OPTISENS MAC 080 Technical Datasheet

Digital multiparameter converter

- Simultaneous measurement and control of up to four parameters in waste water treatment processes
- Supports the full range of OPTISENS 2000 sensors with automated self cleaning
- "Plug and play" installation, easy calibration, networking capability and highest reliability due to the digital technology

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

KROHNE

1.1 The high-end multiparameter converter

The **OPTISENS MAC 080** multiparameter converter allows a reliable and precise measurement of up to four parameters for waste water and sludge applications.

Suitable for the complete range of **OPTISENS 2000 sensors** and fitted with the newest digital technology, a large, illuminated graphic display, build-in heater and up to four measuring channels, this converter is the perfect choice for all measuring applications in industrial and municipal waster water treatment facilities.

The rugged design and automated cleaning features of the stainless steel sensors result in the highest reliability for operation in harsh environments.

Last but not least, the compact device can be easily installed and operated with optimal cost of ownership.

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

Highlights

- Support of the complete OPTISENS 2000 sensor series with automated cleaning function
- Up to four measuring channels
- Digital technology for highest reliability and "Plug & play" installation
- Rugged design and built-in heater for installations in harsh environments
- User friendly operation with only three membrane keys and large graphic display
- Two relays free programmable
- Field upgradeable software
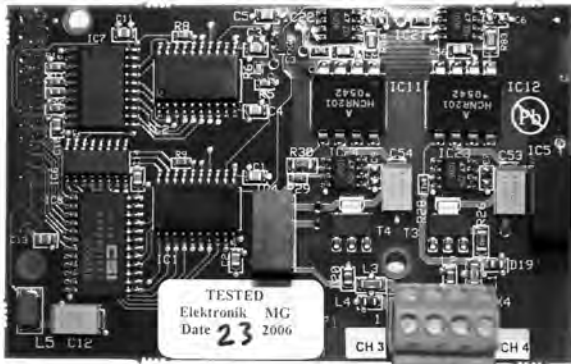- Optional Profibus DP Modul

Industries

- Municipal and industrial waste water treatment facilities
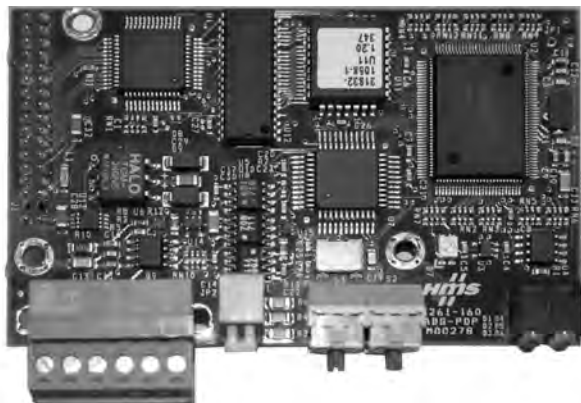- Water monitoring stations

Application

- Monitoring and control of waste water treatment processes

1.2 Options and versions

Expansion module and Profibus DP module

(Expansion module for two add. analog outputs)

(Profibus DP module)

The converter in standard configuration is suitable for the connection of up to two sensors.

An expansion module for two additional analog outputs or a Profibus DP module for transmission of up to four measuring channels are available optional.

Please note: only one expansion module can be mounted, either the extra two mA modules or the Profibus DP module!

Other options:
• Solenoid valves for automated spray cleaning of the sensor (available in 230 V or 117 V)
• Y-splitter for the connection of more than one sensor to the flushing valve
  (Please note: one valve can supply max. 2 sensors!)
• Junction box for connection of up to four sensor

Accessories
• Mounting plate with sunshield for the mounting of converter, solenoid valves and junction box
• Mounting post, if installation on handrail is not possible

For more details regarding the options and accessories please refer to the order code at the end of this data sheet.

Sensor series

(OPTISENS AAS 2000 sensor)

The converter can be used with four different sensors measuring suspended solids, dissolved oxygen (DO), pH and ORP values.

All sensors are equipped with integrated flush nozzles for automated spray cleaning and enclosed in an extremely robust stainless steel body with streamline design and large outer diameter to minimize ragging.

The sensors can either be fitted onto a flexible telescopic rod for immersion into basins or mounted onto a slide rail for installation on side walls. For more information please refer to the respective technical data sheets.

1.3 Combination of sensor / converter / mounting assembly

	MAC 080 converter	MAA 2000 telescopic rod	MAA 2000 slide rail
PAS 2000 pH	x	-	x
PAS 2000 ORP	x	-	x
OAS 2000 (submersible)	x	x	x
OAS 2000 (in-line)	x	-	-
AAS 2000	x	x	x

1.4 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.

2.1 Technical data

- *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 (Downloadcenter).*

Measuring system

Measuring principle	Digital multiparameter converter for connection of up to four sensors. The converter is controlled by a 16 bit micropocessor 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: • 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

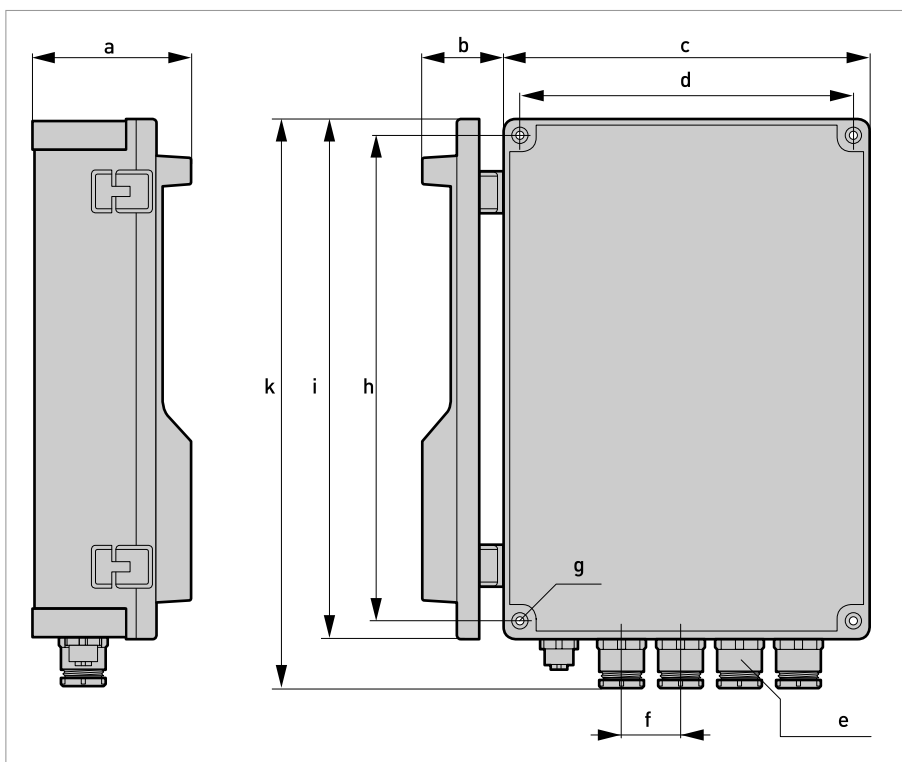| Power supply	85…250 VAC; 50/60 Hz
Power consumption	20 W (0.18 A at 110 V)
Fuse	3.15 A slow 250 V, 4 x 20 mm
Connection cable	5-pin M12 contact; fixed on sensor side, shielded; 10 m / 33 ft long
Cable feedthrough	Standard: M20 x 1.5 (IP68 rated)
	Option: ½" NPT adapter

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

2.2 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		

3.1 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.

3.2 Notes on installation

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

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

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.

3.3 Storage

• Store the device in a dry, dust-free location.
• Avoid continuous direct sunlight.
• Store the device in its original packing.
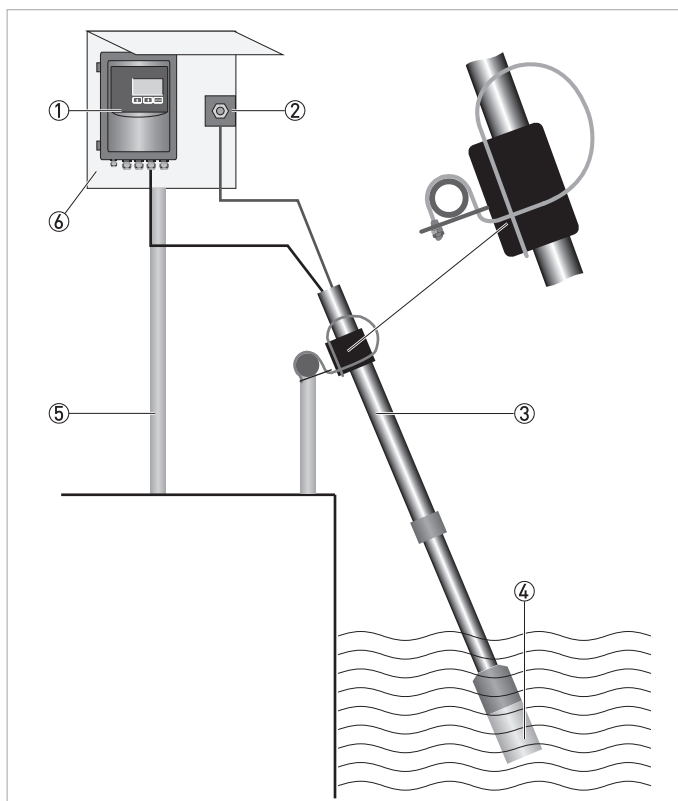
3.4 Configuration of a measuring point

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 available solenoid valve is necessary as well.

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

3.4.1 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
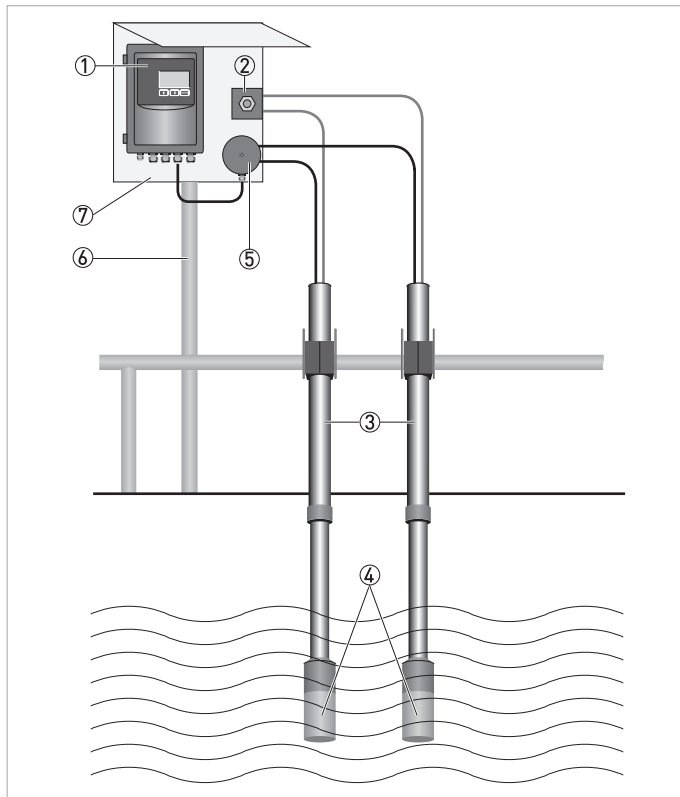⑥ Mounting plate with sunshield

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 sunshield and the mounting post are available optional.
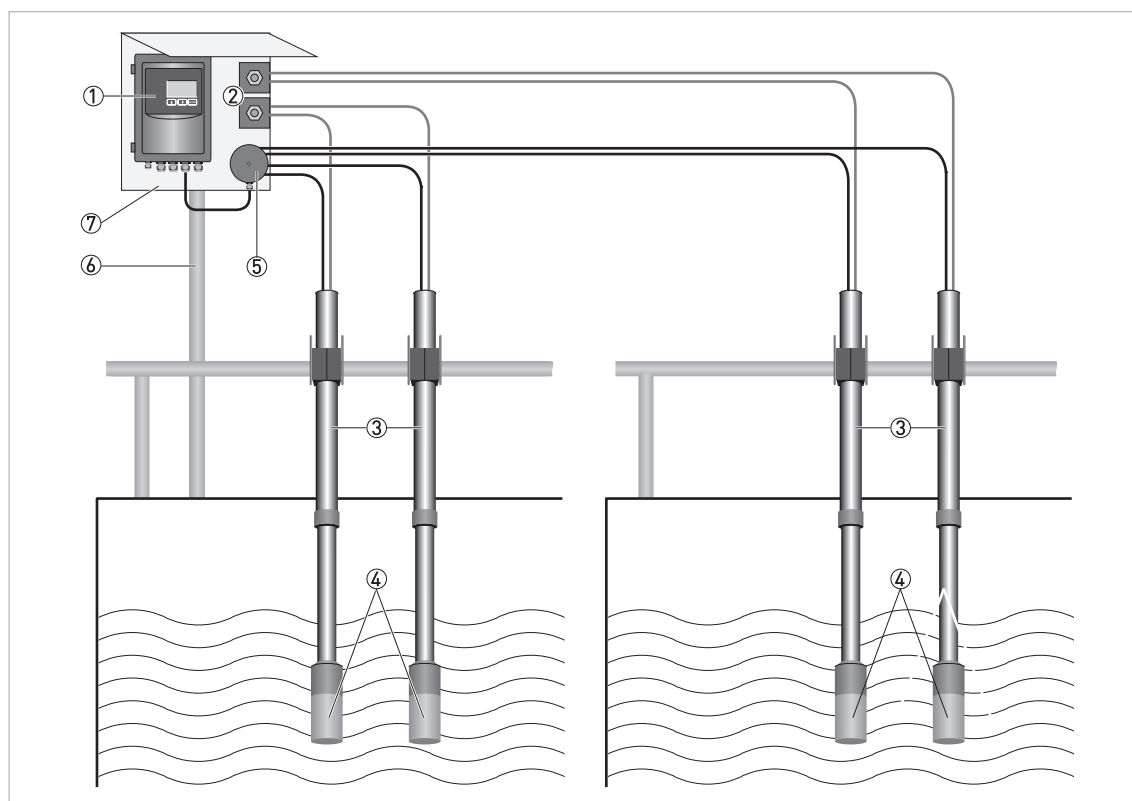
3.4.2 Two parameter measuring point

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 sunshield

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 available Y-splitter.

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

3.4.3 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 sunshield

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 available Y-splitter.

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

3.5 Installation order

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

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).

3.6 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 10).

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

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

Observe the national regulations for electrical installations!

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

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.

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.

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.
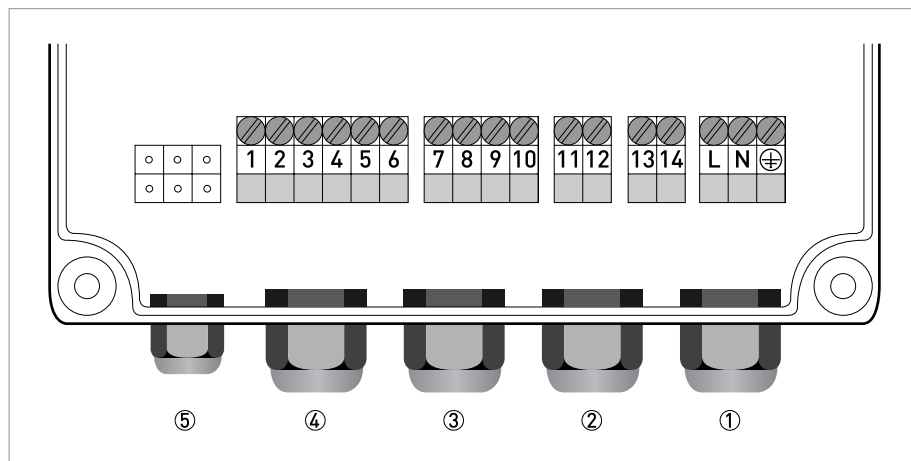

Figure 4-1: Terminals

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 mm^2) 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 mm^2) 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

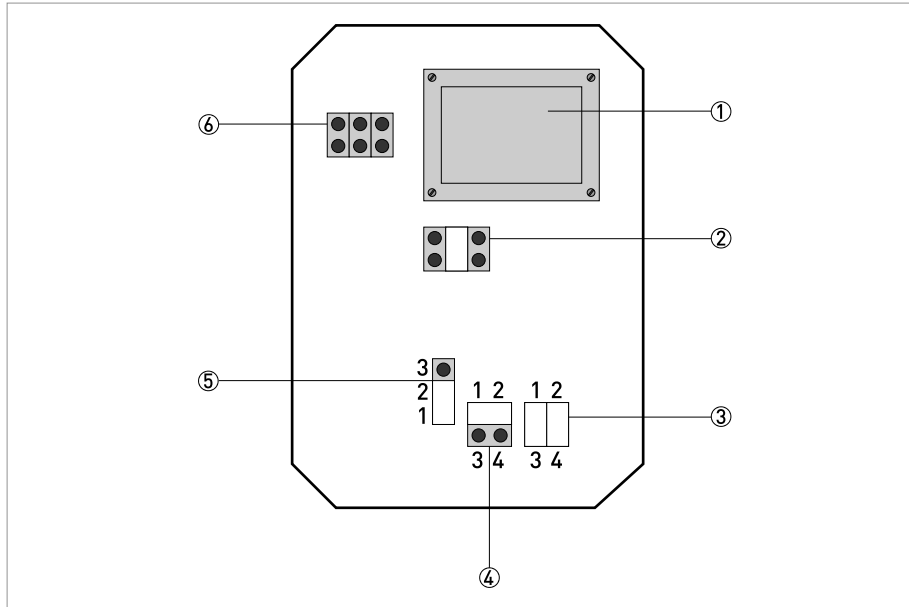The converter has four jumpers to configure the board.

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)

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.

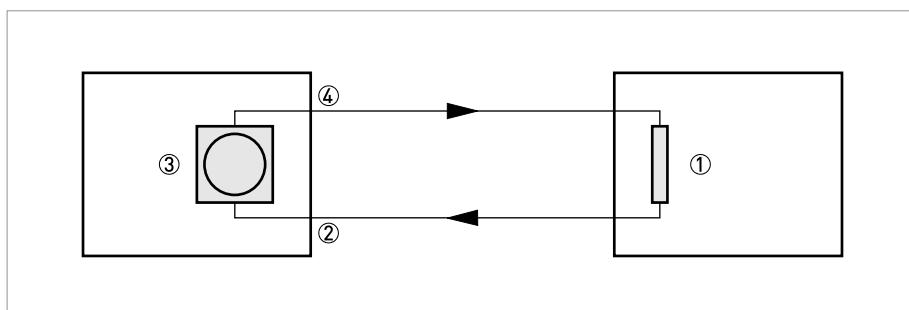| Analog output channel 2	Position JP1	Position JP7
Active, sourcing (default)	1-3 and 2-4	1-2
Passive, sinking	1-2 and 3-4	3-4

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

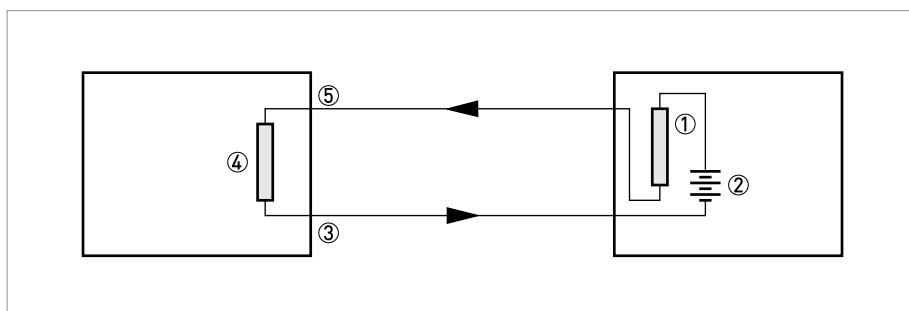**Figure 4-4: Passive analog output (channel 2 only)**

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.

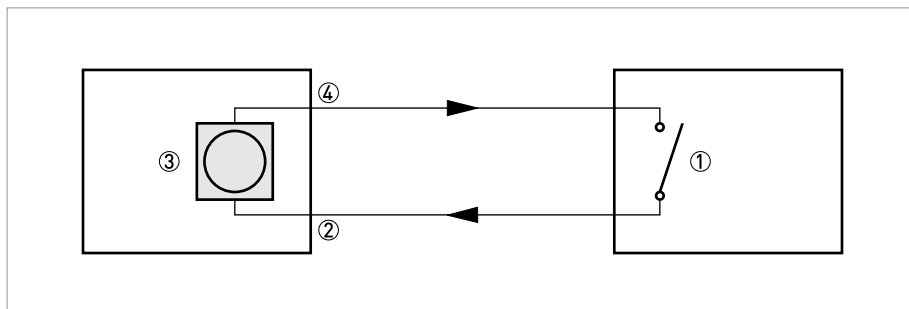| Digital inputs	Position JP2
Active, internal 24 VDC (default)	1-2
Passive, external 24 VDC	2-3

Figure 4-5: Active digital input

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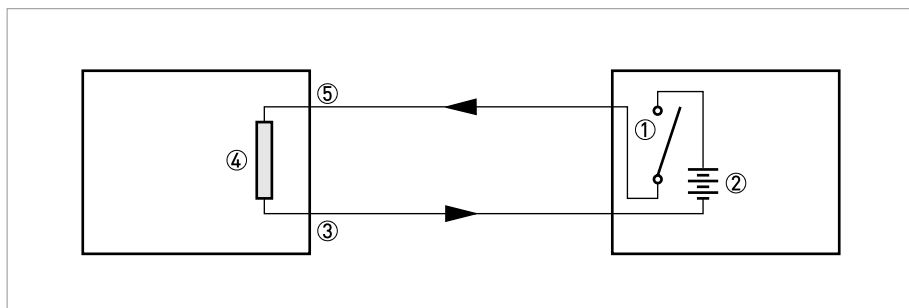③ Converter active internal 24 VDC
④ Converter terminal 5

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

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

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.
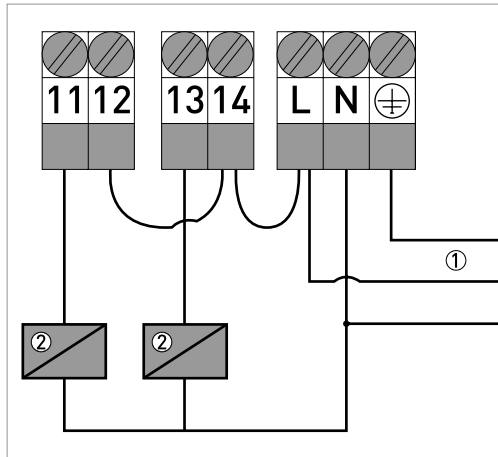

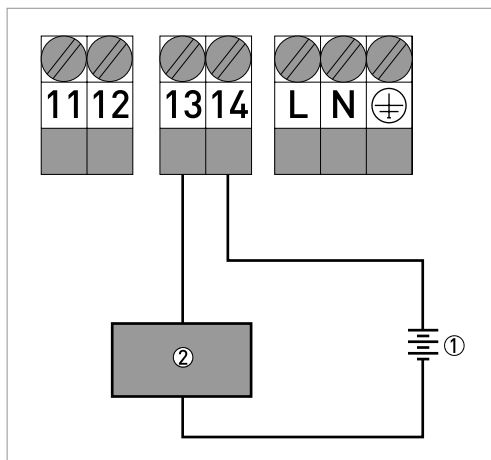Figure 4-7: Connection of 230 VAC flushing relay using AC mains
① 230 VAC
② Flushing relay

Figure 4-8: Connection of 24 VDC alarm device
① e.g. 24 VDC
② Alarm device

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 vales 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.

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".
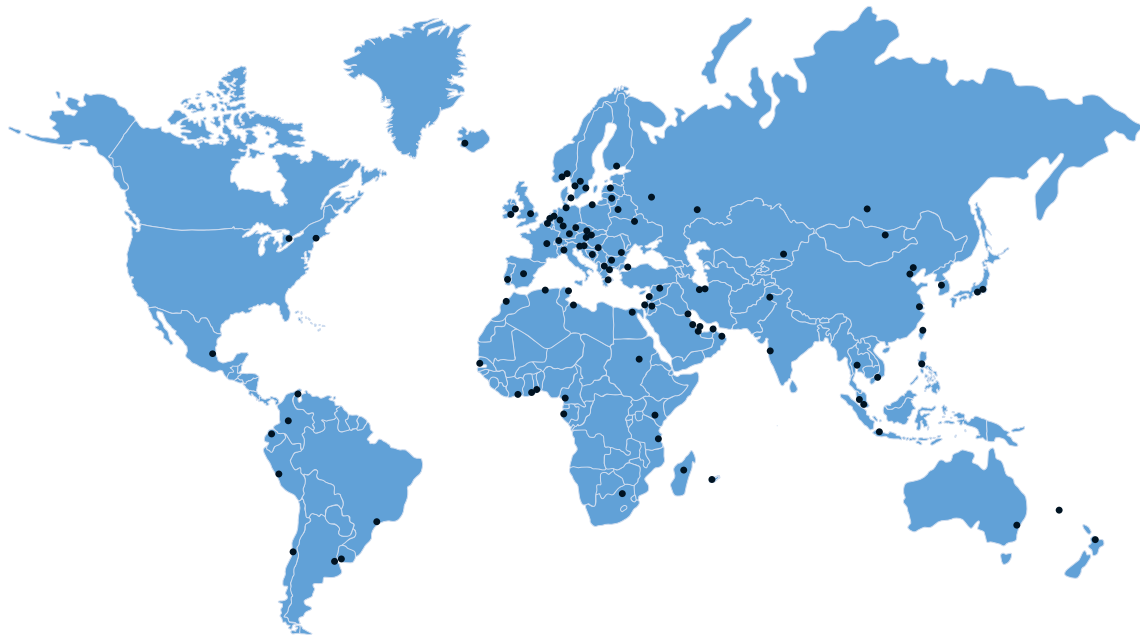
5.1 Order code

The characters of the order code highlighted in light grey describe the standard.

Type / housing converter										
0	None									
A	OPTISENS MAC 080 W									
	Sensor input									
	0	None								
	A	1 x OPTISENS 2000 sensor								
	B	2...4 x OPTISENS 2000 sensor incl. junction box								
		Signal output								
		0	None							
		2	2 x 0/4...20 mA							
		4	4 x 0/4...20 mA							
		A	Profibus DP, 2 x 0/4..20 mA							
			Relais							
			0	None						
			2	2 x freely programmable						
				Language						
				0	None					
				1	English and German					
					Approvals					
					0	None				
						Power supply				
						0	None			
						A	85...250 VAC, no cleaning valve			
						B	85...250 VAC, 230 V cleaning valve			
						C	85...250 VAC, 115 V cleaning valve, NPT adapter			
							Options			
							0	None		
							A	1 cleaning valve (1 sensor)		
							B	1 cleaning valve, 1 splitter (2 sensors)		
							C	2 cleaning valves (2 sensors)		
							D	2 cleaning valves, 1 splitter (3 sensors)		
							E	2 cleaning valves, 2 splitter (4 sensors)		
								Documentation		
								0	None	
								1	English	
								2	German	
VGA T	4								Order code	

5.2 Accessories

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

KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Measuring systems for the oil and gas industry
- Measuring systems for sea-going tankers

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