

## 1. DESCRIPTION

E-RHT-20 is a microprocessor based transmitter designed using single-chip relative humidity and temperature sensor module. Single-chip sensor contains two micro sensors calibrated for relative humidity and temperature and enables humidity-temperature information to be read in the form of 16 bit serial digital output.

In addition to the sensor input, the device is available in 0 (4) -20 mA and 0-10 V retraction of humidity and temperature values two configurable analog outputs, two digital outputs with relay capable of switching 3 A at 220 V AC, modbus communication protocol, which is controlled according to the RS-485 communication link.

Transmitter is housed in a waterproof plastic case, it has types with and without indicator. Transmitters can be used for all sorts of humidity and temperature measurements by choosing appropriate assembly form.

## 2. TYPE CODING

### E-RHT-20 - U - V - W - X - Y - Z

#### Indicator

No (There is no relay options) ..... 0  
Yes ..... 1

#### Output

No ..... 0  
2x0-20 mA ..... 1  
2x4-20 mA ..... 2  
2x0-10 VDC ..... 3  
2xNA-0 Relay/2x0-20 mA ..... 4  
2xNA-0 Relay/2x4-20 mA ..... 5  
2xNA-0 Relay/2x0-10 VDC ..... 6

#### Communication

No ..... 0  
RS-485 Modbus ..... 1

#### Probe Type

Wall mounting ..... 0  
Duck mounting, Length 10cm ..... 1  
Duck mounting, Length 20cm ..... 2  
Duck mounting, Length 30cm ..... 3  
Portable, 2m Cable ..... 4  
Portable, 5m Cable ..... 5

#### Probe Filter

Plastic Grid ..... 0  
Sintered Bronze ..... 1  
Membran ..... 2  
Metal Grid ..... 3  
Sintered Stainless Steel ..... 4  
PTFE ..... 5  
DF Filter (Diameter of pipe is 18 mm) ..... 6

#### Operation Voltage

20-60V AC or 20-85V DC ..... 1  
85-265V AC or 85-375V DC ..... 2

## 3. SPECIFICATIONS

### HUMIDITY:

Range: 0 - 100 %RH  
Accuracy: See **Figure 3.1.**  
Response Time ( $\tau_{63\%}$ )\*: 4 sc  
Repeatability:  $\pm 0.1$  %RH  
Resolution: 0.1 %RH

### TEMPERATURE:

Range: -40 - 120 °C  
Accuracy: See **Figure 3.1.**  
Response Time ( $\tau_{63\%}$ )\*: 2 sc  
Repeatability:  $\pm 0.1$  °C  
Resolution: 0.1 °C

### OPERATING TEMPERATURE:

Transmitter: -10 to 55 °C  
Probe: -40 to 120 °C

\*Temperature and humidity response times depend on how the sensor is integrated into the application and on process conditions (such as airflow).

The product life of this instrument is 10 years.

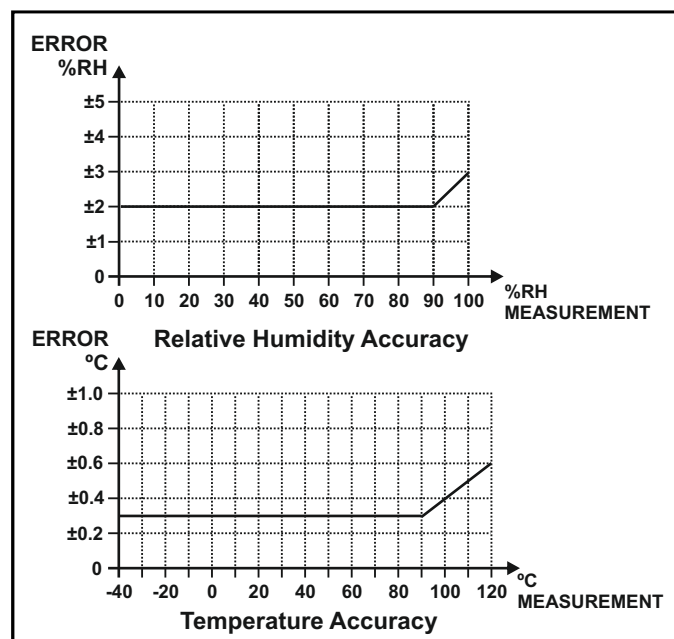
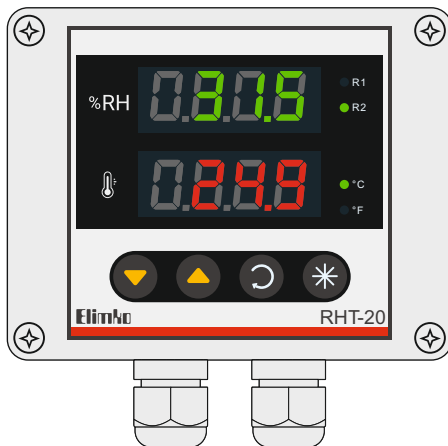


Figure 3.1. Accuracy Graphic

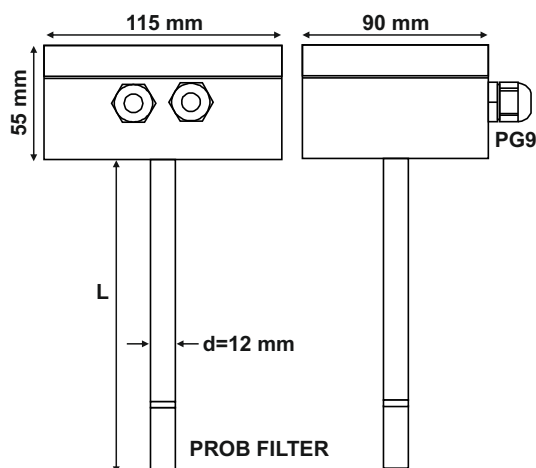
#### 4. DIMENSIONS

Drawings showing overall view and dimensions of E-RHT-20 are shown in **Figure 4.1**. The device is housed in a waterproof plastic case in dimensions 115 x 90 x 55 mm. In types with indicator, indicator is assembled on the box cover. In devices without indicator, the box cover is empty.



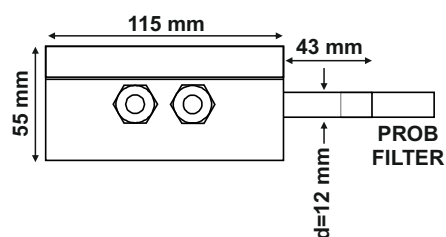
External connecting cables are connected to the device by getting them through cable glands. Different cable glands are used for operating voltage, outputs and communication line connections.

##### Duck Mount Type



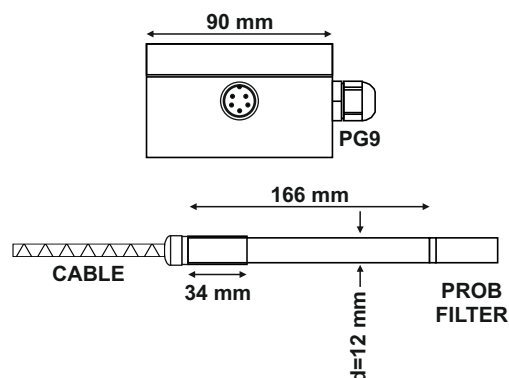
Duck mount transmitter probe is made of a 12 mm diameter stainless pipe. There is a sensor and sensor protecting probe filter on pipe end. Immersion length measure is shown as "L" in the drawings.

##### Wall Mount Type



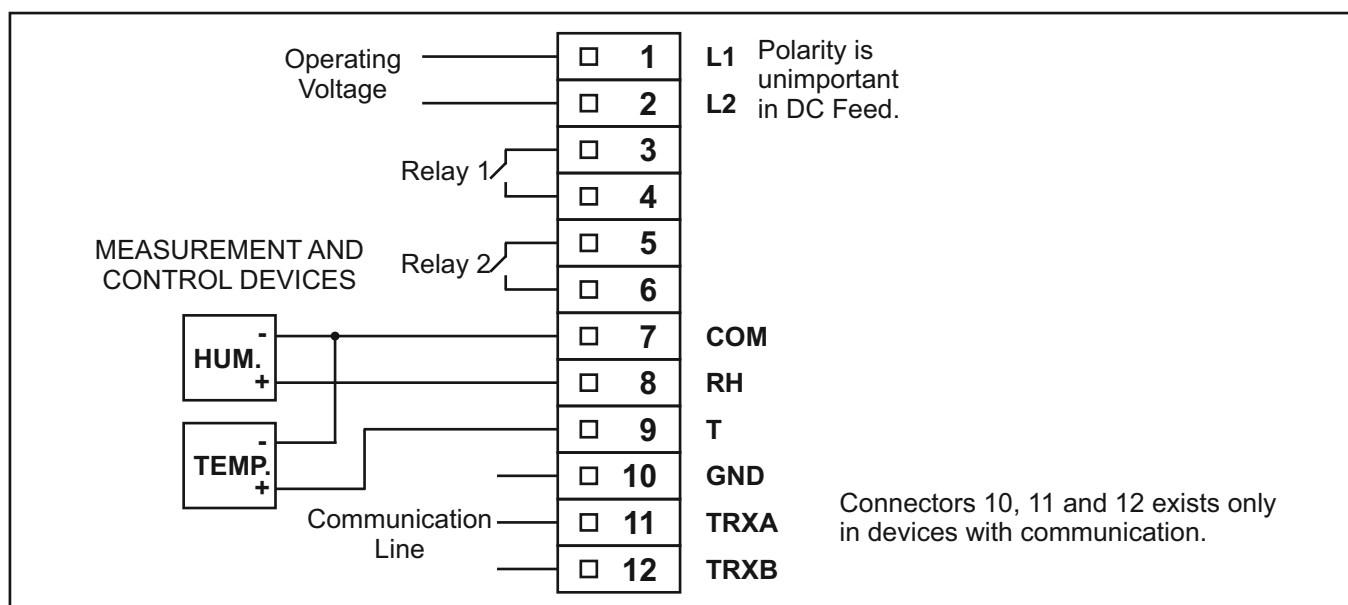
In wall-mounted devices, there is a piece approximately 43 mm in length before the probe is attached. The probe is mounted onto the end of this piece.

##### Wired, Portable Type



In wired, portable-type devices, there is an M16 connector on the side of the device. The sensor is connected using the M16 socket located at the end of the cable. The sensor is mounted onto a tube. The cable exits from the rear part of the tube.

## 5. CONNECTION DIAGRAM



**Figure 5.1.** Connection Diagram of E-RHT-20

In order to access connectors of E-RHT-20, it is required to unscrew cover screws and open the cover. View of the connectors and connection diagram are shown in **Figure 5.1**.

Operating voltage is applied to connectors 1 and 2. Polarity is not important for DC operating voltage.

The connections of the alarm relays must be made to terminals 3 and 4 for Relay 1 and terminals 5 and 6 for Relay 2.

Negative (-) poles of humidity and temperature outputs of the device are common (7), humidity output is taken from connector 8, temperature output is taken from connector 9.

In types with communication option, there are also connectors 10, 11, and 12 enabling communication line connection. The maximum number of devices that can be connected to communication line is 32.

In devices with current output, maximum load resistance is 750  $\Omega$ . In devices with voltage output, load impedance must be over 10 k $\Omega$ .

## 6. OPERATION

### 6.1. Normal Operating Mode

If the device is energized after making the connections according to connection diagram, it comes to normal operating position. In types without indicator, user cannot change the parameters, the device is used according to label information.

Display of device has 2 pieces of 4-digit 7-segment display, R1, R2,  $^{\circ}\text{C}$  and  $^{\circ}\text{F}$  leds and  $\nabla$ ,  $\blacktriangle$ ,  $\square$  and  $\boxtimes$  keys located. R1 led when Relay1 is energized, R2 led when Relay2 is energized, lower display unit of displayed temperature value  $^{\circ}\text{C}$   $^{\circ}\text{C}$  led, while  $^{\circ}\text{F}$  led.

In types with indicator, during the normal operating mode, humidity is shown in upper display, temperature is shown in lower display. During the normal operating mode, as long as key  $\nabla$  is pressed, minimum values measured as of last installation, as long as key  $\blacktriangle$  is pressed, maximum values measured as of last installation are shown. If keys  $\nabla$  and  $\blacktriangle$  are pressed simultaneously installation process is done, maximum and minimum values are equalized to the values measured at that moment.

### 6.2. Configuration Operations

While in normal operation screen, 5E1 and 5E2 values can be displayed by pressing  $\square$  key. Set values can be set with  $\nabla$  and  $\blacktriangle$  keys on the screens where set values are displayed. You can switch between set values with  $\square$  key. When the set values are displayed,  $\boxtimes$  key returns to the normal operation screen.

In order to set other parameters of the device, it must be entered in the configuration pages.

To access the configuration pages, press  $\square$  and  $\boxtimes$  together in the normal operation screen. After this, Cod is displayed in the upper display and 0 in the lower display. In this screen, password value is set with  $\nabla$  and  $\blacktriangle$  keys. The factory setting of the password is 10. When the password value is set, when  $\square$  key is pressed, the display will read PRGE in upper display,  $\alpha\text{LnF}$  in lower display and access the  $\alpha\text{LnF}$  page. While you are on this screen, you can move to other pages with  $\nabla$  and  $\blacktriangle$  keys. If the  $\square$  key is pressed after the page selection, the first parameter of the selected page is reached. The upper display shows the name of the parameter and the lower display shows its value. Parameter is adjusted with  $\nabla$  and  $\blacktriangle$  keys. Use  $\square$  key to switch between the parameters. Press  $\boxtimes$  key to return to the normal operation screen and if  $\square$  key is pressed for a few seconds, return first parameter of page.

If you enter the configuration pages with the wrong password, parameters other than 5Cod can be monitored, but the values are not changed.

The pages and the parameters in the pages are given in **Table 6.2.1**.

PAGE	Prm 1	Prm 2	Prm 3	Prm 4	Prm 5	Prm 6	Prm 7	Prm 8	Prm 9	Prm 10	Prm 11	Prm 12
oLnF	HrnG	HrL	HrH	ErnG	ErL	ErH	rL 15	rL 16	HYS 1	rL25	rL26	HYS2
GLnF	FLtr	Snbr	Adr5	bRud	Prty	Un 16	Scod	—	—	—	—	—
d2Lt	HP 1	H 1a	HP2	H2a	EP 1	E 1a	EP2	E2a	—	—	—	—
ELbr	HC 4	HC20	Hu 2	Hu 10	EC 4	EC20	Eu 2	Eu 10	—	—	—	—

Table 6.2.1. Configuration Pages and Parameters in the Pages

## 7. PARAMETERS

### 7.1. Alarm Set Values

**SEt 1:** Set values of Alarm Relay 1. If the temperature unit is °C, parameter can be adjusted between -40.0 and 120.0. If the temperature unit is °F, parameter can be set -40.0 and 248.0.

**SEt2:** Set values of Alarm Relay 2. If the temperature unit is °C, parameter can be adjusted between -40.0 and 120.0. If the temperature unit is °F, parameter can be set -40.0 and 248.0.

### 7.2. oLnF Page

**HrnG:** Output type of humidity is shown. Parameter can be adjusted as 0-20 mA, 4-20 mA or 0-10 V.

**HrL:** Zero value of the humidity output is shown. It can be adjusted between 0.0 (%) and (HrH - 10.0)(%).

**HrH:** Span value of the humidity output is shown. It can be adjusted between (HrL + 10.0) (%) and 100.0(%).

**ErnG:** Output type of temperature is shown. Parameter can be adjusted as 0-20 mA, 4-20 mA or 0-10 V.

**ErL:** Zero value of the temperature output is shown. If the temperature unit is °C, parameter can be adjusted between -40.0 and (ErH - 10.0). If the temperature unit is °F, parameter can be set -40.0 and (ErH - 10.0).

**ErH:** Span value of the temperature output is shown. If the temperature unit is °C, parameter can be adjusted between (ErL + 10.0) and 120.0. If the temperature unit is °F, parameter can be set (ErL + 10.0) and 248.0.

**rL 15:** Alarm source of Relay 1 is shown. Parameter can be adjusted rH or EEP.

**rL 16:** Alarm type of Relay 1 is shown. Parameter can be adjusted Lo or Hi. See **8. ALARM TYPES** for details.

**HYS 1:** Hysteresis of Relay 1 is shown. Parameter can be adjusted between 0 and 10.0.

**rL25:** Alarm source of Relay 2 is shown. Parameter can be adjusted rH or EEP.

**rL26:** Alarm type of Relay 2 is shown. Parameter can be adjusted Lo or Hi. See **8. ALARM TYPES** for details.

**HYS2:** Hysteresis of Relay 2 is shown. Parameter can be adjusted between 0 and 10.0.

### 7.3. GLnF Page

**FLtr:** It is a filter parameter that can be set from 1 to 16. This parameter defines how many of the most recent measurement samples the device will average to calculate the displayed value.

**Snbr:** Defines the device behavior in case of a sensor disconnection. When the device cannot read data from the sensor and the message SENS ARZ is displayed on the screen, the current output values are determined according to this parameter. When set to LO, the outputs are fixed to the lower limit; when set to HI, they are fixed to the upper limit.

**Adr5:** Communication address of device is shown. Parameter can be adjusted between 0 and 32. Communication address of devices which are connected same line must be different.

**bRud:** Communication speed of device is shown. Parameter can be adjusted as 9.6, 19.2 or 38.4 kBaud. Communication speed of devices which are connected same line must be same.

**Prty:** Communication parity of device is shown. Parameter can be adjusted none, odd or Even. Communication parity of devices which are connected same line must be same.

**Un 16:** Unit of temperature value is shown. Parameter can be adjusted °C or °F.

**Scod:** Password value of device is shown. Parameter can be adjusted between 0 and 9999. When entering configuration pages, this value must be enter the Scod value. Otherwise, parameters are shown but they are not changed. Factory value of Scod is 10.

### 7.4. d2Lt Page

See to **9. CORRECTION POINTS AND THEIR ADJUSTMENTS** for setting the parameters on this page.

**HP 1:** 1. relative humidity correction point. It can be adjusted between 1.0 and (HP2 - 10.0).

**H 1a:** correction value on HP 1 point. It can be adjusted between -10.0 and 10.0.

**HP2:** 2. relative humidity correction point. It can be adjusted between (HP 1 + 10.0) and 100.0.

**H2a:** Correction value on HP2 point. It can be adjusted between -10.0 and 10.0.

**EP 1:** 1. temperature correction point. It can be adjusted between -40.0 and (EP2 - 10.0).

**E 1a:** Correction value on EP 1 point. It can be adjusted between -10.0 and 10.0.

**EP2:** 2. temperature correction point. If the temperature unit is °C, it can be adjusted between (EP 1 + 10.0) and 120.0. If the temperature unit is °F, it can be adjusted between (EP 1 + 10.0) and 248.0.

**E2a:** Correction value on EP2 point. It can be adjusted between -10.0 and 10.0.

### 7.5. Calibration Page

**H<sub>4</sub>**: 4 mA calibration value of humidity output. It can be adjusted between 0 and 4095. For the adjustment of this parameter, a milliamperemeter is connected humidity output. When this parameter is chosen, humidity output is adjusted 4 mA.

**H<sub>20</sub>**: 20 mA calibration value of humidity output. It can be adjusted between 0 and 4095. For the adjustment of this parameter, a milliamperemeter is connected humidity output. When this parameter is chosen, humidity output is adjusted 20 mA.

**H<sub>2</sub>**: 2 V calibration value of humidity output. It can be adjusted between 0 and 4095. For the adjustment of this parameter, a milliamperemeter is connected humidity output. When this parameter is chosen, humidity output is adjusted 2 V.

**H<sub>10</sub>**: 10 V calibration value of humidity output. It can be adjusted between 0 and 4095. For the adjustment of this parameter, a milliamperemeter is connected humidity output. When this parameter is chosen, humidity output is adjusted 10 V.

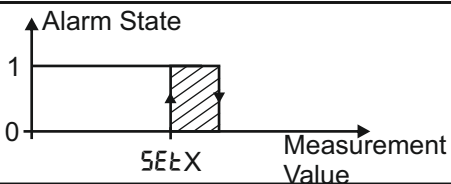
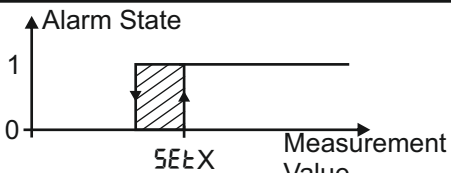
**Ɛ<sub>4</sub>**: 4 mA calibration value of temperature output. It can be adjusted between 0 and 4095. For the adjustment of this parameter, a milliamperemeter is connected temperature output. When this parameter is chosen, temperature output is adjusted 4 mA.

**Ɛ<sub>20</sub>**: 20 mA calibration value of temperature output. It can be adjusted between 0 and 4095. For the adjustment of this parameter, a milliamperemeter is connected temperature output. When this parameter is chosen, temperature output is adjusted 20 mA.

**Ɛ<sub>2</sub>**: 2 V calibration value of temperature output. It can be adjusted between 0 and 4095. For the adjustment of this parameter, a milliamperemeter is connected temperature output. When this parameter is chosen, temperature output is adjusted 2 V.

**Ɛ<sub>10</sub>**: 10 V calibration value of temperature output. It can be adjusted between 0 and 4095. For the adjustment of this parameter, a milliamperemeter is connected temperature output. When this parameter is chosen, temperature output is adjusted 10 V.

## 8. ALARM TYPES

Parameter	DESCRIPTION	
<b>L<sub>0</sub></b>		Low Alarm
<b>H<sub>1</sub></b>		High Alarm

**Table 8.1.** Alarm Types

The alarm types set according to **r<sub>L</sub> 1t** and **r<sub>L</sub> 2t** parameters are shown in **Table 8.1**.

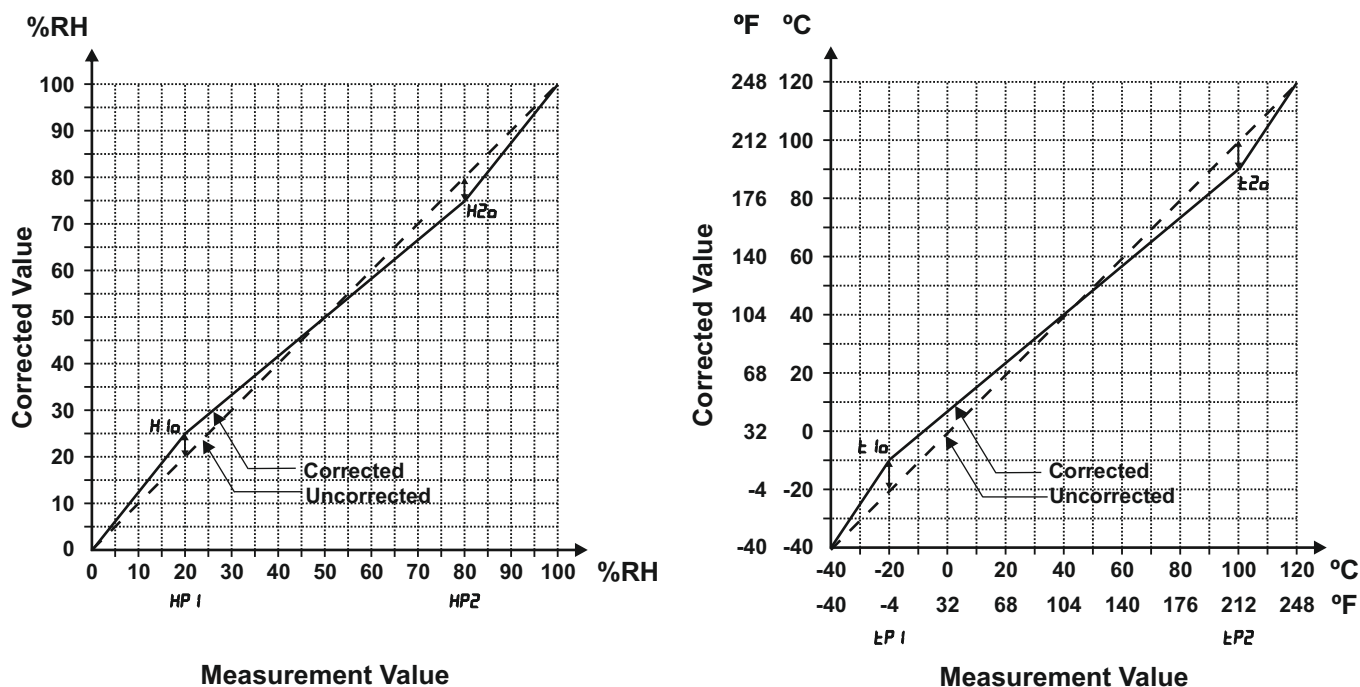
The shaded area shown in the graphs shows the hysteresis area adjusted by **H<sub>Y5</sub> 1** and **H<sub>Y5</sub> 2**.

Alarm (relay) is active in the sections shown as Alarm Status 1.

## 9. CORRECTION POINTS AND THEIR ADJUSTMENTS

Measurement accuracy of E-RHT-20 device is shown in Section 3.SPECIFICATIONS. Comparing measurements with reliable references, accuracy can be the best as far as possible. To this end, for relative humidity  $HP1$ ,  $H1a$ ,  $HP2$  and  $H2a$  parameters are used, for temperature  $tP1$ ,  $t1a$ ,  $tP2$  and  $t2a$  parameters are used.

Correction form of relative humidity and temperature measurements of these parameters is shown in **Figure 9.1**. In the graphics, dashed lines show uncorrected measurement values, continuous lines show measurements values after correction.



**Figure 9.1.** Correction Graph of Correction Points

**EXAMPLE:** E-RHT-20 device measures 19% for 20% RH reference, 82% for 80% reference. In order that the device measures correctly, how the parameters should be adjusted?

As the reference points are 20% and 80%,  $HP1$  and  $HP2$  values are adjusted successively to 20.0 and 80.0. If  $H1a$  is adjusted to 1.0 as the measurement in 20% is 19%,  $H2a$  is adjusted to -2.0 as the measurement in 80% is 82% the desirable state is achieved. Correction in intermediate values is made in linear form.

## 10. MODBUS ADDRESSES

E-RHT-20 relative humidity and temperature transmitter can be inspected and monitored from a central system according to modbus protocol on RS-485 communication line. Function codes 03, 06 and 16 of Modbus can be used. Parameter addresses are given in **TABLE 10.1**. Parameters with R feature can only be read, with R/W feature can be both read and written. Limit of parameters are shown in EXPLANATION column.

ADDRESS	FEATURE	PARAMETER	EXPLANATIONS
0	R	RH	Relative Humidity Measured Value
1	R	T	Temperature Measured Value
2	R	RH Maximum	Maximum Relative Humidity Value
3	R	RH Minimum	Minimum Relative Humidity Value
4	R	T Maximum	Maximum Temperature Value
5	R	T Minimum	Minimum Temperature Value
6	R/W	Hr nÜ	Humidity Output Type. (0: 0-20 mA, 1: 4-20 mA, 2: 0-10 V)
7	R/W	Hr L	Humidity Zero Value. (0 - (Hr H - 100))
8	R/W	Hr H	Humidity Span Value. ((Hr L + 100) - 1000)
9	R/W	tr nÜ	Temperature Output Type. (0: 0-20 mA, 1: 4-20 mA, 2: 0-10 V)
10	R/W	tr L	Temperature Zero Value. (-400 - (tr H - 100))
11	R/W	tr H	Temperature Span Value. ((tr L + 100) - 2160)
12	R/W	rL 1S	Alarm Source of Relay 1. (0: rH, 1: tEñP)
13	R/W	rL 1t	Alarm Type of Relay 1. (0: L0, 1: H1)
14	R/W	SEt 1	Set Value of Relay 1. ((-400) - 2160)
15	R/W	HYS 1	Hysteresis Value of Relay 1. (0 - 100)
16	R/W	rL 2S	Alarm Source of Relay 2. (0: rH, 1: tEñP)
17	R/W	rL 2t	Alarm Type of Relay 2. (0: L0, 1: H1)
18	R/W	SEt 2	Set Value of Relay 2. ((-400) - 2160)
19	R/W	HYS 2	Hysteresis Value of Relay 2. (0 - 100)
20	R/W	Un 1t	Temperature Unit. (0: °C, 1: °F)

**Table 10.1.** Modbus Addresses

### Manufacturer / Technical Support

Elimko Elektronik İmalat ve Kontrol Ltd. Şti.  
 ASO 2. Organize Sanayi Bölgesi Alcı OSB Mahallesi  
 2001. Cad. No:14 Temelli 06909 Ankara / TÜRKİYE  
 Tel: +90 312 212 64 50 (Pbx) • Fax: +90 312 212 41 43  
 E-mail: elimko@elimko.com.tr • www.elimko.com.tr