INTRA-AUTOMATION GmbH

Electronic measurement and control devices

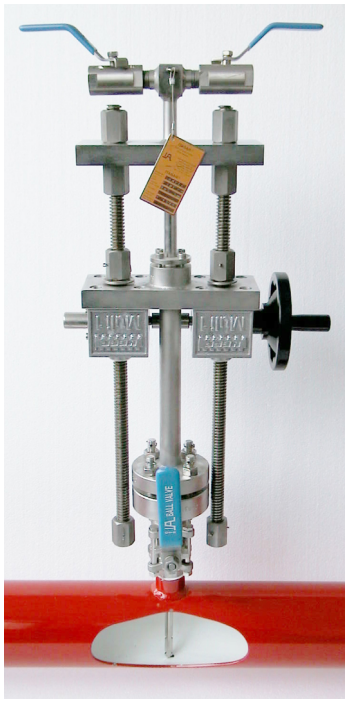
Instrumentation and control technology

Itabar-Flow-Sensors for Gases and Liquids

(FloTap-Versions)

Series: FTN, FTM and FTH

FTN



FTM

FTH

Installation and Operation Manual

THE EXPERT IN LEVEL AND FLOW

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MEASUREMENT AND CONTROL

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Itabar-Flow-Sensors for Gases and Liquids
(FloTap-Versions)

Series: FTN, FTM and FTH

List of Contents:

List of Contents (Continuation):

1. Safety Instructions

In this manual you will find information for your own safety and to prevent any type of damage. The hints are marked with a danger sign described as follows:

DANGER
means, that death, personal injury or high damage to property **will** occur, if there should be taken no precaution.

WARNING
means, that death, personal injury or high damage to property **can** occur, if there should be taken no precaution.

CAUTION
with danger sign means, that only small personal injuries can occur, if there should be taken no precaution.

CAUTION
without danger sign means, that damage to property can occur, if there should be taken no precaution.

ATTENTION
highlights actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.

NOTE
Is important information about the product itself, the handling of the product or that part of the manual to which special attention is to be drawn to.

Limited liability

We checked the content of the manual in accordance to the hardware. But we can not guarranty that there will be differences between the manual and the hardware. The manual will be checked regularly to correct the manual in the following versions.

A.2 General Instructions

NOTE

For reasons of clarity the manual does not contain detailed information about all types of products and cannot take into account every conceivable case of installation, operation or maintenance.

If you require further information or should any problems occur which are not sufficiently explained in the manual, you can consult your local Intra-Automation branch to obtain the necessary information.

May we also draw your attention to the fact that the contents of the manual are not part of a previous or existing agreement, approval or legal relationship or an amendment thereof. All obligations of the Intra-Automation GmbH result from the contract of purchase which also contains the full and solely valid warranty agreement. These contractual warranty conditions are neither extended nor restricted by the contents of the manual.

The contents reflect the technical state at the time of going to print. They are subject to technical modifications in the course of further development.

WARNING

Intrinsically safe devices lose their license as soon as they are operated on circuits which do not meet the requirements of the EC test certificate.

The device may be operated with high pressure and corrosive media. Therefore serious injuries and/ or considerable material damage cannot be ruled out in the event of improper handling of the device.

The perfect and safe operation of this equipment is conditional upon proper transport, proper storage, installation and assembly as well as on careful operation and commissioning.

The equipment may only be used for the purposes specified in this instruction manual.

Exclusion of liability

All modifications to the device require the expressed approval of the manufacturer.

Qualified Personnel

Qualified personnel is persons familiar with installation, commissioning and operation of the product and wo have the appropriate qualifications for their activities, such as:

- training or instruction or authorization to operate and maintain devices/ systems according to the standard of safety technology for high pressures and corrosive media.
- training or instruction according to the standards of safety engineering in the care and use of suitable safety equipment.
- training in first aid.

CAUTION

Modules which are sensitive to electrostatic charge may be destroyed by voltages which are far below the human level of perception. These voltages occur already when you touch a component or electrical connections of a module without first discharging yourself electro-statically. The damage incurred by a module as a result of an overvoltage is not usually immediately perceptible but only becomes noticeable after a long time in operation.

Trade mark

Itabar is a trade mark of Intra-Automation GmbH.

3. Measurement principle of Itabar-Flow-Sensors

Once a corpus like our patented flow sensor profile is being brought into parallel flow with the velocity of w, the fluid will partly pond while passing the barrier. The streamline flowing in the middle of the ponding area, the ponding flow line, hits the barrier vertically. The fluid will totally calm down at this very point, called the ponding point. As ponding flows are always laminar – at least until they reach the corpus (Ponding point) – and therefore are always certainly calculable (even if the flow friction is involved), which makes them very usable for measurement procedures. Using the energy equation acc. to Bernoulli, the outcome is:

$$p_{ges} = p_{stat} + \frac{1}{2}\rho w^2$$

With the patented sensor profile of the Itabar-sensor it is possible to measure the total pressure p_{ges} on the front side as well as the static pressure p_{stat} on the backside of the sensor. From the difference the flow velocity can be calculated:

$$w = \sqrt{\frac{2 * p_{dyn}}{\rho}}$$

At known pipe inside diameter the following applies acc. to the continuity equation:

$$V \sim wA$$

From that completed by a proportional coefficient (or correction coefficient “k”) the following equations result:

$$V = k * w * A \text{ or } m = k * \rho * w * A$$

The correction coefficient “k” is only related to the patented Itabar-sensor-profile. The coefficient has been determined by empiric methods for all sensor profiles by Intra-Automation GmbH.

4. Product description

Congratulations for your choice of an Itabar®-Flow Sensor series FTN, FTM or FTH.

When installed properly, the ITABAR®-sensor offers an array of advantages over other measurement systems with respect to it’s accuracy, pressure loss and installation. The following guide is designed to help you with the sensor’s installation and operation.

5. Operating conditions

The Itabar-Flow-Sensor in your hands can be applied to the following operation conditions

	series FTN	series FTM	series FTH
Operation pressure	up to PN6	up to PN40	up to PN100
Operation temperature	up to 200 °C	up to 300 °C	up to 400 °C
Nominal pipe sizes	DN40….DN2000	DN40…DN2000	DN40…DN2000

For special process conditions (e.g. corrosive fluids or extreme temperatures) the material of the sensor can be customized for your application.

6. Receipt, Transport and Storing

On receipt of the equipment, the outside packing has to be checked for any damage incurred while shipment. If the packing case is damaged, the local carrier should be notified immediately regarding the liability. Remove the envelope containing the packing list. Carefully remove the equipment from the transport box and inspect for damaged or missing parts. Please check the case to be sure that all parts (e.g. accessories) have been unpacked. For transport or storing please only use the original packing case. Conditions for storing:

- Do not pile up the cases at any time!
- For storage, protect the units against heat frost, humidity, dust of chemical vapour/media.
- Storage temperature: 10°C [50 °F] up to 40 °C [104 °F]

The time of storage is unlimited, but pay attention to the agreed guarantee period.

WARNING

For transport of units with weights higher than 25 kg [55 lbs], only use lifting tools. Please take care of the centre of gravity signed on the packing (without sign if the centre is in the middle of the case). During transport do not enter the area of danger. Wear safety clothes (e.g. shoes) only.

7. Pre-Installation Checks

Before installation, please make sure that all of the following parts are included in the sensor kit:

	Series FTN	Series FTM	Series FTH
Itabar-Flow-Sensor	☑	☑	☑
Weld socket with cutting ring and pressure nut	☑	☑	
Mounting stud with flange			☑
Gasket for the mounting flange			☑
Bolts & Nuts			☑
Opposite end support (profiles: -21/26/36/66)	☑	☑	☑
Instrument valve assembly (if ordered)	☑	☑	☑

Compare the specification on the TAG-plate with the given specification of your Purchase order. The TAG-plate contains the following details:

- Serial-no.
- Sensor type
- Pipe inside diameter
- TAG-no. (measurement location number) – if provided
- Material of construction
- Measuring range

fig 1: TAG plate Itabar

NOTE

Make sure that the pipe inside diameter indicated on the TAG-plate matches your pipe diameter!

8. General Instructions for Installation

In order to obtain optimal measurement results, follow the instructions concerning the installation of the Itabar-Flow-Sensor as given below.

8.1 Equipment required for Installation

FloTap series Itabar-flow-sensors are designed to be installed under pressure. So some special tools are needed for installation:

1.) Welding equipment
2.) Pressure (hot-tap) drilling machine, e.g. Mueller type DH5 or equivalent
3.) 1 1/16" drill bit Mueller 33530
4.) Drill holder Mueller 33555
5.) Adapter nipple Mueller 36195

(Items 2 to 5 are available from Mueller Co., Decatur, Illinois. In most cases, the public service company in your city is able to do the "hot-tapping" job, or the equipment may be rented or purchased locally.)

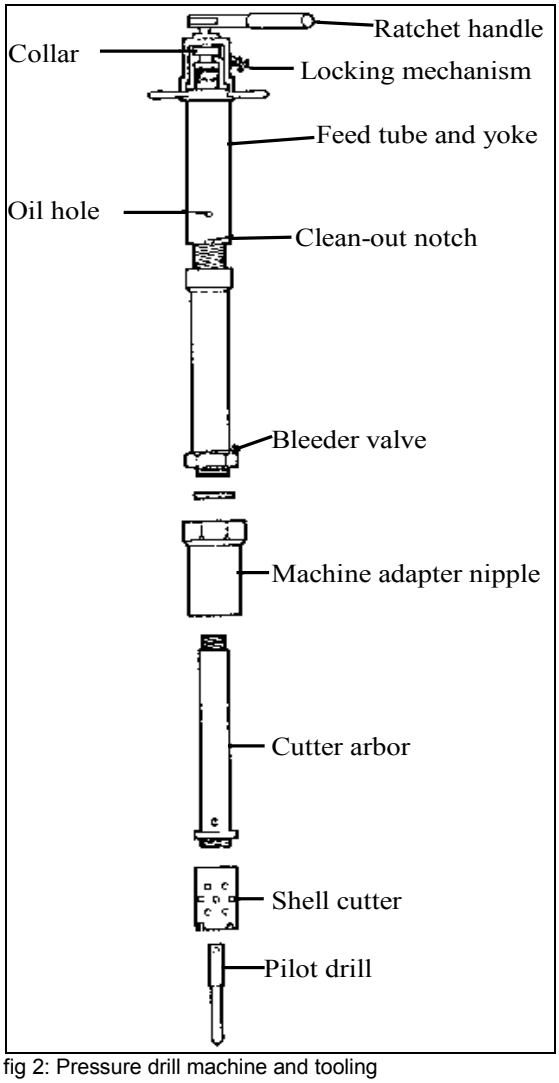
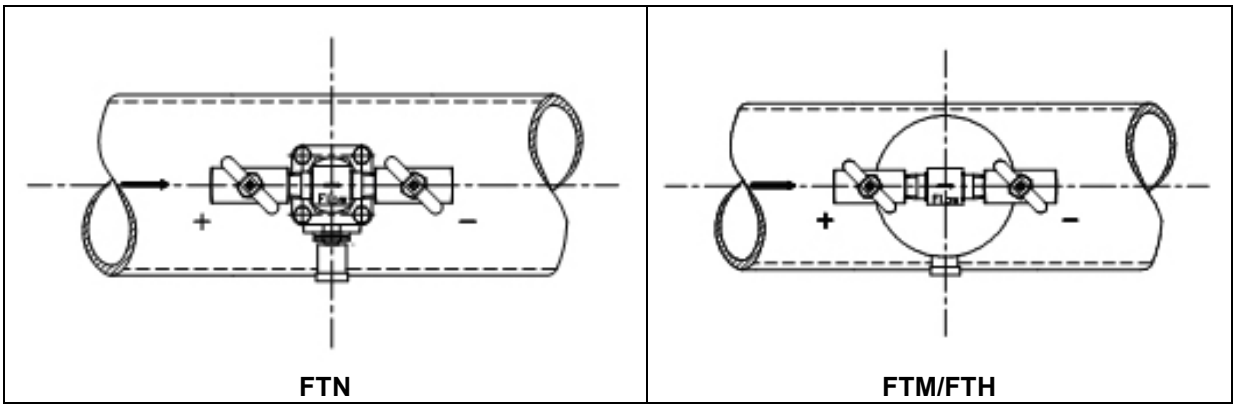


fig 2: Pressure drill machine and tooling

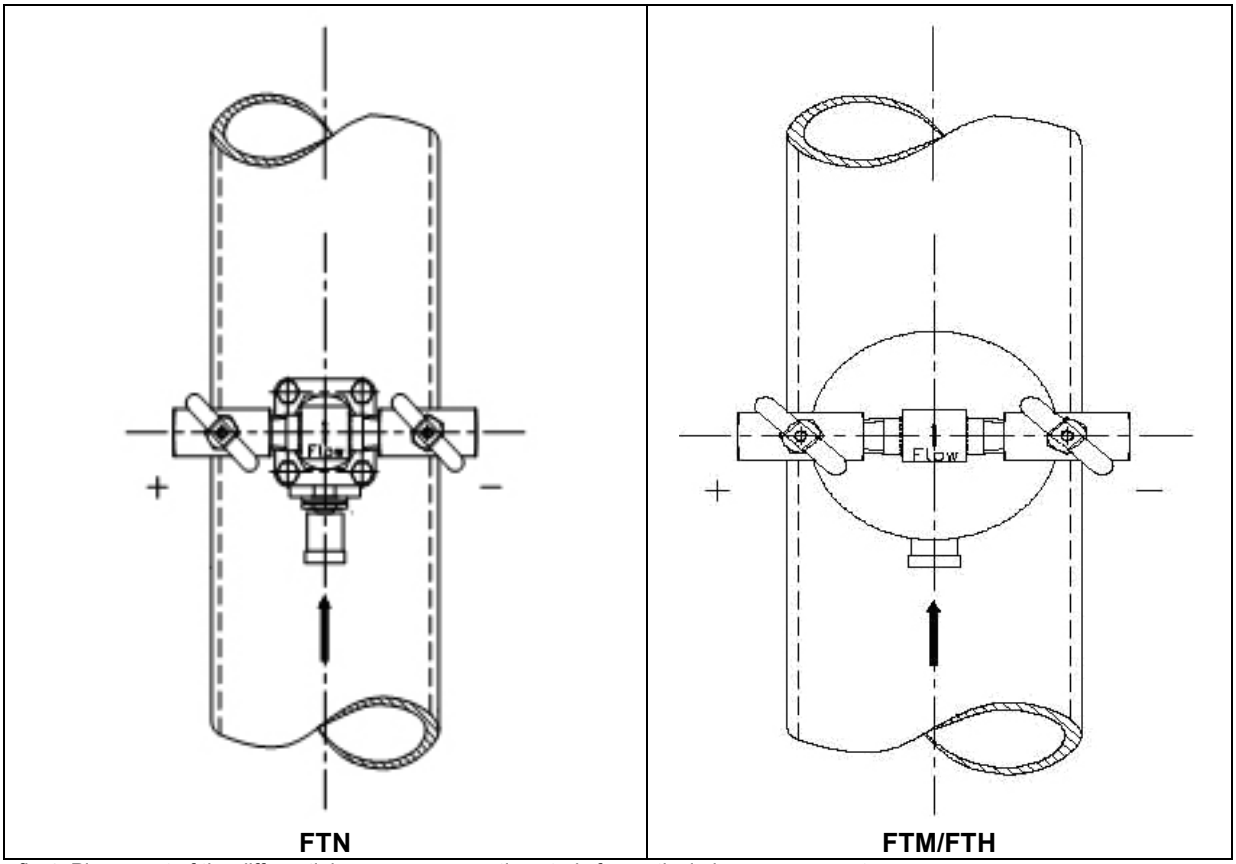
8.2 Specification of the Pipe Arrangement at Place of Installation

For design reasons, the pipe arrangement at the installation has to be known before the sensor is manufactured.
For horizontal pipe arrangements the instrument connections are placed in line with the flow direction (see figure 3).
For vertical pipe arrangements the instrument connections for the measurement of the differential pressure are arranged with an angle of 90° to the flow direction (see figure 4).



FTN **FTM/FTH**

fig 3: Placement of the differential pressure connection studs for horizontal pipe arrangement



FTN **FTM/FTH**

fig 4: Placement of the differential pressure connection studs for vertical pipe arrangement

NOTE

NOTE
In each case, the flow direction is indicated by an arrow on the sensor head.

8.3 Vertical Pipe Arrangement

The Itabar-Sensor for flow measurement of liquids and gases can be installed in vertical pipe runs at any location, however, the instrument connections have to be located in the same horizontal plain (see fig. 5).

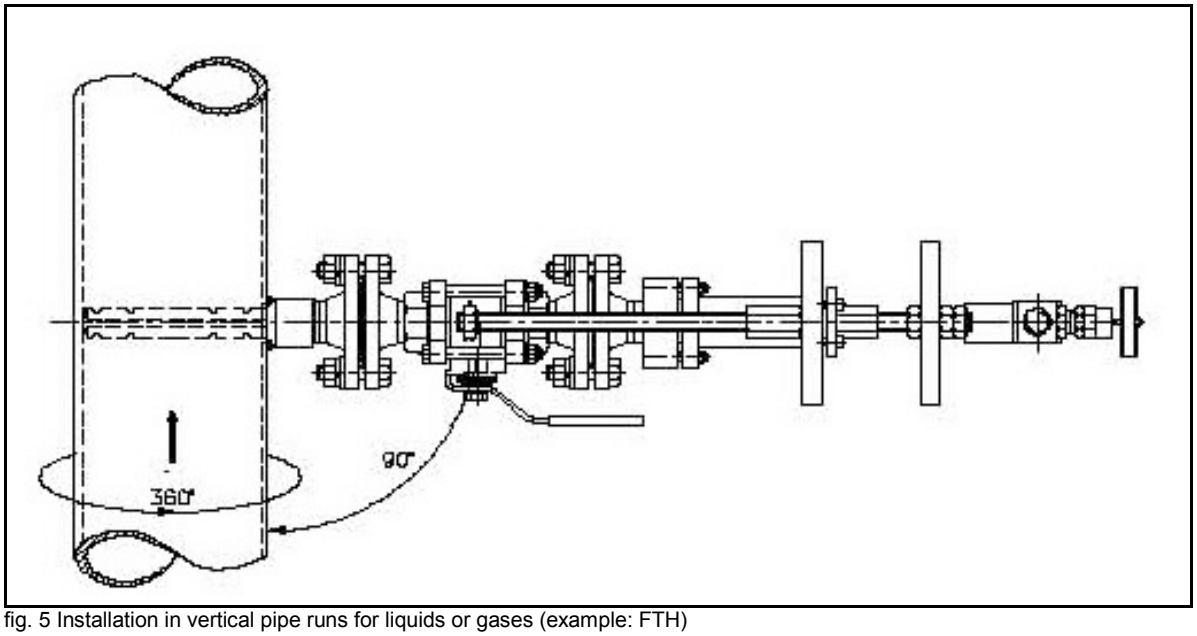


fig. 5 Installation in vertical pipe runs for liquids or gases (example: FTH)

8.4 Horizontal Pipe Arrangement

Liquids:	**Gases:**
For flow measurement of liquids, the Itabar-Sensor has to be installed in the lower half of the pipe perimeter; the connections to the instruments have to be located below the pipe axis. This assures gas or air bubbles in the pressure piping will find their way back into the flowing liquid (see fig 6).	For flow measurement of gases, the Itabar-Sensor has to be installed in the upper half of the pipe perimeter; the connections to the instruments have to be located below the pipe axis. This will prevent moisture and condensations from entering the instrument connections and from altering the measurement (see fig 7).

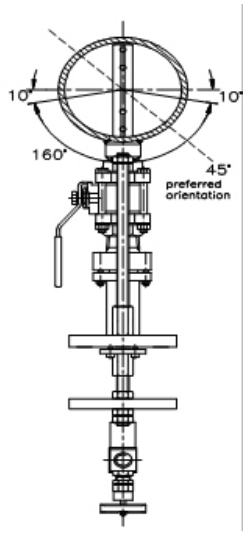
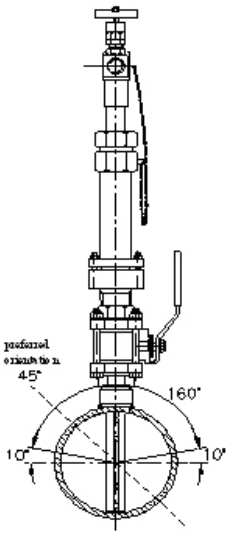

	

fig. 6 Installation in horizontal pipe runs for liquids (example: FTM)	fig. 7 Installation in horizontal pipe runs for gases (example: FTN)

8.5 Misalignment

The Itabar-Sensor operates based on simple physical principles. Its design incorporates no moving parts which are subject to wear. The sensor is not affected by being slightly out of alignment. The influence on the accuracy of the measurement is neglible as long as the limits in the below fig 8 are not exceeded (The pictures show IBR-types, but the values are also valid for IBF.)

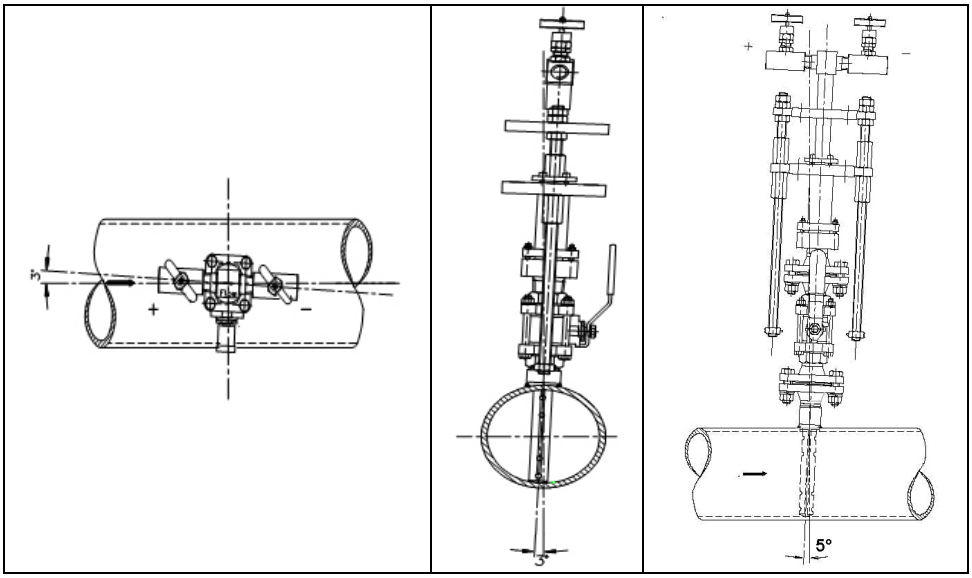


Fig 8 Allowable Misalignments.

8.6 Required undisturbed Pipe Run Lengths (in Multiples of D) to achieve an Accuracy of ± 1 %

The accuracy of the measurements with the Itabar-Sensor depends on the development of a stream profile which should be as undisturbed as possible. Therefore, the selection of the installation location within the pipe run is of considerable importance. The following tried and true hints (see table page 12) regarding the required pipe lengths ahead of and behind the sensor are designed to help you in your selection of the most advantageous location.

NOTE

NOTE

As a general rule, control valves, throttle valves and gate-type valves should be installed behind the sensor.

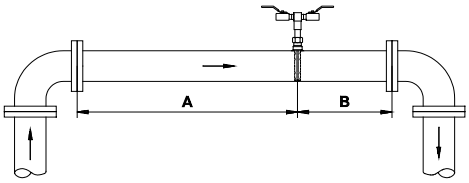
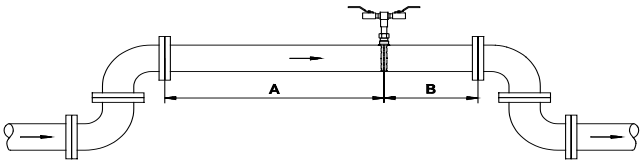
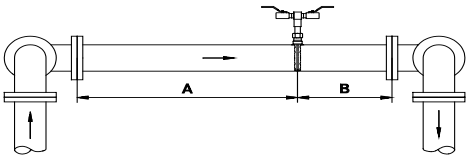
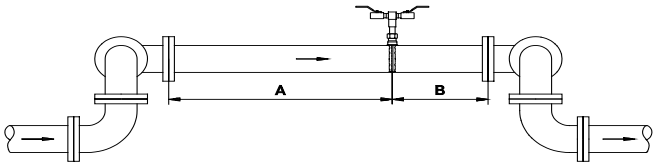
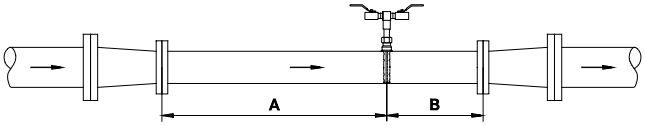
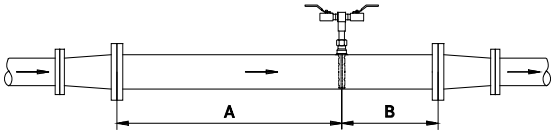
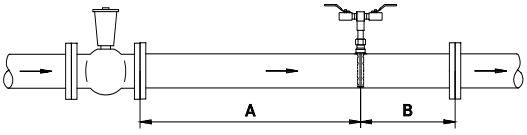
NOTE

NOTE

If the recommended straight pipe lengths are not available, the measuring accuracy can be adjusted to the specific conditions of the measuring section by conducting a comparison measurement.

The measurement guarantees that the differential pressure corresponds to the true flow velocity, thereby assuring the specified accuracy.

For details, please contact us.

D = Pipe diameter	A = Upstream	B= Downstream
	7D	3D
	9D	3D
	17D	4D
	18D	4D
Restriction in the pipe run 	7D	3D
Widening in the pipe run 	7D	3D
Control device 	24D	4D

(The pictures do not show FloTap-Sensors, but the values are also valid for FTN, FTM or FTH.)

9 Installation of the Itabar-Flow-Sensor

WARNING

Please observe the general security notes of this manual! Take good care to always wear adequate safety clothes while installing the sensor!

Table bore diameters (pipe line):

Sensor type:	Mounting stud:	Bore diameter Installation of sensor	Bore diameter opposite end support
...-20	DN25PN16 resp PN 40 or 1“150# resp 300#	18 mm	
	DN25PN100 resp. PN160 or 1“600#	30 mm	
...-21	DN25PN16 resp PN 40 or 1“150# bzw. 300#	18 mm	15 mm
	DN25PN100 resp. PN160 or 1“600#	30 mm	26 mm
...-25	DN32PN16 resp. PN 40	30 mm	
	DN40, DN50, 1 ½“ and 2“	36 mm	
...-26	DN32PN16 resp. PN 40	30 mm	30 mm
	DN40, DN50, 1 ½“ and 2“	36 mm	36 mm
...-35	DN50 resp. 2“	47 mm	
...-36	DN50 resp. 2“	47 mm	44 mm
…-65	For mounting the welding stud, please measure the inside diameter of the stud and drill this diameter into the pipe line. For mounting the opposite end support (…-66), please act analogical.		
…-66			

9.1 Instructions to install FTN

9.1.1 Installation of the Itabar-Flow-Sensor without End Support (FTN-20/25/35)

1. Verify that the line pressure is with rated limits of the drilling equipment to be used.
2. Grind off paint or other coatings from the pipe in the area where the Flo-Tap is to be installed.
3. Tack the mounting stud (1) (supplied with the Flo-Tap) onto the pipe leaving a clearance of 1-2 mm (see fig. 9)
4. Check the alignment of the mounting stud again. Then the finish weld can be made.
5. Fasten unit Isolating valve (2) to the mounting stud (1) and open valve. Verify that the stem is in position as shown in fig 9.

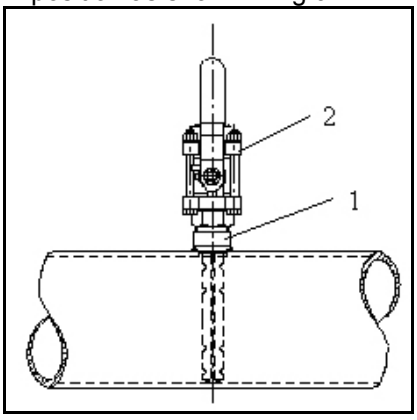


Fig 9

6. Fasten special adapter flange nipple to unit isolating valve (see fig 10)

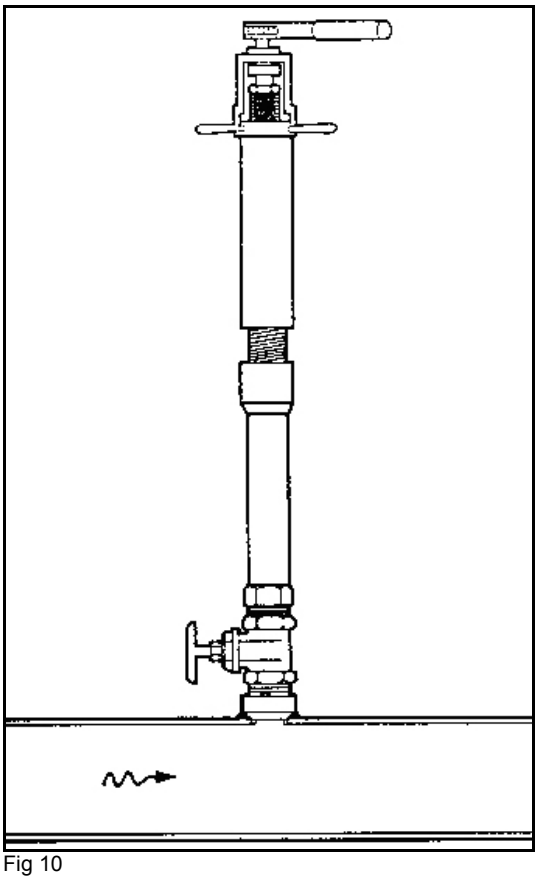


Fig 10

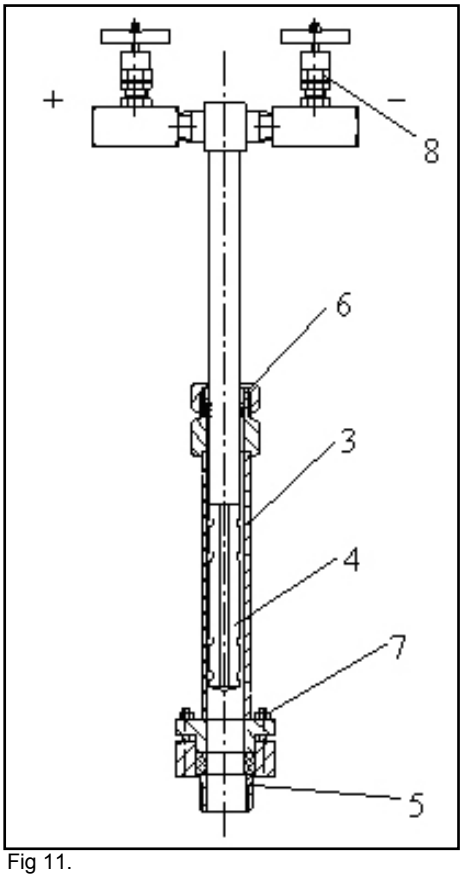


Fig 11.

7. Install cutter arbour, shell cutter and pilot drill to the pressure drilling machine and attach the machine to its special flanged nipple.
8. Drill through the pipe wall in accordance with the instructions supplied with the drilling machine. (Drilling hole dimension: please see table page 13)
9. Withdraw the drill past the Flo-Tap unit isolating valve. Close the valve and remove drilling machine and special flanged nipple. Check fro leakage at valve and connections.
10. Verify that the sensor profile (4) is fully retracted in the protection pipe (3) (see fig. 11).
11. Now seal the threaded stud (5) with a suitable sealing compound (see fig 11).
12. Install the threaded stud (5) on the isolating valve (2) (see fig 9 and 11).
13. Verify that the instrument valves are fully closed.
14. Check all connections for leakage by cracking open the unit isolating valve. If the unit was ordered with the optional high-temperature packing glad. If necessary, screw down the nut (6) of the top packing gland and the 4 screw nuts (7) of the bottom packing gland.
15. Increase line pressure to normal limits and check for leakage. If there is no apparent leakage, proceed with Chapter 9.1.2 “Insertion procedure for FTN”.

9.1.2 Installation of the Itabar-Flow-Sensor with End Support (FTN-21/26/36)

WARNING

Due to the construction of FTN-21/26/36 with end support a first-time installation under process conditions would cause many problems.
So this type has to be installed during an operational stop. After installation, the sensor can be rejected and inserted under pressure.

The design of the Itabar-Sensor types IBR-21/26/36 is almost identical to the types IBR-20/25/35. The only difference is the end support (see fig. 12), which permits higher stream velocities in the pipe. Except for the installation of the sensor end support, the installation steps are identical to those for type IBR-20/25/35.

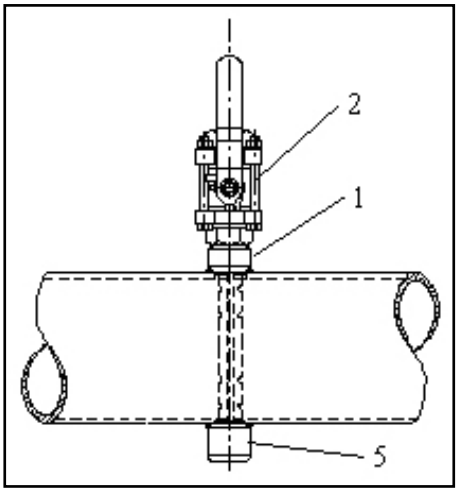


Fig 12 Mounting hardware with end support

Installation of weld socket:

1. Drill a hole into the pipe (Dimensions: please see table page 13).
2. Tack the weld socket (1) onto the pipe leaving approx. 2 mm clearance. Align the socket (e.g. with a bolt or a pin so that it is exactly perpendicular to the pipe axis (see fig 12).
3. Before final welding and installing the sensor, the end support (5) has to be mounted.

Installation of the end support:

4. Take a cord and tie one end around the installed weld socket (1). Wrap the other end of the cord around the pipe that it forms a ring around the pipe. Mark the half-way point of the pipe circumference on the pipe.
5. Now drill a second hole at this marked point (Dimensions: please see table page 13).
6. Tack the sensor end support onto the pipe leaving approx. 2 mm clearance.
7. Insert the sensor into the pipe and check the alignment of the end support. If necessary, correct the alignment
8. Now the final welding can be carried out. Check the alignment of the weld socket again. Tolerances can be found in chapter 8.4.
9. Install the Flo-Tap isolating valve (2) on the welding socket (2). Verify that the valve is in fully open position, and that the stem is in line with the pipe.
10. Perform the installation for the sensor according to the instructions given in chapter 9.1.1, step 10 to 15.

9.1.3 Insertion procedure for FTN

1. Verify that the Flo-Tap inser-retract mechanism is in the position as shown in fig 13.
2. Verify that Flo-Tap instrument valves [8] are fully closed and that the unit isolating valve is fully opened.
3. Initiate prove insertion until probe contacts the opposite side of the pipe or end support.
   Now the screw nut and screws [6+7] of the packing gland can be screwed down.
4. Inspect the packing gland for evidence of leakage. If the unit was ordered with high temperature gland, additional adjustment may be required this time.
5. Connect instrument lines to the instrument valves [8] and to the appropriate meter, recorder, transmitter or controller.
6. Open the Flo-Tap instrument valves [8]. Vent the pressure lines and the differential pressure transmitter.

9.1.4 Retraction procedure for FTN

1. Fully close the Flo-Tap instrument valves [8]. Then, if required, depressurize and disconnect the instrument lines.
2. Loosen slightly packing gland [7+6] before proceeding with retraction.
3. Retract the Flo-Tap [4] until the probe is completely retracted (see fig. 13)
4. After the probe is retracted completely, close the isolating valve for complete disassembly.

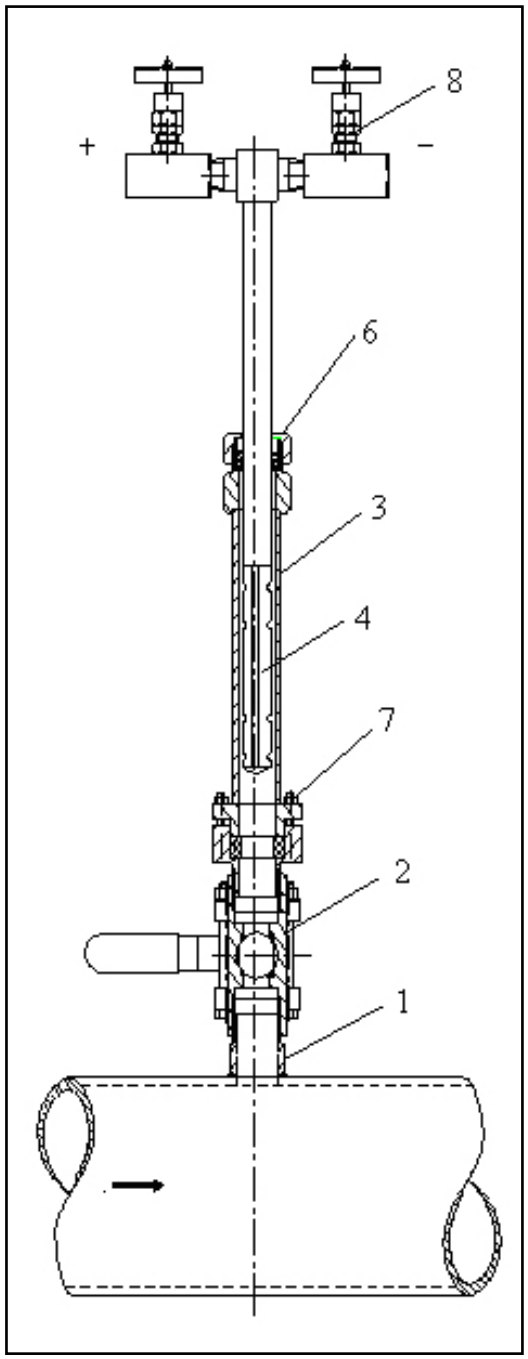


Fig. 13 Insertion / Retraction of FTN type flow sensor

9.2 Instructions to install FTM

9.2.1 Installation of the Itabar-Flow-Sensor without End Support (FTM-20/25/35)

1. Verify that the line pressure is within the rated limits of the drilling equipment to be used.
2. Grind off paint or other coatings form the pipe in the area where the Flo-Tap is to be installed
3. Tack the mounting stud [1] (supplied with the Flo-Tap onto the pipe leaving a clearance of 1 to 2 mm (please refer to fig. 14)
4. Check the alignment of the mounting stud again. Then the finish weld can be done.
5. Fasten unit isolating valve [2] to the mounting stud [1] and open valve. Verify that the stem is in position as shown in fig. 14 to ensure clearance for the insert-retract rods.

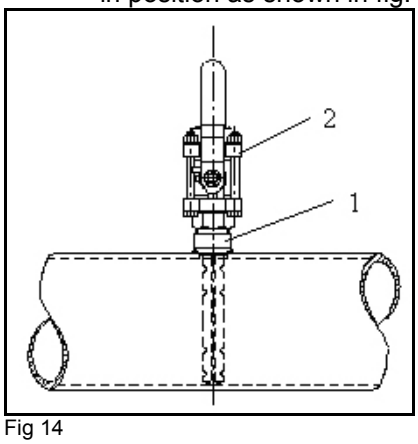


Fig 14

6. Fasten special adapter flange nipple to unit isolation valve (see fig. 15).
7. Install cutter arbour, shell cutter and pilot drill to the drilling machine and attach the machine to its special flanged nipple.
8. Drill through the pipe in accordance with the instructions supplied with the drilling machine. Please take the boring dimensions from table on page 13 of this manual.
9. Withdraw the drill past the Flo-Tap unit isolating valve. Close the valve and remove drilling machine and special flange nipple. Check for leakage at valve and connections.
10. Verify that the sensor profile [4] is fully retracted in the protection pipe [3]. Check the position of the threaded rod. (see fig. 16

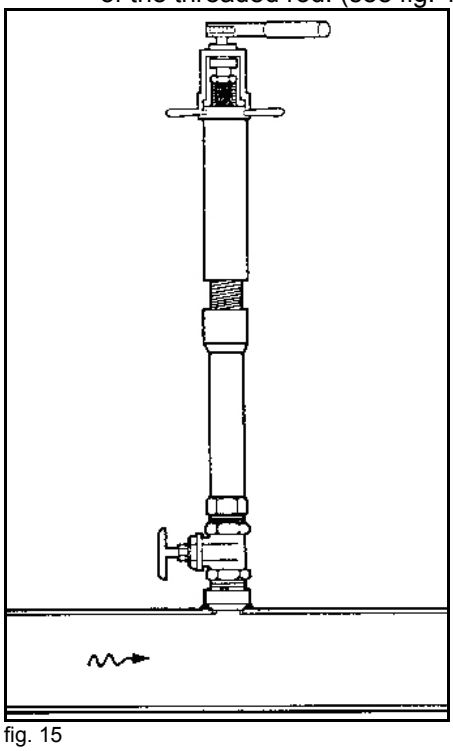


fig. 15

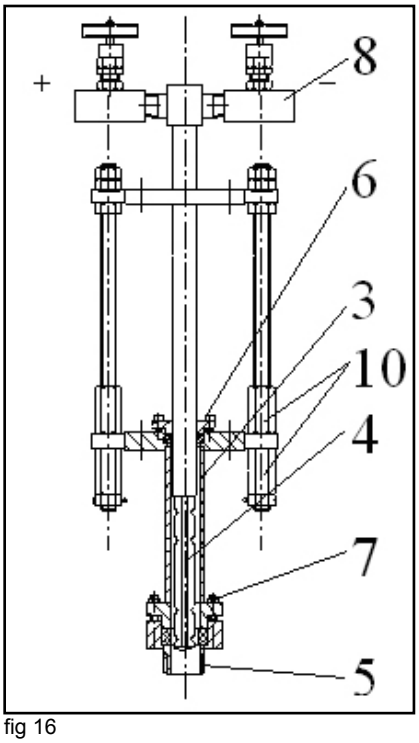


fig 16

11. Now seal the threaded stud [5] with a suitable sealing compound.
12. Install the threaded stud [5] onto the isolating valve [2] (see fig. 14 and 16).
13. Verify that the instrument valves are fully closed.
14. Check all connections for leakage by opening the isolating valve. If the unit was ordered with the optional high temperature packing gland, additional adjusting may be required at this time. If necessary, screw down the 4 screws [6] of the top packing gland and the 4 screw nuts [7] of the bottom packing gland.
15. Increase the line pressure to normal limits and check for leakage. If there is no apparent leakage, proceed with Flo-Tap insertion as described in chapter 9.2.3.

9.2.2 Installation of the Itabar-Flow-Sensor with End Support (FTM-21/26/36)

WARNING

Due to the construction of FTM-21/26/36 with end support a first-time installation under process conditions would cause many problems.
So this type has to be installed during an operational stop. After installation, the sensor can be rejected and inserted under pressure.

The design of the Itabar sensor of the types FTM-21/26/36 is almost identical to the types FTM-20/25/35. The only difference is the sensor end support (see fig. 17) which permits higher stream velocities in the pipe.

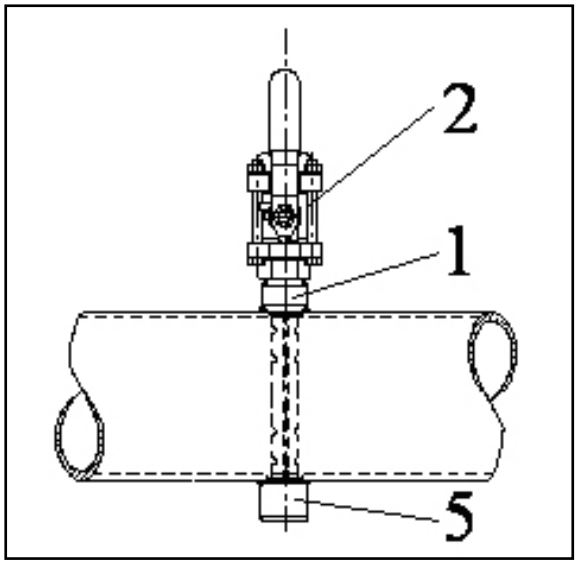


Fig. 17 Installation hardware with sensor end support

Installation of weld socket:

1. Drill a hole into the pipe (Dimensions: please see table page 13).
2. Tack the weld socket [1] onto the pipe leaving approx. 2 mm clearance. Align the socket (e.g. with a bolt or a pin) so that it is exactly perpendicular to the pipe axis.
3. Before final welding and installing the sensor, you have to mount the end support [5].

Installation of the end support:

4. Take a cord and tie one end around the installed weld socket [1]. Wrap the other end around the pipe so that it forms a ring around the pipe. Mark the half-way point of the pipe circumference on the pipe.
5. Now, at the place of the mark, pleas drill a second hole into the pipe (Dimensions: please see table page 13).
6. Tack the sensor end support onto the pipe leaving a clearance of approx. 2 mm.
7. Insert the sensor into the pipe and check the alignment of the sensor end support. If necessary, correct the alignment.
8. Now the final welding can be carried out. Check the alignment of the weld socket again! For permissible deviations, see chapter 8.5.
9. Install the Flo-Tap unit isolating valve [2] on the welding socked. Verify that the valve is in fully open position, and that the stem is in line with the pipe to ensure clearance for the insert-retract rods.
10. Perform the installation of the sensor as per the instructions given in chapter 9.2.1, items 10 to 15.

9.2.3 Insertion procedure for FTM

1. Verify that the Flo-Tap inser-retract mechanism is in the position as shown in fig 18.
2. Verify that Flo-Tap instrument valves [8] are fully closed and that the unit isolating valve is fully opened.
3. Initiate probe insertion by rotating the drive nuts [10] clockwise as viewed from the top, using ratchet wrench. The nuts must be tightened alternatively, about two turns at a time to prevent bending resulting from unequal load. Continue this procedure.until probe contacts the opposite side of the pipe or end support.
4. Inspect the packing gland for evidence of leakage. If the unit was ordered with high temperature gland, additional adjustment may be required this time.
5. Connect instrument lines to the instrument valves [8] and to the appropriate meter, recorder, transmitter or controller.
6. Open the Flo-Tap instrument valves [8]. Vent the pressure lines and the differential pressure transmitter.

9.2.4 Retraction procedure for FTM

5. Fully close the Flo-Tap instrument valves [8]. Then, if required, depressurize and disconnect the instrument lines.
6. Loosen slightly packing gland [6] before proceeding with retraction.
7. Retract the Flo-Tap [4] by rotating the drive nuts [10] counter-clockwise as viewed from the top, using ratchet wrench. The nuts must be tightened alternatively, about two turns at a time to prevent bending resulting from unequal load. Continue this procedure until the probe is fully retracted (see fig. 19).
8. After the probe is retracted completely, close the isolating valve for complete disassembly.

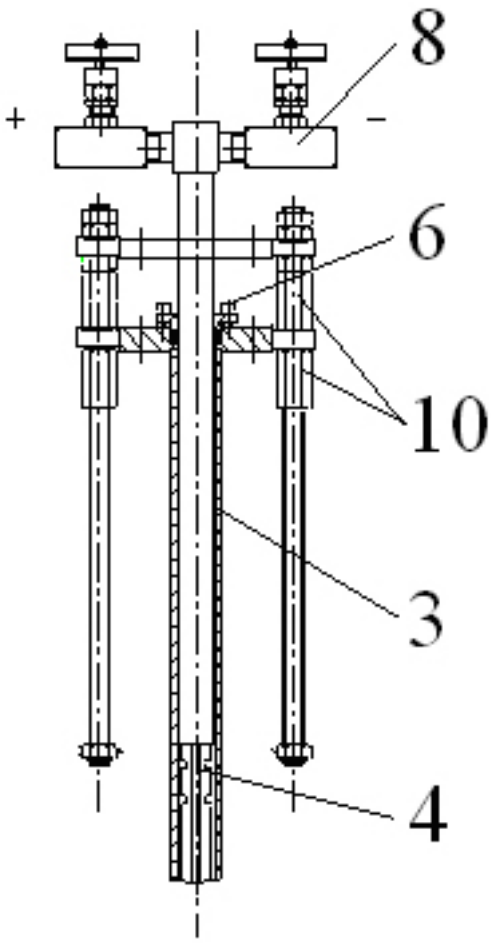


Fig. 18 Insertion / Retraction of FTN type flow sensor

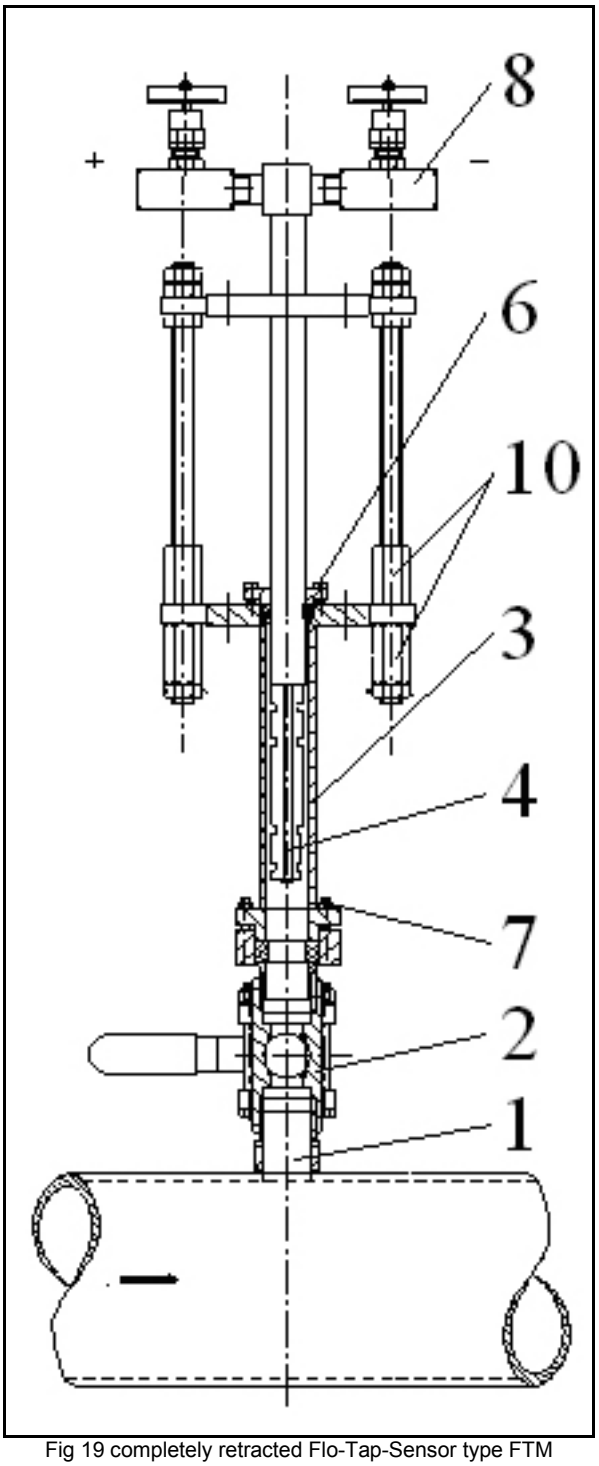


Fig 19 completely retracted Flo-Tap-Sensor type FTM

9.2.5 Installation of type FTMK

The difference between type FTM and FTMK is the gear drive mechanism instead of the threaded rod system.

So you do not have to move the nuts, you only have to drive the hand wheel of the gear drive system.

For installation, the steps are the as per chapters 9.2.1 to 9.2.4.

9.3 Instructions to install FTH

! WARNING !

WARNING

While mounting the unit always wear the appropriate safety gear (safety shoes, protecting glasses etc.)!

It is particularly to make sure that the distance from the gasket surfaces to the pipe complies with the H-dimension given with your order (see fig. 20).

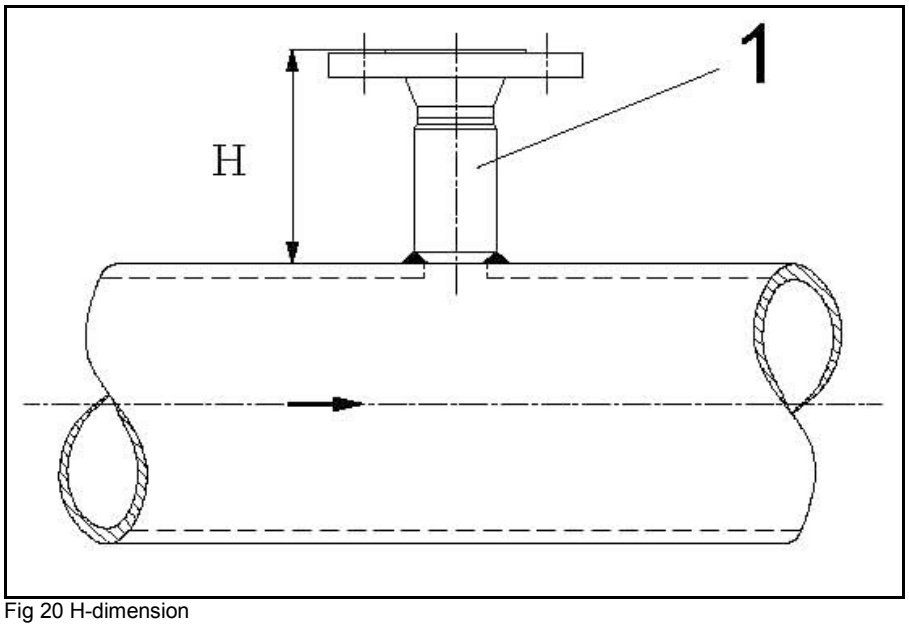


Fig 20 H-dimension

9.3.1 Installation of the Itabar-Flow-Sensor without End Support (FTH-20/25/35/65)

! DANGER !

DANGER!

Verify that the line pressure is within rated conditions of the drilling equipment to be used.

1. Grind off paint and other coatings from the pipe in the area where the Flo-Tap is to be installed.
2. Tack the mounting stud [1 (see fig 23)] (supplied with the Flo-Tap) onto the pipe leaving a clearance of 1 to 2 mm. The bolt holes of the flange must be at 45 ° angles to the pipe axis (see fig 21).

NOTE

NOTE

Using flanges with eight bolt holes, the welding stud must be welded on so that the bolt holes in the flange form an angle of 22,5° with the pipe axis (see fig 22).

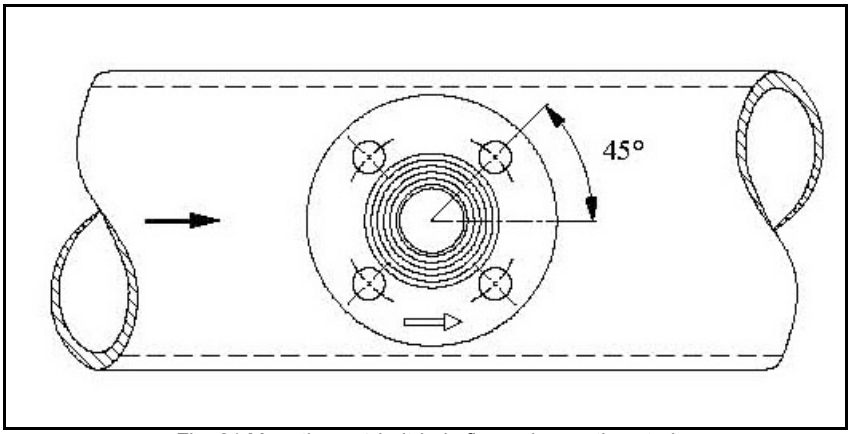


Fig 21 Mounting a 4-bolt-hole flanged mounting stud

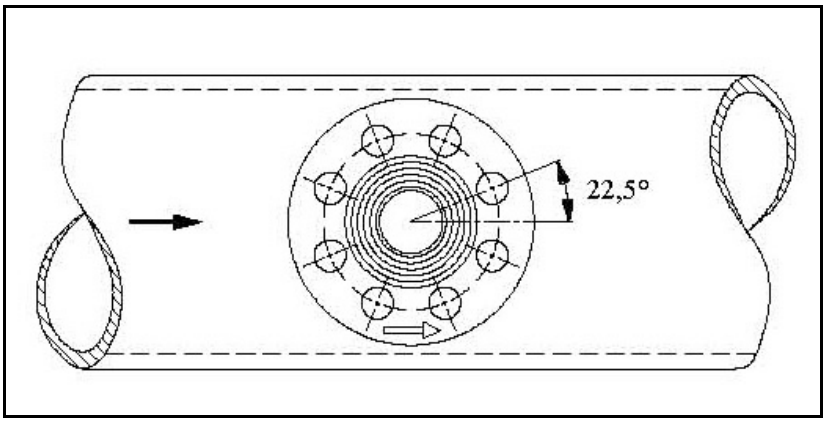


Fig 21 Mounting a 8-bolt-hole flanged mounting stud

3. Observe the H-dimension during the welding of the mounting stud.
4. Check the alignment of the mounting stud again. Then the finish weld can be done.
5. Fasten unit isolating valve [2] to the mounting flange and open valve. Verify that the stem is in position as per fig 22 to ensure clearance for the insert-retract rods.

6. Fasten special adapter flanged nipple to unit isolating valve.
7. Install cutter arbour, shell cutter and pilot drill to pressure drilling machine and attach the machine to its special flanged nipple.
8. Drill through the pipe wall in accordance with the instructions supplied with the drilling machine (Dimensions: please see table page 13).
9. Withdraw the drill past the Flo-Tap isolating valve [2]. Close the unit valve and remove the drilling machine and special flanged nipple. Check for leakage at valve and connections.

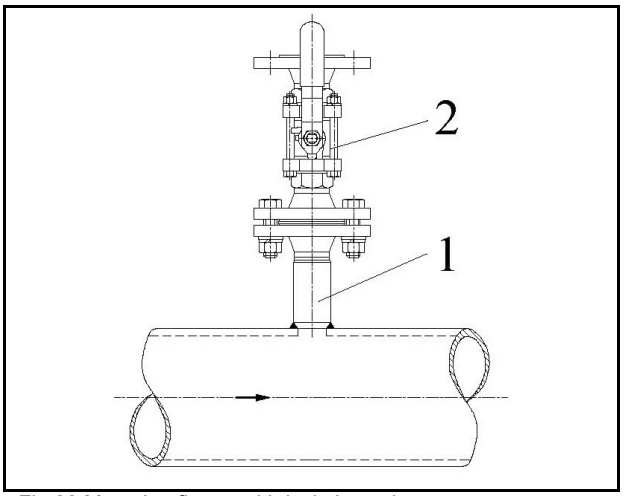


Fig 22 Mounting flange with isolating valve

DANGER"

For all drilling work, follow exactly the safety instructions from the drilling machine's manual.

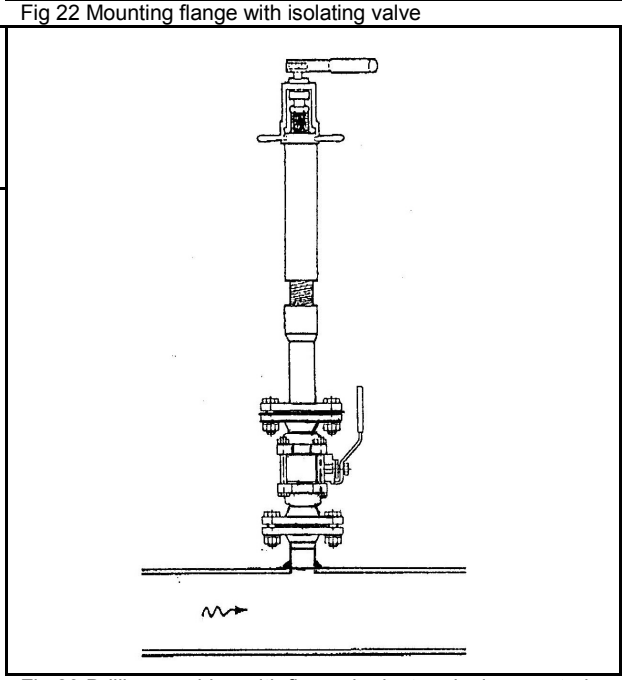


Fig 23 Drilling machine with flanged adapter nipple-mounted on unit isolating valve.

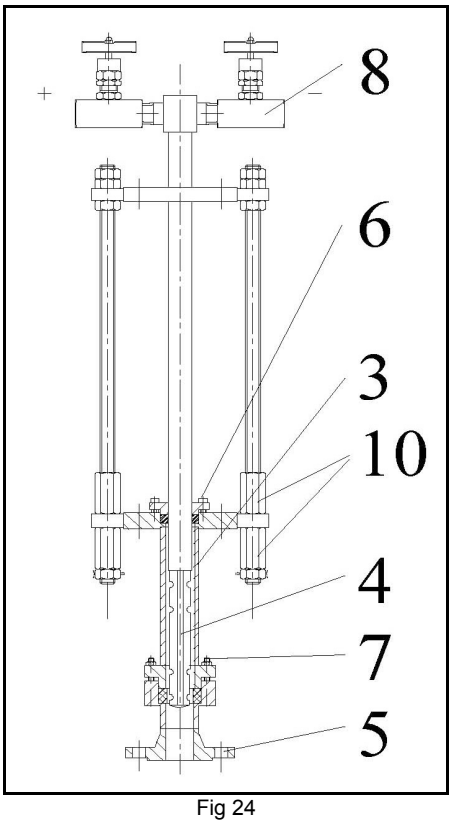
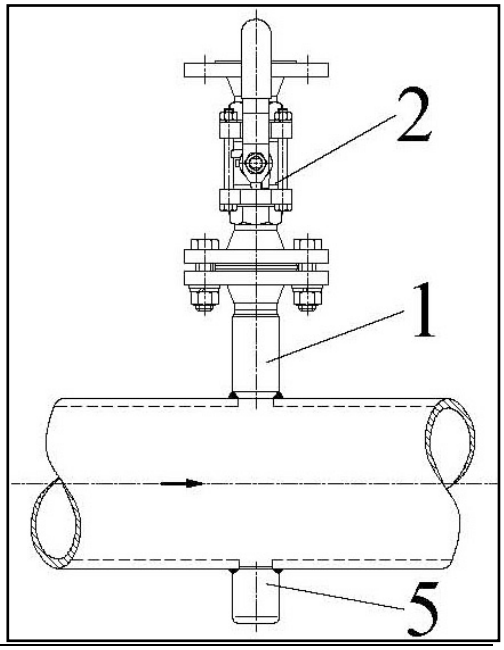


Fig 24

10. Inspect Flo-Tap assembly to ensure that the insert-retract mechanism is full retracted as shown in fig 24.
11. Install the complete Flo-Tap onto the unit isolation valve [2], using the gasket and flangebolts supplied. Once tight, the flow arrow on the top of the Flo-Tap head must point in direction of flow.
12. Adjust the Flo-Tap packing gland if needed. If necessary, screw down the screws [6+7]. The standard PTFE packing does not require preload or adjustment prior to use. If the Flo-Tap was ordered with the optional high-temperature-packing, the gland must be adjusted in accordance tihe the instruction tag supplied with the unit.
13. Check all connections for leakage by cracking. Open the unit isolating valve [2]. If the unit was ordered with optional high temperature packing gland, additional adjustment may be required now.
14. Increase line pressure to normal limits and check for leakage. If there is no leakage apparent, proceed with chapter 9.3.3 (Insertion procedure for FTH).

9.3.2 Installation of the Itabar-Flow-Sensor with End Support (FTH-21/26/36/66)



WARNING

Due to the construction of FTH-21/26/36/66 with end support a first-time installation under process conditions would cause many problems.
So this type has to be installed during an operational stop. After installation, the sensor can be rejected and inserted under pressure.

The design of the Itabar sensor of the types FTH-21/26/36 is almost identical to the types FTH-20/25/35. The only difference is the sensor end support (see fig. 25) which permits higher stream velocities in the pipe.

Fig. 25 Installation hardware with sensor end support

Installation of weld socket:

1. Drill a hole into the pipe (Dimensions: please see table page 13).
2. Tack the weld socket [1] onto the pipe leaving a clearance of approx. 2 mm. Align the socket (e.g. with a bolt or a pin) so that it is exactly perpendicular to the pipe axis.
3. Before final welding and installing the sensor, you have to mount the end support.

Installation of the end support:

4. Take a cord and tie one end around the installed weld socket [1]. Wrap the other end of the cord around the pipe so that it forms a ring around the pipe. Mark the half-way point of the pipe circumference on the pipe
5. Now, at the place of the mark, pleas drill a second hole into the pipe (Dimensions: please see table page 13).
6. Tack the sensor support [5] onto the pipe leaving a clearance of approx. 2 mm.
7. Insert the sensor into the pipe and check the alignment of the sensor end support. If necessary, correct the alignment.
8. Now the final welding can be carried out. Check the alignment of the weld socket again! For alignment tolerances, please see chapter 8.5.
9. Install the FloTap unit isolating valve [2] on the mounting stud [1]. Verify that the valve is in fully open position, and that the stem is in line with the pipe to ensure clearance for the insert-retract rods.
10. Perform the installation of the sensor into the pipe according to the instructions given in chapter 9.3.1, steps 9 to 14.

9.3.3 Insertion procedure for FTH

1. Fully close the Flo-Tap instrument valves [8]. Then, if needed, depressurize and disconnect the instrument lines.
2. Loosen slightly packing gland [6+7] before proceeding with insertion.
3. Initiate probe insertion by rotating the drive nuts [10] clockwise as viewed from the top, using ratchet wrench. The nuts must be tightened alternatively, about two turns at a time to prevent bending resulting from unequal load. Continue this procedure until probe contacts the opposite side of the pipe or end support.
4. Upon completion fo the Flo-Tap insertion, the threaded rods and nuts of the insert-retract mechanism should be in a position as shown in fig 26.
5. Inspect the packing gland for evidence of leakage, if needed, screw down screws and nuts [6+7]. If the unit was ordered with high temperature gland, additional adjustment may be required this time.
6. Connect instrument lines to the instrument valves [8] and to the appropriate meter, recorder, transmitter or controller.
7. Open the Flo-Tap instrument valves [8]. Vent the pressure lines and the differential pressure transmitter.

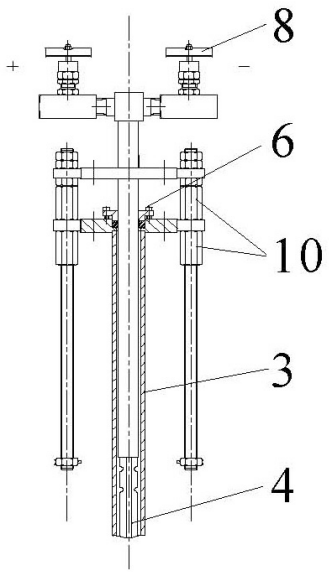


Fig. 26 Sensor profile in working position

9.3.4 Retraction procedure for FTH

1. Fully close the Flo-Tap instrument valves [8]. Then, if required, depressurize and disconnect the instrument lines.
2. Loosen slightly packing gland [6] before proceeding with retraction.
3. Retract the Flo-Tap [4] by rotating the drive nuts [10] counter-clockwise as viewed from the top, using ratchet wrench. The nuts must be tightened alternatively, about two turns at a time to prevent bending resulting from unequal load. Continue this procedure until the probe is fully retracted (see fig. 19).
4. After the probe is retracted completely, close the isolating valve for complete disassembly.

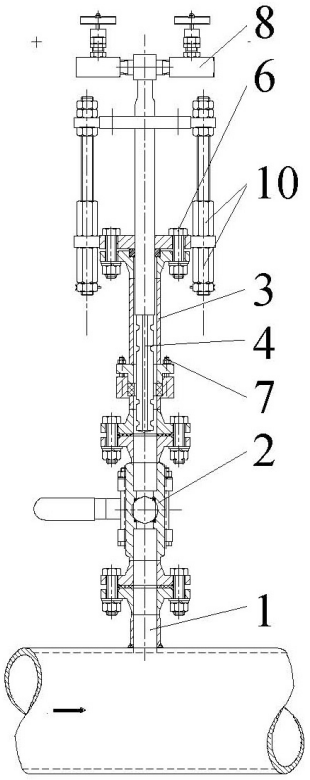


Fig. 27 Sensor profile in retracted position

9.3.5 Installation of type FTHK

The difference between type FTH and FTHK is the gear drive mechanism instead of the threaded rod system.

So you do not have to move the nuts, you only have to drive the hand wheel of the gear drive system.

For installation, the steps are the as per chapters 9.3.1 to 9.3.4.

10. Installation of Accessories and the Differential Pressure Transmitter

10.1 Accessories

The instrument valves for the differential pressure lines are pre-installed by the manufacturer, if they are part of the order.

When installing multi-directional valve blocks, make sure that all bolts are tightened uniformly and opposite bolts are tightened in sequence.

10.2 Differential Pressure Transmitter

For liquid measurements, the differential pressure transmitter should always be installed below the ITABAR®-Sensor in order to avoid the occurrence of air bubbles in the instrument connections. (see fig 28)

When measuring dry gases and air, the differential pressure transmitter should always be installed above the ITABAR®-Sensor in order to avoid measurement degradation due to condensation and the presence of solid particles. (see fig 29)

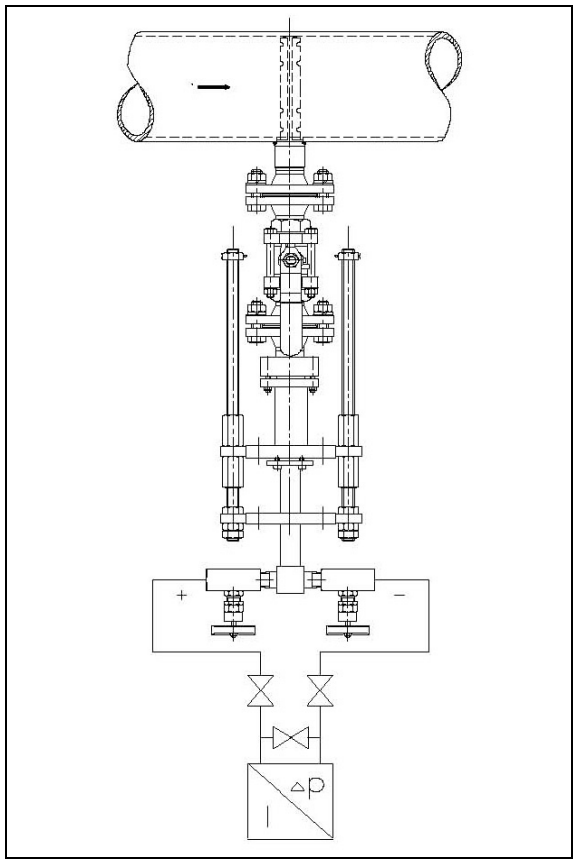


Fig 28

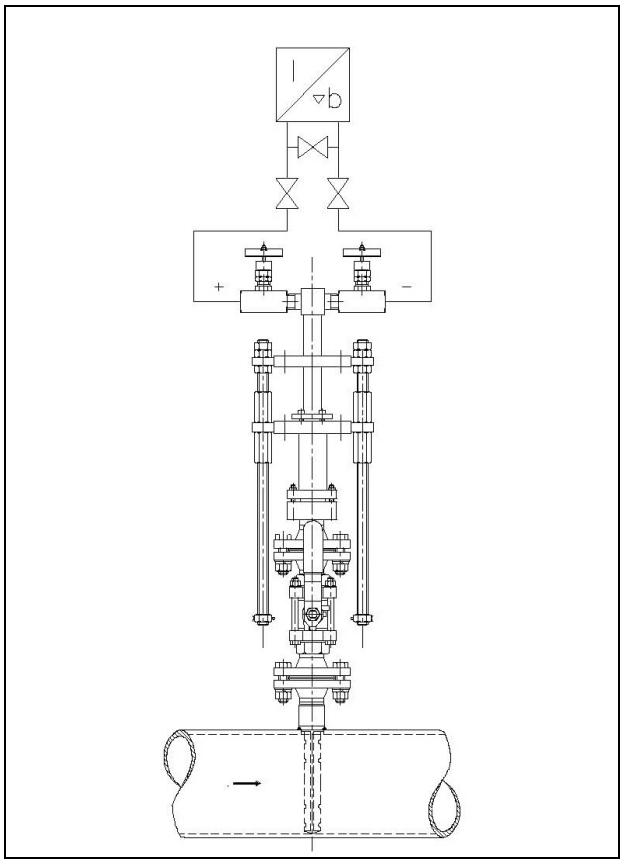


Fig 29

11. Start-Up

Make sure that
- all installation openings are closed,
- all installed parts are firmly bolted together and
- all instrument valves are closed.

Now the pipe can be cleared for the appropriate medium. Check all connections for tightness, especially the threaded connection around the cutting ring (FTN, FTM) resp. the mounting flange (FTH). Then open the instrument valves to the differential pressure transmitter.

NOTE
When measuring liquids, the differential pressure lines and the transmitter absolutely have to be vented. Open the venting screws on the backside of the transmitter and keep them open until all air has escaped from the transmitter and the connecting lines.

12. Preventive Maintenance of the Itabar-Sensors

Itabar-Sensors are insensitive against dirt and soil built-up and therefore, they are nearly mainentance-free.

13. Trouble Shooting

If, after the start-up of the Itabar-sensor, any measuring errors occur, they may possibly be corrected quite easily:

Error:	Correction:
No differential pressure indication	Check whether all instrument valves to the Δp-Transmitter are opened. Check the alignment of the sensor with the pipe. The arrow on the sensor must point exactly to the flow direction.

NOTE
With highly corrosive media it is possible (if the sensor material has not been specifically for such operating conditions) that a connection between plus and minus sides has been formed. This can only be checked after removal of the sensor from the pipe. Close the holes in the sensor rod and blow through both minus and plus connections of the sensor (e.g. with compressed air). If air emerges from the opposite connection, the sensor is defective. In this case, please notify the manufacturer.

Besides the products covered by this brochure, Intra-Automation GmbH also manufactures other high-quality and high precision instruments for industrial measurement tasks. For more information, please contact us (contact details on the backside of this brochure).

Flow measurement

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IntraSonic IS210 Ultrasonic Flow Meter

Level measurement

ITA-mag. Level Gauge

MAGLINK Level Indicator

Other Measurement Tasks:

DigiFlow Flow and Level Computers

IntraCon Digital Controllers

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