

FHT01-I

Flood, air humidity and temperature sensor – interior version



Content

General information	3
Measured parameters	4
Air humidity	4
Temperature.....	4
Flood	5
Installation	5
Sensor completion	5
Cable routing for sensor connection	6
Placing and installing the sensor in interior	6
Connection and communication	7
Modbus Registers (address space)	7
Address space overview	7
Data section – INT16	8
Data section – FLOAT	9
Configuration section	10
Information section.....	11
Command section.....	11
User section.....	12
RS-485 bus and Modbus RTU protocol - general description	12
RS-485 communication bus.....	12

General information

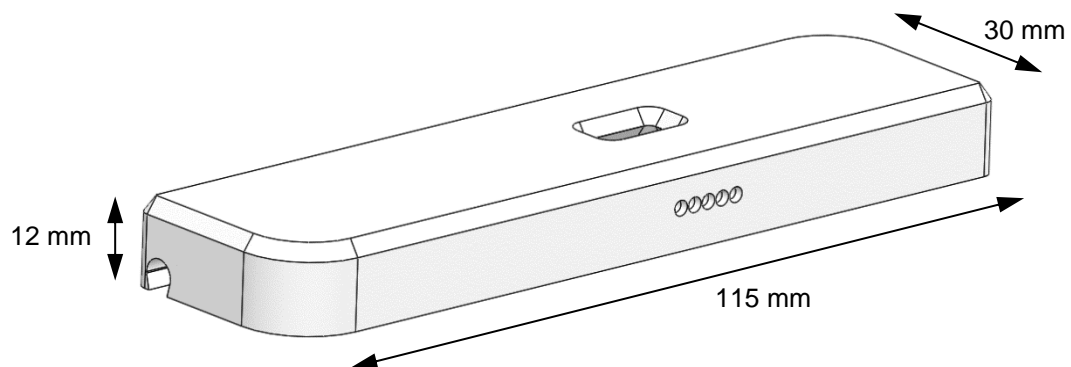
FHT-I sensor is meant for sensing floor flooding in interiors of houses in areas such utility rooms, behind washing machine, kitchen cabinets etc. In cooperation with central unit the sensor can shut off the main water valve in case of leakage detection.

Note: Sensor is not suitable for installation in places with regular flooding. Installation in cellars or undergrounds with pumps removing flood are not recommended.

Sensor detects flooding by water utilizing sensing cable of 1 or 2 meters which is being laid on the floor.

Sensor measures also ambient temperature and air humidity. Based on central unit setting the Senzomatic system can detect leakage earlier before flooding the cable from the rapid increase of humidity. This functionality is optional since this feature is not suitable for areas with repeatedly increasing humidity (e.g. bathrooms).

Measured parameters	air humidity, temperature, flooding
Power supply	5 to 16 V DC, < 3 mA
Operating range	-40 to +85 °C, 0 to 80 %RH non-condensing
Communication interface	Modbus RTU (RS-485)
Sensor fixation	double-sided tape on the interior wall
Input	white Senzomatic cable with black connector flood Senzomatic cable with white connector, reduction
Dimensions	115 x 30 x 12 mm

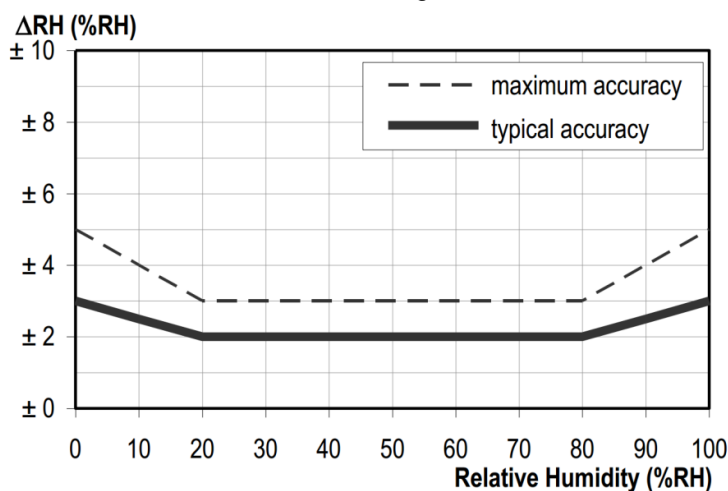


Measured parameters

Air humidity

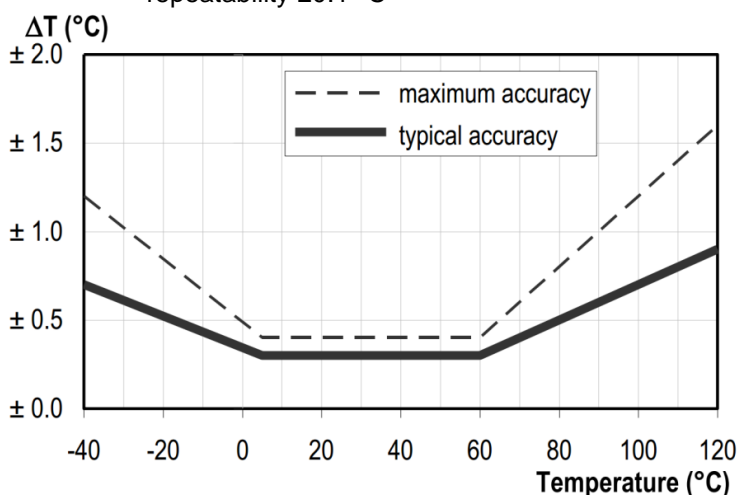
Measurement of relative air humidity range 0 to 100 %RH
resolution 0.04 %RH
accuracy ± 2 %RH (typically)
repeatability ± 0.1 %RH
hysteresis ± 1 %RH
nonlinearity < 0.1 %RH

Measurement of absolute air humidity conversion from relative humidity
resolution 0.01 g/m³



Temperature

Temperature measurement range -40 to $+125$ °C
resolution 0.01 °C
accuracy ± 0.3 °C
repeatability ± 0.1 °C

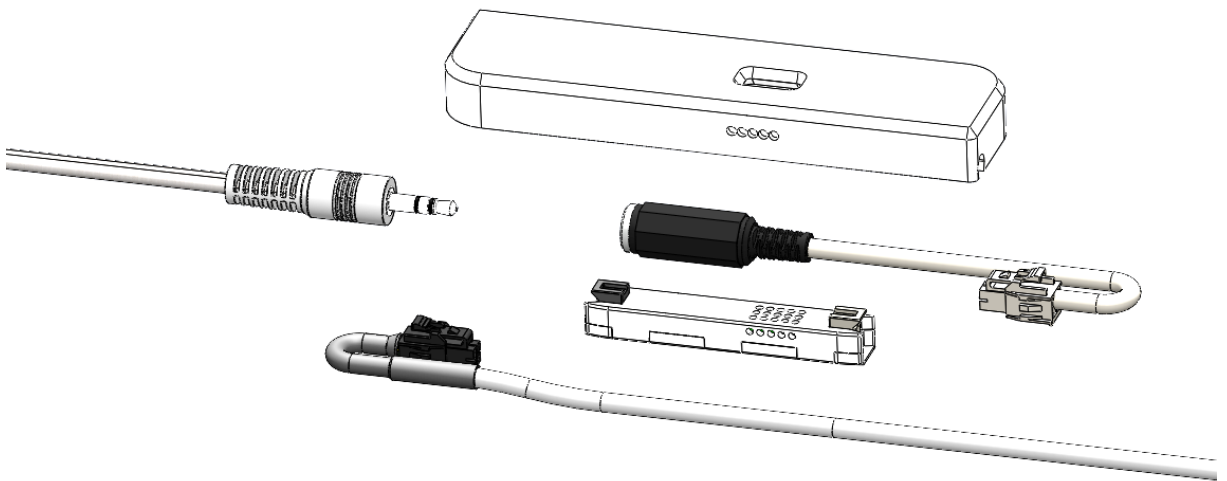


Flood

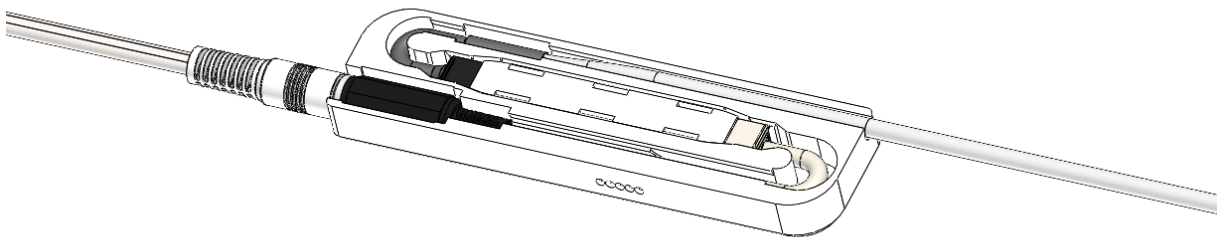
Minimal range of detection is 5 cm of wet flood-sensing cable. Reaction time is 10 seconds at maximum.

Installation

Sensor completion



Insert the Senzomatic cable with black connector to the black connector of FHT sensor. Insert the reduction with white connector to the white connector of FHT sensor. Put FHT sensor with both cables attached to the bigger enclosure as it is shown on the pictures. Put double sided tape on the rear side of the sensor afterwards.



As the last step insert jack connector of the flood sensing cable to the sensor assembly. It is possible to finish this step after sensor installation.

Cable routing for sensor connection

Cables connecting sensors to the central unit are being installed during construction similarly as mains electricity and other infrastructure. The cables are terminated with black connector which is being inserted into the sensor on the one side and free end which is being connected to the central unit on the other side.

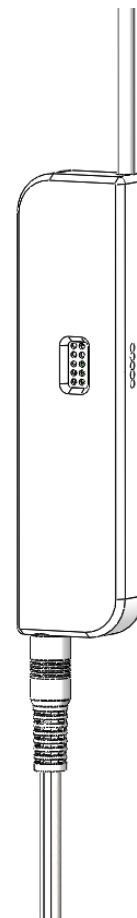
Sensors are being installed after walls and floors are finished. Ideally the installation takes place during equipping house with furniture and appliances in order not to damage sensor and ensure ideal placing flood sensing cable.

Placing and installing the sensor in interior

FHT-I sensor is meant for installation in interiors for sensing flooding in places such like utility rooms, areas behind washing machines, kitchen cabinets etc.

For house structure monitoring there is FHT-C sensor instead. Its small size and different flood detecting cable is more convenient for built-in applications.

Sensor is being installed by sticking it on the wall with double sided tape. The preferred orientation is vertical, but horizontal is acceptable as well, the height shall be between 10 and 15 cm above the floor level. Flood sensing cable is left freely on the floor such it covers the protected area equally. The example of installation is shown in the picture.



Connection and communication

Communication with the sensors is done via RS-485 bus with the Modbus RTU communication protocol. In order to eliminate self-heating of the sensors and get the most accurate values of the temperature and humidity, a cyclic readout is recommended. 5-minute readout period with 12 V power supply is recommended. The recommended reading cycle for the correct functionality is:

1. wait 5 minutes after starting central unit
2. switch on sensor power supply (connect 12 V supply wire via a relay)
3. wait 55 seconds
4. read all connected sensors
5. switch off the power (disconnect 12 V power supply)
6. wait X seconds so that the 5-minute cycle is reached
(depending on the number of sensors approx. 240 seconds)
7. continue with Point 2

Modbus Registers (address space)

All registers are INT16 type (16-bit **signed** integer) unless otherwise stated. Care must be taken to convert negative numbers, which are expressed as their binary complement

Address space overview

Address	Input registry	Holding registry
0+	Data section – INT16	
100+	Data section – FLOAT	
1000+		<i>User section</i>
2000+	Configuration section →	<i>Configuration section</i>
3000+	Information section	
4000+		<i>Command section</i>

Data section – INT16

Input registers, int16 data type, read-only (function 04)

This section contains the values of the measured quantities. The values are in INT16 registers, the conversion to obtain decimal numbers is described below.

Address	Register name	Meaning
0	TEMPERATURE	Temperature
1	HUMIDITY_REL	Relative air humidity
2	DEWPOINT	Dewpoint temperature
3	-	<i>reserved</i>
4	-	<i>reserved</i>
5	-	<i>reserved</i>
6	HUMIDITY_ABS	Absolute air humidity
7	-	<i>reserved</i>
8	VOLTAGE	Supply voltage
9	-	<i>reserved</i>
...
20	-	<i>reserved</i>
21	FLOOD	Cable flooded
22	-	<i>reserved</i>

- TEMPERATURE**
DEWPOINT Signed value of temperature and dew point temperature in degrees Celsius with 2 fixed decimal places
(e.g., 2345 → 23,45 °C)
- HUMIDITY_REL** Humidity value in percent with 2 fixed decimal places.
(e.g., 1234 → 12,34 %)
- HUMIDITY_ABS** Absolute humidity value in g/m3 with 2 fixed decimal places.
(e.g., 567 → 5,67 g/m³)
- VOLTAGE** Supply voltage value in volts with 2 fixed decimal places.
(e.g., 1234 → 12,34 V)
- FLOOD** Flooded status.
(0 → not flooded, 1 → flooded)

Data section – FLOAT

Input registers, float data type, read-only (function 04)

This section contains the values of the measured quantities. The values are always in two consecutive registers (4 bytes in total) and are float 32-bit type (single precision according to IEEE 754).

Address	Register name	Meaning
100	TEMPERATURE_F	Temperature
102	HUMIDITY_REL_F	Relative air humidity
104	DEWPOINT_F	Dewpoint temperature
106	-	<i>reserved</i>
108	-	<i>reserved</i>
110	-	<i>reserved</i>
112	HUMIDITY_ABS_F	Absolute air humidity
114	-	<i>reserved</i>
116	VOLTAGE_F	Supply voltage
118	-	<i>reserved</i>
...
140	-	<i>reserved</i>
142	FLOOD_F	Cable flooded
144	-	<i>reserved</i>

TEMPERATURE_F	Temperature and dew point temperature in <u>degrees Celsius</u> .
DEWPOINT_F	
HUMIDITY_REL_F	Humidity value in <u>percent</u> .
HUMIDITY_ABS_F	Absolute humidity value in <u>g/m3</u> .
VOLTAGE_F	Supply voltage value in <u>volts</u> .
FLOOD_F	Flooded status. (0 → not flooded, 1 → flooded)

Configuration section

Input registers, read-only by default (function 04)

This section stores information about the sensor communication settings. By default, this section is protected against unwanted writing, but it is possible to temporarily unlock it (remapping the input register to the holding register section). Changes are valid only after resetting the sensor (hardware or bus message).

Address	Register name	Meaning
2000	ADDRESS	Sensor address
2001	SPEED	Communication speed
2002	PARITY	Parity used
2003	ANSWER_DELAY	Query to Reply delay

ADDRESS Device address, range 1 to 247, default 240.

SPEED Baud rate setting, default 19200 Bd.

0	1	2	3	4	5	6
1 200	2 400	4 800	9 600	19200	38 400	57 600

PARITY Communication parity settings (9th bit), even parity by default.

0	1	2	3	4
none	odd	even	mark	space

ANSWER_DELAY Sets a delay between the query and the answer in milliseconds. After receiving the entire query, the necessary technical delay follows for its processing in the order of ms. Optional gap of 0 - 250 ms is added to this time, default 10 ms. A response is then sent.

Information section

input registers, read-only (function 04)

This section contains sensor type and version information. The section is read-only, modification is not possible.

Address	Register name	Meaning
3000	SENSOR_TYPE	Sensor type
3001	SERIAL_NUMBER	Sensor serial number
3002	HW_VERSION	Hardware version
3003	FW_VERSION	Firmware version
3004	CHIP	Measurement chip code

SENSOR_TYPE	Sensor type code, always ? (FHT-I).
SERIAL_NUMBER	Sensor serial number, unique sensor identifier.
HW_VERSION	Hardware version, format HI_BYTE.LO_BYTE (0x0202 → 2.2).
FW_VERSION	Firmware version, format HI_BYTE.LO_BYTE (0x0200 → 2.0).
CHIP	Code of the humidity/temperature measurement chip (5 → SHT31).

Command section

Holding registers, read (function 03), write (function 06)

This section contains sensor configuration commands. Note that register 4001 is not implemented. Writing to both function registers WRITEMULTIPLEREGISTERS (16, 0x10) function is not possible.

Address	Register name	Meaning
4000	LOCKS	Configuration section lock
4002	COMMAND	Sensor commands

LOCKS	Writing value of 1 temporarily (for the duration of the next command) unlocks the configuration section for writing (temporarily remapping from the input register space to the holding register space).
COMMAND	Writing value of 1 performs a software restart of the sensor. By entering the value 2, a random Modbus address is temporarily (until restarted) assigned to the sensor.

User section

Holding registers, read (function 03), write (function 06 and 16)

This section provides the user with a space of 32 16-bit registers, the use of which is up to the user. A possible use is, for example, a 64-character ASCII string.

Address	Register name	Meaning
1000	USER[0]	User defined
...
1031	USER[31]	User defined

RS-485 bus and Modbus RTU protocol - general description

RS-485 communication bus

The bus connection is made preferably with a 4-core twisted-pair cable (2 pairs). The bus topology should be a bus type with a maximum of 32 devices. Proper bus termination is done by 120 Ω resistors at the beginning and end of the bus and is especially important when using higher communication speeds. The bus should have quiescent states defined at one end (ideally for the master) by means of pull-up and pull-down resistors with values from 560 to 1000 Ω.

In case of smaller projects with short length of cables (max 20m) and with limited number of sensors it is possible to use star topology of the bus.

