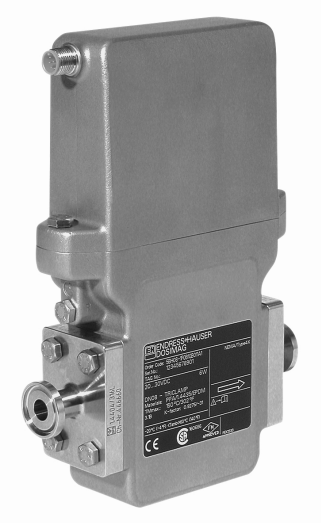
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Dosimag

Electromagnetic Flow Measuring System
Volume flow measuring system for filling applications



Application
Electromagnetic flowmeter for measuring in filling applications.

- Flow up to 1.66 l/s
- Fluid temperature up to +130 °C
- Process pressures up to 16 bar
- CIP/SIP cleanable
- Stainless steel housing

All liquids with a conductivity of ≥5 µS/cm can be measured in the following sectors for example:
- Food industry
- Cosmetics industry
- Pharmaceuticals industry
- Chemicals industry

Approvals in the food industry/hygiene sector:
- 3-A approval, EHEDG-tested, in conformity with FDA

Application-specific lining material:
- PFA

Your benefits
Dosimag guarantees the highest level of accuracy and repeatability even for short measuring times. The compact housing shape means the units can be arranged very close together in filling plants.

The "Batchline" concept comprises additionally:
- Identical process connections enable an uncomplicated exchange between "Dosimag" and the Coriolis mass flowmeter "Dosimass"
- Uniform operating concept using the "ToF Tool - Fieldtool Package" operating software:
  - Graphic display of measured values for detailed trend analysis and optimization of the filling process
  - Complete plant documentation with device configuration and filling diagrams can be created

The Dosimag flowmeter offers:
- Simple installation and commissioning
- Insensitivity to pipe vibrations

TI066D/06/en
71008913

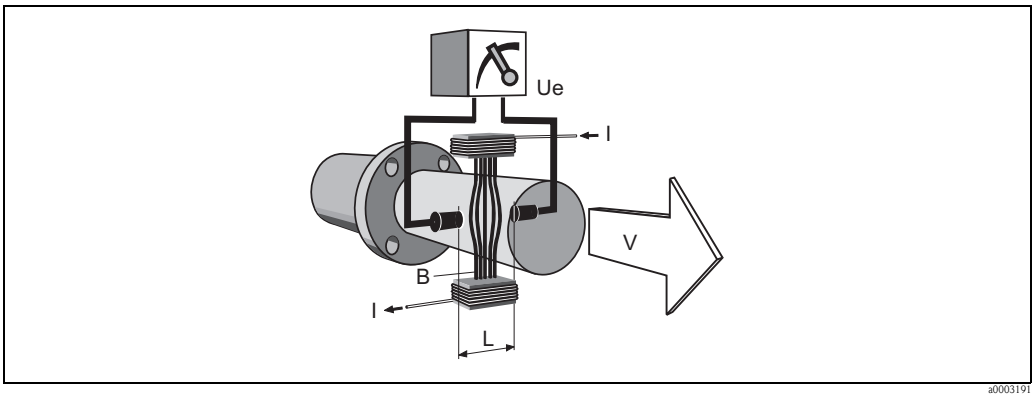
Endress+Hauser
People for Process Automation

Table of contents

Function and system design

Measuring principle

In accordance with *Faraday's law of magnetic induction* a voltage is induced in a conductor which is moved through a magnetic field. In the electromagnetic measuring principle, the flowing medium corresponds to the moving conductor. The induced voltage is proportional to the flow velocity and is directed to the amplifier by means of two measuring electrodes. The flow volume is calculated from the pipe cross-sectional area. The DC magnetic field is generated by a switched direct current of alternating polarity.



$Ue = B \cdot L \cdot v$
$Q = A \cdot v$

Ue *Induced voltage*
B *Magnetic induction (magnetic field)*
L *Electrode spacing*
v *Flow velocity*
Q *Volume flow*
A *Pipe cross-section*
I *Intensity of current*

Measuring system

The measuring system is a compact unit consisting of a sensor and transmitter.

Input

Measured variable

Flow rate (proportional to induced voltage)

Measuring range

Typically v = 0.01 to 10 m/s with the specified measuring accuracy

Operable flow range

Over 1000:1

Output

Output signal

Pulse output:
Passive, open emitter, max. 30 V DC / 25 mA, galvanically isolated, pulse value and pulse polarity can be selected, adjustable pulse width (0.04 to 4 ms).

Signal on alarm

Pulse output → failsafe mode can be selected
Status output → transistor non-conductive in the event of a fault or if the power supply fails

Low flow cutoff

Switch-on point for low flow cutoff selectable.

Galvanic isolation

The circuits of the pulse/status output are galvanically isolated on the device side from the communication and power supply.

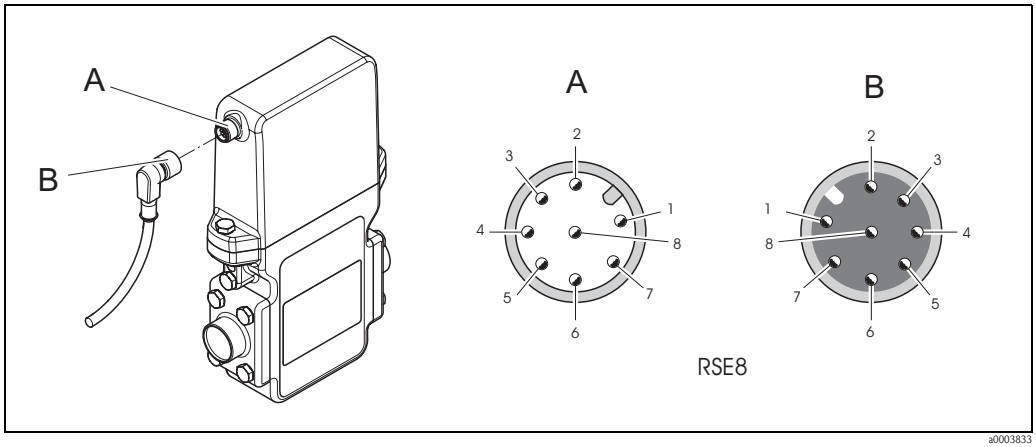
Switching output

Status output:
Passive, open emitter, max. 30 V DC / 25 mA, galvanically isolated

Power supply

Electrical connections

The device electrical connection is by means of a Lumberg connector (type RSE8, M12x1).



Wiring diagram (direct connection without an adapter)

A Socket on device
B Cable connector
1 (+), power supply (24 V DC nominal voltage (20 to 30 V DC), 6 W)
4 (–), power supply (24 V DC nominal voltage (20 to 30 V DC), 6 W)
5 (+), pulse output, status output (max. 30 V)
6 (–), pulse output (max. 25 mA)
7 (–), status output (max. 25 mA)
2 Service interface (may not be connected during normal operation)
3 Service interface (may not be connected during normal operation)
8 Service interface (may not be connected during normal operation)

Supply voltage

24 V DC nominal voltage (20 to 30 V DC), PELV or SELV
When installing the Dosimag based on the CAN/CSA-C22.2 No. 1010.1-92 safety standard for Canada, the power must be supplied via a SELV power supply with maximum 30 V DC.

Cable connection

Lumberg plug (RSE 8, M12x1) for power supply and signal outputs.

Cable specifications

Use connecting cables with a cross-section of at least 0.25 mm^2 (e.g. AWG23). The temperature specification of the cable must be at least 20 °C higher than the ambient temperature in the application.

Power consumption

DC: <6 W (incl. sensor)
Switch-on current: max. 1.9 A (< 5 ms) at 24 V DC

Power supply failure

At least up to 20 milliseconds. All sensor and measuring point data remain in the M-DAT.

Potential equalization

No potential matching is needed for grounded steel pipings.

Performance characteristics

Reference operating conditions

To DIN EN 29104 and VDI/VDE 2641:
- Fluid temperature: +28 °C ± 2 K
- Ambient temperature: +22 °C ± 2 K

- Warm-up period: 30 minutes

Installation:
- Inlet run >10 x DN
- Outlet run >5 x DN
- Sensor and transmitter grounded.
- Sensor centered relative to the pipe.

Maximum measured error

Volume flow:
- ±0.25% o.r. (1 to 4 m/s) or
- ±0.5% o.r. ± 1 mm/s or
- ± 5% o.r.

o.r. = of reading

Repeatability

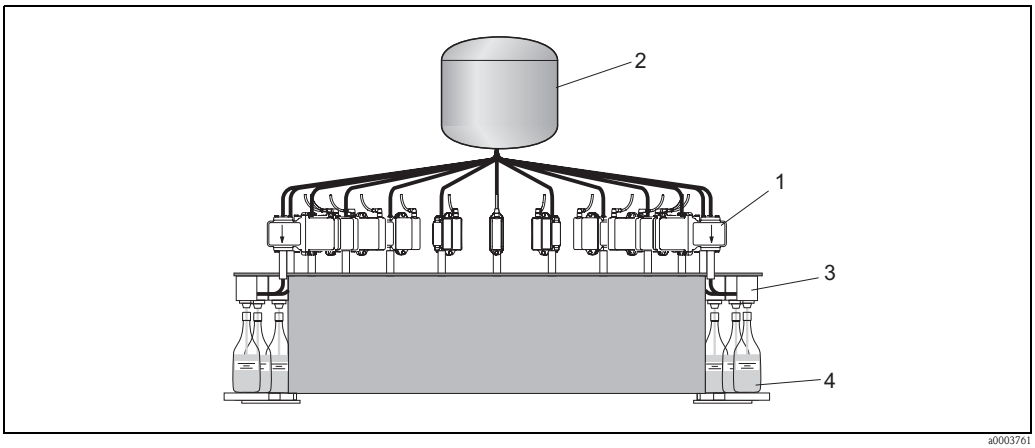
Batch time "ta" [s]	Relative standard deviation in relation to the batched volume [%]
1.5 s < ta < 3 s	0.4
3 s < ta < 5 s	0.2
5 s < ta	0.1

Operating conditions: Installation

Installation instructions

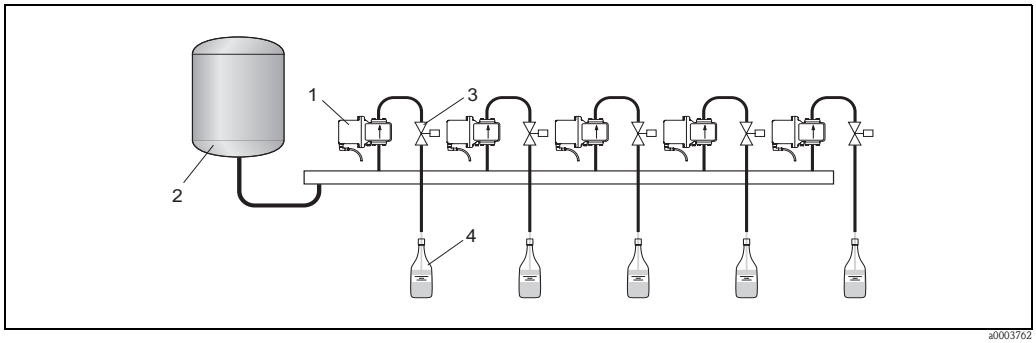
Mounting location

Correct measuring is possible only if the pipe is completely full. For this reason, we recommend you run trial fillings before starting productive batching.



Rotary filling system (example)

1 = Dosimag
2 = Tank
3 = Filler valve
4 = Container

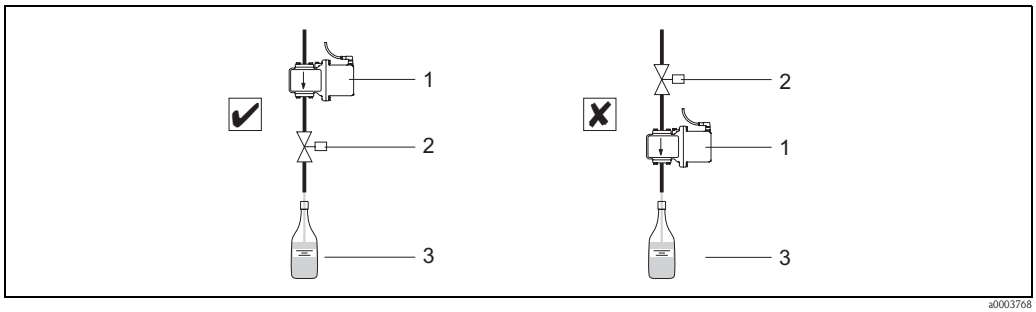


Line filling system (example)

1 = Dosimag
2 = Tank
3 = Filler valve
4 = Container

Installation near valves

Do not install the sensor downstream of a filler valve. If you do, the measuring tube of the sensor would be completely emptied after every filling cycle which would greatly distort the measured value during the next flow measurement.



Installation near valves (✓ = recommended, x = not recommended)

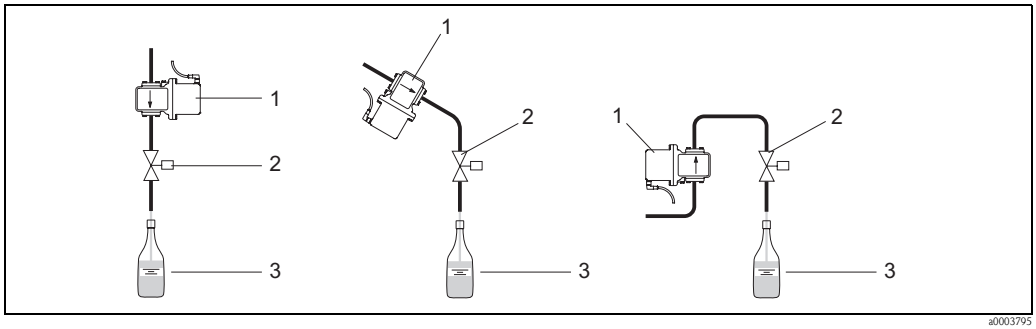
1 = Dosimag
2 = Filler valve
3 = Container

Orientation

An optimum orientation position helps avoid gas and air accumulations, and deposits in the measuring tube.

Vertical orientation

Optimum measurement takes place when the pipe system is completely filled with the fluid.

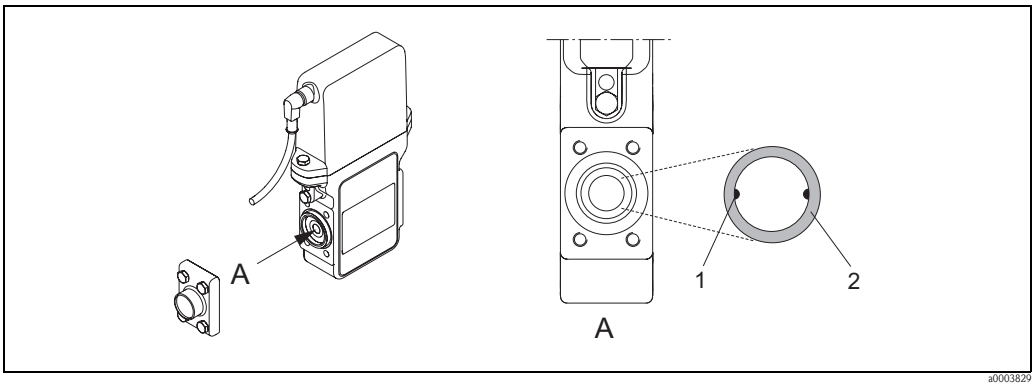


Dosimag orientations

1 = Dosimag
2 = Filler valve
3 = Container

Horizontal orientation

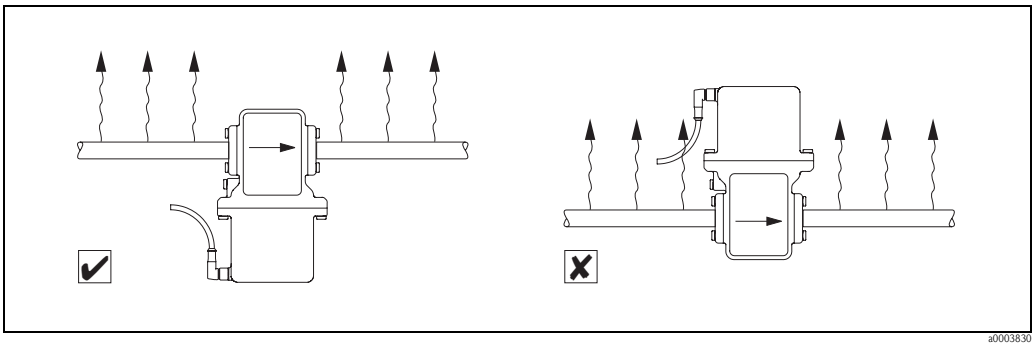
The measuring electrode plane should be horizontal. This prevents brief insulation of the two electrodes by entrained air bubbles.



Horizontal installation with Dosimag

1 Measuring electrodes for signal acquisition
2 Measuring tube liner

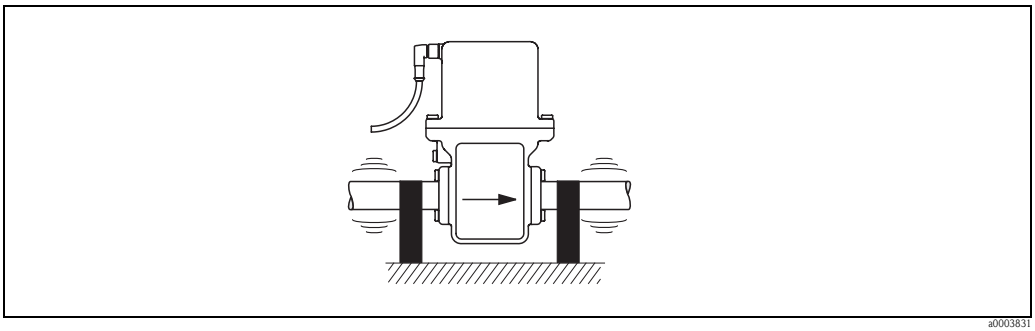
Caution!
In the event of extreme heating (e.g. for CIP or SIP cleaning processes), we recommend you install the measuring device in such a way that the transmitter part is pointing downwards. This reduces the risk of the electronic components overheating.



Recommended orientation in the event of extreme heating (✓ = recommended, x = not recommended)

Vibrations

Secure the piping and the sensor if vibration is severe.

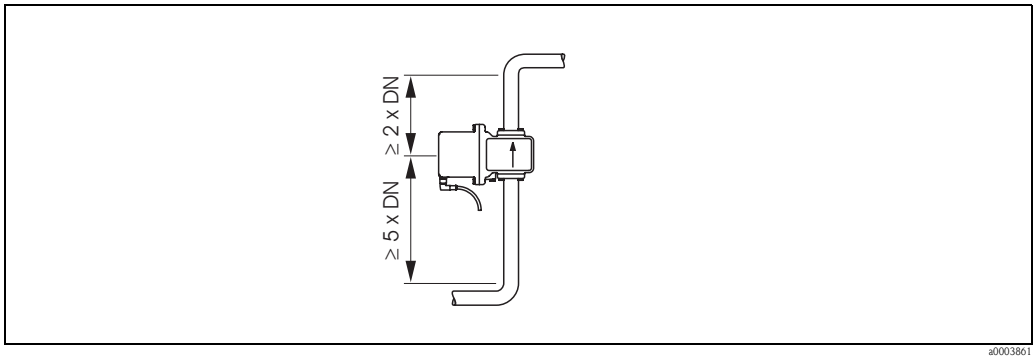


Measures to prevent vibration of the measuring device

Inlet and outlet runs

If possible, install the sensor before fittings such as valves, T-pieces, elbows, etc. Compliance with the following requirements for the inlet and outlet runs is necessary in order to ensure measuring accuracy.

- Inlet run ≥ 5 x DN
- Outlet run ≥ 2 x DN



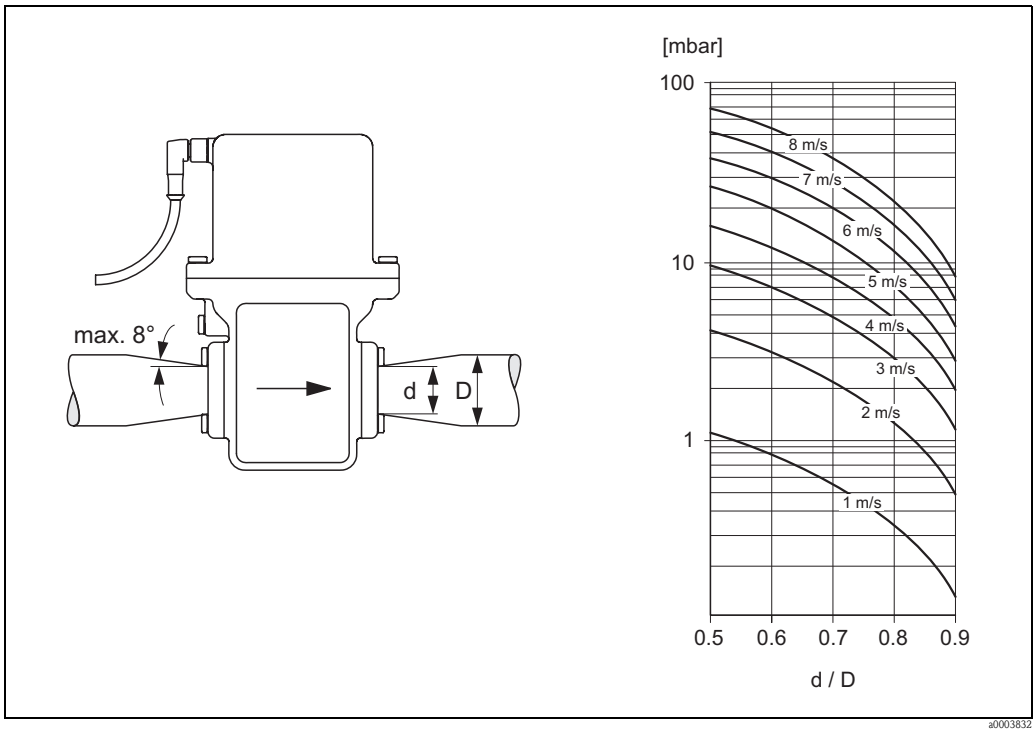
Inlet and outlet runs

Adapters

Suitable adapters can be used to install the sensor in larger-diameter pipes (see also DIN EN 545). The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids.
The nomogram shown here can be used to calculate the pressure loss caused by cross-section reduction.

Note!
The nomogram applies to fluids of viscosity similar to water.

1. Calculate the ratio of the diameters d/D.
2. From the nomogram, read off the pressure loss as a function of fluid velocity (*downstream* from the reduction) and the d/D ratio.



Pressure loss due to adapters

Operating conditions: Environment

Ambient temperature range

–20 to +60 °C (sensor, transmitter)
Do not install the measuring device directly over equipment generating heat.

Storage temperature

The storage temperature corresponds to the permitted ambient temperature range of the transmitter and sensor.

Degree of protection

Standard: IP 67 (NEMA 4X) for transmitter and sensor

Shock and vibration resistance

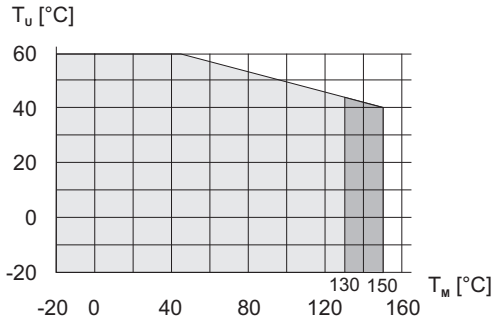
Acceleration up to 2 g by analogy with IEC 60068-2-6

Operating conditions: Process

Medium temperature range

Sensor:
- Process: –20 to +130 °C
- Cleaning: +150 °C/60 min for CIP and SIP processes

Seals:
- EPDM: –20 to +130 °C (max. +150 °C for cleaning)
- Silicone: –20 to +150 °C
- Viton: 0 to +150 °C



a0004805

TU = ambient temperature, TM = medium temperature
Light gray = standard medium temperature range, dark gray = medium temperature range for cleaning

Conductivity

Minimum conductivity:
- 5 µS/cm for liquids generally
- 20 µS/cm for demineralized water

Limiting medium pressure range (nominal pressure)

16 bar

Pressure tightness (liner)

< 1 mbar at a temperature range of +25 to +150 °C

Limiting flow

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is 1 to 4 m/s. The velocity of flow (v), moreover, has to be matched to the physical properties of the fluid:

- v < 2 m/s: for abrasive fluids such as cleaning agents, etc.
- v > 2 m/s: for fluids producing buildup such as liquids containing oil and sugar

Note!
Flow velocity can be increased, if necessary, by reducing the nominal diameter of the sensor.

Flow rate characteristic values - Dosimag (SI units)				
Nominal diameter		**Recommended flow rate**	**Factory settings**	
[mm]	[inch]	Max. full scale value	Pulse value	Low flow cutoff (v ~ 0.04 m/s)
4	5/32"	0.14 l/sec	5 µl	2 l/h
8	5/16"	0.5 l/sec	20 µl	8 l/h
15*	1/2"*	1.2 l/sec	100 µl	26 l/h
15	1/2"	1.66 l/sec	100 µl	26 l/h
* = Conical version				

Flow rate characteristic values - Dosimag (US units)				
Nominal diameter		**Recommended flow rate**	**Factory settings**	
[inch]	[mm]	Max. full scale value	Pulse value	Low flow cutoff (v ~ 0.13 ft/s)
5/32"	4	0.035 gal/sec	0.0002 oz fl	0.009 gal/min
5/16"	8	0.13 gal/sec	0.001 oz fl	0.035 gal/min
1/2"*	15*	0.32 gal/sec	0.004 oz fl	0.12 gal/min
1/2"	15	0.44 gal/sec	0.004 oz fl	0.12 gal/min
* = Conical version				

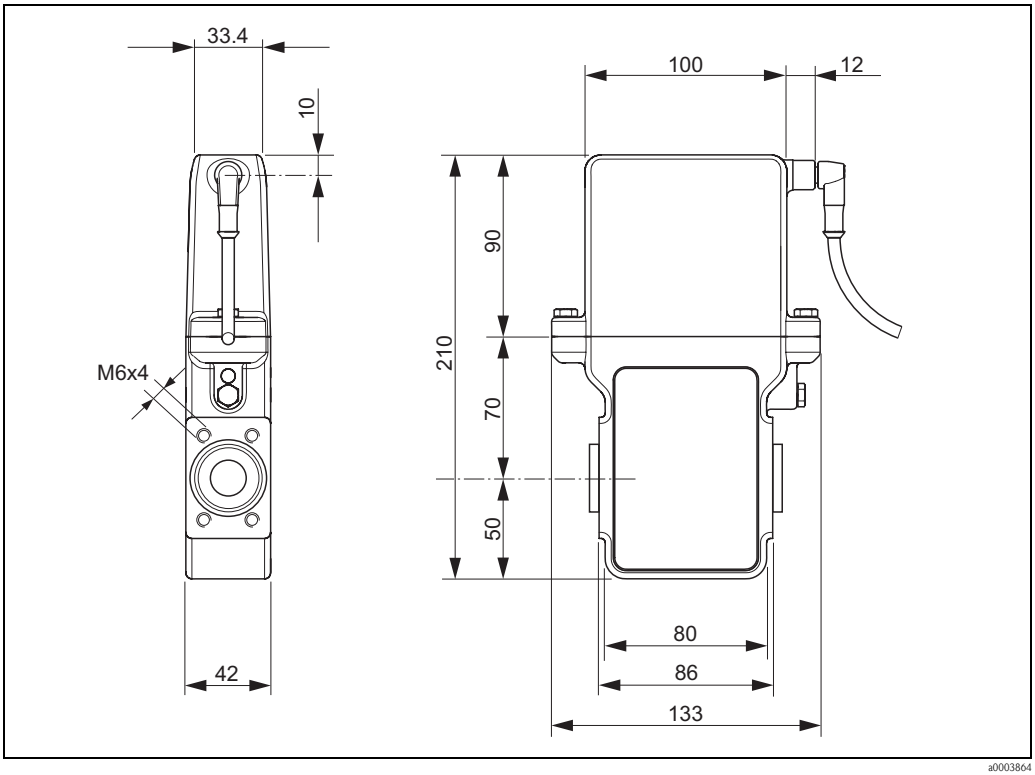
Pressure loss

- No pressure loss at DN 8 and DN 15 if the sensor is installed in a pipe of the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545 → Page 8.

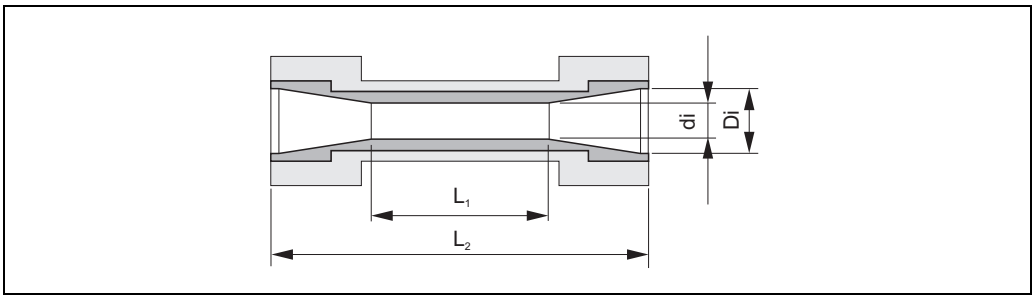
Mechanical construction

Design / dimensions

Dosimag dimensions

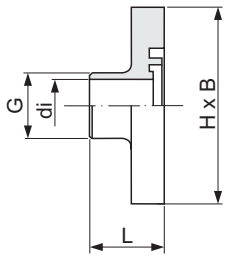


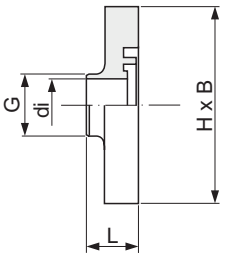
Measuring tube dimensions

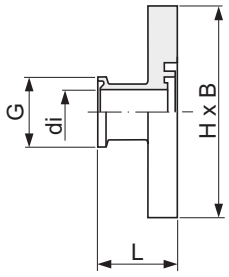


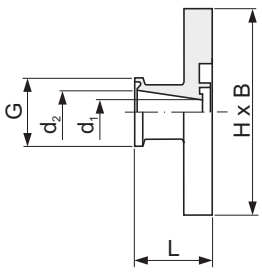
DN		L_1	L_2	Di	di
DIN [mm]	ANSI [inch]	DIN [mm]	[mm]	[mm]	[mm]
4	5/32"	44	90	9	4.5
8	5/16"	–	90	9	9
15*	1/2"*	20	90	16	12
15	1/2"	–	90	16	16
Fitting length depends on process connections * = Conical version					

Process connection dimensions (with aseptic molded seal)

Weld nipples 1.4404 / 316L **H**-U**********	Sensor DN [mm]	Suits pipe DIN 11850	di [mm]	G [mm]	L [mm]	H x B [mm]
	4 / 8	14 x 2	9	14	23.3	60 x 42
	15 / 15*	20 x 2	16	20	23.3	60 x 42
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of the measuring tube (→ Page 11) and process connection (di) into account. – * = Conical version					

Weld nipple ODT/SMS 1.4404 / 316L **H**-V**********	Sensor DN [mm]	Suits pipe OD/SMS	di [mm]	G [mm]	L [mm]	H x B [mm]
	4 / 8	12.7 x 1.65	9	12.7	16.1	60 x 42
	15 / 15*	19.1 x 1.65	16	19.1	16.1	60 x 42
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of the measuring tube (→ Page 11) and process connection (di) into account. – * = Conical version					

Tri-Clamp L14 AM7 1.4404 / 316L **H**-1**********	Sensor DN [mm]	Suits pipe OD	di [mm]	G [mm]	L [mm]	H x B [mm]
	4 / 8	Tube 12.7 x 1.65 (ODT 1/2")	9.4	25.0	28.5	60 x 42
	15 / 15*	Tube 19.1 x 1.65 (ODT 3/4")	15.8	25.0	28.5	60 x 42
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of the measuring tube (→ Page 11) and process connection (di) into account. – * = Conical version					

Tri-Clamp L14 AM7 1.4404 / 316L **H**-2**********	Sensor DN [mm]	Suits pipe OD	d_1 [mm]	d_2 [mm]	G [mm]	L [mm]	H x B [mm]
	4 / 8	Tube 19.1 x 1.65 (ODT 3/4")	9	15.8	25.0	28.5	60 x 42
	– Fitting length = (2 x L) + 86 mm – If pigs are used for cleaning, it is essential to take the inside diameters of the measuring tube and process connection (d_1 or d_2) into account!						

Weight

Approx. 2.8 kg

Material

Transmitter housing:
1.4308/304

Sensor housing:
Acid and alkali-resistant outer surface; stainless steel 1.4308/304

Measuring tube:
Stainless steel 1.4301/304 with PFA lining

Process connection:
- Weld nipples → stainless steel 1.4404/316L
- Aseptic weld nipples → stainless steel 1.4404/316L
- Tri-Clamp → stainless steel 1.4404/316L

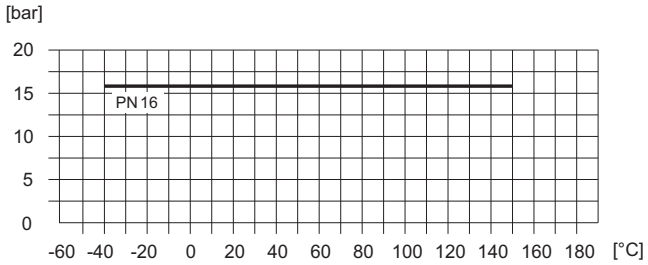
Measuring electrodes:
Standard: 1.4435 (AISI 316L); option: Alloy C-22

Seals:
Molded seal (EPDM, silicone, Viton)

Material load diagram

Weld nipple (DIN 11850, ODT/SMS), Clamp L14 AM7

Material: 1.4404 / 316L (with molded seal)



A0005121

Process connection

Dairy fittings: weld nipple (DIN 11850, ODT/SMS), Tri-Clamp L14 AM7

Surface roughness

- Measuring tube lining with PFA: ≤0.4 µm
- Electrodes (1.4435 (AISI 316L), Alloy C-22): 0.3 to 0.5 µm
- Process connection Dosimag: ≤0.8 µm

(all information refers to wetted parts)

User interface

Display elements

Dosimag does not have a display or display elements.

Remote operation

Operation takes place via the "ToF-Tool - FieldTool Package" configuration and service program from Endress+Hauser. This can be used to configure functions and read off measured values.

Certificates and approvals

CE mark

The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

C-tick mark

The measuring system meets the EMC requirements of the Australian Communication and Media Authority (ACMA).

Sanitary compatibility

3-A
EHEDG
Seals in conformity with FDA

Other approvals

Additional approvals from the certification bodies FM (USA) and CSA (Canada) are available for all Dosimag devices for use in non-explosion protected atmospheres. Contact your Endress+Hauser sales office for more information.

Pressure measuring device approval

All Dosimag devices correspond to Article 3(3) of the EC Directive 97/23/EC (Pressure Equipment Directive) and have been designed and manufactured according to good engineering practice.

Other standards and guidelines

EN 60529:
Degrees of protection by housing (IP code)

EN 61010-1:
Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.

EN 61326 (IEC 1326):
Electromagnetic compatibility (EMC requirements)

CSA-C22.2 No. 142-M1987
Process Control Equipment

CAN/CSA-C22.2 No. 1010.1-92
Safety Requirements for Electrical Equipment for Measuring, Control and Laboratory Use. Pollution degree 2, Installation Category I

ANSI/ISA-S82.01
Safety Standard for Electrical and Electronic Test, Measuring, Controlling and related Equipment - General Requirements. Pollution degree 2, Installation Category I

Ordering information

The Endress+Hauser service organization can provide detailed ordering information and information on specific order codes on request.

Accessories

Various accessories and spare parts, which can be ordered separately from Endress+Hauser, are available for the transmitter and sensor. The Endress+Hauser service organization can provide detailed information on the specific order codes on request.

Accessories	Description	Ordering code
Dosimag transmitter	Transmitter for replacement or for storage. The following specifications can be indicated by means of the order code: – Approvals – Housing – Cables – Cable connection – Power supply – Software functions – Outputs/inputs	5BXXX-XXXXX*******
Housing seal	To seal the transmitter	50102857

Accessories	Description	Ordering code
Seal set	For regular replacement of the seals on the process connections.	DK5HS – ***
Mounting kit	Mounting kit comprising: – 2 process connections – Threaded fasteners – Seals	DKH** – ****
Adapter connection	Adapter connections for installing Dosimag on other process connections	DK5HA – ******
Conversion kit	Kit for converting Dosimag A to Dosimag	DK5UP – H
RSE8 adapter	Lumberg RSE8 connection jack, 8-pole adapter (RSE8), 24 V DC, pulse, status	50107169
RSE5 adapter	Lumberg RSE8 connection jack, 5-pole adapter (RSE5), 24 V DC, pulse, status	50107168
RSE4 adapter	Lumberg RSE8 connection jack, 4-pole adapter (RSE4), 24 V DC, pulse	50107167
RSE8 supply cable	Lumberg cable RKWTN8-56/5 P92	50107895
ToF Tool - FieldTool Package	Configuration and service software for flowmeters in the field: – Commissioning, maintenance analysis – Configuring measuring devices – Service functions – Visualization of process data – Troubleshooting Contact your Endress+Hauser representative for more information.	DXS10 - * * * * *
FXA 193	Service interface connecting cable from the device to the PC for using the “ToF Tool FieldTool Package” operating software	FXA193 – *
Service adapter	Adapter for connecting FXA 193 to the device.	50106443
Applicator	Software for selecting and configuring flowmeters. Applicator can be downloaded from the Internet or ordered on CD-ROM for installation on a local PC. Contact your Endress+Hauser representative for more information.	DKA80 - *

Supplementary Documentation

❑ Flow Measurement (FA005/06/en)
❑ Operating Instructions Dosimag (BA098/06/en)

Registered trademarks

TRI-CLAMP ®
Registered trademark of Ladish & Co., Inc., Kenosha, USA

HistoROM™, M-DAT®, ToF Tool - Fieldtool® Package, Applicator®
Registered or registration-pending trademarks of Endress+Hauser Flowtec AG, Reinach, CH

International Headquarters

Endress+Hauser
GmbH+Co. KG
Instruments International
Colmarer Str. 6
79576 Weil am Rhein
Deutschland

Tel. +49 76 21 9 75 02
Fax +49 76 21 9 75 34 5
www.endress.com
info@ii.endress.com

Endress+Hauser

People for Process Automation

TI066D/06/en/11.05
71008913
FM+SGML 6.0 ProMoDo