Technical Information Manual

Series 6622 – Fuel Consumption Meter

Unique measurement instruments with built-in air eliminator for direct measurement of Cummins PT technology engines

Applications

- Diesel generators
- Marine engines
- Mobile compressors
- Construction equipment

Device Properties

- Wide engine service range – 100 kVA to 1100 kVA
- Measured error: 0.25%
- Medium temperature: -45 to 150 deg C
- Built-in air eliminator
- Remote display available
- 18-26 VDC and 86-275 VAC , self powered compatible
- Explosion proof electronics

Your benefits

- Industry leading accuracy of 0.25%
- Repeatability of better than 0.1%
- Space saving installation – no straight lengths needed
- Unaffected by pulsating flow
- Fuel agnostic
- The lowest pressure drop in a Positive Displacement flowmeter – 0.1 kg/cm^2
- Easy-to-use UI with Backlight enabled LCD
- Process and diagnostic information available for speedy maintenance

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
1.0	03 April 2022	Operation, spares and service of the 6622 FCM with instructions and do's and don'ts	Shubhankar M	Shivdas M	
2.0	10 May 2024	Updating of registers and display screen	Ganesh S	Shubhankar M	
3.0	28 April 2026	Updating of registers and display screen	Ganesh S	Shubhankar M	

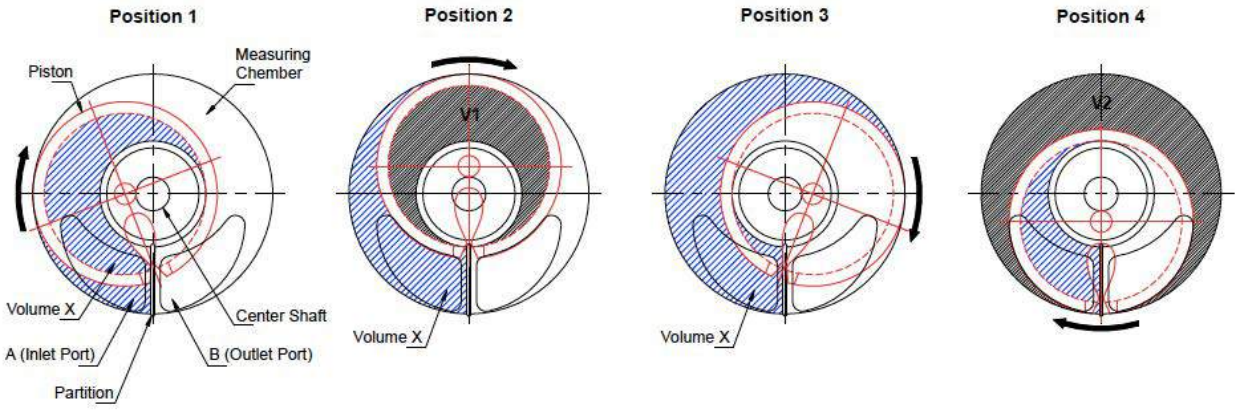
2. Measurement principle

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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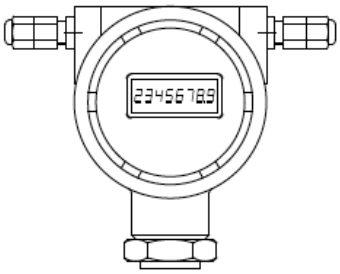
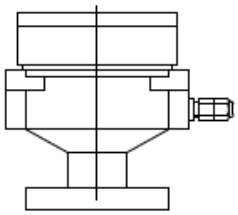
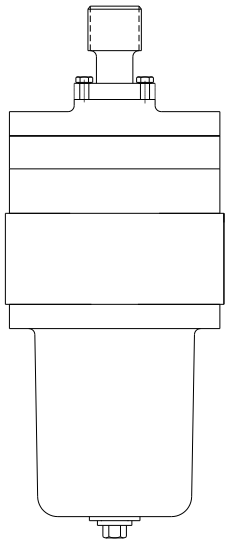
3. Measurement System

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

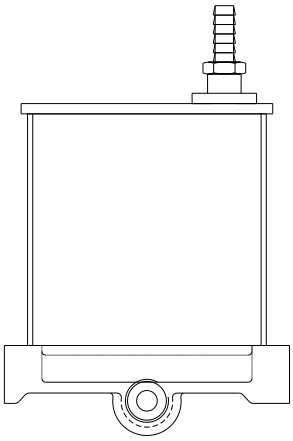
Transmitter

	**Powered transmitter** **Device materials** - Die cast Aluminium LM06 - ASTM A351 CF3M 316L (option) **Window material** - Cast, stainless: glass **Specifications** - Cable entries – 2 nos M20 x1.5 - Rating – Ex db IIC Gb T6 IP66/68 (option) - PESO approved - Capacitive touch keys - Dual compartment with terminal box - 4-20 mA, Modbus, pulse output, 2xDI, 2xDO available - LCD with backlight - AC supply – 86-260 VAC 50 Hz/60 Hz, DC supply – 18-26 VDC - Two wire 24 VDC HART (optional)
	**Device materials** - Aluminum coated: AlSi10Mg **Specifications** - Cable entries – 1 nos - PESO approval IIA, IIB, IIC gas groups - Pulse output only - No display

Sensor

	**Material of Construction** - Aluminum LM04 - Optional (SS304) **Process connections** - BSPF - Special connection available on request **Advantages** - Low pressure drop due to one moving part - Measurement of volumetric flow and mass flow - Immune to process influences and pipe bends - Nominal diameter DN15 (1/2”) - **Built-in 149 micron pre-filter (washable and reusable)**

Air eliminator

	**Material of Construction** - Aluminum LM04 - Optional (SS304) **Process connections** - BSPF - Special connection available on request **Advantages** - Float actuated mechanism - Air outlet valve DN15 (1/2”)

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4. Input

4.1 Measured variables - Direct

- Instantaneous volume
- Totalized volume

4.2 Measured variables – Calculated

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

4.3 Measuring Range

Pipe size (mm)	**Pipe size (inch)**	**Calibrated flow range (LPH)**	**Suitable engine kVA rating**
15	1/2	12-700	100-1100 kVA

4.4 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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5. Outputs

5.1 Pulse output

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

5.2 Digital Outputs

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

5.3 MODBUS with RS485

Protocol	Modbus Applications Protocol Specification V1.1
Mode	32 bit floating point
Response times	Direct data access: typically 20-50 ms
Device type	Slave
Slave Address Range	1 - 255
Baud rates supported	9600 BAUD 19200 BAUD 38400 BAUD 57600 BAUD 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

5.4 4-20 mA

4-20 mA is not provided with device due to extreme variation of flow rates as air eliminator fills and empties continuously

6. Power Supply

6.1 Supply Voltage

Terminal Voltage	Frequency (Hz)
86 – 240 VAC ±20%	50/60 Hz
DC 18-26V +-10%	-
Internal battery powered 3.3 VDC	-

6.2 Power Consumption

Transmitter – Max 3.5 W

6.3 Current Consumption

Max – 180 mA (24 VDC)
Max – 150 mA (110 VAC 50/60 Hz, 230 VAC 50/60 Hz)
Max – 10 uA (sleep mode), 800-1000 uA (measurement mode)

6.4 Power supply failure

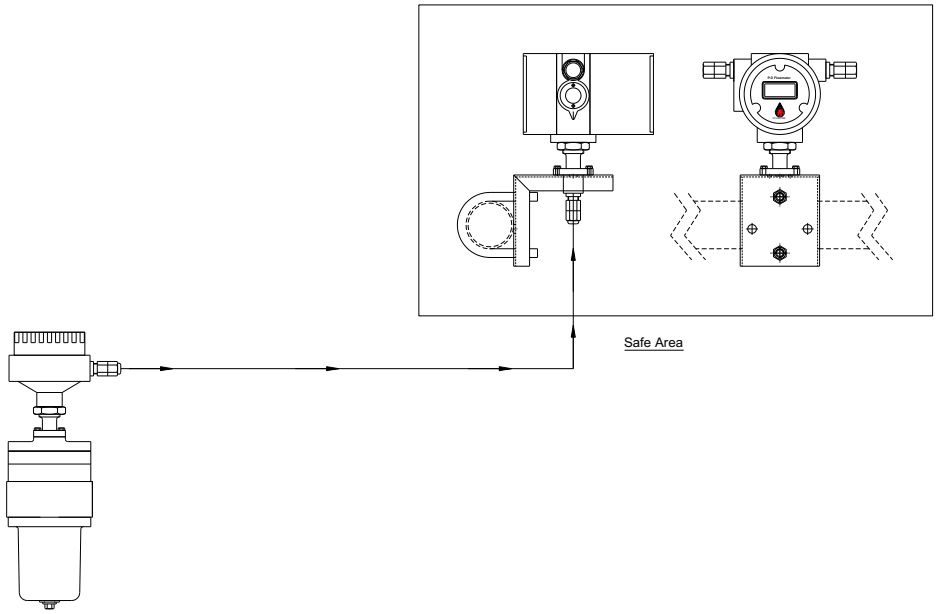
- Totalizers stop at last value measured
- Data is maintained in NV memory

6.5 Electromagnetic compatibility

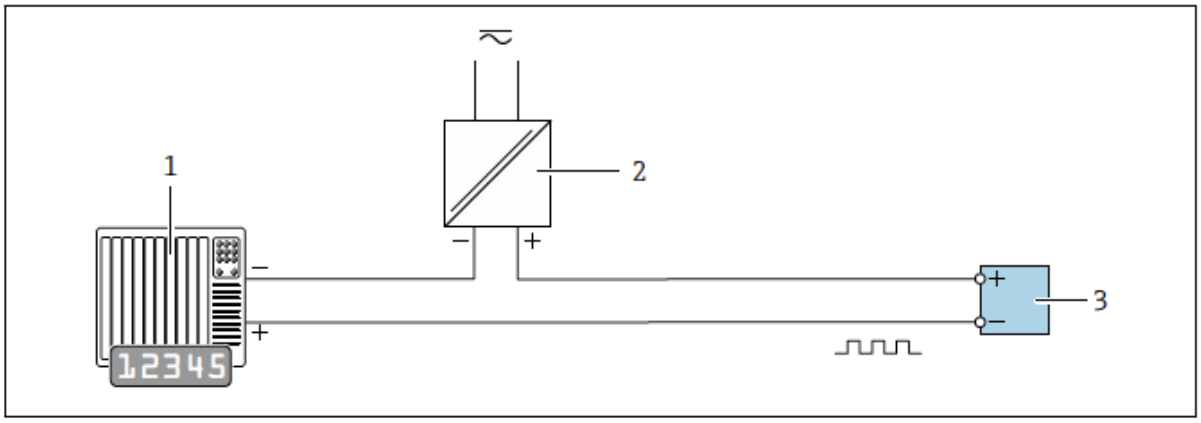
The device is class A certified device as per emission and immunity norms stated in standard EN/IEC 61326, CISPR 11/AMD1/AMD2 and in conformance with EMC Directive 2014/30/EU .

- 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

6.6 Connecting the remote placed transmitter to the sensor

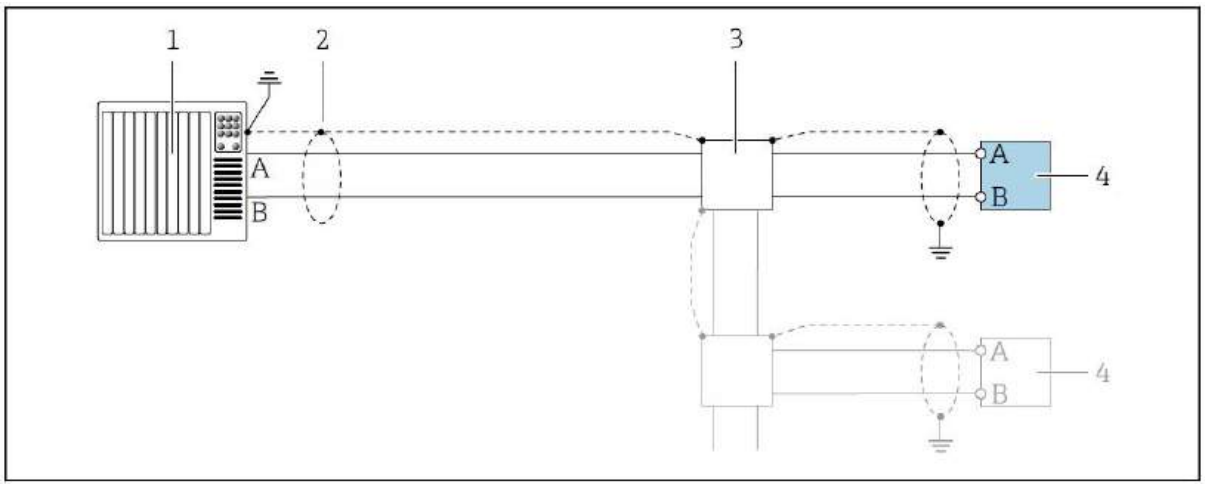


6.7 Connection for pulse output



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

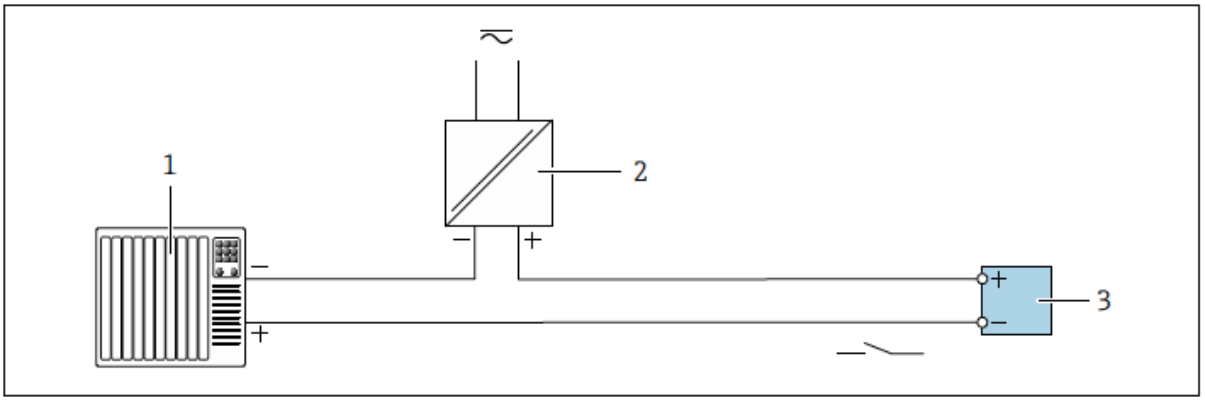
6.8 Connection for RS485-Modbus



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

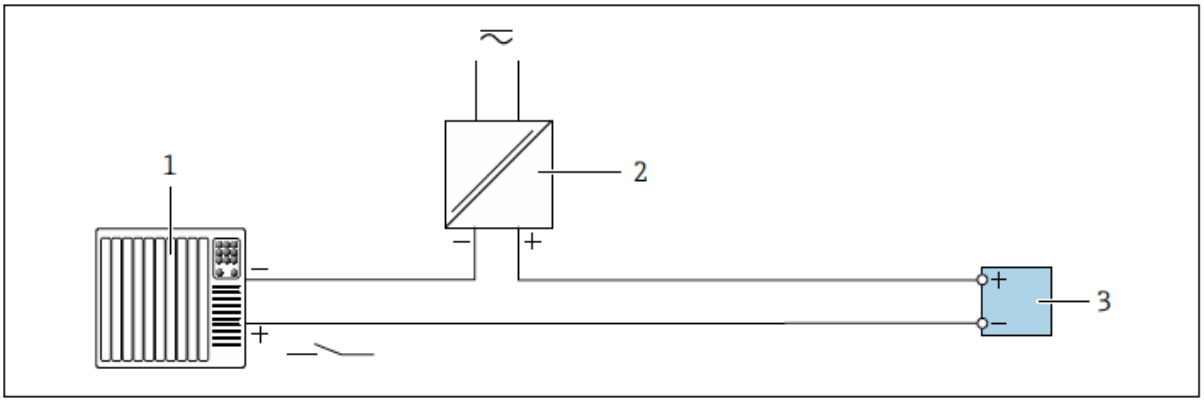
6.9 Connection for Digital Output(s)



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

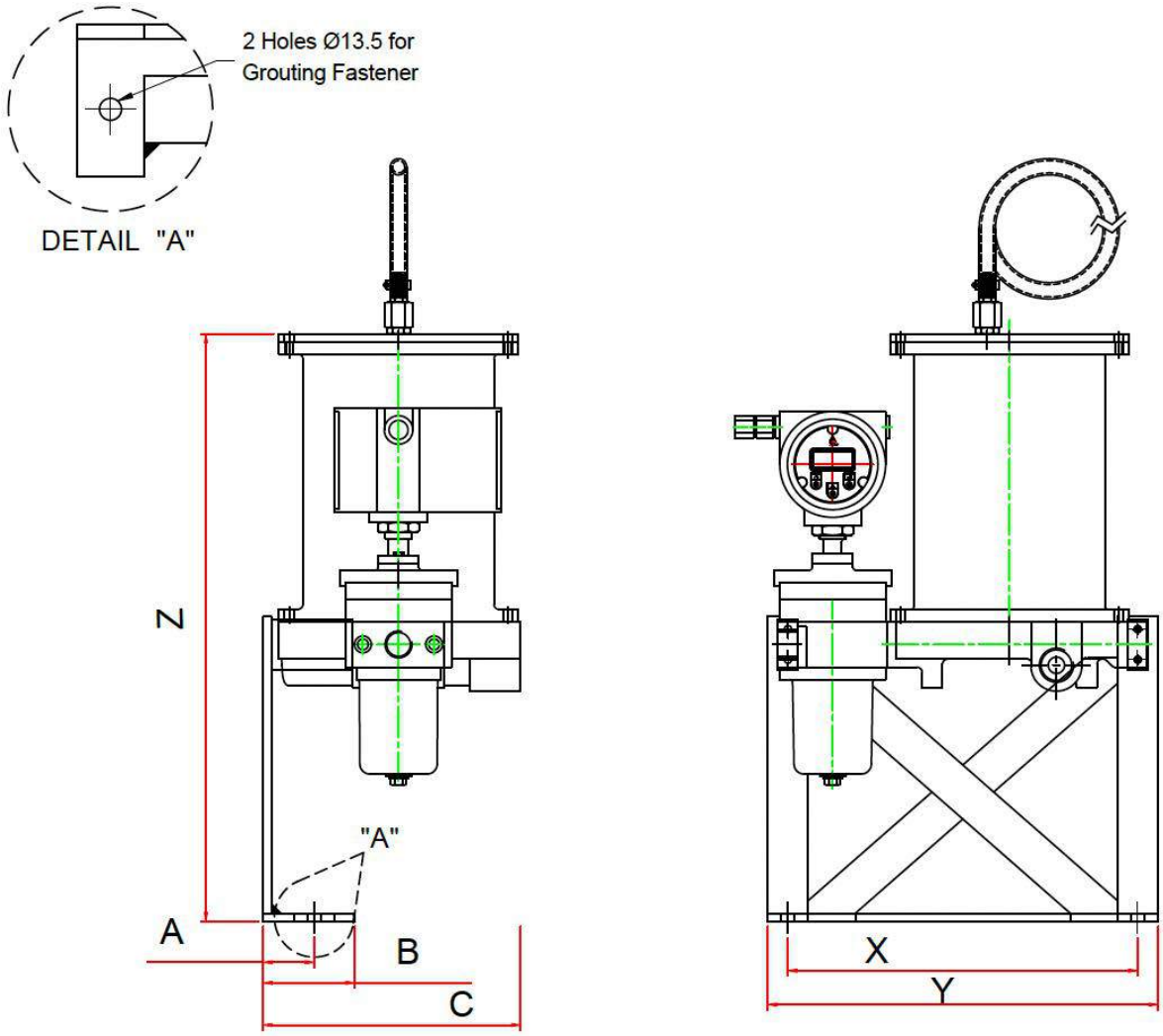
6.10 Connection for Digital Input(s)



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. Dimensional details



X (mm)	Y (mm)	Z (mm)	A (mm)	B (mm)	C (mm)	Weight (kgs)
344.0	384.5	578.0	50.0	90.0	253.0	20

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 J11 or J17 from the terminal card.

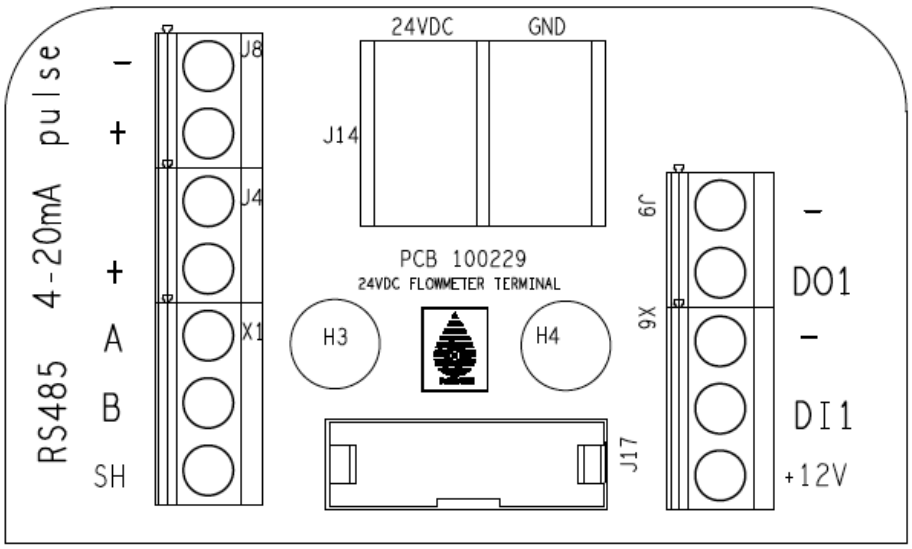
DO NOT feed AC supply to DC configured transmitter.

Cable recommendation

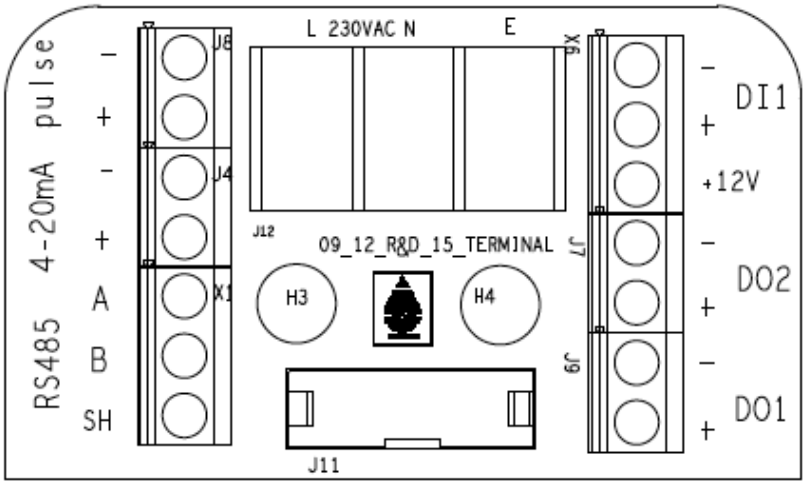
For RS485 and 4-20 mA connectors please use shielded twisted pair with earthing shield cable. 18 AWG or 0.82 mm^2 cable is preferred. All conductors to be copper material only.

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

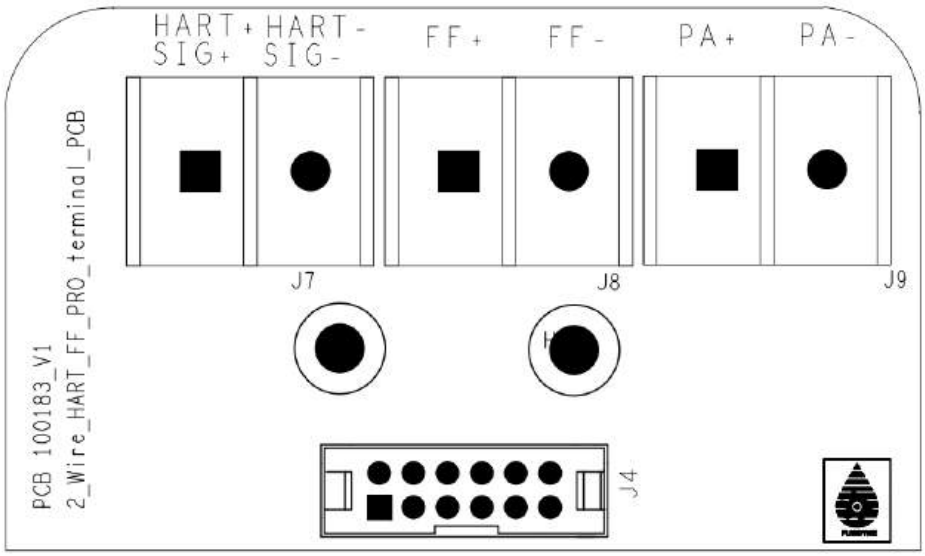
8.1 Four Wire transmitter with DC voltage



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.

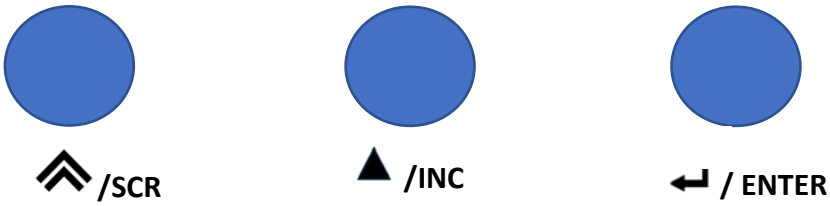
9. Internal Device Settings

9.1 Precautions prior to accessing settings

- *Allow device to initialize and do not pass liquid through the device until it is initializing under initial level Fluidyne software information screen*
- *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*

9.2 Internal settings in flowmeter device

- Capacitive touch 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.

9.3 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 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 LPH/LPM/KGPH/KGPM/LBPH/LBPM

Use the enter key to scroll to the next screen.

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9.4 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 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 flowrate	4-20 mA 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 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 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 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 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 xxx.xxxx

Use the enter key to scroll to the next screen.

- The next configurable parameter shown is **PRE SWCH**. Keep this setting disabled as it is not generally required for flowmeters.

PRE SWCH ENABLED/DISABLED

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.

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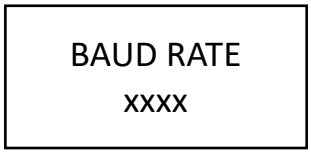
9.5 MODBUS settings in device

- 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.

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9.6 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)

DOP Point
0000000L

Use the enter key to scroll to the next screen.

9.7 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.

Vel Unit
ft/s

Vel Unit
m/s

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.

LSIZE MM
xxx

Use the enter key to scroll to the next screen.

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10. Standard Display Parameters

10.1 STD Transmitter (Powered)

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. 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.
- Please view section 8.3 for more information

xxxxxx LT xxxxxLPH

- Press 'View' Switch 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. Please view section 8.3 for more information

TT.LTR / TT KGS/TT LBS 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 x.x

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

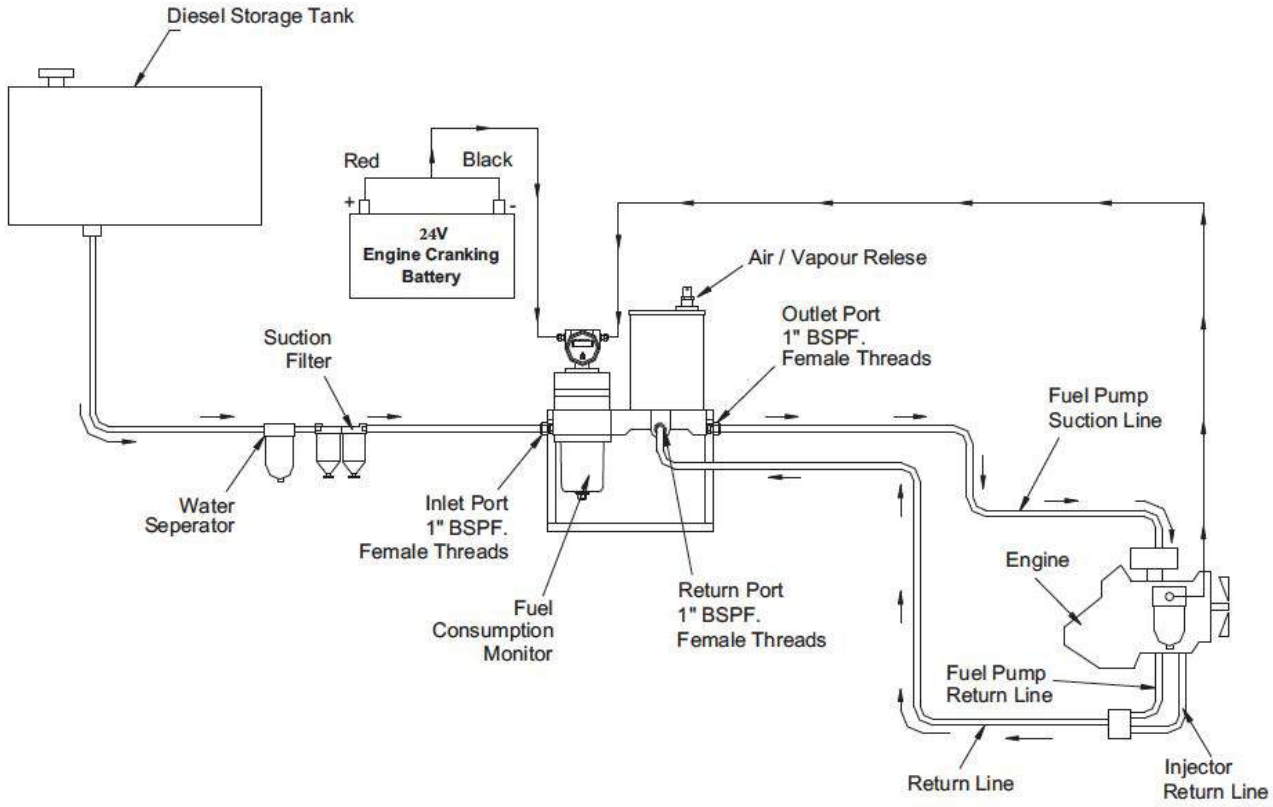
Modbus Query Positions	Position Value	Description
1	1	Slave Id
2	16(0x10)	Function code
3	0	Data Address of Register (High)
4	0	Data Address of Register (LOW)
5	0	No of registers (High)
6	2	No of registers (LOW)
7	4	The number of bytes to write
8	0	Value writes at 400001(High)
9	0	Value writes at 400001(LOW)
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. Fuel Consumption Monitor Installation Guidelines

12.1 Typical installation diagram



In an engine service configuration, the FCM **inlet port** must be connected after the suction filter and water separator to protect the instrument from debris and solid particles. The **Outlet port** as labeled must be connected to engine fuel pump. The return line must be connected from engine to **return port.**

Install preferably downstream of fine filter of 100 micron mesh size minimum.

12.2 Prior to installation of FCM

Do's

- Review the system installation to ensure all components are in proper sequence, all isolation valves must be closed, and all electrical connections are complete.
- It is recommended that the FCM connected via **rubber hoses only**. Metal piping might lead to loosening of the connection to the meter due to vibrations and subsequent leakages.
- Before the FCM is installed in line ensure that the hose is sufficiently flushed with water or required liquid service to remove any debris like burr, soil particles and other dirt, rust, welding slag from the hoses
- Ensure all joints are tight to prevent air lock. Use Teflon tape and minimal sealant liquid. Wipe off excess sealant before tightening hoses
- The unit should be mounted on the ground next to the engine base frame and should be grouted with the help of fasteners provided
- The unit should be installed between the engine fuel filter and the fuel pump
- Use recommended oil pressure switch to activate the engine run hours totalizer of the unit
- The recommended calibration interval of the unit is one year
- Please view section 6 for power supply recommendations and strictly follow the same

Don'ts

- Never mount the unit on the engine base rail or any vibrating structure
- Do not mount the unit before the engine fuel filter
- Do not connect the unit to a power supply other than recommended supply in section 6
- Use only recommended end fittings
- Do not make pipe reductions as engine may hunt or overspeed
- Do not share the contacts of an already installed Oil Pressure Switch on the engine. Use of independent pressure switch is highly recommended

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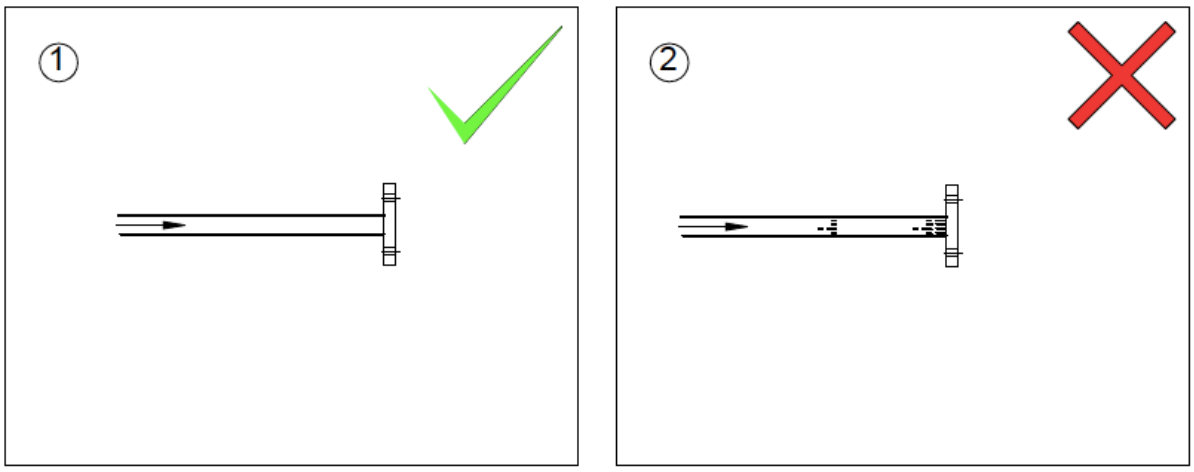

- Ensure that hoses are free of burr, particles and other material before FCM installation
- Particles left behind might jam the internal measurement chamber or cause filter choke. It is recommended to take a few runs of liquid and collect the same into a storage tank until the service at the installation point appears clean and devoid of solid matter

12.3 Air elimination

The FCM comes with a standard built-in air eliminator.

12.4 Products

The FCM is recommended for usage with liquid fuels such as HSD, LDO, Gasoline, HFO, Biodiesel derivates, Kerosene derivates only. Beyond such fuels or for fuels with additives, it is recommended to consult Fluidyne before operation.

12.5 Normal startup

1 – Ensure clean fuel service

2 – Ensure correct connections as per terminal connection diagram (Section 8)

3 – Ensure right voltage input to the device

4 – Set load to 10% and run the FCM for a period of 2-3 minutes to warm up the system. in this time electronics must be switched off.

5 - Set load to 50% and run the FCM for a period of 2-3 minutes. Now the system is sufficiently ready for operation to any load condition

12.6 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 FCM warm up time.

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

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.

12.7 Continuous Operation - Clean Filtered Liquid Service

A positive displacement meter is used for clean service applications. This FCM is not suitable for liquids with greater than 100 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 FCM 6622 comes 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 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 FCM installation or continuous circulation of the product so that it does not solidify upon staying stationary or even flushing the lines with clean diesel to remove all traces of the product.

12.9 Orientation of FCM in pipeline

FCM must always be installed horizontally only.

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13. Maintenance

The Fluidyne 6622 FCM 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.

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.

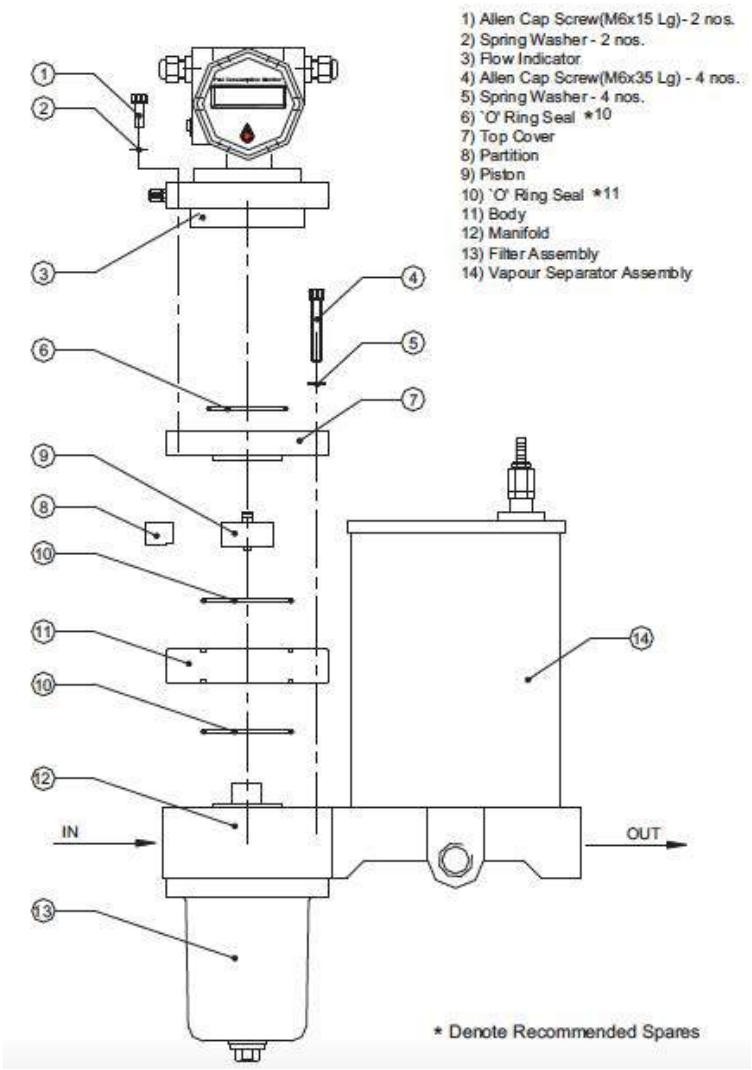
Working Flow Rate – The life of the instrument is proportional to the speed of its operation. If the instrument is operating at near or above maximum flow rate it will have a shorter life expectancy than if it were operating at its minimum flow rate.

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 Cleaning the Flowmeter Assembly



In the event of dirt particles entering the Flow Sensor Assembly owing to incorrect or damaged filter, the assembly has to be opened and thoroughly cleaned with a solvent such as kerosene or diesel fuel. In the interest of through cleaning and proper reassembly Strictly follow the procedure given below.

- Refer Flow Sensor Assembly Schematic
- Remove 02 Allen Cap Screw M6 X 15 (1) and 02 Spring Washer (2) lift out the Totalizer Assembly (3)
- Remove 04 Allen Cap Screw M6 X 40 (4) and 04 spring Washer (5) which clamp the entire
- Flow Sensor module.
- Lift out 'O' Ring seal (6) assembled on the face of Top Cover (7) and the Top Cover
- Lift out Piston (9)

- Lift out body (11) along with partition (8). Remove 02 ‘O’ Rings seals (10) from the face of body.
- Thoroughly clean the Top Cover, Partition, Piston, Body and Manifold face with the help of solvent like kerosene or diesel fuel. Remove all adherent dirt particles smooth out any burr with a fine emery stick or 600 grit emery papers. If emery paper or stick is used to deburr, thoroughly washed all parts again in the solvent.
- Carefully examine the Piston (9) preferably under a magnifying glass. Carefully remove any metallic particles embedded on the bottom or top face and the outer diameter of the piston. Embedded metallic particles on the Piston are the single biggest reason for the piston jamming while in regular use. Thoroughly clean the piston with the solvent
- Examine 02 ‘O’ Rings (10) assembled in the Body (11). Replace if found damaged
- Assemble ‘O’ Rings (10) on both faces of the Body and locate and assemble the Body on the Manifold (12)
- Align the groove on the ID of the Body with the groove on the face of the Manifold and insert the Partition (8) such that is fully meshes with the groove in the Body and the Manifold. Ensure that the Partition has been fully located in the groove and its top faces with the circular cup of the Manifold
- Aligning the profile on the Piston (9) with the Partition, assemble the piston inside the body. Gently rotate the piston inside the body. It should rotate freely without the slightest friction. If the Piston is found to stick at some point during its rotation or resist movement even slightly, repeat the cleaning procedure of all parts again. The free rotation of the Piston inside the body is the single most important condition for ensuring accuracy and proper functioning of the flowmeter
- Aligning the groove on the lowest face of the Top Cover (7) with the partition locate and assemble the Top Cover on the Body
- Firmly clamp the Top Cover with the help of 04 Allen cap screw
- Assemble the Totalizer Assembly on the Top Cover and firmly clamp with 02 Allen Cap Screws M6 X 15 (1) and 03 Spring Washer (2)
- Keeping the Outlet Port of the Vapor Separator Assembly (14) open blow air into the inlet
- The free rotation of the piston should be felt and the totalizer should record the rotation Cap Screws M6 X 40 (4) with spring washer (5)
- Examine ‘O’ Rings seal (6) on the face of Top Cover. Replace if found damaged.
- Gently try to rotate the Piston by rotating its pin guided in the hole on the Top Cover. The piston should rotate freely. The assembly is now ready for use

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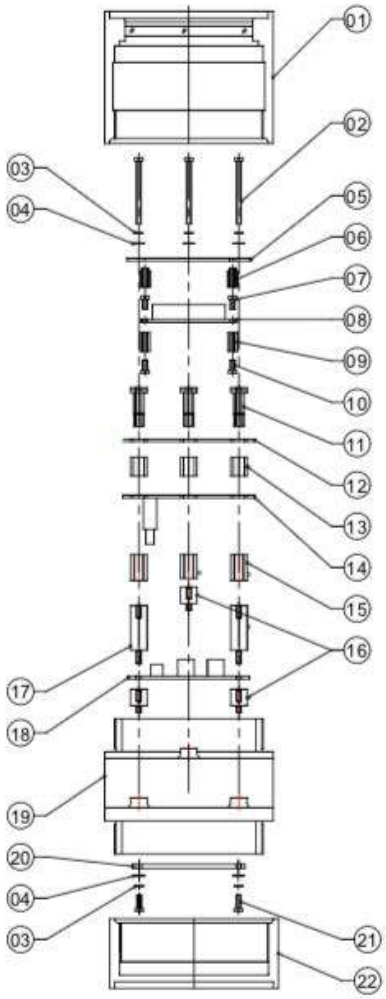
13.3 Removal/Replacement of the electronic cards



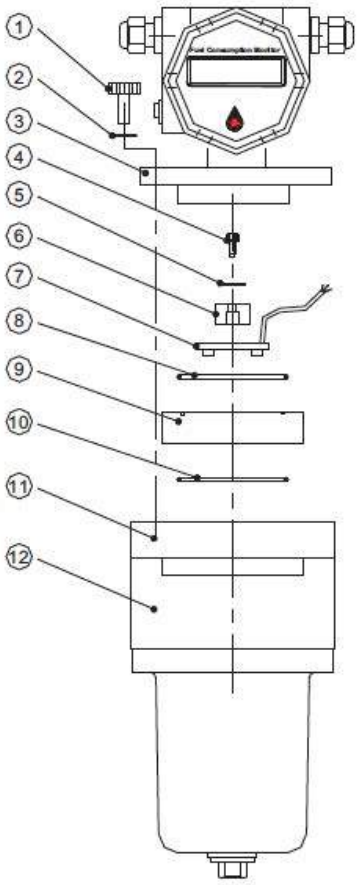
01) Front Cover
02) Ch Head Screw(M3×40) - 03 Nos
03) Spring Washer
04) Plain Washer
05) Facia PCB
06) Display PCB Rivet - 02 Nos
07) Ch Head Screw (M3×6)- 03 Nos
08) Display PCB
09) Display PCB Spacer-1 - 04 Nos
10) Ch Head Screw (M3×20)- 02 Nos
11) Stud For Spacer Clamping - 3nos
12) CPU PCB
13) Sleeve 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

ESD precautions must be followed.

13.4 Removal/Replacement of the sensor card

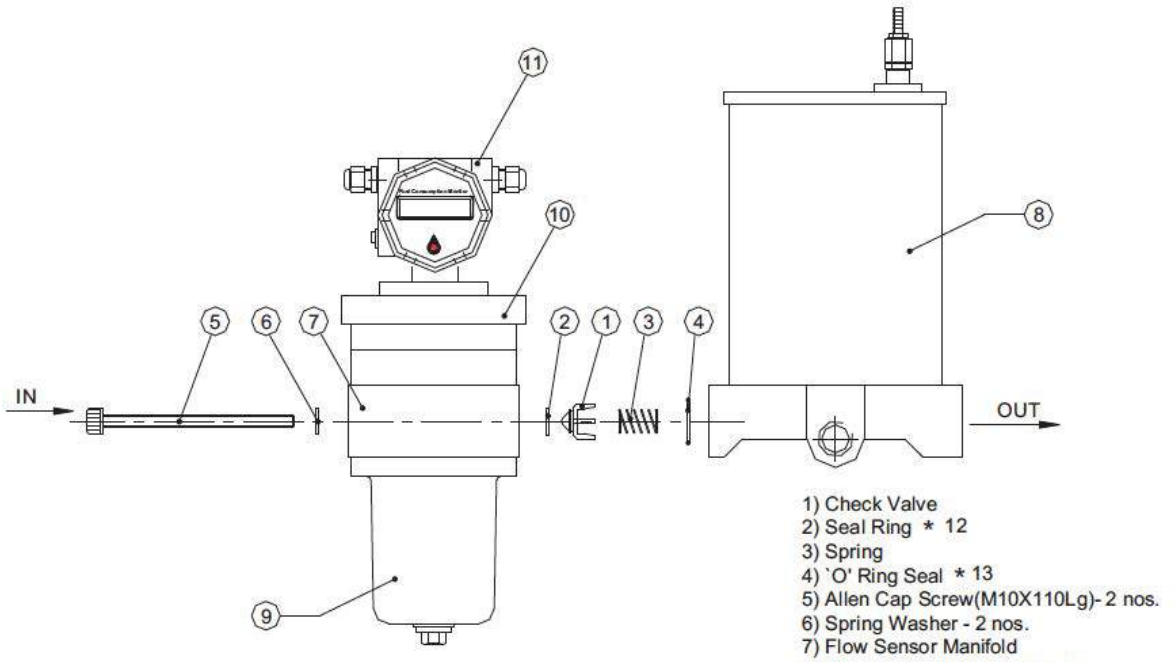


1) Allen Cap Screw (M5x15Lg)-4 nos.
2) Spring Washer - 4nos.
3) Sensor Housing Clamping Plate
4) M3x15 L Cheese Head Screw
5) Washer
6) Spacer
7) Sensor PCB
8) `O' Ring
9) Sensor Housing
10) `O' Ring
11) Top Cover
12) Manifold

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

- Remove the 04 nos M5x15 Allen cap screws (1)
- Lift out the sensor housing clamping plate (3)
- Lift out the sensor housing (9) and sensor PCB assembly (7)
- Remove the M3x15 cheese head screw (4) and lift out the washer (5) and the spacer (6)
- Lift out sensor PCB (7)
- Assemble new PCB assembly and locate it with sensor housing (9)
- Clamp the sensor PCB with the help of spacer (6), washer (5) and cheese head screw M3x15 (4)
- Before placing the sensor housing back in top cover (11), examine and confirm O ring (8) and O ring (10) in good condition. Replace O rings if found damaged.
- Clamp the sensor housing (9) with the help of the sensor housing clamp plate (3) and secure with 04 nos allen cap screw M5x15 (1)

13.5 Servicing check valve assembly

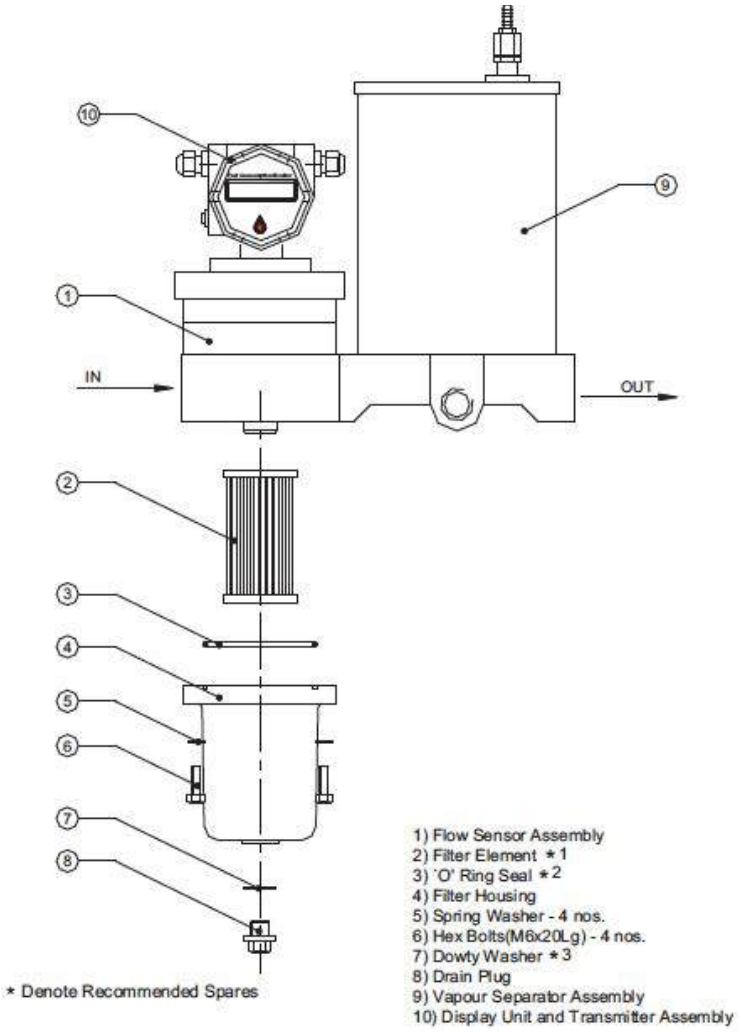


1) Check Valve
2) Seal Ring * 12
3) Spring
4) `O' Ring Seal * 13
5) Allen Cap Screw(M10X110Lg)- 2 nos.
6) Spring Washer - 2 nos.
7) Flow Sensor Manifold
8) Vapour Separator Assembly
9) Filter Assembly
10) Flow Sensor Assembly
11) Display Unit and Transmitter Assembly

* Denote Recommended Spares

- Remove 02 cap screws M10 X 110 (5) with 02 spring washer (6). Detach Flow Sensor Assembly (10) From Air Separator Assembly (8)
- Pull out Check Valve (1) and spring (3) housed in the Flow Sensor Manifold (7).
- Clean the Check Valve housing in the Flow Sensor Manifold of any dirt or deposition. Clean the Check Valve and carefully clean any dirt or deposition sticking to its four guide ribs
- Examine the Seal Ring (2). Replace if found damaged
- Examine `O' Ring Seal (4). Replace if found damaged
- Assemble the Check Valve and spring in the Flow Sensor Manifold Housing. Ensure free back and forth movement of the Check Valve.
- Ensure `O' Ring seal (4) correctly assembled in its groove on the face of the Air Separator. Assembly Manifold (8) Join the Flow Sensor Manifold and the Air Separator Manifold together
- Secure both assemblies by tightening 02 cap screws (5) with spring washer (6).
- The assembly is now ready for use.

13.6 Removal/Replacement of the FCM flowmeter filter



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

Note: It is recommended to replace the filter element once every 6 months for trouble free performance of the FCM.

The frequency of filter element change will depend upon the contamination level in the fuel and will vary from site to site. To replace filter element, follow below steps with above diagram as a reference.

- Examine O ring seal (3) on the face of the filter housing. Replace if found damaged
- Placing the face of the filter housing on the flow sensor assembly manifold, assembly 04 nos M6x20 hex head bolts and firmly tighten them
- Examine Dowty washer (7). Replace if the sealing rubber ring is damaged
- Assemble the drain plug (8) and Dowty washer (7) and tighten firmly. The unit is now ready for regular use

- Remove drain plug (8) and drain liquid from the filter housing and flow sensor assembly (1)
- Remove 4 nos Hex bolts M6x20 (6) to detach the filter housing from the flow sensor assembly (1)
- Pull out the filter element (2) from the manifold provided on flow sensor assembly
- Fully push the new filter element on the round boss provided

To reuse the same mesh, it is recommended that the filter be examined for mesh damages or large dents. 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.

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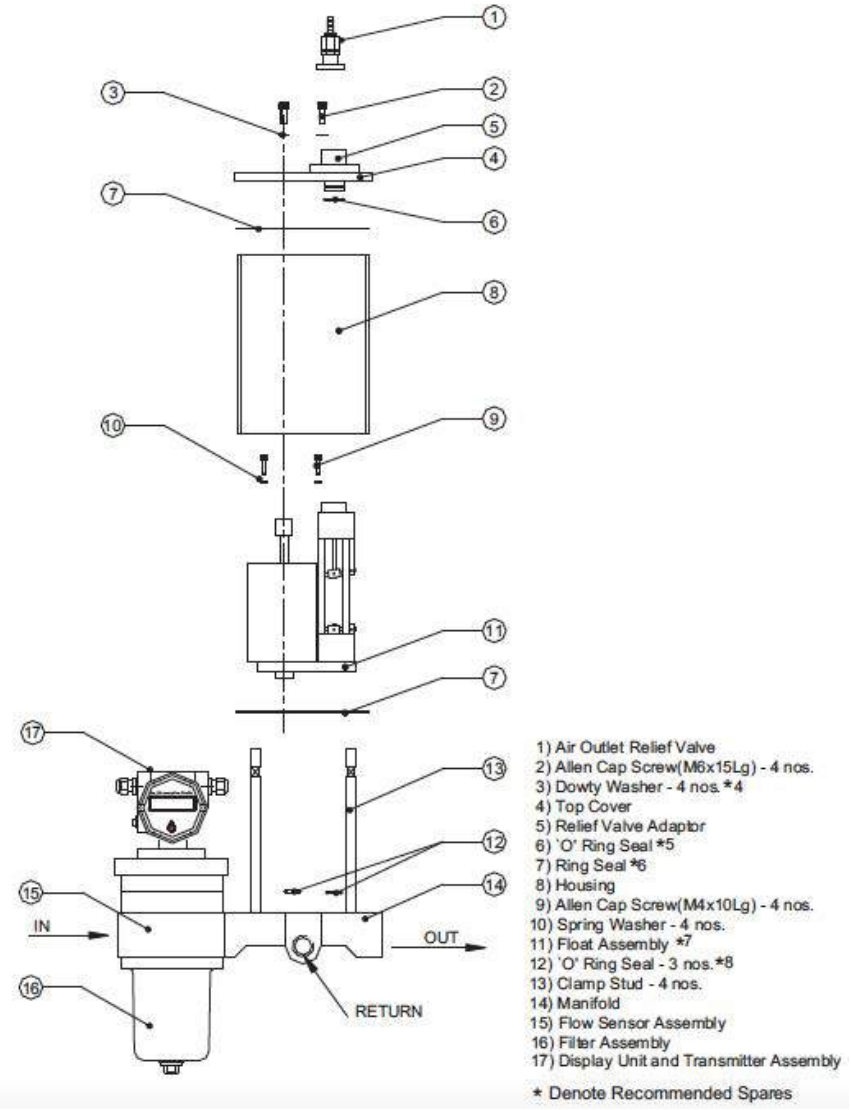
13.7 Removal/Replacement of the float assembly



Ensure all liquid is drained from the flowmeter and isolate the flowmeter on upstream and downstream ends.

- Remove 04 Allen Cap Screws M6 X 15 (2) along with 04 Nos. Dowty Washer (3)
- Firmly lift out Top Cover (4)
- Lift out Housing (8)
- Remove 04 Allen Cap Screws M4 X 10 (9) along with 04 Nos. spring washers (10)
- Lift out Float assembly (11)
- Examine 03 'O' Ring Seals (12) assembled on face of Manifold (14). Replace if found
- damaged
- Examine Ring Seal (7) assembled in groove on the face of Manifold. Replace if found damaged

- Correctly place new Float Valve Assembly taking care to ensure that ‘O’ Ring Seals (13) are assembled properly on the face of manifold (14)
- Firmly clamp Float Valve Assembly with 04 Allen Cap Screw M4 X 10(9) and ensure that spring washer (10) are assembled correctly
- Place Housing (8) in the circular groove on Ring Seal (7) on face Of Manifold (14)
- Examine Ring Seal (7) assembled in the groove on Top Cover (4). Replace if found damaged
- Carefully position top cover (4) such that the adapter (5) aligns on float assembly air outlet port. Gently push the top cover so that the adapter (5) with its O ring on the outer diameter assembles into the float valve air outlet port
- Clamp Housing (8) with the help of 04 Cap Screws (2) and spring washer (3)
- Assembly is now ready for normal use

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14. Troubleshooting

The information on this section has been provided as an aid for basic troubleshooting. Disassembly procedures have been outlined in chapter 13. If the 6622 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
Engine starves with no fuel supply/engine hunting or overspeeding	Very low or no fuel in supply tank	Ensure enough fuel in tank
	Choked filter element	Replace filter element. Check section 13.6
	Suction leak in connecting hoses (for -ve suction head only)	Retighten all hoses
	Piston jammed with debris	Open the meter, clean the internal measurement chamber. Check section 13.2
	Air not being removed from air eliminator	Replace float assembly and air release seal
Fuel leakage from air breather assembly	Defect in air release valve in float assembly	Replace float assembly and seal. Check section 13.7
Totalizer display is not counting or blank	Piston jammed with debris	Open the meter, clean the internal measurement chamber. Check section 13.2
	Breakage in wiring/incorrect supply	Check wiring line for any damages or breakages. Ensure right supply voltage to FCM
	Flow sensor card defective	Replace flow sensor card. Check section 13.4
	Incorrect calibration	Recalibrate flow sensor. Connect with Fluidyne representative. Check section 15 for details.
	Choked filter element	Replace filter element. Check section 13.6
Modbus data not showing	Incorrect polling of registers	Please check Modbus interfacing spec in section 11
	Breakage in wiring	Check wiring thoroughly between FCM to receiver
	Flowmeter not powered on	Switch on power to flowmeter

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	Defective Modbus card	Change Modbus card. Check section 13.3

15. Contact personnel

Original Equipment Manufacturer

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