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Каталог продукции GALLTEC+MELA

Digital
Dual Function Controller EDJ_MIC
for **humidity** and **temperature**
Input: 2 x 0 ... 20mA
with integrated sensor power supply

Description

The controller EDJ_MIC for humidity and temperature consists of two integrated, digital microprocessor controllers and also an integrated 15-VDC power supply for the sensors.

The humidity temperature sensor type TFG80J, TFK80J or TFK120J (refer to page 2) with output signals 0 ... 20 mA is used as the readings recorder. The humidity and temperature values are displayed digitally on the EDJ_MIC controller as actual values.

The EDJ_MIC controller can be used as a two or three point controller. The output states are shown by LEDs.

The user-friendly EDJ_MIC controller is really very easy to use. It has been pre-programmed in the factory so that no particular previous knowledge of control engineering is required to be able to solve simple control tasks. After successfully connecting up and entering the target values, it is ready for immediate use to control humidifying or dehumidifying as well as heating and cooling.

Apart from that, the controller also allows you to solve complex control tasks. By using the keyboard to enter the parameters, you can set the PID characteristics of the controller and also the switching time, the switching hysteresis, the working point and also the output limiting.

The filters on the controller inputs filter out changes in the input signal which are too fast. The filter time constant can be set to between 0.0 ... 100.0 sec by pressing a button. Thus the control is no longer affected by distortions and transients.

A special feature of the EDJ_MIC is the self-optimisation. This means that the controller independently determines the optimal control parameters for a PID or PI controller in the given control environment.

The humidity and temperature controller type EDJ_MIC provides you with a control unit which can be used to solve a wide range of problems. The EDJ_MIC controller simultaneously acquires and controls the humidity and temperature and is thus suitable for controlling e.g. computer rooms, air conditioning and maturing chambers, monitoring and regulating the ambient conditions at print shops, in the textile industry, the film industry, in hothouses, in warehouses and many other places.

Technical Data

Power supply
..... 230VAC, 11VA (incl. sensors), 45...55Hz
Controller type ..... two or three point controller
controller structures ..... PD/PI/PID
A/D-transducer ..... resolution > 15 Bit
Data storage ..... EEPROM
sampling time 210ms
measurement accuracy ..... ≤ 0,1% / 100ppm/K
outputs ..... Relay
Make contact (NO contact)
..... 3A at 250 VAC resistive load
..... 150,000 switches at rated load
Output sensor supply ..... 15 VDC max. 60 mA
Target value display ..... 4-digit can be retrieved using keys
Actual value display 4-digit
housing
..... panel housing to IEC 61554 black
housing dimensions (HxBxT mm) ..... 144 x 72 x 135
Contacts ..... on the back using pluggable screw terminals
electromagnetic compatibility..... EN 61 326
ambient temperature .....+10…+50°C
protective system, front.....IP50
rear..... IP20

Technical Data for Humidity

Input.....0...20mA
Control range ..... 0...100 %rh
Display range .....00,0 ... 100,0 %rh
output.....2 x NO contacts

Technical Data for Temperature

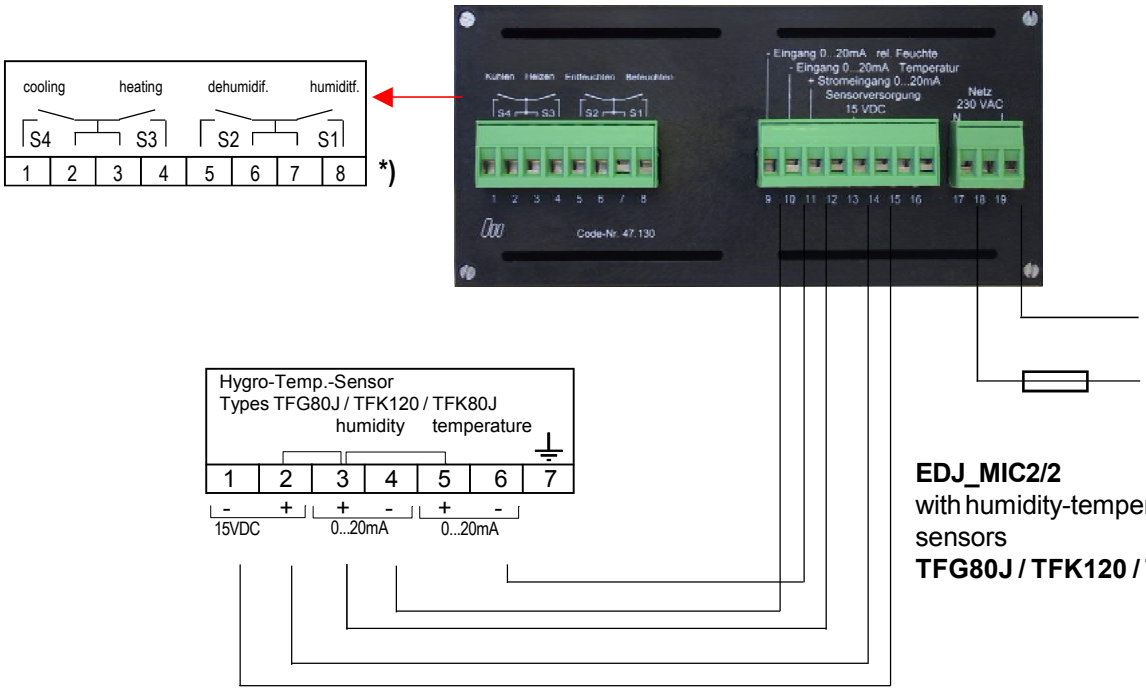
input.....0...20mA
Control range.....-10...+90°C
Display range.....-10,0....90,0°C
Output.....2 x NO contacts

"subject to technical modifications"

For more complex control tasks and a wide range of sensors, our type EDR_MIC is available.

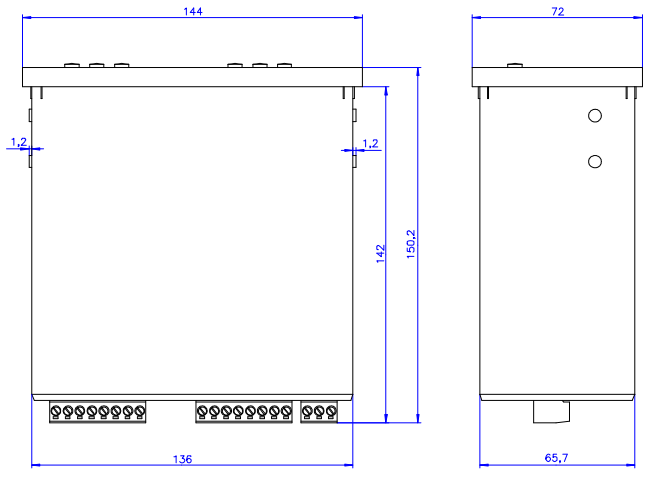
Please ask for the detailed data sheet.

Connecting Diagram



*) **Caution! If you have been using a EDJ2/2 controller until now:** Please note that on the EDJ_MIC at the relay output, clamp 2 is connected to clamp 3 and clamp 6 to clamp 7.

Dimensions



Sensor Data

Sensor Type	Measured Variable	Structural Shape	Order No.	for Controllers
TFG80J	Humidity and temperature	duct version	44623030	EDJ_MIC2/2
TFK80J	Humidity and temperature	duct version	58623030	EDJ_MIC2/2
TFK120J	Humidity and temperature	room version	59623030	EDJ_MIC2/2

Please refer to the respective data sheets for the technical data on the sensors!

Operation of the Controller

There are three buttons on the front of each of the two controllers: **P** ▲ ▼
Use the **P** button to select the required parameter. The display changes between the description of the parameter and the value. You use the ▲ or the ▼ button to respectively increase or decrease the value for the parameter. The new value will be automatically saved after 2 sec. approx.

Switching on, setting the target value

After switching on, first of all a display check is carried out for 3 s. After that, the four-digit, seven segment displays show the actual values for the humidity and the temperature (**Normal display**).
After pressing the **P** button, the first parameter will appear: **SP** the target value (**user interface**). It is set by pressing the ▲ or the ▼ q button and the new target value set is accepted after approx. 2 s. The normal display with the actual value is then retrieved by pressing the **P** button again or returns automatically after approx. 30 s.

Setting additional parameters

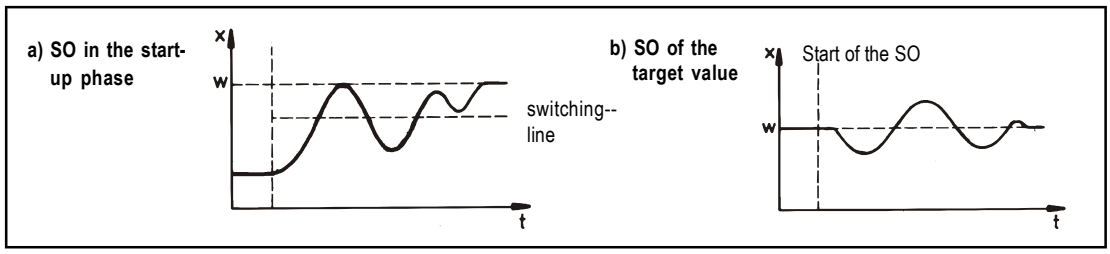
To avoid the parameters being inadvertently changed by people who are not experts, the **Parameter interface**, in which thirteen more parameters can be set, has been protected with a simple locking mechanism: : You can switch to the **Parameter interface** by pressing the **P** button for approx. 3seconds, either directly with the normal display, or on the user interface. The other parameters are also selected by pressing the **P** button and are then set with the ▲ or the ▼ button. Here the new values are also accepted after approx. 2 s, which is confirmed by the display flashing briefly once. After the last parameter, the SP (target value) is shown again at the end before normal display is resumed.

For most applications the EDJ_MIC controller works correctly with the factory settings. The user only has to set „SP“, „db“, „HYS.1“, „HYS.2“ and possibly „df“. If the target value (SP) is now changed after making this adjustment, the control switching points do not move relatively to each other. The target value is always at half the contact distance (db) (refer to graphics p. 4).

We recommend that you do not change the other parameters without sufficient expertise in control engineering.

Self-optimization

In many cases, with this function the controller can determine the optimal parameters for a PID or PI controller. The following controller parameters are defined: rt, dt, Pb.1, Pb.2, CY 1, CY 2, df. Depending on the size of the system deviation, the controller chooses between two processes **a** or **b**.



Caution: Please make sure you make a note of the parameters set before implementing self-optimization!

To start self-optimization, the ▲ ▼ buttons must be pressed simultaneously for 3 s. On the display „tunE“ and the actual value are shown alternately. Self-optimization is ended automatically or can be cancelled by briefly pressing the ▲ ▼ buttons simultaneously

Please note that the relative humidity depends on the temperature. For this reason it is necessary to start self-optimization of humidity control at a constant temperature!

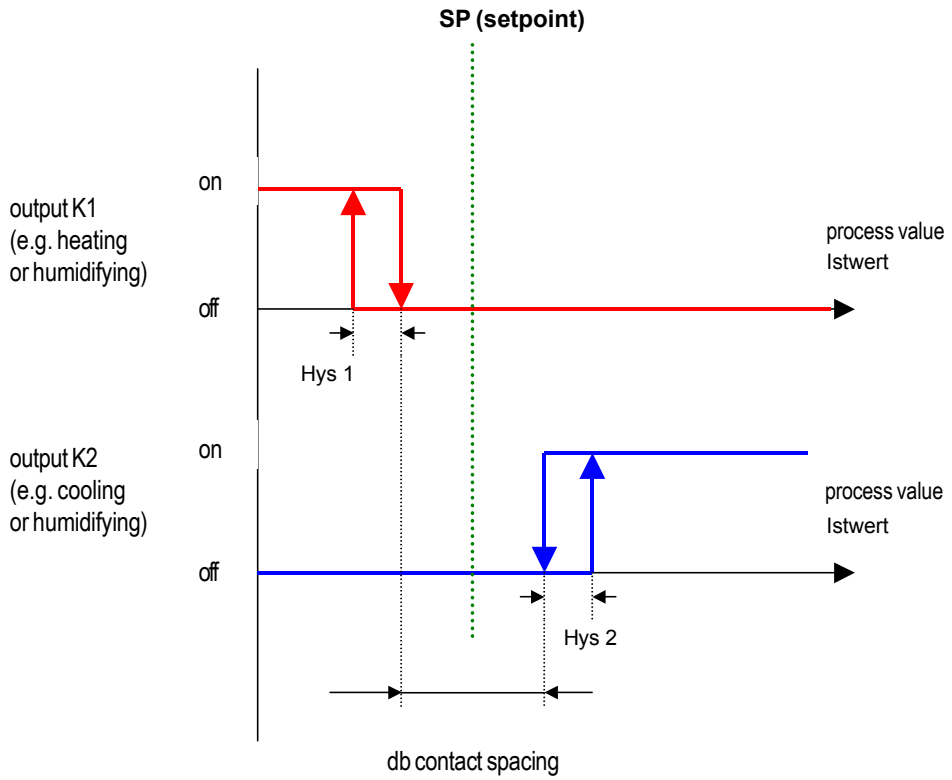
Alarm messages

The display for the process value flashes **1999**. The cause may be a over/underrange of the process value.

Parameter

Parameter	Value range	Explanation	Settings	
			factory-set	your setting
SP	**20…100%rh bei Feuchte -10…90 °C bei Temperatur**	**setpoint**	**40,0%rh 25,0°C**	
Pb.1	0,0…999,9	proportional band 1 (controller output 1) P-action	0,0	
Pb.2	0,0…999,9	proportional band 2 (controller output 2) P-action	0,0	
dt	0…9999s	derivative time D-action	80s	
rt	0…9999s	reset time I-action	343s	
CY 1	1,0…999,9s	cycle time 1 (controller output 1)	20,0s	
CY 2	1,0…999,9s	cycle time 2 (controller output 2)	20,0s	
db	**0,0…100,0**	**contact spacing**	**3,0 [%rh or °C]**	
HYS.1	**0,0…999,9**	**differential 1 (controller output 1)**	**1,0 [%rh or °C]**	
HYS.2	**0,0…999,9**	**differential 2 (controller output 2)**	**1,0 [%rh or °C]**	
Y .0	-100…100%	working point (working point)	0%	
Y .1	0…100%	maximum output	100% *	
Y .2	-100…100%	minimum output	-100% *	
dF	**0,0…100,0s**	**Filter time constant**	**0,6s**	

* For controllers without controller structure (Pb.1 = 0 or Pb.2 = 0) Y.1 = 100% and Y.2 = -100%.



Digital
Dual Function Controller EDR_MIC
e.g. for humidity and **temperature**
optional with integrated sensor power supply

Inputs:

standard signal 0/4 ... 20mA			
standard signal 0/0.2 ...1 V			
Pt100 (3-wire)		Pt1000 (3-wire)	
Pt100 (2-wire)		Pt1000 (2-wire)	
KTY11-6			
Cu-Con	„T“	Fe-Con	„J“
Cu-Con	„U“	Fe-Con	„L“
NiCr-Ni	„K“	Pt10Rh-Pt	„S“
Pt13Rh-Pt	„R“	Pt30Rh-Pt	„B“
NiCrSi-NiSi	„N“		

Description

The dual function controller EDR_MIC e.g. for humidity and temperature consists of two integrated, digital microprocessor controllers and also, optional, an integrated 15-VDC power supply for the sensors.

Humidity temperature sensors with the standard signals 0/4...20mA, 0/0.2 ...1V or others are used as readings recorders. In the Galltec+Mela programme you will find a large selection of different sensors.

The humidity and temperature values are displayed digitally as actual values on the EDR_MIC controller.

The measurement ranges can be set to any scale within the maximum ranges.

The filters on the controller inputs filter out changes in the input signal which are too fast. The filter time constant can be set to between 0.0 ... 100.0 sec by pressing a button. Thus the control is no longer affected by distortions and transients.

The individual microprocessor controllers can be programmed independently of each other for the various control tasks. Whether as a two point controller, three point controller, with timer or ramp function - you decide through programming. The structure of the controller, e.g. as a PI controller or PID controller with the corresponding parameters, is also entered via the programming level. Thus a universal combination controller is at your disposal.

Technical Data

power supply ..... 230VAC, 11VA (incl. sensors), 45...55Hz
controller type ..... two or three point controller
controller structures ..... P/PD/PI/PID
A/D-transducer ..... resolution > 15 bit
accuracy (timer) ..... 0.7 % / 10ppm/K
data storage ..... EEPROM
sampling time ..... 210 ms
measurement accuracy (analogue input) ..... ≤ 0.1% / 100ppm/K
outputs ..... 4 relays (2 per controller) make contact (NO contact)
..... 3 A at 250 VAC resistive load
output sensor supply (optional)
..... 15 VDC max. 60 mA
target value display ..... 4-digit can be retrieved using keys
actual value display 4digit
housing ..... panel housing to DIN43700 black
housing dimensions ..... 144 x 72 x 135
contacts
..... on the back using screw terminals
conductor cross section ..... ≤ 1.5 mm²
electromagnetic compatibility ..... EN 61 326
ambient temperature ..... +10...+50°C
protective system, front IP50
rear IP20
resistance to climatic conditions
..... ≤ 75%rh without condensation

Technical Data

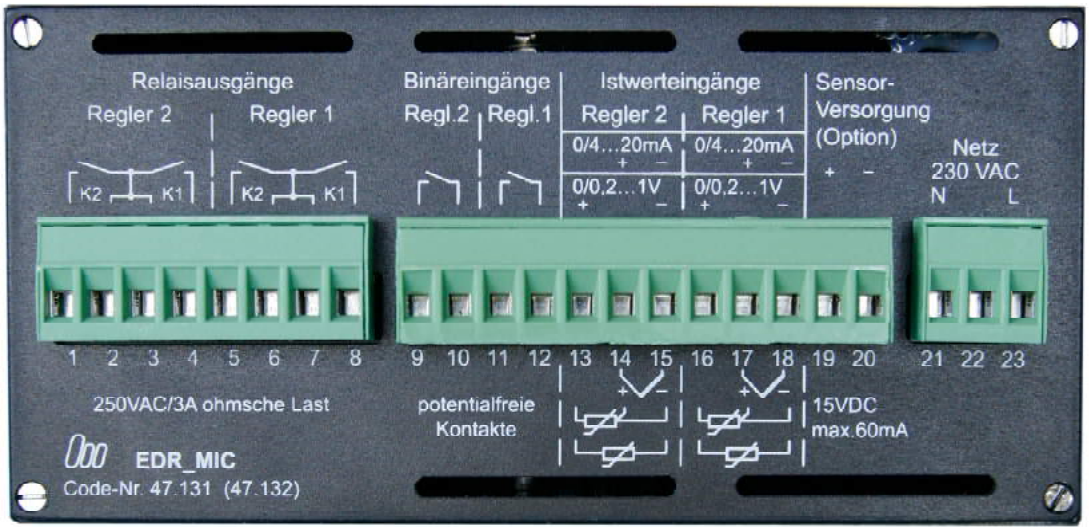
inputs ..... 0/4 ...20mA
..... 0/0.2 ... 1 V
..... 100 ... 138.5 Ohm, 1000 ... 1385 Ohm
or thermocouples see above

voltage drop current input: ..... ≤ 1 V
R_E voltage input ..... 10 MOhm

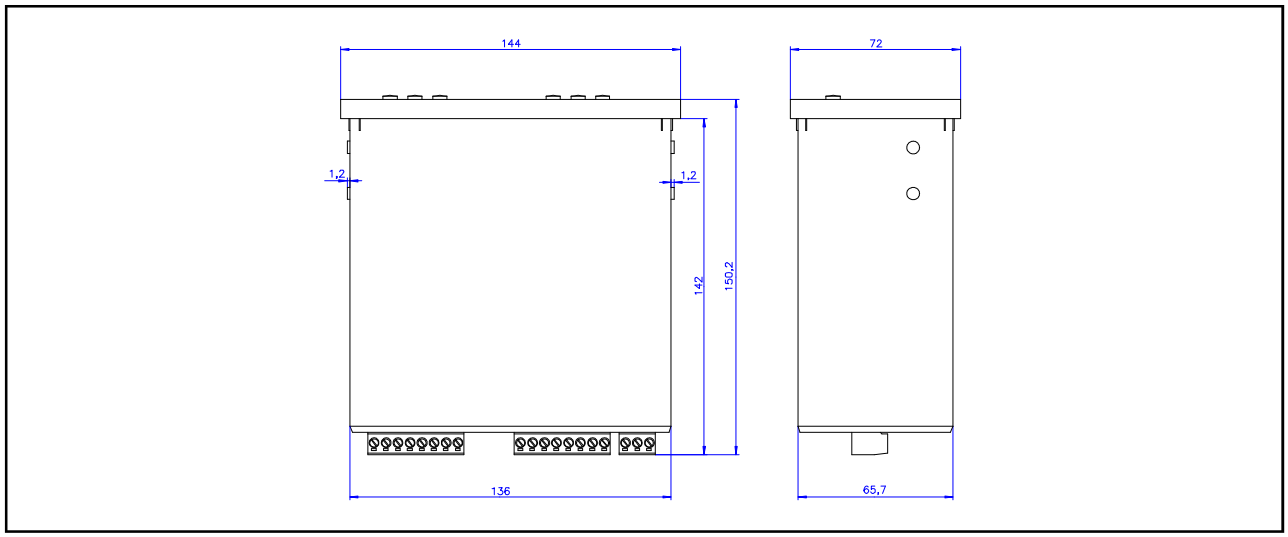
control range ..... depending on sensor used
display range ..... depending on sensor used

"subject to technical modifications"

Connecting Diagram

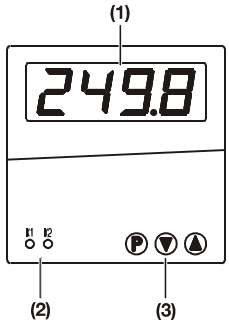


Dimensions

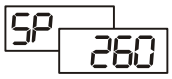


Operation of the Controller

Display and keys



(1) Display

7-segment display	4 places, green Display alternates when setpoints, parameters and codes are entered and indicated 
Character height	10 mm
Display range	-1999...+9999 digit
Decimal places	none, one, two
Unit	°C/ °F (process value display)

(2) Status indicators

LED	two LEDs for the outputs 1 and 2, yellow

(3) Keys

P , ▲ , ▼	for operating and programming the instrument. Dynamic modification of settings and parameters * Increase value with ▲ * Decrease value with ▼ Automatic value acceptance after 2 seconds.

Principle of operation

Normal display
The display shows the process value.

Operating level
The setpoint **SP** is input here. On active setpoint switching via the logic input, **SP 1** or **SP 2** appears in the display. When the ramp function is active, the ramp setpoint **SPr** is displayed. With activated timer function, the timer value **t.** or the timer start value **t. 0** is shown.
The setpoint is altered dynamically using the ▲ and ▼ keys. The setting will be accepted automatically after approx. 2 sec.

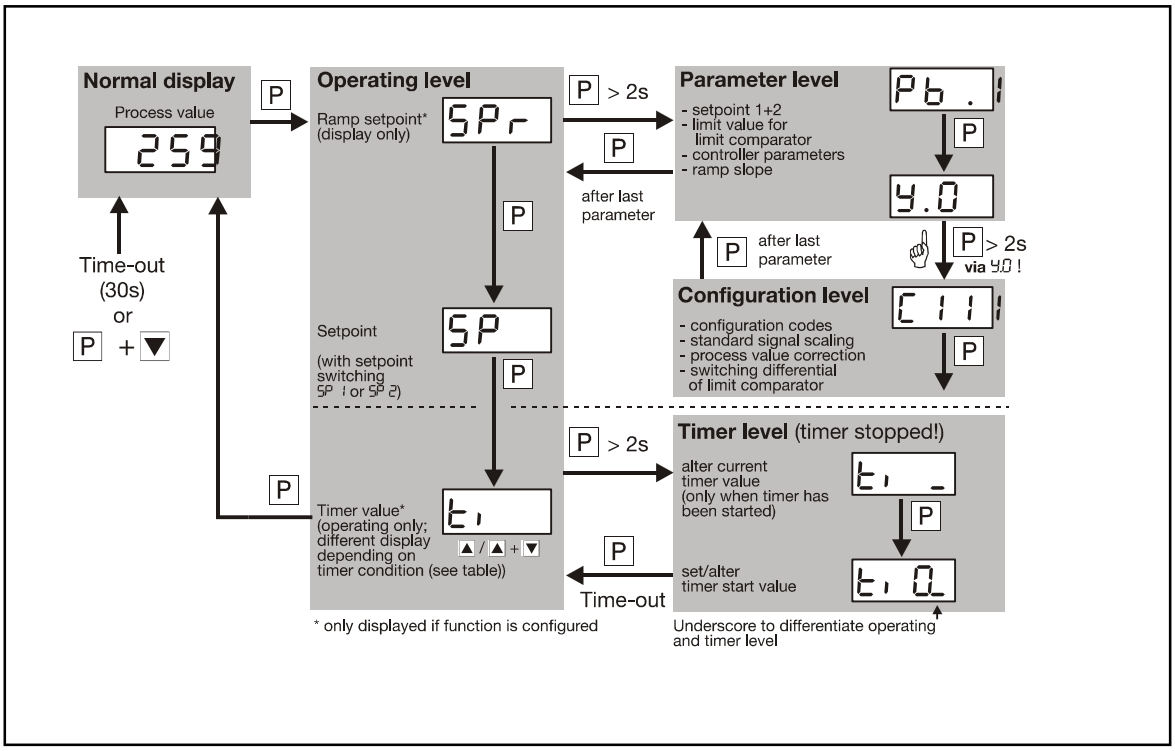
Parameter level
The setpoints, the limit value of the limit comparator, the controller parameters and the ramp slope are programmed here.

Configuration level
The basic functions of the controller are set here.

In order to make the settings, it is necessary to change to the configuration level via the parameter y .0 (parameter level).

Timer level
The current timer value (only when the timer has been started) and the timer start value are altered here. The parameters at this level are marked with an underscore in the display.

Time-out
If no operation occurs, the controller returns automatically to normal display after approx. 30 sec (exception: with timer functions starting via power ON, the timer value is displayed). If the timer value is displayed at the operating level, time-out is not active.



Operation of the timer function

Operation from the keys

The timer can be operated if the timer (operating level) is indicated. Time-out is not active here.

Operation via the logic input

If the logic input is configured accordingly, then a key, such as the ▲ key can be used. In this case, the timer can also be operated even if the timer value does not appear in the display.

Display	State/Action	Display	State/Action
t1 0 12.00	Timer not running * Start with ▲	t1 11.58	Timer has stopped * Continue with ▲ * Cancel with ▲ + ▼
t1 0 12.00 ☀	Timer has been started, but the tolerance limit has not yet been reached * Cancel with ▲ + ▼	t1 End	Timer has run down * Acknowledge with any key (timer start value t. 0 is indicated). With time-delayed control (C120=3), acknowledge with ▲ + ▼
t1 (1x) 11.59 ☀	Timer running; t. is displayed * Stop with ▲ * Cancel with ▲ + ▼		
When the timer has been started, the decimal point in the display for the timer value will blink! ☀			

Functions

We recommend the following procedure:

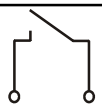
*	Familiarize yourself with the controller functions
*	Enter the configuration codes and the parameter values in the tables provided for this purpose in chapter " Configuration and parameter tables". Write down the appropriate values (✎) or mark selection with a cross (**x** ✎). The parameters and the configuration codes are listed in the order of their appearance. Parameters which are not relevant are masked out (see table below).
*	Enter the configuration code and parameters on the instrument

Configuration	**Masking out the parameters for**	**Parameter**
Single-setpoint controller	Double-setpoint controller	Pb .2, CY 2, db, HYS.2
Double-setpoint controller	Limit comparator	C114, HYSt, AL
Limit comparator no function	Limit comparator	HYSt, AL
Resistance thermometer, thermocouple	Standard signal scaling	SCL, SCH
Ramp function off	Ramp function	rASd, SPr
Setpoint switching not activated	Setpoints at the parameter level	SP 1, SP 2
Timer function: no function	Timer function	t. , C 121, C 122, C 123

Process value input

Symbol	**Notes**
C 111	**Transducer/probe (process value input)** ⇨ **page 12**
C 112	**Unit of process value (°C/°F)/decimal places of display** ⇨ **page 12**
SCL SCH	**Start/end value of value range** for standard signals ⇨ **page 14** Example: 0...20 mA → 20...200°C: SCL = 20 / SCH =200
OFFS	**Process value correction** ⇨ **page 14** Using the process value correction, a measured value can be corrected by a programmable amount upwards or downwards (offset). Lead compensation can be implemented in software for 2-wire circuit through process value correction. Examples: **Measured value** **Offset** **Displayed value** 294,7 + 0,3 295,0 295,3 - 0,3 295,0
dF	**Filter time constant** (damping) to adapt the digital input filter (0sec = filter off) ⇨ **page 15** if dF high: - high damping of interference signals - slow reaction of the process value display to changes in the process value - low cut-off frequency (2nd order low-pass filter)

Logic input

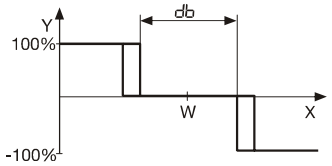
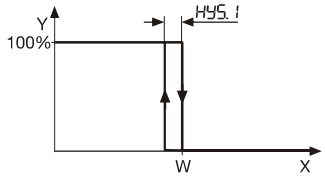
		
Key inhibit	Operation is possible from keys.	**No** operation from keys.
Level inhibit	Access to the parameter and configuration levels is possible. Starting self-optimization is possible.	**No** access to the parameter and configuration levels. Starting self-optimization is **not** possible
Ramp stop	Ramp running	Ramp stopped
Setpoint switching	Setpoint SP 1 is active	Setpoint SP 2 is active
	The appropriate symbols SP 1 and SP 2 are displayed at the operating level.	
Timer control	Ackowledge start/stop/continue/timer run-down (edge-triggered)	

Symbol	Notes
C117	**Function of the logic input** ⇨ **page 13**

Controller

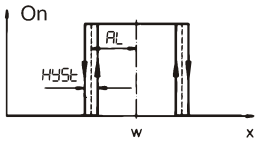
Controller structure
The controller structure is defined via the parameters Pb, dt and rt .
Example: Setting for PI controllerr → **Pb .1** =120, **dt** =0s, **rt** =350sec

Symbol	Notes
C113	**Controller type and assignment of the controller outputs to the physical outputs 1+2** ⇨ **page 13**
C116	**Outputs in fault condition** ⇨ **page 13** The switching states of the outputs are defined here in the event of over/underrange, probe break/ short circuit or display overflow. ⇨ Alarm messages
Pb .1 Pb .2	**Proportional band 1** (controller output 1) ⇨ **page 15** **Proportional band 2** (controller output 2) Influences the P action of the controller. If Pb=0 the controller structure is not effective.
dt	**Derivative time** ⇨ **page 15** Influences the D action of the controller. If dt=0 the controller has no D action.
rt	**Reset time** ⇨ **page 15** Influences the I action of the controller. If rt=0 the controller has no I action.
Cy 1 Cy 2	**Cycle time 1** (controller output 1) **page 15** ⇨ **Cycle time 2** (controller output 2) The cycle time has to be selected so that the energy supply to the process is virtually continuous, while not subjecting the switching elements to excessive wear.

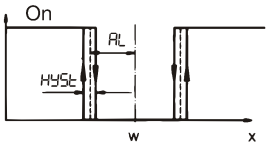
Symbol	Notes
db	**Contact spacing** ⇨ **page 15** for double-setpoint controller 
HYS. 1 HYS.2	**Differential 1** (controller output 1) ⇨ **page 15** **Differential 2** (controller output 2) for controllers with Pb. 1 =0 or Pb.2 =0 
y .0	**Working point (basic load)** ⇨ **page 15** Output if process value = setpoint
Y . 1 Y .2	**Output limiting** ⇨ **page 15** y . 1 - maximum output y .2 - minimum output ☞ For controllers without controller structure (Pb. 1 =0 or Pb.2 =0) it is necessary that y . 1 =100% and y .2 = -100%.

Limit comparator (alarm contact)

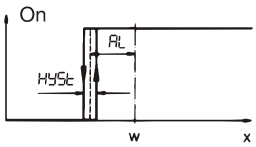
lk1



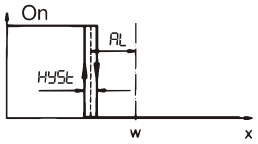
lk2



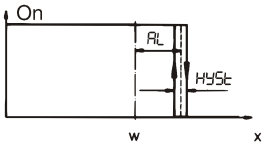
lk3



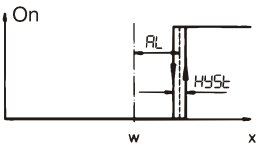
lk4



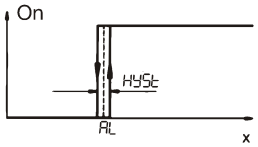
lk5



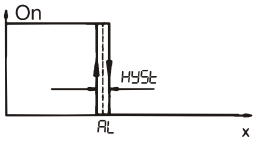
lk6



lk7



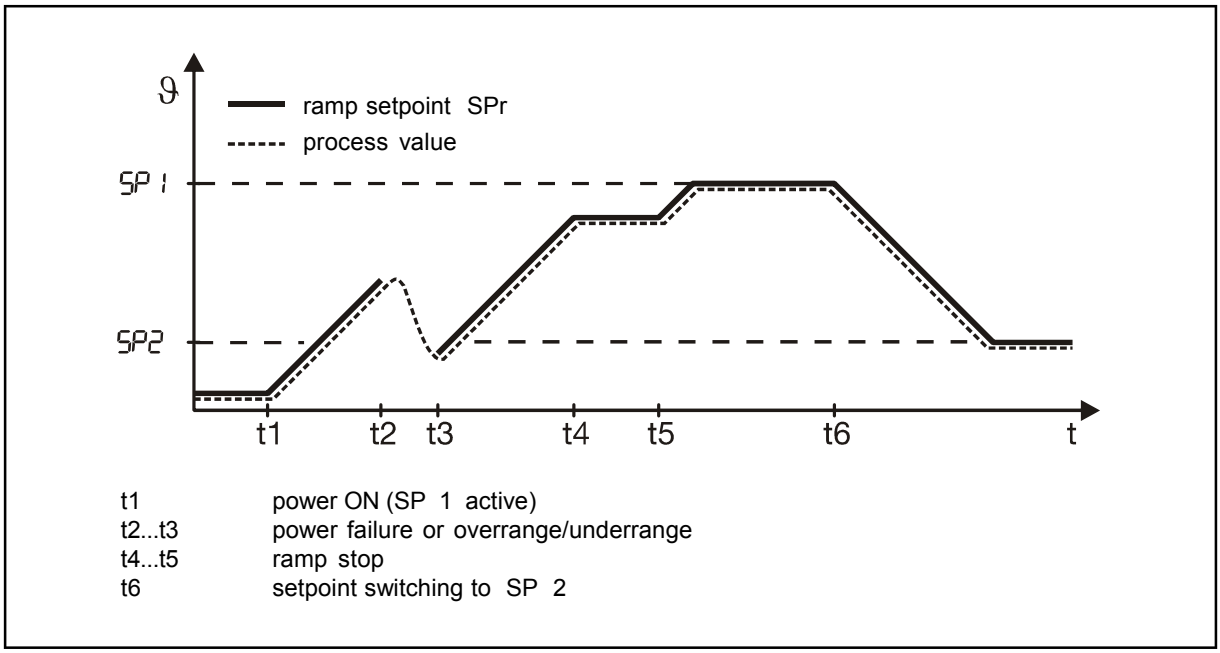
lk8



lk1...lk6: Monitoring referred to the setpoint.
lk7 / lk8: Monitoring referred to a fixed value AL.

w - setpoint, x - process value

Symbol	Notes
C114	**Limit comparator function** (lk1...lk8) ⇨ **page 13**
HYSt	**Differential of limit comparator** ⇨ **page 14**
AL	**Limit value of limit comparator** ⇨ **page 15**

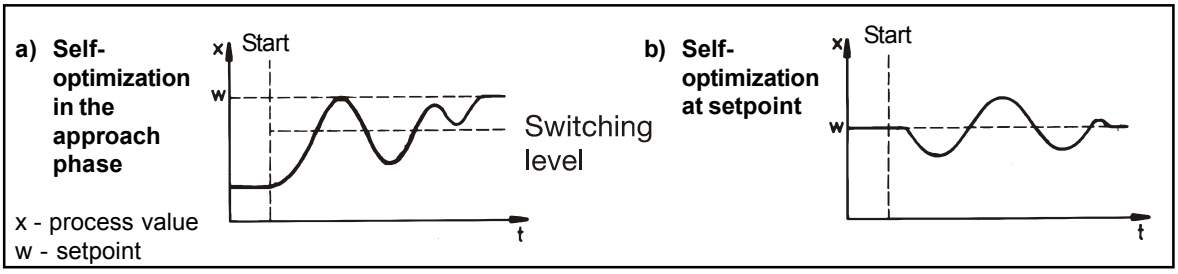


t1	power ON (SP 1 active)
t2...t3	power failure or overrange/underrange
t4...t5	ramp stop
t6	setpoint switching to SP 2

Symbol	Notes
C115	**Ramp function** (on/off, time unit) ⇨ **page 13**
C117	**Ramp stop** via logic input (floating contact) ⇨ **page 13**
rASd	**Ramp slope** in °C/h or °C/min ⇨ **page 15**

Self-optimization

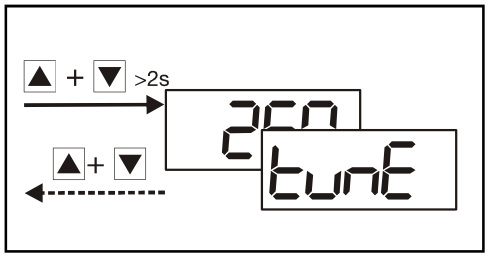
Self-optimization determines the optimum controller parameters for PID or PI controllers.
The following controller parameters are defined: **rt, dt, Pb . 1, Pb .2, CY 1, CY 2, dF**
IThe controller selects procedure **a** or **b**, depending on the size of the control deviation:



Starting self-optimization

☞ Starting self-optimization is not possible with active level inhibit and ramp function.

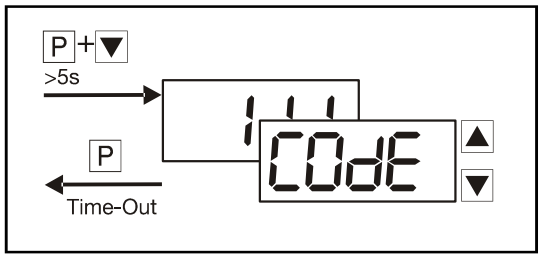
Self-optimization is automatically terminated, or can be cancelled.



Level inhibit via code

As an alternative to the logic input, the level inhibit ca be set via a code (logic input has priority).

* Set the code using P + ▼ (at least 5sec) in normal display



Level inhibit via the logic input will lock the parameter and configuration levels (corresponds to code 011).

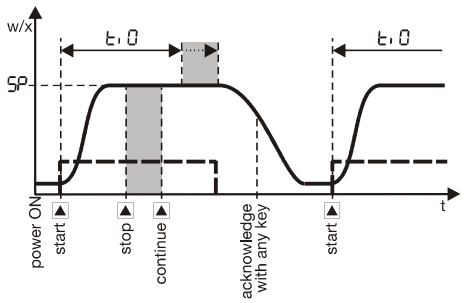
Code	Operating level	Parameter level	Configuration level	Timer level
000	enabled	enabled	enabled	enabled
001	enabled	enabled	inhibited	enabled
011	enabled	inhibited	inhibited	enabled
111	inhibited[1]	inhibited	inhibited	inhibited[2]

1. The values at the operating level can only be indicated but not modified.
2. Timer operation (start/stop/continue/cancel) will continue to be possible.

Timer function (extra code)

Using the timer function, the control action can be influenced by means of the adjustable time **t. 0**. After the timer has been started by power ON, by pressing the key, or via the logic input, the timer start value **t. 0** is counted down to 0, either instantly or after the process value has gone above or below a programmable tolerance limit. When the timer has run down, several events are triggered, such as control switch-off (output 0%) and setpoint switching. Furthermore, it is possible to implement timer signalling via an output.

Example:



w - setpoint
x - process value
SP - programmed setpoint
t. 0 - timer start value
----- - timer signalling (here C122=1)
▲ - increment key

Notes on the timer function in conjunction with the ramp function

- Generally, the setpoints can also be approached using the ramp function.
- Stopping the timer does not influence the ramp function
- If control is active after the timer has run down, the current setpoint is approached with the ramp. Cancellation of the timer is followed by a setpoint step without ramp.
- For timer functions with a tolerance limit, only the setpoint (=ramp end value) is monitored.

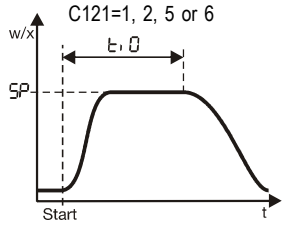
Note on setpoint switching via the logic input

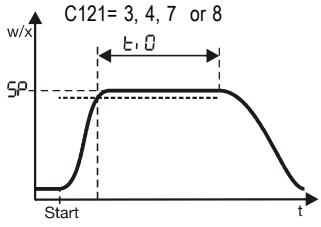
- Setpoint switching via the logic input is generally possible. An exception here is the timer function "Time-dependent setpoint switching". In this case, configured setpoint switching via the logic input will not be active.

Note on the display status in the event of a power failure

- The state of the display before the power failure will be restored, except for events that are related to the timer (start, cancel, continue, stop). Then the timer value will be shown in the display.

Symbol	Notes
C 120	**Timer function** ⇨ **page 14**
C120=1	**Time-limited control**: The control is switched off after the timer has run down (output 0%)

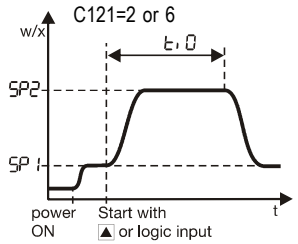


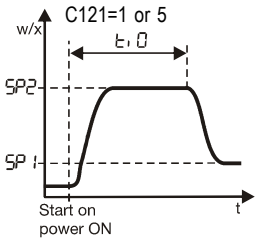


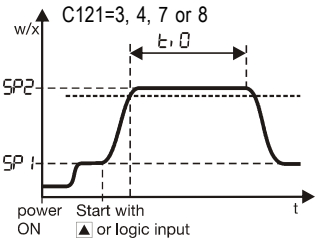
Diagrams with and without start above tolerance limit.

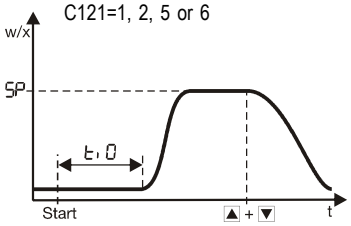
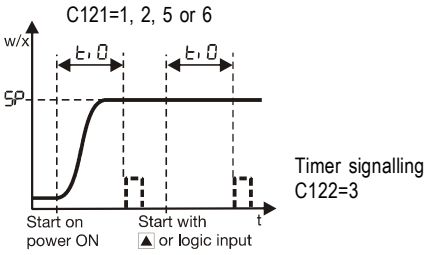
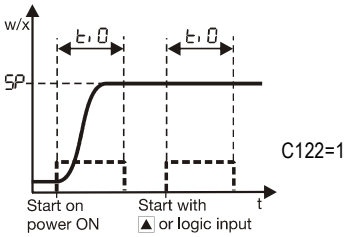
---- Tolerance limit

C120=2	**Time-dependent setpoint switching:** After the start of the timer function, the process is controlled to setpoint SP2. After the timer has run down, the controller automatically switches over to SP 1.







Symbol	Notes
C 120 C120=3	**Time-delayed control:** The control action starts after the timer has run down  ☞ After the timers has run down (End), the ▲ + ▼ keys are used for acknowledgement.
C120=4	**Timer:** After the start of the timer function, t. 0 is counted down to 0. The control action is independent of the timer. Here, too, the timer run-down can be signalled via an output.  

Symbol	Notes
C 121	**Start condition of the timer** ⇨ **page 14** The timer start value t. 0 is counted down as selected in the following events: 1. Power ON or logic input/keys 2. Start via keys/logic input 3. Process value has reached tolerance limit (1°C or 5°C) (start via keys/logic input) The position of the tolerance limit depends on the controller type: - 1-setpoint controller (direct): tolerance limit above setpoint - 1-setpoint controller (reversed): tolerance limit below setpoint - 2-setpoint controller: tolerance limit below setpoint  If, during the control process, the process value goes above/below the tolerance limit, the timer will be stopped for the duration of the infringement. **Response to a power failure** ⇨ **page 14** After a power failure, the condition before the power failure can be restored, or the timer function can be cancelled. If the timer had run down before the power failure, the timer start value will be loaded. The timer will start automatically when C121=1 or 5. The timer value is saved at one minute intervals, to cover the case of a power failure.
C 122	**Timer signalling** ⇨ **page 14** From the start of the timer function until timer run-down, a signal can be produced via an output.
C 123	**Time unit for the timer** ⇨ **page 14**

Programming example

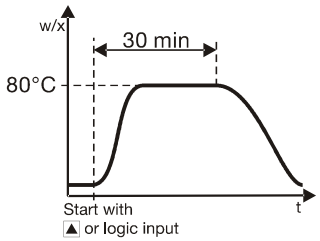
After the start via the logic input or from the keys, the process has to be controlled for 30 minutes to a setpoint of 80°C. The control action is to be cancelled in the event of a power failure.

Configuration:

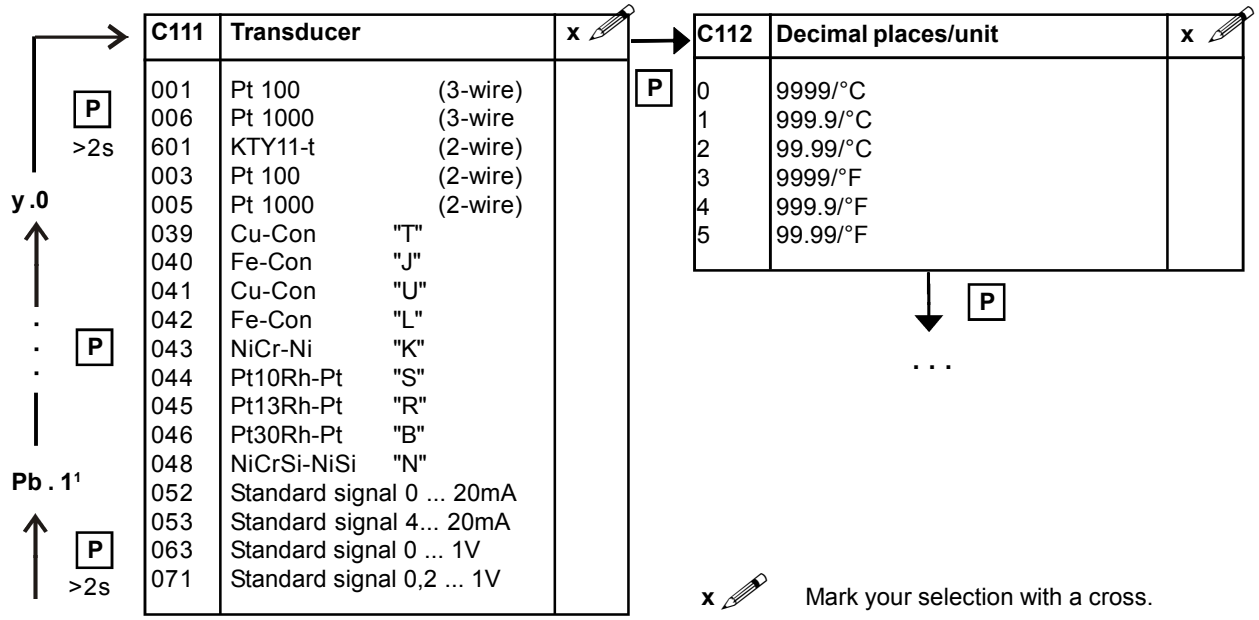
- C111...C116: Controller programming
- C117=5: Logic input = timer control
- C120=1: Timer function = time-limited control
- C121=6: Start condition for timer = via logic input/keys -cancellation on power failure
- C122=0: Timer signalling = no function
- C123=1: Time unit (timer) = mm.ss

Operation:

* Enter the setpoint **SP** (80°C)
* Press the P key until **t. 0** is indicated
* Change over to the timer level using P (at least 2sec)
* Enter the timer start value **t. 0_** (30.00)
* Return to the operating level (timer value) with P
* Start the control action via the logic input or with ▲



Configuration and parameter tables



Normal display/
Operating level

1. **SP 1, AL** or **Pb . 1** is shown here, depending on the configuration.

C113	Controller type	Output 1 (relay)	Output 2+3 (logic+relay)	x
10	single setpoint (reversed)	controller	LK/timer signalling[1]	
11	single setpoint (direct)	controller	LK/timer signalling[1]	
30	double setpoint	controller reversed	controller direct	
20	single setpoint (reversed)	LK/timer signalling[1]	controller	
21	single setpoint (direct)	LK/timer signalling[1]	controller	
33	double setpoint	controller direct	controller reversed	

1. A programmed limit comparator (LK) has priority over the timer signalling.

P

C114	Limit comparator (LK)	x
0	no function	
1	lk 1	
2	lk 2	
3	lk 3	
4	lk 4	
5	lk 5	
6	lk 6	
7	lk 7	
8	lk 8	

P

C115	Ramp function	x
0	ramp function off	
1	ramp function (°C/min)	
2	ramp function (°C/h)	

P

. . .

reversed = heating (output is active when process value is below setpoint)
direct = cooling (output is active when process value is above setpoint)

C116	Outputs on fault I		x
0	0%[1]	LK/timer signalling OFF	
1	100%[2]		
2	-100%[1]		
3	0%[1]	LK/timer signalling ON	
4	100%[2]		

P

C117	Logic input	x
0	no function	
1	key inhibit	
2	level inhibit	
3	ramp stop	
4	setpoint switching	
5	timer control	

P

. . .

1. Minimum output limiting y.2 is effective
2. Maximum output limiting y. 1 is effective

C120	Timer function	x
0	no function	
1	time-limited control	
2	time-dependent setpoint switching	
3	time-delayed control	
4	timer (control independent of timer)	

P

C121	Start condition for timer	Action on power failure	x
1	after power ON, logic input/keys	Condition as before the power failure	
2	via logic input/keys		
3	via logic input/keys; timer counts 1°C from tolerance limit		
4	via logic input/keys; timer counts5°C from tolerance limit		
5	after power ON, logic input/keys	Cancellation of timer function (StOP appears in the display)	
6	via logic input/keys		
7	via logic input/keys; timer counts 1°C from tolerance limit		
8	via logic input/keys; timer counts 5°C from tolerance limit		

The start conditions with tolerance limit (C121=3, 4, 7, 8) are not valid for C120=3 or 4.
If C120 is altered, the validity of C121 must be checked.

C122	Timer signalling	x
0	no function	
1	timer start until run-down	
2	after run-down for 10sec	
3	after run-down for 1 min.	
4	after run-down until acknowledgement	

P

C123	Unit of time (timer)	x
1	mm.ss (max. 99.59)	
2	hh.mm (max. 99.59)	
3	hhh.h (max. 999.9)	

s = seconds; m = minutes;
h = hours

One output has to be configured correspondingly (C113).

P

Parameter	Explanation	Value range	factory-set	Your setting
SCL	start valued of the standard signal	-1999 ... +9999 digit	0	
SCH	end value of the standard signal	-1999 ... +9999 digit	100	
SPL	lower setpoint limiting	-1999 ... +9999 digit	-200	
SPH	upper setpoint limiting	-1999 ... +9999 digit	850	
OFFS	process value correction	-1999 ... 9999 digit[1]	0	
HYSt	switching differential of the limit comparator	0 ... 9999 digit[1]	1	

P

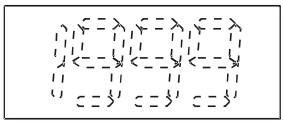
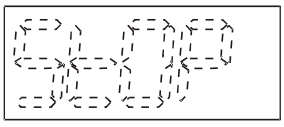
. . .

1. For displays with one or two decimal places, the value range and the factory setting change accordingly.
Example: 1 decimal place → value range: -199,9...+999,9

Parameter	Explanation	Value range	factory-set	Your setting
SP 1	setpoint 1	SPL ... SPH	0	
SP 2	setpoint 2	SPL ... SPH	0	
AL	limit value of limit comparator	-1999 ... +9999 digit	0	
Pb . 1	proportional band 1	0 ... 9999 digit [1]	0	
Pb .2	proportional band 2	0 ... 9999 digit [1]	0	
dt	derivative time	0 ... 9999 sec	80sec	
rt	reset time	0 ... 9999sec	350sec	
Cy 1	cycle time 1	1.0 ... 999.9sec	20,0sec	
Cy 2	cycle time 2	1.0 ... 999.9sec	20.0 sec	
db	contact spacing	0 ... 1000 digit [1]	0	
HYS. 1	differential 1	0 ... 9999 digit [1]	1	
HYS.2	differential 2	0 ... 9999 digit [1]	1	
Y .0	working point	-100 ... 100%	0%	
Y . 1	maximum output	0 ... 100%	100%	
Y .2	minimum output	-100 ... +100%	-100%	
dF	filter time constant	0.0 ... 100.0sec	0,6sec	
rASd	ramp slope	0 ... 999 °C/h (°C/min)[1]	0	

1. For displays with one or two decimal places, the value range and the factory setting change accordingly.

Alarm messages

Display	Description	Cause/response
	The displays for the process value or timer value flashes "1999". Display current timer value by repeatedly pressing the P key.	Over/underrange of process value. Controller and limit comparators referred to the process value input behave in accordance with the configuration of the outputs. The timer is stopped.
	The display for the timer value alternates between showing "StOP" and the time. * Acknowledge by using any key, (the timer start value t. 0 is loaded)	The timer function has been cancelled due to a supply failure. The timer value that was present at the time of the supply failure will be indicated.

☞ The following events come under the heading over/underrange:
- probe break/short-circuit
- Measurement is outside the control range of the probe that is connected
- Display overflow

Measurement circuit monitoring (• = recognized)

Transducer		Overrange/ underrange	Probe/ lead short-circuit	Probe/lead break
Thermocouple		•	-	•
Resistance thermometer		•	•	•
Voltage	0.2 ...1V	•	•	•
	0 ...1V	•	-	-
Current	4 ... 20mA	•	•	•
	0 ... 20mA	•	-	-

Technical data

Input for thermocouple

Designation			Range
Fe-Con	"L"		-200 ... +900°C
Fe-Con	"J"	DIN EN 60584	-200 ... +1200°C
Cu-Con	"U"		-200 ... +600°C
Cu-Con	"T"	DIN EN 60584	-200 ... +400°C
NiCr-Ni	"K"	DIN EN 60584	-200 ... + 1372°C
NiCrSi-NiSi	"N"	DIN EN 60584	-200 ... +1300°C
Pt10Rh-Pt	"S"	DIN EN 60584	0 ... 1768°C
Pt13Rh-Pt	"R"	DIN EN 60584	0 ... 1768°C
Pt30Rh-Pt6Rh	"B"	DIN EN 60854	0 ... 1820C[1]
Measurement accuracy: ≤ 0.4% / 100ppm/°C Cold junction: Pt 100 internal			

1. Accuracy is assured within the range 300 ... 1820°C

Input for standard signals

Designation	Range
Voltage	0 ... 1V, R_E > 10MΩ 0,2 ... 1V, R_E > 10MΩ R_E - input resistance
Current	4 ... 20mA, voltage drop ≤ 1.5V 0 ... 20mA, voltage drop ≤ 1.5V
Measurement accuracy: ≤ 0.1% / 100ppm/K	

Outputs
Relay:
Make contact (NO contact); 3A at 250V AC resistive load; 150.000 operations at rated load

Supply:
230V AC ±10%, 45 ... 55Hz

eStat10
Electronic room humidistat with 2 switching outputs

- **Easy to install**
- **2 potential-free switching outputs configurable as openers or closers**
- **2 independently configurable setpoints**
- **2 independently configurable switching hystereses**
- **Display of current relay switching states**
- **2 continuous 0...10 V signal outputs for relative humidity and temperature**
- **Temperature compensation**
- **Alternating display of relative humidity and temperature**

Technical Data

Humidity

Measuring range	0...100 %rh
Setting range of the setpoints	5...95 %rh
Setting range of the switching hystereses	0.5...9 %rh
Measuring uncertainty	
10...90 %rh at 25 °C max	≤ ±3 %rh
0...10 %rh and 90...100 %rh at 25 °C	Additional ≤ ±0.2 %rh / %rh
Long term stability	≤ 0,5 %rh/a
Hysteresis	±1 %rh
Typ. temperature influence at 25 °C	±0.05 %rh/K

Electrical data

Switching outputs:	2 relay contacts potential-free, normally open
Setting as opener / closer	Via DIP switch
Switching voltage	≤ 48V DC / AC ≥ 100 µV
Breaking capacity	≤ 60 W / 62.5 VA
Power factor	> 0.9
Switching cycles (at Pmax)	> 10^5
Switching current	≤ 2A
Continuous output rel. humidity	0...10 V DC
Continuous output temperature	0...10 V DC
Supply voltage	15...30 V DC 13...26 V AC
Consumption	≤ 30 mA
Standards applied	EN 61326-1

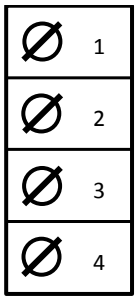
Temperature

Output ranges	0...+50 °C -30...+70 °C 0...+100 °C Further ranges on request
Measuring uncertainty at 23°C	Typ. ±0.3 K

General Data

Measuring medium condensing,	Air, non-pressurised, non-condensing,non-aggressive
Operating temperature	-30...+60 °C
Storage temperature	-40...+85 °C
Electrical connections at mains terminals	
Wire cross-section at each connection	max. 1.5 mm²
Cable diameter	
→ Surface-mounted cable	max. Ø 5 mm
→ Concealed cable	
See: User instructions on page 4	
Housing IP rating	IP 30D
Safety category	III
Housing materials	ABS
Housing colour	Similar to RAL 9003 Signal white
Digital dispaly	2 lines

Connection diagrams

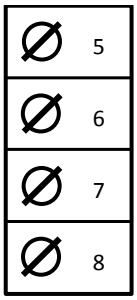


GND

+ U_B 15…30 V DC or 13…26 V AC

Output humidity 0…10 V

Output temperature 0…10 V



Relay 1

Relay 1

Relay 2

Relay 2

Relay outputs: potential free, normally open

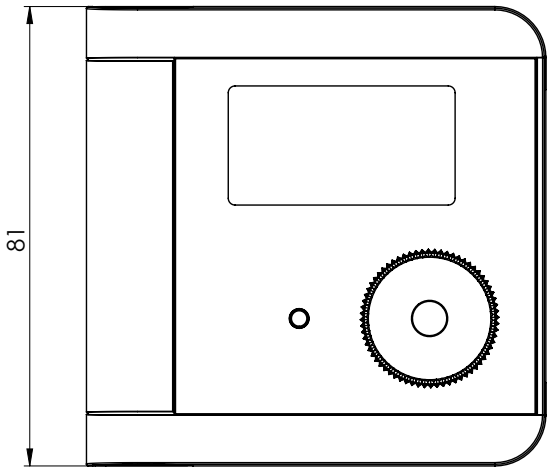
ESD protection advice

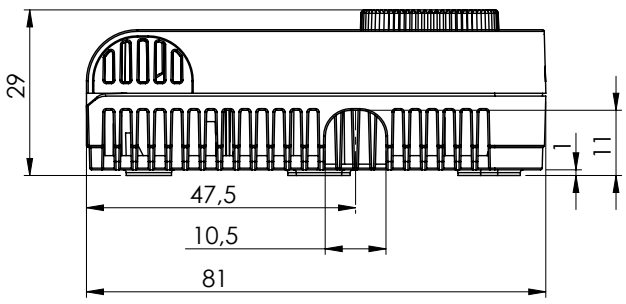
The devices contain components which can be damaged by the effects of electrical fields or by charge equalisation when touched.

The following protective measures must be taken when the housing of the device is to be opened for connection:

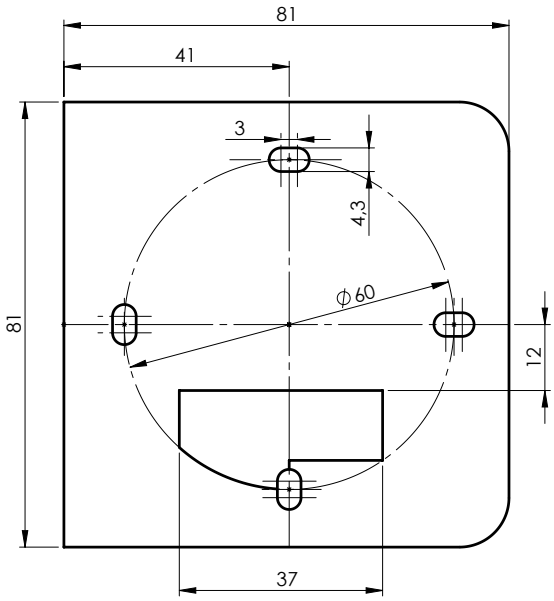
- Before opening the housing, ensure electrical potential equalisation between you and your environment.
- Pay particular attention to ensure that this potential equalisation is maintained while you are working with the housing open.

Dimensions

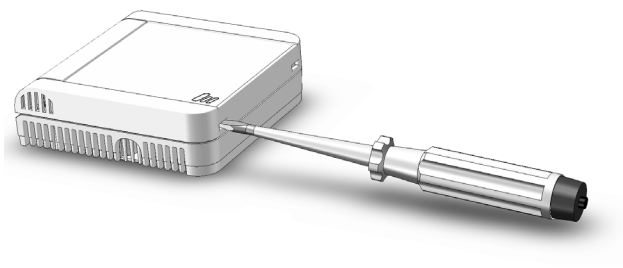




Drilling pattern

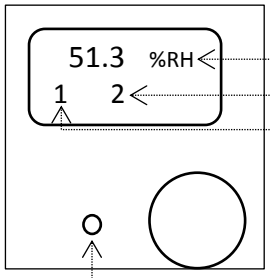


Opening the housing



Configuration guide

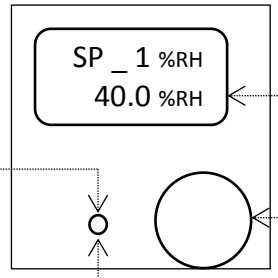
Operation mode



Alternately displays current relative humidity/temperature
„2“ displayed if relay 2 = contacts 7-8 closed
„1“ displayed if relay 1 = contacts 5-6 closed

Press black button *briefly*: switch to

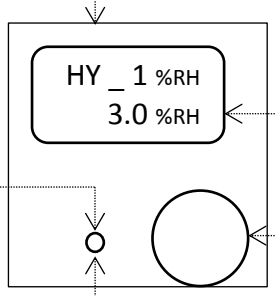
Configuration mode



Setpoint for relay 1; adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

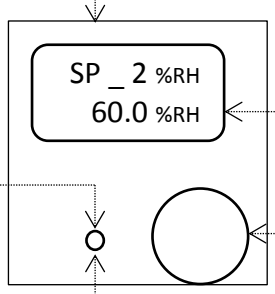
Press black button *briefly*:
Switch to next parameter *or* (after turning rotary controller) display shows "_ESC" and return to operation mode



Switching hysteresis for setpoint 1; adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

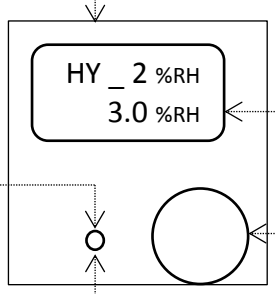
Press black button *briefly*:
Switch to next parameter *or* (after turning rotary controller) display shows "_ESC" and return to operation mode



Setpoint for relay 2; adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

Press black button *briefly*:
Switch to next parameter *or* (after turning rotary controller) display shows "_ESC" and return to operation mode



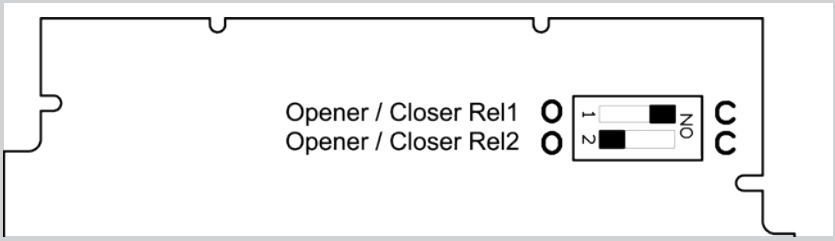
Switching hysteresis for setpoint 2; adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

Press black button *briefly*:
Return to operation mode *or* (after turning rotary controller) display shows "_ESC" and return to operation mode

Setting relay 1 and 2 as opener or closer

DIP-Switch set to	Current reading < setpoint - switching hysteresis / 2	Current reading > setpoint + switching hysteresis / 2
C (closer)	Relay = open	Relay = closed
O (opener)	Relay = closed	Relay = open



Installation instructions

Position	The installation site should be chosen such that a representative measurement of air humidity can be guaranteed, i.e. the humidity readings at the installation site should correspond to those in the room. Avoid areas in the vicinity of radiators, doors and exterior walls, as well as direct sunlight.
Flush mounting Connection to surface-mounted and concealed cables	When flush-mounting the device, appropriate seals should be used to prevent external air from reaching the sensor element of the device through the concealed housing. When connecting to a concealed cable, the knock-out part of the housing floor should be broken out to allow the cable to pass through. When connecting to a surface-mounted cable, the separators at the hollowed-out points in the side of the housing can be broken out.
Connection	The device must be connected by qualified personnel.
	The housing contains sensitive components. When opening the housing, electrostatic discharge (ESD) precautions must be observed.
	Leads connected to the sensor must not run parallel to strong electromagnetic fields.
	Where there is a possibility of voltage surges, install surge protection devices.

User instructions

Damaging influences	Depending on their type and concentration, aggressive media containing solvents can cause incorrect reasings or cause the sensor to fail. Substances deposited on the sensor element (e. g. resin aerosols, paint aerosols, smoke deposits etc.) are harmful as they eventually form a water-repellent film.

eStat10 DUO
Electronic Room Hygro-Thermostat
1 switching output each for temperature and humidity

- **Easy to install**
- **2 potential-free switching outputs configurable as opener or closer**
- **Setpoint and switching hystereses for temperature and relative humidity independently configurable**
- **Display of current relay switching states**
- **2 continuous 0...10 V signal outputs for relative humidity and temperature**
- **Temperature compensation**
- **Alternating display of relative humidity and temperature**

Technical Data

Humidity

Measuring range	0...100 %rh
Control range of the relative humidity	5...95 %rh
Setting range of the switching hystereses	0.5...9 %rh
Measuring uncertainty	
10...90 %rh at 25 °C max	≤ ±3 %rh
0...10 %rh and 90...100 %rh at 25 °C	additional ≤ ±0.2 %rh / %rh
Long term stability	≤ 0.5 %rh/a
Hysteresis	≤ ±1 %rh
Typ. temperature influence at 25 °C	±0.05 %rh/K

Electrical data

Switching outputs:	2 relay contacts potential-free, normally open
Setting as opener / closer	Via DIP switch
Switching voltage	≤ 48V DC / AC ≥ 100 µV
Breaking capacity	≤ 60 W / 62.5 VA
Power factor	> 0.9
Switching cycles (at Pmax)	> 10^5
Switching current	≤ 2A
Continuous output rel. humidity	0...10 V DC
Continuous output temperature	0...10 V DC
Supply voltage	15...30 V DC 13...26 V AC
Consumption	≤ 30 mA
Standards applied	EN 61326-1

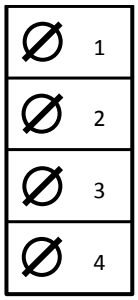
Temperature

Control range of the temperature	-25...+55 °C
Setting range of the switching hystereses	0.1...10 K
Output ranges	0...+50 °C -30...+70 °C 0...+100 °C Further ranges on demand
Measuring uncertainty at 23°C and ≤ mA switching current	typ. ±0.3 K

General Data

Measuring medium	Air, non-pressurised, non-condensing, non-aggressive
Operating temperature	-30...+60 °C
Storage temperature	-40...+85 °C
Electrical connections at mains terminals	
Wire cross-section at each connection	max. 1.5 mm²
Cable diameter	
→ Surface-mounted cable	max. 1 x Ø 6.5 mm or 2 x Ø 4.5 mm
→ Concealed cable	
See: User instructions on page 4	
Housing IP rating	IP 30D
Safety category	III
Housing materials	ABS
Housing colour	similar to RAL 9003 Signal white
Digital dispaly	2 lines

Connection diagrams

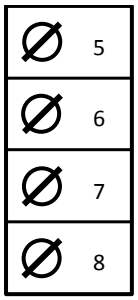


GND

+ U_B 15…30 V DC or 13…26 V AC

Output humidity 0…10 V

Output temperature 0…10 V



Relais 1

Relais 1

Relative humidity

Relais 2

Relais 2

Temperature

Relay outputs: potential free, normally open

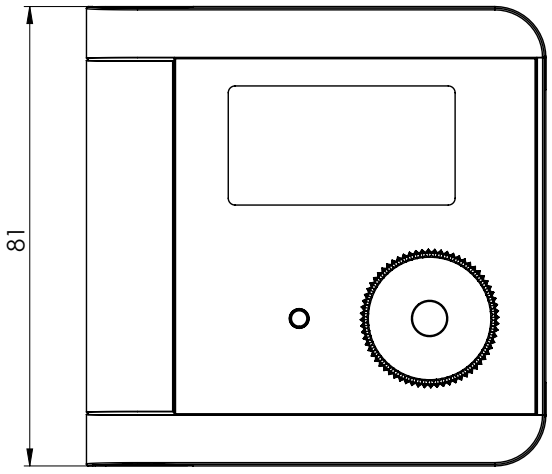
ESD protection advice

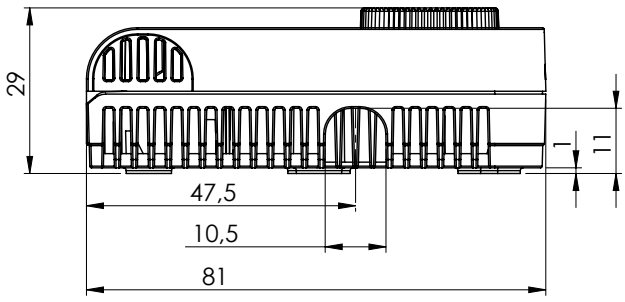
The devices contain components which can be damaged by the effects of electrical fields or by charge equalisation when touched.

The following protective measures must be taken when the housing of the device is to be opened for connection:

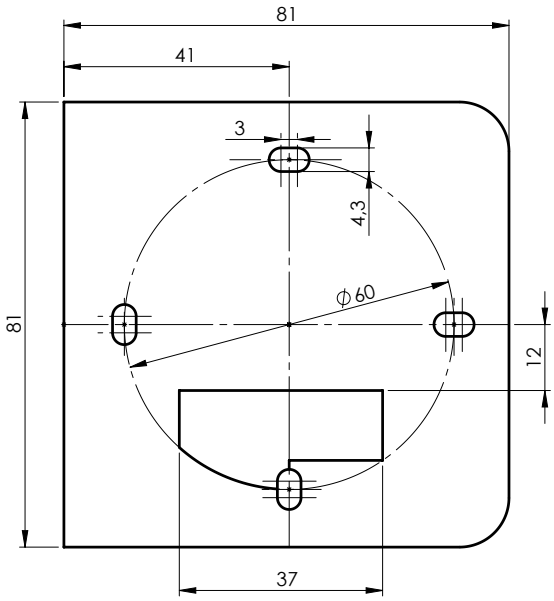
- Before opening the housing, ensure electrical potential equalisation between you and your environment.
- Pay particular attention to ensure that this potential equalisation is maintained while you are working with the housing open.

Dimensions

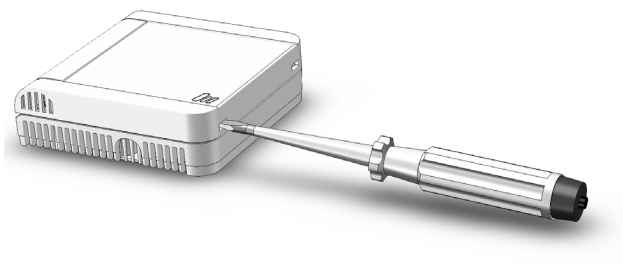




Drilling pattern

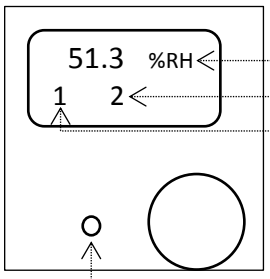


Opening the housing



Configuration guide

Operation mode



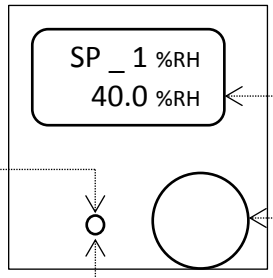
Alternately displays current relative humidity/temperature

„2“ displayed if relay 2 (Temp) = contacts 7-8 closed

„1“ displayed if relay 1 (rel. humidity) = contacts 5-6 closed

Press black button *briefly*: switch to

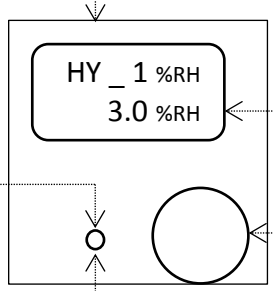
Configuration mode



Setpoint for relay 1 (rel. humidity); adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

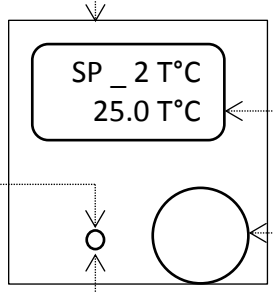
Press black button *briefly*: Switch to next parameter *or* (after turning rotary controller) display shows "_ESC" and return to operation mode



Switching hysteresis for setpoint 1; adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

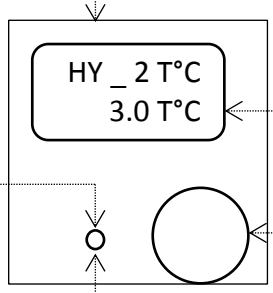
Press black button *briefly*: Switch to next parameter *or* (after turning rotary controller) display shows "_ESC" and return to operation mode



Setpoint for relay 2 (Temp.); adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

Press black button *briefly*: Switch to next parameter *or* (after turning rotary controller) display shows "_ESC" and return to operation mode



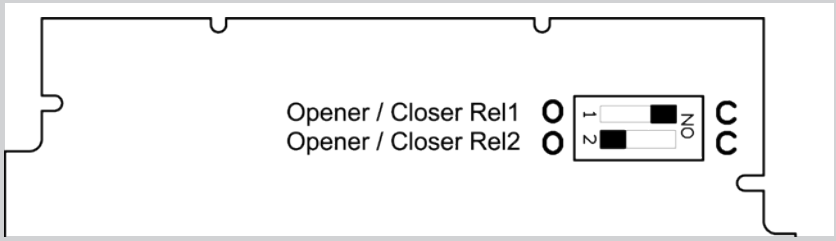
Switching hysteresis for setpoint 2; adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

Press black button *briefly*: Return to operation mode *or* (after turning rotary controller) display shows "_ESC" and return to operation mode

Setting relay 1 and 2 as opener or closer

DIP-Switch set to	Current reading < setpoint - switching hysteresis / 2	reading > setpoint + switching hysteresis / 2
C (Closer)	Relay = open	Relay = closed
O (Opener)	Relay = closed	Relay = open



Installation instructions

Position	The installation site should be chosen such that a representative measurement of air humidity can be guaranteed, i.e. the humidity readings at the installation site should correspond to those in the room. Avoid areas in the vicinity of radiators, doors and exterior walls, as well as direct sunlight.
Flush mounting Connection to surface-mounted and concealed cables	When flush-mounting the device, appropriate seals should be used to prevent external air from reaching the sensor element of the device through the concealed housing. When connecting to a concealed cable, the knock-out part of the housing floor should be broken out to allow the cable to pass through. When connecting to a surface-mounted cable, the separators at the hollowed-out points in the side of the housing can be broken out.
Connection	The device must be connected by qualified personnel.
	The housing contains sensitive components. When opening the housing, electrostatic discharge (ESD) precautions must be observed.
	Leads connected to the sensor must not run parallel to strong electromagnetic fields.
	Where there is a possibility of voltage surges, install surge protection devices.

User instructions

Damaging influences	Depending on their type and concentration, aggressive media containing solvents can cause incorrect reasings or cause the sensor to fail. Substances deposited on the sensor element (e. g. resin aerosols, paint aerosols, smoke deposits etc.) are harmful as they eventually form a water-repellent film.

eStat20
Electronic Humidistat
with remote sensor head

- **Easy to install**
- **up to 25 m cable length for remote sensor head**
- **2 potential-free switching outputs configurable as openers or closers**
- **2 independently configurable setpoints**
- **2 independently configurable switching hystereses**
- **Display of current relay switching states**
- **2 continuous 0...10 V signal outputs for relative humidity and temperature**
- **calibrated measuring probe in exchangeable plug-in design**
- **Alternating display of relative humidity and temperature**
- **Sensor head up to +125°C**

Technical data

Humidity

Measuring range	0...100 %rh
Setting range of the setpoints	5...95 %rh
Setting range of the switching hystereses	0.5...9 %rh
Measuring uncertainty	
10...90 %rh at 25°C max	≤ ±2 %rh
0...10 %rh and 90...100 %rh at 25°C	additional ≤ ±0.2 %rh / %rh
Long term stability	≤ 0.5 %rh/a
Hysteresis	≤ ±1 %rh
Typ. temperature influence at 25°C	±0.05%rh/K

Temperature

Output ranges		0...+50°C -30...+70°C 0...+100°C
Sensor head high temperature		-40...+125°C further ranges on request
Measuring uncertainty 5...60°C		typ. ±0.2K
Temperature influence at +5°C or +60°C		
Standard	-40...5°C	≤12mK/K
	60...80°C	≤14mK/K
High temperature	60...100°C	≤14mK/K
	100...125°C	additional ≤20mK/K

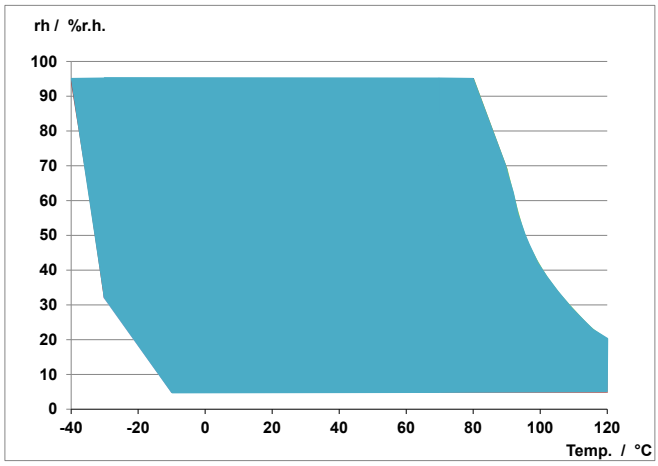
Electrical data

Switching outputs:	2 relay contacts potential-free, normally open
Setting as opener / closer	Via DIP switch
Switching voltage	≤ 48V DC / AC ≥ 100 µV
Breaking capacity	≤ 60 W / 62.5 VA
Power factor	≥ 0.9
Switching cycles (at Pmax)	> 10^5
Switching current	≤ 2A
Continuous output rel. humidity	0...10 V DC
Continuous output temperature	0...10 V DC
Load resistance (voltage output)	≥ 10 kΩ
Supply voltage	15...30 V DC 13...26 V AC
Consumption	≤ 30 mA
Directive about electromagnetic compatibility **2014/30/EU**	
DIN EN 61326-1	issue 07/13
DIN EN 61326-2-3	issue 07/13

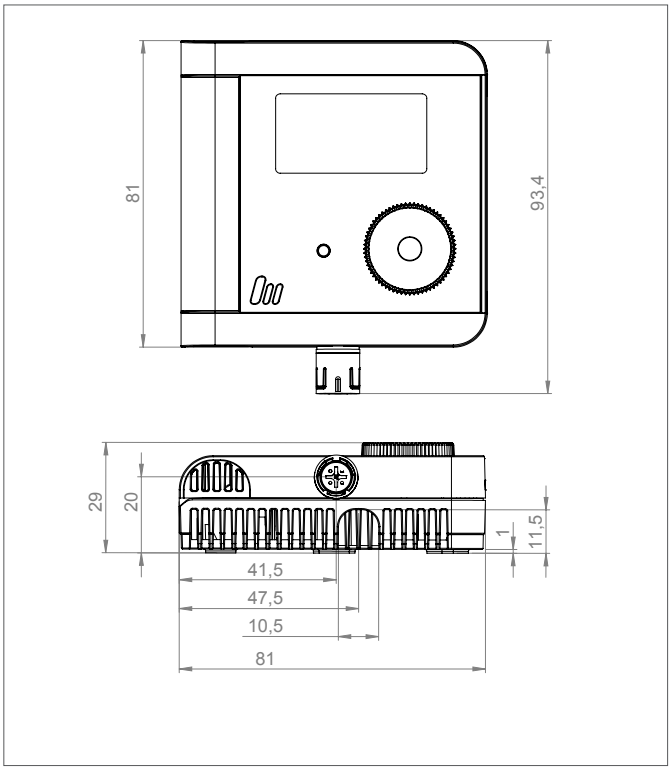
General data

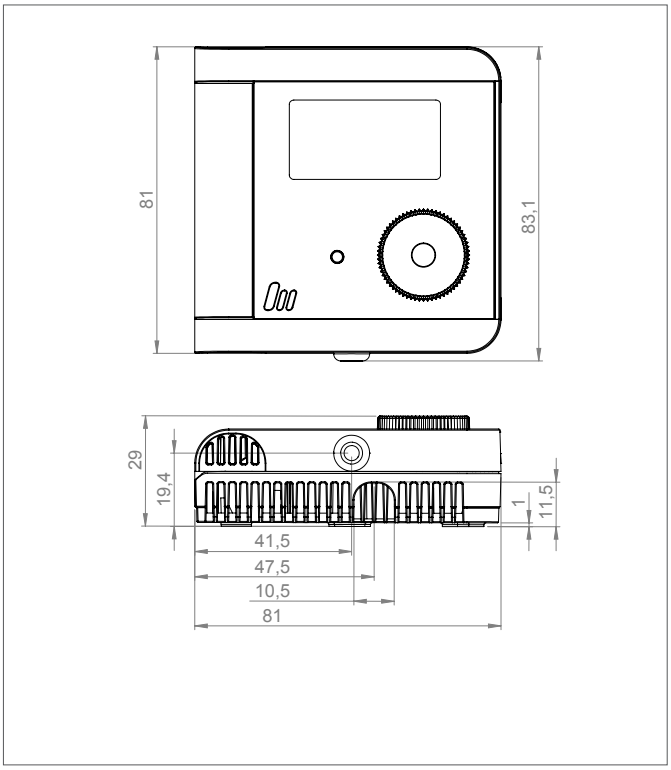
Measuring medium	Air, non-pressurised, non-condensing, non-aggressive
Operating temperature housing	-30...+60 °C
sensor head (standard)	-40...+85°C
sensor head+cable firmly connected	-40...+80°C
sensor head high temperature	-40...+125°C
Storage temperature	-40...+80°C
Electrical connections at mains terminals	
Wire cross-section at each connection	max. 1.5 mm²
Cable diameter	
→ Surface-mounted cable	max. 1 x Ø 6.5 mm or 2 x Ø 4.5 mm
→ Concealed cable	
see: user instructions on page 10	
degree of protection cable sensor	
with membrane filter ZE08 (basic equipment)	IP30
PTFE sintered filter ZE05 up to 125°C (optional)	P65
Housing IP rating	IP 30D
Safety category	III
Materials housing	ABS
cable sensor	PC
Housing colour	signal white similar to RAL 9003
Cable length of remote sensor head	
standard	2 m
max.	25 m
Display	2 lines 3 digits + 1 decimal place display approx. 21 x 40 mm² digit height approx. 8 mm T + H alternating relay switching state 1 + 2

Working range humidity and temperature

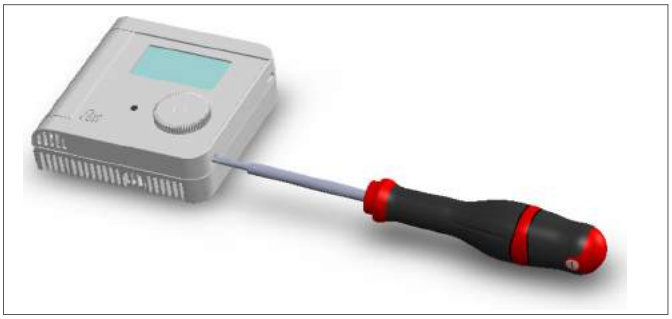


Dimensional drawing

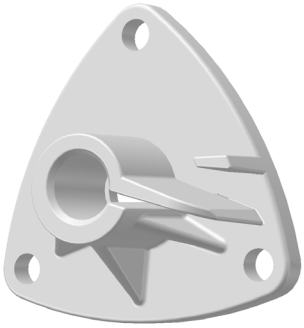




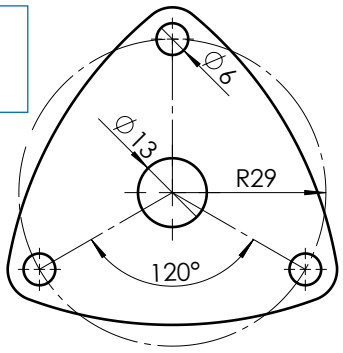
Opening the housing



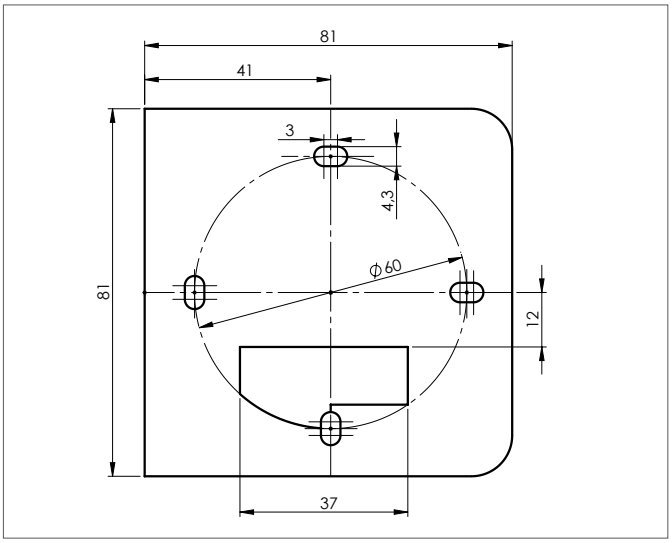
Fixing flange (accessories)



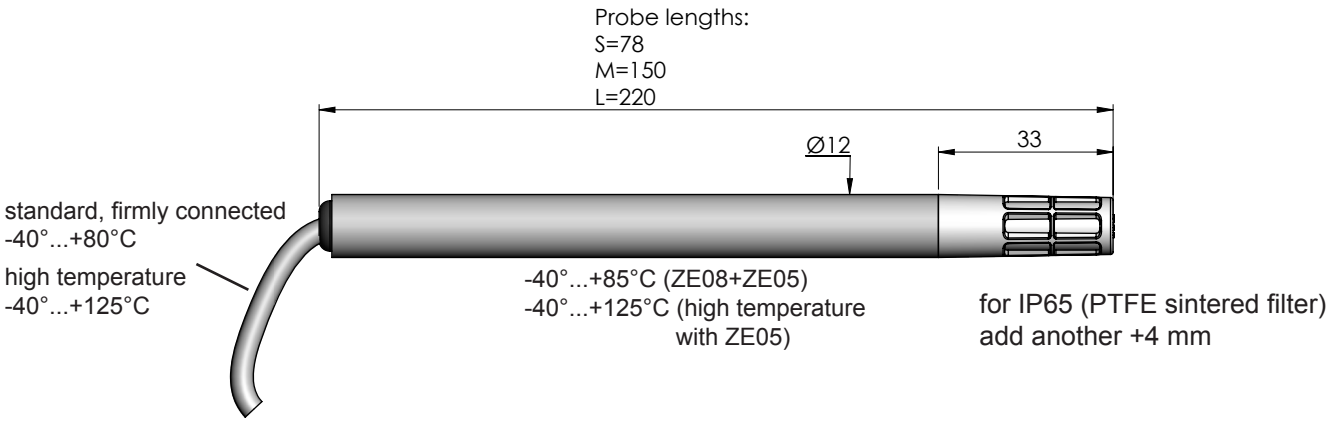
Drilling pattern of fixing flange



Drilling pattern

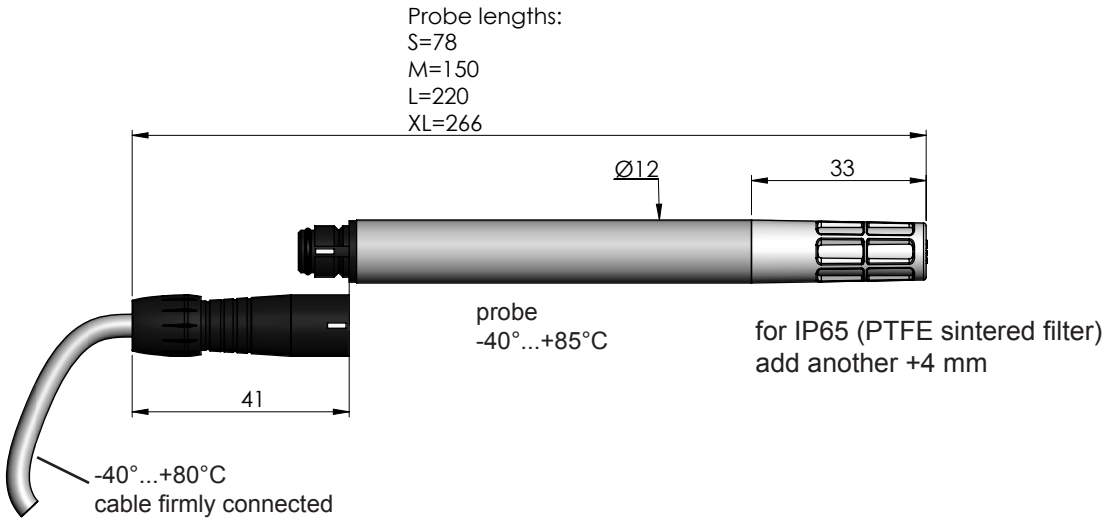


Probe with cable

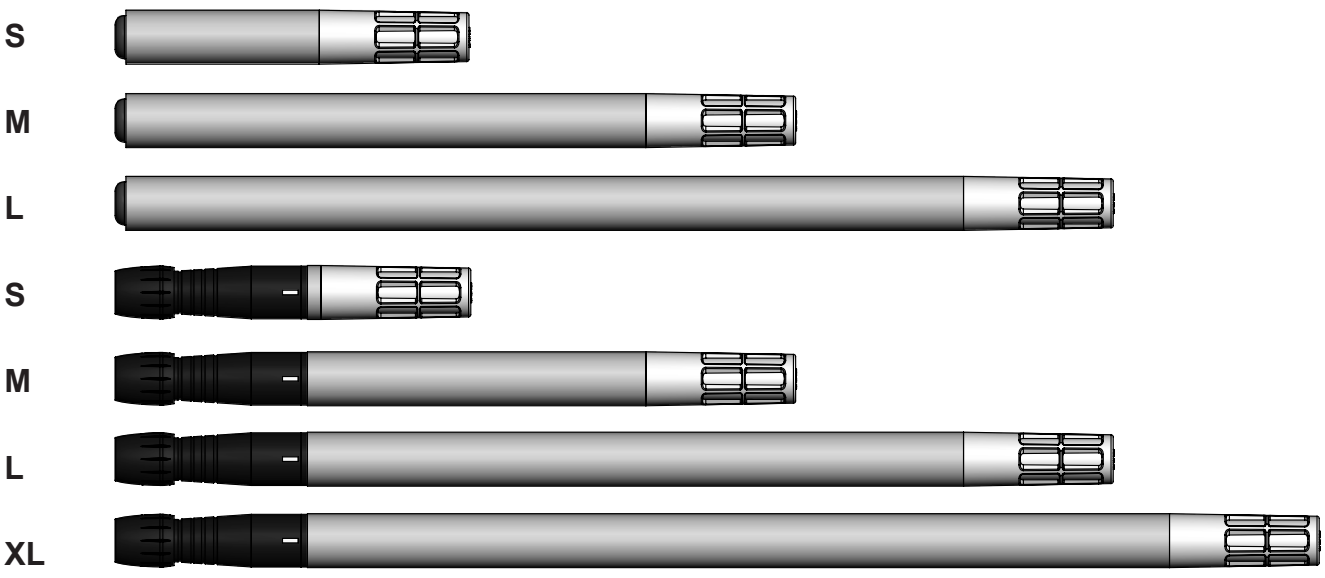


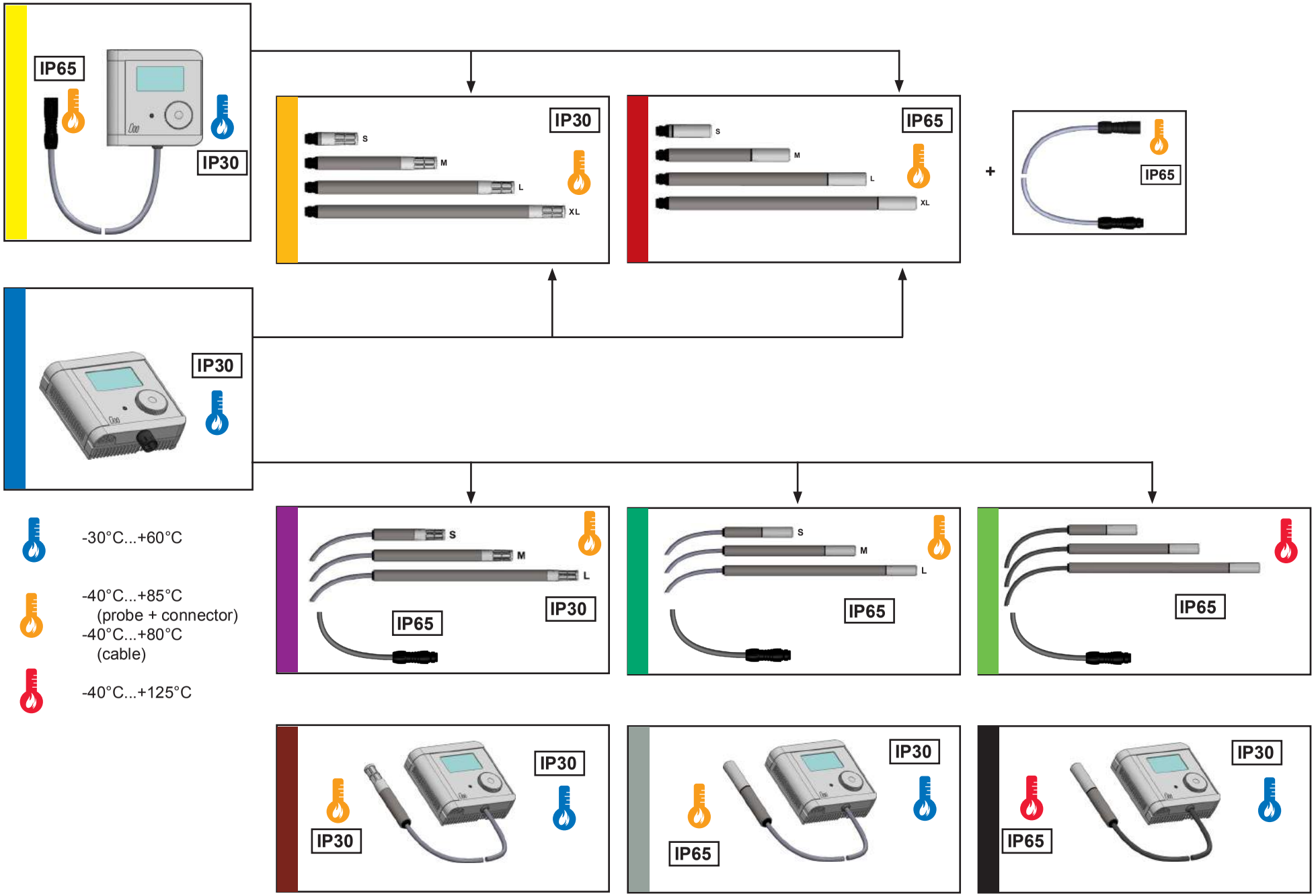
Probe pluggable

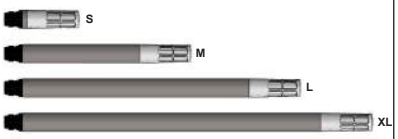
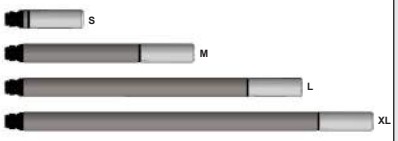
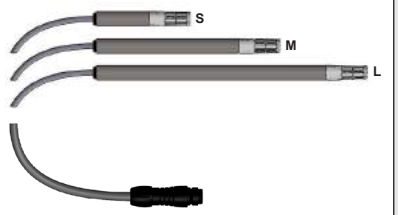
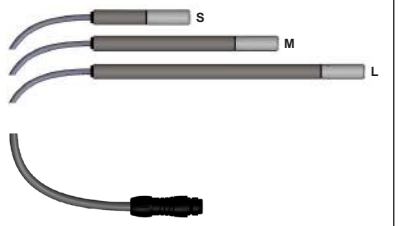
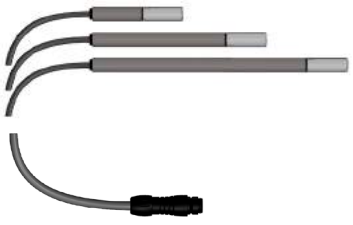
(not possible for cable probe high temperature +125°C)



Probe Versions




IP65
IP30
IP30
S
M
L
XL
IP65
S
M
L
XL
+
IP65
IP30
-30°C...+60°C
-40°C...+85°C
(probe + connector)
-40°C...+80°C
(cable)
-40°C...+125°C
IP65
IP30
S
M
L
IP65
S
M
L
IP65
IP30
IP30
IP65
IP30
IP65
IP30

	Description controller	„Description probe optional equipment / accessories“
	**Controller for wall mounting** with ventilation slots and display -30…+60°C IP30 (housing) **with cable connected connector** cable length 2m **(without probe)** -40…+80°C (cable)	
		**Probe pluggable** with female socket Selection from 4 probe lengths: S, M, L, XL protective cage with membrane filter (ZE08) -40…+85°C IP30 (when plugged)
		**Probe pluggable** with female socket Selection from 4 probe lengths: S, M, L, XL PTFE sintered filter (ZE05) -40…+85°C IP65 (when plugged)
	**Controller for wall mounting** with ventilation slots and display **with integrated connector** **(without probe)** -30…+60°C IP30 (when plugged)	
		**Probe** Selection from 3 probe lengths: S, M, L protective cage with membrane filter (ZE08) -40…+85°C (probe), cable max. +80°C IP30 (probe) **with cable connected female cable connector**, cable length 2m (pluggable in the housing)
		**Probe** Selection from 3 probe lengths: S, M, L PTFE sintered filter (ZE05) -40…+85°C (probe), cable max. +80°C IP65 (when plugged) **with cable connected female cable connector**, cable length 2m (pluggable in the housing)
		**Probe** Selection from 3 probe lengths: S, M, L PTFE sintered filter (ZE05) -40…+125°C (probe + cable) IP65 (when plugged) **with cable connected female cable connector**, cable length 2m (pluggable in the housing)
	connecting cable pluggable on both sides: cable end with cable plug connector to connect to the probe cable end with female cable connector to connect to the housing cable length 2m -40…+80°C	

	Description controller	„Description probe optional equipment / accessories“
	**Controller for wall mounting** with ventilation slots and display -30…+60°C (housing) IP30 (housing) **with cable connected probe** Selection from 3 probe lengths: S, M, L cable length 2m protective cage with membrane filter (ZE08) -40…+85°C (probe), cable max. +80°C IP30 (probe)	
	**Controller for wall mounting** with ventilation slots and display -30…+60°C (housing) IP30 (housing) **with cable connected probe** Selection from 3 probe lengths: S, M, L cable length 2m PTFE sintered filter (ZE05) -40…+85°C (probe), cable max. +80°C IP65 (probe)	
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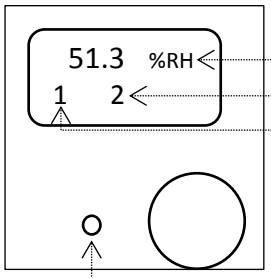
Accessories

Product n°	Description
20.077	sintered filter made of fine-pored PTFE, IP 65
20.045	fixing flange, synthetic material, with fixing mechanism for easy sensor mounting and removal for sensors Ø 12 mm, with rubber sealing
ZE 31/1-12 ZE 31/1-75	humidity standard to check the accuracy of the sensor at 12 %RH humidity standard to check the accuracy of the sensor at 75 %RH
ZE 31/1-33 ZE 31/1-84	humidity standard to check the accuracy of the sensor at 33 %RH humidity standard to check the accuracy of the sensor at 84 %RH
ZE36	testing adapter for humidity standards for for sensor tubes Ø 12 mm

Configuration guide

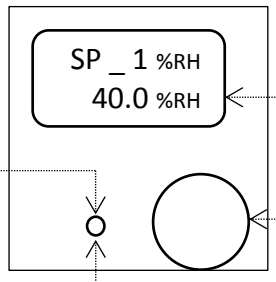
Operation mode



Alternately displays current relative humidity/temperature
„2“ displayed if relay 2 = contacts 7-8 closed
„1“ displayed if relay 1 = contacts 5-6 closed

Press black button *briefly*: switch to

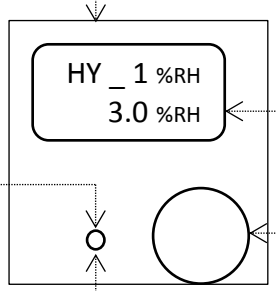
Configuration mode



Setpoint for relay 1; adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

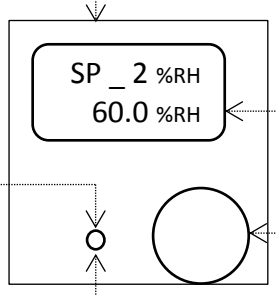
Press black button *briefly*:
Switch to next parameter *or* (after turning rotary controller) display shows "_ESC" and return to operation mode



Switching hysteresis for setpoint 1; adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

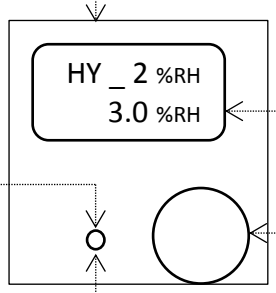
Press black button *briefly*:
Switch to next parameter *or* (after turning rotary controller) display shows "_ESC" and return to operation mode



Setpoint for relay 2; adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

Press black button *briefly*:
Switch to next parameter *or* (after turning rotary controller) display shows "_ESC" and return to operation mode



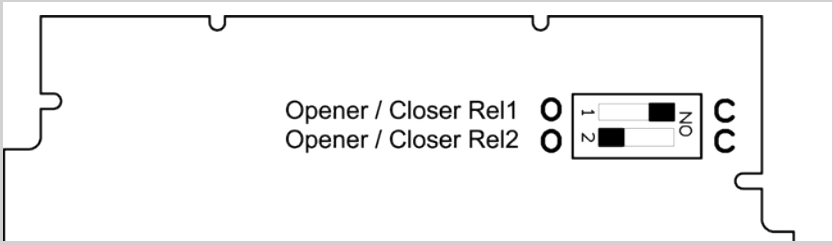
Switching hysteresis for setpoint 2; adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

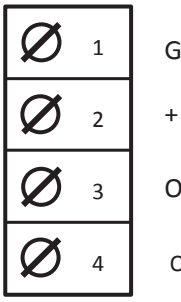
Press black button *briefly*:
Return to operation mode *or* (after turning rotary controller) display shows "_ESC" and return to operation mode

Setting relay 1 and 2 as opener or closer

DIP-Switch set to	Current reading < setpoint value - $\frac{\text{switching hysteresis}}{2}$	reading > setpoint value + $\frac{\text{switching hysteresis}}{2}$
C (Closer)	relay = open	relay = closed
O (Opener)	relay = closed	relay = open



Connection diagrams

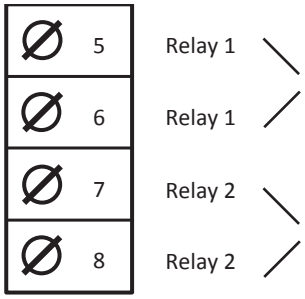


GND

+ U_B 15...30 V DC or 13...26 V AC

Output humidity 0...10 V

Output temperature 0...10 V



relative humidity

relative humidity

Relay outputs: potential-free, normally open

ESD protection advice

The devices contain components, which can be damaged by the effects of electrical fields or by charge equalisation when touched.

The following protective measures must be taken when the housing of the device is to be opened for connection:

- Before opening the housing, ensure electrical potential equalisation between you and your environment.
- Pay particular attention to ensure that this potential equalisation is maintained while you are working with the opened housing.

Installation instructions

Position	The installation site of the remote probe should be chosen such that a representative measurement of air humidity can be guaranteed. Avoid areas in the vicinity of radiators, doors and exterior walls, as well as direct sunlight.
	Do not position the sensor where ingress of water could occur. IP65 protection is - only ensured with PTFE sintered filter ZE05 with O-Ring - only ensured when the probe is plugged, see „Probe pluggable“ on page 4.
	We recommend that you lay the connection lines in a loop so that any water that may be present can run off.
Operating temperature	Please note the maximum permissible ambient temperature for probe and housing when installing the sensor. When firmly connected the standard cable must not be exposed to an increased ambient temperature > +80°C.
Connection to surface-mounted and concealed cables	When connecting to a concealed cable, the knock-out part of the housing floor should be broken out to allow the cable to pass through. When connecting to a surface-mounted cable, the separators at the hollowed-out points in the side of the housing can be broken out.
Connection	The electrical connection must be carried out by properly qualified personnel only.
	The housing contains sensitive electrical components. When opening the housing, make sure you comply with the electrostatic discharge precautions.
	Lines to and from the sensor and the sensor cable must not be installed parallel to strong electromagnetical fields.
	The installation site should be chosen such that a representative measurement of air humidity can be guaranteed

User instructions

Cleaning of filters and protective baskets	If necessary, soiled filters and protective baskets can carefully be unscrewed and rinsed. Bear in mind the sensors will not measure accurately again until filters are completely dry.
Damaging influences	Depending on their type and concentration, aggressive media containing solvents can cause incorrect reasings or cause the sensor to fail. Substances deposited on the sensor element (e. g. resin aerosols, paint aerosols, smoke deposits etc.) are harmful as they eventually form a water-repellent film.

eStat20 DUO
Electronic Hygro-Thermostat with remote sensor head

- **Easy to install**
- **up to 25 m cable length for remote sensor head**
- **2 potential-free switching outputs configurable as openers or closers**
- **Setpoint and switching hystereses for temperature and relative humidity independently configurable**
- **Display of current relay switching states**
- **2 continuous 0...10 V signal outputs for relative humidity and temperature**
- **calibrated measuring probe in exchangeable plug-in design**
- **Alternating display of relative humidity and temperature**
- **Sensor head up to +125°C**

Technical data

Humidity

Measuring range	0...100 %rh
Control range of relative humidity	5...95 %rh
Setting range of the switching hystereses	0.5...9 %rh
Measuring uncertainty	
10...90 %rh at 25°C max	≤ ±2 %rh
0...10 %rh and 90...100 %rh	additional
at 25°C	≤ ±0.2 %rh / %rh
Long term stability	≤ 0.5 %rh/a
Hysteresis	≤ ±1 %rh
Typ. temperature influence at 25°C	±0.05%rh/K

Temperature

Control range of temp. standard		-35...+80 °C
high temperature		-35...+120 °C
Setting range of the setpoints		0.1...10 K
Output ranges, analogue		0...+50 °C
		-30...+70 °C
		0...+100 °C
sensor head high temperature		-40...+125°C
		further ranges on request
Measuring uncertainty		
5...60°C		≤±0.35K
Influence of temperature ref. to +5°C or +60°C		
Standard	-40...5°C	≤12mK/K
	60...80°C	≤14mK/K
High temperature	60...100°C	≤14mK/K
		additional
	100...125°C	≤20mK/K

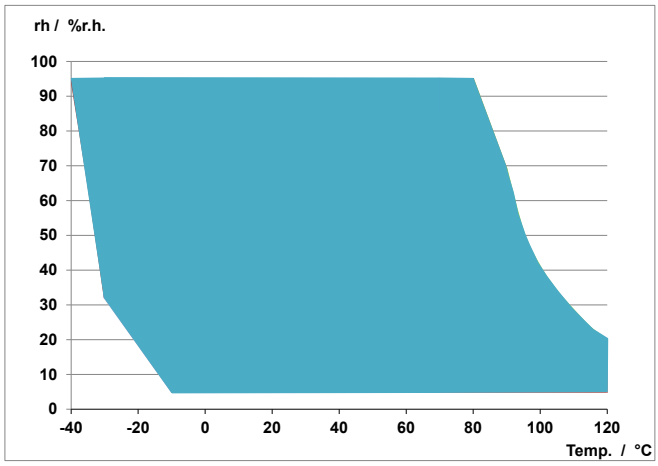
Electrical data

Switching outputs:	2 relay contacts potential-free, normally open
Setting as opener / closer	Via DIP switch
Switching voltage	≤ 48V DC / AC ≥ 100 µV
Breaking capacity	≤ 60 W / 62.5 VA
Power factor	≥ 0.9
Switching cycles (at Pmax)	> 10^5
Switching current	≤ 2A
Continuous output rel. humidity	0...10 V DC
Continuous output temperature	0...10 V DC
Load resistance (voltage output)	≥ 10 kΩ
Supply voltage	15...30 V DC 13...26 V AC
Consumption	≤ 30 mA
Directive about electromagnetic compatibility **2014/30/EU**	
DIN EN 61326-1	issue 07/13
DIN EN 61326-2-3	issue 07/13

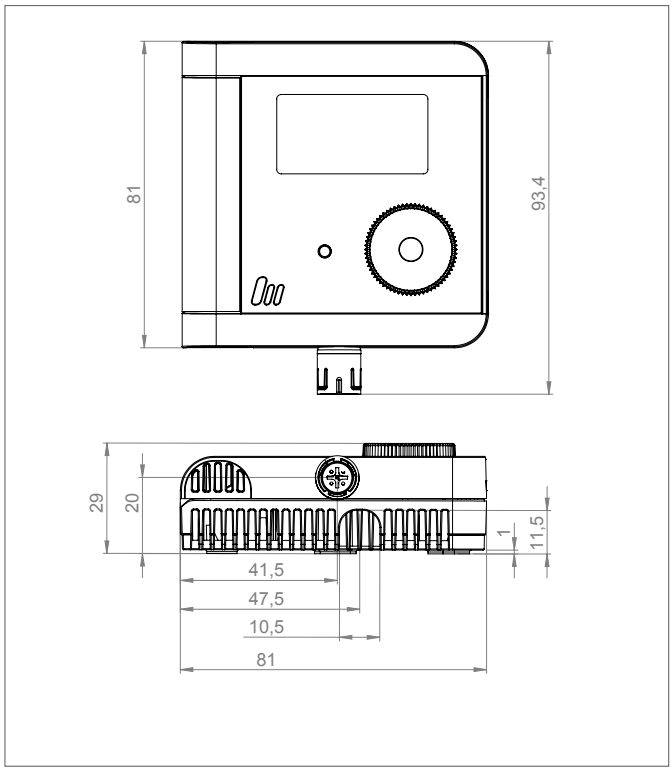
General data

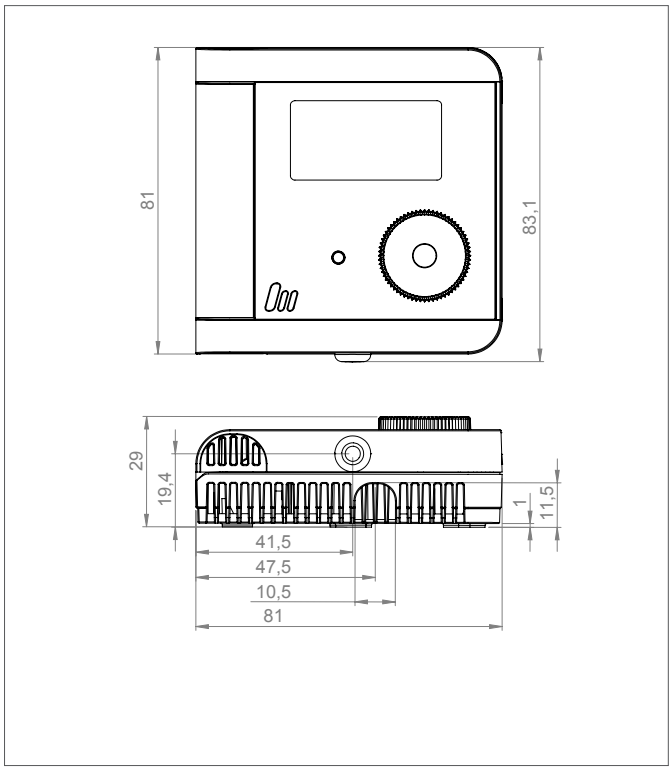
Measuring medium	Air, non-pressurised, non-condensing, non-aggressive
Operating temperature housing	-30...+60 °C
sensor head (standard)	-40...+85°C
sensor head+cable firmly connected	-40...+80°C
sensor head high temperature	-40...+125°C
Storage temperature	-40...+80°C
Electrical connections at mains terminals	
Wire cross-section at each connection	max. 1.5 mm²
Cable diameter	
→ Surface-mounted cable	max. 1 x Ø 6.5 mm or 2 x Ø 4.5 mm
→ Concealed cable	
see: user instructions on page 10	
degree of protection cable sensor	
with membrane filter ZE08 (basic equipment)	IP30
PTFE sintered filter ZE05 up to 125°C (optional)	P65
Housing IP rating	IP 30D
Safety category	III
Materials housing	ABS
cable sensor	PC
Housing colour	signal white similar to RAL 9003
Cable length of remote sensor head	
standard	2 m
max.	25 m
Display	2 lines 3 digits + 1 decimal place display approx. 21 x 40 mm² digit height approx. 8 mm T + H alternating relay switching state 1 + 2

Working range humidity and temperature



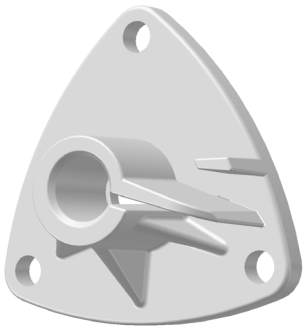
Dimensional drawing



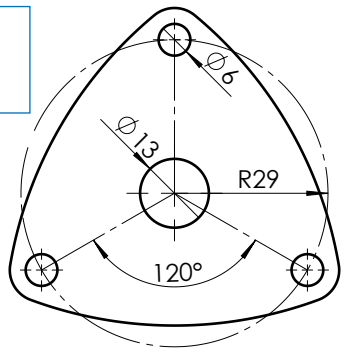


Opening the housing

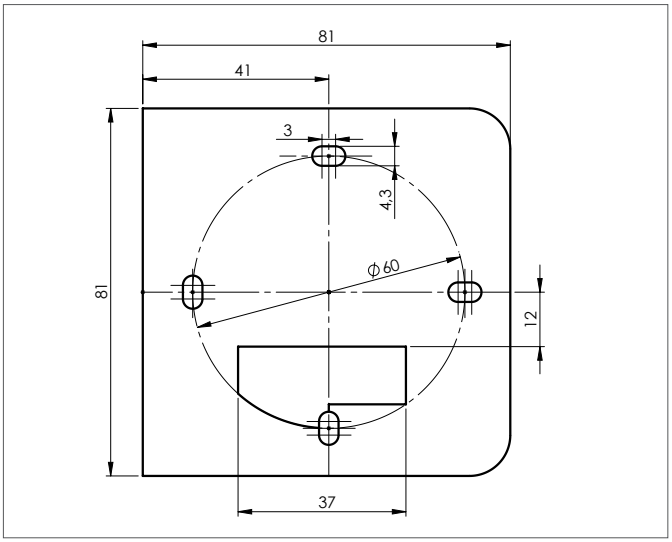
Fixing flange (accessories)



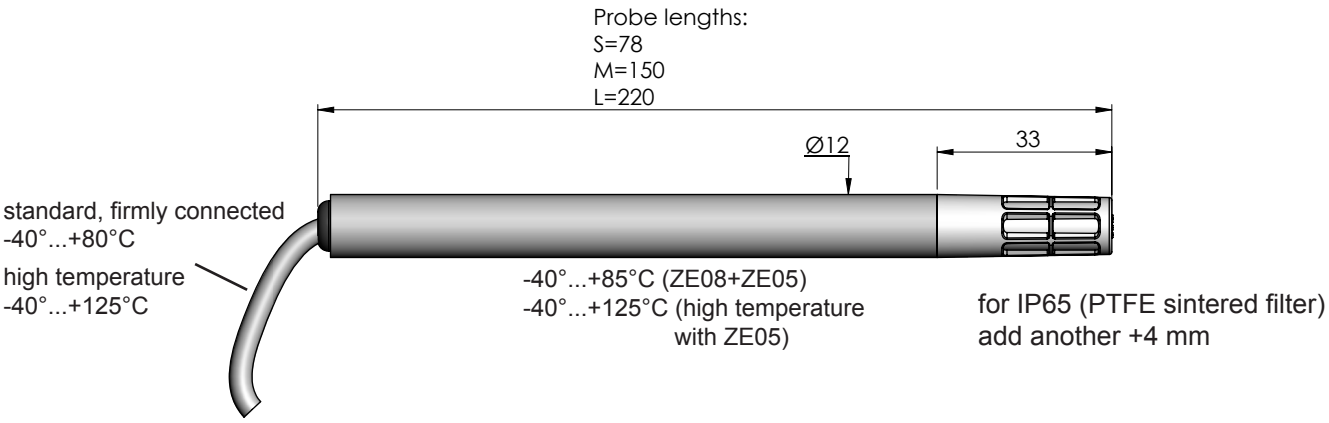
Drilling pattern of fixing flange



Drilling pattern

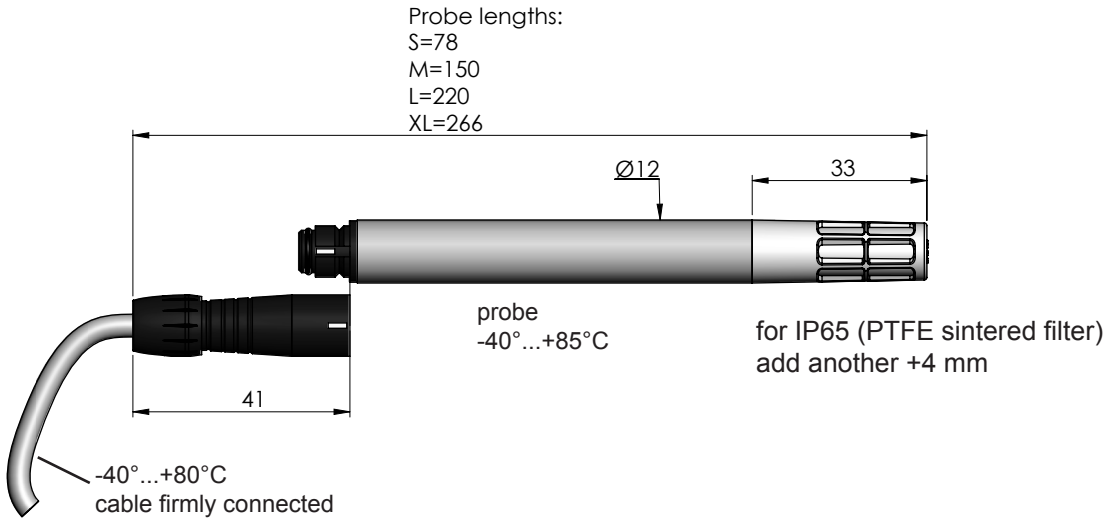


Probe with cable

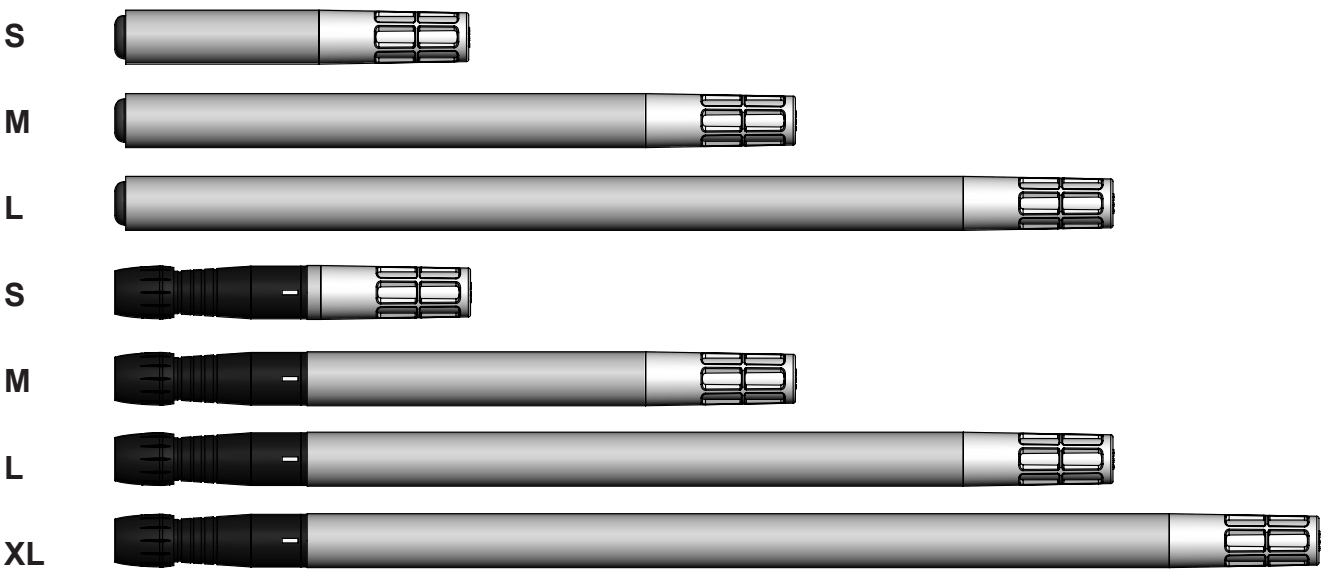


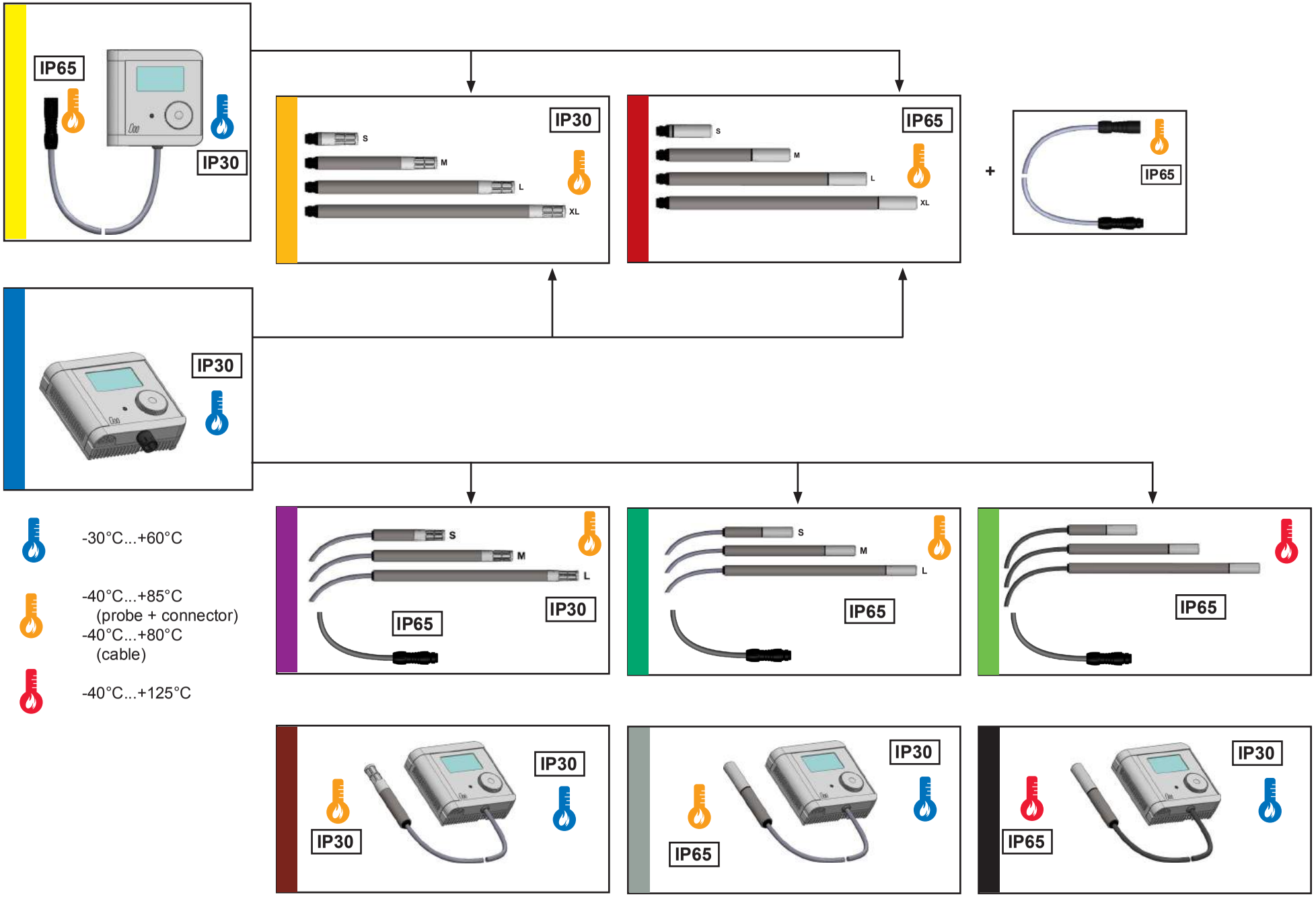
Probe pluggable

(not possible for cable probe high temperature +125°C)



Probe Versions




IP65
IP30
IP30
S
M
L
XL
IP65
S
M
L
XL
+
IP65
IP30
-30°C...+60°C
-40°C...+85°C
(probe + connector)
-40°C...+80°C
(cable)
-40°C...+125°C
IP65
IP30
S
M
L
IP65
S
M
L
IP65
IP30
IP30
IP65
IP30
IP65
IP30

	Description controller	„Description probe optional equipment / accessories“
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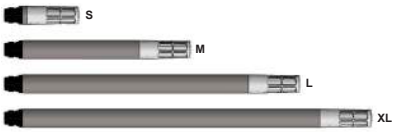
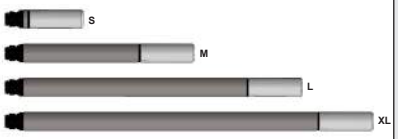
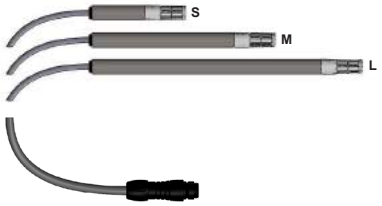
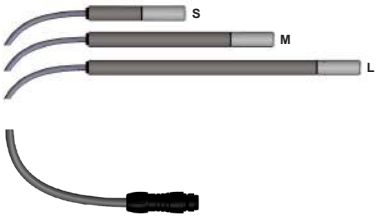
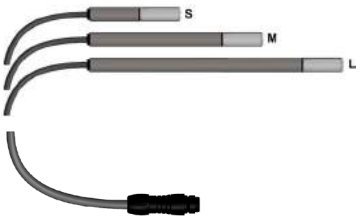
		**Probe pluggable** with female socket Selection from 4 probe lengths: S, M, L, XL protective cage with membrane filter (ZE08) -40…+85°C IP30 (when plugged)
		**Probe pluggable** with female socket Selection from 4 probe lengths: S, M, L, XL PTFE sintered filter (ZE05) -40…+85°C IP65 (when plugged)
	**Controller for wall mounting** with ventilation slots and display **with integrated connector** **(without probe)** -30…+60°C IP30 (when plugged)	
		**Probe** Selection from 3 probe lengths: S, M, L protective cage with membrane filter (ZE08) -40…+85°C (probe), cable max. +80°C IP30 (probe) **with cable connected female cable connector**, cable length 2m (pluggable in the housing)
		**Probe** Selection from 3 probe lengths: S, M, L PTFE sintered filter (ZE05) -40…+85°C (probe), cable max. +80°C IP65 (when plugged) **with cable connected female cable connector**, cable length 2m (pluggable in the housing)
		**Probe** Selection from 3 probe lengths: S, M, L PTFE sintered filter (ZE05) -40…+125°C (probe + cable) IP65 (when plugged) **with cable connected female cable connector**, cable length 2m (pluggable in the housing)
	connecting cable pluggable on both sides: cable end with cable plug connector to connect to the probe cable end with female cable connector to connect to the housing cable length 2m -40…+80°C	

	Description controller	„Description probe optional equipment / accessories“
	**Controller for wall mounting** with ventilation slots and display -30…+60°C (housing) IP30 (housing) **with cable connected probe** Selection from 3 probe lengths: S, M, L cable length 2m protective cage with membrane filter (ZE08) -40…+85°C (probe), cable max. +80°C IP30 (probe)	
	**Controller for wall mounting** with ventilation slots and display -30…+60°C (housing) IP30 (housing) **with cable connected probe** Selection from 3 probe lengths: S, M, L cable length 2m PTFE sintered filter (ZE05) -40…+85°C (probe), cable max. +80°C IP65 (probe)	
	**Controller for wall mounting** with ventilation slots and display -30…+60°C (housing) IP30 (housing) **with cable connected probe** Selection from 3 probe lengths: S, M, L cable length 2m PTFE sintered filter (ZE05) -40…+125°C (probe + cable) IP65 (probe)	

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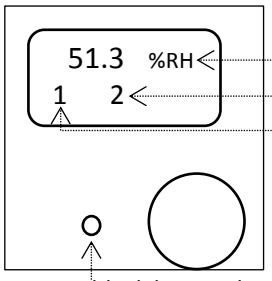
Configuration guide

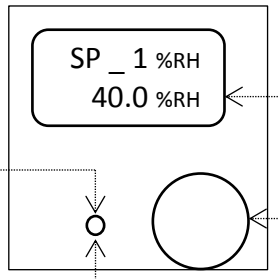
Operation mode



Alternately displays current relative humidity/temperature
„2“ displayed if relay 2 (Temp) = contacts 7-8 closed
„1“ displayed if relay 1 (rel. humidity) = contacts 5-6 closed

Press black button *briefly*: switch to

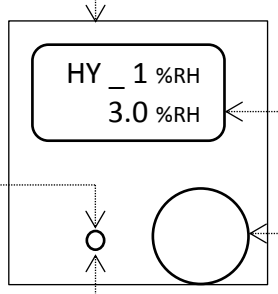
Configuration mode



Setpoint for relay 1 (rel. humidity); adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

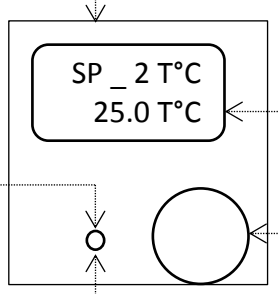
Press black button *briefly*:
Switch to next parameter *or* (after turning rotary controller) display shows "_ESC" and return to operation mode



Switching hysteresis for setpoint 1; adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

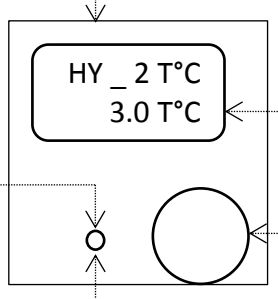
Press black button *briefly*:
Switch to next parameter *or* (after turning rotary controller) display shows "_ESC" and return to operation mode



Setpoint for relay 2 (Temp.); adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

Press black button *briefly*:
Switch to next parameter *or* (after turning rotary controller) display shows "_ESC" and return to operation mode



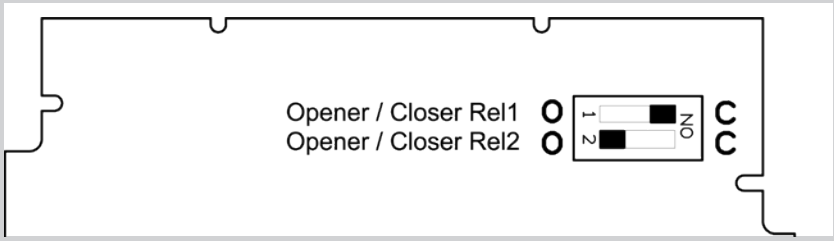
Switching hysteresis for setpoint 2; adjustable with rotary controller

Press black button and *hold* (>3s): store value (display: „Store“)

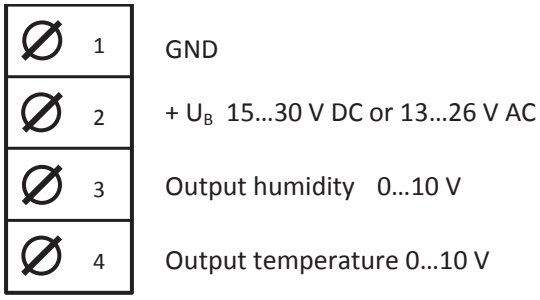
Press black button *briefly*:
Return to operation mode *or* (after turning rotary controller) display shows "_ESC" and return to operation mode

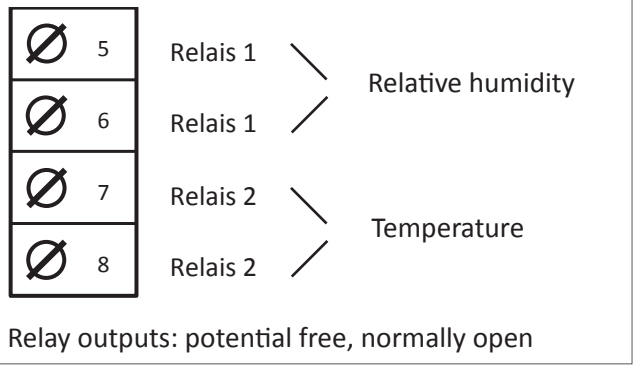
Setting relay 1 and 2 as opener or closer

DIP-Switch set to	Current reading < setpoint - switching hysteresis / 2	Current reading < setpoint + switching hysteresis / 2
C (Closer)	Relay = open	Relay = closed
O (Opener)	Relay = closed	Relay = open



Connection diagrams





ESD protection advice

The devices contain components, which can be damaged by the effects of electrical fields or by charge equalisation when touched.

The following protective measures must be taken when the housing of the device is to be opened for connection:

- Before opening the housing, ensure electrical potential equalisation between you and your environment.
- Pay particular attention to ensure that this potential equalisation is maintained while you are working with the opened housing.

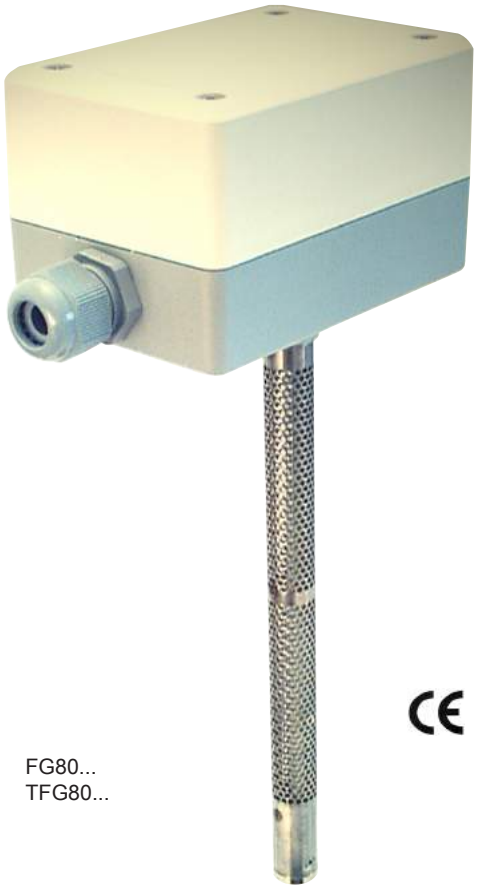
Installation instructions

Position	The installation site of the remote probe should be chosen such that a representative measurement of air humidity can be guaranteed. Avoid areas in the vicinity of radiators, doors and exterior walls, as well as direct sunlight.
	Do not position the sensor where ingress of water could occur. IP65 protection is - only ensured with PTFE sintered filter ZE05 with O-Ring - only ensured when the probe is plugged, see „Probe pluggable“ on page 4.
	We recommend that you lay the connection lines in a loop so that any water that may be present can run off.
Operating temperature	Please note the maximum permissible ambient temperature for probe and housing when installing the sensor. When firmly connected the standard cable must not be exposed to an increased ambient temperature > +80°C.
Connection to surface-mounted and concealed cables	When connecting to a concealed cable, the knock-out part of the housing floor should be broken out to allow the cable to pass through. When connecting to a surface-mounted cable, the separators at the hollowed-out points in the side of the housing can be broken out.
Connection	The electrical connection must be carried out by properly qualified personnel only.
	The housing contains sensitive electrical components. When opening the housing, make sure you comply with the electrostatic discharge precautions.
	Lines to and from the sensor and the sensor cable must not be installed parallel to strong electromagnetical fields.
	The installation site should be chosen such that a representative measurement of air humidity can be guaranteed

User instructions

Cleaning of filters and protective baskets	If necessary, soiled filters and protective baskets can carefully be unscrewed and rinsed. Bear in mind the sensors will not measure accurately again until filters are completely dry.
Damaging influences	Depending on their type and concentration, aggressive media containing solvents can cause incorrect reasings or cause the sensor to fail. Substances deposited on the sensor element (e. g. resin aerosols, paint aerosols, smoke deposits etc.) are harmful as they eventually form a water-repellent film.

Humidity sensors - TFG80...
and combined
Humidity-temperature sensors - TFG80...
with Polyga® humidity measuring element for the measurement of relative air humidity and temperature
- for rooms and air channels.



FG80...
TFG80...

Model overview

passive sensors

FG80H	**Humidity Sensor** with resistance output up to 10k ohms
TFG80H	**Humidity-temperature Sensor** with resistance output up to 10k ohms

active sensors

FG80J	**Humidity Sensor** 0(4)...20mA or 0...10V DC for U=15...30V DC
TFG80J	**Humidity-temperature Sensor** each 0(4)...20mA or 0...10V DC for U=15...30V DC
FG80AC	**Humidity Sensor** each 0(4)...20mA or 0...10V DC for U=24V AC
TFG80AC	**Humidity-temperature Sensor** each 0(4)...20mA or 0...10V DC for U=24V AC

Description of the sensor

The Polyga® humidity measuring element consists of several synthetic fabric bands each with 90 individual fibres with a diameter of 3 µm each. In their untreated state, the synthetic fibres are not hygroscopic - their hygroscopic properties are acquired by means of a special process which allows the synthetic fibres to absorb moisture. The molecular structure of the individual fibres is arranged lengthways. When water is absorbed, the molecular chains alter, the outward result being a change in length. A loss of water has a converse effect on the fibre. If the fibre is in equilibrium with the air humidity, there is neither absorption nor a loss of water. The length at this point serves as a gauge for the relative humidity.
If the measuring element is exposed to an air humidity of 100%rh, a film of water forms on the surface of the element (dew point). The physical effect is one as if the measuring element had been immersed in water. The measuring element is saturated. An ideal fixed point is thus attained for adjusting or controlling the sensors. The measuring element is waterresistant. Once administered to the Galltec measuring element, the hygroscopic properties remain stable, the sensitivity remaining until it becomes destroyed by extraneous influences. Regeneration as with fine-measuring elements is not necessary, but does not cause any harm.

Design of the sensor

The expanding action (predominantly lengthways) of the fibres is picked up by means of an electronic sensing system and converted by integrated signal preprocessing into standardised signals **0..20mA or 4..20mA or 0...10V**.
The fan-shaped measuring element, which faces outward from the housing, is protected by a perforated sensor tube. The sensors are designed for pressureless systems. The unit should be installed in a location where condensation cannot enter into the housing. A preferred position would be ”sensor vertically down” or ”sensor horizontal”. In these positions, a cover plate with a 0.8 mm diameter hole will prevent water from entering.
The TFG80 range of sensors have built-in temperature sensors (mainly Pt100) for simultaneous measurement of temperature. Temperature readings are converted likewise into standardised signals **0..20mA or 4..20mA or 0..10V**.

Ageing

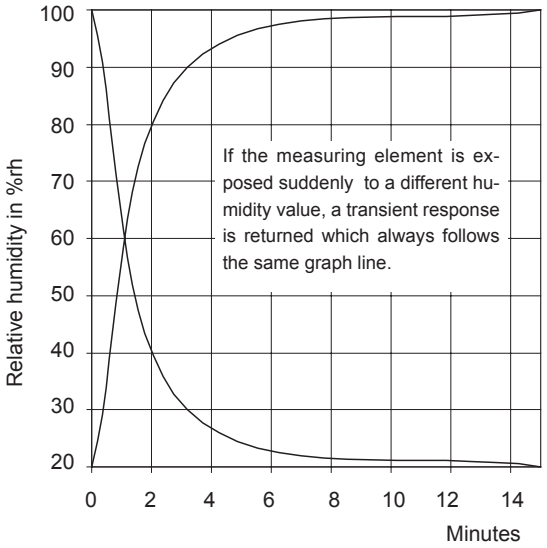
In order to maintain their long-term stability, it is important that the measuring elements undergo a special ageing process, details of which cannot be given here.

Reaction of the sensor

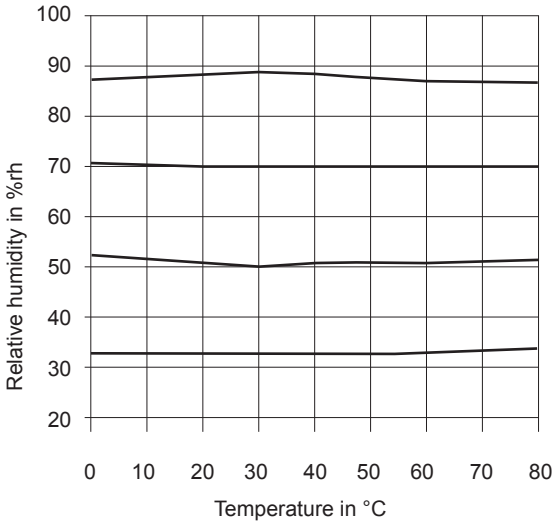
Due to the law of diffusion, there is a time delay before the fibres are saturated during water absorption. This is a decisive factor when determining the reaction time. Thus, for one individual fibre with a diameter of 3 µm, a short saturation time (several seconds) can be measured. Empirical investigations show that bundled or woven fibres, as are used here in the Galltec sensor, give rise to a longer period prior to saturation. This is because the individual fibres impede each other during water absorption and/or water loss, and the ensuing humidity does not register until later. Measurements have shown that, at a wind speed of 2m / sec. the half-life period is 1.2 mins. This represents an effective period of approx. 30 - 40 mins.

80° C is given as the maximum temperature value. Higher temperatures can only be tolerated for a short period of time. The eventual result is a change in the molecular structure which causes a constant error. The maximum temperature of 80° C only applies, however, if no harmful substances (acids, solvents etc.) are present in the medium.

Half-life period



Thermal behaviour



Technical data

Physical data

humidity measuring range ..... 0...100%rh
measuring accuracy
..... >40%rh ..... ±2.5%rh
.....<40%rh .. according to tolerance diagram
working range ..... 30...100%rh
temperature working range ..... -30...+80ºC
measuring accuracy ..... ±0.5ºC
measuring medium ..... air, pressureless, non-aggressive
permissible ambient temperature
at the housing ..... -20...60ºC
at the sensor ..... -40...+80ºC
medium temperature coefficient ..... -0.1%/K at 20ºC and 50%rh
adjustment ..... at average air pressure 430m NN
permissible air speed 8m/sec
with protective gauze (order no. 20.014) 15m/sec
half-life period at v=2m/sec.....1.2 min
sensor length ; sensor material ..... 220mm; high-grade steel
fixing ..... slots in housing base for channel mounting
(order no. 20.009) ..... console for wall mounting
mounting position ... sensor vertically downwards, or horizontal
connecting terminals ..... for conductor cross sections 0.5mm²
cable connection ..... by twist nipple M20x1,5
Directive about electromagnetic compatibility **2014/30/EU**
DIN EN 61326-1 ..... issue 07/13
DIN EN 61326-2-3 ..... issue 07/13

housing ..... ABS
protective system IP64
weight ..... ca 0.4 kg

Electrical data for passive sensors

Humidity Output 1 ..... 0...100 ohm linear 2-wire
..... 0...200 ohm linear 2-wire
..... 0...1000 ohm linear 2-wire
..... 100...138.5 ohm linear 2-wire
.....5..100..5 ohm unlinear 3-wire
further resistance ranges on request
permissible load 250mW
insulation resistance ..... 10 M ohm

Temperature Output 2 (TFG80H) ..... Pt100 ref. DIN EN 60751
permissible load for air 1m/sec and t=0.1K ..... 2 mA

Electrical data for active sensors

Humidity Output 1 ..... 0...20mA or 0...10V 4-wire system
... or 4...20mA .... 2-wire system (only with DC)
Temperature Output 2 ..... 0...20mA or 0..10V 4-wire system
.. or 4...20mA ..... 2-wire system (only with DC)
operating voltage ..... 15...30V DC or 24V AC ±10 %
max. load for current output ..... 500 Ohm
min. load resistance for voltage output .....10k Ohm
internal consumption per range ..... 5 mA, DC version
internal consumption per range .....10 mA, AC version
temperature measuring range ..... see table
linearity distortion of the temperature output ..... <0.5%

Type Survey passive Sensors

Type	Order no.	Measuring range		Conductor-system	Outputs	
		Humidity	Temperature		Humidity	Temperature
FG80H	44010300	0 … 100 % rh	-	2-pin	0 … 1000 Ω linear	-
	44010400	0 … 100 % rh	-	2-pin	100 … 138,5 Ω lin.	-
	44010100	0 … 100 % rh	-	2-pin	0 … 100 Ω lin.	-
	44010200	0 … 100 % rh	-	2-pin	0 … 200 Ω linear	-
TFG80H	44700350	0 … 100 % rh	Pt100	2-pin	0 … 1000 Ω linear	Pt100
	44700450	0 … 100 % rh	Pt100	2-pin	100 … 138,5 Ω linear	Pt100
	44700150	0 … 100 % rh	Pt100	2-pin	0 … 100 Ω linear	Pt100
	44700250	0 … 100 % rh	Pt100	2-pin	0 … 200 Ω linear	Pt100
	44732666	0 … 100 % rh	NTC	2-pin	0 … 48 kΩ non-linear	NTC

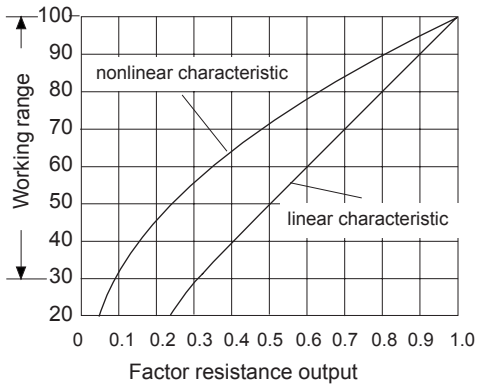
Further resistance ranges on request.

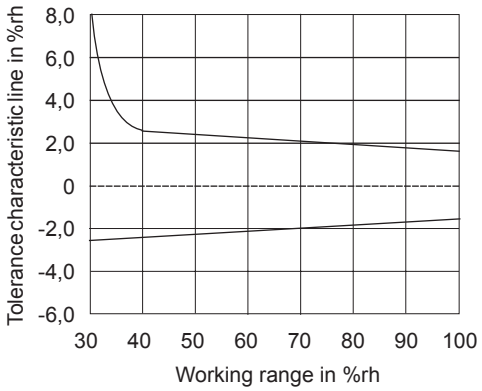
Type Survey active Sensors

Type	Order no.	Measuring range		Outputs		Conductor-system	Supply-voltage
		Humidity	Temperature	Humidity	Temperature		
FG80J FG80AC	44014700	0 … 100 % rh	-	0 … 10 V DC	-	3/4-wire	15 … 30 V DC/ 24 V AC ±10 %
	44014800	0 … 100 % rh	-	4 … 20 mA	-	2-wire	15 … 30 V DC
	44013000	0 … 100 % rh	-	0 … 20 mA	-	3/4-wire	15 … 30 V DC
	44014200	0 … 100 % rh	-	0 … 20 mA	-	3/4-wire	24 V AC
TFG80J TFG80AC	44514747	0 … 100 % rh	0 … 40°C	0 … 10 V DC	0 … 10 V DC	3/4-wire	15 … 30 V DC/ 24 V AC ±10 %
	44574747	0 … 100 % rh	-30 … 60°C	0 … 10 V DC	0 … 10 V DC	3/4-wire	15 … 30 V DC/ 24 V AC ±10 %
	44544747	0 … 100 % rh	0 … 100°C	0 … 10 V DC	0 … 10 V DC	3/4-wirer	15 … 30 V DC/ 24 V AC ±10 %
	44624747	0 … 100 % rh	-10 … 90°C	0 … 10 V DC	0 … 10 V DC	3/4-wire	15 … 30 V DC/ 24 V AC ±10 %
	44514848	0 … 100 % rh	0 … 40°C	4 … 20 mA	4 … 20 mA	2-wire	15 … 30 V DC
	44574848	0 … 100 % rh	-30 … 60°C	4 … 20 mA	4 … 20 mA	2-wire	15 … 30 V DC
	44544848	0 … 100 % rh	0 … 100°C	4 … 20 mA	4 … 20 mA	2-wire	15 … 30 V DC
	44624848	0 … 100 % rh	-10 … 90°C	4 … 20 mA	4 … 20 mA	2-wire	15 … 30 V DC
	44513030	0 … 100 % rh	0 … 40°C	0 … 20 mA	0 … 20 mA	3/4-wire	15 … 30 V DC
	44573030	0 … 100 % rh	-30 … 60°C	0 … 20 mA	0 … 20 mA	3/4-wire	15 … 30 V DC
	44543030	0 … 100 % rh	0 … 100°C	0 … 20 mA	0 … 20 mA	3/4-wire	15 … 30 V DC
	44623030**	0 … 100 % rh	-10 … 90°C	0 … 20 mA	0 … 20 mA	3/4-wire	15 … 30 V DC
	44514242	0 … 100 % rh	0 … 40°C	0 … 20 mA	0 … 20 mA	4-wire	24 V AC
	44574242	0 … 100 % rh	-30 … 60°C	0 … 20 mA	0 … 20 mA	4-wire	24 V AC
	44624242	0 … 100 % rh	-10 … 90°C	0 … 20 mA	0 … 20 mA	4-wire	24 V AC
	44544242	0 … 100 % rh	0 … 100°C	0 … 20 mA	0 … 20 mA	4-wire	24 V AC
FG80JPt100	44704750	0 … 100 % rh	Pt100	0 … 10 V DC	Pt100	3/4-wire	15 … 30 V DC/ 24 V AC ±10 %
	44703050	0 … 100 % rh	Pt100	0 … 20 mA	Pt100	3/4-wire	15 … 30 V DC
	44704850	0 … 100 % rh	Pt100	4 … 20 mA	Pt100	2-wire	15 … 30 V DC

** suitable for EDJ regulator

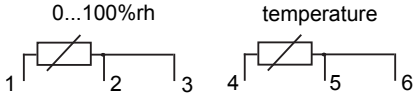
Humidity and tolerance diagram



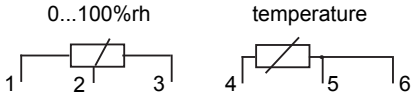


Connection diagram for passive sensors with resistance output

2-pin output linear



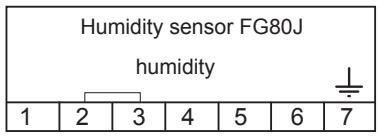
potentiometer output non-linear



Connection diagram for active sensor U =15...30V DC

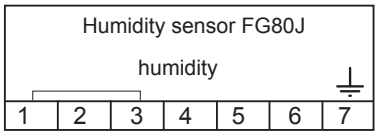
EMV information: use shielded signalling lines and earth the shielding!

4-wire system



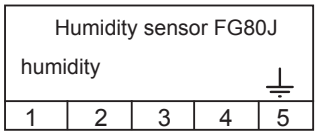
not galvanically disconnected

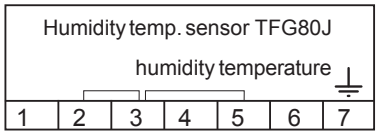
3/4-wire system



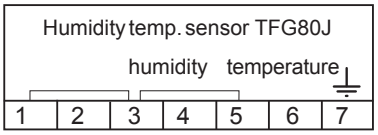
not galvanically disconnected

2-wire system

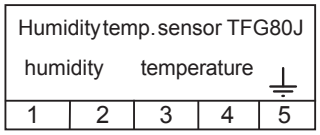




not galvanically disconnected

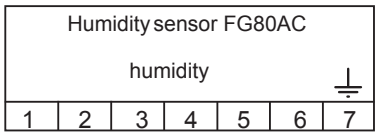


not galvanically disconnected



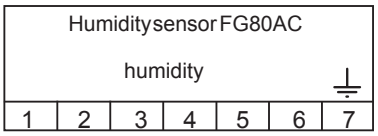
galvanically disconnected

Connection diagram for active sensors U_B=24V AC (± 10 %)

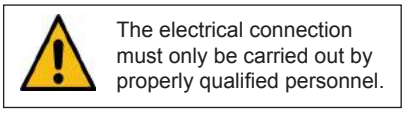


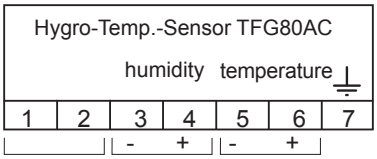
not galvanically disconnected

EMV information:
use shielded signalling lines
and earth the shielding!

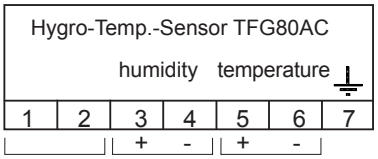


not galvanically disconnected





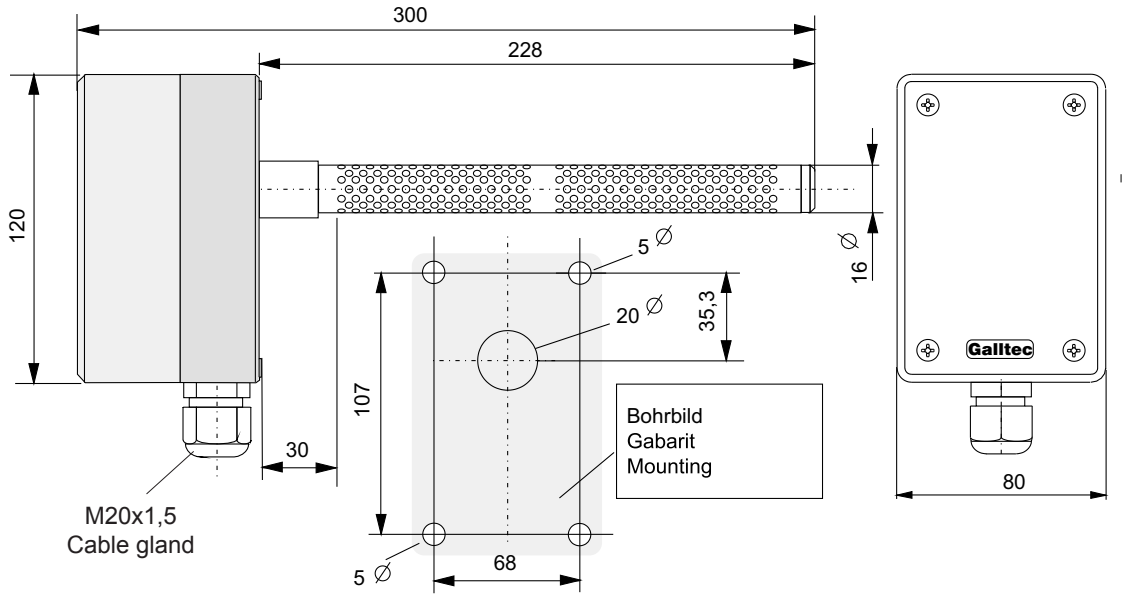
not galvanically disconnected



not galvanically disconnected

Information for voltage output and 3-wire connection: the internal consumption of the sensor of about 15...25 mA causes a voltage drop on the supply lines. If the measuring signal is taken from terminal 4 / terminal 6 to the connecting point at the power supply (three-wire circuit), then an additional measuring error is incurred, dependant upon the circuit length. A 4-wire connection is recommended.

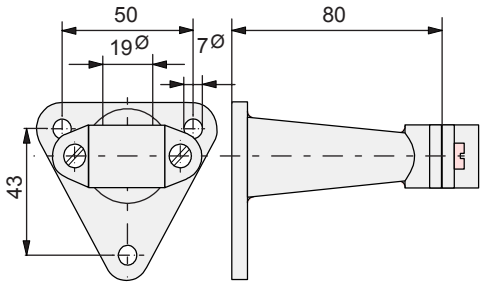
Dimensions diagram



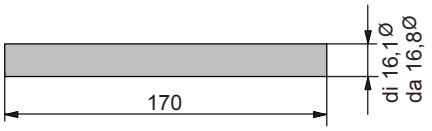
Accessories

Canvas blind for exterior assembly without solar cell Item No. 20.024
with solar cell Item No. 20.025

Console for wall mounting Item No. 20.009

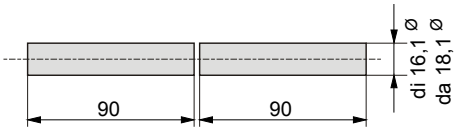


Gauze protector Item No. 20.014
recommended for air speeds between 8 and 15 m/s

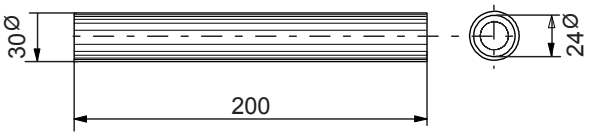


Ventilated sensor tube
for improved air flow
Item No. 20.022

PTFE filter, two-part, Item No. 23.063
recommended for extreme operating conditions



Protector tube for external mounting
without ventilating fan, Item No. 20.011



Important The air's capacity to absorb water is influenced among other factors by the temperature. This is a physical law (identified in the *hx* diagram of Mollier). The higher the air temperature, the larger the amount of steam that can be absorbed up to saturation point (100%rh). If a sensor is calibrated under varying air temperature conditions, the result is an irregular, unhomogenous measuring medium which automatically gives calibration errors. The table below shows the influence of the air temperature on air humidity. If, for example, calibration occurs at an air temperature of 20ºC and 50%rh and a varying temperature range of only +/-1 ºK, this results in a variation in humidity of the measuring medium (air) of +/-3.2%rh.

	10°C	20°C	30°C	50°C
10%rh	+/-0,7%rh	+/-0,6%rh	+/-0,6%rh	+/-0,5%rh
50%rh	+/-3,5%rh	+/-3,2%rh	+/-3,0%rh	+/-2,6%rh
90%rh	+/-6,3%rh	+/-5,7%rh	+/-5,4%rh	+/-4,6%rh

Physical influence of air temperature on air humidity

Calibration

Equipment with Galltec sensors is correctly set by the factory at a room temperature of 23°C and 50% rel. humidity, relative to the average air pressure of 430m NN.
If, however, subsequent adjustment should be necessary, the following procedure should be observed.

- Ensure that the ambient humidity and the ambient temperature are constant.
- If possible, use a psychrometer for checking (no checking equipment with capacitive sensors).
- Leave the equipment to be checked for at least *1 hour in a* **constant** *checking climate.*
- All Galltec sensors are equipped with an adjustment facility. In most cases this is an adjuster screw fixed with screw securing lacquer. After removing the lacquer, the adjuster screw can be moved in the area of ±2.0%rh. Never make a readjustment several times in the same direction; this could have a cumulative effect.
  After calibration, the adjuster screw should again be secured.

Maintenance - Instructions for use - Effect of pollutants

The measuring element is maintenance-free in pure ambient air. Depending on their type and concentration, aggressive media containing solvents can cause incorrect readings or cause the humidistat to fail. Direct sunlight should be avoided. Substances deposited on the measuring element (e. g. resin aerosols, paint aerosols, smoke deposits etc.) are harmful as they eventually form a water-repellent film. The water-resistant property of the Galltec measuring elements allows cleaning to be carried out in water. Solvents cannot be used for this purpose. A light-duty detergent is recommended, but any residue should always be washed out thoroughly. A special process ensures that Galltec sensors have good long-term stability. Regeneration is not necessary, but is also not harmful.
The temperature coefficient as well as the self-heating of the electronic may vary according to the location and the application (especially with sensors where electronic and measuring system are integrated in one housing).

NOTE
Contact with the inner parts of the humidistat nullifies the warranty.

Guide to installation

Interference is often to be encountered during installation. The correct installation procedure can prevent interference to a very large extent. However, some ground rules should be observed.
To avoid interference, suppression should be carried out in accordance with VDE 0875 and VDE 0874 (*VDE* - this is assumed to be the *Vorschriftenwerk Deutscher Elektrotechniker* - regulations governing German electrical engineers*).*
Fundamentally, interference must be removed at its source, where suppressor material is most effective. Interference can, however, also result from electromagnetic fields via signalling lines. The EMV law determines the corresponding protective measures. All Jumo equipment is designed in accordance with European standards EN 61326. In addition, further protective measures must be observed.

Unavoidable sources of interference should be kept at a good distance from the control systems.

Data and signalling lines should not be used in parallel with control, networking and power lines.

For data and signalling lines, shielded cable should be used, and the shielding must be applied to the earth terminal. Ensure that earth circuits and fault currents do not arise as a result of a second earth connection.

For equipment with a network connection, it is recommended that a separate network circuit be used.

During the switch process, electrical power consumers such as switch contactors, magnetic valves etc. produce induction voltages that can cause interference. In the trade there is an abundance of protective and suppressor component parts that are most effective when applied directly to the source of the trouble. A suitable suppressor has the added advantage that components such as relays, microswitches etc. have a longer service life.

Further difficulties during installation can arise if signalling lines are joined together with common lines. It is essential to check whether this is permissible. Interference is particularly likely when installing using equipment of different makes. Here, too, the trade offers isolating amplifiers that overcome the problem.

Humidity Sensor type FG120

and combined

Humidity-Temperature Sensor type TFG120

with Polyga® humidity measuring element for the measurement of relative air humidity and temperature for rooms

FG120...
TFG120...

Type overview

passive sensors

FG120	**Humidity Sensor** with resistance output up to 10kOhms
TFG120	**Humidity-temperature Sensor** with resistance output up to 10kOhms

Description of the sensor :

The Polyga® humidity measuring element consists of several synthetic fabric bands each with 90 individual fibres with a diameter of 3 µm each. In their untreated state, the synthetic fibres are not hygroscopic - their hygroscopic properties are acquired by means of a special process which allows the synthetic fibres to absorb moisture. The molecular structure of the individual fibres is arranged lengthways. When water is absorbed, the molecular chains alter, the outward result being a change in length. A loss of water has a converse effect on the fibre. If the fibre is in equilibrium with the air humidity, there is neither absorption nor a loss of water. The length at this point serves as a gauge for the relative humidity.
If the measuring element is exposed to an air humidity of 100%rh, a film of water forms on the surface of the element (dew point). The physical effect is one as if the measuring element had been immersed in water. The measuring element is saturated. An ideal fixed point is thus attained for adjusting or controlling the sensors. The measuring element is waterresistant. Once administered to the Galltec measuring element, the hygroscopic properties remain stable, the sensitivity remaining until it becomes destroyed by extraneous influences. Regeneration as with fine-measuring elements is not necessary, but does not cause any harm.

Design of the sensor

The expanding action (predominantly lengthways) of the fibres is picked up by means of an electronic sensing system and converted by a potentiometer into a resistance signal.
The fan-shaped measuring element is protected in the housing. The sensors are designed for pressureless systems.
The unit should be installed in a location where condensation cannot enter into the housing. The mounting position is optional, preferably with ventilation slots at right angles to direction of airflow.

The TFG120 sensors have built-in temperature sensors (mainly Pt100) for simultaneous measurement of temperature.

Mounting instructions

The room sensor should be mounted on a vertical wall about 1.5m above the floor. Ensure that the housing can not be deformed because of rough walls. Do not fit above radiators, near windows or doors, on areas exposed to intense vibration or direct sunlight, exterior walls or chimneys. Under no circumstances must the sensors be mounted into a wall or niche. The sensors should be protected from dripping water or splashes.
Ensure that no external air can flow into the interior of the housing via the concealed cable lead. Do not use a silicon sealing compound to seal the cable lead.
The sensors should be mounted such that air in the room can flow upwards unimpeded through the ventilation slots in the housing cover.

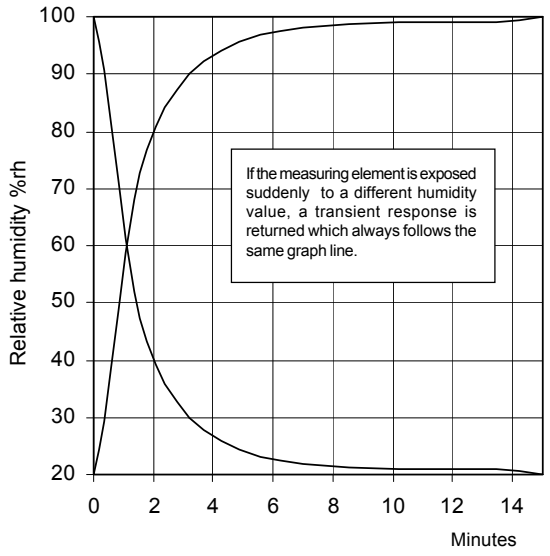
Ageing

In order to maintain their long-term stability, it is important that the measuring elements undergo a special ageing process, details of which cannot be given here.

Reaction of the sensor

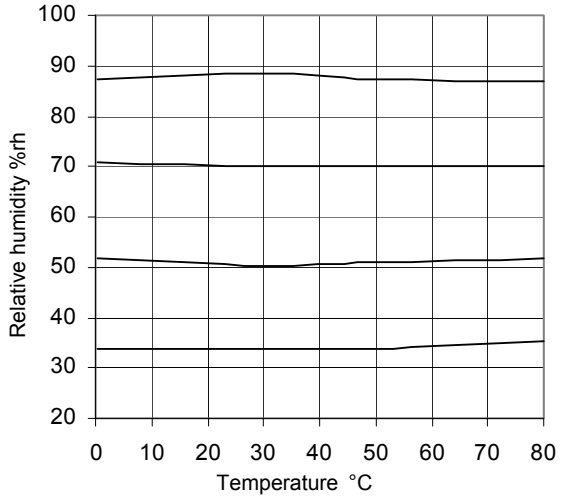
Due to the law of diffusion, there is a time delay before the fibres are saturated during water absorption. This is a decisive factor when determining the reaction time. Thus, for one individual fibre with a diameter of 3 µm, a short saturation time (several seconds) can be measured. Empirical investigations show that bundled or woven fibres, as are used here in the Galltec sensor, give rise to a longer period prior to saturation. This is because the individual fibres impede each other during water absorption and/or water loss, and the ensuing humidity does not register until later. Measurements have shown that, at a wind speed of 2m / sec. the half-life period is 1.2 mins. This represents an effective period of approx. 30 - 40 mins.

Half-life period



Transient response of the measuring element between 20 and 100%rh

Thermal behaviour



50º C is given as the maximum temperature value. Higher temperatures can only be tolerated for a short period of time. The eventual result is a change in the molecular structure which causes a constant error. The maximum temperature of 50º C only applies, however, if no harmful substances (acids, solvents etc.) are present in the medium.

The temperature coefficient as well as the self-heating may vary according to the location and the application (especially with sensors where electronic and measuring system are integrated in one housing).

Technical Data

Physical data

humidity measuring range ..... 0...100%rh
measuring accuracy
...>40%rh ..... ±2.5%rh
...<40%rh ...according to tolerance diagram
working range ..... 35...100%rh
temperature measuring accuracy ..... +/-0.5°C
working range ..... -10...+60°C
measuring medium ..... air, pressureless, non-aggressive
permissible ambient temperature ..... 0...50°C
mean temperature coefficient ..... -0.1%/K at 20ºC and 50%rh
adjustment ..... at average air pressure 430m NN
permissible air speed 15m/sec
half-life period at v=2m/sec.....1.2 min
fixing ..... slots in housing base
mounting position ..... optional, preferably with ventilation slots at right angles to direction of airflow
connecting terminals ..... for conductor cross sections 0.5mm²
cable connection.....by flush device box
EMC-tested ..... to EN 50 081-2, to EN 50 081-2
housing ..... impact resistant plastic, light grey
protective system IP20
weight ..... approx. 0.2 kg

Electrical data

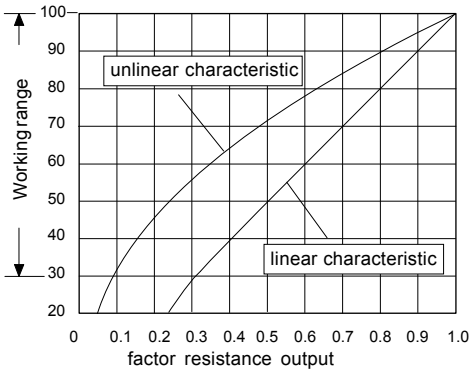
Humidity Output 1 ..... 0...100 ohms linear 2-wire
..... 0...200 ohms linear 2-wire
..... 0...1000 ohms linear 2-wire
..... 100...138.5 ohms linear 2-wire
.....5..100..5 ohms unlinear 3-wire
further resistance ranges on request
permissible load ..... 1.0 watt
max. voltage 42V
insulation resistance ..... 10 Mohms

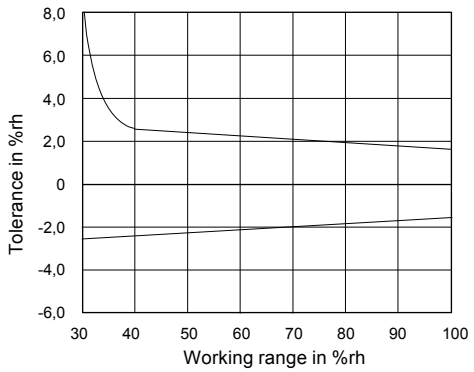
(only for TFG120)
Temperature Output 2 ..... Pt100 ref. DIN EN 60751
permissible load for air 1m/sec and t=0.1K ..... 2 mA

Overview of passive sensors

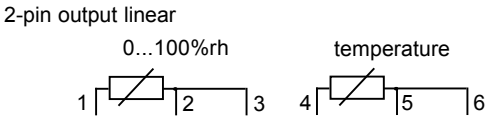
Type	Humidity		Temperature		power supply	wire-system	Item no.
	measuring range 1	output 1	measuring range 2	output 2			
FG120	0...100%rh	0...100 Ohm			max 42V	2wire	45010100
	0...100%rh	0...200 Ohm			max 42V	2wire	45010200
	0...100%rh	0...1000 Ohm			max 42V	2wire	45010300
	0...100%rh	100...138,5 Ohm			max 42V	2wire	45010400
	0...100%rh	50...30...50 Ohm			max 42V	3wire	45010500
	0...100%rh	5...100...5 Ohm			max 42V	3wire	45010600
TFG120	0...100%rh	0...100 Ohm	+5...+50°C	Pt100	max 42V	2wire	45700150
	0...100%rh	0...200 Ohm	+5...+50°C	Pt100	max 42V	2wire	45700250
	0...100%rh	0...1000 Ohm	+5...+50°C	Pt100	max 42V	2wire	45700350
	0...100%rh	100...138,5 Ohm	+5...+50°C	Pt100	max 42V	2wire	45700450
	0...100%rh	5...100...5 Ohm	+5...+50°C	Pt100	max 42V	3wire	45700650

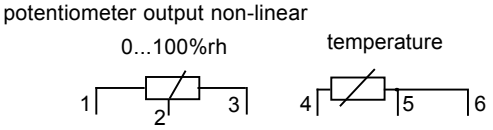
Humidity and tolerance diagram



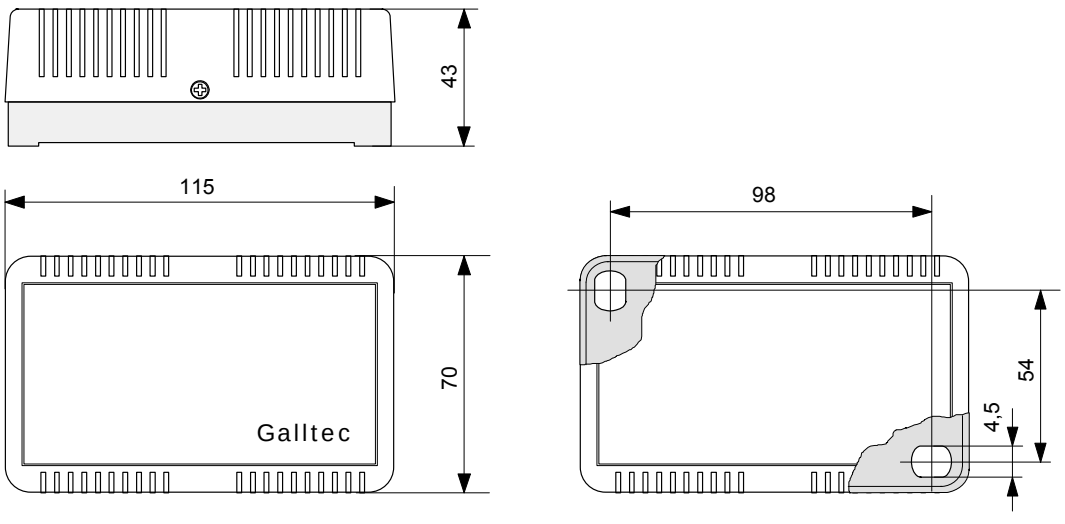


Connection diagram for passive sensors with resistance output





Dimensions diagram



Humidity Sensor FK80J
and

Humidity-Temperature Sensor TFK80J
with capacitive measuring element
with current or voltage output,
0...20mA / 0...10VDC or 4...20mA to determine relative air humidity and temperature, duct version

Technical Data

measuring range **humidity** ..... 0..100%rh
measuring element ..... capacitive FE09
accuracy at 23°C (73,4°F) ..... ±2.0%rh (40...60%rh)
at 23°C (73,4°F) ..... ±2.5%rh (otherwise)
includes linearity and repeatability
influence of temperature ..... < 0.15%rh per K
working range ..... 5...95%rh
measuring medium ..... air, pressureless, non-aggressive
Response time (at calm air) ..... < 20 s
output **humidity** .....0...10V or 0...20mA (4wire)
..... or 4...20mA (2wire)
measuring range **temperature**
.....0...+50°C,-10...90°C[1],-30...60°C,0...100°C[1]
measuring element ..... Pt100 class B
accuracy at 0...10V ..... ±0.2 K ±0.36 °F
at (0)4...20mA ..... ±0.3 K ±0.54 °F
working range ..... -30...+80°C (-22...176°F)
output **temperature** .....0...10V or 0...20mA (4wire)
..... or 4...20mA (2wire)
0ther temperature outputs
NTC; PTC; KTY; LMx35; Pt100; Pt1000; Ni1000; AD592; LM34; BALKO 1kΩ; SILICON 2kΩ;
SEMICONDUCTOR 559 mVDC @23°C (75°F)
Thermistors @ 25°C (77°F) 1,8kΩ; 2,252kΩ; 3kΩ; 5kΩ; 10kΩ; 1,8kΩ (Type II; III, CSI); 20kΩ; 100kΩ

power supply ..... 15..30V DC / 24VAC± 10%
electromagnetic compatibility EMC
resistance to interference ..... EN 50 082-2
interference emission ..... EN 50 081-2
max. load ..... $R_L(\Omega) = \frac{\text{supply - 10 VDC}}{\text{0.02 amps}}$
(current output only)
min load (voltage output only) ..... 10 kΩ
power consumption ..... < 5 mA
permissible ambient temperature ..... -40...+80°C (-40...176°F)
at the housing ..... -10....+60°C (14...140°F)
admitted air speed ..... 15 m/sec (50 ft/sec)
Minimum air speed (across the sensor):
output 0...10V, 2x 0...1V ..... ≥0.5m/s
4...20mA, 2x 0...10V ..... ≥1m/s
2x 4...20mA ..... ≥1.5m/s
probe length ..... 200mm (7,87")
probe material ..... aluminium, electrolytically oxidized
for channel mounting ..... perforation in the case
mounting position ..... as you like
contacting ..... connecting terminals in the housing
connecting terminal conductor cross sections
..... 1.5mm² (0,023"²)
housing ..... polystyrol-ABS
protective system IP64
weight ..... approx. 0.3 kg (0.6 lbs)

[1] please observe working range

Description of the sensors

The sensors FK80J (humidity only) / TFK80J (humidity and temperature) measure the air humidity by means of a humidiy-dependant condenser. The capacitive humidity measuring element, produced using thinfilm technology, consists of a base plate, on which the electrodes are housed and a hygroscopic polymer layer avove it. The hygroscopic polymer layer absorbs water molecules from the medium to be measured (air) or releases them, thereby altering the capacity of the condenser. In a tandem-arranged electronic device, the change in capacity is processed via integrated signal preprocessing into signals–**0..20mA or 0..10VDC or 4..20mA.**
The measuring element is protected by a protective guard. The sensors are designed for pressureless systems - the measuring medium is non-corrosive air.

The TFK80J sensors also contain a semi-conductor temperature sensor for simultaneous temperature measurement. Its measured values are likewise converted into standardised signals **0..20mA or 0..10VDC or 4..20mA**

The temperature coefficient as well as the self-heating of the electronic may vary according to the location and the application (especially with sensors where electronic and measuring system are integrated in one housing.

Maintenance - Application instructions - Influence of dirt

In a clean environment, the measuring element is maintenance-free. Depending on their type and concentration, aggressive media containing solvents can cause incorrect readings or cause the sensor to fail. Direct sunlight should be avoided. Substances deposited on the sensor element (e. g. resin aerosols, paint aerosols, smoke deposits etc.) are harmful as they eventually form a water-repellent film (this applies to all humidity sensors with hygroscopic measuring elements).

Please consult "***application instructions for the sensing elements"*** (product info sheet no. A 1) or check with the manufacturer for further information which you need to bear in mind when using humidity sensors with capacitive sensing elements.

Overview of *capacitive* sensors power supply 15...30V DC (24V AC ±10 %)

FK80J DC-Version	0...100%rh	0...10V DC			15...30V DC / 24 V AC	3/4 wire	**58014700**
	0...100%rh	4...20 mA			15...30V DC	2 wire	**58014800**
	0...100%rh	0...20 mA			15...30V DC	3/4 wire	**58013000**
TFK80J	0...100%rh	0...10V DC	-30...+60°C	0...10V DC	15...30V DC / 24 V AC	3/4 wire	**58574747**
	0...100%rh	0...10V DC	0...100°C*	0...10V DC	15...30V DC / 24 V AC	3/4 wire	**58544747**
	0...100%rh	0...10V DC	0...+50°C	0...10V DC	15...30V DC / 24 V AC	3/4 wire	58524747
	0...100%rh	0...10V DC	-10...+90°C	0...10V DC	15...30V DC / 24 V AC	3/4 wire	58624747
	0...100%rh	4...20mA	0...50°C	4...20mA	15...30V DC	2wire	**58524848**
	0...100%rh	4...20mA	-30...+60°C	4...20mA	15...30V DC	2wire	**58574848**
	0...100%rh	4...20mA	-20...+80°C	4...20mA	15...30V DC	2wire	**58264848**
	0...100%rh	4...20mA	-10...+90°C	4...20mA	15...30V DC	2wire	58624848
	0...100%rh	4...20mA	0...100°C*	4...20mA	15...30V DC	2wire	58544848
	0...100%rh	0...20mA	0...+50°C	0...20mA	15...30V DC	3/4 wire	**58523030**
	0...100%rh	0...20mA	-10...+90°C**	0...20mA	15...30V DC	3/4 wire	**58623030**
	0...100%rh	0...20mA	-30...+60°C	0...20mA	15...30V DC	3/4wire	58573030
	0...100%rh	0...20mA	0...100°C*	0...20mA	15...30V DC	3/4 wire	58543030
Speciality **FK80JPt100**		0...20 mA	Pt100	Resistance	15...30V DC	3/4 wire	58703050
		0...10V DC	Pt100	Resistance	15...30V DC	3/4 wire	58704650
		4...20 mA	Pt100	Resistance	15...30V DC	2wire	58704850

Overview of *capacitive* sensors power supply 24V AC ±10 %

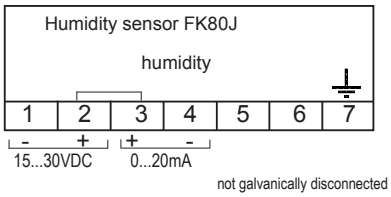
FK80J AC-version	0...100%rh	0...10V DC			15...30V DC / 24 V AC	3/4 wire	**58014700**
	0...100%rh	0...20 mA			24 V AC	4 wire	58014200
TFK80J	0...100%rh	0...10V DC	0...+50°C	0...10V DC	15...30V DC / 24 V AC	3/4 wire	58524747
	0...100%rh	0...10V DC	-30...+60°C	0...10V DC	15...30V DC / 24 V AC	3/4 wire	**58574747**
	0...100%rh	0...10V DC	-10...+90°C	0...10V DC	15...30V DC / 24 V AC	3/4 wire	58624747
	0...100%rh	0...10V DC	0...100°C*	0...10V DC	15...30V DC / 24 V AC	3/4 wire	**58544747**
	0...100%rh	0...20mA	0...+50°C	0...20mA	24 V AC	4 wire	58524242
	0...100%rh	0...20mA	-30...+60°C	0...20mA	24 V AC	4 wire	58574242
	0...100%rh	0...20mA	-10...+90°C	0...20mA	24 V AC	4 wire	58624242
	0...100%rh	0...20mA	0...100°C*	0...20mA	24 V AC	4 wire	58544242

* observe max. temperature range ** suitable for EDJ controller

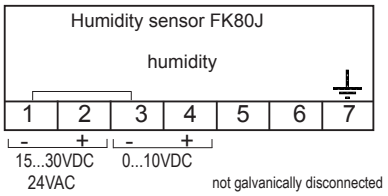
Connection diagram

EMC-information: use shielded signalling lines and earth the shielding!

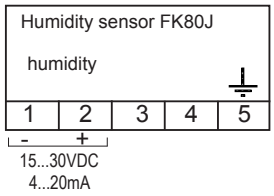
3/4-wire system

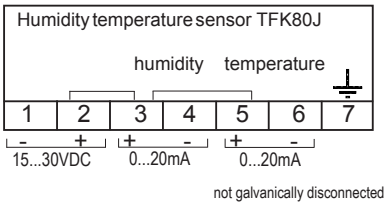


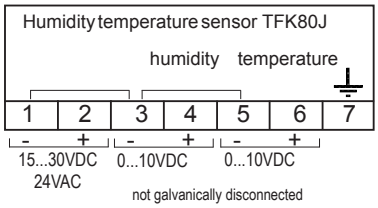
3/4-wire system

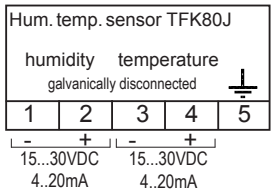


2-wire system

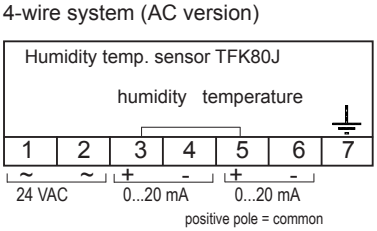




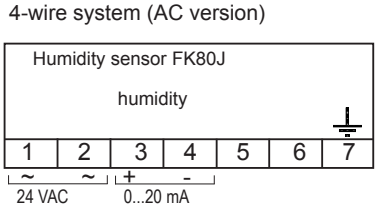




4-wire system (AC version)

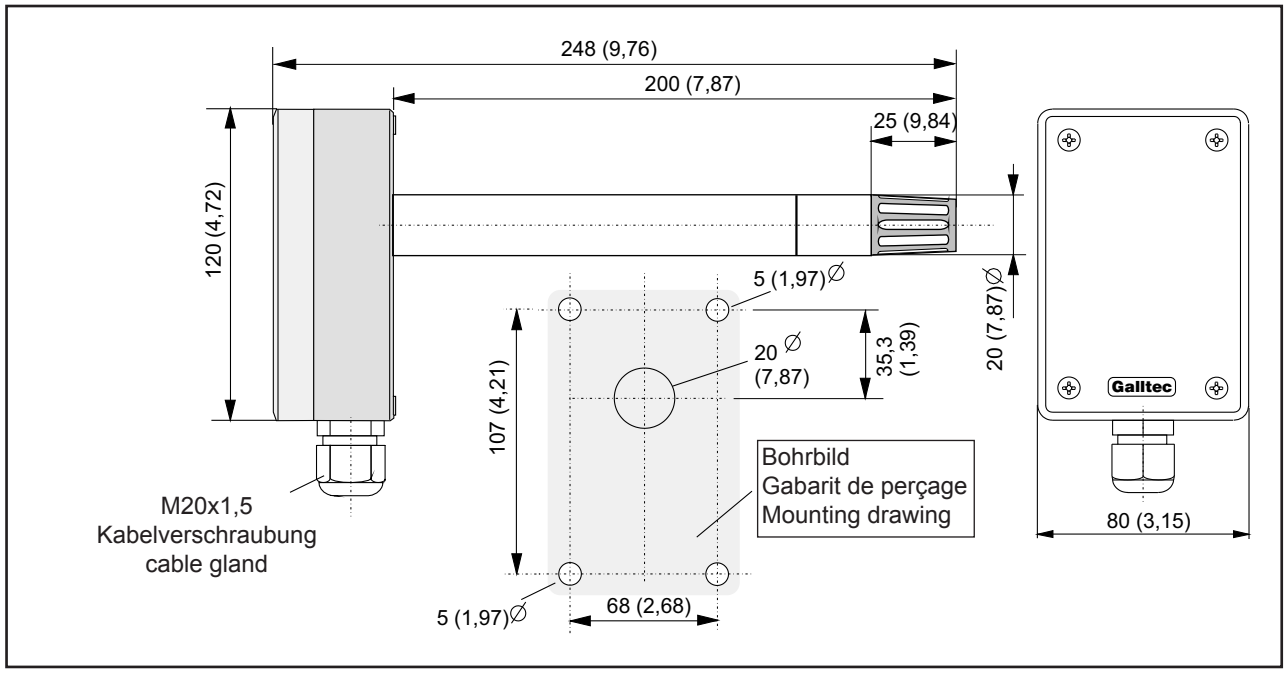


4-wire system (AC version)

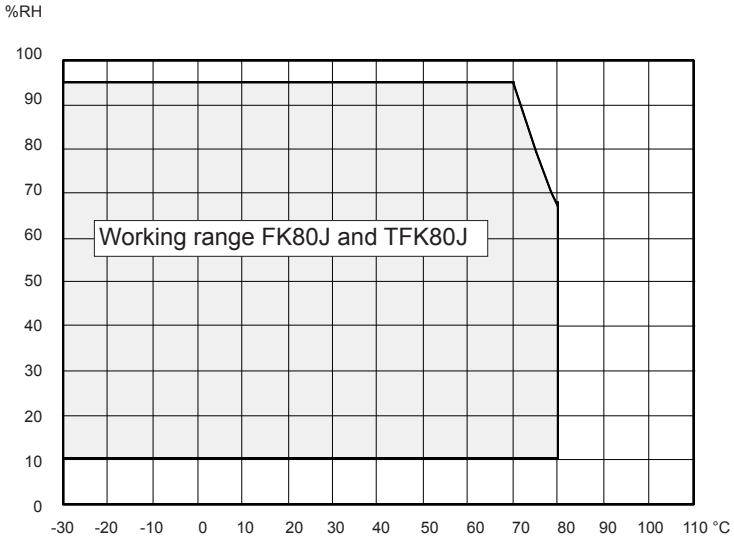


⚠ The electrical connection must only be carried out by properly qualified personnel.

Dimensions diagram



Working range



Cleaning instruction

The surface of the measuring element must not be touched.

To clean the measuring element, its surface can be rinsed, however should only be moistened with water drops; immersing into distilled water is possible

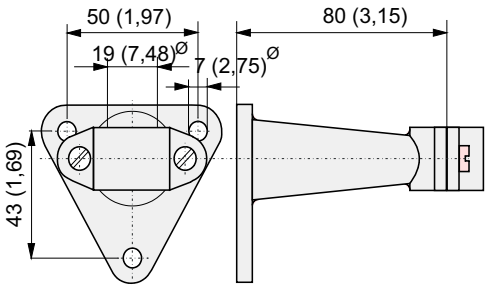
Correct measuring values will be regained as soon as the measuring element has been dried completely. Dry dust can simply be blown off the measuring element. Don't use compressed air for this purpose.

Contact with the inner parts nullifies the guarantee.

Accessories

Ventilated sensor tube
for improved air flow
item no. 20.022

Console for wall mounting item no. 20.009



Checking calibration

It is possible to use sensor checks in order to test the humidity sensors from time to time for accuracy. The physical process is described in detail in **DIN 50 008, IEC Publikation 260, ISO/R 483-1966**. In the air space above an aqueous saturated saline solutaion an ambient climate is formed whose air humidity is dependant on the water vapour pressure of the saline solution.
The Galltec+Mela sensor checks are designed so that a foil permeable to vapour is positioned between the saline solution and the air space (space in which the measuring element is located). This makes carrying out the sensor checks a very straightforward procedure as follows:

Remove the protective cap of the sensor check while opening the PG screw and introduce the sensor duct up to the mark. Tie the sensor in the PG screw. Please make sure that the sensor check is well tight and air-sealed while caring out your measurement. If you are using a sensor with a "Polyga" measuring element, ensure particularly that the lid of the sensor is well tight and that the cable duct is well sealed.

Sensor check **33%rh**

°C	5	10	15	20	25	30
%rh	34	34	34	33	33	33

Screw the check firmly onto the humidity sensor. Wait for 2 hours. Ensure that the temperature is kept constant. Take humidity reading according to temperature.

Sensor check **55%rh**

°C	5	10	15	20	25	30
%rh	58	57	56	55	53	52

Screw the check firmly onto the humidity sensor. Wait for 2 hours. Ensure that the temperature is kept constant. Take humidity reading according to temperature.

Sensor check **76%rh**

°C	5	10	15	20	25	30
%rh	76	76	76	76	76	75

Screw the check firmly onto the humidity sensor. Wait for 2 hours. Ensure that the temperature is kept constant. Take humidity reading according to temperature.

After a certain period of time, a constant humidity builds up between the saline solution and the air space in which the humidity measuring element is located. Depending on the type of saline solution and the sensor check, humidity values range from 33%RH to 98%RH. The standard values of the Galltec+Mela sensor checks are 33%RH, 55%RH, 76%RH and98%RH. We recommend a compensation period of about 2 hours. Please ensure that there are no major fluctuations in temperature during this period. Temperature fluctuations severely disturb the equilibrium.

The equilibrium moisture content is dependent on the temperature - according to the type of salt. The corresponding values are given in a correction table located on the sesnsor check.

It is important that you replace the sealing cap of the sensor check after use, otherwise the water of the saline solution will evaporate and the check will become unusable.

Guide to installation

Interference is often to be encountered during installation. The correct installation procedure can prevent interference to a very large extent. However, some ground rules should be observed.
To avoid interference, suppression should be carried out in accordance with VDE 0875 and VDE 0874
(*VDE* - this is assumed to be the *Vorschriftenwerk Deutscher Elektrotechniker* - regulations governing German electrical engineers*)*.
Fundamentally, interference must be removed at its source, where suppressor material is most effective. Interference can, however, also result from electromagnetic fields via signalling lines. The EMV law determines the corresponding protective measures. All Galltec+Mela equipment is designed in accordance with European standards EN 50081-2 and EN 50082-2 (for industrial locations). In addition, further protective measures must be observed.

Unavoidable sources of interference should be kept at a good distance from the control systems.

Data and signalling lines should not be used in parallel with control, networking and power lines.

For data and signalling lines, shielded cable should be used, and the shielding must be applied to the earth terminal. Ensure that earth circuits and fault currents do not arise as a result of a second earth connection.

For equipment with a network connection, it is recommended that a separate network circuit is used.

During the switch process, electrical power consumers such as switch contactors, magnetic valves etc. produce induction voltages that can cause interference. In the trade there is an abundance of protective and suppressor component parts that are most effective when applied directly to the source of the trouble. A suitable suppressor has the added advantage that components such as relays, microswitches etc. have a longer service life.

Further difficulties during installation can arise if signalling lines are joined together with common lines. It is essential to check whether this is permissible. Interference is particularly likely when installing using equipment of different makes. Here, too, the trade offers isolating amplifiers that overcome the problem.

FK120J for humidity
TFK120J for humidity and temperature

Humidity Sensor FK120J

with capacitive measuring element
with current or voltage output, to determine air humidity

Humidity-temperature Sensor TFK120J

with capacitive measuring element
with current or voltage output, to determine air humidity and temperature

Technical Data

measuring range **humidity** ..... 0...100%rh
working range ..... 10...95%rh
measuring accuracy ..... ±3.5 %rh
measuring medium..... air, pressureless, non-corrosive/condence
temperature coefficient ..... 0.05%/K at 20°C and 50%rh
adjustment ..... at average air pressure 430m NN
half-life period (v=2m/sec) ..... approx. 10 sec
output **humidity** .... 0...20mA or 0...10V 4-wire system
..... or 4...20mA 2-wire system
measuring range **temperature**
..... 0...+50°C, -10...90°C[1)], -30...60°C, 0...100°C[1)]
measuring accuracy ..... ±0.8 K
working range ..... -10...+60°C
output **temperature** .... 0...20mA or 0...10V 4 wire-system
..... or 4...20mA 2 wire-system
linearity tolerance ..... <0.5%
operating voltage ..... 15..24V DC / 24V AC
max. load for current output ..... 500 ohms
min. ballast resistance for voltage-output .....10 k ohms
internal consumption per measuring range (4-wire) .....15 mA
permissible ambient temperature ..... -10...60°C
permissible air speed .....15 m/sec.
fixing ..... slots in housing base for wall mounting
mounting position ..... preferably ventilation slots at right-angles to wind direction
contact ..... connecting terminals in the housing
connecting terminals .....
..... for conductor cross-sections 1.5mm^2
cable connection ..... simple shielding
EMC tested ..... to EN 50 081-2, EN 50 082-2
housing ..... impact resistant plastic, light grey
dimensions 115x70x43mm
protective system IP20
weight ..... ca 0.2 kg

1) please heed working range

Description of the sensor

The FK120J (humidity only) / TFK120J (humidity and temperature) sensor measures the air humidity by means of a humidity-dependant condenser. The capacitive humidity measuring element, produced using thin-film technology, consists of a base plate, on which the electrodes are housed, and a hygroscopic polymer layer above it. The hygroscopic polymer layer absorbs water molecules from the medium to be measured (air) or releases them, thereby altering the capacity of the condenser. In a tandem-arranged electronic device, the change in capacity is processed via integrated signal preprocessing into standardised signals **0...20mA** or **0...10VDC** or **4...20mA**.

The measuring element is protected in the housing. The sensors are designed for pressureless systems - the measuring medium is non-corrosive air.

The TFK120J sensors also contain a Pt100 resistance for simultaneous temperature measurement. Its measured values are likewise converted into stan-dardised signals **0...20mA** or **0...10VDC** or **4...20mA**.

Maintenance

In a clean environment, the measuring element is maintenance-free. Depending on their type and concentration, aggressive media containing solvents can cause incorrect readings or cause the sensor to fail. Direct sunlight should be avoided. Substances deposited on the sensor element (e. g. resin aerosols, paint aerosols, smoke deposits etc.) are harmful as they eventually form a water-repellent film.

Please consult "***application instructions for the sensing elements"*** (product info sheet no. A 1) or check with the manufacturer for further information which you need to bear in mind when using humidity sensors with capacitive sensing elements.

ATTENTION: Contact with the inner parts nullifies the guarantee.

Overview of *capacitive* sensors operating voltage = 15...24V DC and/or 24V AC

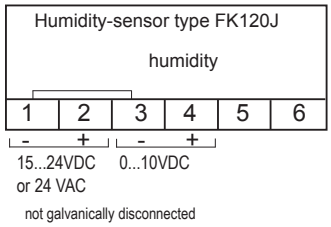
FK120J	0...100%rh	0...10V DC			15...24V DC 24V AC	3/4 wire	59014700
	0...100%rh	4...20 mA			15...24V DC	2 wire	59014800
TFK120J	0...100%rh	0...20 mA	0...+50°C	0...20 mA	15...24V DC	3/4 wire	59523030
	0...100%rh	0...10V DC	0...+50°C	0...10V DC	15...24V DC 24V AC	3/4 wire	59524747
	0...100%rh	4...20 mA	0...+50°C	4...20 mA	15...24V DC	2 wire	59524848
	0...100%rh	4...20 mA	-30...+60°C	4...20 mA	15...24V DC	2 wire	59574848
	0...100%rh	0...20 mA	0...+50°C	0...20 mA	24V AC	4 wire	59524242
	0...100%rh	0...20 mA	-30...+60°C	0...20 mA	24V AC	4 wire	59574242
	0...100%rh	0...20 mA	-10...+90°C	0...20 mA	24V AC	4 wire	59624242
	0...100%rh	0...20 mA	0...100°C	0...20 mA	24V AC	4 wire	59544242

* observe max. temperature range

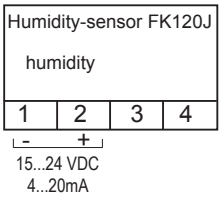
Connection diagram

EMC-information: use shielded signalling lines and earth the shielding!

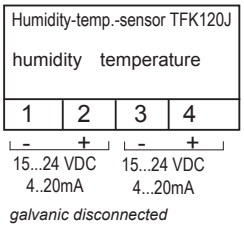
3/4-wire system



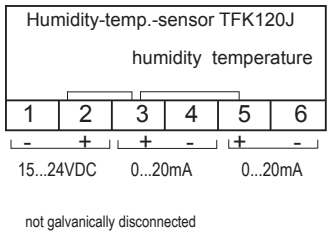
2-wire system



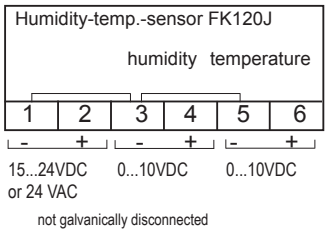
2-wire system



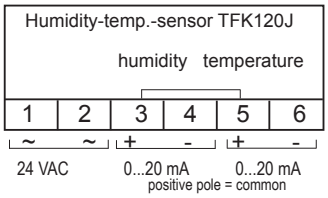
3/4-wire system



3/4-wire system

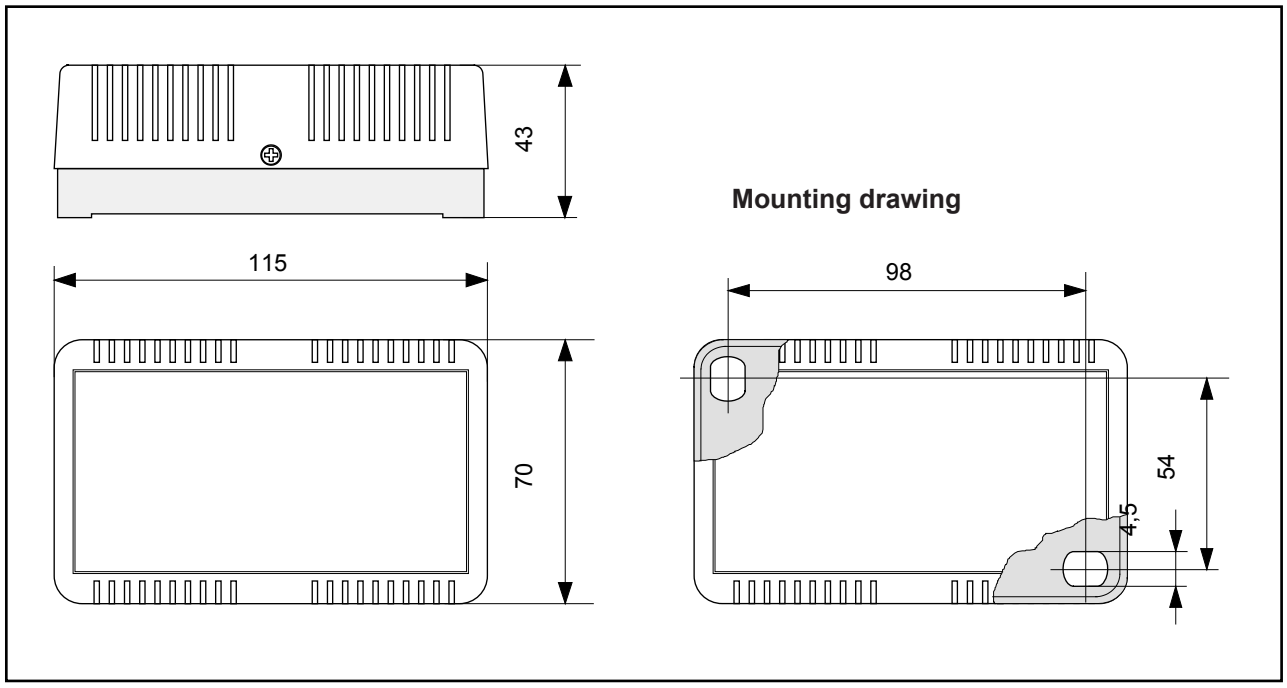


4-wire system (AC-version)



⚠ The electrical connection must only be carried out by properly qualified personnel.

Dimensions diagram



Mounting instructions
The room sensor should be mounted on a vertical wall about 1.5m above the floor.
Do not fit above radiators, near windows or doors, on areas exposed to intense vibration or direct sunlight, exterior walls or chimneys. Under no circumstances must the sensors be mounted into a wall or niche. The sensors should be protected from dripping water or splashes. Ensure that no air can flow into the interior of the housing via the concealed cable lead. Do not use a silicon sealing compound to seal the cable lead.
The sensors should be mounted such that air in the room can flow upwards unimpeded through the ventilation slots in the housing cover.

The temperature coefficient as well as the self-heating of the electronic may vary according to the location and the application (especially with sensors where electronic and measureing system are integrated in one housing.

Guide to installation
Interference is often to be encountered during installation. The correct installation procedure can prevent interference to a very large extent. However, some ground rules should be observed.
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(*VDE* - this is assumed to be the *Vorschriftenwerk Deutscher Elektrotechniker* - regulations governing German electrical engineers*).*
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For data and signalling lines, shielded cable should be used, and the shielding must be applied to the earth terminal. Ensure that earth circuits and fault currents do not arise as a result of a second earth connection.

For equipment with a network connection, it is recommended that a separate network circuit be used.

During the switch process, electrical power consumers such as switch contactors, magnetic valves etc. produce induction voltages that can cause interference. In the trade there is an abundance of protective and suppressor component parts that are most effective when applied directly to the source of the trouble.
A suitable suppressor has the added advantage that components such as relays, microswitches etc. have a longer service life.

Further difficulties during installation can arise if signalling lines are joined together with common lines. It is essential to check whether this is permissible. Interference is particularly likely when installing using equipment of different makes. Here, too, the trade offers isolating amplifiers that overcome the problem.

Humidity module type FM80H

with resistance output to determine relative air humidity, in built-in design.

Humidity-Temperature module type TFM80H

with resistance output to determine relative air humidity and temperature, in built-in design.

FM80H
TFM80H

Description of the module

The humidity measuring element, produced by Galltec under the name Polyga®, consists of several synthetic fabric bands each with 90 individual fibres with a diameter of 3 µm. A special process gives the fibre hygroscopic properties. The measuring element absorbs and desorbs humidity. The swelling effect, which is predominantly in a lengthways direction, is sensed by means of a suitable fine loop resistor. The coil and slide contact of the fine loop resistor consist of a gold wire alloy. Minimum contact resistance and safe contact are guaranteed.
The fan shaped measuring element is protected by a perforated sensor tube. The modules are designed for pressureless systems. Pt100 resistance temperature sensors are mounted in the TFM80H module for simultaneous temperature acquisition. Other temperature measuring systems can be supplied on request.

Technical Data

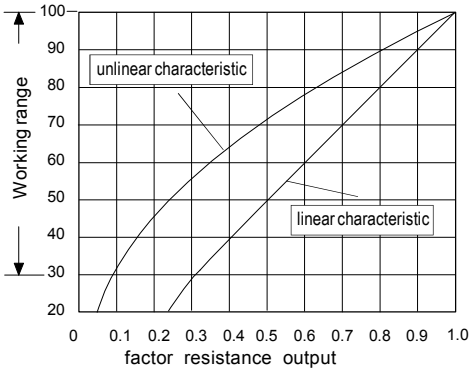
humidity measuring range ..... 0...100%rh
measuring accuracy
... >40%rh ..... ±2.5%rh
... <40%rh ... according to tolerance diagram
working range ..... 30...100%rh
temperature working range ..... -30...+80°C
measuring accuracy ..... ±0.5°C
measuring medium ..... air, pressureless, not aggressive
permissible ambient temperature
at the case ..... 0...50°C
at the probe ..... -40...+80°C
medium temp. coefficient ..... -0,1%/K at 20°C and 50%rh
adjustment ..... at average air pressure 430m NN
permissible air speed 8m/sec
with protective gauze (ord.no. 20.014) 15m/sec
t_{05} at v=2m/sec 1.2min
probe length; probe material ..... 220mm; highgrade steel
position ..... probe vertically downwards or horizontally
connecting terminal ..... for conductor cross section 0.5mm²
electromagnetic compatibility EMC
immunity ..... to EN 50 082-2
emission ..... to EN 50 081-2
protective system IP00
weight (approx.) ..... 0.6 kg
humidity output 1 ..... 0...100 ohms linear 2-wire
..... 0...200 ohms linear 2-wire
..... 0...200 ohms linear 2-wire
..... 0...1000 ohms linear 2-wire
..... 100...138.5 ohms linear 2-wire
..... 5..100..5 ohms nonlinear 3-wire
further resistance ranges on request
permissible load ..... 1.0 Watt
max. voltage ..... 42 V
insulation resistance ..... 10 MOhms
temperature output 2 (TFG80H)...Pt100 in acc. with DIN EN 60751
permissible load for air 1m/sec and t=0,1K ..... 2 mA
"subject to technical modifications"

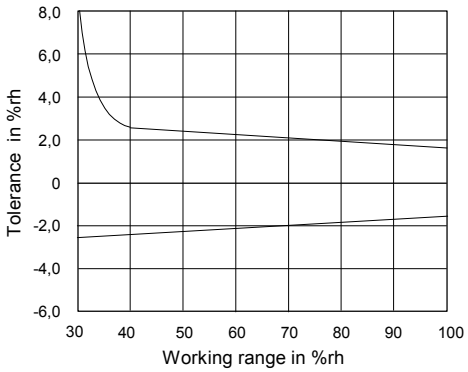
Maintenance

The measuring element is maintenance free when the surrounding air is clean. Agents that are corrosive and contain solvents, depending upon the type and concentration of the agent, can result in faulty measurements and cause the measuring element to break down. Substances deposited on the sensor are damaging as they eventually form a water-repellent film (this applies to all humidity sensors with hygroscopic measuring elements). Such substances are resin aerosols, lacquer aerosols, smoke deposits etc. The water-resistant property of the Galltec sensors allows for cleaning using water. Solvents cannot be used for this purpose. A light-duty detergent is recommended. Any detergent residue should, however, always be thoroughly washed out.
A special process ensures that Galltec sensors have good long-term stability. Regeneration is not necessary, but is also not harmful.

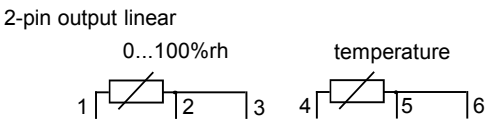
ATTENTION: No warranty will be guaranteed when inner parts of the device have been handled.

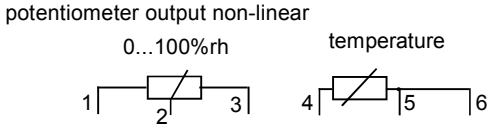
Humidity and tolerance diagram





Connection diagram for passive sensors with resistance output

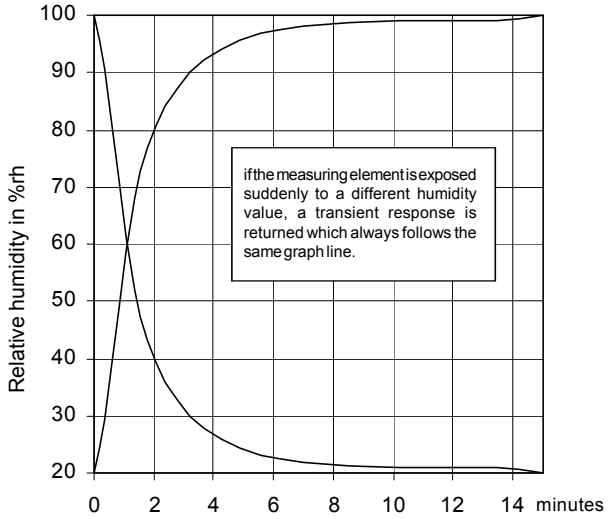




Reaction of the sensor

Due to the law of diffusion, there is a time delay before the fibres are saturated during water absorption. This is a decisive factor when determining the reaction time. Thus, for one individual fibre with a diameter of 3 µm, a short saturation time (several seconds) can be measured. Empirical investigations show that bundled or woven fibres, as are used here in the Galltec sensor, give rise to a longer period prior to saturation. This is because the individual fibres impede each other during water absorption and/or water loss, and the ensuing humidity does not register until later. Measurements have shown that, at a wind speed of 2m / sec. the half-life period is 1.2 mins. This represents an effective period of approx. 30 - 40 mins.

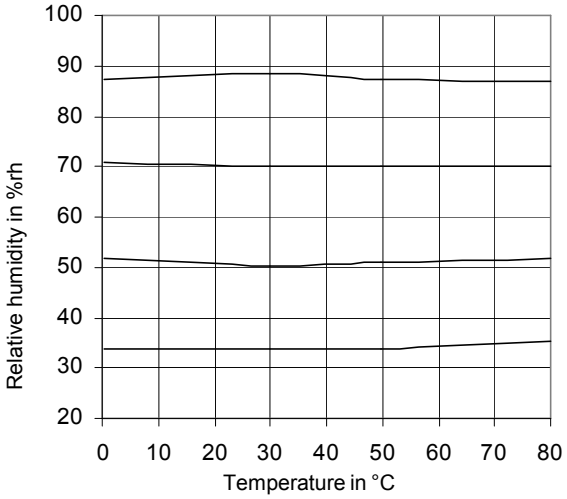
Half-life period



Transient response of the measuring element between 20 and 100% rh.

Thermal behaviour

The average deviation of temperature behaviour is 4%rh. the sensors are adjustd at 23°C. The following chart shows the temperature behaviour of the Polyga® measuring elements.



80º C is given as the maximum temperature value. Higher temperatures can only be tolerated for a short period of time. The eventual result is a change in the molecular structure which causes a constant error. The maximum temperature of 80º C only applies, however, if no harmful substances (acids, solvents etc.) are present in the medium.

Ageing

In order to maintain their long-term stability, it is important that the measuring elements undergo a special ageing process, details of which cannot be given here.

Product info sheet
Hygro-Modul HM80

with one changeover contact, scale range 30...100%rh, IP00

Application

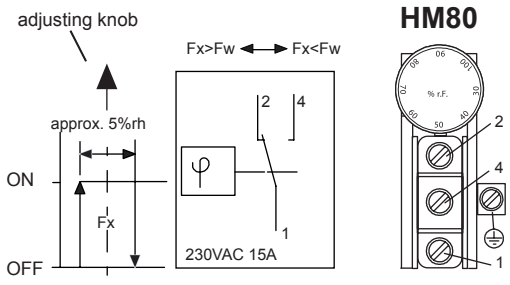
The hygro module HM80 is a humidity-dependent switch that can be fitted in equipment such as hygrostats, humidifiers, dehumidifiers, ventilating fans, driers and many more. The module represents an on-off controller with changeover contact. The switch connection is via a connecting terminal, but can also be supplied ready-made with cable connections. Several versions of different lengths are available as a shaft. Protection of the module is of the IP00 type.

Description of the Hygrostat

The humidity measuring element, produced by Galltec under the name Polyga®, consists of several synthetic fabric bands each with 90 individual fibres with a diameter of 3µm. A special process gives the fibre hygroscopic properties. The measuring element adsorbs and desorbs humidity. The swelling effect, which is predominantly in a lengthways direction, is carried via a suitable lever system to a microswitch with an extremely small switching path. The measuring element reacts quickly and precisely to the change in air humidity. By adjusting the setpoint value control knob, the lever system is engaged so that when the set air humidity is reached the microswitch is activated.

The fan shaped measuring element is protected by a perforated sensor tube. The hygro module is designed for pressureless systems. The mounting position should be chosen such that condensed water cannot get onto the microswitch.

Connection diagram



The electrical connection must only be carried out by properly qualified personnel

Fx actual value of the relative humidity
Fw setpoint value of the rel. humidiy set at the adjusting knob

If the rel. humidity Fx (actual value) falls below the setpoint value Fw, contact 1/2 opens and contact 1/4 closes.

Technical Data

scale range ..... 30..100%rh
measuring accuracy for measuring range > 50%rh ..... ±3.5%rh
for measuring range < 50%rh ..... ±4%rh
range of operation ..... 35...95%rh
measuring medium ..... air, pressureless, non-aggressive
switching difference (microswitch) ref. to 50%rh.. approx. 4%rh
switching distance between the microswitches
for HM80-2 ..... 0...+15%rh
breaking capacity of the changeover contact
ohmic load (cos φ=1) .....15A AC 230V
inductive load (cos φ=0,7) ..... 2A AC 230V
direct voltage ..... 0.25A DC 230V
low voltage .....100mA, 125V AC
contact material ..... silver
allowable storage temperature ..... -30...60°C
allowable operating temperature ..... 0...60°C
medium temp. coefficient ..... -0.2%/K relative to 20°C and 50%rh
adjustment ..... at average air pressure 430 m NN
allowable air speed 8m/sec
with gauze protection (order no. 20.014) 15m/sec
time constant T_{63} at v=2m/sec 120sec
sensor length, material ..... 220mm, high-grade steel
connecting terminals ..... for conductor cross sections 1.5mm²
cable connection ..... via twist nipple M20x1.5

applied directives / standards
low-voltage directive 2014/35/EU
EMC directive 2014/30/EU
DIN EN 60730-1:2012-10
DIN EN 60730-2-13:2008-09

type of protection (external adjusting knob) IP00
measuring element .....
..... Polyga®-measuring element, water resistent, washable
weight ..... approx. 0.25 kg

Operating instructions for channel hygrostat HM80 and HM80-2

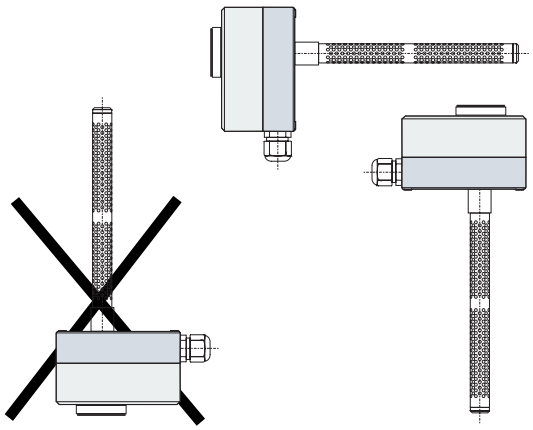
Mounting

- The hygrostats must not come into direct contact with water (e.g. splashed water when cleaning the climatic chamber etc.)
- The mounting location should be chosen so that a representative measurement of the air humidity can be guaranteed, i.e. the humidity readings at the mounting location should correspond to those in the room as far as possible.
- The hygrostat should be exposed to the flow of air.

Operating information:
Note that, with restrictions in the upper range of operation, the possible tolerances (measurement accuracy, switching difference and temperature coefficient) should be observed when adjusting the switch point.

Preferred mounting positions

Condensed water must not get into the housing interior.



Maintenance

The measuring element is maintenance-free in pure ambient air. Depending on their type and concentration, aggressive media containing solvents can cause incorrect readings or cause the humidistat to fail. Substances deposited on the measuring element (e.g. resin aerosols, paint aerosols, smoke deposits etc.) are harmful as they eventually form a water-repellent film. The water-resistant property of the Galltec measuring elements allows cleaning to be carried out in water. Solvents cannot be used for this purpose. A light-duty detergent is recommended, but any residue should always be washed out thoroughly.
A special process ensures that Galltec sensors have good long-term stability. Regeneration is not necessary, but is also not harmful.

Contact with the inner parts of the humidistat nullifies the warranty.

Calibration

Equipment with Galltec hygrostats is correctly set by the factory at a room temperature of 23°C and 50% rel. humidity, relative to the average air pressure of 430m NN.

If, however, subsequent adjustment should be necessary, the following procedure should be observed.

- Ensure that the ambient humidity and the ambient temperature are constant.
- If possible, use a psychrometer for checking (no chekking equipment with capacitive sensors).
- Leave the equipment to be checked for at least *1 hour in a* **constant** *checking climate.*
- The adjuster screw is at the end of the sensor - fixed with screw securing lacquer. After removing the lacquer, the adjuster screw can be moved. A right-hand rotation means that the measured value goes down, and with a left-hand rotation the measured value goes up. After calibration, the adjuster screw should again be secured.

Note:
Moving the adjuster screw nullifies the guarantee.

Important. The water absorption capacity of the air is influenced, amongst other things, by the temperature. This is a physical law (which can be seen from the hx diagram of Mollier). The higher the air temperature, the greater the volume of water vapour that can absorbed up to saturation point (100%rh). If a hygrostat is now calibrated at fluctuating air temperature, there is an irregular, non-homogeneous measured medium and there are automatically calibration errors. The table below shows the influence of the air temperature on air humidity. If, for example, calibration occurs at an air temperature of 20 °C and 50%rh, and at a temperature fluctuation of just ±1 °K, then there will be a humidity fluctuation in the measured medium (air) of ±3.2%rh.

	10°C	20°C	30°C	50°C
10%rh	+/-0,7%rh	+/-0,6%rh	+/-0,6%rh	+/-0,5%rh
50%rh	+/-3,5%rh	+/-3,2%rh	+/-3,0%rh	+/-2,6%rh
90%rh	+/-6,3%rh	+/-5,7%rh	+/-5,4%rh	+/-4,6%rh

Maintenance instructions

for humidity measuring equipment with Polyga®humidity measuring element.

Impact of dirt

The measuring element is maintenance-free in pure ambient air. Depending on their type and concentration, aggressive media containing solvents can cause incorrect readings or cause the humidistat to fail. Hygroscopic humidity measuring elements - and these include particularly the capacitive measuring elements, resite measuring elements and fibre measuring elements (Polyga) - are sensitive if a water-repellent film forms on the surface of the elements. Such sensors and hygrostats cannot be used for example during wood drying as, depending on the type of wood to be dried, resin aerosols in the surrounding air are deposited on the measuring element. The same applies to lacquer drying equipment where there are paint aerosols in the surrounding air.
The water-repellent property of the Galltec® humidity measuring element allows cleaning to be carried out in water. An important benefit when the sensors are used in extreme atmospheres.

Cleaning instruction

for humidity sensors, hygrostats in channel design as well as all shaft equipment, FG80.., TFG80.., HG80, HG80-2, HM80 and HM80-2.

The humidity measuring equipment is designed with a perforated sensor tube. The humidity and temperature measuring elements are in the interior of the sensor tube. The humidity measuring element is arranged axially and the temperature measuring element is seated sideways at the top or bottom between the perforation holes.
Measuring equipment with Pt100 glass measuring resistors can be immersed in water. Other temperature sensors, in particular semi-conductor sensors or customer-specific temperature sensors should not come into contact with water. Enquire if in doubt.
The measuring elements are designed for use in pressureless air (gases). The measurement accuracy depends on the degree of pollution of the element. The humidity measuring element, in particular, loses its hygroscopic properties if the surface is covererd with grease, soot, smoke deposits, paint, resinous substances etc. By cleaning the elements, their function can be reproduced, but only if no damage is caused by acids, alkaline solutions or other aggressive substances.

Cleaning process

1. Disconnect the device from the power supply!

2. Dip the sensor tube into a receptacle containing clean water (20°C) and, with a gentle rotating motion, disperse the dirt deposits. If the dirt contains grease deposits, it is recommended that a mild detergent be added to the water.

Do not brush or treat with any other cleaning utensils. Only the sensor tube should be immersed - not the housing.

The sensor tube is open to the housing interior (0.8mm hole)

3. As mild detergents are known to contain chemical substances, rinse carefully after cleaning. Cleaning residue will impair the measured result.

4. Air drying. Where a measuring element is moistened with water, the device indicates 100% relative humidity. If necessary, it is possible to carry out sensitive recalibration at the adjusting spindle at the end of the sensor. This should only be done where there are large deviations. Slight movement of the adjusting spindle of a wet element causes the measured value in the dry area to be badly out. Here, there is an intensifying effect of the linearisation (factor 6). Indications of 98..100% relative humidity at the wet element are adequate.
The accuracy in the dry area must be determined under normal climatic conditions.

The measuring element must not be dried using warm or hot air (hair dryer).

Cleaning should be carried out for no longer than some seconds.

Installation advises

On installation ensure that there is sufficient overcurrent protection (e. g. fuse). Also a separation device (e. g. plug or switch) has to be installed.

Further detailes informationen you will find in „HUMIDITY SENSOR IN ACCORDANCE WITH THE ABSORPTION PRINCIPLE“

Product info sheet
Hygro-Modul HM120

with one changeover contact, scale range 30...100%rh, IP00

Application

The hygro module **HM120** is a humidity-dependent switch that can be fitted in equipment such as hygrostats, humidifiers, de-humidifiers, ventilating fans, driers and many more. The module represents an on-off controller with changeover contact. The switch connection is via a connecting terminal, but can also be supplied ready-made with cable connections. Several versions of different lengths are available as a shaft. Protection of the module is of the IP00 type.

Technical Data

measuring element ..... Polyga®-measuring element, water resistent
control range ..... 40...90%rh

breaking capacity
- max. 250VAC and
  - 0,1 ... 5A ohmic load for dehumidifying
  - 0,1 ... 2A ohmic load for humidifying
  - 0.1 ... 1A for inductive load (power factor >0.8)
- lifetime ..... > 6.000 breaking cycles
- **Please observe the notes on voltage.**

optional microswitch with gold contact
breaking capacity
- max. 48 VAC and
  1...100 mA

allowable operating temperature ..... 0...60°C
allowable storage temperature ..... -40...60°C
air-speed ..... 0.2...8 m/s
installation altitude ..... ≤ 4.000m above sea level
influence of temperature
- ref. to 23 °C ..... ≤ +/- 0.2 % r.h. / K

typ. response time t_{50} at v=2m/s 1.2min
fixing ..... only with plastic screws M3
contacting ..... connecting terminals

applied directives / standards
- low-voltage directive 2014/35/EU
- EMC directive 2014/30/EU
  - DIN EN 60730-1:2012-10
  - DIN EN 60730-2-13:2008-09

type of protection IP00
Abmessungen ..... see technical drawing
..... height depends on adjusting shaft, up to approx. 33 mm
weight ..... about 25 grams

Description of the Hygro Modul

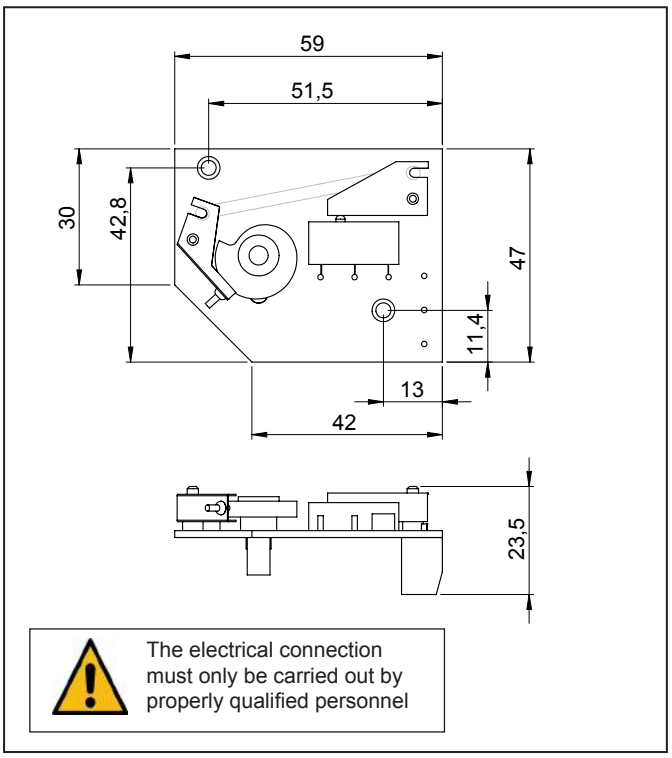
The humidity measuring element, produced by Galltec under the name Polyga®, consists of several synthetic fabric bands each with 90 individual fibres with a diameter of 3µm. A special process gives the fibre hygroscopic properties. The measuring element adsorbs and desorbs humidity. The swelling effect, which is predominantly in a lengthways direction, is carried via a suitable lever system to a microswitch with an extremely small switching path. The measuring element reacts quickly and precisely to the change in air humidity. By adjusting the setpoint value control knob, the lever system is engaged so that when the set air humidity is reached the microswitch is activated.

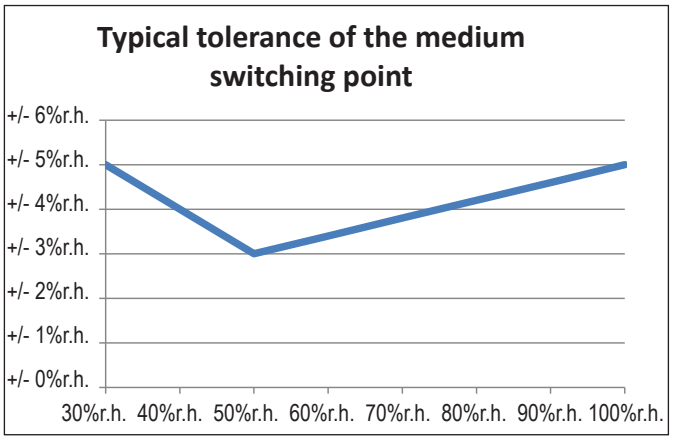
The fan shaped measuring element should be protected from dust, dirt and water. The hygro module is designed for pressure-less systems.

Notes on voltage

The measurement location of the humidity controller should be selected such that there is no build-up of condensate on or in the device. This applies particularly for operation with a voltage higher than 48V. If the voltage is higher, there is a risk of voltage arcing in the event of water condensation on the microswitch or connecting terminals which might destroy the controller. In the case of voltage below 48V, the humidity controller can be used up to 100%rh.

Technical drawing





1-point-adjustment at 48 % r.h. / 23 °C
Long-term drift: ≤ ±1%r.h. p.a.

Typical switching differential with typical tolerance

Setpoint value humidity	Switching differential	Tolerance
50 % r.h.	5 % r.h.	+/- 1,5 % r.h.
60 % r.h.	4 % r.h.	+/- 1,5 % r.h.
70 % r.h.	4 % r.h.	+/- 1,5 % r.h.
80 % r.h.	3 % r.h.	+/- 1 % r.h.
90 % r.h.	3 % r.h.	+/- 1 % r.h.

Cleaning instruction

1. Disconnect the device from the power supply

2. Remove the cover. Clean the cord shaped measuring element using a soft brush and clean water. Do not use a detergent as it cannot be dispersed.

It is important that no water is allowed to get onto the other components, particularly microswitches, terminals or printed circuit boards.

3. Air drying. Do not use warm or hot air (hair dryer).

Maintenance

The measuring element is maintenance-free in pure ambient air. Aggressive media containing solvent can cause measuring errors and failure, depending on the type and concentration. Deposits which eventually form a water-repellent film over the measuring element are harmful (such as resin aerosols, lacquer aerosols, smoke deposits etc.)

Physical influence of temperature on the relative air humidity

at a temperature fluctuation of ±1K referred to various room temperatures.

	10°C	20°C	30°C	50°C
10%rh	+/-0,7%rh	+/-0,6%rh	+/-0,6%rh	+/-0,5%rh
50%rh	+/-3,5%rh	+/-3,2%rh	+/-3,0%rh	+/-2,6%rh
90%rh	+/-6,3%rh	+/-5,7%rh	+/-5,4%rh	+/-4,6%rh

It is thus of extreme importance that the temperature is constant for measurements of the relative air humidity. The air must be homogenous.

Contact with the inner parts of the hygro modul HM120 nullifies the warranty.

MCK...4S0

MCK...1K0

M-Series
Humidity/-temperature compact sensors with cable or plug-in connection
Miniature sensors / for assembly in non-visible areas

These sensors are especially adapted to the requirements of measurement tasks which only have limited space available. They are suitable for measuring the relative humidity and temperature in air and other non-aggressive gases. Using the sensors for outdoor applications is not recommended.
The sensors are based on our miniature sensors in the calHT series (product info B1.10). They are fitted with a filter and a 4-pin plug (MCK...4S0) or with a permanently connected 1.5 m long cable (MC(P)K...1Kn). Suitable cables for the model MCK...4S0 can be supplied in different lengths as an option.
The sensors feature high long-term stability, small hysteresis and good dynamic performance.

Technical Data

Humidity
measuring range ..... 0...100%rh
resolution 0.5%rh
accuracy ..... ±2.5%rh (10...40 °C, 10...90 %rh) ±1 digit
other range ..... ±5% rh ±1 digit
influence of temperature ..... ±0.1% rh/K for < 10 °C and > 40 °C

Temperature
measuring ranges ..... colour code
resolution ..... 0.125 °C
accuracy ..... ± 0.5 K @ 23 °C ±1 digit
(details see diagramm)

General data
operating voltage ..... 5...30 V DC
output signal :
MC(P)K1..... 2 x 0...1 V (at RL ≥ 100 kΩ)
MC(P)K6 ..... digital (similar I²C)
I²C-bus-voltage ..... 3.3 VDC
storage temperature ..... -40...85°C
working temperature ..... -40...85°C
working temperature (with permanent cable) ..... -20...70°C
power consumption ..... < 250 µA

degree of protection
sensor with PTFE filter ZE05 ..... IP40/IP64 (cable versions)
sensor with protective basket ZE07..... IP00
sensor with protective basket ZE08 ..... IP30

Maximum cable lengths:
MC(P)K1 ..... 5 m at RL >= 100kOhm **1)**
MC(P)K6 ..... 0.5m at a clock rate f = 100kHz **1)**

1) longer cables possible depending on the load or clock rate

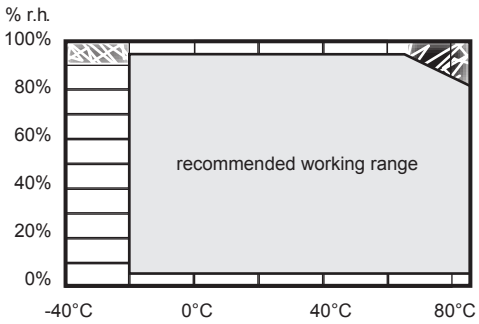
Series	**Compact sensors**	M
Design	with tube extension	P
	direct connection plug or cable	C
Physical output	rel.humidity and temperature	K
Output signal	0..1 V	1
	I²C	6
Special edition	none	00
	seal for increased requirements	0S
Measuring range H	0...100 % r.h.	F1
Measuring range T	-30...70 °C	37
	-20...80 °C	28
	0...100 °C	01
	-40...60 °C	46
	-40...85 °C (I²C)	48
Operating voltage	5...30 VDC	5
Filter	PTFE filter ZE05	05
	open ZE07 (standard)	07
	with membrane ZE08	08
Type of connection and characteristics of the design	4-pin plug	4S0
	permanent cable 0,5 m	0K(n)
	permanent cable 1,5 m	1K(n)
	special lengths of cable in m	yy(n)
	other specialities of design	Xyy

n: additional tube extension depending on sensor type and special design
(n) = 0: no tube extension
(n) = 1: total length sensor 53 mm
(n) = 4: total length sensor 95 mm

Special versions available on request.

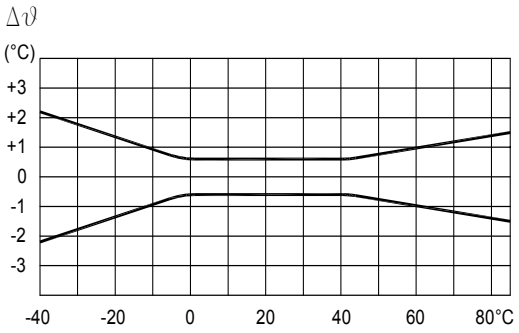
User instructions
Install the sensors at a place in the room where characteristic levels of humidity occur. Avoid installing them close to heaters or windows or against outside walls.
In general, the sensors are maintenance-free. If the PTFE filter is contaminated with dust, grease and oils, this can have a negative impact on the dynamic behaviour. In this case the sensor head of the plug version needs to be disconnected from the cable and to be cleaned by blowing or carefully rinsing off with distilled water. After removing the filter, make sure that the sensitive sensor surface is not touched, as this can lead to irreparable damage. An exact measured value can only be attained again after being completely dried; this also applies to condensation.
Please consult „**application instructions for the sensing elements**“ (product info sheet no. A 1) for further information.

Working range of humidity and temperature



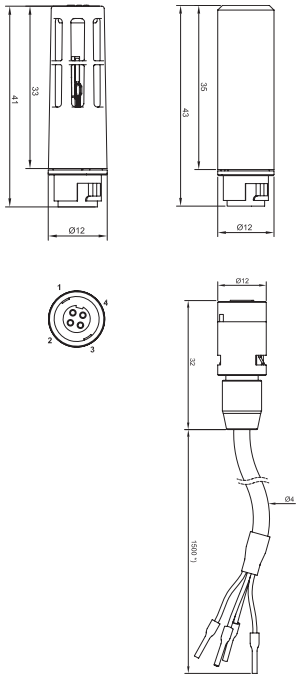
Operating the sensor in these areas can damage it!

Temperature accuracy of the sensors



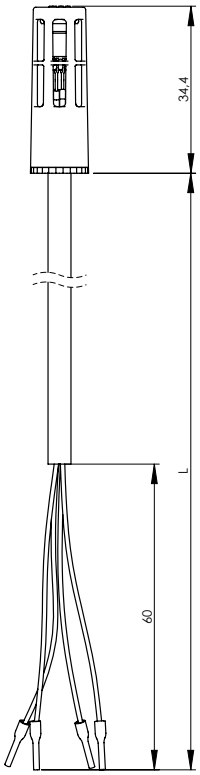
Dimensions diagrams

MCK...4S0

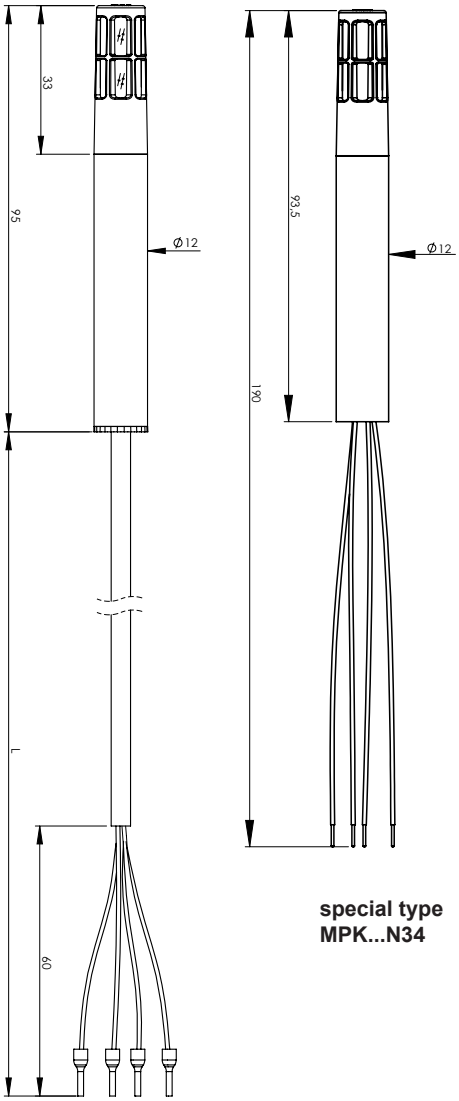


MCK.02-xx.x

MCK...1K0



MPK...yy4



special type MPK...N34

order designation cable with jack:

MCK.02-xx.x

length of cable in meter

Colour code for output range and characteristics of types MCK...4S0

		colour code
measuring range [°C]	0...100	green
	-20...80	red
	-30...70	black (without)
	-40...60	yellow
	-40...85	white
additional: seal for increased requirements		blue

Configurations of cable versions

Variable	Pin	Pin configuration analogue	Pin configuration digital	conductor colour
UB +	1	5...30 VDC	+ UB	green (red)
UB - (GND)	2	GND	GND	brown (brown)
Humidity	3	0...100% r.h.	SDA	white (black)
Temperature	4	1)	SCL	yellow (orange)

1) depending on sensor head selected (see table page 1)

Protocol for MC(P)K6.* (similar to I²C-output)

Microcontroller sends command for read-out of one byte

S	1	0	0	1	0	0	0	0	A	0	0	0	0	C4	C3	C2	C1	A	P

C4	C3	C2	C1	
0	0	0	0	**Read-Out Humidity**
0	0	1	0	**Read-Out Temperature Byte 1**
0	0	1	1	**Read-Out Temperature Byte 2**

Microcontroller requests data byte according control command and reads out

S	1	0	0	1	0	0	0	1	A	D7	D6	D5	D4	D3	D2	D1	D0	NA	P

from sensor

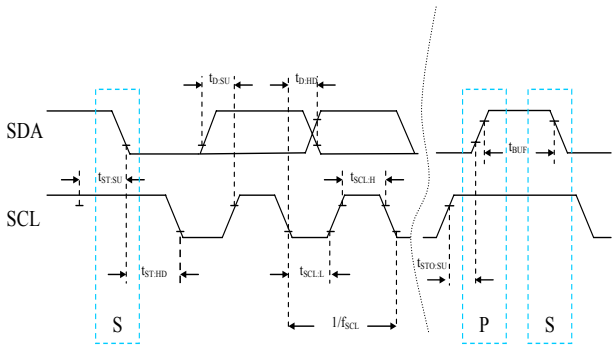
D7	D6	D5	D4	D3	D2	D1	D0	
0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	**Humidity**
0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	**Temperature Byte 1**
X	X	X	X	0/1	0/1	0/1	0/1	**Temperature Byte 2**

x will not be evaluated

Humidity = decimal value humidity * 0.5
Temperature = (decimal value temp.* 0.125)-40
(decimal value DV temp. = DV Byte 1+ DV Byte 2 * 256)

Symbol	Parameter	min	max	
t_{BUF}	idle period between BUS actions	4,7		µs
$t_{D:SU}$	data set-up time	250		ns
$t_{D:HD}$	data hold time	50		ns
$t_{ST:HD}$	start hold time	4		µs
$t_{ST:SU}$	start set-up time	4,7		µs
$t_{SCL:L}$	SCL „low“ time	4,7		µs
$t_{SCL:H}$	SCL „high“ time	4		µs
f_{SCL}	SCL frequency		100	kHz
t_r	SDA, SCL LOW/HIGH time		1	µs
t_f	SDA, SCL HIGH/LOW time		0,3	µs
$t_{STO:SU}$	stop set-up time	4		µs
t_{SP}	interference signal rejection		100	ns
CL	capacity SDA, SCL BUS (internal pull-up 120 kΩ)		10	pF
t_{MUPD}			150	ms
t_{SMPL}			5	ms
t_{Hold}	blocking time after device access	200		ms

Signal characteristics at 25 °C and 3.3 V I²C BUS voltage



BUS Timing

Description of the Sensor

The sensor PM15P measures the air humidity by means of a humidiy-dependant condenser. The capacitive Mela® humidity measuring element, produced using thinfilm technology, consists of a base plate, on which the electrodes are housed and a hygroscopic polymer layer above it. The hygroscopic polymer layer absorbs water molecules from the medium to be measured (air) or releases them, thereby altering the capacity of the condenser.

The humidity or temperature values measured are calculated in the exchangeable PMU-P measuring head, with the calibration values stored there, and communicated on to the following electronic transmitter components as calibrated digital measuring values.

The PMU-P measuring heads are calibrated and thus enable a replacement within seconds. Replaced measuring heads can be recalibrated in the factory.

The transmitter with the hx processor uses the values of the relative humidity and the temperature to calculate the dew point temperature, the enthalpy, the mixing ratio, the absolute humidity or the wet-bulb temperature, in accordance with the laws of physics. The values are emitted at two analogue outputs with the standardised signals 0...10VDC, 0...1VDC, 0...20mA or 4...20mA. The outputs can be configured differently and are defined using the software.

The Mela® measuring element is protected by a filter and a basket guard. The sensors are designed for unpressurised systems, the measurement medium is non-aggressive air.
Please consult the application instructions for the sensing elements (product info sheet no. A 1) or check with the manufacturer for further information which you need to bear in mind when using humidity sensors with capacitive sensing elements.

1) Ex works. Depending on the specific range of application a regular recalibration of the measuring head (PMU-P) has to be effected.
2) Higher accuracies on request.
3) The accuracy of the calculated values depends on both the operating point in accordance with the hx diagram and on the primary values measured.
4) See load diagram

PM15P

Modular Sensor for Humidity and Temperature with hx processor

Digital Measuring Head PMU-P

Humidity
measuring range ..... 0...100%rh
measuring accuracy 10...90%rh at 25°C ..... ±1.5%rh 1)2)
at <10%rh or >90%rh ..... ±2%rh
at <10°C or >40°C ..... ±0.05%rh/K additional
resolution ..... 0.01%rh (read out)
hysteresis ..... < 1%rh
protection against dust ..... PTFE-pocket filter

Temperature
measuring element Pt1000 1/3DIN
measuring range ..... -40...+85°C
measuring accuracy ..... ±0.15 K at 25°C
resolution ..... 0.01 K (read out)
influence of temperature (TK) ..... <0.005 K/K

Transmitter PMO15P with hx processor

physical outputs
dew point temperature ..... 0...70°C 3)
enthalpy ..... 0...80 kJ/kg 3)
mixing ratio ..... 0...100g/kg dry air 3)
absolute humidity ..... 0...20g/m³ or 0...100g/m ³)
wet-bulb temperature ..... -10...+50°C 2)
relative humidity ..... 0...100%rh
temperature ranges .....
..... -30...+70°C; 0...+50°C; 0...100°C
There are respectively 2 physical values available at the output
response time t_{63} at v=2m/s with PTFE-pocket filter ..... < 15 s
electrical outputs
voltage ..... 2x 0...1VDC or 2x 0...10VDC
current ..... 2x 0(4)...20mA
linearity ..... <0.25%
power supply ..... 0...1V ..... 6...30V DC
..... 0...10V ..... 15...30V DC
..... 0(4)...20mA .... 6...30V DC 4)
load ..... acc. diagram
electromagnetic compatibility ..... ref. EN 61326-1
min. load resistance for voltage output ..... 10 kOhm
consumption of electronics ..... <10 mA
permissible ambient temperature ..... -20...+70°C
max. air speed 15m/s
minimum air speed across the measuring head
for output: 2x 0(4)...20mA ..... 1 m/s
2x 0...10V, 2x 0...1V ..... ≥0.5 m/s
protective system transmitter ..... IP 64
housing material ..... plastic, black
mounting position ..... optional
cable connection 6 x AWG24 ..... 2.5 m

ESD protection advice

All PM15P sensors are made up of a PMO15P transmitter with a PMU-P sensor head and contain components which can be damaged by the effects of electrical fields or by charge equalisation when touched. This is why the PMU-P sensor heads, that can be supplied separately and that are suitable for being exchanged on location, are packaged in conductive, reusable ESD protected bags.

The following protective measures must be taken when exchanging a PMU-P sensor head on the PMO15P transmitter:

- Before unpacking the PMU-P sensor head, ensure electrical potential equalisation between you and your environment.
- Pay particular attention to ensuring that this potential equalisation is maintained while you are exchanging the PMU-P sensor head.
- Only store or transport the PMU-P sensor head in the ESD protective bag supplied, or in comparable packaging

Type	Order No.	Physical output 1	Measuring value 1	Electrical output 1	Physical output 2	Measuring value 2	Electrical output 2
PMU-P "plug and measure unit"	6201010232AA	relative humidity	0...100%rh	ASCII (digital)	temperature	-30...70°C	ASCII (digital)
PM15P	700101023211	relative humidity	0...100%rh	0...10VDC	temperature	-30...+70°C	0...10VDC
	700101023111	relative humidity	0...100%rh	0...10VDC	temperature	0...100°C	0...10VDC
	700101023011	relative humidity	0...100%rh	0...10VDC	temperature	0...+50°C	0...10VDC
	700305023211	dew point temperature	0...70°C	0...10VDC	temperature	-30...+70°C	0...10VDC
	700410023211	enthalpy	0...80kJ/kg	0...10VDC	temperature	-30...+70°C	0...10VDC
	700515023211	mixing ratio	0...100g/kg dry air	0...10VDC	temperature	-30...+70°C	0...10VDC
	700621023211	absolute humidity	0...100g/m³	0...10VDC	temperature	-30...+70°C	0...10VDC
	700620023211	absolute humidity	0...20g/m³	0...10VDC	temperature	-30...+70°C	0...10VDC
	700833023211	wet-bulb temperature	-10...+50°C	0...10VDC	temperature	-30...+70°C	0...10VDC
PM15P	700101023221	relative humidity	0...100%rh	0...1VDC	temperature	-30...+70°C	0...1VDC
	700101023121	relative humidity	0...100%rh	0...1VDC	temperature	0...100°C	0...1VDC
	700101023021	relative humidity	0...100%rh	0...1VDC	temperature	0...+50°C	0...1VDC
	700305023221	dew point temperature	0...70°C	0...1VDC	temperature	-30...+70°C	0...1VDC
	700410023221	enthalpy	0...80kJ/kg	0...1VDC	temperature	-30...+70°C	0...1VDC
	700515023221	mixing ratio	0...100g/kg dry air	0...1VDC	temperature	-30...+70°C	0...1VDC
	700621023221	absolute humidity	0...100g/m³	0...1VDC	temperature	-30...+70°C	0...1VDC
	700620023221	absolute humidity	0...20g/m³	0...1VDC	temperature	-30...+70°C	0...1VDC
	700833023221	wet-bulb temperature	-10...+50°C	0...1VDC	temperature	-30...+70°C	0...1VDC

0...10VDC

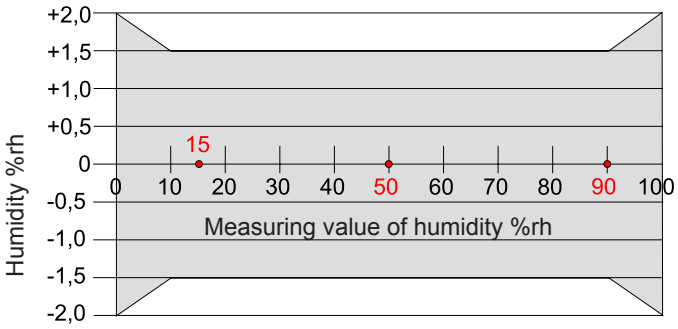
0...1VDC

Type	Order No.	Physical output 1	Measuring value 1	Electrical output 1	Physical output 2	Measuring value 2	Electrical output 2
PMU-P "plug and measure unit"	6201010232AA	relative humidity	0...100%rh	ASCII (digital)	temperature	-30...70°C	ASCII (digital)
PM15P	700101023261	relative humidity	0...100%rh	0...20mA	temperature	-30...+70°C	0...20mA
	700101023161	relative humidity	0...100%rh	0...20mA	temperature	0...100°C	0...20mA
	700101023061	relative humidity	0...100%rh	0...20mA	temperature	0...+50°C	0...20mA
	700305023261	dew point temperature	0...70°C	0...20mA	temperature	-30...+70°C	0...20mA
	700410023261	enthalpy	0...80kJ/kg	0...20mA	temperature	-30...+70°C	0...20mA
	700515023261	mixing ratio	0...100g/kg dry air	0...20mA	temperature	-30...+70°C	0...20mA
	700621023261	absolute humidity	0...100g/m³	0...20mA	temperature	-30...+70°C	0...20mA
	700620023261	absolute humidity	0...20g/m³	0...20mA	temperature	-30...+70°C	0...20mA
	700833023261	wet-bulb temperature	-10...+50°C	0...20mA	temperature	-30...+70°C	0...20mA
PM15P	700101023271	relative humidity	0...100%rh	4...20mA	temperature	-30...+70°C	4...20mA
	700101023171	relative humidity	0...100%rh	4...20mA	temperature	0...100°C	4...20mA
	700101023071	relative humidity	0...100%rh	4...20mA	temperature	0...+50°C	4...20mA
	700305023271	dew point temperature	0...70°C	4...20mA	temperature	-30...+70°C	4...20mA
	700410023271	enthalpy	0...80kJ/kg	4...20mA	temperature	-30...+70°C	4...20mA
	700515023271	mixing ratio	0...100g/kg dry air	4...20mA	temperature	-30...+70°C	4...20mA
	700621023271	absolute humidity	0...100g/m³	4...20mA	temperature	-30...+70°C	4...20mA
	700620023271	absolute humidity	0...20g/m³	4...20mA	temperature	-30...+70°C	4...20mA
	700833023271	wet-bulb temperature	-10...+50°C	4...20mA	temperature	-30...+70°C	4...20mA
	further outputs and measuring ranges on demand						

0...20mA

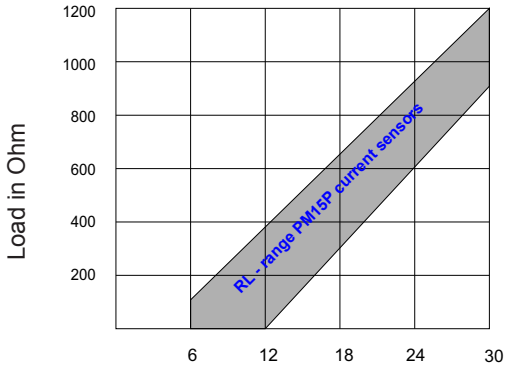
4...20mA

Accuracy of humidity in %rh at 25°C

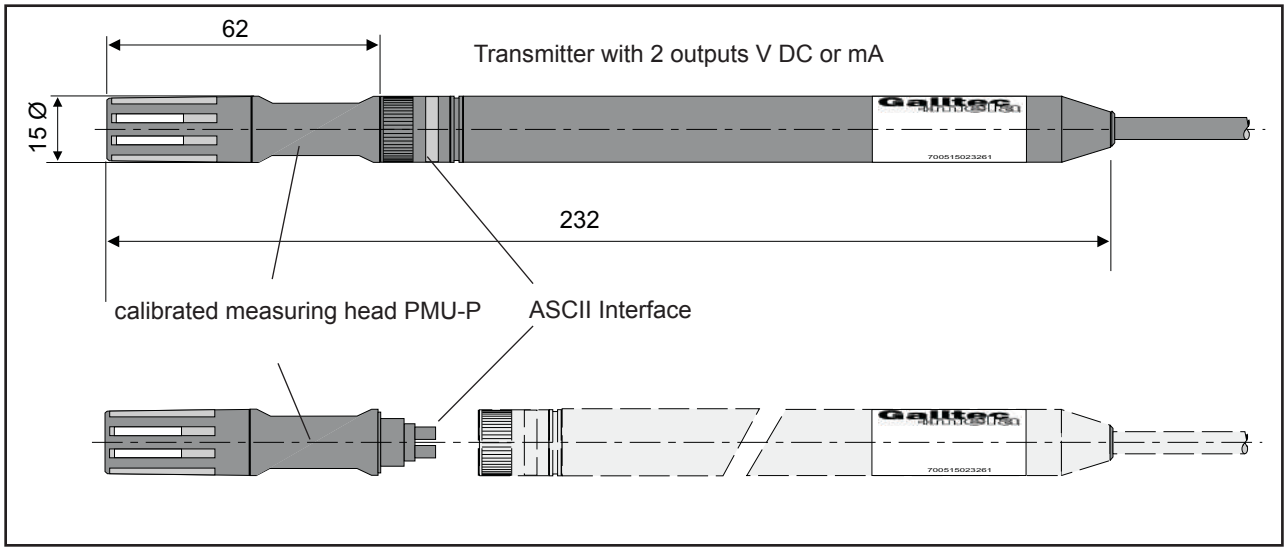


• Calibration values (humidity generator)

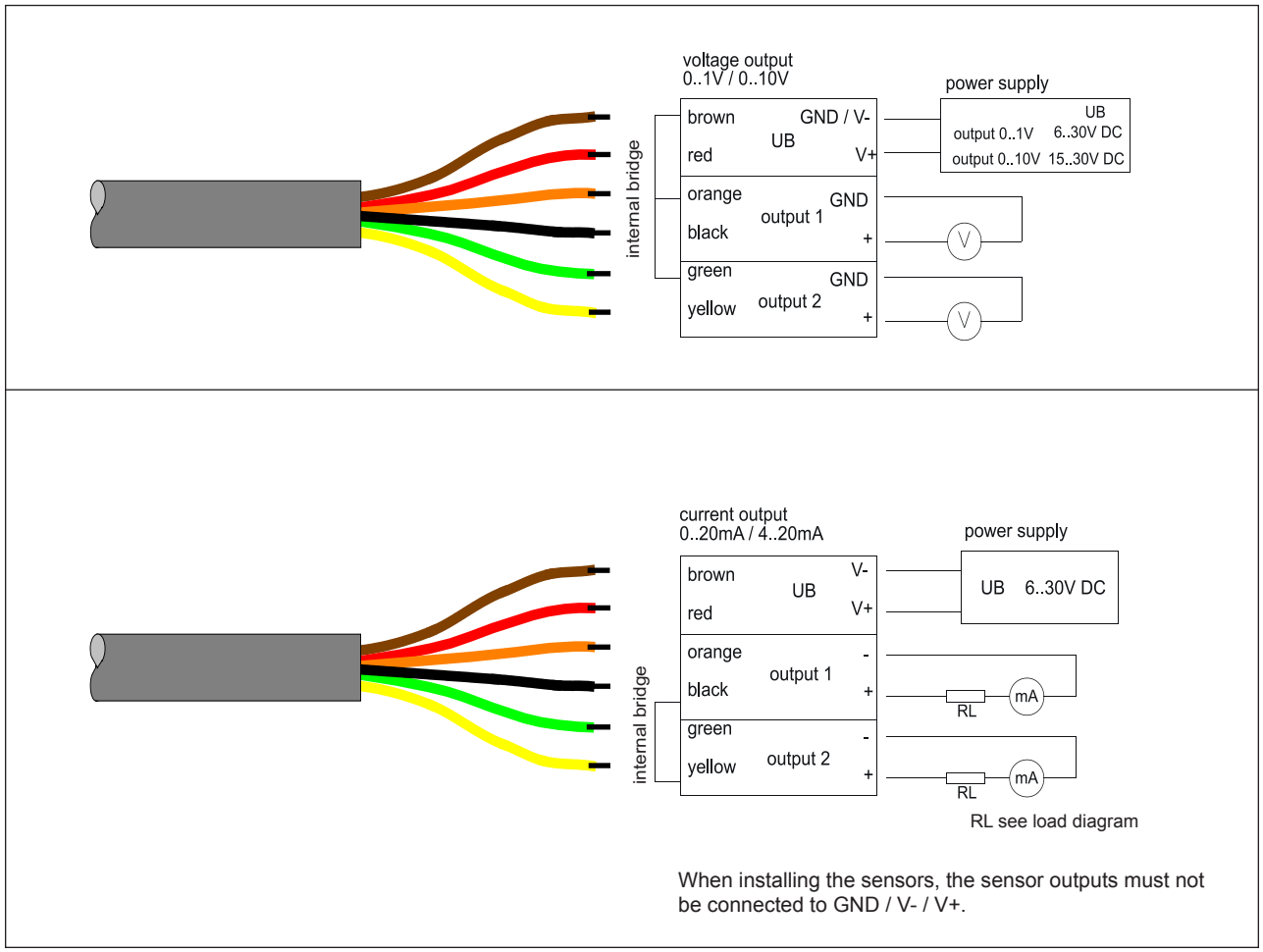
Load for 0(4)...20mA current version



Dimensions



Connection diagrams



PM15PS
Sensor for humidity and temperature with RS232 signal level converter

for digital transfer of the measurement values
Rod design

with **exchangeable** „Plug and Measure Unit“ PMU

Description

The PM15PS transmitter by Galltec+Mela combines digital Plug-and-Measure technology with the advantages of a digital RS232 output, making it suitable for data transfer via a network or the Internet.
Equipped with the serial Sub-D jack, the PM15PS is suitable for being installed in systems and also for local applications, for example with a laptop.

Like all Plug-and-Measure sensors, the PM15PS is equipped with a digital PMU: The capacitively measured humidity values and the temperature values measured by using a PT1000, are calculated in the calibrated Plug-and-Measure Unit PMU, with the calibration values stored there, and are passed on as digital measurement values. The PMU measuring heads are exchangeable and can be factory-calibrated and readjusted using software.

General Technical Data

General

measuring medium ..... air, non-aggressive
min. air speed across the measuring head 0.3m/s
supply voltage ..... using RS232 level (RTS, DTR)
consumption of electronics ..... < 7 mA
electromagnetic compatibility ..... EN 61326-1 / A1
max. transfer distance for RS232 .....15 m
max. ambient temperature at the housing (PMO) ..... 70° C
housing ..... plastic, black
degree of protection ..... housing (PMO) IP64
measuring head (PMU) IP30
9 pin SUB-D data line (jack) ..... 2.3 m

Technical Data for Humidity and Temperature

Humidity

measuring range ..... 0...100% rh
measuring accuracy 10...90 % rh at 23° C ..... ±1.5% rh
at <10%rh and >90%rh ..... ±2% rh
at <10°C and >40°C ..... ±0.05% rh/K additional
influence of temperature ..... <0.04% rh/K
response time T_{90} at v=2m/s ..... < 10 s
resolution ..... 0.01% rh (read out)
filter ..... PTFE element filter

Temperature

measuring element (ref. DIN IEC 751) ..... Pt1000 1/3-DIN cl.B
accuracy @ 23°C ..... ±0.15 K
influence of temperature (TK) ..... <0.004 K/K
resolution ..... 0.01°C (read out)

Type Survey

Type	Product No.	Measuring Range		PMU-Type	max. ambient temperature at PMU	Output
		rel. humidity	temperature			
PM15PS	700101023583	0 ... 100 % rh	-40 ... +85°C	PMU-P	-20 ... +70°C	RS232

Software „VisualPMU“ (Freeware)

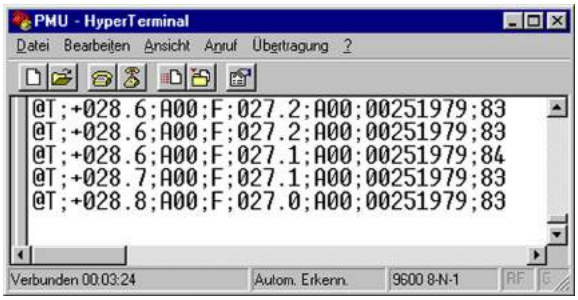
This simple and very clear visualisation software supports the data output of a sensor via a serial interface on the PC or Laptop without an additional power supply.
For USB connections, a *USB adapter* can be supplied.

The relative humidity, the dew point and the temperature (°C or F) can be displayed and can be depicted as a graph. Apart from that, the programme has a simple data logger function. Recorded data can be exported to other programmes.
This freeware version can be obtained from our Homepage www.galltec-mela.de as a free of charge download..

Connection settings

HyperTerminal (Windows)

The sensor PM15PS can be read via the Hyper Terminal programme from Windows. The picture below shows the character string of the data issued by the P15PS.



Notes on ASCII protocol

start of protocol	end of protocol	separation sign
@	"CR" and "LF"	"; "

The measurement data is sent in the measurement phase as ASCII-protocol on the RxD-pin:

@T	<sign>	<temperature>	<alarm-code>	F	<humidity>	<alarm-code>	<serial number>	<check-sum>	<CR>	<LF>

Example:

@T;	+	021.37;	A00;	F;	038.92;	A00;	00000121;	38	control character Carriage Return	control character Line Feed

The check sum is calculated as follows:

check sum = 255 - (Σ_{dez} % 256) = check sum $_{dez}$ = check sum $_{hex}$

Example:

check sum = 255 - (1991 Modulo 256) = 255 - 199 = 56 = 38 $_{hex}$

The check sum is not transmitted as a hexadecimal character with 1 byte, but is translated into readable digits with 2 bytes. Through the comparison of the transmitted check sum with a check sum calculated at the read-out point, the user has the opportunity to check whether the transmission of the data is error-free.

Alarm codes:

Temperature channel:		*Humidity channel:*	
A00 =	*no alarm, the temperature value is within the limits*	A00 =	no alarm, the humidity value is within the limits
A01 =	*temperature measurement range exceeded*	A01 =	humidity measurement range exceeded (=100% rh)
A02 =	*below temperature measurement range*	A02 =	below humidity measurement range (= 0% rh)
A03 =	*no sensor signal*	A03 =	no sensor signal
A04 =	*short circuit at PT1000 (resistance < 500 Ω)*	A04 =	humidity sensor defective

Accessories

Description	Data sheet	Description
USB-Adapter serial -> USB	-	USB adapter for Sub-D-data line *To connect up the Sub-D-data line to a USB interface on the PC or Laptop*
ZA 24	F5.1	Attachment plate for attaching ducts or wall bushings for sensor tubes 15 mm
ZE 31/1-12 ZE 31/1-33 ZE 31/1-75 ZE 31/1-84	F5.2	Standard humidity to check the accuracy of the sensors 12 %rh and 25°C Standard humidity to check the accuracy of the sensors 33 %rh and 25°C Standard humidity to check the accuracy of the sensors 75 %rh and 25°C Standard humidity to check the accuracy of the sensors 84 %rh and 25°C
ZE33	F5.2	Adapter for humidity standards ZE 31/1

User information

Installation
The sensors are to be attached in a position representative for the climate measurement.
The position the sensor is mounted in (horizontal, vertical) does not matter. However, it should be mounted in such a way that no water can get into it.

Please note the maximum permissible ambient temperature when installing it (max. +70°C).

In a clean environment, the sensor is maintenance-free.
The capacitive MELA sensor element is also protected by the integrated PTFE filter.
Dust does not cause any harm to the humidity sensor, however, if there is an increased build-up of dust this does affect dynamic performance.
If there is too much dust around, then the protective basket can be carefully removed and washed. Loose dirt can also be removed from the PTFE filter above the sensor element by being blown on or carefully rinsed with distilled water.
Caution! The PTFE filter may not be removed from the sensor element!

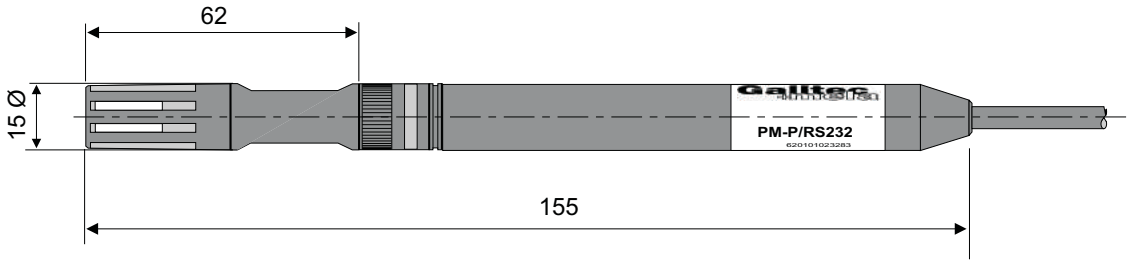
Dew formation
Dew formation and splashes do not damage the sensor, although corrupted measurement readings are recorded until all the moisture on and directly around the sensor element has dried up.

Damaging Influences
Agents that are corrosive and contain solvents, depending upon the type and concentration of the agent, can result in faulty measurements and cause the measuring element to break down. Substances deposited on the sensor are damaging as they form a water-repellent film (this applies to all humidity sensors with hygroscopic measuring elements); e.g. resin aerosols, lacquer aerosols, smoke deposits etc.
In order to check functioning in the place of installation, we recommend that you use our *ZE31/1*-type *humidity standard... (accessories)* .

To ensure the given accuracy of the sensors, we recommend a regular calibration cycle (timing depends on the kind of application).

Please consult the ***application instructions*** for the sensing elements (product info sheet no. A 1 and B1.1), which you can get from www.galltec-mela.de, for further information which you need to bear in mind when using humidity sensors with capacitive sensing elements.

Dimensions



Digital Humidity-Temperature Sensor PMU-P

Order No. 620101023594

with asynchronous ASCII transmission protocol, calibrated for relative humidity and temperature in exchangeable, plug-in design.

Technical Data

Humidity

measuring range ..... 0..100%rh
measuring accuracy 10...90%rh at 25°C ..... ±1,5%rh [1)2)]
at <10%rh or >90%rh ..... ±2%rh
at <10°C or >40°C ..... ±0,05%rh/K additional
resolution ..... 0,01%rh (read out)
hysteresis ..... < 1%rh
protection against dust ..... PTFE pocket filter

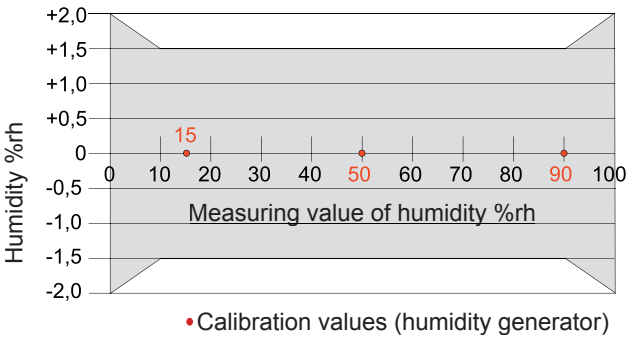
Temperature

measuring element Pt1000 1/3DIN
measuring range ..... -40...+85°C
measuring accuracy ..... ±0,15 K at 25°C
resolution ..... 0,01K (read out)
influence of temperature (TK) ..... <0,005 K/K

General

permissible ambient temperature ..... -20...+70°C
response time t_{63} at v=2m/s with PTFE-pocket filter ..... < 15 s
protective system sensor IP20
protective system plug IP40
measuring medium ..... air, pressureless, non-aggressive
Vcc 3.3VDC
output ..... ASCII (Galltec-protocol)
housing ..... plastic
consumption of electronics ..... < 5 mA
maximum air speed ..... 15 m/s
mounting position ..... optional
electromagnetic compatibility..... EN 61326-1
contacting .... 4Pin female socket, series 719 **from Binder**

Accuracy of humidity in %rh at 25°C



Description of the sensor

The exchangeable digital sensor PMU-P is equipped with the tried and tested Mela® humidity measuring element FE09/4. Protected by a PTFE pocket filter, the measuring element measures the air humidity. The pocket filter consists of porous vapour-permeable material and protects the sensor element from most dirt, dust and pollutants.
The electronics and the plug contacts on the back are extrusion-coated with plastic to make them watertight.

The capacitive Mela® humidity measuring element, produced using thin-film technology, consists of a base plate, on which the electrodes are housed, and a hygroscopic polymer layer above it. The hygroscopic polymer layer absorbs water molecules from the medium to be measured (air) or releases them, thereby altering the capacity of the condenser.

The electronics sets off the humidity values measured in this way against the calibration values it has stored and emits them via the plug contacts in the form of calibrated, digital ASCII protocol. The sensor head is also equipped with a temperature probe Pt1000 1/3DIN which is used for both acquiring the air temperature and also for temperature compensation in the humidity measurement by the PMU-P.
The PMU-P measuring heads are calibrated and thus enable an easy replacement. Replaced measuring heads can be recalibrated in the factory.

Please consult the "*application instructions for the sensing elements*" (product info sheet no. A 1) or check with the manufacturer for further information which you need to bear in mind when using humidity sensors with capacitive sensing elements.

[1)] *Ex works. Depending on the specific range of application a regular recalibration of the sensor head (PMU-P) has to be effected.*
[2)] *Higher accuracies on request.*

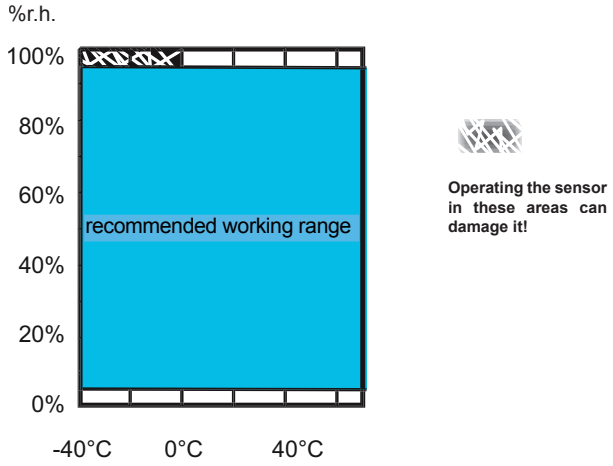
ESD protection advice

All PM15P sensors are made up of a PMO15P transmitter with a PMU-P sensor head and contain components which can be damaged by the effects of electrical fields or by charge equalisation when touched. This is why the PMU-P sensor heads, that can be supplied separately and that are suitable for being exchanged on location, are packaged in conductive, reusable ESD protected bags.

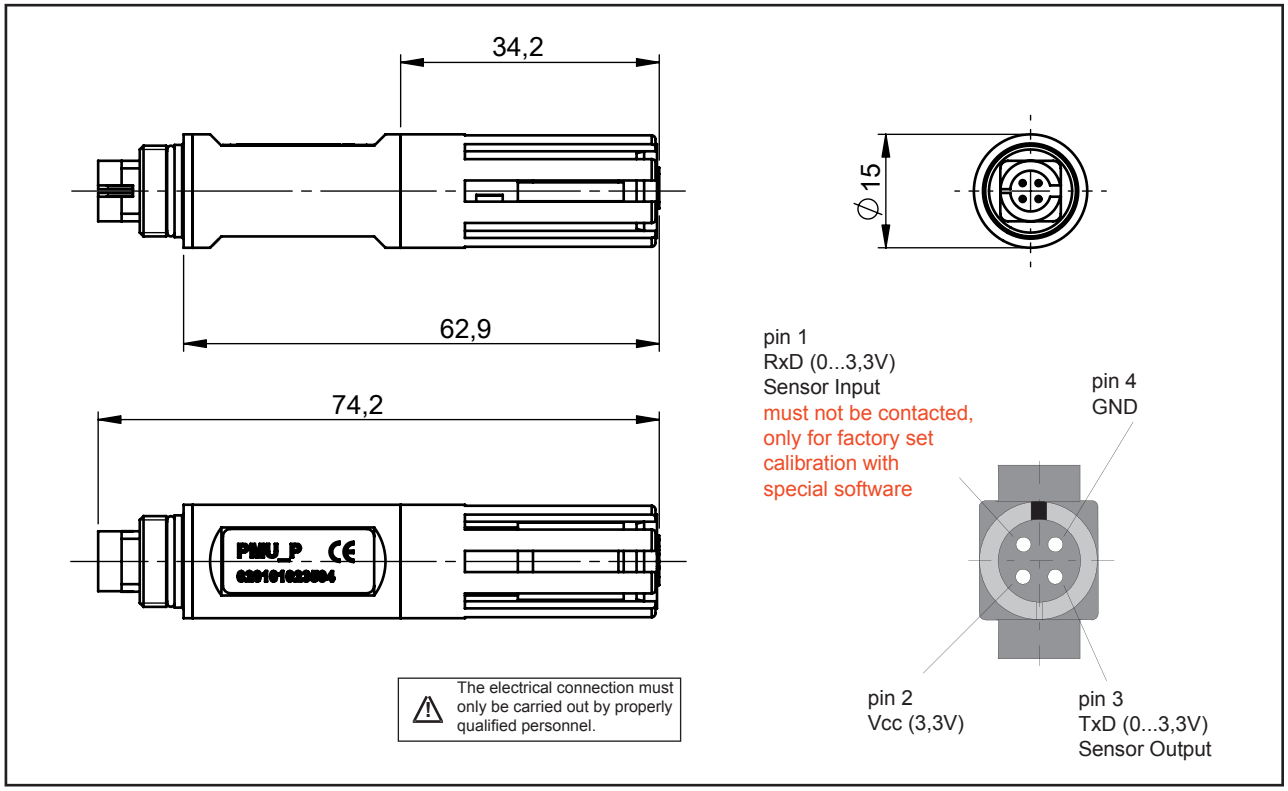
The following protective measures must be taken when exchanging a PMU-P sensor head on the PMO15P transmitter:

- Before unpacking the PMU-P sensor head, ensure electrical potential equalisation between you and your environment.
- Pay particular attention to ensuring that this potential equalisation is maintained while you are exchanging the PMU-P sensor head.
- Only store or transport the PMU-P sensor head in the ESD protective bag supplied, or in comparable packaging

Working range humidity and temperature



Dimensions and connection diagramm



Function and implementation of the digital humidity temperature sensor PMU-P

The exchangeable digital measuring head measures the current temperature and the relative humidity in the direct surroundings.

Output

After contacting and supply via Vcc & GND, the measuring head automatically transmits the measurement protocol via the TxD pin. Every 3-4 seconds the respective current measurement value is re-issued at 9600 Baud. Between the individual measurement protocols (ASCII output), the TxD pin is at 3.3V DC (High Level).

Symbol	Parameter	Min	Max
Vcc	Supply Voltage	3,2 V	3,4 V
Vss	Supply Voltage GND	0 V	0 V
Vol	Output low voltage	Vss	Vss + 0,6V
Voh	Output high voltage	Vcc - 0,6V	Vcc
Ioh	Output source current		0,5mA at Vcc = 3,3V
Iol	Output sink current		0,5mA at Vcc = 3,3V

The above table shows the electrical signals of the digital sensor head PMU-P. The customer must provide a stable, regulated distribution voltage of +3.3V DC.

Notes on ASCII protocol

start of protocol	end of protocol	separation sign
@	“CR“ and “LF“	“; “

The measurement data is sent in the measurement phase as ASCII-protocol on the RxD-pin:

@T	<sign>	<temperature>	<alarm-code>	F	<humidity>	<alarm-code>	<serial number>	<check-sum>	<CR>	<LF>

Example:

@T; + 021.37; A00; F; 038.92; A00; 00000121; 38 control character Carriage Return control character Line Feed

The check sum is calculated as follows:

check sum = 255 - ($\sum_{dez}$ % 256) = Check sum $_{dez}$ = Check sum $_{hex}$

Example:

check sum = 255 - (1991 Modulo 256) = 255 - 199 = 56 = 38 $_{hex}$

The check sum is not transmitted as a hexadecimal character with 1 byte, but is translated into readable digits with 2 bytes. Through the comparison of the transmitted check sum with a check sum calculated at the read-out point, the user has the opportunity to check whether the transmission of the data is error-free.

Alarm codes:

Temperature channel:		*Humidity channel:*	
A00 =	no alarm, the temperature value is within the limits	A00 =	no alarm, the humidity value is within the limits
A01 =	temperature measurement range exceeded	A01 =	humidity measurement range exceeded (=100% rh)
A02 =	below temperature measurement range	A02 =	below humidity measurement range (= 0% rh)
A03 =	no sensor signal	A03 =	no sensor signal
A04 =	short circuit at PT1000 (resistance < 500 Ω)	A04 =	humidity sensor defective

Please note:

> Short leads (max. 1m) between PMU-P and the analysis electronics (provided by customer);

> PMU-P must be contacted, powered and analysed via hardware and software by customer;

> The PMU-P is not a „stand alone“ device and must be checked together with the analysis electronics in accordance with the EMC guidelines;

> The PMU-P does not have an internal polarity reversal protection. Please ensure that the plug contact is only connected to the correct voltage level;

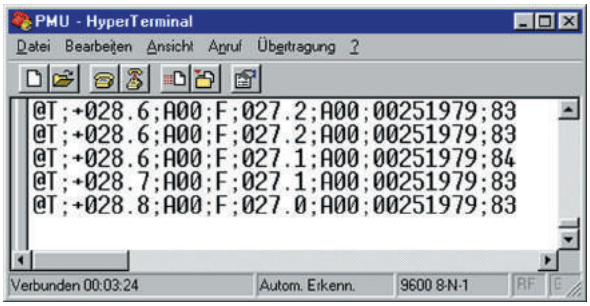
Connection settings

Output via the Hyper Terminal

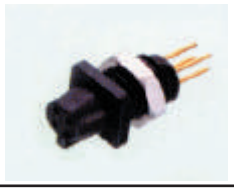
In connection with a separate signal level converter (RS232), the PMU-P can be read via the Hyper Terminal programme in Windows. The picture below shows the character string of the data issued by the PMU-P.

Output via Visual PMU

For recording data and for online display purposes, the visualisation programme „Visual PMU“ by Galltec+Mela is available.



Connector versions for contacting the PMU-P

Binder No.	Version	Model	
09-9766-20-04	female	Soldered connection for printed-circuit boards	
09-9766-30-04	female	solder termination	
09-9764-70-04	female	cable connector with strain relief	
09-9764-00-04	female	cable connector without strain relief	

PM-V
Sensor for Humidity and Temperature with hx Processor

with calibrated and exchangeable measuring head
for direct output of various physical values

Digital Measuring Head PMU-V

Humidity

measuring range ..... 0..100%rh
measuring accuracy 10...90%rh at 23°C ..... ±1.5%rh [1)2)]
at <10%rh or >90%rh ..... ±2%rh
at <10°C or >40°C ..... ±0.05%rh/K additional
resolution ..... 0.01%rh (read out)
hysteresis ..... < 1%rh

Temperature

measuring element Pt1000 1/3DIN
measuring range ..... -40...+85°C
measuring accuracy ..... ±0.15 K at 23°C
resolution ..... 0.01K (read out)
influence of temperature (TK) ..... <0.005 K/K

housing ..... stainless steel
filter ..... ZE04 (standard)
..... ZE13 (optional) / IP65

Transmitter PMO...V with hx Processor

physical outputs
dew point temperature ..... 0...70°C [3)]
enthalpy ..... 0...80 kJ/kg [3)]
mixing ratio ..... 0...100g/kg dry air [3)]
absolute humidity ..... 0...20g/m³ or 0...100g/m³ [3)]
wet-bulb temperature ..... -10...+50°C [3)]
relative humidity ..... 0...100%rh
temperature ranges ..... -30...+70°C; 0...+50°C; 0...100°C
There are respectively 2 physical values available at the output

response time t_{63} at v=2m/s ..... < 15 s
electrical outputs
voltage ..... 2x 0...1VDC, or 2x 0...10VDC
current (PM80V and PM100V) ..... 2x 0(4)...20mA
linearity ..... <0.25%
power supply:
PM80V + PM100V: 0 ...1V: 6 ... 30V DC / 24V AC ±10%
0 ... 10V: 15 ... 30V DC / 24V AC ±10%
0(4) ... 20mA: 15 ... 30VDC[4)]
PM15V: 0 ... 1V: 6 ... 30VDC
0 ... 10V: 15 ... 30VDC
electromagnetic compatibility ..... ref. EN61326-1
min. load resistance for voltage output ..... 10 kOhm
consumption of electronics ..... <10 mA
load for current output ..... acc. diagram
permissible ambient temperature
at the sensor tube ..... -40...+85°C
at the housing (PM80V) ..... -40...+85°C
(PM100V) .....-10...+60°C
max. air speed 15m/s
minimum air speed across the measuring head
for output: 2 x 0(4)...20mA ..... 1,5 m/s
2 x 0...1V, 2 x 0...10V ..... 1 m/s
housing PMO100V ..... ABS light grey
PMO80V ..... aluminium die-casting,varnished
PMO15V ..... stainless steel
protective system housing PM15V, PM80V IP65
protective system housing PM100V IP64
protective system connector IP65
probe material ..... stainless steel
mounting position ..... optional
contacting ..... connecting terminals 1.5mm² in the housing
PM15V length of connection cable 1.5m

Description of the Sensor

PM-V sensors with **integrated hx-processor** measure humidity by means of a humidity-dependant condenser. The capacitive Mela® humidity measuring element, produced using thinfilm technology, consists of a base plate, on which the electrodes are housed and a hygroscopic polymer layer above it. The hygroscopic polymer layer absorbs water molecules from the medium to be measured (air) or releases them, thereby altering the capacity of the condenser.

The humidity or temperature values measured are calculated in the exchangeable PMU-V measuring head, with the calibration values stored there, and communicated on to the following electronic transmitter components as calibrated digital measuring values.

The PMU-V measuring heads are calibrated and thus enable an easy replacement. Replaced measuring heads can be recalibrated in the factory.

The transmitter with the hx processor uses the values of the relative humidity and the temperature to calculate the dew point temperature, the enthalpy, the mixing ratio, the absolute humidity or the wet-bulb temperature, in accordance with the laws of physics. The values are emitted at two analogue outputs with the standardised signals 0….10VDC, 0 ….1VDC, 0….20mA or (0) 4 ….20mA. The outputs can be configured differently and are defined using the software. Further measuring ranges on request.

The Mela® measuring element is protected by a filter and a basket guard. The PM-V is supplied with a ZE04 filter with PTFE protection (IP00). The sensors are designed for unpressurised systems, the measurement medium is non-aggressive air.
Please consult the "*application instructions for the sensing elements*" (product info sheet no. A 1) or check with the manufacturer for further information which you need to bear in mind when using humidity sensors with capacitive sensing elements.

1) Ex works. Depending on the specific range of application a regular ecalibration of the sensor head (PMU-V) has to be effected.
2) Higher accuracies on request.
3) The accuracy of the calculated values depends on both the opera ting point in accordance with the hx diagram and on the primary values measured.
4) See load diagram

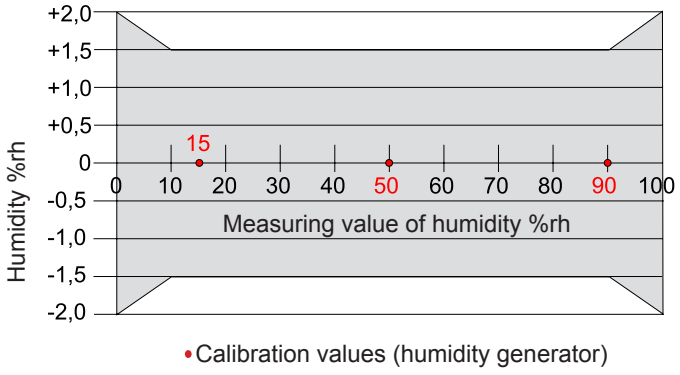
Type Survey

Type	Order No.	Physical output 1	Measuring value 1	Electrical output 1	Physical output 2	Measuring value 2	Electrical output 2
PMU-V "plug-and-measure unit"	630101023594	relative humidity	0...100%rh	ASCII (digital)	temperature	-30...70°C (-40...85°C)	ASCII (digital)
PM80V duct version alu housing	740101023261	relative humidity	0...100%rh	0...20mA	temperature	-30...+70°C	0...20mA
	740101023161	relative humidity	0...100%rh	0...20mA	temperature	0...100°C	0...20mA
	740101023061	relative humidity	0...100%rh	0...20mA	temperature	0...+50°C	0...20mA
	740305023261	dew point temperature	0...70°C	0...20mA	temperature	-30...+70°C	0...20mA
	740410023261	enthalpy	0...80kJ/kg	0...20mA	temperature	-30...+70°C	0...20mA
	740515023261	mixing ratio	0...100g/kg dry air	0...20mA	temperature	-30...+70°C	0...20mA
	740621023261	absolute humidity	0...100g/m³	0...20mA	temperature	-30...+70°C	0...20mA
	740620023261	absolute humidity	0...20g/m³	0...20mA	temperature	-30...+70°C	0...20mA
0...20mA	740833023261	wet-bulb temperature	-10...+50°C	0...20mA	temperature	-30...+70°C	0...20mA
PM80V duct version alu housing	740101023271	relative humidity	0...100%rh	4...20mA	temperature	-30...+70°C	4...20mA
	740101023171	relative humidity	0...100%rh	4...20mA	temperature	0...100°C	4...20mA
	740101023071	relative humidity	0...100%rh	4...20mA	temperature	0...+50°C	4...20mA
	740305023271	dew point temperature	0...70°C	4...20mA	temperature	-30...+70°C	4...20mA
	740410023271	enthalpy	0...80kJ/kg	4...20mA	temperature	-30...+70°C	4...20mA
	740515023271	mixing ratio	0...100g/kg dry air	4...20mA	temperature	-30...+70°C	4...20mA
	740621023271	absolute humidity	0...100g/m³	4...20mA	temperature	-30...+70°C	4...20mA
	740620023271	absolute humidity	0...20g/m³	4...20mA	temperature	-30...+70°C	4...20mA
4...20mA	740833023271	wet-bulb temperature	-10...+50°C	4...20mA	temperature	-30...+70°C	4...20mA
PM100V duct version ABS housing	750101023261	relative humidity	0...100%rh	0...20mA	temperature	-30...+70°C	0...20mA
	750101023161	relative humidity	0...100%rh	0...20mA	temperature	0...100°C	0...20mA
	750101023061	relative humidity	0...100%rh	0...20mA	temperature	0...+50°C	0...20mA
	750305023261	dew point temperature	0...70°C	0...20mA	temperature	-30...+70°C	0...20mA
	750410023261	enthalpy	0...80kJ/kg	0...20mA	temperature	-30...+70°C	0...20mA
	750515023261	mixing ratio	0...100g/kg dry air	0...20mA	temperature	-30...+70°C	0...20mA
	750621023261	absolute humidity	0...100g/m³	0...20mA	temperature	-30...+70°C	0...20mA
	750620023261	absolute humidity	0...20g/m³	0...20mA	temperature	-30...+70°C	0...20mA
0...20mA	750833023261	wet-bulb temperature	-10...+50°C	0...20mA	temperature	-30...+70°C	0...20mA
PM100V duct version ABS housing	750101023271	relative humidity	0...100%rh	4...20mA	temperature	-30...+70°C	4...20mA
	750101023171	relative humidity	0...100%rh	4...20mA	temperature	0...100°C	4...20mA
	750101023071	relative humidity	0...100%rh	4...20mA	temperature	0...+50°C	4...20mA
	750305023271	dew point temperature	0...70°C	4...20mA	temperature	-30...+70°C	4...20mA
	750410023271	enthalpy	0...80kJ/kg	4...20mA	temperature	-30...+70°C	4...20mA
	750515023271	mixing ratio	0...100g/kg dry air	4...20mA	temperature	-30...+70°C	4...20mA
	750621023271	absolute humidity	0...100g/m³	4...20mA	temperature	-30...+70°C	4...20mA
	750620023271	absolute humidity	0...20g/m³	4...20mA	temperature	-30...+70°C	4...20mA
4...20mA	750833023271	wet-bulb temperature	-10...+50°C	4...20mA	temperature	-30...+70°C	4...20mA

Type	Order No.	Physical output 1	Measuring value 1	Electrical output 1	Physical output 2	Measuring value 2	Electrical output 2
PM80V duct version alu housing	740101023211	relative humidity	0...100%rh	0...10VDC	temperature	-30...+70°C	0...10VDC
	740101023111	relative humidity	0...100%rh	0...10VDC	temperature	0...100°C	0...10VDC
0...10VDC	740101023011	relative humidity	0...100%rh	0...10VDC	temperature	0...+50°C	0...10VDC
	740305023211	dew point temperature	0...70°C	0...10VDC	temperature	-30...+70°C	0...10VDC
	740410023211	enthalpy	0...80kJ/kg	0...10VDC	temperature	-30...+70°C	0...10VDC
	740515023211	mixing ratio	0...100g/kg dry air	0...10VDC	temperature	-30...+70°C	0...10VDC
	740621023211	absolute humidity	0...100g/m³	0...10VDC	temperature	-30...+70°C	0...10VDC
	740620023211	absolute humidity	0...20g/m³	0...10VDC	temperature	-30...+70°C	0...10VDC
	740833023211	wet-bulb temperature	-10...+50°C	0...10VDC	temperature	-30...+70°C	0...10VDC
PM80V duct version alu housing	740101023221	relative humidity	0...100%rh	0...1VDC	temperature	-30...+70°C	0...1VDC
	740101023121	relative humidity	0...100%rh	0...1VDC	temperature	0...100°C	0...1VDC
0...1VDC	740101023021	relative humidity	0...100%rh	0...1VDC	temperature	0...+50°C	0...1VDC
	740305023221	dew point temperature	0...70°C	0...1VDC	temperature	-30...+70°C	0...1VDC
	740410023221	enthalpy	0...80kJ/kg	0...1VDC	temperature	-30...+70°C	0...1VDC
	740515023221	mixing ratio	0...100g/kg dry air	0...1VDC	temperature	-30...+70°C	0...1VDC
	740621023221	absolute humidity	0...100g/m³	0...1VDC	temperature	-30...+70°C	0...1VDC
	740620023221	absolute humidity	0...20g/m³	0...1VDC	temperature	-30...+70°C	0...1VDC
	740833023221	wet-bulb temperature	-10...+50°C	0...1VDC	temperature	-30...+70°C	0...1VDC
PM100V duct version ABS housing	750101023211	relative humidity	0...100%rh	0...10VDC	temperature	-30...+70°C	0...10VDC
	750101023111	relative humidity	0...100%rh	0...10VDC	temperature	0...100°C	0...10VDC
0...10VDC	750101023011	relative humidity	0...100%rh	0...10VDC	temperature	0...+50°C	0...10VDC
	750305023211	dew point temperature	0...70°C	0...10VDC	temperature	-30...+70°C	0...10VDC
	750410023211	enthalpy	0...80kJ/kg	0...10VDC	temperature	-30...+70°C	0...10VDC
	750515023211	mixing ratio	0...100g/kg dry air	0...10VDC	temperature	-30...+70°C	0...10VDC
	750621023211	absolute humidity	0...100g/m³	0...10VDC	temperature	-30...+70°C	0...10VDC
	750620023211	absolute humidity	0...20g/m³	0...10VDC	temperature	-30...+70°C	0...10VDC
	750833023211	wet-bulb temperature	-10...+50°C	0...10VDC	temperature	-30...+70°C	0...10VDC
PM100V duct version ABS housing	750101023221	relative humidity	0...100%rh	0...1VDC	temperature	-30...+70°C	0...1VDC
	750101023121	relative humidity	0...100%rh	0...1VDC	temperature	0...100°C	0...1VDC
0...1VDC	750101023021	relative humidity	0...100%rh	0...1VDC	temperature	0...+50°C	0...1VDC
	750305023221	dew point temperature	0...70°C	0...1VDC	temperature	-30...+70°C	0...1VDC
	750410023221	enthalpy	0...80kJ/kg	0...1VDC	temperature	-30...+70°C	0...1VDC
	750515023221	mixing ratio	0...100g/kg dry air	0...1VDC	temperature	-30...+70°C	0...1VDC
	750621023221	absolute humidity	0...100g/m³	0...1VDC	temperature	-30...+70°C	0...1VDC
	750620023221	absolute humidity	0...20g/m³	0...1VDC	temperature	-30...+70°C	0...1VDC
	750833023221	wet-bulb temperature	-10...+50°C	0...1VDC	temperature	-30...+70°C	0...1VDC

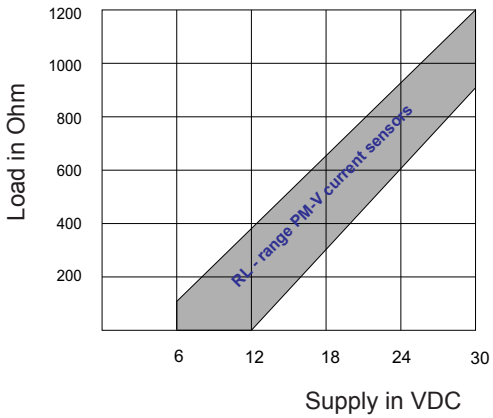
Type	Order No. (PM-key)	Physical output 1	Measuring value 1	Electrical output 1	Physical output 2	Measuring value 2	Electrical output 2
PMU-V "plug-and-measure unit"	630101023594	relative humidity	0...100%rh	ASCII (digital)	temperature	-30...70°C (-40...85°C)	ASCII (digital)
PM15V cable version **0...10VDC**	730101023211	relative humidity	0...100%hr	0...10VDC	temperature	-30...+70°C	0...10VDC
	730101023111	relative humidity	0...100%rh	0...10VDC	temperature	0...100°C	0...10VDC
	730101023011	relative humidity	0...100%rh	0...10VDC	temperature	0...+50°C	0...10VDC
	730305023211	dew point temperature	0...70°C	0...10VDC	temperature	-30...+70°C	0...10VDC
	730410023211	enthalpy	0...80kJ/kg	0...10VDC	temperature	-30...+70°C	0...10VDC
	730515023211	mixing ratio	0...100g/kg dry air	0...10VDC	temperature	-30...+70°C	0...10VDC
	730621023211	absolute humidity	0...100g/m³	0...10VDC	temperature	-30...+70°C	0...10VDC
	730620023211	absolute humidity	0...20g/m³	0...10VDC	temperature	-30...+70°C	0...10VDC
	730833023211	wet-bulb temperature	-10...+50°C	0...10VDC	temperature	-30...+70°C	0...10VDC
PM15V cable version **0...1VDC**	730101023221	relative humidity	0...100%rh	0...1VDC	temperature	-30...+70°C	0...1VDC
	730101023121	relative humidity	0...100%rh	0...1VDC	temperature	0...100°C	0...1VDC
	730101023021	relative humidity	0...100%rh	0...1VDC	temperature	0...+50°C	0...1VDC
	730305023221	dew point temperature	0...70°C	0...1VDC	temperature	-30...+70°C	0...1VDC
	730410023221	enthalpy	0...80kJ/kg	0...1VDC	temperature	-30...+70°C	0...1VDC
	730515023221	mixing ratio	0...100g/kg dry air	0...1VDC	temperature	-30...+70°C	0...1VDC
	730621023221	absolute humidity	0...100g/m³	0...1VDC	temperature	-30...+70°C	0...1VDC
	730620023221	absolute humidity	0...20g/m³	0...1VDC	temperature	-30...+70°C	0...1VDC
	730833023221	wet-bulb temperature	-10...+50°C	0...1VDC	temperature	-30...+70°C	0...1VDC

Accuracy of humidity in %rh at 23°C



• Calibration values (humidity generator)

Load for 0(4)...20mA current version



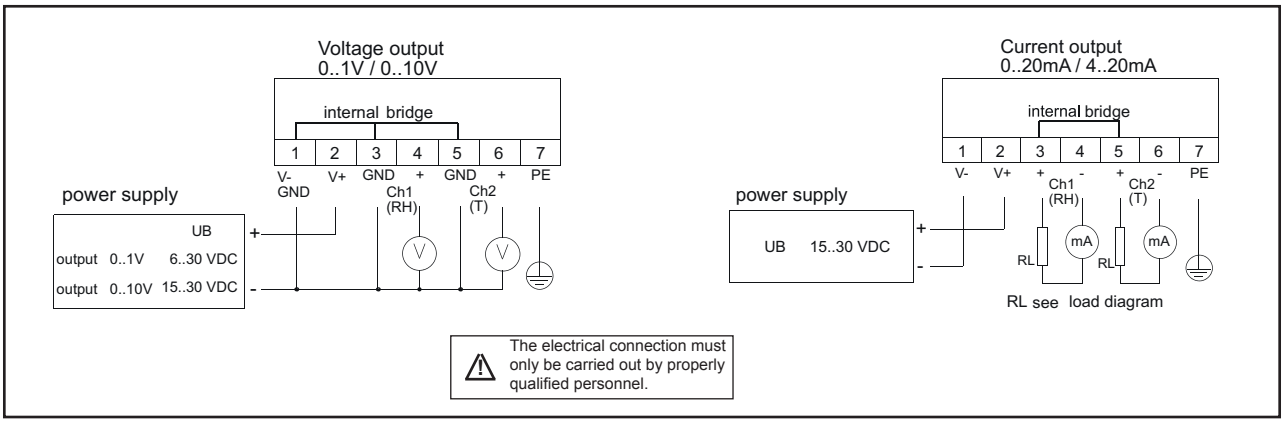
ESD protection advice

All PM15V sensors are made up of a PMO15V transmitter with a PMU-V sensor head and components which can be damaged by the effects of electrical fields or by charge equalisation when touched. This is why the PMU-V sensor heads, that can be supplied separately and that are suitable for being exchanged on location, are packaged in conductive, reusable ESD protected bags.

The following protective measures must be taken when exchanging a PMU-V sensor head on the PMO15V transmitter:

- Before unpacking the PMU-V sensor head, ensure electrical potential equalisation between you and your environment.
- Pay particular attention to ensuring that this potential equalisation is maintained while you are ex changing the PMU-V sensor head.
- Only store or transport the PMU-V sensor head in the ESD protective bag supplied, or in comparable packaging

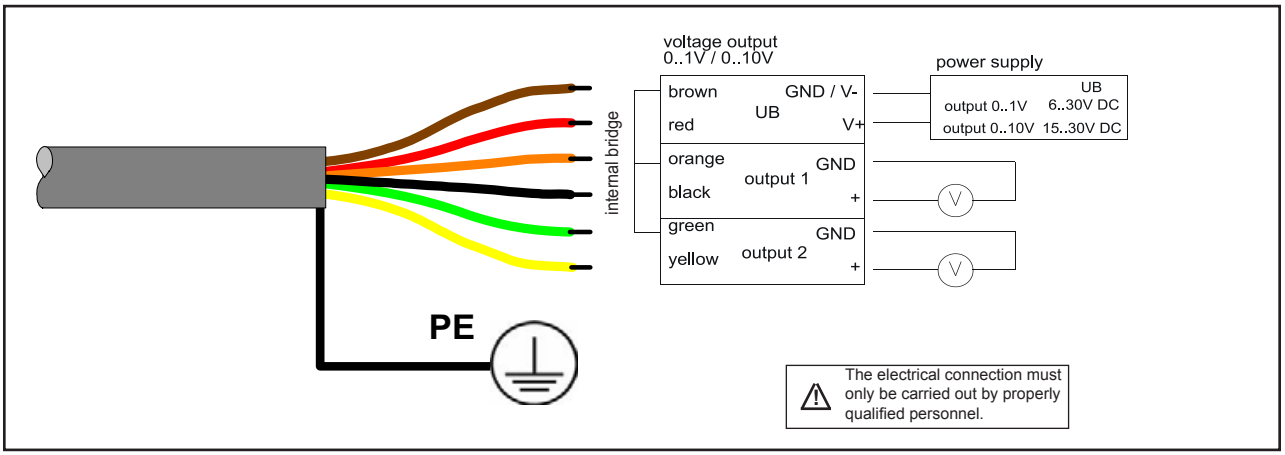
Connection diagrams PM80V, PM100V



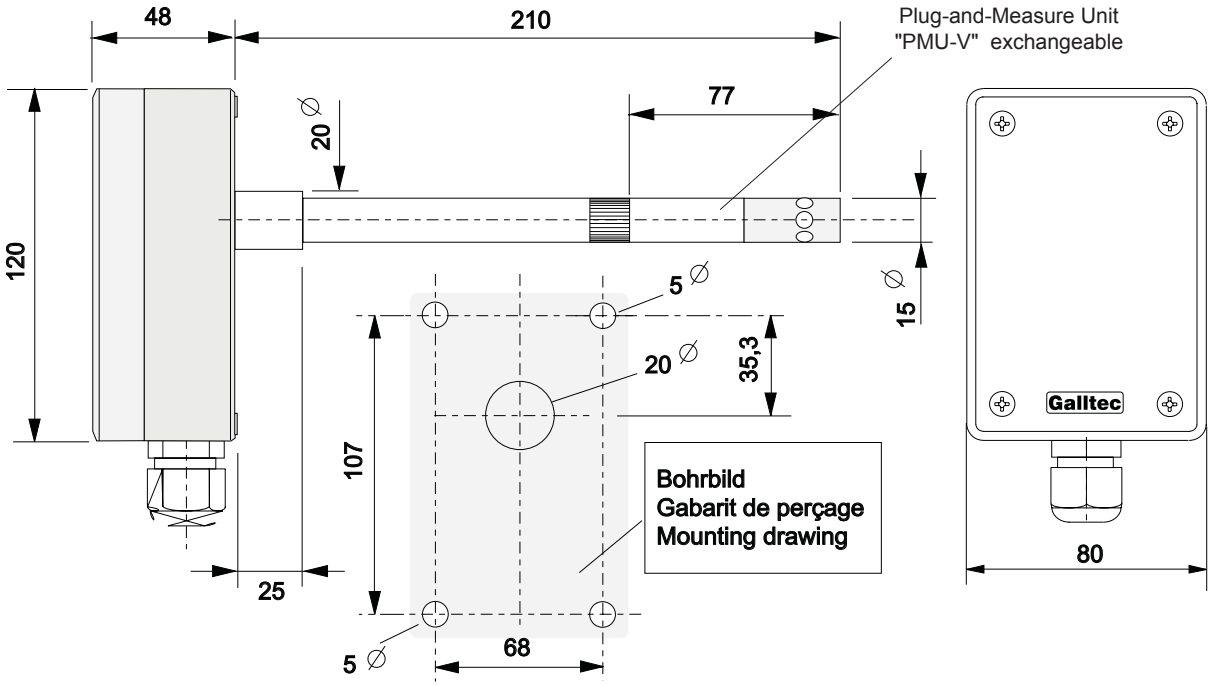
Shielding PM80V

Please fix the shielding for PM80V (with alu housing) in the cable gland (see photo).

Connection diagram PM15V

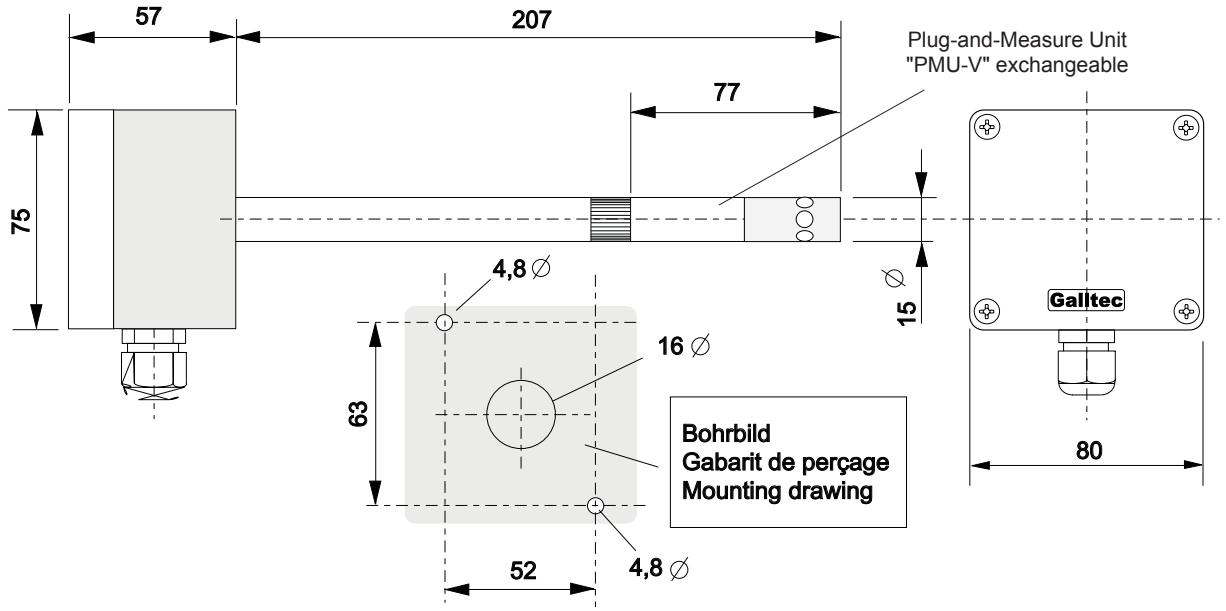


Humidity-Temperature Sensor PM100V
with plastic housing IP64

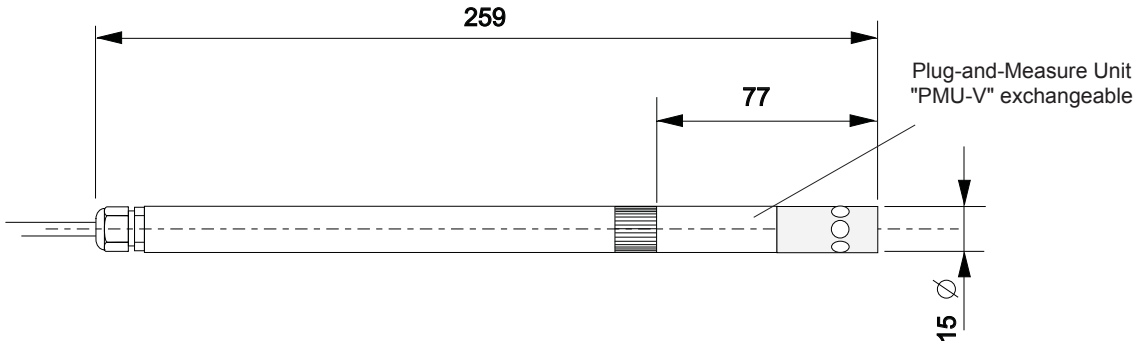


⚠ The electrical connection must only be carried out by properly qualified personnel.

Humidity-Temperature Sensor PM80V
with housing made of aluminium die-casting IP65



Humidity-Temperature Sensor PM15V
in cable version



Compact microprocessor controller TFR2

for humidity, temperature and pressure
for sensors with resistance-, current-, and voltage output

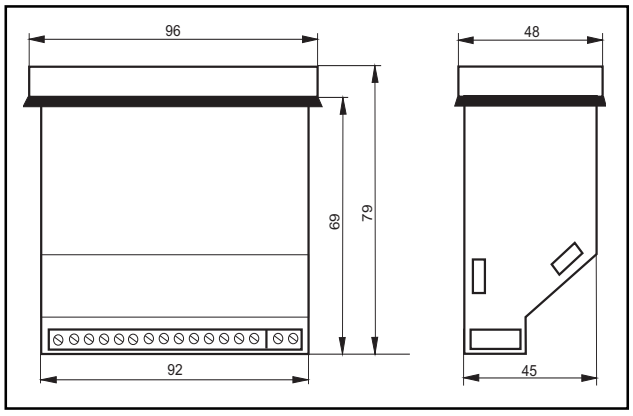
Description

The universal double-set point controller type TFR2 does not only regulate humidity, temperature and pressure but also flow and speed of the wind. It is a digital microprocessor-controller allowing configuration with many standardized input signals Pt100, Pt1000, KTY-11-6, 0(2)...10VDC, 0(4)...20mA and thermocouple.
The TFR2 can be used as display, single set and double set point, with ON/OFF or PID-function. The self-optimisation function determines the optimum controller parameters for PID or PI controllers.

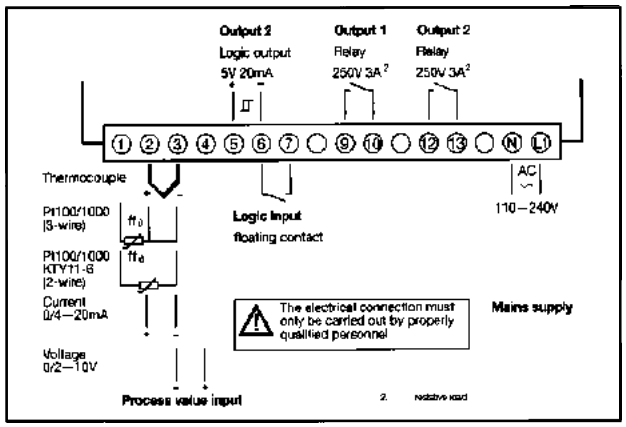
The controller disposes of two NO-relays, one logic output which can be freely configurated and a binary input for various functions.The TFR2 has also a programmable output function on faults.

The process value is shown on the display with 4 green figures. The relay position is displaid on the LED. All parameters and the measuring range are to be programmed with the three keys.

Dimensions



Electrical connection



Technical details

input Pt100, Pt1000, KTY11-6
..... thermocouple, 0(2)...10V, 0(4)...20mA
measuring range ..... programmable (-1999...+9999)
output ..... 2 NO-contacts
..... 1 logic output 5V/20mA
breaking capacity ..... max. 3A ohmic load at 250VAC
sampling time 210ms
control characteristics .....programmable
switching hysteresis .....programmable
mains supply ..... 110...240V
frequency ..... 48... 63 Hz
power consumtion ..... max 5 VA
ambient temperature ..... 0...55°C
climatic conditions ..... max. 75%r.F. no condensation
housing type ..... plastic für panel mounting to DIN 43700
housing dimensions ..... 96 x 48 x 70 mm
operating position ..... any
electromagnetic compatibility
resistance to interference..... EN50082-2
interference emission..... EN50081-2
protective system
front..... IP65 to EN 60 529
rear.....IP20
weight ..... 0,2 kg

Operation of the Controller

Setting of the basic functions of the controller (configuration level):

In order to make the settings, it is necessary to change from the process value display to the configuration level, where the basic functions are set.

Press the **P** button for approx. 3 sec. until the parameter **Pb .1** appears, press P several times until the parameter **Y .0** appears, then press **P** again for another 3 sec. approx. The first parameter will appear on the configuration level (**C111**)

Now the display will show in change the parameter symbol and the parameter value. The parameters can be changed dynamically with the keys ▲ and ▼. The setting will be automatically saved after 2 sec. approx.

On the display appears the parameter **C111** (process value input)

Choose the desired transducer by pressing ▲ or ▼. It will be automatically saved after approx. 2 sec.

parameter	transducer
001	Pt100 (3-wire)
006	Pt1000 (3-wire)
601	KTY11-6
003	Pt100 (2-wire)
005	Pt1000 (2-wire)
039	Cu-CuNi „T“
040	Fe-CuNi „J“
041	Cu-CuNi „U“
042	Fe-CuNi „L“
043	NiCr-Ni „K“
044	Pt10Rh-Pt „S“
045	Pt13Rh-Pt „R“
046	Pt30Rh-Pt „B“
048	NiCrSi-NiSi „N“
052	standard signal 0...20mA
053	standard signal 4...20mA
063	standard signal 0...10V
071	standard signal 2...10V

By pressing **P** the parameter ***C112*** (decimal places/unit of process value) will appear

Choose the desired unit or number of decimal places by pressing ▲ or ▼. They will be automatically saved after 2 sec.

parameter	decimal places/ unit
0	9999/°C
1	999.9/°C
2	99.99/°C
3	9999/°F
4	999.9/°F
5	99.99/°F

By pressing **P** the parameter ***C113*** (controller type / output 1 / output 2) will appear.

Choose the desired controller type by pressing ▲ or ▼. It will be saved after about 2 sec.

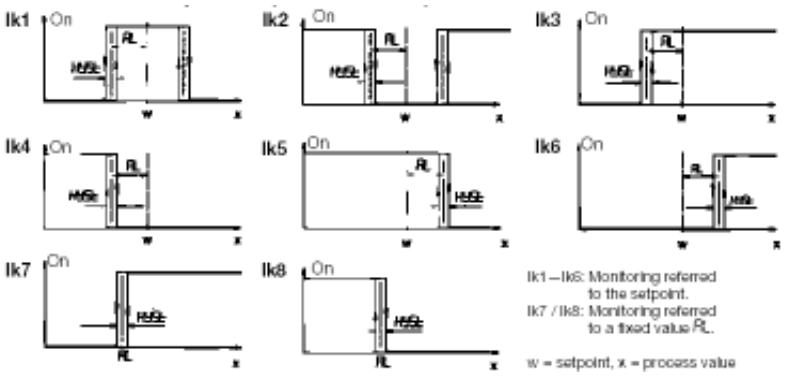
parameter	controller type	output 1	output 2
10	single setpoint (reversed)	controller	limit comparator
11	single setpoint (direct)	controller	limit comparator
30	double setpoint	controller reversed	controller direct
20	single setpoint (reversed)	limit comparator	controller
21	single setpoint (direct)	limit comparator	controller
33	double setpoint	controller direct	controller reversed

reversed = heating (output is active when process value is below setpoint)
direct = cooling (output is activ when process value is above setpoint)

By pressing **P** the parameter ***C114*** (limit comparators LK) appears

parameter	limit comparator
0	no function
1	lk 1
2	lk 2
3	lk 3
4	lk 4
5	lk 5
6	lk 6
7	lk 7
8	lk 8

Limit comparator (alarm contact)



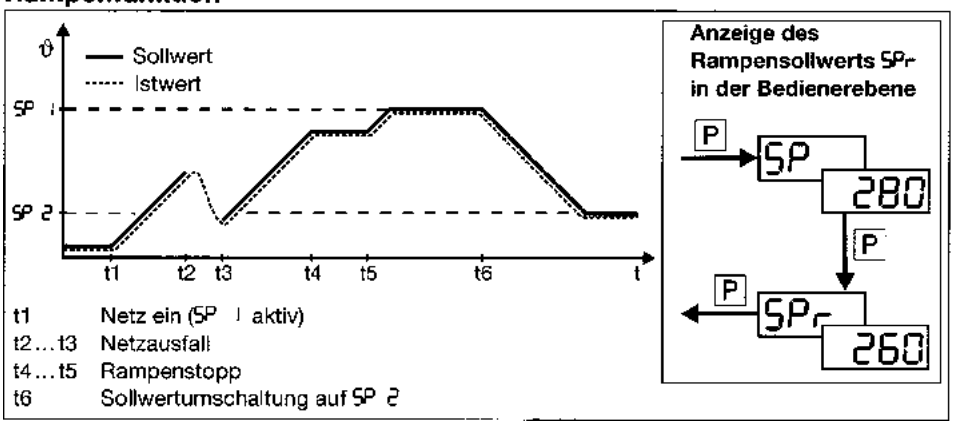
Choose the required limit comparator by pressing ▲ or ▼ . It will be automatically saved after about 2 sec.

Press **P** again to get the parameter ***C115*** (ramp function)

Choose the required ramp function by pressing ▲ or ▼. It will be automatically saved after about 2 sec.

Parameter	Ramp function
0	ramp function off
1	ramp function (K/min)
2	ramp function (K/h)

Rampenfunktion



Press **P** again to get the parameter ***C116*** (outputs on fault)

Choose the required function by pressing ▲ or ▼ . It will be automatically saved after about 2 sec.

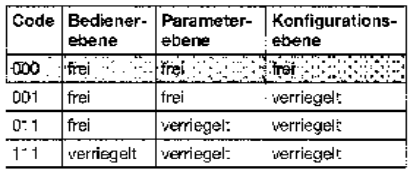
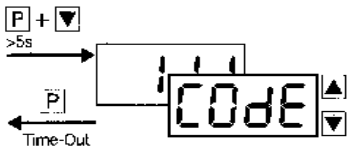
Parameter	Outputs on fault
0	0% output / lk off
1	100% output / lk off
2	-100% output / lk off
3	0% output / lk on
4	100% output / lk on

Press **P** again to get to parameter ***C117*** (Binary input)

Choose the required function by pressing ▲ or ▼. It will be automatically saved after about 2 sec.

Parameter	Function of binary input
0	no function
1	key inhibit
2	level inhibit
3	ramp stop
4	setpoint switching

Binäreingang

		
Tastaturverriegelung	Bedienen über Tasten **ist** möglich.	Bedienen über Tasten ist **nicht** möglich.
Ebenenverriegelung	Zugang zu den Ebenen **ist** möglich. Das Starten der Selbstoptimierung ist möglich.	Zugang zu den Ebenen **nicht** möglich. Das Starten der Selbstoptimierung ist **nicht** möglich.
Alternativ zum Binäreingang kann eine Ebenenverriegelung über einen Code eingestellt werden (Binäreingang hat Priorität)		
Rampenstopp	Rampe läuft.	Rampe gestoppt.
Sollwertumschaltung	Sollwert SP 1 ist aktiv	Sollwert SP 2 ist aktiv
	Darstellung der entsprechenden Symbole SP 1 und SP 2 in der Bedienerebene.	

Continue to press **P** to get to the ***parameter level*** that offers according to the previous configuration the following parameters. Here again, select the requird value by pressing ▲ or ▼. The values will be automatically saved after 2 seconds. To select the next parameter press **P** again.

Parameter	Explanation	Value range	Factory set
SCL	start value of the standard signal	-1999... 9999 Digit	0
SCH	en value of the standard signal	-1999... 9999 Digit	100
SPL	lower setpoint limiting	-1999... 9999 Digit	-200
SPH	upper setpoint limiting	-1999... 9999 Digit	850
OFFS	process value correction	-1999... 9999 Digit	0
HYSt	switching differential of the limit comparator	0... 9999 Digit	1
SP 1	setpoint 1	SPL... SPH	0
SP2	setpoint 2 (only with activated ramp function)	SPL... SPH	0
AL	limit value of limit comarator	-1999... 9999 Digit	0
Pb .1	proportional band 1 (controller output 1) (influences P action of the controller, at Pb=0 the controller shows ON/OFF action)	0... 9999 Digit	0
Pb .2	proportional band 2 (controller output 2)	0... 9999 Digit	0
dt	derivative time (influences D action of controller, at dt=0 controller shows no D action)	0... 9999 Sekunden	80s
rt	reset time (influences I action of controller, at rt=0 controller shows no I action)	0... 9999 Sekunden	350s
CY 1	cycle time 1 (controller output 1)	1,0... 999,9 Sekunden	20,0s
CY 2	cycle time 2 (controller output 2)	1,0... 999,9 Sekunden	20,0s
db	contact spacing with double setpoint control	0... 1000 Digit	0
HYS.1	differential 1 (controller output 1)	0... 9999 Digit	1
HYS.2	differential 2 (controller output 2)	0... 9999 Digit	1
Y .0	working point (output process value = set point)	-100... 100%	0%
Y .1	maximum output (has to be 100 % at Pb=0)	0... 100%	100%
Y .2	minimum output (has to be 100 % at Pb=0)	-100... +100%	-100%
dF	filter time constant	0,0... 100,0 Sekunden	0,6s
rASd	ramp slope	0... 999 Digit/h oder Digit/min	0

Symbol	Bemerkungen
db	**Kontaktabstand** Bei Dreipunktregler
HYS.1 HYS.2	**Schaltdifferenz 1** (1.Reglerausgang) **Schaltdifferenz 2** (2.Reglerausgang) Für Regler mit Pb=0

Parameter level

It is also possible to change directly from the ***parameter level*** to the process value indication. Press therefore **P** for 3 seconds until **Pb.1** appears. The parameter can now be called and changed as described.

Setpoint adjustment and indication of ramp setpoint

To change the setpoint directly from the process value indication press **P. SP** or **SPr** will appear. Adjust these parameter againg by pressing ▲ or ▼ to the required value. It will be automatically saved after about 2 seconds. Change back to the process value indication by pressing **P** again.

Alarm messages: The display for the process value flashes **1999**

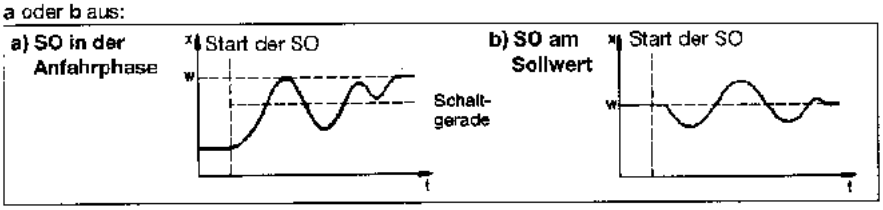
The causes may be: over/underrange of process value e. g. by sensor break/short circuit
the measurement is outside the control range of the connected sensor,
display overflow;
Controller and limit comparators referred to the process value input behave in accordance with the configuration of the outputs.

Selbstoptimierung

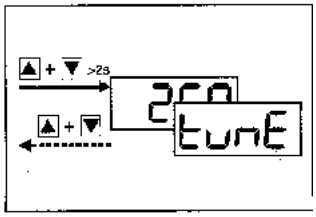
Die Selbstoptimierung SO ermittelt die optimalen Reglerparameter für einen PID- oder PI-Regler.

Folgende Reglerparameter werden bestimmt: rt, dt, Pb.1, Pb.2, CY.1, CY.2, dF

In Abhängigkeit von der Größe der Regelabweichung wählt der Regler zwischen zwei Verfahren a oder b aus:



Start der Selbstoptimierung



☞ Ein Starten der Selbstoptimierung ist bei aktiver Ebenenverriegelung und Rampenfunktion nicht möglich.

Die Selbstoptimierung wird automatisch beendet oder kann abgebrochen werden.

Example of a configuration

problem: In a climatic chamber humidity has to be measured by a air humidity sensro (output 0... 10 V). By steering a humidifier with the ***TFR2 controller*** a relative humidity of 80 % rh with PID action has to be controlled. At a deviation of more than +/- 10 % of the setpoint value an alarm signal has to be issued.

course of controller configuration:

1. set basic controller functions on configuration level

In order to effect the necessary adjustments change from the process value indication to the configuration level. Therefore press **P** for about 3 seconds until the Parameter **Pb.1** appears. Go on pressing **P** until the parameter **Y .0** appears, then press **P** again for about 3 seconds. The first parameter will appear on configuration level (***C111***).

Now the display will show in change the parameter symbol and the parameter value. The parameters can be changed dynamically with the keys ▲ and ▼. The setting will be automatically saved after 2 sec. approx. Change to the next parameter by pressing **P**.

2. Input of parameters

parameter	setting	description
C111	063	sensor signal 0... 10V
C112	1	values will be displayed with one decimal place
C113	10	output 1 (K1) is the controller output for humidification output 2 (K2) is the alarm output (limit comparator)
C114	2	alarm has to be activated when a preset tolerance (+ or -) of the setpoint has been reached.
C115	0	no ramp function necessary
C116	3	on sensor breakage the humidification has to be switched off and the alarm has to be activated
C117	0	binary input without function
SCL	0	inital value of the standard signal 0%rh
SCH	100	final value of the standard signal 100%rh
SPL	75	lower setpoint limit 75%rh
SPH	85	upper setpoint limit 85%rh - the setpoint can only be changed between 75 and 85 % rh
OFFS	0	process value correction not necessary
HYSt	0	differential for alarm not activated
AL	10	at a deviation of the setpoint of +/-10%rh an alarm has to be activated
Pb .1	10	the proportional band has to be 10%
dt	20	derivative time has to be 20 seconds
rt	50	reset time has to be 50 seconds
CY 1	20	cycle time of output 1 has to be 20 seconds
HYS.1	1	differential at output 1 has to be 1 digit (0,1%rh)
Y .0	0	if the setpoint is reached humidification will be stopped
Y .1	100	maximum output (power) can be 100%
Y .2	-100	minimum output (power) can be reduced to 0%
dF	0.6	the filter time constant is set optimally to 0,6 seconds approx.
SP	80.0	the setpoint has to be 80%rh

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