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Valid from software version:
V 1.01.XX (measuring amplifier)

prosonic flow 92
Portable Ultrasonic Flow Measuring System

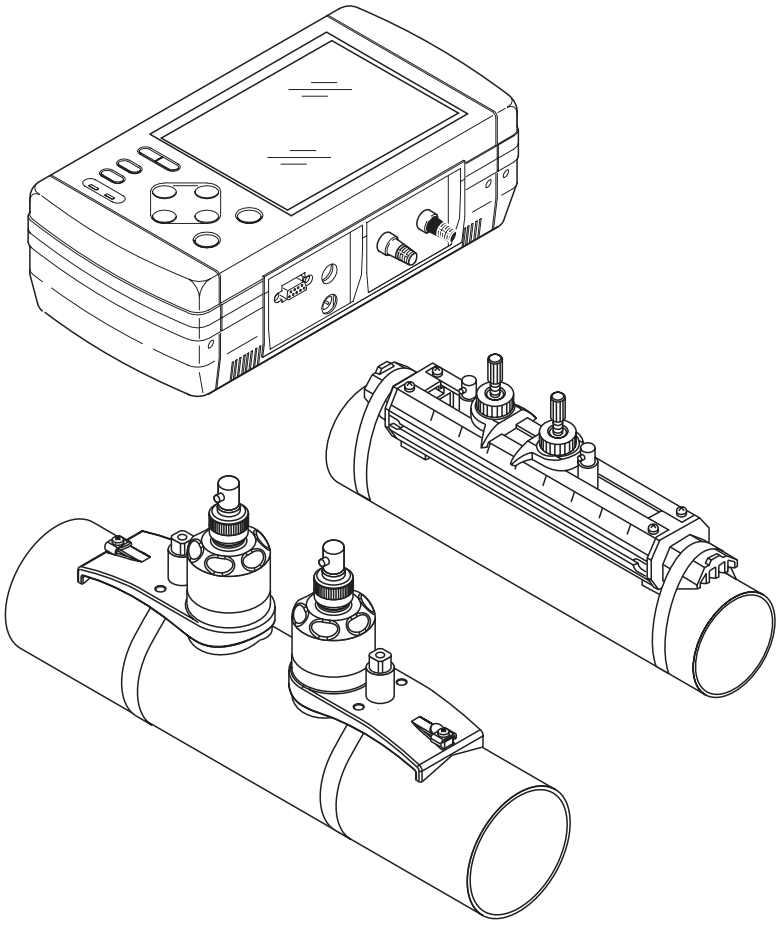
Operating Instructions







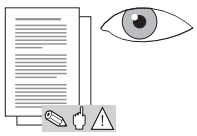




Endress+Hauser
The Power of Know How

Brief operating instructions

These brief operating instructions explain how to configure your measuring device quickly and easily.

Safety instructions	Page 7
Please read the safety instructions through carefully.	

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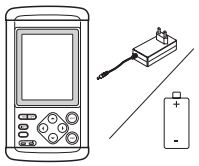
Connecting the transmitter	Page 28
Install the sensors using the transmitter software. To do so, connect the transmitter first to the power adapter or if the battery is fully charged operate with battery power.	

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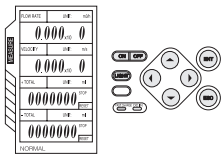
Display and operating elements	Page 35
A short overview of the different display and operating elements to allow you to start quickly.	

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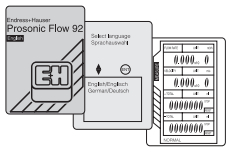
Switching on the measuring device	Page 41
Description of the start-up sequence visible on the graphic display after switching on the transmitter.	

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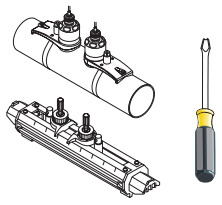
Installing the sensors	Page 17 ff.
Installing the flow measuring sensors Prosonic Flow W Installing the flow measuring sensors Prosonic Flow P Installing the flow measuring sensors Prosonic Flow U	
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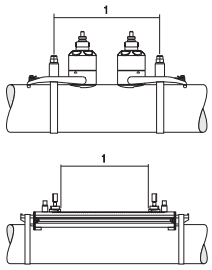
“SENSOR INSTALLATION” with the Site Setup	Page 67
Use the “Site Setup” to determine the data required for sensor installation such as sensor distance (1), wire length, pipe materials, sound velocity in fluids, etc. – With the Prosonic Flow W and P sensors, you receive the sensor distance as distance data and in the form of a letter for sensor 1 and as a number for sensor 2. You can use the mounting rail to locate the sensors easily. – With Prosonic Flow U, you receive the sensor distance as distance data. Installation of the sensor/transmitter connecting cable → Page 25	

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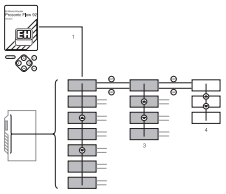
“Commissioning” with SITE SETUP menu	Page 42
You can commission your measuring device quickly and easily using the special “Site Setup” menu. It allows you to use the local display to configure important basic functions, such as measured variables, units of measure, type of signal, etc. Complex measurement tasks require the configuration of additional functions which you can individually select, set and adapt to your process conditions using the function matrix. All functions are described in detail, as is the function matrix itself, in the **“Description of device functions”** appendix, which is a part of these Operating Instructions.	

✎ Note!
Always start trouble-shooting with the checklist on Page 49, if faults occur after startup.

Contents

1 Safety instructions

1.1 Designated use

The measuring device described in these Operating Instructions is to be used only for measuring the flow of fluids in closed pipes, e.g.:
- Water, wastewater
- Ultrapure water with low conductivity
- Process applications

In addition to the volume flow, the system measures the sound velocity in the fluid. The sound velocity can be used to distinguish different fluids or as a measure of fluid quality.

Resulting from incorrect use or from use other than that designated the operational safety of the measuring devices can be suspended. The manufacturer accepts no liability for damages being produced from this.

1.2 Installation, commissioning and operation

Note the following points:
- Installation, connection to the electricity supply, commissioning and maintenance of the device must be carried out by trained, qualified specialists authorised to perform such work by the facility's owner-operator. The specialist must have read and understood these Operating Instructions and must follow the instructions they contain.
- The device must be operated by persons authorised and trained by the plant operator. Strict compliance with the instructions in the Operating Instructions is mandatory.
- Invariably, local regulations governing the opening and repair of electrical devices apply.

1.3 Operational safety

Note the following points:
- The measuring device complies with the general safety requirements in accordance with EN 61010 and the EMC requirements of EN 61326/A1.
- The manufacturer reserves the right to modify technical data without prior notice. Your E+H distributor will supply you with current information and updates to these Operating Instructions.

1.4 Return

The following procedures must be carried out before a flowmeter requiring repair or calibration, for example, is returned to Endress+Hauser:

- Always, enclose a fully completed “Declaration of Contamination” form. Only then can Endress+Hauser transport, examine and repair a returned device.
- Enclose special handling instructions if necessary, for example a safety data sheet as per EN 91/155/EEC.

Note!
A *copy* of the “Declaration of Contamination” can be found at the end of these Operating Instructions.

Warning!
- Do not return a measuring device if you are not absolutely certain that all traces of hazardous substances have been removed, e.g. substances which have penetrated crevices or diffused through plastic.
- Costs incurred for waste disposal and injury (caustic burns, etc.) due to inadequate cleaning will be charged to the owner-operator.

1.5 Notes on safety conventions and icons

The devices are designed to meet state-of-the-art safety requirements. They have been tested and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations in accordance with EN 61010 “Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures”. They can, however, be a source of danger if used incorrectly or for use other than that designated.
Consequently, always pay particular attention to the safety instructions indicated in these Operating Instructions by the following symbols:

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 Identification

2.1 Device designation

The “Prosonic Flow 92” flow measuring system consists of the following components:
- Prosonic Flow 92 transmitter
- Prosonic Flow W, P and Prosonic Flow U sensors

2.1.1 Nameplate of the transmitter

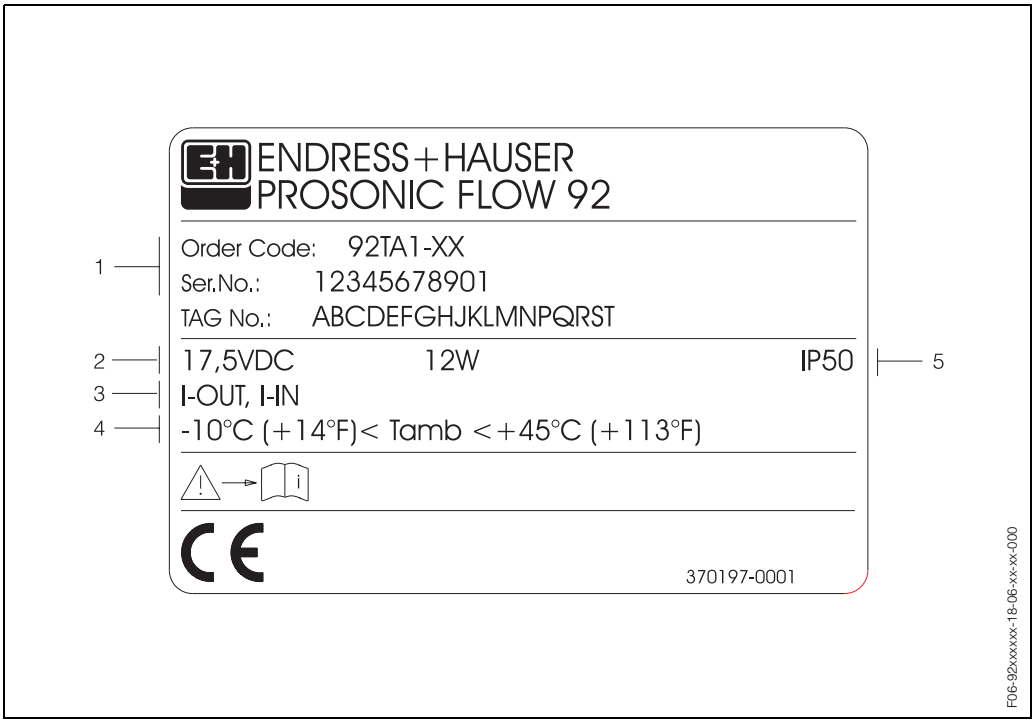


Fig. 1: Nameplate specifications for the “Prosonic Flow 92” transmitter (example)

1 *Order code/serial number: see the specifications on the order confirmation for the meanings of the individual letters and digits.*
2 *Power supply of the transmitter: 17.5 V DC*
(Power supply / frequency of the power adapter: 100...240 V AC / 47...63 Hz)
Power consumption: 12 VA / W
3 *Available inputs and outputs:*
I-OUT: with current output
I-IN: with current input
4 *Ambient temperature range*
5 *Degree of protection*

2.1.2 Nameplate of the Prosonic Flow W/P sensors

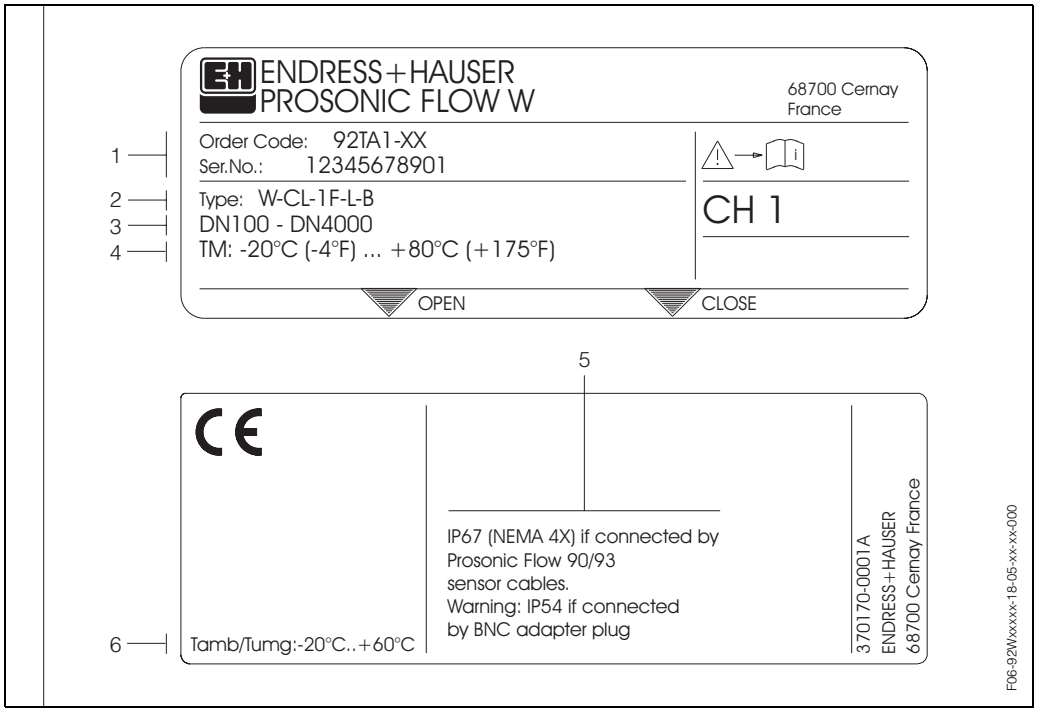


Fig. 2: Nameplate specifications for the "Prosonic Flow W/P" sensors (example)

1 *Order code/serial number: see the specifications on the order confirmation for the meanings of the individual letters and digits.*
2 *Sensor type*
3 *Range of nominal diameter: DN 100...4000*
4 *Max. liquid temperature range: –20 °C (–4 °F) ... +80 °C (+175 °F)*
5 *Degree of protection*
6 *Ambient temperature range*

2.1.3 Nameplate of the Prosonic Flow U sensors

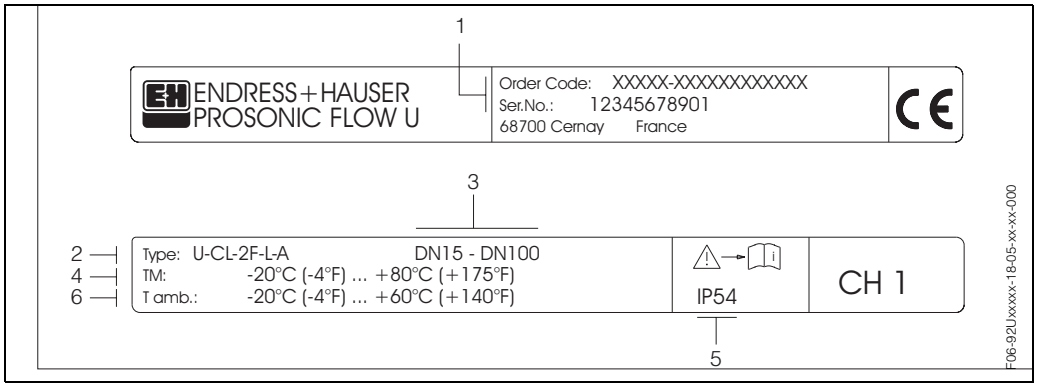


Fig. 3: Nameplate specifications for the "Prosonic Flow U" sensors (example)

1 *Order code/serial number: see the specifications on the order confirmation for the meanings of the individual letters and digits.*
2 *Sensor type*
3 *Range of nominal diameter: DN 15...100*
4 *Max. liquid temperature range: –20 °C (–4 °F) ... +80 °C (+175 °F)*
5 *Degree of protection*
6 *Ambient temperature range*

2.2 CE approval, Declaration of Conformity

The devices are designed to meet state-of-the-art safety requirements in accordance with sound engineering practice. They have been tested and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations in accordance with EN 61010 “Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures”.
The measuring system described in these Operating Instructions is therefore in conformity with the statutory requirements of the EC directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

2.3 Registered trademarks

SilGel ® is a registered trademark of Wacker-Chemie GmbH, Munich, Germany

3 Installation

3.1 Incoming acceptance, transport and storage

3.1.1 Incoming acceptance

- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

3.1.2 Transport

The devices must be transported in the carrying case supplied when transporting them to the measuring point.

3.1.3 Storage

Note the following points:
- Pack the measuring device in such a way as to protect it reliably against impact for storage (and transportation). The original packaging provides optimum protection.
- The storage temperature corresponds to the ambient temperature range (Page 57) of the transmitter, the measuring sensors and the corresponding sensor cables.
- When stored, the device should not be exposed to direct sunlight to avoid impermissibly high surface temperatures.

3.2 Installation conditions

3.2.1 Dimensions

The dimensions and the fitting lengths of the sensors and the transmitter are on Page 61 ff.

3.2.2 Installation location

Correct measuring is possible only if the pipe is full. **Avoid** the following installation locations:
- Do not install at the highest point in the run. Risk of air accumulating.
- Do not install directly upstream from an open pipe outlet in a down pipe.

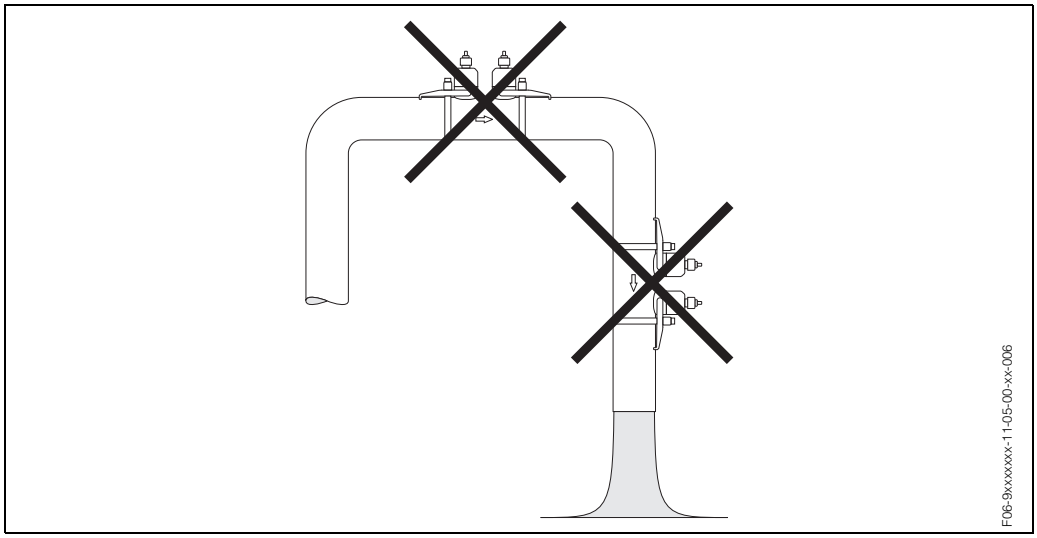


Fig. 4: Installation location

Down pipes
Notwithstanding the above, the installation proposal below permits installation in an open down pipe. Pipe restrictions or the use of an orifice plate with a smaller cross-section than the nominal diameter prevent the pipe from running empty while measurement is in progress.

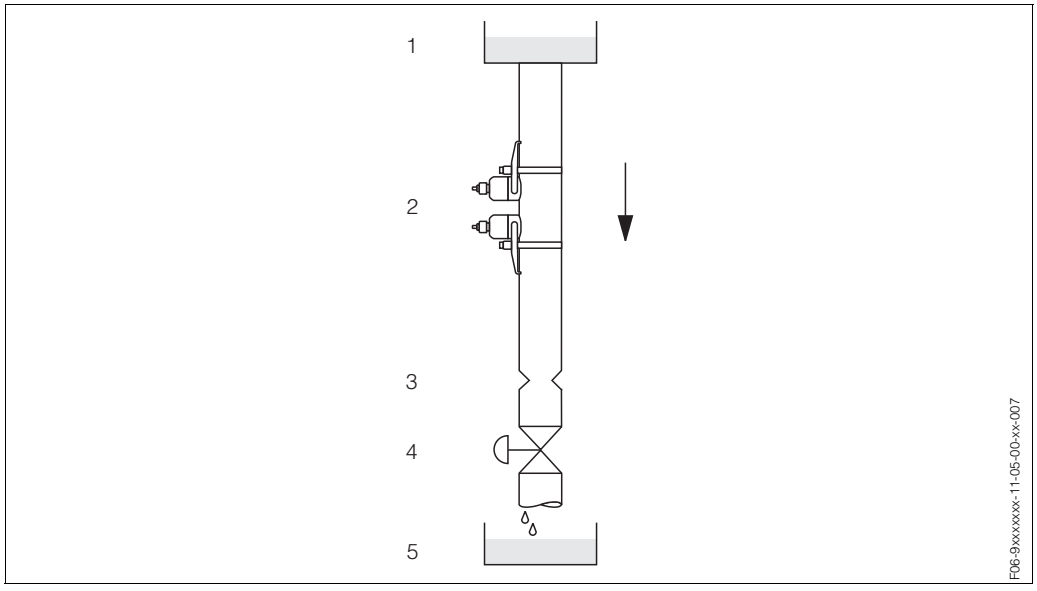


Fig. 5: Installation in a down pipe
1 = Supply tank, 2 = Measuring sensors, 3 = Orifice plate, pipe restriction, 4 = Valve, 5 = Filling tank

3.2.3 Orientation

Vertical orientation
Recommended orientation with upward direction of flow (View A). Entrained solids sink down. Gases rise away from the measuring sensor when fluid is not flowing. The piping can be completely drained and protected against build-up.

Horizontal orientation
In the recommended installation range (C) with horizontal orientation (View B), gas and air collections at the top of the pipe and problematic deposits at the bottom of the pipe have a minor influence on the measurement.

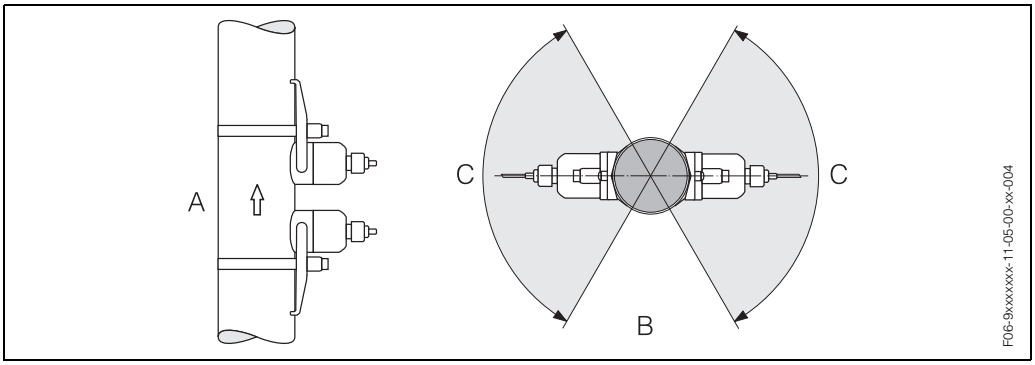


Fig. 6: Orientation (A = Vertical, B = Horizontal, C = Recommended installation range max. 120°)

3.2.4 Inlet and outlet runs

If possible, install the sensor well clear of assemblies such as valves, T-pieces, elbows, etc. If several flow obstructions are installed, the longest inlet or outlet run must be considered. Compliance with the following requirements for the inlet and outlet runs is recommended to ensure measuring accuracy:

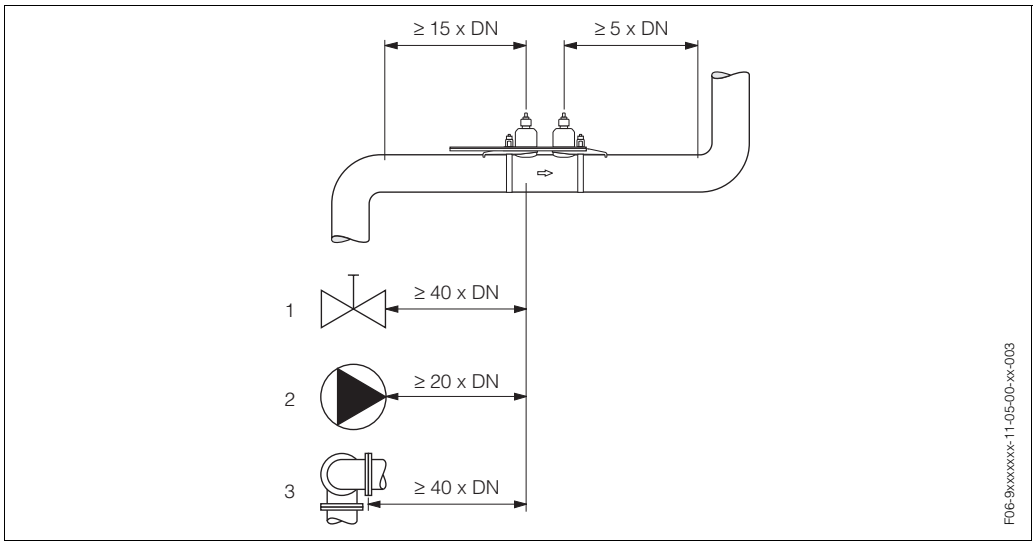


Fig. 7: Inlet and outlet runs
1 = Valve; 2 = Pump; 3 = Two pipe bends in different directions

3.2.5 Connecting cable length

Shielded cables are available in the following lengths:
5 m and 10 m

Caution!
Route the cable well clear of electrical machines and switching elements.

3.2.6 Sensor arrangement (Clamp On)

The transmitter offers a number of options between 1 and 4 traverses for the type of installation. Please note that the signal strength is reduced with each additional reflection point in the pipe. (Example: 2 traverses = 1 reflection point)
To achieve the best signal quality possible, choose the least number of traverses required for a sufficient transit time difference.

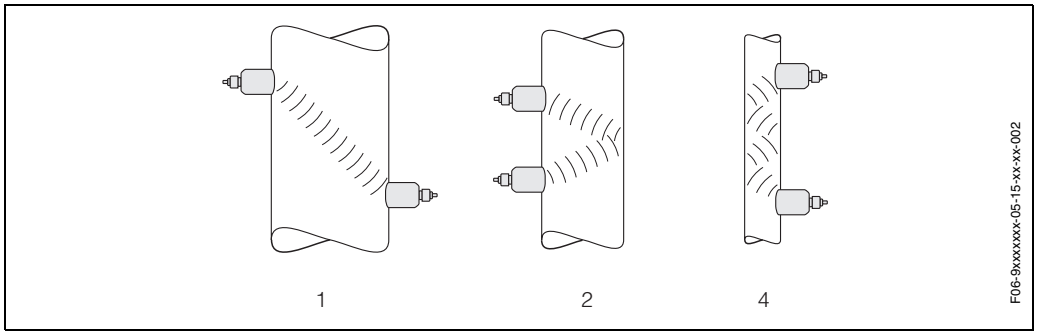


Fig. 8: Sensor arrangement (Clamp On)

1 = 1 traverse, 2 = 2 traverses, 4 = 4 traverses

Recommendations:
Due to their design and properties, the Prosonic Flow sensors are particularly suited to certain nominal diameter ranges and pipe wall thicknesses. For this reason, various sensor types are offered for Prosonic Flow W, P and U for these different applications. Recommendations for sensor installation can be found in the following table.

Sensor type	Nominal diameter	Type of mounting
Prosonic Flow U	DN 15...100	2 traverses
Prosonic Flow W Prosonic Flow P	DN 50...60 DN 80...600 DN 650...4000	2 (or 4) traverses* 2 traverses 1 traverse

** see note below*

✎ Note!

- The installation of Clamp On sensors is principally recommended in the 2 traverse type of installation. This type of installation allows the easiest and most comfortable type of mounting and means that a system can also be mounted even if the pipe can only be accessed from one side.
- If the pipe nominal diameter is small (DN 60 and smaller), the sensor spacing with Prosonic Flow W/P can be too small for an installation with 2 traverses. In this case, the 4 traverse type of installation must be used. In all other instances, the 2 traverse configuration is the preferred method.
- The use of Prosonic Flow W/P sensors DN 100...4000 is principally recommended for pipes with a wall thickness >4 mm, pipes made of composites such as GRP, pipes with lining, even for nominal diameters < DN 100. This applies also to applications with media with high acoustic damping. For these applications, we principally recommend mounting the W/P sensors with 1 traverse configuration.
- In the DN 15...50 nominal diameter range, Prosonic Flow U is preferred for use on plastic pipes. Both the Prosonic Flow W/P and the Prosonic Flow U sensor types can be used in the DN 50...100 nominal diameter range. The use of Prosonic Flow W/P sensors is principally recommended for applications as of DN 60.
- If the measuring device displays an insufficient signal strength, reduce the number of the traverses.

3.3 Installation instructions

3.3.1 Installing tensioning bands

For W sensor DN 50...4000

Caution!
Before use, check that the ratchet and springs are functioning correctly. Check tensioning bands for any damage.

Procedure for closing the tensioning band lock:

1. Push one of the supplied threaded bolts on the tensioning band.
2. Run the tensioning band around the pipe without twisting it and push the end through the axis slit with the ratchet (a) open. Pretension manually by pulling the free tensioning band end (a).

Note!
It is more difficult to release the tensioning bands if you do not pretension.

3. Continuous tensioning via ratchet movement, i.e. move the lever back and forth (b) until the tensioning band has the optimum tension.
4. Then push down the lever (c).

Caution!
The tension lock (d) must engage on both sides!

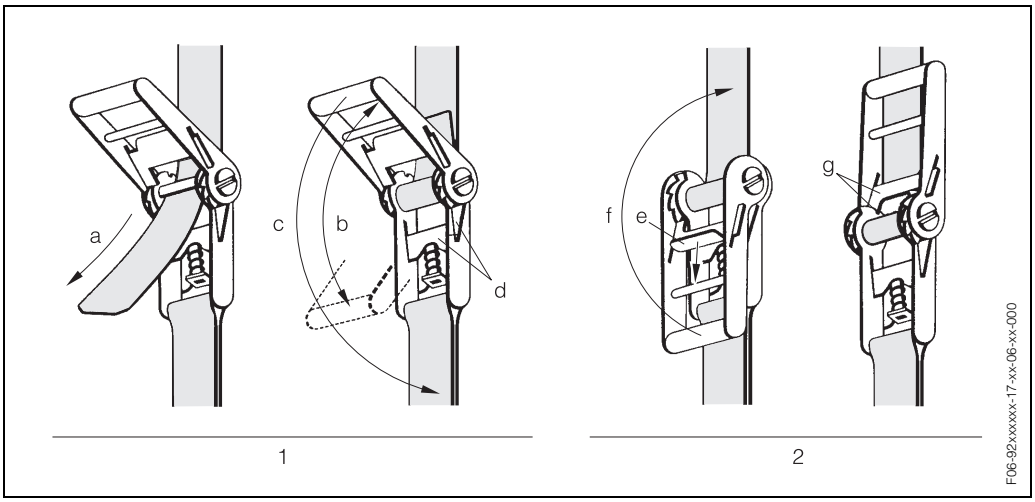


Fig. 9: Tensioning band lock

1 = Procedure for closing the tensioning band lock
2 = Procedure for opening the tensioning band lock

Procedure for opening the tensioning band lock:

1. Pull back lever lock (e) and, at the same time, pull back the lever by 180° (f) until the lever lock (g) is engaged. Remove the tensioning band.

For W sensor DN 250...4000 for permanent installation
Accessories for permanent installation of tensioning bands on big diameter pipes. For the purpose of repeated measurements it is useful to maintain the tensioning bands mounted to the pipe. To support this, tensioning bands and centering plates for permanent installation are available as accessories (see Page 47). The Prosonic Flow W sensor holders are equally suitable.

The following steps relate to Fig. 10 on Page 18.

1. Measure the pipe circumference.
   Shorten the tensioning band to the pipe circumference +10 cm.

   Caution!
   Risk of injury. When shortening the metal tensioning band, avoid sharp edges.

2. Loop the tensioning band through one of the centering plates with the threaded bolt (1).
3. Insert both ends of the tensioning bands down into the openings in the tensioning band lock (2). Bend back the ends of the tensioning bands.
4. Interlock both halves of the lock (3). Make sure that there is sufficient space for the tensioning band to be tightened with the locking screw.
5. Tighten the tensioning band using a screwdriver (4).

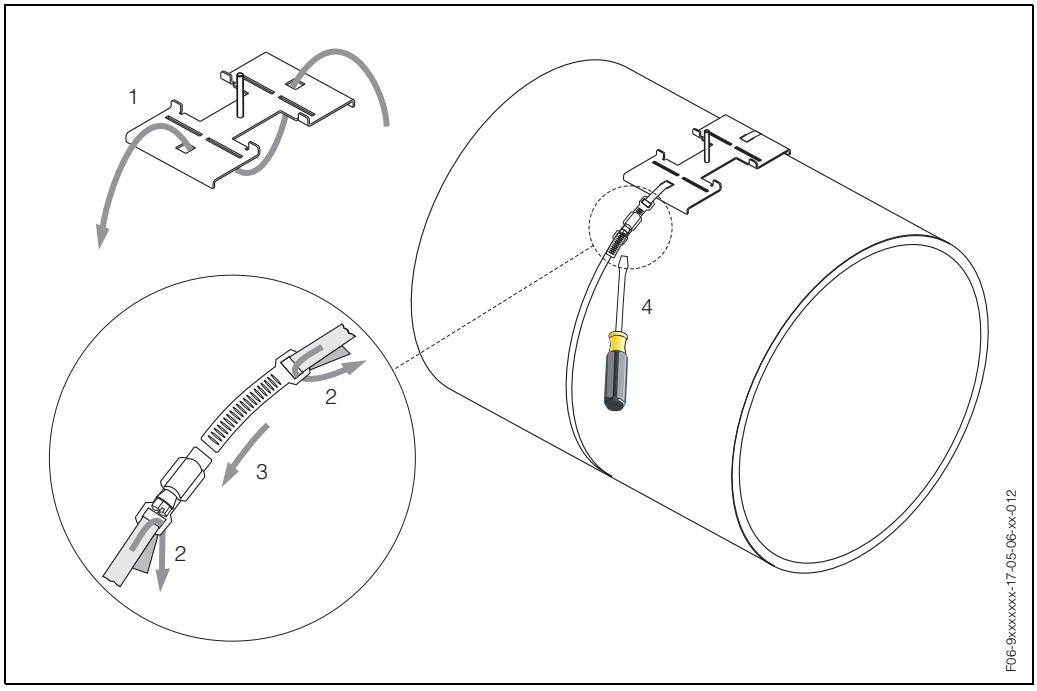


Fig. 10: Tensioning band installation for DN 250...4000

For U sensor, DN 15...100
The procedure for installing the tensioning bands for the U sensor is explained on Page 23 in Section “Installing the measuring sensors Prosonic Flow U”.

For sensors P - DN 50...300

1. Push one of the supplied threaded bolts on the tensioning band (or both bolts in the case of sound velocity measurement).
2. Run the tensioning band around the pipe without twisting it and push the end through the tensioning band lock (make sure that the screw is pushed up).
3. By hand, make the tensioning band as tight as possible.
4. Push the screw down and tighten the tensioning band with a screwdriver so that it cannot slip.
5. If so desired, shorten the tensioning band to the desired length.

Caution!
Risk of injury! When shortening the tensioning band, avoid sharp edges.

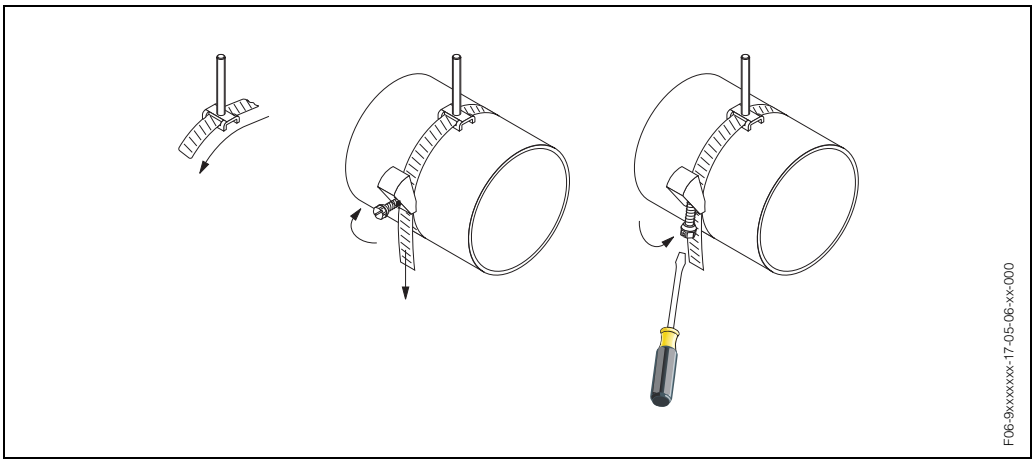


Fig. 11: Tensioning band installation for DN 50...300

3.3.2 Installing the measuring sensors Prosonic Flow W, P

1 traverse version

1. Fix a tensioning band for small or large nominal diameters as described on Page 17 and Page 18.
   Install the second tensioning band (threaded bolt on the opposite side). The second tensioning band must still be moveable.

Intermediate step
The wire length is determined via the “Site Setup” menu (see Page 42, 68).

2. Enter the wire length on both halves of the wire.

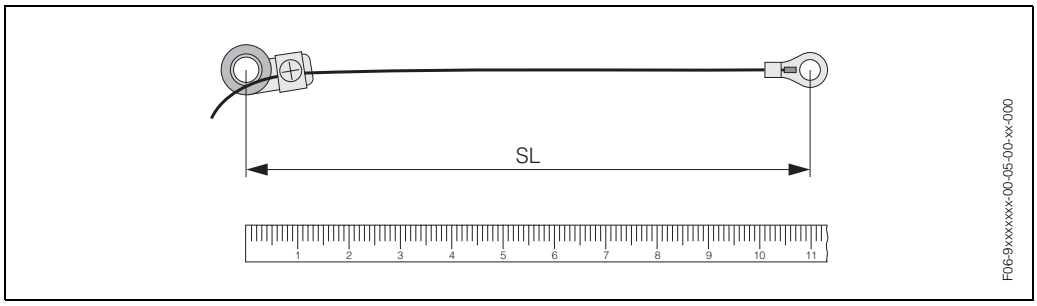


Fig. 12: Marking off the determined wire length on the wire measurement equipment (SL = wire length)

3. Push the cable lug and the fixer over the first threaded bolt. Lead each wire along one side of the pipe. Push the cable lug and the fixer over the second threaded bolt. Pull in the threaded bolt with the tensioning band until both cords are the same length. Fix the tensioning band. Loosen the Phillips screws of the fixing parts. Remove the cords.

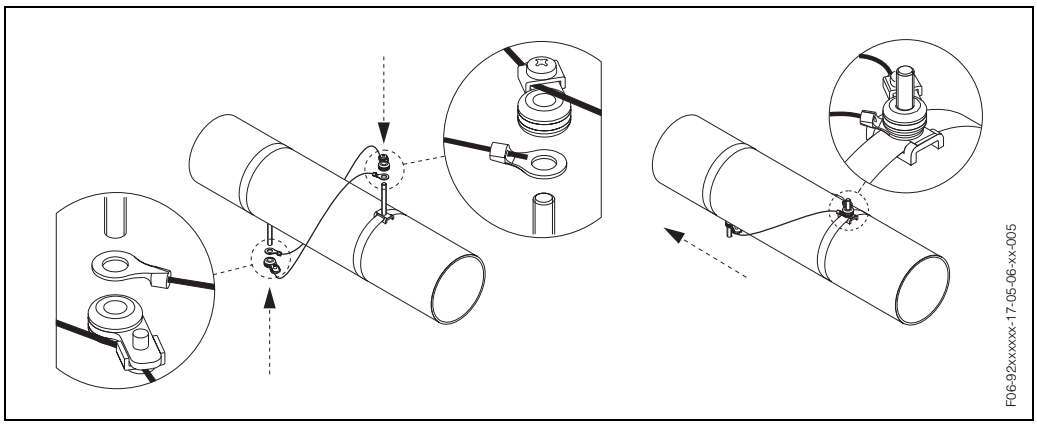


Fig. 13: Use of the wire measuring equipment for positioning the threaded bolts

4. Push both of the sensor holders onto the pipe over the threaded bolts and tighten the fixing nuts using a spanner (AF 13).

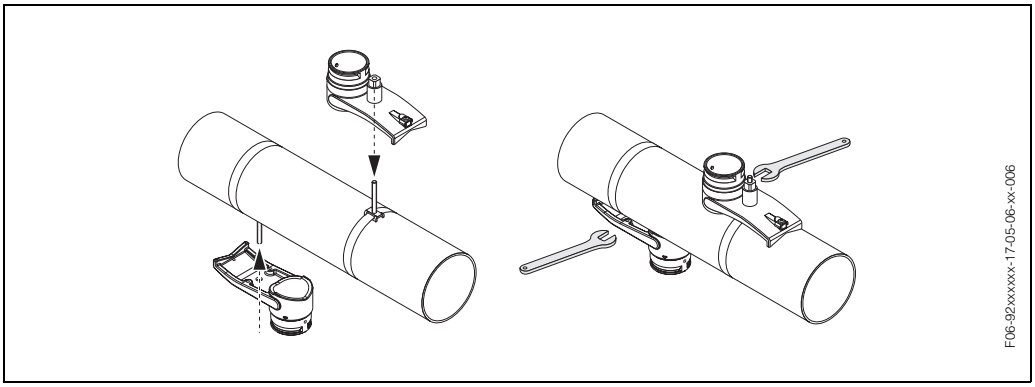


Fig. 14: Installing the sensor holders

5. Coat the contact surface of the sensors with an even (approx. 1 mm thick) layer of the coupling fluid from the centre to the groove, see Page 45.
Then carefully insert the sensors into the sensor holders. Press the sensor cover onto the sensor holder until you hear a click. Make sure that the arrows (▲ / ▼ "close") on the sensor housing and sensor holder are pointing to each other. Then insert the sensor cable adapter plug into the opening provided and manually tighten the plug to the stop. Connect the BNC sensor cables to the adapter plugs.

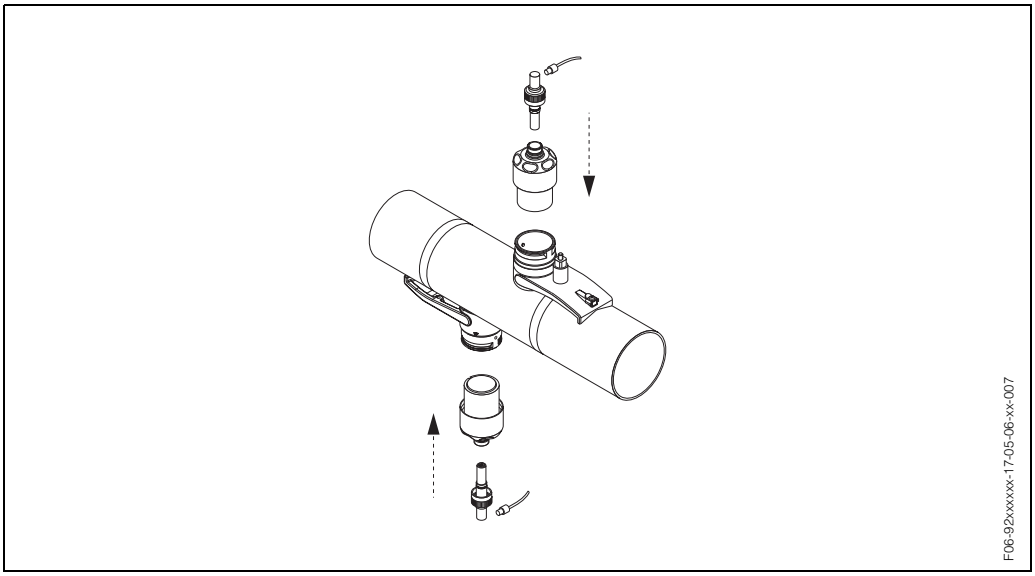


Fig. 15: Installing the sensors and the sensor connectors

6. To remove the sensors, proceed in reverse order.

2 or 4 traverses version

1. Fix a tensioning band as described on Page 17.
   Do not fasten the second tensioning band. You must still be able to move the second tensioning band along the pipe.

2. Use the “Site Setup” menu (see Page 42, 68) to obtain the appropriate distancing holes (sensor distance) on the mounting rail for your application (i.e. a letter between A...K for sensor 1 and a number between 10 and 76 for sensor 2).

3. Place the mounting rail on the threaded bolts and then fasten the second tensioning band. Remove the mounting rail.

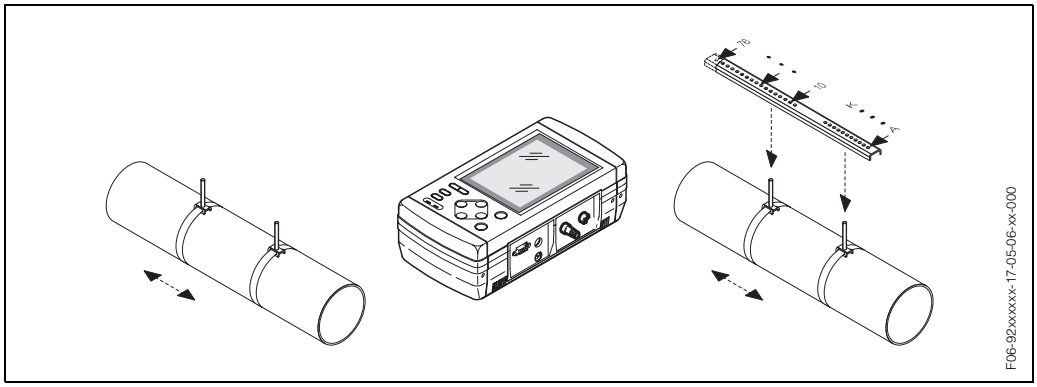


Fig. 16: Installation steps 1 to 3, measuring sensors Prosonic Flow W, 2 or 4 traverses version

4. Fix the sensor holder to the pipe using the threaded bolts. Tighten the fixing nuts using a spanner (AF 13).

5. Coat the contact surface of the sensors with an even (approx. 1 mm thick) layer of the coupling fluid from the centre to the groove, see Page 45. Then carefully insert the sensor into the sensor holder. Press the sensor cover over the sensor holder until you hear a click. Make sure that the arrows (▲ / ▼ “close”) on the sensor housing and sensor holder are pointing to each other. Then insert the sensor cable adapter plug into the opening provided and manually tighten the plug to the stop. Connect the BNC sensor cables to the adapter plugs.

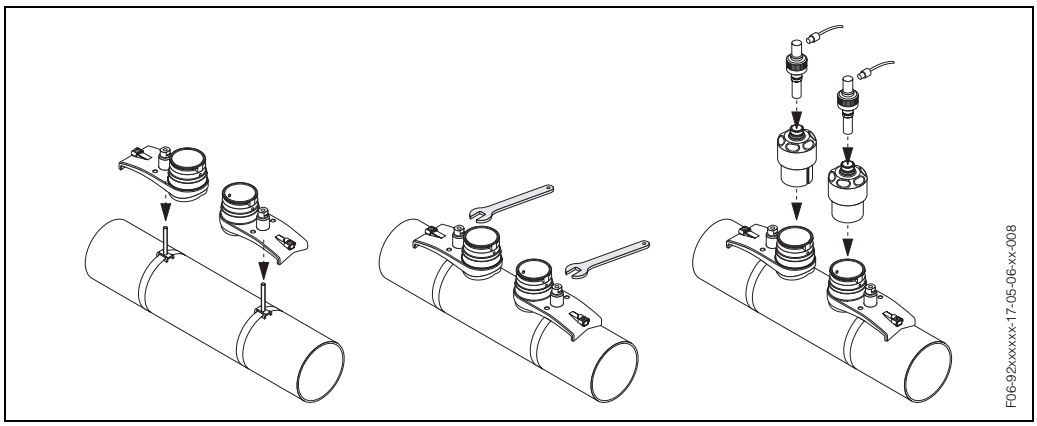


Fig. 17: Installation steps 4 to 5, measuring sensors Prosonic Flow W, 2 or 4 traverses version

6. To remove the sensors, proceed in reverse order.

3.3.3 Installing the measuring sensors Prosonic Flow U

Intermediate step:
Preparation of tensioning band lock for initial mounting.

1. Guide the tensioning band with the Velcro side face up through the lowest opening in the tensioning band fastener (a).
2. Loop the tensioning band back through the top opening (b).
3. Twist the tensioning band in such a way that you can guide it through the centre opening (C) to such an extent that you have at least 20 mm for pressing the two Velcro sides together (d).
4. Pull the tensioning band back tightly through the bottom opening (e).
5. Continue with the sensor installation.

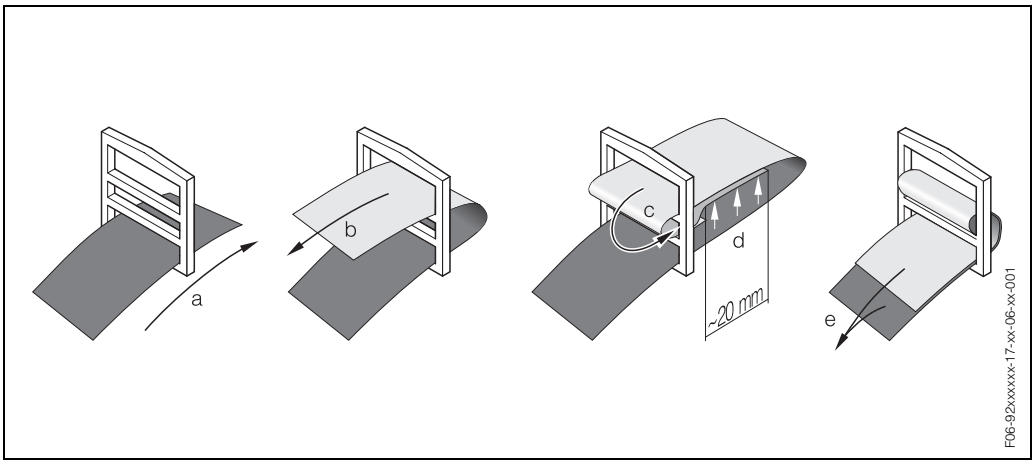


Fig. 18: Preparing the tensioning band lock

1. Loop the tensioning band for U sensors around the pipe and feed it through the lock. Make sure the band is not twisted and that the smooth surface is oriented towards the pipe. Do not yet tighten the band. Continue with the second band.

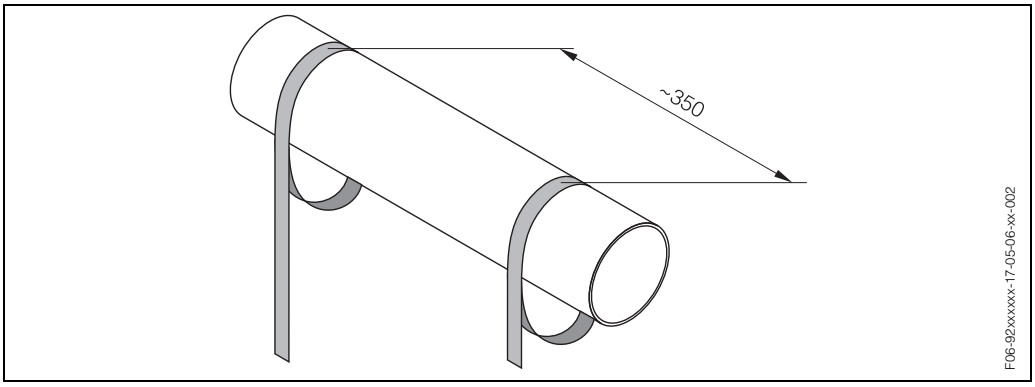


Fig. 19: Preparing the tensioning bands for sensor installation

2. Prepare the U sensor for installation:
   Use the sensor installation Site Setup menu (see Page 67) to obtain the appropriate sensor distance for your application.

✎ Note!
The U sensor only supports the 2 traverses configuration. Make sure that the number of traverses is set to 2 (see Page 71) in the “Site Data” menu.

3. Adjust the sensor distance by moving the sensors (a) along the assembly frame and tighten the sensor fixing nuts (b). You may freely choose the sensor's position within the adjustment range.
   Rotate the sensor adjustment screw counter-clockwise (c) so that the sensor is moved up inside the mounting rail. Apply coupling fluid to the sensors as described on Page 45.

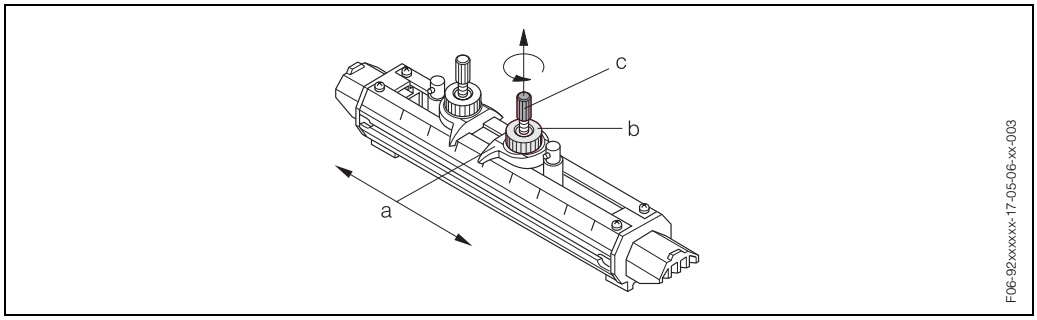


Fig. 20: Preparing the sensor assembly for installation

4. Installation of U sensor assembly:
   Locate the sensor assembly on the pipe as shown in the graphic below. Place the tensioning bands across the saddles at the frame ends of the sensor assembly. Tighten the bands by hand and fix them by pressing the band's rough surfaces together. Lower the sensors by rotating the sensor adjustment screw (e) clockwise until the sensor surface makes contact with the pipe surface. Then connect the upstream and downstream BNC cables to the sensors (f).

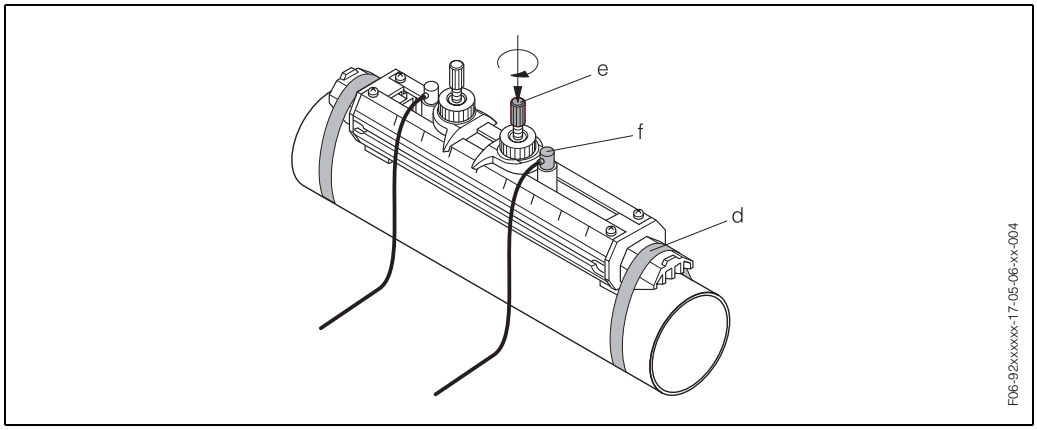


Fig. 21: Installing U sensor assembly

5. To remove the sensors, proceed in reverse order.

3.4 Post-installation check

Perform the following checks after installing the measuring device on the pipe:

Device condition and specifications	Notes
Is the device damaged?	visual inspection
Does the device correspond to specifications at the measuring point, including process temperature, ambient temperature, measuring range, etc.?	see Page 55 ff.
Installation	Notes
Are the measuring point number and labelling correct?	visual inspection
Process environment / process conditions	Notes
Are the sensors installed correctly according the compulsory installation location?	see Page 14
Are the inlet and outlet runs respected?	see Page 15
Is the measuring device protected against moisture and direct sunlight?	visual inspection

4 Wiring

4.1 Connecting the sensor connecting cable

4.1.1 Connecting Prosonic Flow W, P, U sensors

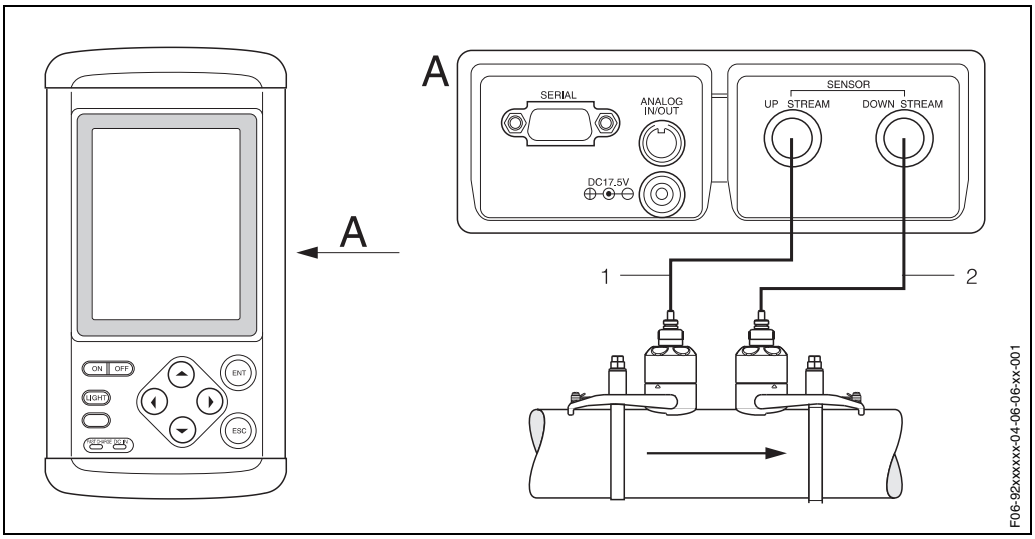


Fig. 22: Connection of the flow sensors of the measuring system

A = View A
1 = Upstream sensor cable
2 = Downstream sensor cable

4.1.2 Cable specifications

Sensor cable
- Special type coaxial cable.
- Use the ready-to-use cables supplied by E+H with each sensor pair.
- The cables are available in lengths of 5 m and 10 m.
- The W, U sensors are connected by means of the BNC-connector plugs (IP 54).

Caution!
See special notes in Section 4.4 “Degree of protection” on Page 33.

Operation in zones of severe electrical interference:
The measuring device complies with the EMC requirements in accordance with EN 61326/A1.

4.2 Connecting the measuring unit

4.2.1 Connecting the transmitter

Warning!
- Don't use other power supply adapters as this may result in an accident or in damage to the device.
- Compare the specifications on the nameplate of the power adapter with the local supply voltage and frequency. The national regulations governing the installation of electrical equipment also apply.

Power supply via power adapter

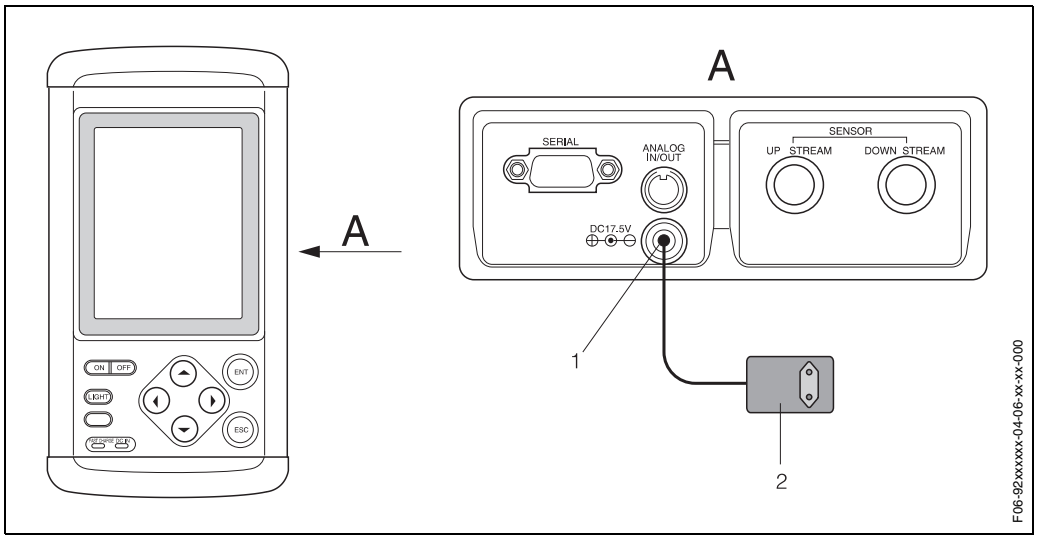
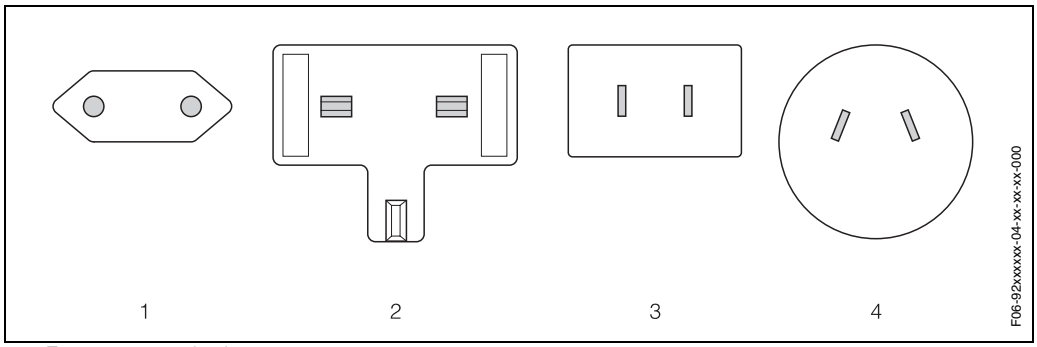


Fig. 23: Connection of the power adapter

A = View A
1 = 17.5 V DC connector
2 = AC power adapter for power supply and recharging the battery: 100...240 V AC, 47...63 Hz, power consumption ≤12 W

The following mains connector adapters are delivered with the power supply:



1 = European standard
2 = GB standard
3 = USA/Japan standard
4 = Australian standard

Power supply via built-in battery
To charge the battery, turn off the instrument power and connect the AC power adapter to the device as shown below. The “FAST CHARGE” LED is lit red, and the “DC IN” LED is lit green. When the instrument is fully charged, the “FAST CHARGE” LED flashes red. With a fully charged battery pack, the instrument can measure for about 5 hours (with the backlight turned off). The time required for charging is approximately 3 hours.

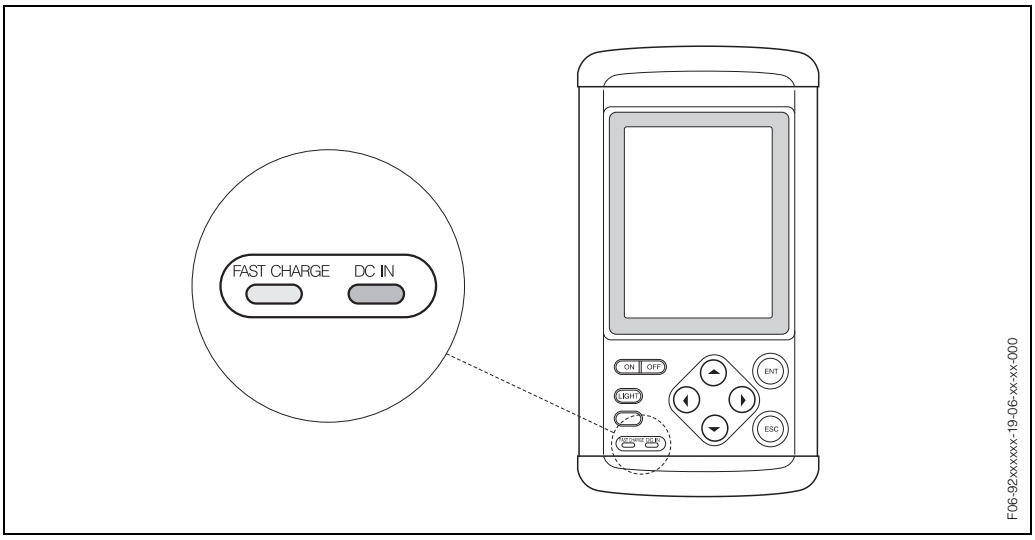


Fig. 24: Charging status display of the built-in battery

4.2.2 Connecting the analog input/output

This connection is used for connecting receiving instruments (indicators, recorders, etc.) and the flow transmitter.

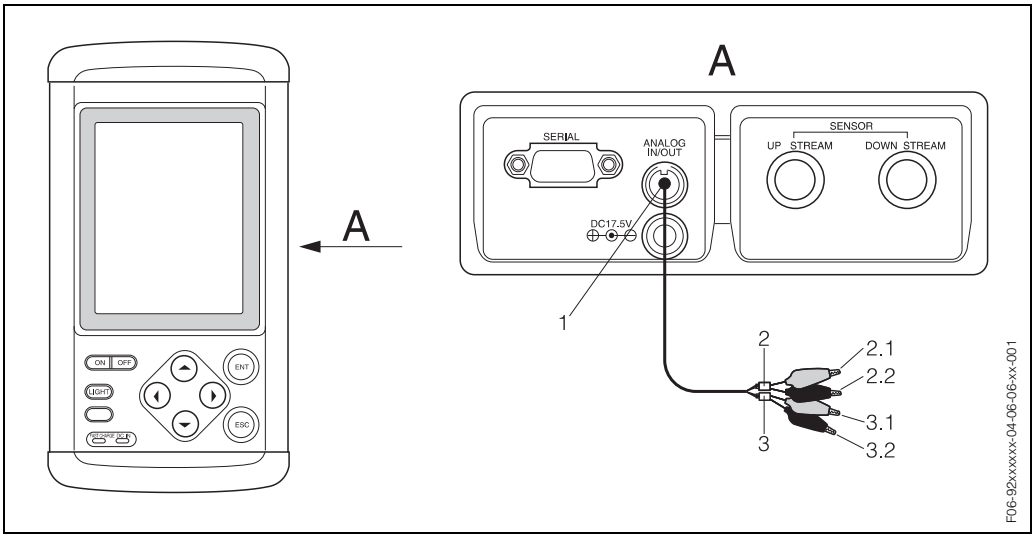


Fig. 25: Connection of the analog input/output cable

A = View A
1 = Analog input/output connector
2 = Analog output wires; 2.1 = red (+); 2.2 = black (–)
3 = Analog input wires; 3.1 = red (+); 3.2 = black (–)

The permissible load resistance of analog output is 0...1 kΩ.
The input resistance of analog input is 100 Ω.

4.2.3 Data logging connection

The following logging parameters for up to 20 measuring points can be transmitted to a personal computer:
- On line data
- A maximum of 40000 data points (time, velocity, flow rate, totals, analog input, status) can be stored in the data logger's memory

When using a personal computer for data logging, use an RS-232C cable for serial transmission between the RS232C connector of the personal computer and the "SERIAL" connector (see Fig. below) of the flow transmitter.

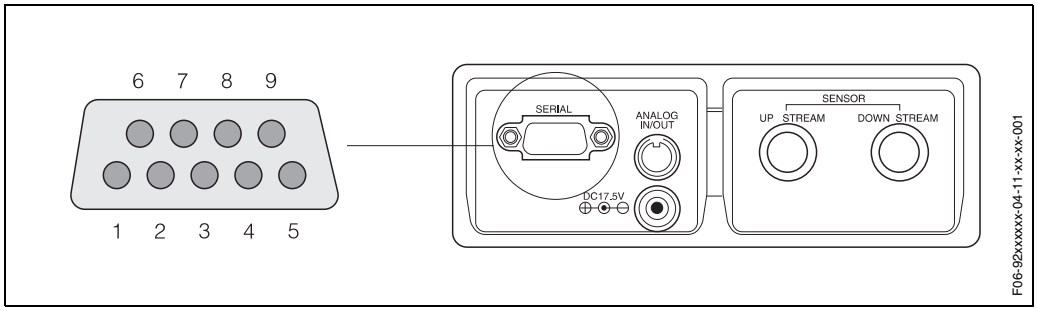


Fig. 26: Serial communication for data logging

D-SUB, 9 pin, socket

Pin No.	Symbol	Item
1	–	–
2	R x D	Receive data
3	T x D	Send data
4	D T R	Data terminal ready
5	G N D	Signal ground
6	D S R	Data set ready
7	R T S	Send request
8	C T S	Send ready
9	–	–

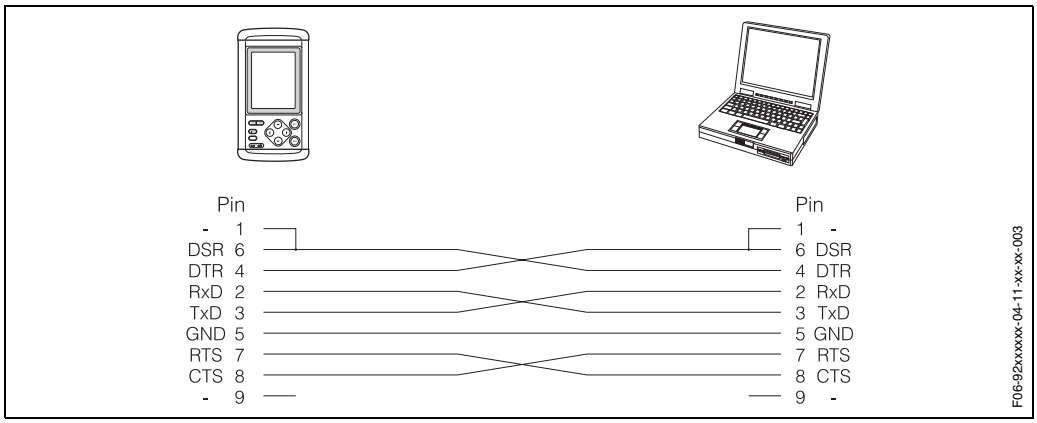


Fig. 27: Strand assignment of the data transmission cable

Max. cable length 15 m

Note!
You need a zero modem cable and a gender changer adapter (9-pin sub D connector) for the connection.

Data logging specifications
Communication system: Half-duplex
Synchronising system: Start-stop synchronising
Transmission speed: 300 / 600 / 1200 / 2400 / 4800 / 9600 bps (selectable)
Parity: Even/odd number / none (selectable)
Data length: 8 bits
Stop bit: 1 bit / 2 bits (selectable)
Data code: ASCII
Isolation: Non-isolation between transmission line and transmitter.

Note!
After setup, make the following settings:
- Transmission speed
- Parity
- Stop bit

Communication control
- Transmission of data with Prosonic Flow 92 is made following a request command from the host computer.
- When a command is received from the host computer, the data corresponding to the command are transmitted from Prosonic Flow 92 to the host computer.
- Commands with ASCII code are transmitted from the host computer to Prosonic Flow 92.
- The last code of each command is carriage return (0DH).

4.2.4 Cable connection

Power supply connection:
• Standard power supply cable connection (1)

Signal cable connection (input/output)
• Circular connector, 4 pin (2)

Sensor cable connection (upstream/downstream):
• BNC connector (3)

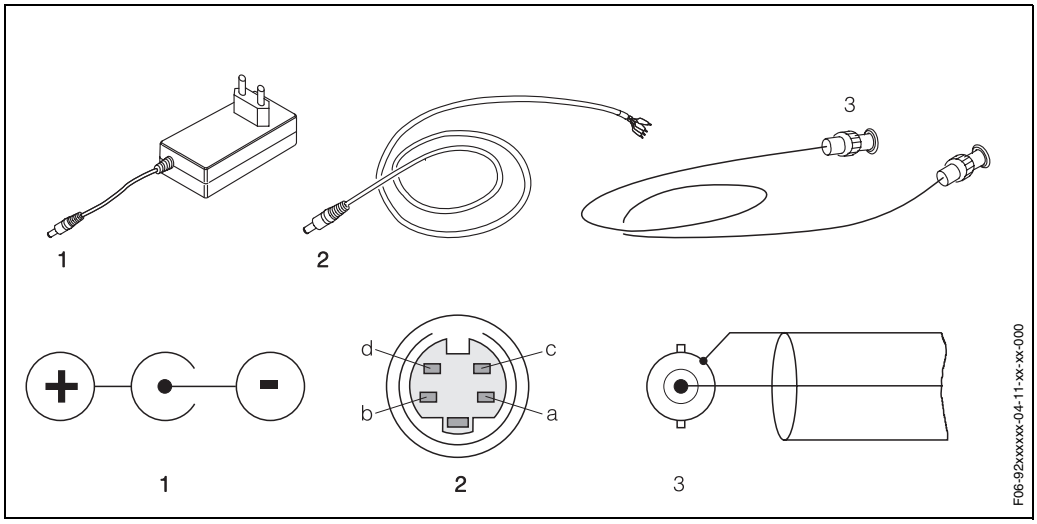


Fig. 28: Cable connections at the transmitter

Pin	Item	Colour
a	Analog input +	Black
b	Analog output –	Red
c	Analog input –	White
d	Analog output +	Blue

4.3 Potential equalisation

Special measures for potential equalisation are not necessary.

4.4 Degree of protection

The measuring system fulfills all the requirements for IP 50 degree of protection.

- Flow measuring transmitter Prosonic Flow 92:
  IP 50

- Flow measuring sensors Prosonic Flow W, P:
  – Sensor in IP 54, if BNC adapter and BNC cable fully engaged.
  – Sensor in IP 67/68 (NEMA 4X / NEMA 6P), if Prosonic Flow sensor cable fully engaged.

Caution!
The BNC adapter resp. the cable connection defines the W (P) sensors specification for the degree of protection (IP 54).

- Flow measuring sensors Prosonic Flow U:
  IP 54

4.5 Post-connection check

Perform the following checks after completing electrical installation of the measuring device:

Device condition and specifications	Notes
Are cables or the device damaged?	visual inspection
Electrical connection	Notes
Does the supply voltage match the specifications on the nameplate of the power adapter?	100...240 V AC (47...63 Hz)
Do the cables comply with the specifications?	see Page 27
Cables correctly segregated by type, without loops and crossovers?	visual inspection
Are the power supply and sensor cables correctly connected?	see Page 27, 28

5 Operation

5.1 Display

The local display enables you to read all important parameters directly at the measuring point and configure the device using the “Site Setup” or the function matrix.

The display field comprises a full graphic display on which measured values, status variables etc. can be displayed in numerical format or measured values can be displayed in the form of curves.

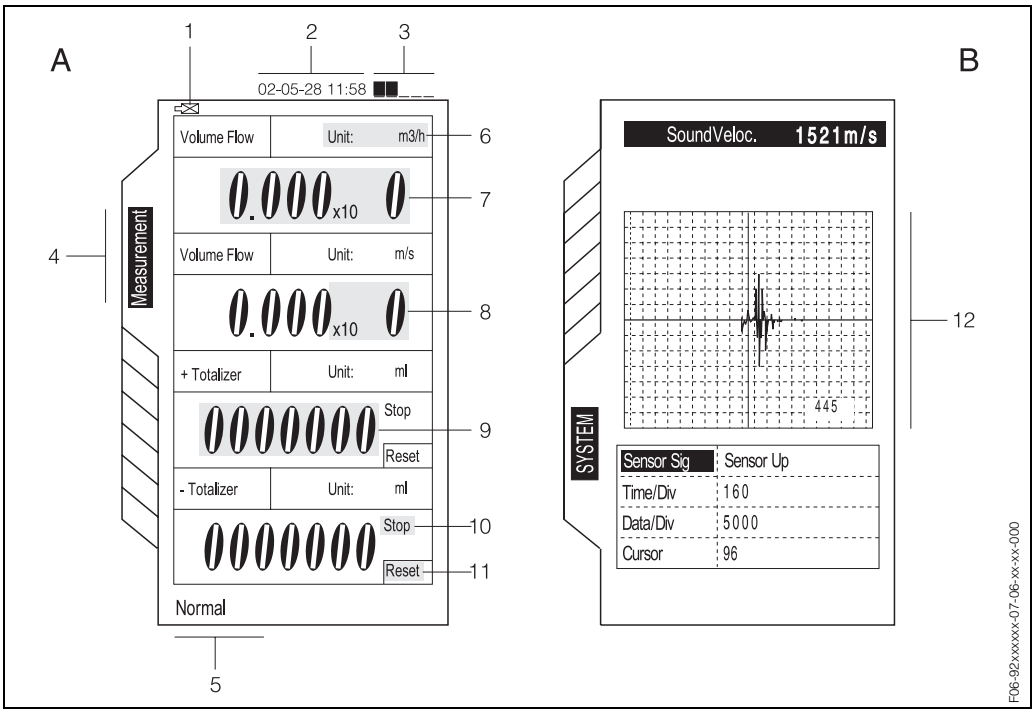


Fig. 29: Display (example)

1 ***Battery alarm***
When activating this instrument on the built-in battery, check whether the BATTERY ALARM is not displayed. If BATTERY ALARM is displayed, the power is turned OFF in about 20 minutes. For charging the battery see Page 29.

2 ***Instrument clock***
This instrument has a timer function. For the timer to set the time see Page 80. The timer function should be used based on this clock.

3 ***Indicator***
Shows the intensity of ultrasonic receiving signal. Check whether two or more indicators are displayed. If one or even no indicator is displayed, raise the burst voltage level as shown on Page 71. When the sensor is not connected, the indicator may be influenced by noise.

4 ***Function page***
You can use the ↓ and ↑ keys to scroll back and forth within the function pages.

Note!
When the cursor points to the MEASUREMENT group tab as displayed, the measurement screen is not active. Move the cursor onto the screen by pressing the → key.

5 ***Status display***
Check whether NORMAL is displayed. If another message is displayed after installing and connecting the sensors, take corrective actions as per Section 9 “Trouble-shooting”.

6 ***Unit of indication***
To change the units of flow rate and flow velocity on the MEASURE screen:
Move the cursor to UNIT by pressing the ↑ or the ↓ key. Press the ENT key and select any unit by pressing the ↑ or the ↓ key and confirm by pressing the ENT key again.

7 ***Instantaneous reading***
On the MEASUREMENT screen, instantaneous flow, instantaneous flow velocity, analog output and analog input can be displayed.
Two of these contents can be arbitrarily allocated to the 1st and 2nd stage. Allocation is accomplished by selection of UNIT (see "Unit of indication").
If a flow rate is displayed when the flow is stopped, see Page 72 ZEROPOINT ADJUST and Page 73 LOW FLOW CUT-OFF. If the flow display fluctuates, see Page 72 TIME CONSTANT.

8 ***Exponent***
How to read the exponent display:
x10 ***0*** *= 1 time*
x10 ***1*** *= 10 times*
x10 ***2*** *= 100 times*
Example: 1.200 x10 1 corresponds to 1.2 x 10 = 12

9 ***Integrated flow rate***
Totalizers for upstream and downstream flow (+Totalizer/-Totalizer) are displayed at the 3rd and 4th stage. Integrated flow rate value is available in the range from 0000000 to 9999999. If the value exceeds 9999999, it is automatically reset to 0000000.

10 ***Status display of totalizers***
STOP: Totalizing off
RUN: Totalizing in progress
To start the action of integration, refer to the TOTALIZER function described on Page 73.

11 ***Reset***
The starting value for integration can be set to 0 or any other numeric value. To reset to the preset starting value, move the cursor to RESET by pressing the ↑ or the ↓ key, and then press the ENT key. To reset to any value other than zero, see Page 73 function PRESET TOTALIZER.

12 ***Curve display***
Some values can be displayed as a curve as in this example SENSOR SIG (sensor upstream wave).

5.2 Operating elements

The operating elements illustrated below allow you to operate the Prosonic Flow 92 transmitter quickly and safely.

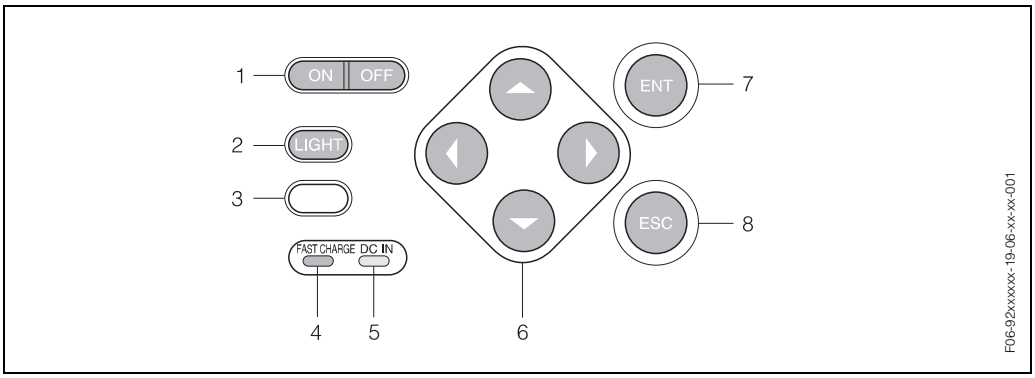


Fig. 30: Operating elements

1 ***ON/OFF switch***
To turn the power supply of the Prosonic Flow 92 transmitter ON or OFF.

2 ***LIGHT***
Turns the backlight of the display screen on or off.

3 *Not used*

4 ***Fast charge***
Red LED, turns ON while the battery is being charged. Flashes if the battery is fully charged.

5 ***DC IN***
Green LED, turns ON if power adapter is connected.

6 ***Cursor control***
↑ cursor upward = increments set value, etc.; ↓ cursor downward = decrements set value, etc.; ← cursor left = change scale, etc.; → cursor right = change scale, etc.

7 ***ENT (enter)***
Selected item etc. will be set or entry confirmed by pressing this key.

8 ***ESC (escape)***
Cancels setting, exit menu (function or function group).

5.3 Brief operating instructions for the function matrix

Note!
- See the general notes on Page 39.
- Descriptions of device functions → see Page 63

1. Power on → start-up approx. 10 sec. → entering function matrix, group MEASUREMENT
2. Select a group (e.g. SITE SETUP)
3. Select a function group (e.g. SITE DATA)
4. Select a function (e.g. PIPE MATERIAL)

   Change parameter / enter numerical values:
   Select or enter parameters, numerical values using cursor control, →, ↑, ↓, ←, ENT and ESC.

5. Exit the function matrix:
   Power off

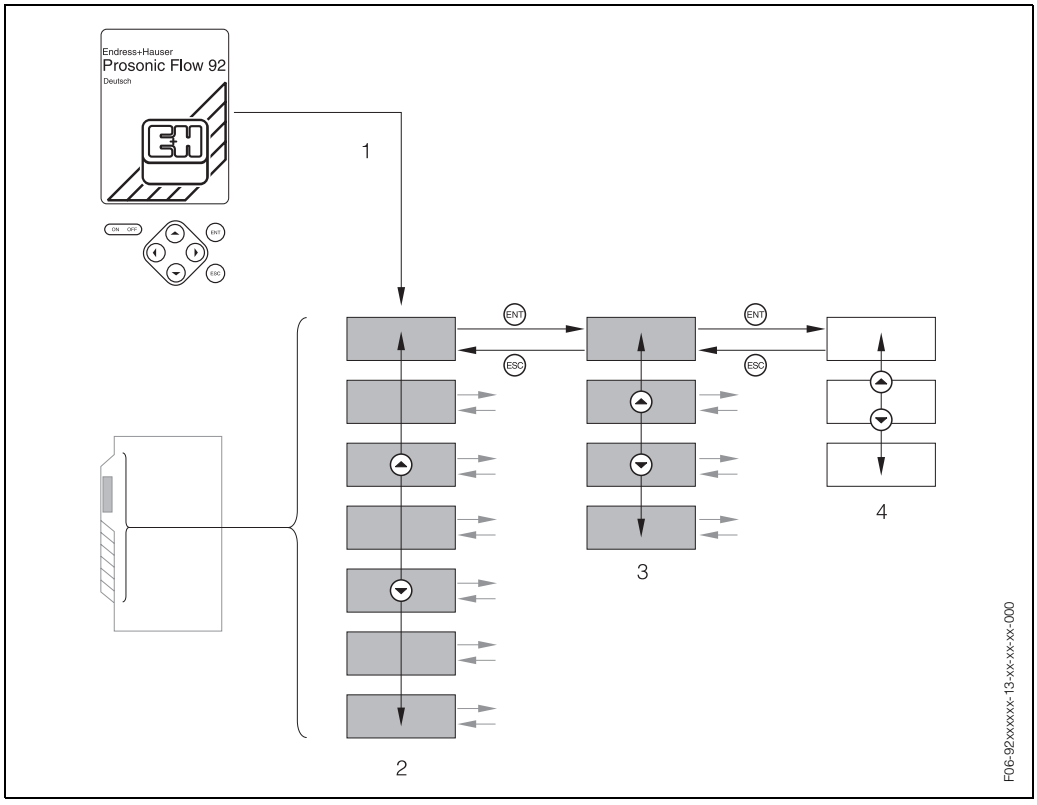


Fig. 31: Selecting functions and configuring parameters (function matrix)

1 Entering the function matrix
2 Selecting a group
3 Selecting a function group
4 Selecting a function level (1...3 sub-levels are possible depending on the function group)

Note!
To go from one group to the next, you must first activate the group navigator. To do so, use the ← key and then use the ↑ and ↓ keys to move up or down.

5.3.1 General notes

The Site Setup menu (see Page 42) is adequate for commissioning with the necessary standard settings. Complex measurement tasks on the other hand necessitate additional functions that you can configure as necessary and customise to suit your process conditions. The function matrix, therefore, comprises a multiplicity of additional functions which, for the sake of clarity, are arranged in groups, function groups and functions.

Comply with the following instructions when configuring functions :
- You select functions as described on Page 38.

Note!
- The transmitter continues to measure while data entry is in progress, i.e. the current measured values are output via the signal outputs in the normal way.
- If the power supply fails, all preset and parameterised values remain safely stored in a memory backup powered by a lithium battery.

Caution!
All functions are described in detail, including the function matrix itself, in the **"Description of device functions"** appendix which is a part of these Operating Instructions.

5.4 Error messages

Errors which occur during commissioning or measuring operation are displayed immediately. If two or more system or process errors occur, the error with the highest priority is always the one shown on the display. For "Error messages" see Page 50.

6 Commissioning

6.1 Function check

Make sure that all final checks have been completed before you start up your measuring point:
- "Post-installation check" checklist → Page 25
- "Post-connection check" checklist → Page 33

6.2 Commissioning

6.2.1 Switching on the measuring device

Switch on the device by pressing the ON key.

1. The start-up screen (A) appears on the local display.
2. The language selection (1) flashes for approx. 5 seconds. Press the ESC key during this time to select another language. The language selection display (B) appears. Use the ↓ or ↑ cursor to select the language required. Press the ENT key to complete the selection. The MEASUREMENT display (C) appears. The device is now operational.
3. If no language change is required, the device goes directly to the MEASUREMENT display (C) after approx. 5 seconds. The device is now operational.

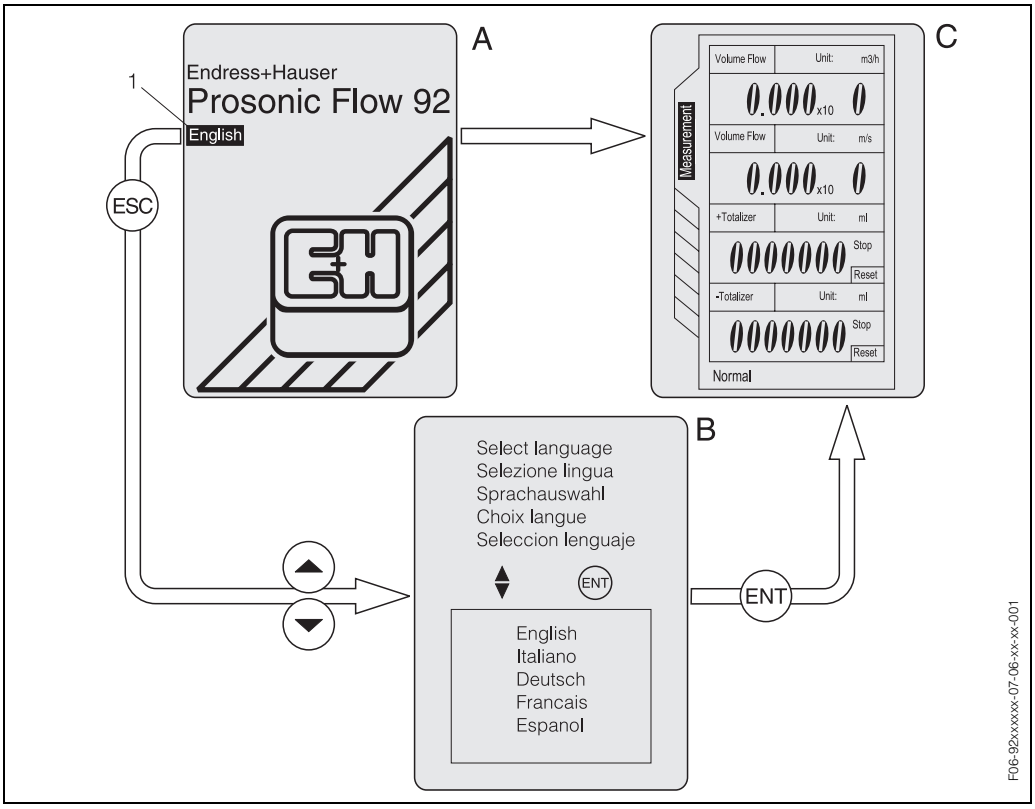


Fig. 32: Start-up screens after switching on the measuring device

1 = The set language flashes for approx. 5 seconds
A = Start-up screen
B = Display language selection
C = Display MEASUREMENT (HOME position)

6.2.2 “Commissioning” Site Setup menu

This Site Setup menu guides you systematically through the setup procedure for all the major device functions that have to be configured for standard measuring operation. Use this “Site Setup” as well to determine the sensor distance or the wire length required for sensor installation.

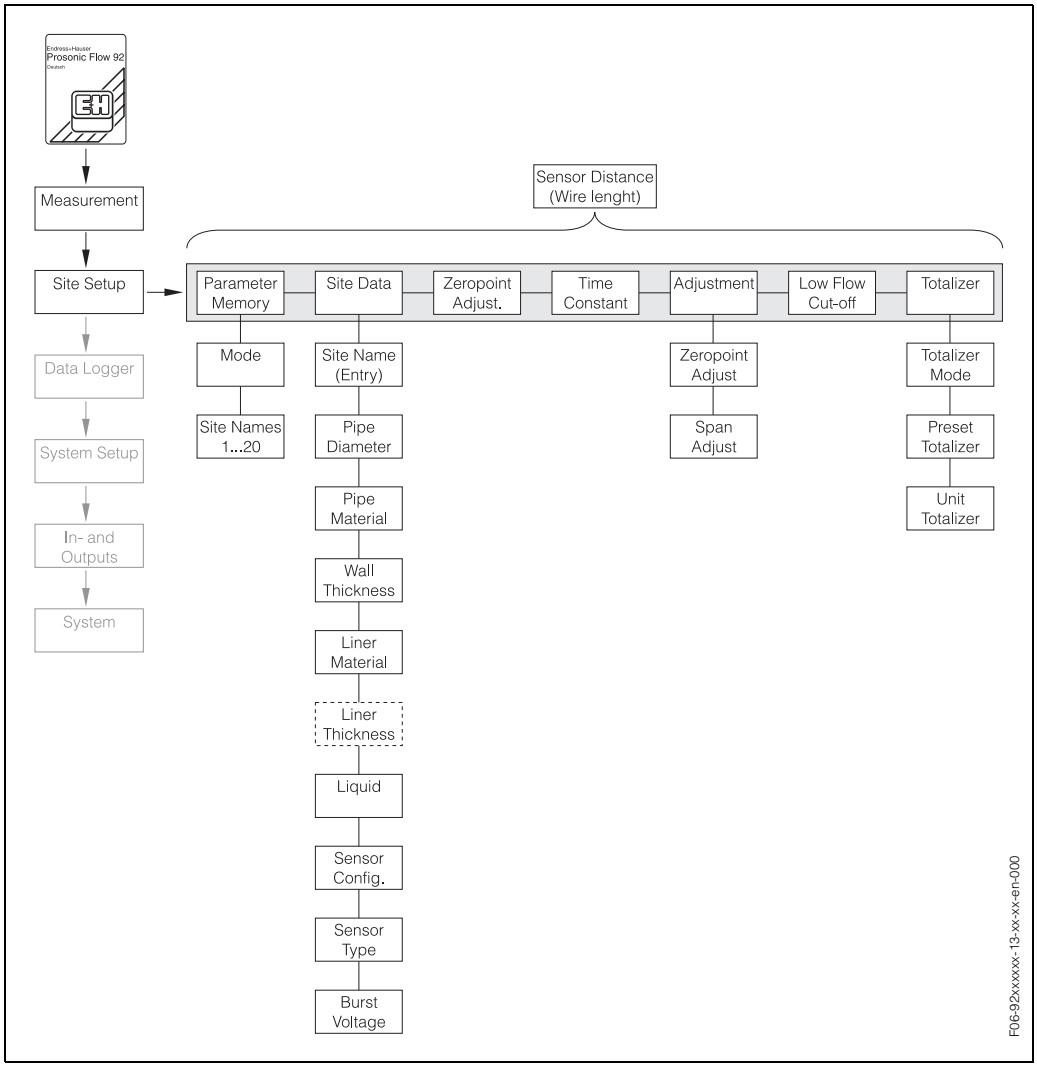


Fig. 33: Site Setup menu for straightforward configuration of the major device functions

6.2.3 Sensor distance or wire length for installing the sensors

To get the sensor distance or wire length required for sensor installation, enter all of the parameters displayed above for the “Site Data” function group. The result appears in the bottom section of the screen display for the “Site Setup” group.

Use this value for:
Installing the Prosonic Flow W, P sensors, see Page 20 and 22
Installing the Prosonic Flow U sensors, see Page 23

Note!
You need the sensor distance for 2/4 traverse installation. You need the wire length for single traverse installation.

6.2.4 Zero point adjustment

Zero point adjustment is generally **not** necessary.

Experience shows that zero point adjustment is advisable only in special cases:
- To achieve highest measuring accuracy even with very small flow rates.
- Under extreme process or operating conditions (e.g. high process temperatures or very high viscosity fluids).

Preconditions for a zero point adjustment
Note the following before you perform a zero point adjustment:
- Zero point adjustment can be performed only with fluids that have no gas or solid contents.
- Zero point adjustment is performed with the pipe completely filled and at zero flow (v = 0 m/s). This can be achieved, for example, with shut-off valves upstream and/or downstream of the measuring range or by using existing valves and gates (Fig. 34).
  – Standard operation → valves 1 and 2 open
  – Zero point adjustment *with* pump pressure → valve 1 open / valve 2 closed
  – Zero point adjustment *without* pump pressure → valve 1 closed / valve 2 open

Caution!
- If the fluid is very difficult to measure (e.g. containing entrained solids or gas) it may prove impossible to obtain a stable zero point despite repeated zero point adjustments. In instances of this nature, please contact your E+H service centre.
- You can view the zero point value currently valid using the “Zeropoint Adjust” function (see the “Description of device functions” appendix).

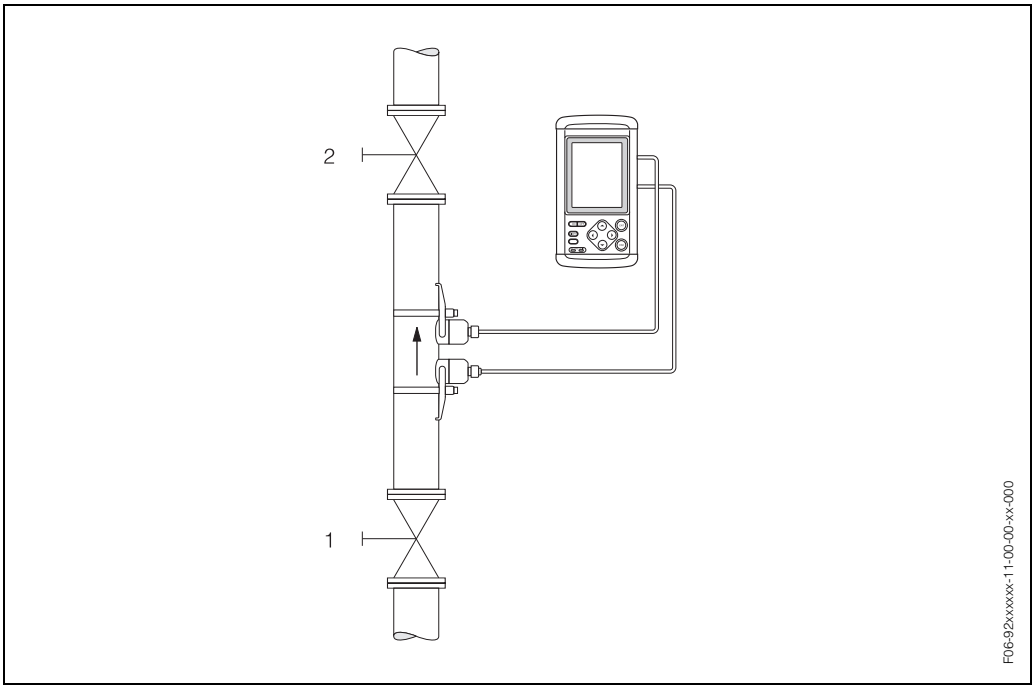


Fig. 34: Zero point adjustment and shut-off valves

Performing a zero point adjustment

1. Operate the system until normal operating conditions resume.
2. Stop the flow (v = 0 m/s).
3. Check the shut-off valves for leaks.
4. Check that operating pressure is correct.
5. Using the local display, select the “ZEROPOINT ADJUST” function in the function matrix:
   SITE SETUP → ZEROPOINT ADJUST → START

6.3 Data storage

If the power supply (via battery or adapter) fails, all the data are stored with the aid of a lithium battery.

Caution!
In normal usage, the battery has a service life of about 5 years. When the battery has reached the end of its service life, all data stored in the memory will be lost, see Section 9 “Trouble- shooting”.

For replacement, please contact E+H.

7 Maintenance

The Prosonic Flow 92 flow measuring system requires no special maintenance.

Exterior cleaning
When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing and the seals.

Coupling fluid
A coupling fluid (1) is required to ensure the acoustic coupling between the sensor and the piping. This is applied to the sensor surface (2/3) during commissioning. Replace the coupling fluid for each new measuring point.

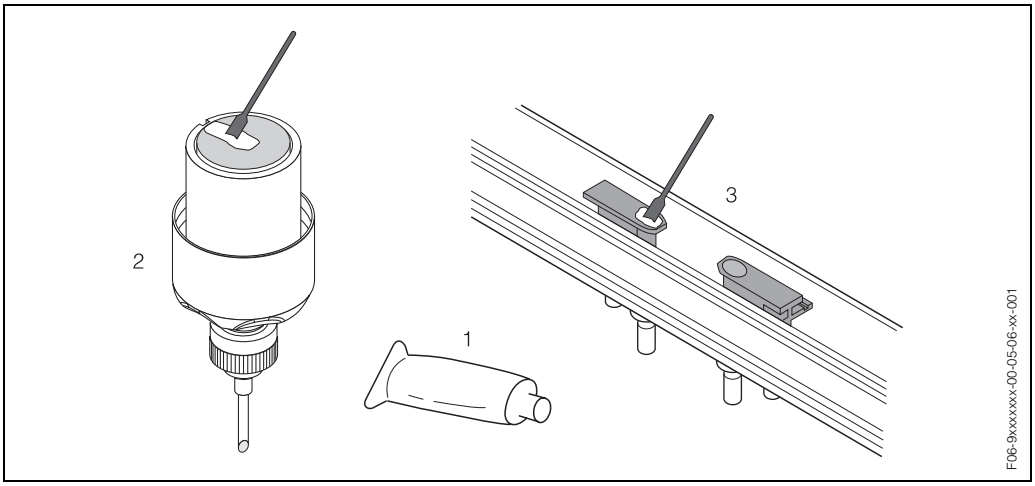


Fig. 35: Application of the coupling fluid

1 Coupling fluid
2 Sensor surface Prosonic Flow W, P
3 Sensor surface Prosonic Flow U

8 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor. The E+H service organisation can provide detailed information on the order codes of your choice.

Fig. 36: Accessories

Accessory	Description	Order code
Flow sensors Prosonic Flow W (1)	• –20...+80 °C (–4...175 °F); DN 100...4000 (4"...160") • –20...+80 °C (–4...175 °F); DN 50...300 (2"...12")	DK9WS – AA DK9WS – BA
Flow sensors Prosonic Flow P (1)	• 0...+170 °C (32...340 °F); DN 50...300 (2"...12")	DK9PS – FA
Flow sensors Prosonic Flow U (2)	• –20...+80 °C (–4...175 °F); DN 15...100 (0.6"...4") (incl. mounting rail)	DK9UF – A
Sensor holder set for Prosonic Flow W sensors (3)	• One pair of sensor holders, fixed retaining nut • One pair of sensor holders, removable retaining nut	DK9SH – A DK9SH – B
Adapter plug for Prosonic Flow W sensors (4)	• One pair of adapter plugs for Prosonic Flow W sensors, IP 54	DK9AP – A

Accessory	Description	Order code
Installation set for Prosonic Flow W, P, U sensors Sensor fastening (5)	• Without sensor fastening • Tensioning bands for U sensors DN 15...100 (0.6"...4") • Tensioning bands for W sensors DN 50...1500 (2"...59") • Tensioning bands for W sensors DN 1000...4000 (40"...160") • Tensioning bands for W sensors DN 50...300 (2"...12")	DK9MC – A* DK9MC – B* DK9MC – C* DK9MC – D* DK9MC – E*
Installation set for Prosonic Flow W, P sensors Mounting support tool (6)	• Without mounting support tool • Variable spacing ruler DN 50...600 (4"...24") • Traverse positioning tool, supports one traverse sensor installation	DK9IC – *1 DK9IC – *2 DK9IC – *3
Sensor cable set (7)	For Prosonic Flow W, P, U sensors: • 5 m BNC sensor cable, PVC, –20...+70 °C (–4...165 °F) • 10 m BNC sensor cable, PVC, –20...+70 °C (–4...165 °F) Only for Prosonic Flow W, P sensors: • 5 m BNC sensor cable, PTFE, –40...+170 °C (–40...340 °F) • 10 m BNC sensor cable, PVC, –40...+170 °C (–40...340 °F)	DK9SK – A DK9SK – B DK9BC – E DK9BC – F
Carrying case (8)	• Carrying case for transmitter, sensors and accessories	50102921
Acoustic coupling fluid (9)	• Wacker P –40...+80 °C (–40...175 °F) • Coupling medium 0...+170 °C (32...340 °F), standard • Water-soluble coupling medium –20...+80 °C (–4...175 °F) • SilGel –40...+130 °C (–40...266 °F) • Coupling medium –40...+80 °C (–40...175 °F), standard, type MBG2000	DK9CM – 1 DK9CM – 2 DK9CM – 4 DK9CM – 5 DK9CM – 7
Installation set, Clamp On for Prosonic Flow W sensors	Tensioning bands for permanent installation on big diameter pipes (DN 200...4000) suitable for use with W sensor holders. • Tensioning band DN 200...600 (8"...24") • Tensioning band DN 600...2000 (24"...80") • Tensioning band DN 2000...4000 (80"...160")	DK9IC – C1 DK9IC – D1 DK9IC – E1

9 Trouble-shooting

9.1 Trouble-shooting instructions

Always start trouble-shooting with the checklist below if faults occur after start-up or during operation. This takes you directly (via various queries) to the cause of the problem and the appropriate remedial measures.

Check the display	
No display visible and no output signals present.	1. Check supply voltage → see Page 56 2. Electronics defective → order spare part → contact E+H
No display visible, but output signals are present.	1. Display module defective → order spare part → contact E+H 2. Electronics defective → order spare part → contact E+H
Display texts are in a foreign language.	see Page 41
Measured value indicated, but no signal at the current output.	Electronics PCB defective → order spare part → contact E+H

▼

Error messages on display	
Errors that occur during commissioning or measuring mode are displayed immediately.	
Error message.	Error has occurred → Page 50

▼

Other error (without error message)	
Some other error has occurred.	Diagnosis and remedial measures → Page 51

9.2 Error messages

Serious system errors are **always** recognised by the instrument as “Fault messages”, and are shown on the display. Fault messages immediately affect the inputs and outputs.

Caution!
In the event of a serious fault, a flowmeter might have to be returned to the manufacturer for repair. The procedures on Page 8 must be carried out before you return a flowmeter to Endress+Hauser. Always enclose a fully completed “Declaration of Contamination” form. You will find a copy of the form at the back of these Operating Instructions.

Note!
Also observe the information on Page 39 and 52.

Error message	Error description	Remedy / spare part
Communication	No data transfer between internal modules or faulty internal data transfer.	Spare parts see Page 53 → contact E+H
Amplifier Fault	Amplifier board defective.	Replace the amplifier board. Spare parts see Page 53 → contact E+H
Amplifier Data	Amplifier data invalid.	Verify Site Setup data. Restart device.
Received Signal	The strength of received signals is changing.	– Check whether the application causes interference of the signal. – Check for air in the fluid. – Check for solid content. – Check for stable flow conditions.
Init. Run	Initialisation running.	Wait until the procedure is completed.
Signal Low	Attenuation of acoustic measurement section too high.	– Check to see if coupling fluid must be renewed. – It is possible that the fluid indicates too much attenuation. – Check the sensor distance (installation dimensions). – Reduce the number of traverses if possible.
Signal High	Received signal is too high.	Reduce burst voltage.
Error Current Output	Range current out exceeded.	Modify the range.
Backup Battery Fail.	The backup battery for setup and log data failed and needs to be exchanged.	Spare parts see Page 53 → contact E+H

9.3 Process errors without messages

Symptoms	Remedial measures
Note! You may have to change or correct certain settings in functions in the matrix in order to rectify faults. The functions outlined below, such as TIME CONSTANT, for example, are described in detail in the "Description of device functions" appendix.	
Flow values are negative, even though the fluid is flowing forwards through the pipe.	1. Check wiring → Page 27. If necessary, reverse the connections "SENSOR UP" and "SENSOR DOWN".
Measured value reading fluctuates even though flow is steady.	1. Check the fluid for presence of gas bubbles. 2. "TIME CONSTANT" function (see Page 72) → increase value
Measured value reading shown on display even though the fluid is at a standstill and the measuring tube is full.	1. Check the fluid for presence of gas bubbles. 2. Activate the "LOW FLOW CUT-OFF" function (see Page 73), i.e. enter or increase the value for the switching point.
The current output signal is always 4 mA, irrespective of the flow signal at any given time.	1. Low flow cut-off too high. Reduce the corresponding value in the "LOW FLOW CUT-OFF" function (see Page 73).
The fault cannot be rectified or some other fault not described above has occurred. In these instances, please contact your E+H service organisation.	The following options are available for tackling problems of this nature: **Request the services of an E+H service technician** If you contact our service organisation to have a service technician sent out, please be ready with the following information: – Brief description of the fault – Nameplate specifications (Page 9 ff.): order code and serial number **Returning devices to E+H** The procedures on Page 8 must be carried out before you return a flowmeter requiring repair or calibration to Endress+Hauser. In all cases, enclose a duly completed "Declaration of Contamination" form with the flowmeter. You will find a copy of the form at the back of these Operating Instructions.

9.4 Response of outputs to errors

Note!
The failsafe mode of current outputs can be customised by means of various functions in the function matrix. You will find detailed information on these procedures in the "Description of device functions" appendix (see Section 11).

Low flow cut-off and failsafe mode:
You can use "low flow cut-off" to set the signal of the current output to its fallback value, for example when measuring has to be interrupted while a pipe is being cleaned. This function takes priority over all other device functions. Simulations, for example, are suppressed.

Failsafe mode of outputs		
	Process/system error is present	Low flow cut-off is activated
Caution! System or process errors have no effect whatsoever on the inputs and outputs. See the information on Page 39 ff.		
Current output	Hold Value 4...20 mA → Last measured value *MIN. CURRENT* 4–20 mA → 0.8 mA *MAX. CURRENT* 4–20 mA → 23.2 mA *ZERO* 4...20 mA → 4 mA	Output signal corresponds to "zero flow"

9.5 Spare parts

Section 9.1 contains a detailed trouble-shooting guide. The measuring device, moreover, provides additional support in the form of continuous self-diagnosis and error messages. Trouble-shooting can entail replacing defective components with tested spare parts. The illustrations below show the available scope of spare parts.

✎ Note!
You can order spare parts directly from your E+H service organisation by providing the serial number printed on the nameplates (see Page 9).

Spare parts are shipped as sets comprising the following parts:
- Spare part
- Additional parts, small items (threaded fasteners, etc.)
- Mounting instructions
- Packaging

Transmitter spare parts

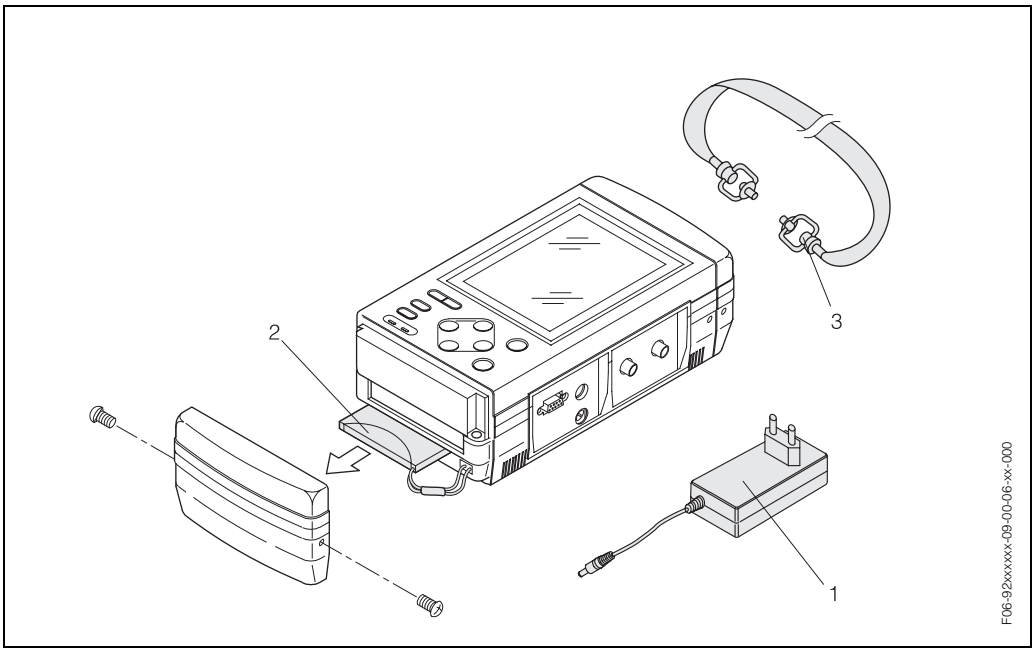


Fig. 37: Spare parts for Prosonic Flow 92 transmitter

1 Power adapter
2 Battery pack
3 Carrying strap

The Prosonic Flow 92 transmitter is also available as a replacement device. Please contact your nearest E+H service organisation.

9.6 Replacing the device fuse

Please contact your local E+H representative if the device fuse is defective.

9.7 Replacement of built-in battery

The built-in battery is a special Ni-Cd type of battery. This battery can be charged approx. 500 times in its service life. Proceed as follows to replace a used battery:

1. Remove the two Phillips screws (1) in the lower housing cover.
2. Remove the housing cover (2).
3. Disconnect the battery plug (3).
4. Carefully remove the battery (4) from the transmitter and replace it with a new one.

Note!
You can order spare parts directly from your E+H service organisation by providing the serial number printed on the nameplates (see Page 9).

5. Installation is the reverse of the removal procedure.

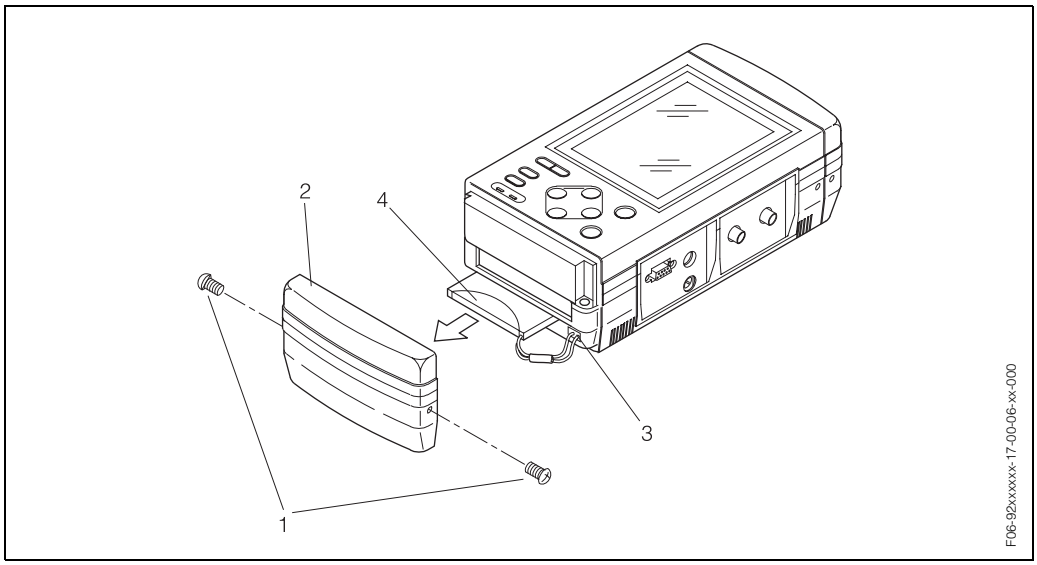


Fig. 38: Replacing the built-in battery.

9.8 Software history

Software version / date	Changes to software	Documentation changes/additions
Amplifier		
V 1.00.00 / 06.2002	Original software.	–
V 1.01.00 / 01.2004	Software expansion: New functionalities	• Expansion • Selection table fluids

Note!
Usually, an upload or download between the different software versions is only possible at Endress+Hauser. Please contact your nearest E+H service organisation.

10 Technical data

10.1 Brief technical data guide

10.1.1 Application

- Measuring the flow rate of fluids in closed piping systems.
- Applications in measuring, control and regulation technology for temporary process surveying.

10.1.2 Function and system design

Measuring principle	Prosonic Flow 92 operates on the principle of transit time difference.
Measuring system	The flow measuring system consists of a transmitter and sensors. *Transmitter:* • Prosonic Flow 92 *Flow measuring sensors:* • Prosonic Flow W for nominal diameters DN 50...4000 • Prosonic Flow U for nominal diameters DN 15...100 • Prosonic Flow P for nominal diameters DN 50...300

10.1.3 Input

Measured variable	Flow velocity (transit time difference proportional to flow velocity)
Measuring range	Prosonic Flow W, P, U sensors typically v = 0...7 m/s with the specified measuring accuracy
Operable flow range	Over 70 : 1
Input signal	Current input: 4...20 mA, galvanically not isolated

10.1.4 Output

Output signal	Current output: Active 4...20 mA, R_L = 0...1 kW, galvanically isolated (from ground and analog input)
Signal on alarm	Current output → failsafe mode selectable
Load	See “Output signal”
Low flow cut-off	Switch point for low flow cut-off is selectable.
Galvanic isolation	All circuits for outputs and power supply are galvanically isolated from each other.

10.1.5 Power supply

Electrical connection	see Page 27 ff.
Potential equalisation	see Page 33
Cable entry	see Page 32 Power supply connection: • Standard power supply cable connection Signal cable connection: • Circular connector, 4 pin Sensor cable connection: • BNC connector
Cable specification	see Page 27
Supply voltage	Transmitter: • Built-in battery Special type Ni-Cd battery Continuous operation time up to 5 hours (backlight OFF) Recharging time 3 hours (power adapter used) • Special type power adapter 100...240 V AC, 47...63 Hz Flow measuring sensors: • Powered by the transmitter
Power consumption	DC: < 12 W (incl. sensors)
Power supply failure	Memory backup with lithium battery (lifetime approx. 5 years)

10.1.6 Performance characteristics

Reference operating conditions	• Liquid temperature: +28 °C ± 2 K • Ambient temperature: +22 °C ± 2 K • Warm-up period: 30 minutes Installation: • Inlet run >10 x DN • Outlet run > 5 x DN • Sensors grounded. • The measuring sensors are correctly installed.

Maximum measured error

For flow velocities between 0.5 m/s and 7 m/s and a Reynolds number of >10000, the system accuracy is:

± 0.5 % o.r. (of current reading)

The system is dry calibrated. The calibration factor by dry calibration is calculated based on the actual pipe and liquid properties. This dry calibration procedure results in an additional uncertainty for the measurement. The resulting accuracy of the measurement therefore is better than 2 % typically.
The zero point instability is < 10 mm/s.

Repeatability

Max. ± 0.3% for flow velocities > 0.5 m/s

10.1.7 Operating conditions

Installation

Installation instructions

Any orientation (vertical, horizontal)
Restrictions and additional installation instructions → Page 14 ff.

Inlet and outlet run

see Page 15

Length of connecting cable

Shielded cables are offered in the following lengths:
5 m and 10 m

Note!
Route the cable well clear of electrical machines and switching elements.

Environment

Ambient temperature range

- Transmitter Prosonic Flow 92:
  –10...+45°C

- Flow measuring sensors Prosonic Flow W, U:
  –20...+60 °C
- Flow measuring sensors Prosonic Flow P:
  0...+170 °C

- Sensor cable PVC:
  –20...+70 °C
- Sensor cable PTFE (only for Prosonic Flow W/P):
  –40...+170 °C

Avoid direct sunlight, particularly in warm climatic regions.

Storage temperature

The storage temperature corresponds to the operating temperature range of the transmitter and the appropriate flow measuring sensors and the corresponding sensor cable (see above).

Degree of protection	• Transmitter Prosonic Flow 92: IP 50 • Flow measuring sensors Prosonic Flow W, P: – Sensor in IP 54, if BNC adapter and BNC cable fully engaged. – Sensor in IP 67/68 (NEMA 4X / NEMA 6P), if Prosonic Flow sensor cable fully engaged. Caution! The BNC adapter resp. the cable connection defines the W (P) sensors specification for the degree of protection (IP 54). • Flow measuring sensors Prosonic Flow U: IP 54
Shock and vibration resistance	As per IEC 68-2-6
Electromagnetic compatibility (EMC)	As per EN 61326/A1 (IEC 1326) “Emission to class A requirements”
	Process
Medium temperature range	• Flow measuring sensors Prosonic Flow W, U: –20...+80 °C • Flow measuring sensors Prosonic Flow P: 0...+170 °C
Medium pressure range (nominal pressure)	Perfect measurement requires that the static fluid pressure is higher than vapour pressure.
Pressure loss	There is no pressure loss.

10.1.8 Mechanical construction

Design, dimensions	see Page 61 ff.
Weight	Transmitter housing Prosonic Flow 92: • Handheld housing: 1.5 kg Flow measuring sensors: • Flow measuring sensors W, P incl. sensor holders and tensioning band: 2.8 kg • Flow measuring sensors U incl. tensioning bands: 0.6 kg

Material

Transmitter housing Prosonic Flow 92:
- Handheld housing: plastic case

Standard designations of the materials (measuring sensors P / W / U / DDU 18 / DDU 19):

	DIN 17660	UNS
Standard sensor cable – Cable connector (nickled brass) – Cable sheath	2.0401 PVC	C38500 PVC
	DIN 17440	**AISI**
Sensor housing W / P / DDU 18 / DDU 19	1.4301	304
Sensor holder W (Clamp on)	1.4308	CF-8
Sensor housing U (Clamp On)	Plastic	
Frame end-piece for U sensor	Plastic	
Sensor contact surface	Chemical resistant plastic	
Metal tensioning bands	1.4301	304
Tensioning bands	textile	
High temperature sensor cable – Cable connector (stainless steel) – Cable sheath	1.4301 PTFE	304 PTFE
	DIN EN 573-3	**ASTM B3221**
U sensor fixation bar – Cast aluminum	EN AW-6063	AA 6063

Sensor cables
- PVC / PTFE

10.1.9 Human interface

Display elements
- Liquid crystal graphic display 240 x 320 dot (with backlight)
- Custom configurations for presenting different measured value and status variables
- Supported language for display: English, German, French, Italian and Spanish

Operating elements

9 pushbuttons:
ON, OFF, ←, ↑, →, ↓, ESC, ENT, LIGHT

Serial communication

RS-232C (not isolated)
- Transmission speed: max. 9600 BPS
- Max. cable length: 15 m

Logging functions:
- Site data (name, piping, fluid, sensor installation method, type of sensor) for up to 20 sites
- A maximum of 40000 data points (time, velocity, flow rate, totals, analog input, status) can be stored in the memory.

10.1.10 Certificates and approvals

CE approval

The measuring system is in conformity with the statutory requirements of the EC Directives.
Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

Other standards and guidelines

EN 60529:
Degrees of protection by housing (IP code)

EN 61010
Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.

EN 61326/A1 (IEC 1326) “Emission to class A requirements”
Electromagnetic compatibility (EMC requirements)

The power adapter is approved according to UL/UL-C and IEC 950.

10.1.11 Ordering information

The E+H service organisation can provide detailed ordering information and information on the order codes on request.

10.1.12 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the flow measuring sensors (see Page 47). The E+H service organisation can provide detailed information on the order codes of your choice.

10.1.13 Documentation

- System Information Prosonic Flow 92 (SI 038D/06/en)
- Technical Information Prosonic Flow 92 (TI 060D/06/en)

10.2 Dimensions of portable transmitter

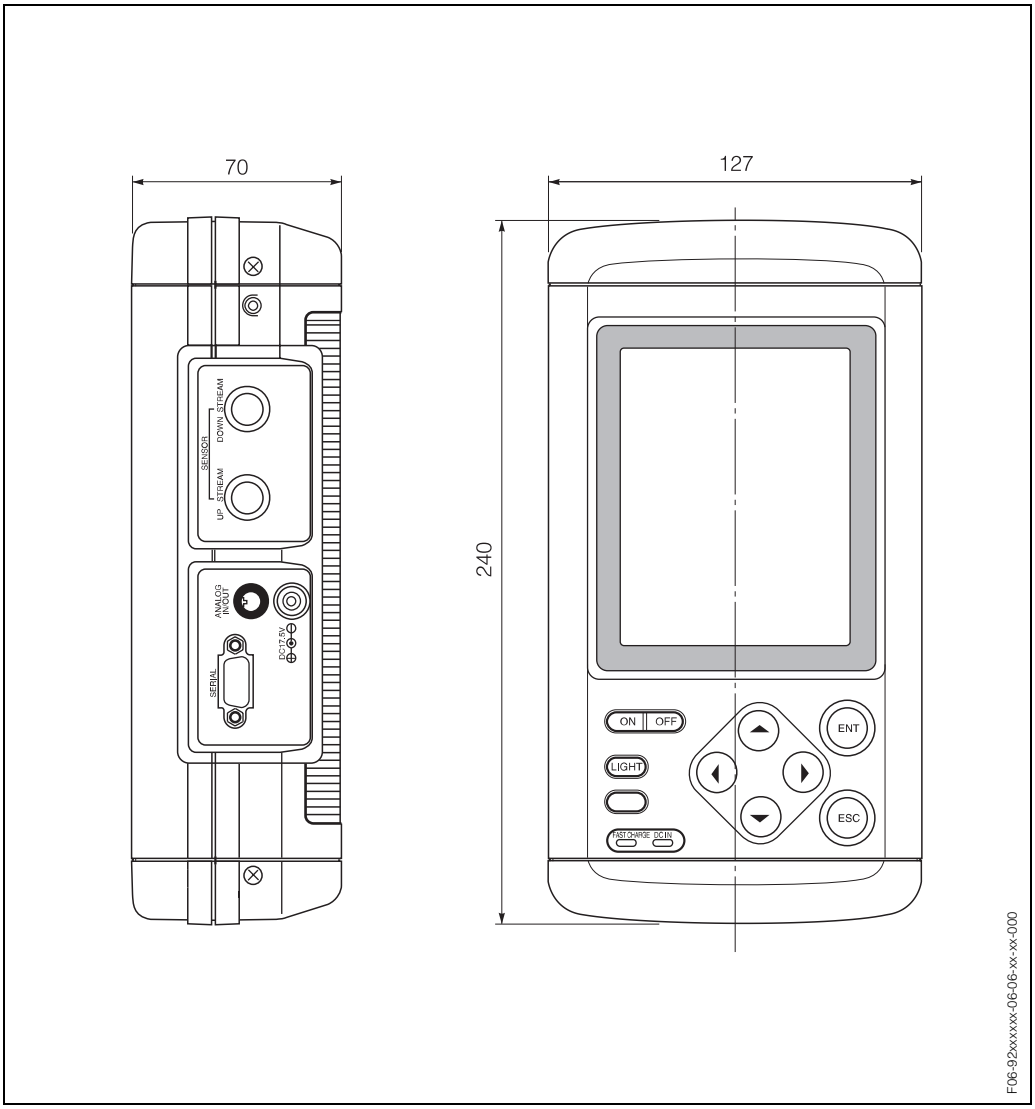


Fig. 39: Dimensions of handheld transmitter housing

10.3 Dimensions of W, P sensors

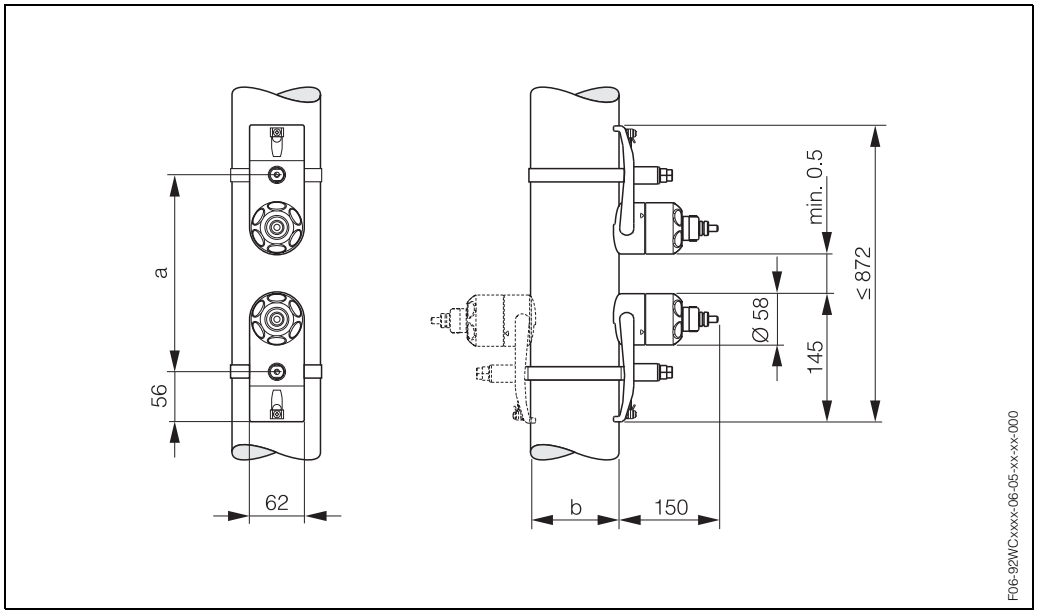


Fig. 40: Dimensions of W, P sensors

a = Sensor distance can be determined using Site Setup
b = Pipe outer diameter (defined by the application)

10.4 Dimensions of U sensors

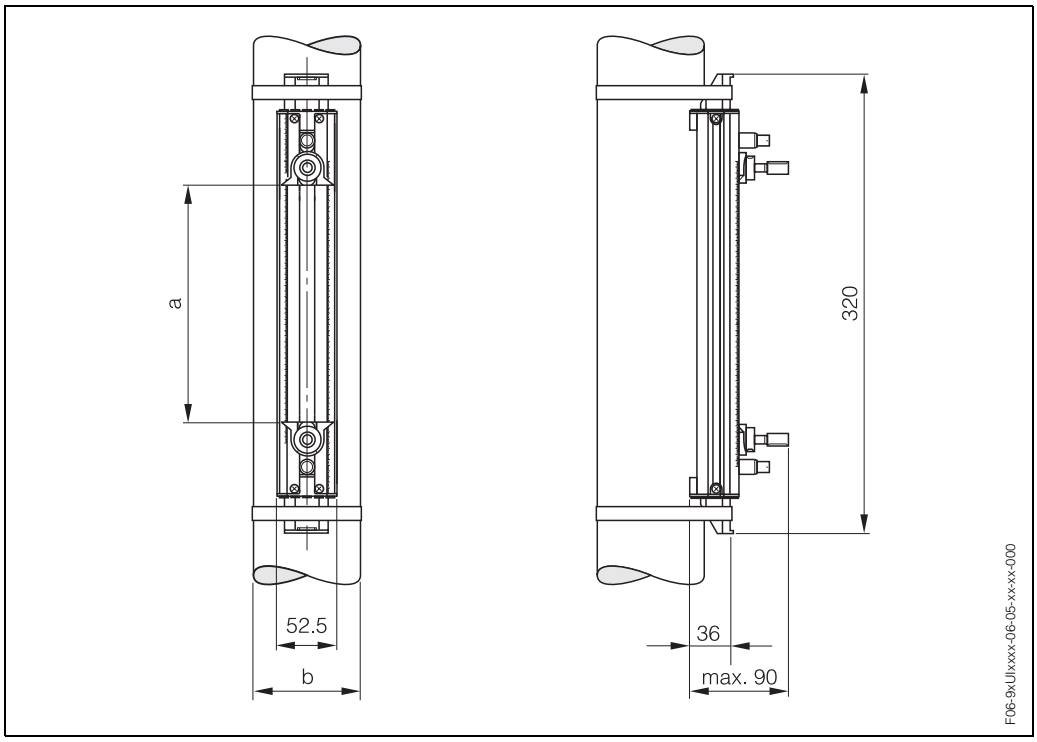


Fig. 41: Dimensions of U sensors

a = Sensor distance can be determined using Site Setup (0...135 mm)
b = Pipe outer diameter (defined by the application)

11 Description of device functions

There are various ways of locating the description of a function of your choice in the manual:

11.0.1 Using the table of contents to locate a group of the device functions

The table of contents provides you with a list of all the function matrixes as well as the groups and device functions.
The table of contents is on Page 5.

11.0.2 Using the graphic of the function matrix to locate a function description

This step-by-step, top-down approach starts with the groups, the highest level of the matrix, and works down through the matrix to the description of the function you need:

1. All available groups and their corresponding function groups are illustrated on Page 64. Select the group (or the function group within the group) which you need for your application and use the page reference to locate the information corresponding to the next level.
2. The page in question contains a graphic showing the group with all its subordinate function groups and functions.
   Select the function which you need for your application and use the page reference to locate the detailed function description.

11.0.3 Using the index to locate all function descriptions

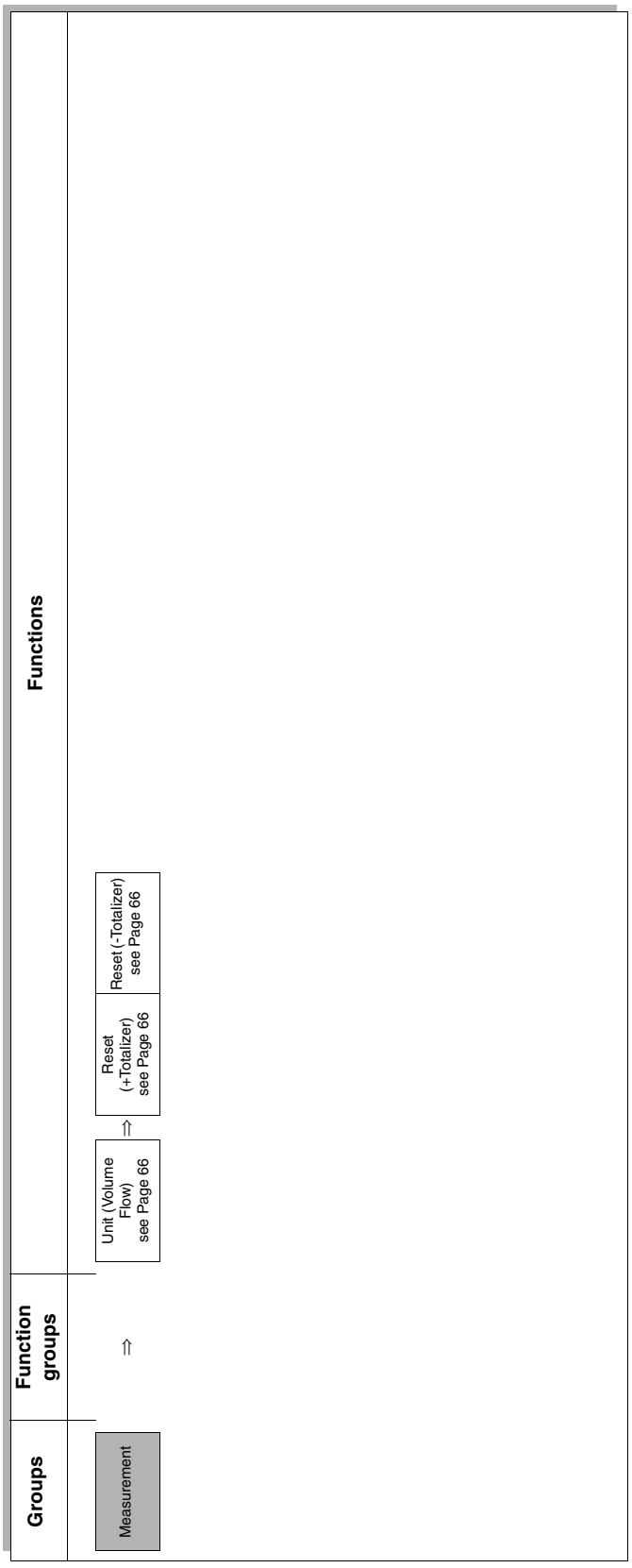
The designations of all the cells in the function matrix are listed in the index. You can use these designations (such as Site Name, Sensor Type, Totalizer Mode, etc.), to choose whichever functions are applicable to a particular set of conditions. The page references show you exactly where to find the detailed descriptions of the functions in question.
All the “cells” of the function matrix can be found in the index using the following key words:
- Groups
- Function groups
- Functions

The index is on Page 93.

11.1 Function matrix Prosonic Flow 92

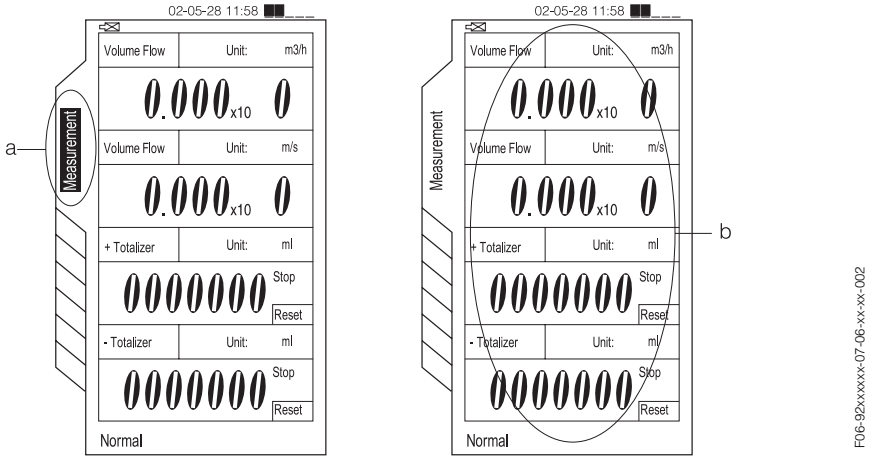
Groups	Function groups	
Measurement (see Page 65)		
Site Setup (see Page 67)	**Parameter Memory**	→ Page 68
	Site Data	→ Page 69
	Zeropoint Adjust	→ Page 72
	Time Constant	→ Page 72
	Adjustment	→ Page 72
	Low Flow Cut-Off	→ Page 73
	Totalizer	→ Page 73
Data Logger (see Page 74)	**Oper. Mode**	→ Page 75
	Log Name	→ Page 75
System Setup (see Page 79)		
Inputs and Outputs (see Page 83)		
System (see Page 89)	**Fault Message**	→ Page 90
	Signal Check	→ Page 91
	Simulation Current	→ Page 92
	SW-Rev. Amplifier	→ Page 92

11.2 Group matrix MEASUREMENT

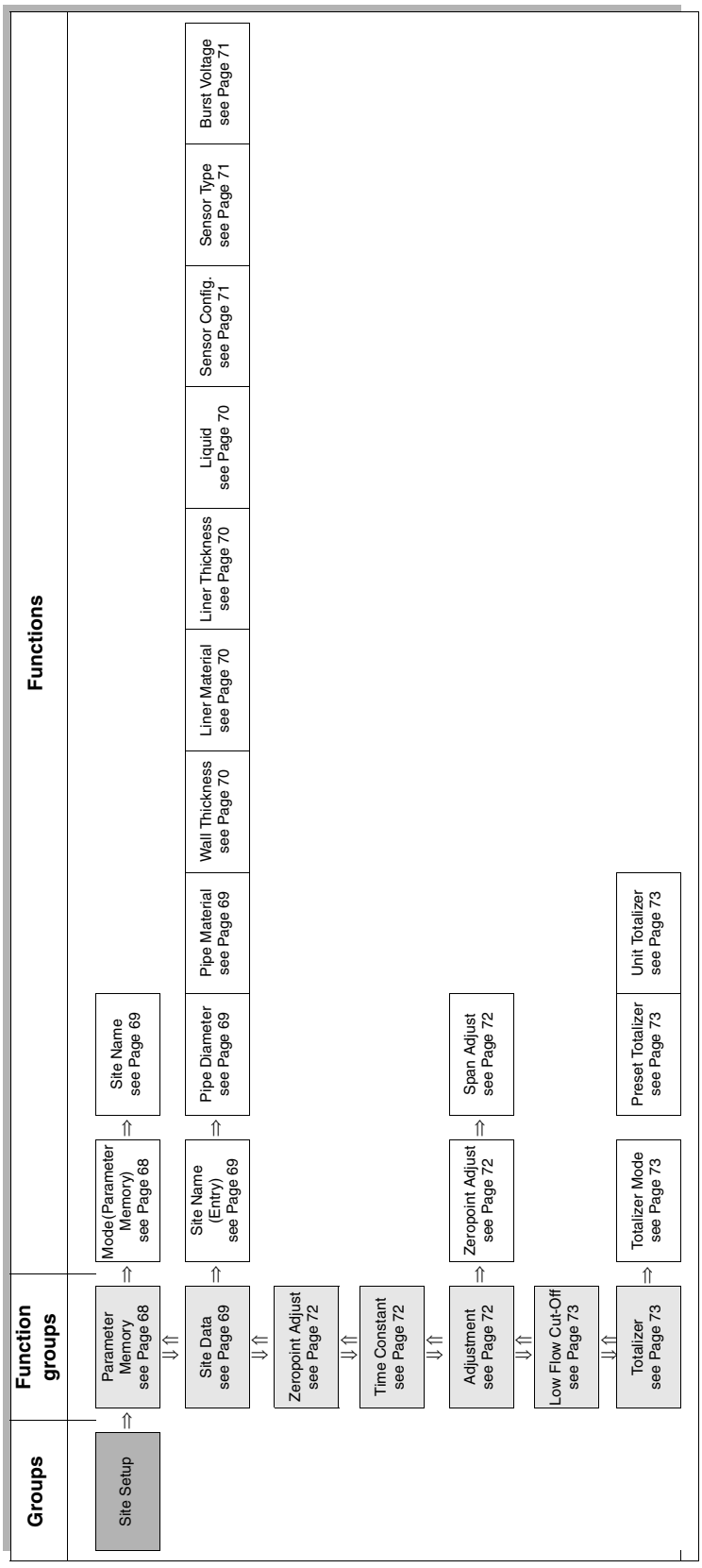


11.2.1 Group MEASUREMENT

Measurement ⇒ **Function**

Measurement	
Note! When the cursor points to the MEASUREMENT group tab (a), the measurement screen is not active. Move the cursor onto the screen by pressing the → key (b).  	
Unit	Use this function to select the unit for displaying the volume flow or the flow velocity. The unit you select here is also valid for the current output. *Metric options:* L/s – L/min – L/h – ML/d – m3/s – m3/min – m3/h – Mm3/d – BBL/s – BBL/min – BBL/h – MBBL/d – m/s – AI % – AO % *US options:* gal/s – gal/min – gal/h – Mgal/d – ft3/s – ft3/min – ft3/h – Mft3/d – BBL/s – BBL/min – BBL/h – MBBL/d – ft/s – AI % – AO % *Factory setting:* – Volume flow: L/s – Flow velocity: m/s
Reset (+Totalizer)	If you activate this function, the value of the +Totalizer (forward flow) is set to the value which is defined in PRESET TOTALIZER, see Page 73.
Reset (-Totalizer)	If you activate this function, the value of the -Totalizer (reverse flow) is set to the value which is defined in PRESET TOTALIZER, see Page 73.

11.3 Group matrix SITE SETUP



11.3.1 Group SITE SETUP

Site Setup	⇒	Parameter Memory	⇒	Function
	⇒	Site Data	⇒	Function
	⇒	Zeropoint Adjust	⇒	Function
	⇒	Time Constant	⇒	Function
	⇒	Adjustment	⇒	Function
	⇒	Low Flow Cut-Off	⇒	Function
	⇒	Totalizer	⇒	Function

Site Setup

Site Setup	Parameter Memory
The function group “PARAMETER MEMORY” serves for entry and recovery of all site data and assists during commissioning of the measurement.	
Mode (Parameter Memory)	Use this function to select the operating mode of the parameter memory: *Options:* SAVE – LOAD – DELETE The selection of operating mode is used to operate the respective function in the selection table “NO. / SITE NAME” which is displayed at the bottom section of the screen. Change to the selection table after selecting the operating mode by means of the ↓ key and enable the desired data set by pressing “ENT”. SAVE A data set of Site Setup data is saved by selecting the desired No. in the selection table by means of the ↓ and ↑ keys and consecutively pressing the “ENT” key once. Herewith the set of site date which has been defined in the function group “SITE DATA” will be stored at the number selected. Caution! If a different name is already displayed in the column “SITE NAME”, the number in question is occupied with a set of site data. Executing the command “SAVE” will overwrite the existing set of data. LOAD The operating mode “LOAD” calls up an already existing set of site data which is stored in the parameter memory. The data are automatically transferred and loaded into the function group “SITE DATA” and enabled for use. The name of the data set selected is displayed in the field “LOAD NAME”. DELETE Caution! The selected data set with site data will be erased irreversibly from the data memory when performing the selection described next. Deleting the definition and parameters of a specific measurement site is performed through selecting the respective set of data in the selection table by means of the ↓ and ↑ keys and consecutively pressing the “ENT” key once. *Factory setting:* SAVE

Site Setup	Parameter Memory
The function group “PARAMETER MEMORY” serves for entry and recovery of all site data and assists during commissioning of the measurement.	
Site Name	An empty line in column “SITE NAME” indicates that there is no data set available at the respective number. Start defining a new measurement site in the function group “SITE DATA” (see Page 69).
Site Setup	**Site Data**
The function group “SITE DATA” serves for entry of all site data and assists during commissioning of the measurement.	
Site Name (Entry)	Choose this function for entering the name of the measurement site. An alphanumeric on-screen keyboard will assist you during entry. Choose “EXIT” to complete the entry and close the on-screen keyboard.
Pipe Circumference	Use this function to enter the outer circumfernce of the pipe. *User input (Metric):* Fixed-point number 40.00...19200.00 mm *User input (US):* Fixed-point number 1.5000...760.0000 inch *Factory setting:* 190.06 mm / 7.5000 inch
Pipe Diameter	Use this function to enter the outer diameter of the pipe. *User input (Metric):* Fixed-point number 13.00...6100.00 mm *User input (US):* Fixed-point number 0.5000...240.0000 inch *Factory setting:* 60.0 mm
Pipe Material	Use this function to enter the pipe material. *Options:* CARBON STEEL – STAINLESS STEEL – CAST IRON – COPPER – PVC – ALUMINIUM – DUCTILE IRON – ASBESTOS CEMENT – GRP – PEEK – PVDF – ACRYLIC GLASS – OTHER Note! • If “OTHER” is selected, the sound velocity can be entered in m/s (metric) or ft/s (US). • If a liquid apart from “OTHER” is selected, the temperature of the fluid must be entered. *Factory setting:* PVC

Site Setup	Site Data
Wall Thickness	Use this function to enter the thickness of the pipe wall. *User input (Metric):* Fixed-point number 0.01...100.00 mm. *User input (US):* Fixed-point number 0.0004...4.000 inch *Factory setting:* 4.5 mm
Liner Material	Use this function to select the liner material of the pipe. *Options:* NO LINER – TAR EPOXY – MORTAR – RUBBER – TEFLON – GLASS PYREX – PVC – OTHER Note! If “OTHER” is selected, the sound velocity can be entered in m/s (metric) or ft/s (US). *Factory setting:* NO LINER
Liner Thickness	Use this function to enter the thickness of the liner. *User input (Metric):* Fixed-point number 0.01...100.00 mm. *User input (US):* Fixed-point number 0.0004...4.000 inch
Liquid	Use this function to select the liquid in the pipe. *Options:* WATER – SEAWATER – DISTILLED WATER – AMMONIA – ALCOHOL – BENZENE – BROMIDE – ETHANOL – GLYCOL – KEROSENE – MILK – METHANOL – TOLUOL – LUBRICATING OIL – FUEL OIL– PETROL – OTHER If “OTHER” is selected, the sound velocity can be entered in m/s (metric) or ft/s (US) and the viscosity in mm^2/s (metric) or ft^2/s. *Factory setting:* WATER
Temperature	Use this function to enter the process temperature of the selections liquid. *User input:* Fixed-point number 0...300.00 °C *Factory setting:* 20.0 °C

Site Setup	Site Data
Sensor Config.	Use this function to select the configuration for the ultrasonic sensors, e.g. the number of traverses. *Options:* 1 traverse 2 traverse 4 traverse *Factory setting:* 2 traverse
Sound Velovity	This line displays the calculated sound velocity for the liquid, i. e. the calculated value resulting from the selections liquid and temperature which was made in the liquid menu. In case of Liquid “Others” will the display show the numbers entered in the menu “Others”.
Viscosity	This line displays the calculated viscocity for the liquid, i. e. the calculated value resulting from the selections liquid and temperature which was made in the liquid menu. In case of Liquid “Others” will the display show the numbers entered in the menu “Others”.
Sensor Type	Please enter the sensor type you connected here. *Options:* W-CL-1F-L-B W-CL-2F-L-B P-CL-1F-L-B P-CL-2F-L-B P-CL-1F-M-B P-CL-2F-M-B U-CL-2F-L-A *Factory setting:* U-CL-2F-L-A Note! The U sensor is designed for 2 traverses only. Please ensure that “NO. TRAVERSE: 2” is selected for the number of traverses in the SENSOR CONFIGURATION function (see Page 71).
Burst Voltage	Use this function to select the burst voltage. *Options:* x1 – x2 – x4 – x8 *Factory setting:* x1
Note! After completing all entries, exit the function group “SITE DATA” by pressing the “ESC” key. The sensor distance required for the installation of clamp-on sensors will be displayed in the bottom screen section of the group “SITE SETUP”.	

Site Setup	Zeropoint Adjust
This function enables a zero point adjustment to be carried out manually. *Options:* START – MANUAL Before carrying this out, please refer to the chapter ZERO POINT ADJUSTMENT on Page 43 for a detailed description of the procedure for zero point adjustment. START Use this calibration function to perform an automatic zero point adjustment at 0.0 m/s flow velocity. MANUAL Use this function only if the zero point adjustment via the START function is not possible, e.g. with a flow velocity > 0.1 m/s. The display values will be cleared and reset to 0 m/s manually. Note: The MANUAL setting does not perform an automatic zero point adjustment but rather allows you enter the value for the zero point in the “Zeropoint Adjust” function numerically as a deviation of the flow velocity. See the “Site Setup - Adjustment” function on Page 72 *Factory setting:* MANUAL	

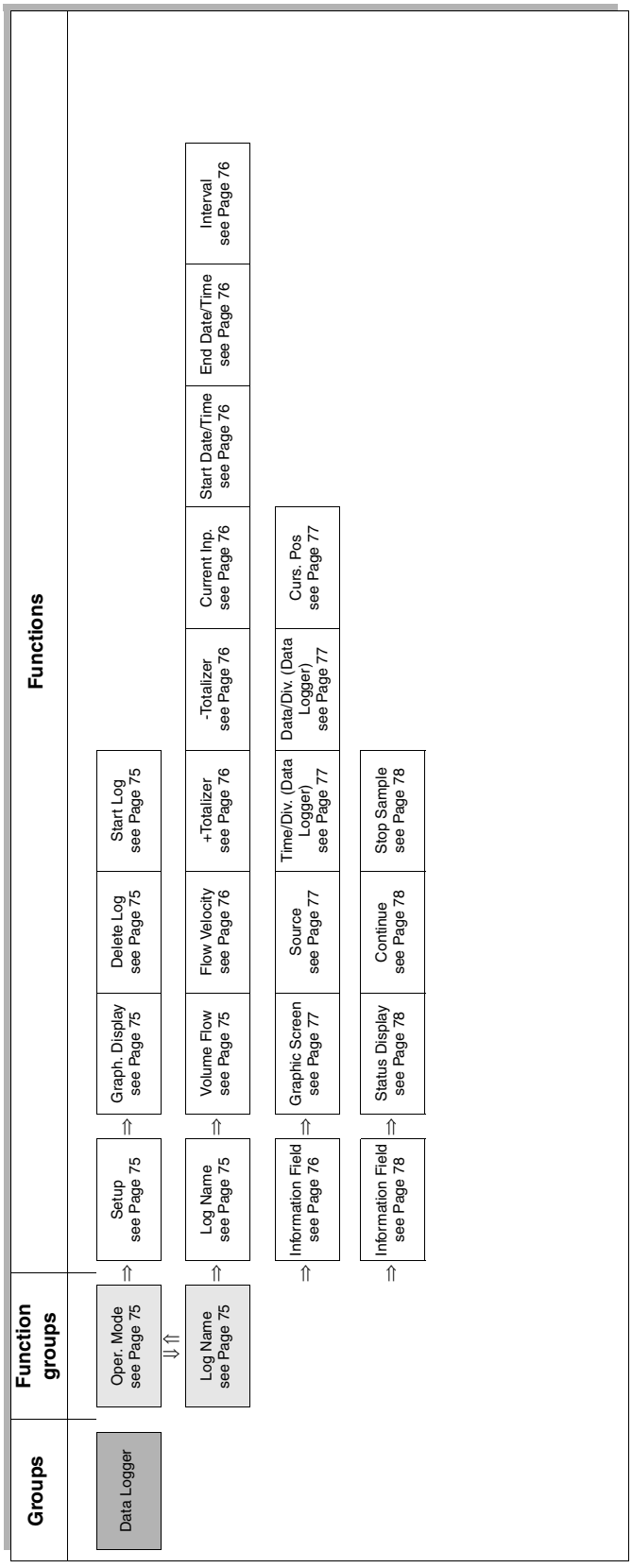
Site Setup	Time Constant
Use this function to enter a time constant defining how the output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). *User input:* 1...99 s *Factory setting:* 3 s	

Site Setup	Adjustment
Zeropoint Adjust	Use this function to call up or change the value for manual zero point correction. *User input (Metric):* Fixed-point number –9.999...9.999 m/s *User input (US):* Fixed-point number –9.999...9.999 ft/s *Factory setting:* 0.000 m/s
Span Adjust	Use this function to set the span adjust. *User input:* Fixed-point number 0.00%...200.00 % *Factory setting:* 100 %

Site Setup	Low Flow Cut-Off
Use this function to assign a value to the switch-on point for low flow cut-off. Low flow cut-off is active if the value entered is not equal to 0. *User input:* 5-digit floating-point number *Factory setting:* 0.010 m/s	

Site Setup	Totalizer
Totalizer Mode	Use this function to define how the flow components are to be totalled by the totalizer in question. Options: OFF – CONTINUOUS – QUICK TIMER – TIMER OFF If the totalizer setting OFF is selected and the ENT key pressed, a totalizer function is switched off. CONTINUOUS If the totalizer setting CONTINUOUS is selected and the ENT key pressed, the +TOTALIZER and -TOTALIZER totalizer displays are started. QUICK TIMER If the totalizer setting QUICK TIMER is selected and the ENT key pressed, successive time units (hh:mm) appear which can be selected for a totalizer process for a limited time: 00:30 – 01:00 – 01:30 – 02:00 – 02:30 – 03:00 TIMER If the totalizer setting TIMER is selected and the ENT key pressed, the start and finish values of a pre-programmed totalizer process can be entered: START DATE/TIME – END DATE/TIME – START TIMER If the timer function STAR TIMER is selected and the ENT key pressed, the pre-programmed totalizer process is started. *Factory setting:* OFF
Preset Totalizer	Use this function to define a starting value for the totalizer. *User input:* Definable range 0000000...9999999 *Factory setting:* 0
Unit Totalizer	The unit selected will be used for displaying a totalizer value in the group “MEASUREMENT”. *Metric options:* mL – L – m3 – Km3 – Mm3 – mBBL – BBL – KBBL *US options:* gal – Kgal – ft3 – Kft3 – Mft3 – mBBL – BBL – KBBL *Factory setting:* mL

11.4 Group matrix DATA LOGGER



11.4.1 Group DATA LOGGER

Data Logger ⇒ **Function**

Data Logger

Data Logger	Oper. Mode
Use this function group to select the operating mode for the data logger. The selection of operating mode is used to operate the respective function in the selection table “NO. / NAME / DATA” which is displayed in the bottom section of the screen. Change to the selection table after selecting the operating mode by means of the ↓ key and enable the desired data set by pressing “ENT”.	
Setup	Use this function to define or modify a parameter set.
Graph. Display	Use this function to display logged data on the graphic screen.
Delete Log	Use this function to delete a parameter set incl. logged data.
Start Log	Use this function to initiate the start of recording for the data logger. Note! Observe the information on Page 78.

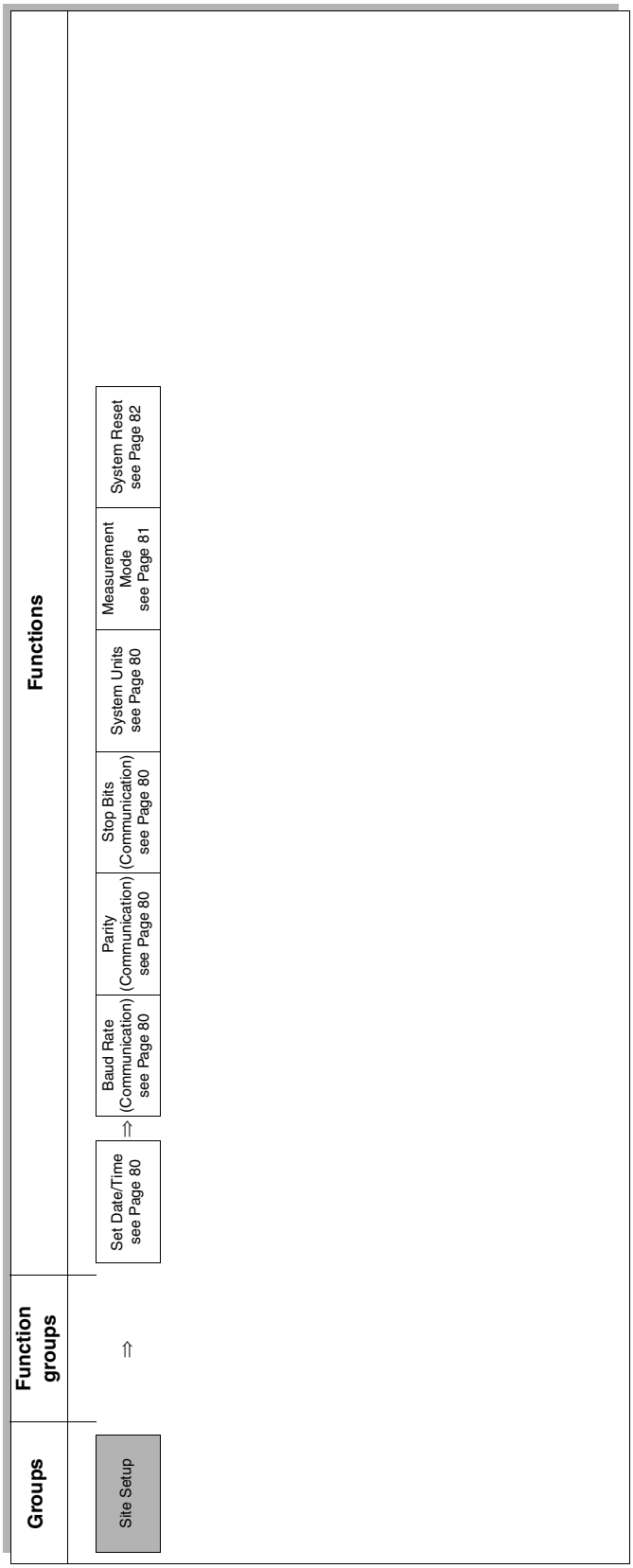
Data Logger	Log Name
Note! Display **NO DATA** indicates that there a data set for recording has not yet been defined at the respective number. Start your definition by selecting the function group “OPER. MODE” and the function “Setup”. A “✓” displayed in the column “Data” indicates that a stored set of log data is already present. It is not possible to access this set of log data or change the data in this data set by means of the functions “SETUP” or “START LOG”.	
The functions described below are available in the operating mode “SETUP”.	
Log Name	Choose this function to define a name for the data set. An alphanumeric on-screen keyboard will assist you during entry. Choose “EXIT” to complete the entry and close the on-screen keyboard.
Volume Flow	Use this function to define the units for recording the volume flow. It is possible to log the volume flow in different units simultaneously. Select the desired units in the sub-menu “UNIT VOLUME” and confirm by means of the “ENT” key. *Metric options:* L/s – L/min – L/h – ML/d – m3/s – m3/min – m3/h – Mm3/d – BBL/s – BBL/min – BBL/h – MBBL/d *US options:* gal/s – gal/min – gal/h – Mgal/d – ft3/s – ft3/min – ft3/h – Mft3/d – BBL/s – BBL/min – BBL/h – MBBL/d

Data Logger	Log Name
Flow Velocity	Use this function to enable recording of flow velocity. Confirm your selection in the sub-menu “FLOW VELOCITY” by pressing the “ENT” key. The following units are available to record flow velocity: m/s (metric), ft/s (US) *Factory setting:* Off
+Totalizer	Use this function to enable recording of positive totalizer (forward flow). Confirm your selection in the sub-menu “+TOTALIZER” by pressing the “ENT” key. *Factory setting:* Off
-Totalizer	Use this function to enable recording of negative totalizer (reverse flow). Confirm your selection in the sub-menu “-TOTALIZER” by pressing the “ENT” key. *Factory setting:* Off
Current Inp.	Use this function to enable actual value recording at the current input. Confirm your selection in the sub-menu “CURRENT INP.” by pressing the “ENT” key. *Factory setting:* Off
Start Date/Time	Use this function to set the date and time for the start of data logger recording. *Format:* MM-DD hh:mm Note! Date and time entered must be future values because the start of logging will be triggered by passing the starting values. If the start values are defined for values in the past, recording will not start.
End Date/Time	Use this function to set the date and time for automatically terminating a data logger record. *Format:* MM-DD hh:mm
Interval	This function defines the measurement interval for data logger recording. It is equally valid for all recorded variables. *Format:* hh:mm:ss
The functions described below are available in the operating mode “GRAPH DISP.” Note! Selecting the screen for graphic display of data is only possible if the “✓” display in the “Data” column indicates that a valid set of log data is available at the number in question.	
Information Field	An information field is displayed in the upper section of the graphic screen display. It shows the following information about the recorded and saved log data: log name, start date/time, end date/time and measurement interval.

Data Logger	Log Name
Graphic Screen	In addition to the graphic display of data, the graphic screen display in the centre of the screen also indicates the actual time and actual measured value at the cursor position. *Format of time:* MM-DD hh:mm:ss *Format of measured value:* +/-x.xxxE+/-x “unit”
Source	Field for displaying and selecting the data source or designation for measured variables (e.g.: volume flow, flow velocity) and the respective units (e.g.: m/s). The measured variables are selected by pressing the → and ← keys.
Time/Div. (Data Logger)	Field for displaying and selecting the time resolution (horizontal axis) of the graphic screen display. The resolution is selected by pressing the → and ← keys. *Format:* DD hh:mm:ss
Data/Div. (Data Logger)	Field for displaying and selecting the vertical resolution (vertical axis) of the graphic screen display. The resolution is selected by pressing the → and ← keys. *Format:* xxE+/-x “unit”
Curs. Pos	Field for displaying and selecting the actual cursor position on the graphic screen display. The selection is made by pressing the → and ← keys. The number shown on the display to the right of “CURS. POS” indicates the number of the data point at the display. Moving the cursor allows you to display specific measured values in the lower section of the graphic screen. See also the “GRAPHIC SCREEN” description above.
The function described is available in the operating mode “DELETE LOG”. Caution! • The selected data set with log data will be erased irreversibly from the data memory when performing the selection described next. The log's definition and logged data is deleted by selecting the appropriate set of data in the selection table by means of the ↓ and ↑ keys and then pressing the “ENT” key once.	

Data Logger	Log Name
The functions described below are available in the operating mode “START LOG”. Data logging is started by selecting the appropriate set of data with the log's definition in the selection table by means of the ↓ and ↑ keys and then pressing the “ENT” key once. Note! • Date and time entered must be future values because the start of logging will be triggered by passing the starting values. If the start values are defined for values in the past, recording will not start. • A “✓” displayed in the “Data” column indicates that a stored set of log data is already present at the number in question. It is not possible to restart this log again by means of “START LOG”. First define a new data set or delete some of the data sets already existing. • If the notice message “Sample not selected!” appears on the screen during the start, the definition of the log is faulty or invalid (e.g.: none of the variables has been selected for recording). If this occurs, verify the definition of parameters by means of the function “SETUP”. • If the notice message “Out of Memory !” appears on the screen during the start, the recording data set exceeds the maximum storage capacity of the data logger's memory. If this occurs, verify the definition of parameters by means of the function “SETUP” and erase any earlier log data from memory. • While recording is in progress, it is possible to exit the group data logging by means of the “ESC” button without interrupting the logging process. • After logging is completed the display screen will automatically switch to the group “DATA LOGGER”.	
Information Field	An information field is displayed in the upper section of the graphic screen display. It shows the following information about the recorded and saved log data: log name, start date/time, end date/time and measurement interval.
Status Display	While logging is in progress, the data logger displays the message “Data Logger Sampling” in the centre of the graphic screen.
Continue	The cursor is always set to the default position “CONTINUE” to prevent a logging process in progress from being stopped accidentally.
Stop Sample	Use this function to abort a log in progress before the end date/time has actually expired. Note! If a log in progress is aborted, all recorded data are saved up to the point where logging was terminated.

11.5 Group matrix SYSTEM SETUP



11.5.1 Group SYSTEM SETUP

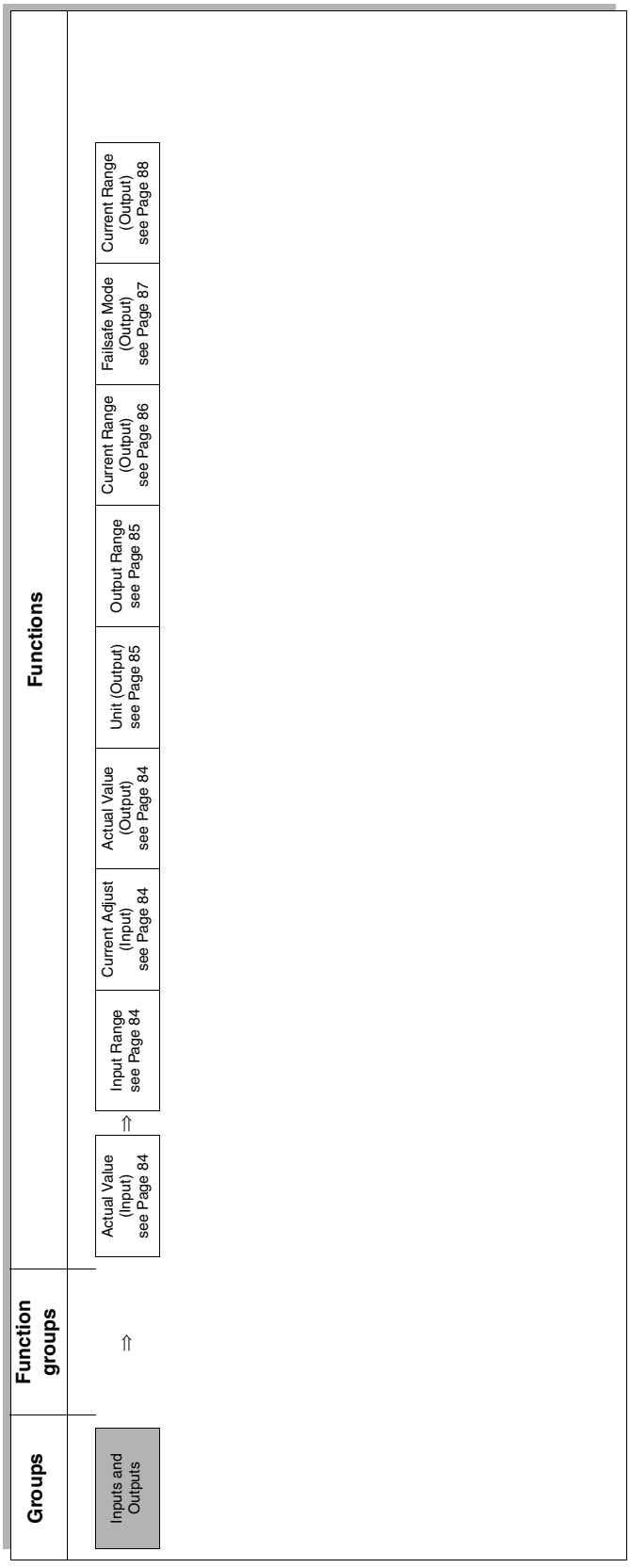
System Setup ⇒ **Function**

System Setup	
Set Date/Time	Use this function to set the actual date and the actual local time. Remember to change the time if your country changes between summer/ winter time. *User input:* YY-MM-DD – hh:mm:ss Date and time will be stored by the internal back-up battery.
Baud Rate (Communication)	Use this function to set the appropriate baud rate for transmitting the values to a computer. *Options:* 300 – 600 – 1200 – 2400 – 4800 – 9600 *Factory setting:* 300
Parity (Communication)	Use this function to set the parity for communication. *Options:* NONE – EVEN – ODD *Factory setting:* NONE
Stop Bits (Communication)	Use this function to set the stop bit for communication. *Options:* 1 BIT – 2 BITS *Factory setting:* 1 BIT
System Units	Use this function to set the system unit needed. *Options:* METRIC – US Caution! To make the setting active, switch off the device briefly and then switch it on again. When the device is switched on again, the units of the system unit selected are adjusted. *Factory setting:* METRIC

System Setup	
Measurement Mode	Use this function to change between two measurement modes. *Option:* 1 – 2 Caution! The optimum measurement mode is automatically initialised during power on and the Site Setup procedure. It is normally not required to manually change the setting. See also the note below. *Factory setting:* 1 Note: Measurement mode1 – Trigger Mode: The measuring device uses mode 1 for pipes in the nominal diameter range DN50 and above. Mode 1 weights the signal start of the ultrasonic signal received during analysis. This method has the advantage that both the transit time and the transit time difference of the signal can be determined very precisely. The method is reliable if the signal shape of the measuring signals are stable. This applies if not a lot of interference is transmitted via the pipe and the application. On the other hand, measurement mode 2 offers greater interference resistance for applications with fluctuating reception signals or reception signals that have high interference. If the measuring device indicates low signal intensity and a fluctuating measuring signal for sound velocity and volume flow, this can be improved by manually switching to Mode 2. Measurement mode 2 – correlation mode: The measuring device uses mode 2 for pipes with a nominal diameter smaller than DN50. In applications in this nominal diameter range, ultrasonic signals are naturally often superposed by interference signals (e.g. pipe-transmitted signals). This interference can affect the stability of the measurement or result in errors when determining the transit time difference. However, measuring mode 2 is immune to such interference to a large extent as the correlation process generally has a high degree of interference resistance. Due to it being somewhat less accurate when determining the transit time, this method is normally not used for pipes with larger nominal diameters. However, if stable measurement is not possible with measurement mode 1, the measuring device can be switched manually to the correlation mode. This often improves the situation. See also the description for “Measurement mode 1” above.

System Setup	
System Reset	Use this function to re-initialise the memory and reset all current settings to the factory settings. *Options:* NO – YES Caution! During memory initialisation, all data sets including Site Setup and log data are erased irreversibly. Exception: The operating language selection remains unchanged as well as the settings of the following functions: – *Pipe Diameter* (see Page 69) – *Pipe Material* (see Page 69) – *Wall Thickness* (see Page 70) – *Liner Material* (see Page 70) – *Liquid* (see Page 70) – *Sensor Config.* (see Page 71) – *Sensor Type* (see Page 71) – *Burst Voltage* (see Page 71) – *Input Range* (see Page 84) – *Unit (Output)* (see Page 85) – *Output Range* (see Page 85)

11.6 Group matrix INPUTS AND OUTPUTS

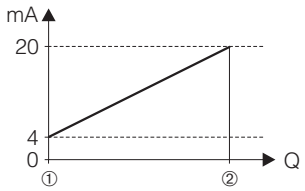
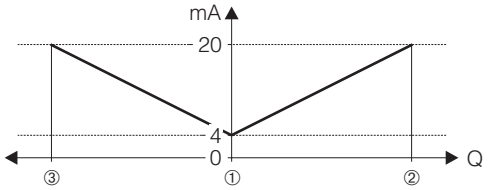


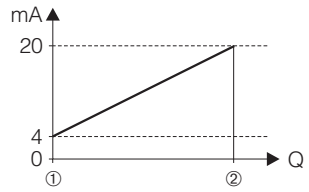
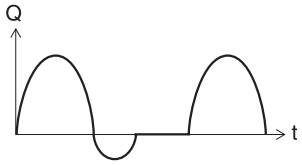
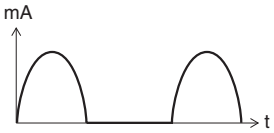
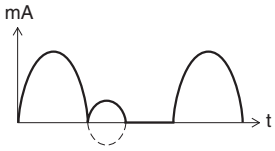
11.6.1 Group INPUTS AND OUTPUTS

Inputs and Outputs ⇒ **Function**

Inputs and Outputs	
Actual Value (Input)	This function is used to display a scaled measured value which is proportional to the input current. The graduation of the scale is set in the function “IINPUT RANGE” (see below).
Input Range	This function is used to convert the current input range (4...20 mA) to a scaled measured value which can be displayed and logged as the actual measured value. To convert an input value in the range of 4...20 mA to a measured value between 0 and “X” relative units, set the value for “INPUT RANGE” to “X”. *Format:* x.xxx E +/- x *Factory setting:* 1.000E2
Current Adjust (Input)	This function is used to automatically adjust the zero point (4 mA) and full scale value (20 mA) of the current input. *Options:* 4 mA – 20 mA Note! To perform this function, a 4 mA and 20 mA current signal (provided externally) must be feed into the current input. 4 mA Adjustment of zero point for current input. To adjust the external current source to 4 mA, move the cursor to the option “4 mA” and press the “ENT” key. The zero point is automatically adjusted. 20 mA Adjustment of full scale value for current input. To adjust the external current source to 20 mA, move the cursor to the option “20 mA” and press the “ENT” key. The full scale value is automatically adjusted.
Actual Value (Output)	This function is used to display a scaled measured value which is proportional to the output current. The graduation of the scale is set in the function “OUTPUT RANGE” (see Page 85). Note! The display value in the function “ACTUAL VALUE” also depends on the setting in the function “OUTPUT RANGE”.

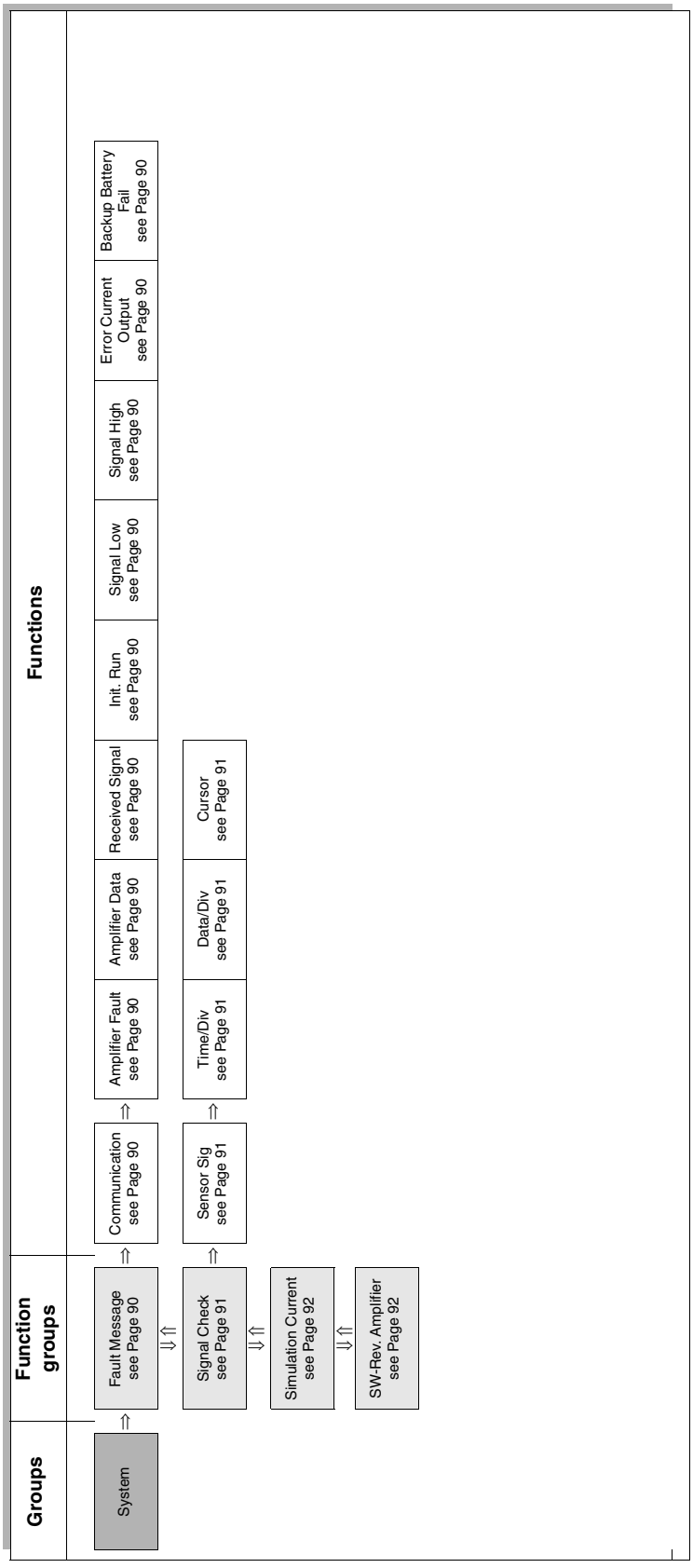
Inputs and Outputs	
Unit (Output)	Use this function to assign a measured value and its unit to the current output. *Metric options volume flow:* L/s – L/min – L/h – ML/d – m3/s – m3/min – m3/h – Mm3/d – BBL/s – BBL/min – BBL/h – MBBL/d *US options volume flow:* gal/s – gal/min – gal/h – Mgal/d – ft3/s – ft3/min – ft3/h – Mft3/d – BBL/s – BBL/min – BBL/h – MBBL/d *Options flow velocity:* m/s (metric) – ft/s (US) *Factory setting:* m/s Note! This setting influences the function “OUTPUT RANGE” (see next page).
Output Range	Use this function to define the maximum range of a measured value (i.e. maximum range for volume flow or flow velocity) which can be output via the current output. The specified range of 0...“Output Range” (maximum value for the measurement variable) is converted to a current output between 4...20 mA. Note! • Unit and definition of the measured value depend on the selection in function “UNIT” (see Page 85). • The current output function can be disabled by setting the output range to “0.000E0”. *Factory setting:* 4.000E0

Inputs and Outputs	
Current Range (Output)	Use this function to define the current range. You can configure the current output for either standard or symmetry mode. *Options:* 0.8-4-20 mA – 4-20 mA – 20-4-20 mA STANDARD: • 0.8-4-20 mA • 4-20 mA The current output signal is proportional to the measured variable.  F-xxxxxxx-05-xx-xx-xx-003 SYMMETRY: • 20-4-20 mA In the symmetry mode, the current output signal is independent of the direction of flow (absolute amount of the measured variable). The 20 mA value ③ (e.g. backflow) corresponds to the mirrored 20 mA value ② (e.g. flow).  F-xxxxxxx-05-xx-xx-xx-007 Caution! If the measuring range is exceeded or undershot, the current output responds in accordance with the parameter setting in the function “FAIL-SAFE MODE” (see Page 87). *Factory setting:* 0.8-4-20 mA

Inputs and Outputs	
Further information on the “CURRENT SPAN (OUTPUT)” function	**How the current output responds under the following conditions:** 1. Defined measuring range (①-②):  F-xxxxxxx-05-xx-xx-xx-003 and the following flow behaviour:  F-x3xxxxx-05-xx-xx-xx-008 • STANDARD The current output signal is proportional to the measured variable. The flow components outside the scaled measuring range are not taken into account for signal output.  F-x3xxxxx-05-xx-xx-xx-009 • SYMMETRY The current output signal is independent of the direction of flow.  F-x3xxxxx-05-xx-xx-xx-010
Failsafe Mode (Output)	For safety reasons it is advisable to ensure that the current output assumes a predefined state in the event of a fault. *Options:* HOLD VALUE – MIN. CURRENT – MAX. CURRENT – ZERO HOLD VALUE Measured value output is based on the last measured value saved before the error occurred. MIN. CURRENT Output current = 0.8 mA (–20 %; independent of the setting selected in the function “CURRENT SPAN”, see Page 86) MAX. CURRENT Output current = 23.2 mA (+20 %; independent of the setting selected in the function “CURRENT SPAN”, see Page 86) ZERO Output current = 4.0 mA (0.0 %; independent of the setting selected in the function “CURRENT SPAN”, see Page 86) *Factory setting:* HOLD VALUE

Inputs and Outputs	
Current Adjust (Output)	This function is intended for manual adjustment of the zero point (4 mA) and full scale value (20 mA) of the current output. Note! To perform this function, the current signal must be measured externally at the current output. *Options:* 4 mA – 20 mA 4 mA To adjust the zero point for the current output to a value of 4 mA, proceed as follows: Move the cursor by means of the → and → keys to the field “4 mA Adjust” and adjust the output current using the ↓ and ↑ keys. To confirm completion of procedure and store the new setting press the “ENT” key. 20 mA To adjust the full scale value for the current output to a value of 20 mA, proceed as follows: Move the cursor by means of the → and → keys to the field “20 mA Adjust” and adjust the output current using the ↓ and ↑ keys. To confirm completion of procedure and store the new setting press the “ENT” key.

11.7 Group matrix SYSTEM



11.7.1 Group SYSTEM

System	⇒	Fault Message	⇒	Function
	⇒	Signal Check	⇒	Function
	⇒	Simulation Current	⇒	Function
	⇒	SW-Rev. Amplifier	⇒	Function

System

System	Fault Message
Please refer to Section 9 “Trouble-shooting” on Page 49 for further information and remedial measures.	
Communication	You will find the message “Communication”, as displayed on the screen, on Page 50.
Amplifier Fault	You will find the message “Amplifier Fault”, as displayed on the screen, on Page 50.
Amplifier Data	You will find the message “Amplifier Data”, as displayed on the screen, on Page 50.
Received Signal	You will find the message “Received Signal”, as displayed on the screen, on Page 50.
Init. Run	You will find the message “Init. Run”, as displayed on the screen, on Page 50.
Signal Low	You will find the message “Signal Low”, as displayed on the screen, on Page 50.
Signal High	You will find the message “Signal High”, as displayed on the screen, on Page 50.
Error Current Output	You will find the message “Error Current Output”, as displayed on the screen, on Page 50.
Backup Battery Fail	You will find the message “Backup Battery Fail”, as displayed on the screen, on Page 50.

System	Signal Check
The function group “SIGNAL CHECK” provides additional information to support the diagnostic of application and measurement units in the event of error. The upper section of the screen contains a display field which indicate the current measured sound velocity of the liquid. The graphic screen display in the centre of the screen shows the shape of the ultrasonic signal received. In addition to the graphic display of the signal wave, the current signal amplitude at the cursor position is also displayed. *Format:* +/- xxxxx	
Sensor Sig	This function is used to display and select the source of the signal (sensor). The selection is made by pressing the → and ← keys. *Option:* SENSOR UP – SENSOR DOWN SENSOR UP Upstream sensor signal SENSOR DOWN Downstream sensor signal *Factory setting:* SENSOR UP
Time/Div	Field for displaying and selecting the time resolution (horizontal axis) of the graphic screen display. The resolution is selected by pressing the → and ← keys. *Options:* 10 (max. resolution) – 20 – 40 – 80 – 160 (min. resolution) *Factory setting:* 160
Data/Div	Field for displaying and selecting the vertical resolution (vertical axis) of the graphic screen display. The resolution (factor of magnification) is selected by pressing the → and ← keys. *Options:* 10 (max. resolution) – 100 – 1000 – 5000 – 10000 (min. resolution) *Factory setting:* 5000
Cursor	Field for displaying and selecting the current cursor position on the graphic screen display. The selection is made by pressing the → and ← keys. The number shown on the display to the right of “Curs. Pos.” indicates the number of the data point at the display. Moving the cursor allows you to display the signal amplitude in the lower section of the graphic screen. See also the description of the “Graphic Screen” in the function group “SIGNAL CHECK”. *Factory setting:* 96

System	Simulation Current

Use this function to define a freely selectable value (e.g. xx % of full scale) to be output at the current output. This value can be used to test downstream devices and the measuring device itself.

User input:
Floating-point number: –20.00...120.00 %

Factory setting:
0.00 %

Caution!
- The “SIMULATION CURRENT” function is enabled as soon as the group “SYSTEM” is selected.
- The setting is saved if the power is turned off and on.

Note!
To disable the “SIMULATION CURRENT” function, exit the group “SYSTEM”.

System	SW-Rev. Amplifier

Use this function to display the product designation and the software revision number of the amplifier.

Example:
V 1.00.00 (original software)
Prosonic Flow 92

Index

Declaration of contamination

Dear customer,
Because of legal determinations and for the safety of our employees and operating equipment we need this "Declaration of contamination" with your signature before your order can be handled. Please put the completely filled in declaration to the instrument and to the shipping documents in any case. Add also safety sheets and/or specific handling instructions if necessary.

type of instrument / sensor: _____ serial number: _____

medium / concentration: _____ temperature: _____ pressure: _____

cleaned with: _____ conductivity: _____ viscosity: _____

Warning hints for medium used:

☐ radioactive ☐ explosive ☐ caustic ☐ poisonous ☐ harmful to health ☐ biologically hazardous ☐ inflammable ☐ safe

Please mark the appropriate warning hints.

Reason for return:

_____

_____

Company data:

company: _____ contact person: _____

_____ _____

_____ department: _____

address: _____ phone number: _____

_____ fax / e-mail: _____

_____ your order no.: _____

I hereby certify that the returned equipment has been cleaned and decontaminated acc. to good industrial practices and is in compliance with all regulations. This equipment poses no health or safety risks due to contamination.

_____ _____

(Date) (company stamp and legally binding signature)

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