

ABB WATERMASTER

Electromagnetic Flowmeter

Condensed product and selection datasheet



DN10-DN2400

$\pm 0.4\%$ standard

IP68 sensor

HART | DP | MODBUS

Manufacturer: ABB | Product family: WaterMaster

Technical content condensed from ABB Data Sheet DS/WM-EN Rev. AD (November 2023).

Final specification depends on selected sensor, size, flange, liner, electrode, calibration and communication options.

Product overview

Designed for water and wastewater duties, with full-bore, optimized full-bore and reduced-bore sensor options.

WaterMaster is an electromagnetic flowmeter family for conductive liquids. The modular design supports integral or remote transmitters, bidirectional flow, self-diagnostics and replaceable electronics.

Key standard capabilities

- Standard flow accuracy: $\pm 0.4\%$ of reading; optional high accuracy: $\pm 0.2\%$.
- Flow measurement in forward and reverse directions.
- Fit-and-Flow sensor data storage for automatic transmitter configuration.
- Through-the-Glass setup, Easy Setup menus and rotatable backlit display.
- NAMUR NE107 diagnostic classification and diagnostic help text.
- Three configurable digital outputs; HART standard variant, with PROFIBUS DP or MODBUS variants.



Measurement principle

A magnetic field is applied across the full pipe. Conductive liquid moving through the field generates a voltage proportional to flow velocity. Electrodes detect the voltage and the transmitter converts it to volumetric flow and totaled flow.

WaterMaster product family

Variant	Sensor design	Nominal size range	Typical selection reason
FEW	Full bore	DN10-DN2400, depending configuration	Broadest size coverage
FEV	Optimized full bore	DN40-DN200	Improved installation performance; 5D upstream / 0D downstream
FEF	Full bore	DN250-DN600	Medium and large water lines
FER	Reduced bore	DN40-DN600	High turndown and low-flow performance

Applications

- Potable water distribution and custody-transfer applications where approved.
- Raw water, wastewater, treatment plants and pumping stations.
- Irrigation, abstraction, district metering and leakage management.
- Conductive process liquids and liquids containing limited suspended solids.

Selection limits

- Minimum liquid conductivity: $> 20 \mu\text{S/cm}$.
- Pipe must remain completely full during measurement.
- Suspended solids should not exceed 6% of total process-medium volume.
- Not for gases, steam, hydrocarbons or other non-conductive fluids.

Full-bore flow performance - DN10 to DN600

Metric flow ranges in m³/h for FEV optimized full-bore and FEF/FEW full-bore meters.

How to read: Q4 is overload flow, Q3 is permanent flow, Q2 is transitional flow and Q1 is minimum flow. Q2 = 1.6 × Q1 and Q4 = 1.25 × Q3. Q0.4% and Q0.2% identify the flow above which the stated percentage accuracy applies.

DN	Q4	Q3	Std Q0.4%	Std Q2	Std Q1	High Q0.2%	High Q2	High 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	1,000	80	50

Standard calibration - Class 2

Typical performance: ±0.4% of reading or ±0.9 mm/s, whichever is greater. Around Q2, typical performance is ±0.7 mm/s.

High-accuracy calibration - Class 1

Typical performance: ±0.2% of reading or ±0.9 mm/s, whichever is greater. High accuracy is an ordering option.

* DN40-DN200 have OIML R49 Class 1 and Class 2 conformity, with OIML R49 and MID versions available.

Full-bore flow performance - DN700 to DN2400

Continuation of the FEV/FEF/FEW metric flow-performance table.

DN	Q4	Q3	Std Q0.4%	Std Q2	Std Q1	High Q0.2%	High Q2	High Q1
700	20,000	16,000	1,600	102	64	1,600	160	100
750	20,000	16,000	1,600	102	64	1,600	160	100
30 in. (750)	20,000	16,000	1,600	102	64	1,600	160	100
800	20,000	16,000	1,600	102	64	1,600	160	100
900	31,250	25,000	2,500	160	100	2,500	250	156
1000	31,250	25,000	2,500	160	100	2,500	250	156
42 in.	31,250	25,000	2,500	160	100	2,500	250	156
1100	31,250	25,000	2,500	160	100	2,500	250	156
1200	50,000	40,000	4,000	256	160	4,000	400	250
1350	78,750	63,000	6,300	403	252	6,300	630	394
1400	78,750	63,000	6,300	403	252	6,300	630	394
1500	78,750	63,000	6,300	403	252	6,300	630	394
60 in. (1500)	78,750	63,000	6,300	403	252	6,300	630	394
1600	78,750	63,000	6,300	403	252	6,300	630	394
1650	78,750	63,000	6,300	403	252	6,300	630	394
1800	125,000	100,000	10,000	640	400	10,000	1,000	625
1950	125,000	100,000	10,000	640	400	10,000	1,000	625
2000	125,000	100,000	10,000	640	400	10,000	1,000	625
2200	200,000	160,000	16,000	1,024	640	16,000	1,600	1,000
2400	200,000	160,000	16,000	1,024	640	16,000	1,600	1,000

FEV optimized full-bore with MID approval

DN	Q4	Q3	Q2	Q1	Q3/Q1
40	50	40	0.80	0.50	80
50	79	63	1.26	0.79	80
65	125	100	2.00	1.25	80
80	200	160	3.20	2.00	80
100	313	250	5.00	3.13	80
125	313	250	5.00	3.13	80
150	788	630	12.6	7.88	80
200	1,250	1,000	20.0	12.5	80

Values in m³/h. MID performance is equivalent to OIML R49:2006 Class 2 accuracy.

FER reduced-bore flow performance

Reduced-bore geometry provides a high turndown ratio and enhanced low-flow performance. Values are in m³/h.

Class 2 - standard 0.4% calibration

Size	Q4	Q3	Q0.4%	Q2	Q1	R
DN40	31	25	0.83	0.063	0.04	630
DN50	50	40	1.0	0.1	0.063	630
DN65	79	63	1.6	0.16	0.1	630
DN80	125	100	2.0	0.25	0.16	630
DN100	200	160	3.2	0.41	0.25	630
DN125	200	160	3.2	0.41	0.25	630
DN150	500	400	8.0	1.0	0.63	630
DN200	788	630	13.0	1.6	1.0	630
DN250	1,250	1,000	20	2.5	1.6	630
DN300	2,000	1,600	32	4.1	2.5	630
DN350	2,000	1,600	32	6.4	4.0	400
DN375	2,000	1,600	32	6.4	4.0	400
DN400	3,125	2,500	50	10	6.3	400
DN450	3,125	2,500	50	10	6.3	400
DN500	5,000	4,000	80	16	10	400
DN600	7,875	6,300	126	25.2	15.8	400

Class 1 - high-accuracy 0.2% calibration

Size	Q0.2%	Q2	Q1	R
DN40	1.7	0.1	0.063	400
DN50	2.0	0.16	0.1	400
DN65	3.2	0.25	0.16	400
DN80	4.0	0.4	0.25	400
DN100	6.4	0.64	0.4	400
DN125	6.4	0.64	0.4	400
DN150	16	1.6	1.0	400
DN200	25	2.5	1.6	400
DN250	40	4.0	2.5	400
DN300	64	6.4	4.0	200
DN350	64	12.8	8.0	200
DN375	64	12.8	8.0	200
DN400	100	20	12.5	200
DN450	100	20	12.5	200
DN500	160	32	20	200
DN600	252	50.4	31.5	200

$R = Q3/Q1$. $Q2 = 1.6 \times Q1$; $Q4 = 1.25 \times Q3$.

Sensor and process specifications

Common limits are shown below; liner, flange, size and approval selections can change the permitted range.

Functional specification

Parameter	Specification
Remote-transmitter ambient	-20 to 70 °C
Integral-transmitter ambient	-20 to 60 °C
OIML process range	0.1 to 50 °C, T50 approved
Conductivity	>20 µS/cm
Suspended solids	Maximum 6% of total volume
Sensor IP rating	IP68 / NEMA 6 to 7 m depth; DN10-DN32 are IP67 / NEMA 4X
Buriable sensor	FEV DN40-DN200; FER DN40-DN600; FEF DN250-DN600; FEW DN450-DN2400, to 5 m depth
Transmitter mounting	Integral (not FEF) or remote
Remote signal cable	Standard or armored; maximum 200 m
Electrical entries	20 mm glands, 1/2 in. NPT or 20 mm armored glands

Process-temperature limits

Code / liner / flange	Minimum	Maximum
FEF, FEW3 / hard rubber / carbon or stainless flange	-10 °C	80 °C
FEW1 / PTFE / carbon steel flange	-10 °C	80 °C
FEW1 / PTFE / stainless steel flange	-25 °C	80 °C
FEW3 / PTFE / carbon or stainless flange	-10 °C	80 °C
FEW3 / elastomer / carbon or stainless flange	-5 °C	80 °C
FEF, FER / elastomer / carbon steel flange	-6 °C	70 °C
FEV / polypropylene	-6 °C	70 °C

Materials of construction

Component	Available material / construction
Measuring electrodes	316L / 316Ti stainless steel; super-austenitic steel; Hastelloy C-22; Hastelloy C4; other materials on request
Liners	PTFE, elastomer, hard rubber or polypropylene, depending on model and size
Potential equalization	Minimum one potential-equalizing ring recommended
Flanges	Carbon steel, stainless steel or SG iron, depending on model and size
Meter tube	Stainless steel, DN10-DN2400
Sensor housing	Carbon steel, plastic or aluminium, depending on model and size
Terminal box	Polycarbonate or aluminium; aluminium terminal box cannot be buried
Cable glands	Plastic or brass
Finish	Zinc-based primer; coating at least 70 µm; RAL 9002 light grey

Pressure and installation

Parameter	Specification
Process pressure	As selected flange rating
OIML / MID meters	Maximum 16 bar
PN25	Maximum process temperature 50 °C
PN40	Maximum process temperature 40 °C
Full-bore pressure loss	Negligible at Q3
FEV pressure loss	<0.25 bar at Q3
FER pressure loss	<0.63 bar at Q3
Straight runs FEW / FEF	5 × DN upstream; 2 × DN downstream
Straight runs FEV	5 × DN upstream; 0 × DN downstream
Straight runs FER	0 × DN upstream; 0 × DN downstream

Potable-water approval availability depends on model, liner, size and destination. Options in the reference include WRAS, ACS, DVGW, NSF-61 and AS/NZS 4020.

Transmitter, outputs and diagnostics

Universal transmitter with local display, configuration security, digital outputs and selectable communications.

Power and I/O

Item	Specification
Mains supply	85 to 265 V AC, <7 VA
Low-voltage AC	24 V AC +10% / -30%, <7 VA
DC supply	24 V DC $\pm$ 30%, <0.4 A
Digital outputs	3 open-collector outputs, galvanically isolated; 30 V at 220 mA; maximum 5250 Hz
Output allocation	1 alarm/logic output; 2 configurable pulse/frequency or alarm/logic outputs
Current output	4-20 mA or 4-12/20 mA active; galvanically isolated; maximum loop resistance 750 Ω
HART variant	HART 5.7; NAMUR NE43 signal levels; low alarm 3.6 mA; high alarm 21.8 mA
Current-output accuracy	Additional $\pm$ 0.1% of reading; typical temperature coefficient $<\pm$ 20 ppm/ $^{\circ}$ C

Local operation

- Backlit, rotatable display with adjustable contrast and configurable lines, character size and decimal resolution.
- Through-the-Glass local configuration and smart-key navigation.
- Easy Setup workflow with entry-range checking.
- English, French, German, Italian, Spanish and Polish languages.
- Read-only switch and security sealing for MID applications.

Communication

Interface	Specification
HART	Standard FEX100 variant over current output
PROFIBUS DP	RS485; 9.6 kbps to 1.5 Mbps; DPV0 / DPV1; PA Profile 3.01
MODBUS RTU	RS485; 9.6 kbps to 115.2 kbps
Infrared service port	USB adapter accessory; supports remote HMI and parameter transfer
Remote cable	ABB WaterMaster standard or armored cable, up to 200 m

Condition monitoring

- NAMUR NE107 alarm categories: Maintenance Required, Check Function, Failure and Out of Specification.
- Electrode and coil impedance monitoring, simulation functions and multiple programmable alarms.
- Diagnostic help text on the display and replaceable electronics cartridges.
- Fit-and-Flow automatic transfer of calibration, meter size, serial number and site settings.
- Optional VeriMaster in-situ verification to within $\pm$ 1% of original factory calibration.

Environmental data and transmitter dimensions

Environmental / mechanical	Specification
Transmitter ambient	-20 to 60 $^{\circ}$ C
Humidity	0 to 100%
Transmitter enclosure	IP67 / NEMA 4X to 1 m depth
Housing	Powder-coated aluminium with glass window; RAL 9002; coating at least 70 μ m
Vibration test	7 m/s ² , 20-150 Hz, 20 sweeps in 3 orthogonal planes
Integral transmitter envelope	Approx. 202 mm wide $\times$ 200 mm high; side-depth references 98 / 118 mm
Remote transmitter envelope	Approx. 152 mm wide $\times$ 205 mm high; 179 mm vertical fixing centres; depth references 71 / 98 mm

Sensor face-to-face dimensions and weights vary by DN, flange standard, pressure class and lay-length option. Confirm the final ABB dimensional drawing before fabrication or procurement.

Installation, approvals and ordering checklist

Use this page as the final application and configuration review before requesting a quotation.

Installation essentials

- Install where the pipe remains completely full; avoid air pockets and free-discharge conditions.
- Cross-bond the sensor to upstream and downstream pipework and follow the selected grounding arrangement.
- Keep the electrode axis horizontal where possible.
- Provide pipe supports and avoid transferring excessive pipe forces, vibration or localized heat to the sensor.
- Observe the model-specific straight-run requirement: FEW/FEF 5D/2D; FEV 5D/0D; FER 0D/0D.
- Use ABB WaterMaster signal cable for remote installations; maximum specified length is 200 m.

Approvals and verification

- OIML R49:2006 Class 1 and Class 2 conformity for FEV DN40-DN200.
- MID 2014/32/EU Annex MI-001 option for FEV DN40-DN200.
- OIML Type P continuous self-checking.
- FM / FMc Class I Division 2 and ATEX / UKEX / IECEx Zone 2, 21 and 22 configurations are model-dependent.
- Nationally traceable factory calibration; certificate options depend on configuration.
- Optional VeriMaster fingerprint and in-situ verification record.

Configuration checklist

Ordering field	Required customer selection
Sensor family	FEW full bore / FEV optimized full bore / FEF full bore / FER reduced bore
Mounting	Integral / remote / sensor only / transmitter only
Nominal size	DN or inch size; confirm expected minimum, normal and maximum flow
Process connection	Flange standard, pressure class and face-to-face / lay length
Process compatibility	Liquid, conductivity, temperature, pressure, suspended solids and chemical compatibility
Wetted materials	Liner, electrode and potential-equalizing ring material
Calibration	Standard 0.4% Class 2 / optional high accuracy 0.2% Class 1 / MID where applicable
Electrical	Mains / 24 V AC / 24 V DC; cable entry and remote cable length/type
Outputs	HART + current + pulse/contact / PROFIBUS DP / MODBUS RTU
Protection / approvals	IP class, burial/submersion, potable water and hazardous-area requirements
Options	VeriMaster, configuration lead, documentation language and calibration test points

Common accessories

Common accessory	Reference item
Infrared communications pack	MJBX9932
Communications cable	WEBC2500
Standard remote signal cable	STT4500 series; 5, 10, 20, 30, 50, 80, 100, 150 or 500 m references
Armored remote signal cable	STT4501 series; 5, 10, 20, 30, 50, 80, 100, 150 or 500 m references

Important: This condensed datasheet supports initial selection and customer communication. It does not replace the manufacturer document, certified drawing, approval certificate, calibration certificate or final order code. Technical changes and configuration restrictions may apply.