

Efcon[®] Water

Installation & User Manual

Electro Magnetic Flowmeter (EMF)



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1.1 General

Efcon[®] flowmeters are designed for measuring and controlling wastewater flows.

Other Products from the Efcon[®] program are:

Samplers (several types), level controllers, pump controllers, registration equipment, sample distributor systems, flowmeters industrial and sewers, measurement pits, cool units, mobile systems, etc.



BEFORE YOU START:

Read the manual before you connect the meter to a power supply or install.

In case of illegal use or use in non-defined area's any form of warranty will be denied. The user needs to be informed about the users manual and application dangers.



Installing and adjusting parameters of the flowmeter should be done by qualified personnel.

Check if the equipment is transported without transport damage. In case of damage directly contact your supplier and do not install the equipment. The equipment is tested in the Efcon[®] factory in Hei- en Boeicop, Netherlands to different quality tests before it is transported. Required maintenance or repair, which will not influence the warranty period, will have to be done by trained Efcon[®] specialists. All equipment returned to Efcon[®] needs to be cleaned, sterilised and transported in a safe enclosure to avoid health-threatening situations. In case of service or repair, the equipment will not be accepted by Efcon[®] if there is no declaration of origin and safety added to the equipment. Extra cleaning can be refused or will be charged! Warranty will be denied if there are mechanical, electronic or software changes in the unit which are not performed by Efcon[®].

BASIC WARRANTY PERIODS:

12 months after delivery for Efcon[®] equipment ex. Works used and installed according specifications, in a non aggressive well ventilated environment.



1.2 Application area

Be aware! Wrong application or misuse can damage the equipment or the surrounding of the unit and is not covered by any form of warranty.

Surrounding conditions:

- Temperature: -15°C / + 50°C avoid large changes
- Well ventilated space
- Avoid direct sunlight, especially the liquid crystal display
- Avoid strong vibration
- Avoid installation near strong electromagnetic devices, such as large motors, pumps or transformers



Use in explosion hazardous environment is prohibited unless mentioned on product and manual!

Measured Medium:

- Especially designed for waste water measurement
- Minimum fluid conductivity: 50 µS/cm
- Free of air inclusion
- Medium temperature range: -40 °C / +150°C.

1.3 Transportation

- For warranty claims send the system packed in the original package and on the supplied pallet. All products should be declared clean and safe to work on.

1.4 Principle of Operation

The operation of a magnetic flowmeter or Mag meter is based upon Faraday's Law, which states:

A voltage induced across any conductor as it moves at a right angle through a magnetic field is proportional to the velocity of that conductor.

Faraday's Formula: $E = V \times B \times D$

E = Voltage generated in a conductor

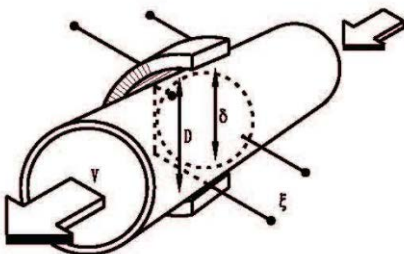
V = Velocity of the conductor

B = The magnetic field strength

D = Length of the conductor

To apply this principle to flow measurement with a magnetic flowmeter, the fluid being measured should be electric conductive.

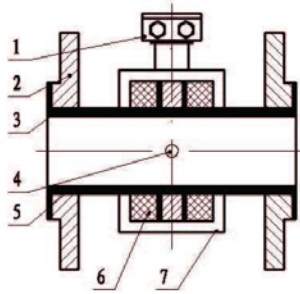
As applied to the design of the flowmeter, Faraday's Law indicates that the voltage E is dependent if the average liquid velocity (V), the magnetic field (B) and the length of the conductor (distance between electrodes).



functional diagram

1.5 Product description

The Efcon EMF Compact Flowmeter consists out of mainly 2 parts: the sensor tube and transmitter.



The sensor tube consist out of the following parts:

- 1) Junction box / transmitter mounting flange
- 2) DN Flange connection
- 3) Insulated Teflon lining
- 4) SS Electrodes
- 5) Measuring tube
- 6) Excitation coil
- 7) Protective shell

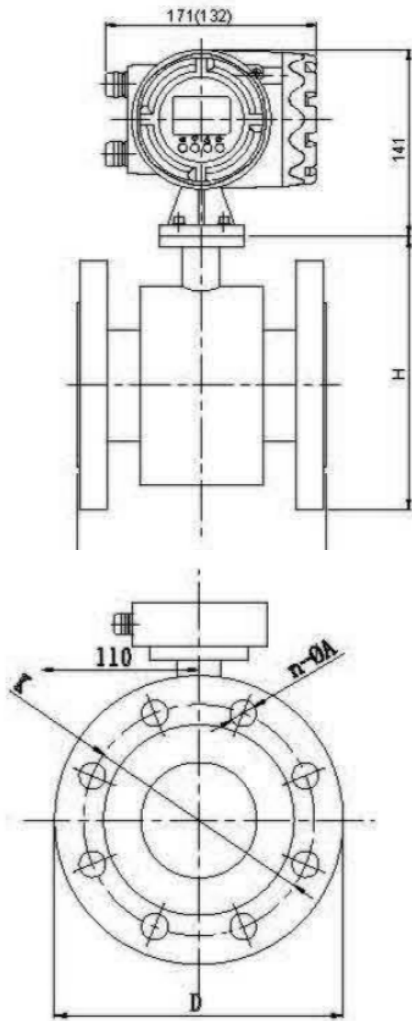
The transmitter consist out of the following parts:

- 1) Sensor tube mounting flange
- 2) Operation lid
- 3) Display
- 4) Cursor buttons
- 5) Swivels for signal & power lines
- 6) Connection lid

2.1 Product specifications

Sensor Range	DN10...DN1000
Flow Range	0,05 m/s...10 m/s
Accuracy	±1% >0,5m/s, (pulse calibrated at 0,1 – 0,5 – 1 – 2 – 5 m /s)
Repeatability	± 0,5%
Medium Conductivity	>50µS/cm
Power supply	230VAC ±2%
Power rating	10VA
Protection grade	IP65
Pulse Output	Open collector, maximum load 24VDC / 50mA
Current Output	4-20mA, maximum load <750Ω
Display language	English
Control buttons	3
Low flow cut off %	0,0%... 9,9% adjustable (for display or output)
Damping Time	0,1s... 99,9s adjust (for display)
Auto Trim	Current output self-calibration, empty/full trim. Zero trim
Self test function	Current frequency output self test

Measurements



DN (mm)	max work pressure (bar)	L* (mm)	D (mm)	K (mm)	Weight (kg)
10	25	150	90	60	4
15			95	65	
20			105	75	
25			115	85	5
32			140	100	7
40			150	110	8
50			200	165	125
65	185	145		15	
80	200	160			
100	10	250	220	180	20
125			250	210	22
150		300	240	33	
200	6	350	340	295	43
250			395	350	82
300		500	445	400	100
350			505	460	121
400		600	565	515	145
450			615	565	207
500			670	620	210
600			780	725	250
700		700	895	840	350
800		800	1015	950	460
900	900	1115	1050	550	
1000	1000	1235	1120	680	

*** BEWARE:**

Gaskets & ground rings are not included in the measurements.

2.3 Installation



Installation, commissioning and service should be carried out by qualified and authorized personnel.

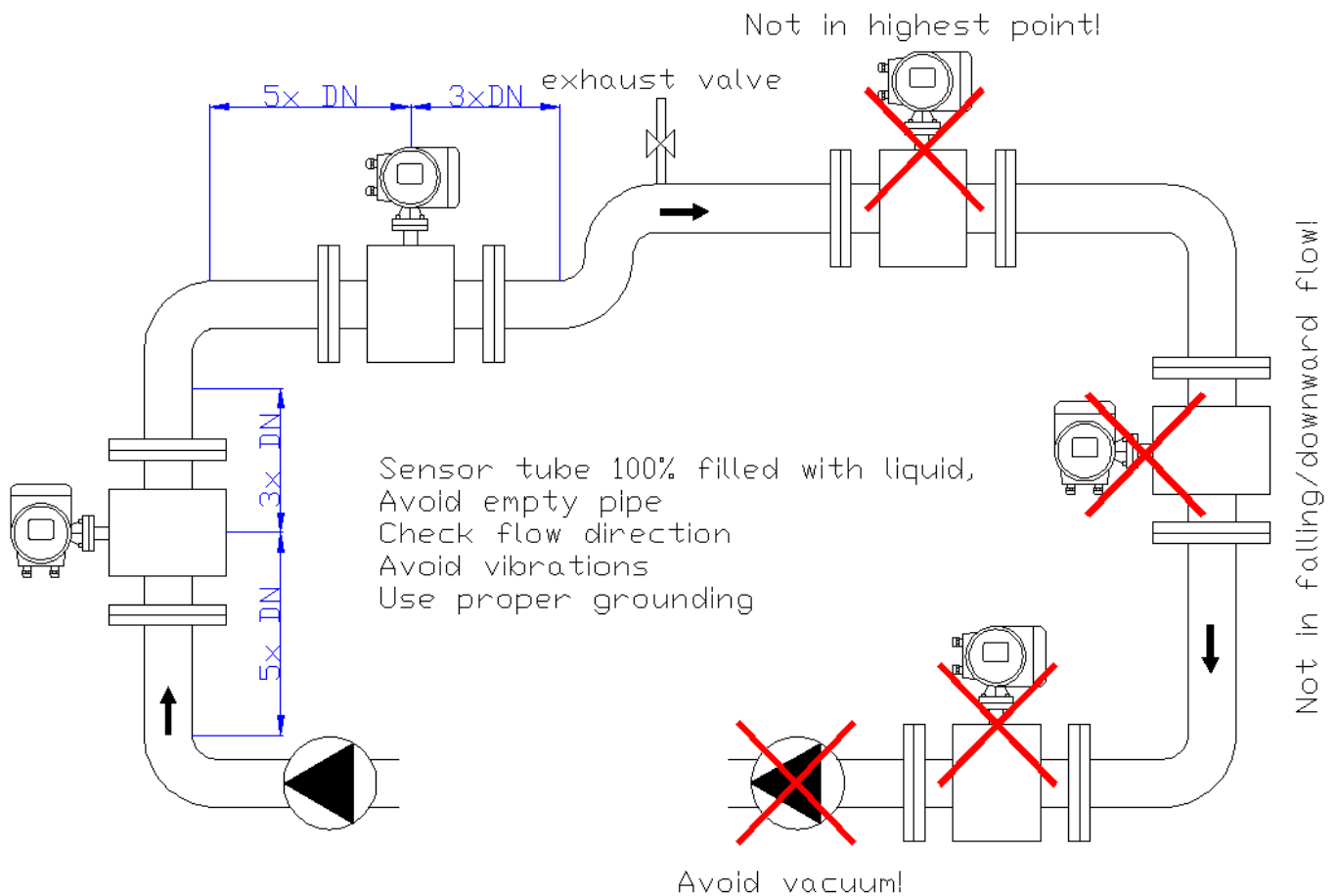
2.3.1 Mechanical:

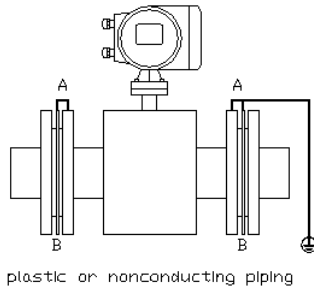
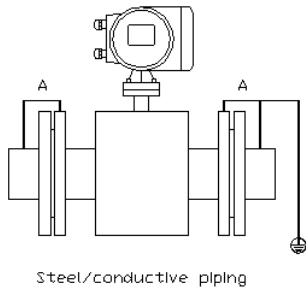
When installing a flowmeter in a pipe system beware of the following :

- The sensor tube should always be 100% filled with liquid medium.
- Minimum fluid conductivity: 50 $\mu\text{S}/\text{cm}$
- The Free of air inclusion
- Temperature range medium: $-40\text{ }^{\circ}\text{C} / +150\text{ }^{\circ}\text{C}$
- Use proper gaskets when making the flange connection.
- Use proper grounding

Don't install:

- In a downward flow
- At the highest point in a pipe system
- In pipe systems not free of air inclusion
- Avoid vibrations





Grounding:

Steel/conducting piping:

Connect the supplied yellow/green ground lines(A) on both sides of the flowmeter to the piping. Ensure the piping is properly grounded.

Plastic or non-conducting piping:

Install the flowmeter with the supplied grounding rings(B), connect these with the ground lines (A) on both sides. Ensure the rings are placed in the centre so the flow isn't interrupted by the ground rings.



2.3.2 Electric:

Before connecting the power supply, check the name plate and connection terminals, to avoid misoperation and damage the instrument.

To access and connect the wires to the terminals remove/open the screw-lid. Ensure when removing the lid the tread doesn't damage. A damage tread can make the lid get stuck.

Feed the power line cable and output signal cable through separate cavities.

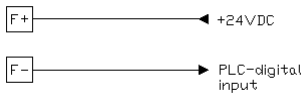
Power Supply

- Connect the ground line to the transmitter to screw with ground symbol
- Connect the 230VAC line to the L & N terminals

Current Output

The current output creates an active 4-20mA signal powered from the transmitter, with 4 mA stands for a flow of 0 m³/h and 20mA stands for full scale value or Q_{max}. The maximum current output load is 750Ω.

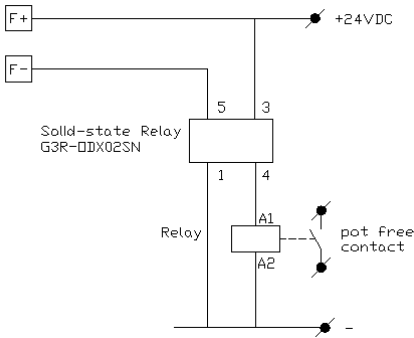
- Connect the signal cable (shielded recommended) to terminals I+ and I-.



Pulse Output

Direct connection to PLC input

Connect the 24VDC wire to the F+ connection of the transmitter, connect the F- connection of the transmitter to the desired digital PLC-input (<50mA load).



Pulse Output Connecting to a relay

Use solid state relay and normal relay (Efcon® uses Omron G3R-ODX02SN) to create a potential free contact from the pulse output. See the diagram to the left how to wire the relays.



2.4 Maintenance

BE AWARE! Before maintenance or revision switch off power supply, remove pressure and medium from piping.



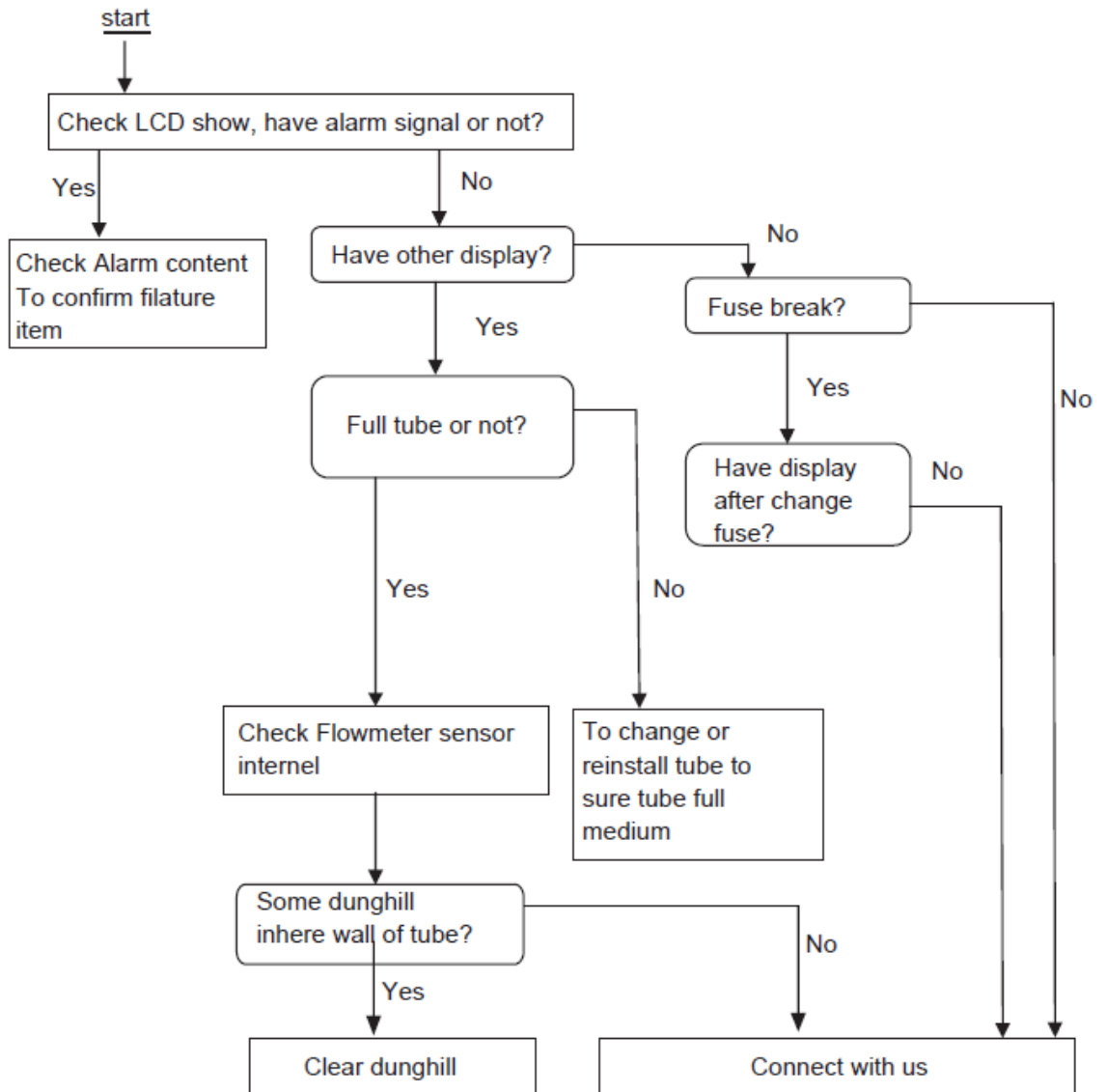
Maintenance and reparations should be done by qualified personnel.

Avoid direct contact with wastewater. Wear protective gloves during use, maintenance and reparation.

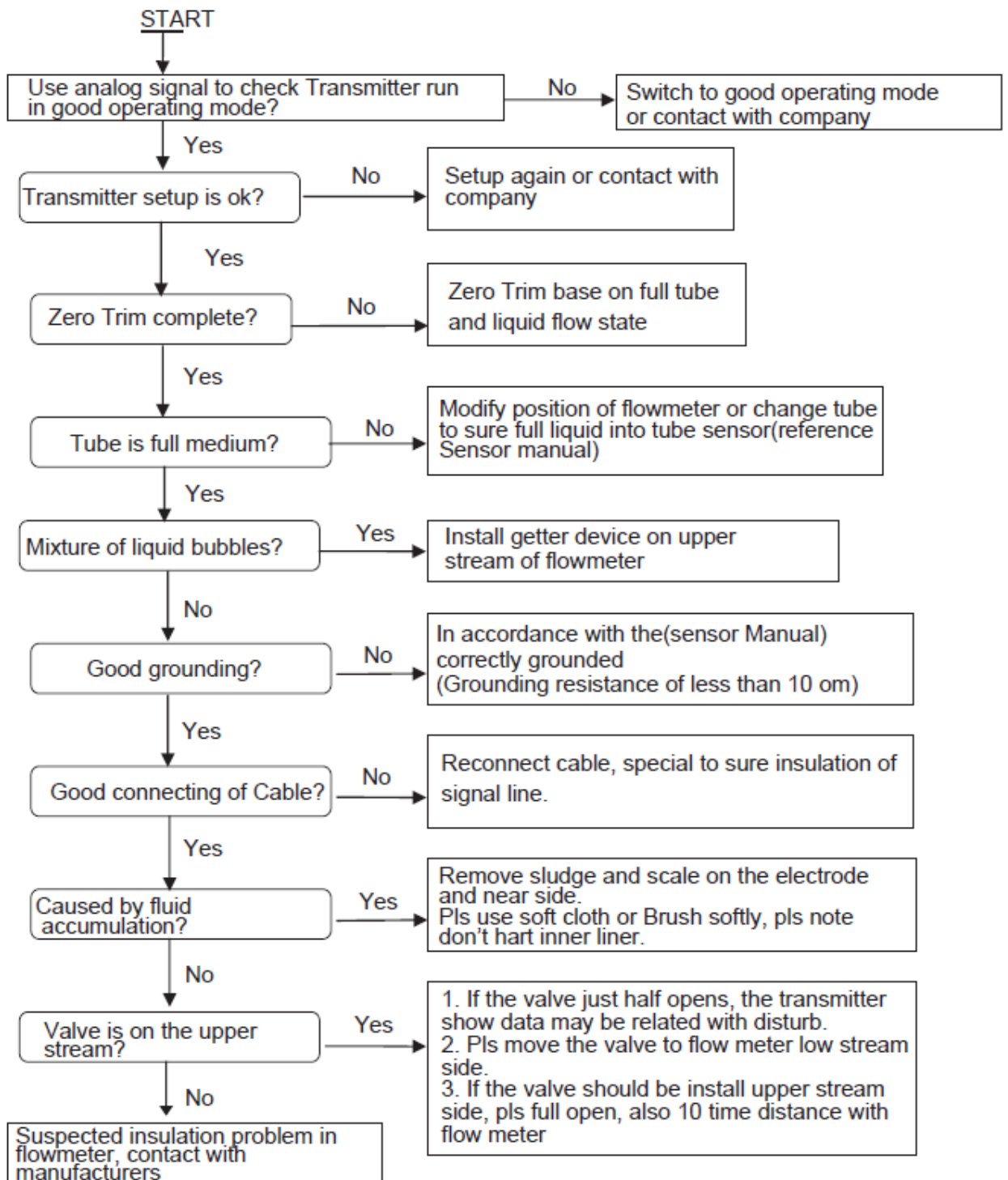
Check the inside of the sensor tube regularly and inspect the SS electrodes inside the tube. Clean inside with a soft cloth.

2.5 Trouble shooting

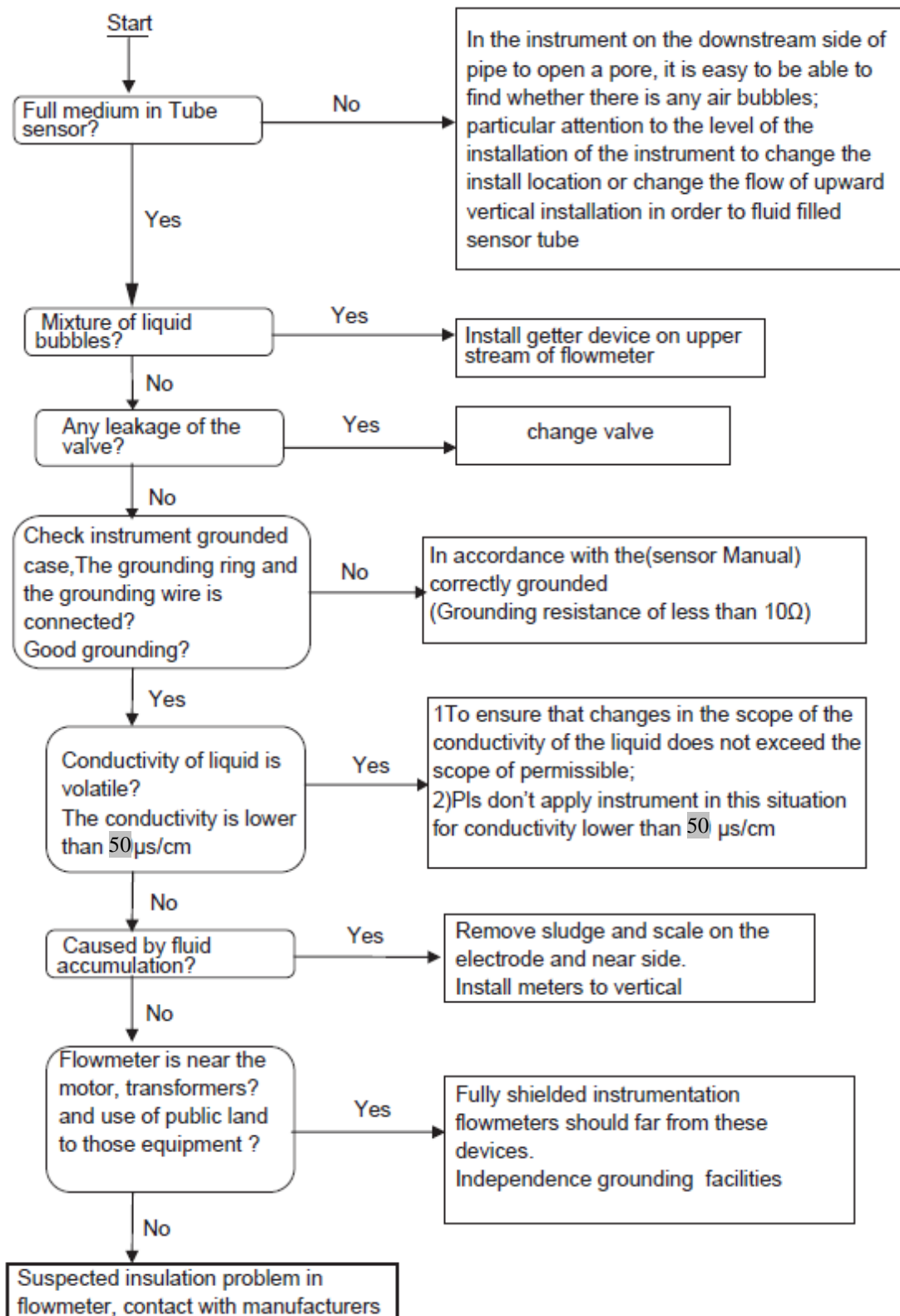
No flow data shown in display

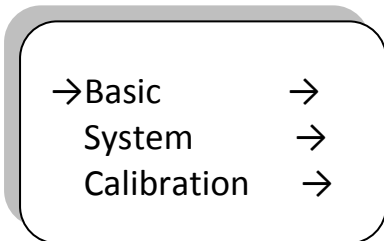
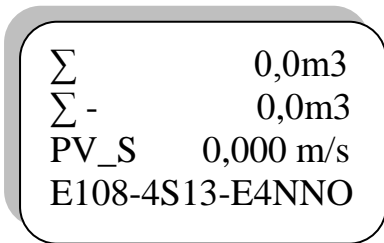
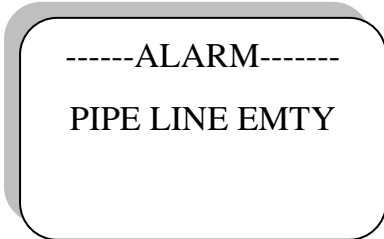
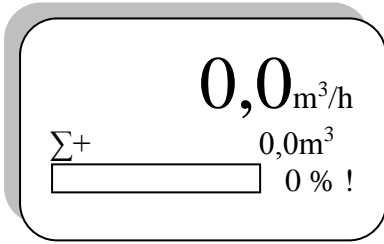


Instrument shows flow data inconsistent with actual flow.



Zero point instability





3.1 Display & Operation

After the first power up the display will show the following:

- * Current flow (upper row)
- * Totalizer positive flow
- * Percentage flow (100% = full range scale)
- * Blinking Exclamation mark (= alarm signal)

Press ▼ to check the Alarm message display

Press ▼ again to check the totalizer display

- * Cumulative total positive direction (upper row)
- * Cumulative total negative direction
- * Current flow velocity
- * Software version

3.2 Programming

To access the programming open the display lid.

Programming and setting changes should be done by qualified personnel.

Ensure when removing the lid the tread doesn't damage. A damage tread can make the lid get stuck.

Press ► to enter the menu.

By pressing ▼ or ▲ to change the cursor and press ► to select.

Basic	Basic settings; change the Pulse value unit, number of pulse value decimals, totalizer units, number of totalizer decimals and damping
System	System settings; change signal settings, Pulse output settings, clear totalizers, load settings, load settings
Calibration	Calibration settings; Zero trim, tube trim, loop trim & calibration factor (don't change!)

3.2.1 Basic settings

Press ► to enter the menu, press ► again to enter the basic settings menu.

→PV Units
PV Decimal
Total units
↓ Total Decimal

PV Units	Pulse Value units , select which SI unit to use Select unit with ▼ or ▲ (L/s, L/m, L/h, m ³ /s, m ³ /m, m ³ /h G/s, G/m or G/h) and press ◀ to select and press ◀ again to confirm, (or ► to cancel)
PV Decimal	Pulse Value decimals , select how many decimals to use for the pulse value setting, Press ▼ or ▲ to select how many decimals are used and press ◀ to select and press ◀ again to confirm, (or ► to cancel)
Total Units	Total Units , select which SI unit to use Select unit with ▼ or ▲ (L/s, L/m, L/h, m ³ /s, m ³ /m, m ³ /h G/s, G/m or G/h) and press ◀ to select and press ◀ again to confirm, (or ► to cancel)
Total Decimal	Total decimals , select how many decimals to use for the totalizers in the display. Press ▼ or ▲ to select how many decimals are used and press ◀ to select and press ◀ again to confirm, (or ► to cancel)
Damping	Damping time, for display & output Move cursor with ► and change value with ▼ or ▲ and press ◀ to select and press ◀ again to confirm, (or ► to cancel).

3.2.2 System settings

Press ► to enter the menu, press ▼ to select System, press ► to enter the basic settings menu.

→Signal →
Pulse Output →
Total Set →
↓ Load Settings

Signal	Signal settings , Q max (full scale value), low flow cut off (%), Direction and indication
Pulse Output	Pulse output settings , maximum frequency (Hz), Liters/pulse, Pulse width and pulse level
Total Set	Clear totalizers, or preset totalizers.
Load Settings	Load factory default settings, Press ▼ or ▲ to change from YES or NO, press ◀ to select and press ◀ again to confirm, (or ► to cancel).

3.2.2.1 Signal settings

Press ► to enter the menu, press ▼ to select System, press ► to enter Signal settings menu.

→Qmax (m3/h)
Low Cutoff%
Direction
Indication

Qmax (m3/h)	Q max, full scale value , 20mA current flow value. The maximum and minimum value are bound to the flowmeter diameter size. Move cursor with ► and change value with ▼ or ▲ and press ◀ to select and press ◀ again to confirm, (or ► to cancel).
Low Cutoff%	Low flow cut off , Fill at what percentage of the Qmax the flowmeter should keep the flow at 0. Move cursor with ► and change value with ▼ or ▲ and press ◀ to select and press ◀ again to confirm, (or ► to cancel).
Direction	Flow direction , choose flow direction. Press ▼ or ▲ to select Fwd. (forward) or Rev. (reverse) press ◀ to select and press ◀ again to confirm, (or ► to cancel)
Indication	Flow indication, select which direction to display Press ▼ or ▲ to select Forward or Reverse, press ◀ to select and press ◀ again to confirm, (or ► to cancel)

3.2.2.2 Pulse Output settings

Press ► to enter the menu, press ▼ to select System, press ▼ to select Pulse Output, press ► to enter the Pulse Output settings menu.

→Freq Max (hz)
Liter/Pulse
PulseWidth(ms)
Pulse Level

Freq Max (Hz)	Maximum pulse frequency , fill in the maximum pulse frequency Move cursor with ► and change value with ▼ or ▲ and press ◀ to select and press ◀ again to confirm, (or ► to cancel).
Liter/Pulse	Liter / Pulse value , enter the desired volume per pulse measured by the flowmeter. Move cursor with ► and change value with ▼ or ▲ and press ◀ to select and press ◀ again to confirm, (or ► to cancel).
PulseWidth(ms)	Pulse Width , enter how long the pulse output remains active when active. Move cursor with ► and change value with ▼ or ▲ and press ◀ to select and press ◀ again to confirm, (or ► to cancel).
Pulse Level	Pulse Level Press ▼ or ▲ to Active H or active L or Rev. (reverse) press ◀ to select and press ◀ again to confirm, (or ► to cancel)

3.2.2.3 Totalizer settings

Press ► to enter the menu, press ▼ to select System, press 2x ▼ to select Total Set, press ► to enter the Totalizer settings menu.

→Clear Total
FWD Preset (m3)
REV Preset (m3)

Clear Total	Clear Totalizer, clear the totalizer Press ▼ or ▲ to No or Yes, press ◀ to select and press ◀ again to confirm, (or ► to cancel)
FWD Preset (m3)	Forward Preset, enter a value to change the forward totalizer. Move cursor with ► and change value with ▼ or ▲ and press ◀ to select and press ◀ again to confirm, (or ► to cancel).
REV Preset (m3)	Reverse Preset, enter a value to change the reverse totalizer. Move cursor with ► and change value with ▼ or ▲ and press ◀ to select and press ◀ again to confirm, (or ► to cancel).

3.2.3 Calibration settings

Press ► to enter the menu, press ▼ to select System, press 3x ▼ to select Calibration, press ► to enter the Pulse Output settings menu.

Before Zero Trim, the flowmeter sensor tube needs to be filled with medium and be in quiescent state. The flowmeter needs to be powered for more than 15 minutes (warm-up time).

→Zero Trim
Tube Trim →
Loop Trim →
K Character

Zero Trim	Fast Calibration method , to correct the flow measurement. Press ▼ or ▲ to select Yes press ◀ to select and press ◀ again to confirm, (or ► to cancel)
Tube Trim	Tube Trim manual calibration method , trim empty pie, full pipe & Tube region-%.
Loop Trim	Loop trim , adjust the 4-20mA output signal, for 4mA and 20mA
K Character	Don't change keep on 1.00000