# Technical Information Manual

## Series 6600 – Oscillating Piston Flowmeter

Flowmeter suited for high precision measurement with rugged design and easily configurable transmitter

**Applications**

- Custody Transfer
- Line metering
- Batching
- Precision dosing at ultra-low flowrates
- Fuel dispensing
- Viscous product measurement
- Loading and Unloading products

**Device Properties**

- Flow range: 3 LPH to 120,000 LPH
- Measured error: 0.1%
- Medium temperature: -45 to 150 deg C
- Nominal Diameter – DN6 to 100
- Remote display available
- Backlight display with key and data output protocols
- ATEX IECEx approved
- Two wire system compatible
- IEC 61326 certified electronics

**Your benefits**

- Industry leading accuracy of 0.1%
- Repeatability of better than 0.02%
- Space saving installation – no straight lengths needed
- No metal-to-metal contact
- Performance unaffected by turbulent flow
- Suitable for measurement of the most corrosive liquids
- The lowest pressure drop in a Positive Displacement flowmeter – 0.1 kg/cm$^2$
- Easy-to-use UI with Backlight enabled LCD
- Built-in strainer for protection

FLUIDYNE
S.No. 79/2, Plot No. 12,
Near Agarwal Godown,
Shivane
Pune, Maharashtra 411023.
India

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# 1. Revision History

| Versions | Release Date | Description | Author | Approver | Remark |
|---|---|---|---|---|---|
| **1** | 03 April 2022 | Operation, spares and service of the flowmeter with instructions and do's and don'ts | Shubhankar M | Shivdas M | |
| **2** | 15 May 2023 | New settings of DOPPoint, Velocity unit and Velocity screen added | Pratik S | Shubhankar M | View section 9.3 to for updated part |
| **3** | 15 Mar 2024 | Settings of battery powered dual display added | Pratik S | Shubhankar M | View section 10 for updated part |
| **4** | 30 Aug 2024 | Two wire system details | Ganesh S | Shubhankar M | |
| **5** | 14 Apr 2026 | ATEX-IECEx related details added in section 4 and 14-15 + labeling plate + specific conditions of use Changed doc name to Fluidyne/SAL/F/13/6600 | Ganesh S, Akshay D, Sai Prashad | Shubhankar M | |

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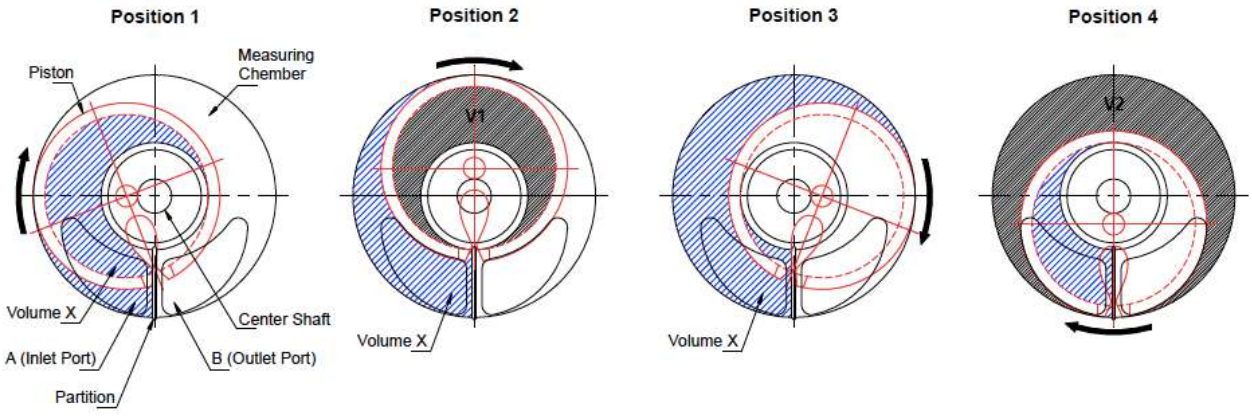
## 2. Measurement principle

The Positive Displacement principle is the only accurate method of flow measurement due to its direct measurement of volume. Volume is not inferred from velocity of liquid of mass flow rates as in inferential meters.

The Positive Displacement principle works by continuously separating the flow stream into discrete volumetric segments and precisely measuring this volume in a calibrated measurement chamber. The Fluidyne PD meter is based on the time-tested and robust oscillating piston mechanism. In this mechanism, the piston is the only moving part which displaces calibrated volume of liquid from meter inlet to outlet in every rotation. The movement of the piston is recorded by magnetic pickup coils and thus a number of movements are equal to the actual measured volume by multiplying movements with calibrated volume displaced.

The calibrated volume is a nearly constant value for a every size of PD meter Fluidyne manufactures. This correlation of piston movement to the calibrated volume is the calibration factor or 'k factor' which is adjusted as per the liquid to be measured by the flowmeter.

As per below diagram, **k factor = (V1+ V2) ml**
**Total volume in flow stream = k factor * number of oscillations of piston**




- High Inlet pressure condition fills the Piston Inner cavity V1 which drives the piston in the direction of the arrow
- Volume X outside the Piston starts expanding

- The Piston Inner space V1 is completed filled and sealed off
- Due to the high pressure at the Inlet Piston continues to rotate in the direction of the arrow
- Volume X has further expanded

- Piston continues to move in the direction of the arrow
- Volume X further expands
- Piston inner cavity V1 connects with the Outlet causing the Volume V1 to flow out through the outlet

- Volume X fully expands to volume V2 and is sealed
- Liquid filling into the Piston inner cavity rotates the piston in the same direction
- As the Piston moves ahead showed in Position 1, Volume V2 connects with the Outlet
- For One revolution of the piston Volume V1+V2 is displaced from Inlet to the Outlet

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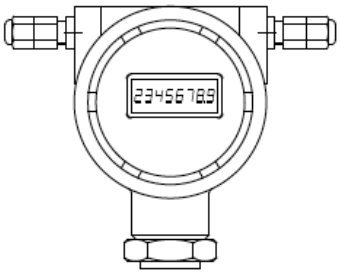
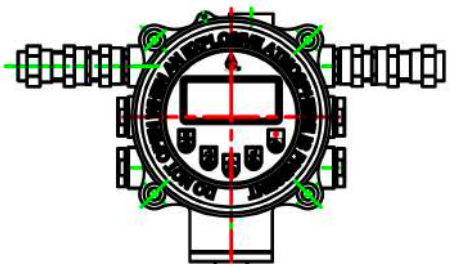
## 3. Measurement System

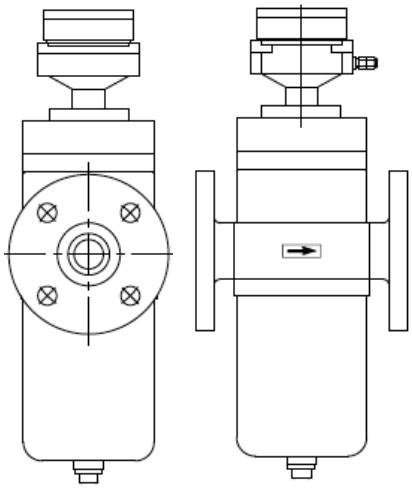
The measuring system consists of a sensor and transmitter. The transmitter and sensor form a mechanical unit.

**Transmitter**

| | |
|---|---|
|  | **Powered transmitter**<br>**Device materials**<br>- Die cast Aluminium LM06<br>- ASTM A351 CF3M 316L (option)<br><br>**Window material**<br>- Cast, stainless: glass<br><br>**Specifications**<br>- Cable entries – 2 nos M20 x1.5<br>- Rating – Ex db IIC Gb T6 IP66/68 (option)<br>- PESO approved<br>- Capacitive touch keys<br>- Dual compartment with terminal box<br>- 4-20 mA, Modbus, pulse output, 2xDI, 2xDO available<br>- LCD with backlight<br>- AC supply – 86-260 VAC 50 Hz/60 Hz, DC supply – 18-40 VDC<br>- Two wire 24 VDC HART (optional) |
|  | **Powered transmitter**<br>**Device materials**<br>- Die cast Aluminium LM06<br>- ASTM A351 CF3M 316L (option)<br><br>**Window material**<br>- Cast, stainless: glass<br><br>**Specifications**<br>- Cable entries – M20 x1.5<br>- Rating – Ex db IIC Gb T6, Ex tb IIIC T85 Db<br>- IP66, 68<br>- ATEX/IECEx/UKEx/PESO approvals<br>- Ambient temperature - -20 deg C to +60 deg C<br>- Capacitive touch keys<br>- Dual compartment with terminal box<br>- 4-20 mA, Modbus, pulse output, 2xDI, 2xDO available<br>- LCD with backlight |

| | |
|---|---|
| | - AC supply – 86-260 VAC 50 Hz/60 Hz, DC supply – 18-40 VDC<br>- Two wire 24 VDC 4-20 mA with HART (optional) |

**Sensor**

| | |
|---|---|
|  | **Material of Construction**<br>- Aluminum LM04 (EN1559, BS1490)<br>- Stainless Steel 316L (ASTM A351 Gr CF3M<br>- Special materials available on request<br><br>**Process connections**<br>- ANSI flanges upto 300 psi rating<br>- Triclamp<br>- BSP/NPT female<br>- Special connection available on request<br><br>**Advantages**<br>- Low pressure drops due to single rotor<br>- Measurement of volumetric flow and mass flow<br>- Immune to process influences and pipe bends<br>- Nominal diameter from DN6 to DN100 (1/4” to 4”)<br>- **Built-in 149 or 100 micron pre-filter (washable and reusable)** |

# 4. Explosion Protection (Ex d) section

Applicable to integral mount and remote mount Series 6500 Advanced Flow Computer XXX. Where XXX – STD/BTC/CT2 transmitter variant.

⚠ **WARNING – EXPLOSION HAZARD**

This equipment is certified for use in hazardous areas under **flameproof protection (Ex d)**.

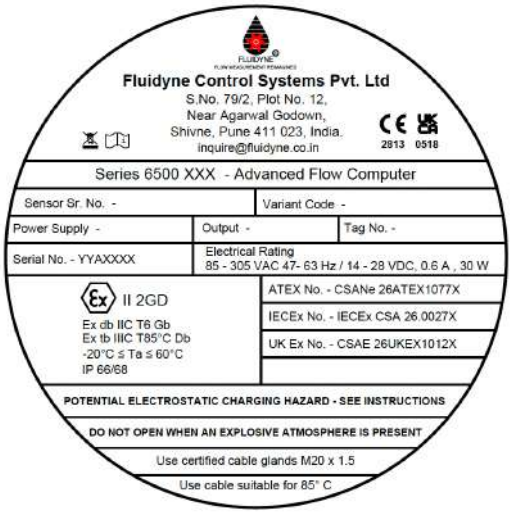
Failure to follow these instructions may:

- Result in ignition of explosive atmosphere
- Lead to serious injury or fatality
- Invalidate ATEX / IECEx/ UKEx certification

The flameproof enclosures come with specific conditions of use

i. This equipment is designed for use in an ambient temperature range of -20 °C to +60 °C
ii. Flameproof joints shall not be repaired, as this may compromise the integrity of the type of protection.
iii. Fasteners shall have a minimum yield strength of 450 MPa and shall comply with property class A2-70.
iv. Before installation, all cable entry openings shall be fitted with IECEx/ATEX certified Ex db IIC Gb and/or Ex tb IIIC Db cable glands or certified stopping plugs, rated minimum IP66 and IP68, suitable for the intended conditions of use, and correctly installed.
v. Each entry shall have no more than one thread adapter when an adapter is used. A blanking element shall not be used with an adapter.
vi. For Group III applications, the painted surface of the enclosure can accumulate electrostatic charge and may present an ignition hazard under conditions of low relative humidity (approximately below 30 %), particularly when the surface is clean and free from contaminants such as dust, dirt, or oil. Information regarding measures for the prevention of ignition resulting from electrostatic discharge is provided in IEC 60079-32-1. Any cleaning of the painted surface shall be carried out using a damp cloth only.

## 4.1 Equipment marking and certification


II 2GD

Ex db IIC T6 Gb

Ex tb IIIC T85°C Db

IP66 / IP68

–20°C ≤ Ta ≤ +60°C

Interpretation

| Parameter | Meaning |
|---|---|
| II 2GD | Suitable for Gas & Dust environments |
| Ex db | Flameproof enclosure protection |
| IIC | Suitable for hydrogen/acetylene (most severe gas group) |
| T6 | Max surface temp ≤ 85°C |
| Gb | Zone 1 (Gas) |
| IIIC | Conductive dust |
| Db | Zone 21 (Dust) |

## 4.2 Permitted area of use

**Gas atmospheres**

| Zone | Use |
|---|---|
| Zone 0 | ✗ Not permitted |
| Zone 1 | ✓ Permitted |
| Zone 2 | ✓ Permitted |

**Dust atmospheres**

| Zone | Use |
|---|---|
| Zone 20 | ✗ Not permitted |
| Zone 21 | ✓ Permitted |
| Zone 22 | ✓ Permitted |

## 4.3 Ambient conditions

- Ambient Temperature: **–20°C to +60°C**
- IP Protection: **IP66 / IP68 (**Depends on order specification)

⚠ Operation outside these limits may:

- Compromise flameproof integrity
- Invalidate certification

## 4.4 Flameproof enclosure design

This equipment uses **flameproof joints (Ex d)** to prevent ignition propagation

| Joint Type | Location | Requirement |
|---|---|---|
| Cylindrical spigot | Covers & body | Controlled gap |
| Threaded joints | Bushings, cable entries | ≥ 8 full threads engagement |
| Cemented joint | Glass window | - |

## 4.5 Mandatory Safety Instruction

Flameproof joints shall **not be repaired, machined, modified, or tampered with**.

### Additional Clarification:

- Any damaged enclosure or part → **replace only**

## 4.6 Cable Entries

⚠ **MANDATORY INSTALLATION CONDITION**

Before installation:

- All cable entries shall be fitted with:
  - Certified **Ex db IIC Gb / Ex tb IIIC Db glands or certified blanking plugs**
  - Minimum protection: **IP66 / IP68**
  - Size M20x1.5

*Rules:*

- Only **one adapter per entry**
- No blanking element with adapter
- Unused entries must be sealed

## 4.7 Electrostatic Hazard

⚠ **CAUTION – STATIC CHARGE RISK IN Group III applications**

- Painted enclosure may accumulate charge
- Risk increases at humidity < 30%

**Cleaning:**

- Use **damp cloth only**
- Do NOT dry wipe

Reference standard: IEC 60079-32-1

## 4.8 Installation requirements

- Installation shall be done by **qualified personnel**
- Ensure:
  - Correct hazardous area classification
  - Proper earthing
  - All joints fully tightened with torque wrench to values specified below

| Fastener detail | Material | Location | Torque rating |
|---|---|---|---|
| Allen cap screws M8x25 (8 nos) | SS316 A4-70 to ISO 4762 | Body-Front Cover, Body-Rear cover | 28.8 Nm |
| Hex Bolt M6x20 (4 nos) | SS316 A4-70 to ISO 4762 | Transmitter body-sensor housing | 12.0 Nm |
| Allen cap screw M6x20 (4 nos) | SS316 A4-70 to ISO 4762 | Sensor housing-flange | 12.0 Nm |
| Earthing M8x12 (1nos) | SS316 A4-70 to ISO 4762 | Body (left side) | 28.8 Nm |

⚠️ **DO NOT OPEN ENCLOSURE PARTS WHEN ENERGIZED**

## 4.9 Operation

- Do not open enclosure in hazardous area
- Ensure IP integrity is maintained
- Ensure all fasteners are tightened

## 4.10 Maintenance

⚠️ **WARNING**

- Isolate power before opening
- Inspect:
  - Glands
  - Seals
  - Fasteners

👉 No field modification permitted

## 4.11 Prohibited actions

- Opening enclosure in hazardous area
- Using non-certified glands
- Modifying enclosure
- Using incorrect fasteners

# 5. Input

## 5.1 Measured variables - Direct

- Instantaneous volume
- Totalized volume

## 5.2 Measured variables – Calculated

- Instantaneous volume flow
- Instantaneous mass flow
- Instantaneous mass
- Totalized mass

## 5.3 Measuring Range

| Pipe size (mm) | Pipe size (inch) | Calibrated flow range (LPH) |
|---|---|---|
| 06 | 1/4 | 3-60 |
| 15 | 1/2 | 12-600 |
| 20 | 3/4 | 150-1500 |
| 25 | 1 | 240 - 3000 |
| 40 | 1.5 | 600 – 6000 |
| 50 | 2 | 1200 – 25,000 |
| 65 | 2.5 | 2400 – 36,000 |
| 80D or 100 | ¾ | 6000-120,000 |

## 5.4 Digital Inputs

| | |
|---|---|
| Function | Digital event input from PLC/supervisory systems |
| Max input value | 12 VDC pulse |
| Voltage drop | <= 2VDC |
| Output frequency | Upto 100 Hz |

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# 6. Outputs

## 6.1 Pulse output

| | |
|---|---|
| Function | Pulse output to DCS/PLC/BCUs |
| Version | Open Collector |
| Max output value | 12 VDC pulse (86-230 VAC supply)<br>24 VDC pulse (24-40 VDC supply) |
| Open Circuit voltage | 12 VDC pulse (86-230 VAC supply)<br>24 VDC pulse (24-40 VDC supply) |
| Voltage drop | <= 2VDC |
| Output frequency | Upto 100 Hz |

## 6.2 Digital Outputs

| | |
|---|---|
| Function | Digital outputs (signal isolated) |
| Max output value | 12 VDC pulse (86-230 VAC supply)<br>24 VDC pulse (24-40 VDC supply) |
| Open Circuit voltage | 12 VDC pulse (86-230 VAC supply)<br>24 VDC pulse (24-40 VDC supply) |
| Voltage drop | <= 2VDC |
| Output frequency | Upto 1000 Hz |

## 6.3 4-20 mA (4 wire and 2 wire)

| | |
|---|---|
| Signal Mode | Standard 4-20 mA |
| Signal translation | See min-max measuring range in section 4.3 |
| Maximum output value | 22 mA (alarm condition) |
| Open circuit voltage | 12 VDC |
| Load | 0 to 500 ohm |
| Resolution | 0.01 mA |
| Assigned variables | Volume flow, mass flow (dependent on selected mode) |

## 6.4 MODBUS with RS485

| | |
|---|---|
| Protocol | Modbus Applications Protocol Specification V1.1 |
| Mode | 32 bit floating point mode |
| Response times | Direct data access: typically 20-50 ms |
| Device type | Slave |
| Slave Address Range | 1 - 255 |
| Baud rates supported | 9600 BAUD<br>19200 BAUD<br>38400 BAUD<br>57600 BAUD<br>115200 BAUD |
| Data Transfer mode | RTU |
| Compatibility with earlier model | Fluidyne devices prior to 2021 have older version protocol with data distributed into 3 registers. Please check section 11 for more information on past Modbus implementation |

## 6.5 4-20 mA HART

| | |
|---|---|
| Version | HART 7.0 |
| Device discovery | Microcyber/Fluidyne |
| Supported functions | 0- Read unique device identification<br>1- Read primary variable units, primary variable values<br>2- Read the primary variable current value and percentage<br>9- Read device variables and status |
| Over range lower limit | 3.800 mA |
| Over range limit | 20.800 mA |
| Fault alarm (low current) | 3.70 mA |
| Fault alarm (high current) | 21.750 mA |

## 6.6 Foundation Fieldbus

| | |
|---|---|
| Version | H1 |
| Device discovery | Microcyber/Fluidyne |
| Function blocks supported | Multiple analog output<br>Integrator (Totalizer) |
| Speed | 31.25 kbit/s |

# 7. Power Supply and Connections

## 7.1 Supply Voltage

| Terminal Voltage | Frequency (Hz) |
|---|---|
| 85 – 275 VAC ±20% | 50/60 Hz |
| DC 14-28 V +-20% | - |
| DC 3.30 V +-5% (for battery powered app only | - |

## 7.2 Power Consumption

Transmitter – Max 3.5 W.

## 6.3 Current Consumption

Max – 180 mA (24 VDC Four wire)
Max – 150 mA (110 VAC 50/60 Hz, 230 VAC 50/60 Hz Four wire)
Battery powered application – Running current – 200 uA. Sleep current – 8 uA
Two wire system – 1.8 mA

## 7.3 Power supply failure

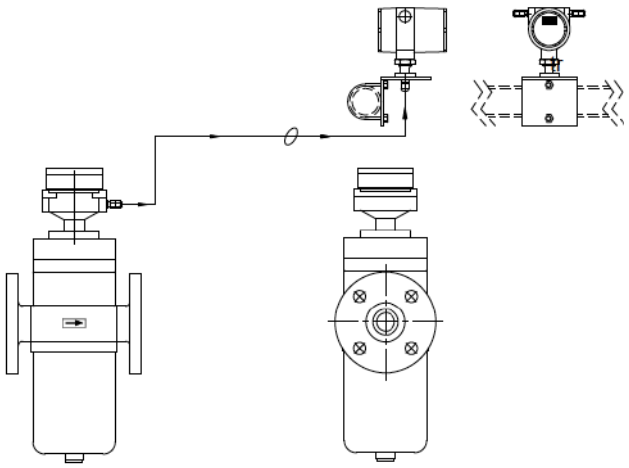
- Totalizers stop at last value measured
- Data is maintained in NV memory

## 7.4 Electromagnetic compatibility

The device is class A certified device as per emission and immunity norms stated in standard EN/IEC 61326, CISPR 11/AMD1/AMD2 and in conformance with EMC Directive 2014/30/EU .

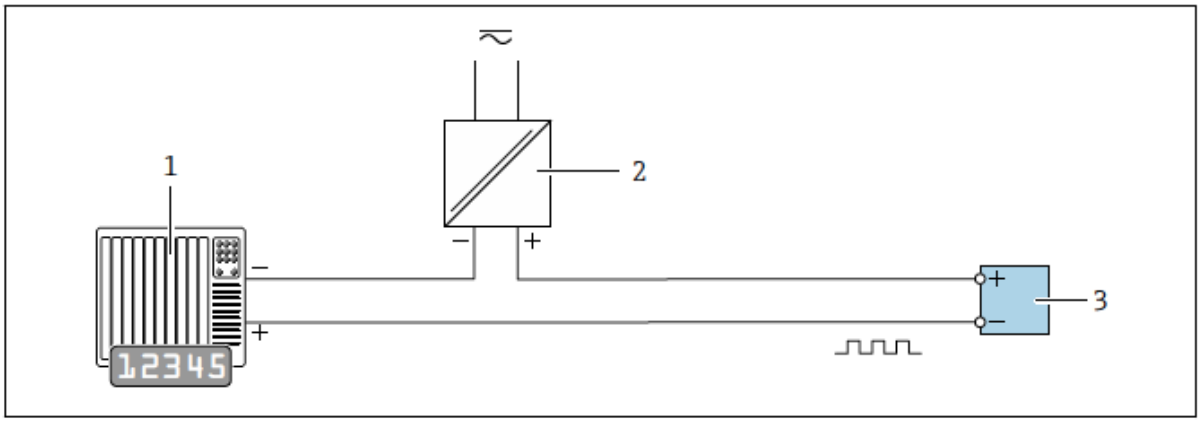
- Installed signal wiring should not be run together in same cable tray as AC power wiring.
- Fluidyne does not provide output cables
- Power supply cable to instrument recommended to be under 3 metre in length
- Device must be grounded and earthed at all times acc. to electrical codes and N-E voltage under 1V
- During application of EMI, flowrate and subsequent 4-20 mA output may vary upto 30% of m.v. and Fieldbus poll-response miss upto 35 nos

## 7.5 Connecting the remote placed transmitter to the sensor



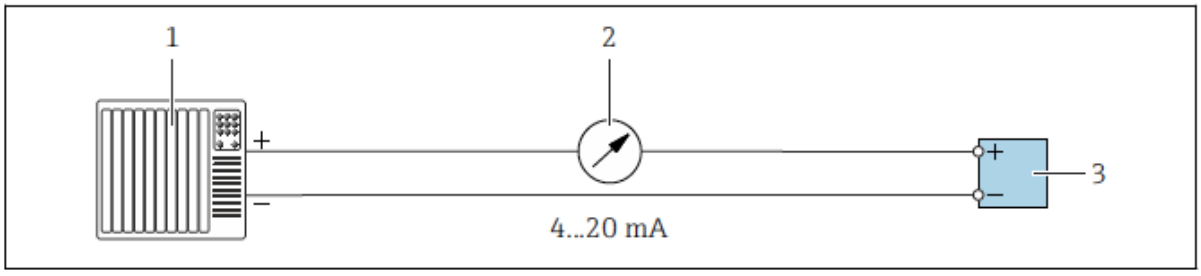
In this case the 6500 – Advanced Flow Computer is used as per order code configuration.

## 7.6 Connection for pulse output




1 – Automation system with pulse input with suitable frequency card (eg PLC/DCS)
2 – Power supply
3 – Transmitter

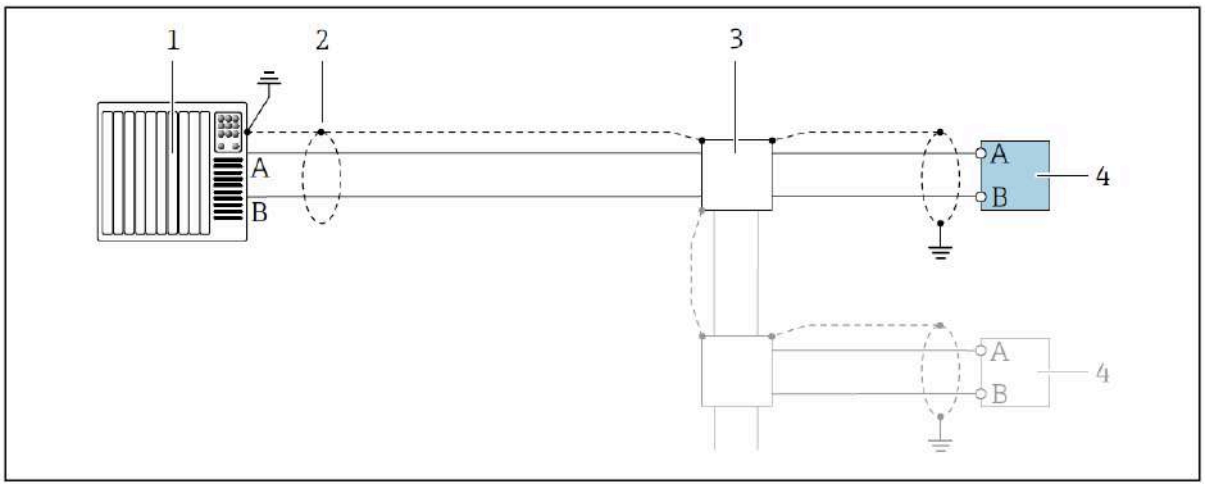
## 7.7 Connection for 4-20 mA loop




1 – Automation system with current input (eg PLC/DCS)

2 – Analog display unit
3 – Transmitter

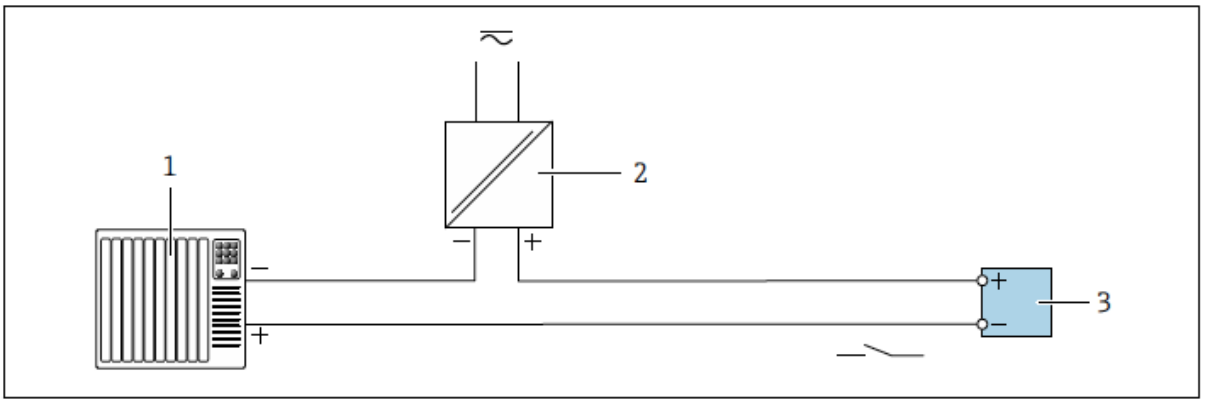
## 7.8 Connection for RS485-Modbus




Connection example for Modbus RS485 in non-hazardous area and Zone 2

1 – Automation system (eg PLC/DCS)
2 – Cable shield provided. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
3 – Distribution box
4 – Transmitter

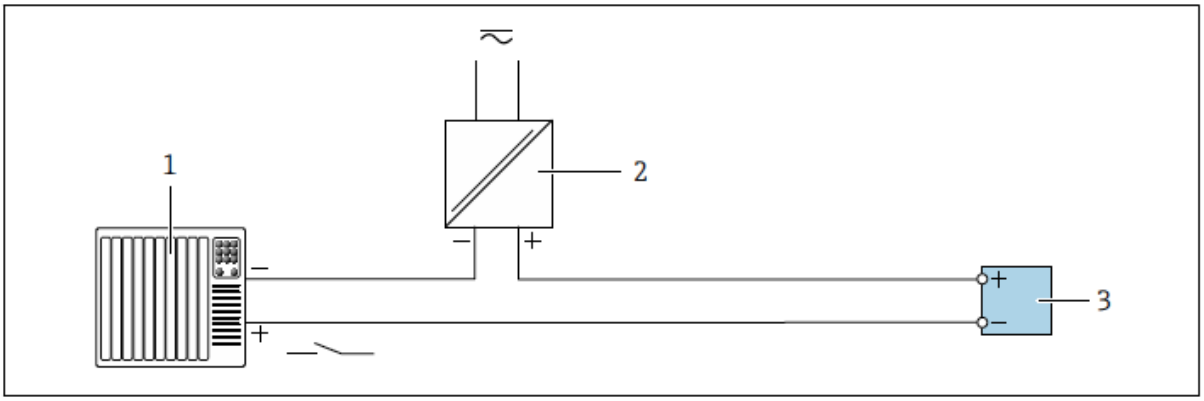
## 7.9 Connection for Digital Output(s)




1 – Automation system with switch input (eg PLC/DCS)
2 – Power supply
3 – Transmitter (Values given in 5.2)

**Note – Output is transistor NPN type**

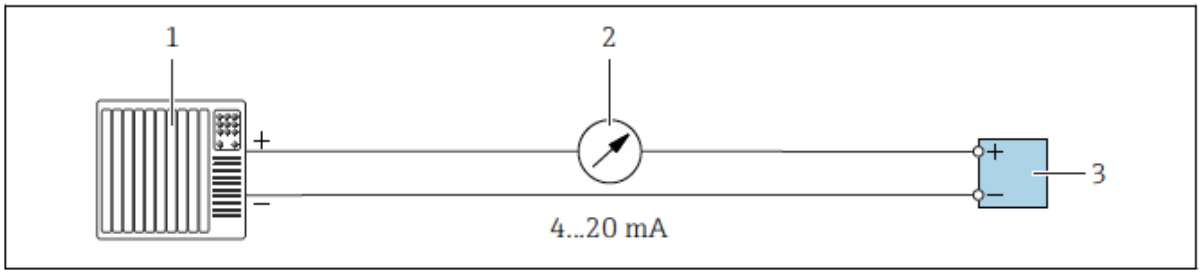
## 7.10 Connection for Digital Input(s)




1 – Automation system with digital output (eg PLC/DCS)
2 – Power supply
3 – Transmitter (Values given in 4.3)

**Note – Transistor or Potential Free input can be given**

## 7.11 Connection for Two wire system – 4-20 mA or 4-20 mA HART




1 – Automation system with digital output (eg PLC/DCS)
2 – Power supply
3 – Transmitter (Values given in 4.3)

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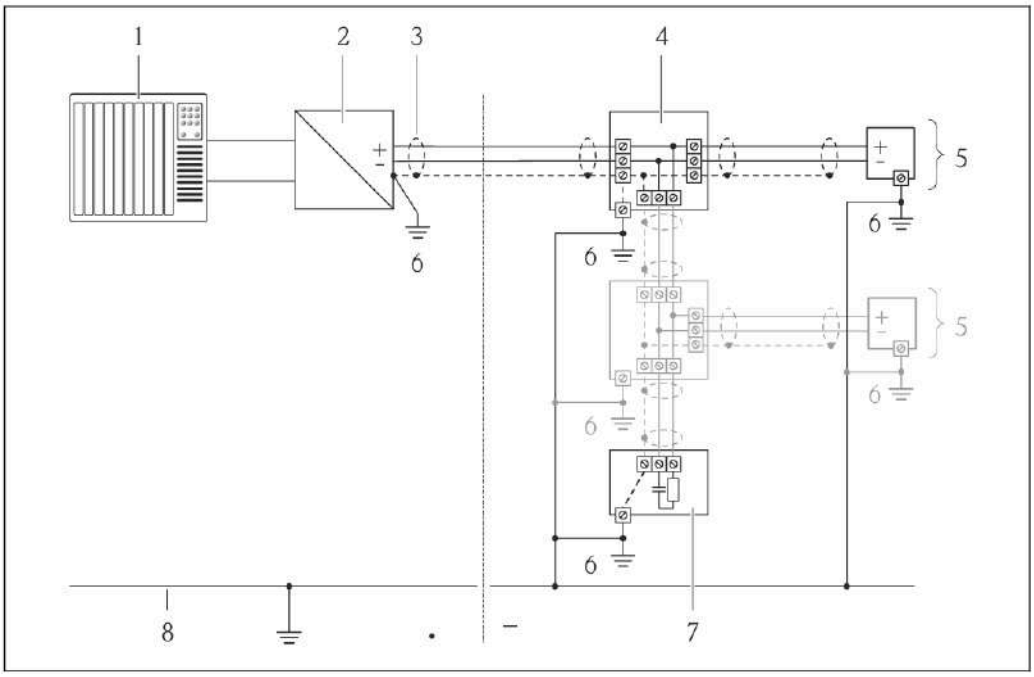
## 7.12 Connection for Foundation Fieldbus system two wire H1




1 – Controller (PLC)
2 – Power conditioner (FF Bus)
3 – Cable shield
4 – Junction Box
5 – Fluidyne Flowmeter
6 – Local grounding
7 – Bus terminator
8 – Potential matching line

## 8. Electrical Terminal Connections

L/24 V, N/GND, EARTH – Either use 24 VDC or 85-275 VAC supply based on order code and device nameplate detail.

4-20 mA – I and GND signify +ve and -ve terminal for loop

Factory bus – Used for direct calibration with sensor output (do not use without Fluidyne approval)

RLY 1, RLY 2 – P and NO terminals provided (potential free)

**Caution: Do not disconnect the FRC connector J6 from the terminal card.**

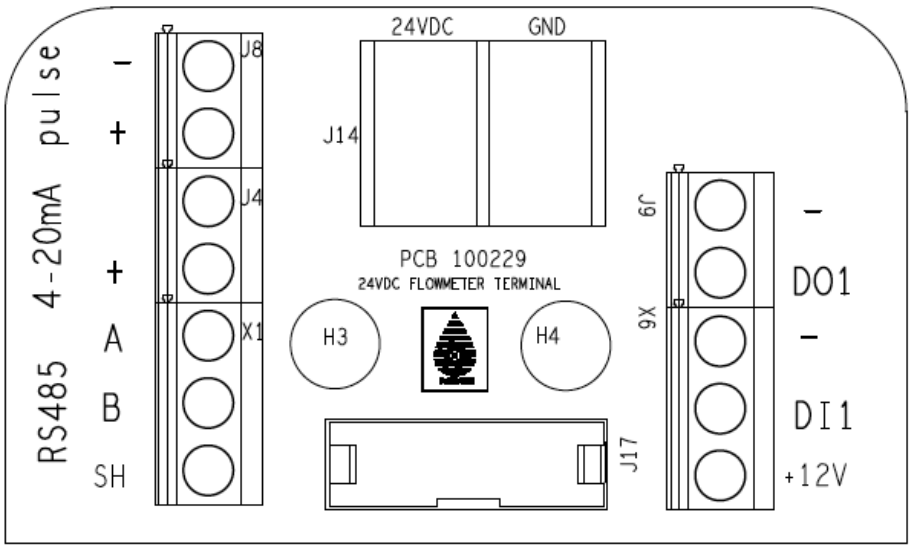
**DO NOT feed AC supply to DC configured transmitter.**

**Cable recommendation**

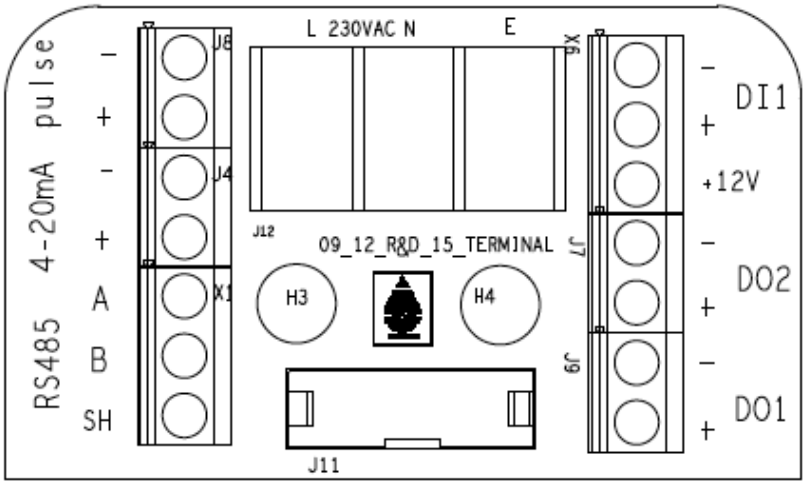
For RS485 and 4-20 mA connectors please use shielded twisted pair with earthing shield cable. 18 AWG or 0.82 $mm^2$ cable is preferred. All conductors to be copper material only.

For Supply and Relay connections please use 14 AWG or 2.1 $mm^2$ type cable. For earth use copper conductor of 4 mm2. Fault current – 3 A max. Clearance time 3600 seconds

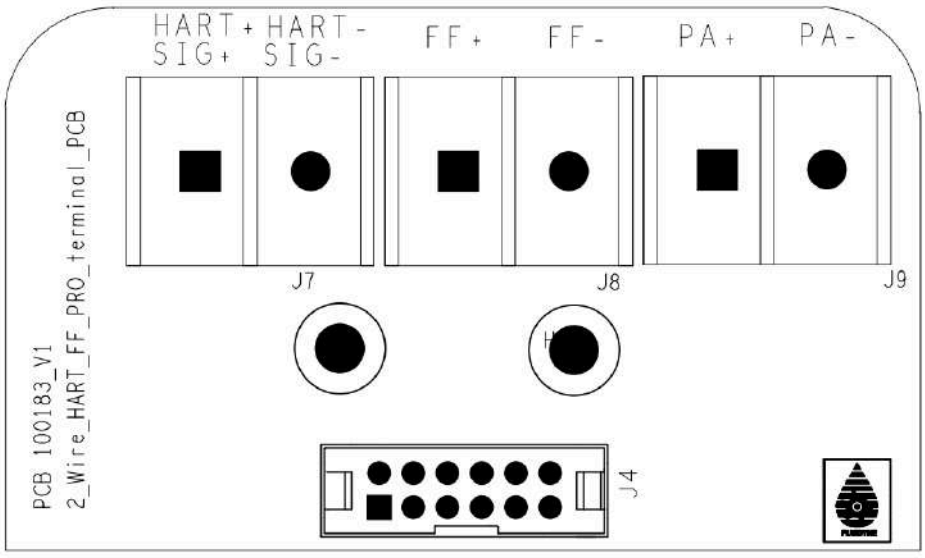
### 8.1 Four Wire transmitter with DC voltage



## 8.2 Four Wire transmitter with AC voltage




## 8.3 Two Wire transmitter




For 4-20 mA and HART options, connect the appropriate cable in SIG+/HART+, SIG-/HART-

For FF Bus H1, connect cables in FF+, FF-.

For Profibus H1, connect cables in PA+, PA-.

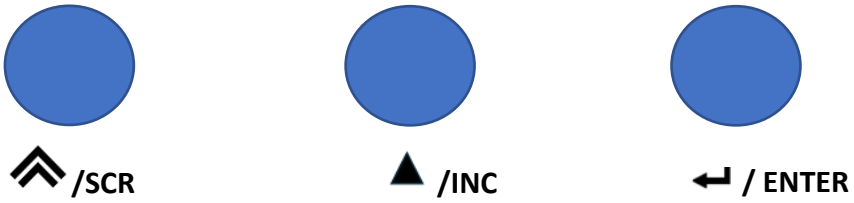
Cable sizes 18 AWG or 0.82 $mm^2$ cable is preferred.

**Caution: Do not disconnect the FRC connector J4 from the terminal card.**

# 9. Internal Device Settings – STD Transmitter (Four wire system)

## 9.1 Two wire system on older generation transmitter (Serial numbers prior to 26XXXX – prior to 2026)

- Keys are capacitive touch type and can be operated via glass directly
- Ensure hands are not covered with gloves and oil free for best experience




- Long press enter key for 5 seconds, the password screen comes up as below

| 0000 |
|---|

- Use the scroll key to move between digits and the INC key to change digit values or option.

### 9.1.1 General settings in device

- Enter 1105 password to access general setting.
- The first parameter shown is the **transmitter type.** If the customer has purchased 4-20 mA HART, the selection will show hArt screen whereas if it is std 2 wire 4-20 mA, it will show 420reG

**Note** – This parameter must not be changed without the prior intimation to Fluidyne personnel as applicable hardware will not be assembled on PCB.

| hArt | 420rEG |
|---|---|

Use the enter key to scroll to the next screen.

**Variable map:**

1. PV- Flowrate
2. SV- Current Liters
3. TV- Total Liter
4. QV- Velocity

- The second configurable parameter shown is the **Unit**. The unit has selection choice of Liter, Gallon and $m^3$ for Vol Flow mode and Kilograms, Pounds and tonnes for mass flow respectively. Use the INC key to select desired unit.

| Un | Ltr |
|---|---|

| Sr.No | Display screen | Interpretation |
|---|---|---|
| 1 | Ltr | liter |
| 2 | GAL | gallon |
| 3 | HILO | kilogram |
| 4 | LbS | pounds |
| 5 | tOnn | tons |
| 6 | CU3 | Meter cube |

Use the enter key to scroll to the next screen.

- The next configurable parameter shown is **Density or Specific gravity**. In case data is required in terms of mass flow, this parameter must be set to desired value. The units of this density screen are fixed to kg/l or $g/cm^{3.}$ Use the scroll key to move between digits and the INC key to change digit values. The first digit is to be kept zero. The decimal point is between digit two and three. For example, if density to be set is 0.820, set the value as 00820. If it is to be set as 1.095, set as 01095.
- If density is not set and the units are in mass flow, the transmitter will show the same value as vol flow mode.

| SPG | 00820 |
|---|---|

Use the enter key to scroll to the next screen.

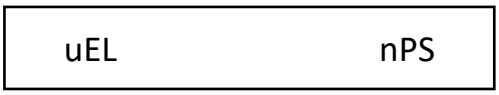
- The next configurable parameter shown is Line size. Enter appropriate line size in **millimetre** units only.
  Use the scroll key to move between digits and the INC key to change digit values.

| LS | 000 |
|---|---|

Use the enter key to scroll to the next screen.

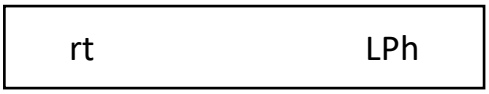
- The next configurable parameter shown is velocity unit. This setting takes predecessor values of line size to provide options of meter per second. Set appropriate line size for accurate velocity.

  Use the INC key to select desired unit.




| Sr.No | Display screen | Interpretation |
|---|---|---|
| 1 | nPS | Metre per sec |
| 2 | FtPS | Feet per sec |

- The next configurable parameter shown is the **Flow Rate.** This setting takes predecessor values of Unit to provide options of per minute or per hour readings. Hence, please select appropriate Unit prior to selection of flow rate units.




Use the INC key to select desired flowrate units – per hr or per min.

| Sr.No | Display screen | Interpretation |
|---|---|---|
| 1 | LPh | Liter per hour |
| 2 | LPn | Liter per minute |
| 3 | GPh | Gallon per hour |
| 4 | GPn | Gallon per minute |
| 5 | HGPh | Kg per hour |
| 6 | HGPn | Kg per minute |
| 7 | LbPn | Pounds per hour |
| 8 | LbPh | Pounds per minute |
| 9 | tPh | Tons per hour |
| 10 | tpn | Tons per minute |
| 11 | CU3h | Meter cube per hour |

Use the enter key to scroll to the next screen.

- The next configurable parameter shown is the **4-20 mA selection.** This parameter is use to set the 4-20 mA current with respect to **velocity or flowrate**.

Use the INC key to scroll between flowrate and velocity. Default is set to flowrate.

| | |
|---|---|
| 4-20 | FL |

| Sr.No | Display screen | Interpretation |
|---|---|---|
| 1 | FL | Flowrate |
| 2 | vEL | Velocity |

Use the enter key to scroll to the next screen

- The next configurable parameter shown is the **4-mA limit.** This setting takes predecessor values of 4-20 mA selection. Hence, please select appropriate parameter prior to selection of 4-20 mA selection.

Use the INC key to increment number and use SCROLL key to scroll between digit.

| | |
|---|---|
| 4F | 00000 |

Use the enter key to scroll to the next screen.

- The next configurable parameter shown is the **20-mA limit.** This setting takes predecessor values of 4-20 mA selection. Hence, please select appropriate parameter prior to selection of 4-20 mA selection.

Use the INC key to increment number and use SCROLL key to scroll between digit.

| | |
|---|---|
| 20F | 00000 |

Use the enter key to exit the password mode.

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### 9.1.2 System factor setting (Do not access this password without Fluidyne written permission)

- Upon entering password 1111, parameter shown is the **k factor or Vol/Pls (Calibration factor).** Note – This value must not be changed without the prior intimation to Fluidyne personnel as it is the main calibration factor of the flowmeter.
- Use the scroll key to move between digits and the INC key to change digit values.

| |
|---|
| 0000 |

- The next configurable parameter shown is the Minium flowrate. This parameter is use to set the minimum flowrate (in LPM only) at which 4- 20 mA current remains stable.
  **Note – This value must not be changed without the prior intimation to Fluidyne personnel.**

| | |
|---|---|
| nInF | 00.0 |

Use the INC key to increment number and use SCROLL key to scroll between digit.

Use the enter key to scroll to the next screen.

- The next configurable parameter shown is the **No. of flow sensor used.** This parameter is use to set the quantity of sensor used in transmitter.
  **Note** – This value must not be changed without the prior intimation to Fluidyne personnel.

Use the INC key to increment number and use SCROLL key to scroll between digits.

| | |
|---|---|
| SEn | 1 |

Use the enter key to scroll to the next screen.

- The next configurable parameter shown is the No. of samples. This parameter is use to set the number of instantaneous samples of flowrate to show average flowrate. Maximum limit 100 samples.
  **Note – This value must not be changed without the prior intimation to Fluidyne personnel.**

Use the INC key to increment number and use SCROLL key to scroll between digits.

| | |
|---|---|
| SnPl | 000 |

Use the enter key to scroll/exit the password setting

## 9.2 Four wire system

### 9.2.1 Precautions prior to accessing settings

- *Isolate power for at least 10 minutes before opening cover*
- *Ensure safe environment before opening cover*
- *Ensure that no liquid is being passed through flowmeter by stopping pump or isolation valve*
- *Allow device to initialize and do not pass liquid through the device until it is initializing under initial level Fluidyne software information screen*

### 9.2.2 Internal settings in flowmeter device

- Open front cover and check keys below display card. Keys are labeled as SW1, SW2, SW3


- Long press enter key for 5 seconds, the password screen comes up as below

| PASSWORD |
| --- |
| xxxx |

- Use VIEW key to scroll between digits and INC key to set the digit.
  Enter the passkey as (1105) and press ENTER key to confirm the passkey.

### 9.2.3 General settings in device

- The next configurable parameter shown is the **Mode**. The mode has selection choice of VolFlow or MassFlow. The Fluidyne meter is capable of measuring values in terms of mass as well. For this, specific gravity of the liquid must be set in the following screens as well. Use the INC key to select VolFlow or MassFlow. The default value is VolFlow.

| MODE |
| --- |
| VOLFLOW/MASSFLOW |

  Use the enter key to scroll to the next screen.

- The next configurable parameter shown is the **Unit**. The mode has selection choice of Liter and Gallon for VolFlow mode. When mode is set to MassFlow, customer can select between Kilograms and Pounds. Use the INC key to select desired unit.

| UNIT<br>LITER/GALLON/KILOGRAM/POUNDS |
|---|

Use the enter key to scroll to the next screen.

- The next configurable parameter shown is the **Flow Rate.** This setting takes predecessor values of Mode as well as Unit to provide options of per minute or per hour readings. Hence, please select appropriate Mode and Unit prior to selection of flow rate units.

| FLOW RATE<br>LPH/LPM/KGPH/KGPM/LBPH/LBPM |
|---|

Use the enter key to scroll to the next screen.

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### 9.2.4 4-20 mA settings in device

- The next configurable parameter shown is the **Analog 4-20 mA.** This setting should be enabled to select max and min values in 4-20 mA limits or disabled if not required. Use the VIEW key to scroll between Once enabled, please check next parameter for setting the flowrate limits of 4-20 mA signal.

| 4-20 mA<br>ENABLED/DISABLED |
|---|

Use the enter key to scroll to the next screen. When 4-20 mA is enabled the below settings appear on the lcd.

- The next configurable parameter shown is the **4-20mA flowrate/velocity.** To switch between flowrate and velocity settings, press the increment key. This feature enables the user to define the desired low and high values for either flowrate or velocity, which will be reflected in the corresponding 4-20 mA output.

| 4-20 mA<br>flowrate | 4-20 mA<br>Velocity |
|---|---|

Use the enter key to scroll to the next screen.

**For flowrate**

-

The next configurable parameter shown is the **4-mA flow rate**. Enter the flowrate that is required for the transmitter to provide value of 4 mA.

| 4 mA F/R<br>xxxxLPH |
|---|

Use the enter key to scroll to the next screen.

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- The next configurable parameter shown is the **20-mA flow rate.** This setting takes predecessor values of 4-20 mA to allow value setting. Enter the flowrate that is required for the transmitter to provide value of 20 mA.

| 20 mA F/R<br>xxxxLPH |
|---|

Use the enter key to scroll to the next screen.

**For Velocity**

- The next configurable parameter shown is the **4-mA Velocity**. Enter the Velocity that is required for the transmitter to provide value of 4 mA.

| 4 mA VEL<br>xxxxft/s |
|---|

Use the enter key to scroll to the next screen.

- The next configurable parameter shown is the **20-mA Velocity.** Enter the Velocity that is required for the transmitter to provide value of 20 mA.

| 20mA VEL<br>xxxxft/s |
|---|

- The next configurable parameter shown is **Density**. In case data is required in terms of mass flow, this parameter must be set to desired value. The units of this density screen are fixed to kg/l or g/cm$^{3.}$ Use the VIEW key to move between digits and the INC key to change digit values. Press the ENTER key to confirm value.

| Density<br>xxx.xxxx |
|---|

Use the enter key to scroll to the next screen.

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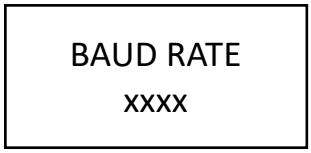
### 9.2.5 MODBUS settings in device

- The next configurable parameter is **Baud Rate**. There are five Baud Rate that can be set. They are 9600 B/S, 19,200 B/S and 38,400 B/S and 57,600 B/S & 115200 B/S. Use the'VIEW' key to select any of the above Baud Rates. Press 'ENTER' key to confirm the setting.




Use the enter key to scroll to the next screen.

- The next configurable parameter shown is **Parity**. Three options are available for this parameter. These are ODD Parity, EVEN parity and NONE Parity. Use 'ENTER key to confirm the settings.

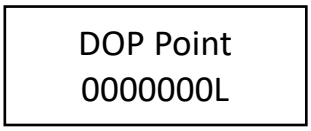

Use the enter key to scroll to the next screen.

- The next configurable parameter shown is **Slave ID**. There are maximum sixteen slave addresses that can be set from 01 to 255. Use VIEW key to select any required address. Press 'ENTER' key to confirm the settings.


Use the enter key to scroll to the next screen.

### 9.2.6 DOP Point

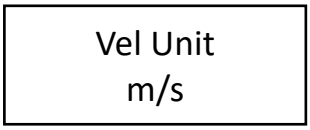
- The next configurable parameter shown is **DOPPoint** (short for Digital Output Point). This setting can be used in case digital output pulse is required after a set interval of liquid displacement.(the unit depends upon the selection of unit in previous setting)




Use the enter key to scroll to the next screen.

### 9.2.7 Velocity Unit

- The next configurable parameter shown is **Velocity Unit**. This setting is used to set the unit for liquid velocity display through the pipe. There are two units available feet/seconds and metres/seconds. Switch between ft/s and m/s by pressing the increment key.

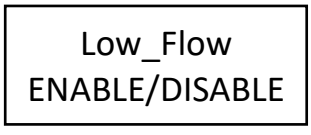




Use the enter key to scroll to the next screen.

- The next configurable parameter shown is **Line Size in mm**. This setting is used to set the diameter of the pipe in millimetres, which is used further in velocity calculations.

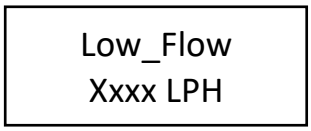

Use the enter key to scroll to the next screen.

- The next configurable parameter shown is **Low Flow Cutoff**. Default setting is disabled. Toggle to enable to enable the setting.




Use the enter key to scroll to the next screen.

- The next configurable parameter shown is **Low Flow Cutoff in LPH**. Once set, if the operating flowrate is below the set value, displayed flowrate will be zero and totalizer will not be counted.




Use the enter key to scroll to the next screen.

Use the enter key to scroll to exit the password mode.

- Upon entering password 1111, parameter shown is the **k factor or Vol/Pls (Calibration factor).** Note – This value must not be changed without the prior intimation to Fluidyne personnel as it is the main calibration factor of the flowmeter.


Use the enter key to exit the mode.

- Next setting is hall qty. Note – This value must not be changed without the prior intimation to Fluidyne personnel as it is the main calibration factor of the flowmeter.


- Next setting is min Flowrate Note – This value must not be changed without the prior intimation to Fluidyne personnel as it is the main calibration factor of the flowmeter.

- Next setting is Samples Note – This value must not be changed without the prior intimation to Fluidyne personnel as it is the main calibration factor of the flowmeter.

| SAMPLES |
| --- |
| xxxx |

## 10. Display Parameters

### 10.1 Two wire system

| Lt | XXXXXX.X |
| --- | --- |

- The display shows the batch totalizer in Litres. This can be reset to zero by long pressing the scroll key.

| Lt | XXXXXXX |
| --- | --- |

- The display shows the cumulative totalizer in Litres. It automatically resets to zero upon completion of 99999999 litres.
-

| Lph/Lpm/Kph/Kpm | XXXXXX.X |
| --- | --- |

- The display shows the rate applicable unit set.

| unS/uFS | XXXXXXX |
| --- | --- |

- The display shows the velocity applicable unit set.

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## 10.2 Four wire system

The transmitter displays the following parameters on the 8X2 dot-matrix LCD display provided.

- The above display shows the Current litres in Litres(default). This can be reset to zero by long pressing the scroll key (hold for 3 seconds or more). This totalizer will automatically reset to 0.0 after completion of 9,99,999 lits. The rate screen depends on values set in Mode and Units. The bottom display shows the instantaneous flowrate through the meter. If the flow through the meter stops, the flowrate will be zero.

| xxxxxx LT<br>xxxxxLPH |
|---|

- Press 'View' Switch or Scroll key once to display the next parameter. This above display shows the Cumulative Totalizer in litres. This Totalizer cannot be reset to zero. Press 'VIEW' Switch once to display the next parameter. This totalizer will automatically reset to 0 after 9,99,999.99 lits. The rate screen depends on values set in Mode and Units.

| TT.LTR / TT KGS/TT LBS<br>xxxxxxxxx |
|---|

- This display shows the instantaneous liquid velocity through the meter. If the flow through the meter stops, the velocity will be zero. The rate screen depends on values set in Mode and Units.

| VEL m/s / ft/s<br>x.x |
|---|

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## 10.3 Battery Powered Transmitter


- The top display shows the batch totalizer in Litres. This can be reset to zero by long pressing the View Key (Left side of the enclosure). This totalizer will automatically reset to 0.0 after completion of 99,999.9 lits
- The lower display shows the cumulative totalizer in Litres. This totalizer will automatically reset to 0.0 after completion of 99999999 lits

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## 11. MODBUS RTU protocol in Fluidyne devices

The flowmeter always acts as a Modbus slave device and supports the following function codes only. Fluidyne devices follow the 32 bit addressing mode (floating point) for all registers.

| Sr. No. | Functions | Function Code |
|---|---|---|
| 1 | Read Input Register | 04 |
| 2 | Read Holding Register | 03 |
| 3 | Write Multiple Holding Register | 10 |

The Flow Transmitter Modbus Module receives the frequency input from the Flow sensor, calibrates the signal based on the calibration factor programmed and transmits the following data to the Master.

1. Cumulative Totaliser : This is a non- resettable totaliser whose range is from 0 to 9999 9999 lits
2. Current Totaliser : This is a resettable totaliser whose range is from 0 to 9999 999.9 lits
3. Instantaneous Flowrate in LPH or LPM. This depends on the setting in the parameter settings made by customer
4. Velocity of flowing media in m/s or ft/s, depending on settings made in parameter settings
5. Density in g/cm3 only

## 11.1 Free and Open source Modscan software settings

1. To utilize these features effectively, follow these steps for setting up Modscan:
2. Install the Silicon Labs CP210x USB to UART Bridge drivers from Silicon Labswebsite. https://www.silabs.com/developers/usb-to-uart-bridge-vcp- drivers?tab=downloads
3. Install Modscan software on your system.
4. Launch Modscan.exe.
5. Navigate to Connection -> Connect.
6. Select the appropriate Port (Silicon Labs CP210x USB to UART Bridge) in the'Connect Using' option.
7. Adjust the Baud rate according to your configuration matching with what baud rate is set in device. Default baud rate in device is 9600 bps
8. Default parity is none
9. Match the Slave ID as per what is set in device. Default slave ID is 1
10. In setup, select display options->floating point -> most significant register first
11. Confirm the settings by clicking OK.
12. Set the Length to 10
13. In the Drop-Down menu, select Holding Register/Input Register.

## 11.2 The Current LTR values can be read by using function code (0x03) (read holding register)

**Query**

| Modbus Query Positions | Position Value | Description |
|---|---|---|
| 1 | 1 | Slave Id |
| 2 | 3 | Function code |
| 3 | 0 | Data Address of Register (High) |
| 4 | 0 | Data Address of Register (LOW) |
| 5 | 0 | No of register requested (High) |
| 6 | 1 to 20 | No of register requested (LOW) |
| 7 | CRC | Error Check |
| 8 | CRC | Error Check |

**Response by Fluidyne device (slave)**

| Modbus Register | Description |
|---|---|
| 40001 | CURRENT.LTR (XXXXXXX.XXXXX) |
| 40002 | |

## 11.3 The Cumulative LTR and Flowrate values can be read by using function code (0x04) read input register

**Query**

| Modbus Query Positions | Position Value | Description |
|---|---|---|
| 1 | 1 | Slave Id |
| 2 | 4 | Function code |
| 3 | 0 | Data Address of Register (High) |
| 4 | 0 | Data Address of Register (LOW) |
| 5 | 0 | No of register requested (High) |
| 6 | 1 to 20 | No of register requested (LOW) |
| 7 | CRC | Error Check |
| 8 | CRC | Error Check |

**Response by Fluidyne device (slave)**

| Modbus Register | Description |
|---|---|
| 30001 | CUMULATIVE.LTR (XXXXXXX.XXXXX) |
| 30002 | |
| 30003 | Flow Rate (LPH/LPM or set unit) |
| 30004 | |
| 30005 | Density |
| 30006 | |
| 30007 | Velocity (m/s ft/s) |
| 30008 | |

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## 11.4 To reset the value of the Current LTR using Function code (0x10) preset multiple registers

**Query**

| Modbus Query Positions | Position Value | Description |
|---|---|---|
| 1 | 1 | Slave Id |
| 2 | 16(0x10) | Function code |
| 3 | 0 | Data Address of Register (High) |
| 4 | 0 | Data Address of Register (LOW) |
| 5 | 0 | No of registers (High) |
| 6 | 2 | No of registers (LOW) |
| 7 | 4 | The number of bytes to write |
| 8 | 0 | Value writes at 40001(High) |
| 9 | 0 | Value writes at 40001(LOW) |
| 10 | CRC | Error Check |
| 11 | CRC | Error Check |

**Response by Fluidyne device (slave)**

| Response | Description |
|---|---|
| 1 | Slave Id |
| 16(0x10) | Function code |
| 0 | Data Address of Register (High) |
| 0 | Data Address of Register (LOW) |
| 0 | No of registers (High) |
| 2 | No of registers (LOW) |
| CRC | Error Check |
| CRC | Error Check |

# 12. Flowmeter Installation Guidelines and general instructions

## 12.1 Prior to flowmeter installation

✖ Installation in unflushed pipelines containing debris is not permitted.
✓ The pipeline shall be thoroughly flushed and free of foreign matter before installation

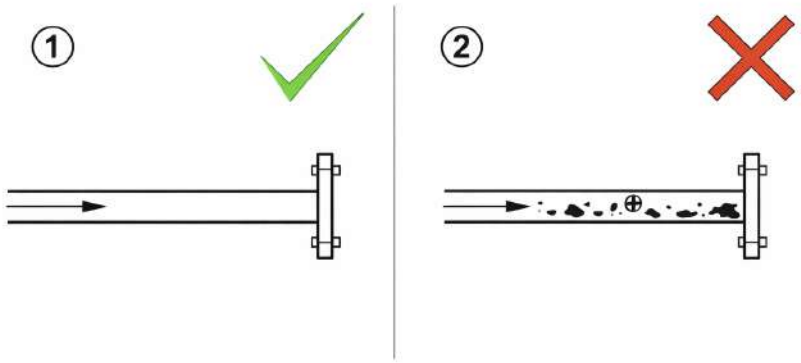


 Image 1 **(✖ Not Recommended):**
Pipe interior containing debris such as rust, burrs, and welding slag, clearly overlaid with a **cross (X)** to indicate improper installation condition.

 **Image 2 (✓ Recommended):**
Clean, flushed pipeline with smooth internal surface, overlaid with a **tick/check mark** to indicate acceptable condition prior to flowmeter installation.

## 12.2 Possibility of containers running dry / Air elimination

⚠ CAUTION – AIR / VAPOR ENTRAINMENT

In systems where the supply tank may become empty or drained, or where multiple products are routed through a common manifold into a single metering system, air or vapor may become entrained in the fluid stream. The presence of air or vapor can result in inaccurate measurement and unstable operation.

To prevent this condition, an **air or vapor eliminator shall be installed upstream of the flowmeter** to remove entrained air or vapor from the liquid prior to measurement.

Effective air elimination is **mandatory for custody transfer applications** and is required to comply with **legal metrology and regulatory approval standards**.

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## 12.3 Commissioning startup

**⬢ Ex A. Pre-Commissioning Safety Checks (Mandatory)**

✓ Verify that the installation complies with the applicable hazardous area classification.
✓ Confirm that the flowmeter, accessories, and electrical components are certified for use in the hazardous area in accordance with **ATEX / IECEx / applicable national standards**.
✓ Ensure that all ⬢ **Ex certification markings, labels, and temperature class ratings** are legible and suitable for the site classification.

✓ Apply **Lock-Out / Tag-Out (LOTO)** procedures to all electrical power sources prior to inspection, wiring, or adjustment.
✓ Verify a zero-energy state before opening any enclosure, terminal box, or housing.

**B. System Pressurization**

✓ Ensure all mechanical connections are completed and securely tightened.
✓ Confirm that the downstream isolation valve is fully closed.

✓ Slowly open the upstream (inlet) isolation valve to allow gradual entry of the product into the system.
⚠ Open valves slowly to prevent pressure shock.

✓ Gradually open the downstream isolation valve to approximately **10% open** to purge entrained air from the system.
⚠ Ensure the instrument is not subjected to overspeed conditions during air purging.

✓ Once air elimination is complete, close the downstream isolation valve.
✓ Inspect all flanged and threaded joints for leakage.
✓ If leakage is detected, isolate the system, verify seal integrity, and retighten all connections as required.

✓ Fully open the upstream isolation valve to bring the system to normal operating pressure.

**C. Flow Start-Up**

✓ Confirm that the system is fully pressurized and verified to be leak-free.

✓ Energize all electronic circuits and confirm correct operation of the flowmeter and associated instrumentation.

✓ Slowly open the flow control valve and operate the instrument at approximately **20% of its rated flow**.
✓ Maintain this operating condition for a minimum duration of **5 minutes**.

✓ Monitor all system components during the initial run to ensure stable and correct operation.

✓ Upon completion of the initial run, adjust the flow control valve to the required operating flow rate.
⚠ Verify that the maximum allowable flow rate of the instrument is not exceeded.

---

⚠ **WARNING**

- Sudden or rapid opening of isolation or control valves may cause pressure shock, resulting in equipment damage or personal injury.
- Operation above the maximum rated flow may cause permanent damage to the flowmeter and lead to inaccurate measurements.

⚠ **CAUTION**

- Inadequate air purging may result in unstable operation and measurement errors

⬢ **Ex** ⚠ **CAUTION – HAZARDOUS AREA**

- Do not energize the system if any enclosure cover, terminal cover, or housing is open or improperly secured.
- Electrical power shall only be applied when all ⬢ **Ex certified enclosures** are fully closed and tightened in accordance with **ATEX / IECEx certification requirements**.
- Failure to comply may result in loss of explosion protection and serious safety hazards.

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## 12.4 High temperature startup

On higher temperature start up above 212 F (100 C) based on an ambient temperature of 25 C, special start up procedures are required to prevent damage to the flow meter components. A similar procedure should be followed on any thermal shock in excess of 80 C. The following equation may be used to determine approximate flowmeter warm up time.

$T_h = ( (C_{nom}) * (OT_F-212) ) / 100$

$T_h$ – warm up time in hours
$C_{nom}$ – Nominal connection size
$O_T$ – Operating Temperature in F

During this warm-up time the meter should be operated at approximately 5% of maximum flow so that temperature stabilizes slowly.

## 12.5 Control Valves

Control valves should be installed **downstream of the flowmeter** wherever possible. Installing control valves upstream can introduce turbulence, pressure fluctuations, or cavitation, which may adversely affect measurement accuracy and long-term instrument performance. Downstream placement promotes a stable and fully developed flow profile through the flowmeter.

## 12.6 Best plumbing configuration

1. Flowmeter must have secure mounting to a riser stand or foundation
2. Inlet and outlet must be secured, and weight of meter must be supported
3. System should be designed to always keep flowmeter full of liquid. Meter inlet and outlet should be lower than associated system plumbing.
4. The pipe must be installed as straight as possible to prevent pressure drop due to flow restrictions
5. The metering system must include a means for onsite calibration with two parallel isolation valves in a T joint installed immediately at outlet of flowmeter

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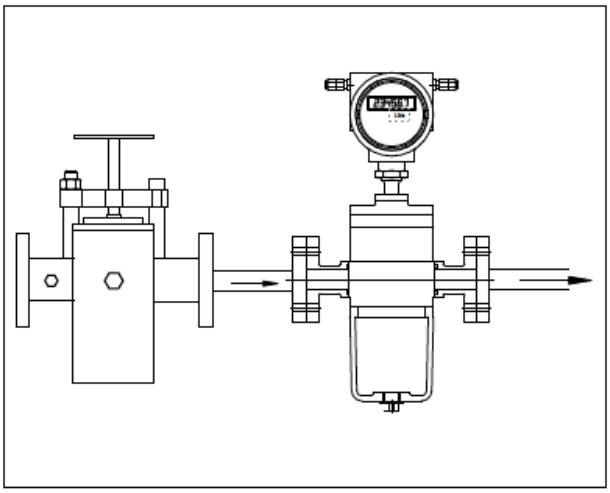
## 12.7 Continuous Operation - Clean Filtered Liquid Service

A positive displacement meter is used for clean service applications. **This flowmeter is not suitable for liquids with greater than 150 micron particle sizes because the internal piston will not be able to move smoothly and will soon not move at all due to build-up of debris and solid sludge inside the meter.**



Strainers are installed in pipelines ahead of pumps, meters, valves etc to protect such equipment from intrusion of pipe scale, welding splatter and other foreign material.
The use of proper size strainer together with a element of suitable mesh pays dividends in reduced maintenance on mechanisms which are in contact with flowing liquids. When it is known that comparatively large amounts of lint or iron oxide are present in stream, a large strainer must be used as these materials clog up element screens rapidly-especially if resins, gums or varnishes are also present.

Larger size foreign matter like pebbles, welding beads etc should be removed at frequent intervals to prevent their abrasive action from damaging the element screen.

**Fluidyne meters come equipped with 149 micron reusable strainer. However, it is recommended that the customer installs additional 100 micron (minimum) strainer upstream in the inlet run of the PD meter in the pipework as shown**

This enables all filter cleaning service to be localized at large strainer location and the larger strainer will also take longer for dirt deposits to eventually reduce flowrate to a certain threshold due to large surface area.

## 12.8 Hydraulic Shock (Water-hammer effect)

Hydraulic shock is the rise in pressure that occurs when an operating system has a sudden deceleration of liquid due to upstream valve closure. This can be due to valve closure while the system is operating at high flow rates. Hydraulic shock can damage the meter piston and other components and high pressure failure of the meter body. The use of 2 stage preset control valves or surge suppressing bladders or risers help reduce or eliminate this problem.

## 12.9 Products that dry/crystallize or polymerize

There are many liquids that crystallize, harden or polymerize on contact with air or decreased temperature. A proper system design and a good understanding of the product being measured will help avoid the possibility of air entering the system and product to be affected.
In applicable cases, customers must ensure heating or insulation of pipelines near to the point of flowmeter installation or continuous circulation of the product so that it does not solidify upon staying stationary or even flushing the lines with DM water to remove all traces of the product.

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## 12.10 Custody transfer

A right k factor will need to be established under actual operating conditions if the instrument is to be used in custody transfer applications. This initial proving run should be carried our following the completion of above startup procedure and in accordance with local regulations.

**NOTE – There are no user adjustable parts in the flowmeter. However, the meter cover and transmitter are provided with two cross-drilled bolts to facilitate sealing if required by local weights and measurements regulations.**

## 12.11 Strainer Elements

To be efficient, strainer elements must be kept clean. A buildup of sediment increases pressure drop and decreases flow. If a element is allowed to become completely clogged, damage will result. A regular procedure should be set up for cleaning the strainer elements – the frequency depending on amount and character of foreign material in stream. It is advisable to keep a spare element on hand.

**Recommended screen mesh for various liquids**

| Liquid types | US Mesh |
|---|---|
| Gasoline/Diesel or similar liquids | 60 to 100 |
| Aviation fuels | 80 |
| Solvents, chemicals | 100 |
| Mineral spirits, heating oils | 100 |

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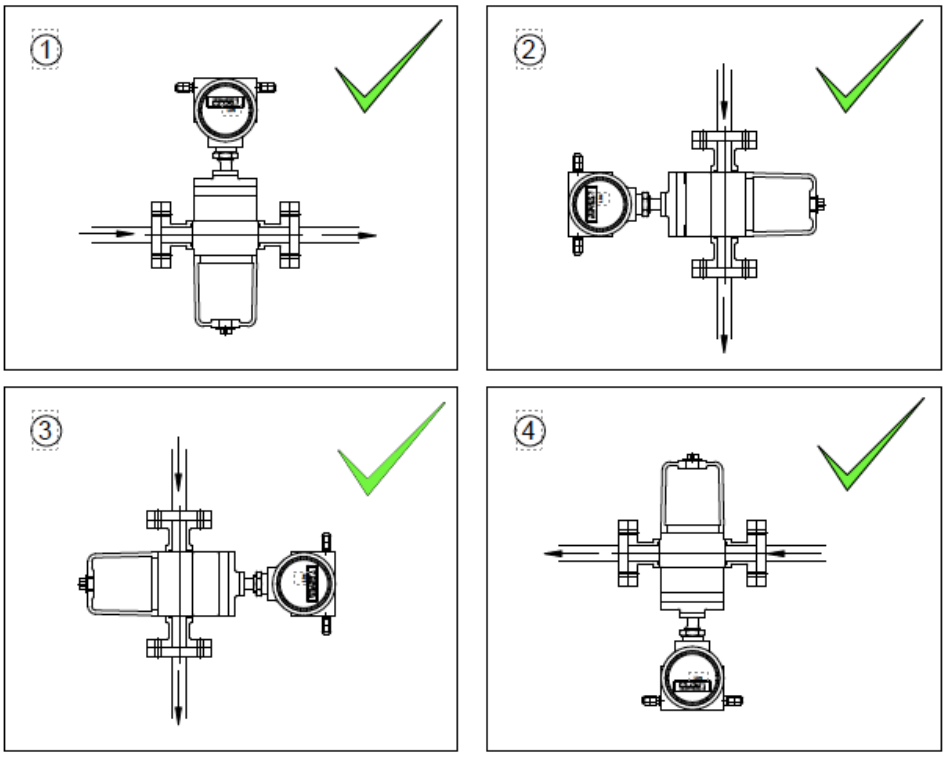
## 12.12 Orientation of flowmeter in pipeline




1 – This orientation of the flowmeter ensures that meter cavity remains full of liquid

2 and 3 – Due to vertical section, liquid in the flowmeter may drain due to gravitational force. This can cause inaccuracy and will require priming of the pipework. This orientation is used in applications where liquid is required to be removed before next batch. If not, please use NRVs at the inlet of the flowmeter to improve performance

4 – Flowmeters used in this orientation are permissible, but servicing will become difficult due to overhead filter element

5 – In case liquid service temperature is greater than 70 degrees C, Fluidyne recommends remote mounting of display transmitter away from the flowmeter with a pulse output cable. Please contact your Fluidyne representative for this provision

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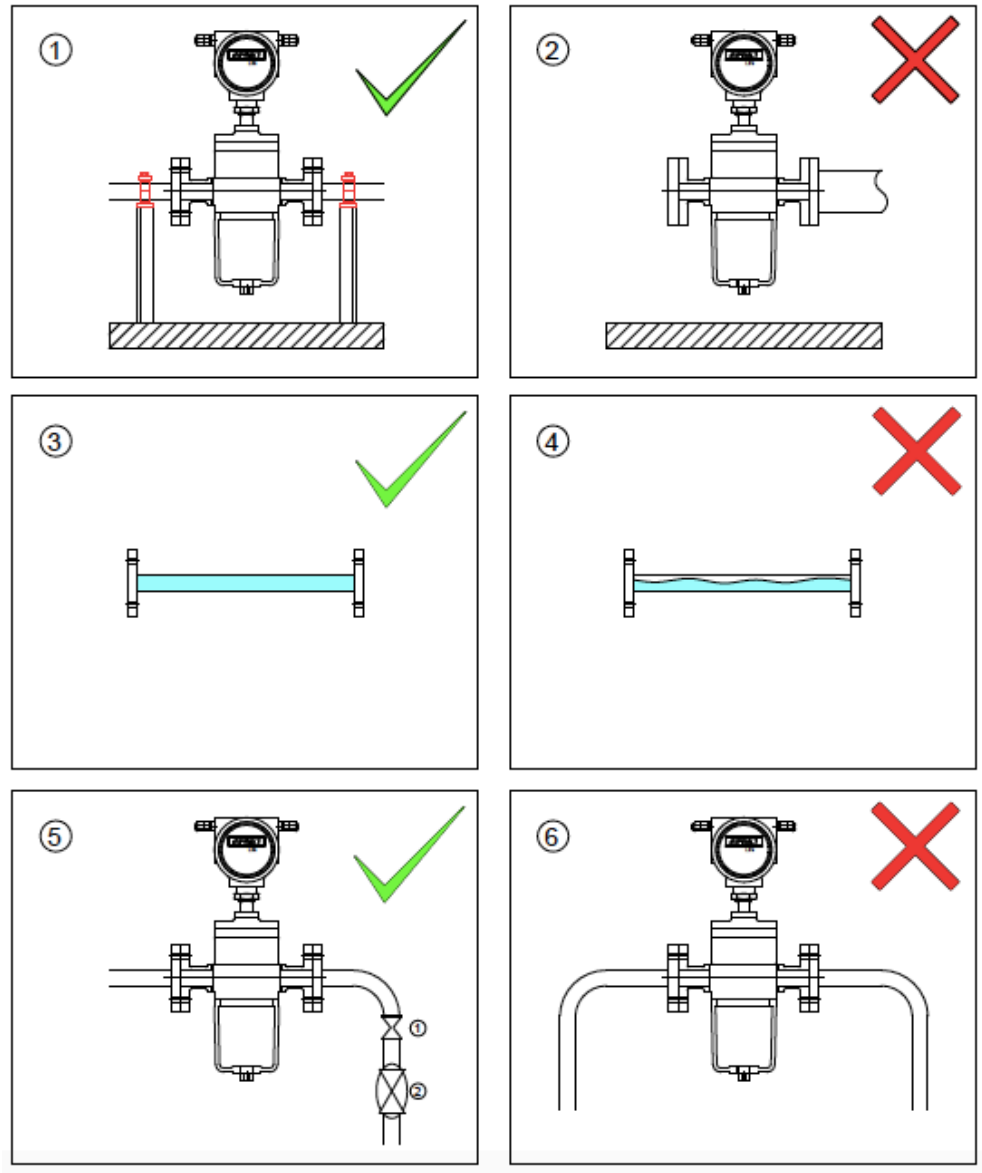
## 12.13 General Installation Principles




1 – Fully support the weight of the flowmeter. The meter can be supported with clamps next to mating flanges/connections

2 – Do not use extreme reductions in process pipework size

3 – Make sure that process pipework is full at all times

4 – Do not let the flow fall below a certain threshold such that pipe is partially empty or fully empty. In case this is unavoidable, please contact your Fluidyne representative for additional air separator provision

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5 – If the meter has been **installed** with an open-ended down pipe, install a (1) restrictor or orifice plate to ensure that pipework remains full during measurement. A fast-acting batching valve or ball valve (Shut-off) should also be ideally installed downstream of the flowmeter. **Never install the meter in the suction side of a pump. Install only in delivery side.**

6 – It is recommended that the flowmeter not be mounted at the highest point in the pipework because air or gas can collect in the meter when operation is halted. In case this is unavoidable, please contact your Fluidyne representative for additional air separator provision

## 12.14 Product Lifecycle

Given all above recommended operation guidelines, the Fluidyne oscillating piston flowmeter is guaranteed for a shelf-life of 15 years or for an operating lifetime of 10 years from date of commissioning whichever is earlier.

The above timelines may increase or decrease depending upon the product measured, regular maintenance, calibration, service and upkeep of the instrument throughout its lifetime. Adherence to all guidelines in section 13 ensures maximum life of the instrument.

## 12.15 Recycling Instructions and Disposal

With every Fluidyne order, recycling instruction document is given with name FLUIDYNE/EMS/F/03. Upon disposal of the product, please follow the instructions for recycling and separation of components.

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# 13. Maintenance

The Fluidyne 6600 PD meter will give many years of consistent performance with little need for maintenance or service. There are, however, several recommendations which if followed, will further extend the instrument's service life.

The instrument should be kept filled with the process fluid it is measuring. This prevents the exposure to any product vapors which, in the case of many products, are more corrosive than their liquids. In addition, this also prevents formation and build-up of deposits or gums which would cause increased mechanical friction. The instrument should be kept free of air, keeping it full of process fluid will accomplish this, but if there are chances of air entrained liquid or empty pipe conditions, then additional Fluidyne air separator device must be fitted at the inlet of the flowmeter.

Filter and strainer elements should be cleaned frequently. Debris and foreign matter are the biggest cause of meter wear and damage.

All other associated equipment within the system should be regularly maintained and checked for functionality.

**NOTE – If instrument is being used in hazardous area, all instructions on the meter instruction plate and in this manual must be followed before the start of any maintenance.**

If the instrument is removed from the process line, the line should be sealed with suitable covers. Rinsing the meter internals with solvent will ensure all internal parts remain free of debris.

## 13.1 Performance Considerations

The amount of maintenance necessary for efficient instrument performance is dependent on many factors and some are listed below –

**Continuity of Operation** – An instrument that operates continuously will require more attention than one used intermittently.

**Working Flow Rate** – The life of the instrument is proportional to the speed of its operation. If the instrument is operating at near or above maximum flow rate it will have a shorter life expectancy than if it were operating at its minimum flow rate.

**Lubricity** – The lower the lubrication properties of a process fluid being measured, the lower the life expectancy of the meter.

**Cleanliness** – A product contaminated with abrasive particulate will accelerate the wear of the instrument.

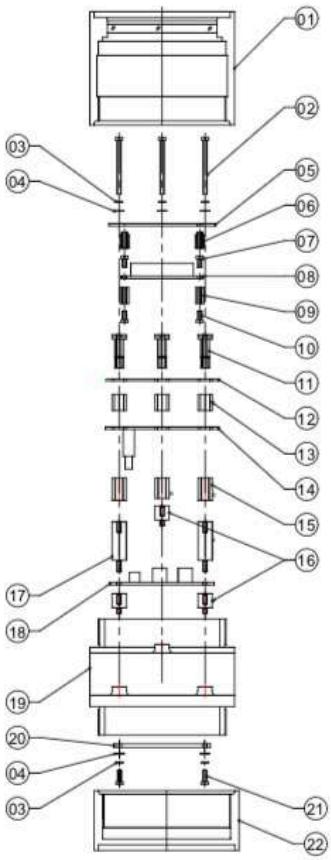
**Air pockets** – Intermittent air pockets in the liquid will cause sudden speed bursts of the internal piston which will lead to excessive wear.

## 13.2 Electronics

This instrument can be provided with up to five magnetic pickup sensors and a common pre-amplifier. Maintenance of the electronics does not require system line pressure to be drained or the instrument to be removed from the system.

ESD precautions must be followed.

## 13.3 Removal/Replacement of the electronic cards



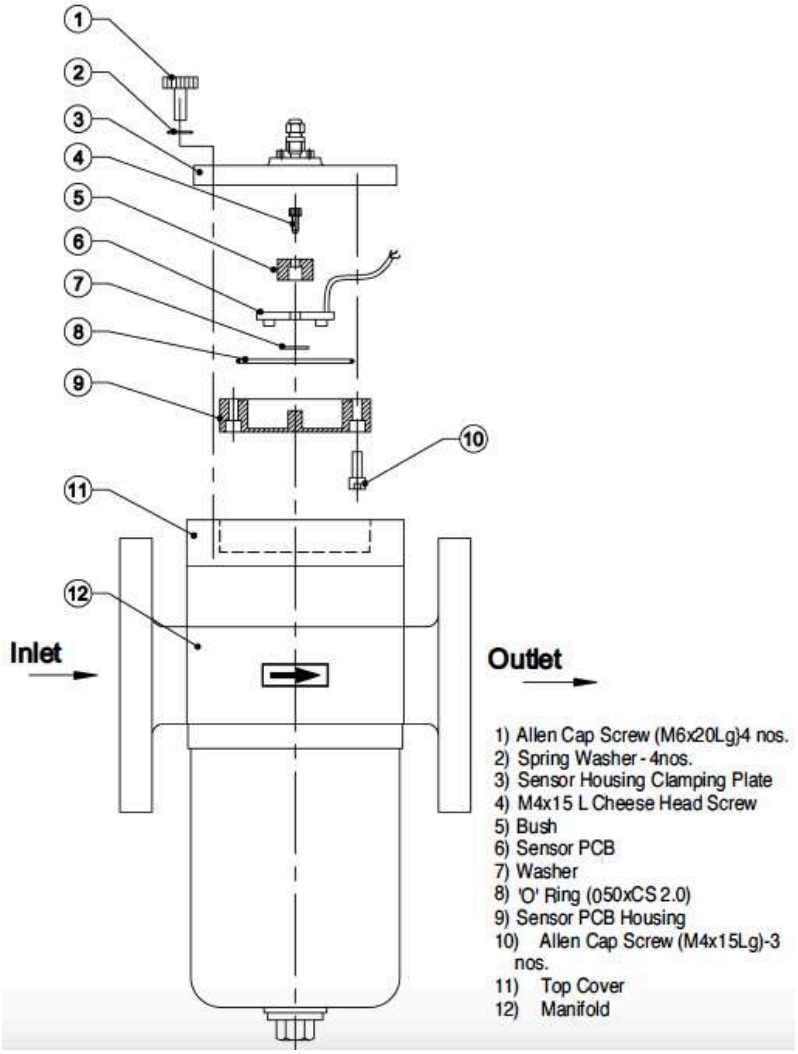
01) Front Cover
02) Ch Head Screw(M3×40) - 03 Nos
03) Spring Washer
04) Plain Washer
05) Facia PCB
06) Display PCB Rivet - 02 Nos
07) Ch Head Screw (M3×6)- 03 Nos
08) Display PCB
09) Display PCB Spacer-1 - 04 Nos
10) Ch Head Screw (M3×20)- 02 Nos
11) Stud For Spacer Clamping - 3nos
12) CPU PCB
13) Sleeve Spacer - 3 Nos
14) Power Supply PCB
15) Stud Clamp Spacer - 3 Nos
16) Bottom Spacer 2 - 3 Nos
17) Bottom Spacer 1 - 2nos
18) Mother Board PCB
19) Housing
20) Rear Terminal PCB
21) Ch Head Screw (M3×8)- 02 Nos
22) Rear Cover

**Caution – Isolate power before removing front cover. Do not open when module is energized when used in hazardous area.**

The front cover has to be screwed out to access the electronic card stack. The stack must first be disassembled by removing the screws, spacers and washers.

Gently disassemble the assembly and contact Fluidyne representative for more information

## 13.4 Removal/Replacement of the sensor card

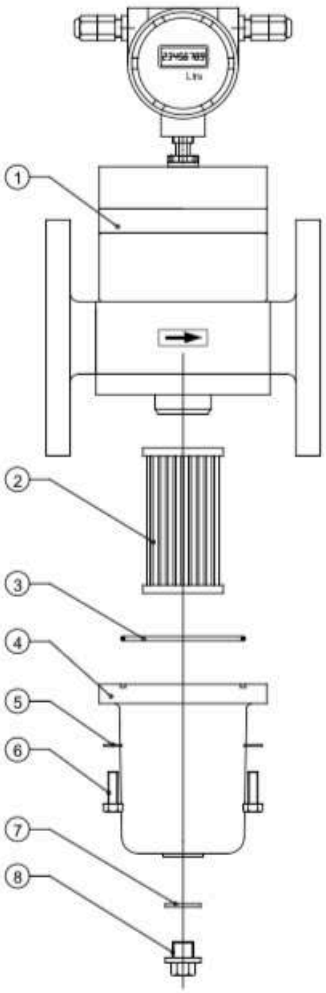



**Caution: Ensure no flow in pipeline. Isolate the flowmeter on upstream and downstream ends. Ensure isolation of power before opening cover.**

At times it may be necessary to change the flow transducer board. This can be done by unscrewing the Allen cap screws 1 and then reaching the sensor PCB 6. The sensor PCB must be removed from position by loosening the screw 4. Remove the PCB and discard it.

Place new sensor PCB in housing, insert screw 4 and bush 5 and tighten to secure the flow sensor PCB. The orientation of the PCB does not matter. Ensure that the PCB fits with sensor side facing downward.

## 13.5 Removal/Replacement of the meter filter



1) Flow Sensor Assembly
2) Filter Element *
3) 'O' Ring Seal (Ø87.7×Ø2.62) *
4) Filter Housing
5) Spring Washer - 4 nos.
6) Hex Bolts (M6×25Lg) - 4 nos.
7) Dowty Washer *
8) Drain Plug

* Denote Recommended Spares

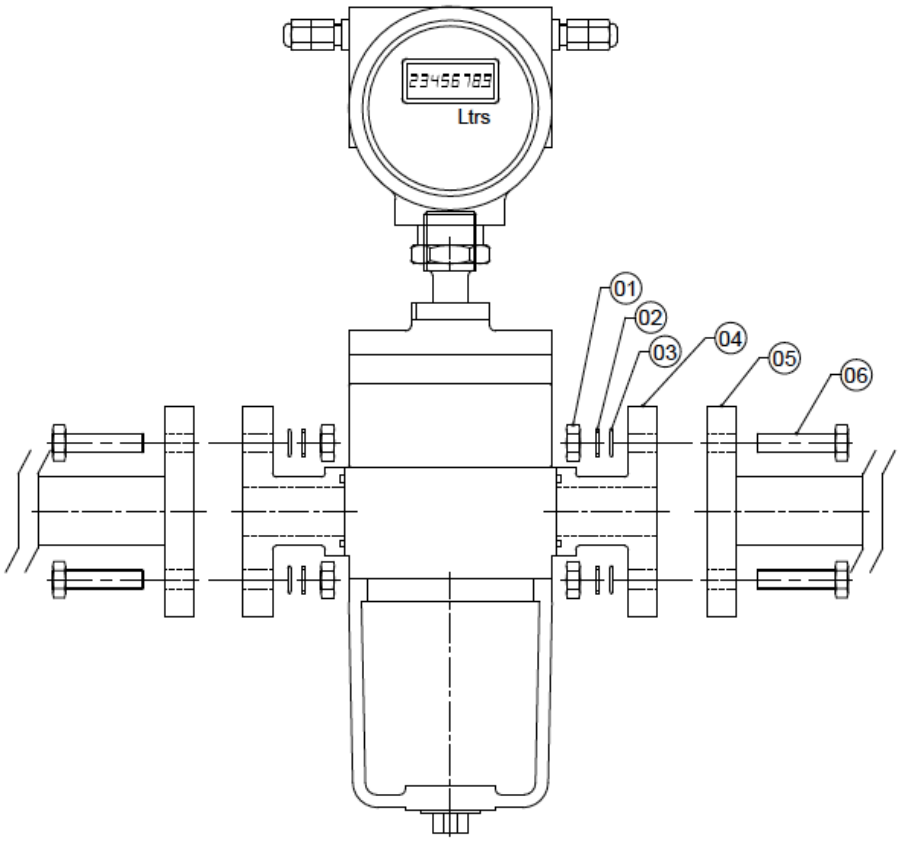
**Caution: Ensure no flow in pipeline. Isolate the flowmeter on upstream and downstream ends.**

To remove the filter, loosen the bolts shown in 6 and remove the filter housing 4. Then gently remove the filter element 2 from its position. Examine the filter element for debris, weld splatter and other foreign particles.

Clean the filter in a jet of debris-free clear DM water/solvent. Ensure all debris is washed away and filter is free of contaminants. Check the filter again for any damages to the mesh. If the mesh appears damaged, contact your local Fluidyne representative for replacement.

If filter is not damaged, dry the filter with compressed air at 2-3 bar. Fit the filter back into the flowmeter, change the O Ring seal 3 and with the help of original bolts, screw the filter housing back on the filter.

## 13.6 Removal/Replacement of the unit from the process line




01) Hex Nut - 8 Nos
02) Plain Washer - 8 Nos
03) Spring Washer - 8 Nos
04) Flowmeter Flange
05) Pipe Flange
06) Hex Bolts - 8 Nos

**Caution – Isolate power before removing front cover. Do not open when module is energized.**
**Ensure all liquid is drained from the flowmeter and isolate the flowmeter on upstream and downstream ends.**

Unbolt the pipe flange from the flowmeter flanges and support the weight of the flowmeter while it is being removed.

## 14. Preventive Maintenance Checklist – Flowmeter

### ⬢ Ex ⚠ SAFETY PRECAUTIONS (Before Maintenance)

✓ Apply Lock-Out / Tag-Out (LOTO) to all electrical power sources.
✓ Depressurize and drain the system completely before opening the meter.
✓ Ensure the area is gas-free and safe for work in hazardous locations.
✓ Do not open any enclosure unless power is isolated, and covers are allowed to be removed as per certification.

A. External Inspection (Routine)

| ✓ | Check Item | Observation |
|---|---|---|
| ☐ | No visible leakage at flanges, joints, or seals | ☐ OK ☐ Not OK |
| ☐ | Meter body free from cracks, corrosion, or damage | ☐ OK ☐ Not OK |
| ☐ | Nameplate and ⬢ Ex markings legible | ☐ OK ☐ Not OK |
| ☐ | Electrical cables and conduit intact | ☐ OK ☐ Not OK |
| ☐ | All covers, plugs, and glands fully secured | ☐ OK ☐ Not OK |

B. Operating Condition Check (Monthly / Quarterly)

| ✓ | Check Item | Observation |
|---|---|---|
| ☐ | Flow indication stable and smooth | ☐ OK ☐ Not OK |
| ☐ | No abnormal noise or vibration | ☐ OK ☐ Not OK |
| ☐ | Pressure drop across meter within limits | ☐ OK ☐ Not OK |
| ☐ | Meter does not overspeed at maximum flow | ☐ OK ☐ Not OK |
| ☐ | No signs of pulsation or cavitation | ☐ OK ☐ Not OK |

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C. Strainer / Filter Inspection (As Applicable)

⚠ **Always isolate and depressurize before removal**

| ✓ | Check Item | Observation |
|---|---|---|
| ☐ | Upstream strainer installed | ☐ Yes ☐ No |
| ☐ | Strainer clean and free of blockage | ☐ OK ☐ Not OK |
| ☐ | No excessive debris accumulation | ☐ OK ☐ Not OK |
| ☐ | Strainer gasket / seal in good condition | ☐ OK ☐ Not OK |

D. Internal Inspection (Periodic / Annual)

⚠ **To be performed by trained personnel only**

| ✓ | Check Item | Observation |
|---|---|---|
| ☐ | Oscillating piston free to move smoothly | ☐ OK ☐ Not OK |
| ☐ | No scoring, wear, or deformation on piston | ☐ OK ☐ Not OK |
| ☐ | Measuring chamber clean | ☐ OK ☐ Not OK |
| ☐ | Bearings / guides in good condition | ☐ OK ☐ Not OK |
| ☐ | Seals and O-rings intact and elastic | ☐ OK ☐ Not OK |

E. Functional Verification (After Reassembly)

✓ Ensure all internal components are correctly reinstalled.
✓ Tighten fasteners uniformly as per recommended torque. O rings/gaskets to be replaced
✓ Confirm all covers are closed and secured.

| ✓ | Check Item | Observation |
|---|---|---|
| ☐ | Meter rotates freely at low flow | ☐ OK ☐ Not OK |
| ☐ | No leakage after pressurization | ☐ OK ☐ Not OK |
| ☐ | Reading repeatability within tolerance | ☐ OK ☐ Not OK |

⚠ CAUTION

- Operating the flowmeter with contaminated fluid or without an upstream strainer may cause premature wear of the piston and measuring chamber
- Do not operate the flowmeter beyond its rated flow, pressure, or temperature limits.

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# 15. Preventive Maintenance Checklist – Flameproof enclosure (Transmitter housing)

## F. Flameproof enclosure (Routine – weekly/monthly)

| | Check Item | Acceptance Criteria | Status |
|---|---|---|---|
| ☐ | Enclosure body condition | No cracks, dents, deformation | ☐ OK ☐ Not OK |
| ☐ | Surface coating | No peeling, flaking, corrosion | ☐ OK ☐ Not OK |
| ☐ | Nameplate / marking | Legible ATEX / IECEx marking | ☐ OK ☐ Not OK |
| ☐ | Warning labels | "DO NOT OPEN…" visible | ☐ OK ☐ Not OK |
| ☐ | Glass window | No cracks, scratches, clouding | ☐ OK ☐ Not OK |

## G. Flameproof enclosure cable entry and glands (Monthly)

| | Check Item | Acceptance Criteria | Status |
|---|---|---|---|
| ☐ | Cable glands | Certified Ex glands installed | ☐ OK ☐ Not OK |
| ☐ | Gland tightening | Fully tightened, no looseness | ☐ OK ☐ Not OK |
| ☐ | Unused entries | Sealed with certified plugs | ☐ OK ☐ Not OK |
| ☐ | Adapters | Max one adapter per entry | ☐ OK ☐ Not OK |
| ☐ | Cable condition | No cuts, cracks, exposed conductor | ☐ OK ☐ Not OK |

## H. Flameproof enclosure fasteners (Critical)

| ✓ | Check Item | Acceptance Criteria | Status |
|---|---|---|---|
| ☐ | Cover bolts | All present and tightened | ☐ OK ☐ Not OK |
| ☐ | Fastener type | A4-70 or approved equivalent | ☐ OK ☐ Not OK |
| ☐ | Thread condition | No damage, cross-threading | ☐ OK ☐ Not OK |
| ☐ | Cover seating | Fully closed, no visible gap | ☐ OK ☐ Not OK |

## I. Earthing/Grounding (Critical)

| ✓ | Check Item | Acceptance Criteria | Status |
|---|---|---|---|
| ☐ | Surface cleanliness | No dust accumulation | ☐ OK ☐ Not OK |
| ☐ | Cleaning method | Damp cloth only used | ☐ OK ☐ Not OK |
| ☐ | Environment | Humidity > 30% (if applicable) | ☐ OK ☐ Not OK |

## J. Seals and Gaskets (Bi-annual)

| ✓ | Check Item | Acceptance Criteria | Status |
|---|---|---|---|
| ☐ | O-rings | No cracks, hardening, deformation | ☐ OK ☐ Not OK |
| ☐ | Gaskets | Proper seating, no extrusion | ☐ OK ☐ Not OK |
| ☐ | Seal integrity | No ingress (dust/water) | ☐ OK ☐ Not OK |

## K. Enclosure Integrity (Annual)

| ✓ | Check Item | Acceptance Criteria | Status |
|---|---|---|---|
| ☐ | Flameproof joints (visual only) | No corrosion, pitting, damage | ☐ OK ☐ Not OK |
| ☐ | Threads | Clean, intact, no wear | ☐ OK ☐ Not OK |
| ☐ | Glass sealing | No loosening or leakage | ☐ OK ☐ Not OK |

## L. Electrostatic Safety (Dust areas)

| ✓ | Check Item | Acceptance Criteria | Status |
|---|---|---|---|
| ☐ | Surface cleanliness | No dust accumulation | ☐ OK ☐ Not OK |
| ☐ | Cleaning method | Damp cloth only used | ☐ OK ☐ Not OK |
| ☐ | Environment | Humidity > 30% (if applicable) | ☐ OK ☐ Not OK |

⚠ **IMPORTANT:**

Flameproof joints shall NOT be:

- Machined
- Filed
- Repaired

## M. Non-conformance actions

If any item is marked **NOT OK**:

- ⛔ Do NOT operate in hazardous area
- ⛔ Do NOT attempt repair on Ex enclosure
- ✔ Replace component with certified part
- ✔ Inform Fluidyne / authorized service

## N. Recommended frequency summary

| Activity | Frequency |
|---|---|
| External inspection | Monthly |
| Glands & entries | Monthly |
| Fasteners | Monthly |
| Earthing | Quarterly |
| Seals | 6 months |
| Full integrity check | Annual |

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# 16. Troubleshooting

The information on this section has been provided as an aid for basic troubleshooting. Disassembly procedures have been outlined in chapter 12. If the 6600 has been found to be in need of repair, it is recommended the user contact the nearest Fluidyne service office or representative. It is important that servicing is performed by trained and qualified personnel.

| Condition | Probable Cause | Corrective Actions |
|---|---|---|
| | | |
| No change in flow parameter/pulse output not present | No flow through meter | Ensuring the pipeline has requisite flow |
| | Improper electrical connection | Ensure proper wiring connections have been made |
| | Insufficient input voltage | Supply sufficient voltage as per spec |
| | Power failure | Ensure power is connected to device and all associated accessories |
| | Piston jammed with debris | Open the flowmeter, clean the internal measurement chamber. Check for damages to internal parts |
| | Flow transducer failure | Replace flow sensor PCB |
| | Filter element choked | Remove filter element and clean with clear DM water and air dry with 4 kg air |
| | | |
| Erratic/Non-uniform pulse output | Improper electrical connection | Ensure proper wiring connections have been made |
| | Insufficient or fluctuating supply voltage | Supply sufficient voltage as per spec |
| | Piston movement impaired due to debris/solid matter | Open meter, clean the internal measurement chamber. Check for damages to internal parts |
| | Loss of magnetic strength of piston magnet | Send flowmeter to Fluidyne lab for checking |
| | Flow transducer failure | Replace flow sensor PCB |
| | Filter element choked | Remove filter element and clean with clear DM water and air dry with 4 kg air |
| | | |
| Modbus data not showing | Improper connection | Connection with A, B and termination must be checked |
| | Breakage in wiring | Check wiring line for any damages or breakages. Isolate flowmeter before repair |

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| | | |
|---|---|---|
| | Wrong polling of registers or wrong slave settings | Read section 11 and 8.5 for correct settings on device |
| | Module damaged | Connect with Fluidyne representative for card change |
| | | |
| 4-20 mA data not showing | Improper connection | Please check the connections at system and flowmeter end |
| | Damage to module due to swapped connections | Connect with Fluidyne representative for card change |
| | 4-20 mA mode not enabled | Please read section 8.3 for enabling signal output |
| | | |
| Gland loosening | Improper installation | Retighten certified gland |
| Damaged enclosure | Mechanical impact | Replace enclosure (DO NOT repair) |
| Missing blanking plug | Open cable entry | Install certified plug |
| Electrostatic risk | Dry cleaning / low humidity | Use damp cloth only |
| Cover not fully tightened | Improper assembly | Tighten to specified torque |

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## 17. Contact personnel

**Authorized Distributor (North region)**

**Saika Instruments and Solution**
201, Rishabh Corporate Tower, Karkardooma Community Centre, Delhi -92

**Sales, Service and Spares contact**
Name – Ankit Gupta/ Mrinal Kaushik
Ph No – +91 98739 04600 / +91 97186 88851
Mail ID – info@saikainstruments.in / tech@saikainstruments.in

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**Original Equipment Manufacturer**

**Fluidyne Control Systems P Ltd**
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Phone No. - +9120 2529 0504
Email – inquire@fluidyne.co.in

***Sales, spares contact***

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Ph No – +91 992250 7989
Email ID – nita.bobade@fluidyne.co.in

***Service contact***

Person Name – Lalit Janala
Ph No – +91 99232 76935
Email ID – techsupport@fluidyne.co.in

Person Name – Akshay Kadam
Ph No – +91 77988 34651
Email ID – akshay.kadam@fluidyne.co.in