Data sheet DS/WM–EN Rev. I

WaterMaster
Electromagnetic flowmeter

The perfect fit for all water industry applications

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

OIML R49 Approved
— Type approved to OIML R49 to accuracy Class 1 and Class 2, for any pipe orientation and bidirectional flow
— Zero downstream pipe disturbance class, with T50 (0.1 to 50 °C [32.2 to 122 °F]) rating for guaranteed performance in any water application

OIML R49 permanent self-checking
— Type P approved
— continuous self checking of the sensor and transmitter to ensure the highest accuracy and long term performance

VeriMaster in situ verification software option
— allows the customer to perform in situ verification at the flowmeter

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 10 to 2200 mm (3/8 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 sizes DN40 to DN2200 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-type 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
- bus options: HART (4 to 20 mA), PROFIBUS (RS485)
- 3 configurable pulse/frequency and alarm outputs
- advanced infrared service port supports remote HMI, HART, cyclic data out and parameter dump
- VeriMaster in situ verification software available as option
- 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 200 mm ($1^1/_2$ to 8 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 WaterMaster versions utilize an electronics cartridge to simplify installation and reduce the number of spare parts. Two variants of the cartridge are available, a standard HART protocol variant and a PROFIBUS variant – both variants enable online modification and monitoring of parameters.

The same cartridge type (HART or PROFIBUS) is used in both integral and remote installations. The HART cartridge features active current and passive pulse outputs while the PROFIBUS cartridge features passive pulse outputs.

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 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.

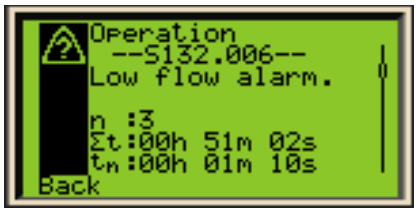
This redundant storage of data in both the sensor and transmitter memory is continually updated during all operations to ensure the integrity of the measurement.

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

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.

Transmitter with infrared communications device attached

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!

In situ verification

WaterMaster is now extended to include VeriMaster for in situ verification. VeriMaster is a PC application, that when coupled to the WaterMaster through the infrared service port, generates a report on the accuracy of the complete flowmeter, both sensor and transmitter. It builds on over 10 years of ABB's experience in the verification field, through its leading CalMaster range. VeriMaster is a quick and easy to use utility, that uses the advanced self-calibration and diagnostic capability of WaterMaster, coupled with fingerprinting technology, to determine the accuracy status of the WaterMaster flowmeter to within +/-1 % of its original factory calibration. VeriMaster also supports printing of calibration verification records for regulatory compliance.

VeriMaster integrates with WaterMaster seamlessly, meaning:

- no interruption to any of the wiring
- no cover removal, with operation through the front glass using the infrared service port
- no interruption to the measurement

If desired, an operator can additionally check and record the accuracy of the current and pulse outputs. VeriMaster is compatible with Microsoft Windows 7, Windows XP and Vista operating systems

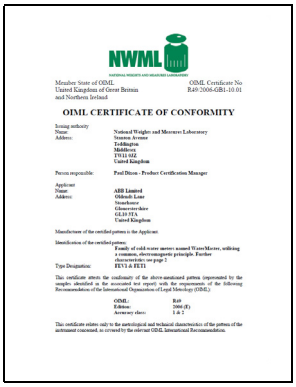
The WaterMaster family

OIML / MID approved

WaterMaster has been type tested and Internationally approved through UK National Weights and Measures Laboratory, to the highest accuracy class 1 and 2 for cold and hot potable water meters, known as OIML R49-1 (Organisation Internationale de Métrologie Légale). For full details, OIML R49 is available to download from www.oiml.org. Its requirements are very similar to other International standards, such as the latest revisions of EN14154 and ISO4064. WaterMaster accuracy is better than OIML R49-1 or any of these International standards, with a tighter accuracy specification at the higher flow rates, improving over OIML Class 1 of ±1 % to ±0.2 % above $Q_{0.2\ \%}$, also from Class 2 of ±2 % to ±0.4 % above $Q_{0.4\ \%}$. At lower flowrates, typical WaterMaster accuracies follow the 'trumpet' accuracy curve defined by typically ±0.9 mm / s, again tighter than the OIML accuracy limits.

The OIML R49-1 certificate of conformity is available from:

http://www.abb.com/product/seitp330/b42ec2377d3293cdc12573de003db93b.aspx



NWML

Member State of OIML
United Kingdom of Great Britain and Northern Ireland

OIML Certificate No
R49-2006-GB1-10.01

OIML CERTIFICATE OF CONFORMITY

Issuing authority
Name: National Weights and Measures Laboratory
Address: Stanton Avenue
Teddington
Middlesex
TW11 0JZ
United Kingdom

Person responsible: Paul Dixon - Product Certification Manager

Applicant
Name: ABB Limited
Address: Oldends Lane
Stonehouse
Gloucestershire
GL10 3TA
United Kingdom

Manufacturer of the certified pattern is the Applicant

Identification of the certified pattern: Family of cold-water meters named WaterMaster, utilising a common, electromagnetic principle. Further characteristics: see page 2
Type Designation: FET1 & FET1

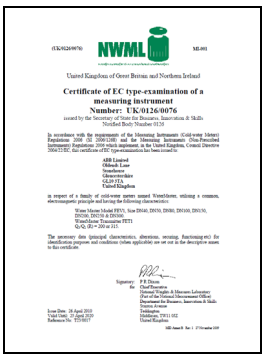
This certificate attests the conformity of the above-mentioned pattern (represented by the samples identified in the associated test report) with the requirements of the following Recommendation of the International Organization of Legal Metrology (OIML):

OIML: R49
Edition: 2006 (E)
Accuracy class: 1 & 2

This certificate relates only to the metrological and technical characteristics of the pattern of the instrument concerned, as covered by the relevant OIML International Recommendation.

WaterMaster is also approved under the EU Measuring Instruments Directive (MID) 2004/22/EC, that covers putting into use water meters for certain applications. MID WaterMaster is secured against tamping and is available as an option, along with fingerprinting for ABB VeriMaster in situ Verification product, with certificate printout to ±1 % accuracy. WaterMaster certificates of EC type-examination of a measuring instrument are available from:

http://www.abb.com/product/seitp330/b42ec2377d3293cdc12573de003db93b.aspx



NWML

United Kingdom of Great Britain and Northern Ireland

Certificate of EC type-examination of a measuring instrument
Number: UK/0126/0076

issued by the Secretary of State for Business, Innovation & Skills
Notified Body Number 0120

ABB Limited
Oldends Lane
Stonehouse
Gloucestershire
GL10 3TA
United Kingdom

Water Meters Model FET1, Size DN40, DN50, DN80, DN100, DN150, DN200, DN250 & DN300,
WaterMaster Transmitter FET1
Q3/Q1 R = 160 or 315

Signatory: P.R. Dixon
the Chief Examiner
National Weights & Measures Laboratory
(Part of the National Measurement Office)
Department for Business, Innovation & Skills
Stanton Avenue
Teddington
Middlesex, TW11 0JZ
United Kingdom

WaterMaster has been assessed by type approval at the National Measurement Office (NMO) to OIML R49 and passed to the very highest accuracy designations for sizes DN40 to DN200.

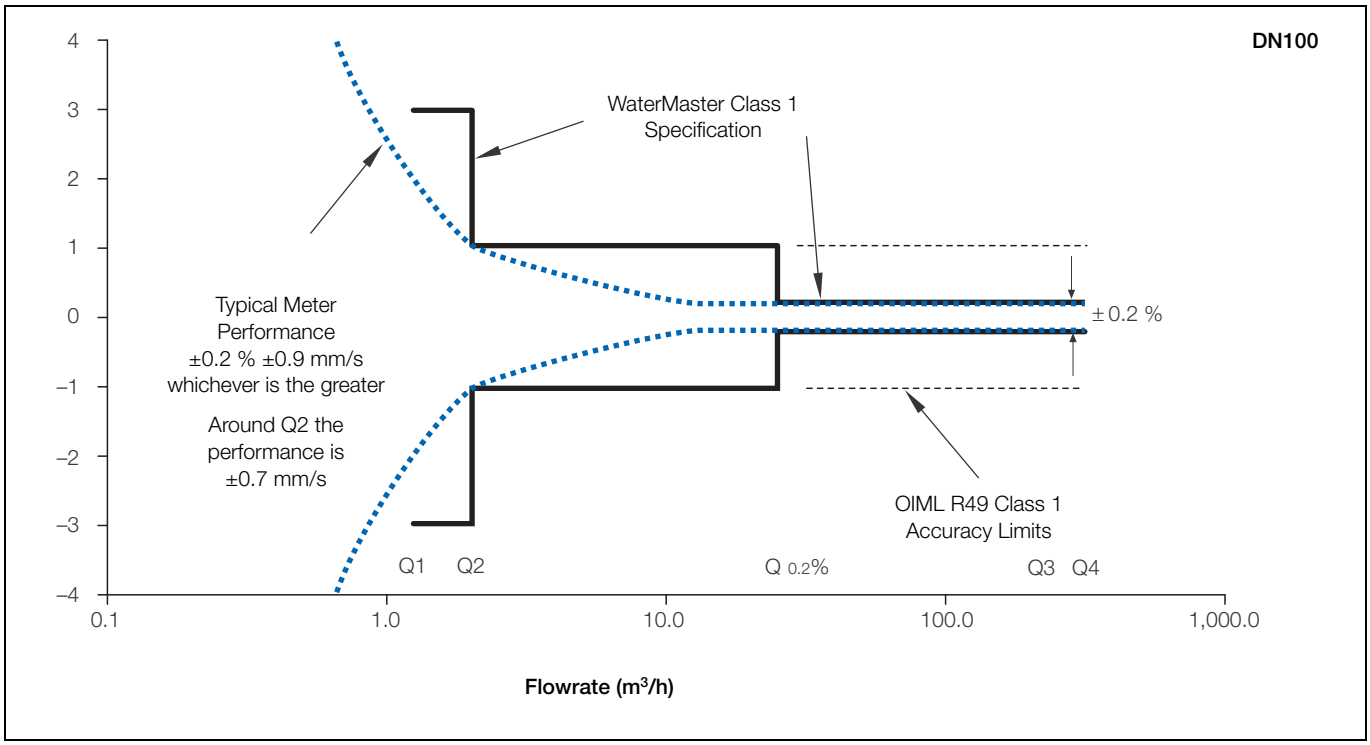
The approval is for:

- Class 1 and Class 2 accuracy (calibration option)
- Environmental class T50 for water temperatures of 0.1 °C to 50 °C
- Electromagnetic Environment E2 (10V/m)
- Any pipe orientation
- 5 Diameters upstream pipe
- 0 Diameters downstream pipe
- Pressure Loss Class <0.25 bar
- Integral or remote transmitter (<200 m cable)
- DN40 – DN200, bi-directional flow

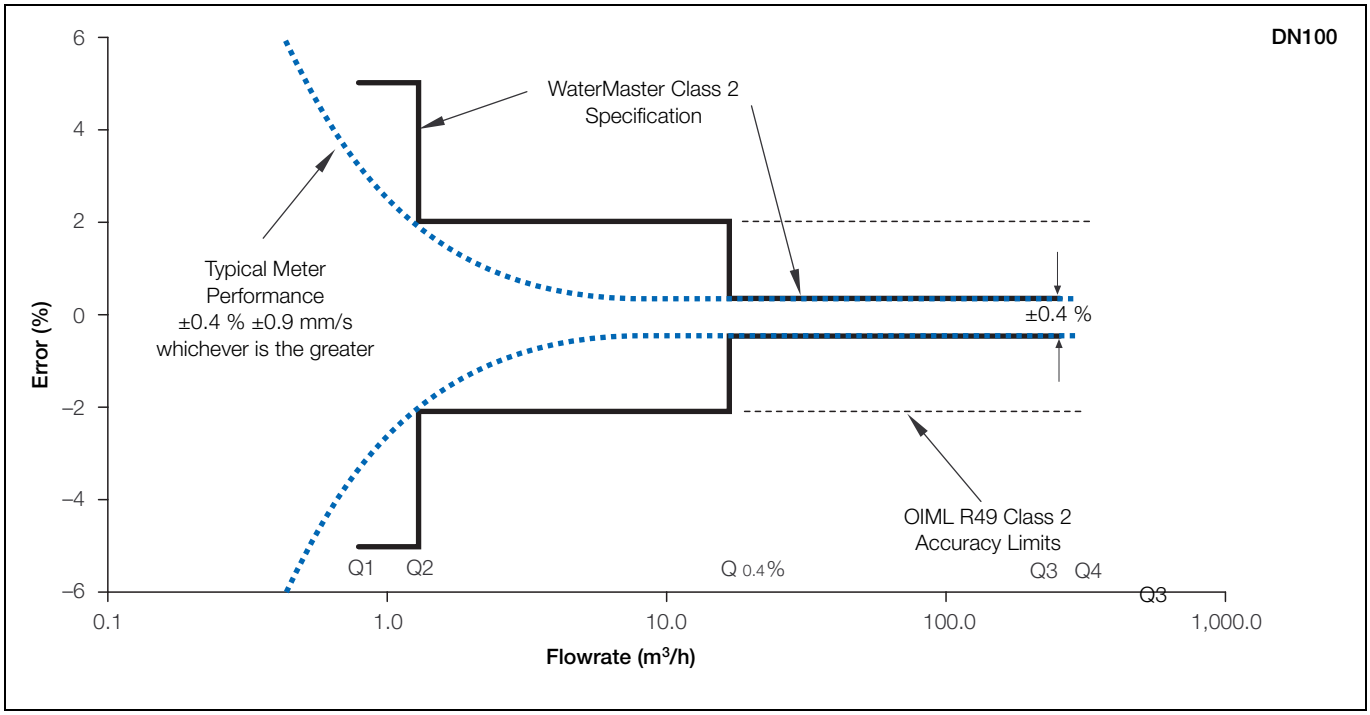
A major advance in WaterMaster is the self-checking capabilities which meet and exceed the R49 requirements and is first electromagnetic flowmeter to be approved to OIML Type P permanent self checking during normal operation (not just at startup) and alarm indication for:

- 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

WaterMaster specification to OIML R49 Class 1



WaterMaster specification to OIML R49 Class 2



Although OIML R49 does not define the flow accuracy below Q1, WaterMaster continues to measure flow at lower flow rates down to a cutoff velocity of ±5 mm/s (±0.2 in/s). The accuracy between cutoff and Q1 is typically ±0.9 mm/s (±0.04. in/s).

WaterMaster flow performance – m^3/h

			Standard Calibration 0.4 % OIML R49 Class 2			High Accuracy Calibration 0.2 % OIML R49 Class 1		
	Q4	Q3	$Q_{0.4\%}$	Q2	Q1	$Q_{0.2\%}$	Q2	Q1
DN	(m^3/h)	(m^3/h)	(m^3/h)	(m^3/h)	(m^3/h)	(m^3/h)	(m^3/h)	(m^3/h)
10	3.1	2.5	0.167	0.013	0.008	0.31	0.02	0.012
15	7.88	6.3	0.42	0.032	0.02	0.79	0.05	0.03
20	12.5	10	0.67	0.05	0.032	1.25	0.08	0.05
25	20	16	1.1	0.08	0.05	2	0.13	0.08
32	31.25	25	1.67	0.13	0.08	3	0.20	0.13
40**	50	40	4.2	0.2	0.13	6	0.32	0.2
50**	79	63	4.2	0.32	0.20	7.9	0.5	0.32
65*	125	100	6.7	0.5	0.32	12.5	0.8	0.5
80**	200	160	10.7	0.81	0.51	16	1.3	0.8
100**	313	250	16.7	1.3	0.79	25	2	1.25
125	313	250	16.7	1.3	0.79	25	2	1.25
150**	788	630	42	3.2	2.0	63	5	3.2
200**	1,250	1,000	67	5.1	3.2	100	8	5
250	2,000	1,600	107	8.1	5.1	160	13	8
300	3,125	2,500	167	12.7	7.9	250	20	12.5
350	5,000	4,000	267	20.3	12.7	400	32	20
400	5,000	4,000	267	20.3	12.7	400	32	20
450	7,875	6,300	420	32	20	630	50	32
500	7,875	6,300	420	32	20	630	50	32
600	12,500	10,000	667	51	32	1000	80	50
700	20,000	16,000	1600	102	64	1600	160	100
30 in	20,000	16,000	1600	102	64	1600	160	100
800	20,000	16,000	1600	102	64	1600	160	100
900	31,250	25,000	2500	160	100	2500	250	156
1000	31,250	25,000	2500	160	100	2500	250	156
42 in	31,250	25,000	2500	160	100	2500	250	156
1200	50,000	40,000	4000	256	160	4000	400	250
1400	78,750	63,000	6300	403	252	6300	630	394
60 in	78,750	63,000	6300	403	252	6300	630	394
1600	78,750	63,000	6300	403	252	6300	630	394
1800	125,000	100,000	10000	640	400	10000	1000	625
2000	125,000	100,000	10000	640	400	10000	1000	625
2200	200,000	160,000	16000	1024	640	16000	1600	1000

*Future option

** OIML R49 Certificate of Conformance to Class 1 and Class 2.

Note. OIML R49–1 allow Class 1 only for meters with $Q_3 \geq 100$ m^3/h. Meters outside this range have been tested and conform to Class 1.

WaterMaster flow performance – gal/min

			Standard Calibration 0.4 % OIML R49 Class 2			High Accuracy Calibration 0.2 % OIML R49 Class 1		
NPS/NB (DN)	Q4 (gal/min)	Q3 (gal/min)	$Q_{0.4\%}$ (gal/min)	Q2 (gal/min)	Q1 (gal/min)	$Q_{0.2\%}$ (gal/min)	Q2 (gal/min)	Q1 (gal/min)
3/8 (10)	13.8	11	0.73	0.06	0.035	1.38	0.09	0.053
1/2 (15)	34.7	27.7	1.85	0.14	0.09	3.48	0.22	0.14
3/4 (20)	55	44	2.94	0.22	0.14	5.5	0.35	0.22
1 (25)	88	70.4	4.7	0.35	0.22	8.8	0.57	0.35
1 1/4 (32)	137.6	110	7.3	0.57	0.35	13.2	0.88	0.57
1 1/2 (40)	220	176	18.5	0.89	0.56	26.4	1.41	0.88
2 (50)	347	277	18.5	1.41	0.88	34.7	2.22	1.39
2 1/2* (65*)	550	440	29.4	2.24	1.40	55.0	3.52	2.20
3 (80)	881	704	47.0	3.58	2.24	70.4	5.64	3.52
4 (100)	1,376	1,101	73.4	5.59	3.49	110	8.81	5.50
5* (125*)	1,376	1,101	73.4	5.59	3.49	110	8.81	5.50
6 (150)	3,467	2,774	185	14.1	8.81	277	22.2	13.9
8 (200)	5,504	4,403	294	22.4	14.0	440	35.2	22.0
10 (250)	8,806	7,045	470	35.8	22.4	704	56.4	35.2
12 (300)	13,759	11,007	734	55.9	34.9	1,101	88.1	55.0
14 (350)	22,014	17,611	1,174	89.5	55.9	1,761	141	88.1
16 (400)	22,014	17,611	1,174	89.5	55.9	1,761	141	88.1
18 (450)	34,673	27,738	1,849	141	88.1	2,774	222	139
20 (500)	34,673	27,738	1,849	141	88.1	2,774	222	139
24 (600)	55,036	44,029	2,935	224	140	4,403	352	220
27/28** (700)	88,057	70,446	7,045	451	282	7,045	704	440
30 (760)	88,057	70,446	7,045	451	282	7,045	704	440
32 (800)	88,057	70,446	7,045	451	282	7,045	704	440
36 (900)	137,590	110,072	11,007	704	440	11,007	1,100	688
39/40** (1000)	137,590	110,072	11,007	704	440	11,007	1,100	688
42 (1050)	137,590	110,072	11,007	704	440	11,007	1,100	688
48 (1200)	220,143	176,115	17,611	1,127	704	17,611	1,761	1,101
54 (1400)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
60 (1500)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
66 (1600)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
72 (1800)	550,358	440,287	44,029	2,818	1,761	44,029	4,403	2,752
78 (2000)	550,358	440,287	44,029	2,818	1,761	44,029	4,403	2,752
84 (2200)	880,573	704,459	70,446	4,509	2,818	70,446	7,045	4,403

*Future option
**Size is dependent on flange specification

Specification – sensor

Functional specification

Pressure limitations

As per flange rating – non approved
PN16 for OIML R49 Approved

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) – non approved 0.1 to 50 °C (32.2 to 122 °F) – OIML R49 T50 Approved

Environmental protection

Rating:

IP68 (NEMA 6) to 10m (33 ft) depth with fully-potted terminal box – not DN10 to DN32

IP67 (NEMA 4X) – DN10 to DN32

Buriable (sensor only)

FEWNo

FEV and FEFYes

Conductivity

>5µS 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

PTFE	(sizes DN10 to DN32 [$^3/_8$ to 1$^1/_4$ NB])
Polypropylene	(sizes DN40 to 200 [1$^1/_2$ to 8 NB])
Elastomer	(sizes DN250 to 2200 [10 to 84 NB])
WRAS listed – NSF61 approved	(sizes DN40 to 200 [1$^1/_2$ to 8 NB])
NSF	(FEW DN350 to 600) (FEW DN350 to 600) (FEV40 to 200 and FEF250 to 2200)

Electrode material

Stainless steel 316 L

Hastelloy® C-22 (Hastelloy C4 on DN10 to DN32)
(Other electrode materials available on request)

Potential equalizing rings

Optional (recommended)

Lining protection plates

Not required

Installation conditions (recommended)

Upstream ≥ 5D

Downstream ≥ 0D

Pressure loss

<0.25 bar at Q3	(sizes DN40 to 200 [1$^1/_2$ to 8 NB])
Negligible at Q3	(sizes DN10 to 32 [$^3/_8$ to 1$^1/_4$ NB], DN250 to 2200 [10 to 84 NB])

Non-wetted parts

Flange material

Carbon steel	(sizes DN20 to DN2200 [$^3/_4$ to 84 NB])
Stainless steel	(sizes DN10 to DN15 [$^3/_8$ to $^1/_2$ NB])

Housing material

Carbon steel	(sizes DN40 to 200 [1$^1/_2$ to 8 NB] and DN700 to 2200 [28 to 84 NB])
Plastic	(sizes DN250 to 600 [10 to 24 NB])
Aluminium	(FEW, sizes DN10 to DN32 [$^3/_8$ to 1$^1/_4$ NB]) (FEW, sizes DN350 to DN400 [14 to 16 NB])
Carbon steel	(FEW, sizes DN450 to DN600 [18 to 24 NB])

Terminal box material

Polycarbonate

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 ±30 % @ <0.4 A

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

Digital Outputs (3 off)

Rating 30 V @ 220 mA, open collector, galvanically isolated

Maximum output frequency 5250 Hz

1 off dedicated to Alarm / Logic, programmable function

2 off configurable to either Pulse / Frequency or Alarm/Logic function

Current output – HART FEX100 variant

4 to 20 mA or 4 to 12/20 mA, galvanically isolated

Maximum loop resistance 750 Ω

HART protocol Version 5.7 (HART registered)

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

±0.1 % of reading

Temperature coefficient: typically <±20 ppm/°C

RS485 Communications – PROFIBUS FEX100-DP variant

Registered name: FEX100-DP

RS485 (9.6kbps to 1.5Mbps), galvanically isolated

DPV0, DPV1

PA Profile 3.01

Standard idents: 9700, 9740, 9741

FEX100-DP specific ident: 3431

3 Concurrent MS2 master connections

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 <±10 ppm/°C @ Vel ≥0.5 mls

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 for MID applications

Languages

English, French, German, Italian, Spanish, Polish

Infrared service port

USB adapter (accessory), USB 1.1. and 2.0 compatible

Driver software for Windows 2000, XP, 7 and Vista

Housing material

Powder-coated aluminium with glass window

Hazardous approvals (HART variant only)

FM & FMc Class 1 Div 2

(FM listing NI / 1 / 2 / ABCD / T4, S / II, III / 2 / FG /T4,

Ta=60C; Type 4X, IP67 - for transmitter and integral mounting

Ta=70C, Type 6P, IP68 - for remote sensor type)

(FMc listing NI / 1 / 2 / ABCD / T4, DIP / II, III / 2 / FG /T4,

Ta=60C; Type 4X, IP67 - for transmitter and integral mounting

Ta=70C, Type 6P, IP68 - for remote sensor type)

FET, FEV, FEW and FEF DN700 to 2200 (27/28* to 84) only

*Size is dependent on flange specification

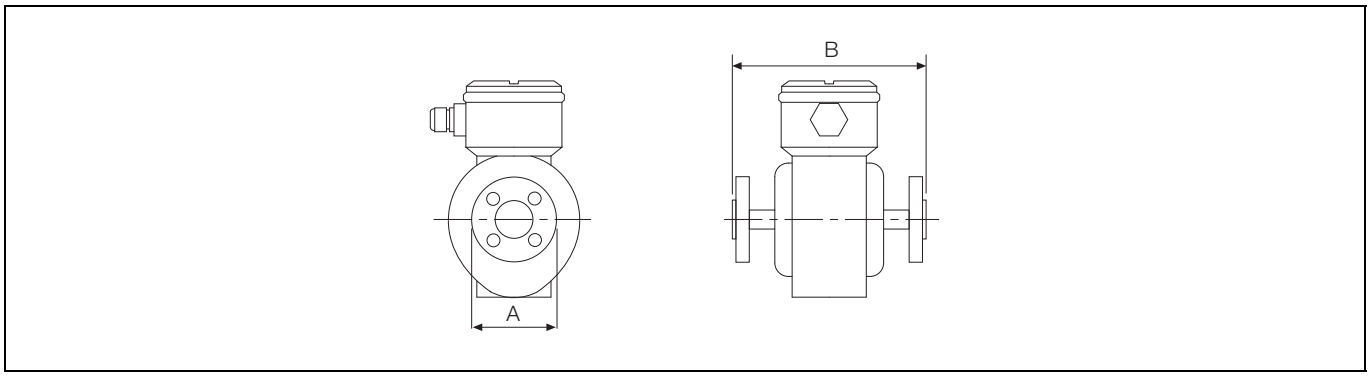
Declaration of Conformance

Copies of CE and PED certification will be available on request.

WaterMaster has OIMLR49 Certificate of Conformity to accuracy class 1 and 2. Copies of accuracy certification are available on request.

WaterMaster has been type examined under directive MID 2004/22/EC, Annex MI-001. Copies of this certificate are available on request.

Sensor dimensions

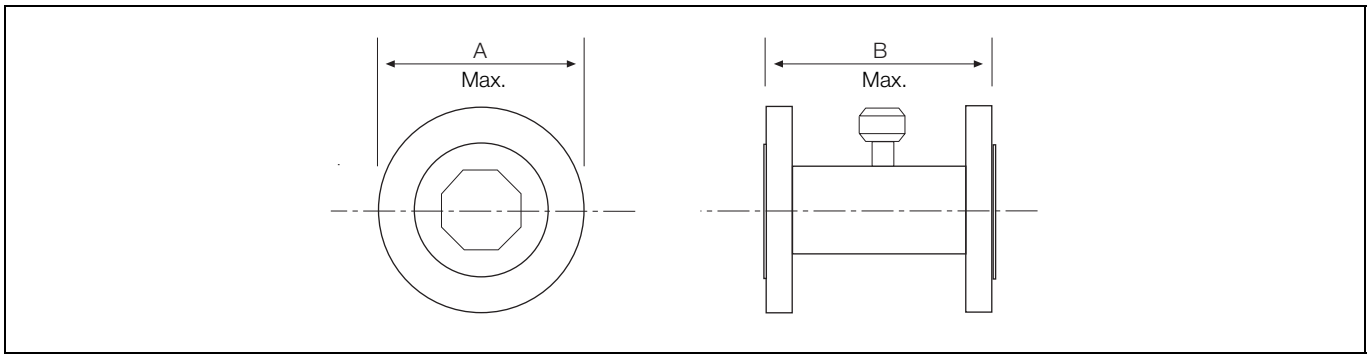


DN10 to 32 ($^{3}/_{8}$ to $1^{1}/_{4}$ NB) full-bore

Meter Size		Dimensions mm (in)		Approximate Weight	
DN	NPS/NB	A*	B	kg	lb
10	$^{3}/_{8}$	93 (3.7)	200 (7.9)	6	13.2
15	$^{1}/_{2}$	95 (3.7)	200 (7.9)	7	15.4
20	$^{3}/_{4}$	111 (4.4)	200 (7.9)	7	15.4
25	1	120 (4.7)	200 (7.9)	8	17.6
32	$1^{1}/_{4}$	137 (5.4)	200 (7.9)	10	22

*Dimensions are approximate and vary depending on flange type

DN10 to 32 ($^{3}/_{8}$ to $1^{1}/_{4}$ NB) full-bore

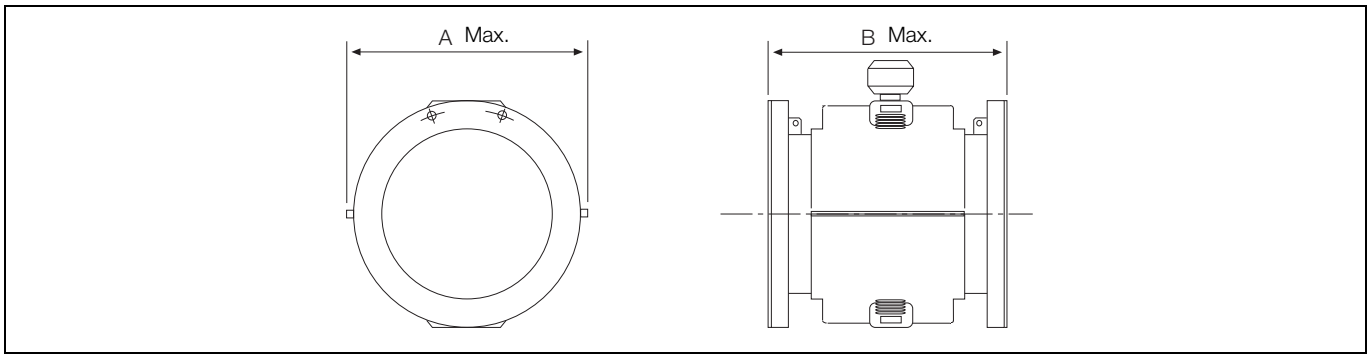


DN40 to 300 ($1^{1}/_{2}$ to 12 NB) full-bore

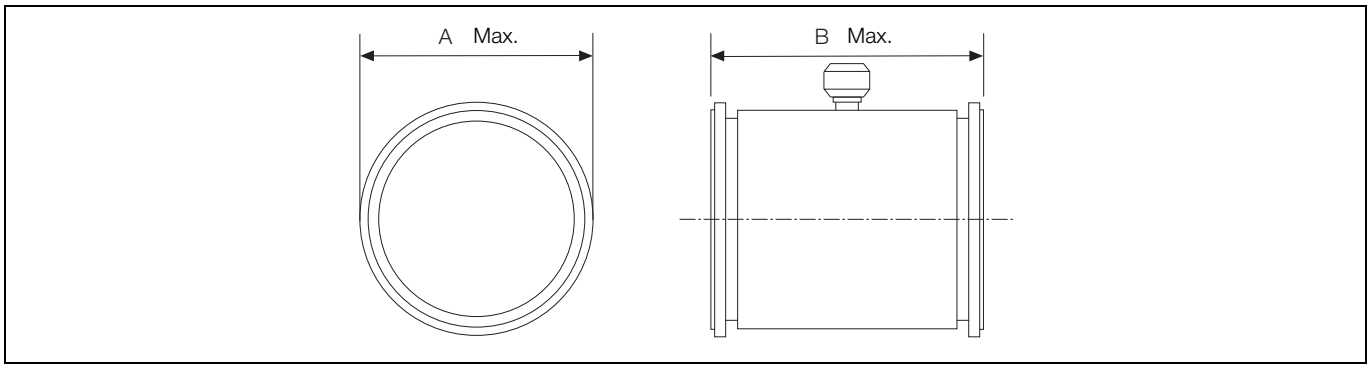
Meter Size		Dimensions mm (in)		Approximate Weight	
DN	NPS/NB	A*	B	kg	lb
40	$1^{1}/_{2}$	150 (5.9)	200 (7.9)	11	24
50	2	165 (6.5)	200 (7.9)	12	27
80	3	200 (7.9)	200 (7.9)	15	33
100	4	230 (9.1)	250 (9.8)	18	40
150	6	280 (11.0)	300 (11.8)	31	68
200	8	345 (13.6)	350 (13.8)	48	106
250	10	405 (15.9)	450 (17.7)	75	165
300	12	460 (18.1)	500 (19.7)	112	247

*Dimensions are approximate and vary depending on flange type

DN40 to 300 ($1^{1}/_{2}$ to 12 NB) full-bore



DN250 to 600 (10 to 24 NB) full-bore



DN700 to 2200 (28 to 84 NB) full-bore

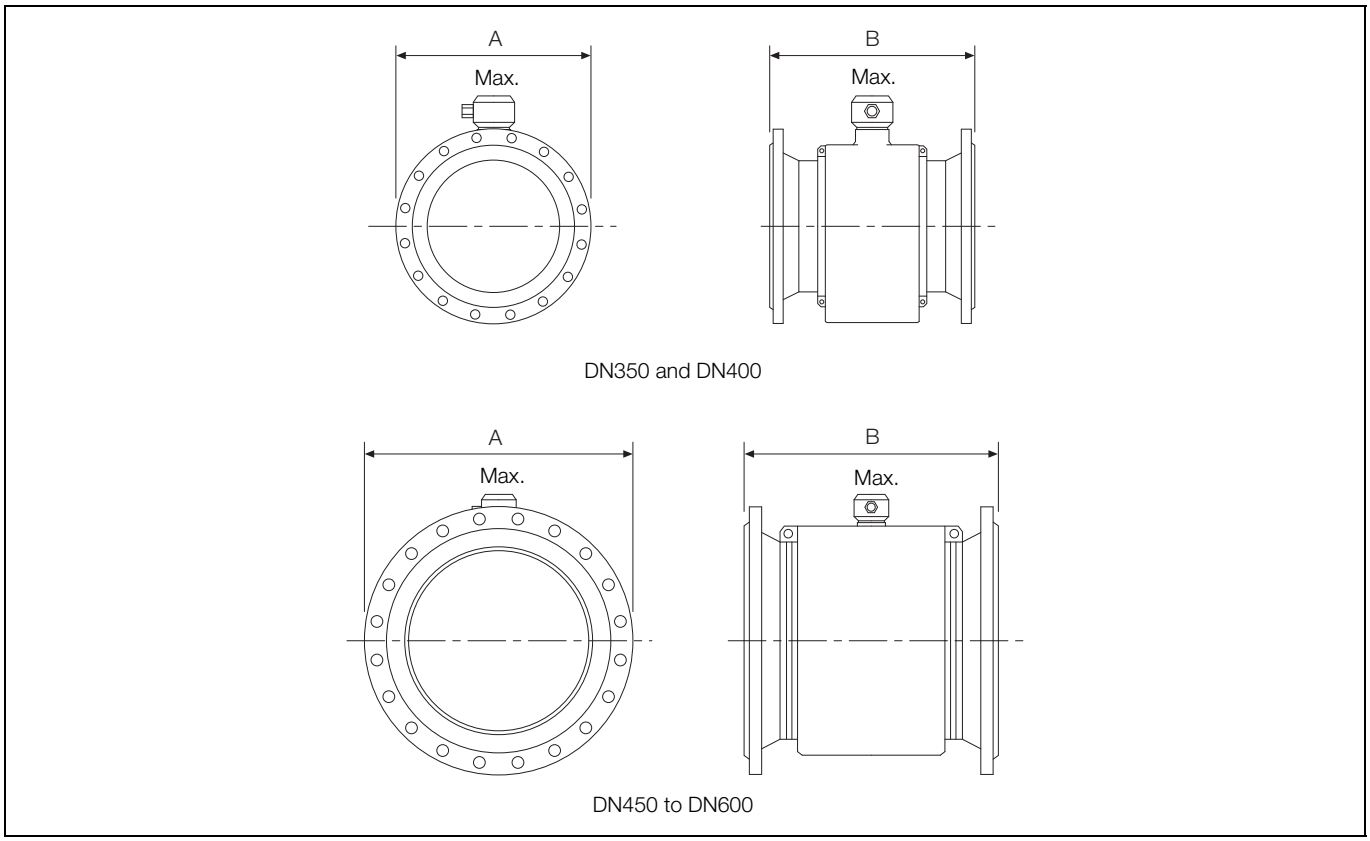
Meter Size		Dimensions in mm (in)			Approximate Weight	
DN	NPS/NB	A	B (<PN25)	B (PN25, PN40, ASME, CL300)	kg	lb
250	10	405 (15.99)	450 (17.7)**	488 (19.2)	88	194
300	12	460 (18.1)	500 (19.7)**	538 (21.2)	128	282
350	14	535 (21.1)	550 (21.7)**	568 (22.3)	100	220
400	16	600 (23.6)	600 (23.6)**	618 (24.3)	115	253
450	18	640 (25.2)	698 (27.5)**	698 (27.5)	160	352
500	20	715 (28.1)	768 (30.2)**	768 (30.2)	217	455
600	24	840 (33.1)	918 (36.1)**	918 (36.1)	315	693
700	27/28*	927 (36.5)	700 (27.6)***	–	430	945
760	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
1050	42	1405 (55.3)	1067 (42)***	–	880	1930
1100	44	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/–10 mm (0.40 in) *** +0/–20 mm (1.0 in)

DN250 to 2200 (10 to 84 NB) full-bore



DN350 to 600 (14 to 24 NB) FM – approved version

Meter Size		Dimensions in mm (in)*		Approximate Weight**	
DN	**NPS/NB**	**A**	**B**	**kg**	**lb**
350	14	585 (23.0)	550 (21.7)	145	319
400	16	690 (27.2)	600 (23.6)	179	394
450	18	711 (28.0)	686 (27.0)	189	417
500	20	775 (30.5)	752 (29.6)	195	430
600	24	914 (36.0)	914 (36.0)	275	606

* Sizes are approximate and dependent on flange specification

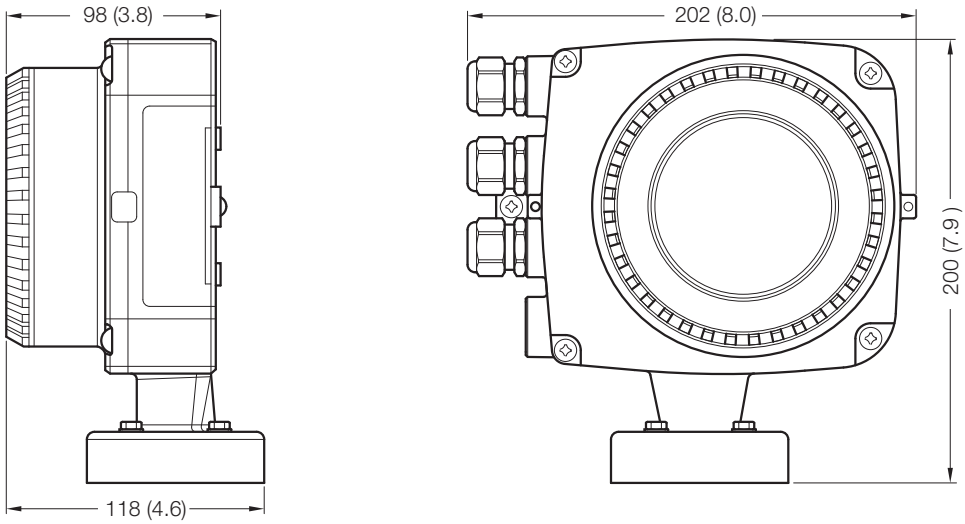
**Approximate weight for Class 150 flanges

DN350 to 600 (14 to 24 NB) FM – approved version

Transmitter dimensions

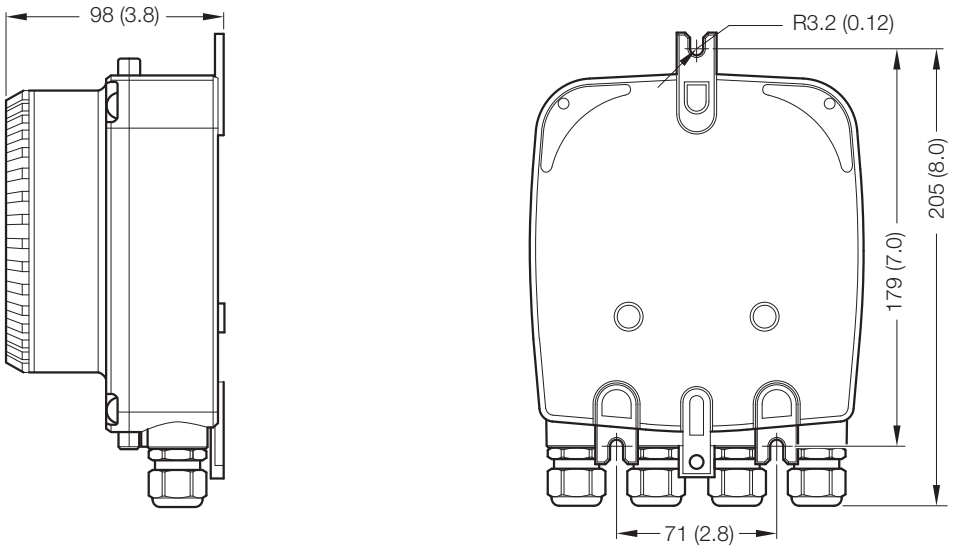
Integral transmitter

Dimensions in mm (in)

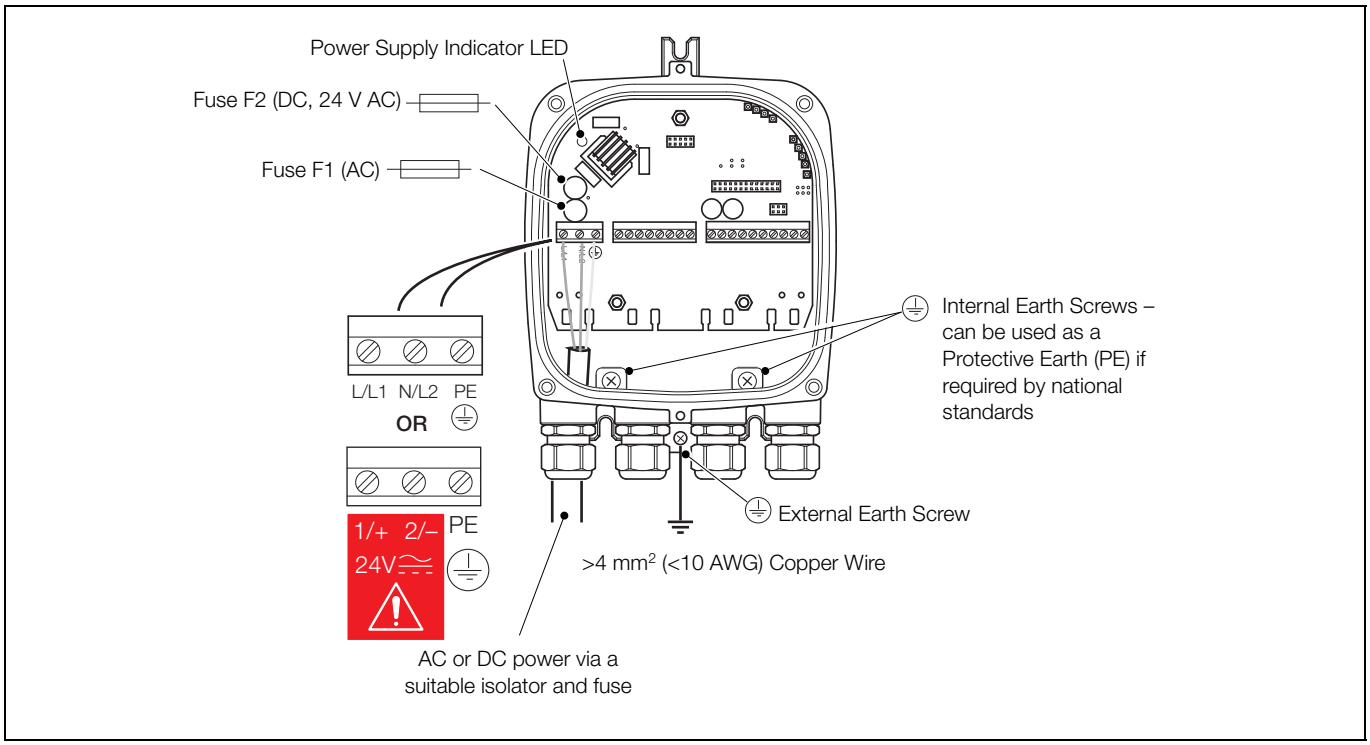


Remote transmitter

Dimensions in mm (in)



Electrical connections



AC and DC power supply connections

Ordering information

Electromagnetic flowmeter WaterMaster FEF12 and FEF18

Variant digit number	1 … 5	6	7 … 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27	Options
Flowmeter system, full bore, remote mount	**FEF12**		XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X	
Full bore sensor only, for use with WaterMaster transmitter / remote	**FEF18**																				
Design																					
Non-hazardous areas		1																			
Hazardous areas (DN≥700)		5																			
Bore diameter																					
DN250 (10 in)			250																		
DN300 (12 in)			300																		
DN350 (14 in)			350																		
DN375 (15 in)			375																		
DN400 (16 in)			400																		
DN450 (18 in)			450																		
DN500 (20 in)			500																		
DN600 (24 in)			600																		
DN700 (28 in)			700																		
30 in			760																		
DN800 (32 in)			800																		
DN900 (36 in)			900																		
DN1000 (40 in)			001																		
42 in			051																		
DN1200 (48 in)			201																		
DN1400 (54 in)			401																		
60 in			501																		
DN1600 (66 in)			601																		
DN1800 (72 in)			801																		
DN2000 (78 in)			002																		
DN2200 (84 in)			202																		
Others			999																		
Liner material																					
Elastomer				K																	
FEP				B																	
Neoprene				C																	
Linatex				J																	
Polyurethane				U																	
Electrode design																					
Standard					1																
Others					9																
Measuring electrodes material																					
Stainless steel 316						S															
Hastelloy® C-22						C															
Others						Z															
Grounding accessories																					
Standard							1														
One potential equalizing ring (stainless steel)							3														
Two potential equalizing rings (stainless steel)							4														
Others							9														

Continued on page 20

Variant digit number	1 … 5	6	7 … 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27	Options
Flowmeter system, full bore, remote mount	**FEF12**		**XXX**	**X**	**X**	**X**	**X**	**XX**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	
Full bore sensor only, for use with WaterMaster transmitter / remote	**FEF18**																				
Process connection type																					
Flanges ASME B16.5 class 150								A1													
Flanges ASME B16.5 class 300								A3													
Flanges AWWA C207 class B								C1													
Flanges AWWA C207 class D								C2													
Flanges AS 4087 PN21								E0													
Flanges AS 4087 PN16								E1													
Flanges AS 4087 PN14								E2													
Flanges AS 2129 Table F								E3													
Flanges AS 2129 Table E								E4													
Flanges AS 2129 Table D								E5													
Flanges AS 2129 Table C								E6													
Flanges JIS 10K								J1													
Flanges JIS 5K								J2													
Flanges ISO / EN PN6								S0													
Flanges ISO / EN PN10								S1													
Flanges ISO / EN PN16								S2													
Flanges ISO / EN PN25								S3													
Flanges ISO / EN PN40								S4													
Others								Z9													
Process connection material																					
Carbon steel flanges									B												
Others									Z												
Usage certifications																					
Standard										1											
Calibration type																					
Class 2 Calibration – standard accuracy 0.4 %											A										
Class 1 Calibration – enhanced accuracy 0.2 %											B										
Class 2 Calibration – standard accuracy 0.4 % with VeriMaster											D										
Class 1 Calibration – enhanced accuracy 0.2 % with VeriMaster											H										
Temperature range installation / ambient temperature range																					
Standard design / –20 … 60 °C (–4 … 140 °F)												1									
Nameplate																					
Adhesive													A								

Continued on page 21

Variant digit number	1 … 5	6	7 … 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27	Options
Flowmeter system, full bore, remote mount	**FEF12**		**XXX**	**X**	**X**	**X**	**X**	**XX**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	
Full bore sensor only, for use with WaterMaster transmitter / remote	**FEF18**																				

Signal cable length and type*

Without signal cable	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)	9

Explosion protection certification

General purpose (non-Ex design)	A
FM Class 1 Div. 2 (DN≥600, DN≤1600)	G
FMc Class 1 Div. 2 (DN≥600, DN≤1600)	P
Others	Z

Protection class transmitter / protection class sensor

IP67 (NEMA 4X) / IP68 (NEMA 6P) – cable not fitted and not potted	2
IP67 (NEMA 4X) / IP68 (NEMA 6P) – cable fitted and potted	3

Cable conduits *

M20 x 1.5	A
NPT 1/2 in	B
M20 SWA armored	D
M20 SWA sensor, output and power connector	F

Power supply

Without (FEF18 only)	0
100... 230 V AC (50 Hz)	1
24 V AC or 24 V DC (50 Hz)	2
100... 230 V AC (60 Hz)	3
24 V AC or 24 V DC (60 Hz)	4

Input and output signal type

HART + 20 mA + pulse + contact output (FEF12 only)	A
PROFIBUS DP RS485 physical layer + pulse + contact output (FEF121 only)	G
Without (FEF181 only)	Y

Configuration type / diagnostics type

Without (FEF18 only)	0
Factory defaults / standard diagnostics (FEF12 only)	1

Options**

Documentation language

German	M1	English	M5 (default)
Italian	M2	Portuguese	MA
Spanish	M3	Russian	MB
French	M4	Danish	MF

Power supply frequency (sensor FEF 18 only)

50 Hz	F5	60 Hz	F6

* The type of signal cable supplied (standard or armored) depends on the type of cable conduit (variant digit number 24) ordered.
For FM or FMC Approved versions, NPT only permitted.

**Add codes for options.

Electromagnetic flowmeter WaterMaster FEV11, FEV12 and FEV18

Variant digit number	1 … 5	6	7 … 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27	Options
Flowmeter system, optimized full bore, integral mount	**FEV11**																				
Flowmeter system, optimized full bore, remote mount	**FEV12**		XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X	
Optimized full bore sensor only, for use with WaterMaster transmitter/remote	**FEV18**																				
Design																					
Non-hazardous areas		1																			
Hazardous areas		5																			
Bore diameter																					
DN40 (1½ in)			040																		
DN50 (2 in)			050																		
DN80 (3 in)			080																		
DN100 (4 in)			100																		
DN125 (5 in)			125																		
DN150 (6 in)			150																		
DN200 (8 in)			200																		
Liner material																					
Polypropylene				V																	
Electrode design																					
Standard					1																
Measuring electrodes material																					
Stainless steel 316						S															
Hastelloy® C-22						C															
Grounding accessories																					
Standard							1														
One potential equalizer ring							3														
Two potential equalizer rings							4														
Process connection type																					
Flanges ASME B16.5 class 150								A1													
Flanges AS 4087 PN21 (≥ DN50 [2 NB])								E0													
Flanges AS 4087 PN16 (≥ DN50 [2 NB])								E1													
Flanges AS 4087 PN14								E2													
Flanges AS 2129 Table F								E3													
Flanges AS 2129 Table E								E4													
Flanges AS 2129 Table D								E5													
Flanges AS 2129 Table C								E6													
Flanges JIS 7.5K (≥ DN80 [3 NB])								J0													
Flanges JIS 10K								J1													
ISO/EN PN10								S1													
ISO / EN PN16 (≥ DN50 [2 NB])								S2													
ISO / EN PN40 (DN40 [1½ NB] only) 16 bar rated								S4													
Process connection material																					
Carbon steel flanges									B												
Usage certifications																					
Standard										1											
Calibration type																					
Class 2 Calibration – standard accuracy 0.4 %, OIML* R49 Approved											A										
Class 1 Calibration – enhanced accuracy 0.2 %, OIML* R49 Approved											B										
Class 2 Calibration – standard accuracy 0.4 %, OIML* R49 with VeriMaster											D										
Class 1 Calibration – high accuracy 0.2 %, OIML* R49 with VeriMaster											H										
Class 2 Extended Range Calibration – standard accuracy 0.4 %, MID* with VeriMaster											V										
Class 1 Extended Range Calibration – high accuracy 0.2 %, MID* with VeriMaster											S										

* OIML & MID options are available only in FEV, DN40, DN50, DN80, DN100, DN125, DN150, DN200

Continued on page 23

Variant digit number	1 … 5	6	7 … 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27	Options
Flowmeter system, optimized full bore, integral mount	**FEV11**																				
Flowmeter system, optimized full bore, remote mount	**FEV12**		**XXX**	**X**	**X**	**X**	**X**	**XX**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	
Optimized full bore sensor only, for use with WaterMaster transmitter/remote	**FEV18**																				
Temperature range installation / ambient temperature range																					
Standard design/ –20 … 60 °C (–4 … 140 °F)												1									
Nameplate																					
Adhesive													A								
Signal cable length and type *																					
Without signal cable														0							
5 m (15 ft.) cable (FEV12 and FEV18 only)														1							
10 m (30 ft.) cable (FEV12 and FEV18 only)														2							
20 m (60 ft.) cable (FEV12 and FEV18 only)														3							
30 m (100 ft.) cable (FEV12 and FEV18 only)														4							
50 m (165 ft.) cable (FEV12 and FEV18 only)														5							
80 m (260 ft.) cable (FEV12 and FEV18 only)														6							
100 m (325 ft.) cable (FEV12 and FEV18 only)														7							
150 m (490 ft.) cable (FEV12 and FEV18 only)														8							
Special Length > 150 m (> 490 ft.) (FEV12 and FEV18 only)														9							
Explosion protection certification																					
General purpose (non-Ex design)															A						
FM Class 1 Div. 2															G						
FMc Class 1 Div. 2															P						
Others															Z						
Protection class transmitter / protection class sensor																					
IP67 (NEMA 4X) / IP67 (NEMA 4X) – integral (FEV11 only)																1					
IP67 (NEMA 4X) / IP68 (NEMA 6P) – cable not fitted and not potted (FEV12 and FEV18 only)																2					
IP67 (NEMA 4X) / IP68 (NEMA 6P) – cable fitted and potted (FEV12 and FEV18 only)																3					
Cable conduits *																					
M20 x 1.5																	A				
NPT 1/2 in																	B				
M20 SWA armored (FEV121 and FEV181 only)																	D				
M20 SWA sensor, output and power connector (FEV121 and FEV181 only)																	F				
Power supply																					
Without (FEV181 only)																		0			
100... 230 V AC, 50 Hz																		1			
24 V AC or 24 V DC, 50 Hz																		2			
100... 230 V AC, 60 Hz																		3			
24 V AC or 24 V DC, 60 Hz																		4			
Others																		9			
Input and output signal type																					
HART + 20 mA + pulse + contact output (FEV11 and FEV12 only)																			A		
PROFIBUS DP RS485 physical layer + pulse + contact output (FEV111 and FEV121 only)																			G		
Without (FEV181 only)																			Y		
Configuration type / diagnostics type																					
Without (FEV18 only)																				0	
Factory defaults / standard diagnostics (FEV11 and FEV12 only)																				1	

Options**

Documentation language

German	M1	English	M5 (default)
Italian	M2	Portuguese	MA
Spanish	M3	Russian	MB
French	M4	Danish	MF

Power supply frequency (sensor FEV18 only)

50 Hz	F5	60 Hz	F6

* The type of signal cable supplied (standard or armored) depends on the type of cable conduit (variant digit number 24) ordered.
For FM or FMC Approved versions, NPT only permitted.

**Add codes for options.

Electromagnetic flowmeter transmitter for WaterMaster FET10 and FET12

Variant digit number	1 … 5	6	7	8	9	10	11	12	13	14	15	Options
Transmitter cartridge	**FET10**		X	X	X	X	X	X	X	X	X	
Remote transmitter	**FET12**											
Design												
Non-hazardous area		1										
Hazardous area		5										
Temperature range installation / ambient temperature range												
Standard design / –20 … 60 °C (–4 … 140 °F)			1									
Nameplate												
Adhesive				A								
Signal cable length and type												
Without signal cable					0							
Explosion protection certification												
Without (transmitter only)						Y						
FM Class 1 Div. 2						G						
FMc Class 1 Div. 2						P						
Others						Z						
Protection class transmitter / protection class sensor												
IP67 (NEMA 4X) / IP67 (NEMA 4X)							1					
Cable conduits												
M20 x 1.5 (FET121 only)								A				
NPT 1/2 in (FET121 only)								B				
M20 SWA armored (FET121 only)								D				
M20 Plastic power/output + M20 SWA armored sensor cable entry (FET121 only)								F				
Power supply												
100... 230 V AC									1			
24 V AC or 24 V DC									2			
Input and output signal type*												
HART + 20 mA + pulse + contact output										A		
PROFIBUS DP RS485 physical layer + pulse + contact output (FET101 and FET121 only)										G		
Configuration type / diagnostics type												
Factory defaults/standard diagnostics											1	
Options**												

Documentation language

German	M1	English	M5 (default)
Italian	M2	Portuguese	MA
Spanish	M3	Russian	MB
French	M4	Danish	MF

*The transmitter cartridge Input and Output Signal Type must match the transmitter backplane output configuration (HART or PROFIBUS) – see IM/WM.
**Add codes for options.

Electromagnetic flowmeter WaterMaster – FEW11, FEW12 and FEW18

Variant digit number	1 … 5	6	7 … 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27	Options
Flowmeter system – full bore, integral mount (DN10 to DN32 Only)	**FEW11**																				
Flowmeter system – full bore, remote mount	**FEW12**		**XXX**	**X**	**X**	**X**	**X**	**XX**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	
Full bore sensor only – for use with WaterMaster transmitter/remote	**FEW18**																				
Design																					
Non-hazardous areas		1																			
Hazardous areas		5																			
Bore diameter																					
DN10 (3/8 in)			010																		
DN15 (1/2 in)			015																		
DN20 (3/4 in)			020																		
DN25 (1 in)			025																		
DN32 (1 1/4 in)			032																		
DN350 (14 in) (FEW12 and FEW 18 only)			350																		
DN400 (16 in) (FEW12 and FEW 18 only)			400																		
DN450 (18 in) (FEW12 and FEW 18 only)			450																		
DN500 (20 in) (FEW12 and FEW 18 only)			500																		
DN600 (24 in) (FEW12 and FEW 18 only)			600																		
Liner material																					
PTFE (DN10 to 32 only)				A																	
Elastomer NSF (DN350 to 600 only)				M																	
Electrode design																					
Standard					1																
Other					9																
Measuring electrodes material																					
Hastelloy® C-4 (2.4610) – DN10 to DN32						D															
Stainless steel 316 (1.4571) – DN350 to DN600						S															
Grounding accessories																					
Not required							0														
One potential equalizing ring (stainless steel)							3														
Two potential equalizing rings (stainless steel)							4														
Other							9														

Continued on page 26

Variant digit number	1 … 5	6	7 … 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27	Options
Flowmeter system – full bore, integral mount (DN10 to DN32 Only)	**FEW11**																				
Flowmeter system – full bore, remote mount	**FEW12**		**XXX**	**X**	**X**	**X**	**X**	**XX**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	
Full bore sensor only – for use with WaterMaster transmitter/remote	**FEW18**																				
Process connection type																					
ASME B16.5 B class 150								A1													
ASME B16.5 B class 300								A3													
ISO / EN PN40 – DN10 to DN32 only								S4													
Other								Z9													
Process connection material																					
Carbon steel flanges – DN20 to DN32 and DN350 to DN600									B												
Stainless steel flange 1.4571 (316 Ti) – DN10 to DN15									D												
Other									Z												
Usage certifications																					
Standard (without PED)										1											
Other										9											
Calibration type																					
Class 2 calibration – without fingerprint											A										
Class 1 calibration – without fingerprint											B										
Class 2 calibration – with VeriMaster											D										
Class 1calibration – with VeriMaster											H										
Temperature range installation / ambient temperature range																					
Standard design/ –20 … 60 °C (–4 … 140 °F)												1									
Nameplate																					
Adhesive													A								
Signal cable length and type																					
Without signal cable														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 or cable type														9							
Explosion protection certification																					
General purpose															A						
FM Class 1 Div. 2															G						
FMc Class 1 Div. 2															P						
Others															Z						

Continued on page 27

Variant digit number	1 … 5	6	7 … 9	10	11	12	13	14, 15	16	17	18	19	20	21	22	23	24	25	26	27	Options
Flowmeter system – full bore, integral mount (DN10 to DN32 Only)	**FEW11**																				
Flowmeter system – full bore, remote mount	**FEW12**		**XXX**	**X**	**X**	**X**	**X**	**XX**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	
Full bore sensor only – for use with WaterMaster transmitter/remote	**FEW18**																				

Protection class transmitter / protection class sensor

IP67 (NEMA 4X) / IP67 (NEMA 4X) – cable not fitted and potted to sensor (DN10 to DN32 only)	1
IP67 (NEMA 4X) / IP68 (NEMA 6P) – cable not fitted and potted to sensor (DN350 to DN600 only)	2
IP67 (NEMA 4X) / IP68 (NEMA 6P) – cable fitted and potted to sensor (DN350 to DN600 only)	3
IP67 (NEMA 4X) / IP67 (NEMA 4X) – cable fitted and potted to sensor (DN10 to DN32 only)	7

Cable conduits *

M20 (Plastic) – glands: all 20 mm plastic	A
NPT 1/2 in (blanked) – no glands or conduit adaptors supplied	B
M20 SWA (armored) – glands: all 20 mm armored	D
M20 SWA sensor, M20 others – glands: 20 mm armored for sensor connections, plastic for other connections	F
Not required	Y
Other	Z

Power supply

Without	0
100... 230 V AC, 50 Hz	1
24 V AC or 24 V DC, 50 Hz	2
100... 230 V AC, 60 Hz	3
24 V AC or 24 V DC, 60 Hz	4

Input and output signal type

HART + 20 mA + pulse + contact output	A
PROFIBUS DP RS485 physical layer and contact output (FEW111 and FEW121 only)	G
Without	Y

Configuration type / diagnostics type

Not required (FEW18 only)	0
Standard / Standard (FEW11 and FEW12 only)	1

Options**

Documentation language

German	M1	English	M5 (default)
Italian	M2	Portuguese	MA
Spanish	M3	Russian	MB
French	M4	Danish	MF

Power supply frequency (sensor FEW 18 only)

50 Hz	F5	60 Hz	F6

* For FM or FMC Approved versions, NPT only permitted.
** Add codes for options.

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