COMAC CAL

CZECH PRODUCER
AND DEVELOPER
OF MEASUREMENT
AND SENSOR TECHNOLOGY

FLOW 32

Ver. 3.0

Installation and technical conditions

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Contents:

Description of the unit

The FLOW 32 is a flow meter based on the measuring principle of Faraday's electromagnetic induction law, according to which a voltage is induced when a conductive fluid flows through the magnetic field of the flow meter. This voltage is picked up with two electrodes that are in direct contact with the liquid measured and it is evaluated in the electronic unit.

The inductive meter FLOW 32 is suitable exclusively for one way measuring volumetric flow of conductive liquids with minimum conductivity of 20 μS/cm.

The meters are designed for flow measuring where the speed of liquid is within the range 0,16 ÷ 10 m/s. The greatest accuracy of measurement is reached within the range 1 ÷ 10 m/s.

Scope of delivery

The accessories vary according to flow detector versions and above standard optional features.

The electronic evaluation unit is built right in the flow meter's body so it is an integral part of it, the flow detector itself (flow measuring component), grounding electrodes in the sensor body, and installation manual.

The process connection is always customized to customer needs, most often fitted with pipe thread, hose fittings or with pure cylindrical termination for quick-couplers.

Storage conditions

The transportation and storage temperature must be within the range -10 °C up to 50 °C.

Warranty

Incompetent installation or application of inductive meters (devices) may result in loss of warranty as well as failure to comply with mounting and/or operating conditions pursuant to this Manual.

When the meters are shipped out to the COMAC CAL plant to be checked and/or repaired, enclose please the completed form, refer to the last page of this manual. Unfortunately, we will not be able to process correctly and promptly your requirement for modification and/or repair of your meter.

In-pipe installation

Important information for selection of location

!!! In case of detached design, the cable must not be extended or cut short !!!

Outdoor conditions
It is necessary to ensure that the flow sensor is not exposed to weather effects and that the measured medium cannot freeze in the flow sensor as it would damage the measuring tube.
In case of outdoor location of the electronic evaluation unit, the manufacturer recommends using a protective box or a roof to avoid direct solar exposure so that the evaluation electronics cannot get overheated.

Sources of disturbances

The following items rank among the most frequent sources of disturbances to the steady flow of liquid:

- Abrupt changes in pipe cross-section if not performed as a cone with an angle of $\alpha \leq 7°$ (where α is the angle made by bevelled walls of the pipe reduction).
- Incorrectly centred sealing, low ID sealing or sealing made of soft elastic materials which are pushed out into the interior pipe cross-section after flanges are tightened.
- Anything interfering in the flow of liquid, for example thermowells, branch pipes, T-pieces, bends, elbows, slide valves, cocks, flap valves, shut-off valves, control valves, butterfly valves and check valves. Pipe outlets from tanks, heat exchangers and filters.
- No intensive magnetic fields in the proximity of the induction flow sensor (detector) must be present.

No sources of disturbances affecting the steady flow must be present in the straight pipeline sections. They must be located in the piping after the flow sensor or at the farthest distance before it. Sources of disturbances may substantially reduce the measuring range and accuracy of the flow meters.

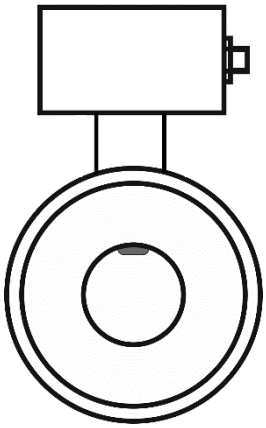
Vibration
We recommend supporting the connecting pipes on both sides of the meter for partial elimination of vibrations. Levels and range of vibrations must be under 2.2 in the frequency range of 20 ÷ 50 Hz according to IEC 068-2-34. If the pipeline is exposed to excessive vibrations (e.g. from pumps), using compact meters is not recommended.

Actual location
The flow sensor (detector) must not be at the top position of the pipe which may be airlocked, or in declining or even in horizontal pipelines with open ends in which air may penetrate. Impurities may accumulate during long-term measurement of very low flow rates Q < 0.1 m/sec. There must be a sufficient pressure in the place of flow sensor installation so that the expulsion of gas or vapour bubbles from the liquid is avoided. Little bubbles that always occur in liquids may accumulate at any of the electrodes and this may result in incorrect operation of the meter. Gas bubbles are expelled also at an abrupt pressure drop. Therefore, butterfly valves and similar elements should be located **after the flow sensor**. For the same reason, the flow sensor should not be placed at the suction side of the pump. To prevent the bubbles from accumulation at a low flow in the flow sensor, it is suitable, e.g. that the pipe is slightly ascending or that the flow sensor is located in the vertical section of the pipeline.

If the meter is populated with measuring electrodes only (2 or 3 electrodes located **beyond the upper profile** of the tube), it is necessary for proper function of the meter, to fill up the flow sensor with the fluid to be measured so that erroneous readout of quantity of liquid passing through the meter can be avoided when the pipe is empty. It is necessary to select the location of the meter in such a way that the flow sensor aeration can be avoided. In the case of an open system, the flow sensor is placed in the bottom position of the U-profile pipework, ensuring that the fluid will not flow out of the sensor.

In the case that the sensor is equipped with an empty pipe testing electrode (3rd or 4th electrode in the upper part f the measuring tube profile), there is no risk of erroneous readout of quantity of liquid passing through the meter due to aeration of measuring electrodes. This function must be activated in PARAMETERS (EMPTY TUBE TEST) menu. If it be to the contrary, the same conditions apply as if the testing electrode is not populated.

The function of empty tube detection in horizontal mounting position operates correctly only if the evaluation unit is oriented upwards (see Fig. below). Alternatively, it is not possible to ensure that the activation of empty tube detection in case of partly filled or empty pipes will take place.



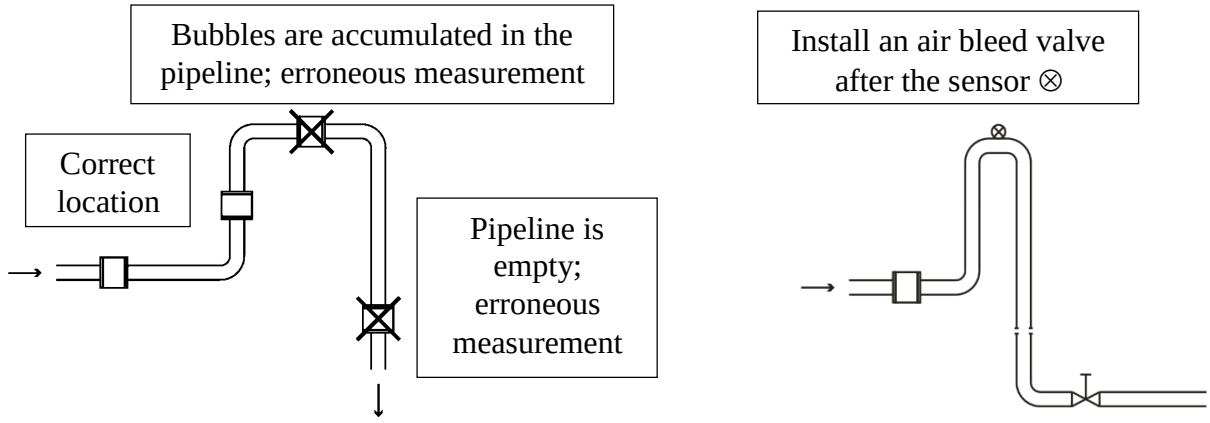
Due to the principle, it is necessary that the maximum conductivity of medium is 6000 μS for ensuring the functional evaluation of empty tube. Beyond this limit, errors may occur in empty tube test, and in this case, it is necessary to deactivate the empty tube test. If the conductivity of medium is beyond the permissible range, the meter may, despite the flooded system, register empty pipeline and the measurement will not start.

In case of any intervention into the measuring circuit must be accessed like a pipe is fulfilled of medium, and regardless of the displayed status "empty pipe test" on the meter!!!

Installation examples

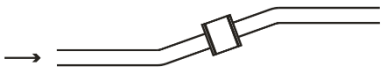
Trouble-free and exact operation of the meter is dependent on its correct location in the system. The most frequent methods of the placement are shown in the following figures:

Recommended installation locations **Downtake pipe**



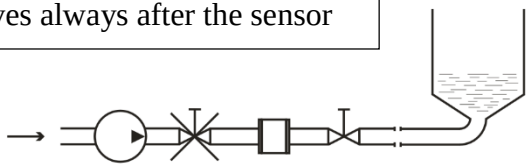
Horizontally laid pipeline

Place the sensor in a slightly ascending pipeline



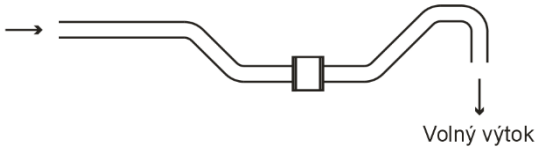
Long pipeline

Install controls and shut-off valves always after the sensor



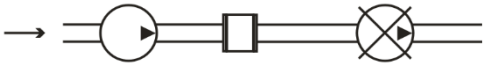
Free inlet or outlet

Built in the U-shaped pipeline



Pumps

The flow meter must not be installed in the suction side of the pump



The flow of liquid flow in the flow sensor should be **steady and free of whirling**. For this reason, straight sections of pipeline with the same ID as that of the flow meter before and after the flow sensor (with permissible deviation of +5%). Recommended minimum length of straight sections is 5×d before the flow sensor and 3×d after the flow sensor where d is the inside diameter of the meter in millimetres. The same principles apply before and after the flow sensor in case of bi-directional flow measurement.

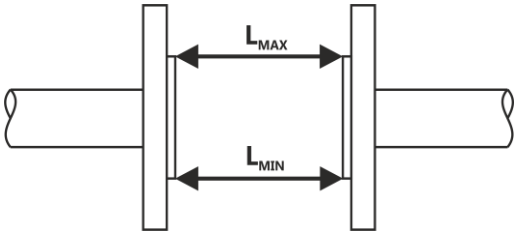
Recommendations

- In case of whirled up flow, extend the calming sections of pipeline or integrate a flow conditioner.
- When blending a mixture of substances, it is necessary to install the flow meter either before the point of blending or at a sufficient distance after it (30×d min. where d is the inside diameter of the meter in millimetres), otherwise it will result in instability of indication.
- When plastic pipeline is used or in case of metallic pipes with internal non-conductive layer, earthing rings are needed.
- Do not install the sensor at the suction side of the pumps; this will eliminate the risk of vacuum and possible damage to the measuring tube lining.
- Pumps, bends and elbows found closely in succession in various levels should be at a distance of 20×d at least before the flow sensor. In case of a separate elbow or bend, the placement 10×d before the meter is recommended.
- When piston pumps, diaphragm pumps, and flexible tube pumps are used, it is necessary to install a pulse damper in the system.
- In order to provide the highest accuracy, it is important to ensure permanent flooding for the sensor (for example, by installation of the sensor in the U-shaped pipeline) even if the sensor is equipped with empty tube test. This will serve as an additional safety measure for detection of non-flooded tube.

The responsibility for suitability and adequacy of application of induction flow meters is borne by the designer or possibly the user himself.

Actual installation in pipeline

When welding both counter-flanges to the pipelines, it is necessary to maintain their **alignment** so that levelness of bearing surfaces of the flanges onto the front faces of the detector is ensured (at the same time, this must not be achieved by unequal tightening of the bolts as there is a risk of leakage due to thermal loading in the future or the measuring tube may break during such tightening). The difference of L_{MAX} and L_{MIN} distances of the sealing surfaces of the flanges before the flow sensor is installed **must not be greater than 0.5 mm.**



The opposition of the holes in the counter-flanges for the bolts should be ensured in the same manner and a sufficient room behind the flanges should be available for the bolts and nuts so that the actual installation of the sensor in pipeline and its attachment with the bolts is made possible.

The manufacturer recommends using an intermediate piece during welding. It is absolutely excluded to use the flow sensor as an intermediate piece due to thermal damage. The welding current must not run through the flow sensor during electrical welding. The installation of the flow sensor is carried out after welding, coating, building and similar works are completed.

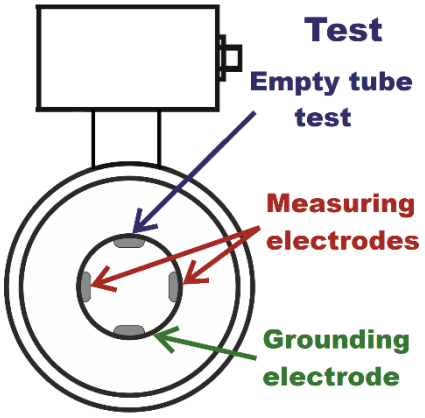
The actual installation is performed by the fixation between the counter-flanges that are welded to the calming pipeline (5×d before and 3×d in the direction of flow) whereas the liquid must run through the flow sensor in the direction **indicated by the arrow** on the sensor name plate.

During installation, do not lift the meter by the evaluation unit housing (in case of detached design, by the sensor terminal box), possibly under the meter's metallic housing but always use slings round the process connection or use the lifting lugs on the flanges.

Installation position

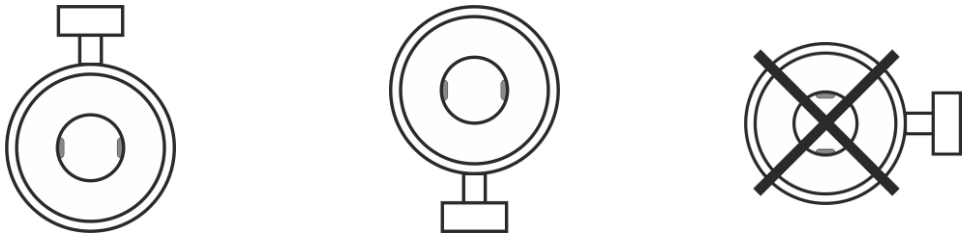
The inductive flow sensor is installed in arbitrary position in vertical piping. In case of horizontal piping, it is necessary to make sure that the sensor is installed with its measuring electrodes in horizontal position. In case of the earthing electrode design, possibly with testing for empty pipeline, then the installation is always performed with the earthing reference electrode facing down (with the sensor terminal box, eventually with the evaluation unit facing upwards). Then the earthing reference electrode is in the bottom position and the empty tube sensing electrode is in the top position of the flow sensor.

Every time when the empty tube testing electrode is not covered with a liquid for 5sec at least, the flow meter will display the "Empty tube" status, and if it is necessary, it sends out an error message and stops taking measurement. The measurement accuracy is maintained in this way. Once the electrode is covered with the liquid again, the error message disappears and the flow meter starts taking measurement again.

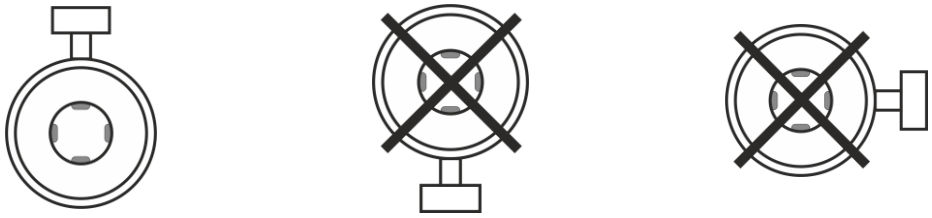


Installation in piping and placement of measuring electrodes in flow sensor

1) in the version without the earthed reference electrode and/or empty piping test (2 electrodes)



2) in the version with earthed electrode and/or empty piping test electrode (3/4 of the electrode)

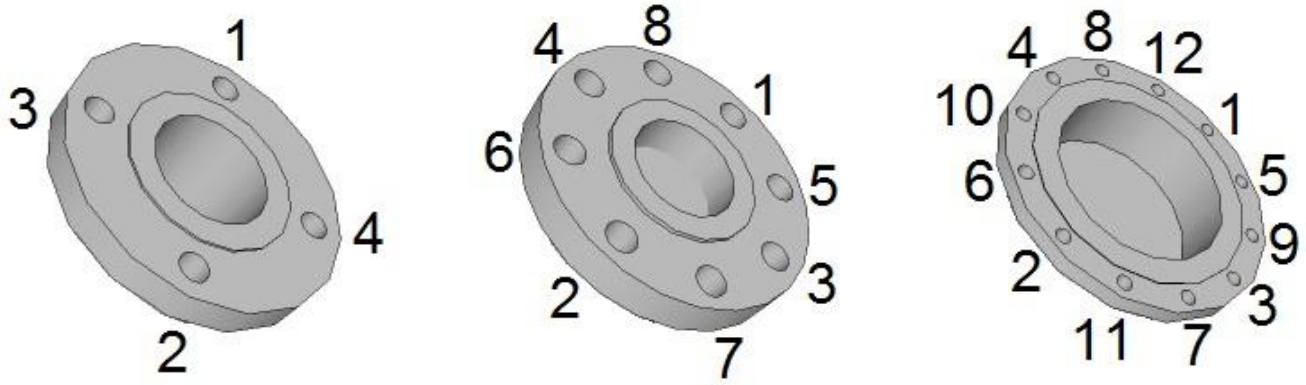


During installation, beware of:

- dropping the meter onto the ground and damaging the measuring tube or electronics
- contamination of the electrodes (do not touch the electrodes, otherwise they get contaminated)
- when additional sealing is used, avoid its interference in the flow profile of the detector between the flanges and the pipeline, otherwise the flow measurement error may be increased

Tightening torques

It is absolutely necessary to tighten the bolts and nuts equally by alternating sides and in the order shown in figure applying the maximum torque according to the table.



If the bolts are tightened too much during the installation of pipework components, deformation of the sealing surface may occur. In consequence, the torque values indicated in the table are used as a guidance for tightening the screws and bolts.

Table with tightening torques for screws/bolts:

Diameter nominal DN	**PN 10**			**PN 16**		
	Screws	Tightening torque [Nm]		Screws	Tightening torque [Nm]	
		Rubber	PTFE		Rubber	PTFE
15	4 x M12	20	25	4 x M12	20	25
20		20	25		20	25
25		20	25		20	25
32	4 x M16	20	25	4 x M16	20	35
40		20	25		20	35
50		20	45		20	45
65		20	46		20	46
80	8 x M16	20	48	8 x M16	20	48
100		20	50		20	50
125		20	80		20	80
150	8 x M20	24	90	8 x M20	27	90
200		25	115	12 x M20	28	80
250	12 x M20	27	95	12 x M24	38	110
300		34	115		55	150
350	16 x M20	47	140	16 x M24	75	160
400	16 x M24	65	155	16 x M27	85	200

Diameter nominal DN	**PN 25**			**PN 40**		
	Screws	Tightening torque [Nm]		Screws	Tightening torque [Nm]	
		Rubber	PTFE		Rubber	PTFE
15	4 x M12	25	25	4 x M12	25	25
20		25	25		25	25
25		25	25		25	25
32	4 x M16	25	35	4 x M16	25	40
40		25	35		35	50
50		35	45		35	60
65	8 x M16	35	46	8 x M16	45	55
80		40	48		45	60
100	8 x M20	40	55	8 x M20	50	75
125	8 x M24	50	110	8 x M24	70	120
150		57	115		75	136
200	12 x M24	68	100	12 x M27	85	145
250	12 x M27	88	120	12 x M30	105	-
300	16 x M27	95	125	16 x M30	115	-
350	16 x M30	115	200	16 x M33	140	-
400	16 x M33	135	255	16 x M36	165	-

The flanged connection design corresponds to EN 1092-1.

In case of using a corundum or thermoplastic tube, the same torques apply as in case of using the PTFE tube according to the given pressure series.

If you do not find your size or structure in the Torque Table, it is a special or non-standard design. In such a case, contact the manufacturer for more detailed information.

It is necessary to do the tightening three times, whereas for the first time, to 50% of the maximum torque according to the above given Table. For the second time, to 80% and for the third time, to 100% of the maximum torque. We recommend checking the screws/bolts for tightening some 24 hours after installation of the meter.

When installing the flow sensors over 200 mm, it is necessary to follow, except for the above mentioned rules, also simultaneous tightening of parallel screws on both opposite flanges to avoid possible damaging the electrodes or the measuring tube (symmetrical tensioning of the lining).

If the flanged joint is not tight, although all of the screws are tightened closely, **these must not be tightened more** but slackened on the opposite side to the untightness and tightened on the other side. If the untightness manifests itself even after that, it is necessary to check the sealing surfaces for scratches or mechanical impurities. If the scratches or any other damage are deeper than some 15% of the thickness of the flange, it is possible to remove them using fine emery paper.

In case of the threaded connection, it is necessary to check, while tightening, the screwed connection on the sensor so that torsional displacement is be avoided.

Seal

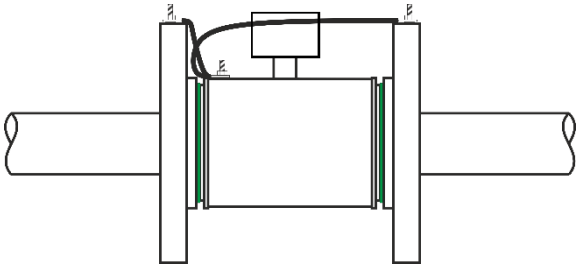
The turned up part of the lining does not carry out the function of sealing so it is necessary to insert the appropriate seal precisely centred between the sensor and the pipeline. If the sealing extends in some place into the flow profile, it makes whirls and reduces the measurement quality. Use the seals compatible with the liquid and 5mm thick. Do not use graphite or any other electrically conductive material to hold the sealing in place during installation. It could influence the measuring signal accuracy.

Earthing

For reliable and correct operation of the induction sensor it is necessary nto provide proper protective and working eathing. The earth line must not transmit interference voltages so the other electrical devices must not be earthed by means of this line.

The flow sensor is provided with the M5 earthing screw of stainless steel with a washer and nut for proper connection of the sensor body with both counter-flanges of the metallic pipeline. The earthing cable lug is screwed there and it should be conductively connected with the counter-flanges. On the counter-flanges, it is recommended their connection to the welded crews or into a threaded hole. Connecting under the fixing screws of the flange is not suitable as they may corrode with time and cause failures in measurement.

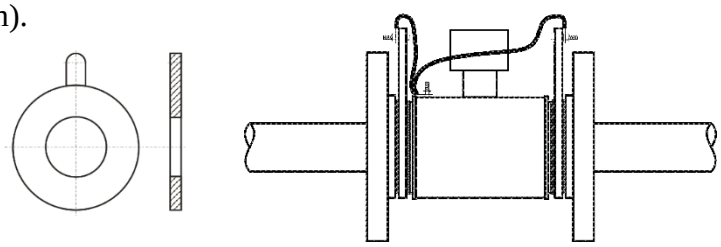
However, if it is not ensured that the counter-flanges are in dicert contact with the measured media and they are conductive, the earthing rings must be used, refer hereinafter.



Earthing rings

Using for a plastic pipeline or in case of metallic pipelines with internal plastic lining turned up or pulled out to the front faces of the pipeline flanges. Conductive earthing rings of stainless steel create conductive connection with the measured substance. Usually, potential equalization is carried out by means of the reference earthing electrode in the measuring tube. In exceptional cases, the equalizing currents may run through the reference electrode based on the device earthing conception. This may lead to deterioration of the sensor, e.g. by electrochemical disintegration of the electrodes. In such cases, it is **necessary** to use the earthing rings for potential equalization. This holds true for two-phase or two-component flows in which the medium is blended badly or its components cannot be blended. In general it can be said that using the earthing rings is always the protection against stray currents and the warranty of correct measurement at the same time.

The flow sensor is provided with the earthing screw of stainless steel for the earthing cable supplied with the mounting accessories. Then this cable must be conductively connected with the earthing rings. The earthing rings are not part of our standard package and must be ordered separately. Chemical durability of the material must correspond with the liquid to be measured; it is usually made of the same material as the sensor electrodes. While mounting, it is necessary to insert seals in both sides of the earthing ring and take care that no part extends to the internal profile of the sensor (whirling and turbulence of the medium).



Electrodes

The electrode material must be selected according to chemical resistance to the liquid to be measured. The purity of the electrodes may have an influence on measurement accuracy, their heavy foulness may cause even the interruption of the measuring function (isolation from the liquid). It is not necessary to clean the electrodes right after delivery before their installation in the pipeline. If the electrodes indicate signs of foulness, clean them with a soft cloth or use a chemical cleaning agent. Mind damaging to the lining! During routine operation, in case of a great majority of liquids, it is not necessary to clean the flow meter for the entire operation period of the flow sensor; self-cleaning by flow of the liquid is sufficient (recommended velocity is over 2 m/sec).

PTFE lining

Meters with PTFE lining are equipped with protective covers to prevent the sealing surfaces from damaging during transportation or storage and from changing the shape (due to elastic memory of the PTFE material, it is restraightened to the tube). Protective covers may be removed only right before the installation. If these covers are removed due to a check, it is necessary to replace them immediately. Carry out the installation at the lowest point of the pipeline to avoid the occurrence of vacuum. Never detach and damage the rim of the PTFE lining turned up to the of flow sensor faces. Remove the covers from the inlet and outlet sides right before insertion of the sensor between the pipeline flanges and replace them with metal plates (0.3 ÷ 0.6 mm thick). After insertion of the sensor, remove the metal plates and install the screws/bolts.

High temperature pipeline
High temperature medium
At temperatures of the medium to be measured over 100°C, it is necessary to compensate the forces caused by thermal expansion of the pipeline due to its temperature rise. For short pipelines, it is necessary to use flexible seals, for long pipelines, use flexible pipe elements (e.g. bends).
The flow sensor must never by thermally insulated. In case that the sensor is placed in a thermally insulated pipeline, the thermal insulation must be interrupted and the flow sensor is installed without thermal insulation.
When a compact meter is used (evaluation unit placed on the sensor body), it is necessary to respect the temperature of medium up to 90 °C. In case of exceeding this temperature, the correct functionality of the electronic evaluation unit is not guaranteed, or there is a risk of its destruction.

Installation check

After installation of the flow sensor in the pipeline, the following must be checked:

- According to the name plate, if there is a relevant meter in the given measuring point (pressure, temperature, dimension, etc.).
- If the direction of the arrow on the device is in agreement with the direction of the flow in the pipeline.
- Correct position of the measuring electrodes (horizontally).
- Correct position of the electrode for empty pipeline detection (up).
- If all bolts (screws) are tightened properly.
- If earthing rings are used, then their correct installation and connection with the sensor.
- Accuracy of flow sensor earthing.
- Accuracy of execution of the pipeline calming section lengths
- If the sensor is protected against vibrations and mechanical damage.
- If the name plate (serial number) on the sensor corresponds to the one on the electronics.

Electrical installation

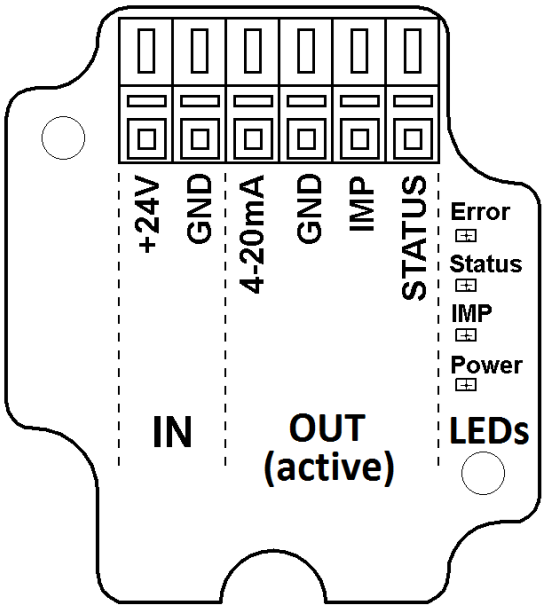
This works can be done just by a competent person with the appropriate electro technical qualification in accordance with terms of Law Regulation!!!
The warranty for errors resulting from incompetent implementation of operations described below becomes null and void !!!

Meter wiring

Evaluation unit
As a standard, the evaluation unit is delivered for 24VDC ±15% / 250mA supply voltage.

The signal outputs of the flow meter may only be connected to devices where personal accident protection is ensured by safety extra-low voltage and where the generated voltages do not exceed the limits specified for the safety extra-low voltage.

All needed signals are located on 6-possition terminal. All signals are **active.**



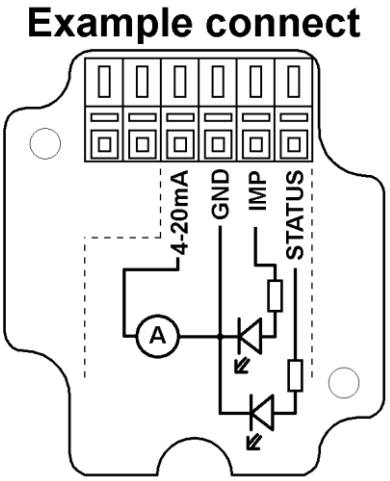
1 - Vdd (+24V)
2 - GND
3 - 4-20mA +
4 - GND
5 - OUT1 impuls (positive pulses)
6 - OUT2 status

Pulse output OUT1

The volumetric pulse output is intended for remote transmission of volumetric pulses and metrology verification of the flow meter.

The pulse output maximum frequency depend at the pulse width setted from factory.

Constant transfer and the pulse width are set by the manufacturer at the factory.
Output pulse volume is realized via PNP transistor whose emitor is connected internally to VCC and whose colector on terminal is named IMP, output is active.
Load transistor must be chosen so that the limit parameters must not be exceeded (max.200mA / 100mW).



The maximum frequency of the pulse output is 1,6kHz when pulse width min. 250µs

Status output OUT2

Status output OUT2 is determined to send information fault, the fault status means one of three states:

- defective flow sensor
- empty pipe – no medium inside the pipe
- the measured signal is outside the limits (signal can not be measured)

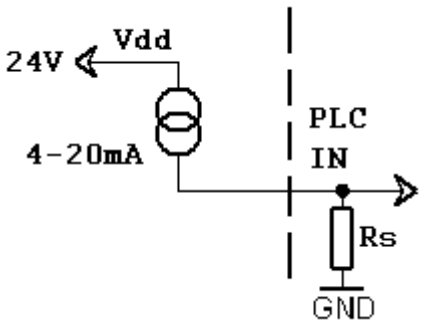
This fault output is **active** and is realized like OUT1, on terminal board is exact terminal STATUS.

Note : Fault state is indicated as a open output!

Current output

The current output is also **active**. Positive current loop output is connected to the terminal 5.
The loop resistance must not be greater than 600Ω. Standardly is set so that at maximum flow Qmax loop current is 20 mA and at zero flow or negative flow loop current is 4 mA. The current value is directly proportional to the flow rate in the sample.
Limits of the flow current output are freely adjusted (float data type) using a service communication interface.
In case of failure or loss of power supply current output falls below 4 mA (usually at 3 mA), and this can be detected fault condition by the master system.

Active current loop example:



Starting up

Before connecting power, check the installation of the unit if it is correct according to "Installation in pipework" a "Electrical installation" chapters.

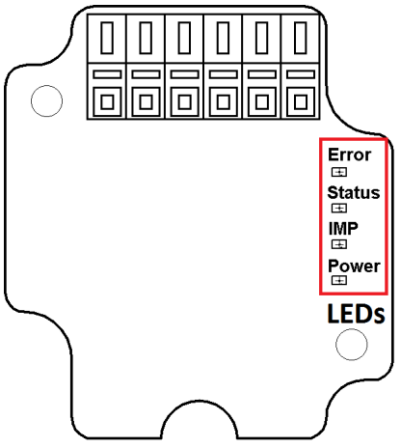
Do not turn the power on before the system has been filled up with the medium to be measured and similarly, turn the meter off before the system has been discharged. Right after the meter is powered up the meter starts taking measurements (Stabilization of the measured values occurs after approx. 20 seconds).

Basic parameter setting
The parameters of the meter and/or those of flow meter are preset by the manufacturer according to your order and basic parameters are on the meter nameplate.

Boundary values of the measuring range	Refer to meter's nameplate
Excitation time constant	Default 1,10 ms
Pulse output width / gap	Min. 250µs / max. 250ms
Pulse output constant	fmax [800Hz] => Qmax
Application	Stable flow

Status of sensor :
It is continuously displayed by four LED's
on the PCB on the right side:

- Power (green led, lighting after powering)
- IMP (orange led, copy closing of the output OUT1)
- Status (orange led, copy closing of the output OUT2)
- Error (red led, indication of error of the sensor)



Safety rules for operator

Any interference with the induction flow sensor and in the evaluation unit by the operator is illegal and it may lead to direct scalding by the medium if the induction flow sensor is manipulated with improperly. Carry out electric connections always after powering off.

Technical data

Power	24V DC±15 % / 250mA with polarity reversal protection
Input power	4 VA
Electrical connection	via the connector 6 possition terminal
Display	4× LED
Construction	compact
Max. temperature of medium	70 °C, at a higher temperature, upon agreement with manufacturer
Size	DN 10 ÷ 40
Lining material	rubber (hard, soft, certificate for potable water), PTFE
Electrode material	CrNi steel DIN 1.4571
Sensor material	stainless steel
Measuring range (Qmin/Qmax)	unidirectional/bidirectional for 0.2÷12 m/s (1/60)
Flow meter accuracy	1% pro 1 ÷ 10 m/s 3% pro 0,2 ÷ 1 m/s
Repeatability	up to 0.4% (for 0.1 ÷ 10m/s)
Additional electrodes	reference grounding and detection ones for empty pipeline (DN 15÷DN 40)
Min. medium conductivity	20 μS (at a lower conductivity, upon agreement with manufacturer)
Outputs (active)	OUT1 - impulse (max. 1.6 kHz) OUT2 – status Analogue 4÷20 mA
Sampling:	900 samples per second (standard)
Max. ambient temperature	55°C
Ambient humidity:	max. 90%
Pressure	PN10, PN16, PN25, PN40
Pressure loss	negligible
Flow meter protection	IP65

If you do not find your inside diameter or construction in the table of flow sensor characteristic, it is a special or non-standard construction. In this case you will find this information on the sensor label where this is always indicated or contact the manufacturer and ask for detailed information please.

Operation checks

Faults and their symptoms during measurement

Unstable indications and readouts may appear due to:

- big portion of solids
- in homogeneities as a result of the state of matter
- turning point of immixture
- continuous chemical reactions in the measured fluid
- use of diaphragm pumps or plunger pumps
- poor grounding

Servicing

All repairs within warranty and after warranty period are only conducted by the manufacturer, **COMAC CAL s. r.o.**

When the operations described below are carried out incompetently, the claim for warranty for errors resulting from this becomes null and void !!!

Factory configuration

The pulse output is always selected as the nearest decimal constant meeting the condition that the output frequency at the maximum flow rate for the given bore is not higher than 800Hz. The current loop is set like following 4 mA correspond to zero flow and 20 mA correspond to maximum value.

Form for shipment of the meter back to COMAC CAL s.r.o.

The meter you have was made with the maximum precision and it has been checked many times and wet calibrated.

If the meter is used in agreement with this manual, the occurrence of faults is very rare. Should they ever occur, contact our service department. If you return the meter to the manufacturing plant, adhere to the conditions stated below:

- Clear the meter of contaminations stuck to the sensor and measuring tube (eventually to the Evaluation Unit).
- If the meter was run with poisonous, etching, combustible liquids or with fluids dangerous to water, check it and if appropriate, flush and neutralize the cavities inside the sensor.

Fill in the following data please and the form duly completed attach to your consignment. COMAC CAL s.r.o. will not be able to process your request promptly and correctly without this form.

Customer

Company…… City……

Department……... Name……

Phone no…….

Enclosed meter

Type…… Serial number…….

Measured liquid…….

Description of a fault or modifications required……
……
……
……
……

We confirm that the meter was duly cleaned, and if required, it was flushed out and neutralized. Therefore, this consignment does not constitute any risk to humans and environment due to remnants of the measured fluid.

Date…….. Signature and stamp…….