

System information SITRANS F M Electromagnetic flowmeters

**Overview**

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

The full SITRANS F M program consists of three different types of flowmeters making Siemens unique in that it covers all possible applications where electromagnetic flowmeters are a suitable match:

Modular pulsed DC flowmeters cover all ordinary applications within all industries. The wide variety of combinations and versions from the modular system means that ideal adaptation is possible to each measuring task and application.

High-powered flowmeters are used for difficult applications where other flowmeters cannot stand up to the task. This flowmeter can handle liquids and heavy slurries in industries such as mining, cement and pulp and paper.



SITRANS F M products

Battery-operated water meters (fully electronic) are the perfect match for drinking water applications like network distribution, revenue metering and irrigation where mains power is not available. In addition, it complies with the MID (EU) and OIML R 49 water meter standards and has the MCERTS certificate.



SITRANS F M MAG 8000



SITRANS F M 911/TRANSMAG 2

## Flow Measurement SITRANS F M

### System information SITRANS F M Electromagnetic flowmeters

#### 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 commissioning of MAG 5000, 6000, 6000 I

All SITRANS F M pulsed DC 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 SITRANS F M Verificator is stored during the initial sensor calibration.

#### Easier 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 conductive liquids, pastes and slurries.

A prerequisite is that the medium must have a minimum conductivity. 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 industries
- 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 SITRANS F M Electromagnetic flowmeters

Please see product selector on the Internet, because some constraints might be related to some of the features:

[www.pia-portal.automation.siemens.com](http://www.pia-portal.automation.siemens.com)



MAG 1100	MAG 1100 HT	MAG 1100 F	MAG 3100	MAG 3100 HT	MAG 3100 P	MAG 5100 W	911/E	MAG 8000/ MAG 8000 CT	MAG 8000 Irrigation	
7ME6110	7ME6120	7ME6140	7ME6310	7ME6320	7ME6340	7ME6520	7ME6580	7ME5610	7ME6810 7ME6820	7ME6880

Industry	MAG 1100	MAG 1100 HT	MAG 1100 F	MAG 3100	MAG 3100 HT	MAG 3100 P	MAG 5100 W	911/E	MAG 8000/ MAG 8000 CT	MAG 8000 Irrigation
Water / waste water	XX			XX		X	XXX	XXX	X	XXX <sup>1)</sup> XXX <sup>1)</sup>
Chemical	XXX	XXX	XX	XXX	XXX	XXX	X	X		X
Pharmaceutical	XX	XX	XXX	XX	XX	XX	X	X		X
Food and beverage	XX		XXX	X	X	X	X	X		X
Mining, aggregates and cement	XX			XXX			X	X	XXX	X
HPI	XX	X		XX	X	XX	X	X		X
Other	XX	XX	XX	XX	XX	XX	XX	XX	XXX	X
<b>Design</b>										
Compact	●		●	●	●	●	●	●		●
Remote	●	●	●	●	●	●	●	●	●	●
Constant field (DC)	●	●	●	●	●	●	●	●		●
Alternating field (AC)								●		
Battery-operated constant field (DC)										●
<b>Size</b>										
DN 2 (1/12 )	●									
DN 3 (1/8 )	●									
DN 6 (1/4 )	●									
DN 10 (3/8 )	●		●							
DN 15 (1/2 )	●	●	●	●	●	●	●	●		
DN 25 (1 )	●	●	●	●	●	●	●	●		●
DN 32 (1 1/4 )			● <sup>2)</sup>							
DN 40 (1 1/2 )	●	●	●	●	●	●	●	●		●
DN 50 (2 )	●	●	●	●	●	●	●	●		●
DN 65 (2 1/2 )	●	●	●	●	●	●	●	●		●
DN 80 (3 )	●	●	●	●	●	●	●	●		●
DN 100 (4 )	●	●	●	●	●	●	●	●		●
DN 125 (5 )				●	●	●	●	●		●
DN 150 (6 )				●	●	●	●	●		●
DN 200 (8 )				●	●	●	●	●		●
DN 250 (10 )				●	●	●	●	●		●
DN 300 (12 )				●	●	●	●	●		●
DN 350 (14 )				●	●	●	●	●		●
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 )				●	●	●	●	●		●

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

<sup>1)</sup> Not suitable for wastewater applications

<sup>2)</sup> Only in combination with DN 32 adapter A5E02054637, A5E02218297, FDK:083G2120 and FDK:083G2160

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	MAG 1100	MAG 1100 HT	MAG 1100 F	MAG 3100	MAG 3100 HT	MAG 3100 P	MAG 5100 W	911/E	MAG 8000/ MAG 8000 CT	MAG 8000 Irrigation	
	7ME6110	7ME6120	7ME6140	7ME6310	7ME6320	7ME6340	7ME6520	7ME6580	7ME5610	7ME6810 7ME6820	7ME6880
<b>Size (continued)</b>											
DN 1400 (54 )				●					●		
DN 1500 (60 )				●					●		
DN 1600 (66 )				●					●		
DN 1800 (72 )				●					●		
DN 2000 (78 )				●					●		
<b>Process connection</b>											
Wafer design	●	●									
Sanitary process connections			●								
Flanges				●	●	●	●	●	●	●	● <sup>2)</sup>
<b>Flange norms</b>											
EN 1092-1				●	●	●	●	●	●	●	● <sup>2)</sup>
ANSI B 16.5 class 150				●	●	●	●	●	●	●	● <sup>2)</sup>
ANSI B 16.5 class 300				●	●				●		
ASME B 16.47 class 150				●							
AWWA class D				●			●	●	●	●	
AS 2129				●	●						● <sup>2)</sup>
AS 4087, PN 16				●	●		●	●		●	
AS 4087, PN 21				●	●						
AS 4087, PN 35				●	●						
JIS 10K				●				●	●		
JIS 20K				●							
<b>Pressure rating<sup>1)</sup></b>											
PN 6				●				●			
PN 10				●	●	●	●	●	●	●	
PN 16	●		●	●	●	●	●	●	●	●	
PN 25				●	●				●		
PN 40	●	●	●	●	●	●	●	●	●	●	
PN 63				●							
PN 100				●							
<b>Accuracy</b>											
Flow error – 0.2 % of rate	●	●	●	●	●	●	●	●		●	
Flow error – 0.4 % of rate	●	●	●	●	●	●	●	●		●	
Flow error – 0.5 % of rate									●		
Flow error – 0.8 % of rate											●
<b>Repeatability<sup>4)</sup></b>											
0.1 %	●	●	●	●	●	●	●	●		●	●
0.2 %									●		
Grounding electrodes, incl.				● <sup>3)</sup>		● <sup>3)</sup>	●	●	( ● )	●	
Grounding rings premounted from factory											●

● = available

<sup>1)</sup> Pressure may be limited by the liner material chosen

<sup>2)</sup> Drilled pattern flange max. 7 bar (107 psi).

<sup>3)</sup> Optional on PFA

<sup>4)</sup> Of actual flow for  $v \geq 0.5$  m/s (1.5 ft/s) and conductivity  $> 10$   $\mu$ S/cm

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MAG 1100	MAG 1100 HT	MAG 1100 F	MAG 3100	MAG 3100 HT	MAG 3100 P	MAG 5100 W	911/E	MAG 8000/ MAG 8000 CT	MAG 8000 Irrigation	
7ME6110	7ME6120	7ME6140	7ME6310	7ME6320	7ME6340	7ME6520	7ME6580	7ME5610	7ME6810 7ME6820	7ME6880

**Materials/temperature:****Liner material/max. temperatures**

NBR Hard Rubber: 70 °C (158 °F)

EPDM: 70 °C (158 °F)

Soft rubber: 70 °C (158 °F)

PTFE: 100 °C (212 °F)

PTFE: 130 °C (266 °F)

PTFE: 180 °C (356 °F)

Ebonite Hard Rubber: 95 °C (203 °F)

Linatex: 70 °C (158 °F)

Ceramic: 150 °C (302 °F)

Ceramic: 200 °C (392 °F)

PFA: 100 °C (212 °F)

PFA: 150 °C (302 °F)

Novolak: 130 °C (266 °F)

**Electrodes**

Stainless steel

Hastelloy C

Platinum

Titanium

Tantalum

**Flange/housing material**

Carbon steel

Stainless steel / carbon steel

Polished stainless steel

**Approvals****Custody transfer**

Cold water - MI-001 (EU)

Cold water approval - OIML R 49/OIML R 49 MAA

NMI 10 (Australia)

Chilled water pattern approval PTB K 7.2

OE12/C 040 (Austria)

Chilled water pattern approval

KIWA water approval

**Marine**

ABS

Bureau Veritas

DNV

GL

Lloyd's Register

● = available

<sup>1)</sup> 150 °C (302 °F)

<sup>2)</sup> Ex sensor: 180 °C (356 °F)

<sup>3)</sup> 70 °C (158 °F)

<sup>4)</sup> For verification submit Product Variation Request (PVR)

## Flow Measurement

### SITRANS F M

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	MAG 1100	MAG 1100 HT	MAG 1100 F	MAG 3100	MAG 3100 HT	MAG 3100 P	MAG 5100 W	911/E	MAG 8000/MAG 8000 CT	MAG 8000 Irrigation	
	7ME6110	7ME6120	7ME6140	7ME6310	7ME6320	7ME6340	7ME6520	7ME6580	7ME5610	7ME6810 7ME6820	7ME6880

#### Approvals (continued)

##### Hazardous areas

ATEX - 2 GD (Zone 1/21)	●	●	●	●	●	●					
IECEX Zone 1/21				●	●	●					
FM Class I/II/III, Div 1				● <sup>8)</sup>	● <sup>8)</sup>	● <sup>8)</sup>					
FM Class I, Zone 1/21				●	●	●					
FM Class I, Div 2	●	●	●	●	●	●	●	●			
FM Class I, Zone 2	●	●	●	●	●	●	●	●			
CSA Class I, Zone 1/21				●	●	●					
CSA Class I, Div 2				●	●	●	●	●			
NEPSI Zone 1				●		●					
EAC Ex	●	●	●	●	●	●					

##### Hygienic

EHEDG			●								
3A			●								
EC 1935:2004 European food contact material			●								

##### Drinking water

WRAS (WRc) - (GB)				●			● <sup>4)</sup>	●		●	●
ANSI/NSF 61 (US) <sup>7)</sup>				● <sup>4)</sup>			●	●		●	●
ACS (FR) EPDM liner				●			●			●	
Belgaqua (B) EPDM liner				●			●			●	
DVGW-W270 (D) EPDM liner				●			●			●	
KIWA (NL) EPDM liner							●				
MCERTS (GB environmental)				● <sup>5)</sup>			● <sup>3)</sup>			●	

##### Other

CRN (Canada)	● <sup>9)</sup>			●	●	●	●	●		●	
FM Fire Service (class number 1044)							● <sup>6)</sup>			● <sup>6)</sup>	
EAC (Russia, Belarus and Kazakhstan)	●	●	●	●	●	●	●	●	●	●	
CMC/CPA (China)				●				●			●
PED 97/23 EC	●	●	●	●	●	●	●	●	●	●	
VdS							● <sup>2)</sup>				
Verificator compatible	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>			

● = available

- 1) Only in combination with MAG 5000 and MAG 6000 transmitters.
- 2) Only valid for DN 50 to DN 300 (2" to 12")
- 3) EPDM liner
- 4) Only EPDM with Hastelloy electrodes
- 5) EPDM or PTFE liner with AISI 316 or Hastelloy electrodes.

- 6) Sizes: DN 50, DN 80, DN 100, DN 150, DN 200, DN 250, and DN 300 (2", 3", 4", 6", 8", 10", and 12") with ANSI B16.5 Class 150 flanges
- 7) Including Annex G
- 8) Only DN 15 to DN 300 (½" to 12") with MAG 6000 I Ex, compact mounted
- 9) Only PFA liner

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	MAG 5000	MAG 6000	MAG 6000 I	MAG 6000 I Ex	MAG 6000 + Ex Safety barrier	TRANSMAG 2	MAG 8000/ MAG 8000 CT	MAG8000 Irrigation
	7ME6910	7ME6920	7ME6930	7ME6930	7ME6920	7ME5034	7ME6810 7ME6820	7ME6880
<b>Industry</b>								
Water / waste water	XXX	XXX	XX	X		X	XXX	XXX
Chemical	X	XX	XX	XXX	X		X	
Pharmaceutical	X	XXX	XX	XXX	X		X	
Food and beverage	XX	XXX	XX				X	
Mining, aggregates and cement	XX	X	XX	X		XXX	X	
HPI	X	X	X	XX			X	
Other	XX	XX	XX	XX		XX	X	
<b>Design</b>								
Compact	●	●	●	●			●	●
Remote	●	●	●	●	●	●	●	●
Constant field (DC)	●	●	●	●	●		●	●
Alternating field (AC)						●		
Battery-operated constant field (DC)							●	●
<b>Enclosure transmitter</b>								
Polyamide, IP67	●	●						
Die-cast aluminum			●	●		●		
Stainless steel		●					● <sup>1)</sup>	● <sup>1)</sup>
19 rack	●	●			●			
Front panel mounting	●	●			●			
Panel mounting	●	●			●			
IP66 wall mounting	●	●	●	●	●			
<b>Accuracy</b>								
Flow error – 0.2 % of rate		●	●	●	●		●	
Flow error – 0.4 % of rate	●						●	
Flow error – 0.5 % of rate						●		
Flow error – 0.8 % of rate								●
<b>Repeatability<sup>3)</sup></b>								
0.1 %	●	●	●	●	●		●	●
0.2 %						●		
<b>Communication</b>								
HART	●	●	●	●	●	●		
PROFIBUS PA		●	●	●	●	●		
PROFIBUS DP		●	●		●			
FOUNDATION Fieldbus H1		●	●	●	●			
DeviceNet		●	●		●			
Modbus RTU/RS 485		●	●		●		● <sup>2)</sup>	● <sup>2)</sup>
Encoder interface module (Sensus protocol) for Itron 200WP radio							●	●
GSM/GPRS module							●	
<b>Batching</b>								
		●	●	●	●			

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

<sup>1)</sup> IP68 enclosure

<sup>2)</sup> Modbus RTU also as serial RS 232

<sup>3)</sup> Of actual flow for  $v \geq 0.5$  m/s (1.5 ft/s) and conductivity  $> 10$   $\mu$ S/cm

## Flow Measurement

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	MAG 5000	MAG 6000	MAG 6000 I	MAG 6000 I Ex	MAG 6000 + Ex Safety barrier	TRANSMAG 2	MAG 8000/ MAG 8000 CT	MAG8000 Irrigation
	7ME6910	7ME6920	7ME6930	7ME6930	7ME6920	7ME5034	7ME6810 7ME6820	7ME6880
<b>Power supply</b>								
24 V	● <sup>1)</sup>	● <sup>1)</sup>	●	●			● <sup>1) 2)</sup>	● <sup>1) 2)</sup>
115 V - 230 V	●	●	●	●	●	●	● <sup>2)</sup>	● <sup>2)</sup>
Battery							●	
<b>Approvals</b>								
<u>Custody transfer</u>								
Cold water - MI-001 (EU)	●	●					●	
Cold water approval - OIML R 49/OIML R 49 MAA							●	
Chilled water pattern approval PTB K 7.2	● <sup>5)</sup>	● <sup>5)</sup>					● <sup>5)</sup>	
OE12/C 040 (Austria) Chilled water pattern approval	●	●						
KIWA water approval		●					●	
<u>Marine</u>								
ABS	●	●						
Bureau Veritas	●	●						
DNV	●	●						
GL	●	●						
Lloyd's Register	●	●						
<u>Hazardous areas</u>								
ATEX - 2 GD (Zone 1/21)				●	(●) <sup>3)</sup>			
IECEX Gb Zone 1/21				●				
FM Class I/II/III, Div 1				● <sup>4)</sup>				
FM Class I, Zone 1/21				●				
FM Class I, Div 2	●	●	●					
FM Class I, Zone 2	●	●	●					
CSA Class I, Zone 1/21				●				
CSA Class I, Div 2	●	●	●					
UL / C-UL- general safety	●	●			●			
NEPSI Zone 1				●				
EAC Ex				●	●			
<u>Other</u>								
FM Fire Service (1044)	●	●					●	
C - tick (Australia)	●	●	●	●	●			
EAC (Russia, Belarus and Kazakhstan)	●	●	●	●	●	●	●	
CMC/CPA (China)	●	●	●	●				●
VdS	●	●						
Other national approvals, see internet	●	●	●	●	●	●	●	●
Verifactor compatible	●	●						

● = available

<sup>1)</sup> 12/24 V AC/DC

<sup>2)</sup> Main power with battery backup

<sup>3)</sup> Only sensor in hazardous area

<sup>4)</sup> Only with sensors sizes DN 15 to DN 300 (½" to 12") compact

<sup>5)</sup> For verification submit Product Variation Request (PVR)

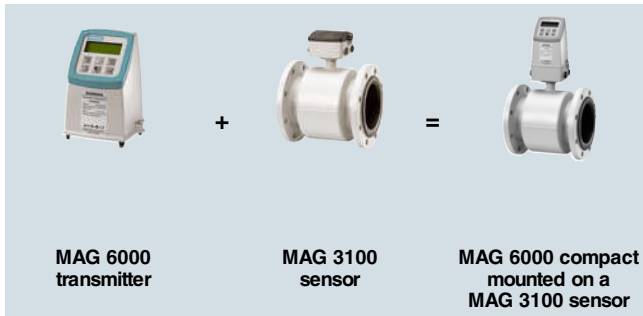
For more national approvals please check our internet page

<http://support.automation.siemens.com/WWW/view/en/10806954/134200>



## Practical examples of ordering

## SITRANS F M compact installation



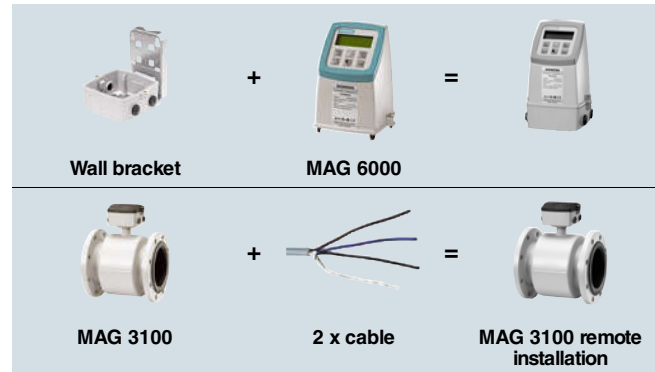
## Example

Sensor	7ME6310-3TC11-1JA1
Pipe size	DN 100
Liner	Soft rubber
Electrodes	SS 316
Flanges	EN 1092-1, PN 16
Transmitter	MAG 6000, Polyamide, 115 ... 230 V AC
Accuracy	$\pm 0.2\% \pm 1 \text{ mm/s}$
Supply	230 V AC

## Note:

MAG 5000/6000 transmitters, sensors and communication modules are packed in separate boxes, the final assembly takes place during installation at the customer's place.

## SITRANS F M remote installation



## Example

Sensor	7ME6310-3TC11-1AA1
Pipe size	DN 100
Liner	Soft rubber
Electrodes	SS 316
Flanges	EN 1092-1, PN 16
Transmitter	7ME6920-1AA10-0AA0
Accuracy	$\pm 0.2\% \pm 1 \text{ mm/s}$
Supply	230 V AC
Wall mounting kit	FDK:085U1018
Cable kit with sensor cable and electrode cable	A5E01181647

## Overview



Transmitter MAG 5000/6000 compact version (left) and 19" insert version (right)

The MAG 5000 and 6000 are transmitters engineered for high performance, easy installation, commissioning and maintenance. The transmitters evaluate the signals from the SITRANS F M sensors type MAG 1100, MAG 1100 F, MAG 3100, MAG 3100 P and MAG 5100 W.

## Transmitter types:

MAG 5000: Max. measuring error  $\pm 0.4 \% \pm 1 \text{ mm/s}$  (incl. sensor)

MAG 6000: Max. measuring error  $\pm 0.2 \% \pm 1 \text{ mm/s}$  (incl. sensor, see also sensor specifications) and with additional features such as: "plug & play" add-on bus modules; integrated batch functions.

## Benefits

- Superior signal resolution for optimum turn down ratio
- Digital signal processing with many possibilities
- Automatic reading of SENSORPROM data for easy commissioning
- User configurable operation menu with password protection. 3 lines, 20 characters display in 11 languages.
- Flow rate in various units
- Totalizer for forward, reverse and net flow as well as additional information available
- Multiple functional outputs for process control, minimum configuration with analogue, pulse/frequency and relay output (status, flow direction, limits)
- Comprehensive self-diagnostic for error indication and error logging (see under SITRANS F M diagnostics)
- Batch control (MAG 6000 only)
- Custody transfer approval: PTB, OIML R 117, OIML R 49, MI-001, PTB K 7.2 and OE12/C 040 for chilled water
- MAG 6000 with add-on bus modules for HART, FOUNDATION Fieldbus H1, DeviceNet, Modbus RTU/RS 485, PROFIBUS PA and DP

## Application

The SITRANS F M flowmeters are suitable for measuring the flow of almost all electrically conductive liquids, pastes and slurries. The main applications can be found in:

- Water and waste water
- Chemical and pharmaceutical industries
- Food and beverage industries
- Power generation and utility

## Design

The transmitter is designed as either IP67 NEMA 4X/6 enclosure for compact or wall mounting or 19" version as a 19" insert as a base to be used in:

- 19" rack systems
- Panel mounting IP20/NEMA 1 (prepared for IP65/NEMA 2 display side)
- Back of panel mounting IP20/NEMA 1
- Wall mounting IP66/NEMA 4X

Several options on 19" versions are available such as:

- Transmitters mounted in safe area for Ex ATEX approved flow sensors (incl. barriers)
- Transmitters with electrode cleaning unit on request

## Function

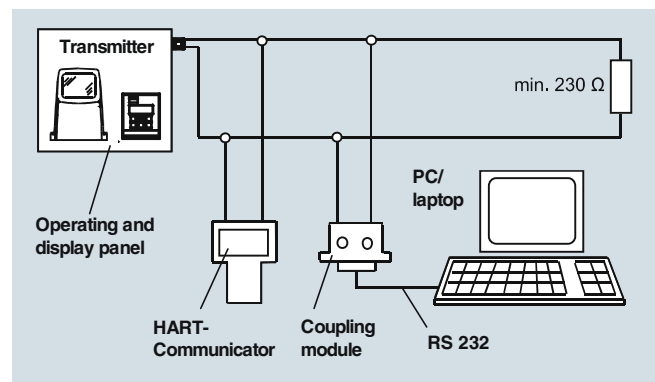
The MAG 5000/6000 are transmitters with a built-in alphanumeric display in several languages. The transmitters evaluate the signals from the associated electromagnetic sensors and also fulfil the task of a power supply unit which provides the magnet coils with a constant current.

Further information on connection, mode of operation and installation can be found in the data sheets for the sensors.

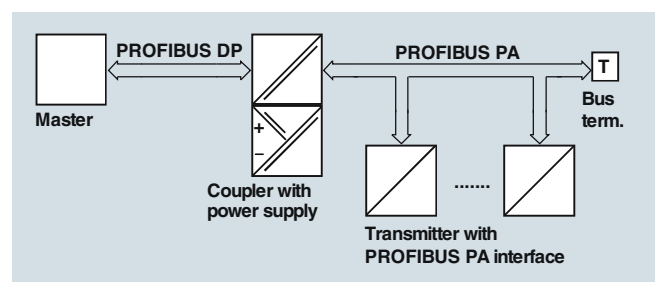
## Displays and controls

Operation of the transmitter can be carried out using:

- Control and display unit
- HART communicator
- PC/laptop and SIMATIC PDM software via HART communication
- PC/laptop and SIMATIC PDM software using PROFIBUS or Modbus communication



HART communication



PROFIBUS PA communication

## Overview



The SITRANS F M MAG 6000 I/MAG 6000 I Ex transmitter is designed for the demands in the process industry. The robust die cast aluminum housing provides superb protection, even in the most harsh industrial environments. Full input and output functionality is given even in the Ex version.

## Benefits

Full range of Ex-rated flowmeters with intrinsically safe rated input and outputs

For compact or remote installation

HART, FOUNDATION Fieldbus H1, DeviceNet, PROFIBUS PA and DP, Modbus RTU/RS 485 add-on communication modules available

Superior signal resolution for optimum turn down ratio

Digital signal processing with many possibilities

Automatic reading of SENSORPROM data for easy commissioning

User configurable operation menu with password protection

- 3 lines, 20 characters display in 11 languages

- Flow rate in various units

- Totalizer for forward, reverse and net flow as well as much more information available.

Multiple functional outputs for process control, minimum configuration with analogue, pulse/frequency and relay output (status, flow direction, limits)

Comprehensive self-diagnostic for error indication and error logging

Batch control

MAG 6000 I NAMUR: compliant with NAMUR NE 21, NE 32, NE 43, NE 53 and NE 70

## Design

The transmitter is designed for either compact or remote installation in non-hazardous or hazardous areas (compact mounted transmitter to be ordered together with the sensors).

## Function

The following functions are available:

Flow rate

2 measuring ranges

2 totalizers

Low flow cut-off

Flow direction

Error system

Operating time

Uni-/bidirectional flow

Limit switches and pulse output

Batch control

The MAG 6000 I/6000 I Ex is a microprocessor-based transmitter with a built-in alphanumeric display in several languages. The transmitters evaluate the signals from the associated electromagnetic sensors and also fulfil the task of a power supply unit which provides the magnet coils with a constant current.

Further information on connection, mode of operation and installation can be found in the data sheets for the sensors.

Displays and keypads

Operation of the transmitter can be carried out using:

Keypad and display unit

HART communicator

PC/laptop and SIMATIC PDM software via HART communication

PC/laptop and SIMATIC PDM software using PROFIBUS or Modbus communication

## Technical specifications

Mode of operation and design	
Measuring principle	Electromagnetic with pulsed constant field
Empty pipe	Detection of empty pipe (special cable required in remote mounted installation)
Excitation frequency	Depend on sensor size
Electrode input impedance	$> 1 \times 10^{14} \Omega$
Input	
Digital input	11 ... 30 V DC, $R_i = 4.4 \text{ k}\Omega$
Activation time	50 ms
Current	$I_{11 \text{ V DC}} = 2.5 \text{ mA}$ , $I_{30 \text{ V DC}} = 7 \text{ mA}$
Output	
Current output	
Signal range	4 ... 20 mA (active/ passive)
Load	$< 560 \Omega$
Time constant	0.1 30 s, adjustable
Digital output	
Frequency	0 10 kHz, 50 % duty cycle (uni-/bidirectional)
Time constant	0.1 30 s, adjustable
Pulse (passive)	3 30 V DC, max 110 mA (30 mA Ex version), $200 \Omega \leq R_i \leq 10 \text{ k}\Omega$ (powered from connected equipment)
Time constant	0.1 30 s, adjustable
Relay output	
Time constant	Changeover relay, same as current output
Load	42 V AC/2 A, 24 V DC/1 A
Low flow cut off	0 9.9 % of maximum flow
Galvanic isolation	All inputs and outputs are galvanic isolated
Max. measuring error	
MAG 6000 I/MAG 6000 I Ex (incl. sensor)	$\pm 0.2 \% \pm 1 \text{ mm/s}$

## Flow Measurement SITRANS F M

### Flow sensor MAG 1100 and MAG 1100 HT

#### Overview



The SITRANS F M MAG 1100 is an electromagnetic flow sensor in a compact wafer design designed for flow applications in the process industry.

#### Benefits

- Sensor sizes: DN 2 to 100 (1/12 to 4 )
- Compact wafer design meets EN 1092, DIN and ANSI flange standards
- Corrosion resistant AISI 316 stainless steel sensor housing
- Highly resistant liner and electrodes fitting most extreme process media
- Temperature rating up to 200 °C (392 °F)
- Hose proof IP67/NEMA 4X enclosure rating
- Designed that patented in-situ verification can be conducted. Using SENSORPROM fingerprints.

#### Application

The main applications of the SITRANS F M electromagnetic flow sensors can be found in the following fields:

- Process industry
- Chemical industry
- Pharmaceutical industry
- Water treatment like e.g. chemical dosing

#### Design

- Compact or remote mounting possible
- Easy "plug & play" field changeability of transmitter
- Simple on site upgrade to IP68/NEMA 6P terminal box
- ATEX 2G D version
- FM Class I, Div 2

#### Mode of operation

The flow measuring principle is based on Faradays law of electromagnetic induction according to which the sensor converts the flow into an electrical voltage proportional to the velocity of the flow.

#### Integration

The complete flowmeter consists of a flow sensor and an associated transmitter SITRANS F M MAG 5000, 6000 or 6000 I. The flexible communication concept USM II simplifies integration and update to a variety of fieldbus systems such as HART, FOUNDATION Fieldbus H1, DeviceNet, PROFIBUS DP and PA, Modbus RTU/RS 485.

## Flow Measurement SITRANS F M

### Flow sensor MAG 1100 F

#### Overview



The electromagnetic sensor SITRANS F M MAG 1100 F is designed to meet applications in the food and beverage industry.

#### Benefits

- Sensor sizes: DN 10 to DN 100 (3/8 to 4 )
- AISI 316 stainless steel enclosure
- Sensor: Hygienic connection, 3A approval and EHEDG certified
- Sanitary design for CIP / SIP cleaning
- Easy commissioning, the SENSORPROM unit automatically updates settings
- Hose proof IP67/NEMA 4X enclosure rating
- Designed that patented in-situ verification can be conducted. Using SENSORPROM fingerprints

#### Application

The main applications of the SITRANS F M electromagnetic sensors can be found in the following fields:

- Food industry
- Beverage industry
- Pharmaceutical industry

#### Design

- Unique mechanical design with a wide range of customer specified sanitary connection
- Compact or remote mounting possible easy "plug & play" field changeable
- Simple on site upgrade to IP68/NEMA 6P terminal box
- ATEX 2G D version for hazardous areas (ceramic liner)

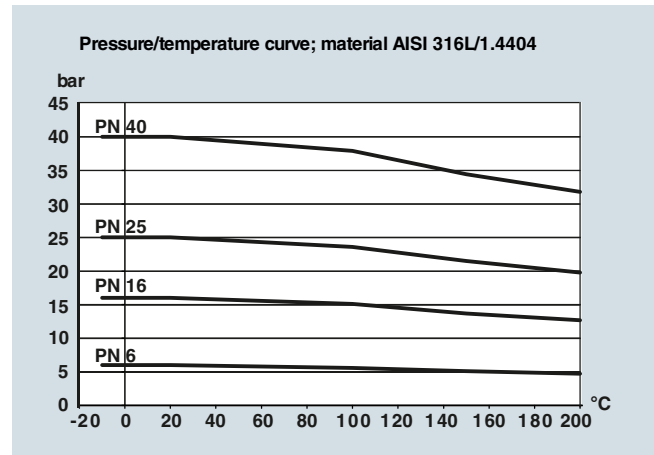
#### Mode of operation

The flow measuring principle is based on Faraday's law of electromagnetic induction according to which the sensor converts the flow into an electrical voltage proportional to the velocity of the flow.

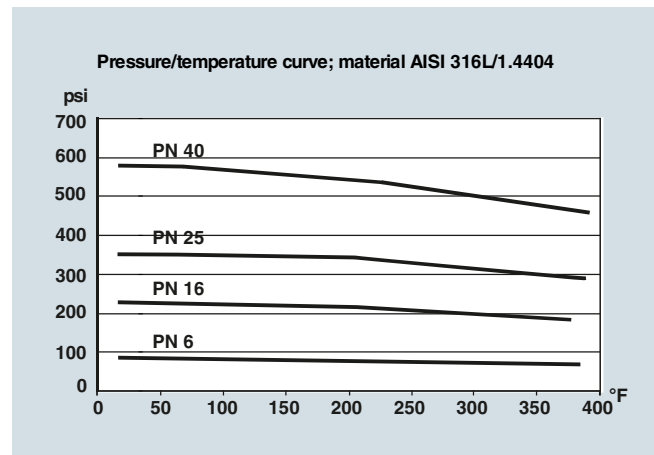
#### Integration

The complete flowmeter consists of a sensor and an associated transmitter SITRANS F M MAG 5000, 6000 and 6000 I. The flexible communication concept USM II simplifies integration and update to a variety of fieldbus systems such as PROFIBUS DP and PA, Modbus RTU/RS 485, HART, FOUNDATION Fieldbus H1, DeviceNet.

Pressure/temperature curve; material AISI 316L/1.4404



Pressure/temperature curve; material AISI 316L/1.4404



For further information on the PED standard and requirements, see page 10/15.

**Overview**

The SITRANS F M MAG 3100 is an electromagnetic flow sensor in a large variety that meets the demands of almost every flow application.

**Benefits**

Wide range of sizes: DN 15 to DN 2000 (½ to 78 )

The flexible design is for all applications not covered by the standard industry-specific sensors: MAG 1100, MAG 1100 F, MAG 3100 P and MAG 5100 W

Wide pressure range: PN 6 to PN 100

ANSI Class 150/300, AS 2129, AS 4087, JIS K10 and K20. On request up to 690 bar (10 000 psi)

Wide range of electrode and liner material to fit even the most extreme process media

Fully welded construction provides a ruggedness that suits the toughest applications and environments

Easy commissioning, the SENSORPROM unit automatically updates settings.

Designed to allow patented SITRANS F M in-situ verification using the SENSORPROM fingerprints.

**Application**

The main applications of the SITRANS F M electromagnetic flow sensors can be found in the following fields:

Process industry

Chemical industry

Steel industry

Mining

Utility

Power generation and distribution

Oil and gas / HPI

Water and waste water

**Design**

Compact or remote mounting possible

Easy plug & play field changeability of transmitter

ATEX and FM/CSA versions

High temperature sensor for applications with temperatures up to 180 °C (356 °F)

Meets EEC directives: PED, 2014/68/EU pressure directive for EN1092-1 flanges

Built-in length according to ISO 13359, the standard includes sizes up to DN 400

Onsite or factory upgrade to IP68/NEMA 6P of a standard sensor.

**Mode of operation**

The flow measuring principle is based on Faraday's law of electromagnetic induction according to which the sensor converts the flow into an electrical voltage proportional to the velocity of the flow.

**Integration**

The complete flowmeter consists of a flow sensor and an associated transmitter MAG 5000, 6000 and 6000 I.

The flexible communication concept USM II simplifies integration and update to a variety of fieldbus systems such as HART, FOUNDATION Fieldbus H1, DeviceNet, PROFIBUS DP and PA, Modbus RTU/RS 485.

## Overview



The SITRANS F M MAG 3100 P is designed to meet the most common specifications within chemical and process industries.

## Benefits

- DN 15 to DN 300 (½ to 12 )
- Included in Quick Ship Program (delivery time see PIA LCP)
- Most used flowmeter in the chemical and process industries with PTFE/PFA liner and Hastelloy electrodes
- Excellent chemical resistance
- Full scope of global approvals for hazardous areas:
  - ATEX, FM, CSA, IECEx
  - 24 V and 115/230 V Ex compact and remote
  - intrinsically safe ia analog output
- Comprehensive self-diagnostic for error indication and error logging
- Fully welded construction provides a ruggedness that suits the toughest applications and environments
- Easy commissioning, the SENSORPROM unit automatically updates settings.
- MAG 6000 I full NAMUR compliance
  - compliant with NE 21, NE 32, NE 43, NE 53 and NE 70

## Application

The main applications of the SITRANS F M electromagnetic flow sensors can be found in the following fields:

- Chemical industry
- Process industry
- Pulp and paper
- Industrial waste water

## Design

- Compact or remote mounting possible
- Easy plug & play field changeability of transmitter
- High temperature sensor for applications with temperatures up to 150 °C (302 °F)
- Meets EEC directives: PED, 2014/68/EU pressure directive for EN1092-1 flanges
- Built-in length according to ISO 13359
- Onsite or factory upgrade to IP68/NEMA 6P of a standard sensor.

## Mode of operation

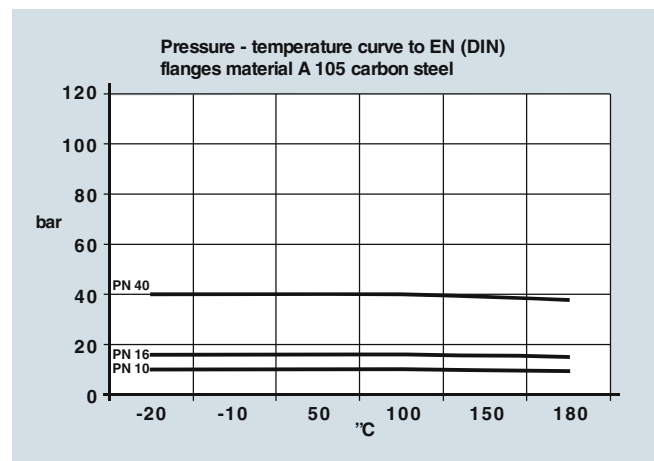
The flow measuring principle is based on Faradays law of electromagnetic induction according to which the sensor converts the flow into an electrical voltage proportional to the velocity of the flow.

## Integration

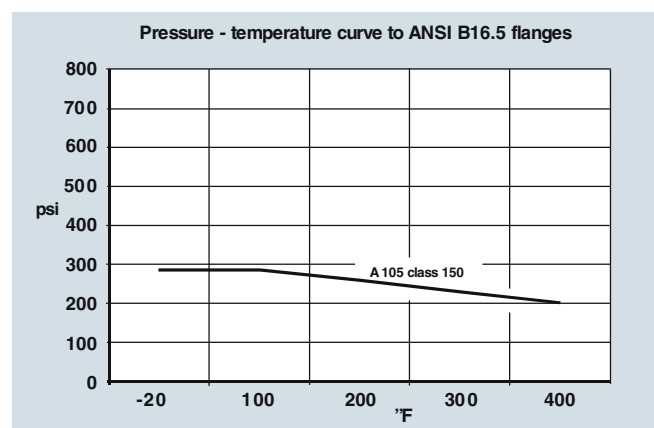
The complete flowmeter consists of a flow sensor and an associated transmitter MAG 5000, 6000 and 6000 I.

The flexible communication concept USM II simplifies integration and update to a variety of fieldbus systems such as HART, FOUNDATION Fieldbus H1, DeviceNet, PROFIBUS DP and PA, Modbus RTU/RS 485.

Pressure/temperature curve to EN (DIN) flanges, material A 105 carbon steel



## Pressure/temperature curve to ANSI B16.5 flanges



Note: The pressure-temperature curves only assist in the selection of a system. No responsibility is taken for the correctness of the information. For further information on the PED standard and requirements, see page 10/15.

## Flow Measurement SITRANS F M

### Flow sensor MAG 5100 W

#### Overview



The SITRANS F M MAG 5100 W is an electromagnetic flow sensor designed to meet ground water, drinking water, waste water, sewage or sludge applications.

#### Benefits

- DN 15 to DN 1200/2000 (½ to 48" / 78 )
- Stock program of MAG 5100 W secures short delivery time
- Connection flanges EN 1092-1 (DIN 2501), ANSI, AWWA, AS and JIS.
- NBR Hard Rubber and Ebonite Hard Rubber liner for all water applications
- EPDM liner with drinking water approvals
- Hastelloy integrated grounding and measuring electrodes
- Increased low flow accuracy for water leak detection, due to coned liner design.
- Drinking water approvals
- Suitable for direct burial and constant flooding
- Custody transfer approvals
- Built-in length according to ISO 13359; the standard includes sizes up to DN 400.
- Easy commissioning, SENSORPROM unit automatically uploads calibration values and settings.
- Designed so patented in-situ verification can be conducted. Using SENSORPROM fingerprint.
- Custody transfer option for water billing, with type approval after OIML R 49 and verified according to MI-001 - OD inlet/OD outlet installation
  - Pattern approval OIML R 49
  - Conform to ISO 4064 and EN 14154 for mechanical flowmeters
  - PTB K7.2
  - Kiwa water approval
- FM Fire Service Meter (Class Number 1044) for automatic fire protection systems
- Meets EEC directives: PED 2014/68/EU pressure directive for EN1092-1 flanges
- Simple onsite or factory upgrade to IP68/NEMA 6P of a standard sensor
- Type approval of marine equipment (ABS, Bureau Veritas, DNV, GL, Lloyd's Register)

#### Application

The main applications of the SITRANS F M electromagnetic flow sensors can be found in the following fields:

- Water abstraction
- Water treatment
- Water distribution network (leak detection management)
- Custody transfer water meters
- Irrigation
- Waste water treatment
- Filtration plant (e.g. reverse osmosis and ultra filtration)
- Industrial water applications

#### Mode of operation

The flow measuring principle is based on Faradays law of electromagnetic induction according to which the sensor converts the flow into an electrical voltage proportional to the velocity of the flow.

#### Integration

The complete flowmeter consists of a flow sensor and an associated transmitter SITRANS F M MAG 5000, MAG 6000 or MAG 6000 I.

The flexible communication concept USM II simplifies integration and update to a variety of fieldbus systems, e.g. HART, DeviceNet, PROFIBUS DP and PA, FOUNDATION Fieldbus H1 or Modbus RTU/RS 485.



## Overview



SITRANS F M TRANSMAG 2 with the SITRANS F M 911/E sensor is a pulsed alternating field magnetic flowmeter where the magnetic field strength is much higher than conventional DC pulsed magnetic flowmeters.

## Benefits

- Wide range of sizes DN 15 to DN 1000 (½" to 40")
- Broad range of liner and electrode materials for extreme process medias
- Fully welded construction provides a ruggedness that suits the toughest applications and environments.
- Automatic reading of SmartPLUG for easy commissioning
- Simple menu operation with two-line display
- Comprehensiv self-diagnostic with selfmonitoring and internal simulation

## Application

The main applications of the SITRANS F M transmitter TRANSMAG 2 can be found in the following sectors:

- Pulp and Paper industry
- Mining industry

The pulse alternating field technology is ideal for difficult applications like:

- High concentrated paper stock > 3 %
- Heavy mining slurries up to 70 % solid concentration
- Mining slurries with magnetic particles.
- Low conductive medias  $\geq 1 \mu\text{S/cm}$  (0.1  $\mu\text{S/cm}$  depending on medium)

## Design

- Available for remote mounting
- PROFIBUS PA (profile 2.0) / HART communication
- Analog output and digital outputs for pulses, device status, limits, flow direction, frequency output

## Mode of operation

The flow measuring principle is based on Faradays law of electromagnetic induction according to which the sensor converts the flow into an electrical voltage proportional to the velocity of the flow.

## Function

The TRANSMAG 2 is a microprocessor-based transmitter with a built-in alphanumeric display in several languages. The transmitters evaluate the signals from the associated electromagnetic sensors and also fulfill the task of a power supply unit which provides the magnet coils with a constant current.

The magnetic flux density in the sensor is additionally monitored by reference coils.

Further information on connection, mode of operation and installation can be found in the data sheets for the sensors.

## Displays and keypad

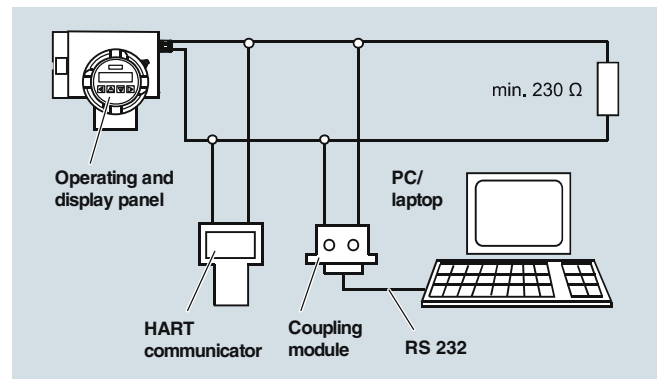
Operation of the transmitter can be carried out using:

Keypad and display unit

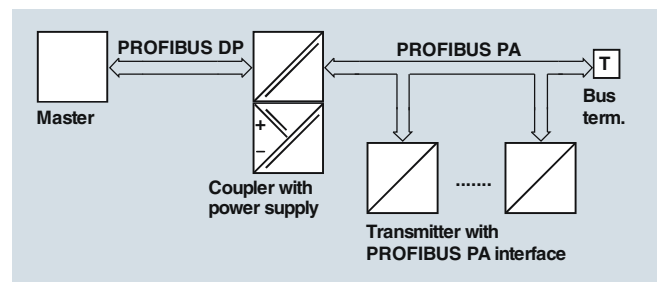
HART communicator

PC/laptop and SIMATIC PDM software via HART communication

PC/laptop and SIMATIC PDM software using PROFIBUS PA communication



## HART communication



## PROFIBUS PA communication

## Overview



MAG 8000 is a comprehensive meter which intelligent information and high performance measurement as well as the easy to install concept take cost of ownership and customer service to a new level for water meter.

## Benefits

## Easy to install

Compact or remote solution with factory mounted cable and customer setting from factory

IP68/NEMA 6P enclosure. Sensor can be buried

Flexible power supply - internal or external battery pack or mains power supply with battery back-up possibilities

Superior measurement

Down to 0.2 % maximum uncertainty

OIML R 49 type approval

PTB K7.2

FM Fire Service Approval

Bi-directional measurement

## Long lasting performance/Low cost of Ownership

Verification according to Directive 2014/32/EU of the European Parliament and Council of 26 February, 2014 on measuring instruments, Annex VI Thermal Energy Meters (MI-004)

No moving parts means less wear and tear

Up to 6 to 10 years maintenance-free operation in typical revenue application

Robust construction built for the application

## Intelligent information, easy to access

Advanced information on site

Data logger

Advanced statistics and diagnostics

Add-on communication modules

## Application

The following MAG 8000 versions are available as stand-alone water meters:

MAG 8000 (7ME6810) for abstraction and distribution network

MAG 8000 CT (7ME6820) for revenue and bulk metering

MAG 8000 (7ME6880) for irrigation

## Design

MAG 8000 is designed to minimize power consumption.

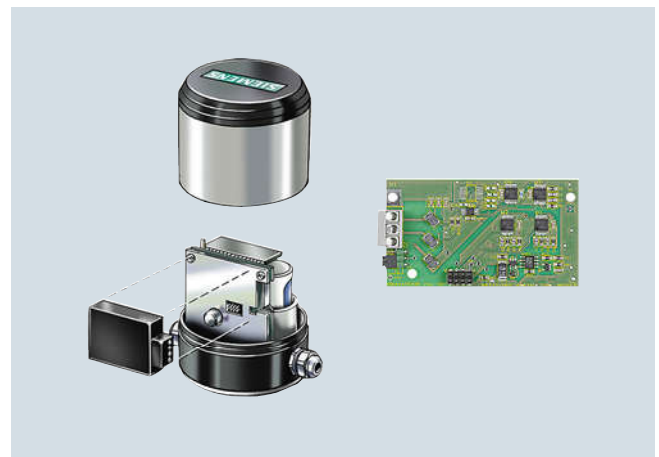
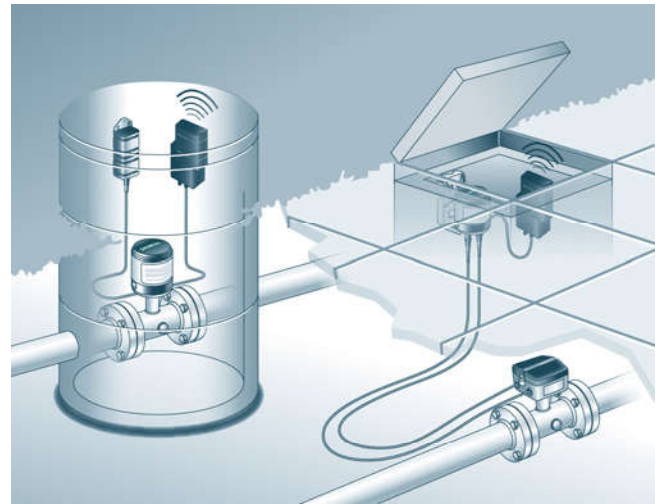
The product program consists of

Basic and advanced version

Sensor sizes from DN 25 to 1200 (1" to 48")

Compact and remote installation in IP68/NEMA 6P enclosure and factory-mounted cable

SIMATIC PDM and Flow Tool PC configuration softwares



Modbus/Encoder module