ECO-420/wi

4-20mA to network Modbus TCP and MQT, WiFi acquisition module

Product features:

- ●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
- ● Dimensions: 79 x 69.5x 25mm

Typical applications:

- ● Signal measurement, monitoring, and MQTT reporting
- ●TCP network, data collection
- ●Intelligent building control, security engineering and other application systems
- ●Industrial automation control system based on TCP network
- ●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:

Th□□□ □□□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.
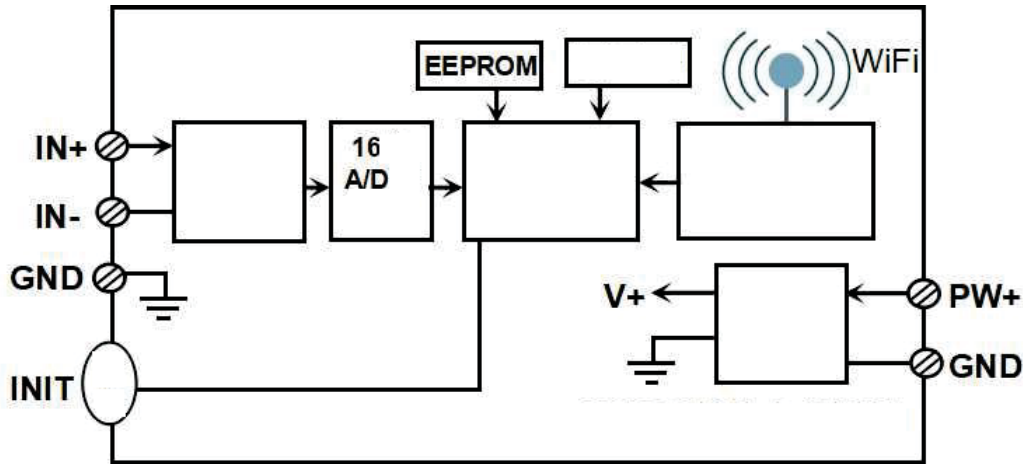

Figure Internal Block Diagram

This product includes power conditioning, analog data acquisition, and WiFi 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.

This model is 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.

This product is designed and manufactured according to industrial standards, with strong anti-interference ability and high reliability.   The working temperature range is -45 ℃ to +80 ℃.

Function Introduction:

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

1、Analog signal input

16 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: WiFi network interface.   Can connect to WiFi within the local area network.

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 ℃, Vs is 24VDC)

Input type: current input/voltage input

Accuracy: 0.1%

Temperature drift: ± 50 ppm/℃ (± 100 ppm/℃, maximum)

Input resistance: 150 Ω (4-20mA/0-20mA/0- ± 20mA current input)

300 Ω (0-10mA/0- ± 10mA current input)

1.5K Ω (0-1mA/0- ± 1mA current input)

Greater than 200K (5V/10V voltage input)

Greater than 1M Ω (input voltage below 2.5V)

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 Ω Source Imbalance @ 50/60 Hz)

Normal mode suppression (NMR): 60 dB (1k Ω 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: WiFi network interface.

Communication response time: 100 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 ℃

Working humidity: 10~90% (no condensation)

Storage temperature: -45~+80 ℃

Storage humidity: 10~95% (no condensation)

Dimensions: 79 mm x 69.5mm x 25mm

Pin definition and wiring:

Pin	name	Description	Pin	name	Description
one	PW+	Positive end of power supply	three	NC	Empty feet
two	GND	Negative terminal of power supply, signal common ground	four	GND	Signal Ground
switch	INIT	Enter AP configuration mode switch	five	IN-	Analog signal input negative terminal
			six	IN+	Analog signal input positive terminal

Note: **The** pins **with the** same name are internally connected
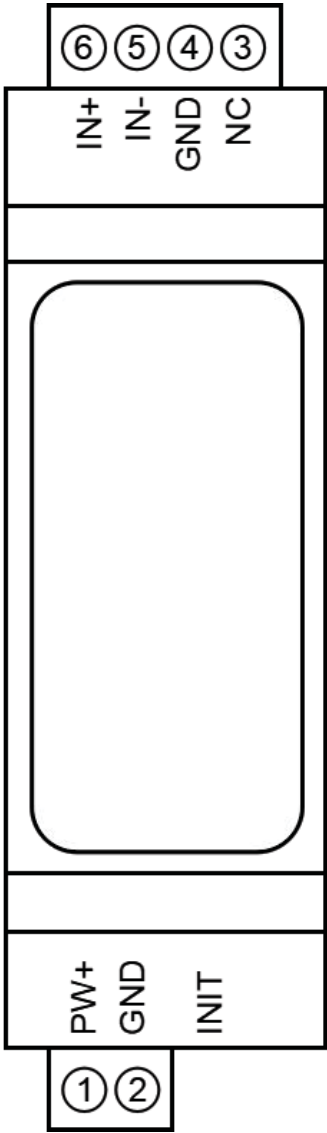
Character Communication Protocol:

MQTT protocol: After a successful connection, a command is sent to the MQTT subscription topic of the module, and the replied data is displayed on the MQTT publication topic of the module.

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: {"rangeStart": 0, "rangeEnd": 10, "dataRate": 6, "WifiSide": "w", "WifiPassword": "12345678", "work mode": 0, "setIP": 1, "ipAddress": "192.168.0.5", "gateway": "192.168.0.1", "netmask": "255.255.255.0", "localPort": 23, "remoteServerIP": "192.168.0.160", "remotePort": 23, "setQuickUp": 0, "sendTime": 0, "devName": "A848FAC BC4BB", "setMQTT": 0, "mqttHostURL": "broker. emqx. io", "port": 1883, "contentId": "A848FACBC4BB", "username": "", "passwd": "", "topic": "wayjunf", "pubTime": 0, "subtopic": "wayjund", "version": "V1.00", "mac": "A8:48: FA: CB: C4: BB"}

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{"rangeStart":0,"rangeEnd":10,"dataRate":6,"WifiSsid":"w","WifiPassword":"12345678","workmode": 0,"setIP":1,"ipAddress":"192.168.0.5","gateway":"192.168.0.1","netmask":"255.255.255.0","localPort":23,"remoteServe rIp":"192.168.0.160","remotePort":23,"setQuickUp":0,"sendTime":0,"devName":"A848FACBC4BB","setMQTT":0,"mq ttHostUrl":"broker.emqx.io","port":1883,"clientId":"A848FACBC4BB","username":"","passwd":"","topic":"wayjunf","p ubTime":0,"subtopic":"wayjund","version":"V1.00","mac":"A8:48:FA:CB:C4:BB"}

You can also set only a single parameter, such as modifying WIFI:% 01WriteConfig {"WifiSid": "w"}

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

Modbus TCP protocol

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 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.
forty thousand two hundred and eleven	two hundred and ten	Module Name	read-only	High bit: 0x03 Low bit: 0x21

WEBSOCKET communication protocol

If the module is already connected to the local WiFi, you can enter the module IP in the computer or mobile browser, for example: 192.168.0.5, to open the module webpage (provided that the computer IP or mobile IP is in the same network segment as the module, login to the webpage should be based on the current module IP address), and then enter the module configuration interface. In the configuration interface, you can change the working mode to websocket, save it, wait for 10 seconds, and then enter 192.168.0.5/w to directly enter websocket. If your IP is not 192.168.0.5, you can add/w after your actual IP to enter websocket. It is recommended to use Google Chrome browser or IE10 browser for testing. The Websocket web interface is as follows:

After clicking connect to websocket, if the connection is successful, a green "Connected" message will appear, and then you can send a character protocol command to read the data.

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.

The zero point 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.

calibration.

2. Input zero signal to module, 4mA.

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 module.

After the signal stabilizes, send $01 {"calibrationCH0": 1}, and the module will perform full-scale calibration.

6. Calibration completed

Common problems

1，How to determine the status of a module based on lighting

The **light** is on **twice** for **1 second:** the module is waiting for the configured AP mode and can be connected to the module's WiFi 8 network settings parameters using a mobile phone.

The **light** is on **once** every **1** second**:** the module is currently connected to WiFi. If it cannot be connected for a long time, please reset the WiFi parameters of the module.

The **light** is on **once** every **5** seconds**:** the module has been connected to WiFi and is working normally.

2. 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.

3. 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.

4. 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

5. 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.

6. 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

Dimensions: (Unit: mm)
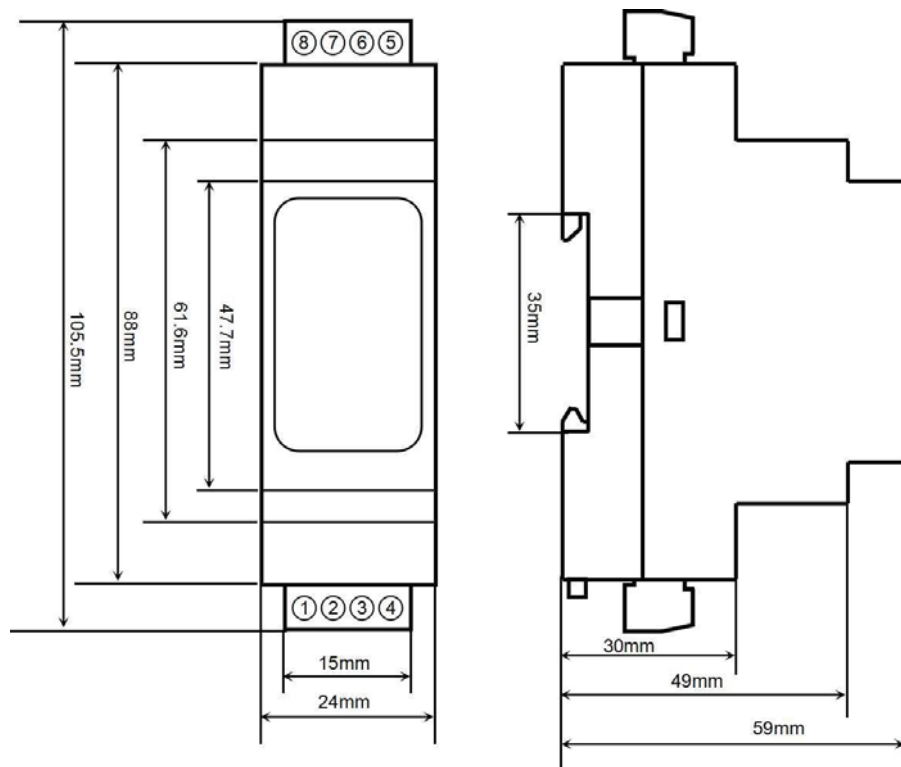
Can be installed on standard DIN35 rails

guarantee:

Within two years from the date of sale, if the user complies with the storage, transportation, and usage requirements and the product quality is lower than the technical specifications, it can be returned to the factory for free repair. If damage is caused due to violation of operating regulations and requirements, device fees and maintenance fees shall be