



VEC-VA motion controller expansion module hardware description

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VAEX001E

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Contents

Contents	1
Chapter I Overview of extension modules	4
1.1 Introduction to extension modules	4
1.1.1 Expansion Module Models and Functions	4
1.1.2 Module configuration	4
1.2 Overall dimensions	5
1.3 General specifications	5
1.3.1 Module Storage Environment	5
1.3.2 Module Installation Environment	6
1.3.3 Installation and disassembly	6
Chapter 2 IO extension module	8
2.1 IO Extension Concepts	8
2.2 Product introduction	8
2.3 8IO	8
2.3.1 Product appearance and introduction	8
2.3.2 Product Wiring Description	10
2.4 16I	12
2.4.1 Product appearance and introduction	12
2.4.2 Product Wiring Description	13
2.5 16O	14
2.5.1 Product appearance and introduction	14
2.5.2 Product Wiring Description	15
Chapter 3 The extension module of AD/DA	16
3.1 AD/DA Concept of transformation	16
3.2 Product introduction	16
3.3 Product appearance and introduction of each p	16
3.4 Terminal definition:	18
3.5 Functional specification	19

Chapter IV PT100 input expansion module	20
4.1 Basic concept of platinum temperature sensing resistor (PT100)	20
4.2 Product introduction	20
4.3 Product appearance and each department introduction	21
4.4 Terminal definition	22
4.5 Functional specifications:	23
Chapter V Thermocouple input expansion module	24
5.1 Basic concept of thermocouple temperature sensor	24
5.2 Product introduction	24
5.3 Product appearance and the introduction of each part	24
5.4 Terminal definition	26
Chapter VI Weighing expansion module	27
6.1 Basic concept of weighing	27
6.2 Product introduction	27
6.3 Product appearance and each department introduction	27
6.4 Terminal definition:	29
6.5 Schematic diagram of external wiring:	30
6.6 Functional specifications:	31

Chapter I Overview of extension modules

1.1 Introduction to extension modules

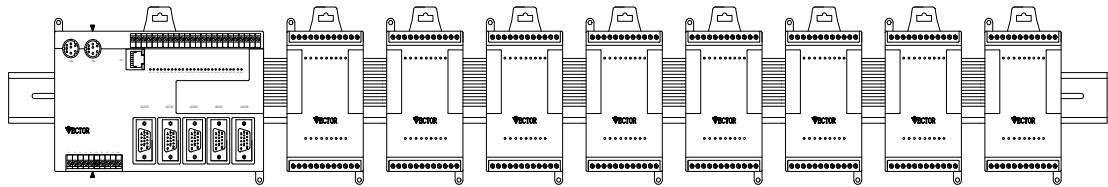
The motion controllers of VECTOR VA series not only integrated rich motion control module, it has a powerful processing, computing functions, by using input/output module, temperature control module, weighing module and so on, VA series motion controller can be widely used in temperature, flow, pressure and other process control systems.

1.1.1 Expansion Module Models and Functions

Model	Function
VEC-VA-EX-8IO	8-channel digital input, 8-channel digital output module; The output type is transistor output.
VEC-VA-EX-16I	16-channel digital input module.
VEC-VA-EX-16O	16-channel digital output module; The output type is transistor output.
VEC-VA-EX-4XA-B	4 channels AD input, 4 channels DA output module; The resolution is 12bit. The AD input can be set to 0 to 5V, 0 to 10V, ±10V, and 0 to 20mA. The DA output can be set to 0 to 5V, 0 to 10V, and ±10V.
VEC-VA-EX-4PT-B	4-way three-wire PT100 input module; Temperature range -200~+600°C, 1mA constant current source drive, 0.1°C measurement accuracy
VEC-VA-EX-4TC-B	4-channel thermocouple input module; Support up to 8 types of thermocouples, broken couple detection, 0.1°C measurement accuracy.
VEC-VA-EX-2WT-B	2-channel weighing module; Multiple eigenvalues optional, 24bit high resolution sampling.

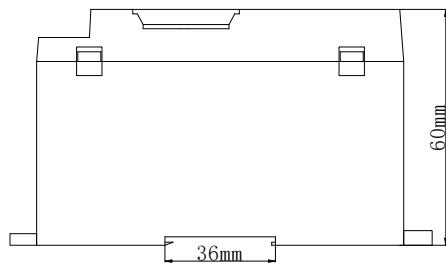
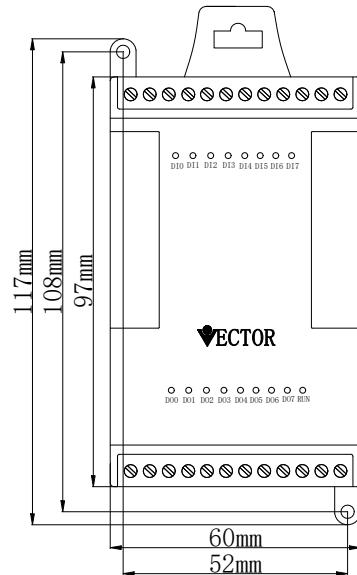
1.1.2 Module configuration

The EX extension module of the VA series can be installed on the right side of the main unit and extension unit. As shown below:



➤The MM host of the VA series can be connected to a maximum of eight expansion modules, with any combination, the host can automatically identifies the extension module type and assigns an address.

1.2 Overall dimensions



1.3 General specifications

1.3.1 Module Storage Environment

The product must be placed in packing box before installation; If the machine is not in use

temporarily , In order to make the product can meet the company's warranty scope and future maintenance, note the following when storing:

- (1) Must be placed in a dry and grime free place;
- (2) The ambient temperature of the storage location must be within the range of -20°C to +65°C;
- (3) The relative humidity of the storage location must be in the range of 0% to 95%, and there is no condensation;
- (4) Avoid storage in an environment containing corrosive gases and liquids;
- (5) Properly packaged and stored on shelves or countertops.

1.3.2 Module Installation Environment

The operating temperature of this product is -10°C to +40°C.

It is recommended that the ambient temperature be below +40°C for Long hours at work. If the ambient temperature is above +40 °C , place it in a well-ventilated place to ensure product reliability. If the product is installed in a distribution box, the size and ventilation conditions of the distribution box must be make sure all internal electronic devices are not in danger of overheating, and attention should be paid to whether vibration of the machine will affect the electronics of the distribution box .In addition, the conditions of use also include the following:

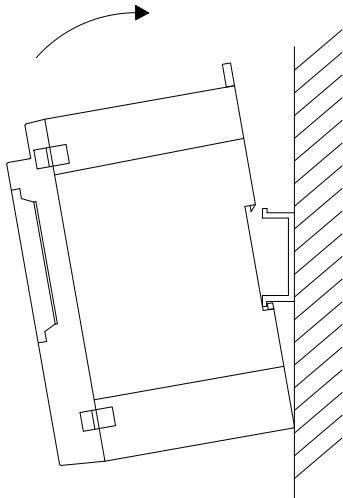
- (1) Places without high heat generating devices;
- (2) Places without water droplets, steam, dust and oily dust;
- (3) Places without non-corrosive, flammable gas, liquid places;
- (4) Places without no- floating dust and metal particles ;
- (5) Places without vibration;
- (6) Places without electromagnetic noise interference.

1.3.3 Installation and disassembly

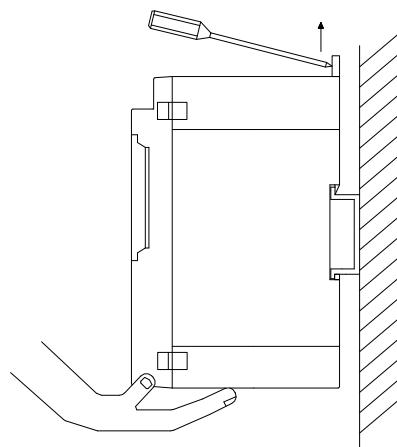
The expansion modules of EX series can be installed on the right side of VA series motion controller host and expansion module, It can be installed using DIN rails (35mm) or fixed directly with M3 screws.

I. Installation and disassembly using guide rail:

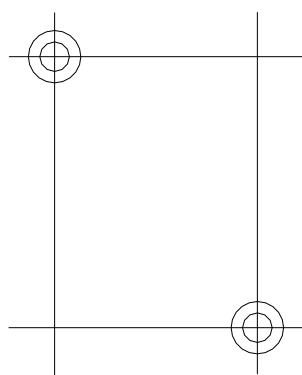
Hold the EX Extension Module at an Angle of approximately 15° vertically and slowly slide up so that the lower edge of the groove on the back of the controller hooks onto the lower edge of the DIN RAIL (35mm). Then slowly apply pressure from this axis to clamp the EX Extension Module onto the guide rail.



Insert a long-handled flat-head screwdriver into the clip, hold the lower part of the module with your hand, and then twist or pull the screwdriver out of the clip to remove it.



II. Installed directly: Expansion modules can also be installed directly through mounting holes using M3 screws.



Matters needing attention:

- Please confirm the specification and select the appropriate module.

-
- During screw hole machining and wiring engineering, please do not let chips and wire chips fall into the module.
 - Before connecting, Please reconfirm the specifications of modules and connected devices ,make sure they are OK.
 - When connecting cables, ensure that the cables are secure. If the cables are disconnected, data errors and short circuits may occur.
 - Install and remove cables,Please do this after all power is disconnected.

Chapter 2 IO extension module

2.1 IO Extension Concepts

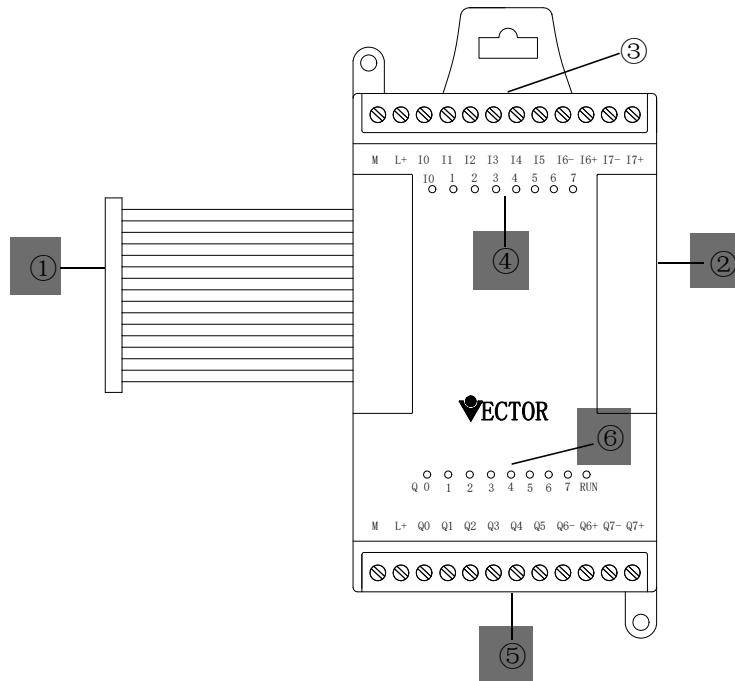
The I/O capacity of the host is limited. If the system needs more I/O control, you can connect the I/O expansion module to the host.

2.2 Product introduction

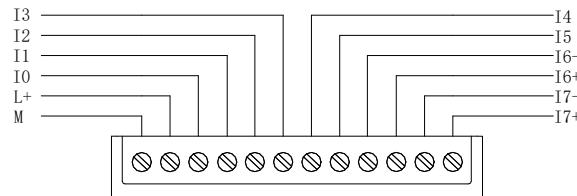
The host IO expansion module of VECTOR motion controller mainly includes 8IO, 16I and 16O,8IO indicates that the expansion module has eight digital input ports and eight digital output ports (transistor output);16I indicates that the expansion module has 16 DI ports； 16O indicates that the expansion module has 16 DO ports (transistor output); DI and DO can be selected as NPN and PNP by the jumper on the host of the motion controller.

2.3 8IO

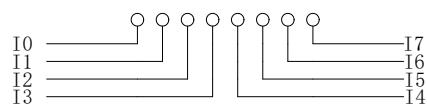
2.3.1 Product appearance and introduction



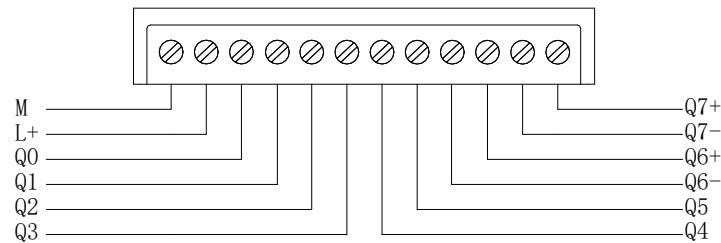
- ① Expansion module cables can be connected to the right of the host or other expansion modules.
- ② Interface of the expansion module.
- ③ External 24V power supply and DI wiring terminal. The definition is as follows:



- The L+ and M of this terminal are connected to the L+ and M of the host, Just pick up one of them.
- ④ Digital DI port indicator

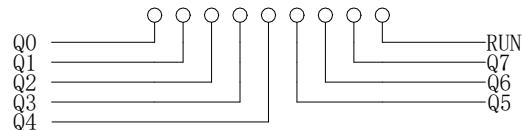


- When the indicator is on, the corresponding DI port is valid.
- ⑤ External 24V power supply and DO terminal. Its definition is as follows:



➤ The L+ and M of this terminal are connected to the L+ and M of the host, Just pick up one of them.

⑥Digital DO port indicator



➤ When the indicator is on, the corresponding DO port is valid.

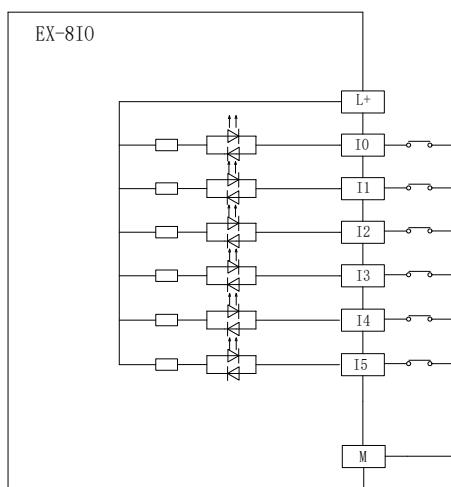
Running indicator light

Indicator status	instructions
ON	Normal running
OFF	Abnormal running

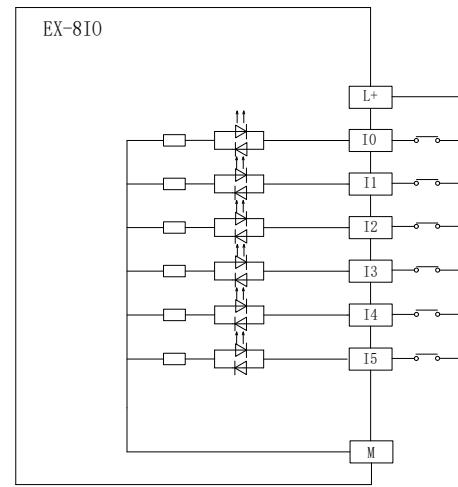
2.3.2 Product Wiring Description

I. I0-I5 接线示意图:

I.I0-I5 Wiring diagram:

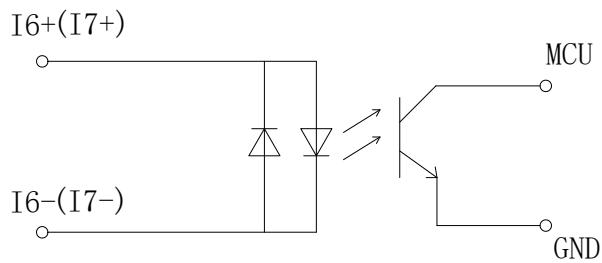


DI 的 NPN 型接线图



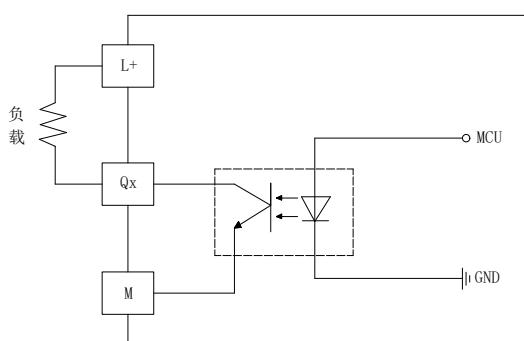
DI 的 PNP 型接线图

II. I6-、I6+与 I7-、I7+Wiring diagram:

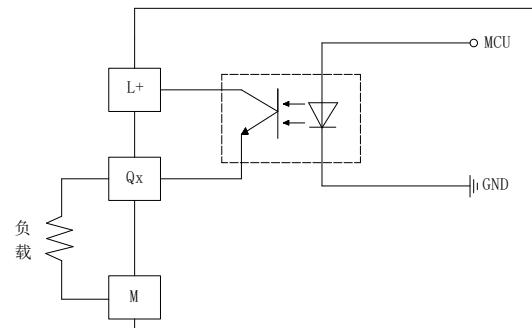


➤ DI6-, DI6+ and DI7-, DI7+ are not restricted by the host NPN, PNP jumper, When DI6 + (DI7 +) connects to L +, DI6-(DI7-) is the input terminal, the effective input is COM (NPN type); When DI6 + (DI7 +) connects to M, DI6+(DI7+) is the input terminal, the effective input is 24V(PNP type).

III. Q0-Q5Wiring diagram:

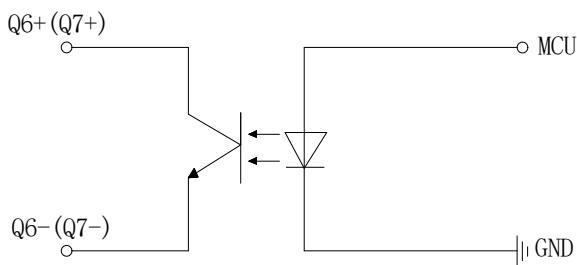


DO 的 PNP 型接线图



DO 的 NPN 型接线图

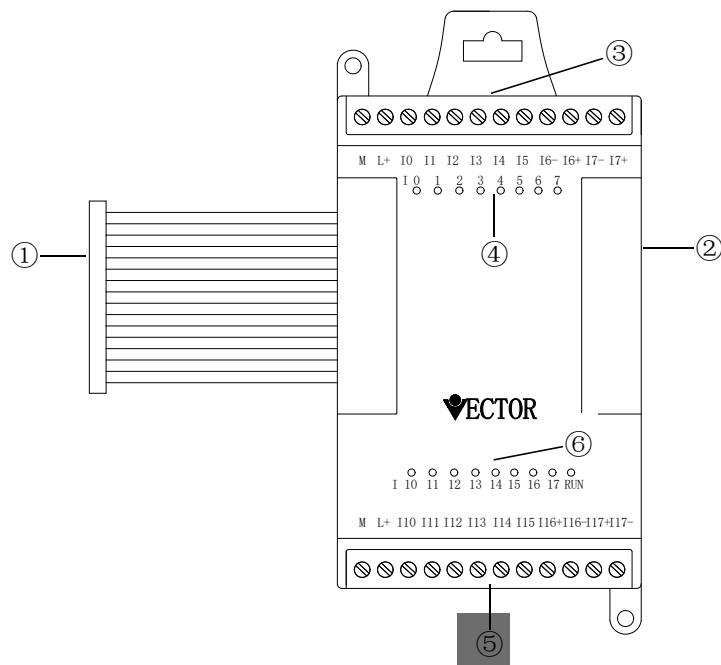
IV. Q6-、Q6+ and Q7-、Q7+Wiring diagram:



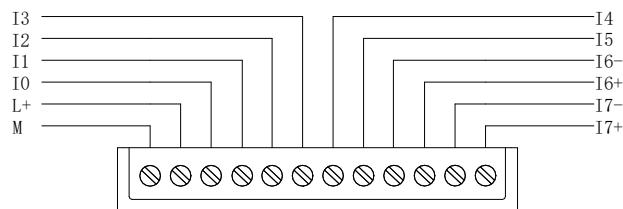
➤ Q6-, Q6+ and Q7-, Q7+ are not restricted by the host NPN, PNP jumper, When Q6 + (Q7 +) connects to L +, Q6-(Q7-) is the output terminal, the effective output is 24V(PNP type); When Q6 + (Q7 +) connects to Q M, Q6+(Q7+) is the output terminal, the effective output is COM (NPN type).

2.4 16I

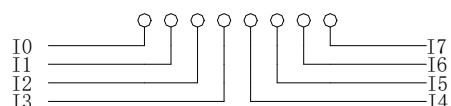
2.4.1 Product appearance and introduction



- ① Expansion module cables can be connected to the right of the host or other expansion modules.
- ② Interface of the expansion module.
- ③ External 24V power supply and DIO-DI7 wiring terminal. The definition is as follows:

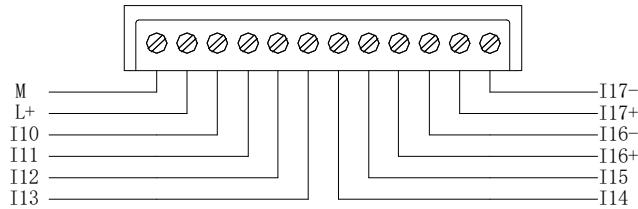


- The L+ and M of this terminal are connected to the L+ and M of the host, Just pick up one of them.
- ④ Digital IO-I7 port indicator

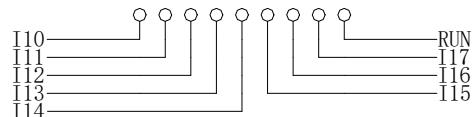


- ⑤ External 24V power supply and I10-I17 wiring terminal. The definition is as

follows:



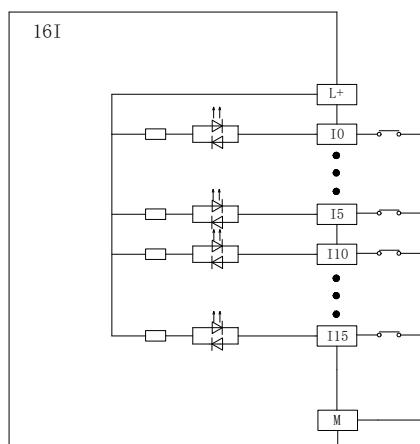
⑥Digital I10-I17 port indicator



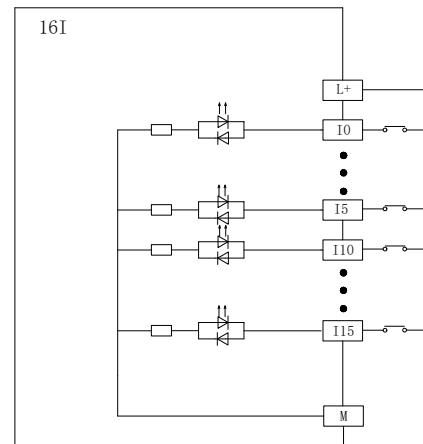
➤ The L+ and M of this terminal are connected to the L+ and M of the host, Just pick up one of them.

2.4.2 Product Wiring Description

I. I0-I5、I10-I15Wiring diagram:

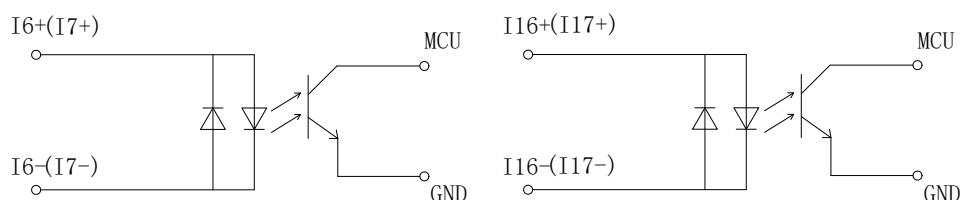


DI 的 NPN 型接线图



DI 的 PNP 型接线图

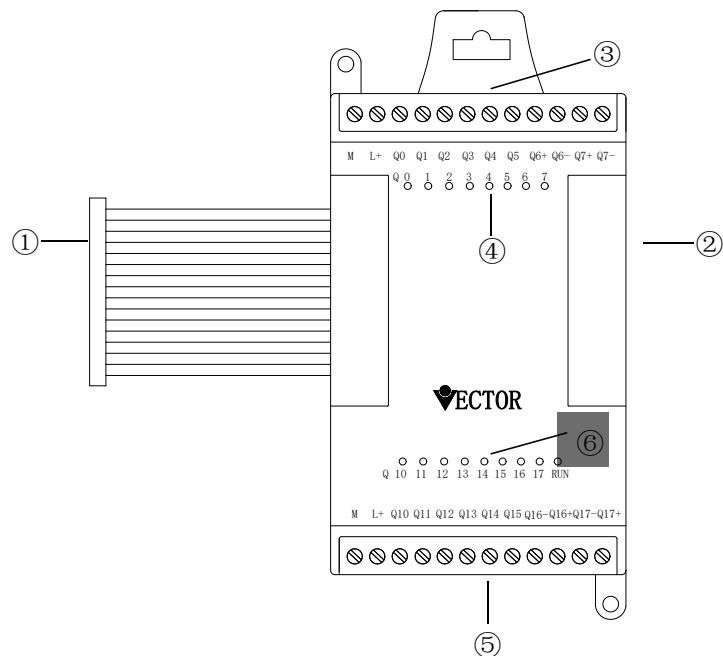
II. DI6-、DI6+/DI7-、DI7+/DI16-、DI16+/DI17-、DI17+Wiring diagram:



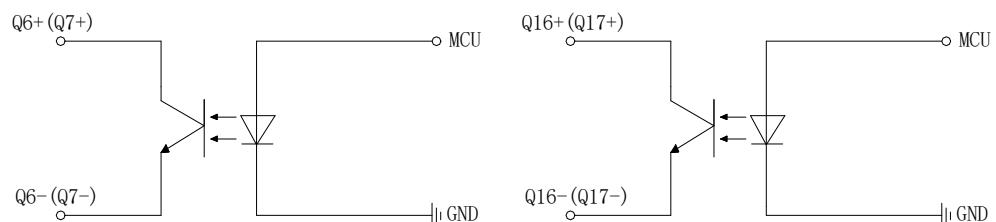
➤ I6-, I6+ and I7-, I7+ are not restricted by the host NPN, PNP jumper. When I6 + (I7 +) connects to L +, I6-(I7-) is the input terminal, the effective input is COM (NPN type); When I6 - (I7 -) connects to M, I6+(I7+) is the input terminal, the effective input is 24V(PNP type); I16- and I16+ are the same as I17- and I17+.

2.5 16O

2.5.1 Product appearance and introduction



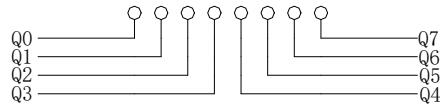
- ① Expansion module cables can be connected to the right of the host or other expansion modules.
- ② Interface of the expansion module.
- ③ External 24V power supply and Q0-Q7 wiring terminal. The definition is as follows:



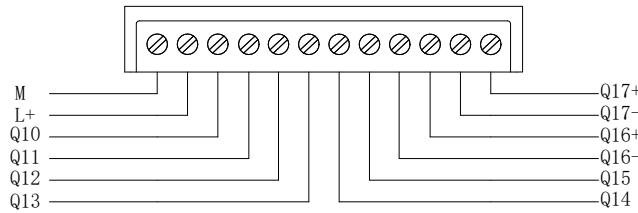
➤ The L+ and M of this terminal are connected to the L+ and M of the host, Just

pick up one of them.

④Digital Q0-Q7 port indicator

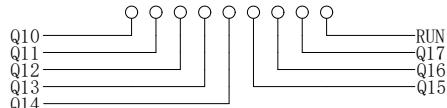


⑤External 24V power supply and Q10-Q17 wiring terminal. The definition is as follows:



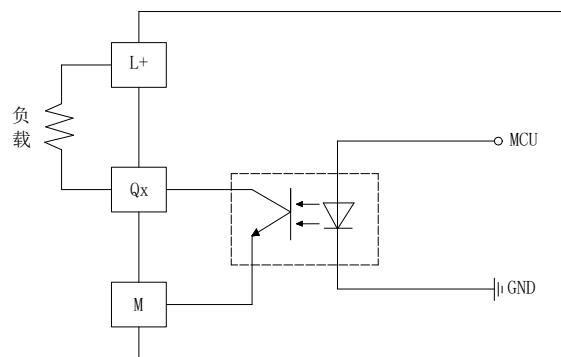
➤ The L+ and M of this terminal are connected to the L+ and M of the host, Just pick up one of them.

⑥Digital Q10-Q17 port indicator

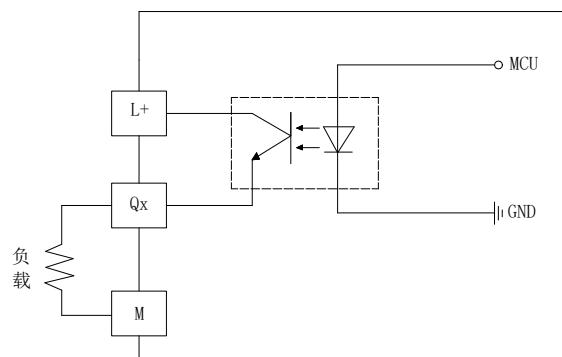


2.5.2 Product Wiring Description

I. Q0-Q5、Q10-Q15Wiring diagram

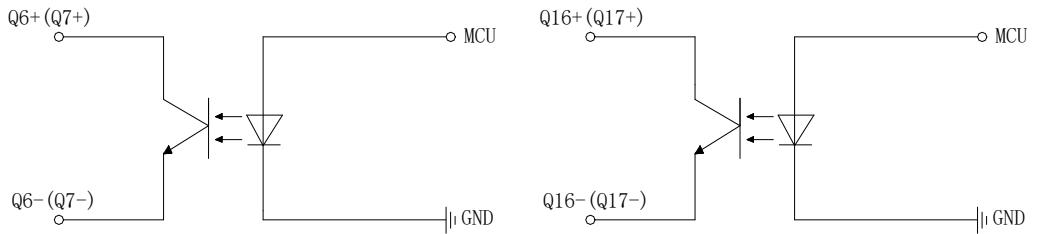


DO 的 PNP 型接线图



DO 的 NPN 型接线图

II. Q6-、Q6+/Q7-、Q7+/Q16-、Q16+/Q17-、Q17+Wiring diagram:



➤ Q6-, Q6+ and Q7-, Q7+ are not restricted by the host NPN, PNP jumper, When Q6 + (Q7 +) connects to L +, Q6-(Q7-) is the output terminal, the effective output is 24V(PNP type); When Q6 - (Q7 -) connects to M, Q6+(Q7+) is the output terminal, the effective output is COM (NPN type); I16- and I16+ are the same as I17- and I17+.

Chapter 3 The extension module of AD/DA

3.1 AD/DA Concept of transformation

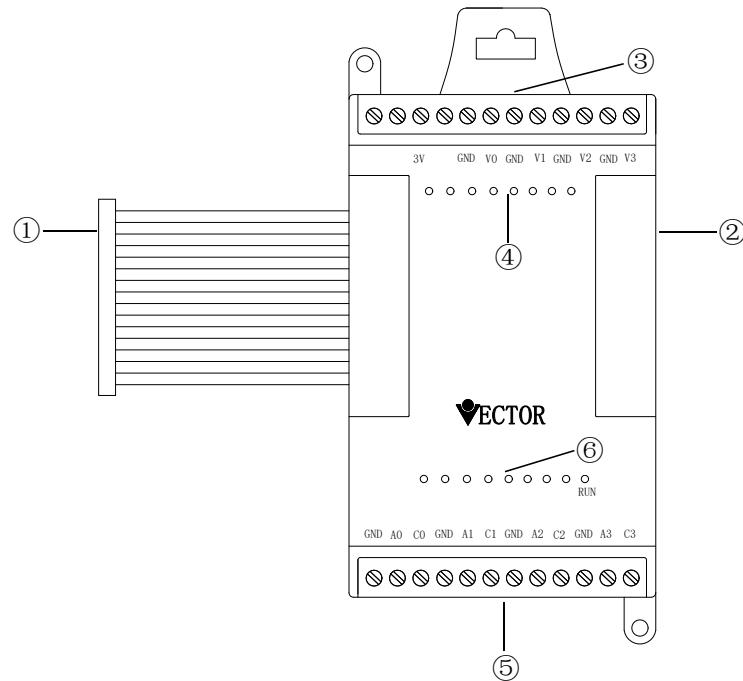
In the field of automation, many units of measurement are transmitted in the form of analog quantities, The most common examples are:-10V~+10V and current 0~20mA. If the analog signal is to be used as the parameter of motion controller control calculus, it needs to be converted to digital quantity. At the same time, many control signals are controlled in the mode of analog signals, and the range of -10V~10V is the most common signal range, so it is necessary to convert the numerical data of motion controller into analog signals to control peripheral devices.

3.2 Product introduction

The 4XA series extension module of VECTOR can accept 4-point analog signal input and convert it to 12-bit digital signal. The host can read and write the data in the module with instructions. The analog signal output module receives 12-bit digital data from the host of the motion controller, and then converts the digital data to 4-point analog signal output. The AD input can be set to 0 to 5V, 0 to 10V, ±10V, or 0 to 20mA, and the DA output can be set to 0 to 5V, 0 to 10V, or ±10V.

3.3 Product appearance and introduction of each part

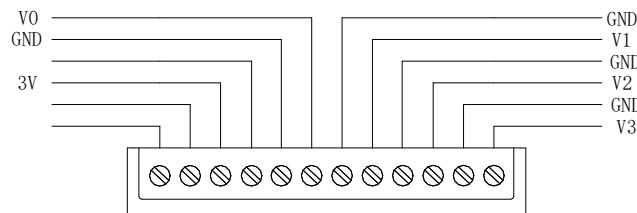
Description of wiring port:



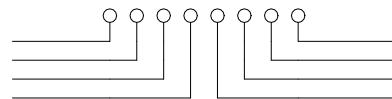
① Expansion module cables can be connected to the right of the host or other expansion modules.

② Interface of the expansion module.

③ DA conversion wiring terminal.

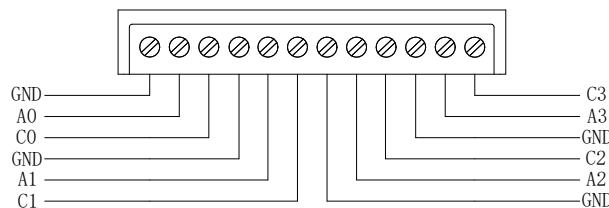


④ Indicator light.

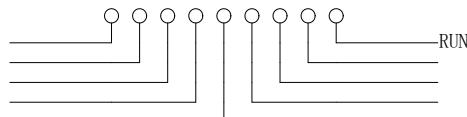


➤ The indicator light here is undefined

⑤ AD conversion wiring terminal port. The definition is as follows:



⑥Indicator light



Power, error and operation indicators:

Indicator status	instructions
ON	Running normally
FLICKER	Running error
OFF	Abnormal power supply

3.4 Terminal definition:

Terminal	Signal name
C0	Channel 0 current analog input (0-20mA)
A0	Channel 0 voltage analog input (0-5V, 0-10V, ± 10V can be selected by software)
V0	Channel 0 voltage analog output (0-5V, 0-10V, ± 10V can be selected by software)
C1	Channel 1 Current analog input (0-20mA)
A1	Channel 1 voltage analog input 0-5V, 0-10V, ± 10V can be selected by software

V1	Channel 1 voltage analog output (0-5V, 0-10V, \pm 10V can be selected by software)
C2	Channel 2 Current analog input (0-20mA)
A2	Channel 2 voltage analog input (0-5V, 0-10V, \pm 10V can be selected by software)
V2	Channel 2 voltage analog output (0-5V, 0-10V, \pm 10V can be selected by software)
C3	Channel 3 current analog input (0-20mA)
A3	Channel 3 voltage analog input (0-5V, 0-10V, \pm 10V can be selected by software)
V3	Channel 3 voltage analog input (0-5V, 0-10V, \pm 10V can be selected by software)
3V	3.3V output
GND	Analog ground

3.5 Functional specification

Analog input (AD) section	The input voltage	Current input
Analog input range	0-5V、0-10V、 \pm 10V	0-20mA
Maximum input range	\pm 15V	0-40mA
Digital output range	A 12-bit binary number (0-4095)	A 12-bit binary number (0-4095)
The input impedance	56K Ω	249 Ω
Combined accuracy	\pm 1%	
The response time	/channel	
Isolation method	Analog and digital quantities are isolated	

Analog output (DA) section	The output voltage
Analog output range	0-5V、0-10V、 \pm 10V
Digital input range	A 12-bit binary number (0-4095)

Output impedance	100 Ω
The response time	/channel
Isolation method	Analog and digital quantities are isolated

Chapter IV PT100 input expansion module

4.1 Basic concept of platinum temperature sensing resistor (PT100)

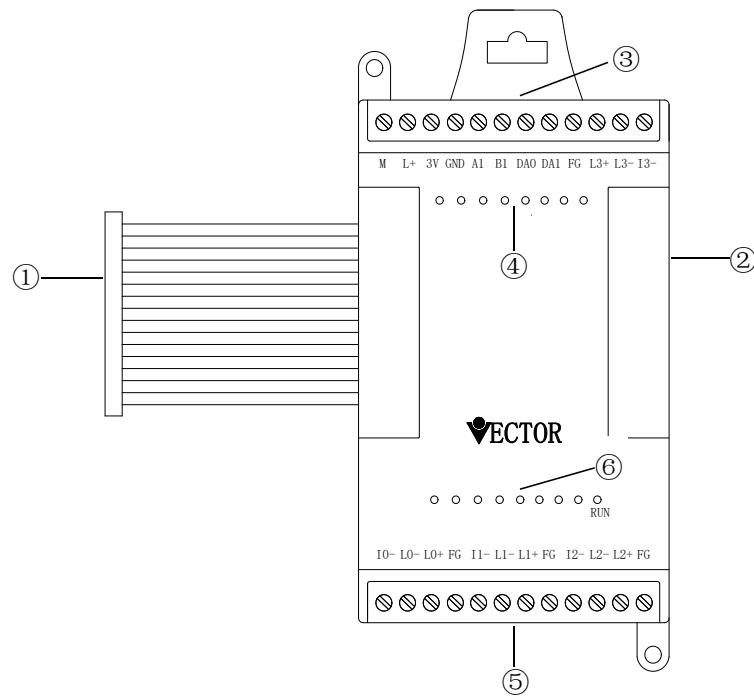
Platinum temperature resistance has high accuracy and stability, and has good linearity between -200°C and 600°C. The temperature coefficient of Platinum PT100 temperature sensing resistance is large at low temperature -200°C~100°C ;It has good linearity between 100°C and 300°C;The temperature coefficient decreases at 300°C~500°C.The 100 after PT indicates that it has a resistance of 100 ohms at 0°C and about 138.5 ohms at 100 °C.The 100 after PT indicates that it has a resistance of 100 ohms at 0°C and about 138.5 ohms at 100°C.

Platinum PT100 temperature resistance should be used to avoid too large working current, in order to reduce self heating,Therefore, its rated current can be limited to less than 2mA.Because platinum PT100 self heating 1mW causes the temperature change of 0.02°C~0.75°C, so reducing the current of platinum PT100 can also reduce its temperature change.However, if the current is too small, it is susceptible to noise interference, so the current of platinum PT100 is generally limited to 0.5mA~2mA.

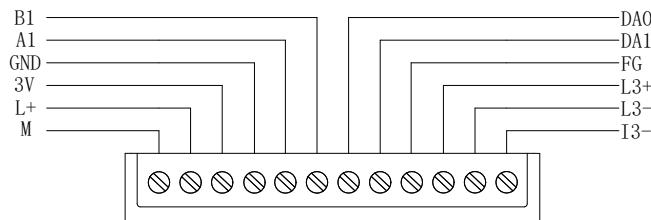
4.2 Product introduction

The PT series extension module of VECTOR can accept external four-way three-wire PT100 input module, temperature range -200~+600°C, 1mA constant current source drive, 0.1 °C comprehensive measurement accuracy.

4.3 Product appearance and each department introduction

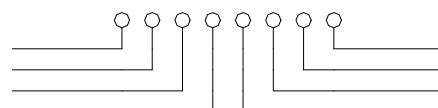


- ① Expansion module cables can be connected to the right of the host or other expansion modules.
- ② Interface of the expansion module.
- ③ PT100 conversion wiring terminal.



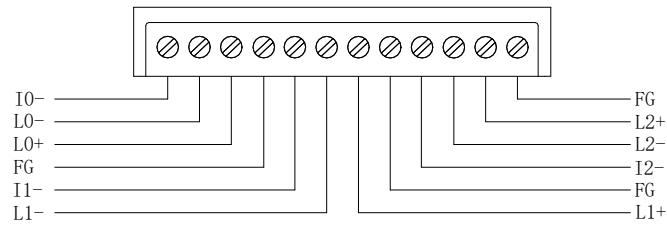
➤The 24V and COM of this terminal are connected to the 24V and COM of the host.
Just only need to connect one of these terminals

- ④ Indicator light

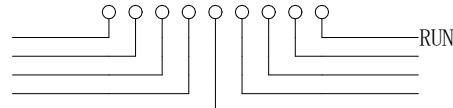


➤The indicator is undefined

⑤Terminal port



⑥Indicator light



Power, error and operation indicators:

Indicator status	instructions
ON	Running normally
FLASH	Runtime error
OFF	Abnormal power supply

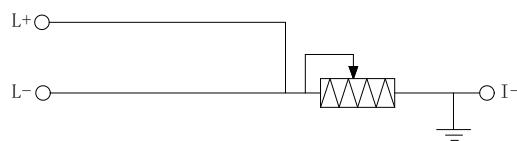
4.4 Terminal definition

Terminal	The signal name
L0+	
L0-	PT100 input of channel 0
I0-	PT100 input common end of channel 0
L1+	
L1-	PT100 input of channel 1
I1-	PT100 input common end of channel 1
L2+	
L2-	PT100 input of channel 2
I2-	PT100 input common end of channel 2
L3+	
L3-	PT100 input of channel 3
I3-	PT100 input common end of channel 3
DA0	PT100 voltage signal amplification and output
DA1	PT100 voltage signal amplification and

	output
A1	RS485 signals +
B1	RS485 signal -
3V	3.3 V output
GND	3.3V

4.5 Functional specifications:

Temperature measurement (4PT) section	instructions
Sensor type	3 line PT100 Ω
Drive current	1mA
Input temperature range	-200 ° C-600 ° C
Digital conversion range	K2000-K6000
Combined accuracy	$\pm 0.5\%$
Resolution	0.1 ° C
The response time	200ms/ channel
Isolation method	Analog and digital quantities are isolated
Communication mode (RS485)	Modbus RTU model, Communication baud rate 9600, data format8bit 、 Even、 1stop bit



For ordinary three-wire PT100, wiring mode can be distinguished according to wire color, Two wires of the same color can be randomly connected to L+ and L-, and the other end is connected to I-.

Chapter V Thermocouple input expansion module

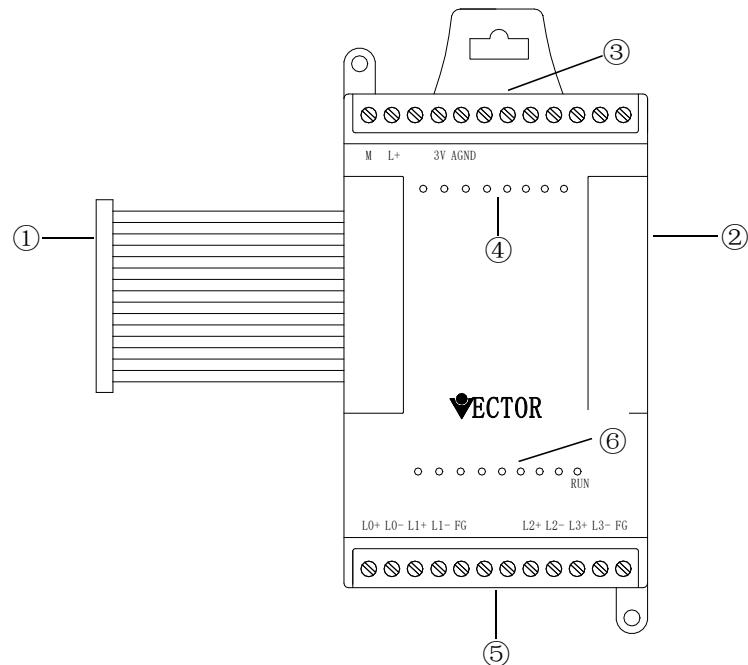
5.1 Basic concept of thermocouple temperature sensor

A thermocouple usually consists of two different semiconductor materials in a circuit. When the two ends are connected to each other, an electromotive force will be generated in the loop as long as the temperature at the two nodes is different. The direction and magnitude of the electromotive force are related to the material of the conductor and the temperature of the two nodes. The voltage signal produced by the electromotive force ranges from tens (uV) to thousands (uV), so a voltage amplification process is required in use. Thermocouple temperature sensing component is represented by differential voltage, which has eliminated external noise interference during internal calculation. Its characteristics are better than ordinary thermistors, resistance thermometers and so on, so it is widely used.

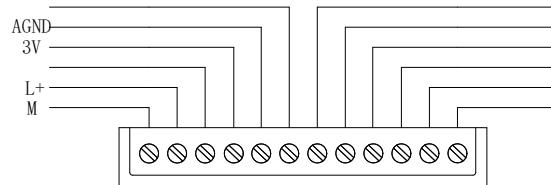
5.2 Product introduction

4TC thermocouple expansion module of VECTOR supports up to 8 types of thermocouples, breaking detection, can achieve 0.1°C measurement accuracy.

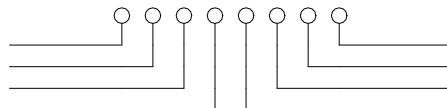
5.3 Product appearance and the introduction of each part



- ① Expansion module cables can be connected to the right of the host or other expansion modules.
- ② Interface of the expansion module.
- ③ Thermocouple power supply terminal.

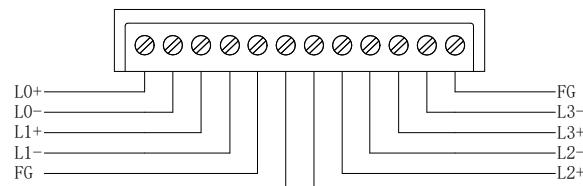


④ Indicator light

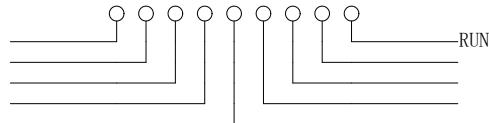


➤The indicator is undefined

⑤ Terminal port



⑥ Indicator light



Power, error and operation indicators:

Indicator status	instructions
ON	Running normally
FLASH	Runtime error
OFF	Abnormal power supply

5.4 Terminal definition

Terminal	The signal name
L0+	Thermocouple input of channel 0
L0-	
L1+	Thermocouple input of channel 1
L1-	
L2+	Thermocouple input of channel 2
L2-	
3V	3.3 V output
AGND	3.3V

Functional specifications:

Temperature measurement (4TC) part	instructions
Sensor type and temperature range	K type: 0° C-1300° C S type: 0° C-1700° C E type: 0° C-600° C N type: 0° C-1200° C B type: 0° C-1800° C T type: 0° C-400° C J type: 0° C-800° C R type: 0° C-1700° C
Digital conversion range	K type:K0-K13000 S type:K0-K17000 E type:K0-K6000 N type:K0-K12000 B type:K0-K18000 T type:K0-K4000 J type:K0-K8000

	R type:K0-K17000
Combined accuracy	±0.5%
resolution	0.1° C
The response time	200ms/channel
Isolation method	Analog and Digital isolation

Chapter VI Weighing expansion module

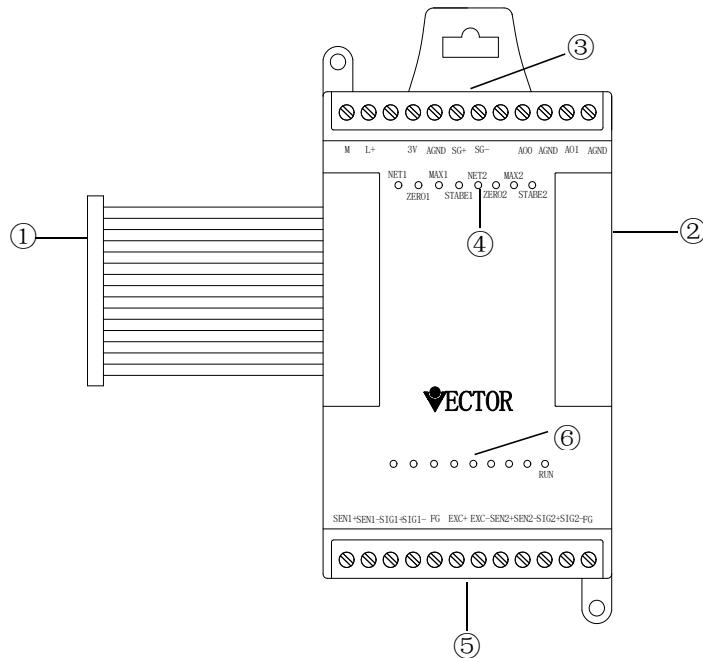
6.1 Basic concept of weighing

Metallic materials become thinner when subjected to tension or tension, the resistance value increases; otherwise, the resistance of a metal decreases when it is compressed, this type of sensor can convert pressure signals into electrical outputs and is usually used in situations of load, tension or pressure conversion.

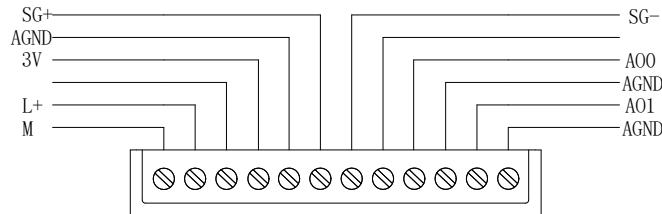
6.2 Product introduction

2WT weighing module of VECTOR has 2 inputs, Offers 24BIT high resolution, 4 - or 6-line input, multiple eigenvalues are optional; The response speed can be adjusted according to customer requirements, and can meet most applications in the market.

6.3 Product appearance and each department introduction

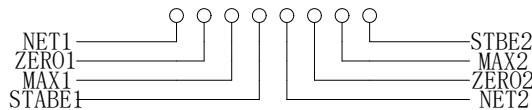


- ① Expansion module cables can be connected to the right of the host or other expansion modules.
- ② Interface of the expansion module.
- ③ Weighing wiring terminal port.



➤ The L+ and M of this terminal are connected to the L+ and M of the host. only need to connect one of these terminals.

- ④ Indicator light

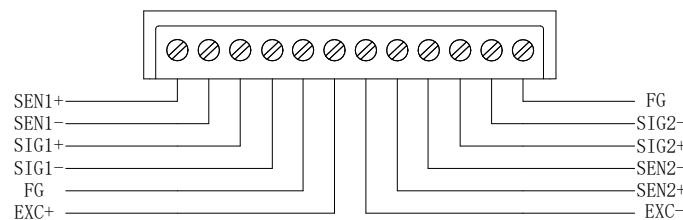


Indicator instructions:

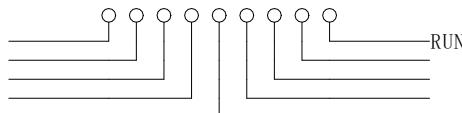
Name	Function
NET1	1 channel net weight / gross weight display (net weight on, gross weight off)
ZERO1	Zero weight display of channel 1
MAX1	1 channel weight upper limit display

STABE1	1 channel measurement stable display
NET2	2 channel net weight / gross weight display (net weight on, gross weight off)
ZERO2	1 channel measurement stable display
MAX2	2 channel weight upper limit display
STABE2	2-channel measurement stable display

⑤Terminal port.



⑥Indicator light



Power, error and operation indicators:

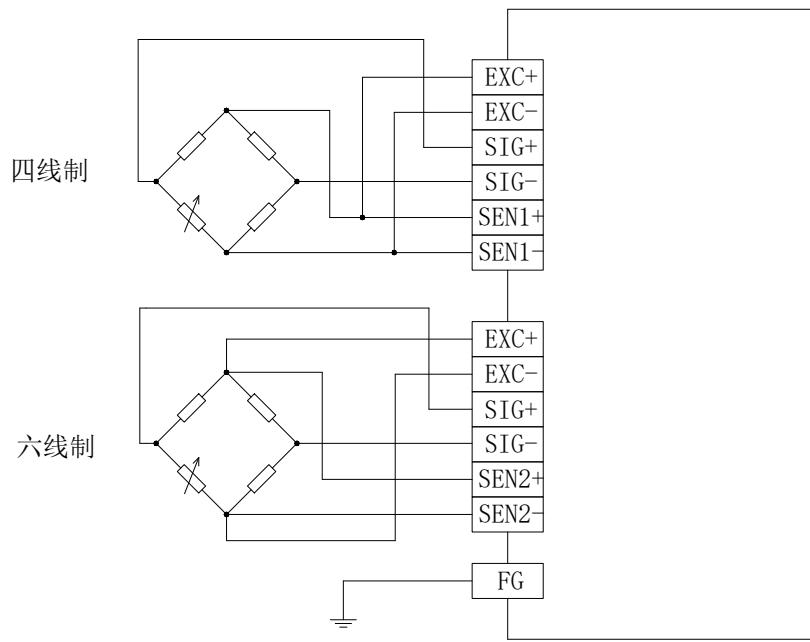
Indicator status	instructions
ON	Running normally
FLASH	Runtime error
OFF	Abnormal power supply

6.4 Terminal definition:

The name of the terminal	Definition
SEN1+	1 channel sensing voltage input positive terminal
SEN1-	1 channel sensing voltage input negative terminal
SIG1+	1 channel measuring voltage input positive terminal
SIG1-	1 channel measuring voltage

	input negative terminal
EXC+	The positive end of power output for pressure sensor is 3.3V
EXC-	Power output negative terminal 0V for pressure sensor
SEN2+	2-channel sensing voltage input positive terminal
SEN2-	2-channel sensing voltage input negative terminal
SIG2+	2-channel measuring voltage input positive terminal
SIG2-	2-channel measuring voltage input negative terminal
SG+	RS485+
SG-	RS485-
AO0	1 channel sensor voltage amplification and output
AO1	2 channel sensor voltage amplification and output
3V	3.3V output
AGND	3.3V ground
FG	Ground

6.5 Schematic diagram of external wiring:



6.6 Functional specifications:

Weighing module (2WT)	instructions
Input signal range	0-110mVDC
Sensor eigenvalue	1mV/V、2mV/V、4mV/V、8mV/V、16mV/V、32mV/V,The six eigenvalues can be selected by software configuration
Internal resolution	24bit
Communication interface	RS-485
Suitable for sensor type	4 wire or 6 wire
reaction time	2ms、10ms、20ms、40ms、100ms,The four response times can be selected by software configuration
Maximum output current	3.3VDC 150mA
Dynamic value filtering	10%-50% can be selected by software configuration
average function	1-100 times Can be selected by software configuration
Isolation method	Analog and Digital isolation