MEASURE **TODAY.** ENSURE **TOMORROW.**

# SpireMag Series MAG888-DC
## Battery-Powered Magnetic Flow Meter

Standalone ! No Wiring ! Plug & Play ! Telemetry Ready !

Integral type

Integral type with GSM / GPRS Wireless


Remote Type

**The SpireMag series MAG888-DC flowmeter is a battery-powered high-performance magnetic water meter designed for the water and wastewater industry to accurately measure the water flow in closed conduits.**

**MAG888-DC is ideal for remote locations in municipal, irrigation, wastewater treatment and industrial liquid processes industries where no power connection is available.**

- Stand alone water meter with battery lifetime for more than 4 years. Easy battery change
- Billing grade with class 0.5 accuracy
- Plug and play. No need for programming, no need for wiring
- Compact and rugged design. IP68 submersible
- Large measurement range. Bi-directional
- No moving parts to wear and tear. Maintenance free
- Short straight-pipe run requirement. Suitable for any desired installation location
- Optional GSM/GPRS wireless and turnkey data service. Battery powered for more than 3 years

SPIRE METERING TECHNOLOGY

**Spire Metering Technology** LLC, 249 Cedar Hill Street, Marlborough, MA 01752, USA
**Tel** +1 978 263-7100 / 888 738-0188 (toll-free) **Fax** +1 978 418-9170 sales@spiremt.com www.SpireMT.com

DS888DC-QT-1502-Rev.13

# SpireMag Series MAG888-DC

Battery-Powered Magnetic Flow Meter

## Applications

- Accurate water metering for water consumption and revenue generation
- Water metering in remote locations
- Potable water metering
- Irrigation water metering
- Wastewater and raw water metering
- Water distribution network monitoring
- Leakage detection
- Pump performance monitoring

## Specifications

| | |
|---|---|
| **Nominal Size** | DN15 (½")~DN800 (32") |
| **Accuracy** | ±0.5% |
| **Measurement Range** | 0 ~±15m/s (±49ft/s) |
| **Nominal Pressure** | • DN15~DN100 (0.5"~4"): 2.5MPa (362psig)<br>• DN125~DN250 (5"~10"): 1.6MPa (232psig)<br>• DN300~DN800 (12"~32"): 1.0MPa (145psig)<br>• Higher pressure rating is available upon request |
| **Medium Electrical Conductivity** | ≥ 20us/cm |
| **Medium Temperature** | -10°C ~ +100°C (14°F ~ 212°F) |
| **Display** | Large LCD for displaying instantaneous flow, forward flow total, reverse flow total and alarm |
| **Recordable parameters** | Accumulative total of flow, 32 events |
| **Alarms** | • Fluid empty-tube alarm<br>• Excitation current alarm<br>• Battery capacity low alarm |
| **Totalizer** | Built-in forward flow totalizer and reverse flow totalizer |

***Note:** *This device is not recommended for pulp applications.*

# SpireMag Series MAG888-DC

## Battery-Powered Magnetic Flow Meter

| | |
|---|---|
| **Output Signals** | Pulse output (optional for integral type or for remote type with battery power supply only)<br>Pulse/Frequency output (for remote type with dual power supply only)<br>Dry Contact interface for pulse output. 0.001L ~ 1m$^3$ per pulse. |
| **Communication (optional)** | • RS485/Modbus (for remote type)<br>• GSM or GPRS Wireless<br>**Note:** with GPRS, a server with Static IP address is needed or you can use our data service<br>• CDMA wireless |
| **Lining Material** | Rubber, PTFE, Polyurethane |
| **Electrode Material** | 316L SS, Hastelloy B, Hastelloy C, Titanium, Tantalum |
| **Sensor Body Material** | • Measuring tube: stainless steel<br>• Housing: carbon steel as standard offer. Stainless steel available upon request<br>• Flange: carbon steel as standard offer. Stainless steel available upon request |
| **Excitation Frequency** | • 1/30Hz (default): longer battery life but slower response<br>• 1/15Hz: shorter battery life but faster response |
| **Pipe Connection** | • DIN flange as standard offer<br>• ASME ANSI flange |
| **Ambient Condition** | -10°C ~ +60°C (14°F ~ 140°F), Humidity <95% |
| **Power Supply*** | • For battery-only flowmeter (integral type, Model# MAG888-DC-1/2): 3.6V built-in Li batteries. Lifetime: more than 4 years<br>• For GSM/GPRS (integral type): up to 3 years. Easy to replace<br>• For flowmeter with dual-power supply (remote type, Model# MAG888-DC-3): 3.6V built-in Li batteries, plus interface for external DC power supply – 24VDC/1A. |
| **Protection Class** | • For integral type: IP68 submersible<br>• For remote type:<br>**a.** IP68 for Flow sensor, IP65 for converter<br>**b.** IP68 for Flow sensor, IP68 for converter<br>*(The cable length between converter and flow sensor is 15m, up to 25m)* |
| **Structure Type*** | • Integral type<br>• Remote type:<br>º Remote type with battery-only power supply<br>º Remote type with dual power supply (external 24VDC power source is required) |

***Note:** *Battery-only powered flowmeter is good for flow which does not change fast. It measures the flow once every 15s to save battery. You may program the measurement to a shorter interval, but the battery will be consumed faster. For a fast changing flow, you may consider the dual power model.*

# SpireMag Series MAG888-DC

Battery-Powered Magnetic Flow Meter

## Dimension and Pressure Rating of Flow Sensor (full bore only)

| Nominal Size | Nominal Pressure* | Dimension | | | | | | Weight** | |
|---|---|---|---|---|---|---|---|---|---|
| | | L | | H | | D** | | | |
| | | mm | in | mm | in | mm | in | kg | lbs |
| 15 (½″) | 2.5 MPa (362psig) | 200 | 7.9 | 220 | 8.7 | 80 | 3.1 | 8 | 0.3 |
| 20 (¾″) | | 200 | 7.9 | 220 | 8.7 | 90 | 3.5 | 10 | 0.4 |
| 25 (1″) | | 200 | 7.9 | 223 | 8.8 | 100 | 3.9 | 12 | 0.5 |
| 32 (1 ¼″) | | 200 | 7.9 | 240 | 9.4 | 120 | 4.7 | 13 | 0.5 |
| 40 (1 ½″) | | 200 | 7.9 | 250 | 9.8 | 130 | 5.1 | 14 | 0.6 |
| 50 (2″) | | 200 | 7.9 | 263 | 10.4 | 140 | 5.5 | 15 | 0.6 |
| 65 (2 ½″) | 1.6 MPa (232psig) | 200 | 7.9 | 283 | 11.1 | 180 | 7.1 | 18 | 0.7 |
| 80 (3″) | | 200 | 7.9 | 290 | 11.4 | 195 | 7.7 | 20 | 0.8 |
| 100 (4″) | | 250 | 9.8 | 318 | 12.5 | 215 | 8.5 | 25 | 1.0 |
| 125 (5″) | | 250 | 9.8 | 350 | 13.8 | 245 | 9.6 | 28 | 1.1 |
| 150 (6″) | | 300 | 11.8 | 380 | 15.0 | 280 | 11.0 | 30 | 1.2 |
| 200 (8″) | | 350 | 13.8 | 430 | 16.9 | 335 | 13.2 | 50 | 2.0 |
| 250 (10″) | | 450 | 17.7 | 495 | 19.5 | 405 | 15.9 | 70 | 2.8 |
| 300 (12″) | 1.0 MPa (145 psig) | 500 | 19.7 | 547 | 21.5 | 440 | 17.3 | 95 | 3.7 |
| 350 (14″) | | 550 | 21.7 | 602 | 23.7 | 500 | 19.7 | 120 | 4.7 |
| 400 (16″) | | 600 | 23.6 | 665 | 26.2 | 565 | 22.2 | 140 | 5.5 |
| 450 (18″) | | 600 | 23.6 | 720 | 28.3 | 615 | 24.2 | 160 | 6.3 |
| 500 (20″) | | 600 | 23.6 | 783 | 30.8 | 670 | 26.4 | 200 | 7.9 |
| 600 (24″) | | 600 | 23.6 | 897 | 35.3 | 780 | 30.7 | 280 | 11.0 |
| 700 (28″) | | 700 | 27.6 | 982 | 38.7 | 895 | 35.2 | 350 | 13.8 |
| 800 (32″) | | 800 | 31.5 | 1092 | 43.0 | 1010 | 39.8 | 400 | 15.7 |

## Dimension and Pressure Rating of Flanges (full bore flow sensor only)

| Nominal Size | DIN Flange (mm) | | | | | ANSI RF#150 Flange (in) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Nominal Pressure* | Diameter of flange | Diameter of Bolts | No. of Bolts | Bolt Circle | Diameter of Flange | Diameter of bolts | No. of Bolts | Bolt Circle |
| 15 (½″) | 2.5 MPa (362psig) | 80 | 12 | 4 | 55 | 3 ½ | ½ | 4 | 2 ⅜ |
| 20 (¾″) | | 90 | 12 | 4 | 60 | 3 ⅞ | ½ | 4 | 2 ¾ |
| 25 (1″) | | 100 | 12 | 4 | 75 | 4 ¼ | ½ | 4 | 3 ⅛ |
| 32 (1 ¼″) | | 120 | 14 | 4 | 80 | 4 ⅝ | ½ | 4 | 3 ½ |
| 40 (1 ½″) | | 130 | 14 | 4 | 100 | 5 | ½ | 4 | 3 ⅞ |
| 50 (2″) | | 140 | 14 | 4 | 110 | 6 | ⅝ | 4 | 4 ¾ |
| 65 (2 ½″) | 1.6 MPa (232psig) | 180 | 18 | 4 | 145 | 7 | ⅝ | 4 | 5 ½ |
| 80 (3″) | | 195 | 18 | 8 | 160 | 7 ½ | ⅝ | 4 | 6 |
| 100 (4″) | | 215 | 18 | 8 | 180 | 9 | ⅝ | 8 | 7 ½ |
| 125 (5″) | | 245 | 18 | 8 | 210 | 10 | ¾ | 8 | 8 ½ |
| 150 (6″) | | 280 | 23 | 8 | 240 | 11 | ¾ | 8 | 9 ½ |
| 200 (8″) | | 335 | 23 | 12 | 295 | 13 ½ | ¾ | 8 | 11 ¾ |
| 250 (10″) | | 405 | 25 | 12 | 355 | 16 | ⅞ | 12 | 14 ¼ |
| 300 (12″) | 1.0 MPa (145psig) | 440 | 23 | 12 | 400 | 19 | ⅞ | 12 | 17 |
| 350 (14″) | | 500 | 23 | 16 | 460 | 21 | 1 | 12 | 18 ¾ |
| 400 (16″) | | 565 | 25 | 16 | 515 | 23 ½ | 1 | 16 | 21 ¼ |
| 450 (18″) | | 615 | 25 | 20 | 565 | 25 | 1 ⅛ | 16 | 22 ¾ |
| 500 (20″) | | 670 | 25 | 20 | 620 | 27 ½ | 1 ⅛ | 20 | 25 |
| 600 (24″) | | 780 | 30 | 20 | 725 | 32 | 1 ¼ | 20 | 29 ½ |
| 700 (28″) | | 895 | 30 | 24 | 840 | | | | |
| 800 (32″) | | 1010 | 34 | 24 | 950 | | | | |

***Notes:***

** For metric flange only. If ANSI RF150# flange is chosen, the pressure should exceed that allowed by the ANSI flange spec.*

***May vary with ANSI flange*

# Flow Sensor Selection

## Liner Material Selection

| Liner material | Main performance | Applications |
|---|---|---|
| Polytetrafluoroethylene (PTFE) | 1. A plastic material with the most stable chemical properties, able to resist the corrosion of boiling hydrochloric acid, sulfuric acid, nitric acid, aqua regia, concentrated alkali and many kinds of organic solvent.<br>2. Unable to resist the corrosion of chlorine trifluoride, high temperature vanadyltrifluoride, high flow-rate liquid fluorine, liquid oxygen and ozon.<br>3. Poor abrasion resistance.<br>4. Poor ability of anti-negative pressure. | 1. 100°C (212°F)<br>2. Strong corrosive medium like concentrated acid, alkali, and more.<br>3. Sanitary medium. |
| Chloroprene rubber (Neoprene rubber) | 1. Excellent elasticity, retractility and abrasion resistance. High degree of tensile strength, good wear resistance.<br>2. Able to resist the corrosion of low concentration acid, alkali and salt, but unable to resist that of the oxidative medium. | 1. <80°C (176°F)<br>2. Water, sewage and slurry, polluted water, mineral serosity of low abrasion. |
| Polyurethane rubber | 1. Excellent wear resistance (ten times higher than that of the natural rubber).<br>2. Not suitable in acid and alkali resistance.<br>3. Unable to work with water mixed with organic solvent. | 1. <80°C (176°F).<br>2. Middle and strong wear ability for mud.<br>3. High abrasion liquids such as mineral rich liquids, slurry and coal slurry. |

## Electrode Material Selection

| Materials of Electrode | Applications |
|---|---|
| Mo-containing stainless steel (0Cr18Ni12Mo2Ti) | Liquids with weak corrosivity, such as industrial water, sewage, wastewater, polluted water, are widely used in industries like oil, chemical, petrochemical, urea, vinylon, carbamide, etc. |
| Hastelloy B (HB) | Good corrosion resistance of different concentration of hydrochloric acid under boiling point, resist the corrosion of non-oxidizing acid, alkali, non-oxidizing salt solution, such as sulfuric acid, phosphoric acid, organic acid, etc. |
| Hastelloy C (HC) | Able to resist the corrosion of oxidizing acid, such as nitric acid, mixed acid,the mixture of chromic acid and sulfuric acid, oxidizing salt like Fe+++,Cu++ or other oxidants such as hypochlorite solution above ordinary temperature and seawater |
| Titanium (Ti) | Seawater, chloride, hypochlorite salt, oxidable acid, organic acid, alkali, etc. Unable to resist the corrosion of purer reducing acid like sulfuric acid and hydrochloric acid. The corrosivity of alpha hydroxy acids will be substantially decreased if there are oxidants such as nitric acid, Fe+++, Cu++, etc. in it. |
| Tantalum (Ta) | The corrosion resistance of tantalum is as good as glass. Except hydrofluoric acid, fuming nitric acid and alkali, it is able to resist the corrosion of almost any other chemical media. |

As there are a great variety of mediums and the corrosiveness of each medium could significantly depend on temperature, concentration, flow rate and more, the above two tables can only be used as references. Users should make a choice according to the actual situation of their applications. If necessary, corrosion resistance experiments such as a hanging sheet experiment using similar material should be performed.

## Grounding

In general, extra grounding accessory is not needed for water flow in metal pipes which have normally been connected to Earth ground already. However, if the pipe is plastic or the pipe is not Earth grounded, you may consider the following accessories.

| Type | Applications |
|---|---|
| Tri-electrode | Economical. Recommended.<br>This is not a separate part. It is part of the electrode. Therefore, it cannot be ordered separately.<br>Applicable to non-conductive pipeline such as plastic pipeline. |
| Grounding Ring | Economical.<br>Applicable to non-conductive pipeline such as plastic pipeline. However, it is not required for the sensor with polytetrafluoroethylene (PTFE) liner. |
| Grounding Flange | Higher cost but better grounding.<br>Applicable to non-conductive pipeline such as plastic pipeline. However, it is not required for the sensor with polytetrafluoroethylene (PTFE) liner. |

## Nominal Diameter Selection

1. MAG888-DC electromagnetic flowmeter has a high rangeability. Thus, you may select the nominal diameter of flow sensor to be the same as that of the process pipe.

2. If there are solid particles in the measured medium, a flow velocity range of 1~3m/s (3~10ft/s) is recommended.

   - If the actual flow velocity is over this range yet inconvenient to reduce, it is recommended to select a nominal diameter larger than that of the process pipe. As such, the flow velocity in the measuring tube of the sensor can be properly decreased and the abrasion of electrode and liner caused by the particles can be alleviated.

   - If the actual flow velocity is below this range yet inconvenient to increase, it is recommended to select a nominal diameter smaller than that of the process pipe. As such, the flow velocity in the measuring tube of the sensor can be properly increased in order to avoid particle deposition and related accuracy degradation.

3. If the flow rate is too small yet a high accuracy measurement is required, you may select a sensor nominal diameter smaller than that of the process pipe. This is to increase the velocity thus to increase the accuracy.v

When you select a flow sensor which nominal diameter is different from the process pipe, a size adaption pipe should be jointed to both the upstream and downstream of the flow sensor. The center taper angle should be no more than 150° and there should be a straight pipe at least 5 times of the process pipe diameter jointed to the adaption pipe.

To help sensor size selection, please consult the following table which shows the flow rate of each size at different flow velocity.

## Comparison Table of Flow Velocity and Flowrate

| Velocity m/s(ft/s) / Flowrate m³/h (gpm) / Diameter mm (inch) | 0.01(0.03) (Min) | 1 (3.28) | 2 (6.56) | 3 (9.84) | 4 (13.12) | 5 (16.4) | 15 (49.2) (Max) |
|---|---|---|---|---|---|---|---|
| 15 (½″) | 0.006 (0.026) | 0.64(2.82) | 1.27(5.60) | 1.9(8.40) | 2.5(11.20) | 3.2(14.00) | 9.5(41.99) |
| 20 (¾″) | 0.011 (0.048) | 1.13(4.97) | 2.26(9.95) | 3.4(14.93) | 4.5(19.91) | 5.6(24.88) | 16.9(74.64) |
| 25 (1″) | 0.018 (0.079) | 1.77(7.79) | 3.53(15.55) | 5.3(23.33) | 7.1(31.10) | 8.8(38.88) | 26.5(116.63) |
| 40 (1 ½″) | 0.45 (1.98) | 4.52(19.89) | 9.04(39.81) | 13.5(59.72) | 18.1(79.62) | 22.6(99.53) | 67.8(298.58) |
| 50 (2″) | 0.07 (0.31) | 7.07(31.11) | 14.13(62.20) | 21.2(93.31) | 28.2(124.41) | 35.3(155.51) | 106.0(466.53) |
| 65 (2 ½″) | 0.12 (0.53) | 11.95(52.58) | 23.89(105.12) | 35.8(157.69) | 47.7(210.25) | 59.7(262.81) | 179.2(788.43) |
| 80 (3″) | 0.18(0.79) | 18.1(79.64) | 36.19(159.24) | 54.3(238.86) | 72.3(318.48) | 90.4(398.10) | 271.4(1194.31) |
| 100 (4″) | 0.28(1.23) | 28.27(124.41) | 56.5(248.81) | 84.8(373.22) | 113.1(497.63) | 141.3(622.04) | 424.1(1866.11) |
| 150 (6″) | 0.63(2.80) | 63.61(279.92) | 127.2(559.83) | 190.8(839.75) | 254.4(1119.66) | 318.1(1399.58) | 954.2(4198.74) |
| 200 (8″) | 1.13(4.98) | 113.1(497.63) | 226.1(995.26) | 339.3(1492.88) | 452.3(1990.51) | 565.4(2488.14) | 1696.4(7464.42) |
| 250 (10″) | 1.76(7.78) | 176.7(777.54) | 353.4(1555.09) | 530.1(2332.63) | 706.8(3110.18) | 883.5(3887.72) | 2650.7(11663.16) |
| 300 (12″) | 2.54(11.2) | 254.4(1119.66) | 508.9(2239.33) | 763.4(3358.99) | 1017.8(4478.65) | 1272.3(5598.32) | 3817.0(16794.95) |
| 350 (14″) | 3.46(15.2) | 346.3(1990.51) | 692.7(3047.97) | 1039.1(4571.96) | 1385.4(6095.95) | 1731.8(7619.93) | 5195.4(22859.80) |
| 400 (16″) | 4.52(19.91) | 452.3(4478.65) | 904.7(3981.03) | 1357.1(5971.54) | 1809.5(7962.05) | 2261.9(9952.57) | 6785.8(29857.70) |
| 450 (18″) | 5.72(25.19) | 572.5(2519.24) | 1145.1(5038.49) | 1717.6(7557.73) | 2290.2(10076.97) | 2962.7(13036.22) | 8588.3(37788.65) |
| 500 (20″) | 7.06(31.10) | 706.8(3110.18) | 1413.7(6220.35) | 2120.5(9330.53) | 2827.4(12440.71) | 3534.3(15550.88) | 10602.8(46652.65) |
| 600 (24″) | 10.17(44.79) | 1017.8(4478.65) | 2035.7(8957.31) | 3053.6(13435.96) | 4071.5(17914.62) | 5089.3(22393.27) | 15268.1(67179.82) |

# SpireMag Series MAG888-DC

Battery-Powered Magnetic Flow Meter

## How to Order

Please select one option (ID) from each category.

**MAG888-DC-□-□-□□□□□□-□-□-□-□-□-□-□**

| Type* | ID |
|---|---|
| Integral Type (Default) | 1 |
| Remote Type | 2 |
| Remote Type with Dual Power Supply | 3 |

| Wireless | ID |
|---|---|
| None | 0 |
| With GSM Wireless (Output must be A-None) | 1 |
| With GPRS Wireless (Output must be A-None) | 2 |

| Unit System | ID |
|---|---|
| Metric System | DN |
| English System | IN |

| Calibre | ID |
|---|---|
| DN15 (½") | 0015 (0050) |
| DN20 (¾") | 0020 (0075) |
| DN25 (1") | 0025 (0100) |
| DN32 (1 ¼") | 0032 (0125) |
| DN40 (1 ½") | 0040 (0150) |
| DN50 (2") | 0050 (0200) |
| DN65 (2 ½") | 0065 (0250) |
| DN80 (3") | 0080 (0300) |
| DN100 (4") | 0100 (0400) |
| DN125 (5") | 0125 (0500) |
| DN150 (6") | 0150 (0600) |
| DN200 (8") | 0200 (0800) |
| DN250 (10") | 0250 (1000) |
| DN300 (12") | 0300 (1200) |
| ..... | ..... |
| DN800 (32") | 0800 (3200) |

**Note: battery-only type (Model# MAG888-DC-1/2) is good for relatively constant flow. For fast changing flow, please consider the dual-power type (Model# MAG888-DC-3) which needs a 24VDC external power supply.*

| ID | Nominal Pressure |
|---|---|
| 1 | 2.5MPa (362psig) / DN15-50 (½"-2") |
| 2 | 1.6MPa (232psig) / DN65-250 (2½"-10") |
| 3 | 1.0MPa (145psig) / DN300-8000 (12"-32") |
| 4 | Other, please specify |

| ID | Liner Material |
|---|---|
| A | PTFE |
| B | Chloroprene Rubber (for DN50/2" or above only) |
| C | Other, please specify |

| ID | Electrode Material |
|---|---|
| 1 | 316LSS (OCr18N112M02Ti) (default) |
| 2 | HC (Hastelloy C) |
| 3 | Ti (Titanium) |
| 4 | Other, please specify |

| ID | Output |
|---|---|
| A | None (Default) |
| B | Pulse (not available if wireless is selected) |
| C | RS485/Modbus and Pulse (for remote type with dual power supply but without wireless) |
| D | Other, please specify |

| ID | Flange |
|---|---|
| 1 | DIN flange (Default) |
| 2 | ANSI RF#150 (for size up to 24") |
| 3 | ANSI RF#125 (for size larger than 24") |
| 4 | Other, please specify |

| ID | Grounding |
|---|---|
| A | None (Default) |
| B | Tri-electrode |
| C | Ground Ring |
| D | Ground Flange |

| ID | Cable Length |
|---|---|
| A | 15m |
| B | 25m |

**Example**

**Model# MAG888-DC-10-DN0100-2A1A1B**

stands for integral type battery powered magnetic flowmeter of size DN100mm with PTFE liner, 316L SS tri-electrode, DIN flange, rated for 1.6MPa.