PRODUAL

PART OF BEMSIQ GROUP

PEL 10K differential pressure transmitter

USER GUIDE

This user guide is for software version 2.1.4.

Made in Finland

5 years warranty

MANAGEMENT SYSTEM CERTIFICATION DNV ISO 9001 • ISO 14001 Finland

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1 Introduction

The PEL 10K differential pressure transmitter is designed for measuring static pressure, pressure differences and air volume flow in air handling systems. The transmitter compensates pressure measurement according to the ambient temperature. It provides eight fixed pressure measurement ranges selectable with jumpers and a custom range configurable with the ML-SER commissioning tool.

This transmitter has one voltage output and one current output. Both outputs are scalable (0...10 / 2...10 / 0...5 Vdc and 4...20 / 0...20 mA). Output mode options include pressure linear and flow (volume) linear modes.

Regular automatic zeroing removes output signal drift that can occur due to thermal, electronic or mechanical effects.

The influence of process disturbances (e.g. turbulence) can be decreased by selecting a suitable response time (2 s or 8 s).

The optional, backlit display (-N model) shows the measurement values at one decimal accuracy up to ±199.9 Pa and at 1 Pa accuracy from ±200 Pa.

Commissioning the transmitter is simple. You can select the measurement range, response time and output mode with jumpers. You can configure the custom range and output scaling using the ML-SER commissioning tool.

1.1 About this user guide

This user guide contains important information about the installation, wiring, configuration and use of the product. Read this guide carefully before you install the product, connect the wires, or operate the product. Make sure that you fully understand all instructions before you start work. If you are not sure what the instructions mean, contact the seller or the manufacturer.

Follow all instructions in this user guide carefully. Always obey the applicable local rules and regulations.

The original instructions were written in English. If there are differences between the English instructions and the translations, refer to the English instructions.

If you find a mistake in the English instructions or in the translations, please send the details to the manufacturer.

1.2 Intended use

The PEL 10K differential pressure transmitters are intended to be used for measuring static pressure, differential pressure or air volume flow in air handling systems.

This device is compatible with dry air. It is intended to be connected to a building automation system in the HVAC/R industry.

2 Safety precautions

The product is developed, manufactured and tested according to high quality standards. However, instructions for safe use must be followed when installing, using or disposing of the product or parts of the product.

Read this user guide carefully before you commission, use or service this device. To avoid any kind of damage to people or property, follow the instructions carefully. Produal is not liable for any hazards, injury to people, or damage to property caused by incorrect installation or misuse of the device.

To avoid electrical shock or damage to equipment, disconnect power before you install or service the product. Use only proper wiring that is rated for the full operating voltage and maximum current in the system. The wiring must also withstand fault conditions.

To avoid fire and/or explosion, do not use the product in potentially flammable or explosive atmosphere.

Make sure that the product is not damaged before installation. Do not drop the product or use excessive force during installation. Do not use the product if you can see any damages.

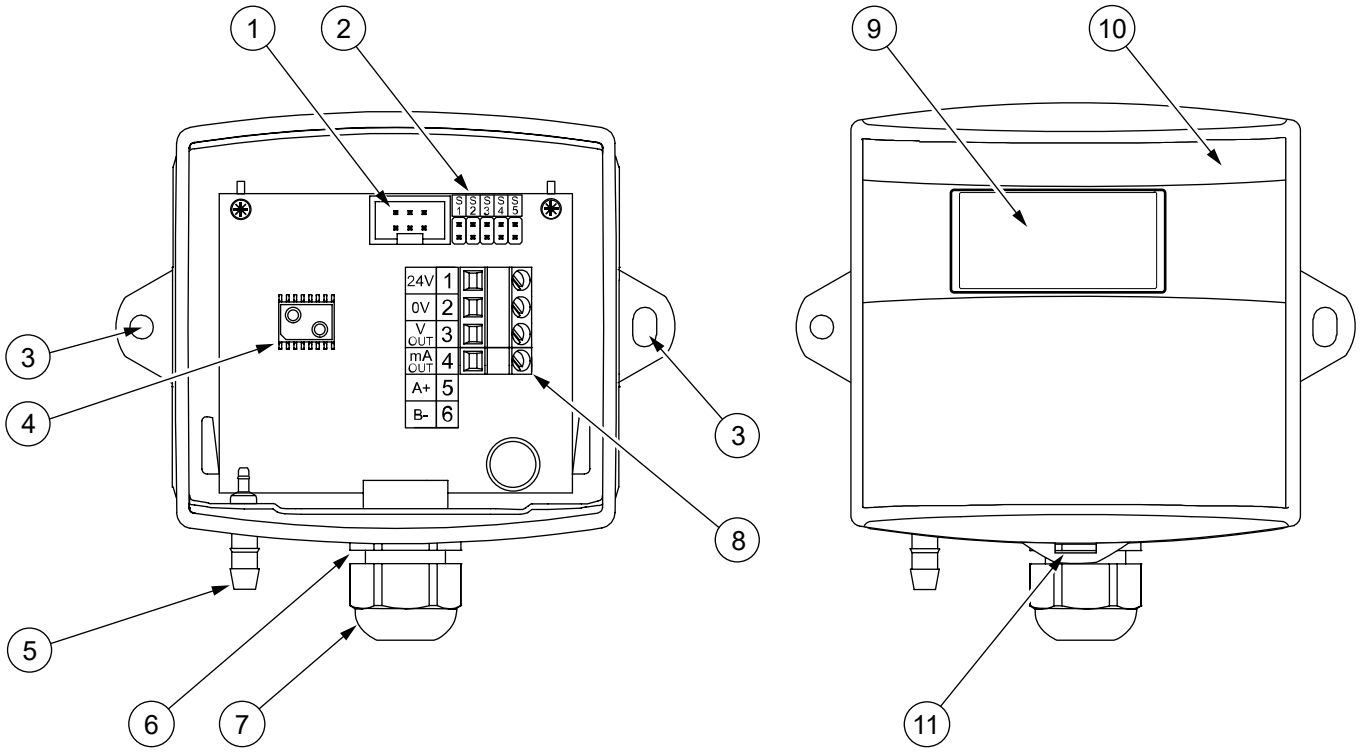
After installation, the product will be part of a system whose specifications and performance characteristics are not designed or controlled by Produal. Refer to national and local authorities to ensure that the installation is functional and safe.

The product should only be used in professionally designed applications. Unauthorised modifications are not allowed. The product must not be used in relation to any equipment that in case of a failure may threaten, directly or indirectly, human health or life or result in danger to human beings, animals or property.

In this document, there are different warnings and notes. The warning and note types are defined in the following table.

Sign	Description
WARNING:	The warning symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION:	The caution symbol indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.
Important:	The important symbol indicates a potentially hazardous situation which, if not avoided, could result in damage to the device or property.
Note:	The note symbol indicates a useful tip or a recommended way to complete a task. These notes also provide information that is useful but not critical to the user.

3 Main components



1	Connector for display and ML-SER commissioning tool	2	Jumpers for device settings
3	Mounting point	4	Pressure sensor
5	Pressure connection (+ high pressure / - low pressure)	6	Cable gland
7	Strain relief	8	Terminal block
9	Display (-N models)	10	Cover
11	Cover opening tab		

4 Functional description

This chapter introduces the main functions of the device.

4.1 Analogue outputs

The transmitter has two analogue outputs:

- Voltage output (0...10 / 2...10 / 0...5 Vdc, 2 mA)
- Current output (4...20 / 0...20 mA, 700 Ω)

You can select one of these outputs during wiring according to system requirements.

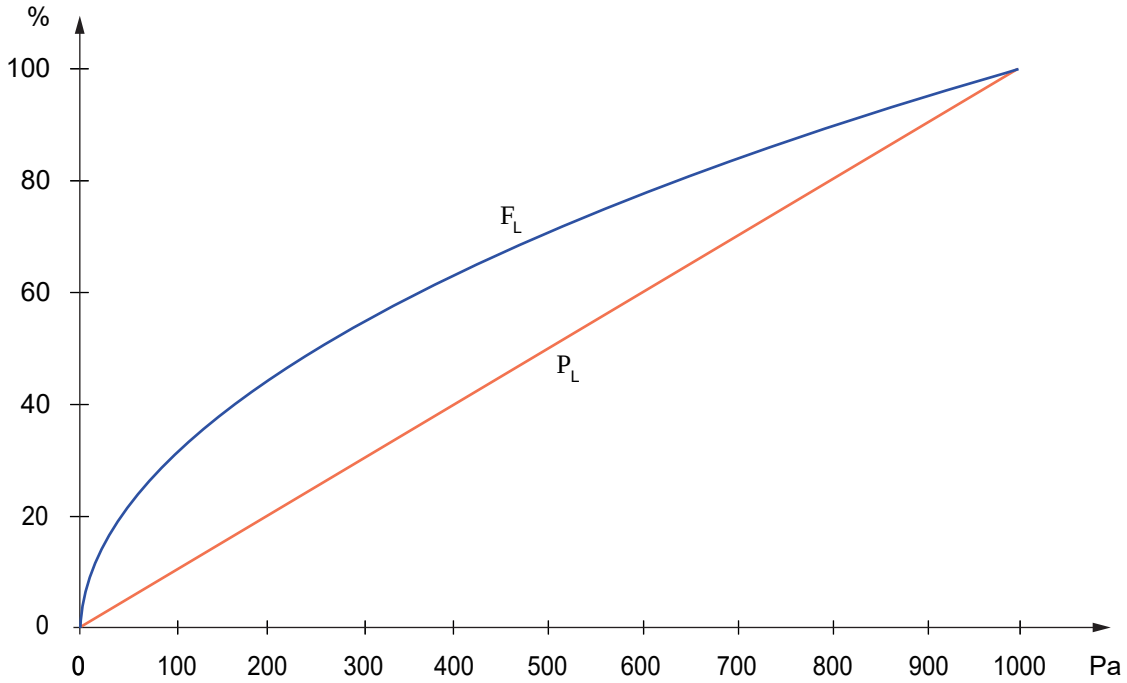
Both outputs are scalable. You can select the scaling using the ML-SER commissioning tool.

This transmitter has two output signal mode options: pressure linear mode and flow (volume) linear mode. You can select the output signal mode with a jumper during commissioning.

4.1.1 Flow linear output

If you select the flow linear output mode, transmitter output signals are converted to follow the flow across the measurement area. The transmitter uses a square root extraction method for the conversion.

See the following figure for an output signal conversion example in the 0...1000 Pa measurement range.

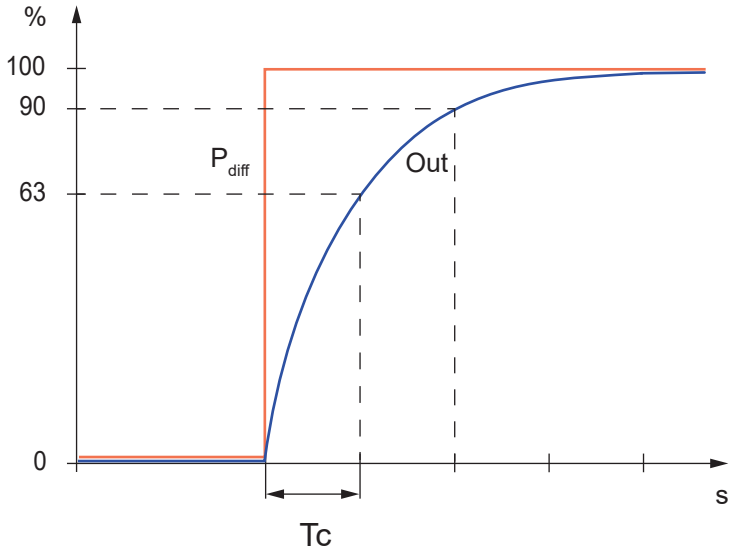


%	Output signal level
F_L	Output signal for flow linear output
P_L	Output signal for pressure linear output
Pa	Pressure (Pa)

4.2 Response time

The transmitter output signal starts to change immediately when the pressure difference increases or decreases. Response time is the time it takes for the transmitter output signal to reach 63 % of the final value after a change in differential pressure. This time period is also known as T_{63}.

Response time increases exponentially. The first 63 % of the final value equals to one time constant, but it takes four time constants before the output signal reaches 98 % of the final value. For example, if the response time is 8 seconds, the output signal reaches 98 % of the final value 32 seconds after differential pressure changes. Although the output signal can go very close to 100 % of the final value, it does not reach 100 % because of the laws of physics.



%	Final value
P_{diff}	Pressure difference
Out	Output signal
Tc	Time constant
s	Time (seconds)

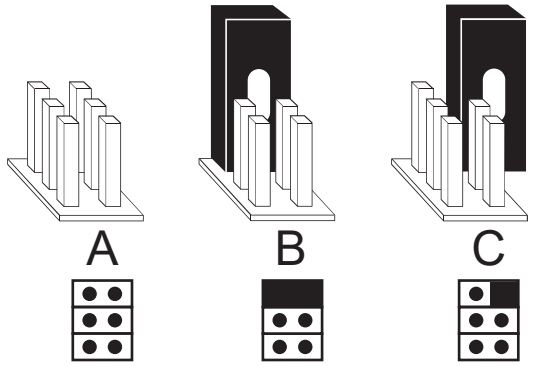
You can set the transmitter response time to 2 seconds or 8 seconds. Select 2 seconds in applications where fast changes in pressure must be tracked accurately. Select 8 seconds in applications where stability is more important than tracking fast changes. For example, you can use the 8-second response time to decrease the effects that turbulence or other process disturbances have on the measurement results.

5 Commissioning

5.1 Setting the jumpers

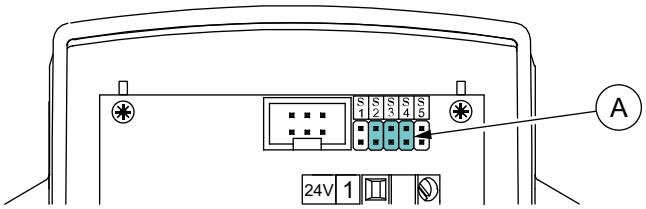
Important: Set the jumpers in the correct position before you turn on the power.

Install the jumpers as shown in the figure below to close the circuit or to store the jumper while the circuit remains open.



A. No jumper: circuit open
B. Jumper installed: circuit closed
C. Jumper stored: circuit open

5.1.1 Selecting the measurement range



A. Pressure range selection jumpers

1. Disconnect the supply voltage to the device.
2. Open the cover.
3. Install a jumper to jumper blocks that are fully black ■ in the table below.

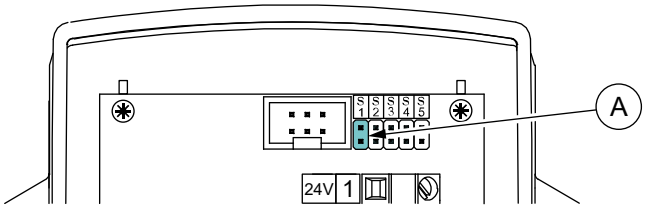
	0...200	*-2500...0*	*0...5000*	*0...1000*	*±1000*	*±500*	*0...2500*	*0...10000* [1)]
S2	● ●	■	● ●	■	● ●	■	● ●	■
S3	● ●	● ●	■	■	● ●	● ●	■	■
S4	● ●	● ●	● ●	● ●	■	■	■	■

[1)] Factory setting. The 0…10000 Pa range is also used for the custom range setting.

You can configure the custom range by using the ML-SER tool.

4. Close the cover.
5. Connect the supply voltage to the device.

5.1.2 Selecting response time



A. Response time selection jumper

1. Disconnect the supply voltage to the device.
2. Open the cover.
3. Install a jumper to *S1* jumper block to select 8 second response time or remove the jumper to select 2 second response time.

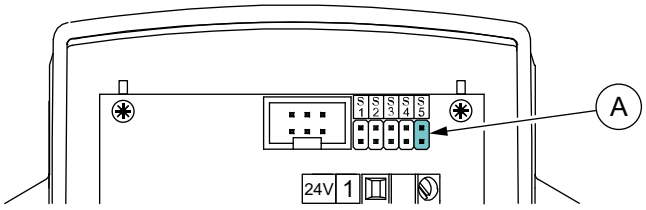
	[1] 8 s	2 s
S1	■	• •

[1] Factory setting.

4. Close the cover.
5. Connect the supply voltage to the device.

5.1.3 Selecting the output mode

You can select the output mode from two options: pressure linear or flow linear output mode.



A. Output mode selection jumper

1. Disconnect the supply voltage to the device.
2. Open the cover.
3. Install a jumper to *S5* jumper block to select pressure linear output mode. Remove the jumper to select flow linear output mode.

	[1] Pressure linear	Flow linear
S5	■	• •

[1] Factory setting.

4. Close the cover.
5. Connect the supply voltage to the device.
6. If you want to change the output scaling, see section The Output menu on page 14 for instructions.

5.2 Mounting

WARNING: Handle the product with care. Dropping the product can damage it internally and cause unwanted functions in the connected system.

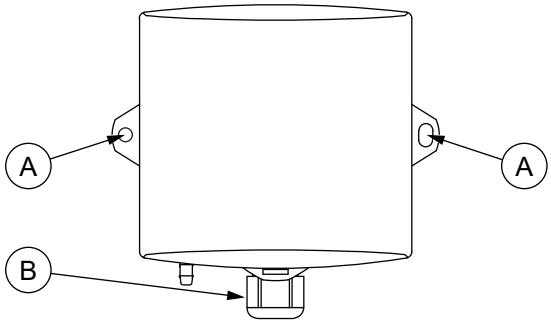
CAUTION: Place the device outside the reach of children and animals.

Important: Only install this device in a location where the ambient conditions meet the operating condition requirements.

Operating conditions

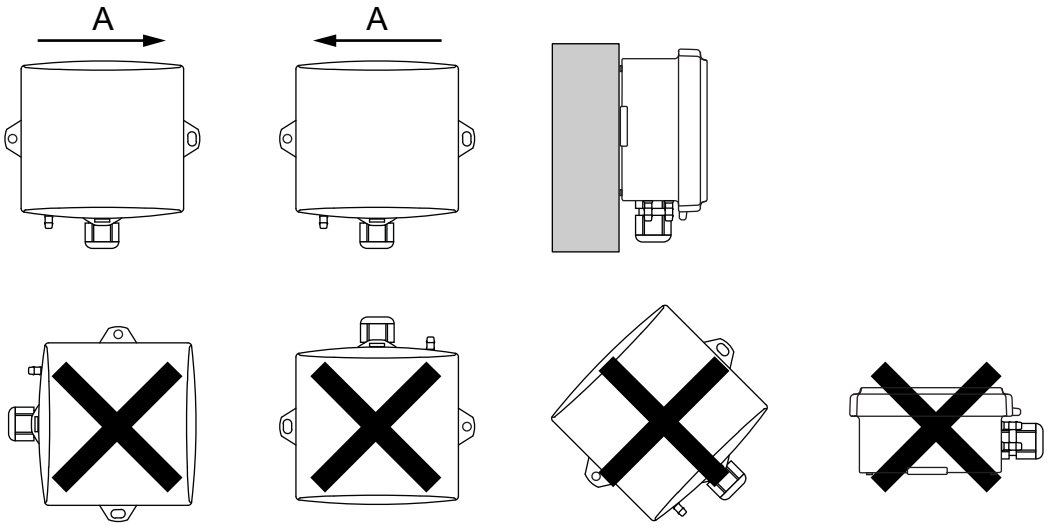
Temperature	0...45 °C
Humidity	0...95 %rH (non-condensing)

1. Check that the product is not damaged during transportation.
2. Select the mounting position on a flat and vertically upright surface.
   Install the transmitter above the measuring point to avoid condensation problems.
3. Use the device as a template and mark the screw holes on the mounting surface.
4. Select the mounting screws according to the mounting surface.
   The maximum screw diameter is 4.5 mm.
5. Make sure that the cable gland points down.



A. Mounting point
B. Cable gland

6. Mount the device with the screws using the mounting points.
   See the figure below for the correct mounting orientation.



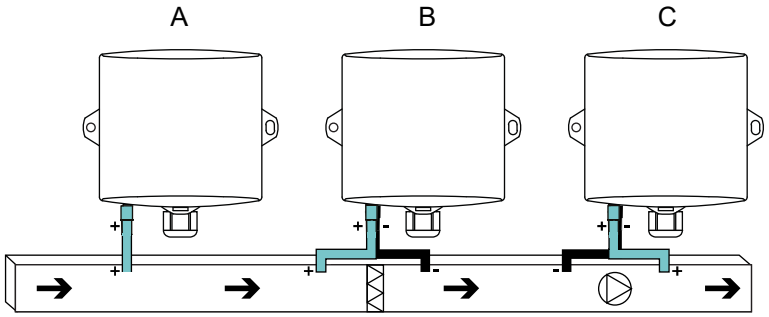
7. Make sure that the device is horizontally and vertically level.

8. Tighten the screws.

5.3 Connecting the pressure measurement hoses

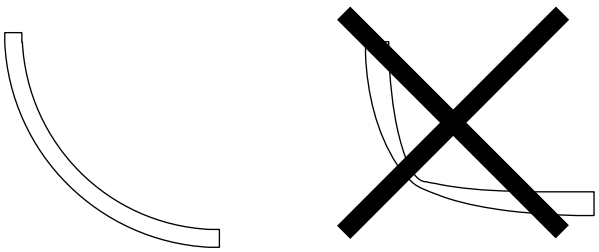
Note: The hose length does not have an effect on the measurement accuracy. However, long hoses cause delay to the measurement.

Connect the pressure measurement hoses to the pressure connections of the device according to your application. See the examples below.



A. Static pressure
B. Filter/damper monitoring
C. Fan/blower monitoring

- If the pressure is static, connect the pressure measurement hose to the "+" connection only.
- Filter or damper monitoring:
  1. Connect a pressure measurement hose to the duct on the high pressure side before the filter/damper and another pressure measurement hose on the low pressure side after the filter/damper.
  2. Connect the high pressure measurement hose to the "+" connection.
  3. Connect the low pressure measurement hose to the "–" connection.
- Fan or blower monitoring:
  1. Connect a pressure measurement hose to the duct on the low pressure side before the fan/blower and another pressure measurement hose on the high pressure side after the fan/blower.
  2. Connect the high pressure measurement hose to the "+" connection.
  3. Connect the low pressure measurement hose to the "–" connection.
- Install the measuring hoses carefully and make sure that the hoses do not bend too tightly. Too tight curves can prevent the airflow to the sensor.



5.4 Wiring

WARNING: Only connect wires and commission the device if you are qualified for electrical work and familiar with building automation products. Risk of electric shock and damage to the device.

WARNING: Always commission the device in a de-energised electricity network. Risk of electric shock.

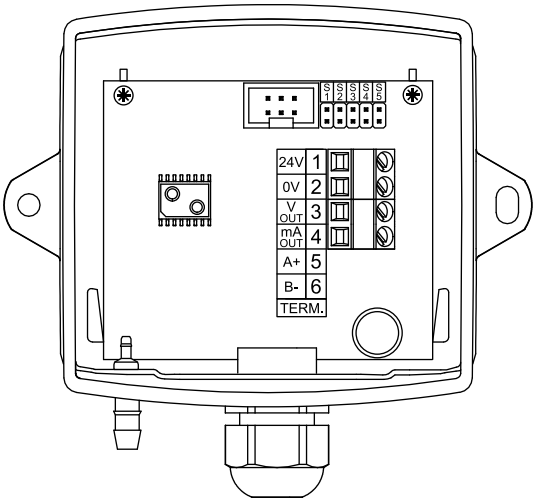
WARNING: Connect this device to SELV (separated extra low voltage) electricity network only. This device is an appliance class III product according to IEC 60664-1.

CAUTION: Use single-stranded wires if possible. If you use multi-stranded wires, always install wire end sleeves to the wires to prevent short circuits and ensure secure attachment.

Important: For CE and UKCA compliance, use correctly grounded, shielded cable.

1. Open the cover.
2. Unscrew the strain relief on the cable gland.
3. Route the cable through the strain relief and the cable gland.
4. Connect the wires to the terminal block according to the table below.

   Connect the signal wire to voltage output or current output according to system requirements.



24V	Power supply, 24 Vac/dc (22…28 V), < 2 VA
0V	0 V
V out	Voltage output, 0…10 / 2…10 / 0…5 Vdc, < 2 mA
mA out	Current output, 4…20 / 0…20 mA, 700 Ω

The nominal tightening torque for wiring terminal screws is 0.6 Nm.

Important: Do not use excessive force when you tighten the wiring terminal screws.

5. Tighten the strain relief.
6. Close the cover.

5.5 Configuring transmitter using the ML-SER commissioning tool

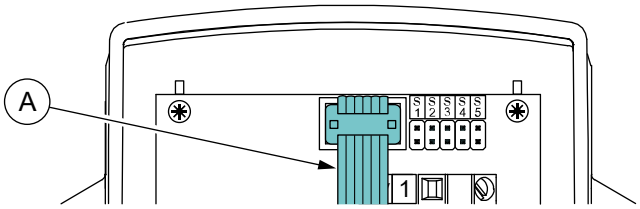
You can configure all transmitter settings that do not require jumpers using the ML-SER transmitter commissioning tool.

5.5.1 Connecting the ML-SER tool to the device

1. Open the cover.

   CAUTION: Be very careful if you touch the device when the power supply is connected and the cover is removed.

2. If the device has a display, remove the display cable from the display connector on the circuit board.
3. Connect ML-SER commissioning tool's cable to the display connector.



   A. ML-SER cable

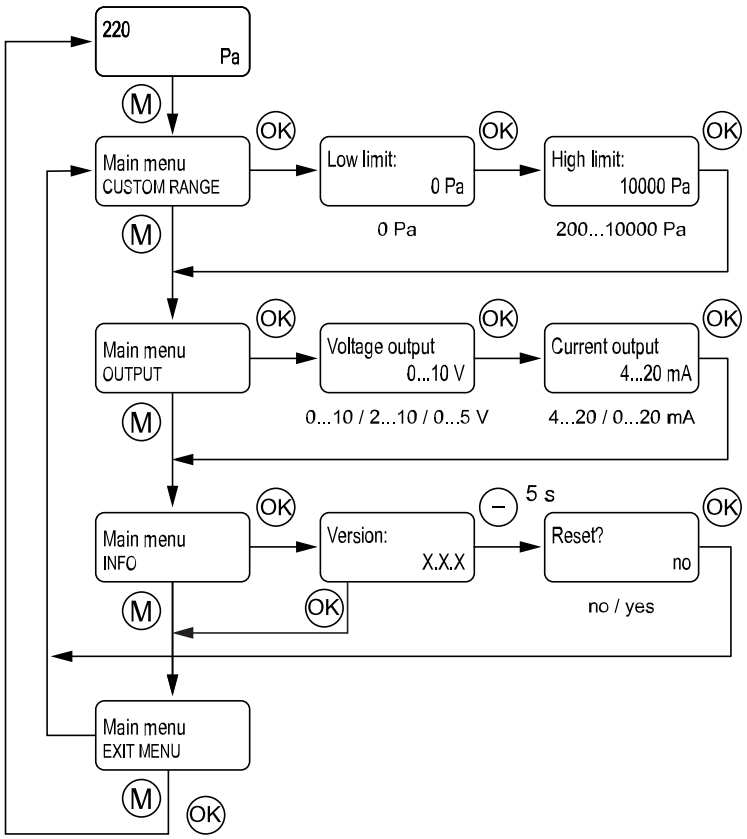
4. Wait until the ML-SER commissioning tool has initialised.

After initialisation, the commissioning tool shows the measured value.

5.5.2 ML-SER menu

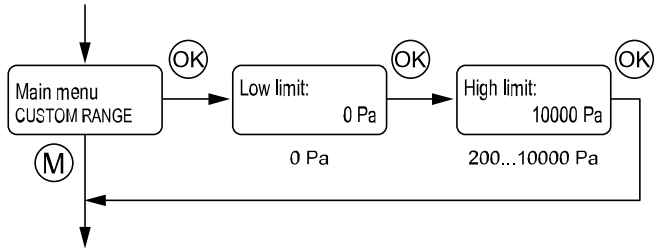
Press the Ⓜ button to open the ML-SER main menu. Press the OK button to open a submenu. You can change the values by pressing the ⊕ and ⊖ buttons.

This menu is device-specific. Menu content depends on the device model and the installed options. See the figure below for the full menu structure that shows the menu options and the factory settings for all models. See the following chapters for detailed explanations of the menu options.



5.5.3 The Custom range menu

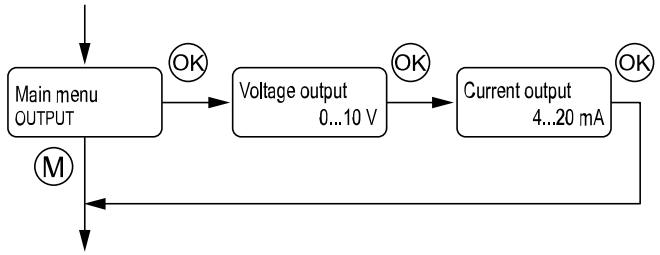
In this menu, you can set a custom measurement range. Before you configure this setting, install jumpers to jumper blocks *S2*, *S3* and *S4* on the circuit board to activate the custom measurement range. This jumper setting is the same as the factory setting for the measurement range. See section Selecting the measurement range on page 8 for the instructions.



Parameter name	Values	Default	Description
Low limit	*0 Pa*	*0 Pa*	Low limit value for the measurement range. This value is fixed and cannot be adjusted.
High limit	*200...10000 Pa*	*10000 Pa*	Sets the high limit value for the measurement range. You can adjust this value by 10 Pa steps.

5.5.4 The Output menu

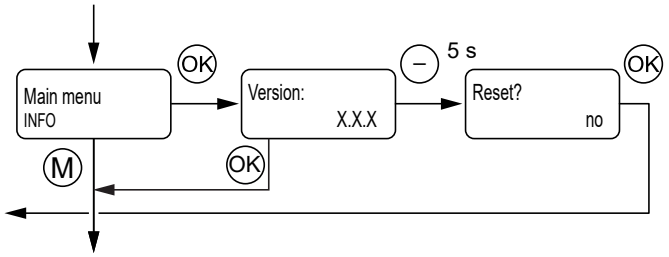
In this menu, you can select the output scaling for each output.



Parameter name	Values	Default	Description
Voltage output	*0...10 V* *2...10 V* *0...5 V*	*0...10 V*	Output scaling for the voltage output signal.
Current output	*4...20 mA* *0...20 mA*	*4...20 mA*	Output scaling for the current output signal.

5.5.5 The Info menu

You can check the device software version and reset the device to factory settings in this menu.



Parameter name	Values	Description
VERSION	*X.X.X*	Device software version.
RESET?	*no / yes*	Reset to factory settings. Press the ⊖ button for 5 seconds in the *VERSION* view. Select *yes* in the *RESET?* view. Press the OK button. The ML-SER commissioning tool resets the device settings to factory settings.

6 Maintenance

6.1 Automatic zeroing

Automatic zeroing removes output signal drift that can occur due to thermal, electronic or mechanical effects. This differential pressure transmitter includes an automatic zeroing function, which adjusts the transmitter zero point at startup, one minute after startup and then every 5 minutes. As a result, it is not necessary to calibrate the transmitter zero point manually.

Automatic zeroing takes approximately 5 seconds. The display is blank during the zeroing process. When the zeroing process is completed, the device returns to its normal measuring mode.

7 Disposal

This device is considered as electrical and electronic equipment for disposal in terms of the applicable European Directive. At the end of life, the product must enter the recycling system at an appropriate collection point.

- The device must be disposed through channels provided for this purpose.
- The disposal must be completed according to the local and currently applicable laws and regulations.

Generally all metals can be recycled as material. Plastics and cardboard packaging material can be used in energy recovery. Printed circuit boards need selective treatment according to IEC 62635 guidelines. To aid recycling, plastic parts are marked with an appropriate identification code. Contact your local Produal distributor for further information on environmental aspects and recycling instructions for professional recyclers.

