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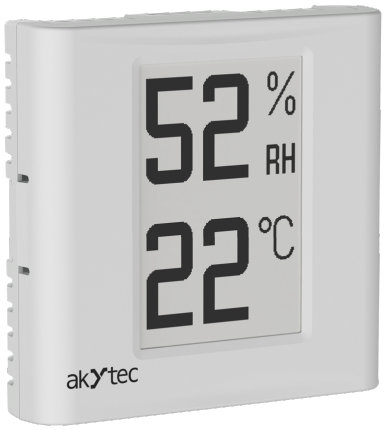


IMS20

Relative Humidity and Temperature Transmitter

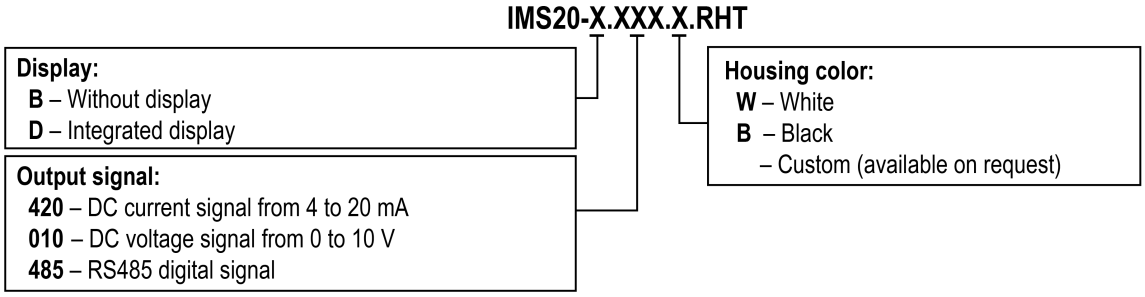
User guide

IMS20_3-EN-158975-1.1

Contents

1 Overview

The device is designed for the continuous measurement and conversion of relative humidity and temperature values of non-corrosive gaseous media into an analog output signal (DC current or voltage) or a digital signal via the Modbus RTU protocol over an RS485 interface.
The device is intended for continuous environmental monitoring in workspaces, warehouses, storage facilities, offices, and residential premises. The device is suitable for applications across a wide range of industries, including the food and medical sectors. It is also utilized in HVAC (Heating, Ventilation, and Air Conditioning) systems, meteorology, public utilities, and research and development (R&D) facilities.
The device is designed for operation in closed, explosion-safe premises free of corrosive vapors and gases.
For the device configuration and data communication via USB connection, please use the akYtec Tool Pro software.
IMS20 can be ordered in various models depending on specifications required (see the ordering key below):



2 Recycling and disposal

The device is considered an electronics device for disposal in terms of European Directive 2012/19/EU and may not be disposed of as domestic garbage.

– Dispose of the device through channels provided for this purpose.
– Comply with all local and currently applicable laws and regulations.

3 Symbols and key words

DANGER
WARNING indicates a potentially dangerous situation that could result in death or serious injuries.

CAUTION
CAUTION indicates a potentially dangerous situation that could result in minor injuries.

NOTICE
NOTICE indicates a potentially dangerous situation that could result in damage to property.

NOTE
NOTE indicates helpful tips and recommendations, as well as information for efficient and trouble-free operation.

4 Specifications

Table 4.1 Specifications

Parameter	Value
Power supply	
Power supply voltage (IMS20-X.420(010).X.RHT)	24 (14...30) V DC
Power supply voltage (IMS20-X.485.X.RHT)	24 (10...30) V DC
Power consumption, max.	1 W
Measurement channels	
Conversion function	Linear
Relative humidity measurement range	5...95 %
Relative humidity measurement accuracy	±3.0 %
Temperature measurement range	0…+50 °C
Temperature measurement accuracy	±0.5 %
DC signal conversion range (IMS20-X.420.X.RHT)	4…20 mA
Load resistance of DC current signal (IMS20-X.420.X.RHT), max.	1000 Ω
DC voltage signal conversion range (IMS20-X.010.X.RHT)	0…10 V
Load resistance of DC voltage signal (IMS20-X.010.X.RHT), min.	2000 Ω
Warm-up time, max.	30 s
RS485 interface (IMS20-X.485.X.RHT)	
Communication protocol	Modbus RTU
Baud rate	1200…115 200 bit/s
Line length, max.	1200 m
USB-Device interface	
Number of ports	1
USB standard	USB 2.0
Communication protocol	Modbus RTU
Cable length, max.	3 m
Mechanical	
Dimensions	(82 × 80 × 22.5) ±2 mm
IP code	IP20
Flammability rating	V2
Weight, max.	0.1 kg
Display	
Display type (matrix)	EPD
Backlight	no
Number of display colors	2
Size	2.7″

Parameter	Value
Work area	38.2 × 57.3 mm
Resolution	264 × 176 px
Reliability	
Mean time between failures	≥ 50 000 h
Average service life	≥ 7 years
Environmental conditions	
Ambient air temperature	0...+50 °C
Relative humidity	5...95 % (non-condensing)
Atmospheric pressure	84.0...106.7 kPa

5 Design and features

The technique of measuring humidity is based on the dependence of the dielectric permittivity of a polar polymer sorbent (used as a moisture-sensitive layer) on the amount of absorbed moisture. When measuring temperature, the technique is based on the dependence of the resistance of the sensing element on the measured ambient temperature.
The design of the device is shown in *Figure 5.1*.

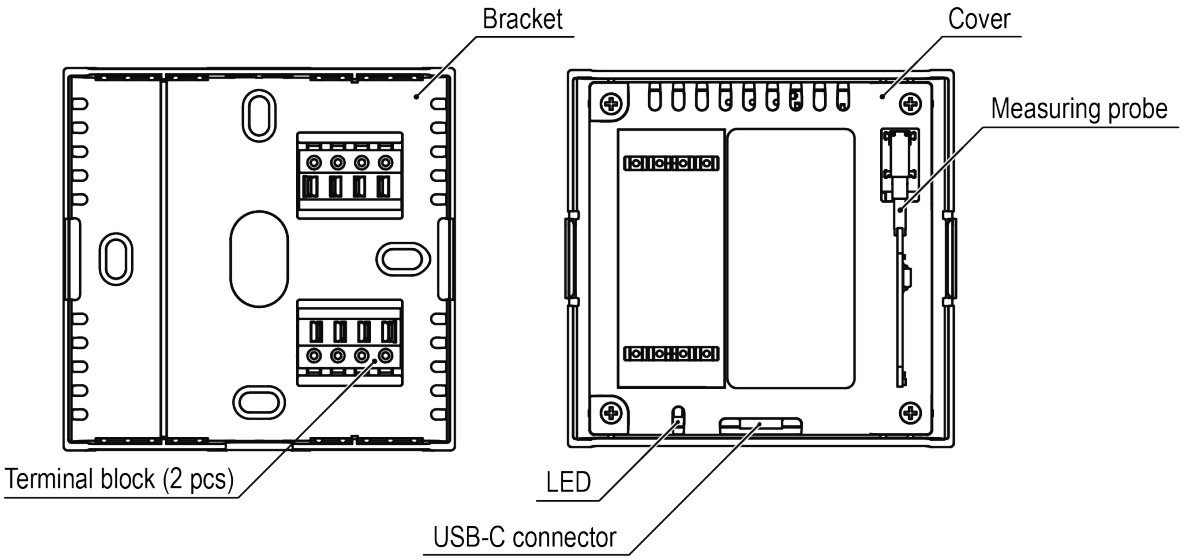


Fig. 5.1 Design

NOTE
Devices with analog outputs have only one terminal block.

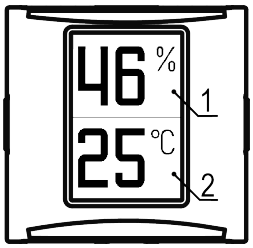


Fig. 5.2 Display

There is a display on the cover of IMS20-D (see *Figure 5.2*) presenting:
1 – measured relative humidity
2 – measured temperature

NOTE
You can choose a display font from the list available in the akYtec Tool Pro software.

6 Installation

CAUTION
Any connections to the device and maintenance work must be performed only when the power is switched off and there is no voltage on the communication lines.

Regarding protection against electric shock, the device corresponds to protection class III according to EN 61140:2016.
During connection, operation, and maintenance of the device, the requirements of EN 50191:2010 must be observed.
Installation, connection, and inspection of the technical condition of the device during operation must be carried out by qualified personnel in accordance with this manual.
Avoid moisture ingress into the device.
The device must not be used in corrosive environments containing acids, alkalis, oils, etc.
The overall and mounting dimensions of the device are shown in *Fig. 6.1*.

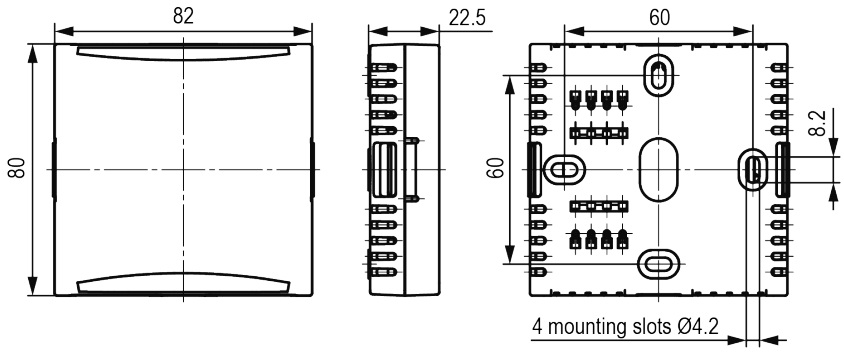


Fig. 6.1 Overall and mounting dimensions

The device should be installed and fastened in a prepared site using the fastening elements included into the scope of delivery (see *Figures 6.2* and *6.3*).

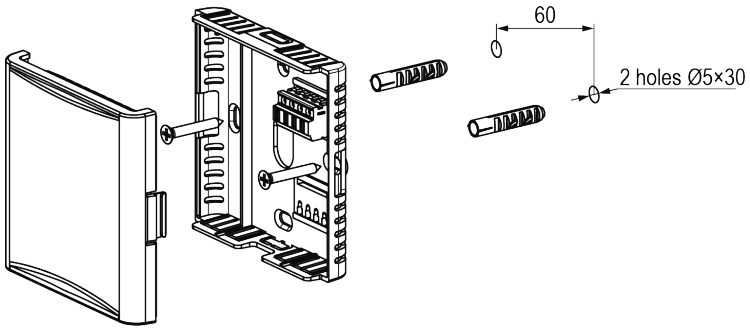


Fig. 6.2 Wall mounting

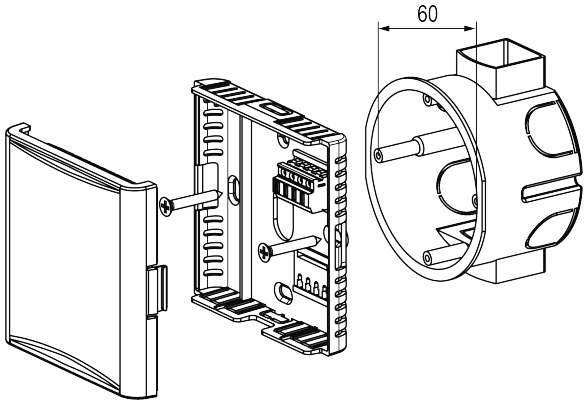


Fig. 6.3 Mounting in a socket box

7 Connection

External connections to the device should be made using a round cable with an outer diameter of 4 to 6 mm and a wire cross-section of 0.2 to 0.75 mm². The total length of signal lines must not exceed 1200 m.

Prepare the cable before connection according to the steps below(see *Figure 7.1*):

1. Remove 35 mmof cable jacket insulation.
2. Strip off 8-10 mm of insulation of the cable wires and clean the wire conductors.
3. Twist and tin the wire conductors or terminate them using cable ferrules.

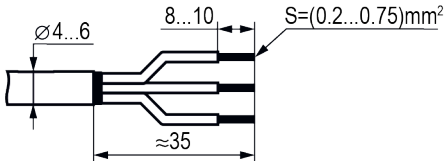


Fig. 7.1 Cable preparation

NOTE
Cable is not included into the scope of delivery.

Connection steps:

1. Simultaneously press the latches on the device cover with the thumb and middle finger of one hand and pull the cover (see *Figure 7.2* (1)) or insert a flat screwdriver home into the groove of the bracket, along the bevel of the latch, and remove the cover (see *Figure 7.2* (2)) .
2. Pass the prepared cable through the central hole (for concealed wiring) or through the top/bottom hole (for open wiring), having previously broken out the corresponding knockout in the bracket.
3. Connect the conductors to the screwless terminal block according to the corresponding diagram (*Figure 7.3* or *7.4*).
4. Install the device cover back into place until it clicks. There should be no gaps between the bracket and the cover.

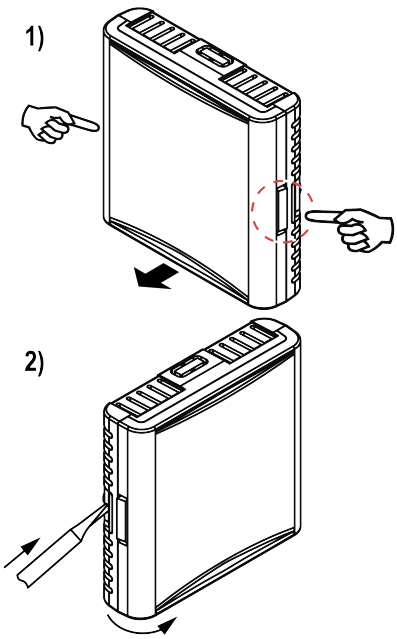


Fig. 7.2 Removing the cover

Wiring diagrams for the device with analog outputs are shown in *Figures 7.3* and *7.4*.

CAUTION
Observe polarity when connecting the power supply.
Incorrect connection may result in damage to the equipment.

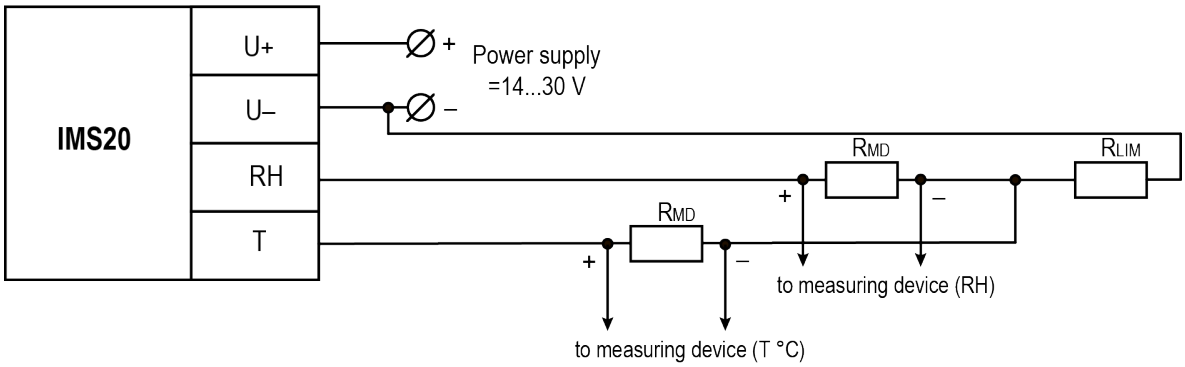


Fig. 7.3 Wiring diagram (output signal of 4-20 mA)

Load resistance limitation for the 4–20 mA output:

$$(R_{MD} + R_{LIM}) \leq R_{L\,MAX} = (U_{SUP} - 6) / 0.022,$$

where R_{MD} – input resistance of the measuring device, Ω
R_{LIM} – limiting resistance, Ω
$R_{L\,MAX}$ – maximum load resistance, Ω
U_{SUP} – power supply voltage, V

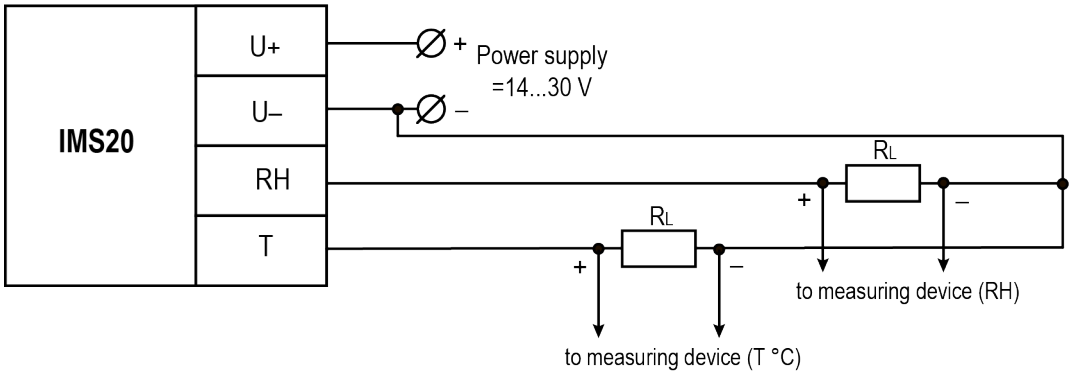


Fig. 7.4 Wiring diagram (output signal of 0-10 V)

Output 0-10 V is provided for a resistive load of at least 2 kΩ.
Figure 7.5 illustrates the bus connection of several IMS20-485.

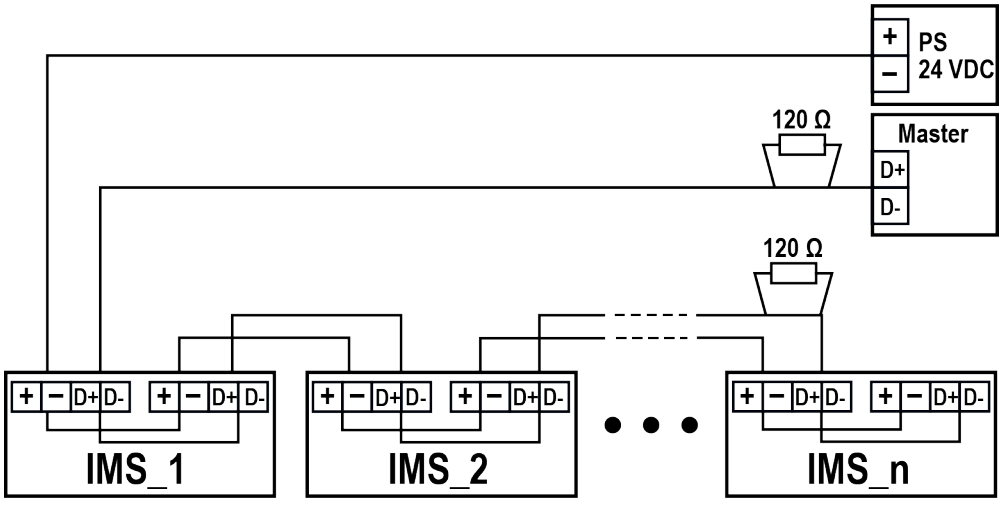


Fig. 7.5 Bus topology diagram

8 Operation

After powering on, the measuring sensor warms up and then the device switches to normal operation mode.
The measured values are determined by the formulas given in *Table 8.1*.

Table 8.1 Calculation of measured values

Device operating mode	Measured RH, %	Measured temp, °C
4 - 20 mA	RH = 5 + (I_{out1} − 4) × 5.625	T = (I_{out2} − 4) × 3.125
0 - 10 V	RH = 5 + U_{out1} × 9	T = U_{out2} × 5
I_{out1} – Output signal value of the relative humidity measurement channel, mA I_{out2} – Output signal value of the temperature measurement channel, mA U_{out1} – Output signal value of the relative humidity measurement channel, V U_{out2} – Output signal value of the temperature measurement channel, V		

The measured values are output output as presented in *Table 8.2*, depending on the device model.

Table 8.2 Analog output signals relative to measured values

Output signal type	Measured RH	Measured temperature
4 - 20 mA	5 % — 4 mA 95 % — 20 mA	0 °C — 4 mA 50 °C — 20 mA
0 - 10 V	5 % — 0 V 95 % — 10 V	0 °C — 0 V 50 °C — 10 V

During operation, the device continuously monitors the integrity of the connected measuring probe. System status is displayed via the LED indicator and is available in the "Device Status" register (refer to *Table 9.1*). Additionally, the LED provides real-time status for data packet transmission and reception over the RS485 interface.
LED indications depending on the operating mode are presented in the table below.

Table 8.3 LED indications

LED	Device status
Solid green	Device is operating, connection to the measuring probe is established, no communication via RS485/USB
Flashing green (sampling frequency)	Device is operating, connection to the measuring probe is established, communication via RS485/USB is in progress
Flashing green at 2 Hz	Relative humidity measurement is out of range
Flashing green at 1 Hz	Temperature measurement is out of range
Flashing red (sampling frequency)	Failure when receiving packet via RS485/USB
Solid red	Device error

9 Operation over RS485

To configure the device using the akYtec Tool Pro software, connect it to a PC via the service port (see *Figure 5.1*) using a standard USB-A to USB-C cable. The configurator allows for the adjustment of network settings, measurement filter optimization, alarm threshold definition for operational parameters, and the option to deactivate the LED indicator.

Default Factory Network Settings (Fixed for USB service port):

– Baud rate (9600 baud);
– Network address (16);
– Parity (none);
– Stop bits (1 bit).

The device operates in Slave mode via the Modbus RTU protocol. A list of main parameters is provided in *Table 9.1*. The full register map is available in the online version of the user manual on the company website: *www.akytec.de*.

The device supports the following Modbus functions:

– 03 — Read Holding Registers;
– 06 — Write Single Register;
– 16 — Write Multiple Registers.

The device supports the following Modbus error codes:

– 01 — Illegal Function (The requested function code cannot be processed);
– 02 — Illegal Data Address (The data address specified in the request is not available);
– 03 — Illegal Data Value (The value contained in the request data field is not permitted).

Table 9.1 Basic registers

Parameter	Address (DEC)	Address (HEX)	No. of registers	Type	Note	Access
General parameters						
Device name	61440	F000	4	STRING[8]	IMS20-485	RO
Firmware version	61456	F010	3	STRING[6]	XX.XX	RO
Serial number	61572	F084	10	STRING [20]	XXXXXXX-XXXXXXX-XXX	RO
Operational parameters						
Device status	4096	1000	1	UC16	See register 0x1000	RO
Humidity value, %RH	4097	1001	2	FLOAT32	5.00… 95.00	RO
Tempera-ture value, °C	4099	1003	2	FLOAT32	0.00… 50.00	RO
Device status (register 0x1000)						
bit[0] = 1 – probe communication error bit[1] = 1 – temperature out of range bit[2] = 1 – humidity out of range bit[8] = 1 – probe memory error bit[9] = 1 – internal temperature exceeds +55 °C bit[3-8, 10-15] = 0 – reserved						

Parameter	Address (DEC)	Address (HEX)	No. of registers	Type	Note	Access
Data type FLOAT32 — four-byte floating-point variable; STRING[X] — ASCII string with X characters; UC16 — unsigned two-byte variable						
Access type RO — read-only						

10 Maintenance

The safety requirements must be observed when the maintenance is carried out.

DANGER
Cut off all power before maintenance.

Maintenance includes:

– Cleaning of the housing and terminal blocks from dust, dirt and debris
– Checking the device fastening
– Checking the wiring (connecting wires, terminal connections, absence of mechanical damages)

Table 10.1 outlines common device malfunctions, their root causes, and the corrective actions to be taken upon detection.

Table 10.1 Possible faults and remedies

Fault	Possible cause	Remedy
LED is off	No power supply	Check the power supply circuit, measure the voltage at the "+" and "-" terminals
	Indication disabled	Enable indication via akYtec Tool Pro
LED is red	Alarm condition (see the "Device status" parameter under address 0x1000 in akYtec Tool Pro)	Open the device and make sure the probe is correctly installed in the connector

NOTICE
Operation of the device is PROHIBITED if any damage or malfunctions are present.

11 Transport and storage

Pack the device in such a way as to protect it reliably against impact for storage and transportation. The original packaging provides optimum protection.
If the device is not taken immediately after delivery into operation, it must be carefully stored at a protected location. The device should not be stored in an atmosphere with chemically active substances. The environmental conditions must be taken into account during transportation and storage.
Storage temperature range: 0...+50 °C.

NOTE
The device may have been damaged during transportation.
Check the device for transport damage and completeness!
Report the transport damage immediately to the shipper and akYtec GmbH!

12 Scope of delivery

– IMS20	1
– Short guide	1
– Mounting kit	1