



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services

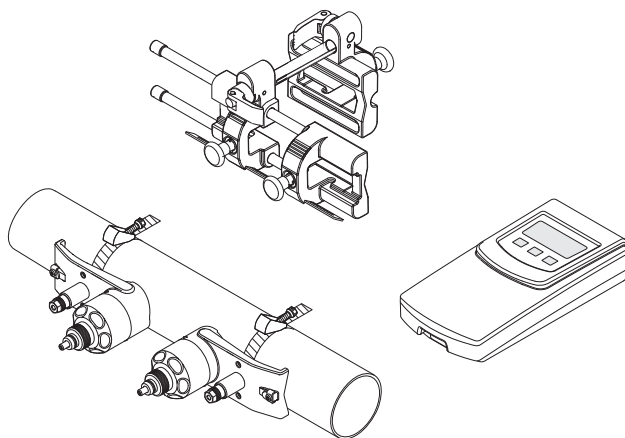


Solutions

Brief Operating Instructions

Proline Prosonic Flow 93T Portable

Portable ultrasonic flow measuring system



These Brief Operating Instructions are **not** intended to replace the Operating Instructions provided in the scope of supply. Detailed information is provided in the Operating Instructions and the additional documentation on the CD-ROM supplied.

The complete device documentation consists of:

- These Brief Operating Instructions
- Depending on the device version:
 - Operating Instructions and the Description of Device Functions
 - Approvals and safety certificates
 - Special safety instructions in accordance with the approvals for the device (e.g. explosion protection, pressure equipment directive, etc.)
 - Additional device-specific information

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1 Safety instructions

1.1 Designated use

- The measuring device described in these Operating Instructions is to be used only for measuring the flow rate of liquids in closed pipes, e.g.:
 - Acids, alkalis, paints, oils
 - Liquid gas
 - Ultrapure water with low conductivity, water, wastewater
- As well as measuring the volume flow, the sound velocity of the fluid is also always measured. Different fluids can be distinguished or the fluid quality can be monitored.
- The designated operation of the measuring device is battery operation without connection to the charger.
- The transmitter having the ingress protection IP 40 is intended for operation in dry, clean and non-hazardous environment. Mechanical stresses are to be avoided.
- Any use other than that described here compromises the safety of persons and the entire measuring system and is, therefore, not permitted.
- The manufacturer is not liable for damage caused by improper or non-designated use.

1.2 Installation, commissioning and operation

- The measuring device must only be installed, connected, commissioned and maintained by qualified and authorized specialists (e.g. electrical technicians) in full compliance with the instructions in these Brief Operating Instructions, the applicable norms, legal regulations and certificates (depending on the application).
- The specialists must have read and understood these Brief Operating Instructions and must follow the instructions they contain. If you are unclear on anything in these Brief Operating Instructions, you must read the Operating Instructions (on the CD-ROM). The Operating Instructions provide detailed information on the measuring device.
- The measuring device may only be modified if such work is expressly permitted in the Operating Instructions (on the CD-ROM).
- Repairs may only be performed if a genuine spare parts kit is available and this repair work is expressly permitted.
- If performing welding work on the piping, the welding unit may not be grounded by means of the measuring device.

1.3 Operational safety

- The measuring device is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. Relevant regulations and standards have been observed.
- The manufacturer reserves the right to modify technical data without prior notice. Your Endress+Hauser distributor will supply you with current information and updates to these Operating Instructions.
- The information on the warning notices, nameplates and connection diagrams affixed to the device must be observed. These contain important data on the permitted operating conditions, the range of application of the device and information on the materials used.
- If the device is not used at atmospheric temperatures, compliance with the relevant marginal conditions as specified in the device documentation supplied (on CD-ROM) is mandatory.
- The device must be wired as specified in the wiring and connection diagrams. Interconnection must be permitted.
- When hot fluids pass through the measuring tube, the surface temperature of the housing increases. In the case of the sensor, in particular, users should expect temperatures that can be close to the fluid temperature. If the temperature of the fluid is high, implement sufficient measures to prevent burning or scalding.
- Endress+Hauser will be happy to assist in clarifying any questions on approvals, their application and implementation.

1.4 Safety conventions



Warning!

“Warning” indicates an action or procedure which, if not performed correctly, can result in injury or a safety hazard. Comply strictly with the instructions and proceed with care.



Caution!

“Caution” indicates an action or procedure which, if not performed correctly, can result in incorrect operation or destruction of the device. Comply strictly with the instructions.



Note!

“Note” indicates an action or procedure which, if not performed correctly, can have an indirect effect on operation or trigger an unexpected response on the part of the device.

2 Installation

2.1 Installation conditions

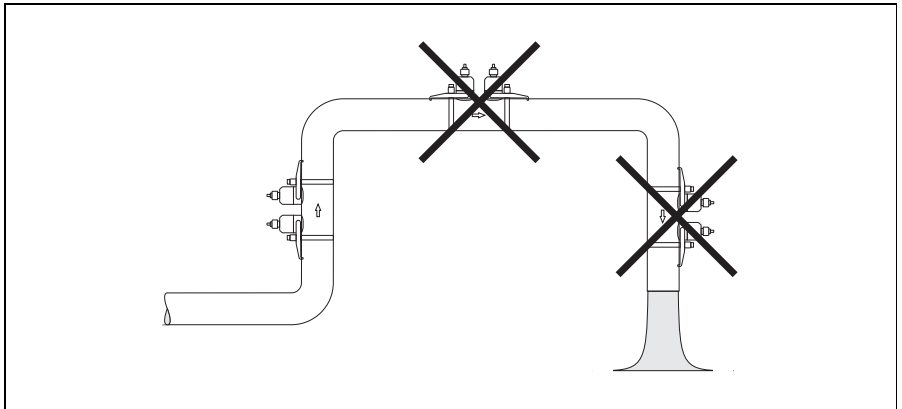
2.1.1 Dimensions

For the dimensions of the measuring device, see the associated Technical Information on the CD-ROM.

Mounting location

Correct flow measurement is possible only if the pipe is full. Entrained air or gas forming in the pipe can result in an increase in measuring errors. For this reason avoid the following mounting locations in the pipe:

- Highest point of a pipeline. Risk of air accumulating.
- Directly upstream of a free pipe outlet in a vertical pipeline.



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Orientation

Vertical

Recommended orientation with upward direction of flow (View A). With this orientation, entrained solids will sink and gases will rise away from the sensor when the fluid is stagnant. The piping can be completely drained and protected against solids buildup.

Horizontal

In the recommended installation range in a horizontal installation position (View B), gas and air collections at the pipe cover and problematic deposits at the bottom of the pipe have a smaller influence on measurement.

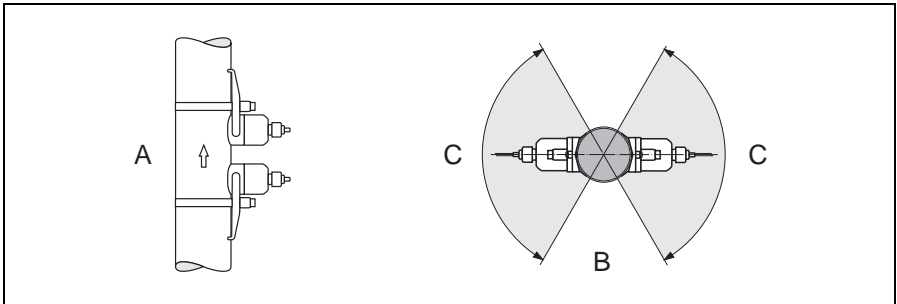
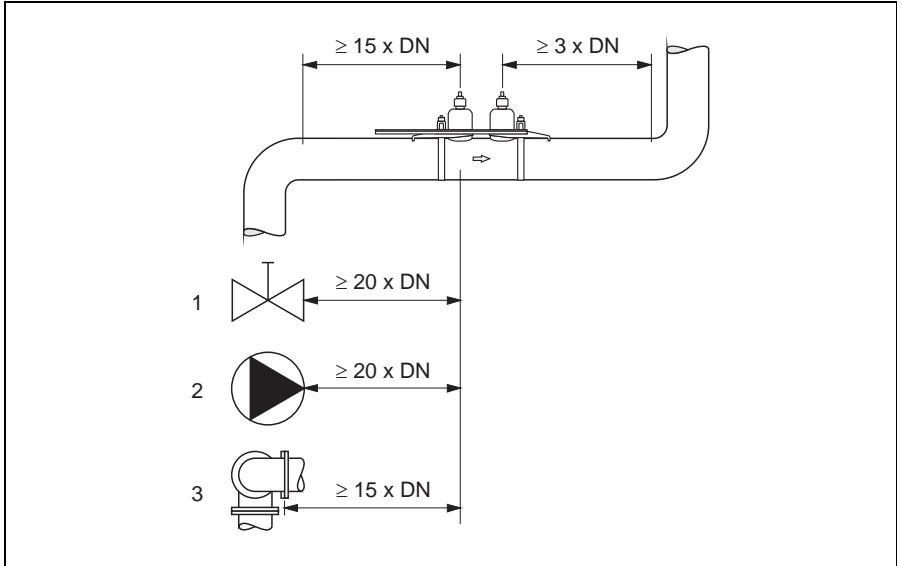


Fig. 1: Recommended orientation and recommended installation range

- A Recommended orientation with upward direction of flow
- B Recommended installation range with horizontal orientation
- C Recommended installation range max. 120°

Inlet and outlet run

If possible, install the sensor well clear of fittings such as valves, T-pieces, elbows, etc. Compliance with the following inlet and outlet runs is recommended in order to ensure measuring accuracy.



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Fig. 2: Inlet and outlet run

- 1 Valve (2/3 open)
- 2 Pump
- 3 Two pipe bends in different directions

2.2 Preparatory steps prior to installation

Depending on the conditions specific to the measuring point (e.g. Clamp On, number of traverses, fluid, etc.), a number of preparatory steps have to be taken before actually installing the sensors:

1. Using the conditions specific to the measuring point, determine which installation distances are necessary for installation.
2. Determine the values for the requisite installation distances.
3. Mechanical preparation of the Clamp On holders for the sensors:
 - Mount the sensor holder (DN 15 to 65 / ½ to 2½")
 - Premount the strapping bands (DN 50 to 200 / 2 to 8") or (DN 250 to 4000 / 10 to 160")

2.3 Determining the necessary installation distances

The installation distances that are necessary for installation depend on:

- The type of sensor: Prosonic Flow P DN 50 to 4000 (2 to 160") or DN 15 to 65 (½ to 2½")
- Number of traverses

DN 50 to 4000 (2 to 160")		DN 15 to 65 (½ to 2½")	
1 traverse	2 traverses	1 traverse	2 traverses
SENSOR DISTANCE	SENSOR DISTANCE	SENSOR DISTANCE*	
WIRE LENGTH	POSITION SENSOR	POSITION SENSOR*	

* In the SENSOR DISTANCE function, the distance is indicated in millimeters. The POSITION SENSOR function displays the values for using the mounting rail (e.g. A3).

2.4 Connecting and switching on the transmitter

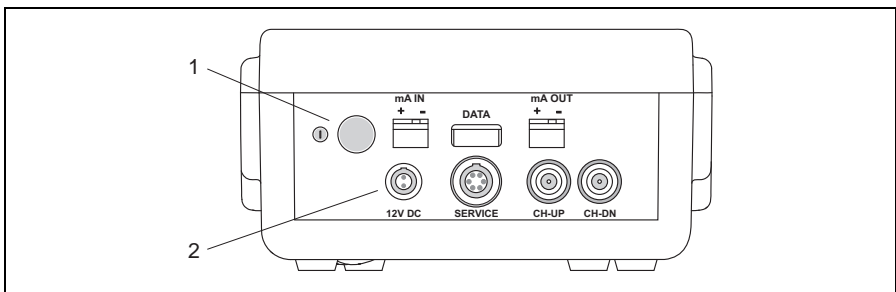


Fig. 3: Connecting and switching on the transmitter

- 1 On/off switch (press switch ≥ 3 seconds)
- 2 Charger connection (different adapters are available for the connection)

2.5 Determining the installation distances

2.5.1 Running the "Sensor Installation" Quick Setup menu

Calling the Quick Setup

All the installation distances required for sensor mounting are determined with the Quick Setup.



Note!

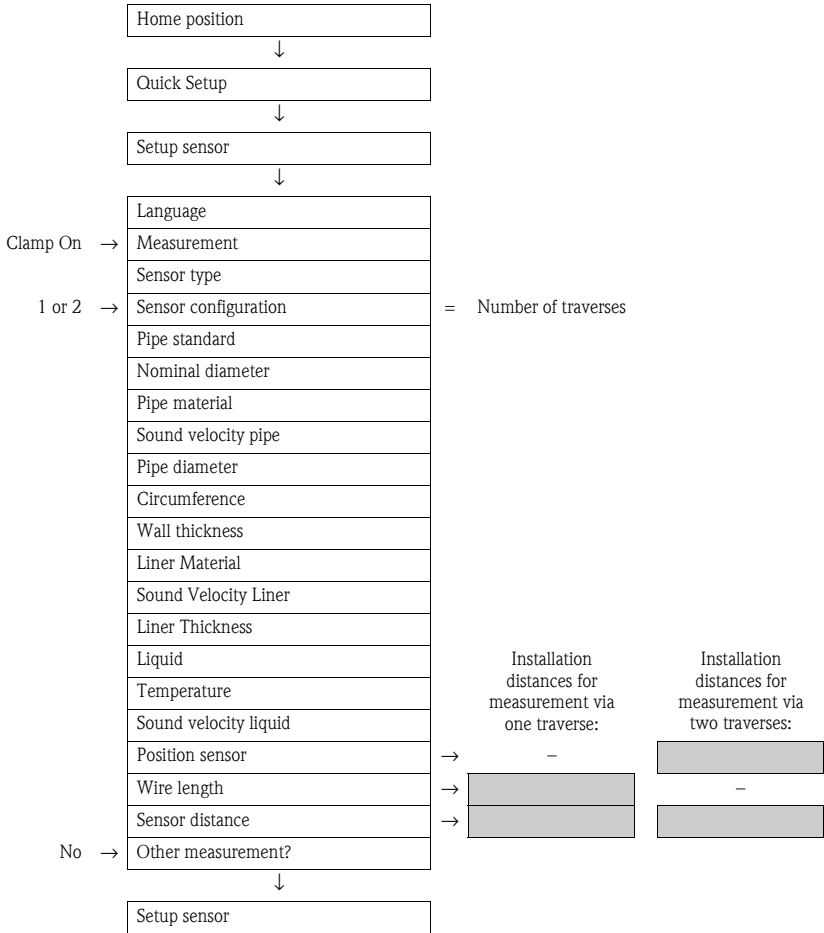
If you are not familiar with the operation of the device → [28](#).

1. → Enter the function matrix (starting with measured value display)
2. → Select the group QUICK SETUP
 → Confirm selection
3. → Select the SENSOR INSTALLATION function
 → Confirm selection
4. Intermediate step if configuration is blocked:
 → Enter the code **93** (confirm with) and thus enable configuration
5. → Go to Sensor Installation Quick Setup
6. → Select YES
 → Confirm selection
7. → Start Sensor Installation Quick Setup

For subsequent steps, see the following section "Running the Quick Setup for Clamp On type of mounting".

Running the Quick Setup for Clamp On type of mounting

- Only the steps necessary for the type of mounting (Clamp On) are described.
- Enter or select installation-specific values or the values specified here.
- Read off the installation distances necessary for mounting.



2.6 Mechanical preparation

The way in which the sensors are secured differs on account of the pipe nominal diameter and the sensor type.

Overview of possible ways to secure the various sensors:

Sensor	For the measuring range	Pipe nominal diameter	Secured by	
P	DN 15 to 65 (½ to 2½")	DN 15 to 65 (½ to 2½")	Sensor holder	→ 17
P	DN 50 to 4000 (2 to 160")	DN ≤ 200 (8")	Strapping bands (metal, medium nominal diameters)	→ 14
		DN > 200 (8")	Strapping bands (metal, large nominal diameters)	→ 15
		DN 50 to 4000 (2 to 160")	Mounting with strapping bands (flexible)	→ 16

2.6.1 Mounting the sensor holder

Sensor: Prosonic Flow P (DN 15 to 65 / ½ to 2½")

- Set the sensor distance determined (e.g. C9) on the sensor holder.
 - Position the sensor holders with the aid of the mounting rail.

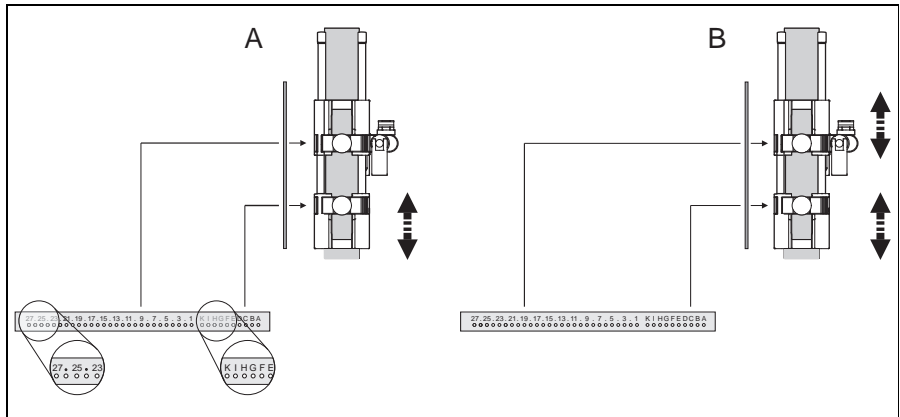


Fig. 4: Setting the sensor distance with the aid of the mounting rail

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- A Sensor distance for measurement via one traverse
- B Sensor distance for measurement via two traverses

2. Guide the sensor holder over the pipe.

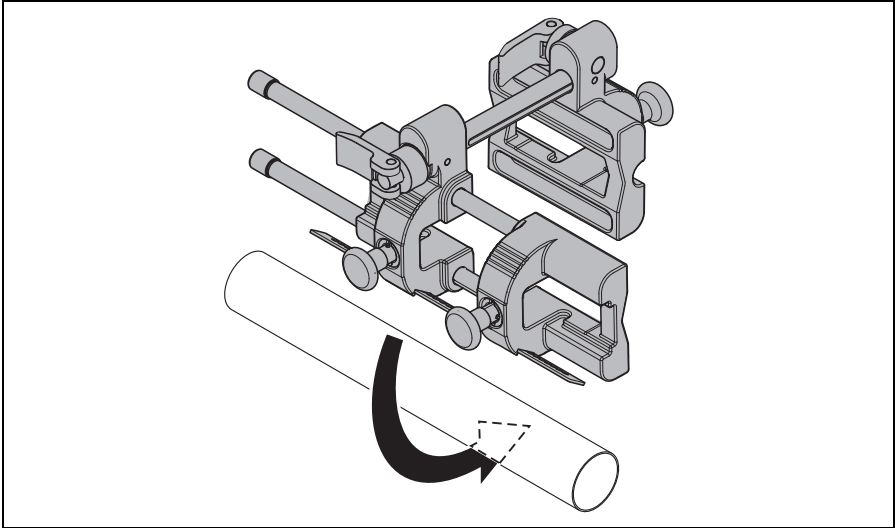


Fig. 5: Setting the sensor holder on the pipe

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3. Release the quick release of the retaining bracket (a) and push the retaining bracket up against the pipe.

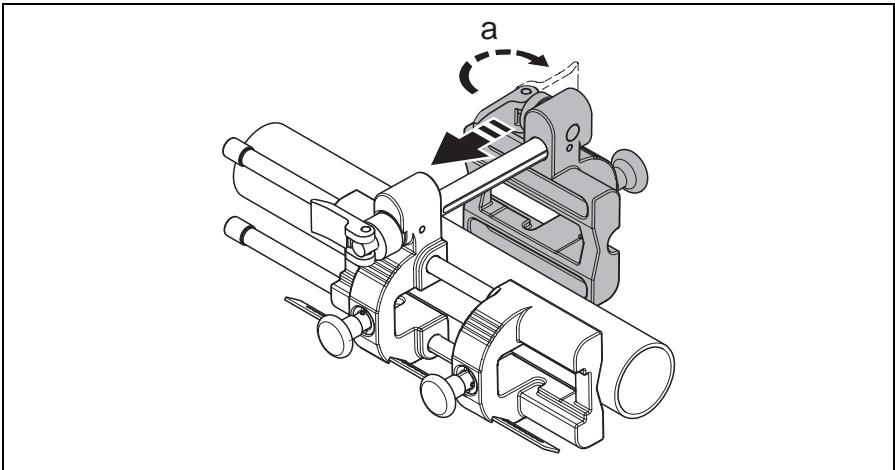


Fig. 6: Guiding the retaining bracket onto the pipe

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- a Quick release of retaining bracket

4. Fix the sensor holder in place by:
 - Tightening the quick release of the retaining bracket (a)
 - Tightening the quick release (b)

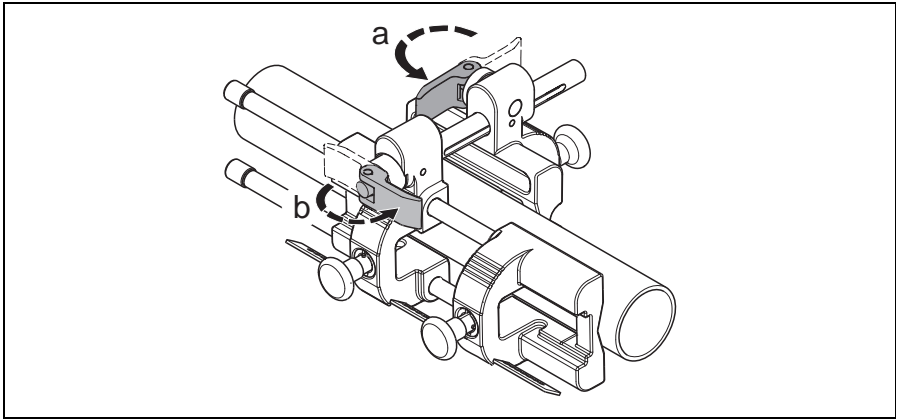


Fig. 7: Fixing the sensor holder in place

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- a Quick release of retaining bracket
- b Quick release

2.6.2 Premounting the strapping bands (medium nominal diameters)

When mounting on a pipe with a nominal diameter of $DN \leq 200$ (8").

Sensor: Prosonic Flow P (DN 50 to 4000 / 2 to 160")

First strapping band

1. Fit the mounting bolt over the strapping band.
2. Wrap the strapping band around the pipe without twisting it.
3. Guide the end of the strapping band through the strapping band lock (tensioning screw is pushed up).
4. Tighten the strapping band as tight as possible by hand.
5. Set the strapping band to the desired position.
6. Push down the tensioning screw and tighten the strapping band so that it cannot slip.

Second strapping band

7. Proceed as for the first strapping band (steps 1 to 7). Only slightly tighten the second strapping band for final mounting. It must be possible to move the strapping band for final alignment.

Both strapping bands

8. Where necessary, shorten the strapping bands and trim the cut edges.

 **Warning!**

Risk of injury. To avoid sharp edges, trim the cut edges after shortening the strapping bands.

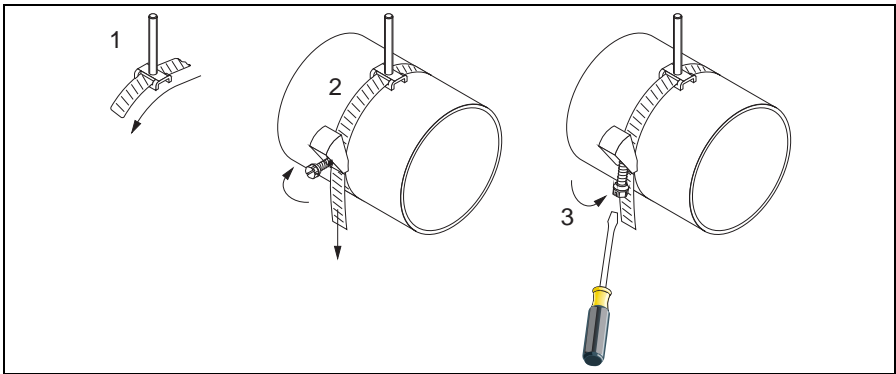


Fig. 8: Premounting strapping bands for pipe diameters $DN \leq 200$ (8")

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- 1 Mounting bolt
- 2 Strapping band
- 3 Tensioning screw

2.6.3 Premounting the strapping bands (large nominal diameters)

When mounting on a pipe with a nominal diameter of $DN > 200$ (8").

For sensor: Prosonic Flow P (DN 50 to 4000 / 2 to 160")

1. Measure the pipe circumference.
2. Shorten the strapping bands to one length (pipe circumference + 10 cm / 3.94") and trim the cut edges.

 Warning!

Risk of injury. To avoid sharp edges, trim the cut edges after shortening the strapping bands.

First strapping band

3. Fit the centering plate along with the mounting bolt over the strapping band.
4. Wrap the strapping band around the pipe without twisting it.
5. Guide the end of the strapping band through the strapping band lock (tensioning screw is pushed up).
6. Tighten the strapping band as tight as possible by hand.
7. Set the strapping band to the desired position.
8. Push down the tensioning screw and tighten the strapping band so that it cannot slip.

Second strapping band

9. Proceed as for the first strapping band (steps 3 to 8). Only slightly tighten the second strapping band for final mounting. It must be possible to move the strapping band for final alignment.

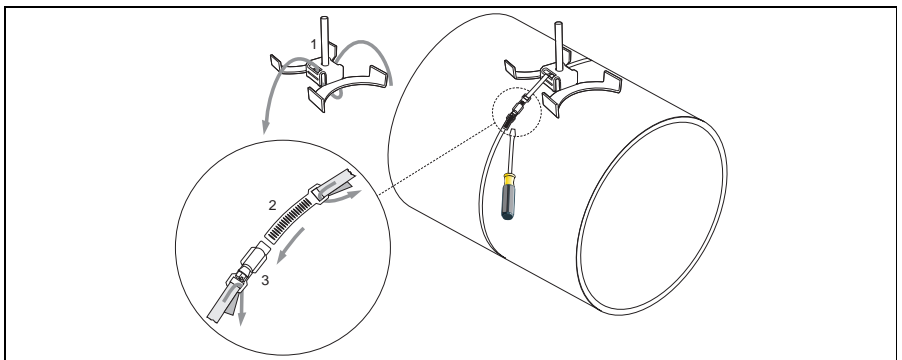


Fig. 9: Premounting strapping bands for pipe diameters $DN > 200$ (8")

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- 1 Centering plate with mounting bolt
- 2 Strapping band
- 3 Tensioning screw

2.6.4 Mounting with strapping bands (flexible)

For sensor Prosonic Flow P (DN 50 to 4000 / 2 to 160")

☞ Caution!

- Each time you use the strapping bands, check that the ratchet locks and springs function safely beforehand.
- Inspect the strapping bands for damage.

Procedure

Closing the strapping band lock

1. Fit the mounting bolt onto the strapping band.
2. Guide the strapping band around the pipe making sure it is not twisted in the process and, with the ratchet lock (a) open, push the end through the slot. Pretension manually by pulling on the free end of the strapping band.

✎ Note!

If you do not pretension the bands it is more difficult to release the strapping bands.

3. Tension continuously by moving the lever back and forth (b) until the strapping band is optimally tensioned.
4. Then push down the lever (c).

☞ Caution!

The tensioning clamp (d) must engage on both sides!

Opening the strapping band lock

1. Pull back the lever lock (e) while simultaneously opening the lever 180° (f) until the lever lock (g) is engaged.
2. Remove the strapping band.

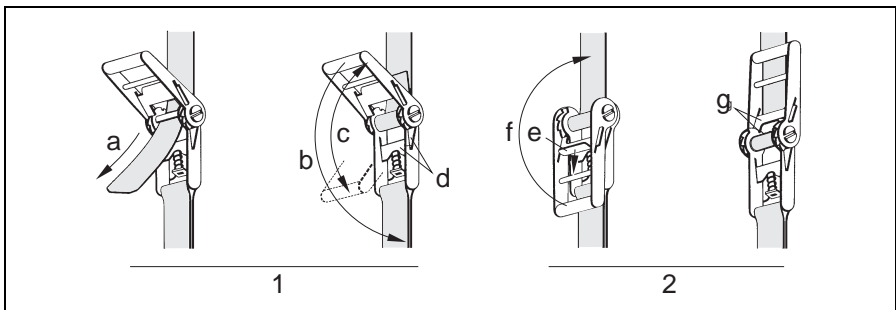


Fig. 10: Strapping band lock

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- 1 Closing the strapping band lock
- 2 Opening the strapping band lock

2.7 Installing Prosonic Flow P (DN 15 to 65 / ½ to 2½")

2.7.1 Mounting the sensor

Prerequisites

- The sensor holder is already mounted → 11.
- The distance of the sensor holder is set (sensor distance) → 11.

Material

The following material is needed for mounting:

- Sensor
- Connecting cable



Note!

Prior to mounting, connect the connecting cables to the sensors.

Procedure

1. Coat the contact surfaces (1) of the sensors with an even layer of coupling fluid approx. 1 mm (0.04") thick.

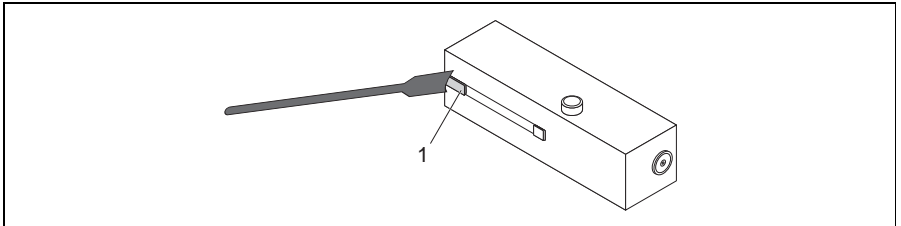


Fig. 11: Coating with coupling fluid

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2. Mount as illustrated in the graphic (steps 1 to 5):

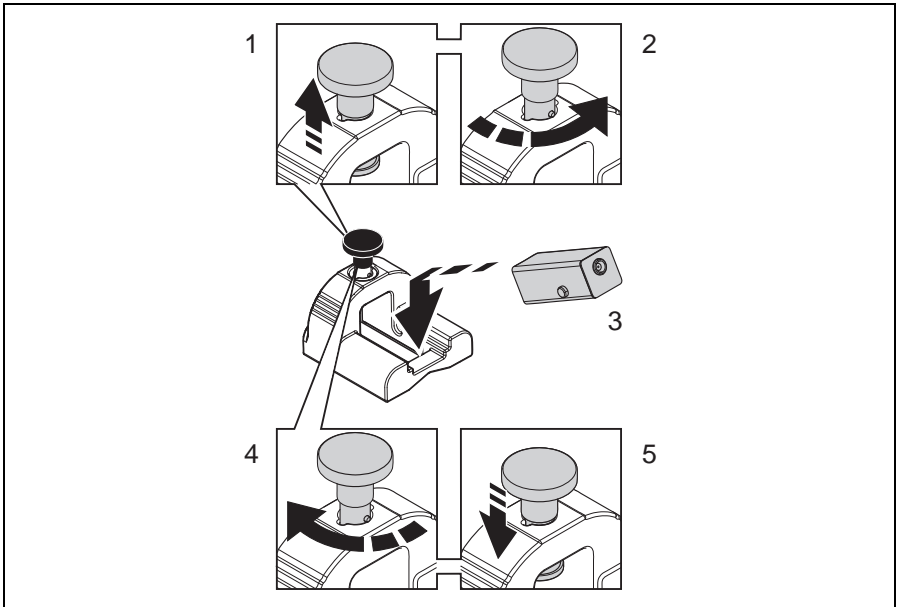


Fig. 12: Mounting the sensors

This completes the mounting process. The sensors can now be connected to the transmitter via the connecting cables → 25.

2.8 Installing Prosonic Flow P (DN 50 to 4000 / 2 to 160") (Clamp On)



Note!

Sensor orientation shown in the following sketches is for visual purposes only. Please apply the recommended orientation → 6.

2.8.1 Installation for measurement via one traverse

Prerequisites

- The installation distances (sensor distance and wire length) are known → 8.
- The strapping bands are already mounted → 14/ → 15.

Material

The following material is needed for mounting:

- Two strapping bands incl. mounting bolts and centering plates where necessary (already mounted)
- Two measuring wires, each with a cable lug and a fixer to position the strapping bands
- Two sensor holders
- Coupling fluid for an acoustic connection between the sensor and pipe
- Two sensors incl. connecting cables

Procedure

1. Prepare the two measuring wires:
 - Arrange the cable lugs and fixer such that the distance they are apart corresponds to the wire length (SL).
 - Screw the fixer onto the measuring wire.

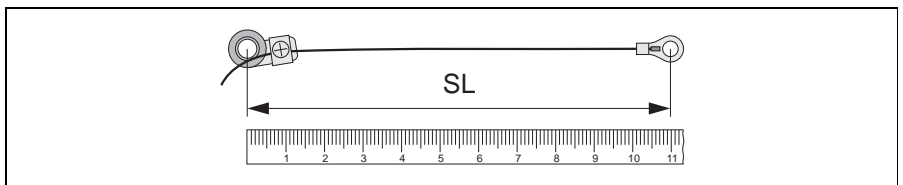


Fig. 13: Fixer (a) and cable lugs (b) at a distance that corresponds to the wire length (SL)

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2. With the first measuring wire:
 - Fit the fixer over the mounting bolt of the strapping band that is already securely mounted.
 - Run the measuring wire **clockwise** around the pipe.
 - Fit the cable lug over the mounting bolt of the strapping band that can still be moved.

3. With the second measuring wire:
 - Fit the cable lug over the mounting bolt of the strapping band that is already securely mounted.
 - Run the measuring wire **counterclockwise** around the pipe.
 - Fit the fixer over the mounting bolt of the strapping band that can still be moved.
4. Take the still movable strapping band, incl. the mounting bolt, and move it until both measuring wires are evenly tensioned and tighten the strapping band so that it cannot slip.

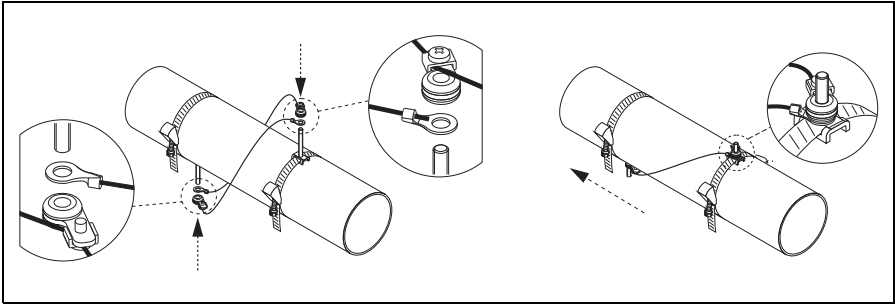


Fig. 14: Positioning the strapping bands (steps 2 to 4)

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5. Loosen the screws of the fixers on the measuring wires and remove the measuring wires from the mounting bolt.
6. Fit the sensor holders over the individual mounting bolts and tighten securely with the retaining nut.

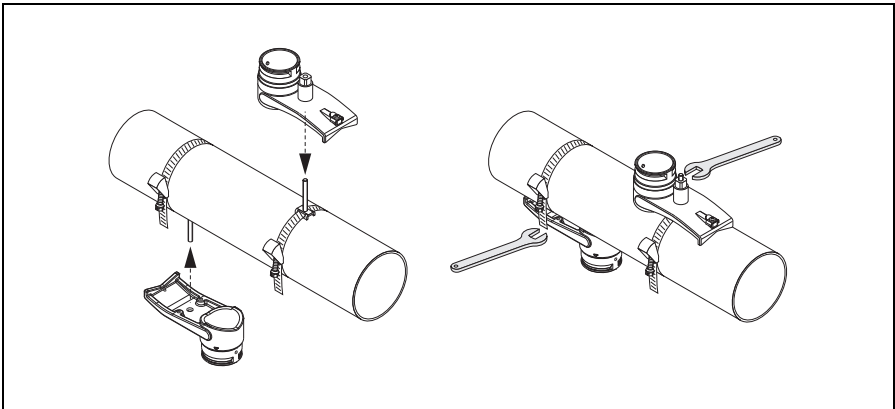


Fig. 15: Mounting the sensor holders

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7. Coat the contact surfaces of the sensors with an even layer of coupling fluid approx. 1 mm (0.04") thick, going from the groove through the center to the opposite edge.

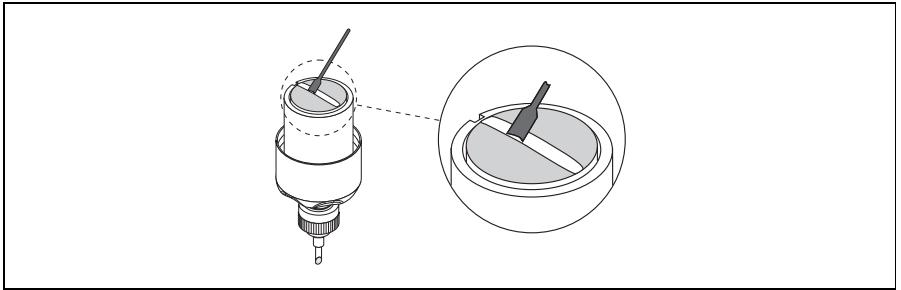


Fig. 16: Coating the contact surfaces of the sensor with coupling fluid

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8. Insert the sensor into the sensor holder.
9. Fit the sensor cover on the sensor holder and turn until:
 - The sensor cover engages with a click.
 - The arrows (▲ / ▼ "close") are pointing towards one another.
10. Screw the connecting cable into the individual sensor.

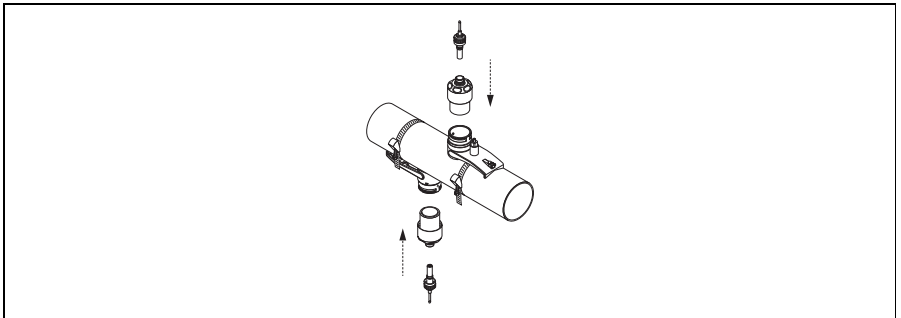


Fig. 17: Mounting the sensor and connecting the connecting cable

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This completes the mounting process. The sensors can now be connected to the transmitter via the connecting cables → [25](#).

2.8.2 Installation for measurement via two traverses

Prerequisites

- The installation distance (position sensor) is known → 8.
- The strapping bands are already mounted → 14/→ 15.

Material

The following material is needed for mounting:

- Two strapping bands incl. mounting bolts and centering plates where necessary (already mounted)
- A mounting rail to position the strapping bands
- Two mounting rail holders
- Two sensor holders
- Coupling fluid for an acoustic connection between the sensor and pipe
- Two sensors incl. connecting cables

Mounting rail and POSITION SENSOR installation distance

The mounting rail has two rows with bores. The bores in one of the rows are indicated by letters and the bores in the other row are indicated by numerical values. The value determined for the POSITION SENSOR installation distance is made up of a letter and a numerical value.

The bores that are identified by the specific letter and numerical value are used to position the strapping bands.

Procedure

1. Position the strapping bands with the aid of the mounting rail.
 - Slide the mounting rail with the bore identified by the letter from POSITION SENSOR over the mounting bolt of the strapping band that is permanently fixed in place.
 - Position the movable strapping band and slide the mounting rail with the bore identified by the numerical value from POSITION SENSOR over the mounting bolt.

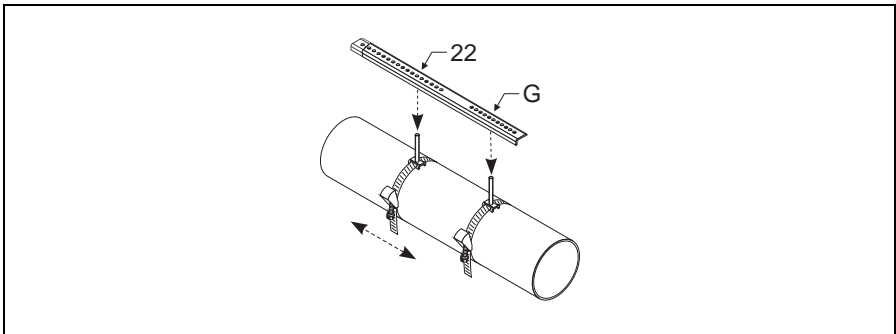


Fig. 18: Determining the distance in accordance with the mounting rail (e.g. POSITION SENSOR G22)

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2. Tighten the strapping band so that it cannot slip.
3. Remove the mounting rail from the mounting bolt.
4. Fit the sensor holders over the individual mounting bolts and tighten securely with the retaining nut.

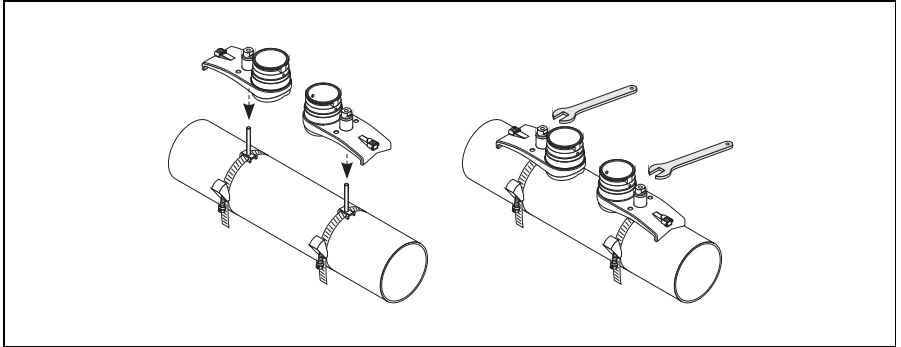


Fig. 19: Mounting the sensor holders

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5. Coat the contact surfaces of the sensors with an even layer of coupling fluid approx. 1 mm (0.04") thick, going from the groove through the center to the opposite edge.

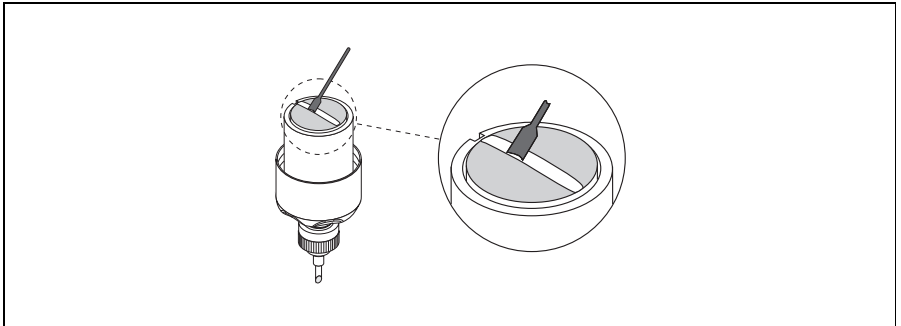


Fig. 20: Coating the contact surfaces of the sensor with coupling fluid

A0011373

6. Insert the sensor into the sensor holder.
7. Fit the sensor cover on the sensor holder and turn until:
 - The sensor cover engages with a click.
 - The arrows (▲ / ▼ "close") are pointing towards one another.

- Screw the connecting cable into the individual sensor.

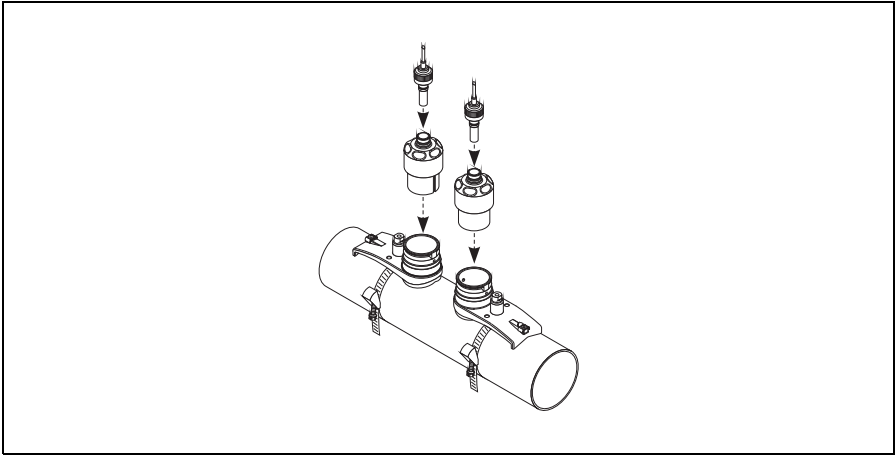


Fig. 21: Mounting the sensor and connecting the connecting cable

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This completes the mounting process. The sensors can now be connected to the transmitter via the connecting cables → 25.

2.9 Post-installation check

- Are cables or the device damaged (visual inspection)?
- Does the device correspond to specifications at the measuring point, including process temperature, ambient temperature, minimum fluid conductivity, measuring range, etc.?
- Are the measuring point number and labeling correct (visual inspection)?
- Have the inlet and outlet runs been observed?
- Is the measuring device protected against moisture and direct sunlight?


3 Wiring

3.1 Charging the NiMH storage battery



Warning!

- The storage battery for the device (NiMH storage batteries) may only be charged with the charger supplied. Other equipment could cause the battery to overheat.
- Compare the information on the nameplate of the charger with the local supply voltage and frequency.

To charge the storage battery, connect the charger to the connection for 12 V DC power supply of the measuring device (→  26, No. 7). It takes approx. 3.6 hours to charge the battery. Once charged, the unit operating life is approx. 8 hours.

3.2 Connecting the connecting cable

⚠ Warning!

- Only use the connecting cables supplied by Endress+Hauser.
- The measuring device only complies with the general safety requirements in accordance with EN 61010-1 and the EMC requirements of IEC/EN 61326 during storage battery operation. Disconnect the charger from the measuring device for measuring operation.

Connect the connecting cable to the connections CH-DN (downstream) and CH-UP (upstream) (→  26, No. 4 and 5). The connectors on the connecting cable and measuring device have the same color code.

📎 Note!

To ensure correct measuring results, route the cable well clear of electrical machines and switching elements.

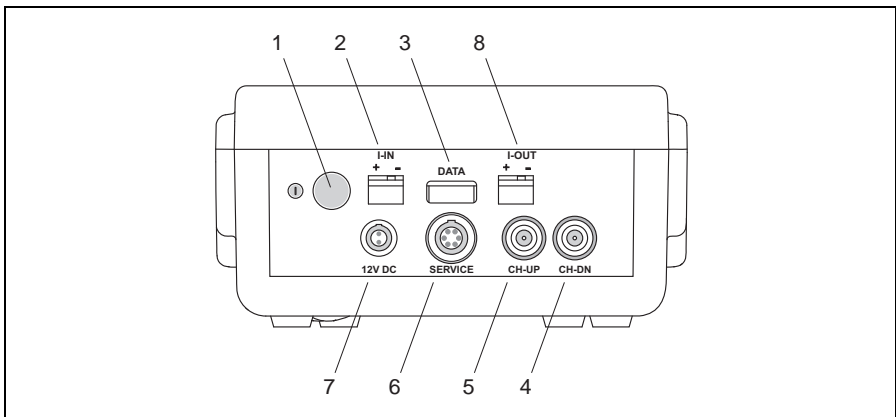


Fig. 22: Transmitter connections

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- 1 On/off switch (press switch ≥ 3 seconds)
- 2 Current input connection
- 3 USB plug connection
- 4 Connecting cable connection (CH-DN, downstream)
- 5 Connecting cable connection (CH-UP, upstream)
- 6 FXA193/FXA291 modem connection
- 7 Charger connection (different adapters are available for the connection)
- 8 Current output connection

3.3 Post-connection check

- Are cables or the device damaged (visual inspection)?
- Does the supply voltage match the information on the nameplate of the charger?
- Is the connecting cable connected correctly?

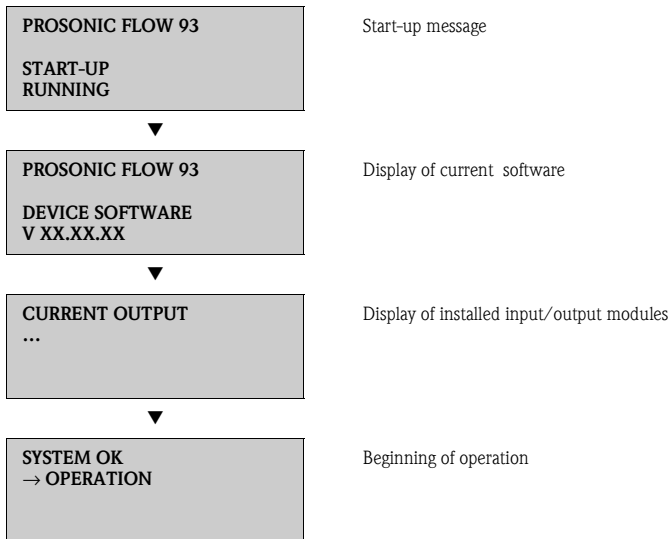
4 Commissioning

4.1 Switching on the measuring device

The measuring device is switched on by pressing the ON/OFF switch ≥ 3 seconds (→ , No. 1).

After being switched on, the measuring system performs a number of internal test functions. As this procedure progresses the following sequence of messages appears on the onsite display:

Display examples:



The measuring device starts operating as soon as the startup procedure is complete. Various measured values and/or status variables appear on the display.

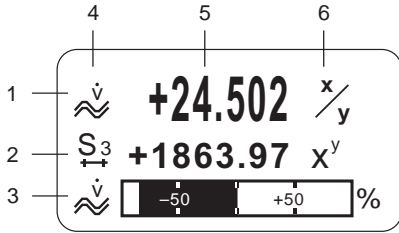


Note!

If an error occurs during startup, this is indicated by an error message. List of all error messages, see associated Operating Instructions on the CD-ROM.

4.2 Operation

4.2.1 Display elements

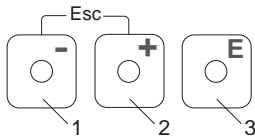


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Display lines/fields

1. Main line for primary measured values
2. Additional line for additional measured variables/status variables
3. Information line for bar graph display for example
4. Info icons, e.g. volume flow
5. Current measured values
6. Engineering units/time units

4.2.2 Operating elements



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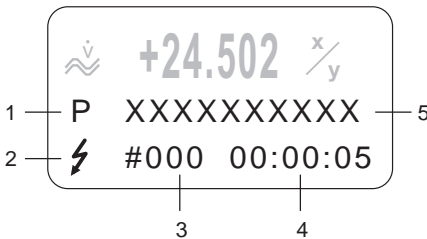
Operating keys

1. (-) Minus key for entering, selecting
2. (+) Plus key for entering, selecting
3. Enter key for calling the function matrix, saving

When the +/- keys are pressed simultaneously (Esc):

- Exit the function matrix step-by-step:
- > 3 sec. = cancel data input and return to the measured value display

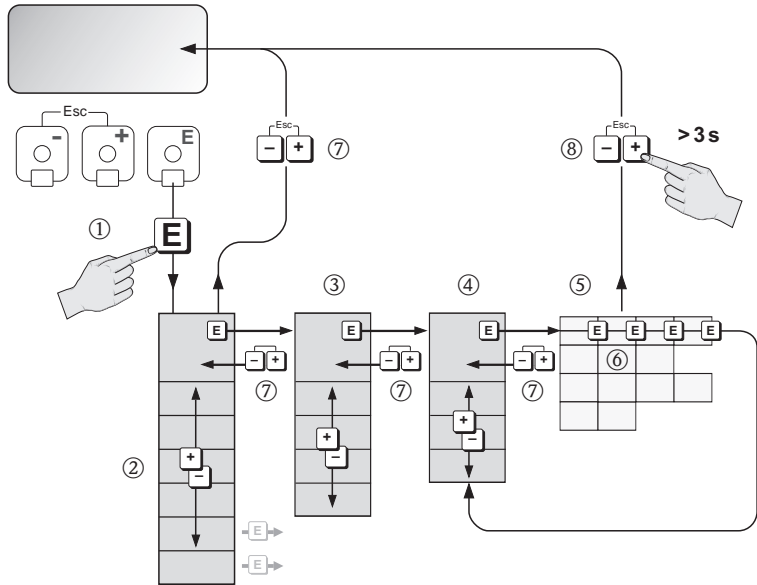
4.2.3 Displaying error messages



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1. Type of error:
P = Process error, S = System error
2. Error message type:
f = Fault message, ! = Notice message
3. Error number
4. Duration of the last error that occurred:
Hours: Minutes: Seconds
5. Error designation
List of all error messages, see associated Operating Instructions on the CD-ROM

4.3 Navigating within the function matrix















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1. → Enter the function matrix (starting with measured value display)
2. → Select the Block (e.g. USER INTERFACE)
 → Confirm selection
3. → Select the group (e.g. CONTROL)
 → Confirm selection
4. → Select the function group (e.g. BASIC CONFIGURATION)
 → Confirm selection
5. → Select function (e.g. LANGUAGE)
6. → Enter code **93** (only for the first time you access the function matrix)
 → Confirm entry

 → Change function/selection (e.g. ENGLISH)
 → Confirm selection
7. → Return to measured value display step by step
8. > 3 s → Return immediately to measured value display

4.4 Calling the Commissioning Quick Setup

All the functions needed for commissioning are called up automatically with the Quick Setup. The functions can be changed and adapted to suit the individual processes.

1.  → Enter the function matrix (starting with measured value display)
2.  → Select the group QUICK SETUP
 → Confirm selection
3. QUICK SETUP COMMISSIONING function appears.
4. Intermediate step if configuration is blocked:
 → Enter the code **93** (confirm with ) and thus enable configuration
5.  → Go to Commissioning Quick Setup
6.  → Select YES
 → Confirm selection
7.  → Start Commissioning Quick Setup
8. Configure the individual functions/settings:
 - Via -key, select option or enter number
 - Via -key, confirm entry and go to next function
 - Via -key, return to Setup Commissioning function (settings already made are retained)



Note!

Observe the following when performing the Quick Setup:

- Configuration selection: Select the ACTUAL SETTING option
- Unit selection: This is not offered again for selection after configuring a unit
- Output selection: This is not offered again for selection after configuring an output
- Automatic configuration of the display: select YES
 - Main line = volume flow
 - Additional line = totalizer 1
 - Information line = operating/system condition
- If asked whether additional Quick Setups should be executed: select NO

All the available functions of the measuring device and their configuration options as well as additional Quick Setups, if available, are described in detail in the "Description of Device Functions" Operating Instructions. The related Operating Instructions can be found on the CD-ROM.

The measuring device is ready for operation on completion of the Quick Setup.

4.5 Troubleshooting

A complete description of all the error messages is provided in the Operating Instructions on the CD-ROM.

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