

# GE Q/6421GVJ

- Convert 4-20mA signal to standard Modbus TCP protocol
- Supports communication protocols such as TCP Server, UDP, MQTT, etc
- Built in web page function, data can be queried through web pages
- Wide power supply range: 8~32VDC
- High reliability, easy programming, and easy application
- Standard DIN35 rail installation, convenient for centralized wiring
- Users can set module IP addresses and other parameters on the webpage
- Low cost, small size, modular design

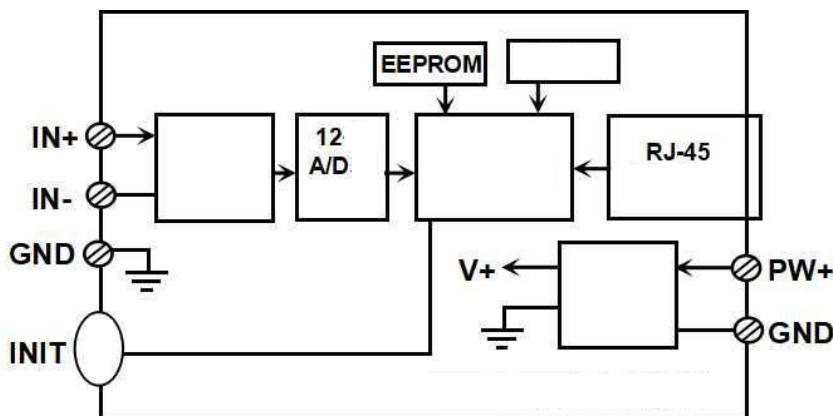
### Typical applications:

- Signal measurement, monitoring, and MQTT reporting
- Modbus TCP network, data acquisition
- Intelligent building control, security engineering and other application systems
- Industrial automation control system
- Industrial site signal isolation and long-distance transmission
- Equipment operation monitoring, MES system
- Measurement of sensor signals
- Acquisition and recording of industrial field data
- Development of medical and industrial control products
- 4-20mA signal acquisition



### Product Overview:

The product is an IoT and industrial Ethernet acquisition module that enables transparent data exchange between sensors and networks. The analog data from sensors can be forwarded to the network.



**Figure 2** Internal Block Diagram of Module

include power conditioning, analog acquisition, and RJ-45 network interface communication. The communication method adopts MODBUS TCP protocol. TCP is a transport layer based protocol that is widely used and a reliable connection oriented protocol. Users can directly set module IP addresses, subnet masks, etc. on the webpage. Can be used for monitoring and controlling the operation of sensor devices.

The products are intelligent monitoring and control systems based on microcontrollers, where user set module IP addresses, subnet masks, and other configuration information are stored in non-volatile memory EEPROM.

The series products are designed and manufactured according to industrial standards, with strong anti-interference ability and high reliability. The working temperature range is -45 °C to +80 °C.

## **Function Introduction:**

The remote I/O module can be used to measure one analog signal.

### **1. Analog signal input**

12 bit acquisition accuracy, one analog signal input. All signal input ranges have been calibrated before the product leaves the factory. During use, users can also easily program and calibrate themselves. Please refer to the product selection for specific current or voltage input range.

### **2. Communication Protocol**

Communication interface: RJ-45 network interface. The two indicator lights at the network port position, the Link light (green light) stays on and the Data light (yellow light) stays on after the network cable is plugged in.

Communication protocol: MODBUS TCP protocol is adopted to achieve industrial Ethernet data exchange. It can also communicate with modules through TCP sockets.

Network cache: 2K bytes (for both sending and receiving)

Communication response time: less than 10mS.

### **3. Anti interference**

There is a transient suppression diode inside the module, which can effectively suppress various surge pulses and protect the module.

## **General Parameters:**

(Typical @+25 °C, Vs is 24VDC)

Input type: current input/voltage input

Accuracy: 0.1%

Temperature drift:  $\pm 50$  ppm/°C ( $\pm 100$  ppm/°C, maximum)

Input resistance: 150  $\Omega$  (4-20mA/0-20mA/0-  $\pm 20$ mA current input)

Bandwidth: -3 dB 10 Hz

Conversion rate: 16FPS (factory default value, users can modify the conversion rate on the webpage.)

You can set the AD conversion rate to 2SPS, 4SPS, 8SPS, 16SPS, 32SPS, 50SPS, 80SPS, 100SPS by sending commands

Common mode rejection (CMR): 120 dB (1k  $\Omega$  Source Imbalance @ 50/60 Hz)

Normal mode suppression (NMR): 60 dB (1k  $\Omega$  Source Imbalance @ 50/60 Hz)

Input protection: overvoltage protection, overcurrent protection

Communication: MODBUS TCP communication protocol or TCP socket character protocol or MQTT protocol

Web page: Supports web access module and web page setting module parameters.

Interface: RJ-45 network interface.

Communication response time: 10 ms maximum

Working power supply: +8~32VDC wide power supply range, with internal anti reverse and overvoltage protection circuits

Power consumption: less than 3W

Working temperature: -45~+80 °C

Working humidity: 10~90% (no condensation)

Storage temperature: -45~+80 °C

Storage humidity: 10~95% (no condensation)

Dimensions: 106 mm x 59mm x 37mm

### Pin definition and wiring:

Pin	name	Description	Pin	name	Description
<b>one</b> <b>(Switch)</b>	INIT	Long press for 3 seconds to restore factory settings	<b>three</b>	GND	Negative terminal of power supply, signal common ground
			<b>four</b>	PW+	Positive end of power supply
<b>two</b> <b>(Internet port)</b>	RJ-45	RJ-45 network interface	<b>five</b>	GND	Signal public area
			<b>six</b>	IN-	Analog signal input negative terminal
			<b>seven</b>	IN+	Analog signal input positive terminal

Note: The pins with the same name are internally connected

**Under working modes** such as **TCP Server, TCP Client, UDP Mode, Web Socket, etc.**: After a successful connection, commands can be sent and data can be received.

### (1) Read data command

**Send:** # 01 (If timed automatic reporting is set, there is no need to send commands, the module will report data at regular intervals)

**Reply:** {"devName": "98CDAC3FA407", "time": 43545, "ADC": [0], "overrange": [0], actual data ": [0]}

Format Description:

The module name 'devName' can be modified on the webpage as needed

The internal time of the 'time' module, measured in mS.

The AD conversion data collected by the **ADC** module ranges from 0 to 32767. 0=zero point; 32767=full degree.

For example, 4-20mA input: 0=4mA; 32767=20mA; Users can also directly use the converted engineering values.

**OverRanger** "0 indicates normal, 1 indicates input signal below zero, and 2 indicates input signal above full scale.

The 'practicalData' data is a value obtained by converting the zero point and fullness set by the user on the webpage.

Generally, this value can be directly used for general applications.

No need to process the data in the **ADC**.

You can also read a single set of data:

#01>ADC **reply:** {"ADC": [32767]}

#01>actual data **reply:** {"actual data": [20000]}

#01>OverRanger **reply:** {"overRanger": [0]}

### (2) Set range

**Send:** \$01 {"range": [0,20]}

**Reply:**! 01 (cr) indicates successful setting? 01 (cr) indicates a command error

## 3. Read configuration commands

The configuration parameters of the reading module can also be viewed directly on the webpage.

**Send:**% 01ReadConfig

Reply: {"version": "V1.0", "rangeStart": 4.000000, "rangeEnd": 20.000000, "dataRate": 1, "setIP": 1, "mac": "EE: 86: B0:52:7F:12", "ipAddress": "192.168.0.7", "gateway": "192.168.0.1", "netmask": "255.255.255.0", "work mode": 0, "localPort": 23, "remoteServerIP": "192.168.0.160", "remotePort": 23, "setQuickUp": 0, "sendTime": 0, "devName": "EE86B0527F12", "setMQTT": 0, "mqttHostURL": "broker.emqx.io", "contentId": "EE86B0527F12", "username": "", "passwd": "", "topic": "/wayjun/sub", "port": 1883, "pubTime": 1000, "subtopic": "/wayjun/sub" }

## 4. Set configuration commands

The configuration parameters of the module can also be set directly on the webpage. You can set all or some parameters, and the module will automatically restart after setting.

**send out:**

%01WriteConfig{"version":"V1.0","rangeStart":4.000000,"rangeEnd":20.000000,"dataRate":1,"setIP":1,"mac":"EE:86:B0:52:7F:12","ipAddress":"192.168.0.7","gateway":"192.168.0.1","netmask":"255.255.255.0","workmode":0,"localPort":23,"remoteServerIp":"192.168.0.160","remotePort":23,"setQuickUp":0,"sendTime":0,"devName":"EE86B0527F12","setMQTT":0,"mqttHostUrl":"broker.emqx.io","clientId":"EE86B0527F12","username":"","passwd":"","topic":"/wayjun/pub","port":1883,"pubTime":1000,"subtopic":"/wayjun/sub" }

You can also set only a single parameter, such as modifying IP:% 01WriteConfig {"ipAddress": "192.168.0.7"}

**Reply:**! 01 (cr) indicates successful setting? 01 (cr) indicates a command error

(4) Description of supported function codes

03 (0x03) Read hold register

In a remote device, use this function code to read the contents of consecutive blocks in the hold register. The request PDU specifies the starting register address and the number of registers. Address registers from scratch. Therefore, addressing registers 1-16 are 0-15. In the response message, each register has two bytes, with the first byte being the data high bit and the second byte being the data low bit.

Example of function code 03, read input analog quantity, register address 40001:

request			response		
Field Name		hexadecimal	Field Name		hexadecimal
MBAP message header	Transmission identification	01	MBAP message header	Transmission identification	01
		00			00
	Protocol Logo	00		Protocol Logo	00
		00			00
	length	00		length	00
		06			05
	Unit identifier	01		Unit identifier	01
Function code		03	Function code		03
Starting address Hi		00	Byte count		02
Starting address Lo		00	Register value Hi (0x00)		00
Register number Hi		00	Register value Lo (DI7-DI0)		00
Register number Lo		01			

Register address description (note: addresses are all decimal numbers)

Supports registers with function code 03.

Address 4X (PLC)	Address (PC, DCS)	Data content	attribute	Data Explanation
forty thousand and one	0	Input analog quantity	read-only	Signed integer, AD converted value. 0x0000=zero point; 0x7FFF=Full Degree For example, 4-20mA: 0x0000=4mA; 0x7FFF=20mA;
forty thousand and two	one	Is it out of range	read-only	Signed integer, 0 represents normal, 1 represents input signal below zero, and 2 represents input signal above full scale.
40003~40004	2~3	Actual engineering value	read-only	The data is a 32-bit floating-point number stored in CDAB order. It is a value obtained by converting the zero point and fullness set by the user on the

				<p>webpage. For example, if the input signal is 4-20mA, representing a temperature of -20~100 degrees, the zero point can be set to -20 and the full degree can be set to 100. After the setting is completed, the actual engineering value read out is the actual temperature value. Generally, this value can be directly used for general applications. No need to process the data in the 40001 register. Note that some PLCs require swapping of high 16 and low 16 bit SWAPs to read data.</p>
forty thousand two hundred and eleven	two hundred and ten	Module Name	read-only	High bit: 0x01 Low bit: 0x81

## Calibration module:

**The product has been calibrated before leaving the factory, and users can use it directly without calibration.**

During use, you can also use the product's calibration function to recalibrate the module. When in school, the module needs to input appropriate signals, and different input ranges require different input signals.

To improve calibration accuracy, it is recommended to use the following equipment for calibration:

1. A DC voltage/current signal source with stable output and low noise
2. A voltage/current measuring instrument with a precision of 5 and a half bits or higher is used to monitor the accuracy of input signals

Calibration process

1. Connect the corresponding input signal to the channel that needs to be calibrated according to the input range of the module.
2. The zero point of the is module is calibrated when the zero point signal is input, and the full degree is calibrated when the full degree signal is input. For example, when inputting 4-20mA, input 4mA for zero calibration and 20mA for full calibration. When inputting 0-5V, input 0V for zero calibration and 5V for full calibration.
2. Input zero signal to module, usually 4mA or 0V.
- After the signal stabilizes, send \$01 {"calibrationCH0": 0}, and the module will perform zero point calibration.
4. Input a full current or voltage signal to the WJ181 module.
- After the signal stabilizes, send \$01 {"calibrationCH0": 1}, and the module will perform full-scale calibration.
6. Calibration completed

## Common problems

### 1. Cross network segment issues

If the IP of the device and the communicating PC are not in the same network segment and are directly connected via Ethernet or under the same sub router, then the two cannot communicate at all.

give an example:

Device IP: 192.168.0.7

Subnet mask: 255.255.255.0

PC's IP: 192.168.1.100

Subnet mask: 255.255.255.0

Due to the device's IP being 192.168.0.7, it is unable to log in to the device's webpage or ping it on the PC.

If you want the two to communicate, you need to set the subnet mask of the device and PC, as well as the subnet mask on the router, to 255.255.0.0, so that you can log in to the module webpage.

## **2. The device can ping, but the webpage cannot be opened**

There may be several reasons for this:

- 1) The device has set a static IP address that conflicts with the IP addresses of existing devices in the network
- 2) The HTTP server port has been modified (default should be 80)
- 3) Other reasons

Solution: Reset the device to an unused IP address; Restore factory settings or enter the correct port when opening the browser.

## **3. Every once in a while, there is a disconnection and reconnection**

Every once in a while, there will be a phenomenon of disconnection and reconnection

Reason: There is an issue of IP address conflict between the serial server and other devices

## **4. Communication is abnormal, network connection cannot be established, or search cannot be found**

The firewall of the current computer needs to be turned off (in the Windows firewall settings)

Three local ports must not conflict, meaning they must be set to different values. Default values are 23, 26, and 29

Having illegal MAC addresses, such as full FF MAC addresses, may result in inability to connect to the target IP address or duplicate MAC addresses.

Illegal IP addresses, such as network segments that are not in the same network segment as the router, may not be able to access the external network.

## **5. Hardware problem search**

Poor power supply from the power adapter or poor contact of the plug

If the power light and network port light are not on, it means there is no power supply or the hardware is broken