Pressure transmitter
PiezoSwitch (PS)

Operating instructions

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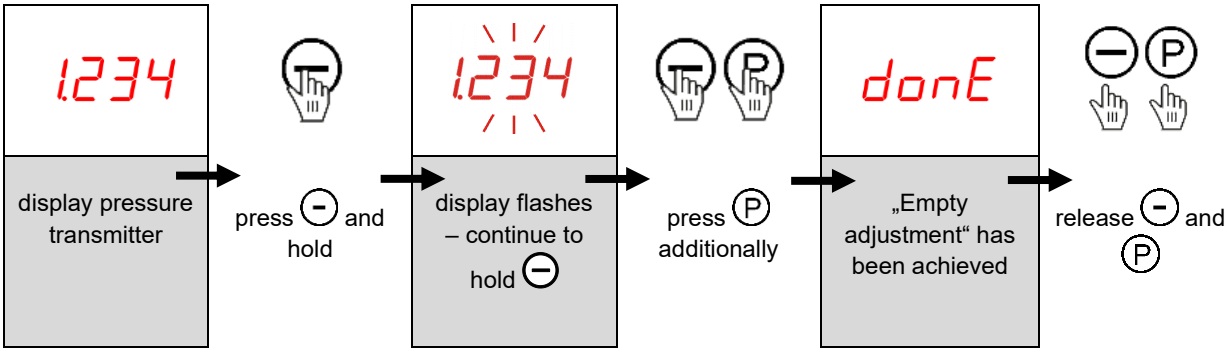
1 Quick commissioning

	**During quick commissioning, make sure that the applied pressure is within the maximum permissible limits for the transmitter.** **You will find the sensor measuring range of the pressure transmitter on the type plate (see also p. 8).**

1.1 Setting the bias / position correction („empty adjustment“)

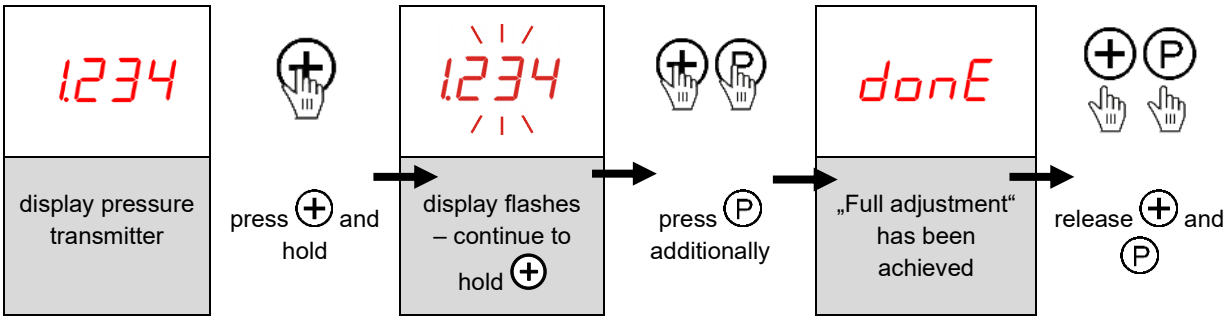
If an offset pressure is displayed after installation of the pressure transmitter (e.g., caused by the installation position), this can be corrected by the "empty adjustment".



The display should output a pressure around 0,0bar and the loop current should be around 4,0mA.

1.2 Setting the end of the measuring range („Full adjustment“)

Here, the current process pressure is used by the pressure transmitter as the end of the measuring range (loop current 20mA).



	**If instead of donE the message FAIL is displayed, it was not possible for the transmitter to accept the current process pressure. In this case, check whether the process pressure is outside the permissible limits.** **You will find the sensor measuring range of the pressure transmitter on the type plate (see also p. 8).**

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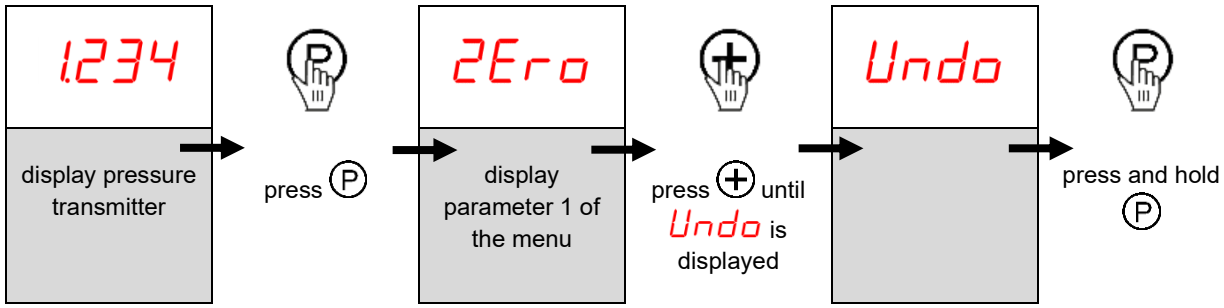
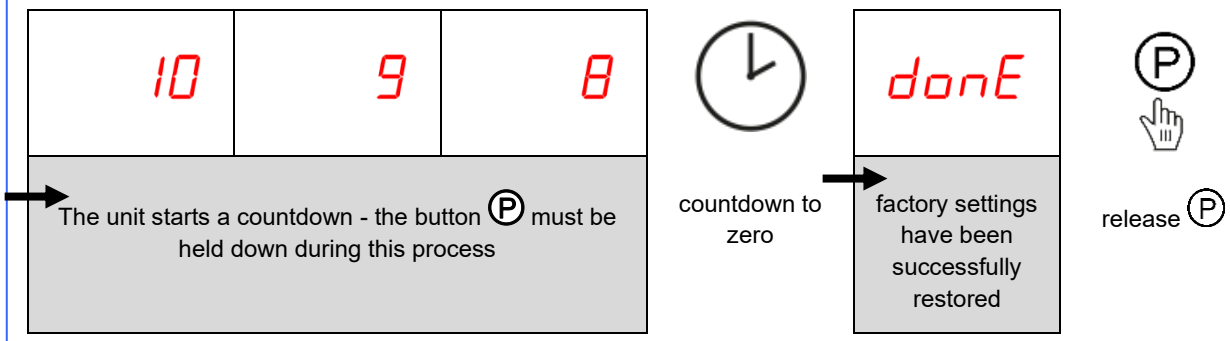
1.3 Restore factory settings

Restoring the factory settings returns the unit to the factory settings.

All parameter settings made by the user are lost during this process.





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2 Important notes

2.1 Explanation of the notes and warnings

	**Information** represents notes that make operation easier for you or contribute to a better understanding.
	**Warnings** indicate important criteria required for safe and smooth operation.
	Notes marked with **caution** must be strictly observed. Failure to do so may result in damage to the unit.
	Notes marked with **Do not touch** must be strictly observed. Otherwise, irreparable damage to the unit may result.
	**Protect from moisture** draws your attention to the fact that the unit or parts of the unit can be damaged by moisture and thus negatively affect operation.
	**Electrostatic danger** indicates that the appliance or parts of the appliance may be irreparably damaged by electrostatic discharge.
	**Magnetically sensitive** indicates that the function of the unit can be negatively influenced by electromagnetic fields under unfavourable conditions.
	Notes marked **Caution, Heat** warn you of personal injury from burns or scalds.
	Notes marked **Caution, Cold** warn you of personal injury from cold burns or frostbite.
	Notes marked with **Explosive area** concern the use of the unit in applications where there is an increased risk of explosion.
	**Caution, overpressure** warns you of situations where there is an increased risk of injury from pressurised parts.
	**Caution, corrosive** informs you that there is a risk of injury from aggressive media.
	**Caution, Electricity** alerts you to the risk of electric shock from live parts.
	**Open carefully** warns you against accidental damage to internal parts by sharp objects.

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2.2 Intended use

The pressure transmitters of the PiezoSwitch (PS) series are designed for measuring the process pressure of aggressive and non-aggressive gases, vapours and liquids. Depending on the device version, the transmitter can be used for both absolute and relative pressure measurements.

Please observe the permissible nominal pressure of the selected process connection. Stated specifications and certifications are only guaranteed when using original Hengesbach parts. Ensuring material compatibility with the process conditions and the periphery is the responsibility of the system operator. The units are not suitable for use in potentially explosive atmospheres or safety-relevant system parts (SIL).

	**The manufacturer is not liable for damage caused by other use or improper handling. In case of doubt, clarify the suitability of the unit for your specific application before installation.**
	**The unit is not intended for use in safety-relevant areas (SIL).**
	**The unit is not intended for use in potentially explosive atmospheres.**

Before commissioning, the operating instructions must be read carefully. If anything is unclear, consult the manufacturer's technical department.

You can reach the manufacturer at:

Hengesbach Prozessmesstechnik

Schimmelbuschstr. 17
40699 Erkrath-Hochdahl

Tel.: +49 (0)2104 3032 – 0
Fax: +49 (0)2104 3032 – 22

info@hengesbach.com
www.hengesbach.com

2.3 Installation, commissioning and operation of the unit

The transmitter is built according to the current state of the art and complies with the guidelines necessary for it to ensure a safe process.

Installation, connection, commissioning, operation and maintenance of the unit should always be carried out by competent personnel. Persons performing these tasks must be authorised to do so by the plant operator.

This document must be kept in a place freely accessible to the relevant persons. If necessary, request another copy or download it from the manufacturer's homepage.

3 Opening the outer packaging

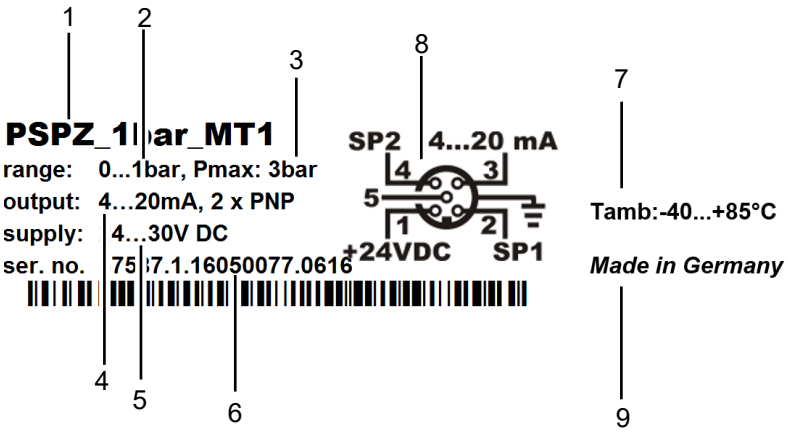
To avoid damage to the shipment, please read the following instructions before unpacking the transmitter.

	Be careful when cutting with sharp objects - there is a risk of destroying internal parts.
	Avoid any contact with the sensor membrane. Depending on the device version, this is provided with a protective cover - remove this only immediately before mounting the transmitter. Contact with the membrane can cause irreparable damage to the unit.
	Protect the contents of your consignment from moisture until commissioning and the associated check for tightness of all screw connections.

Check the goods for correctness, integrity and completeness. To do this, compare the information on the delivery note with the contents of your consignment. Please report any discrepancies to the manufacturer immediately.

4 Identification of the device

The following illustration shows the type plate of a transmitter (example illustration) and the meaning of the type plate information. Before installation, please compare the information on the type plate of your transmitter with the information on the delivery note and your order data. If there are discrepancies between the delivery note and the type plate, the information on the type plate applies. In this case, contact the manufacturer.



1: Device designation
2: Sensor measuring range
3: Overload protection
4: Output signal
5: Supply voltage
6: Serial number
7: Ambient temperature
8: Electrical connection
9: Place of manufacture

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5 Mounting instructions

Please observe the following instructions for mounting the unit. They are primarily for your own safety but also ensure smooth installation as well as low-maintenance and reliable operation of the transmitter.

	**Before mounting the unit, bring the unit to ambient pressure. If this is not the case, there is a risk of being injured by flying parts or by suddenly escaping gases or media.**
	**Before assembly, make sure that the affected parts of the unit are not too hot for safe working. Allow surfaces and add-on parts to cool down before assembly.**
	**Also be aware of the danger of cold burns on parts of the system that have cooled down considerably. Make sure that you can work safely at the workplace.**
	**Make sure that you do not come into contact with aggressive residual media that are still in the system during installation.**
	**Ensure that the potential between the transmitter and the system is equal. Please also refer to the section on the electrical connections of the unit.**
	**Do not remove the protective cover of the measuring cell during installation preparations. Only remove it shortly before installing the transmitter. Make sure that the membrane is not touched during installation.**
	**If conditions permit, the manufacturer recommends leaving openings such as the vent facing downwards when mounting the unit. In the event of wetting by leaked media, this will prevent clogging by highly viscous or drying substances.**
	**If possible, the unit should be installed in a low-vibration location with some distance to larger installations and strong electrical fields.**
	**Make sure that the process connection is tight to the equipment and that no medium leaks at the connection point. Use the appropriate seal for your process, paying particular attention to its suitability for the process temperature and its compatibility with the medium.**
	**Screw on the transmitter with the torque suitable for your process connection. If you are unsure, contact the manufacturer. Metal screw connections that have been damaged by incorrect installation may no longer be able to be loosened without problems.**

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6 PZM process connection system with O-ring seal made of EPDM

Following this are general notes concerning the cleaning, installation and welding of the process connection system PZM sealed with an o-ring gasket, material EPDM (for e.g. pressure transmitters PZM, VRM and membrane diaphragm MDM7887).

6.1 Cleaning notes

The process connection system PZM consists of a PZM process adaptor (e.g. PZM welding socket Z-PEM5FPZM) and a PZM sensor (e.g. pressure transmitter type PZM).

The process connection system PZM is cleanable via CIP and sterilizable via SIP. Cleaning and sterilization can thus be completed inline.

Please avoid any mechanical contact with the in-process parts as this may damage the pressure membrane.

6.2 Installation notes

The PZM process adaptor must be installed front-flush and without dead spaces, both in tanks as well as in pipes. If dead spaces cannot be avoided (as in t-pieces, extrusions) their length L should always be smaller than their diameter d, thus L < d. Devices must always be mounted as to be self-draining. In tanks, the cleaning jet must be able to directly impinge and clean dead spaces completely.

In storage, take care to avoid corrosion. Do not let stainless steel parts be exposed to inferior metals.

Avoid mechanical damage (scratches, dents) during installation of the PZM sensor into its respective process connection. Remove the protective cap just as the PZM sensor is to be inserted, not earlier. Act accordingly during PZM sensor removal.

Clean all sealing surfaces prior to inserting the PZM sensor to avoid leaks and contamination. The supplied o-ring may be greased (only use NSF-approved substances). Restrict the greasing to small amounts to avoid problems with microorganism contamination.

To attain front-flush installation, slowly and with care push the PZM sensor until the axial stop of the process connection (adaptor or welding socket) is reached. Only then screw in and tighten the hexagon screw.

Use PZM process adaptors together with the corresponding sealing according to the EHEDG position paper Easy cleanable Pipe couplings and Process connections, e.g. ASEPTO-STAR k-flex-sealing (process connection according to DIN 11851) or Tri-Clamp seals (process connections according to DIN 32676 and ISO 2852).

Further installation instructions may be found in the EHEDG guideline Doc. 37 (Hygienic design and application of sensors).

6.3 Welding notes

The PZM welding adaptors are welded using the WIG procedure. To protect the seam root forming gas should be used. Skilled personnel must perform the preparations and the welding itself. The EHEDG guidelines Doc. 9 (Welding stainless steel to meet hygienic requirements) and Doc. 35 (Hygienic welding of stainless steel tubing in the food processing industry) may serve as further instructions. During welding, the PZM sensor must not be present in the adaptor. Use a welding

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dummy instead. Avoid mechanical damages (scratches, dents) to any of the welding parts and avoid corrosion (see “Installation notes” also).

To avoid welding distortion Hengesbach recommends:

- Use a welding dummy or a comparable, state-of-the-art cooling procedure

- Tack the adaptor to multiple, opposing points which are roughly the same distance apart

- Weld opposing segments segmentally between the tack points

- After welding opposing segments allow all parts to cool down before proceeding

The welding seam must be cohesive, and its surface must be flat, regular and free of welding defects. The first welding seam should be from the process product side (inside). As a rule, a post-treatment of the welding seam (e.g. polishing) is necessary to attain the required surface finish.

Before inserting the PZM sensor, all welded parts must be allowed to cool down completely.

7 Maintenance and cleaning

The transmitter contains no user-serviceable parts. If any problems occur with the unit, please contact the manufacturer to discuss how to proceed.

	**Any changes made to the interior of the unit will immediately invalidate the warranty. Furthermore, the manufacturer reserves the right to refuse repair of units opened by the customer (this does not apply to opening the lid for operation).**

As part of your regular maintenance work, you should only check the electrical connection, the seals and the pressure compensation openings (only for relative pressure units).

Make sure that the M12 unit plug is firmly screwed in. Furthermore, check the tight fit of the cover to ensure optimum tightness here as well. To ensure good readability of the display during operation, contamination of the sight glass should always be avoided.

The vent opening must be free of highly viscous or other adhering media. A clogged vent hole prevents pressure equalisation in relative pressure devices and thus leads to a falsification of the measured value.

During the cleaning process, strong heating and subsequent cooling can cause a vacuum inside the unit. The small dead space volume reduces this effect to a minimum. Nevertheless, a visual inspection should be carried out in the head of the transmitter at certain intervals to detect the inadmissible entry of media. These can cause leakage currents due to conductive deposits (salts, etc.), which falsify the measurement result.

Also check the seals, both in the cover and at the process connection, for corrosion.

	**Observe the maximum permissible temperatures when cleaning. Sustained, excessive temperature can destroy both the electronics and attached parts on the housing.**
	**The membrane of the measuring cell must not be directly irradiated by punctual pressure sources such as those emitted by high-pressure cleaners or similar. This can destroy the diaphragm. Furthermore, avoid any other form of mechanical contact with the membrane.**

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8 Electrical connection

8.1 Permissible operating range

In its simplest application, this transmitter is a loop-powered 2-wire low-voltage DC unit. As with all 2-wire devices, it draws its supply voltage directly from the current loop and injects a current of 4...20mA proportional to the measured variable. In addition, it has two switching points with PNP switching behaviour, which makes it a 3- or 4-wire device. The supply voltage is applied to the switching outputs in the switched state.

	**The operating voltage of the unit is 24-30V DC. Do not operate the transmitter on any other supply voltage under any circumstances. A voltage that is too low can cause malfunctions, and a voltage that is too high can damage the unit irreparably.**
	**The switching points are designed for an output current of 50mA each. This maximum value should not be exceeded. Although the unit is protected against overload and short circuit, an overload of the outputs should be avoided at all times.**
	**When making the electrical connection, ensure that the polarity is correct - if it is reversed, the unit will not work. You cannot damage the transmitter by doing this, it is protected against reverse polarity.**

8.2 Pin assignment and correct connection

	**Please note the different connection types depending on the availability of shielding/grounding!**
	**The manufacturer recommends earthing yourself and the unit before installing the connections in order to minimise unnecessary stress due to electrostatic charging.**
	**Use shielded, twisted cables to connect the transmitter in order to suppress interference from electromagnetic fields as best as possible.**

The unit is supplied with a 5-pin M12 device connector. Pin 1 (+) and pin 3 (-) form the 2-wire current loop. If no switching points are used, the loop current can be measured in both the forward and return conductor of the loop.

If at least one of the two switching points is also used, the current measurement must be made in the return conductor, otherwise the current taken from the switching points is also measured. The two switching points are located at pin 2 (switching point 1) and pin 4 (switching point 2) of the M12 device connector.

The M12 connector has an internal electrical connection to the metal housing of the unit at pin 5. When using a suitable connection cable with electrically continuous shielding at earth potential up to the M12 device plug, it is not necessary to use pin 5.

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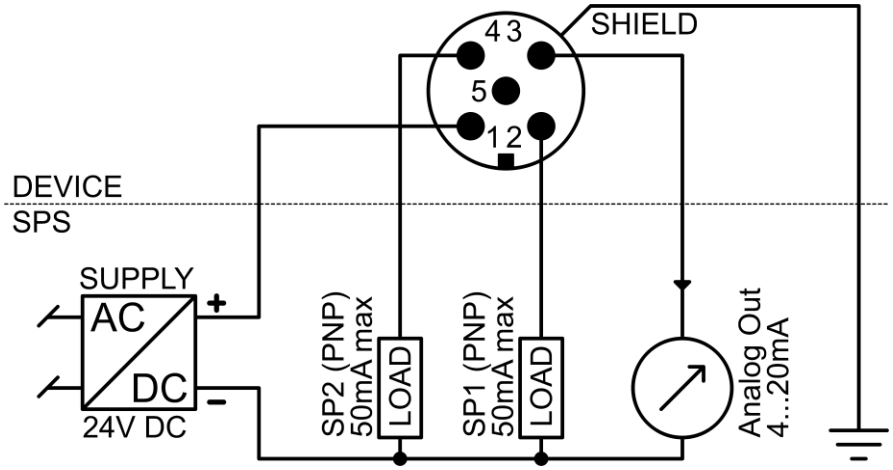
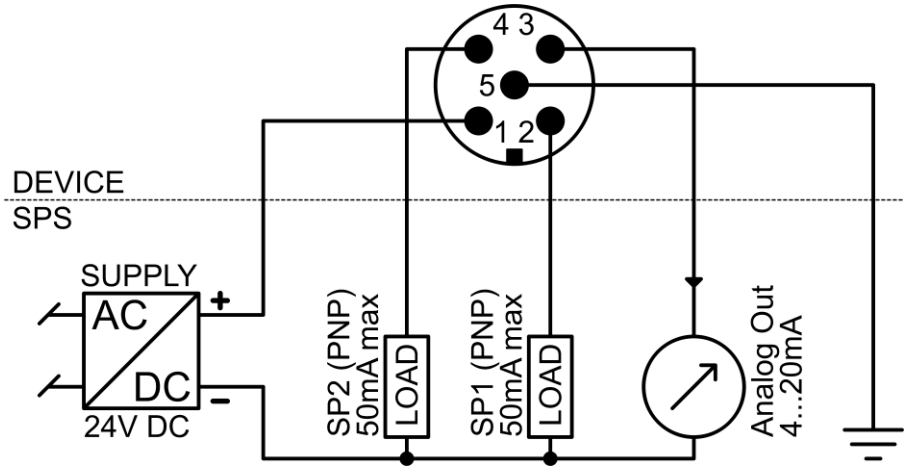
⚠	**Earthing via pin 5 is absolutely necessary** if - there is no continuous shielding and thus earthing via the connection cable - the shielding is not connected to the metal housing of the pressure transmitter through the M12 device plug (e.g. with non-metallic plugs) - there is no earthing to the metal housing of the pressure transmitter at the place of use.

8.3 Connection diagram for installation

- with suitable possibility for shielding in the connection cable - the shielding of the connection cable is placed onto the housing of the M12 device connector.



- without a suitable possibility for shielding in the connection cable as well as missing earthing at the place of use - the earth potential is carried along in the cable via pin 5.



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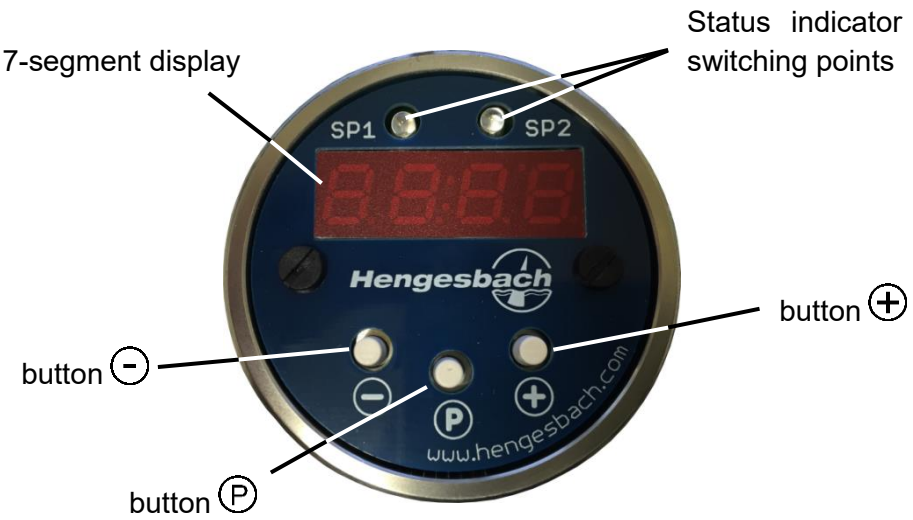
9 Operating and display elements in the unit head

The operating and display elements are located inside the housing head. In addition to a 4-digit 7-segment display and two LEDs, there are three push-buttons.



Status indicator for switching points

The unit has two switching points, the operating status of each of which is indicated by an LED. If a switching point is switched on, the supply voltage can be measured at the corresponding connection of the M12 device plug (PNP behaviour). At the same time, the corresponding LED is switched on. If the switching point is off, the LED is also not lit and no voltage can be measured at the output of the corresponding switching point.

Buttons

The three buttons are used to parameterise the unit to the desired settings. The button ⊕ is generally used to increment values as well as to navigate in the parameter menu in positive direction. The button ⊖ is used for decrementing as well as navigation in negative direction. The button Ⓟ is mainly used for confirmation. For the exact function of the keys for the respective operating state, please refer to the section on parameterising the transmitter.

	**The transmitter allows an undercut of the set measuring range of approx. 1.3% (3.8mA) and an overcut of 3.1% (20.5mA). Within these limits, the output signal is still linear to the applied process pressure.** **Outside the limits, the transmitter switches into current limitation.**

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The behaviour and the contents of the 4-digit 7-segment display provide information about the operating range of the process and thus also of the unit during measurement operation. This is explained below.

1234	**Display lights up continuously**	**The applied process pressure is within the operating limits set for the transmitter. The output current is proportional to the measured value. The transmitter is in the optimal operating range.**
1234	**Display flashes (frequency approx. 1 Hz)**	**The applied process pressure is outside the operating limits set for the transmitter. The transmitter has left its optimal operating range. The output current continues to follow the measuring signal linearly until the current limit is reached.**

10 Repair, return and warranty

10.1 Repair

If the transmitter no longer functions properly, please contact the manufacturer first. The manufacturer will help you with the further processing by telephone and may be able to provide a solution in advance - often there is an incorrect setting that causes the unit not to function properly.

However, if there is a real defect, please return the unit to the manufacturer. There are no user repairable parts inside the transmitter. The QA department will take care of repairing the unit as quickly as possible or will provide you with a replacement unit free of charge in the event of a warranty claim.

	**Do not attempt to repair the transmitter yourself. You may lose your right to claim under the warranty and possibly aggravate the defect.**

10.2 Return

1. Please note the following points when returning the unit.
2. Secure the measuring cell against any kind of contact.
3. Pack the unit in a transport-safe outer packaging.
4. Pack electronic components in ESD-safe packaging.
5. Use the return form for the return.
   https://www.hengesbach.com/fileadmin/user_upload/pdf/RMA-WR-Formular.pdf
6. Enclose an accurate description of the transmitter's fault with the return.
7. If applicable, indicate what is to be done with the delivered item.

The manufacturer's return address is:

Hengesbach Prozessmesstechnik

Schimmelbuschstr. 17
40699 Erkrath-Hochdahl

Tel.: +49 (0)2104 3032 – 0
Fax: +49 (0)2104 3032 – 22

info@hengesbach.com
www.hengesbach.com

10.3 Warranty

The manufacturer provides a warranty of 1 year from delivery on all manufactured products. Units that malfunction or fail during this period will be repaired or replaced by the manufacturer. Please contact the manufacturer before making a complaint to discuss the further procedure - this guarantees a quick and trouble-free settlement.

	**Defects caused by incorrect handling, faulty installation or other improper handling are not covered by the warranty. In this case, the manufacturer will provide an expert opinion on a case-by-case basis.**

Please also note the return instructions in the event of a warranty claim. A unit that has suffered damage during return transport due to improper packaging cannot always be assigned to a specific causer by the manufacturer. In the worst case, you could be held responsible for the damage. So always make sure that the transport packaging is secure and pay particular attention to the membrane of the measuring cell - the most frequent defects are found here.

11 Storage

A clean, dry and cool place should be provided for storage devices. In addition, they should be protected from shocks and under no circumstances should they be stored standing on the measuring cell. In any case, protect the measuring cell from any contact.

	**Contact of the pressure transmitter with metals, especially black steel, can cause the stainless steel to rust. A hazard also exists in the presence of flash rust.**

12 Disposal

In order to protect the unit against damage during transport, a certain amount of packaging is necessary. Please recycle the packaging materials properly or continue to use them for packaging other items.

The units consist of a variety of different materials that should be disposed of specifically. Therefore, please take disused equipment to a suitable recycling facility or return it to the manufacturer for disposal.

	**The appliance is not subject to the WEEE 2002/96/EC directive and the associated legal provisions. Therefore, discarded appliances are not intended for disposal at municipal collection points.**

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13 Operation via the local display

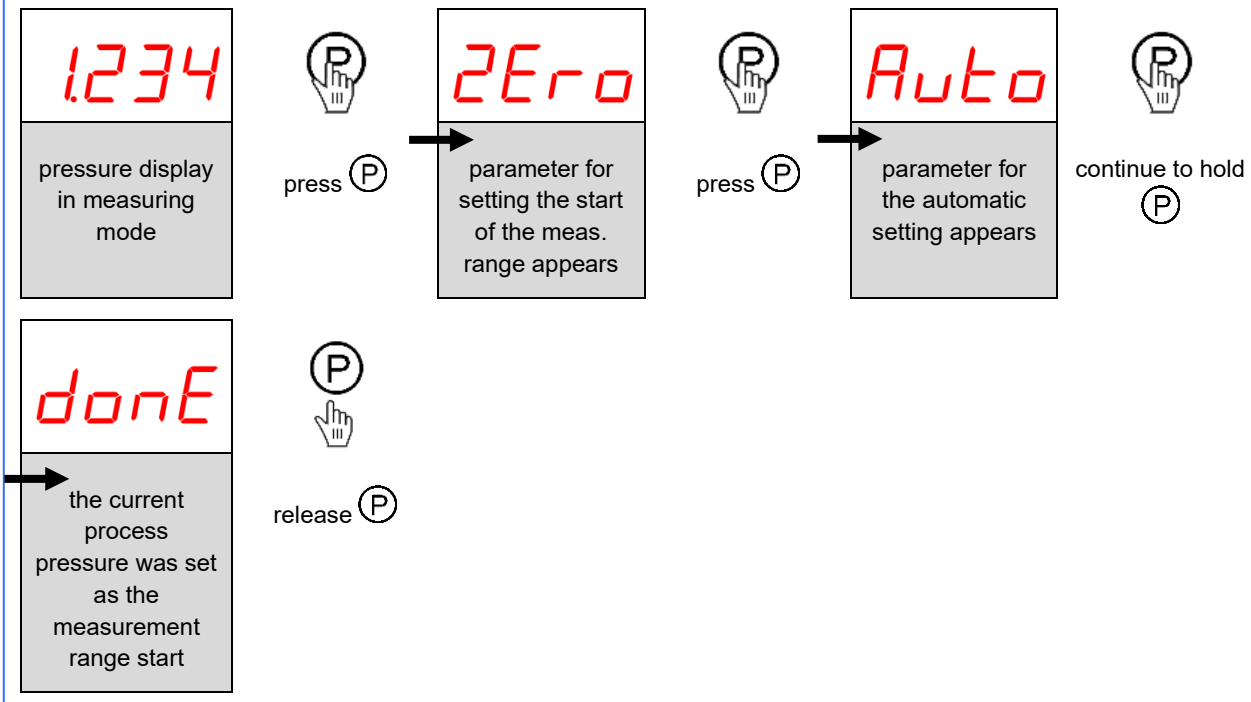
13.1 Setting the start of the measuring range

	**The start of measuring range determines at which pressure the transmitter has a loop current of 4mA.**

Setting the start of the measuring range can be done in two ways. On the one hand, the current process pressure can be automatically stored by the transmitter as the new start of measuring range. If, on the other hand, a specific process pressure is to serve as the start of the measuring range, the user can set this manually in the unit.

13.1.1 Automatic setting of the start of the measuring range

To carry out the automatic transfer of the applied process pressure, proceed as described below.



	**Make sure that there is a constant process pressure during the automatic transfer.**
	**If the message "fail" appears instead of the success message "done", it is not possible for the transmitter to accept the applied process pressure. In this case, check whether the pressure is outside the possible setting limits.**
	**By pressing ⊕ and ⊖ together the menu will be exited without any changes.**

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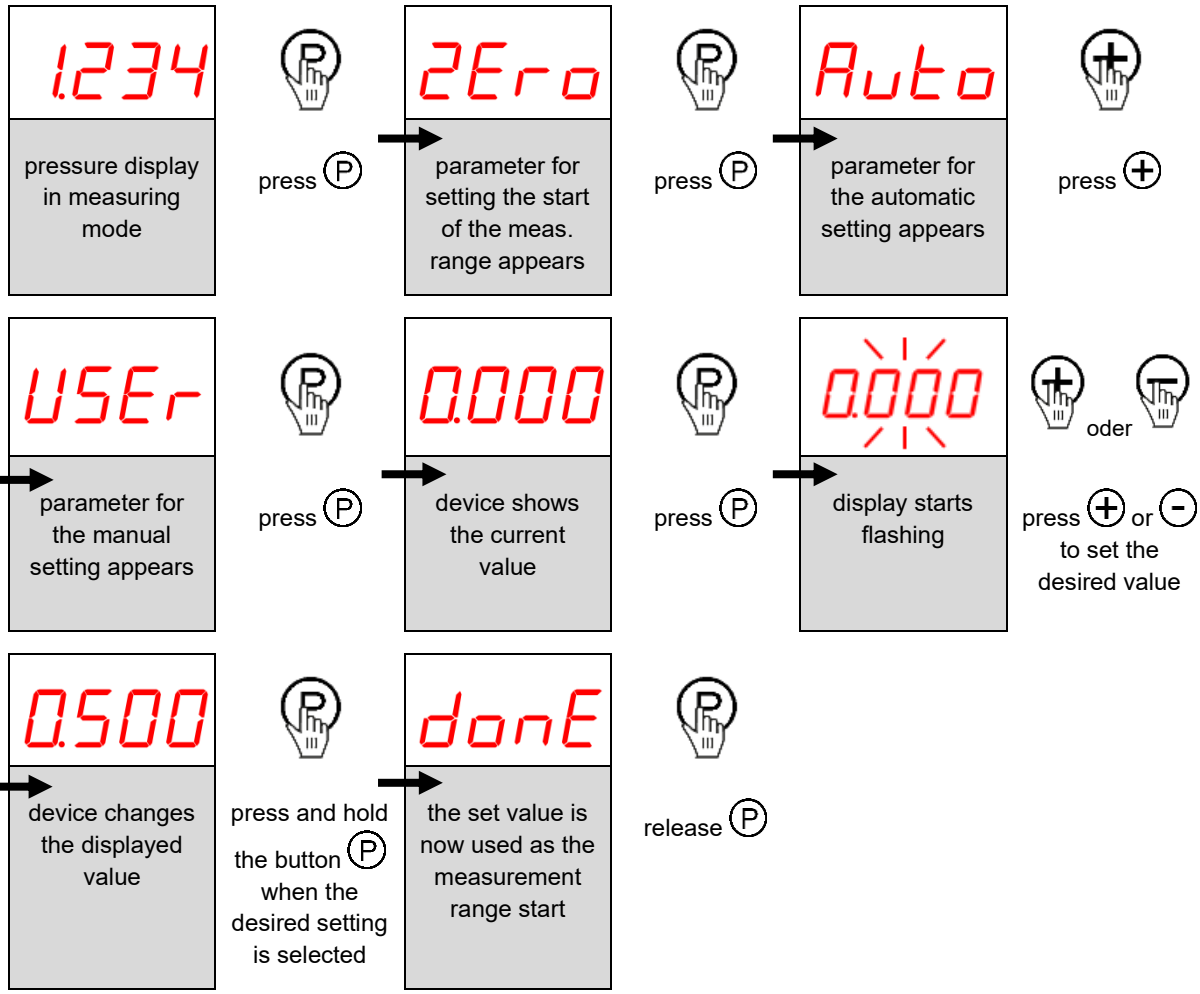
13.1.2 Manual setting of the start of the measuring range

To set the lower range value manually, proceed as described below.



	The transmitter automatically limits the setting to the maximum permissible range. If the display does not change further during setting, the limit value has been reached.
	By pressing ⊕ and ⊖ together the menu will be exited without any changes. **If the button ⊕ or ⊖ or is held down while setting the value, the unit automatically increments or decrements the value. The speed of this process increases with longer button presses.**

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13.2 Setting the end of the measuring range

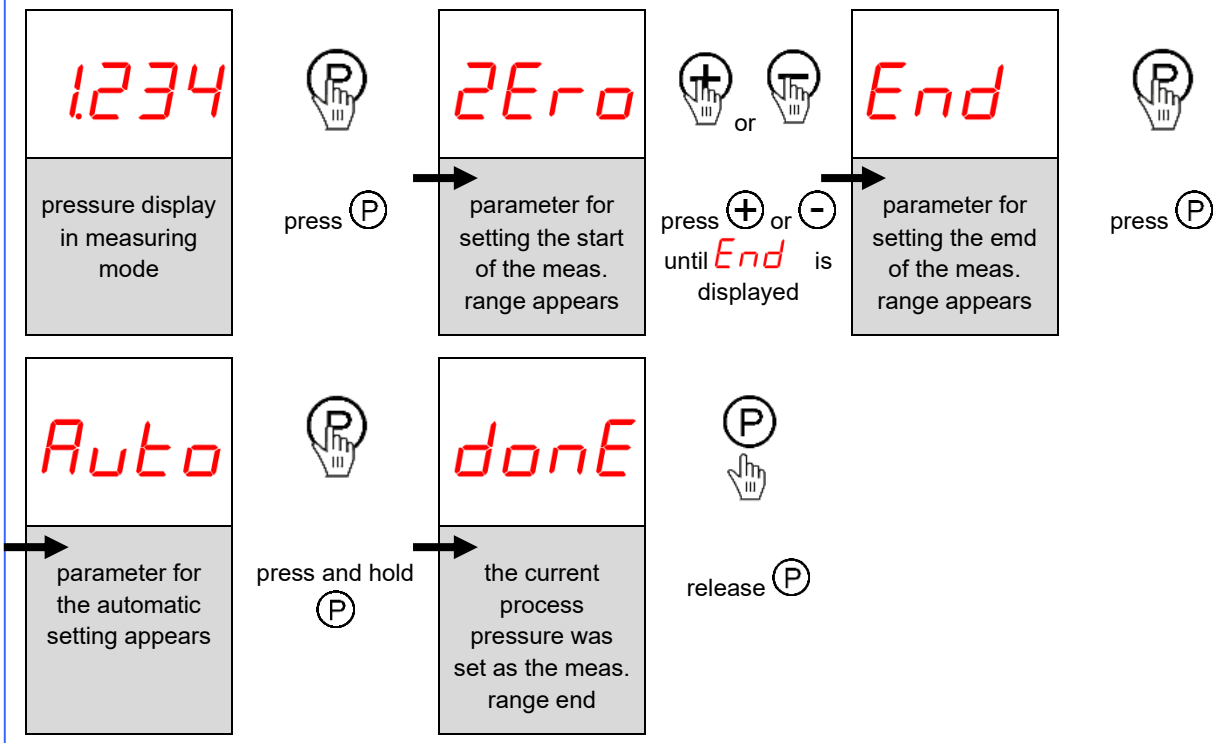
	The end of range determines at which pressure the transmitter outputs a loop current of 20mA.

The end of the measuring range can be set in two ways. Firstly, the current process pressure can be automatically stored by the transmitter as the new end of measuring range. If, on the other hand, a specific process pressure is to serve as the end of the measuring range, the user can set this manually in the unit.

- The end of the measuring range is changed.
- The displayed pressure of the on-site display does **not** change!

13.2.1 Automatic setting of the end of the measuring range

To carry out the automatic take-over of the applied process pressure, proceed as follows.



	Make sure that there is a constant process pressure during the automatic transfer.
	If the message "fail" appears instead of the success message "done", it is not possible for the transmitter to accept the applied process pressure. In this case, check whether the pressure is outside the possible setting limits.
	By pressing ⊕ and ⊖ together the menu will be exited without any changes.

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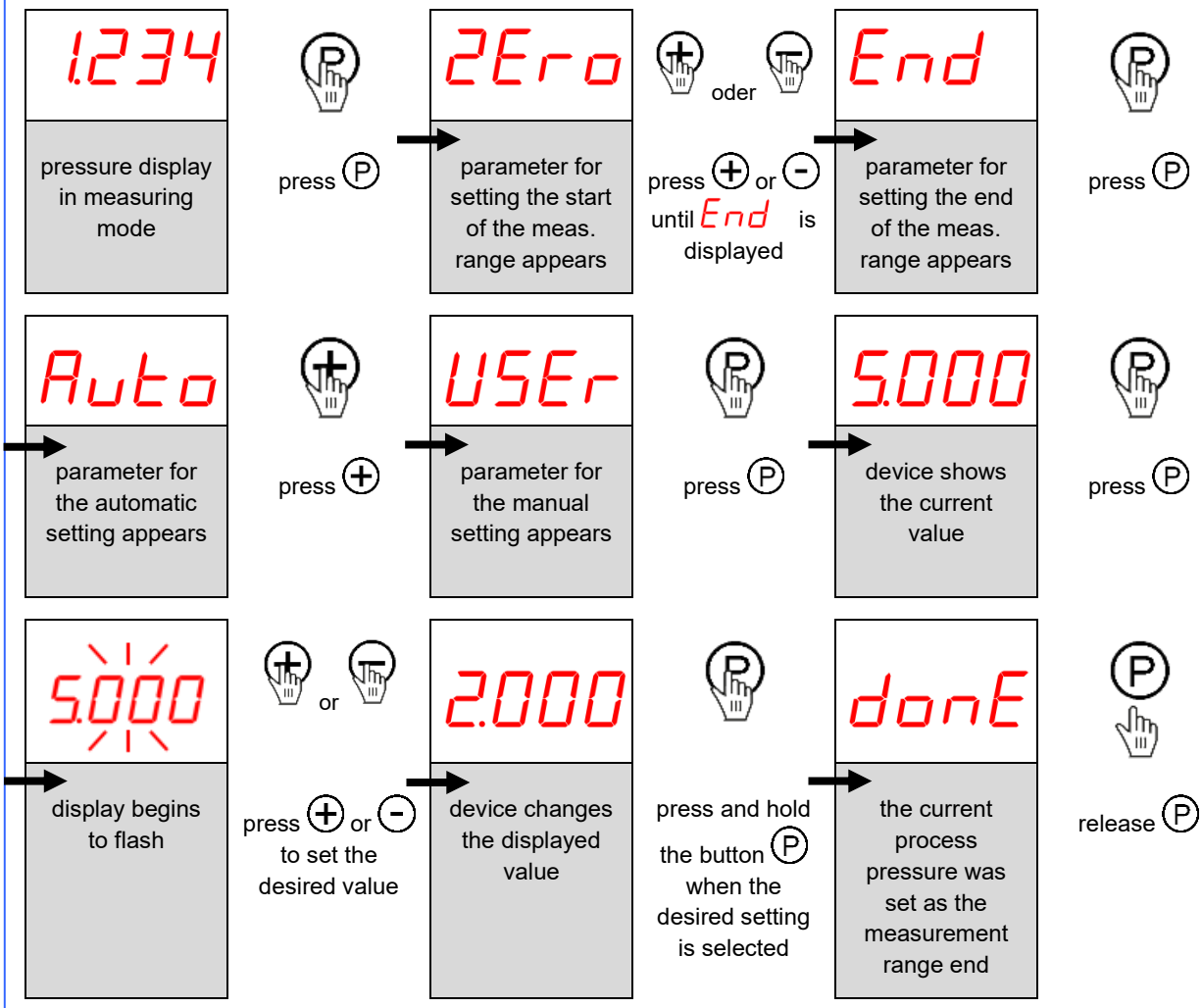
13.2.2 Manual setting of the end of the measuring range

To set the end of the measuring range manually, proceed as described below.



	The transmitter automatically limits the setting to the maximum permissible range. If the display does not change further during setting, the limit value has been reached.
	By pressing ⊕ and ⊖ together the menu will be exited without any changes. **If the button ⊕ or ⊖ or is held down while setting the value, the unit automatically increments or decrements the value. The speed of this process increases with longer button presses.**

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13.3 Configuration of the switching points

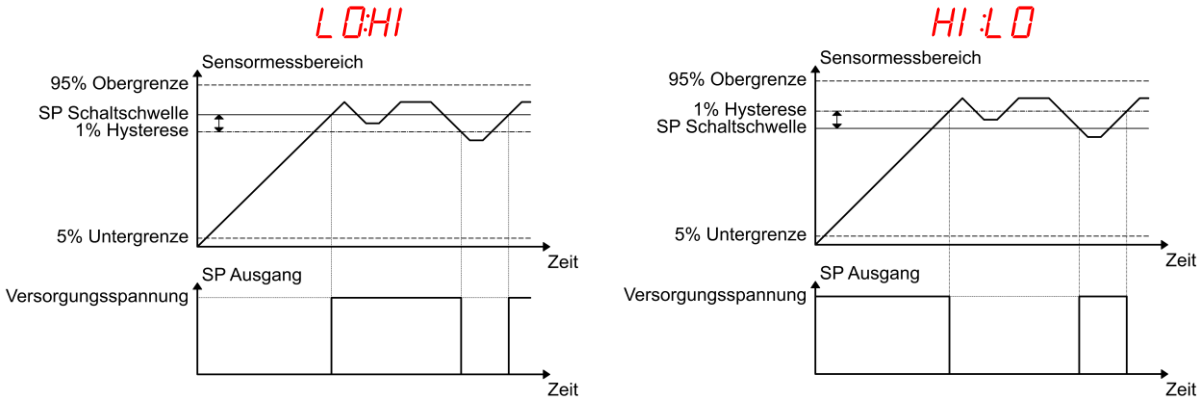
The two switching points SP1 and SP2 can be configured independently of each other. If the switching point is armed and the process pressure reaches the set threshold value, the unit activates the corresponding switching output and outputs the supply voltage at the respective output (PNP behaviour). Both the rising and the falling edge can be switched.

	By means of the two switching points integrated in the unit, it is possible to react to pressure limits being exceeded or undershot. The hysteresis is 1% of the sensor measuring range. The switching points can be set between 5% and 95% of the sensor measuring range.

Symbol description:

On	**Switching point is activated and reacts to pressure (switching output dependent on pressure value)**
OFF	**Switching point is deactivated and does not react to pressure (switching output always inactive)**
LO:HI	**Switching point active when process pressure exceeds the set value (rising edge)**
HI :LO	**Switching point active when process pressure falls below the set value (falling edge)**

The following diagram explains the switching behaviour of the pressure transmitter.



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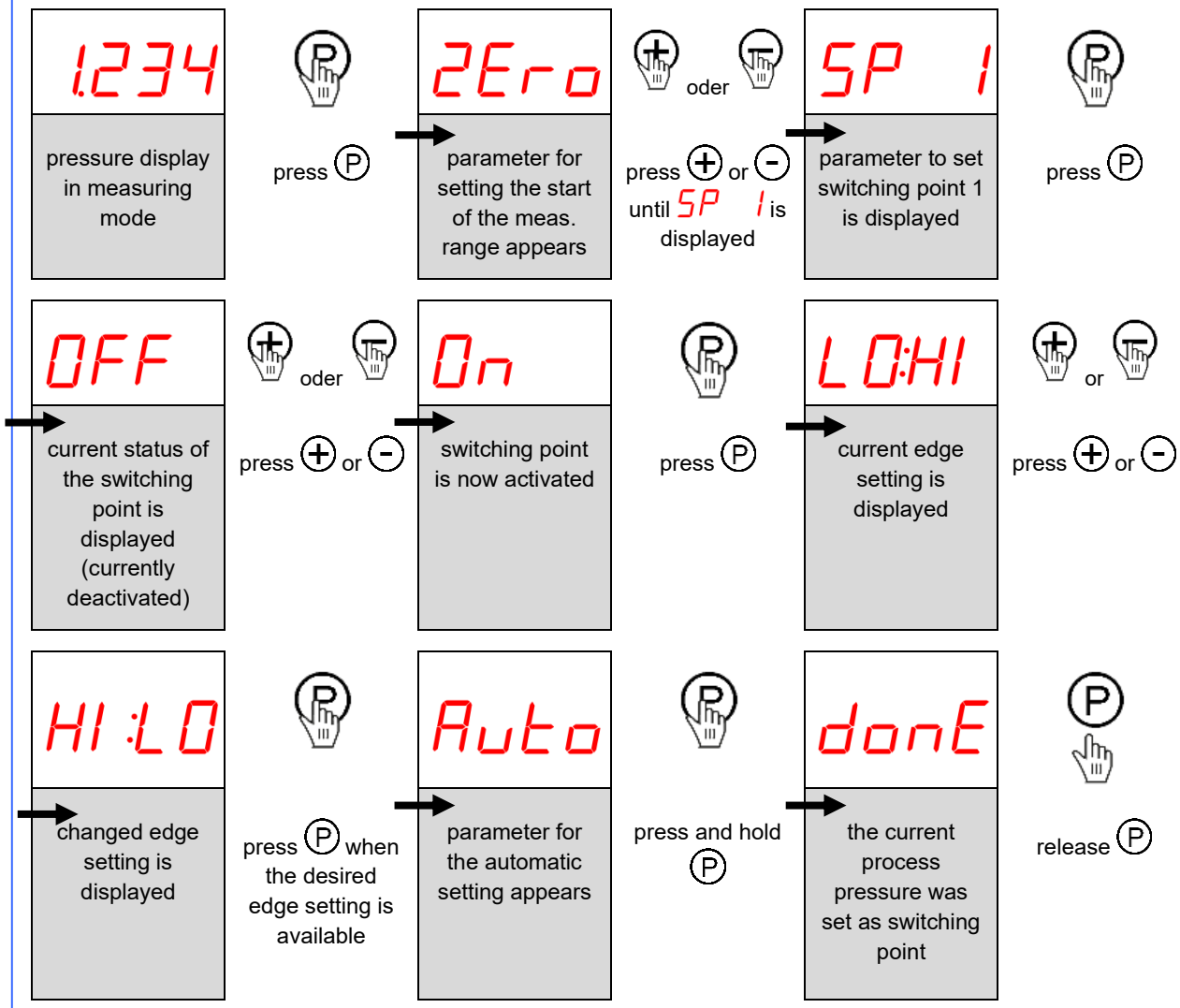
13.3.1 Automatic configuration of the switching point

For the automatic setting of the switching points SP1 and SP2, proceed as described below (example shows SP1).



	**Make sure that there is a constant process pressure during the automatic transfer.**
	**If the message "fail" appears instead of the success message "done", it is not possible for the transmitter to accept the applied process pressure. In this case, check whether the pressure is outside the possible setting limits.**
	**By pressing ⊕ and ⊖ together the menu will be exited without any changes.**

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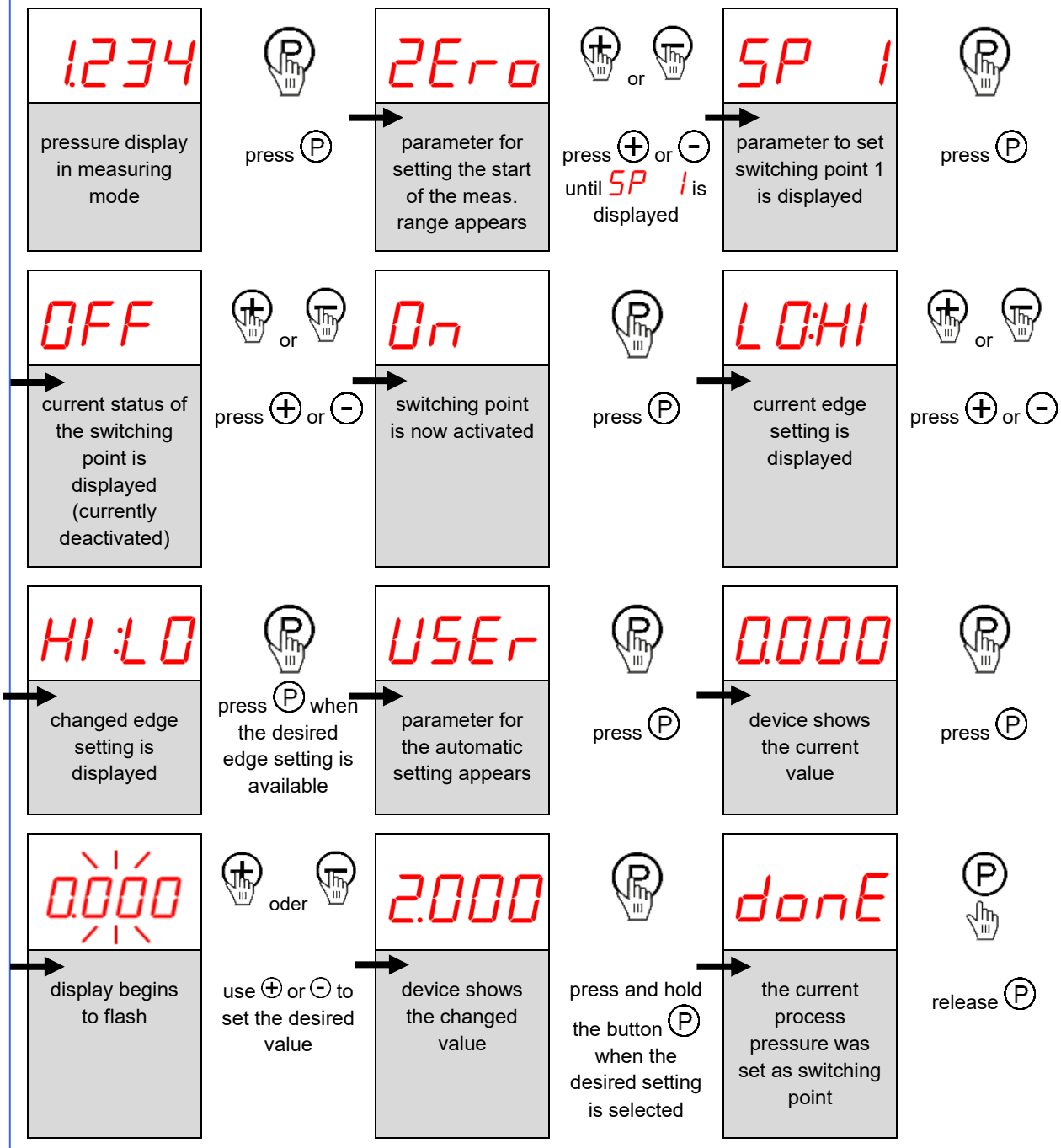
13.3.2 Manual configuration of the switching point

To set the switching points SP1 and SP2 manually, proceed as described below (example shows SP1).



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13.4 Setting the position correction (bias)

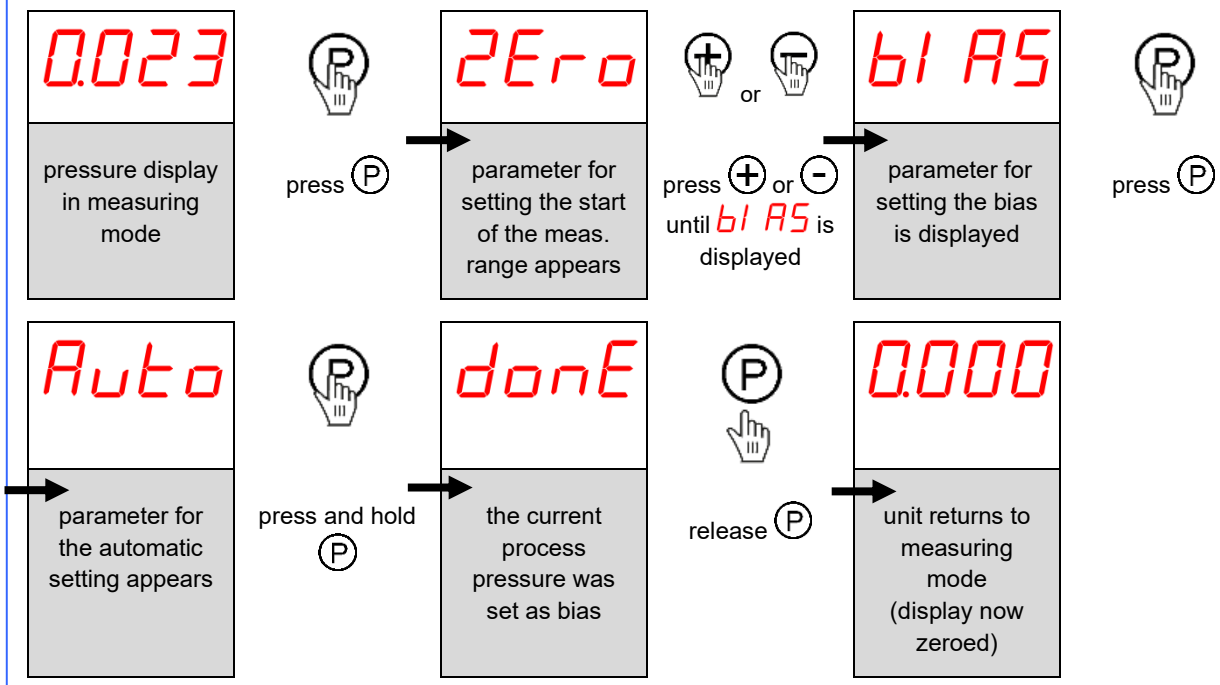
	**By means of the position correction (bias), an undesired pre-pressure can be compensated. Future measurements are corrected by the set value.**

The position correction can be set in two ways. The current process pressure can be automatically stored by the transmitter as the new correction value. If, on the other hand, a specific correction value is to be used, the user can set this manually in the unit.

- The start and end of the measuring range are not changed.
- The displayed pressure of the on-site display changes.

13.4.1 Automatic setting of the position correction (bias)

To carry out the automatic transfer of the applied process pressure, proceed as described below.



	**Make sure that there is a constant process pressure during the automatic transfer.**
	**If the message "fail" appears instead of the success message "done", it is not possible for the transmitter to accept the applied process pressure. In this case, check whether the pressure is outside the possible setting limits.**
	**By pressing ⊕ and ⊖ together the menu will be exited without any changes.**

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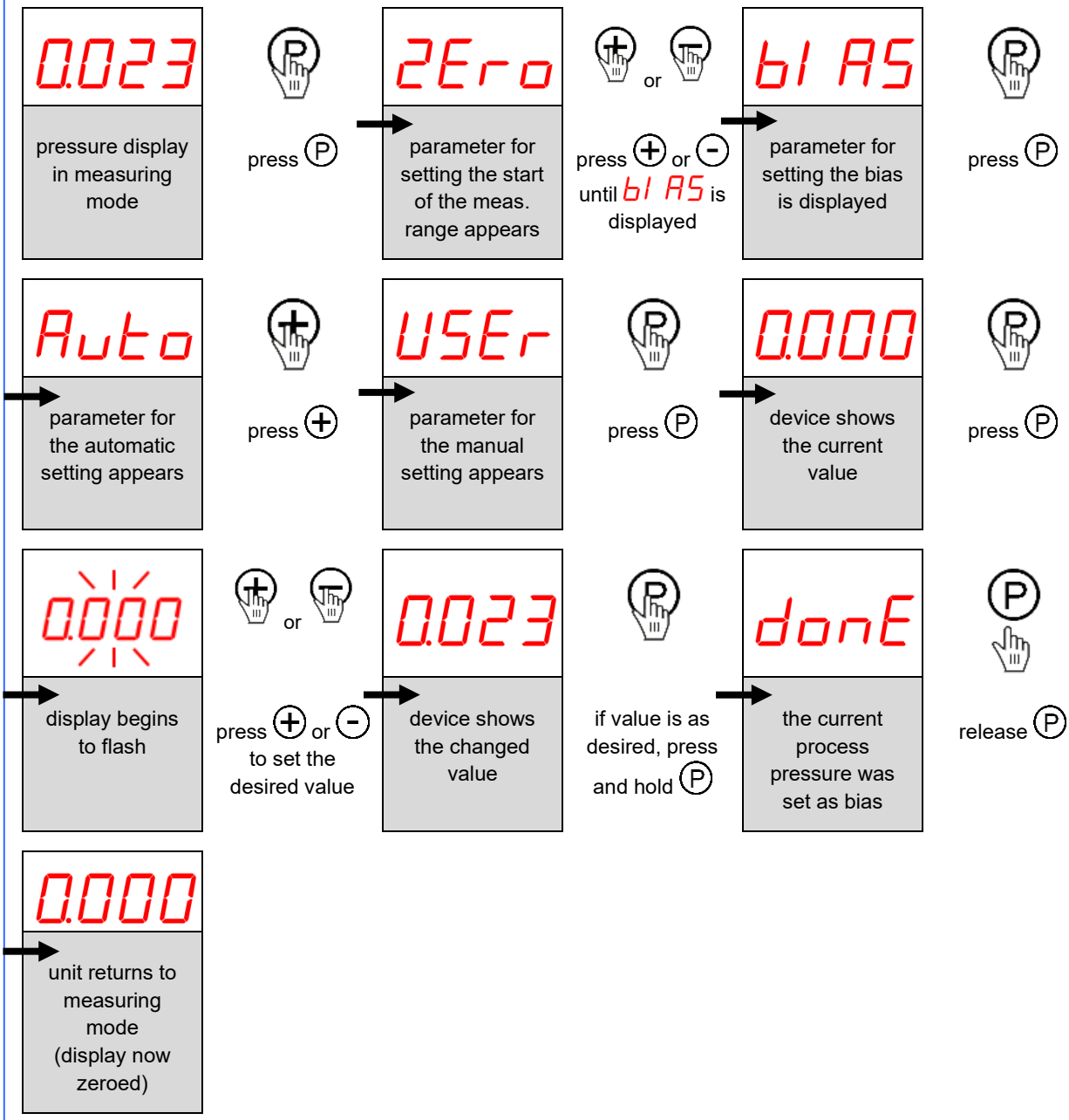
13.4.2 Manual setting of the position correction (bias)

To make the manual setting of the position correction, proceed as follows.



	The transmitter automatically limits the setting to the maximum permissible range. If the display does not change further during setting, the limit value has been reached.
	By pressing ⊕ and ⊖ together the menu will be exited without any changes. **If the button ⊕ or ⊖ or is held down while setting the value, the unit automatically increments or decrements the value. The speed of this process increases with longer button presses.**

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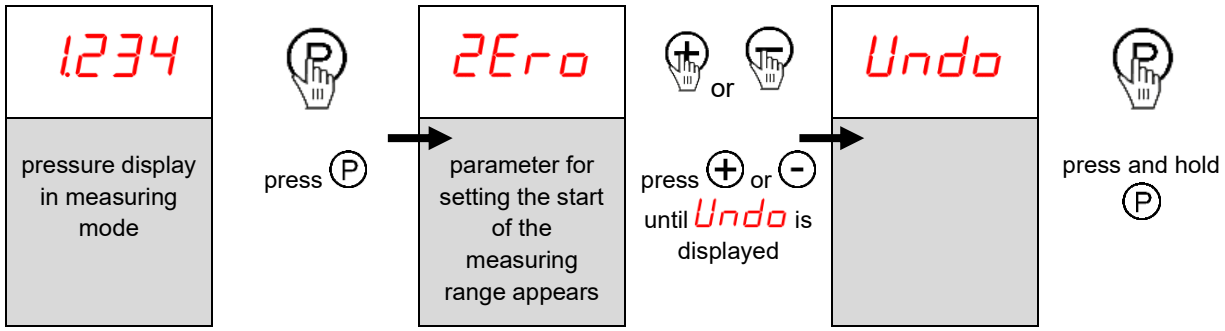
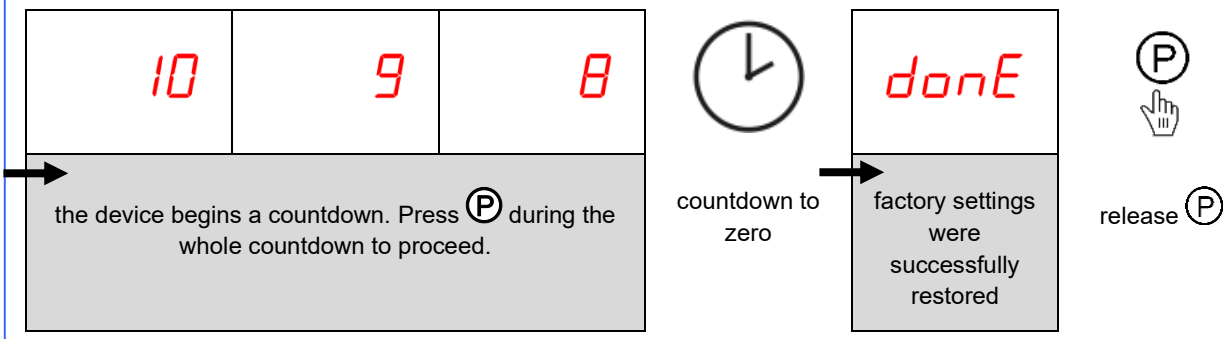
13.5 Restore factory settings

The revert to factory settings resets the device to its delivery status.

	**All parameter settings made by the user are lost during this process.**





	**By pressing ⊕ and ⊖ together the menu will be exited without any changes.**

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14 Fault diagnosis and rectification

If the unit does not behave as expected, please check the following points before contacting the manufacturer.

Malfunction	Possible causes	Check / remedy
The unit does not start OR no current flows in the loop OR the display remains dark.	The polarity of the power supply is reversed / incorrectly connected.	Make sure that the power supply is connected correctly.
	The power supply is not switched on.	Check with a voltmeter that the supply voltage is provided by the supply line.
	There is a cable break in the supply line.	
The current value is outside the limits of 4 to 20mA.	The pressure applied to the transmitter is outside its set measuring range.	Return the transmitter to its set measuring range.
	The diaphragm of the transmitter has been damaged.	It is not possible to repair the membrane - contact the manufacturer.

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