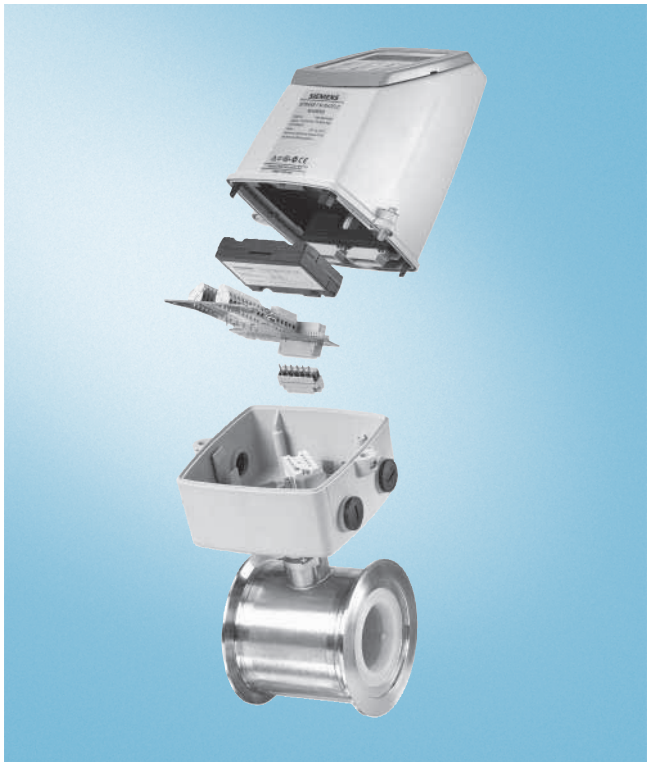
Overview

SITRANS F M family

SITRANS F M electromagnetic flowmeters are designed for measuring the flow of electrically conductive mediums.

Benefits



Greater flexibility

- Wide product program
- Compact or remote installation using the same transmitter and sensor
- USM II communication platform for easy integration with all systems

Easier to commission

All MAGFLO electromagnetic flowmeters feature a unique SENSORPROM memory unit which stores sensor calibration data and transmitter settings for the lifetime of the product.

At commissioning the flowmeter commences measurement without any initial programming.

The factory settings matching the sensor size are stored in the SENSORPROM unit. Also customer specified settings are downloaded to the unit. Should the transmitter be replaced, the new transmitter will upload all previous settings and resume measurement without any need for reprogramming.

Further, the "fingerprint" used in connection with the MAGFLO Verificator is stored during the initial sensor calibration.

Easier to service

Transmitter replacement requires no programming. SENSORPROM automatically updates all settings after initialization.

Room for growth

USM II the Universal Signal Module with "plug & play" simplicity, makes it easy to access and integrate the flow measurement with almost any system and bus-protocol and it ensures the flowmeter will be easy to upgrade to future communication/bus platforms.

Application

Electromagnetic flowmeters are suitable for measuring the flow of almost all electrically conducting liquids, pastes and slurries.

A prerequisite is that the medium must have a minimum conductivity of 5 µS/cm. The temperature, pressure, density and viscosity have no influence on the result.

The main applications of the electromagnetic flowmeters can be found in the following sectors:

- Water and waste water
- Chemical and pharmaceutical industries
- Food and beverage industry
- Mining, aggregates and cements industries
- Pulp and paper industry
- Steel industry
- Power; utility and chilled water industry

The wide variety of combinations and versions from the modular system means that ideal adaptation is possible to each measuring task.

System information MAGFLO electromagnetic flowmeters

Please see Product selector on the Internet, since some constrains might be related to some of the features 	 MAG 3100	MAG 3100 Ex	MAG 3100 HT	 MAG 5100 W	 MAG 1100	MAG 1100 Ex	MAG 1100 HT	 MAG 1100 F	MAG 1100 F Ex	 911/E	 MAG 8000
Industry											
Water / waste water	**X**	**X**	**X**	**XXX**	**X**	**X**					**XX**
Chemical	**XXX**	**XXX**	**XXX**	**X**	**XX**	**XXX**	**XXX**		**XX**		**XX**
Pharma	**XX**	**XXX**	**XX**	**X**	**X**	**XX**	**XX**	**XXX**	**XXX**		**XX**
Food & beverage	**X**			**X**	**XX**			**XXX**	**X**		**XX**
Mining, aggregates & cement	**XXX**			**X**	**XX**					**XXX**	**XX**
HPI	**XX**	**XX**	**X**	**X**	**XX**	**XX**	**X**				**XX**
Other	**XX**	**XX**	**XX**	**XX**	**XX**	**XX**	**XX**	**XX**		**XXX**	**XX**
Design											
Compact	●	●		●	●	●		●	●	●	●
Remote	●	●	●	●	●	●	●	●	●	●	●
Constant field (DC)	●	●	●	●	●	●	●	●	●	●	●
Alternating field (AC)										●	
Nominal diameter											
DN 2 (1/12“)					●						
DN 3 (1/8“)					●						
DN 6 (1/4“)					●	●					
DN 10 (3/8“)					●	●		●	●		
DN 15 (½“)	●	●	●		●	●	●	●	●	●	
DN 20 (3/4“)										●	
DN 25 (1“)	●	●	●	●	●	●	●	●	●	●	●
DN 32 (1¼“)								●	●	●	
DN 40 (1½“)	●	●	●	●	●	●	●	●	●	●	●
DN 50 (2“)	●	●	●	●	●	●	●	●	●	●	●
DN 65 (2½“)	●	●	●	●	●	●	●	●	●	●	●
DN 80 (3“)	●	●	●	●	●	●	●	●	●	●	●
DN 100 (4“)	●	●	●	●	●	●	●	●	●	●	●
DN 125 (5“)	●	●	●	●						●	●
DN 150 (6“)	●	●	●	●						●	●
DN 200 (8“)	●	●	●	●						●	●
DN 250 (10“)	●	●	●	●						●	●
DN 300 (12“)	●	●	●	●						●	●
DN 400 (16“)	●	●		●						●	●
DN 450 (18“)	●	●		●						●	●
DN 500 (20“)	●	●		●						●	●
DN 600 (24“)	●	●		●						●	●
DN 700 (28“)	●	●		●							
DN 750 (30“)	●	●		●							
DN 800 (32“)	●	●		●							
DN 900 (36“)	●	●		●							
DN 1000 (40“)	●	●		●							
DN 1050 (42“)	●	●		●							
DN 1100 (44“)	●	●		●							
DN 1200 (48“)	●	●		●							
DN 1400 (54“)	●	●									
DN 1500 (60“)	●	●									
DN 1600 (66“)	●	●									
DN 1800 (72“)	●	●									
DN 2000 (78“)	●	●									

● = available, **X** = can be used, **XX** = often used, **XXX** = most often used

Please see Product selector on the Internet, since some constrains might be related to some of the features 	 MAG 3100	MAG 3100 Ex	MAG 3100 HT	 MAG 5100 W	 MAG 1100	MAG 1100 Ex	MAG 1100 HT	 MAG 1100 F	MAG 1100 F Ex	 911/E	 MAG 8000
Process connection											
Wafer design					●	●	●				
Sanitary process connections								●	●		
Flanges	●	●	●	●						●	●
Flange norms											
EN 1092-1	●	●	●	●						●	●
ANSI B 16.5 class 150	●	●	●	●						●	●
ANSI B 16.5 class 300	●	●	●							●	
AWWA class D	●	●		●							
AS 2129	●	●	●								
AS 4087, PN 16	●	●	●	●							●
AS 4087, PN 21	●	●	●								
AS 4087, PN 35	●	●	●								
JIS 10K	[3]									●	
Pressure rating [1]											
PN 6	●	●									
PN 10	●	●	●	●						●	●
PN 16	●	●	●	●	●			●	●	●	●
PN 25	●	●	●							●	
PN 40	●	●	●	●	●	●	●	●	●	●	●
PN 63	●	●									
PN 100	●	●									
Accuracy											
0.2%											●
0.25%	●	●	●	●	●	●	●	●	●		
0.4%											●
0.5%					●			●		●	
Grounding electrodes, incl. [2]	●	●		●						(●)	●
Cable glands											
PG 13.5										●	
M20	●	●	●	●	●	●	●	●	●	●	●
½" NPT	●	●	●	●	●	●	●	●	●	●	
Materials:											
Liner material / max . temperatures											
NBR Hard Rubber: 70 °C (158 °F)				●							
Neoprene: 70 °C (158 °F)	●	●								●	
EPDM: 70 °C (158 °F)	●	●		●						● [7]	●
PTFE: 100 °C (212 °F)	●	●								●	
PTFE: 180 °C (356 °F)			● [6]							(●) [4]	
Ebonite: 95 °C (203 °F)	●	●									
Linatex: 70 °C (158 °F)	●	●									
Ceramic: 150 °C (302 °F)					●	● [5]		●	● [5]		
Ceramic: 200 °C (392 °F)							●				
PFA: 130 (150) °C (266 (302) °F)					●			●			
Novolak: 130 °C (266 °F)	●									●	

● = available
[1] Pressure may be limited by the liner material chosen
[2] Not for PTFE liner and tantalum/platinum electrodes
[3] On request
[4] 150 °C (300 °F)
[5] Ex versions limited to 100 °C (212 °F)
[6] Also available in 130 °C (266 °F)
[7] 95 °C (203 °F)

System information MAGFLO electromagnetic flowmeters

Please see Product selector on the Internet, since some constrains might be related to some of the features






	MAG 3100	MAG 3100 Ex	MAG 3100 HT	MAG 5100 W	MAG 1100	MAG 1100 Ex	MAG 1100 HT	MAG 1100 F	MAG 1100 F Ex	911/E	MAG 8000
Materials (continued):											
Electrodes											
S/S AISI 316 Ti	●	●	●							●	
Hastelloy C	●	●	●	●	●			●		●	●
Platinum	●	●	●		●	●	●	●	●	●	
Titanium	●	●	●							●	
Tantalum	●	●	●							●	
Monel										●	
Flange/housing material											
Carbon steel	●	●	●	●						●	●
Stainless steel / carbon steel	●	●	●							●	
Polished stainless steel	●	●	●		●	●	●	●	●		
Approvals:											
Custody transfer											
Cold water - DANAK TS 22.36.001	●		●		●		●	●			
Cold water - OIML R 49				●							●
Cold water - PTB	●		●	●	●		●	●			●
Hot water - OIML R 75	●		●		●		●	●			
Hot water - PTB	●		●		●		●	●			
Other media than water - OIML R 117	●		●		●		●	●			
Other media than water - PTB	●		●		●		●	●			
Hazardous areas											
ATEX - zone 1		●				●			●		
ATEX - zone 2 [1]	●			●	●			●			
FM - class 1, div 2	●		●	●	●		●	●			
CSA - class 1, div 2	[2]		[2]								
Hygienic											
3A								●	●		
EHEDG								●	●		
Drinking water											
WRAS (WRc) - (UK)	●			●							●
NSF - (US)	●			●							●
ACS (FR)	●			●							
Belgaque (B)	●			●							
KTW (D)	●			●							
DVGW-W270 (D)	●			●							
Other											
GOSS / GOST (Russia)	●	●	●	●	●	●	●	●	●		
CRN (Canada)	●	●	●	●	●	●	●	●	●		●
Other national approvals, see internet	●	●	●	●	●	●	●	●	●	●	●
MAGFLO Verificator compatible	●		●	●	●		●	●			

● = available

[1] Compact MAG 6000 I

[2] On request

Please see Product selector on the Internet, since some constrains might be related to some of the features 	 MAG 5000	MAG 6000	 MAG 6000 I	 MAG 6000 I Ex d	 MAG 6000 + Ex barriere	MAG 6000 + Cleaning unit	 Transmag 2	 MAG 8000
Industry								
Water / waste water	**XXX**	**XXX**	**XX**	**X**		**XX**		**XXX**
Chemical	**X**	**XX**	**XX**	**XXX**	**X**			**XXX**
Pharma	**X**	**XXX**	**XX**	**XXX**	**X**			**XXX**
Food & beverage	**XX**	**XXX**	**XX**					**XXX**
Mining, aggregates & cement	**XX**	**X**	**XX**	**X**			**XXX**	**XXX**
HPI	**X**	**X**	**X**	**XX**				**XXX**
Other	**XX**	**XX**	**XX**	**XX**			**X**	**X**
Design								
Compact	●	●	●	●			●	●
Remote	●	●	●	●	●	●	●	●
Constant field (DC)	●	●	●	●	●	●		●
Alternating field (AC)							●	
Enclosure transmitter								
Polyamide, IP67	●	●						
Die-cast aluminium			●	●			●	
Stainless steel		●						● [1]
19“ rack	●	●			●	●		
Back of panel	●	●			●	●		
Panel mounting	●	●			●	●		
IP67 wall mounting	●	●			●	●		
Accuracy								
0.2%								●
0.25%		●	●	●	●	●		
0.4%								●
0.5%	●						●	
Communication								
HART	●	●	●	●	●	●	●	
PROFIBUS PA		●	●	●	●	●	●	
PROFIBUS DP		●	●		●	●		
MODBUS RTU/RS 485		●	●		●	●		● [2]
Batching		●	●	●	●	●		
Electrode cleaning						●		
PG 13,5					●	●	●	
M20	●	●	● [4]	● [4]			●	●
½" NPT	●	●	●	●			●	
Supply voltage								
24 V	● [3]	● [3]	●	●		● [3]		● [3][5]
115 V - 230 V	●	●	●	●	●	●	●	● [5]
Battery								●

● = available, **X** = can be used, **XX** = often used, **XXX** = most often used

[1] IP68 for MAG 8000 enclosure

[2] Modbus RTU also as serial RS232

[3] 12/24 V AC/DC

[4] M25

[5] Main power with battery backup

System information MAGFLO electromagnetic flowmeters

Please see Product selector on the Internet, since some constrains might be related to some of the features 	 MAG 5000	MAG 6000	 MAG 6000 I	 MAG 6000 I Ex d	 MAG 6000 + Ex barriere	MAG 6000 + Cleaning unit	 Transmag 2	 MAG 8000
Approvals:								
Custody transfer								
Cold water - DANAK TS 22.36.001	●	●						
Cold water - OIML R 49	●	●						●
Cold water PTB	●	●						●
Hot water - OIML R 75	●	●						
Hot water - PTB	●	●						
Other media than water - OIML R 117	●	●						
Other media than water - PTB	●	●						
Hazardous areas								
ATEX - zone 1				●	(●)			
ATEX - zone 2			● [1]					
FM - class 1, div 2	●	●	●					
UL / cUL - general safety	●	●			●	●		
Other								
C - tick (Australia)	●	●			●	●		
GOSS / GOST (Russia)	●	●	●	●	●	●		●
Other national approvals, see internet								
MAGFLO Verificator compatible	●	●	pending					

● = available

[1] Compact version only

Practical examples of ordering

SITRANS F M compact installation

MAG 6000 transmitter + MAG 3100 sensor = MAG 6000 compact mounted on a MAG 3100 sensor

Example

Sensor	**7ME6310-3TC11-1AA1**
Pipe size	DN 100
Liner	Neoprene
Electrodes	SS 316
Flanges	EN 1092-1, PN 16
Transmitter	**7ME6920-1AA10-0AA0**
Accuracy	0.25%
Supply	230 V AC

Note:
Transmitter and sensor are shipped in separate boxes.In order to get a compact unit, it is necessary to order transmitter and sensor separately. These will be delivered individually packed and the final assembly takes place during installation at the customer's place.
Please also see www.siemens.com/SITRANSFordering for practical examples of ordering

SITRANS F M remote installation

Wall bracket + MAG 6000 =

MAG 3100 + 2 x cable = MAG 3100 remote installation

Example

Sensor	**7ME6310-3TC11-1AA1**
Pipe size	DN 100
Liner	Neoprene
Electrodes	SS 316
Flanges	EN 1092-1, PN 16
Transmitter	**7ME6920-1AA10-0AA0**
Accuracy	0.25%
Supply	230 V AC
Wall mounting kit	**FDK-085U1018**
Cable coils, 10 m	**FDK-083F0121**
Cable electrodes, 10 m	**FDK-083F0121**

Function

All electromagnetic flowmeters are based on Faraday's law of induction:

$U_M = B \cdot v \cdot d \cdot k$

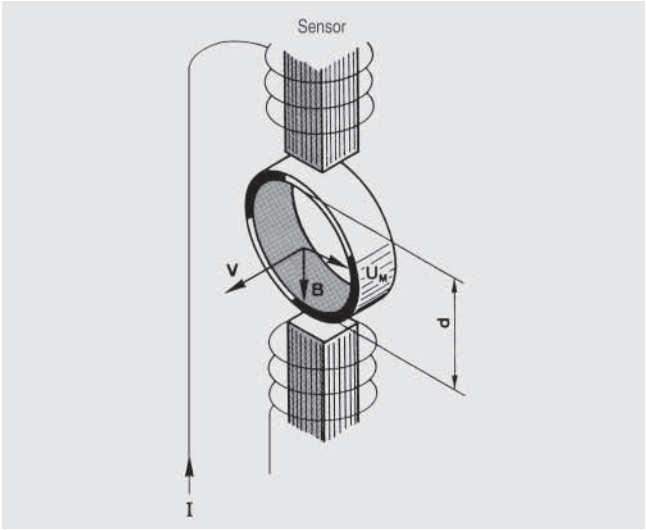
U_M = Measured voltage induced in the medium perpendicular to the magnetic field and the flow direction. The voltage is tapped at two point electrodes.

B = Magnetic flux density which permeates the flowing medium perpendicular to the flow direction.

v = flow velocity of medium

d = internal diameter of metering tube

k = proportionality factor or sensor constant



Function and measuring principle of electromagnetic measurement

An electromagnetic flowmeter generally consists of a magnetically non-conducting metering tube with an internal electrically non-conducting surface, magnet coils connected in series and mounted diametrically on the tube, and at least two electrodes which are inserted through the pipe wall and are in contact with the measured medium. The magnet field coils through which the current passes generate a pulsed electromagnetic field with the magnetic flux density B perpendicular to the pipe axis.

This magnetic field penetrates the magnetically non-conducting metering tube and the medium flowing through it, which must have a minimum electrical conductivity.

According to Faraday's law of induction, a voltage U_M is generated in an electrically conducting medium, and is proportional to the flow velocity v of the medium, the magnetic flux density B, and the distance between the electrodes d (internal diameter of pipe).

The signal voltage U_M is tapped by the electrodes which are in contact with the medium, and passed through the insulating pipe wall. The signal voltage U_M which is proportional to the flow velocity is converted by an associated transmitter into appropriate standard signals such as 4 to 20 mA.

MAGFLO diagnostics

The diagnostic functions are all internal tools in the meter:

- Identification in clear text and error log
- Error categories: function; warning; permanent and fatal errors
- Transmitter self-check including all outputs and the accuracy
- Sensor check: coil and electrode circuit test
- Overflow
- Empty pipe: partial filling; low conductivity; electrode fouling

MAGFLO Verificator

The MAGFLO Verificator is an external tool designed for all MAGFLO products to verify the entire product, the installation and the application.

The goal is to improve the operation, reduce downtime and maintain measurement accuracy as long as possible.

Thus we have developed the SIEMENS MAGFLO Verificator a highly advanced instrument to carry out the complex verification and performance check of the entire flowmeter system, according to unique SIEMENS patented principles. The whole verification test is automated and easy to operate so there is no opportunity for human error or influence. The system is traceable to international standards and tested by WRc (Water Research Council).

MAGFLO Verificator

The MAGFLO Verificator consists of:

- a stand alone Verificator to measure a number of selected parameters in the flow sensor and a transmitter which affects the integrity of the flow measurement
- a Windows based PC programme enabling printing and management of verification reports.

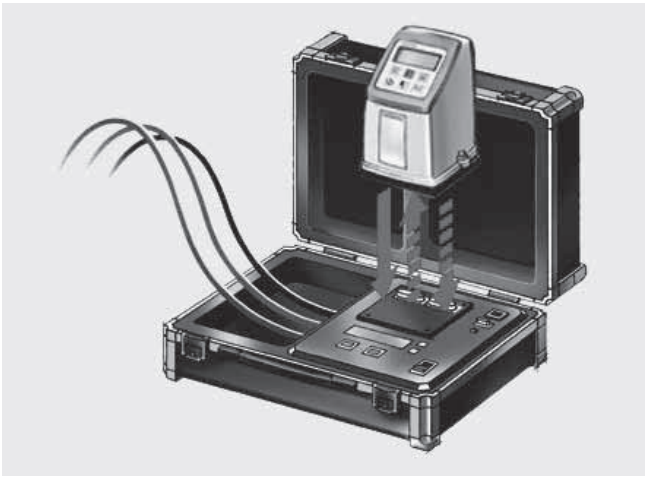
Verification - Steps

Verification of a SITRANS F M MAGFLO flowmeter consists of the following test routines
1. Transmitter test
2. Flowmeter and cable insulation test
3. Sensor magnetism test

System information MAGFLO electromagnetic flowmeters

1. Transmitter test

The transmitter test is the traditional way of on-site testing on the market and checks the complete electronic system from signal input to output.

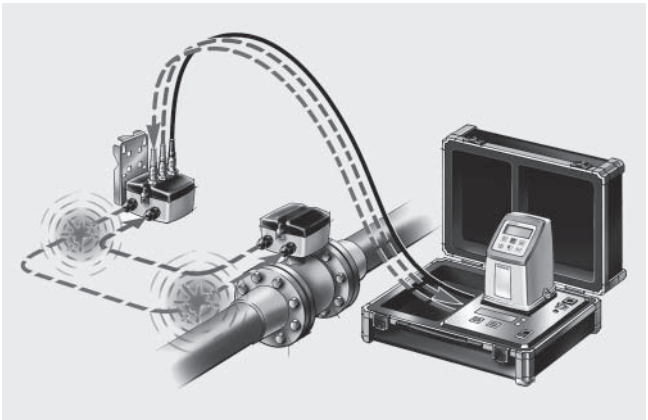


Transmitter test

Using the excitation power output, which is generated to drive the magnetic field of the sensor, the verificator simulates flow signal to the transmitter input. By measuring the transmitter outputs the verificator calculates its accuracy against defined values. Test includes:

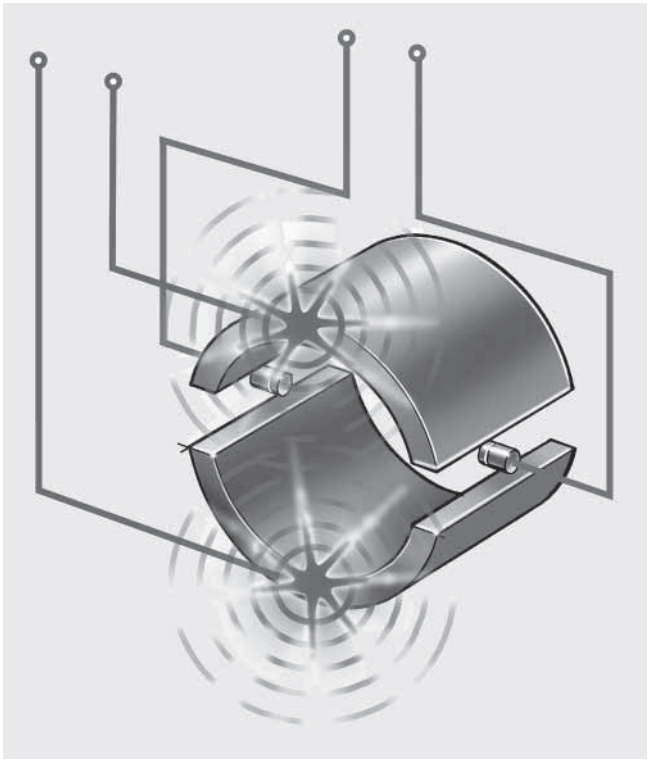
- excitation power to drive the magnetic field
- signal function from signal input to output
- signal processing – gain, offset and linearity
- test of analogue and frequency output

2. Insulation test

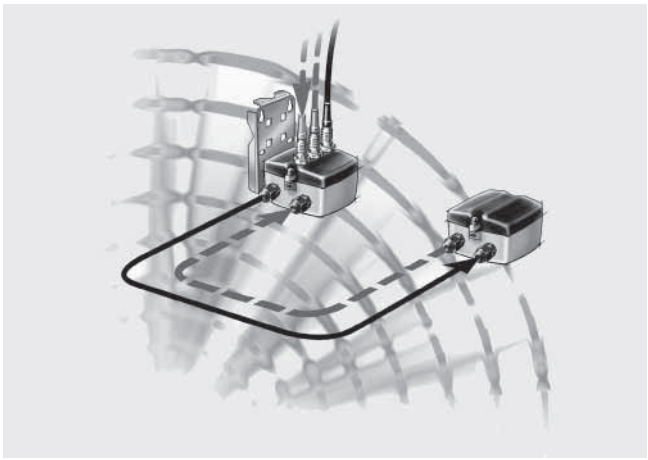


Flowmeter insulation test

The verification test of the flowmeter insulation is a "cross-talk" test of the entire flowmeter which ensures that the flow signal generated in the sensor is not affected by any external influences.



Signal disturbance coil

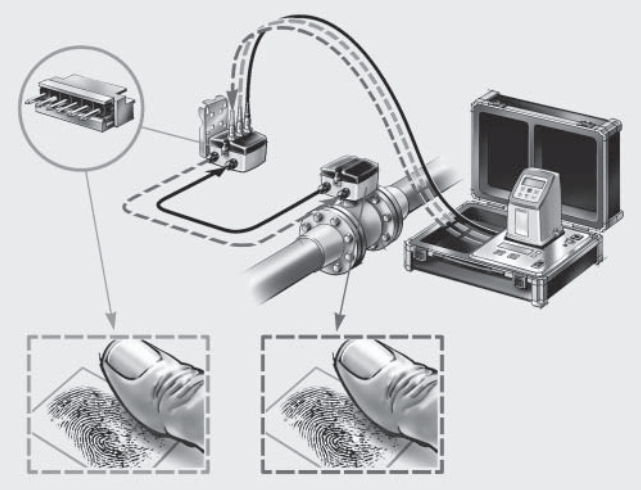


Signal disturbance outside

In the "cross-talk" test the verificator generates a high voltage disturbance within the coil circuit and then looks for any "crosstalk" induced in the flow signal circuit. By generating dynamic disturbances close-coupled to the flow signal, the flowmeter is tested for noise immunity to a maximum level:

- EMC influence on the flow signal
- Moisture in sensor, connection and terminal box
- Non-conductive deposit coating the electrodes within the sensor
- Missing or poor grounding, shielding and cable connection.

3. Sensor magnetism test



Sensor magnetism test

The verification of the sensor magnetism is a "boost" test of the magnetic field coil. The test ensures that the magnetism behaviour is like the first time, by comparing the current sensor magnetism with the "fingerprint" which was determined during initial calibration and stored in the SENSORPROM memory unit.

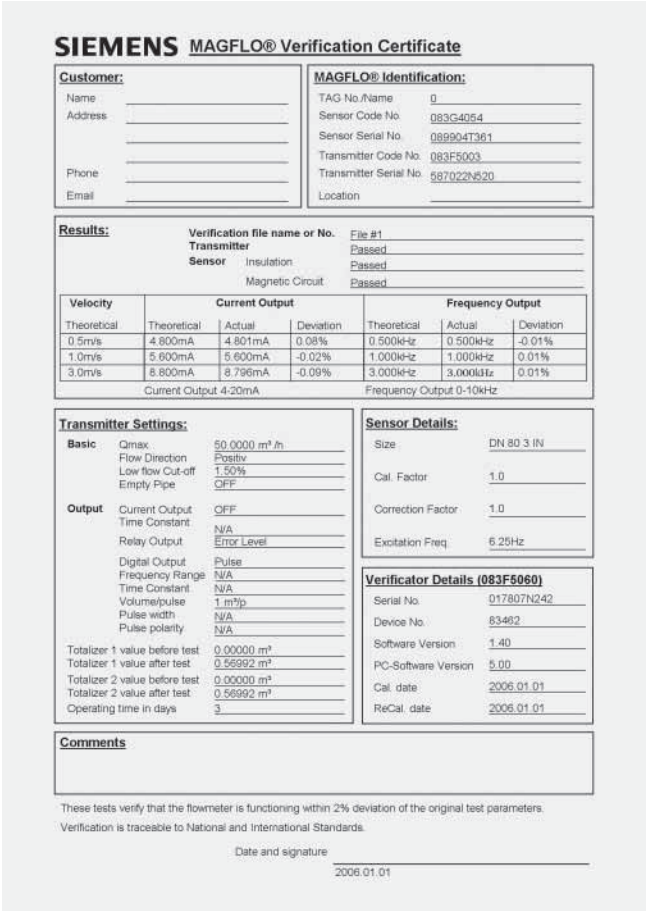
In the "Boost" test the verificator changes the magnetic field in certain pattern and with high voltage to get quick stable magnetic condition. This unique test is fulfilled without any interference or compensation of surrounding temperature or interconnecting cabling.

- Changes in dynamic magnetic behaviour
- Magnetic influence inside and outside the sensor
- Missing or poor coil wire and cable connection

Certificate

The test certificate generated by a PC contains:

- Test result with passed or failed
- Installation specification
- Flowmeter specification and configuration
- Verificator specification with date of calibration ensuring traceability to international standards.



SIEMENS MAGFLO® Verification Certificate

Customer:
Name
Address
Phone
Email

MAGFLO® Identification:
TAG No./Name 0
Sensor Code No. 083G4054
Sensor Serial No. 089904T361
Transmitter Code No. 083F5003
Transmitter Serial No. 587022N520
Location

Results:
Verification file name or No. File #1
Transmitter Passed
Sensor Insulation Passed
Magnetic Circuit Passed

Velocity	Current Output			Frequency Output		
Theoretical	Theoretical	Actual	Deviation	Theoretical	Actual	Deviation
0.5m/s	4.800mA	4.801mA	0.08%	0.500kHz	0.500kHz	-0.01%
1.0m/s	5.600mA	5.600mA	-0.02%	1.000kHz	1.000kHz	0.01%
3.0m/s	8.800mA	8.796mA	-0.09%	3.000kHz	3.000kHz	0.01%
	Current Output 4-20mA			Frequency Output 0-10kHz		

Transmitter Settings:
Basic: Qmax 50.0000 m³/h; Flow Direction Positiv; Low flow Cut-off 1.50%; Empty Pipe OFF
Output: Current Output OFF; Time Constant N/A; Relay Output Error Level; Digital Output Pulse; Frequency Range N/A; Time Constant N/A; Volume/pulse 1 m³/p; Pulse width N/A; Pulse polarity N/A
Totalizer 1 value before test 0.00000 m³
Totalizer 1 value after test 0.56992 m³
Totalizer 2 value before test 0.00000 m³
Totalizer 2 value after test 0.56992 m³
Operating time in days 3

Sensor Details:
Size DN 80 3 IN
Cal. Factor 1.0
Correction Factor 1.0
Excitation Freq. 6.25Hz

Verificator Details (083F5060)
Serial No. 017807N242
Device No. 83462
Software Version 1.40
PC-Software Version 5.00
Cal. date 2006.01.01
ReCal. date 2006.01.01

Comments

These tests verify that the flowmeter is functioning within 2% deviation of the original test parameters.
Verification is traceable to National and International Standards.

Date and signature
2006.01.01

Description	Order No.	Symbol
MAGFLO Verificator		
• 24 V, 115 ... 230 V, 50 Hz	**FDK-083F5060**	
• 24 V, 115 ... 230 V, 60 Hz	**FDK-083F5061**	

4

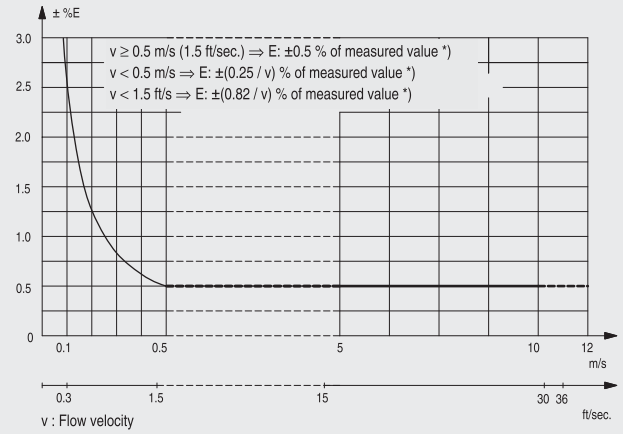
Technical specifications

Flowmeter uncertainty

To ensure continuous accurate measurement, flowmeters must be calibrated. The calibration is conducted at SIEMENS flow facilities accredited according to ISO/IEC 17025 by DANAK or UKAS.

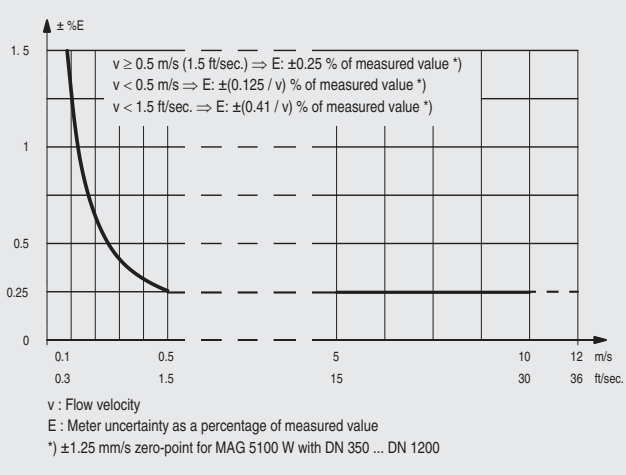
The accreditation bodies DANAK and UKAS have signed the ILAC MRA agreement (International Laboratory Accreditation Corporation - Mutual Recognition Arrangement). Therefore the accreditation ensures international traceability and recognition of the test results in 39 countries world wide, including the US (NIST traceability).

A calibration certificate is shipped with every sensor and calibration data are stored in the SENSORPROM memory unit.



Flowmeter uncertainty:

- MAG 5000,
- MAG 6000 or MAG 6000 I used with MAG 1100 PFA



Flowmeter uncertainty:

- MAG 6000 or MAG 6000 I used with MAG 3100, MAG 1100 (Ceramic) or MAG 5100 W

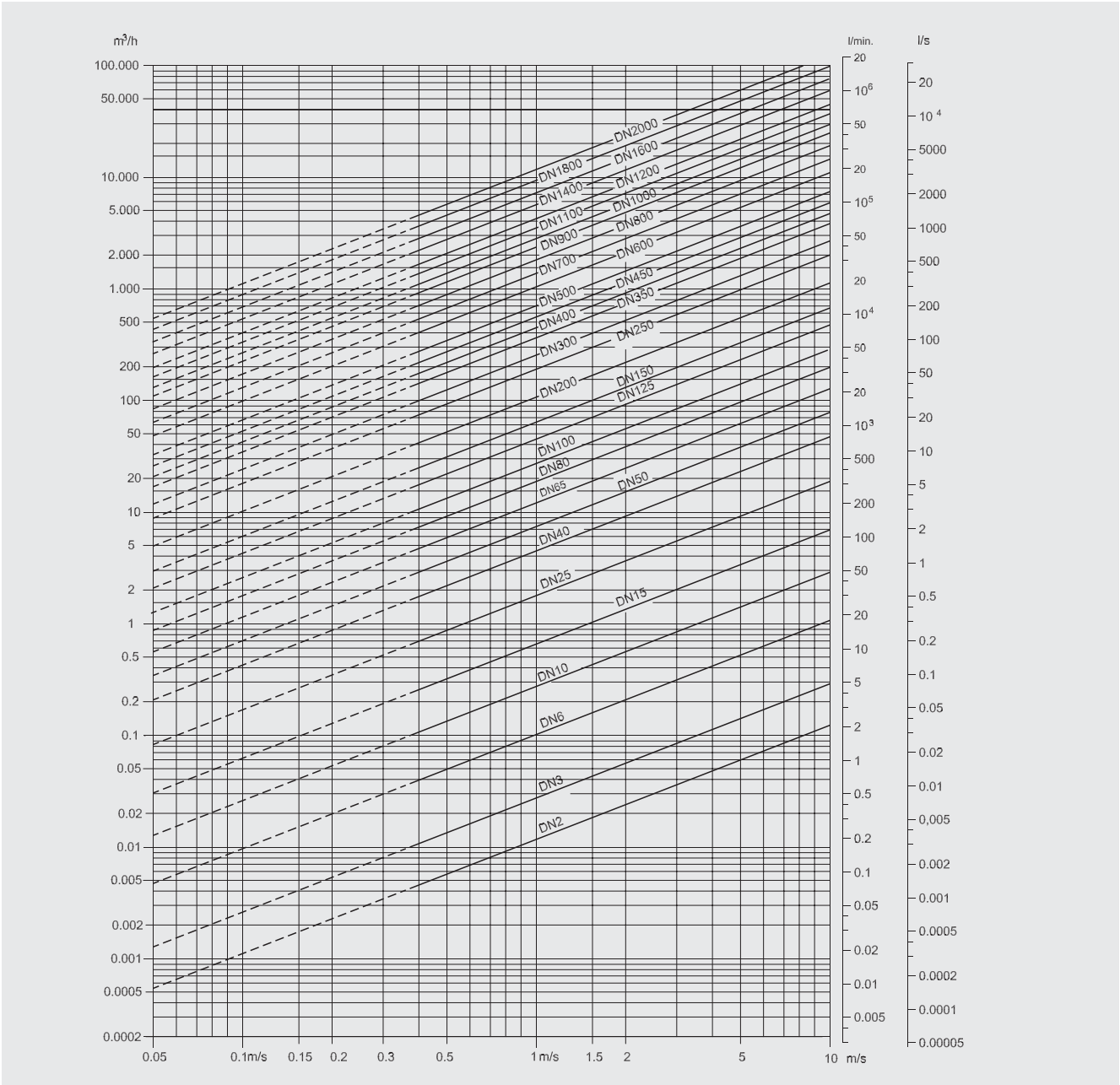
Reference conditions

Reference conditions (ISO 9104 and DIN EN 29104)	
Temperature medium	20 °C ± 5 K (68 °F ± 9 °F)
Temperature ambient	20 °C ± 5 K (68 °F ± 9 °F)
Supply voltage	U_n ± 1%
Warming-up time	30 minutes
Incorporation in conductive pipe section	
• Inlet section	10 x DN (DN ≤ 1200/48") 5 x DN (DN > 1200/48")
• Outlet section	5 x DN (DN ≤ 1200/48") 3 x DN (DN > 1200/48")
Flow conditions	Fully developed flow profile

Additions in the event of deviations from reference conditions	
Current output	As pulse output (± 0.1 % of actual flow + 0.05 % FSO)
Effect of ambient temperature	
• Display / frequency / pulse output	< ±0.003% / K act.
• Current output	< ±0.005% / K act.
Effect of supply voltage	< 0.005% of measuring value on 1% change
Repeatability	± 0.1% of actual flow for v ≥ 0.5 m/s (1.5 ft/s) and conductivity > 10 µS/cm

Selection of sensor

Metric



Sizing table (DN 2 … DN 2000)

The table shows the relationship between flow velocity v, flow quantity Q and sensor dimension DN.

Guidelines for selection of sensor

Min. measuring range: 0 … 0.25 m/s

Max. measuring range: 0 … 10 m/s

Normally the sensor is selected, that the nominal flow velocity v lies within the measuring range 1 … 3 m/s.

Flow velocity calculation formula	Units
$v = 1273.24 \cdot Q / DN^2$ or	v : [m/s], Q : [l/s], DN : [mm]
$v = 353.68 \cdot Q / DN^2$	v : [m/s], Q : [m^3/h], DN : [mm]

Link to „Sizing program“: www.siemens.com/flow-productsizing

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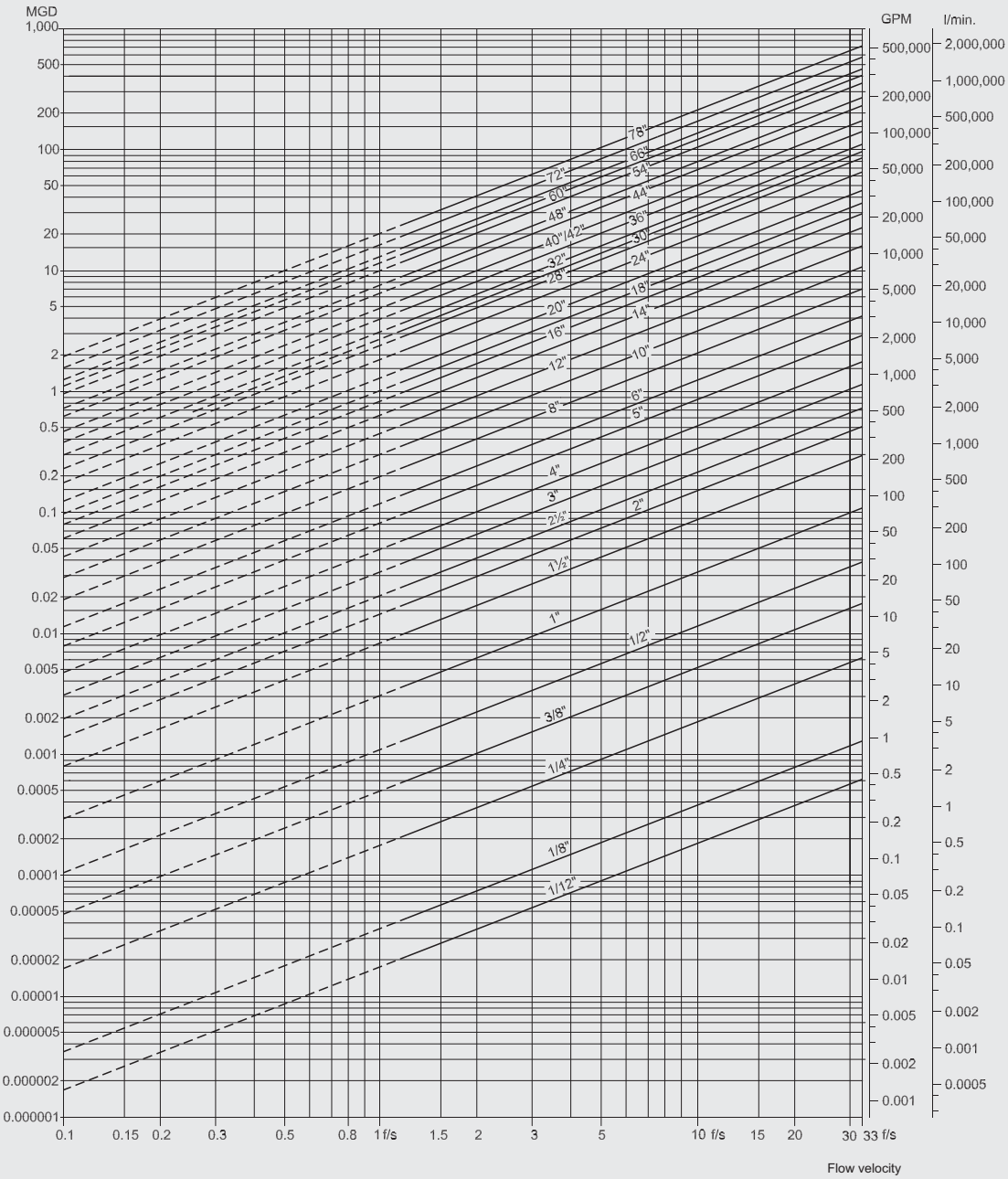
Imperial



Sizing table ($^1/_{12}$" … 78")

The table shows the relationship between flow velocity v, flow quantity Q and sensor dimension size.

Guidelines for selection of sensor

Min. measuring range: 0 … 0.8 ft/s

Max. measuring range: 0 … 33 ft/s

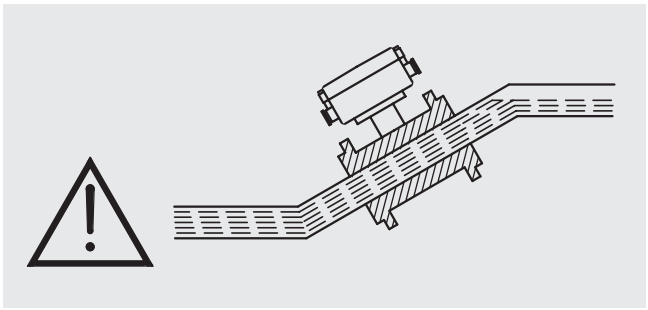
Normally the sensor is selected, that the nominal flow velocity v lies within the measuring range 3 … 10 ft/s.

Flow velocity calculation formula	Units
$v = 0.408 \cdot Q / (\text{Pipe I.D.})^2$ or	v : [ft/s], Q : [GPM], Pipe I.D. : [inch]
$v = 283.67 \cdot Q / (\text{Pipe I.D.})^2$	v : [ft/s], Q : [GPM], Pipe I.D. : [inch]

Link to „Sizing program“: www.siemens.com/flow-productsizing

Installation conditions

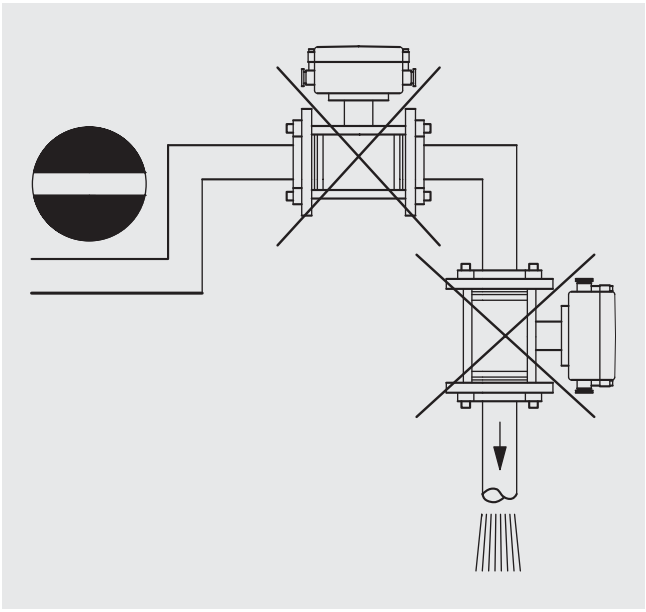
The sensor must always be completely filled with liquid.



Install in pipelines which are always full

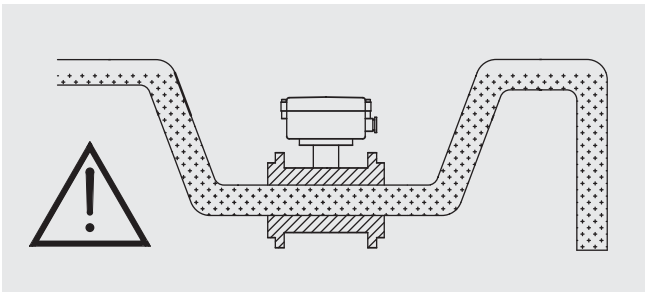
The sensor must always be completely filled with liquid. Therefore avoid:

- Installation at the highest point in the pipe system
- Installation in vertical pipes with free outlet



Do not install in pipelines which can run empty

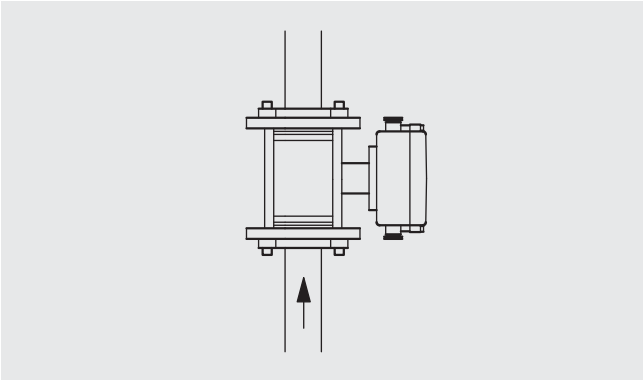
For partially filled pipes or pipes with downward flow and free outlet the flowmeter should be located in a U-Tube.



Install in U-tubes when pipe is partially filled

Installation in vertical pipes

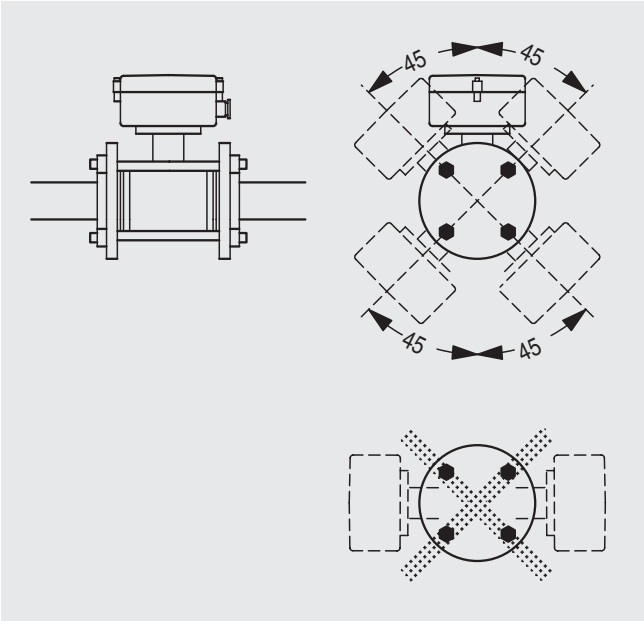
Recommended flow direction: upwards. This minimizes the effect on the measurement of any gas/air bubbles in the liquid.



Install in vertical pipes with upward flow direction

Installation in horizontal pipes

The sensor must be mounted as shown in the below figure. Do not mount the sensor as shown in the lower figure. This will position the electrodes at the top where there is possibility for air bubbles and at the bottom where there is possibility for mud, sludge, sand etc.

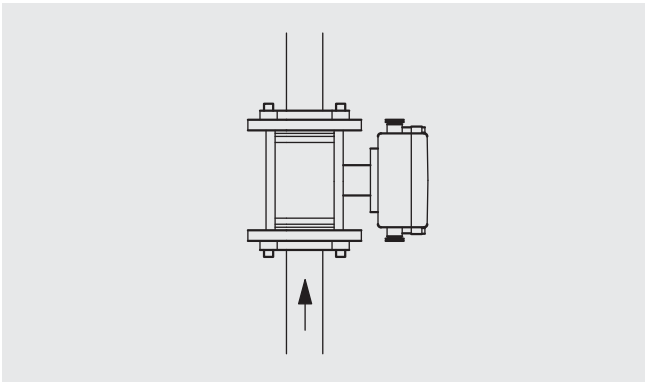


If using empty pipe detection, the sensor can be tilted 45°.

System information MAGFLO electromagnetic flowmeters

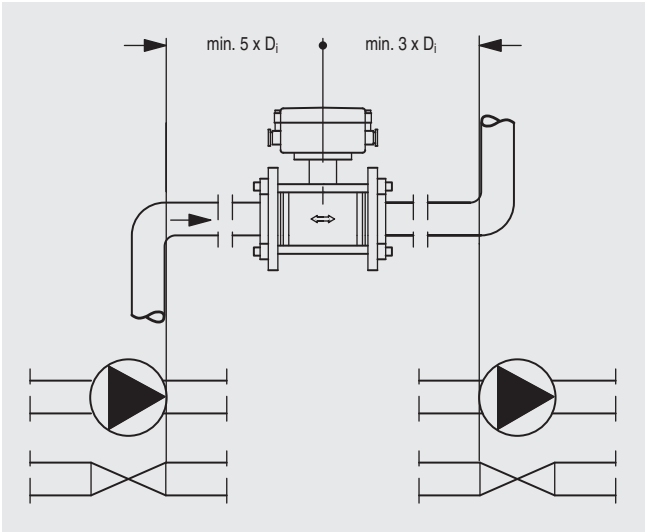
Measuring abrasive liquids and liquids containing particles

Recommended installation is in a vertical/inclined pipe to minimize the wear and deposits in the sensor.



Install in vertical pipelines with upward flow direction if measuring abrasive liquids

Inlet and outlet conditions

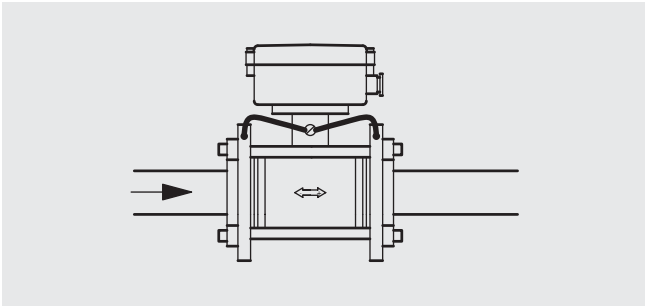


Installation between elbows, pumps and valves: standard inlet and outlet pipe sections

To achieve maximum accurate flow measurement it is essential to have straight length of inlet and outlet pipes and a certain distance between the flowmeter and pumps or valves.

It is also important to center the flowmeter in relation to pipe flange and gaskets.

Potential equalization

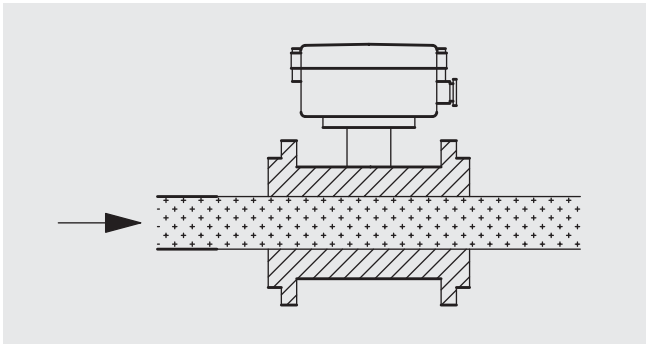


Potential equalization

The electrical potential of the liquid must always be equal to the electrical potential of the sensor. This can be achieved in different ways depending on the application:

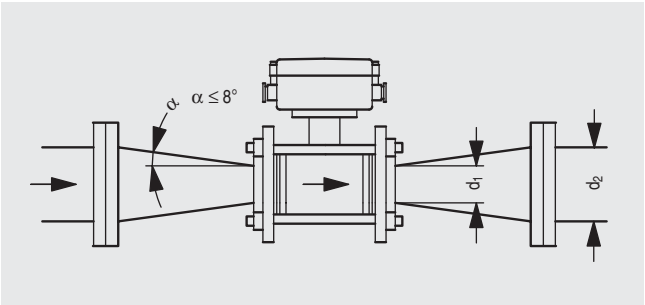
- Wire jumper between sensor and adjacent flange (MAG 1100, MAG 3100)
- Direct metallic contact between sensor and fittings (MAG 1100 Food)
- Build-in grounding electrodes (MAG 3100, MAG 3100 W, MAG 5100 W)
- Optional grounding/protection flanges/rings (MAG 1100, MAG 3100)
- Optional graphite gaskets on MAG 1100 (standard for MAG 1100 High Temperature)

Vacuum



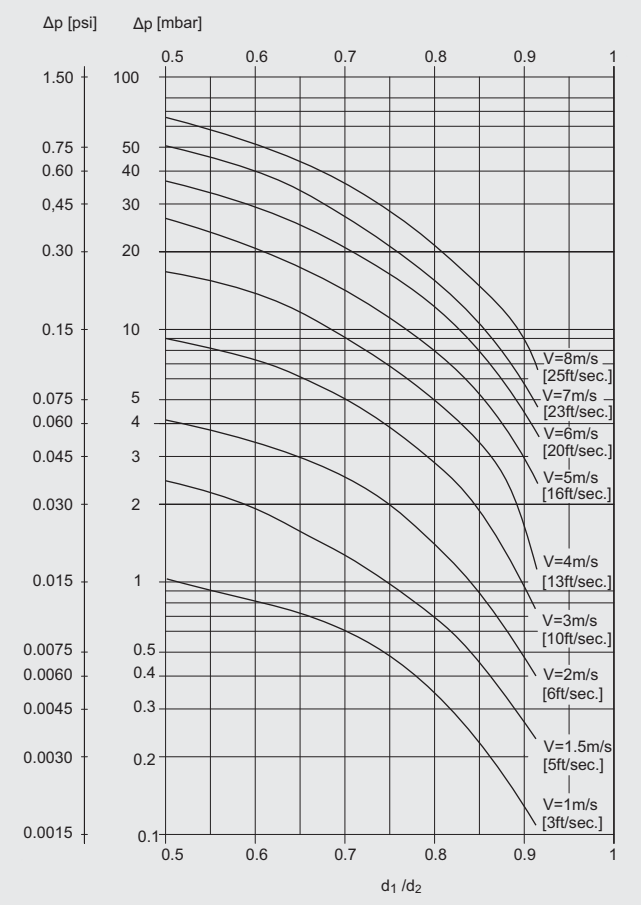
Avoid a vaccum in the measuring pipe, since this can damage certain liners.

Installation in large pipes



Reduction in nominal pipe diameter

The flowmeter can be installed between two reducers (e.g. DIN 28545). Assuming that at 8° the following pressure drop curve applies. The curves are applicable to water.

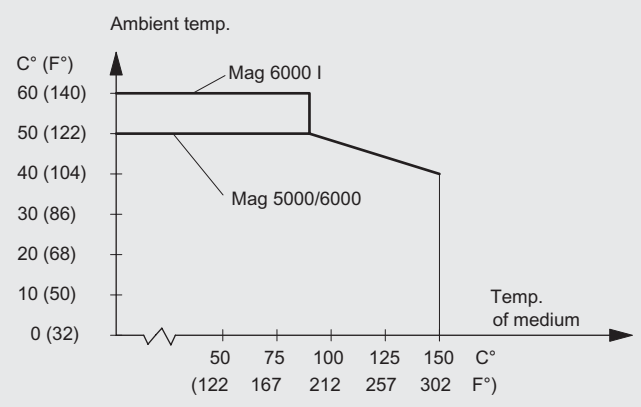


Pressure drop as function of diameter reduction between reducers

Example:

Flow velocity (v) of 3 m/s (10 ft/s) in a sensor with a diameter reduction DN 100 (4") to DN 80 (3") (d_1/d_2 = 0.8) gives a pressure drop of 2.9 mbar (0.04 psi).

Ambient temperature



Max. ambient temperature as a function of temperature of medium

The transmitter can be installed either compact or remote.

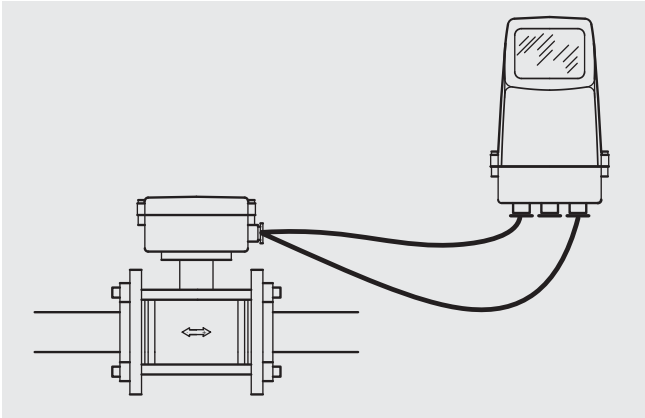
With compact installation the temperature of medium must be according to the graph.

Sensor cables and conductivity of medium

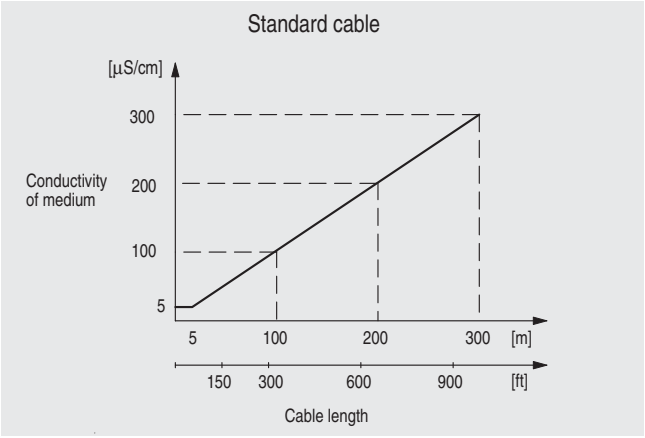
Compact installation:

Liquids with an electrical conductivity ≥ 5 µS/cm.

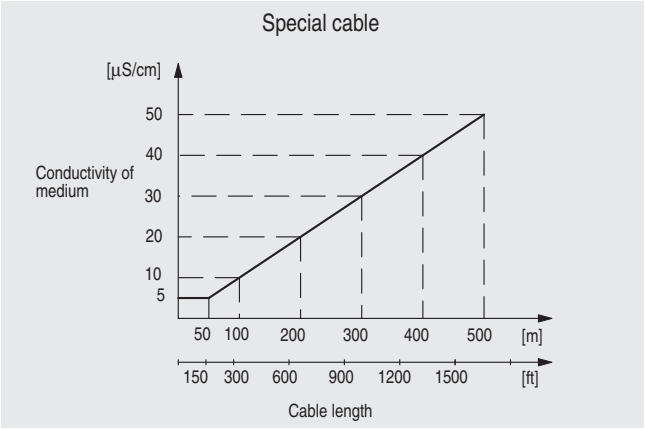
Remote installation:



Remote installation



Conductivity of medium (using standard electrode cable)



Conductivity of medium (using special electrode cable)

Note

For detection of empty sensor the minimum sensor conductivity must always be ≥ **20 µS/cm** and the maximum length of electrode cable when remotely mounted is 50 m (150 ft). Special shield cable must be used.

For **DN 2, DN 3** and for remote mounting in Ex applications special cable cannot be used, empty sensor cannot be detected and the conductivity must be ≥ **30 µS/cm**. For remotely mounted CT installations the maximum cable length is 200 m (600 ft).

For Ex installations with safety barriers, 25 m (75 ft) of cable can be used in order to obtain ±0,25%, and 50 m (150 ft) to obtain ±0.5%.