# Modbus Protocol
# For THS17-MD

V1.0

# Modbus Protocol of THS17-MD

## Introduction

This document describes the protocol detail of Modbus for THS17-MD

1.Independent COM Port RS485 Connection
RS485 connections should be dedicated to connecting THS17-MD devices only, ensuring that all devices on the line are of the same model.

2.Maximum of 16 Devices per Batch
A maximum of 16 devices can be connected in each RS485 network.

3.Communication Protocol
Set the communication parameters as follows:

Baud rate: 9600
Parity: None
Data Bits: 8
Stop Bits: 1

4.Terminal Resistor Installation
Install a 120Ω terminal resistor at the last device (end of the line). Ensure the terminal resistor is connected between the A and B signal lines to prevent signal reflection and communication issues.

Installation Notes
Power Supply: Verify that the voltage and current supplied to each device meet the required specifications to avoid malfunction due to insufficient power supply.
Grounding: It is recommended to establish a common ground (GND) for RS485 communication to enhance noise immunity.
Testing: After installation, test communication step by step to ensure proper functionality, especially when adding new devices.

# Modbus Protocol of THS17-MD

## Hardware interface

- The interface on the sensor is RS-485.
- Hardware named D+, D-
- Meet the standards TIA/EIA-232-F and TIA/EIA-485-A

## RS-485 Address, Baud rate, Data format

- Address: 1~247
- Baud rate: 9600, 19200, 38400, 57600, 115200
- Parity: None, Even, Odd
- Data length: 8 bit
- Stop bit: 1 or 2 bit
- Default Address = 1, Data format= 9600, N81

## About Modbus (ref PI–MBUS–300)

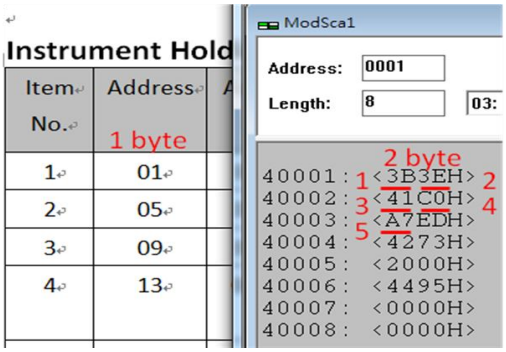
- Support RTU mode
- Broadcast support (Address 0)
- Bit addressable items (i.e. Coils and Discrete inputs) will not be implemented
- Measurement Values are represented in IEEE 754 single-precision 32-bit floating point type http://en.wikipedia.org/wiki/IEEE_754
- Modbus protocol structure:
  - 1st byte: Address (1~247)
  - 2nd byte: Function code (1 byte)
  - 3~Nth bytes: Data bytes
  - N+1th~N+2th byte: CRC (16 bits), LSB first

# Modbus Protocol of THS17-MD

## Instrument Holding Registers for application engineering (ex: ModScan)

| Item No. | Address | Address HEX | Parameter | Point Type | Data Type | Value |
|---|---|---|---|---|---|---|
| 1 | 1 | 0001H | Temperature | HOLDING REGISTER | Floating Pt. | ˚C |
| 2 | 5 | 0005H | Relative Humidity | HOLDING REGISTER | Floating Pt. | % |
| 3 | 33 | 0021H | Temperature | HOLDING REGISTER | Integer | ˚C x10 |
| 4 | 35 | 0023H | Relative Humidity | HOLDING REGISTER | Integer | % x10 |
| 5 | 1025 | 0401H | Temperature | HOLDING REGISTER | Floating Pt. | ˚C |
| 6 | 1029 | 0405H | Relative Humidity | HOLDING REGISTER | Floating Pt. | % |
| 7 | 1033 | 0409H | Dew Point Temperature | HOLDING REGISTER | Floating Pt. | ˚C |
| 8 | 1037 | 040DH | Forst Point Temperature | HOLDING REGISTER | Floating Pt. | ˚C |
| 9 | 1041 | 0411H | Wet Bulb Temperature | HOLDING REGISTER | Floating Pt. | ˚C |
| 10 | 1045 | 0415H | Saturation Vapour Pressure | HOLDING REGISTER | Floating Pt. | mbar |
| 11 | 1049 | 0419H | Vapour Pressure | HOLDING REGISTER | Floating Pt. | mbar |
| 12 | 1053 | 041DH | Mixture Ratio | HOLDING REGISTER | Floating Pt. | g/kg |
| 13 | 1057 | 0421H | Absolute Humidity | HOLDING REGISTER | Floating Pt. | $g/m^3$ |
| 14 | 1061 | 0425H | Specific Enthalpy | HOLDING REGISTER | Floating Pt. | kJ/kg |

- The base address is 1 rather than 0 in ModScan application.
- The register shown on the table is 1 byte whereas the Modscan 2 bytes.
- So the corresponding value against address 5 of the "table" would be address 40003 of the Modscan



# Modbus Protocol of THS17-MD

## Instrument Holding Registers

| Item No. | Address | Address HEX | Parameter | Data Bytes | Data Type | Value |
|---|---|---|---|---|---|---|
| Information | | | | | | |
| 1 | 65-80 | 0041H-0050H | Model Name | 16 bytes | ASCII | |
| 2 | 81-96 | 0051H-0060H | Serial Number | 16 bytes | ASCII | |
| 3 | 97-112 | 0061H-0070H | Firmware version | 16 bytes | ASCII | |
| RS-485 Slave Address, Baud rate, Data format | | | | | | |
| 4 | 129 | 0081H | Slave Address | 1 bytes | unsigned Integer | 1-247 |
| 5 | 131 | 0083H | Baud rate | 1 bytes | unsigned Integer | 0: 9600<br>1: 19200<br>2: 38400<br>3: 57600<br>4: 115200 |
| 6 | 133 | 0085H | Data type | 1 bytes | unsigned Integer | 0: N81<br>1: N82<br>2: E81<br>3: E82<br>4: O81<br>5: O82 |

# Modbus Protocol of THS17-MD

**ASCII format, Item No. 1-3**

| 1st Word | | 2nd Word | | 3rd Word | | 4th Word | | 5th Word | | 6th Word | | 7th Word | | 8th Word | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hi byte | Lo byte | Hi byte | Lo byte | Hi byte | Lo byte | Hi byte | Lo byte | Hi byte | Lo byte | Hi byte | Lo byte | Hi byte | Lo byte | Hi byte | Lo byte |

"ABCDEF0123456789" is represented in byte of hexadecimal as

<41><42><43><44><45><46><30><31><32><33><34><35><36><37><38><39>

**IEEE754 format, Item No. 7-12**

| Data Hi Word, Hi Byte | Data Hi Word, Lo Byte | Data Lo Word, Hi Byte | Data Lo Word, Lo Byte |
|---|---|---|---|
| **SEEE EEEE** | **EMMM MMMM** | **MMMM MMMM** | **MMMM MMMM** |

**Where**

S represents the sign bit where 1 is negative and 0 is positive

E is the two's complement exponent with an offset of 127 i.e. an exponent of zero is represented by 127, an exponent of 1 by 128 etc.

M is the 23-bit normal mantissa. The highest bit is always 1 and, therefore, is not stored.

Using the above format the floating point number 23.83 is represented in byte of hexadecimal as <41><BE><A3><D7>:

| Data Hi Word, Hi Byte | Data Hi Word, Lo Byte | Data Lo Word, Hi Byte | Data Lo Word, Lo Byte |
|---|---|---|---|
| **0x41** | **0xBE** | **0xA3** | **0xD7** |

# Modbus Protocol of THS17-MD

## Communication Examples

### Read Temperature Measurement Value

| Request the host (PC or PLC) to polling the data of GTH53 | | | |
|---|---|---|---|
| Field Name | Value | Type | Byte |
| Address of Transmit | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Starting Address Hi | 0x00 | Byte | 1 |
| Starting Address Lo | 0x00 | Byte | 1 |
| No. of registers Hi | 0x00 | Byte | 1 |
| No. of registers Lo | 0x02 | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

*Registers of Temperature are 0x00 ~ 0x03

| Response GTH53 response data to the host (PC or PLC) | | | |
|---|---|---|---|
| Field Name | Value | Type | Byte |
| Address of Transmit | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Byte Count | 04 | Byte | 1 |
| IEEE 754 **Data Lo Word, Hi Byte** | 0xA3 | Byte | 1 |
| IEEE 754 **Data Lo Word, Lo Byte** | 0xD7 | Byte | 1 |
| IEEE 754 **Data Hi Word, Hi Byte** | 0x41 | Byte | 1 |
| IEEE 754 **Data Hi Word, Lo Byte** | 0xBE | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

* the floating point number 23.83 is represented in byte of hexadecimal as <41><BE><A3><D7>

# Modbus Protocol of THS17-MD

## Read Relativity Humidity Measurement Value

| Request the host (PC or PLC) to polling the data of THS17-MD | | | |
|---|---|---|---|
| Field Name | Value | Type | Byte |
| Address of Transmit | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Starting Address Hi | 0x00 | Byte | 1 |
| Starting Address Lo | 0x04 | Byte | 1 |
| No. of registers Hi | 0x00 | Byte | 1 |
| No. of registers Lo | 0x02 | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

*Registers of Relativity Humidity are 0x04 ~ 0x07

| Response THS17-MD response data to the host (PC or PLC) | | | |
|---|---|---|---|
| Field Name | Value | Type | Byte |
| Address of Transmit | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Byte Count | 04 | Byte | 1 |
| IEEE 754 **Data Lo Word, Hi Byte** | 0x77 | Byte | 1 |
| IEEE 754 **Data Lo Word, Lo Byte** | 0xCF | Byte | 1 |
| IEEE 754 **Data Hi Word, Hi Byte** | 0x42 | Byte | 1 |
| IEEE 754 **Data Hi Word, Lo Byte** | 0x13 | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

* the floating point number 36.87 is represented in byte of hexadecimal as <42><13><77><CF>:

# Modbus Protocol of THS17-MD

## Read Temperature Measurement Value In Integer

| Request the host (PC or PLC) to polling the data of THS17-MD | | | |
|---|---|---|---|
| Field Name | Value | Type | Byte |
| Address of Transmit | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Starting Address Hi | 0x00 | Byte | 1 |
| Starting Address Lo | 0x20 | Byte | 1 |
| No. of registers Hi | 0x00 | Byte | 1 |
| No. of registers Lo | 0x01 | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

*Register of Temperature is 0x0020

| Response THS17-MD response data to the host (PC or PLC) | | | |
|---|---|---|---|
| Field Name | Value | Type | Byte |
| Address of Transmit | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Byte Count | 02 | Byte | 1 |
| Integer Data , Hi Byte | 0x00 | Byte | 1 |
| Integer Data, Lo Byte | 0xEE | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

* the integer number 238 is represented in byte of hexadecimal as <00><EE> and the temperature reading is 23.8

# Modbus Protocol of THS17-MD

## Read Relativity Humidity Measurement Value In Integer

| Request the host (PC or PLC) to polling the data of THS17-MD | | | |
|---|---|---|---|
| Field Name | Value | Type | Byte |
| Address of Transmit | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Starting Address Hi | 00 | Byte | 1 |
| Starting Address Lo | 22 | Byte | 1 |
| No. of registers Hi | 00 | Byte | 1 |
| No. of registers Lo | 01 | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

*Register of Relative Humidity is 0x022

| Response THS17-MD response data to the host (PC or PLC) | | | |
|---|---|---|---|
| Field Name | Value | Type | Byte |
| Address of Transmit | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Byte Count | 02 | Byte | 1 |
| Integer Data , Hi Byte | 0x02 | Byte | 1 |
| Integer Data, Lo Byte | 0x8E | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

* the integer number 654 is represented in byte of hexadecimal as <02><8E> and the humidity reading is 65.4

# Modbus Protocol of THS17-MD

## Read Serial No.

| Request the host (PC or PLC) to polling the data of THS17-MD | | | |
|---|---|---|---|
| Field Name | Value | Type | Byte |
| Address of Transmit | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Starting Address Hi | 0x00 | Byte | 1 |
| Starting Address Lo | 0x50 | Byte | 1 |
| No. of registers Hi | 0x00 | Byte | 1 |
| No. of registers Lo | 0x08 | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

*Registers of Serial No. are 0x50 ~ 0x5F

| Response THS17-MD response data to the host (PC or PLC) | | | |
|---|---|---|---|
| Field Name | Value | Type | Byte |
| Address of Transmit | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Byte Count | 10 | Byte | 1 |
| 1st Word, Lo byte | 0x4E | Byte | 1 |
| 1st Word, Hi byte | 0x53 | Byte | 1 |
| 2nd Word, Lo byte | 0x31 | Byte | 1 |
| 2nd Word, Hi byte | 0x30 | Byte | 1 |
| 3rd Word, Lo byte | 0x33 | Byte | 1 |
| 3rd Word, Hi byte | 0x32 | Byte | 1 |
| 4th Word, Lo byte | 0x35 | Byte | 1 |
| 4th Word, Hi byte | 0x34 | Byte | 1 |
| 5th Word, Lo byte | 0x37 | Byte | 1 |
| 5th Word, Hi byte | 0x36 | Byte | 1 |
| 6th Word, Lo byte | 0x39 | Byte | 1 |
| 6th Word, Hi byte | 0x38 | Byte | 1 |
| 7th Word, Lo byte | 0x42 | Byte | 1 |
| 7th Word, Hi byte | 0x41 | Byte | 1 |
| 8th Word, Lo byte | 0x44 | Byte | 1 |
| 8th Word, Hi byte | 0x43 | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

*example of Serial No. is “SN0123456789ABCD”

# Modbus Protocol of THS17-MD

## Read Firmware Version

| Request the host (PC or PLC) to polling the data of THS17-MD | | | |
|---|---|---|---|
| Field Name | Value | Type | Byte |
| Address of Transmit | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Starting Address Hi | 0x00 | Byte | 1 |
| Starting Address Lo | 0x60 | Byte | 1 |
| No. of registers Hi | 0x00 | Byte | 1 |
| No. of registers Lo | 0x08 | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

*Registers of Firmware Version are 0x60 ~ 0x6F

| Response THG17-MD response data to the host (PC or PLC) | | | |
|---|---|---|---|
| Field Name | Value | Type | Byte |
| Address of Transmit | 1~247 | Byte | 1 |
| Read Holding registers | 03 | Byte | 1 |
| Byte Count | 10 | Byte | 1 |
| 1st Word, Lo byte | 0x2E | Byte | 1 |
| 1st Word, Hi byte | 0x32 | Byte | 1 |
| 2nd Word, Lo byte | 0x31 | Byte | 1 |
| 2nd Word, Hi byte | 0x31 | Byte | 1 |
| 3rd Word, Lo byte | 0x31 | Byte | 1 |
| 3rd Word, Hi byte | 0x2E | Byte | 1 |
| 4th Word, Lo byte | 0x30 | Byte | 1 |
| 4th Word, Hi byte | 0x2E | Byte | 1 |
| 5th Word, Lo byte | 0x00 | Byte | 1 |
| 5th Word, Hi byte | 0x00 | Byte | 1 |
| 6th Word, Lo byte | 0x00 | Byte | 1 |
| 6th Word, Hi byte | 0x00 | Byte | 1 |
| 7th Word, Lo byte | 0x00 | Byte | 1 |
| 7th Word, Hi byte | 0x00 | Byte | 1 |
| 8th Word, Lo byte | 0x00 | Byte | 1 |
| 8th Word, Hi byte | 0x00 | Byte | 1 |
| CRC Lo | CRC Lo | Byte | 1 |
| CRC Hi | CRC Hi | Byte | 1 |

*example of Firmware Version is “2.11.1.0”

# Modbus Protocol of THS17-MD

## Revise history

- V1 2025_12_26 Initial