BM 500 Handbook

Potentiometric Level Transmitter for hygienic liquid applications

KROHNE

IMPRINT

1.1 Intended use

CAUTION!
Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

INFORMATION!
The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

The potentiometric level meter **BM 500** is designed solely for measuring continuously the level of liquids and pasty and sticky products.

The device is particularly suitable for measuring low levels in the range of 50...1000 mm / 2...39.4". Thanks to the principle involved, this potentiometric measuring system is independent of sticky deposits and varying product properties. All it needs is a minimum conductivity of 50 µS/cm.

1.2 Certifications

CE marking

CE

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

- EMC specification acc. to EN 61326-1 (2006)

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

1.3 Safety instructions from the manufacturer

1.3.1 Copyright and data protection

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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.

1.3.2 Disclaimer

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

1.3.3 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 or 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.

1.3.4 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 icons as shown below.

1.3.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.

DANGER!
This warning 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.

1.4 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 packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

INFORMATION!
Do a check of the packing list to make sure that you have all the elements given in the order.

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.

The following items are supplied with the device:

- Measuring device
- Hygienic adapter (optional)
- Product documentation

2.2 Device description

The BM 500 level meter utilises the potentiometric measuring principle and can be used in all medias that have a minimum conductivity of 50 µS/cm.

From the low resistive measuring rod a high frequent current is fed through the media to the tank wall. The voltage between the tip of the rod and the tank wall is measured. This output voltage is proportional to the level in the tank.

The measurement is unaffected by temperature and adhesive media.

The device is ideal for measurements in small vessels with tough, pasty or strong adhesive media, such as ketchup, honey, and toothpaste. The integrated electronics provide a 4...20 mA output.

The device has automatic recognition of top/buttom mounting position. Even angled installation is possible.

In non-conductive tanks, e.g. plastic, a reference rod must be installed (order a standard LS 7200 without electronics).

The BM 500 is available as compact and remote version. The remote version is recommended for applications where the ambient temperature at the measuring point exceeds +60°C / +140°F. Due to the high process temperature limit, the device is well suitable for CIP and SIP processes.

The hygienic installation is guaranteed by using one of the hygienic weld-in sleeves. For further information refer to the specific data sheet "Hyg. accessories".

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.

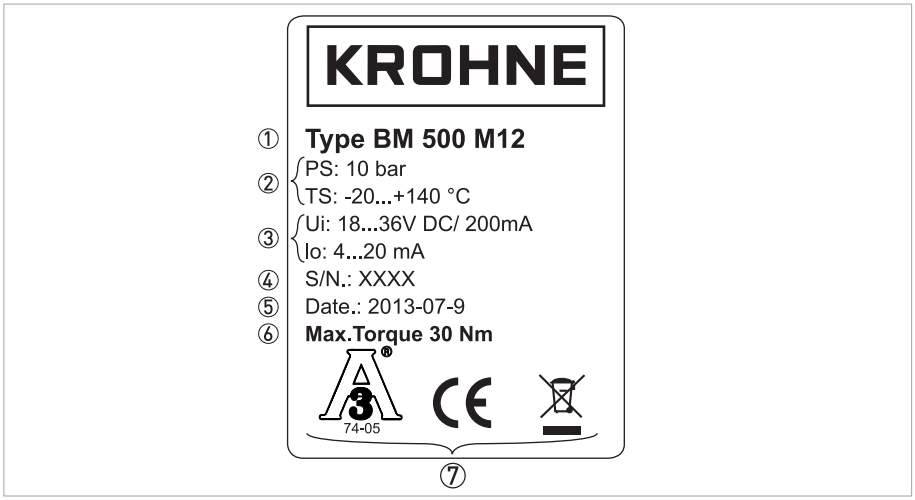

Figure 2-1: Example of a nameplate

① Device type
② Operating pressure and temperature limits
③ Electrical data
④ Serial number
⑤ Manufacturing date
⑥ Maximum torque value
⑦ Approval and disposal icons

3.1 Installation requirements

- Be sure that the measuring rod has the correct depth of immersion when placing your order. The sensor **cannot** be shortened subsequently!
- Use only the recommended sleeves or adapters. If other systems are used, no guarantee can be given for proper functioning or leak-tightness.
- The connection thread must have electrical contact with the metal vessel. If this is not possible, use a separate grounding cable to meet this condition.
- Do not use Teflon or paper gaskets.
- The tightening torque for the sleeve should be 20...30 Nm.
- If the vessel is electrically non-conductive (e.g. plastic tank), the frame potential can be established via an additional ground electrode, which is electrically connected to the connection thread. E.g. a standard LS 7200 without electronics. Consult your local contact for ordering assistance.
- Make absolutely sure that the measuring rod cannot come into contact with the wall of the vessel. Also take into consideration the possibility of rod deflection caused by moving product.
- For distances of less than 100 mm / 3.9" (e.g. when installed in vertical pipe runs) the sensor rod should be located parallel to the wall, otherwise conditions of non-linearity can occur. For large distances non-parallelity of the rods can be allowed.
- The level meter measures linearly over the full rod length.
  Lower dead zone: approx. 8 mm / 0.3" of the lower end of the measuring rod
  Upper dead zone: approx. 44 mm / 1.73" of the upper end of the measuring rod (at the lower end of the conical part of the rod)

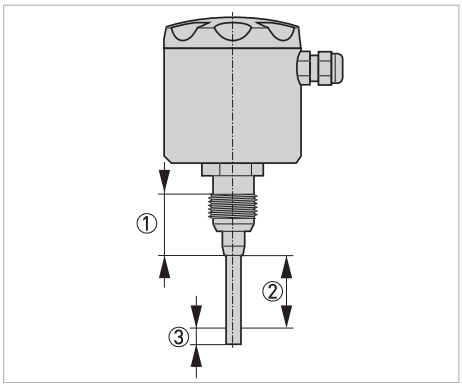

Figure 3-1: Upper and lower dead zone at measuring rod

① Upper dead zone: approx. 44 mm / 1.73"
② Active measuring range
③ Lower dead zone: approx. 8 mm / 0.3" immerged in the liquid

WARNING!
A measuring deviation of max. 25 % can occur when there is a strong electromagnetic field (according to EN 61000-4-3) in the frequency band of 200-350 MHz.

INFORMATION!
Please be aware of the active measuring zone of the rod (refer to the following drawing).

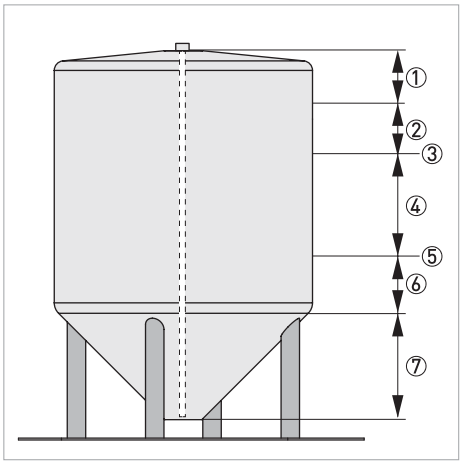

Figure 3-2: Measuring zone and output settings

① 21.6 mA
② 21.6...20 mA
③ Set point 100% = 20 mA
④ 20...4 mA
⑤ Set point 0% = 4 mA
⑥ 4...2.4 mA
⑦ 2.4 mA

INFORMATION!
The BM 500 tracks level outside its normal 4...20 mA measuring range; up to 21.6 mA and down to 2.4 mA.

- *Above 21.6 mA, the unit will freeze output at 21.6 mA.*
- *Below 2.4 mA level, the unit will freeze output to 2.4 mA.*

3.2 Process connection

The hygienic 1¨ process sleeve is easy to weld into tanks or pipes. This kind of assembly allows installation in conformity with standards of hygiene such as FDA / Regulation (EC) No 1935:2004 / Regulation (EC) No 2023:2006. The G 1 connections can be mounted in any counter thread acc. to ISO 228.

Various hygienic adapter sleeves are available for fitting to other process connections. For more data, refer to the appendix or the "Hyg. accessories" data sheet.

The level transmitter can be installed either from top or bottom.

3.3 Mounting of 3A marked products

The 3A mark is valid only when the product is mounted in a 3A marked counterpart and installed acc. to the installation manual. Use also a 3A marked O-ring or gasket if relevant.

The 3A marked products conform to the 3A sanitary standards criteria. Materials and surfaces fulfill the FDA demands.

EPDM O-rings supplied with 3A marked products are conform to sanitary standards class II (8% milk fat).

① Use only 3A approved counterparts.
② The inspection hole should be visible and drained. Face it downwards so that possible leaking can be observed.
③ Mount the device in a self-drained position.
④ Level the inner surface of the pipe with the counterpart.
⑤ Weld from the inside of the tank, if possible. Welds shall be free from cracks, crevices and grooves. Weldings should be grinded to R_a = 0.8 µm.
⑥ The level meter can be installed on the side of the tank with a bent measuring probe.
⑦ The level meter can be installed from the bottom of the tank.

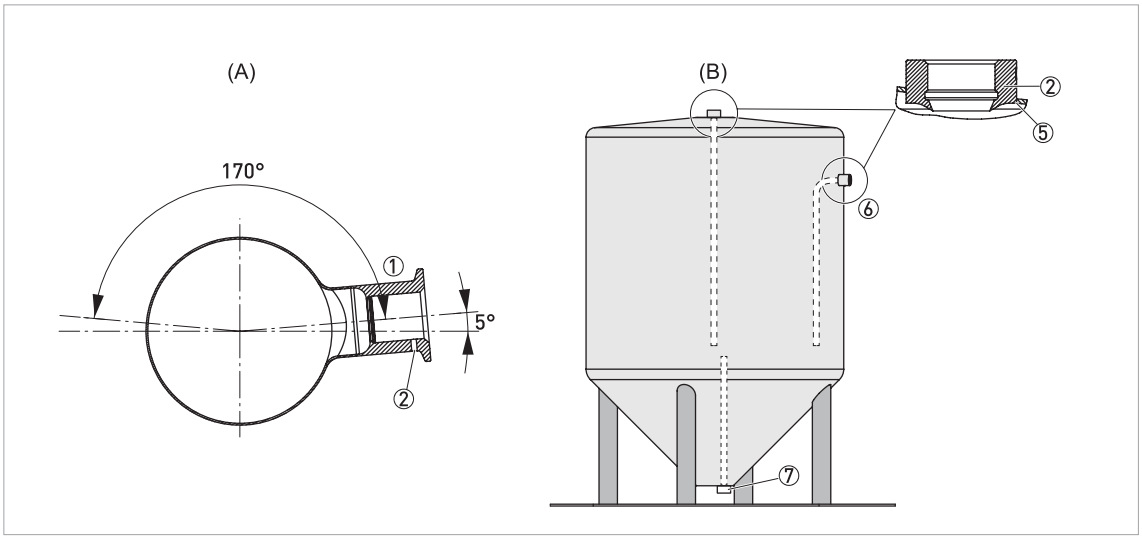

Figure 3-3: Mounting of 3A products in pipe installations (A) or tank installations (B)

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 Electrical connection diagrams

Terminals 1 (+) and 2 (-) are used for supplying a DC voltage of 18...36 V. Terminal 2 is connected to the housing via a protective diode.

The maximum power consumption is 200 mA. This value should be taken into account in connection with the recommended use of a fuse.

An active, galvanically isolated 4...20 mA current output is provided at terminals 3 and 4. Please consider the applicable wiring regulations.

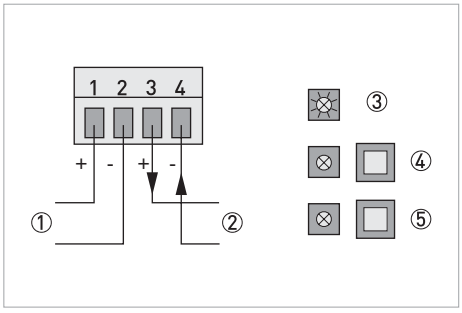

Figure 4-1: Electrical connection and LED indication for setpoints for M16 cable gland

① 18...36 VDC
② 4...20 mA
③ LED is flashing at correct measurement
④ Push button > 3 seconds to set point for 100%, 20 mA
⑤ Push button > 3 seconds to set point for 0%, 4 mA

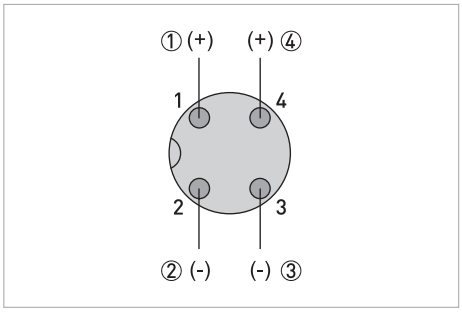

Figure 4-2: Electrical connection of M12 plug

① 18...36 VDC (+)
② 4...20 mA (-)
③ 18...36 VDC (-)
④ 4...20 mA (+)

- Pin 1: brown
- Pin 2: white
- Pin 3: blue
- Pin 4: black

5.1 Start-up

Before connecting to power, please check that the system has been correctly installed. This includes:

- The device must be mechanically safe and mounted in compliance with the regulations.
- Check that the measuring rod is not in contact with the vessel wall.
- Check the leak-tightness at the leakage inspection hole of the sleeve or adaptor.
- Make sure that the M12 plug is properly connected or the M16 cable gland properly tightened.
- The power connections must have been made in compliance with the regulations.
- Check that the electrical operating data of the power supply are correct.

5.2 4 and 20 mA setting

- The green LED indicates that supply voltage (> 18 V) is present (operation indicator).
- The 2 red LEDs show different flashing rates (LED monitor), according to the control of the current output.
- The level meter can be installed at the top or the bottom of the tank.
- The level meter is factory calibrated for installation from the top. This corresponds to 4 mA at the lower rod end and 20 mA at the upper end (lower part of the conical section of the measuring rod; see drawing on page 11). When installed from the bottom, the current will drop down step by step until the tank is empty or the current hits 2.4 mA.
- **4 and 20 mA setting:**
  This procedure is only required when a smaller measuring range is needed than the maximum measuring range calibrated from factory or in case of a big difference in conductivity with tap water exits. When two liquids are present - choose the liquid with the lowest conductivity for the lowest level setting.
  1. Bring level to 0% level - then press for > 3 seconds the 4 mA setpoint key. The 4 mA red LED is "ON" which confirms the setting.
  2. Raise level to 100% level - then press for > 3 seconds the 20 mA setpoint key. The 20 mA red LED is "ON" which confirms the setting.
- **In bottom mounting position:** The level meter will show a negative value, when the level representing the 20 mA level, accidently was set at a lower level than the 4 mA level.
- **Resetting to factory calibration:**
  Press simultanously for > 3 seconds both setpoint keys, both red LEDs will continously flash to indicate that the level meter is reset. Repeat above calibration procedure for setting the 0% and 100% values.
- The "dry" signalling threshold is set simultaneously with the low level calibration. When the conductivity measured here is undershot, the sensor signals the "dry" condition with a current output value of 2.4 mA. Given different products with widely differing conductivity, the 4 mA adjustment should be carried out using the least conductive liquid.

5.3 Fault diagnosis and corrective action

INFORMATION!

- *In the event of a fault or malfunction, please go through the various possible faults listed in the table.*
- *Please do not attempt to take the device apart.*
- *There are no parts requiring maintenance.*

Fault	Cause	Action / elimination
LED status display not "on"	Supply voltage < 18 V	Measure voltage at pin 1, 2.
	Supply voltage has false polarity Note: The level meter is polarity protected. No damage to the electronics will occur when the wiring was accidently reversed.	Reverse terminals 1, 2.
Current output < 4 mA	Sensor "dry"	OK
	Conductivity too low	4 mA adjustment
	No connection to metal	Check connection to frame / thread
Measured value incorrect	Adjustment faulty	Adjust 4 and 20 mA settings or factory reset
	Poor connection to frame	Check connection to frame / thread

6.1 Availability of services

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

INFORMATION!
For more precise information, please contact your local sales office.

6.2 Spare parts

This device contains no replaceable parts. In case of malfunction the device must be returned to the manufacturer. Refer also to chapter "Returning the device to the manufacturer".

Designation	Type
Housing cover	KMD.006.090.000
Cable gland M16	KVV.M16.010.008
Connector insert M12	KVV.100.004.000
Connector part 4-pin	KVK.046.210.018

6.3 Returning the device to the manufacturer

6.3.1 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 the personnel, the 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 neutralising, 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.*

6.3.2 Form (for copying) to accompany a returned device

CAUTION!
To avoid any risk for our service personnel, this form has to be accessible from outside of the packaging with the returned device.

Company:		Address:
Department:		Name:
Tel. no.:		Fax no. and/or Email address:
Manufacturer's order no. or serial no.:		
The device has been operated with the following medium:		
This medium is:		radioactive
		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:		

6.4 Disposal

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

Separate collection of WEEE (Waste Electrical and Electronic Equipment) in the European Union:

According to the directive 2012/19/EU, the monitoring and control instruments marked with the WEEE symbol and reaching their end-of-life **must not be disposed of with other waste**.
The user must dispose of the WEEE to a designated collection point for the recycling of WEEE or send them back to our local organisation or authorised representative.

7.1 Measuring principle

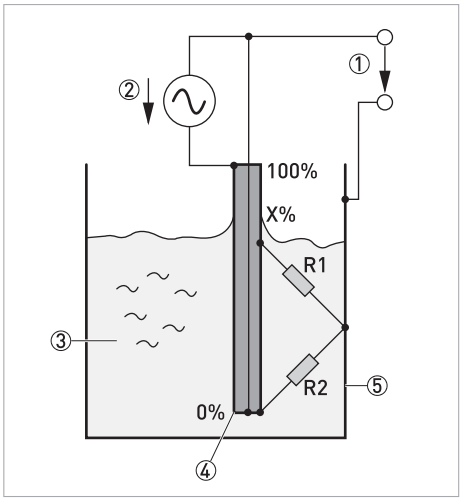

Figure 7-1: Measuring principle

① U_{out} to amplifier
② U_{gen}
③ Medium
④ Tube
⑤ Tank

The liquid is stored in a tank, connected to ground. The immersed measuring rod is a low resistance rod where the ends are powered by an AC generator operating in the lower kilohertz frequency range.

Between the rod and the tank wall is an endless amount of high level resistances. Since they connect to the same potential (the tank wall) they can be shown as two equivalent resistances, R1 and R2 connected to an imaginary center point. A high resistance input amplifier is connected between the generator and the tank wall.

Since the generator is supplying a high range current it will create a significant voltage drop across the low resistance rod. The resistances R1 and R2 form a voltage divider in range of the immersed part of the rod. Output from this divider will indicate half the level of the liquid. The amplifier then calculates the actual level of liquid from 0 to 100%.

The formula is:
U_{out} = 1/2 x media level (%) x U_{gen}
Media level (%) = U_{out}/U_{gen} x 2

The level measurement is insensitive to adhesion.

CAUTION!
It is very essential that the media conductivity is homogeneous. Otherwise R1 will not be equal to R2 and the output voltage will be influenced.

7.2 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 sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).*

Measuring system

Measuring principle	Potentiometric, low-resistive
Application range	Level detection of all media with the minimum conductivity of 50 µS/cm in tanks.

Design

Options	Remote version for applications with ambient temperature above +60°C / +140°F
Accessories	Comprehensive range of adapters and process connections for hygienic installation. For more data, refer to "Order code" in the appendix.

Measuring accuracy

Accuracy	± 0.5% of full measuring length
Repeatability	± 0.1%

Operating conditions

Temperature	
Ambient temperature (compact)	-20...+60°C / -4...+140°F
Ambient temperature (remote)	-20...+100°C / -4...+212°F
Process temperature	-20...+140°C / -4...+284°F
Medium conductivity	≥ 50 µS/cm
Min. measuring range	50 mm / 2", configurable by push-buttons
Pressure	
Ambient pressure	Atmospheric
Process pressure	≤ 16 bar / 232 psi
Other conditions	
Ingress protection (acc. to EN 60529)	IP67 equivalent to NEMA 4X

Installation conditions

Installation	Installation from top or bottom (automatic position detection)
Probe length	200...3000 mm / 0.6...10 ft
Cable length	1000...5000 mm / 3.3...16.4 ft (only for remote version)
Dimensions and weights	For more data, refer to the "Dimensions and weights" chapter.

Materials

Probe	Stainless steel 1.4404 / AISI 316 L
Housing	Stainless steel 1.4301 / AISI 304
Process connection	Stainless steel 1.4404 / AISI 316 L
Sensor insulation	PEEK, agrees with FDA / Regulation (EC) No 1935:2004 / Regulation (EC) No 2023:2006
Electrical connection	M16 cable glands: Plastic
	M12 plug: Nickel-plated brass

Process connections

Standard	Hygienic G 1
Other	For other hygienic process connections, e.g. Tri-Clamp®, DIN 11851, VARIVENT® – for more data, refer to "Order code" in the appendix

Electrical connections

Power supply	18...36 VDC; max. 200 mA
Resolution, input	15 bit
Output	4...20 mA; max. load 500 ohms
Status signal, "dry"	2.4 mA
Status signal, "full"	21.6 mA
Response time	T_{66} < 10 ms
Cable entry	M16 cable glands, M12 plug

Approvals and certifications

CE	This device fulfils the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE marking.
Other standards and approvals	
Electromagnetic compatibility (EMC)	EN 61326-1 (2006)
Vibration resistance	IEC 60068-2-6, GL test 2
Hygiene	3-A, EHEDG, FDA / Regulation (EC) No 1935:2004 / Regulation (EC) No 2023:2006, FDA-conform materials

7.3 Dimensions

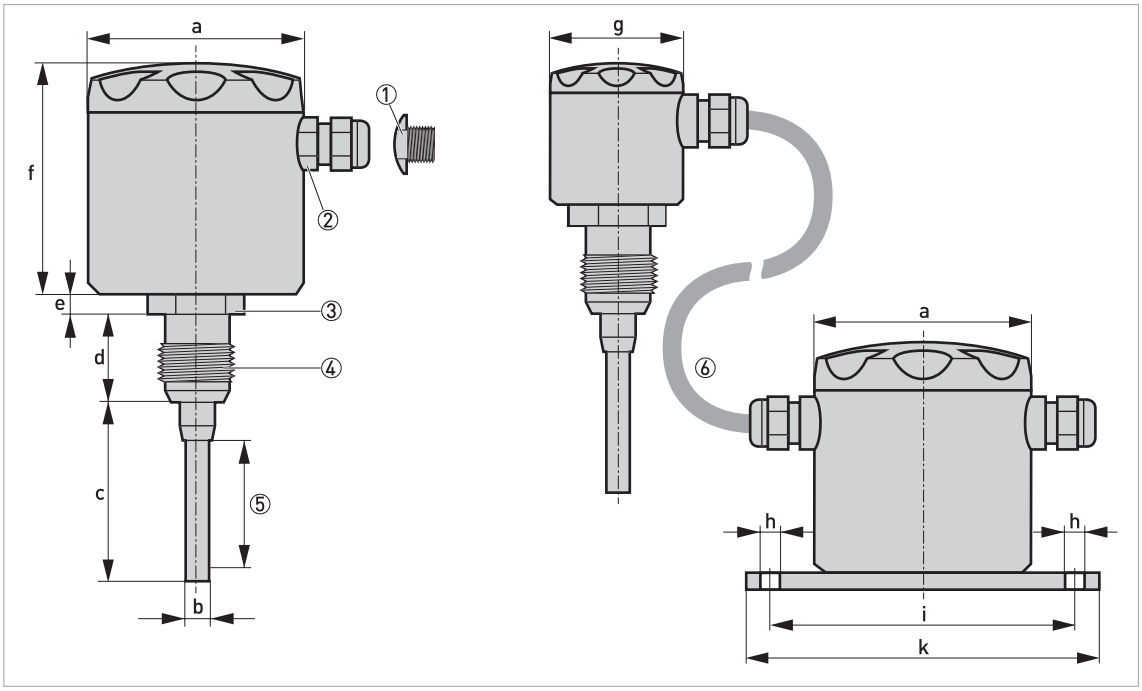

Figure 7-2: Dimensions of compact (left) and remote (right) version

① M12×1 plug
② M16×1.5 cable gland
③ WS 36
④ G 1
⑤ Active zone
⑥ Connecting cable (please specify length on ordering (min.: 1 m / 3.3 ft; max.: 5 m / 16.4 ft))

Dimensions in mm

	a	b	c	d	e	f	g	h	i	k
BM 500	89	10	L ①	33	8	92	55	8	125	145

① Ordered rod length

Dimensions in inches

	a	b	c	d	e	f	g	h	i	k
BM 500	3.5	0.49	L ①	1.30	0.31	3.62	2.17	0.31	4.92	5.71

① Ordered rod length

8.1 Device order code

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

VGP3	4	1	BM 500: compact version (stainless steel housing – IP67 (equiv. NEMA 4X))						
		2	BM 500: remote version (stainless steel housing – IP67 (equiv. NEMA 4X))						
			Insertion length of measuring rod						
			G	Specify measuring probe length in mm increments; Minimum insertion length: 200 mm; Maximum insertion length: 3000 mm					
				Electrical connection					
				1	M16, plastic cable gland included / second entry with M16 plastic blind plug				
				2	M12, 4-pin connector plug / second entry with plastic blind plug				
					Accessories				
					1	Potted electronics			
VGP3	4		G		1	0	0	0	Order code

8.2 Order code for process connections options

Order code	Old code	Description	Max. pressure		Approval options
			[barg]	[psig]	
KPW2-521	HWN 500	Weld-in sleeve (outside Ø 50.5 mm)	100	1450	3-A® / EHEDG ①
KPH1-5236	HSM 551	DN 51 adapter SMS 1145 ②	25	363	—
KPH1-5213	HTC 540	1½¨ Tri-Clamp® DN25/40 DIN 32676, 25/38 mm ISO 2852 ②	40	580	3-A® / EHEDG ①
KPH1-5216	HTC 550	2¨ Tri-Clamp® DN50 DIN 32676, 51 mm ISO 2852 ②	40	580	3-A® / EHEDG ①
KPH1-5224	HMT 540	DN40 conical nozzle DIN 11851 ②	40	580	—
KPH1-5225	HMT 550	DN50 conical nozzle DIN 11851 ②	25	363	—
KPH1-524E	HVF 550	DN40/50 VARIVENT® Type N ②	10	145	3-A® / EHEDG ①
KPX5-62	HST 500	Allen screw blanking plug	70	1015	—

① EHEDG approval pending

② To order union nuts and gaskets, refer to "Accessories" in the section that follows

INFORMATION!

All hygienic process connections agree with FDA regulations, Regulation (EC) No 1935:2004 and Regulation (EC) No 2023:2006.

INFORMATION!

EHEDG approval pending

8.3 Order code for accessories

Order code	Description	Hygienic connection new code	Hygienic conenction old code	Approval options
KPX4-310	Clamp-ring AISI 304 for 1½¨ Tri-Clamp®, DN40 DIN 32676, 38 mm ISO 2852	KPH1–3213	HTC 240	—
KPX3-7233	EPDM gasket for 1½¨ Tri-Clamp®, DN25/40 DIN 32676, 25/38 mm ISO 2852	KPH1–5213	HTC 540	FDA
KPX4-610	Clamp-ring AISI 304 for 2¨ Tri-Clamp®, DN50 DIN 32676, 51 mm ISO 2852	KPH1-3216	HTC 250	—
KPX3-7263	EPDM gasket for 2¨ Tri-Clamp®, DN50 DIN 32676, 51 mm ISO 2852	KPH1–5216	HTC 550	FDA
KPX4-630	Union nut AISI 304 for DN51 adapter SMS 1145	KPH1–5236	HSM 551	—
KPX3-8160	NBR gasket for DN51 SMS 1145	KPH1–5236	HSM 551	—
KPX4-440	Union nut AISI 304 for DN40 conical nozzle DIN 11851	KPH1–5224	HMT 540	—
KPX3-9140	NBR gasket for DN40 conical nozzle DIN 11851	KPH1–5224	HMT 540	—
KPX4-540	Union nut AISI 304 for DN50 conical nozzle DIN 11851	KPH1–5225	HMT 550	—
KPX3-9150	NBR gasket for DN50 conical nozzle DIN 11851	KPH1–5225	HMT 550	—
KPX2-323	EPDM O-ring for DN40/50 VARIVENT® Type N	KPH1–524E	HMT 550	3-A® / FDA

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