

+ User Manual EE772

**Multifunctional Flow Sensor for
Compressed Air and Gases
DN40 (1 1/2") - DN80 (3") / 40 bar (580 psi)**



Content

1	General Information.....	4
1.1	Explanation of Warning Notices and Symbols.....	4
1.2	Safety Instructions	5
1.2.1	General Safety Instructions	5
1.2.2	Intended Use.....	5
1.2.3	Mounting, Start-up and Operation.....	5
2	Scope of Supply	6
3	Product Description	7
3.1	General.....	7
3.2	Dimensions.....	8
4	Mounting and Installation	10
4.1	Determining the Installation Site	10
4.2	Installation Position.....	11
4.3	Required Length of Straight Pipe	12
4.4	Assembly of the Measurement Section	13
4.4.1	Assembly Without Flow Sensor, but with a Screw Cap Instead (Blind Cap).....	14
4.5	Installation of the Flow Sensing Probe	14
4.5.1	Flow Direction.....	14
4.5.2	Installation of the Sensing Probe into the Gauge Mounting Block.....	14
4.5.3	Installation of the Sensing Probe into the Gauge Mounting Block with Hot Tap Valve.....	15
5	Electrical Connection	17
5.1	Connection Diagram	17
5.1.1	Relay and Pulse Output, Internal Switching.....	18
5.1.2	Connection with Optional Plug for Power Supply and Outputs (Order Code E4).....	18
6	Setup and Configuration	19
6.1	Jumpers for Output Configuration	19
6.2	USB Configuration Interface	19
6.3	Display / Indicator with Keypad (Optional)	20
6.3.1	Indication of the Analogue and Pulse Output.....	20
6.3.2	Indication of the Switch Output.....	20
6.3.3	Indication of the MIN / MAX Values.....	21
6.3.4	Reset of the Consumption Meter or the MIN / MAX Value	21
6.3.5	Maximum Consumption Meter	22
6.4	Bus Output (Optional)	22
6.4.1	Device Address	22
6.4.2	M-Bus (Meter-Bus)	22
6.4.3	Modbus RTU Setup (Modbus RTU Protocol Settings)	24
6.5	Modbus Register Map.....	25
7	Maintenance and Service	28
7.1	Error Messages.....	28
7.2	Calibration and Adjustment at E+E Elektronik	28
7.3	Maintenance	28
7.3.1	Removal of the Sensing Probe of the Gauge Mounting Block.....	28
7.4	Sensing Probe Extraction from Gauge Mounting Block with Hot Tap Valve	28
7.5	Cleaning the Sensing Element of the Flow Sensor.....	29
7.6	Repairs	29

8	Replacement Parts / Accessories	29
8.1	Order Code Replacement Sensor	29
8.2	Accessories	30
9	Technical Data	31
9.1	Factory Setting of Outputs	33
9.1.1	SI Units.....	33
9.1.2	US Units	34
10	Configuration Software	35
10.1	Introduction	35
10.2	Installation	35
10.3	User Interface	37
10.4	Menu Toolbar	38
10.4.1	File	38
10.4.2	Transmitter	38
10.4.3	Extras	38
10.5	Input Screen	39
10.5.1	Output 1, Output 2	39
10.5.2	Minimum Flow Shutdown.....	42
10.5.3	Display	42
10.5.4	Adjustment	42
10.5.5	Measuring Values Overview	44
10.5.6	Setting up Process Parameters	45
10.5.7	External Pressure Sensor for Pressure Compensation.....	46
10.5.8	Bus Configuration	46
11	Conformity	47
11.1	Declarations of Conformity.....	47
11.2	Electromagnetic Compatibility	47
11.3	FCC Part 15 Compliance Statement	47
11.4	ICES-003 Compliance Statement.....	47
12	Recycling of the Device	47

1 General Information

This user manual is intended to ensure proper handling and optimal functioning of the device. The user manual shall be read before commissioning the equipment and it shall be provided to all staff involved in transport, installation, operation, maintenance and repair. E+E Elektronik Ges.m.b.H. accepts no liability for any warranty or liability claims arising from this publication or improper handling of the product(s) described.

All information, technical data and diagrams included in this document are based on the information available at the time of writing. The document may contain technical inaccuracies and typographical errors. The contents will be revised on a regular basis and changes will be implemented in subsequent versions. The product(s) described and the contents of this document may be changed or improved at any time without prior notice.

All rights are reserved by E+E Elektronik Ges.m.b.H. No part of this document may be reproduced, published or publicly displayed in any form or by any means, nor may its contents be modified, translated, adapted, sold or disclosed to a third party without prior written permission of E+E Elektronik Ges.m.b.H.

PLEASE NOTE

Find this document and further product information on our website at www.epluse.com/ee772.

1.1 Explanation of Warning Notices and Symbols

Safety precautions

Precautionary statements warn of hazards in handling the device and provide information on their prevention. The safety instruction labeling is classified by hazard severity and is divided into the following groups:

DANGER

Danger indicates hazards for persons. If the safety instruction marked in this way is not followed, the hazard will very likely result in severe injury or death.

WARNING

Warning indicates hazards for persons. If the safety instruction marked in this way is not followed, there is a risk of injury or death.

CAUTION

Caution indicates hazards for persons. If the safety instruction marked in this way is not followed, minor or moderate injuries may occur.

NOTICE

Notice signals danger to objects or data. If the notice is not observed, damage to property or data may occur.

Informative notes

Informative notes provide important information that is characterised by its relevance.

INFO

The information symbol indicates tips on handling the device or provides additional information on it. This information is useful to achieve optimum performance of the device.

The title field may deviate from "INFO" depending on the context. For instance, it may also read "PLEASE NOTE".

1.2 Safety Instructions

1.2.1 General Safety Instructions

NOTICE

Improper handling of the device may result in its damage.

- Do not expose the enclosure, sensing probe, or module to unnecessary mechanical stress.
- Do not apply the supply voltage to the RS485 data lines.
- Use the EE772 only as intended and observe all technical specifications.

1.2.2 Intended Use

The flow sensor is designed for measuring air and other non-corrosive gases in pipeline systems. Contact the factory first if you wish to measure wet or dirty gases.

The EE772 flow sensor is engineered for measurement in pressurised system up to PN40, i.e. 40 bar (580 psi).

WARNING

Non-compliance with the product documentation may cause safety risks for people and the entire measurement installation.

- Mounting, electrical installation, commissioning and maintenance may only be performed by qualified personnel. The plant operator must ensure that only authorised and qualified personnel work on the system.
- Any use of the EE772 flow sensor other than as described in this manual bears a safety risks to personnel and the entire measurement installation, and is therefore strictly prohibited.
- The manufacturer cannot be held responsible for damages resulting from improper handling, installation, or insufficient maintenance of the equipment.
- To avoid health hazards and damage to the equipment, do not use tools or accessories that are not specifically mentioned or described in this manual.
- Excessive mechanical stress and improper handling must be avoided at all times.
- A brief interruption of the flow through the measurement ball valve is unavoidable when replacing the sensing probe.
- The flow sensor may only be used under conditions specified in the technical data. Otherwise, measurement inaccuracies will occur and equipment failures cannot be ruled out.
- For user safety and for proper equipment functionality, all commissioning, testing, and maintenance procedures recommended by the manufacturer must be followed and completed.

NOTICE

Failure to follow the instructions in this user manual may lead to measurement inaccuracy and device malfunctions.

- The EE772 may only be operated under the conditions described in this user manual and within the specification included in chapter 9 Technical Data.
- Any unauthorised product modifications will invalidate all warranty claims. Modifications may only be carried out with the express authorisation of E+E Elektronik Ges.m.b.H.!

1.2.3 Mounting, Start-up and Operation

The EE772 has been produced under state of the art manufacturing conditions, has been thoroughly tested and has left the factory after fulfilling all safety criteria. The manufacturer has taken all precautions to ensure safe operation of the device. The device shall be set up and installed in a way that does not impair its safe use. All applicable local and international safety guidelines for safe installation and operation of the device have to be observed. This user manual contains information and warnings that must be observed in order to ensure safe operation.

** PLEASE NOTE**

The manufacturer or his authorised agent can only be held liable in case of willful or gross negligence. In any case, the scope of liability is limited to the corresponding amount of the order issued to the manufacturer. The manufacturer assumes no liability for damage caused by non-compliance with the applicable regulations, operating instructions or the specified operating conditions. Any consequential damage is excluded from liability.

** WARNING**

Non-compliance with the product documentation may result in accidents, personal injury or property damage.

- Mounting, installation, commissioning, start-up, operation and maintenance of the device may only be carried out by qualified staff. Such staff must be authorised by the operator of the facility to carry out the mentioned activities.
- The qualified staff must have read and understood this user manual and must follow the instructions contained within. The manufacturer accepts no responsibility for non-compliance with instructions, recommendations and warnings.
- All process and electrical connections must be thoroughly checked by authorised staff before commissioning the device.
- Do not install or start-up a device suspected to be faulty. Mark it clearly as faulty and remove it from the process.
- Service operations other than described in this user manual may only be performed by the manufacturer. A faulty device may only be investigated and possibly repaired by qualified, trained and authorised staff. If the fault cannot be fixed, the device shall be removed from the process.

2 Scope of Supply

- EE772 Multifunctional Flow Sensor for Compressed Air and Gases
- Inspection certificate according to DIN EN 10204-3.1
- User Manual

3 Product Description

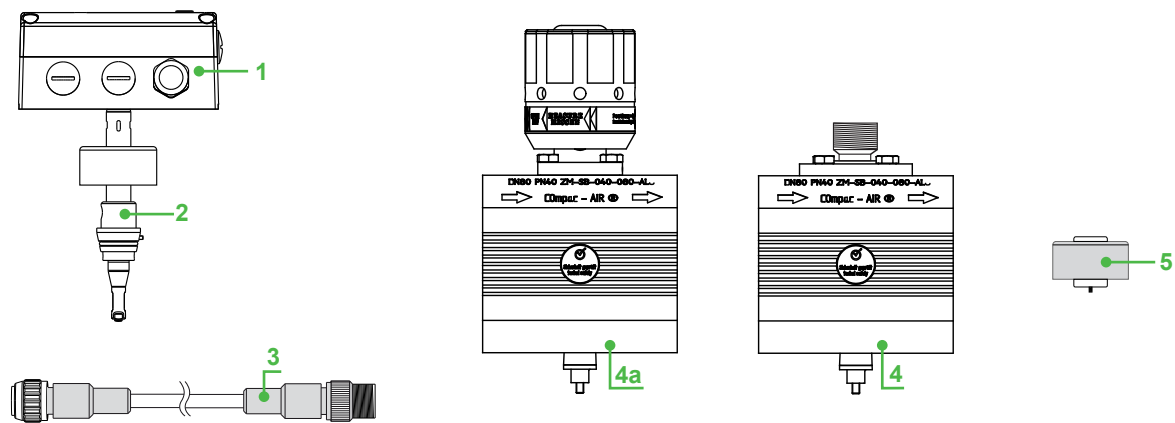
3.1 General

The flow sensor of the series EE772, based on the measurement principle of thermal mass flow, is suited for the measurement of flow of air and gases in pipelines. Measurement of for instance the consumption of compressed air, nitrogen, CO₂ or other non-corrosive and non-flammable gases.

The EE772 measures the volume flow at standard conditions according to DIN 1343 (pn = 1013.25 mbar; Tn = 0 °C (32 °F)). In addition to the standard volume flow, the measurand mass flow, norm flow and temperature are available.

The EE772 has an integrated consumption counter. The consumption quantity is indicated in the display. This value is not lost after a power failure. Two signal outputs are available. Depending on the application, the outputs can be configured as analogue (current or voltage), switch output or as pulse output for the measurement of the consumption.

Associated Numbering with Description



1. Signal conditioning with optional display

The signal-conditioning enclosure is mounted either directly on the measurement probe (type T19 or T20 compact) or remotely using a plugable sensor cable up to 10 m (33 ft) – (type T3 with remote probe).

2. Sensing probe with measurement electronics

The interchangeable sensing probe contains the sensing element and the measurement electronics, including the stored factory calibration data. The sensing probe is easily and quickly interchangeable in the field and operates independently of the signal-conditioning electronics. After probe exchange, all output configurations remain unchanged.

3. Sensor cable (only by model C with remote sensing probe)

The sensor cable enables remote installation of the sensing probe, at distances of up to 10 m (33ft) from the enclosure containing the signal-conditioning electronics.

4. Gauge mounting block

The gauge mounting block enables easy and reliable installation within the pipeline. Observe the required inlet and outlet paths during installation in a pipeline (refer to chapter 4.3 Required Length of Straight Pipe). The gauge mounting block's nominal size must match the the pipe's nominal size. The gauge mounting block is suitable for pressures up to 40 bar (580 psi) and is available for pipe diameters from DN40 (1 1/2") to DN80 (3").

4a. The gauge mounting block with a hot-tap valve allows the sensing probe to be inserted and removed under pressure without interrupting the process flow.

5. Screw cap

The screw cap with internal thread is screwed on when the flow meter is not installed and the pipe must remain in service.

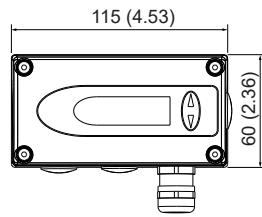
Fig. 1 Part description

3.2 Dimensions

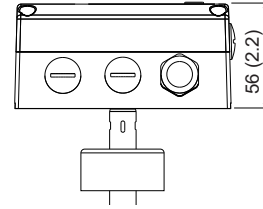
Values in mm (inch)

EE772 compact

Type T19, T20

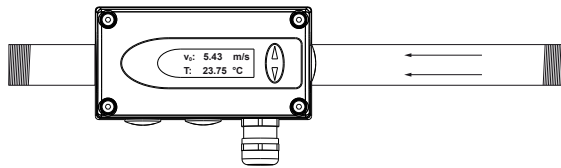


Type T19, T20

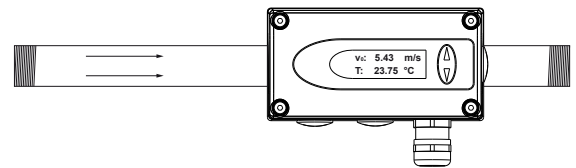


EE772 compact

Type T19: flow direction right to left

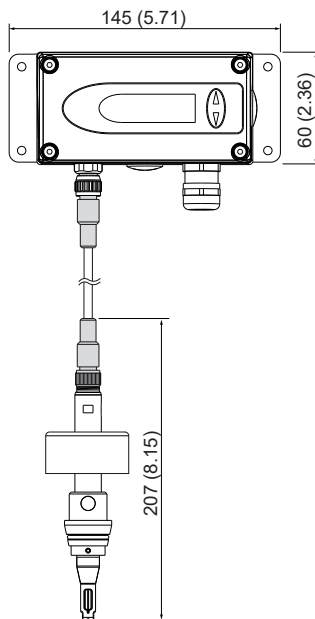


Type T20: flow direction left to right



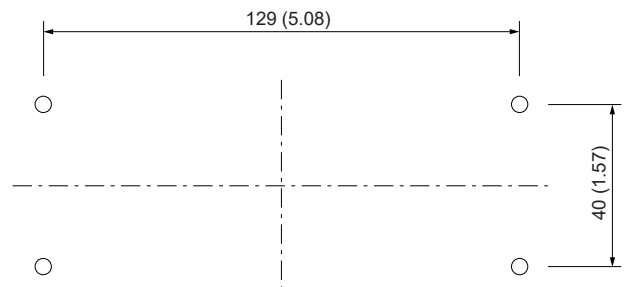
EE772 remote

Type T3:

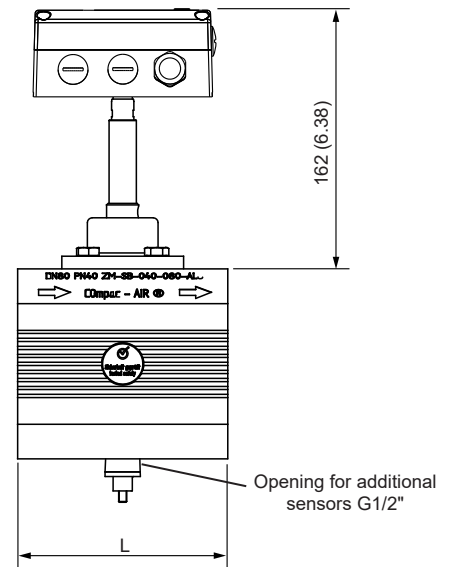
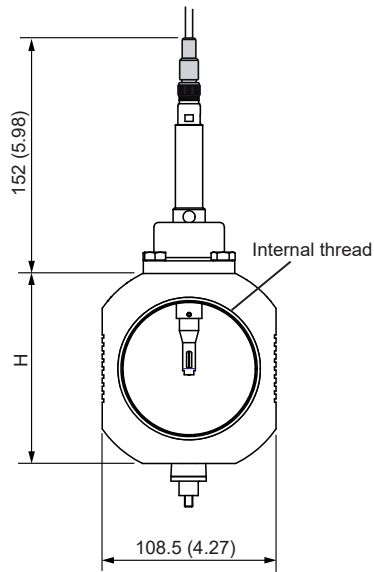


Drilling plan

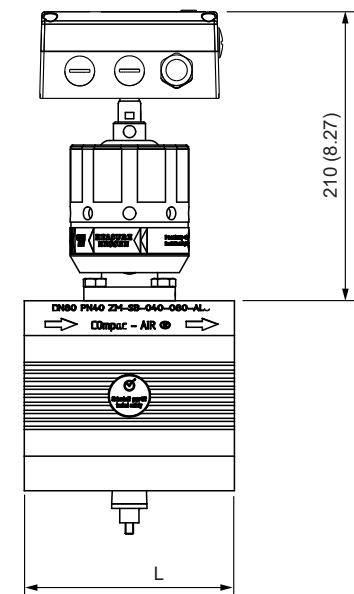
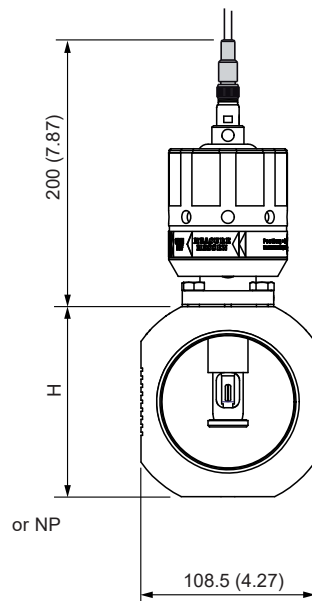
The bottom part of the enclosure is mounted with 4 screws (not in the scope of supply). Max. screw diameter: 4.5 mm (0.17 inch).
e.g. 4.2 x 38 mm DIN 7938H Screws



Gauge mounting block HA071xxx



Gauge mounting block with hot tap valve HA072xxx



Valve	Thread ¹⁾	L in mm (inch)	H in mm (inch)
DN40 (1 1/2")	R _p or NPT 1 1/2"	110 (4.3)	108.5 (4.27)
DN50 (2")	R _p or NPT 2"	131 (5.2)	108.5 (4.27)
DN65 (2 1/2")	R _p or NPT 2 1/2"	131 (5.2)	108.5 (4.27)
DN80 (3")	R _p or NPT	131 (5.2)	118.5 (4.67)

1) Internal thread: Whitworth acc. to EN 10226 (old DIN 2999).

4 Mounting and Installation

4.1 Determining the Installation Site

1. Ensure accessibility and stability

The installation site must be easy to access and free from vibration and shock.

2. Maintain sufficient clearance

Provide at least 260 mm (10.24 inch) of clearance above the enclosure with the signal-conditioning electronics, to allow the sensing sensor to be removed if necessary.

3. Observe ambient temperature limits

The ambient temperature must not exceed the value stated in the specifications (please refer to chapter 9 Technical Data) – consider heating by radiation.

4. Ensure adequate air

The air purity on the installation site must be at least class 3.4.4 in accordance with ISO 8573-1:2010.

5. Prevent condensation

Fluids should not condense at the installation site. Condensation on the tip of the sensing probe must be avoided.

6. Install downstream of air treatment equipment

In compressed air systems, the sensor must be installed downstream of the dryer. If no dryer is present, install at least a steam trap and suitable filters.

7. Observe flow direction

Install the sensor according to the correct flow direction (refer to chapter 4.2 Installation Position).

8. Maintain straight-pipe lengths

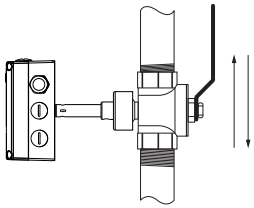
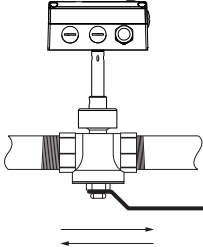
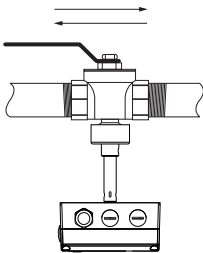
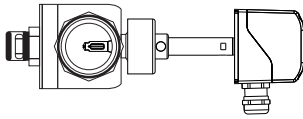
Observe the recommended straight-pipe lengths up and downstream to warrant the specified measurement accuracy.

9. Avoid flow disturbances

Install the flow sensor as far as possible from sources of any flow disturbance. Valves or check-valves must be installed in an respective distance from the flow sensor.

4.2 Installation Position

The flow sensor has a defined flow direction. Ensure that the arrow on the sensing probe tip points in flow direction.

Mounting	Type	
	Compact	Remote
Vertical		
	+	++
Horizontal, sensor downwards		
	++	++
Horizontal, sensor upwards		
	-	-
Horizontal, sensor across		
	+	++

++...recommended installation position
+...not recommended if there is vibration on the pipeline
-...not recommended

Tab. 1 Correct or incorrect sensor position

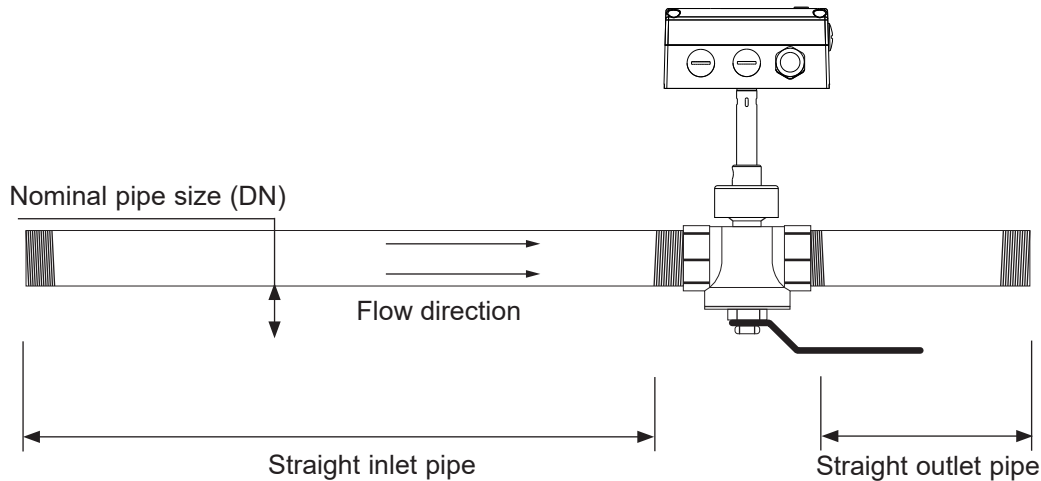
4.3 Required Length of Straight Pipe

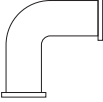
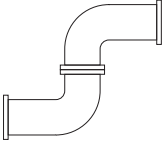
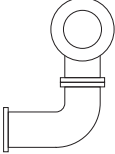
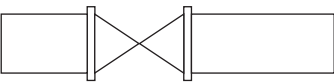
For accurate measurement results, the flow sensor must be installed as far as possible from any flow disturbances. Common sources of flow disturbance include:

- reducers and expanders
- elbows and bends,
- T-pieces,
- valves and gate valves,
- other fittings or obstructions in the pipeline

To ensure the specified measurement accuracy, the minimum straight inlet and outlet pipe lengths listed for device must be observed:

- The wall thickness of the inlet and outlet pipe should be 2.6 mm (0.10")
- The stated distances represent minimum values.
If installation spaces allows, longer straight pipe sections are recommended to further stabilize the flow profile.
- Valves or gate valves should allways be installed downstream of the flow sensor to avoid influencing the measurement.
- When measuring lighter gases, a longer straight inlet pipe is required, as these gases are more sensitive to flow disturbances.



(DN = Nominal Pipe Size)			
	Type	Straight inlet pipe	Straight outlet pipe
	Extension	15 x DN	5 x DN
	Reduction	15 x DN	5 x DN
	90° - elbow	20 x DN	5 x DN
	Two 90° - elbows, in one level	25 x DN	5 x DN
	Two 90° - elbows, in two levels, T-piece	30 x DN	5 x DN
	Valve, gate valve	50 x DN	5 x DN

Tab. 2 Optimum conditions to achieve the specified measurement accuracy

4.4 Assembly of the Measurement Section

WARNING

Modifying the measuring system while the pipeline system is pressurised can create significant safety risks for personnel and may damage the entire measurement installation.

Depressurise the pipeline system before installing or removing the gauge mounting block!

Failure to depressurise the system may result in sudden release of pressure, leading to serious injury, equipment failure, or uncontrolled gas discharge.

- Use appropriate sealing material on the threads for all connections.
- Ensure that the sealing material does not obstruct or reduce the inner cross-sectional area of the pipe. After installation, guarantee that all connections are free from leaks.
- Test all fittings to verify seal tightness.
- During assembly of the measurement section, ensure that the arrows on the pipe section and the gauge mounting blocks point in the same direction of flow.
- Position the recess for the alignment pin on the outlet side.

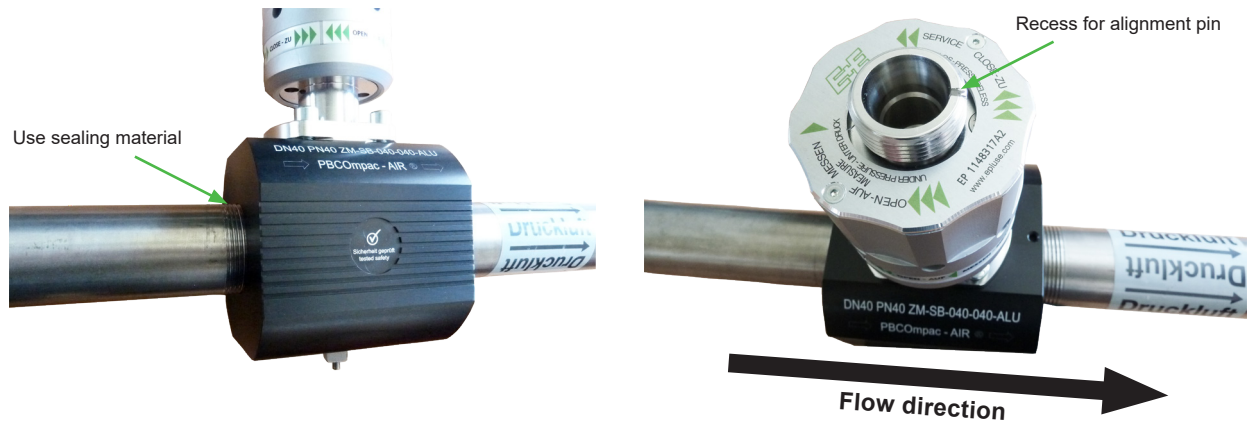


Fig. 2 Assembly hints

4.4.1 Assembly Without Flow Sensor, but with a Screw Cap Instead (Blind Cap)

To use the measurement section without the flow sensor installed, securely screw the supplied blind screw cap onto the opening of the gauge mounting block. When the blind cap is not in use, it can be stored by screwing it onto the side of the gauge mounting block.

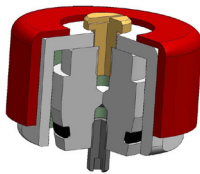


Fig. 3 Blind cap

4.5 Installation of the Flow Sensing Probe

4.5.1 Flow Direction

The flow direction is marked by an arrow at the tip of the probe. Due to the alignment pin, the sensing probe can only be inserted into the gauge mounting block in the correct flow direction. After disassembly, the sensing probe must be reinstalled in the measuring section in exactly the same position as it was configured at the factory. This ensures maximum measurement reproducibility and prevents orientation-related measurement deviations.



Fig. 4 Flow direction arrow on the tip of the probe

4.5.2 Installation of the Sensing Probe into the Gauge Mounting Block

WARNING

Ensure that the pipe line is depressurised.

1. Remove transport protection cap from the head of the sensing probe.



2. Insert the sensing probe into the gauge mounting block, ensuring that the alignment pin correctly engages with the recess on the gauge mounting block.



3. Hand-tighten the retainer nut until a noticeable resistance is felt.
4. Verify the installation position of the flow sensor:
 - The alignment pin must be fully seated in the recess of the gauge mounting block.
 - The flow direction must match the arrow in the probe
5. Tighten the red coloured retainer nut by hand:
 - Hand-tightening is normally sufficient.
 - If the seal is not leak-tight carefully tighten the nut a little further using an appropriate tool.
 - Do not overtighten.



6. Mechanical installation of the flow sensor is now complete.

4.5.3 Installation of the Sensing Probe into the Gauge Mounting Block with Hot Tap Valve

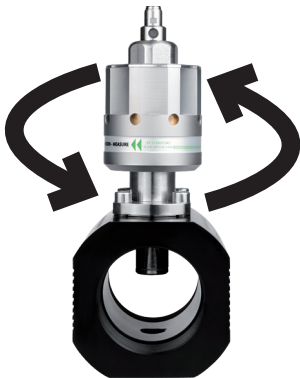
The gauge mounting block equipped with hot tap valve enables the installation and removal of the sensing probe under operating pressure, without the need to interrupt the process flow.

WARNING

Only operate the hot tap valve on the gauge mounting block by hand.

Do not use tools, as excessive force may damage the valve mechanism, compromise the seal, or create a safety risk during pressurised operation.

Functionality

Position Open – Measure	Position Close – Service
The sensor head is fully immersed into the pipe for measurement.	The gauge mounting block with hot tap valve is closed in a pressure-tight manner. The sensing probe can be safely removed.
	

Tab. 3 Functionality in relation to position

1. Turn the gauge mounting block with hot tap valve to the “Close – Service” position.
2. Insert the sensing probe into the gauge mounting block with hot tap valve so that the alignment pin correctly fits into the recess on the sealing cone.



3. Hand-tighten the retainer nut until a noticeable resistance is felt.
4. Verify the correct installation position of the flow sensor:
 - The alignment pin must be fully seated in the recess on the sealing cone.
5. Tighten the retainer nut by hand.
 - Hand-tightening is typically sufficient.
 - If the seal is not leak-tight, carefully tighten the nut a little further using an appropriate tool.
 - Do not overtighten.
6. Turn the gauge mounting block with hot tap valve to the “Open – Measure” position.



7. Mechanical installation of the flow sensor is now complete.

5 Electrical Connection

WARNING

Incorrect installation, wiring or power supply may cause overheating and result in personal injury or property damage.

Cables must not be under voltage during electrical installation and connection or disconnection, especially at terminal connections on circuit boards. For correct cabling, always observe the presented wiring diagram for the product version used.

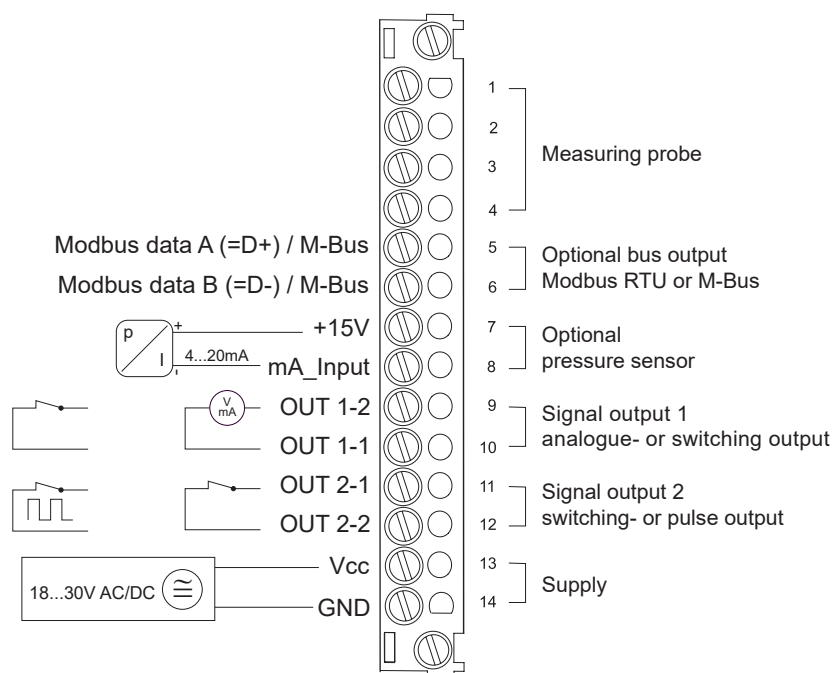
The manufacturer cannot be held responsible for personal injury or damage to property caused by incorrect handling, installation, wiring, power supply or maintenance of the device.

EE772 features screw terminals for connecting the power supply and the outputs. The cables are fed into the enclosure through the M16 cable gland.

- Unscrew the four cover screws and remove the enclosure cover.
- The screw terminals are located in the bottom part of the enclosure.
- For the electrical connection of the flow sensor, use a six-wire cable, for example 6x1 mm² (AWG 17).

NOTICE

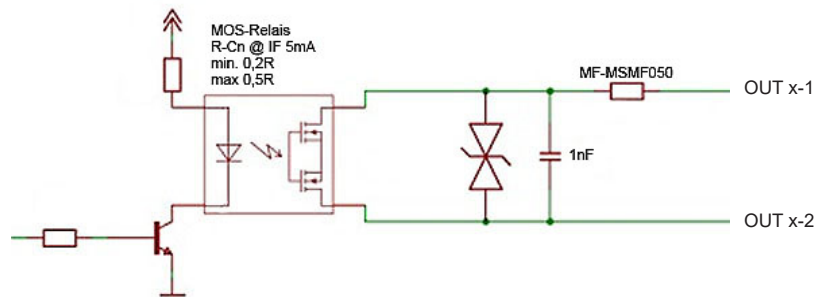
Ensure that the cable glands for the power supply and outputs cables are tightened securely. Proper tightening is necessary to maintain the enclosures IP rating according to the EE772 specification and to provide stress relief for the screw terminals on the EE772 board.



5.1 Connection Diagram

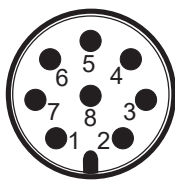
- Screw terminal OUT 1-1 for the analogue output is internally connected to GND.
- The enclosure should be properly grounded to achieve optimal electromagnetic compliance.

5.1.1 Relay and Pulse Output, Internal Switching



The relay switch and pulse outputs are both potential free.

5.1.2 Connection with Optional Plug for Power Supply and Outputs (Order Code E4)



Pin	Assignment
1	OUT 2-2
2	OUT 1-2
3	OUT 1-1
4	GND
5	OUT 2-1
6	n.c.
7	Vcc
8	n.c.

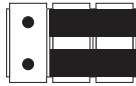
6 Setup and Configuration

6.1 Jumpers for Output Configuration

If the signal output is altered from relay output to analogue output, or vice versa, the “Jumper Output 1” must be repositioned accordingly.

If the analogue output is altered from current output to a voltage output, or vice versa, the “Jumper Out-1” has to be relocated to the appropriate position.

Signal output 1 =
switching output



Signal output 1 =
analogue output



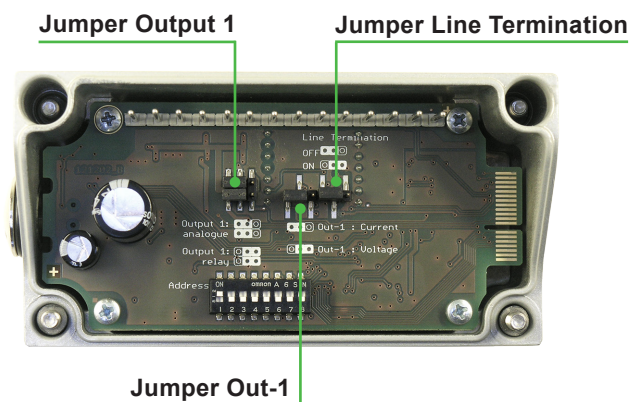
Modbus RTU only



Line termination = OFF



Line termination = ON
150 Ω parallel to
Bus output A and B



Analogue output = current signal (e.g. 4 - 20 mA)



Analogue output = voltage signal (e.g. 0 - 10 V)



Fig. 5 Jumper positions

6.2 USB Configuration Interface

The USB connector is located behind the blind screw cap on the side of the enclosure.

1. Remove the blind screw cap using a screwdriver
2. Plug in the USB cable to connect the sensor to the PC.

i PLEASE NOTE

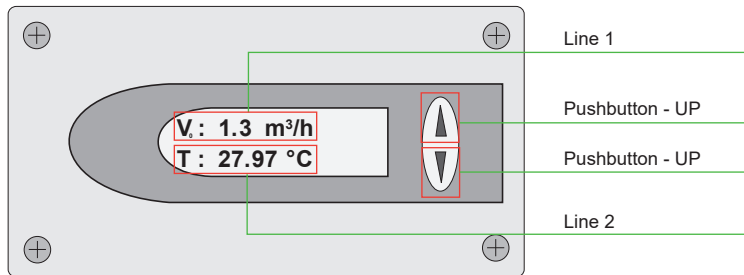
Install the configuration software included in the scope of supply. The configuration software can also be downloaded from our website www.epluse.com/ee772.



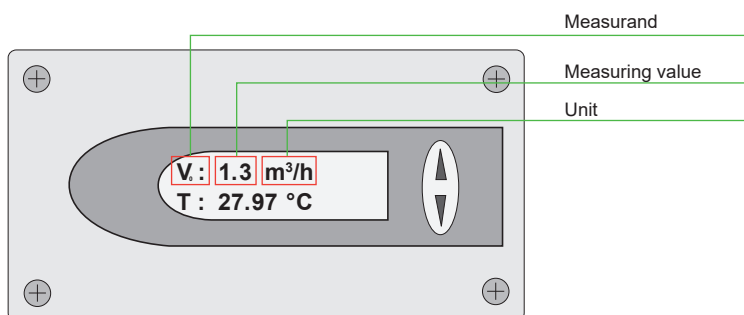
Fig. 6 USB interface connection

6.3 Display / Indicator with Keypad (Optional)

An optional 2-line display is available for the EE772 flow sensor. The display is integrated into the enclosure cover and features two softkeys that allow the user to operate and display functions.



Depending on the configuration of the outputs, the display can show the measured values, the relay status or the consumption.



	Measurand	SI Unit	US/GB Unit
v ₀	Standardised flow / velocity	m/s	SFPM
T	Temperature	°C	°F
$\dot{V}_0$	Standardised volume flow	m³/h, m³/min; l/min	SCFM, SLPM
$\dot{m}$	Mass flow	kg/h, kg/min; kg/s	kg/h, kg/min; kg/s
Q	Consumption reading	m³	ft³
p	Pressure	bar	psi

6.3.1 Indication of the Analogue and Pulse Output

Line 1 always indicates the measurand assigned to output 1. Using the UP and DOWN softkeys, the desired measurement value can be displayed in line 2.

6.3.2 Indication of the Switch Output

Line 1 indicates the status of the switch output. Using the UP and DOWN softkeys, the desired measurement value can be displayed in line 2.

When the relay output is active (relay has switched), the display appears as an inverse image.

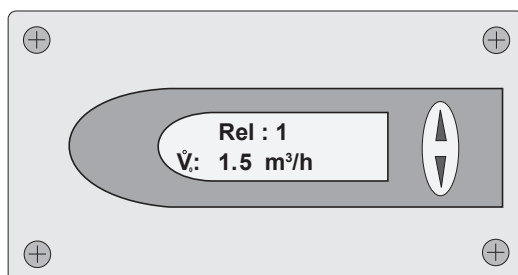


Fig. 7 Switch output inactive (relay has not switched)

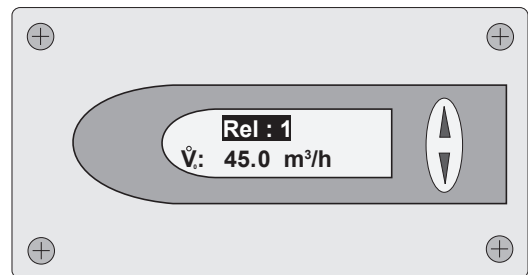
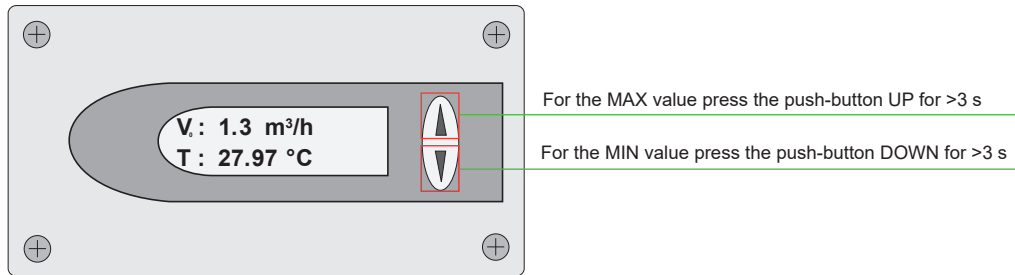


Fig. 8 Switch output active (relay has switched)

6.3.3 Indication of the MIN / MAX Values

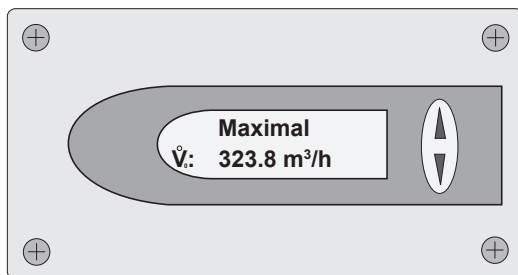
To display the MIN value, keep the DOWN key pressed for more than 3 seconds.

To display the MAX value, keep the UP key pressed for more than 3 seconds.



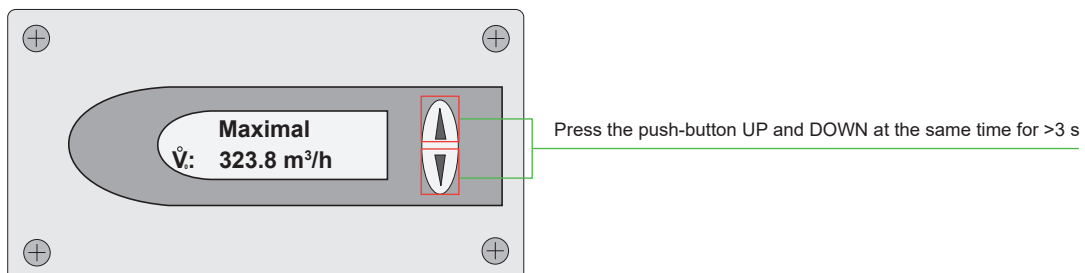
After exiting the initial MIN or MAX display, various measurement values can be scrolled through using the UP or DOWN keys.

To exit the MIN/MAX mode, keep either the UP or DOWN key pressed for more than 3 seconds.

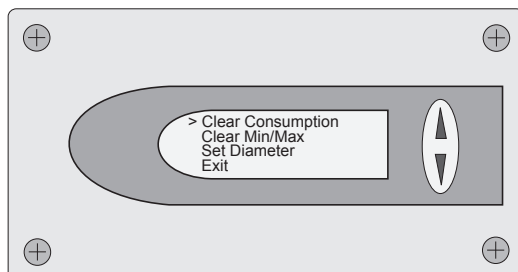


6.3.4 Reset of the Consumption Meter or the MIN / MAX Value

Keep both the UP and DOWN key pressed for more than 3 seconds to enter the reset menu for the consumption meter or the MIN / MAX value. Select the desired menu item by briefly pressing the UP or DOWN key.



To confirm the selected menu option, keep the UP or DOWN key pressed for more than 3 seconds. To cancel the procedure without performing a reset, select menu item "NO" or "EXIT".



6.3.5 Maximum Consumption Meter

The maximum consumption meter readout on the display is 999 999 999.0 m³ or 99 999 999.0 ft³. Then it shows "LCD maximum". The internal memory continues counting. The maximum counter reading is 3.4×10^{38} m³. It is possible to read-out the counter reading with the configuration software.

6.4 Bus Output (Optional)

6.4.1 Device Address

The DIP switches on the electronics board can be used to set the device address directly on-board or to switch to software configuration.

The flow sensors are factory-set to address 1.

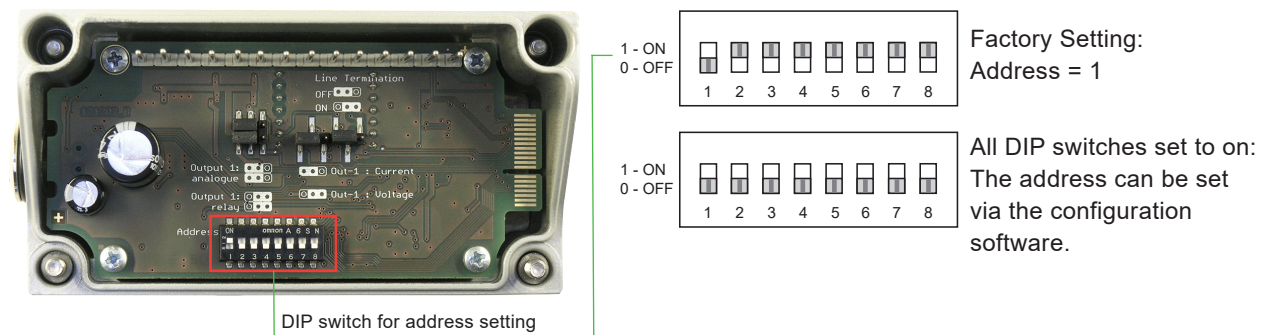


Fig. 9 Address setting

6.4.2 M-Bus (Meter-Bus)

The M-Bus (Meter Bus) is a field bus for recording consumption data. Transmission is carried out serially over a reverse-polarity-protected 2-wire line. The flow sensor operates as an M-Bus slave and therefore requires a separate supply voltage. No specific topology (line or star) is prescribed for the cabling. For wiring, a standard telephone cable of type J-Y(St)Y Nx2x0.8 mm can be used. A maximum cable length of 250 meters per segment (primary address) is permissible.

Read-out of the current measurement / consumption data

The following measurement/consumption values are transmitted during a standard query:

Floating-point values (32-bit Real)

- Standardised volume flow
- Temperature
- Mass flow
- Consumption meter status
- Flow velocity

Integer values

- Standardised volume flow (32 bit Integer)
- Temperature (32 bit Integer)
- Mass flow (32 bit Integer)
- Consumption meter status (64 bit Integer)
- Flow velocity (32 bit Integer)

The table below shows the package structure of the measurement/consumption data sent by the EE77x sensor:

Header	
68	Start of telegram
4F 4F	L-field (Length)
68	Second starting signal
08	C-field (RSP_UD)
XX	A-field (Address)
Start User Data	
72	CI-field (Variable data structure)
XX XX XX XX	Identification number
A5 16	Producer (0x16A5 ... EUE)
01	Version
09	Medium (9 ... compressed air)
XX	Access number (Continuous)
00	Status
00 00	Signature
Data Record 1: Volume Flow	
05	DIF (32 bit Real)
3E	VIF (Volume flow in m ³ /h)
XX XX XX XX	Act. measuring value
Data Record 2: Temperature	
05	DIF (32 bit Real)
5B	VIF (Temperature in °C)
XX XX XX XX	Act. measuring value
Data Record 3: Mass Flow	
05	DIF (32 bit Real)
53	VIF (Mass flow in kg/h)
XX XX XX XX	Act. measuring value
Data Record 4: Consumption Meter Reading	
05	DIF (32 bit Real)
16	VIF (Volume in m ³)
XX XX XX XX	Act. measuring value
Data Record 5: Flow Rate	
05	DIF (32 bit Real)
7F	VIF (manufacturer specific in m/s)
XX XX XX XX	Act. measuring value
Data Record 6: Pressure	
05	DIF (32 bit Real)
6B	VIF (Pressure in bar)
XX XX XX XX	Act. measuring value
Data Record 7: Volume Flow	
04	DIF (32 bit Integer)
3B	VIF (Volume flow in 10 ⁻³ m ³ /h)
XX XX XX XX	Act. measuring value
Data Record 8: Temperature	
04	DIF (32 bit Integer)
59	VIF (Temperature in 10 ⁻² °C)
XX XX XX XX	Act. measuring value
Data Record 9: Mass Flow	
04	DIF (32 bit Integer)
51	VIF (Mass flow in 10 ⁻² kg/h)
XX XX XX XX	Act. measuring value
Data Record 10: Consumption Meter Reading	
07	DIF (64 bit Integer)
13	VIF (Volume in 10 ⁻³ m ³)
XX XX XX XX XX XX XX XX	Act. consumption data
Data Record 11: Flow Rate	
04	DIF (32 bit Integer)
7F	VIF (manufacturer specific in 10 ⁻² m/s)
XX XX XX XX	Act. measuring value
Data Record 12: Pressure	
04	DIF (32 bit real)
68	VIF (Pressure in 10 ⁻³ bar)
XX XX XX XX	Act. measuring value
End of User Data	
XX	Check sum
16	End of telegram

Tab. 4 Package structure of the measurement and consumption data

Secondary Addressing

In addition to primary addressing, the EE77x sensor provides the option of secondary addressing. For this purpose, the following identification fields are used together as the secondary address:

- Identification number
- Manufacturer
- Version
- Medium

The exact sequence of secondary addressing is described in detail in the M-Bus Standard:

<https://m-bus.com/assets/downloads/MBDOC48.PDF>.

M-Bus Setup

	Factory settings	Selectable values
Baud rate	2 400	600, 1 200, 2 400, 4 800, 9 600
Data bits	8	8
Parity	Even	Non, odd, even
Stop bits	1	1 or 2
M-Bus address	1	0...254

Tab. 5 M-Bus protocol settings

6.4.3 Modbus RTU Setup (Modbus RTU Protocol Settings)

	Factory settings	Selectable values
Baud rate	9 600	9 600, 19 200, 38 400, 57 600
Data bits	8	8
Parity	Even	Non, odd, even
Stop bits	1	1 or 2
Modbus address	1	1...247

Tab. 6 Modbus RTU protocol settings

PLEASE NOTE

- The recommended settings for multiple devices in a Modbus RTU network are 9600, 8, even, 1.
- The EE772 represents 1 unit load on an RS485 network.

Device address, baud rate, parity and stop bits can be set via:

- Configuration Software and the USB cable.
The software can be downloaded free of charge from www.epluse.com/ee772.
- Modbus protocol in the register 1 (0x00) and 2 (0x01).
See Application Note Modbus AN0103 (available at www.epluse.com/ee772).

The serial number as ASCII-code is located in read-only registers 1 - 8 (0x00 - 0x07).

The firmware version is located in read-only register 9 (0x08) (bit 15...8 = major release; bit 7...0 = minor release).

The sensor name as ASCII-code is located in read-only registers 10 - 17 (0x09 - 0x10).

NOTICE

When reading information that spans multiple registers, it is always necessary to read all registers, even if the desired information requires less.

NOTICE

To obtain the correct floating point values, both registers have to be read within the same reading cycle. The measured value may change between two Modbus requests. This can cause inconsistencies in the exponent and mantissa.

i INFO

The Modbus function codes mentioned throughout this document shall be used as described in chapter 6 of of [MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1b3](https://www.modbus.org/), available at <https://www.modbus.org/>.

Communication settings (INT16)

Parameter	Register number ¹⁾ [Dec]	Register address ²⁾ [Hex]	Size ³⁾
Write register: function code 0x06			
Modbus address ⁴⁾	1	00	1
Modbus protocol settings ⁴⁾	2	01	1

Device information (INT16)

Parameter	Register number ¹⁾ [Dec]	Register address ²⁾ [Hex]	Size ³⁾
Read register: function code 0x03 / 0x04			
Serial number (as ASCII)	1	00	8
Firmware version	9	08	1
Sensor name (as ASCII)	10	09	8

1) Register number (decimal) starts from 1.

2) Register address (hexadecimal) starts from 0.

3) Number of registers

4) For Modbus address and protocol settings see Application Note Modbus AN0103 (available at www.epluse.com/ee772).

Tab. 7 EE772 registers for device setup

6.5 Modbus Register Map

The measured data is stored as 32 bit floating point values (data type FLOAT32). Depending on the selected measurement unit, the data is saved in either SI units or US/GB units. The measurement unit can be changed using the configuration software.

To reset the MIN / MAX values, write 0 to the corresponding write register.

For details on Modbus protocol setting, please refer to Application Note AN0103 available at www.epluse.com/ee772.

FLOAT32

Parameter	SI Unit	US/GB Unit	Register number ¹⁾ [DEC]	Register address ²⁾ [HEX]
Read register: function code 0x03 / 0x04				
Standardised flow	m/s	SFPM	26	19
Standardised volume flow	m ³ /h	SCFM	28	1B
Temperature	°C	°F	30	1D
Mass flow	kg/h	kg/h	32	1F
Consumption meter reading	m ³	ft ³	34	21
Pressure	bar	psi	36	23
MIN value standardised flow	m/s	SFPM	261	104
MAX value standardised flow	m/s	SFPM	263	106
MIN value standardised volume flow	m ³ /h	SCFM	265	108
MAX value standardised volume flow	m ³ /h	SCFM	267	10A
MIN value temperature	°C	°F	269	10C
MAX value temperature	°C	°F	271	10E
MIN value mass flow	kg/h	kg/h	273	110
MAX value mass flow	kg/h	kg/h	275	112
MIN value pressure	bar	psi	277	114
MAX value pressure	bar	psi	279	116

1) Register number (decimal) starts from 1.

2) Register address (hexadecimal) starts from 0.

Tab. 8 EE772 FLOAT32 measured data registers

Write registers for resetting values (INT16)

Parameter	Register number ¹⁾ [DEC]	Register address ²⁾ [HEX]
Write register: function code 0x06		
Reset MIN/MAX value standardised flow	261	104
Reset MIN/MAX value standardised volume flow	262	105
Reset MIN/MAX value temperature	263	106
Reset MIN/MAX value mass flow	264	107
Reset MIN/MAX value pressure	265	108

1) Register number (decimal) starts from 1.

2) Register address (hexadecimal) starts from 0.

Tab. 9 EE772 write registers for value resetting

Modbus RTU Example

The EE772's Modbus address is 1 [0x01].

Please refer to

- Chapter 6 of [MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1b3](https://www.modbus.org/), available at <https://www.modbus.org/>.
- E+E Application Note Modbus AN0103 (available at www.epluse.com/ee772)

Read the temperature (FLOAT32) T = 25.087642669677734375 °C from register address 0x1D:

Master (e.g. PLC)

EE772

Request [Hex]:								
Modbus address	Function code	Starting address Hi	Starting address Lo	Qty. of registers Hi	Qty. of registers Lo	CRC		
01	03	00	1D	00	02	54	0D	
Response [Hex]:								
Modbus address	Function code	Byte count	Register 1 value Hi	Register 1 value Lo	Register 2 value Hi	Register 2 value Lo	CRC	
01	03	04	B3	7E	41	C8	8D	69

Tab. 10 Example temperature query

NOTICE

To obtain the correct values, both registers containing the floating-point numbers have to be read within the same read cycle. The measured value may change between two Modbus requests. This can cause inconsistencies in the exponent and mantissa.

Decoding of floating point values:

Floating point values are stored according to IEEE754. The byte pairs [1], [2] and [3], [4] are transformed as follows (register contents taken from the T reading Modbus request/response example above):

Modbus response [Hex]			
Register 1 Hi	[3]	Register 1 Lo	[4]
B3		7E	
Register 2 Hi	[1]	Register 2 Lo	[2]
41		C8	
MMMM MMMM		EEEE EEEE	

Tab. 11 Modbus response

IEEE754

Register 2 Hi	[1]	Register 2 Lo	[2]	Register 1 Hi	[3]	Register 1 Lo	[4]
41		C8		B3		7E	
0100 0001		1100 1000		1011 0011		0111 1110	
EEEE EEEE		EEEE EEEE		EEEE EEEE		EEEE EEEE	
Decimal value: 25.087642669677734375							

Tab. 12 Data representation according to IEEE754

7 Maintenance and Service

7.1 Error Messages

If the flow sensor is equipped with the optional display, the following error message can be indicated.

Error Category	Error Description	Recommended Action
01	Sensing probe is not detected or defect. The display indicates "0" for all measurands. The analogue output defaults to the lowest configured value.	Check the head of the sensing probe for any visible signs of damage or contamination.
		Check the connection cable between the sensing probe and the electronics of the signal-conditioning.
02	The EEPROM for storing of the consumption meter and MIN / MAX value is defect. The consumption meter and MIN / MAX values are no longer available. All measurement values are still indicated. The analogue, relay and pulse output are still functional.	Return the faulty unit to E+E for service

Tab. 13 Explanation of the error category

7.2 Calibration and Adjustment at E+E Elektronik

Calibration and/or adjustment can be performed in the E+E Elektronik calibration laboratory. For information on the E+E capabilities in ISO 17025 or accredited calibration please see www.eplusecal.com.

7.3 Maintenance

7.3.1 Removal of the Sensing Probe of the Gauge Mounting Block

WARNING

When installing a gauge mounting block without a hot-tap valve, ensure that the pipeline is depressurised.

- Loosen the retainer nut and pull the sensor from the gauge mounting block.
- For operation without a flow sensor installed, refer to chapter 4.4 Assembly of the Measurement Section.

7.4 Sensing Probe Extraction from Gauge Mounting Block with Hot Tap Valve

The probe can be removed under pressure without flow interruption.

- Turn the gauge mounting block with hot-tap valve by hand, without using tools, and rotate it counterclockwise to the "Close – Service" position.
- The sensor is only hermetically sealed from pressurised line when the gauge mounting block with hot-tap valve is fully in the "Close – Service" position.
- Loosen the retainer nut slowly.
Allow any air to escape slowly and ensure that the released air is only relief pressure and that the gauge mounting block with hot-tap valve remains hermetically sealed.
- Loosen the retainer nut fully and pull the sensor probe from the gauge mounting block with hot-tap valve.
- For operation without an installed flow sensor, refer to chapter 4.4 Assembly of the Measurement Section.

PLEASE NOTE

The probe head is sensitive. Always fit the protection cap for transport and storage.

7.5 Cleaning the Sensing Element of the Flow Sensor

Clean the head of the sensing probe by gently swirling it in warm water or isopropyl alcohol. It is recommended to use isopropyl alcohol if the pollutant is grease or oil.

i PLEASE NOTE

- Do not use an abrasive cleaning agent, an organic solvent containing halogen or acetone.
- Do not touch the sensor with fingers or solid objects like screwdrivers, brushes or similar tools.

Let the probe dry in the ambient air.

7.6 Repairs

i PLEASE NOTE

Repairs may only be carried out by the manufacturer. The attempt of unauthorised repair excludes any warranty claims.

8 Replacement Parts / Accessories

8.1 Order Code Replacement Sensor

Feature	Description	PE772-	
Type	Compact ri-le (flow direction right to left)	T19	
	Compact le-ri (flow direction left to right)	T20	
	Remote probe		T3
Measuring range	High - 0...200 m/s (656.2 ft/s)	HV33	HV33
Measurement valve for pipe diameter	DN40	N40	N40
	DN50	N50	N50
	DN65	N65	N65
	DN80	N80	N80
Mounting	Gauge mounting block	TG2	TG2
	Gauge mounting block with hot tap valve	TG3	TG3
Electrical connection	Cable gland and screw terminals	No code	
	1 plug for power supply and outputs	E4	

Order Examples

PE772-T19HV33N65TG2E4

Feature	Code	Description
Type	T19	Compact ri-le (flow direction right to left)
Measuring range	HV33	High
Measurement valve for pipe diameter	N65	DN65 (2 1/2")
Display	No code	Without display
Mounting	TG3	Gauge mounting block with hot tap valve
Electrical connection	E4	1 plug for power supply and outputs

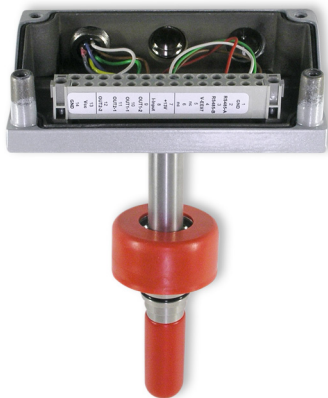


Fig. 10 Compact probe



Fig. 11 Remote probe

PE772-T3HV33N65TG2

Feature	Code	Description
Type	T3	Remote probe
Measuring range	HV33	High
Measurement valve for pipe diameter	N65	DN65 (2 1/2")
Display	No code	Without display
Mounting	TG2	Gauge mounting block with hot tap valve
Electrical connection	No code	1 plug for power supply and outputs

8.2 Accessories

For further information see datasheet [Accessories](#).

Description	Code
Sampling cell ISO with quick connector for dew point sensor	HA050102
Coupling socket for Multicontroller, DN7.2, external thread G 1/2"	HA070202

9 Technical Data

Measurands

Volume Flow (V'n)

Standard conditions	Factory setting according to DIN 1343 pn = 1 013.25 mbar (14.7 psi), Tn = 0 °C (32 °F)	
Measuring range Standardised volumetric flow in air	Pipe-diameter	HV33 (high)
	DN40 (1 1/2")	2.26...904 m³/h (1.33...531.8 SCFM)
	DN50 (2")	3.50...1 400 m³/h (2.06...823.6 SCFM)
	DN65 (2 1/2")	5.97...1 400 m³/h (3.51...823.6 SCFM)
	DN80 (3")	9.04...1 400 m³/h (5.32...823.6 SCFM)
Measuring range Standardised flow in air, CO ₂ , nitrogen, argon, O ₂	Pipe-diameter	HV33 (high)
	≤DN50 (2")	0.5...200 m/s (100...39 370 SFPM)
	DN65 (2 1/2")	0.5...117 m/s (100...23 031 SFPM)
	DN80 (3")	0.5...77 m/s (100...15 157 SFPM)
Accuracy ¹⁾ in air @ 7 bar (101.5 psi) (abs) and 23 °C (73 °F)	±(1.5 % of measured value + 0.5 % of full scale)	
Temperature dependency	±(0.1 % of measured value/°C)	
Response time t90, typ.	<1 s	
Sampling interval	0.1 s	

1) The accuracy statement includes the uncertainty of the factory calibration with an coverage factor k=2 (2-times standard deviation).
The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).
The accuracy specifications apply when using inlet and outlet sections of suitable length, see accessories and User Manual.

Temperature (T)

Measuring range	-20...+80 °C (-4...+176 °F)
Accuracy @ 20 °C (68 °F)	±0.7 °C (±1.26 °F)

Outputs

Analogue

Signal range and measurands are freely configurable	0 – 10 V	0 mA < I _L < 1 mA	I _L = load current R _L = load resistance
	4 – 20 mA 3-wire	R _L < 500 Ω	
	0 – 20 mA 3-wire	R _L < 500 Ω	

Switch output	Potential free, max. 44 V DC, 500 mA switching capacity
Pulse output	Totalizer, pulse length: 0.02...2 s

Digital (optional)

Digital interface	RS485 (EE772 = 1 unit load)
Protocol¹⁾ Factory settings Supported Baud rates Measured data types	Modbus RTU 9 600 Baud, parity even, 1 stop bit, Modbus address 1 9 600, 19 200, 38 400 and 57 600 FLOAT32
Protocol²⁾ Factory settings Supported Baud rates	M-Bus 2 400 Baud, parity even, 1 stop bit, M-Bus address 1 600, 1 200, 2 400, 4 800 and 9 600

1) Find more details about communication setting in chapter 6.5 Modbus Register Map and the Modbus Application Note at www.epluse.com/ee772.

2) Find more details about communication setting in chapter 6.4.2 M-Bus (Meter-Bus).

Input**External Dynamic Pressure Compensation**

Requirements to the pressure sensor	4 – 20 mA (2-wire, 15 V) (relevant for gases other than air and nitrogen)
--	---

General

Power supply class III  USA & Canada: Class 2 supply necessary, max. voltage 30 V DC	18 – 30 V AC/DC
Current consumption , max.	200 mA (with display)
Electrical connection	Cable gland M16 and screw terminals max. 1.5 mm2 (AWG 16), optional with connector M12x1, 8 poles
Nominal pressure	40 bar (580 psi)
Humidity range	0...100 %RH, non-condensing
Temperature range Ambient, Storage Medium	-20...+60 °C (-4...140 °F) -20...+80 °C (-4...+176 °F)
Material Enclosure Probe Probe head Gauge mounting block	AlSi9Cu3 (Metal) Stainless steel Stainless steel / glass Aluminium
Protection rating Enclosure	IP65 / NEMA 4X
Electromagnetic compatibility	EN 61326-1 EN 61326-2-3 Industrial environment FCC Part15 Class A ICES-003 Class A
Conformity	

9.1 Factory Setting of Outputs

9.1.1 SI Units

Analogue output [0 – 10 V / 0 (4) – 20 mA]

	Pipe		From	Up to		Unit
	DN	Inch		Low (L1)	High (H1)	
Standardised volume flow	40	1 1/2	0	450	900	m ³ /h
	50	2	0	700	1 400	m ³ /h
	65	2 1/2	0		1 400	m ³ /h
	80	3	0		1 400	m ³ /h
Mass flow	40	1 1/2	0	570	1 140	kg/h
	50	2	0	890	1 780	kg/h
	65	2 1/2	0		1 780	kg/h
	80	3	0		1 780	kg/h
Standardised flow	40/50	1 1/2 / 2	0	100	200	m/s
	65	2 1/2	0		117.25	m/s
	80	3	0		77.41	m/s
Temperature	all Ø		-20	80	80	°C

Switching output

	Pipe		[Switching point/Hysteresis]		Unit
	DN	Inch	Low (L1)	High (H1)	
Standardised volume flow	40	1 1/2	360/36	720/72	m ³ /h
	50	2	560/56	1 120/112	m ³ /h
	65	2 1/2		1 120/112	m ³ /h
	80	3		1 120/112	m ³ /h
Mass flow	40	1 1/2	460/46	920/92	kg/h
	50	2	700/70	1 400/140	kg/h
	65	2 1/2		1 400/140	kg/h
	80	3		1 400/140	kg/h
Standardised flow	40/50	1 1/2 / 2	80/8	180/18	m/s
	65	2 1/2		80/8	m/s
	80	3		60/6	m/s
Temperature	all Ø		30/3	70/7	°C

Pulse output

pulse value = 1 m³ ; pulse duration = 0.1 s

9.1.2 US Units

Analogue output [0 – 10 V / 0 (4) – 20 mA]

	Pipe		From	Up to		Unit
	DN	Inch		Low (L1)	High (H1)	
Standardised volume flow	40	1 1/2	0	260	520	SCFM
	50	2	0	410	820	SCFM
	65	2 1/2	0		820	SCFM
	80	3	0		820	SCFM
Mass flow	40	1 1/2	0	570	1 140	kg/h
	50	2	0	890	1 780	kg/h
	65	2 1/2	0		1 780	kg/h
	80	3	0		1 780	kg/h
Standardised flow	40/50	1 1/2 / 2	0	19 685	39 370	SFPM
	65	2 1/2	0		23 081	SFPM
	80	3	0		15 238	SFPM
Temperature	all Ø		-4	176	176	°F

Switching output

	Pipe		[Switching point/Hysteresis]		Unit
	DN	Inch	Low (L1)	High (H1)	
Standardised volume flow	40	1 1/2	210/21	420/42	SCFM
	50	2	330/33	660/66	SCFM
	65	2 1/2		660/66	SCFM
	80	3		660/66	SCFM
Mass flow	40	1 1/2	460/46	920/92	kg/h
	50	2	700/70	1 400/140	kg/h
	65	2 1/2		1 400/140	kg/h
	80	3		1 400/140	kg/h
Standardised flow	40/50	1 1/2 / 2	15 000/1 500	30 000/3 000	SFPM
	65	2 1/2		15 000/1 500	SFPM
	80	3		10 000/1 000	SFPM
Temperature	all Ø		90/9	150/15	°F

Pulse output

pulse value = 1 CF ; pulse duration = 0.1 s

10 Configuration Software

10.1 Introduction

The configuration software enables user-friendly adaptation of the flow sensor to the specific application. In addition, the measured values for flow and temperature can be calibrated and adjusted as required.

Two separate software packages are available free of charge on our website at www.epluse.com/ee772.

- One package for Microsoft Windows 7 and earlier operating systems
- One package for Microsoft Windows 10 / 11

i LIMITED LIABILITY

E+E Elektronik shall not be held liable for any damages or consequential damages (including, but not limited to, loss of earnings, business interruption, loss of information or data, or any other financial losses) arising from the installation, use, or inability to use an E+E Elektronik software product, or from any associated support services or the failure to provide such support services.

The system requirements for the installation and execution of the software are:

- Windows XP with SP3, Windows Vista or Windows 7
- .NET framework 3.5 with SP1
- USB 2.0 interface

i PLEASE NOTE

During setup there will be no installation of .NET Framework 3.5 SP1 – if the required version is not already installed on the computer, the following error message will appear at the start of the configuration software. .NET Framework 3.5 SP1 can be installed using Windows Update.



Upgrading from Microsoft Windows 7 to Microsoft Windows 10 / 11

When a system is upgraded from Microsoft Windows 7 to Microsoft Windows 10 or Microsoft Windows 11, the configuration software version for Microsoft Windows 10 / Microsoft Windows 11 must be downloaded and installed.

The configuration software version intended for Microsoft Windows 7 is not compatible with Microsoft Windows 10 or Microsoft Windows 11.

10.2 Installation

Administrator rights on the personal computer are required to ensure a smooth installation of the EE772 configuration software.

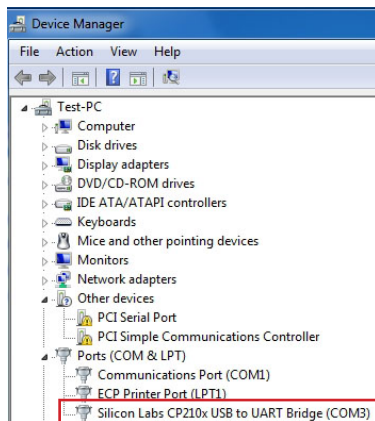
- During the software installation the EE772 must NOT be connected to the computer via the USB cable.
- Run Setup.exe the InstallShield-Wizard for the EE772 configurator.
- Follow the on-screen instructions to complete the installation process.

i PLEASE NOTE

- After the configuration software has been installed, the installation of the USB driver is initiated – unless USB setup has been explicitly disabled.
- The USB driver is installed automatically when the EE772 is connected to the computer for the first time.
- Any dialogue boxes that appear can be confirmed by selecting “No. Do not download driver from the Internet” and “Install the hardware automatically”.

If the EE772 configuration software and the USB driver have been installed correctly, and the EE772 is connected to the personal computer via the USB interface, a device entry named “Silicon Labs C210x USB to UART Bridge” should appear in the device manager.

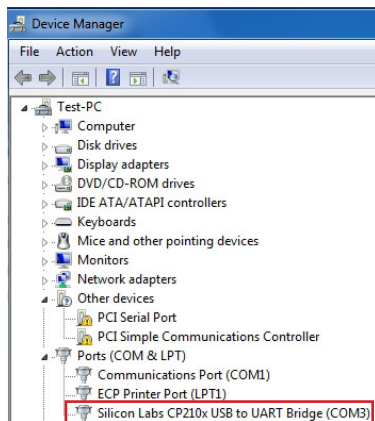
See: Start → Settings → Control Panel → System → Hardware → Device Manager



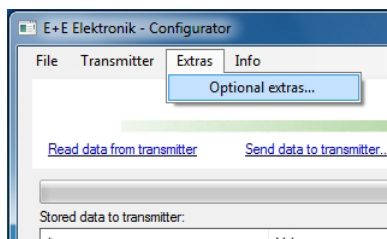
Configuration of the USB Interface (VirtualCOM)

After starting the software, configure the correct VirtualCOM interface for the USB driver. The number assigned to the active USB interface can be found under:

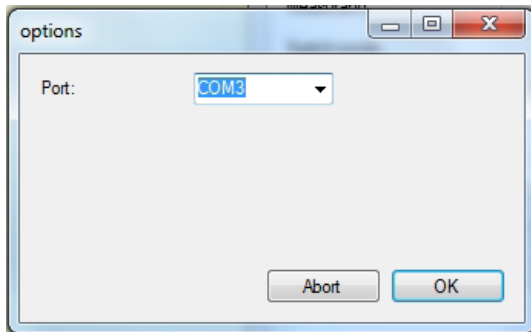
Start → Settings → Control Panel → System → Hardware → Device Manager



Do the setting under menu “Extras” and menu item “Optional extras ...”



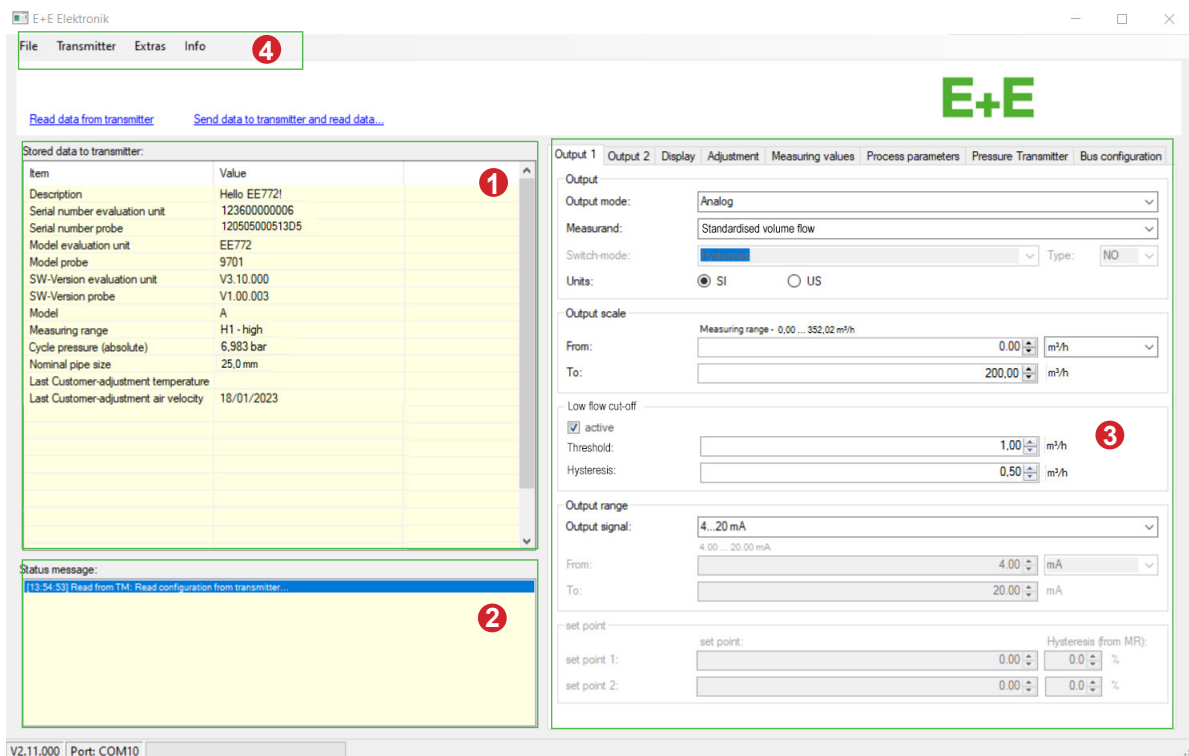
Select the COM-port number as displayed in the device manager.



i PLEASE NOTE

These settings are required only once, during the initial start-up of the configuration software. The settings are then stored for future use..

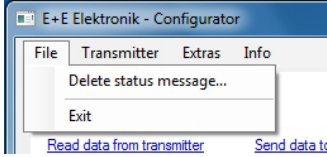
10.3 User Interface



No.	Function
1	Basic information: After the sensor data has been retrieved, the basic device information is displayed in this section.
2	Status message: This section displays the status messages and other relevant information.
3	Input screen: Input screen for configuring or adjusting the flow sensor.
4	Menu tool bar: Selection of menu items.

10.4 Menu Toolbar

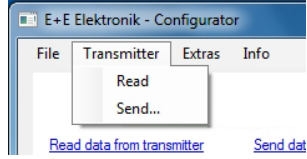
10.4.1 File

Menu	Item	Description
	Delete status message	Deletes the status messages.
	Exit	Closes the configuration software.

10.4.2 Transmitter

i PLEASE NOTE

The term “Transmitter” is used synonymously with “Sensor” throughout this user manual.

Menu	Item	Description
	Read	Reads the actual configuration of the transmitter.
	Send	Uploads the “new” configuration to the transmitter. The following settings are uploaded to the transmitter. - Units - Output 1 - Output 2 - Display mode - Pressure transmitter

Before uploading the “new” configuration to the transmitter, a dialog box will display a summary of the changes. Click “OK” to upload the configuration to the transmitter, or click “Cancel” to abort the operation.

10.4.3 Extras

Details on configuring the VirtualCOM interface can be found in chapter 10.2 Installation under “Configuration of the USB Interface (VirtualCOM)”.

10.5 Input Screen

10.5.1 Output 1, Output 2

This screen displays the current transmitter settings for outputs 1 and 2, as well as for relay 1 and 2. The user can alter and upload these settings to the transmitter, together with other changes of the configuration.

Output Mode

This section allows the selection of the signal output mode.

- Output 1: Analogue or switch (relay) output
- Output 2: Switch (relay) output or pulse output

PLEASE NOTE

If the mode of output 1 is changed, jumper J1 on the signal conditioning electronics board must always be repositioned (refer to chapter 6.1 Jumpers for Output Configuration).

Measurand

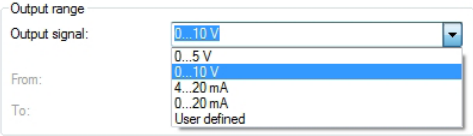
This setting defines which measurand is assigned to the selected output.

Units

Here, the engineering units for the selected measurand are chosen. Units can be set either to SI units (m/s; °C; m³/h) or US units (SFPm; °F; SCFM).

PLEASE NOTE

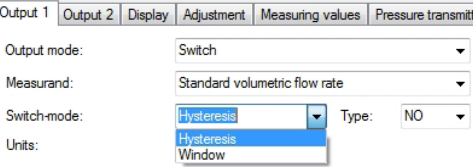
The “Units” setting on the Output 1 and Output 2 tabs is synchronised. If the units are changed on one output tab, the units on the other output tab are automatically updated accordingly.

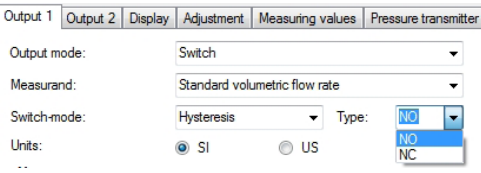
Menu	Description
Output Mode – Analogue 	Within the limits of measurement range and the output scaling, the analogue output can be freely configured and scaled. A standard output signal (0 – 5 V, 0 – 10 V, 0 – 20 mA, 4 – 20 mA) can be selected, or a user-defined current or voltage range may be specified (e.g. 1 – 9 V).

PLEASE NOTE

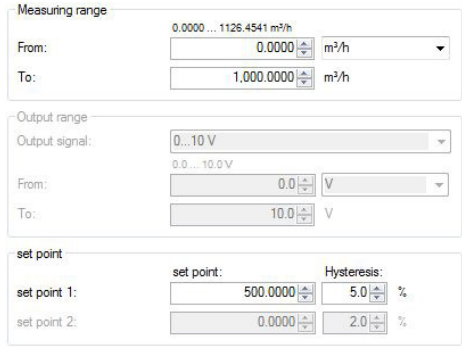
If the analogue output is changed (from current to voltage or vice versa), jumper J2 on the signal-conditioning electronics board must also be repositioned (refer to chapter 6.1 Jumpers for output configuration).

Output Mode – Switch (Relay)

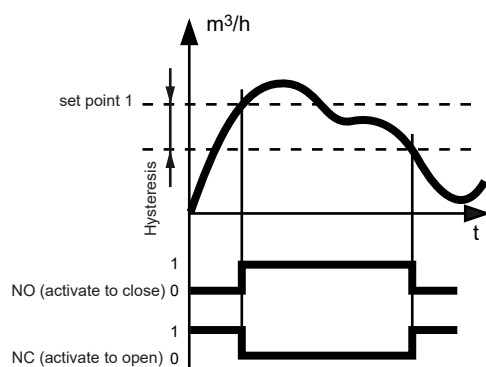
Menu	Description
	In the “Switch-mode” field, either “Hysteresis” or “Window” can be selected.

Menu	Description
	The "Type" field defines the switching behaviour of the relay, NO (Normally Open): The relay closes when activated. NC (Normally Close): The relay opens when activated.

In the "Measuring range" section, the range can be defined using "From" to set the lower value and "To" to set the higher value.

Menu	Description
	The hysteresis for the set point is entered as a percentage of the measuring range. [Measuring range] = high measuring value - low measuring value Example – Hysteresis: Set point = 500 m³/h Reset point = 450 m³/h Hysteresis = 50 m³/h = 0.5 % of measuring range

Hysteresis



When the measurement value reaches set point 1, the relay is activated. The reset point value is equal to set point 1 minus the hysteresis.

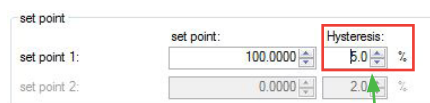
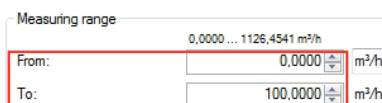
Example:

Set point 1 = 100 m³/h

Hysteresis 5 m³/h.

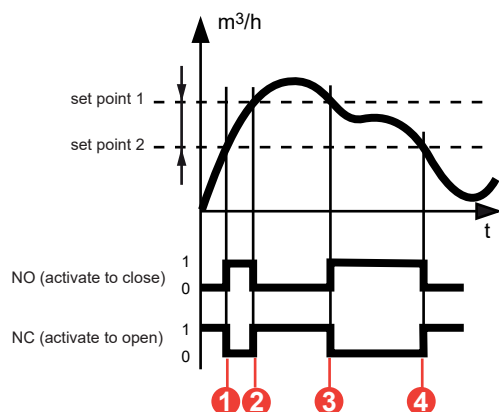
The relay switches at 100 m³/h.

The reset point is at 96 m³/h.

Hysteresis = 5 m³/h = 5 % of the measuring range

Window



No.	Data
1	$80 \text{ m}^3/\text{h} = \text{set point 2}$
2	$100 \text{ m}^3/\text{h} = \text{set point 1}$
3	$99 \text{ m}^3/\text{h} = \text{set point 1 - hysteresis}$
4	$79 \text{ m}^3/\text{h} = \text{set point 2 - hysteresis}$

When the measured value lies between set point 1 and set point 2, the relay remains activated. For each set point, the hysteresis is fixed at 0.2 % of the measuring range.

Example:

Set point 1 = $100 \text{ m}^3/\text{h}$

Set point 2 = $80 \text{ m}^3/\text{h}$.

The screenshot shows the configuration window for the device. It includes fields for 'set point 1' (100.0000), 'set point 2' (80.0000), and 'Hysteresis' (0.2 %). The 'Measuring range' section shows 'From: 0.0000' and 'To: 500.0000' m^3/h . Red boxes highlight the 'From' and 'To' fields, and green arrows point from the text below to these fields.

Hysteresis of each point is $1 \text{ m}^3/\text{h} = 0.2 \%$ of the measuring range $500 \text{ m}^3/\text{h}$.

Output Mode – Pulse

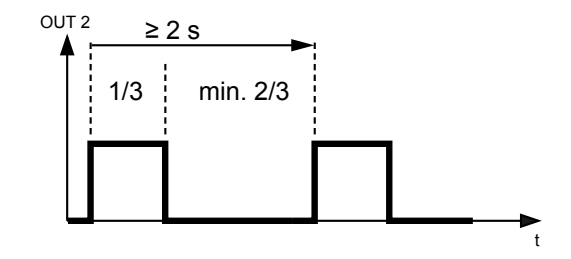
If output 2 is configured for a pulse mode, the selected measurand must be consumption. The pulse duration and value (significance level of the pulse) can be freely configured in the "Pulse" section.

$$\frac{\text{Volume Flow [m}^3/\text{h}]}{\text{Pulse Value [m}^3/\text{Pulse}]} = \frac{\text{Number of Pulses}}{\text{Hour}}$$

The pulse duration can be set within a range of 0.02 and 2 seconds.

Menu	Description
Pulse 0.02 ... 2.00 sec Pulse duration: 0.10 sec. pulse-value: 1.000 m³	Example: Pulse duration = 100 ms; Pulse value = 1 pulse per 1 m^3 consumed

The pulse-to-interval ratio must be at least 1:2, meaning that the pulse interval duration must be at least twice as long as the pulse duration.



Calculation of the minimum “pulse value” or the maximum “pulse duration”.

$$\text{IMPW_MIN} = \text{NORMV_MAX} [\text{m}^3/\text{h}] * \text{IMPL} [\text{s}] / 1200$$

$$\text{IMPL_MAX} = \text{IMPW} [\text{m}^3] * 1200 / \text{NORMV_MAX} [\text{m}^3/\text{h}]$$

Short Form	Description
IMPW	Pulse value [m ³]
IMPL	Pulse length (duration) [s]
IMPW_MIN	Minimum pulse value [m ³]
IMPL_MAX	Maximum pulse length (duration)
NORMV_MAX	Expected maximum volume flow (m ³ /h)

10.5.2 Minimum Flow Shutdown

The minimum flow shutdown can be activated or deactivated using the “active” checkbox.

If the output signal is ≤ to the configured “Shutdown value”, the flow sensor outputs 0 on the analogue output.

Low flow cut-off

☒ active

Threshold: m³/h

Hysteresis: m³/h

10.5.3 Display

If an optional display is installed, the following settings can be configured on the Display tab:

Drop-down input field “Display-Mode”

- Single spaced
- Double spaced (default)

Checkbox “Backlight”

- Checked = ON
- Unchecked = OFF

Stored data to transmitter:

Item	Value
Description	Hall 1
Serial number EE776	999999999993
Serial number probe	0000/P00000.0000
Model EE776	E772
Model probe	9701
SW-Version EE776	V0.00.010
SW-Version probe	V1.00.007

Display

Display-mode: Double spaced

☒ Backlight

Description (free text)

Description:

In the “Description (free text)” input field, a user-specific name for the transmitter (maximum 16 characters) can be entered.

E.g.: HALL 1

Using the “send” button, only the description will be uploaded to the transmitter.

10.5.4 Adjustment

The air’s normflow and temperature measurands can be adjusted.

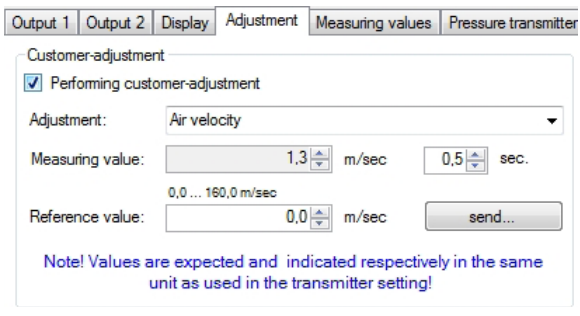
The configuration software automatically distinguishes between a 1-point and a 2-point adjustment, depending on the number of reference points entered.

The values entered for the customer’s adjustment are stored in the sensing probe electronics. They are therefore retained even if the the signal-conditioning electronics are replaced (refer to chapter 3 Product Description).

If the checkbox “Performing customer-adjustment” is activated, the adjustment mode is enabled. In this mode, the current measuring value is automatically retrieved from the flow sensor (transmitter) at the defined interval.

i PLEASE NOTE

- At first switch to “Calibration gas” in the “Process parameters” tab.
- While customer-adjustment is active, all other pages, functions and commands are disabled.

Menu	Item	Description
	Adjustment	Select the measurand to be adjusted.
	Measuring value	Indicates the actual measurement value of the transmitter. Set the update-interval.
	Reference value	Enter the measurement value of the standard.

After clicking the “send” button, a control dialog box appears in which the entered values can be corrected if necessary. Once confirmed, the reference value is transferred to the flow sensor (transmitter), and the adjustment process is completed.

The reference value used for the customer-adjustment must lie within the defined measuring range.

The customer-adjustment results in a slight rotation of the characteristic curve, ensuring that the measurement deviation at both the upper and lower adjustment points becomes zero.

Depending on the position of the entered reference value, the configuration software automatically determines whether it represents an upper or lower adjustment point.

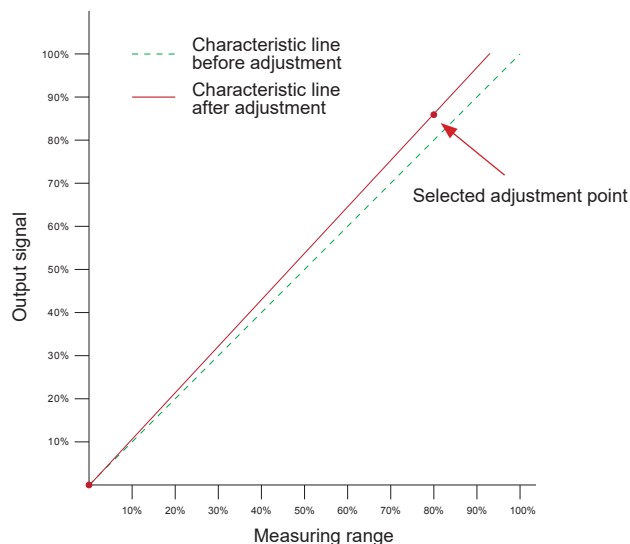
1-point Adjustment

Possibility	Lower adjustment point	Upper adjustment point
1	0 ... 50 % of m.r.	100 % of m.r.
2	0 % of m.r.	>50 ... 100 % of m.r.

m.r. = measuring range

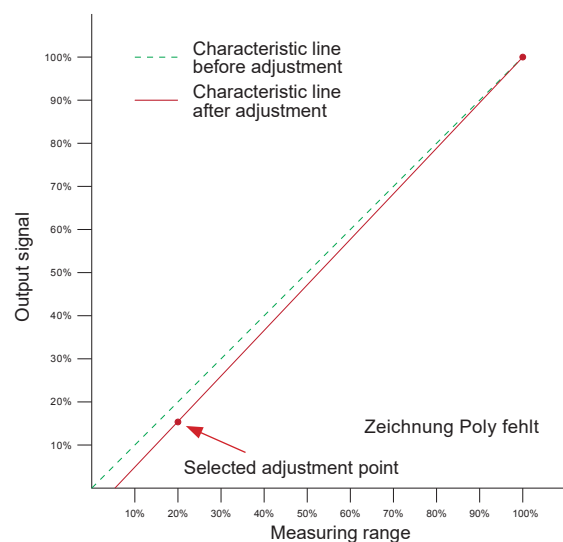
Upper adjustment point at 80% of measuring range

Lower adjustment point automatically at 0% of m.r.



Lower adjustment point at 20% of measuring range

Upper adjustment point automatically at 100% of m.r.



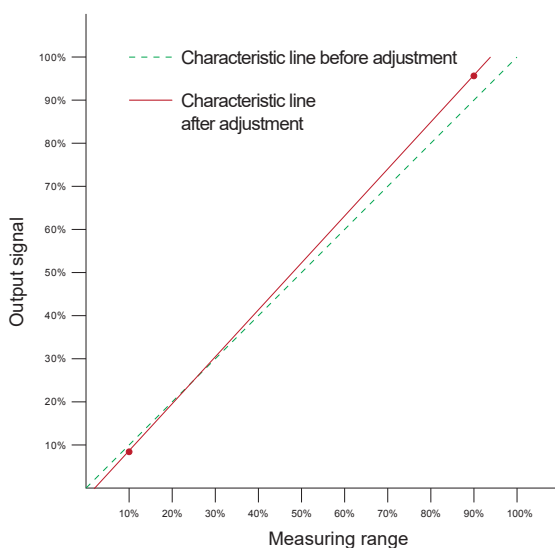
2-point Adjustment

In a 2-point adjustment procedure the lower adjustment point must be between 0 and 40 % and the upper adjustment point must be between 60 and 100 % of the measuring range. If the adjustment point is between 40 and 60 % of the measuring range, a 1-point adjustment procedure will be automatically executed instead.

Possibility	Lower adjustment point	Upper adjustment point
1	0 ... <40 % of m.r.	60...100 % of m.r.
2	40 ... <50 % of m.r.	100 % of m.r.
3	0 % of m.r.	50 ... <60 % of m.r.

m.r. = measuring range

Lower adjustment point at 10% of measuring range Upper adjustment point at 90% of measuring range



Reset to factory settings

Customer-adjustment can be reset to the factory settings by checking the appropriate checkbox and subsequently clicking the “reset” button.

Reset to factory adjustment
☐ Temperature customer-adjustment
☐ Air velocity customer-adjustment

reset

10.5.5 Measuring Values Overview

The “measuring values” tab provides an overview of the actual measurement values retrieved from the flow sensor (transmitter).

Menu	Description																														
Output 1 Output 2 Display Adjustment Measuring values Pressure tr Fetch values ☐ Polling 2 sec. <table><thead><tr><th>Measurand</th><th>Actual</th><th>Min</th><th>Max</th><th>Unit</th></tr></thead><tbody><tr><td>Air velocity</td><td>1,279</td><td>0,500</td><td>1,412</td><td>m/sec</td></tr><tr><td>Volumetric flow rate</td><td>9,006</td><td>0,247</td><td>9,939</td><td>m³/h</td></tr><tr><td>Temperature</td><td>23,58</td><td>16,05</td><td>26,66</td><td>°C</td></tr><tr><td>Mass flow</td><td>11,483</td><td>0,315</td><td>12,672</td><td>kg/h</td></tr><tr><td>Pressure</td><td>2,029</td><td>0,000</td><td>2,047</td><td>bar</td></tr></tbody></table>	Measurand	Actual	Min	Max	Unit	Air velocity	1,279	0,500	1,412	m/sec	Volumetric flow rate	9,006	0,247	9,939	m³/h	Temperature	23,58	16,05	26,66	°C	Mass flow	11,483	0,315	12,672	kg/h	Pressure	2,029	0,000	2,047	bar	Clicking “Fetch values” retrieves the current measurement values and the MIN / MAX values for flow, volume flow, temperature, mass flow and pressure (pressure only if a pressure transmitter is connected). In addition, the current reading of the consumption meter is retrieved. Enabling the “Polling” checkbox retrieves the measurement data from the transmitter at the configured interval.
Measurand	Actual	Min	Max	Unit																											
Air velocity	1,279	0,500	1,412	m/sec																											
Volumetric flow rate	9,006	0,247	9,939	m³/h																											
Temperature	23,58	16,05	26,66	°C																											
Mass flow	11,483	0,315	12,672	kg/h																											
Pressure	2,029	0,000	2,047	bar																											

Reset of the MIN / MAX values

The MIN and MAX values of each measurand, as stored in the flow sensor (transmitter), can be reset by selecting the corresponding checkbox and then clicking the “Clear MIN / MAX” button.

Reset of the Consumption Meter (Totalizer)

The consumption meter reading can be reset by clicking the “Reset meter” button.

10.5.6 Setting up Process Parameters

In the “Process Parameters” tab, the process gas (medium) can be changed, and the pressure compensation settings can be configured.

Change the process gas

i PLEASE NOTE

This function is only active if the flow sensor has been ordered for a medium other than air (refer to order code “Medium” in the datasheet).

Menu	Item	Description
	Calibration gas	The gas (medium) in which the flow sensor was factory-calibrated. Unless otherwise specified, the flow sensor is always factory calibrated in air.
	Process gas	The gas (medium) presented in the actual measurement process. The adjustable process gases are set at the factory and can be chosen from a list.

The flow sensor is factory-set to the gas (medium) specified in the order. If the process-gas setting is modified, or if the calibration gas and the process gas differ, the updated setting must be transmitted to the device. To do this, use the “send data to the transmitter and read ...” button. The currently “active gas” setting is displayed in the basic information field.

Units	US
Process gas	CO2
Active gas	Calibration gas
Computation version	1

Changing the Standard Conditions

The flow sensor is factory-set to standard conditions according to DIN 1343.

Factory setting: $p_n = 1013.25 \text{ mbar}$, $T_n = 0 \text{ °C}$ (32 °F).

The corrected volume-flow value is calculated based on the standard conditions configured in the device.

Pressure compensation

To achieve the highest measuring accuracy, the actual pressure can be entered in the dropdown field “pressure”. The “Send” button is only used to send the process pressure value to the transmitter.

10.5.7 External Pressure Sensor for Pressure Compensation

To achieve the highest accuracy under conditions of strongly fluctuating pressure (e.g. 3 to 10 bar (45 to 150 psi), the use of an external pressure transmitter is highly recommended. An absolute pressure transmitter with a 2-wire loop, powered 4 – 20 mA output should be used.

In the “Pressure transmitter” tab, the measuring range of the external pressure sensor can be entered.

10.5.8 Bus Configuration

If the flow sensor is equipped with an optional bus module, the data transfer rate and the network address can be set on the “Bus configuration” tab.

The configured network address is only applied when the DIP switches on the flow-sensor PCB are set to 255 (refer to 6.4.2 M-Bus (Meter-Bus)).

11 Conformity

11.1 Declarations of Conformity

E+E Elektronik Ges.m.b.H. hereby declares that the product complies with the respective regulations listed below:



European directives and standards.

and



UK statutory instruments and designated standards.

Please refer to the product page at www.epluse.com/ee772 for the Declarations of Conformity.

11.2 Electromagnetic Compatibility

EMC for industrial environment.

The sensor is a group 1 device and corresponds to class A.



WARNING

This device is not intended for use in residential areas and cannot ensure adequate protection of radio reception in such environments.

11.3 FCC Part 15 Compliance Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

11.4 ICES-003 Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

12 Recycling of the Device



PLEASE NOTE

Products from E+E Elektronik Ges.m.b.H. are developed and manufactured in compliance with relevant environmental protection requirements. Please observe local regulations for the disposal of the device.



For disposal, the individual components of the device must be separated according to local recycling regulations. The electronics shall be disposed of correctly as electronics waste.

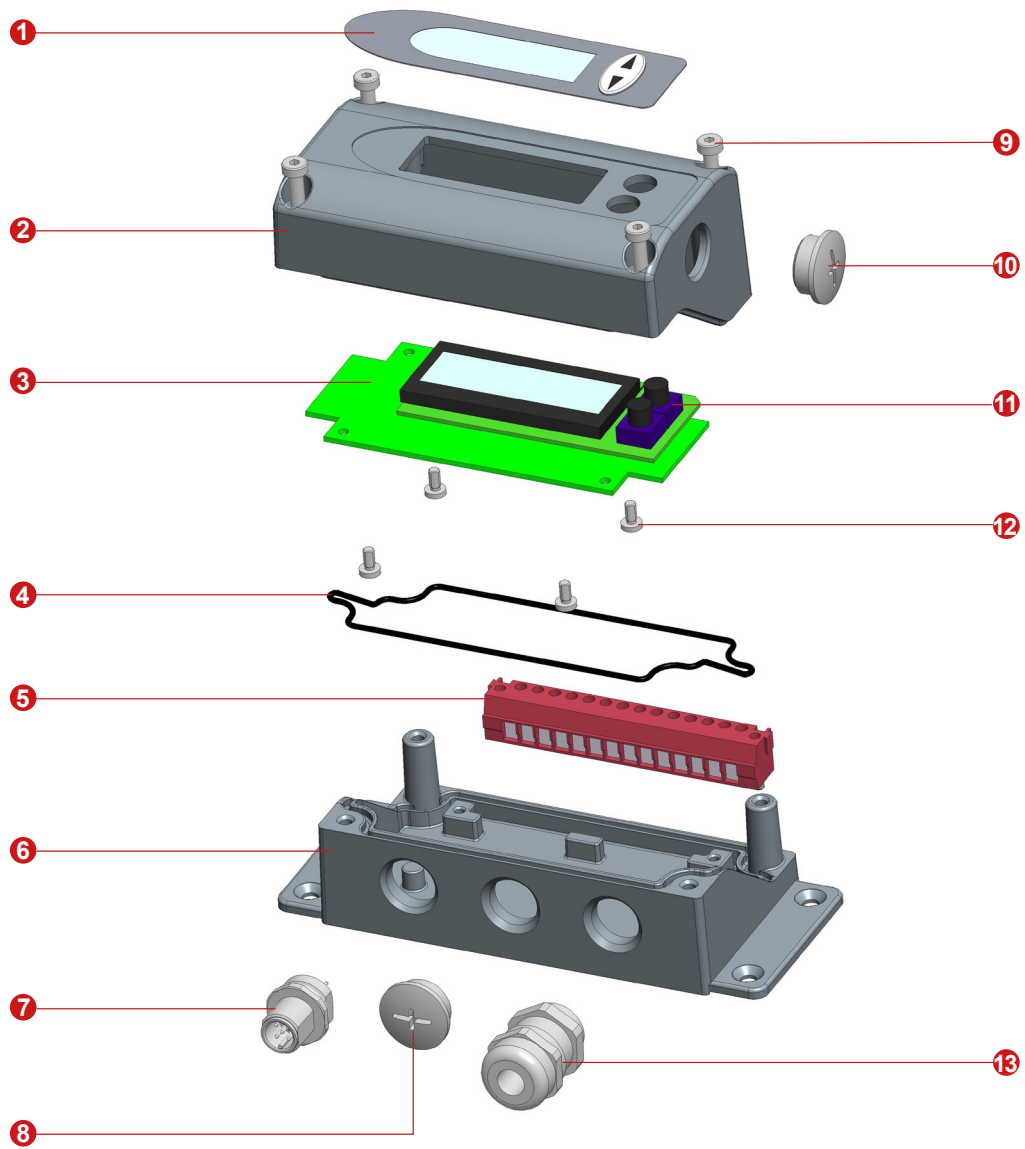


Fig. 12 Evaluation unit

No.	Part	Material	Recycling Type
1	Protective foil	Die-cast Aluminium	Plastics waste
2	Sensor module enclosure part	Die-cast Aluminium	Metal waste
3	Electronics board with display	Various materials	Electrical and Electronics waste
4	Rubber seal	Neoprene	Plastics waste
5	Terminal block	Various materials	Electrical and Electronics waste
6	Base module enclosure part	Die-cast aluminium	Metall waste
7	M12 plug	Various materials	Electrical and Electronics waste
8	Dummy plug	Nickel-plated brass	Metal waste
9	Screws	Stainless steel	Metal waste
10	Dummy plug	Nickel-plated brass	Metal waste
11	Soft keys	Various materials	Electrical and Electronics waste
12	Screws	Stainless steel	Metal waste
13	Cable gland	Nickel-plated brass	Metal waste

Tab. 14 Recycling of the parts of the EE772 evaluation unit

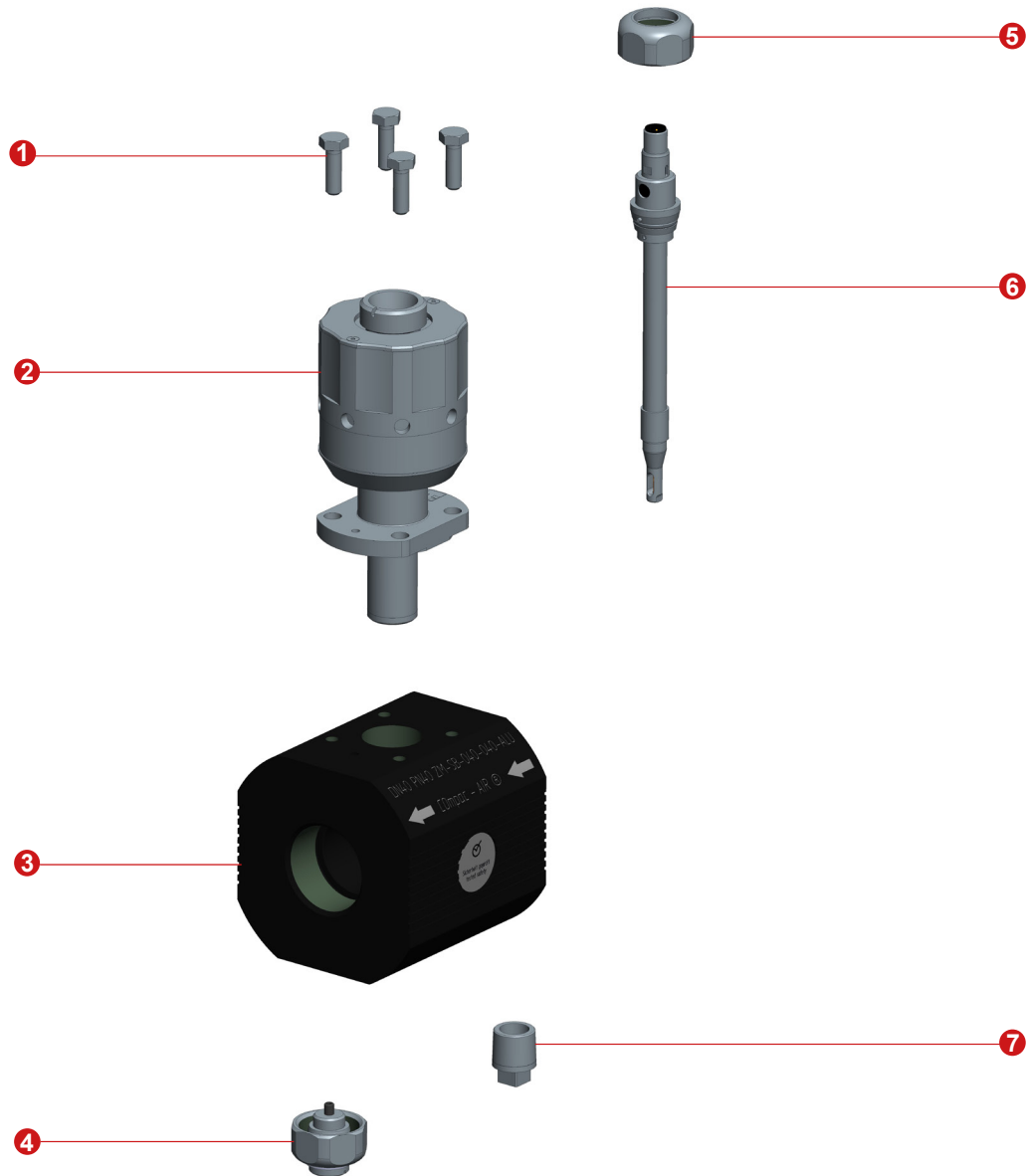
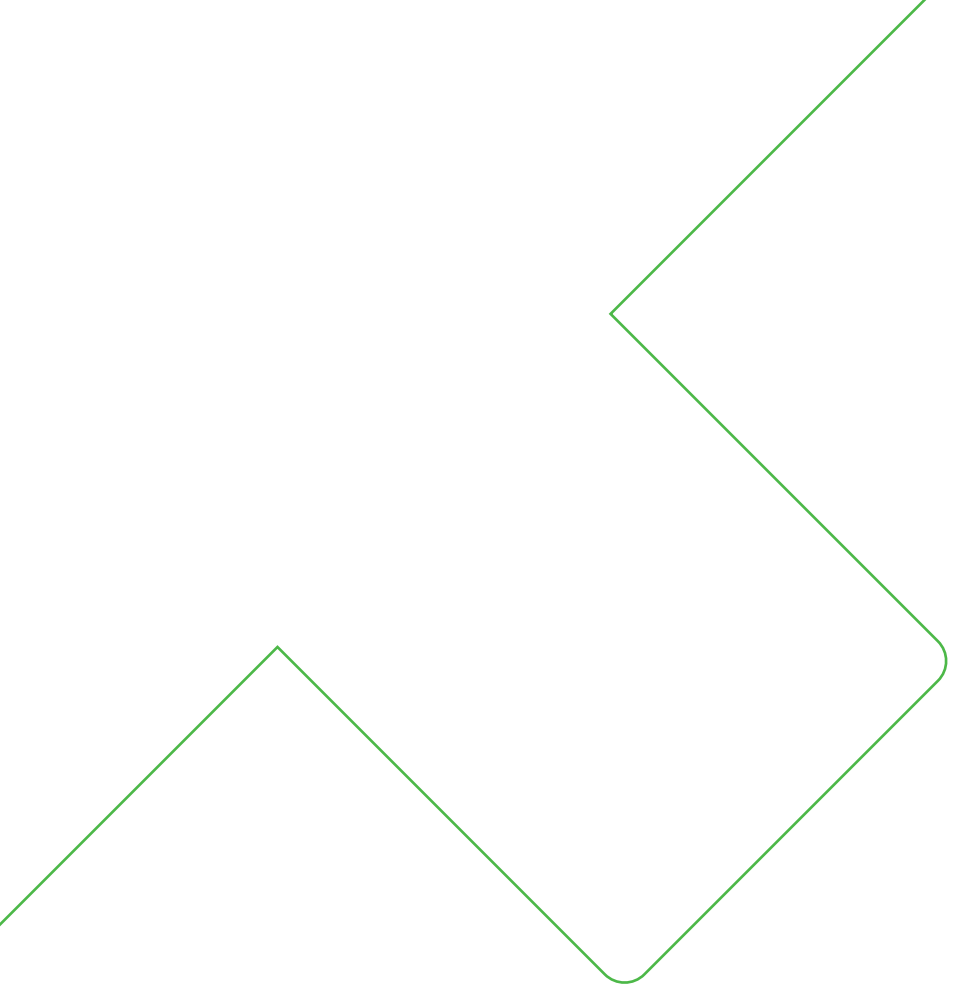


Fig. 13 Gauge mounting block with hot-tap valve

No.	Part	Material	Recycling Type
1	Screws	Stainless steel	Metal waste
2	Hot-tap valve	Aluminium	Metal waste
3	Gauge mounting block	Aluminium	Metal waste
4	Blind screw cap	Various materials	Plastics and Metal waste
5	Knurled nut	Stainless steel	Metal waste
6	Remote probe	Stainless steel and Various materials	Metal waste, electrical and electronics waste
7	Stop bolt	Stainless steel	Metal waste

Tab. 15 Recycling of EE772 gauge mounting block with hot-tap valve parts



Company Headquarters &
Production Site

E+E Elektronik Ges.m.b.H.
Langwiesen 7
4209 Engerwitzdorf | Austria
T +43 7235 605-0
F +43 7235 605-8
info@epluse.com
www.epluse.com

Subsidiaries

E+E Sensor Technology (Shanghai) Co., Ltd.
T +86 21 6117 6129
info@epluse.cn

E+E Elektronik France SARL
T +33 4 74 72 35 82
info.fr@epluse.com

E+E Elektronik Deutschland GmbH
T +49 6171 69411-0
info.de@epluse.com

E+E Elektronik India Private Limited
T +91 990 440 5400
info.in@epluse.com

E+E Elektronik Italia S.r.l.
T +39 02 2707 86 36
info.it@epluse.com

E+E Elektronik Korea Ltd.
T +82 31 732 6050
info.kr@epluse.com

E+E Elektronik Corporation
T +1 847 490 0520
info.us@epluse.com



—
your partner
in sensor
technology.