



MID-MDS ECO Handbook



Electromagnetic flowmeter for volumetric filling
machines

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1	Safety instructions	5
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1.1	Intended use	5
1.2	Certification	5
1.3	Safety instructions from the manufacturer	6
1.3.1	Copyright and data protection	6
1.3.2	Disclaimer	6
1.3.3	Product liability and warranty	7
1.3.4	Information concerning the documentation	7
1.3.5	Warnings and symbols used	8
1.4	Safety instructions for the operator	8
2	Device description	9
<hr/>		
2.1	Scope of delivery	9
2.2	Device description	10
2.3	Nameplate (example)	11
3	Installation	12
<hr/>		
3.1	General notes on installation	12
3.2	Storage	12
3.3	Pre-installation requirements	12
3.4	General requirements	13
3.4.1	Vibration	13
3.4.2	Magnetic field	13
3.5	Installation conditions	14
3.5.1	Inlet and outlet	14
3.5.2	Open feed or discharge	14
3.5.3	Pump	15
3.5.4	Control valve	15
3.5.5	Mounting position	16
3.5.6	Mounting	17
3.5.7	Installation location	17
3.5.8	Flange deviation	17
3.5.9	Temperatures	18
3.5.10	Hot filling	18
4	Electrical connections	19
<hr/>		
4.1	Safety instructions	19
4.2	Grounding	19
4.3	Electrical connection	20
4.3.1	Cable connector M12 - 5 pin	20
4.3.2	Cable connector M12 - 8 pin (with status output)	21

5 Service	23
<hr/>	
5.1 Spare parts availability	23
5.2 Availability of services	23
5.3 Returning the device to the manufacturer	23
5.3.1 General information	23
5.3.2 Form (for copying) to accompany a returned device	24
5.4 Disposal	24
6 Technical data	25
<hr/>	
6.1 Measuring principle	25
6.2 Technical data	26
6.3 Dimensions and weights	30
6.4 Measurement accuracy	33

1.1 Intended use

The electromagnetic flowmeter is designed exclusively for measuring the volumetric flowrate of electrically conductive, liquid process products.

Minimum electrical conductivity:

- > 5 $\mu\text{S}/\text{cm}$ (except for water)
- > 20 $\mu\text{S}/\text{cm}$ (for water)

1.2 Certification

CE marking



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

This device fulfils the statutory requirements of the relevant EU directives.

For full information of the EU directives and standards and the approved certifications, please refer to the EU Declaration of Conformity or the website of the manufacturer.

1.3 Safety instructions from the manufacturer

1.3.1 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 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.

We draw your attention to the fact that data transmission over the Internet (e.g. when communicating by e-mail) may involve gaps in security. It is not possible to protect such data completely against access by third parties.

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.



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



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



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



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.

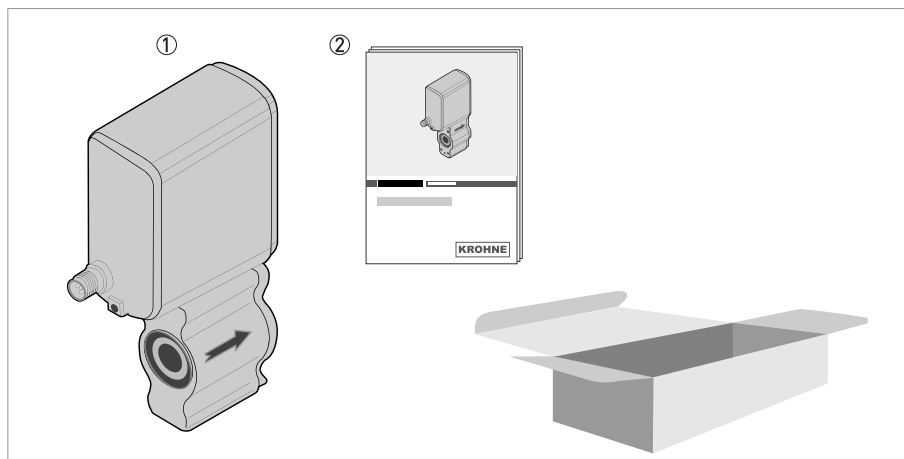


Figure 2-1: Scope of delivery

- ① Flowmeter in ordered size
- ② Product documentation (on request)



Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.

2.2 Device description

Your measuring device is supplied ready for operation. The factory settings for the operating data have been made in accordance with your order specifications.

The following compact versions are available:

- Version 1: converter directly mounted on cast sensor housing in size DN2.5..6
- Version 2: converter and sensor in solid cast BNG construction for DN10 and DN 15
- Version 3: converter mounted on conventional sensor construction (DN25 and DN40)

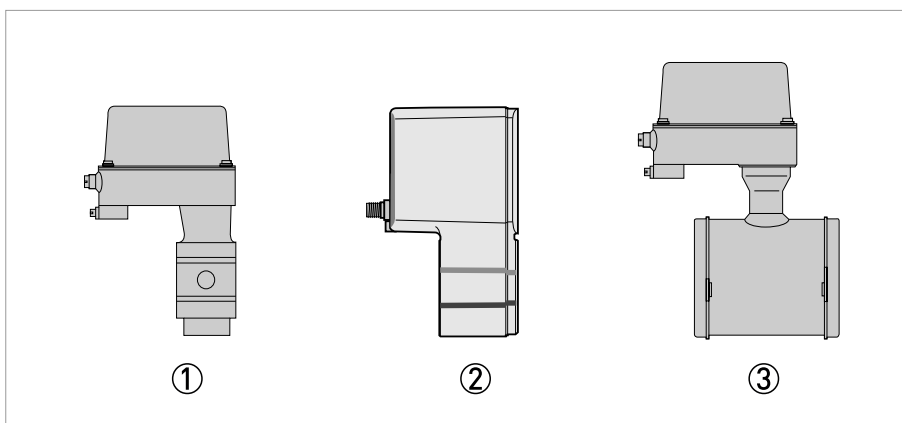


Figure 2-2: Device version

- ① DN2.5 - 4 - 6 ($1/10$ - $1/6$ - $1/4$ ").
- ② DN10 - DN15 ($3/8$ - $1/2$ ").
- ③ DN25 - DN40 (1 - $1 1/2$ ").

2.3 Nameplate (example)

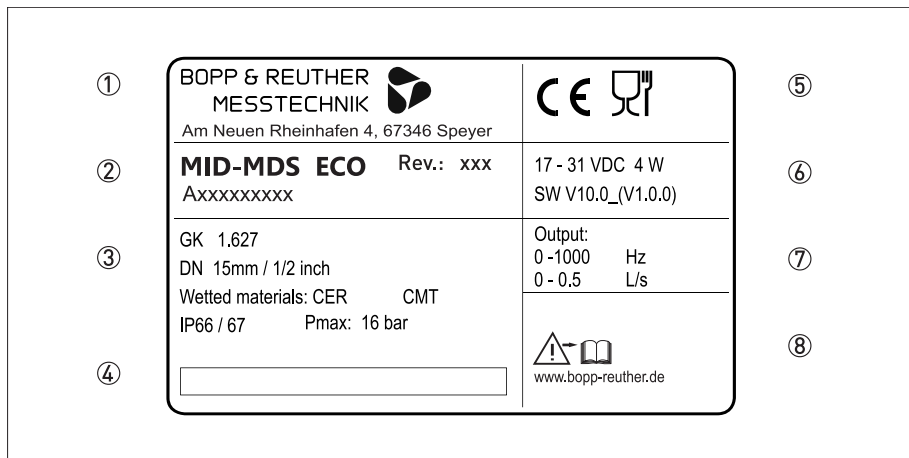


Figure 2-3: Example of nameplate

- ① Name and address of the manufacturer
- ② Type designation
- ③ Calibration and device data, wetted materials
- ④ Tag number
- ⑤ Marking (eg. CE and logo)
- ⑥ Electrical values and software revision nr.
- ⑦ Output data
- ⑧ Additional info (e.g. manufacturer website)

3.1 General notes on installation



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



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



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 and dust-free location.
- Avoid lasting direct exposure to the sun.
- Store the device in its original packaging.
- Storage temperature: -50 ...+70°C / -58...+158°F

3.3 Pre-installation requirements

Make sure that you have all necessary tools available:

- Small wrench (M5) for connection to ground
- Torque wrench for installing flowmeter in pipeline
Always tighten the bolts uniformly and in diagonally opposite sequence !

Accessories necessary for the correct installation are available on request at the manufacturer

Make sure that these accessoires are available before starting installation;

- O-rings / L-ring gasket
- Special pipe flanges
- Stud bolts with lockwasher, plain washer and nut



*To facilitate servicing and/or exchanging of the device, please note that:
it must be possible to shut off the flow through the pipeline (control valve upstream in pipeline).
Drain the pipeline before removing device (provide drain valve)*

3.4 General requirements



The following precautions must be taken to ensure a reliable installation.

- Make sure that there is adequate space to the sides.
- Signal converters installed in control cabinets require adequate cooling, e.g. by fan or heat exchanger.
- Do not expose the signal converter to intense vibration. The is tested for a vibration level in accordance with IEC 60721-3-3 Class 3M3.

3.4.1 Vibration

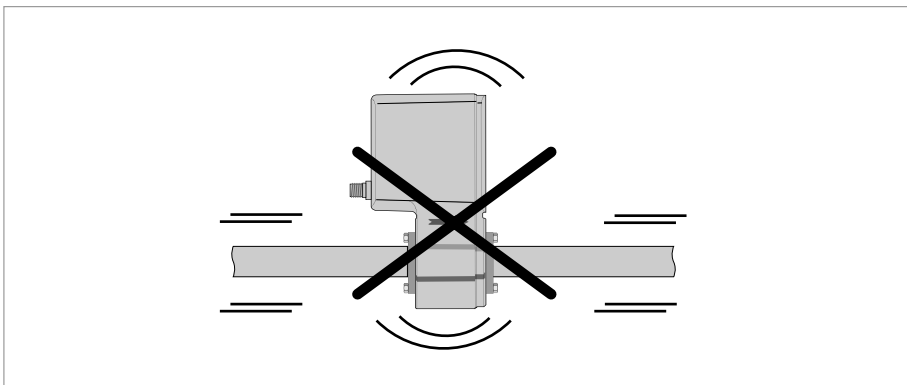


Figure 3-1: Avoid vibrations

3.4.2 Magnetic field

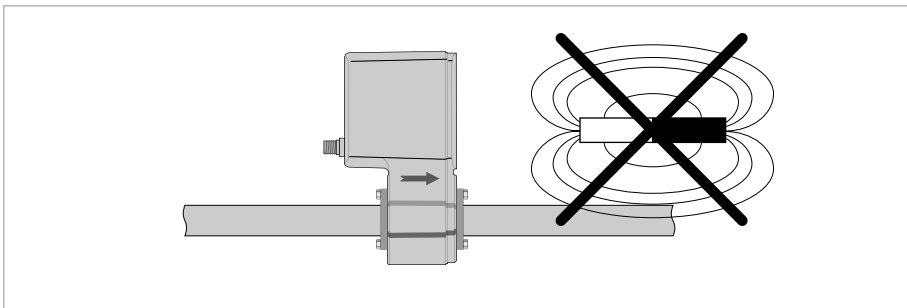


Figure 3-2: Avoid strong magnetic fields

3.5 Installation conditions

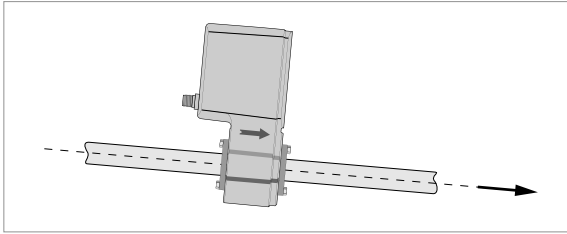


Figure 3-3: Horizontal piperun

3.5.1 Inlet and outlet

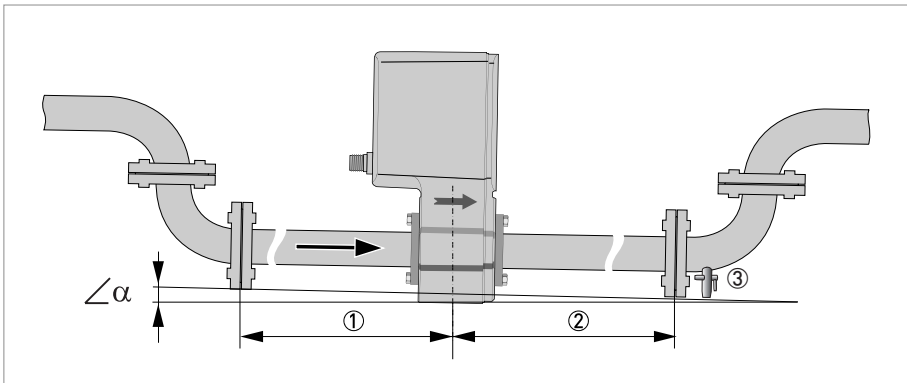


Figure 3-4: Inlet and outlet section

- ① ≥ 5 DN
- ② ≥ 2 DN
- ③ Drain valve (to empty pipeline)

$\angle\alpha > 2^\circ$
 ① Drain valve (to empty pipeline)

3.5.2 Open feed or discharge

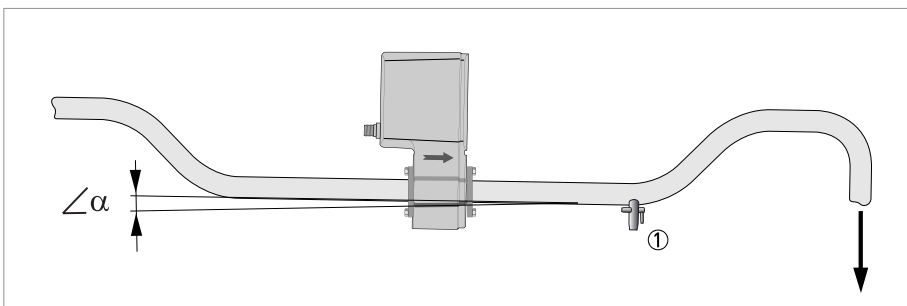


Figure 3-5: Installation in front of an open discharge

$\angle\alpha > 2^\circ$
 ① Drain valve (to empty pipeline)

3.5.3 Pump

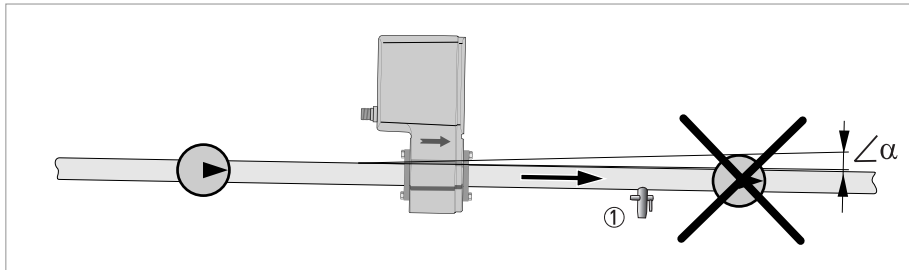


Figure 3-6: Installation behind a pump

$$\angle \alpha > 2^\circ$$

① Drain valve (to empty pipeline)

3.5.4 Control valve

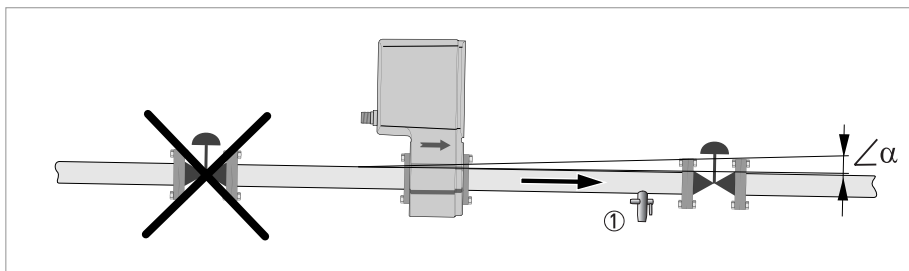


Figure 3-7: Installation in front of a control valve

$$\angle \alpha > 2^\circ$$

3.5.5 Mounting position

The flowmeter can be installed in every position.

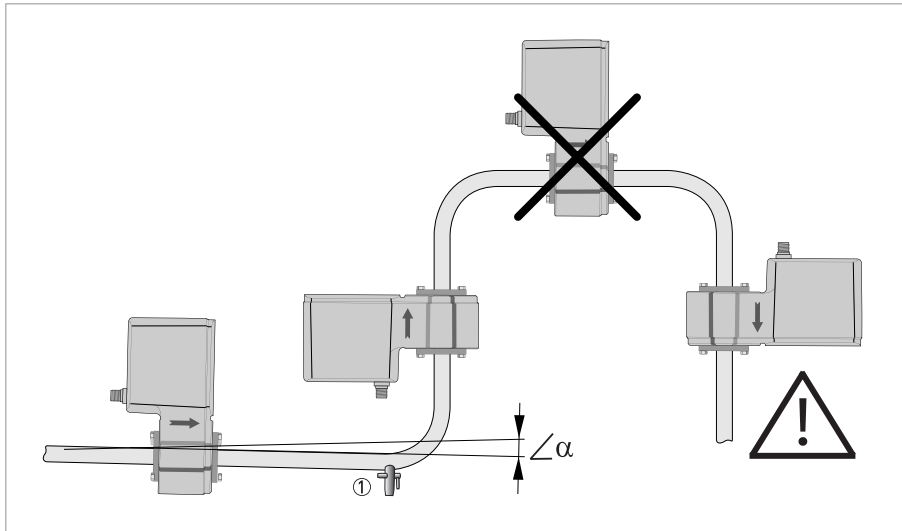


Figure 3-8: Installation in bending pipes

$\angle \alpha > 2^\circ$

① Drain valve (to empty pipeline)



WARNING!

Vertical down position only in conjunction with a control valve



CAUTION!

To ensure a correct measurement, avoid draining or partial filling of the flow sensor during operation.



Avoid installation near hot product tanks. If possible, try to insulate the flowmeter from radiant heat sources.

3.5.6 Mounting

3.5.7 Installation location

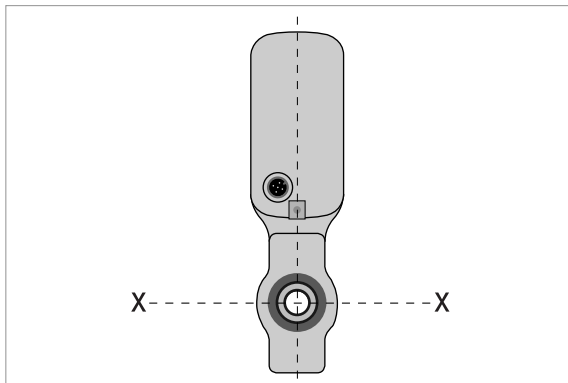


Figure 3-9: Horizontal installation



CAUTION!

Mount the flow sensor in such a way that the electrode axis (X-----X) is approximately in a horizontal pipe run.

3.5.8 Flange deviation

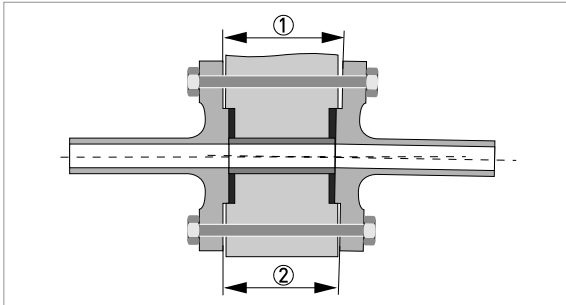


Figure 3-10: Mounting position and flange deviation

- ① L_{max}
- ② L_{min}

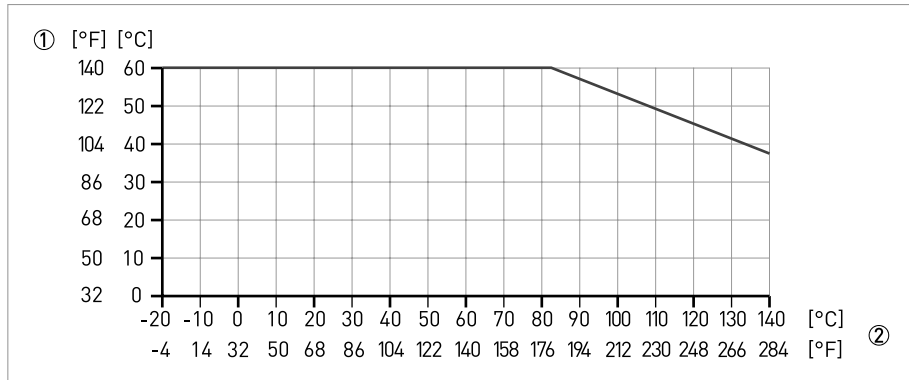


CAUTION!

Max. permissible deviation of pipe flange faces:
 $L_{max} - L_{min} \leq 0.5 \text{ mm} / 0.02''$

3.5.9 Temperatures

Process temperature vs ambient temperature



- ① Ambient temperature
- ② Process temperature

3.5.10 Hot filling

Installation position

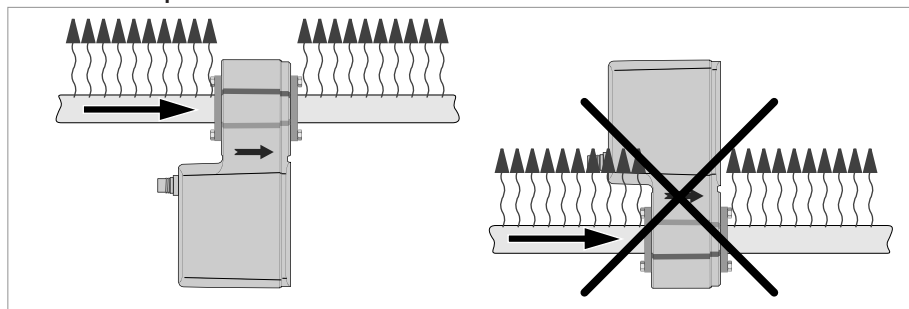


Figure 3-11: In case of hot fluids



CAUTION!

On high temperature pipes and where temperatures exceed 100°C / 212°F, provide facilities to compensate for longitudinal expansion of pipeline (due to heat-up). Use flexible pipe elements (e.g. elbows).

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!



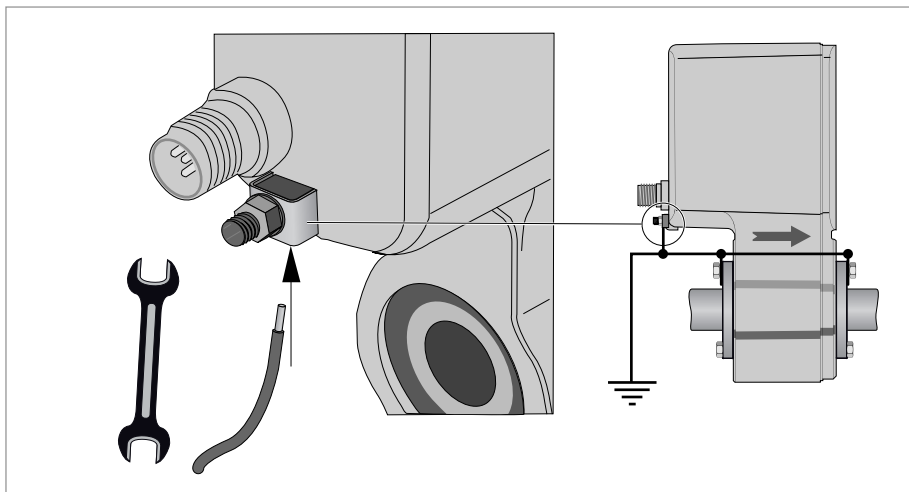
WARNING!

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.



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 Grounding



CAUTION!

The grounding should not transmit any interference voltage. Therefore do not ground any other electrical device at the same conductor.



CAUTION!

When connecting to functional extra-low voltages (24VDC), ensure that you use protective separation (PELV) according to IEC 364/IEC 536 or VDE 0100/VDE 0106.



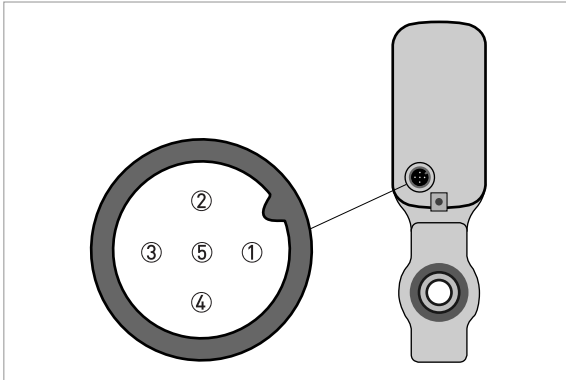
CAUTION!

Do not remove the secured (glued) adjusting screw. Removing the screw will affect the gas tightness and durability of the device.

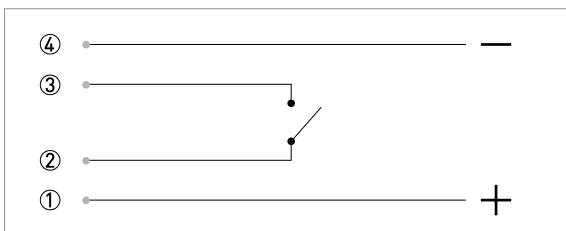
4.3 Electrical connection

4.3.1 Cable connector M12 - 5 pin

All the operating data are preset at the factory.



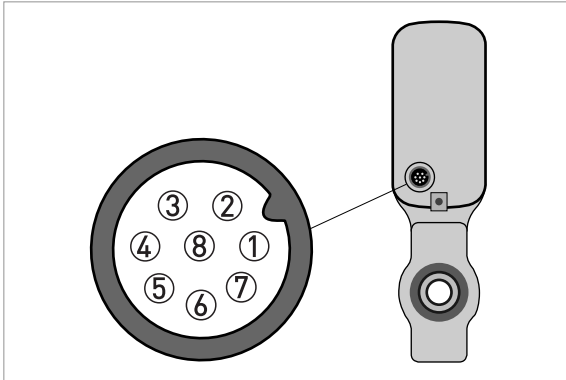
- ① +24 VDC
- ② Frequency output
- ③ Frequency output (ground)
- ④ Ground
- ⑤ To be connected for servicing only



Note; the switch circuits have a resistance of approximately 76 Ohms

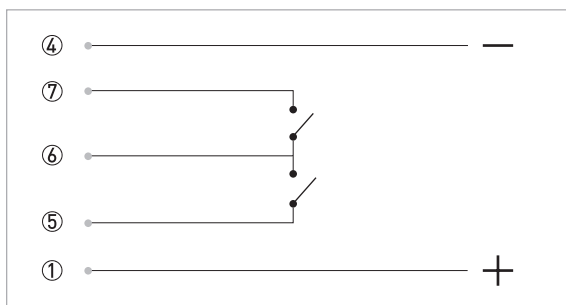
4.3.2 Cable connector M12 - 8 pin (with status output)

The 8 pin electric connection has a status output. This status output is configurable to customer specifications and offers either the flow direction (of the medium) or an error signal.



- ① + 24 VDC
- ② Not Connected
- ③ To be connected for servicing only
- ④ Ground
- ⑤ Frequency output
- ⑥ Ground common I/O
- ⑦ Status output
- ⑧ Not Connected

Options on status output ⑦; Off / Error / Flow direction



Note; the switch circuits have a resistance of approximately 76 Ohms

Mode

- Status output On / Off
 - Flow direction
- Default value :Flow Direction
- Forward flow : status output; open
- Reversed flow ; status output ; closed
- Error software / application failure

Error signaling for following events: software failure or application failure (detection of empty pipe only). No error ; status output open

Use one of the following attachment plug types to connect the flowmeter to a third party system:

- moulded plug, straight or angle-entry form
- integrally extruded plug with cable in various lengths
- moulded plug, straight form, especially suitable for high-interference environments

Possible vendors of these plugs are:

- Binder
- Hirschmann
- Lumberg
- Amphenol
- Coninvers

5.1 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 subject to wear and tear under normal operating conditions.

5.2 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.



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

5.3 Returning the device to the manufacturer

5.3.1 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.



WARNING!

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.*



WARNING!

If the device has been operated with toxic, caustic, radioactive, 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 it is safe to handle and stating the product used.*

5.3.2 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.:			
Manufacturer's order no. or serial no.:			
The device has been operated with the following medium:			
This medium is:	<input type="checkbox"/>	radioactive	
	<input type="checkbox"/>	water-hazardous	
	<input type="checkbox"/>	toxic	
	<input type="checkbox"/>	caustic	
	<input type="checkbox"/>	flammable	
	<input type="checkbox"/>	We checked that all cavities in the device are free from such substances.	
	<input type="checkbox"/>	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:			

5.4 Disposal



LEGAL NOTICE!

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.

6.1 Measuring principle

An electrically conductive fluid flows inside an electrically insulated pipe through a magnetic field. This magnetic field is generated by a current, flowing through a pair of field coils.

Inside of the fluid, a voltage U is generated:

$$U = v * k * B * D$$

in which:

v = mean flow velocity

k = factor correcting for geometry

B = magnetic field strength

D = inner diameter of flowmeter

The signal voltage U is picked off by electrodes and is proportional to the mean flow velocity v and thus the flow rate Q . A signal converter is used to amplify the signal voltage, filter it and convert it into signals for totalizing, recording and output processing.

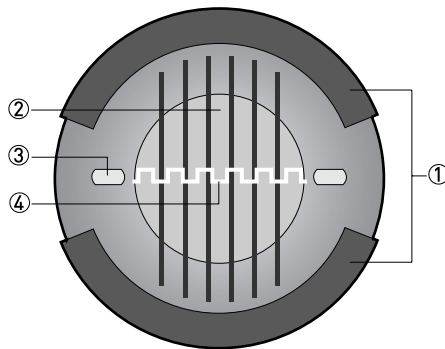


Figure 6-1: Measuring principle

- ① Field coils
- ② Magnetic field
- ③ Electrodes
- ④ Induced voltage (proportional to flow velocity)

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

Measuring system

Measuring principle	Faraday's law
Application range	Electrically conductive fluids
Measured value	
Primary measured value	Flow velocity
Secondary measured value	Volume flow

Design

Features	Standard wet calibration
Modular construction	The measurement system consists of a flow sensor and a signal converter. It is only available as compact version.
Compact version	MID-MDS ECO
Nominal diameter	DN2.5...40 / 0.1...1½"
Measurement range	-12...+12 m/s / -39...+39 ft/s
User interface	
Operating data	Factory set to customer specification.
Cable connections	Standard; 1x M12, 5-pin connector With status output; 1x M12, 8-pin connector

Measuring accuracy

Reference conditions	Medium: water	
	Inlet / outlet section: 10 DN / 5 DN	
	Valve closing time variation: < 1 ms	
	Flow velocity: 1 m/s, flow conditions similar to EN 29104	
	Operating pressure: 1 bar / 14.5 psi	
Error limits at reference conditions for tap water, 400 µS/cm, 20°C / 68°F:		
Maximum measuring error	DN2.5...6:	
	v ≤ 1 m/s: ±0.4% of measured value + 1 mm/s	
	v > 1 m/s: ±0.5% of measured value	
	DN10...15:	
	±0.2% of measured value + 1 mm/s	
	DN25...40:	
	v ≤ 1 m/s: ±0.2% of measured value + 1 mm/s	
v > 1 m/s: ±0.3% of measured value		
Repeatability	DN2.5...6 / DN25...40:	Standard deviation:
	Filling time 1.5...3 s:	≤ 0.4%
	Filling time 3...5 s:	≤ 0.2%
	Filling time > 5 s:	≤ 0.1%
	DN10...15:	Standard deviation:
	Filling time 1.5...3 s:	≤ 0.3%
	Filling time 3...5 s:	≤ 0.15%
	Filling time > 5 s:	≤ 0.08%
	Error limits at reference conditions for hot water, 400 µS/cm, 80°C / 176°F:	
Maximum measuring error	DN10...15:	
	±0.2% of measured value + 1 mm/s	
Repeatability	DN10...15:	Standard deviation:
	Filling time 1.5...3 s:	≤ 0.3%
	Filling time 3...5 s:	≤ 0.2%
	Filling time > 5 s:	≤ 0.1%

Operating conditions

Temperature	
Process temperature	Dependent on ambient temperature. See chapter "Temperatures".
Cleaning temperature	SIP: Maximum 1 hour at 150°C / +302°F
	CIP: Maximum 1 hour, at 140°C / +284°F
Shock	≤ 3 K/s
Ambient temperature	-40...+60°C / -40...+140°F
Storage temperature	-50...+70°C / -58...+158°F
Pressure	
Ambient	Atmospheric
Process pressure	up to 16 bar / 232 psi for DN10...15
	up to 40 bar / 580 psi for DN2.5...6 / DN25...40
	Option: DN25 up to 200 bar / 2900 psi
Vacuum load	0 mbara / 0 psig
Chemical properties	
Physical condition	Liquids
Electrical conductivity	≥ 5 μS/cm (≥ 20 μS/cm for demineralised water)
Recommended flow velocity	-12...+12 m/s / -39...+39 ft/s

Installation conditions

Installation	For detailed information see chapter "Installation".
Inlet run	≥ 5 DN
Outlet run	≥ 2 DN
Dimensions and weights	For detailed information see chapter "Dimensions and weights".

Materials

Sensor- and converter housing	Stainless steel 1.4404 / 1.4408
Measuring tube	Fused-in-place Zirconium oxide
Measuring electrodes	Fused-in cermet (DN2.5...25)
	DN40: Platinum

Process connections

Connection	Sandwich design
	Optional: Pressure relief groove at flange facing of the sensor
	Construction drawings of recommended counter flanges are available on the manufacturer website, under services.

Electrical connections

Power supply	24 VDC \pm 25%
Power consumption	\leq 3 W
Switch on current	\leq 5 A (< 100 μ s) at 24 VDC
Voltage loss	Possible for a maximum of 20 ms according to NAMUR NE21.
Status output	Configurable; error, flow direction, on/offFlow direction and error only
Frequency output	
Type	Frequency (passive) / galvanically isolated from power supply
Function	All operating data preset at factory.
Interval	Counter gate time \geq 1000 / (P _{100%} [Hz])
Frequency output	\leq 10 kHz
Pulse width at full scale value	\leq 10 Hz: 50, 100, 200 or 500 ms
	> 10 Hz: automatic, pulse width = 1 / (2 x f _{100%}) or symmetrical, 1:1
Passive operation	Connection of electronic or electromechanical counters.
	External voltage: \geq 5 \leq 30 VDC / \leq 24 VAC
	Load: I _{max} \leq 20 mA
Low flow cut-off	Threshold: 0...20 %
	Hysteresis: 0...20 %
	Hysteresis \leq threshold
	Depending on customers specifications.

Approvals and certifications

CE	
This device fulfills the statutory requirements of the EU directives. The manufacturer certifies successful testing of the product by applying the CE mark.	
	For full information of the EU directives and standards and the approved certifications, please refer to the EU Declaration of Conformity or the website of the manufacturer.
Other approvals and standards	
Protection category acc. to IEC 60529	DN2.5...6 / DN25...40: IP 66/67
	DN10...15: IP 69K
Shock test	IEC 60068-2-27 30g, half sine, time 18ms.
Vibration test	IEC 60068-2-64 ; f1 = 20...2000Hz. rms a = 4,5g, t = 30min.

6.3 Dimensions and weights

DN2.5...6

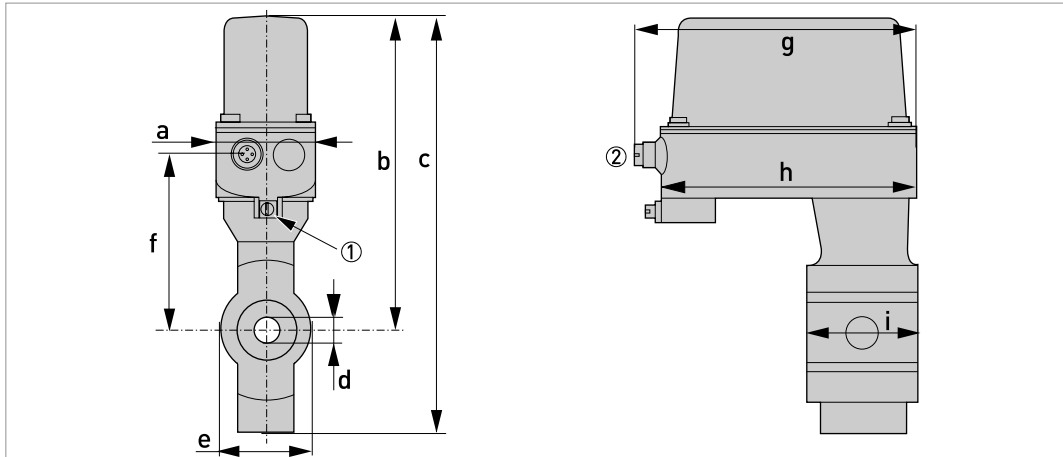


Figure 6-2: Dimensions

- ① [Grounding]
- ② M12; 5 - 8 pins connector

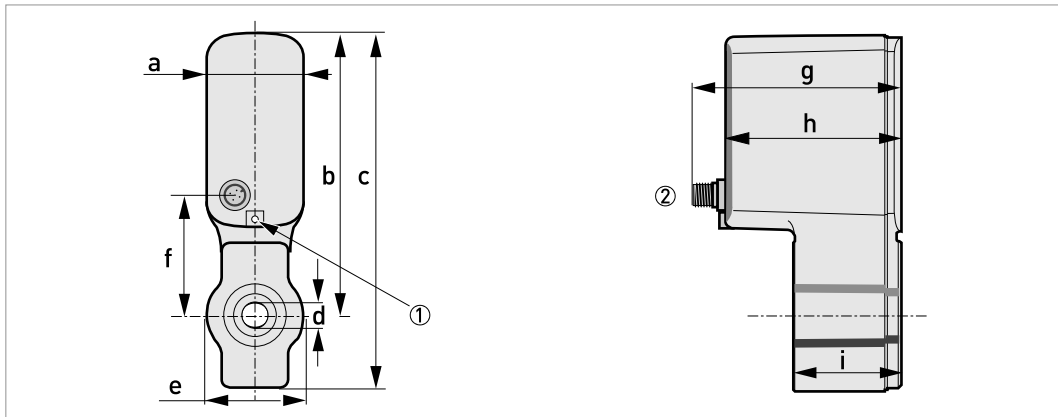
Nominal size	Dimensions [mm]									Weight [kg]
	a	b	c	d	e	f	g	h	i	
DN2.5	50	156	206	6 → 2.5	44	88	141	128	54	1.5
DN4	50	156	206	7 → 3.2	44	88	141	128	54	1.6
DN6	50	156	206	9 → 4.8	44	88	141	128	54	1.6

Note on dimension d: As the diameter reduces to the middle, the diameter is specified for the inlet and for the middle

Nominal size	Dimensions [inches]									Weight [lb]
	a	b	c	d	e	f	g	h	i	
1/10"	1.97	6.14	8.11	0.24 → 0.10	1.73	3.46	5.55	5.0	2.13	3.4
1/6"	1.97	6.14	8.11	0.28 → 0.13	1.73	3.46	5.55	5.0	2.13	3.6
1/4"	1.97	6.14	8.11	0.35 → 0.19	1.73	3.46	5.55	5.0	2.13	3.6

Note on dimension d: As the diameter reduces to the middle, the diameter is specified for the inlet and for the middle

DN10...15



- ① (Grounding)
- ② M12; 5 - 8 pins connector

Nominal size	Dimensions [mm]									Weight [kg]
	a	b	c	d	e	f	g	h	i	
DN10	50	140	179	10.5 → 8	45.4	60	106.5	88	54	1.4
DN15	50	140	179	14 → 12	45.4	60	106.5	88	54	1.4

Note on dimension d: As the diameter reduces to the middle, the diameter is specified for the inlet and for the middle

Nominal size	Dimensions [inches]									Weight [lb]
	a	b	c	d	e	f	g	h	i	
3/8"	1.97	5.51	7.05	0.41 → 0.31	1.79	2.36	4.19	3.46	2.13	3.1
1/2"	1.97	5.51	7.05	0.55 → 0.47	1.79	2.36	4.19	3.46	2.13	3.1

Note on dimension d: As the diameter reduces to the middle, the diameter is specified for the inlet and for the middle

DN25..40

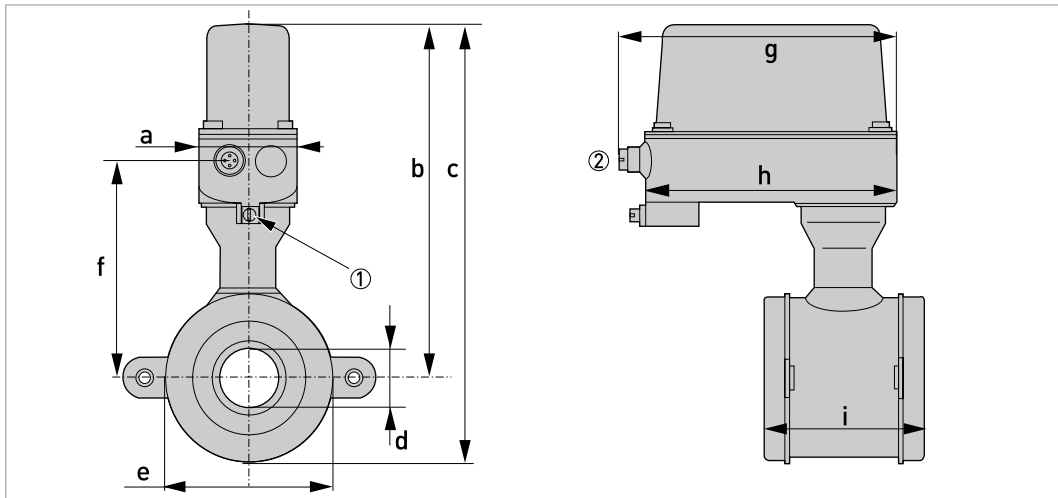


Figure 6-3: Dimensions

- ① (Grounding)
- ② M12; 5 - 8 pins connector

Nominal size	Dimensions [mm]									Weight [kg]
	a	b	c	d	e	f	g	h	i	
DN25	50	170	204	26 → 20	68	102	141	128	58	1.6
DN40	50	177	219	39 → 30	84	117	141	128	83	2.3

Note on dimension d: As the diameter reduces to the middle, the diameter is specified for the inlet and for the middle

Nominal size	Dimensions [inches]									Weight [lb]
	a	b	c	d	e	f	g	h	i	
1"	1.97	6.69	8.03	1.02 → 0.79	2.68	4.02	5.55	5.04	2.28	3.6
1 1/2"	1.97	6.97	8.62	1.54 → 1.18	3.30	4.61	5.55	5.04	3.27	5.1

Note on dimension d: As the diameter reduces to the middle, the diameter is specified for the inlet and for the middle

6.4 Measurement accuracy

Every electromagnetic flowmeter is calibrated by direct volume comparison. The wet calibration validates the performance of the flowmeter under reference conditions against accuracy limits.

The accuracy limits of electromagnetic flowmeters are typically the result of the combined effect of linearity, zero point stability and calibration uncertainty.

Reference conditions

- Medium: water
- Temperature: +5...35°C / +41...95°F
- Operating pressure: 0.1...5 barg / 1.5...72.5 psig
- Inlet section: ≥ 5 DN
- Outlet section: ≥ 2 DN

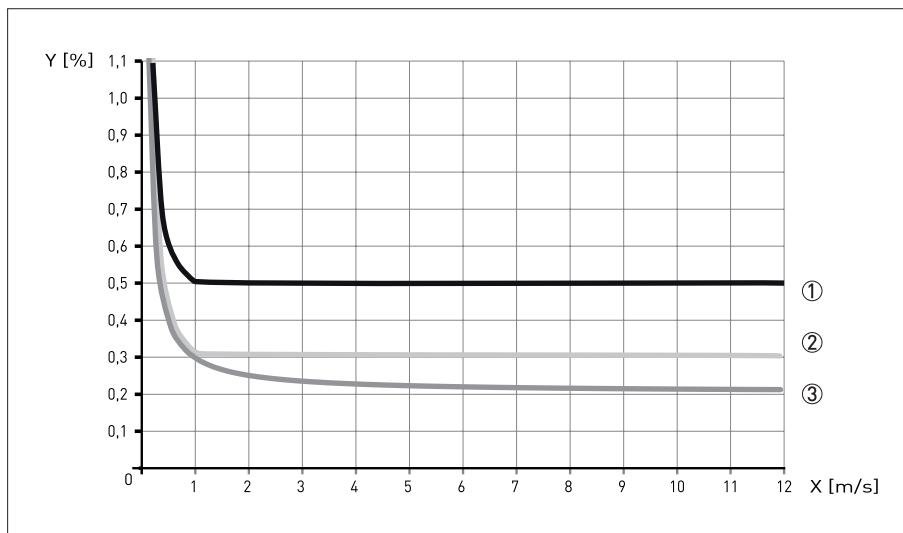


Figure 6-4: Measuring accuracy
X [m/s]: Flow velocity; Y [%]: Maximum measuring error

Accuracy

Size	Velocity	Accuracy	Curve
DN2.5...6 / 1/10...1/4"	$v \leq 1$ m/s	0.4% of measured value + 1 mm/s	①
	$v > 1$ m/s	0.5% of measured value	
DN10...15 / 3/8...1/2		0.2% + 1 mm/s	③
DN25...40 / 1...1½"	$v \leq 1$ m/s	0.2% of measured value + 1 mm/s	②
	$v > 1$ m/s	0.3% of measured value	

Bopp & Reuther Messtechnik GmbH
Am Neuen Rheinhafen 4
67346 SPEYER, Germany
Tel: +49 6232 657-0
Fax: +49 6232 657-505
Web: www.bopp-reuther.de
Email: info@bopp-reuther.de