

SITRANS F flowmeters

SITRANS F M

Transmitter TRANSMAG 2 with sensor 911/E

Overview



SITRANS F M 911/TRANSMAG 2

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

This makes it ideal for difficult applications like:

- High concentrated paper stock > 3%
- Heavy mining slurries
- Mining slurries with magnetic particles.

TRANSMAG 2 is used with the SITRANS F M 911/E sensor, available with diameters of DN 15 to DN 1000.

Benefits

- Fast signal processing with 16-bit technology
- Automatic recognition of sensor type and calibration data as result of SmartPLUG
- PROFIBUS PA (profile 2.0) / HART communication
- Simple menu operation with two-line display
- Self-monitoring functions
- Internal simulator (for all input and output functions)
- Monitoring of sensor using magnetizing current and reference voltage as well as wet electrode function
- Analog output and digital outputs for pulses, device status, limits, flow direction, frequency output
- Optional passive switch input for resetting the counter values or for switching off the measuring equipment (PZR)
- With pulsed alternating field for minimum conductivity of $\geq 1 \mu\text{S}/\text{cm}$, on request $0.1 \mu\text{S}/\text{cm}$ depending on medium
- Fully-welded steel enclosure
- Liners available in hard rubber, PTFE, Linatex, Neoprene or Novolak

Application

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

- Pulp & Paper Industry
- Mining Industry

The measuring procedure with pulsed alternating field patented by Siemens AG is particularly suitable for media with a high solids content, or magnetically conducting media.

Design

The complete flowmeter consists of a flow sensor and an associated transmitter from the SITRANS F M TRANSMAG 2 for pulsed alternating field. These are available as remote version. They operate according to Faradays law of induction where an electric voltage is induced in a conductor moving through a magnetic field.

Function

Function

The TRANSMAG 2 is a microprocessor-based transmitter with a build-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.

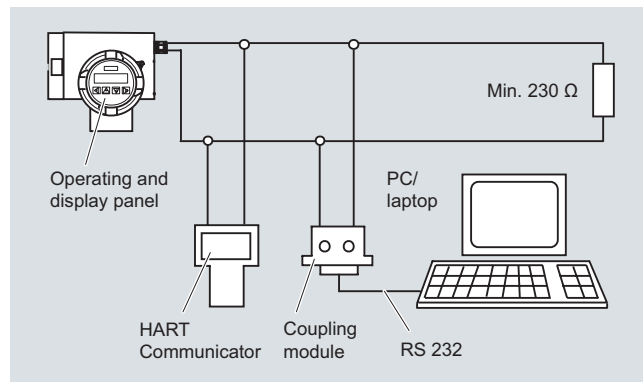
The magnetic flux density in the sensor is additionally monitored by reference coils.

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

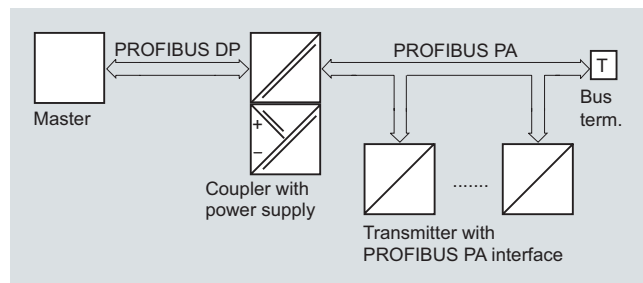
Displays and keypad

Operation of the TRANSMAG 2 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

Technical specifications**Transmitter 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 ± 0.0012 m/s (0.0039 ft/s)
• With $v < 0.25$ m/s (0.82 ft/s)	± 0.0025 m/s (0.0082 ft/s)
Measuring tolerance of analog output	As pulse output plus $\pm 0.1\%$ 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

Outputs

Electrical isolation	Outputs electrically isolated from one another and from the power supply, max. 60 V permissible against PE/equipotential bonding
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Current output

	0/4 ... 20 mA
	Only for 20 mA / HART devices (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....)

Relay

• Rating	NC or NO function 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)

(only 7ME5034-2....)

• Input function configurable as high-active or low-active	Set measured value or counter to zero
• Signal voltage	Max. 30 V DC, $R_i = 3$ k: 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

Installation conditions	See also sensors
Ambient temperature	
• Operation	-20 ... +60 °C (-4 ... +140 °F)
• Display module	0 ... 50 °C (32 ... 122 °F)
Storage	-25 ... +80 °C (-13 ... +176 °F)
Degree of protection	IP67/NEMA 4X
Electromagnetic compatibility (EMC)	
• Emitted interference	To EN 61326 for use in industrial areas
• Noise immunity	To EN 61326 for use in industrial areas NAMUR NE21 for use in residential areas

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Transmitter TRANSMAG 2 with sensor 911/E

Medium conditions	
<ul style="list-style-type: none"> Process temperature with compact design 	-20 ... +150 °C (-4 ... 302 °F) depending on sensor and ambient temperature
Minimum conductivity of medium	
<ul style="list-style-type: none"> With SITRANS F M 911/E sensors 	≥ 1 μS/cm, on request 0.1 μS/cm depending on medium
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 aluminium, painted
Displays and keypad	
General display	LCD, backlit, 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	
<ul style="list-style-type: none"> AC supply 	100 ... 250 V AC ± 15%, 47 ... 63 Hz
<ul style="list-style-type: none"> Power consumption 	Approx. 120 ... 630 VA, depending on sensor
Power failure	Bridging of min. 1 power supply cycle (> 20 ms)
Line fuse	100 ... 230 V AC: T1.6A
Magnet current fuse	F5A / 250 V

911/E sensor	
Process connection	
Nominal diameters	DN 15 ... 1000 (½" ... 40")
Metering tube connections	EN 1092-1, ANSI B16.5, others on request
Rated operating conditions	
Installation conditions	
See system information	
<ul style="list-style-type: none"> Minimum process temperature 	-20 °C (-4 °F)
<ul style="list-style-type: none"> With hard rubber liner 	Max. 90 °C (194 °F) Option: 100 °C (212 °F)
<ul style="list-style-type: none"> With PTFE liner 	<ul style="list-style-type: none"> 150 °C (300 °F) at 25 bar (363 psi) 100 °C (194 °F) at 40 bar (580 psi)
<ul style="list-style-type: none"> Linatex® (rubber) 	-40 ... +70 °C (-40 ... +158 °F) (for temperatures below -20 °C (-4 °F) AISI 316 flanges must be used)
<ul style="list-style-type: none"> With Novolak liner 	130 °C (266 °F) at 40 bar (580 psi)
Degree of protection	IP67/NEMA 4X Optional IP68/NEMA 6
Medium conditions	
Minimum conductivity	> 1 μS/cm, on request 0.1 μS/cm depending on medium
Maximum flow velocity	12 m/s (39.4 ft/s)
Full scale value of flow velocity	0.15 ... 12 m/s (0.49 ... 39.4 ft/s)

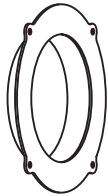
Notes on pressure equipment directive

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.

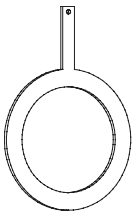
The minimum temperature is defined at -10 °C (14 °F) for the flange materials C22.8 (1.0460) and ST52-5 (1.0570).

The minimum temperature is defined at -20 °C (-4 °F) for the flange material 1.4571/316Ti.

Classification according to pressure equipment directive (PED 97/23/EC)					
Nominal diameter		Nominal pressure		Permissible media	Category
DN	(inches)	PN	(MWP psi)		
15 ... 25	(½" ... 1")	10 ... 40	(145 ... 580)	Gases fluid group 1 and liquids fluid group 1	Article 3.3
32 ... 100	(1¼" ... 4")	10	(145)	Gases fluid group 1 and liquids fluid group 1	I
32 ... 50	(1¼" ... 2")	16	(232)	Gases fluid group 1 and liquids fluid group 1	I
32 ... 40	(1¼" ... 1½")	25	(363)	Gases fluid group 1 and liquids fluid group 1	I
100 ... 350	(4" ... 12")	10	(145)	Gases fluid group 1 and liquids fluid group 1	II
65 ... 200	(2½" ... 8")	16	(232)	Gases fluid group 1 and liquids fluid group 1	II
50 ... 125	(2" ... 5")	25	(363)	Gases fluid group 1 and liquids fluid group 1	II
32 ... 80	(1¼" ... 3")	40	(580)	Gases fluid group 1 and liquids fluid group 1	II
350 ... 600	(14" ... 24")	10	(145)	Gases fluid group 1 and liquids fluid group 1	III
250 ... 600	(10" ... 24")	16	(232)	Gases fluid group 1 and liquids fluid group 1	III
150 ... 600	(6" ... 24")	25	(363)	Gases fluid group 1 and liquids fluid group 1	III
100 ... 600	(4" ... 24")	40	(580)	Gases fluid group 1 and liquids fluid group 1	III

Protection rings for liners

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 300 °F).
Contact with medium	Yes, please always check resistance to measured medium.
Material	Stainless steel mat. No. 1.4571/316Ti, optionally Hastelloy C4 mat. No. 2.4610
Material thickness	The overall length of the sensor is increased by <ul style="list-style-type: none"> • 6 mm for DN 15 to DN 150 (0.24" for ½" to 6") or • 10 mm for DN 200 to DN 600 (0.4" for 8" to 24")
Standard	No, optional for PTFE and soft rubber liners. They are required for PTFE liners of PN 16 (MWP 232 psi) or more instead of protection washers, and must be ordered separately.
Order No.	7ME591x-....

Earthing washers

Function	Electrical reference and earthing of the medium. Required if the pipelines are not electrically conducting or are lined (plastic pipelines, concrete pipelines etc.). All earthing rings must be connected to the earthing screw present on the sensor.
Contact with medium	Yes, please always check resistance to measured medium.
Material	Stainless steel mat. No. 1.4571/316Ti, or Hastelloy C4 mat. No. 2.4610
Material thickness	The overall length of the sensor is increased by 2 mm (0.08") per earthing ring.
Standard	No, only optional. Required between the medium and sensor for equipotential bonding between non-conducting pipelines or lined pipelines.
Order No.	7ME590x-....

Sensor cables between sensor and transmitter

The signal voltage proportional to the flow and present at the electrodes of the EMF is only a few μV to mV. Superimposed on this are electrochemical interferences resulting from the contact between the electrodes and liquid, and which can be up to several Volt. Also frequently superimposed are line frequency interferences, interferences resulting from vibrations on the pipelines or signal cables, as well as strong magnetic fields in the vicinity. Sufficient shielding must therefore be provided, as well as fixed routing of the signal cables (electrode and magnet current cable) in the case of remote versions. This also applies to devices with integral preamplifier (smartPLUG). The cable length between the sensor and transmitter must not exceed 100 m (328 ft).

Attention must also be paid to the cable routing. 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 earthed steel conduit.

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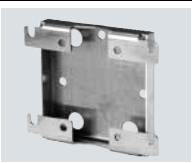




Transmitter TRANSMAG 2 with sensor 911/E

Selection and Ordering data	Order No.
SITRANS F M electromagnetic transmitter TRANSMAG 2 for alternating field, remote version, 110 ... 230 V AC	7ME5034 - AA 1 - AA 0
Output/communication	
4 ... 20 mA with HART protocol	0
PROFIBUS PA connection	1
4 ... 20 mA with HART protocol, digital input	2
Operator display and keypad	
Without	0
With	1
Cable glands	
M20/M16 x 1.5	1
½" NPT	2

This device is shipped with a Quick Start guide and the SITRANS F manual CD containing the complete manual library. Printed Operating Instructions are available for purchase via PMD

Selection and Ordering data	Order code
Additional information	
Please add "-Z" to Order No. and specify Order code(s) and plain text.	
Strengthened mounting bracket for wall and pipeline installation	A02
Measuring range, specify in plain text: Y01: 0 to ... m ³ /h	Y01
Pulse significance, specify in plain text: Y02: 0 to ... pulses/l	Y02
Setting of digital outputs, specify in plain text: Y03: Setting of digital outputs: ...	Y03
Measuring-point number (max. 8 characters), specify in plain text: Y15:	Y15
Measuring-point description (max. 16 characters), specify in plain text: Y16:	Y16
Stainless steel tag plate	Y17
Special design specify in plain text, state quotation	Y99

Accessories

Type/description	Order No.	
Operating/Display module	7ME5933-0AC00	
Electronics cover with glass plate (non Ex)	7ME5933-0AC01	
Cover for sensor cable and gasket	7ME5933-0AC02	
Cover for mains supply/communication	7ME5933-0AC03	
Standard wall mounting bracket	7ME5933-0AC04	
Special wall-/pipe mounting bracket kit	7ME5933-0AC05	
Safety clamp for electronic cover with glass plate (7ME5933-0AC01)	7ME5933-0AC06	
M20 cable gland set for power and output connection, grey 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, grey PA plastic, 2 pcs. • cables Ø 6 ... 12 mm (0.24" ... 0.47") • -40 ... 100 °C (-40 ... 212 °F)	A5E02246396	
M16 x 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	

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Selection and Ordering data	Order No.	Order code
SITRANS F M electromagnetic flowmeter		
Protection rings for flow sensor 911E (per pair)	7ME5912 -	
Liner		
Hard rubber/soft rubber		1
Novolak		7
PTFE		0
Nominal diameter		
<i>for PTFE, material 1.4571/316 Ti</i>		
DN 15 (1/2")		AA
DN 20 (3/4")		BA
DN 25 (1")		CA
DN 32 (1 1/4")		DA
DN 40 (1 1/2")		EA
DN 50 (2")		FA
DN 65 (2 1/2")		GA
DN 80 (3")		HA
DN 100 (4")		JA
DN 125 (5")		KA
DN 150 (6")		LA
DN 200 (8")		MA
DN 250 (10")		NA
DN 300 (12")		PA
Other nominal diameters: specify in plain text		ZA J 1 Y
<i>for Hard/Soft rubber, Novolak material 1.471/316 Ti</i>		
DN 15 (1/2")		AB
DN 20 (3/4")		BB
DN 25 (1")		CB
DN 32 (1 1/4")		DB
DN 40 (1 1/2")		EB
DN 50 (2")		FB
DN 65 (2 1/2")		GB
DN 80 (3")		HB
DN 100 (4")		JB
DN 125 (5")		KB
DN 150 (6")		LB
DN 200 (8")		MB
DN 250 (10")		NB
DN 300 (12")		PB
Other nominal diameters: specify in plain text		ZB J 1 Y
Flange design		
Flange to DIN		1
Flange to ANSI		2
Flange to JIS		3

Selection and Ordering data	Order code
Additional information	
Please add "-Z" to Order No. and specify Order code(s) and plain text.	
Tag plate of stainless steel	
• Y30 - tag number (max. 16 digits, specify in plain text)	Y17
• Special design, specify quotation No./date in plain text	Y99

Selection and Ordering data	Order No.	Order code
SITRANS F M electromagnetic flowmeter		
Earthing rings for flow sensor 911E (per unit)	7ME5902 -	
Liner		
Hard rubber/soft rubber		1
Novolak		7
PTFE		0
Nominal diameter		
<i>Material 1.4571/316 Ti</i>		
DN 15 (1/2")		AA
DN 20 (3/4")		BA
DN 25 (1")		CA
DN 32 (1 1/4")		DA
DN 40 (1 1/2")		EA
DN 50 (2")		FA
DN 65 (2 1/2")		GA
DN 80 (3")		HA
DN 100 (4")		JA
DN 125 (5")		KA
DN 150 (6")		LA
DN 200 (8")		MA
DN 250 (10")		NA
DN 300 (12")		PA
DN 350 (14")		QA
DN 400 (16")		RA
DN 500 (20")		SA
DN 600 (24")		TA
DN 700 (28")		UA
DN 800 (32")		VA
DN 900 (36")		WA
DN 1000 (40")		XA
Other nominal diam.: specify in plain text		ZA J 1 Y
<i>Material Hastelloy C4/2.4610</i>		
DN 15 (1/2")		AB
DN 20 (3/4")		BB
DN 25 (1")		CB
DN 32 (1 1/4")		DB
DN 40 (1 1/2")		EB
DN 50 (2")		FB
DN 65 (2 1/2")		GB
DN 80 (3")		HB
DN 100 (4")		JB
DN 125 (5")		KB
DN 150 (6")		LB
DN 200 (8")		MB
DN 250 (10")		NB
DN 300 (12")		PB
DN 350 (14")		QB
DN 400 (16")		RB
DN 500 (20")		SB
DN 600 (24")		TB
Other nominal diam.: specify in plain text		ZB J 1 Y
Flange design		
Flange to DIN		1
Flange to ANSI		2
Flange to JIS		3

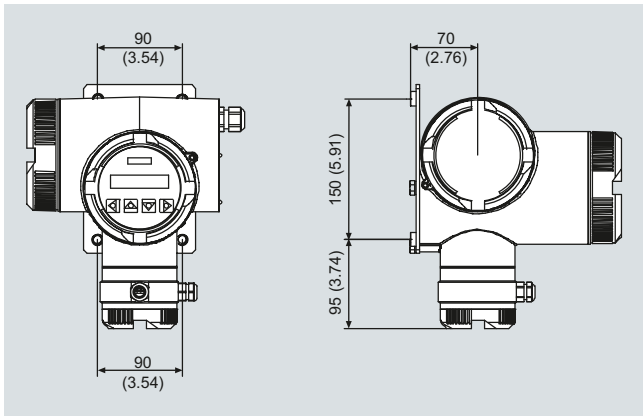
Selection and Ordering data	Order code
Additional information	
Please add "-Z" to Order No. and specify Order code(s) and plain text.	
Special design, specify quotation No./date in plain text	Y99

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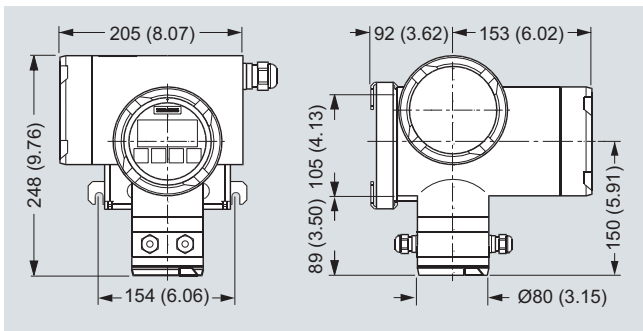
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Transmitter TRANSMAG 2 with sensor 911/E

Dimensional drawings

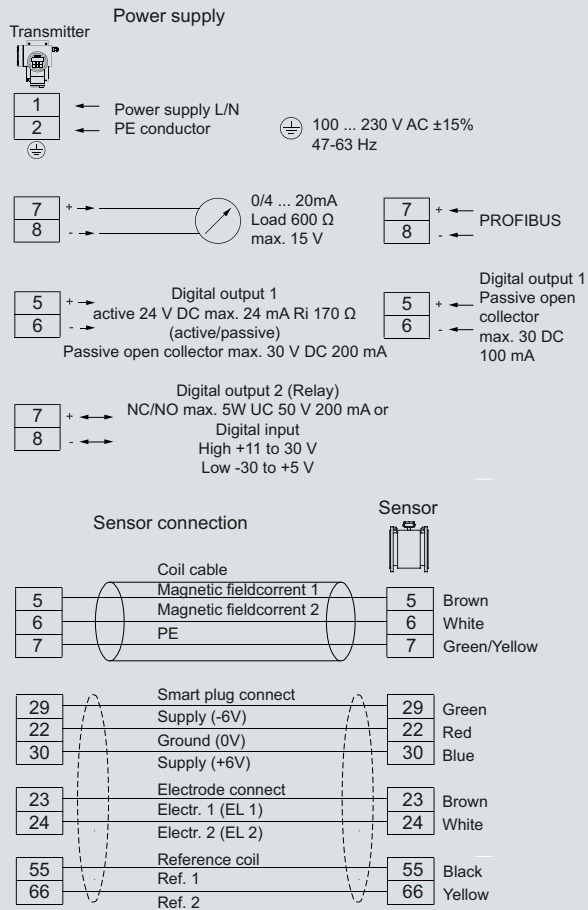


SITRANS F M transmitter TRANSMAG 2 with wall mounting bracket, dimensions in mm (inch)



SITRANS F M transmitter TRANSMAG 2 with wall and pipeline mounting bracket, dimensions in mm (inch)

Schematics

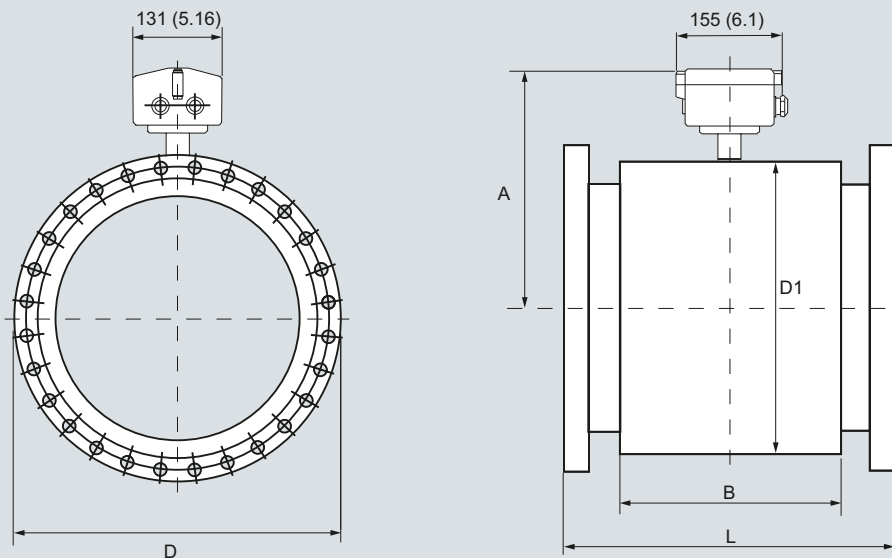


SITRANS F M transmitter TRANSMAG 2, connection diagram

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Transmitter TRANSMAG 2 with sensor 911/E



SITRANS F M flow sensor 911/E, remote version, dimensions in mm (inches)

Build-in length 911/E [in mm and inches]

Nominal diameter	DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250	DN 300	DN 350	DN 400	DN 500	DN 600																		
	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	4"	5"	6"	8"	10"	12"	14"	16"	20"	24"																		
	Build-in length B ¹⁾																																			
Hard rubber version				280			330			340			370			410			470			500			550			600			650			780		
Soft rubber / neopren version				280			330			340			370			410			470			500			550			600			650			780		
PTFE-liner without protection washers				280			330			340			370			410			470			500			550			600			650			780		
PTFE-liner with protection washers				280			330			340			370			410			470			500			550			600			650			780		
Novolak-version						275		325		335		333		362		401		460		489		538		588		638		772								
	Dimensions of sensor housing																																			
Housing width C	170											240		306			360		412		552															
Height H with compact version	281					285		291		298		314		326		345		371		408		441		553		578		633		688						
Height H2 with remote version	175					180		187.5		195		215		230		252.5		285		330		370		347		372		424		477						
Housing diameter D	135			169			184		249		274		298		324		394		442		492		469		536		631		746							
Weight of PN10 Version in kg (MWP 145 psi version in lb)	8.0		8.5		11.0		11.5		25.0		26		28		34		38		68		80		90		110		150		210		370					

¹⁾ Tolerance for build-in length: B + 0.0 mm (0.00 inches) / - 4.0 mm (-0.157 inches).
With protection rings or washers for > DN25 + 6.0 mm, > DN200 + 10.0 mm (> 1" + 0.236 inches. > 8" + 0.394 inches)