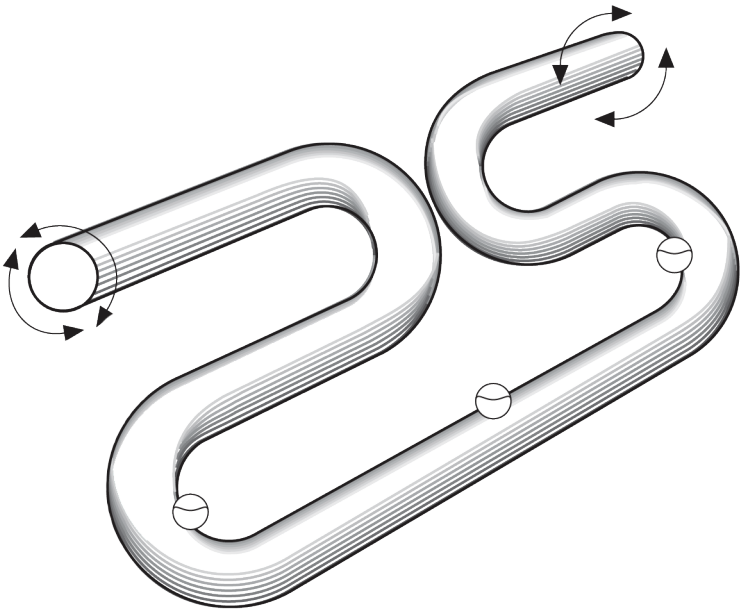
m012

# Coriolis Mass Flowmeters

**Flow rate 0.09 to 9.0 kg/min (0.2 to 20 lb/min)**



**ISO 9001 Certified Manufacturing Facility**

## DESCRIPTION

The m® m012 provides accurate, continuous direct measurement of mass, density, temperature and percent solids over the flow range 0.09 to 9.0 kg/min (0.2 to 20 lb/min).

## DESIGN FEATURES

## ACCURACY

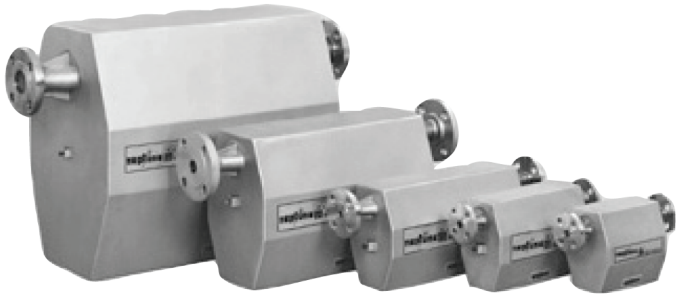
Patented dual omega-shaped tubes provide outstanding sensitivity to Coriolis forces. m® mass flow accuracy is ±0.10% and the mass flow rate repeatability is ±0.10%. Its density accuracy is ±0.005 g/cc over its operating range.

## LOW PRESSURE DROP AND 100:1 TURNDOWN

The m® transducer is more sensitive to Coriolis forces than conventional mass flowmeters, providing a greater mechanical gain. Fluid velocity requirements are much lower to produce a given signal. This results in a lower pressure drop and unequaled 100:1 turndown. Therefore, accuracy never has to be compromised to obtain an acceptable pressure drop.

## RELIABILITY

The smooth-bore, non-obtrusive flow path is free from moving parts, seals and bellows. The omega shapes produce torsional loading instead of bending loading or improved reliability.



- **Direct mass, density and temperature measurement**
- **Patented omega-shaped flowtubes provide unequaled sensitivity to Coriolis force**
- **Wide 100:1 turndown**
- **Lowest pressure drop**
- **Smooth-bore, non-obtrusive flow path free from moving parts**
- **316L stainless steel**
- **3A-Authorized version available**

## MATERIALS OF CONSTRUCTION

Wetted parts: 316L stainless steel
Sensor housing: 304L stainless steel
3A-Authorized version: Connection facing and flowtube surface finish is equivalent to 32 Ra or better

## ELECTRONICS

DATAMATE 2200™ Mass Flow Computer:
(Complete information is available in Technical Specification No. TS-612)
NexGen® SFT100 Mass Flow Transmitter:
(Complete information is available in Technical Specification No. TS-620)

## HAZARDOUS AREA CLASSIFICATION TABLE

| Agency | Components | Method | Class | Div/ Zone | Group | Temp. Class | Ambient Temp. |
|---|---|---|---|---|---|---|---|
| CSA | Transducer | Intrinsic Safety | I, II, III | 1, 2 | C, D, E, F, G | T5 | Note 1 |
| | Datamate | Non-incendive | I | 2 | A, B, C, D | T3C | Note 5 |
| | NexGen | Explosion Proof | I, II, III | 1 | C, D, E, F, G | T6 | Note 2 |
| | | Non-incendive | I | 2 | A, B, C, D | T4 | Note 2 |
| LCIE | Transducer | EX ia | | 0, 1, 2 | IIB | T5, T4, T2 | Note 3 |
| | Datamate | N/A | N/A | N/A | Safe Area | | |
| | Nexgen | EX id | | 1, 2 | IIB | T6 | Note 4 |

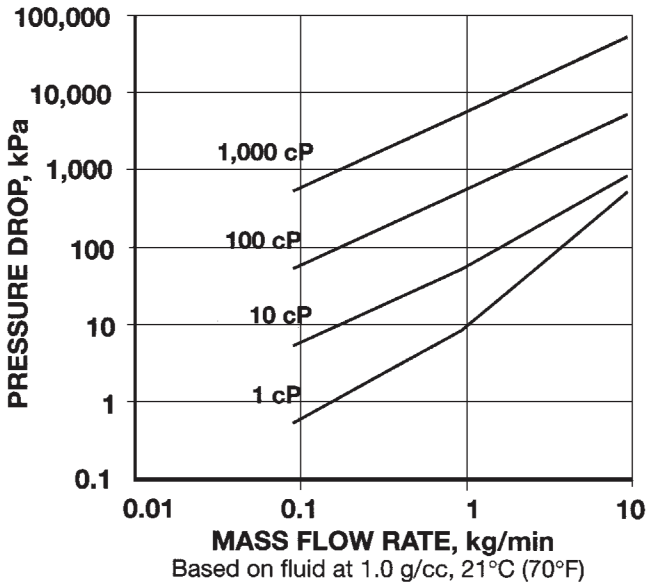
Note 1: -20°C to 40°C (-4°F to 104°F)
Note 2: -20°C to 65°C (-4°F to 149°F)
Note 3: T5 where ambient temperature is: -20°C 40°C (-4°F to 104°F)
T4 where ambient temperature is: +40°C to +60°C (104°F to 140°F)
T2 where ambient temperature is: +60°C to +200°C (140°F to 392°F)
Note 4: -20°C to 65°C (-4°F to 149°F)
Note 5: +65°C ambient

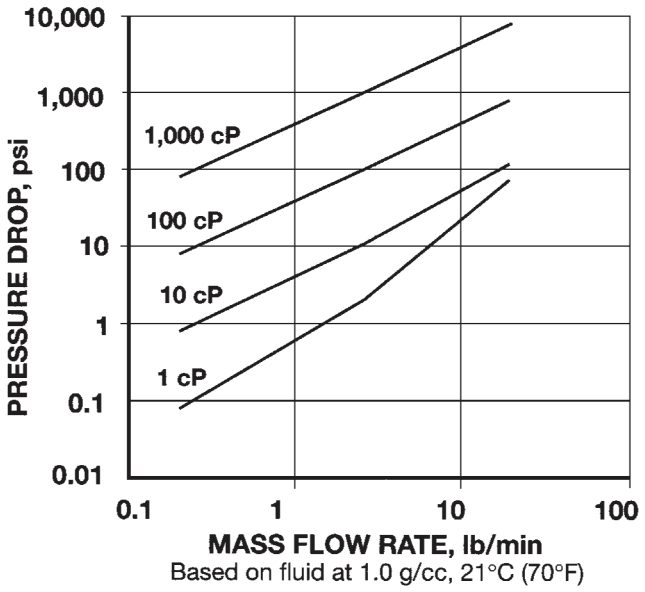
## m012 OPERATING SPECIFICATIONS

| METERING ELEMENT | |
|---|---|
| Connections:<br>Connection type (flanges) | <br>VCO: 1/2" female[2]<br>ANSI: 1/2"; 150# 300# Raised Face SST<br>3A-Authorized: 1[1/2]" Tri-Clamp® |
| Meter:<br>Tube material<br>Tube shape<br>Nominal tube bore<br>Housing<br>Hazardous area classification<br><br>Mass accuracy[1]<br>Mass Repeatability<br>Mass zero stability<br>Turndown ratio<br>Density range<br>Density accuracy<br>Density repeatability<br>Temperature measurement<br>Temperature accuracy<br>Signal output | <br>316L SST<br>Omega<br>3mm (1/8")<br>304L SST<br>Transducer is intrinsically safe when connected to an approved mass flow computer (See table above for approval ratings)<br>±0.10% of rate ± zero stability[1]<br>±0.10% of rate<br>±0.0014 kg/min (0.0031 lb/min)<br>100:1<br>0.4 to 2.0 g/cc<br>±0.005 g/cc<br>±0.0005 g/cc<br>100 ohm platinum resistance sensor<br>0.56°C (±1ºF)<br>8-core shielded twisted pair |
| Fluid:<br>Flow rate<br>Max. temperature<br>Max. operating pressure | <br>0.09 to 9.0 kg/min (0.2 to 20 lb/min)<br>204ºC (400ºF)<br>-45ºC (-50ºF)<br>137 bar (2000 psi); limited by flange rating |
| ASSOCIATED INSTRUMENT | |
| Max. length of signal cable<br>Electrical connections<br>Manufacturer<br>Instrument model number | 300m (1000 ft.) 8 core Belden 89892 shielded twisted pair<br>Screw terminal<br>Red Seal Measurement, Inc.<br>Refer to electronics Technical Specification Form<br>Datamate 2200: TS-612<br>NexGen SFT100: TS-620 |

[1]All calibration equipment traceable to N.I.S.T.
[2]Mating Flange, for MT truck accessories
[3]Only available as 1/2" female CAJON VCO connections Requires Male CAJON VCO-8-VCO by SWAGELOCK®.

# PRESSURE DROP VERSUS FLOW RATE




## DETERMINING PRESSURE DROP

1. Flow rate vs. pressure drop varies with viscosity. To approximate m012 pressure drop for fluids with viscosity approximating that of water, locate the point on the 1 -cP curve corresponding with your desired flow rate.
2. From that point, locate the nearest horizontal line and follow it to the vertical scale on the left, which indicates pressure drop for the flow rate you selected.
3. Divide the pressure drop indicated on the graph by the specific gravity (S) of the process fluid:

$$^{\Delta P}\text{actual} = {}^{\Delta P}\text{plotted} / \text{Sp. gr.}$$

## m012 MASS FLOWMETER ORDERING INFORMATION

| MODEL NUMBER | | | | | | | DESCRIPTION |
|---|---|---|---|---|---|---|---|
| m012 | X | X | X | X | X | | |
| | | | | | | | Type |
| | 8 | | | | | | Transducer 1/8" SST1 |
| | S | | | | | | Transducer 1/8" Sanitary Tri Clamp[1] |
| | | | | | | | Flange |
| | | 000 | | | | | 1-1/2' 3A SST Sanitary Tri Clamp |
| | | 801 | | | | | 3/8' CAJON VCO2 |
| | | 812 | | | | | 1/2' 150lb. ANSI RF SST |
| | | 813 | | | | | 1/2' 300lb. ANSI RF SST |
| | | XXX | | | | | SPECIAL - Contact Factory[2] |
| | | | | | | | Approvals |
| | | | 0 | | | | General Purpose |
| | | | 2 | | | | CSA |
| | | | 3 | | | | ATEX |
| | | | | | | | Cable |
| | | | | | 000 | | No Cable |
| | | | | | 101 | | ASM CBL KIT 10ft.[3] |
| | | | | | 102 | | ASM CBL KIT 20ft.[3] |
| | | | | | 103 | | ASM CBL KIT 30ft.[3] |
| | | | | | 105 | | ASM CBL KIT 50ft.[3] |
| | | | | | 110 | | ASM CBL KIT 100ft.[3] |
| | | | | | | | Electronics |
| | | | | | | 0 | No Electronics |
| | | | | | | 02 | For Use With Nexgen |
| | | | | | | 03 | For Use With Datamate 2200 |

1Note: Wetted materials and connection materials must be the same.
2Note: Only available as 3/8" female CAJON VCO connections Requires Male CAJON VCO-8-VCO by SWAGELOCK®.
3Note: For a complete list of available cables, contact factory.

## CALCULATING ACTUAL ACCURACY

Use the following formula to calculate accuracy for your selected flow rate:

% accuracy, $\pm_{actual} = \{[(0.0010\ m) + S_0]/m\} \times 100\%$

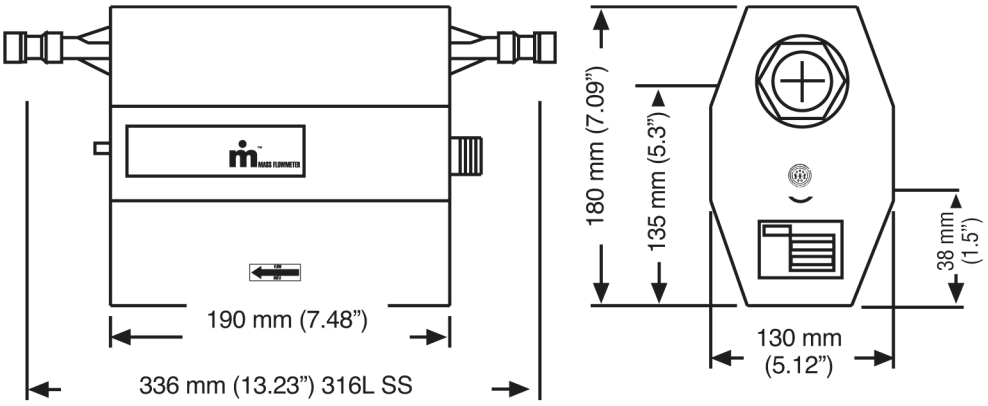
where:

m = mass flow rate, kg/min or lb/min

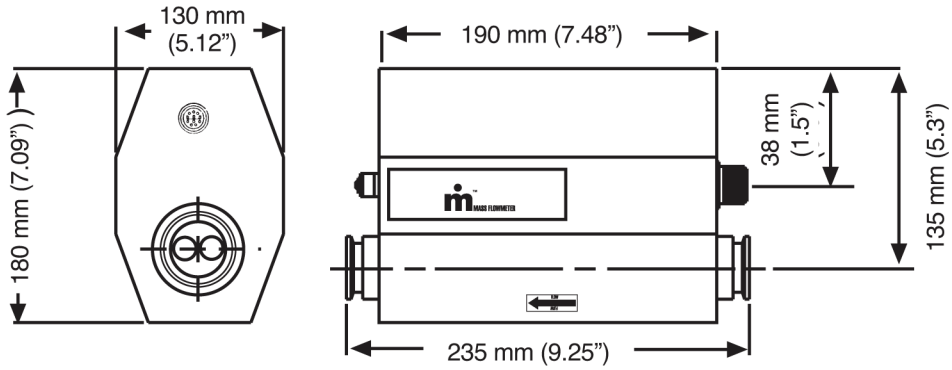
$S_0$ = mass zero stability, kg/min or lb/min for the m012 flowmeter

## DIMENSIONAL DATA, mm (in.)

m012 3/8” VCO Transducer

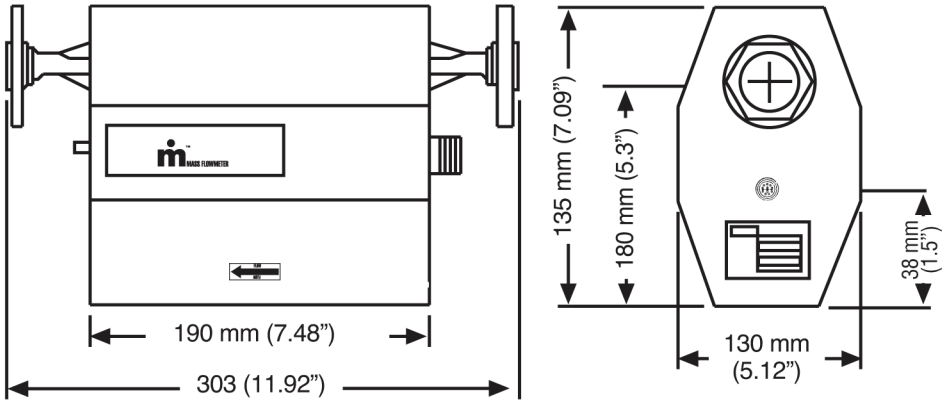



m012 3A-Authorized Transducer




Optional 1-1/2” x 1/2” Tri-Clamp® eccentric reducers are available.

m012 ANSI RF Transducer




| | Dimensions |
|---|---|
| Connection | A<br>316L SS<br>Wetted Parts |
| 1/2” 150#<br>ANSI RF | 303 (11.92) |

## WEIGHTS OF COMPONENTS

| | |
|---|---|
| Transducer: | approx. 4.6 kg (10 lbs) |
| Datamate 2200: | approx. 5.2 kg (11.5 lbs) |
| NexGen: | approx. 7.1 kg (15.6 lbs) |

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RED SEAL MEASUREMENT