Electromagnetic flowmeter

FLONET FN30xx

Content

1. BASIC INFORMATION

1.1 Application

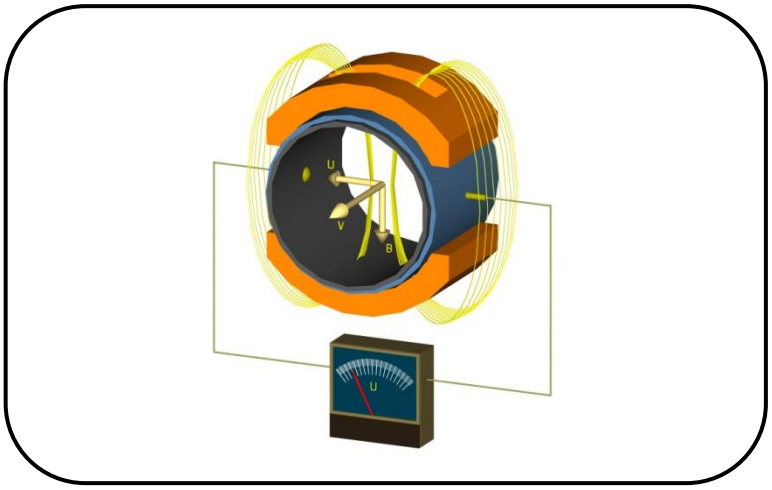
FLONET FN30xx is an electromagnetic flowmeter intended for measurement of volume flow rate of electrically conductive liquids in closed piping. The meter facilitates high-accuracy bi-directional flow rate measurements at flow velocities standard range from 0.05 to 10 m/s. The minimum required conductivity of the measured fluid is 10 µS/cm (by remote version conductivity of the measured fluid is acc to graph – see chapter 5.1.2.)

1.2 Measurement principle

The function of electromagnetic flowmeters is based on the Faraday induction law. The meter sensor consists of a non-magnetic electrically non-conductive tube and two inbuilt electrodes that pick up the induced voltage in a plane perpendicular to the direction of the magnetic power lines. The magnetic field is generated by electric current flowing through two coils wound on the tube. The flow of the conductive liquid through the tube gives rise to induced voltage **U** proportional to the magnetic flux density **B**, flow velocity **v** and the length of the virtual conductor **l**:

$$U = B \times l \times v$$

U induced voltage
B magnetic flux density
l distance between the measuring electrodes
v flow velocity of the measured liquid



For the given sensor size, the values of flux density and distance between electrodes are constant. Therefore, the voltage induced on the electrodes is proportional to the velocity of the liquid flowing through the sensor tube. The volume flow rate is then the product of the liquid flow velocity and the tube cross-section: $Q = v \times S$.

1.3 Meter properties and functions

The functions of the meter transmitter include visualization of the measured values and, using the associated control pushbuttons, setting of the operational meter parameters.

Main flowmeter functions:

- Bi-directional measurements of:
  - volume flow rate.
  - aggregate fluid volume passed through the meter sensor.
- Archiving the measured data and information on specific operational events.
- Checking on sensor flooding condition.

Flowmeter interface facilities:

- Pulse and current output 4 to 20 mA
- Communication interface RS-485 MODBUS RTU

1.4 Important user information

Electromagnetic flowmeters of the FLONET FN30xx type series are manufactured and tested in accordance with the applicable international regulations and standards. To ensure successful meter commissioning, the user shall duly observe all directions and recommendations given in the product manual.

1.4.1 Safety instructions

- Prior to any meter handling, the user and/or the meter installation staff shall get acquainted with the meter documentation.
- When connecting the flowmeter to the power supply, due attention shall be paid to the applicable national regulations and standards with special regard to the issues of labour safety and health protection.
- The meter installation, electrical connection and commissioning work shall be performed by suitably qualified operators.
- It is essential to observe all conditions and instructions given in the product manual regarding the meter installation and electrical connection, and to pay due attention to all warning labels.
- Should the product show signs of incorrect function, the user shall not attempt to dismantle the meter. Any repair work is reserved to the meter manufacturer or their duly authorized partners. When sending a meter for repair, make sure to attach a representation on decontamination as of Chapter 17 (ANNEX) hereof (see page 54).
- The key meter parts are protected against dismantling by company seals. Should any such seal be broken, the customer will forfeit their right to claim free warranty services.

1.4.2 Liability

ELIS PLZEŇ a.s., the manufacturer of flowmeters for liquids, delivers its products in the highest possible quality. All products developed by ELIS PLZEŇ are part of intellectual property of the company and are a subject of copyrights. The same rights also apply to the documents delivered together with the product. It is forbidden to supplement, amend or otherwise alter documents without prior consent of ELIS PLZEŇ a.s. Any infringement of the afore-mentioned intellectual property is punishable.

The documents delivered with the product are meant for familiarizing them with the product itself and with the conditions of its use and installation. All flowmeter users are obliged to get familiar in detail with these documents and follow the manufacturer's instructions as described therein. Following the above-mentioned instructions will prevent the loss of warranty for reasons of incorrect installation and misapplication.

Installation of this flowmeter shall be performed only by a company trained for this purpose by ELIS PLZEŇ a.s. Such a company, after receiving the training, shall be fully responsible for the correct installation and commissioning. ELIS PLZEŇ a.s. bears no responsibility for defects in the product caused by an incorrect installation, its wrong application or incompetent configuration or programming.

These products, that ELIS PLZEŇ a. s. makes available on the market, are certified according to applicable standards. The accompanying documentation consists of *Project design, installation and service manual* and *Declaration of Conformity*. The products have a warranty as stated in the *Confirmation of Purchase Order* or in the *Purchase Contract*.
All product manuals are regularly updated, and the current version is delivered together with the product and available on the Internet under www.elis.cz/en.
ELIS PLZEŇ a. s. shall have the sole right to update technical documentation for its products.

When ordering a flowmeter, the buyer shall provide all required parameters. ELIS PLZEŇ a.s., as the purchaser, shall confirm the received Purchase Order and send it back together with manufacturer's General Terms and Conditions.

Deliveries of flowmeters shall be governed by the Czech Civil Code. The product is delivered pursuant to the confirmed Purchase Order or Purchase Contract. ELIS PLZEŇ a. s. is not responsible for differences in flowmeter parameters that were not confirmed in writing.

The following icons are used in the *Project design, installation and service manual*:

Warning: incorrect operation or erroneous flowmeter configuration may cause damage to product or injury to persons.

Information about another flowmeter features or types of documents delivered together with the product.

1.5 Product warranty

The flowmeter manufacturer provides a product warranty in accordance with their valid commercial conditions.
Additional information regarding the warranty is included in Chapter 16 hereof.

1.6 Representations and certificates

Applicable to electromagnetic flowmeters of the FLONET FN30xx type series are representations and certificates referred to in Chapter 17 below, namely:

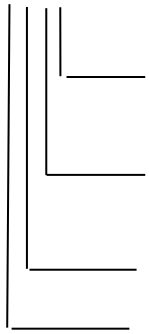
- **Representation on decontamination**
- **Representation on CE compliance**

2. METER IDENTIFICATION

2.1 FLONET FN30xx flowmeter type designation

Review of the flowmeter FLONET FN30xx design versions:

FLONET FN30xx



4 – Compact version COMFORT
5 – Remote version COMFORT

0 – Non-standard sensor design
1 – Flanged flow-rate sensor

0 – Normal operating environment

3 – Transmitter C8.50 (95 to 250VAC / 24V DC)

2.2 *Scope of delivery*

2.2.1 Compact meter version FLONET FN30x4

- Flowmeter FLONET FN30x4 with interfaces RS-485 MODBUS RTU
- Product manual – Electromagnetic flowmeter FLONET FN30xx
- Product manual – Communication interface RS-485 MODBUS RTU

2.2.2 Remote meter version FLONET FN30x5

- Transmitter for FLONET FN30x5 including signal cable / connector, communication interface RS-485 MODBUS RTU
- Meter sensor with connection box
- Product manual – Electromagnetic flowmeter FLONET FN30xx
- Product manual – Communication interface RS-485 MODBUS RTU
- Transmitter holder

2.3 Associated documents

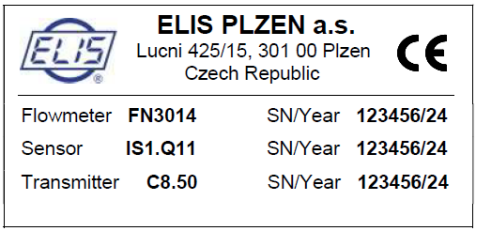
- Representation on CE compliance
- Calibration report – optional (provided on request)

2.4 Flowmeter rating plates

2.4.1 Main meter plate

The main meter rating plate is located on top of the meter housing.

Both compact and remote meter versions

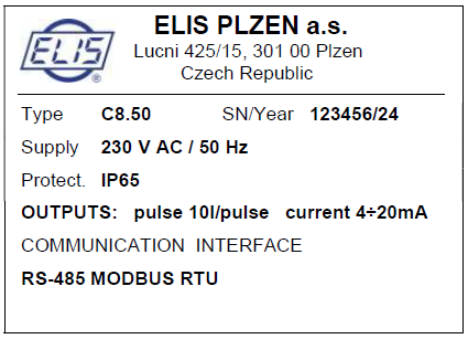


Example of the main meter plate

2.4.2 Transmitter plate

The transmitter rating plate is attached to the rear cover of the transmitter terminal box.

Both compact and remote meter versions



Example of the transmitter plate

Comments

1 Transmitter for both compact and remote meter versions

2 Power supply 95 to 250VAC or 24 VDC, <20W max.

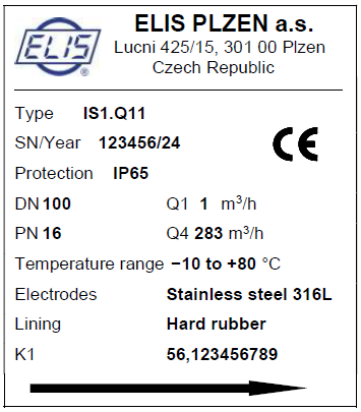
3 Output functions (frequency, pulse or current outputs, communication interface) are pre-set in production as required in the product order documentation, but the user may subsequently change the setting.

The initial output parameter setting is described in the flowmeter delivery note.

2.4.3 Sensor plate

The sensor rating plate is attached to the induction sensor housing.

Both compact and remote meter versions



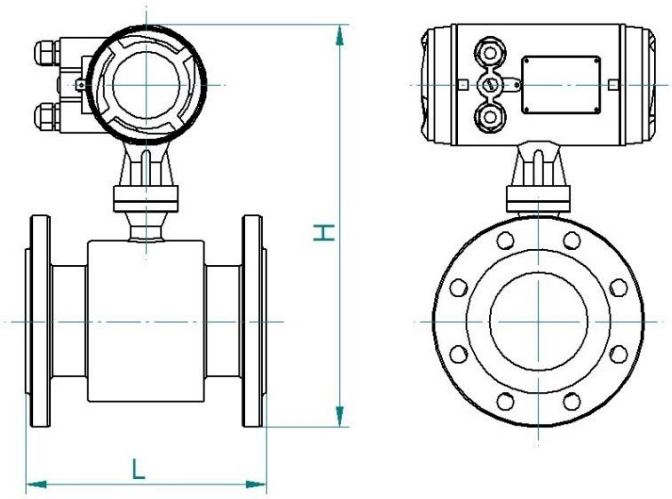
Example of the sensor plate

3. METER DESIGN AND MATERIAL VERSIONS

3.1 Compact/remote version

3.1.1 Compact version

In the cases of compact flowmeter version, the meter sensor and transmitter are connected internally and are integrated into a single unit.



Compact flanged design

3.1.2 Remote meter version

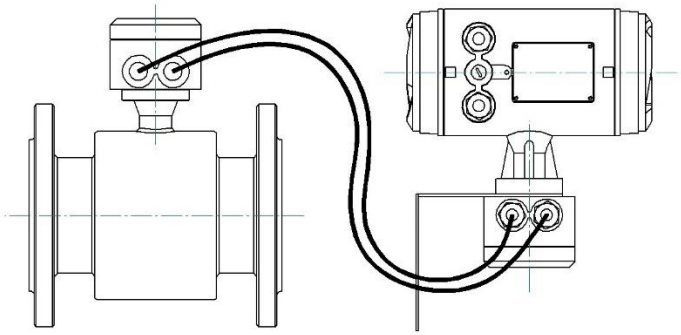
In the remote meter version, the sensor and transmitter are connected by a cable.

The remote flowmeter version is preferable in the following cases:

- the measured fluid temperatures is more than 80°C
- space limitations not permitting application of the compact meter version.
- where the meter installation spot is difficult to reach.

To eliminate the risk of electromagnetic interference acting on the connecting cable, the transmitter should be as close as possible to the meter sensor.

The meter sensor is supplied including a signal cable of the length specified by the customer. During the on-site meter installation, the cable shall be brought to the transmitter connection box by plastic glands and connected to the transmitter terminals.



Remote version – sensor IP67 and transmitter in IP65

3.2 Operating pressure of the measured fluid

Electromagnetic flowmeters have been designed for the minimum permitted operating overpressure more than 0.1 bar, there must be no negative pressure in the pipes.

To select the correct rated pressure of the sensor flanges, the following parameters should be considered:

- Maximum operating pressure of the measured fluid, PS.
- Rated inner diameter (DN) of the connected piping.
- Maximum temperature of the measured fluid, TS

Standard sensor design

Operating pressure of flanged sensors according to standard EN 1092-1; material: carbon steel

Rated sensor size DN	Rated sensor pressure PN	**Maximum permitted pressure PS (bar)** for maximum permitted temperature TS_{max}	
		TS_{max} = 80°C (Sensor lining material HR, NR, PR	TS_{max} = 120°C Sensor lining material PTFE
DN15 to DN50	PN40	38.3	36.7
DN65 to DN200	PN16	15.3	14.6
DN250 to DN700	PN10	9.5	9.1
DN800 to DN1200	PN6	5.5	5.4

Comments: applicable to flanges made of materials of class 3E0 according to EN1092-1, such as steel P245GH or P265GH

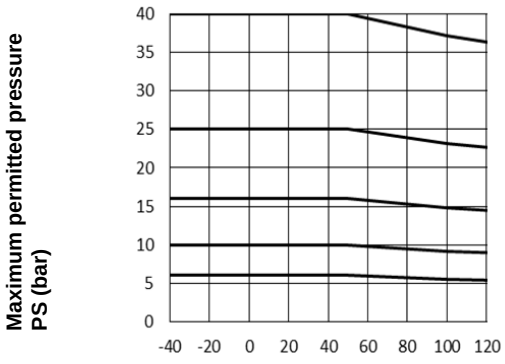
Operating pressure of flanged sensors according to standard ASME B16.5; material: carbon steel

Rated sensor size DN	Rated sensor pressure PN	**Maximum permitted pressure PS (bar)** for maximum permitted temperature TS_{max}	
		TS_{max} = 80°C Sensor lining materials HR, NR, PR	TS_{max} = 120°C Sensor lining material PTFE
NPS ½“ to 24“	Class 150	18,3	16,9
NPS ½“ to 24“	Class 300	48,3	46,0

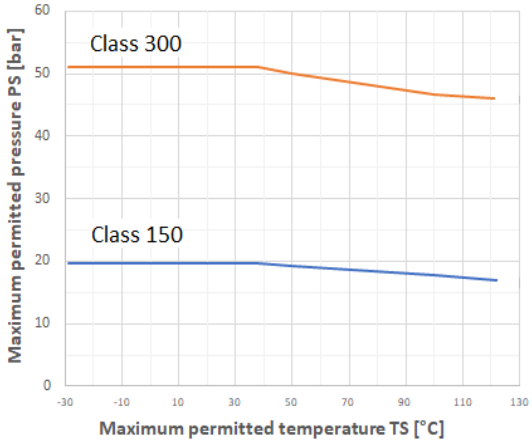
Comments: flanges made of materials of class 3E0 according to EN1092-1, such as steel P245GH or P265GH

Upon consultation with the manufacturer and in consideration of the pressure and temperature characteristics of other flange materials as specified in standards EN 1092-1 and ASME B16.5, meter sensors can be provided with flanges of other PS and TS parameters

Pressure vs. temperature classes of flanges according to standard EN 1092-1



Pressure vs. temperature classes of flanges according to standard ANSI



3.3 Sensor dimensions

Electromagnetic flowmeters FN30xx are intended for flow rate measurements with fluid flow velocity within the standard range of 0.05 to 10 m/s. In practical situations it is recommended to limit the fluid flow velocity values to the range of 0.5 to 5 m/s. At low fluid flow velocities, the relative measurement error tends to increase, while at high velocities flow turbulences may occur.

If the inner sensor diameter is the same as those of the connecting piping, the pressure loss at the meter sensor is negligible.

If the operating fluid flow velocity is too low and the measurement error too high, it is possible to increase the fluid velocity by using a meter sensor of a smaller size with the corresponding reduction of the inner diameters of the connecting pining. The disadvantage of this solution consists of a pressure loss at the pipe reduction area. Therefore, in practical situations, to reduce the pressure loss to a reasonable value, the pipe size reduction should be limited to a single degree.

Fluid flow velocity in a piping can be calculated using the formula:

$$v = \frac{353{,}6 \times Q}{D^2}$$

v - fluid flow velocity (m/s)
Q - flow rate (m^3/h)
D - inner diameter of the sensor (mm)

3.4 Sensor lining

The sensor lining material shall be chosen with respect to the type and properties of the measured fluid. In cases of the meter application in chemical or food-processing industries, the user should consult the choice of the best suitable lining with the meter manufacturer.
The sensors used with FLONET FN30xx flowmeters can be supplied lined with one of the following standard materials (others on request):

- Hard rubber
- Neoprene
- Polyurethane
- PTFE
- Others on request

General properties

Hard rubber (HR)

Material is suitable for medium-aggressive liquids with operating temperatures in the range of -10ºC to +80ºC (hot service water, condensate and similar fluids).

Neoprene (NR)

Excellent elasticity, good abrasion resistance. Withstand the corrosion of low-concentration acid, alkali, salt and other media. Not resistant to corrosion by oxidizing medium. Material is suitable for operating temperatures in the range of -10ºC to +80ºC for sizes from DN40.

Polyurethane (PR)

Strong abrasion resistant, applicable for slurries and muds. Poor corrosion resistance can't be used for corrosive medium. Material is suitable for operating temperatures in the range of -10ºC to +60ºC for sizes from DN40.

PTFE

PTFE lining is suitable for applications in chemical and food-processing industries. It can also be used with aggressive liquids at operating temperatures ranging from −20ºC to +110ºC (on request, −35ºC to +150ºC). PTFE lining can also be used in applications with the occurrence of under pressure 0 to 0,5 bar depending on medium temperature and flowmeter size. Manufacturer's prior consent is required. Material is suitable for drinking water too.

3.5 Electrode materials

Standard materials for the measuring and grounding electrodes:

- Stainless steel 1.4571 (SUS316L)
- Hastelloy C
- Hastelloy B
- Titanium
- Tantalum
- Platinum - iridium

4. INSTALLATION

4.1 Taking over

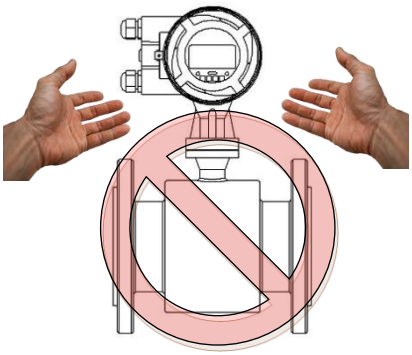
When taking over a delivered product, visual inspection shall be carried out to confirm the integrity of both the product and its packaging.
The correct scope of delivery shall be checked in reference to the product order, delivery note and product rating plates.

4.2 Meter handling

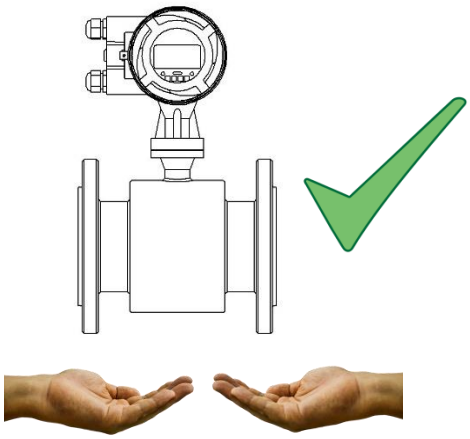
Avoid lifting the meter by holding onto any transmitter part or connection box; use for this purpose the meter flanges or lifting eyes only.

In transport, to avoid irreversible damage to the meter lining, do not place any auxiliary component parts into the meter piping.

Forbidden gripping



Recommended gripping



When using lifting equipment, apply suitable textile slings; application of metal chains or cables might result in damage to the meter.
It is recommended to transport the meter to the installation site in transport packaging.

4.3 Storage

For a flowmeter in storage, it is essential to:

- Observe the specified storage conditions regarding temperature and humidity.
- Avoid long-term meter exposure to direct sunshine (risk of damage to the meter display).
-

It is recommended to store the meter in complete transport packaging and remove the covers and packaging materials only immediately before installation.

4.4 Installation conditions

4.4.1 General principles

Applicable to mechanical installation of the flowmeter are the following rules:

- The protection covers and packaging shall only be removed immediately before the meter installation.
- The arrow on the sensor housing shall point at the positive fluid flow direction.
- In cases of sensor installation into vertical piping the fluid flow direction shall be upwards.
- The piping flanges shall be parallel to one another.
- The inner piping and seal diameters shall correspond to the inner sensor diameter.
- The seals and grounding rings shall be correctly fitted between the flanges and not extend in the flow profile.
- The piping supports before and after the flowmeter location shall minimize the mechanical stresses acting on the sensor (vibration, tension, bend and others);
- No piping support shall be located under the meter sensor.
- The transmitter shall be protected from direct sunshine.
- The meter installation location should be selected so as to ensure easy access for the operator to the transmitter and all meter rating plates.
- The meter sensor shall always be fully flooded by the measured fluid to avoid aeration.
- In cases of electrically non-conductive piping the measured fluid shall be grounded by means of grounding rings.

The sensor shall be inserted between the piping flanges by a shifting movement. With larger sensor sizes it is recommended to use installation inserts. It is also advisable, during the sensor insertion in the piping, to protect the sealing surfaces on the lining with a metal sheet or similar material.

Following the meter installation, no subsequent electric-arc welding operations shall be carried out on the piping at the sensor location. Avoid welding on the piping flanges connected to the meter sensor.

4.4.2 Straight piping sections

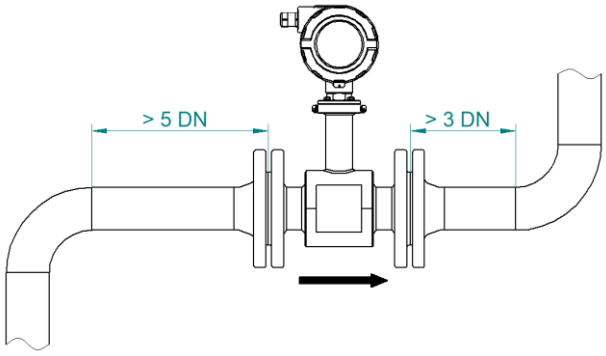
Standard straight piping sections 5D in front of flow meter and 3D behind of flow meter ensures correct functioning of an electromagnetic flowmeter, conditions shall be provided for continuous fluid flow and flow profile stability in the meter sensor.
Before and after the meter sensor there shall be straight piping sections the required lengths of which are specified as multiples of the inner piping diameter. In cases of bi-directional measurements, the same requirements concern straight piping sections before and after the sensor. If there are flow-disturbing elements (such as bend or fitting) in the piping near the sensor location, the required length of straight piping section shall be increased – multiplied by the number of such elements.

At the contact plane between the sensor and the attached piping there shall not be any protruding edges causing the flow turbulence. The inner diameter of the pipe shall not be smaller or greater by more than 3% than that of the sensor.

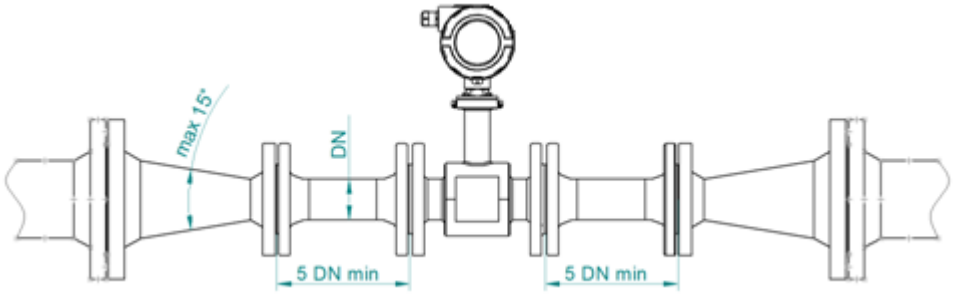
Avoid sensor placement at locations where at the sensor input are chemicals (especially chloride compounds) injected or dosed in the measured fluid. Imperfect blending of the fluid components may cause errors in the flow rate measurements or, in extreme cases, reduction of the measured flow rate to nil.

Preferably are flowmeter sensor installation locations before any piping elements affecting the smooth flow of the measured fluid.

In cases of bi-directional flow measurement, the basic required length of straight piping sections in front of and behind the flowmeter is 5DN.

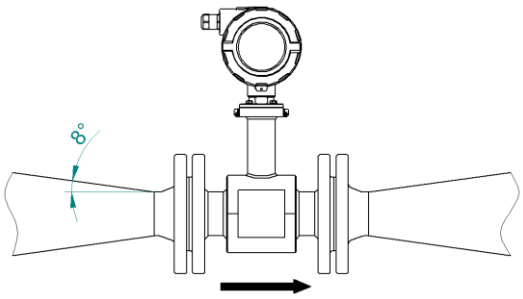


Installation of a flowmeter of a smaller size than that of the attached piping requires the use of cone-shaped reduction pieces with the angle of inclination not exceeding 15°.



In cases of sensor installation in horizontal piping, to prevent generation of air bubbles in the fluid, it is recommended to use eccentric reduction pieces (see standard EN 6817).

Reduction pieces with angle of inclination up to 8º can be included in the straight piping length.

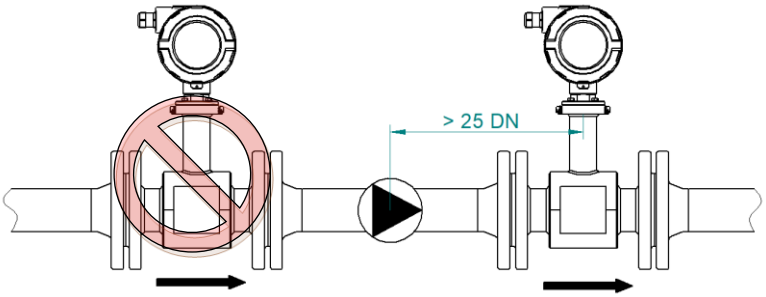


4.4.3 Suppression of the pump effects

To prevent creation of a low-pressure zone in the sensor and possible damage to the sensor lining, a pump shall always be placed before (at the input side of) the sensor. The length of the straight piping section between the pump and the sensor shall be at least 25 DN.

Placing the pump before the meter sensor reduces the cavitation effect and release of gases from the measured fluid. Increased pressure in the piping system will keep the fluid above the saturated vapor pressure and prevent cavitation effects.

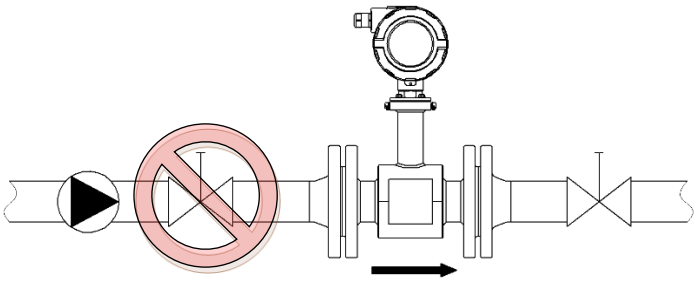
The movement of the fluid in piping should be continuous and stable. If a pump generates fluid pressure pulses (e.g. pneumatic pump), a suitable pulse damping device should be included in the piping.



Correct pump position

4.4.4 Suppression of the effects of closing valves

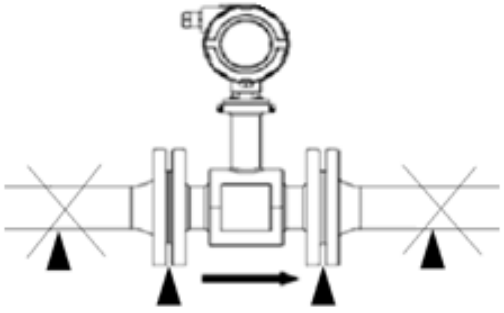
To eliminate the disturbing effects on the fluid flow velocity profile in the sensor and prevent the action of the cavitation phenomenon, the closing and throttling valves shall always be located after (at the output side of) the sensor.



Correct valve position

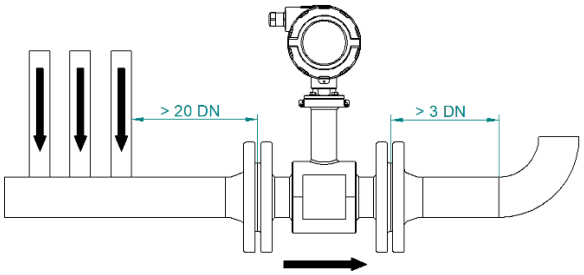
4.4.5 Suppression of vibration effects

Mechanical stress and vibrations acting on the meter sensor might be detrimental to its function or integrity. It is therefore necessary to fix the position (support) the attached piping as close to the sensor housing as possible. It is assumed that the number of events involving particularly large stress on the piping, such as filling or draining the piping system, or major fluid pressure changes, does not exceed 1,000 over the meter lifetime.



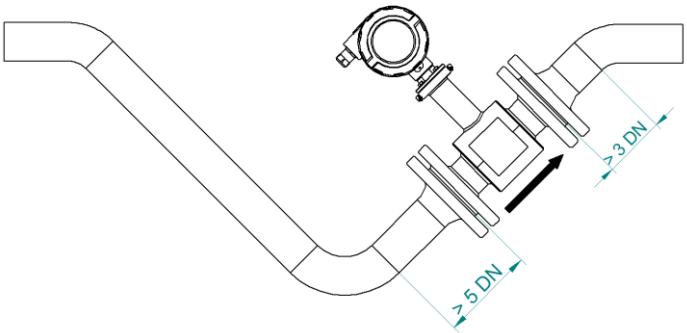
4.4.6. Piping stacks

The nearest stack on the piping system on the sensor input side should be at the distance of at least 20DN from the sensor.



4.4.7 Sensor flooding

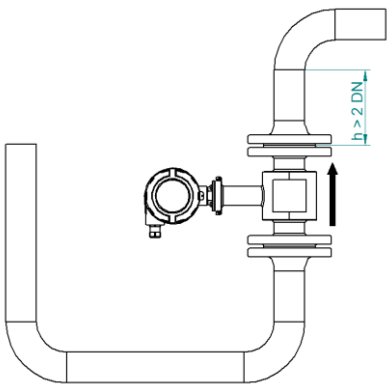
The meter sensor shall be fully always filled with the measured fluid. In cases where complete flooding of the whole cross-section of the connecting piping cannot be ensured, the meter sensor shall be located at such spot where this condition is always met

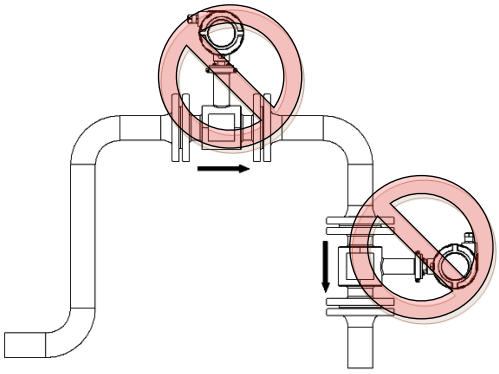


Permanent sensor flooding

4.4.8 Free discharge points

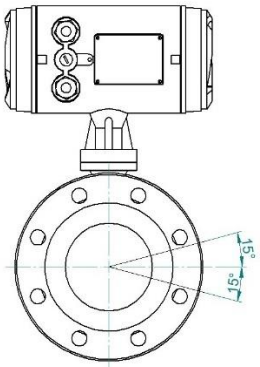
The sensor shall not be located at the highest piping section or in a vertical piping section with the flow direction downwards, especially in cases where a free discharge point is close by. Observation of this rule will prevent measuring errors due to a higher air bubble concentration within the sensor.



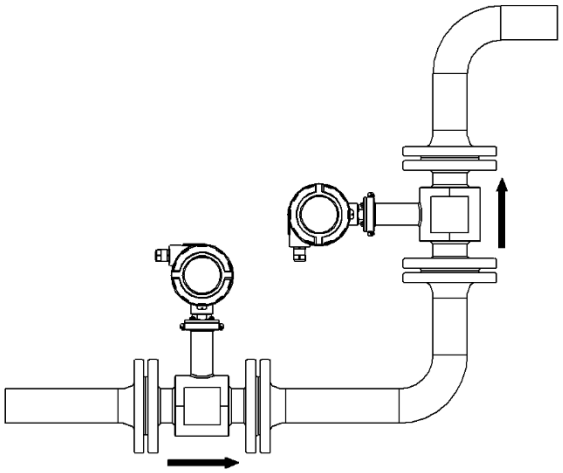


Free discharge Risk of fluid aeration

The sensor will work equally well in both horizontal and vertical positions. However, care shall be taken that the measuring electrode axis in the sensor be to the extent possible in a horizontal plane and the fluid flow direction be upwards.
The permitted deviation of the electrode axis from the horizontal plane is 15° in both fluid flow directions.
The free discharge point shall be higher by 2DN than the sensor output end.



Electrode axis



Vertical sensor position

4.5 Tightening torque

Electromagnetic flowmeters of the type FN30xx are supplied without bolts, nuts and other fasteners or sealing elements.
The entity contracted to perform the meter installation work shall provide the necessary fasteners and seals and carry out the installation work in observance of the applicable standards, paying due attention to the operational requirements and conditions given.

Electromagnetic flowmeters with PTFE lining do not require any additional sealing. The sealing function is facilitated by the flared sensor lining. However, it is necessary for the sealing planes on the piping flanges to be free of any sharp edges. Due attention should also be paid to observance of the recommended tightening torque.
Rubber-lined sensors require the use of special sealing elements.

In cases where the meter sensor is to be attached to flanges made glass, ceramics, enamel or other smooth-surface materials, it is recommended to use additional sealing rings at the contact planes. The tightening torque shall be determined with respect to the specific material properties of the connecting flanges.

The sealing material shall not contain any electrically conductive components that might get loose during the sensor operation, collect on the sensor lining and deteriorate its insulation properties.

Bolt tightening:
- Tighten the flange bolts using a suitable torque wrench, never an impact wrench.
- The connecting bolts shall be undamaged, preferable new, slightly greased.
- Stop tightening the bolts as soon as the required tightness has been achieved.
- Tighten the bolts along the flange perimeter in a crosswise manner, each in three steps: 50, 80 and 100% of the specified torque. Do not use torque more than the recommended/specified value.

Recommended bolt-tightening torque for sensor with PTFE lining

Flanges according to EN 1092-1

PN	DN	Number of bolts	Thread	Specified torque (Nm)
PN40	15	4	M12	16
	20	4	M12	27
	25	4	M12	37
	32	4	M16	61
	40	4	M16	78
	50	4	M16	100
PN16	65	8	M16	62
	80	8	M16	76
	100	8	M16	84
	125	8	M16	112
	150	8	M20	161
	200	12	M20	147
PN10	250	12	M20	163
	300	12	M20	195
	350	16	M20	220
	400	16	M24	310
	500	20	M24	325
	600	20	M24	330
	700	•	•	•
PN6	800	•	•	•
	900	•	•	•
	1000	•	•	•
	1200	•	•	•

Comment: ●… Non-standard sensor sizes; parameters to be specified within the product ordering process

Flanges according to ASME B16.5

Class	NPS	Number of bolts	Thread	Specified torque (Nm)
150	½“	4	½“, M12	12
	¾“	4	½“, M12	18
	1“	4	½“, M12	23
	1 ¼“	4	½“, M12	35
	1 ½“	4	½“, M12	48
	2“	4	5/8“, M16	94
	2 ½“	4	5/8“, M16	110
	3“	4	5/8“, M16	161
	4“	8	5/8“, M16	114
	5	8	¾“, M20	160
	6“	8	¾“, M20	200
	8“	8	¾“, M20	272
	10“	12	7/8“, M22	255
	12“	12	7/8“, M22	340
	14“	12	1“, M24	430
	16“	16	1“, M24	410
	18“	16	1 1/8“, M30	610
	20“	20	1 1/8“, M30	540
	24“	20	1 ¼“, M33	765

The flange tightening torque for rubber-lined sensors depends on the seal material and the sensor design version. Consult this issue with the seal supplier.

4.6 Thermal insulation

When installed in thermally insulated piping, to prevent unnecessary heat loss, the meter sensor is usually provided with thermal insulation too.
In such cases, the following rules need to be observed:

- Insulation shall be applied onto the meter sensor only.
- The maximum surface temperature of the sensor, whether thermally insulated or not, shall not exceed the values given in Section 3.4.
- The maximum insulation thickness shall not exceed 40mm (the thermal conductivity coefficient $\lambda_D \leq 0.045$ ($Wm^{-1}K^{-1}$) at 50°C; see standard EN 13787);
- In the cases of compact meter version, the part connecting the meter sensor and transmitter shall always remain bare.
- The transmitter shall be protected from additional heating (by direct sunshine or heat emanating from nearby equipment).

4.7 Flowmeter heating

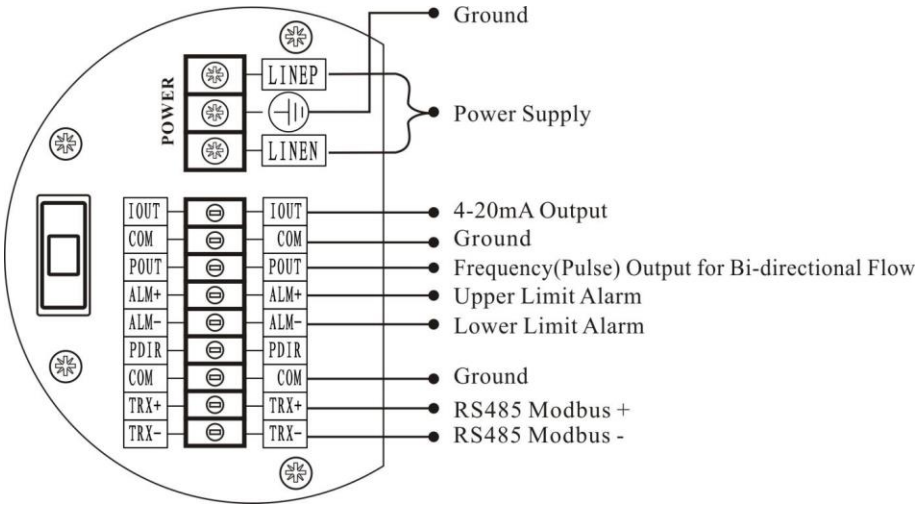
In measuring fluids with sub-zero operational temperatures, or at ambient temperatures close to the specified minimum fluid temperatures, it is permitted to provide the meter sensor with thermal insulation and auxiliary heating system.

- The sensor heating can be facilitated by electricity or a suitable heat-carrying medium supplied through a special piping system.
- In cases of electric heating, it is recommended to use a regulated AC power source with current switching at zero.

5. ELECTRICAL CONNECTIONS

5.1 Transmitter

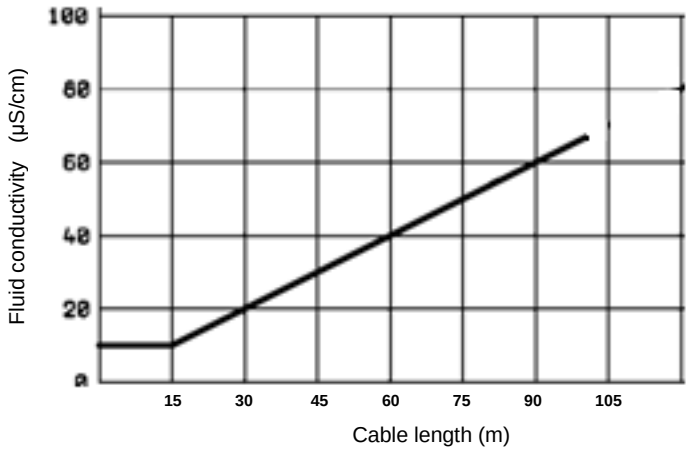
5.1.1 Terminal board



The output and communication signals shall be connected to the target devices via shielded cables.
The cable shielding shall be connected at one end only, to the PE terminal, located on the terminal blocks.

5.1.2 Signal cables

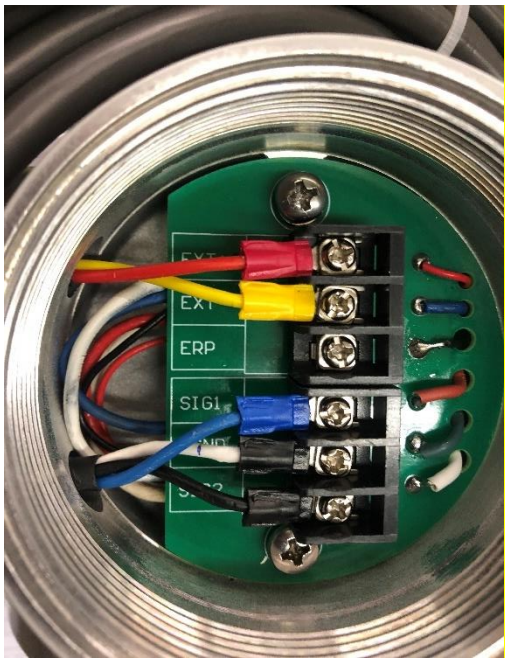
The maximum length of the signal cables depends on the measured fluid conductivity and electric parameters of the cables themselves.
To eliminate risk of electromagnetic interference via the connecting cables, the transmitter shall be located as close as possible to the meter sensor.
The relationship between the measured fluid conductivity and the maximum length of the cables connecting the meter transmitter and sensor is shown in the following graph:



The signal cables are included in the product delivery scope. In their order, the customer shall specify the cable length.

The flowmeter is calibrated with the connecting signal cable in place. The customer shall not modify or exchange the cable; such action shall be reserved to the authorized service staff or the meter manufacturer.
The connecting cable shall be fixed in position. Should it be left free, changes in the cable capacity due to its movement adversely affect the measurement accuracy, especially at low fluid flow velocities.
Cable extension or shortening is not permitted. Replacement of a damaged cable shall be arranged with the meter manufacturer.

5.2 Sensor connection box



Sensor connection box

Signal cable connection table – the sensor protection class IP 67/IP 68

Terminal	Description	Conductor color
SIG2	Electrode E2	Black
SIG1	Electrode E1	Blue
SGND	Signal Ground	White (shielding for the conductor pair)
EXT+	Excitation winding	Red
EXT−	Excitation winding	Yellow
ERP	reserved terminal	

Conductors leading to terminals EXT+ and EXT− may be connected or disconnected only with the transmitter power source switched off.

The sensor designed with protection class IP 68 has a fixed connection of the signal cable conductors to the sensor terminals. In production, the terminal box is sealed and the terminals embedded in an impregnation compound protecting the sensor from the ambient humidity. The other end of the cable is provided with a connector facilitating connection to the meter transmitter.

5.3 Power and information cables

In operating environments free of explosion risk, the power and information cable connections do not require any special arrangement. Applicable to the meter installation work are standard procedures known from conventional measurement and control systems. However, due attention should be paid to the applicable national regulations and standards.

The flowmeter does not include any integrated line circuit breaker. Unless the meter configuration includes a moveable power cord and plug, a separate power switch or circuit breaker shall be used (see the provisions of section 6.11.3.1 of standard EN 61010-1).
The protective conductor of the power supply cable connected to the SGND terminal must be longer than the L and N conductors. The SGND conductor must be disconnected as last if the power cable is removed from the bushing. This SGND terminal is located at the bottom of the terminal box of the instrument box.

5.4 Cable placement

To minimize the effect of electromagnetic interference, the cables connecting the sensor and the meter transmitter shall be laid at least 25cm away from the power cables of other electric equipment.
In selecting cable routes, attention should be paid to the risk of thermal degradation of the cable insulation due to nearby technological heat sources. All cables shall be laid outside the thermal insulation layers on piping.
The cable glands shall be properly sealed and tightened with suitable tooling. To prevent cables from being pulled out of the glands, their position shall be mechanically fixed no further than 0.3m away from each gland.
Outside the gland, the cable shall be bent to form a “dripping loop” (the straight length of about 30mm of the cable is led horizontally from the gland and then bent down to form a loop).

5.5 Power supply specifications

The electrical circuits of the transmitter forming part of a FLONET FN30xx flowmeter are designed as floating, insulated from the ground potential.
The FN30xx electromagnetic flowmeter can be delivered with either AC or DC power supply.

AC power supply
- 95 to 250VAC, 20W max.
- Internal fuse T 1.2A/250 V, 5 x 20 mm

DC power supply
- 24V (20 to 36 VDC), 20W max.
- Internal fuse T 2A/250V, 5 x 20mm

5.6 Input and output connections

Outputs from the flowmeter of the type series FLONET FN30xx are not intrinsically safe.

5.6.1 Multifunction output POUT

Functions and parameters
- Passive output: electrically insulated from the ground and other inputs and outputs
- Open collector: Umax = 24V, Imax = 10mA
- Status in cases of power cut: open
- Output operational modes:
  - Frequency output: Frequency range 0 to 1kHz or 0 to 5 kHz, duty cycle 1:1
  - Pulse output: Maximum frequency 10 Hz
    Selectable pulse number
    Pulse length setting

The output parameters of the frequency output are influenced by the capacity of the connected cable. When transmitting a frequency output signal with a value reaching up to 5 kHz over long distances, this negative effect on the quality of the transmitted signal at the evaluation point must be considered.

Multifunction output – selectable functions

- Pulses/frequency for Q+
- Pulses/frequency for Q–
- Pulses/frequency for IQI
- Q > Qmax
- |Q| > Qmax
- Output negation

Pulse number determination for the pulse output

Restrictive conditions in setting the pulse output parameters:

- Maximum output frequency: f_{max} = 10Hz
- The middle period between pulses ***M*** shall be equal to or wider than the pulse width **P**. Breaching this condition will result in an error message.

Pulse output mainly applies in count mode. A pulse output delegates a unit flow such as 1 litter or 1 m3 etc. Pulse output units divided into 0.001L, 0.01L, 0.1L, 1L, 0.001 m3, 0.01m3, 0.1m3, 1 m3. When users choose the pulse unit, they should notice the match of the flux range of flow meter and pulse unit. For volume flux, count formula as follows:

$Q_L=0.0007854\times D^2\times V$ (L/S)

$Q_M=0.0007854\times D^2\times V\times 10^{-3}$ (M^3/S)

Note: D = size of a flow meter (mm)

V = velocity of flow (m/s)

The setting of pulse units should match flow rate in working sites. If the flow rate is large but the pulse unit setting is small, the number of pulse outputs will exceed the limit. Generally, pulse output should be controlled below 3000 Pulse/Second. Conversely, if the flow rate is small but the pulse unit is set too large, it will take too long to generate a pulse.

Meanwhile, pulse output is different from frequency output. One pulse output stands for the value of flow volume for pulse unit. equal to the value of one pulse unit. Generally, measuring pulse output should use count instrument, but not frequent instrument.

Shield cables must be used to connect the output signals. The shield is only connected on one side, namely the SGND) terminal located on the terminal board.

5.6.2 Current output 4～20mA (0～10mA)

Current output is active 4 to 20mA (on request 0 to 10 mA).

Signal output is 24V under 0 to 20mA, it can drive 750Ω resistance.

Selectable functions of the current output

- Output −Q .. +Q
- Output 0 ... |Q|
- Fixed current 4 ... 20mA

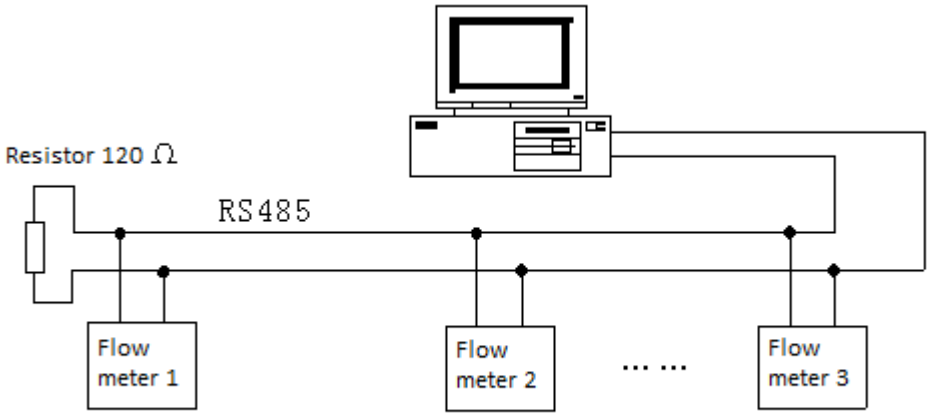
The flow rates corresponding to 4 or 20mA can be either positive or negative, and their mutual relationships can be either “greater than” or “lower than”.

Shielded cables must be used to connect the output signals. The shielding is only connected on one side, namely on the PE terminal, which is located on the terminal board.

5.6.3 Communication interface RS-485 MODBUS RTU

The physical form of this interface consists of a serial line RS-485 of the following parameters:

- Speed 300, 600,1200, 2400, 4800, 9600, 19200, 38400, 57600 Bd.
- 8 data bits, 1 stop bit.
- No parity.
- See more in manual "**Description of MODBUS protocol" Es90468K**



Communication interface: RS-485 MODBUS RTU according to standard EN 61158, electrically insulated

Connecting cable: Type A according to EN 61158-2 (a twisted pair of conductors, 90% shielding)

Interconnection:

FN 30xx	Bus conductor
1	TRX + (A)
2	TRX – (B)
COM	Ground

Detailed instructions regarding application of the RS-485 MODBUS RTU communication interface can be found in the manual:

Es 90768 K Communication interface RS-485 MODBUS RTU of electromagnetic flow meters FLONET FN30xx

5.7 Grounding and potential equalizing

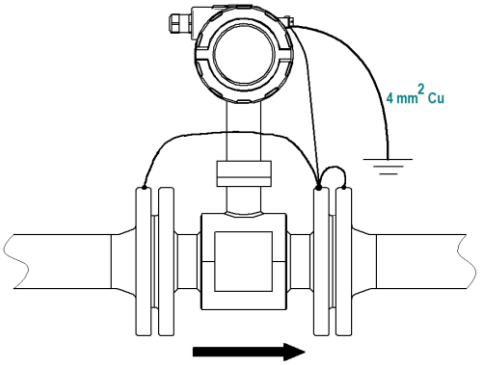
To guarantee the correct operation of the FN30xx electromagnetic flowmeter, it is necessary to ensure that the potential of the measured fluid before and after the flowmeter, the reference meter potential and the PE protection conductor be equalized with the ground potential at the meter installation site. For the equipment grounding and potential equalizing, use Cu conductor of cross-section min 4mm^2.

The external PE terminal on the transmitter box should be internally connected to the reference meter potential.

Electrically conductive piping
Flanges on the conductive piping shall be connected to the PE terminals on the sensor and transmitter housing and to the ground potential.

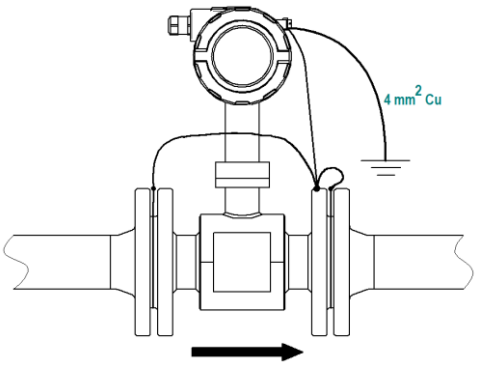
The bolted connections between the piping and sensor flanges cannot be taken for a reliable and satisfactory conductive connection. It is recommended to provide threaded holes on the flanges for a reliable bolted connection of the grounding/equalizing conductor.

It is not recommended to place the grounding or equalizing conductors under the heads of the main flange bolts; such connection may be subject to corrosion and adversely affect the measurement accuracy.



Piping made of insulating materials or piping with insulating lining
In such cases, the requirement for the fluid potential equalization shall be met by two grounding rings installed before and after the flowmeter. Each grounding ring shall be inserted between two sealing rings.

The grounding rings are not included among the standard meter accessories, but they can be ordered with the product. Regarding chemical stability and resistance with respect to the measured fluid, the grounding rings shall meet the same criteria as the measuring electrodes.



To ensure potential equalization for remote version of flowmeter, it is recommended to interconnect the sensor body with the transmitter housing with a copper conductor of cross-section 4mm^2.

This connection shall not serve the purpose of potential equalization with any other equipment or devices.

6. METER COMMISSIONING

6.1 Check on electrical connections

Prior to meter energizing, check and make sure that:

- The power network voltage complies with the specifications on the meter rating plate.
- The power network is properly protected.
- All terminals and electrical connections are properly tightened.
- The installation cables are:
    - intact,
    - connected at their ends to the correct terminals in the flowmeter and the co-operating equipment,
    - secured against incidental excessive stress (pulling out of the respective glands), and
- The meter grounding and potential equalizing has been carried out as specified in the product manual.

6.2 Check on meter housing tightness

To attain the parameters of the equipment protection class referred to in Chapter 10 (METER SPECIFICATIONS), the flowmeter installation shall be carried out in observance of the following directions:

- Use only cables of external diameters corresponding to the sizes of the cable glands installed.
- Form dripping loops on the cables.
- Avoid meter installation position where the cable glands lead upwards.
- Tighten properly all covers and lids on the meter housing.

Following every service action:

- Check the condition (integrity and intactness) of all sealing elements and surfaces.
- Using suitable tooling, tighten all cable glands and meter housing covers.

6.3 Check on the installed meter

The flowmeters are supplied calibrated with verified functions and parameters set according to the customer specifications.
Prior to the meter commissioning, inspect the meter installation site in reference to the requirements of Section 4.4 above, and assess the possible adverse effects from the nearby technological equipment such as:

- Undesirable meter warming by external heat sources.
- Excessive temperature stress on cable insulation.
- Vibrations and shocks in the piping, and others.

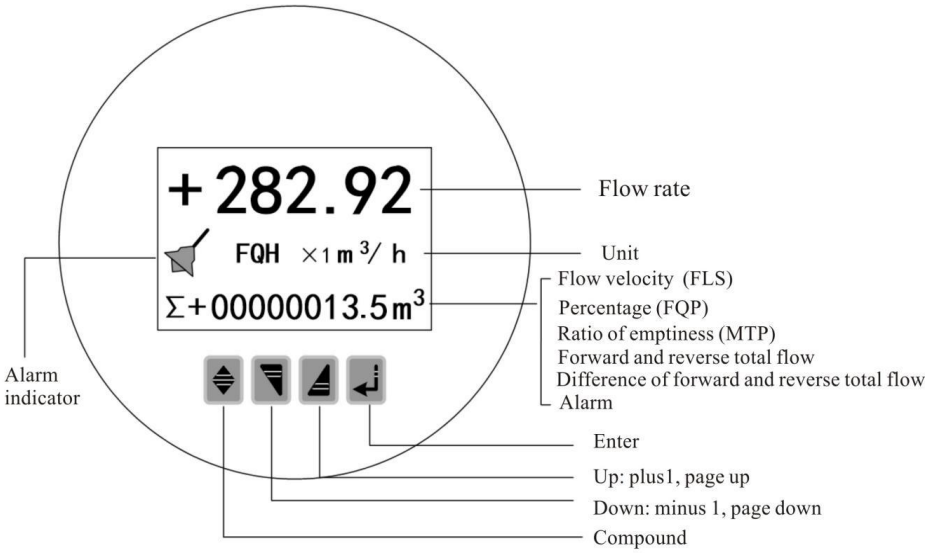
6.4 Check on the meter operation conditions

Prior to filling the piping and the installed meter sensor with the fluid to be measured, make sure that the fluid parameters (temperature and pressure) are within the limits specified on the meter plate, and that any risk to life or health of personnel is excluded.

7. OPERATION

All parameters for full operation are set by the manufacturer according to an order.

7.1 Front panel - Display and control buttons



After power on, the instrument comes into measure mode automatically, and under this mode it can work normally and display data. Under the parameter setting mode, users can set the parameter by the four keys.

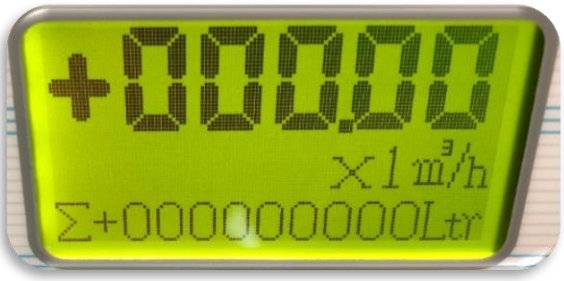
“Down” key: Select display data on lower line on screen;
“Up” key: Select display data on higher line on;
“Compound” key + “Enter” key: Come into parameter setting menu
“Enter” key: Press this key to check sensor factor revise history.

Under measure mode, user could adjust the LCD contract by press “Compound” key + “Up” key or “Compound” key + “Down” key for several seconds;

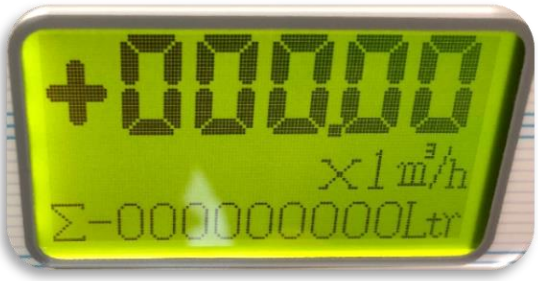
7.2 Display - scrolling screens

First line always shows the **FLOW RATE**

Further lines as follow on scrolling screens:



Total volume (litres) **in one direction**



Total volume (litres) **in opposite direction**

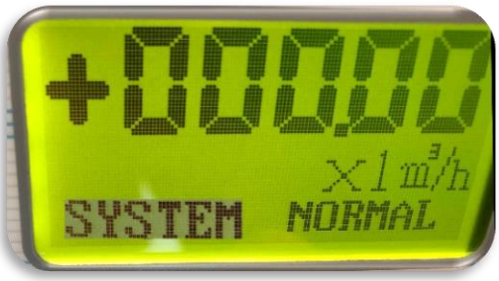
Absolute value of a total volume (litres)

Velocity (m/s)

Flow rate as function of maximal flow (%)

Flux normal (fluid is passing through the flow meter, and the flow meter is operating normally)

Liquid normal (measured medium is a liquid that the flow meter can measure)



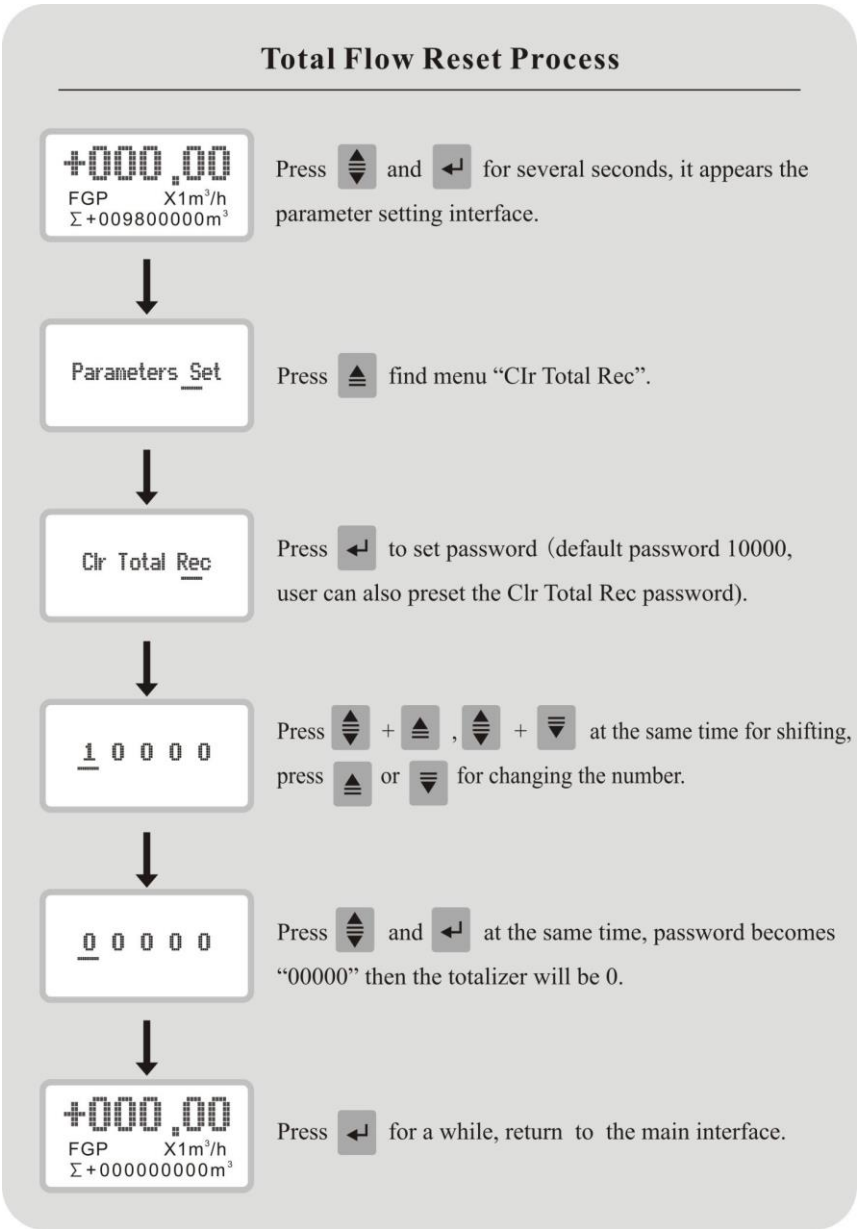
System Normal – (flow meter systems are working properly. If not, Error massages in Alarm)

7.3 Total volume reset

This only procedure is available for an user!

The manufacturer supplies the flowmeter verified as to its functions, calibration and with parameters set according to the customer's order. If installed in the user's technology in observance of the requirements specified in the product manual, the flowmeter will be ready for immediate operational start.

Detailed description of the procedures:



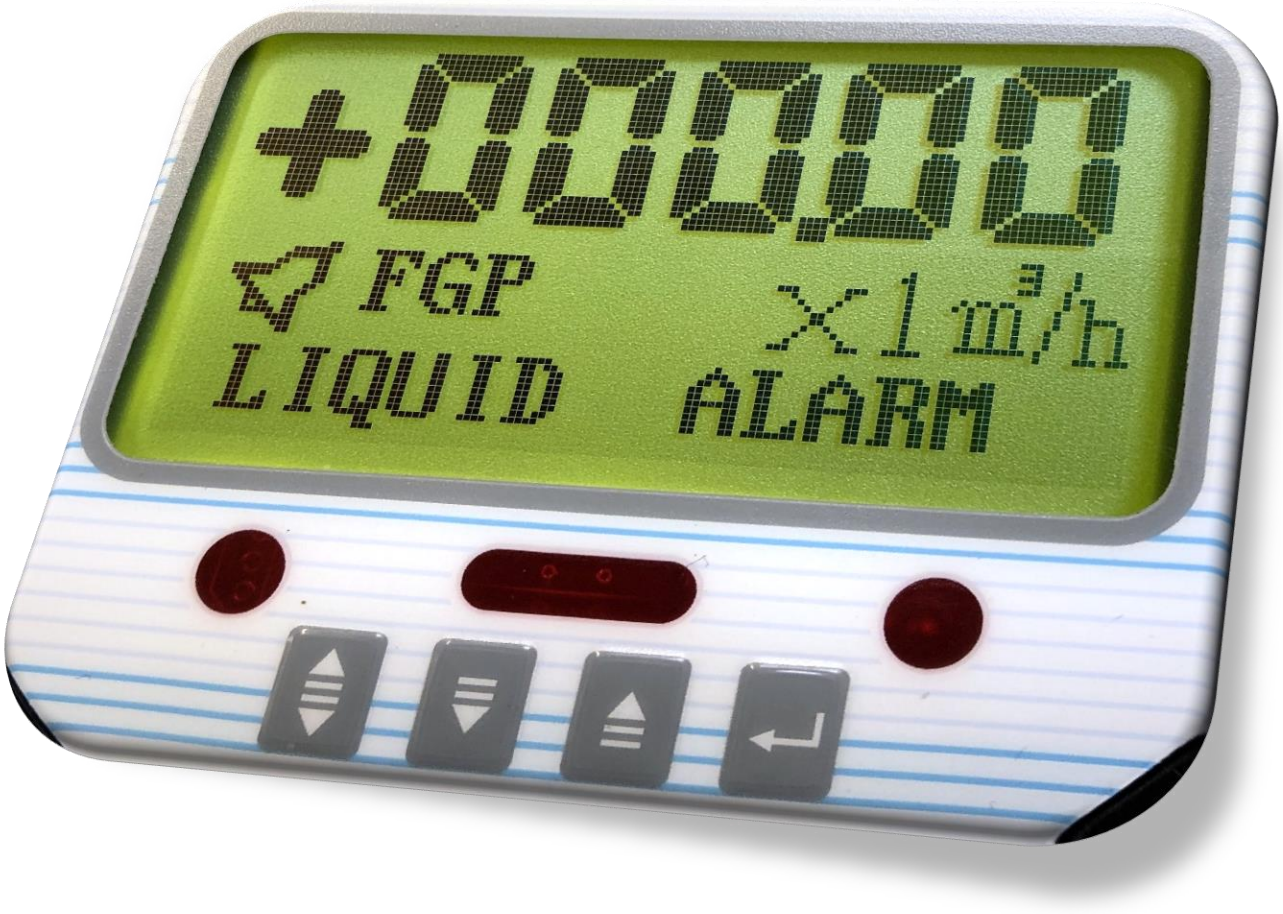
7.4 Alarm information

PCB of electromagnetic flow meters converters use SMT, so for users, it is unable to service and cannot open the shell of converter. Intelligent converters have self-diagnose functions. Without trouble of power and hardware circuit, the normal trouble can be alarmed correctly. This information is displayed on the left of LCD. The trouble is like this:

FQH	Flow high limit alarm	**FQL**	Flow low limit alarm
FGP	Flow empty pipe alarm	**SYS**	System exciting alarm

SYS – System exciting Alarm possible causes:

1. Coil short circuit, open circuit
2. Loose connections, poor contact, or incorrect wiring of the excitation coil.
3. The circuit board is damaged.



Screen sample of empty pipe ALARM

8. TROUBLE SHOOTING

Item	Trouble Shooting
No display	a) Check the power supply connection. b) Check if the power fuse is OK or not. c) Check the contrast of LCD and regulate it to working state
Exciting alarm	d) Check if the exciting cables EX1 and EX2 is connecting or not. e) Check if the total resistance of sensor's exciting coil resistances is less than 150 Ω.
Empty pipe alarm	● If measured fluid full of testing pipe of sensor. ● When shorting circuit three connectors SIG 1, SIG 2, SGND of converter, and no "Empty Alarm" displayed then the converter works OK. In this case, it is possible that conductivity of measured fluid may be small or empty threshold of empty pipe and range of empty pipe are set wrongly. ● Check if the signal cable is OK. ● Check if the electro-poles are OK or not. Let the flow is zero, then the displayed conductivity should be less than 100%. Resistances of SIG1 to SGND and SIG2 to SGND are all less than 50kΩ (conductivity of water) during measurement operation. (It is better to test the resistances by means of multimeter with pointer to see the charging process well.) ● The DC voltage should be less than 1V between DS1 and DS2 testing the voltage by means of multimeter. If DC voltage is larger than 1V, the electro poles of sensor were polluted that must be cleaned.
The measured flow is not accurate	● If measured fluid full of testing pipe of sensor. ● Check if the signal cable is OK.

9. TECHNICAL DATA

Basic information and parameters				
Measurement principle	The Faraday induction law			
Minimum fluid conductivity	>10 µS/cm (remote version for length of cable up to 15 m)			
Measured flow velocity range	0.05 to 10 m/s			
Rated inner diameter of connected piping	DN15 to DN1200 NPS ½“ to 48“			
Flowmeter design version	Compact Remote			
Measuring and grounding electrode materials	Standard: • Stainless steel 1.4571 [Neoprene rubber (NR), Polyurethane (PR), Hard rubber (HR)] • Hastelloy C276 (PTFE) Optional: • Hastelloy C, Hasteloy B • Titanium • Tantalum • Platinum and iridium			
Measured fluid temperature / sensor lining material	**Flanges**	**Lining**	**Temperature range (°C)**	**Sensor size**
	Carbon steel (standard)	NR	−10 to +80	DN40 to DN1200
		HR	-10 to +80	DN40 to DN1200
		PR	-10 to +80	DN40 to DN1200
		PTFE	−20 to +120	DN15 to DN1200
	Stainless steel (optional)	NR	−35 to +80	DN25 to DN1200
		HR	-10 to +80	DN25 to DN1200
		PR	-10 to +80	DN40 to DN1200
		PTFE	−35 to +150	DN15 to DN1200
Sensor design version	Flanged DN15 to DN1200/1/2” to 48”			
Grounding	On flanges With grounding rings Grounding electrode (DN25 to DN1200 for PTFE, HR, NR, PR)			
Manufacturing materials	Transmitter housing: pressure casting, Al alloy Sensor connection box: pressure casting, Al alloy Sensor: measuring tube – stainless steel 1.4301 Sensor flanges and casing: standard – carbon steel optional – stainless steel 1.4301			
Surface finish	Transmitter housing: powder paint Sensor connection box: powder paint Sensor flanges and casing: standard – polyurethane paint All-stainless-steel sensor: shot blasting			
AC power supply	95 to 250VAC, 20 W Internal fuse: T 1.25 A/250 V, 5 x 20 mm			

DC power supply	24V (20 to 36 VDC), 20W max, Internal fuse: T 2A/250V, 5 x 20mm
Magnetic field	Pulse unidirectional field Selectable frequencies 1.56Hz; 3.125Hz; 6.25Hz;12.5Hz
Operating environment	Free of explosion risk
Protection class	Transmitter: IP 65 standard, optional IP 67 Sensor: standard IP 67, optional IP 68 (remote meter version)
Pressure loss	Negligible provided the sensor and connected piping are of the same inner diameter

Functions and properties	
Meter display	LCD backlit display, 128x128 mm, 3 lines, 4 buttons
Control elements	Tactile sensors actuated by touch across the front viewing window in the transmitter
Language	English
Physical units of displayed quantities	Metric
Functions	Bidirectional measurements of: • Volume flow rate • Aggregate fluid volume passed through the meter sensor Communication with external equipment Empty pipe detection
Zero insensitivity	Selectable
Condition following power cut	Summary counters: No change Meter configuration and setting: No change Diagnostic and error messages: Stored Multifunction outputs, Alarm Open Current output: The last value prior to the power cut retained

Process parameters	
Fluid temperature	Compact meter version: standard −20°C to +50°C Remote meter version: standard −20°C to +120°C optional −35°C to +150°C
Pressure class	PN 40 (4.0MPa) for DN15 to DN50 PN 16 (1.6MPa) for DN65 to DN200 PN 10 (1.0MPa) for DN250 to DN700 PN 6 (0.6MPa) for DN800 to DN1200 Class 150 ASME B16.5 for NPS ½“ to 24“

Environment	
Ambient temperature	Standard: −20°C to +60°C, no condensation
Environment humidity	≤ 95%
Storage temperature	−10°C to +70°C, no condensation (for HR, NR, PTFE)

Outputs	
1 × Current output 4 to 20mA	Active, electrically insulated from the ground and other outputs;
2 x Multifunctional output	Passive: electrically insulated from the ground and other outputs. Open collector Operational modes: Frequency: Frequency range 0 to 1kHz or 0 to 5 kHz Pulse: Maximum frequency 10Hz Pulse length 50 ms Selectable pulse number Output negation Binary: Exceeding limit values of measured quantities Error messages Output negation
Communication interfaces	• RS-485 MODBUS RTU, electrically insulated from the ground and other outputs

Cables	
Data and power cables	Common cables for application in measurement and regulation systems Data cables: twisted pair of conductors, 90% shielding
Signal cable for remote meter version	Supplied with the meter: • Sensor version of IP 67: maximum cable length 100 m • Sensor version of IP 68: maximum cable length 100 m
Communication cable	Twisted pair of conductors with common shielding; bus-bar cable, type A according to standard EN 61158-2
Cable glands	Compact meter version: • Transmitter: 2 pcs of glands M20x1.5 Remote meter version: • Transmitter: 2 pcs of glands M20x1.5 Sensor connection box: 1 pc of gland M20x1

10. CALIBRATION

10.1 General

The flowmeter is supplied verified as to its functions, calibrated and with parameters set according to the customer's requirements.
The measurement accuracy of the flowmeter in its standard form and configuration is guaranteed to meet the provisions of the international standard EN ISO 4064-1**: Water meters for cold drinking water and hot water**. The calibration factor is putted on sensor serial number.

10.2 Reference conditions

Measured fluid: water, temperature 22°C ± 4K
Ambient temperature: 22°C ± 2K
Electrical conductivity of the measured fluid: > 300µS/cm
Straight piping sections: ≥ 5DN before and 3DN after the flowmeter
Minimum medium pressure at the meter output: 0,1 bar
Time for the temperature stabilization: > 30min
The sensor to be centred grounded and supplied with power as required by the product manual
The meter shall be set for zero flow rate

10.3 Measurement accuracy

10.3.1 Flowmeter FLONET FN30xx – standard measurement accuracy

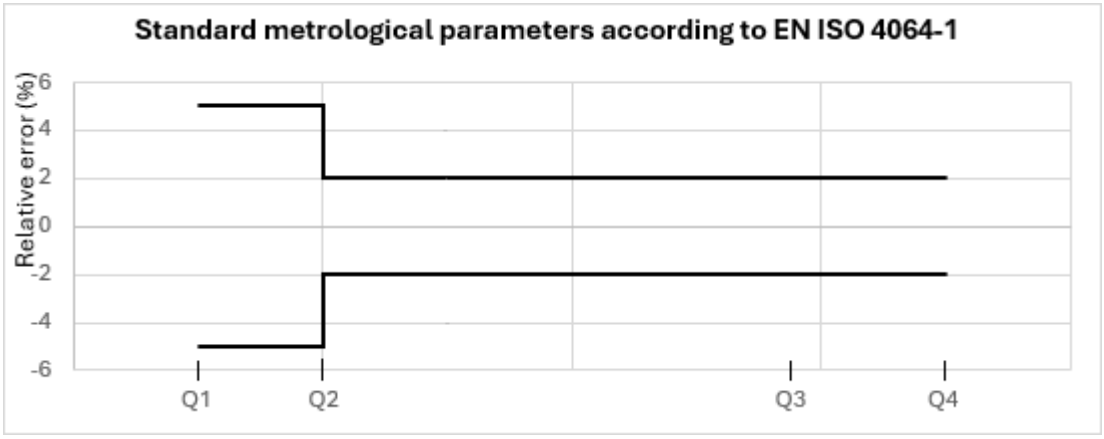
The meter accuracy shall meet the requirements of standard **EN ISO 4064-1** (Water meters for cold drinking water and hot water).

Definitions according to EN ISO 4064-1:

$$\frac{Q_4}{Q_3} = 1.25 \qquad \frac{Q_2}{Q_1} = 1.6$$

$$R = Q_3 / Q_1 = v_3 / v_1 = 200$$

Q_4 flow rate for fluid flow velocity at the meter sensor of v = 10 m/s.
Q_1 flow rate for fluid flow velocity at the meter sensor of v = 0.035 m/s



Compact version and remote version for max length of cable 15 m - flow rates Q_1, Q_2, Q_3 and Q_4 for various meter sizes

Size	m3/h					
DN	Q1	Q2	Q3	Q4	R=Q3/Q1	*liters/pulse
10	0,01	0,02	2,3	2,8		0,1
15	0,03	0,04	5,1	6,4		1
20	0,05	0,07	9,0	11,3		1
25	0,07	0,11	14,1	17,7		1
32	0,1	0,2	23	29		1
40	0,2	0,3	36	45		10
50	0,3	0,5	57	71		10
65	0,5	0,8	96	119		10
80	0,7	1,2	145	181		10
100	1	2	226	283		10
125	2	3	353	442		100
150	3	4	509	636		100
200	5	7	905	1 131	200	100
250	7	11	1 414	1 767		100
300	10	16	2 036	2 545		100
350	14	22	2 771	3 464		100
400	18	29	3 619	4 524		1000
450	23	37	4 580	5 726		1000
500	28	45	5 655	7 069		1000
600	41	65	8 143	10 179		1000
700	55	89	11 084	13 854		1000
800	72	116	14 476	18 096		1000
900	92	147	18 322	22 902		1000
1000	113	181	22 619	28 274		1000
1200	163	261	32 572	40 715		10000

* **“liters/pulse”** is recommended min pulse number for pulse width and gap **50 ms**!

10.3.2 Flowmeter FLONET FN30xx – increased measurement accuracy

For zero flowrate setting and reference conditions:

Relative error		Flow rate range
±0.5%	of the measured value	5 –100% Q_4
±0.2%	of the measured value	10 –100% Q_4

Upon agreement with the manufacturer, flowmeters may be supplied with other (optional) accuracy parameters.

11. METER DESIGN DETAILS

11.1 Transmitter

Transmitter C8.50 is produced in protection IP65 or IP67 for both versions (compact or remote).

11.2 Sensor

The induction sensor consists of a measuring tube made of non-magnetic steel with insulation lining, two measuring electrodes and, in some cases, one grounding electrode. Located outside the measuring tube is a winding, the function of which is to generate electromagnetic field perpendicular to the measuring electrode axis. The excitation winding and measuring electrodes are protected by the sensor housing made of carbon or stainless steel. In its standard design version, the sensor is provided with flanges according to EN 1092-1 or ANSI B16.5. Upon agreement with the manufacturer, other types of flanges can be provided.
The sensor can also be supplied in all-stainless-steel design.

Sensor for compact and remote meter version is produced in protection IP67.

11.3 Cable gland sizes

Compact meter version

- Transmitter terminal box is provided with 2 glands with threaded plugs M20x1.5

Remote meter version

- Transmitter: 2 pcs of glands M20x1.5
- Sensor terminal box: 1 pc of gland M20x1.5

11.4 Company seals

Electromagnetic flowmeters of the type series FLONET FN30xx are supplied calibrated, verified as to their functions and with parameters set according to the customer's order specifications. Upon completion of all fabrication and testing procedures, the meters are provided with the manufacturer's (company) seals.

Company seal

- Upon closing the meter transmitter housing, the front lid including a viewing window is secured against opening or removal by a self-adhesive company seal.
- In the cases of compact meter version, a self-adhesive company seal is applied onto the flanges connecting the meter transmitter and sensor.

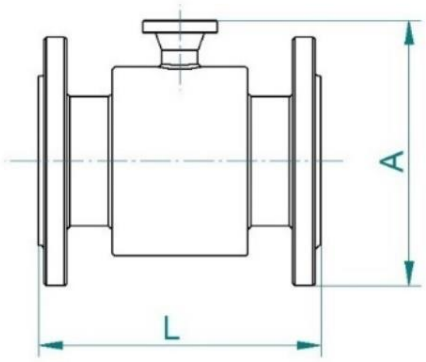
If a company seal is broken, the user will forfeit their right to warranty services, i.e. free-of-charge meter repair during the agreed product warranty period.

Assembly seal

Following electrical connection of the meter and closing the terminal compartment on the meter transmitter, the organization responsible for the meter installation will secure the lid position by a self-adhesive seal.

11.5 Dimensions and weight

11.5.1 Sensor



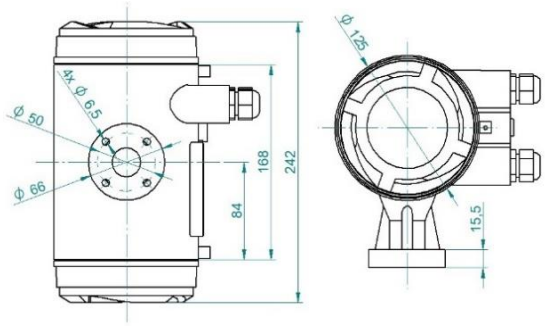
11.5.1.1 *Flanges according to EN 1092-1*

Rated pressure	DN	A	L	Weight * (kg)
PN40	15	150	200	2.5
	20	150	200	3
	25	153	200	4.2
	32	170	200	6.2
	40	180	200	6.5
	50	193	200	8.6
PN16	65	213	200	10.4
	80	220	200	12.1
	100	240	250	15.5
	125	270	250	20.4
	150	303	300	25
	200	360	350	35
PN10	250	425	450	54
	300	470	500	65
	350	525	550	92
	400	588	600	112
	450	708	600	•
	500	760	600	159
	600	882	600	315
	700	982	600	•
PN6	800	1092	700	•
	900 - 1200	•	•	•

Comment: • Non-standard dimensions; parameters to be specified within the customer order processing
* The weight data are of informative nature only

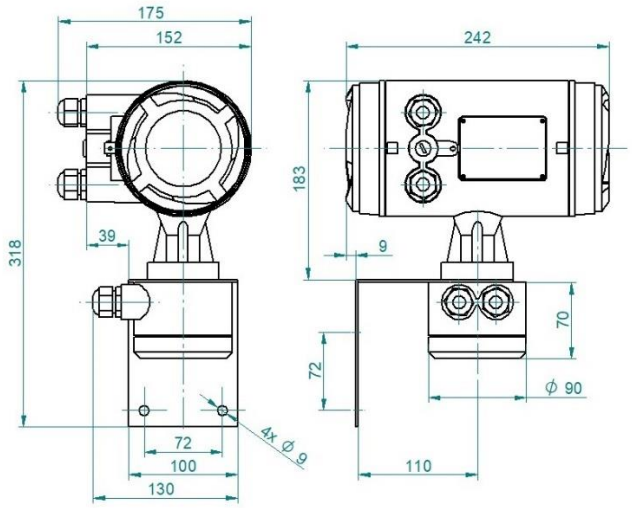
11.5.2 Transmitter

11.5.2.1 *Transmitter for compact meter version*



Transmitter: approx. weight 3kg

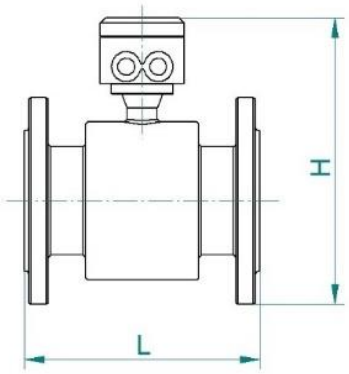
11.5.2.2 *Transmitter for remote version – sensor protection IP67/IP68*



The signal cable is permanently attached to the transmitter

Transmitter including holder: approx. weight 4kg

11.5.3 Sensor connection box



Connection box weight: 0.4kg

Rated pressure	DN	H	L	Weight * (kg)
PN40	15	220	200	2.5
	20	220	200	3
	25	223	200	4.2
	32	240	200	6.2
	40	250	200	6.5
	50	263	200	8.6
PN16	65	283	200	10.4
	80	290	200	12.1
	100	310	250	15.5
	125	340	250	20.4
	150	373	300	25
	200	430	350	35
PN10	250	495	450	54
	300	540	500	65
	350	595	550	92
	400	658	600	112
	450	708	600	•
	500	830	600	159
	600	952	600	315
	700	1052	600	•
PN6	800	1162	700	•
	900 to 1200	•	•	•

*** Weight is estimated only**

12. FLOWMETER FAULTS

14.1 General rules

Prior to any flowmeter handling, it is necessary for the staff (of the user or service organization) concerned to study carefully the product documentation.

The staff authorized to correct/repair flowmeter defects shall:

- Be duly qualified to perform repair of electronic equipment and measuring devices and be certified for work on electrical equipment with rated voltage up to 1,000V according to Czech Regulation 50/1978 Coll. or a corresponding national standard in other countries.
- Be properly trained for repair of flowmeters of the type series FLONET FN under the authority of the meter manufacturer.
- Observe the relevant national regulations and standards applicable to work on electrical equipment with special regard to labour safety and health protection.

The meter manufacturer shall not be liable for any damage due to unprofessional conduct on the side of the user or their service organization.
Some service actions require that the flowmeter or a part thereof be energized. Such actions shall be performed with due care to prevent the risk of electric shock.

12.2 Fault identification

Make sure to de-energize the meter prior to starting any actions related to fault identification and repair, such as opening the transmitter housing, checking the power cable connections, disconnecting the meter sensor or removing PC boards from the transmitter housing.
Nevertheless, some operations require that parts of the meter or its PC boards remain live. In such cases proceed with the utmost care to minimize the risk of electric shock.

12.2.1 Extraordinary operational conditions of the flowmeter

At the time of the flowmeter commissioning, when the setting of the meter parameters with respect to the co-operating technology and/or the higher-level computer control system may still have to be optimized, it can happen that the meter behaviour is irregular.

Description	Likely cause	Corrective action
Unintelligible text on the display	Display or processor board fault	Switch off and on the meter power; if it does not help, follow the standard meter repair procedure (replace processor board or display)
Meter including display is functioning well, the meter menu control does not work	Incorrect procedure in working with the optical reflex sensors.	See the manual: touch just one optical sensor at a time.
The measured values of instantaneous flow rates fluctuate excessively including drops to zero flow rate	Imperfect transmitter or fluid grounding. In cases of remote meter version, signal interference. Loose signal cable. Power line interference. Excessive content of air bubbles or solid particles in measured fluid.	In reference to the manual, check potential equalization connections and sensor and fluid grounding. Connect a line voltage filter. Eliminate the effects of external interference sources. Check the correct sensor installation in the target technology. Replace of sensor-by-sensor simulator (remote meter version only). Prevent aeration of the fluid in piping.
Meter is apparently fully functional, but it does not perform measurements	Fluid conductivity too low.	Check the fluid conductivity, consult the problem with the product manufacturer.

12.3 Meter repair procedures

If the flowmeter is not functioning as it should, where:

- No data appears on the display.
- Connection via the RS-485 communication line does not work; and/or
- Meter outputs (current, frequency and pulse outputs) are not activated, check the meter power source and power supply connections.

The power supply terminals and connections can be accessed upon removal of the rear cover on the transmitter housing.

Procedure

1. Switch off the meter power source.
2. Release the Allen bolt securing the closed position of the rear cover on the transmitter housing.
3. Remove the rear cover on the transmitter housing.
4. Check the tightness of the power supply cable conductor connections in the respective terminals.
5. Switch on the meter power source.

Warning: risk of electric shock

6. Check the live condition of the transmitter terminals and the value of the power supply voltage.
7. If the line voltage is within the required range (consult the product manual) and the error condition still prevails, check the condition of fuse F1 5 x 20mm on the terminal plate.
   Fuse specifications:

   - AC power source: T 2A/250V, breaking capacity 1500A/250V
   - DC power source: T 2A/250 V

When checking the fuse condition, observe the standard rules applicable to repair of electronic equipment and measuring devices – remove the fuse from its holder only after switching off the meter power supply.

8. If fuse F1 is in order or if upon its replacement the error condition still exists, dismantle the terminal board and remove the power supply board located underneath.
9. Loosen three bolts M4 and take away the terminal board. Unscrew distance columns M4 x 25 and remove the power supply board from the transmitter housing.
10. Connect both PC boards (the power-supply and terminal boards) removed from the transmitter housing. Bring the external power supply voltage (AC or DC, as the case may be) to the terminal board.

Warning: risk of electric shock

Check on the power supply board

13. MAINTENANCE

The FLONET FN30xx flowmeter does not require any special maintenance. During regular product inspections, apart from visual check on the mechanical integrity and absence of signs of damage to the external meter parts, it is recommended to check the tightness of cable glands and grounding terminals.

Transmitter

The transmitter housing exterior is coated with a layer of powder paint. For cleaning, use standard procedures applicable to maintenance of measuring devices.

When cleaning the viewing window and rubber seals, avoid application of abrasive cleaning agents.

Sensor

To clean the sensor surface, use standard procedures applicable to maintenance of measuring devices. The PIGS method (mechanical cleaning) is not permitted for maintenance of the inner parts of the sensor as it implies a risk of damage to the sensor lining and measuring electrodes. The inner surfaces of a dismantled sensor should be cleaned using a piece of cloth or brush and a cleaning agent with degreasing and mild abrasive effects (for example a liquid cleaning cream).

14. SERVICES

General principles
Prior to leaving the meter for service with the meter manufacturer or an authorized service centre, the product shall be thoroughly decontaminated.

Representation on product decontamination
In observance of the applicable environment conservation, labour safety and health protection regulations, attached to any requirement for meter repair shall be a **representation in writing on the meter decontamination**. A recommended form to be used for these purposes is included in this manual (see Chapter 17).

Any costs of the meter decontamination needed to be performed at the manufacturer's laboratories shall be invoiced to the customer concerned.

A meter that cannot be decontaminated shall not be sent away for any service action.

15. WARRANTY

15.1 Warranty services

Warranty services consist of product maintenance or repair actions carried out free of charge within the agreed warranty period by the product manufacturer or a duly authorized manufacturer's partner organization.

A warranty repair action is product repair carried out free of charge within the agreed warranty period where the product fault concerned has been caused by defective material, meter component part or workmanship.
Should the product fault as of the preceding paragraph be found irreparable, the product will be replaced at no cost to the customer.
Warranty services may only be performed by the product manufacturer, their duly authorized service center or an authorized distributor who may prove their qualifications by a license in writing received after thorough training at the manufacturer's plant.

Excluded from warranty services shall be:

- Products with broken company seals.
- Products with defects caused by incorrect installation or electric connection.
- Transmitters damaged due to incorrect electric connection.
- Defects caused by non-standard meter application.
- Defects due to mechanical damage.
- Defects caused by force majeure or natural disaster.
- Alienated products.

Any warranty service or repair claims shall be communicated to the manufacturer **in writing** (by E-mail, fax or registered post).
The manufacturer should reject a warranty claim. Such a position should be made known to the customer **in writing** whereby the repair costs will be invoiced to the customer.

15.2 Post-warranty services

Post-warranty services consist of any product maintenance or repair actions related to conditions and/or defects occurring upon expiry of the agreed warranty period. Any such action irrespective of the location where it is to be carried out and whether performed by the manufacturer or their duly authorized partner organization, shall be invoiced to and paid for by the customer.
Post-warranty product service or repair requirements shall be communicated to the manufacturer **in writing** (by E-mail, fax or registered post).

16. ASSOCIATED DOCUMENTS AND STANDARDS

Standards

EN ISO 6817	Flow rate measurement of conductive liquids in closed profiles – Measuring method using electromagnetic flowmeters
EN 29104	Flow rate of measurement of liquids in closed profiles
EN ISO 4064-1	Water meters for cold drinking water and hot water
EN 1092-1	Flanges and flanged connections
ASME B16.5	Pipe flanges and flanged fittings
EN 13480	Metal pipes for industrial application
EN 61010-1	Electrical measuring, control and laboratory equipment; safety requirements
EN 60664-1	Low voltage equipment insulation co-ordination

17. ANNEX

17.1 Representation on decontamination

Representation on decontamination

CUSTOMER	**ADDRESS**	
	Name	Telephone
FLOWMETER TYPE	Delivery date	Delivery note

Production serial number			
MEASURED FLUID			
FLUID PROPERTIES AND ASSOCIATED RISKS			
Toxic		Implying biological hazard	
Corrosive		Caustic agent	
Flammable		Detrimental to environment	
Other types of risk			
The sensor cavities have been emptied and cleaned			
Meter surface is free of fluid traces			
Residual contamination		Yes	
		No	
METER HANDLING SAFETY PRECAUTIONS AND PROTECTIVE EQUIPMENT			
Protection gloves			
Protection glasses			
Protection face shield			
Respirator			
Protection clothing			
Fume chamber			
Safety precautions:			

We confirm that the flowmeter has been properly decontaminated.
Provided the above safety precautions are observed and the recommended protective equipment used, the flowmeter handling will not constitute any risk to health or environment.

Date	Place	Signature

17.2 Representation on CE compliance

CE- PRODUCT COMPLIANCE STATEMENT

ZJ Es90146H

October 2, 2024

Company ELIS PLZEŇ a.s. Luční 425/15
301 00 Plzeň
Czech Republic
Company identification number: 25210068

represents, on its own exclusive responsibility, that the product below, under the conditions of correct installation, maintenance, and specified manner of use, is safe and that the necessary measures have been adopted to ensure compliance of all company products with their respective technical specifications

Product name: INDUCTION FLOW METER FLONET

Type designation: FN30xx

Function and purpose: The product shall be used as operational meter for measuring instantaneous flow rate and total volume of the measured water and technical liquid passed through the meter.

The product for which this Statement of Compliance is made meets the requirements of the following standards:

Electric safety:
EN 61010-1, ed.2:2010+A1:2019

EMC:
EN 61326-1:2013
EN 61000-4-2:2009
EN 61000-4-3:3:2006+A2:2020
EN 61000-4-4:2012
EN 61000-4-5:2014
EN 61000-4-6:2014
EN 61000-4-11:2004

and the following Government Directives:
Electric safety: no. 17/2003 Coll. (commensurate directive 2014/35/EU)
EMC: no. 616/2006 Coll. (commensurate directive 2014/30/EU)

In Plzeň, dated: .....

Name: Petr Mareska

Title: Production Director

Signature:

Manufacturer's address:

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