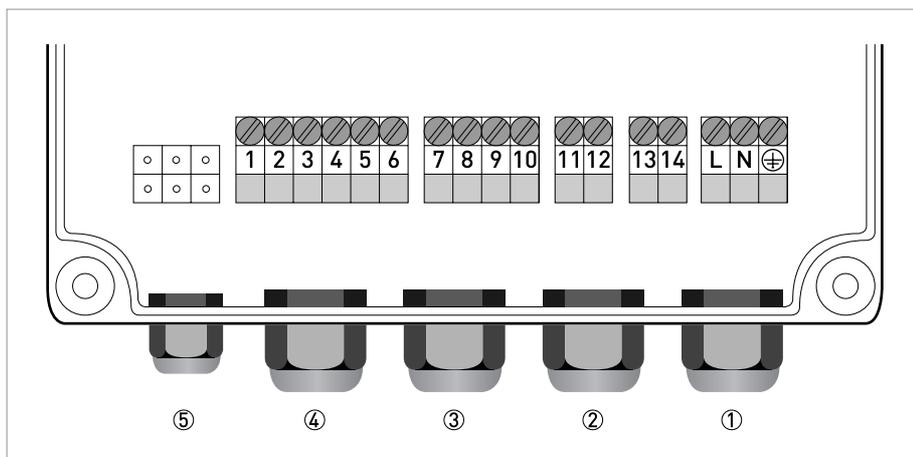


Figure 4-1: Terminals

- ① M20 cable feedthrough for connection of power
- ② M20 cable feedthrough for connection of relays (terminals 11...14)
- ③ M20 cable feedthrough for connection of 4...20 mA outputs (terminals 7...10)
- ④ M20 cable feedthrough for connection of digital inputs (terminals 1...6)
- ⑤ M12 socket for connection of one sensor or 2...4 sensors with a junction box

Description of terminals

Description	Terminal	Function
Digital inputs ④	1, 2, 3	Digital in
	4	-
	5	+24 VDC
	6	Signal ground SG
4...20 mA outputs ③	7	Channel 1, 4...20 mA neg.
	8	Channel 1, 4...20 mA pos.
	9	Channel 2, 4...20 mA neg.
	10	Channel 2, 4...20 mA pos.
Relays ②	11, 12	Relay 1
	13, 14	Relay 2
Power ①	L	Load or power
	N	Neutral
	⏚	Protective Earth (PE)

Sensor

The sensors are connected to the converter via the M12 socket ⑤ at the lower side of the converter housing using 10 m / 33 ft cables which are attached to the sensor. If the standard cable length is not sufficient several cables may be connected in series. The maximum length is 100 m / 328 ft.

In the event that more than one sensor is connected to the same converter, then the junction box is needed. Furthermore, for the connection of 3...4 sensors an extra 4...20 mA module or a Profibus DP module must be installed in the converter to transfer the measuring results to a SCADA or DCS system.

Digital inputs

The 3 digital inputs are used to select calibration curves for consistency or suspended solids sensors from a remote location. They are activated by applying +24 VDC and have a common ground. We suggest the use of a 4-lead AWG20 (0.5 mm²) cable.

4...20 mA outputs

As a standard, there are 2 analog 4...20 mA outputs to transfer the measuring results from the converter to a SCADA, DCS or other type of system. The use of the two outputs is configured in the sensor menu, and the converter will prevent two sensors from using the same output. We suggest using a shielded twisted pair AWG20 (0.5 mm²) cable to connect the converter to another system. If both outputs are connected to the same system a double twisted pair cable may be used. Make sure the shield is properly grounded according to EMC practice.

Optional, the converter can be extended with 2 additional analog 4...20 mA outputs via an expansion module.

Relay outputs

The two relay outputs may be configured to be used for alarm or cleaning. The cable type required depend on the use and selected voltage. Make sure that the maximum ratings of the outputs are not exceeded. Maximum rating per relay is 250 VAC / 12 A.

A connection diagram for the relays is attached on the inner side of the front door of the converter housing.

Power

The converter is connected to power using a 3-lead cable approved for the rated current and voltage. We recommend that power has to be connected with an external on/off switch.

4.3 Jumper settings and connector X9

The converter has four jumpers to configure the board.

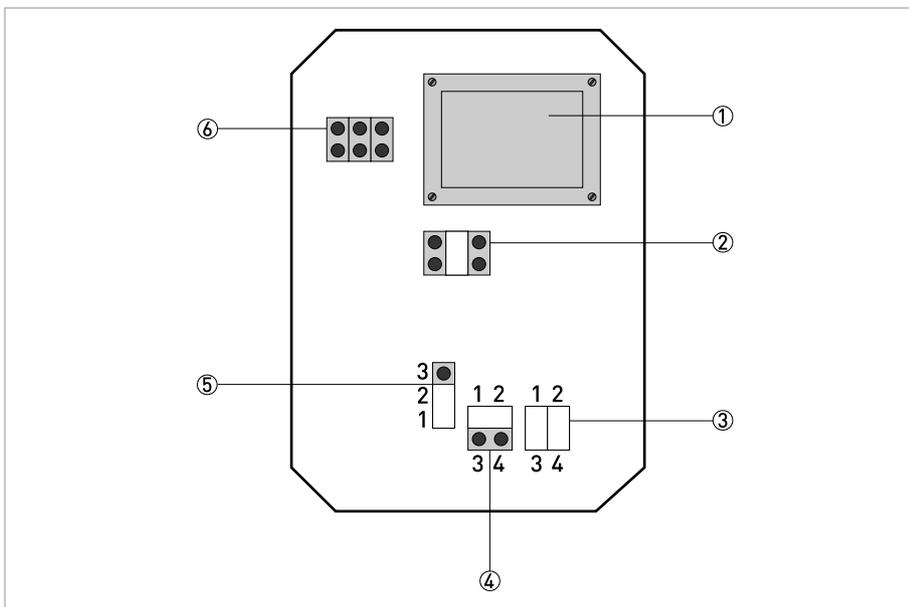


Figure 4-2: Overview of jumpers/connectors

- ① Display
- ② Jumper JP14
- ③ Jumper JP1
- ④ Jumper JP7
- ⑤ Jumper JP2
- ⑥ Connector X9 (RS232)



CAUTION!

Do not change the setting of jumper JP14. Improper setting of jumper JP14 may destroy the unit and will void the warranty! Only to be changed by authorized service personnel.

Jumpers

Function	Jumper/connector
Analog outputs	Jumper JP1
	Jumper JP7
Digital inputs	Jumper JP2
Program download (for service use only)	Jumper JP14
PC-cable connector (for service use only)	Connector X9

4.3.1 Analog outputs

The two analog outputs of the converter are default active, sourcing 4...20 mA into a load of maximum 450 Ω . They are galvanic isolated from the rest of the system, but the two channels use a common ground.

Channel 2 can be jumpered to be passive, and fully isolated sink 4...20 mA from an external supply of max. 24 VDC, by changing JP1 and JP7.

Analog output channel 2	Position JP1	Position JP7
Active, sourcing (default)	1-3 and 2-4	1-2
Passive, sinking	1-2 and 3-4	3-4

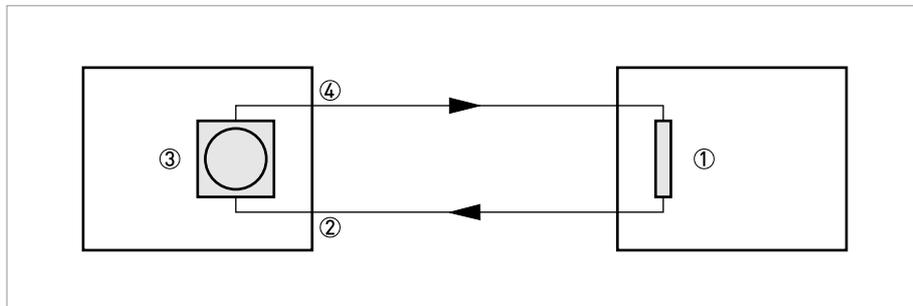


Figure 4-3: Active analog output (channel 1 or channel 2)

- ① External load passive
- ② Converter terminal 6 or 8
- ③ Converter active sourcing 4...20 mA
- ④ Converter terminal 7 or 9

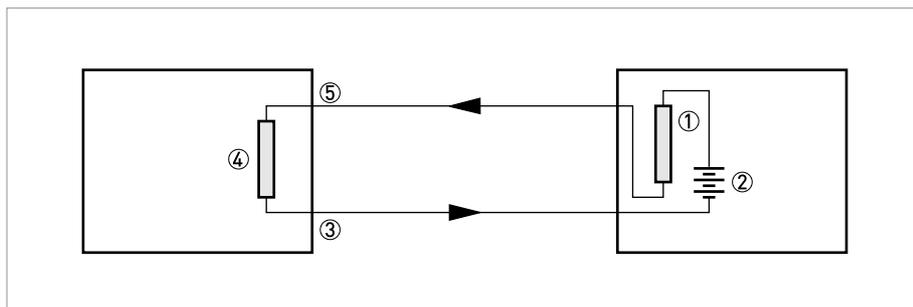


Figure 4-4: Passive analog output (channel 2 only)

- ① External load
- ② External 24 VDC
- ③ Converter terminal 8
- ④ Converter passive sinking 4...20 mA (channel 2 only)
- ⑤ Converter terminal 9

4.3.2 Digital inputs

The three digital inputs are using the converter's internal 24 VDC. To use an external 24 VDC source, galvanic isolated from the rest of the system (e.g. from a DCS or control system), the inputs need to be jumpered. These inputs can be used for selecting calibration for sensors having more than one calibration curve by setting up the sensor to use an external calibration. To connect a sensor using a multiple point calibration (setup external calibration) the digital outputs are used to select calibration of the sensor.

No active input will result in calibration curve "A". If input 1 is activated calibration curve "B" will be used, if input 2 is activated calibration curve "C" will be used, and finally if input 3 is activated calibration curve "D" will be used. The higher the number of the input the more dominant it is, in other words if input 3 is active calibration curve "D" will be used regardless of the state of the other inputs.

Digital inputs	Position JP2
Active, internal 24 VDC (default)	1-2
Passive, external 24 VDC	2-3

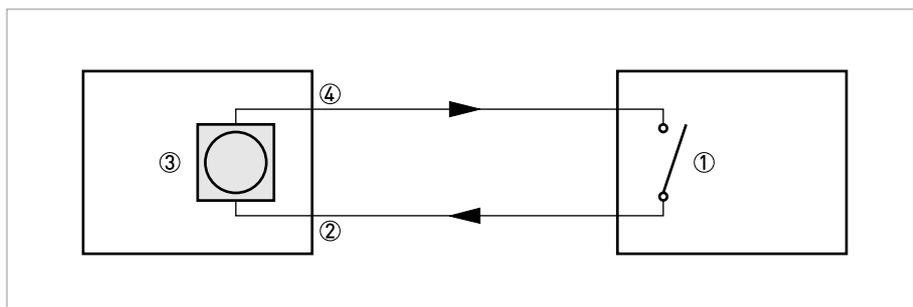


Figure 4-5: Active digital input

- ① External switch passive
- ② Converter terminal 1, 2 or 3
- ③ Converter active internal 24 VDC
- ④ Converter terminal 5

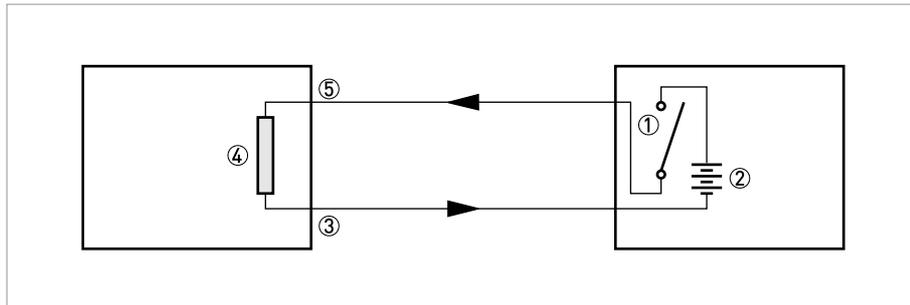


Figure 4-6: Passive digital input

- ① External switch
- ② External 24 VDC
- ③ Converter terminal 4
- ④ Converter passive
- ⑤ Converter terminal 1, 2 or 3

4.3.3 Program download



CAUTION!

Do not change the setting of jumper JP14. Improper setting of jumper JP14 may destroy the unit and will void the warranty! Only to be changed by authorized service personnel.

The jumper JP14 is used when downloading new firmware to the converter.

4.3.4 PC cable connector X9



CAUTION!

The connector X9 is intended to be used for service and troubleshooting. Connection of the converter to a PC via the connector X9 should only be carried out by authorized service personnel!

Connector X9 is a serial RS232 port that may be used to transfer values to a PC or printer via the PC cable. The functionality of the serial port is configured in the settings menu of the converter where the sensor(s) to be logged and the logging interval is set. The serial port uses 19200 Baud, 8 bits, 1 stop bit, no parity and no flow control.

4.4 Relay outputs

The converter has two relay outputs, configurable for alarm or cleaning. The relays can be used as dry contacts only.

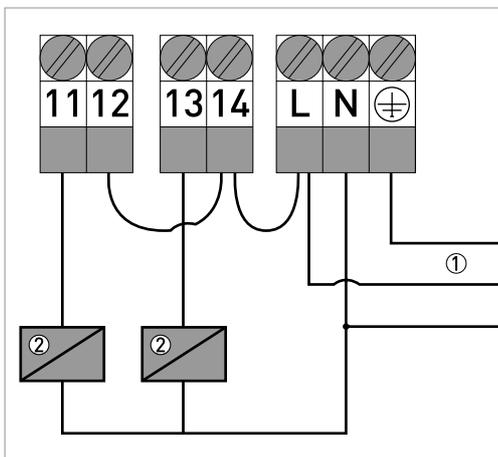


Figure 4-7: Connection of 230 VAC flushing relay using AC mains

- ① 230 VAC
- ② Flushing relay

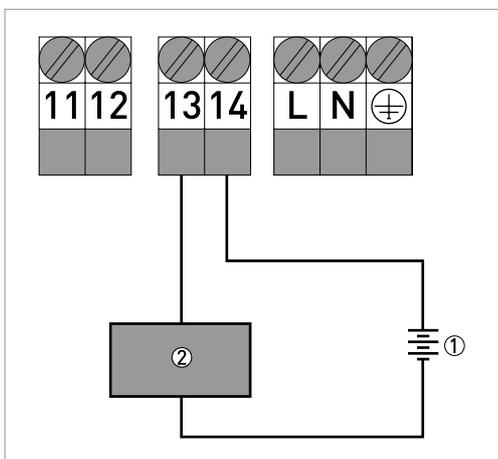


Figure 4-8: Connection of 24 VDC alarm device

- ① e.g. 24 VDC
- ② Alarm device

**CAUTION!**

Do not overpower the relay contacts! Max. rating per relay is 250 VAC, 12 A)

Observe the following points

- The relays are a normally open contact only. For driving solenoid valves and other devices use external power sources.
- During setup, please verify that the relay is not already being used for another function like flush cleaning.
- Several solenoid valves may be connected to the same terminal block. However, the power rating of the relay output must not be exceeded.

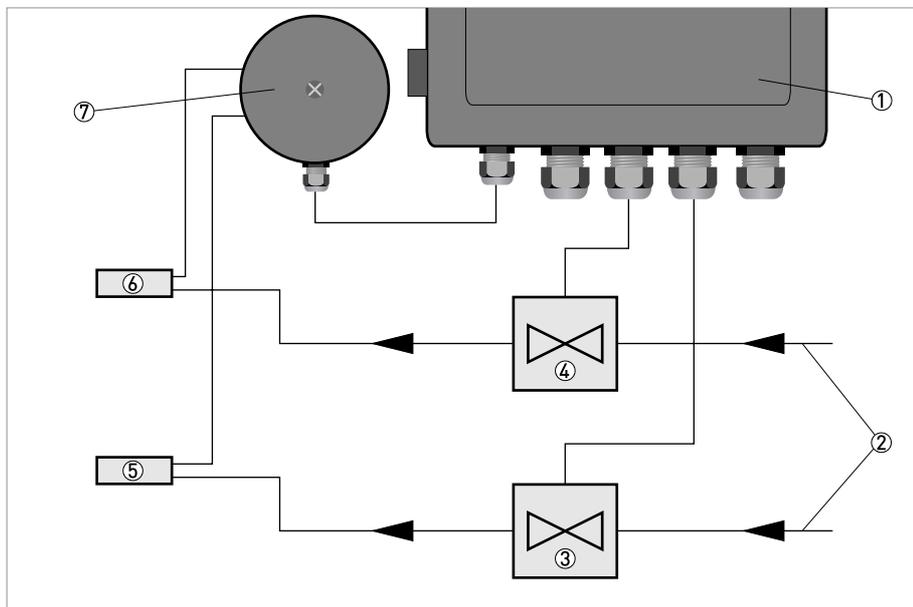
4.4.1 Connection of automatic cleaning

Figure 4-9: Connection of two sensors and two flushing valves

- ① Converter
- ② Flushing water/air
- ③ Solenoid valve 2
- ④ Solenoid valve 1
- ⑤ Sensor 2
- ⑥ Sensor 1
- ⑦ Junction box

All sensors are equipped with integrated spray cleaning. The cleaning function is controlled by the converter relays. A solenoid valve is connected to relay contact 1 or 2, which must be configured in the sensor menu.

In order not to interfere with the measurement, the output of the sensor is frozen during the cleaning and for the configured I-time after the cleaning. Additional freeze time can be configured if required.

If more than one sensor shall be cleaned using the same relay, one of them is configured as master, with all parameters set, to use the relay. The others are configured to clean as slaves along with the selected relay. The output of a slave is frozen during the cleaning and additionally its own I-time and its own additional freeze time if used. Other cleaning parameters cannot be configured for a slave, the master's configuration is used.

**INFORMATION!**

If relay 1 is set for alarm then relay 2 can be used for flushing and vice versa.

**The following procedures are to be performed**

- Connect the solenoid valve to relay contact 1 or 2 (relay 1 - terminals 11/12 or relay 2 - terminals 13/14; for detailed information refer to *Wiring connections* on page 17).
- Configure the relay for cleaning in the sensor menu under "Cleaning/Relay" (refer to the sensor manual).
- Check that flushing water/air pressure does not exceed 8 bar / 116 psi rating of solenoid valves. Refer to the sensor manual for maximum flush pressure for the sensor.

Automatic cleaning is not started when a menu is open. This is to avoid flushing during maintenance and calibration.

4.4.2 Connection of external alarm

The relay outputs may be used for external alarms, flushing or brush signals. Configure the relay for alarm as shown in the sensor service manual under "Scale/Alarm/Alarm Relay".

**The following procedures are to be performed**

- Connect the alarm to relay 1 or 2 (for detailed information refer to *Wiring connections* on page 17).
- Configure the relay for alarm as shown in the sensor service manual under "Scale/Alarm/Alarm Relay".

5.1 Start-up

Start-up of the device begins when power is supplied. While a self-test is being performed, it may take up to 30 seconds for the sensor to initialize and be identified. Changes to the settings can not be made until the converter has recognized the sensor. When recognized, the sensor will appear in the display mode.

If the self-test indicates that the internal clock has been without electric power for a period of time, the unit goes to a menu for setting date and time. After this setting is complete, the display mode shows the sensors in the order in which they were tagged or the slot number.

5.2 Connect sensors

When the converter detects a new sensor an identification process is started, indicated by a rotating line between the header and the time on the first line of the display. Once the sensor is identified, the converter asks how it shall be used. Default choice is to connect the sensor to an empty slot from a list of free slots. If no slot is free, a message saying so will be displayed. Slots with no sensor currently connected can be freed in the converter menu. If a sensor is added to slot 1 or 2, the converter will ask if the corresponding 4...20 mA output shall be used (unless it is already used by another sensor). The use of an output can be changed in the sensor setting menu.

If an identical sensor has been connected, but is currently not, the slot of this sensor can be reused. The new sensor inherits most of the configuration and calibration of the old sensor. This function is intended to quickly get up and running when a sensor is replaced. The inherited calibration will not be perfect since it's done for another sensor, but it will be closer than the factory default. Some sensor types can not reuse slots.



How to get started:

- Press ↑ and ← simultaneously for 5 seconds.
- ➔ The converter menu opens.
- Select "Settings" and confirm by pressing ←.
- Set the different parameters for the converter in this menu.
- Press ↑ and ← simultaneously to return to the main menu.
- Connect the sensors, let the converter identify them, and assign slots for them.
- Select the sensor you want to setup using ↓ and ↑.
- Press ← for 5 seconds.
- ➔ The sensor menu for the selected sensor opens.
- Select "Settings", insert the appropriate values for the sensor selected. Then select the first line and press ← to return to the sensor menu.
- If automatic cleaning is used, select "Cleaning" and enter the parameters. Then select the first line and press ← to return to the sensor menu.
- Select "Scale" then insert the appropriate values for the sensor selected. "Min." and "Max." refers to the measured value required for 4 and 20 mA output.
- Select "Calibrate". Calibrate each sensor according to the sensor manual.
- Press ↑ and ← simultaneously to return to the main menu.
- Repeat the sensor configuration for all attached sensors.

6.1 Operational interface

6.1.1 Main display

The layout of the main display varies depending on the number of sensors connected. The converter can handle up to 4 sensors. The slots in the menu are numbered top down from 1 to 4.

The first line of the display always shows the internal clock and the temperature of the active sensor. Slots without a sensor connected are shown with the text "empty slot". Connected sensors are shown with their name, the measured value, the unit and a bar indicating percentage of full scale. If the contact with a sensor is lost, the text "No transmitter" is displayed in the slot where the sensor is configured. At the bottom of the screen, the min. and max. values for selected sensor are displayed. An arrow to the left of the sensor name indicates the active sensor.

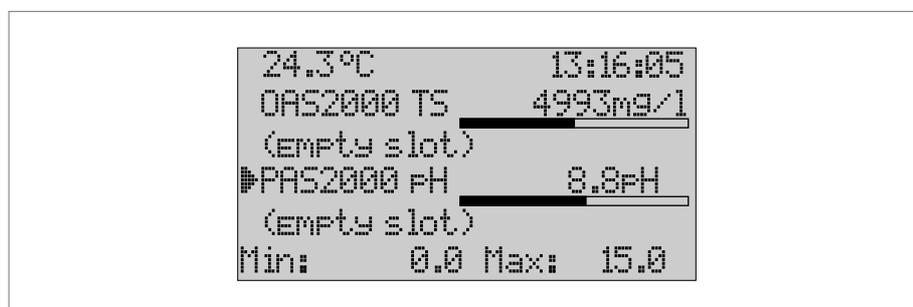


Figure 6-1: Main display

- Use the buttons \uparrow or \downarrow to select a sensor in the main display.
- An empty slot cannot be chosen for display.
- If communication with the sensor is lost the slot may still be chosen for display. The arrow returns to the first active sensor after five seconds.
- The sensor name (max. 10 characters) can be changed in the sensor menu, default is the type of sensor.

6.1.2 Sensor display

Many (not all) sensors have one or more info displays showing extra information about the selected sensor. What information is showed depends on the sensor type; please refer to the sensor manual for more information.

To switch between the main menu and the sensor display for the selected sensor or vice versa, press \downarrow and \leftarrow simultaneously.

6.1.3 Menus

There are different menus to configure the converter and the sensors. One set of menus is for settings referring to the converter and another set of menus is for settings referring to each type of sensor.



INFORMATION!

This manual only describes the menus used to configure the converter. For information regarding the different sensor menus, please refer to the sensor manual.

When a menu is open the automatic cleaning is inhibited. The values of the two analog outputs are frozen in order to avoid unnecessary alarms in the control system when parameters are changed, and during calibration. This functionality can also be used if a sensor shall be temporary removed, e.g. to be inspected or cleaned. Just remember that open menus will time out if not used for 8 minutes.

Time out for menus

Menus that are inactive for more than 8 minutes are automatically closed and the converter returns to the main menu. A menu is not considered to be inactive if a value is being edited, a dialogue box is open, or a function, e.g. calibration, is carried out. The backlight of the display is switched off at the same time, it is switched back on by pressing any button.

6.1.4 Menu topology

There are menus to configure the converter and the sensors. They are divided in two branches, each having a set of submenus:

- Converter menu, to make changes to the setup of the converter. It is selected by pressing \uparrow and \leftarrow simultaneously for five seconds.
- Sensor menu, to make changes to each sensor's setting, calibration, scale or system parameters. It is selected by bringing the cursor to the desired sensor, then pressing \leftarrow for five seconds.

Menu topology

Sensor display

Press $\leftarrow + \downarrow$ to change between sensor display and main display

Main display

Press \leftarrow for 5 seconds to select sensor menu

Press $\leftarrow + \uparrow$ for 5 seconds to select converter menu

Sensor menu		Converter menu	
	Settings		Settings
	Calibrate		System
	Cleaning		Empty slot
	Scale & Alarm		
	System		

6.1.5 Working in the menus

- A square in front of a line in the menu indicates the top of the menu. If \leftarrow is pressed when this line is highlighted, the menu is ended.
- An arrow to the right \triangleright indicates that a submenu is displayed if \leftarrow is pressed when this line is highlighted.
- Pressing \leftarrow on a highlighted line with an arrow to the left \triangleleft will take the user back to the previous menu.
- If there is not enough room on the screen for the menu, an arrow pointing down ∇ is shown at the end of the screen to indicate that the menu continues. Use the button \downarrow to access these additional lines.

All the menus can be ended anywhere by pressing $\uparrow + \leftarrow$ simultaneously to go back to the main menu or sensor listing screen. It is not necessary to go through the whole screen menu to get back to the main menu.

6.1.6 Changing values in the menus

A highlighted area in the converter means that you can use the ↑ or ↓ keys to change the selection. However, an exception is when values or numbers are displayed one figure at a time. In this case, the arrow keys are used to change the value and ← is used to advance to the next digit. Simultaneously pressing ↓ and ← steps back one digit.

When changing options, the highlighted option "Settings" indicates that ↑ and ↓ can be used to change between options. When the shaded area is over a number, then the arrow keys will increase or decrease the value.

Occasionally, a list indicator (↕) will appear in a dialog box. This indicates that the user can use the arrows to select between the different functions that are available.

When a value can not be displayed, which might be due to the fact that it is too large, negative or an error has occurred in a calculation, stars are shown instead of a number, e.g. ***** (number of stars is depending on value and unit settings). If it is possible to edit the parameter it can be set to zero by pressing ← a number of times. All selected changes are implemented immediately and measuring is continued.

6.1.7 Dialogs

The converter sometimes shows a small dialog box containing a message. Sometimes at the bottom of the dialog box there is a message that says, "Enter". This indicates that the dialog will be confirmed and consequently disappears when the ← key is pressed. If several dialogs are stacked, the one at the top will be confirmed first.

6.1.8 Sensor menu

The sensor menu is accessed by first selecting the sensor, then pressing ← for five seconds. See the sensor manual for more information.

If the selected sensor is not active (the text "No transmitter" is shown) a warning is displayed that asks you to make another choice in order to show the sensor menu.

To access the menu of a sensor that is not connected, change the highlighted text from "abort" to "show" using the arrows and press ←.



6.1.9 Symbols

Symbol	Description
+	The converter is looking for previously attached sensors that have been lost. This is indicated with a plus sign between the header and the time in the main menu.
*	The converter is looking for new sensors. This is indicated with a star between the header and the time in the main menu.
	The converter has found a new sensor that it is trying to identify. This is indicated with a rotating line between the header and the time in the main menu.
	Sensor cleaning; the value of the sensor is frozen during, and for a while after the cleaning (I-time plus freeze time). Meanwhile the cleaning symbol is shown next to the sensor name in the main menu.
	The converter is storing data in the sensor. This is indicated with the store symbol shown next to the sensor name in the main menu.

6.1.10 Messages

The converter sometimes displays messages to inform the operator of a problem. These messages are explained below.

Total Reset, Disconnect transmitter cable for 10 sec and reconnect.

The converter has done a total reset, the sensor database is emptied. If a total reset is done with any sensor attached to the converter, the sensor must be disconnected for a while to be recognized by the converter.

Date and time must be set!

The internal clock has lost its time, this happens after about one month when the converter is not connected to the mains.

No empty slots. Please empty one.

A new sensor has been identified, but there are no free slots. In the converter menu there is a sub-menu to empty slots. Only slots where the sensor is currently connected can be emptied.

This sensor can't reuse slot.

Some sensor types can't reuse a slot. If the new sensor shall replace an old one, note the settings for the old sensor, then empty the slot, and install the new one.

Faulty sensor data Contact KROHNE. Load default? Yes/No (Destroys all settings)

The sensor database is corrupt, there is a risk the sensor has lost important information. This shall never happen, please contact our service personnel if this message is shown. Do NOT load default values without first consulting us.

Relay X is used for alarm by transmitter on slot 1!

The chosen relay is used for alarm by sensor in slot 1. The converter has two relays, please consult your project documents.

Relay X is used by transmitter 1!

The chosen relay is used for another function by sensor in slot 1. The converter has two relays, please consult your project documents.

Transmitter on slot1 is using Channel 1!

The chosen 4...20 mA output is used by sensor in slot 1. The converter has two 4...20 mA outputs, please consult your project documents. Optional 4...20 mA module will give two more.

No transmitter measuring!

Calibration or another function has been aborted due to the sensor being lost. Maybe the sensor cable was disconnected.

Not possible, currently storing

Some functions can not be run while the converter is storing data in the sensor. Wait until the storing symbol in the main display disappears.

Not possible, currently cleaning

Some functions can not be run while the sensor is being cleaned. Wait until the cleaning symbol in the main display disappears.

6.2 Menus of the converter (overview)

Press ↑ + ← simultaneously for 5 seconds to enter the converter menu.

6.2.1 Menu "Setup"

Menu	Description
Language	English, German or Swedish.
Base unit	Metric or US, selects mm or inch, m ³ or Gallon, °C or °F (the latest can be overridden in the format menu below).
Date	Show and change current date.
Time	Show and change current time.
Contrast	The contrast is compensated for temperature effects but may have to be changed due to local lighting conditions or temperature.
Backlight	"Auto" / "On"; Selects if the backlight of the display shall switch of automatically eight minutes after last key was pressed (recommended), or be on all the time.
No.Slots	"Auto", "4", "2" or "1"; Selects how many slots shall be shown in the main menu. "1" shows only slot one, "2" shows slot one and two. "4" shows all four slots. Auto selects the lowest possible from 1, 2 and 4.
Alarm type	"Level" / "Confirmed"; Select if an alarm shall go away when the level is OK, or if it shall stay on until confirmed.
Formats	Press ← to go to the "Formats" sub menu.
Temp	°F or °C.
Date	YY-MM-DD, MM/DD/YY or DD-MM-YY
Time	HH:MM:SS or HH:MM
Exp.Module	Installed module type, press ← to set the node address if applicable.
Outputs	Press ← to go to the "Outputs" sub menu.
On fail	"Freeze" / "2 mA"; Selects what shall happen with the analog output signals if communication to a sensor is lost.
Out sig 1	4...20 mA or 20...4 mA
Out sig 2	4...20 mA or 20...4 mA
Out sig 3	4...20 mA or 20...4 mA (only with extra 4...20 mA module)
Out sig 4	4...20 mA or 20...4 mA (only with extra 4...20 mA module)
Integrate	"Normal" / "Smart"; Smart shortens the integration time when more than five consecutive samples are on the same side of the average to get faster response to large changes.
Serial log	"Off", "Slot 1 - Slot 4", "All" or "Slot1&2"; Selects a sensor to be logged using the serial RS232 interface. The protocol is clear text. This function is implemented for our service and may change in the future without notice.
Interv.min	0...999 minutes interval logging a value on the serial channel. Choosing 0 will give a log value every second.

6.2.2 Menu "System"

Menu	Description
Version	Program version, read only.
Serial	Circuit board S/N, read only.
Box temp	Internal box temperature, read only.
Exp.Module	Press ← to see the Fieldbus status sub menu.
Fieldbus	Yes or no, read only.
Installed	Yes or no, read only.
Hardwarefail	Yes or no, read only.
Initialised	Yes or no, read only.
Online	Yes or no, read only.
Software v.	Software version of the Profibus module, read only.
Out data	Last data sent to master, read only.
Err Cmd	Last error, read only
Err Cmd 1	Last error, read only
SW Reset	Restart the fieldbus module.
Test	Press ← to go to the system test sub menu.
Dig.in	Calibration curve selected by the digital inputs.
Relay1	"Off" / "On"; Be careful if something is connected to the relay. If the relay is configured for a function, it cannot be changed.
Relay2	"Off" / "On"; Be careful if something is connected to the relay. If the relay is configured for a function, it cannot be changed.
Analog 1 mA	Analog output 1, press ← to get 4/20 mA output.
Analog 2 mA	Analog output 2, press ← to get 4/20 mA output.
Analog 3 mA	Analog output 3 (only with extra 4...20 mA module).
Analog 4 mA	Analog output 4 (only with extra 4...20 mA module).
Panel LED	Green / Red.
Box heat	Off / On, read only.
Service	Locked service menu for internal use of manufacturer.

6.2.3 Menu "Empty slot"

Menu	Description
Slot 1	"Yes" / "No"; Clear slot 1 to be able to use it for new sensor.
Slot 2	"Yes" / "No"; Clear slot 2 to be able to use it for new sensor.
Slot 3	"Yes" / "No"; Clear slot 3 to be able to use it for new sensor.
Slot 4	"Yes" / "No"; Clear slot 4 to be able to use it for new sensor.
All	"Yes" / "No"; Clear all 4 slots, acknowledge each one.

6.3 Alarm limits

When a measured value goes above a high alarm limit or goes below a low alarm limit an alarm is triggered, and an alarm window is displayed on the converter telling what sensor and reason caused the alarm. If a second alarm occurs a second line is added in the window. When an alarm is active the panel LED will change from green to red, measurement will continue uninterrupted.

An alarm is acknowledged by pressing the \leftarrow button. If there is more than one alarm, they are acknowledged one at a time in chronological order.

Alarm is issued if the following is fulfilled

- An alarm limit (high, low or both) other than zero is set in the sensor "Scale"/"Alarm" menu.
- The sensor menu for this sensor is not active (alarms are blocked while the menu is open).
- The measured value has been OK since it passed the alarm limits last time.

It is not needed for an alarm relay to be configured to activate the internal alarm handling.

Alarm type

Alarms can be configured under "Settings" / "Alarm type" to automatically disappear when the signal level gets back within the limits or to stay on until it is acknowledged with the \leftarrow button. The level type is intended to be used to control an activity, e.g. a pump or dosing valve while the confirmed type is intended to inform the user about the alarm condition.

Alarm relays

The same relay is always used for high and low alarms from a sensor. One alarm relay can be used for one or more sensors. Once an alarm relay is triggered, it is not released until the last active alarm connected to this relay is acknowledged or the measured value returns to normal, depending on the selected alarm type.

7.1 Spare parts availability

The manufacturer adheres to the basic principle that functionally adequate spare parts for each device or each important accessory part will be kept available for a period of 3 years after delivery of the last production run for the device.

This regulation only applies to spare parts which are under normal operating conditions subjects to wear and tear.

7.2 Availability of services

The manufacturer offers a range of services to support the customer after expiration of the warranty. These include repair, technical support and training.



INFORMATION!

For more precise information, please contact your local representative.

7.3 Accessories

Accessories	Order code
Mounting post, 1700 mm height, incl. horizontal bar	XGA Z 08000
Mounting plate with sunshield for converter	XGA Z 08010

7.4 Returning the device to the manufacturer

7.4.1 Contact prior to returning of the device

**INFORMATION!**

Please contact your local representative prior to returning the device!

7.4.2 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.

**CAUTION!**

Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:

- *Due to statutory regulations on environmental protection and safeguarding the health and safety of our personnel, manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.*
- *This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.*

**CAUTION!**

If the device has been operated with toxic, caustic, flammable or water-endangering products, you are kindly requested:

- *to check and ensure, if necessary by rinsing or neutralizing, that all cavities are free from such dangerous substances,*
- *to enclose a certificate with the device confirming that is safe to handle and stating the product used.*

7.4.3 Form (for copying) to accompany a returned device

Company:		Address:	
Department:		Name:	
Tel. no.:		Fax no.:	
Manufacturer's order no. or serial no.:			
The device has been operated with the following medium:			
This medium is:	water-hazardous		
	toxic		
	caustic		
	flammable		
	We checked that all cavities in the device are free from such substances.		
	We have flushed out and neutralized all cavities in the device.		
We hereby confirm that there is no risk to persons or the environment through any residual media contained in the device when it is returned.			
Date:		Signature:	
Stamp:			

7.5 Disposal



CAUTION!

Disposal must be carried out in accordance with legislation applicable in your country.

8.1 Measuring principle

The converter is based on a 16-bit microprocessor. The internal software uses a real-time operating system, allowing multiple tasks to be carried out in "parallel". One process takes care of the display and the dialogs, one process is dedicated to handle each attached sensor, and one task is taking care of all the housekeeping.

After power up, the software will initialize the functionality and data structures, reading information from a non-volatile memory. A welcome message is displayed for about ten seconds, showing the software version and serial number of the converter. The unit will then start looking for sensors it already knows, and if found initialize them to start measuring. Twice a minute the unit looks for unknown sensors. If one is found, the converter will find out the type and serial number and open up a dialog box to let the operator select what slot to use for the new sensor.

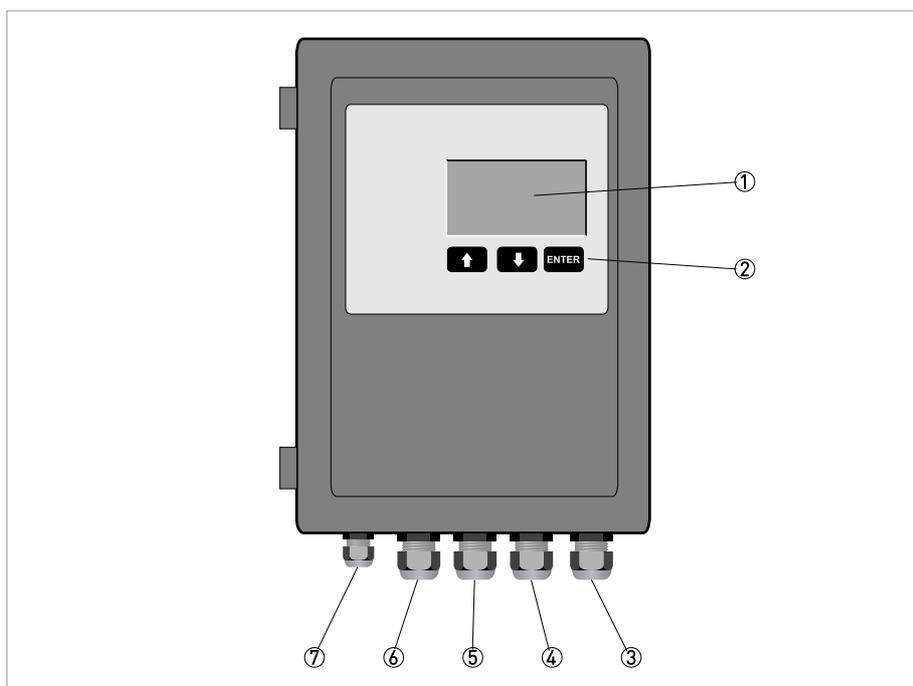


Figure 8-1: Description of the converter

- ① Display
- ② Operation keys
- ③ Power supply
- ④ Relays
- ⑤ 4...20 mA outputs
- ⑥ Digital inputs
- ⑦ One sensor or 2...4 sensors with a junction box

8.2 Technical data



INFORMATION!

- The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local representative.
- Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Download Center).

Measuring system

Measuring principle	Digital multiparameter converter for connection of up to four sensors. The converter is controlled by a 16 bit microprocessor and the communication to the sensor is realised via RS485.
Field of application	Monitoring and control of waste water treatment processes.

Design

Construction	A typical measuring system consists of: <ul style="list-style-type: none"> • MAC 080 multiparameter converter • 1 (or up to 4) OPTISENS 2000 sensors • Solenoid valves for flushing • MAA 2000 mounting assemblies
Option	Mounting plate and mounting post
Display and user interface	
Graphic display	Illuminated LC display Size: 64 x 128 pixels, corresponds to 70 x 40 mm = 2.76" x 1.57"
Operating elements	Three button membrane keypad
Language of display texts	English, German, Swedish
Units	Metric and US units selectable

Measuring error

Measuring error	For detailed information refer to technical data for the relevant sensor.
Display resolution	Suspended solids: no decimal place (0.1 in extended mode)
	DO: 0.1 (or 0.01 in extended mode)
	pH: 0.1 pH (or 0.01 pH in extended mode)
	ORP: no decimal place
	Temperature: 0.1°C / 0.1°F

Operating conditions

Ambient temperature	-20...+50°C / -4...+122°F
Process temperature	-20...+50°C / -4...+122°F
Storage temperature	0...+60°C / +32...+140°F
Process pressure	Atmosphere
Other conditions	
Protection category	IP65 (Nema 4X)

Installation conditions

Installation	Wall or handrail mountable (using optional available mounting plate)
Dimensions and weights	For detailed information refer to "Dimensions and weights".

Materials

Enclosure	Polycarbonate
Cable feedthrough	Nickel plated brass; inserts: polyamid
Solenoid valve (wetted parts)	Enclosure: brass
	Internal parts: Stainless Steel
	Gaskets: EPDM

Electrical connections

Power supply	85...250 VAC; 50/60 Hz
Power consumption	20 W (0.18 A at 110 V)
Fuse	3.15 A slow 250 V, 4 x 20 mm
Connection cable	5-pin M12 contact; fixed on sensor side, shielded; 10 m / 33 ft long
Cable feedthrough	Standard: M20 x 1.5 (IP68 rated)
	Option: ½" NPT adapter

Inputs and outputs

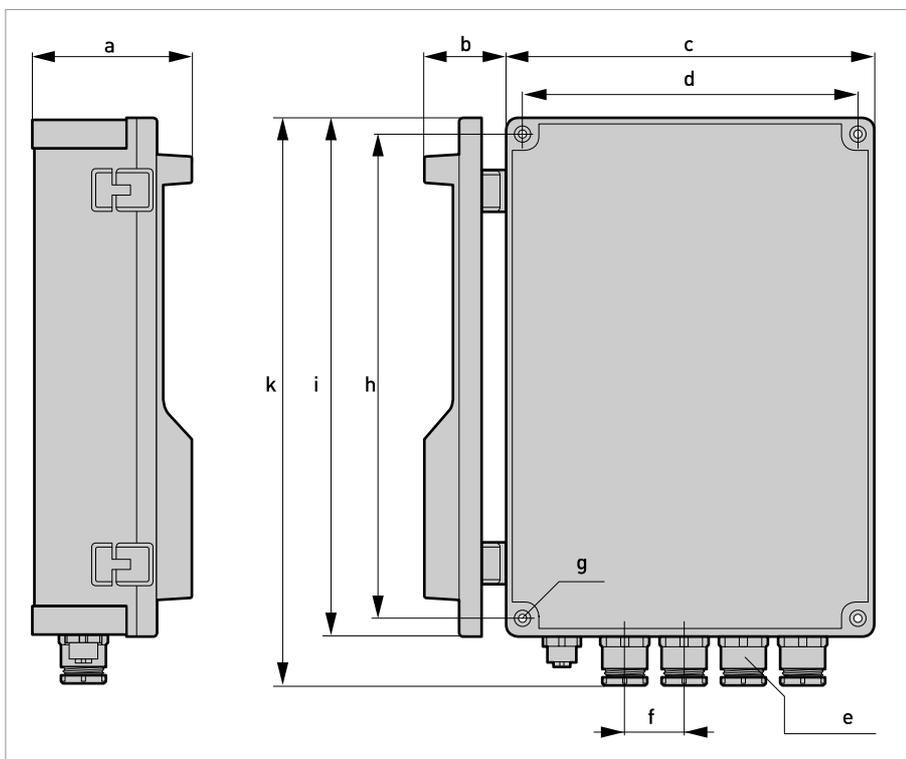
Sensor inputs (up to four)	Digital communication RS485
	One direct sensor input via M12 plug
	2...4 via external junction box (option)
	Cable length: 10 m / 33 ft (max. 100 m / 328 ft)
Digital inputs	3 digital inputs (for selection of different calibration curves)
Analog outputs	Two 4...20 mA outputs, (extendable to four via expansion module)
	Galvanic isolated
	Load: 450 Ω
Relay outputs	2 relays
	Dry contacts, normally open
	Max. 250 VAC, max. 12 A
Serial interface	RS232 "log line" to PC (mainly used for service)
	19200 Baud, 8 bits, 1 stop bit, no parity, no flow control
	Using simple ASCII protocol described in the manual.
Profibus (option)	Profibus DP-V0 (slave) module

Module for 2 additional outputs (option)	Only one optional module can be installed. Either the 2 additional outputs module or the Profibus DP module.
	Functions: to extend the converter analog outputs to a total of 4.
	Design: PCB only, will be installed inside of the converter box.
	Ambient temperature: -20...+50°C / -4...+122°F, if installed in a operational converter
	Storage temperature: 0...+60°C / +32...+140°F
	Dimensions: 86 x 54 mm / 3.39" x 2.13"
	Weight: 35 g / 1.23 oz
	Output signals
	Two 4...20 mA outputs
	Galvanic isolated
	Load: 450 Ω
Profibus DP module (option)	Only one optional module can be installed. Either the 2 additional outputs module or the Profibus DP module.
	Functions: for connection of converter to a Profibus network as a slave and to enable connection of four sensors.
	Interface type: DP-V0 slave communication according to EN 50170 (DIN 19245, IEC 61158), protocol version 1.10
	Design: PCB only, will be installed inside of the converter box.
	Ambient temperature: -20...+50°C / -4...+122°F, if installed in a operational converter
	Storage temperature: 0...+70°C / +32...+158°F
	Dimensions: 86 x 54 mm / 3.39" x 2.13"
	Power: +5 V, max. 350 mA
	Output: RS485 optically isolated Profibus interface with DC/DC converter on board; Automatic baudrate detection (96000 bit/s...12 Mbit/s)
	Physical interface
	Transmission media: Profibus bus line, type A or B specified in EN 50170
	Topology: Master-Slave communication
	Profibus connectors: screw terminal
	Cable: shielded copper cable, twisted pair
	Isolation: the bus is galvanically separated from the other electronics with an on board DC/DC converter. Bus signals (A-line and B-line) are isolated via optocouplers.
	Configuration and indications
	Address range: 1...99 using switches on the module or 1...126 via converter menus
Bus termination: switch inboard	
LED indications: ON-line, OFF-line, Profibus related diagnostic	

Approvals

Approvals	
CE	This device fulfils the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE marking.
EMC	Electromagnetic compatibility (EMC) in accordance with:
	EN 61000-6-4:2001 Emission standard for industrial environments EN 61000-6-2:2001 Immunity for industrial environments
Low Voltage Directive	Safety requirements for electrical equipment for measurement, control, and laboratory use in accordance with EN 61010-1:2001

8.3 Dimensions & weights



	Dimensions		Weights	
	[mm]	[inches]	[kg]	[lbs]
a	78	3.07	1.3	2.8
b	40	1.57		
c	180	7.09		
d	164	6.46		
e	M20 cable feedthrough (NPT adapter optional)			
f	29	1.14		
g	4.3	Ø0.17		
h	239	9.41		
i	255	10.04		
k	279	10.98		

9.1 Description of additional analog outputs

9.1.1 Device description

The optional converter expansion module (2 extra analog outputs) is used to expand the converter with two 4...20 mA loops. It is assumed that the user is familiar with the MAC 080 and 4...20 mA technology.

The module has two active 4...20 mA outputs. The module is connected to the converter via a 34 pin connector, and fixed with three M2.5 screws.

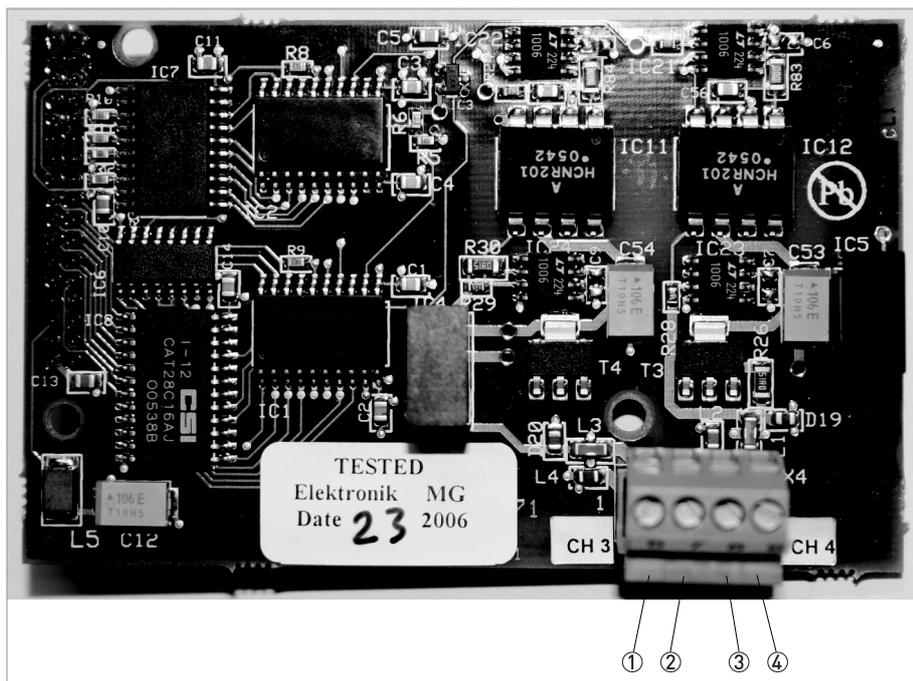


Figure 9-1: Expansion module for two additional analog outputs

- ① Terminal 6: 4...20 mA Channel 3 (-)
- ② Terminal 7: 4...20 mA Channel 3 (+)
- ③ Terminal 8: 4...20 mA Channel 4 (-)
- ④ Terminal 9: 4...20 mA Channel 4 (+)

9.1.2 Mounting the expansion module

If the converter is ordered with 4 current outputs, the expansion module is already pre-mounted inside the converter. If this option is ordered separately, the module shall be mounted inside the converter following the instructions below.



DANGER!

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!



CAUTION!

Connect yourself and the converter chassis to protective ground before opening the antistatic package of the module!

This will avoid static discharges that can damage the module or the box.



How to get started:

- Make sure the converter to be used is switched off.
- Open the front and locate the expansion module connector.
- Connect yourself and the converter chassis to protective ground before opening the antistatic package of the module.
- Mount the module into the box, be careful to fit all 34 pins into the socket.
- Fasten the three M2.5x5 screws.
- Connect the 4...20 mA loops to the screw terminals according to the table below.
- Switch on the power to the converter and check that the module identifies itself in the converter menu.
- ➔ When correctly mounted, the module will identify itself as "4-20mA" in the converter start-up display and under "Exp.module" in the converter "Settings" menu.
- Configure the sensor(s) that shall use channels 3 and 4 via the sensor menus.

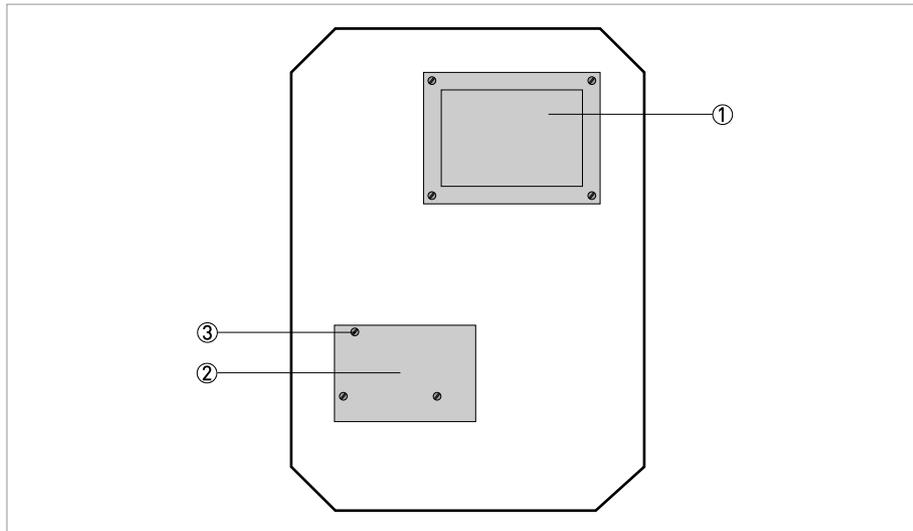


Figure 9-2: Mounting the module in the converter

- ① Display
- ② Expansion module
- ③ M2.5 screw

Connection of the 4...20 mA loops

Terminal	Name	Function
6	Ch3 -	Channel 3 return
7	Ch3 +	Channel 3 positive
8	Ch4 -	Channel 4 return
9	Ch4 +	Channel 4 positive

9.2 Description of additional Profibus DP expansion module

9.2.1 Device description

The optional Profibus DP expansion module is used to connect the converter unit to a Profibus network as a slave. The user is assumed to be familiar with Profibus and the Profibus configuration of the master.

The module for Profibus DP is a slave node that can be read and written to, from a Profibus DP master. The module will not initiate communication to other nodes, it will only respond to incoming commands. The module is connected to the converter via a 34 pin connector.

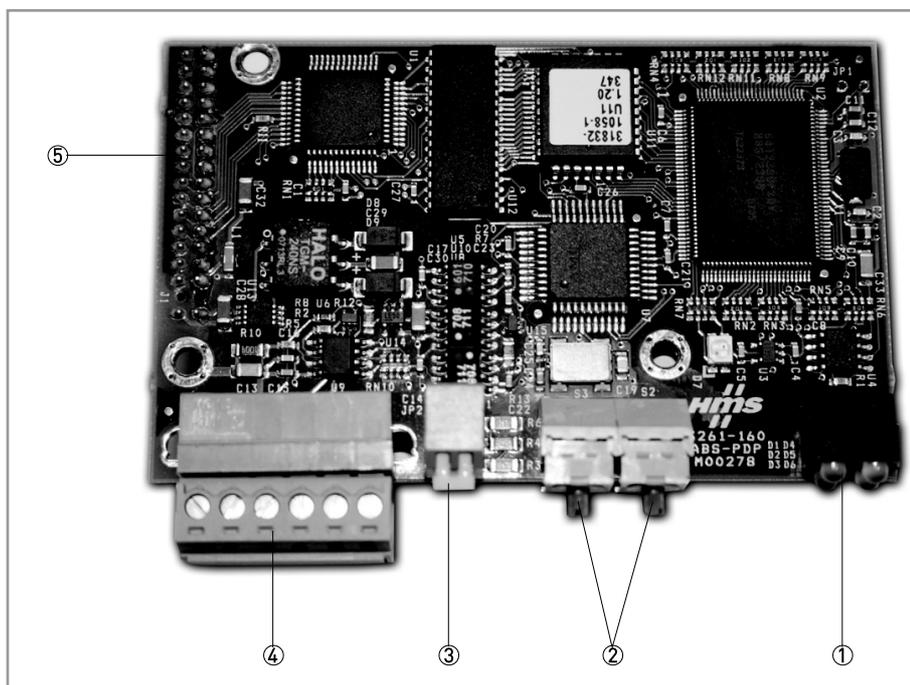


Figure 9-3: Expansion module for Profibus DP

- ① LED indicators
- ② Address switches
- ③ Termination switch
- ④ Profibus DP interface
- ⑤ Application connector

9.2.2 Introduction

Profibus has an international user organisation called Profibus International (PI) and local national organisations (PNO). Technical questions regarding the Profibus should be addressed to your local Profibus User Group in the first instance. Address list is available on the Profibus Internet site www.Profibus.com. For general help on Profibus, contact Profibus International on e-mail: Profibus_international@compuserve.com.

Profibus DP is normally used in industrial automation, to transfer fast data for motor controllers, MMI, I/O units and other industrial equipment.

Network Overview

The media for the bus is a shielded copper cable consisting of a twisted pair. The baudrate for the bus is between 9.6 kbaud to max. 12 Mbaud. The Profibus DP network is able to carry 126 nodes and the total amount of data for a Profibus DP node is 244 Byte out and 244 Byte in.

The figure below gives an overview of a Profibus DP network.



INFORMATION!

Node No. 126 is only used for commissioning purposes and should not be used to exchange user data.

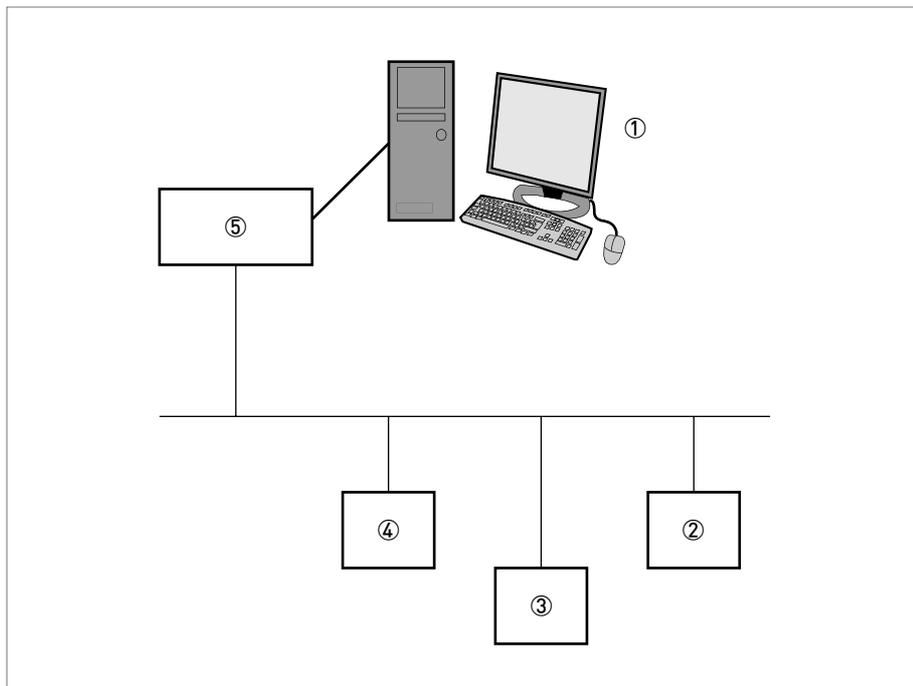


Figure 9-4: Example of a Profibus DP network

- ① PC with configuration software
- ② Profibus DP slave node n
- ③ Profibus DP slave node 2
- ④ Profibus DP slave node 1
- ⑤ Profibus DP master

9.2.3 Mounting the expansion module

If the converter is ordered with Profibus option included, the Profibus DP expansion module is already pre-mounted inside the converter. If this option is ordered separately, the module shall be mounted inside the converter following the instructions below.

**DANGER!**

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

**CAUTION!**

Connect yourself and the converter chassis to protective ground before opening the antistatic package of the module!

This will avoid static discharges that can damage the module or the box.

**How to get started:**

- Make sure the converter to be used is switched off.
- Open the front and locate the bus module connector.
- Connect yourself and the converter chassis to protective ground before opening the antistatic package of the module.
- Mount the module into the box, be careful to fit all 34 pins into the socket.
- Fasten the three M2.5x5 screws.
- Set the rotary switches to the desired node address, or to "0 0" if you want to configure the address in the converter menu "Settings / Profibus".
- Set the bus termination switch in position "On" if this is the last unit on the bus, else set it to "Off".
- Connect the Profibus network to the screw terminals according to the table below.
- Switch on the power to the converter box and check that the green led on the module starts flashing.
- If you have not set the address switches on the module you must set the node address in the converter menu "Settings / Profibus", exit the menu and then switch the power off at least 10 seconds before it is switched on again.
- Check in the converter menu "System / Profibus" that the module is found and initiated.
- Configure the master system (PC, PLC or DCS) to communicate with the converter at the selected node address using the data structure described in the following chapter.
- When the communication starts working the red LEDs in the lower right corner of the module will go dark, and the green LED will light up.
- In the converter menu "System / Profibus", "Online" will shift to "Yes". Now the Profibus communication should be working.

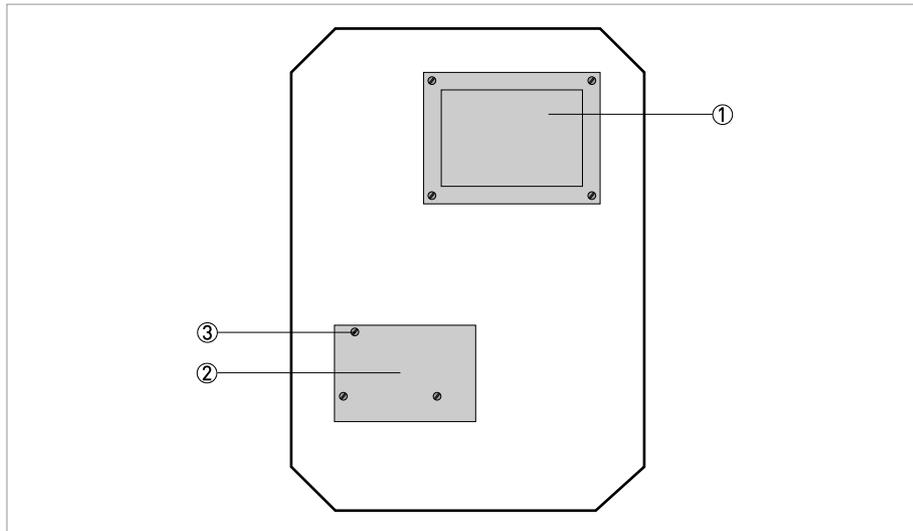


Figure 9-5: Mounting the module in the converter

- ① Display
- ② Expansion module
- ③ M2.5 screw

Connection of the Profibus network

Terminal	Name	Function
1	+5 V BUS	Isolated +5 V from RS485 side ①
2	GND BUS	Isolated GND from RS485 side ①
3	A-Line	Negative RxD/TxD according to RS485 specification (green)
4	B-Line	Positive RxD/TxD according to RS485 specification (red)
5	Shield	Bus cable shield, connected to PE
6	RTS	Request to send ①

① notes optional signals

9.2.4 Baudrate

The baudrate on a Profibus DP network is set during configuration of the master and only one baudrate is possible in a Profibus DP installation. The Profibus DP module has an auto baudrate detection function and the user does not have to configure the baudrate on the module.

Baudrates supported by the Profibus DP module are:

- 9.6 kbit/s
- 19.2 kbit/s
- 93.75 kbit/s
- 187.5 kbit/s
- 500 kbit/s
- 1.5 Mbit/s
- 3 Mbit/s
- 6 Mbit/s
- 12 Mbit/s

9.2.5 Termination of DP network

The end nodes in a Profibus DP network has to be terminated to avoid reflections on the bus line. The Profibus DP module is equipped with a termination switch to accomplish this in an easy way. If the module is used as the first or last module in a network the termination switch has to be in ON position. Otherwise the switch has to be in OFF position.



INFORMATION!

If an external termination connector is used the switch must be in OFF position.

Termination switch ON	Bus termination enabled. If the module is the last or first module, the bus termination has to be set on.
Termination switch OFF	Bus termination disabled.

9.2.6 Node address

The Profibus DP node address has to be set in the field. This can be done in two ways:

- Two rotary switches on module can be set for 1...99.
- Setting the switches to 00 tells the module to use the address configured in the converter menu. It can be set from 1...125. To set up address you go into the converter menu by pressing ENTER and ↑ for 5 seconds together. Then go down to "Setup" and press ENTER. Scroll down to "EXP. Module" and press ENTER. Screen will say "NODE ADDRESS 002". Change address between 2...125 and then press ENTER to exit (The reason to start with no 002 is that the main control system normally is addressed as 001).

Do not forget to terminate box if this is the first or last item in loop as shown above.



INFORMATION!

The node address is not changed just by adjusting the settings. The converter must be turned off for 10 seconds and then powered up for address to be recognized.

9.2.7 GSD file

Each device on a Profibus DP network is associated with a GSD file, containing all necessary information about the device. This file is used by the network configuration program during configuration of the network. The latest version of GSD file can be received by contacting us.

9.2.8 Data structure

The data to and from the converter is structured as described in the table below. Total length for input data is 84 bytes and for output data 4 bytes. We use "Big Endian".

In/Out	Type	Length	Name	Content	
In	57	16 byte	Id	Four bytes ID for each sensor. First byte (U8) is sensor type (which is also the first part of the serial number), second byte (U8) is middle part of serial number, the two last bytes (U16) is the second part of the serial number.	
In	51	4 byte	Status	One status byte per sensor slot.	
				Bit 0	Online, sensor is connected and measures.
				Bit 1	Online, the sensor is flushing or brushing.
				Bit 2	Frozen, the sensor value is frozen after cleaning.
				Bit 3	Alarm, the sensor has triggered a local alarm in the converter.
				Bit 4	Currently not used.
				Bit 5	Currently not used.
				Bit 6	Currently not used.
In	40.5F	64 byte	Value	Four IEEE float values per sensor slot. First value is the sensor output value, the rest is sensor dependant.	
				Out	61

9.2.9 Indications

The module is equipped with four LEDs mounted at the front and one LED on the board, used for debugging purposes. The front LEDs can be mounted in two ways, either top mounted or angle mounted. The function of the LEDs are described in the table and figure below.

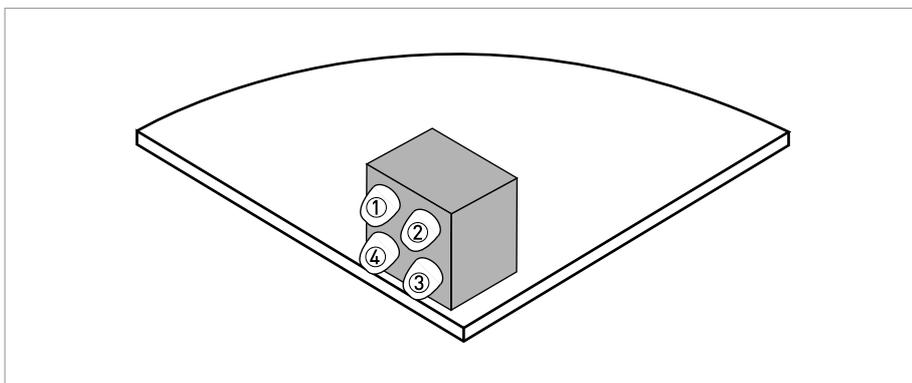


Figure 9-6: Indications

- ① Not used
- ② Green
- ③ Red
- ④ Red

Indications

No	Indication	Description
①	Not used	-
②	Green	Indicates that the module is On-Line on the bus. Green: Module is On-Line and data exchange is possible. Turned Off: Module is not On-Line.
③	Red	Indicates that the module is Off-Line on the bus. Red: Module is Off-Line and no data exchange is possible. Turned Off: Module is not Off-Line.
④	Red	Bus diagnostics, indicates certain faults on the bus side. Flashing Red 1 Hz: Error in configuration: IN and/or OUT length set during initialisation of the module is not equal to the length set during configuration of the network. Flashing Red 2 Hz: Error in User Parameter data: The length/contents of the User Parameter data set during initialisation of the module is not equal to the length/contents set during configuration of the network. Flashing Red 4 Hz: Error in initialisation of the Profibus communication ASIC. Turned Off: No diagnostics present



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