



# ***TEK-COR 1100A***

## ***Coriolis Mass Flowmeter***

### **Instruction Manual**

Document Number: IM-1100A



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## 1 Safety Instructions

### 1.1 Intended Use

This measuring device is intended to measure the mass flow rate. At the same time, the system also measures fluid density and fluid temperature. These parameters are then used to calculate other variables such as volumetric flow.

### 1.2 Certification

Tek-Cor 1100A has UL, CE, NTEP, and HMO certifications.

### 1.3 Safety Instructions from the Manufacturer

#### 1.3.1 Disclaimer

The manufacturer will not be held accountable for any damage that happens by using its product, including, but not limited to direct, indirect, or incidental and consequential damages.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer has the right to modify the content of this document, including the disclaimer, at any time for any reason without prior notice, and will not be answerable in any way for the possible consequence of such changes.

#### 1.3.2 Product Liability and Warranty

The operator shall bear authority for the suitability of the device for the specific application. The manufacturer accepts no liability for the consequences of misuse by the operator. Wrong installation or operation of the devices (systems) will cause the warranty to be void. The respective Terms and Conditions of Sale, which forms the basis for the sales contract shall also apply.

#### 1.3.3 Information Concerning the Documentation

To prevent any injury to the operator or damage to the device it is essential to read the information in this document and the applicable national standard safety instructions. This operating manual contain all the information that is required in various stages, such as product identification, incoming acceptance and storage, mounting, connection, operation and commissioning, troubleshooting, maintenance, and disposal.

### 1.4 Safety Precautions

You must read these instructions carefully prior to installing and commissioning the device. These instructions are an important part of the product and must be kept for future reference. Only by observing these instructions, optimum protection of both personnel and the environment, as well as safe and fault-free operation of the device can be ensured.

For additional information that are not discussed in this manual, contact the manufacturer

### Warnings and Symbols Used

The following safety symbol marks are used in this operation manual and on the instrument.



#### **WARNING**

---

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury

---



#### **CAUTION**

---

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

---



#### **NOTE**

---

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.

---

## 1.5 Packaging, Transportation and Storage

### 1.5.1 Packaging

The original package consists of

1. Tek-Cor 1100A Coriolis Mass Flowmeter
2. Documentation



### 1.5.2 Transportation

- Avoid impact shocks to the device and prevent it from getting wet during transportation.
- Verify local safety regulations, directives, and company procedures with respect to hoisting, rigging, and transportation of heavy equipment.
- Transport the product to the installation site using the original manufacturer's packing whenever possible.

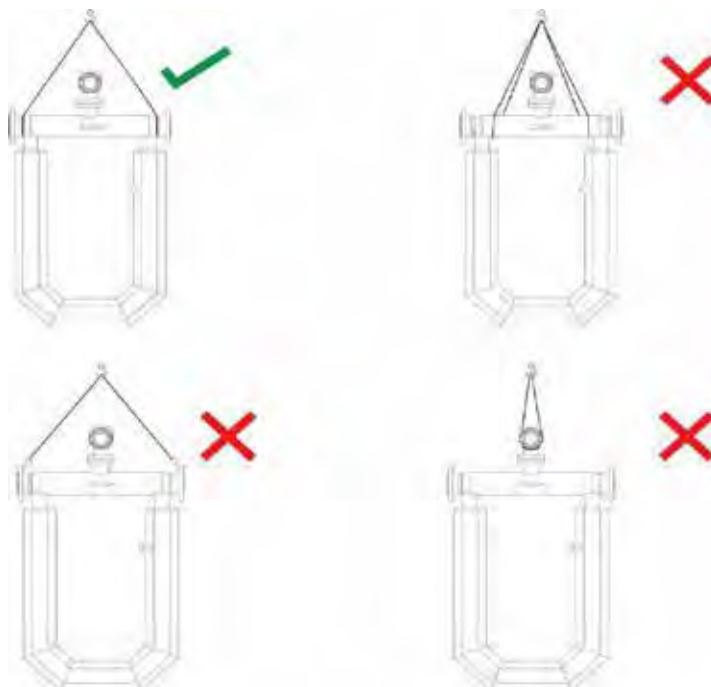
### 1.5.3 Handling

- Use a sling to lift and carry the instrument.
- Do not lift the instrument using the flange bolt holes.
- Do not lift the instrument on the transmitter housing and on the transmitter stem.



#### WARNING

The centre of gravity of the instrument is higher than the suspension points of the sling. There is a risk of injury if the instrument slips. Fulfil the local safety instructions while lifting the instrument



### 1.5.4 Storage

If this product is to be stored for a long period of time before installation, take the following precautions:




- Store your product in the manufacturer's original packing used for shipping.
- Storage location should conform to the following requirements:
  - Free from rain and water
  - Free from vibration and impact shock
  - At room temperature with minimal temperature and humidity variation
- Before storing a used flowmeter remove any fluid from the flowmeter line completely. Properties of the instrument can change when stored outdoors.

### 1.5.5 Nameplate




The nameplate lists the order number and other important information, such as design details and technical data

#### **i** NOTE

Check the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

| Tek-Cor 1100A Mass Flowmeter |                            |   |                           |
|------------------------------|----------------------------|---|---------------------------|
| Model Tek-Cor 1100A          | 1100A-2-2-025A-1-1-150-1-G | Flow Range  | 37 to 881 lb/min MMQ 14lb |
| Size                         | 1"                         | Material (Wetted)   | SS316L                    |
| Connection                   | 1.5 ANSI 150#              | Nominal Pressure  | 928 Psig                  |
| IP Class                     | 67                         | Temperature Range   | -58F to 257F              |
| Supply Voltage               | 24 VDC                     | Flow Cal  | 915.740                   |
| Ambient                      | -4F to 131F                | D1  | 0.0012                    |
| SN                           | 1711245                    | D2  | 0.9965                    |
| Ex Marking                   | Class I Div 1              | K1  | 3653.21                   |
| Tag No.                      |                            | K2  | 3975.42                   |
| www.tek-trol.com             |                            |    |                           |
| Crystal Lake, IL60014, USA   |                            | NTEP CC NO.45-033   |                           |

#### Name Plate of Tek-Cor 1100A Sensor

| Tek-Cor Mass Flowmeter     |   | CE  |
|----------------------------|---|---|
| Model 1100A                | 1100A-2-2-025A-1-1-150-1-G  | IP Class 67   |
| Supply Voltage             | 24 VDC  | GPE, NJ, USA<br>GPE, F1001, ENCL  |
| SN                         | 1711245   |     |
| www.tek-trol.com           |  | <p>CAUTION: To reduce the risk of ignition in hazardous atmospheres, disconnect the equipment supply circuit before opening. Keep assembly tight closed when in operation</p> <p>WARNING: To reduce the risk of ignition in hazardous atmospheres, conduit runs must have a sealing fitting connected within 18 in. of enclosure.</p> |
| Crystal Lake, IL60014, USA |   |   |

#### Name Plate of Tek-Cor 1100A Transmitter

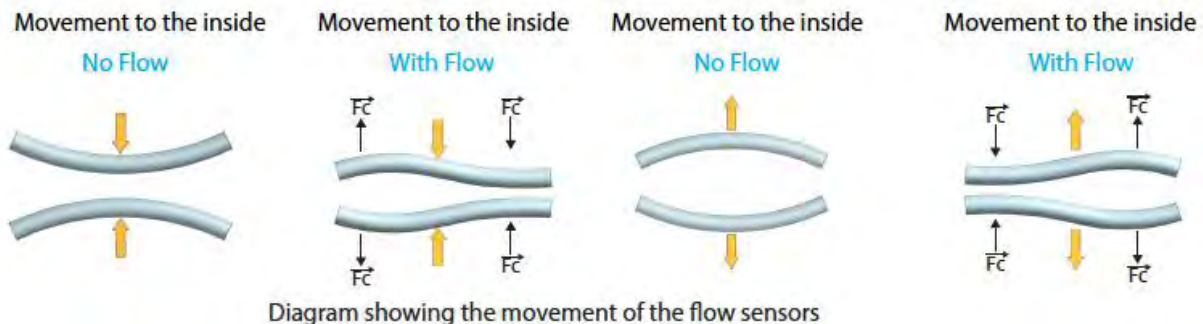
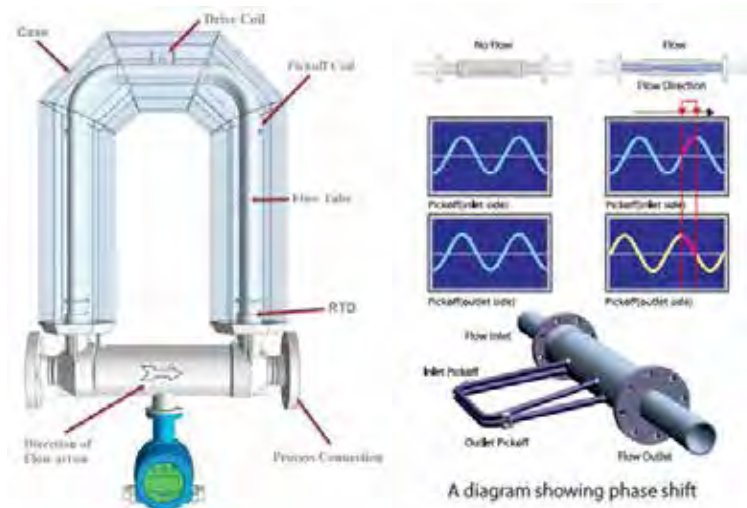


## 2 Product Description

This section covers the reference and specification data, as well as ordering information.

### 2.1 Principle of Operation

The Coriolis measuring principle refers to the effect that a moving mass has on a body in a rotating frame of reference. The moving mass exerts an apparent force on the body, causing a deflection. This force is called the Coriolis force. It does not act directly on the body, but on the motion of the body. This principle is used in Coriolis flowmeters. A Coriolis flowmeter consists of two parallel tubes that are made to oscillate using a magnet. These oscillations are recorded by sensors fitted at the inlet and outlet of each tube. In a no-flow state, the oscillations are synchronized, since there is no mass exerting any force on the tubes. Any fluid flowing through the tubes generates Coriolis forces, causing the tubes to twist in proportion to the mass flow rate of the fluid.



## 2.2 Models

The Tek-Cor 1100A Series Coriolis Mass Flowmeters are available in the following three configurations:

### 2.2.1 U-Shaped

These flowmeters are comprised of two U-shaped tubes, a magnet and coil assembly, and sensors at the inlet and outlet of the tubes. Coriolis forces exerted by the flowing medium are used to determine the mass flow rate and density of the medium.



U-Shaped sensor (Size 1½" – 8")

### 2.2.2 Micro-bend Shaped

These flowmeters are comprised of two U-shaped tubes in a casing with a considerably smaller radius than the conventional U-Shaped Coriolis flowmeters. The smaller radius ensures a more compact instrument with significantly lower pressure differential values compared to other flowmeters.



Micro-bend Shaped sensor (Size ½" – 8")

### 2.2.3 Triangle Shaped

These flowmeters are the most compact in our range of Coriolis Mass Flowmeters, designed specifically to provide optimum performance in low-flow applications. It comprises a single flow tube which is considerably smaller in size than the conventional U-Shaped flowmeters.



Triangle Shaped sensor (Size ½" – 1")

## 2.3 Technical Specifications

|                                |   |
|--------------------------------|---|
| <b>Service</b>                 | Liquids and gas                                   |
| <b>Size</b>                    | U-Shaped: 1 ½" to 8"                              |
|                                | Micro-bend Shaped: ½" to 8"                       |
|                                | Triangle Shaped: ½" to 1"                         |
| <b>Accuracy</b>                | 0.1% or 0.2% or 0.5%                              |
| <b>Density measuring range</b> | 2 to 30 lb/gal (0.2 to 3 g/cm <sup>3</sup> )      |
| <b>Density Accuracy</b>        | 0.001 g/cm <sup>3</sup>                           |
| <b>Density basic error</b>     | ±0.02 lb/gal (±0.002 g/cm <sup>3</sup> )          |
| <b>Density Repeatability</b>   | ±0.01 lb/gal (± 0.001 g/cm <sup>3</sup> )         |
| <b>Repeatability</b>           | For 0.1% accuracy: ±0.05%                         |
|                                | For 0.2% accuracy: ±0.1%                          |
|                                | For 0.5% accuracy: ±0.25%                         |
| <b>Temperature limits</b>      | Direct mount: -58 °F to 257 °F (-50 °C to 125 °C) |
|                                | Remote mount: -58 °F to 392 °F (-50 °C to 200 °C) |
| <b>Power requirements</b>      | 18 to 28 VDC or 85 to 220 VAC                     |
| <b>Output signal</b>           | 4-20 mA and pulse, Optional: HART or Modbus RS485 |
| <b>Process Connection</b>      | As per DIN or ANSI                                |
| <b>Enclosure rating</b>        | NEMA 4X (IP67)                                    |
| <b>Agency approvals</b>        | UL, CE, NTEP, and HMO                             |

## 2.4 Flow Ranges

### 2.4.1 Flow Ranges for Liquid (U-Shaped)

| Size (inch) | Allowable Flow Range (lb/min) | Normal Flow Range for Accuracy 0.1% (lb/min) | Normal Flow Range for Accuracy 0.2%, 0.5% (lb/min) |
|-------------|-------------------------------|--|--|
| 1 ½"        | 12 - 1175                     | 74 - 1175                                    | 56 - 1175  |
| 2"          | 19 - 1837                     | 110 - 1837                                   | 92 - 1837  |
| 3"          | 52 - 5144                     | 221 - 5144                                   | 203 - 5144   |
| 4"          | 74 - 7340                     | 552 - 7348                                   | 441 - 7348   |
| 6"          | 184 - 18371                   | 1287 - 18371                                 | 1103 - 18371                                       |
| 8"          | 368 - 36743                   | 2572 - 36743                                 | 2573 - 36743                                       |

### 2.4.2 Flow Range for Liquid (Micro-bend Shaped)

| Size (inch) | Allowable Flow Range (lb/min) | Normal Flow Range for Accuracy 0.1% (lb/min) | Normal Flow Range for Accuracy 0.2%, 0.5% (lb/min) |
|-------------|-------------------------------|--|--|
| ½"          | 1 - 110                       | 8 - 110                                      | 6 - 110  |
| 1"          | 3 - 293                       | 23 - 293                                     | 15 - 293   |
| 1 ½"        | 9 - 881                       | 89 - 881                                     | 42 - 881   |
| 2"          | 19 - 1837                     | 184 - 1837                                   | 92 - 1837  |
| 3"          | 30 - 4409                     | 294 - 4409                                   | 294 - 4409   |
| 4"          | 56 - 7348                     | 552 - 7348                                   | 368 - 7348   |
| 6"          | 184 - 18371                   | 1838 - 18371                                 | 919 - 18371  |
| 8"          | 368 - 36743                   | 3674 - 36743                                 | 18372 - 36743                                      |

### 2.4.3 Flow Range for Gas

| Size (Inch) | Measurable Flow Range (lb/min) | Flow Range with 0.5% (lb/min) |
|-------------|--------------------------------|-------------------------------|
| 1/2"        | 1 - 110                        | 3 - 110                       |
| 1"          | 2 - 293                        | 8 - 293                       |
| 1 ½"        | 12 - 1176                      | 30 - 1176                     |
| 2"          | 19 - 1837                      | 46 - 1837                     |
| 3"          | 26 - 5144                      | 129 - 5144                    |
| 4"          | 37 - 7348                      | 184 - 7348                    |
| 6"          | 92 - 18371                     | 460 - 18371                   |

#### 2.4.4 Flow Range of Volume of Air under STP Conditions

| Size (Inch) | Initial flow (Nm <sup>3</sup> /h) | Initial flow (Scfm) | Flow range with accuracy 0.5% (Nm <sup>3</sup> /h) | Flow range with accuracy 0.5% (Scfm) |
|-------------|-----------------------------------|---------------------|--|--------------------------------------|
| 1/2"        | 12.5                              | 8                   | 62.5 – 2500  | 40 – 1585                            |
| 1"          | 33.33                             | 21                  | 166.7 – 6666.7                                     | 106 – 4226                           |
| 1 1/2"      | 133.33                            | 84                  | 666.7 – 26666.7                                    | 423 – 16906                          |
| 2"          | 208.33                            | 132                 | 1041.7 – 41666.7                                   | 661 – 26416                          |
| 3"          | 583.33                            | 370                 | 2916.7 – 116666.7                                  | 1849 – 73966                         |
| 4"          | 833.33                            | 528                 | 4166.7 – 166666.7                                  | 2642 – 105665                        |
| 6"          | 2083.33                           | 1321                | 10416.7 – 416666.7                                 | 6604 – 264164                        |

#### 2.4.5 Flow Rate Factor

The flow rate of the Tek-Cor 1100A must be checked according to the formula below:

$$\text{Medium flow rate} = \frac{\text{Volume flow rate under working conditions}}{\text{Flow rate factor}}$$

| Size (inch)      | 1/2"  | 1"    | 1 1/2" | 2"    | 3"    | 4"    | 6"    | 8"    |
|------------------|-------|-------|--------|-------|-------|-------|-------|-------|
| Flow rate factor | 0.362 | 1.558 | 1.634  | 3.535 | 8.338 | 15.89 | 26.15 | 58.84 |



#### NOTE

- The gas flow velocity is usually much higher than liquid when measured by a flowmeter, so there is noise caused by gas medium and tube wall of flowmeter under a high-speed gas flow and if the noise becomes loud enough, the signal of flowmeter will be influenced, so use the Tek-Cor 1100A Coriolis flowmeter for gaseous medium at velocity less than 1/3<sup>rd</sup> of the sound velocity (360 fps).
- Use Tek-Cor 1100A for gas with a pressure less than 29 PSI (0.2 MPa).

#### 2.4.6 Accuracy, Basic Error and Repeatability

|   |        |        |        |
|---|--------|--------|--------|
| <b>Accuracy</b>   | 0.1%   | 0.2%   | 0.5%   |
| <b>Basic Error</b>  | ±0.10% | ±0.20% | ±0.50% |
| <b>Repeatability</b>  | ±0.05% | ±0.10% | ±0.25% |
| Accuracy is calculated based on the water measurement under the conditions of 68°F to 77°F (20°C to 25°C) and 14.5 PSI to 29 PSI (0.1 MPa to 0.2 MPa) |        |        |        |

#### 2.4.7 Density Measuring

|                      |   |
|----------------------|---|
| <b>Density Range</b> | 2 – 30 lb/gal (0.2 to 3 g/cm <sup>3</sup> ) |
| <b>Basic Error</b>   | ±0.02 lb/gal (±0.002 g/cm <sup>3</sup> )    |
| <b>Repeatability</b> | ±0.01 lb/gal (±0.001 g/cm <sup>3</sup> )    |

#### 2.4.8 Temperature Measuring

|                          |                  |                                     |
|--------------------------|------------------|-------------------------------------|
| <b>Temperature Range</b> | Direct Mount     | -58 °F to 257 °F (-50 °C to 125 °C) |
|                          | Remote Mount     | -58 °F to 392 °F (-50 °C to 200 °C) |
| <b>Basic Error</b>       | ≤±32 °F (≤±1 °C) |                                     |

## 2.5 Electrical Specifications

### 2.5.1 Current Output

A passive current output of 4-20mA can be configured to indicate the mass flow, volume flow, or density.

|  |              |
|--|--------------|
| <b>Output Range</b>                        | 4-20 mA      |
| <b>Resolution</b>                          | 0.000244 mA  |
| <b>Basic Error</b>                         | 0.2% FS      |
| <b>Temperature Influence</b>               | ±0.005 FS/°F |
| External resistor should be 250 Ω to 600 Ω |              |

### 2.5.2 Pulse Output

Active pulse output can be configured to indicate the mass flow, volume flow, or density.

|                                      |              |
|--------------------------------------|--------------|
| <b>Output Range</b>                  | 0 – 10 kHz   |
| <b>Resolution</b>                    | 0.152 kHz    |
| <b>Basic Error</b>                   | 0.075% FS    |
| <b>Temperature Influence</b>         | ±0.005 FS/°F |
| Capability of output range is 12 kHz |              |

### 2.5.3 Low Flow Cut-off

When the mass flow value is lower than the value of low flow cut-off, the Tek-Cor 1100A Coriolis Mass Flowmeter shows the output of flow rate as zero, and the totalizer stops accumulating. The value of low flow cut-off is usually set to be 1% of the maximum flow rate.

### 2.5.4 RS 485 Output

RS485 output is compatible with the RTU mode of the Modbus protocol. For details, contact Tek-Trol.

### 2.5.5 Power Consumption

The normal power consumption for flowmeter is 10 W, and the maximum power consumption is 15 W.



## 2.6 Environmental Specification

### 2.6.1 Environment Vibration

|                                 |               |
|---------------------------------|---------------|
| <b>Frequency Range</b>          | 10 to 2000 Hz |
| <b>Maximum Acceleration</b>     | 2 g           |
| <b>Maximum Vibration cycles</b> | 50            |

### 2.6.2 Environment Temperature

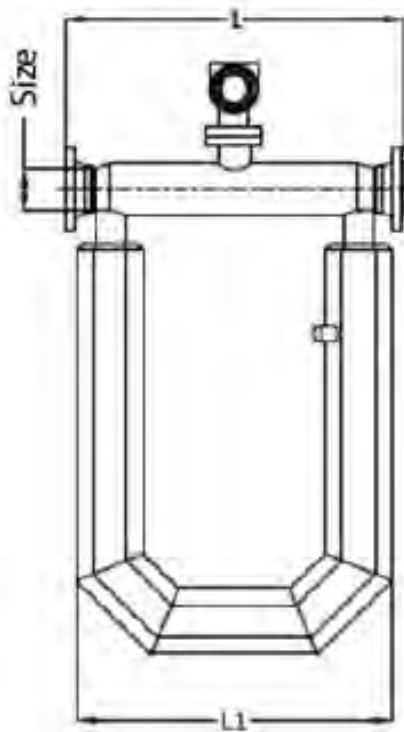
|                            |                                    |
|----------------------------|------------------------------------|
| <b>Working Temperature</b> | -40 °F to 131 °F (-40 °C to 55 °C) |
| <b>Storage Temperature</b> | -68 °F to 158 °F (-20 °C to 70 °C) |

### 2.6.3 Enclosure Grade

The enclosure grade for the Tek-Cor 1100A Coriolis Mass Flowmeter is IP67.

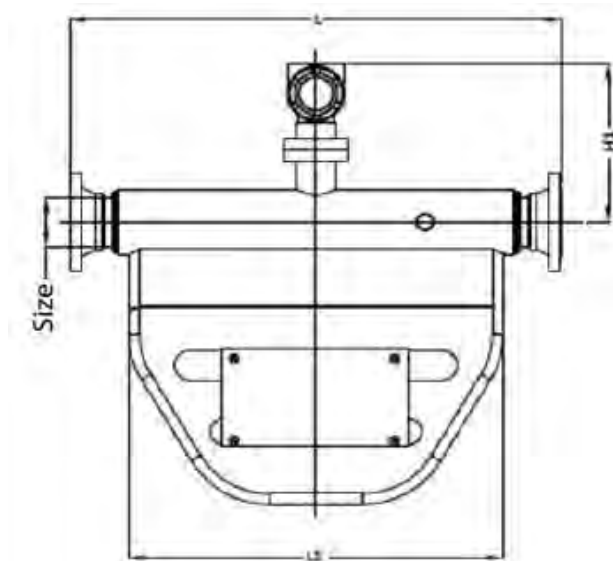
## 2.7 Dimensional Drawings

### 2.7.1 Outline Dimensions for U-Shaped



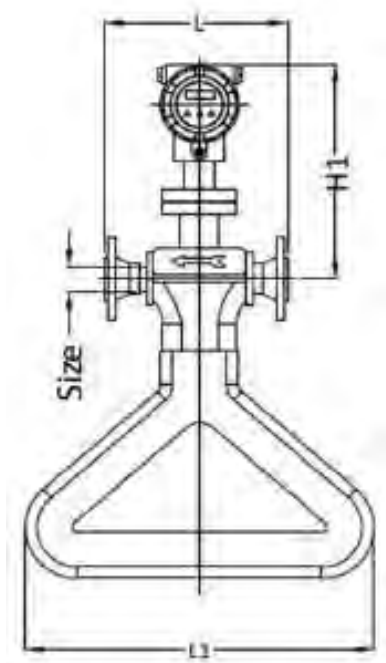
| Size              | L                   |                     | L1                  | H                   | H1                  |                     |
|-------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
|                   | ≤300# (4 MPa)       | ≥600# (6.3 MPa)     |                     |                     | Integrated          | Remote              |
| 1 ½"<br>(0.13 ft) | 20.47"<br>(1.70 ft) | 21.53"<br>(1.79 ft) | 18.5"<br>(1.54 ft)  | 25.98"<br>(2.16 ft) | 11.02"<br>(0.91 ft) | 8.26"<br>(0.68 ft)  |
| 2"<br>(0.16 ft)   | 21.96"<br>(1.83 ft) | 23.14"<br>(1.92 ft) | 21.65"<br>(1.80 ft) | 27.95"<br>(2.32 ft) | 11.41"<br>(0.95 ft) | 8.66"<br>(0.72 ft)  |
| 3"<br>(0.26 ft)   | 30.70"<br>(2.55 ft) | 31.81"<br>(2.65 ft) | 27.95"<br>(2.32 ft) | 40.94"<br>(3.41 ft) | 12.59"<br>(1.04 ft) | 9.84"<br>(0.82 ft)  |
| 4"<br>(0.32 ft)   | 36.22"<br>(3.01 ft) | 37.32"<br>(3.11 ft) | 33.85"<br>(2.82 ft) | 44.88"<br>(3.74 ft) | 13.77"<br>(1.14 ft) | 11.02"<br>(0.91 ft) |
| 6"<br>(0.49 ft)   | 43.30"<br>(3.60 ft) | 44.88"<br>(3.74 ft) | 41.33"<br>(3.44 ft) | 59.84"<br>(4.98 ft) | 14.96"<br>(1.24 ft) | 12.20"<br>(1.01 ft) |
| 8"<br>(0.65 ft)   | 53.70"<br>(4.47 ft) | 55.51"<br>(4.62 ft) | 45.66"<br>(3.80 ft) | 65.15"<br>(5.42 ft) | 16.53"<br>(1.37 ft) | 13.77"<br>(1.14 ft) |

## 2.7.2 Outline Dimensions for Micro-Bend Shaped



| Size              | L                   |                     | L1                  | H                   | H1                  |                     |
|-------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
|                   | ≤300# (4 MPa)       | ≥600# (6.3 MPa)     |                     |                     | Integrated          | Remote              |
| ½"<br>(0.04 ft)   | 15.74"<br>(1.31 ft) | 16.29"<br>(1.35 ft) | 11.02"<br>(0.91 ft) | 7.24"<br>(0.60 ft)  | 11.41"<br>(0.95 ft) | 8.66"<br>(0.72 ft)  |
| 1"<br>(0.08 ft)   | 19.68"<br>(1.64 ft) | 21.10"<br>(1.75 ft) | 14.17"<br>(1.18 ft) | 9.84"<br>(0.82 ft)  | 11.81"<br>(0.98 ft) | 9.05"<br>(0.75 ft)  |
| 1 ½"<br>(0.13 ft) | 23.62"<br>(1.96 ft) | 24.96"<br>(2.08 ft) | 18.11"<br>(1.50 ft) | 11.81"<br>(0.98 ft) | 12.20"<br>(1.01 ft) | 9.44"<br>(0.78 ft)  |
| 2"<br>(0.16 ft)   | 31.49"<br>(2.62 ft) | 32.59"<br>(2.71 ft) | 25.19"<br>(2.09 ft) | 16.14"<br>(1.34 ft) | 12.59"<br>(1.04 ft) | 9.84"<br>(0.82 ft)  |
| 3"<br>(0.26 ft)   | 35.43"<br>(2.95 ft) | 36.53"<br>(3.04 ft) | 27.55"<br>(2.29 ft) | 19.29"<br>(1.60 ft) | 13.77"<br>(1.14 ft) | 11.02"<br>(0.91 ft) |
| 4"<br>(0.32 ft)   | 44.48"<br>(3.70 ft) | 45.51"<br>(3.79 ft) | 33.85"<br>(2.82 ft) | 25.98"<br>(2.16 ft) | 14.56"<br>(1.21 ft) | 11.41"<br>(0.95 ft) |
| 6"<br>(0.49 ft)   | 55.51"<br>(4.62 ft) | 57.08"<br>(4.75 ft) | 47.24"<br>(3.93 ft) | 35.43"<br>(2.95 ft) | 15.74"<br>(1.31 ft) | 12.99"<br>(1.08 ft) |
| 8"<br>(0.65 ft)   | 70.86"<br>(5.90 ft) | 72.59"<br>(6.04 ft) | 57.08"<br>(4.75 ft) | 46.06"<br>(3.83 ft) | 16.53"<br>(1.37 ft) | 13.77"<br>(1.14 ft) |

### 2.7.3 Outline Dimensions for Triangle Shaped



| Size            | L                  |                    | L1                  | H                   | H1                  |                    |
|-----------------|--------------------|--------------------|---------------------|---------------------|---------------------|--------------------|
|                 | ≤300# (4 MPa)      | ≥600# (6.3 MPa)    |                     |                     | Integrated          | Remote             |
| ½"<br>(0.04 ft) | 7.08"<br>(0.59 ft) | 7.63"<br>(0.63 ft) | 13.77"<br>(1.14 ft) | 11.41"<br>(0.95 ft) | 10.23"<br>(0.85 ft) | 7.48"<br>(0.62 ft) |
| 1"<br>(0.08 ft) | 7.87"<br>(0.65 ft) | 7.96"<br>(0.81 ft) | 18.03"<br>(1.50 ft) | 15.74"<br>(1.31 ft) | 11.02"<br>(0.91 ft) | 8.26"<br>(0.68 ft) |

### 2.7.4 Weights

| Size (inch)                | ½"            | 1"            | 1 ½"          | 2"            | 3"              | 4"              | 6"              | 8"               |
|----------------------------|---------------|---------------|---------------|---------------|-----------------|-----------------|-----------------|------------------|
| U-shaped, lb (kg)          | -             | -             | 67<br>(30 kg) | 89<br>(40 kg) | 220<br>(100 kg) | 419<br>(190 kg) | 717<br>(325 kg) | 1182<br>(536 kg) |
| Micro-bend shaped, lb (kg) | 27<br>(12 kg) | 33<br>(15 kg) | 55<br>(25 kg) | 84<br>(33 kg) | 172<br>(78 kg)  | 298<br>(135 kg) | 629<br>(285 kg) | 948<br>(430 kg)  |
| Triangle shaped, lb (kg)   | 29<br>(13 kg) | 38<br>(17 kg) | -             | -             | -               | -               | -               | -                |

## 2.8 Model Chart

|                           |                      |             |          |  |          |          |  |          |          |  |
|---------------------------|----------------------|-------------|----------|--|----------|----------|--|----------|----------|--|
| <b>EXAMPLE</b>            | <b>Tek-Cor 1100A</b> | <b>2</b>    | <b>1</b> | <b>025B</b>  | <b>1</b> | <b>S</b> | <b>150</b>   | <b>1</b> | <b>E</b> | <b>Tek-Cor 1100A-2-1-025B-1-S-150-1-E</b>  |
| <b>Series</b>             | Tek-Cor 1100A        |             |          |  |          |          |  |          |          | Coriolis Mass Flow Meter   |
| <b>Type</b>               |                      | 1<br>2<br>3 |          |  |          |          |  |          |          | U-Shaped<br>Micro-bend Shaped<br>Triangle Shaped   |
| <b>Process Media</b>      |                      |             | 1        |  |          |          |  |          |          | Liquid or Gas  |
| <b>Size and Accuracy</b>  |                      |             |          | 015A<br>025A<br>040A<br>050A<br>080A<br>100A<br>150A<br>200A<br>015B<br>025B<br>040B<br>050B<br>080B<br>100B<br>150B<br>200B<br>015C<br>025C<br>040C<br>050C<br>080C<br>100C<br>150C<br>200C |          |          |  |          |          | ½", ± 0.5% Accuracy (M and T type only)<br>1", ± 0.5% Accuracy (M and T type only)<br>1-½", ± 0.5% Accuracy (M and U type only)<br>2", ± 0.5% Accuracy (M and U type only)<br>3", ± 0.5% Accuracy (M and U type only)<br>4", ± 0.5% Accuracy (M and U type only)<br>6", ± 0.5% Accuracy (M and U type only)<br>8", ± 0.5% Accuracy (M and U type only)<br>½", ± 0.2% Accuracy (M and T type only)<br>1", ± 0.2% Accuracy (M and T type only)<br>1-½", ± 0.2% Accuracy (M and U type only)<br>2", ± 0.2% Accuracy (M and U type only)<br>3", ± 0.2% Accuracy (M and U type only)<br>4", ± 0.2% Accuracy (M and U type only)<br>6", ± 0.2% Accuracy (M and U type only)<br>8", ± 0.2% Accuracy (M and U type only)<br>½", ± 0.1% Accuracy (M and T type only)<br>1", ± 0.1% Accuracy (M and T type only)<br>1-½", ± 0.1% Accuracy (M and U type only)<br>2", ± 0.1% Accuracy (M and U type only)<br>3", ± 0.1% Accuracy (M and U type only)<br>4", ± 0.1% Accuracy (M and U type only)<br>6", ± 0.1% Accuracy (M and U type only)<br>8", ± 0.1% Accuracy (M and U type only) |
| <b>Electronics</b>        |                      |             |          |  | 1<br>2   |          |  |          |          | Direct Mount<br>Remote Mount (Comes with 10 meters of cable)   |
| <b>Output</b>             |                      |             |          |  |          | I<br>S   |  |          |          | 4-20 mA, HART, Pulse<br>4-20 mA, Modbus RS485, Pulse   |
| <b>Process Connection</b> |                      |             |          |  |          |          | 025<br>040<br>100<br>160<br>260<br>150<br>300<br>600 |          |          | DIN 2.5 MPa Flange<br>DIN 4 MPa Flange<br>DIN 10 MPa Flange<br>DIN 16 MPa Flange<br>DIN 26 MPa Flange<br>150# ANSI Flange<br>300# ANSI Flange<br>600# ANSI Flange  |
| <b>Power Supply</b>       |                      |             |          |  |          |          |  | 1<br>2   |          | 18-28 VDC<br>85-220 VAC  |
| <b>Approvals</b>          |                      |             |          |  |          |          |  |          | E        | UL Class I Div. I  |

### 3 Installation

This section covers instructions on installation and commissioning. Installation of the device must be carried out by trained, qualified specialists authorized to perform such works.



#### CAUTION

- When removing the instrument from hazardous processes, avoid direct contact with the fluid and the meter
- All installation must comply with local installation requirements and local electrical code

#### 3.1 Basic Requirement for Installation

##### 3.1.1 Position Selection

- The flowmeter should be placed away from interference sources (such as a pump), which may cause vibration in the pipe. If the flowmeters are used in series along the same line, care must be taken to avoid the mutual influence due to vibration resonance. The distance between sensors should be more than 7 ft. (2 m).
- When installing the sensor, pay attention to the expansion and contraction of the process pipeline due to temperature changes. It is strongly recommended that the sensor not be installed near an expansion joint of the process pipeline. Otherwise, the pipe expansion and contraction of the pipeline will cause transverse stress, which will affect the flowmeter's zero and will affect the measurement accuracy.
- The flowmeter should be placed at least 16 ft. (5 m) away from industrial electromagnetic interference sources, such as large power motors and transformers.
- The sensor should be placed in the position where its measuring tube is always filled with fluid and pressure is maintained at the outlet, thus it should be placed in a position lower than the pipeline.
- Tek-Cor 1100A does not require straight pipe upstream or downstream. However, if more than one mass flow transmitters are installed in the same pipe, ensure the length of pipe between any two flowmeters is more than 2 meters.

##### 3.1.2 Maximum Length of the Cable

| Cable Model               | Cable Specification           | Max. Length     |
|---------------------------|-------------------------------|-----------------|
| Special Nine-Core Cable   | Special                       | 985 ft. (300 m) |
| Current Power Line        | 18AWG (0.8 mm <sup>2</sup> )  | 985 ft. (300 m) |
| RS485 Communication Cable | 22AWG (0.35 mm <sup>2</sup> ) | 985 ft. (300 m) |

### 3.1.3 Closing of Valve before Zero-Point Calibration

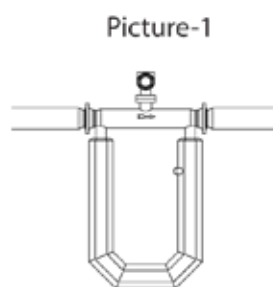
It is necessary to do zero-point calibration after the installation is completed. Close the downstream stop valve before zero-point calibration, and then close the upstream stop valve.

## 3.2 Installation Direction

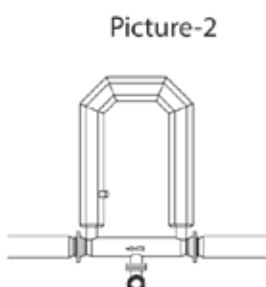
### 3.2.1 Horizontal and Vertical Installation

The Tek-Cor 1100A should be installed in the orientation that can ensure the measuring tube is filled with the medium being measured.

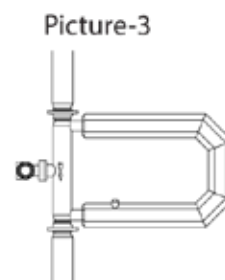
#### U-Shaped Installation



For Liquid or Slurry

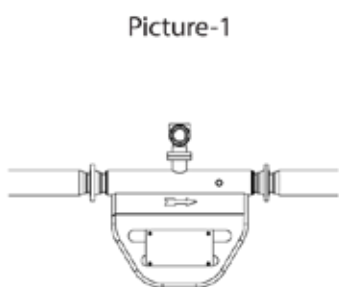


For Gas

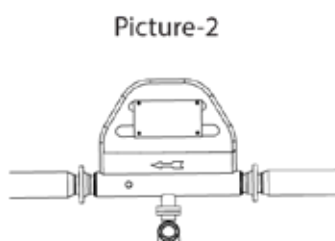


For Liquid or Slurry or Gas

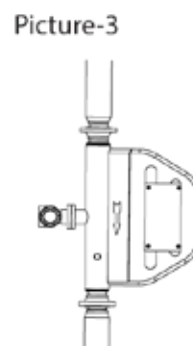
#### Micro-bend Shaped installation



For Liquid or Slurry



For Gas

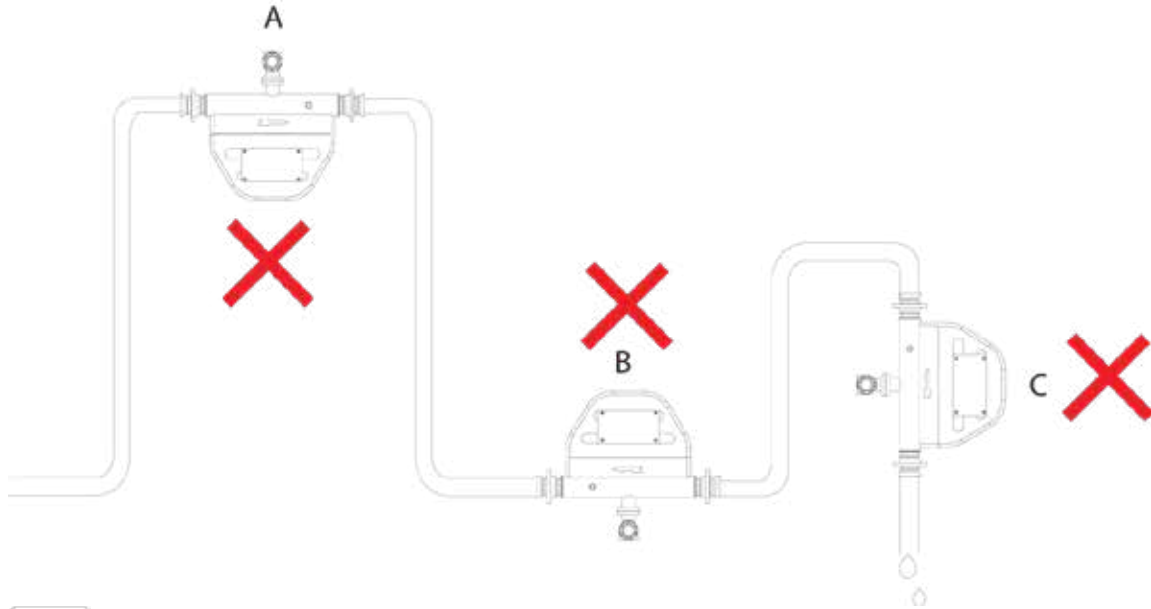


For Liquid or Slurry or Gas

For horizontal installation, the measuring tube should be installed downside of the pipeline when the process medium is liquid or slurry (Picture 1); upside of the pipeline when the process medium is gas (Picture 2). For vertical installation, the measuring tube should be installed besides the pipeline when the process medium is liquid or slurry or gas (Picture 3).

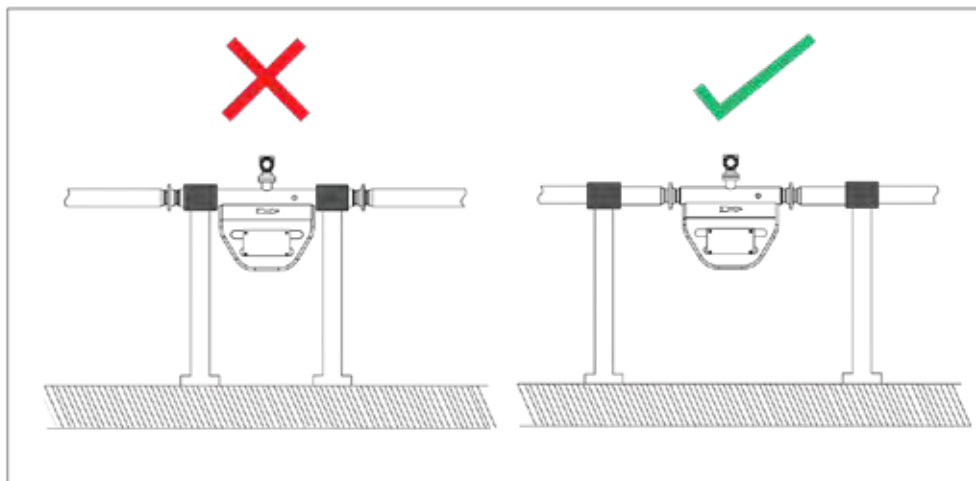
### 3.2.2 Difficult Installation Location for Liquid and Gas Measurement

The flowmeter must not be mounted at the highest point of the tubing (A) if gas bubbles are expected, or at the lowest point (B) if solid particles are expected. Also, the meters must not be mounted in a drop-line near the open end (C), to avoid the flowmeter becoming empty.

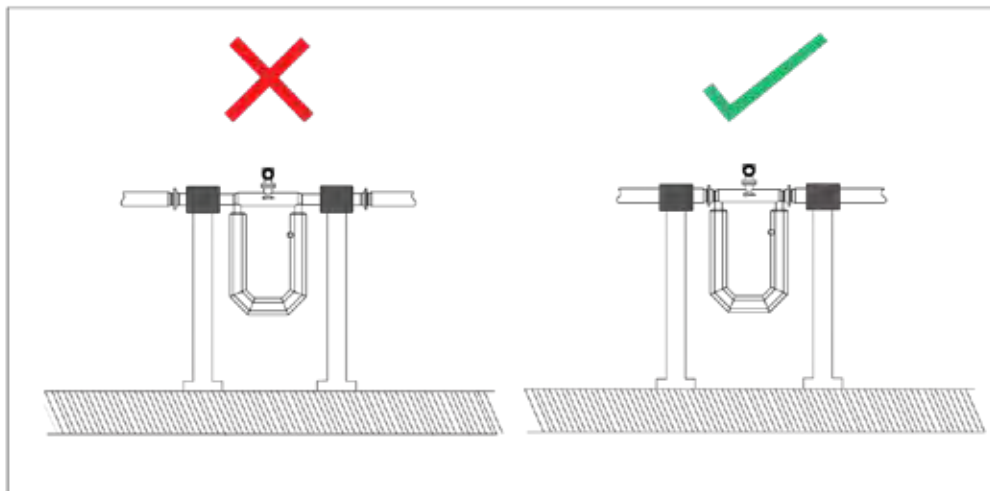


#### **i** NOTE

- Pipe reduction or extension should be avoided directly before or after the flowmeter
- Avoid any control valves, or orifices, or any sound generator near the sensor

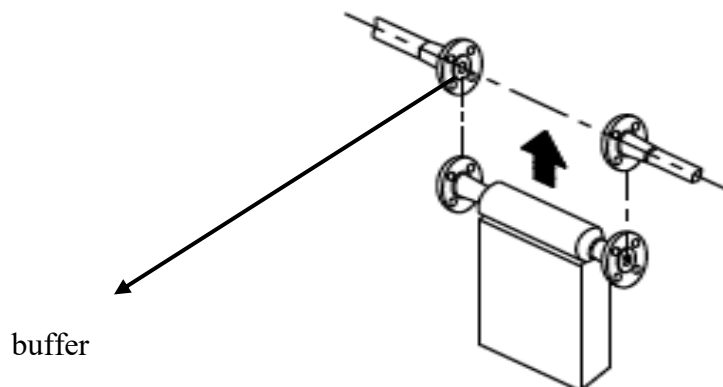




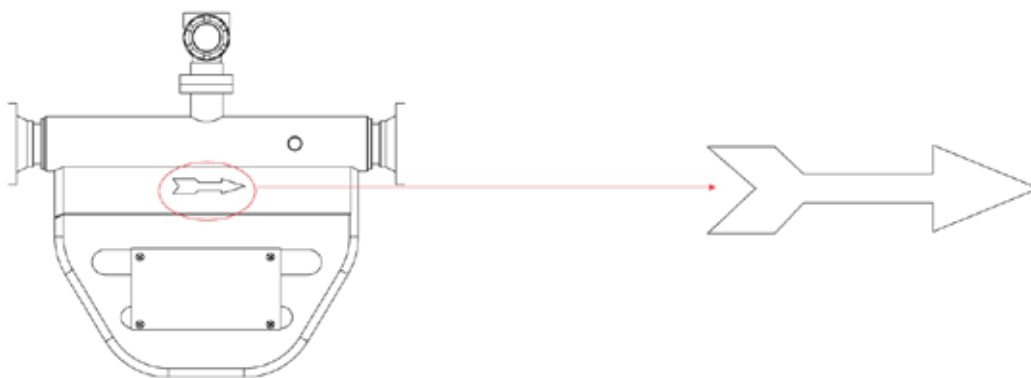


Avoid direct installation at the sensor side as this can cause measurement errors.

For installing 6" or larger size flowmeter, support the sensors using the rubber connectors as the buffer.



### 3.2.3 Flow Direction

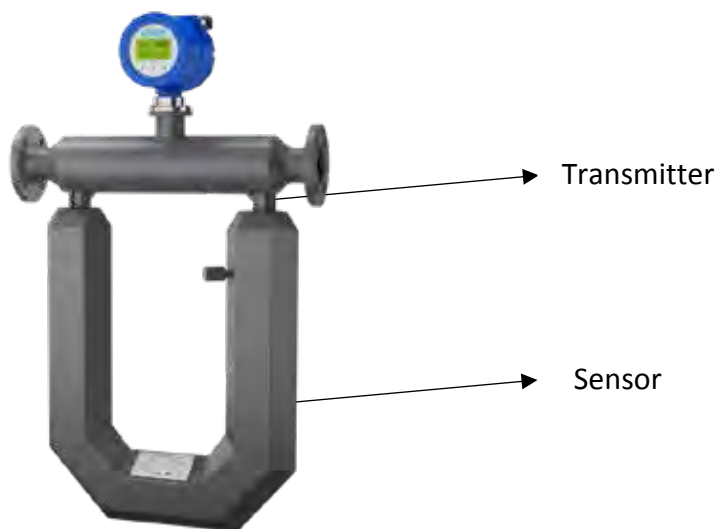


The flow arrow in front of the flowmeter indicates the direction of flow, so install the Tek-Cor 1100A accordingly. Otherwise, the transmitter may not display the mass flow accurately. If the process medium is liquid or slurry, the flow direction is down-to-up; if the process medium is gas, the flow direction can be either down-to-up or up-to-down.

### 3.3 Mounting

There are 2 types of mounting that can be done on Tek-Cor 1100A Coriolis Mass Flowmeter:

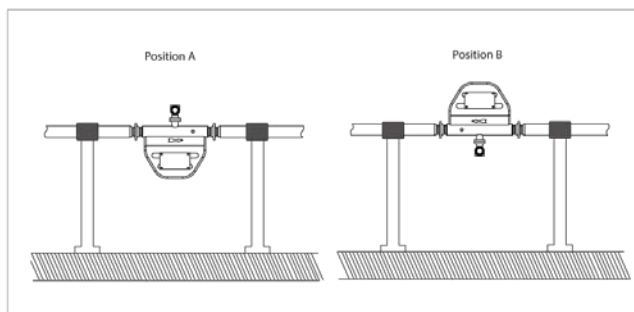
1. Sensor Mounting
2. Transmitter Mounting



### 3.3.1 Sensor Mounting

If the medium contains solid particles, mount the meter as shown in Position A, and in all other cases mount the meter as shown in Position B. Vertical Mounting would be the recommended, if the medium contains gas bubbles and solid particles.

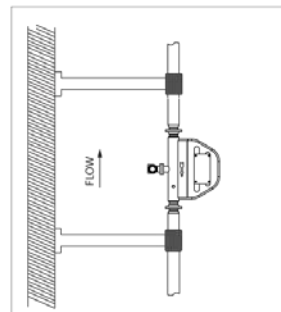
Micro-bend Shaped Mounting



Liquid

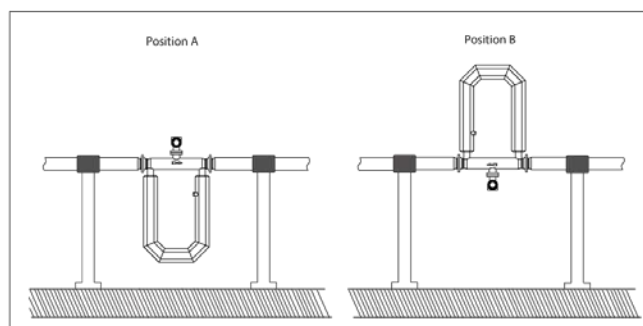
Gas

Recommended Horizontal Installation



Vertical Mounting

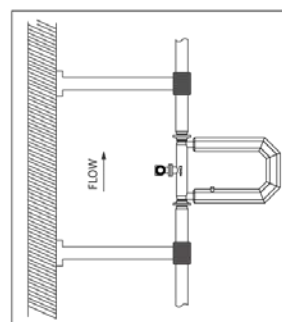
U-Shaped Mounting



Liquid

Gas

Recommended Horizontal Installation



Vertical Mounting

### 3.3.2 Transmitter Mounting

The Tek-Cor 1100A can be mounted directly or remotely with the help of a nine-core cable.



Install the sensor and the transmitter in the pipeline. The transmitter can be mounted with 90° rotation according to the requirement of sensor installation as shown in the picture above.

### 3.4 Wiring

#### 3.4.1 Basic Requirements

If the sensor of the Tek-Cor 1100A Coriolis Mass Flowmeter is installed integrally with the transmitter, it is easy to power up the transmitter. If the sensor of Tek-Cor 1100A is installed separately from the transmitter then the transmitter is connected with the sensor through special nine-core cable.

#### 3.4.2 Junction Box

If the sensor and the transmitter are installed separately, ensure that the sensor and transmitter have been respectively matched with junction box for connecting the special nine-core cable.



#### **CAUTION**

---

Cut off power before connecting the cables. The power input voltage must match the voltage specified in the junction box of the transmitter. The earth connector must be well connected with earth wire to ensure its intrinsic safety performance.

---

### 3.4.3 Cable Connection

A nine-core cable is used when the sensor and the transmitter are connected separately. The following picture shows a nine-core cable.

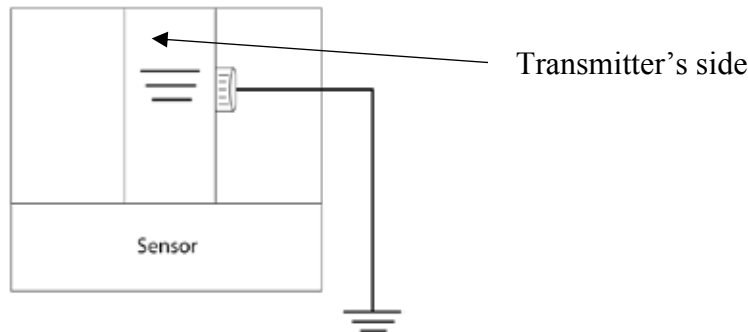


| Line No. | Line Colour | Function                 |
|----------|-------------|--------------------------|
| 1        | Brown       | Left coil +              |
| 2        | Red         | Left coil -              |
| 3        | Orange      | Right coil +             |
| 4        | Yellow      | Right coil -             |
| 5        | Green       | Driving coil +           |
| 6        | Blue        | Driving coil -           |
| 7        | Gray        | Temperature +            |
| 8        | White       | Temperature -            |
| 9        | Black       | Temperature compensation |

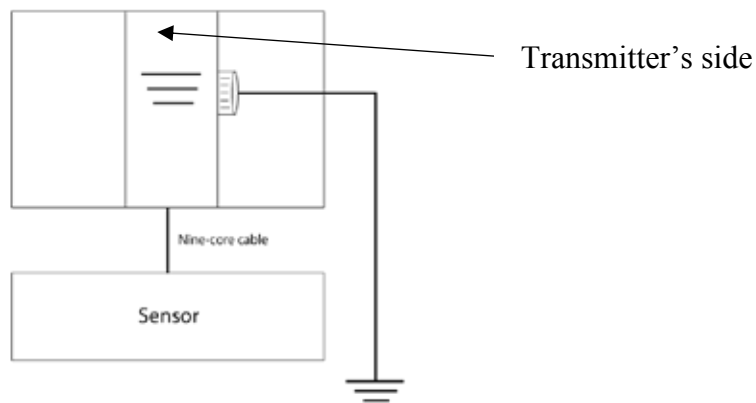
### 3.4.4 Earthing

The sensor and the transmitter must be earthed correctly, otherwise there can be a measurement error and the sensor may not work. If the pipeline is connected to the ground, the transmitter can be earthed through the pipeline; if the pipeline is not connected with the ground, the transmitter should be earthed independently. The grounding terminal is provided at the external part of the transmitter and must be grounded when put into service.

For direct mounting, protective earth terminal is connected as shown below:



For remote mounting, protective earth terminal is connected as shown below:



### 3.4.5 Power Line Wiring

The transmitter can be supplied with 18 to 28 VDC (standard) or 85 to 220 VAC (optional). The power line more than 0.00124 in<sup>2</sup> (0.8 mm<sup>2</sup>) is recommended and the maximum length of power line should be 985 ft. (300 m). For Tek-Cor 1100A of size 6" (DN150 mm) or larger, the drive-amplifier needs to be supplied with separate power.

## 4 Electrical Connections

### 4.1 Basic Requirement

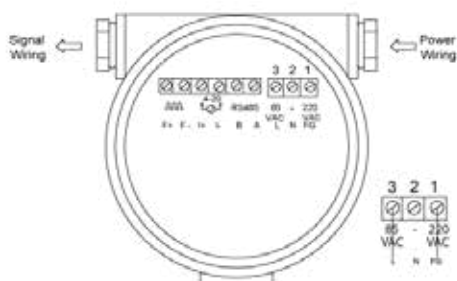
The transmitter can be connected to the AC or the DC power.

|               |  |
|---------------|--|
| 85 to 220 VAC | Power consumption: Normal 10 W, Maximum 15 W |
| 18 to 28 VDC  | Power consumption: Normal 10 W, Maximum 15 W |

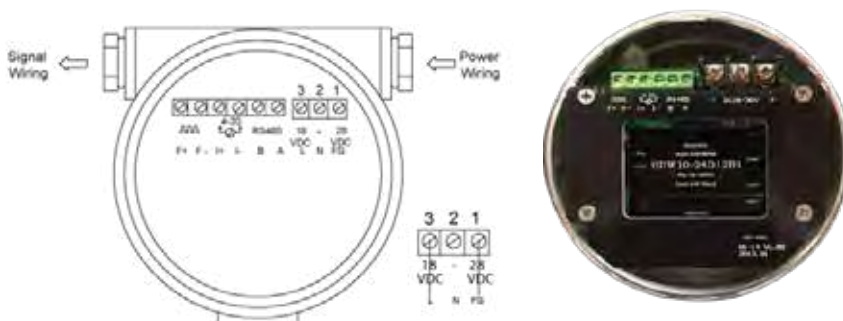
### 4.2 Power Cable

The power cable should be a two-core cable and 20-gauge minimum. The maximum length of the power cable is 985 ft. (300 m).

#### AC Power Wiring



#### DC Power Wiring





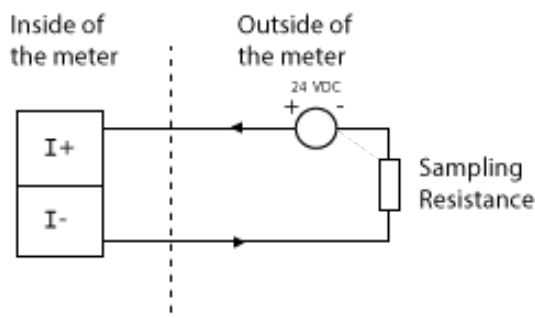
### 4.3 Current Output Wiring

- 4-20 mA output can be configured to display mass flow, volume flow, density or water ratio.
- The cable should be two-core cable and 24-gauge minimum.
- The factory default current output is passive current output.



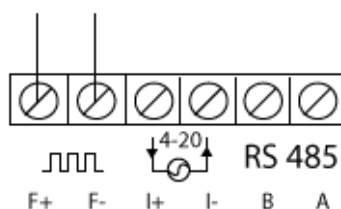
#### Current Output Wiring

The outer wiring of passive current output is as the figure show below:



### 4.4 Pulse Output Wiring

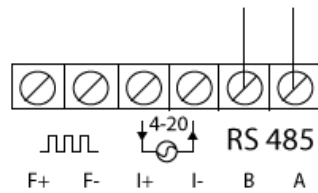
- Active pulse output can be configured to mass flow, volume flow, density or water ratio.
- The cable should be two-core cable and 24-gauge minimum. The maximum length of output line is 492 ft. (150 m).



#### Pulse Output Wiring

#### 4.5 RS 485 Output Wiring

RS 485 output is compatible to RTU mode of MODBUS protocol. The maximum length of output line is 985 ft. (300 m).



#### RS 485 Output Wiring

## 5 Operation

This section covers operation techniques and guidelines.

Data setting can be done by HART-Communication or with the 3 keys on the front panel. The following section describes how to use the three panel keys.

### 5.1 Display

Components of Tek-Cor 1100A display:

- LED with 2-line indication
- 3 photoelectric keys



Use the operation panel of the transmitter to set the configuration parameters such as the zero calibration, cut-off value of low flow and output range of current frequency, etc.



| No. | Notes                               |
|-----|-------------------------------------|
| 1   | E key: enter                        |
| 2   | → key: move cursor or return        |
| 3   | ↓ key: Page down                    |
| 4   | Light indication for working status |
| 5   | Two line LED display                |

| Key      | Measurement State   | Menu State  | Function State                | Data State   |
|----------|---|---|-------------------------------|--|
| <b>E</b> | Show the Measurement Results and State on Page1/2/3. Page Down to Menu State. | Next Menu   | Select Function               | <ul style="list-style-type: none"> <li>• Change Number</li> <li>• Change Unit</li> <li>• Change Character</li> </ul> |
| <b>→</b> | Return to the Previous Screen   | Return to the Upper-Level Menu. Press this Key to Return to the Measurement State | Select Function               | Move the Cursor to the Right   |
| <b>↓</b> |   | Enter the Menu  | Confirm and Save the Function | Save the Input, then Go Back to the Function Menu  |



**NOTE**

- Operation point of the photoelectric key is located right behind the glass panel.
- It is better to operate the photoelectric key in vertical direction, rather than horizontal direction.

## 5.2 Configuration Parameter

Review or set the configuration parameters according to the following indications

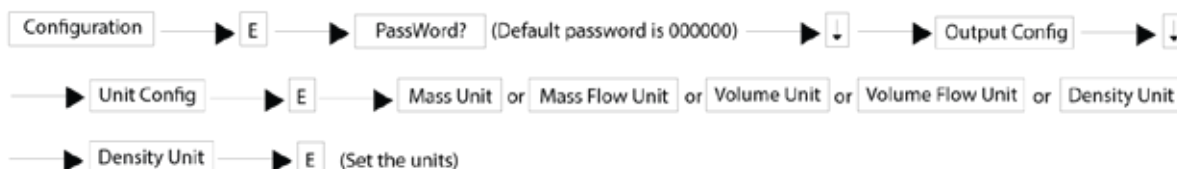
(Press ↓ to go to the next page and press → to move the position of cursor)



### WARNING

If you forget your password, you must call a Tek-Trol engineer to reset it.

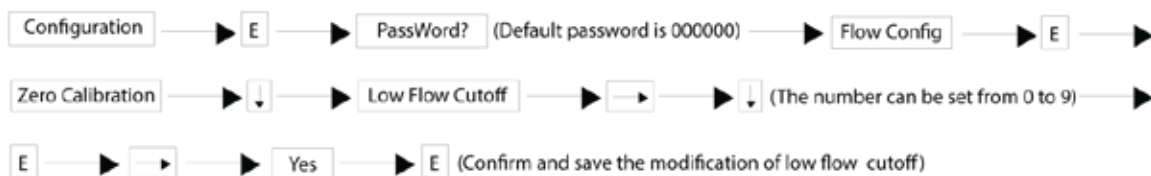
### 5.2.1 Measuring Unit



### 5.2.2 Reset Totalizer



### 5.2.3 Low Flow Cut-off



### 5.2.4 Current Output

- Set the Flow Rate for 20 mA

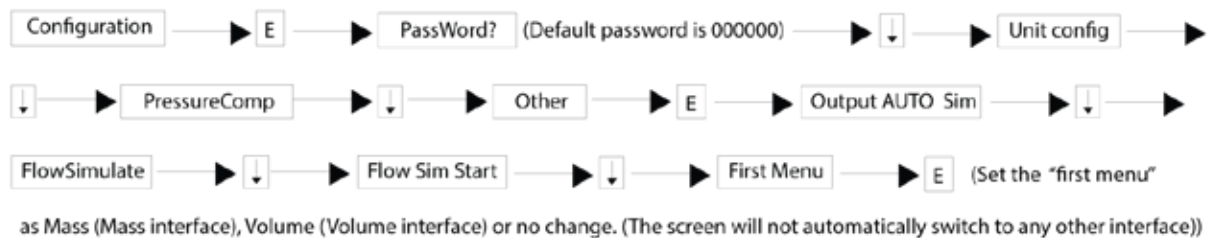


- Configuration → E → PassWord? (Default password is 000000) → ↓ → Output config → E → Pulse Weight → ↓ → Pulse Output → ↓ → 20mA Value → Current Output
- E (Choose the current output as mass flow (Default), volume flow, density or water content)

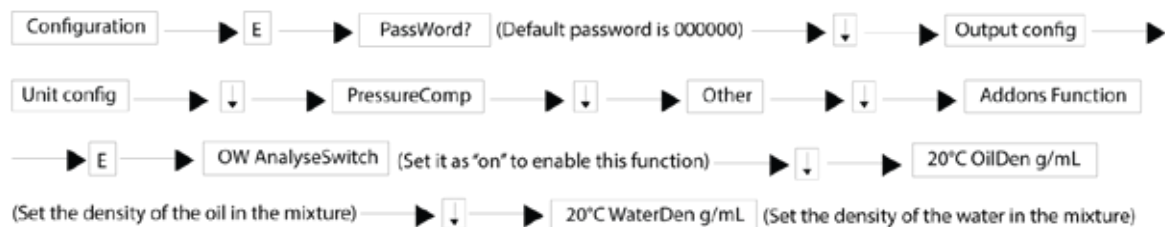
- Set Pulse Equivalent



The screen automatically displays the content chosen in “First menu” if no key operation is being done for 128 seconds.



### 5.2.8 Oil and Water Content Analysis



### 5.2.9 Zero Calibration



### 5.3 Calibration

The Tek-Cor 1100A Coriolis Mass Flowmeter does not need field calibration because it is calibrated before delivery. Each Tek-Cor 1100A has its own instrumental coefficient, including one flow coefficient and four density coefficients, which are high density D1, high period K1, low density D2, and low period K2. These are present on the sensor. The direct mount instrument comes preset with the instrument coefficients and the user cannot change this.

#### 5.3.1 Zero Calibration

Zero calibration provides the reference point for the flowmeter. It is necessary to conduct zero calibration whenever the Coriolis Mass Flowmeter installation is performed.

For zero calibration, perform the following steps after installation-

1. Warm-up the flowmeter for 30 minutes.
2. After the warm-up time is complete, continue the flow through the flowmeter till the temperature of the flowmeter is same as the working temperature of the fluid.
3. After the flowmeter has reached the required temperature, close the downstream valve and make the fluid pass through the flowmeter under normal temperature, density, and pressure and then close the upstream valve to ensure that the sensor is full of liquid during the process of zero calibration.
4. Do the zero calibration of the flowmeter.



#### NOTE

Each zero calibration takes 30 seconds and must be repeated at least 10 times.

#### 5.3.2 Flow Calibration

The mass measured by Tek-Cor 1100A is calculated from the multiplication of the detected signals' time difference between two circuits and flow calibration factor. If the accuracy is not up to grade after long-term service, modify the flow calibration factor according to the following formula:

$$K_1 = K_0 \times \left(1 + \frac{(M - M_t)}{M_t}\right)$$

$$K_1 = K_0 \times \frac{M}{M_t}$$

where,

K1 = New flow calibration factor

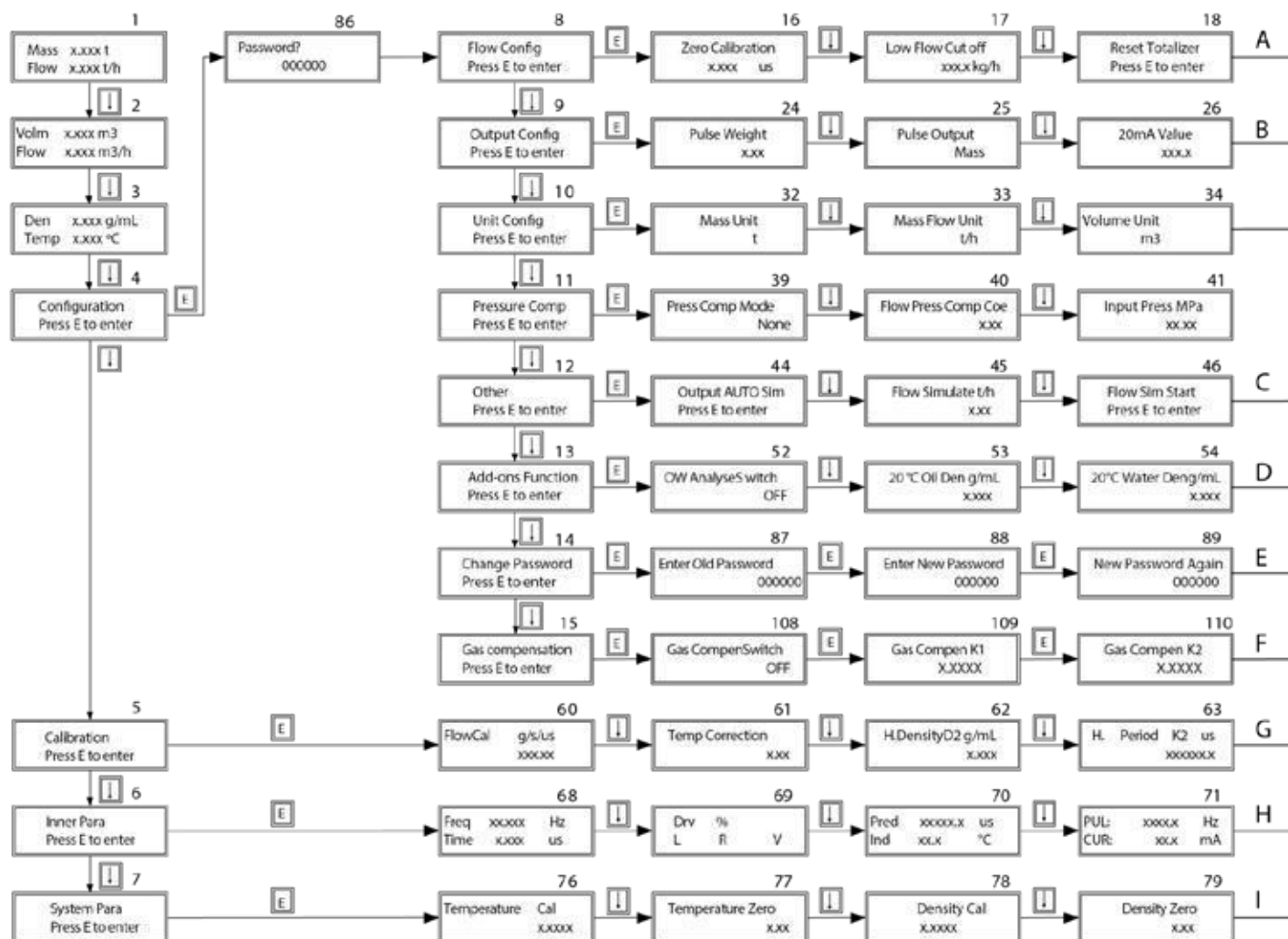
K0 = Old flow calibration factor

M = Total mass flow of the mass flowmeter

Mt = Total mass flow of tested flowmeter



## 5.4 Menu Tree





## 6 Pressure Loss

Pressure loss in Tek-Cor 1100A Coriolis Mass Flowmeter can be checked on the following Pressure Loss Charts (including pressure loss, flow, and viscosity parameters). When the viscosity is between two adjacent pressure loss lines, the pressure loss can be calculated with following formula:

$$\Delta P = \Delta P_1 + \frac{\Delta P_2 - \Delta P_1}{\mu_2 - \mu_1} \times (\mu - \mu_1)$$

$\Delta P_1$  = Pressure at the upstream side

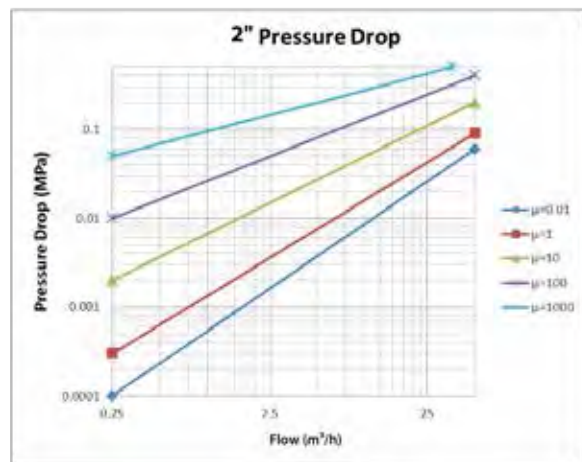
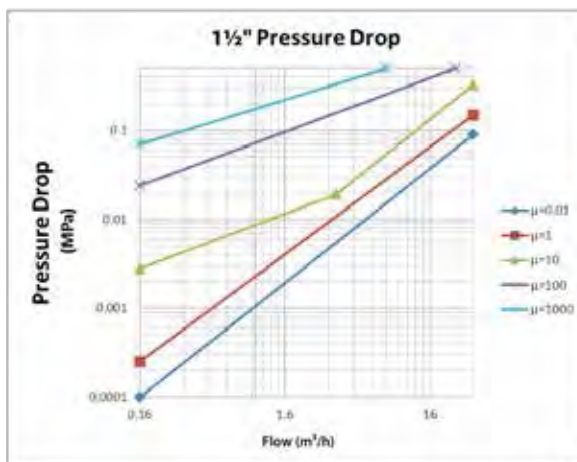
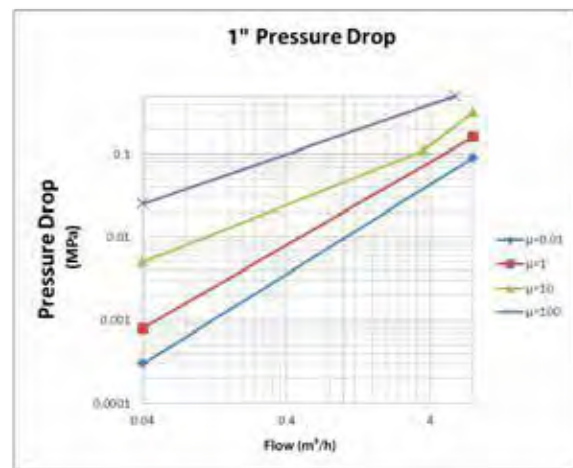
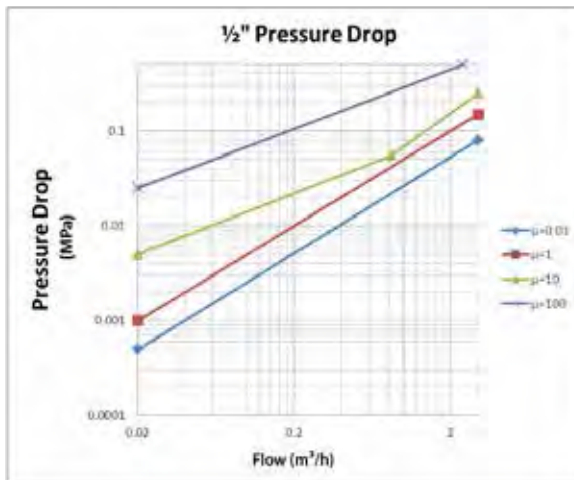
$\Delta P_2$  = Pressure at the downstream side

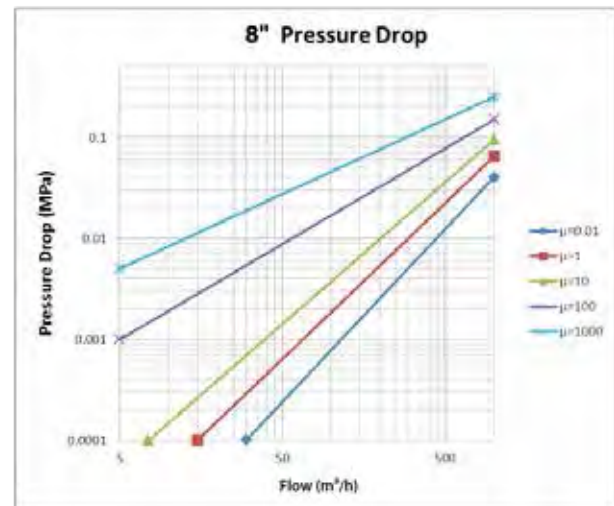
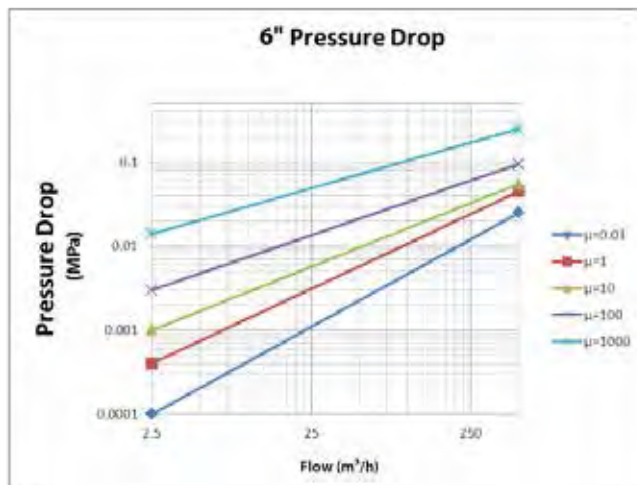
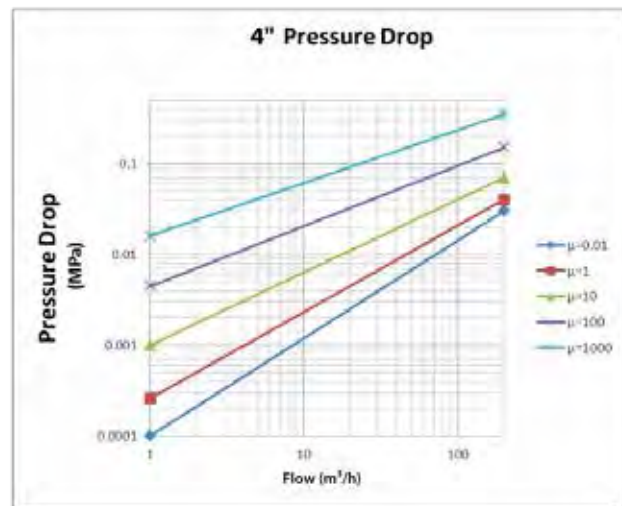
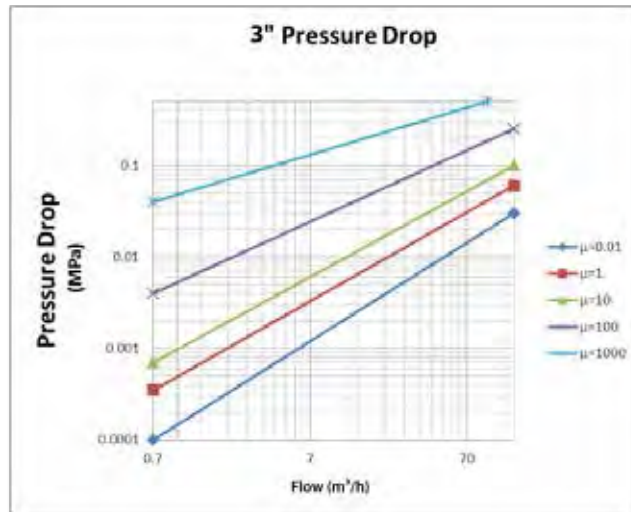
$\Delta P$  = Total differential pressure

$\Delta \mu_1$  = viscosity at the upstream side

$\Delta \mu_2$  = viscosity at the downstream side

Following is the pressure loss chart for different flowmeter sizes:





## 7 Troubleshooting

This section provides troubleshooting techniques for most common operating problems.

### 7.1 Diagnostic Tool

You can detect the fault in the flowmeter with the help of the LED indicator and LCD displays. Different colours of the LED lights indicate the working condition of the flowmeter, while the LCD displays shows the self-diagnostic error indication of the transmitter, which is useful for detecting malfunctions.

| LED Indication | Working Condition |
|----------------|-------------------|
| Green light    | Normal operation  |
| Red light      | Error             |

In addition, use handheld digital multi-meter when testing the static resistance values and cables of the sensor.

### 7.2 Checking the Sensor Connection

When testing a malfunction of the flowmeter, first test the coils resistance according to the Table below and check if their values are within the normal range.

| Loop        | Line Color     | Sensor Port | Normal Resistance Range |
|-------------|----------------|-------------|-------------------------|
| Left Coil   | Brown, Red     | 1,2         | (60-75) $\Omega$        |
| Right Coil  | Orange, Yellow | 3,4         | (60-75) $\Omega$        |
| Drive Coil  | Blue, Green    | 5,6         | (6-30) $\Omega$         |
| Temperature | Gray, White    | 7,8         | (75-175) $\Omega$       |
| Temperature | Gray, Black    | 7,9         | (75-175) $\Omega$       |