

## QFlow Electromagnetic Flowmeter QMAG 1100 Series

Rugged electromagnetic flowmeter for accurate, low-maintenance measurement of conductive liquids from DN6 to DN1600.

### Certifications

Quality Lab Solutions data sheet R4



### Applications

- Water and wastewater treatment plants, including raw water, clean water and sewage flows
- Municipal water distribution networks, irrigation schemes and water conservancy projects
- Industrial utility systems such as cooling water, boiler feed and condensate return lines
- Chemical and petrochemical
- Mining, mineral processing and slurry transfer duties
- Food, beverage and sugar process streams
- Pulp and paper stock flows and recycled water circuits
- Steel, power generation and general industrial process water and wastewater monitoring

### Special Features

- Wide DN6...DN1600 line size coverage with flanged, wafer, threaded and clamp process connections
- High accuracy up to  $\pm 0.2$  % of reading with stable low-flow performance from low-frequency excitation
- Choice of abrasion- and corrosion-resistant liners and electrode materials for demanding media
- Flexible power, 4–20 mA, pulse and multi-protocol digital communications for easy integration
- Compact or remote-mounted converter with clear LCD display and IP65–IP68 environmental protection



### QMAG 1100

### Description

QFlow QMAG 1100 Electromagnetic Flowmeter is a versatile, full-bore electromagnetic meter for conductive liquids in industrial and infrastructure applications. It combines a proven measuring tube with a compact or remote converter, offering line sizes from DN6 to DN1600 and multiple flange, wafer, threaded and clamp connections. High-accuracy electronics with low-frequency excitation deliver stable measurement down to low velocities, while an optional integrated pressure input allows simultaneous flow and pressure monitoring on a single process connection. Flexible power, analogue, pulse and digital communication options simplify integration into new or existing control systems. Robust liners, electrode materials and IP65–IP68 protection enable long service life in water, wastewater, chemical and general process duties, even under demanding operating conditions.

## Specifications

| Performance Specifications   |                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measurement Principle        | Electromagnetic (Faraday's law)                                                                                                                                                                                                                                                                                                                                                                   |
| Primary Measurement          | Volumetric flow rate                                                                                                                                                                                                                                                                                                                                                                              |
| Secondary Measurement        | Flow velocity; Totalised volume; Pressure (optional integrated sensor)                                                                                                                                                                                                                                                                                                                            |
| Line Sizes                   | DN6...DN1600 flanged; wafer DN25...DN200; threaded DN10...DN50; clamp DN15...DN150                                                                                                                                                                                                                                                                                                                |
| Flow Range                   | Approx. 0.05...50 700 m <sup>3</sup> /h (0.5...7 m/s, DN6...DN1600, water at 20 °C)                                                                                                                                                                                                                                                                                                               |
| Accuracy                     | ±0.2 % of reading (DN10...DN350); ±0.5 % of reading (DN6...DN1600); typical 0.5 % o.r. + 1 mm/s                                                                                                                                                                                                                                                                                                   |
| Process & Environment        |                                                                                                                                                                                                                                                                                                                                                                                                   |
| Medium                       | Conductive liquids only; conductivity ≥5 µS/cm; full-pipe conditions required. Suitable for clean, slightly dirty and slurry media with appropriate liner and electrode selection.                                                                                                                                                                                                                |
| Pressure Rating              | Flanged EN 1092-1 PN6...PN100 (DN6...DN1600); ASME B16.5 Class 150/300/600 (DN15...DN300).                                                                                                                                                                                                                                                                                                        |
| Medium Temperature           | Approx. –20...150 °C depending on liner: NR/CR/PU up to 60 °C; PTFE up to 120 °C; F46/PFA up to 150 °C.                                                                                                                                                                                                                                                                                           |
| Ambient Temperature          | –20...60 °C                                                                                                                                                                                                                                                                                                                                                                                       |
| Storage Temperature          | –40...60 °C                                                                                                                                                                                                                                                                                                                                                                                       |
| Relative humidity            | 5...90 % RH (non-condensing)                                                                                                                                                                                                                                                                                                                                                                      |
| Pressure Loss                | Full-bore meter with negligible additional pressure loss, comparable to the adjacent straight pipe.                                                                                                                                                                                                                                                                                               |
| Mechanical/ Wetted Parts     |                                                                                                                                                                                                                                                                                                                                                                                                   |
| Process connections          | Flanged EN 1092-1 PN6...PN100; ASME B16.5 Class 150/300/600; wafer DN25...DN200; threaded DN10...DN50; clamp DN15...DN150.                                                                                                                                                                                                                                                                        |
| Wetted Parts                 | Liners: NR, CR, PU, PTFE, F46 (FEP), PFA. Electrodes and optional grounding rings: 316L stainless steel, titanium, Hastelloy B, Hastelloy C, tantalum, tungsten carbide, platinum.                                                                                                                                                                                                                |
| Housing / Ingress Protection | Sensor body in carbon steel (standard) or 304 stainless steel; aluminium converter housing; protection classes IP65, IP67 or IP68 depending on configuration.                                                                                                                                                                                                                                     |
| Installation                 | Install in permanently full pipes, avoiding high points and outlets where the pipe may run part-full. Provide at least 5×DN straight pipe upstream and 2×DN downstream (up to 10×DN after valves, expanders or other strong disturbances). Keep the electrode axis horizontal where possible and support the piping so the meter is not subjected to mechanical loads, vibration or misalignment. |
| Grounding                    | Use the meter's grounding electrodes or optional ground rings to bond the process liquid to earth. Connect sensor and converter protective earth terminals to a low-impedance plant earth so that liquid, sensor reference and converter share the same potential, following the grounding diagram to minimise noise pickup.                                                                      |
| Electrical & I/O             |                                                                                                                                                                                                                                                                                                                                                                                                   |
| Power supply                 | 100...240 V AC, 24 V DC or 12 V DC mains-powered versions; optional 3.6 V battery-powered converter with RS485 communication.                                                                                                                                                                                                                                                                     |
| Analogue Outputs             | One 4–20 mA DC output (0...full scale, 0–750 Ω load) and a configurable pulse/frequency output for flow, plus two configurable flow alarm outputs for high and low limits.                                                                                                                                                                                                                        |
| Communication                | Digital communication options include RS485 Modbus RTU, HART (with 4–20 mA, not simultaneous with RS485), Profibus-DP and optional 4G wireless transmission.                                                                                                                                                                                                                                      |
| Inputs                       | Dedicated input for a 3-wire 0.5...2.5 V pressure transmitter with 3.3 V excitation, enabling integrated pressure measurement.                                                                                                                                                                                                                                                                    |
| Display                      | Backlit dot-matrix LCD displaying totalised and instantaneous flow, flow velocity, percentage of range and diagnostic information, with local keypad configuration via structured menus.                                                                                                                                                                                                          |
| Diagnostic                   | Non-volatile EEPROM retains configuration and totals during power loss. Bidirectional measurement with separate totals for forward and reverse flow, flow alarm outputs, and status indication via display and communication.                                                                                                                                                                     |
| Approvals/Certification      |                                                                                                                                                                                                                                                                                                                                                                                                   |
| Hazardous area Approvals     | ATEX Ex d ib mb IIC T4 Gb (Option)                                                                                                                                                                                                                                                                                                                                                                |
| General Approvals            | CE/UKCA/RoHS/PED                                                                                                                                                                                                                                                                                                                                                                                  |

## Sensor Type

| Code | Sensor type                          | Notes                                               |
|------|--------------------------------------|-----------------------------------------------------|
| AS0  | Standard electromagnetic flow sensor |                                                     |
| AS1  | Sensor with integrated pressure port | Allows simultaneous flow and pressure measurement.  |
| AS2  | ATEX Explosion-proof CT4 sensor      | ATEX Ex d ib mb IIC T4 Gb rated integrated variant. |

## Line Size

| Code | DN (mm) | DN (inch) | Qmin (m³/h) | Qmax (m³/h) | Velocity range (m/s) |
|------|---------|-----------|-------------|-------------|----------------------|
| 6    | DN6     | 1/8"      | 0.0509      | 0.7125      | 0.5...7              |
| 10   | DN10    | 3/8"      | 0.1414      | 1.9792      | 0.5...7              |
| 15   | DN15    | 1/2"      | 0.3181      | 4.4532      | 0.5...7              |
| 20   | DN20    | 3/4"      | 0.5655      | 7.9168      | 0.5...7              |
| 25   | DN25    | 1"        | 0.8836      | 12.37       | 0.5...7              |
| 32   | DN32    | 1 1/4"    | 1.4476      | 20.267      | 0.5...7              |
| 40   | DN40    | 1 1/2"    | 2.2619      | 31.6673     | 0.5...7              |
| 50   | DN50    | 2"        | 3.5343      | 49.48       | 0.5...7              |
| 65   | DN65    | 2 1/2"    | 5.973       | 83.6213     | 0.5...7              |
| 80   | DN80    | 3"        | 9.0478      | 126.669     | 0.5...7              |
| 100  | DN100   | 4"        | 14.1372     | 197.9203    | 0.5...7              |
| 125  | DN125   | 5"        | 22.0893     | 309.2505    | 0.5...7              |
| 150  | DN150   | 6"        | 31.8086     | 445.3208    | 0.5...7              |
| 200  | DN200   | 8"        | 56.5487     | 791.6813    | 0.5...7              |
| 250  | DN250   | 10"       | 88.3573     | 1237.0021   | 0.5...7              |
| 300  | DN300   | 12"       | 127.2345    | 1781.283    | 0.5...7              |
| 350  | DN350   | 14"       | 173.1803    | 2424.5241   | 0.5...7              |
| 400  | DN400   | 16"       | 226.1947    | 3166.7253   | 0.5...7              |
| 450  | DN450   | 18"       | 286.2776    | 4007.8868   | 0.5...7              |
| 500  | DN500   | 20"       | 353.4292    | 4948.0083   | 0.5...7              |
| 600  | DN600   | 24"       | 508.938     | 7125.132    | 0.5...7              |
| 700  | DN700   | 28"       | 692.7212    | 9698.0964   | 0.5...7              |
| 800  | DN800   | 32"       | 904.7787    | 12666.9014  | 0.5...7              |
| 900  | DN900   | 36"       | 1145.111    | 16031.547   | 0.5...7              |
| 1000 | DN1000  | 40"       | 1413.717    | 19792.0334  | 0.5...7              |
| 1200 | DN1200  | 48"       | 2035.752    | 28500.5281  | 0.5...7              |
| 1400 | DN1400  | 56"       | 2770.885    | 38792.3854  | 0.5...7              |
| 1600 | DN1600  | 64"       | 3619.115    | 50667.6055  | 0.5...7              |

## Process connection

| Code | Connection mode          | DN range     | Notes                                                                                   |
|------|--------------------------|--------------|-----------------------------------------------------------------------------------------|
| 1    | Flanged                  | DN6...DN1600 | Standard flange connections in DIN/EN, ASME or JIS depending on pressure-rating option. |
| 2    | Threaded                 | DN10...DN50  | Thread process connection for smaller line sizes.                                       |
| 3    | Wafer                    | DN25...DN200 | Wafer-style between-flange installation.                                                |
| 4    | Clamp                    | DN15...DN150 | Clamp / sanitary connection for hygienic and food applications.                         |
| 9    | Other process connection |              | Custom mechanical connection on request.                                                |

## Pressure Rating

| Code  | Pressure rating / class | Standard                           | Notes                                    |
|-------|-------------------------|------------------------------------|------------------------------------------|
| 10    | PN100                   | DIN 2501 / EN 1092-1, DN6...DN100  | -                                        |
| 6.3   | PN63                    | DIN 2501 / EN 1092-1, DN6...DN100  | -                                        |
| 4.0   | PN40                    | DIN 2501 / EN 1092-1, DN6...DN500  | -                                        |
| 2.5   | PN25                    | DIN 2501 / EN 1092-1, DN6...DN500  | -                                        |
| 1.6   | PN16                    | DIN 2501 / EN 1092-1, DN6...DN1600 | -                                        |
| 1.0   | PN10                    | DIN 2501 / EN 1092-1, DN6...DN1600 | -                                        |
| 0.6   | PN6                     | DIN 2501 / EN 1092-1, DN6...DN1600 | -                                        |
| 150LB | Class 150               | ASME B16.5, DN15...DN300           | -                                        |
| 300LB | Class 300               | ASME B16.5, DN15...DN300           | -                                        |
| 600LB | Class 600               | ASME B16.5, DN15...DN300           | -                                        |
| 10K   | JIS 10K                 | JIS flange, DN15...DN300           | -                                        |
| 20K   | JIS 20K                 | JIS flange, DN15...DN300           | -                                        |
| 40K   | JIS 40K                 | JIS flange, DN15...DN300           | -                                        |
| 9     | Other rating on request | -                                  | Custom pressure class / flange standard. |

## Liner Material

| Code | Lining material       | Temperature range (°C) | Applicable DN | Typical media                                                                      | Notes                                                                                       |
|------|-----------------------|------------------------|---------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| 1    | PFA                   | -20...150              | DN25...DN500  | Corrosive acids, alkalis and salt solutions                                        | High-performance fluoropolymer lining; good chemical resistance and temperature capability. |
| 2    | Natural rubber (NR)   | -10...60               | DN25...DN1600 | Domestic water, industrial water, neutral sewage                                   | General-purpose elastic lining; good for low-concentration alkali and salt solutions.       |
| 3    | Neoprene (CR)         | -10...60               | DN50...DN1600 | Tap water, domestic sewage                                                         | Medium abrasion resistance; resistant to low-concentration alkali and salt.                 |
| 4    | Polyurethane (PU)     | -10...60               | DN25...DN500  | Pulp, mineral slurry and other abrasive slurries                                   | Excellent abrasion resistance, limited acid/alkali resistance.                              |
| 5    | PTFE (F4)             | -20...120              | DN25...DN1600 | Strong corrosive acids, alkalis and salt solutions including boiling mineral acids | Very stable chemical performance; suitable for highly aggressive media.                     |
| 6    | F46 (FEP)             | -20...150              | DN6...DN500   | Corrosive acids, alkalis and salt solutions                                        | Similar chemical resistance to PTFE with improved mechanical strength.                      |
| 9    | Other lining material |                        |               |                                                                                    | Special linings on request.                                                                 |

## Electrode Material

| Code | Electrode material   | Typical media                                                                                                      | Notes                                                                                             |
|------|----------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 0    | 316L stainless steel | Drinking water, industrial water, raw water, groundwater, urban sewage, treated neutral sewage                     | Not recommended for strong acids, alkalis or salt brines.                                         |
| 1    | Platinum (Pt)        | Most acid, alkali and salt solutions                                                                               | Not suitable for aqua regia or some ammonium salts; premium general-purpose corrosion resistance. |
| 2    | Hastelloy B (HB)     | Weak organic acids                                                                                                 | Poor resistance to strongly oxidising acids and salts.                                            |
| 3    | Tantalum (Ta)        | Hydrochloric acid up to ~40%, dilute and concentrated sulphuric acid, oxidising chlorides such as chlorine dioxide | Not suitable for strong alkalis or hydrofluoric acid.                                             |
| 4    | Titanium (Ti)        | Chloride-containing waters and salts, some alkaline solutions below ~50 % concentration                            | Not suitable for strong reducing mineral acids.                                                   |
| 5    | Hastelloy C (HC)     | Oxidising salt solutions and seawater                                                                              | Limited resistance to strong reducing acids.                                                      |
| 6    | Wolfram carbide (WC) | Neutral industrial and domestic sewage containing solids                                                           | Good wear resistance; not intended for aggressive acids or alkalis.                               |

## Grounding

| Code | Ground mode                        | DN applicability           | Notes                                                                                            |
|------|------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------|
| *    | Without grounding electrodes       | DN6...DN20                 | Pipework grounding achieved through process connection; no dedicated ground electrodes.          |
| 1    | With grounding electrodes          | Typically DN25 and above   | Pair of built-in grounding electrodes used for reference potential.                              |
| 2    | 304 stainless-steel grounding ring | As specified in order data | Grounding ring material same as measuring electrode; used where pipe is non-conductive or lined. |
| 9    | Other grounding arrangement        |                            | Special grounding configurations on request.                                                     |

## Housing and Flange Materials

| Code | Sensor material                      | Notes                                                |
|------|--------------------------------------|------------------------------------------------------|
| 0    | Carbon-steel body and flanges        | Standard sensor body and flange material.            |
| 1    | 304 stainless-steel body and flanges | For enhanced corrosion resistance of external parts. |
| 9    | Other sensor material                | Special external materials on request.               |

## Electrical Outputs

| Code | Output                      | Power supply limits                     | Load / wiring notes                                                              | Notes                                             |
|------|-----------------------------|-----------------------------------------|----------------------------------------------------------------------------------|---------------------------------------------------|
| *    | No analogue output          |                                         |                                                                                  | Analogue output segment set to no current output. |
| 0A   | 4...20 mA current output    | Requires mains or DC supply             | Load 0...750 $\Omega$                                                            |                                                   |
| 1A   | 4...20 mA + HART            | Requires mains or DC supply             | Load 0...750 $\Omega$ ; HART cannot be used together with RS485                  |                                                   |
| 9A   | Other analogue signal       |                                         |                                                                                  | Special analogue configuration.                   |
| 0D   | No digital communication    |                                         |                                                                                  | Digital output segment set to none.               |
| 1D   | RS485 (Modbus RTU)          | Usable on mains, DC or battery versions | Screened twisted pair recommended; RS485 cannot be used simultaneously with HART |                                                   |
| 2D   | Profibus-DP                 | Mains or DC supply                      | Profibus cabling and termination as per standard                                 |                                                   |
| 3D   | 4G wireless transmission    | Mains or DC supply                      |                                                                                  | Wireless telemetry option.                        |
| 9D   | Other digital communication |                                         |                                                                                  | Special protocol or interface on request.         |

## Power supply & Load

| Code | Power supply                           | Max consumption | 4–20 mA load range | Notes                                                                                                       |
|------|----------------------------------------|-----------------|--------------------|-------------------------------------------------------------------------------------------------------------|
| 0    | 100...240 V AC, 50/60 Hz               | $\leq 5$ W      | 0...750 $\Omega$   | Standard mains supply option; 4–20 mA and frequency/pulse outputs available.                                |
| 1    | 24 V DC (18...28 V)                    | $\leq 5$ W      | 0...750 $\Omega$   | External DC supply for panel/distribution applications.                                                     |
| 2    | 12 V DC                                | $\leq 5$ W      | 0...750 $\Omega$   | Low-voltage DC supply option where required.                                                                |
| 3    | 3.6 V battery supply (with RS485 only) |                 |                    | Battery-powered version; 4–20 mA and pulse / frequency outputs not available, RS485 used for communication. |
| 9    | Other customer-specific power supply   |                 |                    | Special variants on request.                                                                                |

## Other options

| Segment name                 | Code | Description                                 | Notes                                                                           |
|------------------------------|------|---------------------------------------------|---------------------------------------------------------------------------------|
| Electrode type               | 1    | Standard electrode configuration            | Represents fixed standard electrode design.                                     |
| Medium temperature class     | E    | Medium temperature $\leq 60$ °C             | Typical for water and low-temperature process duties.                           |
| Medium temperature class     | H    | Medium temperature $\leq 120$ °C            | Requires appropriate lining and process connection rating.                      |
| Transmitter Type / enclosure | 00   | Integrated transmitter, IP65                |                                                                                 |
| Transmitter Type / enclosure | 01   | Integrated transmitter, IP67                |                                                                                 |
| Transmitter Type / enclosure | 10   | Integrated transmitter, IP68 (battery only) | Submersible sensor and transmitter; typically used with battery-powered option. |
| Transmitter Type / enclosure | 11   | Remote sensor and Transmitter, IP65         | Transmitter IP65, sensor IP65.                                                  |
| Transmitter Type / enclosure | 20   | Remote sensor and Transmitter, IP68 sensor  | Transmitter IP65, sensor IP68 for buried or flooded locations.                  |
| Transmitter Type / enclosure | 90   | Other Transmitter Type / enclosure          | Special mechanical / enclosure variant.                                         |

## Accessories

| Code | Accessory                                | Notes                                                                  |
|------|------------------------------------------|------------------------------------------------------------------------|
| 0    | Without accessories                      |                                                                        |
| 1    | Carbon-steel companion flange set        | Includes matching flanges, bolts and nuts for installation.            |
| 2    | 304 stainless-steel companion flange set | Includes matching flanges, bolts and nuts in stainless steel.          |
| 4    | Pressure transmitter                     | Additional pressure transmitter for use with integrated pressure port. |
| 9    | Other accessory                          | Special accessories on request.                                        |

## Certification/Documentation

| Code | Description                                                                               |
|------|-------------------------------------------------------------------------------------------|
| CE   | CE (EMC)                                                                                  |
| UK   | UKCA                                                                                      |
| RO   | RoHS                                                                                      |
| AT   | ATEX Ex d ib mb IIC T4 Gb                                                                 |
| PED  | Pressure Equipment Directive: 2014/68/EU, Article 4(3) – SEP (Sound Engineering Practice) |

## Measurement principle

The QFlow QMAG 1100 operates according to Faraday's law of electromagnetic induction. A magnetic field is generated across the insulated measuring tube. When a conductive liquid flows through this field, a voltage is induced that is proportional to the mean flow velocity, the magnetic flux density and the internal diameter of the tube.

A set of measuring electrodes flush with the liner picks up this induced voltage. The transmitter processes the electrode signal, compensates for noise and provides a volumetric flow value. Because only the liner and electrodes are in contact with the medium and there are no moving parts, the meter is largely insensitive to changes in density, viscosity, temperature and pressure within the specified limits, provided the liquid conductivity remains above the required threshold. Bidirectional measurement is supported, allowing both forward and reverse flow to be monitored.

## Design and measuring system

The measuring system consists of a full-bore flow tube with an insulating liner, embedded excitation coils and one or more pairs of electrodes, combined with a microprocessor-based transmitter. Compact versions mount the transmitter directly on the sensor body, while remote versions use a cable connection to allow installation away from vibration, heat or flooded locations.

Nominal diameters span DN6 to DN1600 for flanged sensors, with wafer, clamp and threaded designs covering specific size ranges for smaller lines. The flow tube is typically fabricated from stainless steel with carbon-steel or stainless-steel flanges, and the transmitter housing is an aluminium die-casting with ingress protection up to IP68 for suitable configurations.

Standard, antifouling and multi-electrode configurations are available, with integrated grounding electrodes or optional ground rings depending on line size and piping material. The transmitter provides a backlit LCD for indication of instantaneous flow, totalised volume, velocity and percentage of nominal flow, together with local configuration of parameters and stored totals

## Performance characteristics

The QMAG 1100 is designed for high measuring accuracy and stable performance over a wide dynamic range. For nominal diameters between DN10 and DN350, a basic accuracy of up to  $\pm 0.2\%$  of measured value is specified, with  $\pm 0.5\%$  of measured value applied across the full DN6 to DN1600 range. The absence of moving parts and the multi-electrode arrangement support good linearity and long-term stability.

The available flow range depends on line size and velocity. The device is characterised over velocities from approximately 0.5 to 7 m/s, providing flows from around 0.05 m<sup>3</sup>/h in a DN6 sensor up to roughly 50 000 m<sup>3</sup>/h in the largest DN1600 size, as summarised by the flow-range table. An accuracy curve, shown in Figure 1, illustrates the relationship between flow velocity and deviation.

The meter offers two-way measurement with separate totalisers for forward and reverse flow. Low-frequency rectangular-wave excitation and digital processing improve zero stability and noise immunity, enabling the device to measure steady flows as well as slowly varying or pulsating conditions within the stated specification.

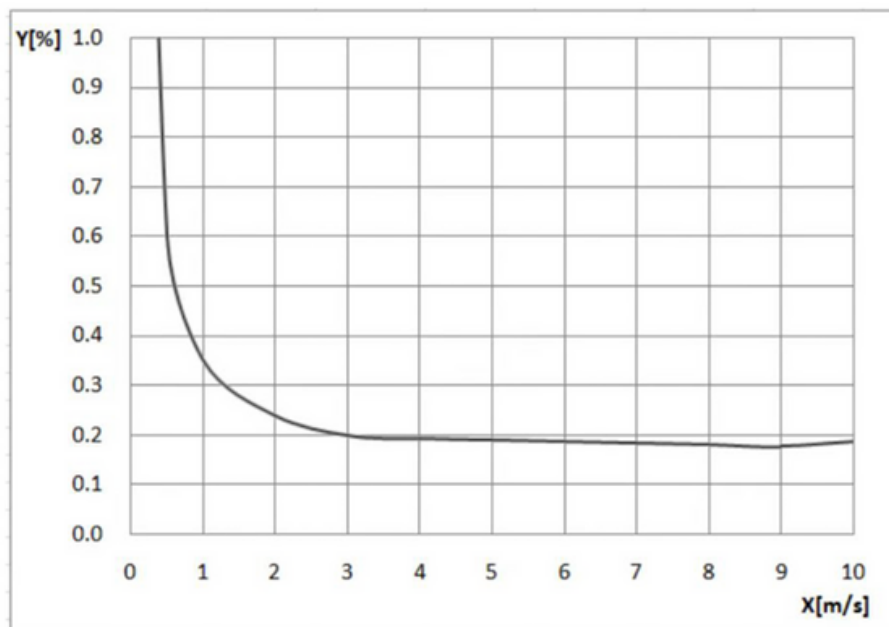


Figure 1.

## Operating and installation conditions

Correct installation is essential to achieve the specified performance. The QMAG 1100 can be supplied either as an integrated unit, with the transmitter mounted on the sensor, or as a remote transmitter version connected by a cable. In general both types provide equivalent measurement capability, but the remote transmitter is recommended where access to the display is difficult, where high ambient temperatures or strong vibration are present, and for larger diameters. When the nominal diameter is  $\geq$  DN500, a remote transmitter design is advised to ease maintenance. For buried or below-ground installations a remote configuration with IP68 protection for the sensor must be selected, and when the meter is installed at a pump outlet a separated structure is also recommended; these arrangements are illustrated in Figure 2.

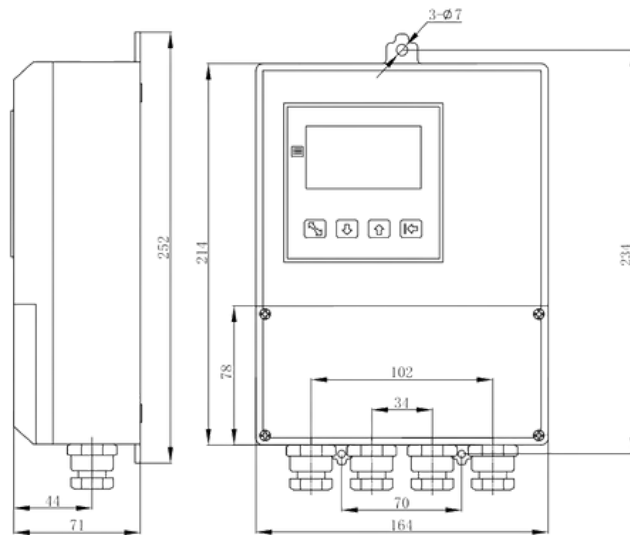


Figure 2.

The sensor must always operate with a completely filled measuring tube and should not be mounted at the highest point of a pipeline where air pockets can form. Recommended upstream and downstream straight-run lengths are given for common fittings: typically at least 5 pipe diameters upstream and 2 downstream when valves are located close to the meter, 5D after tees and 90° elbows, and 10D after expanders or partially open valves, as shown in Figures 3 to 8.

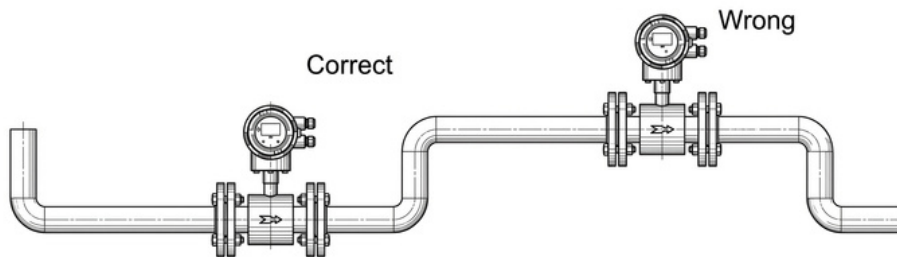


Figure 3.

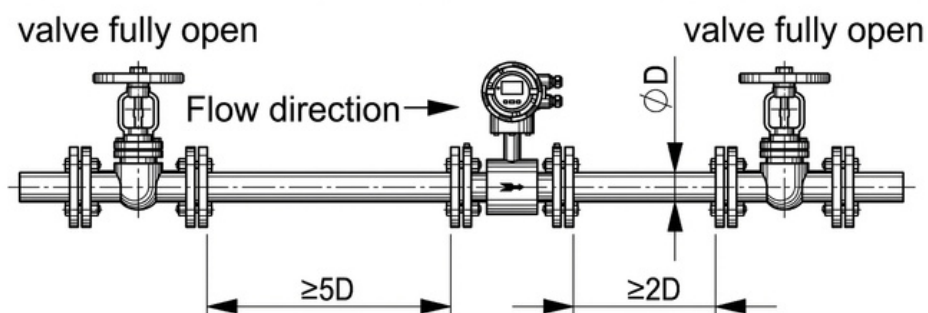


Figure 4.

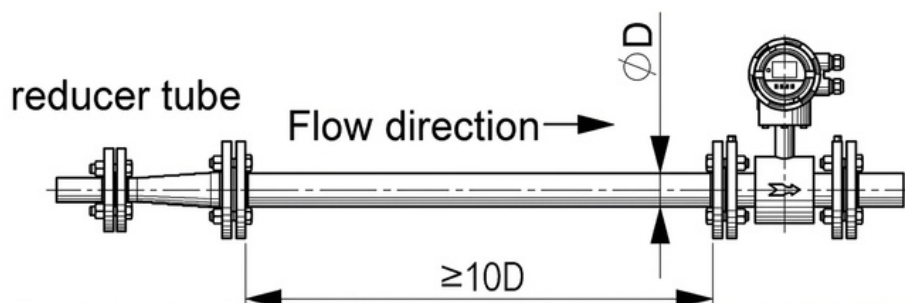


Figure 5.

90° elbow

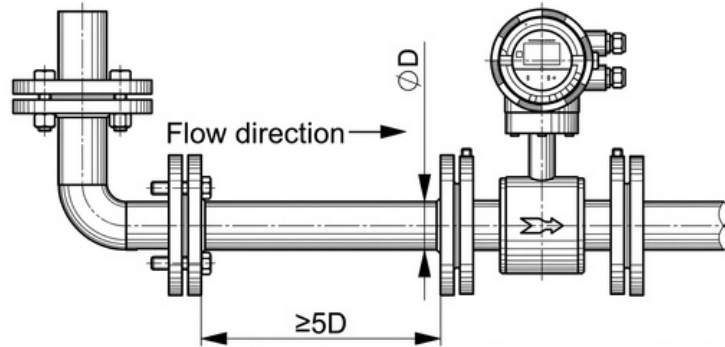


Figure 6.

T-tube

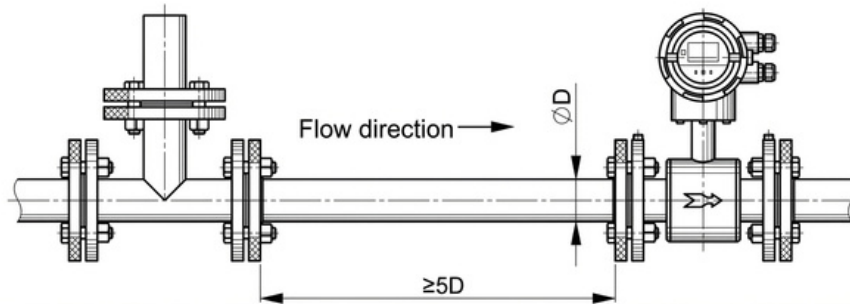


Figure 7.

valve

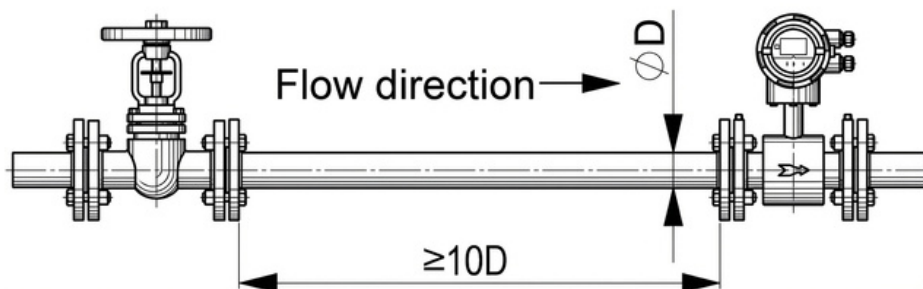


Figure 8.

The preferred mounting orientation is horizontal with the electrode axis horizontal, the pipe and meter axes aligned, and adequate external supports to prevent mechanical stress. The transmitter housing is suitable for ambient temperatures from  $-20$  to  $+60$  °C with relative humidity between 5 % and 90 %.

### Process conditions and medium limitations

- The meter is suitable only for conductive liquids; the medium conductivity must exceed  $5 \mu\text{S}/\text{cm}$ .
- Medium temperature limits are governed by the selected liner: rubber and polyurethane linings are typically rated from  $-10$  to  $60$  °C, PTFE up to  $120$  °C and F46/PFA up to  $150$  °C within their stated diameter ranges.
- The maximum working pressure of the application must always remain below the rated pressure of the chosen sensor and flange combination (DIN PN6–PN100, ASME Class 150–600 or JIS 10K–40K depending on size).
- Recommended flow velocities are  $1.5$ – $3$  m/s for clean liquids,  $3$ – $4$  m/s for media prone to crystallisation or deposition, and  $1$ – $2$  m/s for abrasive slurries in order to balance self-cleaning with lining and electrode wear.

- Actual operating flows should be selected so that minimum and maximum values fall within the velocity range defined by the flow-range table for the selected nominal diameter.
- The process design should avoid conditions leading to sustained negative pressure in the measuring tube, as this can damage the lining.

### Grounding and potential equalization

- Because the induced signal voltage is small, the sensor, transmitter and liquid must share the same reference potential; the ground terminal and grounding loop are used to tie the measuring system to plant earth while protecting the liner.
- Where the pipeline or flanges are not reliably conductive, grounding rings or dedicated ground conductors should be used to ensure the fluid is at earth potential, as indicated in the grounding arrangement shown in Figure 9.
- The protective earth terminal on the transmitter housing must be connected to a suitable protective-earth system, and signal cable shields should be earthed in accordance with the wiring diagrams.
- To minimise electromagnetic interference, the meter should not be installed close to large motors, transformers or other equipment producing strong magnetic fields.

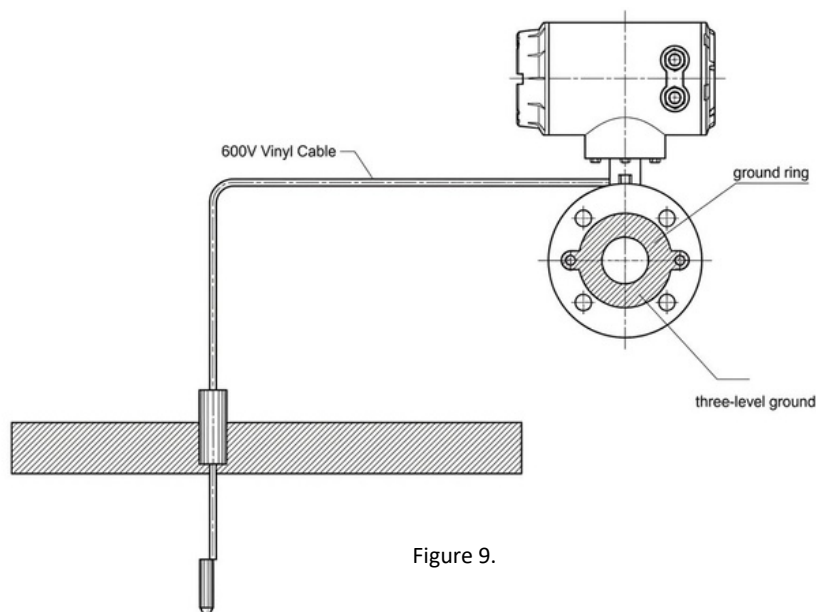


Figure 9.

### Electrical connections, outputs and communication

The QMAG 1100 offers several power-supply options, including a wide-range 100–240 V AC input, 24 V DC and 12 V DC supplies, plus a low-power battery version for remote locations. The integrated and remote transmitters share a similar terminal concept, with dedicated terminals for power, analogue and pulse outputs, alarm contacts, communication lines, excitation coils and optional pressure-transmitter connections. Typical terminal assignments and layouts are shown in the wiring diagrams in Figures 10 and 11 and detailed in the terminal definition tables.

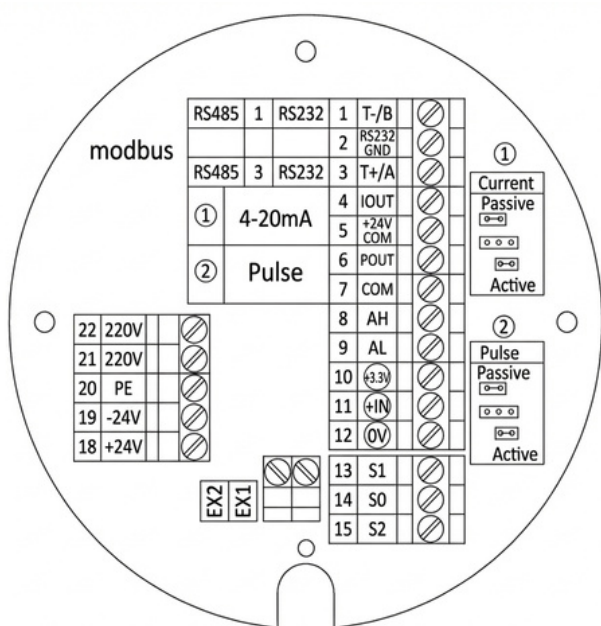


Figure 10. (Integrated Transmitter)

| Terminal Symbol    |             | Function                                                                                   |
|--------------------|-------------|--------------------------------------------------------------------------------------------|
| 1                  | T-/B        | RS485/RS232 communication output                                                           |
| 2                  | RS232 GND   | RS232 grounding wire                                                                       |
| 3                  | T+/A        | RS485/RS232 communication input                                                            |
| 4                  | IOUT        | 4mA~20mA DC output;                                                                        |
| 5                  | +24V DC COM | 4mA~20mA DC output grounding wire;                                                         |
| 6                  | POUT        | Pulse/frequency output                                                                     |
| 7                  | COM         | Pulse/frequency output grounding wire                                                      |
| 8                  | AH          | Alarm output for Upper Limit of flow                                                       |
| 9                  | AL          | Alarm output for Lower Limit of flow                                                       |
| 10                 | (4~20)      | Pressure transmitter +IN                                                                   |
| 11                 | (+IN)       | Pressure transmitter output terminal                                                       |
| 12                 | (OV)        | Pressure transmitter GND                                                                   |
| 13                 | S1          | Electrode wire                                                                             |
| 14                 | S0          | Signal grounding wire                                                                      |
| 15                 | S2          | Electrode wire                                                                             |
| 18                 | +24V        | 24V DC (12V DC) power supply access                                                        |
| 19                 | -24V        | 24V DC (12V DC) power supply access                                                        |
| 20                 | PE          | Power grounding wire                                                                       |
| 21                 | 220V        | 220V AC power supply access                                                                |
| 22                 | 220V        | 220V AC power supply access                                                                |
|                    | EX1         | Exciting current+                                                                          |
|                    | EX2         | Exciting current-                                                                          |
| Short Circuit lugs | Passive     | When lugs are connected to Passive, the current ① or pulse ② will output an active signal. |
| Short Circuit lugs | Active      | When lugs are connected to Active, the current ① or pulse ② will output a passive signal.  |

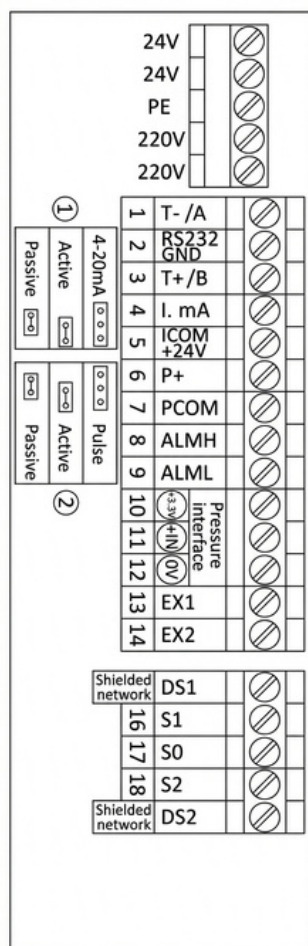


Figure 11. (Integrated Transmitter)

| Terminal Symbol    |             | Function                                                                                   |
|--------------------|-------------|--------------------------------------------------------------------------------------------|
| 1                  | T-/B        | RS485/RS232 communication output                                                           |
| 2                  | RS232 GND   | RS232 grounding wire                                                                       |
| 3                  | T+/A        | RS485/RS232 communication input                                                            |
| 4                  | IOUT        | 4mA~20mA DC output;                                                                        |
| 5                  | +24V DC COM | 4mA~20mA DC output grounding wire;                                                         |
| 6                  | POUT        | Pulse/frequency output                                                                     |
| 7                  | COM         | Pulse/frequency output grounding wire                                                      |
| 8                  | AH          | Alarm output for Upper Limit of flow                                                       |
| 9                  | AL          | Alarm output for Lower Limit of flow                                                       |
| 10                 | (4~20)      | Pressure transmitter +IN                                                                   |
| 11                 | (+IN)       | Pressure transmitter output terminal                                                       |
| 12                 | (0V)        | Pressure transmitter GND                                                                   |
| 13                 | S1          | Electrode wire                                                                             |
| 14                 | S0          | Signal grounding wire                                                                      |
| 15                 | S2          | Electrode wire                                                                             |
| 18                 | +24V        | 24V DC (12V DC) power supply access                                                        |
| 19                 | -24V        | 24V DC (12V DC) power supply access                                                        |
| 20                 | PE          | Power grounding wire                                                                       |
| 21                 | 220V        | 220V AC power supply access                                                                |
| 22                 | 220V        | 220V AC power supply access                                                                |
|                    | EX1         | Exciting current+                                                                          |
|                    | EX2         | Exciting current-                                                                          |
| Short Circuit lugs | Passive     | When lugs are connected to Passive, the current ① or pulse ② will output an active signal. |
| Short Circuit lugs | Active      | When lugs are connected to Active, the current ① or pulse ② will output a passive signal.  |

Standard signal interfaces include a 4–20 mA DC analogue output with a load range up to 750  $\Omega$ , configurable pulse or frequency outputs for flow or totalising functions, and relay outputs for high- and low-flow alarms. Digital communication options comprise HART superimposed on the current output (where selected), RS485 with Modbus RTU protocol, RS232, Profibus-DP and an optional 4G wireless transmission module. Certain combinations are mutually exclusive; in particular, HART communication and RS485 cannot be used at the same time.

Standard signal interfaces include a 4–20 mA DC analogue output with a load range up to 750  $\Omega$ , configurable pulse or frequency outputs for flow or totalising functions, and relay outputs for high- and low-flow alarms. Digital communication options comprise HART superimposed on the current output (where selected), RS485 with Modbus RTU protocol, RS232, Profibus-DP and an optional 4G wireless transmission module. Certain combinations are mutually exclusive; in particular, HART communication and RS485 cannot be used at the same time.

### **Diagnostics and verification functions**

The EM600E provides basic diagnostic and monitoring capabilities to support reliable operation. High- and low-flow alarm outputs can be configured so that external systems are notified when the measured flow rises above or falls below user-defined limits. Configuration parameters and cumulative totals are stored in non-volatile memory, meaning that key settings are retained even if the power supply is interrupted.

Combined with the clear local indication on the backlit display and the available communication interfaces, these functions provide straightforward status feedback without the need for complex additional diagnostic packages.

### **EMC**

The QMAG 1100 electromagnetic flowmeter is manufactured and tested in line with recognised flowmeter and electromagnetic-compatibility standards. The measuring principle and performance follow dedicated electromagnetic flowmeter and verification regulations, while mechanical interfaces are based on steel pipe flange standards.

Electromagnetic compatibility has been evaluated using a series of immunity tests covering electrostatic discharge, radiated radio-frequency fields, fast transients, surge voltages and power-frequency magnetic fields. Enclosure tightness is qualified against protection-class standards up to IP68, depending on the selected configuration. Together, these standards underpin the device's suitability for use in industrial environments where mechanical stresses, conducted and radiated interference and varying environmental conditions are present.

### **Device versions and configuration options**

The QMAG 1100 family offers a wide range of configuration options to match different process and installation requirements. Sensors can be ordered in flanged form over the full DN6–DN1600 range, with pressure ratings from PN6 to PN100 in DIN/EN standards, as well as ASME Class 150, 300 and 600 and JIS 10K, 20K and 40K for selected diameters. For smaller lines, threaded, wafer and clamp-connection versions are available in appropriate size and pressure ranges.

Two basic sensor types are provided: a standard model and a version with an integrated pressure-measurement interface, together with an explosion-protected variant for suitable hazardous-area applications. Liner materials include rubber and polyurethane for water and slurry services and fluoropolymer options for aggressive chemicals and higher temperatures, each with defined temperature and diameter limits. Electrodes can be selected from stainless steel, titanium, Hastelloy, tantalum, tungsten carbide or platinum depending on corrosion and abrasion requirements.

Converters are available in compact and separated designs with IP65, IP67 or IP68 protection, powered from AC mains, DC supplies or a battery pack. Output configurations can be tailored to include analogue, pulse, alarm and one of several digital communication interfaces. Accessories such as carbon-steel or stainless-steel companion flanges, ground rings and pressure transmitters can be specified where needed.

## Order Guide

| Segment                          | Your Code                                                                            | Options                                          |
|----------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------|
| Product family                   | QMAG 1100                                                                            | QMAG 1100                                        |
| Sensor type                      | AS0 / AS1 / AS2                                                                      | See Sensor Type                                  |
| Line size                        | 6...1600                                                                             | See Line Size                                    |
| Pressure rating / flange class   | 0.6 / 1.0 / 1.6 / 2.5 / 4.0 / 6.3 / 10 / 150LB / 300LB / 600LB / 10K / 20K / 40K / 9 | See Pressure Rating                              |
| Process connection               | 1 / 2 / 3 / 4 / 9                                                                    | See Process Connection                           |
| Medium temperature class         | E / H                                                                                | See Other Options (medium temperature class)     |
| Liner material                   | 1 / 2 / 3 / 4 / 5 / 6 / 9                                                            | See Liner Material                               |
| Electrode material               | 0 / 1 / 2 / 3 / 4 / 5 / 6                                                            | See Electrode Material                           |
| Ground mode                      | * / 1 / 2 / 9                                                                        | See Grounding                                    |
| Sensor material                  | 0 / 1 / 9                                                                            | See Sensor Material                              |
| Transmitter Type / enclosure     | 00 / 01 / 10 / 11 / 20 / 90                                                          | See Other Options (transmitter type / enclosure) |
| Analogue output                  | * / 0A / 1 A / 9A                                                                    | See Outputs (analogue rows)                      |
| Digital output                   | 0D / 1D / 2D / 3D / 9D                                                               | See Outputs (digital rows)                       |
| Power supply                     | 0 / 1 / 2 / 3 / 9                                                                    | See Power Supply                                 |
| Accessories                      | 0 / 1 / 2 / 4 / 9                                                                    | See Accessories                                  |
| Approvals / certificates / notes | UK/CE/RO/AT/PED                                                                      | See Certification/Documentation                  |

**Ordering Example** *QFlow - QMAG 1100 electromagnetic flowmeter, DN100 flanged PN16, standard electrode type with 316L electrodes, PTFE lining, medium temperature class E ( $\leq 60$  °C), stainless-steel grounding ring, integrated IP65 transmitter, 4–20 mA output with RS485 Modbus, carbon-steel sensor body with carbon-steel companion flange set, 100...240 V AC power supply, CE.*

| Product family | Sensor type | Line size | Pressure rating / class | Process connection | Medium temperature class | Liner material | Electrode material | Ground mode | Sensor material | Transmitter Type / enclosure | Analogue output | Digital output | Power supply | Accessories | Approvals / certificates / notes |
|----------------|-------------|-----------|-------------------------|--------------------|--------------------------|----------------|--------------------|-------------|-----------------|------------------------------|-----------------|----------------|--------------|-------------|----------------------------------|
| QMAG 1100      | AS1         | 100       | 1.6                     | 1                  | E                        | 5              | 0                  | 2           | 0               | 00                           | 0A              | 1D             | 0            | 1           | CE                               |

### Notes

Ensure media compatibility with wetted parts. Torque depends on gasket, mating material and lubrication.