

SITRANS FM (electromagnetic) Flowmeters with alternating (AC) field technology

SITRANS FM TRANSMAG 2 with SITRANS FM MAG 911/E

Overview



SITRANS FM TRANSMAG 2 with the SITRANS FM MAG 911/E sensor is a flowmeter using alternating (AC) field technology where the magnetic field strength is much higher than conventional magnetic flowmeters with pulsed DC field technology.

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
- Comprehensive self-diagnostic with self-monitoring and internal simulation

Application

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

- Pulp and Paper industry
 - Mining industry
- The patented 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 $\geq 1 \mu\text{S/cm}$

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 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.

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.

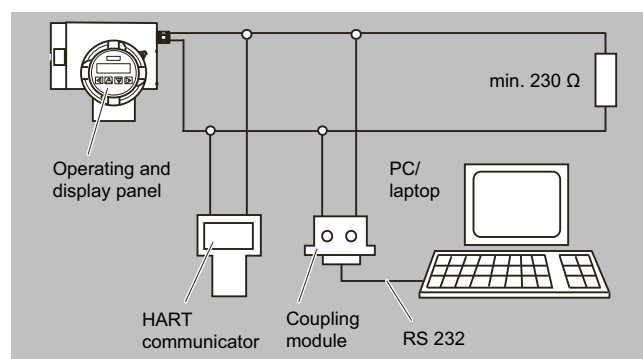
The magnetic flux density in the sensor is additionally monitored by reference coils.

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

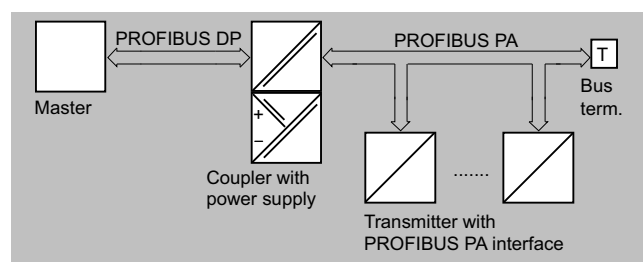
Displays and keypads

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 PA communication



HART communication



PROFIBUS PA communication

SITRANS FM (electromagnetic)

Flowmeters with alternating (AC) field technology

SITRANS FM TRANSMAG 2 with SITRANS FM MAG 911/E

Selection and ordering data

Transmitter TRANSMAG 2		Article No.									
Remote with standard wall mounting bracket, local display, die cast aluminum		7ME5034-									
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		●	A	A	1	1	-	●	A	A	0
Output/communication											
4 ... 20 mA with HART		0									
PROFIBUS PA		1									
4 ... 20 mA with HART and digital input		2									
Cable glands											
M20 × 1.5								1			
½" NPT								2			

Order code	
Additional information	
Please add "-Z" to Article No. and specify Order code(s) and plain text.	
Special mounting bracket for wall and pipeline installation	A02
Transmitter setting for parameter "TAG number" (specify in plain text, max. 8 characters)	Y15
Transmitter setting for parameter "TAG descriptor" (specify in plain text, max. 16 characters)	Y16
Tag name, stainless steel plate (specify in plain text)	Y17
Special version (specify in plain text)	Y99

Sensor MAG 911/E		Article No.									
		7ME5610-									
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		●	●	●	●	●	-	●	A	A	●
Nominal size											
DN 15 (½")		1	V								
DN 25 (1")		2	D								
DN 40 (1½")		2	R								
DN 50 (2")		2	Y								
DN 65 (2½")		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								
DN 350 (14")		5	K								
DN 400 (16")		5	R								
DN 450 (18")		5	Y								
DN 500 (20")		6	F								
DN 600 (24")		6	P								
DN 700 (28")		6	Y								
DN 800 (32")		7	H								
DN 900 (36")		7	M								
DN 1000 (40")		7	R								
Flange norm and pressure rating											
EN 1092-1, PN 10 (DN 200 ... 1000 (8" ... 40"))			B								
EN 1092-1, PN 16 (DN 65 ... 1000 (2½" ... 40"))			C								
EN 1092-1, PN 25 (DN 200 ... 1000 (8" ... 40"))			E								
EN 1092-1, PN 40 (DN 15 ... 1000 (½" ... 40"))			F								
ANSI B16.5, Class 150 (½" ... 24") ¹⁾			J								
ANSI B16.5, Class 300 (½" ... 24") ²⁾			K								
AWWA C-207 Class D (28" ... 40")			L								
JIS 10 K (½" ... 24")			R								

SITRANS FM (electromagnetic)

Flowmeters with alternating (AC) field technology

SITRANS FM TRANSMAG 2 with SITRANS FM MAG 911/E

Selection and ordering data (continued)

Grounding and protection ring for sensor MAG 911/E		Article No.	
Protection ring		7ME5942-	● ● ● ● ●
Grounding ring		7ME5943-	● ● ● ● ●
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			
Nominal size			
DN 15 (½")			1 V
DN 25 (1")			2 D
DN 40 (1½")			2 R
DN 50 (2")			2 Y
DN 65 (2½")			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
DN 350 (14")			5 K
DN 400 (16")			5 R
DN 450 (18")			5 Y
DN 500 (20")			6 F
DN 600 (24")			6 P
DN 700 (28")			6 Y
DN 800 (32")			7 H
DN 900 (36")			7 M
DN 1000 (40")			7 R
Flange design			
EN 1092-1, PN10			B
EN 1092-1, PN16			C
EN 1092-1, PN25			E
EN 1092-1, PN40			F
ANSI B16.5, class 150			J
ANSI B16.5, class 300			K
AWWA C-207, class D			L
JIS B2220, 10K			R
Material			
Stainless steel AISI 316/1.4571			1
Hastelloy C4/2.4610			2
Liner			
Soft rubber			1
PTFE			3
Hard rubber			4
Linatex			5
Novolak			6

Accessories

Description	Article No.	
Standard wall-mounting bracket, stainless steel AISI 316L/1.4404	7ME5933-0AC04	

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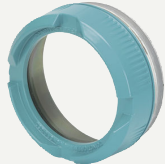
Flowmeters with alternating (AC) field technology

SITRANS FM TRANSMAG 2 with SITRANS FM MAG 911/E

Selection and ordering data (continued)

Description	Article No.	
Special wall-mounting bracket, BI 2.5 DIN 59382 X6Cr17	7ME5933-0AC05	
Potting kit for IP68/ NEMA 6P sealing of sensor junction box	FDK-085U0220	

Spare parts

Description	Article No.	
Display unit	7ME5933-0AC00	
Display lid in die-cast aluminum, with corrosion resistant coating (min. 60 mm)	7ME5933-0AC01	
Blind lid for sensor cables connection compartment (only remote version) in die-cast aluminum, with corrosion resistant coating (min. 60 mm) incl. O-ring seal	7ME5933-0AC02	
Blind lid (mains supply, input/outputs) in die-cast aluminum, with corrosion resistant coating (min. 60 mm)	7ME5933-0AC03	

SITRANS FM (electromagnetic)

Flowmeters with alternating (AC) field technology

SITRANS FM TRANSMAG 2 with SITRANS FM MAG 911/E

Selection and ordering data (continued)

Description	Article No.	
Safety clamp for electronic cover with glass plate (7ME5933-0AC01)	7ME5933-0AC06	
M20 cable gland set for power and output connection, gray PA plastic, 2 pcs. • cables Ø 6 ... 12 mm (0.24" ... 0.47") • -40 ... +100 °C (-40 ... +212 °F)	A5E02246350	
1/2" NPT cable gland set for power and output connection, gray PA plastic, 2 pcs. • cables Ø 6 ... 12 mm (0.24" ... 0.47") • -40 ... +100 °C (-40 ... +212 °F)	A5E02246396	
M16 × 1.5 cable gland set for sensor connection, brass chrome, 2 pcs. and 2 pcs. blind • cables Ø 5 ... 9 mm (0.20" ... 0.35") • -20 ... +105 °C (-4 ... +221 °F)	A5E02246369	

SITRANS FM (electromagnetic)

Flowmeters with alternating (AC) field technology

SITRANS FM TRANSMAG 2 with SITRANS FM MAG 911/E

Technical specifications

TRANSMAG 2	
Mode of operation and design	
Measuring principle	Electromagnetic with pulsed alternating field (PAC)
Magnetic field excitation	Automatic power supply synchronization
• 50 Hz AC power supply	Bipolar (16.7 Hz) Bipolar with prepulse (10 Hz) Unipolar (8.33 Hz)
• 60 Hz AC power supply	Bipolar (20 Hz) Bipolar with prepulse (12 Hz) Unipolar (10 Hz)
Accuracy under reference conditions	
Measuring tolerance of pulse output	
• With $v > 0.25$ m/s (0.82 ft/s)	$\leq \pm 0.5$ % of measured value ± 1.2 mm/s (0.05 inch/s)
• With $v < 0.25$ m/s (0.82 ft/s)	± 2.5 mm/s (0.1 inch/s)
Measuring tolerance of analog output	As pulse output plus ± 0.1 % conversion error ± 20 μ A
Repeatability	0.2 % of measured value
Reference conditions	
• Process temperature	25 °C $\pm$ 5 °C (77 °F $\pm$ 9 °F)
• Ambient temperature	25 °C $\pm$ 5 °C (77 °F $\pm$ 9 °F)
• Warm-up time	Min. 30 min
• Installation conditions	Inlet pipe section $\geq 10 \times$ DN Outlet pipe section $\geq 5 \times$ DN Installed centered in pipe
• Medium	Water without gaseous or solid components
Calibration	
Default calibration, calibration report shipped with sensor	2 $\times$ 20 %, 2 $\times$ 50 % and 2 $\times$ 100 %
Outputs	
Electrical isolation	Outputs electrically isolated from one another and from the power supply, max. 60 V permissible against PE/equipotential bonding
Current output	
	0/4 ... 20 mA (7ME5034-0.... or 7ME5034-2....)
• Signal	
- Upper limit	0/4 ... 20 mA, selectable
- Failure	20 ... 22.5 mA, optional 3.6; 20 or 24 mA
• Load	
- Output	max. 600 Ω , max. load voltage 15 V DC
- For HART communication	≥ 250 Ω
Communication	Via analog output with PC coupling module or HART communicator
• Protocol	HART, version 5.1
Digital output	
Signal	
• Output	Configurable as active or passive signals
- Active signal	24 V DC, ≤ 24 mA, $R_i = 170$ Ω
- Passive signal	Open collector, max. 30 V DC, 200 mA
Output configuration	
• Pulse	
- Pulse significance	≤ 5000 pulses/s
- Pulse width	≥ 0.1 ms
• Limit frequency	≤ 10000 Hz
• Limits	Limits for flow and quantity, flow direction, alarm
Digital output 2 (relay)	
(only 7ME5034-0....)	

TRANSMAG 2	
Relay	NC or NO function
• Rating	Max. 5 W, max. 50 V AC/DC, max. 200 mA
• Output configuration	Limits for flow and quantity, flow direction, alarm
Digital input (optional to digital output 2)	Non-intrinsically-safe
(only 7ME5034-2....)	
• Input function configurable as high-active or low-active	Set measured value to zero or reset totalizer
• Signal voltage	Max. 30 V DC, $R_i = 3$ k Ω : High level: +11 ... +30 V DC Low level: -30 ... +5 V DC
For PROFIBUS devices	
PROFIBUS PA (for PROFIBUS-devices 7ME5034-1....)	
• Communication	Layer 1 and 2 according to PROFIBUS PA Transmission according to IEC 1158-2 Layer 7 (protocol layer) according to PROFIBUS PA and DP V1 (EN 50170) Device Class B, device profile 2.0 Max. 4 simultaneous C2 connections
• Bus voltage	9 ... 32 V DC permissible
• Current consumption from bus	10 mA; limited to ≤ 15 mA in event of fault by electrical current limitation
Rated operating conditions	
Ambient temperature	
• Operation	-20 ... +60 °C (-4 ... +140 °F)
• Storage	-25 ... +80 °C (-13 ... +176 °F)
Degree of protection	IP67/NEMA 4X
Electromagnetic compatibility (EMC)	
• Emitted interference	To IEC/EN 61326 for use in industrial areas
• Noise immunity	To IEC/EN 61326 for use in industrial areas
Design	
Weight of transmitter	4.4 kg (9.7 lb)
Remote version	Transmitter must be connected to sensor using shielded cable
Maximum cable length	100 m (328 ft)
Housing	Die-cast aluminum, painted
Cables entries	
• Power supply and outputs	2 $\times$ M20 (HART)/M25 (PROFIBUS) or 2 $\times$ 1/2" NPT (HART)
• Sensor connections	2 $\times$ M16 (HART) or 2 $\times$ 1/2" NPT
Displays and keypad	
General display	LCD, backlid, two lines with 16 characters each
Multi-display for	Flow, totalizer, flow velocity
Keypad	4 keys for entering parameters
Power supply	
corresponding to rating plate	
• AC supply	100 ... 250 V AC ± 15 %, 47 ... 63 Hz
• Power consumption	Approx. 120 ... 630 VA, depending on sensor
Line fuse	100 ... 230 V AC: T1.6A
Magnet current fuse	F5A/250 V

Sensor cables between sensor and transmitter

Sufficient shielding must be provided, as well as fixed routing of the signal cables (electrode and coil cable).

Signal cables must be routed free of vibration, and protected against strong magnetic and stray fields. In case of doubt, the sensor cables must be routed in grounded steel conduit. The cable length between the sensor and transmitter must not exceed 100 m (328 ft).

SITRANS FM (electromagnetic)

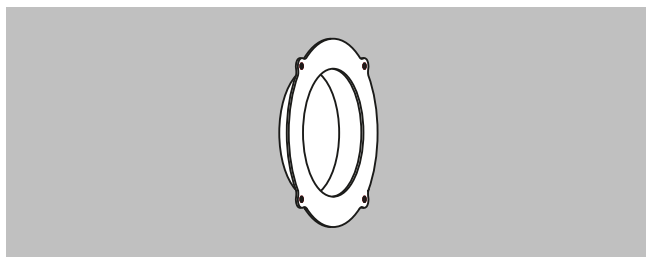
Flowmeters with alternating (AC) field technology

SITRANS FM TRANSMAG 2 with SITRANS FM MAG 911/E

Technical specifications (continued)

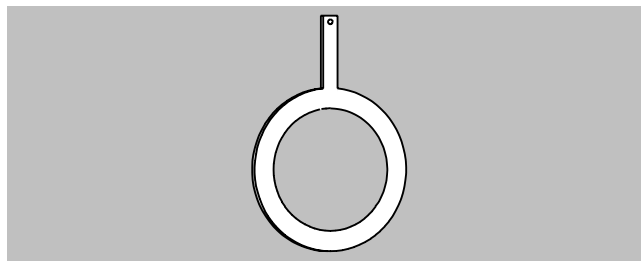
MAG 911/E	
Process connection	
Flanges	
- EN 1092-1, raised face (EN 1092-1, DIN 2501 and BS 4504 have the same mating dimensions) - ANSI B16.5 (BS 1560), raised face - AWWA C-207, raised face - JIS B 2220:2004	- DN 200 ... 1000 (8" ... 40"): PN 10 (145 psi) - DN 65 ... 1000 (2½" ... 40"): PN 16 (232 psi) - DN 200 ... 1000 (8" ... 40"): PN 25 (362 psi) - DN 15 ... 1000 (½" ... 40"): PN 40 (580 psi) ½" ... 40": Class 150 (20 bar (290 psi)) ½" ... 24": Class 300 (50 bar (725 psi)) 28" ... 40": Class D (10 bar) ½" ... 24": 10K
Media conductivity	Minimum conductivity ≥ 1 µS/cm
Rated operating conditions	
Enclosure rating	IP67/NEMA 6 Optional IP68/NEMA 6P
Temperature of medium	
- Soft rubber - Hard rubber - PTFE - Linatex - Novolac	0 ... +70 °C (32 ... 158 °F) 0 ... +90 °C (32 ... 194 °F) Option: 100 °C (212 °F) -20 ... +150 °C (-4 ... +302 °F) at 25 bar (363 psi) -20 ... +100 °C (-4 ... +212 °F) at 40 bar (580 psi) -40 ... +70 °C (-40 ... +158 °F) (for temperatures below -20 °C (-4 °F) AISI 316L/1.4404 flanges must be used) 130 °C (266 °F) at 40 bar (580 psi)
Design	
Weight	See dimensional drawings
Material	
- Flange and sensor housing - Measuring tube - Electrode - Terminal box - Standard - Option	- Carbon steel ASTM A 105, with corrosion protection EN ISO 12944 grade C3 or - AISI 316L/1.4404 flanges and carbon steel housing ASTM A105, with corrosion protection EN ISO 12944 grade C3 - Stainless steel AISI 304 or higher - AISI 316/1.4571 - Hastelloy C276/2.4819 - Platinum - Titanium - Tantalum - Fibre glass reinforced polyamide - Stainless steel AISI 316/1.4436

Protection ring



Technical specifications	
Function	To protect the edges of liners from abrasion (e.g. gravel, sand etc.). Used mainly with soft rubber liners and for PTFE liners at high temperatures from 100 to 150 °C (212 to 302 °F).
Contact with medium	Yes, please always check resistance to measured medium.
Material	Stainless steel AISI 316/1.4571, optionally Hastelloy C276/2.4819
Material thickness	The overall length of the sensor is increased by 6 mm for DN 15 ... 150 (0.24" for ½" ... 6") or 10 mm for DN 200 ... 600 (0.4" for 8" ... 24")
Standard	Optional for all liners. Must be ordered separately.
Article No.	7ME5942-...

Grounding ring



Technical specifications	
Function	Electrical reference and grounding of the medium. Required if the pipelines are not electrically conducting or are lined (plastic pipelines, concrete pipelines etc.). All grounding rings must be connected to the grounding screw present on the sensor.
Contact with medium	Yes, please always check resistance to measured medium.
Material	Stainless steel AISI 316/1.4571 or Hastelloy C4/2.4610
Material thickness	The overall length of the sensor is increased by 2 mm (0.08") per grounding ring.
Standard	Optional for all liners. Required between the medium and sensor for equipotential bonding between non-conducting pipelines or lined pipelines.
Article No.	7ME5943-...

Important:

The rings must be ordered together with the sensor. Gaskets are not included. In case of replacement please include the sensor MLFB code on the order.

SITRANS FM (electromagnetic) Flowmeters with alternating (AC) field technology

SITRANS FM TRANSMAG 2 with SITRANS FM MAG 911/E

Technical specifications (continued)

Classification according to pressure equipment directive (PED 2014/68/EU)

Nominal size DN	(inches)	Nominal pressure PN	(MWP psi)	Permissible media	Category
15 ... 25	(½" ... 1")	40	580	Gases fluid group 1 and liquids fluid group 1	Article 4.3
200 ... 300	(8" ... 12")	10	(145)	Gases fluid group 1 and liquids fluid group 1	II
65 ... 250	(2½" ... 10")	16	(232)	Gases fluid group 1 and liquids fluid group 1	II
40 ... 100	(1½" ... 4")	40	(580)	Gases fluid group 1 and liquids fluid group 1	II
350 ... 1000	(14" ... 40")	10	(145)	Gases fluid group 1 and liquids fluid group 1	III
300 ... 1000	(12" ... 40")	16	(232)	Gases fluid group 1 and liquids fluid group 1	III
200 ... 600	(8" ... 24")	25	(363)	Gases fluid group 1 and liquids fluid group 1	III
125 ... 600	(5" ... 24")	40	(580)	Gases fluid group 1 and liquids fluid group 1	III

Notes on pressure equipment directive

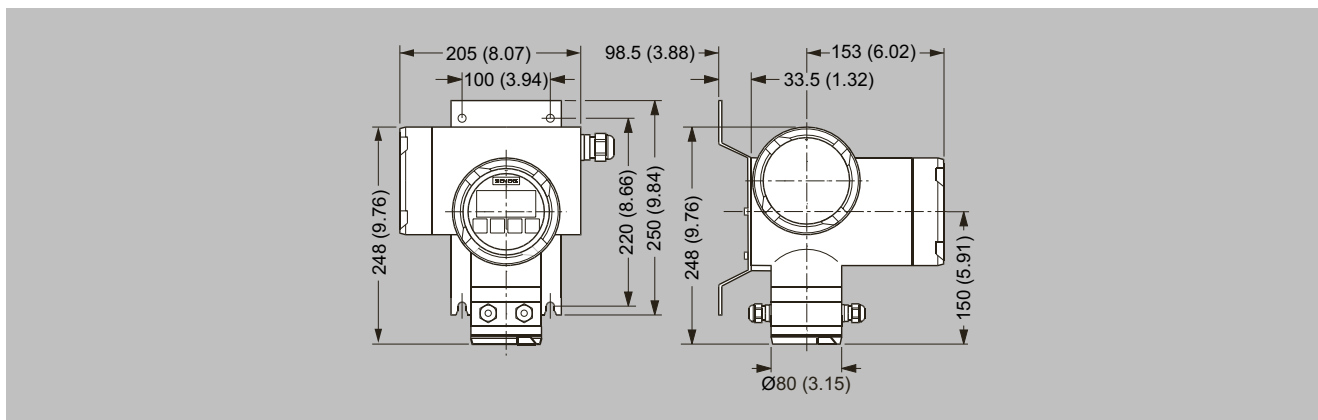
The devices are designed for liquids of danger group "Gases of fluid group 1". The categories differ according to the version, and are listed in the table below.

SITRANS FM (electromagnetic)

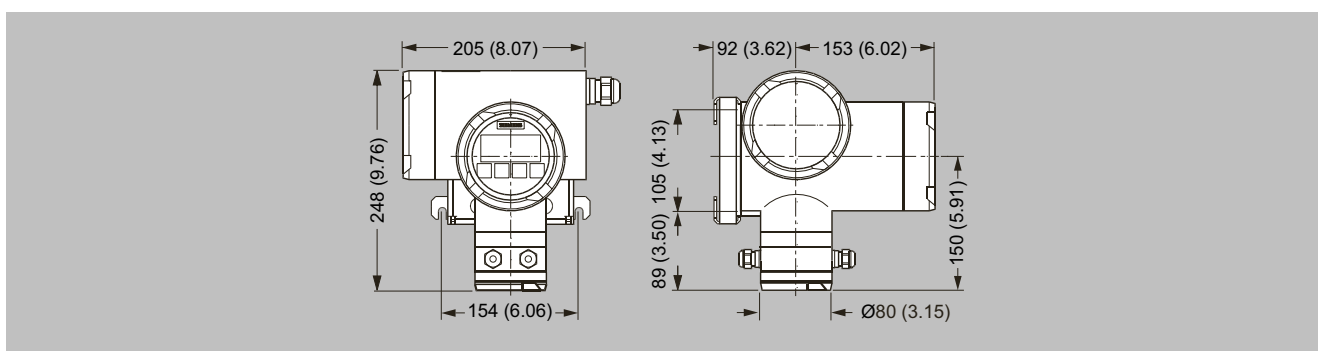
Flowmeters with alternating (AC) field technology

SITRANS FM TRANSMAG 2 with SITRANS FM MAG 911/E

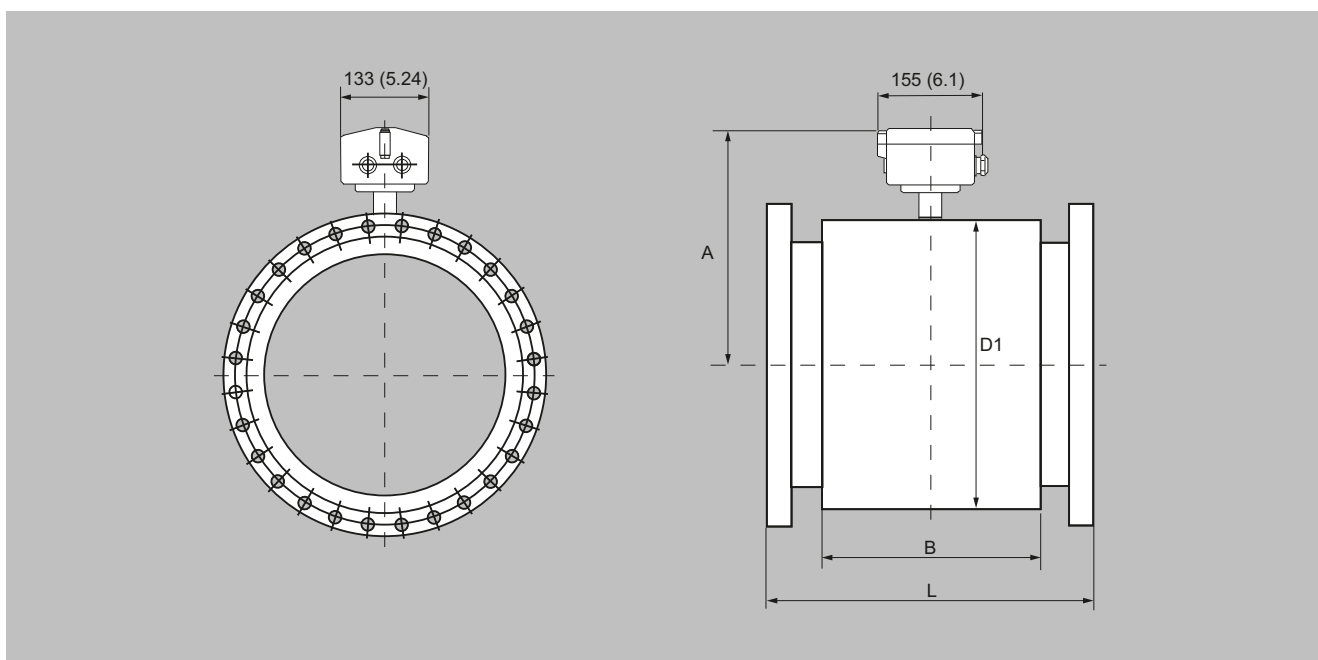
Dimensional drawings



SITRANS FM transmitter TRANSMAG 2 with wall-mounting bracket, dimensions in mm (inch)



SITRANS FM transmitter TRANSMAG 2 with special wall-mounting bracket, dimensions in mm (inch)



SITRANS FM flow sensor MAG 911/E, compact version, dimensions in mm (inches)

SITRANS FM (electromagnetic) Flowmeters with alternating (AC) field technology

SITRANS FM TRANSMAG 2 with SITRANS FM MAG 911/E

Dimensional drawings (continued)

Built-in length MAG 911/E

Nominal size	DN 15 ½"	DN 25 1"	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"
Built-in length L¹⁾											
Hard rubber version	270 (10.63)	270 (10.63)	280 (11.02)	280 (11.02)	330 (12.99)	340 (13.39)	340 (13.39)	370 (14.57)	370 (14.57)	410 (16.14)	470 (18.50)
Linatex/soft rubber version	270 (10.63)	270 (10.63)	280 (11.02)	280 (11.02)	330 (12.99)	340 (13.39)	340 (13.39)	370 (14.57)	370 (14.57)	410 (16.14)	470 (18.50)
PTFE-liner without protection rings	-	-	275 (10.83)	275 (10.83)	325 (12.79)	335 (13.19)	333 (13.11)	362 (14.25)	362 (14.25)	401 (15.79)	460 (18.11)
Novolak-version	-	-	275 (10.83)	275 (10.83)	325 (12.79)	335 (13.19)	333 (13.11)	362 (14.25)	362 (14.25)	401 (15.79)	460 (18.11)
Dimensions of sensor housing											
Housing width B	170 (6.69)	170 (6.69)	170 (6.69)	170 (6.69)	170 (6.69)	170 (6.69)	170 (6.69)	170 (6.69)	170 (6.69)	240 (9.45)	240 (9.45)
Height A	206 (8.11)	206 (8.11)	222 (8.74)	229 (9.02)	262 (10.32)	262 (10.32)	274 (10.79)	286 (11.26)	299 (11.78)	334 (13.15)	358 (14.10)
Housing diameter D ₁	135 (5.35)	135 (5.35)	167 (6.58)	182 (7.17)	247 (9.73)	247 (9.73)	272 (10.71)	296 (11.65)	322 (12.68)	392 (15.43)	440 (17.32)
Weight of PN 16 version in kg (MWP 232 psi version in lb) approx.	8.0 (17.64)	8.5 (18.74)	11.5 (25.35)	25.0 (55.12)	26 (57.32)	27 (59.53)	28 (61.73)	34 (74.95)	38 (83.78)	68 (149.9)	81 (178.6)

Nominal size	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"
Built-in length L¹⁾											
Hard rubber version	500 (19.68)	550 (21.65)	600 (23.62)	650 (25.59)	650 (25.59)	780 (30.71)	910 (35.83)	910 (35.83)	1040 (40.95)	1170 (46.06)	1300 (51.18)
Linatex/soft rubber version	500 (19.68)	550 (21.65)	600 (23.62)	660 (25.98)	650 (25.59)	780 (30.71)	-	-	-	-	-
PTFE-liner without protection rings	500 (19.68)	550 (21.65)	600 (23.62)	660 (25.98)	650 (25.59)	780 (30.71)	-	-	-	-	-
Novolak-version	489 (19.25)	538 (21.18)	592 (23.31)	638 (25.12)	638 (25.12)	772 (30.39)	903 (35.55)	903 (35.55)	1033 (40.63)	1163 (45.79)	1293 (50.91)
Dimensions of sensor housing											
Housing width B	240 (9.45)	225 (8.86)	250 (9.84)	270 (10.63)	300 (11.81)	360 (14.17)	420 (16.54)		500 (19.69)	560 (22.05)	620 (24.41)
Height A	383 (15.08)	375 (14.76)	400 (15.75)	433 (17.05)	453 (17.84)	505 (19.88)	558 (21.97)	590 (23.23)	608 (23.94)	658 (25.91)	713 (28.07)
Housing diameter D ₁	490 (19.29)	474 (18.66)	524 (20.63)	591 (23.26)	629 (24.76)	734 (28.90)	839 (33.03)	904 (35.59)	939 (36.97)	1039 (40.91)	1150 (45.28)
Weight of PN 16 version in kg (MWP 232 psi version in lb) approx.	95 (209.4)	118 (260.2)	161 (354.9)	185 (407.9)	233 (513.7)	401 (884.1)	420 (925.9)	450 (992.1)	500 (1102.3)	560 (1234.6)	620 (1366.9)

¹⁾ Tolerance for built-in length: L + 0.0 mm/-4.0 mm (-0.00/-0.157 inches). With protection rings for > DN 25 +6.0 mm, > DN 200 +10.0 mm (> 1" +0.236 inches, > 8" +0.394 inches)