BATCHFLUX 5500 C

Technical Datasheet

Electromagnetic flowmeter for volumetric filling machines

- High-stability zirconium oxide measuring tube
- Extreme long-term stability
- Most compact and lightweight design in the market

3-A 28-04 FDA

KROHNE

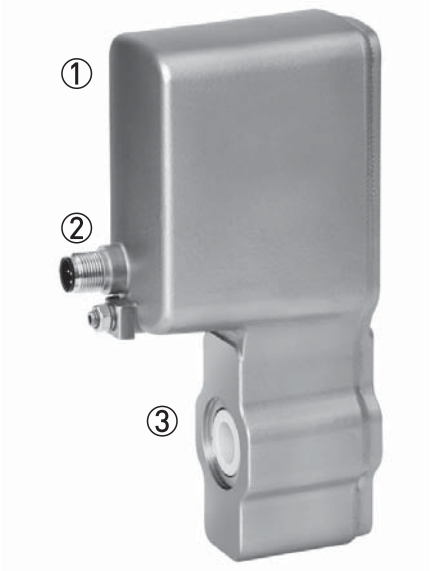
1.1 Flowmeter for volumetric filling machines

BATCHFLUX 5500 C is the industrial standard for volumetric filling machines. Its zirconium oxide liner guarantees extreme long-term dimensional stability and therefore no change in repeatability of filling volumes over long periods of time.

The **BATCHFLUX 5500 C** offers major improvements for the most commonly used sizes: DN10 and DN15. It has a better versatility of applications with improved performance in difficult applications like fibrous products, hot filling and CIP / SIP processes.

An additional improvement is the further reduction of the flowmeter dimensions and weight, to allow integration in more compact machinery and installations. Also, the weight and load on the filling machines can be reduced and energy savings are possible. Especially for linear fillers this can lead to an improved duty cycle.

The BATCHFLUX 5500 C has an extreme low energy consumption. For the owner of the filling machine this means lower operation costs.



① Fully welded all stainless steel housing
② Sealed electronics
③ Hygienic design of process connection

Highlights

- Design enables high speed filling with minimal product loss
- High level of filling accuracy
- Long term reliability due to extreme high dimensional stability
- Low power consumption of only 3 W
- Hygienic construction
- Easy to clean.
- CIP and SIP proof
- Absolutely leak-free stainless steel housing concept (DN10 and DN15); IP 69K
- Application versatility
- 3A approval, FDA food contact material compliance , EC 1935/2004, EC 2023/2006

Industries

- Food & Beverages
- Chemical
- Pharmaceutical

Applications

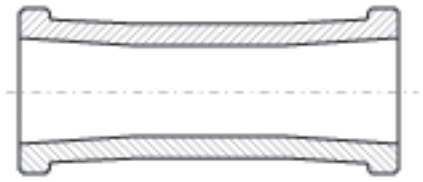
- Carousel and linear filling machines
- Water
- Soft drinks
- Milk
- Beer
- Fruit juices and other fluids with fibres
- Hot fillings up to 140°C / 284°F

1.2 Features

1.2.1 Innovative design

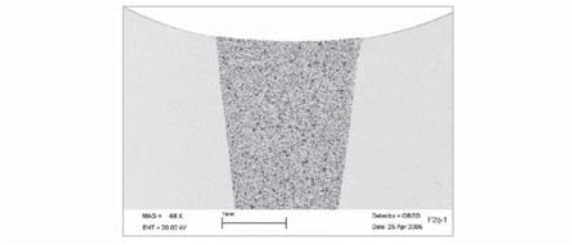
Zirconium Oxide liner

The measuring tube of the BATCHFLUX 5500 C consists of high-strength, temperature shock resistant zirconium oxide. This material is dimensionally extremely stable as it does not leak, creep or absorb any moisture and is vapour proof. Even with hot filling or after steam-cleaning the measuring accuracy and repeatability remain excellent over a long period of time. Repairs, replacements or recalibrations are not required leading to minimal downtime and maintenance.



Measuring tube for an optimized flow profile

The BATCHFLUX 5500 C tapers off to the measuring electrode. As a result, the flow profile is optimised and more regular.



Gap-free fused-in-place electrodes

The sensing electrodes are composed of a mixture of platinum with zirconium oxide (cermet). It is sintered to the ceramic measuring tube, forming a gap-free and hermetically tight connection.

Potential leakage along the electrodes is eliminated

1.2.2 Designed for hygienic use

Any contaminants are unacceptable for the Food & Beverages and pharmaceutical industry. The BATCHFLUX 5500 C meets these hygienic requirements as the housing is easy to clean with all rounded corners, it is non-corrosive and fully welded.

1.2.3 Lightweight and compact design

The BATCHFLUX 5500 C helps to reduce the costs of construction and operation.

The BATCHFLUX 5500 C is the smallest and most lightweight electromagnetic flowmeter for batching and filling and allows for a more compact design of filling machines. Its low weight reduces the load on and weight of the filling machine. The power consumption of only 3 W results in less cost for cabling and power supply.

1.2.4 Quick and continuous data transmission

All operating data for the BATCHFLUX 5500 C are preset at the factory. For changing the parameters and diagnostic purposes BATCHMon plus operation software can be used.

The easy to operate service tool provides quick and continuous data transmission.

For diagnostic purposes, the filling process can be graphically analysed.

The required hardware for connection from BATCHFLUX 5500 C to computer consists of a connector, cable and service tool, which are optionally available.

Additionally, there is a version available with an extra status output.
This output can be used to monitor either flow direction or error mode.

1.3 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.

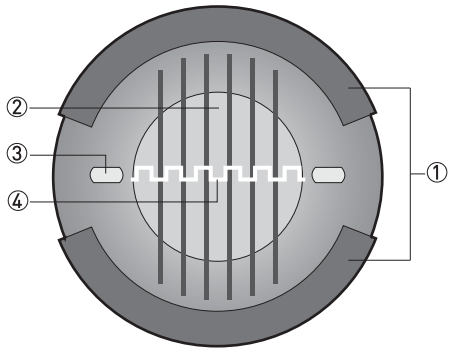


Figure 1-1: Measuring principle

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

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 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	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	BATCHFLUX 5500 C
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.
Human Machine Interface (HMI)	Option: BATCHMon Plus software
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 (≥ 10 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 ± 25%
Power consumption	≤ 3 W
Switch on current	≤ 5 A (< 100 µs) at 24 VDC
Voltage loss	Possible for a maximum of 20 ms according to NAMUR NE21.
BATCHMON	For parameter setting and diagnostic purposes, communication via PC with a single device (optional)
Status output	Configurable; error, flow direction, on/off
Frequency output	
Type	Frequency (passive) / galvanically isolated from power supply
Function	All operating data preset at factory.
Interval	Counter gate time ≥ 1000 / ($P_{100\%}$ [Hz])
Frequency output	≤ 10 kHz
Pulse width at full scale value	≤ 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: ≥ 5 ≤ 30 VDC / ≤ 24 VAC
	Load: I_{max} ≤ 20 mA
Low flow cut-off	Threshold: 0...20 %
	Hysteresis: 0...20 %
	Hysteresis ≤ 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 CE declaration or the website of the manufacturer.
Other approvals and standards	
Protection category acc. to IEC 529 / EN 60529	DN2.5...6 / DN25...40: IP 66/67
	DN10...15: IP 69K
Shock test	IEC 68-2-27 30g, half sine, time 18ms.
Vibration test	IEC 60068-2-64 ; f1 = 20 - 2000Hz. rms a = 4,5g, t = 30min.
Hygienic	DN2.5...40; 3A
	FDA approved materials
	EN1935/2004 / EC2023/2006

2.2 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: ≥ 2DN

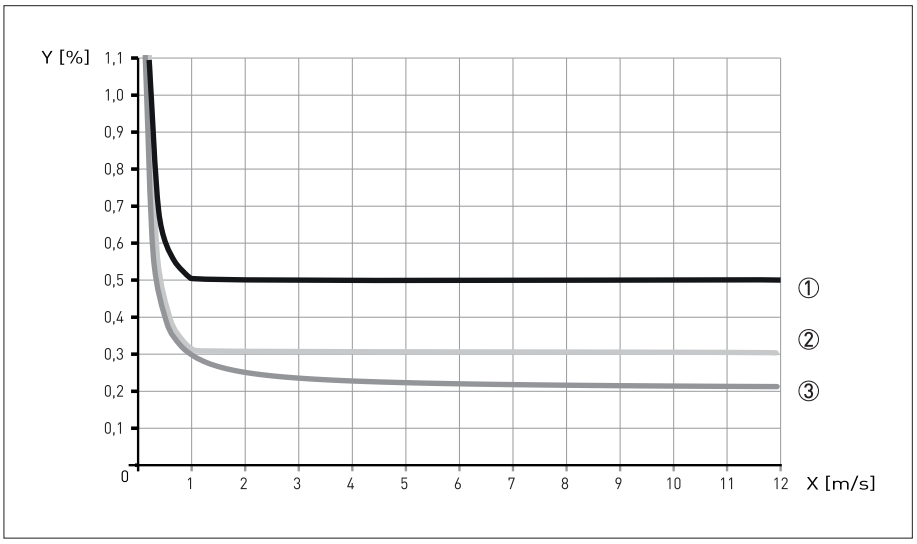


Figure 2-1: Measuring accuracy
X [m/s]: Flow velocity; Y [%]: Maximum measuring error

Accuracy

Size	Velocity	Accuracy	Curve
DN2.5...6 / 1/10...1/4"	v ≤ 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 ≤ 1 m/s	0.2% of measured value + 1 mm/s	②
	v > 1 m/s	0.3% of measured value	

2.3 Dimensions and weights

DN2.5...6

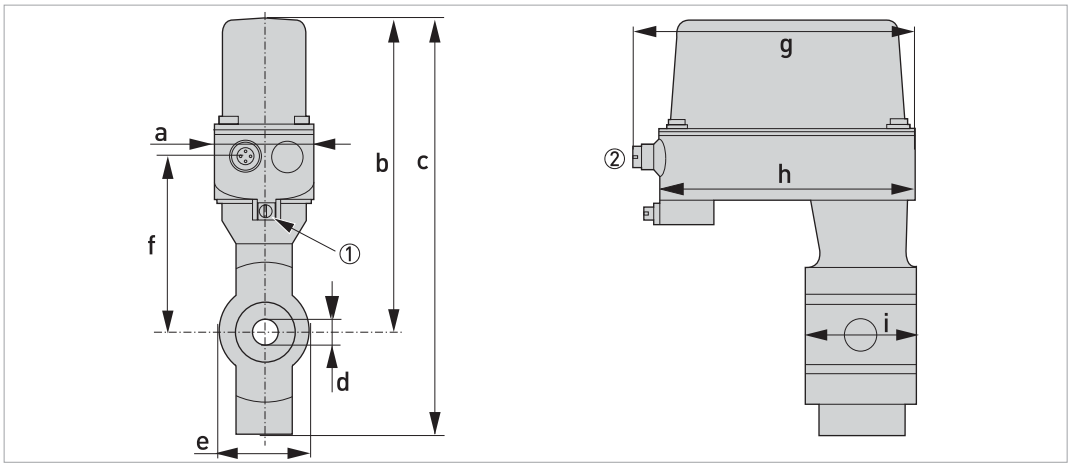


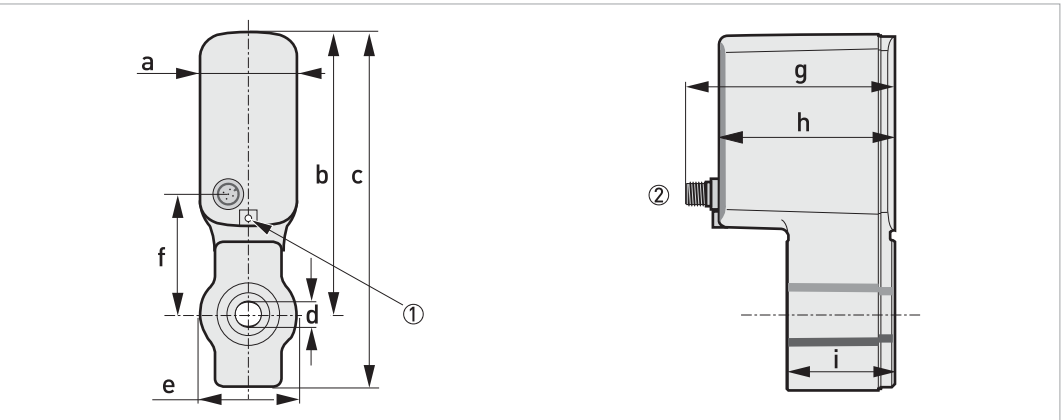
Figure 2-2: Dimensions

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

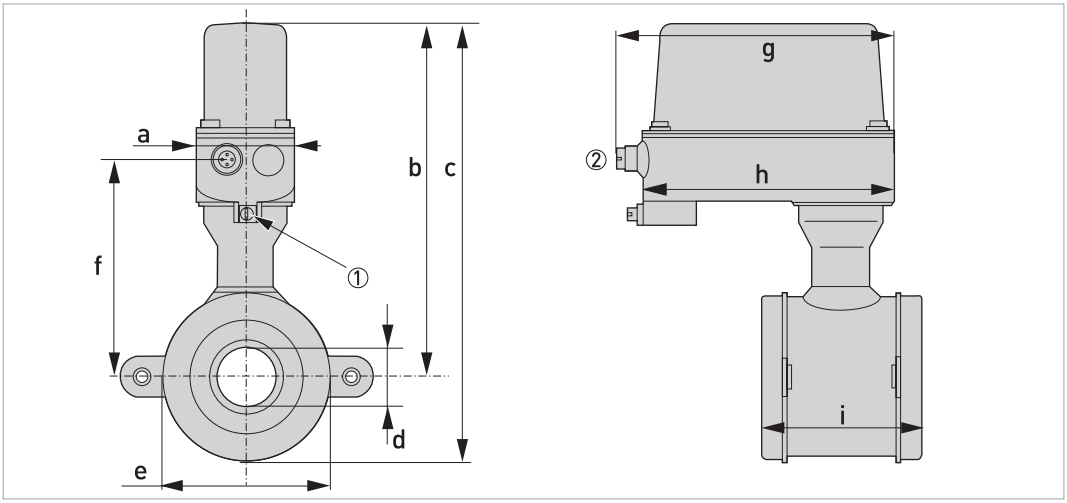


Figure 2-3: Dimensions

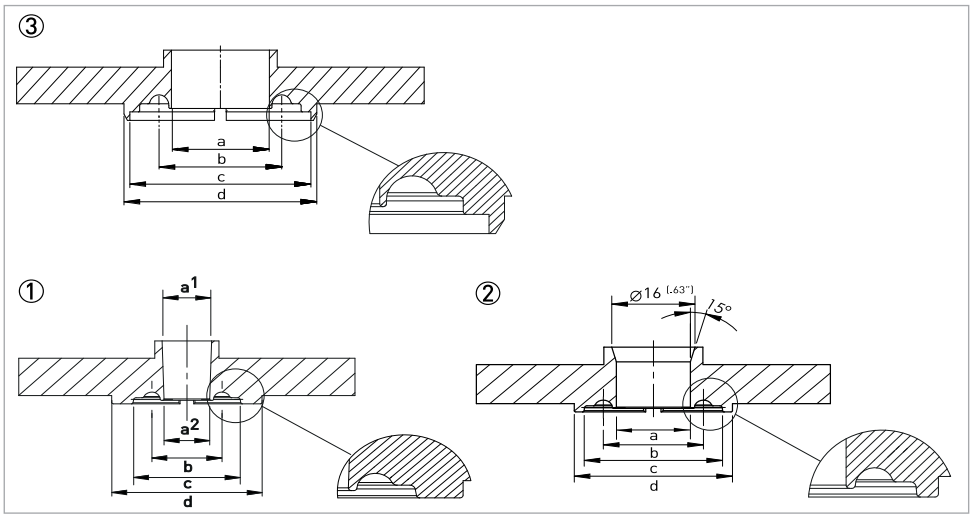
① (Grounding)
② M12; 5 - 8 pins connector

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										

2.4 Counter Flanges

The BATCHFLUX 5500 must be mounted between counter flanges (as shown in the following drawing), to ensure that the device works correctly.



Sizes of flanges

	DN	a [mm]	b [mm]	c [mm]	d [mm]	O-ring
Flange ①	2,5...10	* see table below	* see table below	* see table below	Ø 30.4	Special L-ring
Flange ②	15	Ø 14.2	Ø 19.2	Ø 26.6	Ø 30.4	15.47 * 3.53
Flange ③	25	Ø 25	Ø 31.3	Ø 41.2	Ø 49.2	15.47 * 3.53

Size DN	a^1[mm]	a^2 [mm]	b [mm]	c [mm]
2,5	Ø 10	Ø 6.2	Ø 11.1	Ø 18.4
4	Ø 10	Ø 7.2	Ø 12.1	Ø 19.4
6	Ø 10	Ø 9.2	Ø 14.2	Ø 21.5
10	Ø 10	Ø 10.7	Ø 15.7	Ø 23

Note; flanges must be fully welded and surface roughness, grinded and polished (roughness 0,8). See for more information the 3A CCE 2007-2 Coordination Bulletin.

The O-rings require periodic inspection and replacement. As the interval depends on process-specific variables, the length of the interval cannot be specified.
The O-rings are not part of the manufacturer portfolio.

For 3A applications, O-rings must conform to the requirements of the 3A sanitary standard for Flow meters, number 28-04 Class I or Class II (max. 8% milk fat).
The used O-rings must also withstand the processing, sterilization and chemical conditions for the intended use (for more information, contact the manufacturer)

Reference to specific dimensions and drawing numbers

Size DN	Pcd [mm]	D [mm]	W [mm]	Drawing number
2,5	Ø 56	Ø 68	14.5	4000587801
4	Ø 56	Ø 68	14.5	4000587807
6	Ø 56	Ø 68	14.5	4000587810
10	Ø 56	Ø 68	14.5	4000587815
15	Ø 56	Ø 68	14.9	4000587818
25	Ø 84	Ø 104	16.5	4000587824
40	#	#	#	#

Dimensions for DN40; on request

Detailed construction drawings of the above sketches are available from the manufacturer website (see table for drawing numbers)

3.1 Intended use

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

Minimum electrical conductivity:

- > 5 µS/cm (except for water)
- > 10 µS/cm (for water)

3.2 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.

3.2.1 Vibration

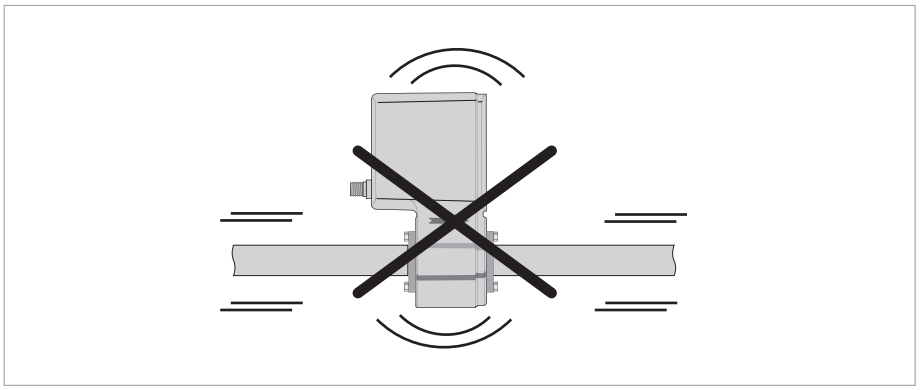


Figure 3-1: Avoid vibrations

3.2.2 Magnetic field

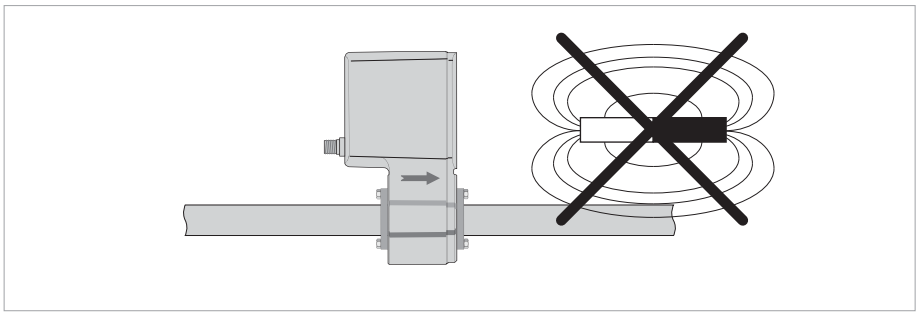


Figure 3-2: Avoid strong magnetic fileds

3.3 Installation conditions

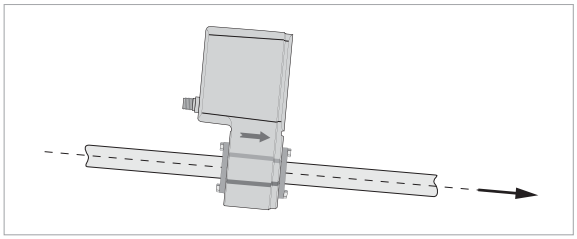


Figure 3-3: Horizontal piperun

Install in a slightly descending pipe section to prevent air from collecting and to avoid faulty measurements (meter can drain).

3.3.1 Inlet and outlet

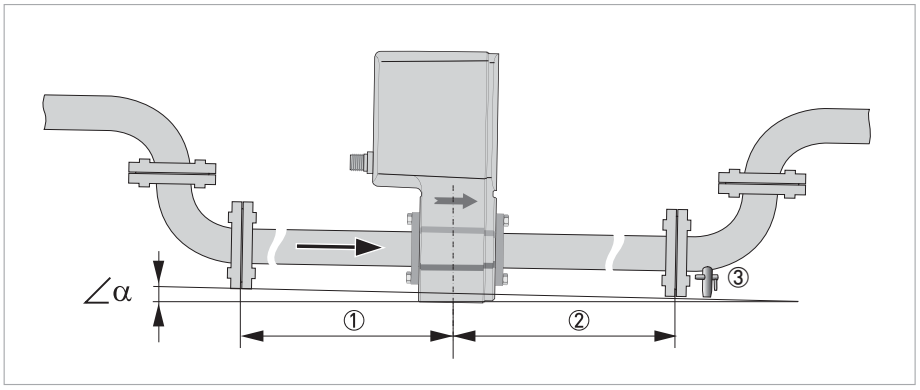


Figure 3-4: Inlet and outlet section

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

3.3.2 Open feed or discharge

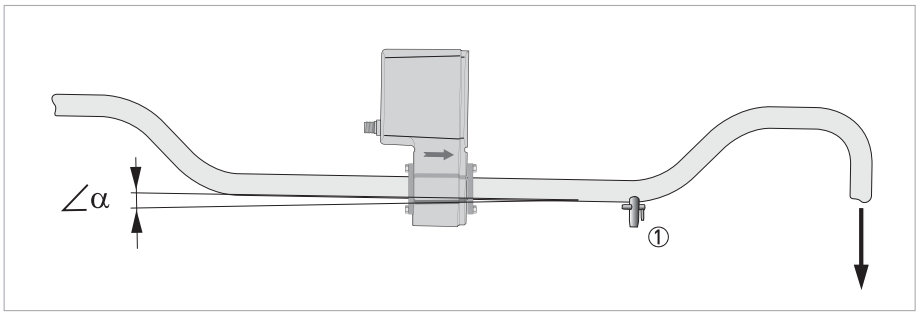


Figure 3-5: Installation in front of an open discharge

∠α > 2°
① Drain valve (to empty pipeline)

3.3.3 Pump

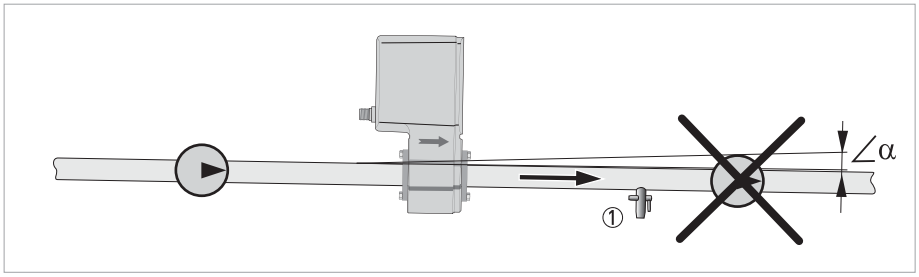


Figure 3-6: Installation behind a pump

3.3.4 Control valve

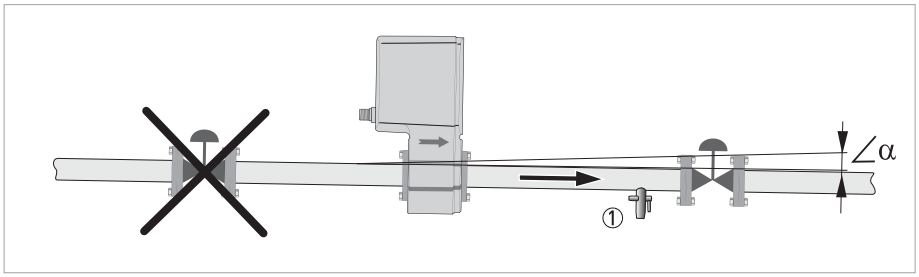


Figure 3-7: Installation in front of a control valve

3.3.5 Mounting position

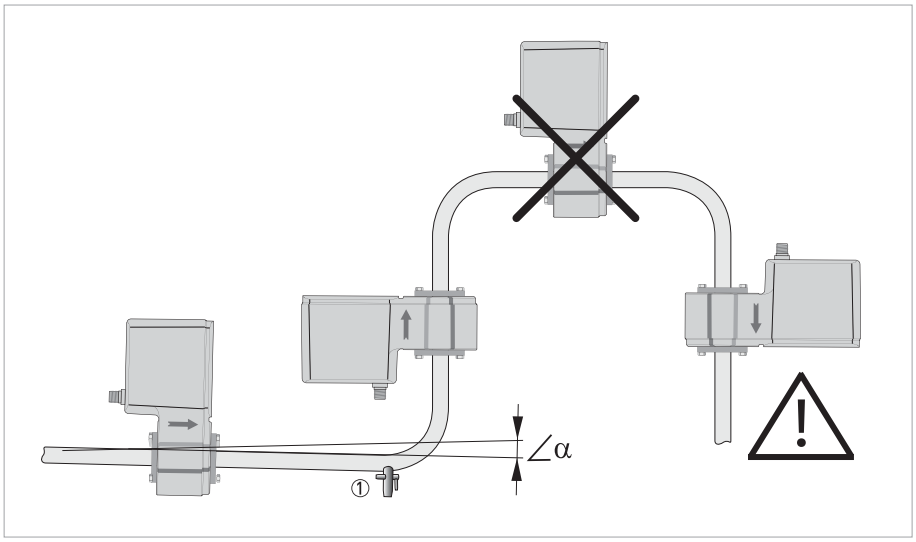


Figure 3-8: Installation in bending pipes

∠α > 2°
① Drain valve (to empty pipeline)

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

Vertical down position only in conjunction of a control valve

3.4 Installation location

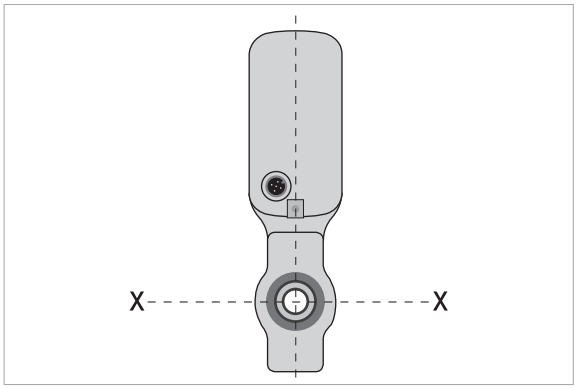


Figure 3-9: Horizontal installation

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

3.5 Flange deviation

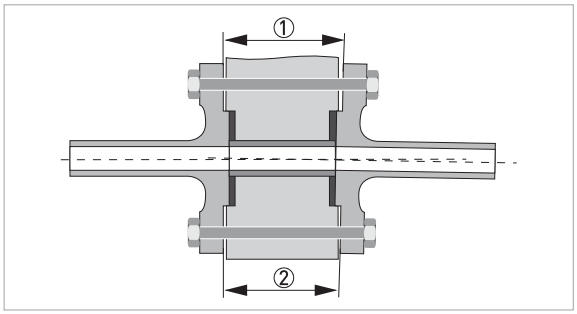


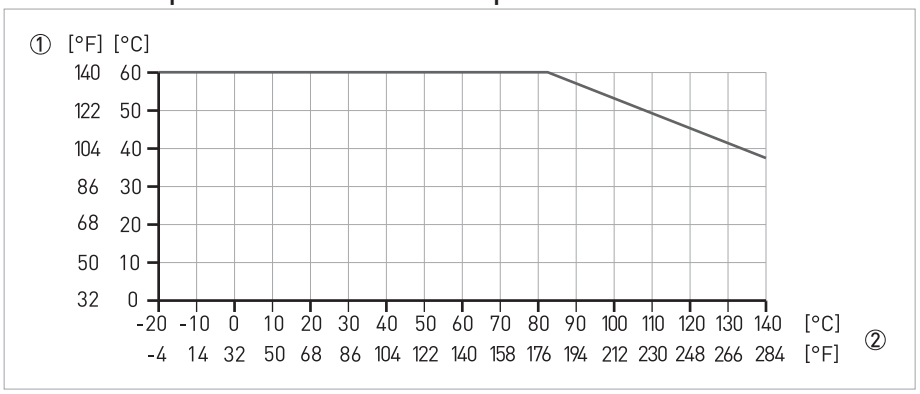
Figure 3-10: Mounting position and flange deviation

① L_{max}
② L_{min}

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

3.6 Temperatures

Process temperature vs ambient temperature



① Ambient temperature
② Process temperature

3.7 Hot filling

Installation position

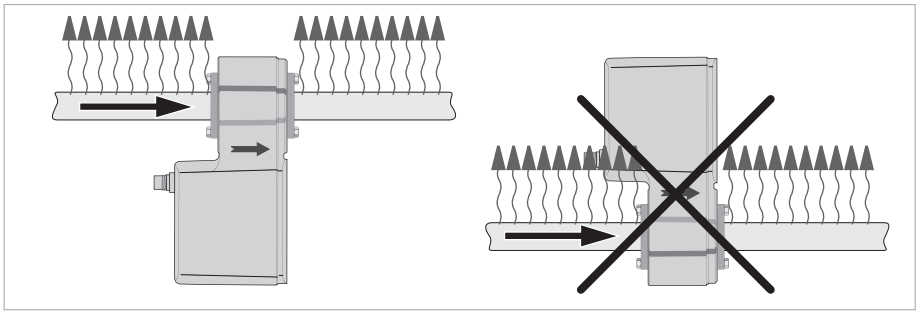


Figure 3-11: In case of hot fluids

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

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

4.1 Safety instructions

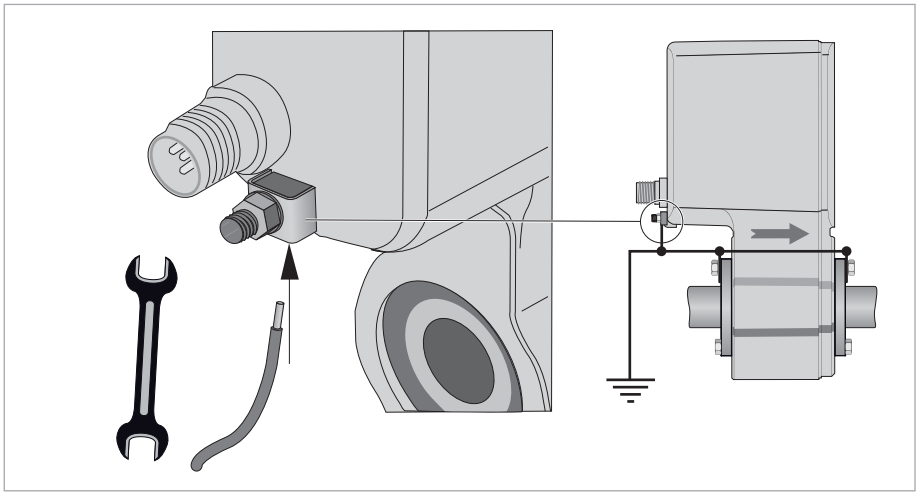
All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

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 Grounding



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

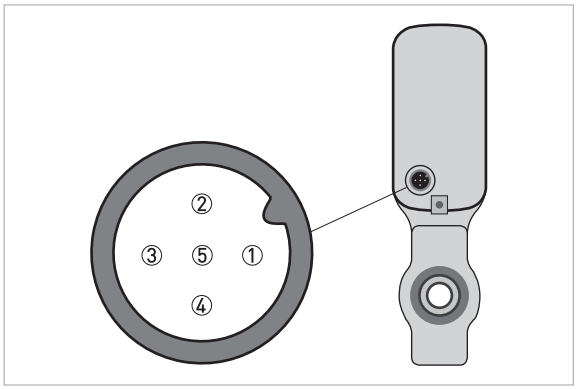
When connecting to functional extra-low voltages (24VDC) , ensure that you use protective separation (PELV) according to IEC 364/IEC 536 or VDE 0100/VDE 0106.

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

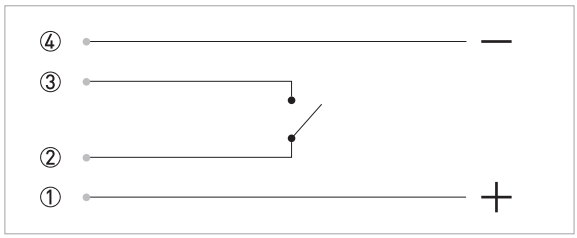
4.3 Electrical connection

4.3.1 Cable connector M12 - 5 pin

All the operating data are preset at the factory. For changing the parameters and diagnostic purposes BATCHMon plus operation software can be used.



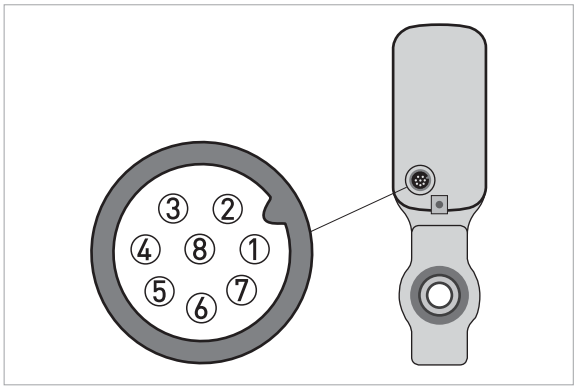
① +24 VDC
② Frequency output
③ Frequency output (ground)
④ Ground
⑤ To be connected for servicing only



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

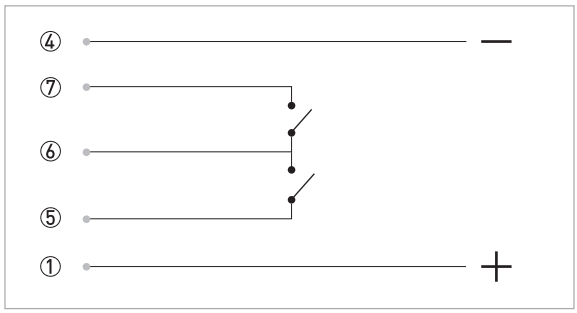
4.3.2 Cable connector M12 - 8 pin (with status output)

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

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