Data Sheet DS/FER200/FEF200/FEV200–EN Rev. E

AquaMaster 3
Electromagnetic flowmeter

The high value, precision solution for remote water metering and irrigation applications

Full range of power supply options for lowest cost site preparation and energy usage
- AC mains
- long-life battery
- renewable / solar / wind-power compatible

Optional built in multi-sampling rate, pressure and flow data logger
- integrated, all-in-one solution
- high resolution flow and pressure data logger
- three instruments for the price of one – no need to purchase a separate pressure transmitter or data logger

Wireless communication via optional built in GSM modem
- access and download all logged data remotely
- remote diagnostics
- reduces the requirement for costly and time-consuming site visits

Peace of mind with class leading, fully potted, IP68 electronic package
- zero water ingress, even during flood conditions
- military specification IP68 plug and socket connections
- sealed-for-life = zero maintenance

Compatible with ABB's full range of industry-leading flow sensors
- reduced-bore series for high turn-down applications, for example, leakage detection
- full-bore series for general-purpose water metering and irrigation applications
- all sensors are buriable, eliminating the need for costly chamber construction – a significant site preparation saving

Full range of approvals
- optional MID approval
- optional OIML R049 approval
- NMI approval pending

The next generation commercial water flowmeter

AquaMaster 3, available in sizes 15 to 600 mm (1/2 to 24 in.) with a reduced-bore construction, is the total solution for flow measurement in the water industry. Outstanding performance, innovative features and user benefits, coupled with low cost of ownership ensures that AquaMaster 3 is the first choice for District Metering, Bulk Revenue, Trunk Mains and Treatment Works applications.

AquaMaster 3 is also available in sizes 250 to 600 mm (10 to 24 in.) in full-bore and 40 to 200 mm (1 1/2 to 8 in.) in optimized full-bore construction where minimal pressure loss is essential, such as in irrigation applications.

AquaMaster has been designed specifically for the water industry in response to its stringent demands for enhanced metering capability; enabling ever more efficient and cost-effective operation and compliance with increasing legislative requirements.

Based on our proven technology, AquaMaster 3 is supported by the expertise of ABB – the world's leading flowmeter manufacturer with many pioneering advances in water flow metering over the last decade – for example AquaMag™, MagMaster™, AquaProbe™, WaterMaster™ and CalMaster™. ABB operates nationally- and internationally-accredited flow calibration facilities in the UK, USA, Germany, Australia and India. We also offer comprehensive, locally-based before- and after-sales support and service.

In addition to high measurement performance, AquaMaster 3 offers totalizer readings via the industry-standard inductive pad reader.

Typical applications

- Leakage detection
- Bulk revenue
- District metering
- Trunk mains
- Treatment works
- Irrigation

AquaMaster 3 system

AquaMaster 3 is a new design of mains, renewable energy and battery-powered transmitter. It has a stainless steel housing with a thermoplastic outer and the assembly is sealed-for-life to IP68 as standard. The transmitter incorporates military specification plug & socket connections for all inputs and outputs.

Transmitter

- Comprehensive display
- Rated IP68 (NEMA 6P) for submerged use in flooded chambers
- Resettable or secure totals
- 8 mm (0.31 in.) high displays for totals (exceeds ISO 4064 requirements)
- All connections via plug and socket
- Tamper-resistant and MID approved
- 3 outputs (forward and reverse pulse, or pulses, direction and alarm)

The AquaMaster 3 transmitter provides the most comprehensive range of flow data and information currently available to the water industry. If all the data is not required, the transmitter can be configured so that only the required values are displayed, ensuring simple reading with no superfluous data.

The transmitter can be mounted directly onto the AquaMaster sensor (close-coupled) or remotely from it. For close-coupled meters, the mounting system positions the display so that it is visible from both the top and the side.

The AquaMaster 3's program memory (or firmware) uses reprogrammable flash memory technology that has been enhanced to enable this firmware to be upgraded in the field via a local serial port connection. This future-proofs AquaMaster 3, making enhancements or new features available to installed units.

The AquaMaster 3 transmitter can contain an optional multi-speed, multi-channel, dual-variable logger. The ability of the logger to run at two speeds simultaneously enables the user to investigate, in precise detail, flow and pressure activity during a period of interest. The logger records both flow and pressure via direct digital data transfer, ensuring optimum accuracy and measurement resolution. Traditional techniques of counting pulses over a short logging interval leads to 'quantization' effects corresponding to whole numbers of pulses on logger graphs. AquaMaster 3 eliminates such effects, averaging digitally over the selected logging interval. Such high resolution data facilitates step testing, leak detection and water network analysis.

The AquaMaster's internal loggers feature an advanced automatic time synchronization facility that ensures operation on synchronized time boundaries, irrespective of what logging interval is set. This ensures all flow and pressure data, when combined with data from other meters, is synchronized precisely.

For revenue application, not only is flow and pressure information available; there are also totalizer and tariff loggers, that log all volume totals (forward, reverse, net) and tariff readings totals daily at midnight. The in-built memory of 732 days keeps all records for 2 years. The readings stored are the precise register volumes and are not inferred by pulse integration or other similar techniques.

Access to the loggers and logger configuration is security-protected by user-definable passwords.

AquaMaster 3 transmitter close-coupled to FEV series (optimized) full bore sensor

Remote access via mobile phone technology

- Remote access to logger data over quad-band GSM network by SMS text message
- Remote configuration, status monitoring and preventive maintenance
- Diagnostics and configuration, via standard GSM mobile phone
- Automated metering data reporting via SMS text

Transmitter power options

Mains power with super capacitor back-up

- Mains-only option supplied with a built-in rechargeable super capacitor backup power source
- The super capacitor can operate for up to 5 days without power (depending on operating conditions)
- The super capacitor has recharge cycles greater than 10,000 and with mains power offers continuous SMS operation
- In the event of mains interruption, continuous measurement is maintained and alarms reported via SMS protocols for up to 5 days without power
- No batteries to replace

Battery power for remote locations

- Up to 5-year* battery life
- Manganese alkaline battery pack*
- Site-replaceable battery pack
- The battery can be replaced without loss of logger contents enabling smooth switchover

*Operation at extremes of temperature can significantly shorten battery capacity and life.

Manganese battery pack with 5-year life

AquaMaster 3 is the ideal solution for locations where there is no external power.

Solar and wind power

Utilizes a simple DC (6 to 22 V) connection from sources as small as a 5 W solar panel / wind generator. Wind generators and solar panels are not supplied by ABB.

- No external rechargeable batteries required
- No external regulators
- Very simple installation
- Super capacitor backup

It is now possible to access sun and wind energy power sources. The internal super capacitor can power the transmitter at night or for up to 3 weeks during power interruptions (dependent on operational conditions).

Tariff feature

AquaMaster 3 incorporates a multiple tariff feature where the accumulated flow volume is routed to one of two 8-digit signed tariffs; tariff A or tariff B, depending on time and date. This feature is fully-programmable by the user for time-of-day, day-of-week or date during the year. These user-defined times / days / dates can be combined in a variety of modes to produce the tariff regimes illustrated in the tables below.

Weekly cycle defined

Mode	Tariff A	Tariff B
1	Day time during weekend	Night time at weekend + day and night during
2	Day time during week	Night time during week + day and night during weekend
3	All day times	All night times
4	Night time during weekend	Day time during weekend + day and night during
5	Day and night during weekend	Day and night during week
6	Day time during weekend + night time during	Night time during week + day time during weekend
7	All day times + night time during	Night time during week

Yearly cycle defined

Mode	Tariff A	Tariff B
1	Day time during summer	Night time during summer + day and night during winter
2	Day time during winter	Night time during winter + day and night during summer
3	All day times	All night times
4	Night time during summer	Day time during summer + day and night during winter
5	Day and night during summer	Day and night during winter
6	Day time during winter + night time during summer	Night time during winter + day time during summer
7	All day times + night time during summer	Night time during winter

Easy, low-cost installation

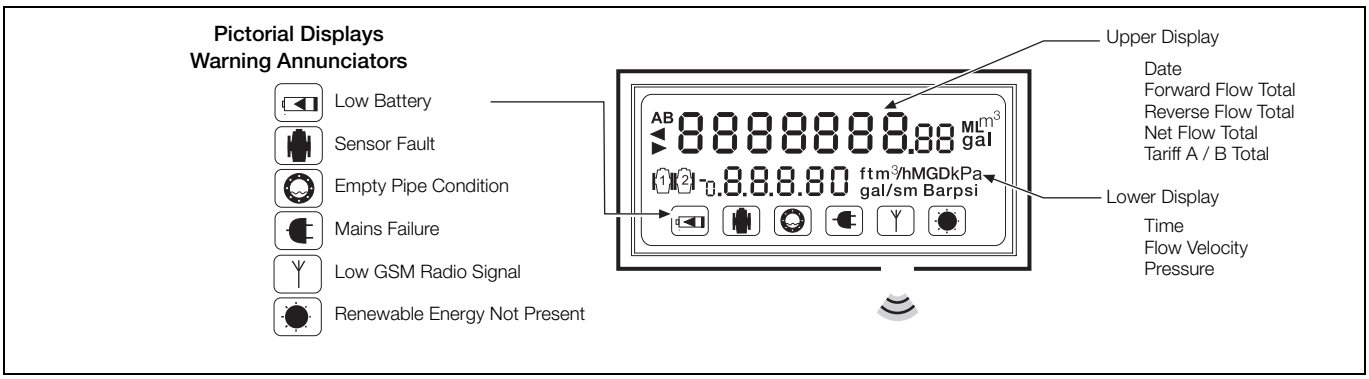
No matter what the location or installation requirements, AquaMaster 3 provides a cost-effective solution. Both the sensor and the transmitter are fully submersible, enabling installation in flooded chambers. In addition, the sensor is buriable, eliminating the need for a chamber.

Installation merely involves excavating to the pipeline, fitting the sensor and back-filling the hole, ensuring very fast, low-cost installation. The associated transmitter is then located in the most convenient position for the user. The elimination of bypasses and ancillary items such as strainers, enables the installation cost to be kept to an absolute minimum.

Installation requirement of zero pipe diameters (OD) upstream and downstream for the reduced-bore version removes concern over where to install a sensor, while delivering the highest performance. These factors, together with the innovative 'Fit and Flow™' system, ensure foolproof installation with total user confidence.

Fit and Flow

- No need to match sensor and transmitter
- Fast, reliable installation
- Foolproof, no errors
- Sensor stores all calibration factors, site settings and serial numbers
- Volume totalizer and tariff values backed-up in sensor for total security
- Multiple, programmable password levels stored for measurement security



AquaMaster 3 Display

New performance standards for flow measurement

With the widest flow range, optimum accuracy and long term stable calibration, AquaMaster 3 sets new performance standards in the water industry.

The reduced-bore (FER) performance is OIML R49 type approved (DN40 to DN300) to the latest Class 1 and Class 2 accuracies with a tighter accuracy above Q 0.5 % and Q 0.25 % (Fig. 1).

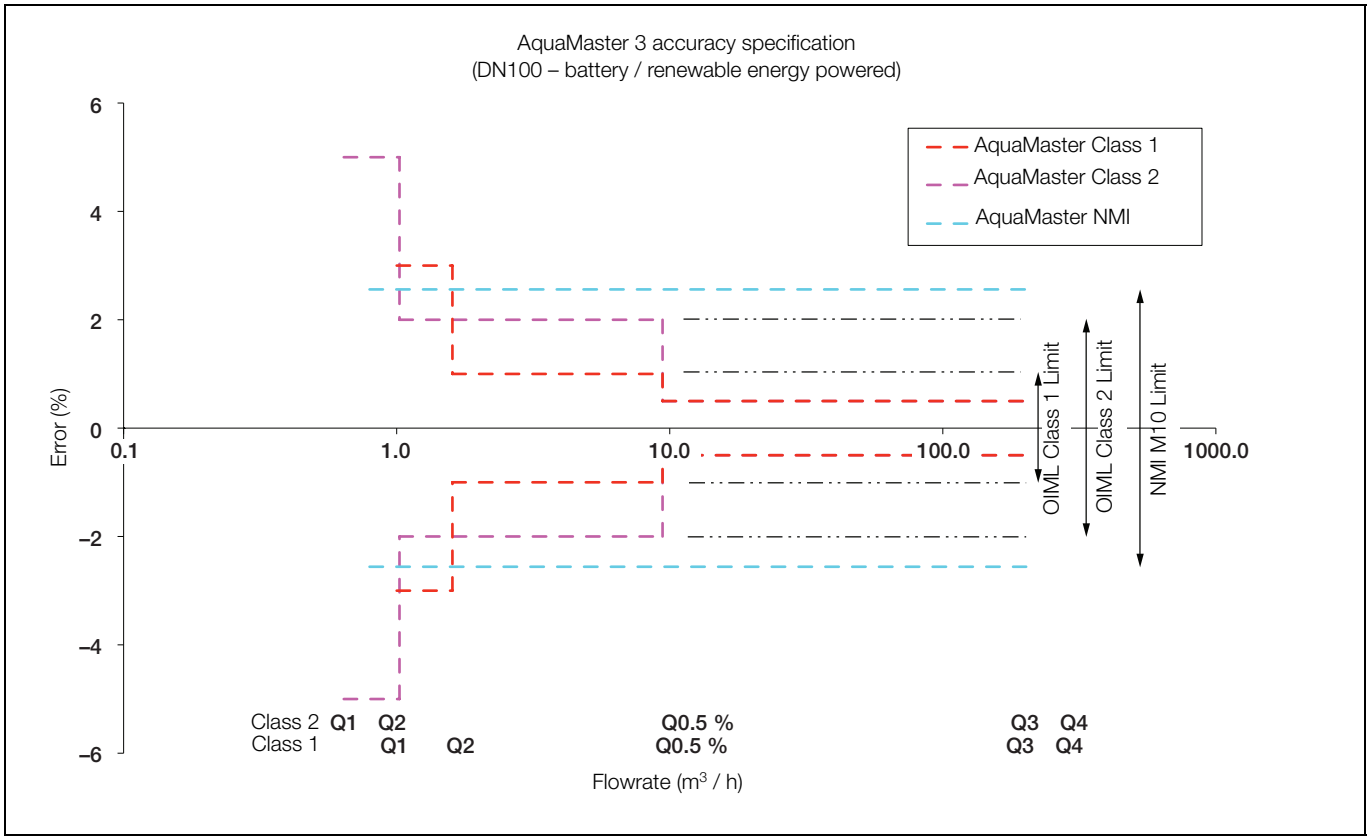
This unique low flow rate capability enables previously unrecordable minimal night flow rates to be metered; particularly important for bulk revenue and district metering applications.

The clear bore of the AquaMaster 3 eliminates the possibility of damage by particulate matter and the absence of moving and wearing components ensures that this unique level of performance is maintained long term.

The unique design of the AquaMaster 3 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 meter performance, even with very bad hydraulic installation conditions.

Hydraulic disturbance tests conducted during OIML R49 type approval confirmed a guaranteed accuracy to Class 1 and Class 2, even with flow disturbers bolted directly on the meter, either upstream or downstream at zero pipe diameters.

AquaMaster 3 reduced-bore version has been type examined and conforms to EU Measuring Instrument Directive (MID).



AquaMaster 3 specification to OIML R49 and NMI M10

Specification – flowmeter

Battery- or renewable energy-powered reduced-bore meters (FER) – flow specifications

					Class 2 specification			Class 1 specification		
Size		Q_4	Q_3	$Q_{(0.5\%)}$	Q_2	Q_1	R	Q_2	Q_1	R
mm	in.	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)		m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	
15	1/2	5.0 (22.01)	4.0 (17.61)	0.24 (1.05)	0.026 (0.110)	0.016 (0.070)	250	0.04 (0.176)	0.025 (0.11)	160
20	3/4	7.9 (34.8)	6.3 (27.74)	0.37 (1.62)	0.04 (0.176)	0.025 (0.110)	250	0.063 (0.277)	0.04 (0.176)	160
25	1	12.5 (55)	10 (44)	0.6 (2.64)	0.064 (0.281)	0.04 (0.176)	250	0.1 (0.44)	0.063 (0.277)	160
40*	1 1/2	31 (138)	25 (110)	1.5 (6.6)	0.16 (0.704)	0.1 (0.44)	250	0.25 (1.10)	0.16 (0.704)	160
50*	2	50 (220)	40 (176)	2.4 (10.56)	0.26 (1.14)	0.16 (0.70)	250	0.4 (1.76)	0.25 (1.10)	160
65	2 1/2	79 (347)	63 (277)	3.7 (16.29)	0.40 (1.76)	0.25 (1.10)	250	0.63 (2.77)	0.4 (1.76)	160
80*	3	125 (550)	100 (440)	5.9 (25.97)	0.64 (2.82)	0.4 (1.76)	250	1.0 (4.40)	0.63 (2.77)	160
100*	4	200 (880)	160 (704)	9.4 (41.38)	1.0 (4.4)	0.64 (2.82)	250	1.6 (7.04)	1.0 (4.40)	160
125	5	200 (880)	160 (704)	9.4 (41.38)	1.0 (4.4)	0.64 (2.82)	250	1.6 (7.04)	1.0 (4.40)	160
150*	6	500 (2200)	400 (1760)	23.5 (103.46)	2.56 (11.27)	1.6 (7.04)	250	4.0 (17.61)	2.5 (11.01)	160
200*	8	788 (3470)	630 (2770)	37 (162.90)	4.0 (17.61)	2.5 (11.01)	250	6.3 (27.74)	3.9 (17.17)	160
250*	10	1250 (5500)	1000 (4400)	60 (260)	6.4 (28.18)	4.0 (17.61)	250	10 (44)	6.3 (27.74)	160
300*	12	2000 (8810)	1600 (7045)	90 (400)	10.2 (44.91)	6.4 (28.18)	250	16 (70.44)	10 (44)	160
350	14	2000 (8810)	1600 (7045)	110 (484.3)	16 (70.44)	10 (44.02)	160	41 (180.5)	25 (110)	63
375	15	2000 (8810)	1600 (7045)	110 (484.3)	16 (70.44)	10 (44.02)	160	41 (180.5)	25 (110)	63
400	16	3125 (13760)	2500 (11007)	170 (750)	25 (110)	15.6 (68.68)	160	63 (277.4)	40 (176)	63
450	18	3125 (13760)	2500 (11007)	170 (750)	25 (110)	15.6 (68.68)	160	63 (277.4)	40 (176)	63
500	20	5000 (22014)	4000 (17610)	270 (1190)	40 (176)	25 (110)	160	100 (440)	63.5 (279)	63
600	24	7875 (34670)	6300 (27740)	420 (1850)	63 (277)	39 (172)	160	160 (704)	100 (440)	63

* OIML R49 version available to Class 1 and Class 2

Note. OIML R49–1 allows Class 1 only for meters with $Q_3 \geq 100$ m^3 / h. Meters outside this range were tested to Class 1 accuracy and passed.

Battery- or renewable energy-powered full-bore meters (FEF) – flow specifications

					Class 2 specification			Class 1 specification		
Size		Q_4	Q_3	$Q_{(0.5\%)}$	Q_2	Q_1	R	Q_2	Q_1	R
mm	in.	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)		m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	
250	10	2000 (8810)	1600 (7045)	107 (471)	16 (70.45)	10 (44)	160	26 (114)	16 (70.45)	100
300	12	3125 (13760)	2500 (11007)	167 (735)	25 (110)	15.6 (68.68)	160	40 (176)	25 (110)	100
350	14	5000 (22014)	4000 (17610)	267 (1175)	40 (176)	25 (110)	160	40 (282)	40 (176)	100
375	15	5000 (22014)	4000 (17610)	267 (1175)	40 (176)	25 (110)	160	40 (282)	40 (176)	100
400	16	5000 (22014)	4000 (17610)	267 (1175)	40 (176)	25 (110)	160	40 (282)	40 (176)	100
450	18	7875 (34670)	6300 (27740)	420 (1850)	63 (277)	39 (172)	160	101 (445)	63 (277)	100
500	20	7875 (34670)	6300 (27740)	420 (1850)	63 (277)	39 (172)	160	101 (445)	63 (277)	100
600	24	12500 (55030)	10000 (44030)	667 (2937)	100 (440)	63 (277)	160	160 (704)	100 (440)	100

* OIML R49 version available to Class 1 and Class 2

Battery- or renewable energy-powered optimized full-bore meters (FEV) – flow specifications

					Class 2 specification			Class 1 specification			NMI M10 Class 2.5	
Size		Q_4	Q_3	$Q_{(0.5\%)}$	Q_2	Q_1	R	Q_2	Q_1	R	Q_1	R
mm	in.	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)		m^3 / h (Ugal / min)	m^3 / h (Ugal / min)		m^3 / h (Ugal / min)	
40	1½	50 (220)	40 (176)	2.7 (11.89)	0.4 (1.76)	0.25 (1.10)	160	0.64 (2.82)	0.4 (1.76)	100	0.32 (1.41)	125
50	2	79 (347)	63 (277)	4.2 (18.5)	0.63 (2.77)	0.39 (1.72)	160	1.0 (4.40)	0.63 (2.77)	100	0.50 (2.20)	125
65	2½	125 (550)	100 (440)	6.7 (29.5)	1.0 (4.40)	0.6 (2.64)	160	1.6 (7.04)	1.0 (4.40)	100		
80	3	200 (880)	160 (704)	10.7 (47.11)	1.6 (7.04)	1.0 (4.40)	160	2.6 (11.45)	1.6 (7.04)	100	1.28 (5.64)	125
100	4	313 (1378)	250 (1100)	16.7 (73.53)	2.5 (11.01)	1.6 (7.04)	160	4.0 (17.61)	2.5 (11.01)	100	2.0 (8.81)	125
125	5	313 (1378)	250 (1100)	16.7 (73.53)	2.5 (11.01)	1.6 (7.04)	160	4.0 (17.61)	2.5 (11.01)	100		
150	6	788 (3470)	630 (2774)	42 (185)	6.3 (27.74)	3.9 (17.17)	160	10 (44)	6.3 (27.74)	100	5.0 (22.01)	125
200	8	1250 (5504)	1000 (4403)	67 (2985)	10 (44)	6.0 (26.42)	160	16 (70.45)	10 (44)	100	8.0 (35.22)	125

AC-powered reduced-bore meters (FER) – flow specifications

					Class 2 specification			Class 1 specification		
Size		Q_4	Q_3	$Q_{(0.25\%)}$	Q_2	Q_1	R	Q_2	Q_1	R
mm	in.	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)		m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	
15	1/2	5 (22)	4 (18)	0.11 (0.48)	0.010 (0.044)	0.006 (0.026)	630	0.016 (0.070)	0.010 (0.04)	400
20	3/4	7.9 (35)	6.3 (27.74)	0.18 (0.79)	0.016 (0.070)	0.010 (0.044)	630	0.025 (0.11)	0.016 (0.070)	400
25	1	12.5 (55)	10 (44)	0.29 (1.27)	0.025 (0.11)	0.016 (0.070)	630	0.04 (0.176)	0.025 (0.11)	400
40*	1 1/2	31 (138)	25 (110)	1.5 (6.6)	0.063 (0.28)	0.040 (0.176)	630	0.1 (0.44)	0.063 (0.28)	400
50*	2	50 (220)	40 (176)	1.5 (6.6)	0.1 (0.44)	0.063 (0.277)	630	0.16 (0.70)	0.1 (0.44)	400
65	2 1/2	79 (247)	63 (277)	3 (13.2)	0.16 (0.7)	0.1 (0.44)	630	0.25 (1.10)	0.16 (0.70)	400
80*	3	125 (550)	100 (440)	3 (13.2)	0.3 (1.32)	0.16 (0.70)	630	0.4 (1.76)	0.25 (1.10)	400
100*	4	200 (880)	160 (704)	4.6 (20.25)	0.41 (1.8)	0.25 (1.10)	630	0.64 (2.82)	0.4 (1.76)	400
125	5	200 (880)	160 (704)	4.6 (20.25)	0.41 (1.8)	0.25 (1.10)	630	0.64 (2.82)	0.4 (1.76)	400
150*	6	500 (2200)	400 (1760)	11.4 (50.19)	1.0 (4.40)	0.63 (2.77)	630	1.6 (7.04)	1.0 (4.40)	400
200*	8	788 (3470)	630 (2774)	18 (79.25)	1.6 (7.04)	1.0 (4.40)	630	2.5 (11.01)	1.6 (7.04)	400
250*	10	1250 (5504)	1000 (4400)	29 (127.7)	2.5 (11.01)	1.6 (7.04)	630	4.0 (17.61)	2.5 (11.01)	400
300*	12	2000 (8806)	1600 (7045)	46 (202)	4.1 (18.05)	2.5 (11.01)	630	6.4 (28.18)	4.0 (17.61)	400
350	14	2000 (8806)	1600 (7045)	80 (352)	6.4 (28.18)	4.0 (17.61)	400	12.8 (56.35)	8.0 (35.22)	200
375	15	2000 (8806)	1600 (7045)	80 (352)	6.4 (28.18)	4.0 (17.61)	400	12.8 (56.35)	8.0 (35.22)	200
400	16	3125 (13760)	2500 (11007)	125 (550)	10 (44)	6.3 (27.74)	400	20 (88.06)	12.5 (55.04)	200
450	18	3125 (13760)	2500 (11007)	125 (550)	10 (44)	6.3 (27.74)	400	20 (88.06)	12.5 (55.04)	200
500	20	5000 (22014)	4000 (17610)	200 (880)	16 (70.45)	10 (44)	400	32 (140.9)	20 (88.05)	200
600	24	7875 (34670)	6300 (27740)	315 (1387)	25.2 (110.9)	15.8 (69.56)	400	50.4 (221.9)	31.5 (138.7)	200

* OIML R49 version available to Class 1 and Class 2

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

AC-powered full-bore meters (FEF) – flow specifications

					Class 2 specification			Class 1 specification		
Size		Q_4	Q_3	$Q_{(0.25\%)}$	Q_2	Q_1	R	Q_2	Q_1	R
mm	in.	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)		m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	
250	10	2000 (8806)	1600 (7045)	160 (704)	8.1 (35.66)	5.1 (22.45)	315	13 (57.24)	8 (35.22)	200
300	12	3125 (13760)	2500 (11007)	250 (1100)	12.7 (55.92)	7.9 (34.78)	315	20 (88.06)	12.5 (55.04)	200
350	14	5000 (22014)	4000 (17610)	400 (1761)	20.3 (89.38)	12.7 (55.92)	315	32 (140.9)	20 (88.06)	200
375	15	5000 (22014)	4000 (17610)	400 (1761)	20.3 (89.38)	12.7 (55.92)	315	32 (140.9)	20 (88.06)	200
400	16	5000 (22014)	4000 (17610)	400 (1761)	20.3 (89.38)	12.7 (55.92)	315	32 (140.9)	20 (88.06)	200
450	18	7875 (34670)	6300 (27740)	630 (2774)	32 (140.9)	20 (88.06)	315	50 (220.1)	32 (140.9)	200
500	20	7875 (34670)	6300 (27740)	630 (2774)	32 (140.9)	20 (88.06)	315	50 (220.1)	32 (140.9)	200
600	24	12500 (55030)	10000 (44030)	1000 (4400)	51 (224.5)	32 (140.9)	315	80 (220.1)	50 (220.1)	200

* OIML R49 version available to Class 1 and Class 2

AC-powered optimized full-bore meters (FEV) – flow specifications

					Class 2 specification			Class 1 specification			NMI M10 Class 2.5	
Size		Q_4	Q_3	$Q_{(0.25\%)}$	Q_2	Q_1	R	Q_2	Q_1	R	Q_1	R
mm	in.	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)		m^3 / h (Ugal / min)	m^3 / h (Ugal / min)		m^3 / h (Ugal / min)	
40	1½	50 (220)	40 (176)	4 (17.61)	0.2 (0.88)	0.13 (0.57)	315	0.32 (1.41)	0.20 (0.88)	200	0.16 (0.70)	250
50	2	79 (348)	63 (277)	6.3 (27.74)	0.32 (1.41)	0.20 (0.88)	315	0.50 (2.20)	0.32 (1.41)	200	0.25 (1.10)	250
65	2½	125 (550)	100 (440)	10 (44)	0.50 (2.20)	0.32 (1.41)	315	0.80 (3.52)	0.50 (2.20)	200		
80	3	200 (880)	160 (704)	16 (70.45)	0.81 (3.57)	0.51 (2.25)	315	1.30 (5.72)	0.80 (3.52)	200	0.6 (2.64)	250
100	4	313 (1378)	250 (1100)	25 (110)	1.30 (5.72)	0.79 (3.48)	315	2.0 (8.81)	1.25 (5.50)	200	1.0 (4.40)	250
125	5	313 (1378)	250 (1100)	25 (110)	1.30 (5.72)	0.79 (3.48)	315	2.0 (8.81)	1.25 (5.50)	200		
150	6	788 (3470)	630 (2774)	63 (277)	3.2 (14.09)	2.0 (8.81)	315	5.0 (22.01)	3.2 (14.09)	200	2.52 (11.1)	250
200	8	1250 (5504)	1000 (4403)	100 (440)	5.10 (22.45)	3.2 (14.09)	315	8.0 (35.22)	5.0 (22.01)	200	4.0 (17.61)	250

Specification – FER, FEF and FEV sensors

Wetted materials

Screw-end meters
Brass and stainless steel 316L and super-austenitic steel

Flanged meters
Electrodes – stainless steel 316L

Potable water approvals

	WRAS Listed	NSF Approved	ACS	AS / NZS 4020
FER	✔	Pending	✔ (DN40 to 600 only)	✔
FEF	✔	✔	✔	✔
FEV	✔	✔	✘	✔

Pressure limitations
As flange rating

PN25 Max Process Temp 50 °C (122 °F)

PN40 Max Process Temp 40 °C (104 °F)

OIML / MID Approved Meters 16 bar (232 psi)

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.

Environmental protection
Rating

IP68 (NEMA 6P) to 10 m (33 ft.)

Buriable (sensor only) to 5 m (16 ft.)

Temperature limitations

Ambient temperature
- Remote transmitter
  - –20 to 70 ° C (–4 to 158 °F)
- Close-coupled transmitter
  - –20 to 60 ° C (–4 to 140 °F)

Process temperature
- Non-approved
  - –6 to 70 ° C (21 to 158 °F)
- OIML R49 T50 approval
  - 0.1 to 50 ° C (32 to 122 °F)

Conductivity
>50 µS/cm

End connections

Thread-end connections (FER)
15 mm – ISO 228 G $^{3}/_{4}$ in. B $^{3}/_{4}$ in. NPSM

20 mm – ISO 228 G 1 in. B 1 in. NPSM

25 mm – ISO 228 G $1^{1}/_{4}$ in. B $1^{1}/_{4}$ in. NPSM

40 to 300 mm (1.5 to 12 in.) flanged (FER)
EN1092-1 / ISO 7005 – PN10, PN16

ANSI B16.5 Class 150

AS 2129 Tables C, D, E and F

AS 4087 PN14, PN16, PN21

JIS to BS2210, 10k

350 to 600 mm (14 to 24 in.) flanged (FER)
EN1092-1 / ISO 7005 – PN10, PN16

AS 4087 PN14, PN16, PN21

AS 2129 Tables C, D

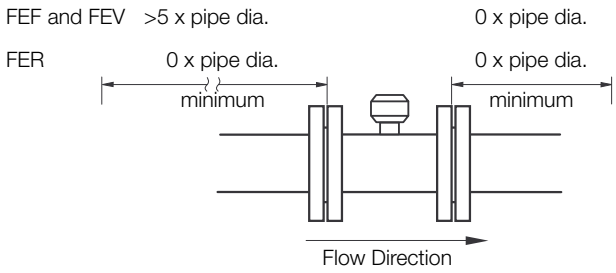
JIS to B2210 5k and 10k

25 to 300 mm (1 to 12 in.) flanged (FEF)
EN1092-1 / ISO 7005 – PN10, PN16

ANSI B16.5 Class 150

AS 4087, PN16

Pipe conditions



Pressure loss

	Flow Rate	Pressure Loss in bar (psi)
FER	Q_3	<0.63 (9.1)
	Q_3 / 2	<0.16 (2.3)
FEV	Q_3	<0.25 (3.6)
FEF	Q_3	Negligible

OIML R49 approval (FER only)

Size range and flow specification
See specification table

Accuracy class
1 and 2

Environmental class
T50 0.1 °C to 50 °C (32.18 °F to 122 °F)

Pressure loss class
< 0.63 bar

Minimum upstream pipe
0 D

Minimum downstream pipe
0 D

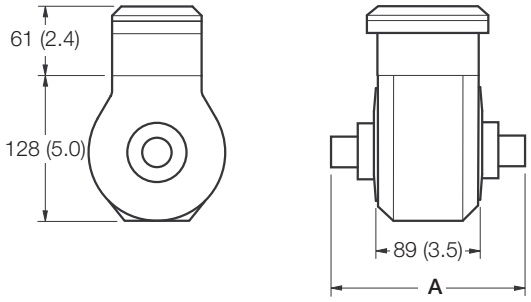
Orientation
Any

MID Approval
Approved to directive 2004/22/EC

Nominal dimensions

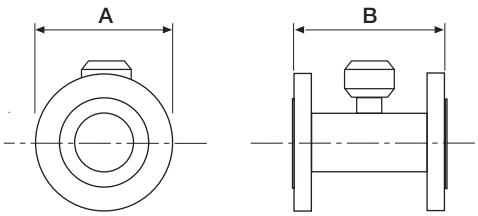
15 to 25 mm (1/2 to 1 in.) – screw ends (FER)

Dimensions in. mm (in.)



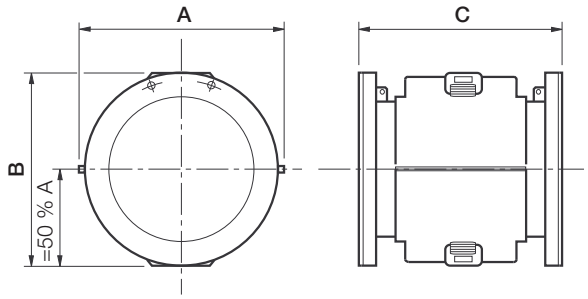
Meter Size		Dimensions mm (in.)		Approx. Weight	
mm	in.	A	Connection	kg	lb
15	1/2	119 (4.7)	G 3/4 in. B or 3/4 in. NPSM	2.5	5
20	3/4	127 (5)	G 1 in. B or 1 in. NPSM	2.5	5
25	1	127 (5)	G 1 1/4 in. B or 1 1/4 in. NPSM	2.5	5

40 to 300 mm (1 1/2 to 12 in.) – flanged (FER)



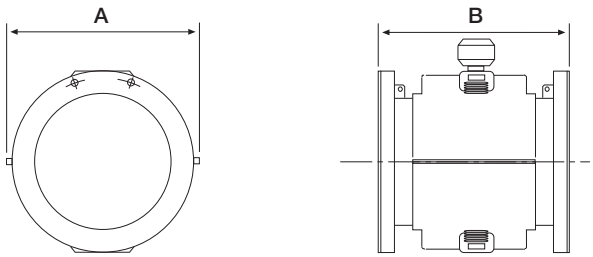
Meter Size		Dimensions mm (in.)		Approx. Weight	
mm	in.	A	B	kg	lb
40	1 1/2	150 (5.9)	200 (7.9)	11	24
50	2	165 (6.5)	200 (7.9)	12	27
65	2 1/2	219 (8.6)	200 (7.9)	13	29
80	3	200 (7.9)	200 (7.9)	18	40
100	4	220 (8.6)	250 (9.8)	25	55
125	4	220 (8.6)	250 (9.8)	25	55
150	6	285 (11.2)	300 (11.8)	31	68
200	8	340 (13.3)	350 (13.8)	48	106
250	10	405 (15.9)	450 (17.7)	75	165
300	12	460 (18.1)	500 (19.7)	112	247

350 to 600 mm (14 to 24 in.) – flanged (FER)



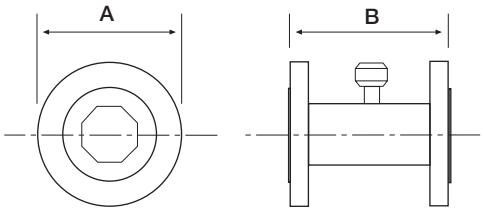
Meter Size		Dimensions mm (in.)			Approx. Weight	
mm	in.	A	B	C	kg	lb
350	14	513 (20.2)	520 (20.5)	550 (21.7)	100	220
375	15	550 (21.7)	520 (20.5)	550 (21.7)	105	231
400	16	570 (22.4)	576 (22.7)	600 (23.6)	115	253
450	18	632 (24.9)	627 (24.7)	698 (27.5)	160	352
500	20	686 (27.0)	679 (26.7)	768 (30.2)	217	455
600	24	772 (30.4)	770 (30.3)	918 (36.1)	315	693

250 to 600 mm (10 to 24 in.) – full-bore (FEF)



Meter Size		Dimensions mm (in.)		Approx. Weight	
mm	in.	A	B	kg	lb
250	10	405 (15.9)	450 (17.7)	80	176
300	12	460 (18.1)	500 (19.7)	110	242
350	14	535 (21.1)	550 (21.7)	130	286
375	15	550 (21.7)	550 (21.7)	135	297
400	16	600 (23.6)	600 (23.6)	145	319
450	18	640 (25.2)	698 (27.5)	160	352
500	20	715 (28.1)	768 (30.2)	217	455
600	24	840 (33.1)	918 (36.1)	315	693

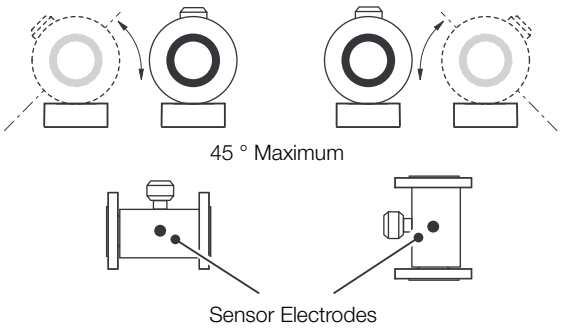
40 to 200 mm (1 1/2 to 8 in.) – optimized full-bore (FEV)



Meter Size		Dimensions mm (in)		Approx. Weight	
mm	in.	A*	B	kg	lb
40	1 1/2	150 (5.9)	200 (7.9)	11	24
50	2	165 (6.5)	200 (7.9)	12	27
65	2 1/2	185 (7.2)	200 (7.9)	14	31
80	3	200 (7.9)	200 (7.9)	15	33
100	4	230 (9.1)	250 (9.8)	18	40
125	5	250 (9.9)	250 (9.8)	21	46
150	6	280 (11.0)	300 (11.8)	31	68
200	8	345 (13.6)	350 (13.8)	48	106

*Dimensions are approximate and vary depending on flange type

Mounting



Specification – AquaMaster 3 transmitter

Mounting
Directly on sensor (close-coupled)

or

Remote up to 200 m (650 ft)

Housing
IP68 (NEMA 6P), <2 m (6 ft.)

Stainless steel housing in a thermoplastic outer cover with window, encapsulated with polyurethane-based resin.

Electrical connections
IP68 plug and socket, mains cable

Sensor cable
ABB cable supplied as standard

SWA cable available (via adaptor box) on application

Mains supply
85 to 265 V AC @ <3 VA

Connection cable: approx. 3 m (10 ft.)

Mains power failure backup time: approx. 5 days

Renewable power
Solar or wind

Input voltage: 6 to 22 V DC @ <5 W

Note. Renewable energy generators do not operate at maximum capacity, for example, low wind speed, coating of the solar panel, short daylight periods. As a consequence, some installations will require generators with a capacity greater than the specified 5 W minimum.

Max. current: 200 mA

Backup power time up to 3 weeks
(dependent on operating conditions)

External battery pack
IP68 (NEMA 6P)

Manganese alkaline battery life: 0 to 45 °C (32 to 113 °F) typically 5 years

Battery life is shorter with GSM, depending on how frequently it is used and for what period. For example, used once per day for SMS automated reporting of data logged at 15 minute intervals, the life of a battery pack would be typically reduced by 20 %.

Backup power time
Approximately 1 minute

Pulse and alarm outputs
Three, bidirectional, solid-state switches with common isolation

±35 V DC 50mA

Output 1 – forward only or forward plus reverse pulses

Output 2 – reverse pulses or direction indicator

Output 3 – alarm indicates any problem with measurement or with power

Pulse output – 50 Hz maximum, 50 % nominal duty cycle

Communications options
Serial data communications

Local Port RS232

Note. On battery and renewable energy versions frequent use of the RS232 port considerably reduces battery / standby life.

RS485 MODBUS

MODBUS RTU slave

Baud rates:

1200, 2400, 4800, 9600 or 19200

RS485:

2-wire + ground signalling
Low power shut-off mode after 10 s of inactivity

Encoder interface / scancoder / scanreader (non-logging versions only)
Function – remote reading of totalizer and serial number

- Connections
  - 2-wire for inductive pads
    (max. cable length 80 m [260 ft])
  - 3-wire for AMR
- Compatible readers
  - Severn Trent Services Smart reader
  - ABB or Elster SR100 and SR50
  - Logicon Versaprobe
  - Itron ERT
- Compatible inductive pads
  - Starpad
  - ABB

Telemetry applications (option)

GSM / SMS modem

Mounting:

Internal

Frequency bands:

Quad band: 850 / 900 / 1800 / 1900 MHz

Functions:

SMS auto report of flow and optionally, pressure logger data (typically 1 s or 1 min. average)

SMS report frequency: typically daily

SMS alarm reporting at time of event, for example power loss, limited to 1 per day

SMS flowmeter configuration

SMS flowmeter diagnosis

SMS total / tariff auto report

GSM antenna (option)

Quad band operation:

850 / 900 / 1800 / 1900 MHz

Mounting:

Integral with transmitter or remote.

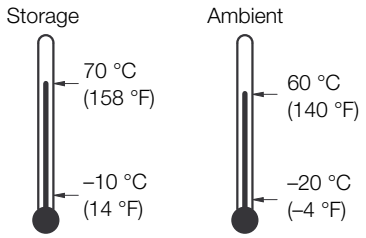
Antenna environmental:

IP66 (NEMA4) waterproof for accidental submersion

Note. The GSM does not operate with integral antenna under water.

General advice is to mount the antenna as high as possible, always outside of any metal enclosure and not under the surface of the ground.

Temperature ranges



Operation outside the ambient temperature limits of 0 to 45 °C (32 to 113 °F) reduces battery capacity and shortens battery life.

Response time (programmable)

Minimum

1 s (mains-powered)

15 s (battery-powered + external renewable energy)

Device languages

English

French

German

Spanish

Italian

Dutch

Pressure system – external transducer (option)

Pressure range

16 bar Abs.

Connection

Standard quick-fit male probe connector via an adapter cable

Operating temperature range

–20 (ambient) to 70 °C (–4 to 158 °F)

Protect the sample and transducer from freezing.

Accuracy (typical)

±0.4 % of range

Thermal error band (typically 100 °C [212 °F])

±1.5 % span

Cable length

5 or 10 m (16 or 33 ft)

Logger details (option)

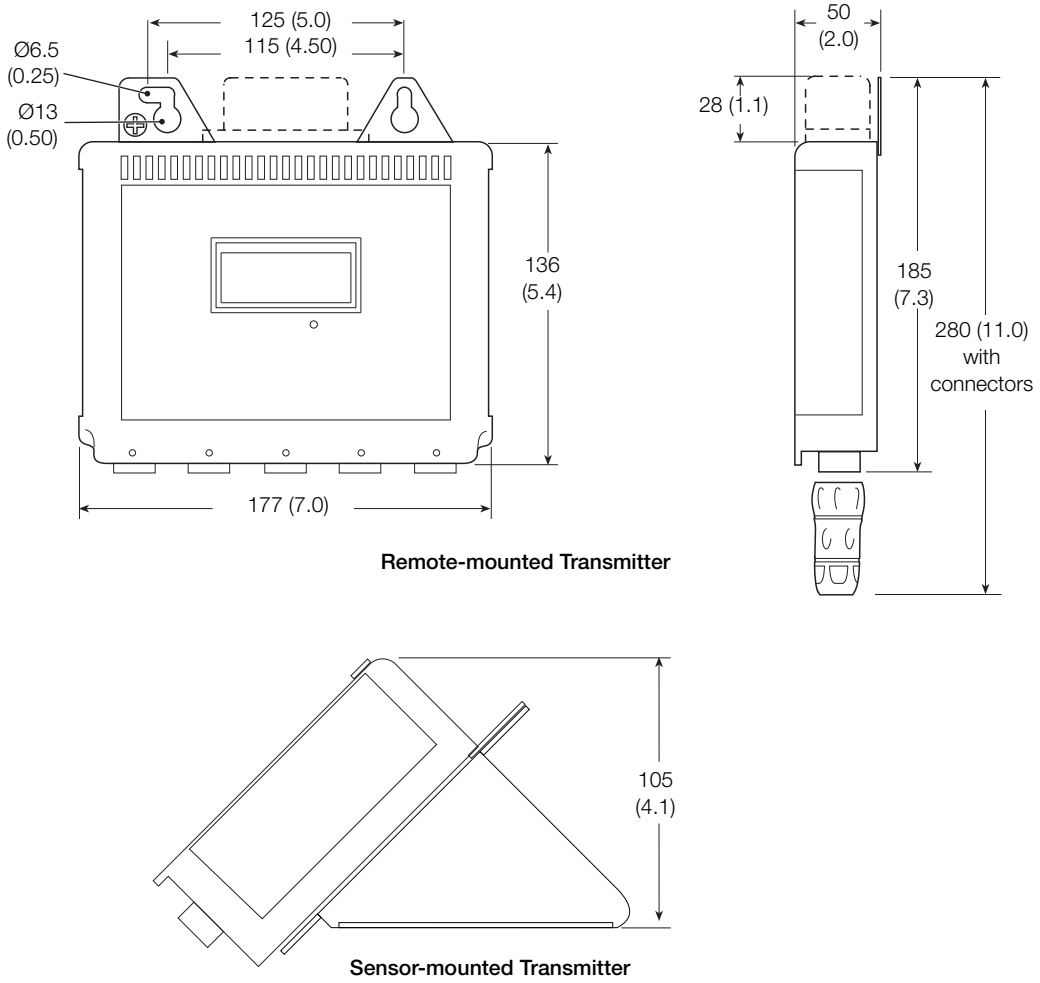
	Logger		
	1	**2**	**3**
Logger Function	**Flow & Pressure**	**Flow & Pressure**	**Forward, Reverse, Tariffs & Net Flow Totals**
No. of Records	8831	11361	732
Logging Interval	15 to 65500 s (adjustable)		24 hour (fixed)
Typical Capacity	3 months @15 min	7 days (approx.) @ 1 min	2 years

Software availability

Software	Direct RS232	SMS (Text)
ABB AC800M	✘	✔
ABB Generic (for example, LogMaster)	✔	✘
Areal (Topkapi)	✘	✔
AutoChart	✘	✔
EcoTech	✘	✔
HydroComp	✘	✔
Mobile phone text	✘	✔
OSI PI Database or Capula	✔	✘
QTech	✘	✔
Zeepaard	✘	✔
Agua Ambiente Servicios Integrales SA	✘	✔

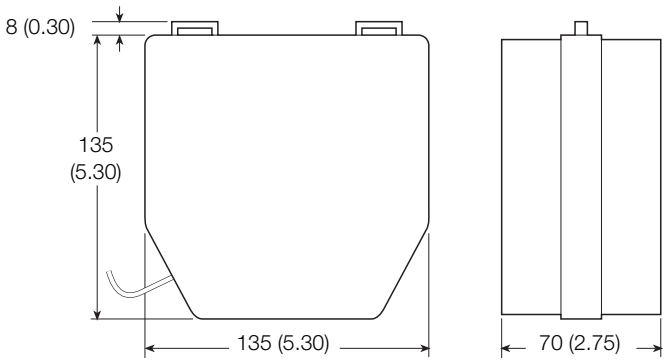
Overall dimensions

Dimensions in mm (in)



Transmitter dimensions

Dimensions in mm (in)



Battery pack dimensions

Ordering Information

AquaMaster FER reduced-bore sensor flowmeter series

Product coding field number	1,2,3,4,5,6	7,8,9	10	11	12	13	14,15	16	17	18	19	20	21	22	23	24	25	26	27	Options
AquaMaster system. Reduced-bore sensor with remote mounted transmitter	**FER221**	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X	Add as required – see page 20
AquaMaster system. Reduced-bore sensor with close coupled transmitter	**FER251**																			
AquaMaster reduced-bore sensor only, close coupled, without transmitter	**FER271**																			
AquaMaster reduced-bore sensor only, remote mount, without transmitter	**FER281**																			
Bore diameter																				
DN 15	1/2 in.	015																		
DN 20	3/4 in.	020																		
DN 25	1 in.	025																		
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 (40 … 600mm)			K																	
PPS (15 … 25mm)			R																	
Electrode design																				
Standard				1																
Measuring electrodes material																				
Stainless steel 316					S															
Super Austenitic steel (1.4529) – 40 … 600 mm					U															
Grounding accessories																				
2 x stainless steel potential 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	(80 / 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													
Male thread acc. ISO 228 / DIN 2999 (conical)	(15 … 25)						M1													
Male thread acc. NPSM (conical)	(15 … 25)						M2													
Process connection material																				
Brass	(15 … 25)							A												
Carbon steel	(40 … 600)							B												
Usage certifications																				
Standard									1											

Continued on next page…

AquaMaster FER reduced-bore sensor flowmeter series *(Continued)*

Product coding field number	1,2,3,4,5,6	7,8,9	10	11	12	13	14,15	16	17	18	19	20	21	22	23	24	25	26	27	Options
										See page 18										
Calibration type																				
Standard factory calibration										A										
High accuracy factory calibration										B										
Extended range calibration (Class 1)										N										
Extended range calibration (Class 2)										P										
Installation temperature range / ambient temperature range																				
Standard design –20 … 60 °C (–4 … 140 °F)											1									
Name plate																				
Adhesive label												A								
Signal cable length and type																				
Without signal cable													0							
5 m (16.4 ft)													1							
10 m (32.8 ft)													2							
20 m (65.6 ft)													3							
30 m (98.4 ft)													4							
50 m (164.0 ft)													5							
80 m (262.5 ft)													6							
Others													9							
Explosion protection certification																				
Without														A						
Protection class transmitter / protection class sensor																				
IP68 (NEMA 6P) / IP68 (NEMA 6P) – cable not fitted and not potted															5					
IP68 (NEMA 6P) / IP68 (NEMA 6P) – cable fitted and potted															6					
Cable conduits																				
MIL style																G				
Power supply																				
Battery powered – battery not fitted																	5			
AC + internal back-up																	7			
External renewable energy																	8			
Input and output signal type																				
MODBUS																		M		
Mobile communication																		H		
ScanReader																		S		
Without (**Note.** Pulse outputs and RS232 are always present)																		Y		
Configuration type / diagnostics type																				
Parameters set to factory defaults																			1	

Continued on next page…

AquaMaster FER reduced-bore sensor flowmeter series *(Continued)*

Product coding field number	1,2,3,4,5,6	7,8,9	10	11	12	13	14,15	16	17	18	19	20	21	22	23	24	25	26	27	Options
							See page 18								See page 19					

Options – add to order code

Transmitter related

Accessories

Configuration lead RS232	AC
Standard battery pack	AD
AC + external battery back-up connector (power supply option 7 only)	AS
Modbus cable RS485	AT

Mobile communication

Without	G0
Integral (850 / 900 / 1800 / 1900 MHz)	G3
Remote 1 m (850 / 900 / 1800 / 1900 MHz)	G6
Remote 5 m (850 / 900 / 1800 / 1900 MHz)	G7
Remote 10 m (850 / 900 / 1800 / 1900 MHz)	G8

Logger and protocol

ABB Logger – Capula / BVS	LP2
ABB Logger – Hydreka	LP5
ABB Logger – QTech	LP6
ABB Logger – Areal Topkai	LP7
ABB Logger – EcoTech	LP8
ABB Logger – Autochart I+P	LP9
ABB Logger – HydroComp	LPA
ABB Logger – ABB Generic (e.g. LogMaster)	LPB
ABB Logger – ABB AC800M System	LPC
ABB Logger – Zeepaard	LPE
ABB Logger – Agua Ambiente Servicios Integrales SA	LPF
Not Required / No Logger	LP0
Others	LPZ

Documentation language

German (pending)	M1
Italian (pending)	M2
Spanish (pending)	M3
French (pending)	M4
English	M5

Pressure span

1000 kPa / 10 bar / 145 psi	PS1
1600 kPa / 16 bar / 232 psi	PS2
2000 kPa / 20 bar / 300 psi	PS3
Without	PS0
Others	PSZ

Sensor related

Other usage certifications

Measuring Instruments Directive (MID) (40 to 300 mm)	CM1
OIML R049 calibration (40 to 300 mm)	CM2

Verfication type

Without fingerprint	V0
CalMaster	V2

Potable water and Food & Beverage approvals

WRAS	CWA
AS4020	CWE
ACS	CWF

Pressure transducer

Remote, no transducer	PT2
Remote, cable length 5 m (15 ft)	PT4
Remote, cable length 10 m (33 ft)	PT5
Remote, cable length 20 m (65 ft)	PT6
Without	PT0
Others	PTZ

AquaMaster FEF full-bore sensor flowmeter series

Product coding field number	1,2,3,4,5,6	7,8,9	10	11	12	13	14,15	16	17	18	19	20	21	22	23	24	25	26	27	Options
AquaMaster system. Full-bore sensor with remote mounted transmitter	**FEF221**	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X	Add as required – see page 23
AquaMaster system. Full-bore sensor with close coupled transmitter	**FEF251**																			
AquaMaster full-bore sensor only, close coupled, without transmitter	**FEF271**																			
AquaMaster full-bore sensor only, remote mount, without transmitter	**FEF281**																			
Bore diameter																				
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) – 250 … 600 mmm					U															
Grounding accessories																				
2 x stainless steel potential equalizing rings						4														
Process connection type																				
Flanges ANSI / ASME B16.5 / 16.47 series B Class 150	(250 … 350 / 400 … 600)						A1													
Flanges ANSI / ASME B16.5 / 16.47 series B Class 300	(250 … 350 / 400 … 600)						A3													
Flanges JIS 7.5K	(250 … 350 / 400 … 600)						J0													
Flanges JIS 10K	(250 … 350 / 400 … 600)						J1													
Flanges JIS 5K	(250 … 350 / 400 … 600)						J2													
Flanges AS 4087 PN 21	(250 … 350 / 400 … 600)						E0													
Flanges AS 4087 PN 16	(250 … 600)						E1													
Flanges AS 4087 PN 14	(250 … 600)						E2													
Flanges AS 2129 Table F	(250 … 350 / 400 … 600)						E3													
Flanges AS 2129 Table E	(250 … 350 / 400 … 600)						E4													
Flanges AS 2129 Table D	(250 … 350 / 400 … 600)						E5													
Flanges AS 2129 Table C	(250 … 600)						E6													
ISO 7005 PN 10 EN 1092-1	(250 … 350 / 400 … 600)						S1													
ISO 7005 PN 16 EN 1092-1	(250 … 350 / 400 … 600)						S2													
ISO 7005 PN 25 EN 1092-1	(250 … 350 / 400 … 600)						S3													
ISO 7005 PN 40 EN 1092-1	(250 … 350 / 400 … 600)						S4													
Process connection material																				
Carbon steel								B												
Usage certifications																				
Standard									1											

Continued on next page…

AquaMaster FEF full-bore sensor flowmeter series *(Continued)*

Product coding field number	1,2,3,4,5,6	7,8,9	10	11	12	13	14,15	16	17	18	19	20	21	22	23	24	25	26	27	Options
										See page 21										
Calibration type																				
Standard factory calibration										A										
High accuracy factory calibration										B										
Extended range calibration (Class 1)										N										
Extended range calibration (Class 2)										P										
Installation temperature range / ambient temperature range																				
Standard design –20 … 60 °C (–4 … 140 °F)											1									
Name plate																				
Adhesive label												A								
Signal cable length and type																				
Without signal cable													0							
5 m (16.4 ft)													1							
10 m (32.8 ft)													2							
20 m (65.6 ft)													3							
30 m (98.4 ft)													4							
50 m (164.0 ft)													5							
80 m (262.5 ft)													6							
Others													9							
Explosion protection certification																				
Without														A						
Protection class transmitter / protection class sensor																				
IP68 (NEMA 6P) / IP68 (NEMA 6P) – cable not fitted and not potted															5					
IP68 (NEMA 6P) / IP68 (NEMA 6P) – cable fitted and potted															6					
Cable conduits																				
MIL style																G				
Power supply																				
Battery powered – battery not fitted																	5			
AC + internal back-up																	7			
External renewable energy																	8			
Input and output signal type																				
MODBUS with RS485																		M		
Mobile communication																		H		
ScanReader																		S		
Without (**Note.** Pulse outputs and RS232 are always present)																		Y		
Configuration type / diagnostics type																				
Parameters set to factory defaults																			1	

Continued on next page…

AquaMaster FEF full-bore sensor flowmeter series *(Continued)*

Product coding field number	1,2,3,4,5,6	7,8,9	10	11	12	13	14,15	16	17	18	19	20	21	22	23	24	25	26	27	Options
							See page 21										See page 22				

Options – add to order code

Transmitter related

Accessories

Configuration lead RS232	AC
Standard battery pack	AD
AC + external battery back-up connector (power supply option 7 only)	AS
Modbus cable RS485	AT

Mobile communication

Without	G0
Integral (850 / 900 / 1800 / 1900 MHz)	G3
Remote 1 m (850 / 900 / 1800 / 1900 MHz)	G6
Remote 5 m (850 / 900 / 1800 / 1900 MHz)	G7
Remote 10 m (850 / 900 / 1800 / 1900 MHz)	G8

Logger and protocol

ABB Logger – Capula / BVS	LP2
ABB Logger – Hydreka	LP5
ABB Logger – QTech	LP6
ABB Logger – Areal Topkai	LP7
ABB Logger – EcoTech	LP8
ABB Logger – Autochart I+P	LP9
ABB Logger – HydroComp	LPA
ABB Logger – ABB Generic (e.g. LogMaster)	LPB
ABB Logger – ABB AC800M System	LPC
ABB Logger – Zeepaard	LPE
ABB Logger – Agua Ambiente Servicios Integrales SA	LPF
Not Required / No Logger	LP0
Others	LPZ

Documentation language

German (pending)	M1
Italian (pending)	M2
Spanish (pending)	M3
French (pending)	M4
English	M5

Pressure span

1000 kPa / 10 bar / 145 psi	PS1
1600 kPa / 16 bar / 232 psi	PS2
2000 kPa / 20 bar / 300 psi	PS3
Without	PS0
Others	PSZ

Sensor related

Verification type

Without fingerprint	V0
CalMaster	V2

Potable water and Food & Beverage approvals

WRAS	CWA
NSF61	CWC
AS4020	CWE
ACS	CWF

Pressure transducer

Remote, no transducer	PT2
Remote, cable length 5 m (15 ft)	PT4
Remote, cable length 10 m (33 ft)	PT5
Remote, cable length 20 m (65 ft)	PT6
Without	PT0
Others	PTZ

AquaMaster FEV optimized full-bore sensor flowmeter series

Product coding field number	1,2,3,4,5,6	7,8,9	10	11	12	13	14,15	16	17	18	19	20	21	22	23	24	25	26	27	Options
AquaMaster system. Optimized full-bore sensor with remote mounted transmitter	**FEV221**	XXX	X	X	X	X	XX	X	X	X	X	X	X	X	X	X	X	X	X	Add as required – see page 26
AquaMaster system. Optimized full-bore sensor with close coupled transmitter	**FEV251**																			
AquaMaster optimized full-bore sensor only, close coupled, without transmitter	**FEV271**																			
AquaMaster optimized full-bore sensor only, remote mount, without transmitter	**FEV281**																			
Bore diameter																				
DN 40		1½ in. 040																		
DN 50		2 in. 050																		
DN 65		2½ in. 065																		
DN 80		3 in. 080																		
DN 100		4 in. 100																		
DN 125		5 in. 125																		
DN 150		6 in. 150																		
DN 200		8 in. 200																		
Liner material																				
Polypropylene			V																	
Electrode design																				
Standard				1																
Measuring electrodes material																				
Stainless steel 316					S															
Super Austenitic steel (1.4529) – 40 … 200 mmm					U															
Grounding accessories																				
2 x stainless steel potential equalizing rings						4														
Process connection type																				
Flanges ANSI / ASME B16.5 / 16.47 series B Class 150							A1													
Flanges JIS 7.5K	(80 / 100 / 150 / 200)						J0													
Flanges JIS 10K	(40 / 50 / 80 / 100 / 150 / 200)						J1													
Flanges AS 4087 PN 21	(50 / 80 / 100 / 150 / 200)						E0													
Flanges AS 4087 PN 16	(50 / 80 / 100 / 150 / 200)						E1													
Flanges AS 4087 PN 14	(40 / 50 / 80 / 100 / 150 / 200)						E2													
Flanges AS 2129 Table F	(40 / 50 / 80 / 100 / 150 / 200)						E3													
Flanges AS 2129 Table E	(40 / 50 / 80 / 100 / 125 / 150 / 200)						E4													
Flanges AS 2129 Table D	(40 / 50 / 80 / 100 / 150 / 200)						E5													
Flanges AS 2129 Table C	(40 / 50 / 80 / 100 / 150 / 200)						E6													
ISO 7005 PN 10 EN 1092-1							S1													
ISO 7005 PN 16 EN 1092-1							S2													
ISO 7005 PN 40 EN 1092-1							S4													
Process connection material																				
Carbon steel	(40 … 600)							B												
Usage certifications																				
Standard									1											

Continued on next page…

AquaMaster FEV optimized full-bore sensor flowmeter series *(Continued)*

Product coding field number	1,2,3,4,5,6	7,8,9	10	11	12	13	14,15	16	17	18	19	20	21	22	23	24	25	26	27	Options
							See page 24													
Calibration type																				
Standard factory calibration										A										
High accuracy factory calibration										B										
Extended range calibration (Class 1)										N										
Extended range calibration (Class 2)										P										
Class 2.5										J										
Installation temperature range / ambient temperature range																				
Standard design –20 … 60 °C (–4 … 140 °F)											1									
Name plate																				
Adhesive label												A								
Signal cable length and type																				
Without signal cable													0							
5 m (16.4 ft)													1							
10 m (32.8 ft)													2							
20 m (65.6 ft)													3							
30 m (98.4 ft)													4							
50 m (164.0 ft)													5							
80 m (262.5 ft)													6							
Others													9							
Explosion protection certification																				
Without														A						
Protection class transmitter / protection class sensor																				
IP68 (NEMA 6P) / IP68 (NEMA 6P) – cable not fitted and not potted															5					
IP68 (NEMA 6P) / IP68 (NEMA 6P) – cable fitted and potted															6					
Cable conduits																				
MIL style																G				
Power supply																				
Battery powered – battery not fitted																	5			
AC + internal back-up																	7			
External renewable energy																	8			
Input and output signal type																				
MODBUS with RS485																		M		
Mobile communication																		H		
ScanReader																		S		
Without (**Note.** Pulse outputs and RS232 are always present)																		Y		
Configuration type / diagnostics type																				
Parameters set to factory defaults																			1	

Continued on next page…

AquaMaster FEV optimized full-bore sensor flowmeter series *(Continued)*

Product coding field number	1,2,3,4,5,6	7,8,9	10	11	12	13	14,15	16	17	18	19	20	21	22	23	24	25	26	27	Options
							See page 24										See page 25				

Options – add to order code

Transmitter related

Accessories

Configuration lead RS232	AC
Standard battery pack	AD
AC + external battery back-up connector (power supply option 7 only)	AS
Modbus cable RS485	AT

Mobile communication

Without	G0
Integral (850 / 900 / 1800 / 1900 MHz)	G3
Remote 1 m (850 / 900 / 1800 / 1900 MHz)	G6
Remote 5 m (850 / 900 / 1800 / 1900 MHz)	G7
Remote 10 m (850 / 900 / 1800 / 1900 MHz)	G8

Logger and protocol

ABB Logger – Capula / BVS	LP2
ABB Logger – Hydreka	LP5
ABB Logger – QTech	LP6
ABB Logger – Areal Topkai	LP7
ABB Logger – EcoTech	LP8
ABB Logger – Autochart I+P	LP9
ABB Logger – HydroComp	LPA
ABB Logger – ABB Generic (e.g. LogMaster)	LPB
ABB Logger – ABB AC800M System	LPC
ABB Logger – Zeepaard	LPE
ABB Logger – Agua Ambiente Servicios Integrales SA	LPF
Not Required / No Logger	LP0
Others	LPZ

Documentation language

German (pending)	M1
Italian (pending)	M2
Spanish (pending)	M3
French (pending)	M4
English	M5

Pressure span

1000 kPa / 10 bar / 145 psi	PS1
1600 kPa / 16 bar / 232 psi	PS2
2000 kPa / 20 bar / 300 psi	PS3
Without	PS0
Others	PSZ

Sensor related

Other usage certifications

NMI (pending) *	CM3

* not applicable to 65 or 125 mm sensors

Verification type

Without fingerprint	V0
CalMaster	V2

Potable water and Food & Beverage approvals

WRAS	CWA
NSF61	CWC
AS4020	CWE

Pressure transducer

Remote, no transducer	PT2
Remote, cable length 5 m (15 ft)	PT4
Remote, cable length 10 m (33 ft)	PT5
Remote, cable length 20 m (65 ft)	PT6
Without	PT0
Others	PTZ

AquaMaster 3 transmitter

FET2211A0Y5G	X	X	X
Power supply			
Battery	5		
AC + backup	7		
External renewable energy	8		
Input and output signal type			
Mobile radio communication		H	
MODBUS with RS485		M	
ScanReader		S	
Without		Y	
Note. Pulse outputs and RS232 are always present			
Configuration			
Standard			1

Options

Options – add to order code

Transmitter related

Accessories

Configuration lead RS232	AC
Standard battery pack	AD
AC + external battery back-up connector (power supply option 7 only)	AS
Modbus cable RS485	AT

Mobile communication

Without	G0
Integral (850 / 900 / 1800 / 1900 MHz)	G3
Remote 1 m (850 / 900 / 1800 / 1900 MHz)	G6
Remote 5 m (850 / 900 / 1800 / 1900 MHz)	G7
Remote 10 m (850 / 900 / 1800 / 1900 MHz)	G8

Logger and protocol

ABB Logger – Capula / BVS	LP2
ABB Logger – Hydreka	LP5
ABB Logger – QTech	LP6
ABB Logger – Areal Topkai	LP7
ABB Logger – EcoTech	LP8
ABB Logger – Autochart I+P	LP9
ABB Logger – HydroComp	LPA
ABB Logger – ABB Generic (e.g. LogMaster)	LPB
ABB Logger – ABB AC800M System	LPC
ABB Logger – Zeepaard	LPE
ABB Logger – Agua Ambiente Servicios Integrales SA	LPF
Not Required / No Logger	LP0
Others	LPZ

Documentation language

German (pending)	M1
Italian (pending)	M2
Spanish (pending)	M3
French (pending)	M4
English	M5

Pressure span

1000 kPa / 10 bar / 145 psi	PS1
1600 kPa / 16 bar / 232 psi	PS2
2000 kPa / 20 bar / 300 psi	PS3
Without	PS0
Others	PSZ

Sensor related

Other usage certifications

MID (Measurement Instrument Directive) – FER2, 40 … 300 mm sensors only	CM2
NMI – FEV sensor only (pending) *	CM3

* not applicable to 65 or 125 mm sensors

Pressure transducer

Remote, no transducer	PT2
Remote, cable length 5 m (15 ft)	PT4
Remote, cable length 10 m (33 ft)	PT5
Remote, cable length 20 m (65 ft)	PT6
Without	PT0
Others	PTZ

Contact us

ABB Limited
Process Automation
Oldends Lane
Stonehouse
Gloucestershire GL10 3TA
UK
Tel: +44 1453 826 661
Fax: +44 1453 829 671

ABB Inc.
Process Automation
125 E. County Line Road
Warminster
PA 18974
USA
Tel: +1 215 674 6000
Fax: +1 215 674 7183

ABB Engineering (Shanghai) Ltd.
No.5, Lane 369, Chuangye Road
201319, Shanghai, P.R. China
Tel: +86 (0) 21 61056666
Fax: +86 (0) 21 61056992
Mail: china.instrumentation@cn.abb.com

www.abb.com

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