

Flow Measurement

SITRANS FM (electromagnetic)

Flow transmitters / SITRANS FM MAG 5000 and 6000

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 FM 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 SITRANS FM diagnostics)
- Batch control (MAG 6000 only)
- Custody transfer approval: MI-001 for cold water, 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 FM 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 6 enclosure for compact or wall mounting or 19" version as a 19" insert as a base to be used in:

- 19" rack systems
- Front panel mounting IP65/NEMA 2
- 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

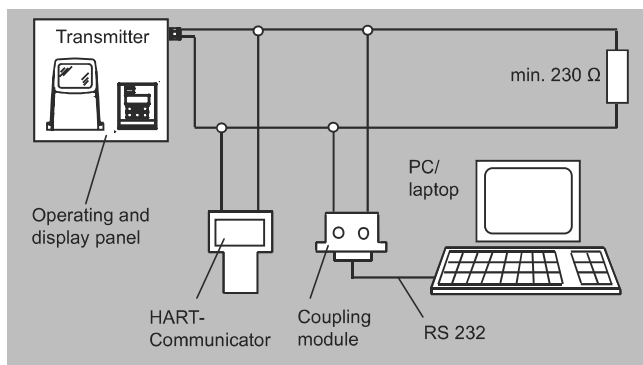
The MAG 5000/6000 are transmitters with a built-in alphanumeric display in several languages. The transmitters evaluate the signals from the associated electromagnetic sensors and also fulfil the task of a power supply unit which provides the magnet coils with a constant current.

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

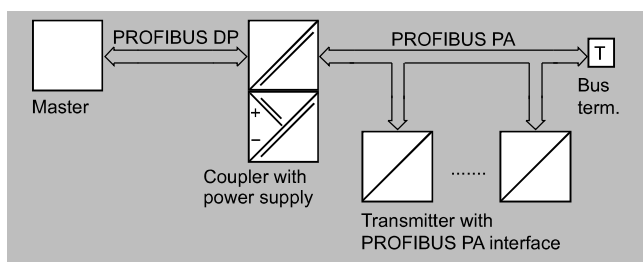
Displays and controls

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

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Selection and ordering data

Transmitter MAG 5000

Description	Article No.	
Transmitter MAG 5000 blind for compact and wall mounting; IP67/NEMA 6, fibre glass reinforced polyamide • 11 ... 30 V DC/11 ... 24 V AC • 115 ... 230 V AC, 50/60 Hz	7ME6910-1AA30-0AA0 7ME6910-1AA10-0AA0	
Transmitter MAG 5000 display for compact and wall mounting; IP67/NEMA 6, fibre glass reinforced polyamide • 11 ... 30 V DC/11 ... 24 V AC • 115 ... 230 V AC, 50/60 Hz • 115 ... 230 V AC, 50/60 Hz, with HART communication	7ME6910-1AA30-1AA0 7ME6910-1AA10-1AA0 7ME6910-1AA10-1BA0	
Transmitter MAG 5000 CT for compact and wall mounting, approved for custody transfer, without initial verification (no type approval marking); IP67/NEMA 6, glass fibre reinforced polyamide • 11 ... 30 V DC/11 ... 24 V AC • 115 ... 230 V AC, 50/60 Hz	7ME6910-1AA30-1AD0 7ME6910-1AA10-1AD0	
Transmitter MAG 5000 for 19" rack and wall mounting • 11 ... 30 V DC/11 ... 24 V AC • 115 ... 230 V AC, 50/60 Hz	7ME6910-2CA30-1AA0 7ME6910-2CA10-1AA0	

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Selection and ordering data (continued)

Transmitter MAG 6000

Description	Article No.	
Transmitter MAG 6000 blind for compact and wall mounting; IP67/NEMA 6, glass fibre reinforced polyamide • 11 ... 30 V DC/11 ... 24 V AC • 115 ... 230 V AC, 50/60 Hz	7ME6920-1AA30-0AA0 7ME6920-1AA10-0AA0	
Transmitter MAG 6000 Display for compact and wall mounting; IP67/NEMA 6, glass fibre reinforced polyamide • 11 ... 30 V DC/11 ... 24 V AC • 115 ... 230 V AC, 50/60 Hz	7ME6920-1AA30-1AA0 7ME6920-1AA10-1AA0	
Transmitter MAG 6000 for compact and wall mounting; IP65/NEMA 4, stainless steel AISI 316/1.4436 (only for sensor with stainless steel terminal box) (for remote version order stainless steel terminal box separately) • 11 ... 30 V DC/11 ... 24 V AC • 115 ... 230 V AC, 50/60 Hz	7ME6920-1QA30-1AA0 7ME6920-1QA10-1AA0	
Transmitter MAG 6000 CT for compact and wall mounting, approved for custody transfer without initial verification (no type approval marking); IP67/NEMA 6, glass fibre reinforced polyamide • 11 ... 30 V DC/11 ... 24 V AC • 115 ... 230 V AC, 50/60 Hz	7ME6920-1AA30-1AD0 7ME6920-1AA10-1AD0	
Transmitter MAG 6000 SV for compact and wall mounting; special excitation frequency 44 Hz for Batch application DN ≤ 25/1" IP67/NEMA 6, glass fibre reinforced polyamide • 11 ... 30 V DC/11 ... 24 V AC • 115 ... 230 V AC, 50/60 Hz	7ME6920-1AB30-1AA0 7ME6920-1AB10-1AA0	
Transmitter MAG 6000 for 19" rack and wall mounting • 11 ... 30 V DC/11 ... 24 V AC	7ME6920-2CA30-1AA0	

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Selection and ordering data (continued)

Description	Article No.	
• 115 ... 230 V AC, 50/60 Hz	7ME6920-2CA10-1AA0	
Transmitter MAG 6000 SV for 19" rack and wall mounting; special excitation frequency 44 Hz for Batch application DN ≤ 25/1" • 11 ... 30 V DC/11 ... 24 V AC • 115 ... 230 V AC, 50/60 Hz	7ME6920-2CB30-1AA0 7ME6920-2CB10-1AA0	
MAG 6000 19" insert, complete mounted with IP66/NEMA 4X wall mounting enclosure in ABS plastic; 115 ... 230 V AC, 50/60 Hz; cable gland PG13.5	7ME6920-2EA10-1AA0	
MAG 6000 19" insert with safety barrier for Ex-approved sensors, complete mounted with IP66/NEMA 4X wall mounting enclosure in ABS plastic, 115 ... 230 V AC, 50/60 Hz; cable gland PG13.5 • For ATEX 2G D sensors	7ME6920-2MA11-1AA0	
MAG 6000 SV 19" insert, complete mounted with IP66/NEMA 4X wall mounting enclosure in ABS plastic, special excitation frequency 44 Hz for Batch application DN ≤ 25/1"; cable gland PG13.5 • 11 ... 30 V DC/11 ... 24 V AC • 115 ... 230 V AC, 50/60 Hz	7ME6920-2EB30-1AA0 7ME6920-2EB10-1AA0	

Communication modules for MAG 6000

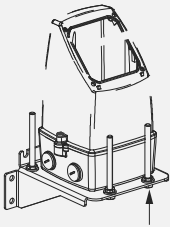
Description	Article No.	
HART (not for MAG 6000 I)	FDK:085U0226	
Modbus RTU/RS485	FDK:085U0234	
PROFIBUS PA Profile 3	FDK:085U0236	
PROFIBUS DP Profile 3	FDK:085U0237	
DeviceNet	FDK:085U0229	
FOUNDATION Fieldbus H1	A5E02054250	

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Selection and ordering data (continued)

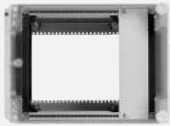
Accessories for MAG 5000 and MAG 6000

Description	Article No.	
Accessory kit for remote use of sensor with two 5-pin terminal blocks	A5E34827189	
Wall mounting unit for MAG 5000/6000 with IP67/NEMA 6, terminal box in polyamide ²⁾ • 4 × M20 cable glands • 4 × 1/2" NPT cable glands	FDK:085U1018 FDK:085U1053	
Special wall mounting unit for MAG 5000/6000 IP67/NEMA 6, mounting bracket in stainless steel AISI 316 (1.4401), terminal box in polyamide • 4 × M20 cable glands • 4 × 1/2" NPT cable glands	A5E36699702 A5E36699938	
Sun lid for MAG 5000/6000 transmitter (frame and lid)	A5E02328485	
Standard coil or electrode cable, 3 × 1.5 mm ² /18 gage, single shielded with PVC jacket; Temperature range -30 ... +70 °C (-22 ... +158 °F) • 5 m (16.5 ft) • 10 m (33 ft) • 20 m (65 ft) • 30 m (98 ft) • 40 m (131 ft) • 50 m (164 ft) • 60 m (197 ft) • 100 m (328 ft) • 150 m (492 ft) • 200 m (656 ft) • 500 m (1640 ft)	A5E02296523 FDK:083F0121 FDK:083F0210 A5E02297309 FDK:083F0211 A5E02297317 FDK:083F0212 FDK:083F0213 FDK:083F3052 FDK:083F3053 FDK:083F3054	
Special electrode cable ¹⁾ (empty pipe detection or low conductivity), 3 × 0.25 mm ² double shielded with PVC jacket, Temperature range -30 ... +70 °C (-22 ... +158 °F) • 10 m (33 ft)	FDK:083F3020	

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Description	Article No.	
• 20 m (65 ft) • 40 m (131 ft) • 60 m (197 ft) • 100 m (328 ft) • 150 m (492 ft) • 200 m (656 ft) • 500 m (1640 ft)	FDK:083F3095 FDK:083F3094 FDK:083F3093 FDK:083F3092 FDK:083F3056 FDK:083F3057 FDK:083F3058	
Low-noise electrode coaxial cable for low conductivity and high vibration levels, 3 × 0.13 mm², Temperature range -25 ... +85 °C (-13 ... +185 °F) • 2 m (6.6 ft) • 5 m (16.5 ft) • 10 m (33 ft)	A5E02272692 A5E02272723 A5E02272730	
Cable kit including standard coil cable (3 × 1.5 mm²/18 gage, single shielded with PVC jacket) and special electrode cable¹⁾ (3 × 0.25 mm², double shielded with PVC jacket). Temperature range -30 ... +70 °C (-22 ... +158 °F) • 5 m (16.5 ft) • 10 m (33 ft) • 15 m (49 ft) • 20 m (65 ft) • 25 m (82 ft) • 30 m (98 ft) • 40 m (131 ft) • 50 m (164 ft) • 60 m (197 ft) • 100 m (328 ft) • 150 m (492 ft) • 200 m (656 ft) • 500 m (1640 ft)	A5E02296329 A5E01181647 A5E02296464 A5E01181656 A5E02296490 A5E02296494 A5E01181686 A5E02296498 A5E01181689 A5E01181691 A5E01181699 A5E01181703 A5E01181705	
Potting kit for IP68/NEMA 6P sealing of sensor junction box	FDK:085U0220	
19" safety barrier (21 TE) ¹⁾ [EEEx e ia] IIC for MAG 1100 Ex sensors 12 ... 24 V, 115 ... 230 V and MAG 3100 Ex sensors, incl. back plate (A5E02559810)	FDK:083F5034	
Front panel mounting enclosure IP65/NEMA 2 in ABS plastic for 19" insert (21 TE)	FDK:083F5030	

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Selection and ordering data (continued)

Description	Article No.	
Front panel mounting enclosure IP65/NEMA 2 in ABS plastic for 19" insert (42 TE)	FDK:083F5031	
Panel mounting enclosure IP20/NEMA 1 in aluminum for 19" insert (21 TE)	FDK:083F5032	
Panel mounting enclosure IP20/NEMA 1 in aluminum for 19" insert (42 TE)	FDK:083F5033	
Wall mounting enclosure IP66/NEMA 4X in ABS plastic for 19" insert (cable glands and connection board not included). • 21 TE • 42 TE	FDK:083F5037	
	FDK:083F5038	
Front cover (7TE) for panel mounting enclosure	FDK:083F4525	
Sun shield for MAG 5000/6000 transmitter in remote design	A5E01209496	
Sun Shield for MAG 5000/6000 transmitter in compact design on MAG 3100 (DN 15 ... 2000 (1/2" ... 78") or MAG 5100 W (DN 150 ... 1200 (6" ... 48"))	A5E01209500	

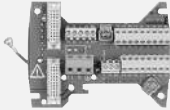
1) Safety cables cannot be used with 19" safety barrier
2) For stainless steel wall mounting kit, order:- M20: FDK:085U1018 and A5E00836867- 1/2 NPT: FDK:085U1053 and A5E00836868

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Selection and ordering data (continued)

Spare parts

Description	Article No.	
Connection board (for polyamide terminal box) • 12 ... 24 V • 115 ... 230 V	A5E02559817 A5E02559816	
Connection board (for stainless steel terminal box) • 12 ... 24 V • 115 ... 230 V	A5E02604280 A5E02604272	
Connection board MAG 5000/6000 19" insert for panel mounting enclosure, 12 ... 24 V/115 ... 230 V	A5E02559809	
Connection board MAG 5000/6000 19" insert • with safety barrier for panel mounting enclosure, 12 ... 24 V/115 ... 230 V • with safety barrier for panel mounting enclosure, 12 ... 24 V/115 ... 230 V (only for sensors produced before October 2007) • with cleaning unit for panel mounting enclosure, 12 ... 24 V/115 ... 230 V	A5E02559810 A5E02559811 FDK:083F4123	
SENSORPROM memory unit (sensor code and serial numbers must be specified on order) • 2 kB (for MAG 5000/6000/6000 I) - 1 pc. - 10 pcs.	FDK:085U1005 FDK:083F5052	
Display unit for MAG 5000/6000 • Black neutral front	FDK:085U1038	
• SIEMENS front	FDK:085U1039	
HW key	On request	

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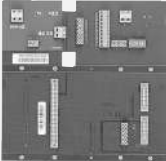
Selection and ordering data (continued)

Description	Article No.	
Cable glands (polyamide), 4 pcs. • M20 • ½" NPT • PG 13.5, 2 pcs.	A5E00822490	 ½" NPT  M20
	A5E00822501	
	FDK:083G0228	
Sealing screws for sensor/transmitter, 2 pcs.	FDK:085U0221	
Terminal box, in polyamide, inclusive lid, terminal blocks, gasket and screws • M20 • ½" NPT	FDK:085U1050	
	FDK:085U1052	
Terminal box lid, in polyamide	FDK:085U1003	
Terminal box, in stainless steel, inclusive lid, terminal blocks, gasket and screws, for MAG 6000 in stainless steel and for all Ex sensors • M20 • ½" NPT	A5E00836867	
	A5E00836868	
Terminal box (3A) for MAG 1100 F in polyamide, inclusive lid, terminal blocks, gasket and screws • M20 • ½" NPT	A5E00822478 A5E00822479	

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Selection and ordering data (continued)

Description	Article No.	
Gasket for terminal box lid in polyamide or for MAG 5000/6000 IP67/ NEMA 6 enclosure in polyamide (5 pcs.)	A5E37086797	
Spare part kit for remote use of sensor with twenty 5-pin terminal blocks	A5E34346873	
Display frame in polyamide for MAG 5000/6000 IP67/NEMA 6 (5 pcs.)	A5E43491675	
Connection board MAG 5000/6000 19" insert for wall mounting enclosure, 12 ... 24 V/115 ... 230 V	A5E02559813	
Connection board MAG 5000/6000 19" insert • with safety barrier for wall mounting enclosure, 12 ... 24 V/115 ... 230 V • with safety barrier for wall mounting enclosure, 12 ... 24 V/115 ... 230 V (only for sensors produced before October 2007) • with cleaning unit for wall mounting enclosure, 12 ... 24 V/115 ... 230 V	A5E02559814 A5E02559812 A5E02559815	

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Technical specifications

MAG 5000 and MAG 6000	
Mode of operation	
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, $R_i = 4 \cdot 4 \text{ k}\Omega$
• 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	0 ... 20 mA or 4 ... 20 mA
• Load	$< 800 \Omega$
• Time constant	0.1 ... 30 s, adjustable
Digital output	
• Frequency	0 ... 10 kHz, 50 % duty cycle (uni/bidirectional)
• Pulse (active)	24 V DC, 30 mA, $1 \text{ k}\Omega \leq R_i \leq 10 \text{ k}\Omega$, short-circuit-protected (power supplied from flowmeter)
• Pulse (passive)	3 ... 30 V DC, max. 110 mA, $200 \Omega \leq R_i \leq 10 \text{ k}\Omega$ 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 galvanically isolated
Max. measuring error (incl. sensor and zero point) (for detailed accuracy specifications see "System information")	
• MAG 5000	$\pm 0.4 \% \pm 1 \text{ mm/s}$
• MAG 6000	$\pm 0.2 \% \pm 1 \text{ mm/s}$
Rated operation conditions	
Ambient temperature	
• Operation	- Display version: $-20 \dots +60 \text{ }^\circ\text{C}$ ($-4 \dots +140 \text{ }^\circ\text{F}$) - Blind version: $-20 \dots +60 \text{ }^\circ\text{C}$ ($-4 \dots +140 \text{ }^\circ\text{F}$) - Custody transfer (CT) version: $-20 \dots +50 \text{ }^\circ\text{C}$ ($-4 \dots +122 \text{ }^\circ\text{F}$)
• Storage	$-40 \dots +70 \text{ }^\circ\text{C}$ ($-40 \dots +158 \text{ }^\circ\text{F}$)
Mechanical load (vibration)	
Compact version	18 ... 1000 Hz, 3.17 g RMS, sinusoidal in all directions to IEC 68-2-36
19" insert	1 ... 800 Hz, 1 G, sinusoidal in all directions to IEC 68-2-36
Degree of protection	
Compact version	IP67/NEMA 6 to IEC 529 and DIN 40050 (1 mH ₂ O 30 min.)
19" insert	IP20/NEMA 1 to IEC 529 and DIN 40050
EMC performance	IEC/EN 61326-1 (all environments) IEC/EN 61326-2-5
Display and keypad	
Totalizer	Two eight-digit counters for forward, net or reverse flow
Display	
	Background illumination with alphanumeric text, 3 x 20 characters to indicate flow rate, totalized values, settings and faults; Reverse flow indicated by negative sign
Time constant	Time constant as current output time constant

MAG 5000 and MAG 6000	
Design	
Enclosure material	
• Compact version	IP67 / NEMA 6; Fiber glass reinforced polyamide IP65 / NEMA 2; Stainless steel AISI 316/1.4436
• 19"-insert	DIN 41494 steel sheet housing and aluminum front plate with display; width: 21 TE, height: 3 HE
- Panel mounting	IP20/NEMA 1; Aluminium
- Front panel mounting	IP65/NEMA 2; ABS plastic
- Wall mounting	IP66/NEMA 4X; ABS plastic
Dimensions	
• Compact version	See dimensional drawings
• 19" insert	See dimensional drawings
Weight	
• Compact version	0.75 kg (2 lbs)
• 19" insert	See dimensional drawings
Power supply	115 ... 230 V AC +10 % -15 %, 50 ... 60 Hz 11 ... 30 V DC or 11 ... 24 V AC
Power consumption	230 V AC: 17 VA 24 V AC: 9 VA, $I_N = 380 \text{ mA}$, $I_{ST} = 8 \text{ A}$ (30 ms) 12 V DC: 11 W, $I_N = 920 \text{ mA}$, $I_{ST} = 4 \text{ A}$ (250 ms) 24 V DC: 8.4 VA, $I_N = 350 \text{ mA}$, $I_{ST} = 4 \text{ A}$ (10 ms) $I_{ST} = 4 \text{ A}$ (250 ms); for solar panel please securestable current supply
Certificates and approvals	
General purpose	- CE (LVD, EMC, PED, RoHS) - UL (c-UL-us)
Hazardous area	- FM, CSA - NI Class I Div. 2 Groups A, B, C, D
Custody transfer	- Cold water: MI-001 - Chilled water - PTB K 7.2 (Germany) - OE 12/C 040 (Austria)
Marine (only for remote version with MAG 5100 W, DN 50 ... 300)	- ABS - Bureau Veritas - DNV-GL - Lloyd's Register
Others	- CPA (China) - EAC (Russia, Belarus, Kazakhstan) - KCs (South Korea)
Communication	
Standard	
• MAG 5000	HART 5.2 optional
• MAG 6000	Optional as add-on modules - HART 5.2 - Modbus RTU/RS 485 - FOUNDATION Fieldbus H1 - DeviceNet - PROFIBUS PA - PROFIBUS DP

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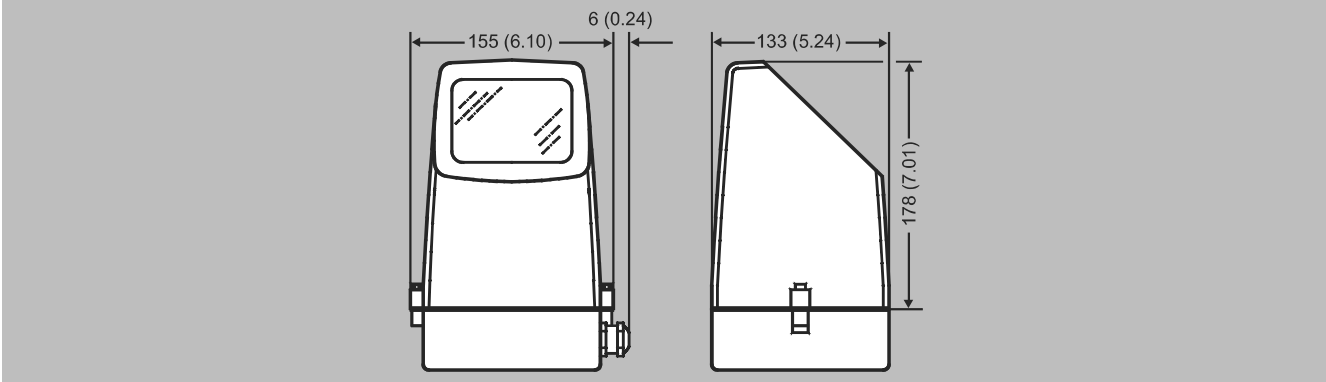
Technical specifications (continued)

Safety barrier (e/ia)

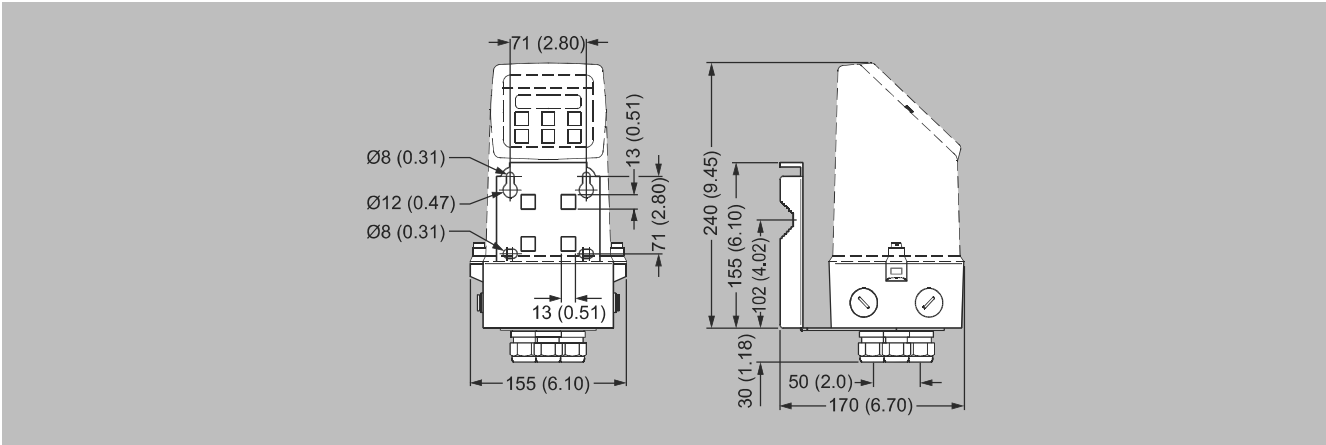
	Application	For use with MAG 5000/MAG 6000 19" and MAG 1100 Ex/MAG 3100 Ex		
	Ex approval	MAG 1100 Ex [EEx e ia] IIB ATEX, EAC Ex MAG 3100 Ex [EEx e ia] IIC ATEX, EAC Ex		
	Cable parameter Electrode	Group	Capacity in µF	Inductance in mH
		IIC	≤ 4.1	≤ 80
		IIB	≤ 45	≤ 87
		IIA	≤ 45	≤ 87
	Ambient temperature			
	• During operation	-20 ... +50 °C (-4 ... +122 °F)		
	• During storage	-20 ... +70 °C (-4 ... +158 °F)		
	Enclosure			
• Material		Standard 19" insert in aluminum/steel (DIN 41494)		
• Width		21 TE (4.75")		
• Height		3 HE (5.25")		
• Rating		IP20/NEMA 1 to EN 60529		
• Mechanical load		1 g, 1 ... 800 Hz sinusoidal in all directions to EN 60068-2-36		

Dimensional drawings

Transmitter IP67/NEMA 6 compact polyamide



Transmitter compact mounted, dimensions in mm (inch)



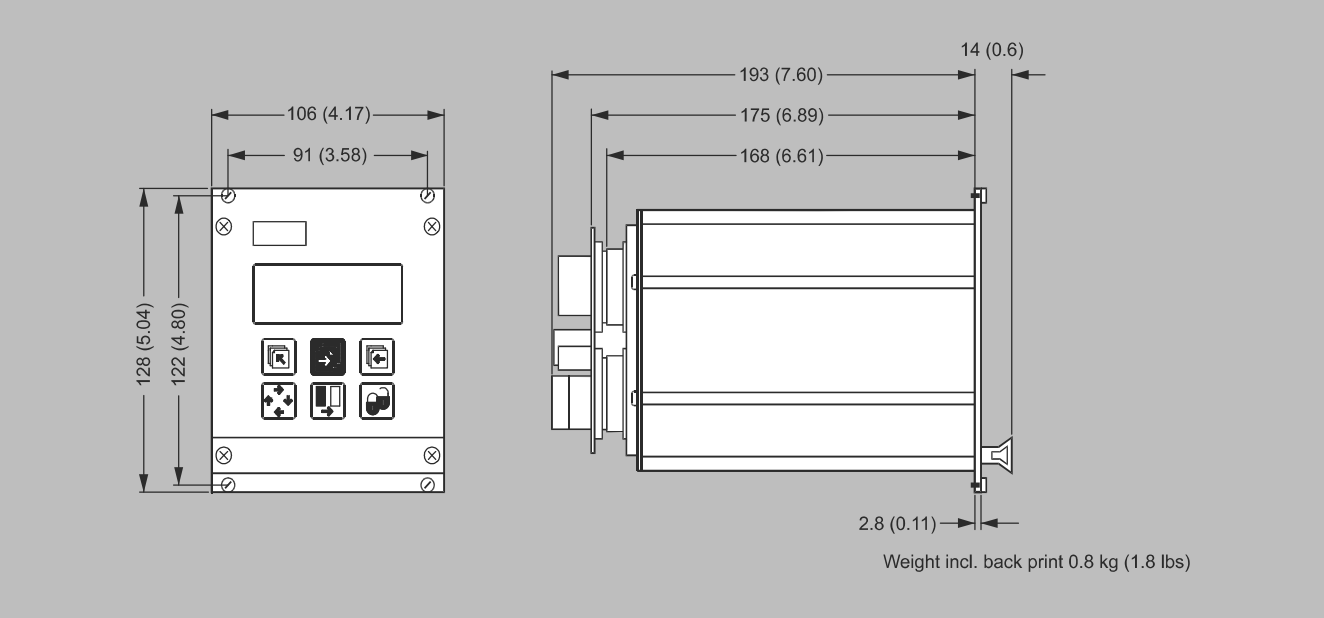
Transmitter wall mounted, dimensions in mm (inch)

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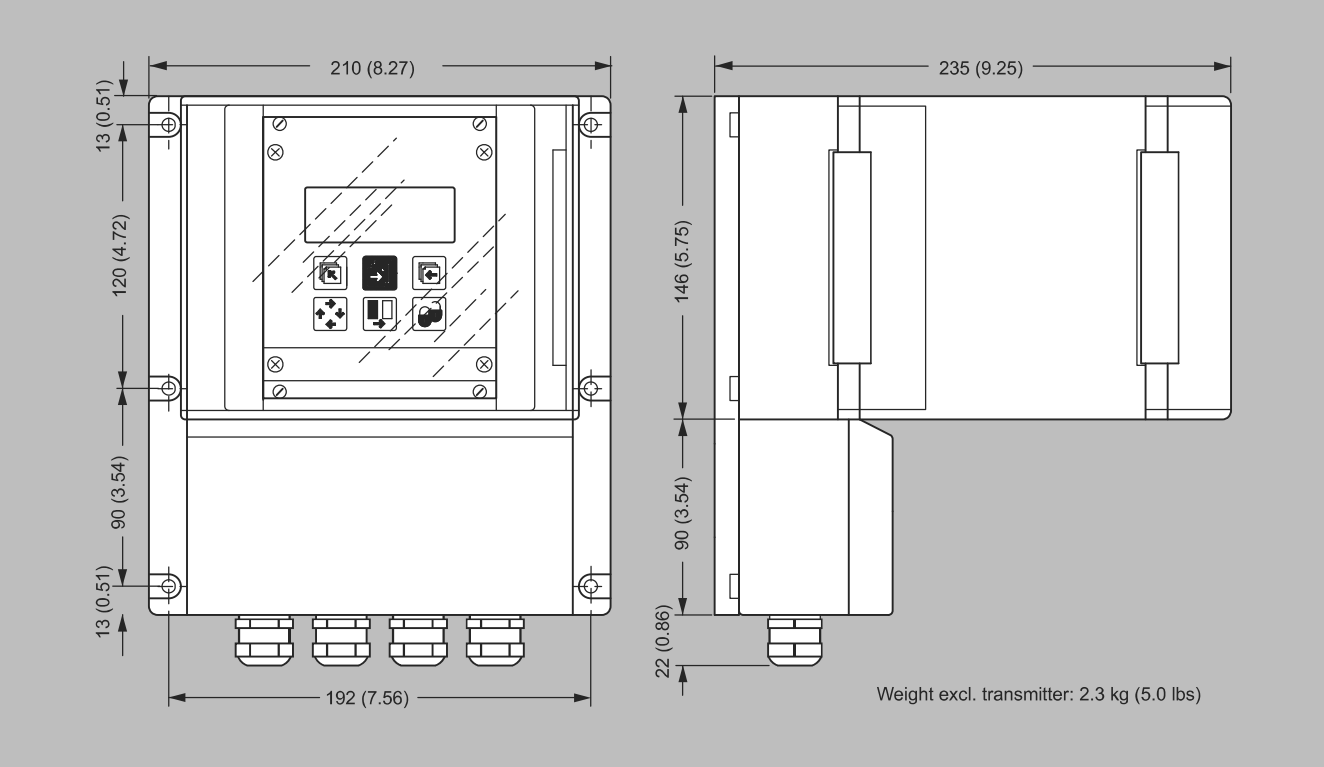
Dimensional drawings (continued)

Transmitter, 19" IP20/NEMA 2 standard unit



Dimensions in mm (inch)

Transmitter, wall mounting IP66/NEMA 4X, 21 TE



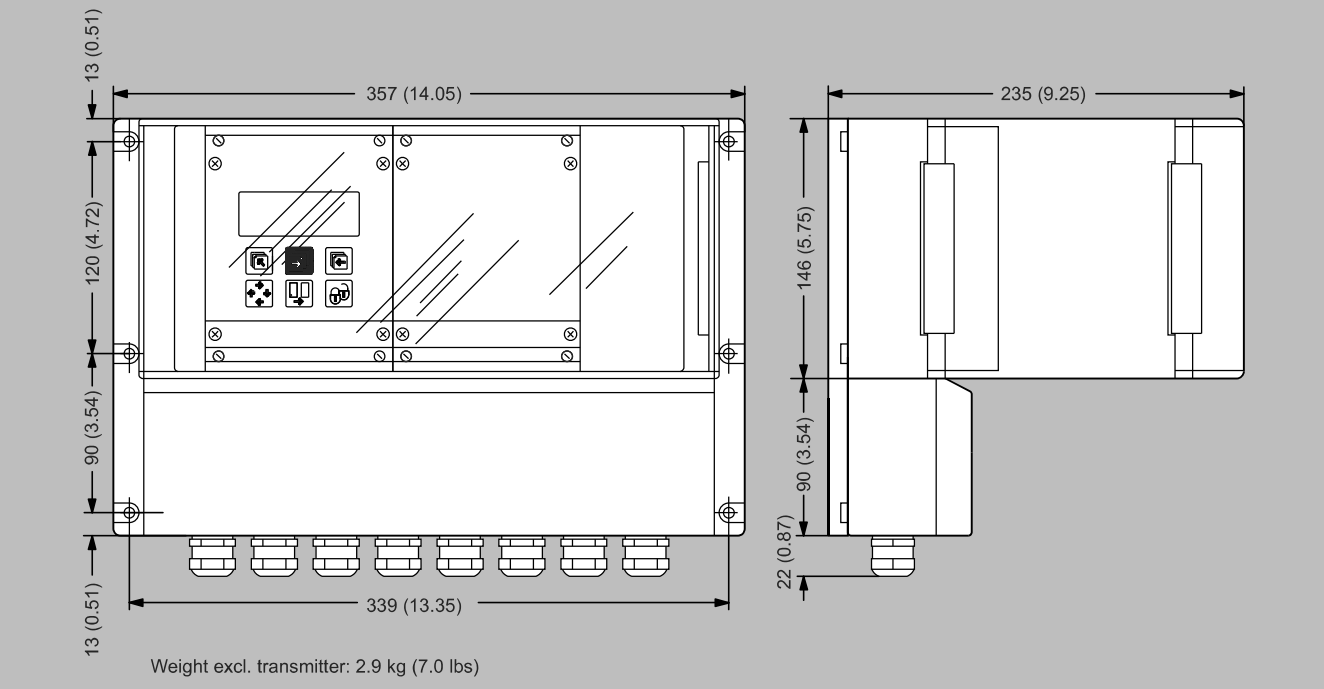
Dimensions in mm (inch)

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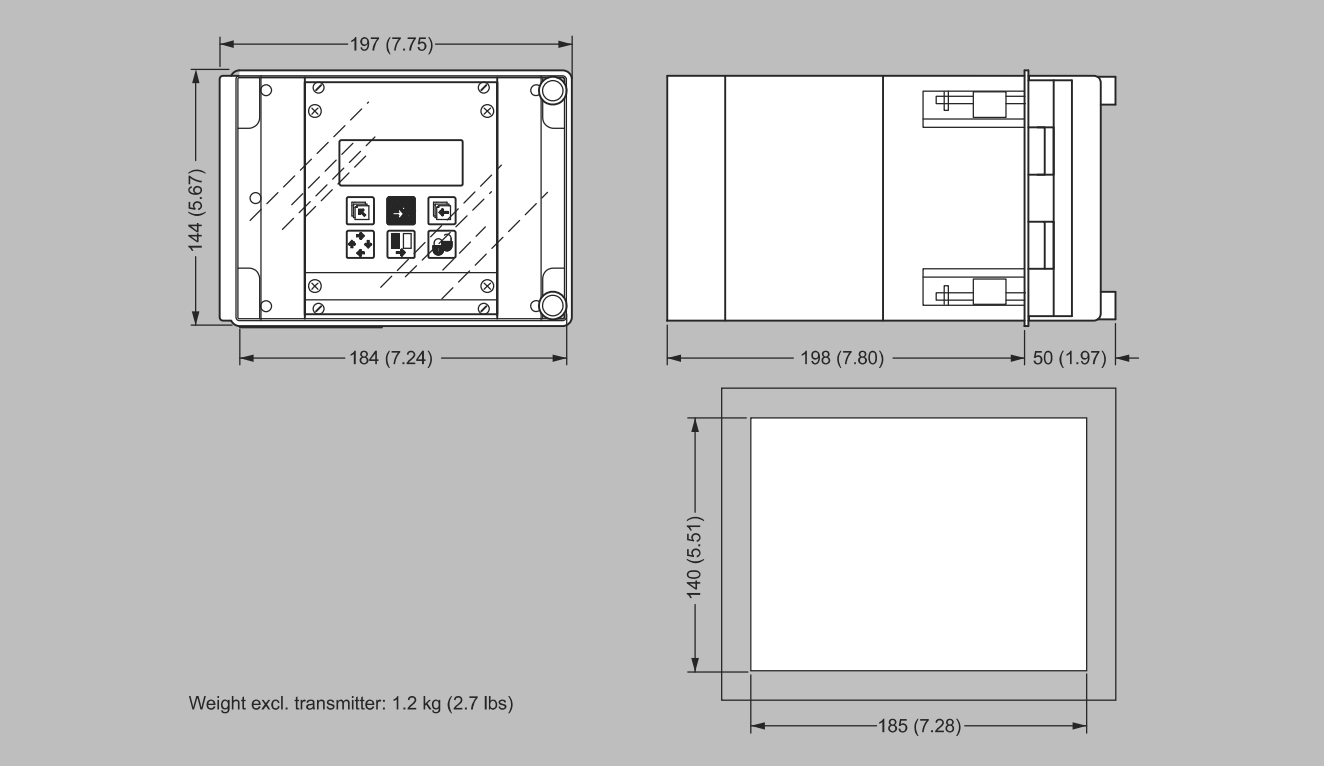
Dimensional drawings (continued)

Transmitter, wall mounting IP66/NEMA 4X, 42 TE



Dimensions in mm (inch)

Transmitter, front panel mounting IP65/NEMA 4, 21 TE



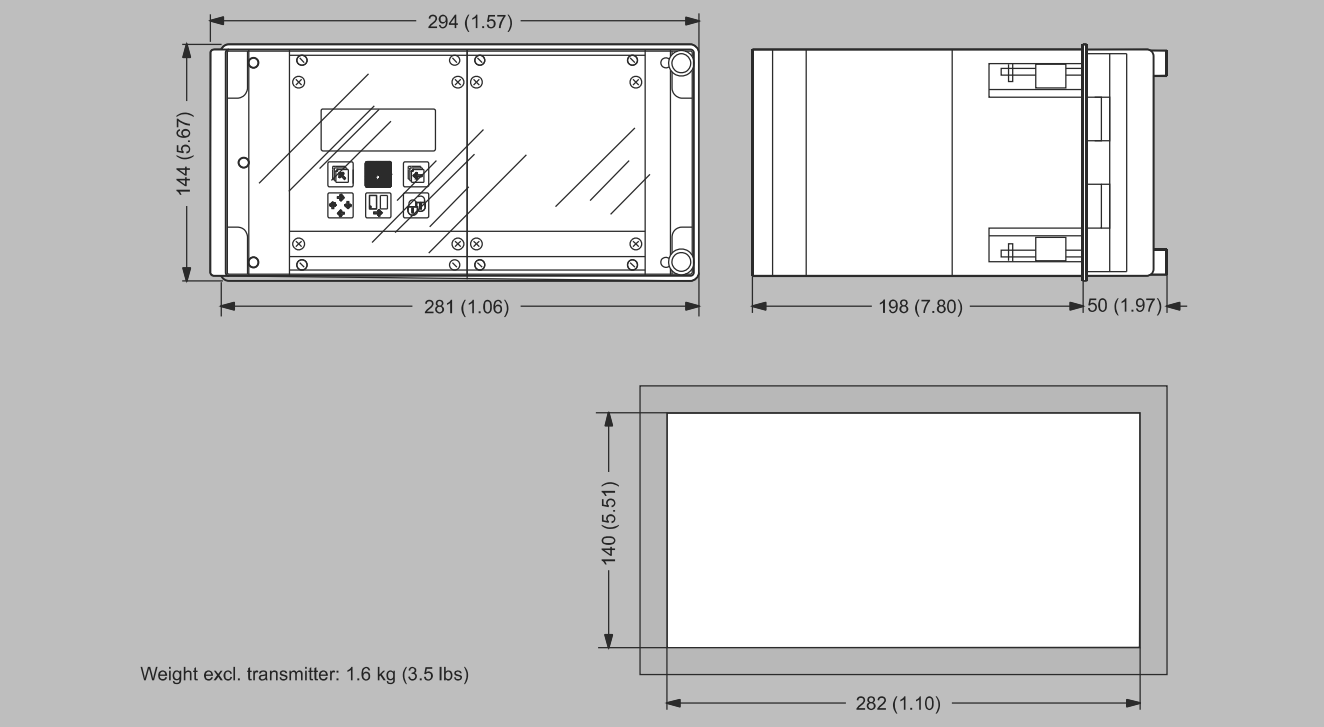
Dimensions in mm (inch)

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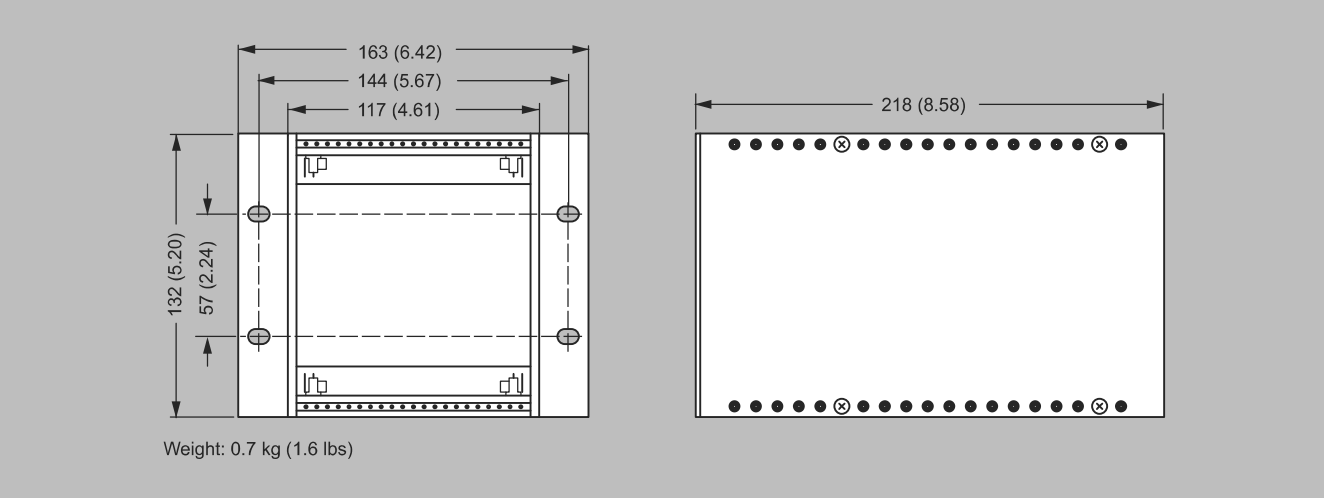
Dimensional drawings (continued)

Transmitter, front panel mounting IP65/NEMA 4, 42 TE



Dimensions in mm (inch)

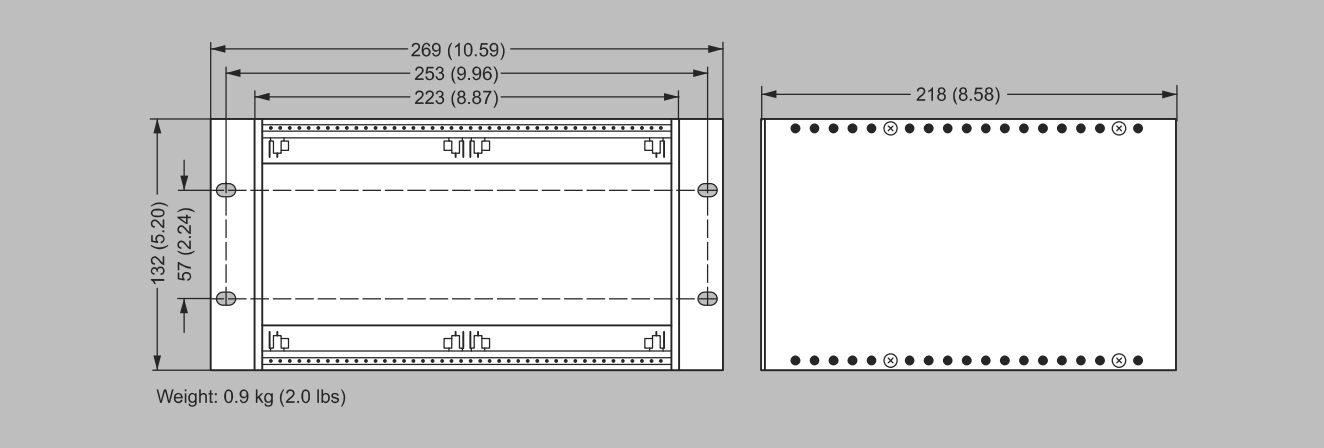
Transmitter, panel mounting IP20/NEMA 2, 21 TE



Dimensions in mm (inch)

Dimensional drawings (continued)

Transmitter, panel mounting IP20/NEMA 2, 42 TE



Dimensions in mm (inch)