

## Flow Measurement

SITRANS FM (electromagnetic)

Flow sensors

### MAG 3100 P

3

#### Overview



The SITRANS FM 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 NE70

#### Application

The main applications of the SITRANS FM 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 EN 1092-1 flanges
- Build-in length according to ISO 20456
- Onsite or factory upgrade to IP68/NEMA 6P of a standard sensor.

#### Mode of operation

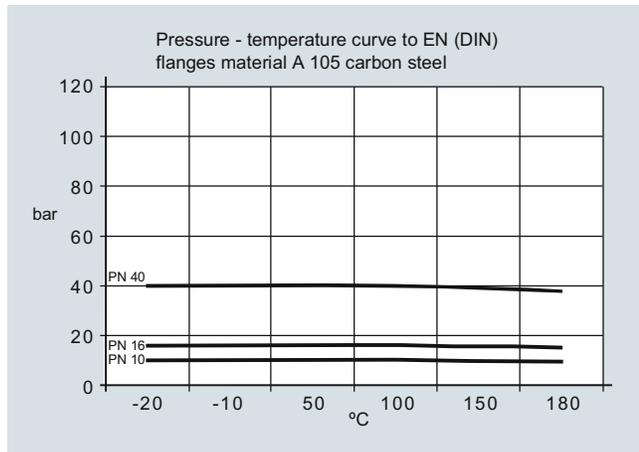
The flow measuring principle is based on Faraday's law of electromagnetic induction according to which the sensor converts the flow into an electrical voltage proportional to the velocity of the flow.

## Integration

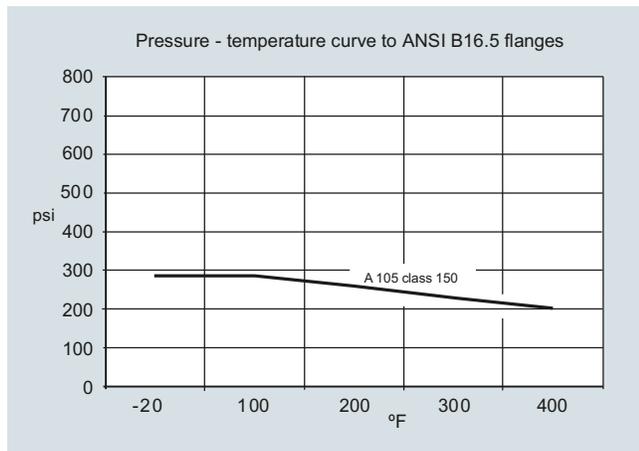
The complete flowmeter consists of a flow sensor and an associated transmitter MAG 5000, 6000 and 6000 I.

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.

### **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 exact data please refer to the PED requirements. For further information on the PED standard and requirements, see Pressure Equipment Directive in Appendix (chapter 10).

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#### Technical specifications

<b>Product characteristic</b>	Chemical and process industry-oriented (Included in Quick Ship Program)
Nominal size	<ul style="list-style-type: none"> <li>• PTFE: DN 15 ... 300 (½" ... 12")</li> <li>• PFA: DN 15 ... 150 (½" ... 6")</li> </ul>
Measuring principle	Electromagnetic induction
Excitation frequency (Mains supply: 50 Hz/60 Hz)	<ul style="list-style-type: none"> <li>• DN 15 ... 65 (½" ... 2½"): 12.5 Hz/15 Hz</li> <li>• DN 80 ... 150 (3" ... 6"): 6.25 Hz/7.5 Hz</li> <li>• DN 200 ... 300 (8" ... 12"): 3.125 Hz/3.75 Hz</li> </ul>
<b>Process connection</b>	
Flanges	EN 1092-1, raised face <sup>1)</sup> (EN 1092-1, DIN 2501 & BS 4504 have the same mating dimensions) <ul style="list-style-type: none"> <li>• DN 15 ... 50 (½" ... 2"): PN 40 (580 psi)</li> <li>• DN 65 ... 300 (2½" ... 12"): PN 16 (232 psi)</li> <li>• DN 200 ... 300 (8" ... 12"): PN 10 (145 psi)</li> </ul> ANSI B16.5 (~BS 1560), raised face <ul style="list-style-type: none"> <li>• ½" ... 12": Class 150 (20 bar (290 psi))</li> </ul>
<b>Rated operation conditions</b>	
<b>Ambient temperature</b> (conditions also dependent on liner characteristics)	
<ul style="list-style-type: none"> <li>• Standard Sensor</li> <li>• Ex sensor</li> <li>• Compact with transmitter</li> </ul>	-40 ... +100 °C (-40 ... +212 °F) -20 ... +60 °C (-4 ... +140 °F)
<ul style="list-style-type: none"> <li>- MAG 5000/6000</li> <li>- MAG 6000 I</li> <li>- MAG 6000 I Ex</li> </ul>	-20 ... +60 °C (-4 ... +140 °F) -20 ... +60 °C (-4 ... +140 °F) -20 ... +60 °C (-4 ... +140 °F)
<b>Operating pressure</b> [abs. bar] (maximum operating pressure decreases with increasing operating temperature and with stainless steel flanges)	<ul style="list-style-type: none"> <li>• PTFE Teflon               <ul style="list-style-type: none"> <li>- DN 15 ... 300 (½" ... 12"): 0.3 ... 40 bar (4 ... 580 psi)</li> </ul> </li> <li>• PFA               <ul style="list-style-type: none"> <li>- DN 15 ... 150 (½" ... 6"): Vacuum 0.02 ... 50 bar (0.29 ... 725 psi)</li> </ul> </li> </ul>
Enclosure rating	IP67 to EN 60529/NEMA 4X/6, 1 mH <sub>2</sub> O for 30 min  Option: IP68 to EN 60529/NEMA 6P, 10 mH <sub>2</sub> O cont. (not for Ex)
Pressure drop at 3 m/s	As straight pipe
Test pressure	1.5 x PN (where applicable)
Mechanical load (Vibration)	<ul style="list-style-type: none"> <li>• 18 ... 1000 Hz random in x, y, z, directions for 2 hours according to EN 60068-2-36</li> <li>• Sensor: 3.17 g RMS</li> <li>• Sensor with compact MAG 5000/6000 mounted transmitter: 3.17 g RMS</li> <li>• Sensor with compact MAG 6000 I/6000 I Ex mounted transmitter: 1.14 g RMS</li> </ul>
Temperature of medium	<ul style="list-style-type: none"> <li>• PTFE -20 ... +130 °C (-4 ... +266 °F)</li> <li>• PFA -20 ... +150 °C (-4 ... +302 °F)</li> </ul>
EMC	2014/30/EU

<b>Design</b>	
Weight	See dimensional drawings
Flange and housing material	Carbon steel ASTM A 105, with corrosion resistant coating of category C4 according to ISO 12944-2
Measuring pipe material	Stainless steel AISI 304/1.4301
Electrode material	PTFE: Hastelloy C276/2.4819, Platinum, Tantalum PFA: Hastelloy C22/2.4602
Grounding electrode material	Optional in Hastelloy C22/2.602
Terminal box (remote version only)	<ul style="list-style-type: none"> <li>• Standard fibre glass reinforced polyamide</li> <li>• Option Stainless steel AISI 316/1.4436</li> <li>• Ex sensor: Stainless steel AISI 316/1.4436</li> </ul>
Cable entries	<ul style="list-style-type: none"> <li>• Remote installation 2 x M20 or 2 x ½" NPT</li> <li>• Compact installation               <ul style="list-style-type: none"> <li>- MAG 5000/MAG 6000: 4 x M20 or 4 x ½" NPT</li> <li>- MAG 6000 I: 2 x M25 or 2 x ½" NPT (for supply/output)</li> <li>- MAG 6000 I Ex de: 2 x M25 or 2 x ½" NPT (for supply/output)</li> </ul> </li> </ul>
<b>Certificates and approvals</b>	
Calibration	
<ul style="list-style-type: none"> <li>• Default calibration</li> </ul>	Zero-point, 2 x 25 % and 2 x 90 %
Hazardous areas	
<ul style="list-style-type: none"> <li>• Ex-sensor in compact or remote version with MAG 6000 I Ex</li> </ul>	<ul style="list-style-type: none"> <li>• ATEX, FM, CSA, IECEx, EAC Ex, NEPSI               <ul style="list-style-type: none"> <li>- Zone 1 Ex de ia IIC T6 Gb</li> </ul> </li> <li>• ATEX, FM, CSA, IECEx               <ul style="list-style-type: none"> <li>- Zone 21 Ex td A21 IP67</li> </ul> </li> <li>• FM               <ul style="list-style-type: none"> <li>- XP IS Class I Div. 1 Groups A, B, C, D<sup>2)</sup></li> <li>- DIP Class II+III Div. 1 Groups E, F, G<sup>2)</sup></li> </ul> </li> <li>• Standard sensor with/without MAG 5000/6000/6000 I               <ul style="list-style-type: none"> <li>• FM                   <ul style="list-style-type: none"> <li>- NI Class I Div. 2 Groups A, B, C, D</li> <li>- NI Class I Zone 2 Groups IIC</li> </ul> </li> </ul> </li> </ul>
Pressure equipment	PED, CRN
Others	<ul style="list-style-type: none"> <li>• EAC (Russia, Belarus, Kazakhstan)</li> <li>• KCC (South Korea)</li> </ul>

<sup>1)</sup> DN ≤ 600 type 01 (SORF); DN > 600 type 11 (WNRF)

<sup>2)</sup> In compact version only.

#### Technical specifications (continued)

##### Available Options for the SITRANS MAG 3100 P

The MAG 3100P is designed to meet the most common specifications within chemical and process industries. Therefore not all options are available. If you miss a few options please check out our product MAG 3100 which is covering many more options.

##### Available Options for Liner PTFE with Platinum electrodes

Diameter		Connection			
MAG 3100 P	Order code	EN 1092-1, PN 10	EN 1092-1, PN 16	EN 1092-1, PN 40	AISI B 16.5, class 150
DN 15, 1/2"	1V			•	
DN 25, 1"	2D			•	•
DN 40, 1 1/2"	2R			•	
DN 50, 2"	2Y			•	•
DN 65, 2 1/2"	3F				
DN 80, 3"	3M		•		
DN 100, 4"	3T		•		
DN 125, 5"	4B		•		
DN 150, 6"	4H		•		
DN 200, 8"	4P				
DN 250, 10"	4V				
DN 300, 12"	5D				

##### Available Options for Liner PTFE with Tantalum electrodes

Diameter		Connection			
MAG 3100 P	Order code	EN 1092-1, PN 10	EN 1092-1, PN 16	EN 1092-1, PN 40	AISI B 16.5, class 150
DN 15, 1/2"	1V			•	
DN 25, 1"	2D			•	•
DN 40, 1 1/2"	2R			•	
DN 50, 2"	2Y			•	•
DN 65, 2 1/2"	3F		•		
DN 80, 3"	3M		•		•
DN 100, 4"	3T		•		•
DN 125, 5"	4B				
DN 150, 6"	4H		•		
DN 200, 8"	4P		•		
DN 250, 10"	4V		•		
DN 300, 12"	5D				

##### Available Options for Liner PTFE with Hastelloy C electrodes incl. grounding electrodes

Diameter		Connection			
MAG 3100 P	Order code	EN 1092-1, PN 10	EN 1092-1, PN 16	EN 1092-1, PN 40	AISI B 16.5, class 150
DN 15, 1/2"	1V			•	
DN 25, 1"	2D			•	•
DN 40, 1 1/2"	2R			•	
DN 50, 2"	2Y			•	•
DN 65, 2 1/2"	3F		•		
DN 80, 3"	3M		•		•
DN 100, 4"	3T		•		•
DN 125, 5"	4B				
DN 150, 6"	4H		•		•
DN 200, 8"	4P				•
DN 250, 10"	4V				•
DN 300, 12"	5D				

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#### Selection and ordering data

#### Article No.

#### Order code

Selection and ordering data	Article No.	Order code
<b>Sensor SITRANS FM MAG 3100 P (Short delivery time)</b>	7ME6340-	
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
<b>Diameter</b>		
DN 15 (1/2")	1 V	
DN 25 (1")	2 D	
DN 40 (1 1/2")	2 R	
DN 50 (2")	2 Y	
DN 65 (2 1/2")	3 F	
DN 80 (3")	3 M	
DN 100 (4")	3 T	
DN 125 (5")	4 B	
DN 150 (6")	4 H	
DN 200 (8")	4 P	
DN 250 (10")	4 V	
DN 300 (12")	5 D	
<b>Flange norm and pressure rating</b>		
EN 1092-1		
PN 10 (DN 200 ... 300 (8" ... 12"))	B	
PN 16 (DN 65 ... 300 (2 1/2" ... 12"))	C	
PN 40 (DN 15 ... 50 (1/2" ... 2"))	F	
ANSI B16.5		
Class 150 (1/2" ... 12")	J	
<b>Flange material</b>		
Carbon steel flanges ASTM A 105	1	
<b>Liner material</b>		
PTFE (150 °C (302 °F))	3	
PFA (150 °C (302 °F)) (DN 15 ... 150 (1/2" ... 6"))	7	
<b>Electrode material</b>		
Hastelloy C	2	
Platinum	3	
Tantalum	5	
Hastelloy C incl. grounding electrodes	6	
<b>Transmitter</b>		
Standard sensor for remote transmitter (Order transmitter separately)	A	
Ex sensor for remote transmitter (Order transmitter separately)	B	
MAG 6000 I, Aluminum, 18 ... 90 V DC, 115 ... 230 V AC	C	
MAG 6000 I, Aluminum, 18 ... 30 V DC, Ex	D	
MAG 6000 I, Aluminum, 115 ... 230 V AC, Ex	E	
MAG 6000, Polyamide, 11 ... 30 V DC/11 ... 24 V AC	H	
MAG 6000, Polyamide, 115 ... 230 V AC	J	
MAG 5000, Polyamide, 11 ... 30 V DC/11 ... 24 V AC	K	
MAG 5000, Polyamide, 115 ... 230 V AC	L	
<b>Communication</b>		
No communication, add-on possible	A	
HART	B	
PROFIBUS PA Profile 3 (only MAG 6000/MAG 6000 I)	F	
PROFIBUS DP Profile 3 (not for Ex) (only MAG 6000/MAG 6000 I)	G	
Modbus RTU/RS 485 (not for Ex) (only MAG 6000/MAG 6000 I)	E	
FOUNDATION Fieldbus H1 (only MAG 6000/6000 I)	J	
<b>Cable glands/terminal box</b>		
Metric: Polyamide terminal box or MAG 6000 I compact	1	
1/2" NPT: Polyamide terminal box or MAG 6000 I compact	2	
Metric: Stainless steel terminal box	3	
1/2" NPT: Stainless steel terminal box	4	

#### Additional information

Please add "-Z" to Article No. and specify Order code(s) and plain text.

#### Certificates

- Factory certificate according to EN 10204-2.2
- Factory certificate according to EN 10204-2.1

C14

C15

#### Terminal blocks

- Factory mounted terminal blocks

N02

#### Country specific label

- CRN (Canadian Registration Number)

H25

Tag name plate, stainless steel (specify in plain text)

Y17

Tag name plate, plastic (self adhesive)

Y18

Customer-specific transmitter setting

Y20

#### Factory mounted sensor cables

- Sensor cables wired (specify Article No. for sensor cables and order cables separately)

Y40

- Sensor cables wired and IP68 sealing (specify Article No. for sensor cables and order cables separately)

Y41

#### Additional calibrations

- Matched-pair calibration
- Accredited matched-pair calibration acc. to ISO/IEC 17025: 2005
- Customer-specified calibration up to 10 points
- Customer-witnessed calibration

On request<sup>1)</sup>On request<sup>1)</sup>On request<sup>1)</sup>On request<sup>1)</sup>

<sup>1)</sup> Product Variation Request (PVR).

#### Operating instructions for SITRANS FM MAG 3100 P

#### Description

#### Article No.

- English
- German

A5E03005599

A5E03086288

All literature is available to download for free, in a range of languages, at

<http://www.siemens.com/processinstrumentation/documentation>

#### Accessories

#### Description

#### Article No.

Potting kit for IP68/NEMA 6P sealing of sensor junction box

FDK-085U0220



Please use online Product selector to get latest updates.

Product selector link:

<http://www.pia-selector.automation.siemens.com>