Air Health Indicator

QHT 24R/24RS

Feb. 16

Features

- **High sensitivity to VOCs and Odorous Gases**
- **High Impact Plastic Enclosure provides Durability in Commercial Environments**
- **Back-lit LCD Display shows actual value for VOC, humitity and temperature**
- **Low Energy Consumption**
- **VOC, Temperature and Humidity readings all in one**
- **Dew point and enthalpy can be configured by Modbus register list**

Techncal Data

Sensor reference	Tin dioxide film
Display reading	0 - 1000 ppm
Fine	99 - 200
Fair	200 - 400
Poor	400 -600
Bad	600 - 1000
Humidity	0 - 100% rH
Temp	0 - 100°C
Accuracy	
VOC	Reacts differently according to type of gas
rH	+/-2% rH@10-90% rH
Temp	+/-0,5°C
Element life	>10 years in normal conditions
Protection class	IP31
Measuring range	
VOC	0-1000ppm
Temperature	-30 to +70°C (corresp. to output signal)
Relative humidity	0-100% rH
Power supply	15-24Vac/dc (±20%), 50-60 Hz
Output VOC, RH+T	0-10Vdc, 4-20mA, 0-5Vdc
	Modbus RTU vid 19200 or 9600 baud
EMC	Meets CE approval
Weight	200 g

Function

This fully-featured CPU based device is ideal for the detection of Air Contaminants.

In residential and commercial environment, the AP Model Sensor has high sensitivity to VOCs and odorourless gases.

This unit comes with an LCD display with back lighting for easy viewing.

It comes standard with Air Quality, Humidity and Temperature reading capabilities, which are vital when managing air quality by using the manual jumper output selection.

Readings can be extremy precise.

The detector monitors the temperature, humidity and air quality conditions in the room.

Changes in any of the mentioned elements are monitored continuously, with the shortest time constant possible.

Applications

Offices	Schools
Hotels	Airports
Meeting rooms	Apartments
Convention centres	Stores
Restaurants etc	

Order Code

QHT 24R	Air Quality, rH+T Detector	
QHT 24RS	Air Quality, rH+T Detector	Hotels, Schools

Sensors

- The detector monitors the temperature, humidity and air quality conditions in the room.
  Changes in any of the mentioned elements are monitored continuously, with the shortest time constant possible.
- Humidity monitoring is done with the Humidity Sensor Module.
- Air Quality monitoring is done with specially devloped sensor element.
- Temperature monitoring is done with a 10K Thermistor.

Humidity Calibration

The main criteria for selecting the Sensing Element is for its linear behavior with respect to Relative Humidity.

This reduces its complexity and increases its reproducibility and reliability to an overall 2% accuracy.

Air Quality Calibration

Special considerations must be taken for the Air Quality Calibration to avoid false alarms.

The IAQ sensing element is dependent on temperature humidity or basic environmental changes.

To counteract this effect, the Microprocessor of the thermostat calculates the average value of the sensor and determines if there are any air pollutants present.

Any sudden change in the sensor will trigger the alarm telling the user that hazardous air is present.

Temperature Calibration

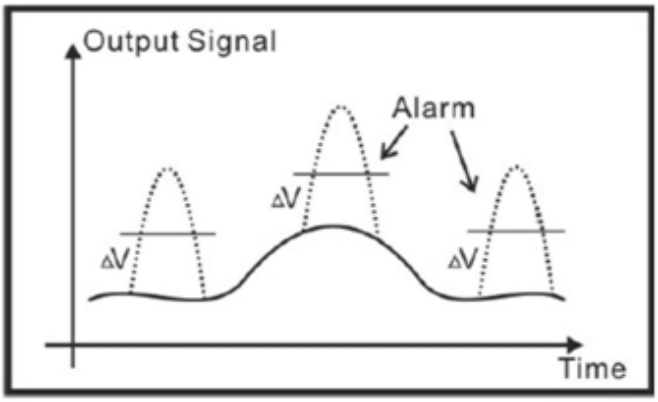
The detector monitors the temperature conditions in the room with its built-in thermistor sensor.

It is located in such a way that it is not affected by the temperature of the wall on which it is mounted.

Nor is it affected by internal heat created in the device cavity.

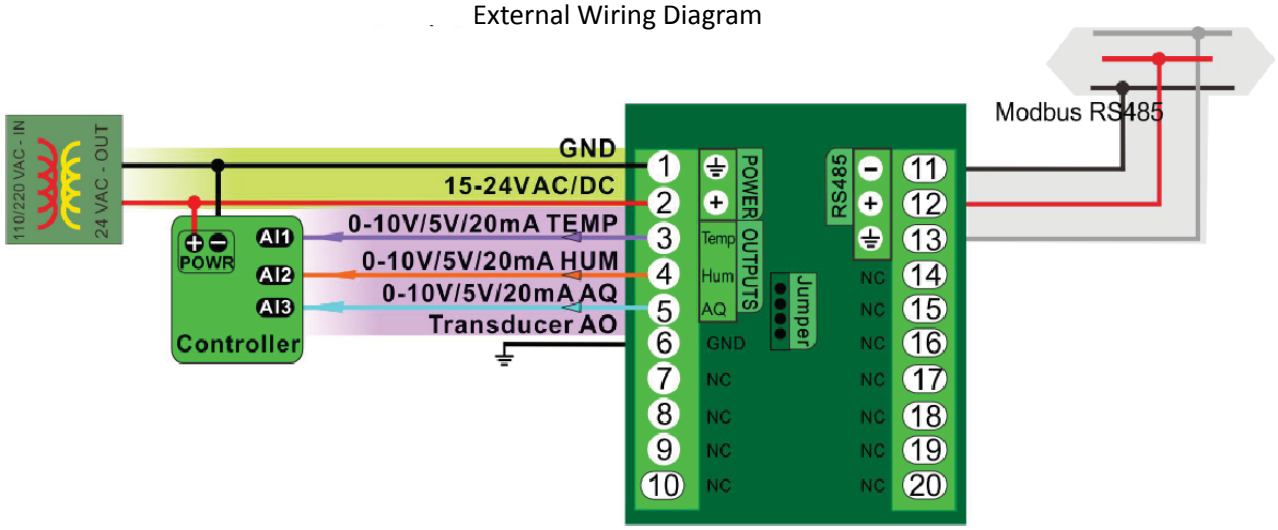
Changes in temperature are monitored continuously, with the shortest time constant possible.

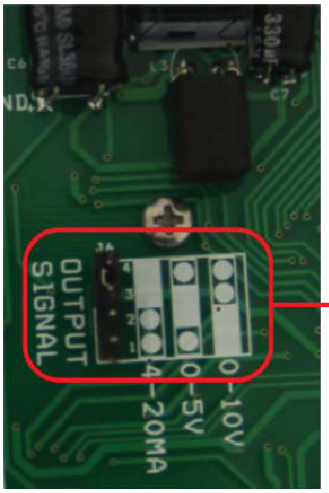
Calibration of the sensor is possible through the detector's internal menu at any time.



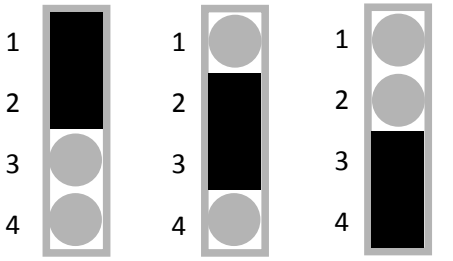
External Inputs

External Wiring Diagram





QHT jumper settings



4-20mA 0-5Vdc 0-10Vdc

Typical Wiring Route

Advanced Menu Item Instructions

1. There are four buttons to operate the QHT:

	Buttons	Functions
Adjust	▼	AQ value displayed/adjust:AQ level 1/2/3, Temperature unit C/F, Display scrolling On/Off
	▲	Temperature value displayed/ Move in the menu
Mode	◀	Humidity value displayed/adjust:AQ level 1/2/3, Temperature unit C/F, Display scrolling On/Off
	▶	Enter in the menu/Move in the menu

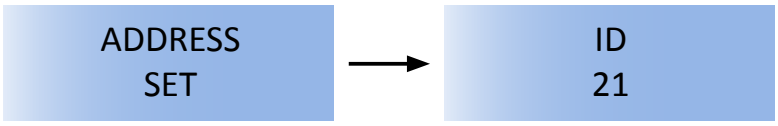
Scroll ON/OFF	ON: Temp, Humidity, Air Quality displayed in circulation OFF: Only Temp, Humidity or Air Quality displayed	
Air Quality Level 1	Fine	99-200
Air Quality Level 2	Fair	200-400
Air Quality Level 3	Poor	400-600
	Bad	600-1000
Air Quality Calibration	You can set the correct values according to your needs	

a. To set your unit's address, press ▶ to enter into the menu mode. It will display "ADDRESS SET".

Click ◀ to enter into editing mode. The ID screen will display.

Press ▲ to increase the ID value or ▼ to decrease the ID value.

Press ◀ to confi rm your settings.



b. To set your unit's baudrate, while in the menu mode, click ▶ to switch to the baudrate screen.

Click ◀ to edit the baudrate and use ▲ or ▼ to choose the baudrate 19200 or 9600.

Press ◀ to confi rm your settings.

c. To set the temperature calibrations enter the menu mode and click ▶ until you reach the "TEMP CAL" screen.

Press ◀ to enter the edit screen.

Click ▲ to increase and ▼ to decrease the value. When the setting is ok, click ◀ to confirm.

Use the same procedure to adjust the humidity calibration who's screen appears as "HUMIDITY CAL".

▼ Increase value / Temp

▲ Decrease value / AQ

◀ Humidity / Confirm

▶ Menu

The sensor is sensitive to a number of different pollutants

Acetone	Ethylene	Methyl chloride	R-502
Acrylonitrile	Ethylene oxide	Methyl ether	R-11
Ammonia	Formaldehyde	Methyl acetate	R-12
Benzene	Hydrogen	Methyl ethyl ketone	R-502
Carbon dioxide	Hydrogen sulfide	n-Hexane 2	R-123
Carbon Monoxide	Isobutane	n-Petane	Sulphur dioxide
Chlorine	Methanol	Propane	Vinyl chloride

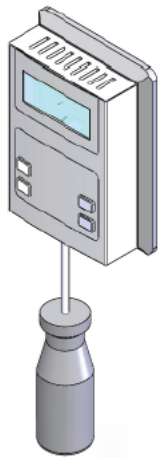
Registers for Reading Temperature, Humidity and Air Quality

There are 4 registers to read temperature, humidity and air quality.

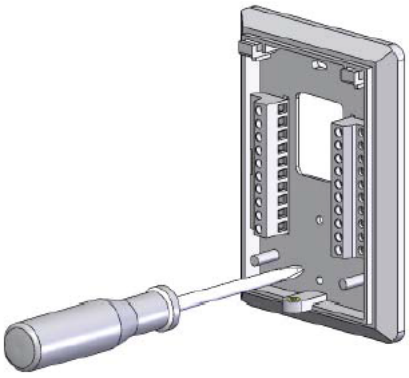
Address	Bytes	Description
100	2	Temperature value in °F
101	2	Temperature value in °C
102	2	Humidity sensor reading in percentage
103	2	Air quality reading : 0-1000ppm where 1000ppm corresponds to 10ppm H_2 gas

Mounting Intallations

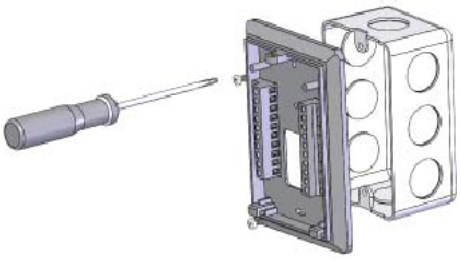
Unfasten the screw located at the base and lift off the front panel of the enclosure.



Wall Mount
Fasten the screws on the back panel to the wall, and re-attach the front panel to the now mounted panel. Refasten the screw at the base connecting both panels.



Standard
'11-10' Electrical Box
Fasten the screws on the back panel to the electrical box, and re-attach the front panel to the now mounted panel. Refasten the screw at the base connecting both panels.



Calibration of Temperature
To calibrate the temperature shown on the Air Quality Sensor display, you will need a handheld digital or mercury thermometer.

Hold the meter close to the thermostat and allow it to come to equilibrium.

Connect the Air Quality Sensor to the PC via a RS485 cable and run a Modbus Tool to show and modify the registers.

While the thermometer temperature is at a steady state write the correct temperature to the register 101.

If necessary repeat until the readings on the thermostat and thermometer agree.

Note that the written value should be ten times the actual temperature to avoid a decimal place. For example if the temperature is 22.3 degree, then you should write 223.

The detector will store the calibration fi gures even through extended power outages and should not need to be adjusted for many years. The main point to keep in mind when calibrating is to let everything come to equilibrium.

The detector should be powered up for 5 minutes prior to any calibration and the thermometer should be left near the thermostat for about the same amount of time.

Some Calibration Tips

- The main error in calibration comes from not waiting long enough for the handheld thermometer to come to equilibrium.
- Calibrate using the customer's thermometer, even if it is not an accurate one, so that all subsequent measurements are compared to the same benchmark.
- Make sure the Air Quality Sensor unit is mounted in a location free of air drafts.

Calibration of Humidity

- At the default condition, users can write the current humidity value, which they get from a reference humidity meter, to register 102.

Air Quality
The number on the display means the output voltage of the sensor, the range of the number is 0-1000, corresponding to 0-5Vdc/10Vdc. The bigger the number is, the denser the air contaminants.

There are three icons at the bottom of the display, which give users visual evaluation of air quality.

The user can modify the criterion of air quality evaluation through changing the registers with Modbus.

You can set the level through changing the register of modbus, too.

Analog Outputs
The Air Quality Sensor also transduces three sensors' readings to analog outputs.

The range of analog outputs can be either from 4-20mA, 0-5Vdc or 0-10Vdc.

RANGE		ANOLOG OUTPUT VALUE & FORMULA
0-10Vdc	OUTPUT	anolog_output_value = aq_value/(high_range - low_range)*10 Volt
0- 5Vdc	OUTPUT	anolog_output_value = aq_value/(high_range - low_range)*5 Volt
4- 20mA	OUTPUT	anolog_output_value = aq_value/(high_range - low_range)*16Ma + 4Ma

ie. aq_low_range_set is 0, aq_high_range_set is 600.
temperature_low_range_set is 0, temperature_high_range_set is 1000.
humidity_low_range_set is 0, humidity_high_range_set is 1000.

Analog Outputs

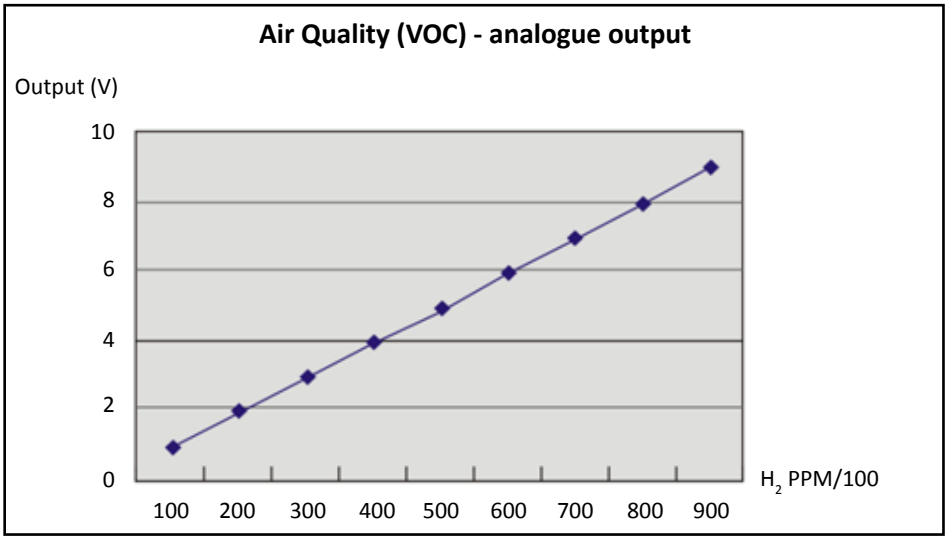
The analogue outputs	• 0-10Vdc • 4-20mA • 0-5Vdc	correspond to:	• Air Quality 0-1000ppm • Humidity 0 to 100% rH • Temperature -30 to +70°C

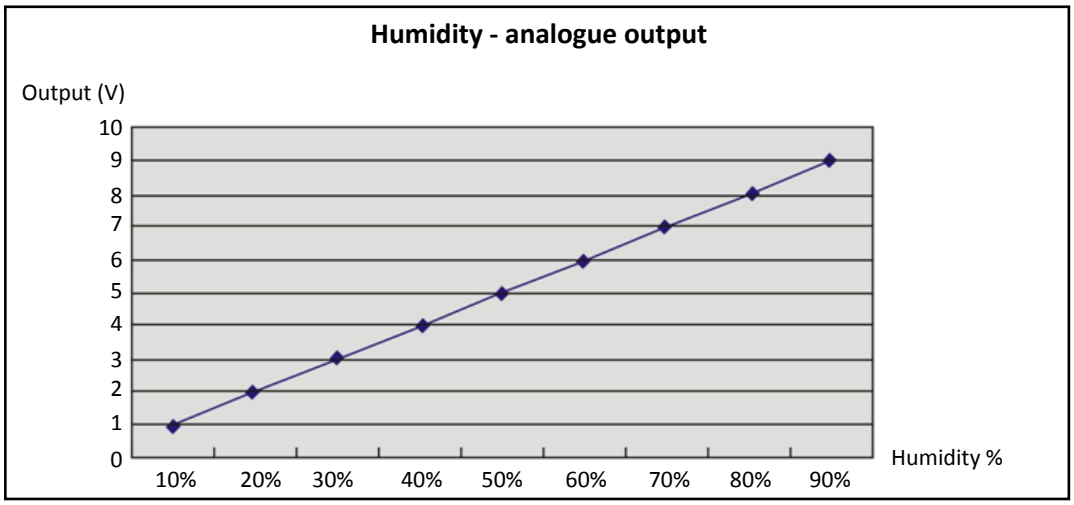
The Air Quality Sensor also transduces three sensors' readings to analog outputs. The range of analog outputs can be either of 4-20mA, 0-5Vdc or of 0-10Vdc.

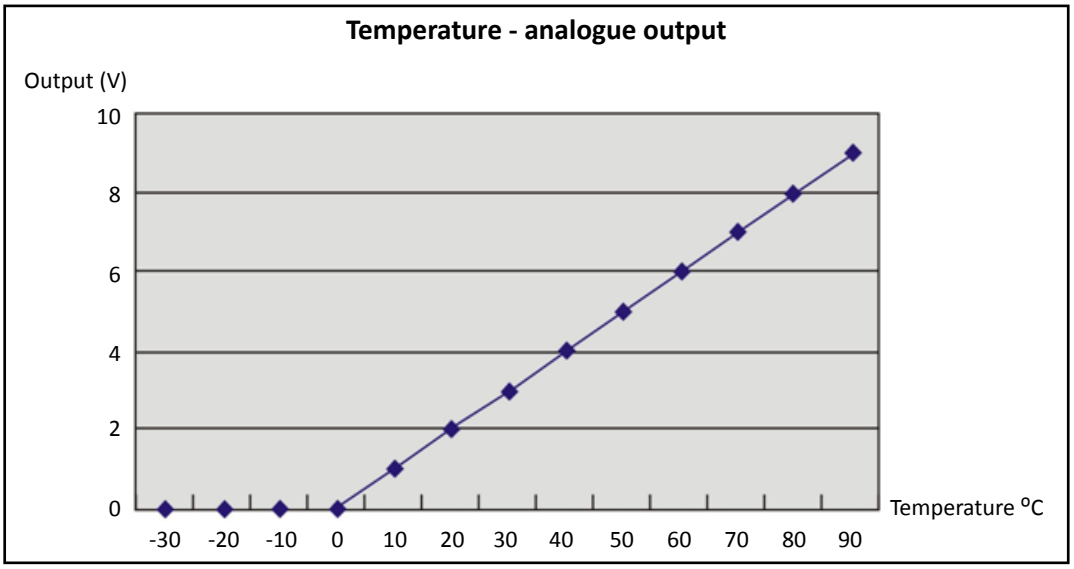
RANGE		ANALOG OUTPUT VALUE & FORMULA
0-10Vdc	OUTPUT	anolog_output_value = aq_value/(high_range - low_range)*10 Volt
0- 5Vdc		anolog_output_value = aq_value/(high_range - low_range)*5 Volt
4- 20mA		anolog_output_value = aq_value/(high_range - low_range)*16mA + 4mA

that is:

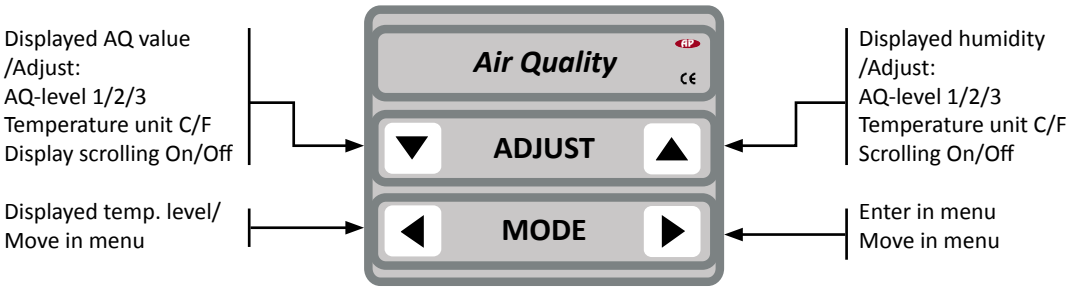
- aq_low_range_set is 0, aq_high_range_set is 600.
- temperature_low_range_set is 0, temperature_high_range_set is 1000.
- humdity_low_range_set is 0, humidity_high_range_set is 1000.






Temperature - analogue output
Output (V)
10
8
6
4
2
0
-30
-20
-10
0
10
20
30
40
50
60
70
80
90
Temperature °C

Instructions



Menu display table

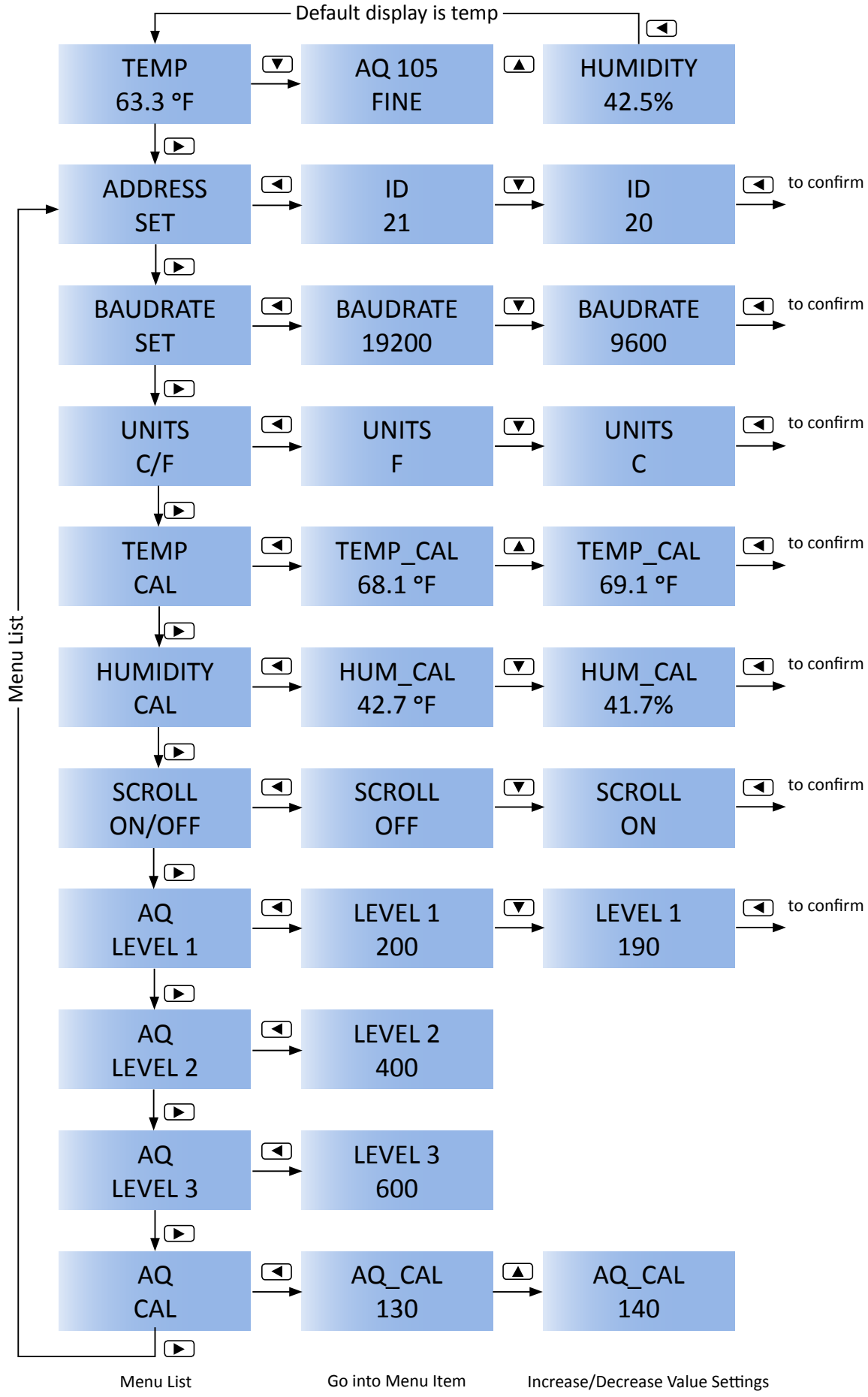
The following table displays all the possible options for your understanding.

Address Set	ID01 - ID254	
Baudrate Set	Baudrate 19200, Baudrate 9600	
Units C/F	Unit C, Unit F	
Temp Calibration	You can set the right value according to your needs	
Humidity Calibration	You can set the right value according to your needs	
Scroll ON/OFF	ON: Temp, Humidity, AQ displayed in circulation OFF: Only Temp, Humidity or AQ displayed	
AQ Level 1	Fine	99-200
AQ Level 2	Fair	200-400
AQ Level 3	Poor	400-600
	Bad	600-1000
AQ Calibration	You can set the right value according to your needs	

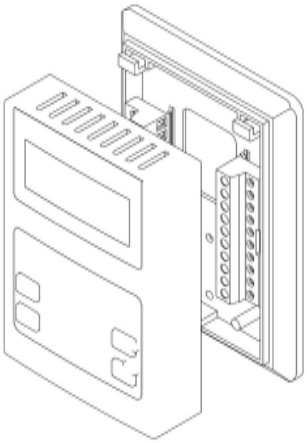
The diagram on the following page shows a complete list of the menu options in the Air Quality Sensor and the methods of which to navigate throughout it.

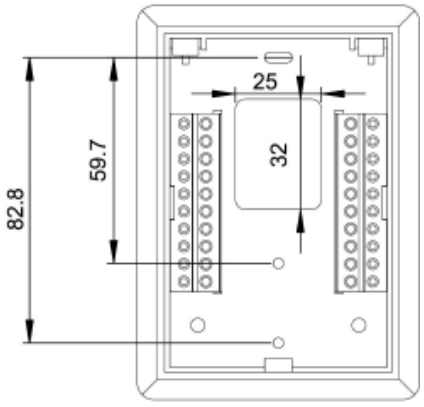
Please note that by using the buttons as explained above in the ‘Keys Layout” the user can directly chose to display the Temperature, the Humidity or the Air Quality.

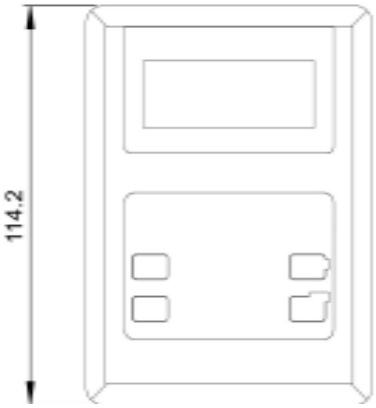
By default the “Scroll” feature is set to ‘OFF’, but if enabled ‘ON’, the Air Quality Sensor will cycle through the Temperature, Air Quality and Humidity displays as the same order shown at the top of the Menu List diagram on the following page.

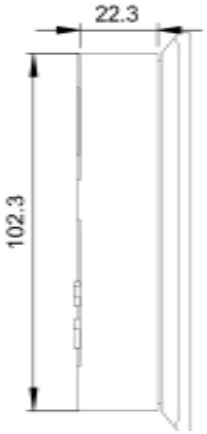

Default display is temp
TEMP 63.3 °F
AQ 105 FINE
HUMIDITY 42.5%
ADDRESS SET
ID 21
ID 20
to confirm
BAUDRATE SET
BAUDRATE 19200
BAUDRATE 9600
to confirm
UNITS C/F
UNITS F
UNITS C
to confirm
TEMP CAL
TEMP_CAL 68.1 °F
TEMP_CAL 69.1 °F
to confirm
HUMIDITY CAL
HUM_CAL 42.7 °F
HUM_CAL 41.7%
to confirm
SCROLL ON/OFF
SCROLL OFF
SCROLL ON
to confirm
AQ LEVEL 1
LEVEL 1 200
LEVEL 1 190
to confirm
AQ LEVEL 2
LEVEL 2 400
AQ LEVEL 3
LEVEL 3 600
AQ CAL
AQ_CAL 130
AQ_CAL 140
Menu List
Menu List
Go into Menu Item
Increase/Decrease Value Settings

Dimensions









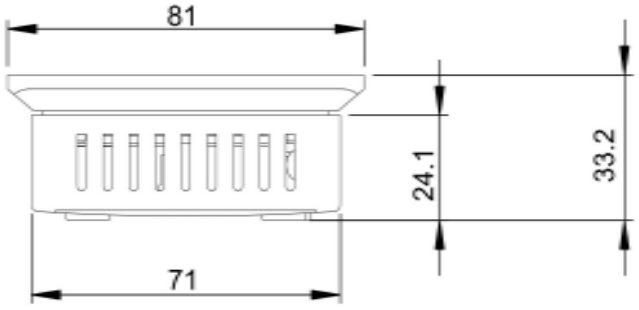


Table of Modbus Registers

Air Quality Sensor uses MODBUS protocol for communication.		
Address	**Bytes**	**Register and Description**
0 ~ 3	4	Serial Number -4 byte value. Read-only
4 ~ 5	2	Software Version –2 byte value. Read-only
6	1	ADDRESS. Modbus device address
7	1	Product Model. This is a read-only register that is used by the microcontroller to determine the product
8	1	Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware Rev
9	1	PIC fi rmware version
10	1	PIC version of Humidity module
10	1	PLUG_N_PLAY_ADDRESS, 'plug n play' address, used by the network master to resolve address conflicts. See VC code for algorithms
15	1	Base address selection. 0 = Protocol address,1 =PLC address.
16	1	Firmware Update Register, used to show the status of fi rmware updates
17~99		Blank, for future use
100	2	Temperature value in °F
101	2	Temperature value in °C
102	2	Humidity Sensor Reading in percent,calibrate humidity
103	2	Air Quality Reading :0-1000 is equivalent to 0-10ppm H2 gas
111	1	temperature input select,0=internal,1external
121	1	the units of temperature. 0 = C ,1=F
180	1	Sets the full scale voltage of the outputs; 1:0~10v;2:0~5v;3:4~20ma;
185	1	Baudrate 0 = 9.6kb/s, 1 = 19.2kb/s
186	1	humidity filter set
187	1	aq filter set
193	1	temperature fi lter set
304	1	Humidity Sensor Reading in percent
305	2	HUmidity Sensor's frequency
312	2	Humidity Calibration, Frequency at fi rst point
313	2	Humidity Calibration, RH at fi rst point
314	2	Humidity Calibration, Frequency at second point (highest humidity reading)
315	2	Humidity Calibration, RH at second point
316	2	Humidity Calibration, Frequency at third point
317	2	Humidity Calibration, RH at third point
318	2	Humidity Calibration, Frequency at the fourth point
319	2	Humidity Calibration, RH at the fourth point
320	2	Humidity Calibration, Frequency at fi fth point
321	2	Humidity Calibration, RH at fi fth point
322	2	Humidity Calibration, Frequency at sixth point (highest humidity reading)

Air Quality Sensor uses MODBUS protocol for communication.		
Address	**Bytes**	**Register and Description**
323	2	Humidity Calibration, RH at sixth point
324	2	Humidity Calibration, Frequency at seventh point
325	2	Humidity Calibration, RH at seventh point
326	2	Humidity Calibration, Frequency at the eighth point
327	2	Humidity Calibration, RH at the eighth point
328	2	Humidity Calibration, Frequency at ninth point
329	2	Humidity Calibration, RH at ninth point
330	2	Humidity Calibration, Frequency at the tenth point
331	2	Humidity Calibration, RH at the tenth point
332	2	the range of lower temperature set
333	2	the range of higher temperature set
334	2	the range of lower humidity set
335	2	the range of higher humidity set
336	2	the range of lower AQ set
337	2	the range of higher AQ set
338	2	the current value of temperature output
339	2	the current of humidty output
340	2	the current of AQ output
341	2	the voltage of temperature output
342	2	the voltage of humidty output
343	2	the voltage of AQ output
345	1	the status of scrolling.0 is off ,1 is on
346	2	the level1 set
347	2	the level2 set
348	2	the level3 set
364	2	sensor serial number
370	2	dew point in unit C
371	2	dew point in unit F
372	2	Partial Pressure of water at saturation at given temperature, [hPa]
373	2	Mixing Ratio, the mass of water over the mass of dry gas, [g/kg]
374	2	Enthalpy of the air, [kJ/kg]