

WaterMaster

Electromagnetic flowmeter

The perfect fit for all water industry applications



One solution for all your needs

- designed for use in all water and waste water applications, from sewage plants to distribution networks

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 eliminating 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 ($\frac{3}{8}$ 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, it 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 and 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 (1½ 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 tampering 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.

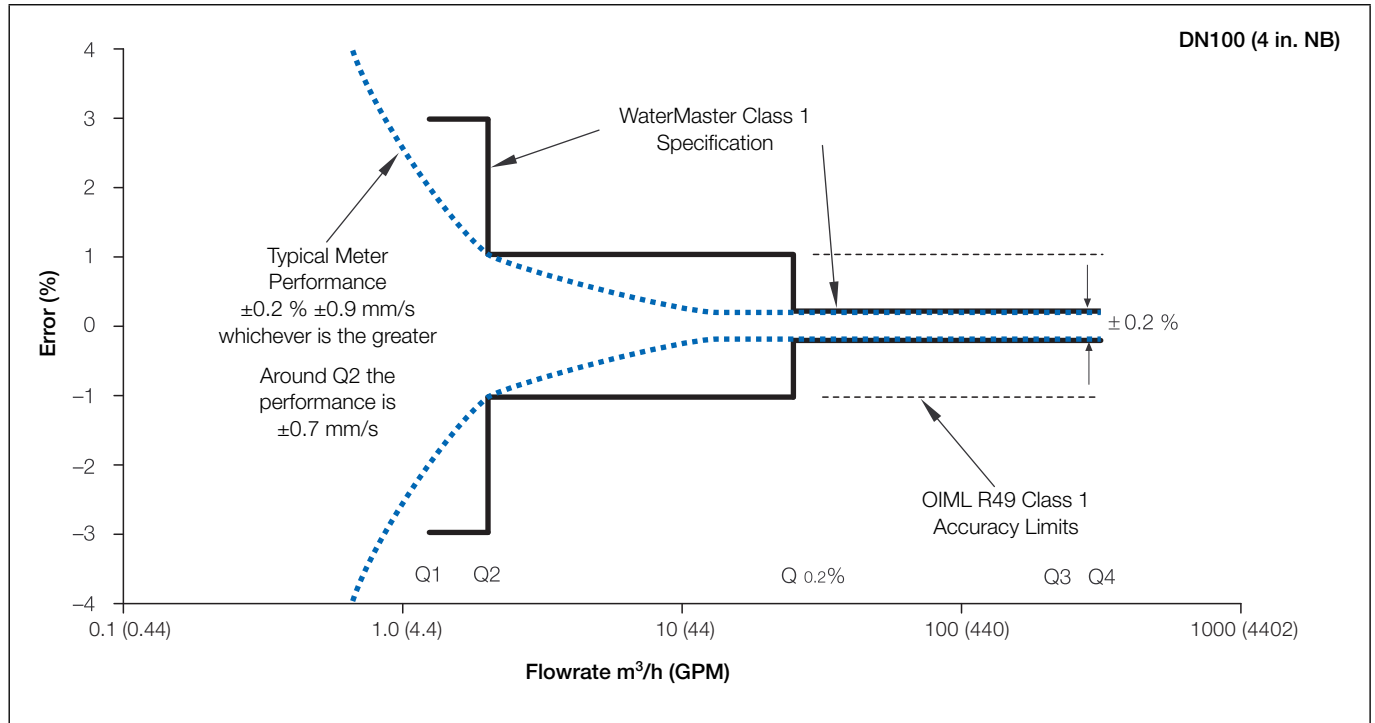


WaterMaster sensors are also available in reduced-bore geometries giving the ultimate in low-flow performance with a very high turn-down range.

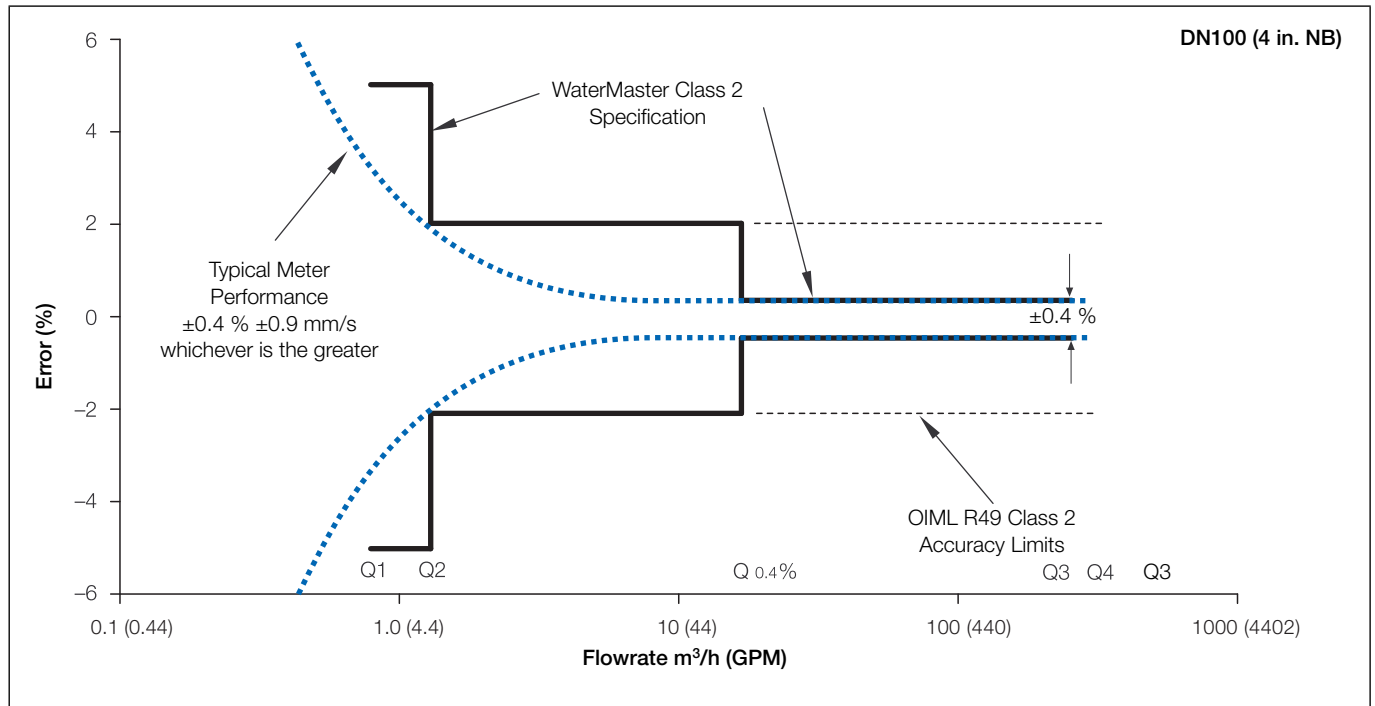
The unique design of the reduced-bore sensor conditions the flow profile in the measuring section so that distortions in the flow profile, either upstream or downstream, are flattened. The result is excellent in situ flowmeter performance, even with very bad hydraulic installation conditions.

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 $\pm 5 \text{ mm/s}$ ($\pm 0.2 \text{ in./s}$). The accuracy between cutoff and Q1 is typically $\pm 0.9 \text{ mm/s}$ ($\pm 0.04 \text{ in./s}$).

WaterMaster optimized full-bore meter (FEV) / full-bore meters (FEF, FEW) flow performance – m³/h

DN	Q4	Q3	Standard Calibration – 0.4 % Class 2			High Accuracy Calibration – 0.2 % Class 1		
			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 (760)	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 $Q_3 \geq 100 \text{ m}^3/\text{h}$. 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

NPS/NB (DN)	Q4	Q3	Standard Calibration 0.4 % Class 2			High Accuracy Calibration 0.2 % Class 1		
			Q0.4%	Q2	Q1	Q0.2%	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
29 (750)	88,057	70,446	7,045	451	282	7,045	704	440
30 (760)	88,057	70,446	7,045	451	282	7,045	704	440
32 (800)	88,057	70,446	7,045	451	282	7,045	704	440
36 (900)	137,590	110,072	11,007	704	440	11,007	1,100	688
39/40* (1000)	137,590	110,072	11,007	704	440	11,007	1,100	688
42 (1050)	137,590	110,072	11,007	704	440	11,007	1,100	688
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 (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 – m³/h (gal/min)

Size		Class 2 specification			R	Class 1 specification			
		Q4	Q3	Q0.4 %	Q2	Q1	Q0.2 %	Q2	Q1
mm	in.	m³ / h (Ugal / min)	m³ / h (Ugal / min)	m³ / h (Ugal / min)	m³ / h (Ugal / min)	m³ / h (Ugal / min)	m³ / h (Ugal / min)	m³ / h (Ugal / min)	m³ / 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)
50	2	50 (220)	40 (176)	1.0 (4.40)	0.1 (0.44)	0.063 (0.28)	630	2.0 (8.8)	0.1 (0.44)
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)	0.16 (0.7)
80	3	125 (550)	100 (440)	2.0 (8.80)	0.25 (1.1)	0.16 (0.7)	630	4.0 (17.6)	0.25 (1.1)
100	4	200 (880)	160 (704)	3.2 (10.56)	0.41 (1.8)	0.25 (1.1)	630	6.4 (28)	0.4 (1.76)
125	5	200 (880)	160 (704)	3.2 (10.56)	0.41 (1.8)	0.25 (1.1)	630	6.4 (28)	0.4 (1.76)
150	6	500 (2200)	400 (1760)	8.0 (35.20)	1.0 (4.4)	0.63 (2.77)	630	16 (70.4)	1.0 (4.4)
200	8	788 (3470)	630 (2770)	13.0 (57.2)	1.6 (7.04)	1.0 (4.4)	630	25 (110)	1.6 (7)
250	10	1250 (5500)	1000 (4400)	20 (88)	2.5 (11.01)	1.6 (7)	630	40 (176)	2.5 (11)
300	12	2000 (8810)	1600 (7045)	32 (140.8)	4.1 (18.05)	2.5 (11)	630	64 (281.6)	4.0 (17.6)
350	14	2000 (8810)	1600 (7045)	32 (140.8)	6.4 (28.18)	4.0 (17.6)	400	64 (281.6)	12.8 (56)
375	15	2000 (8810)	1600 (7045)	32 (140.8)	6.4 (28.18)	4.0 (17.6)	400	64 (281.6)	12.8 (56)
400	16	3125 (13760)	2500 (11007)	50 (220)	10 (44)	6.3 (27.7)	400	100 (440)	20 (88)
450	18	3125 (13760)	2500 (11007)	50 (220)	10 (44)	6.3 (27.7)	400	100 (440)	20 (88)
500	20	5000 (22014)	4000 (17610)	80 (352)	16 (70.45)	10 (44)	400	160 (70.4)	32 (141)
600	24	7875 (34670)	6300 (27740)	126 (554.4)	25.2 (110.9)	15.8 (70)	400	252 (1108)	50.4 (222)

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

Code	Lining	Flange material	Medium temperature °C (°F)	
			Minimum	Maximum
FEF, FEW3	Hard rubber	Carbon steel	–5 (23)	80 (176)
		Stainless steel	–5 (23)	80 (176)
FEW1	PTFE	Carbon steel	–10 (14)	130 (266)
		Stainless steel	–25 (–13)	130 (266)
FEW3	PTFE	Carbon steel	–10 (14)	130 (266)
		Stainless steel	–10 (14)	130 (266)
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)
FEW3	Linatex	Carbon steel	–10 (14)	70 (158)
		Stainless steel	–20 (–4)	70 (158)

IP rating

IP68 (NEMA 6) to 7 m (20 ft.) depth
Note. Not sizes DN10 to DN32 ($\frac{3}{8}$ – $1\frac{1}{4}$ in. NB)
IP67 (NEMA 4X) – DN10 to DN32 ($\frac{3}{8}$ – $1\frac{1}{4}$ in. NB)

Buriable (sensor only)

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

Conductivity

>5µS cm^{–1}

Transmitter mounting

Integral (not FEF) or remote

Electrical connections

20 mm glands
 $\frac{1}{2}$ in. NPT
20 mm armored glands

Sensor cable

ABB WaterMaster cable available in two forms –
standard and armored
Maximum length 200 m (660 ft.)

Physical specification

Wetted parts

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

Code	Size Range	Liner	Potable Water Approvals					
			WRAS	WRAS 60°C	ACS	DVGW	NSF	AZ/ NZS 4020
FEW1	DN10 – 32 ($\frac{3}{8}$ – $1\frac{1}{4}$ in. NB)	PTFE	✓					
FEW3	DN10 – 600 ($\frac{3}{8}$ – 24 in. NB)	PTFE						
FEW3	DN50 – 600 (2 – 24 in. NB)	Linatex						
FEW3	DN40 – 2400 ($1\frac{1}{2}$ – 96 in. NB)	Elastomer	✓					Pending
FEW3	DN40 – 2400 ($1\frac{1}{2}$ – 96 in. NB)	Hard rubber	✓	✓		✓	NSF approved material	
FEV	DN40 – 200 ($1\frac{1}{2}$ – 8 in. NB)	Polypropylene	✓			✓	NSF-61	✓
FEF	DN80 – 600 (3 – 24 in. NB)	Elastomer	✓		✓	✓	NSF-61	✓
FEF	DN80 – 600 (3 – 24 in. NB)	Hard rubber	✓	✓		✓	NSF approved material	
FER	DN40 – 600 ($1\frac{1}{2}$ – 24 in. NB)	Elastomer	✓		✓	✓		✓

*Size is dependent on flange specification

Lining protection plates

Not required

Installation conditions (recommended)

Upstream ≥ 5D (not FER ≥ OD (FER))
Downstream ≥ 2D (not FER ≥ OD (FER))

Pressure loss

Negligible at Q3 All full bore meters
<0.25 bar (<3.62 psi) at Q3 FEV (DN40 to 200 [$1\frac{1}{2}$ to 8 in. NB])
<0.63 bar (<9.13 psi) at Q3 FER (DN40 to 600 [$1\frac{1}{2}$ to 24 in. NB])

Non-wetted parts

Flange material

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

Housing material

Carbon steel	FEV – DN40 to 200 (1 $\frac{1}{2}$ to 8 in. NB) FEW – DN450 to 2400 (18 to 96 in. NB)
Plastic	FEF – DN80 to 600 (3 to 24 in. NB)
Aluminium	FEW – DN10 to 400 ($\frac{3}{8}$ to 16 in. NB)

Terminal box material

Polycarbonate

Cable gland material

Plastic, brass

Paint specification

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

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 m/s

Environmental protection

- Humidity: 0 to 100 %
- Rating: IP67 (NEMA 4X) to 1m (3.3 ft.) depth

Tamper-proof security

- Write access prevented by internal switch combined with external security seals 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/s²
- Frequency range: 20 to 150 Hz
- No. of sweeps in 3 orthogonal planes: 20
- Undetectable shift in transmitter span or zero performance

Hazardous approvals (HART variant only)

- FM & FMc Class 1 Div 2
(FM listing NI / 1 / 2 / ABCD / T4, S / II, III / 2 / FG / T4, Ta=60°C; Type 4X, IP67 – for transmitter and integral mounting
Ta=70°C, 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=60°C; Type 4X, IP67 – for transmitter and integral mounting
Ta=70°C, 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.

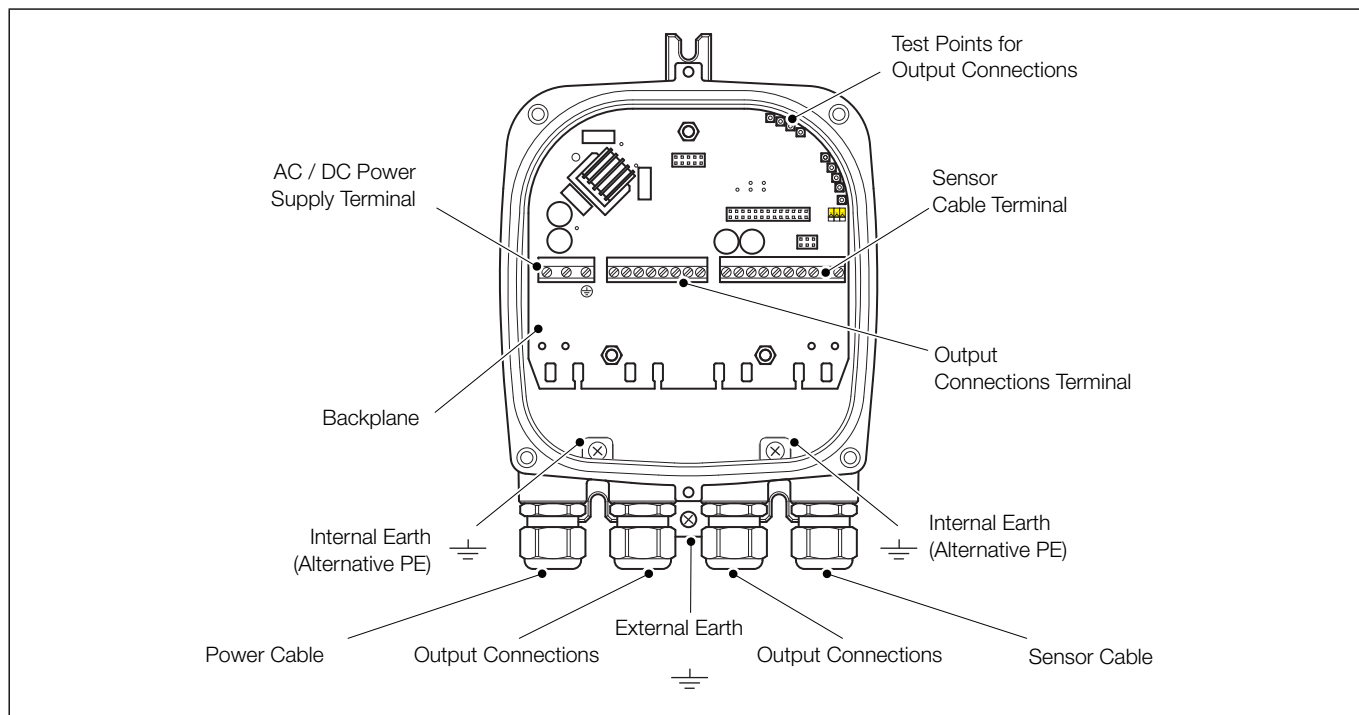
WaterMaster has OIML R49 Certificate of Conformity to accuracy class 1 and 2 (FEV DN40 to 200 [1 1/2 to 8 in.NB]). Copies of accuracy certification are available on request.

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

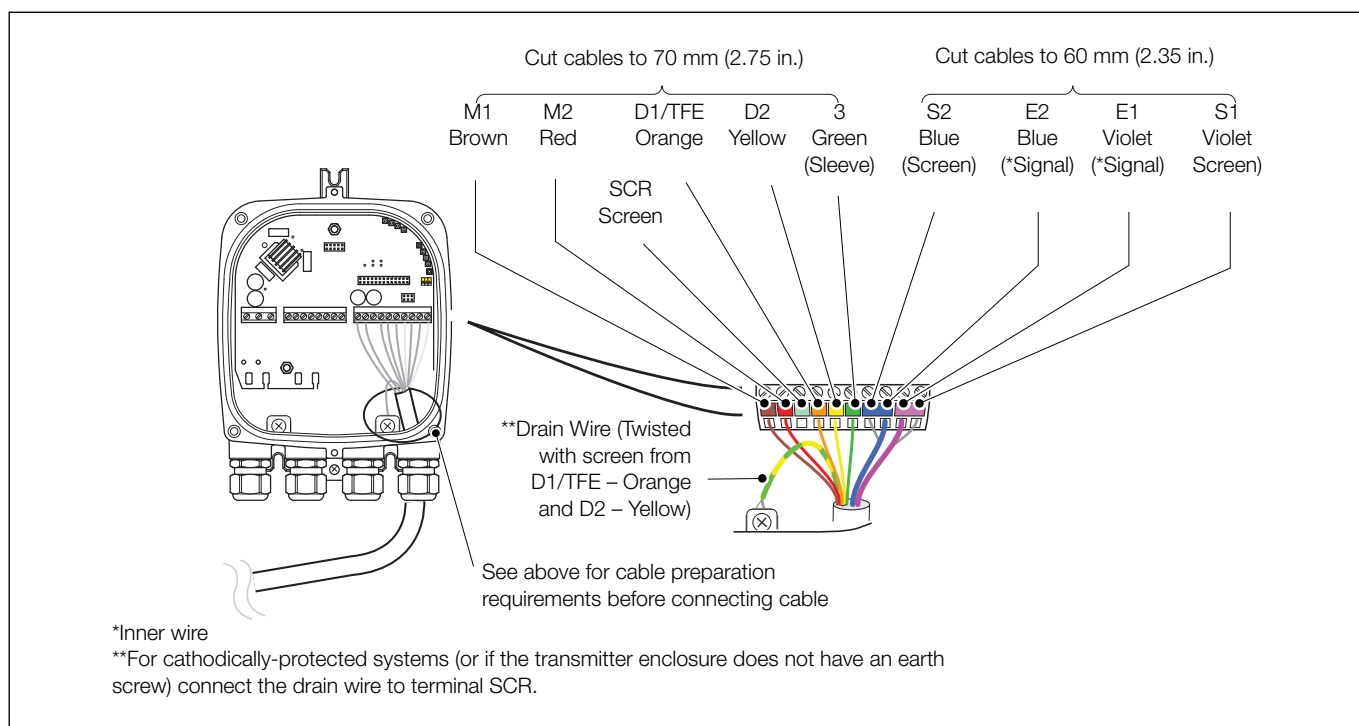
Transmitter terminal connections overview

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)

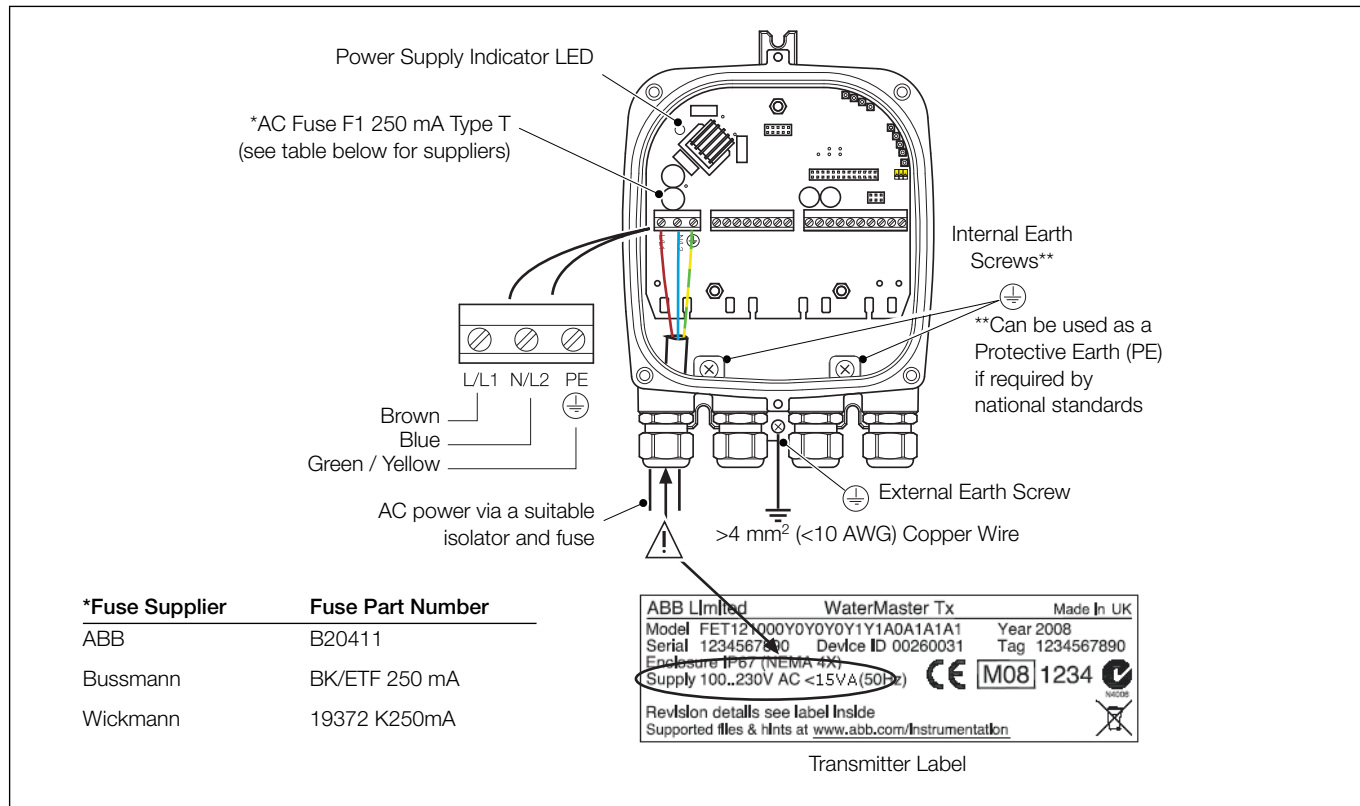
Sensor cable terminal connections and recommended cable lengths



Sensor cable connections at transmitter terminal block – remote transmitter

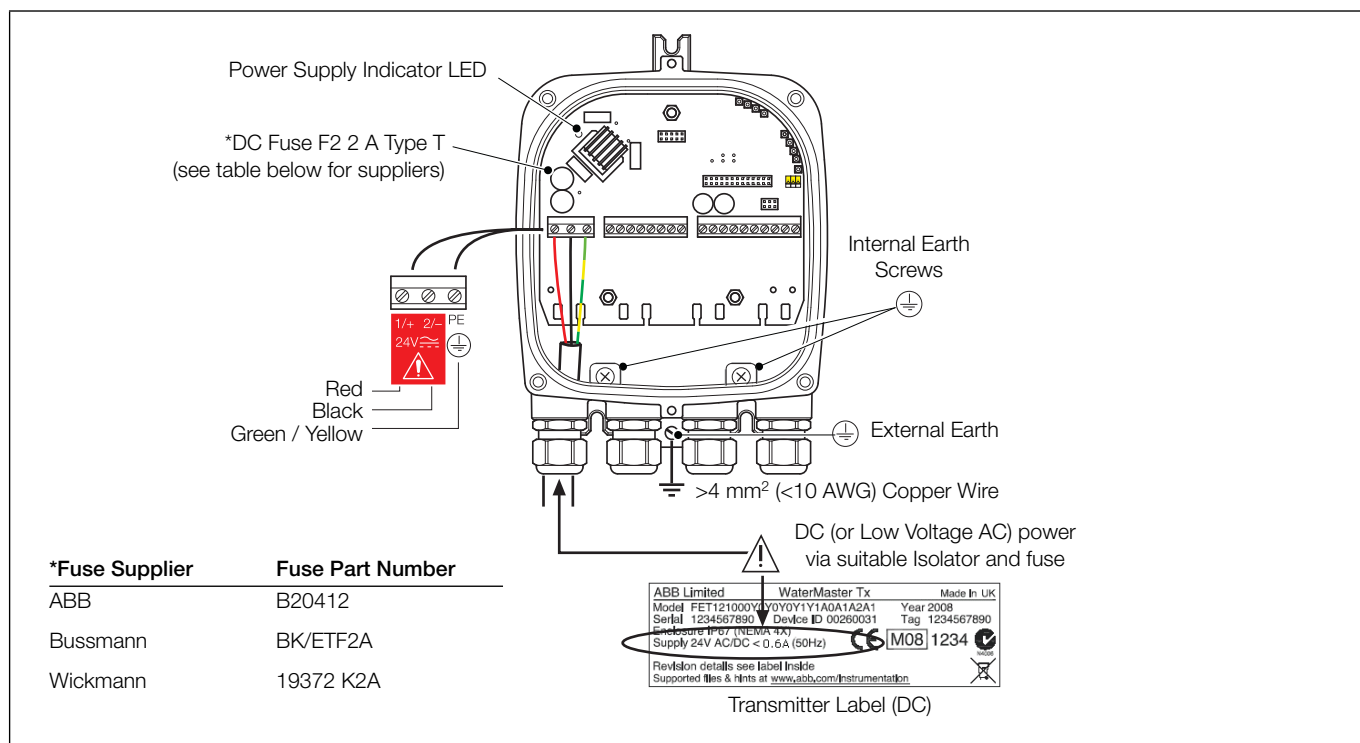
Power supply connections

AC power supply



AC power supply connections

DC (and low voltage AC) power supply



DC (and low voltage AC) power supply connections

Configuration DIP switches

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

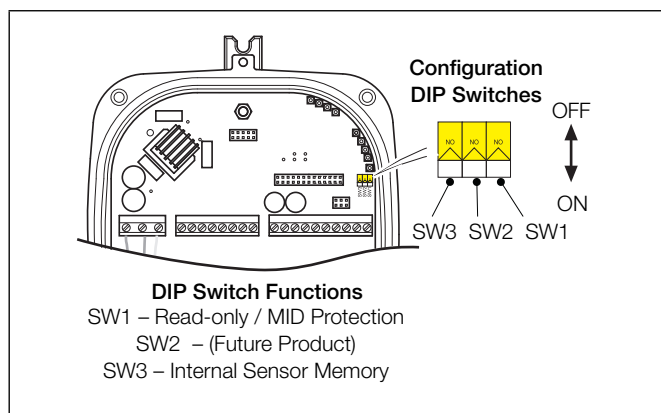
These are factory-set as follows:

- 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.

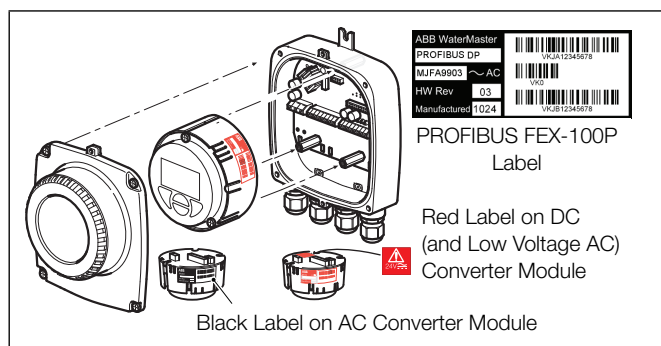
For HART software versions prior to 01.02.XX, this switch (set after commissioning) prevents login via the keypad or bus at any security level.

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.



Transmitter module identification

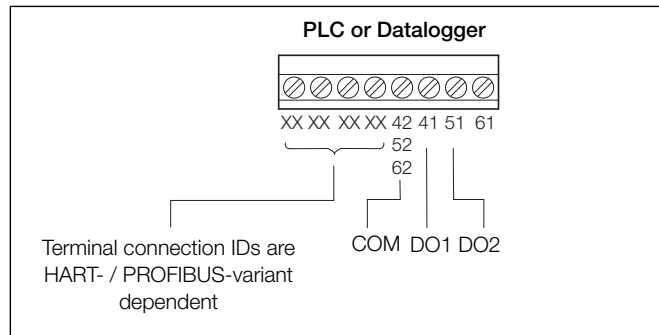
Note. The communications bus type is HART FEX100 if not specified on the transmitter module label. An example of the PROFIBUS FEX100-DP variant transmitter module label is shown below.



Transmitter module identification

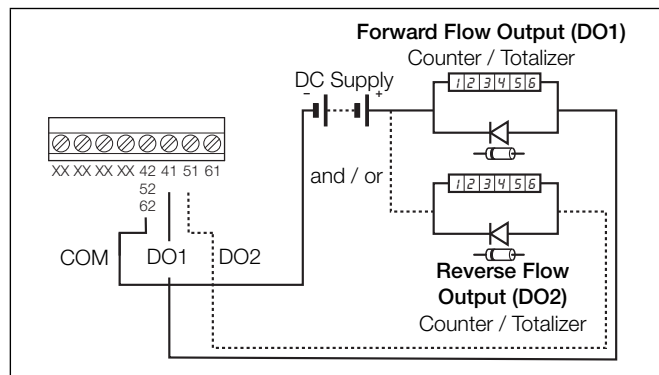
Output connections

Frequency outputs

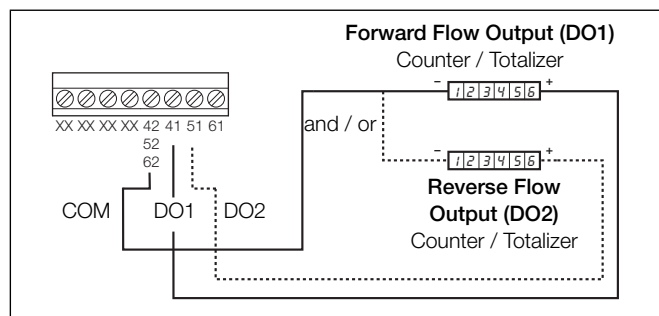


PLC / Datalogger connections

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

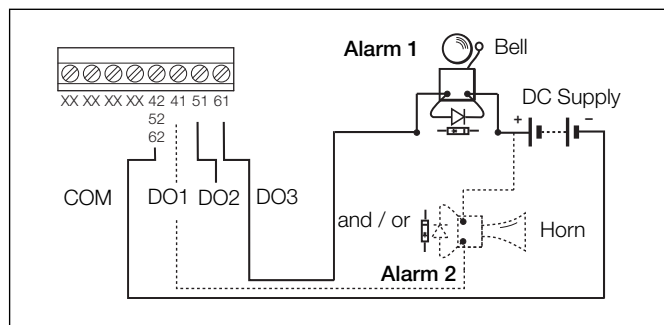
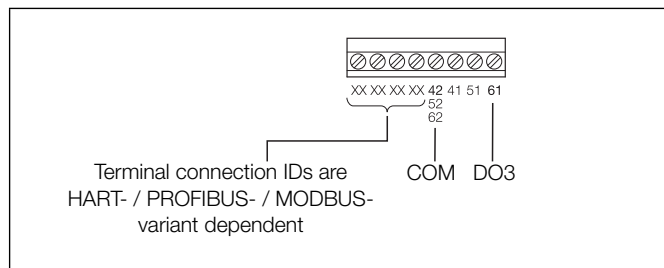


Electromechanical connections



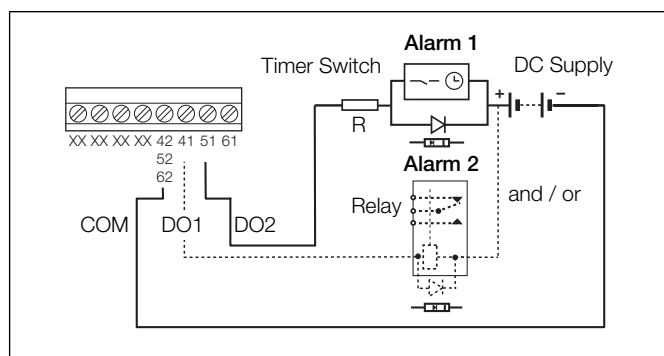
Telemetry / Electronic counters connections

Alarm outputs



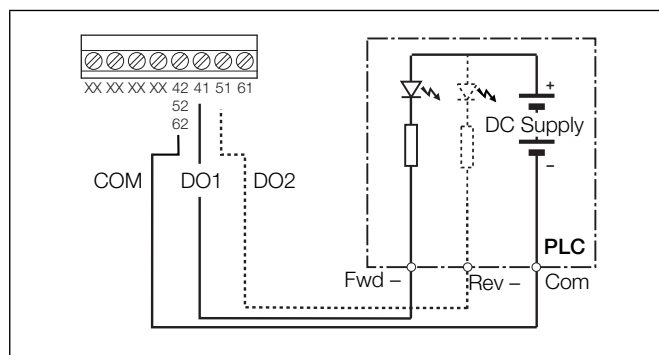
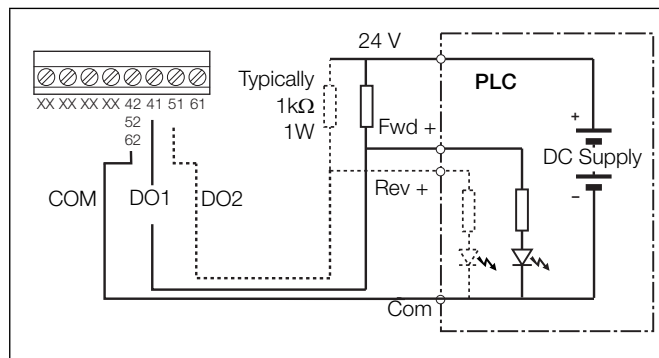
Note.

- 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.

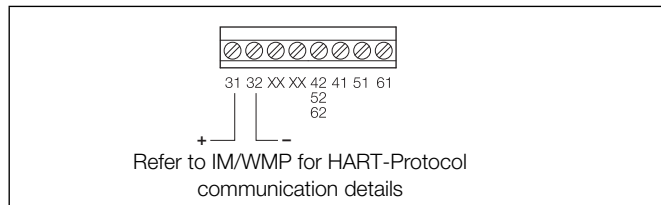
PLC interface



Note.

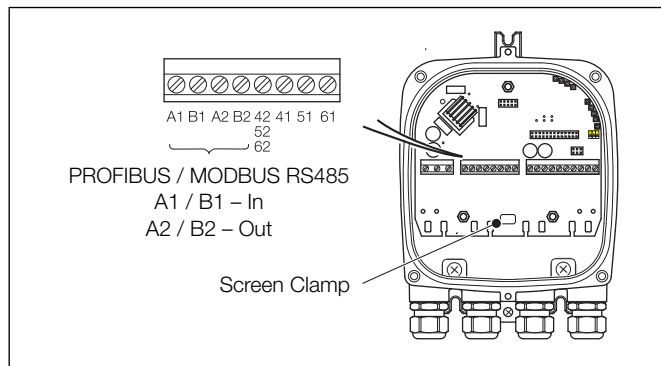
- WaterMaster digital outputs are NPN optocoupled transistors used as switches.
- Maximum allowed voltage at collector is 30 V DC
- Maximum allowed current across transistor is 220 mA.

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



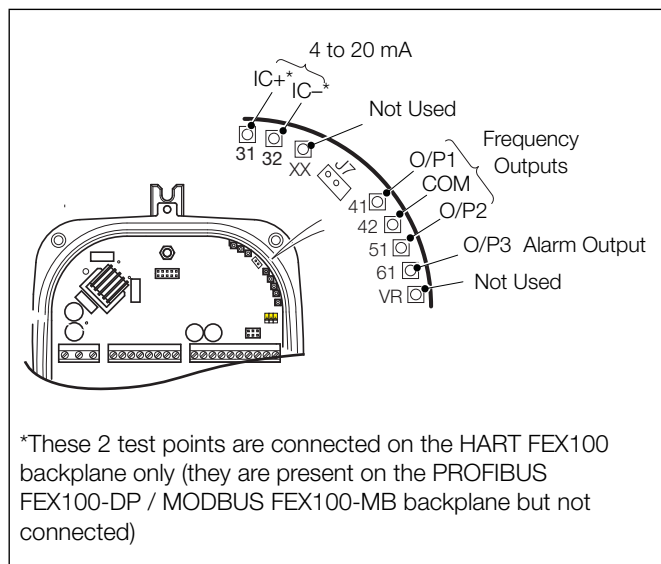
Current output (4 to 20 mA) – HART (FEX100) variant

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.

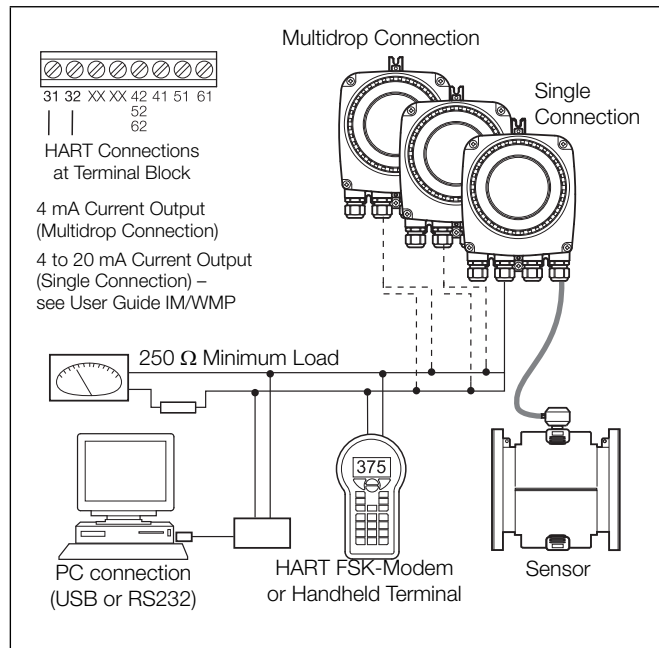


Digital communication

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

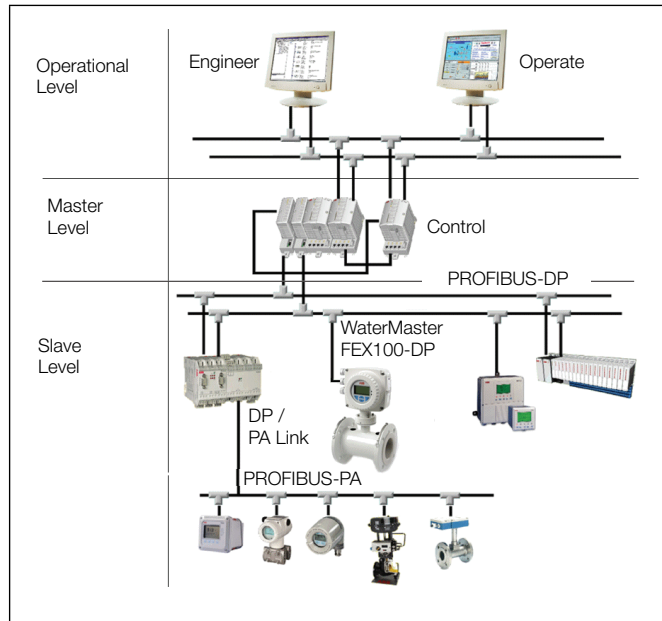
WaterMaster can be integrated into control systems and configuration devices using any Frame application, such as ABB AssetVision or similar third-party applications. ABB Device Type Managers (DTMs) for WaterMaster provide a unified structure for accessing device parameters, configuring and operating 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

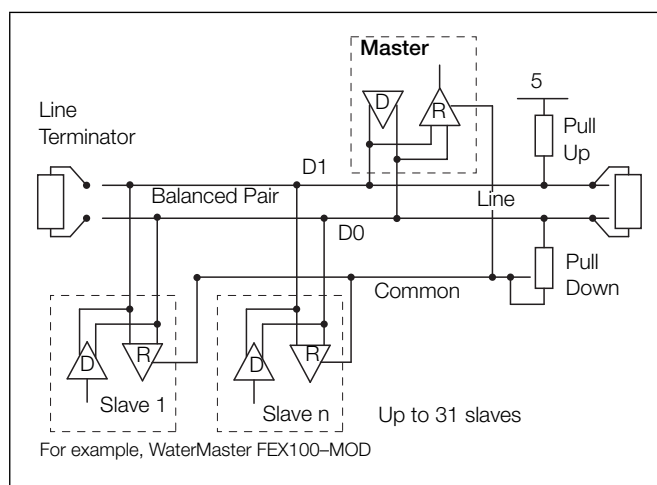
Information about the user parameter block for device-specific configuration and modules containing details of the input and output data that can be exchanged cyclically with a PROFIBUS master.

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.



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.

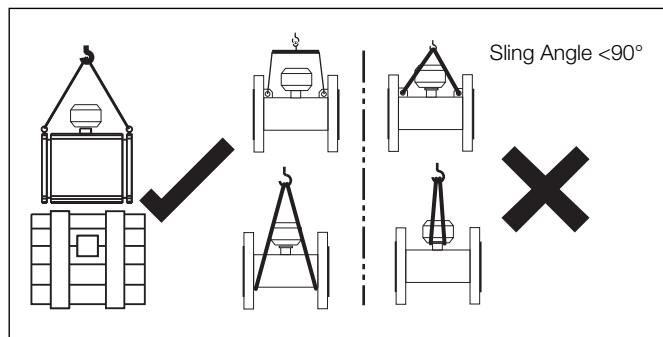
Category 5 cables may be used for RS485-MODBUS to a maximum length of 600 m (1968 ft.). For the balanced pairs used in an RS485-system, a characteristic impedance with value higher than 100Ω is preferred especially for 19200 and higher Baud rates.

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.

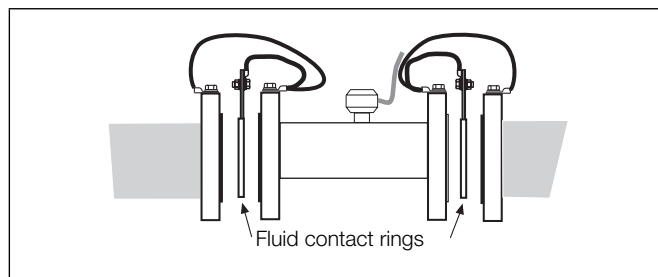
Unpacking the flowmeter

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

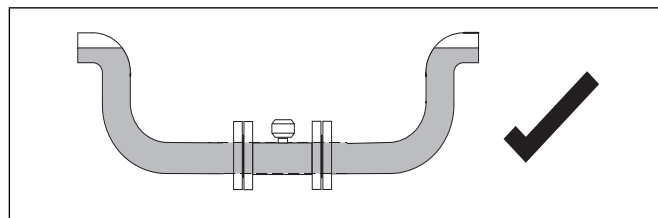
The flowmeter sensor must be cross-bonded to the upstream and downstream pipes and fluid. For technical reasons, this potential should be identical to the potential of the metering fluid. For plastic or insulated lined pipelines, the fluid is grounded by installing a minimum of 1 earthing rings. When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



Mounting

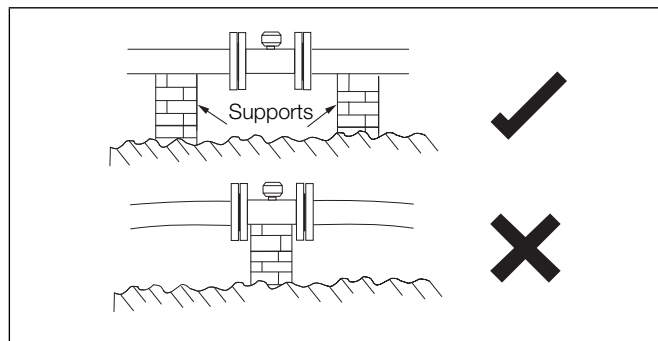
The installation conditions shown below must be observed to achieve the best operational results.

The sensor tube must always be completely full.

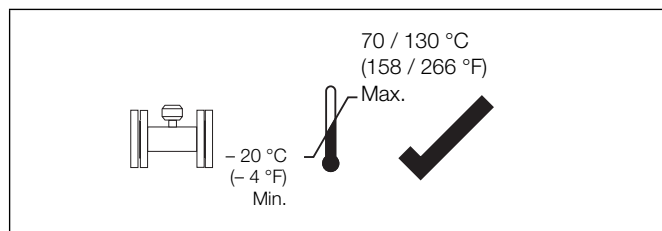


The flow direction must correspond to the identification plate. The device measures the flowrate in both directions. Forward flow is the factory setting.

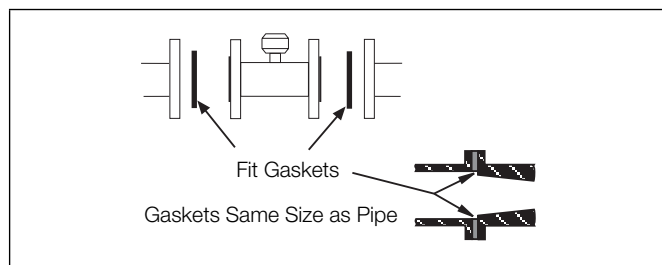
The devices must be installed without mechanical tension (torsion, bending). If required support the pipeline.



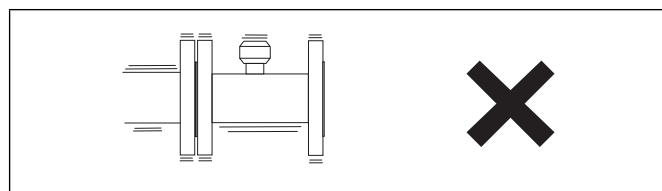
The flange seals must be made from a compatible material for the fluid and fluid temperatures if required.



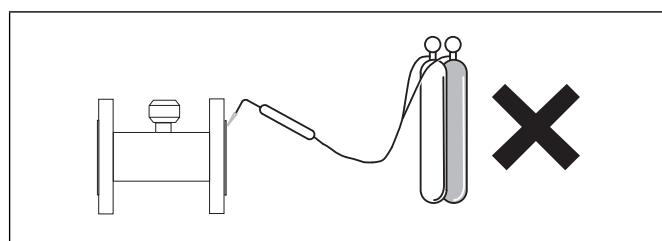
Seals must not extend into the flow area since possible turbulence could influence the device accuracy.



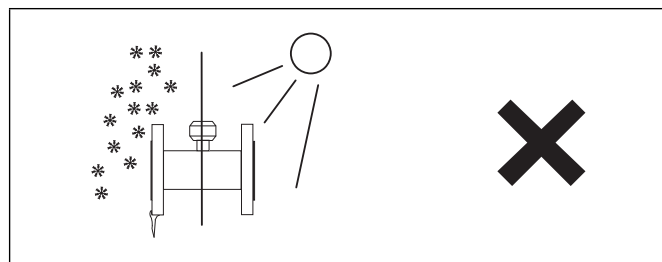
The pipeline may not exert any unallowable forces and torques on the device, such as vibration.



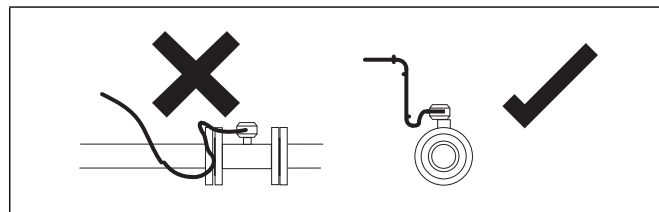
The flowmeter must not be submitted to any localized heat during installation; take care to remember this is a measuring instrument.



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

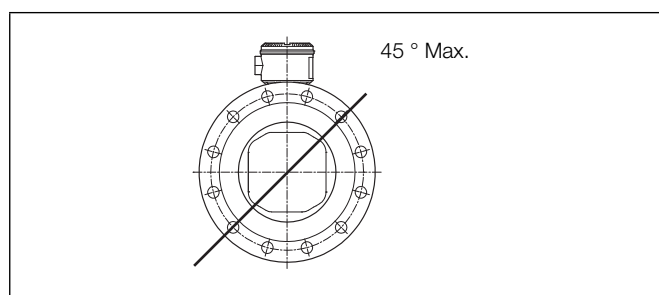


The cable to the flowmeter should be installed neatly or within a conduit, both loose or conduit should have a u shape below the terminal connection box height to allow any water run off to avoid any capillary action into the flowmeter sensor.



Electrode axis

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



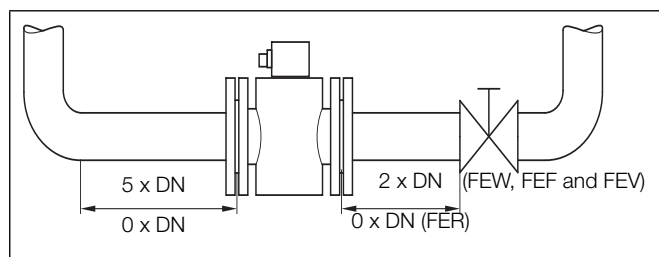
Up and Down stream pipe sections

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.

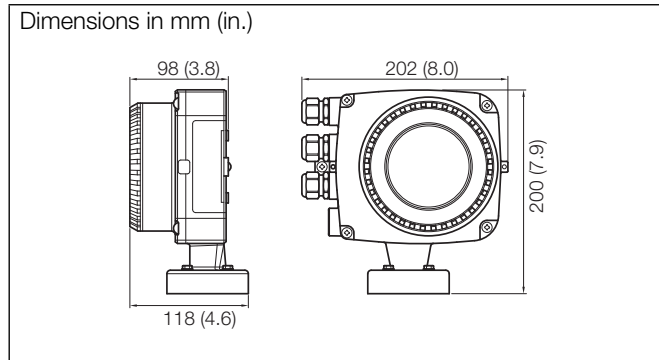
Experience has shown that, in most installations, straight upstream sections 3 x DN long and straight downstream sections 2 x DN long are normally sufficient. We would recommend conditions of 5 x DN straight upstream and 2 x DN straight downstream where possible.

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

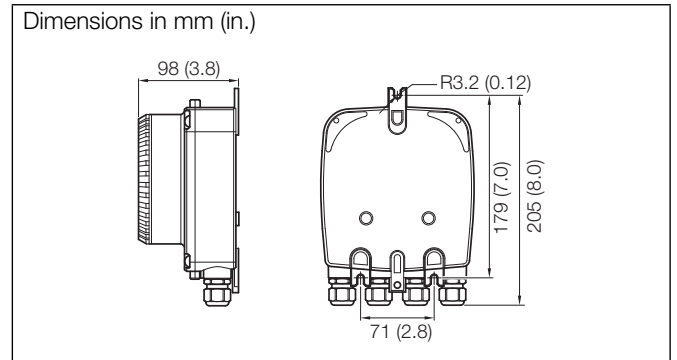


Transmitter dimensions

Integral transmitter

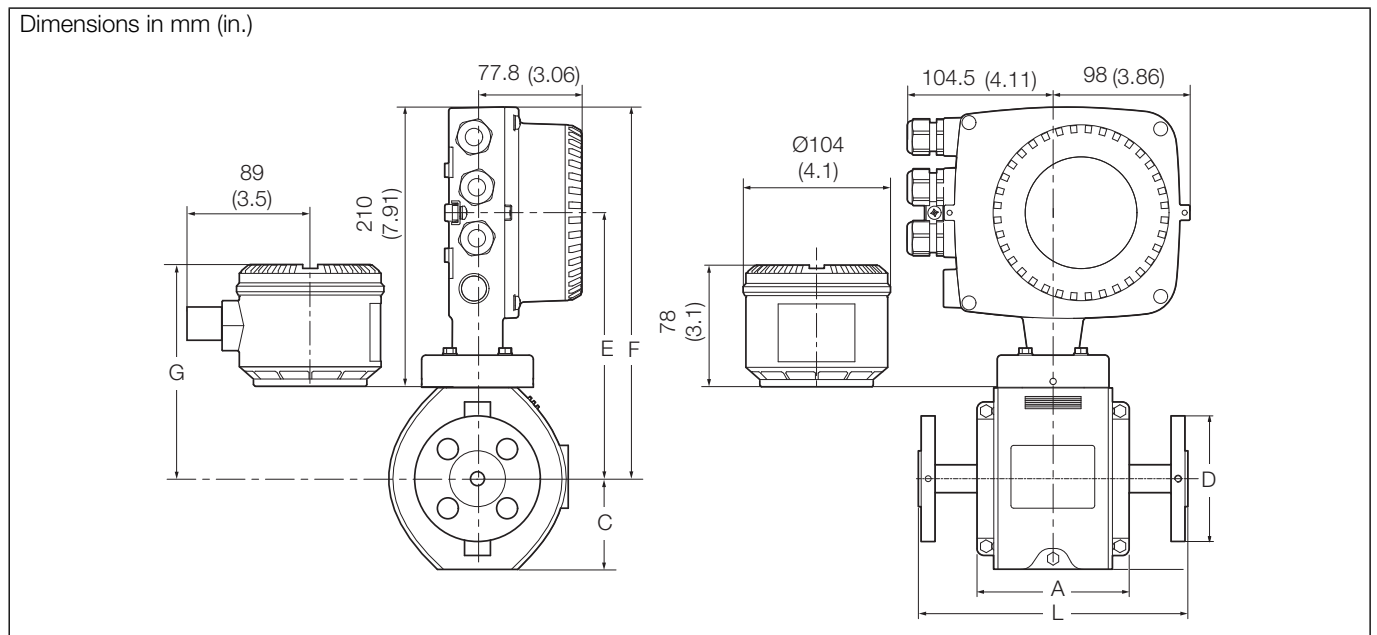


Remote transmitter



Sensor dimensions

FEW – DN10 to 125 (3/8 to 5 in. NB)



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

DN	Mating flange type	Dimensions in mm (in.)							Approx. weight in kg (lb)	
		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)	200 (7.87)	268 (10.55)	82 (3.23)	193 (7.6)	148 (5.83)	113 (4.45)	6 (13)	4 (9)
	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)	200 (7.87)	268 (10.55)	82 (3.23)	193 (7.6)	148 (5.83)	113 (4.45)	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)								

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

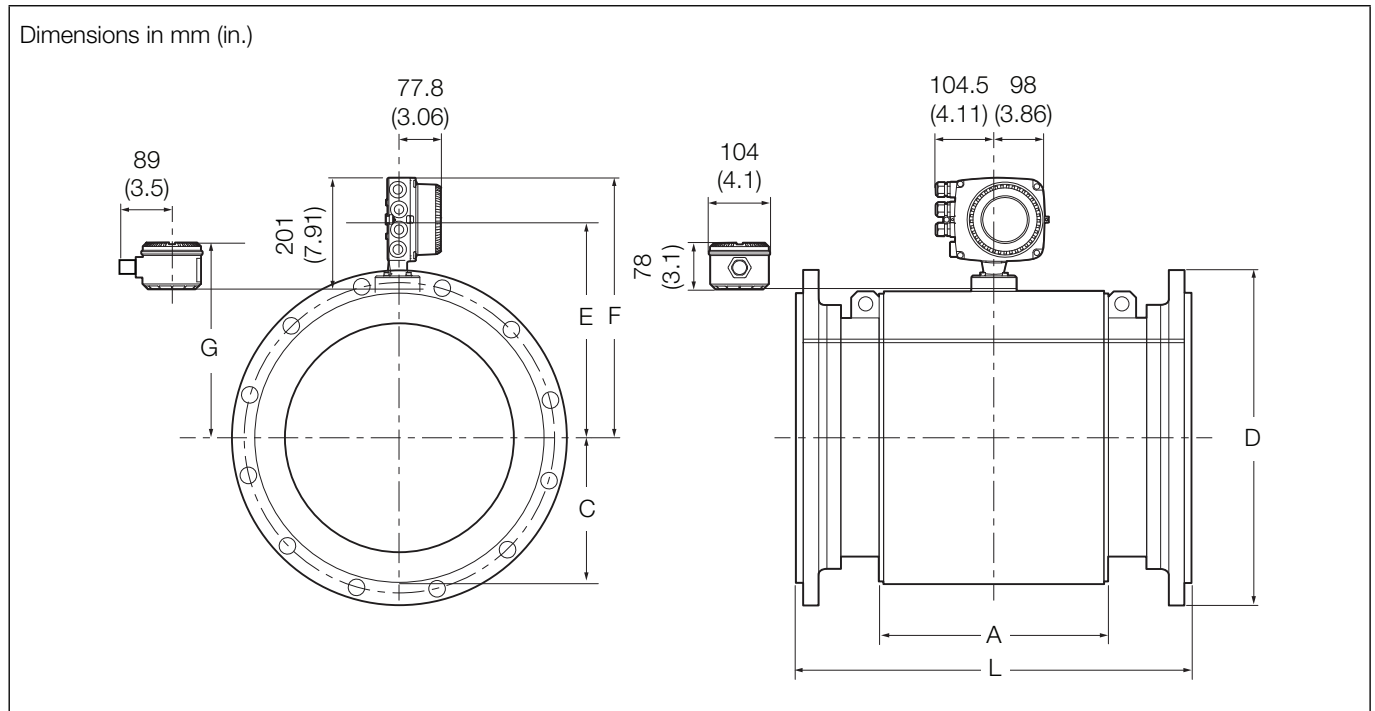
DN	Mating flange type	Dimensions in mm (in.)							Approx. weight in kg (lb)	
		D	L	F	C	E	G	A	Integral	Remote
DN25 (1 in.)	PN10 to 40	115 (4.53)	200 (7.87)	268 (10.55)	82 (3.23)	193 (7.6)	148 (5.83)	113 (4.45)	9 (20)	7 (15)
	JIS5K	95 (3.74)								
	JIS10K	125 (4.88)								
	ASME B16.5 CL300	125 (4.88)								
	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)							23 (51)	21 (46)
	AS4087 PN35	230 (9.06)							30 (66)	28 (62)
	ASME B16.5 CL300	255 (1.04)							21 (51)	19 (42)
	ASME B16.5 CL150	229 (9.00)								
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 (Continued)

DN	Mating flange type	Dimensions in mm (in.)							Approx. weight in kg (lb)	
		D	L	F	C	E	G	A	Integral	Remote
DN300 (12 in.)	PN10	445 (17.52)	500 (19.69)	449 (17.68)	449 (17.68)	449 (17.68)	449 (17.68)	449 (17.68)	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)							130 (286)	128 (282)
	AS4087 PN35	490 (19.29)								
	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)							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)							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)							258 (568)	256 (564)

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

FEW – DN450 to 2400 (18 to 96 in. NB)



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

DN	Mating flange type	Dimensions in mm (in.)							Approx. weight in kg (lb)	
		D	L	F	C	E	G	A	Integral	Remote
DN450 (18 in.)	PN10	615 (24.21)	600 (23.62)	514 (20.24)	310 (12.20)	439 (17.28)	394 (15.51)	328 (12.91)	320 (704)	318 (700)
	PN16	640 (25.20)							335 (737)	333 (732)
	JIS5K	605 (23.82)							320 (704)	318 (700)
	JIS10K	620 (24.41)							333 (733)	331 (728)
	AS4087 PN16	640 (25.20)							380 (836)	378 (832)
	AS4087 PN35	675 (26.57)							480 (1056)	478 (1051)
	ASME B16.5 CL300	710 (27.95)							380 (836)	378 (832)
	ASME B16.5 CL150	635 (25.00)							260 (572)	258 (568)
	PN25	670 (26.38)							393 (865)	391 (860)
	PN40	685 (26.97)							463 (1019)	461 (1015)
DN500 (20 in.)	PN10	670 (26.38)	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)							290 (638)	288 (634)
	AS4087 PN16	705 (27.76)							435 (957)	433 (953)
	AS4087 PN35	735 (28.94)							300 (660)	298 (656)
	ASME B16.5 CL150	700 (27.56)							490 (1078)	488 (1074)
	ASME B16.5 CL300	775 (30.51)							300 (660)	298 (665)
	PN25	730 (28.74)							400 (880)	398 (876)
	PN40	755 (29.72)							246 (541)	244 (536)
DN600 (24 in.)	PN10	780 (30.71)	800 (31.50)	565 (22.24)	361 (14.21)	490 (19.29)	445 (17.52)	469 (18.46)	318 (700)	316 (695)
	PN16	840 (33.07)							460 (1012)	458 (1008)
	PN25	845 (33.27)							275 (605)	273 (600)
	JIS5K	770 (30.31)							306 (673)	304 (668)
	JIS10K	795 (31.30)							382 (840)	380 (835)
	AS4087 PN16	825 (32.48)							452 (994)	450 (990)
	AS4087 PN35	850 (33.46)							550 (1210)	548 (1205)
	ASME B16.5 CL300	915 (36.02)							425 (935)	423 (930)
	ASME B16.5 CL150	815 (32.09)							600 (1320)	598 (1316)
	PN40	890 (35.04)								

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

DN	Mating flange type	Dimensions in mm (in.)							Approx. weight in kg (lb)	
		D	L	F	C	E	G	A	Integral	Remote
DN700 (28 in.)	JIS 5K	875 (34.45)	910 (35.83)	604 (23.77)	403 (15.87)	528 (20.79)	530 (20.87)	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 (1036)	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)	990 (38.98)	630 (24.79)	429 (16.89)	554 (21.81)	556 (21.89)	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)
									280 (616)	278 (612)
DN800 (32 in.)	JIS 5K	995 (39.17)	1040 (40.04)	654 (25.74)	453 (17.83)	578 (22.76)	580 (22.83)	542 (21.34)	364 (801)	362 (796)
	JIS 10K	1020 (40.16)							294 (647)	292 (642)
	PN6	975 (38.39)							406 (893)	404 (889)
	PN10	1015 (39.96)							469 (1032)	467 (1027)
	PN16	1025 (40.35)							328 (722)	326 (717)
	AWWA C207 CLASS B	1060 (41.73)							408 (898)	406 (893)
	AWWA C207 CLASS D	1060 (41.73)							530 (1166)	528 (1162)
	AS4087 PN16	1060 (41.73)							386 (849)	384 (845)
	AS2129 TABLE-D	1060 (41.73)							519 (1142)	517 (1137)
	AS2129 TABLE-E	1060 (41.73)							615 (1353)	613 (1349)
	PN25	1085 (42.72)							866 (1905)	864 (1901)
	PN40	1140 (44.88)							634 (1395)	632 (1390)
	AWWA C207 CLASS E	1060 (41.73)							897 (1973)	895 (1969)
	AWWA C207 CLASS F	1150 (45.28)							751 (1652)	749 (1648)
	AS4087 PN35	1060 (41.73)							700 (1540)	698 (1536)
	ASME CL150 SERIES A	1060 (41.73)							406 (893)	404 (889)
	ASME CL150 SERIES B	940 (37.01)							933 (2053)	931 (2048)
	ASME CL300 SERIES B	1055 (41.54)							369 (812)	367 (807)
DN900 (36 in.)	JIS 5K	1095 (43.11)	1170 (46.06)	705 (27.7)	504 (19.84)	629 (24.76)	631 (24.84)	570 (22.44)	445 (979)	443 (975)
	JIS 10K	1120 (44.09)							390 (858)	388 (854)
	PN6	1075 (42.32)							502 (1104)	500 (1100)
	PN10	1115 (43.90)							589 (1296)	587 (1291)
	PN16	1125 (44.29)							417 (917)	415 (913)
	AWWA C207 CLASS B	1168 (45.98)							493 (1085)	491 (1080)
	AWWA C207 CLASS D	1168 (45.98)							827 (1819)	825 (1815)
	AWWA C207 CLASS E	1168 (45.98)							1150 (2530)	1148 (2526)
	AWWA C207 CLASS F	1270 (50.00)							706 (1553)	704 (1549)
	AS4087 PN16	1175 (46.26)							514 (1131)	512 (1126)
	AS2129 TABLE-D	1175 (46.26)							694 (1527)	692 (1522)
	AS2129 TABLE-E	1175 (46.26)							819 (1802)	817 (1797)
	PN25	1185 (46.65)							1158 (2548)	1156 (2543)
	PN40	1250 (49.21)							1044 (2297)	1042 (2292)
	AS4087 PN35	1185 (46.65)							961 (2114)	959 (2110)
	ASME CL150 SERIES A	1170 (46.06)							595 (1309)	593 (1305)
	ASME CL150 SERIES B	1055 (41.54)							1147 (2523)	1145 (2519)
	ASME CL300 SERIES B	1170 (46.06)								

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

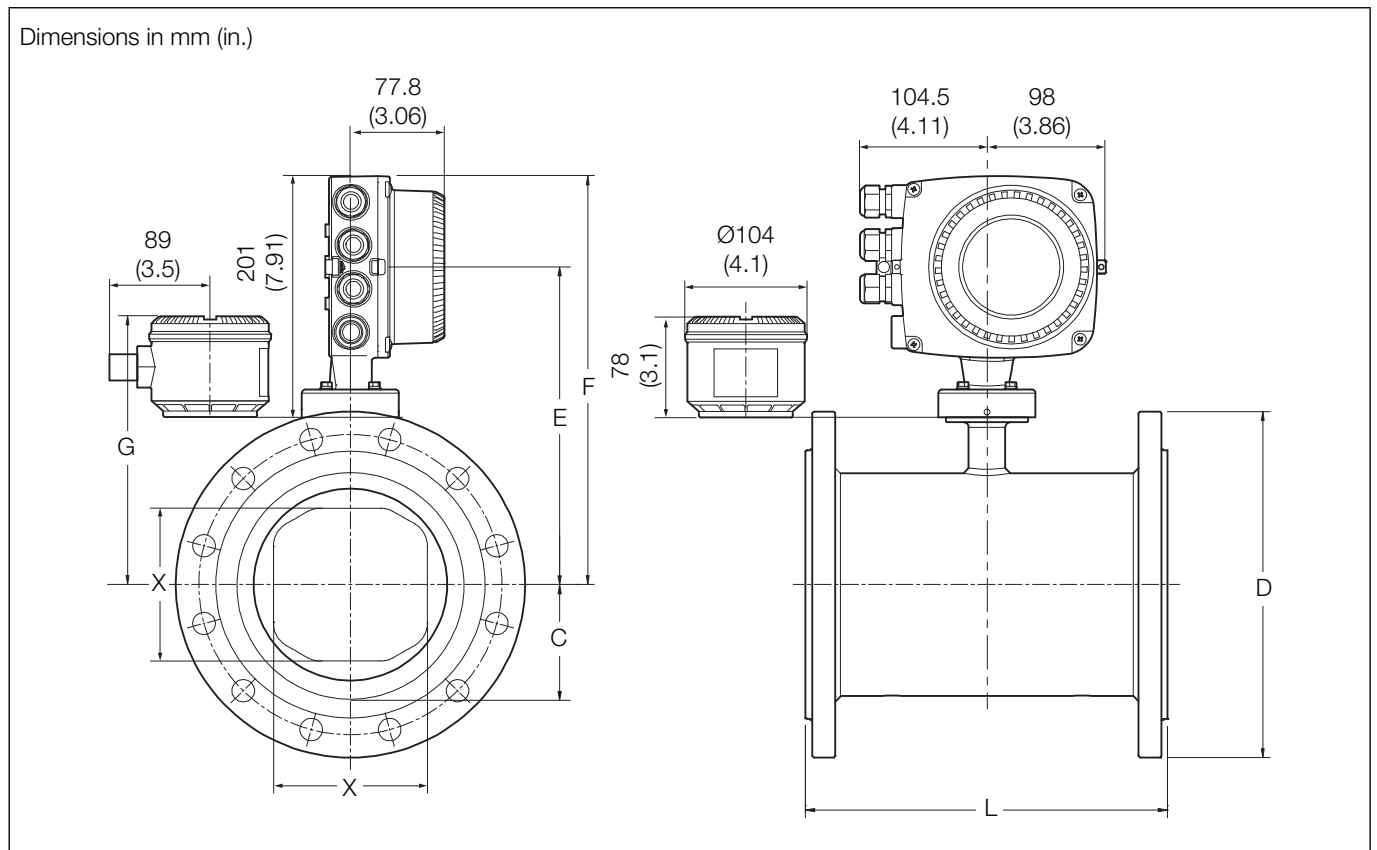
		Dimensions in mm (in.)							Approx. weight in kg (lb)						
DN	Mating flange type	D	L	F	C	E	G	A	Integral	Remote					
DN1000 (40 in.)	JIS 5K	1195 (47.05)	1300 (51.18)	755 (29.71)	554 (21.81)	679 (26.73)	681 (26.81)	624 (24.57)	441 (970)	439 (966)					
	JIS 10K	1235 (48.62)							572 (1258)	570 (1254)					
	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 (52.99)	1365 (53.74)	808 (31.82)	608 (23.92)	733 (28.84)	735 (28.92)	624 (24.57)	564 (1241)	562 (1236)					
	AWWA C207 CLASS D	1346 (52.99)							669 (1472)	667 (1467)					
	AWWA C207 CLASS E	1346 (52.99)							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)	1430 (56.30)	860 (33.85)	659 (25.94)	784 (30.87)	786 (30.94)	802 (31.57)	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)					
DN1200 (48 in.)	JIS 5K	1420 (55.91)	1560 (61.42)						860 (33.85)	659 (25.94)	784 (30.87)	786 (30.94)	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)

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

DN	Mating flange type	Dimensions in mm (in.)							Approx. weight in kg (lb)	
		D	L	F	C	E	G	A	Integral	Remote
DN1350 (54 in.)	AWWA C207 CLASS B	1683 (66.26)	1755 (69.09)	955 (37.59)	754 (29.69)	879 (34.61)	881 (34.69)	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)	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)	1950 (76.77)	1065 (41.92)	864 (34.02)	989 (38.94)	991 (39.02)	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)	2080 (81.89)	1066 (41.96)	865 (34.06)	990 (38.98)	992 (39.06)	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)	2145 (84.45)	1116 (43.94)	915 (36.02)	1040 (40.94)	1042 (41.02)	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)	2340 (92.13)	1181 (46.50)	980 (38.58)	1105 (43.50)	1107 (43.48)	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)	2535 (99.80)	1291 (50.81)	1090 (42.91)	1215 (47.83)	1217 (47.91)	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)	2600 (102.36)						2581 (5678)	2579 (5674)
	PN10	2325 (91.54)							4254 (9359)	4252 (9354)
	PN16	2345 (92.32)							4556 (10023)	4554 (10019)
	PN25	2425 (95.47)							5896 (12971)	5894 (12967)
DN2100 (84 in.)	AWWA C207 CLASS B	2534 (99.76)	2730 (107.48)	1395 (54.91)	1194 (47.01)	1319 (51.93)	1321 (52.01)	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)	2860 (112.60)					1330 (52.36)	3363 (7399)	3361 (7394)
	PN10	2550 (100.39)							5795 (12749)	5793 (12745)
DN2400 (96 in.)	PN6	2685 (105.71)	3120 (122.83)	1495 (58.85)	1294 (50.94)	1419 (55.87)	1421 (55.94)	1450 (57.09)	4100 (9020)	4098 (9016)
	PN10	2760 (108.66)							6968 (15330)	6966 (15325)

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

FEV – DN40 to 200 (1½ to 8 in. NB)



DN40 to 200 (1½ to 8 in. NB) (FEV)

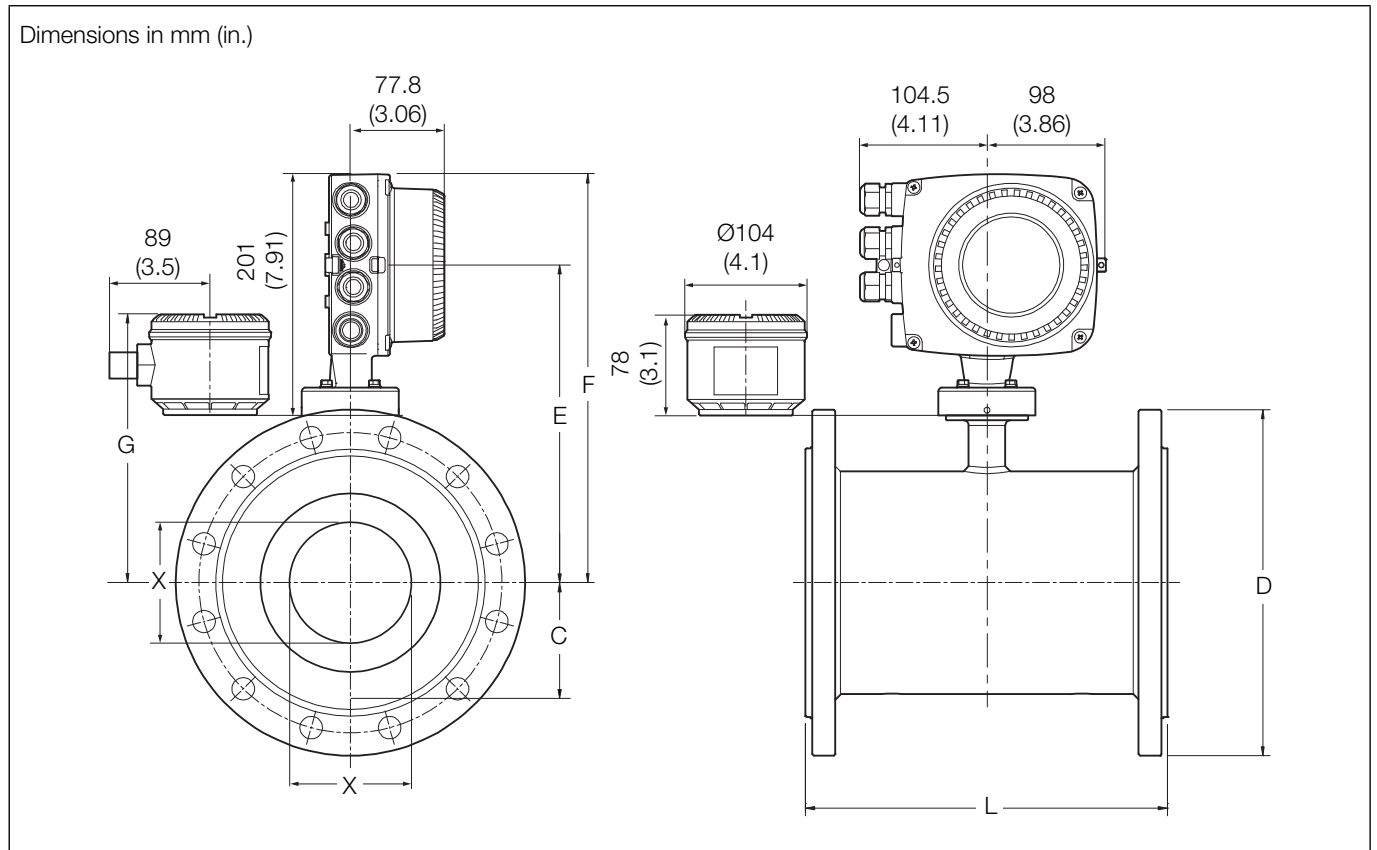
DN	Mating flange type	Dimensions in mm (in.)							Approx. weight in kg (lb)	
		D	L	F	C	E	G	X	Integral	Remote
DN40 (1½ in.)	EN1092-1 PN10, PN40	150 (5.91)	200 (7.87)	260 (10.24)	30.4 (1.20)	185 (7.28)	138 (5.43)	30 (1.18)	12 (27)	11 (24)
	ASME B16.5 CLASS 150	127 (5.00)								
	JIS 10K	140 (5.51)								
	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)								
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)								

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

DN	Mating flange type	Dimensions in mm (in.)							Approx. weight in kg (lb)	
		D	L	F	C	E	G	X	Integral	Remote
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 (Continued)

FER – DN40 to 300 (1½ to 12 in. NB)



DN40 to 300 (1½ to 12 in. NB) (FER)

		Dimensions in mm (in.)							Approx. weight in kg (lb)	
DN	Mating flange type	D	L	F	C	E	G	X	Integral	Remote
DN40 (1½ 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)	60.7 (2.39)	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)								
DN50 (2 in.)	AS4087 PN14	135 (5.31)								
	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)	78 (3.07)	14 (31)	12 (27)
	ASME B16.5 CLASS 150	152.4 (6.00)								
	JIS 10K	155 (6.10)								
	AS4087 PN21	165 (6.50)								
DN65 (2½ in.)	AS2129 TABLE F	165 (6.50)								
	AS2129 TABLE C D E	150 (5.91)								
	AS4087 PN14, PN16	150 (5.91)								
	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)	90 (3.54)	15 (33)	13 (29)
	ASME B16.5 CLASS 150	178 (7.00)								
DN80 (3 in.)	JIS 10K	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)	103 (4.06)	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)								
DN80 (3 in.)	AS2129 TABLE F	205 (8.07)								
	AS4087 PN21	205 (8.07)								

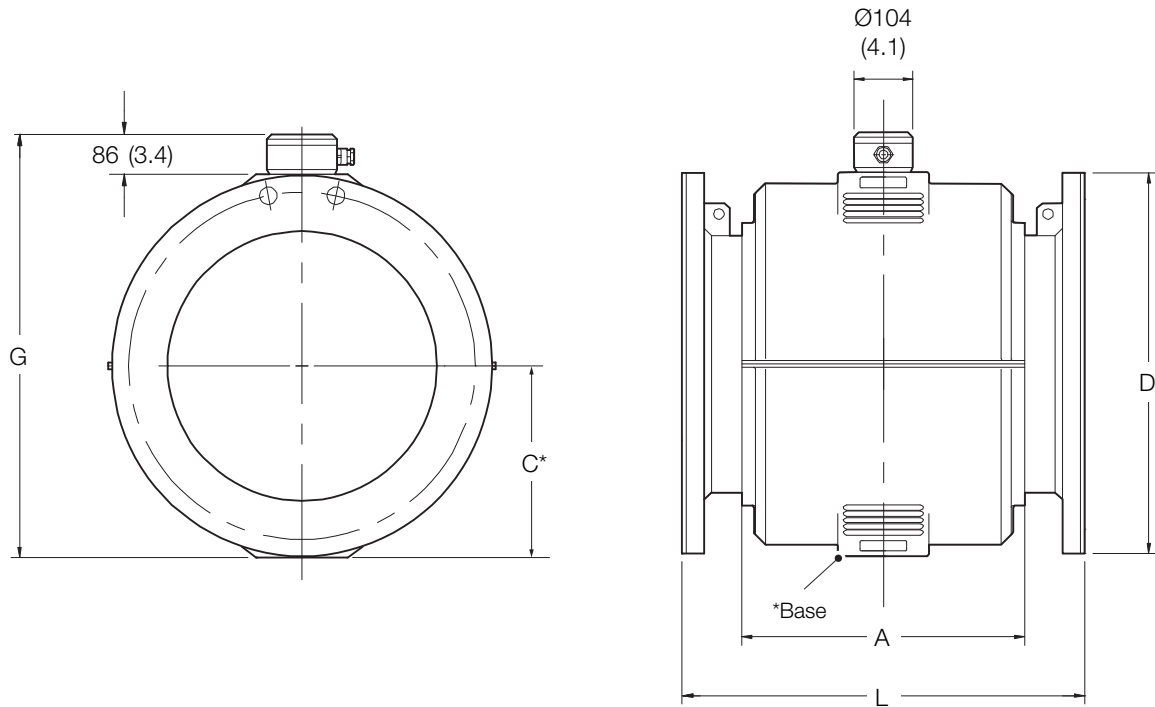
DN40 to 300 (1½ to 12 in. NB) (FER) dimensions / weights

DN	Mating flange type	Dimensions in mm (in.)							Approx. weight in kg (lb)	
		D	L	F	C	E	G	X	Integral	Remote
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)	128 (5.04)	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)								
DN125 (5 in.)	AS4087 PN21	230 (9.06)	250 (9.84)	320 (12.60)	63.75 (2.51)	245 (9.65)	197 (7.76)	128 (5.04)	27 (59)	25 (55)
	EN1092-1 PN10, 16	250 (9.84)								
	EN1092-1 PN25, 40	270 (10.63)								
	ASME B16.5 CLASS 150	254 (10.00)								
	JIS 10K	250 (9.84)								
DN150 (6 in.)	AS2129 TABLE C D	255 (10.04)	300 (11.81)	340 (13.39)	84.4 (3.32)	265 (10.43)	217 (8.54)	170 (6.69)	33 (72)	31 (68)
	EN1092-1 PN10, 16	285 (11.22)								
	EN1092-1 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)								
DN200 (8 in.)	AS4087 PN21	305 (12.01)	350 (13.78)	365 (14.37)	109.8 (4.32)	290 (11.42)	243 (9.57)	221 (8.70)	50 (110)	48 (106)
	EN1092-1 PN10, 16	340 (13.39)								
	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)								
DN250 (10 in.)	AS4087 PN21	370 (14.57)	450 (17.72)	389 (15.31)	136.8 (5.39)	313 (12.33)	268 (10.55)	276 (10.87)	77 (169)	75 (165)
	EN1092-1 PN10	395 (15.55)								
	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 (11.57)	337 (12.87)	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 (1½ to 12 in. NB) (FER) dimensions / weights (Continued)

FEF – DN80 to 600 (3 to 24 in. NB)

Dimensions in mm (in.)



*Dimension C = centre line to base of flowmeter body

DN80 to 600 (3 to 24 in. NB) (FEF)

		Dimensions in mm (in.)					
DN	Mating flange type	D	L	C	G	A	Approx. weight in kg (lb)
DN80 (3 in.)	EN1092-1 PN16	200 (7.90)	200 (7.90)	86 (3.40)	258 (10.20)	113 (4.50)	18 (40)
DN100 (4 in.)	EN1092-1 PN16	220 (8.70)	250 (9.80)	106 (4.20)	298 (11.70)	140 (5.50)	24 (54)
DN150 (6 in.)	EN1092-1 PN16	285 (11.20)	300 (11.80)	138 (5.40)	362 (14.30)	178 (7.00)	38 (84)
DN200 (8 in.)	EN1092-1 PN16	340 (13.40)	350 (13.80)	161 (6.30)	408 (16.10)	203 (8.00)	55 (121)
DN250 (10 in.)	ASME B16.5 CLASS 150	405 (15.94)	450 (17.72)	215 (8.46)	301 (11.85)	300 (11.81)	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							

DN80 to 600 (3 to 24 in. NB) (FEF) dimensions / weights

		Dimensions in mm (in.)					Approx. weight in kg (lb)
DN	Mating flange type	D	L	C	G	A	
DN300 (12 in.)	ASME B16.5 CLASS 150	485 (19.09)	500 (19.69)	231 (9.09)	317 (12.48)	352 (13.86)	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 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)	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)	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)	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)				

DN80 to 600 (3 to 24 in. NB) (FEF) dimensions / weights (Continued)

		Dimensions in mm (in.)					Approx. weight in kg (lb)
DN	Mating flange type	D	L	C	G	A	
DN450 (18 in.)	ASME B16.5 CLASS 150	635 (25.00)	700 (27.56)	317.5 (12.50)	402 (15.83)	480 (18.90)	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)	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)	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)					

DN80 to 600 (3 to 24 in. NB) (FEF) dimensions / weights (Continued)

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	
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								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																									
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 DN32 (3/4 to 1 1/4 in. NB)													B												
Stainless steel flange 1.4571 (316 Ti) – DN10 to DN15 (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 %																									
Class 1 calibration – enhanced accuracy 0.2 %																									
Extended range, class 1 calibration – standard accuracy 0.4 %																									
Extended range, class 2 calibration – enhanced accuracy 0.2 %																									
Temperature range installation / ambient temperature range																									
Standard design / –20 ... 60 °C (–4 ... 140 °F)																	1								
Nameplate																									
Adhesive																									
Signal cable length and type																									
Without signal cable																									
5 m (15 ft.) cable																									
10 m (30 ft.) cable																									
20 m (60 ft.) cable																									
30 m (100 ft.) cable																									
50 m (165 ft.) cable																									
80 m (260 ft.) cable																									
100 m (325 ft.) cable																									
150 m (490 ft.) cable																									
Special length or cable type																									
Explosion protection certification																									
General purpose (non-Ex design)																									
FM Class 1 Div. 2																									
usFMc Class 1 Div. 2																									
ATEX / IECEx Zone 2, 21 & 22																									

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																			
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 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				
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	X	
Optimized full bore sensor only, for use with WaterMaster transmitter / remote					FEV18																					
Design																										
Non-hazardous areas					1																					
Hazardous areas					5																					
Bore diameter																										
DN40 (1½ in.)							040																			
DN50 (2 in.)							050																			
DN65 (2½ 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								V																		
Electrode design																										
Standard								1																		
Measuring electrodes material																										
Stainless steel 316																										
Hastelloy® C-22																										
Super-austenitic steel																										
Grounding accessories																										
Standard																										
One potential equalizing ring (stainless steel)																										
Two potential equalizing rings (stainless steel)																										
Process connection type																										
Flanges ASME B16.5 class 150																										
Flanges AS 4087 PN21 (≥ DN50 [2 in. NB])																										
Flanges AS 4087 PN16 (≥ DN50 [2 in. NB])																										
Flanges AS 4087 PN14																										
Flanges AS 2129 Table F																										
Flanges AS 2129 Table E																										
Flanges AS 2129 Table D																										
Flanges AS 2129 Table C																										
Flanges JIS G5527 7.5K (³ DN100 [4 in. NB])																										
Flanges JIS B2220 10K																										
ISO/EN PN10																										
ISO / EN PN16 (≥ DN50 [2 in. NB])																										
ISO / EN PN40 (DN40 [1½ in. NB] only) 16 bar rated																										
Process connection material																										
Carbon steel flanges																										
Usage certifications																										
Standard																										
Calibration type																										
Class 2 Calibration – standard accuracy 0.4 %																										
Class 1 Calibration – enhanced accuracy 0.2 %																										
Extended range, class 1 calibration – standard accuracy 0.4 %																										
Extended range, class 2 calibration – high accuracy 0.2 %																										

Continued on next page...

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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																				
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)																									
FM Class 1 Div. 2																									
usFMc Class 1 Div. 2																									
ATEX / IECEx Zone 2, 21 & 22					A G P M																				
Protection class transmitter / protection class sensor																									
IP67 (NEMA 4X) / IP67 (NEMA 4X) – integral																									
IP67 (NEMA 4X) / IP68 (NEMA 6P) – cable not fitted and not potted																									
IP67 (NEMA 4X) / IP68 (NEMA 6P) – cable fitted and potted					1 2 3																				
Cable conduits *																									
M20 x 1.5 (plastic)																									
NPT 1/2 in. (blanked when cable not fitted)																									
M20 SWA (armored)																									
M20 SWA sensor, M20 x 1.5 (plastic) power / output																									
Without					A B D F Y																				
Power supply																									
Without																									
100... 230 V AC, 50 Hz																									
24 V AC or 24 V DC, 50 Hz																									
100... 230 V AC, 60 Hz																									
24 V AC or 24 V DC, 60 Hz																									
Others					0 1 2 3 4 9																				
Input and output signal type																									
HART + 20 mA + pulse + contact output																									
PROFIBUS DP RS485 physical layer + pulse + contact output (general-purpose design only)																									
MODBUS RTU RS485 physical layer + pulse + contact output (general-purpose design only)																									
Without					A G M Y																				
Configuration type / diagnostics type																									
Without																									
Factory defaults / standard diagnostics																									
					0 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																					
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																					
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	
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
(sizes up to DN2400 [96 in. NB] still available on request)

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	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																								
DN80 (3 in.)						080																		
DN100 (4 in.)						100																		
DN150 (6 in.)						150																		
DN200 (8 in.)						200																		
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									K															
Hard rubber									H															
Other									9															
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																								
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 DN200 (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 %																								
Class 1 Calibration – enhanced accuracy 0.2 %																								
Extended range, class 1 calibration – standard accuracy 0.4 %																								
Extended range, class 2 calibration – enhanced accuracy 0.2 %																								

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			
Full bore sensor only, for use with WaterMaster transmitter / remote										FEF18										X																				
Temperature range installation / ambient temperature range																																								
Standard design / -20 ... 60 °C (-4 ... 140 °F)																																								
Nameplate																																								
Adhesive																																								
Signal cable length and type*																																								
Without signal cable																																								
5 m (15 ft.) cable																																								
10 m (30 ft.) cable																																								
20 m (60 ft.) cable																																								
30 m (100 ft.) cable																																								
50 m (165 ft.) cable																																								
80 m (260 ft.) cable																																								
100 m (325 ft.) cable																																								
150 m (490 ft.) cable																																								
Special Length > 150 m (> 490 ft.) (and / or armored cable)																																								
Explosion protection certification																																								
General purpose (non-Ex design)																																								
Protection class transmitter / protection class sensor																																								
IP67 (NEMA 4X) / IP68 (NEMA 6P) – cable not fitted and not potted																																								
IP67 (NEMA 4X) / IP68 (NEMA 6P) – cable fitted and potted																																								
Cable conduits**																																								
M20 x 1.5 (plastic)																																								
NPT 1/2 in. (blanked when cable not fitted)																																								
M20 SWA (armored)																																								
M20 SWA sensor, M20 x 1.5 (plastic) power / output																																								
Without																																								
Power supply																																								
Without																																								
100... 230 V AC (50 Hz)																																								
24 V AC or 24 V DC (50 Hz)																																								
100... 230 V AC (60 Hz)																																								
24 V AC or 24 V DC (60 Hz)																																								
Input and output signal type																																								
HART + 20 mA + pulse + contact output																																								
PROFIBUS DP RS485 physical layer + pulse + contact output (general-purpose design only)																																								
MODBUS RTU RS485 physical layer + pulse + contact output (general-purpose design only)																																								
Without																																								
Configuration type / diagnostics type																																								
Without																																								
Factory defaults / standard diagnostics																																								
Options***																																								
Accessories																																								
Configuration lead																																								
Documentation language																																								
German M1																																								
Italian M2																																								
Spanish M3																																								
French M4																																								
English M5 (default)																																								
Verification type																																								
Without fingerprint																																								
VeriMaster																																								
Potable water approvals																																								
WRAS cold water approval																																								
NSF 61 meter approval																																								
DVGW																																								
ACS																																								
WRAS 60 °C (140 °F) water approval																																								
Without																																								
Power supply frequency (sensor FEF 18 only)																																								
50 Hz																																								
60 Hz																																								
Number of testpoints																																								
1 Point																																								
3 Points																																								

*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 (FEF still available on request)

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 (29 in.)							750																			
DN760 (30 in.)							760																			
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								A																		
LINATEX								J																		
Hard rubber								H																		
Elastomer								K																		
Electrode design																										
Standard									1																	
Other									9																	
Measuring electrodes material																										
Hastelloy® C-4 (2.4610)										D																
Stainless steel 316L										S																
Hastelloy C-22										C																
Tungsten (LINATEX only)										T																
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...																										

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																									
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	X	X	X	X	X	
Full bore sensor only – for use with WaterMaster transmitter / remote														FEW38																									
Process connection type																																							
Flanges ANSI / ASME B16.5 / 16.47 series B Class 150																					A1																		
Flanges ANSI / ASME B16.5 / 16.47 series B Class 300																					A3																		
Flanges ANSI / ASME B16.5 / 16.47 series A Class 150																					B1																		
Flanges ANSI / ASME B16.5 / 16.47 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 (700 to 2400 only)																					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 – enhanced 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				
ATEX / IECEx Zone 2, 21 & 22																																			M				
Continued on next page...																																							

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																				
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																				
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 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
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 (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
Lay length																									
Isolength – DN10 to 600 (3/8 to 24 in.)																									JB
and 1.25D DN1800 to 2400 (72 to 96 in.)																									
1.3D DN700 to 2400 (28 to 96 in.)																									JK
1.0D DN700 to 1650 (28 to 66 in.)																									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

* 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	1 1/2 in.	040																			
DN 50	2 in.	050																			
DN 65	2 1/2 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																					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																					
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...

* 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	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Options				
Transmitter module						FET10																			
Remote transmitter						FET12																			
Design																									
Non-hazardous area						1																			
Hazardous area						5																			
Temperature range installation / ambient temperature range																									
Standard design / -20 ... 60 °C (-4 ... 140 °F)						1																			
Nameplate																									
Adhesive						A																			
Signal cable length																									
Without signal cable						0																			
Explosion protection																									
Without (transmitter only)																									
FM Class 1 Div. 2																									
usFMc Class 1 Div. 2																									
ATEX / IECEx Zone 2, 21 & 22																									
Protection class transmitter / protection class sensor																									
IP67 (NEMA 4X) / IP67 (NEMA 4X)																									
Cable conduits																									
M20 x 1.5 (plastic)																									
NPT 1/2 in. (blanked when cable not fitted)																									
M20 SWA (armored)																									
M20 SWA sensor, M20 x 1.5 (plastic) power / output																									
Without																									
Power supply																									
100... 230 V AC																									
24 V AC or 24 V DC																									
Input and output																									
HART + 20 mA + pulse + contact output																									
PROFIBUS DP RS485 physical layer + pulse + contact output (general-purpose design only)																									
MODBUS RTU RS485 physical layer + pulse + contact output (general-purpose design only)																									
Configuration type / diagnostics type																									
Factory defaults / standard diagnostics																									
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

Accessory	Item Number
Signal cable for remote WaterMaster transmitter	
5 m (15 ft.)	STT4500/05
10 m (30 ft.)	STT4500/10
20 m (60 ft.)	STT4500/20
30 m (100 ft.)	STT4500/30
50 m (165 ft.)	STT4500/50
80 m (260 ft.)	STT4500/80
100 m (325 ft.)	STT4500/100
150 m (490 ft.)	STT4500/150
500 m (1650 ft.)	STT4500/500

Accessory	Item Number
Armored signal cable for remote WaterMaster transmitter	
5 m (15 ft.)	STT4501/05
10 m (30 ft.)	STT4501/10
20 m (60 ft.)	STT4501/20
30 m (100 ft.)	STT4501/30
50 m (165 ft.)	STT4501/50
80 m (260 ft.)	STT4501/80
100 m (325 ft.)	STT4501/100
150 m (490 ft.)	STT4501/150
500 m (1650 ft.)	STT4501/500

Acknowledgements

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