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USER GUIDE

KLK-Passive

Produal

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PRODUAL

PART OF BEMSIQ GROUP

KLK-Passive duct humidity transmitter

USER GUIDE

Made in Finland

5 years warranty

MANAGEMENT SYSTEM CERTIFICATION DNV ISO 9001 · ISO 14001 Finland

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1 Introduction

The KLK-Passive duct humidity transmitter with passive temperature measurement measures relative humidity and temperature inside ventilation ducts. It is designed for high- and low-humidity applications in non-condensing environments. It can control relative humidity and temperature in room spaces.

The transmitter measures temperature with a passive sensor and an active sensor. It has a resistance output for the passive sensor data and a dual-mode output (voltage/current) for the active sensor data. In addition, the transmitter has one dual-mode output for humidity measurement data.

This transmitter has a broad humidity measurement range and a wide temperature measurement range. You can set a custom measurement range (low and high limit) separately to temperature and humidity measured with the active sensors.

The transmitter has a P/PI controller. You can use one of the dual-mode outputs as a control output to keep humidity or temperature within the configured range. The controller can control the output according to one measurement value or according to the maximum selection of all values. You can change the controller settings with 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 KLK-Passive duct humidity transmitters are intended to be used for measuring humidity and temperature in ventilation ducts. They are intended to be used in non-condensing environments. If humidity condensates on the probe, the expected lifetime of the transmitter decreases significantly.

These transmitters are intended to be connected to building automation systems in the HVAC/R industry.

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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 the product or parts of 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.

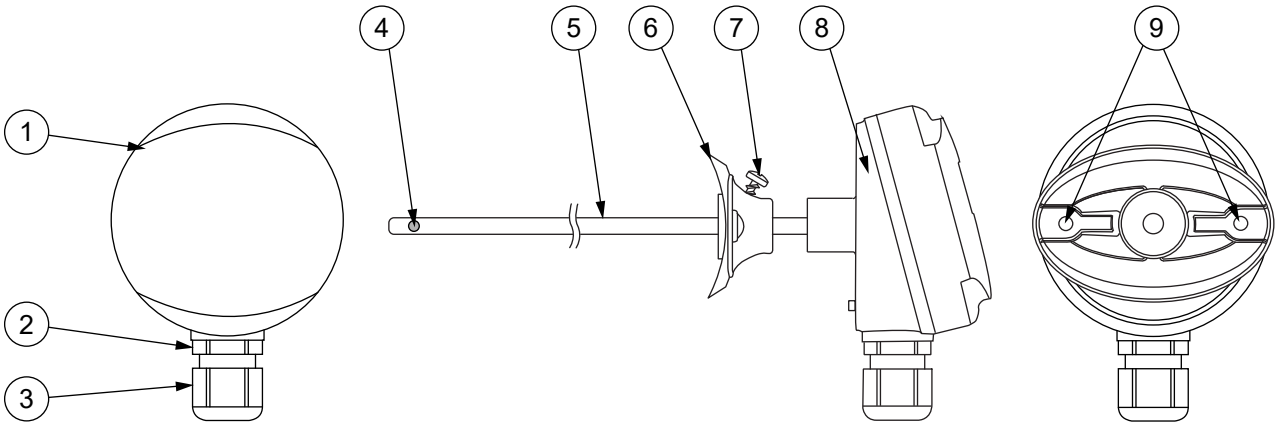
The product should only be used in professionally designed applications. Unauthorised modifications are not allowed. The product must not be used in relation with any equipment that in case of a failure may threaten, directly or indirectly, human health or life or result in danger to human beings, animals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

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

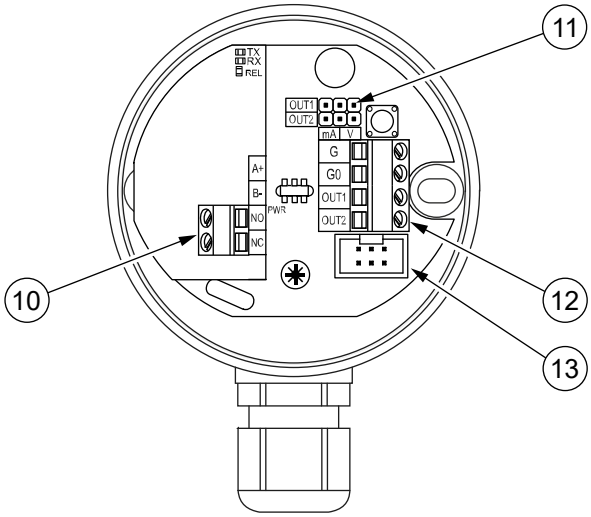
Sign	Description
WARNING:	The warning symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION:	The caution symbol indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.
Important:	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.

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3 Main components



1	Cover	2	Cable gland
3	Strain relief	4	Sensor element
5	Probe	6	Duct flange
7	Probe locking screw	8	Housing
9	Holes for fixing screws		



10	Connector for resistive output	11	Output mode selection jumpers
12	Terminal block	13	Display connector

4 Functional description

This chapter introduces the main functions of the device.

4.1 Analogue outputs

The transmitter has three analogue outputs: two dual-mode outputs and one resistive output. The transmitter does not have a separate control output, but you can configure one of the dual-mode outputs as a control output.

4.1.1 Dual-mode outputs

The transmitter has two dual-mode outputs: a humidity output and a temperature output. You can configure one of these outputs as a control output.

The dual-mode outputs support the following output signal modes:

- Voltage output (0...10 / 2...10 / 0...5 Vdc, 2 mA)
- Current output (4...20 mA ≤ 500 Ω)

You can select the output signal mode separately for each output. You can select the output signal mode with jumpers during commissioning. See section Selecting the output signal mode on page 9 for more information.

4.1.2 Resistive output

The transmitter has one resistive output for passive temperature sensor signal. See the table below for *NTC 10* sensor resistance at different temperatures.

°C	Ω
-30	177000
-25	130400
-20	97070
-15	72980
-10	55330
-5	42340

°C	Ω
0	32650
5	25400
10	19900
15	15710
20	12490
25	10000

°C	Ω
30	8057
35	6532
40	5327
45	4368
50	3603

4.2 Control functions

This transmitter has a P/PI controller. The controller can control the output according to one measurement value or according to the maximum selection of all values.

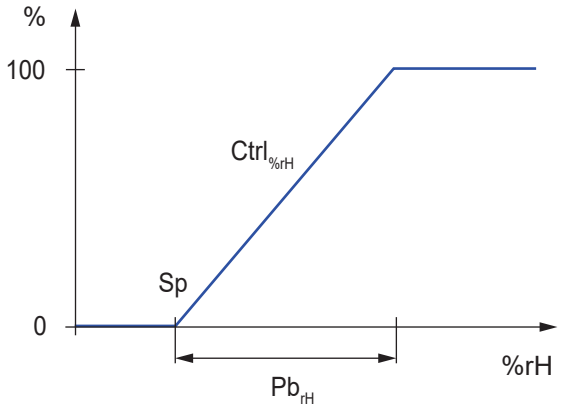
The controller can control humidity or temperature. You can select one of the dual-mode outputs as a control output. You can configure the setpoint, integration time and proportional band for the controller. Proportional band is the range of values within which the control output signal goes between 0 % and 100 % in proportion to the measured input value.

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Humidity control

Property	Value
Setpoint	0...100 %rH, *50 %rH
Proportional band	10...100 %rH, *50 %rH
Integration time	50...5000 s, *300 s
	* factory setting

The following figure shows how the humidity control signal increases while relative humidity increases. For example, if setpoint is 50 %rH and proportional band is 30 %rH, the humidity control signal starts to increase when the relative humidity level goes above 50 %rH. As the relative humidity increases, the humidity control signal increases accordingly until it reaches 100 % when relative humidity is at 80 %rH.



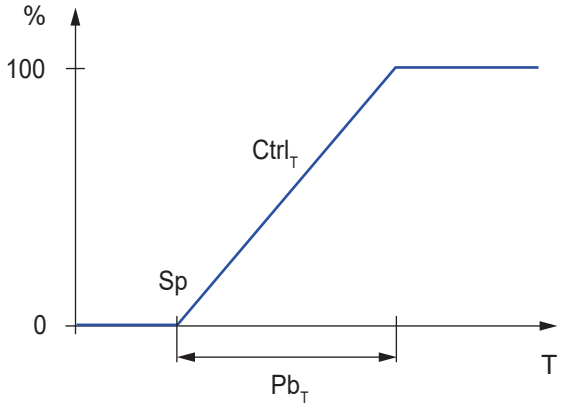
%	Control signal level
Sp	Setpoint
Pb_{rH}	Proportional band for relative humidity
$Ctrl_{\%rH}$	Control signal for relative humidity
%rH	Relative humidity

Temperature control

Property	Value
Setpoint	-50...50 °C, *21 °C
Proportional band	1.0...32.0 °C, *2.0 °C
Integration time	50...5000 s, *300 s
	* factory setting

The following figure shows how temperature control signal increases while temperature increases. For example, if setpoint is 21.0 °C and proportional band is 2.0 °C, the temperature control signal starts to increase when temperature goes above 21.0 °C. The control signal reaches 100 % at 23.0 °C.

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%	Control signal level
Sp	Setpoint
Pb$_T$	Proportional band for temperature
Ctrl$_T$	Control signal for temperature
T	Temperature

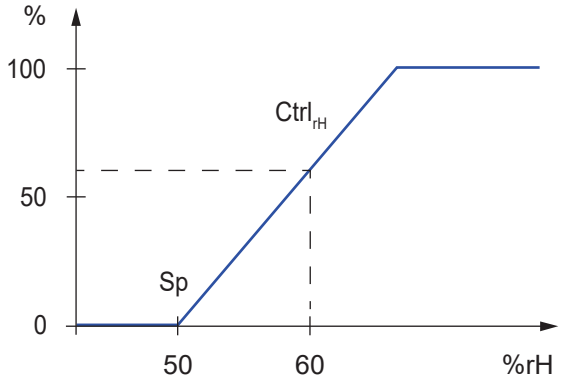
4.2.1 Maximum selection control

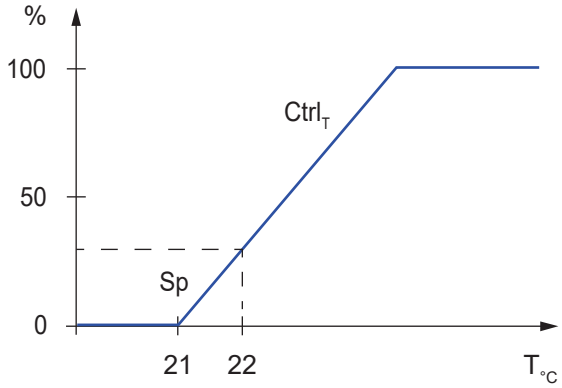
The maximum selection control is available for humidity and temperature control. In the maximum selection control, the controller calculates control output values for relative humidity and temperature continuously as percentages. It forms the control signal for the control output according to the highest of these two values.

The figure below describes the following situation:

- Relative humidity is 60 %rH and the calculated value for the control output is 60 %.
- Temperature is 22 °C and the calculated value for the control output is 30 %.

In this example, the calculated value for relative humidity is higher than the calculated value for temperature. The controller forms the control signal based on the calculated value for relative humidity. If output scaling is 0...10 V, then the 60 % relative humidity level equals to 6 V control signal.





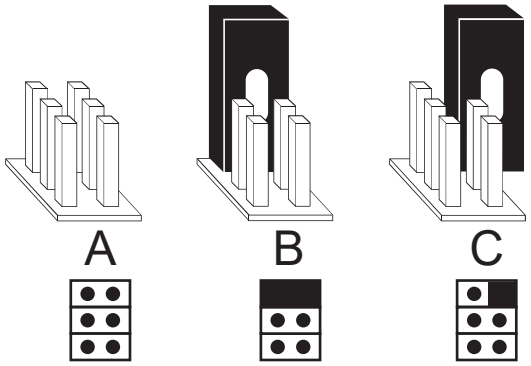
%	Sensor signal level
Sp	Setpoint
Ctrl$_{rH}$	Control signal for relative humidity
%rH	Relative humidity
Ctrl$_T$	Control signal for temperature
T$_{°C}$	Temperature (°C)

5 Commissioning

5.1 Setting the jumpers

Important: Set the jumpers in the correct position before you connect the supply voltage to the device.

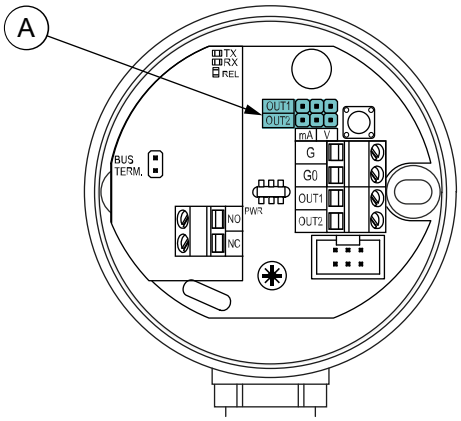
Install the jumpers as shown in the figure below to close the circuit or to store the jumper while the circuit remains open.



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

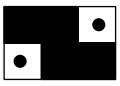
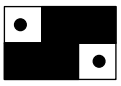
5.1.1 Selecting the output signal mode

The transmitter has two jumpers for output signal mode selection on the circuit board. Select the voltage (0...10 V) or the current (4...20 mA) output signal mode based on the system requirements. You can also select the output signal mode using the ML-SER commissioning tool (see section The Output menu on page 16) or via bus (-M-models).



A. Output signal mode selection jumpers

You can select the output signal mode separately for each output. Set the jumpers in the correct position. See the following table for the jumper settings.

Output				
OUT 1 Humidity output / control output	Output signal mode: current (mA)	*Output signal mode: voltage (V)	Output signal mode: current (mA)	Output signal mode: voltage (V)
OUT 2 Temperature output / control output	Output signal mode: current (mA)	*Output signal mode: voltage (V)	Output signal mode: voltage (V)	Output signal mode: current (mA)
* factory setting				

The voltage output is scalable. You can set the scale using the ML-SER configuration tool. The current output is not scalable.

5.2 Mounting

WARNING: Handle the product with care. Dropping the product may cause internal damage and unwanted functions in the connected system.

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

Important: Remove the device from the ventilation duct before cleaning the duct.

Important: The product may only be installed in a location where the ambient conditions meet the operating condition requirements.

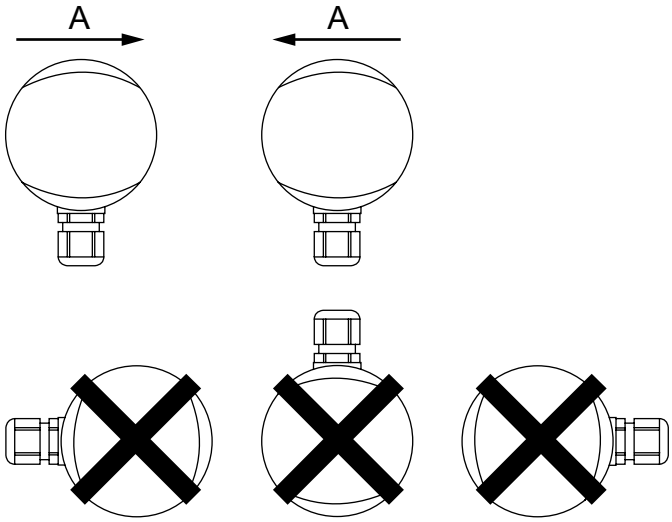
Operating conditions	
Temperature	-30...50 °C
Humidity	0...90 %rH (non-condensing)

The transmitter is installed to a ventilation duct. Select the mounting position carefully. Make sure that the transmitter is easy to remove from the ventilation duct for cleaning. If possible, eliminate all the error factors that can affect the measurements. Typical measurement error factors include:

- Ambient temperature is too high or too low.
- Ambient humidity is too high.
- Condensation forms on the probe or in the duct.
- The device is exposed to vibration.
- The device is adjacent to a source of heat.

1. Check that the product is not damaged during transportation.
2. Select the mounting position on a straight duct.
3. Use the duct flange as a template and mark the screw holes and the probe hole on the duct.
4. Drill the screw holes and the probe hole on the duct.
   The maximum screw diameter is 4 mm. The probe diameter is 10 mm.
5. Mount the duct flange on the duct with screws.
6. Push the transmitter probe into the duct through the hole in the flange.

7. Make sure that the cable gland points down.
   See the figure below for the correct mounting orientation.



A. Air flow direction

8. Adjust the probe to the correct depth.
   Make sure that the sensor element is in the middle of the duct.
9. Tighten the locking screw on the duct flange to hold the probe in position.

5.3 Wiring

WARNING: Device wiring and commissioning can only be carried out by qualified professionals. Always make the device wirings in de-energised electricity network.

WARNING: This product is appliance class III product according to IEC 60664-1. The product may only be connected to SELV (separated extra low voltage) electricity network.

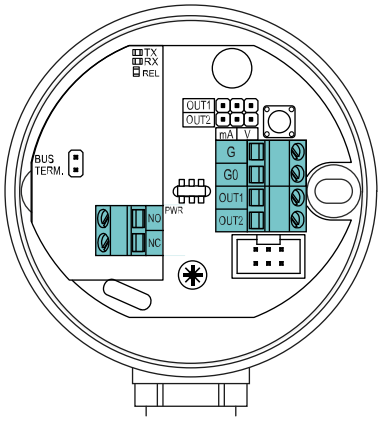
CAUTION: Use single stranded wires or use wire end sleeves if multi stranded wires are used.

Important: For CE and UKCA compliance, a properly grounded shielding cable is required.

1. Turn the cover counterclockwise to open it.
2. Unscrew the strain relief on the cable gland.
3. Route the cable through the strain relief and the cable gland.

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4. Connect the wires to the terminal block and the resistive output connector according to the table below.



G	Power supply, 24 Vac/dc < 2 VA
G0	0 V
OUT1	Dual-mode humidity output / control output
OUT2	Dual-mode temperature output / control output
NO	Resistive temperature output (passive sensor)
NC	

The nominal tightening torque for wiring terminal screws is 0.4 Nm.

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

5. Tighten the strain relief.

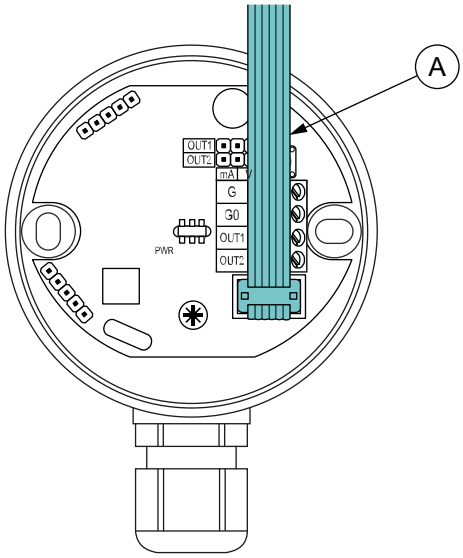
5.4 Configuring transmitter using the ML-SER commissioning tool

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

5.4.1 Connecting the ML-SER tool to the device

1. Turn the cover counterclockwise to open it.

2. Connect ML-SER commissioning tool's cable to the display connector.



A. ML-SER cable

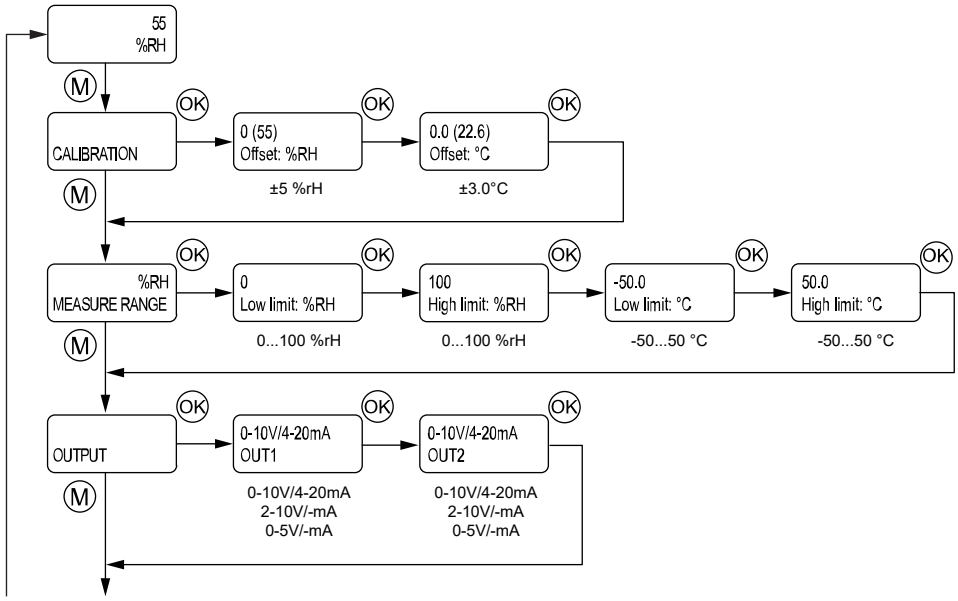
3. Wait until the ML-SER commissioning tool has initialised.

Measurement values are shown on the ML-SER tool display one by one after initialisation.

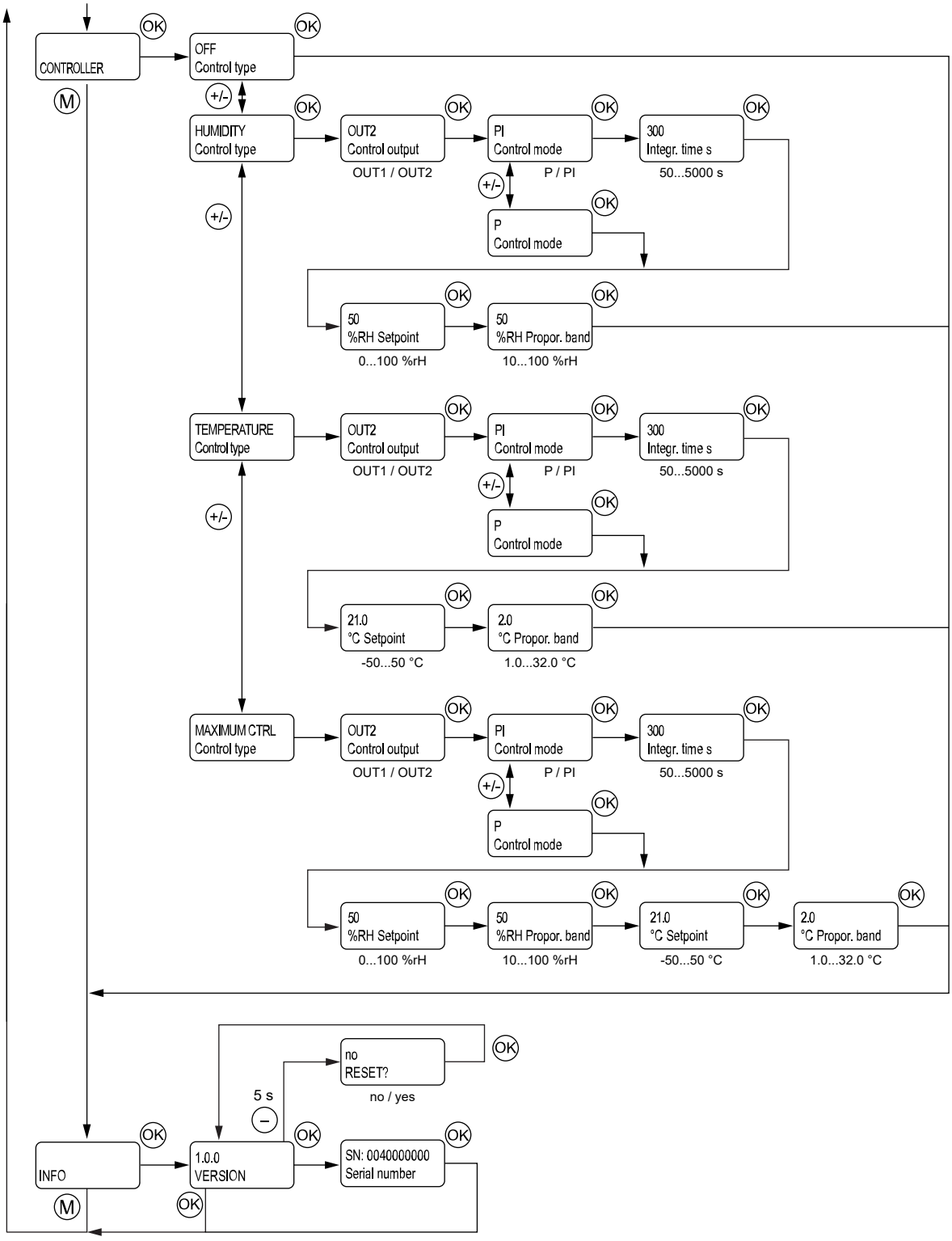
5.4.2 The ML-SER commissioning tool menu

The ML-SER commissioning tool menu is device-specific, and the 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 factory settings for the KLK-Passive models. See the following chapters for detailed explanations of the menu options.



The menu structure continues on the next page.



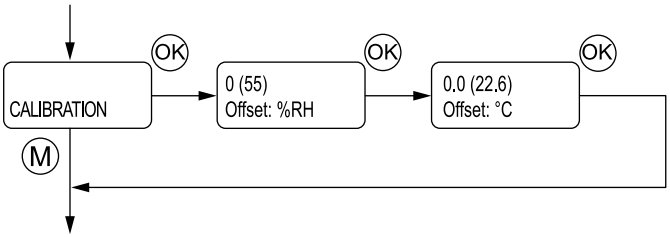
5.4.3 Using the ML-SER commissioning tool

1. Press the Ⓜ button on the ML-SER commissioning tool to open the main menu.
2. Press the Ⓜ button again to go to the next item in the main menu.
3. Press the OK button to open a submenu.

4. Change the parameter values with the ⊕ and ⊖ buttons.
   One button press increases or decreases the value by one small step, for example, by 0.1 °C. If you press the button again and again faster, the value increases or decreases in larger steps.
5. Press the OK button to accept the new parameter value.
6. Press the OK button repeatedly to go back to the main menu.
7. Press the M button repeatedly to exit the main menu.

5.4.4 The Calibration menu

In this menu, you can tune the humidity and temperature measurement values.

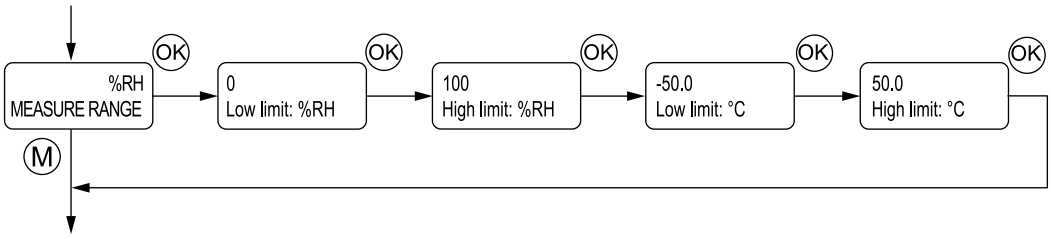


Parameter name	Values	Default	Description
Offset %RH	*-5...5 %RH*	*0 %RH*	Humidity measurement tuning. You can adjust this value by 1 % steps.
Offset °C	*-3.0...3.0 °C*	*0.0 °C*	Temperature measurement tuning. You can adjust this value by 0.1 °C steps.

You can see the tuning result in brackets after the tuning value on the ML-SER tool display.

5.4.5 The Measure range menu

In this menu, you can set a custom measurement range for humidity and temperature.

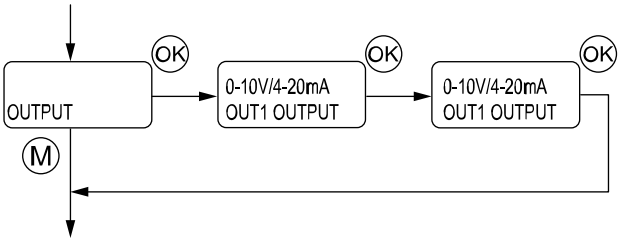


Parameter name	Values	Default	Description
Low limit %RH	*0...100 %RH*	*0 %RH*	Sets the low limit value for the humidity measurement range. You can adjust this value by 1 % steps.
High limit %RH	*0...100 %RH*	*100 %RH*	Sets the high limit value for the humidity measurement range. You can adjust this value by 1 % steps.
Low limit °C	*-50.0...50.0 °C*	*-50.0 °C*	Sets the low limit value for the temperature measurement range. You can adjust this value by 0.1 °C steps.

Parameter name	Values	Default	Description
High limit °C	*-50.0...50.0 °C*	*50.0 °C*	Sets the high limit value for the temperature measurement range. You can adjust this value by 0.1 °C steps.

5.4.6 The Output menu

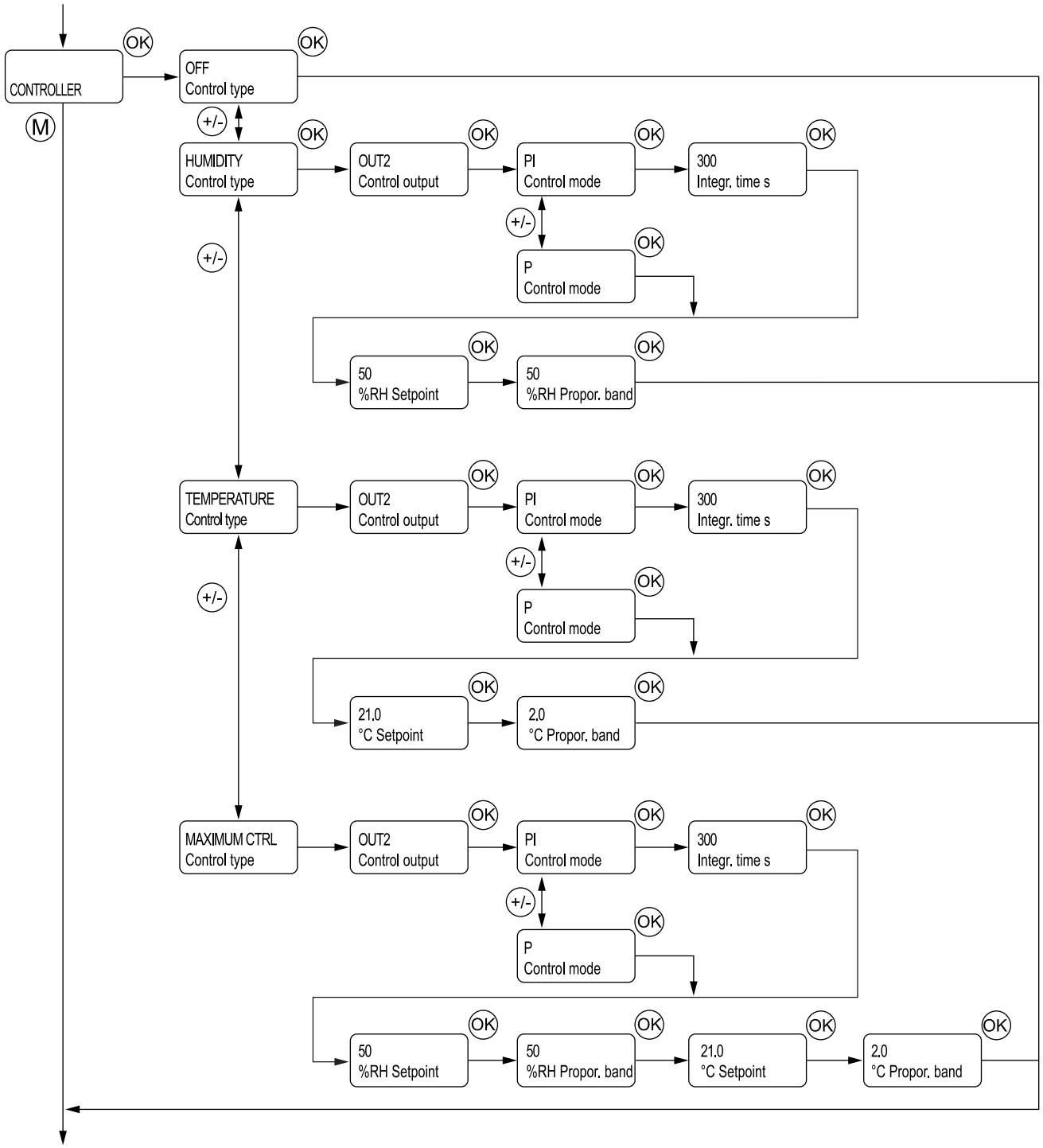
In this menu, you can select the output signal mode for each output. This setting overrides the jumper settings of the device, so it is not necessary to remove the jumpers from the circuit board.



Parameter name	Values	Default	Description
OUT1 OUTPUT	*0-10V/4-20mA* *2-10V/-* *0-5V/-*	*0-10V/4-20mA*	Output scaling for humidity output / control output.
OUT2 OUTPUT	*0-10V/4-20mA* *2-10V/-* *0-5V/-*	*0-10V/4-20mA*	Output scaling for temperature output / control output.

5.4.7 The Controller menu

The controller can control devices based on temperature, humidity or both. The controller uses both measurements in the maximum selection control mode.

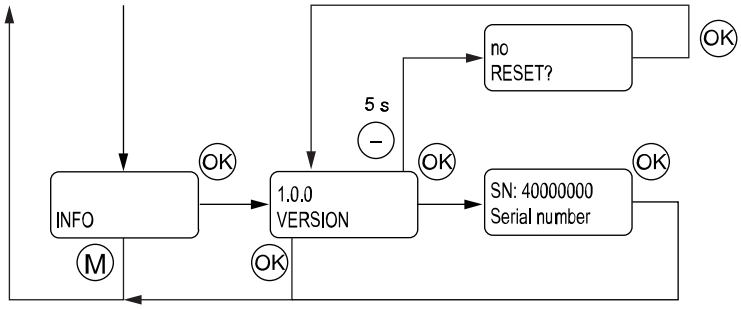


Parameter name	Values	Default	Description
Control type	*OFF / HUMIDITY / TEMPERATURE / MAXIMUM CTRL*	*OFF*	Controlled value. *OFF* — Controller off *HUMIDITY* — Relative humidity *TEMPERATURE* — Temperature *MAXIMUM CTRL* — Maximum selection control. See section Maximum selection control on page 8 for more information.

Parameter name	Values	Default	Description
Control output	*OUT1 / OUT2*	*OUT2*	Control output.
Control mode	*P / PI*	*PI*	Control method.
Integr. time s	*50...5000 s*	*300 s*	Integration time (s).
%RH Setpoint	*0...100 %RH*	*50 %RH*	Setpoint for relative humidity (%rH). You can adjust this value by 5 % steps.
%RH Propor. band	*10...100 %RH*	*50 %RH*	Proportional band for humidity (%rH). You can adjust this value by 5 % steps.
°C Setpoint	*0...50.0 °C*	*21.0 °C*	Setpoint for temperature (°C). You can adjust this value by 0.1 °C steps.
°C Propor. band	*1.0...32.0 °C*	*2.0 °C*	Proportional band for temperature (°C). You can adjust this value by 0.1 °C steps.

5.4.8 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.
Serial number	*SN: XXXXXXXX*	Device serial number.
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.

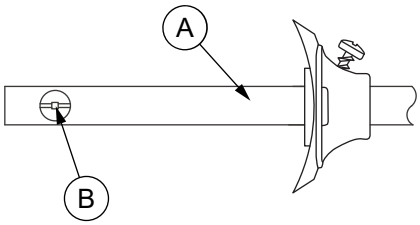
6 Maintenance

6.1 Cleaning the probe and the sensor element

Dust, grease and other dirt can accumulate on the sensor element over time and decrease the measurement accuracy of the sensors. Clean the probe and the sensor element regularly. The required cleaning interval depends on the air cleanliness.

Do not clean the sensor element with detergents or other chemicals.

1. Disconnect the device supply voltage.
2. Clean the probe with a soft cloth.



A. Probe
B. Sensor element

3. Clean the sensor element with compressed air through the net that protects the sensor element.

   Apply compressed air lightly to the sensor element to prevent damage.

   Important: Do not use too high pressure, touch the sensor element or use other cleaning methods that cause mechanical stress. Mechanical stress damages the sensor element and changes the measurement accuracy of the sensors.

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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.



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