

# TH sensor

## Temperature Humidity

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## 1. Design

| Name | MPL3115A2<br>Sensor | HWS<br>version | Comment |
|------|---------------------|----------------|---------|
| TH_X | YES                 | TH_x*          |         |

## 2. Hardware

| 2.1 Hardware parameters |  |              |                |
|-------------------------|--|--------------|----------------|
| Measurement             | Value  | Range        | Comments       |
|                         | Temperature                                    | -30°C ÷ 60°C | In tenth of °C |
|                         | Relative Humidity                              | 0 ÷ 99.9%    | In tenth of %  |
| Power                   | 6 - 26V DC/ max 1.2 mA or 1 mW                 |              |                |
| Interface               | RS485 - MODBUS RTU                             |              |                |
| Hardware                | SHT35 TH sensor                                |              |                |
| Comm. Speed             | 9600 or 115200 Bd                              |              |                |
| Dimension               | Φ15 x 106 mm                                   |              |                |
| Design                  | Interior, Exterior                             |              |                |
| Setup                   | Via software Bootloader or via ModBus directly |              |                |

| 2.2 Sending parameters to RS485 after RESET |                     |   |
|---|---------------------|---|
|   | Parameter           | Comments                                  |
| 1.row                                       | 112:RESET=4<cr><lf> | 112 – address (dec), 4 – com. Protocol    |
| 2.row                                       | 112:SHT=1<cr><lf>   | 112 – address (dec), SHT35 – OK, 0 – NOOK |

## 3. Wiring, standard cable length: 3 m

| 3.1 Wire color | Comment   |
|----------------|-----------|
| Green          | Ground    |
| White          | 12-24V DC |
| Yellow         | RS485 +   |
| Brown          | RS485 -   |

## 4. ModBus RTU communication protocol

| 4.1 Command 0x03 Read Registers |  |
|---------------------------------|--|
| Register Number                 | Parameter                                  |
| 0                               | Temperature in tenth of degrees from SHT35 |
| 1                               | Relative humidity in tenth of % from SHT35 |
| 2                               | Dew point in tenth of degrees from SHT35   |

| 4.2 Command 0x03 Read Configuration Registers |                        |                  |             |
|---|------------------------|------------------|-------------|
| Register Number                               | Register name          | Description      | Units/Notes |
| 100   | Address                | 1 – 247          |             |
| 101   | Communication speed    | 0–115200, 1–9600 | Bd          |
| 102   | HWS version 0          | Read Only        | TH          |
| 103   | HWS version 1          | Read Only        | —           |
| 104   | HWS version 2          | Read Only        | x*          |
| 105   | HWS version 3          | Read Only        | :1          |
| 106   | HWS version 4          | Read Only        | .0          |
| 107   | Communication protocol |                  | 1 ÷ 5       |

| <b>4.3 Command 0x06 Write Registers</b> |                      |  |                         |
|---|----------------------|--|-------------------------|
| <b>Register Number</b>                  | <b>Register name</b> | <b>Description</b>   | <b>Units/Notes</b>      |
| <b>100</b>                              | Address              | 1 – 247  |                         |
| <b>101</b>                              | Communication speed  | 0 – 115200, 1 - 9600   | Bd                      |
| <b>102-106</b>                          | Read Only            |  |                         |
| <b>107</b>                              | Comm. Protocol       | 1 - INGSIMON<br>2 - HTML<br>3 - MODBUS ASCII<br>4 – MODBUS RTU<br>5 – MODBUS TCP | Default: MODBUS RTU (4) |

| <b>4.4 Default parameters</b> |                |                |
|-------------------------------|----------------|----------------|
| <b>Parameter</b>              | <b>Value</b>   | <b>Comment</b> |
| <b>Address</b>                | 0x70h (112d)   |                |
| <b>Communication speed</b>    | 115200, N, 8,1 |                |
| <b>Communication Protocol</b> | 0x04           | MODBUS RTU     |

| <b>4.5 Range of address</b> |   |
|-----------------------------|---|
| <b>Address [dec]</b>        | <b>Comment</b>  |
| <b>1 - 247</b>              | For sensors   |
| <b>248 - 254</b>            | Reserve   |
| <b>255</b>                  | Universal address – used only to read registers<br>Writing to registers does not work with this address |

## 5. Examples for Modbus RTU

### Example 5.1

**Set the communication speed from 115200 Bd to 9600 Bd for Address 0x70 (112 dec)**

|                 |                         |  |
|-----------------|-------------------------|--|
| <b>Poll</b>     | 70 06 00 65 00 01 52 F4 | The response is at 115200 Bd. In the next communication will use 9600 Bd |
| <b>Response</b> | 70 06 00 65 00 01 52 F4 |  |

### Example 5.2

**Set the communication speed from 9600 Bd to 115200 Bd for Address 0x70 (112 dec)**

|                 |                         |  |
|-----------------|-------------------------|--|
| <b>Poll</b>     | 70 06 00 65 00 00 93 34 | The response is at 115200 Bd. In the next communication will use 9600 Bd |
| <b>Response</b> | 70 06 00 65 00 00 93 34 |  |

### Example 5.3

**Read 8 registers from 100 from Address 0x70 (112 dec)**

|                   |  |                       |
|-------------------|--|-----------------------|
| <b>Poll</b>       | 70 03 00 64 00 08 0F 32  |                       |
| <b>Response</b>   | 70 03 10 00 70 00 00 54 48 5F 5F 78 2A 3A 31 2E 30 00 04 CE 5C |                       |
| <b>Meaning:</b>   |  |                       |
| <b>Byte [hex]</b> | <b>Description</b>   | <b>Comment</b>        |
| <b>70</b>         | Address  |                       |
| <b>03</b>         | function code  | Read holding register |
| <b>10</b>         | count of bytes (16 dec)  |                       |
| <b>00 70</b>      | Address  |                       |

|       |                        |                       |
|-------|------------------------|-----------------------|
| 00 00 | communication speed    | 115200 Bd             |
| 54 48 | TH                     | Temperature, Humidity |
| 5F 5F | —                      | —                     |
| 78 2A | x*                     | version, * - reserve  |
| 3A 31 | :1                     |                       |
| 2E 30 | .0                     |                       |
| 00 04 | communication protocol | 4 - MODBUS RTU        |
| CE 5C | CheckSum               |                       |

**Example 5.4**

Getting the current address from a sensor with the unknow address with universal address 0xff  
**Be aware, that only 1 equipment is connected to the Modbus network.**

|          |                         |                          |
|----------|-------------------------|--------------------------|
| Poll     | FF 03 00 64 00 01 D0 0B | Read register 100        |
| Response | FF 03 02 00 70 90 74    | 70 – equipment’s address |

**Example 5.5**

How to set the address. Changing the address from 70h to 1h.

**Be aware, that only 1 equipment is connected to the Modbus network.**

|          |                         |                               |
|----------|-------------------------|-------------------------------|
| Poll     | 70 06 00 64 00 01 03 34 | Write to register 100 value 1 |
| Response | 70 06 00 64 00 01 03 34 | 01 – equipment’s new address  |

The next communication with the equipment will be at address 1

**Example 5.6**

How to set the address. Changing the address from 1h to 2h.

**Be aware, that only 1 equipment is connected to the Modbus network.**

|          |                         |                                   |
|----------|-------------------------|-----------------------------------|
| Poll     | 01 06 00 64 00 02 49 D4 | Write to the register 100 value 2 |
| Response | 01 06 00 64 00 02 49 D4 | 02 – equipment’s new address      |

The next communication with the equipment will be at address 2

**Example 5.7**

Reading measured values from 0. register, 3 registers. Address 70h.

|          |                                  |                  |
|----------|----------------------------------|------------------|
| Poll     | 70 03 00 00 00 03 0F 2A          | Read 3 registers |
| Response | 70 03 06 01 21 01 5F 00 6E 44 F3 |                  |

Meaning:

70 – address

03 – function

06 – count of bytes

01 21 → 1\*256 + 2\*16 + 1 = 289 → 28.9 °C

01 5F → 1\*256 + 5\*16 + 15 = 351 → 35.1 %Rh

00 6E → 0\*256 + 6\*16 + 14 = 110 → 11.0 °C dew point

44 73 CRC

## 6. Used sensors

### 6.1 Humidity and Temperature Sensor IC

- Accuracy tolerance  $\pm 2$  %RH
- Repeatability  $\pm 0.1$  %RH
- Hysteresis  $\pm 1$  %RH
- Nonlinearity  $< 0.1$  %RH
- Operating Range extended 0 to 100 %RH
- Long Term Drift 5 Typ.  $< 0.25$  %RH/year



## 7. Dimensions - holders

Example:

