Operating instructions

DW52310x

Pressure Sensors

Table of contents

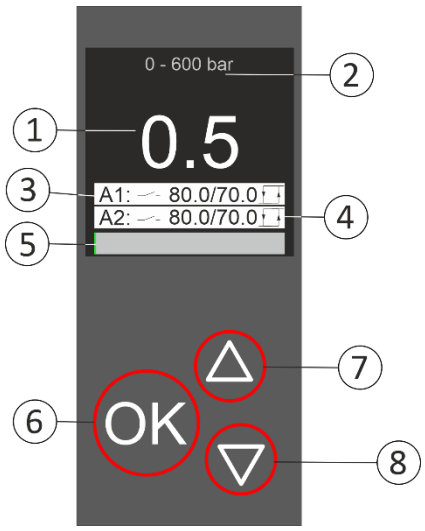
1 Safety instructions

- **The device described is installed as a subcomponent in a system.**
  - **The safety of this system is the responsibility of the manufacturer.**
  - **The system manufacturer is obliged to carry out a risk assessment and to create and include documentation in accordance with the legal and normative requirements for the operator and user of the system. This must contain all necessary information and safety instructions for the operator, user, and, if applicable, service personnel authorized by the system manufacturer.**
- **Read the product description before the start-up of the device and keep it for the duration of use.**
- **Ensure that the product is fully suitable for the application in question application and the environmental conditions.**
- **Check the compatibility of the product materials in all applications.**
- **Only carry out installation when the system is in the pressure-free state! Ensure that and tight screw fitting of the process connection.**
- **The electrical connection may only be made when the power is disconnected.**
- **Failure to observe the application instructions or technical specifications may result in damage to property and/or personal injury.**
- **The manufacturer accepts no liability and provides no warranty for consequences resulting from tampering with the product or misuse by the operator.**
- **Installation, electrical connection, start-up, programming, configuration, operation, and maintenance of the product may only be performed by authorized personnel trained for the respective activity. authorized personnel.**
- **Avoid static and dynamic excess pressures that exceed the specified pressure resistance.**
- **Protect the device and the connection cable effectively against damage.**
- **The application of these products is prohibited if there is a direct impact on personal safety is prohibited.**

2 Intended use

The device is intended for monitoring the system pressure of machines and systems.

3 Control and display elements



Displays on the TFT display (standard)

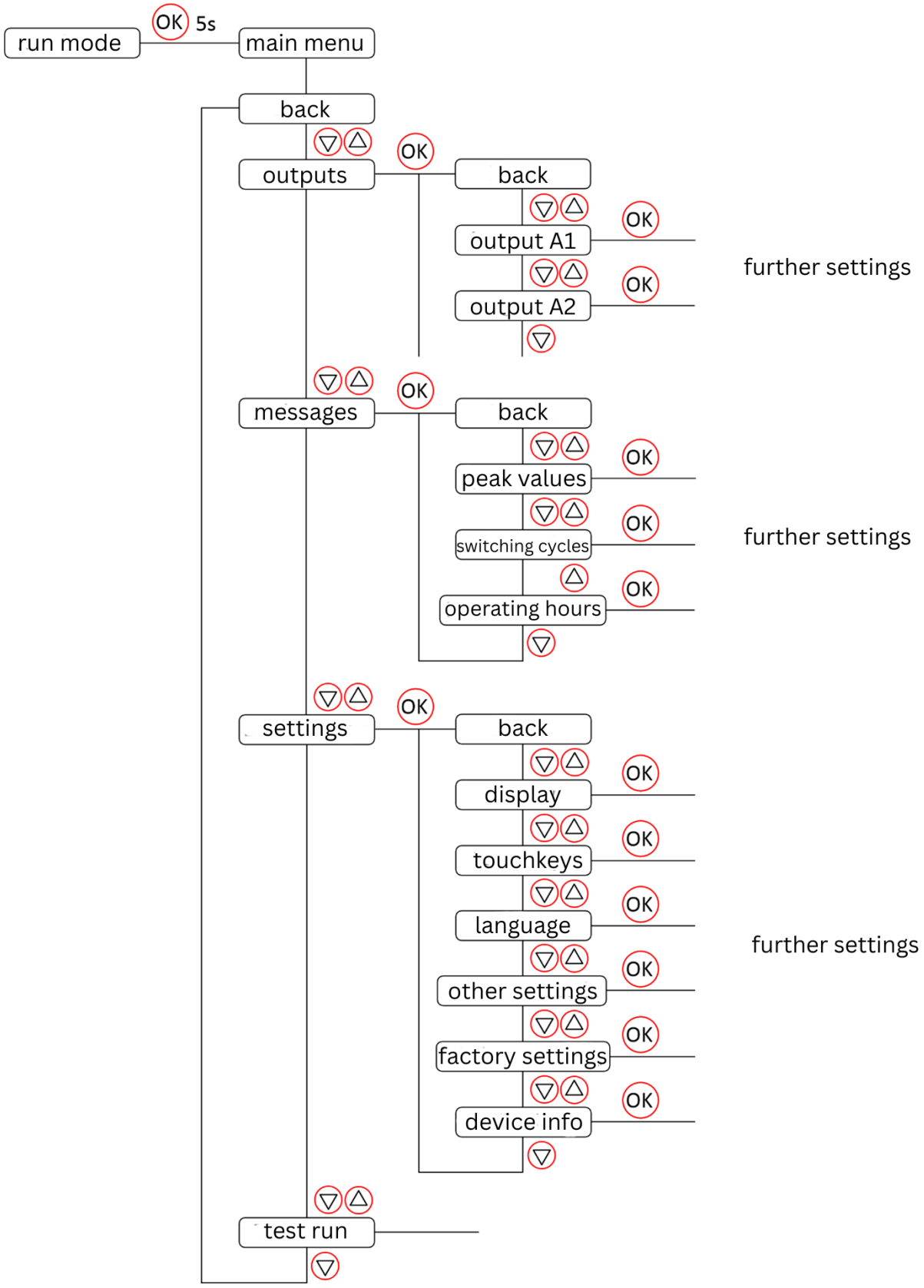
No	description	Function
1	measured value	Display of the measured pressure (decimal)
2	pressure range	Display of the sensor pressure range or note of test mode
3	Output A1	Display of output programming, switching state, and switching points
4	Output A2	As "3", depending on programming, also display of analog or alarm output
5	Bar graph	Trend display of system pressure

Operating keys below the display

No	Key	function	Symbol
6	OK button	Selecting the programming menus and saving the values	OK
7	Up arrow key	Increase parameter values Selecting submenus	△
8	Down arrow key	Decrease parameter values Selecting submenus	▽

4 Menu structure

Here you will find an overview of the structure of the main menu and the first submenu. All other submenus and functions are described on the following pages.



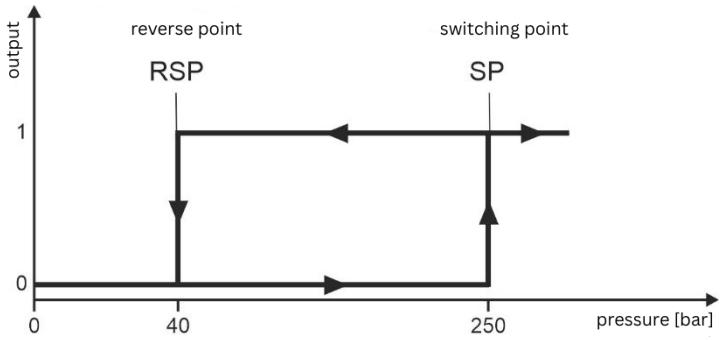
5 Functionality of the switching outputs

Notes:

- The examples and descriptions of the switching output (SP 1) shown refer to the "normally open" switching function (no). If the "normally closed (nc) switching function is programmed, the status are reversed accordingly.
- The minimum distance between the switching outputs (SP 1 and RSP) is set by the system to 0.2% of the nominal pressure.
- The smallest adjustable hysteresis is set by the system to 0.2% of the nominal pressure.
- All examples can be applied to both output 1 and output 2, provided that it is programmed as a switching output.

5.1 Switching point with release position

Programmed parameters: SP: 250.0 bar
RSP: 40.0 bar



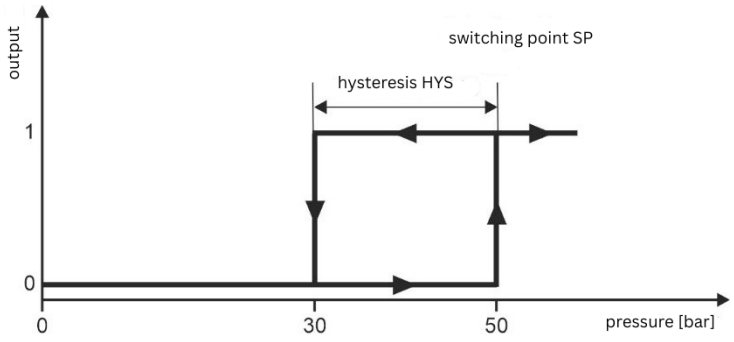
A pressure increase to SP (here 250 bar) switches the output according to the set switching function (NO or NC). Above this, the status is maintained.

The switching state of the output only reverses when the pressure de-energizes below RSP. If SP is changed, RSP remains constant.

The minimum distance between SP and RSP1 is set by the system to 0.2% of the maximum pressure.

5.2 Switching point with hysteresis

Programmed parameters: SP: 50.0 bar
HYS: 20.0 bar



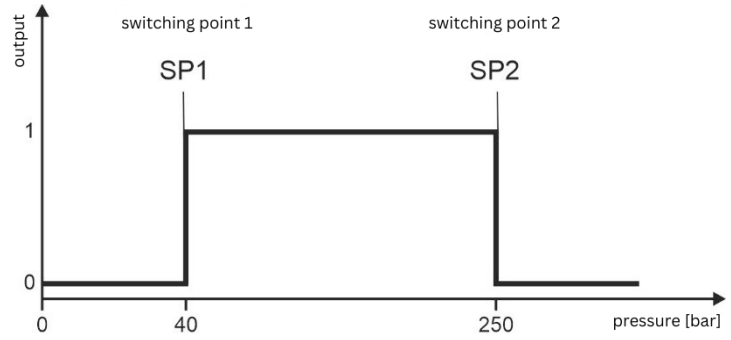
A pressure increase to SP (here 50 bar) switches the output according to the set switching function (NO or NC). The status remains unchanged.

The switching state of the output is only reversed when the pressure de-energizes below the hysteresis value, in this case 20 bar. If SP is changed, the hysteresis remains unchanged, i.e. the release position is (SP – 20) bar.

The minimum hysteresis is set by the system to 0.2% of the maximum pressure.

5.3 Window function with 2 switching points

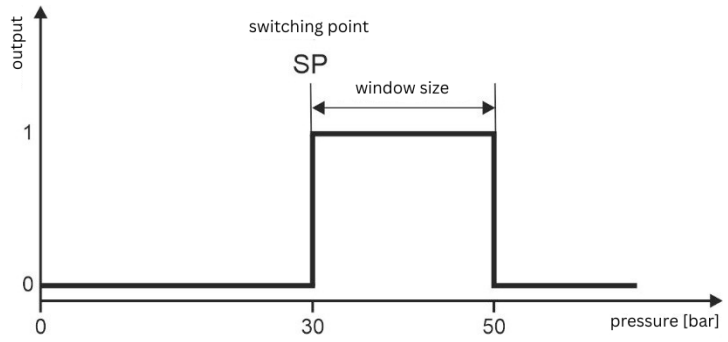
Programmed parameters: SP 1: 40.0 bar
SP 2: 250.0 bar



The window function allows monitoring of a defined good range.
If the pressure reaches the set switching window between SP 1 (40 bar) and SP 2 (250 bar), the output switches according to the set switching function (NO or NC). The output changes its status again when leaving the window. The direction of entry or exit is irrelevant. The values for the switching point and release position must be changed separately. If only SP 1 is changed, SP 2 remains constant.

5.4 Window function with switching point and window size

Programmed parameters: SP: 30.0 bar
Window size: 20.0 bar

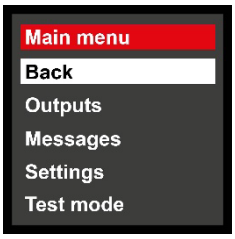
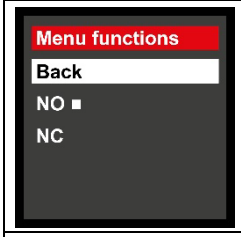
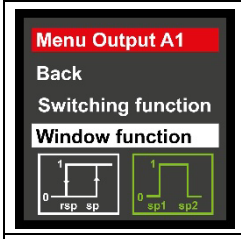
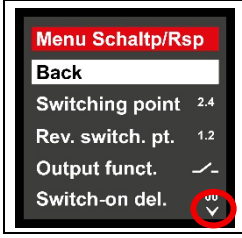


If the pressure reaches the set switching window between SP (30 bar) and (SP + HYS) (50 bar), the output switches according to the set switching function (NO or NC). The output changes its status again when it leaves the window. The direction of entry or exit is irrelevant. If SP is changed, the window size remains the same, i.e., the upper switching point here is (SP + 20) bar.

6 Configuration / Settings

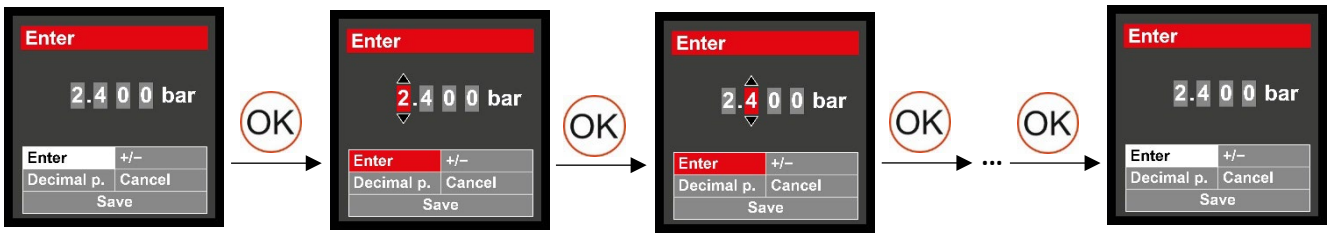
6.1 Description of the display and the various setting modes

The DW5x series devices are operated via three buttons below the display. The arrow keys (one for up and one for down) are used to scroll through the menu items and to increase or decrease various numerical values. Use the OK button to select submenus, save setting changes, or jump back one menu level.

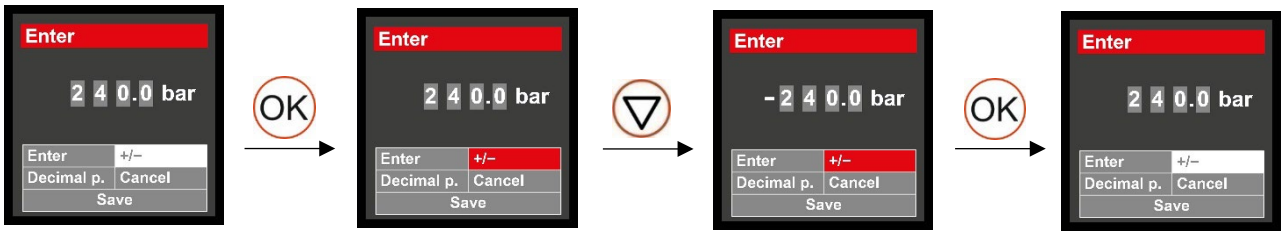
	Standard screen: Display of pressure range, system pressure (numerical value and bar graph), and output configurations (see section 3, Operating and display elements). To access the main menu, press and hold the "OK" button for 5 seconds.
	Selection menu 1 In this selection menu, you can select the feature to be programmed. Use the arrow keys to scroll up or down; the current row is highlighted in white. Press "OK" to go to the next menu level. The first row of a selection menu is always "Back." If this is highlighted in white, press "OK" to go back one level until the start screen reappears. If no changes are made, the sensor automatically returns to the default screen after two minutes.
	Selection menu 2 Here you can activate or deactivate functions. The activated function is indicated by a dot after the text.
	Selection menu 3 Here, too, you can activate the functions, but additional settings are required. For example, the values in the next submenu must be saved here, otherwise the desired function will not be activated.
	If a menu has more than 5 options, an arrow is displayed on the right-hand side in the lower or upper area.

Input menu

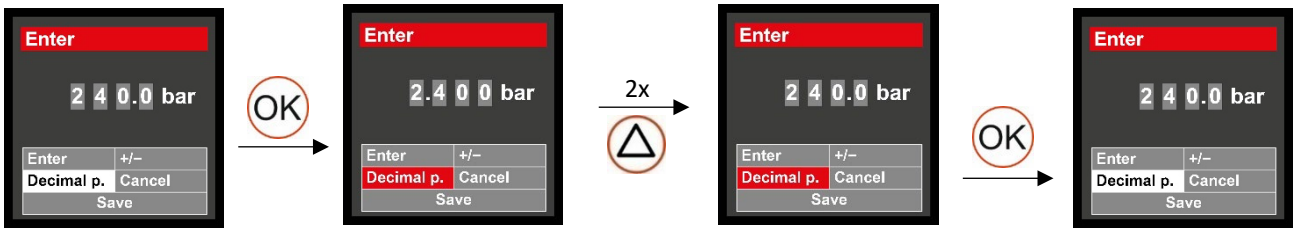
In an input menu, you are expected to enter a number. Here, too, the current setting is displayed first. You can only select the lower fields using the arrow keys. When "Input" is highlighted in white, press "OK" – the background color changes from white to red. At the same time, the first field is highlighted in red and the numerical value it contains can be changed using the arrow keys. Pressing "OK" selects the next digit. Once all numbers have been changed as desired, press "OK" and the background color of "Input" will change back to white.



You can use the same procedure to change the sign by selecting "+/-". However, this is only useful for a pressure sensor with a measuring range extending to -1 bar (vacuum).



You can use the same procedure to move the decimal point by selecting "Decimal point".



Apply value/input
To enable the sensor to operate with the new values, be sure to scroll to "Save" and press "OK."

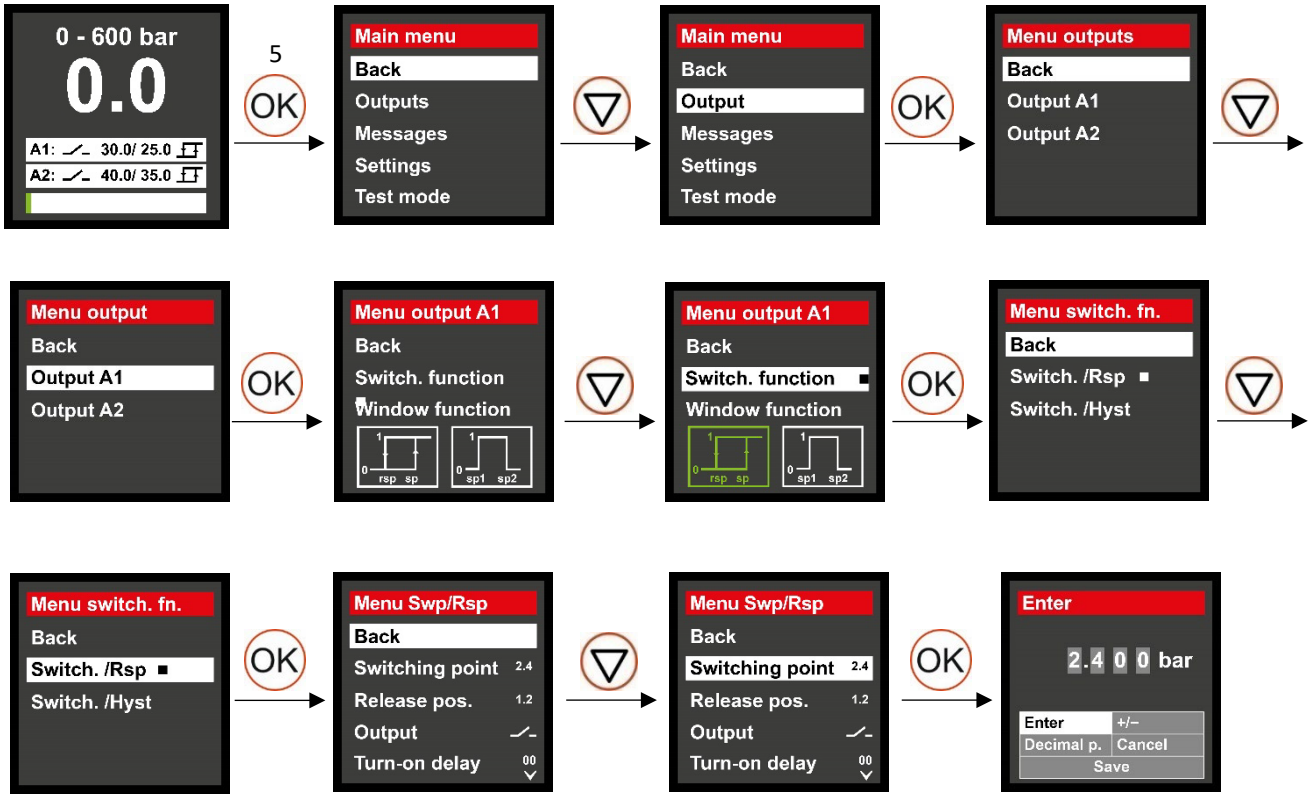
Reset value/input
Scrolling to "Cancel" and pressing "OK" deletes the last entries and the sensor returns to the previously set values.

6.2 Outputs

6.2.1 Output A1

6.2.1.1 Switching point/release position

Use the "OK" and "Down" buttons to navigate via the main menu and the various submenus to the "Switching point/Release position" function. The path to this function is described in detail here with illustrations.



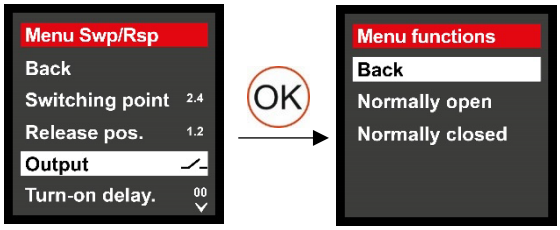
Once you have reached the input menu, proceed as described in 6.1 "Input menu" to set the desired pressure value as the switching point.

The sign selection "-(("is only useful when using a sensor that can also measure in the vacuum range.

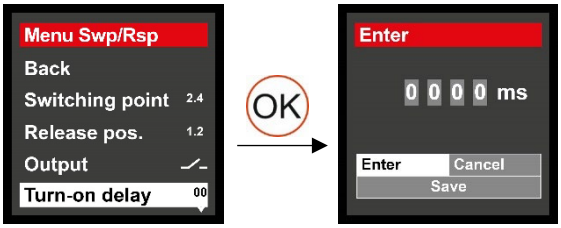
If, for example, the switching point is to be 240 bar, scroll to "Decimal point" and move the decimal point two places to the right.

After entering the value, be sure to scroll to "Save" and press "OK" to confirm. Only then will the identifier be set to "Switch point/Reset" in the "Switch function" menu.

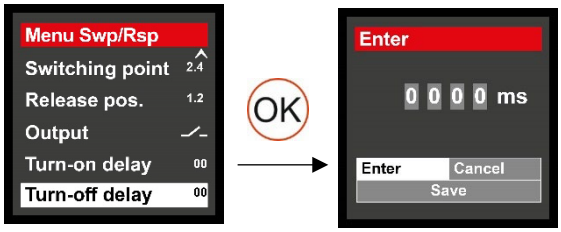
After saving the switching point, the display returns to the "Switching point/Reset" menu. Use the down arrow key to select the "Release position" item. After pressing the OK key, you will return to the input menu. Proceed as described above for the setting of the release position.



Under the menu item "Output function," you can set whether the switching output should function as a normally open or normally closed (nc) contact.



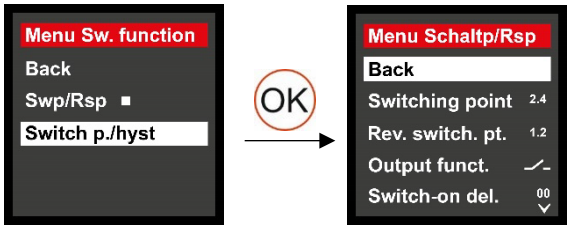
To prevent brief pressure fluctuations from immediately activating the switching output, you can set a turn-on delay. The input is made in "milliseconds" as described in 6.1 "Input menu". There is no decimal point here.



It is also possible to prolong short switching pulses. To do this, select the "Switch-off delay" option. The entry is made as described above.

6.2.1.2 Switching point hysteresis

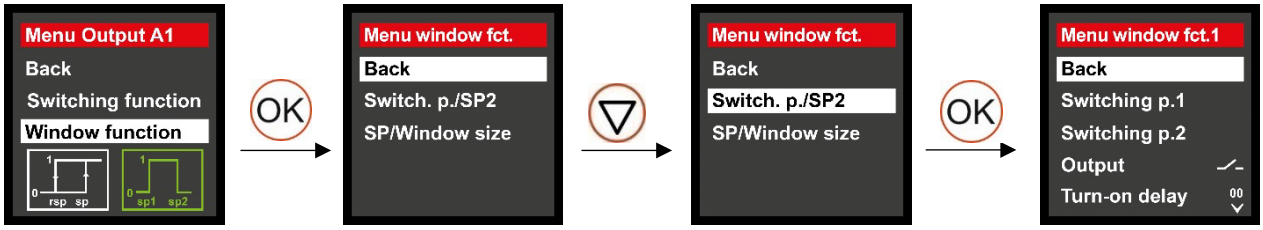
If you want the switching output to operate as described in section 5.2, select "Switching point/hysteresis" under "Switching function menu."



The other settings are made as described in 6.2.1.1. Instead of the release position, enter the hysteresis here. The actual release position is calculated from "switching point minus hysteresis" (see 5.2).

6.2.1.3 Window function – Switching point 1 / Switching point 2

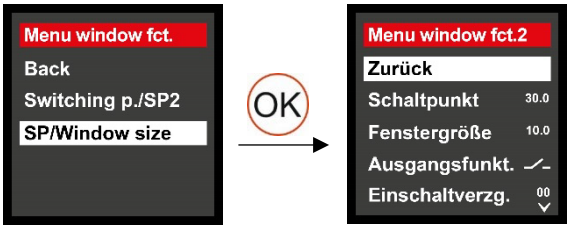
To ensure that the switching output works as described in 5.3, select "window function" under "Menu Output A1" and then "Switching point 1/SP2".



The input menu described in 6.1 is used again to parameterize the switching points. All other configurations, such as output function and delays, are made in the same way as in 6.2.1.1.

6.2.1.4 Window function – switching point / window size

It is also possible to program a fixed window size along with switching point 1.



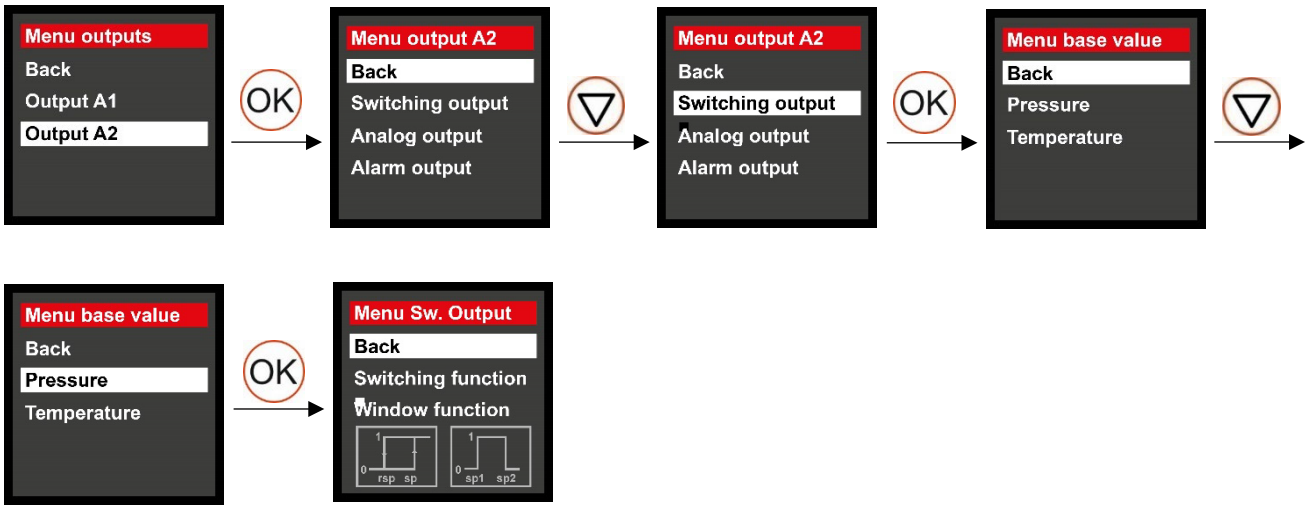
The switching point SP2 is then calculated from "switching point plus window size" (see 5.4).

6.2.2 Output A2

Along with the switching output functions already described under "Output A1," output A2 also has an analog and an alarm output function. You can also choose between the measured variables "pressure" and "temperature" for the switching and analog outputs.

note: **The output function only changes if at least one value has been newly saved in one of the corresponding input menus!**

6.2.2.1 Switching output

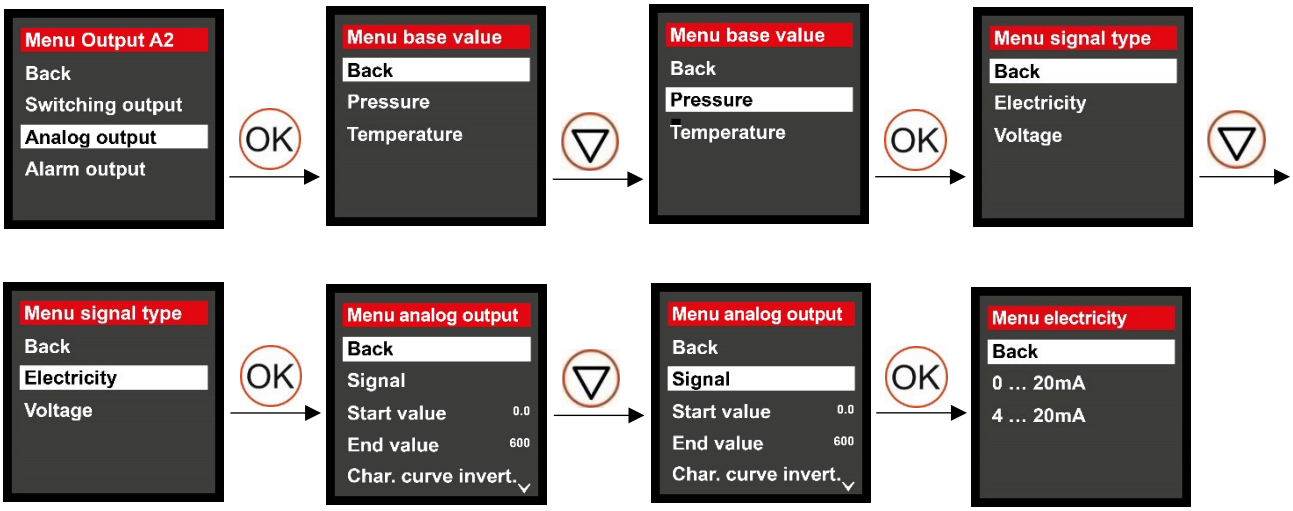


After selecting the measured variable, the "Switching output menu" opens. Further parameterization is carried out as described in 6.2.1.1 to 6.2.1.4.

Note: **The measured variable only changes if at least one value has been newly saved in the input menu in the "Switching Output Menu"!**

6.2.2.2 Analog output – current

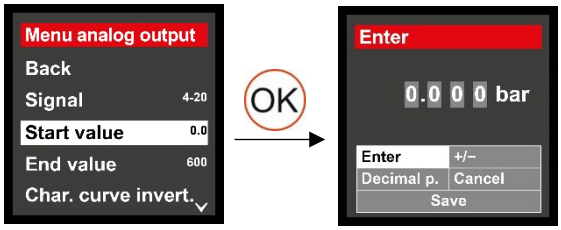
Use the following input sequence to set output 2 as an analog output with a normalized current signal. 0 ... 20mA or 4 ... 20mA are available.



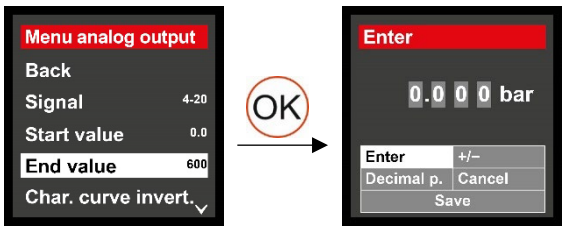
Scroll to the desired signal type and select it by pressing "OK." A dot appears behind the selected parameter. Then scroll to "Back" to set the other parameters in the "Analog Output Menu."

Note: In the "Signal Type Menu," a dot will only appear after "Current" once a selection has been made under "Signal." The corresponding analog output will also only become active at this point.

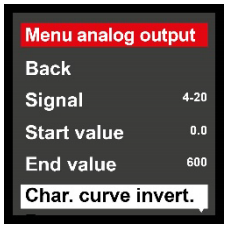
The measuring range of the analog output can be delimited using "Start value" and "Final value." Enter the pressure or temperature value at which the analog output should output 0 or 4 mA in "Start value." The familiar input menu is available for this purpose.



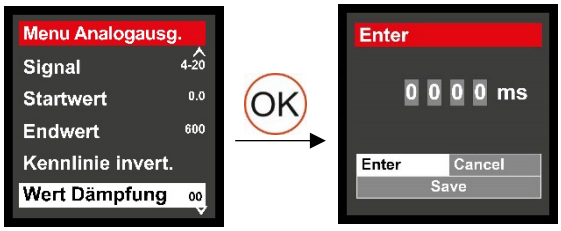
For "final value," enter the pressure or temperature value at which the analog output should output 20 mA – also via the input menu.



If you select "Invert characteristic curve," 20 mA will be output for "Start value" and 0 or 4 mA for "final value." The selection is indicated by a dot.



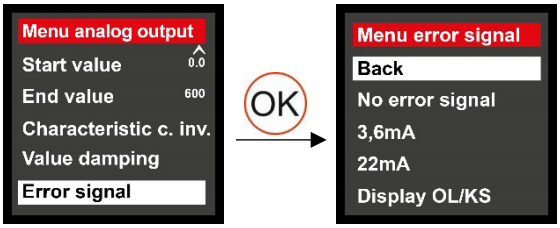
To filter out short-term or high-frequency pressure peaks, a delay time can be programmed under "Value damping." The time entered in ms is the time between the pressure change and the change in the analog signal. The familiar input menu is available for this purpose.



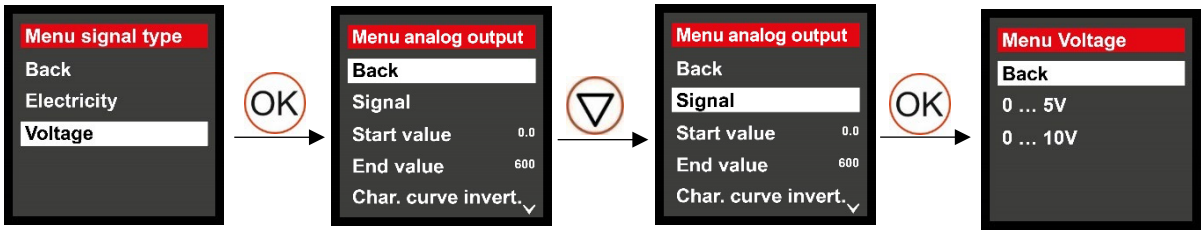
When selecting the "Current" signal type, there is a "Fault Signal" submenu. Here you can select whether and which signal is output when the programmed measuring range is exceeded.

The value 3.6 mA can only be selected if 4 ... 20 mA is configured under "Signal."

If "Display OL/KS" is activated, a red message (OL-AO) is displayed in the analog output area of the standard display in the event of an error.



6.2.2.3 Analog output – voltage



Scroll to the desired signal type and select it by pressing "OK." A dot appears behind the selected parameter. Then scroll to "Back" to set the other parameters in the "Analog output menu."

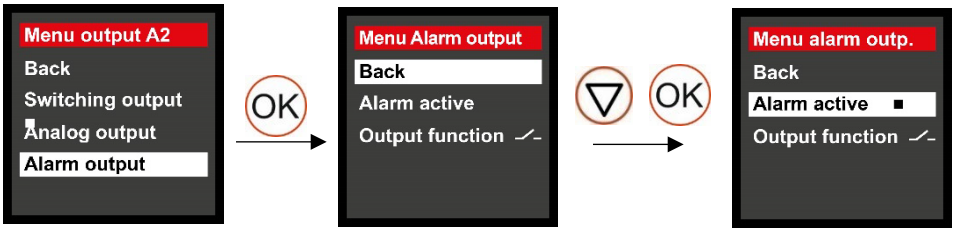
Note: A dot will only appear behind "Voltage" in the "Signal Type Menu" once a selection has been made under "Signal." The corresponding analog output will also only become active at this point.

All further settings are made as described in 6.2.2.2 (analog output – current).

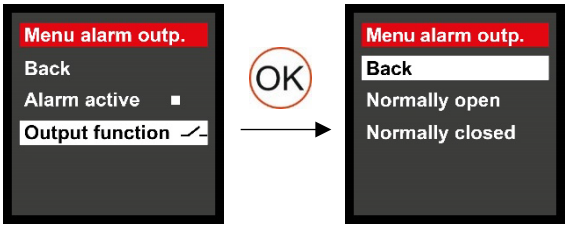
However, no error signal is defined for the standardized voltage signals, which is why the "Error Signal" submenu is missing. If, in the event of an error, the red lettering (KS-AF) is to be displayed in the analog output area of the standard display, "Display OL-KS" must be selected in the "Current" area of the "Error Signal" submenu. Only then should the desired parameterization be carried out under "Voltage."

6.2.2.4 Alarm output

You can configure output A2 as an alarm output. This is switched when an error occurs at the pressure sensor. Scroll to "Alarm active" and press OK. Along with "Alarm active", a dot appears. Only then is the activation as an alarm output indicated by a dot in the "Menu Output A2".

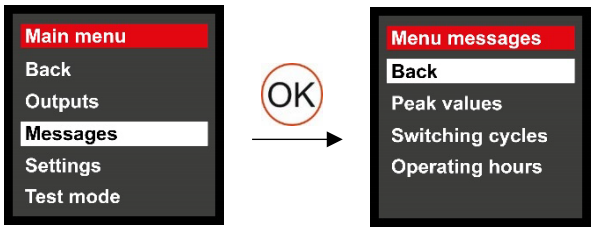


The alarm output can be configured as both a normally open (NO) and a normally closed (nc) contact.



Note: **If output 2 is to be used again as a switching or analog output, the "Alarm active" item must first be deactivated in the "alarm output" menu! Otherwise, no changeover is possible.**

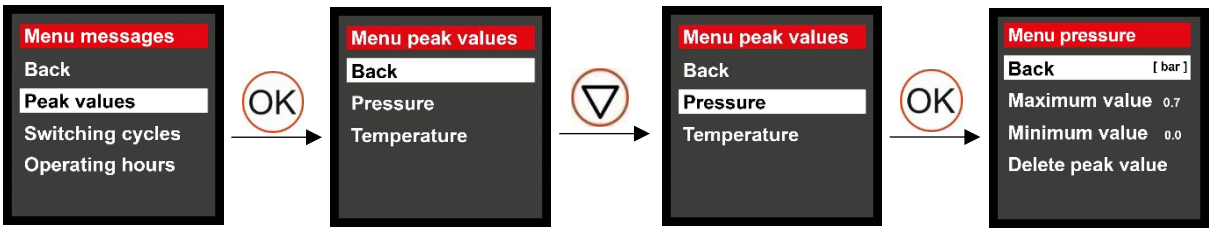
6.3 Messages



Under the "Messages" menu, you will find the peak value memory, the number of switching cycles for output 1, and the display of operating hours:

6.3.1 Peak values

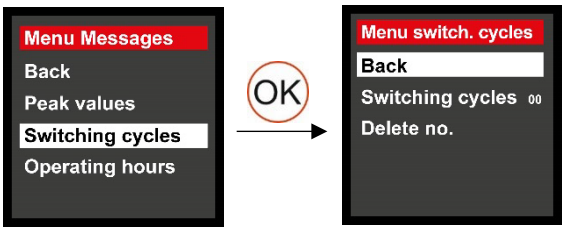
The minimum and maximum values measured by the pressure sensor are stored in the peak value memory. These can be inquired separately for pressure and temperature.



The maximum measured value and the minimum measured value can be read. You can delete the values by scrolling to "Delete peak values" and pressing "OK."

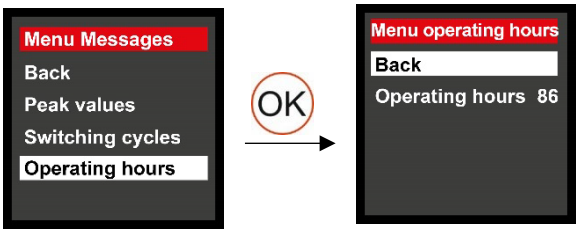
If you select "Temperature" in the "Peak values menu," you will see the corresponding temperature values. These can also be deleted.

6.3.2 Switching cycles



Under "Switching cycles," you can see how often switching output 1 has been activated. Scroll to "Delete switching cycles" and press "OK" to set the value to 0.

6.3.3 Operating hours

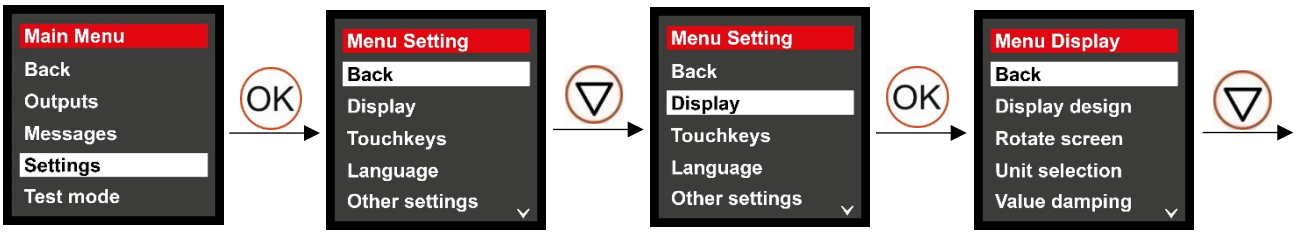


Under "operating hour," you will find the time that the pressure sensor has been in operation so far. This value cannot be deleted.

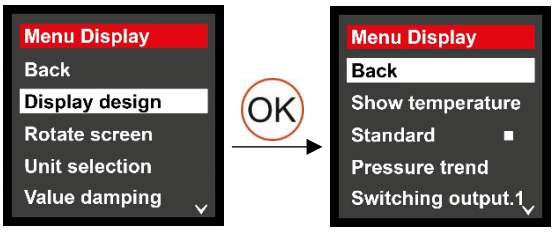
6.4 Settings

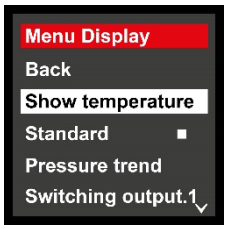
6.4.1 Display

In the "Setting" menu, you can program the display:

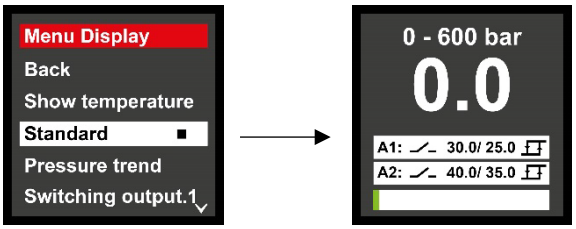


6.4.1.1 Display Design

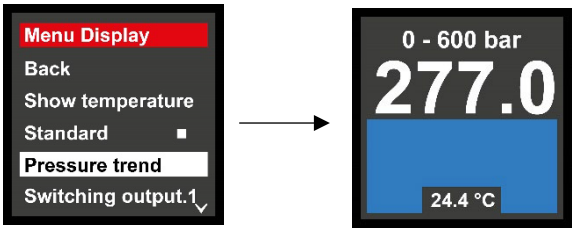




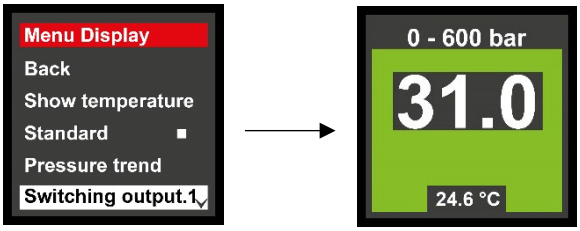
The current processor temperature can be displayed on all display versions. Activation of the temperature display is indicated by a dot.



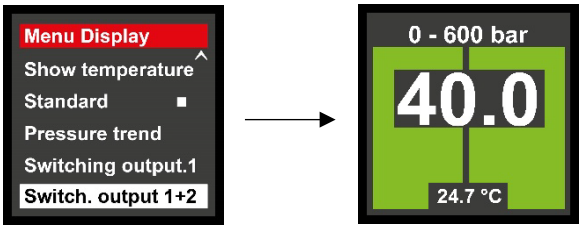
Standard display with temperature display activated.
The configurations of the outputs are shown in the respective bars for A1 and A2. When the switching output is active, the corresponding bar lights up green. Below is the trend display for the measured pressure.



Pressure trend with activated temperature display.
The display of the measured pressure is larger; when the nominal pressure is applied, the blue field takes up almost the entire display size, with only the lettering remaining blank.

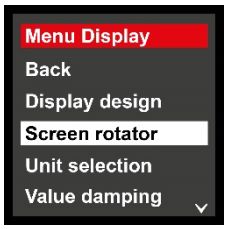


Display of switching output 1.
The display of the measured pressure is larger. When switching output 1 is active, almost the entire display turns green, with only the lettering remaining blank.



Display of switching outputs 1 and 2.
The display of the measured pressure is larger. When switching output 1 is active, the left half of the display turns green; when switching output 2 is active, the right half turns green. Only the lettering remains visible.

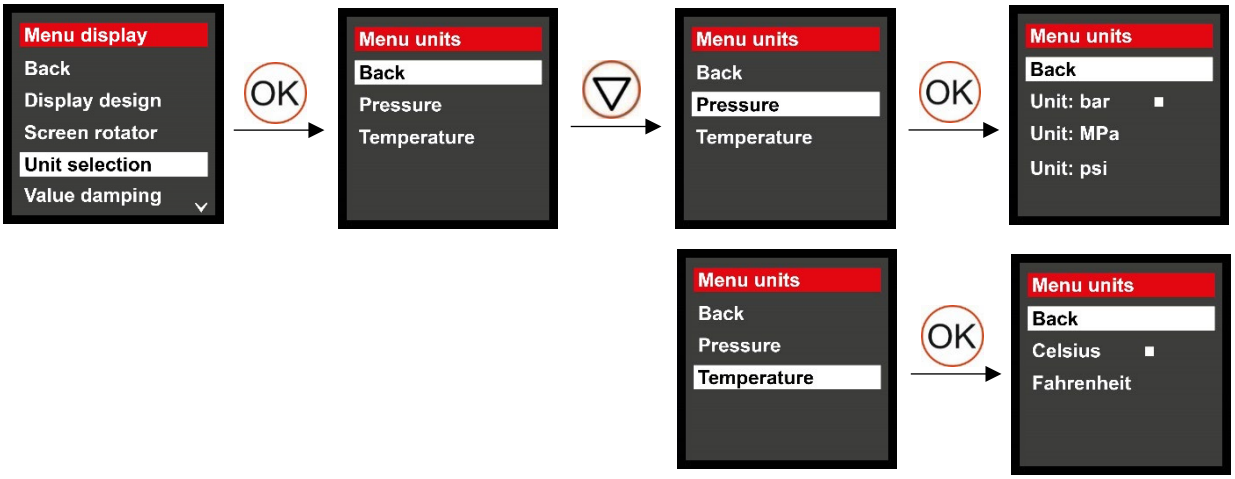
6.4.1.2 Rotate screen



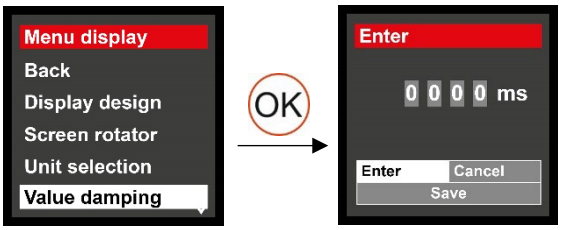
If "Rotate screen" is selected, the alignment rotates 90° clockwise with each click on "OK".

6.4.1.3 Select unit

Here you can choose between the units "bar," "MPa," and "psi" for printing. °C and °F are available for temperature.

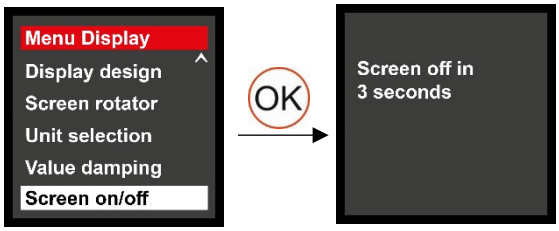


6.4.1.4 Value damping



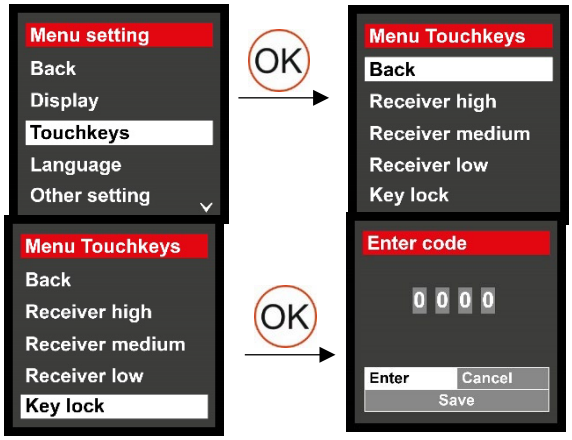
To filter out short-term or high-frequency pressure peaks from the display, a delay time can be programmed under "Damping value." The time entered in ms is the time between the pressure change and the change in the display. The familiar input menu is available for this purpose.

6.4.1.5 Screen on/off



If you scroll to "Screen on/off" and press the "OK" button, the screen will turn off after 6 seconds. The countdown to shutdown is shown on the display.
Pressing the "OK" button again will switch the screen back on permanently.

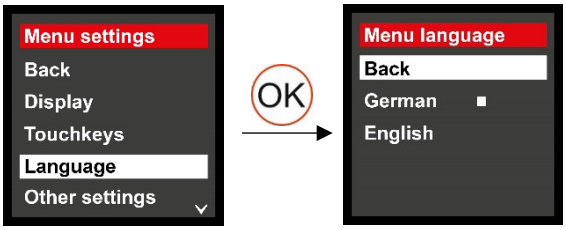
6.4.2 Touch keys



The touch sensitivity of the capacitive operating keys on the pressure sensor can be adjusted in three stages. Scroll to the desired value and click "OK." The selected sensitivity is indicated by a dot.

To protect the pressure sensor against unauthorized parameterization, you can program a key lock code. The four-digit code is entered via the familiar input menu.
If a number sequence other than "0000" is stored, you can only exit run mode and access the main menu after entering your code!

6.4.3 Language

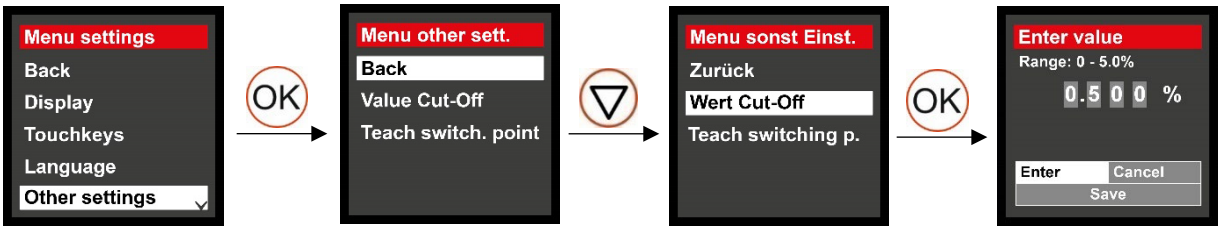


You can choose between the languages "German" and "English."
Scroll to the desired language and click "OK." The selected language is indicated by a dot.

6.4.4 Other settings

6.4.4.1 Cut-off value

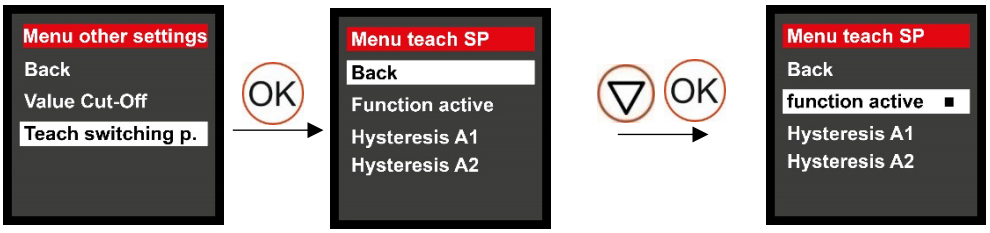
When you open the "Other settings" menu, you will first be taken to the "Cut-off value" section. The cut-off value ensures that the display shows 0 bar and does not constantly fluctuate in the low range when there is no pressure at the sensor. The measurement therefore only starts at 0.5% of the measuring range end value by default. You can adjust this setting according to your parameter. To do this, enter a value between 0 and 5% in the familiar input menu.



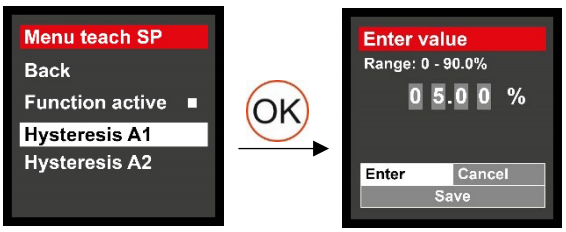
6.4.4.2 Teach switching point

If you activate the "Teach switching point" function, you can later teach the currently applied pressure as a switching point in run mode. This requires both outputs to be programmed as switching outputs with "Switching point / reset point" or "Switching point / hysteresis."

The teach function is activated by scrolling to "Function active" and pressing the "OK" button. This is indicated by a dot.



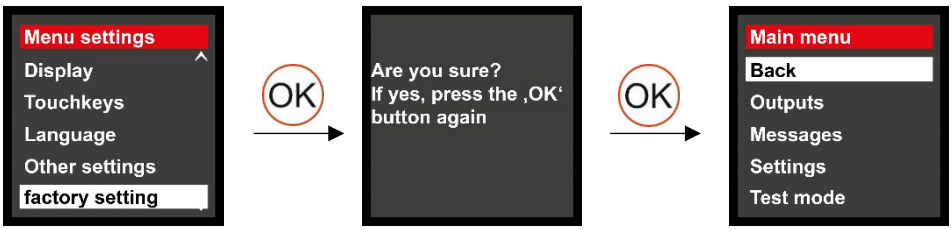
In run mode, the possible teaching is indicated by a green "T" on the display. As soon as the applied pressure has reached the desired value, press the "OK" button for about one second until the "T" changes to "blue". Then release the "OK" button. The current pressure is stored as a switching point on both switching outputs.



Since the current pressure is stored on both switching outputs during teaching, you can assign a different hysteresis to each switching output. This is entered as a percentage via the familiar input menu. The percentage always refers to the taught-in pressure value.

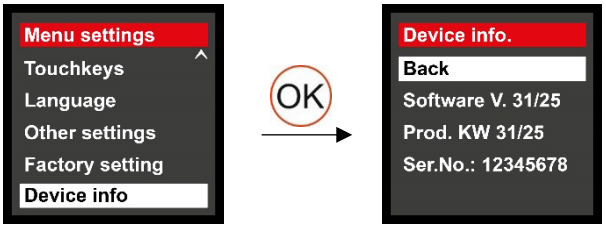
6.4.5 Factory settings

This function resets the pressure sensor to its factory settings. After pressing "OK" a second time, the device jumps to the main menu. Pressing "OK" again returns the sensor to run mode.



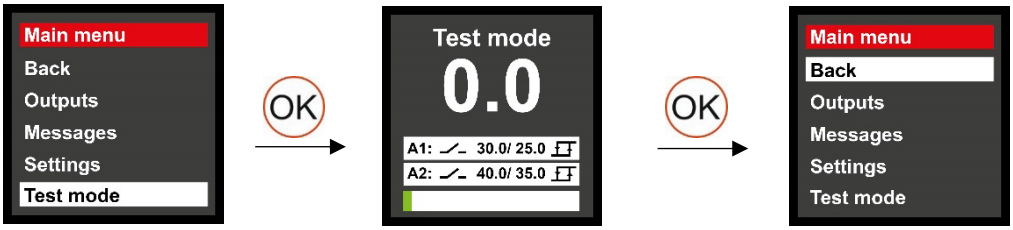
6.4.6 Device information

This menu displays the software version, production date (calendar week/year), and serial number.



6.5 Test mode

Test mode allows you to check all switching and analog functions without the sensor being connected to the pressure side. After pressing the "OK" button, the screen display selected under "Settings – Display" appears (here: standard screen). "Test mode" is displayed instead of the pressure range shown above. You can use the arrow keys to increase or decrease the pressure display. Pressing the key briefly once increases or decreases the pressure by 1 bar. Holding down the arrow keys causes the display to increase or decrease more quickly.

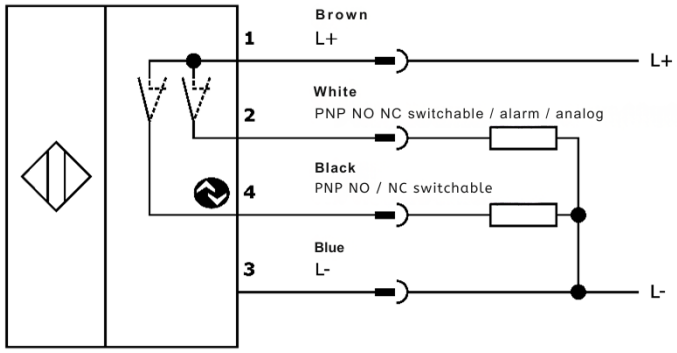


Test mode is ended by pressing the "OK" button.

7 Installation and electrical connection

- Before installing or removing the sensor, make sure that the system is depressurized.

- First, hand-tighten the pressure sensor to a suitable process connection at the installation site. The installation direction is arbitrary. Then tighten the sensor firmly using a suitable tool and the maximum recommended tightening torque of 35 Nm via the wrench surface. The torque depends on the lubrication, the sealing, and the expected pressure load. Only perform the installation when the system is in the pressure-free state! Ensure that the sealing surfaces are clean and undamaged and that the process connection is correctly and tightly screwed together.
- After mechanical fastening, the sensor housing can be rotated a maximum of 305° relative to the process connection in order to achieve alignment of the display with the line of sight of the machine operator. Only turn the display by hand until it reaches the respective limit stop! The limit stop must not be over-tightened under any circumstances! Do not use any tools! The display is rotatable in 90° increments in the settings menu.
- The ventilation hole on the back of the sensor must not be covered or closed.
- Do not touch the pressure membrane under any circumstances. Doing so will cause irreparable damage!
- Protect the device from weather conditions and direct exposure to aggressive media. Install additional shading in case of high ambient temperatures or high UV radiation.
- Only operate the pressure sensor within the permissible ambient and medium temperatures.
- Installation, electrical connection, start-up, programming, configuration, operation, and maintenance of the product may only be carried out by trained, authorized personnel.
- For electrical installation, follow the national and international regulations for the installation of electrical systems. The M12-connector must not be twisted under any circumstances!
- Voltage supply according to EN50178.
- Disconnect the system from the power supply and connect the device according to the following diagram:



After installation, electrical connection, and programming, check that the device is functioning safely.

8 Error messages

Error messages are only shown on the display when the standard screen (factory settings) is selected.

The messages appear directly in the line behind A1 or A2.

KS1!	Short circuit at switching output 1
KS2!	Short circuit at switching output 2
(OL-AO)	Analog output current selection – Line not connected / Line break / Burden too high
(KS-AF)	Analog output voltage selection – short circuit

9 Factory settings

Output A1: Switching point / release position
Switching point: 50% of nominal pressure
Release position: 10% of nominal pressure

Output A2: Analog 4 …20mA, error signal 3.6mA

When switching output is selected: Switching point / release position
Switching point: 75% of nominal pressure
Release position: 10% of nominal pressure

Display: Standard display without temperature
Unit: bar
Damping: none

Touch keys: Sensitivity medium, no key lock

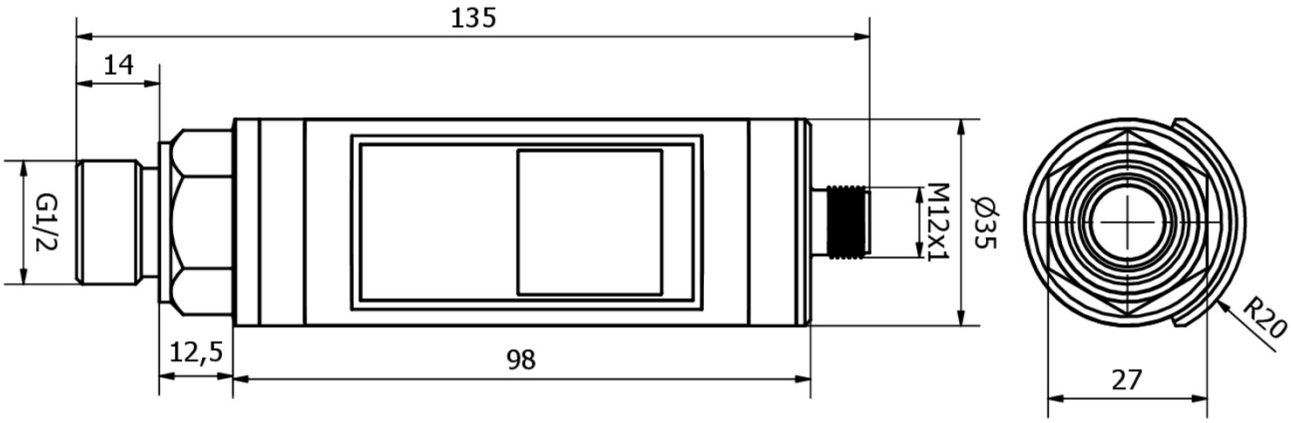
Language: German

Other settings: Cut-off value = 0.5% of the measuring range end value.

10 technical data

Pressure ranges [bar]	See article list
Overload [bar]	4-fold P_n (DW523106 and DW523107 max. 1200 bar)
response time	10 ms
Operating voltage U_B	12 … 32V DC, reverse polarity protection
voltage drop	< 2V
current consumption	< 40mA
Switching outputs	2 x pnp switching, no/nc, 250mA short-circuit protection
delay time	0 … 10s, switch-on and turn-off delay separately adjustable
Switching point adjustment range	1% of P_n
release position	1% of P_n
switching frequency	≤ 50Hz
Relative repeat accuracy	±0.15
current output	0/4 … 20mA, start and end points selectable
burden	≤ 550Ω
voltage output	0 … 5V/0 … 10V, start and end point selectable
load resistance	≥ 2kΩ
error recognition	Analog output in case of line break (current) or short circuit (voltage, from 1V)
damping	0 … 10s, adjustable
accuracy	≤0.25% of P_N
linearity deviation	max. ±0.25% of P_N
operating pressure display	TFT color display
peak hold time	0 … 10s, adjustable
Medium operating temperature	-20°C to +80°C / -20°C to +70°C
temperature drift	< ±1% (-20°C … +80°C)
connection to pressure system	G1/2A, SW27
material NBR	Process connection stainless steel 1.4305 / measuring cell 1.4404 / sealing
housing material	PC polycarbonate
degree of protection	IP67
Electrical connection	M12-connector, 4-pin

11 Dimension sketch



12 article list

article-no.	pressure range
DW52310K	-1 … 10 bar
DW52310D	0 … 10 bar
DW52310T	0 … 60 bar
DW523104	0 … 100 bar
DW523105	0 … 250 bar
DW523106	0 … 400 bar
DW523107	0 … 600 bar

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