

### DESCRIPTION

The ModMAG M-Series<sup>®</sup> M1000 Electromagnetic Flow Meter is the result of years of research and field use of electromagnetic flow meter technology. Designed, developed and manufactured under strict quality standards, the M1000 features sophisticated, processor-based signal conversion with accuracies of  $\pm 0.3$  percent.

The M1000 can be chosen for a broad spectrum of applications and the wide selection of liner and electrode materials provide maximum compatibility and minimum maintenance over a long operating period.

### OPERATION

The operating principle of the electromagnetic flow meter is based on Faraday's law of magnetic induction: The voltage induced across any conductor, as it moves at right angles through a magnetic field, is proportional to the velocity of that conductor. The voltage induced within the fluid is measured by two diametrically opposed internally mounted electrodes. The induced signal voltage is proportional to the product of the magnetic flux density, the distance between the electrodes and the average flow velocity of the fluid.

### ELECTRODES

When looking from the end of the meter into the inside bore, the two measuring electrodes are positioned at three o'clock and nine o'clock. As a conductive fluid flows through the magnetic field, a voltage is induced across the electrodes. This voltage is proportional to the average flow velocity of the fluid and is measured by the two electrodes. This induced voltage is then amplified and processed digitally by the converter to produce an accurate analog or digital signal. The signal can then be used to indicate flow rate and totalization or to communicate to remote sensors and controllers.

The M1000 Electromagnetic Flow Meter also has an "empty pipe" detection feature. This is accomplished with a third electrode positioned in the meter between twelve o'clock and one o'clock. If this electrode is not covered by fluid for a minimum of five-seconds, the meter will display an "empty pipe" condition. When the electrode again becomes covered with fluid, the error message will disappear and the meter will continue measuring.

### DETECTOR

The flow meter is a stainless steel tube lined with a non-conductive material. Outside the tube, two DC powered electromagnetic coils are positioned opposing each other. Perpendicular to these coils, two electrodes are inserted into the flow tube. Energized coils create a magnetic field across the whole diameter of the pipe. With a no moving parts, open flow tube design there is no pressure lost and practically no maintenance required



### APPLICATION

The M1000 Electromagnetic Flow Meter has been specifically designed for industrial water/wastewater, machinery plants, vehicles and batching process applications. Available in sizes 1/4...8 inch (6...200 DN) and nominal pressures up to 1450 psi (100 bar), the meter is best suited for bidirectional flow measurements of fluid  $> 5 \mu\text{S}/\text{cm}$  ( $> 20 \mu\text{S}/\text{cm}$  for demineralized water). The amplifier can be integrally mounted to the detector, or if necessary, mounted remotely. The amplifier is housed in a Type NEMA 4X (IP67) enclosure and the measuring pipes are lined with material approved for drinking water: KTW/DVGW, NSF-61, WRAS, ACS. Several process connections are available, including DIN flanges, dairy pipe connections and TriClamp<sup>®</sup>.

### FEATURES

- Accuracy  $\pm 0.3\%$
- Flow range 0.03...12 m/s
- Sizes 1/4 ... 8 in. (6...200 DN)
- LCD display
- Power supply 92...275V AC, 9...36V DC
- RS-232, RS-485 and RS-422 with Modbus<sup>®</sup> RTU
- Integrated data logger

## SPECIFICATIONS

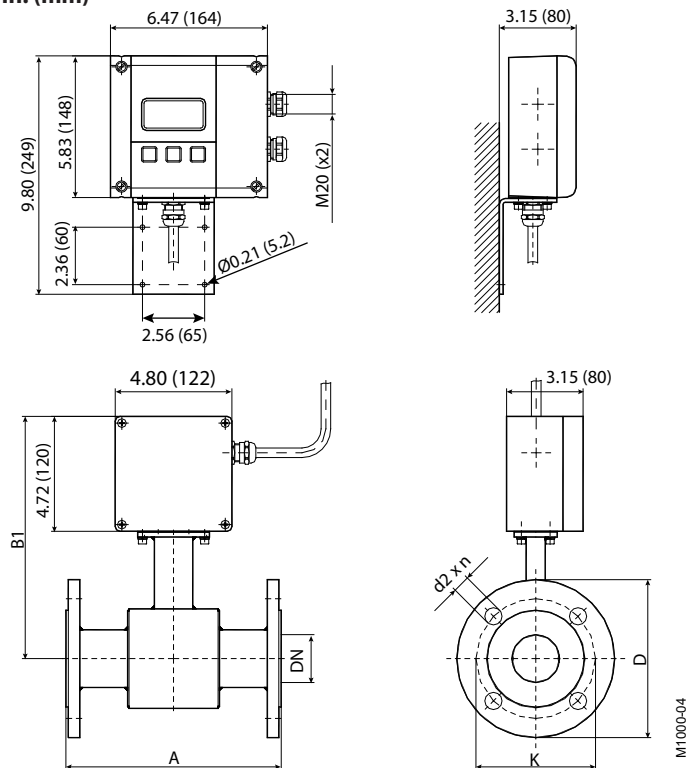
**NOTE:** DN represents nominal diameter in mm.

### Detector Type II Specifications

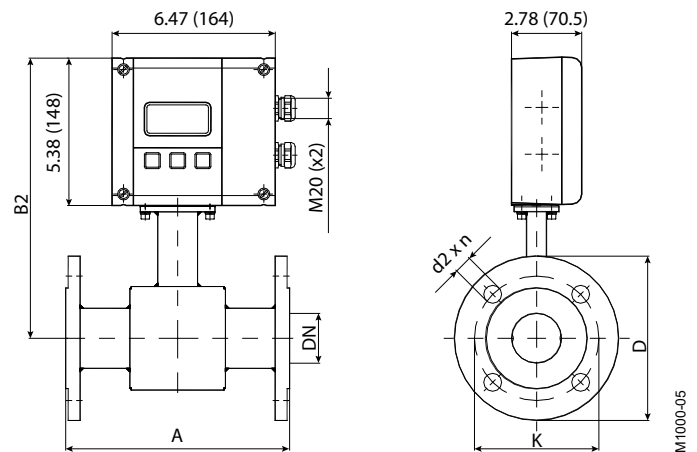
The Detector Type II is not only available in a number of different flange process connections (DIN, ANSI, JIS, AWWA) but also in a number of liners like hard rubber, soft rubber, PTFE, PFA or Halar. Available in sizes 1/4...20 inch (DN 6...500) and nominal pressures up to 1450 psi (100 bar), the Detector Type II is best suited for a variety of applications in the industry and the water/waste water industry. Lined measuring pipes with materials approved for drinking water: KTW/DVGW, NSF-61, WRAS, ACS.

|                             |  |                            |                             |
|-----------------------------|--|----------------------------|-----------------------------|
| <b>Size</b>                 | 1/4...20 in. (DN 6...500)              |                            |                             |
| <b>Process Connections</b>  | Flange: DIN, ANSI, JIS, AWWA           |                            |                             |
| <b>Nominal Pressure</b>     | Up to 1450 psi (100 bar) (PED)         |                            |                             |
| <b>Protection Class</b>     | IP 67, IP 68 optional                  |                            |                             |
| <b>Minimum Conductivity</b> | 5 µS/cm (20 µS/cm demineralized water) |                            |                             |
| <b>Liners</b>               | Hard/soft rubber                       | 1 in. (DN 25) and up       | 32...176° F (0...80° C)     |
|                             | PFA                                    | 1/4...3/8 in. (DN 6...10)  | -40...302° F (-40...150° C) |
|                             | PTFE                                   | 1/2...20 in. (DN 15...500) | -40...302° F (-40...150° C) |
| <b>Electrodes</b>           | Hastelloy C (Standard)                 | Platinum/Gold platinized   |                             |
|                             | Tantalum                               | Platinum/Rhodium           |                             |
| <b>Body</b>                 | Steel/stainless steel optional         |                            |                             |
| <b>Grounding Rings</b>      | Stainless steel                        |                            |                             |

**Process Connection Flange Remote Version**  
in. (mm)



**Process Connection Flange Mounted Version**  
in. (mm)



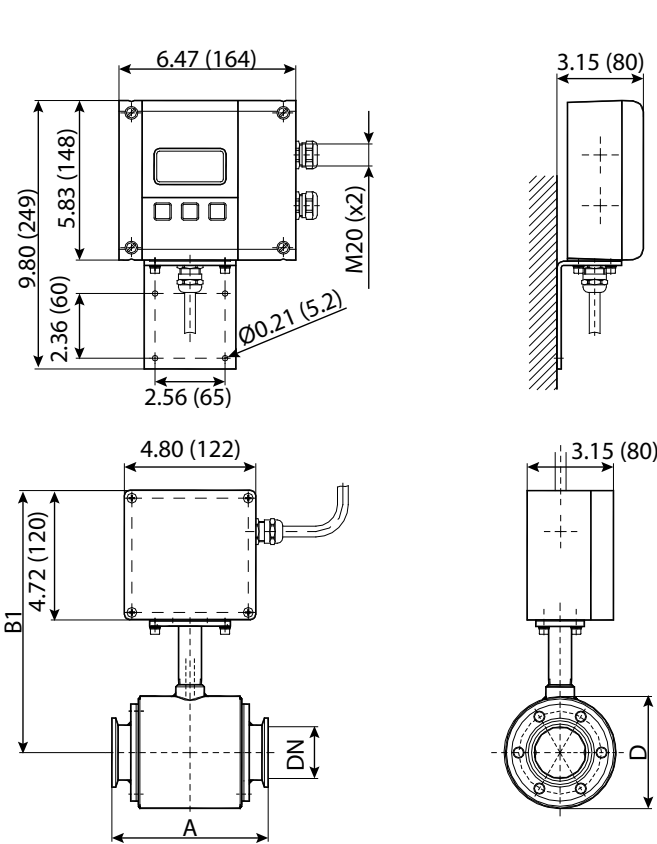
| Size         |     | A Std*<br>in. (mm)         | A ISO**<br>in. (mm) | B1<br>in. (mm) | B2<br>in. (mm) | ANSI Flanges                      |                  |                            | DIN Flanges   |               |                          | Finish Est.<br>Wt.<br>lb (kg) |
|--------------|-----|----------------------------|---------------------|----------------|----------------|-----------------------------------|------------------|----------------------------|---------------|---------------|--------------------------|-------------------------------|
| Inches       | DN  |                            |                     |                |                | D<br>in. (mm)                     | K<br>in. (mm)    | d2xn<br>in. (mm)           | D<br>in. (mm) | K<br>in. (mm) | d2xn<br>in. (mm)         |                               |
| 1/4 in.      | 6   | 6.69 (170)                 | —                   | 8.98 (228)     | 10.08 (256)    | 3.50 (88.9)                       | 2.37 (60.3)      | 0.63 × 0.16<br>(15.9 × 4)  | 3.54 (90)     | 2.37 (60)     | 0.55 × 0.16<br>(14 × 4)  | 9.04 (4.1)                    |
| 5/16 in.     | 8   | 6.69 (170)                 | —                   | 8.98 (228)     | 10.08 (256)    | 3.50 (88.9)                       | 2.37 (60.3)      | 0.63 × 0.16<br>(15.9 × 4)  | 3.54 (90)     | 2.37 (60)     | 0.55 × 0.16<br>(14 × 4)  | 9.04 (4.1)                    |
| 3/8 in.      | 10  | 6.69 (170)                 | —                   | 8.98 (228)     | 10.08 (256)    | 3.50 (88.9)                       | 2.37 (60.3)      | 0.63 × 0.16<br>(15.9 × 4)  | 3.54 (90)     | 2.37 (60)     | 0.55 × 0.16<br>(14 × 4)  | 9.04 (4.1)                    |
| 1/2 in.      | 15  | 6.69 (170)                 | 7.87 (200)          | 9.37 (238)     | 10.47 (266)    | 3.50 (88.9)                       | 2.37 (60.3)      | 0.63 × 0.16<br>(15.9 × 4)  | 3.74 (95)     | 2.56 (65)     | 0.55 × 0.16<br>(14 × 4)  | 9.04 (4.1)                    |
| 3/4 in.      | 20  | 6.69 (170)                 | 7.87 (200)          | 9.37 (238)     | 10.47 (266)    | 3.87 (98.4)                       | 2.75 (69.8)      | 0.63 × 0.16<br>(15.9 × 4)  | 4.13 (105)    | 2.95 (75)     | 0.55 × 0.16<br>(14 × 4)  | 11.24 (5.1)                   |
| 1 in.        | 25  | 8.86 (225)                 | 7.87 (200)          | 9.37 (238)     | 10.47 (266)    | 4.25 (107.9)                      | 3.13 (79.4)      | 0.63 × 0.16<br>(15.9 × 4)  | 4.53 (115)    | 3.35 (85)     | 0.55 × 0.16<br>(14 × 4)  | 16.76 (7.6)                   |
| 1-1/4 in.    | 32  | 8.86 (225)                 | 7.87 (200)          | 9.96 (253)     | 11.06 (281)    | 4.63 (117.5)                      | 3.50 (88.9)      | 0.63 × 0.16<br>(15.9 × 4)  | 5.51 (140)    | 3.94 (100)    | 0.71 × 0.16<br>(18 × 4)  | 18.96 (8.6)                   |
| 1-1/2 in.    | 40  | 8.86 (225)                 | 7.87 (200)          | 9.96 (253)     | 11.06 (281)    | 5.00 (127)                        | 3.87 (98.4)      | 0.63 × 0.16<br>(15.9 × 4)  | 5.91 (150)    | 4.33 (110)    | 0.71 × 0.16<br>(18 × 4)  | 20.06 (9.1)                   |
| 2 in.        | 50  | 8.86 (225)                 | 7.87 (200)          | 9.96 (253)     | 11.06 (281)    | 6.00 (152.4)                      | 4.75 (120.6)     | 0.75 × 0.16<br>(19 × 4)    | 6.50 (165)    | 4.92 (125)    | 0.71 × 0.16<br>(18 × 4)  | 24.47 (11.1)                  |
| 2-1/2 in.    | 65  | 11.02 (280)                | 7.87 (200)          | 10.67 (271)    | 11.77 (299)    | 7.00 (177.8)                      | 5.5 (139.7)      | 0.75 × 0.16<br>(19 × 4)    | 7.28 (185)    | 5.71 (145)    | 0.71 × 0.16<br>(18 × 4)  | 50.92 (23.1)                  |
| 3 in.        | 80  | 11.02 (280)                | 7.87 (200)          | 10.67 (271)    | 11.77 (299)    | 7.50 (190.5)                      | 6.00 (152.4)     | 0.75 × 0.16<br>(19 × 4)    | 7.87 (200)    | 6.30 (160)    | 0.71 × 0.31<br>(18 × 8)  | 53.13 (24.1)                  |
| 4 in.        | 100 | 11.02 (280)                | 9.84 (250)          | 10.94 (278)    | 12.05 (306)    | 9.00 (228.6)                      | 7.50 (190.5)     | 0.75 × 0.31<br>(19 × 8)    | 8.66 (220)    | 7.09 (180)    | 0.71 × 0.31<br>(18 × 8)  | 55.34 (25.1)                  |
| 5 in.        | 125 | 15.75 (400)                | 9.84 (250)          | 11.73 (298)    | 12.83 (326)    | 10.00 (254)                       | 8.50 (215.9)     | 0.87 × 0.31<br>(22.2 × 8)  | 9.84 (250)    | 8.27 (210)    | 0.71 × 0.31<br>(18 × 8)  | 56.44 (25.6)                  |
| 6 in.        | 150 | 15.75 (400)                | 11.81 (300)         | 12.20 (310)    | 13.31 (338)    | 11.00<br>(279.4)                  | 9.50 (241.3)     | 0.87 × 0.31<br>(22.2 × 8)  | 11.22 (285)   | 9.45 (240)    | 0.87 × 0.31<br>(22 × 8)  | 58.64 (26.6)                  |
| 8 in.        | 200 | 15.75 (400)                | 13.78 (350)         | 13.31 (338)    | 14.41 (366)    | 13.5 (342.9)                      | 11.75<br>(298.4) | 0.87 × 0.31<br>(22.2 × 8)  | 13.39 (340)   | 11.61 (295)   | 0.87 × 0.47<br>(22 × 12) | 85.10 (38.6)                  |
| 10 in.       | 250 | 19.69 (500)                | 17.72 (450)         | 14.25 (362)    | 15.35 (390)    | 16.00<br>(406.4)                  | 14.25<br>(361.9) | 1.00 × 0.47<br>(25.4 × 12) | 15.55 (395)   | 13.78 (350)   | 0.87 × 0.47<br>(22 × 12) | —                             |
| 12 in.       | 300 | 19.69 (500)                | 19.69 (500)         | 16.73 (425)    | 17.83 (453)    | 19.00<br>(482.6)                  | 17.00<br>(431.8) | 1.00 × 0.47<br>(25.4 × 12) | 17.52 (445)   | 15.75 (400)   | 0.87 × 0.47<br>(22 × 12) | —                             |
| 14 in.       | 350 | 19.69 (500)                | 21.65 (550)         | 17.72 (450)    | 18.82 (478)    | 21.00<br>(533.4)                  | 18.75<br>(476.2) | 1.13 × 0.47<br>(28.6 × 12) | 19.88 (505)   | 18.11 (460)   | 0.87 × 0.63<br>(22 × 16) | —                             |
| 16 in.       | 400 | 23.62 (600)                | 23.62 (600)         | 18.70 (475)    | 19.80 (503)    | 23.5 (596.9)                      | 21.25<br>(539.7) | 1.13 × 0.63<br>(28.6 × 16) | 22.24 (565)   | 20.28 (515)   | 1.02 × 0.63<br>(26 × 16) | —                             |
| 18 in.       | 450 | 23.62 (600)                | —                   | 19.69 (500)    | 20.79 (528)    | 25.00<br>(635.0)                  | 22.75<br>(577.8) | 1.25 × 0.63<br>(31.7 × 16) | 24.21 (615)   | 22.24 (565)   | 1.02 × 0.79<br>(26 × 20) | —                             |
| 20 in.       | 500 | 23.62 (600)                | —                   | 20.67 (525)    | 21.42 (554)    | 27.50<br>(698.5)                  | 25.00<br>(635.0) | 1.25 × 0.63<br>(31.7 × 16) | 26.38 (670)   | 24.41 (620)   | 1.02 × 0.79<br>(26 × 20) | —                             |
| Standard     |     |                            |                     |                |                |                                   |                  |                            |               |               |                          |                               |
| ANSI flanges |     | 1/4...8 in. (DN 6...200)   |                     |                |                | Nominal Pressure 145 psi (10 bar) |                  |                            |               |               |                          |                               |
| DIN flanges  |     | 1/4...8 in. (DN 6...200)   |                     |                |                | Nominal Pressure 232 psi (16 bar) |                  |                            |               |               |                          |                               |
|              |     | 10...20 in. (DN 250...500) |                     |                |                | Nominal Pressure 145 psi (10 bar) |                  |                            |               |               |                          |                               |
| * Standard   |     |                            |                     |                |                |                                   |                  |                            |               |               |                          |                               |
| **ISO 13359  |     |                            |                     |                |                |                                   |                  |                            |               |               |                          |                               |

### Detector Type Food Specifications

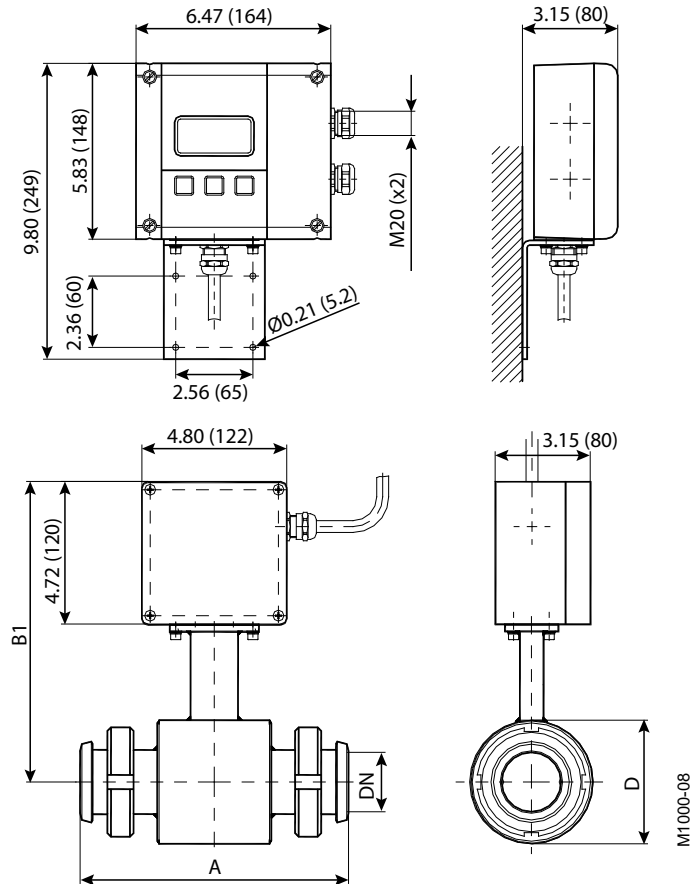
The sanitary detector was developed for the flow measurement of liquid food. This model is available with Tri-Clamp, DIN 11851, ISO2852 or BS4852 process connections or with any customer specified connections. The sanitary detector is delivered in a stainless steel housing and with PTFE lining.

|                             |   |                             |                    |
|-----------------------------|---|-----------------------------|--------------------|
| <b>Size</b>                 | 3/8...4 in. (DN 10...100)                                     |                             |                    |
| <b>Process Connections</b>  | Tri-Clamp, DIN 11851, ISO2852, BS4825 and customer specified. |                             |                    |
| <b>Nominal Pressure</b>     | Tri-Clamp connection  | 145 psi (10 bar)            |                    |
|                             | DIN 11851 connection  | 230 psi (16 bar)            |                    |
| <b>Protection Class</b>     | IP 67, IP 68 optional   |                             |                    |
| <b>Minimum Conductivity</b> | 5 µS/cm(20 µS/cm demineralized water)                         |                             |                    |
| <b>Liners</b>               | PTFE  | -40...302° F (-40...150° C) |                    |
| <b>Electrodes</b>           | Hastelloy C (Standard)  | Platinum/Gold Platinized    |                    |
|                             | Tantalum  | Platinum/Rhodium            |                    |
| <b>Body</b>                 | Stainless steel   |                             |                    |
| <b>Overall Length</b>       | Tri-Clamp connection  | 3/8...2 in. (DN 10...50)    | 5.71 in. (145 mm)  |
|                             |   | 2-1/2...4 in. (DN 65...100) | 7.87 in. (200 mm)  |
|                             | DIN 11851 connection  | 3/8...3/4 in. (DN 10...20)  | 6.69 in. (170 mm)  |
|                             |   | 1...2 in. (DN 25...50)      | 8.86 in. (225 mm)  |
|                             |   | 2-1/2...4 in. (DN 65...100) | 11.02 in. (280 mm) |

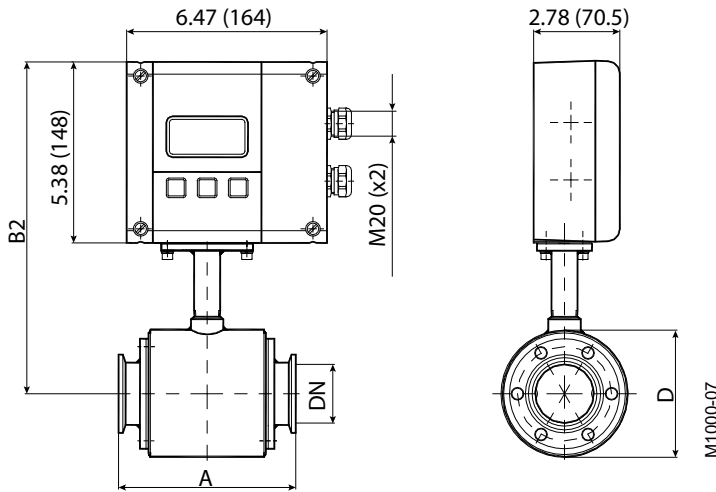
**Process Connection Tri-Clamp Remote Version**  
in. (mm)



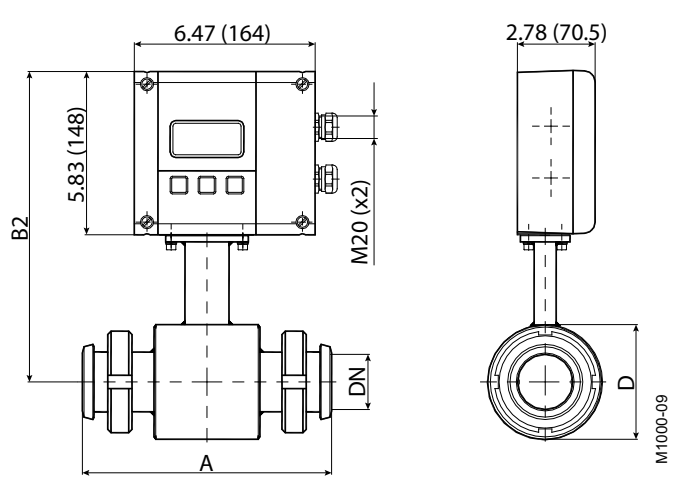
**Process Connection DIN 11851 Remote Version**  
in. (mm)



**Process Connection Tri-Clamp Mounted Version**  
in. (mm)



**Process Connection DIN 11851 Mounted Version**  
in. (mm)



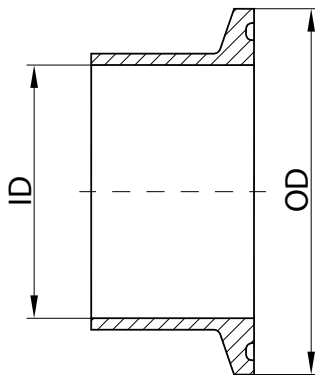
| Type Food Tri-Clamp |     |            |             |             |            |
|---------------------|-----|------------|-------------|-------------|------------|
| Size                |     | A          | B1          | B2          | D          |
| Inches              | DN  | in. (mm)   | in. (mm)    | in. (mm)    | in. (mm)   |
| 3/8 in.             | 10  | 5.71 (145) | 8.98 (228)  | 10.08 (256) | 2.91 (74)  |
| 1/2 in.             | 15  | 5.71 (145) | 8.98 (228)  | 10.08 (256) | 2.91 (74)  |
| 3/4 in.             | 20  | 5.71 (145) | 8.98 (228)  | 10.08 (256) | 2.91 (74)  |
| 1 in.               | 25  | 5.71 (145) | 8.98 (228)  | 10.08 (256) | 2.91 (74)  |
| 1-1/2 in.           | 40  | 5.71 (145) | 9.37 (238)  | 10.47 (266) | 3.70 (94)  |
| 2 in.               | 50  | 5.71 (145) | 9.57 (243)  | 10.67 (271) | 4.09 (104) |
| 2-1/2 in.           | 65  | 7.87 (200) | 10.08 (256) | 11.18 (284) | 5.08 (129) |
| 3 in.               | 80  | 7.87 (200) | 10.28 (261) | 11.38 (289) | 5.51 (140) |
| 4 in.               | 100 | 7.87 (200) | 10.59 (269) | 11.69 (297) | 6.14 (156) |

Nominal Pressure 145 psi (10 bar)

| Type Food DIN 11851 |     |             |             |             |            |
|---------------------|-----|-------------|-------------|-------------|------------|
| Size                |     | A           | B1          | B2          | D          |
| Inches              | DN  | in. (mm)    | in. (mm)    | in. (mm)    | in. (mm)   |
| 3/8 in.             | 10  | 6.69 (170)  | 9.37 (238)  | 10.47 (266) | 2.91 (74)  |
| 1/2 in.             | 15  | 6.69 (170)  | 9.37 (238)  | 10.47 (266) | 2.91 (74)  |
| 3/4 in.             | 20  | 6.69 (170)  | 9.37 (238)  | 10.47 (266) | 2.91 (74)  |
| 1 in.               | 25  | 8.86 (225)  | 9.37 (238)  | 10.47 (266) | 2.91 (74)  |
| 1-1/4 in.           | 32  | 8.86 (225)  | 9.57 (243)  | 10.67 (271) | 3.31 (84)  |
| 1-1/2 in.           | 40  | 8.86 (225)  | 9.76 (248)  | 10.87 (276) | 3.70 (94)  |
| 2 in.               | 50  | 8.86 (225)  | 9.96 (253)  | 11.06 (281) | 4.09 (104) |
| 2-1/2 in.           | 65  | 11.02 (280) | 10.47 (266) | 11.57 (294) | 5.08 (129) |
| 3 in.               | 80  | 11.02 (280) | 10.67 (271) | 11.77 (299) | 5.51 (140) |
| 4 in.               | 100 | 11.02 (280) | 10.98 (279) | 12.09 (307) | 6.14 (156) |

Nominal Pressure 232 psi (16 bar)

**Process Connection Tri-Clamp Standards BS4825/ISO2852**



| BS4825 |      |       |      |       | ISO2852 |      |       |      |       |
|--------|------|-------|------|-------|---------|------|-------|------|-------|
| Size   | OD   |       | ID   |       | Size    | OD   |       | ID   |       |
| in.    | in.  | mm    | in.  | mm    | DN      | in.  | mm    | in.  | mm    |
| —      | —    | —     | —    | —     | 10      | 1.99 | 50.5  | 0.55 | 14.0  |
| 1/2    | 0.98 | 25.0  | 0.37 | 9.4   | 15      | 1.99 | 50.5  | 0.71 | 18.1  |
| 3/4    | 0.98 | 25.0  | 0.62 | 15.75 | 20      | 1.99 | 50.5  | 0.90 | 22.9  |
| 1      | 1.99 | 50.5  | 0.87 | 22.1  | 25      | 1.99 | 50.5  | 1.13 | 28.7  |
| 1-1/2  | 1.99 | 50.5  | 1.37 | 34.8  | 32      | 2.52 | 64.0  | 1.51 | 38.4  |
| 2      | 2.52 | 64.0  | 1.87 | 47.5  | 40      | 2.52 | 64.0  | 1.74 | 44.3  |
| 2-1/2  | 3.05 | 77.5  | 2.37 | 60.2  | 50      | 3.05 | 77.5  | 2.22 | 56.3  |
| 3      | 3.58 | 91.0  | 2.87 | 72.9  | 65      | 3.58 | 91.0  | 2.84 | 72.1  |
| 3-1/2  | 4.17 | 106.0 | 3.32 | 84.3  | 80      | 4.17 | 106.0 | 3.32 | 84.3  |
| 4      | 4.69 | 119.0 | 3.83 | 97.4  | 100     | 5.12 | 130.0 | 4.32 | 109.7 |

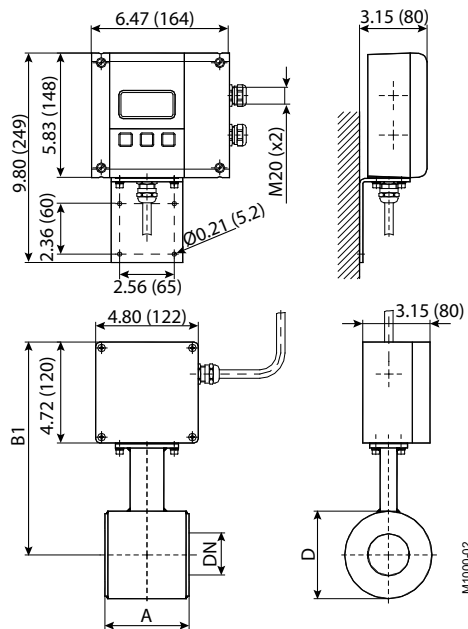
Nominal Pressure 145 psi (10 bar)

### Detector Type III Specifications

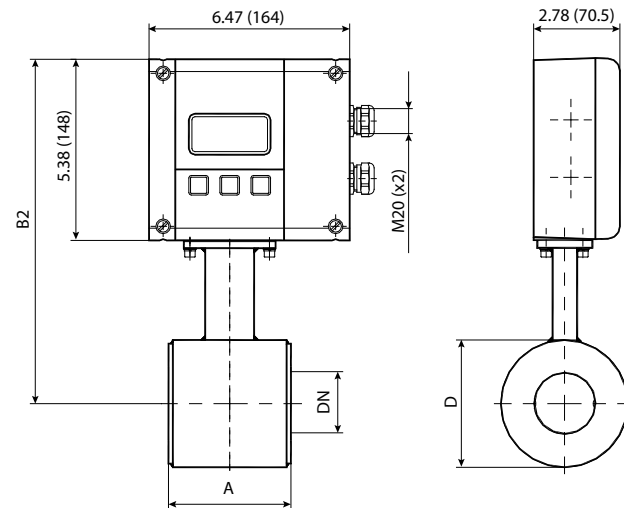
Thanks to its very short lay length, the Detector Type III is often the right alternative. Delivered with a PTFE liner, the Detector Type III has a standard nominal pressure of 580 psi (40 bar).

|                             |  |  |
|-----------------------------|--|--|
| <b>Size</b>                 | 1...4 in. (DN 25...100)                          |  |
| <b>Process Connections</b>  | Wafer connection, (intermediate flange mounting) |  |
| <b>Nominal Pressure</b>     | 580 psi (40 bar)                                 |  |
| <b>Protective Class</b>     | IP 67, IP 68 optional                            |  |
| <b>Minimum Conductivity</b> | 5 µS/cm(20 µS/cm demineralized water)            |  |
| <b>Liner</b>                | PTFE   | -40...302° F (-40...150° C)                  |
| <b>Electrodes</b>           | Hastelloy C (Standard)<br>Tantalum               | Platinum/Gold platinized<br>Platinum/Rhodium |
| <b>Body</b>                 | Steel/stainless steel optional                   |  |
| <b>Grounding Rings</b>      | Stainless steel                                  |  |
| <b>Overall Length</b>       | 1...2 in. (DN 25...50)                           | 3.94 in. (100 mm)                            |
|                             | 2-1/2...4 in. (DN 65...100)                      | 5.91 in. (150 mm)                            |

**Process Connection Wafer Remote Version**  
in. (mm)



**Process Connection Wafer Mounted Version**  
in. (mm)



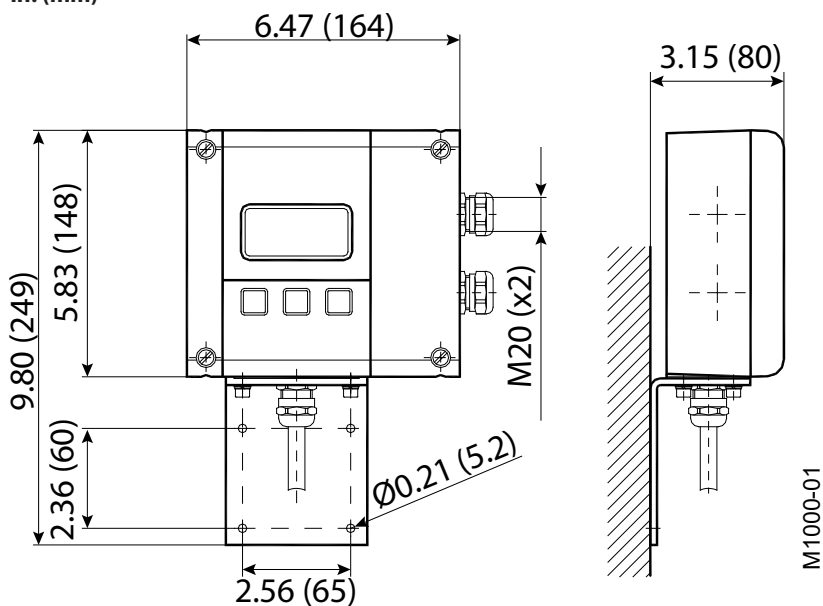
| Size      |     | A<br>in. (mm) | B1<br>in. (mm) | B2<br>in. (mm) | D<br>in. (mm) |
|-----------|-----|---------------|----------------|----------------|---------------|
| Inches    | DN  |               |                |                |               |
| 1 in.     | 25  | 3.94 (100)    | 9.37 (238)     | 10.47 (266)    | 2.91 (74)     |
| 1-1/4 in. | 32  | 3.94 (100)    | 9.57 (243)     | 10.67 (271)    | 3.31 (84)     |
| 1-1/2 in. | 40  | 3.94 (100)    | 9.76 (248)     | 10.87 (276)    | 3.70 (94)     |
| 2 in.     | 50  | 3.94 (100)    | 9.96 (253)     | 11.06 (281)    | 4.09 (104)    |
| 2-1/2 in. | 65  | 5.91 (150)    | 10.47 (266)    | 11.57 (294)    | 5.08 (129)    |
| 3 in.     | 80  | 5.91 (150)    | 10.67 (271)    | 11.77 (299)    | 5.51 (140)    |
| 4 in.     | 100 | 5.91 (150)    | 10.98 (279)    | 12.09 (307)    | 6.14 (156)    |

Nominal Pressure 580 psi (40 bar)

### Amplifier Type ModMAG M1000 Specifications

|                              |  |
|------------------------------|--|
| <b>Type</b>                  | ModMAG M1000   |
| <b>Auxiliary Power</b>       | 92...275V AC (50 / 60 Hz), 13VA optional 9...36V DC, 4 W   |
| <b>Analog Output</b>         | 0/4...20 mA, $\leq 800 \text{ Ohm}$ / 0...10 mA<br>Flow direction is displayed via separate status output                  |
| <b>Digital Outputs</b>       | 2 open collectors, passive 32V DC, 0...100 Hz 100 mA, 100...10,000 Hz 20 mA, optional active Pulse, status, error messages |
| <b>Digital Inputs</b>        | Totalizers and preselectors reset<br>Positive Zero Return  |
| <b>Frequency Output</b>      | 10 kHz   |
| <b>Empty Pipe Detection</b>  | Separate electrode for empty pipe detection / field-tunable for optimal performance  |
| <b>Configuration</b>         | 3 external buttons   |
| <b>Interfaces</b>            | RS232, RS422, RS485, ModBus RTU, Optional Ethernet ModBus TCP/IP, M-Bus or HART  |
| <b>Measuring Range</b>       | 0.10...39.37 ft/s (0.03...12 m/s)  |
| <b>Measuring Accuracy</b>    | 0.3% of reading $\pm 0.08 \text{ in./s}$ (2 mm/s)  |
| <b>Reproducibility</b>       | 0.1%   |
| <b>Flow Direction</b>        | Uni-directional and bi-directional   |
| <b>Pulse Length</b>          | Configurable up to 2000 msec   |
| <b>Outputs</b>               | Short-circuit-proof and galvanically separated   |
| <b>Low Flow Cutoff</b>       | 0...10%  |
| <b>Display</b>               | Graphical LCD 64 $\times$ 128, backlight, actual flow rate, totalizers, status display                                     |
| <b>Housing</b>               | Powder-coated aluminum die casting   |
| <b>Mounting</b>              | Detector or remote wall mount  |
| <b>Protective Class</b>      | IP 67  |
| <b>Cable Insert</b>          | Supply and signal cables 2 $\times$ M20  |
| <b>Remote Signal Cable</b>   | Up to 164 ft / 50 m  |
| <b>Coil Power</b>            | Pulsed DC  |
| <b>Altitude</b>              | 8202 ft (2500 m)   |
| <b>Ambient Temperature</b>   | -4...140° F (-20...60° C)  |
| <b>Humidity</b>              | 90% R.H. max   |
| <b>Approvals</b>             | NSF Listed: Models with hard rubber liner 4 in. size and up; PTFE liner, all sizes   |
| <b>Pollution Degree</b>      | 2  |
| <b>Installation Category</b> | II   |
| <b>Units of Measure</b>      | Gallons, ounces, MGD, liters, cubic meters, cubic feet, imperial gallon, barrel, hectoliter and acre-feet                  |

**ModMAG M1000 Amplifier**  
in. (mm)



**SIZE SELECTION**

| Size   |     | Flow Range        |                               |
|--------|-----|-------------------|-------------------------------|
| Inches | DN  | US                | Metric                        |
| 1/4    | 6   | 0.0134...5.4 GPM  | 0.051...20.4 l/min            |
| 3/10   | 8   | 0.0239...9.6 GPM  | 0.090...36.2 l/min            |
| 3/8    | 10  | 0.0373...14.9 GPM | 0.141...57 l/min              |
| 1/2    | 15  | 0.084...33.6 GPM  | 0.318...127 l/min             |
| 3/4    | 20  | 0.149...60 GPM    | 0.57...226 l/min              |
| 1      | 25  | 0.233...93 GPM    | 0.88...353 l/min              |
| 1 1/4  | 32  | 0.382...153 GPM   | 1.45...579 l/min              |
| 1 1/2  | 40  | 0.60...239 GPM    | 2.26...905 l/min              |
| 2      | 50  | 0.93...373 GPM    | 3.53...1414 l/min             |
| 2 1/2  | 65  | 1.58...631 GPM    | 0.358...143 m <sup>3</sup> /h |
| 3      | 80  | 2.39...956 GPM    | 0.54...217 m <sup>3</sup> /h  |
| 4      | 100 | 3.73...1494 GPM   | 0.85...339 m <sup>3</sup> /h  |
| 5      | 125 | 5.8...2334 GPM    | 1.33...530 m <sup>3</sup> /h  |
| 6      | 150 | 8.4...3361 GPM    | 1.91...763 m <sup>3</sup> /h  |
| 8      | 200 | 14.9...5975 GPM   | 3.39...1357 m <sup>3</sup> /h |
| 10     | 250 | 23.3...9336 GPM   | 5.3...2121 m <sup>3</sup> /h  |
| 12     | 300 | 33.6...13,444 GPM | 7.6...3054 m <sup>3</sup> /h  |
| 14     | 350 | 45.7...18,299 GPM | 10.4...4156 m <sup>3</sup> /h |
| 16     | 400 | 60...23,901 GPM   | 13.6...5429 m <sup>3</sup> /h |
| 18     | 450 | 76...30,250 GPM   | 17.2...6870 m <sup>3</sup> /h |
| 20     | 500 | 93...37,345 GPM   | 21.2...8482 m <sup>3</sup> /h |



## PART NUMBER CONSTRUCTION

If you are interested in a product configuration that is not designated for your region, please contact Badger Meter.

### Detector and Amplifier Ordering Information for North America

| M1   |                                |  |                                 |  |                        |           |                     |                        |               |                                     |                   |
|--|--------------------------------|--|---------------------------------|--|------------------------|-----------|---------------------|------------------------|---------------|-------------------------------------|-------------------|
| M1000  | Meter Type                     | Detector                               |                                 |  | Electrodes & Grounding | Amplifier | Remote Cable Length | Communications/Outputs | Wiring Method | Unit of Measure Totalizer/Flow Rate | Testing & Tagging |
|  |                                | HARD RUBBER<br>C-Steel<br>150# flanges | PTFE<br>C-Steel<br>150# flanges | PFA<br>Stainless Steel<br>150# flanges |                        |           |                     |                        |               |                                     |                   |
|  | <b>Meter Type- Standard LL</b> | <b>R1</b>                              | <b>P1</b>                       | <b>PA</b>                              |                        |           |                     |                        |               |                                     |                   |
|  | 1/4 in.                        | 002                                    | N/A                             | N/A                                    | —                      |           |                     |                        |               |                                     |                   |
|  | 5/16 in.                       | 003                                    | N/A                             | N/A                                    | —                      |           |                     |                        |               |                                     |                   |
|  | 3/8 in.                        | 004                                    | N/A                             | N/A                                    | —                      |           |                     |                        |               |                                     |                   |
|  | 1/2 in.                        | 005                                    | N/A                             | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
|  | 3/4 in.                        | 007                                    | N/A                             | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
|  | 1 in.                          | 010                                    | —                               | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
|  | 1-1/4 in.                      | 012                                    | —                               | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
|  | 1-1/2 in.                      | 015                                    | —                               | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
|  | 2 in.                          | 020                                    | —                               | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
|  | 2-1/2 in.                      | 025                                    | —                               | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
|  | 3 in.                          | 030                                    | —                               | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
|  | 4 in.                          | 040                                    | —                               | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
|  | 5 in.                          | 050                                    | —                               | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
|  | 6 in.                          | 060                                    | —                               | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
|  | 8 in.                          | 080                                    | —                               | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
|  | 10 in.                         | 100                                    | —                               | —                                      | N/A                    |           |                     |                        |               |                                     |                   |
| <b>Electrodes and Grounding</b>                  |                                |  |                                 |  |                        |           |                     |                        |               |                                     |                   |
| Alloy C with 316 Stainless Steel Grounding Rings |                                |  |                                 |  | A                      |           |                     |                        |               |                                     |                   |
| <b>Amplifier Type</b>                            |                                |  |                                 |  |                        |           |                     |                        |               |                                     |                   |
| 110/220V AC; Meter Mounted                       |                                |  |                                 |  |                        | M         |                     |                        |               |                                     |                   |
| 110/220V AC; Remote Mounted                      |                                |  |                                 |  |                        | R         |                     |                        |               |                                     |                   |
| 110/220V AC; Remote Mounted; Submersible         |                                |  |                                 |  |                        | S         |                     |                        |               |                                     |                   |
| 24V DC; Meter Mounted                            |                                |  |                                 |  |                        | E         |                     |                        |               |                                     |                   |
| 24V DC; Remote Mounted                           |                                |  |                                 |  |                        | F         |                     |                        |               |                                     |                   |
| 24V DC; Remote Mounted; Submersible              |                                |  |                                 |  |                        | G         |                     |                        |               |                                     |                   |
| <b>Remote Cable Length</b>                       |                                |  |                                 |  |                        |           |                     |                        |               |                                     |                   |
| None   |                                |  |                                 |  |                        | WW        |                     |                        |               |                                     |                   |
| 5 ft.; Standard Cable                            |                                |  |                                 |  |                        | AA        |                     |                        |               |                                     |                   |
| 10 ft.; Standard Cable                           |                                |  |                                 |  |                        | AB        |                     |                        |               |                                     |                   |
| 15 ft.; Standard Cable                           |                                |  |                                 |  |                        | AC        |                     |                        |               |                                     |                   |
| 30 ft.; Standard Cable                           |                                |  |                                 |  |                        | AF        |                     |                        |               |                                     |                   |
| 50 ft.; Standard Cable                           |                                |  |                                 |  |                        | AK        |                     |                        |               |                                     |                   |
| 75 ft.; Standard Cable                           |                                |  |                                 |  |                        | AR        |                     |                        |               |                                     |                   |
| 100 ft.; Standard Cable                          |                                |  |                                 |  |                        | BW        |                     |                        |               |                                     |                   |
| 125 ft.; Standard Cable                          |                                |  |                                 |  |                        | BE        |                     |                        |               |                                     |                   |
| 150 ft.; Standard Cable                          |                                |  |                                 |  |                        | BK        |                     |                        |               |                                     |                   |
| <b>Communications/Outputs</b>                    |                                |  |                                 |  |                        |           |                     |                        |               |                                     |                   |
| Standard Output                                  |                                |  |                                 |  |                        |           | S                   |                        |               |                                     |                   |
| <b>Wiring Method</b>                             |                                |  |                                 |  |                        |           |                     |                        |               |                                     |                   |
| None   |                                |  |                                 |  |                        |           |                     |                        | XX            |                                     |                   |
| Twist Tight - 5 ft. (MTR, ASSY)                  |                                |  |                                 |  |                        |           |                     |                        | TF            |                                     |                   |
| Twist Tight - 10 ft. (MTR, ASSY)                 |                                |  |                                 |  |                        |           |                     |                        | TH            |                                     |                   |
| Twist Tight - 25 ft. (MTR, ASSY)                 |                                |  |                                 |  |                        |           |                     |                        | TJ            |                                     |                   |
| Twist Tight - 75 ft. (MTR, ASSY)                 |                                |  |                                 |  |                        |           |                     |                        | TK            |                                     |                   |
| Nicor - 6 ft. (MTR, ASSY)                        |                                |  |                                 |  |                        |           |                     |                        | NG            |                                     |                   |
| Nicor - 25 ft. (MTR, ASSY)                       |                                |  |                                 |  |                        |           |                     |                        | NJ            |                                     |                   |
| Itron - 5 ft. (MTR, ASSY)                        |                                |  |                                 |  |                        |           |                     |                        | CF            |                                     |                   |
| Itron - 25 ft. (MTR, ASSY)                       |                                |  |                                 |  |                        |           |                     |                        | CJ            |                                     |                   |
| <b>Unit of Measure Totalizer/ Flow Rate</b>      |                                |  |                                 |  |                        |           |                     |                        |               |                                     |                   |
| Gallons/gallons per minute                       |                                |  |                                 |  |                        |           |                     |                        |               | G                                   |                   |
| Gallons/cubic feet per minute                    |                                |  |                                 |  |                        |           |                     |                        |               | B                                   |                   |
| Gallons/cubic meters per second                  |                                |  |                                 |  |                        |           |                     |                        |               | D                                   |                   |
| Cubic Meters/gallons per minute                  |                                |  |                                 |  |                        |           |                     |                        |               | C                                   |                   |
| Cubic Meters/cubic meters per second             |                                |  |                                 |  |                        |           |                     |                        |               | E                                   |                   |
| Cubic Meters/cubic meters per minute             |                                |  |                                 |  |                        |           |                     |                        |               | T                                   |                   |
| Cubic Meters/cubic meters per hour               |                                |  |                                 |  |                        |           |                     |                        |               | H                                   |                   |
| Cubic Feet/gallons per minute                    |                                |  |                                 |  |                        |           |                     |                        |               | F                                   |                   |
| Cubic Feet/cubic feet per minute                 |                                |  |                                 |  |                        |           |                     |                        |               | J                                   |                   |
| Cubic Feet/cubic meters per hour                 |                                |  |                                 |  |                        |           |                     |                        |               | K                                   |                   |
| Liters/gallons per minute                        |                                |  |                                 |  |                        |           |                     |                        |               | L                                   |                   |
| Liters/liters per second                         |                                |  |                                 |  |                        |           |                     |                        |               | N                                   |                   |
| Liters/liters per minute                         |                                |  |                                 |  |                        |           |                     |                        |               | P                                   |                   |
| Liters/liters per hour                           |                                |  |                                 |  |                        |           |                     |                        |               | Q                                   |                   |
| Million Gallons/gallons per minute               |                                |  |                                 |  |                        |           |                     |                        |               | M                                   |                   |
| Gallons/millions gallons per day                 |                                |  |                                 |  |                        |           |                     |                        |               | R                                   |                   |
| Acre Feet/gallons per minute                     |                                |  |                                 |  |                        |           |                     |                        |               | A                                   |                   |
| Second-Foot Day/cubic feet per second            |                                |  |                                 |  |                        |           |                     |                        |               | S                                   |                   |
| Custom Units                                     |                                |  |                                 |  |                        |           |                     |                        |               | Z                                   |                   |
| <b>Testing and Tagging</b>                       |                                |  |                                 |  |                        |           |                     |                        |               |                                     |                   |
| Factory Calibrated                               |                                |  |                                 |  |                        |           |                     |                        |               |                                     | F                 |
| 3rd Party Calibrated                             |                                |  |                                 |  |                        |           |                     |                        |               |                                     | 3                 |
| Factory Calibrated/Stainless Steel Tag           |                                |  |                                 |  |                        |           |                     |                        |               |                                     | S                 |
| 3rd Party Calibrated w/ Stainless Steel Tag      |                                |  |                                 |  |                        |           |                     |                        |               |                                     | T                 |
| State of Kansas Certified                        |                                |  |                                 |  |                        |           |                     |                        |               |                                     | K                 |

### Detector Ordering Information for International

|  |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
|--|----------------------------------|---|----------------------|---|----------------------|---|----------------------|---|----------------------|---|----------------------|---|----------------------|---|----------------------|---|----------------------|
|  | <input type="text" value="MID"/> | - | <input type="text"/> | / | <input type="text"/> | - | <input type="text"/> | / | <input type="text"/> | - | <input type="text"/> | - | <input type="text"/> | / | <input type="text"/> | - | <input type="text"/> |
| <b>Model</b>                               |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| MID electromagnetic flow meter             | MID                              |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| <b>Type</b>                                |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| Type 2                                     |                                  |   | 2                    |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| Type 3                                     |                                  |   | 3                    |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| Type 5                                     |                                  |   | 5                    |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| Type 6                                     |                                  |   | 6                    |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| <b>Size</b>                                |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| DN 6 to DN 2000                            |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| <b>Pressure rate</b>                       |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| <b>Process connection</b>                  |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| DIN flanges                                |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | F                    |
| ANSI flanges                               |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | A                    |
| Threads acc. DIN 11851                     |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | D                    |
| Tri-Clamp®                                 |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | T                    |
| Wafer                                      |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | W                    |
| <b>Material</b>                            |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| C-steel                                    |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | ST                   |
| SST 1.4301 (ANSI 304)                      |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | V2                   |
| SST 1.4404 (ANSI 316)                      |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | V4                   |
| <b>Liner</b>                               |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| PTFE                                       |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | PT                   |
| (DN 6-10)                                  |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | PFA                  |
| Hard rubber                                |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | HG                   |
| Soft rubber                                |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | WG                   |
| Halar                                      |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | HA                   |
| <b>Electrodes</b>                          |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| Measure + empty pipe electrode             |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | ML                   |
| Measure + grounding + empty pipe electrode |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | MEL                  |
| <b>Electrode material</b>                  |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| Hastelloy C                                |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | HC                   |
| Tantalum                                   |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | TA                   |
| Platinum/gold plated                       |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | PG                   |
| Platinum/Rhodium                           |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | PR                   |
| <b>Housing</b>                             |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |
| C-steel                                    |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | St                   |
| SST 1.4301 (ANSI 304)                      |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | V2                   |
| SST 1.4404 (ANSI 306)                      |                                  |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   |                      |   | V4                   |

### Amplifier Ordering Information for International

|  |                      |                      |                      |    |
|--|----------------------|----------------------|----------------------|----|
|  | <input type="text"/> | <input type="text"/> | <input type="text"/> | m  |
| M1000 (92...275V AC)                                     | M10A                 |                      |                      |    |
| M1000 (9...36V DC)                                       | M10D                 |                      |                      |    |
| M1000 blind version (V AC)                               | MB10A                |                      |                      |    |
| M1000 blind version (V DC)                               | MB10D                |                      |                      |    |
| M1000 blind version, with stainless steel housing (V AC) | MBS10A               |                      |                      |    |
| M1000 blind version, with stainless steel housing (V DC) | MBS10D               |                      |                      |    |
| <b>Mounted/remote/cable length</b>                       |                      |                      |                      |    |
| Amplifier detector mounted                               |                      |                      | M                    |    |
| Remote version cable length                              |                      |                      | R                    |    |
| <b>Remote amplifier with cable length</b>                |                      |                      |                      |    |
| Remote amplifier with 10 m cable length                  |                      |                      |                      | 10 |
| Remote amplifier with 15 m cable length                  |                      |                      |                      | 15 |
| Remote amplifier with 20 m cable length                  |                      |                      |                      | 20 |
| Remote amplifier with 25 m cable length                  |                      |                      |                      | 25 |
| Remote amplifier with 30 m cable length                  |                      |                      |                      | 30 |

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