Humidity / Temp Transmitter & Modbus

HUM-D

HUM-W

HUM-R

1. Descriptions

Applications:

Humidity & Temperature transmitters are designed for environment monitoring and controlling in industrial, commercial and other buildings. These transmitters can be used for indoor air temperature and humidity monitoring in various industrial plant, clean room, lab, machine room, office and commercial building, airport, station, library and stadium.

Highlights:

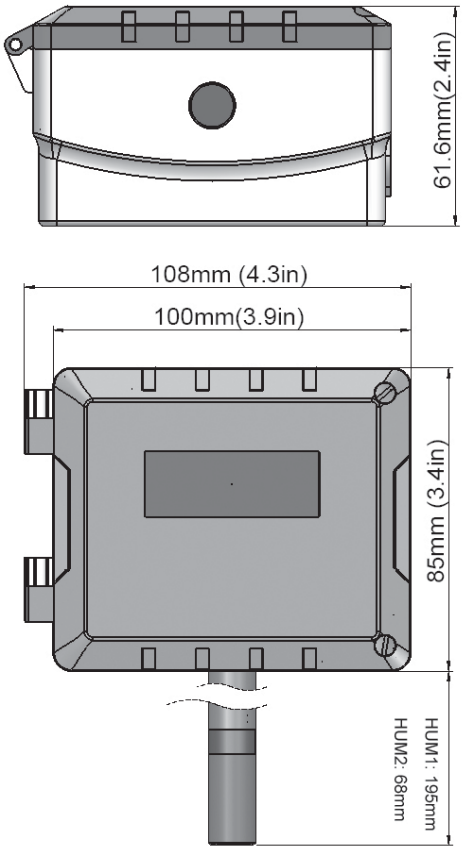
- High performance digital sensors and circuits, ensure accurate measurement and temperature compensation
- Good long term stability and reliability
- 100% field changeable sensors, no re-calibration needed
- Fast response
- Multiple output signals selectable: 4-20mA, 0-5V or 0-10V
- Display in degrees Fahrenheit or Celsius (connection to Modbus)

2. Specifications

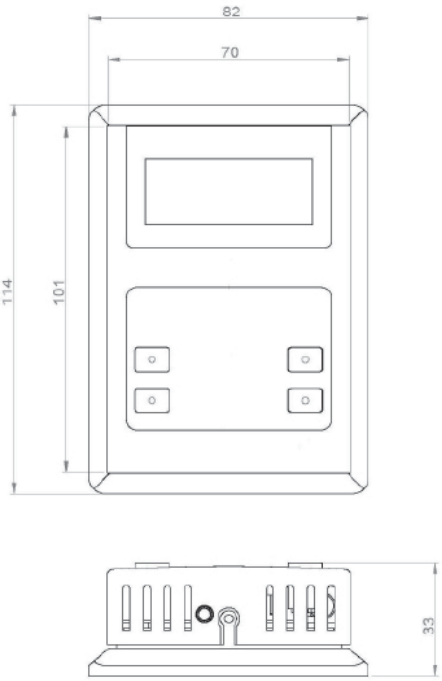
Relative Humidity:	
Sensor	Capacitance polymer,
Range	0~100% non condensing
Output	4-20mA, 0-5V or 0-10V, RS 485
Accuracy	3% RH (25°C, 20~80% RH)
Hysteresis	< ±1% RH
Response time	< 10s (25°C, in slow air)
Drift	< ±0.5% RH / year
Temperature:	
Sensor	10K internal
Range	-30~70°C(-22~158°F)/transmitter
Output	4-20mA, 0-5V or 0-10V, RS 485
Accuracy	< ±0.5°C @ 25°C
General:	
Power	12 to 24V AC or DC, ±10%
Current Output Load	< 500Ω
Display	LCD screen for wall / outdoor mount and duct mount
Display Resolution	0.1°C, 0.1% RH
Temperature Limit	-30~70°C, 0~95% RH(Non condensing)
Plastic Housing	Flammability rating UL 94V0 file E194560
Protection	IP65, outdoor rated for duct and wall mount models; IP30 for room mount

3. Dimensions

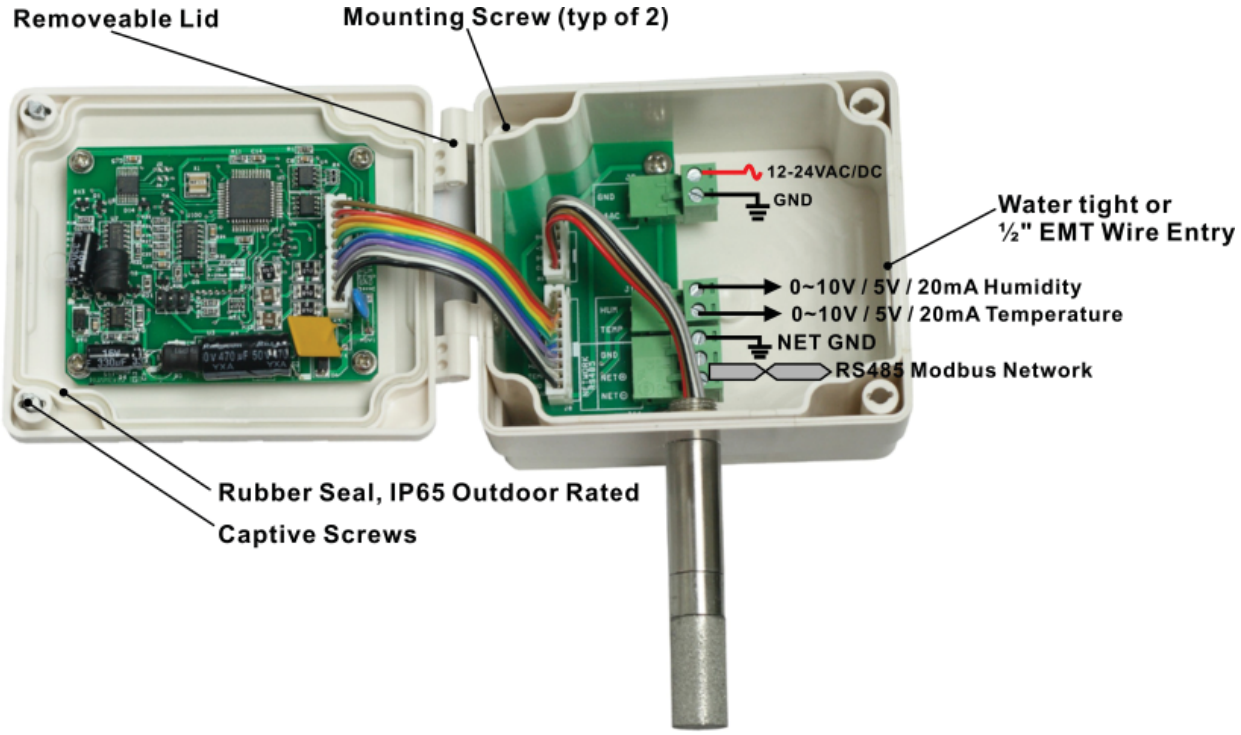
HUM D & HUM W:



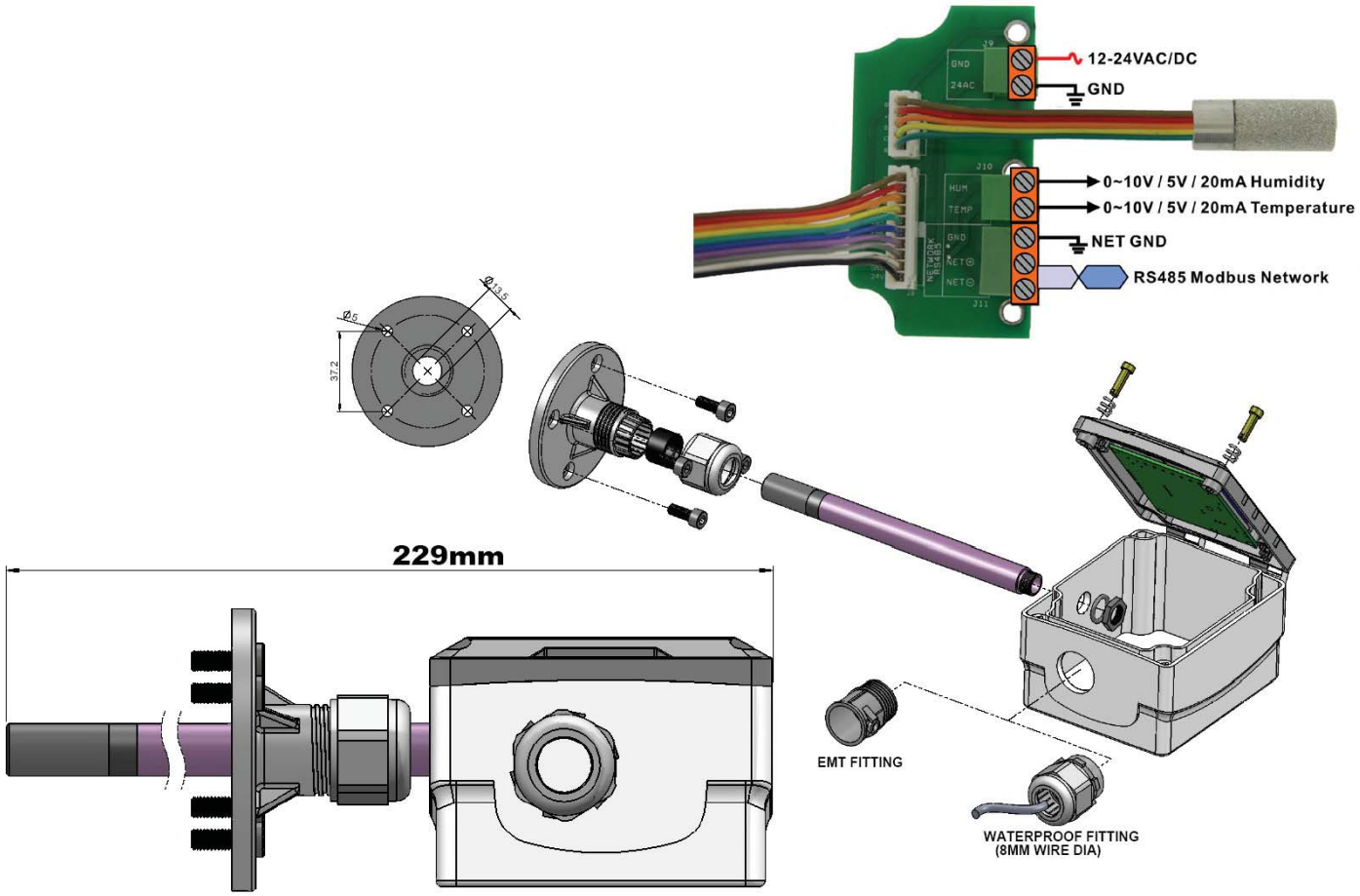
HUM-R



4. Highlights & Wiring Diagram



5. Assembly


12-24VAC/DC
GND
0~10V / 5V / 20mA Humidity
0~10V / 5V / 20mA Temperature
NET GND
RS485 Modbus Network
229mm
EMT FITTING
WATERPROOF FITTING
(8MM WIRE DIA)

REV10 Output Jumpers Settings:
To set 0-10V or 0-5V output, need set register 186,187:
---186 set to 1, means temperature is set to 0-10V output
---187 set to 1, means humidity is set to 0-10V output

---186 set to 2, means temperature is set to 0-5V output
---187 set to 2, means humidity is set to 0-5V output

To set 4-20mA output, need set register 186,187:
---186 set to 3, means temperature is set to 4-20mA output
---187 set to 3, means humidity is set to 4-20mA output

REV12 Output Jumpers Settings:
Rev12 can auto detect hardware jumpers set, do not need to set registers

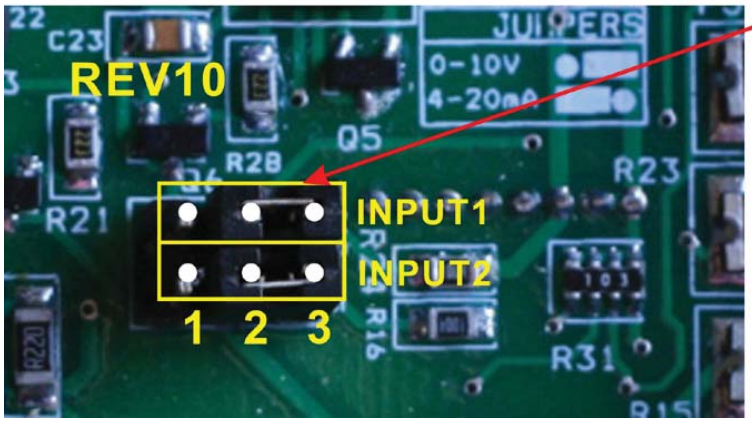
REV10 Output Modbus Settings:	
186 set to 1	Temperature is set to 0-10V output
187 set to 1	Humidity is set to 0-10V output
186 set to 2	Temperature is set to 0-5V output
187 set to 2	Humidity is set to 0-5V output
186 set to 3	Temperature is set to 4-20mA output
187 set to 3	Humidity is set to 4-20mA output
REV11 Output Modbus Settings:	
Rev11 can auto detect hardware jumpers set, do not need to set registers	

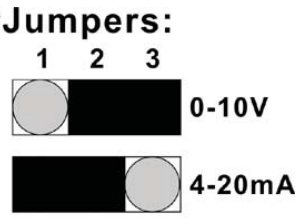
0-10V output
Temperature (C) = (Voltage * 100 - offset) / 10
Temperature (F) = (DegC) * 9 / 5 + 32
Humidity = Voltage / 10

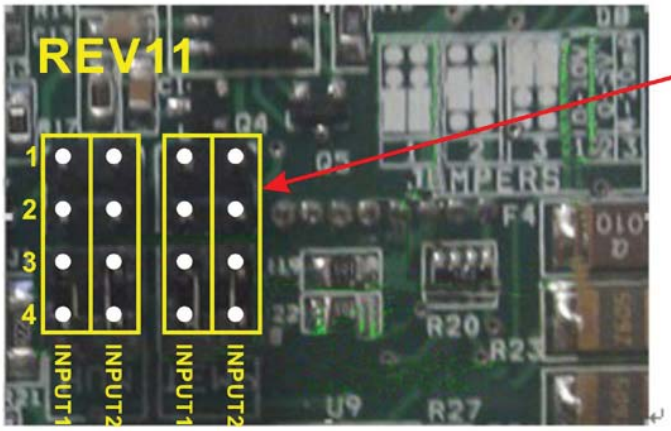
0-5V output
Temperature (C) = (Voltage * 100 - offset) / 20
Temperature (F) = (DegC) * 9 / 5 + 32
Humidity = Voltage / 20

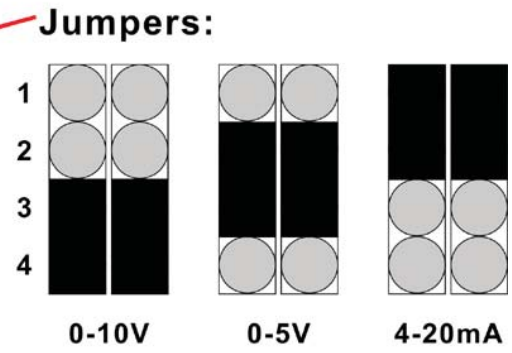
4-20mA output
Temperature (C) = ((Current – 0.004)/0.00016) – offset/10
Temperature (F) = DegC * 9 / 5 + 32
Humidity = (Current – 0.004)/0.00016
--- Temperature(F) : register 100
--- Temperature(C) : register 101
--- Offset : register 443, offset from zero C to adjust temperature range.
For example 0 = 0-100C,
300 = -30 to +70C (Default setting)
--- Where
Voltage is the input voltage in Volts
And Current is in A, ie 10 = 10ma

6. Jumper Settings









Output Modbus Settings:
Can auto detect hardware jumpers set, do not need to set registers

Voltage & Current Formula:	
0-10V output	Temperature (C) = (Voltage * 100 - offset) / 10
	Temperature (F) = (DegC) * 9 / 5 + 32
	Humidity = Voltage / 10
0-5V output	Temperature (C) = (Voltage * 100 - offset) / 20
	Temperature (F) = (DegC) * 9 / 5 + 32
	Humidity = Voltage / 20
4-20mA output	Temperature (C) = ((Current – 4)/0.16) – offset/10
	Temperature (F) = DegC * 9 / 5 + 32
	Humidity = (Current – 4)/0.16
	--- Temperature(F) : register 100
	--- Temperature(C) : register 101
Applied for all	--- Offset : register 442, offset from zero C to adjust temperature range
	For example 0 = 0-100C; 300 = -30 to +70C (Default setting)
	Where Voltage is the input voltage in Volts, and Current is in mA, ie 10 = 10ma

7. Calibration Manual

1) Humidity Sensor Calibration

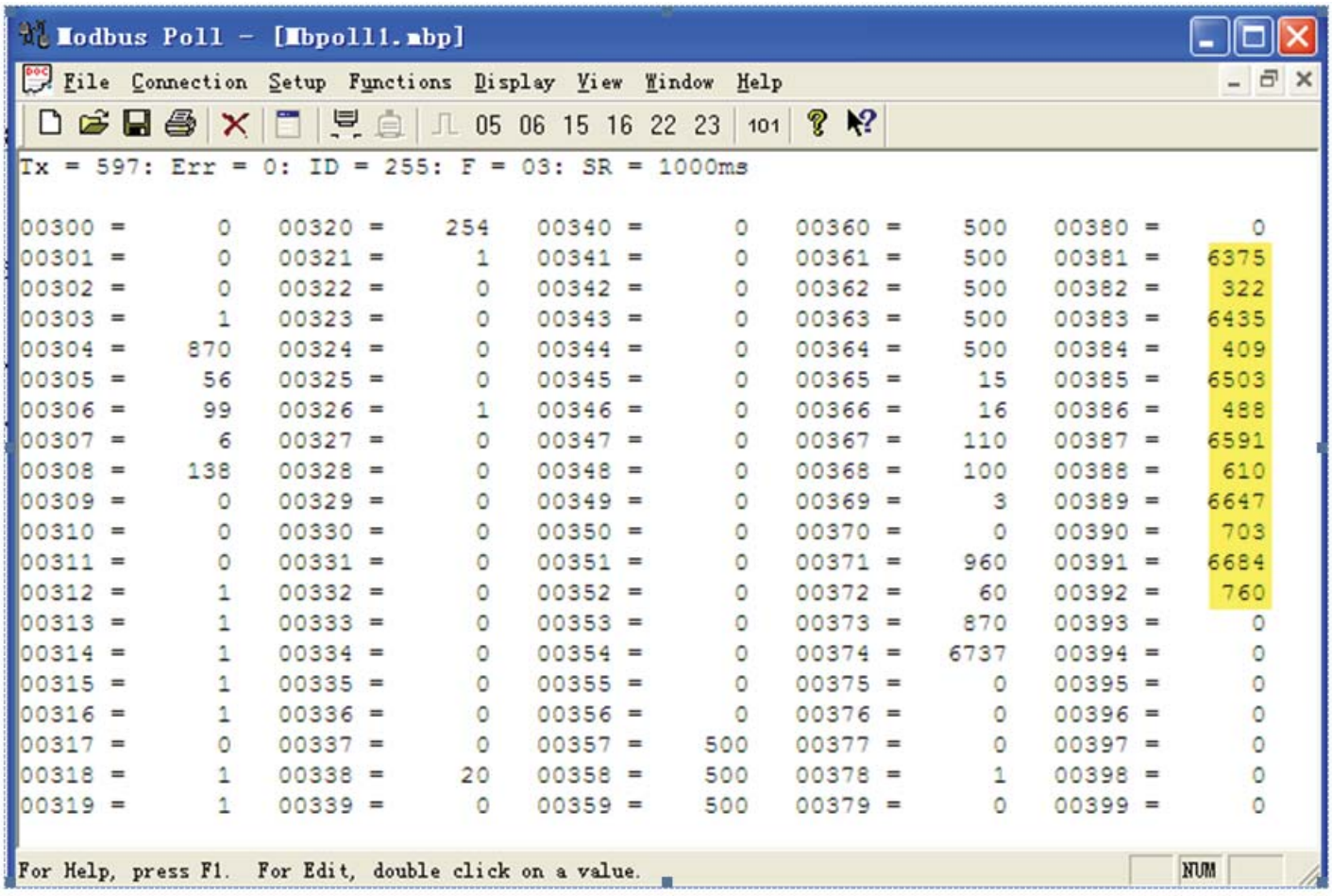
When the devices calibrated in the factory, the calibration points will be stored in the sensor, and will be used as default calibration value, the user can use default value when the current calibration value is lost.

• 1 Point Mode

At default condition(factory two points mode), users can write current humidity value which he gets from reference humidity meter to register 373, this operation will make the device into one point mode, sensor uses the default slope and calculate the offset.

373	Relative humidity in percentage

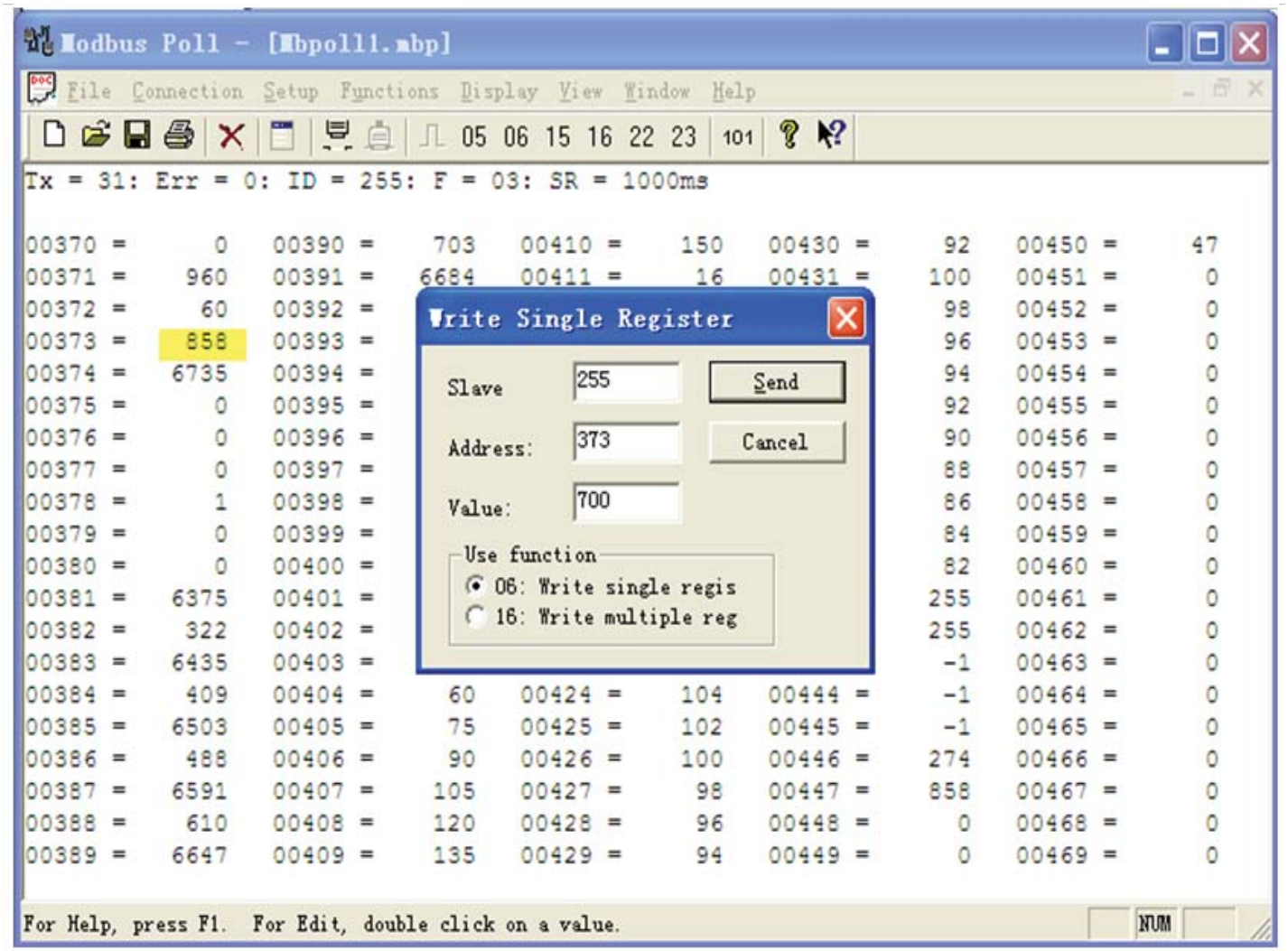
Humidity=48.9%



- **Calibrate Humidity**

  User can calibrate the humidity by writing the real value in the register 373.

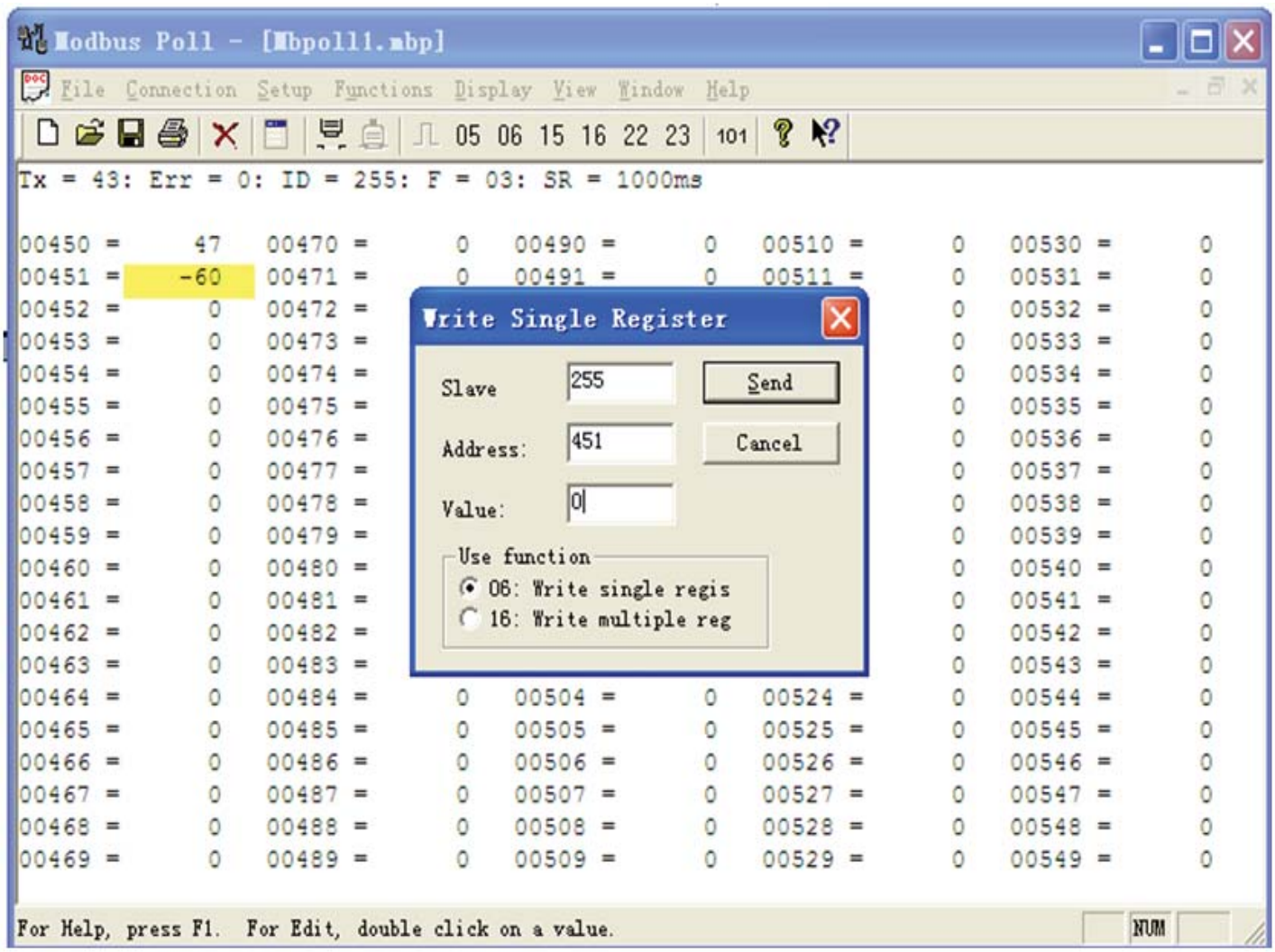
373	Relative humidity in percentage, and humidity calibration



- **Back to factory Default Set**

  User can write 0 to register 451 to back to factory default set.

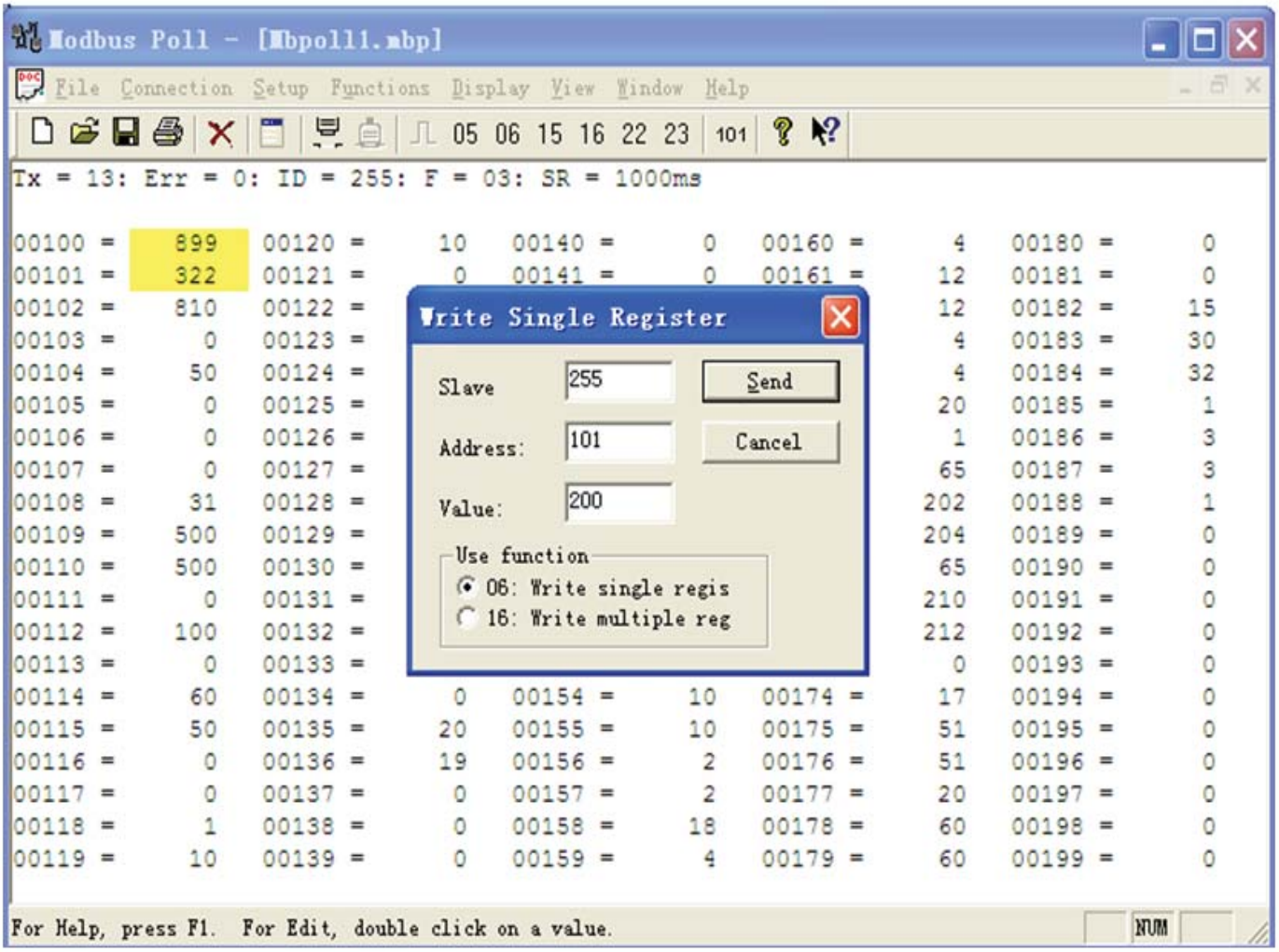
451	Calibration table select. 0: factory data 1: user data



2) Temperature Sensor Calibration

Write current temperature to reg101.

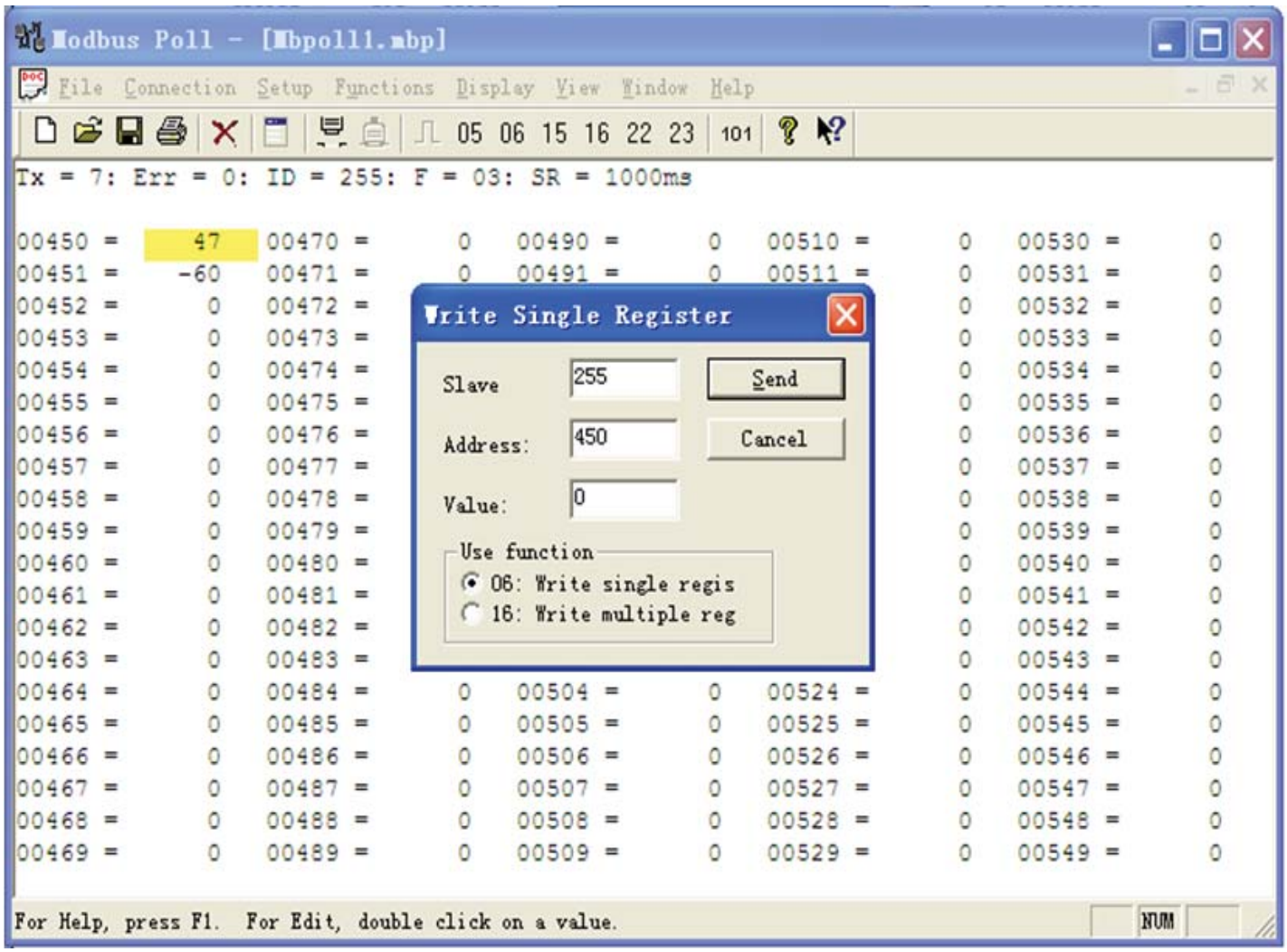
100	ROOM TEMPERATURE Reading in DegF. Can also write to this register for single point calibration.
101	ROOM TEMPERATURE Reading in DegC. Can also write to this register for single point calibration.



• **Back to factory Default Set**

User can write 0 to register 451 to back to factory default set.

450	Temperature Calibration Offset for sensor



3) Humidity Voltage Output Calibration

Write current temperature to reg101.

101	2	0~600	- -	ROOM TEMPERATURE Reading in DegC. Can also write to this register for single point calibration.

366	Humidity Output calibration voltage value(0-10V),0-5V use the same value
411	Humidity output voltage calibration offset value adjust value(0 - 10%)
412	Humidity output voltage calibration offset value adjust value(10% - 20%)
413	Humidity output voltage calibration offset value adjust value(20% - 30%)
414	Humidity output voltage calibration offset value adjust value(30% - 40%)
415	Humidity output voltage calibration offset value adjust value(40% - 50%)
416	Humidity output voltage calibration offset value adjust value(50% - 60%)
417	Humidity output voltage calibration offset value adjust value(60% - 70%)
418	Humidity output voltage calibration offset value adjust value(70% - 80%)
419	Humidity output voltage calibration offset value adjust value(80%- 90%)
420	Humidity output voltage calibration offset value adjust value(90% - 100%)

There are two ways to calibrate voltage output:

• reg366 is an offset for the entire output, if the user finds difference between entire theoretical value and real value, the offset value has to be changed to get it back, this operation can move the output entirely.

• User needs to measure the output to get the current output voltage and write back to relative registers from reg411 to reg420, this operation will make the output to be more accurate.

4) Humidity Current Output Calibration

368	Calibrate Humidity Output in 4-20mA mode
369	Output for current calibration, current calibration decreases the number
431	Humidity output current calibration offset value adjust value(0 - 10%)
432	Humidity output current calibration offset value adjust value(10% - 20%)
433	Humidity output current calibration offset value adjust value(20% - 30%)
434	Humidity output current calibration offset value adjust value(30% - 40%)
435	Humidity output current calibration offset value adjust value(40% - 50%)
436	Humidity output current calibration offset value adjust value(50% - 60%)
437	Humidity output current calibration offset value adjust value(60% - 70%)
438	Humidity output current calibration offset value adjust value(70% - 80%)
439	Humidity output current calibration offset value adjust value(80%- 90%)
440	Humidity output current calibration offset value adjust value(90% - 100%)

• Reg368 is the start offset value of the humidity current output, user can adjust the value of this register to calibrate the humidity current offset.

• Reg369 decides how fast the value of reg368 will decrease, user has to change this until output match 100% humidity value.

• User can also calibrate each 10% output by manually changing the reg431 to reg440.

5) Temperature Voltage Output Calibration

365	Temperature Output calibration voltage value(0-10V), 0-5V use the same value
371	Temperature manual output value input, relative with register 370
401	Temperature output voltage calibration offset value adjust value(0 - 10%)
402	Temperature output voltage calibration offset value adjust value(10% - 20%)
403	Temperature output voltage calibration offset value adjust value(20% - 30%)
404	Temperature output voltage calibration offset value adjust value(30% - 40%)
405	Temperature output voltage calibration offset value adjust value(40% - 50%)
406	Temperature output voltage calibration offset value adjust value(50% - 60%)
407	Temperature output voltage calibration offset value adjust value(60% - 70%)
408	Temperature output voltage calibration offset value adjust value(70% - 80%)
409	Temperature output voltage calibration offset value adjust value(80% - 90%)
410	Temperature output voltage calibration offset value adjust value(90% - 100%)

• Same operation like part 3

6) Temperature Current Output Calibration

367	Calibrate Temperature Output in 4-20mA mode
369	Output for current calibration, current calibration decreases the number
421	Temperature output current calibration offset value adjust value(0 - 10%)
422	Temperature output current calibration offset value adjust value(10% - 20%)
423	Temperature output current calibration offset value adjust value(20% - 30%)
424	Temperature output current calibration offset value adjust value(30% - 40%)
425	Temperature output current calibration offset value adjust value(40% - 50%)
426	Temperature output current calibration offset value adjust value(50% - 60%)
427	Temperature output current calibration offset value adjust value(60% - 70%)
428	Temperature output current calibration offset value adjust value(70%- 80%)
429	Temperature output current calibration offset value adjust value(80% - 90%)
430	Temperature output current calibration offset value adjust value(90% - 100%)

• Same operation just like part 3

7) Relative Registers for Calibration

370	Auto/Manual output calibrate set. 0 : default value 1 : user manual. Bit 0 :temperature bit1 :humidity
371	Temperature manual output value input, relative with register 370
372	Humidity manual output value input, relative with register 370
186	The factory default is 1. Temperature Transducer output range, 1=0-10V, 2=0-5V, 3=4-20mA
187	The factory default is 1. Humidity Transducer output range, 1=0-10V, 2=0-5V, 3=4-20mA

• reg370:this register allows users to set their own output value for temperature and humidity

  • Bit 0 : temperature manual output enable/disable, 0=disable 1=enable

  • Bit 1 : humidity manual output enable/disable, 0=disable 1=enable

• reg371: Temperature manual output value input, relative with register 370, for example, if output type is set to 0-10V(reg186 is set to 1), and bit0 of reg370 is set to manual mode(reg371 is set to 1), if we write 100 to reg371, current temperature output will be 1V, if 200,output will be 2V, this function allow the user to easier test the hardware or generate its own voltage/current.

• reg372: just like reg371, but it's for humidity manual output.

• reg186&reg187: see explanations above

8) Temperature Output Offset Settings

443	Temperature output offset, depending on sensor range

Firmware 340 and below: 0-10V according to 0-100°C
Firmware 341 and up: 0-10V according to -30-70°C
Add register 442, user can set the temperature range offset, base range is 0-100°C:
For example:
If register 442 set to 300, then current output range will be -30-70°C
If register 442 set to 100, then current output range will be -10-90°C

0-10V output:

Temperature (C) = (Voltage * 100 - offset) / 10
Temperature (F) = (Voltage * 100 – offset*9/5) / 10
Humidity = Voltage / 10

0-5V output:

Temperature (C) = (Voltage * 100 - offset) / 20
Temperature (F) = (Voltage * 100 – offset*9/5) / 20
Humidity = Voltage / 20

4-20mA output:

Temperature (C) = ((Current – 0.004)/0.00016) – offset/10
Temperature (F) = ((Current – 0.004)/0.00016) – offset*9/50
Humidity = (Current – 0.004)/0.00016
--- Temperature(F) : register 100
--- Temperature(C) : register 101
--- Offset : register 442, offset from zero C to adjust min max range, for example 0 = 0-100C, 300 = -30 to +70C
--- Voltage in Volt
--- Current in A

8. Register List

Humidity Sensor uses MODBUS protocol to communicate with others. Following is a table of MODBUS Registers.

Address	Bytes	Range	Defaults °C	Defaults °F	Register and Description
0 to 3	4	-	-	-	Serial Number -4 byte value. Read-only
4 to 5	2	-	-	-	Software Version –2 byte value. Read-only
6	1	255	254	254	ADDRESS. Modbus device address
7	1	0-255	13	13	Product Model. This is a read-only register that is used by the microcontroller to determine the product
8	1	0-255	-	-	Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware Rev
9	1	0-255	-	-	PIC firmware version
10	1	0-255	-	-	PLUG_N_PLAY_ADDRESS, 'plug n play' address, used by the network master to resolve address conflicts. See VC code for algorithms
15	1	0-1	0	0	Base address selection. 0 = Protocol address, 1 = PLC address
16	1	0-255	-	-	Firmware Update Register, used to show the status of firmware updates
17-99					Blank, for future use
100	2	0-1000	-	-	ROOM TEMPERATURE reading in DegF. Can also write to this register for single point calibration.
101	2	0-600	-	-	ROOM TEMPERATURE reading in DegC. Can also write to this register for single point calibration.
111	1	0-2	-	-	Display parameter: 0=temp and humidity, 1=hum only, 2 = temp only
113	1	-	0	-	Not used
121	1	0-1	DEGC_OR_F		LCD temperature will show C or F, 0 =C, 1=F
185	1	0-1	1	-	Bau - Baudrate, 0=9600, 1=19.2kbaud
186	1	1~3	-	-	The factory default is 1. Temperature Transducer output range, 1=0-10V, 2=0-5V, 3=4-20mA
187	1	1~3	-	-	The factory default is 1. Humidity Transducer output range, 1=0-10V, 2=0-5V, 3=4-20mA
217	2	0-1000	500	-	Temperature Calibration Offset for single point temperature calibration, offset of 500 in order to store positive and negative numbers in 2 bits, calculated automatically when you write to register 100.
304	2	0-1000	-		Relative Humidity reading. Writing a humidity value to the register will do calibration, for details, refer to Humidity Calibration.
369	1	0-1	-	-	When changed the calibration point ,The modbus register 369 value will auto turn to1 to store the value. Default 369=0.
370	2	- -	hz		Humidity Calibration, Frequency at first point
371	2	0-1000	%/10		Humidity Calibration, RH at first point
372	2	- -	-	-	Humidity Calibration, Frequency at second point
373	2	0-1000	%/10		Humidity Calibration, RH at second point
374	2	- -	-	-	Humidity Calibration, Frequency at third point
375	2	0-1000	%/10		Humidity Calibration, RH at third point
376	2	- -	-	-	Humidity Calibration, Frequency at the fourth point
377	2	0-1000	%/10		Humidity Calibration, RH at the fourth point
378~389	2	- -	-	-	Additional humidity calibration points, 10 total