Data sheet DS/WM–EN Rev. W

WaterMaster
Electromagnetic flowmeter

Measurement made easy

The perfect fit for all water and waste water applications

State-of-the-art technology
— revolutionary data storage enables transmitter interchange and commissioning without the need for re-configuration
— self-calibrating transmitter with ultra-low temperature coefficient for highest accuracy

Versatile and simple configuration
— 'Through-the-Glass' (TTG) configuration eliminating the need to remove the cover
— smart key based functionality
— 'Easy Setup' function

VeriMaster in situ verification software option
— enables the customer to perform in situ verification of the flowmeter system

Unparalleled service ability
— fault-finding Help texts on the display
— minimized downtime with replaceable electronics cartridges

MID and OIML R49 approved with R49 self-checking
— type-approved to accuracy Class 1 and Class 2 for any pipe orientation and bidirectional flows
— type P-approved continuous self-checking of the sensor and transmitter to ensure the highest accuracy and long term performance

Innovative sensors for all applications
— optimized full-bore series for optimum turndown / low pressure drop, irrigation applications
— full-bore series for general-purpose water metering applications
— reduced-bore series for high turn down applications, for example, leakage
— buriable sensors eliminate the need for costly chamber construction

HART, Profibus DP and Modbus
— full system and PLC integration

The Company

ABB is 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 world leader in process automation technology our worldwide presence, comprehensive service and application-oriented know-how make ABB a leading supplier of flow measurement products.

Introduction

Setting the standard for the Water Industry

The WaterMaster range, available in sizes 10 to 2400 mm ($^3/_8$ to 96 in.), is designed specifically for use on the many diverse applications encountered in the Water and Waste-water industry. The modular design concept offers flexibility, cost-saving operation and reliability while providing a long service life and exceptionally low maintenance.

Integration into ABB asset management systems and use of the self-monitoring and diagnostic functions increase the plant availability and reduce downtimes.

VeriMaster – the verification tool

An easy-to-use utility, available through the infra red service port. 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.

Diagnostic functions

Using its diagnostic functions, the flowmeter monitors both its own operability and the process. Limit values for the diagnostic parameters can be set locally. When these limits are exceeded, an alarm is tripped. In the event of an error, diagnostic-dependent help text appears on the display. This considerably simplifies and accelerates the troubleshooting procedure.

In accordance with NAMUR NE107, alarms and warnings are classified with the status of 'Maintenance Required', 'Check Function', 'Failure' and 'Out of Specification'.

Flow performance

Utilizing its advanced filtering methods, the WaterMaster improves accuracy even under difficult conditions. WaterMaster has an operating flow range with ±0.4 % accuracy as standard (±0.2 % optional) in both forward and reverse flow directions.

Easy and quick commissioning

'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 potential for error.

Intuitive, convenient navigation

The 'Easy Setup' function reliably guides unpracticed users through the menu step by step. The smart key based functionality makes handling a breeze – it's just like using a cell phone. During configuration, the permissible range of each parameter is indicated on the display and invalid entries are rejected.

Universal transmitter – powerful and flexible

The backlit display can be rotated easily without the need for tools. The contrast is adjustable and the display fully-configurable. The character size, number of lines and display resolution (number of decimal points) can be set as required. In multiplex mode, several different display options can be pre-configured and invoked one after the other.

The smart modular design of the transmitter unit enables easy disassembly without the need to unscrew cables or unplug connectors. HART is used as the standard communications protocol. Optionally, the transmitter is available with PROFIBUS DP or MODBUS communication.

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 flowmeter.

WaterMaster – always the first choice

WaterMaster sets the standard for the 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.

Submersible and buriable

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 that are susceptible to flooding.

A unique feature of the WaterMaster sensors is that sizes DN40 to DN2400 ($1^1/_2$ to 96 in. NB) are buriable; installation simply involves excavating to the underground pipe, fitting the sensor, cabling back to the transmitter and then backfilling the hole.

The WaterMaster family

Overview of the WaterMaster

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

- bi-directional flow
- unique self-calibrating transmitter (patented) 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 DP (RS485), MODBUS (RS485)
- 3 configurable pulse / frequency and alarm outputs
- advanced infrared service port supports remote HMI, HART, cyclic data out and parameter download
- VeriMaster in situ verification software available as option
- read-only switch and ultra-secure service password for total security

OIML / MID approved

WaterMaster has been type tested and Internationally approved to the highest accuracy class 1 and 2 for cold and hot potable water meters – 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 EN14154 and ISO4064.

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 (1½ to 8 in. NB).

The approval is for:

- Class 1 and Class 2 accuracy (calibration option)
- Environmental class T50 for water temperatures of 0.1 to 50 °C (32.18 to 122 °F)
- Electromagnetic Environment E2 (10 V/m)
- Any pipe orientation
- 5 Diameters upstream pipe
- 0 Diameters downstream pipe
- Pressure Loss Class <0.25 bar (3.62 psi)
- Integral or remote transmitter (<200 m [<656 ft.] cable)
- DN40 to DN200 (1½ to 8 in. NB), bi-directional flow

A major advance in WaterMaster is the self-checking capabilities that meet and exceed the R49 requirements and is the 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

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

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

WaterMaster is also approved under the EU Measuring Instruments Directive (MID) 2004/22/EC, that covers putting into use water flowmeters 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

Superior control through advanced sensor design

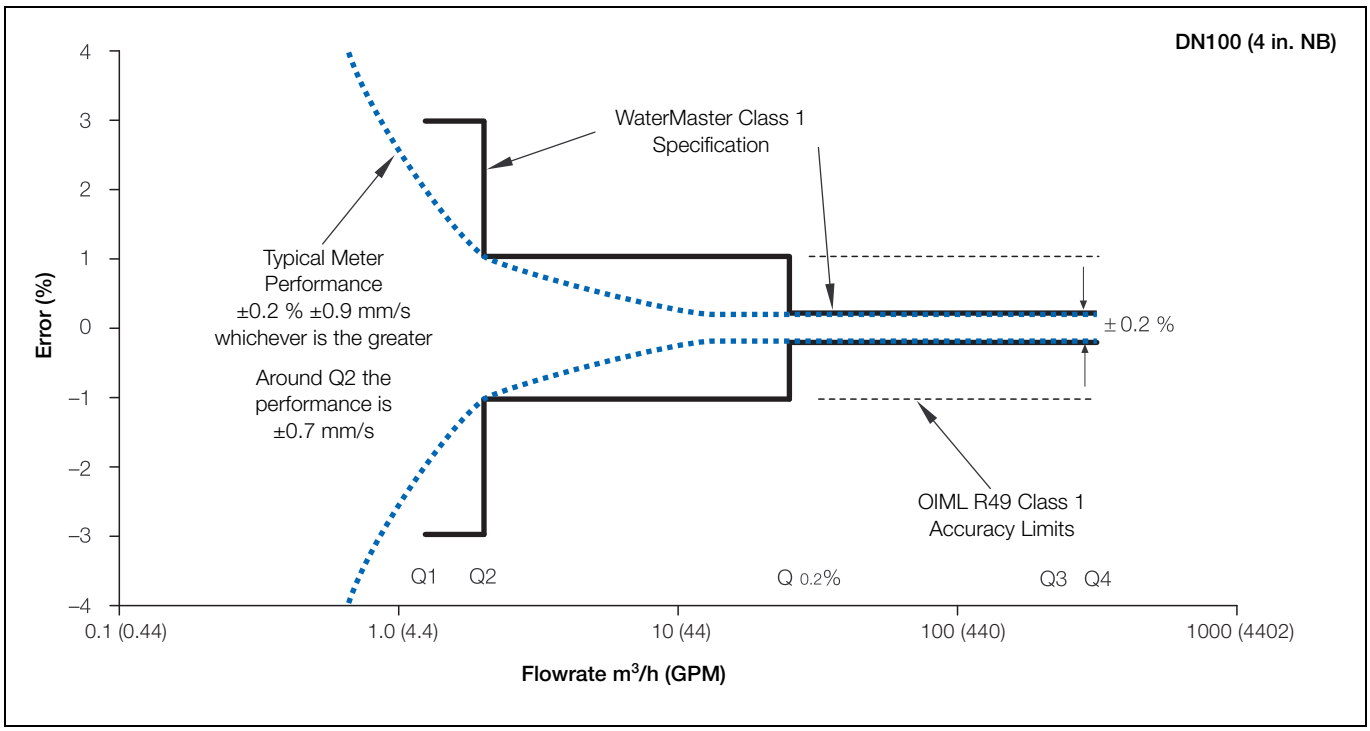
The innovative, patented octagonal sensor design improves flow profile and reduces up- and down-stream piping requirements for the most commonly used sizes of 40 to 200 mm (1½ to 8 in.). This optimized full bore meter provides impressive results in the most difficult of installation requirements.

WaterMaster sensors are also available in reduced-bore geometries giving the ultimate in low-flow performance with a very high turn-down range.

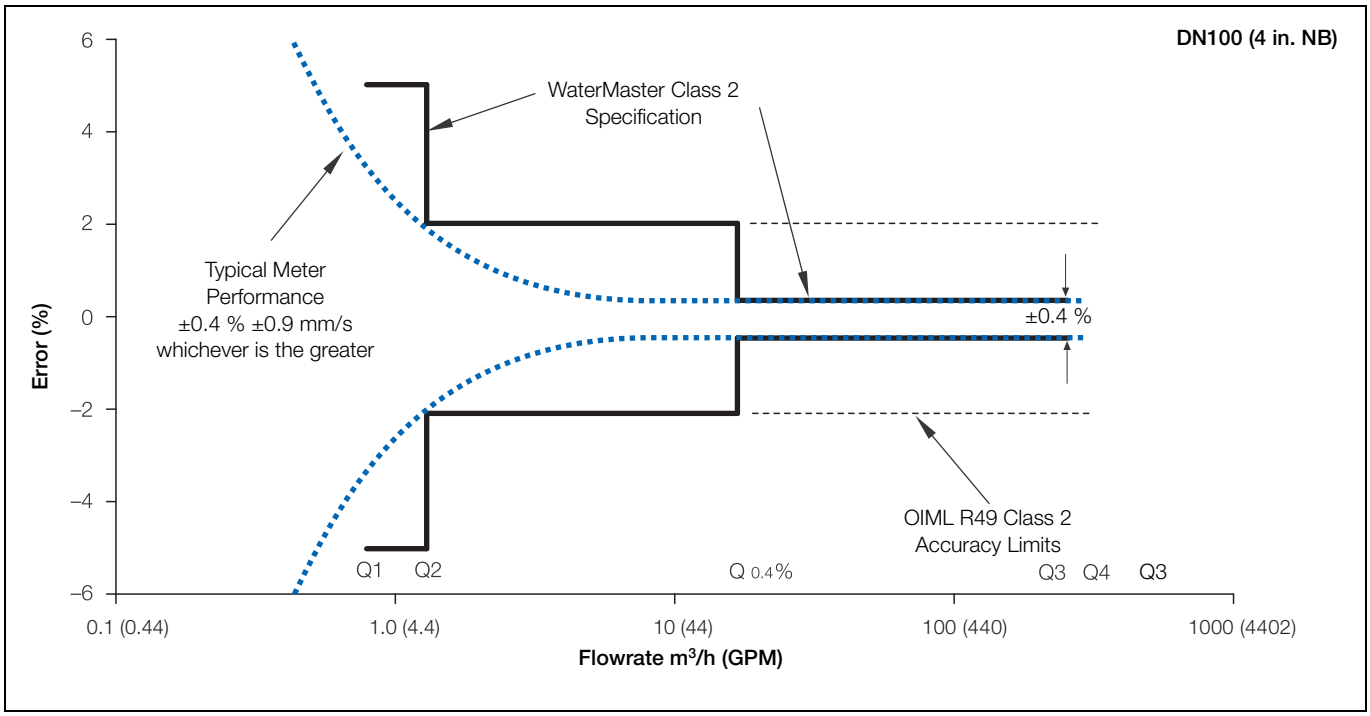
The unique design of the reduced-bore sensor conditions the flow profile in the measuring section so that distortions in the flow profile, either upstream or downstream, are flattened. The result is excellent in situ flowmeter performance, even with very bad hydraulic installation conditions.

Specification

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 optimized full-bore meter (FEV) / full-bore meters (FEF, FEW) flow performance – m^3/h

			Standard Calibration – 0.4 % Class 2			High Accuracy Calibration – 0.2 % Class 1		
DN	Q4	Q3	$Q_{0.4\%}$	Q2	Q1	$Q_{0.2\%}$	Q2	Q1
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
750	20,000	16,000	1600	102	64	1600	160	100
30 in (750)	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
1100	31,250	25,000	2500	160	100	2500	250	156
1200	50,000	40,000	4000	256	160	4000	400	250
1350	78,750	63,000	6300	403	252	6300	630	394
1400	78,750	63,000	6300	403	252	6300	630	394
1500	78,750	63,000	6300	403	252	6300	630	394
60 in (1500)	78,750	63,000	6300	403	252	6300	630	394
1600	78,750	63,000	6300	403	252	6300	630	394
1650	78,750	63,000	6300	403	252	6300	630	394
1800	125,000	100,000	10000	640	400	10000	1000	625
1950	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
2400	200,000	160,000	16000	1024	640	16000	1600	1000

* OIML R49 Certificate of Conformance to Class 1 and Class 2, with OIML R49 and MID versions available.

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 optimized full-bore meter (FEV) / full-bore meters (FEF, FEW) flow performance – gal/min

			Standard Calibration 0.4 % Class 2			High Accuracy Calibration 0.2 % Class 1		
NPS/NB (DN)	Q4	Q3	$Q_{0.4\%}$	Q2	Q1	$Q_{0.2\%}$	Q2	Q1
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 (750)	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
44 (1100)	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
52 (1350)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
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
68 (1650)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
77 (1800)	550,358	440,287	44,029	2,818	1,761	44,029	4,403	2,752
77 (1950)	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
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
96 (2400)	880,573	704,459	70,446	4,509	2,818	70,446	7,045	4,403

*Size is dependent on flange specification

WaterMaster reduced-bore meter (FER) flow performance – m^3/h (gal/min)

				Class 2 specification				Class 1 specification			
Size		Q_4	Q_3	$Q_{0.4\ \%}$	Q_2	Q_1	R	$Q_{0.2\ \%}$	Q_2	Q_1	R
mm	in.	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)		m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	
40	1 1/2	31 (138)	25 (110)	0.83 (1.05)	0.063 (0.28)	0.04 (0.18)	630	1.7 (7.48)	0.1 (0.44)	0.063 (0.28)	400
50	2	50 (220)	40 (176)	1.0 (4.40)	0.1 (0.44)	0.063 (0.28)	630	2.0 (8.8)	0.16 (0.7)	0.1 (0.44)	400
65	2 1/2	79 (347)	63 (277)	1.6 (7.04)	0.16 (0.7)	0.1 (0.44)	630	3.2 (10.56)	0.25 (1.1)	0.16 (0.7)	400
80	3	125 (550)	100 (440)	2.0 (8.80)	0.25 (1.1)	0.16 (0.7)	630	4.0 (17.6)	0.4 (1.76)	0.25 (1.1)	400
100	4	200 (880)	160 (704)	3.2 (10.56)	0.41 (1.8)	0.25 (1.1)	630	6.4 (28)	0.64 (2.8)	0.4 (1.76)	400
125	5	200 (880)	160 (704)	3.2 (10.56)	0.41 (1.8)	0.25 (1.1)	630	6.4 (28)	0.64 (2.8)	0.4 (1.76)	400
150	6	500 (2200)	400 (1760)	8.0 (35.20)	1.0 (4.4)	0.63 (2.77)	630	16 (70.4)	1.6 (7)	1.0 (4.4)	400
200	8	788 (3470)	630 (2770)	13.0 (57.2)	1.6 (7.04)	1.0 (4.4)	630	25 (110)	2.5 (11)	1.6 (7)	400
250	10	1250 (5500)	1000 (4400)	20 (88)	2.5 (11.01)	1.6 (7)	630	40 (176)	4.0 (17.6)	2.5 (11)	400
300	12	2000 (8810)	1600 (7045)	32 (140.8)	4.1 (18.05)	2.5 (11)	630	64 (281.6)	6.4 (28)	4.0 (17.6)	200
350	14	2000 (8810)	1600 (7045)	32 (140.8)	6.4 (28.18)	4.0 (17.6)	400	64 (281.6)	12.8 (56)	8.0 (35.2)	200
375	15	2000 (8810)	1600 (7045)	32 (140.8)	6.4 (28.18)	4.0 (17.6)	400	64 (281.6)	12.8 (56)	8.0 (35.2)	200
400	16	3125 (13760)	2500 (11007)	50 (220)	10 (44)	6.3 (27.7)	400	100 (440)	20 (88)	12.5 (55)	200
450	18	3125 (13760)	2500 (11007)	50 (220)	10 (44)	6.3 (27.7)	400	100 (440)	20 (88)	12.5 (55)	200
500	20	5000 (22014)	4000 (17610)	80 (352)	16 (70.45)	10 (44)	400	160 (70.4)	32 (141)	20 (88)	200
600	24	7875 (34670)	6300 (27740)	126 (554.4)	25.2 (110.9)	15.8 (70)	400	252 (1108)	50.4 (222)	31.5 (138.7)	200

Specification – sensor

Functional specification

Pressure limitations

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

Pressure equipment directive 97/23/EC

This product is applicable in networks for the supply, distribution and discharge of water and associated equipment and is therefore exempt.

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	See table below. 0.1 to 50 °C (32.2 to 122 °F) – OIML R49 T50 Approved

			Medium temperature °C (°F)	
Code	**Lining**	**Flange material**	**Minimum**	**Maximum**
FEF, FEW3	Hard rubber	Carbon steel	–10 (14)	80 (176)
		Stainless steel	–10 (14)	80 (176)
FEW1	PTFE	Carbon steel	–10 (14)	80 (176)
		Stainless steel	–25 (–13)	80 (176)
FEW3	PTFE	Carbon steel	–10 (14)	80 (176)
		Stainless steel	–10 (14)	80 (176)
FEW3	Elastomer	Carbon steel	–5 (23)	80 (176)
		Stainless steel	–5 (23)	80 (176)
FEF, FER	Elastomer	Carbon steel	–6 (21)	70 (158)
FEV	Polypropylene		–6 (21)	70 (158)

IP rating

IP68 (NEMA 6) to 7 m (20 ft.) depth
Note. Not sizes DN10 to DN32 ($^3/_8$ – $1^1/_4$ in. NB)

IP67 (NEMA 4X) – DN10 to DN32 ($^3/_8$ – $1^1/_4$ in. NB)

Buriable (sensor only)

FEV, FEF and FEW – DN450 to 2400 (18 to 96 in. NB) to 5 m (16 ft.) depth

Conductivity

>20 µS cm^{-1}

Transmitter mounting

Integral (not FEF) 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.)

Suspended solids

Suspended solids percentage of process medium should not exceed 6 % of total volume

Physical specification

Wetted parts

Electrode material

Stainless steel 316 L / 316 Ti

Super-austenitic steel

Hastelloy® C-22 and Hastelloy C4

(other electrode materials available on request)

Potential equalizing rings

Minimum of 1 recommended

Lining material / potable water approvals

			Potable Water Approvals					
Code	**Size Range**	**Liner**	**WRAS**	**WRAS 60°C**	**ACS**	**DVGW**	**NSF**	**AZ/ NZS 4020**
FEW1	DN10 – 32 ($^3/_8$ – $1^1/_4$ in. NB)	PTFE	✔					
FEW3	DN10 – 600 ($^3/_8$ – 24 in. NB)	PTFE						
FEW3	DN40 – 2400 ($1^1/_2$ – 96 in. NB)	Elastomer	✔					✔
FEW3	DN40 – 2400 ($1^1/_2$ – 96 in. NB)	Hard rubber	✔	✔		✔	NSF approved material	
FEV	DN40 – 200 ($1^1/_2$ – 8 in. NB)	Poly-propylene	✔		✔	✔	NSF-61	✔
FEF	DN250 – 600 (10 – 24 in. NB)	Elastomer	✔		✔	✔	NSF-61	✔
FEF	DN250 – 600 (10 – 24 in. NB)	Hard rubber	✔	✔		✔	NSF approved material	
FER	DN40 – 600 ($1^1/_2$ – 24 in. NB)	Elastomer	✔		✔	✔		✔

*Size is dependent on flange specification

Lining protection plates

Not required

Installation conditions (recommended)

	Straight pipe requirements	
	Upstream	Downstream
FEW / FEF	5 x DN	2 x DN
FEV	5x DN	0 x DN
FER	0 x DN	0 x DN

Pressure loss

Negligible at Q3	All full bore meters
<0.25 bar (<3.62 psi) at Q3	FEV (DN40 to 200 [$1^1/_2$ to 8 in. NB])
<0.63 bar (<9.13 psi) at Q3	FER (DN40 to 600 [$1^1/_2$ to 24in. NB])

Non-wetted parts

Flange material

Carbon steel	DN20 to DN2400 (3/4 to 96 in. NB)
Stainless steel	DN10 to DN2400 (3/8 to 96 in. NB)
SG iron	FEV – DN40 to DN150 [1 1/2 to 6 in. NB) FER – DN40 to DN150 [1 1/2 to 6 in. NB)

Housing material

Carbon steel	FEV – DN40 to 200 (1 1/2 to 8 in. NB)
	FEW – DN450 to 2400 (18 to 96 in. NB)
Plastic	FEF – DN250 to 600 (10 to 24 in. NB)
Aluminium	FEW – DN10 to 400 (3/8 to 16 in. NB)

Terminal box material

Polycarbonate

Cable gland material

Plastic, brass

Paint specification

Zinc-based primed (all sensors), paint coat ≥70 µm thick RAL 9002 (light grey), in accordance with C4 paint standard

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)

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

RS485 Communications – MODBUS FEX100-MB variant

MODBUS RTU protocol

RS485 (9.6kbps to 115.2kbps), galvanically isolated

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

* When installed, do not leave galvanically isolated circuits (pulse and current) floating.

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 (32-bit) and Vista

Housing material

Powder-coated aluminium with glass window

Paint specification

Paint coat ≥70 µm thick RAL 9002 (light grey)

Transmitter vibration testing

Vibration level: 7 m/s^2

Frequency range: 20 to 150 Hz

No. of sweeps in 3 orthogonal planes: 20

Undetectable shift in transmitter span or zero performance

Hazardous approvals

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,
IP67 on DN10 to 32 [3/8 to 1 1/4 in.NB])

(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, IP67 on
DN10 to 32 [3/8 to 1 1/4 in.NB])

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

*Size is dependent on flange specification

ATEX* Zone 2, 21 & 22

II 3 G Ex nA IIC T5 Gc
II 2 D Ex tb IIIC T100°C Db
TA = –20°C to +60°C (integral transmitter)
TA = –20°C to +70°C (remote sensor)

IECEx* Zone 2, 21 & 22

Ex tb IIIC T100°C Db
Ex nA IIC T5 Gc
TA = –20°C to +60°C (integral transmitter)
TA = –20°C to +70°C (remote sensor)

*FEW, FEV, FET and FEF ≥700 (27/28 in. NB) only

Declaration of Conformance

Copies of CE certification will be available on request.

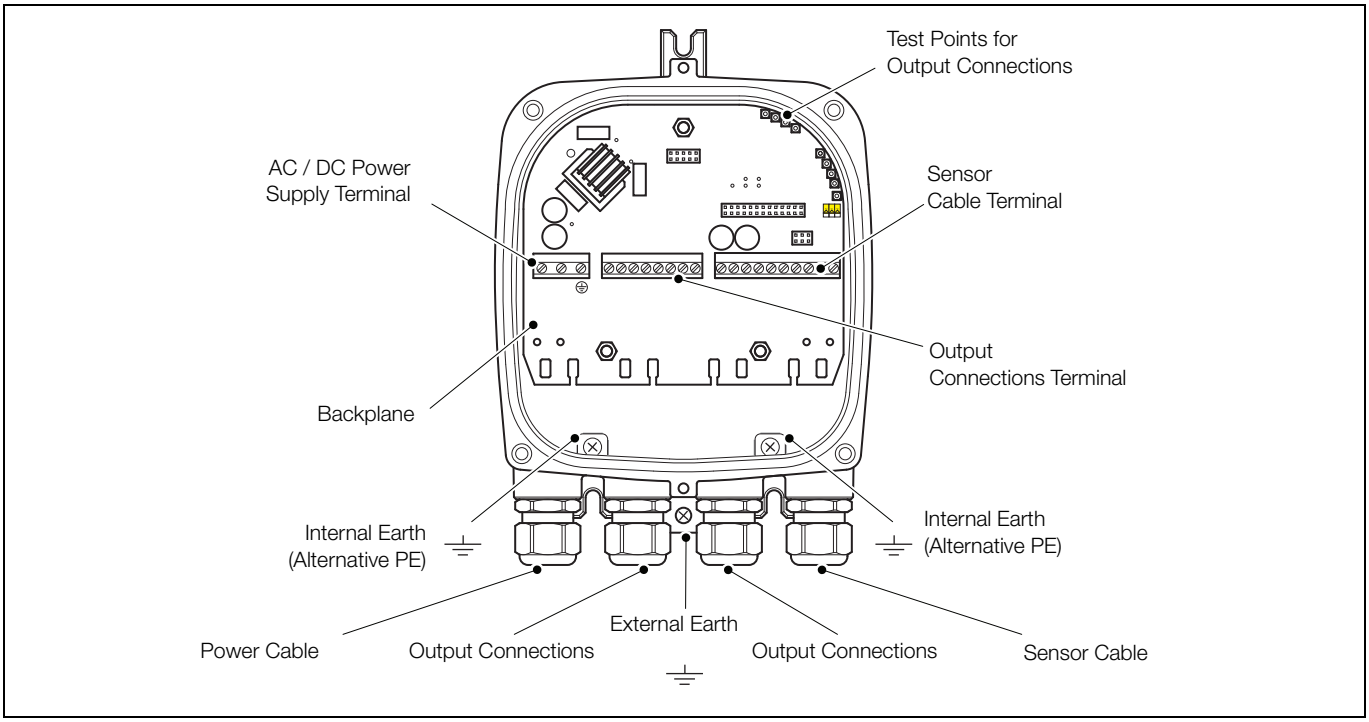
WaterMaster has OIML R49 Certificate of Conformity to accuracy class 1 and 2 (FEV DN40 to 200 [1 1/2 to 8 in.NB]). Copies of accuracy certification are available on request.

WaterMaster (FEV DN40 to 200 [1 1/2 to 8 in.NB]) has been type examined under directive MID 2004/22/EC, Annex MI-001. Copies of this certificate are available on request.

Transmitter connections

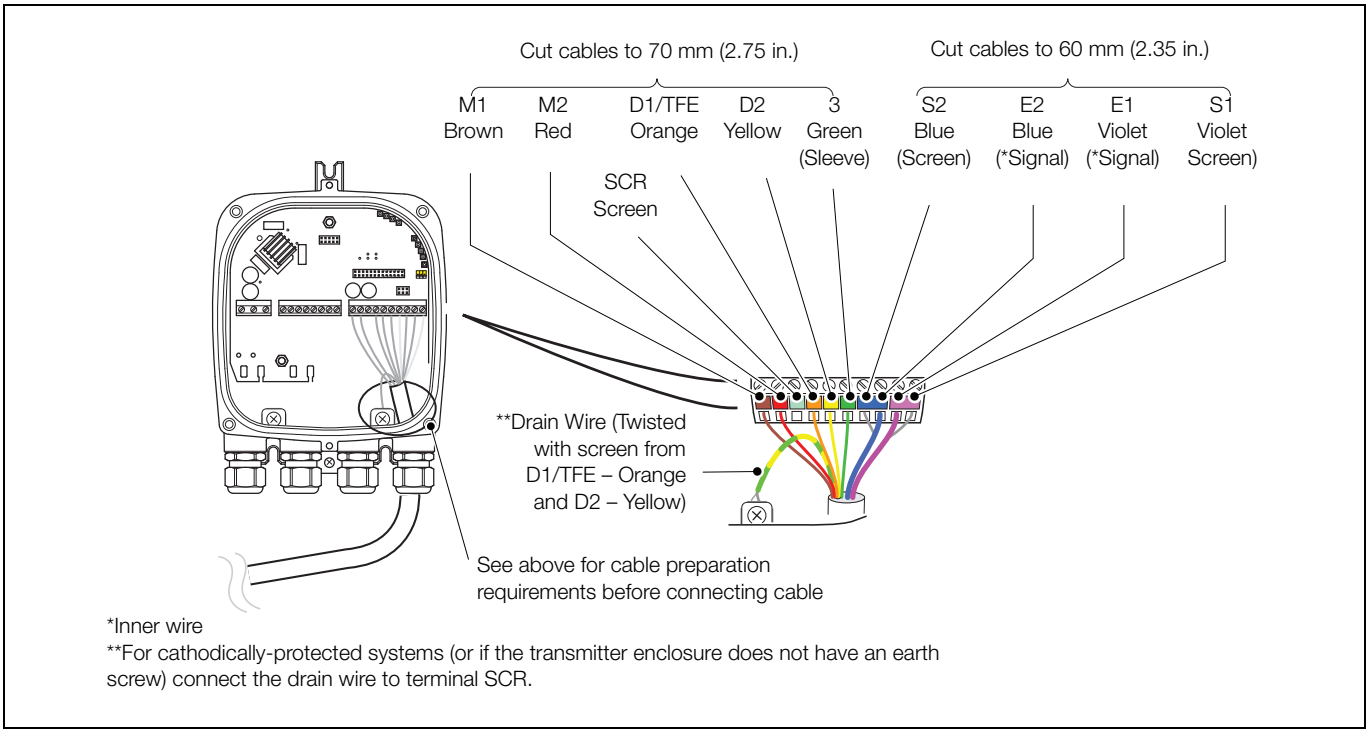
Transmitter terminal connections overview

This section is intended to give an overview of installation of a flowmeter. For Installation requirements, technical information and Health and safety precautions – refer to the User Guide OI/FET100–EN.



Cable gland / conduit entry (Remote transmitter shown)

Sensor cable terminal connections and recommended cable lengths

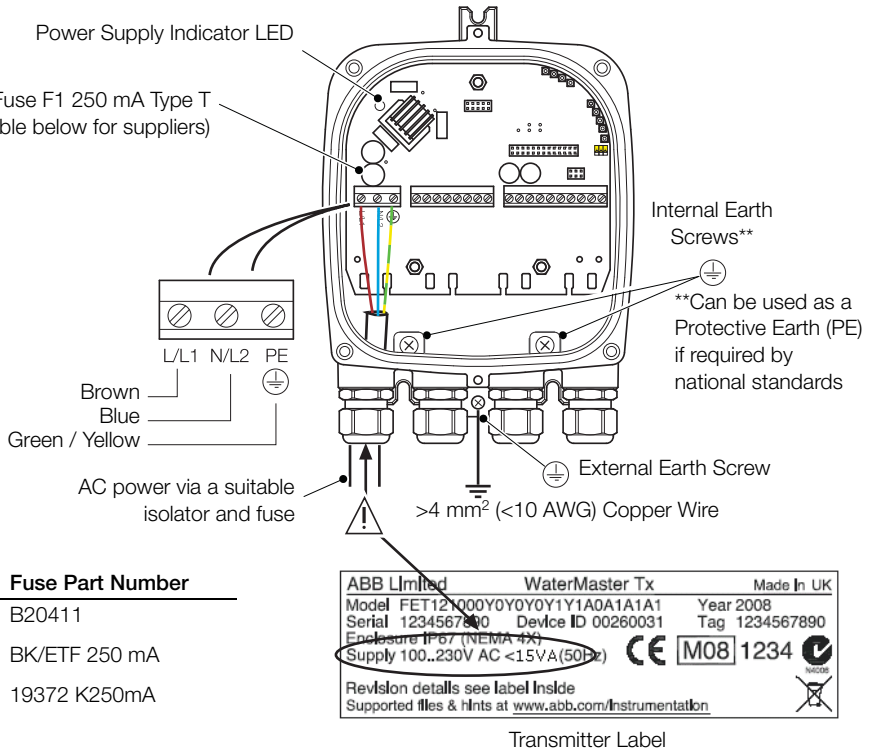


*Inner wire
**For cathodically-protected systems (or if the transmitter enclosure does not have an earth screw) connect the drain wire to terminal SCR.

Sensor cable connections at transmitter terminal block – remote transmitter

Power supply connections

AC power supply

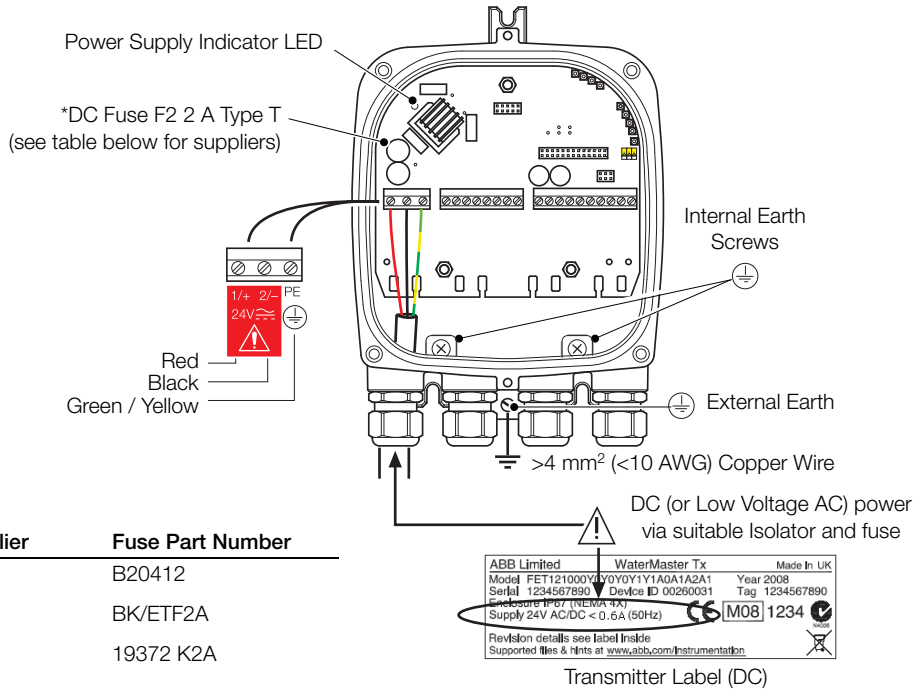


Transmitter Label

*Fuse Supplier	Fuse Part Number
ABB	B20411
Bussmann	BK/ETF 250 mA
Wickmann	19372 K250mA

AC power supply connections

DC (and low voltage AC) power supply



Transmitter Label (DC)

*Fuse Supplier	Fuse Part Number
ABB	B20412
Bussmann	BK/ETF2A
Wickmann	19372 K2A

DC (and low voltage AC) power supply connections

Configuration DIP switches

Three configuration DIP switches are mounted on the transmitter backplane board.

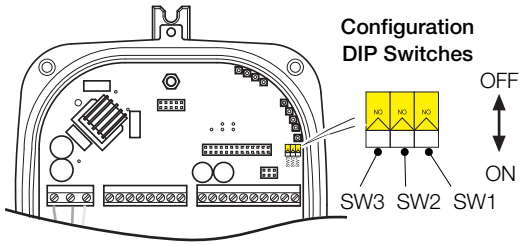
These are factory-set as follows:

- Remote transmitter – all OFF
- Integral transmitter – SW3 ON

For MID-compliant flowmeters the read-only / MID protection switch is set to 'ON' to ensure the meter is secure from tampering.

For HART software versions prior to 01.02.XX, this switch (set after commissioning) prevents login via the keypad or bus at any security level.

From HART software version 01.03.XX onwards and for all PROFIBUS software versions, on MID meters, all metrological-related parameters are locked and inaccessible at the Service level. Standard and Advanced user level parameters can still be modified via the HMI or bus.



DIP Switch Functions

SW1 – Read-only / MID Protection

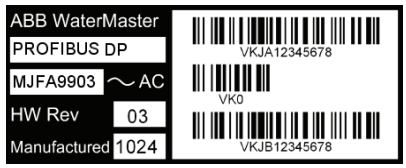
SW2 – (Future Product)

SW3 – Internal Sensor Memory

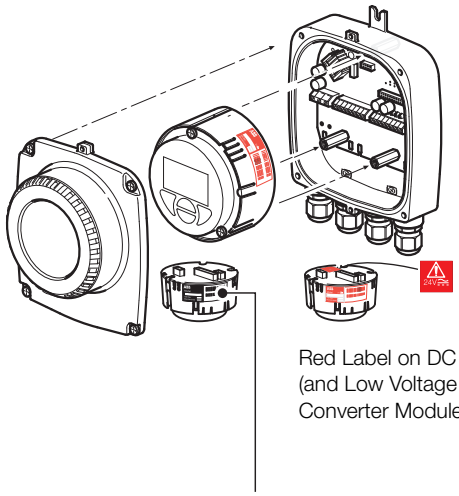
Configuration DIP switches

Transmitter module identification

Note. The communications bus type is HART FEX100 if not specified on the transmitter module label. An example of the PROFIBUS FEX100-DP variant transmitter module label is shown below.



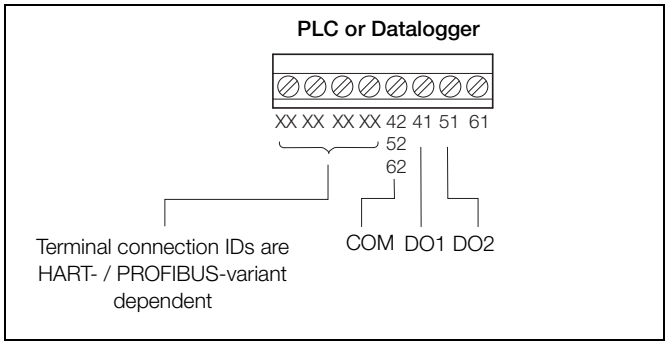
PROFIBUS FEX-100P Label



Transmitter module identification

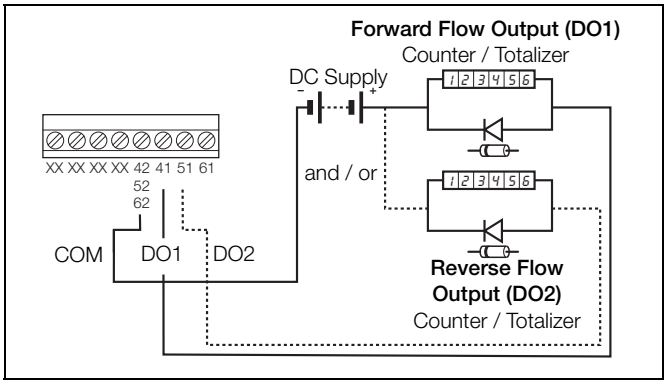
Output connections

Frequency outputs

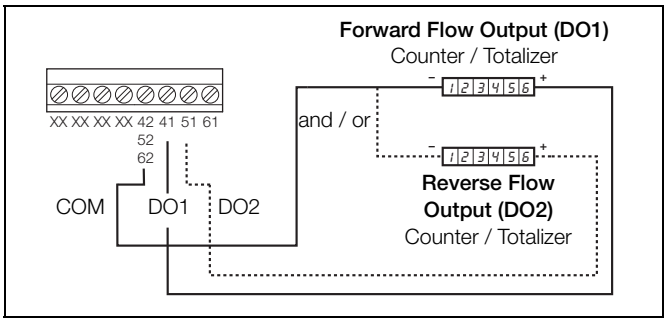


PLC / Datalogger connections

Note. Digital outputs DO1 and DO2 are polarity sensitive. The common (negative) connection for these outputs is designated 'COM'.

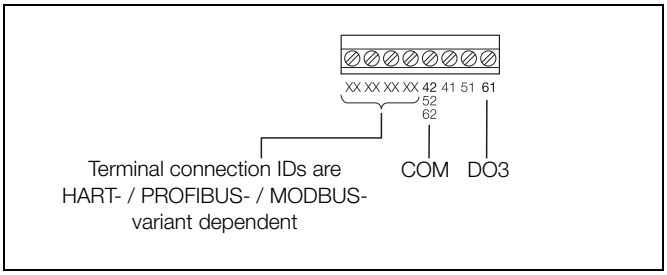


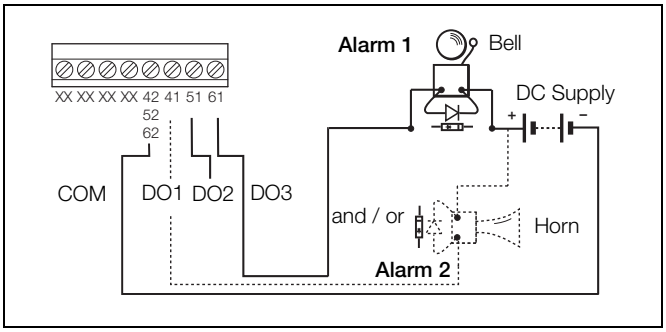
Electromechanical connections



Telemetry / Electronic counters connections

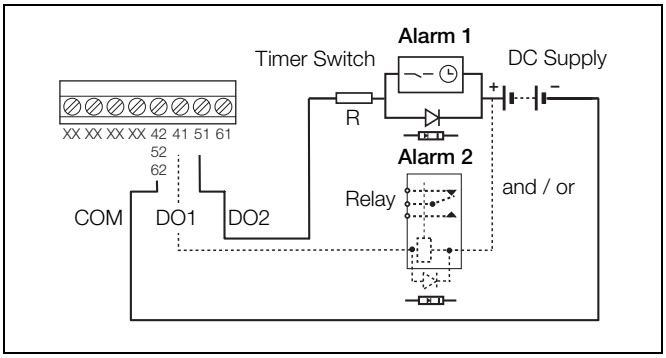
Alarm outputs





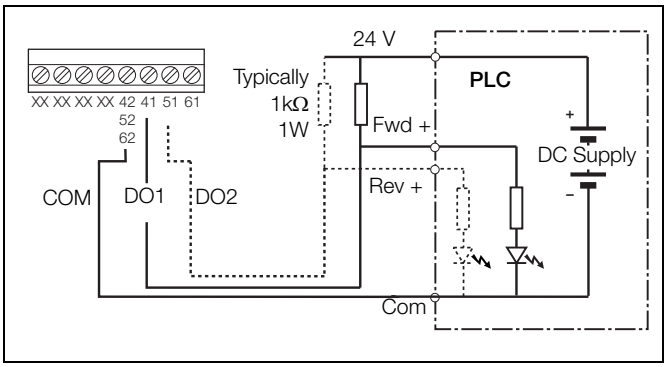
Note.

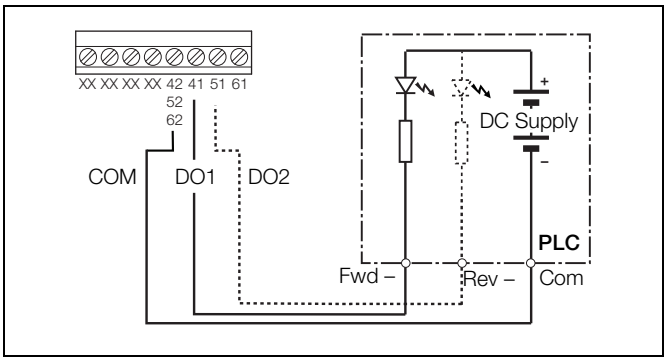
- Normal alarm / logic output is from DO3 (terminal 61). DO1 (41) and DO2 (51) can also be configured as alarms if required but are then NOT available as frequency / pulse outputs as shown in *Electromechanical connections* and *Telemetry / Electronic counters connections*, opposite.
- Bell and horn shown for example only. Any suitable alarm device may be used (for example, lamp, siren, buzzer etc.).



Note. Relay and timer switch shown for example only.

PLC interface

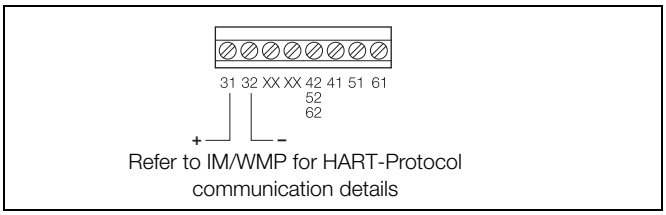




Note.

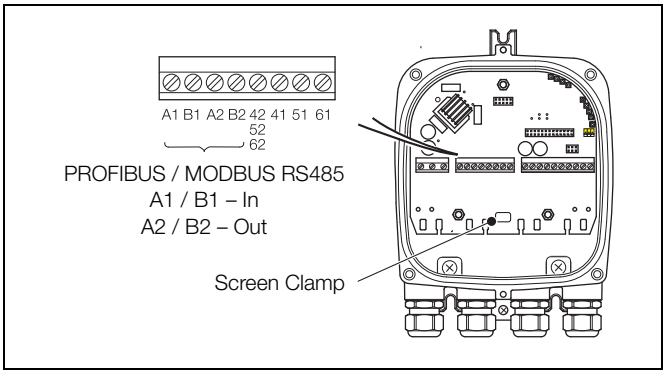
- WaterMaster digital outputs are NPN optocoupled transistors used as switches.
- Maximum allowed voltage at collector is 30 V DC
- Maximum allowed current across transistor is 220 mA.

Current output (4 to 20 ma) – HART (FEX100) variant



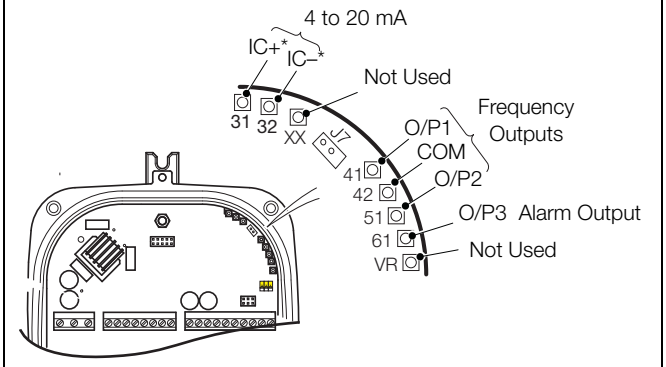
Current output (4 to 20 mA) – HART (FEX100) variant

RS485 communications – PROFIBUS (FEX100-DP) and MODBUS (FEX100-MB) variants



Test point access

Note. A typical DVM probe can access (fit) the PCB's test holes.



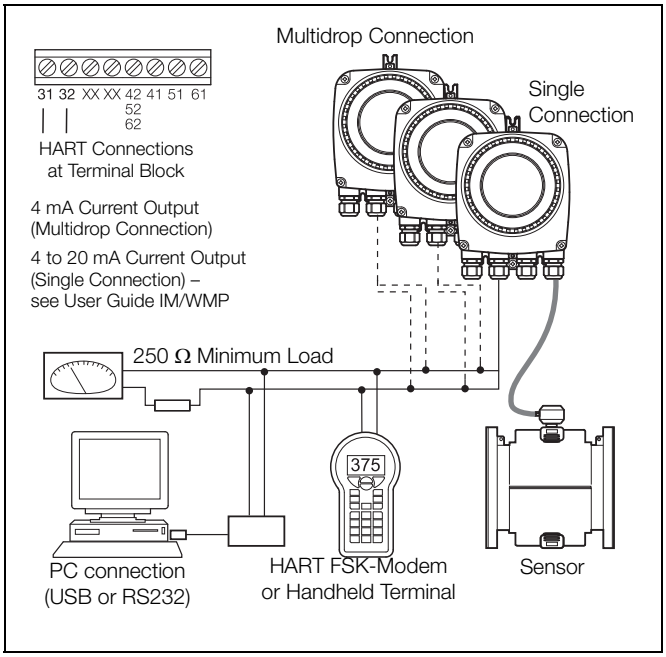
*These 2 test points are connected on the HART FEX100 backplane only (they are present on the PROFIBUS FEX100-DP / MODBUS FEX100-MB backplane but not connected)

Digital communication

The transmitter has the following options for digital communication.

HART protocol

The unit is registered with HART Communication Foundation.



HART protocol	
Configuration	Directly on the Device Software Asset Vision Basic (+ HART -DTM)
Transmission	Install a HART modem (FSK [Frequency Shift Keyed]-Modem) for HART-Communication when connecting to a PC. The HART-Modem converts the analog 4 to 20 mA signal into a digital output signal (Bell Standard 202) and connects to the PC using a USB (or RS232C) connector
Max. signal amplitude	1.2 mA
Current output load	Min. 250Ω, max. = 560Ω
Cable	AWG 24 twisted
Max. cable length	1500 m (4921 ft.)
Baud rate	1.200 baud

System integration

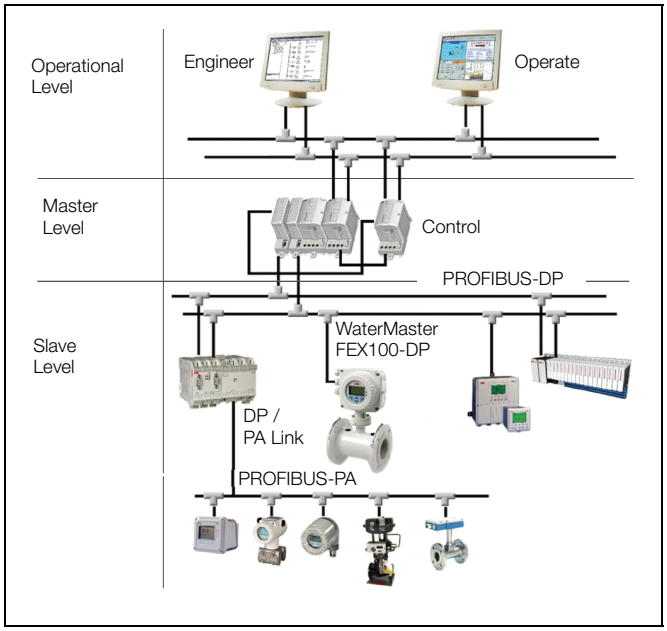
WaterMaster can be integrated into control systems and configuration devices using any Frame application, such as ABB AssetVision or similar third-party applications. ABB Device Type Managers (DTMs) for WaterMaster provide a unified structure for accessing device parameters, configuring and operating the devices and diagnosing problems. FDT (Field Device Tool) technology standardizes the communication and configuration interface between all field devices and host systems.

PROFIBUS DP protocol

PROFIBUS is a manufacturer-independent, open Fieldbus standard for a wide range of applications in manufacturing, process and building automation. Manufacturer independence and openness are ensured by the international standard EN 50170.

PROFIBUS DP ID no.	0x3431
Alternative standard ID no.	0x9701 or 0x9741
Configuration	Directly on the device Software Asset Vision Basic (+PROFIBUS DP-DTM)
Transmission signal	Accuracy to IEC 61158-2
Cable	Shielded, twisted cable (accurate to IEC 61158-2, types A or B)

All devices are connected in a bus structure ('line') as shown in below. Up to 32 stations (master or slaves) can be linked to create one 'segment', although it is recommended not to install more than 16 devices on a single segment. Each end of a segment must be terminated by an active bus terminating resistor. Both bus terminators must always be powered to ensure fault-free operation, therefore it is strongly recommended that they are connected to a back-up power supply. The use of bus amplifiers (repeaters) and segment couplers can be used to extend the network.



System integration

The GSD file for WaterMasters specifies the device-specific Ident No. 3431. It conforms to the PROFIBUS standard, providing a clear and comprehensive description of each instrument in a precisely defined format.

This enables the system configuration tool to use the information automatically when configuring a PROFIBUS bus system.

The ABB GSD file (Ident No. 3431) is divided into 2 sections:

- General specifications

  Identification of the device, together with hardware and software versions, baud rates supported and the possible time intervals for monitoring times.

- DP slave-related specifications

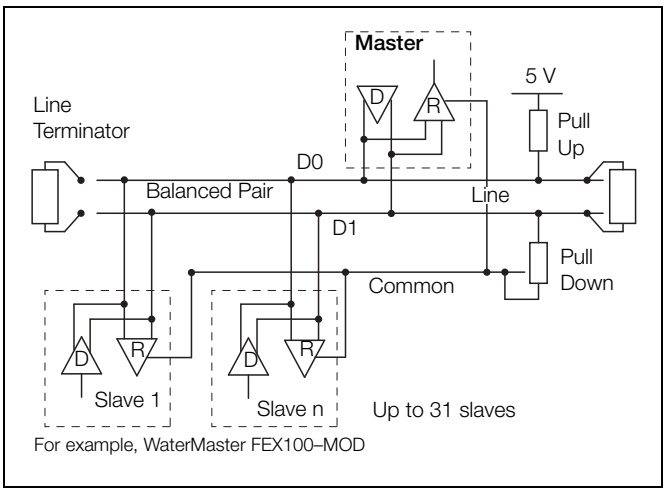
  Information about the user parameter block for device-specific configuration and modules containing details of the input and output data that can be exchanged cyclically with a PROFIBUS master.

The WaterMaster GSD file (ABB_3431.gsd) is available for download from the ABB website at: www.abb.com/fieldbus (follow the link for PROFIBUS DP field devices).

MODBUS protocol

MODBUS is an open standard that is owned and administered by an independent group of device manufacturers called the Modbus Organization (www.modbus.org).

Using the MODBUS protocol, devices from different manufacturers exchange information on the same communications bus without the need for special interface equipment. WaterMaster FEX100-MB follows the specification for Modbus Over Serial Line V1.02, using 2-wire TIA/EIA-485 (RS485) physical layer.



For example, WaterMaster FEX100–MOD

Cable Properties

The end-to-end length of the trunk cable must be limited. The maximum length depends on the Baud rate, the cable (gauge, capacitance or characteristic impedance), the number of loads on the daisy chain and the network configuration (2-wire or 4-wire).

For 9600 Baud rate and AWG26 (or wider) gauge, the maximum length is 1000 m (3280 ft.). Where 4-wire cabling is used as a 2-wire cabling system the maximum length must be divided by 2. The tap cables must be short, never more than 20 m (65.6 ft.). If a multi-port tap is used with n derivations, each one must have a maximum length of 40 m (131 ft.) divided by n.

The maximum serial data transmission line length for RS485 systems is 1200 m (3937 ft.). The lengths of cable that can be used are determined by the cable type, typically:

- Up to 6 m (19.7 ft.) – standard screened or twisted pair cable.
- Up to 300 m (984 ft.) – twin twisted pair with overall foil screen and an integral drain wire – for example, Belden 9502 or equivalent.
- Up to 1200 m (3937 ft.) – twin twisted pair with separate foil screens and integral drain wires – for example, Belden 9729 or equivalent.

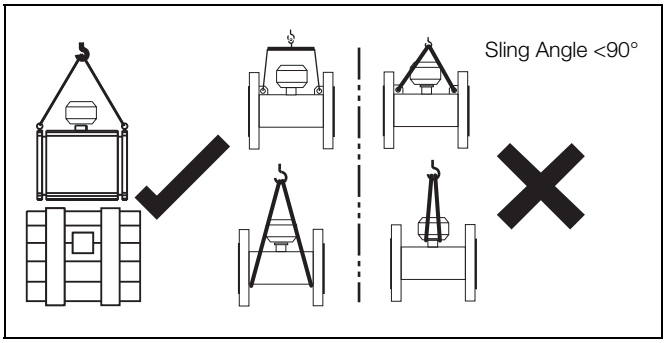
Category 5 cables may be used for RS485-MODBUS to a maximum length of 600 m (1968 ft.). For the balanced pairs used in an RS485-system, a characteristic impedance with value higher than 100Ω is preferred especially for 19200 and higher Baud rates.

Installation requirements

This section is intended to give an overview of installation of a flowmeter. For Installation requirements, technical information and Health and Safety precautions refer to User Guide OI/FEF/FEV/FEW–EN.

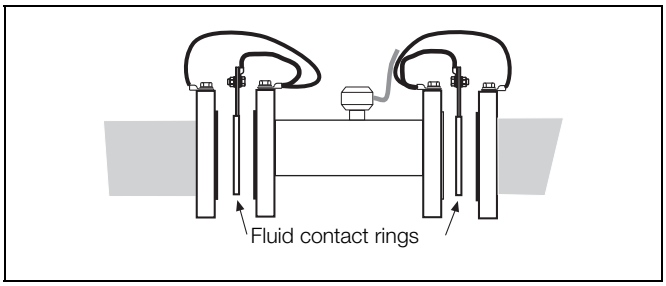
Unpacking the flowmeter

Care must be taken when lifting the flowmeter to use the lifting hooks provided or sling under the body of the meter. Never lift using the terminal connection box of the sensor cable as this will cause damage and invalidate warranty.



Grounding

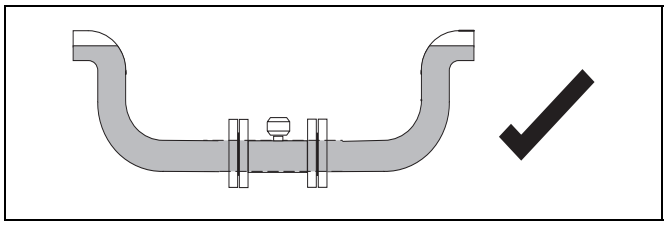
The flowmeter sensor must be cross-bonded to the upstream and downstream pipes and fluid. For technical reasons, this potential should be identical to the potential of the metering fluid. For plastic or insulated lined pipelines, the fluid is grounded by installing a minimum of 1 earthing rings. When there are stray potentials present in the pipeline, an earthing ring is recommended on both ends of the meter sensor.



Mounting

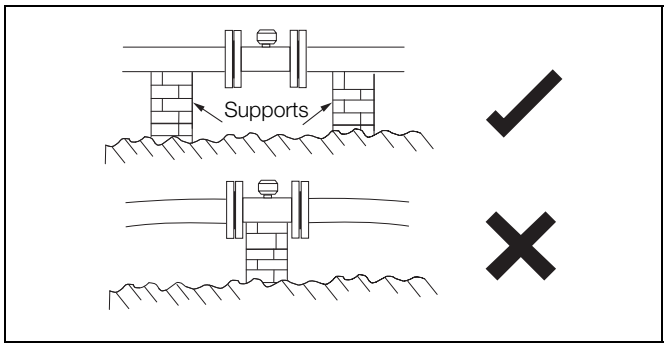
The installation conditions shown below must be observed to achieve the best operational results.

The sensor tube must always be completely full.

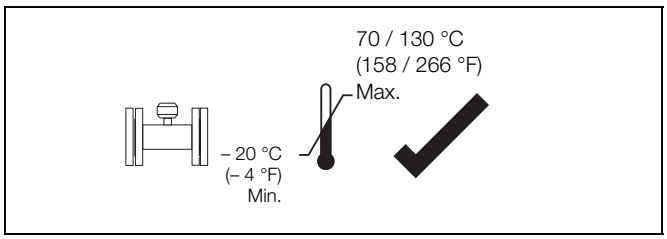


The flow direction must correspond to the identification plate. The device measures the flowrate in both directions. Forward flow is the factory setting.

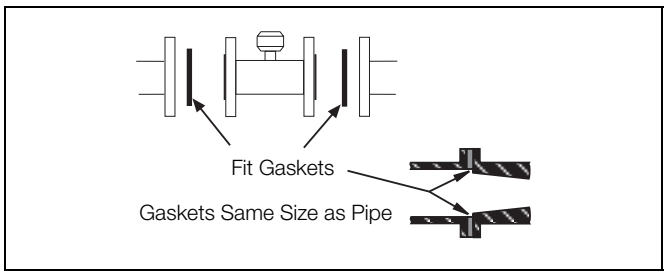
The devices must be installed without mechanical tension (torsion, bending). If required support the pipeline.



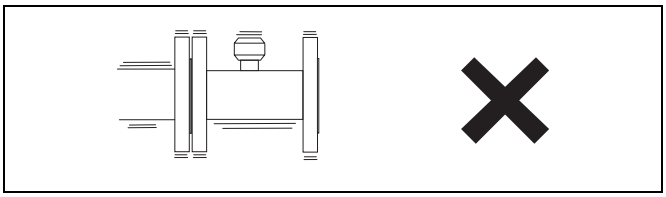
The flange seals must be made from a compatible material for the fluid and fluid temperatures if required.



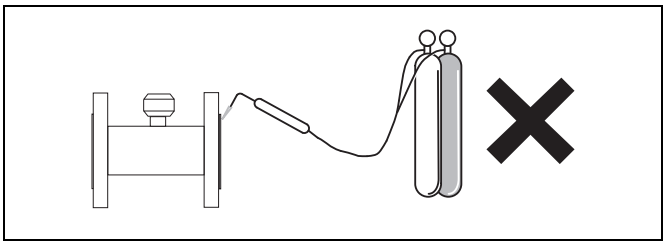
Seals must not extend into the flow area since possible turbulence could influence the device accuracy.



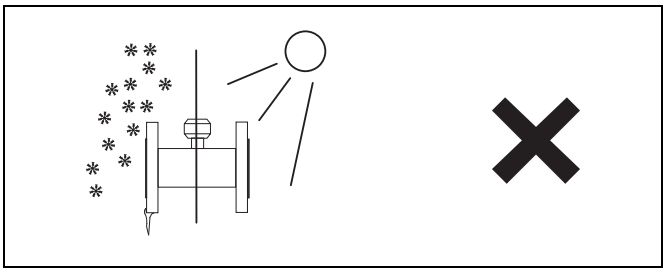
The pipeline may not exert any unallowable forces and torques on the device, such as vibration.



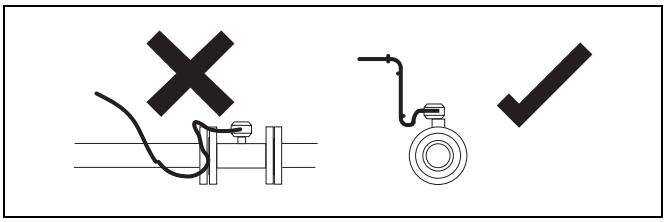
The flowmeter must not be submitted to any localized heat during installation; take care to remember this is a measuring instrument.



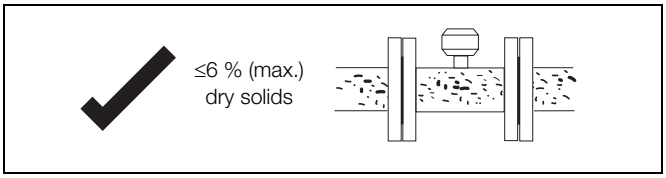
The flowmeter must not be exposed to direct sunlight or provide for appropriate sun protection where necessary.



The cable to the flowmeter should be installed neatly or within a conduit, both loose or conduit should have a u shape below the terminal connection box height to allow any water run off to avoid any capillary action into the flowmeter sensor.

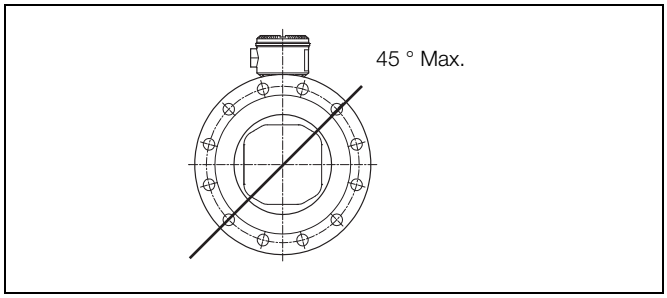


Ensure a maximum 6 % dry solids content flow through pipe – for higher dry solids content, refer to ABB's ProcessMaster range.



Electrode axis

Electrode axis should be horizontal if at all possible or no more than 45° from horizontal.



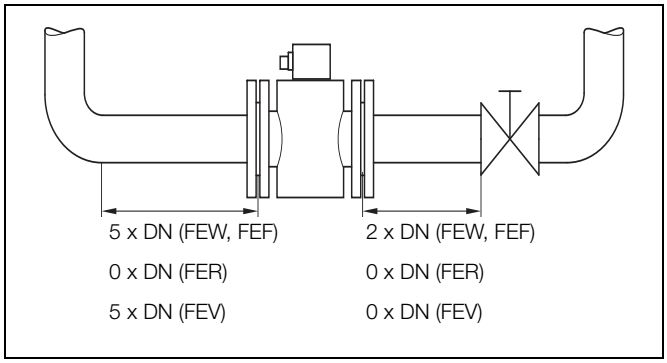
Upstream and Downstream pipe sections

The metering principle is tolerant of the flow profile.

- Wherever possible do not install fittings (for example, manifolds, valves) directly in front of the flowmeter sensor.
- Butterfly valves should be installed so that the valve plate does not extend into the flowmeter sensor.
- Valves or other turn-off components should be installed in the Downstream pipe section.

Experience has shown that, in most installations, straight upstream sections 3 x DN long and straight downstream sections 2 x DN long are normally sufficient. We would recommend conditions of 5 x DN straight upstream and 2 x DN straight downstream where possible.

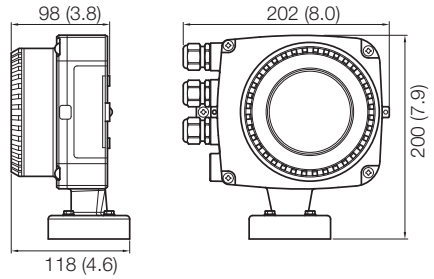
For reduced-bore meters (FER), these straight pipe sections are often not necessary.



Transmitter dimensions

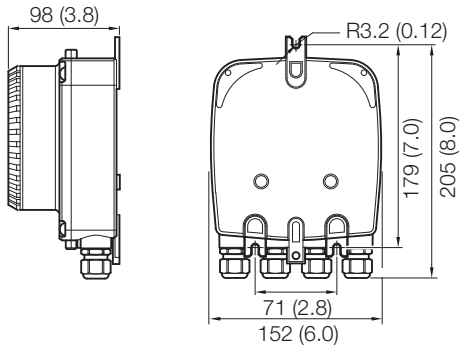
Integral transmitter

Dimensions in mm (in.)



Remote transmitter

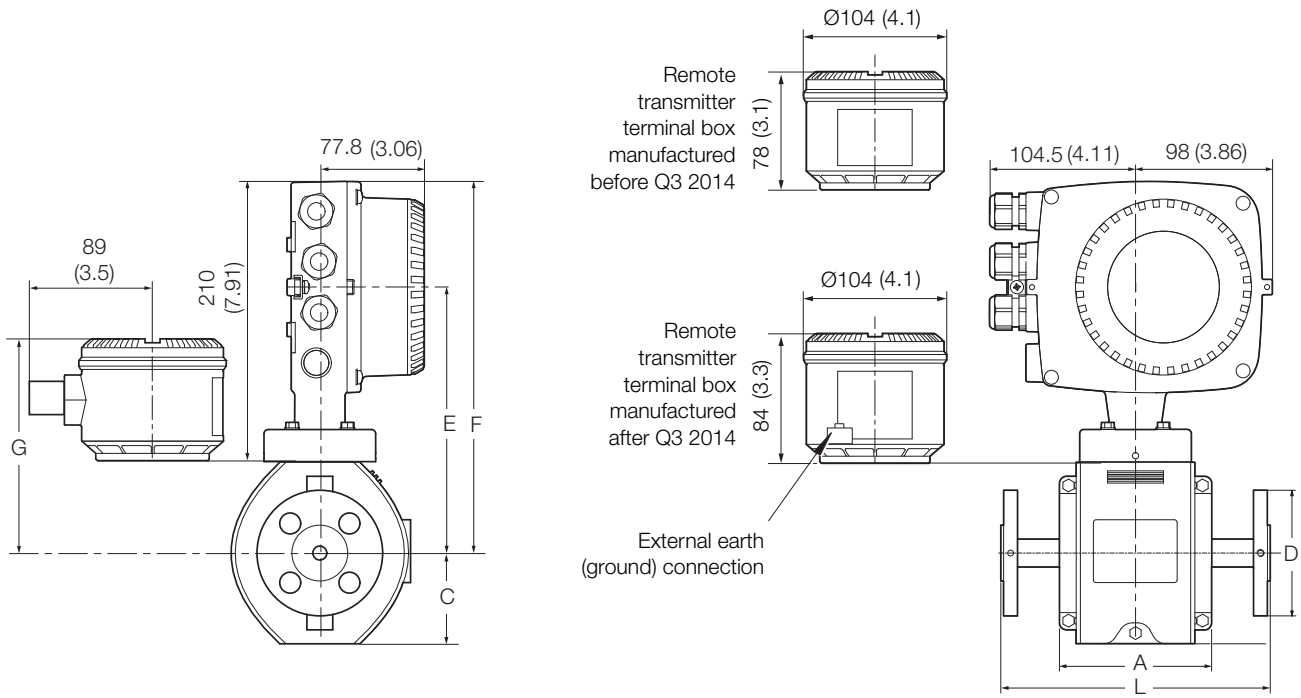
Dimensions in mm (in.)



Sensor dimensions

FEW – DN10 to 125 (3/8 to 5 in. NB)

Dimensions in mm (in.)



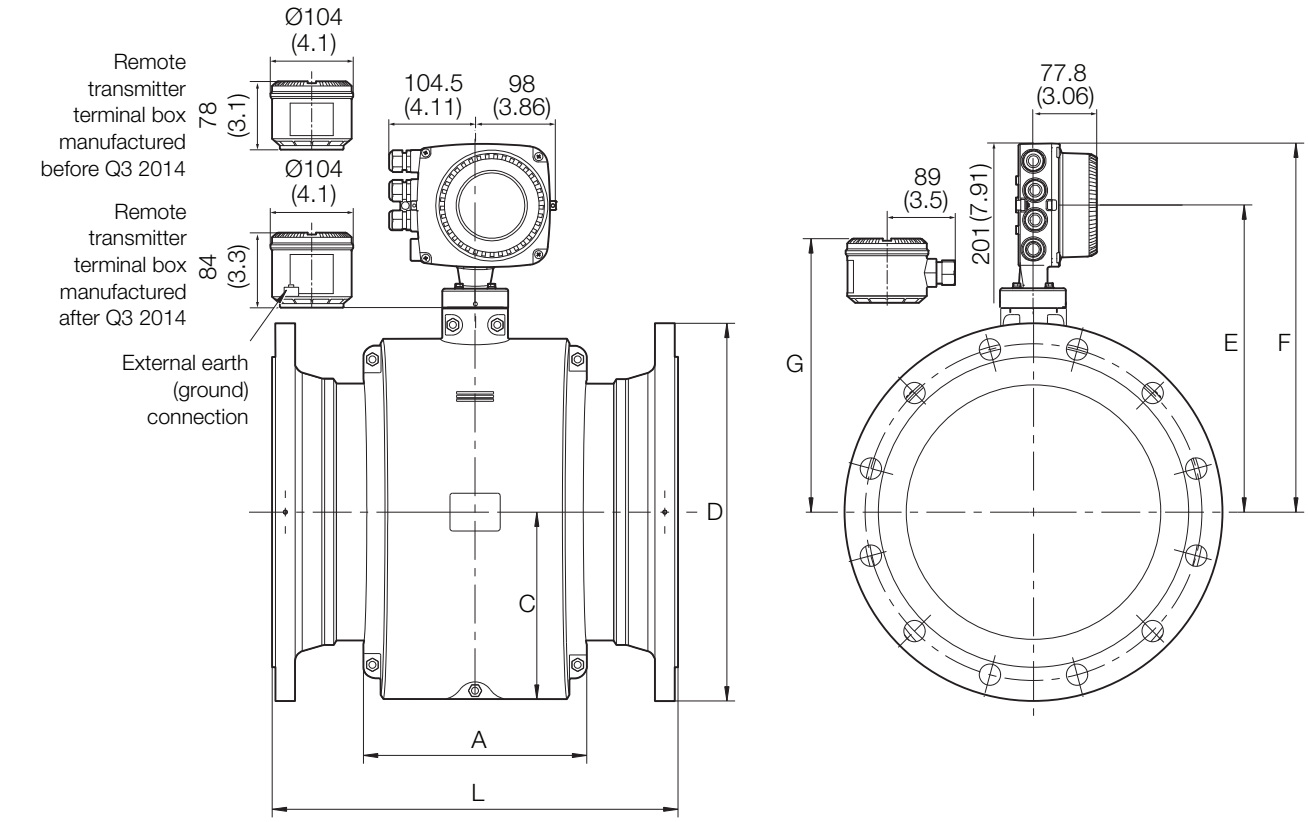
DN10 to 125 (3/8 to 5 in. NB) (FEW)

		Dimensions in mm (in.)							Approx. weight in kg (lb)	
DN	Process connection type	D	L	F	C	E	G	A	Integral	Remote
DN10 (3/8 in.)	JIS10K	90 (3.54)	200 (7.87)	268 (10.55)	82 (3.23)	193 (7.6)	148 (5.83)	113 (4.45)	6 (13)	4 (9)
	PN10 to 40	90 (3.54)								
	ASME B16.5 CL150	90 (3.54)								
	ASME B16.5 CL300	96 (3.78)								
DN15 (1/2 in.)	PN10 to 40	95 (3.74)								
	JIS5K	80 (3.15)								
	JIS10K	95 (3.74)								
	ASME B16.5 CL300	95 (3.74)								
	ASME B16.5 CL150	90 (3.54)								
DN20 (3/4 in.)	PN10 to 40	105 (4.13)							8 (18)	6 (13)
	JIS5K	85 (3.35)								
	JIS10K	100 (3.94)								
	ASME B16.5 CL300	115 (4.53)								
	ASME B16.5 CL150	98 (3.86)								
DN25 (1 in.)	PN10 to 40	115 (4.53)	200 (7.87)	268 (10.55)	82 (3.23)	193 (7.6)	148 (5.83)	113 (4.45)	9 (20)	7 (15)
	JIS5K	95 (3.74)								
	JIS10K	125 (4.88)								
	ASME B16.5 CL300	125 (4.88)								
	ASME B16.5 CL150	108 (4.25)								
DN32 (1 1/4 in.)	PN10 to 40	140 (5.51)		275 (10.83)	92 (3.62)	200 (7.87)	155 (6.10)	113 (4.45)	10 (22)	8 (18)
	JIS5K	115 (4.53)								
	JIS10K	135 (5.31)								
	ASME B16.5 CL300	135 (5.31)								
	ASME B16.5 CL150	117 (4.61)								
DN40 (1 1/2 in.)	PN10 to 40	150 (5.91)							11 (24)	9 (20)
	JIS5K	120 (4.72)								
	JIS10K	140 (5.51)								
	ASME B16.5 CL300	155 (6.10)								
	ASME B16.5 CL150	127 (5.00)								
DN50 (2 in.)	PN10 to 40	165 (6.5)		281 (11.06)	97 (3.82)	206 (8.11)	161 (6.34)	115 (4.53)	12 (26)	10 (22)
	JIS5K	130 (5.12)								
	JIS10K	155 (6.10)								
	AS4087 PN16	150 (5.91)								
	AS4087 PN35	165 (6.50)								
	ASME B16.5 CL150	152 (5.98)								
	ASME B16.5 CL300	165 (6.50)								
DN65 (2 1/2 in.)	PN10 to 40	185 (7.28)		292 (11.50)	108 (4.25)	217 (8.54)	172 (6.77)	104 (4.09)	13 (29)	11 (24)
	JIS5K	155 (6.10)								
	JIS10K	175 (6.89)								
	AS4087 PN16	165 (6.50)								
	AS4087 PN35	185 (7.28)								
	ASME B16.5 CL150	178 (7.01)								
	ASME B16.5 CL300	190 (7.48)							15 (33)	13 (29)
DN80 (3 in.)	PN10 to 40	200 (7.87)		292 (11.5)	108 (4.25)	217 (8.54)	172 (6.77)	104 (4.09)	17 (37)	15 (33)
	JIS5K	180 (7.09)								
	JIS10K	185 (7.28)								
	AS4087 PN16	185 (7.28)								
	AS4087 PN35	205 (8.07)								
	ASME B16.5 CL150	190 (7.48)								
	ASME B16.5 CL300	210 (8.28)							19 (42)	17 (37)
DN100 (4 in.)	PN10 to 16	220 (8.66)	250 (9.84)	314 (12.36)	122 (4.8)	239 (9.41)	194 (7.64)	125 (4.92)	19 (42)	17 (37)
	PN25 to 40	235 (9.25)							23 (51)	21 (46)
	JIS5K	200 (7.87)							19 (42)	17 (37)
	JIS10K	210 (8.27)								
	AS4087 PN16	215 (8.46)								
	AS4087 PN35	230 (9.06)							23 (51)	21 (46)
	ASME B16.5 CL300	255 (1.04)							30 (66)	28 (62)
	ASME B16.5 CL150	229 (9.00)							21 (51)	19 (42)
DN125 (5 in.)	PN10 to 16	250 (9.84)		324 (12.76)	130 (5.12)	249 (9.8)	204 (8.03)	125 (4.92)	22 (48)	20 (44)
	PN25 to 40	270 (10.63)							29 (64)	27 (59)
	JIS5K	235 (9.25)							22 (48)	20 (44)
	JIS10K	250 (9.84)								
	ASME B16.5 CL150	254 (10.00)								
	ASME B16.5 CL300	280 (11.02)							35 (77)	33 (73)

DN10 to 125 (3/8 to 5 in. NB) (FEW) dimensions / weights

FEW – DN150 to 400 (6 to 16 in. NB)

Dimensions in mm (in.)



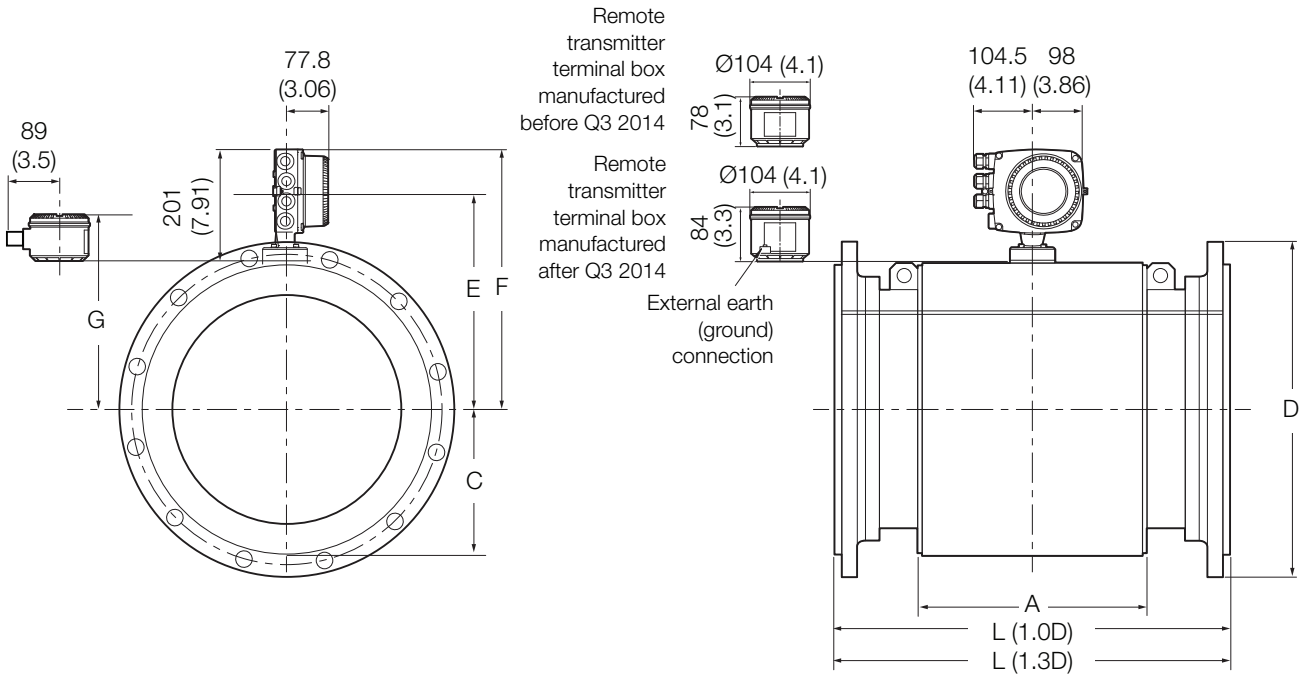
DN150 to 400 (6 to 16 in. NB) (FEW)

		Dimensions in mm (in.)							Approx. weight in kg (lb)	
DN	Process connection type	D	L	F	C	E	G	A	Integral	Remote
DN150 (6 in.)	PN10 to 16	285 (11.22)	300 (11.81)	371 (14.61)	146 (9.88)	296 (11.65)	251 (9.88)	166 (6.54)	33 (73)	31 (68)
	PN25 to 40	300 (11.81)							39 (86)	37 (81)
	JIS5K	265 (10.43)							33 (73)	31 (68)
	JIS10K	280 (11.02)								
	AS4087 PN16	280 (11.02)								
	AS4087 PN35	305 (11.81)							39 (86)	37 (81)
	ASME B16.5 CL300	320 (12.60)							47 (103)	45 (99)
	ASME B16.5 CL150	279 (10.98)							33 (73)	31 (68)
DN200 (8 in.)	PN10	340 (13.39)	350 (13.78)	411 (16.18)	170 (6.69)	336 (13.23)	291 (11.46)	200 (7.87)	41 (90)	39 (86)
	PN16	340 (13.39)								
	PN25	360 (14.17)							55 (121)	53 (117)
	PN40	375 (14.76)							65 (143)	63 (139)
	AS4087 PN16	335 (13.19)							41 (90)	39 (86)
	AS4087 PN35	370 (14.57)							65 (143)	63 (139)
	JIS5K	320 (12.60)							41 (90)	39 (86)
	JIS10K	330 (12.99)								
	ASME B16.5 CL300	380 (14.96)							72 (158)	70 (154)
	ASME B16.5 CL150	345 (13.58)							50 (110)	48 (106)
DN250 (10 in.)	PN10	395 (15.55)	450 (17.72)	426 (16.77)	198 (7.80)	351 (13.82)	306 (12.05)	235 (9.62)	61 (134)	59 (130)
	PN16	405 (15.94)							65 (143)	63 (139)
	PN25	425 (16.73)							84 (185)	82 (180)
	PN40	450 (17.72)							95 (209)	93 (205)
	AS4087 PN16	405 (15.94)							65 (143)	63 (139)
	AS4087 PN35	430 (16.93)							95 (209)	93 (205)
	JIS5K	385 (15.16)							65 (143)	63 (139)
	JIS10K	400 (15.75)								
	ASME B16.5 CL300	445 (17.52)							105 (231)	103 (227)
	ASME B16.5 CL150	405 (15.94)							70 (154)	68 (150)
DN300 (12 in.)	PN10	445 (17.52)	500 (19.69)	449 (17.68)	228 (8.98)	374 (14.72)	329 (12.95)	272 (10.71)	74 (163)	72 (158)
	PN16	460 (18.11)							80 (176)	78 (172)
	PN25	485 (19.09)							100 (220)	98 (216)
	JIS5K	430 (16.93)							80 (176)	78 (172)
	JIS10K	445 (17.52)								
	AS4087 PN16	455 (17.91)								
	AS4087 PN35	490 (19.29)							130 (286)	128 (282)
	ASME B16.5 CL300	520 (20.47)							150 (330)	148 (326)
	ASME B16.5 CL150	485 (19.09)							105 (231)	103 (227)
	PN40	515 (20.28)	600 (23.62)						130 (286)	128 (282)
DN350 (14 in.)	PN10	505 (19.88)	550 (21.65)	464 (18.27)	265 (10.43)	389 (15.31)	344 (13.54)	322 (12.68)	95 (209)	93 (205)
	PN16	520 (20.47)							110 (242)	108 (238)
	PN25	555 (21.85)							145 (319)	143 (315)
	JIS5K	480 (18.90)							95 (209)	93 (205)
	JIS10K	490 (19.29)								
	AS4087 PN16	525 (20.67)							130 (286)	128 (282)
	AS4087 PN35	550 (21.65)							185 (407)	183 (403)
	ASME B16.5 CL300	585 (23.03)							140 (308)	138 (304)
	ASME B16.5 CL150	535 (21.06)							105 (231)	103 (227)
	PN40	580 (22.83)	650 (25.59)						195 (429)	193 (425)
DN400 (16 in.)	PN10	565 (22.24)	600 (23.62)	506 (19.92)	265 (10.43)	431 (16.97)	386 (15.20)	322 (12.68)	103 (227)	101 (222)
	PN16	580 (22.83)							126 (277)	124 (273)
	PN25	620 (24.41)							170 (374)	168 (370)
	JIS5K	540 (21.26)							103 (227)	101 (223)
	JIS10K	560 (22.05)							116 (255)	114 (251)
	AS4087 PN16	580 (22.83)							154 (339)	152 (335)
	AS4087 PN35	610 (24.02)							302 (664)	300 (660)
	ASME B16.5 CL300	650 (25.59)							265 (583)	263 (578)
	ASME B16.5 CL150	600 (23.62)							175 (385)	173 (381)
	PN40	660 (25.98)	650 (25.59)						258 (568)	256 (564)

DN150 to 400 (6 to 5 in. NB) (FEW) dimensions / weights

FEW – DN450 to 2400 (18 to 96 in. NB)

Dimensions in mm (in.)



DN450 to 2400 (18 to 96 in. NB) (FEW)

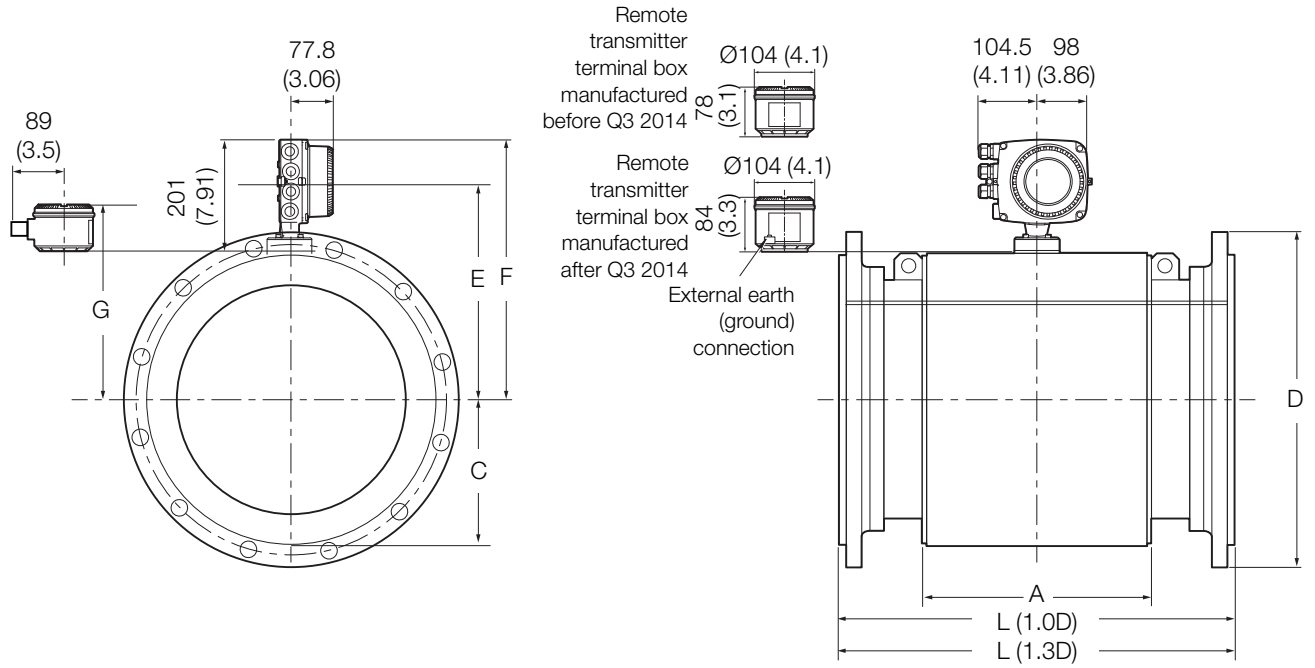
		Dimensions in mm (in.)								Approx. weight in kg (lb)	
DN	Process connection type	D	L (1.0D)	L (1.3D)	F	C	E	G	A	Integral	Remote
DN450 (18 in.)	PN10	615 (24.21)	N/A	600 (23.62)	514 (20.24)	310 (12.20)	439 (17.28)	394 (15.51)	328 (12.91)	173 (381)	171 (377)
	PN16	640 (25.20)								188 (414)	186 (410)
	JIS5K	605 (23.82)								165 (364)	163 (359)
	JIS10K	620 (24.41)								177 (390)	175 (386)
	AS4087 PN16	640 (25.20)								232 (511)	230 (507)
	AS4087 PN35	675 (26.57)								328 (723)	326 (718)
	ASME B16.5 CL300	710 (27.95)								368 (811)	366 (807)
	ASME B16.5 CL150	635 (25.00)								250 (551)	248 (547)
	PN25	670 (26.38)	N/A	686 (27.01)						245 (540)	243 (536)
	PN40	685 (26.97)								315 (694)	313 (690)
DN500 (20 in.)	PN10	670 (26.38)	N/A	600 (23.62)	514 (20.24)	310 (12.20)	439 (17.28)	394 (15.51)	367 (14.45)	190 (418)	188 (413)
	PN16	715 (28.15)								240 (528)	238 (524)
	JIS5K	655 (25.79)								190 (418)	188 (413)
	JIS10K	675 (26.57)									
	AS4087 PN16	705 (27.76)								290 (638)	288 (634)
	AS4087 PN35	735 (28.94)								435 (957)	433 (953)
	ASME B16.5 CL150	700 (27.56)								300 (660)	298 (656)
	ASME B16.5 CL300	775 (30.51)	N/A	762						490 (1080)	488 (1076)
	PN25	730 (28.74)	N/A	700						300 (661)	298 (657)
	PN40	755 (29.72)	N/A	762						392 (864)	390 (860)
DN600 (24 in.)	PN10	780 (30.71)	N/A	800 (31.50)	565 (22.24)	361 (14.21)	490 (19.29)	445 (17.52)	469 (18.46)	284 (626)	282 (622)
	PN16	840 (33.07)								318 (700)	316 (695)
	PN25	845 (33.27)								460 (1012)	458 (1008)
	JIS5K	770 (30.31)								275 (605)	273 (600)
	JIS10K	795 (31.30)								306 (673)	304 (668)
	AS4087 PN16	825 (32.48)								382 (840)	380 (835)
	AS4087 PN35	850 (33.46)								452 (994)	450 (990)
	ASME B16.5 CL300	915 (36.02)								550 (1210)	548 (1205)
	ASME B16.5 CL150	815 (32.09)								425 (935)	423 (930)
	PN40	890 (35.04)	N/A	890						600 (1320)	598 (1316)

DN450 to 2400 (18 to 96 in. NB) (FEW) dimensions / weights

		Dimensions in mm (in.)								Approx. weight in kg (lb)	
DN	Process connection type	D	L (1.0D)	L (1.3D)	F	C	E	G	A	Integral	Remote
DN700 (28 in.)	JIS 5K	875 (34.45)	700 (27.56)	910 (35.83)	604 (23.77)	403 (15.87)	528 (20.79)	488 (19.21)	444 (17.48)	216 (475)	214 (471)
	JIS 10K	905 (35.63)								282 (620)	280 (616)
	PN6	860 (33.86)								225 (495)	223 (491)
	PN10	895 (35.24)								303 (667)	301 (662)
	PN16	910 (35.83)								337 (741)	335 (737)
	AWWA C207 CLASS B	927 (36.50)								249 (548)	247 (543)
	AWWA C207 CLASS D	927 (36.50)								280 (616)	278 (612)
	AS4087 PN16	910 (35.83)								359 (790)	357 (785)
	AS2129 TABLE-D	910 (35.83)								263 (579)	261 (574)
	AS2129 TABLE-E	910 (35.83)								337 (741)	335 (737)
	PN25	960 (37.80)								471 (10.36)	469 (1032)
	PN40	995 (39.17)								586 (1289)	584 (1285)
	AWWA C207 CLASS E	927 (36.50)								472 (1038)	470 (1034)
	AWWA C207 CLASS F	1035 (40.75)								715 (1573)	713 (1569)
	AS4087 PN35	935 (36.80)								539 (1186)	537 (1181)
	ASME CL150 SERIES A	925 (36.42)								503 (1107)	501 (1102)
	ASME CL150 SERIES B	835 (32.87)								323 (711)	321 (706)
	ASME CL300 SERIES B	920 (36.22)								631 (1388)	629 (1384)
DN750 (30 in.)	JIS 5K	945 (37.20)	750 (29.52)	990 (38.98)	630 (24.79)	429 (16.89)	554 (21.81)	514 (20.23)	444 (17.48)	251 (552)	249 (548)
	JIS 10K	970 (38.19)								327 (719)	325 (715)
	AWWA C207 CLASS B	984 (38.74)								273 (601)	271 (596)
	AWWA C207 CLASS D	984 (38.74)								344 (757)	342 (752)
	AS4087 PN16	995 (39.17)								467 (1027)	465 (1023)
	AS2129 TABLE-D	995 (39.17)								340 (748)	338 (744)
	AS2129 TABLE-E	995 (39.17)								454 (999)	452 (994)
	AWWA C207 CLASS E	984 (38.74)								496 (1091)	494 (1087)
	AWWA C207 CLASS F	1092 (43.99)								790 (1738)	788 (1734)
	AS4087 PN35	1015 (39.96)								663 (1459)	661 (1454)
	ASME CL150 SERIES A	985 (38.78)								544 (1197)	542 (1192)
	ASME CL150 SERIES B	885 (34.84)								320 (704)	318 (700)
	ASME CL300 SERIES B	990 (38.98)								748 (1646)	746 (1641)
DN800 (32 in.)	JIS 5K	995 (39.17)	800 (31.49)	1040 (40.04)	654 (25.74)	453 (17.83)	578 (22.76)	538 (21.18)	542 (21.34)	280 (616)	278 (612)
	JIS 10K	1020 (40.16)								364 (801)	362 (796)
	PN6	975 (38.39)								294 (647)	292 (642)
	PN10	1015 (39.96)								406 (893)	404 (889)
	PN16	1025 (40.35)								469 (1032)	467 (1027)
	AWWA C207 CLASS B	1060 (41.73)								328 (722)	326 (717)
	AWWA C207 CLASS D	1060 (41.73)								408 (898)	406 (893)
	AS4087 PN16	1060 (41.73)								530 (1166)	528 (1162)
	AS2129 TABLE-D	1060 (41.73)								386 (849)	384 (845)
	AS2129 TABLE-E	1060 (41.73)								519 (1142)	517 (1137)
	PN25	1085 (42.72)								615 (1353)	613 (1349)
	PN40	1140 (44.88)								866 (1905)	864 (1901)
	AWWA C207 CLASS E	1060 (41.73)								634 (1395)	632 (1390)
	AWWA C207 CLASS F	1150 (45.28)								897 (1973)	895 (1969)
	AS4087 PN35	1060 (41.73)								751 (1652)	749 (1648)
	ASME CL150 SERIES A	1060 (41.73)								700 (1540)	698 (1536)
	ASME CL150 SERIES B	940 (37.01)								406 (893)	404 (889)
	ASME CL300 SERIES B	1055 (41.54)								933 (2053)	931 (2048
DN900 (36 in.)	JIS 5K	1095 (43.11)	900 (35.43)	1170 (46.06)	705 (27.7()	504 (19.84)	629 (24.76)	589 (23.19)	570 (22.44)	369 812)	367 (807)
	JIS 10K	1120 (44.09)								445 (979)	443 (975)
	PN6	1075 (42.32)								390 (858)	388 (854)
	PN10	1115 (43.90)								502 (1104)	500 (1100)
	PN16	1125 (44.29)								589 (1296)	587 (1291)
	AWWA C207 CLASS B	1168 (45.98)								417 (917)	415 (913)
	AWWA C207 CLASS D	1168 (45.98)								493 (1085)	491 (1080)
	AWWA C207 CLASS E	1168 (45.98)								827 (1819)	825 (1815)
	AWWA C207 CLASS F	1270 (50.00)								1150 (2530)	1148 (2526)
	AS4087 PN16	1175 (46.26)								706 (1553)	704 (1549)
	AS2129 TABLE-D	1175 (46.26)								514 (1131)	512 (1126)
	AS2129 TABLE-E	1175 (46.26)								694 (1527)	692 (1522)
	PN25	1185 (46.65)								819 (1802)	817 (1797)
	PN40	1250 (49.21)								1158 (2548)	1156 (2543)
	AS4087 PN35	1185 (46.65)								1044 (2297)	1042 (2292)
	ASME CL150 SERIES A	1170 (46.06)								961 (2114)	959 (2110)
	ASME CL150 SERIES B	1055 (41.54)								595 (1309)	593 (1305)
	ASME CL300 SERIES B	1170 (46.06)								1147 (2523)	1145 (2519)

DN450 to 2400 (18 to 96 in. NB) (FEW) dimensions / weights (Continued)

Dimensions in mm (in.)



…DN450 to 2400 (18 to 96 in. NB) (FEW)

		Dimensions in mm (in.)								Approx. weight in kg (lb)	
DN	**Process connection type**	**D**	**L (1.0D)**	**L (1.3D)**	**F**	**C**	**E**	**G**	**A**	**Integral**	**Remote**
DN1000 (40 in.)	JIS 5K	1195 (47.05)	1000 (39.37)	1300 (51.18)	755 (29.71)	554 (21.81)	679 (26.73)	639 (25.16)	624 (24.57)	441 (970)	439 (966)
	JIS 10K	1235 (48.62)								572 (1258)	570 (1254)
	PN6	1175 (46.26)								466 (1025)	464 (1021)
	PN10	1230 (48.43)								674 (1483)	672 (1478)
	PN16	1255 (49.41)								879 (1934)	877 (1929)
	AWWA C207 CLASS B	1289 (50.75)								503 (1107)	501 (1102)
	AWWA C207 CLASS D	1289 (50.75)								659 (1450)	657 (1445)
	AWWA C207 CLASS E	1289 (50.75)								1028 (2262)	1026 (2257)
	AWWA C207 CLASS F	1378 (54.25)								1367 (3007)	1365 (3003)
	AS4087 PN16	1255 (49.41)								831 (1828)	829 (1824)
	AS2129 TABLE-D	1255 (49.41)								610 (1342)	608 (1338)
	AS2129 TABLE-E	1255 (49.41)								833 (1833)	831 (1028)
	PN25	1320 (51.97)								1207 (2655)	1205 (2651)
	PN40	1360 (53.54)								1413 (3109)	1411 (3104)
	AS4087 PN35	1275 (50.20)								1244 (2737)	1242 (2732)
	ASME CL150 SERIES A	1290 (50.79)								1149 (2528)	1147 (2523)
	ASME CL300 SERIES A	1240 (48.82)								1349 (2968)	1347 (2963)
	ASME CL150 SERIES B	1175 (46.26)								738 (1624)	736 (1619)
	ASME CL300 SERIES B	1275 (50.20)								1487 (3271)	1485 (3267)
DN1050 (42 in.)	AWWA C207 CLASS B	1346 (5299)	1050 (41.33)	1365 (53.74)	808 (31.82)	608 (23.92)	733 (28.84)	693 (27.28)	624 (24.57)	564 (1241)	562 (1236)
	AWWA C207 CLASS D	1346 (5299)								669 (1472)	667 (1467)
	AWWA C207 CLASS E	1346 (5299)								1143 (2515)	1141 (2510)
	AWWA C207 CLASS F	1448 (57.01)								1568 (3450)	1566 (3445)
	ASME CL150 SERIES B	1225 (48.23)								809 (1780)	807 (1775)
	ASME CL150 SERIES A	1345 (52.95)								1289 (2836)	1287 (2831)
	ASME CL300 SERIES A	1290 (50.79)								1527 (3359)	1525 (3355)
	ASME CL300 SERIES B	1335 (52.56)								1704 (3749)	1702 (3744)
DN1100 (44 in.)	JIS 5K	1305 (51.38)	1100 (43.30)	1430 (56.30)						510 (1122)	508 (1118)
	JIS 10K	1345 (52.95)								689 (1516)	687 (1511)
	AWWA C207 CLASS B	1403 (55.24)								615 (1353)	613 (1349)
	AWWA C207 CLASS D	1403 (55.24)								807 (1775)	805 (1771)
	AWWA C207 CLASS E	1404 (55.26)								1205 (2651)	1203 (2647)
	AWWA C207 CLASS F	1505 (59.25)								1719 (3782)	1717 (3777)

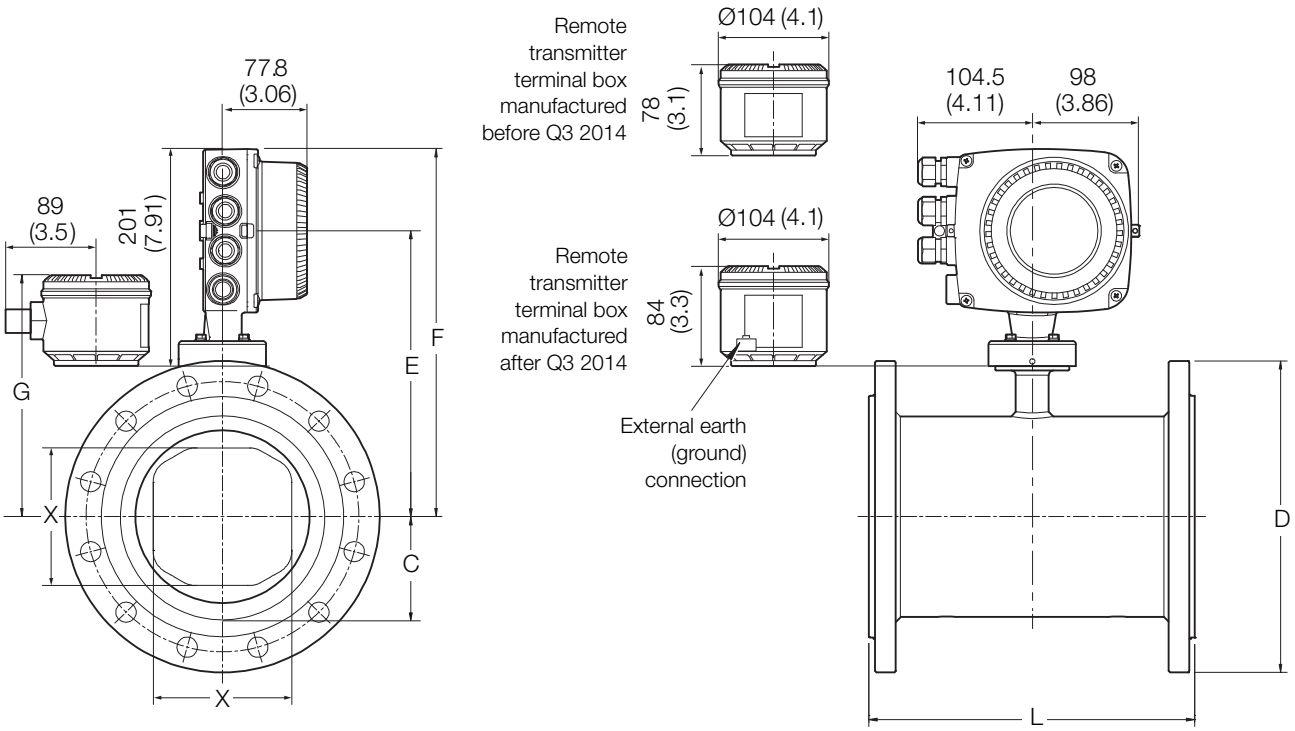
…DN450 to 2400 (18 to 96 in. NB) (FEW) dimensions / weights

		Dimensions in mm (in.)								Approx. weight in kg (lb)	
DN	Process connection type	D	L (1.0D)	L (1.3D)	F	C	E	G	A	Integral	Remote
DN1200 (48 in.)	JIS 5K	1420 (55.91)	1200 (47.24)	1560 (61.42)	860 (33.85)	659 (25.94)	784 (30.87)	744 (29.29)	802 (31.57)	651 (1432)	649 (1428)
	JIS 10K	1465 (57.68)								967 (2127)	965 (2123)
	PN6	1405 (55.31)								710 (1562)	708 (1558)
	PN10	1455 (57.28)								1107 (2435)	1105 (2431)
	PN16	1485 (58.46)								1363 (2999)	1361 (2994)
	AWWA C207 CLASS B	1511 (59.49)								772 (1698)	770 (1694)
	AWWA C207 CLASS D	1511 (59.49)								999 (2198)	997 (2193)
	AWWA C207 CLASS E	1511 (59.49)								1458 (3208)	1456 (3203)
	AWWA C207 CLASS F	1651 (65.00)								2400 (5280)	2398 (5276)
	AS4087 PN16	1490 (58.66)								1253 (2757)	1251 (2752)
	AS2129 TABLE-D	1490 (58.66)								1023 (2251)	1021 (2246)
	AS2129 TABLE-E	1490 (58.66)								1272 (2798)	1270 (2794)
	PN25	1530 (60.24)								1559 (3430)	1557 (3425)
	PN40	1575 (62.01)								2133 (4693)	2131 (4688)
	AS4087 PN35	1530 (60.24)								2115 (4653)	2113 (4649)
	ASME CL150 SERIES A	1510 (59.45)								1707 (3755)	1705 (3751)
	ASME CL300 SERIES A	1465 (57.68)								2163 (4759)	2161 (4754)
	ASME CL150 SERIES B	1390 (54.72)								1085 (2387)	1083 (2383)
	ASME CL300 SERIES B	1510 (59.45)								2352 (5174)	2350 (5170)
DN1350 (54 in.)	AWWA C207 CLASS B	1683 (66.26)	1350 (53.15)	1755 (69.09)	955 (37.59)	754 (29.69)	879 (34.61)	839 (33.03)	902 (35.51	981 (2158)	979 (2154)
	AWWA C207 CLASS D	1683 (66.26)								1213 (2669)	1211 (2664)
	AWWA C207 CLASS E	1683 (66.26)								1942 (4272)	1940 (4268)
DN1400 (56 in.)	PN6	1630 (64.17)	1400 (55.11)	1820 (71.65)						1085 (2387)	1083 (2383)
	PN10	1675 (65.94)								1731 (3808)	1729 (3804)
	PN16	1685 (66.34)								1770 (3894)	1768 (3890)
	ASME CL150 SERIES B	1600 (62.99)								1593 (3505)	1591 (3500)
	PN25	1755 (69.09)								2368 (5210)	2366 (5205)
	PN40	1795 (70.67)								3086 (6789)	3084 (6785)
	ASME CL150 SERIES A	1745 (68.70)								2556 (5623)	2554 (5619)
	ASME CL300 SERIES A	1710 (67.32)								3376 (7427)	3374 (7423)
	ASME CL300 SERIES B	1765 (69.49)								3758 (8268)	3756 (8263)
DN1500 (60 in.)	JIS 5K	1730 (68.11)	1500 (59.05)	1950 (76.77)	1065 (41.92)	864 (34.02)	989 (38.94)	949 (37.36)	910 (35.83)	1029 (2264)	1027 (2259)
	JIS 10K	1795 (70.67)								1504 (3309)	1502 (3304)
	ASME CL150 SERIES B	1725 (67.91)								2031 (4468)	2029 (4464)
	AWWA C207 CLASS B	1854 (72.99)								1229 (2704)	1227 (2699)
	AWWA C207 CLASS D	1854 (72.99)								1514 (3331)	1512 (3326)
	AWWA C207 CLASS E	1854 (72.99)								2544 (5597)	2542 (5592)
	ASME CL150 SERIES A	1855 (73.03)								3084 (6785)	3082 (6780)
	ASME CL300 SERIES A	1810 (71.26)								3875 (8525)	3873 (8521)
	ASME CL300 SERIES B	1880 (74.02								4181 (9198)	4179 (9194)
DN1600 (64 in.)	PN6	1830 (72.05)	1600 (62.99)	2080 (81.89)	1066 (41.96)	865 (34.06)	990 (38.98)	950 (37.4)	1000 (39.37)	1434 (3155)	1432 (3150)
	PN10	1915 (75.39)								2525 (5555)	2523 (5551)
	PN25	1975 (77.76)								3201 (7042)	3199 (7038)
	PN16	1930 (75.98)								2768 (6090)	2766 (6085)
	PN40	2025 (79.72)								4375 (9625)	4373 (9621)
DN1650 (66 in.)	AWWA C207 CLASS B	2032 (80.00)	N/A	2145 (84.45)	1116 (43.94)	915 (36.02)	1040 (40.94)	1000 (39.37)	1000 (39.37)	1504 (3309)	1502 (3304)
	AWWA C207 CLASS D	2032 (80.00)								2025 (4455)	2023 (4451)
DN1800 (72 in.)	PN6	2045 (80.51)	N/A	2340 (92.13)	1181 (46.50)	980 (38.58)	1105 (43.50)	1065 (41.93)	1100 (43.31)	1853 (4077)	1851 (4072)
	PN10	2115 (83.27)								3180 (6996)	3178 (6992)
	PN16	2130 (83.86)								3657 (8045)	3655 (8041)
	PN25	2195 (86.42)								4422 (9728)	4420 (9724)
	AWWA C207 CLASS B	2197 (86.50)								1773 (3901)	1771 (3896)
	AWWA C207 CLASS D	2197 (86.50)								2387 (5251)	2385 (5247)
DN1950 (78 in.)	AWWA C207 CLASS B	2362 (92.99)	N/A	2535 (99.80)	1291 (50.81)	1090 (42.91)	1215 (47.83)	1175 (46.26)	1180 (46.46)	2309 (5080)	2307 (5075)
	AWWA C207 CLASS D	2362 (92.99)								3037 (6681)	3035 (6677)
DN2000 (80 in.)	PN6	2265 (89.17)	N/A	2600 (102.36)						2581 (5678)	2579 (5674)
	PN10	2325 (91.54)								4254 (9359)	4252 (9354)
	PN16	2345 (92.32)								4556	4554
	PN25	2425 (95.47)								5896	5894
DN2100 (84 in.)	AWWA C207 CLASS B	2534 (99.76)	N/A	2730 (107.48)	1395 (54.91)	1194 (47.01)	1319 (51.93)	1279 (50.35)	1180 (46.46)	2641 (5810)	2639 (5806)
	AWWA C207 CLASS D	2534 (99.76)								3487 (7671)	3485 (7667)
DN2200 (88 in.)	PN6	2475 (97.44)	N/A	2860 (112.60)					1330 (52.36)	3363 (7399)	3361 (7394)
	PN10	2550 (100.39)								5795	5793
DN2400 (96 in.)	PN6	2685 (105.71	N/A	3120 (122.83)	1495 (58.85)	1294 (50.94)	1419 (55.87)	1379 (54.29)	1450 (57.09)	4100 (9020)	4098 (9016)
	PN10	2760 (108.66)								6968	6966

…DN450 to 2400 (18 to 96 in. NB) (FEW) dimensions / weights (Continued)

FEV – DN40 to 200 (1½ to 8 in. NB)

Dimensions in mm (in.)



DN40 to 200 (1½ to 8 in. NB) (FEV)

		Dimensions in mm (in.)						Approx. weight in kg (lb)	
DN	**Process connection type**	**D**	**L**	**F**	**E**	**G**	**X**	**Integral**	**Remote**
DN40 (1½ in.)	EN1092-1 PN10, 16, 25, 40	150 (5.91)	200 (7.87)	260 (10.24)	185 (7.28)	137 (5.39)	30 (1.18)	12.8 (28.16)	11.8 (25.96)
	ASME B16.5 CLASS 150								
	AS2129 TABLE D, E, F								
DN50 (2 in.)	EN1092-1 PN10, 16, 25, 40	165 (6.50)	200 (7.87)	261 (10.28)	186 (7.32)	138 (5.43)	38 (1.5)	13.75 (30.25)	12.75 (28.05)
	ASME B16.5 CLASS 150								
DN80 (3 in.)	EN1092-1 PN10, 16, 25, 40	200 (7.87)	200 (7.87)	280 (11.04)	205.5 (8.09)	157.5 (6.2)	61 (2.4)	17.2 (37.84)	16.2 (35.64)
	ASME B16.5 CLASS 150								
	AS4087 PN16, 21								
	AS2129 TABLE D, E, F								
DN100 (4 in.)	EN1092-1 PN10, 16, 25, 40	225 (8.86)	250 (9.84)	300.5 (11.83)	225.5 (8.88)	177.5 (6.98)	70 (2.76)	19.3 (42.5)	18.3 (40.3)
	ASME B16.5 CLASS 150								
	AS4087 PN16								
DN150 (6 in.)	EN1092-1 PN10, 16, 25, 40	300 (11.81)	300 (11.81)	333.5 (13.13)	258.5 (10.18)	210.5 (8.29)	103 (4.06)	35.1 (77.2)	34.1 (75)
	ASME B16.5 CLASS 150								
	AS4087 PN16								
DN200 (8 in.)	EN1092-1 PN10, 16	375 (11.76)	350 (13.78)	358.7 (14.12)	283.7 (11.17)	235.7 (9.28)	150 (5.91)	67 (147.4)	66 (145.2)
	ASME B16.5 CLASS 150								
	AS2129 TABLE C, D, E, F								
	AS4087 PN14, 16, 21								

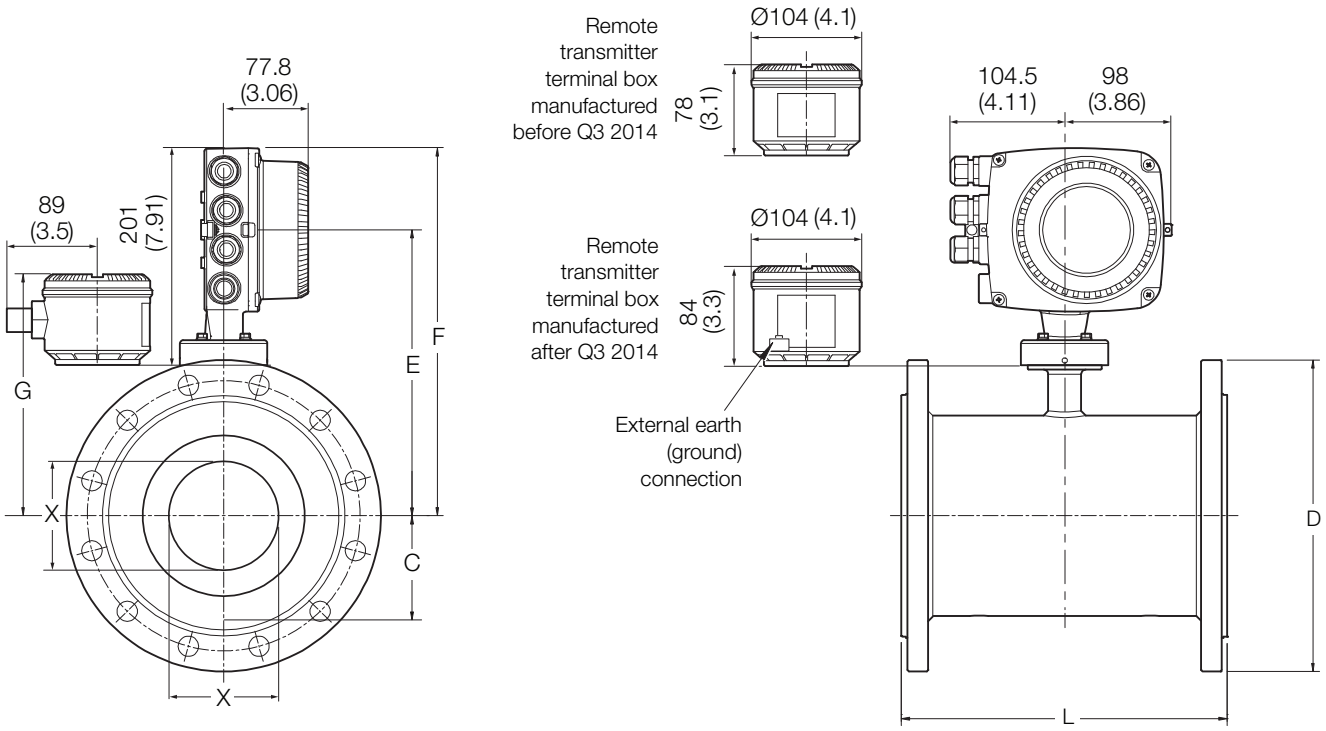
WaterMaster integral / remote FEV – DN40 to 200 (1½ to 8 in.) cast iron sensor dimensions / weights

		Dimensions in mm (in.)							Approx. weight in kg (lb)	
DN	Process connection type	D	L	F	C	E	G	X	Integral	Remote
DN40 (1½ in.)	EN1092-1 PN10, PN40	150 (5.91)	200 (7.87)	260 (10.24)	30.4 (1.20)	185 (7.28)	138 (5.43)	30 (1.18)	12 (27)	11 (24)
	ASME B16.5 CLASS 150	127 (5.00)								
	JIS 10K	140 (5.51)								
	AS2129 TABLE F	140 (5.51)								
	AS2129 TABLE C D E	135 (5.31)								
	AS4087 PN14	135 (5.31)								
DN50 (2 in.)	EN1092-1 PN10, PN16	165 (6.50)	200 (7.87)	270 (10.63)	38.3 (1.51)	195 (7.68)	146 (5.75)	38 (1.50)	13 (29)	12 (27)
	ASME B16.5 CLASS 150	152.4 (6.00)								
	JIS 10K	155 (6.10)								
	AS4087 PN21	165 (6.50)								
	AS2129 TABLE F	165 (6.50)								
	AS2129 TABLE C D E	150 (5.91)								
	AS4087 PN14, PN16	150 (5.91)								
DN65 (2½ in.)	AS4087 PN14, PN16	165 (6.50)	200 (7.87)	275 (10.83)	45.2 (1.78)	200 (7.87)	152 (5.98)	48 (1.89)	15 (33)	14 (31)
	AS2129 TABLE C D E	165 (6.50)								
	EN1092-1 PN10	185 (7.28)								
	EN1092-1 PN16	185 (7.28)								
DN80 (3 in.)	EN1092-1 PN10, PN16	200 (7.87)	200 (7.87)	280 (11.02)	51.5 (2.03)	205 (8.07)	156 (6.14)	61 (2.40)	16 (36)	15 (33)
	ASME B16.5 CLASS 150	190 (7.48)								
	JIS 7.5K	211 (8.31)								
	JIS 10K	185 (7.28)								
	AS2129 TABLE C D E	185 (7.28)								
	AS4087 PN14, PN16	185 (7.28)								
	AS2129 TABLE F	205 (8.07)								
	AS4087 PN21	205 (8.07)								
DN100 (4 in.)	EN1092-1 PN10, PN16	220 (8.66)	250 (9.84)	320 (12.60)	63.75 (2.51)	245 (9.65)	196.8 (7.75)	70 (2.76)	19 (42)	18 (40)
	ASME B16.5 CLASS 150	228.6 (9.00)								
	JIS 7.5K	238 (9.37)								
	JIS 10K	210 (8.27)								
	AS2129 TABLE C D	215 (8.46)								
	AS4087 PN14, PN16	215 (8.46)								
	AS2129 TABLE E	215 (8.46)								
	AS4087 PN21	230 (9.06)								
	AS2129 TABLE F	230 (9.06)								
DN125 (5 in.)	EN1092-1 PN10, PN16	250 (9.84)	250 (9.84)	320 (12.60)	63.75 (2.51)	245 (9.65)	197 (7.76)	70 (2.76)	20 (44)	19 (42)
	ASME B16.5 CLASS 150	254 (10.00)								
	JIS 10K	250 (9.84)								
	AS2129 TABLE C D E	255 (10.04)								
	AS2129 TABLE F	280 (11.02)								
DN150 (6 in.)	EN1092 PN10, PN16	285 (11.22)	300 (11.81)	340 (13.39)	84.4 (3.32)	265 (10.43)	217 (8.54)	103 (4.06)	32 (70)	31 (68)
	ASME B16.5 CLASS 150	279 (10.98)								
	JIS 7.5k	290 (11.42)								
	JIS 10K	280 (11.02)								
	AS2129 TABLE C D	280 (11.02)								
	AS4087 PN14, PN16	280 (11.02)								
	AS2129 TABLE E	280 (11.02)								
	AS2129 TABLE F	305 (12.01)								
	AS4087 PN21	305 (12.01)								
DN200 (8 in.)	EN1092-1 PN10	340 (13.39)	350 (13.78)	365 (14.37)	109.8 (4.32)	290 (11.42)	243 (9.57)	150 (5.91)	49 (108)	48 (105)
	EN1092-1 PN16	340 (13.39)								
	ASME B16.5 CLASS 150	345 (13.58)								
	JIS 7.5K	342 (13.46)								
	JIS 10K	330 (12.99)								
	AS2129 TABLE C D	335 (13.19)								
	AS4087 PN14, PN 16	335 (13.19)								
	AS2129 TABLE E	335 (13.19)								
	AS2129 TABLE F	370 (14.57)								
	AS4087 PN21	370 (14.57)								

DN40 to 200 (1½ to 8 in. NB) (FEV) dimensions / weights

FER – DN40 to 300 (1½ to 12 in. NB)

Dimensions in mm (in.)



DN40 to 300 (1½ to 12 in. NB) (FER)

		Dimensions in mm (in.)						Approx. weight in kg (lb)	
DN	**Process connection type**	**D**	**L**	**F**	**E**	**G**	**X**	**Integral**	**Remote**
DN40 (1½ in.)	EN1092-1 PN10, 16, 25, 40	150 (5.91)	200 (7.87)	260 (10.24)	185 (7.28)	137 (5.39)	23.5 (0.93)	13.4 (29.5)	12.4 (27.3)
	ASME B16.5 CLASS 150								
	AS2129 TABLE D, E, F								
DN50 (2 in.)	EN1092-1 PN10, 16, 25, 40	165 (6.50)	200 (7.87)	261 (10.28)	186 (7.32)	138 (5.43)	29 (1.14)	14.75 (32.45)	13.75 (30.25)
	ASME B16.5 CLASS 150								
DN80 (3 in.)	EN1092-1 PN10, 16, 25, 40	200 (7.87)	200 (7.87)	280 (11.04)	205.5 (8.09)	157.5 (6.2)	47 (1.85)	21.2 (46.64)	20.2 (44.4)
	ASME B16.5 CLASS 150								
	AS4087 PN16, 21								
	AS2129 TABLE D, E, F								
DN100 (4 in.)	EN1092-1 PN10, 16, 25, 40	225 (8.86)	250 (9.84)	300.5 (11.83)	225.5 (8.88)	177.5 (6.98)	64 (2.52)	27.3 (60)	26.3 (58)
	ASME B16.5 CLASS 150								
	AS4087 PN16								
DN150 (6 in.)	EN1092-1 PN10, 16, 25, 40	300 (11.81)	300 (11.81)	333.5 (13.13)	258.5 (10.18)	210.5 (8.29)	100.2 (3.94)	27.3 (60)	26.3 (58)
	ASME B16.5 CLASS 150								
	AS4087 PN16								
DN200 (8 in.)	EN1092-1 PN10, 16	375 (11.76)	350 (13.78)	358.7 (14.12)	283.7 (11.17)	235.7 (9.28)	126.7 (5.00)	68 (150)	67 (147.4)
	ASME B16.5 CLASS 150								
	AS2129 TABLE C, D, E, F								
	AS4087 PN14, 16, 21								

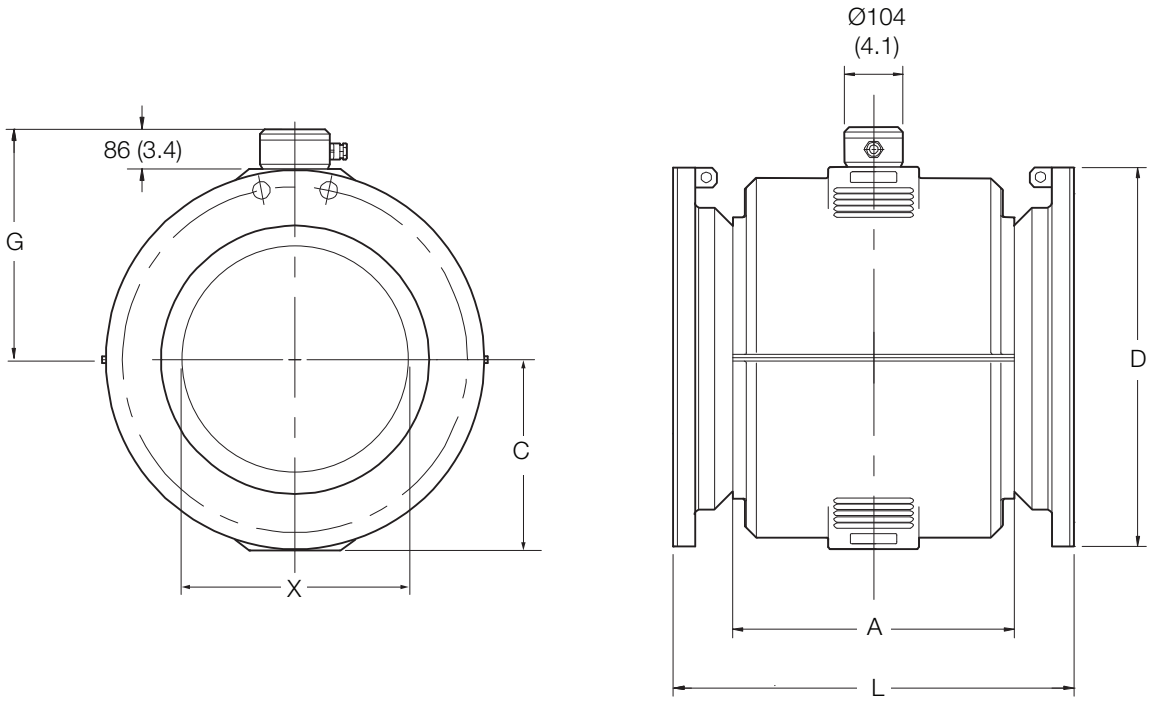
DN40 to 200 (1½ to 8 in.) (FER) cast iron sensor dimensions / weights

		Dimensions in mm (in.)							Approx. weight in kg (lb)	
DN	Process connection type	D	L	F	C	E	G	X	Integral	Remote
DN40 (1 1/2 in.)	EN1092-1 PN10, 16, 25, 40	150 (5.91)	200 (7.87)	260 (10.24)	30.4 (1.20)	185 (7.28)	138 (5.43)	23.5 (0.93)	13 (29)	11 (24)
	ASME B16.5 CLASS 150	127 (5.00)								
	JIS 10K	140 (5.51)								
	AS2129 TABLE C D E	135 (5.31)								
	AS2129 TABLE F	140 (5.51)								
	AS4087 PN14	135 (5.31)								
DN50 (2 in.)	EN1092-1 PN10, 16, 25, 40	165 (6.50)	200 (7.87)	270 (10.63)	38.3 (1.51)	195 (7.68)	146 (5.75)	29 (1.14)	14 (31)	12 (27)
	ASME B16.5 CLASS 150	152.4 (6.00)								
	JIS 10K	155 (6.10)								
	AS4087 PN21	165 (6.50)								
	AS2129 TABLE F	165 (6.50)								
	AS2129 TABLE C D E	150 (5.91)								
	AS4087 PN14, PN16	150 (5.91)								
DN65 (2 1/2 in.)	EN1092-1 PN10, 16, 25, 40	185 (7.28)	200 (7.87)	275 (10.83)	45.2 (1.78)	200 (7.87)	152 (5.98)	37 (1.46)	15 (33)	13 (29)
	ASME B16.5 CLASS 150	178 (7.00)								
	JIS10K	175 (6.89)								
	AS2129 TABLE C D E	165 (6.50)								
	AS2129 TABLE F	185 (7.28)								
	AS4087 PN14, 16	165 (6.50)								
	AS4087 PN21	185 (7.28)								
DN80 (3 in.)	EN1092-1 PN10, 16, 25, 40	200 (7.87)	200 (7.87)	280 (11.02)	51.5 (2.03)	205 (8.07)	156 (6.14)	47 (1.85)	20 (44)	18 (40)
	ASME B16.5 CLASS 150	190 (7.48)								
	JIS 10K	185 (7.28)								
	AS2129 TABLE C D E	185 (7.28)								
	AS4087 PN14, 16	185 (7.28)								
	AS2129 TABLE F	205 (8.07)								
	AS4087 PN21	205 (8.07)								
DN100 (4 in.)	EN1092-1 PN10, 16	220 (8.66)	250 (9.84)	320 (12.60)	63.75 (2.51)	245 (9.65)	196.8 (7.75)	64 (2.52)	27 (59)	25 (55)
	EN1092-1 PN25, 40	235 (9.25)								
	ASME B16.5 CLASS 150	228.6 (9.00)								
	JIS 7.5K	238 (9.37)								
	JIS 10K	210 (8.27)								
	AS2129 TABLE C D	215 (8.46)								
	AS4087 PN14, 16	215 (8.46)								
	AS4087 PN21	230 (9.06)								
DN125 (5 in.)	EN1092-1 PN10, 16	250 (9.84)	250 (9.84)	320 (12.60)	63.75 (2.51)	245 (9.65)	197 (7.76)	64 (2.52)	27 (59)	25 (55)
	EN1092-1 PN25, 40	270 (10.63)								
	ASME B16.5 CLASS 150	254 (10.00)								
	JIS 10K	250 (9.84)								
	AS2129 TABLE C D	255 (10.04)								
DN150 (6 in.)	EN1092 PN10, 16	285 (11.22)	300 (11.81)	340 (13.39)	84.4 (3.32)	265 (10.43)	217 (8.54)	100.2 (3.94)	33 (72)	31 (68)
	EN1092 PN25, 40	300 (11.81)								
	ASME B16.5 CLASS 150	279 (10.98)								
	JIS 7.5k	290 (11.42)								
	JIS 10K	280 (11.02)								
	AS2129 TABLE C D	280 (11.02)								
	AS4087 PN14, 16	280 (11.02)								
	AS4087 PN21	305 (12.01)								
DN200 (8 in.)	EN1092-1 PN10, 16	340 (13.39)	350 (13.78)	365 (14.37)	109.8 (4.32)	290 (11.42)	243 (9.57)	126.7 (4.99)	50 (110)	48 (106)
	EN1092-1 PN25, 40	360 (14.17)								
	ASME B16.5 CLASS 150	345 (13.58)								
	JIS 7.5K	342 (13.46)								
	JIS 10K	330 (12.99)								
	AS2129 TABLE C D	335 (13.19)								
	AS4087 PN14, 16	335 (13.19)								
	AS4087 PN21	370 (14.57)								
DN250 (10 in.)	EN1092-1 PN10	395 (15.55)	450 (17.72)	389 (15.31)	136.8 (5.39)	313 (12.33)	268 (10.55)	153.5 (6.04)	77 (169)	75 (165)
	EN1092-1 PN16	405 (15.94)								
	EN1092-1 PN25	425 (16.73)								
	ASME B16.5 CLASS 150	405 (15.94)								
	JIS 7.5K	400 (15.75)								
	JIS 10K	400 (15.75)								
	AS2129 TABLE C D	405 (15.94)								
	AS4087 PN14, 16	405 (15.94)								
	AS4087 PN21	430 (16.93)								
DN300 (12 in.)	EN1092-1 PN10	445 (17.52)	500 (19.69)	414 (16.30)	162.2 (6.39)	338.6 (13.33)	294 (1157)	203.5 (8.01)	114 (251)	112 (247)
	EN1092-1 PN16	460 (18.11)								
	EN1092-1 PN25	485 (19.09)								
	ASME B16.5 CLASS 150	485 (19.09)								
	JIS 10K	445 (17.52)								
	AS2129 TABLE C D	455 (17.91)								
	AS4087 PN14, 16	455 (17.91)								
	AS4087 PN21	490 (19.29)								

DN40 to 300 (1 1/2 to 12 in. NB) (FER) dimensions / weights

FER – DN350 to 600 (14 to 24 in. NB) remote sensor

Dimensions in mm (in.)



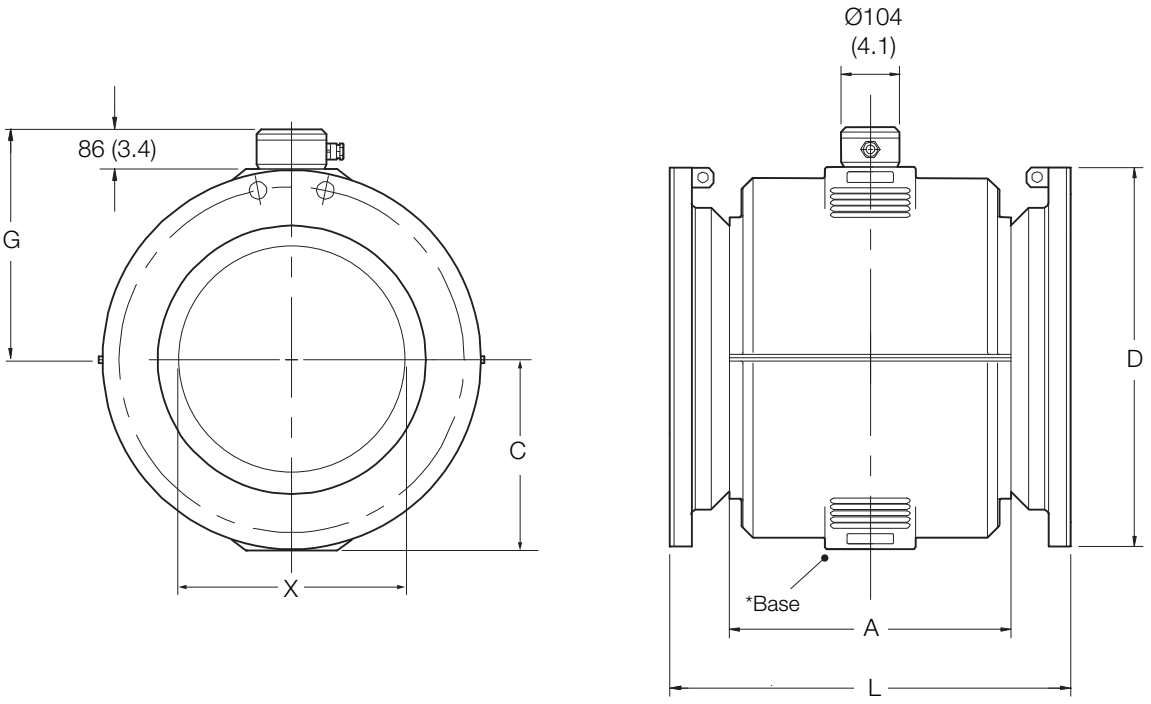
DN350 to 600 (14 to 24 in. NB) (FER) remote sensor

		Dimensions in mm (in.)								Approx. weight in kg (lb)
DN	Process connection type	D	L	F	C	E	G	A	X	Remote
DN350 (14 in.)	EN1092-1 PN10	505 (19.88)	550 (21.65)	472 (18.58)	231 (9.09)	402 (15.83)	325 (12.80)	376 (14.80)	293 (11.53)	100 (220)
	EN1092-1 PN16	520 (20.47)								
	EN1092-1 PN25	555 (21.85)								
	EN1092-1 PN40	580 (22.83)								
	JIS 5K	480 (18.90)								
	JIS 10K	490 (19.29)								
	AS2129 TABLE C D E	525 (20.67)								
	AS2129 TABLE F	550 (21.65)								
	AS4087 PN14, PN16	525 (20.67)								
	AS4087 PN21	550 (21.65)								
DN400 (16 in.)	EN1092-1 PN10	565 (22.24)	600 (23.62)	502 (19.76)	257.5 (10.14)	432 (17.01)	355 (13.98)	420 (16.54)	343 (13.50)	115 (253)
	EN1092-1 PN16	580 (22.83)								
	EN1092-1 PN25	620 (24.41)								
	EN1092-1 PN40	660 (25.98)								
	JIS 5K	540 (21.26)								
	JIS 10K	560 (22.05)								
	AS2129 TABLE C D E	580 (22.83)								
	AS2129 TABLE F	610 (24.02)								
	AS4087 PN14, PN16	580 (22.83)								
	AS4087 PN21	610 (24.02)								
DN450 (18 in.)	EN1092-1 PN10	615 (24.21)	700 (27.56)	537 (21.14)	285 (11.22)	467 (18.39)	390 (15.35)	480 (18.90)	394 (15.52)	160 (352)
	EN1092-1 PN16	640 (25.20)								
	EN1092-1 PN25	670 (26.38)								
	EN1092-1 PN40	685 (26.97)								
	JIS 5K	605 (23.82)								
	JIS 10K	620 (24.41)								
	AS2129 TABLE C D E	640 (25.20)								
	AS2129 TABLE F	675 (26.57)								
	AS4087 PN14, PN16	640 (25.20)								
	AS4087 PN21	675 (26.57)								
DN500 (20 in.)	EN1092-1 PN10	670 (26.38)	770 (30.31)	557 (21.93)	317.5 (12.50)	487 (19.17)	410 (16.14)	520 (20.47)	443 (17.44)	217 (477)
	EN1092-1 PN16	715 (28.15)								
	EN1092-1 PN25	730 (28.74)								
	EN1092-1 PN40	755 (29.72)								
	JIS 5K	655 (25.79)								
	JIS 10K	675 (26.57)								
	AS2129 TABLE C D E	705 (27.76)								
	AS2129 TABLE F	735 (28.94)								
	AS4087 PN14, PN16	705 (27.76)								
	AS4087 PN21	735 (28.94)								
DN600 (24 in.)	EN1092-1 PN10	780 (30.71)	920 (36.22)	602 (23.70)	345 (13.58)	532 (20.94)	455 (17.91)	610 (24.02)	494 (19.45)	315 (693)
	EN1092-1 PN16	840 (33.07)								
	EN1092-1 PN25	845 (33.27)								
	EN1092-1 PN40	890 (35.04)								
	JIS 5K	770 (30.31)								
	JIS 10K	795 (31.30)								
	AS2129 TABLE C D E	825 (32.48)								
	AS2129 TABLE F	850 (33.46)								
	AS4087 PN14, PN16	825 (32.48)								
	AS4087 PN21	850 (33.46)								

DN350 to 600 (14 to 24 in. NB) (FER) remote sensor dimensions / weights

FEF – DN250 to 600 (10 to 24 in. NB)

Dimensions in mm (in.)



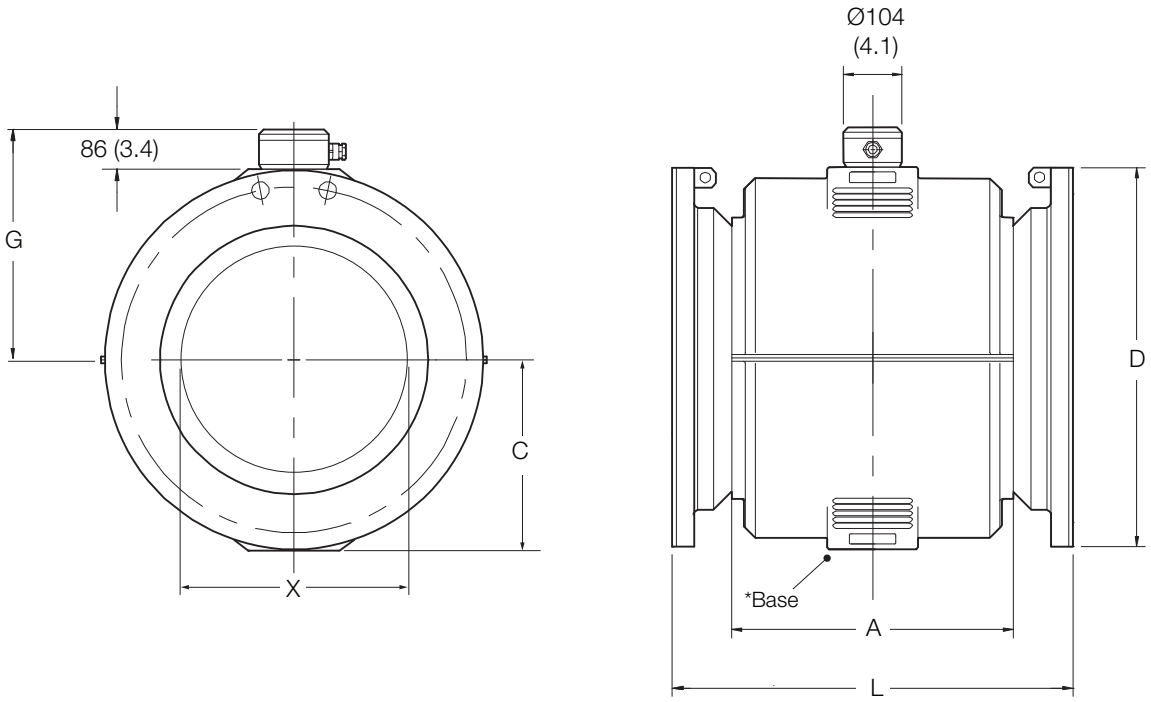
*Dimension C = centre line to base of flowmeter body

DN250 to 600 (10 to 24 in. NB) (FEF)

		Dimensions in mm (in.)						
DN	Process connection type	D	L	C	G	A	X	Approx. weight in kg (lb)
DN250 (10 in.)	ASME B16.5 CLASS 150	405 (15.94)	450 (17.72)	215 (8.46)	301 (11.85)	300 (11.81)	250 (9.84)	88 (194)
	ASME B16.5 CLASS 300	445 (17.52)	490 (19.29)					
	EN1092 -1 PN10	395 (15.55)	450 (17.72)					
	EN1092 – 1 PN16	405 (15.94)						
	EN1092 – 1 PN25	425 (16.73)	490 (19.29)					
	EN1092 – 1 PN40	450 (17.72)						
	JIS 5K	385 (15.16)	450 (17.72)					
	JIS 10K	400 (15.75)						
	AS4087 PN14, PN16	405 (15.94)						
	AS2129 TABLE C D							
	AS2129 TABLE E							
	AS4087 PN21	430 (16.93)						
	AS2129 TABLE F							
DN300 (12 in.)	ASME B16.5 CLASS 150	485 (19.09)	500 (19.69)	231 (9.09)	317 (12.48)	352 (13.86)	300 (11.81)	128 (282)
	ASME B16.5 CLASS 300	520 (20.47)	540 (21.26)					
	EN1092 – 1 PN10	445 (17.52)	500 (19.69)					
	EN1092 – 1 PN16	460 (18.11)	500 (19.69)					
	EN1092 – 1 PN25	485 (19.09)	540 (21.26)					
	EN1092 – 1 PN40	515 (20.28)	540 (21.26)					
	JIS 5K	430 (16.93)	500 (19.69)					
	JIS 10K	445 (17.52)	500 (19.69)					
	AS4087 PN14, PN16	455 (17.91)	500 (19.69)					
	AS2129 TABLE TABLE C D	455 (17.91)	500 (19.69)					
	AS2129 TABLE E	455 (17.91)	500 (19.69)					
	AS4087 PN21	490 (19.29)	500 (19.69)					
	AS2129 TABLE F	490 (19.29)	500 (19.69)					
DN350 (14 in.)	ASME B16.5 CLASS 150	535 (21.06)	550 (21.65)	257.5 (10.14)	346 (13.62)	376 (14.80)	350 (13.78)	100 (220)
	ASME B16.5 CLASS 300	585 (23.03)	570 (22.44)					
	EN1092 – 1 PN10	505 (19.88)	550 (21.65)					
	EN1092 – 1 PN16	520 (20.47)	550 (21.65)					
	EN1092 – 1 PN25	555 (21.85)	570 (22.44)					
	EN1092 – 1 PN40	580 (22.83)	570 (22.44)					
	JIS 5K	480 (18.90)	550 (21.65)					
	JIS 7.5K	530 (20.87)	550 (21.65)					
	JIS 10K	490 (19.29)	550 (21.65)					
	AS4087 PN14, PN16	525 (20.67)	550 (21.65)					
	AS2129 TABLE C D E	525 (20.67)	550 (21.65)					
	AS4087 PN21	550 (21.65)	550 (21.65)					
	AS2129 TABLE F	550 (21.65)	550 (21.65)					
	AS4087 PN35	550 (21.65)	570 (22.44)					
	AS2129 TABLE H	550 (21.65)	570 (22.44)					
DN375 (15 in.)	AS4087 PN14, PN16	550 (21.65)	550 (21.65)	257.5 (10.14)	346 (13.62)	376 (14.80)	350 (13.78)	115 (253)
	AS2129 TABLE C	550 (21.65)	550 (21.65)					
	AS4087 PN35	580 (22.83)	570 (22.44)					
DN400 (16 in.)	ASME B16.5 CLASS 150	600 (23.62)	600 (23.62)	285 (11.22)	371 (14.61)	420 (16.54)	400 (15.75)	115 (253)
	ASME B16.5 CLASS 300	650 (25.59)	620 (24.41)					
	EN1092 – 1 PN10	565 (22.24)	600 (23.62)					
	EN1092 – 1 PN16	580 (22.83)	600 (23.62)					
	EN1092 – 1 PN25	620 (24.41)	620 (24.41)					
	EN1092 – 1 PN40	660 (25.98)	620 (24.41)					
	JIS 5K	540 (21.26)	600 (23.62)					
	JIS 7.5K	582 (22.91)	600 (23.62)					
	JIS 10K	560 (22.05)	600 (23.62)					
	AS4087 PN14, PN16	580 (22.83)	600 (23.62)					
	AS2129 TABLE C D E	580 (22.83)	600 (23.62)					
	AS4087 PN21	610 (24.02)	600 (23.62)					
	AS2129 TABLE F	610 (24.02)	600 (23.62)					
	AS4087 PN35	610 (24.02)	620 (24.41)					
	AS2129 TABLE H	610 (24.02)	620 (24.41)					

DN250 to 600 (10 to 24 in. NB) (FEF) dimensions / weights

Dimensions in mm (in.)



*Dimension C = centre line to base of flowmeter body

…DN250 to 600 (10 to 24 in. NB) (FEF)

		Dimensions in mm (in.)						
DN	**Process connection type**	**D**	**L**	**C**	**G**	**A**	**X**	**Approx. weight in kg (lb)**
DN450 (18 in.)	ASME B16.5 CLASS 150	635 (25.00)	700 (27.56)	317.5 (12.50)	402 (15.83)	480 (18.90)	450 (17.72)	160 (352)
	ASME B16.5 CLASS 300	710 (27.95)						
	EN1092 – 1 PN10	615 (24.21)						
	EN1092 – 1 PN16	640 (25.20)						
	EN1092 – 1 PN25	670 (26.38)						
	EN1092 – 1 PN40	685 (26.97)						
	JIS 5K	605 (23.82)						
	JIS 7.5K	652 (25.67)						
	JIS 10K	620 (24.41)						
	AS4087 PN14, PN16	640 (25.20)						
	AS2129 TABLE C D	640 (25.20)						
	AS2129 TABLE E	640 (25.20)						
	AS4087 PN21	675 (26.57)						
	AS2129 TABLE F	675 (26.57)						
	AS4087 PN35	675 (26.57)						
	AS2129 TABLE H	675 (26.57)						
DN500 (20 in.)	ASME B16.5 CLASS 150	700 (27.56)	770 (30.31)	345 (13.58)	429 (16.89)	520 (20.47)	500 (19.69)	217 (455)
	ASME B16.5 CLASS 300	775 (30.51)						
	EN1092 – 1 PN10	670 (26.38)						
	EN1092 – 1 PN16	715 (28.15)						
	EN1092 – 1 PN25	730 (28.74)						
	EN1092 – 1 PN40	755 (29.72)						
	JIS 5K	655 (25.79)						
	JIS 7.5K	706 (27.80)						
	JIS 10K	675 (26.57)						
	AS4087 PN 14, PN16	705 (27.76)						
	AS2129 TABLE C D E	705 (27.76)						
	AS4087 PN21	735 (28.94)						
	AS2129 TABLE F	735 (28.94)						
	AS4087 PN35	735 (28.94)						
	AS2129 TABLE H	735 (28.94)						
DN600 (24 in.)	ASME B16.5 CLASS 150	815 (32.09)	920 (36.22)	387.5 (15.25)	472 (18.58)	610 (24.02)	600 (23.62)	315 (693)
	ASME B16.5 CLASS 300	915 (36.02)						
	EN1092 – 1 PN10	780 (30.71)						
	EN1092 – 1 PN16	840 (33.07)						
	EN1092 – 1 PN25	845 (33.27)						
	EN1092 – 1 PN40	890 (35.04)						
	JIS 5K	770 (30.31)						
	JIS 7.5K	810 (31.89)						
	JIS 10K	795 (31.30)						
	AS4087 PN14, PN16	825 (32.48)						
	AS2129 TABLE C D	825 (32.48)						
	AS2129 TABLE E	825 (32.48)						
	AS4087 PN21	850 (33.46)						
	AS2129 TABLE F	850 (33.46)						
	AS4087 PN35	850 (33.46)						
	AS2129 TABLE H	850 (33.46)						

…DN250 to 600 (10 to 24 in. NB) (FEF) dimensions / weights

Ordering information

Electromagnetic flowmeter WaterMaster – FEW11, FEW12 and FEW18

Product coding field 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**	X	XXX	X	X	X	X	XX	X	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																		
Liner material																					
PTFE – DN10 to 32 (3/8 to 1 1/4 in. NB)				A																	
Electrode design																					
Standard					1																
Other					9																
Measuring electrodes material																					
Hastelloy® C-4 (2.4610)						D															
Grounding accessories																					
Not required							0														
One potential equalizing ring (stainless steel)							3														
Two potential equalizing rings (stainless steel)							4														
Other							9														
Process connection type (refer to pages 21 and 20)																					
ASME B16.5 B class 150								A1													
ASME B16.5 B class 300								A3													
ISO / EN PN40								S4													
DIN PN40								D4													
Other								Z9													
Process connection material																					
Carbon steel flanges – DN20 to 32 (3/4 to 1 1/4 in. NB)									B												
Stainless steel flange 1.4571 (316 Ti) – DN10 to 15 (3/8 to 1/2 in. NB)									D												
Other									Z												
Usage certifications																					
Standard (without PED)										1											
Other										9											
Calibration type																					
Class 2 calibration – standard accuracy 0.4 %											A										
Class 1 calibration – high accuracy 0.2 %											B										
Extended range, class 1 calibration – high accuracy 0.2 %											N										
Extended range, class 2 calibration – standard accuracy 0.4 %											P										
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 (non-Ex design)															A						
FM Class 1 Div. 2															G						
usFMc Class 1 Div. 2															P						
ATEX / IECEx Zone 2, 21 & 22															M						

Continued on next page…

Product coding field 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**	**X**	**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	1
IP67 (NEMA 4X) / IP67 (NEMA 4X) – cable fitted and potted to sensor	7

Cable conduits*

M20 x 1.5 (plastic)	A
NPT ½ in. (blanked when cable not fitted)	B
M20 SWA (armored)	D
M20 SWA sensor, M20 x 1.5 (plastic) power / output	F
Without	Y

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 + pulse + contact output (general-purpose design only)	G
MODBUS RTU RS485 physical layer + pulse + contact output (general-purpose design only)	M
Without	Y

Configuration type / diagnostics type

Not required	0
Factory default/ standard	1

Options**

Accessories

Configuration lead	AC

Documentation language

German	M1	Chinese	M6
Italian	M2	Swedish	M7
Spanish	M3	Finnish	M8
French	M4	Portuguese	MA
English	M5 (default)	Danish	MF
		Norwegian	MN

Verification type

Without fingerprint	V0
VeriMaster	V3

Potable water approval

WRAS cold water approval	CWA
Without	CWY

Power supply frequency (FEW 18 only)

50 Hz	F5
60 Hz	F6

Number of testpoints (FEW 10 to 32 only)

1 Point	T1
3 Points	T3

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

Electromagnetic flowmeter WaterMaster FEV11, FEV12 and FEV18

Product coding field 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**	X	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 (1 1/2 in.)			040																		
DN50 (2 in.)			050																		
DN65 (2 1/2 in.)			065																		
DN80 (3 in.)			080																		
DN100 (4 in.)			100																		
DN125 (5 in.)			125																		
DN150 (6 in.)			150																		
DN200 (8 in.)			200																		
Liner material																					
Polypropylene – DN40 to 200 (1 1/2 to 8 in. NB)				V																	
Electrode design																					
Standard					1																
Measuring electrodes material																					
Stainless steel 316						S															
Hastelloy® C-22						C															
Super-austenitic steel						U															
Grounding accessories																					
Standard							1														
One potential equalizing ring (stainless steel)							3														
Two potential equalizing rings (stainless steel)							4														
Process connection type (refer to pages 29 and 28)																					
Flanges ASME B16.5 class 150								A1													
Flanges AS 4087 PN21 (≥ DN50 [2 in. NB])								E0													
Flanges AS 4087 PN16 (≥ DN50 [2 in. 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 G5527 7.5K (³ DN100 [4 in. NB])								J0													
Flanges JIS B2220 10K								J1													
ISO/EN PN10								S1													
ISO / EN PN16 (≥ DN50 [2 in. NB])								S2													
ISO / EN PN40 (DN40 [1 1/2 in. 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 %											A										
Class 1 Calibration – high accuracy 0.2 %											B										
Extended range, class 1 calibration – high accuracy 0.2 %											N										
Extended range, class 2 calibration – standard accuracy 0.4 %											P										

Continued on next page…

Product coding field 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**	X	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X	
Flowmeter system, optimized full bore, remote mount	**FEV12**																				
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														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.)														9							
Explosion protection certification																					
General purpose (non-Ex design)															A						
FM Class 1 Div. 2															G						
usFMc Class 1 Div. 2															P						
ATEX / IECEx Zone 2, 21 & 22															M						
Protection class transmitter / protection class sensor																					
IP67 (NEMA 4X) / IP67 (NEMA 4X) – integral																1					
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 (plastic)																	A				
NPT 1/2 in. (blanked when cable not fitted)																	B				
M20 SWA (armored)																	D				
M20 SWA sensor, M20 x 1.5 (plastic) power / output																	F				
Without																	Y				
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			
Others																		9			
Input and output signal type																					
HART + 20 mA + pulse + contact output																			A		
PROFIBUS DP RS485 physical layer + pulse + contact output																			G		
MODBUS RTU RS485 physical layer + pulse + contact output																			M		
Without																			Y		
Configuration type / diagnostics type																					
Without																				0	
Factory defaults / standard diagnostics																				1	

Continued on next page…

* 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.

Product coding field 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**	X	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X	
Flowmeter system, optimized full bore, remote mount	**FEV12**																				
Optimized full bore sensor only, for use with WaterMaster transmitter / remote	**FEV18**																				

Options**

Accessories

Configuration lead	AC

Documentation language

German	M1	Chinese	M6
Italian	M2	Swedish	M7
Spanish	M3	Finnish	M8
French	M4	Portuguese	MA
English	M5 (default)	Danish	MF
		Norwegian	MN

Other usage certifications

Measuring Instruments Directive (MID)	CM1
OIML R49 Calibration	CM2

Verification type

Without fingerprint	V0
VeriMaster	V3

Potable water approval

WRAS cold water approval	CWA
NSF 61 meter approval	CWC
DVGW	CWD
ACS	CWF
Without	CWY

Power supply frequency (sensor FEV18 only)

50 Hz	F5
60 Hz	F6

Number of testpoints

1 Point	T1
3 Points	T3

**Add codes for options.

Electromagnetic flowmeter WaterMaster FEF12 and FEF18

Product coding field 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**	X	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 [27 in. NB])		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																		
Others			999																		
Liner material																					
Elastomer – DN250 to 600 (10 to 24 in. NB)				K																	
Hard rubber – DN250 to 600 (10 to 24 in. NB)				H																	
Other				Z																	
Electrode design																					
Standard					1																
Others					9																
Measuring electrodes material																					
Stainless steel 316						S															
Hastelloy® C-22						C															
Super-austenitic steel (DN250 to 600 [10 to 24 in. NB])						U															
Others						Z															
Grounding accessories																					
Standard							1														
One potential equalizing ring (stainless steel)							3														
Two potential equalizing rings (stainless steel)							4														
Others							9														
Process connection type (refer to pages 35 to 33)																					
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 AS 2129 Table H								E7													
Flanges AS 4087 PN35								E8													
Flanges JIS G5527 7.5K								J0													
Flanges JIS B2220 10K								J1													
Flanges JIS B2220 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													
Note. DN80 to 200 (3 to 10 in. NB) available only with PN16																					
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 – high accuracy 0.2 %											B										
Extended range, class 1 calibration – high accuracy 0.2 %											N										
Extended range, class 2 calibration – standard accuracy 0.4 %											P										

Continued on next page …

Product coding field 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	X	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																				
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 > 150 m (> 490 ft.) (and / or armored cable)														9							
Explosion protection certification																					
General purpose (non-Ex design)															A						
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 (plastic)																	A				
NPT ½ in. (blanked when cable not fitted)																	B				
M20 SWA (armored)																	D				
M20 SWA sensor, M20 x 1.5 (plastic) power / output																	F				
Without																	Y				
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 + pulse + contact output																			G		
MODBUS RTU RS485 physical layer + pulse + contact output																			M		
Without																			Y		
Configuration type / diagnostics type																					
Without																				0	
Factory defaults / standard diagnostics																				1	

Options***

Accessories

Configuration lead	AC

Documentation language

German	M1	Chinese	M6
Italian	M2	Swedish	M7
Spanish	M3	Finnish	M8
French	M4	Portuguese	MA
English	M5 (default)	Danish	MF
		Norwegian	MN

Verification type

Without fingerprint	V0
VeriMaster	V3

Potable water approvals

WRAS cold water approval	CWA
NSF 61 meter approval	CWC
DVGW	CWD
ACS	CWF
WRAS 60 °C (140 °F) water approval	CWK
Without	CWY

Power supply frequency (sensor FEF 18 only)

50 Hz	F5
60 Hz	F6

Number of testpoints

1 Point	T1
3 Points	T3

*Size is dependent on flange specification
**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 – FEW31, FEW32 and FEW38

Product coding field 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	**FEW31**																				
Flowmeter system – full bore, remote mount	**FEW32**	X	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	**FEW38**																				
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																		
DN40 (1 1/2 in.)			040																		
DN50 (2 in.)			050																		
DN65 (2 1/2 in.)			065																		
DN80 (3 in.)			080																		
DN100 (4 in.)			100																		
DN125 (5 in.)			125																		
DN150 (6 in.)			150																		
DN200 (8 in.)			200																		
DN250 (10 in.)			250																		
DN300 (12 in.)			300																		
DN350 (14 in.)			350																		
DN400 (16 in.)			400																		
DN450 (18 in.)			450																		
DN500 (20 in.)			500																		
DN600 (24 in.)			600																		
DN700 (28 in.)			700																		
DN750 (30 in.)			750																		
DN800 (32 in.)			800																		
DN900 (36 in.)			900																		
DN1000 (40 in.)			001																		
DN1050 (42 in.)			051																		
DN1100 (44 in.)			101																		
DN1200 (48 in.)			201																		
DN1350 (54 in.)			351																		
DN1400 (56 in.)			401																		
DN1500 (60 in.)			501																		
DN1600 (64 in.)			601																		
DN1650 (66 in.)			651																		
DN1800 (72 in.)			801																		
DN1950 (78 in.)			951																		
DN2000 (80 in.)			002																		
DN2100 (84 in.)			102																		
DN2200 (88 in.)			202																		
DN2400 (96 in.)			402																		
Others			999																		
Liner material																					
PTFE – DN10 to 600 (3/8 to 24 in. NB)				A																	
Hard rubber – DN40 to 2400 (1 1/2 to 96 in. NB)				H																	
Elastomer – DN40 to 2400 (1 1/2 to 96 in. NB)				K																	
Electrode design																					
Standard					1																
Other					9																
Measuring electrodes material																					
Hastelloy® C-4 (2.4610)						D															
Stainless steel 316Ti/316L						S															
Hastelloy C-22						C															
Grounding accessories																					
Not required							0														
Standard							1														
One potential equalizing ring (stainless steel)							3														
Two potential equalizing rings (stainless steel)							4														

Continued on next page…

Product coding field 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	**FEW31**	x	xxx	x	x	x	x	xx	x	x	x	x	x	x	x	x	x	x	x	x	
Flowmeter system – full bore, remote mount	**FEW32**																				
Full bore sensor only – for use with WaterMaster transmitter / remote	**FEW38**																				
Process connection type (refer to pages 21 to 26)																					
Flanges ASME B16.47 series B / B16.5 Class 150								A1													
Flanges ASME B16.47 series B / B16.5 Class 300								A3													
Flanges ASME B16.47 series A Class 150								B1													
Flanges ASME B16.47 series A Class 300								B3													
Flanges AWWA C207 Class B								C1													
Flanges AWWA C207 Class D								C2													
Flanges AWWA C207 Class E								C3													
Flanges AWWA C207 Class F								C4													
Flanges JIS 10K								J1													
Flanges JIS 5K								J2													
Flanges AS 4087 PN 16								E1													
Flanges AS 2129 Table E								E4													
Flanges AS 2129 Table D								E5													
Flanges AS 4087 PN 35								E8													
ISO 7005, DIN, EN 1092-1 PN6								S0													
ISO 7005, DIN, EN 1092-1 PN10								S1													
ISO 7005, DIN, EN 1092-1 PN16								S2													
ISO 7005, DIN, EN 1092-1 PN25								S3													
ISO 7005, DIN, EN 1092-1 PN40								S4													
Process connection material																					
Carbon steel flanges									B												
Stainless steel flange									D												
Usage certifications																					
Standard (without PED)										1											
Calibration type																					
Class 2 calibration – standard accuracy 0.4 %											A										
Class 1 calibration – high accuracy 0.2 %											B										
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 (non-Ex design)															A						
FM Class 1 Div. 2															G						
usFMc Class 1 Div. 2															P						
ATEX / IECEx Zone 2, 21 & 22															M						

Continued on next page…

Product coding field 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	**FEW31**	X	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X	
Flowmeter system – full bore, remote mount	**FEW32**																				
Full bore sensor only – for use with WaterMaster transmitter / remote	**FEW38**																				
Protection class transmitter / protection class sensor																					
IP67 (NEMA 4X) / IP67 (NEMA 4X) – cable not fitted and not potted to sensor																1					
IP 67 (NEMA 4x) / IP68 (NEMA 6P) – cable not fitted and not potted to sensor																2					
IP 67 (NEMA 4x) / IP68 (NEMA 6P) – cable fitted and potted to sensor																3					
Cable conduits **																					
M20 x 1.5 (plastic)																	A				
NPT ½ in. (blanked when cable not fitted)																	B				
M20 SWA (armored)																	D				
M20 SWA sensor, M20 x 1.5 (plastic) power / output																	F				
Without																	Y				
Power supply																					
Without																		0			
108.. 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 + pulse + contact output																			G		
MODBUS RTU RS485 physical layer + pulse + contact output																			M		
Without																			Y		
Configuration type / diagnostics type																					
Not required																				0	
Factory default / Standard																				1	

Options***

Accessories

Configuration lead	AC

Documentation language

German	M1	Chinese	M6
Italian	M2	Swedish	M7
Spanish	M3	Finnish	M8
French	M4	Portuguese	MA
English	M5 (default)	Danish	MF
		Norwegian	MN

Lay length

ISO length – DN10 to 600 (3/8 to 24 in.) and 1.25D DN1800 to 2400 (72 to 96 in.)	JB
1.3D DN700 to 2400 (28 to 96 in.) – see dimensional pages 25, 26, 27	JK
1.0D DN700 to 1600 (28 to 64 in.) – see dimensional pages 25, 26, 27	JH

Verification type

Without fingerprint	V0
VeriMaster	V3

Potable water approval

WRAS cold water approval	CWA
DVGW	CWD
WRAS 60 °C (140 °F) water approval	CWK
NSF material approval	CWM
Without	CWY

Power supply frequency (sensor FEW38 only)

50 Hz	F5
60 Hz	F6

Number of testpoints

1 Point	T1
3 Points	T3
5 Points	T5

* FM approval in process. FEF product still available with full FM approval

** 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.

WaterMaster FER reduced-bore sensor flowmeter series

Product coding field number	1 … 6	7 … 9	10	11	12	13	14,15	16	17	18	19	20	21	22	23	24	25	26	27	Options
WaterMaster system. Reduced-bore sensor with remote mounted transmitter	**FER121**																			
WaterMaster system. Reduced-bore sensor with integral transmitter	**FER111**	**XXX**	**X**	**X**	**X**	**X**	**XX**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	
WaterMaster reduced-bore sensor only, remote mount, without transmitter	**FER181**																			
Bore diameter																				
DN 40 (1½ in.)		040																		
DN 50 (2 in.)		050																		
DN 65 (2½ in.)		065																		
DN 80 (3 in.)		080																		
DN 100 (4 in.)		100																		
DN 125 (5 in.)		125																		
DN 150 (6 in.)		150																		
DN 200 (8 in.)		200																		
DN 250 (10 in.)		250																		
DN 300 (12 in.)		300																		
DN 350 (14 in.)		350																		
DN 375 (15 in.)		375																		
DN 400 (16 in.)		400																		
DN 450 (18 in.)		450																		
DN 500 (20 in.)		500																		
DN 600 (24 in.)		600																		
Liner material																				
Elastomer – DN40 to 600 (1½ to 24 in. NB)			K																	
Electrode design																				
Standard				1																
Measuring electrodes material																				
Stainless steel 316					S															
Super austenitic steel (1.4529)					U															
Grounding accessories																				
1 x Stainless steel equalizing ring						3														
2 x Stainless steel equalizing rings						4														
Process connection type (refer to pages 30 and 30)																				
Flanges ANSI / ASME B16.5 / 16.47 series B Class 150	(40 / 50 / 80 / 100 / 150 … 300)						A1													
Flanges AWWA C207 Class E	(40 / 50 / 80)						C3													
Flanges JIS 7.5K	(100 / 150 … 300)						J0													
Flanges JIS 10K	(40 / 50 / 80 / 100 / 150 … 300)						J1													
Flanges AS 4087 PN 21	(50 / 80 / 100 / 150 … 600)						E0													
Flanges AS 4087 PN 16	(50 / 80 / 100 / 150 … 350 / 450 … 600)						E1													
Flanges AS 4087 PN 14	(40 / 50 / 80 / 100 / 150 … 600)						E2													
Flanges AS 2129 Table F	(40 / 50 / 80 / 100 / 150 … 600)						E3													
Flanges AS 2129 Table E	(40 / 50 / 80 / 100 / 125 / 150 … 600)						E4													
Flanges AS 2129 Table D	(40 / 50 / 80 / 100 / 150 … 300)						E5													
Flanges AS 2129 Table C	(40 / 50 / 80 / 100 / 150 … 300)						E6													
ISO 7005 PN 10 EN 1092-1	(40 … 600)						S1													
ISO 7005 PN 16 EN 1092-1	(40 … 600)						S2													
ISO 7005 PN 40 EN 1092-1	(40)						S4													
Process connection material																				
Carbon steel								B												
Usage certifications																				
Standard									1											

Continued on next page…

Product coding field number	1 … 6	7 … 9	10	11	12	13	14,15	16	17	18	19	20	21	22	23	24	25	26	27	Options
WaterMaster system. Reduced-bore sensor with remote mounted transmitter	**FER121**																			
WaterMaster system. Reduced-bore sensor with integral transmitter	**FER111**	**XXX**	**X**	**X**	**X**	**X**	**XX**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	
WaterMaster reduced-bore sensor only, remote mount, without transmitter	**FER181**																			

See previous page

Calibration type

Class 2 calibration – standard accuracy 0.4 %	A
Class 1 calibration – high accuracy 0.2	B
Extended range, class 1 calibration – high accuracy 0.2 %	N
Extended range, class 2 calibration – standard accuracy 0.4 %	P

Installation temperature range / ambient temperature range

Standard design –20 … 60 °C (–4 … 140 °F)	1

Name plate

Adhesive label	A

Signal cable length and type

Without signal cable	0
5 m (16.4 ft)	1
10 m (32.8 ft)	2
20 m (65.6 ft)	3
30 m (98.4 ft)	4
50 m (164.0 ft)	5
80 m (262.5 ft)	6
100 m (325 ft)	7
150 m (490 ft)	8
Others	9

Explosion protection certification

General purpose (non-Ex design)	A

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 (blanked when cable not fitted)	B
M20 SWA armored (FEV121 and FEV181 only)	D
M20 SWA sensor, output and power connector (FEV121 and FEV181 only)	F

Power supply

Without (FEV18 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	A
PROFIBUS DP RS485 physical layer + pulse + contact output (FEV111 and FEV121 only)	G
MODBUS RTU RS485 physical layer + pulse + contact output (FEV111 and FEV121 only)	M
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	Chinese	M6
Italian	M2	Portuguese	MA
Spanish	M3	Russian	MB
French	M4	Danish	MF
English	M5 (default)		

Verification type

Without fingerprint	V0
VeriMaster	V3

Potable water approval

WRAS cold water approval	CWA
DVGW	CWD
ACS	CWF

Power supply frequency (sensor FER18 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

Product coding field number	1 … 5	6	7	8	9	10	11	12	13	14	15	Options
Transmitter module	**FET10**											
Remote transmitter	**FET12**		X	X	X	X	X	X	X	X	X	
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												
Without signal cable					0							
Explosion protection												
Without (transmitter only)						Y						
FM Class 1 Div. 2						G						
usFMc Class 1 Div. 2						P						
ATEX / IECEx Zone 2, 21 & 22						M						
Protection class transmitter / protection class sensor												
IP67 (NEMA 4X) / IP67 (NEMA 4X)							1					
Cable conduits												
M20 x 1.5 (plastic)								A				
NPT ½ in. (blanked when cable not fitted)								B				
M20 SWA (armored)								D				
M20 SWA sensor, M20 x 1.5 (plastic) power / output								F				
Without								Y				
Power supply												
100... 230 V AC									1			
24 V AC or 24 V DC									2			
Input and output												
HART + 20 mA + pulse + contact output										A		
PROFIBUS DP RS485 physical layer + pulse + contact output										G		
MODBUS RTU RS485 physical layer + pulse + contact output										M		
Configuration type / diagnostics type												
Factory defaults / standard diagnostics											1	

Options**

Accessories

Configuration lead	AC

Documentation

German	M1	Chinese	M6
Italian	M2	Swedish	M7
Spanish	M3	Finnish	M8
French	M4	Portuguese	MA
English	M5 (default)	Danish	MF
		Norwegian	MN

Other usage

Measuring Instruments Directive (MID)	CM1

*The transmitter converter module Input and Output Signal Type must match the transmitter backplane output configuration (HART or PROFIBUS) – see OI/FET100-EN.
**Add codes for options.

Common accessories

Accessory	Item Number
WaterMaster AC Fuse F1 Type T 250 mA A/S TR5	B20411
WaterMaster DC Fuse F2 Type T 2 A A/S TR5	B20412
WaterMaster Infra Red Comms Pack	MJBX9932
WaterMaster Backplane PCB Board (STD)	WATX2505
WaterMaster Sensor PCB Board	WATX2506
WaterMaster Comms Cable	WEBC2500
Signal cable for remote WaterMaster transmitter 5 m (15 ft.) 10 m (30 ft.) 20 m (60 ft.) 30 m (100 ft.) 50 m (165 ft.) 80 m (260 ft.) 100 m (325 ft.) 150 m (490 ft.) 500 m (1650 ft.)	 STT4500/05 STT4500/10 STT4500/20 STT4500/30 STT4500/50 STT4500/80 STT4500/100 STT4500/150 STT4500/500
Armored signal cable for remote WaterMaster transmitter 5 m (15 ft.) 10 m (30 ft.) 20 m (60 ft.) 30 m (100 ft.) 50 m (165 ft.) 80 m (260 ft.) 100 m (325 ft.) 150 m (490 ft.) 500 m (1650 ft.)	 STT4501/05 STT4501/10 STT4501/20 STT4501/30 STT4501/50 STT4501/80 STT4501/100 STT4501/150 STT4501/500

Acknowledgements

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3KXF211101R1001

DS/WM-EN Rev. W 10.2014

Sales

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PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

WaterMaster V Electromagnetic Flowmeter
With WaterMaster Transmitter
&
WaterMaster F Electromagnetic Flowmeter
With WaterMaster Transmitter
&
WaterMaster W Electromagnetic Flowmeter
With WaterMaster Transmitter

manufactured by:

ABB Limited
Oldends Lane
Stonehouse
Gloucester
GL10 3TA

has been assessed by Sira Certification Service
and for the conditions stated on this certificate complies with:

MCERTS Performance Standards for Water Monitoring Equipment Part 3, Version 2.4 dated February 2013

WaterMaster V Size Range: DN 40 to DN 200 (excluding DN65 & 125)
WaterMaster F Size Range: DN 250 to DN 2200
WaterMaster W Size Range: DN 10 to DN 2400

Project No:	674/0228
Certificate No:	Sira MC080138/05
Initial Certification:	04 November 2008
This Certificate Issued	08 April 2014
Renewal Date:	3 November 2018

R Cooper I Eng MInst MC
Technical Director

MCERTS is operated on behalf of the Environment Agency by

Sira Certification Service
12 Acorn Industrial Park, Crayford Road, Crayford
Dartford, Kent, UK DA1 4AL
Tel: +44 (0)1322 520500 Fax: +44 (0)1322 520501

Approved Site Application

The product may be used on all water applications including abstraction, effluent discharge, ultraviolet disinfection, and industrial processing.

Any potential user should ensure, in consultation with the manufacturer that the product is suitable for the process on which it will be installed.

Basis of Certification

This certification is based on the following Test Report(s) and on Sira's assessment and ongoing surveillance of the product and the manufacturing process:

Sira Evaluation Report: WaterMaster V 674/0228, dated 4 November 2008
WRc Report: UC8496 dated February 2011

Product Certified

Certification only applies to WaterMaster products manufactured in the UK.

The WaterMaster flowmeter consists of the following parts:

- Integral or remote WaterMaster transmitter FET
- WaterMaster electromagnetic flowmeter sensor, model FEV. FEW and FEF, size range DN40 to DN2200

This certificate applies to all instruments fitted with software version V01.00.00 onwards.

Pipe Size (DN)	Flow rates (m^3/h)	
	Min (Q1)	Max (Q3)
10	0.012	2.5
15	0.03	6.3
20	0.05	10
25	0.08	16
32	0.13	25
40	0.2	40
50	0.32	63
80	0.8	160
100	1.3	250
150	3.2	630
200	5	1000
250	8	1600
300	12.5	2500
350	20	4000
400	20	4000
450	32	6300
500	32	6300
600	50	10000
700	100	16000
800	100	16000
900	156	25000
1000	156	25000
1200	250	40000
1400	394	63000
1600	394	63000
1800	625	100000
2000	625	100000
2200	1000	160000
2400	1000	160000

Certified Performance

The instrument was evaluated for use under the following conditions:

Ambient Temperature Range: -25°C to +70°C

Note: Tests were performed over the ambient temperature range -25°C to +70°C. The manufacturers' specification is -20°C to +60 °C.

The instrument meets MCERTS Class 1 requirements for the combined performance characteristic as specified in section 4.2 of the MCERTS performance standard. Details of individual performance characteristics are summarised below:

Test	Results expressed as error % of reading				Other results	MCERTS specification
	<0.5	<1.0	<1.5	<2.0		
Protection against unauthorised access	Transmitter has 'read only' switch, and 3 level password protection if not sealed.					Clause 3.1.2
Indicating device	Analogue and pulse outputs. All versions have display.					Clause 3.1.3
Units of measurement	Various units of measurement are available.					Clause 3.1.6
Bi-directional flow	The sign (-) will stand in front of the flow reading when the reading is negative.					Clause 3.1.8
Combined performance characteristic WaterMaster FEV WaterMaster FEF WaterMaster FEW					 1.31% 0.46% 1.61%	2% Class 1 Table 6
Mean error WaterMaster FEV WaterMaster FEF WaterMaster FEW	 -0.15% 	 0.85% 0.93%				Clause 6.3.2 ±1.5% Class 1
Lower Limit Value					-2.80	Clause 6.3.2 ±5% Class 1
Repeatability WaterMaster FEV WaterMaster FEF WaterMaster FEW	 0.29% 0.04% 0.50%					Clause 6.3.2 1% Class 1
Supply voltage		0.05%				Clause 6.3.3 0.5% Class 1
Output impedance	<0.01%					Clause 6.3.4 0.5% Class 1

Certificate No: Sira MC080138/05
This Certificate Issued: 08 April 2014

Test	Results expressed as error % of reading				Other results	MCERTS specification
	<0.5	<1.0	<1.5	<2.0		
Fluid Temperature WaterMaster FEV WaterMaster FEF	 0.45% 0.01%	+5ºC to +45ºC +24 ºC to +27 ºC				Clause 6.3.5 0.5 % Class 1
Ambient air temperature WaterMaster FEV WaterMaster FEF	 0.35% 0.35%	-25 ºC to +70 ºC +3 ºC to +19 ºC				Clause 6.3.6 0.5% Class 1
Relative humidity	0.14%					Clause 6.3.6 0.5% Class 1
Stray currents	0.06%					Clause 6.3.9 0.5% Class 1
Bi-directional Flow WaterMaster FEV WaterMaster FEF	 Mean error 0.24% Repeatability 0.12% Mean error -0.51% Repeatability 0.47%					Clause 6.3.13 Mean error ±1.5% Class 1 Repeatability 1% Class 1
Vibration	0.11%				Transmitter only	6.3.20 Class I usage only.
Warm up time					~40 seconds	Clause 6.1.2 to be reported
Loss of Power for electronic flowmeters	No changes in pre-set data					Clause 6.3.1 to be reported
Response time	Instrument has adjustable damping. <10 seconds with damping set to 3 seconds.					Clause 6.3.19 30 seconds

Field Test Results

The field trial was conducted with a WaterMaster V in series with a Helix mechanical meter.

Test	Results expressed as error % of reading				Other results	MCERTS specification
	<0.5	<1.0	<1.5	<2.0		
Error under field test conditions						Clause 7.3
WaterMaster FEV	Error range +2.08% to +3.06% Field test error is <2% for 0% of readings Field test error is <5% for 100% of readings					2% Class 1 5% Class 2
WaterMaster FEF	Field test error is <2% for 0% of readings Field test error is <5% for 98% of readings					
Up time						Clause 7.4
WaterMaster FEV					100%	>95%
WaterMaster FEF					100%	
Maintenance						Clause 7.5
WaterMaster FEV					None	to be reported
WaterMaster FEF						

Note 1. The following requirements are not applicable to the flowmeter:

6.3.7	Incident light	6.3.14	Flow reversal
6.3.8	Sensor location	6.3.15	Ancillary devices
6.3.10	Direct Solar Radiation	6.3.16	Effect of conduit material
6.3.11	Accuracy of computation	6.3.17	Effect of conduit size
6.3.12	User defined stage-discharge equation	6.3.18	Fill level

Description:

WaterMaster is a range of Electromagnetic flowmeters, where the order prefix FEV, signifies a design of sensor covering the size range DN40 to DN300. It incorporates a plastic Polypropylene liner, with a novel contour rather than the traditional circular type. This gives improved immunity to hydraulic disturbances, both upstream and downstream.

The order prefix FEF signifies a design of sensors covering the range DN250 to DN2200 which are Elastomer lined.

The order prefix FEW signifies a design of sensors covering the range DN10 to DN2400. DN10 to DN32 are lined using PTFE and DN40 to DN2400 are lined using the same technique as the WaterMaster FEF design (a full bore elastomer lining).

This WaterMaster range incorporates a "sensor memory" which stores all the sensor calibration data, plant / site settings, such as units, pulses / unit etc. and the volumetric flow totals metered. This sensor memory allows ease of installation and mixing of transmitters, including repair, without having to configure the installation or lose the volume totals previously recorded.

Associated with the sensor is the WaterMaster Transmitter. It works with other sensors in the range from DN3 to DN2400. The transmitter has a plug in “cartridge”, which contains all of the electronics, allowing easy serving in the field, in the event of a fault. The Transmitter incorporates a self calibration feature, where the measurement electronics is self calibrated every minute as part of its normal operation. It also includes a built in verification system designed to meet OIML R49 type P checking, for both transmitter and sensor, with diagnosis reporting if the accuracy if outside specification.

General Notes

1. This certificate is based upon the equipment tested. The Manufacturer is responsible for ensuring that on-going production complies with the standard(s) and performance criteria defined in this Certificate. The Manufacturer is required to maintain an approved quality management system controlling the manufacture of the certified product. Both the product and the quality management system shall be subject to regular surveillance according to ‘Regulations Applicable to the Holders of Sira Certificates’. The design of the product certified is defined in the Sira Design Schedule for certificate No. Sira MC 08138/01.

2. If certified product is found not to comply, Sira Certification Service should be notified immediately at the address shown on this certificate.

3. The Certification Marks that can be applied to the product or used in publicity material are defined in ‘Regulations Applicable to the Holders of Sira Certificates’.

4. This document remains the property of Sira and shall be returned when requested by the company.