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USER GUIDE

KLK

Produal

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PRODUAL

PART OF BEMSIQ GROUP

KLK 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 duct humidity transmitters measure relative humidity and temperature inside ventilation ducts. They are designed for high- and low-humidity applications in non-condensing environments. They are typically used in building automation systems for measuring and controlling humidity in locations where relative humidity must be kept constant.

The transmitters options include:

- Display (-N models)
- Relay output (-R model)
- Modbus RTU communication (-M models)

The -M models have an RS-485 connection for Modbus RTU communication.

You can commission all models using the ML-SER commissioning tool. For -M models, you can also configure the transmitter settings via bus. However, Modbus communication settings must be configured with the ML-SER commissioning tool before you can access the transmitter settings via bus.

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 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.

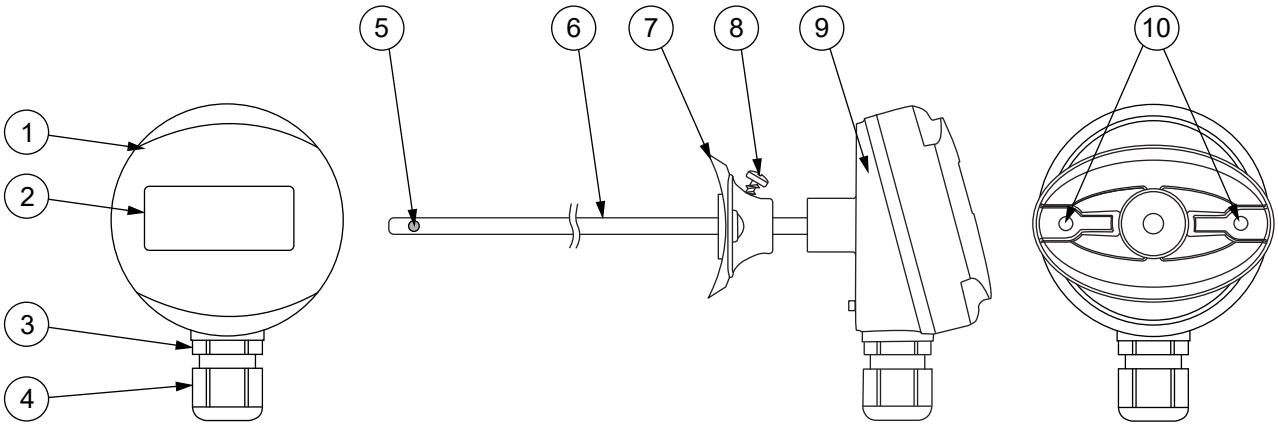
The product should only be used in professionally designed applications. Unauthorised modifications are not allowed. The product must not be used in relation with any equipment that in case of a failure may threaten, directly or indirectly, human health or life or result in danger to human beings, animals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

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

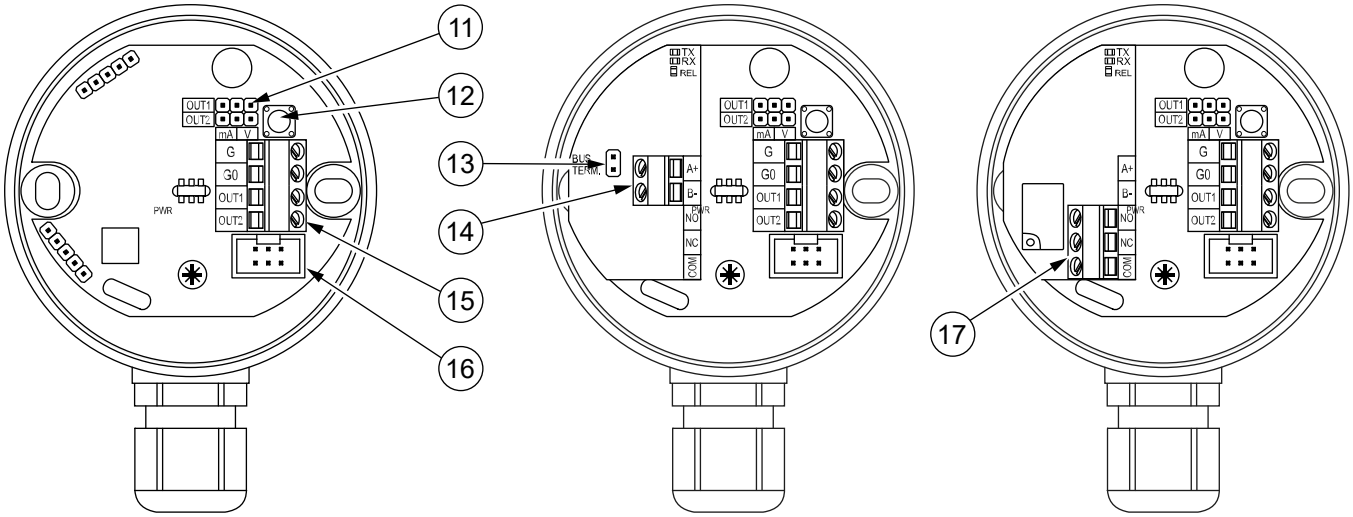
Sign	Description
WARNING:	The warning symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION:	The caution symbol indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.
Important:	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	Display (-N models)
3	Cable gland	4	Strain relief
5	Sensor element	6	Probe
7	Duct flange	8	Probe locking screw
9	Housing	10	Holes for fixing screws



11	Output signal mode selection jumpers	12	Display mode selection button *S1*
13	Modbus termination jumper (-M models)	14	Modbus connector (-M models)
15	Terminal block	16	Display connector
17	Relay output (-R models)		

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4 Functional description

This chapter introduces the main functions of the device.

Note: Modbus communication settings must be configured for the -M model transmitters with the ML-SER commissioning tool before you can access the transmitter settings via bus.

4.1 Analogue outputs

The transmitter has two analogue outputs: a humidity output and a temperature output. The transmitter does not have a separate control output, but you can configure one of the analogue outputs as a control output.

The transmitter has the following output signal modes:

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

The voltage output is scalable. You can select the scale using the ML-SER commissioning tool or via Modbus communication (-M models). The current output is not scalable.

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 10 for more information.

If you configure the settings via bus (-M models), use the following holding registers.

Important: Registers marked with an asterisk (*) are located in the parameter memory. The parameter memory durability is approximately 10000 write cycles.

Holding register	Parameter description	Data type	Values	Range	Default
0	OUT1 output override	S16	*0...1000*	0...100.0 %	*0*
1	OUT2 output override	S16	*0...1000*	0...100.0 %	*0*
*5**	Control output	S16	*0 - 1 - 2 - 3*	0. Off 1. Humidity 2. Temperature 3. Maximum selection	*0*
*21**	OUT1 output mode	S16	*0 - 1 - 2*	0. 0...10 V / 4...20 mA 1. 2...10 V / - mA 2. 0...5 V / - mA	*0*
*22**	OUT2 output mode	S16	*0 - 1 - 2*	0. 0...10 V / 4...20 mA 1. 2...10 V / - mA 2. 0...5 V / - mA	*0*

4.2 Relay output

The -R models have a relay output. You can use the relay output, for example, to switch an alarm or a ventilation fan on and off.

The relay switches on and off according to one measurement value or according to all values. The relay switching point is the sum of the setpoint value and the relay hysteresis value. If the transmitter controls the relay output according to one measurement value, the relay switches on when the measured value is more than the sum of the setpoint value and the relay hysteresis value. For example, if the relay setpoint for humidity is 40 % and the relay hysteresis is 10 %, the relay switches on when the measured humidity

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goes above 50 %. The relay switches off when the measured value goes below the setpoint more than the relay hysteresis value.

If the transmitter controls the relay output according to all values, the relay switches on when one of the measured values is more than the sum of its setpoint value and the relay hysteresis value.

You can adjust the relay setpoint and hysteresis using the ML-SER transmitter commissioning tool.

If you configure the settings via bus (-M models), use the following holding registers.

Important: Registers marked with an asterisk (*) are located in the parameter memory. The parameter memory durability is approximately 10000 write cycles.

Holding register	Parameter description	Data type	Values	Range	Default
*12**	Relay setpoint, humidity	S16	*0…100*	0…100 %rH	*50*
*13**	Relay hysteresis, humidity	S16	*0…50*	0…50 %rH	*5*
*14**	Relay setpoint, temperature	S16	*-500…500*	-50.0…50.0 °C	*230*
*15**	Relay hysteresis, temperature	S16	*0…200*	0.0…20.0 °C	*20*
*16**	Relay function	S16	*0 - 1 - 2 - 3*	0. Off 1. Humidity 2. Temperature 3. All	*1*

4.3 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.

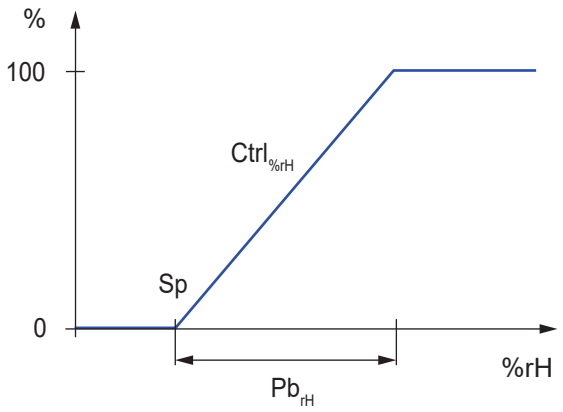
The controller can control humidity or temperature. You can select one of the dual-mode outputs as a control output. You can configure the setpoint, integration time and proportional band for the controller. Proportional band is the range of values within which the control output signal goes between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

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.

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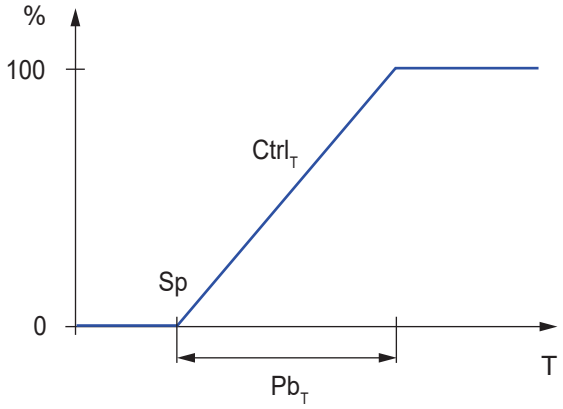


%	Control signal level
Sp	Setpoint
Pb_{rH}	Proportional band for relative humidity
$Ctrl_{\%rH}$	Control signal for relative humidity
%rH	Relative humidity

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.



%	Control signal level
Sp	Setpoint
Pb_T	Proportional band for temperature
$Ctrl_T$	Control signal for temperature
T	Temperature

Modbus holding registers

If you configure the settings via bus (-M models), use the following holding registers.

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Important: Registers marked with an asterisk (*) are located in the parameter memory. The parameter memory durability is approximately 10000 write cycles.

Holding register	Parameter description	Data type	Values	Range	Default
*4**	Control mode	S16	*0 - 1*	0. P 1. PI	*1*
*5**	Control output	S16	*0 - 1 - 2 - 3*	0. Off 1. Humidity 2. Temperature 3. Maximum selection	*0*
*6**	Setpoint, humidity	S16	*0...100*	0...100 %rH	*50*
*7**	Setpoint, temperature	S16	*-500...500*	-50.0...50.0 °C	*210*
*8**	Proportional band, humidity	S16	*10...100*	10...100 %rH	*50*
*9**	Proportional band, temperature	S16	*10...320*	1.0...32.0 °C	*20*
*10**	Integration time	S16	*50...5000*	50...5000 s	*300*

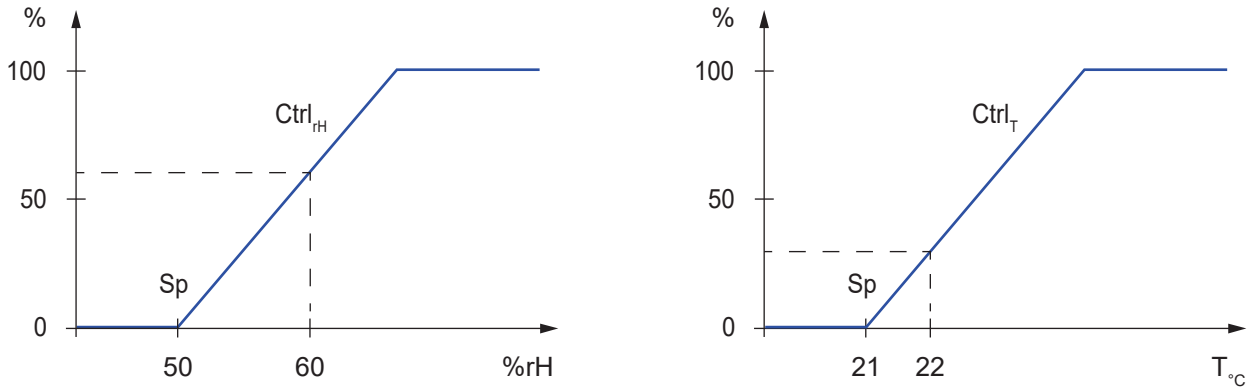
4.3.1 Maximum selection control

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.



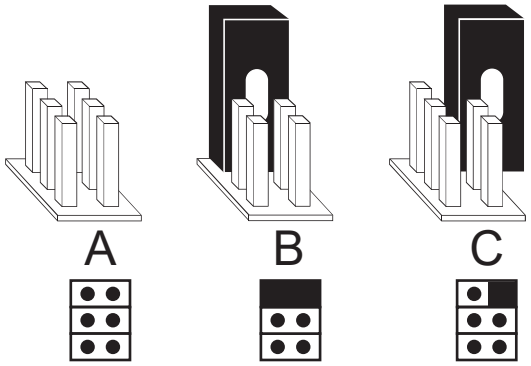
%	Sensor signal level
Sp	Setpoint
$Ctrl_{rH}$	Control signal for relative humidity
%rH	Relative humidity
$Ctrl_{T}$	Control signal for temperature
$T_{°C}$	Temperature (°C)

5 Commissioning

5.1 Setting the jumpers

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

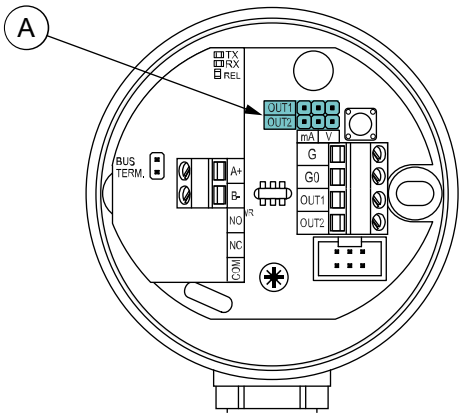
Install the jumpers as shown in the figure below to close the circuit or to store the jumper while the circuit remains open.



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

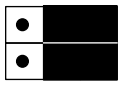
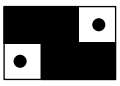
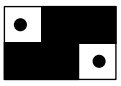
5.1.1 Selecting the output signal mode

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 18) 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.

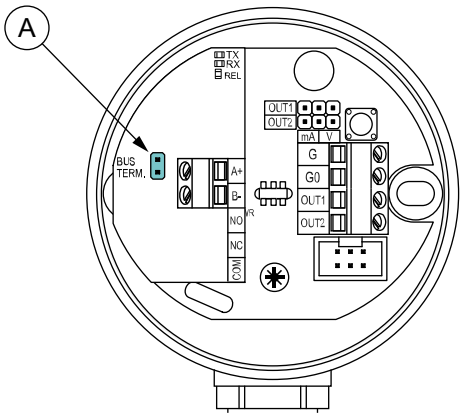
Output				
OUT 1 Humidity output / control output	Output signal mode: current (mA)	*Output signal mode: voltage (V)	Output signal mode: current (mA)	Output signal mode: voltage (V)
OUT 2 Temperature output / control output	Output signal mode: current (mA)	*Output signal mode: voltage (V)	Output signal 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 or via Modbus communication (-M models). The current output is not scalable.

5.1.2 Terminating Modbus

The -M models have pins for a Modbus termination jumper. Insert the termination jumper in the last device of the network to terminate the Modbus network.

1. Disconnect the device supply voltage.
2. Turn the cover counterclockwise to open it.
3. Insert the termination jumper in position on the circuit board.



A. Termination jumper

4. Close the cover.

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.

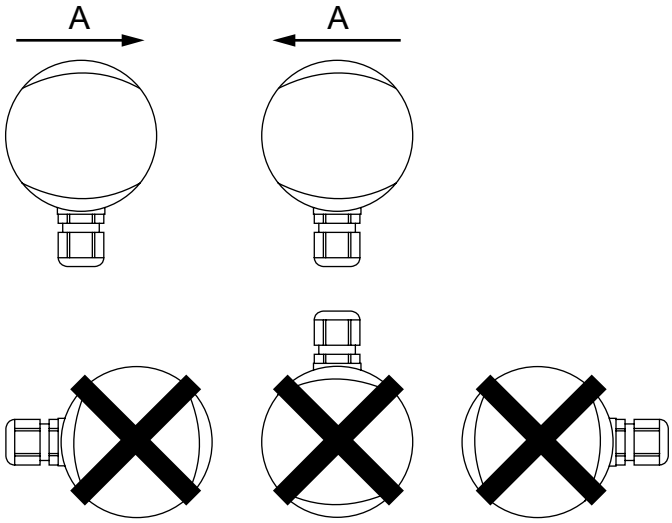
Note: When the temperature drops below 0 °C, the display in -N models fades slightly and the response time increases. The display can stop operating at very low temperatures. It will resume operation when the temperature rises.

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.

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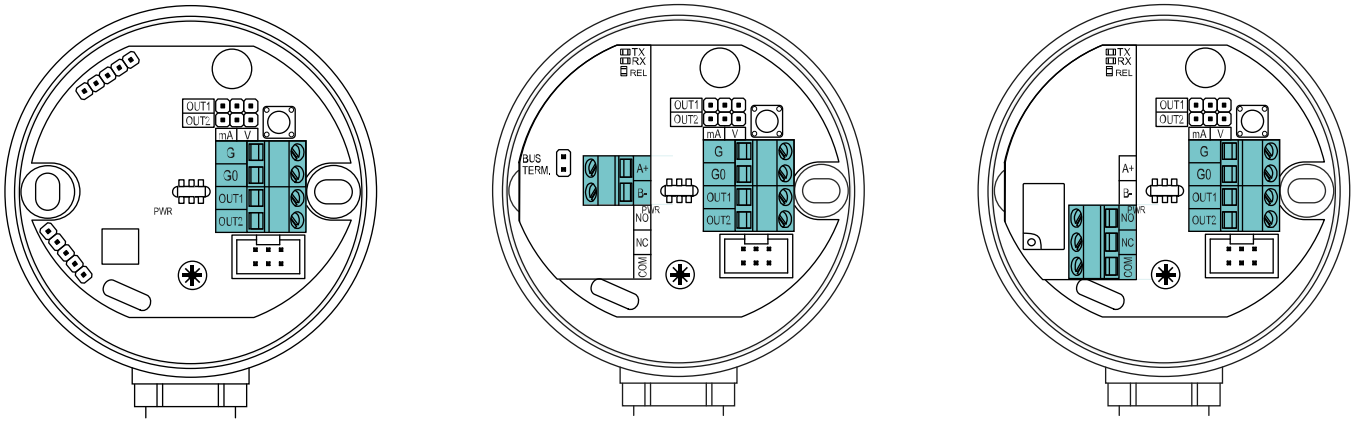
WARNING: This product is appliance class III product according to IEC 60664-1. The product may only be connected to SELV (separated extra low voltage) electricity network.

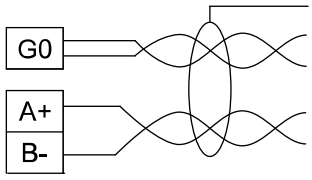
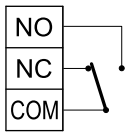
WARNING: The relay port is not protected internally against overload. The wiring of the relay port must be either protected with an external fuse with maximum current rating of 1 A slow blow or the power consumption of the connected external circuitry must be inherently limited to less than 15 W in both normal operation and failure condition.

WARNING: The relay port may be connected only to SELV (separated extra low voltage) circuitry.

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.



G		Supply, 24 Vac/dc, 2 VA
G0		0 V
OUT1		Humidity output / control output
OUT2		Temperature output / control output
A+ *B-*		Modbus RTU, RS-485 (-M models)
NO *NC* *COM*		Relay output, 24 Vac/dc, max. 1 A res. (-R models)

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.

5.4 Selecting the display mode (-N models only)

The display shows both humidity and temperature readings at the same time by default. You can also set the display to show only one measurement (humidity or temperature).

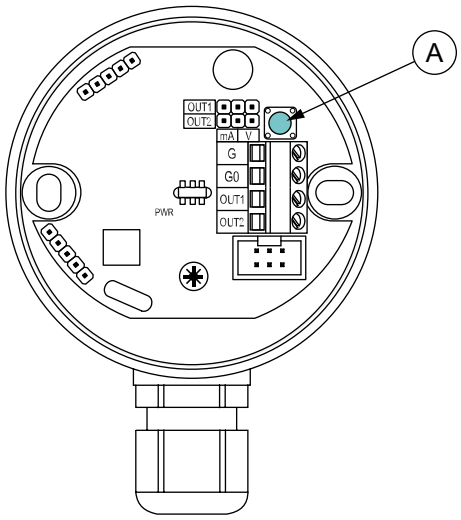
Note: When the temperature drops below 0 °C, the display in -N models fades slightly and the response time increases. The display can stop operating at very low temperatures. It will resume operation when the temperature rises.

Note: In -M models, you can also select the measurement shown on the display via Modbus.

1. Make sure that the wires are correctly connected.
2. Turn on the power.
3. Turn the cover counterclockwise to open it.

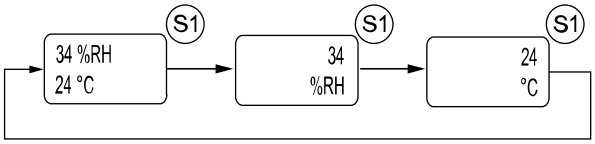
   Be very careful when you open the cover. The display board is connected to the circuit board with a cable.
4. Press the *S1* button to select a different display mode.

   Do not touch the wires.



A. *S1* button

5. Press the *S1* button again until you find the correct display mode.



6. Close the cover.

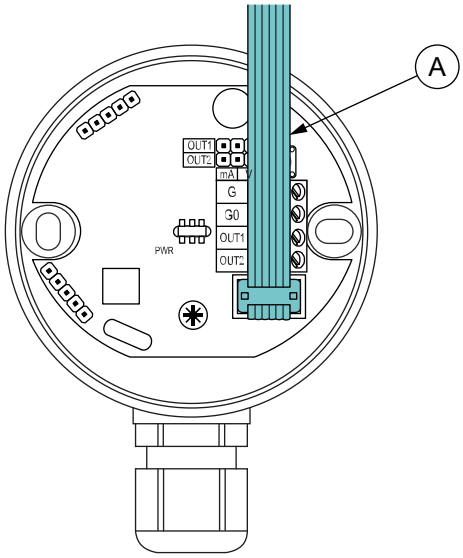
5.5 Configuring transmitter using the ML-SER commissioning tool

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. Turn the cover counterclockwise to open it.
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

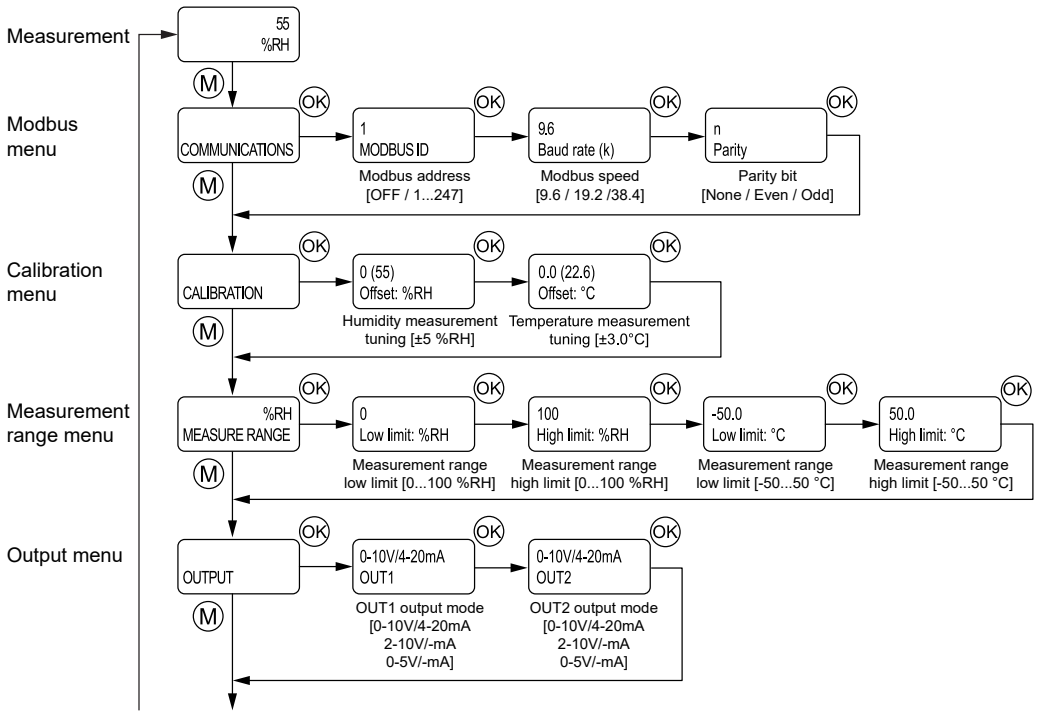
4. Wait until the ML-SER commissioning tool has initialised.

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

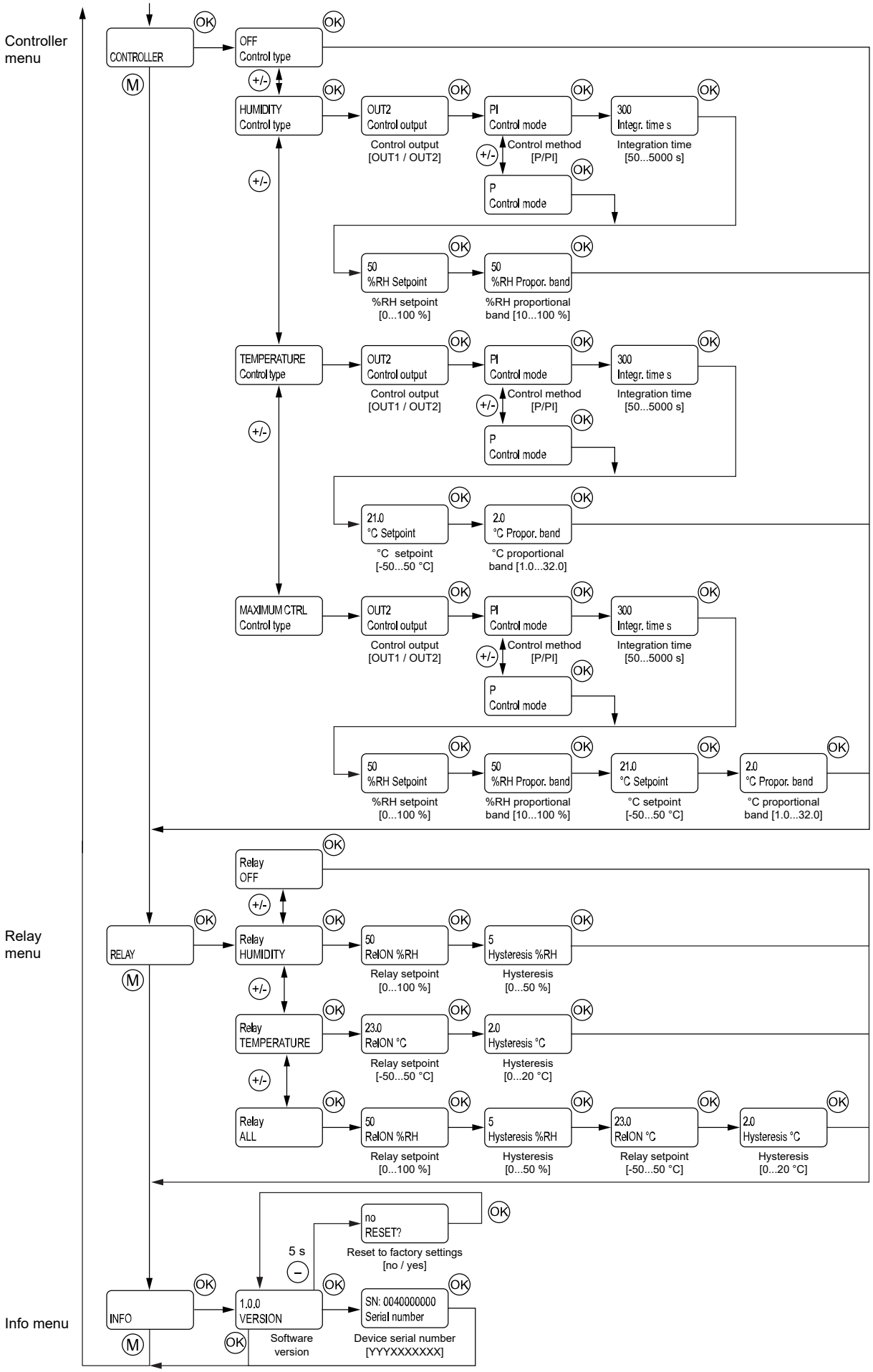
5.5.2 The ML-SER commissioning tool menu

The 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 the factory settings for all models.



The menu structure continues on the next page.


Controller menu
CONTROLLER
OFF
Control type
HUMIDITY
Control type
OUT2
Control output
Control output
[OUT1 / OUT2]
PI
Control mode
Control method
[P/PI]
P
Control mode
300
Integr. time s
Integration time
[50...5000 s]
50
%RH Setpoint
%RH setpoint
[0...100 %]
50
%RH Propor. band
%RH proportional
band [10...100 %]
TEMPERATURE
Control type
21.0
°C Setpoint
°C setpoint
[-50...50 °C]
2.0
°C Propor. band
°C proportional
band [1.0...32.0]
MAXIMUM CTRL
Control type
Relay menu
RELAY
Relay OFF
Relay HUMIDITY
50
RelON %RH
Relay setpoint
[0...100 %]
5
Hysteresis %RH
Hysteresis
[0...50 %]
Relay TEMPERATURE
23.0
RelON °C
Relay setpoint
[-50...50 °C]
2.0
Hysteresis °C
Hysteresis
[0...20 °C]
Relay ALL
Info menu
INFO
1.0.0
VERSION
Software version
SN: 0040000000
Serial number
Device serial number
[YYYXXXXXXX]
no
RESET?
Reset to factory settings
[no / yes]
5 s

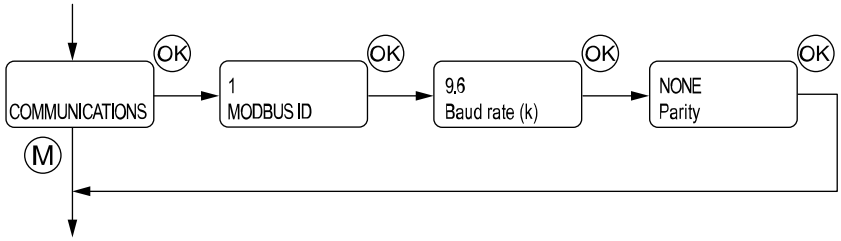
5.5.3 Using the ML-SER commissioning tool

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 Ⓜ button repeatedly to exit the main menu.

5.5.4 The Communications menu (Modbus)

This menu is available in -M models. You can change the bus settings in this menu.

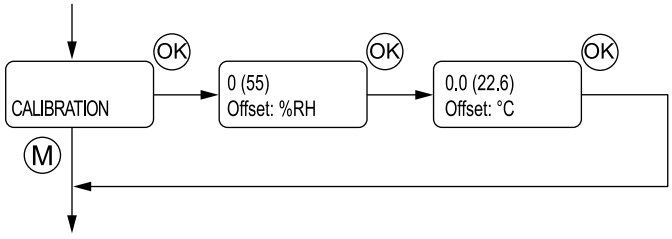
Note: Modbus communication settings must be configured with the ML-SER commissioning tool before you can access the transmitter settings via bus.



Parameter name	Values	Default	Description
Modbus ID	*OFF / 1...247*	*1*	Modbus address.
Baud rate	*9.6 / 19.2 / 38.4*	*9.6*	Modbus speed (kbit/s).
Parity	*NONE / EVEN / ODD*	*NONE*	Bus parity.

5.5.5 The Calibration menu

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



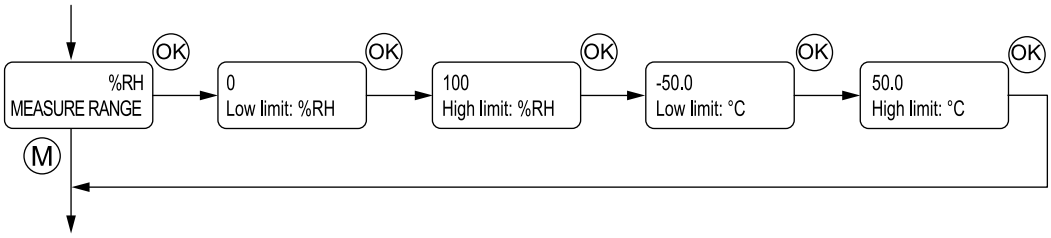
Parameter name	Values	Default	Description
Offset %RH	*-5...5 %RH*	*0 %RH*	Humidity measurement tuning. You can adjust this value by 1 % steps.

Parameter name	Values	Default	Description
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.

5.5.6 The Measure range menu

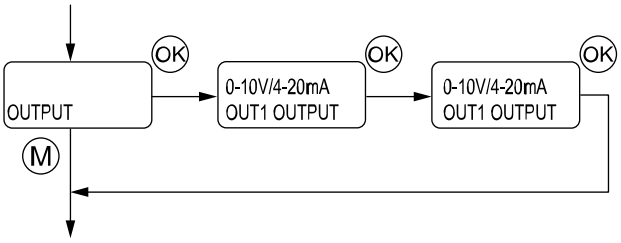
In this menu, you can set a custom measurement range for humidity and temperature.



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.
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.

5.5.7 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.

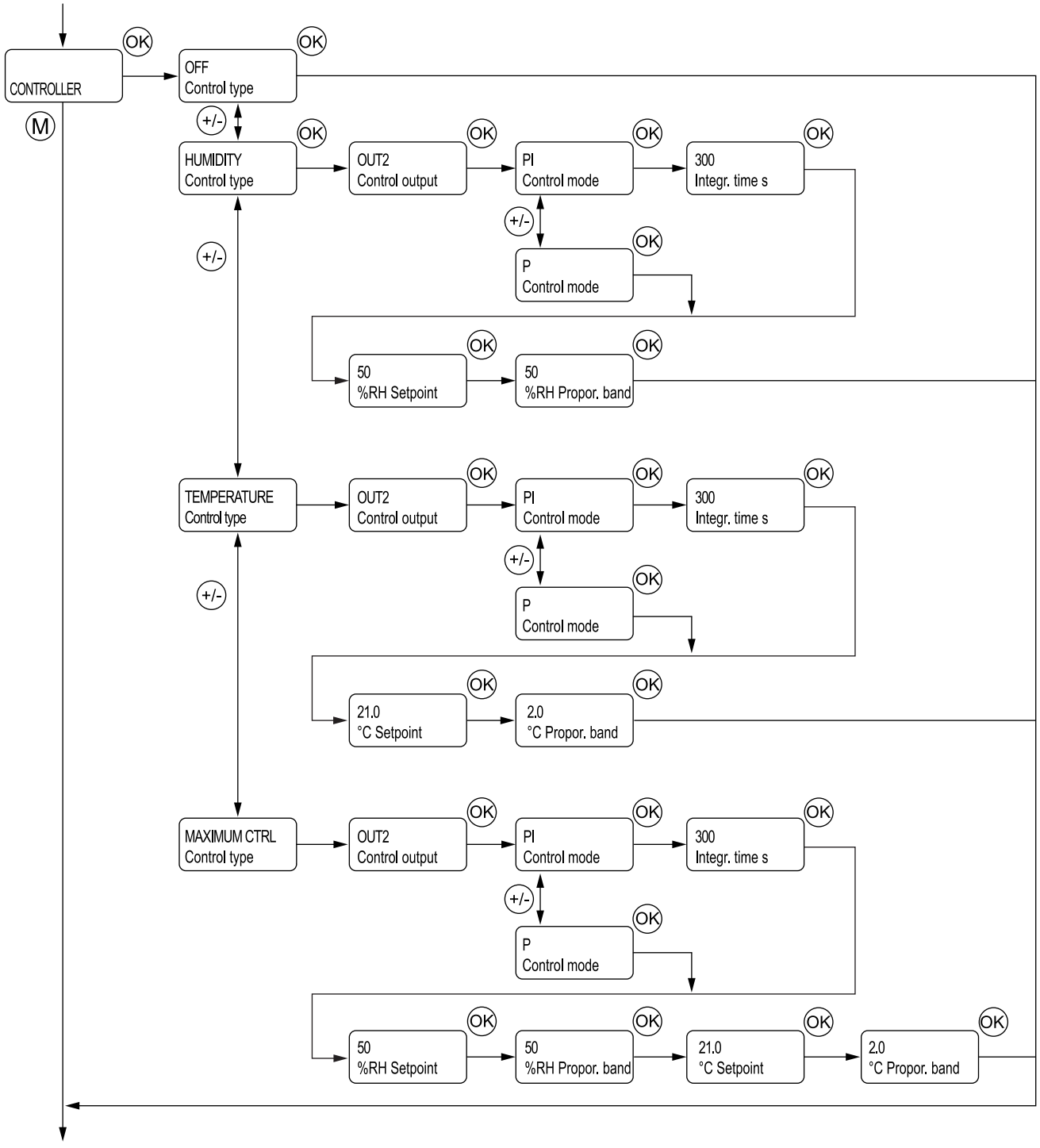


Parameter name	Values	Default	Description
OUT1 OUTPUT	*0-10V/4-20mA* *2-10V/-* *0-5V/-*	*0-10V/4-20mA*	Output scaling for humidity output / control output.

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

5.5.8 The Controller menu

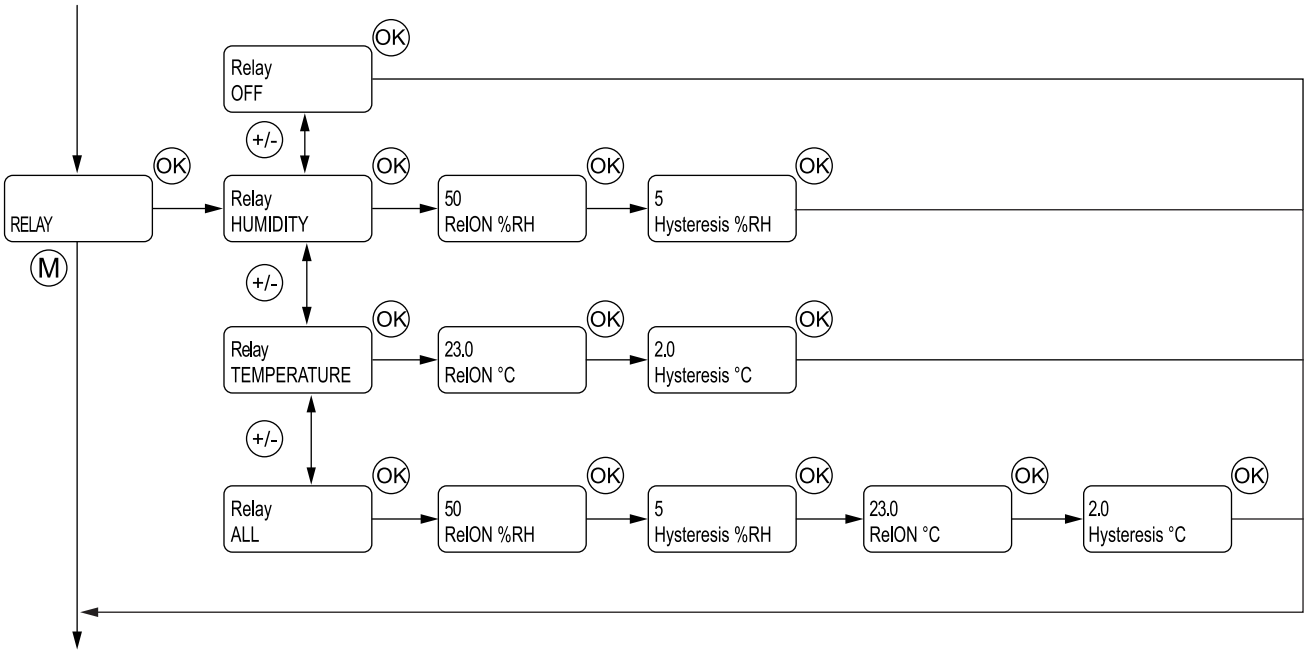
The controller can control devices based on temperature, humidity or both. The controller uses both measurements in the maximum selection control mode.



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 9 for more information.
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.

5.5.9 The Relay menu

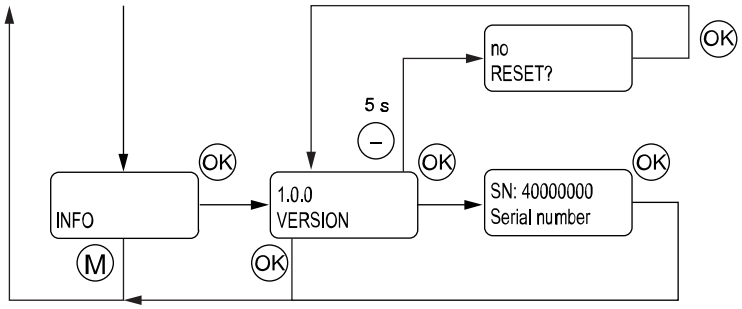
This menu is available in -R models. In this menu, you can adjust the relay setpoint and hysteresis to change the relay switching point.



Parameter	Available values	Description
Relay	*OFF / HUMIDITY / TEMPERATURE / ALL*	Relay function. *OFF* — Relay is not in use. *HUMIDITY* — The relay switches on when the measured relative humidity is more than the sum of the humidity setpoint value and the relay hysteresis value. *TEMPERATURE* — The relay switches on when the measured temperature is more than the sum of the temperature setpoint value and the relay hysteresis value. *ALL* — All measurement values. The relay switches on when one of the measured values is more than the sum of its setpoint value and the relay hysteresis value.
RelON %RH	*0...100*	Setpoint for relative humidity (%rH). You can adjust this value by 1 % steps.
Hysteresis %RH	*0...50*	Hysteresis for relative humidity (%rH). You can adjust this value by 1 % steps.
RelON °C	*-50.0...50.0*	Setpoint for temperature (°C). You can adjust this value by 0.1 °C steps.
Hysteresis °C	*0.0...20.0*	Hysteresis for temperature (°C). You can adjust this value by 0.1 °C steps.

5.5.10 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.

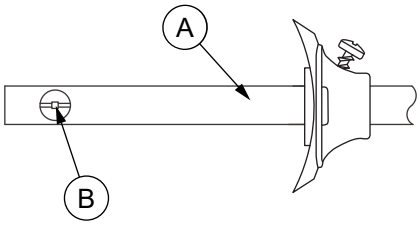
6 Maintenance

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. For the -R models, disconnect the device supply voltage and the relay mains 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 Modbus

Note: Modbus communication settings must be configured with the ML-SER tool before you can access the transmitter settings via bus.

7.1 Modbus properties

Protocol	RS-485 Modbus RTU
Bus speed	9600*/19200/38400 bit/s
Data bits	8
Parity	none*/odd/even
Stop bits	1
Modbus ID	1*
Unit load	max. 1/4 UL
	* factory setting

7.2 Modbus function codes

The device supports the following Modbus function codes.

Decimal	Hexadec-imal	Function
1	0x01	Read Coils
2	0x02	Read Discrete Inputs
3	0x03	Read Holding Registers
4	0x04	Read Input Registers
5	0x05	Write Single Coil
6	0x06	Write Single Register
15	0x0F	Write Multiple Coils
16	0x10	Write Multiple Registers

7.3 Modbus registers

Note: If you try to write a parameter value that is beyond the parameter value range, the value will be replaced by the nearest acceptable value.

Example:

1. The register value range is -500...500.
2. You try to write the value 600 to the register.
3. The value 500 is written to the register.

7.3.1 Coils

Important: Registers marked with an asterisk (*) are located in the parameter memory. The parameter memory durability is approximately 10000 write cycles.

Register	Parameter description	Data type	Values	Range	Default
0	OUT1 output override activation	Bit	*0 - 1*	0. Off 1. On	*0*
1	OUT2 output override activation	Bit	*0 - 1*	0. Off 1. On	*0*
2	Relay override activation	Bit	*0 - 1*	0. Off 1. On	*0*
3	Relay override	Bit	*0 - 1*	0. Off 1. On	*0*
*4**	Controller output terminal	Bit	*0 - 1*	0. *OUT2* 1. *OUT1*	*0*

7.3.2 Discrete inputs

Register	Parameter description	Data type	Values	Range
0	Relay status	Bit	*0 - 1*	0. Off 1. On

7.3.3 Input registers

Register	Parameter description	Data type	Values	Range
0	Humidity measurement	S16	*0...100*	0...100 %rH
1	Temperature measurement	S16	*-500...500*	-50.0...50.0 °C
2	OUT1 output voltage	S16	*0...1000*	0...10.00 V
3	OUT2 output voltage	S16	*0...1000*	0...10.00 V

7.3.4 Holding registers

Register	Parameter description	Data type	Values	Range	Default
0	OUT1 output override	S16	*0...1000*	0...100.0 %	*0*
1	OUT2 output override	S16	*0...1000*	0...100.0 %	*0*
*2**	Humidity measurement tuning (offset)	S16	*-5...5*	-5...5 %rH	*0*
*3**	Temperature measurement tuning (offset)	S16	*-30...30*	-3.0...3.0 °C	*0*
*4**	Control mode	S16	*0 - 1*	0. P 1. PI	*1*
*5**	Control output	S16	*0 - 1 - 2 - 3*	0. Off 1. Humidity 2. Temperature 3. Maximum selection	*0*

Register	Parameter description	Data type	Values	Range	Default
*6**	Setpoint, humidity	S16	*0...100*	0...100 %rH	*50*
*7**	Setpoint, temperature	S16	*-500...500*	-50.0...50.0 °C	*210*
*8**	Proportional band, humidity	S16	*10...100*	10...100 %rH	*50*
*9**	Proportional band, temperature	S16	*10...320*	1.0...32.0 °C	*20*
*10**	Integration time	S16	*50...5000*	50...5000 s	*300*
*11**	Value shown on the display	S16	*0 - 1 - 2*	0. Humidity 1. Temperature 2. Humidity and temperature	*2*
*12**	Relay setpoint, humidity	S16	*0...100*	0...100 %rH	*50*
*13**	Relay hysteresis, humidity	S16	*0...50*	0...50 %rH	*5*
*14**	Relay setpoint, temperature	S16	*-500...500*	-50.0...50.0 °C	*230*
*15**	Relay hysteresis, temperature	S16	*0...200*	0.0...20.0 °C	*20*
*16**	Relay function	S16	*0 - 1 - 2 - 3*	0. Off 1. Humidity 2. Temperature 3. All	*1*
*17**	Humidity measurement range, low limit	S16	*0...100*	0...100 %rH	*0*
*18**	Humidity measurement range, high limit	S16	*0...100*	0...100 %rH	*100*
*19**	Temperature measurement range, low limit	S16	*-500...500*	-50.0...50.0 °C	*-500*
*20**	Temperature measurement range, high limit	S16	*-500...500*	-50.0...50.0 °C	*500*
*21**	OUT1 output mode	S16	*0 - 1 - 2*	0. 0...10 V / 4...20 mA 1. 2...10 V / - mA 2. 0...5 V / - mA	*0*
*22**	OUT2 output mode	S16	*0 - 1 - 2*	0. 0...10 V / 4...20 mA 1. 2...10 V / - mA 2. 0...5 V / - mA	*0*

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8 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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