HAQ61 Series

Integrated Room Air Sensor

Honeywell HAQ61 series room air quality sensor is an integrated air sensor which can simultaneously detect five air parameters: air Temperature & Relative humidity, CO_2 concentration, PM2.5 concentration and formaldehyde (HCHO) concentration, and calculate and display the concentration of Total Volatile Organic Compound (TVOC).

With a built-in Modbus protocol, Honeywell HAQ61 series air quality sensor can be connected with the control compatible with Modbus protocol to upload the air parameters.

There are two versions available: with display and without display. The version with display can display 6 types of air quality parameters on a split screen, and display the air quality with a face symbol according to the PM2.5 data.

Product Features

- Compact and sleek design
- Built-in high-precision sensors can accurately, stably and continuously measure various air parameters.
- Built-in Modbus protocol (RS485 communication) can achieve real-time data transmission.
- TFT screen (version with screen) for wide field of view and clear display with data display on split screen.
- Displaying the indoor air quality data according to PM2.5, and displaying the air quality level, PM1.0 and PM10 data at the same time.
- 86 junction box in-wall mounting for easy installation.

Order information

SKU	description
HAQ61L	Integrated room air sensor with LCD, black panel , Normal dark
HAQ61L-NL	Integrated room air sensor with LCD, black panel , Normal lighting
HAQ61B	Integrated room air sensor without LCD, black panel
HAQ61BW	Integrated room air sensor without LCD, white panel

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Honeywell

Technical Specifications

Communication Interface	Modbus, RS485
Power supply	110~240VAC， 50/60Hz, ⩽100mA
IP Rating	IP40
Operation environment	RH⩽95%（non-condensing ）
Temperature Measurement Range	-10 ~ 55℃（±1℃)
Humidity Measurement Range	0 ~ 99%RH, ±5%RH
PM2.5	0 ~ 999 ug/m^3 0~100ug/m³: ±15ug/m³; >100ug/m³: ±15%
CO_2	400~2000 PPM, ±(50PPM+5% of reading)
HCHO TVOC	0 ~ 999ppb 0 ~ 100ppb: ±20ppb; 100~999ppb: ±20% reading
Display	TFT
Housing Material	PC+ABS
Dimensions	86*86*60mm
Storage Conditions	-25℃~55℃， RH⩽93%

Interface & Installation Instructions

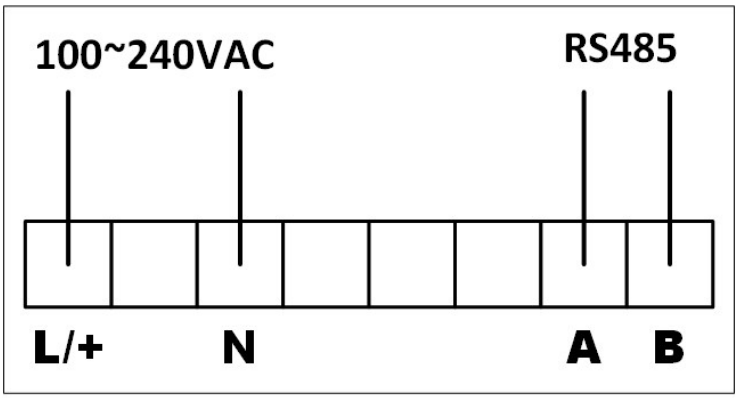
Key Instructions （LCD type)

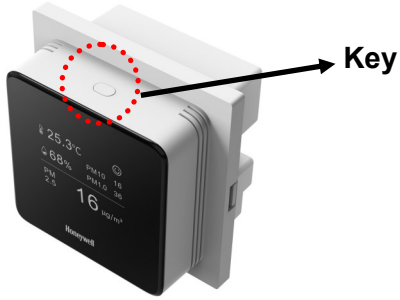
Pressing method	Function
Short pressing (< 1 s)	Switching on or off the screen
Short pressing (> 1 s)	Displaying the current 485 communication address code
Long pressing (> 10 s)	Reset the 485 communication address as 1 （without LCD type only has this function）

Air Quality Level Reference （LCD type)

Face symbol	PM2.5	Corresponding to national standard air quality level
☺	0~75	Superior to good
😐	76~115	Mild contamination
☹	⩾116	Medium contamination to severe contamination

Wiring diagram

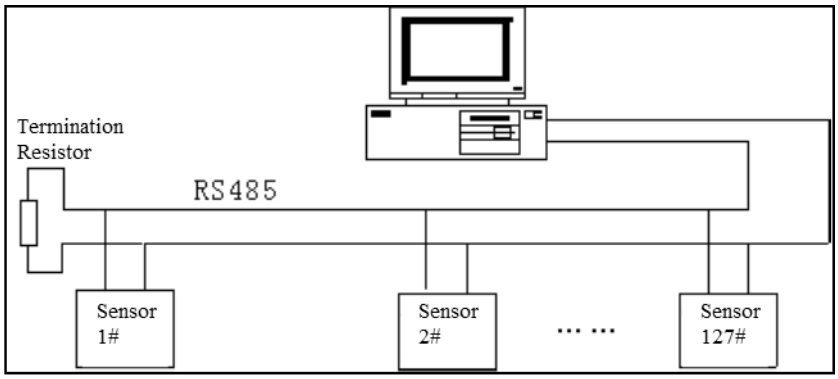




Modbus Protocol Instruction

1. Network Structure and Wiring

The standard MODBUS communication network for multi-function air sensor is a bus-type network structure and supports networking of 1 to 127 multi-function air sensor(s) (the specific number is determined by Modbus gateway or controller parameters). The farthest sensor in the network shall be usually connected to a 120 Ohm matched resistor in parallel at both terminals of the communication line. The standard communication connection medium is shielded twisted pair.



2. RTU Frame Format of Modbus Protocol

The master-slave communication method is adopted for MODBUS protocol. Each communication is initiated by the master station, and the slave station responds to the master station command to send back data.

Word Format

Address Range: 1~254, configurable;

Baud Rate: 38400, configurable;

Check: No parity, not configurable

Data Bits: 8 bits, not configurable; start bit: 1 bit, not configurable; stop bit: 1 bit, not configurable;

Default Factory Parameters of RS485

Name	Address	Baud rate	Parity check	Data bit	Start bit	Stop bit
Factory default	1	38400	No parity check	8 Bits	1 Bit	1 Bit

Frame Format

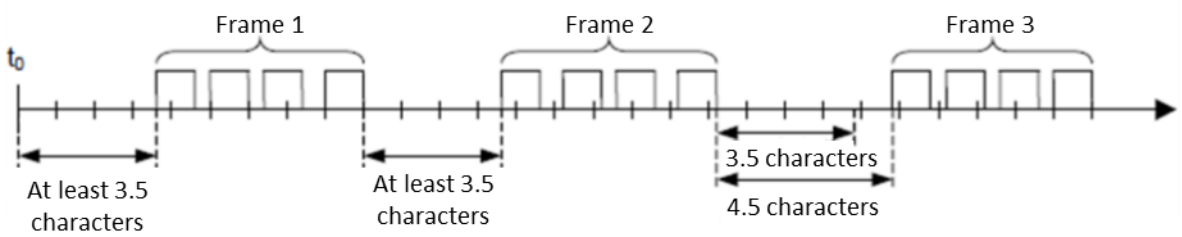
The MODBUS RTU format (hexadecimal format) is adopted for the multifunctional air sensor, and its frame structure is as shown in the table below.

Master station RTU message frame					
Device address	Function code	Register address	Register length	CRC check	
8 Bits	8 Bits	16 Bits	16 Bits	CRCH	CRCL

Slave station RTU message frame				
Device address	Function code	Data	CRC check	
8 Bits	8 Bits	n sets of 8Bits	CRCH	CRCL

Notes:

(1) The MODBUS protocol specifies that the start or end of the frame is realized by 3.5char time of delay between frames, as shown in the figure below.



(2) Device address: The communication address of the sensor is unique in the communication network: The factory default is 0x01

(3) Function code: The function code specified by the Modbus protocol.

Function code	Description of function
03H	Reading the register data (i.e., reading the measurement data)
10H	Setting the register (i.e., setting the address)

(4) Register address and register length: The parameters in the master station command are registered starting from the register address, and the reading length is N registers of the register length.

(5) Slave station response data: Number of bytes and N-digit-bit data.

(6) Error check code (CRC check): This protocol uses CRC16 (cyclic redundancy check), including 2 bits, i.e., 16-bit binary number. The CRC code is calculated by the sending device and placed at the tail of the sending information frame. The device receiving the information recalculates the CRC of the received information, and compares whether the calculated CRC is consistent with the received one. If not, it indicates an error and the erroneous data will be discarded (whether it is sent or received).

In the CRC calculation, only 8 data bits, the start bit and the stop bit are used. If there is a parity check bit, it also includes a parity check bit, which is not involve d in the CRC calculation.

Instruction: Calculation method of CRC check code:

a. Set a 16-bit register as 1 wholly;

b. Store the low eight bits of the high byte XOR register of the message data into the register;

c. Shift the register to the right (the highest position is 0) and store the lower bit shifted out at the flag bit;

d. If the flag bit is 1, the XOR register of 1010000000000001 shall be used; if the flag bit is 0, continue to perform step c;

e. Repeat steps c and d until shift for eight times;

f. XOR next-bit byte and register;

g. Repeat steps c to e, until the XOR and shift of all message data and register for 8 times;

h. At this moment, the CRC check code is in the register, and the high bit is sent first.

3.List of Communication Address and Descriptions

Address	Type	Contents description	Unit	Number of registers
0x0001	R/W	Device address	/	
0x0002	W	Baud Rate	/	
0x000a	R	Temperature (int type); temperature value/10 is the actual temperature value	℃	
0x000b	R	Humidity (int type)	%RH	
0x000c	R	PM1.0 (uint type)	ug/m^3	
0x000d	R	PM2.5 (uint type)	ug/m^3	
0x000e	R	PM10 (uint type)	ug/m^3	
0x000f	R	CO_2 concentration value (uint type)	ppm	
0x001a	R	Formaldehyde concentration value (uint type)	mg/m^3	
0x001b	R	VOC concentration value (uint type)	mg/m^3	

Data format description:

The data occupies 1 register and includes 2 bits in total. Lower 8 bits are transmitted before higher 8 bits

Example: If 015E is the CO_2 concentration value, 01 is the high byte, 5E is the low byte and two bytes form the CO_2 concentration value. When 015E is converted into a decimal number 350, it means that the CO_2 concentration value currently acquired is 350ppm.

4. Communication demonstrations

（1) PM2.5 Reading

The return frame format of the device: 01 03 02 xx xx crcH crcL;
the sending frame format of the master station: 01 03 00 0D 00 01 15 C9

Master device sending	Number of bytes	Sending content	Description
Slave device address	1	01H	Sending to the slave device with the address of 01
Function code	1	03H	Read register
Initial address	2	000DH	Initial address of data
Data length	2	0001H	Reading 1 register
CRC check code	2	15C9H	CRC code calculated by the master device

Slave device response	Number of bytes	Sending content	Description
Slave device address	1	01H	From the salve device with the address of 01
Function code	1	03H	Read register
Number of bytes	1	02H	
Register data	2	xxxxH	The contents of memory at address 001D
CRC code	2	CRC	CRC code calculated by the slave device

2) Set the device address as 0x16 (device address 1-254)

the sending frame format of the master station: ： 01 06 00 01 00 16 59 C4

Master device sending	Number of bytes	Sending content	Description
Slave device address	1	01H	Sending to the slave device with the address of 01
Function code	1	06H	Write register
Register address	2	0001H	The address is 0001H
Save data	2	0016H	Data 0016
CRC code	2	59C4H	CRC code calculated by the master device

The return frame format of the device：01 06 00 01 00 16 59 C4

Slave device response	Number of bytes	Sending content	Description
Slave device address	1	01H	Sending to the slave device with the address of 01
Function code	1	06H	Writing singe register
Register address	2	0001H	Register address
Data	2	00016H	Data
CRC code	2	59C4H	CRC code calculated by the master device

Note: The modified address takes effect immediately, and the device does not need to be powered on again. After the address is modified, the new address shall be used for communication.

5. Baud Rate Setting

Master station sending frame format: 01 10 00 02 00 01 02 00 60 A7 9A

Master device sending	Number of bytes	Sending content	Description
Slave device address	1	01H	Sending to the slave device with the address of 01
Function code	1	10H	Function code
Register address	2	0002H	Address: 0002
Number of registers	2	0001	Number of register: 1
Number of bytes	2	02	Number of bytes: 2
Baud rate	2	00 60H	Refer to the baud rate table for the set baud rate
CRC check code	2	xxxxH	CRC code acquired by the master device

Device return frame format: 01 10 00 02 00 01 A0 09

Slave device response	Number of bytes	Sending content	Description
Slave device address	1	01H	Sending to the slave device with the address of 01
Function code	1	10H	Function code
Register address	2	0002H	Address: 0002
Number of registers	2	0001H	Refer to the baud rate table for the set baud rate
CRC check code	2	xxxxH	CRC code acquired by the master device

Reference Baud Rate

Numerical Value	Baud Rate
00 0C	**1200**
00 18	**2400**
00 30	**4800**
00 60	**9600**
00 C0	**19200**
01 80	**38400**
02 40	**56700**
04 80	**115200**
05 00	**128000**
0A 00	**256000**

Note: The modified baud rate takes effect immediately, and the device does not need to be powered on again. After the baud rate is modified, the new baud rate shall be used for communication.

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