



## OPTISENS OAM 2080 Technical Datasheet

Sludge blanket measuring system

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

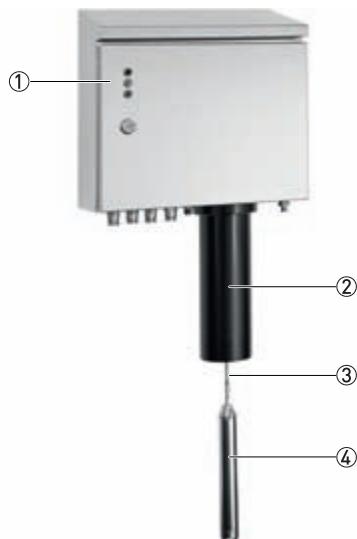
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## 1.1 Reliable sludge blanket measurement via optical sensor

The **OPTISENS OAM 2080** sludge blanket measuring system allows accurate and reliable measurement of the blanket depth and the fluff zone (separation zone) in primary and secondary clarifiers or sludge thickeners. It consists of the **OPTISENS OAM 2080** main unit and a **OPTISENS MAC 080** multiparameter converter which is part of the standard scope of delivery. With an optional expansion module for the **OPTISENS MAC 080** converter the meter can also generate a sludge profile.

The stationary measuring system detects the blanket by means of an optical suspended solids sensor. This sensor travels through the media until it finds the preset sludge concentrations. The system can be preset to two different concentrations. That makes it possible to detect the height of the sludge blanket and the interface zone simultaneously.

The **OPTISENS OAM 2080** has a robust stainless steel enclosure. In conjunction with the built-in heater and the automatic flushing of sensor and cable it is perfectly suited for installations in the harsh environment of a waste water treatment plant.



- ① Stainless steel device enclosure
- ② Flushing tube ("home position" of the sensor)
- ③ Cable (11 m / 36.1 ft)
- ④ Suspended solids sensor

## Highlights

- Direct measurement of consistency via optical suspended solids sensor
- Pre-calibrated sensor
- Low maintenance due to automatic flushing of sensor and cable
- Measures sludge blanket and fluff zone (separation layer)
- IP55 enclosure and built-in heater for outdoor installations
- Digital sensor technology: reliable signal transmission, self-recognition of sensor
- Complete system with multiparameter converter **OPTISENS MAC 080**, all mounting accessories included

## Industry

- Waste water

## Applications

- Measurement of sludge blanket and fluff zone in primary and secondary clarifiers or sludge thickeners
- Monitoring of sedimentation process
- Automation of sludge extraction
- Early warning of sludge washout

## 1.2 Design and option

### Unique measuring principle



(Sensor close-up)

Contrary to the widely used ultra sonic level measurement, the OPTISENS OAM 2080 uses an optical sensor which is immersed into the media. Thus it can measure the suspended solids concentration in different heights.

The measurement of the suspended solids concentration is based on the unique method of the transmission of light through liquids. This measuring principle utilizes the suspended particles ability to absorb and reflect NIR (Near Infra-red) light.

The optical measurement provides accurate results independent of the sludge colour. Misreadings due to echo reflections on walls or separation zones as well as damping of the signal due to fluff or floating sludge are impossible.

### Reliable signal transmission



(Axel board and signal transmission)

The digital signals produced by the sensor are transmitted via a reliable optical transmission system without any contact problems or wear and tear of mechanical parts.

The power supply of the sensor is realized in an equally reliable manner via an inductive coupling.

### Easy to install, everything included



(Device on stand)

The manufacturer delivers the OPTISENS OAM 2080 including all mounting accessories for an installation on handrails of clarifiers and rake bridges. There is no need to drill any holes.

In conjunction with the self recognition of the pre-calibrated sensor and the easy to use software, the installation of the OPTISENS OAM 2080 is done in less than 30 minutes.

### Profile measurement

As an option the OAM 2080 is able to generate a continuous profile of the different sludge concentration in the different heights with the help of two additional current outputs. For this purpose the converter has to be extended using a simple plug-in board.

## 1.3 Measuring principle

The sensor is let down into the clarifier or thickener and measures the suspended solids concentration. While it descends, it transmits the data via a communication cable to the MAC 080 converter. By submersing the sensor into the liquid, you are able to obtain reliable suspended solids readings and avoid problems from foam and fluff layers in the clarifier or thickener.

The sensor measures transmitted light through the liquid. The measuring principle is based on the suspended particles ability to absorb and reflect NIR (Near Infra-red) light. The light source is a light emitting diode that pulses and emits monochromatic light with a wavelength of 880 nm (see drawing below).

The detected measuring signal is inversely logarithmical proportional to the concentration of suspended solids. Signal treatment or linearization is done within the converter. In addition, the temperature is measured to be used for temperature compensation of the measured value.

*The built-in temperature measurement is not a precision measurement, but shall be seen as an indication.*

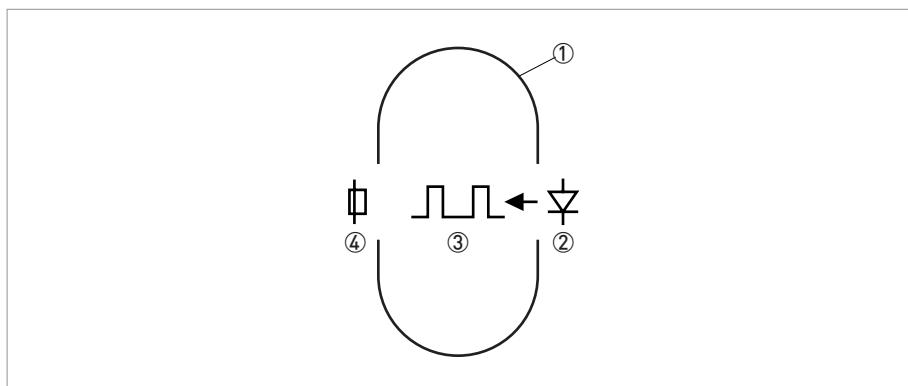


Figure 1-1: Cross-section of measuring gap

- ① Measuring gap
- ② Light source (NIR-LED)
- ③ Monochromatic light beam
- ④ Detector

## 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 (Download Center).*

### Measuring system

Measuring principle	Level measurement via sounding by optical sensor with straight light transmission of NIR-light for suspended solids monitoring.
Application range	Level measurement of sludge blanket and fluff zone in primary and secondary clarifiers as well as in thickeners of waste water treatment plants.

### Design

Features	<ul style="list-style-type: none"> <li>• Usage of NIR (Near Infra-red) light with 880 nm</li> <li>• Reference measurement</li> <li>• Temperature-compensated</li> </ul>
Modular construction	A typical measuring system consists of the MAC 080 multiparameter converter and the OAM 2080 main unit.
Measuring range	<p>0...20000 mg/l, depending on sludge type (Note: the factory calibration was done for the range 0...14000 mg/l).</p> <p>Sensor can be let down and is waterproofed up to 10 m / 32.8 ft maximum immersion depth.</p>
Drive	<p>Lowering speed: maximal 15 cm / 5,9" per second, 12,5 cm / 4,9" at 50 Hz</p> <p>Full cycle time for 10 m / 32,8 ft: 3 min</p>
Rake guard switch	Closing contact normally open, 24 VDC is supplied from OAM 2080.
Display and user interface	Refer to MAC 080 handbook.
Internal heating	"Off" above 15°C / 59°F, full power below 5°C / 41°F.
Transmission of measuring results	4...20 mA outputs (or optional via Profibus DP)

### Measuring accuracy

Reference conditions	<p>Medium: water</p> <p>Temperature: 20°C / 68°F</p> <p>Pressure: ambient</p>
Maximum measuring error (sensor)	5% full scale
Maximum measuring error (immersion depth)	0,5% full scale

### Operating conditions

Temperatures and pressure	
Ambient temperature	-20...+50°C / -4...+122°F
Process temperature	0...+50°C / +32...+122°F
Storage temperature	-10...+60°C / +14...+140°F
Maximal immersion depth	10 m / 32,8 ft
Water pressure (process)	Ambient
Water pressure (flushing)	2...6 bar / 29...87 psi
Protection category	IP 55

### Installation conditions

Installation position	Fixing on a handrail at open channels, basins or tanks.
Dimensions & weights	For detailed information refer to the section "Dimensions and weights".

### Materials

Enclosures	Whole meter and sensor: SIS 2343 (316 SS)
Connection cable to converter	Polyurethane

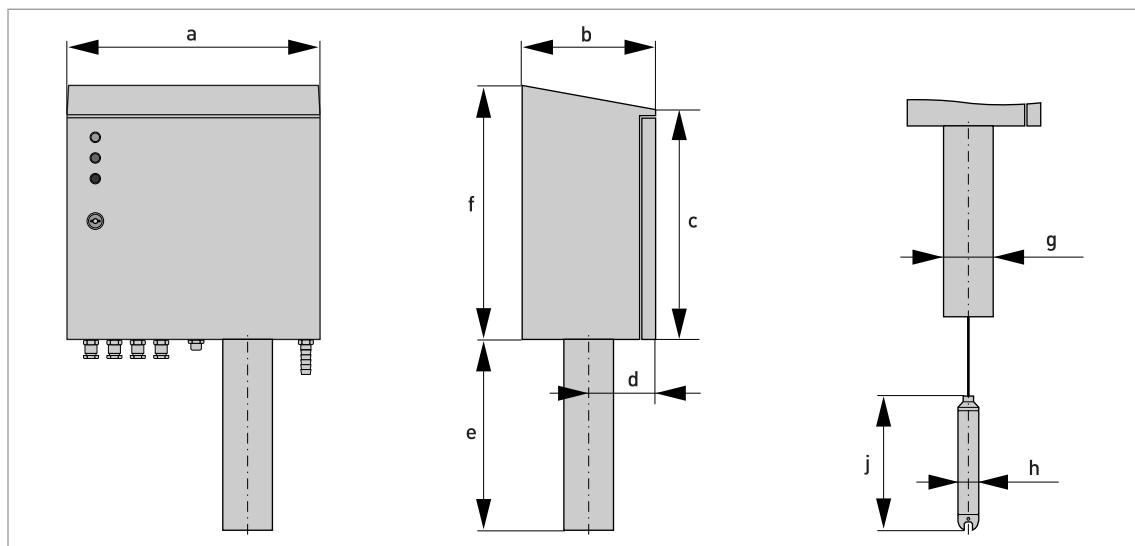
### Electrical connections

Power supply (voltage)	Europe: 230...250 VAC at 50 Hz USA: 115 VAC at 60 Hz
Power consumption	Maximal 450 W
Fuse	5 A (T1AH, 20 x 5 mm)
Connection cable to converter	5-pin M12 contact, shielded, 1,5 m / 4,9 ft long (extension cables optionally available).
Input and output (converter)	Refer to technical documentation of the relevant converter.

### Approvals and certifications

CE	The device fulfils the statutory requirements of the EC directives. The manufacturer certifies that these requirements have been met by applying the CE marking.
EMC	Electromagnetic compatibility (EMC) in accordance with: <ul style="list-style-type: none"><li>EN 61000-6-4:2001 (Emission standard for industrial environments)</li><li>EN 61000-6-2:2001 (Immunity for industrial environments)</li></ul>
Low Voltage Directive	Safety requirements for electrical equipment for measurement, control and laboratory use in accordance with EN 61010-1:2001.

## 2.2 Dimensions



	Dimensions [cm]	Dimensions ["]	Weight	
			[kg]	[lbs]
a	40	15.7	20	44
b	21.1	8.3		
c	34	13.4		
d	10	3.9		
e	30	11.8		
f	40	15.8		
g	7.9	3.1		
h	3.3	1.3		
j	21.1	8.3		

### 3.1 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.*

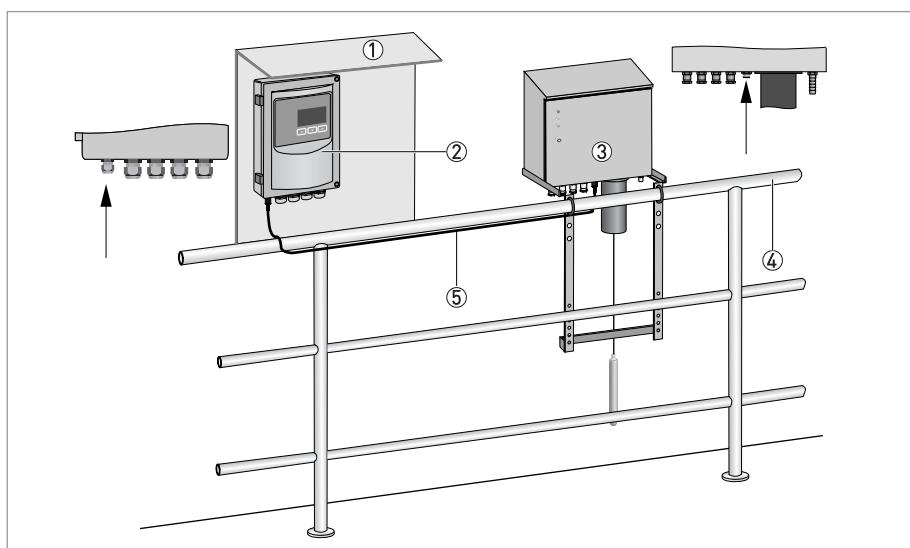
### 3.2 Intended use

*The OPTISENS OAM 2080 only works in conjunction with the OPTISENS MAC 080 multiparameter converter which you need for configuration, local display and transmission of the measuring results. Additionally the converter must have the software version 3.1 or higher. The converter and the mounting plate belong to the standard scope of delivery.*

In combination with the MAC 080 converter the OAM 2080 sludge blanket meter is primarily designed for use in water and waste water treatment plants. There it determines the sludge blanket depth in clarifiers and sludge thickeners. It measures the suspended solids concentration and height of the sensor above ground as the sensor is lowered into the basin or tank.

However, the design of the OAM 2080 makes it possible to use it in other applications where reliable monitoring of interface or stratification in suspensions is necessary.

### 3.3 Typical measuring point



① Mounting plate with sun roof

② Converter

③ Sludge blanket meter

④ Handrail

⑤ Signal cable

### 3.4 Installation order

*Do not install the sludge blanket meter in hazardous areas, it can ignite explosive gases!*

*To install the measuring system in the best way, follow the steps described below. Regard that different steps may vary in meaning, depending on the particular sensor and the number of sensors that you want to connect to the converter.*

*All MAC 080 converters with a program version of 3.1 or higher are able to detect and install the sensor automatically. This procedure starts when both the converter and the sensor are supplied with power and the electrical connection between the devices is established.*

#### Steps to install the measuring system

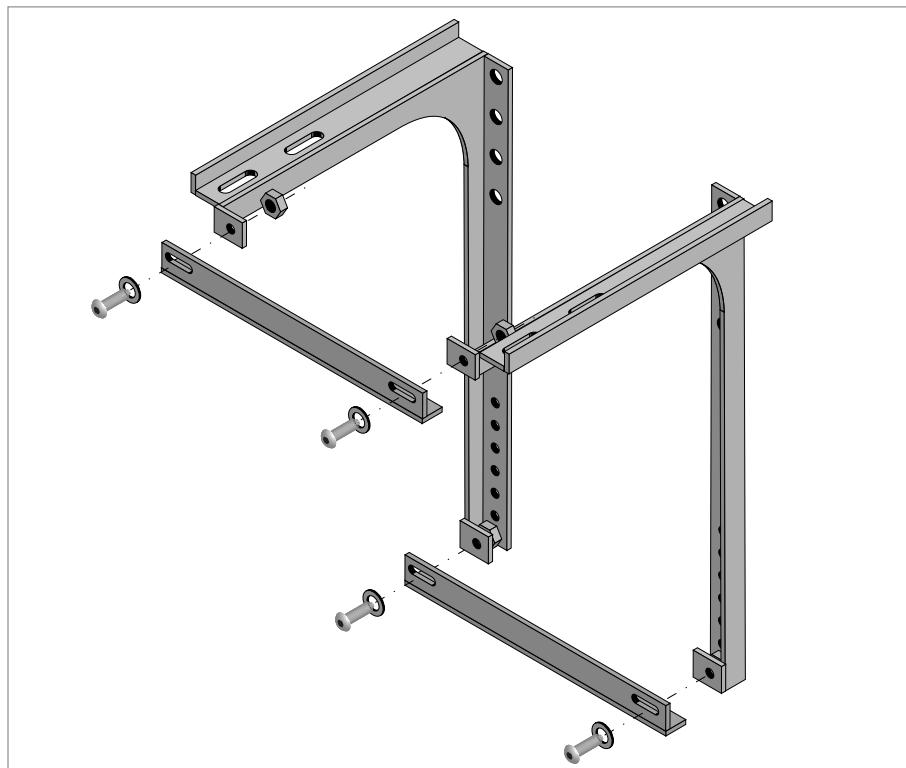
- Mounting of converter  
(for detailed information refer to the relevant chapter in the converter manual).
- Mounting of sludge blanket meter  
(for detailed information refer to the relevant section in this chapter).
- Installation of flushing, if required  
(for detailed information refer to the relevant section in this chapter).
- Connection of the rake guard switch, if required  
(for detailed information refer to the relevant section in this chapter).
- Electrical installation of converter  
(for detailed information refer to the relevant chapter in the converter manual)
- Electrical installation of the sludge blanket meter  
(for detailed information refer to the relevant section in this chapter).
- Setup of converter  
(for detailed information refer to the relevant chapter in the converter manual).
- Settings and calibration of the sludge blanket meter  
(for detailed information refer to the relevant chapter in the manual of the meter).

### 3.4.1 Mounting, adjusting and fixing of meter and frame

*All needed bolts, nuts and washers belong to the standard scope of delivery. The most common application is to fix the stand on a handrail as shown in the following instructions.*

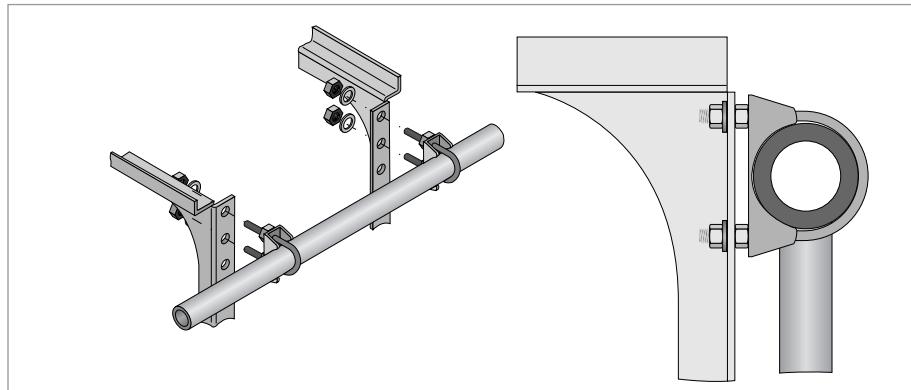
#### Step 1: Assembling of stand

- Assemble the two brackets and two crossbar braces with the help of bolts, nuts and washers according to the following drawing.



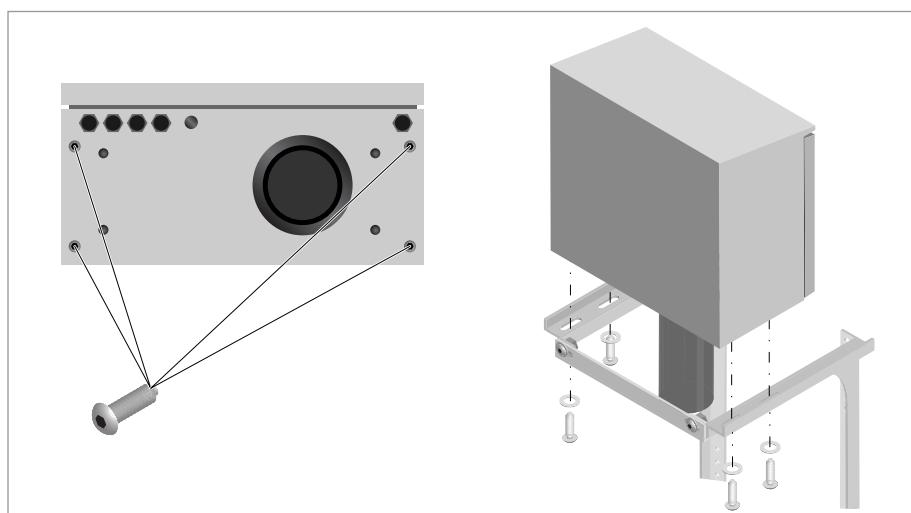
#### Step 2: Fixing stand

- Fix the U-Bolts to the handrail according to the following drawing.
- Fix the frame to the U-Bolts, ask a second person for help.



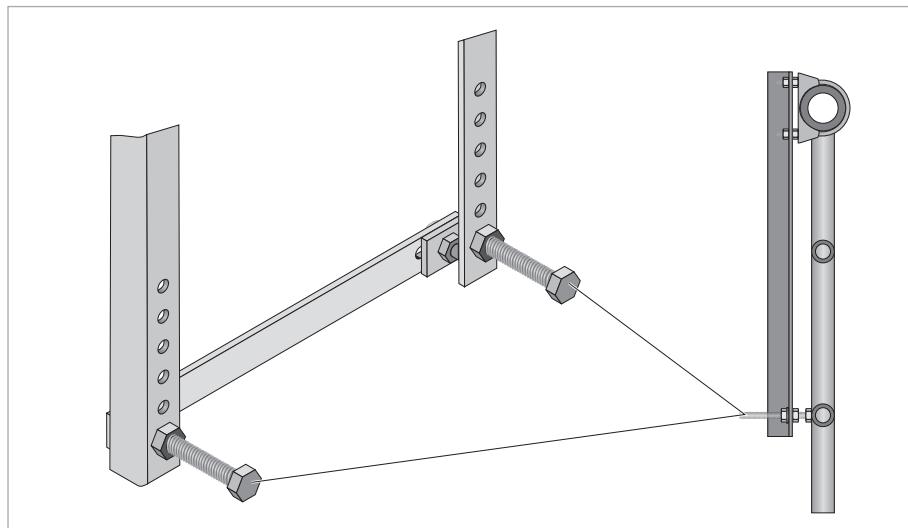
#### Step 3: Fixing of meter

- Fix the meter to the upper part of the brackets with the help of bolts and washers according to the following drawing.



#### Step 4: Adjusting

- Open the door of the meter for 45°.
- Adjust the meter horizontally using the last two screws that you screw in the lower part of the frame.
- Turn the screws until the door does not move any more in the 45° position.



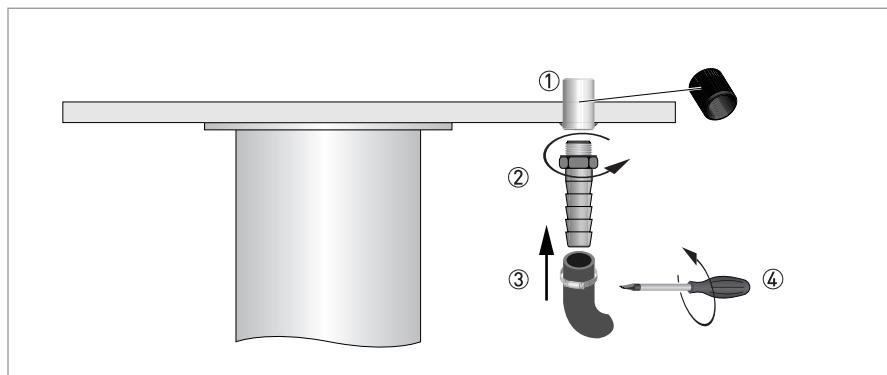
#### 3.4.2 Installation of flushing

*Always regard the following items when installing and using the flushing function:*

- *Do not flush the device at temperatures below 0°C / 32°F as there is the risk of damage by freezing water within the flush hoses and the solenoid valve!*
- *Assure that all outdoor installations protect the hoses and the valve from freezing conditions. If this is not possible, disconnect and empty all hoses!*
- *Assure that the flushing water has a pressure between 2 bar / 29 psi and 6 bar / 87 psi. Below the minimum pressure a sufficient cleaning is not possible, a water pressure above the maximum value can cause damages.*
- *Always use filtered water that is free of visible solids as they can cause damages. If this is the case, you can also use town water.*

*The minimum diameter of the flush hose has to be at least 10 mm / 0.39".*

In Europe you can connect the flush hose according to the following drawing. In the USA there are hoses available with a fixed male connector that you can screw-in directly):



If you do not need the flushing function, you can disable it via the sensor menu.

Plug the flush hose onto the  $\frac{1}{4}$ " NPTmale thread under the lower right hand corner of the enclosure.

### 3.4.3 Rake guard limit switch

*To avoid damages or destructions, use a limit switch in all applications where a rake or other moving devices may come in contact with the sensor or cable! The manufacturer does not assume any responsibility for damages caused by the absence or malfunction of the rake guard limit switch.*

To protect the sensor and cable from being damaged or destructed by rakes or other moving parts, the meter has an N/O contact input for the connection of an external limit switch (you have to buy this switch with another manufacturer). The sampling cycle will only start if this switch is closed.

The function of the limit switch is to trigger the sampling process. When the moving device (e.g. a rake) contacts the limit switch, the sampling process starts. You can define the number of passes of the moving device that should occur before starting the sampling process with the help of the converter (see "Trig" in the "Advanced setup" within the menu "Settings"). For information concerning the electrical connection of a rake guard limit refer to the next chapter.

*Defining the interval of the sampling process is suitable when the position of the moving device is well known (e.g. with surface rakes). If the moving device contacts the limit switch during sampling, the sampling process stops and the sensor moves upwards.*

If there is no danger for the sensor or cable to be caught by moving devices (i.e. installation in thickeners without stirrers), you can set an alternative sampling mode in the converter controlled by the build-in timer. In this case you must wire the connections for the rake guard switch to one of the converter relays (for further information see section "Relay outputs" in chapter 4 "Electrical connections" in the MAC 080 handbook) and set a timer interval in seconds, which triggers the sampling cycle accordingly.

## 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!*

*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.*

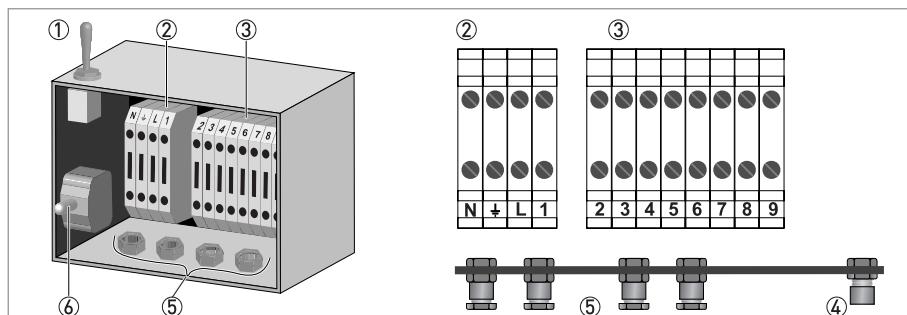
*Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.*

## 4.2 Cable connections

In the bottom lower left corner of the enclosure there are four 1/2" NPT female electrical connections as cable feedthroughs to the junction box. All cables fixed on the terminal blocks go outside the enclosure via these connections.

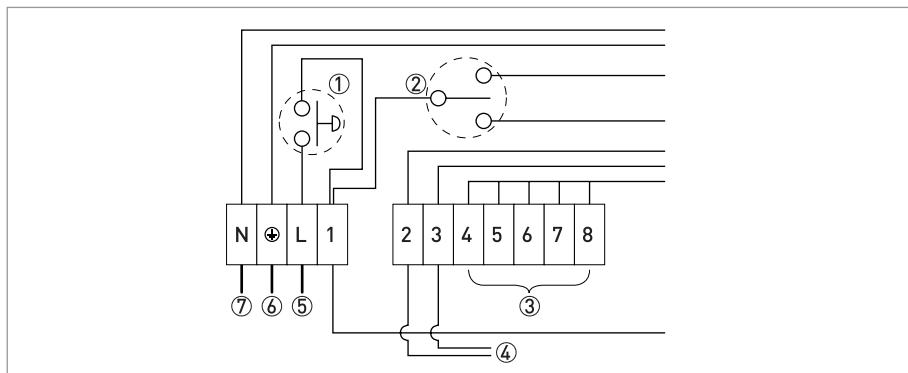
Right beside the 1/2" NPT female electrical connections there is 5-pos. M12 female connector (A-coded). This connector is wired internally and dedicated for a tailored cable with the corresponding male connector that belongs to the scope of delivery.

*The connection cable with in the scope of delivery has 5-pos. M12 male connectors (A-coded) on both ends. Both male connectors fit to the female connector on the converter as well as to the connector on the bottom of the enclosure.*



- ① Manual hauling switch
- ② Left terminal block
- ③ Right terminal block
- ④ 5-pos. M12 female connector (A-coded)
- ⑤ 1/2" NPT female connector
- ⑥ Safety switch

### 4.3 Connection diagram and grounding



- ① Push-button (door open/closed)
- ② Switch for manual hauling (up/neutral/down)
- ③ Spare I/Os
- ④ I/O for rake limit switch (24 VDC)
- ⑤ Power (live)
- ⑥ Power (earth)
- ⑦ Power (neutral)

### 4.4 Protection category

*Do not install the sludge blanket meter in hazardous areas, it can ignite explosive gases!*

The whole meter fulfills the protection category IP55, while the encapsulated electronic fulfills IP 65, NEMA 4.

### 4.5 Power supply

*As the meter does not have an own switch to deenergize it, the manufacturer recommends that the power supply has an external on-off switch.*

The correct power supply of the meter takes place with the help of a 3-lead cable which is approved for the rated current and voltage.

## 5.1 Order code

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

VGA S	4	Type/Housing converter
	0	None
	A	OPTISENS OAM 2080
	<b>Measuring range</b>	
	0	None
	A	0...10 m / 0...32.8 ft
	<b>Features</b>	
	0	None
	A	With MAC 080 converter
	B	Without MAC 080 converter
	<b>Process conditions</b>	
	0	None
	A	-20...+50°C / -4...+122°F
	<b>Signal outputs</b>	
	A	2 x 4...20 mA [sludge blanket and turbidity layer]
	B	4 x 4...20 mA (consistency and height, continuous)
	C	2 x 4...20 mA + Profibus DP
	<b>Relays</b>	
	0	None
	A	2 programmable
	<b>Operation language</b>	
	A	English
	B	German
	<b>Power supply</b>	
	A	230 VAC / 50 Hz
	B	115 VAC / 60 Hz
	<b>Options</b>	
	0	None
	A	Hand rail mounting kit for sludge blanket meter and converter
	<b>Documentation</b>	
	0	None
	1	English
	2	German
VGA S	4	Order code



## 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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