

# THWP sensor

Temperature  
Humidity  
Wind Speed, Wind Direction  
Atmospheric Pressure



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## 1. Design

<b>Mark</b>	<b>MPL3115A2 Sensor</b>	<b>HWS version</b>	<b>Comment</b>
<b>THWPX</b>	<b>YES</b>	<b>THWPx*</b>	
<b>THWPy</b>	<b>NO</b>	<b>THWPy*</b>	<b>Reserved</b>

## 2. Hardware

2.1 Hardware parameters			
	Value	Range	Comments
<b>Measurement</b>	Temperature	-30°C ÷ 60°C	In tenth of °C
	Relative Humidity	0 ÷ 99.9%	In tenth of %
	Wind Speed	0 ÷ 70.0 m/s	Resolution 0.1 m/s
	Wind Direction	0 ÷ 359 °	Resolution 1°
	Atmospheric pressure	200.0 ÷ 1100.0 hPa	Resolution 0.1 hPa
<b>Power</b>	8 - 26V DC/ max 0,4W, 24V – 15 mA		
<b>Interface</b>	RS485 - MODBUS RTU or other		
<b>Hardware</b>	SHT21 TH sensor, MPL3115 pressure sensor, ING01 micro ultrasonic sensor		
<b>Comm. speed</b>	9600 or 115200 Bd		
<b>Dimensions</b>	Φ105 x 162 mm radiation cover		
<b>Design</b>	Exterior		
<b>Setup</b>	Via software Bootloader or via ModBus directly		

2.2 Sending parameters to RS485 after RESET		
	Parameter	Comments
<b>1.row</b>	112:RESET=4<cr><lf>	112 – address (dec), 4 – com. Protocol
<b>2.row</b>	112:USOUND=1<cr><lf>	112 – address (dec), 1 – OK, 0 – NOOK
<b>3.row</b>	112:MPL=1<cr><lf>	112 – address (dec), MPL3115A2 – OK, 0 - NOOK
<b>4.row</b>	112:SHT=1<cr><lf>	112 – address (dec), SHT35 – OK, 0 – NOOK

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

Wire color	Comment
<b>Green</b>	<b>Ground</b>
<b>White</b>	<b>12-24V DC</b>
<b>Yellow</b>	<b>RS485 +</b>
<b>Brown</b>	<b>RS485 -</b>

## 4. ModBus RTU communication protocol

4.1 Command 0x03 Read Registers	
Register	Parameter
<b>0</b>	Temperature in tenth of degrees from SHT35
<b>1</b>	Relative humidity in tenth of % from SHT35
<b>2</b>	Dew point in tenth of degrees from SHT35
<b>3</b>	♦ Calculated atmospheric pressure in 10 Pa from MPL3115 above sea level
<b>4</b>	Wind speed in tenth of m/s
<b>5</b>	Minimum Wind speed in tenth of m/s during the last 1 minute

<b>6</b>	Maximum Wind speed in tenth of m/s during the last 1 minute
<b>7</b>	Wind Direction in degrees

♦ if register 108 is set to 0 then value in register 3 is equal with absolute atm. pressure in 10 Pa

<b>4.2 Command 0x03 Read Configuration Registers</b>			
<b>Register</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</b>	HWS version 0	Read Only	TH
<b>103</b>	HWS version 1	Read Only	WP
<b>104</b>	HWS version 2	Read Only	x*
<b>105</b>	HWS version 3	Read Only	:1
<b>106</b>	HWS version 4	Read Only	.0
<b>107</b>	Communication protocol		1 ÷ 5
<b>108</b>	Altitude above sea level in meter		0 – 4000

<b>4.3 Command 0x06 Write Registers</b>			
<b>Register</b>	<b>Register name</b>	<b>Description</b>	<b>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 2 - HTML 3 - MODBUS ASCII 4 – MODBUS RTU 5 – MODBUS TCP	Default: MODBUS RTU (4)
<b>108</b>	Altitude above sea level in meter	0 to 4000	Default 0. Can be set from 0 to 4000

<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>Altitude above sea level in meter</b>	0	

<b>4.5 Range of addresses</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 Writing to registers does not work with this address

## 5. Examples for Modbus RTU

### Example 5.1

<b>Set the communication speed from 115200 Bd to 9600 Bd for Address 0x70 (112 dec)</b>		
<b>Poll</b>	70 06 00 65 00 01 52 F4	Response with 115200 Bd. In next communication will use 9600 Bd
<b>Response</b>	70 06 00 65 00 01 52 F4	

**Example 5.2**

<b>Set the communication speed from 9600 Bd to 115200 Bd for Address 0x70 (112 dec)</b>		
<b>Poll</b>	70 06 00 65 00 00 93 34	Response with 9600 Bd. In next communication will use 115200 Bd
<b>Response</b>	70 06 00 65 00 00 93 34	

**Example 5.3**

<b>Read 9 registers from 100 from Address 0x70 (112 dec)</b>		
<b>Poll</b>	70 03 00 64 00 09 CE F2	
<b>Response</b>	70 03 12 00 70 00 00 54 48 57 50 78 2A 3A 31 2E 30 00 04 00 00 FC 2A	
<b>Meaning:</b>		
<b>Byte [hex]</b>	<b>Description</b>	<b>Comment</b>
70	Address	
03	function code	Read holding register
12	count of bytes (18dec)	
00 70	Address	
00 00	communication speed	115200 Bd
54 48	TH	Temperature, Humidity
57 50	WP	Wind, Pressure
78 2A	x*	version, * - reserve
3A 31	:1	
2E 30	.0	
00 04	communication protocol	4 - MODBUS RTU
00 00	Altitude above sea level	
FC 2A	Checksum	

**Example 5.4**

<b>Getting the current address of the sensor with universal address 0xff</b> <b>Be care, that only 1 equipment is connected on the Modbus network.</b>		
<b>Poll</b>	FF 03 00 64 00 01 D0 0B	<b>Read register 100</b>
<b>Response</b>	FF 03 02 00 70 90 74	<b>70 – equipment's address</b>

**Example 5.5**

<b>Changing the address from 70h to 1h.</b> <b>Be care, that only 1 equipment is connected on the Modbus network.</b>		
<b>Poll</b>	70 06 00 64 00 01 03 34	<b>Write to register 100 value 1</b>
<b>Response</b>	70 06 00 64 00 01 03 34	<b>01 – equipment's new address</b>
<b>The next communication with equipment will be with address 1</b>		

**Example 5.6**

<b>Changing the address from 1h to 2h.</b> <b>Be care, that only 1 equipment is connected on the Modbus network.</b>		
<b>Poll</b>	01 06 00 64 00 02 49 D4	<b>Write to the register 100 value 2</b>
<b>Response</b>	01 06 00 64 00 02 49 D4	<b>02 – equipment's new address</b>
<b>The next communication with equipment will be with address 2</b>		

Example 5.7		
How to set the Altitude to the value 128 m. Address 70h. Register 108		
Poll	70 06 00 6C 00 80 42 96	Write to the register 108 value 128
Response	70 06 00 6C 00 80 42 96	80h (128d) altitude in m

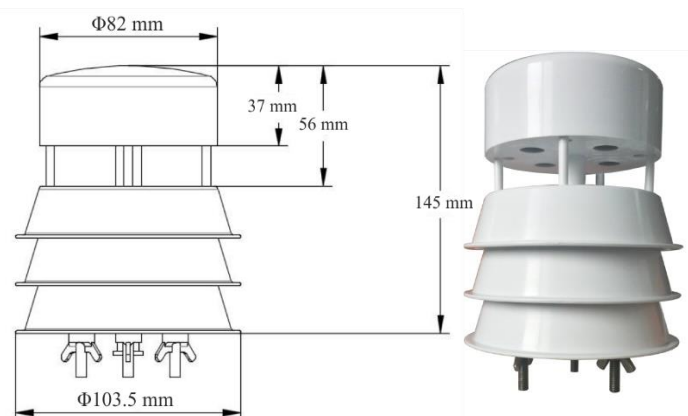
Example 5.8		
How to set the Altitude to the value 128 m using universal CRC (XX). Address 70h. R.108		
Poll	70 06 00 6C 00 80 58 58	Write to the register 108 value 128
Response	70 06 00 6C 00 80 58 58	80h (128d) altitude in m

Example 5.9		
Reading measured values from 0. register, 8 registers. Address 70h.		
Poll	70 03 00 00 00 08 4E ED	Read 8 R.
Response	70 03 10 00 CE 01 A7 00 43 27 1B 00 18 00 05 00 22 00 81 26 B3	
<b>Meaning:</b> 70 – address 03 – function 10 – count of bytes (16 dec) 00 CE → $0*256 + 12*16 + 14 = 206 \rightarrow 20.6 \text{ }^\circ\text{C}$ 01 A7 → $1*256 + 10*16 + 7 = 423 \rightarrow 42.3 \text{ \%Rh}$ 00 43 → $0*256 + 4*16 + 3 = 67 \rightarrow 6.7 \text{ }^\circ\text{C dew point}$ 27 1B → $2*4096 + 7*256 + 1*16 + 11 = 10011 \rightarrow 100110 \text{ Pa} \rightarrow 1001.1 \text{ hPa}$ 00 18 → $0 * 256 + 1 * 16 + 8 = 24 \rightarrow 2.4 \text{ m/s}$ 00 05 → $0 * 256 + 0 * 16 + 5 = 5 \rightarrow 0.5 \text{ m/s}$ 00 22 → $0 * 256 + 2 * 16 + 2 = 37 \rightarrow 3.7 \text{ m/s}$ 00 81 → $0 * 256 + 8 * 16 + 1 = 129 \rightarrow 129 \text{ }^\circ$ 26 B3 CRC		

## 6. Used sensors

### 6.1 Ultrasound anemometer ING01

- Ultrasound sensor
- Best performance-to-price ratio
- Dimensions:  $\Phi 103.5 \text{ mm} \times 165 \text{ mm}$
- Measurement range: 0–70 m/s 0-359°
- Accuracy Low wind speed:  $\pm 0.5 \text{ m/s}$
- Accuracy High wind speed:  $\pm 1 \text{ m/s}$
- Accuracy Low wind speed:  $\pm 5^\circ$
- Accuracy High wind speed:  $\pm 3^\circ$
- Resolution 0.1m/s 0.1°



### 6.2 Humidity and Temperature Sensor IC

- Accuracy tolerance  $\pm 2 \text{ \%RH}$
- Repeatability  $\pm 0.1 \text{ \%RH}$
- Hysteresis  $\pm 1 \text{ \%RH}$
- Operating Range extended 0 to 100 %RH



### 6.3 MPL3115A2 precision pressure sensor

- Pressure absolute accuracy  $\pm 0.4 \text{ kPa}$ , 50 ÷ 110 kPa over  $-10 \text{ }^\circ\text{C}$  to  $70 \text{ }^\circ\text{C}$



- Temperature accuracy @25 °C  $\pm 1$  °C, over temperature range  $\pm 3$  °C

## 7. Mechanical dimensions - holders

### Via customer

For example

