



Ten-in-one Environmental Monitoring R69 Specification

Version: Ver.1.0

Update Record

No.	Version	Remark	Date
1	Ver.1.0	Initial Release	2023.07.11

Note: The document is subject to change without prior notice.

SHENZHEN SYSOLUTION TECHNOLOGY CO.,LTD

Product Picture



Product Introduction

R69 is a highly integrated instrument developed for the current environmental protection in an increasingly severe form, which monitors ten parameters including temperature, humidity, air pressure, wind speed, wind direction, lightness, rainfall, noise, PM2.5, PM10 parameters. It can realize 24-hour continuous online monitoring of outdoor meteorological parameters, and output all parameters to users at one time through digital communication interface.

Applicable fields

Air quality monitoring micro station can be applied to urban grid environmental monitoring and control, intelligent street lamps, scenic area environmental monitoring, factories or mines, construction sites (site dust monitoring), urban roads, highways, public places and other places related to air quality monitoring.



Features

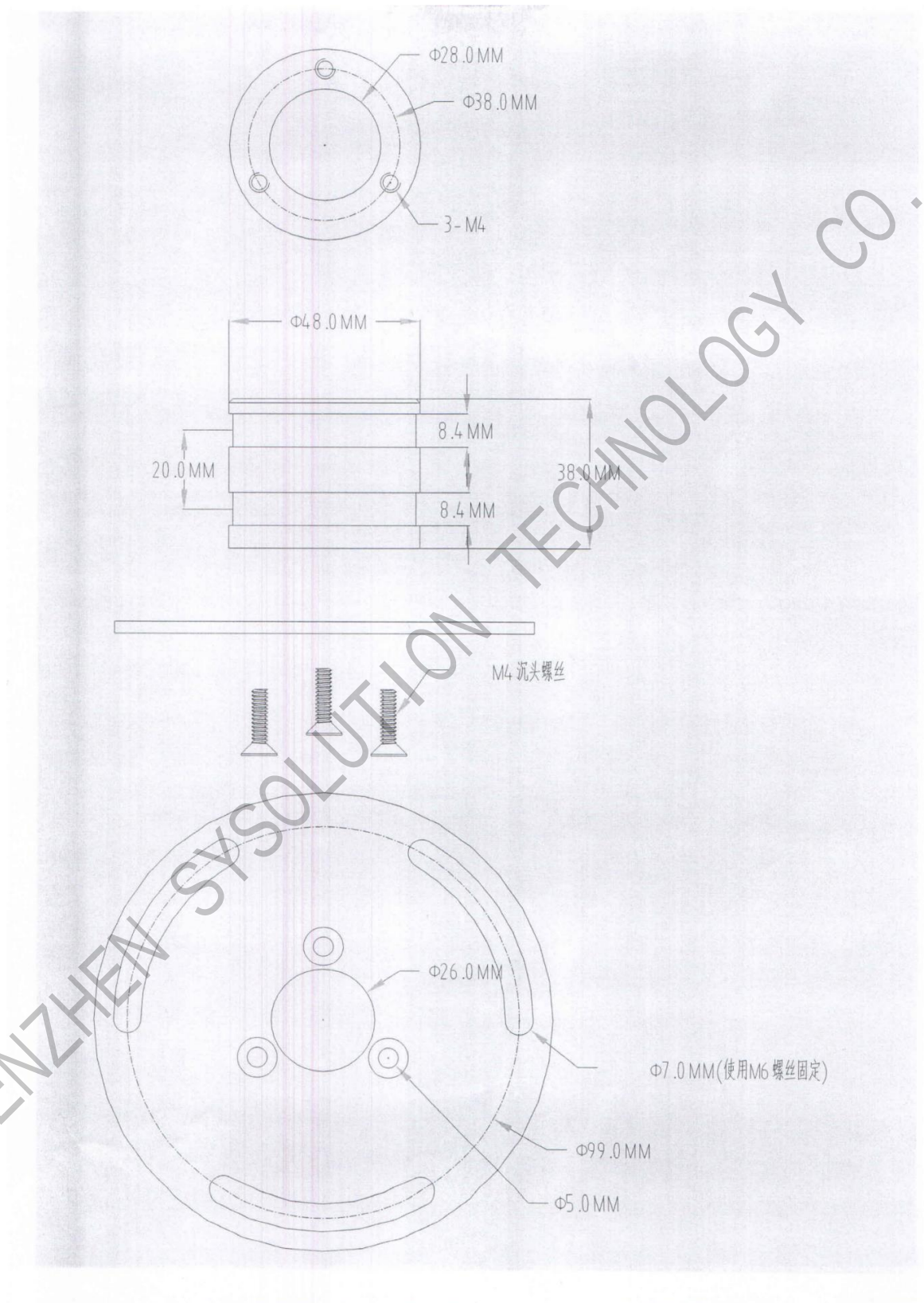
1. Standard configuration monitoring temperature, humidity, wind speed, wind direction, illumination, noise, PM2.5, PM10 eight parameters, RS485 communication;
2. High precision, reliable performance, suitable for outdoor and industrial environment;
3. Realize all kinds of parameter acquisition, optional our wireless data collector. Realize data automatically uploaded to the network platform, cell phone client real-time data view;

4. Real-time monitoring of atmospheric environment data, low cost, suitable for grid distribution;
5. Small volume, modular design, flexible layout;
6. Optional GPS location for equipment tracking function;
7. Data acquisition adopts 32 - bit high - speed processing chip, stable and anti - interference.

Product Parameters

Parameters	Measuring Range	Precision
Temperature	-40-85°C	±0.3°C(@25°C)
Humidity	0-100%RH	±3%RH (10-80%RH) No condensation
Wind speed	0-60M/S	± (0.3+0.03v) m/s (≤30M/S) ± (0.3+0.05v) m/s (≥30M/S) "v" is standardized wind speed
Wind direction	0-360°	±3° (Wind speed < 10m/s)
PM2.5 /PM10	0-1000ug/m³	10ug±10%@0-500ug/m³
Noise	30-130dB(decibel)	±1.5dB
Illumination	0-100klux	The reading is 3% or 1%F·S
Solar radiation	0-2000W/M2	1W
Precipitation	0-200mm	±10%
Power supply	DC12V	
Signal output	Default 485 output, MODBUS RTU protocol	
Installation	Sleeve type fixation, flange type fixation	
Shell material	ASA material	
Protection class	IP65	
Note	Either light or radiation	

Dimensions



MODBUS RTU Protocol

Baud rate: 9600

Data bits: 8

Stop bit: 1

Check Bit: None

CRC Description:

In all of the following descriptions, the two bytes of CRC16 in the MODBUS RTU protocol, according to MODBUS regulations: the low byte comes first and the high byte comes second.

In the following descriptions, it is assumed that the sensor address is 0xFF (the default address of the sensor is FF)

Return Error Code Provision:

The sensor does not return the error code for the reception of error commands (including CRC16 validation errors). The host computer can consider that the instruction has failed when no return data is received 200ms after the instruction is sent, and can re-send the instruction.

Standard MODBUS Register Description

Special note: The number or length of registers in MODBUS commands is two bytes and 16 bits (high byte first, low byte second) instead of a single byte and 8 bits.

Users should ensure that the command register address and the number of these two parameters within the scope of the system. If the range is exceeded, the output of the sensor will not be able to predict the result. The user should ensure that the MODBUS command meets the requirements of this manual in the software design of the host computer, and

supports the minimum query period of 1S/time.

Input register: read with function code 03

Address code	Operation	Details	Note
0x0001	Read-only	Noise, amplified 10 times the hexadecimal number such as 0x01193 represents $403/10 = 40.3\text{dB}$	
0x0002	Read-only	Hydrogen Sulfide/TVOC, hexadecimal number	
0x0003	Read-only	SO ₂ concentration, hexadecimal number, e.g. 0x0172 means SO ₂ concentration is 370ppb	
0x0004	Read-only	NO ₂ concentration, hexadecimal number, e.g. 0x0036 means NO ₂ concentration is 54ppb	
0x0005	Read-only	CO concentration, hexadecimal number, e.g. 0x0A00 means CO concentration is 2560ppb	
0x0006	Read-only	O ₃ concentration, hexadecimal number, e.g. 0x0123 means O ₃ concentration is 291ppb	
0x0007	Read-only	PM _{2.5} concentration, hexadecimal number, e.g. 0x0172 means PM _{2.5} concentration is 370ug/m ³	
0x0008	Read-only	PM ₁₀ concentration, hexadecimal number, e.g. 0x0193 means the PM ₁₀ concentration is 403ug/m ³ .	
0x0009	Read-only	Air temperature, plus 40 magnified 100 times the hexadecimal number, such as 0x1B00 that $6912/100-40 = 29.12\text{ }^{\circ}\text{C}$	

0x000A	Read-only	Air humidity, magnified 100 x 16 x, as 0x1603 means $5635 / 100 = 56.35\%$	
0x000B	Read-only	Air humidity, magnified 100 times in hexadecimal, e.g., 0x1603 means $5635/100 = 56.35\%$	
0x000C	Read-only	Wind speed, a hexadecimal number magnified 100 times, e.g. 0x0125 means $293/100 = 2.93\text{m/s}$	
0x000D	Read-only	Wind direction, magnified by 10 x 16 x, as indicated by 0x0C14 $3092/10 = 309.2^\circ$	0° north
0x000E	Read-only	Wind direction, enlarged by 10 times the hexadecimal number, e.g. 0x0C14 means $3092/10 = 309.2^\circ$	
0x000F	Read-only	Radiation, hexadecimal number, e.g. 0x0172 means the radiation intensity is 370W/m^2 .	
0x0010	Read-only	Light, magnified 100 times the hexadecimal number, such as 0x0123 indicates that the light intensity of 2.91Klux or 2910lux	
0x0011	Read-only	ultraviolet index (UV-index)	
0x0012	Read-only	CO ₂ , hexadecimal number, e.g. 0x01F4 means CO ₂ concentration is 500ppm	
0x0013	Read-only	Negative Oxygen Ions, a hexadecimal number reduced by a factor of 10, e.g. 0x01F4 means the number of negative oxygen ions is 5000.	

0x0014- 0x001f	Read-only	reservations	
0x0020	Read-only	Electronic compass, hexadecimal number, e.g. 0x0036 means currently pointing at 54°.	0° north
0x0021	Read-only	Pitch angle 1	Customization
0x0022	Read-only	Pitch angle 2	Customization
0x0023	Read-only	Pitch angle 3	Customization
0x0024	Read-only	Longitude - 1	Customization
0x0025	Read-only	Longitude-2	Customization
0x0026	Read-only	Latitude -1	Customization
0x0027	Read-only	Latitude -2	Customization
0x0028	Read-only	Customization	Customization

Communication Example

The following is an example of how to access system registers using Modbus RTU

commands:

2. Read multiple input registers (10 real-time data) command

Send: FF 03 00 01 00 10 00 18

FF	03	00 01	00 10	00 18
System Addresses	Function Code	Register Addresses	Number of registers	CRC16 parity bits automatically generated by

				software
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Responsive: FF 03 20 02 08 00 00 00 00 00 00 00 00 00 00 11 00 14 1A 57 0C 5F 27 83 00 11

0C 14 00 01 00 00 01 26 2C 3C

FF	03	0A	02 08 00 00 00 00 00 00 00 00 00 00 00 00 00 00 11 00 14 1A 57 0C 5F 27 83 00 11 0C 14 00 01 00 00 01 26	2C 3C
System Addres ses	Function Code	Number of data segment bytes	Data segment data	CRC16 check bits

Parsing data:

$$0X0208 = 0x02 * 256 + 0x08 = 520$$

$$\text{Noise} = 520 / 10 = 52\text{dB}$$

$$0x0011 = 17$$

$$\text{PM}_{2.5} = 17 \text{ ug/m}^3$$

$$0x0014 = 20$$

$$\text{PM}_{10} = 20 \text{ ug/m}^3$$

$$0x1A57 = 0x1A * 256 + 0x57 = 6743$$

$$\text{Temperature} = 6743 / 100 - 40 = 27.43^\circ\text{C}$$

$$0x0C5F = 0x0C * 256 + 0x5F = 3167$$

$$\text{Humidity} = 3167 / 100 = 31.67\%\text{RH}$$

$$0x2783 = 0x27 * 256 + 0x83 = 10115$$

Barometric pressure = $10115/10 = 1011.5\text{hPa}$

$0x0011=17$

Wind Speed = $17/100 = 0.17\text{m/s}$

$0x0C14=0x0C * 256 + 0x14= 3092$

Wind Direction = $3092/10=309.2^\circ$

Rainfall = $1/10 = 0.1\text{mm}$

$0x0109=0x01*256 + 0x09=265$

Light = $265/100 = 2.65\text{klux} = 2650\text{lux}$

Read Single Input Register Command

Send: FF 03 00 09 00 01 41 D6

FF	03	00 09	00 01	41 D6
System Addresses	Function Code	Register Addresses	Number of registers	CRC16 parity bits automatically generated by software

Responsive: FF 03 02 1A 57 DB 0E

FF	03	02	1A 57	DB 0E
System Addresses	Function Code	Number of data segment bytes	Data segment data	CRC16 check bits

Parsing data:

$0x1A57= 0x1A * 256 + 0x57= 6743$

Temperature = $6743/100-40 = 27.43^\circ\text{C}$

3. Read Address Register Command

Send: 00 03 00 00 00 01 85 DB

00	03	00 00	00 01	85 DB
	System Addresses	Function Code	Register Addresses	Number of registers

Responsive: 00 03 02 00 01 44 44

00	03	02	00 01	44 44
	Function Code	Number of data segment bytes	Data segment data	CRC16 check bits

The data segment data is 0x0001 =01 indicating the system address is 01

4. Modify Internal Registers (System Address) command (change address to 0x33)

Send: 00 06 00 00 00 33 C8 0E

00	06	00 00	00 33	C8 0E
	Function Code	Number of data segment bytes	New address	CRC16 check bits

Responsive: 00 06 00 00 00 33 C8 0E (indicates successful modification)

00	06	00 00	00 33	C8 0E
	Function Code	Starting address	New address	CRC16 check bits

5. Setting the rainfall accumulation time

Send: 00 06 01 07 00 0A B8 21

00	06	01 07	00 0A	B8 21
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	Function Code	Register Addresses	Cumulative time (10 minutes)	CRC16 check bits
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Responsive: 00 06 01 07 00 0A B8 21 (indicates successful modification)

00	06	01 07	00 0A	B8 21
	Function Code	Starting address	Cumulative time (10 minutes)	CRC16 check bits

Note: The factory default of the device is continuous accumulation without clearing 0 mode.

When the rainfall accumulation time is set to 0, the device does not automatically clear the rainfall, but keeps accumulating, and the rainfall can be cleared by restarting after power failure or resetting the rainfall accumulation time (the command 00 06 01 07 00 00 38 26 can be issued at regular intervals to clear 0).

6、Setting the magnetic declination correction (only for the optional electronic compass)

Send: 00 06 01 06 00 05 A9 E

00	06	01 06	00 05	A9 E5
Station number	Function Code	Register Addresses	Revised angle	CRC16 check bits

Responsive: 00 06 01 06 00 05 A9 E5 (indicates successful modification)

00	06	01 06	00 05	A9 E5
Station number	Function Code	Register Addresses	Revised angle	CRC16 check bits

Revision Angle Meaning

The high octet indicates the direction of correction, 0x00 represents positive correction, 0x01 is negative correction

The lower octet is the angle to be corrected

Example: 0x00 05 means that the output value should be increased by 5 degrees.

0x01 03 means the output value needs to be decreased by 3 degrees.

7、Read latitude and longitude information

Send AT+GPS#

Reply

GPS:36.12345,N;114.12345,E;2019-01-01,D;10:20:00,T;0040.2,H#

Supplemental protocol: (default device address is FF)

Active reporting period (register address 0x01 0A) Unit is min, 0 means no reporting

00 06 01 0A 00 0A 29 E2 (Sets active reporting period to 10 minutes)

Active reporting length (register address 0x01 0B)

00 06 01 0B 09 05 3E 76 (Active Reporting register address 09-0D)

Baud rate (register address 0x0102)

00-06 represent 2400, 4800, 9600, 19200, 38400, 57600, 115200 respectively

00 06 01 02 00 02 A9 E6 (**set the baud rate to 9600, non-professionals please do not change yourself**)