

# Operating Instructions

## FLOWSIC610

Flow Meter



**Described product**

Product name: FLOWSIC610

**Manufacturer**

Endress+Hauser SICK GmbH+Co. KG  
 Bergener Ring 27  
 01458 Ottendorf-Okrilla  
 Germany

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# 1 About this document

## 1.1 Function of this document

These Operating Instructions describe:

- Device components
- Mounting
- Electrical installation
- Operation
- Maintenance work required for reliable operation
- Troubleshooting
- Decommissioning

They contain the main safety information for safe operation of the FLOW SIC610.

## 1.2 Scope of application

These Operating Instructions are only applicable for the measuring device described in the product identification.

They are not applicable to other Endress+Hauser measuring devices.

These Operating Instructions cover standard applications which conform with the technical data specified. Additional information and assistance for special applications are available from your Endress+Hauser representative. It is generally recommended to take advantage of qualified consulting services provided by Endress+Hauser experts for your specific application.

## 1.3 Target groups

This Manual is intended for persons installing, operating and maintaining the device.

### Operation

The device may only be operated by authorized persons who, based on their training on, and knowledge of the specific device, as well as knowledge of the relevant regulations can assess the tasks given and recognize the hazards involved.

### Installing and maintaining

Skilled persons are required for installation and maintenance.

Please observe the information at the beginning of the respective Sections.

## 1.4 Further information



Observe the supplied documents.

## 1.5 Abbreviations used

Abbreviation	Significance
a.c.	At actual conditions, operating conditions
BLE	Bluetooth® Low Energy
SOS	Speed of sound, sound velocity
SPU	Signal processing unit
VOG	Velocity of gas, flow velocity

## 1.6 Symbols and document conventions

### 1.6.1 Warning symbols

Symbol	Significance
	Hazard (general)
	Hazard by electrical voltage

### 1.6.2 Warning levels and signal words

**DANGER:**

Risk or hazardous situation which *will* result in severe personal injury or death.

**WARNING:**

Risk or hazardous situation which *could* result in severe personal injury or death.

**CAUTION:**

Hazard or unsafe practice which *could* result in less severe or minor injuries.




**NOTICE:**

Hazard which *could* result in property damage.

**Note:**

Hints

### 1.6.3 Information symbols

Symbol	Significance
	Important technical information for this product
	Important information for electrical or electronic functions
	Information on product condition regarding protection against explosions (general)

## 2 For your safety

### 2.1 Basic safety information

- ▶ Read and observe these Operating Instructions.
- ▶ Observe all safety instructions.
- ▶ If there is something you do not understand: Contact the manufacturer.

#### Retention of documents

- ▶ These Operating Instructions must be kept available for reference.
- ▶ These Operating Instructions must be passed on to new owners.

#### Correct use

- ▶ Only use the measuring device as described in these Operating Instructions. The manufacturer bears no responsibility for any other use.
- ▶ Do not carry out any work or repairs on the measuring device not described in this manual.
- ▶ Do not remove, add or change any components in or on the measuring device unless such changes are officially allowed and specified by the manufacturer.
- ▶ Only use accessories approved by the manufacturer.
- ▶ Do not use damaged components or parts.
- ▶ If you do not follow these guidelines, the following applies:
  - The measuring device can become dangerous
  - The measuring device can lose function.
  - The approval for use in potentially explosive atmospheres is no longer valid.
  - The approval for use in lines pressurized above 50 kPa (0.5 bar) is no longer valid.

#### Special local conditions

- ▶ Follow all local laws, regulations and company-internal operating directives applicable at the installation location.

### 2.2 Warning information on device



#### **WARNING: Danger identification on device**

The following symbol draws attention to important dangers directly on the device:



- ▶ Consult the Operating Instructions in all cases where the symbol is attached to the device or shown on the display.

### 2.3 Intended use

FLOWSIC610 is an ultrasonic gas flow meter designed to measure the actual volumetric flow rate, volume, velocity and Speed of Sound of hydrogen and gas mixtures with different hydrogen concentrations in pipelines. In addition, the FLOW SIC610 can optionally determine hydrogen purity.


Using the device for purposes other than those intended can lead to safety-critical conditions. The manufacturer bears no responsibility for any other use.

## 2.4 Operation in potentially explosive atmospheres

The FLOWSIC610 is suitable for use in potentially explosive atmospheres according to the respective device versions.



**Note:**

- ATEX
-  II 2(1) G Ex db ia [ia Ga] IIC T4 Gb
- IECEx  
Ex db ia [ia Ga] IIC T4 Gb

**Specific conditions for use (denoted by X after the certificate number)**

- The flameproof joints of the flameproof enclosure are not intended to be repaired.
- The painted, coated, or non-metallic parts of the flow meter may pose a potential hazard due to electrostatic charge. To ensure safe operation, the flow meter must not be installed in environments where external conditions could lead to the accumulation of electrostatic charge on its non-metallic surfaces. To prevent static discharge, any parts of the flow meter, which are painted, coated or non-metallic, should only be cleaned using a damp cloth.
- The threaded entries to the flameproof enclosure must be closed with suitably certified cable glands or blind plugs.
- The non-intrinsically safe field wiring of the flow meter must be supplied with a 24 Vdc SELV/PELV or similar power supply compliant with  $U_m = 60$  V voltage.
- The maximum prospective short circuit current at the connections to non-intrinsically safe circuits shall not exceed 50 A.
- An external earth conductor is required between the external Grounding terminal of the enclosure and earth. This earth conductor must have a copper cross-sectional area  $\geq 4$  mm<sup>2</sup>, be permanently installed and adequately mechanically protected.

## 2.5 Restrictions of use

- ▶ Refer to the type plate for the configuration of your measuring device.
- ▶ Check the measuring device is suitably equipped for your application (e.g. fluid conditions).
- ▶ The measuring device is suitable for use in pressurized lines within the combination of maximum allowable temperature and pressure specified on the type plate.
- ▶ It is the user's responsibility to ensure these maximum allowable values are not exceeded during operation.



**NOTICE:**

The device has been tested for electromagnetic compatibility in industrial environments according to IEC 61326-1. Additional measures may be required for use in electromagnetic environments with higher interference levels.

## 2.6 Responsibility of user

The measuring device may only be operated by skilled persons who are knowledgeable of relevant regulations and able to assess potential hazards related to its operation.

Skilled persons are persons according to DIN VDE 0105, DIN VDE 1000-10 or IEC 60050-826 or directly comparable standards.



**NOTICE:**

Skilled persons must have exact knowledge of hazards arising from operation, e.g. through hot, toxic, explosive gases or gases under pressure, liquids, gas-liquid mixtures or other media as well as adequate knowledge of the measuring system gained through training.

## 2.7 Information on cybersecurity threats

Protection against cybersecurity threats requires a comprehensive cybersecurity concept that must be continuously reviewed and maintained.

A suitable concept comprises organizational, technical, procedural, electronic and physical defense levels and takes into account appropriate measures for the different types of risk. The measures implemented in this product can only support protection against cybersecurity threats when the product is used within such a concept.

Visit [www.endress.com/cybersecurity](http://www.endress.com/cybersecurity) for more information, such as:

- General information on cybersecurity
- Contact option for reporting vulnerabilities
- Information on known vulnerabilities (security advisories)

### **CDBT100 Bluetooth® connection device**

The CDBT100 connection device provides transparent communication.

It does not offer any functions for securing the connection, so it is not part of the cybersecurity concept.

### **CDUSB100 USB connection device**

The CDUSB100 connection device provides transparent communication.

It does not offer any functions for securing the connection, so it is not part of the cybersecurity concept.

**Ethernet-to-serial converters**

If Ethernet-to-serial converters are used in the communication to the device, e.g. Modbus TCP to Modbus RTU, which enable several connections (multiplexers), only connections that do not require a login may be used.

For connections that require a login, it must be ensured that only one connection is possible (e.g. via firewall), as otherwise access rights will be extended to all other connections.

**Securing the communication**

Modbus is used as the communication protocol. To secure the communication, it must be operated in a secure environment.

An additional security layer must be used for transmission through unsecured networks (e.g. VPN).

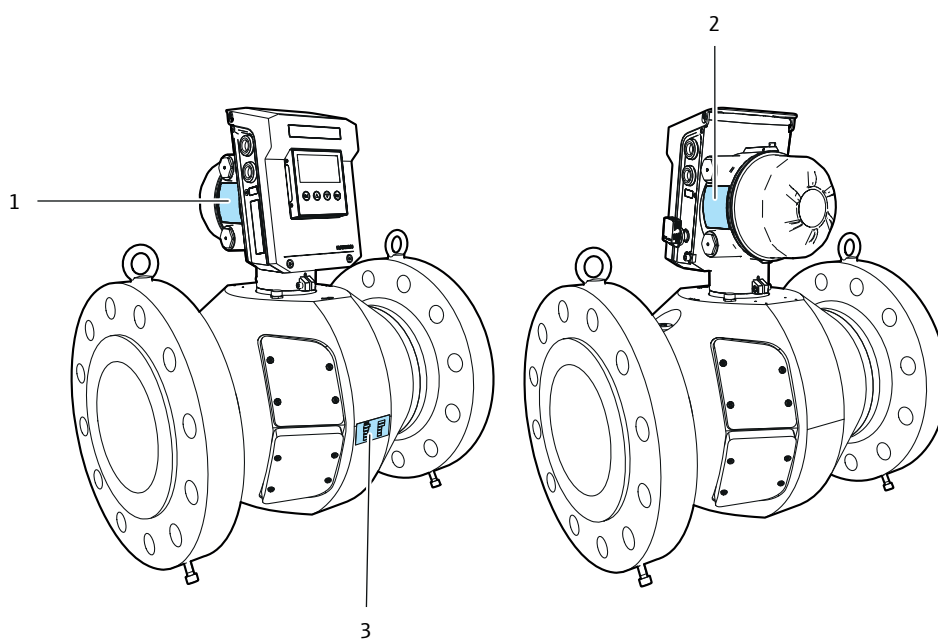
### 3 Product description

#### 3.1 Product identification

Product name:	FLWSIC610
Manufacturer:	Endress+Hauser SICK GmbH+Co. KG Bergener Ring 27 01458 Ottendorf-Okrilla Germany

The type plates are located on the SPU and on the meter body.

► For a detailed view of the type plates, see “Type plates”, page 87.



- 1 Ex type plate on SPU (includes Ex identification)
- 2 Main type plate on SPU (includes Metrology identification)
- 3 Meter body type plate

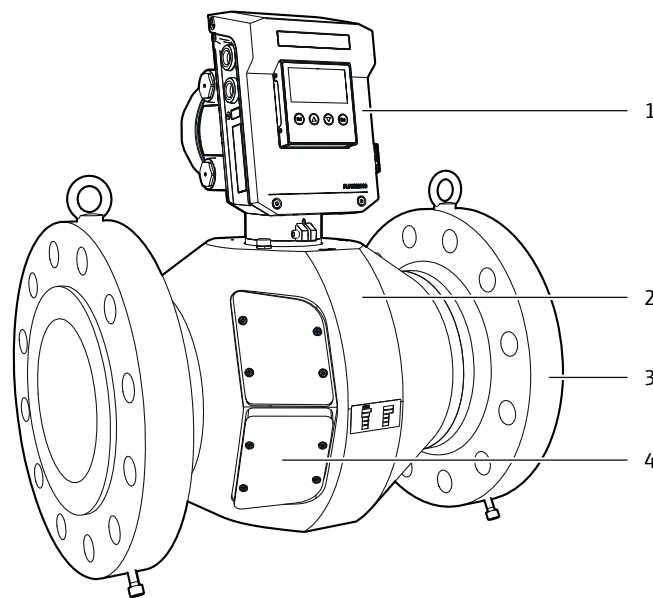
Fig. 1: Position of type plates

## 3.2 Layout and function

### 3.2.1 Overview

The FLOWVIC610 is designed and certified for custody transfer hydrogen gas measurement. It can be used for fiscal gas metering across an entire hydrogen value chain, including export pipelines after hydrogen production, transportation, storage and bulk industrial use.

The main hardware components of the FLOWVIC610 are the meter body, the four pairs of ultrasonic transducers, and the signal processing unit (SPU).



- 1 SPU (Signal Processing Unit)
- 2 Meter body
- 3 Meter body flange (flange)
- 4 Cover for ultrasonic transducers

Fig. 2: FLOWVIC610 components

### 3.2.2 Meter body

The meter body consists of a mid section for mounting the ultrasonic transducers, with flanges on either end. The meter body is made of a single piece casting or forging, which is machined on precision equipment to ensure high reproducibility of the geometric parameters.

The internal diameter, design of the sealing surface, and standard dimensions of the flanges are in accordance with the specifications in the data sheet and type code. The meter body material is chosen to suit customer requirements. Standard meter bodies are available in low temperature carbon steel and stainless steel.

**3.2.3 Ultrasonic transducers**

Ultrasonic transducers optimally tuned to system requirements are fitted on the measuring device. The high quality of the transducer design provides the basis for accurate and highly stable transit time measurement of the ultrasonic signals.

The position of the transducer pairs in the section area depends on the meter size. They can be positioned either parallel or crossed.

Meters with sizes of  $\geq$  DN100 have four parallel paths.

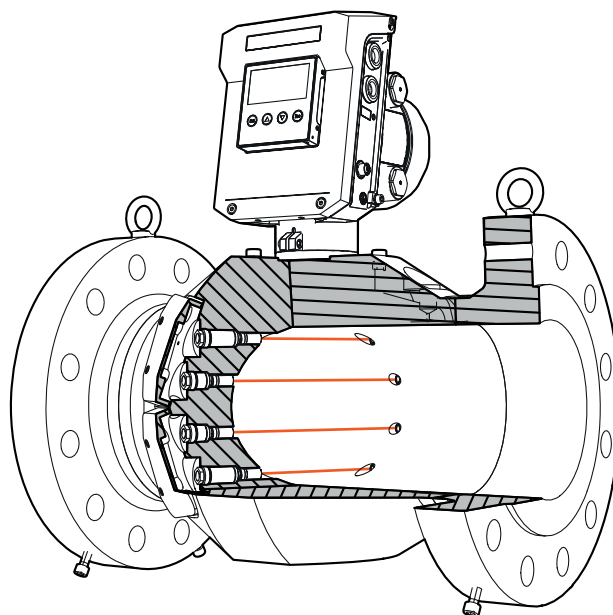


Fig. 3: Parallel path layout for meter sizes  $\geq$  DN100

Meters sized DN50 and DN80 have four crossed paths (2x2).

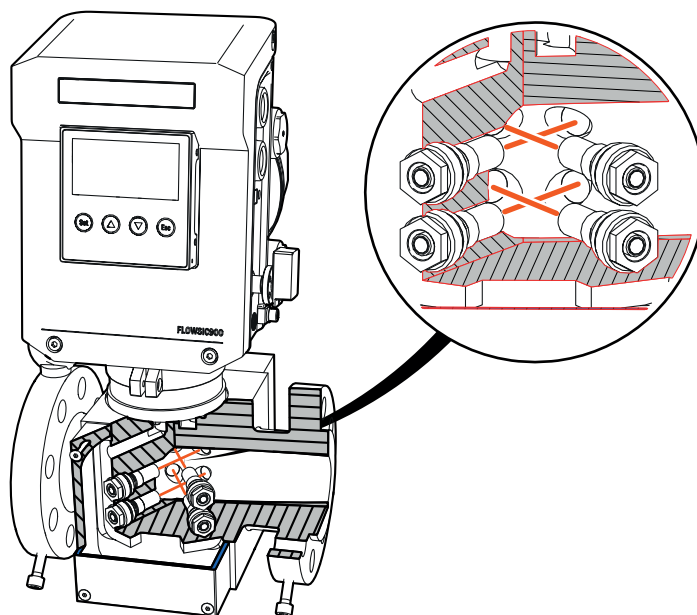


Fig. 4: Crossed path layout for DN50 and DN80 meter sizes

### 3.2.4 Signal processing unit (SPU)

The signal processing unit (SPU) contains all the electrical and electronic components for controlling the ultrasonic transducers. It generates transmission signals and analyzes the received signals to calculate the measured values. The SPU also contains several interfaces for communication with a PC or standardized process control system.

When the system is restarted, the last saved meter values are used as the initial values for the volume counters.

The SPU has a four-line LC display showing the current measured data and diagnostic information. The display can be navigated using the pushbuttons. However, configuration is only possible via the FLOWgate™ operating software, not on the display itself.

The power supply connection terminals and the I/O interfaces for communicating with the device are located in a separate terminal compartment of the SPU.

### 3.2.5 Integrated p/T sensor for geometry correction and Reynolds number calculation

As an option, FLOWsic610 has an integrated pressure and temperature sensor. This sensor measures the temperature and gas pressure inside the meter body. The measured values are used to correct the meter body geometry and to determine the current Reynolds number.

The sensor is not subject to (re-)calibration intervals, but may be checked for function in the course of a re-calibration service. Its measurement uncertainty is 1% over the entire measuring range and is therefore sufficiently accurate for the geometry and Reynolds number correction in electronics.

The integrated pressure and temperature sensor cannot be used for volume conversion.

### 3.2.6 Purity indication

Purity indication is available as an optional diagnostic feature on request. When enabled, it determines the purity of the hydrogen via speed of sound values. This feature can only be used if pressure and temperature values are supplied with sufficient accuracy. If no better source is available, the pressure and temperature values provided by the integrated p/T sensor can be used.

The algorithm uses the full GERG2008 component to calculate a predicted speed of sound based on the measured pressure and temperature. The algorithm then iterates until the measured and calculated speeds of sound are close together. It varies the hydrogen component in the component matrix. The result is the estimated hydrogen content. In order to use the algorithm, at least one impurity component must be selected in the component matrix (set unequal to zero).

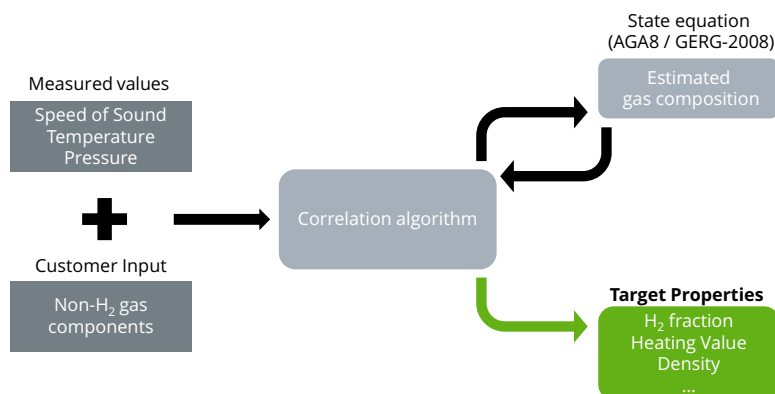
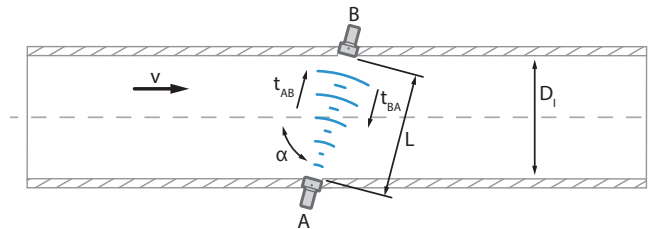


Fig. 5: Calculation scheme of Purity indicator

### 3.3 Measuring principle

The FLOWSIC610 measuring system works according to the principle of ultrasonic transit time difference measurement. This allows conclusions to be made on the gas volume flowing through based on the sound velocity transfer time. Measurement is carried out in a direct path layout to keep disturbing effects such as gas flow turbulence, dirt, moisture or interfering noises as low as possible. Two ultrasonic transducers are positioned opposite each other in a defined angle to the gas flow and operate alternately as sender and receiver.



- A + B = Ultrasonic transducers
- v = Gas velocity
- L = Path length
- α = Path angle in °
- t<sub>AB</sub> = Transit time of signal in flow direction
- t<sub>BA</sub> = Transit time of signal against flow direction
- D<sub>i</sub> = Pipe inner diameter

Fig. 6: Measuring principle

#### 3.3.1 Determination of gas velocity

The FLOWSIC610 determines the gas velocity on each measuring path 10 times per second as standard. The following calculations are carried out to determine the gas volume.

##### 3.3.1.1 Determination of transit time of ultrasonic signals

Signal transit time in flow direction

$$t_{AB} = \frac{L}{c + v \cdot \cos \alpha}$$

Signal transit time against flow direction

$$t_{BA} = \frac{L}{c - v \cdot \cos \alpha}$$

##### 3.3.1.2 Determination of path velocity

The path velocity ( $v_{path\ i}$ ) is calculated from the difference between the two transit times:

$$v_{path\ i} = \frac{L_i}{2 \cdot \cos \alpha} \cdot \left( \frac{1}{t_{AB\ i}} - \frac{1}{t_{BA\ i}} \right)$$

### 3.3.1.3 *Determination of flow velocity*

The sum of the weighted average of each of the n path velocities is the flow velocity through the meter body.

$$v_A = w_i \sum_{i=1}^n v_{path\ i}$$

### 3.3.1.4 *Determination of volumetric flow a. c.*

The uncorrected volumetric flow  $Q^*$  is calculated from the flow velocity  $v_A$  and the open cross-sectional area in the measuring section of the meter body:

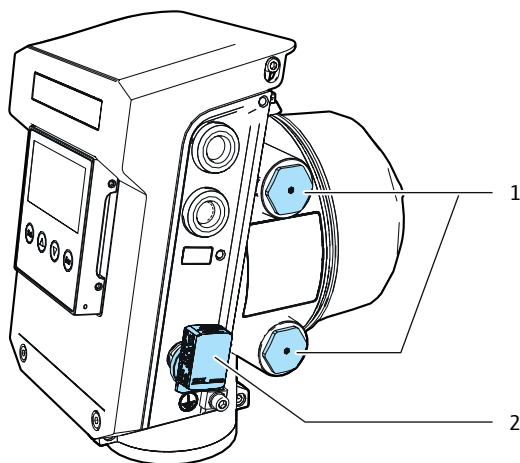
$$Q^* = v_A \cdot \frac{D^2 \cdot \pi}{4}$$

The linearization via the Reynolds number ( $K_{Re}$ ) and the correction of the non-ideal velocity distribution in the flow profile ( $K_{profile}$ ) also affect this result. This is taken into account using correction coefficients.

$$Q = Q^* \cdot K_{Re} \cdot K_{profile}$$

### 3.4 Interfaces

The FLOWSIC610 features several different digital outputs for signaling and flow rate indication. Communication with external systems is provided via an RS-485 serial interface. The device also includes service interface for configuration, diagnostics, and maintenance



- 1 Cable glands (4 pcs in total) for power supply and interfaces (I/O)
- 2 Commissioning and service interface with BLE adapter (as an example)

Fig. 7: SPU connections

#### 3.4.1 Serial data interfaces

Two RS-485 interfaces are available for configuration, measured value output and diagnostics. There are 2 protocol types: MODBUS ASCII or MODBUS RTU.

Both RS-485 interfaces can be configured as DSFG Instance F (ISO17089-1:2019 Appendix F) and support the register values listed there.

For details, see document “9413703 FLOWSIC900, FLOWSIC610 Technical Bulletin MODBUS interface”.

Additionally, the second serial interface (RS485#2) can be set to Encoder mode. In this mode, the Encoder protocol is supported at output at DO.3. In this mode the RS485#2 interface is no longer available.

For details about Encoder, see [“Encoder activation and configuration”, page 22.](#)

#### 3.4.2 Digital outputs

The FLOWSIC610 has four digital outputs (FO.0/DO.0, FO.1/DO.1, DO.2, DO.3) to output the impulses proportional to the volume and status information. The digital outputs are optically isolated and can be configured as NAMUR or OPEN COLLECTOR by hardware switch on the electronics.

3.4.2.1 Status output

All digital outputs can be configured individually to output various status information.

The following output modes are available:

- Inactive  
In this mode, the output is disabled and remains at a static level.
- Measurement valid  
In this mode, the output will be activated if the measurement value is valid. If the device has any error or initialization mode is set, the output is deactivated.
- Error  
The output will be activated if the device has any error signaling active.
- Warning  
The output will be activated if the device has any warning signaling active.
- Reverse flow  
The output will be activated if the device measures reverse flow ( $Q < 0$ )

3.4.2.2 Pulse output

Two digital outputs DO.2 and DO.3 are predefined for status outputs.

Two others FO.0/DO.0 and FO.1/DO.1 can be adjusted as two separate pulse outputs FO.0 and FO.1 or as one dual pulse output FO.0/FO.1 with different pre-configurations.

There are seven possible variants of FO.0/DO.0 and FO.1/DO.1 output adjustment:

- Status (DO.0) + Status (DO.1)
- Pulse #1 (FO.0) + Status (DO.1)
- Pulse #1 (FO.0) + Pulse #2 (FO.1)
- Dual Pulse (FO.0/FO.1)
- Dual Pulse (FO.0/FO.1) Direction separated  
When forward flow is active, FO.0 outputs impulses while FO.1 is inactive. For backward flow, FO.1 outputs pulses while FO.0 is inactive

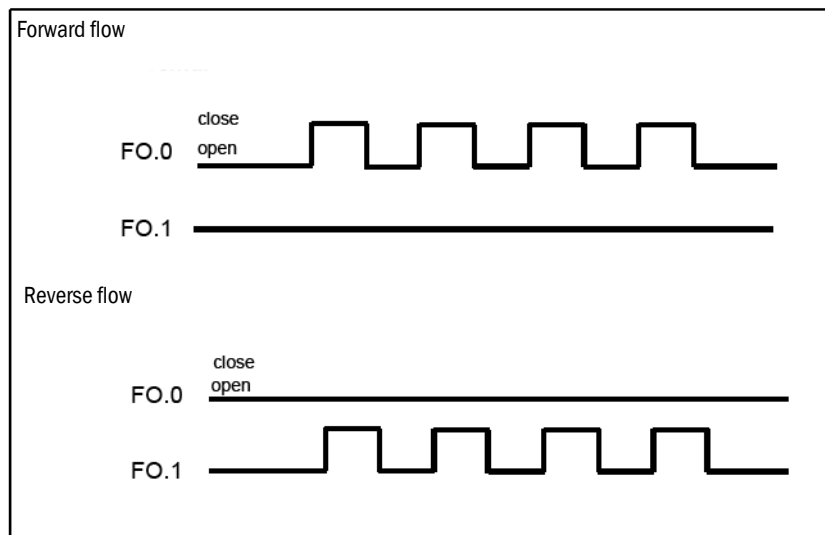


Fig. 8: Direction separated

- Dual Pulse (FO.0/FO.1) Inverted with Error

Direction-independent pulses are output from FO.0. FO.1 outputs an inverted signal to FO.0 and remains inactive in the “Measurement invalid” state.

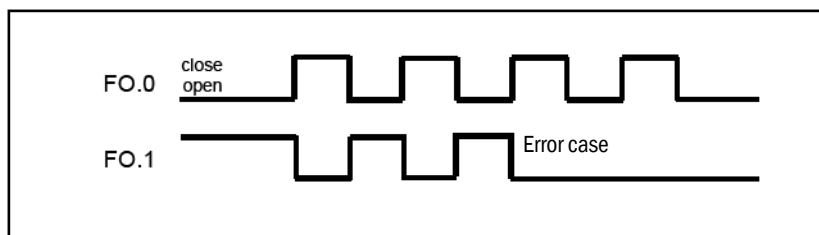


Fig. 9: Inverted with error

- Dual Pulse (FO.0/FO.1) Direction 90° phase coded  
FO.0 and FO.1 output a signal with a phase offset of 90°. FO.0 leads for positive values and follows for negative values.

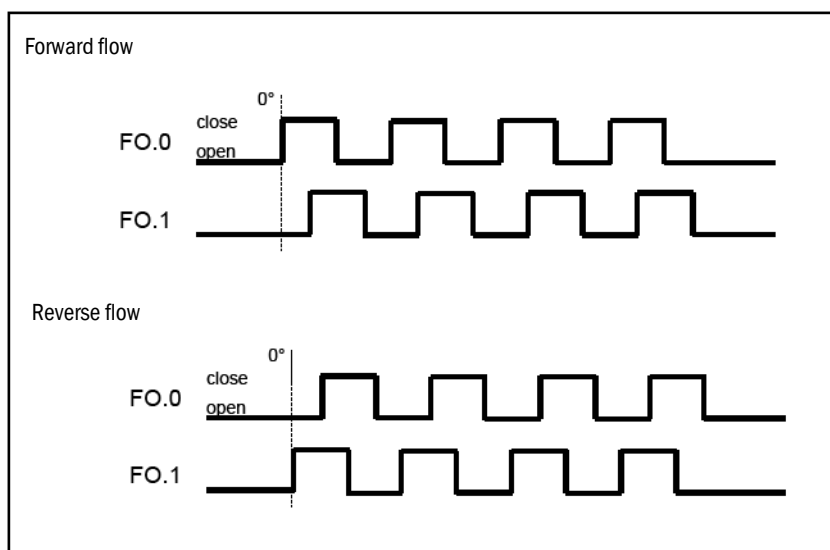


Fig. 10: Direction 90° phase coded

The maximum adjustable frequency is 10 kHz.

The following can be set as output value via the associated configuration register:

- Operational volume (valid)
- Operational volume (total)



**Note:**

Final digital outputs adjustment as well as selection of a variant can be done via FLOWgate™ user software.

3.4.2.3 Encoder activation and configuration

Encoder is a digital interface for primary devices with meter reading transmission according to DVGW Information GAS No. 23, December 2017.

As an alternative to the pulse output, the digitally encoded absolute meter reading index (ENCODER) can be transmitted to volume conversion devices and additional devices by using a metrologically sealed point-to-point connection. Compatibility with the connected device is ensured if it works with the same interface protocol. It is recommended to check this during the course of the field verification.

To activate the Encoder output, in FLOWgate™, open the “I/O configuration” page and select the “Encoder” option, see Fig. “Encoder activation”.

Physical cable connection see Page 46, Fig. “Terminal assignment Ex-d terminal compartment for plugs P1-P5”.

The other interface settings, such as baud rate (2400 baud) and bit configuration (7E1), are automatically set correctly.

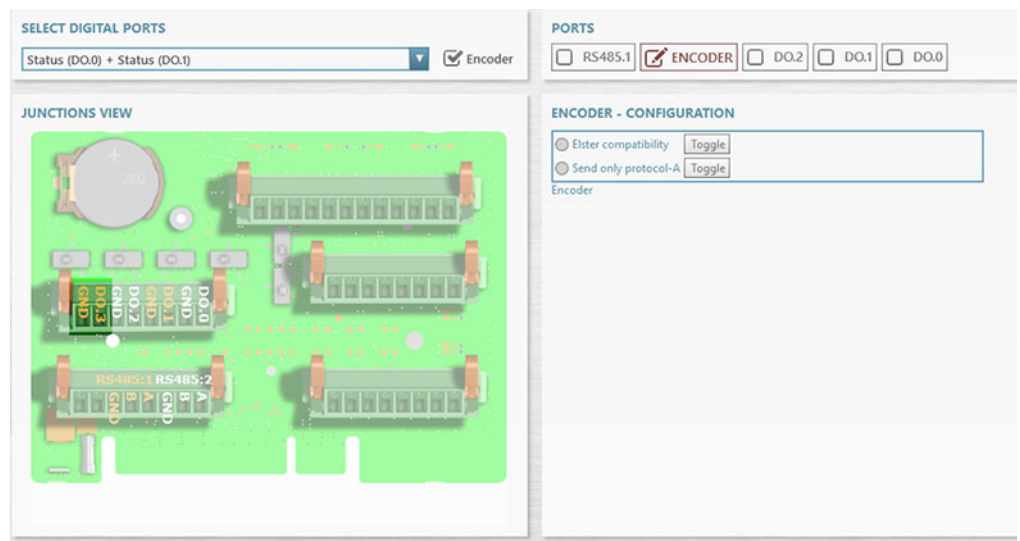


Fig. 11: Encoder activation



**Note:**

With activated Encoder mode the RS485#2 interface is no longer available as well as the digital status output function on DO.3 which is used for the Encoder signal.

The Encoder protocol is sent immediately after the request (application of supply voltage to the Encoder terminals). The protocol is repeated in 0.5 s intervals when the supply voltage is maintained at the output. By default, the “standard protocol” (type A) is sent with the meter level. The “device type protocol” (type B) with device information is sent once every 100 output protocols. The sent meter level is equivalent to the upper eight significant digits of the total operating volume  $V_{original}$  (sum of forward and backward, each uninterrupted and interrupted).

The Elster compatible Encoder protocol can be activated by the user. With this setting, the block check character is transmitted inverted. On the other hand, the sporadic sending of protocol type B can be suppressed.

**3.4.3 Service interface**

In addition to the standardized interfaces for data communication, FLOWSIC610 is equipped with a dedicated commissioning and service interface. A laptop can be connected to the device:

- Wireless via CDBT100 Bluetooth® Low Energy adapter (30m maximum)
- Wired via CDUSB100 USB adapter

**3.5 Correction of the effect of pressure and temperature on the geometry of the meter body**

The influence of process pressure and temperature on the geometric parameters of the meter body can be compensated by the gas meter. In addition to the compensation required by ISO 17089-1:2019, the influence on the ultrasonic transducers is also compensated in order to determine the exact actual flow volume ( $Q_{v, corr, a.c.}$ ).

**3.5.1 Internal correction**

The gas meter compensates for the influence of pressure and temperature on the path length between the ultrasonic transducers and the diameter of the measuring section by linear scaling using the material-specific parameters in registers #7241...7247.

The signal transit times are used to calculate the path velocity with the compensated path lengths. The average flow rate is calculated as the weighted sum of the individual path velocities.

The uncorrected flow rate is derived taking into account the pressure- and temperature-compensated diameter of the measuring section (register #7233). This value is linearized with a function dependent on the Reynolds number as part of the calibration. The adjusted flow rate is displayed in register #9388.

Finally, this linearized and adjusted flow value is calculated back to a velocity of gas VoG (pipe velocity of gas), taking into account the pipe diameter (register #7235).

The current gas velocity can be read in register #9390.

- Register number 7300 ... 7314 Path length
- Register number 7316 ... 7330 Path angle
- Register number 7233 Measuring section diameter, will be accurately measured during manufacturing
- Register number 7235 Pipe diameter, will be provided by customer as a connection diameter to inlet and outlet piping



**Note:**

Endress+Hauser recommends leaving this meter body correction in the device.

**3.5.2 External correction (flow computer)**

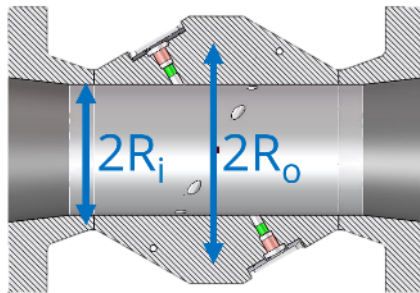
If the meter body diameter is to be corrected in a connected flow computer, it is important to adjust the device-internal correction.

- 1 Read the average flow velocity VoG at register #9390.
- 2 Set registers #7241 (CC\_MeterbodyPress) and #7243 (CC\_MeterbodyTemp) to zero.
- 3 Use the diameter of the pipe section (#7235) as the reference diameter in the external calculation.
- 4 Compensate for the influence of pressure and temperature on the diameter in contrast to the calibration conditions with the specific constants  $\alpha_T$  and  $\alpha_p$ , where  $\Delta T$  and  $\Delta p$  are the difference between the actual process value and the value during calibration.

$$dia_{corr} = dia \cdot (1 + \alpha_T \cdot \Delta T + \alpha_p \cdot \Delta p)$$

- $\alpha_T$  = Material-specific coefficient thermal expansion coefficient
- $\alpha_p$  = Linear coefficient for the pressure influence, calculated from the thick wall cylindrical pipe model (Roark's formulas for stress and strain)

$$\alpha_p = \left( \frac{R_o^2 + R_i^2}{R_o^2 - R_i^2} + \mu \right) \cdot \frac{1}{E}$$



- R<sub>o</sub> = Outside radius (R<sub>o</sub>=R<sub>i</sub>+t)
- R<sub>i</sub> = Inside radius
- μ = Poisson's ratio
- E = Young's modulus
- Δp = Difference between operating pressure and calibration pressure in MPa
- ΔT = Difference between operating temperature and calibration temperature in K
- t = Material thickness of the meter body wall in measurement section t depends on the transducer type and its fitting, see "Transducer types and wall thickness"

Table 1: Transducer types and wall thickness

Transducer type	Transducer fitting	Wall thickness t
P331H	P14	39 mm



**Note:**

The transducer type is coded in the type code of the device which can be found on the type plate. For details see "Type code", page 91. The transducer type and fitting are given in the meters data sheet and delivery specification.

5 Calculate the flow rate with the corrected diameter from step 4.

$$Q_{corr} = \frac{\pi}{4} \cdot dia_{corr}^2 \cdot VOG \cdot 3600$$

- $Q_{corr}$  = Current flow rate in m<sup>3</sup>/h
- VOG = Average flow velocity in m/s
- $dia_{corr}$  = Compensated diameter in m

There is a requirement to set  $p_{fix}$  and  $T_{fix}$  as close as possible to operating conditions. #7796 (Adjust Pressure) and #7798 (Adjust Temperature) will be set by the calibration lab during calibration (without calibration the default values are 20°C and 1 bar (a)). These registers will not be used for any internal correction. They are for information only.

If the pressure and temperature correction will be done in a flow computer, please use these values for calculating  $\Delta p$  ( $p_{op} - p_{cal}$ ) and  $\Delta T$  ( $T_{op} - T_{cal}$ ) as described in step 4.

As an alternative, there is a possibility to correct the gross volume flow rate #9388, if pressure and temperature correction is disabled in the flow meter.

Therefore the following flow correction needs to be implemented in the flow computer:

$$Q_{v,corr} = Q_{v,flow} \cdot (1 + 2 \cdot \alpha_T \cdot (T_{op} - T_{cal}) + 2 \cdot \alpha_p \cdot (p_{op} - p_{cal}))$$

Configure  $\alpha_p$  MeterbodyPress (1/bar) in the flow computer according to register #7241 and set it to zero in the flow meter.

Configure  $\alpha_T$  MeterbodyTemp (1/K) in the flow computer according to register #7243 and set it to zero in the flow meter.

## 3.6 FLOWgate™ operating software

### 3.6.1 Overview

The FLOWgate™ operating software allows user-friendly access to operating actions and measured values of the device.

#### Software functions

- Measured values overview
- Diagnosis data
- Logbook and archive management
- Commissioning
- Parameter modification
- Logbooks and archives
- Session browser

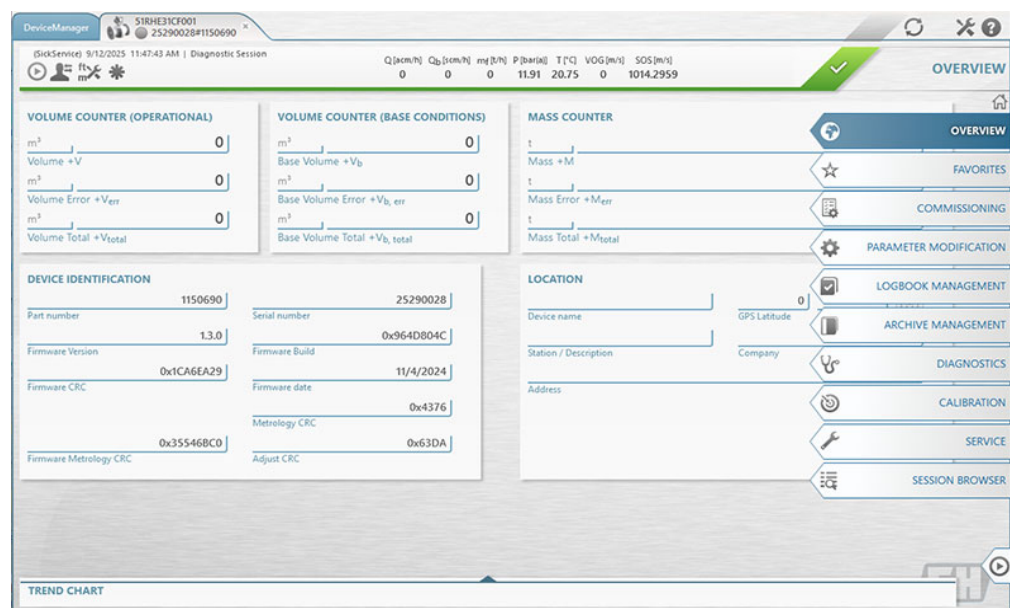


Fig. 12: FLOWgate™ operating software (example overview page)

### 3.6.2 System requirements

- Microsoft Windows 7/8/10/11
- Min. 1.8 GHz CPU
- Min. 1 GB RAM
- About 500 MB free disk capacity (without .NET framework)
- Bluetooth®, USB or serial interface
- Recommended minimum screen resolution: 1024 x 768 pixels, optimum screen resolution 1368 x 768 pixels
- Microsoft .NET framework 4.6

### 3.7 User management

#### 3.7.1 Users and roles

The device provides up to 16 configurable users and 6 user roles with different access rights. 4 users are created by default at time of delivery, so up to 12 more users can be created and adjusted individually during commissioning.

For details on user roles and their access rights see tables [see “Overview user roles”, page 27](#).

For details on users see table [see “Overview users”, page 28](#).

Table 2: Overview user roles

Function	User roles			
	Guest	Operator	Service	Admin
Access priority level	0	1	2	3
Login required	-	X	X	X
Diagnostic status reading	X	X	X	X
Writing of process conditions (e.g. pressure)	X	X	X	X
Diagnostic session	-	X	X	X
Archive readout	-	X	X	X
Commissioning	-	X	X	X
Field service	-	-	X	-
Calibration	-	X	X	X
User account readout	-	X	X	X
User management	-	-	-	X
Own password change	-	X	X	X
Firmware update	-	-	X	-
Factory parameter change	-	-	-	-

Table 3: Overview users

Users	Role	Password	User is by default ...	User can be deleted ...
Admin	Admin	see delivery documentation	activated <sup>[1]</sup>	no
Calibration	Operator		activated <sup>[1]</sup>	yes
-	Factory Service	-	deactivated <sup>[2]</sup>	no
-	Factory	-	deactivated <sup>[2]</sup>	no
Up to 12 more users	adjustable	adjustable	-	yes
-	Service	Admin to create user for trained service personal if service is needed for e.g. repairs / part replacement	-	yes

[1] can only be deactivated if a second admin account is created and activated

[2] needs to be activated by Admin in case of service intervention by Endress+Hauser factory service

### 3.7.2 User sessions

The device has a single user concept, so only one user can be active at any point of time. The user is restricted to the serial interface used at login. Access via other interfaces is possible, but with "Guest" level only.

If another user wants to login and terminate a running session, this is only allowed for user roles with equal or higher priority level. If a user is logged in, a logbook entry is generated with the user id, interface id and the user role.

### 3.7.3 Login procedure

For security reasons passwords are never stored or transmitted in plain text.

Technical information:

- Passwords are stored as “salted hashes” inside the device.
- Transmitting passwords using a challenge response mechanism to secure the transfer

## 3.8 Data processing in FLOWSIC610

### 3.8.1 Logbooks

#### Custody logbook

Maximum number of entries: 1000

The custody logbook stores legally relevant events. These events contain any legally relevant warnings or errors and parameter changes. The logbook can be switched between rolling and stopping mode. If rolling mode is set, the oldest entries will be erased first. If stopping mode is set, the logbook stops event recording when it is completely full. In this case an error is generated and the measurement values are marked invalid. The logbook can only be cleared with opened hardware lock switch.

Additionally, a fill warning can be enabled for the logbook. If this mode is enabled, the device will generate a warning at 90% fill level of the logbook. In the stopping mode, the fill warning is enabled automatically.

If stopping mode is enabled, the logbook can be further configured to support the tracing of metrological parameter changes with closed hardware lock switch (metrological logbook function).

The traced change of metrological parameters with closed hardware lock is only possible below 90% of fill level. The following values can be changed this way:

- Impulse#1 factor
- Impulse#2 factor
- Replacement values for pressure and temperature
- Configuration of custody logbook

The logbook stores timestamp, totalizer, user identification, event number and additional event specific data. In case of parameter changes the previous and the new value will be stored.

#### Non-custody logbook

Maximum number of entries: 1000

The non-custody logbook stores non-legally relevant events. These events contain any non-legally relevant warnings or errors and parameter changes. The logbook works in a rolling mode. The logbook can be cleared with closed hardware lock switch.

The logbook stores timestamp, totalizer, user identification, event number and additional event specific data. In case of parameter changes the previous and the new value will be stored.

### 3.8.2 Archives

#### Diagnostic archive

Maximum number of entries: 10000

The diagnostic archive stores diagnostic data cyclically.

The storage period can be adjusted in the range of 15 minutes to 6 hours. The archive works in a rolling mode. With the standard storage period of one hour, the archive history is one year.

The primary use of this archive is the analysis of historical measurement data. No totalizer data is recorded. The archive stores the timestamp, global measurement data, status and path measurement data. During one period the logged data is averaged.

The data recording is synchronized to the accounting hour, a reference point of day for billing purposes.

#### **Hourly archive**

Maximum number of entries: 10000 (1 year history)

The hourly archive stores totalizer, a maximum load monitor and additional data for billing purposes cyclically. The storage period is fixed to 1h. The archive stores 2 selectable totalizers.

#### **Daily archive**

Maximum number of entries: 2000 (5 years history)

The daily archive stores totalizer, a maximum load monitor and additional data for billing purposes cyclically. The storage period is fixed to 24h. The archive stores 2 selectable totalizers.

### **3.8.3 Protection of parameters from undesired changes**

#### **User identification and authentication**

Every single communication item can only be read and written by a user with a dedicated user role. This applies for accesses via any serial interface with service protocol setting.

To access protected data elements the user must identify and authenticate with a login procedure. Within the login, a user session begins that gives access according to the user role. The session is terminated on logout or automatically with a configurable timeout. Users can be created, deleted and deactivated.

All credentials can be changed. Valid and invalid login attempts can be traced. A brute force protection mechanism protects with time limitation of login attempts. The communication of credentials is protected against man-in-the-middle attacks.

The device has a single user concept, so only one user can be active in any point of time.

#### **Configuration mode**

All configuration parameters are protected against unwanted changes with a configuration mode. This mode can only be activated with a valid user session with minimum level "Operator". The change of configuration mode is traced in the custody logbook. The measurement is invalid, if the hardware lock switch is open.

#### **Locking switches**

The device provides two sealable locking switches inside the housing.

- A metrological hardware lock switch protects against any changes of legally-relevant firmware, parameters and measured data.  
Some configuration parameters can be changed with open metrological hardware lock if the metrological logbook tracing has been enabled for the custody logbook.
- A software download lock switch protects against the remote download and installation of new firmware on closed metrological hardware lock

**Interface write protection**

Every serial communication line can be protected against changes by an additional interface write protection mechanism. If enabled by parametrization, only login and logout actions are still available.

**Deactivation of insecure interfaces**

The serial communication interfaces RS485#1 and RS485#2 can be deactivated. The local service interface can not be deactivated.

## 4 Transport and storage

### 4.1 Transport

During all transport and storage work, ensure:

- ▶ The measuring device is always well secured.
- ▶ Measures to prevent mechanical damage have been taken.
- ▶ Ambient conditions are within specified limits, see [“Technical data”, page 78](#).



**WARNING: Hazard due to heavy loads**

When transporting the measuring device, there is a risk of crushing and impact due to the high weight.

- ▶ The measuring device may only be transported by competent persons.
- ▶ Only use lifting gear and equipment (e.g. lifting straps) suitable for the weight to be lifted.
- ▶ The lifting lugs are designed for transporting the measuring device only. Do not lift or transport the measuring device with additional loads using these lugs.
- ▶ Never attach lifting gear to the meter body neck and avoid contact between these parts and the lifting gear.

If a lifting angle of 45° cannot be ensured due to construction of the FLOWSIC610 (small meter sizes up to 6”) a suitable traverse hoist must be used for lifting.

**Lifting angle**

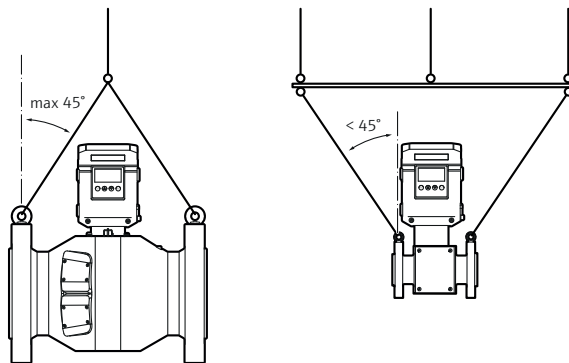


Fig. 13: Lifting requirements

### 4.2 Storage

- ▶ Ensure that storage conditions are within specified limits, see [“Technical data”, page 78](#).
- ▶ If the device is stored outdoors, protect the measuring device from rain, UV radiation and other weather influences.
- ▶ Make sure that open cable ends are protected against weather influences.

## 5 Project planning

### 5.1 Preparing the measuring point

- ▶ Select a suitable installation location.
- ▶ Ensure adequate assembly clearances.

### 5.2 Choosing flanges, seals and other components

For flange connections only use pipeline flanges, bolts, nuts and gaskets suitable for the operating pressure, operating temperature as well as ambient and operating conditions (external and internal corrosion).

The FLOWSIC610 can be installed in straight inlet and outlet pipes depending on the installation configuration:

The inlet and outlet pipes must have the same nominal size as the meter body. The inner diameter is shown in the Data Sheet and is based on the nominal flange value and the standard.

The max. permitted difference of the inner diameter of the inlet pipe from that of the meter body is 3%. Any welding beads and burs on the flanges of the inlet pipe must be removed.

### 5.3 Installation location

Fit the measuring device in an easily accessible and protected position. Carry out all assembly work on-site.

The following must be taken into account:

- ▶ Maintain the ambient temperature range in accordance with the technical data under consideration of possible radiant heat (shield if necessary).
- ▶ Provide sufficient clearance for cables and opening the front panel.
- ▶ Select an installation location free of chemical influence.

It is recommended to:

- ▶ Protect against harsh atmospheric conditions (optional: use SPU weather and sun protection).
- ▶ Select an installation location free from vibrations and stabilize vibrations if necessary.

## 6 Mounting

### 6.1 Safety



**WARNING: Hazards during installation work**

- ▶ Do not carry out any welding work on lines with meters fitted.
- ▶ Comply exactly with mandatory and approved methods.
- ▶ Observe and comply with regulations of the plant operator.
- ▶ Meticulously check completed work. Ensure leak tightness and strength.

Otherwise hazards are possible and safe operation is not ensured.



**WARNING: Hazards through the measuring medium in the system**

The following conditions can increase the risk:

- Toxic measuring medium or measuring medium dangerous to health
- Explosive measuring medium
- High pressure
- Hot or cold measuring medium

- ▶ Only carry out installation, maintenance and repair work when the system is non-pressurized.



**WARNING:**

- ▶ Observe applicable valid regulations, general standards and guidelines.
- ▶ Observe local safety regulations, operating instructions and special regulations.
- ▶ Observe the safety information in this document.
- ▶ Persons carrying out installation work must be familiar with the directives and standards applicable for pipeline construction and have the corresponding qualifications.



**NOTICE:**

The plant operator is responsible for the safety of the system under mechanical load.

### 6.2 Scope of delivery

The measuring device is delivered pre-assembled in sturdy packaging.

- ▶ Inspect for transport damage when unpacking the device.
- ▶ Document any damage found and report this to the manufacturer.



**NOTICE:**

Do not put the measuring device into operation if you notice any damage!

**Scope of delivery**

- ▶ Please see the delivery documents for the scope of delivery.
- ▶ Check the scope of delivery for completeness.

### 6.3 Required tools and auxiliary material

All screw drives on the meter are metric type. All tool sizes mentioned here refer to metric sizes.

#### Meter body

- Lifting gear or fork lift (load according to the specifications on the type plate)
- Box wrench or jaw wrench of suitable size for flange mounting
- Torque wrench
- Hex key, size 4, 5
- Thread seal (e.g. PTFE tape) and flange gaskets
- Bolt lubricant

#### SPU

- Hex keys size, 3, 4, 5, 10
- Small slotted screwdriver (size 2.5)
- Torx key, size 8
- Loctite
- Wrench, size 17

#### Replacement of RTC battery

- Torx screwdriver, size 10
- Small slotted screwdriver (max. 0.3 mm thickness)

### 6.4 Flow direction

#### Observe the flow direction

- A directional arrow shows the gas flow direction in accordance with OIML R 137-1&2.
- The forward or main flow direction is marked with “+” and the reverse direction with “-”.
- In case of unidirectional use, ensure the meter is flowed through in the main flow direction marked with “+”.
- The measured volume is displayed with a negative sign when the meter is flowed through in reverse direction marked with “-”.

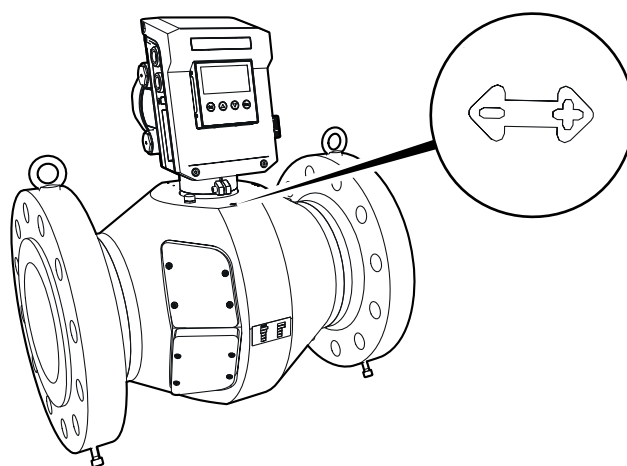
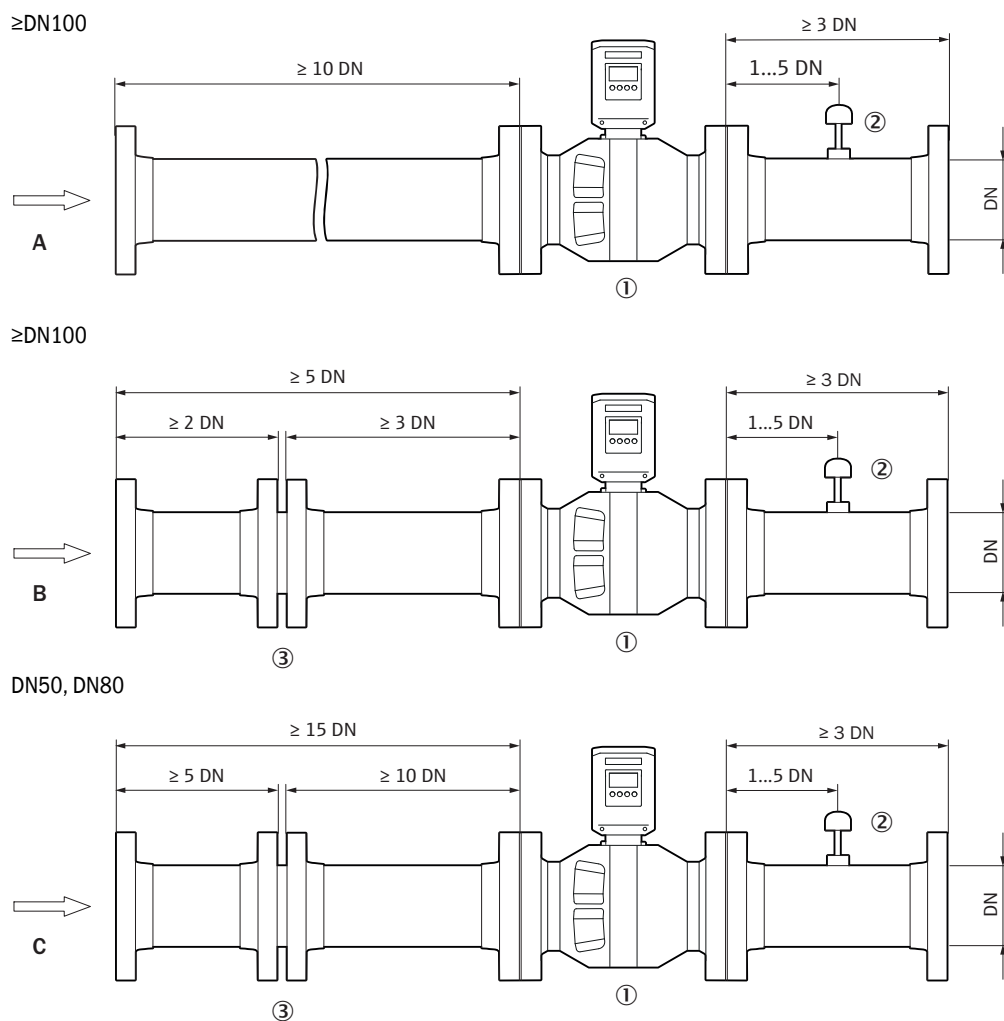


Fig. 14: Flow direction

### 6.5 Installation configurations

#### Unidirectional operation

Variant	Meter sizes	Metrological standard	Inlet	Outlet
Variant A	≥DN100	OIML R 137, Class 1	≥10DN	≥3DN
Variant B	≥DN100		≥2DN+FC+3DN	≥3DN
Variant C	DN50, DN80		≥5DN+FC+10DN	≥3DN



- 1 FLOWSIC610
- 2 Temperature measuring point
- 3 Flow conditioner

Fig. 15: Installation requirements for unidirectional operation

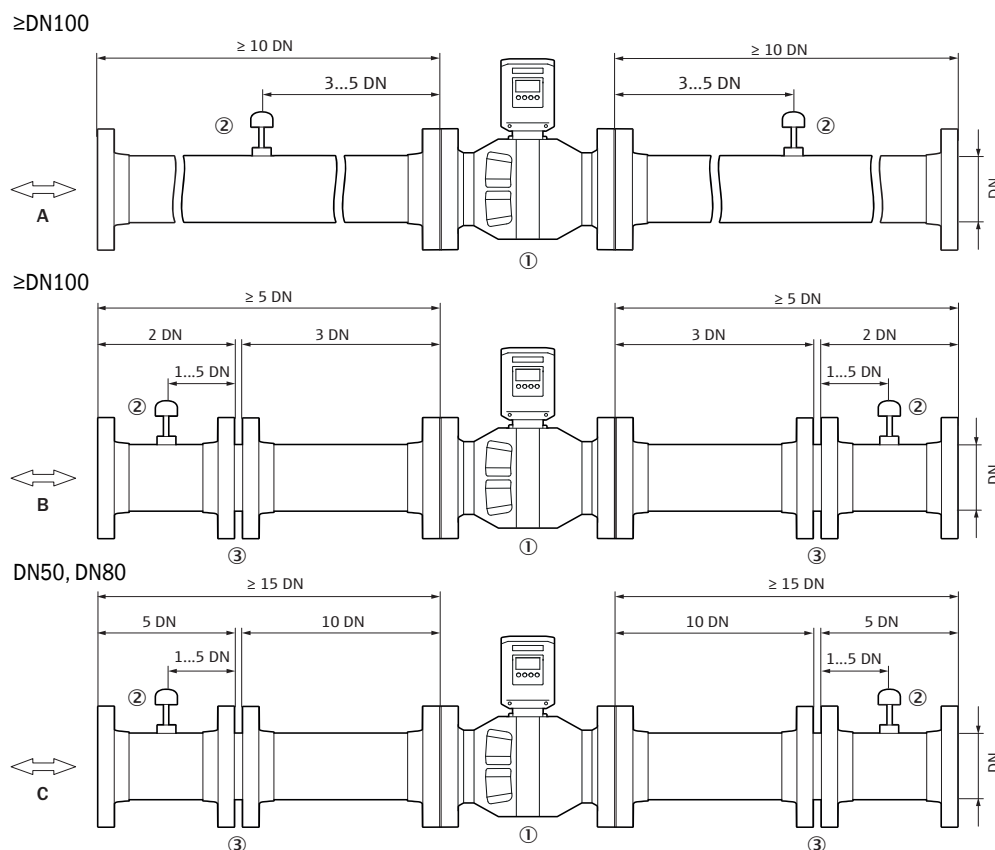
**Bidirectional operation**



**Note: Bidirectional operation**

Recommendation for positioning the temperature measuring point for bidirectional operation: Downstream of the main flow direction used.

Variant	Meter sizes	Metrological standard	Inlet	Outlet
Variant A	≥DN100	OIML R 137, Class 1	≥10DN	≥10DN
Variant B	≥DN100		≥2DN+FC+3DN	≥3DN+FC+2DN
Variant C	DN50, DN80		≥5DN+FC+10DN	≥10DN+FC+5DN



- 1 FLOWSIC610
- 2 Temperature measuring point
- 3 Flow conditioner

Fig. 16: Installation requirements for bidirectional operation

## 6.6 Fitting the meter body in the pipeline

The measuring device can be installed horizontally or vertically.

### Installation in pipeline

- 1 Select suitable bolts.
- 2 Position the measuring device in the desired location in the pipeline. Lay the pipelines without tension to the device to be installed!
- 3 Check for correct seating and alignment of the flange gaskets after installing the flange bolts, but prior to tightening. The gaskets must not project into the area through which the fluid flows.
- 4 Align the FLOWSIC610 so that the offset of the inner diameters (bore) between inlet section, meter body and outlet section is as small as possible.
- 5 Insert the remaining fastening bolts and tighten the nuts cross-wise until the specified tightening torque is reached. The tightening torque applied must not be lower than specified in the project planning.
- 6 Slowly increase the pressure in the pipeline.  
Gradient: Max. 1 MPa/min (10 bar/min)
- 7 Carry out a leak tightness check on the pipeline with suitable means in accordance with the pipeline operating company's specifications.

### Depressurization

Slowly decrease the pressure in the pipeline.  
Gradient: Max. -1MPa/min (-10 bar/min)

## 7 Electrical installation

### 7.1 Safety

All assembly work previously described must be completed (as far as applicable) before starting installation work.



**WARNING: Electrical hazard**

Incorrect cabling can cause device malfunctions, failure of the measurement system or serious injuries.

- ▶ Observe the relevant safety regulations as well as the safety notices during all installation work, see [“For your safety”, page 9](#).
- ▶ Take suitable protection measures against possible local hazards or hazards arising from the equipment.
- ▶ All work may only be carried out when the device is disconnected from the power supply.



**NOTICE:**

- ▶ Disconnect power supply lines before working on power connections or parts carrying main voltage.
- ▶ The device must not be used if the electrical wiring (cables, terminals, ...) is damaged.



**NOTICE:**

Please observe the specific conditions of use in potentially explosive atmospheres, see [“Operation in potentially explosive atmospheres”, page 10](#).

### 7.2 Cable specifications



**WARNING: Electrical hazard**

- ▶ The cables and wires must be permanently installed. The plant operator must provide adequate strain relief.
- ▶ Cables must have a permitted operating temperature of min. 85 °C.



**NOTICE: Requirements on cables and installation**

- ▶ Pay attention to the requirements in EN 60079-14 when selecting the cables and during installation!
- ▶ Further legal requirements must be observed for use in explosive atmospheres.
- ▶ Only copper wires may be used.

**Cables**

- ▶ Protect cables especially endangered by thermal, mechanical or chemical stress, e.g. by laying in protective tubes.
- ▶ Cables must be flame-retardant according to DIN VDE 0472 Part 804. The fire behavior according to B / IEC 60332-1 must be approved.
- ▶ The existing air and creepage paths according to EN 60079-7 or EN 60079-15 may not be reduced by cable connections in the terminal box.
- ▶ Protect the wire ends with connector sleeves against fraying.
- ▶ Connect or safeguard unused wires to ground so that a short circuit with other conductive parts is excluded.
- ▶ Carry out potential equalization in accordance with EN 60079-14 (see also the following Section).
- ▶ Cable cross-sections and see [“Terminal assignment Ex-d terminal compartment”, page 46](#).

### 7.3 Cable entries

The FLOWSIC610 has four cable entries: 4x 3/4" NPT or 4x M25x1.5, see [“Electrical connections”](#), page 42.

- ▶ Depending on the device version, all device inputs are installed with certified cable glands, certified blind plugs or non-certified transport plugs.  
Be aware that all non-certified transport blind plugs have to be changed to certified cable glands or blind plugs!
- ▶ Only installation material approved for the applied hazard zone may be used. The user is responsible for correct selection.
- ▶ Observe the clamping range of the cable glands for cable selection.
- ▶ Unused cable glands must be sealed with the plugs.

**NOTICE:**

If smaller cable entries are required, the user can use suitable and certified reducers. The user is responsible for correct selection.

---

## 7.4 Requirements for installation in the Ex zone



**WARNING: Dangerous voltage**

- ▶ It must be ensured that the rated voltage  $U_m$  60 V is not exceeded when connected to devices not belonging to the system, in particular external power supply devices, power supply units, etc.
- ▶ For IECEx applications, SELV /PELV power supplies or power supplies conforming to the IEC 60950 or IEC 61010-1 or comparable standards must be used.
- ▶ A suitable main power switch must be provided.
- ▶ Take the device out of operation immediately and do not switch it on again when cables, terminals, the enclosure or Ex components are damaged.



**WARNING: Dangerous voltage**

- ▶ Do not open when energized.



**WARNING: Risk of explosion**

DO NOT OPEN WHEN ENERGIZED!

- ▶ The equipment contains a shunt Zener diode barrier, which requires connection to a barrier earth in accordance with IEC 60079-14.
- ▶ In non-intrinsically safe installations, the terminal boxes may only be opened if the system is disconnected from the power supply.
- ▶ In non-intrinsically safe installations, the cables may only be disconnected if the system is disconnected from the power supply.
- ▶ The terminal compartment cover must only be opened if the system is disconnected from the power supply and only 10 minutes or more after the system has been switched off, or the area is known to be non-hazardous.



**NOTICE:**

Please observe the specific conditions of use in potentially explosive atmospheres, see [“Operation in potentially explosive atmospheres”, page 10.](#)

### General operating conditions

The FLOWSIC610 is designed solely for use under normal atmospheric conditions in potentially explosive atmospheres.

The atmospheric conditions must be within the described ranges, see [“Technical data”, page 82.](#)

The ambient temperature must remain within the range specified on the SPU type plate. For fiscal applications, a maximum ambient temperature limit of 55 °C must be taken into account.

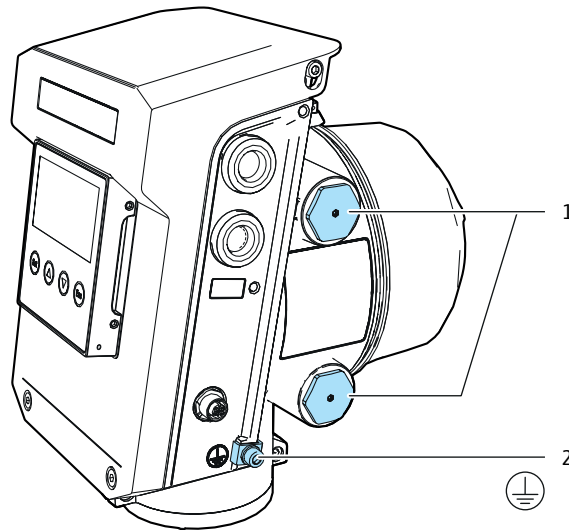
The meter body becomes part of the pipeline as soon as the FLOWSIC610 is installed in the pipeline. The wall of the pipeline and the meter body are then deemed a zone-separating barrier.

### General information

- The documentation for zone classification according to EN 60079-10 must be available.
- The devices to be used must be checked for suitability for the application area.
- After installation, an initial test of the device and the plant according to EN/IEC 60079-17 must be performed.

## 7.5 Electrical connections

### 7.5.1 Overview



- 1 Cable entries
- 2 Exterior ground connection

Fig. 17: Electrical connections

### 7.5.2 Power supply

Power supply specifications are provided in [“Technical data”, page 78](#).

To ensure uninterrupted operation during short-term power interruptions, it is recommended to use a buffer module in conjunction with the power supply.



**NOTICE:**

If specified on the type plate, the use of a buffer or capacitor module is mandatory.

The buffer module must be capable of compensating a complete power failure (0% voltage) for a minimum duration of 100 ms at the typical load of 5 W.

To meet this requirement, the buffer must include a minimum capacitance of 4.82 mF at 24 V. This ensures continued operation of the device during brief power interruptions or switching events.



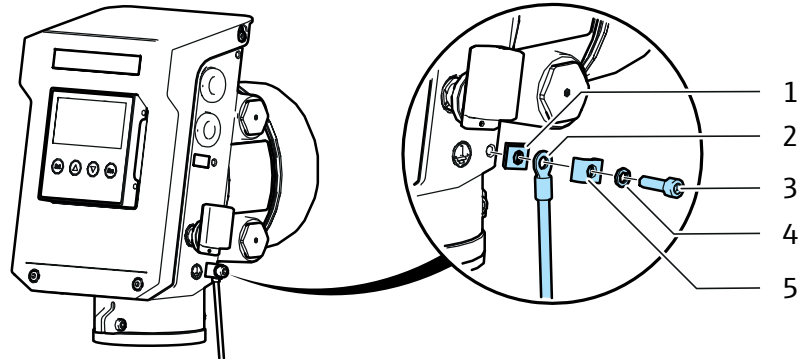
**NOTICE:**

It is recommended to use capacitors with a voltage rating of at least 30 V and to include a safety margin to account for component tolerances and aging.

For a wiring diagram example, see [“Wiring diagram”, page 90](#).

7.5.3 Exterior ground terminal

- ▶ Connect the protective ground connection.  
Use a hex key, size 5. Tightening torque: 6 Nm

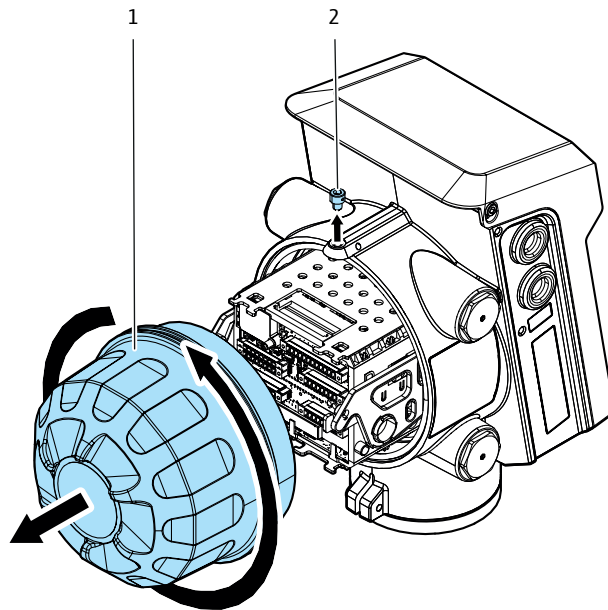


- 1 Square washer
- 2 Line
- 3 Screw M6
- 4 Washer
- 5 C-profile

Fig. 18: Protective ground connection

**7.5.4 Ex-d terminal compartment**

**7.5.4.1 Opening and closing the Ex-d terminal compartment**



- 1 Ex-d terminal compartment cover
- 2 Securing screw

Fig. 19: Ex-d terminal compartment

**Opening the Ex-d terminal compartment**

- 1 Loosen the securing screw on the Ex-d terminal compartment cover with a hex key, size 5.  
Ensure the tip of the screw no longer extends into the groove of the cover.
- 2 Unscrew the terminal compartment cover.  
To loosen the cover, position a suitable tool (e. g. the shaft of a ring spanner) in the provided recesses in the cover.

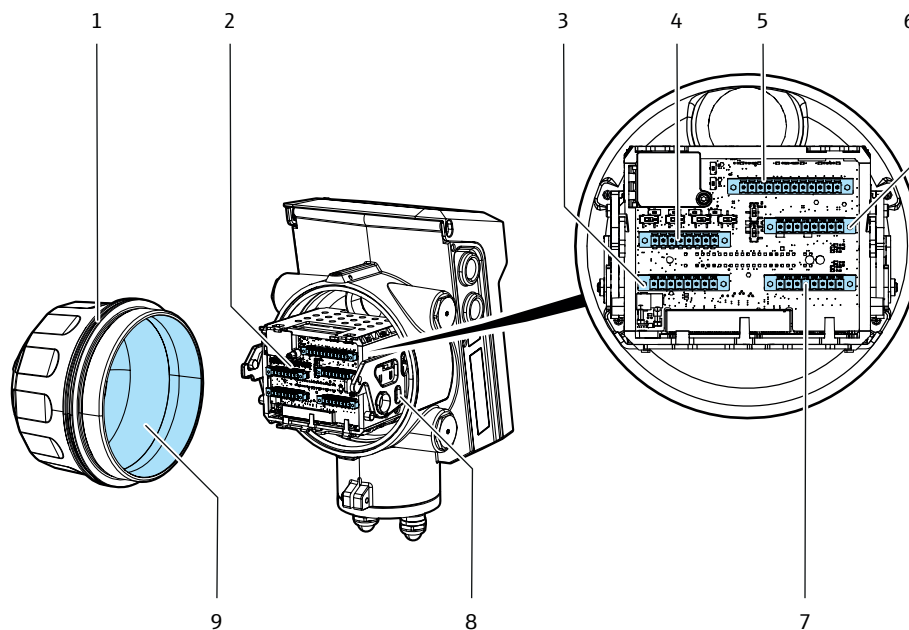
**Closing the Ex-d terminal compartment**

- 1 Make sure that the threads are clean.  
Grease the threads with an assembly paste as required. Use an anti-seize paste with the required application temperature range, see [“Technical data”, page 82](#).
- 2 Screw the terminal compartment cover back on handtight.  
Do not use a tool for this work step.
- 3 Tighten the securing screw on the Ex-d terminal compartment cover with a hex key until the tip of the screw slightly enters the material of the cover.  
Tightening torque: 2 Nm  
Do not operate the device without the securing screw!

If the following parts are lost or damaged, they can be reordered using the part numbers provided:

Part no.	Description
2142865	Ex-d compartment Cover
2142894	O-Ring Ex-d compartment Cover

7.5.4.2 Ex-d terminal assignment



- 1 Ex-d terminal compartment cover
- 2 Ex-d terminal compartment
- 3 Plug P1
- 4 Plug P2
- 5 Plug P3
- 6 Plug P4
- 7 Plug P5
- 8 RS485 termination switches
- 9 Terminal labeling for plugs P1-P5

Fig. 20: Overview Ex-d terminal compartment

On delivery, the plugs are already plugged in and must be assigned by the user. Make sure that the pin assignment is correct see “Terminal numbering plugs P1-P5”, page 45 and see “Terminal assignment Ex-d terminal compartment for plugs P1-P5”, page 46.

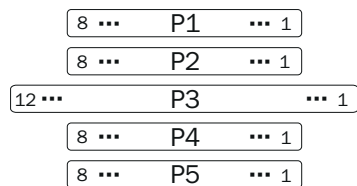


Fig. 21: Terminal numbering plugs P1-P5

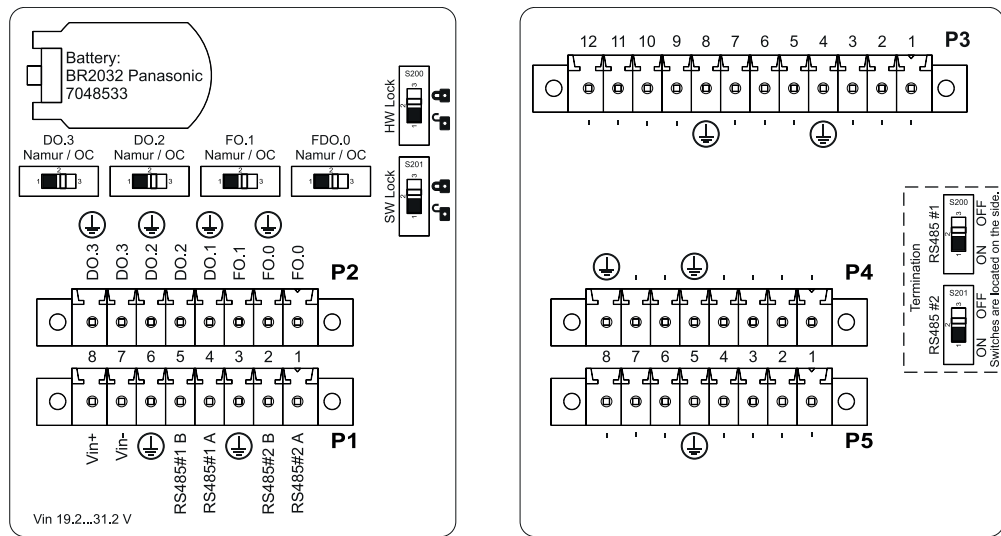


Fig. 22: Terminal assignment Ex-d terminal compartment for plugs P1-P5

Terminal assignment Ex-d terminal compartment

Plug designation	Pin No.	Signal name	Function	Comment	Conductor size
P1	1	RS485#2A	Serial RS485 [1]	RS485.2	0.5 ... 1.5 mm <sup>2</sup>
	2	RS485#2B			
	3	GND			
	4	RS485#1A	Serial RS485 [1]	RS485.1	
	5	RS485#1B			
	6	GND			
	7	Vin-	Minus pole	Voltage supply, galvanically isolated from device grounding "GND"	
	8	Vin+	Positive pole		
P2	1	FO.0	Frequency output	Pulse	0.5 ... 1.5 mm <sup>2</sup>
	2	FO.0 GND			
	3	FO.1	Frequency output	Pulse	
	4	FO.1 GND			
	5	DO.2	Digital output	Status	
	6	DO.2 GND			
	7	DO.3	Digital output	Status, encoder	
	8	DO.3 GND			
P3	1-12	Reserved for future extensions			0.5 ... 1.5 mm <sup>2</sup>
P4	1-8	Reserved for future extensions			0.5 ... 1.5 mm <sup>2</sup>
P5	1-8	Reserved for future extensions			0.5 ... 1.5 mm <sup>2</sup>

[1] Maximum cable length: 1000 m total length; cable: twisted pair, shielded

If the following parts are lost or damaged, they can be reordered using the part numbers provided:

Part no.	Description
2143051	Set of connection terminals

7.5.4.3 Switching (Open Collector - Namur) on digital outputs



**NOTICE:** Electrical parameters, see “Technical data”, page 82 “Digital outputs”.

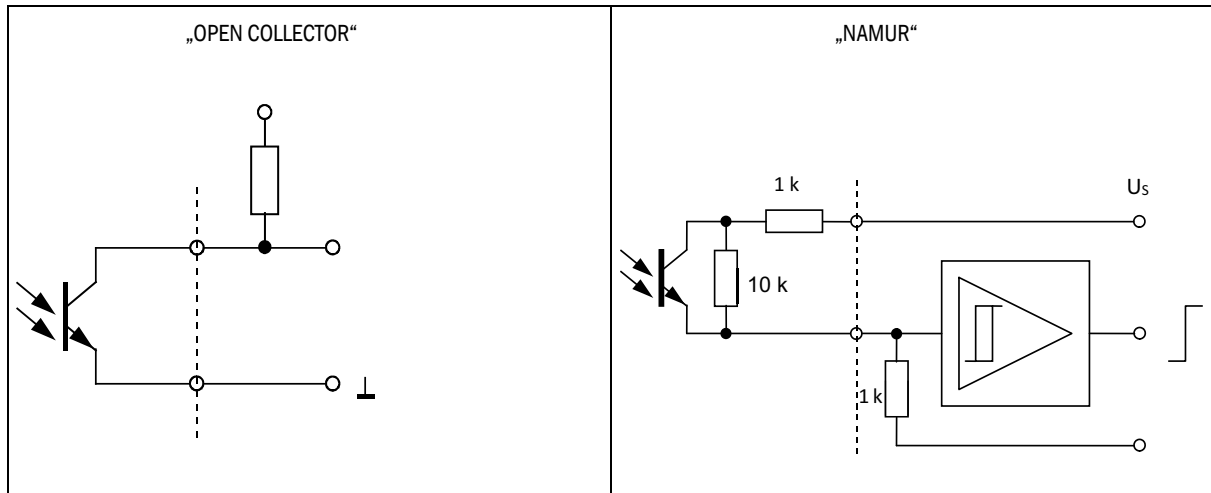


Fig. 23: DO circuitry (Open Collector - Namur)

7.5.4.4 Termination resistors of serial RS485 lines

For the serial RS485 lines, termination resistors can be optionally connected via switches (RS485#1 and RS485#2).

The termination network is structured as follows:

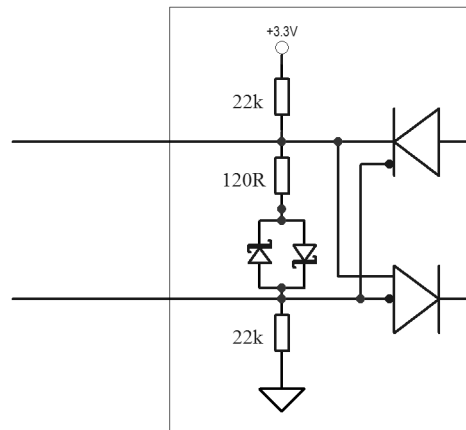
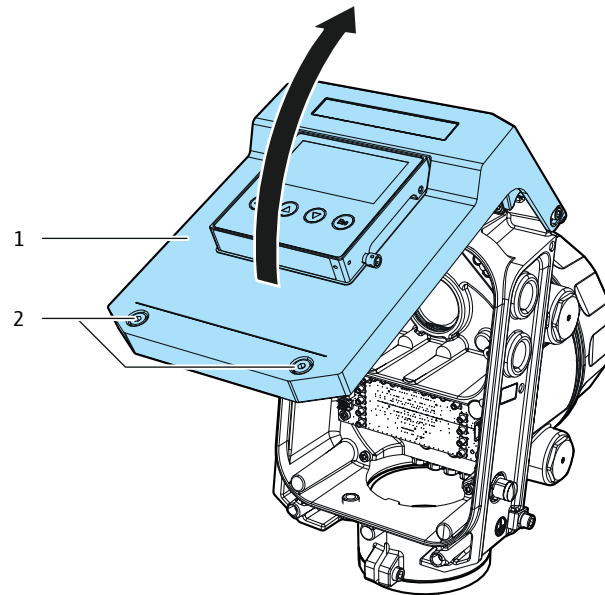


Fig. 24: Termination

## 7.5.5 Ex-i terminal compartment

### 7.5.5.1 Opening and closing the Ex-i terminal compartment

#### Opening the Ex-i terminal compartment



- 1 Ex-i terminal compartment screws (captive)
- 2 Ex-i terminal compartment cover

Fig. 25: Ex-i terminal compartment

- 1 Loosen the two screws (captive) of the Ex-i terminal compartment cover with a hex key, size 4.
- 2 Fold the terminal compartment cover upwards.

#### Closing the Ex-i terminal compartment

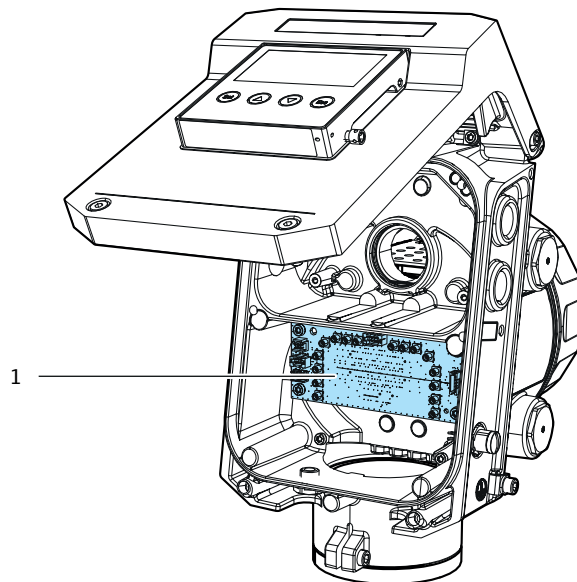
- 1 Ensure the sealing area is free from contamination.
- 2 Fold the terminal compartment cover downwards. Pull the terminal compartment cover forwards out of the catch when closing it.
- 3 Tighten the 2 screws (captive) of the Ex-i terminal compartment cover with a hex key, size 4. Tightening torque: 4 Nm

7.5.5.2 Ex-i terminal assignment



**NOTICE:**

The product shall be used in explosive atmospheres together with separately certified associated apparatus. The connection shall follow the instruction of this product and associated apparatus from outside. There are internal connectors accessible in the Ex i compartment. These connectors are factory assembled and not intended to be changed by the customer.



1 Ex-i terminal assignment

Fig. 26: Overview Ex-i terminal compartment

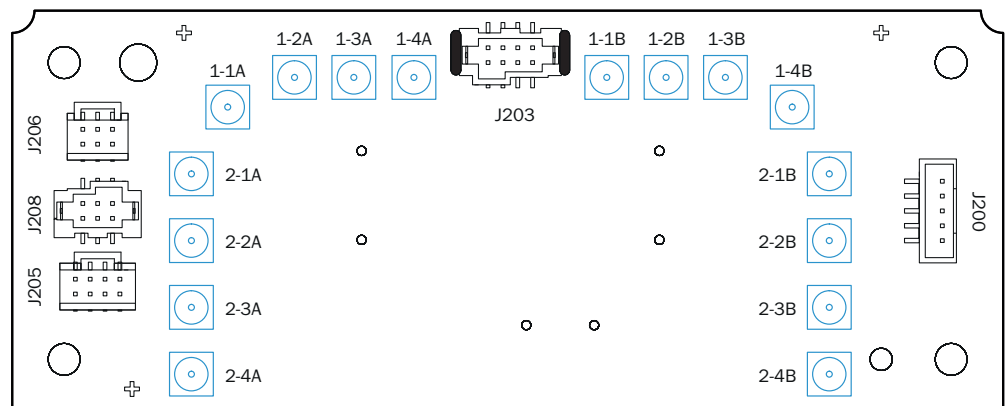


Fig. 27: Terminal assignment Ex-i terminal compartment

**Terminal assignment Ex-i terminal compartment**

Socket	Function
J200	Service connector, factory-wired
J203	Display connector, factory-wired
J205	Not used
J206	Not used
J208	6-pin connector, for connection of cable for digital p/T sensor from the meter body, factory-wired
MCX:	
1-1A ... 1-4A 1-1B ... 1-4B	For connection of ultrasonic transducers, path plane 1
2-1A ... 2-4A 2-1B ... 2-4B	For connection of ultrasonic transducers, path plane 2

**Intrinsically safe connections**

The intrinsic safety parameters for the terminals accessible from outside the SPU housing are as following:

$U_o$	$I_o$	$P_o$	$C_o$	$C_i$	$L_o$
Service interface (M12 socket on the side of the device)					
6.42 V	117 mA	410 mW	24.58 $\mu$ F	0.3 nF	2.59 mH
Display interface (M12 socket in front cover)					
6.42 V	117 mA	410 mW	24.68 $\mu$ F	0.3 nF	2.59 mH


## 8 Commissioning

### 8.1 Important information

All activities described in „Mounting“ and „Electrical installation“ must be completed before commissioning.

### 8.2 Commissioning with the FLOWgate™ operating software

#### 8.2.1 Auxiliary means and accessories required

<p>FLOWgate™ is available on the Endress+Hauser website.</p> 	<p>The current FLOWgate™ version is available via <a href="http://www.endress.com">www.endress.com</a></p>
<p>CDBT100 Connection device Bluetooth®</p>	<p>Available as an accessory</p>
<p>CDUSB100 Connection device USB</p>	<p>Available as an accessory</p>

### 8.3 Connecting to the device via Bluetooth

- 1 Install the FLOWgate™ operating software.
- 2 For connection via Bluetooth®, connect the CDBT100 adapter.

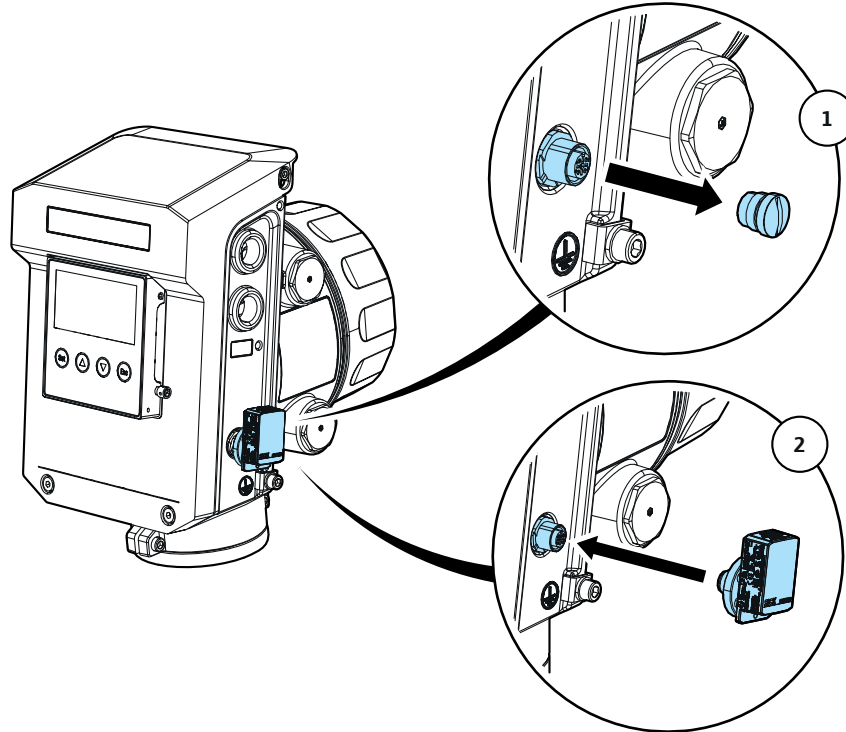
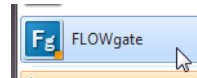


Fig. 28: Connecting the CDBT100 adapter

- 3 Click on the icon to start FLOWgate™:



- 4 In FLOWgate™ click on icon “Scan” and scan for the device:



5 When the device has been found, click on “Connect”.

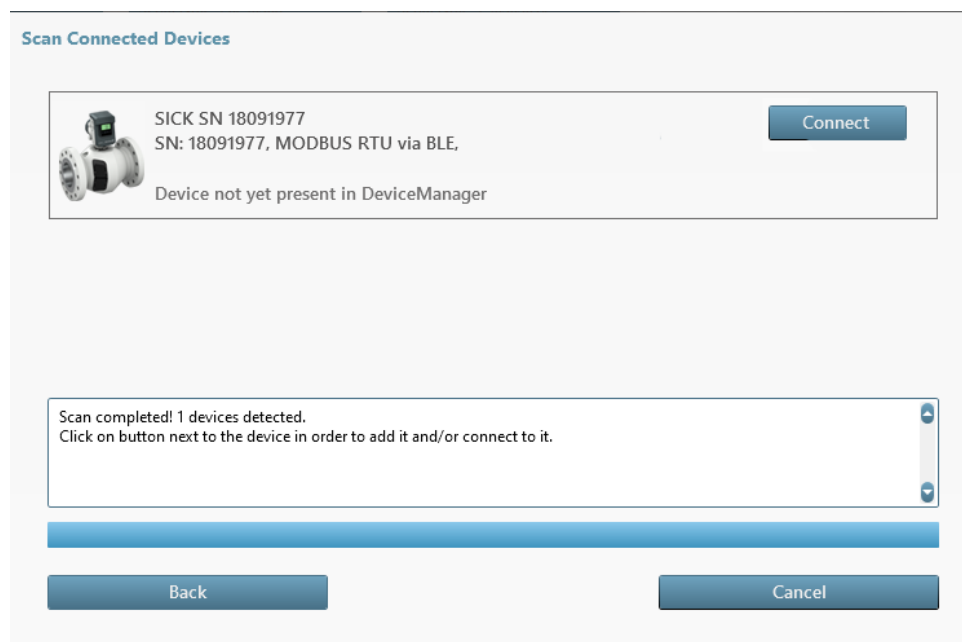
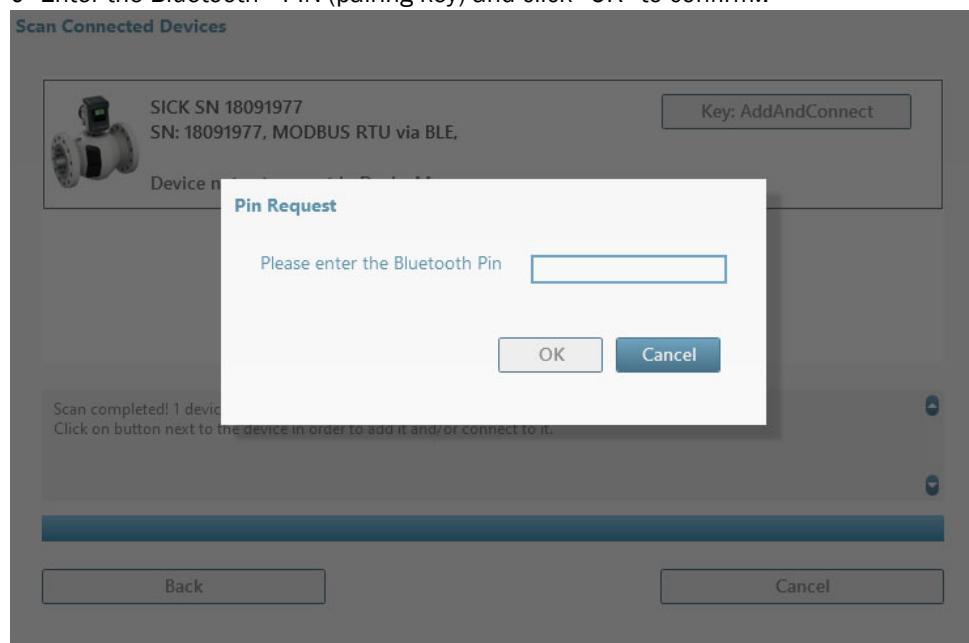


Fig. 29: Device found

6 Enter the Bluetooth® PIN (pairing key) and click “OK” to confirm..



**Note:**

The default Bluetooth® PIN is “0000”.  
Your personal password for the “admin” user can be found in the delivery documentation.

Fig. 30: Bluetooth® PIN

7 Login to the device as user “Admin”.  
After successful login the Overview page is displayed.

### 8.4 Connecting to the device via USB

- 1 Install the FLOWgate™ operating software.
- 2 For connection via USB, connect the CDUSB100 adapter.

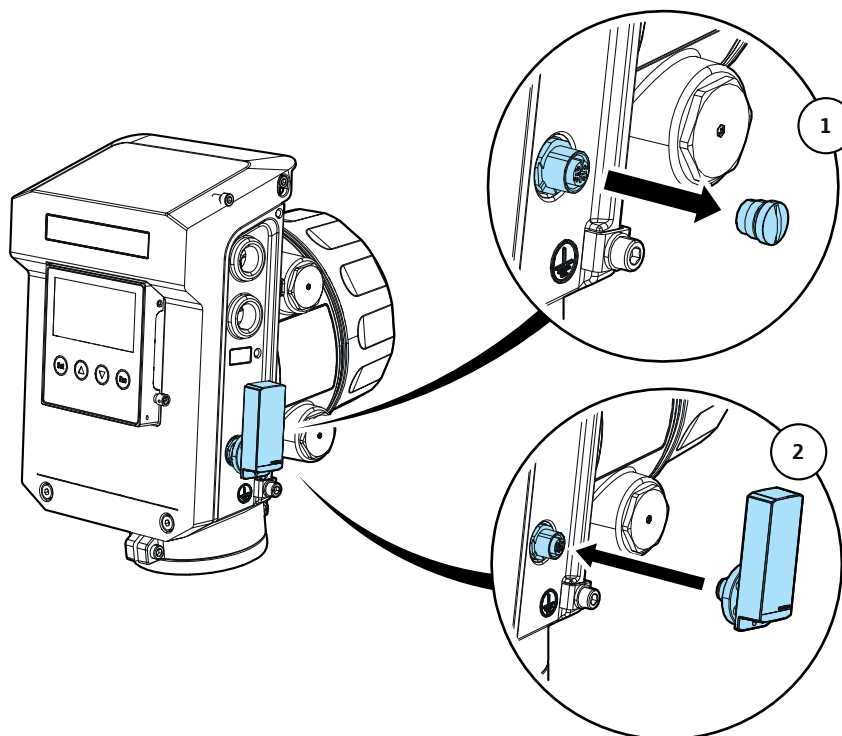
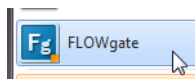


Fig. 31: Connecting the CDUSB100 adapter

- 3 Click on the icon to start FLOWgate™:



- 4 In FLOWgate™ click on icon “Scan” and scan for the device:
- 5 Select Serial port in the “Interface selection” window.

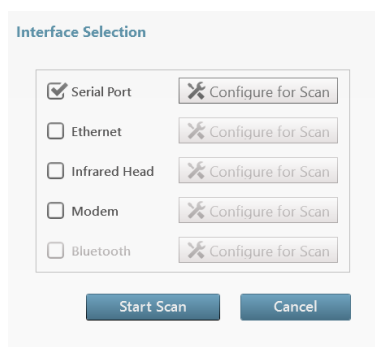


Fig. 32: Interface selection

6 Select the respective com port and the device-specific parameters.

Fig. 33: Configure serial connection (exemplary)

7 When the device has been found, click on “Connect”.

Fig. 34: Device found

8 Login to the device as user “Admin”.  
After successful login the Overview page is displayed.

## 8.5 Commissioning wizard

### 8.5.1 Overview

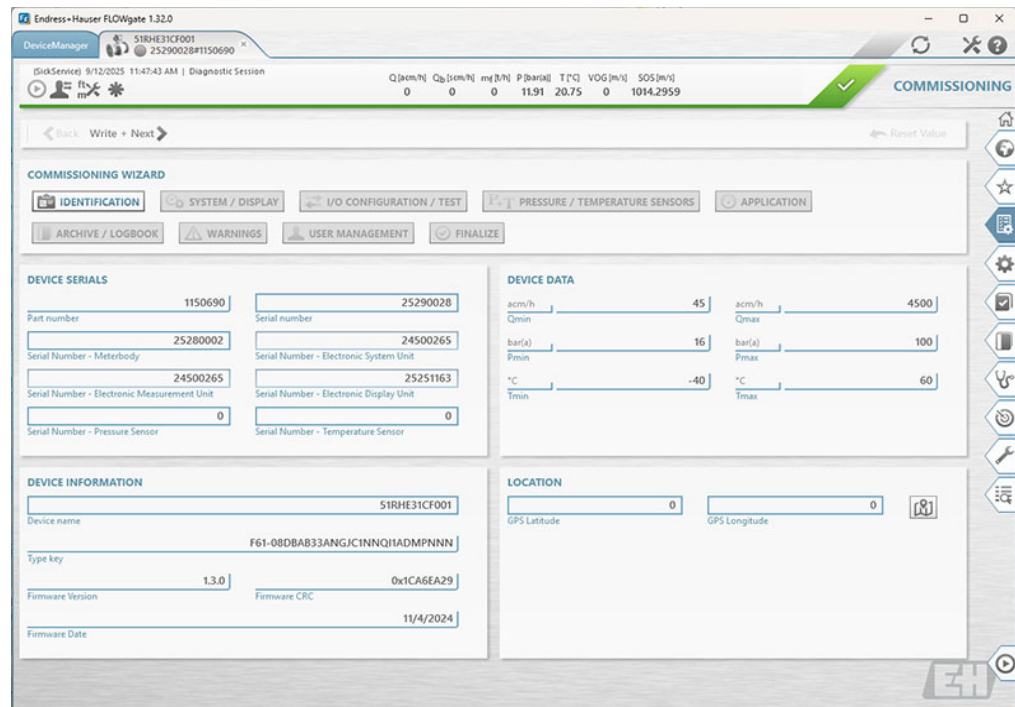


Fig. 35: Overview: Commissioning wizard

### 8.5.2 Identification

#### Device serials

- ▶ Check the device serial numbers: Compare the serial number against the main type plate.

#### Device data

- ▶ Check the device data: Compare the entries against the type plate.

#### Device information

- ▶ Enter a device name: The device name is freely selectable.

#### Location

The GPS coordinates of the flow meter can also be entered as an option.

This allows showing the location of the flow meter on Google maps.

### 8.5.3 System + Display

#### Device date and time

Enter the date and time or synchronize with the PC.

#### Device units

The units are set at the factory as ordered.

Check the settings and adapt if necessary.

**Device display**

Configure the display language, units and time format as well as the measuring values to be shown on the display.

The display has two rolling display pages. Each display page can be parameterized with up to four display lines with measurement counters, measurement and diagnostic values and device information.

Via the button “Start testmode” a testmode for display function and brightness and contrast settings can be started optionally.

**8.5.4 Warnings**

Configure system and path warnings.

**Warning limits**

The standard limits for applications are set at the factory.

Configure the warning limits as desired for your application.

**User warnings activation**

The warnings signaled by the device can be individually activated or deactivated. Activate single warnings as desired.

**8.5.5 Pressure/temperature sensors**

Select the source of pressure and temperature values and configure replacement values and the warning levels for pressure and temperature deviations.

**8.5.6 Archive/Logbooks**

**Logbooks**

- ▶ Select the totalizer which is used for entries in the custody logbook.
- ▶ Configure the custody logbook:
  - Stopping: A warning is output when the logbook is full.
  - Rolling: The oldest entries are overwritten when the logbook is full.

**Data archive settings**

- ▶ Configure the interval for the diagnostic archive. The default interval is set at the factory; default: 60 minutes.
- ▶ Configure the accounting hour: Totalizers and data are saved at the defined accounting hour time (standard = 6:00 AM).

**8.5.7 I/O Configuration**

In the I/O configuration step, the parameters can be set for the interfaces available in accordance with the ordered configuration.

**8.5.8 User management**



**NOTICE:**

Endress+Hauser recommends changing the initial password provided for the administrator for security reasons.

Up to 12 further users can be configured here:

- ▶ Enter a user name and specify a password.
- ▶ Select a user level.
- ▶ Select an expiration date for the account or activate the checkbox “Account never expires”.
- ▶ To create the new user, click on “Create account”.

The screenshot shows a web interface titled "USER MANAGEMENT". At the top, there is a dropdown menu with "Empty User 4" selected and a checked checkbox labeled "Edit Account". Below this is a horizontal line and the text "Select User Account". The main form contains several fields: "User A" in a text box labeled "User Name"; two password fields labeled "Enter Password" and "Re-enter Password", both with masked characters (dots); a dropdown menu labeled "Operator" with "User Level" below it; a checked checkbox labeled "Account never expires"; and a date field showing "5/6/2024" with a calendar icon and "15" in a small box, labeled "Account Expiration Time". At the bottom is a button with a plus sign and a person icon, labeled "Create Account".

Fig. 36: User management

### 8.5.9 Counter settings

- ▶ Configure the resolution for the totalizers.

### 8.5.10 Finalize

#### Finalize

- ▶ If desired, reset the totalizers and clear the logbooks and the archive.

#### Generate reports

- ▶ Endress+Hauser recommends creating a parameter report and a maintenance report and archiving the reports with the delivery documentation.

### 8.5.11 Path failure compensation

#### If Path compensation is activated:

The FLOWSIC610 can compensate one failed measuring path.

In a 4-path system, the flow meter compensates for one failed measuring path and issues a warning in case of one failed measuring path. In that case, the measurement is still valid.

A path is considered failed when its acceptance rate is below the threshold.

In case of failure, the path velocity is substituted using a ratio-based estimation. The original path velocity is reintegrated into the measurement once its acceptance rate exceeds the defined threshold.

Multiple path failures result in “measurement invalid”. The meter issues an error and increments the disturbance volume.

**If Path compensation is deactivated:**

A single path failure or multiple path failures result in “measurement invalid”. The meter issues an error and increments the disturbance volume.

Path compensation is deactivated by default. If path compensation should be activated, it is recommended to set the parameters during commissioning / operation.

**8.6 Function check after commissioning**

Check the device status, [see “Checking the meter state with FLOWgate™”, page 62.](#)

The check for meter performance needs medium inside of the meter.

## 9 Operation

### 9.1 Operating using the display

The display is intended for reading measurement and diagnostic values, not for parameterizing the device.



**NOTICE:**

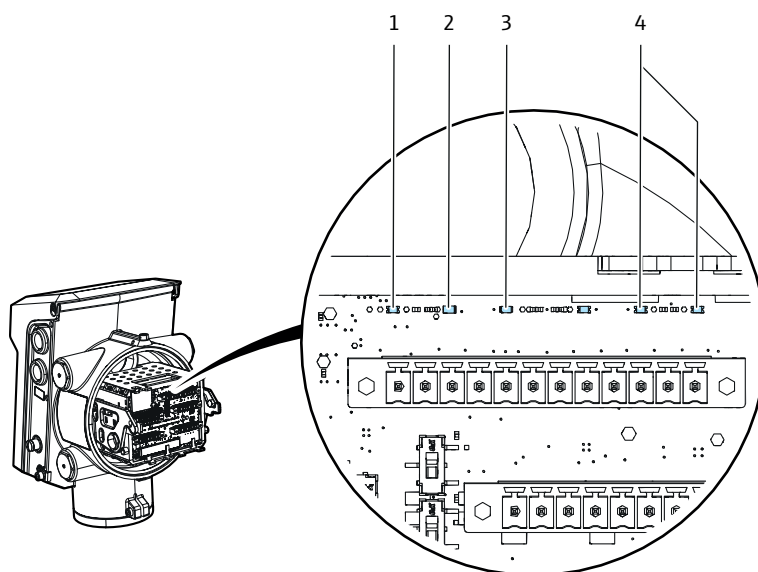
The display can be read at temperatures down to -20 °C. Below this temperature, the display may “freeze”. However, it is not damaged at temperatures between -20 °C and -40 °C. Once the temperature rises to -20 °C or higher, the display becomes readable again.

#### Display in the symbol bar

Symbol	Significance	Description
	Device status: Ok	Measurement valid, no warning or error
	Device status: Malfunction	Error, the measured value is invalid
	Device status: Warning	Warning, the measured value is still valid
	Registered events	Unacknowledged entries in logbook
	Parameter locking switch closed	Metrologically relevant parameters are protected against changing
	Parameter locking switch open	Metrologically relevant parameters can be changed
	Configuration mode	Configuration mode is active, parameters can be changed

## 9.2 Status LEDs on the Ex-d terminal board

The LEDs are located at the top edge of the terminal board in the Ex-d terminal compartment.



- 1 OK
- 2 Warn
- 3 Error
- 4 Power

Fig. 37: Status LEDs

Labeling on the circuit board	Description	LED Color
OK	Status OK	Green
Warn	Warning	Yellow
Error	Error	Red
Power	Internal power supply OK	Green

## 10 Maintenance

### 10.1 General information

The FLOW SIC610 does not include mechanical moving parts. The meter body, the ultrasonic transducers and the p/T -sensor are the only components that come into contact with gas. Hydrogen-stable material ensure that these components are resistant to corrosion, provided that the meter is installed and operated in accordance with the relevant specifications.

This means that the FLOW SIC610 is a low-maintenance system.

User warning limits can be configured to provide early warnings. Maintenance is limited mainly to routine checks to determine the plausibility of the measured values and diagnostic results produced by the system.

Endress+Hauser recommends that Maintenance Reports be created and filed on a regular basis. Over a period of time, this provides a comparison data base useful when diagnosing problems.



The operating conditions (composition of measuring medium, pressure, temperature, flow velocity) of the individual status reports should be similar. When the individual reports are compared, it is recommended to evaluate and document deviations.

### 10.2 Routine checks

Proper device function can be determined directly on a mobile device or the display of FLOW SIC610. The FLOWgate™ operating software provides a user-friendly option for the performance of routine checks.

The FLOW SIC610 checks its own meter state with a system of user warnings and alarms. If the I/O interfaces are configured to indicate alarms and/or user warnings, it is not necessary to manually check the meter state.

The system status in the FLOWgate™ operating software provides a general overview when a visual feedback on the meter's state is desired.

#### 10.2.1 Checking the meter state with FLOWgate™

- ▶ Check the device status.

Table 4: Signaling the device status in FLOWgate™

Status	Description
	Device status OK: Normal operation, neither warnings nor errors exist.
	Device status warning: At least one warning is pending in the device, the measured value is still valid.
	Device status error: At least one error is pending in the device, the measured value is invalid.

- ▶ Click on the symbol in the Status bar when warnings or errors exist. The current Status overview opens and shows details and information on how to proceed.

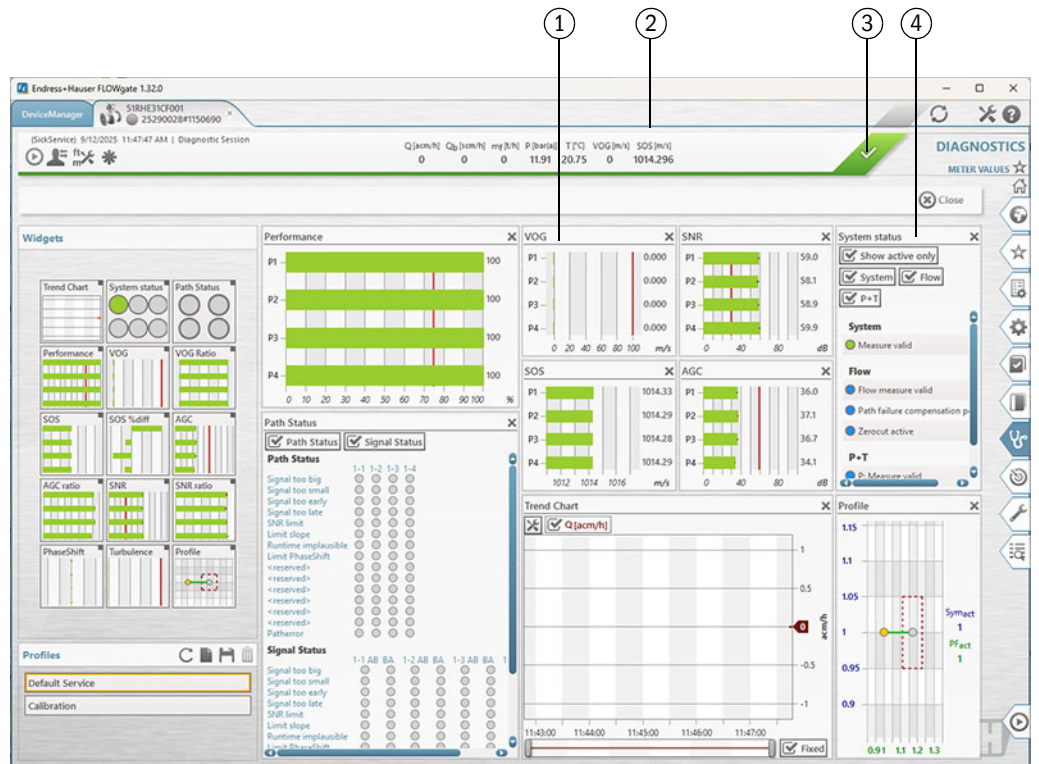
**CURRENT STATUS**

● **Parameter Lock Open**  
The parameter locking switch is open.  
Close the parameter locking switch. Please refer to the operating manual of FLOWSIC600-XT

● **New Logbook Entries**  
New entries have been logged in the event log  
Check the event summary.

Fig. 38: Current status

The “Diagnostics” menu shows under “Meter values” in various profiles all diagnostics values providing information on the status of the device.



- 1 Diagnostic information
- 2 Measured SOS
- 3 Status bar
- 4 System status

Fig. 39: Meter values (example, freely configurable)

**10.2.2 Comparing theoretical and measured speed of sound (SOS)**

One of the main criteria for correct operation of an ultrasonic flow meter is conformity between the theoretical speed of sound calculated for the actual composition of the measuring medium, temperature and pressure, and the speed of sound measured by the flow meter.

The Speed of Sound Calculator (SOS Calculator) available in the FLOWgate™ operating software calculates a theoretical SOS for a specific composition of the measuring media at a specified temperature and pressure. The calculation of thermodynamic properties is based on the “GERG-2008” algorithm.

- 1 Establish a connection between FLWSIC610 and FLOWgate™.
- 2 Open “SOS Calculator” in the “Diagnostics” menu.
- 3 Select the composition of the measuring medium and confirm with “Apply”. The composition can be entered manually or loaded as file.
- 4 Enter the current process conditions and select “Calculate SOS”.
- 5 Compare the theoretical speed of sound with the speed of sound measured with the FLWSIC610.

The deviation of the measured SOS from the calculated SOS is shown for each path in the “Deviations per Path” area.

- 6 The deviation between the two speeds of sound should be less than ±0.2%.

If the deviation exceeds 0.4%:

Check the plausibility of the pressure, temperature and composition values.




The speed of sound should be measured and compared in the stationary system state (= continuous flow) and thermally stable state. The temperature entered must correspond as closely as possible to the temperature in the measuring section.

Example: 1 Kelvin of incorrect temperature measurement or input leads to an SOS deviation of approx. 0.7%

**10.2.3 Checking the device status on the display**

If there is a warning or malfunction on the device, the corresponding symbol is shown in the SPU display.

Table 5: Symbols

Symbol	Significance	Description
	Device status: Malfunction	The device has an error, the measured value is invalid.
	Device status: Warning	The device has a warning, the measured value is still valid.
	Registered events	Events have occurred since the last event summary reset.

- ▶ An active error or warning is shown flashing in the LC display.
- ▶ The status output can be configured to show whether the meter state “Measurement valid”, “Warning”, “Error”, “Maintenance necessary” becomes active.

### 10.3 Time synchronization

#### 10.3.1 Time synchronization with the FLOWgate™ operating software

Date and time can be synchronized in the FLOWgate™ operating software with the connected PC during commissioning or in menu “Parameter Modification” and “System/ User”.

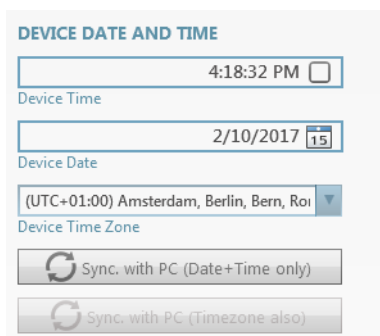


Fig. 40: Time synchronization

#### 10.3.2 Service life/capacity of RTC battery

The real-time clock (RTC) of FLOWsIC610 is buffered by a battery. The device checks permanently whether the real-time clock is working and date and time have valid values. If this is not the case, a device error occurs and results in the respective entry in the event logbook. The error is eliminated only when a valid date is set.


The expected service life of the RTC battery is 10 years. After 90% of the expected service life, a warning is issued so that the battery can be replaced in time, see “Exchanging the RTC battery”, page 69.

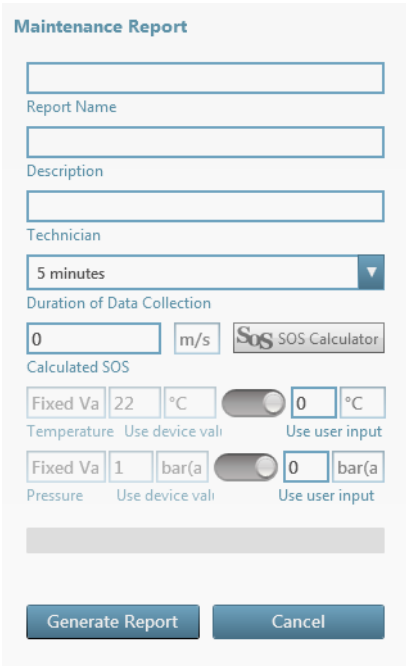
## 10.4 Maintenance report

It is recommended to regularly create and archive a Maintenance report. This serves to create a comparison database and supports diagnostics.



The operating conditions (composition of measuring medium, pressure, temperature, flow velocity) of the individual Maintenance Reports should be similar. When the individual reports are compared, it is recommended to evaluate and document deviations.

- 1 Click  in the status bar.
- 2 The “Maintenance Report” dialog opens.  
It is recommended to set the duration of data collection to 5 minutes, but it can also be changed in the selection list.



**Maintenance Report**

Report Name

Description

Technician

5 minutes

Duration of Data Collection

0 m/s SOS Calculator

Calculated SOS

Fixed Va 22 °C Use device value Use user input

Temperature

Fixed Va 1 bar(a) Use device value Use user input

Pressure

Generate Report Cancel

Fig. 41: Maintenance report

- 3 After the end of data collection, the report opens automatically and can be printed, saved as PDF document or sent via e-mail.
- 4 Finally close the report with the “Close” button.
- 5 It is recommended to file the printed report with the device delivery documentation.

## 10.5 Optional data backup

**+i** To prevent an overflow of the logbooks and possible data loss, logbook entries can be saved to the meter database with the FLOWgate™ operating software. The entries on the meter can then be deleted.

### 10.5.1 Logbook check and data backup

Page “Logbook Management” provides an overview and a general introduction to the logbooks.

The following functions are available here:

- “Load all logbooks from device”: Load the complete contents of all logbooks in the PC database.
- “Load all logbooks from database”: Add the overview data that are already on the PC to the logbook and make them available during the FLOWgate™ session.
- “Clear All Logbooks”: When the logbooks have been loaded from the device, they can be deleted in the device.
- When a logbook is selected, it is possible to only load/delete this logbook or to export it to CSV format or as PDF report.
- The PDF report is automatically opened and can be printed, saved or sent via e-mail.

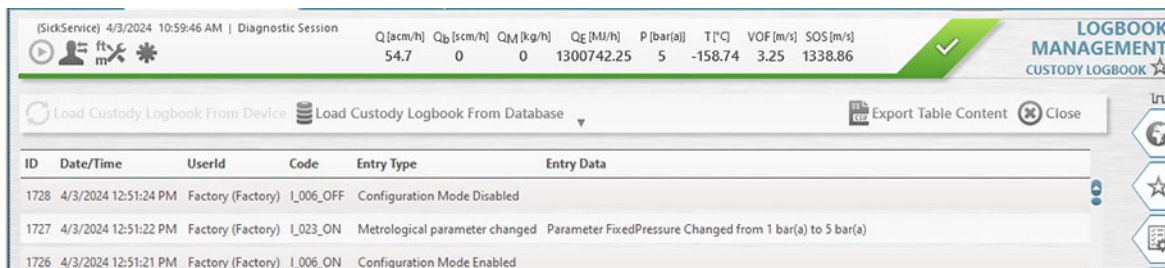


Fig. 42: Example: Custody logbook

#### Deleting logbook entries

Logbook entries can be deleted only via the FLOWgate™ operating software with button “Clear all Logbooks”. It is not possible to delete entries on FLOWSIC610.

### 10.5.2 Checking the data archives (data logs)

The FLOWSIC610 has a Diagnostic Archive.

The measured data are saved accordingly in the archives in the non-volatile memory of the device.

The Diagnostic Archive can be loaded and read in the “Archive Management” overview.

The archive data can be exported in CFX or CSV Format and then stored or sent as e-mail.

ID	Date/Time	Status System	Status Detail	Status Detail2	Status Diag	Status Diag2	Status Path Fail	P [bar(a)]	T [°C]	T SPU [°C]	VOF [m]
27	4/3/2024 12:00:00 PM	0x0000002F	0x19020066	0x00000000	0x00000000	0x00000000	0x0000000F	1	-142.79	24.22	1.53
26	4/2/2024 6:00:00 PM	0x0000002C	0x11000066	0x00000000	0x00000000	0x00000000	0x0000000F	1	-61.79	27.8	0
25	4/2/2024 5:00:00 PM	0x0000000F	0x11020006	0x00000000	0x00000000	0x00000000	0x0000000F	1	-61.59	25.87	0
24	4/2/2024 4:00:00 PM	0x0000000F	0x11020006	0x00000000	0x00000000	0x00000000	0x0000000F	1	-61.64	22.15	0
23	4/2/2024 3:00:00 PM	0x0000002E	0x11000026	0x00000000	0x00000000	0x00000000	0x000000FF	1	-61.84	26.48	0
22	4/2/2024 2:00:00 PM	0x0000000D	0x01420006	0x00000000	0x00000000	0x00000000	0x000000FF	1	-59.31	16.45	0
21	2/27/2024 4:00:00 PM	0x00000001	0x00000006	0x00000000	0x00000000	0x00000000	0x00000000	1	18.36	39.97	3.69
20	2/27/2024 3:00:00 PM	0x00000023	0x00000026	0x00000000	0x00000000	0x00000000	0x00000000	1	18.32	39.7	5.62
19	2/27/2024 2:00:00 PM	0x00000020	0x00000026	0x00000000	0x00000000	0x00000000	0x00000000	1	18.26	39.04	1.65

Fig. 43: Example: Diagnostic Archive

#### Deleting the archive

The archive can be deleted via the FLOWgate™ operating software archive data overview of the “Archive Management” or directly in the Diagnostic Archive.

## 10.6 Exchanging the RTC battery

### 10.6.1 Battery type

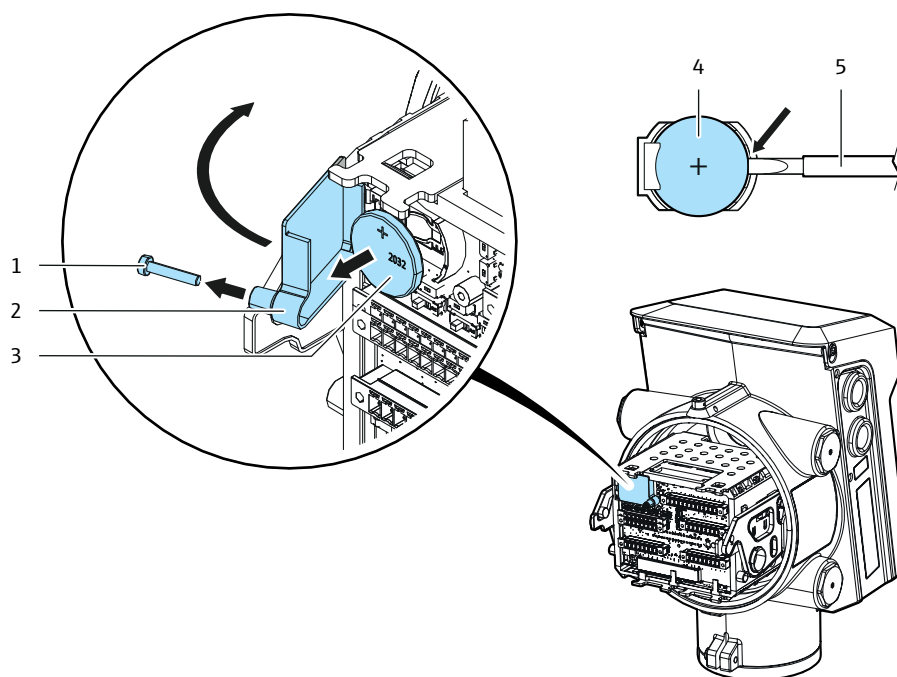
Only PANASONIC battery type BR2032 is permitted as RTC battery, otherwise intrinsic safety is endangered. This specific battery type is available at Endress+Hauser (part no. 2085319).

### 10.6.2 Replacing the RTC battery



**NOTICE: Measures in a metrologically secured area**

- ▶ If stipulated by national regulations, measures on the device in the metrologically secured area after commissioning may be carried out only under official supervision.
- ▶ This must be coordinated with the authorities before carrying out the measures.
- ▶ All actions must be performed on the basis of this manual and, if necessary, the Service Manual for the product.



- |  |  |
|--|--|
| 1 Retaining screw of the battery cover | 4 Ex-d terminal compartment cover        |
| 2 Battery cover                        | 5 RTC battery                            |
| 3 RTC battery                          | 6 Slotted screwdriver (max. size 0.3 mm) |

Fig. 44: Battery replacement

- 1 Open the Ex-d terminal compartment cover, see “Ex-d terminal compartment”, page 44.
- 2 Remove RTC battery cover with a Torx screwdriver, size 10.  
Keep the cover and the screw in a safe place.
- 3 Carefully remove the RTC battery from the holder.
  - ▶ Insert the slotted screwdriver (max. thickness 0.3 mm), on the right-hand side, between the battery and the battery holder.
  - ▶ Carefully lever the battery out of the holder.

**NOTICE:**

Ensure that the old battery is disposed of correctly, [see “Disposal”, page 77](#).

---

- 4 Insert the new RTC battery.
- 5 Refit the battery cover.
- 6 Close the Ex-d cover terminal compartment, [see “Ex-d terminal compartment”, page 44](#).
- 7 Connect with the device using the FLOWgate™ operating software, [see “Connecting to the device via Bluetooth”, page 52](#).
- 8 Open the System + LCD tile in the Parameter Modification menu.
- 9 Set the date and time or synchronize with the PC.
- 10 Reset the battery lifetime counter.

## 10.7 Cleaning

**NOTICE: Cleaning information**

- ▶ Only clean the device with a damp cloth.
  - ▶ Do not use solvents for cleaning.
  - ▶ Only use materials for cleaning which do not damage the surface of the device.
-

## 11 Troubleshooting

### 11.1 Contacting customer service

**+i**

- ▶ Contact Endress+Hauser Customer Service for any malfunctions you cannot clear yourself.
- ▶ To enable customer service to help you fast and efficient in such cases, please provide customer service a diagnostic session of the device showing malfunctions. The diagnostic session can be created with the FLOWgate™ operating software, see [“Recording a diagnostic session”](#), page 73.

### 11.2 Status messages


- Current errors or warnings can be retrieved under “Device status” / “Current events” with error code.
- Detailed information on the status messages is available via the FLOWgate™ operating software in the Diagnostics menu via the “Status Diagnostics” tile.

Table 6: Status messages

Message	Description/clearance
New logbook entries	Check and reset event log book.
Metrology Hardware Lock open	Close metrology hardware lock in device.
Metrology Software Lock open	Remote Firmware Upload and installation possible.
Configuration mode	Change device mode.
System test mode	End test mode after testing is finished or restart device
Firmware checksum error	Contact customer service.
RTC hardware error	Contact customer service.
Date/Time invalid	Set date and time.
RTC battery 10%	Replace battery.
Totalizer checksum error	Reset totalizer.
Parameter invalid	Contact customer service.
Pressure sensor failure	Replace pressure sensor or contact customer service.
Pressure lower user limit exceeded	Check pressure alarm limits.
Pressure upper user limit exceeded	Check pressure alarm limits.
Temperature sensor failure	Replace temperature sensor or contact customer service.
Temperature lower user limit exceeded	Check temperature alarm limits. See user manual.
Temperature upper user limit exceeded	Check temperature alarm limits. See user manual.
Impulse #1 warning. Max Frequency exceeded.	Check flow rate and scaling (pulse factor).
Impulse #2 warning. Max Frequency exceeded.	Check flow rate and scaling (pulse factor).
Flow-hardware error	Contact customer service.

Message	Description/clearance
Path failure (error)	Check process conditions or contact customer service.
Path failure (warning)	Check process conditions or contact customer service.
Flow test active	End test mode after testing is finished or restart device
Flow adjust range exceeded	Save diagnostic session file and contact customer service.
Calculation error energy	Check process conditions or contact customer service.
Calibration mode	Change device mode.
Logbook failure	Check and Reset logbook or contact customer service.
Logbook warning	Check and Reset logbook or contact customer service.
Display module failure	Check Display incl. cabling or contact customer service.
Installed Firmware invalid.	Reinstall Firmware. Contact customer service.
User warning active	A user warning has been activated. Please check the meter diagnostic status in 'Parameter modification/Warnings' or contact customer service.
Diagnostiv archive warning	Check and Reset diagnosis archive or contact customer service.

### 11.3 Recording a diagnostic session

- 1 Click the  icon in the tool bar to start a diagnostic session.
- 2 Select the desired data collection time.  
It is recommended to select a minimum data collection time of 5 minutes and to load the logbooks and data archives
- 3 Click “Start” to start recording.  
The following message with the current storage location of the data collection is shown after successful creation of the diagnostic session.

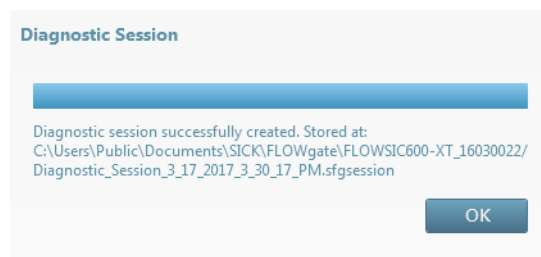


Fig. 45: Diagnostic recording completed

- 4 Click “OK” to confirm the message.
  - Click “Save as” to select a storage location for the diagnostic recording.
  - Click “E-mail” to send the file per e-mail. The file is appended to an e-mail when an e-mail client is available.
  - Click “Close” to leave the file at the standard storage location.

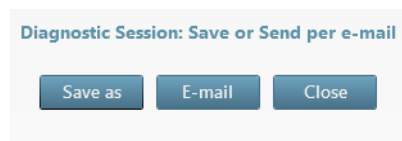



Fig. 46: Save the diagnostic session

 The diagnostic sessions are saved as files with the ending .sfgsession. The files are saved by default under:  
 C:\Users\Public\Documents\SICK\FLOWgate  
 The name of the storage folder consists of device type and serial number of the device.

## 11.4 Password recovery

### 11.4.1 Procedure

In case you have lost access to the device due to missing user name or password information, please contact your “admin” user.

If you no longer have the login information for the “admin” account, a password recovery can be requested from your local Endress+Hauser representative.

The procedure uses device-specific keys, which are compared with the data stored in the factory to prevent unauthorized resetting of passwords. A password recovery can also be performed with the parameter locking switch closed, since user management is not one of the metrologically relevant settings.

### 11.4.2 Initializing a password recovery

- 1 Connect to the device with the FLOWgate™ operating software.
- 2 Connect with known user data or as a guest user.  
No user name and password are required for the “guest” user level.
- 3 Open the “Parameter Modification” menu.
- 4 Open the “User Management” tile.
- 5 To start the password recovery process, click “Start password restore procedure”.

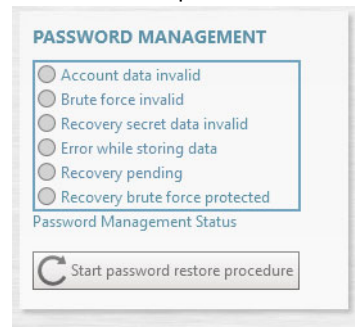


Fig. 47: Password management

- 6 Confirm the query to proceed.

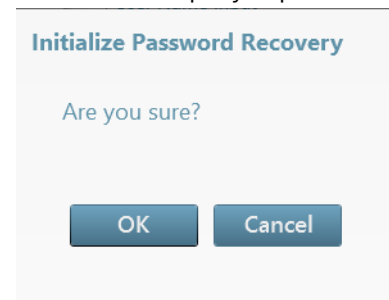


Fig. 48: Confirming password recovery

The password recovery process is initialized.

The password management status shows “Recovery pending” and the “Challenge code” is displayed.

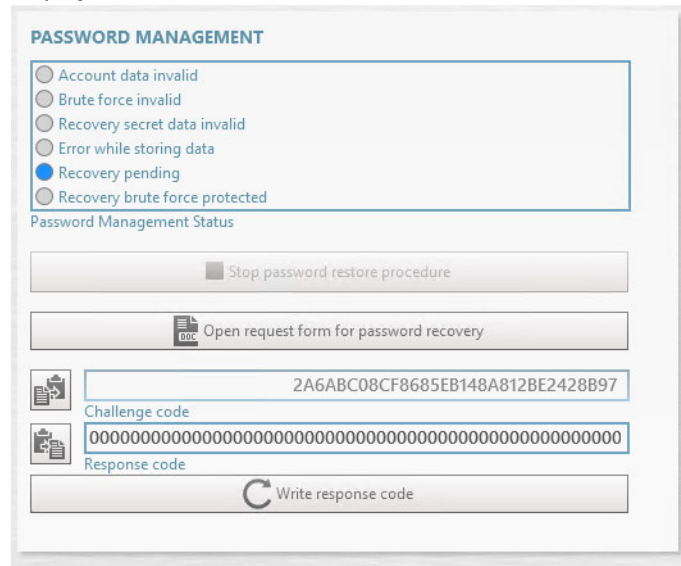


Fig. 49: Password recovery pending



**NOTICE:**

The “Challenge code” is a one-time code and only valid as long as the password recovery process is active.

7 Open the password recovery request form.

**Request for password recovery of FLOWSIC products**

Please fill in the address of your local Sales representative:

Hereby we request:

<b>Company name</b>	
<b>Street</b>	
<b>ZIP / City</b>	
<b>Phone</b>	
<b>Fax / e-mail address</b>	
<b>Responsible</b>	

a password recovery for the following device:

FLOWSIC600 (no challenge code required)       FLOWSIC600-XT (challenge code is required)

<b>Part number</b>	
<b>Serial number</b>	
<b>Challenge code (64 digits)</b>	

We represent and warrant that

- we are fully entitled to unlimited access to the aforementioned equipment and that our access to the equipment is not limited under any agreement/contract with an OEM;
- that we are responsible for checking the complete safety system regarding its effectiveness after each modification in the configuration; and
- we are aware that the device is part of safety equipment, is used for the configuration of the device and, thus, that we will keep the password confidential and protected against unauthorized access and use.
- we have received the Privacy Information and accept it.

We will indemnify and hold harmless Endress+Hauser and its affiliated companies from and against all damages and all claims, suits and actions from third parties arising from the fact that we have failed to comply with one of the above-mentioned representations, unless we did not act negligently or intentionally.  
This Agreement shall be governed and construed in accordance with German law.

Place, date \_\_\_\_\_ Company stamp with signature \_\_\_\_\_

GBC Flow Password recovery request form Version: 1.1

Fig. 50: PDF form for password recovery (example)

- 8 Enter the device and customer data.
- 9 Enter Challenge Code as displayed in FLOWgate™.  
The challenge code can be copied from FLOWgate™ via button to the left of the code.

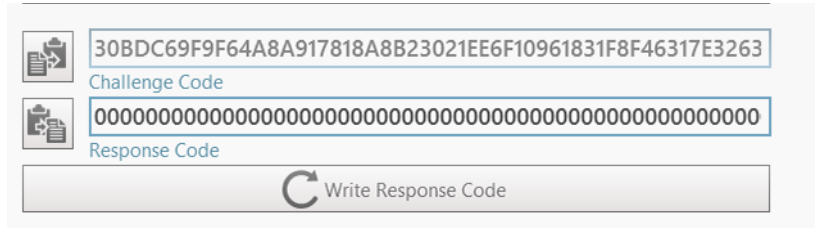


Fig. 51: Challenge code

- 10 Fill out request form completely, print and sign it.
- 11 Send the request form to your local Endress+Hauser representative.



**NOTICE: Cancelling an ongoing password recovery process**

The password recovery process can only be cancelled by the “Admin” user after successful login.

**11.4.3 Resetting the passwords**

- 1 After receiving the response from Endress+Hauser, log into the device again as e.g. guest.
- 2 Open the “Parameter Modification” menu .
- 3 Open the “System/User” tile.
- 4 Enter the response code into the corresponding field.  
Click the button to the left of the field to paste from the clipboard.

Fig. 52: Response code

- 5 To write the response code to the device, click “Write Response Code”.



**NOTICE:**

The recovery process can only be canceled by the login described above. However, after three incorrect entries you have to wait two hours before the next attempt as brute force protection.

- 6 After successful password recovery, the following message is displayed.

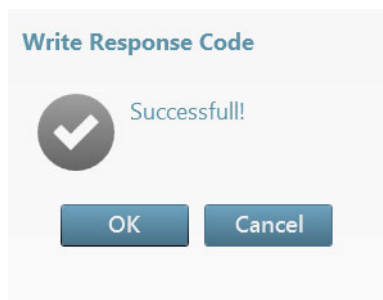


Fig. 53: Response code successfully written

When the response code has been written to the device successfully, the password recovery process is complete.



**Note:**

User name and password for the “admin” account have been reset to the default settings with the recovery. The other accounts have been reset and need to be reconfigured.

Log in with the “Admin” account and reconfigure the user management.

## 12 Decommissioning

### 12.1 Safety information on decommissioning

Ensure that all safety instructions are observed:

- see “For your safety”, page 9
- see “Mounting”, page 34
- see “Electrical installation”, page 39

### 12.2 Return delivery

#### 12.2.1 Contact

Contact your local Endress+Hauser representative for assistance.

#### 12.2.2 Clearance certificate

A clearance certificate will be provided by your local Endress+Hauser representative, if necessary.

#### 12.2.3 Packaging

Make sure the measuring device cannot be damaged during transport.

### 12.3 Permanent decommissioning of the device

If the device is permanently decommissioned, Endress+Hauser recommends deleting critical data before disposal.

### 12.4 Disposal



**NOTICE: Disposal of batteries, electrical and electronic devices**

- ▶ In accordance with international directives and regulations, batteries, accumulators, and electrical or electronic devices must not be disposed of with household waste.
- ▶ The owner is obligated to dispose of the devices at the end of their service life via the appropriate public disposal points.
- ▶ icon on the product, packaging, or in this document indicates that a product is covered by these provisions:



The applicable local and statutory environmental regulations and guidelines for the disposal of industrial and electrical waste must be observed.



**NOTICE:**

The applicable local and statutory environmental regulations and guidelines for the disposal of industrial and electrical waste must be observed.

The following assemblies may contain substances that need to be disposed of separately:

- Electronics: Capacitors, accumulators, batteries
- Displays: Liquid in the LC displays

### 13 Technical data

#### 13.1 Dimensional drawings

Dimensions of the FLOWSIC610

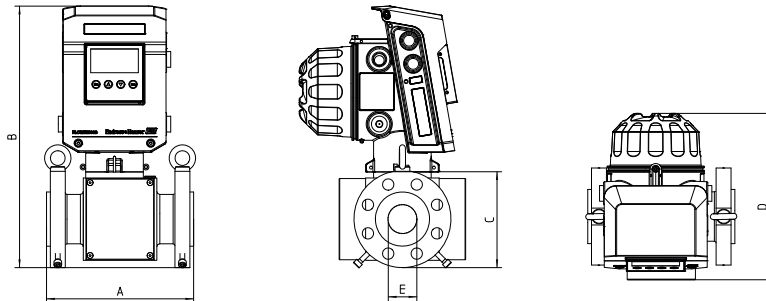


Fig. 54: FLOWSIC610 2"

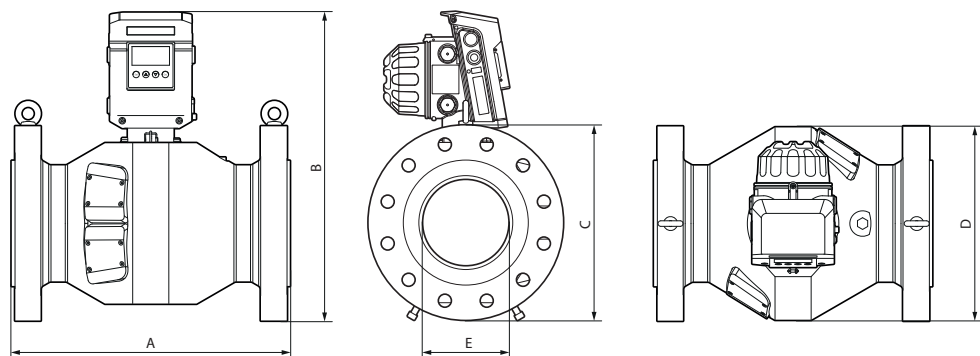


Fig. 55: FLOWSIC610 3" ... 16"



**Note:**

The FLOWSIC610 dimensions for the most common combinations of sizes, flange standards and pressure classes are shown in [Table 7](#) and [Table 8](#), in metric and imperial units respectively.

Dimensions for other device modifications, for instance another nominal length, flange standards, pressure classes, etc., are available on request.

The 2" meter body has a special design.

Table 7: Dimensions in mm, weight in kg

Nominal pipe size	Nominal length	Connection flange	Standard	Weight	Dimensions				
					(A)	(B)	(C)	(D)	(E <sup>(1)</sup> )
					[mm]	[mm]	[mm]	[mm]	[mm]
2"	5D	cl300	ANSI B16.5	40	250	165	445	283	49.22
		cl600	ANSI B16.5	40	250	165	445	283	49.22
		PN40	EN 1092-1 Type 11	40	250	165	445	283	49.22
		PN63	EN 1092-1 Type 11	40	250	180	453	283	49.22
		PN100	EN 1092-1 Type 11	40	250	195	460	283	49.22

Nominal pipe size	Nominal length	Connection flange	Standard	Weight	Dimensions				
				[kg]	(A)	(B)	(C)	(D)	(E <sup>[1]</sup> )
					[mm]	[mm]	[mm]	[mm]	[mm]
3"	4D	cl300	ANSI B16.5	63	320	210	495	220	73.66
		cl600	ANSI B16.5	63	320	210	495	220	73.66
		PN40	EN 1092-1 Type 11	63	320	200	490	220	73.66
		PN63	EN 1092-1 Type 11	63	320	215	498	220	73.66
		PN100	EN 1092-1 Type 11	63	320	230	505	220	73.66
4"	3D	cl300	ANSI B16.5	87	300	254	528	240	97.18
		cl600	ANSI B16.5	87	300	273	538	240	97.18
		PN40	EN 1092-1 Type 11	87	300	235	518	240	97.18
		PN63	EN 1092-1 Type 11	87	300	250	525	240	97.18
		PN100	EN 1092-1 Type 11	87	300	265	533	240	97.18
6"	3D	cl300	ANSI B16.5	146	450	318	585	330	146.36
		cl600	ANSI B16.5	174	450	356	605	330	146.36
		PN40	EN 1092-1 Type 11	131	450	300	577	330	146.36
		PN63	EN 1092-1 Type 11	148	450	345	600	330	146.36
		PN100	EN 1092-1 Type 11	162	450	355	605	330	146.36
8"	3D	cl300	ANSI B16.5	295	600	381	653	415	193.70
		cl600	ANSI B16.5	295	600	420	672	415	193.70
		PN40	EN 1092-1 Type 11	295	600	375	650	415	193.70
		PN63	EN 1092-1 Type 11	295	600	415	670	415	193.70
		PN100	EN 1092-1 Type 11	295	600	430	678	415	193.70
10"	3D	cl300	ANSI B16.5	382	750	445	725	480	242.82
		cl600	ANSI B16.5	478	750	508	756	480	242.82
		PN40	EN 1092-1 Type 11	371	750	450	728	480	242.82
		PN63	EN 1092-1 Type 11	400	750	470	738	480	242.82
		PN100	EN 1092-1 Type 11	450	750	505	755	480	242.82
12"	3D	cl300	ANSI B16.5	486	900	521	773	500	288.94
		cl600	ANSI B16.5	572	900	560	795	500	288.94
		PN40	EN 1092-1 Type 11	460	900	515	770	500	288.94
		PN63	EN 1092-1 Type 11	484	900	530	778	500	288.94
		PN100	EN 1092-1 Type 11	566	900	585	805	500	288.94
14"	3D	cl300	ANSI B16.5	651	1050	585	777	560	317.50
		cl600	ANSI B16.5	715	1050	605	787	560	317.50
		PN40	EN 1092-1 Type 11	615	1050	580	775	560	317.50
		PN63	EN 1092-1 Type 11	655	1050	600	785	560	317.50
		PN100	EN 1092-1 Type 11	760	1050	655	812	560	317.50
16"	SD	cl300	ANSI B16.5	810	762	648	888	610	363.52
		cl600	ANSI B16.5	810	762	686	907	610	363.52
		PN40	EN 1092-1 Type 11	810	762	660	895	610	363.52
		PN63	EN 1092-1 Type 11	810	762	670	900	610	363.52
		PN100	EN 1092-1 Type 11	On request					

[1] Internal diameter

Table 8: Dimensions in inch, weight in lbs

Nominal pipe size	Nominal length	Connection flange	Standard	Weight	Dimensions				
					(A)	(B)	(C)	(D)	(E) <sup>[1]</sup>
				[lbs]	[in]	[in]	[in]	[in]	[in]
2"	5D	cl300	ANSI B16.5	88	9.8	6.5	17.5	11.1	1.94
		cl600	ANSI B16.5	88	9.8	6.5	17.5	11.1	1.94
		PN40	EN 1092-1 Type 11	88	9.8	6.5	17.5	11.1	1.94
		PN63	EN 1092-1 Type 11	88	9.8	7.1	17.8	11.1	1.94
		PN100	EN 1092-1 Type 11	88	9.8	7.7	18.1	11.1	1.94
3"	4D	cl300	ANSI B16.5	138	12.6	8.3	19.5	8.7	2.9
		cl600	ANSI B16.5	138	12.6	8.3	19.5	8.7	2.9
		PN40	EN 1092-1 Type 11	138	12.6	7.9	19.3	8.7	2.9
		PN63	EN 1092-1 Type 11	138	12.6	8.5	19.6	8.7	2.9
		PN100	EN 1092-1 Type 11	138	12.6	9.1	19.9	8.7	2.9
4"	3D	cl300	ANSI B16.5	192	11.8	10.0	20.8	9.4	3.83
		cl600	ANSI B16.5	192	11.8	10.8	21.2	9.4	3.83
		PN40	EN 1092-1 Type 11	192	11.8	9.3	20.4	9.4	3.83
		PN63	EN 1092-1 Type 11	192	11.8	9.8	20.7	9.4	3.83
		PN100	EN 1092-1 Type 11	192	11.8	10.4	21.0	9.4	3.83
6"	3D	cl300	ANSI B16.5	322	17.7	12.5	23.0	13.0	5.76
		cl600	ANSI B16.5	384	17.7	14.0	23.8	13.0	5.76
		PN40	EN 1092-1 Type 11	289	17.7	11.8	22.7	13.0	5.76
		PN63	EN 1092-1 Type 11	326	17.7	13.6	23.6	13.0	5.76
		PN100	EN 1092-1 Type 11	357	17.7	14.0	23.8	13.0	5.76
8"	3D	cl300	ANSI B16.5	650	23.6	15.0	25.7	16.3	7.63
		cl600	ANSI B16.5	650	23.6	16.5	26.5	16.3	7.63
		PN40	EN 1092-1 Type 11	650	23.6	14.8	25.6	16.3	7.63
		PN63	EN 1092-1 Type 11	650	23.6	16.3	26.4	16.3	7.63
		PN100	EN 1092-1 Type 11	650	23.6	16.9	26.7	16.3	7.63
10"	3D	cl300	ANSI B16.5	842	29.5	17.5	28.5	18.9	9.56
		cl600	ANSI B16.5	1054	29.5	20.0	29.8	18.9	9.56
		PN40	EN 1092-1 Type 11	818	29.5	17.7	28.7	18.9	9.56
		PN63	EN 1092-1 Type 11	882	29.5	18.5	29.1	18.9	9.56
		PN100	EN 1092-1 Type 11	992	29.5	19.9	29.7	18.9	9.56
12"	3D	cl300	ANSI B16.5	1072	35.4	20.5	30.4	19.7	11.38
		cl600	ANSI B16.5	1261	35.4	22.0	31.3	19.7	11.38
		PN40	EN 1092-1 Type 11	1014	35.4	20.3	30.3	19.7	11.38
		PN63	EN 1092-1 Type 11	1067	35.4	20.9	30.6	19.7	11.38
		PN100	EN 1092-1 Type 11	1248	35.4	23.0	31.7	19.7	11.38
14"	3D	cl300	ANSI B16.5	1435	41.3	23.0	32.6	22	12.5
		cl600	ANSI B16.5	1577	41.3	23.8	33.0	22	12.5
		PN40	EN 1092-1 Type 11	1356	41.3	22.8	32.5	22	12.5
		PN63	EN 1092-1 Type 11	1444	41.3	23.6	32.9	22	12.5
		PN100	EN 1092-1 Type 11	1676	41.3	25.8	33.9	22	12.5

Nominal pipe size	Nominal length	Connection flange	Standard	Weight	Dimensions				
					(A)	(B)	(C)	(D)	(E) <sup>[1]</sup>
				[lbs]	[in]	[in]	[in]	[in]	[in]
16"	SD	cl300	ANSI B16.5	1786	30.0	25.5	35.0	24.0	14.31
		cl600	ANSI B16.5	1786	30.0	27.0	35.7	24.0	14.31
		PN40	EN 1092-1 Type 11	1786	30.0	26.0	35.2	24.0	14.31
		PN63	EN 1092-1 Type 11	1786	30.0	26.4	35.4	24.0	14.31
		PN100	EN 1092-1 Type 11	On request					

[1] Internal diameter

13.2 Technical data




**Note:**

The exact device specifications and performance data of the product may deviate and depend on the respective application and customer specification. A device-specific data sheet is supplied with the device on delivery.

Table 9: Technical data FLOWSIC610

Meter characteristics and measuring parameters	
Measured values	Volume a. c., volumetric flow a. c., velocity of gas, speed of sound Hydrogen purity (optional)
Number of measuring paths	4 paths
Measurement principle	Ultrasonic transit time difference measurement
Measuring medium	Hydrogen (with purity >95%) Hydrogen (with purity >90%) – on request
Measuring ranges	5 m <sup>3</sup> /h (DN50) ... 25 000 m <sup>3</sup> /h (DN400) 180 ft <sup>3</sup> /h (DN50) ... 880 000 ft <sup>3</sup> /h (DN400)
	Measuring ranges depending on nominal pipe size, see <a href="#">Table 10</a> and <a href="#">Table 11</a> .
Repeatability	≤ ±0.05% of the measured value <sup>[1]</sup>
Uncertainty <sup>[1]</sup>	Typical error limits for flow rates $Q_t \dots Q_{max}$   ( $Q_{min} \dots Q_t$ ) ≤ ±0.5%   (±1.0%) Dry calibrated
	≤ ±0.2%   (±0.5%) After flow calibration and adjustment with constant factor. Without uncertainty of the test calibration facility.
	≤ ±0.1%   (±0.2%) After flow calibration and adjustment with polynomial or piecewise correction. Without uncertainty of the test calibration facility.
Minimum pipe lengths requirement	For ≥DN100: According to OIML Class 1.0: with straight inlet pipe of ≥ 10D or ≥ 2D+FC+3D; outlet section ≥ 3DN For DN50/DN80: According to OIML Class 1.0: with straight inlet pipe of ≥ 5D+FC+10DN; outlet section ≥ 3DN For detailed information see <a href="#">“Installation configurations”, page 36</a> .
Operating pressure	Min. operating pressure 15 bar (g) Optional: 7 bar (g) Lower min. operating pressure on request
	Max. operating pressure 102.1 bar (g) Higher max. operating pressure on request
Operating temperature	-40 °C ... +60 °C / -40 °F ... +140 °F -40 °C ... +85 °C / -40 °F ... +185 °F – on request
Nominal pipe size and Schedule	DN50 ... DN400 / 2" ... 16" ASME B36.10/B36.19: STD, 40, 80 Others on request

Flange type	ASME B16.5: Class300, Class600 EN 1092-1: PN40, PN63, PN100 Others on request	
Flange face	ASME B16.5/16.47: Raised Face Stock Finish, RTJ EN 1092-1: Type A, Type B1 Others on request	
Material	Meter body (wetted): LTCS: ASTM A350 Gr. LF2 / 1.0571 Stainless steel: ASTM A182 F316L / 1.4435 ASTM A182 F316/F316L / 1.4401/1.4404 SPU (electronics) housing: Aluminum (copper-free) <sup>[2]</sup> Stainless steel – on request	
Coating	SPU housing: Coating system: C3, option: CX acc. to ISO 12944 Color: Company Standard  Meter body: C4 / Company Standard Color Others on request	
Flow direction	Unidirectional, bidirectional	
Mounting direction in pipeline	Horizontal, vertical <sup>[3]</sup>	
<b>Ambient conditions</b>		
Ambient temperature <sup>[4]</sup>	IECEX/ATEX: -40 °C ... 60 °C / -40 °F ... 140 °F	
Storage temperature	IECEX/ATEX: -40 °C ... 60 °C / -40 °F ... 140 °F	
Ambient pressure	80 kPa (0.8 bar) ... 110 kPa (1.1 bar) / 12 psi ... 16 psi	
Oxygen content in the air	Air with normal oxygen content, normally 21 percent by volume	
Geographic altitude	Up to 2000 m / 6500 ft (above sea level)	
Ambient humidity	≤ 95% relative humidity, non-condensing	
Transient overvoltage	Overvoltage category I	
Environmental conditions	During use (enclosure closed): pollution degree 4	
	During installation/service (enclosure open): pollution degree ≤ 3	
Installation location	Indoor, outdoor, wet locations	
<b>Certifications</b>		
Ex	ATEX	 II 2(1) G Ex db ia [ia Ga] IIC T4 Gb
	IECEX	Ex db ia [ia Ga] IIC T4 Gb
Enclosure rating	IP66/IP67 acc. EN 60529	
<b>Dimensions and weight</b>		
Dimensions	See dimensional drawings	
Weight	See dimensional drawings	

Electrical connections	
Voltage	U <sub>nom</sub> = 24 V DC +20% /- 15% U <sub>m</sub> = 60 V
Power	I <sub>nom</sub> = 250 mA A higher switch-on current must be expected; recommended power supply: 1 A
Power consumption	Typically 5 W
Cable entries	4x M25x1.5 or 4x NPT 3/4" [5]
<b>Note:</b> For detailed information see <a href="#">“Power supply”</a> , page 42.	
Outputs and interfaces	
Serial RS485	Quantity: 2 Electrically isolated, termination switchable Data protocol: Modbus RTU, Modbus ASCII DSFG, instance F / ISO 17089 Baud Rate: 2.400...230.400 U <sub>m</sub> = 60 V Encoder
Service interface	For connection of commissioning and service adapters: CDBT100 (Bluetooth® Low Energy, wireless) CDUSB100 (USB, wired)
Digital outputs	Digital output/frequency output: Quantity: 4 (2 can be configured as frequency output)  Passive Electrically isolated Reverse polarity protection Switchable Namur/Open Collector Switching frequency: 0 ... 10 kHz Max. input voltage: 30 V DC U <sub>m</sub> = 60 V  In Open Collector configuration: Max. switching voltage (switch closed): 1.8 V DC Max. current: 50 mA  In Namur configuration at 8.2 V Us supply voltage: Power switch state “On”: 3.7mA Power switch state “Off”: 0.7 mA
Display	Measured values, system information, warnings, maintenance requests, alarms
Operation	Commissioning and regular checks via FLOWgate™  Visualization of measured values via integrated display on SPU front cover
Integrated components	Integrated p&T sensor for automatic geometry and Reynolds numbers correction (option)
<b>Note:</b> For detailed information on the interfaces see <a href="#">“Interfaces”</a> , page 19 and see <a href="#">“Ex-d terminal assignment”</a> , page 45 .	

Battery	
Battery type	Coin cell, type BR2032, manufacturer PANASONIC
Battery chemistry	Lithium poly carbon monofluoride Li-(CF) <sub>x</sub>

- [1] At reference conditions
- [2] Aluminium EN AW-6082 or Aluminium EN AC-44300 with ≤ 0.1% copper content, copper-free acc. API definition (API Recommended Practice 14FZ)
- [3] See mounting instructions
- [4] The maximum ambient temperature is limited to 55 °C (131 °F) for MID devices
- [5] Depending on the device variant selected

### 13.3 Design pressure and design temperature

Please refer to the supplied acceptance test certificate (EN 10204 - 3.1) and the type plate on the meter body for the actual values for the design pressure and design temperature for your specific device. A meter body type plate example can be found in [“Type plates”](#), see [page 87](#).

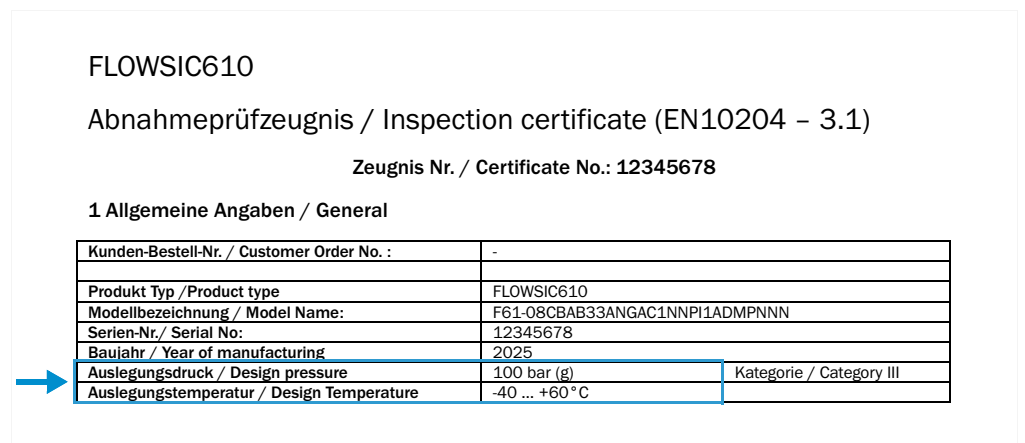


Fig. 56: Example acceptance test certificate (EN10204 - 3.1)

### 13.4 Flow rates

Table 10: Flow rates FLOWSIC610 (metric)

Nominal diameter	p <sub>min</sub> = 15 bar (g)			p <sub>min</sub> = 7 bar (g)		
	Q <sub>min</sub>	Q <sub>t</sub>	Q <sub>max</sub>	Q <sub>min</sub>	Q <sub>t</sub>	Q <sub>max</sub>
	m <sup>3</sup> /h			m <sup>3</sup> /h		
2" / DN50	5	16	400	10	32	400
3" / DN80	8	25	1000	16	50	1000
4" / DN100	13	40	1600	26	80	1600
6" / DN150	32	100	4000	64	200	4000
8" / DN200	40	160	6500	80	320	6500
10" / DN250	65	250	10000	130	500	10000
12" / DN300	100	400	16000	On request		
14" / DN350	120	480	19200			
16" / DN400	160	650	25000			

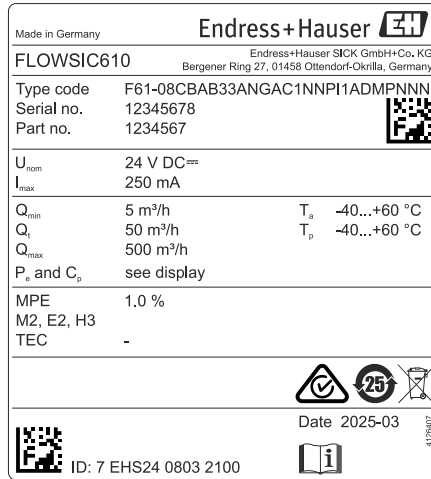
Table 11: Flow rates FLOWSIC610 (imperial)

Nominal diameter	p <sub>min</sub> = 218 psi (g)			p <sub>min</sub> = 102 psi (g)		
	Q <sub>min</sub>	Q <sub>t</sub>	Q <sub>max</sub>	Q <sub>min</sub>	Q <sub>t</sub>	Q <sub>max</sub>
	ft <sup>3</sup> /h			ft <sup>3</sup> /h		
2" / DN50	180	565	14100	360	1130	14100
3" / DN80	285	890	35500	570	1780	35500
4" / DN100	460	1410	56500	920	2820	56500
6" / DN150	1130	3530	142000	2260	7060	142000
8" / DN200	1410	5650	230000	2820	11300	230000
10" / DN250	2300	8830	355000	4600	17660	355000
12" / DN300	3500	14100	565000	On request		
14" / DN350	4250	17000	680000			
16" / DN400	5650	23000	880000			

14 Annex

14.1 Type plates

Main type plate example (general):



Main type plate example (MID):

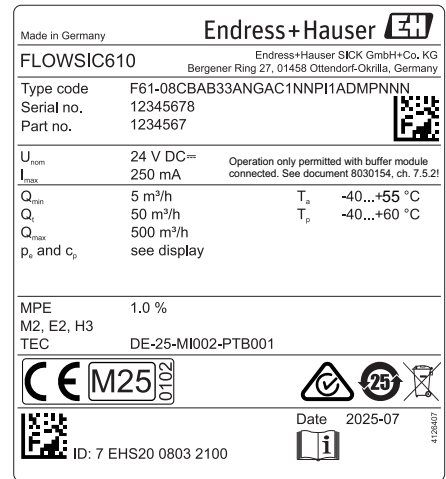


Fig. 57: Main type plate on SPU (example)

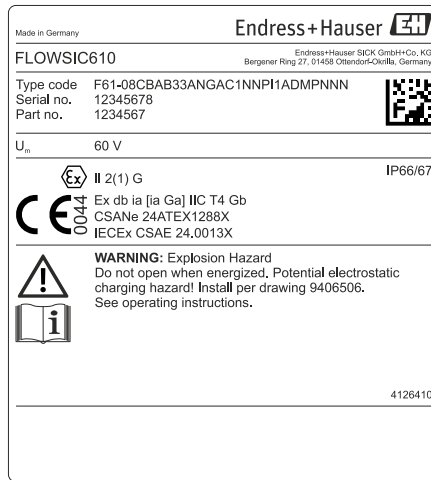


Fig. 58: Ex type plate on SPU ATEX/IECEX (example)

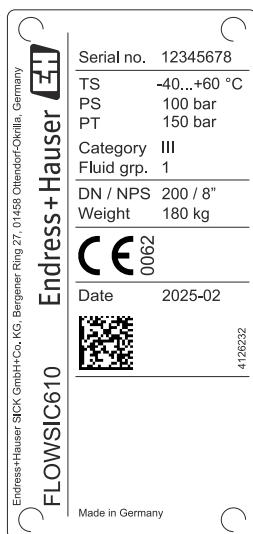


Fig. 59: Meter body type plate (example)

## 14.2 Conformities

The FLOWSIC610 conforms to the following standards or recommendations:

### **ATEX**

- EN IEC 60079-0:2018 (Edition 7)
- EN 60079-1:2014 (Edition 7)
- EN 60079-11:2012 (Edition 6)

### **IECEX**

- IEC 60079-0:2017 (Edition 7)
- IEC 60079-1:2014 (Edition 7)
- IEC 60079-11:2011 (Edition 6)
- EN 61326-1:2013

### **Metrological**

- MID 2014/32/EU
- OIML R137-1&2:2012

14.3 Wiring diagram

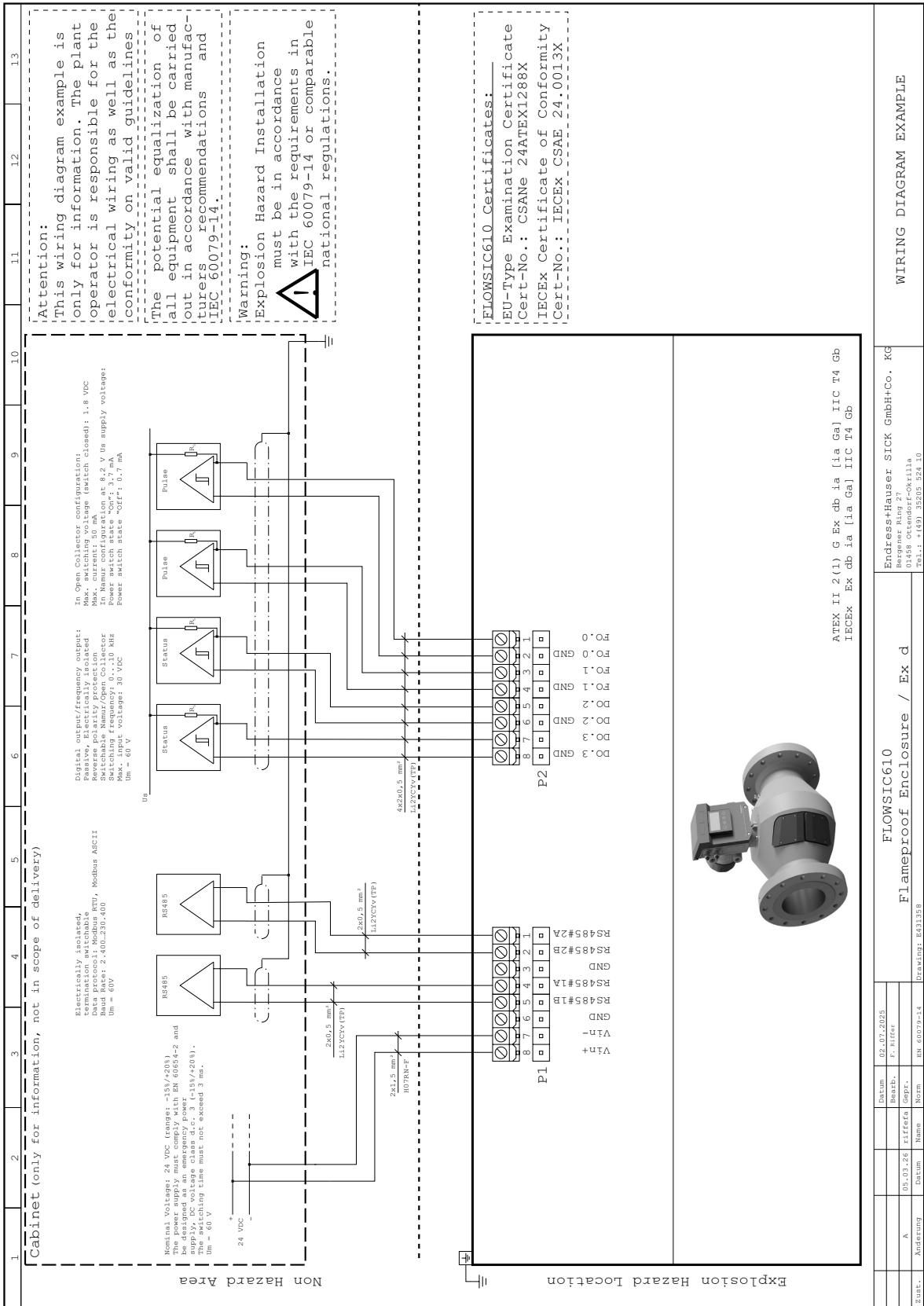


Fig. 60: FLOW SIC610 wiring diagram example

14.4 Type code

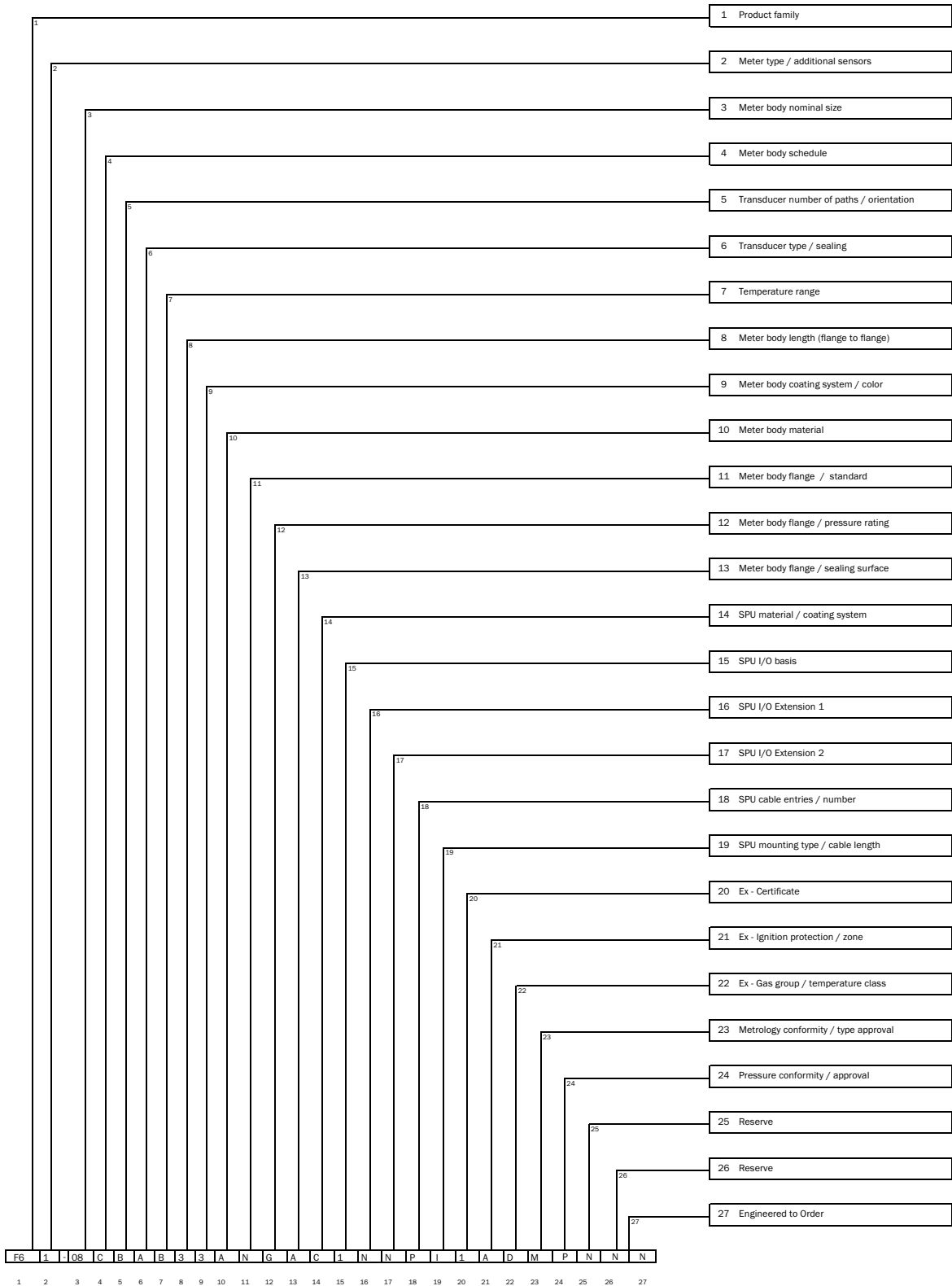


Fig. 61: Type code

<b>1</b>	<b>Product Family</b>		
	F6	Custody transfer gas meter	
<b>2</b>	<b>Meter type / additional sensors</b>		
	1	Hydrogen flow meter	
<b>3</b>	<b>Meter body nominal size</b>		
	02	02" / DN50	
	03	03" / DN80	
	04	04" / DN100	
	06	06" / DN150	
	08	08" / DN200	
	10	10" / DN250	
	12	12" / DN300	
	14	14" / DN350	
	16	16" / DN400	
	XX	Individual EtO	
	<b>4</b>	<b>Meter body schedule</b>	
		C	Schedule STD/40S ASME B36.19
D		Schedule 80S ASME B36.19	
E		EN 1092-1	
G		Schedule STD/40 ASME B36.10	
H		Schedule 80 ASME B36.10	
X		Individual EtO	
<b>5</b>	<b>Transducer number of paths / orientation</b>		
	B	4 path, 2x2 path crossed	
	C	4 path parallel	
<b>6</b>	<b>Transducer type / sealing</b>		
	C	Transducer type P331H	
X	Individual EtO		
<b>7</b>	<b>Temperature range</b>		
	B	T <sub>process</sub> -40 °C ... +60 °C	
	E	T <sub>process</sub> -25 °C ... +60 °C	
	X	Individual EtO	
<b>8</b>	<b>Meter body length (flange to flange)</b>		
	3	3D	
	4	4D	
	5	5D	
	S	SD Short Design (< 3D)	
	X	Individual EtO	
<b>9</b>	<b>Meter body coating system / color</b>		
	A	coating C4/ Standard Grey (RAL 7035)	
	B	coating C4/ White (RAL 9003)	
	C	coating C4/ Yellow (RAL 1021)	
	N	No coating	
	X	Individual EtO	
<b>10</b>	<b>Meter body material</b>		
	A	Stainless Steel EN 1.4401/1.4404 / ASTM A182 Gr. F316/316L	
	C	LTCS 1.0571/ASTM A350 Gr. LF2	
	X	Individual EtO	
<b>11</b>	<b>Meter body flange / standard</b>		
	A	ASME B16.5	
	D	DIN EN 1092-1	
	X	Individual EtO	
<b>12</b>	<b>Meter body flange / pressure rating</b>		
	1	Class 300	
	3	Class 600	
	E	PN40	
	F	PN63	
	G	PN100	
	X	Individual EtO	
<b>13</b>	<b>Meter body flange / sealing surface</b>		
	A	RFSD - Raised Face Stock Finish	
	B	RFSM - Raised Face Smooth Finish	
	C	RTJ Ring Joint	
	1	Form A	
	2	Form B1	
	X	Individual EtO	
<b>14</b>	<b>SPU material / coating system</b>		
	C	Aluminium copper-free / C3 ISO 12944	
	D	Aluminium copper-free / CX ISO 12944	
X	Individual EtO		
<b>15</b>	<b>SPU I/O Basis</b>		
	1	2 x RS485, 2x DO, 2x FO, 1 x service interface, 1 x display interface	
	X	Individual EtO	
<b>16</b>	<b>SPU I/O Extension 1</b>		
	N	None	
<b>17</b>	<b>SPU I/O Extension 2</b>		
	N	None	
<b>18</b>	<b>SPU cable entries / number</b>		
	P	4x M25x1.5	
	Q	4x 3/4" NPT	
<b>19</b>	<b>SPU mounting type / cable length</b>		
	I	Integrated	
	X	Individual EtO	
<b>20</b>	<b>Ex - Certificate</b>		
	1	IECEX/ATEX	
	I	IECEX	
	N	None	
<b>21</b>	<b>Ex - Ignition protection / zone</b>		
	A	Ex d / Zone 1	
	N	None	
<b>22</b>	<b>Ex - Gas group / temperature class</b>		
	D	IIC T4	
	N	None	
<b>23</b>	<b>Metrology conformity / type approval</b>		
	M	MID	
	N	None	
	X	Local type approval	
<b>24</b>	<b>Pressure conformity / approval</b>		
	A	ASME	
	P	PED	
	N	None	
<b>25</b>	<b>Reserve</b>		
	N	None	
<b>26</b>	<b>Reserve</b>		
	N	None	
<b>27</b>	<b>Engineered to Order</b>		
	O	None	
	X	Individual EtO	

Individual EtO = Engineered to Order

Fig. 62: Type code (example)



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