

Flexim Piox R721 Process Refractometer



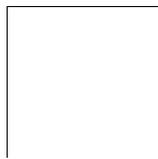


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1 Introduction

This operating instruction has been written for users operating the process refractometer PIOX R721. It contains important information about the measuring equipment, how to handle it correctly, and how to avoid damages. Read the safety instructions carefully. Make sure you have read and understood the operating instruction before using the measuring equipment.

Any work on the measuring equipment has to be carried out by authorized and qualified personnel in order to detect and avoid possible risks and dangers.

Presentation of warnings

This operating instruction contains warnings marked as follows:

Danger!	
	<p>Type and source of danger danger with high level of risk, which, if not avoided, can lead to death or serious injuries → measures of prevention</p>
Warning!	
	<p>Type and source of danger danger with medium level of risk, which, if not avoided, can lead to serious or moderate injuries → measures of prevention</p>
Caution!	
	<p>Type and source of danger danger with low level of risk, which, if not avoided, can lead to moderate or minor injuries → measures of prevention</p>
Important!	
This text contains important information which should be observed to avoid material damage.	
Notice!	
This text contains important information about the handling of the measuring equipment.	

Storage of the operating instruction

The operating instruction must permanently be available at the place where the measuring equipment is used. It must always be available to the user.

User comments

All reasonable effort has been made to ensure the correctness of the content of this operating instruction. If you, however, find some erroneous information or miss information, please inform us.

We will be grateful for any suggestions and comments regarding the concept and your experience working with the measuring equipment. If you have any suggestions about improving the documentation and particularly this operating instruction, please let us know so that we can consider your comments for future reprints.

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2 Safety instructions

2.1 General safety instructions

Prior to any work, read the operating instruction carefully and in full.

Failure to comply with the instructions, in particular with the safety instructions, poses a risk to health and can lead to material damages. For further information, contact FLEXIM.

During installation and operation of the measuring equipment, observe the ambient and installation conditions specified in the documentation. The measuring equipment comprises the transmitter, the sensors and the accessories.

Explanation of symbols on the transmitter:

symbol	explanation
	direct current
	connection to ground
	ground conductor terminal
	warning of voltage
	observe the operating instruction
	Attention!

The measuring equipment has to be checked for proper condition and operational safety before each use. If troubles or damages have occurred during installation or operation of the measuring equipment, please inform FLEXIM.

It is not allowed to make unauthorized modifications or alterations to the measuring equipment.

If the measuring point is within an explosive atmosphere, the danger zone and present explosive atmosphere have to be determined. The transmitter, sensor and accessories have to be appropriate and approved for the conditions within the corresponding zone.

The personnel has to be suitably trained and experienced for the work.

Observe the "Safety instructions for the use in explosive atmospheres", see document SIPIOX_R721. Observe the instructions for hazardous substances and the respective safety data sheets. Observe the regulations for the disposal of electrical equipment.

2.2 Intended use

The measuring equipment is intended for the measurement of fluid properties in closed pipes. The refractive index and temperature are measured via the connected sensor.

The transmitter uses the measured values to calculate the sought analysis quantities, e.g., concentration.

Through comparison with the values stored in the transmitter, further physical quantities can be calculated.

The physical quantities are provided via the outputs and the display.

- All instructions of this operating instruction have to be observed to ensure intended use.
- Any use beyond or other than the intended use is not covered by warranty and can present a danger. Any damage arising from not intended use shall be solely the liability of the operator or user.
- The sensor is installed into a standardized flange using the supplied process connection.
- Observe the operating conditions, e.g., environment, voltage ranges. For technical data of the transmitter, sensors and accessories, see technical specification.

2.3 Not intended use

Not intended use in terms of a misuse means:

- any work on the measuring equipment without observing all instructions in this operating instruction
- use of transmitter, sensor and accessories combinations not intended by FLEXIM
- installation of the transmitter, sensor and accessories in explosive atmospheres they are not approved for
- any work on the measuring equipment (e.g., installation, dismantling, connection, start-up, operation, service and maintenance) carried out by unauthorized and untrained personnel
- storage, installation and operation of the measuring equipment outside the specified ambient conditions (see technical specification)

2.4 Safety instructions for the user

Any work on the transmitter has to be carried out by authorized and qualified personnel. Observe the safety instructions in the operating instruction. For the technical data of the transmitter, sensor and accessories, see technical specification.

- Observe the safety and accident prevention regulations applicable on the site of operation.
- Only use the supplied mounting fixtures, the sensor as well as the intended accessories.
- Always wear the required personal protective equipment.

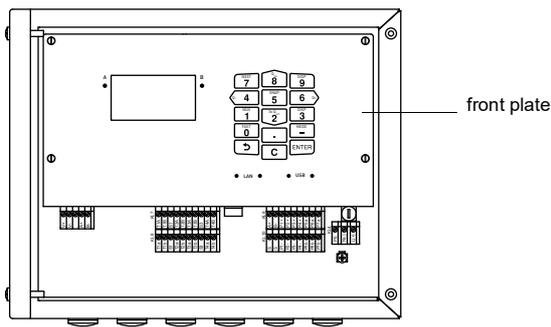
2.5 Safety instructions for the operator

- The operator shall qualify the personnel to perform their assigned tasks. The operator shall provide the required personal protective equipment and oblige the personnel to wear it. It is recommended to risk assess the workplace.
- Besides the safety instructions in this operating instruction, the health, safety and environment regulations applicable for the range of application of the transmitter, sensor and accessories have to be observed.
- With the exceptions stated in chapter 10, the measuring equipment is maintenance-free. Any components and spare parts may only be replaced by FLEXIM. The operator shall carry out periodic checks for changes or damages that can present a danger. For further information, contact FLEXIM.
- Observe the specifications for the installation and connection of the transmitter, sensor and accessories.

2.6 Safety instructions for electrical work

- Prior to any work on the transmitter (e.g., installation, dismantling, connection, service and maintenance), the transmitter has to be disconnected from the power supply. It is not sufficient to remove the internal fuse of the instrument.
- Electrical work may only be carried out if there is enough space.
- Open the transmitter in safe ambient conditions only (e.g., air humidity < 90 %, no conductive pollution, no explosive atmosphere). Otherwise, additional protective measures have to be taken.
- The degree of protection of the transmitter is only ensured if all cables are tightly fitted using cable glands and the housing is firmly screwed.
- The condition and tight fit of the electrical connections have to be checked at regular intervals.
- When connecting the transmitter to the power supply, an appropriate equipment switch according to IEC 60947-1 and IEC 60947-3 has to be installed as disconnecting device. The equipment switch has to disconnect all live wires. The ground conductor connection must not be interrupted. The equipment switch has to be easily accessible and clearly marked as a disconnecting device for the transmitter. It should be located near the transmitter. If the transmitter is used in an explosive atmosphere, the equipment switch has to be installed outside the explosive atmosphere. If this is not possible, it has to be installed in the least hazardous area.
- The connection may only be made to networks up to overvoltage category II. When connecting the inputs and outputs as well as the power supply, observe the installation instructions, in particular the terminal assignment.
- The front plate must not be removed. The transmitter does not contain any components to be maintained by the user. For repair and service work, please contact FLEXIM.
- Observe the safety and accident prevention regulations for electrical systems and equipment.

Fig. 2.1: Transmitter



2.7 Safety instructions for transport

Caution!



Warning of injuries due to falling objects

- Unsecured and falling objects can lead to severe injuries.
- Secure all components against falling during transport.
 - Wear the required personal protective equipment.
 - Observe the applicable rules.

- If you detect a transport damage when unpacking the delivery, please contact the supplier or FLEXIM immediately.
- The transmitter is a sensitive electronic measuring instrument. Avoid shocks or impacts.
- Handle the sensor cable with care. Avoid excessive bending or buckling. Observe the ambient conditions.
- Select a solid surface to put the transmitter, sensors and accessories on.
- The transmitter, sensors and accessories have to be properly packed for transport:
 - Use, if possible, the original packaging by FLEXIM or an equivalent cardboard box.
 - Position the transmitter, sensors and accessories in the middle of the cardboard box.
 - Fill any voids with appropriate packaging material (e.g., paper, foam, bubble wrap).
 - Protect the cardboard box against humidity.

2.8 Recommended procedure in hazardous situations

Fire fighting measures

- If possible, disconnect the transmitter from the power supply.
- Prior to extinguishing, protect any electrical parts that are not affected by the fire (e.g., using a cover).
- Select a suitable extinguishing agent. Avoid, if possible, conductive extinguishing agents.
- Observe the applicable minimum distances. The minimum distances differ depending on the used extinguishing agent.

3 General principles

3.1 Measurement principle

Terms and abbreviations

term/abbreviation	explanation
analyte	components of a mixture which are to be chemically analyzed
matrix	components of a mixture which are not to be chemically analyzed
fluid data set	data set containing fluid and its properties
• standard fluid data set	data set of a standard fluid (one of the most important watery solutions)
• customized fluid data set	data set of a customized fluid
scale	conversion to a scale value for an arbitrary or unknown material system (e.g., Brix scale)

Determination of the refractive index

The refractive index of a fluid is determined using transmitted light refractometry. A light beam propagates through the fluid and is refracted at the interface of a measuring prism. The angle of refraction is measured and is used for the calculation of the refractive index.

The refractive index is calculated using Snell's law of refraction:

$$n_i \cdot \sin\theta_i = n_t \cdot \sin\theta_t$$

where

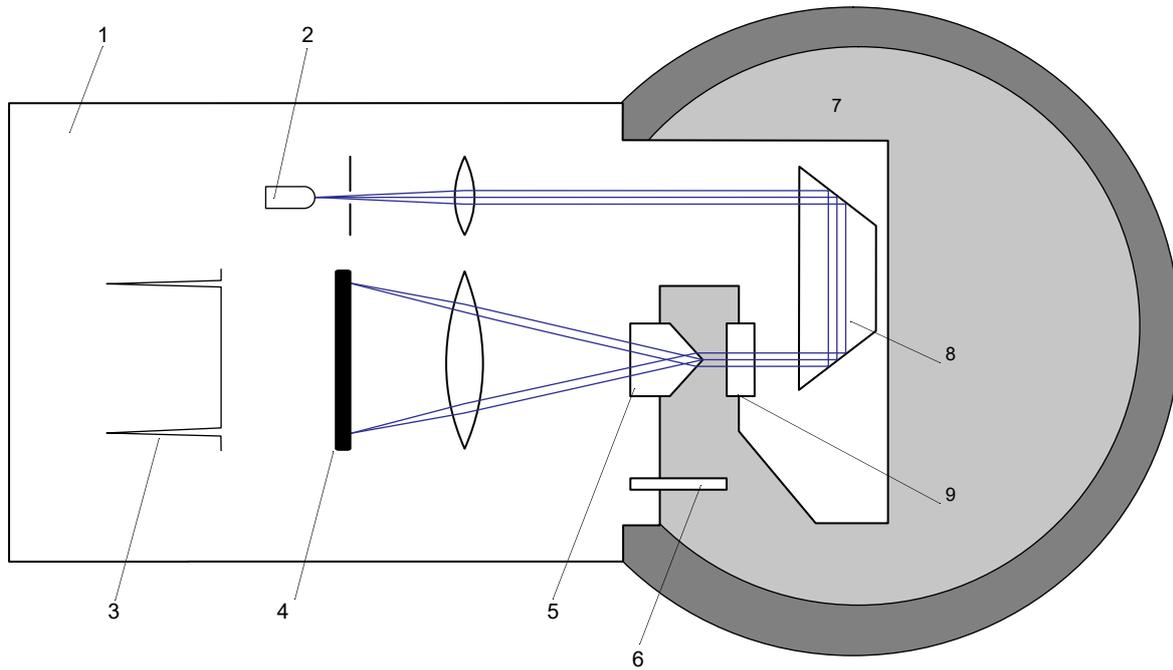
- n_i – refractive index of the fluid
- n_t – refractive index of the measuring prism
- θ_i – angle of incidence
- θ_t – angle of refraction

An LED with a wave length $\lambda = 590$ nm (sodium D-line) is used as the light source. The light passes through a slit, is parallelized by a lens and reversed by a deviating prism.

Then the light enters the fluid through a window and hits a measuring prism. The light beam is split and refracted at the lateral surfaces of the measuring prism.

The resulting light rays are focused in a lens and reproduced on the image sensor creating 2 slit images. The angle of refraction is determined from the distance between the 2 slit images. Influences of pressure and temperature are compensated.

Fig. 3.1: Path of light beam within the sensor



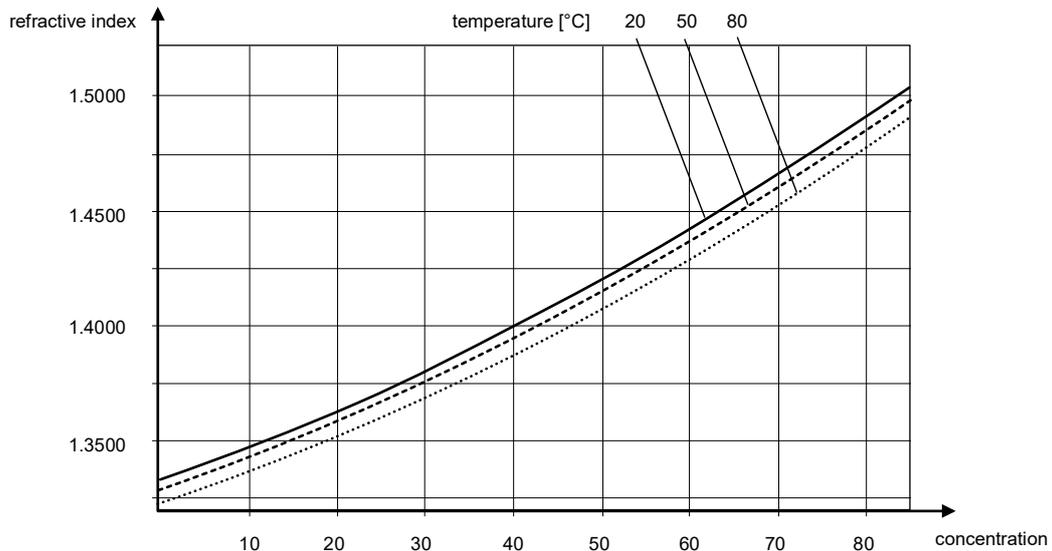
- 1 – sensor electronics
- 2 – LED
- 3 – slit images
- 4 – image sensor
- 5 – measuring prism
- 6 – temperature probe
- 7 – fluid
- 8 – deviating prism
- 9 – window

Determination of the concentration

The concentration is determined with the refractive index.

The refractive index depends on the temperature and concentration of the fluid. This relationship between temperature, refractive index and concentration is depicted with a function. The coefficients and the function are stored in a fluid data set.

Fig. 3.2: Characteristic curves (example for saccharose solution)



Temperature compensation

For industrial applications, it is often necessary not to determine the refractive index of the measured fluid temperature but rather at a reference temperature. The transmitter converts the refractive index.

In case temperature coefficients for the fluid are stored, they will be used to calculate the refractive index at a reference temperature.

Multi-component system

Apart from the refractive index and the temperature to determine the physical quantity for analysis, other physical quantities (e.g., sound speed, density, conductivity) are needed if the fluid consists of more than 2 components. These physical quantities are read via the inputs and processed with the fluid data set stored in the transmitter.

3.2 Diagnostic values

Amplitude

The amplitude (unit: %) is the ratio of max. values of the signals to the product of LED lightness and exposure time of the image sensor. At delivery, the amplification with water is normalized to 100 %.

Amplification (gain)

The amplification (unit: dB) is the ratio of max. values of the signals to the product of LED lightness and exposure time of the image sensor. At delivery, the amplification with water is normalized to 20 dB. 0.01 % of the amplification corresponds to a image amplification of 100 dB.

Symmetry

Symmetry is the relation of amplitudes of both slit images. At delivery, they are optically adjusted to the same value.

Quality

The quality (unit: %) is an evaluation of the signal shape in comparison to the ideal one.

SNR

The SNR (unit: dB) is the ratio of useful signal and noise signal. A high SNR is ideal.

Combination of diagnostic values

It is possible to realize a combined evaluation of diagnostic values to determine the cause of error in situations with strong light scattering:

- A contaminated measurement optics and a turbid fluid can lead to a very low amplitude (e.g., < 0.1 %) or to a very high amplification (> 80 dB).
- A contaminated measurement optics and optical maladjustment lead to a symmetry $\gg 1$ or $\ll 1$.
- A contaminated measurement optics decreases the quality more than a turbid fluid.
- A turbid fluid decreases the SNR more than a strongly absorbing fluid.

3.3 Sensor values

Sensor humidity

The relative humidity within the sensor electronics is measured with an integrated humidity sensor. The humidity sensor only measures water vapor but does not measures other vapors. The sensor humidity must not exceed 80 %.

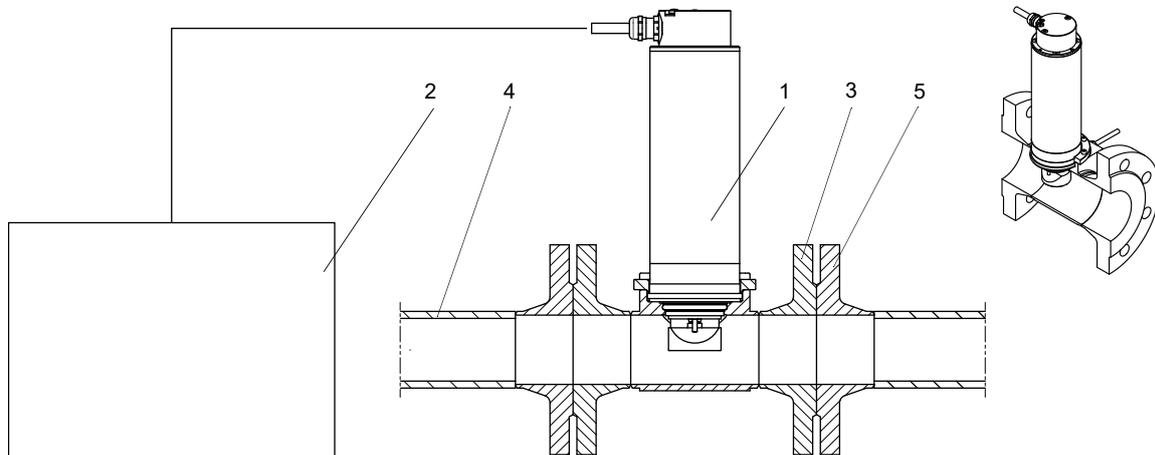
Sensor temperature

The temperature within the sensor electronics is measured with an integrated temperature sensor.

4 Product description

The transmitter and sensor are the main components of the process refractometer. Both are interconnected with the supplied cable.

Fig. 4.1: Measuring setup



- 1 – sensor
- 2 – transmitter
- 3 – process connection (example)
- 4 – pipe
- 5 – connection (customer side)

4.1 Handling concept

The transmitter is operated via the keyboard.

By pressing **4** or **6** the following menus are displayed consecutively:

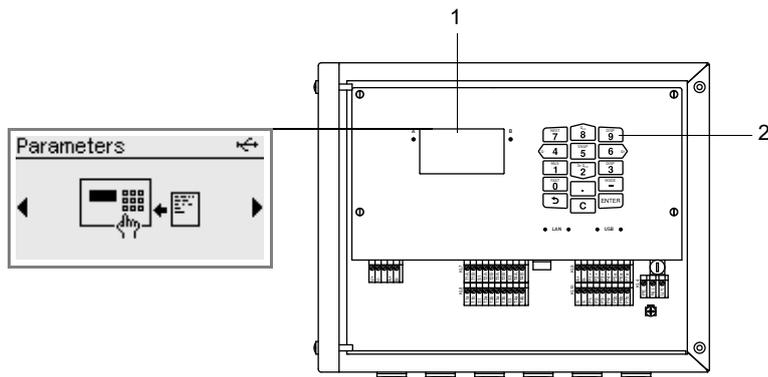
- Parameters
- Start measurement ⁽¹⁾
- Show measurement ⁽²⁾
- Stop measurement ⁽²⁾
- Inputs
- Outputs
- Event trigger
- Data logger
- Calibration
- Communication
- Miscellaneous

⁽¹⁾ will only be displayed if no measurement is running

⁽²⁾ will only be displayed if a measurement is running

A menu is displayed between 2 arrows ◀▶.

Fig. 4.2: Command panel of the transmitter



- 1 – LCD display (backlit)
- 2 – keyboard

Tab. 4.1: Description of the menu

menu	description
Parameters	input of sensor and fluid parameters
Start measurement	measurement start
Show measurement	display of measured values
Stop measurement	measurement stop
Inputs	configuration and assignment of inputs
Outputs	configuration of outputs
Event trigger	configuration of event triggers R1...R4
Data logger	configuration of the data logger; deletion of measured value
Calibration	input of correction values, which are added to the calculated physical quantities or scale values
Communication	configuration of the communication interface (e.g., LAN interface, fieldbuses (option))
Miscellaneous	settings of system and measurement and changes in dialogs and menus

After connecting the transmitter to the power supply and starting up the transmitter for the first time, the following settings according to language, time, date and units of measurement are to be made. Afterwards the menu `Parameters` will be displayed.

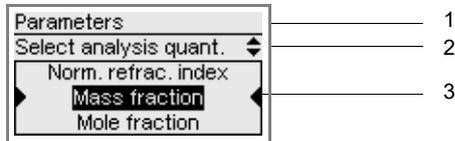
At later start-ups the measured values will be displayed in case the measurement had not been stopped before the transmitter was disconnected from the power supply. If the measurement is stopped, the menu `Parameters` will be displayed.

After starting the measurement, the parameter settings or the configuration of the transmitter outputs can be displayed at any time without interrupting the measurement. A change of the parameter settings is not possible during the measurement. The measurement has to be stopped in order to change the parameter settings or configuration of the transmitter outputs.

4.2 Display

Structure

Fig. 4.3: Menu item of the menu Parameters



- 1 – menu
- 2 – menu item currently edited
- 3 – area for scroll lists or input fields

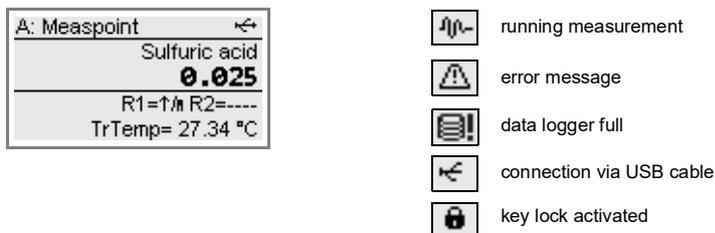
Tab. 4.2: Navigation

horizontal scroll list	vertical scroll list	input fields
<ul style="list-style-type: none"> • scroll horizontally with 4 or 6 	<ul style="list-style-type: none"> • scroll vertically with 8 or 2 	<ul style="list-style-type: none"> • input via the 10 numerical keys of the keyboard, see • delete with C

Status indications

Several symbols are used for the status indications.

Fig. 4.4: Status indications (line 1)



4.3 Keyboard

The keyboard has 15 keys, including 3 function keys: ENTER,  and C.

Some keys have multiple functions. They can be used to enter data or to navigate through scroll lists.

Tab. 4.3: General functions

ENTER	confirmation of selection or input
 + C + ENTER	Reset: press these 3 keys simultaneously to correct a malfunction. The reset has the same effect as a restart of the transmitter. Stored data are not affected.
 + C	INIT: when initializing the transmitter, all settings are reset to the factory settings.

Tab. 4.4: Navigation

	During the parameter input: <ul style="list-style-type: none"> • short press: return to the previous menu item • long press (several seconds): return to the main menu During the measurement: display of the menu <i>Show measurement</i>
 	scroll to the left/right through a scroll list
 	scroll upwards/downwards through a scroll list
ENTER	confirmation of a menu item

Tab. 4.5: Input of numbers

 ... 	input of the number pictured on the key
	sign for the input of negative values
	decimal marker
C	deletion of values After the value has been deleted, the previous value will be displayed.
ENTER	confirmation of the input

Tab. 4.6: Input of text

 	positioning of the cursor
	"A" is displayed and capitalization is activated
	"Z" is displayed and capitalization is activated
	toggling between upper and lower case
 	selection of the previous/next character
	deletion of a character and insertion of a blank
ENTER	confirmation of the input

5 Transport and storage

Caution!

**When packaging, the transmitter can fall down.**

There is a danger of crushing body parts or damaging the measuring equipment.

- Secure the transmitter against falling during packaging.
- Wear the required personal protective equipment.
- Observe the applicable rules.

Caution!

**When lifting, the center of gravity of the transmitter can be displaced within the cardboard box. The transmitter can fall down.**

There is a danger of crushing body parts or damaging the measuring equipment.

- Secure the transmitter against falling during transport.
- Wear the required personal protective equipment.
- Observe the applicable rules.

5.1 Transport

The measuring equipment must be packaged properly for transport. For weight indications, see technical specification.

- Use, if possible, the original packaging by FLEXIM or an equivalent cardboard box.
- Position the transmitter, sensors and accessories in the middle of the cardboard box.
- Fill any voids with appropriate packaging material (e.g., paper, foam, bubble wrap).
- Protect the cardboard box against humidity.

5.2 Storage

Store the measuring equipment in a dry place.

6 Mounting

Danger!



Risk of explosion when using the measuring equipment in explosive atmospheres

This may result in personal or material damage or dangerous situations.

→ Observe the "Safety instructions for the use in explosive atmospheres", see document SIPIOX_R721.

Warning!



Installation, connection and start-up by unauthorized and unqualified personnel

This may result in personal or material damage or dangerous situations.

→ Any work on the transmitter has to be carried out by authorized and qualified personnel.

Danger!



Working in mines or cramped confines

Risk of intoxication and/or asphyxiation because of emerging gases, risk of injuries because of cramped conditions.

→ Wear the required personal protective equipment.

→ Observe the applicable rules.

Caution!



Safety and accident prevention regulations for electrical systems and equipment

Failure to observe these regulations may lead to severe injuries.

→ Observe the safety and accident prevention regulations for electrical systems and equipment.

Caution!



Touching hot or cold surfaces

This may result in injuries (e.g., thermal damages).

→ Observe the ambient conditions at the measuring point during installation.

→ Wear the required personal protective equipment.

→ Observe the applicable rules.

6.1 Transmitter

6.1.1 Opening and closing the housing

6.1.1.1 Opening

Caution!



Possible danger by opening the equipment at improper ambient conditions

Open the transmitter in safe ambient conditions only (e.g., air humidity < 90 %, no conductive pollution, no explosive atmosphere). Otherwise, additional protective measures have to be taken.

Important!

Do not use objects which may damage the housing gasket to open the housing cover.

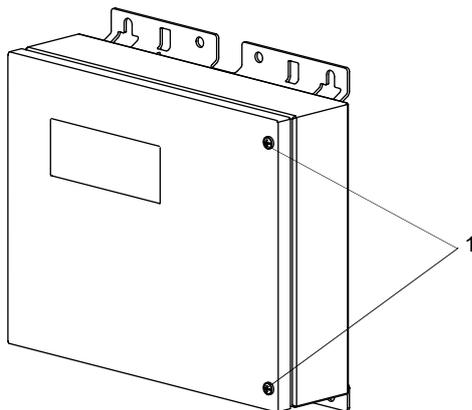
- Loosen the screws of the transmitter housing.
- Open the housing cover of the transmitter.

6.1.1.2 Closing

Transmitter with stainless steel housing

- Close the housing cover.
- Tighten the screws of the transmitter housing with a max. torque of 1 Nm.

Fig. 6.1: Transmitter

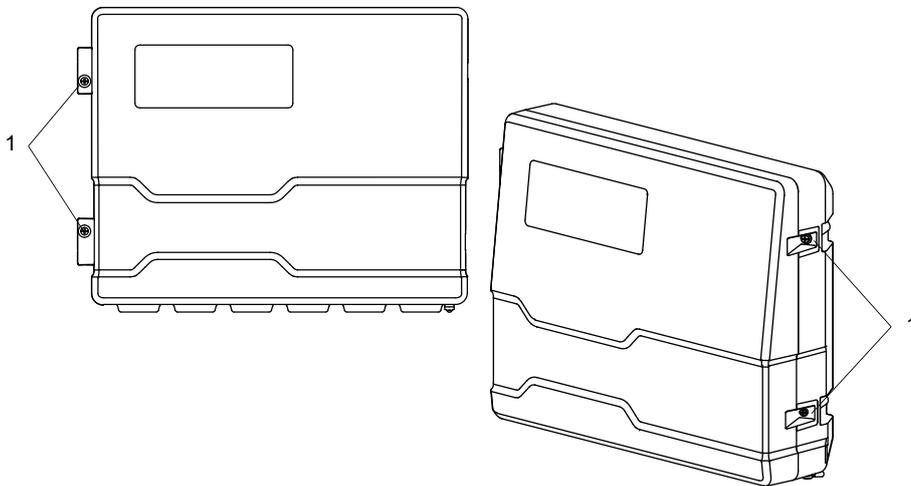


1 – screws

Transmitter with aluminum housing

- Close the housing cover pressing it slightly upwards on the side of the screws.
- Hand-tight all screws of the transmitter housing.

Fig. 6.2: Transmitter



1 – screws

6.1.2 Installation of the transmitter

Notice!

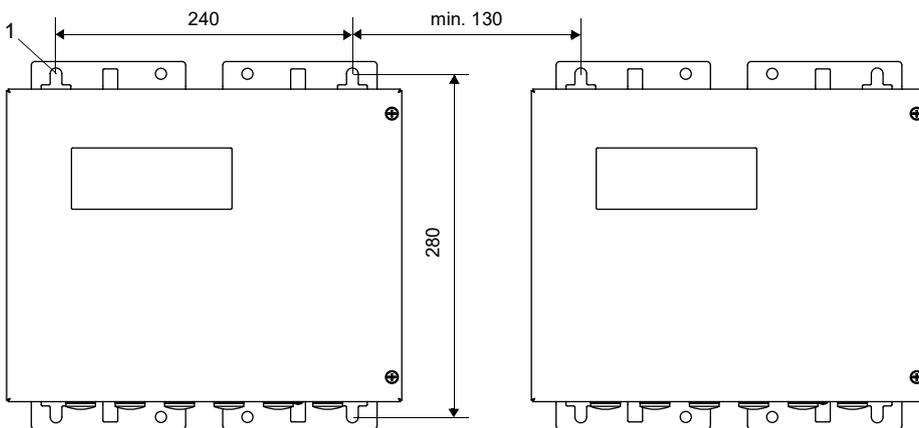
Install the equipment in a shady place, the cable glands facing downward. Observe the temperature and weight indications according to the technical specification when choosing the fixation elements and the place of installation.

6.1.2.1 Wall mounting

Transmitter with stainless steel housing

- Fix the transmitter to the wall using 4 screws.

Fig. 6.3: Transmitter (dimensions in mm)



1 – fixing hole for wall mounting \varnothing 9.5

Transmitter with aluminum housing

- Fix the wall mount (2) with 3 countersunk-head screws (3) firmly to the wall.
- Attach the transmitter (1) to the lower hooks (7) of the wall mount.
- Fix the transmitter to the wall mount by locking the stop bolt (4) into the destined hole and by firmly tightening the screw (5).

Fig. 6.4: Transmitter (dimensions in mm)

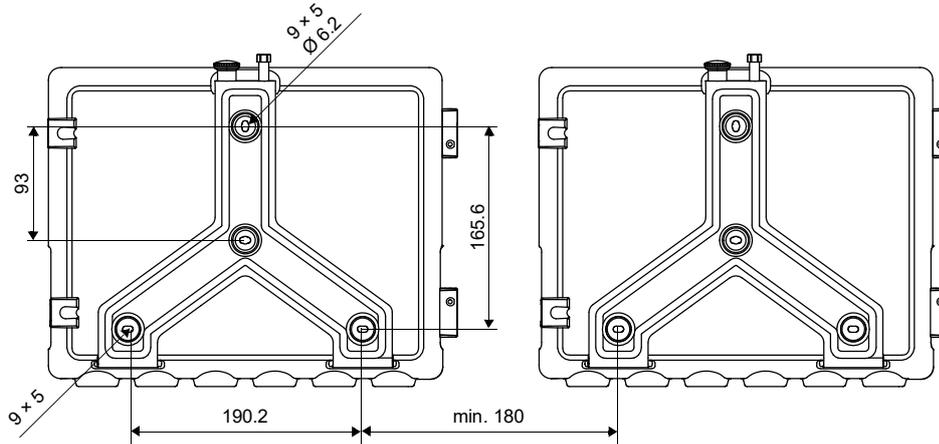
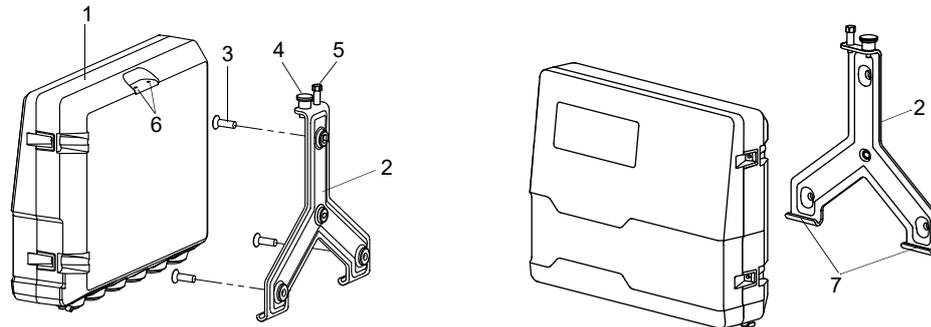


Fig. 6.5: Installation view



- 1 – transmitter
- 2 – wall mount
- 3 – countersunk-head screw
- 4 – stop bolt
- 5 – screw
- 6 – hole
- 7 – hook

6.1.2.2 Pipe mounting

Notice!

The pipe has to be sufficiently stable to withstand the pressure exerted by the transmitter and the shackles.

Transmitter with stainless steel housing

Installation on a 2" pipe

- Position the transmitter and the shackle (1) on the pipe.
- Fix the transmitter to the pipe by tightening the nuts (2) of the shackles.

Mounting on a pipe > 2"

The pipe mounting kit is fixed to the pipe by using tension straps.

Caution!



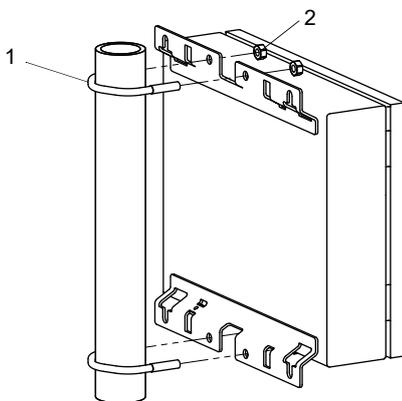
The edge of the tension strap is very sharp.

Risk of injury!

- Debur sharp edges.
- Wear the required personal protective equipment.
- Observe the applicable rules.

- Fix the transmitter to the pipe by using tension straps instead of shackles.

Fig. 6.6: Installation view



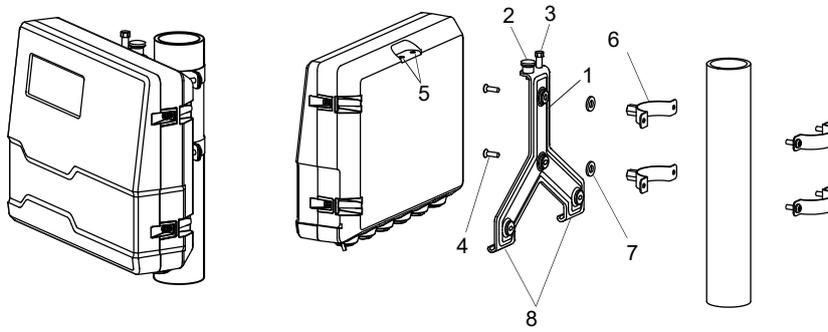
- 1 – shackle
- 2 – nut

Transmitter with aluminum housing**Notice!**

For the mounting on pipes the pipe mounting kit, consisting of 2 band clamps, 2 countersunk-head screws and 2 washers, is needed. The distance of the band clamps has to be identical to the distance of the holes on the wall mount.

- Fix the band clamps (6) with 2 countersunk-head screws (4) firmly to the wall mount (1). Take care to place the washers (7) between the wall mount and the band clamp.
- Fix the wall mount with the band clamps to the pipe.
- Attach the transmitter to the lower hooks (8) of the wall mount.
- Fix the transmitter to the wall mount by locking the stop bolt (2) into the destined hole and by firmly tightening the screw (3).

Fig. 6.7: Installation view



- 1 – wall mount
- 2 – stop bolt
- 3 – screw
- 4 – countersunk-head screw
- 5 – hole
- 6 – band clamp
- 7 – washer
- 8 – hook

6.2 Sensor

6.2.1 Sensor design

The sensor consists of a sensor head with wetted parts (measuring prism, window, temperature probe) and the sensor housing containing the electronic components.

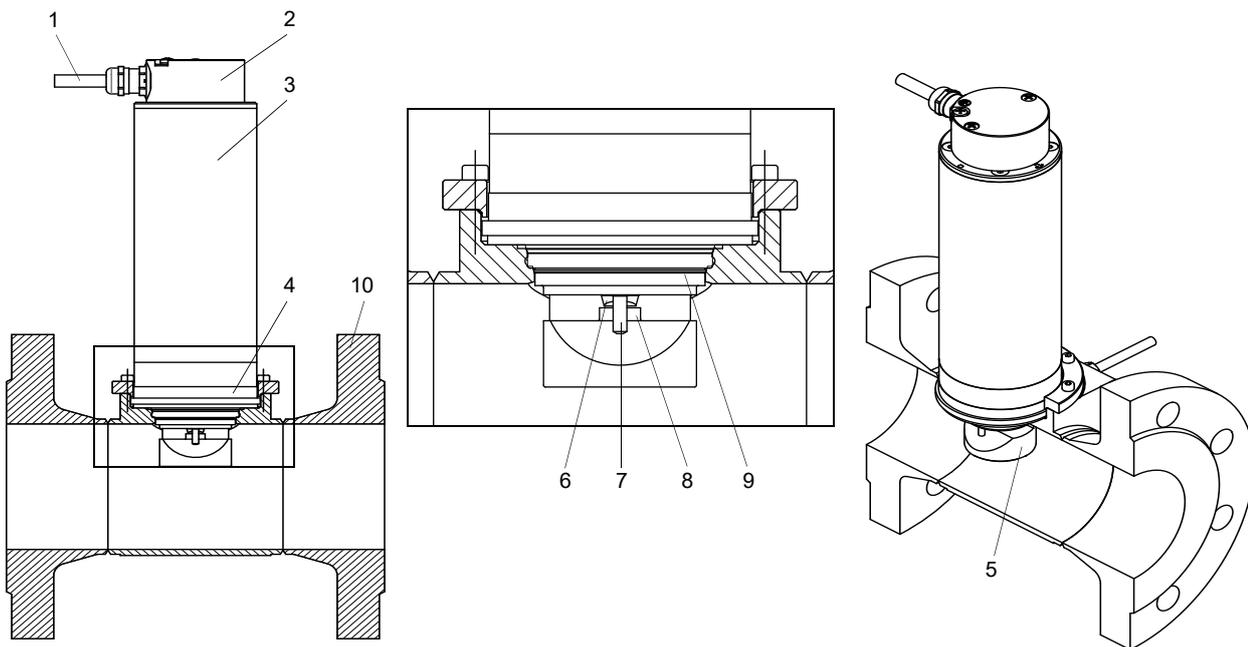
The junction box is situated at the rear part of the sensor housing.

The following 2 sensor designs are available:

- chemistry design
- hygiene design

The designs essentially differ in sealing concept and size and form of the optical components.

Fig. 6.8: Sensor PIOX R500 (chemistry design)



- 1 – sensor cable
- 2 – junction box with cover
- 3 – sensor housing with electronic components
- 4 – flange
- 5 – sensor head
- 6 – measuring prism
- 7 – temperature probe
- 8 – window
- 9 – O-ring
- 10 – process connection (example)

6.2.2 Mounting of the sensor

6.2.2.1 Selection of the measuring point

Caution!



Warning of severe injuries from hot or cold components

Touching hot or cold components can lead to severe injuries (e.g., thermal damage).

- Any mounting, installation or connection work has to be concluded.
- Any work on the measuring point during the measurement is prohibited.
- Observe the ambient conditions at the measuring point during installation.
- Wear the required personal protective equipment.
- Observe the applicable rules.

Danger!



Warning of severe injuries caused by leakage of dangerous fluids

Dangerous fluids can escape from insufficiently tightened screw connections. The contact to the fluid may result in personal or material damage or dangerous situations.

- The mounting has to be carried out with a reproducible torque procedure and defined screw tightening torque. The screw tightening torque depends on the used gasket and has to be defined by the customer.

- Select a measuring point:
 - which is representative for the process and relevant to the given application
 - where the sensor can quickly respond to changes in the process
 - where the pipe is always filled and no gas bubbles can form in the pipe
 - where the flow can be stopped and the sensor can be installed and removed without problems
- In order to counteract the formation of deposits on the measuring prism and the window, the measuring point should be selected in such way that:
 - a minimum flow is always present in pipe
 - the sensor is installed in pipe segments with small pipe diameters because smaller pipe diameters cause higher pressures and, therefore a better cleaning effect
 - the fluid temperature is relatively high but always within the operating range of the sensor because higher temperatures increase the solubility and reduce the viscosity
- Select the location of the transmitter within the cable range of the measuring point. The ambient temperature at the measuring point has to be within the operating temperature range of the transmitter and the sensor, see technical specification.
- Protect the sensor against direct sunlight, rain and vibrations. The ambient temperature at the measuring point has to be within the operating temperature range of the sensor, see technical specification.

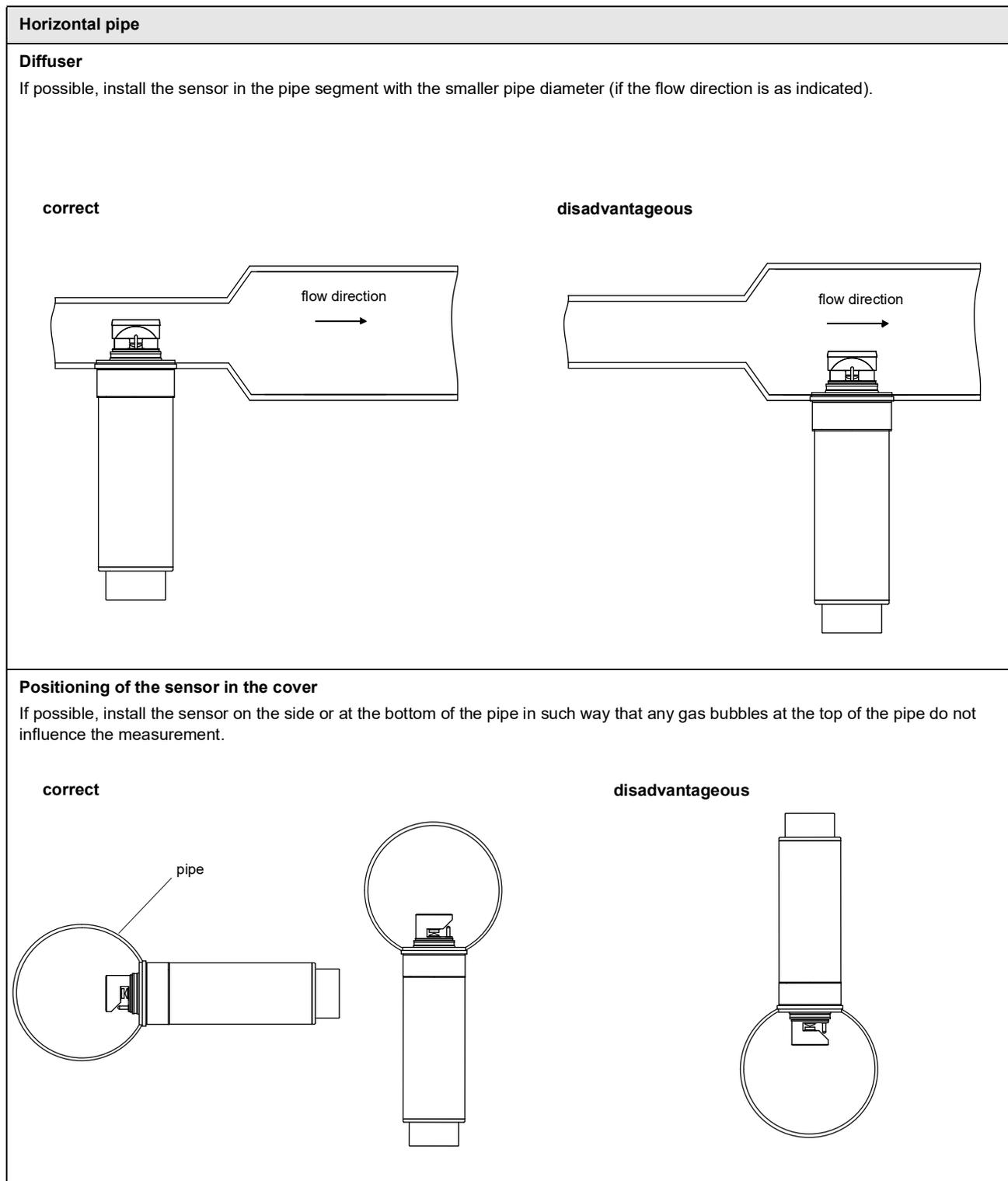
Important!

The sensor cable must never be wrapped around hot pipes.

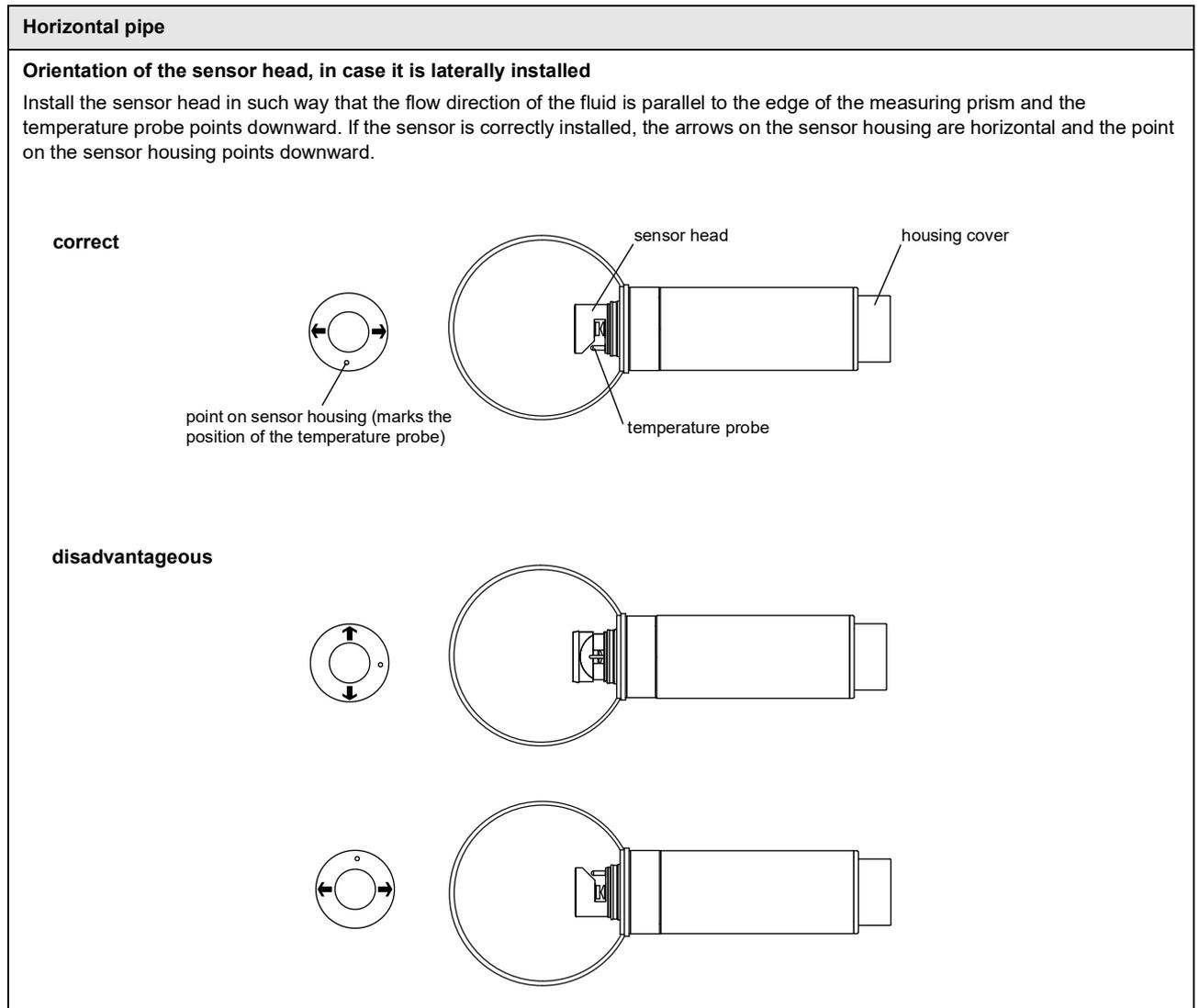
If the measuring point is within an explosive atmosphere, possibly present danger zones and gases have to be determined. The transmitter and sensor have to be appropriate for these conditions.

Observe the notes in the following table.

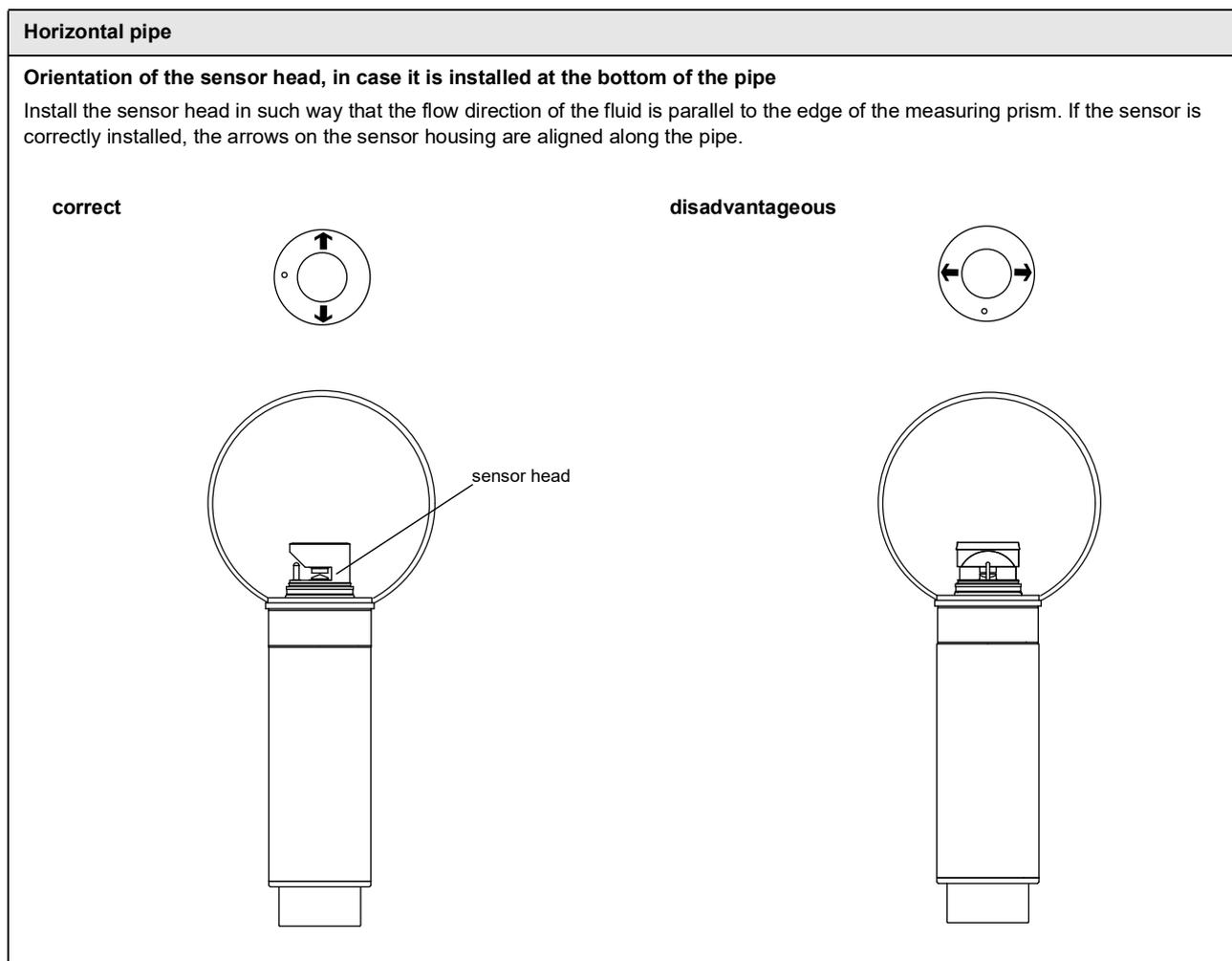
Tab. 6.1: Sensor positioning on a horizontal pipe (basic presentation)



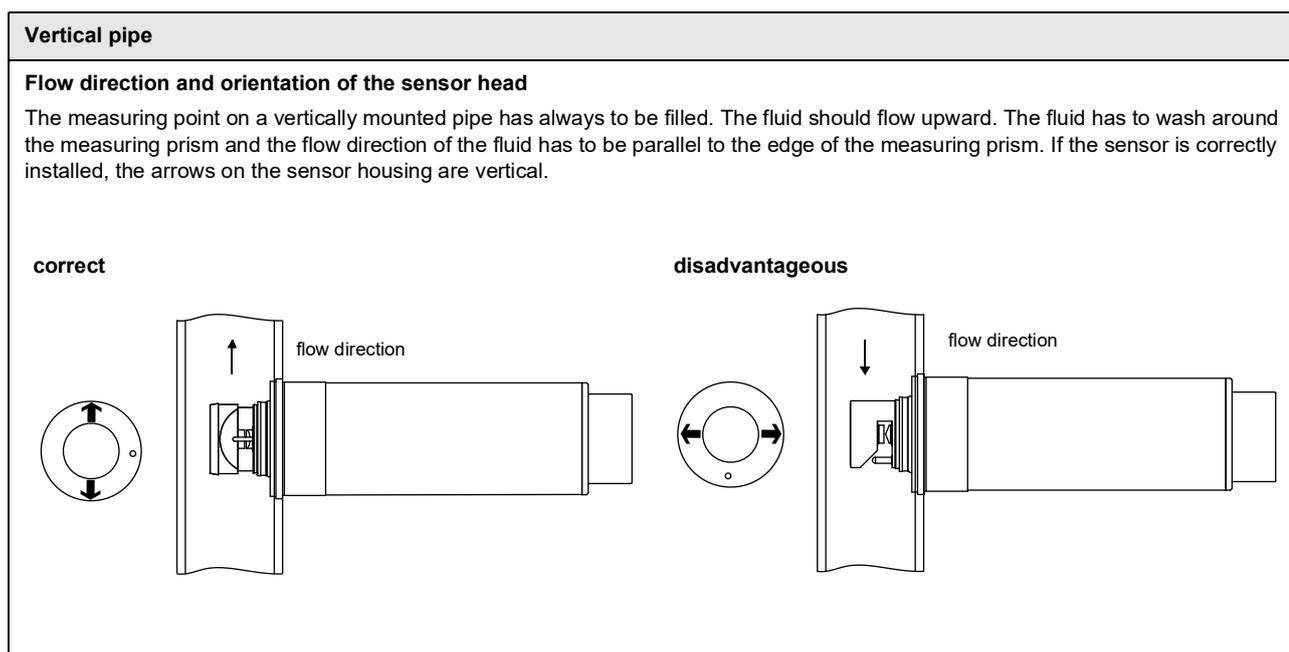
Tab. 6.1: Sensor positioning on a horizontal pipe (basic presentation)



Tab. 6.1: Sensor positioning on a horizontal pipe (basic presentation)



Tab. 6.2: Sensor positioning on a vertical pipe (basic presentation)



6.2.2.3 Installation of the sensor (chemistry design)

The sensor is installed into a standardized flange using the supplied process connection or directly flanged into a T-piece as a long version.

6.2.2.4 Installation of the sensor (hygienic design)

The sensor can be connected to the standardized clamp flange connection Varivent type N or TriClamp 3".

Important!

After installing the sensor, check the tightness of the complete system with a compression test.

7 Connection

Danger!



Risk of explosion when using the measuring equipment in explosive atmospheres

This may result in personal or material damage or dangerous situations.

→ Observe the "Safety instructions for the use in explosive atmospheres", see document SIPIOX_R721.

Warning!



Installation, connection and start-up by unauthorized and unqualified personnel

This may result in personal or material damage or dangerous situations.

→ Any work on the transmitter has to be carried out by authorized and qualified personnel.

Danger!



Working in mines or cramped confines

Risk of intoxication and/or asphyxiation because of emerging gases, risk of injuries because of cramped conditions.

→ Wear the required personal protective equipment.

→ Observe the applicable rules.

Warning!



Touching live parts

Electric shock or arc faults can lead to severe injuries. The measuring equipment can be damaged.

→ Prior to any work on the transmitter (e.g., installation, dismounting, connection, start-up), the transmitter has to be disconnected from the power supply. It is not sufficient to remove the internal fuse of the instrument.

Caution!



Safety and accident prevention regulations for electrical systems and equipment

Failure to observe these regulations may lead to severe injuries.

→ Observe the safety and accident prevention regulations for electrical systems and equipment.

7.1 Sensor

It is recommended to run the cables from the measuring point to the transmitter before connecting the sensors to avoid load on the connectors.

Tab. 7.1: Measurement arrangement

sensor	transmitter	sensor cable	
		type	length
PIOX R500A1	PIOX R721RI-A2	LIYCY 2 x 2 x 0.75 blue	max. 200 m
PIOX R500	PIOX R721GP-NN0	LIYCY 2 x 2 x 0.75 gray	

7.1.1 Connection of the cable to the sensor

Important!

The degree of protection of the transmitter is only ensured if all cables are tightly fitted using cable glands and the housing is firmly screwed.

- Loosen the 2 screws on the junction box of the sensor.
- Remove the housing cover.
- Remove the blind plug on the housing cover to connect the sensor cable.
- Open the cable gland of the sensor cable. The compression part remains in the cap nut.
- Insert the sensor cable through the cap nut, the compression part and the basic part.
- Prepare the sensor cable with the cable gland.
- Insert the sensor cable through the housing cover.
- Tighten the gasket ring side of the basic part firmly into the housing cover.
- Connect the sensor cable to the terminals of the transmitter.

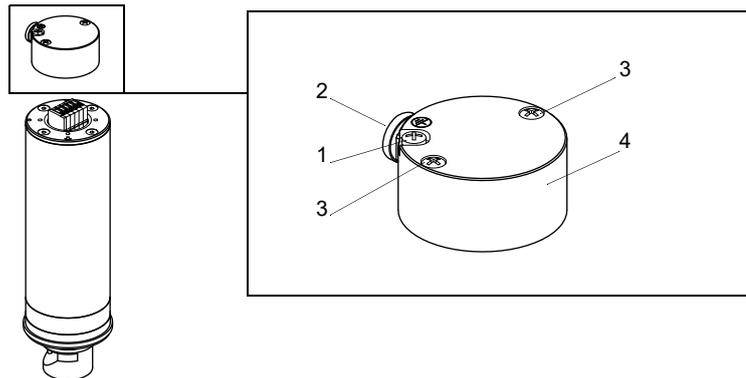
Important!

The external shield of the sensor cable must not have any electrical contact to the sensor housing.

Tab. 7.2: Terminal assignment

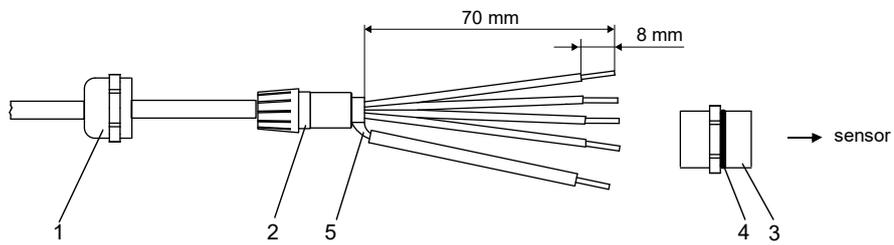
terminal	connection
+	yellow
-	green
A+	brown
B-	white
S	shield

Fig. 7.1. Sensor PIOX R500



- 1 – equipotential bonding terminal
- 2 – blind plug
- 3 – screws
- 4 – housing cover

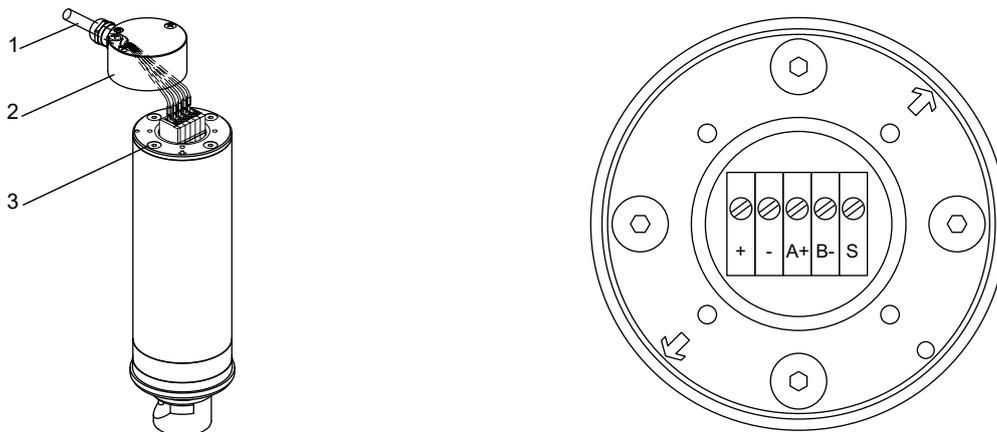
Fig. 7.2: Preparation of the sensor cable



- 1 – cap nut
- 2 – compression part
- 3 – basic part
- 4 – gasket ring side of the basic part
- 5 – external shield

- Position the housing cover with the screws on the holes. Observe the orientation of the cable entries on the housing cover.
- Tighten the screws.
- Fix the cable gland by screwing the cap nut onto the basic part.

Fig. 7.3: Connection of the sensor cable and terminal strip



- 1 – sensor cable
- 2 – housing cover
- 3 – hole

7.1.2 Connection of the sensor cable to the transmitter

Important!

The degree of protection of the transmitter is only ensured if all cables are tightly fitted using cable glands and the housing is firmly screwed.

- Remove the blind plug on the left for the connection of the sensor cable.
- Open the cable gland of the sensor cable. The compression part remains in the cap nut.

Notice!

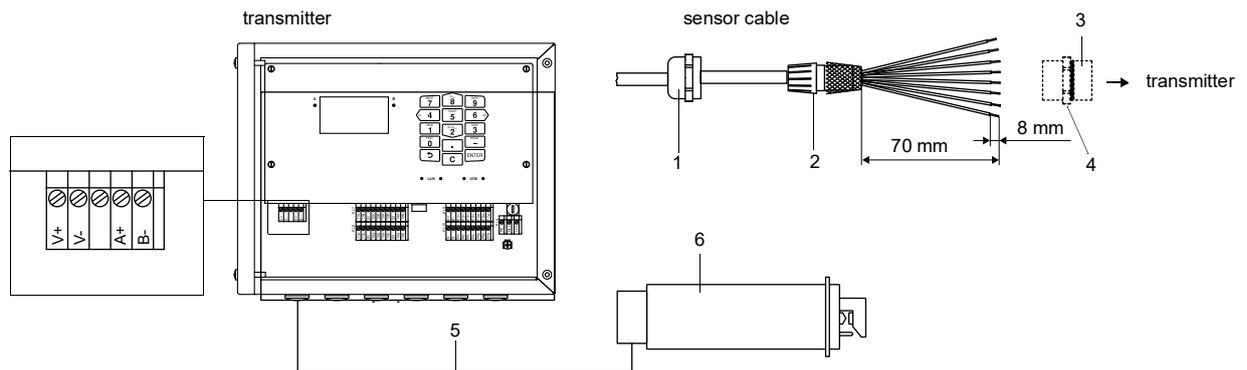
For the connection of the sensor cable to the transmitter, cable glands made from metal have to be used.

- Push the sensor cable through the cap nut and the compression part.
- Prepare the sensor cable.
- Shorten the external shield and brush it back over the compression part.
- Screw the gasket ring side of the basic part tightly into the housing of the transmitter.
- Insert the sensor cable into the housing.
- Fix the cable gland by screwing the cap nut onto the basic part.
- Connect the sensor cable to the terminals of the transmitter.

Tab. 7.3: Terminal assignment

terminal	connection
V+	yellow
V-	green
A+	brown
B-	white

Fig. 7.4: Connection of the sensor to the transmitter



- 1 – cap nut
- 2 – compression part
- 3 – basic part
- 4 – gasket ring side of the basic part
- 5 – sensor cable
- 6 – sensor

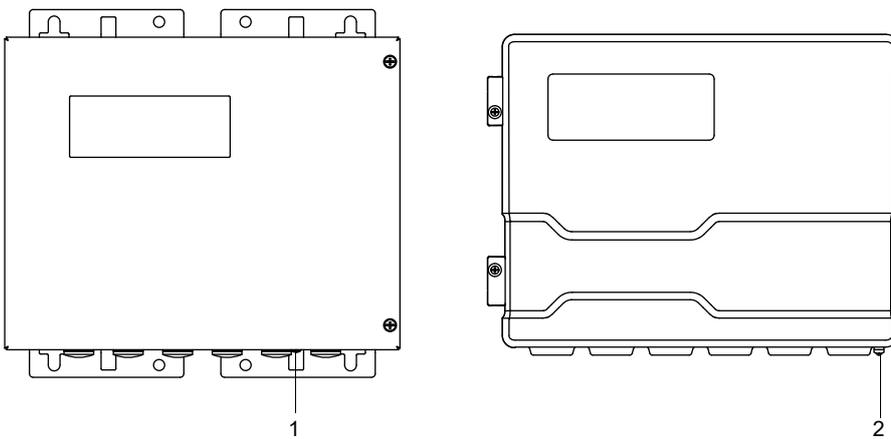
7.2 Power supply

The installation of the power supply is carried out by the operator. The operator has to provide an overcurrent protector (fuse or similar device) disconnecting all energizing wires in case of an inadmissible high current consumption. The impedance of the protective earth has to be low ohmic in order not to allow touch voltage pass the permissible limit. The equipotential bonding terminal serves as functional earth of the transmitter.

Important!

The degree of protection of the transmitter will only be guaranteed if the power cable fits firmly and tightly in the cable gland.

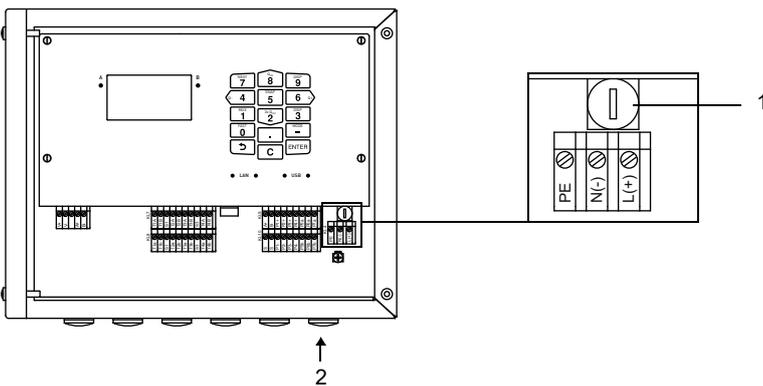
Fig. 7.5: Equipotential bonding terminal on the transmitter



- 1 – equipotential bonding terminal on stainless steel housing
- 2 – equipotential bonding terminal on aluminum housing

- Connect the power cable to the transmitter (see section 7.2.1, Fig. 7.6 and Tab. 7.4).

Fig. 7.6: Connection of the power supply to the transmitter



- 1 – fuse
- 2 – feedthrough for power cable

Tab. 7.4: Terminal assignment

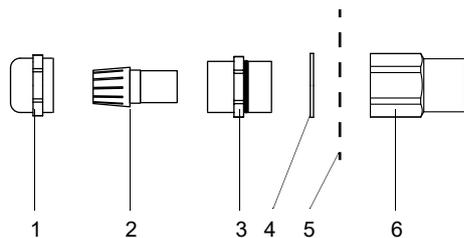
terminal	connection AC	connection DC
PE	earth	earth
N(-)	neutral	-
L(+)	phase 100...230 V AC, 50...60 Hz	+
fuse	1 A, time-lag	1.6 A, time-lag

7.2.1 Cable connection

Transmitter with stainless steel housing

- Remove the blind plug to connect the cable to the transmitter.
- Prepare the cable with a cable gland. The used cable has to have a wire cross-section of 0.25...2.5 mm². The outer diameter of the cable where the ferrite nut is placed may not exceed 7.6 mm.
- Push the cable through the cap nut, compression part, basic part and the sealing ring (sealing ring: only for cable gland M20, not for cable gland 1/2 NPS).
- Insert the cable into the housing of the transmitter.
- Fix the cable gland by screwing the cap nut onto the basic part.
- Fix the sensor cable by tightening the cable gland with the ferrite nut.
- Connect the cable to the terminals of the transmitter.

Fig. 7.7: Cable gland for stainless steel housing



- 1 – cap nut
- 2 – compression part
- 3 – basic part
- 4 – sealing ring (only for cable gland M20, not for cable gland 1/2 NPS)
- 5 – housing wall
- 6 – ferrite nut

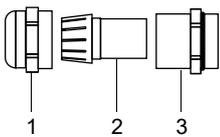
Transmitter with aluminum housing

- Remove the blind plug to connect the cable to the transmitter.
- Prepare the cable with a cable gland.

The used cable has to have a wire cross-section of 0.25...2.5 mm².

- Push the cable through the cap nut, compression part and basic part of the cable gland.
- Insert the cable into the housing of the transmitter.
- Screw the sealing ring side of the basic part into the transmitter housing.
- Fix the cable gland by screwing the cap nut onto the basic part.
- Connect the cable to the terminals of the transmitter.

Fig. 7.8: Cable gland for aluminum housing



- 1 – cap nut
- 2 – compression part
- 3 – basic part

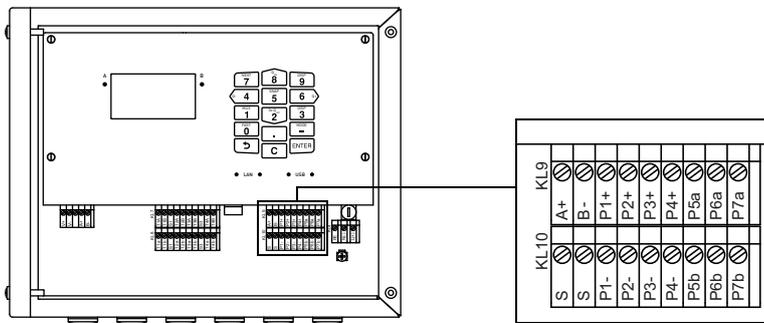
7.3 Outputs

Important!

The max. permissible voltage between the outputs and against PE is 60 V DC (permanent).

- Connect the output cable to the transmitter (see 7.2.1, Fig. 7.9 and Tab. 7.5).

Fig. 7.9: Connection of the outputs on the transmitter



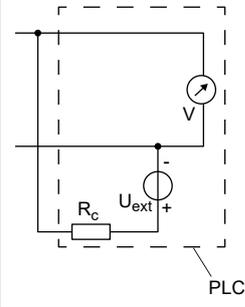
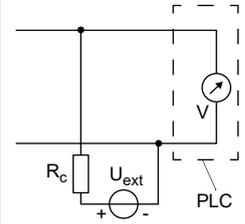
Tab. 7.5: Output circuits

output	transmitter		external circuit	remark
	internal circuit	connection		
active current output/HART	current output			
		PX+ PX-		$U_{int} = 24\text{ V}$ $R_{ext} < 500\ \Omega$
	HART			
		PX+ PX-		$U_{int} = 24\text{ V}$ $R_{ext} < 500\ \Omega$
passive current output/HART	current output			
		PX+ PX-		$U_{ext} = 8 \dots 30\text{ V}$ $U_{ext} > 0.024\text{ A} \cdot R_{ext} [\Omega] + 8\text{ V}$ example: $U_{ext} = 30\text{ V}$ $R_{ext} \leq 900\ \Omega$
	HART			
		PX+ PX-		$U_{ext} = 10 \dots 24\text{ V}$
switchable current output All switchable current outputs are jointly switched to active and passive in the menu item Outputs.	active current output			
		PX+ PX-		$U_{int} = 15\text{ V}$ $R_{ext} < 250\ \Omega$
	passive current output			
	PX+ PX-		$U_{ext} = 8 \dots 30\text{ V}$ $U_{ext} > 0.021\text{ A} \cdot R_{ext} [\Omega] + 8\text{ V}$ example: $U_{ext} = 12\text{ V}$ $R_{ext} \leq 190\ \Omega$	
voltage output		PX+ PX-		$R_{int} = 500\ \Omega$ $R_{ext} > 2\text{ M}\Omega$ If R_{ext} is smaller, the accuracy is less than specified.

The number, type and connections of the outputs depend on the order.

R_{ext} is the sum of all ohmic resistances in the circuit (e.g., resistance of the conductors, resistance of the ammeter/voltmeter).

Tab. 7.5: Output circuits

output	transmitter		external circuit	remark
	internal circuit	connection		
digital output	circuit 1			$U_{\text{ext}} = 5 \dots 30 \text{ V}$ $I_c < 100 \text{ mA}$ $R_c [\text{k}\Omega] = U_{\text{ext}} / I_c [\text{mA}]$
		Pxa Pxb		
	circuit 2			
		Pxa Pxb		

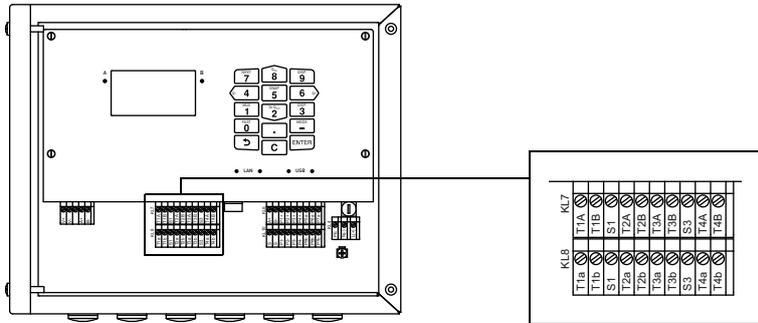
The number, type and connections of the outputs depend on the order.

R_{ext} is the sum of all ohmic resistances in the circuit (e.g., resistance of the conductors, resistance of the ammeter/voltmeter).

7.4 Inputs

Important!
The max. permissible voltage between the inputs and against PE is 60 V DC (permanent).

Fig. 7.10: Connection of the transmitter inputs



7.4.1 Current input

An active (self-powered) or a passive (external powered) current source can be connected to the current inputs of the transmitter.

Connection of an active current source

Important!
The terminals Txa and Txb must not be connected.

For the connection of the input cable to the transmitter see section 7.2.1, Fig. 7.10 and Tab. 7.6.

Tab. 7.6: Connection of an active current source

input	transmitter		external circuit	remark
	internal circuit	connection		
current input		<p>TxA</p> <p>TxB</p> <p>Txb (not connected)</p>		max. permanent overcurrent: 100 mA

If the polarity of the current source is inverted, only the sign of the measured current will change.

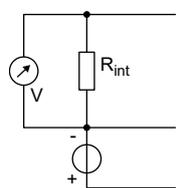
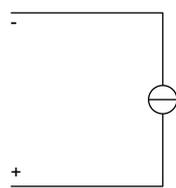
Connection of a passive current source

Important!
The terminals Txa and TxB must not be connected.

Important!
Observe the correct polarity in order to avoid damaging the current source. A permanent short circuit can lead to the destruction of the current input.

For the connection of the input cable to the transmitter see section 7.2.1, Fig. 7.10 and Tab. 7.7.

Tab. 7.7: Connection of a passive current source

input	transmitter		external circuit	remark
	internal circuit	connection		
current input		TxA TxB (not connected) Txb		max. permanent overcurrent: 100 mA

At full load (20 mA), a voltage of 22.9 V DC is available for the supply of the passive current source.

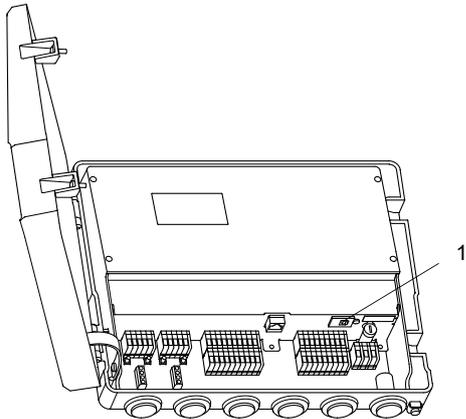
7.5 Service interfaces

7.5.1 USB interface

The transmitter can be connected directly to the PC via USB interface.

- Connect the USB cable to the USB interface of the transmitter and the PC.

Fig. 7.11: Connection of the USB cable



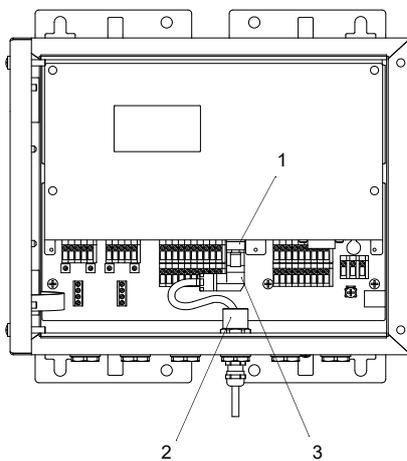
1 – USB interface

7.5.2 LAN interface

The transmitter can be connected to the PC or LAN via a LAN cable.

Transmitter with stainless steel housing

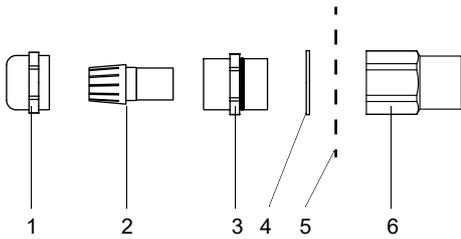
Fig. 7.12: Connection of the LAN cable



1 – LAN interface
2 – ferrite nut
3 – LAN connector

- Remove the blind plug to connect the cable to the transmitter.
- Open the cable gland of the LAN cable. The compression part remains in the cap nut.

Fig. 7.13: Cable gland

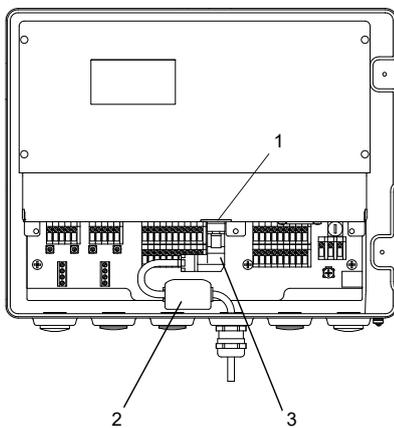


- 1 – cap nut
- 2 – compression part
- 3 – basic part
- 4 – sealing ring (only for cable gland M20, not for cable gland 1/2 NPS)
- 5 – housing wall
- 6 – ferrite nut

- Push the cable through cap nut, compression part, basic part and sealing ring (sealing ring: only for cable gland M20, not for cable gland 1/2 NPS).
- Insert the cable into the housing of the transmitter.
- Push the cable through the ferrite nut.
- Prepare the cable (see the documentation provided by the manufacturer).
- Install the connector (see the documentation provided by the manufacturer).
- Insert the connector into the LAN interface.
- Position the cable in the housing as shown in Fig. 7.12.
- Fix the cable gland by screwing the cap nut onto the basic part.
- Fix the sensor cable by tightening the cable gland with the ferrite nut.

Transmitter with aluminum housing

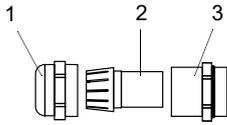
Fig. 7.14: Connection of the LAN cable



- 1 – LAN interface
- 2 – foldable ferrite core
- 3 – LAN connector

- Remove the blind plug to connect the cable to the transmitter.
- Open the cable gland of the LAN cable. The compression part remains in the cap nut.

Fig. 7.15: Cable gland



- 1 – cap nut
- 2 – compression part
- 3 – basic part

- Push the cable through the cap nut, compression part and basic part of the cable gland.
- Insert the cable into the housing of the transmitter.
- Prepare the cable (see the documentation provided by the manufacturer).
- Install the connector (see the documentation provided by the manufacturer).
- Insert the connector into the LAN interface.
- Fix the foldable ferrite core to the cable.
- Position the cable in the housing as shown in Fig. 7.14.
- Screw the sealing ring side of the basic part into the transmitter housing.
- Fix the cable gland by screwing the cap nut onto the basic part.

8 Start-up

Danger!



Risk of explosion when using the measuring equipment in explosive atmospheres

This may result in personal or material damage or dangerous situations.

→ Observe the "Safety instructions for the use in explosive atmospheres", see document SIPIOX_R721.

Warning!



Installation, connection and start-up by unauthorized and unqualified personnel

This may result in personal or material damage or dangerous situations.

→ Any work on the transmitter has to be carried out by authorized and qualified personnel.

Danger!



Working in mines or cramped confines

Risk of intoxication and/or asphyxiation because of emerging gases, risk of injuries because of cramped conditions.

→ Wear the required personal protective equipment.

→ Observe the applicable rules.

Caution!



Safety and accident prevention regulations for electrical systems and equipment

Failure to observe these regulations may lead to severe injuries.

→ Observe the safety and accident prevention regulations for electrical systems and equipment.

Caution!



Warning of severe injuries from hot or cold components

Touching hot or cold components can lead to severe injuries (e.g., thermal damage).

→ Any mounting, installation or connection work has to be concluded.

→ Any work on the measuring point during the measurement is prohibited.

→ Observe the ambient conditions at the measuring point during installation.

→ Wear the required personal protective equipment.

→ Observe the applicable rules.

Notice!

The transmitter and the sensor have to be checked for proper condition and operational safety before each use. The housing of the transmitter must always be closed during operation. Observe that maintenance work must be concluded.

8.1 Start-up settings

When starting up the transmitter for the first time, the following settings are required:

- language
- time/date
- unit of measurement

These displays will only be indicated when the transmitter is switched on for the first time or after an initialization.

Language

The available transmitter languages are displayed.

- Select a language.
- Press ENTER.

The menus are displayed in the selected language.

Set time

The current time is displayed.

- Press ENTER to confirm the time or set the current time via the numeric field.
- Press ENTER.

Set date

The current date is displayed.

- Press ENTER to confirm the date or set the current date via the numeric field.
- Press ENTER.

Units of measurement

- Select **Metric** or **Imperial**.
- Press ENTER.

Region of Canada

- Select **Yes** if the transmitter is to be used in the region of Canada.
- Press ENTER.

This display will only be indicated if **Imperial** is selected.

8.2 Switching on

As soon as the transmitter is connected to the power supply, the menu is displayed in the adjusted language. The language can be changed.

Notice!

The parameters cannot be changed during the measurement. The measurement has to be stopped in order to change the parameters.

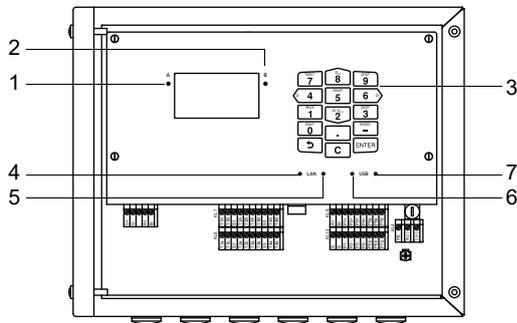
If the transmitter was switched off during the measurement, the message `Measurement started` will be displayed after connecting the transmitter to the power supply. The measurement is carried out with the parameters last set.

By pressing  in the program branch `Measurement` it is possible either to stop the measurement or to display the current parameter settings.

8.3 Status indications

The operation state is indicated by LEDs.

Fig. 8.1: Command panel of the transmitter



- 1 – LED sensor
- 2 – LED sensor (not used)
- 3 – keyboard
- 4 – LED of LAN activity
- 5 – LED of LAN mode
- 6 – LED of USB device
- 7 – LED of USB host (not used)

Tab. 8.1: Operation state of the transmitter

LED sensor	lights, when the transmitter is in measuring mode red – invalid measurement green – valid measurement
LED of LAN activity	lights, when the transmitter is connected to a network via a LAN cable flashes in case of a data exchange via the network connection
LED of LAN mode	lights when the data rate is 100 Mbit/s; otherwise it is 10 Mbit/s
LED of USB device	lights when the transmitter is connected to a PC via a USB cable flashes in case of a data exchange between the PC and the transmitter

8.4 Language

Miscellaneous\System settings\Language

The language of the transmitter can be selected:

- Select the menu item `Language`.
- Press ENTER.
- Select the desired language from the scroll list.
- Press ENTER.

Afterwards the main menu will be displayed in the selected language. The selected language remains activated when the transmitter is switched off and on again.

The language can also be changed by entering a HotCode.

8.5 Initialization

During an initialization (INIT) of the transmitter, all settings are reset to the factory settings.

Proceed as follows to execute an initialization:

- When switching on a transmitter: keep  and C pressed.
- During the operation of the transmitter: press , C and ENTER simultaneously. Release only ENTER. Keep  and C pressed.

During an initialization it is tested whether the key lock is activated. If so, it has to be deactivated.

- Enter a 6-digit key lock code.
- Press ENTER.

If a measurement is currently running, it will be stopped.

It will be requested whether the initial settings are to be carried out.

Initial settings

If Yes is selected, the following setting dialogs will be displayed.

- Language
- Date/time
- Units of measurement
- Delete meas. values
- Delete user subst. (all customized fluids which were stored after delivery will be deleted)

The initialization can also be started with the HotCode **909000**.

8.6 Date and time

Miscellaneous\System settings\Date/time

The transmitter has a battery-powered clock. Measured values are automatically stored with date and time.

- Select the menu item `Date/time`.

The adjusted time is displayed.

- Enter the current time via the numeric field.
- Press ENTER.

The adjusted date is displayed.

- Enter the current date via the numeric field.
- Press ENTER.

8.7 Information regarding the transmitter

Miscellaneous\System settings\Transmitter info

- Select the menu item `Transmitter info`.
- Press ENTER.
- Press `2` or `8` to scroll through the list.
- Press `5` to return to the menu item `System settings`.

The following information regarding the transmitter is displayed:

display	description
Product name	designation of the transmitter
Serial number	serial number of the transmitter
Firmware version	version number of the installed firmware
Firmware date	creation date of the installed firmware
Production date	manufacturing date of the transmitter
MAC address	MAC address of the transmitter
Service TCP port	TCP port of the transmitter
Verification log	state of the verification logger

9 Measurement

Danger!



Risk of explosion when using the measuring equipment in explosive atmospheres

This may result in personal or material damage or dangerous situations.

→ Observe the "Safety instructions for the use in explosive atmospheres", see document SIPIOX_R721.

Caution!



Warning of injuries when operating devices with damaged components

The transmitter and the sensor with damaged components must not be used.

→ The transmitter and the sensor have to be checked for proper condition and operational safety before each use.

→ The housing of the transmitter must always be closed during operation.

→ Observe that connection and maintenance work must be concluded.

Caution!



Warning of severe injuries from hot or cold components

Touching hot or cold components can lead to severe injuries (e.g., thermal damage).

→ Any mounting, installation or connection work has to be concluded.

→ Any work on the measuring point during the measurement is prohibited.

→ Observe the ambient conditions at the measuring point during installation.

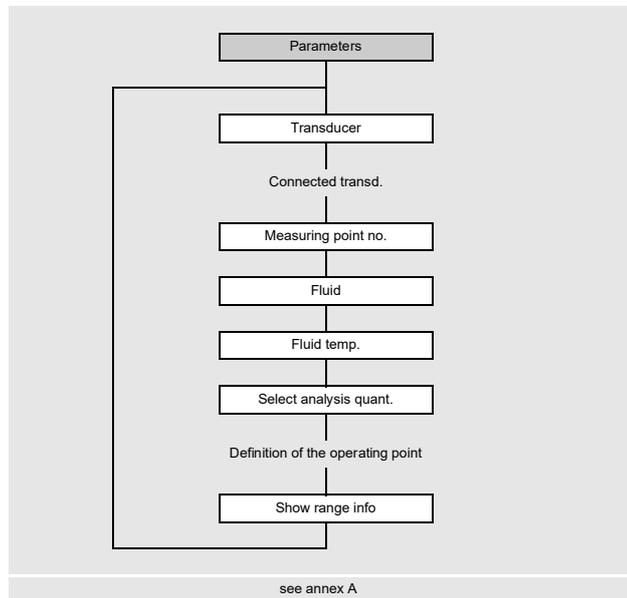
→ Wear the required personal protective equipment.

→ Observe the applicable rules.

9.1 Parameter input

Notice!

Avoid a simultaneous parameter entry via the keyboard and the USB, LAN or process interface. The parameter records received via these interfaces will overwrite the current transmitter parameterization.



- Select the menu `Parameters`.
- Press ENTER.

9.1.1 Display of the sensor type

```
Parameters\Connected transd.
```

The sensor type is displayed.

- Press `2` or `8` to scroll through the list.
- Press ENTER.

9.1.2 Input of the measuring point number

```
Parameters\Measuring point no.
```

- Enter the number of the measuring point.
- Press ENTER.

For the activation of the text input see `Miscellaneous\Dialogs/Menus\Measuring point no.`

9.1.3 Input of fluid parameters

The fluid parameters are entered for the selected measuring point.

Notice!

Customized fluids which are not included in the fluid scroll list can be read via the program FluxDiag. These fluids are displayed in the fluid scroll list with an asterisk.

Notice!

The supplied fluid data remain stored even after an initialization of the transmitter.

Fluid

```
Parameters\Fluid
```

- Select the fluid from the scroll list.
- Press ENTER.

If the fluid is not in the scroll list, select the list item `Other fluid`.

Scale

```
Parameters\Fluid\Other fluid\Scale
```

- Select the scale (Brix, API) from the scroll list.
- Press ENTER.

This display will only be indicated if `Other fluid` is selected.

Fluid temperature

```
Parameters\Fluid temp.
```

- Enter the fluid temperature at the operating point.
- Press ENTER.

9.1.4 Selection of the physical quantity for analysis

A model, describing a substance system consisting of analyte and matrix, was developed in the FLEXIM laboratory. This model enables the calculation of the physical quantity for analysis from the measured refractive index and the fluid temperature.

Tab. 9.1: Physical quantities for analysis

Physical quantity for analysis	display	description	unit of measurement
mass fraction	Mass fraction	mass fraction of the analyte in the mixture (mass fraction, weight proportion)	M% wt% ppm
mole fraction	Mole fraction	analyte proportion of the mixture (mole fraction, particle fraction)	mol% ppm
volume fraction	Volume fraction	volume fraction of the analyte in the mixture	Vol% vol% ppm
concentration analyte	Analyte concentr.	analyte mass per volume of the mixture at reference temperature	g/l
concentration matrix	Matrix concentration	matrix mass per volume of the mixture at reference temperature	g/l
density	Density	density at current fluid temperature (operating density)	kg/m ³ g/cm ³ pounds per gallon
standardized density	Norm. density	density at a reference temperature (laboratory density, reference density)	kg/cm ³ g/cm ³ pounds per gallon
normalized refractive index	Norm. refrac. index	refractive index at reference temperature	-

Notice!

The analysis quantity `Matrix concentration` is only displayed in the menu `Parameters\Select analysis quant.` if a fluid is selected in which analyte and matrix are miscible in any proportion.

Notice!

For the conversion of kg/m³ to g/cm³ and the display from metric to imperial units, see the menu item `Miscellaneous\Units of measurement`.

`Parameters\Select analysis quant.`

- Select the physical quantity for analysis.
- Press ENTER.

This display will not be indicated if `Other fluid` is selected.

`Parameters\Select analysis quant.\...\OP analysis quantity`

- Enter the operating point for the physical quantity for analysis.
- Press ENTER.

Parameters>Select analysis quant.\...\Show range info

The valid range of the physical quantity for analysis, the temperature, the density and the refractive index can be displayed.

- Select **Yes** to display the valid range.
- Press or to display the max. and min. value of the valid range.
- Press ENTER.

9.1.5 Input of the damping

Parameters\Damping

- Enter the damping factor. Values between 0...100 s are accepted.
- Press ENTER.

9.1.6 Input of the error delay

Parameters>Error value delay

The error delay is the time interval after which the error value is transmitted to the output.

This display will only be indicated if the list item **Edit** is selected in the menu item **Miscellaneous\Dialogs/ Menus>Error value delay**.

If no error delay is entered, the damping factor will be used.

- Enter a value for the error delay.
- Press ENTER.

9.2 Measurement settings

Swift damping

If **Swift damping** is activated, each displayed measured value is a floating average of the last x seconds, with x being the damping factor. The display thus takes x seconds to fully respond to changes of the measured value.

If **Swift damping** is deactivated, the damping is calculated as first order low-pass filter, i.e. changes of measured values become effective in form of an exponential time course in the measuring result.

Miscellaneous\Measurement settings\Swift damping

- Select the menu item **Swift damping**.
- Select **On to activate** **Swift damping**. Select **Off to deactivate** **Swift damping**.
- Select **Default (Swift damping = On)** if no customized inputs are to be made.
- Press ENTER.

Input of the reference temperature

Miscellaneous\Measurement settings\Reference temp.

- Enter the temperature for the local reference conditions (default value: 20 °C).
- Press ENTER.

Input of the reference pressure

Miscellaneous\Measurement settings\Reference pressure

- Enter the pressure for the local reference conditions (default value: 1 bar).
- Press ENTER.

9.3 Units of measurement

Miscellaneous\Unit of measurement

- Select the menu item Miscellaneous\Unit of measurement.

The following units of measurement for the physical quantities can be selected:

- Temperature
- Pressure
- Sound speed
- Density
- Kinematic viscosity

- Select the unit of measurement of the physical quantity.
- Press ENTER.

Notice!

If the physical quantity or the unit of measurement is changed, the settings of the outputs will have to be checked.

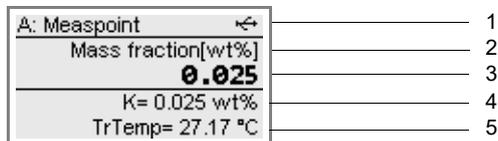
9.4 Start of the measurement

- Select the menu Start measurement.
- Press ENTER.

9.5 Display of measured values

The measured values are displayed during the measurement as follows:

Fig. 9.1: Display of measured values



- 1 – menu, status indications
- 2 – physical quantity
- 3 – measured value
- 4 – further physical quantity
- 5 – further physical quantity

By pressing **3** or **9**, additional physical quantities can be displayed during the measurement.

- Press **3** to display the measured values in line 5. The designation of the physical quantity is displayed in line 4 by pressing **9** for several seconds.
- Press **9** to display the measured values in line 4. The designation of the physical quantity is displayed in line 5 by pressing **3** for several seconds.

9.6 Display of parameters

The parameters can be displayed during the measurement.

- Press  during the measurement.

The measurement is running in the background. The symbol  is displayed in the status indication. The menu `Show measurement` is displayed.

- Select the menu `Parameters` to display the parameters.

Notice!

The parameters cannot be changed during the measurement. When attempting to change the parameters, the message `Read-only mode` will be displayed.

The measurement has to be stopped in order to change the parameters.

9.7 Repeated display of measured values

The measured values can be displayed again.

- Select the menu `Show measurement` to return to the measured value display.
- Press ENTER.

9.8 Stop of the measurement

- Press  during the measurement.

The measurement is running in the background. The symbol  is displayed in the status indication. The menu `Show measurement` is displayed.

- Select the menu `Stop measurement`.
- Press ENTER.

The measurement is stopped. The menu `Parameters` is displayed.

After disconnecting and reconnecting the power supply, the menu `Parameters` appears.

10 Troubleshooting

Danger!



Risk of explosion when using the measuring equipment in explosive atmospheres

This may result in personal or material damage or dangerous situations.

→ Observe the "Safety instructions for the use in explosive atmospheres", see document SIPIOX_R721.

Warning!



Service works by unauthorized and unqualified personnel

This may result in personal or material damage or dangerous situations.

→ Any work on the transmitter has to be carried out by authorized and qualified personnel.

Danger!



Working in mines or cramped confines

Risk of intoxication and/or asphyxiation because of emerging gases, risk of injuries because of cramped conditions.

→ Wear the required personal protective equipment.

→ Observe the applicable rules.

Caution!



Safety and accident prevention regulations for electrical systems and equipment

Failure to observe these regulations may lead to severe injuries.

→ Observe the safety and accident prevention regulations for electrical systems and equipment.

Warning!



Touching live parts

Electric shock or arc faults can lead to severe injuries. The measuring equipment can be damaged.

→ Prior to any work on the transmitter (e.g., installation, dismantling, connection, start-up), the transmitter has to be disconnected from the power supply. It is not sufficient to remove the internal fuse of the instrument.

Caution!



Touching hot or cold surfaces

This may result in injuries (e.g., thermal damages).

→ Observe the ambient conditions at the measuring point during installation.

→ Wear the required personal protective equipment.

→ Observe the applicable rules.

If any problem appears which cannot be solved with the help of this operating instruction, contact our sales office and give a precise description of the problem. Specify the type, the serial number and the firmware version of the transmitter.

The display does not work at all or fails regularly.

- Check the contrast setting of the transmitter or enter the HotCode **555000** to set the display to medium contrast.
- Make sure that the correct voltage is available at the terminals. The destined transmitter voltage is indicated on the nameplate below the outer right terminal strip.
- If the power supply is OK, the sensors or an internal component of the transmitter are defective. The sensors and the transmitter have to be sent to FLEXIM for repair.
- If the transmitter is only connected via the USB interface, the backlight will be switched off.

An error is displayed in the status indication (symbol )

- Press  to return to the main menu.
- Select the menu item `Miscellaneous\System settings\Event log`.
- Press ENTER.

The error message list will be displayed.

Date and time are wrong, the measured values are deleted when the transmitter is switched off.

- If the date and the time are reset or wrong or the measured values are deleted after the transmitter has been switched off and on again, the data backup battery has to be replaced. Send the transmitter to FLEXIM.

An output does not work.

- Make sure that the outputs are configured correctly. Check the function of the output. If the output is defective, contact FLEXIM.

10.1 Problems with the measurement

A measurement is not possible because no signal is received. An interrogation point is displayed after the physical quantity. The LED lights red after starting the measurement.

- Make sure the sensor is correctly connected to the transmitter. The sensor must be recognized by the transmitter. The serial number of the sensor will be displayed (see menu item `Parameters\Connected transd.`).

The signal is lost during the measurement.

- If there is no measuring signal after the pipe had been run empty and refilled, contact FLEXIM.
- Make sure the pipe is filled with the fluid and the sensor head is completely submerged into the fluid. The sensor can only measure within the fluid otherwise the measurement becomes invalid. The measurement can be interrupted due to a temporarily higher proportion of gas bubbles and solids in the fluid.
- The sensor functions according to the transmitted light principle. A turbid fluid and contaminated measurement optics can cause a light attenuation and therefore entailing an invalid measuring signal. Check the measurement optics for contamination.

10.2 Measuring point selection

- Avoid measuring points with deposit formation in the pipe.
- When measuring on a horizontal pipe, the sensor has to be mounted laterally on the pipe.
- The measuring point on a vertically mounted pipe has always to be filled. The fluid should flow upward.
- No gas bubbles should form (even bubble-free fluids can form gas bubbles when the fluid expands, e.g., upstream of pumps and downstream of great cross-section enlargements).

10.3 Application-specific problems

The measuring points of the physical quantities for analysis are outside the valid range

- Check the entered value.

Turbid signals scatter the optical signal

- The measurement of fluids with a turbidity > 10000 FAU (Formazine Attenuation Units) becomes invalid.

Gas bubbles or solids present in high concentration in the fluid scatter and absorb the optical signal and thus attenuate the measuring signal

11 Maintenance and cleaning

Danger!



Risk of explosion when using the measuring equipment in explosive atmospheres

This may result in personal or material damage or dangerous situations.

→ Observe the "Safety instructions for the use in explosive atmospheres", see document SIPIOX_R721.

Warning!



Service works by unauthorized and unqualified personnel

This may result in personal or material damage or dangerous situations.

→ Any work on the transmitter has to be carried out by authorized and qualified personnel.

Danger!



Working in mines or cramped confines

Risk of intoxication and/or asphyxiation because of emerging gases, risk of injuries because of cramped conditions.

→ Wear the required personal protective equipment.

→ Observe the applicable rules.

Warning!



Touching live parts

Electric shock or arc faults can lead to severe injuries. The measuring equipment can be damaged.

→ Prior to any work on the transmitter (e.g., installation, dismantling, connection, start-up), the transmitter has to be disconnected from the power supply. It is not sufficient to remove the internal fuse of the instrument.

Caution!



Safety and accident prevention regulations for electrical systems and equipment

Failure to observe these regulations may lead to severe injuries.

→ Observe the safety and accident prevention regulations for electrical systems and equipment.

Caution!



Touching hot or cold surfaces

This may result in injuries (e.g., thermal damages).

→ Observe the ambient conditions at the measuring point during installation.

→ Wear the required personal protective equipment.

→ Observe the applicable rules.

11.1 Maintenance

The transmitter and the sensor are practically maintenance-free. In order to ensure security, the following maintenance intervals are recommended:

Tab. 11.1: Recommended maintenance intervals

item	maintenance step	interval	measure
transmitter	• visual inspection for corrosion, damages and contamination	annually or more frequently, depending on the ambient conditions	cleaning
	• firmware check for updates	annually	update, if necessary
	• functional test	annually	reading of measured and diagnostic values
sensor	• dismantling and visual inspection of the O-rings and measurement optics for corrosion, damages and contamination	annually or more frequently, depending on the ambient conditions	cleaning, change the O-rings, if necessary
	• functional test	annually	reading of measured and diagnostic values

11.2 Cleaning

Generally, the regular process cleaning and rinsing cycles are sufficient to keep the optical surfaces of the measuring prism or window clean. However, depending on the nature of the measured liquid, it can be necessary to clean the measuring prism or window regularly to avoid the formation of deposits.

For manual cleaning the sensor is dismantled and cleaned with a cloth, see Fig. 11.1.

Important!
Do not use aluminous abrasives when cleaning the measuring prism and window.
Notice!
When using aggressive detergents observe the chemical resistance of the corresponding parts.

Fig. 11.1: Cleaning of measuring prism and window



11.3 Firmware update

A firmware update is carried out with FluxDiagReader or FluxDiag (option).

- For the connection of the transmitter to a PC, see section 7.5.
- For the operation of FluxDiagReader or FluxDiag see the help functions of these programs.

12 Dismounting and disposal

Danger!



Risk of explosion when using the measuring equipment in explosive atmospheres

This may result in personal or material damage or dangerous situations.

→ Observe the "Safety instructions for the use in explosive atmospheres", see document SIPIOX_R721.

Warning!



Installation, connection and start-up by unauthorized and unqualified personnel

This may result in personal or material damage or dangerous situations.

→ Any work on the transmitter has to be carried out by authorized and qualified personnel.

Danger!



Working in mines or cramped confines

Risk of intoxication and/or asphyxiation because of emerging gases, risk of injuries because of cramped conditions.

→ Wear the required personal protective equipment.

→ Observe the applicable rules.

Warning!



Touching live parts

Electric shock or arc faults can lead to severe injuries. The measuring equipment can be damaged.

→ Prior to any work on the transmitter (e.g., installation, dismounting, connection, start-up), the transmitter has to be disconnected from the power supply. It is not sufficient to remove the internal fuse of the instrument.

Caution!



Safety and accident prevention regulations for electrical systems and equipment

Failure to observe these regulations may lead to severe injuries.

→ Observe the safety and accident prevention regulations for electrical systems and equipment.

12.1 Dismounting

The dismounting is carried out in reverse order to the installation.

Caution!



Warning of severe injuries caused by leakage of dangerous fluids

The contact to the fluid may result in personal or material damage or dangerous situations. The disassembly must be carried out while the pipe is empty and pressureless.

→ After dismounting the sensor, the pipe has to be tightly sealed with a specified blind plug.

12.2 Disposal

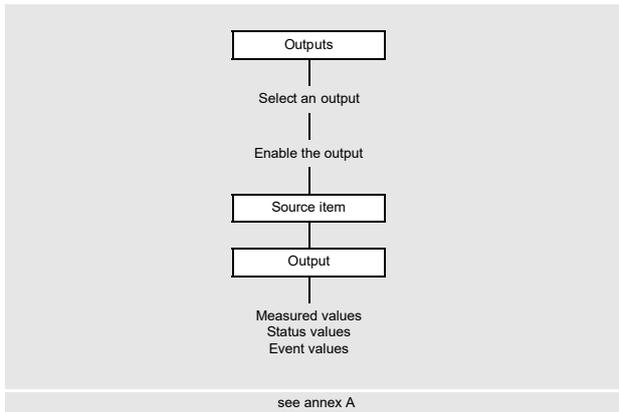
The measuring equipment has to be disposed of in accordance with the applicable regulations.

Important!

Avoiding environmental damage by correct disposal of components

Depending on the material, the corresponding parts have to be disposed of in residual or special waste or recycled. FLEXIM accepts the return of the components. For further information, contact FLEXIM.

13 Outputs



13.1 Analog output

If the transmitter is equipped with outputs, they have to be configured. In principle, the measured value, the status value or an event value can be transmitted via the different outputs.

- Select the menu `Outputs`.
- Press ENTER.

```
Outputs\Current I1(--)
```

- Select the output to be configured.
The scroll list contains all available outputs.
- Press ENTER.

13.1.1 Enabling an output

If the output has to be used, it has to be enabled (here: `Current I1`)

```
Outputs\Current I1(--)
```

- Select the output `Current Ix (--)`.
- Press ENTER.

If the output has already been enabled, it is displayed as follows: `Current I1 (√)`.

```
Outputs\Current I1\I1 Enable
```

- Select `Yes` to enable an output or change the settings for an already enabled output.
- Select `No` to cancel the enabling and to return to the previous menu item.
- Press ENTER.

13.1.2 Assignment of a source item

One source item has to be assigned to each selected output.

```
Outputs\...\Source item
```

- Select a source item whose measured value, status value or event value is to be transmitted to the output.
- Press ENTER.

Tab. 13.1: Configuration of the outputs

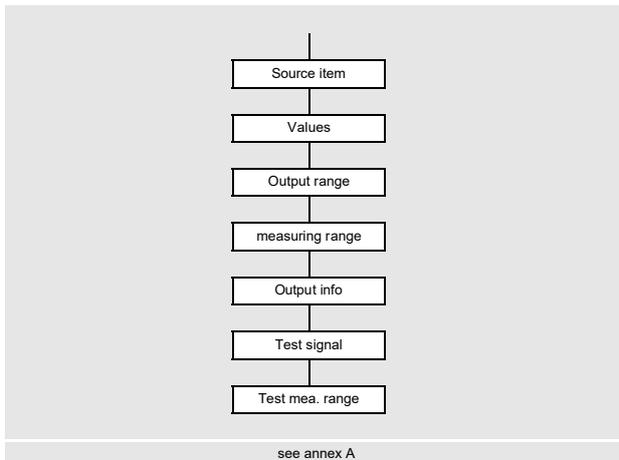
source item	list item	output
Refractometer	Symmetry Amplification Amplitude Quality SNR	diagnostic values
Transducer	Sensor humidity Transducer temp.	sensor values
Analysis	Mass fraction Brix scale	physical quantities for analysis selected in the menu Parameters
Fluid properties	Fluid temp. Fluid density Norm. density	
Event trigger	R1 R2 R3 R4	limit message (Event trigger R1) limit message (Event trigger R2) limit message (Event trigger R3) limit message (Event trigger R4)
Miscellaneous	Custom. Input 1 Custom. Input 2 Custom. Input 3 Custom. Input 4	measured values of input quantities (e.g., temperature, density) which are not used for calculation In the menu item Inputs\Assign inputs it is possible to assign configured inputs to customized inputs.
Refractive index	Refractive index Norm. refrac. index Refractive index (Δ)	

Depending on the selected source item, it is possible to output measured values, status values or event values.

Tab. 13.2: Output of measured values, status values or event values

	source item	measured value		event value
		value	status	
physical quantities	Refractometer	X	X	-
	Analysis	X	X	-
	Fluid properties	X	X	-
	Miscellaneous (Custom. Input 1...4)	X	X	-
	Refractive index	X	X	-
events	Event trigger	-	-	X

13.1.3 Output of a measured value



Output range

- Select the list item `Values` in the menu item `Source item`.
- Press ENTER.

```
Outputs\...\Output range
```

- Select a list item.
 - 4...20 mA
 - Other range

- Press ENTER.

If `Other range` is selected, enter the values `Output MIN` and `Output MAX`.

The output range has to be > 10 % of the max. output value (`Output MAX`).

An error message will be displayed if the output range is smaller.

The next possible value will be displayed.

- Repeat the input.

Error output

```
Outputs\...\Error value
```

An error value can be defined which is output if the source item cannot be measured.

- Select a list item for the error output.
- Press ENTER.
- If `Other value` is selected, enter an error value. The value has to be outside the output range.
- Press ENTER.

Example

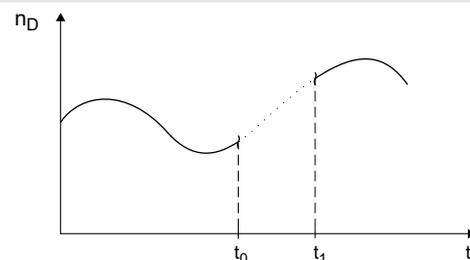
source item: normalized refractive index n_D

output: current output

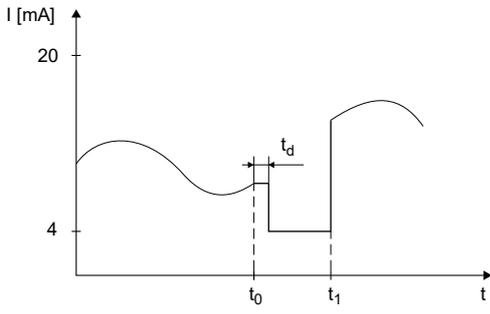
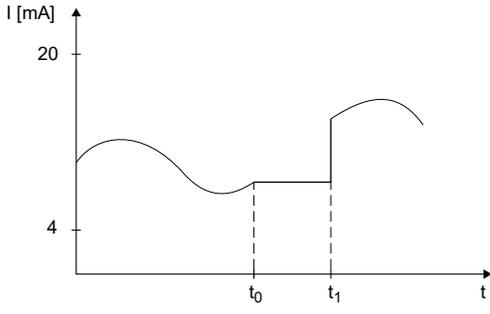
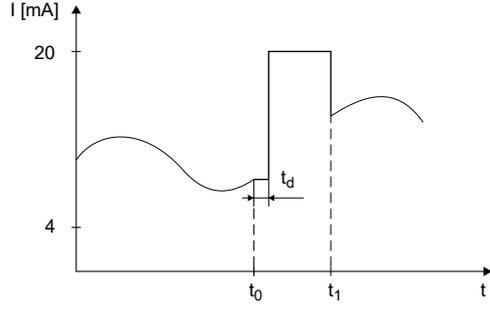
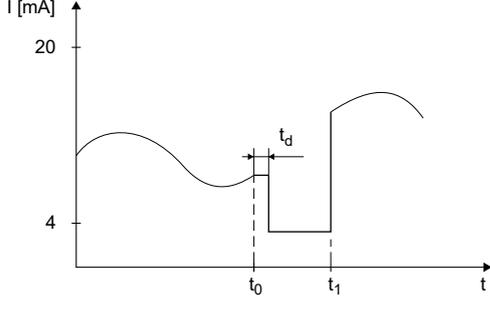
output range: 4...20 mA

error delay: $t_d > 0$

The normalized refractive index n_D cannot be measured during the time interval $t_0...t_1$. The error value will be output.



Tab. 13.3: Examples for the error output (output range: 4...20 mA)

list item	output signal
Minimum (4.0 mA)	
Last value	
Maximum (20.0 mA)	
Other value error value = 3.5 mA	

Measuring range

The measuring range is defined.

```
Outputs\...\Start of meas. range
```

- Enter the lowest expected measured value. The unit of measurement of the source item will be displayed.
Start of meas. range is the value assigned to the value Output MIN of the output range.

```
Outputs\...\End of meas. range
```

- Enter the highest expected measured value. The unit of measurement of the source item will be displayed.
End of meas. range is the value assigned to the value Output MAX of the output range.

Terminal assignment

```
Outputs\...\Output info
```

The terminals for the connection of the output are displayed.

By pressing or further information is displayed.

- Press ENTER.

Output function test

The function of the output can now be tested.

- Connect an external measuring instrument to the terminals of the output.

```
Outputs\...\Test signal
```

- Select Yes to test the output. Select No to display the next menu item.
- Press ENTER.

```
Outputs\...\Enter test value
```

- Enter a test value. It has to be within the output range.
- Press ENTER.

If the external measuring instrument displays the entered value, the output functions correctly.

- Select Repeat to repeat the test, Finish to display the next menu item.
- Press ENTER.

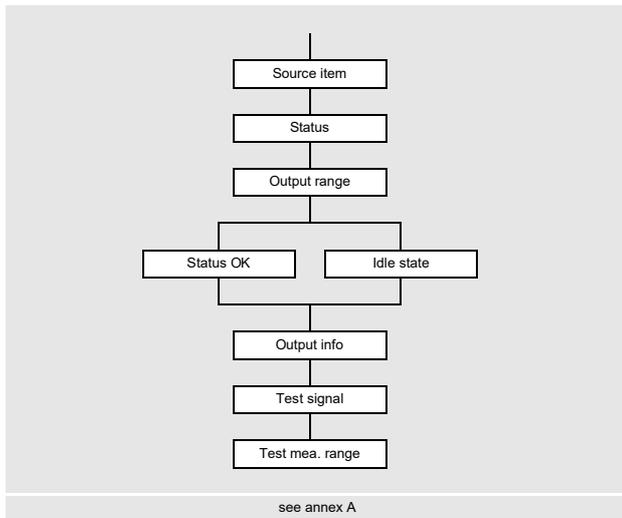
```
Outputs\...\Test mea. range
```

- Select Yes to test the assignment of the measured value to the output signal. Select No to display the next menu item.
- Press ENTER.

```
Outputs\...\Enter test value
```

- Enter a test value for the selected physical quantity. It has to be within the output range.
- Press ENTER. If the external measuring instrument displays the entered value, the output functions correctly.
- Select Repeat to repeat the test. Select Finish to display the next menu item.
- Press ENTER.

13.1.4 Output of a status value/event value



- Select the list item `Status` in the menu item `Source item`.
- Press ENTER.

Output range

```
Outputs\...\Output range
```

- Select a list item.
 - 4...20 mA
 - Other range
 - Press ENTER.
- If `Other range` is selected, enter the values `Output MIN` and `Output MAX`.

The output range has to be > 10 % of the max. output value (`Output MAX`). An error message will be displayed if the output range is smaller. The next possible value will be displayed.

status value – state OK	event value – idle state
The status of the output signal is defined which is to be output when measuring a measured value.	The status of the output signal is defined which is to be output if no event occurs.
<ul style="list-style-type: none"> • Select in the scroll list the value for state OK. • Press ENTER. 	<ul style="list-style-type: none"> • Select the value for the idle state. • Press ENTER.

Terminal assignment

```
Outputs\...\Output info
```

The terminals for the connection of the output are displayed.

By pressing `2` or `8` further information is displayed.

- Press ENTER.

Output function test

The function of the output can now be tested.

- Connect an external measuring instrument to the terminals of the output.

```
Outputs\...\Test signal
```

- Select `Yes` to test the output. Select `No` to display the next menu item.
- Press ENTER.

```
Outputs\...\Enter test value
```

- Enter a test value. It has to be within the output range.
- Press ENTER.

If the external measuring instrument displays the entered value, the output functions correctly.

- Select `Repeat` to repeat the test, `Finish` to display the next menu item.
- Press ENTER.

Outputs\...\Test mea. range

- Select **Yes** to test the assignment of the measured value to the output signal. Select **No** to display the next menu item.
- Press **ENTER**.

Outputs\...\Enter test value

- Select a list item as test value.
- Press **ENTER**.

status value	event value
Status OK Or Status error. If the external measuring instrument displays the value (min. output value for Status error, max. output for Status OK), the output functions correctly.	Active Or Passive. If the external measuring instrument displays the value (min. output value for Passive, max. output for Active), the output functions correctly.

- Select **Repeat** to repeat the test. Select **Finish** to display the next menu item.
- Press **ENTER**.

13.2 Digital output

A digital output switches if one of the following switching conditions is met:

- the measured value exceeds or falls below a limit
- the measured value lays within or outside a defined range
- a measurement is not possible
- an event occurs

13.2.1 Configuration of a digital output as binary output

- Select the menu **Outputs**.
- Press **ENTER**.

Outputs\Binary B1\B1 Enable

- Select **Yes** to change the settings for an assigned output or to assign a new output.
- Select **No** to cancel the assignment and to return to the previous menu item.
- Press **ENTER**.

Assignment of a source item

Outputs\...\Source item

Depending on the selected source item, status or event values can be output.

Tab. 13.4: Output of status values and event values

	source item	status value	event value
physical quantities	Refractometer	X	
	Analysis	X	
	Fluid properties	X	
	Miscellaneous	X	
	Refractive index	X	
events	Event trigger		X

- Select the source item.
- Press ENTER.

13.2.2 Definition of the switching function for the status/event value

- Select the switching function for the output of the status/event value.
- Press ENTER.

Tab. 13.5: Selection of the switching condition

property	switching function	description
Status OK (status value)	NC	<ul style="list-style-type: none"> • valid measured value: binary output is closed • invalid measured value: binary output is open
	NO	<ul style="list-style-type: none"> • valid measured value: binary output is open • invalid measured value: binary output is closed
Idle state (event value)	NO	<ul style="list-style-type: none"> • event occurs: binary output is closed • event has not occurred yet: binary output is open
	NC	<ul style="list-style-type: none"> • event occurs: binary output is open • event has not occurred yet: binary output is closed

If no measurement is carried out, all binary outputs are open (de-energized), independent of the set switching condition.

Terminal assignment

Outputs\...\Output info

The terminals for the connection of the output are displayed.

By pressing  or  further information is displayed.

- Press ENTER.

Output function test

The function of the output can now be tested.

- Connect a multimeter to the output.

Outputs\...\B1 Test signal

- Select **Yes** to test the output. Select **No** to display the next menu item.
- Press **ENTER**.

Outputs\...\B1 Enter test value

- Select a list item as test value.
- Press **ENTER**.

Tab. 13.6: Output function test – signal

list item	description
NC	<ul style="list-style-type: none"> • binary output is energized • measured value has to be low ohmic
NO	<ul style="list-style-type: none"> • binary output is de-energized • measured value has to be high ohmic

- Select **Repeat** to repeat the test, **Finish** to display the next menu item.
- Press **ENTER**.

Outputs\...\B1 Test mea. range

- Select **Yes** to test the status of the output signal. Select **No** to display the next menu item.
- Press **ENTER**.

Outputs\...\B1 Enter test value

- Select a list item as test value.
- Press **ENTER**.

Tab. 13.7: Output function test – measuring range

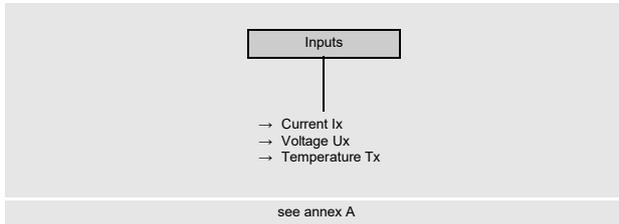
list item	switching function	test value	description
Status OK (status value)	NC	Status OK	<ul style="list-style-type: none"> • binary output is energized • measured value has to be low ohmic
		Status error	<ul style="list-style-type: none"> • binary output is de-energized • measured value has to be high ohmic
	NO	Status OK	<ul style="list-style-type: none"> • binary output is de-energized • measured value has to be high ohmic
		Status error	<ul style="list-style-type: none"> • binary output is energized • measured value has to be low ohmic
Idle state (event value)	NC	Passive	<ul style="list-style-type: none"> • binary output is energized • measured value has to be low ohmic
		Active	<ul style="list-style-type: none"> • binary output is de-energized • measured value has to be high ohmic
	NO	Passive	<ul style="list-style-type: none"> • binary output is de-energized • measured value has to be high ohmic
		Active	<ul style="list-style-type: none"> • binary output is energized • measured value has to be low ohmic

- Select **Repeat** to repeat the test or **Finish** to display the next menu item.
- Press **ENTER**.

14 Inputs

The inputs are configured in the menu `Inputs`.

14.1 Configuration of an input



If the transmitter is equipped with inputs, they have to be configured.

- Select the menu `Inputs`.
- Press ENTER.

```
Inputs\Configure inputs
```

- Select the input to be configured.
- Press ENTER.

The scroll list contains all available inputs.

- Select a list item:
 - Current Ix (-)
 - Voltage Ux (-)
 - Temperature Tx (-)

If the input has already been configured, it is displayed as follows: `Current I1 (✓)`.

Enabling the input

To use the input, it has to be enabled (here: `Current I1`)

```
Inputs\Current I1\Enable
```

- Select `Yes` to enable an input or change the settings for an already enabled input.
- Select `No` to cancel the enabling and to return to the previous menu item.
- Press ENTER.

14.1.1 Temperature inputs

When configuring the temperature input, the temperature probe can now be selected.

Selection of the temperature probe

```
Inputs\Temperature Tx\Pt100/Pt1000
```

- Select the temperature probe:
 - Pt100
 - Pt1000
- Press ENTER.

Activation of the temperature correction

A temperature correction (offset) can be set for each temperature input.

```
Inputs\Temperature Tx\Temperature offset
```

- Select `Yes` to activate the temperature correction. Select `No` to deactivate it.
- Press ENTER.

Notice!

The entered correction values for each temperature input will be stored and displayed when the temperature correction is activated again.

The temperature correction will be added automatically to the measured temperature. The temperature correction is used e.g., if the characteristic curves of the two temperature probes differ considerably from each other or a known and constant temperature gradient exists between the measured and the actual temperature.

Input of the temperature correction

```
Inputs\Temperature Tx\Temperature offset\Temperature
```

- Enter the offset for the temperature input.
- Press ENTER.

14.1.2 Current and voltage inputs

When configuring the current or voltage inputs, the source item can now be selected and the input and measuring range is defined.

Selection of the source item

```
Inputs\...\Source item
```

- Select the source item.

Input range

Now the input range is defined.

```
Inputs\...\Input range
```

- Select a list item:

- 0...20 mA
- 4...20 mA
- Other range

- Press ENTER.

If *Other range* is selected, enter the values *Input MIN* and *Input MAX*.

Measuring range

```
Inputs\...\Start of meas. range
```

- Enter the lowest expected measured value. The unit of measurement of the source item will be displayed. *Start of meas. range* is the physical quantity assigned to the lower limit of the input range (*Input MIN*).
- Enter the highest expected measured value. The unit of measurement of the source item will be displayed. *End of meas. range* is the physical quantity assigned to the higher limit of the input range (*Input MAX*).

Input of an error value

```
Inputs\...\Error value
```

It is possible to define an error value which is output if the source item is not available.

- Enter the error value.
- Press ENTER.

14.1.3 Definition of a switching condition

A switching condition can be defined.

```
Inputs\...\Trigger value
```

- Select **Yes** if a switching condition is to be defined. Select **No** to display the next menu item.
- Press **ENTER**.

If a switching condition is defined, several transmitter functions can remotely be triggered.

```
Inputs\...\Function
```

- Select a list item:
 - **MAX** ($x > \text{limit}$): the switching condition is met if the measured value exceeds the limit.
 - **MIN** ($x < \text{limit}$): the switching condition is met if the measured value falls below the limit.
 - **ERR** ($x = \text{fail}$): the switching condition is met if a measurement is not possible.
 - **Within range**: the switching condition is met if the measured value is within the defined range.
 - **Out of range**: the switching condition is met if the measured value is outside the defined range.
- Press **ENTER**.

```
Inputs\...\Trigger value
```

- Enter the limit for the switching condition.
- Press **ENTER**.

This display will only be indicated if **MAX** ($x > \text{limit}$) or **MIN** ($x < \text{limit}$) is selected.

```
Inputs\...\Hysteresis
```

It is possible to define a hysteresis to avoid a constant switching of the event trigger.

The event trigger will be activated if the measured value exceeds the upper limit and deactivated if it falls below the lower limit.

- Enter the value for the hysteresis.
- If zero is entered, no hysteresis is used.
- Press **ENTER**.

This display will only be indicated if **MAX** ($x > \text{limit}$) or **MIN** ($x < \text{limit}$) is selected.

```
Inputs\...\Glitch interval
```

- Enter a time interval at the end of which the event trigger has to switch.
- Press **ENTER**.

14.1.4 Terminal assignment

```
Inputs\...\Input info
```

The terminals for the connection of the input are displayed.

By pressing or further information is displayed.

- Press **ENTER**.

14.1.5 Function test of the input

The function of the installed input can now be tested.

Analog input

- Connect the signal source to the input.

```
Inputs\...\I1 Test signal
```

- Select **Yes** to test the input signal. Select **No** to display the next menu item.
- Press **ENTER**.

```
Inputs\...\I1 Test signal\Current
```

- If the transmitter displays a value (here: **Current**), the input functions.
- Press **ENTER**.
- Select **Repeat** to repeat the test, **Finish** to display the next menu item.
- Press **ENTER**.

```
Inputs\...\I1 Test mea. range
```

- Select **Yes** to test the assignment of the measured value to the input signal. Select **No** to display the next menu item.
- Press **ENTER**.

```
Inputs\...\I1 Test mea. range\Temperature
```

- If the transmitter displays a value (here: **Temperature**), the input functions.
- Press **ENTER**.
- Select **Repeat** to repeat the test, **Finish** to display the next menu item.
- Press **ENTER**.

14.2 Assignment of an input

- Select the menu **Inputs**.
- Press **ENTER**.

```
Assign inputs
```

- Select **Assign inputs**.
- Press **ENTER**.

```
Assign inputs\...
```

The following physical quantities can be selected:

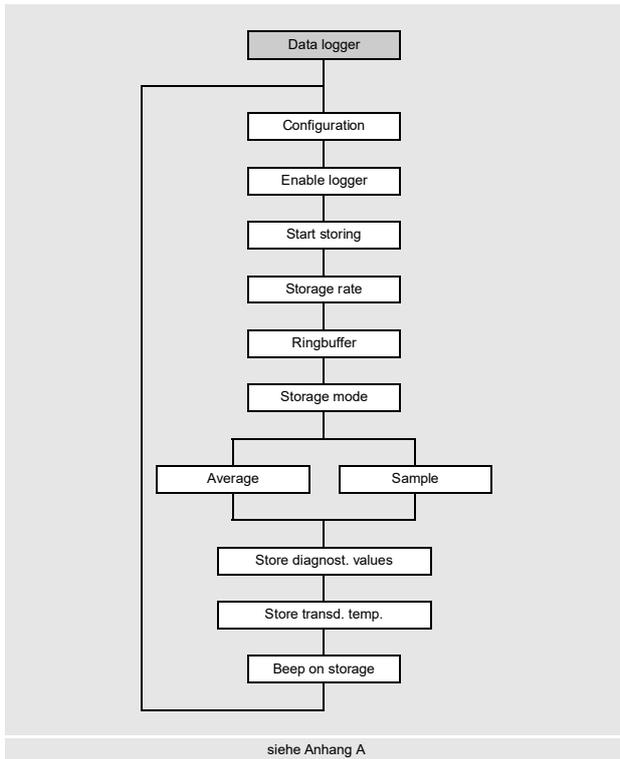
- Fluid temp.
- Fluid pressure
- Fluid density

- Select the physical quantity to be assigned to an input.
- Press **ENTER**.
- Select the input to be assigned to a physical quantity.

Only the enabled inputs are displayed in the scroll list.

- Select the list item **No linkage** if no input is to be assigned to the physical quantity.
- Press **ENTER**.

15 Data logger



The transmitter has a data logger which stores the measured values during the measurement.

Notice!

In order to store measured data, the data logger has to be configured.

The following data is stored within the data logger:

- date
- time
- measuring point number
- fluid parameters
- sensor data
- physical quantity
- unit of measurement
- measured value

Measured values transmitted via the outputs are also stored in the data logger.

- Select the menu item `Data logger\Configuration`.
- Press ENTER.

15.1 Configuration of the data logger

Starting time

`Data logger\Configuration\Start storing`

It is possible to set a starting time if it is necessary to synchronize the storing of measured values for several transmitters.

- Select the menu item `Start storing`.
- Press ENTER.
- Select the moment at which to start the storing.

display	description
Immediately	The storing starts immediately.
Full 5 minutes	The storing starts in the next full 5 minutes.
Full 10 minutes	The storing starts in the next full 10 minutes.
Full 15 minutes	The storing starts in the next full 15 minutes.
Full 30 minutes	The storing starts in the next full 30 minutes.
Full hour	The storing starts in the next full 60 minutes.
Event-based	The storing starts once a defined event has been occurred.

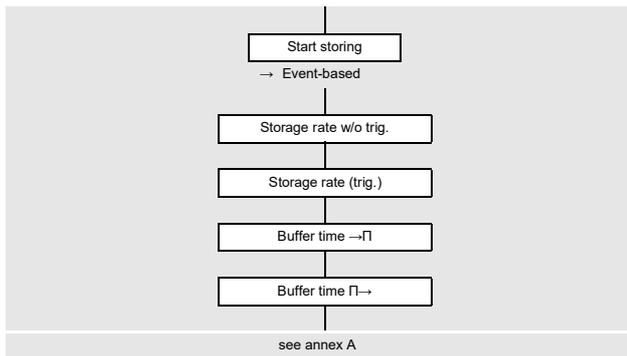
Example

actual time: 09:06 am
setting: Full 10 minutes
The storing starts at 09:10 am.

Notice!

Make sure that the date and time settings of all transmitters are synchronized.

Event-based starting time



```
Data logger\Configuration\Start storing\
Event-based
```

If it is necessary to start the storing of measured values at a particular event, select `Event-based` as starting time.

```
Data logger\Configuration\Start storing\
Event-based\Rx
```

The event is signaled via an input or event trigger. All configured inputs and event triggers are displayed in the scroll list.

For the configuration of the inputs or even triggers, see the menu item `Inputs\Configure inputs` or menu `Event trigger`.

- Select the input or the event trigger through which the event is to be signaled.
- Press ENTER.

```
Data logger\Configuration\Start storing\Event-based\Storage rate w/o trig.
```

The storage rate indicates the interval how often the measured values are transmitted or stored.

- Select in the scroll list a storage rate for storing the measured values in case the event does not occur.
- Select `Off` if no measured values are to be stored, as long as the event does not occur.
- Press ENTER.

```
Data logger\Configuration\Start storing\Event-based\Storage rate (trig.)
```

- Select in the scroll list a storage rate for storing the measured values in case the event occurs.
- Press ENTER.

```
Data logger\Configuration\Start storing\Event-based\Buffer time ->Π
```

- Enter the time interval for the measured values to be stored before reaching the event (switching condition is met).
- Press ENTER.

```
Data logger\Configuration\Start storing\Event-based\Buffer time Π->
```

- Enter the time interval for the measured values to be stored if the event is no longer active (switching condition is no longer met).
- Press ENTER.

Storage rate

Data logger\Configuration\Storage rate

If a starting time for storing the measured values is defined, a storage rate has to be entered. The storage rate indicates the interval how often the measured values are transmitted or stored.

- Select the menu item `Storage rate`.
- Press ENTER.
- Select a storage rate from the scroll list.
- Press ENTER.
- If `Customized` is selected, enter the storage rate.
- Press ENTER.

Ringbuffer

Data logger\Configuration\Ringbuffer

The data logger can be configured as linear logger or ringbuffer. If the ringbuffer is deactivated and the data logger is full, the storing of measured values will be terminated. It can be continued after clearing the data logger. If the ringbuffer is activated and the data logger is full, the oldest measured values will be overwritten. In ringbuffer mode, the remaining capacity of the data logger is displayed during the measurement, e.g.:

Log→ : 1d 6h 57m is displayed, if no measured values have been overwritten.

Log|←| : 1d 6h 57m is displayed, if the old measured values have been overwritten.

- Select the menu item `Configuration`.
- Press ENTER until the menu item `Ringbuffer` is displayed.
- Select `On` to activate the ringbuffer.
- Press ENTER.

If the ringbuffer is deactivated and the data logger is full, the storing of measured values will be terminated.

- Select `Off` to deactivate the ringbuffer.
- Press ENTER.

Storage mode

Data logger\Configuration\Storage mode

- Select the menu item `Storage mode`.
- Press ENTER.
- Select `Sample` to store the current measured value.
- Select `Average` if the average of all undamped measured values of a storage interval is to be stored.

Notice!

The storage mode does not affect the outputs.

Notice!

Storage mode = Average

The average of the physical quantity and of other quantities (e.g., the measured temperature) will be calculated.

If a storage rate < 5 s is selected, `Sample` will be used.

If no average could be calculated over the complete storage interval, the value will be marked as invalid.

Further parameters for storing

It can be defined whether the following parameters are to be stored together with the measured values.

Tab. 15.1: Parameters for storing

display	description of the parameters
Store diagnost. values	diagnostic values
Store transd. temp.	sensor temperature

- Select **Yes** to store the value. Select **No** in order not to store the value.

Acoustic signal during the storing

Data logger\Configuration\Beep on storage

The storing of each measured value can be acoustically signalized. The signal can be activated or deactivated in the menu `Data logger\Configuration\Beep on storage`.

- Select **On** to activate the acoustic signal. Select **Off** to deactivate the acoustic signal.
- Press **ENTER**.

15.2 Deletion of the data logger

Data logger>Delete meas. values

- Select the menu item `Delete meas. values`.
- Press **ENTER**.
- Select **Yes** to delete the measured values. Select **No** if the measured values are not to be stored.
- Press **ENTER**.

15.3 Information regarding the data logger

Data logger\Data logger info

- Select the menu item `Data logger info`.
- Press ENTER.

The following information regarding the data logger is displayed:

display	description
Activated	data logger is activated/deactivated This display will only be indicated if the measurement has started and the data logger is activated.
Full (date)	date on which the data logger will be full This display will only be indicated if the measurement has started and the ringbuffer is deactivated.
Full (time)	time at which the data logger will be full This display will only be indicated if the measurement has started, the ringbuffer is deactivated and the data logger is not full yet.
Overflow (date)	date from which the oldest measured values will be overwritten This display will only be indicated if the measurement has started, the ringbuffer is activated and the data logger is not full yet.
Capacity (time)	remaining data logger capacity This display will only be indicated if the measurement has started and the ringbuffer is activated.
Ringbuffer	ringbuffer is activated/deactivated
Meas. val. Series	number of stored series of measured values
Occup. Logger	percentage of memory actually used

16 Data transmission

The data is transmit via the service interfaces or the process interface (optional) of the transmitter.

16.1 Service interfaces

By means of the program FluxDiagReader it is possible to transmit via service interfaces (USB, LAN) data to the PC.

The following tasks can be carried out:

- read and store measured values, setup settings and snaps
- graphically display measured values
- export of data in csv format

For the operation of FluxDiagReader see the help function of this program.

16.1.1 LAN interface

In order to use the LAN interface it is important to enter the network parameters.

Communication\Network

- Select the menu item `Network`.
- Press ENTER.

Manual input

- Select `Manual` to enter the network parameter (IP address, subnet mask and standard gateway).

Notice!

The entered network parameters have to accord with the network parameters of the LAN.

Default values in the transmitter:

- IP address: 192.168.0.70
- subnet mask: 255.255.255.0
- standard gateway: 192.168.0.1

Automatic addressing with DHCP

- Select `Automatic` to automatically identify the network parameter (IP address, subnet mask and standard gateway) via a DHCP server.

Notice!

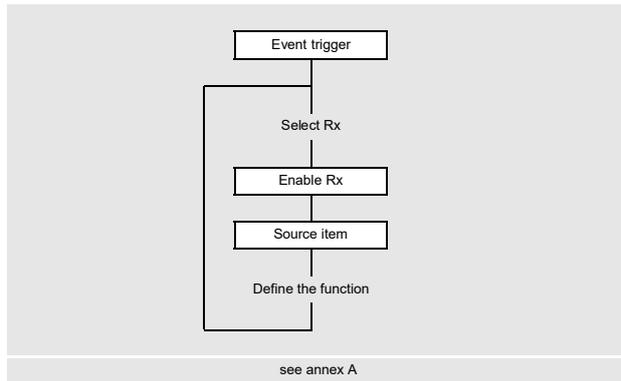
The network parameters can only be automatically identified if the LAN supports DCHP.

- Select the menu item `Show auto config.` to display the identified network parameters.
- Press ENTER.

16.2 Process interface

The transmitter can be equipped with a process interface (e.g., Profibus, Modbus). For the connection of the process interface to the transmitter see supplement to operating instruction.

17 Event trigger



It is possible to configure max. 4 independent event trigger R1, R2, R3, R4.

The event triggers can be used, e.g., to:

- output information about the running measurement
- trigger special remote functions
- Select the menu `Event trigger`.
- Press `ENTER`.

`Event trigger\Rx(-)`

- Select the event trigger.

If an event trigger has already been installed, it is displayed as follows: `Rx (+)`.

`Event trigger\Rx Enable`

- Select `Yes` to change the settings for an already assigned event trigger or to assign a new one.
- Select `No` to cancel the assignment and to return to the previous menu item.
- Press `ENTER`.

`Event trigger\Rx Enable\Source item`

- Select the source item (physical quantity) for which a condition has to be defined.

Tab. 17.1: Source items

source item	list item	output
Refractometer	Symmetry Amplification Amplitude Quality SNR	diagnostic values
Transducer	Sensor humidity Transducer temp.	sensor values
Analysis	Volume fraction Brix scale	physical quantities for analysis selected in the menu <code>Parameters</code>
Fluid properties	Fluid temp. Fluid density Norm. density	fluid temperature fluid density standardized density
Miscellaneous	Custom. Input 1 Custom. Input 2 Custom. Input 3 Custom. Input 4	measured values of input quantities (e.g., temperature, density) which are not used for calculation In the menu item <code>Inputs\Assign inputs</code> it is possible to assign configured inputs to customized inputs. For further information, see chapter 14.

Tab. 17.1: Source items

source item	list item	output
Refractive index	Refractive index	measured refractive index in the fluid
	Refractive index (Δ)	
	Norm. refrac. index	

Afterwards the properties of the event trigger are defined.

Tab. 17.2: Properties of the event trigger

property event trigger	setting	description
Function (switching condition)	MAX (x>limit)	The event trigger will switch if the measured value exceeds the upper limit.
	MIN (x<limit)	The event trigger will switch if the measured value falls below the lower limit.
	Within range	The event trigger will switch if the measured value is within the defined range.
	Out of range	The event trigger will switch if the measured value is outside the defined range.
	ERR (x=fail)	The event trigger will switch if a measurement is not possible.
Type (holding behavior)	Non-hold	If the switching condition is no longer met, the event trigger will return to the idle state after approx. 1 s.
	Hold	The event trigger remains activated even if the switching condition is no longer met.
	Hold for a while	The event trigger remains activated during a defined time even if the switching condition is no longer met.

Definition of the switching condition

```
Event trigger\Rx Enable\Source item\...\Function
```

- Select the switching condition.
- Press ENTER.

Definition of the holding behavior

```
Event trigger\Rx Enable\Source item\...\Type
```

- Select the type of the holding behavior.
- Press ENTER.

Definition of trigger limits

```
Event trigger\Rx Enable\Source item\...\Trigger value
```

It is important to enter the limits, at which the event trigger has to toggle.

- Enter the upper limit `MAX (x>limit)`.
- Press ENTER.
- Enter the lower limit `MIN (x<limit)`.
- Press ENTER.

```
Event trigger\Rx Enable\Source item\...\Hysteresis
```

It is possible to define a hysteresis to avoid a constant switching of the event trigger.

The event trigger will be activated if the measured values exceed the upper limit. It will be deactivated if the measured values fall below the lower limit.

- Enter the value for the hysteresis.

If zero is entered, no hysteresis is used.

- Press ENTER.

Example

```
MAX (x>limit): 40 M%
```

```
Hysteresis: 1 M%
```

The event trigger will switch at a value of 40.5 M% and higher. The event trigger will be deactivated at a value of 39.5 M%.

```
Event trigger\Rx Enable\Source item\...\Range center
```

- Enter the center of the range in which the event trigger has to be switched.
- Press ENTER.

```
Event trigger\Rx Enable\Source item\...\Range width
```

- Enter the width of the range in which the event trigger has to be switched.
- Press ENTER.

Example

```
Function: Out of range
```

```
Range center: 40 M%
```

```
Range width: 10 M%
```

The event trigger will switch if the measured value is below 35 M% or above 45 M%.

Definition of the switching delay

```
Event trigger\Rx Enable\Source item\...\Glitch interval
```

- Enter a time interval after which the event trigger has to switch in case the event occurred.
- Press ENTER.

```
Event trigger\Rx Enable\Source item\...\Failure delay
```

- Enter a time interval after which the event trigger has to be deactivated in case of a measurement failure.

17.1 Apparent switching delay

The measured values will be displayed rounded according to the set number of decimal places. The limits, however, will be compared to the non-rounded measured values. This might cause an apparent switching delay when the measured value changes marginally (less than the displayed decimal places). In this case, the switching accuracy of the event trigger is higher than the accuracy of the display.

17.2 Reset and initialization of the event trigger

After an initialization of the transmitter all event triggers are deactivated.

- Press 3 times C during the measurement to set all event triggers to the idle state.

Event triggers whose switching condition is still met will be activated again after 1 s. This function is used to reset event trigger of the type HOLD if the switching condition is no longer met.

If a measurement is stopped, all event triggers will be de-energized, independently of the programmed idle state.

17.3 Event trigger during the measurement

An event trigger with the switching condition MAX ($x > \text{limit}$), MIN ($x < \text{limit}$), Within range or Out of range will be updated max. once per second to avoid a constant switching of the event trigger (i.e. fluctuation of the measured values around the value of the switching condition).

An event trigger with switching condition ERR ($x = \text{fail}$) will be activated during a measurement failure.

An event trigger of the type Non-hold will be activated if the switching condition is met. It will be deactivated if the switching condition is no longer met. The alarm remains activated for at least 1 s even if the switching condition is met for a shorter period of time.

An event trigger of the type Hold will be activated if the switching condition is met. It remains activated even if the switching condition is no longer true.

An event trigger of the type Hold for a while will be activated if the switching condition is met. In the menu item Hold interval the time is defined when deactivation takes place.

17.4 Status display of the event trigger

Notice!
There is no visual or acoustic indication of event trigger switching.

The state of the event triggers is displayed during the measurement.

- Press 9 to scroll through the second line from below until the event trigger status is displayed.

The status display of the event triggers is structured as follows.

Rx = with x being the number of the event trigger and a pictogram according to Tab. 17.3.

Tab. 17.3: Pictograms for the status display of the event triggers

	no.		Function (switching condition)	Type (holding behavior)	current state
R	<input type="text"/>	=	<input type="text"/>	<input type="text"/>	<input type="text"/>
	1		 MAX ($x > \text{limit}$)	 Non-hold	 not activated (false state)
	2		 MIN ($x < \text{limit}$)	 Hold	 activated (true state)
	3		 Within range	 Hold for a while	
	4		 Out of range		
			 ERR ($x = \text{fail}$)		

ExampleR1 = **17.5 Event protocol**

If an error occurs, an error message will be displayed in the first line indicating the symbol . The error message can be displayed via the menu item `Event log`.

```
Miscellaneous\System settings\Event log
```

- Select the menu item `Event log`.
- Press ENTER.

A list is displayed containing all error messages since the last time the transmitter was switched on.

- Press  and  to select an error message.
- Press ENTER.

The display indicates the cause of the error.

Notice!

After reading out the event protocol the error message symbol will be deleted on the display, even if the error has not been eliminated yet.

The event protocol will be deleted after a restart of the transmitter.

18 Calibration

Correction values can be entered:

- for the values calculated by the transmitter (e.g., percentage by mass)
- for scale values (z.B. Brix scale).

Correction values for the values calculated by the transmitter

The correction value is added to the value calculated by the transmitter.

```
Calibration\Result offset
```

- Select the menu item `Calibration\Result offset`.
- Press ENTER.
- Select `On` to define an offset for the displayed physical quantity.
- Press ENTER.

Correction values for the scale values

The correction value is added to the scale value.

```
Calibration\Scale offset
```

- Select the menu item `Calibration\Scale offset`.
- Press ENTER.
- Select `On` to define an offset for the scale value.
- Press ENTER.

19 Settings

19.1 Dialogs and menus

Miscellaneous\Dialogs/Menu

- Select the menu item `Miscellaneous\Dialogs/Menu`.
- Press ENTER.

Measuring point number

Miscellaneous\Dialogs/Menu\Measuring point no.

- Select the menu item `Measuring point no.`
- Select `Number` if the measuring point is to be identified only by numbers. Select `Text` if the measuring point is to be identified only by characters.
- Press ENTER.

Error delay

The error delay is the time after which an error value will be sent to an output if no valid measured values are available.

Miscellaneous\Dialogs/Menu/Error value delay

- Select the menu item `Error value delay`.
- Select `Edit` to enter an error delay. Select `Damping` if the damping factor is to be used as the error delay.
- Press ENTER.

Temperature correction

Miscellaneous\Dialogs/Menu\Tx temperature offset

- Select the menu item `Tx temperature offset`.
- Select `Yes` to enable the input of a temperature correction.
- Press ENTER.

Display of the last value

Miscellaneous\Dialogs/Menu\Display last value

- Select the menu item `Display last value`.
- Select `Yes` to display the last valid value.

If `Yes` is selected and no valid measured value can be displayed during the measurement, the last valid value will be displayed. Behind this value an interrogation point will be displayed.

Switching off the display backlight

Miscellaneous\Dialogs/Menu\Light autom. off

- Select `Yes` to activate the automatic switch-off.
- Press ENTER.

If the automatic switch-off of the display backlight is activated, the backlight is switched off after about 30 s. When pressing a key or connecting a USB cable, the backlight is switched on again.

19.2 Working with parameter records

19.2.1 Introduction

Working with parameter records will make repeated measurement tasks easier and faster. Setup settings of the transmitter are stored in the parameter records. Depending on which measuring task has to be carried out, it is possible to load the corresponding parameter record and use it for the measurement. The transmitter can store max. 20 parameter records.

A parameter record contains the following parameters:

- sensor parameter
- fluid parameters
- input quantities
- output quantities
- input and output parameters

Notice!

No parameter records are stored in the delivery state. Parameter records have to be entered manually.

19.2.2 Creation of a parameter record

The parameters have first to be entered in the following menus:

- Parameters
- Inputs
- Outputs
- Event trigger
- Data logger
- Calibration
- Communication
- Miscellaneous

Afterwards, they can be stored as parameter record.

```
Miscellaneous\Param. record memo.
```

- Select the menu item `Param. record memo.`
- Press ENTER.
- Select `Save current record.`
- Press ENTER.

```
Miscellaneous\Param. record name
```

- Enter the name the parameter record has to be stored with.
- Press ENTER.

19.2.3 Load of a parameter record

Stored parameter records can be loaded and used for measurement.

```
Miscellaneous\Param. record memo.\Load param. record
```

- Select the menu item `Load param. record.`
- Press ENTER.
- Select the parameter record to be loaded.
- Press ENTER.

19.2.4 Deletion of parameter records

Miscellaneous\Param. record memo.\Delete param. record

- Select the menu item Delete param. record.
- Press ENTER.
- Select the parameter record to be deleted.
- Press ENTER.

19.3 Contrast settings

Miscellaneous\System settings\Display contrast

- Select the menu item Display contrast.
- Press ENTER.

The display contrast is adjusted with the following keys:

 increases the contrast

 reduces the contrast

- Press ENTER.

Notice!

After an initialization of the transmitter, the display is reset to medium contrast.

19.4 HotCodes

A HotCode is a digit sequence that activates certain functions and settings.

- Press  for several seconds to return to the beginning of the program branch.
- Press C.
- Enter the HotCode via the keyboard. It is not displayed during the input.

function	HotCode
set display to medium contrast	555000
language	9090xx
initialization	909000

Language

The language selection can either be carried out via the menu Miscellaneous or a HotCode:

language	HotCode
English	909044
German	909049
French	909033
Spanish	909034
Dutch	909031
Russian	909007

After the last digit has been entered, the main menu is displayed in the selected language. The selected language remains activated when the transmitter is switched off and on again.

19.5 Key lock

An ongoing measurement can be protected from an inadvertent intervention by means of a key lock.

Defining a program code for the key lock

Miscellaneous\System settings\Key lock

- Select the menu item `Key lock`.
- Press ENTER.
- Enter a 6-digit key lock code.
- Press ENTER.

Notice!

Do not forget the key lock code!

Intervention in the measurement

If the key lock is activated, the message `Key lock activated` will be displayed for a few seconds when pressing a key. In order to interrupt a measurement, the key lock has to be deactivated.

- Press .
- Select `Show parameters`.
- Press ENTER.
- Deactivate the key lock.

Deactivation of the key lock

Miscellaneous\System settings\Key lock

- Select the menu item `Key lock`.
- Press ENTER.
- Enter a 6-digit key lock code.
- Press ENTER.

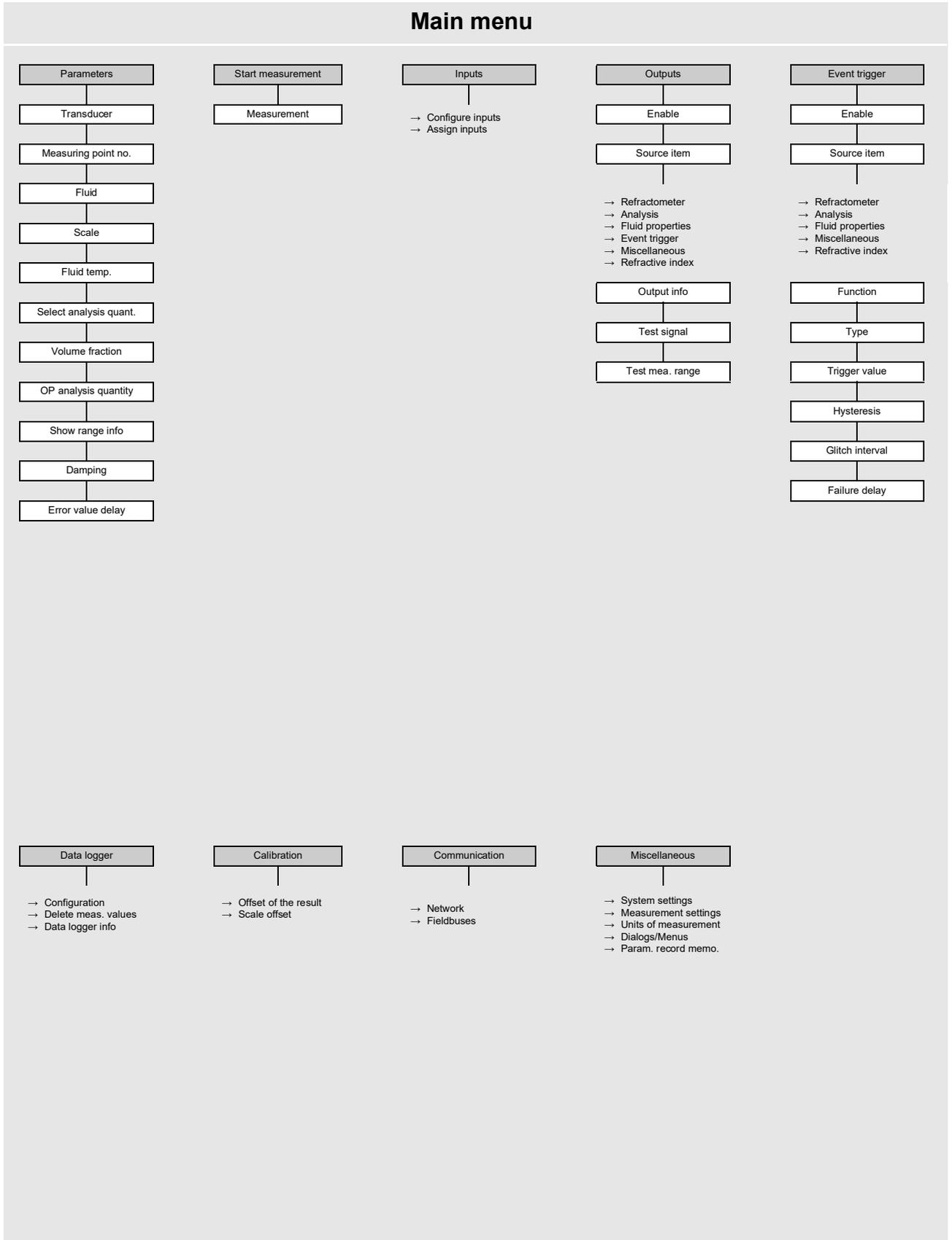
Disabled functions with activated key lock

The following table gives an overview of the transmitter functions that are not available when the key lock is activated.

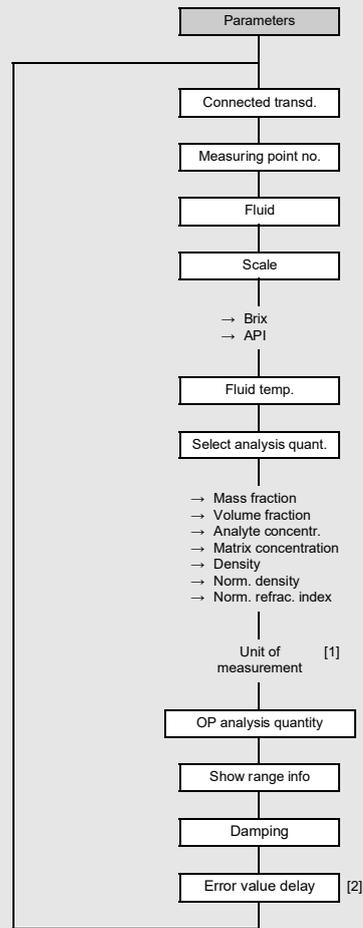
measurement not started	measurement started
<ul style="list-style-type: none">• parameter input• modification of settings (e.g., measuring modes)• deletion of the data logger• setting of time/date• start of measurement (start-up)	<ul style="list-style-type: none">• modification of settings that are available in an ongoing measurement (e.g., language selection)• measurement stop

Annex

A Menu structure



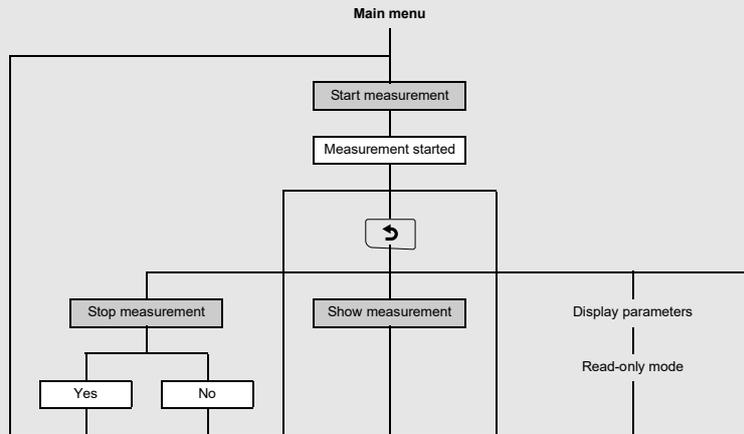
Parameter input



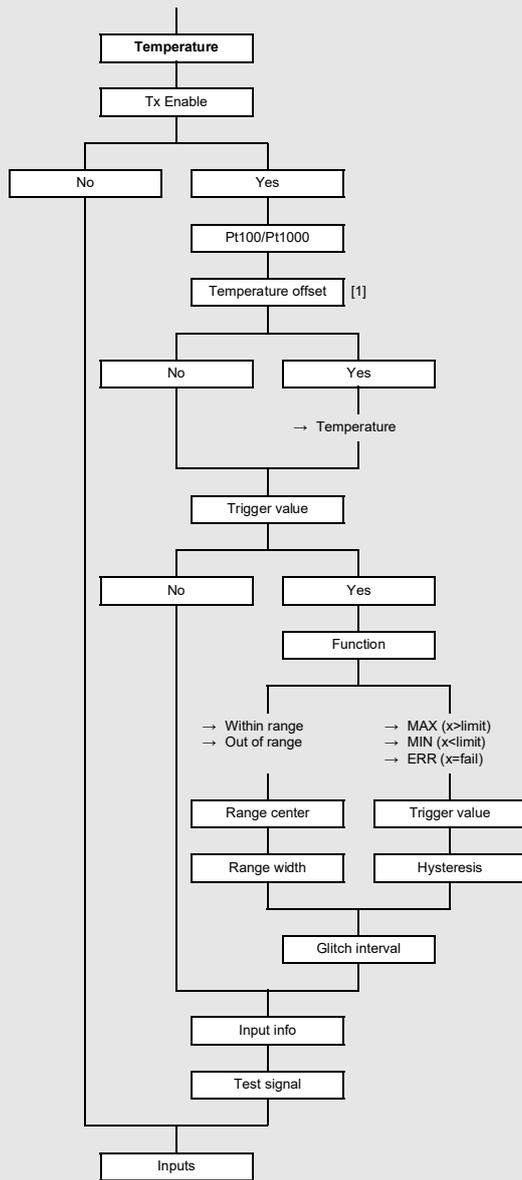
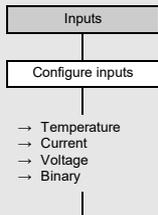
Legend

- [1] only if Mass fraction or Volume fraction has been selected as physical quantity for analysis
- [2] only if Edit is selected in the menu item Miscellaneous > Dialogs/Menu > Error value delay

Measurement start

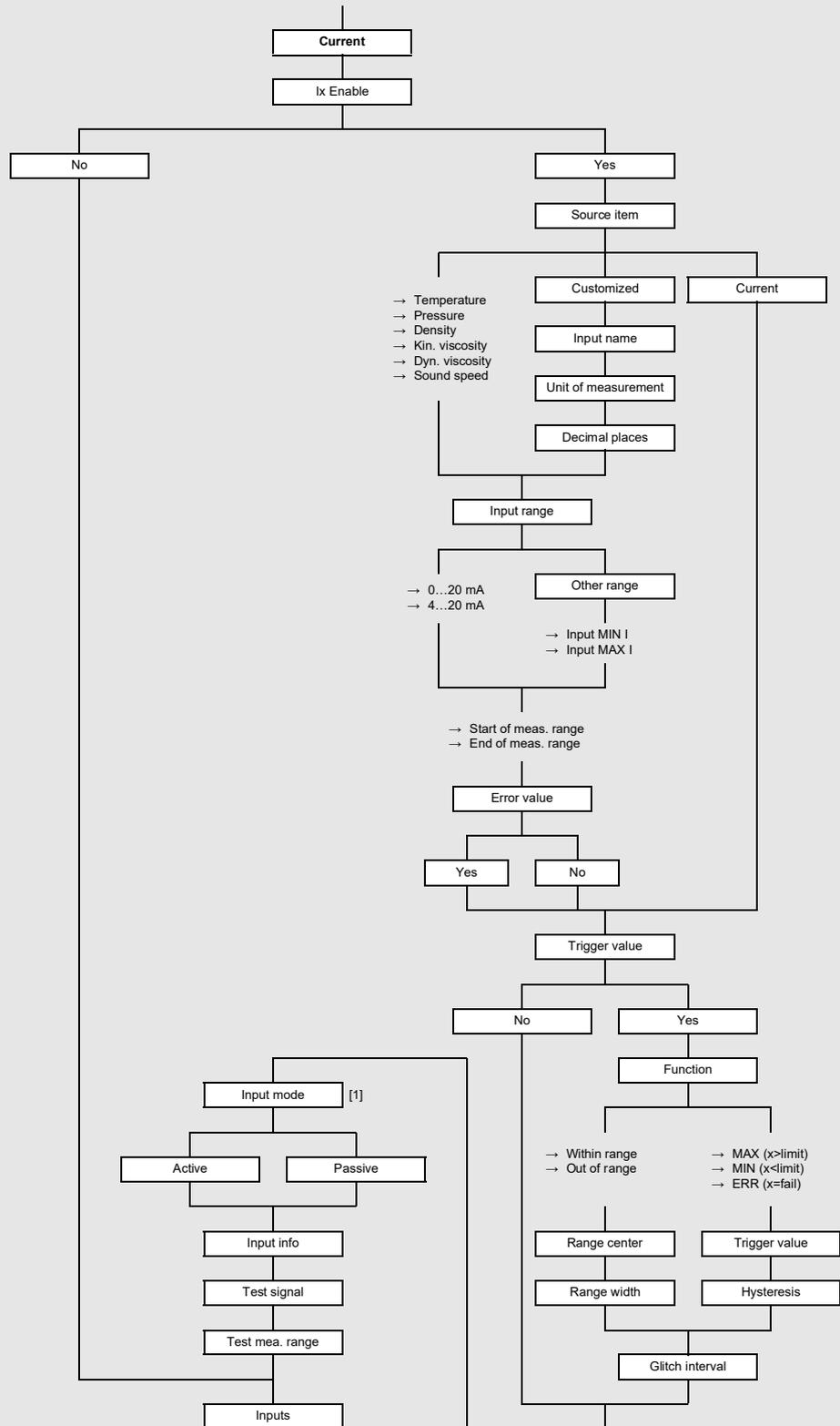
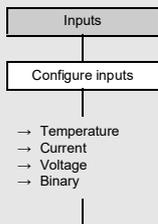


Configuration of inputs



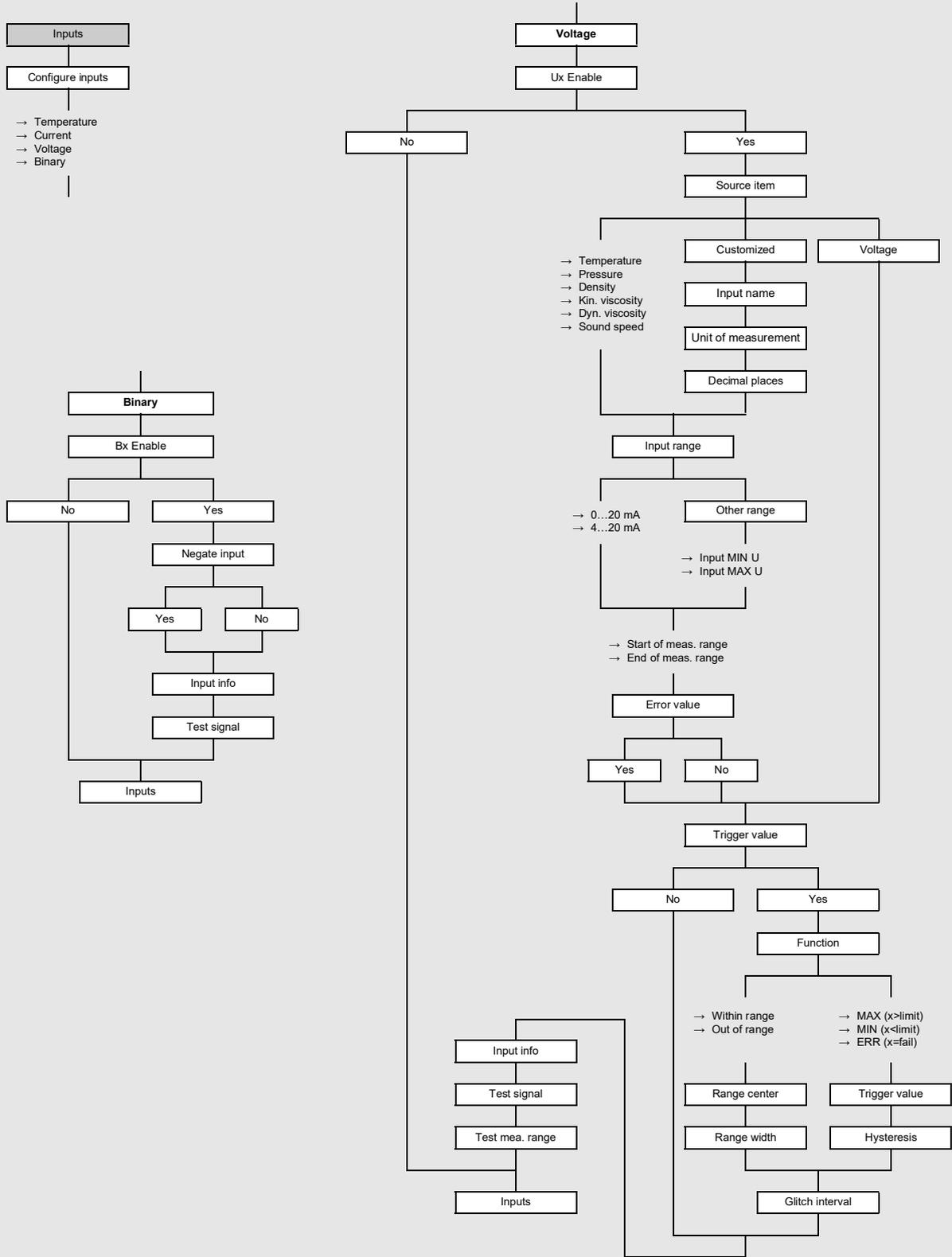
Legend
[3] only if enabled in the menu item Special functions > Dialogs/Menu

Configuration of inputs

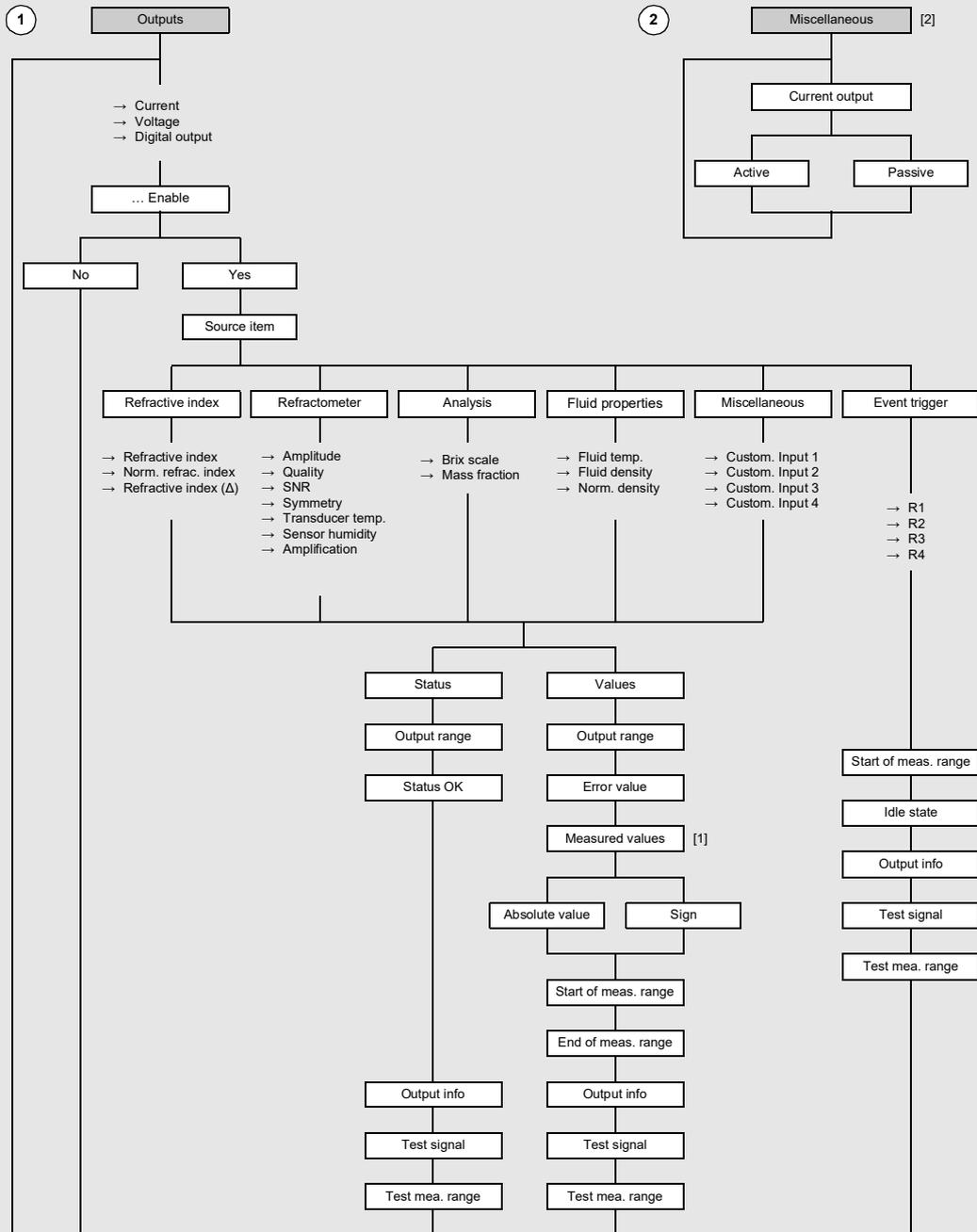


Legend
[1] only if supported by the hardware

Configuration of inputs

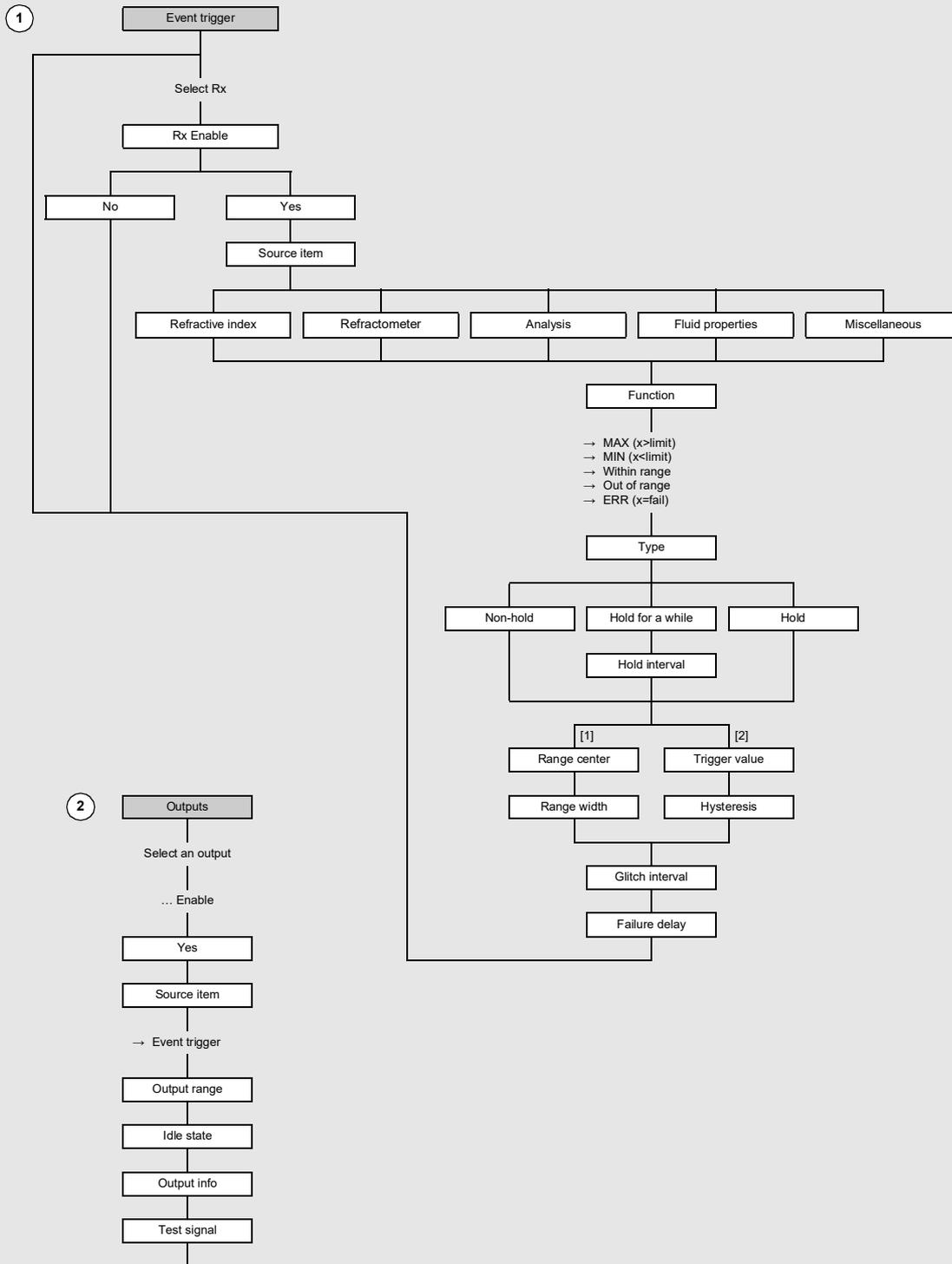


Configuration of outputs



Legend
 [1] requested only if the physical quantity can adopt a negative value
 [2] only if switchable current outputs are available

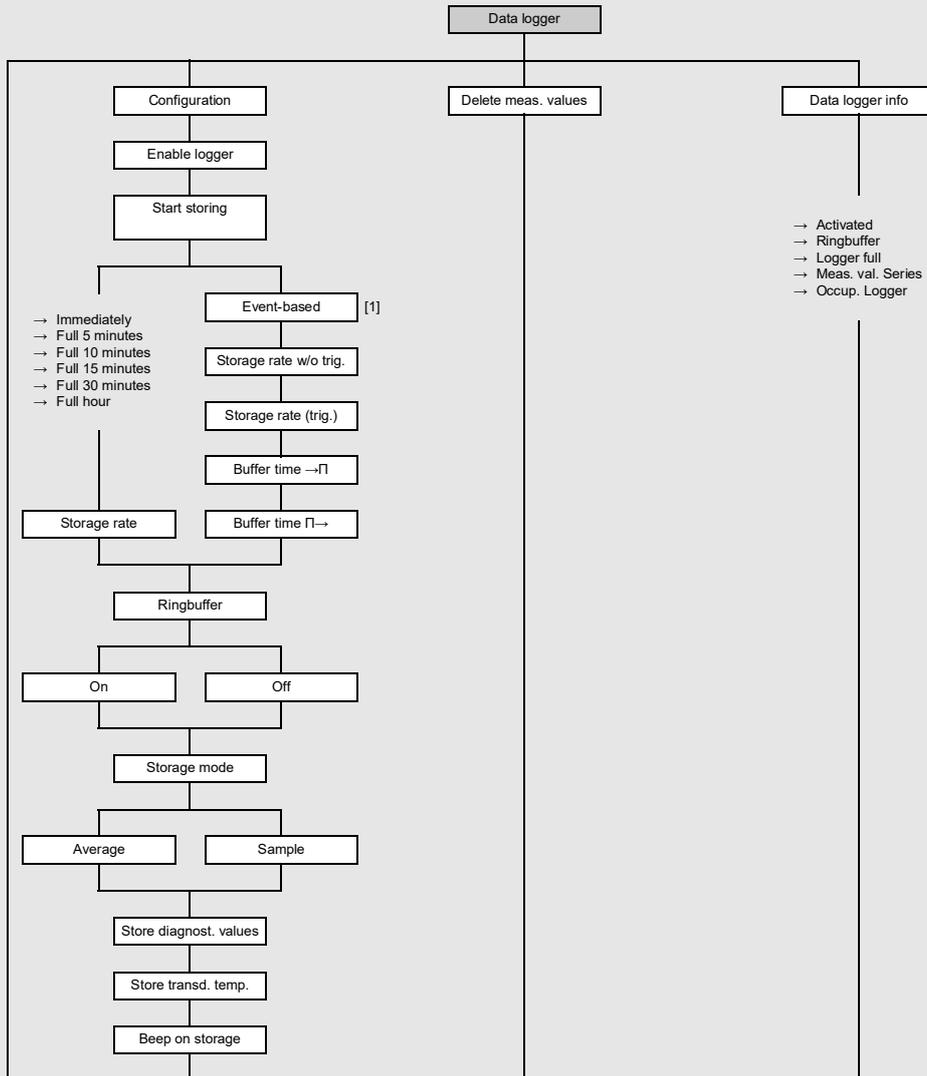
Event triggers



Legend

- [1] if Within range or Out of range has been selected as function
- [2] if MAX (x>limit), MIN (x<limit) or ERR (x=fail) has been selected as function

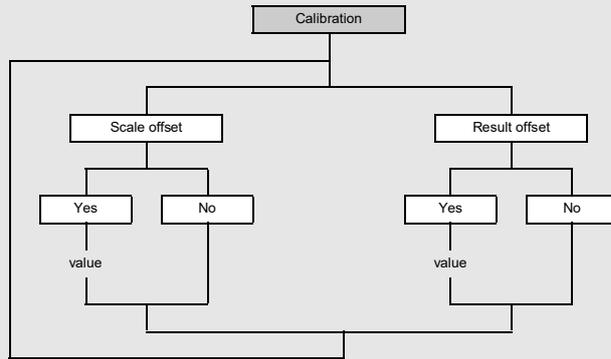
Data logger



Legend

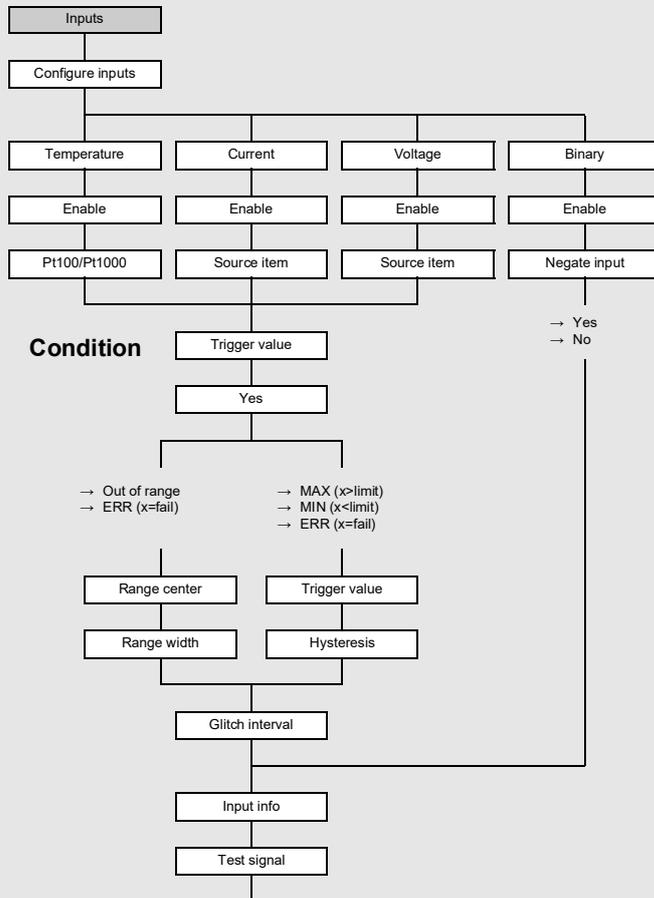
[1] list of parameterized triggerable inputs and event triggers

Calibration

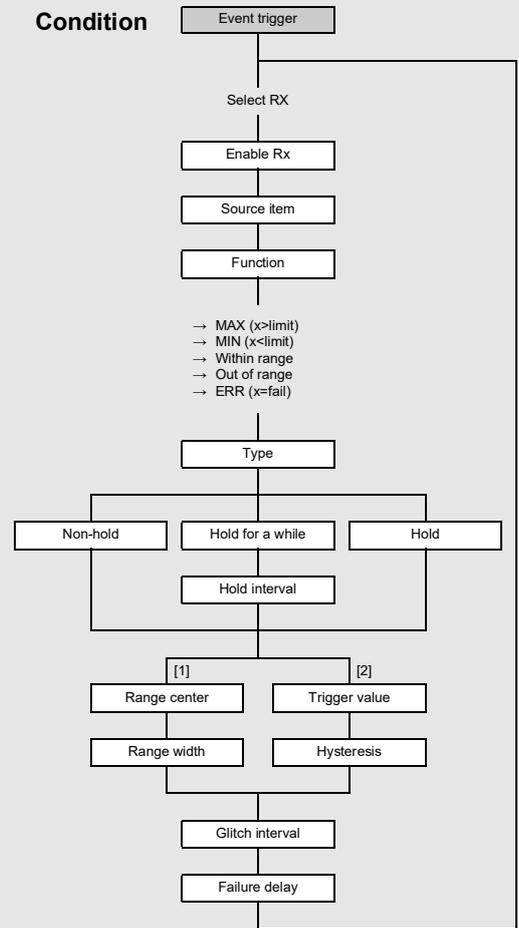


Event-based storing of measured values

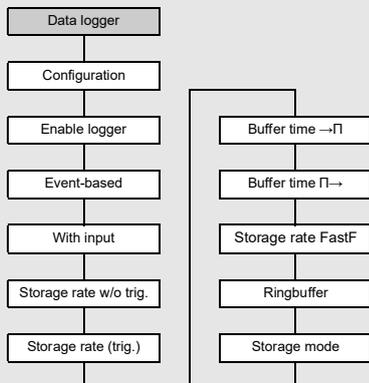
1 Trigger



Condition



2 Action



Legend

- [1] if Within range or Out of range has been selected as function
- [2] if MAX (x>limit), MIN (x<limit) or ERR (x=fail) has been selected as function

B Start-up protocol

Start-up

device			
sensor	PIOX R500-	ser. no.:	
transmitter	PIOX R721	ser. no.:	

measuring point (designation):

process fluid		
solvent		
physical quantity		
concentration	operating point:	
	range:	
other components		
fluid temperature		
ambient temperature		
pressure		

settings and measured values in the transmitter:

selected fluid in the transmitter	
--	--

characteristic curve of the fluid created by:

FLEXIM
 customer

measured values: one representative measured value for each typical process state at the measuring point (e.g., operating point, CIP)

process state	physical quantity	reference value ⁽¹⁾	T _{fluid}	n _D	humidity [%]	T _{dev}	amplitude	amplification	symmetry

⁽¹⁾ determined with (e.g., lab refractometer, type)

accuracy:

input of offsets:

no offset:

offset: Result offset _____

offset: Scale offset _____

outputs

	type	source item	min. value	max. value	output range [mA]	abs/sign	error [mA]	terminal
I1								P1+, P1-
I2								P2+, P2-
I3								P3+, P3-
I4								P4+, P4-

	type	source item	trigger condition	trigger value	trigger hysteresis	trigger duration	hold	0/1	terminal
R1									P5a, P5b
R2									P6a, P6b
R3									P7a, P7b

inputs

	type	source item	min. value	max. value	input range [mA]	error [mA]	terminal
I1							
I2							
I3							
I4							

notes

start-up completed on:

signature:

C Maintenance protocol

Maintenance

date: _____

device			
sensor	PIOX R500-	ser. no.:	
transmitter	PIOX R721	ser. no.:	

C.1 Visual inspection

- Clean the sensor. Remove any deposits or dirt on the window and biprism.
- Check the sensor head (the part in contact with the fluid). If there are any signs of corrosion, deep scratches or damages, especially on the gaskets, please contact FLEXIM and give a precise description of the problem.

The sensor head is intact: yes no: contact FLEXIM

- Check all gaskets. If the gaskets are swollen or brittle and cracked, send the sensor to FLEXIM to replace the gaskets.

The gaskets are intact: yes no: send the sensor to FLEXIM for repair

C.2 Functional test

measuring point (designation): _____

the composition of the fluid has not changed since the last start-up/maintenance
date: _____

a changed/new fluid is measured since: _____

type of change: _____

process fluid		
solvent		
physical quantity		
concentration	operating point:	
	range:	
other components		
fluid temperature		
ambient temperature		
pressure		

settings and measured values in the transmitter:

selected fluid in the transmitter	
--	--

characteristic curve of the fluid created by:

FLEXIM customer _____

measured values: one representative measured value for each typical process state at the measuring point (e.g., operating point, CIP)

process state	physical quantity	reference value ⁽¹⁾	T _{fluid}	n _D	humidity [%]	T _{dev}	amplitude	amplification	symmetry

⁽¹⁾ determined with (e.g., lab refractometer, type)

accuracy:

Comparison of the amplitude values

If the amplitude value measured during maintenance is far below the value measured at the start-up, for example, if the fluid is slightly cloudy, a cleaning of the sapphire optic is recommended.

$$\text{amplitude value}_{(\text{maintenance})} \leq 1/20 \text{ amplitude value}_{(\text{start-up})}$$

Notice!
Make sure that the material of the sensor (stainless steel 1.4571) and the gaskets of the sensor (see confirmation of order) are resistant against the solvent. The solvent also has to be suitable for the fluid.

cleaned with: _____

Check of the zero point (optional)

After the cleaning, we recommend to check the zero point. PIOX R500 is checked using deionized water.

- Select **Brix** in the menu item `Parameters\Fluid\Other fluid\Scale`.

default: Brix value = 0

operating temperature	Brix value	deviation

input of offsets:

- no offset:
- offset: Result offset _____
- offset: Scale offset _____

maintenance completed on:

signature:

D Conformity declarations

EU declaration of conformity according to low voltage directive

FLEXIM Flexible Industriemesstechnik GmbH

Boxberger Straße 4
12681 Berlin
Germany

declares as manufacturer under its sole responsibility that the transmitter **PIOX R721aa-NN0** and the transducer **R500 a = any**

comply with the relevant EU regulations and directives, including any amendments valid at the time this declaration was signed. This declaration of conformity is based on the following harmonized EU standards:

EU directive 2014/35/EU (low voltage directive) relating to the making available on the market of electrical equipment designed for use within certain voltage limits

EN 61010-1:2010/A1:2019 Safety requirements for electrical equipment for measurement, control, and laboratory use
Part 1: General requirements

EN 61010-2-030:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use
Part 2-030: Particular requirements for testing and measuring circuits

EU directive 2014/30/EU (EMC directive) relating to electromagnetic compatibility

EN 61326-1:2013 Electrical equipment for measurement, control, and laboratory use – EMC requirements
Part 1: General requirements

EN 55011:2009/A1:2010 Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics –
Limits and methods of measurement

EU directive 2011/65/EU (RoHS directive) on the restriction of the use of certain hazardous substances in electrical and electronic equipment

EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

FLEXIM GmbH

Signed for and on behalf of

Berlin, 2021-01-01

Place and date



Jens Hilpert
Managing Director

Operating Instruction

UMPIOX_R721V1-3-1-0EN

AN 25177

For more information: **Emerson.com**

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