# Instruction manual

Differential Pressure Transmitter PT-SXR 2

AIRFLOW

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# 1 Safety instructions

This section provides an overview of all important safety aspects for optimal protection of personnel as well as for safe and trouble-free operation.

## 1.1 Importance of the operatin instruction

This operating manual explains the function and handling of the PT-SXR 2 differential pressure transmitter. The operating instructions are part of the product and must be kept for the entire life of the device.

Any person assigned to carry out work on or with the equipment must have read and understood the operating instructions before starting work on the equipment. This also applies if the person in question has already worked with such or similar equipment or has been trained by the manufacturer.

These devices can pose a risk to persons and property due to improper use and incorrect operation. Therefore, every person who is entrusted with the handling of the equipment must be instructed and know the dangers. The operating instructions and in particular the safety instructions given therein must be carefully observed.

Be sure to contact the manufacturer if you do not understand any parts of it.

Oversee these operating instructions carefully:

- It must be kept at hand during the life of the equipment
- It must be passed on to subsequent staff
- Supplements issued by the manufacturer must be inserted

The manufacturer reserves the right to further develop this type of device without documenting this in each individual case. The manufacturer will be happy to provide you with information about the recency of these operating instructions.

You can find more technical information about your product at the following link: https://www.airflow.de/produkte/messgeraet/druckmessumformer-pt-sxr-2/.

## 1.2 Target group

This operating manual is aimed at electricians and fitters who are authorised to assemble, electrically connect, commission and label devices and systems in accordance with safety standards, as well as to the operator and manufacturer of the system.

The personnel must be provided with all applicable accident prevention and safety regulations that arise during the commissioning or installation of the system.

It must be ensured that personnel are familiar with all applicable accident prevention and safety regulations.

## 1.3 Symbol explanation

In this operating manual, the following emphasis is made on the dangers described in the handling of the system:

The following warnings are used in this owner's manual:

| | |
|---|---|
| ⚠ **DANGER!** | **DANGER!**<br>Failure to comply with this safety notice **will** result in death or serious bodily injury. |
| ⚠ **WARNING!** | **WARNING!**<br>Failure to comply with this safety advice **may** result in death or serious bodily injury. |
| ⚠ **CAUTION!** | **CAUTION!**<br>Failure to comply with this safety advice **may** result in moderate or minor bodily injury. |
| **NOTICE** | **NOTICE**<br>Failure to comply with this safety notice may result in property damage. |

## 1.4 Intended use

The PT-SXR 2 differential pressure transmitter is designed to measure differential pressure in clean rooms, machines, filter technology and heating, air conditioning, and ventilation systems (HVAC). It is used to measure the differential pressure of non-aggressive and non-flammable dry gases up to 100 kPa in non-explosive environments.

**⚠ WRNING!**

Failure to comply with this safety advice can result in serious bodily injury and damage to property.

- The device is not intended for outdoor use.
- The operating requirements stated on the nameplate and in the data sheet, in particular the permissible supply voltage, must be complied with.
- The appliance must only be handled in accordance with these operating instructions. Changes to the device are not permitted.
- The manufacturer is not liable for damage resulting from improper or improper use. In this case, the warranty claims also expire. Repair measures may only be carried out by the manufacturer.

**NOTICE**

The device is only used as intended if all instructions and information in this operating manual are observed.

- Only operate the device in perfect technical condition.
- Observe the relevant regulations for the prevention of accidents (e.g. accident prevention regulations).
- Store and transport the product in its original packaging, reuse plug caps if necessary.

## 1.5 Improper use

The use of the differential pressure transmitter outside the operating conditions described in the documentation and specified technical data and specifications is considered "not in accordance with the intended purpose".

The PT-SXR 2 is designed to operate as intended under normal environmental conditions (in accordance with EN/IEC/UL 61010-1), with the exception of an extended temperature range:

- Operation in the interior of buildings
- Operation at altitudes up to 2000 m above sea level
- Ambient temperatures deviating from the standard: 10 °C to 50 °C
- Maximum relative humidity 80% at temperatures up to 31 °C, decreasing linearly to 50 % relative humidity at 40 °C
- Supply voltage fluctuations up to ±10 % of nominal voltage
- Transient overvoltages up to the values of overvoltage category II

Any use of the device beyond its intended use and/or in any other way can lead to dangerous situations

- Submerged operation is not permitted.
- Exceeding the requirements set out in Chapter **6. Specifications** may result in personal injury or property damage.
- The device should be installed in such a way that it is not mounted unprotected or in an exposed position to avoid unintentional damage – for example by passenger traffic or transport processes.

## 1.6 Limitation of liability

The appliance must only be handled in accordance with these operating instructions. All information and information in this operating manual have been compiled considering the applicable standards and regulations, the state of the art and our many years of experience and knowledge.

The manufacturer assumes no liability arising from improper or improper use. In this case, the warranty claims also expire:

- Failure to comply with the operating instructions
- improper use
- improper installation
- non-intended use
- Use of untrained personnel
- Changes to the device
- Technical changes
- Unauthorized conversions

The user is responsible for conducting the commissioning in accordance with the safety regulations of the applicable standards and all other relevant state or local regulations regarding conductor dimensioning and protection, grounding, disconnectors, overcurrent protection, etc. The person who conducted the assembly or installation is liable for damage that occurs during assembly or connection.

## 1.7 Assembly, connection and commissioning

Qualified personnel may only conduct the installation and electrical connection of the device. It must be instructed and commissioned by the plant operator.

The PT-SXR 2 pressure transmitter is a precision measuring device and should be handled with care despite its robustness. Installation in the immediate vicinity of heat and radiation sources should be avoided. It is advisable to attach the device to a vibration-free wall in a vertical installation position (hose connections for pressure (+) and vacuum (-) point downwards).

Only instructed persons commssioned by the plant operator are allowed to operate the device.

| ⚠ **CAUTION!** |
| --- |
| Do not perform a functional test with compressed or breathing air. Devices with low measuring ranges will otherwise be damaged. |

The pressure connections may only be connected and disconnected when switched off. Protect the device from sunlight, otherwise measurement errors will occur. Special safety instructions are given in the individual chapters.

The appliance must only be opened in clean and dry environments.

## 1.8 Faults, Maintenance

Faults or damage to the appliance must be reported immediately to the specialist personnel responsible for the electrical connection.

The device must be taken out of operation by the responsible specialist staff until the fault has been rectified and secured against accidental use.

The device does not require any maintenance.

The appliance may only be cleaned from the outside with a damp cloth..

## 1.9 Repair

Replace the fuse:

To avoid unnecessary service and associated equipment failure, you can replace the fuse. The fuse can be removed by hand.

See figure in chapter **4. Electrical connection**

During the following steps, the device must be disconnected from the power supply.

To replace the fuse, follow these steps:

1. Make sure that the device is de-energized.
2. Pull the fuse up.
3. Then plug the new fuse back in accordingly.

Use only the following backup:

Miniature fuse TR5, inert, nominal current: 315 mA, nominal voltage 250 V, polarity is not to be considered.
Repair measures may only be carried out by the manufacturer.

## 1.10 Storing and transporting

The PT-SXR 2 differential pressure transmitter should always be stored in its original packaging and made available for assembly in its original packaging.

## 1.11 Disposal Notice

The electronic components of the device contain environmentally harmful substances and are also recyclable material carriers. The device must therefore be recycled after its final decommissioning. The environmental guidelines of the respective country must be observed for this purpose.

## 1.12 Product labelsing

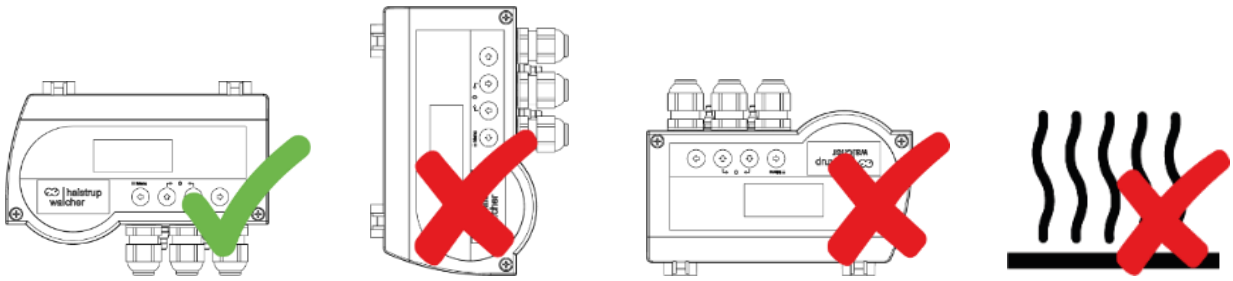
The warning icons included in this guide are for general safety and may not apply to this device without exception. Relevant symbols and notes are only valid in connection with the actual device configuration and the intended purpose.

| Symbol | Meaning |
|---|---|
|  | **Reference to further documentation**<br>Read the operating instructions and safety instructions before transport, installation, or commissioning |
|  | **Warning of dangerous electrical voltage**<br>Before working on the product, check whether all power connections are de-energized! |
|  | **Disposal of batteries, electrical and electronic equipment**<br>According to international regulations, batteries, rechargeable batteries and electrical and electronic equipment may not be disposed of with household waste.<br>The owner is legally obliged to dispose of these devices properly at the end of their service life.<br>WEEE: This symbol on the product, its packaging or in this document indicates that a product is subject to the said regulations. |
|  | **CE marking**<br>CE stands for "Conformité Européenne". The CE marking expresses the conformity of a product with the relevant EC directives. |
|  | **Risk of explosion**<br>The utmost caution is required when handling flammable gases! In combination with atmospheric oxygen, highly explosive mixtures can form. |
|  | **Class II**<br>Equipment with protection class II has reinforced or double insulation between active and touchable parts. |
|  | **Class III**<br>Equipment is designed to be supplied from a safety extra-low voltage (SELV) or a protective extra-low voltage (PELV) power source. |

# 2 Asssembly

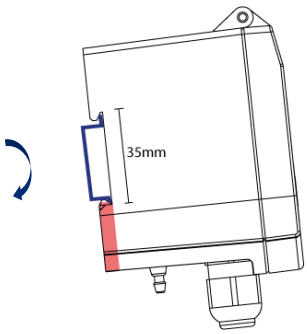
You can mount the device on a DIN rail or screw it to a wall.

Install the device with pressure connections facing downwards so that any condensation that may occur in the hoses does not run into the sensor.



Installation in the immediate vicinity of heat and radiation sources (e.g. radiators, solar radiation…) should be avoided, as this can lead to measurement errors.

## 2.1 Mount/Unmount on a DIN rail

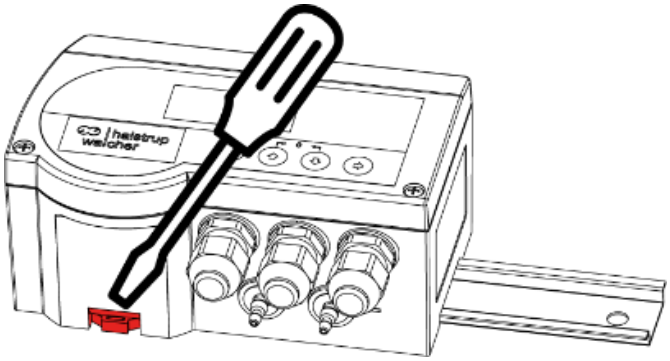



The housing is prepared for DIN rail mounting.

- Place the housing in the desired position with the top recess on the DIN rail.
- Snap it into place by pressing down on the device.

The device is now mounted.

| NOTICE |
| --- |
| To unmount the device, pull the red tab down using a screwdriver. |



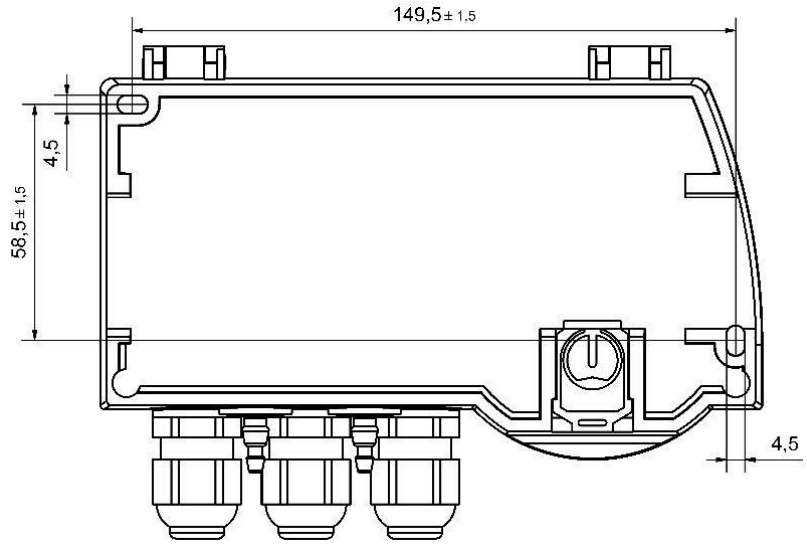
## 2.2 Wall installation

You can attach the device to the wall with 2 screws.

- Prepare the drill holes.
- Place the device against the wall.
- First, screw the right screw into the wall and do not tighten it all the way yet.
- Screw in the left screw.
- Screw both screws into the wall, do not tighten them all the way yet.
- Use the slotted holes for alignment/adjustment.
- Then tighten all the screws tightly.

The device is now installed on the wall.

The following illustration shows the rear view of the device with drilling distances and mounting points.




## 2.3 Torque values during device assembly

The following torque values must be observed when installing the PT-SXR 2:

| Designation | Tightening torque in Nm |
|---|---|
| **Cover screw** | 0,75 |
| **Cable gland** | 0,75 |
| **M12-plug** | 0,6 |
| **Clamping fitting** | Depending on the materials used, it is recommended to hold the fitting in place with a second wrench |

# 3 Device Description

## 3.1 Description

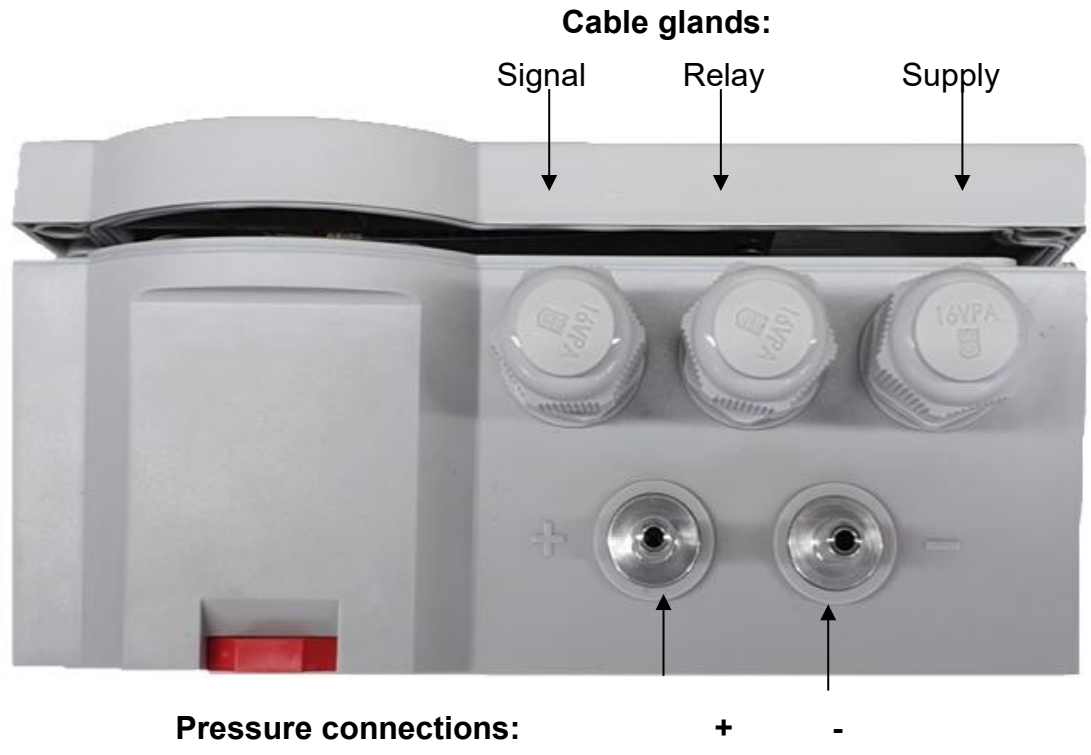
The functions of the PT-SXR 2 at a glance:

- Measurement of pressure differences
- Derivation of volume flow, mass flow, and flow velocity
- Optional temperature detection
- Optional detection of absolute pressure (dynamic or static)
- Two analogue outputs and two freely configurable switching outputs
- USB-C configuration port for PC connection
- Real-time data reading and configuration with "Start-Up Tool P 2x.2"

The PT-SXR 2 is a high-precision measuring device for detecting pressure differences in technical systems. Based on this pressure data, it automatically calculates volume flow, mass flow and flow velocity.

Optional temperature and absolute pressure sensors can be dynamically or statically integrated to further increase measurement accuracy. The device can be integrated into control and automation systems via the two analogue and freely configurable switching outputs. With the USB-C port, you can connect the PT-SXR 2 to a PC and use the "Start-Up Tool P 2x.2" software for real-time visualization and user-friendly configuration.

## 3.2 Frontal view



## 3.3 Status-LED

The green LED "ON" informs about the operating status of the PT-SXR 2

| LED status | Operating status |
|---|---|
| LED lights up continuously | Device in normal operation |
| LED flashes slowly (0.5 Hz) | There is an operational problem:<br>• Negative or positive pressure (± 120 % of the measuring range)<br>• Undervoltage supply<br>• Short circuit at the voltage output (fault detection active at output voltages > 1 V)<br>• Line break at the current output (fault detection active at output currents > 0 mA) |
| LED flashing (1 Hz) | Performing firmware update |
| LED 800 ms ON and 200 ms OFF | EEPROM Error |
| LED 20 ms ON and 980 ms OFF | No device firmware available<br>Troubleshooting: Loading a device firmware, see chapter **5.9 Firmware update** |
| LED flashes quickly (2 Hz) | Zeroing active |

## 3.4 Configuration interface

The PT-SXR 2 can be parameterized via the internal USB-C interface, and the actual values can be displayed. The prerequisite is a USB data connection cable.

The PC software can be found under https://www.airflow.de/downloads/.

The minimum requirement for the trouble-free operation of the PC software is the installation of .NET Framework 4.8.

The PT-SXR 2 is automatically detected when connected to the PC (from Windows 10 onwards) and the device settings are read. There is no need to install drivers.

## 3.5 Zeroing

Zeroing corrects for deviations caused by external influences such as temperature or location to ensure accurate readings. It can be triggered manually, externally, or time-controlled, whereby the current zero-point displacement is recorded and factored into the pressure measurement. During zeroing, the pressure measurement is inactive. The outputs are kept at the last measured value.

A positive edge at the External Zeroing input triggers the zeroing.

**NOTICE**

The best possible measurement accuracy is achieved at a room temperature of 23 °C.

### 3.5.1 Zeroing Interval

The distance between two zeros can be adjusted via the software. Cyclic zeroing can also be disabled, but this is not recommended.

### 3.5.2 External Zeroing

The devices also have an input to start a zeroing from the outside. With this it is possible to determine the time of zeroing depending on external regulations.

For connection assignments, see Chapter **4.2.3 Connection of input and output signals**

**NOTICE**

If zeroing is invoked, it will be executed in any case. It is irrelevant whether the zero adjustment has been deactivated or the PT-SXR 2 is in the menu.

## 3.6 Overpressure protection

The PT-SXR 2 has an internal overpressure protection that protects the precision pressure load cell from destruction. (Overload range: 200 times [max. 400 kPa]). Applied overpressure/negative pressure (±120 % of the measuring range) leads to zeroing of the load cell.

In the case of positive overpressure, the device outputs the maximum value of the set output stroke and in the case of negative overpressure the minimum value.

# 4 Electrical connection

The supply lines for the device's power input must be protected by an appropriate fuse. This protection may be provided by the building installation or implemented at another suitable location. The fuse rating must be selected in accordance with applicable legal and local regulations, considering the conductor cross-section and the installation method.

**NOTICE**

Note that the maximum power consumption may increase when multiple switching outputs are activated simultaneously (see **4.1 Power consumption**).

For device versions equipped with an M12 connector, the maximum permissible load of 2.5 A must be observed.

Trained specialists may only make the electrical connection.

## 4.1 Power consumption

The power consumption of the device's electronics is a maximum of 4 W with DC supply and 8 VA with AC power supply.

For variants in which the switching signal is routed through the M12 connector, the design of the supply line must also take the switching power into account. The switching power depends on the application and can reach up to 60 VA for the relay option and up to 8 VA for the semiconductor-switch option.

For variants with cable glands, the switching power depends on the applied voltage and the current flowing. The switching power is determined by the specifications of the switching elements:

- Electromechanical relays: up to 250 V AC or 24 V DC, switching current up to 6 A (maximum switching power 1500 VA per contact for AC, 144 W for DC).
- Semiconductor switches: up to 24 V AC or DC, switching current up to 0.325 A (maximum switching power 8 VA per contact).

The power consumption for the switching contacts may double if both switching contacts are used.

## 4.2 Preparing supply voltage through cable glands

**⚠ WARNING!**

Inside the device there may be electrical conductors with a voltage that is dangerous to touch (option relay or corresponding power supply).

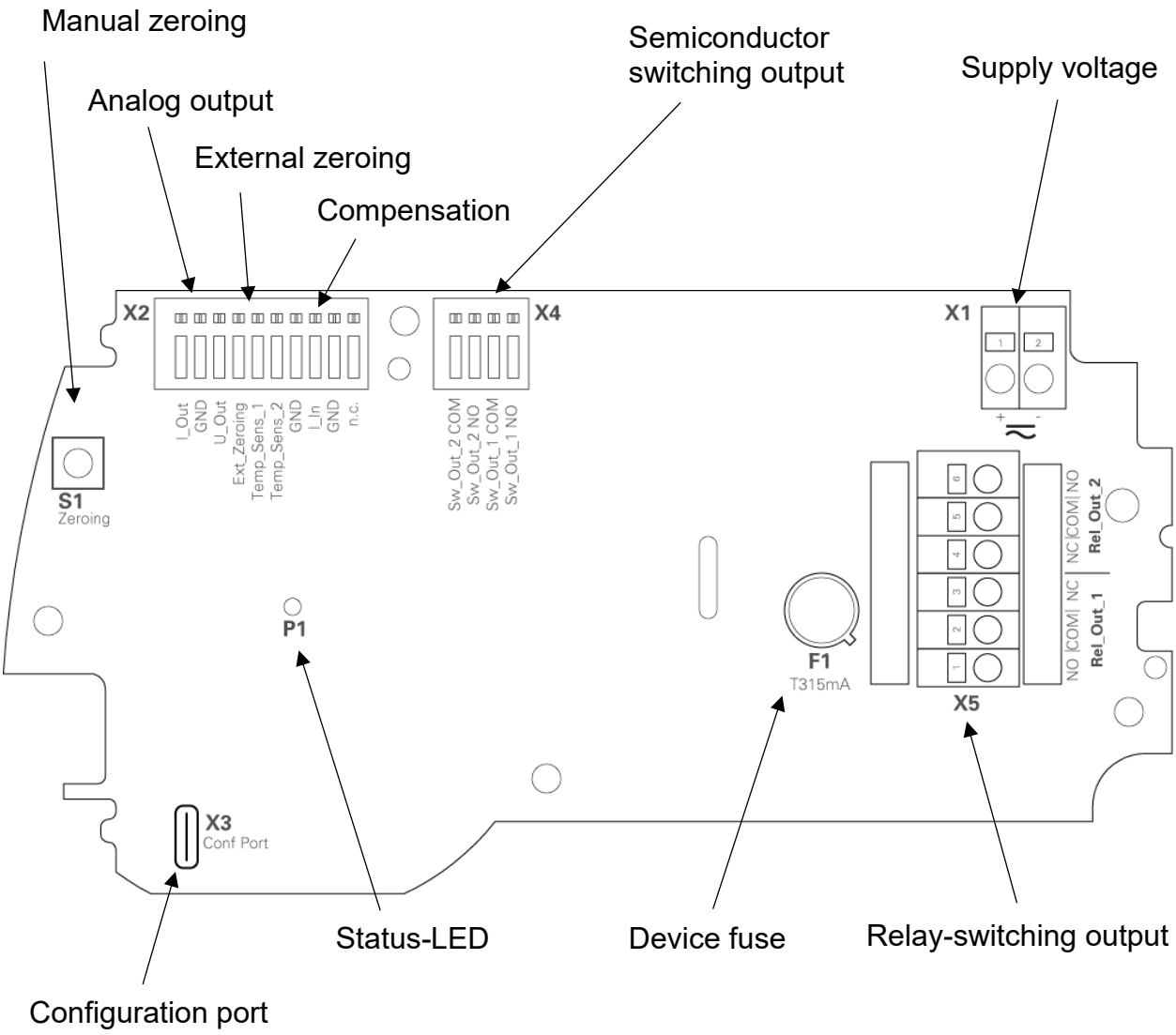
**⚠ WARNING!**

Before opening, the device must be de-energized and secured!

**⚠ WARNING!**

The device may only be opened and electrically connected by qualified personnel.

For devices with cable glands, you can route the cables through the housing to the terminals for the supply voltage. Below is the illustration of the internal terminals.




The figure also shows optional components.

If the relay option has been ordered, the terminals for relays (X5) are equipped on the PCB; the component for the semiconductor switch (X4) is not present in this case.

If the relay option was not ordered, the terminal for the semiconductor circuit (X4) is equipped instead, while the components for relays (X5) are missing.

### 4.2.1 Selection of the cable cross section

X2 and X4

The permissible conductor cross-sections for terminals X2 and X4 are specified as follows:

- 0.2 mm² to 1.0 mm² when using ferrules
- 0.2 mm² to 1.5 mm² when connecting without ferrules and using solid conductors

X1 and X5

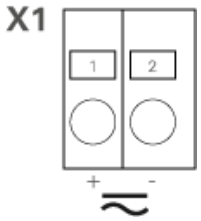
For terminals X1 and X5, the following conductor cross-sections continue to apply:

- up to 2.5 mm², with or without ferrules

The specified conductor cross-sections apply equally to solid and flexible conductors.

For a reliable connection, a stripping length of 10 mm is recommended; when using ferrules, a ferrule length of 10 mm should also be selected.

### 4.2.2 Connection of the supply voltage

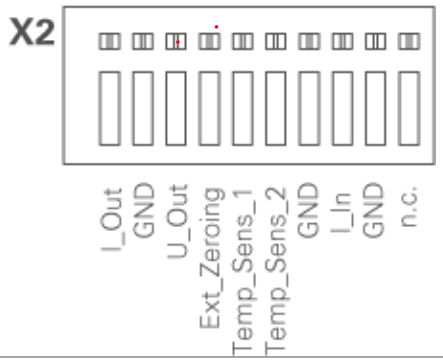



| Designation | Description |
|---|---|
| + | Connect to DC supply "+" on the left side. |
| - | For DC supply "-" connect on the right side. |

With alternating voltage, polarity does not matter.

The maximum values of the supply voltage depend on the variant and can be found in the data sheet.

### 4.2.3 Connection of inüut and ouput signals

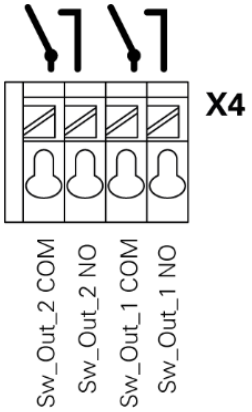



| Designation | Description |
|---|---|
| **I_Out** | Terminal through which the configured current signal is output. |
| **GND** | Ground |
| **U_Out** | Terminal through which the configured voltage signal is output. |
| **Ext_Zeroing** | Terminal, which can be used to start a zeroing of the device by means of a 24 V signal. (Attention: In variants with galvanic isolation, it must be noted that the ground of the supply has no connection to the ground of this terminal.) |
| **Temp_Sens_1/2** | Terminals for a PT100 or PT1000 temperature sensor. (Option T compensation or P/T compensation) |
| **GND** | Ground |
| **I_In** | Connection terminal for an active temperature sensor with 0/4-20 mA output (option T compensation or P/T compensation) |
| | |

### 4.2.4 Connection of the semiconductor switches (option)

The semiconductor switches may be loaded with a maximum of 24 V AC/DC and 0.325 A. The supply line must be designed according to the requirements.

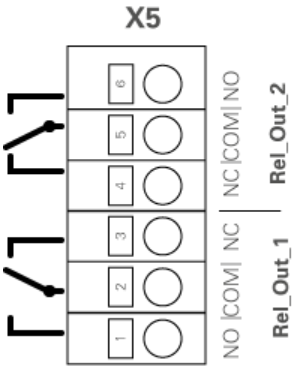
| Designation | Description |
|---|---|
| **Sw_Out_2 COM** | 1st switching port of the second semiconductor switch |
| **Sw_Out_2 NO** | 2.th switching terminal of the second semiconductor switch |
| | |
| **Sw_Out_1 COM** | 1st switching terminal of the first semiconductor switch |
| **Sw_Out_1 NO** | 2nd switching port of the first semiconductor switch |




### 4.2.5 Connection of the relays(option)

The relays may be loaded with a maximum of 250 V AC / 24 V DC and 6 A. The supply line must be designed according to these requirements. The recommended minimum load for reliable switching performance is 0.5 W.

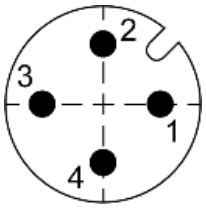
| Designation | Description |
|---|---|
| **Rel_Out_2:** | |
| **6: NO** | Normally open (working contact) of relay 2 |
| **5: COM** | Centre contact of relay 2 |
| **4: NC** | Normally closed (idle contact) of relay 2 |
| **Rel_Out_1:** | |
| **3: NC** | Normally closed (idle contact) of relay 1 |
| **2: COM** | Centre contact of relay 1 |
| **1: NO** | Normally open (working contact) of relay 1 |



## 4.3 Supply voltage through connection plug

You can also optionally obtain the device with a connection plug.

**Prerequisite**:
For connection, please provide a cable with a suitable socket for the 4-pin, A-coded M12 plug. Plan with the following pin assignment of the connector (top view from the outside):

| | | **Option: supply, analogue output and ext. zeroing** | **Option: Power supply, analogue output and switching output** |
|---|---|---|---|
|  | 1 | Supply voltage | Supply voltage |
| | 2 | Output | Output |
| | 3 | Ground | Ground |
| | 4 | Ext. Zeroing | Switching |

**Supply voltage:**
When supplied with DC voltage, connection for the positive supply. When using AC voltage, polarity does not have to be considered.

**Ground:**
When supplied with DC voltage, connection of the ground potential. When using AC voltage, polarity does not have to be considered.

**Output signal:**
Configured output signal (voltage/current) related to ground.

**Ext. Zeroing (Option):**
Input to trigger a zeroing. This is triggered by applying 24 V DC in relation to the ground of the analogue plug.

**Switching signal (option):**
Normally open contact of the switching element, the second contact is connected to the supply voltage (pin 1) at the factory.
If the switching signal option is used with the semiconductor switch option, the user must ensure that the current via the switching contact does not exceed 0,325 A. Failure to comply with this requirement can lead to permanent damage to the device!
If the switching signal option is used with the relay option, the user must ensure that the current via the switching contact does not exceed 2.5 A. Failure to comply with this requirement can lead to permanent damage to the device!

## 4.4 Starting conditions of the measuring system

To achieve the best possible accuracy, the device needs a **run-in time of about 30 minutes** after switching on until the temperatures of the electronics and sensor have levelled out. During the process, the device should remain completely locked. The output signal can behave unstable during this time.

After the break-in period, the device should be zeroed to compensate for any offset drift that has occurred.

# 5 Functionality

Each PT-SXR 2 unit can be customized by the user, in addition to the factory pre-configuration. There are **two options** available for this:

PC software "Start-Up Tool P 2x.2"

The device can be comprehensively configured and parameterized via the PC software.

In-device configuration (for devices with display)

If the device has an integrated display, the configuration can alternatively be carried out directly via the controls on the device.

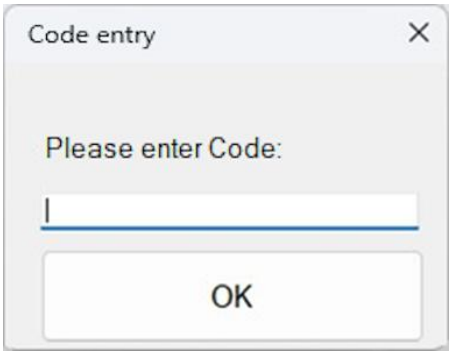
## 5.1 Uster interface




The PC software is used to configure, parameterize and monitor the device. After starting the software and successfully connecting to the device, various functional areas are available to the user via the main menu.

| Menu item | Description |
|---|---|
| **File** | Load existing device configurations onto the device and save current configurations to the local machine. |
| **Language** | Selecting the display language of the PC software.<br>• German<br>• English<br>• Italian<br>• French |
| **Parameterization** | Carrying out the parameterization of the connected device. |
| **Device** | Configuration of device-specific settings as well as display settings. In addition, firmware updates can be carried out here. |
| **Measured data** | Display of the recorded measurement data in diagram form. The pressure measurement is displayed by default; other measurands must be configured beforehand. |
| **Log** | View a log to track historical data and events. |

## 5.2 Login




If Access Protection (see **5.8 Device settings**) is enabled, a code (numeric, 0-999999) must be entered before accessing certain features.

A temporary deactivation of access protection is possible via a special sequence within the PC software "**Start-Up Tool P 2x.2**". The exact procedure for entering this sequence is documented in the software itself.

## 5.3 Alerts

The following warning messages may be displayed on the device. From firmware version 1.010 and PC software version 1.010 onwards, these warning messages are additionally displayed in plain text in the PC software.

**NOTICE**

The prerequisite for communication between PT-SXR 2 and the PC software is a USB data connection cable.

| Alerts | Potential cause | Possible solution |
|---|---|---|
| **Scaling temperature input implausible** | Upper and lower scale values of the temperature input are at the **same** value | Properly scale **temperature input under "**Parameterization**" > "**Compensation" |
| **Scaling voltage output implausible** | Upper and lower scaling values of the voltage output are at the **same** value | Properly scale voltage output under "**Output**"->"**Voltage output**" |
| **Scaling current output implausible** | Upper and lower scaling values of the current output are at the **same** value | Scale current output properly under "**Output**" ->"**Current output**" |
| **Switching output 1/2 threshold value over measuring range** | The threshold value of the switching output is set to a value that **is not** within the measuring range of the device | • Set threshold value within the measurement range<br>• Order a device with a larger measuring range |

| Alerts | Potential cause | Possible solution |
|---|---|---|
| **Switching output 1/2 hysteresis over measuring range** | Hysteresis of the switching output is at a value that is **not** within the measuring range of the device | • Set hysteresis within the measuring range<br>• Order a device with a larger measuring range |
| **Dynamic pressure implausible** | The value of the dynamic pressure is **less** than 1% of the measuring range of the device | • Set dynamic pressure within the measuring range<br>• Order a device with a smaller measuring range |
| **Value assigned to dynamic pressure is 0** | The value of the dynamic pressure is set to 0 | Enter a value for the dynamic pressure |
| **Correction factor is 0** | • The correction factor has been set to 0<br>• Dynamic pressure determination pressure >0 and calculated value =0 | • Set the correction factor to **>0**<br>• Configure dynamic pressure determination correctly |
| **Lower limit of temperature input undercut** | • PT100/1000 Sensor Resistance Too Low (**<80/800** Ω)<br>• 4-20 mA Input Current **<4** mA | • Dissolve short circuit<br>• PT100/1000 Sensor Increase Resistance<br>• Scale current input or select correct sensor type under "**Parameterization**"->"**Compensation**" |
| **Upper limit of temperature input exceeded** | • PT100/1000 Sensor Resistance Too High (**>138.5/1385** Ω)<br>• Input current **>20** mA | • PT100/1000 Reduce Resistance<br>• Scale current input or select correct sensor type under "**Parameterization**"->"**Compensation**" |
| **Switching output alarm sound exceeds 1000ms** | Alarm tone of the switching outputs have a warning tone which totals **>1000** ms | Set the alarm sound so that it results in a total **of <=1000** ms. |
| **Colour change switching output 1/2 configured, but switching output 1/2 deactivated** | Colour switching under "**Display**" enabled but "**Output**" >"**Switching output1/2**" disabled | • Activate switching output<br>• Disable colour switching for switching output |
| **Undervoltage!** | Supply voltage **<17** V | Set the supply voltage to 24 V |

| Alerts | Potential cause | Possible solution |
|---|---|---|
| **Overvoltage!** | Supply voltage **>40** V | Set the supply voltage to 24 V |
| **Overpressure/negative pressure detected!** | **>120 %/<-120 %** of the pressure measurement range is at the device | • Relieve pressure<br>• Order a device with a larger measuring range |
| **Fault current output** | Power output is **open** | • Connect the power output<br>• Disable power output |
| **Voltage output error** | Voltage output is **shorted** | • Cancel short circuit<br>• Disable voltage output |

## 5.4 Device Info

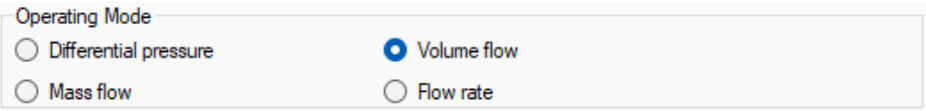
In the PC software, the device information is displayed from left to right in the following order:

| Field | Description |
|---|---|
| **Designation** | Type designation of the device. |
| **Variant number** | Factory-assigned number to identify the specific device variant. |
| **Serial number** | Unique serial number of the device for traceability. |
| **Version** | Currently installed firmware version of the device. |

## 5.5 Application

### 5.5.1 Mode

The PT-SXR 2 supports various operating modes, which can be selected depending on the application. The operating mode is selected via the PC software or, in the case of devices with a display, directly on the device.



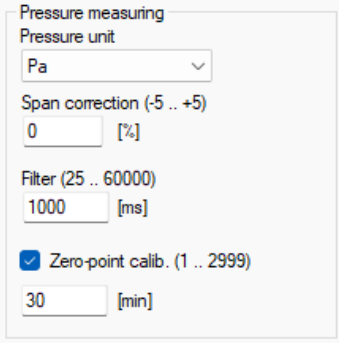

The following operating modes are available:

- Differential pressure
- Volume Flow
- Mass flow
- Flow Rate

**NOTICE**

The differential pressure measurement forms the basis for all other operating modes and can therefore always be parameterized. The conversion into volume flow, mass flow or flow velocity is carried out using a characteristic curve.
See chapter **5.5.3 Characteristic curve calculation**

### 5.5.2 Pressure measurement



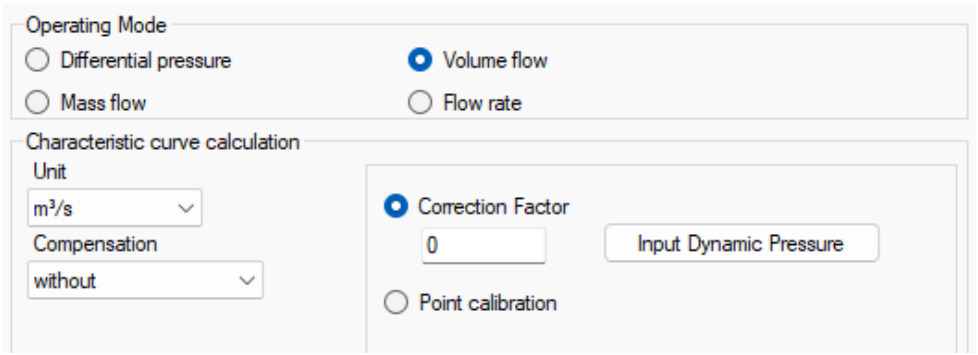
In this field, basic settings for differential pressure measurements and the zeroing interval can be made. The following options are available:

| Function | Description |
|---|---|
| **Pressure unit** | Selection of the physical unit to represent the differential pressure. Available units:<br>• Pascal (**Pa**)<br>• Hectopascal (**hPa**)<br>• Kilopascal (**kPa**)<br>• Millibar (**mbar**)<br>• Millimeters of water column (**mm$H_2O$**)<br>• Millimeters of mercury (**mmHg**)<br>• Pounds per Square Inch (psi)<br>• Inches of water column (**in $H_2O$**)<br>• Inches of mercury (**inHg**) |
| **Span correction** | Enables linear correction of the measurement span in the range of **-5 % to +5 %.** |
| **Filter** | Smoothing of the measured pressure values by means of an adjustable time constant. The values are filtered before output to the display and analog output. Setting range: **25 ms – 60000 ms** |
| **Zeroing Interval** | Determination of the time interval for automatic zero point adjustment. The input is done in **minutes**. |

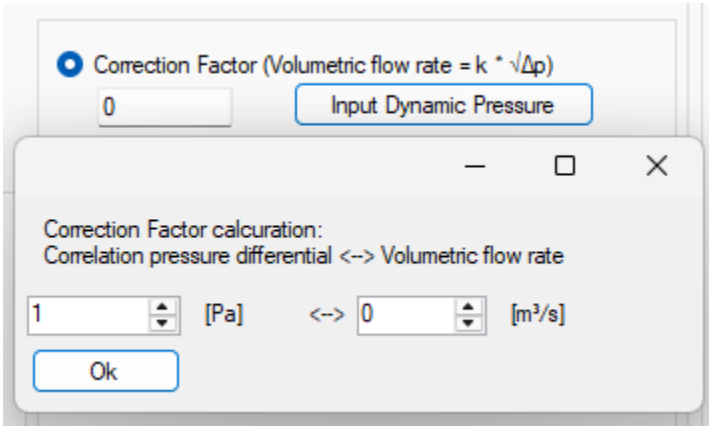
### 5.5.3 Characteristic curve calculation

To calculate volume flow, mass flow or flow velocity based on the differential pressure measurement, the parameterization of a characteristic curve is required. This characteristic curve establishes the relationship between the measured differential pressure and the desired physical quantity. This characteristic curve can be determined using two different methods:

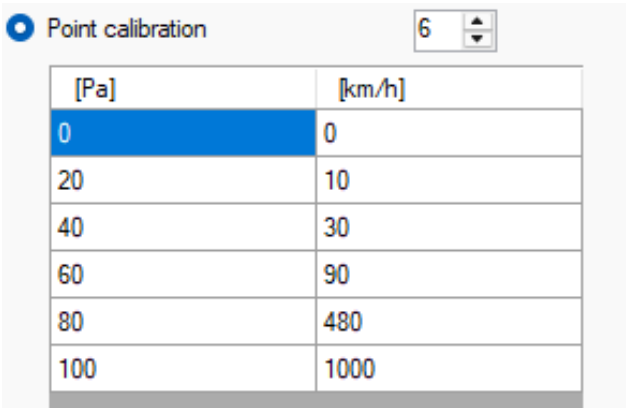
| Method | Description |
|---|---|
| **Correction factor** | Scaling the calculated values by multiplying them by a user-defined correction factor. This method is suitable for applications with known flow characteristics. It can be determined in two ways and entered in the PC software |
| **Point Calibration** | Creation of an individual characteristic curve by entering up to 20, and at least 2 measuring points (pressure-value pairs). This method enables a more precise mapping of flow behaviour influenced by circumstances (e.g. canal routing). |




The **correction factor** can be determined in advance with the help of the manufacturer's specifications / design of the system and then entered manually in the software.




Alternatively, the **correction factor** can be calculated directly in the software. For this purpose, the ratio between a measured differential pressure and the corresponding reference value (volume flow, mass flow rate or flow rate) is used:




In addition to using a correction factor, the characteristic curve for calculating volume flow, mass flow or flow rate can also be determined by a multi-point calibration.

In **point calibration**, the characteristic curve is defined by entering several measuring points. Each point consists of a measured differential pressure value and the corresponding reference value (e.g. volume flow). The software interpolates between these points to enable precise mapping of unconventional flow characteristics.

| Function | Description |
|---|---|
| **Unit Volume Flow** | Selection of the unit for the representation of the **volume flow**:<br>• Cubic meter per second (m3/s)<br>• Cubic meter per minute (m3/min)<br>• Cubic meter per hour (m3/h)<br>• Cubic foot per minute (cfm)<br>• Cubic foot per hour (cfh) |
| **Unit Mass Flow** | Selection of the unit for the representation of the **mass flow**:<br>• Kilograms per second (kg/s)<br>• Kilograms per minute (kg/min)<br>• Kilograms per hour (kg/h)<br>• Pounds per second (lbs/s)<br>• Pounds per minute (lbs/min)<br>• Pounds per hour (lbs/h) |
| **Unit Flow Rate** | Selection of the unit for the representation of the **flow rate**:<br>• Meters per second (m/s)<br>• Miles per hour (mph)<br>• Feet per second (fps)<br>• Feet per minute (fpm)<br>• Kilometers per hour (km/h) |

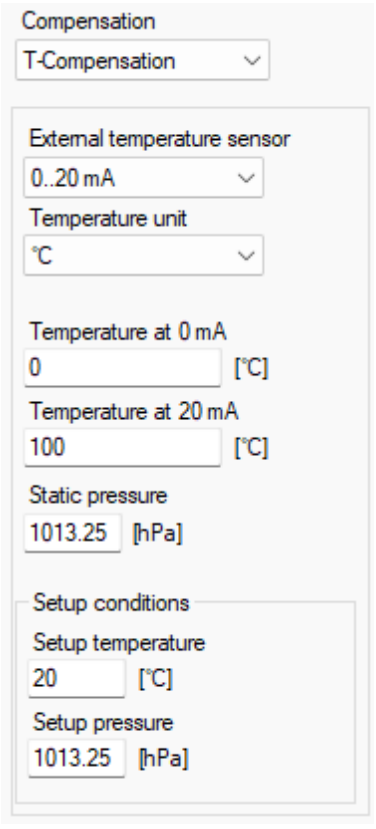
| Function | Description |
|---|---|
| **Correction factor** | Factor for calculating the flow quantity from the differential pressure. Can be entered manually or determined from known measured values. (**Dynamic pressure determination**) |
| **Dynamic pressure determination** | Calculation of the correction factor by entering a known differential pressure and the associated volume flow, mass flow or flow velocity. |
| **Point Calibration** | Creation of an individual characteristic curve by entering several measuring points (differential pressure and associated flow value). The software interpolates between the points for precise mapping of nonlinear flow conditions. |
| **Compensation (optional)** | Activation of compensation to consider temperature and/or static pressure. For more information, see section T or P/T compensation. |
| **Creep Suppression** | Setting for suppressing miniscule calculated values in the lower measuring range.<br>This parameter specifies the value for creep suppression in percent. If the measured pressure falls below this value, the calculated variable (volume flow, mass flow, or flow velocity) is set to zero. |

### 5.5.4 Compensation

The compensation function is used to correct the density in relation to the medium temperature and static pressure when calculating the volume flow, mass flow, or flow velocity.

The temperature is measured using an additional temperature sensor (not included in the scope of delivery).

The static pressure is determined using an integrated pressure sensor. The measuring range extends up to 2000 hPa abs.



| Function | Description |
|---|---|
| **Compensation** | Choice between T-compensation (temperature only) and PT compensation (temperature and static pressure).<br>Both variants require an external temperature sensor. |
| **External temperature sensor** | Temperature compensation is provided via an external input (0/4–20 mA or PT100/PT1000).<br>For more information see chapter **4.2.3 Connection of input and output signals** |
| **Temperature Unit** | Temperature Unit Selection:<br>• Degrees Celsius (°C)<br>• Degrees Fahrenheit (°F)<br>• Kelvin (K) |
| **Scaling temperature sensor** | Freely definable temperature range for the 0/4–20 mA input. |
| **Set up temperature** | Determination of the reference temperature for the calculation of the standard value. |
| **Set up pressure** | Determination of the reference pressure for the calculation of the standard value. |
| **Static Pressure** | Input or measurement of the current static pressure for pressure compensation. |

**NOTICE**

When calibrating the measuring section with active compensation, the actual prevailing installation conditions in terms of temperature and static pressure must be specified.

There are two different compensation methods to choose from:

1. T-Compensation

   With T-Compensation, the influence of temperature on air density is corrected using an additional temperature sensor.

   It is also possible to compensate for static pressure that deviates from the setup conditions. For this purpose, the static pressure during operation must be entered in the ‘Static pressure’ field.

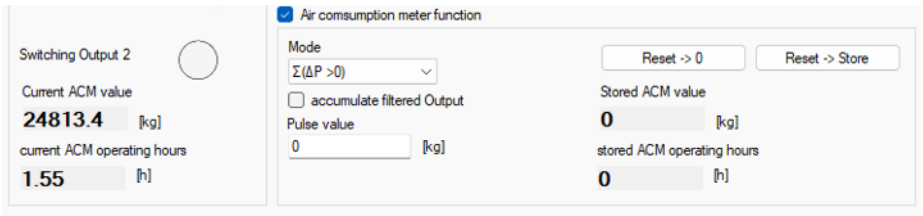
   If no static-pressure compensation is required, the ‘Static pressure’ and ‘Setup pressure’ fields must be set to the same value.

2. **P-/T-Compensation**

   P/T compensation corrects the effects of temperature and static pressure on air density.

   An additional temperature sensor is required for temperature measurement, while static pressure is measured by an internal sensor

### 5.5.5 Air consumption meter function (optional)




If volume flow or mass flow is selected as the application, the air consumption meter can be activated under parameterization.

This function records the consumed volume or mass of the measured medium and sums it up over time. The summed-up value and the duration for which the summation has already been running can be shown on the display and output via one of the switching outputs in the form of pulses with a defined value.

**NOTICE**

When the air consumption meter function is active, it is not possible to change the parameters for volume flow or mass flow measurement.

| Function | Description |
|---|---|
| **Mode** | Various acquisition modes are available for recording the volume<br>Off<br>The recording of consumption values is deactivated. The scaling function is available<br>Σ(ΔP >0)<br>The consumption quantity is only recorded for pressures > 0. When creep volume suppression is activated, only pressures greater than the creep amount are considered.<br>Σ(ΔP)<br>The recording of the consumption values also takes negative differential pressures into account here. The consumption or mass values resulting from the negative pressures are subtracted from the total.<br>Σ(abs ΔP)<br>In this mode of operation, the sign of the differential pressures is not considered. In both cases, the resulting consumption or mass value is added to the total. |
| **Accumulate filtered output** | When recording consumption values, you can choose whether to use the filtered or unfiltered pressure value. |
| **Pulse value** | Defines the value of a pulse |
| **Pulse duration** | This parameter defines the duration of the relay pulse. Values between 20 and 1999 ms can be set |
| **Pulse pause** | This parameter defines the min pause after a relay pulse. Values between 50 and 1999 ms can be set |
| **Current ACM value/ACM operating hours** | The current value of the air consumption meter function |
| **Stored ACM value/ACM operating hours** | The stored value of the air consumption meter function |
| **Reset -> 0** | This function resets the current values of the consumption function. The current values are written to storage. |

| Function | Description |
|---|---|
| **Reset -> Store** | This function sets the current values of the consumption function to the value in the storage. The last current values are written to the storage. |

**NOTICE**

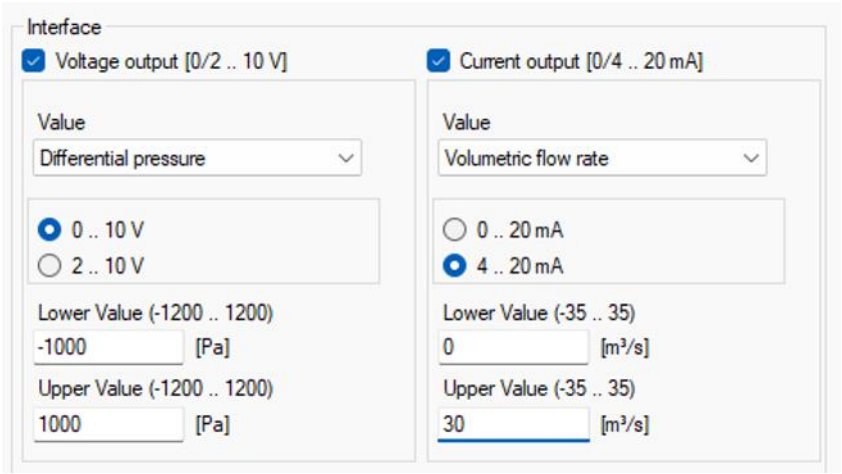
If the output frequency (pulse pause/pulse duration) is exceeded, the accumulated pulses are output in sequence.
It is recommended to adjust the frequency to the maximum value. Increase the pulse value if necessary.

## 5.6 Outputs

The device always has two analogue and two switching outputs. The outputs can be configured completely independently of each other.

For example, the voltage output and switching output 1 can simultaneously provide the differential pressure, while the current output and switching output 2 depending on the configuration - can deliver either the volume flow or the temperature.

### 5.6.1 Analog Outputs




This settings area specifies the measured value to be output, along with its signal format and scaling parameters.

| Function | Description |
|---|---|
| **Value** | Selection of the measured value to be output via the analogue output:<br>• Differential<br>• Square-rooted differential pressure[1], Volume/mass flow rate or flow velocity<br>• Temperature<br>• Static pressure (optional) |
| **Signal Type** | Selection of the signal type for the analogue output:<br>Voltage Signal Type:<br>• 0… 10 V<br>• 2… 10 V<br>Power Signal Type:<br>• 0… 20 mA<br>• 4… 20 mA |
| **Lower value** | Reading that corresponds to the lower signal value (e.g. 0/2V or 0/4 mA). |
| **Upper value** | Reading that corresponds to the upper signal value (e.g. 10 V or 20 mA). |

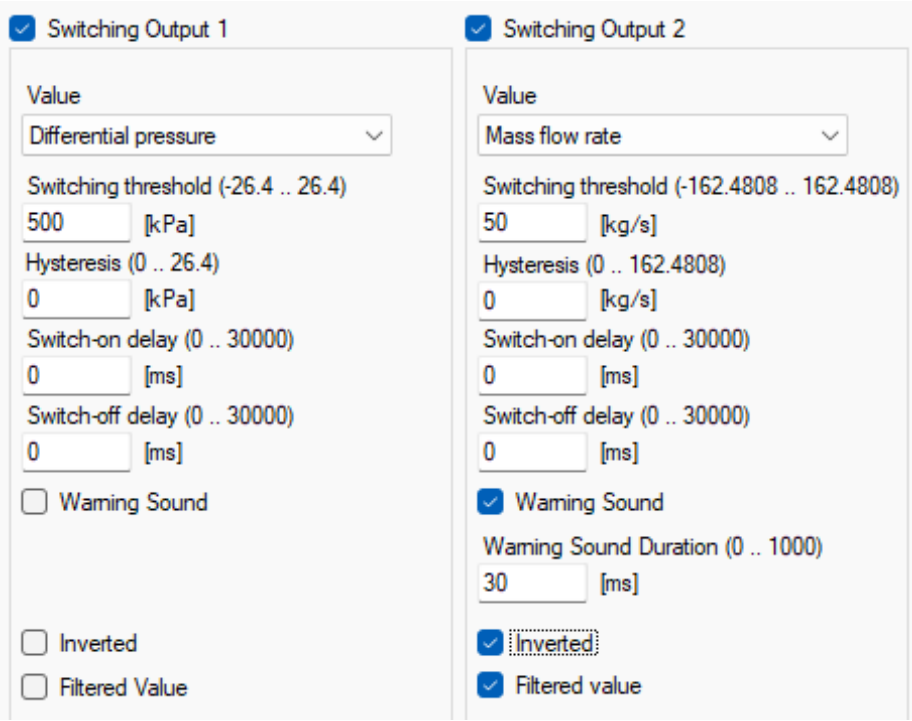
**NOTICE**

In the event of a failure of the device, the outputs can assume the following states:

- In the event of an overpressure error in the differential pressure, the output is set to the maximum value of the output range.
- In the event of a negative pressure error of the differential pressure, the output is set to the minimum value of the output area.
- If the supply voltage is undervoltage (< approx. 18 V), the outputs are switched off (0V or 0 mA).
- In case of other errors, the outputs are set to the following values:
  - when the voltage output is set to 0.. 10V →0V
  - when the voltage output is set to 2.. 10 V → < 1.8 V
  - when the current output is set to 0.. 20 mA → 0 mA
  - when the current output is set to 4.. 20 mA → < 3.6 mA

[1] square-rooted differential pressure
In this output mode, the device provides an output signal that is proportional to the square root of the measured differential pressure. This characteristic is typically used for flow measurements, as the flow rate in common measurement methods (e.g. orifice plates, nozzles, or Venturi tubes) is proportional to the square root of the differential pressure.
In this mode, the conversion of the output signal into a physical flow value (e.g. m³/h or l/min) must be performed externally, for example in a PLC or a higher-level control system. If the conversion is to be carried out within the device, a different operating mode must be selected (see Section **5.5.1. Mode**).

### 5.6.2 Switch Outputs (Relais)




The device is equipped with two configurable switching outputs (semiconductor or relay, depending on configuration) that can respond to specific measured values. This section allows configuration of the switching conditions as well as the behavior of the output signal.

| NOTICE |
| --- |
| If the supply voltage drops below 18 V, the switching contacts are deactivated. |

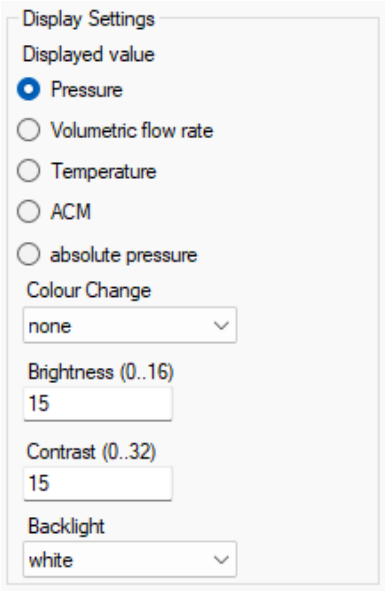
| Function | Description |
|---|---|
| **Value** | Selection of the measured value to which the switching output should react:<br>• Differential<br>• Volume/mass flow rate or flow rate<br>• Temperature (optional)<br>• Error/Alarm<br>• Air consumption meter function |
| **Switching Threshold** | Limit value when the switching output is exceeded or undercut. Adjustment range: **–120 % to +120 %** of the nominal pressure measurement range or the calculated value. |
| **Hysteresis** | Determination of hysteresis to avoid switching flutter. Adjustable in the range of **0 % to 120 %** of the nominal measuring range. |
| **Switch-on delay** | Time delay (in milliseconds) after which the relay switches when the threshold value is exceeded. |
| **Switch-off delay** | Time delay (in milliseconds) after which the relay switches back when the threshold value is undercut. |
| **Warning Sound** | Activation of an acoustic signal during switching operations. Adjustable pulse duration from **0 to 1000 ms** (with a base duration for the period of 1000 ms).<br>If both outputs are activated at the same time, the alarm duration adds up (max. 1000 ms). |
| **Invert Signal** | Inversion of the switching signal. |
| **Apply filtered value** | Enables the application of the previously set jump response time (see chapter **5.5.2. Pressure messurement)** to the switching output. This feature can be disabled. |

**NOTICE**

If the switching output is set to "error output", the switching value and hysteresis settings are not available.
If the switching output is used for the LVZ function (option), none of the listed settings are available, but the pulse duration and pulse pause are available.
See chapter **5.5.5 Air consumption meter function**

## 5.7 Display settings (optional)

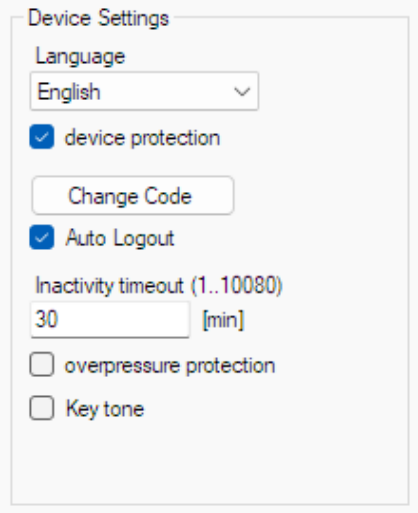
For devices with a display, additional settings can be made within the device and the PC software




| Function | Description |
|---|---|
| **Display value** | Select the value to be displayed on the display. Available options:<br>• Differential<br>• Volume Flow / Mass Flow / Flow Rate<br>• Temperature<br>• Air consumption meter function<br>• Absolute pressure<br>To display values other than differential pressure, the corresponding function must be configured beforehand and correctly parameterized. |
| **Colour Switching** | The LCD display shows the status of the switching outputs in colour. The function can be deactivated or activated for one or both outputs.<br>• Green: Output inactive<br>• Yellow: Output in hysteresis<br>• Red: Output/outputs actively switched |
| **Brightness** | Adjustment of the backlight in the range of 0 to 15. |
| **Contrast** | Display contrast adjustment in the range of 0 to 32. |
| **Backlight** | Selecting the display lighting state:<br>• Off<br>• White<br>• Blue |

## 5.8 Device settings

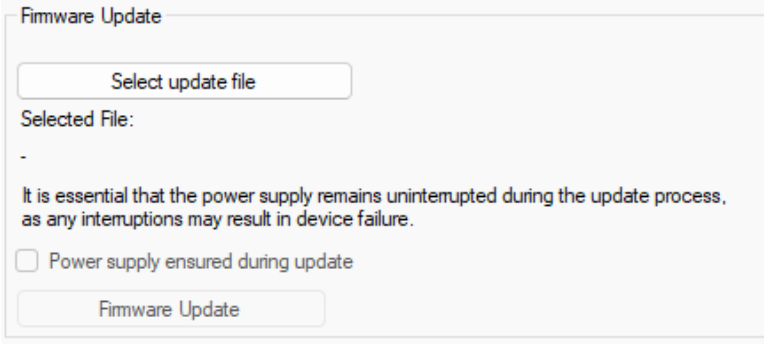
In this section, basic settings for the device can be made.




| Function | Description |
|---|---|
| **Language** | Selection of the device language.<br>• German<br>• English<br>• French<br>• Italian |
| **Access protection** | Enable access protection to prevent unauthorized changes. |
| **Change code** | Determination of an individual code (numeric, 0–999999) to ensure access protection. |
| **Auto-Logout** | Automatic logout of the user after a defined period of inactivity. |
| **Inactivity Duration** | Adjustable time span (in minutes) until automatic logout. The maximum period of inactivity is 7 days. |
| **Overpressure protection** | When the function is activated, automatic zeroing is carried out in the event of positive/negative pressure events (±120 % of the measuring range). This feature can be disabled. |
| **Key tone** | Activation of an acoustic signal when the controls are operated. |
| **Factory** | Restoration of factory-saved basic settings. |

## 5.9 Firmware-update

This section provides information on the firmware update.




| Function | Description |
|---|---|
| **Select update file** | Select a locally stored firmware file to play on the device. |
| **Firmware update** | Starts the firmware update |

**NOTICE**

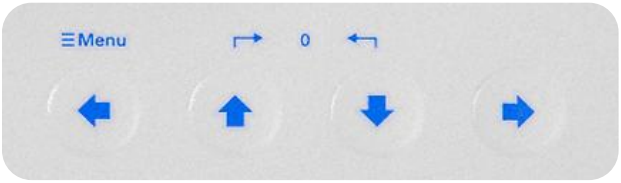
During the update, the power supply must not be interrupted, as this can lead to a defective device.

Further information on the LED status during the update can be found in Chapter **3.3 Status-LED**.

## 5.10 Display (Option)

The display and the button menu are optional and not available on all variants of the PT-SXR 2

Four buttons are available for navigation and operation:




**Menu** **UP** **Down** **Right**

In the navigation of the device, a distinction is made between menu level and display mode. The function of the buttons varies depending on the active mode.

| Key | Meaning (Display Mode) | Meaning (menu) |
|---|---|---|
| Left | Switch to menu mode (time lock 2 seconds) | Jump one menu level back/back to display mode<br>Move cursor to the left |
| High | Start Zeroing | Increase value or scroll up |
| Down | | Decrease the value or scroll down. |
| Right | Roll between Current Value -> Min Value -> Max Value | • Jump one menu level in<br>• Move the cursor to the right<br>• Confirm |




In *Display* the current measured value (or min. value or max. value) is displayed. The displayed value can be parameterized individually. See **5.7 Display settings (optional)**
In this mode, the button on the right can be used to switch between measured value > min. value > max value. can be changed.

The top row of the display shows the current reading. The bottom line of the display on the right edge shows the unit of the display value.

If a zeroing of the device is currently active, its status is shown in the display.

In addition, the display shows the status of the switching outputs in the lower row on the left edge in the first two places and an indicator with reference to the present warning in the third place.

In the *Menu level* can be accessed the parameterization of the PT-SXR 2, see **5.11 Menu Tree**. There are also notes on any available for warnings. From the Display mode can be accessed by pressing and holding the Left button " 🡄 " to the menu level.

When Access Protection is activated, the menu is secured by an adjustable six-digit numerical code (numeric,0-999999).
Without entering the code, alerts and device information can be accessed, see **5.3 Alerts**. All other functions are only accessible after a successful login

## 5.11 Menu Tree

| Main level | 1. Sublevel | 2. Sublevel | 3. Sublevel | 4. Sublevel |
|---|---|---|---|---|
| Login | | | | |
| | | | | |
| Alert | See **5.3 Alert** | | | |
| | | | | |
| Device information | Designation | | | |
| | Variant number | | | |
| | Serial number | | | |
| | Version | | | |
| | | | | |
| Application | Mode select | Pressure | | |
| | | Volume Flow | | |
| | | Mass Flow | | |
| | | Flow Rate | | |
| | | | | |
| | Param. method | Correction Factor | | |
| | | Point Calibration | P/T compensation | |
| | | | T compensation | |
| | | | Without compensation | |
| | Parameterization | Unit Volume Flow<br>Unit Mass Flow<br>Unit Flow Rate | | |
| | | Set compensation | Temp. Input | |
| | | | Temp. Unit | |

| Main level | 1. Sublevel | 2. Sublevel | 3. Sublevel | 4. Sublevel |
|---|---|---|---|---|
| | | | Temp. Offset | |
| | | | Set up conditions | Media temperature |
| | | | | Absolute pressure |
| | | Correction Factor settings | Manually | |
| | | | Enter dynamic pressure | Detect velocity pressure |
| | | | | Enter velocity pressure |
| | | | | V.Flow at vel. press.<br>M.Flow at vel. press.<br>Fl.Rate at vel. press. |
| | | Creep suppression | | |
| | | Configure pressure measurement | Pressure unit | |
| | | | Set zeroing interval | |
| | | | Set filter constant | |
| | | | | |
| | | Air consumption counter | Mode | |
| | | | Impulse value | |
| | | | Use filter | |
| | | | Conter reset | |
| | | | Saved value | |
| Interface | Voltage output | | | |
| | Current output | Chosen measurement | | |
| | | Output type | | |
| | | Parameterize output | | |
| | Switch output 1 | | | |

| Main level | 1. Sublevel | 2. Sublevel | 3. Sublevel | 4. Sublevel |
|---|---|---|---|---|
| | Switch output 2 | Chosen measurement | | |
| | | Set threshold | | |
| | | Invert output | | |
| | | Set hysteresis | | |
| | | Set switch-on delay | | |
| | | Set switch-off delay | | |
| | | Set sound length | | |
| Display | Display value | | | |
| | Automatic colour change | | | |
| | Brightness | | | |
| | Contrast | | | |
| | Backlight | | | |
| | | | | |
| Settings | Language | | | |
| | Activate password | | | |
| | Set password | | | |
| | Auto Logout | | | |
| | Overpressure protection | | | |
| | Span correction | | | |
| | Activate button sound | | | |
| | Reset min/max values | | | |
| | Factory reset | | | |
| | | | | |
| Logout | | | | |

# 6 Specifications

For the technical data and the drawing, please refer to the current data sheet on the website: https://www.airflow.de/produkte/messgeraet/druckmessumformer-pt-sxr-2/

Please contact us if you require further information.

AIRFLOW

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