

- **The most stable transmitter in the world**
 - self-calibrating transmitter and ultra-low temperature coefficient for highest accuracy
- **One solution for all your needs**
 - designed for use in all water and waste water applications, from sewage plants to distribution networks
- **Quick transmitter exchange**
 - revolutionary data storage enables transmitter interchange and commissioning without the need for reconfiguration
- **Advanced infrared service port**
 - supports simultaneous and parallel operation of HART, remote HMI, cyclic data output and parameter dump
- **Octagonal full-bore flow measurement sensor**
 - unique inner octagonal bore reduces sensitivity to flow profile disturbances
- **Verification to OIML R49 type 'P' requirements**
 - continuous self checking of the sensor and transmitter to ensure the highest accuracy and long term performance
- **NAMUR compliant diagnostics**
 - comprehensive diagnostics categorized into NAMUR NE107 classifications for clear diagnostic indication



The perfect fit for all water industry applications

The Company

We are an established world force in the design and manufacture of instrumentation for industrial process control, flow measurement, gas and liquid analysis and environmental applications. As a part of **ABB**, a world leader in process automation technology, we offer customers application expertise, service and support worldwide. We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support. The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology. Over ten flow calibration plants are operated by the Company, which is indicative of our dedication to quality and accuracy.

Introduction

Setting the Standard

The WaterMaster range, available in sizes 40 to 2200 mm (1½ to 84 in), is designed specifically for use on the many diverse applications encountered in the Water and Waste-water industry.

The specification, features and user benefits offered by this range are based on ABB's worldwide experience in this industry and they are all targeted specifically to the industry's requirements.

Flow Performance

WaterMaster has an operating flow range with ± 0.4 % accuracy as standard (± 0.2 % optional) in both forward and reverse flow directions.

Submersible and Buriable

All WaterMaster sensors have a rugged, robust construction to ensure a long, maintenance-free life under the arduous conditions experienced in the Water and Waste Industry. The sensors are, as standard, inherently submersible (IP68, NEMA 6P), thus ensuring suitability for installation in chambers and metering pits which are liable to flooding.

A unique feature of the WaterMaster sensors is that all sizes are buriable; installation merely involves excavating to the underground pipe, fitting the sensor, cabling back to the transmitter and then backfilling the hole.

Comprehensive Features

A wide range of features and user benefits are built into WaterMaster as standard:

- bi-directional flow
- unique, self-calibrating transmitter (patent approval in progress) for the ultimate in stability and repeatability
- OIML compliant, continuous self-checking, with alarms, ensures both sensor and transmitter accuracy
- true electrode and coil impedance measurement
- comprehensive simulation mode
- universal switch mode power supply (options are available for AC and DC supplies)
- comprehensive self-diagnostics compliant with NAMUR NE107
- programmable multiple alarm capability
- HART protocol over 4 to 20 mA and infrared link
- 3 configurable pulse/frequency and alarm outputs
- advanced infrared service port supports remote HMI, HART, cyclic data out and parameter dump
- NAMUR compliant current output with alarm signalling
- Read-only switch and ultra-secure service password for total security

Assured Quality

WaterMaster is designed and manufactured in accordance with international quality procedures (ISO 9001) and all flowmeters are calibrated on nationally-traceable calibration rigs to provide the end-user with complete assurance of both quality and performance of the meter.



WaterMaster – Electromagnetic Flowmeter

The perfect fit for all water industry applications

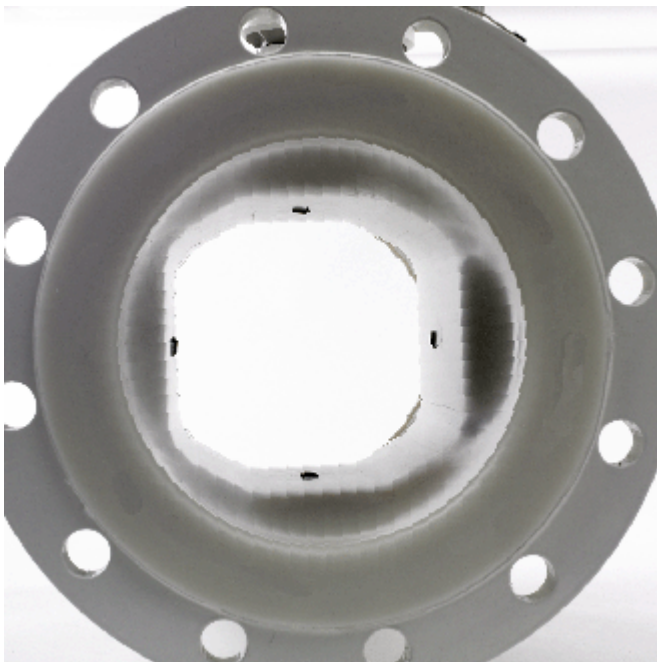
Unrivalled in its scope and applications expertise, ABB offers the world's most comprehensive range of flow measurement products. The FlowMaster family of products is unsurpassed in the number of proven measurement techniques, variety of models and scope of application and includes the WaterMaster range of Electromagnetic Flowmeters.

Getting the best levels of efficiency and performance from your production process requires reliable, accurate instrumentation. WaterMaster provides the flexibility to solve your most demanding water applications enabling previously unattainable operational and financial benefits. WaterMaster is the ultimate solution for flow measurement and management in sectors as diverse as water, wastewater, sewage and effluent.

WaterMaster delivers speed, simplicity and ease of use at every stage of the product's lifecycle. In fact, WaterMaster doesn't just plug the gaps left by competitive products, it is simply the best flow metering solution available today.

Superior control through advanced sensor design

Innovative, patented octagonal sensor design improves flow profile and reduces up- and down-stream piping requirements for the most commonly used sizes of 40 to 300 mm (1½ to 12 in).



Octagonal Bore

Using a unique, controlled derivative excitation combined with advanced filtering, WaterMaster improves accuracy by raising zero stability to new levels, resulting in higher accuracy measurements.

Proven in the toughest applications, WaterMaster's rugged, robust and buriable sensors eliminate the need for expensive meter chambers thus providing a long, productive and maintenance-free asset life.

Powerful and flexible transmitter

The backlit, graphical display is rotated easily up to 180 ° (90 ° each way) without any tools, enabling users to position it as best fits their needs. 'Through-the-glass' control allows local operator interface to enable short, quick data entry for all user-specific parameters.



Transmitter Display

ABB's universal Human Machine Interface (HMI) simplifies operation, maintenance and training; thereby reducing cost of ownership and providing one common user experience.

All product versions utilize a common electronics cartridge to simplify installation and reduce the number of spare parts. The same cartridge is used in both integral and remote installations and features active current and passive pulse outputs. Standard HART protocol enables online modification and monitoring of parameters.

Intuitive navigation and configuration

The user-friendly interface allows fast and simple data entry for all parameters. 'Easy Setup' guides the operator step-by-step through the menu to set parameters as quickly as possible, thereby simplifying the commissioning phase.

Improved Performance through Digital Signal Processing (DSP)

Advanced Digital Signal Processing (DSP) gives improved performance and enables real time measurements for maximum reliability.

DSP enables the transmitter to separate the real signal from the noise, therefore providing high quality outputs especially in harsh environments involving vibration, hydraulic noise and temperature fluctuation.

Self-calibration

A unique self-calibration concept developed by ABB (patent pending) has been implemented in WaterMaster. Compliance with OIML R49 Type P (Permanent) checking requirements requires that electromagnetic flowmeters have 'Checking Facilities', where a simulated signal is fed into the input of the flow transmitter and the output is compared and checked within predetermined limits.

WaterMaster has taken this to the next level and uses this signal to not only check the accuracy, but also to perform automatic calibration. This not only meets and exceeds the OIML R49 requirements, it also means the instrument has the following features:

- self-calibrating instrument
- factory calibration no longer necessary
- calibration adjustment is continuous during normal running
- ultra-stable performance with time
- very low temperature coefficient
- the measurement accuracy depends on one precision resistor only
- adjustment % displayed to user for diagnostic use
- alarm limits to trap hardware failures and out-of-range adjustments

Speed, ease and security in the field

'Fit-and-Flow' data storage inside the WaterMaster eliminates the need to match sensor and transmitter in the field. On initial installation, the self-configuration sequence automatically replicates into the transmitter all calibration factors, meter size and serial numbers, as well as customer site-specific settings, eliminating the opportunity for error.

This redundant storage of data in both the sensor and transmitter memory is continually updated during all operations to ensure the integrity of the measurement.

An automatic data self-repair routine corrects any data corruption such as totalizer volume corruption that could occur during a power failure.

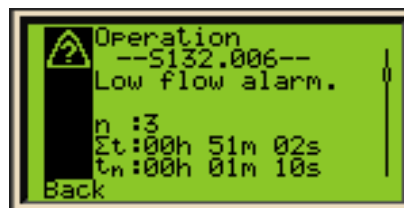


Transmitter with Infrared Communications Device Attached

Detailed diagnostics for rapid decision making

WaterMaster is proven to be robust and reliable, with unmatched diagnostic capabilities providing the correct information to keep your process up and running. In accordance with NAMUR NE107, alarms and warnings are classified with the status of 'maintenance required', 'check function', 'failure' and 'out of specification'.

The following screen shows an alarm history with the number of occurrences for the alarm together with time durations.



Diagnostics Display

Advanced infrared service port

WaterMaster as standard incorporates an infrared service port that enables the meter's configuration to be saved externally.

If a customer alters the configuration and causes the instrument to behave erratically, the infrared service port enables ABB technicians to assist in troubleshooting the problem by allowing easy, remote access to the configuration data.

The infrared service port is used to interrogate HMI menu items automatically and dump the HMI parameter settings and cyclic output measured values (such as flowrate and diagnostic measurement) through the service port to a terminal program. Data can then be downloaded to a PC, saved to a terminal application and output as text or spreadsheet data.

Attention to the smallest technical detail delivers big operational benefits

ABB's WaterMaster sets the standard for flow measurement and management applications in the water, sewage and effluent industries.

Leveraging advanced technology, WaterMaster delivers the power to solve your most demanding applications, enabling previously unattainable operational and financial benefits.

The perfect balance of power, performance, flexibility and control

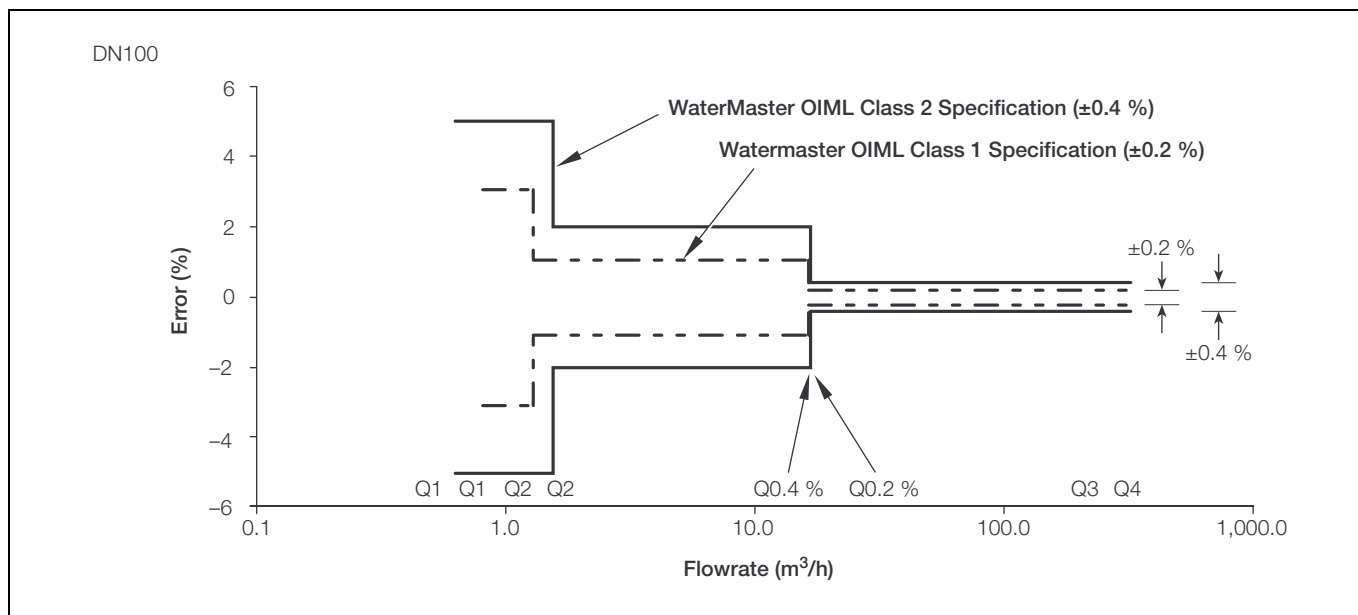
With WaterMaster, flexible doesn't mean complicated. Take advantage of its innovative and versatile attributes to achieve interoperability within a wide range of asset management systems. WaterMaster, the best solution for your flow measurement needs.

Now the best in class is even better!



The WaterMaster Family

WaterMaster Specification to OIML R49



Organization Internationale de Métrologie Légale (OIML)

What is OIML?

OIML is an inter-governmental body, established in 1955. Its main objective is to achieve international harmonization for legal metrology, providing an important basis for measurement credibility, eliminating technical barriers to the trade in measuring instruments and promoting international trade by confidence in measurement capability.

A main output of OIML's work is the production of International Recommendations (such as R49), which are technically based models for legal control of measuring instruments.

OIML R49

Under EU Measuring Instruments Directive (MID) 2004/24/EC, that includes Water Meters for certain applications, conformity can be achieved by various routes. WaterMaster conformity is being sought through the OIML International Recommendation known as R49-1(2006), a Recommendation for cold potable water and hot water meters. The OIML has very similar requirements to the latest ISO4064 and EN14154 standards, but allows the option of a higher accuracy, Class 1 (1%), classification. WaterMaster is designed to meet this very highest accuracy designation with a wide flowrate turndown ratio. A major advance in WaterMaster is the self checking capabilities designed to meet the R49 requirements, with continuous OIML Type 'P' self checking during normal operation (not just at startup) and alarm indication for:

- transmitter and sensor status, with an accuracy alarm
- program ROM and RAM status
- double, independent storage of totalizer values, in both the sensor and transmitter non-volatile memories
- display test

OIML R49 is in 2 parts and can be downloaded from the OIML web site. To download the documents, enter the following addresses in the web browser's address bar:

<http://www.oiml.org/publications/R/R049-1-e06.pdf>

<http://www.oiml.org/publications/R/R049-2-e06.pdf>

WaterMaster Flow Performance

DN			Standard Calibration 0.4 % OIML R49 Class 2			High Accuracy Calibration 0.2 % OIML R49 Class 1		
	Q4 (m ³ /h)	Q3 (m ³ /h)	Q _{0.4%} (m ³ /h)	Q2 (m ³ /h)	Q1 (m ³ /h)	Q _{0.2%} (m ³ /h)	Q2 (m ³ /h)	Q1 (m ³ /h)
40	50	40	4.2	0.25	0.1	6	0.32	0.2
50	79	63	4.2	0.4	0.16	8	0.5	0.32
65	125	100	6.7	0.63	0.25	13	0.8	0.5
80	200	160	11	1	0.4	16	1.3	0.8
100	313	250	17	1.6	0.63	25	2	1.3
125	500	400	27	2.5	1	40	3.2	2
150	788	630	42	4	1.6	63	5	3.2
200	1,250	1,000	67	6.3	2.5	100	8	5
250	2,000	1,600	107	10	4.0	160	13	8
300	3,125	2,500	167	16	6.3	250	20	13
350	5,000	4,000	267	25	10	400	32	20
400	5,000	4,000	267	25	10	400	32	20
450	7,875	6,300	420	39	16	630	50	32
500	7,875	6,300	420	39	16	630	50	32
600	12,500	10,000	667	63	25	1000	80	50
700	20,000	16,000	1067	100	40	1600	160	100
750	20,000	16,000	1067	100	40	1600	160	100
800	20,000	16,000	1067	100	40	1600	160	100
900	31,250	25,000	1667	156	63	2500	250	156
1000	31,250	25,000	1667	156	63	2500	250	156
1050	31,250	25,000	1667	156	63	2500	250	156
1200	50,000	40,000	2667	250	100	4000	400	250
1400	78,750	63,000	4200	394	158	6300	630	394
1500	78,750	63,000	4200	394	158	6300	630	394
1600	78,750	63,000	4200	394	158	6300	630	394
1800	125,000	100,000	6667	625	250	10000	1000	625
2000	125,000	100,000	6667	625	250	10000	1000	625
2200	125,000	100,000	6667	625	250	10000	1000	625

Specification – Sensor

Functional Specification

Pressure limitations

As per flange rating

Temperature limitations

Ambient temperature

Remote transmitter –20 to 70 °C (–4 to 158 °F)

Integral transmitter –20 to 60 °C (–4 to 140 °F)

Process temperature

–6 to 70 °C (21 to 158 °F)

Environmental protection

Rating: IP68 (NEMA 6) to 10m (33 ft) depth with fully-potted terminal box

Conductivity

>5 μ S cm⁻¹

Transmitter mounting

Integral or remote

Electrical connections

20 mm glands

1/2 in NPT

20 mm armored glands

Sensor cable

ABB WaterMaster cable available in two forms – standard and armored

Maximum length 200 m (660 ft)

Physical Specification

Wetted Parts

Lining material

Polypropylene (sizes DN40 to 200)

Elastomer (sizes DN250 to 2200)

WRAS listed

ACS and NSF61 approved (sizes DN40 to 200 pending)

Electrode material

Stainless steel 316 L

Hastelloy C

(Other electrode materials available on request)

Grounding rings

Not required

Protection plates

Not required

Installation conditions (recommended)

Upstream \geq 5D

Downstream \geq 2D

Pressure loss

<0.25 bar at Q3 (sizes DN40 to 200)

Negligible at Q3 (sizes DN250 to 2200)

Non-wetted Parts

Flange material

Carbon steel

Housing material

Carbon steel (sizes DN40 to 200 and DN700 to 2200)

Plastic (sizes DN250 to 600)

Terminal box material

Polycarbonate or aluminium

Cable gland material

Plastic or brass

Specification – Transmitter

Functional Specification

Power supply

Mains 85 to 265 V AC @ <7 VA

Low voltage 24 V AC +10 %/–30 % @ <7 VA

DC 24 V \pm 30 % @ <0.4 A

Supply voltage fluctuations within the specified range have no effect on accuracy

Pulse/frequency outputs

One dedicated, second configurable output, programmable function:

Maximum output frequency 5,250 Hz

Rating 30 V @ 220 mA open collector

Galvanically isolated

Alarm/Logic outputs

One dedicated, second configurable output, programmable function:

Rating 30 V @ 220 mA open collector

Galvanically isolated

Current output

4 to 20 mA or 4 to 12/20 mA

Maximum loop resistance 750 Ω

Galvanically isolated

HART protocol Version 5.7

Signal levels compliant with NAMUR NE 43 (3.8 to 20.5 mA)

Low alarm 3.6 mA

High alarm 21.8 mA

Additional accuracy

\pm 0.1 % of reading

Temperature coefficient Typically \leq \pm 20 ppm/°C

Electrical connections

20 mm glands

1/2 in NPT

20 mm armored glands

Temperature limitations

Ambient temperature –20 to 60 °C (–4 to 140 °F)

Temperature coefficient Typically \leq \pm 10 ppm/°C @ Vel \geq 0.5 m/s

Environmental protection

Humidity: 0 to 100 %

Rating: IP67 (NEMA 4X) to 1m (3.3 ft) depth

Tamper-Proof Security

Write access prevented by internal switch combined with external security seals

Languages

English

French

German

Italian

Spanish

Infrared Service port

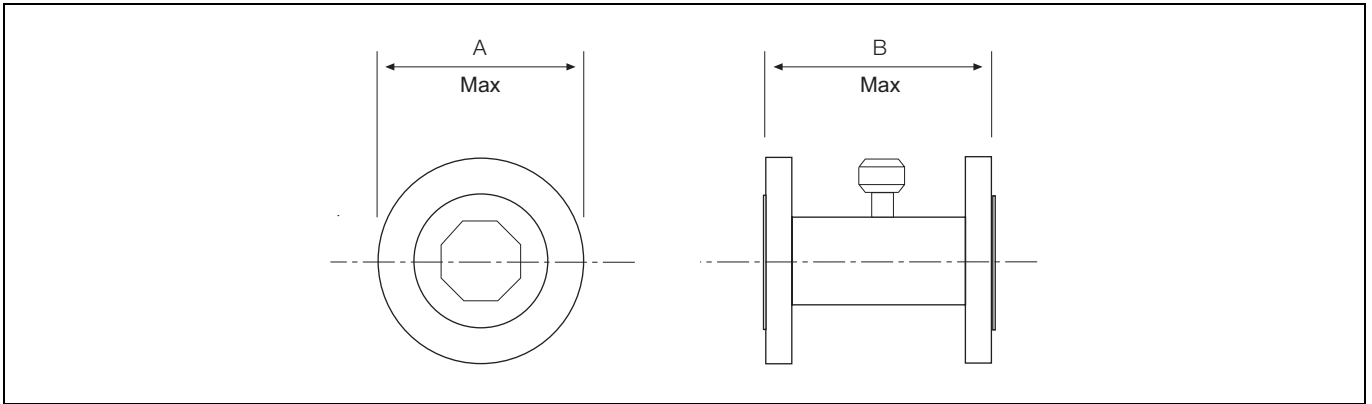
USB adapter (accessory)

USB 1.1. and 2.0 compatible

Driver software for PC only

Windows 2000, XP and Vista compatible

Sensor Dimensions

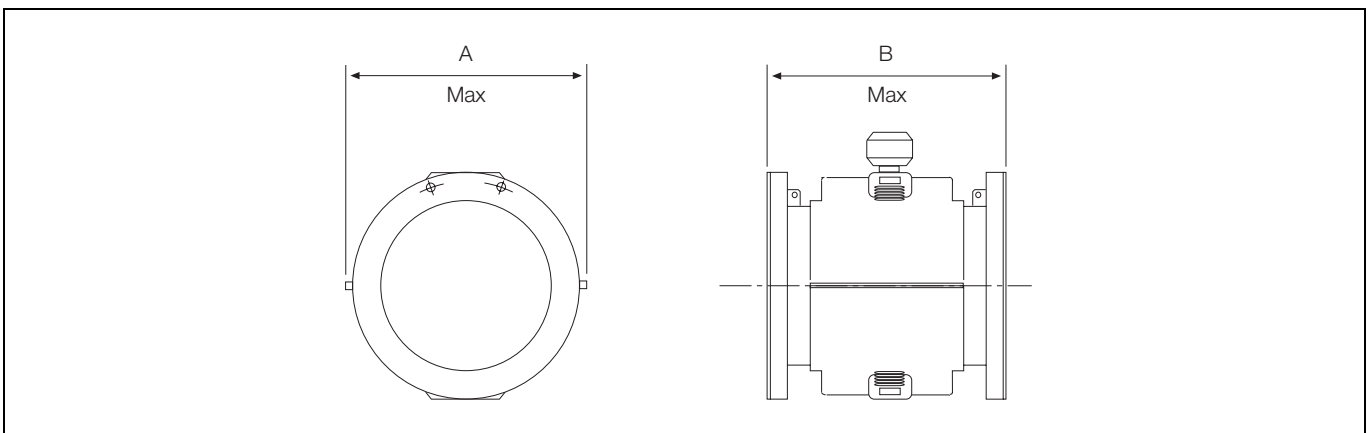


DN 40 to 300 Full-bore

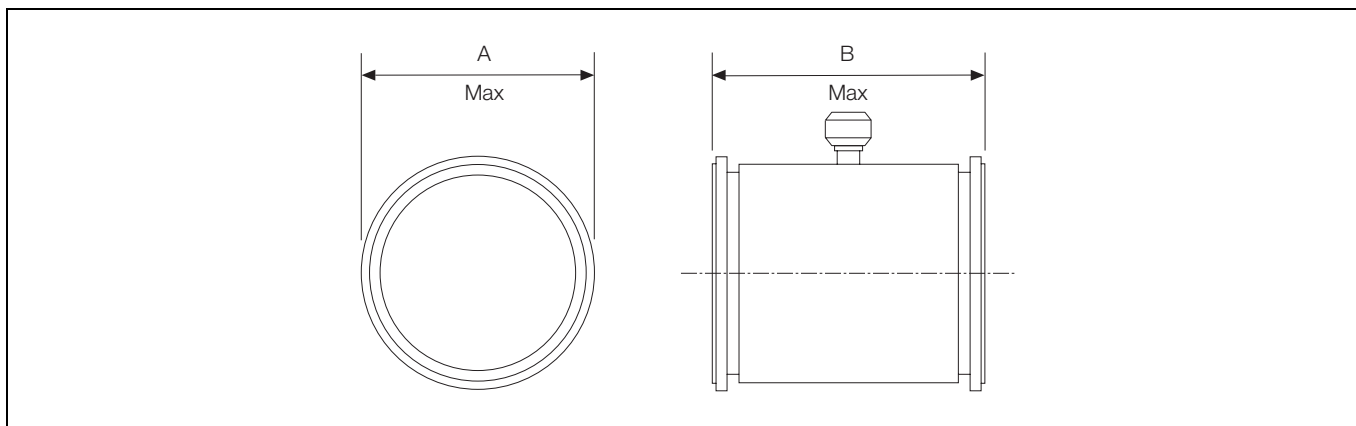
Meter Size		Dimensions mm (in)		Approximate Weight	
DN	NPS/NB	A*	B	kg	lb
40	1½	150 (5.9)	200 (7.9)	11	24
50	2	165 (6.5)	200 (7.9)	12	27
80	3	200 (7.9)	200 (7.9)	15	33
100	4	230 (9.1)	250 (9.8)	18	40
150	6	280 (11.0)	300 (11.8)	31	68
200	8	345 (13.6)	350 (13.8)	48	106
250	10	405 (15.9)	450 (17.7)	75	165
300	12	460 (18.1)	500 (19.7)	112	247

*Dimensions are approximate and vary depending on flange type

DN 40 to 300 Full-bore



DN 350 to 600 Full-bore



DN 700 to 2200 Full-bore

Meter Size		Dimensions in mm (in)		Approximate Weight	
DN	NPS/NB	A	B	kg	lb
350	14	535 (21.1)	550 (21.7)**	100	220
400	16	600 (23.6)	600 (23.6)**	115	253
450	18	640 (25.2)	698 (27.5)**	160	352
500	20	715 (28.1)	768 (30.2)**	217	455
600	24	840 (33.1)	918 (36.1)**	315	693
700	27/28*	927 (36.5)	700 (27.6)***	430	945
750	30	985 (38.8)	762 (30)***	430	945
800	32	1060 (41.7)	800 (31.5)***	430	945
900	36	1170 (46.1)	900 (35.4)***	540	1190
1000	39/40*	1290 (50.8)	1000 (39.4)***	720	1585
1100	42	1405 (55.3)	1067 (42)***	880	1930
1200	48	1511 (59.5)	1200 (47.2)***	1000	2160
1400	54	1745 (68.7)	1400 (55.1)***	1450	3190
1500	60	1855 (73.0)	1524 (59)***	1370	3000
1600	66	2032 (80.0)	1600 (63)***	2000	4400
1800	72	2197 (86.5)	2250 (88.6)***	2400	5280
2000	78	2362 (93.0)	2500 (98.4)***	3200	7040
2200	84	2534 (100.0)	2750 (110)***	4200	9300

* Size is dependent on flange specification

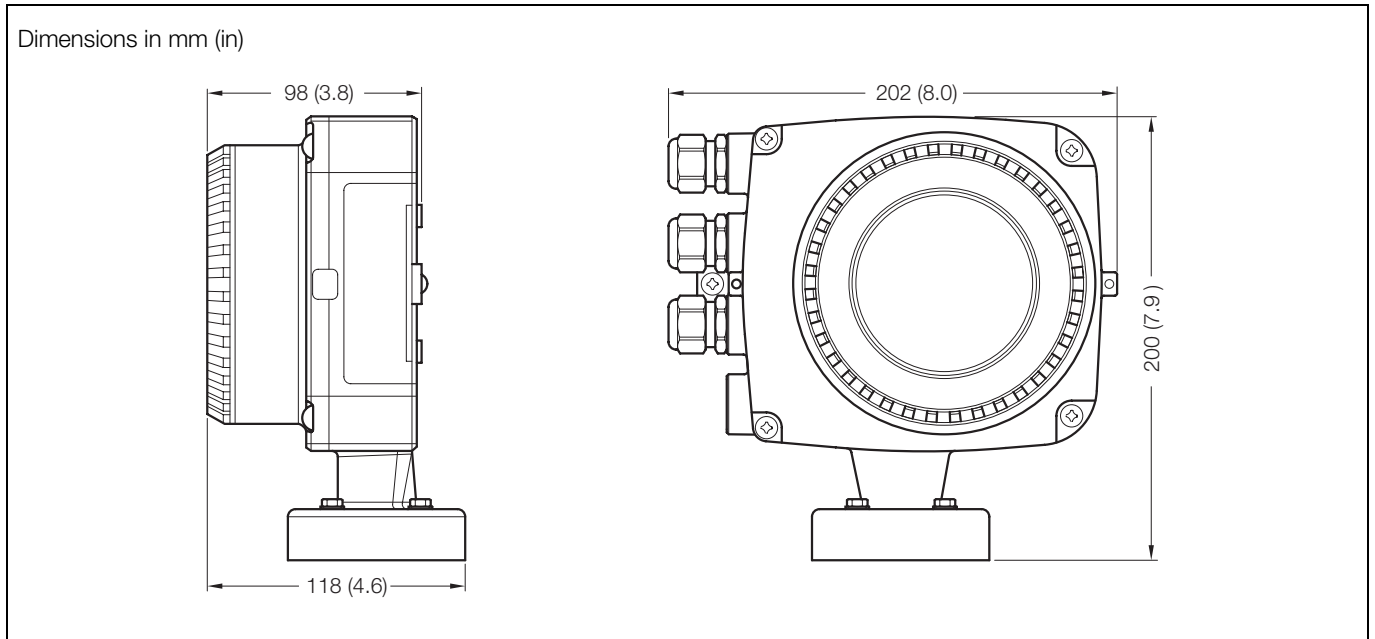
Typical tolerances: **+0/-6 mm (0.24 in); ***+0/-10 mm (0.40 in)

Items **/** DN700 up +0/-25 mm (1.0 in) if using Weld Neck flanges

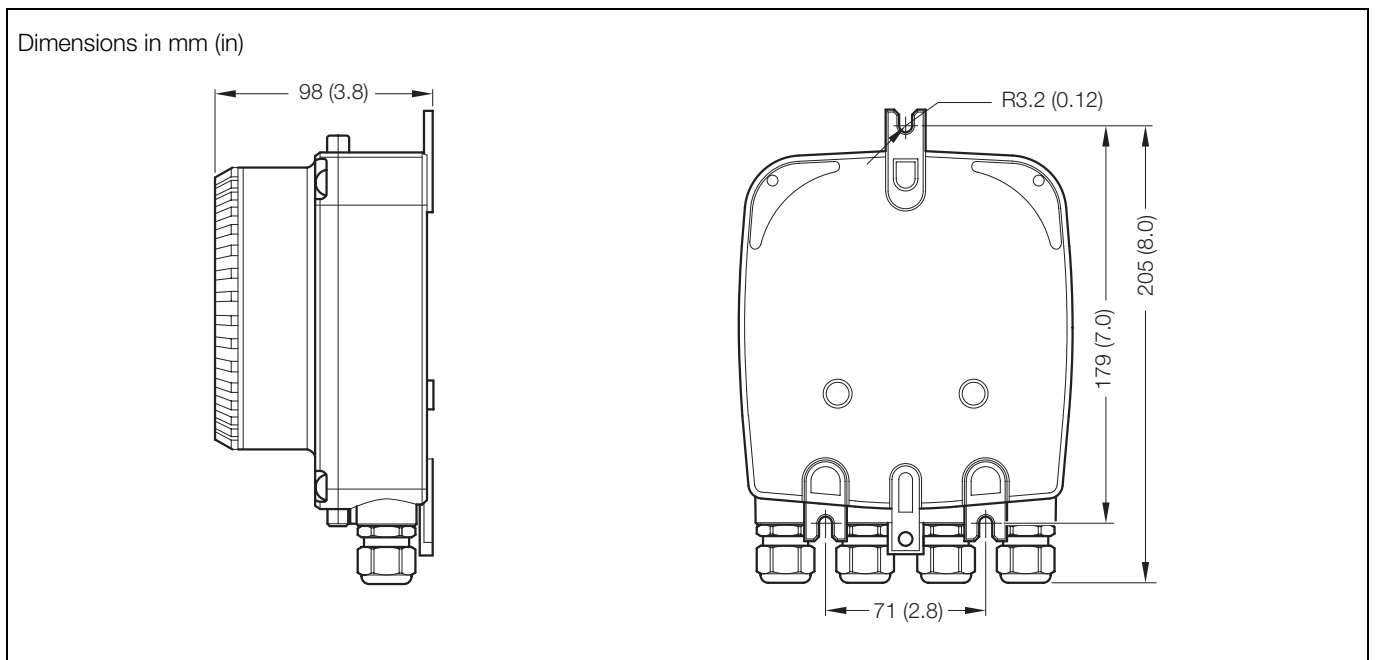
DN 350 to 2200 Full-bore

Transmitter Dimensions

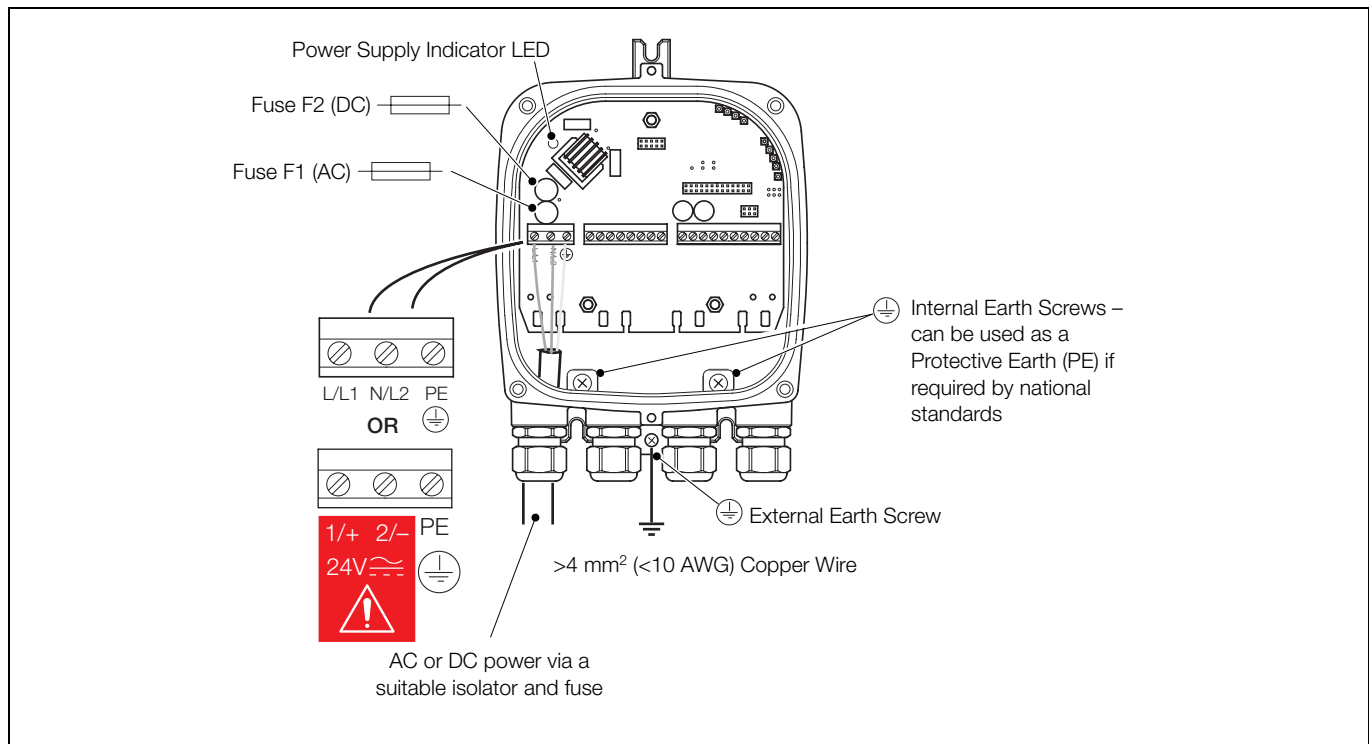
Integral Transmitter



Remote Transmitter



Electrical Connections



AC and DC Power Supply Connections

Ordering Information

Electromagnetic Flowmeter WaterMaster FEF121 and FEF181

Variant digit number		1 ... 6	7 ... 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27
Flowmeter system, full bore, remote mount	FEF121																			
		XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X	X
Full bore, for use with WaterMaster transmitter / remote	FEF181																			
Bore Diameter																				
	DN 250 (10 in)	250																		
	DN 300 (12 in)	300																		
	DN 350 (14 in)	350																		
	DN 400 (16 in)	400																		
	DN 450 (18 in)	450																		
	DN 500 (20 in)	500																		
	DN 600 (24 in)	600																		
	DN 700 (28 in)	700																		
	DN 760 (30 in)	760																		
	DN 800 (32 in)	800																		
	DN 900 (36 in)	900																		
	DN 1000 (40 in)	001																		
	DN1050 (42 in)	051																		
	DN 1100 (44 in)	101																		
	DN 1200 (48 in)	201																		
	DN 1400 (54 in)	401																		
	DN 1500 (60 in)	501																		
	DN 1600 (66 in)	601																		
	DN 1800 (72 in)	801																		
	DN 2000 (80 in)	002																		
	DN 2200 (84 in)	202																		
	Others	999																		
Liner Material																				
	Elastomer			K																
	Elastomer with ACS approval			L																
	Others			Z																
Electrode Design																				
	Standard			1																
	Others – FEF181 only			9																
Measuring Electrodes Material																				
	Stainless steel 316Ti (1.4571)				S															
	Hastelloy C-276 (FEF121 – DN350 to DN2200 only)				E															
	Others				Z															
Grounding Accessories																				
	Standard							1												
	One grounding plate							3												
	Two grounding plates							4												
	Others							9												
Process Connection Type																				
	Flanges ASME class 150																			A1
	Flanges AWWA class B																			C1
	Flanges AWWA class D																			C2
	Flanges AS 4087 class 16																			E1
	ISO 7005 PN16																			S2
Process Connection Material																				
	Carbon steel flanges																			B
	Others																			Z

Continued on page 14

Variant digit number	1 ... 6	7 ... 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27
Flowmeter system, full bore, remote mount	FEF121																		
Full bore, for use with WaterMaster transmitter / remote	FEF181	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X
Usage Certifications																			
Standard (without PED)																			1
Material monitoring with inspection certificate 3.1 acc. EN 10204																			2
Others																			9
Calibration Type																			
Standard accuracy 0.4 %																			A
Enhanced accuracy 0.2%																			B
Witnessed factory calibration																			M
Custody transfer for cold/waste water (witnessed calibration) (FEF181 only)																			N
UKAS/NAMAS (FEF181 only)																			U
Others																			Z
Temperature Range Installation / Ambient Temperature Range																			
Standard design / -20 ... 60 °C (-4 ... 140 °F)																			1
Language																			
English																			A
German																			D
French																			G
Spanish																			K
Italian																			N
Signal Cable Length and Type *																			
Without signal cable – FEF181 only																			0
5 m (15 ft.) cable																			1
10 m (30 ft.) cable																			2
20 m (60 ft.) cable																			3
30 m (100 ft.) cable																			4
50 m (165 ft.) cable																			5
80 m (260 ft.) cable																			6
100 m (325 ft.) cable																			7
150 m (490 ft.) cable																			8
Special Length > 150 m (> 490 ft.) (and/or armored cable – FEF181 only)																			9
Explosion Protection Certification																			
General purpose (non-Ex design)																			A
Others (FEF181 only)																			Z
Protection Class Transmitter / Protection Class Sensor																			
IP67 (NEMA 4X) / IP68 (NEMA 6X) – cable not fitted and not potted																			2
IP67 (NEMA 4X) / IP68 (NEMA 6X) – cable fitted and potted																			3
Others (FEF181 only)																			9
Cable Conduits *																			
M20 x 1.5																			A
NPT 1/2 in																			B
M20 SWA armored																			D
Others (FEF181 only)																			Z

Continued on page 15

Variant digit number		1 ... 6	7 ... 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27
Flowmeter system, full bore, remote mount	FEF121																			
	FEF181	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X	X
Full bore, for use with WaterMaster transmitter / remote																				
Power Supply																				
Without (FEF181 only)																			0	
100... 230 V AC, 50 Hz (FEF121 only)																			1	
24 V AC or 24V DC, 50 Hz (FEF121 only)																			2	
100 ... 230 V AC, 60 Hz (FEF121 only)																			3	
24 V AC or 24 V DC, 60 Hz (FEF121 only)																			4	
Input and Output Signal Type																				
HART + 20 mA + pulse + contact output (FEF121 only)																			A	
Without (FEF181 only)																			Y	
Configuration Type / Diagnostics Type																				
Factory defaults / standard diagnostics																			1	

* The type of signal cable supplied (standard or armored) depends on the type of cable conduit (variant digit number 24) ordered.

Electromagnetic Flowmeter WaterMaster FEV111, FEV121, FEV181 and FEF191

Variant digit number	1 ... 6	7 ... 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27
Flowmeter system, optimized full bore, integral mount	FEV111																		
Flowmeter system, optimized full bore, remote mount	FEV121																		
Optimized full bore, for use with WaterMaster transmitter / remote	FEV181	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X
Optimized full bore, for use with WaterMaster transmitter / integral	FEV191																		
Bore Diameter																			
DN 40 (1 ³ / ₄ in)		040																	
DN 50 (2 in)		050																	
DN 80 (3 in)		080																	
DN 100 (4 in)		100																	
DN 150 (6 in)		150																	
DN 200 (8 in)		200																	
DN 250 (10 in)		250																	
DN 300 (12 in)		300																	
Others		999																	
Liner Material																			
Polypropylene (DN 40 ... DN 200 only)			V																
Electrode Design																			
Standard				1															
Measuring Electrodes Material																			
Stainless steel 316Ti (1.4571)					S														
Grounding Accessories																			
Standard						1													
Process Connection Type																			
Flanges ASME class 150								A1											
Flanges AS 4087 class 16 (DN50 ... DN300 only)								E1											
Flanges AS 2129 table F (DN40 only)								E3											
ISO 7005 PN16 (DN50 ... DN300 only)								S2											
ISO 7005 PN40 (DN40 only)								S4											
Process Connection Material																			
Carbon steel flanges									B										
Usage Certifications																			
Standard (without PED)										1									
Material monitoring with inspection certificate 3.1 acc. EN 10204										2									
Others (FEV121, FEV181 and FEV191 only)										9									
Calibration Type																			
Standard accuracy 0.4 %																			A
Enhanced accuracy 0.2%																			B
Witnessed factory calibration																			M
Others																			Z
Temperature Range Installation / Ambient Temperature Range																			
Standard design / -20 ... 60 °C (-4 ... 140 °F)																			1

Continued on page 17

Variant digit number	1 ... 6	7 ... 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27
Flowmeter system, optimized full bore, integral mount	FEV111																		
Flowmeter system, optimized full bore, remote mount	FEV121																		
Optimized full bore, for use with WaterMaster transmitter / remote	FEV181	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X
Optimized full bore, for use with WaterMaster transmitter / integral	FEV191																		
Language																			
English																			A
German																			D
French																			G
Spanish																			K
Italian																			N
Signal Cable Length and Type *																			
Without signal cable (FEV111 and FEV 191 only)																			0
5 m (15 ft.) cable (FEV121 and FEV181 only)																			1
10 m (30 ft.) cable (FEV121 and FEV181 only)																			2
20 m (60 ft.) cable (FEV121 and FEV181 only)																			3
30 m (100 ft.) cable (FEV121 and FEV181 only)																			4
50 m (165 ft.) cable (FEV121 and FEV181 only)																			5
80 m (260 ft.) cable (FEV121 and FEV181 only)																			6
100 m (325 ft.) cable (FEV121 and FEV181 only)																			7
150 m (490 ft.) cable (FEV121 and FEV181 only)																			8
Special Length > 150 m (> 490 ft.) (FEV121 and FEV181 only)																			9
Explosion Protection Certification																			
General purpose (non-Ex design)																			A
Protection Class Transmitter / Protection Class Sensor																			
IP67 (NEMA 4X) / IP67 (NEMA 4X) – integral (FEV111 and FEV191 only)																			1
IP67 (NEMA 4X) / IP68 (NEMA 6X) – cable not fitted and not potted (FEV121 and FEV181 only)																			2
IP67 (NEMA 4X) / IP68 (NEMA 6X) – cable fitted and potted (FEV121 and FEV181 only)																			3
Cable Conduits *																			
M20 x 1.5																			A
NPT 1/2 in																			B
M20 SWA armored (FEV121 and FEV181 only)																			D
Power Supply																			
Without (FEV181 and FEV191 only)																			0
100... 230 V AC, 50 Hz (FEV111 and FEV121 only)																			1
24 V AC or 24V DC, 50 Hz (FEV111 and FEV121 only)																			2
100... 230 V AC, 60 Hz (FEV111 and FEV121 only)																			3
24 V AC or 24V DC, 60 Hz (FEV111 and FEV121 only)																			4
Others (FEV111 only)																			9
Input and Output Signal Type																			
HART + 20 mA + pulse + contact output (FEV111 and FEV121 only)																			A
Without (FEV181 and FEV191 only)																			Y
Configuration Type / Diagnostics Type																			
Factory defaults / standard diagnostics																			1

* The type of signal cable supplied (standard or armored) depends on the type of cable conduit (variant digit number 24) ordered.

Electromagnetic Flowmeter Transmitter for WaterMaster FET101, FET111 and FET121

Variant digit number	1 ... 6	7 ... 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27
Transmitter cartridge	FET101																		
Integral transmitter	FET111	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X
Remote transmitter	FEV181																		
Bore Diameter	Transmitter only		000																
Liner Material	Without (transmitter only)			Y															
Electrode Design	Without (transmitter only)				0														
Measuring Electrodes Material	Without (transmitter only)					Y													
Grounding Accessories	Without (transmitter only)						0												
Process Connection Type	Without (transmitter only)								Y0										
Process Connection Material	Without (transmitter only)									Y									
Usage Certifications	Without (transmitter only)										8								
Calibration Type	Without (transmitter only)											Y							
Temperature Range Installation / Ambient Temperature Range	Standard design / -20 ... 60 °C (-4 ... 140 °F)												1						
Language	English												A						
	German												D						
	French												G						
	Spanish												K						
	Italian												N						
Signal Cable Length and Type	Without signal cable													0					
Explosion Protection Certification	Without (transmitter only)														Y				
Protection Class Transmitter / Protection Class Sensor	IP67 (NEMA 4X) / IP67 (NEMA 4X)															1			
Cable Conduits	Without (FET101 only)																		Y
	M20 x 1.5 (FET111 and 121 only)																		A
	NPT 1/2 in (FET111 and 121 only)																		B
	M20 SWA armored (FET111 and 121 only)																		D
	Others (FET111 and 121 only)																		Z

Continued on page 19

Variant digit number	1 ... 6	7 ... 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27
Transmitter cartridge	FET101																		
Integral transmitter	FET111	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X
Remote transmitter	FEV181																		
Power Supply																			
100... 230 V AC, 50 Hz																		1	
24 V AC or 24V DC, 50 Hz																		2	
100... 230 V AC, 60 Hz																		3	
24 V AC or 24V DC, 60 Hz																		4	
Input and Output Signal Type																			
HART + 20 mA + pulse + contact output (FEV111 and FEV121 only)																			A
Configuration Type / Diagnostics Type																			
Factory defaults / standard diagnostics																			1

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