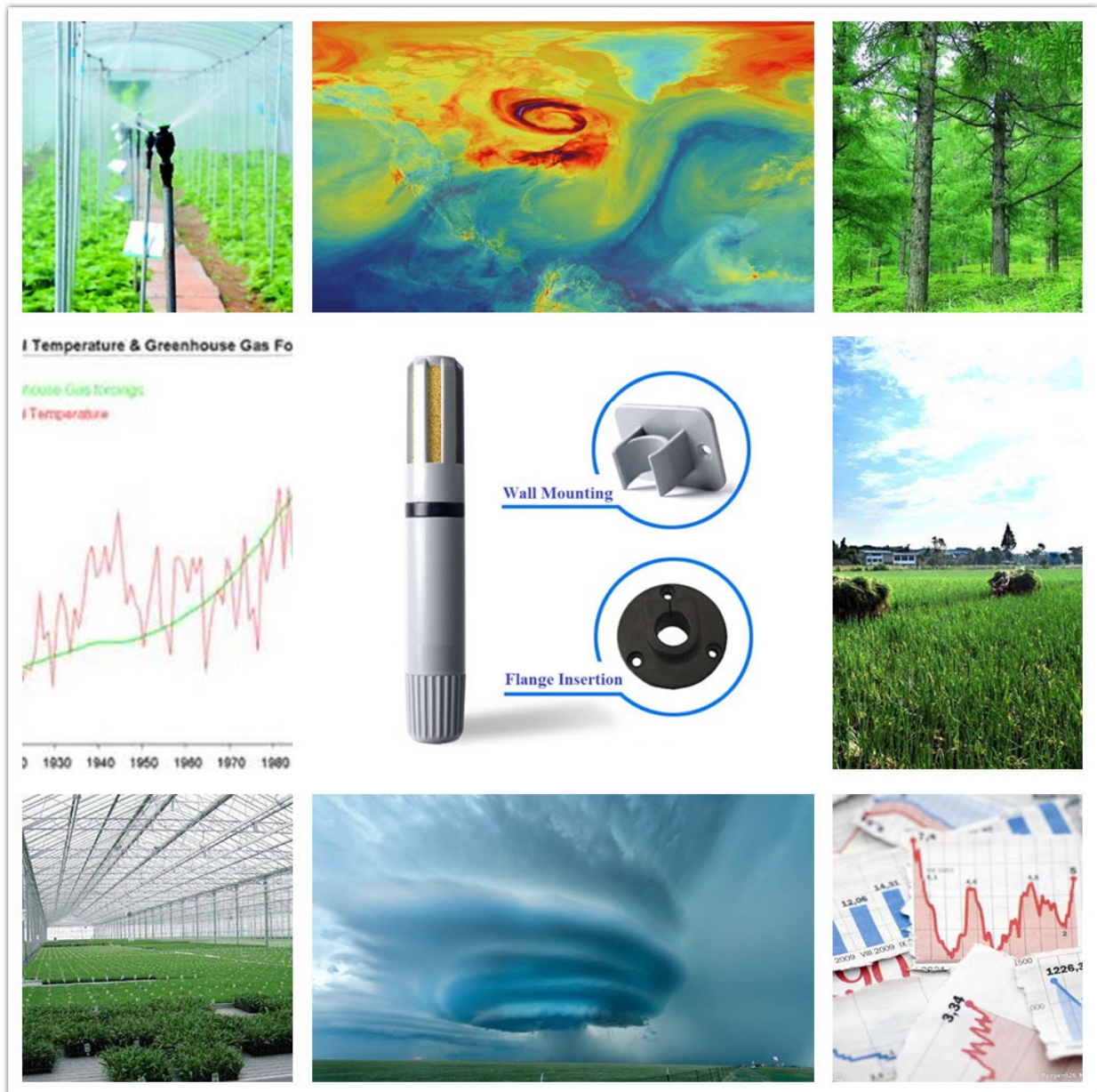


DigiTH

Air Humidity, Temperature and Dew Point Sensor

User Manual



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1 Customer Support

Thank you very much for your order. Our success comes from the continuous faith in the excellence of our products and services, something we are committed to and would never sacrifice. Our customer service, especially in the after sales phase, guarantees the satisfaction of our clients. In line with this strategy, we appreciate that you can share with us your feedback at any time for our improvement, be it positive or negative, so if we can serve you better in anyway, please do inform us.

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2 Introduction

DigiTH is an air humidity, temperature and dew point sensor with RS485 modbus interface. The sensing elements are located on a PCB in the tip of the sensor. The acquisition circuit is completely over-moulded. Temperature and humidity sensor is based on a precision SENSIRION® sensor. Each sensor is individually factory-calibrated. With dimensions of only 108mm x 16mm, the sensor can easily be fitted into many standard radiation shields and field application.

- Air humidity and temperature sensor with dew point
- RS485 modbus-RTU interface
- Small size with high accuracy with excellent stability
- Cleanable 10um copper sintering filter cap
- Wall mounting or pipe flange insertion installation
- Reverse power protection and Built-in TVS/ESD protection
- Excellent price-performance ratio

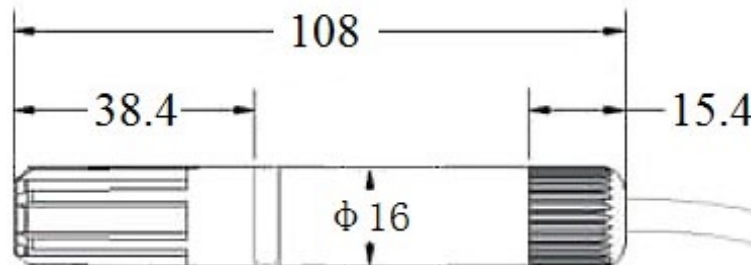
Specification	
Output Interface	RS485, Modbus-RTU
Power supply	3.6-24V DC
Power Consumption	4mA@24V DC
Humidity	Range:0-100%, Resolution:0.01%, Accuracy: +/-1.8% RH(SENSIRION® SHT25) Range:0-100%, Resolution:0.01%, Accuracy: +/-2% RH(SENSIRION® SHT21) Range:0-100%, Resolution:0.01%, Accuracy: +/-3% RH(SENSIRION® SHT20)
Temperature	Range:-40~80°C, Resolution:0.01°C, Accuracy: +/-0.2°C(SENSIRION® SHT25) Range:-40~80°C, Resolution:0.01°C, Accuracy: +/-0.3°C(SENSIRION® SHT21) Range:-40~80°C, Resolution:0.01°C, Accuracy: +/-0.3°C(SENSIRION® SHT20)
IP Rating	IP56
Operating Temperature	-40~85°C
Installation	Wall mounting or Pipe flange insertion
Cable Length	2 meters, or Customize
Dimension	Sensor Body 108*16mm

3 Wiring diagrams

Output Interface	Wiring Diagrams
RS485 Modbus	<p>Red (V+): Power Supply + Black (G): Power Supply - Yellow (T+): RS485+/A/T+ White (T-): RS485-/B/T-</p> <div data-bbox="319 638 1412 1064" style="border: 1px solid black; padding: 10px; text-align: center;"> <p>Wiring Diagram for RS485 Modbus</p> </div> <p>ALL RS485 communication parameters (Mosbus Slave Address, baudrate, parity, databits, stopbits) are set in internal register and can be saved when power down, the factory setting is ADDRESS=1, BAUDRATE=9600bps, PARITY=NONE, DATABITS=8bits, STOPBITS=1bit;</p> <p>Sometimes you may FORGET the communication settings, In this case, you can open the shield module and press the SET button for more that 3 seconds, then all the communication parameters reset to factory setting, then communicating with the sensor using the factory setting to set your desired settings. Please re-power up the sensor to make the settings effective.</p>

4 Dimension and Ordering Information

4.1 Dimension



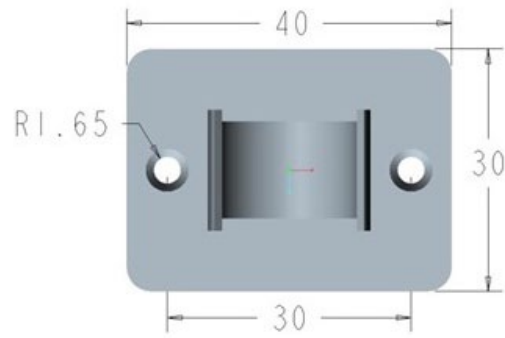
Unit: mm

4.2 Ordering Information

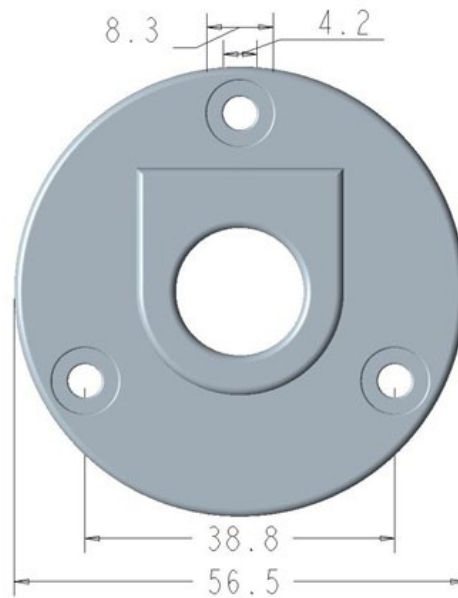
Parameters	Code	Comments
Code 1:Product Series	DigiTH	DigiTH sensor
Code 2:Measuring Parameters	A	Air humidity, temperature and dew point
Code 3:Temperature Accuracy	A	-40-80°C, +/-0.3°C (SENSIRION® SHT20)
	B	-40-80°C, +/-0.3°C (SENSIRION® SHT21)
	C	-40-80°C, +/-0.2°C (SENSIRION® SHT25)
Code 4:Humidity Accuracy	A	0-100%RH, +/-3% (SENSIRION® SHT20)
	B	0-100%RH, +/-2% (SENSIRION® SHT21)
	C	0-100%RH, +/-1.8% (SENSIRION® SHT25)
Code 5:Power Supply	A	3.6-24V DC
Code 6: Output Interface	A	RS485, Modbus-RTU
	C	Customize
Code 7: Cable Length	002	2 meters
	XXX	Customize, XXX is required cable length(Unit: meter)
Ordering Code Example: DigiTH sensor with Air humidity, temperature and dew point, Temperature Accuracy -40-80°C, +/-0.3°C, Humidity Accuracy 0-100%RH, +/-3%, Power Supply 3.6-24V DC, Output Interface RS485 Modbus-RTU, Cable Length 5 meters. Ordering Code is : DigiTH - A A A A A 005		

5 Installation

Wall Mounting (Unit: mm)



Pipe Flange Insertion (Unit: mm)



6 Output Signal Conversion

Output Interface	Parameters Range	Conversion Formula
RS485 Modbus-RTU	Temperature: -40-80°C	TEMP=(REGISTER VALUE)/100. When REGISTER VALUE=2013, then TEMP=2013/100=20.13°C.
	Humidity: 0-100%	HUMIDITY=(REGISTER VALUE)/100. When REGISTER VALUE=2013, then HUMIDITY=2013/100=20.13%.
	Dew Point: -40-80°C	DEWPOINT=(REGISTER VALUE)/100. When REGISTER VALUE=2013, then DEWPOINT=2013/100=20.13°C.
Customize	Contact support for customized sensor interface	

7 RS485 Modbus Protocol

7.1 Modbus Protocol

Modbus Protocol is widely used to establish master-slave communication between intelligent devices or sensors. A MODBUS message sent from a master to a slave contains the address of the slave, the function code (e.g. 'read register' or 'write register'), the data, and a check sum (LRC or CRC).

The sensor is RS485 interface with Modbus protocol. The default serial communication settings is slave address 1, modbus rtu, 9600bps, 8 databits and 1 stop bit. All communication settings can be changed with modbus command, and take effective after re-power up the sensor.

Following modbus function code are supported by sensor.

Modbus Function Code 0x03 : used for reading holding register.

Modbus Function Code 0x04 : used for reading input register.

Modbus Function Code 0x06 : not supported, use Function Code 0x10 instead.

Modbus Function Code 0x10: used for writing multiple holding register.

7.2 Modbus Register

Parameters	Register Addr. (HEX/DEC)	Data Type	Modbus Function Code(DEC)	Range and Comments	Default Value
TEMPRATURE	0x0000 /0	INT16 RO	3/4	-4000-8000 for -40.00~80.00°C.	N/A
HUMIDITY	0x0001 /1	UINT16 RO	3/4	0-10000 for 0-100%	N/A
DEWPOINT	0x0002 /2	UINT16 RO	3/4	-4000-8000 for -40.00~80.00°C.	N/A
RESERVED	0x0003/3	UINT16 RO	3/4	N/A	N/A
ADDRESS	0x0200 /512	UINT16 R/W	3/16	0-255	1
BAUDRATE	0x0201 /513	UINT16 R/W	3/16	0-6 0:1200bps	3:9600bps

				1:2400bps 2:4800bps 3:9600bps 4:19200bps 5:38400bps	
PROTOCOL	0x0202 /514	UINT16 R/W	3/16	0 0:Modbus RTU	0:Modbus RTU
PARITY	0x0203 /515	UINT16 R/W	3/16	0-2 0:None 1:Even 2:Odd	0:None Parity
DATABITS	0x0204 /516	UINT16 R/W	3/16	1 1:8 databits	1:8 databits
STOPBITS	0x0205 /517	UINT16 R/W	3/16	0-1 0:1 stopbit 1:2 stopbits	0:1 stopbit

NOTE: UINT16:16 bit unsigned integer, INT16:16bit signed integer

NOTE: RO: Register is Read Only, R/W: Register is Read/Write

NOTE: HEX is Hexadecimal (data with 0x/0X prefix), DEC is Decimal

7.3 Modbus Register Detail Descripton

TEMPERATURE		
Data Range	-4000-8000 For -40.00~80.00°C	Default: N/A
Power Down Save	N/A	

Note:Temperature value (Binary complement).

Example:When REGISTER = 0x0702 (HEX format), then

VALUE=(0x07*256+0x02)/100=17.94°C .When REGISTER=FF05H (HEX format),then

VALUE=((0xFF*256+0x05)-0xFFFF-0x01)/100 =(0xFF05-0xFFFF-0x01)/100=-2.51°C .

HUMIDITY		
Data Range	0-10000 For 0-100%	Default: N/A
Power Down Save	N/A	

Note:Volmetric Water Content value.

Example:When REGISTER = 0x0702 (HEX format), then VALUE=(0x07*256+0x02)/100=17.94%

DEWPOINT		
Data Range	-4000-8000 For -40.00~80.00°C	Default: N/A
Power Down Save	N/A	

Note: Temperature value (Binary complement).

Example: When REGISTER = 0x0702 (HEX format), then

VALUE=(0x07*256+0x02)/100=17.94°C. When REGISTER=FF05H (HEX format), then

VALUE=((0xFF*256+0x05)-0xFFFF-0x01)/100=(0xFF05-0xFFFF-0x01)/100=-2.51°C.

SLAVEADDR --- Modbus Slave Address		
Data Range	0-255	Default: 1
Power Down Save	YES	

Note: Please re-power on the sensor to take effective after set.

BAUDRATE --- Serial Comm Baudrate		
Data Range	0-5 0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	Default: 3
Power Down Save	YES	

Note: Please re-power on the sensor to take effective after set.

PROTOCOL --- Serial Comm Protocol		
Data Range	0 0:Modbus RTU	Default: 0
Power Down Save	YES	

Note: Please re-power on the sensor to take effective after set.

PARITY --- Serial Comm Parity		
Data Range	0-2 0:NONE 1:EVEN 2:ODD	Default: 0
Power Down Save	YES	

Note: Please re-power on the sensor to take effective after set.

DATABITS --- Serial Comm Databits		
Data Range	1 1:8 databits	Default: 1
Power Down Save	YES	

Note: Please re-power on the sensor to take effective after set.

STOPBITS --- Serial Comm Stopbits		
Data Range	0-1 0:1 stopbit 1:2 stopbits	Default: 0
Power Down Save	YES	

Note: Please re-power on the sensor to take effective after set.

7.4 Modbus Function Code

For description below, data started with 0X/0x means that it's in HEX format.

7.4.1 Function Code 3 Protocol Example

Master Request:AA 03 RRRR NNNN CCCC

AA	1 byte	Slave Address,0-255
0x03	1 byte	Function Code 3
RRRR	2 byte	Starting Register Addr
NNNN	2 byte	Quantity of Register to read
CCCC	2 byte	CRC CHECKSUM

Slave Response:AA 03 MM VV0 VV1 VV2 VV3... CCCC

AA	1 byte	Slave Address,0-255
0x03	1 byte	Function Code 3
MM	1 byte	Register Data Byte Count
VV0,VV1	2 byte	Register Value (High8bits first)
VV2,VV3	2 byte	Register Value (High8bits first)
...	...	Register Value (High8bits first)
CCCC	2 byte	CRC CHECKSUM

Example:Read register 0x0200-0x0201,that is slave address and baudrate.

Master Request:01 03 0200 0002 C5B3

Slave Addr.	1 byte	0x01
Function Code	1 byte	0x03
Starting Register Addr.	2 byte	0x0200
Quantity of Register to read	2 byte	0x0002
Checksum	2 byte	0xC5B3

Slave Response:01 03 04 00 01 00 03 EB F2

Slave Addr.	1 byte	0x01
Function Code	1 byte	0x03
Register Data Byte Count	1 byte	0x04
Register Value: Address	2 byte	0x00(HIGH 8 Bits)
		0x01(LOW8 Bits)
Register Value: Baudrate	2 byte	0x00(HIGH 8 Bits)
		0x03(LOW8 Bits)
Checksum	2 byte	0xEBF2

7.4.2 Function Code 4 Protocol Example

Master Request:AA 04 RRRR NNNN CCCC

AA	1 byte	Slave Address,0-255
0x04	1 byte	Function Code 4
RRRR	2 byte	Starting Register Addr
NNNN	2 byte	Quantity of Register to read
CCCC	2 byte	CRC CHECKSUM

Slave Response:AA 04 MM VV0 VV1 VV2 VV3... CCCC

AA	1 byte	Slave Address,0-255
0x04	1 byte	Function Code 4
MM	1 byte	Register Data Byte Count
VV0,VV1	2 byte	Register Value (High8bits first)
VV2,VV3	2 byte	Register Value (High8bits first)

...	...	Register Value (High8bits first)
CCCC	2 byte	CRC CHECKSUM

Example: Read Register 0x0000-0x0002,that is temperature, humidity and dew point.

Master Request:01 04 0000 0003 B00B

Slave Addr.	1 byte	0x01
Function Code	1 byte	0x04
Starting Register Addr.	2 byte	0x0000
Quantity of Register to read	2 byte	0x0003
Checksum	2 byte	0xB00B

Slave Response:01 04 06 0890 0E93 024E D257

Slave Addr.	1 byte	0x01
Function Code	1 byte	0x04
Register Data Byte Count	1 byte	0x08
Register Value: Temperature	2 byte	0x08(HIGH 8 Bits)
		0x90(LOW8 Bits)
Register Value: Humidity	2 byte	0x0E(HIGH 8 Bits)
		0x93(LOW8 Bits)
Register Value: Dew Point	2 byte	0x02(HIGH 8 Bits)
		0x4E(LOW8 Bits)
Checksum	2 byte	0xD257

Temperature= (0x08*256+0x90) /100=2192/100=21.92°C

Humidity= (0x0E*256+0x93) /100=3731/100=37.31%

Dew Pont= (0x02*256+0x4E)/100=590/100 =5.90°C

7.4.3 Function Code 6 Protocol Example

Function Code 6 is not supported, please use Function Code 16 instead.

7.4.4 Function Code 16 Protocol Example

Master Request:AA 10 RRRR NNNN MM VVVV1 VVVV2 ...CCCC

AA	1 byte	Slave Address,0-255
0x10	1 byte	Function Code 0x10
RRRR	2 byte	Starting Register Addr
NNNN	2 byte	Quantity of Register to write
MM	1 byte	Register Data Byte Count
VVVV1	2 byte	Register Value(High8bits first)
VVVV2	2 byte	Register Value(High8bits first)
...	...	Register Value(High8bits first)
CCCC	2 byte	CRC CHECKSUM

Slave Response:AA 10 RRRR NNNN CCCC

AA	1 byte	Slave Address,0-255
0x10	1 byte	Function Code 0x10
RRRR	2 byte	Starting Register Addr
NNNN	2 byte	Quantity of Register to write
CCCC	2 byte	CRC CHECKSUM

Example:Write Register 0x0200-0x0201,that is set slave address to 1,and baudrate to 19200bp.

Master Request:01 10 0200 0002 04 0001 0004 BACC

0x01	1 byte	Slave Addr.
0x10(HEX)	1 byte	Function Code 0x10
0x0200	2 byte	Starting Register Addr
0x0002	2 byte	Quantity of Register to write
0x04	1 byte	Register Data Byte Count
0x0001	2 byte	Register Value: Slave Address 1
0x0004	2 byte	Register Value: Baudrate 19200bps
0xBACC	2 byte	CRC CHECKSUM

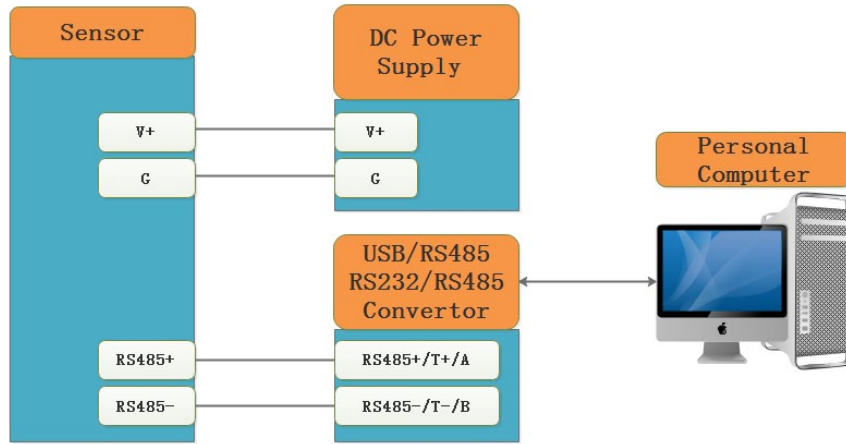
Salve Response:01 10 0200 0002 4070

0x01	1 byte	Slave Addr.
0x10(HEX)	1 byte	Function Code 0x10
0x0200	2 byte	Starting Register Addr(High8bits first)

0x0002	2 byte	Quantity of Register to write(High8bits first)
0x4070	2 byte	CRC CHECKSUM

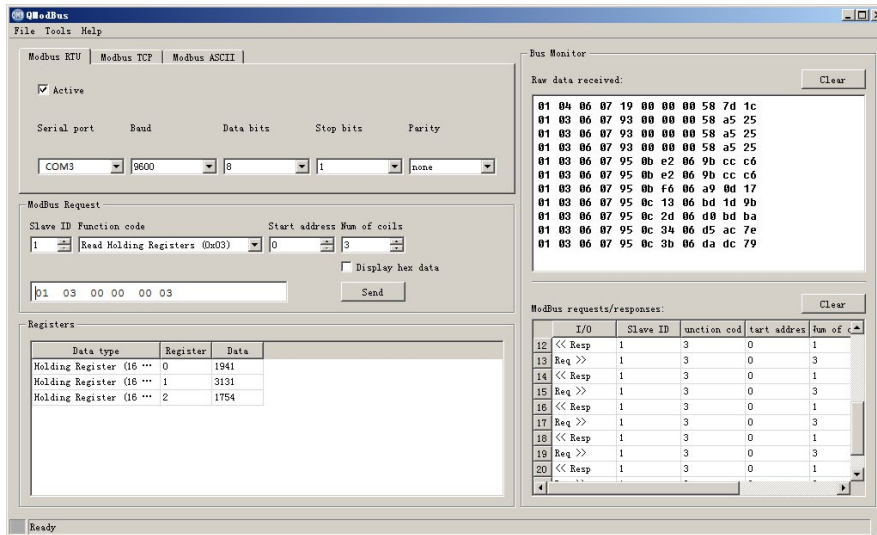
8 Software Configuration Utility

8.1 Hardwar Setup



8.2 Universal Modbus Comm Utility

You can use software listed below to try reading/writing the register of sensor, <https://github.com/ed-chemnitz/qmodbus/releases>



8.3 SensorOneSet Configuration Utility

SensorOneSet is a configuration utility to read/set sensor config for all of our serial communication sensor products. Please contact us if you need the English version.

Appendix

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Version Control

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2016-12-12	V1.0	Initial Creation	fg49597