VC Series
Expansion Module
User Manual

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Chapter 1 Expansion module

1.1 Expansion module model description

1.1.1 I/O Terminal Expansion module

EX	-	IO01-STM
①		②

Identification	Specifications	Specific content
①	Part code	EX: Expansion module
②	Expansion module type	I001-STM: Standard IO Expansion module MCU edition

1.1.2 Bus communication Expansion module

EX	-	EC
①		②

Identification	Specification	Specific content
①	Part code	EX: Expansion module
②	Expansion module type	EC: EtherCAT communication protocol PN: ProfiNet communication protocol

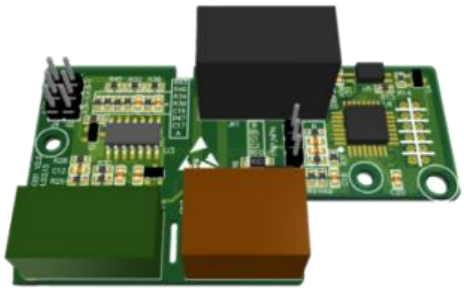
1.1.3 Encoder communication expansion module

EX	-	PGIP
①		②

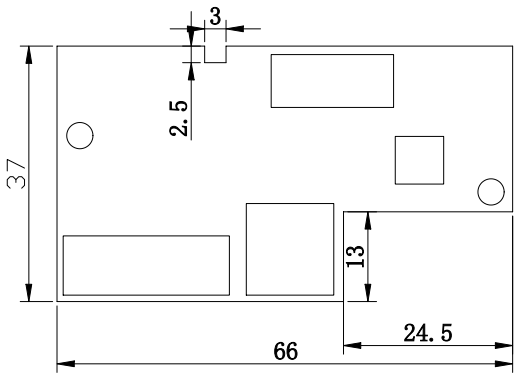
Identification	Specification	Specific content
①	Part code	EX: Expansion module
②	Expansion module type	PGIP: Incremental photoelectric encoder PGRT: Rotary encoder

1.2 Specification of structural dimensions

VC series Expansion module In order to ensure the versatility of the whole series, the size of each type of Expansion module is compatible with the design, and its basic size and the installation and connection mode of the inverter body are consistent (external wiring cannot be maintained because of different external equipment and wiring cables). The basic structure size information is as follows:



Expansion module 3D model diagram

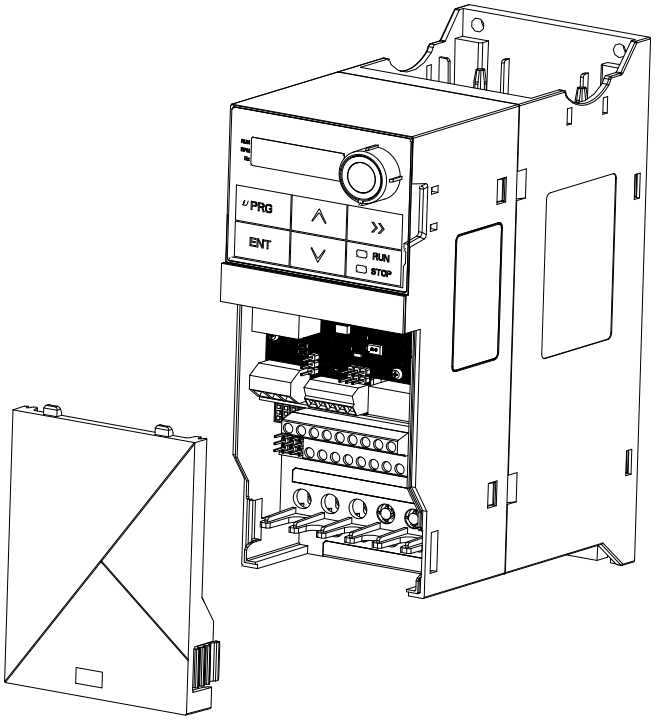


Expansion module main dimensions diagram

✎**Note:** 1. Due to different functional configurations, Expansion modules may differ in hardware device type, component layout, and type of external ports, as well as the required installation space and height. The required installation space and height may vary depending on the actual situation.

1.3 Expansion module installation instructions

VC series considers the use of ease of use. When using the Expansion module, the module is fixed in the relative position of the inverter product. The installation method can be referred to the following figure:



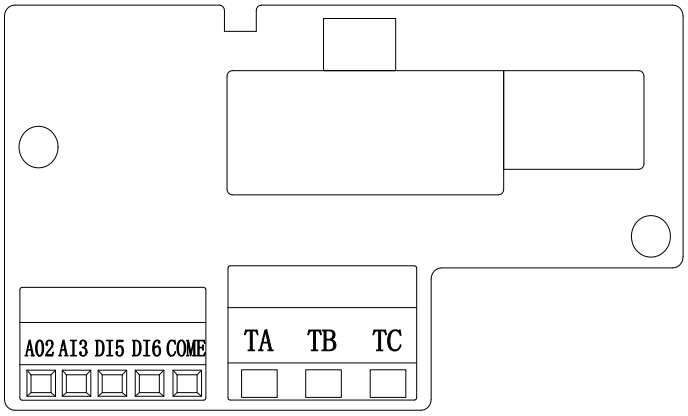
Operation process:

1. Be sure to disconnect the power supply of the inverter, and remove the wiring operation after the inverter is actually powered off to ensure the safety of the operator;
2. Open the lower wiring cover of the inverter;
3. Take out the selected expansion board from the package, make sure that the connector on the back of the expansion version is firmly inserted with the reserved connector expansion port on the VFD, and then use the screw accessories in the accessory bag to fix the Expansion module and the VFD;
4. Connect the corresponding external signal cable/industrial network cable to the corresponding port on the expansion version;
5. After making sure that the wiring is firm, close the lower wiring cover of the upper VFD again;
6. Turn on the power inverter power, communication can be used normally without abnormal.

1.4 Expansion module technical indicators

1.4.1 IO Expansion module

A.Terminal configuration and arrangement



No.	Terminal identification	Terminal function	Correlation description
1	AO2	Analog output	Voltage or current output can be switched via jumper cap Output voltage range: 0V-10V Output current range: 0mA - 20mA
2	AI3	Analog input	Can change the voltage&current output by the jumper cap Input range: DC0V - 10V/0mA - 20mA Input impedance: Voltage input 100kΩ, current input 500kΩ
3	DI5	Digital input	Optocoupler isolation Input impedance: 4kΩ Voltage range when level input: 9V to 30V
4	DI6	Digital input	
5	COME	Granding	Same as COM with inverter
6	TA-TB	Relay normally closed	Contact drive capability AC 250V,3A, COSø=0.4; DC 30V, 1A
7	TA-TC	Relay normally on	

B.VFD parameter setting

Function code	Name	Set the scope and description	Factory default	Status	Communication address
F5.04	DI5 Terminal function selection	0: Non-function 1: Forward running (FWD) 2: Reverse running (REV) 3: Three-wire operation control 4: Forward rotation (FJOG) 5: Reverse motion(RJOG) 6: Terminal UP 7: Terminal DOWN 8: Free Stop 9: Fault RESET(RESET) 10: The running stops 11: The external fault is normally turned on 12: Multi-speed command terminal 1 13: Multi-speed command terminal 2 14: Multi-speed command terminal 3 15: Multi-speed command terminal 4 16: Acceleration and deceleration time select terminal 1 17: Acceleration and deceleration time select terminal 2 18: Frequency source switching (terminal, keyboard) 19: Reset the UP/DOWN setting 20: Run commands to switch terminals 21: Acceleration and deceleration prohibited 22: PID is suspended		●	0x0504
F5.05	DI6 Terminal function selection		0	●	0x0505

Function code	Name	Set the scope and description	Factory default	Status	Communication address
		23: The PLC status is reset 24: Pendulum pause 25: Counter input 26: The counter reset 27: Length count input 28: The length is reset 29: Torque control prohibited 30: PULSE pulse input (only DI4 valid) 31: Reservations 32: Immediate DC braking 33: The external fault is normally closed 34: Reserved 35: The direction of PID action is reversed 36: External parking terminal 1 37: Control command switching terminal 38: PID integration pause terminal 39: Main frequency source and preset frequency switching terminal 40: Auxiliary frequency source and preset frequency switching terminals 41: Reserved 42: Reserved 43: PID parameter switching terminal 44: User-defined fault 1 45: User-defined fault 2 46: Speed control/torque control switch 47: Emergency stop			

Function code	Name	Set the scope and description	Factory default	Status	Communication address
		48: External parking terminal 2 49: Decelerate DC braking 50: The running time is cleared 51: Indicates that the function is enabled periodically 52: Periodic reset			
F5.38	Enter terminal valid status setting 2	0: Active low 1: Active high LED bits: D5 terminal LED ten: D6 terminal	0	●	0x0526
F5.39	Enter terminal valid status setting 3	0: The low level is valid 1: The high level is valid LED hundred: AI3	0	●	0x0527
F5.40	Analog input curve selection	0: Straight line (default) 1: Curve 1 2: Curve 2 Hundreds place: AI3	0	●	0x0528
F5.57	AI3 Select the DI terminal function	0: Non-function 1: Forward running (FWD) 2: Reverse running (REV) 3: Three-wire operation control 4: Forward rotation (FJOG) 5: Reverse motion(RJOG) 6: Terminal UP 7: Terminal DOWN 8: Free Stop 9: Fault RESET(RESET) 10: The running stops 11: The external fault is normally turned on 12: Multi-speed command terminal 1 13: Multi-speed command terminal 2		○	0x0539

Function code	Name	Set the scope and description	Factory default	Status	Communication address
		14: Multi-speed command terminal 3 15: Multi-speed command terminal 4 16: Acceleration and deceleration time select terminal 1 17: Acceleration and deceleration time select terminal 2 18: Frequency source switching (terminal, keyboard) 19: Reset the UP/DOWN setting 20: Run commands to switch terminals 21: Acceleration and deceleration prohibited 22: PID is suspended 23: The PLC status is reset 24: Pendulum pause 25: Counter input 26: The counter reset 27: Length count input 28: The length is reset 29: Torque control prohibited 30: PULSE pulse input (only DI4 valid) 31: Reserved 32: Immediate DC braking 33: The external fault is normally closed 34: Reserved 35: The direction of PID action is reversed 36: External parking terminal 1 37: Control command			

Function code	Name	Set the scope and description	Factory default	Status	Communication address
		switching terminal 38: PID integration pause terminal 39: Main frequency source and preset frequency switching terminal 40: Auxiliary frequency source and preset frequency switching terminals 41: Reserved 42: Reserved 43: PID parameter switching terminal 44: User-defined fault 1 45: User-defined fault 2 46: Speed control/torque control switch 47: Emergency stop 48: External parking terminal 2 49: Decelerate DC braking 50: The running time is cleared 51: Indicates that the function is enabled periodically 52: Periodic reset			
F5.59	AI3(Extension) Input selection	0: 0-10V 1: 4-20mA 2: 0-20mA 3: 0-5V 4: 0.5-4.5V	0		0x053B
F5.61	AI3(extended) lower limit	0 -F5.63	0.00V	○	0x053D
F5.62	AI3(extended) lower limit is set accordingly	-100.0% - +100.0%	0.00%	○	0x053E
F5.63	AI3(extended) Upper limit	F5.61 - +10.00V	10.00V	○	0x054F

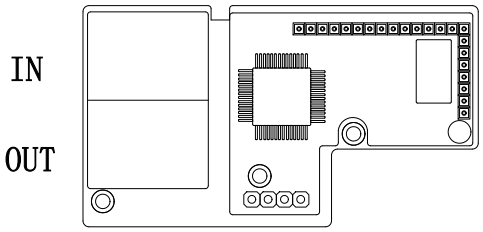
Function code	Name	Set the scope and description	Factory default	Status	Communication address
F5.64	AI3(extended) upper limit corresponds to the setting	-100.0% - +100.0%	100.00%	○	0x0540
F5.65	AI3(extended) filtering time	0.00-10.00s	0.10s	○	0x0542
F5.66	AI4(Extended) lower limit	0 - F5.68	0.00V	○	0x0543
F5.67	AI4(extended) lower limit is set accordingly	-100.0% - +100.0%	0.00%	○	0x0544
F5.68	AI4 (extended) Upper limit	F5.66 - +10.00V	10.00V	○	0x0545
F5.69	AI4(extended) upper limit corresponds to the setting	-100.0% - +100.0%	100.00%	○	0x0546
F5.70	AI4(extended) filtering time	0.00-10.00s	0.10s	○	0x0547
F6.03	Relay 2 Output selection (extended)	0: No output 1: The inverter is in operation. 2: Fault output (fault shutdown) 3: Frequency level detection FDT1 output 4: Frequency reaches 5: Zero speed running 1 6: Motor overload forecast alarm 7: inverter overload forecast alarm 8: Set meter value reached 9: The specified count value is reached. 10: Length reached 11: The PLC cycle is complete 12: The accumulated running time reaches 13: Reserved		-	0x0609

Function code	Name	Set the scope and description	Factory default	Status	Communication address
		14: Torque limit 15: Ready to run 16: AI1 > AI2 17: The upper frequency reaches 18: The lower limit frequency reaches 1 19: Output in undervoltage state 20: Communication control 21: Positioning completed (Reserved) 22: Positioning close (Reserved) 23: Zero speed running 2 24: The cumulative power-on time reaches 25: Frequency level detection FDT2 output 26: Frequency reaches 1 output 27: Frequency reaches 2 output 28: Current reaches 1 output 29: Current reaches 2 output 30: Timed to reach output 31: Reserved 32: Reserved 33: Running direction 34: Reserved 35: The module temperature reaches 36: Reserved 37: The lower limit frequency reaches 2 38: Fault output 2 39: Reserved 40: The running time			

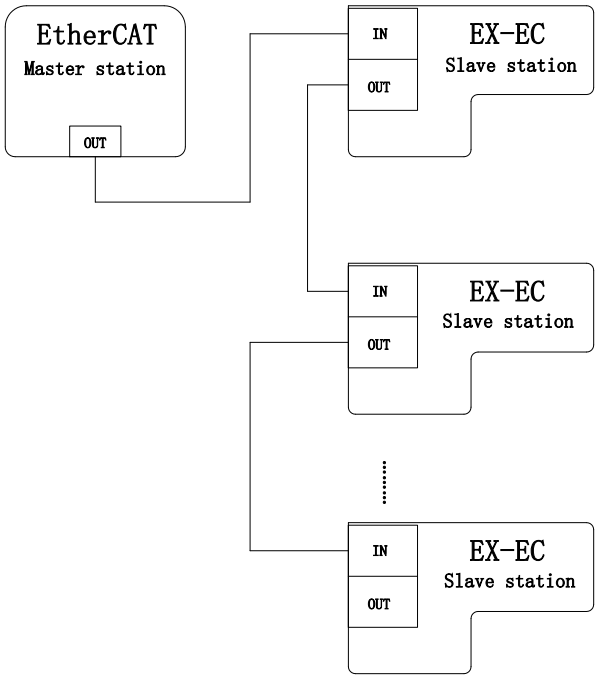
Function code	Name	Set the scope and description	Factory default	Status	Communication address
		arrives 41: User-defined output 1 42: User-defined output 2 43: Timer output 44: Running forward 45: Reverse running			
F6.25	Relay 2 on delay time	0.0s - 3600.0s	0.0s	○	0x0619
F6.29	Relay 2 disconnect delay time	0.0s - 3600.0s	0.0s	○	0x061D

1.4.3 EtherCAT Protocol bus communication

A.Terminal configuration and arrangement



B.The connection topology when multi-machine connections are used



C.EtherCAT Communication description

① EtherCAT Communication description: In DC mode, ensure that the DC is greater than or equal to 1ms and the synchronization period is less than 100ms. Otherwise, the EtherCAT communication module may report an error.

② Indicator status: LED5 blinks rapidly ---------- Normal communication
LED5 Blinking at a slow rate or the status does not change -------Disconnected

③ PDO description: The data in the PDO area realizes the real-time change and reading of the data from the master station to the inverter and periodic data interaction. The communication address of the data is directly configured by the VFD. These include:

●VFD control command and target frequency are given in real time

●The current status and running frequency of inverter can be read in real time.

●Real-time interaction of functional parameters and monitoring parameters between VFD and

EtherCAT master station.

The PDO process data mainly completes the periodic data interaction between the main station and the VFD. The interactive data is shown in the following table.PDO.

Master send PDO(0x1600)

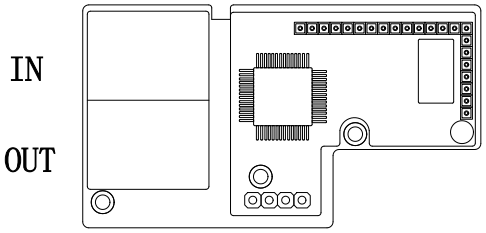
RPDO1	The command from AC Driver	01:Running forward 02: Running reverse 03:Positive turn point stop 04: Reverse the dots 05: Free stop 06: Slow down & stop 07: Reset the fault
RPDO2	AC Driver's target frequency	-10000~10000 (-10000 for -100% 10000 for 100%)

Master reception PDO(0x1A00)

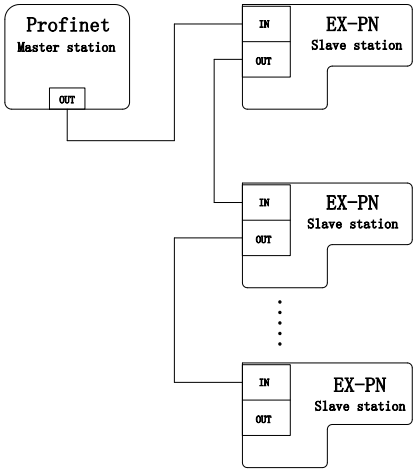
TPDO1	AC Driver state	01: Running forward 02: Running reverse 03: Standby 04: Fault 05: Under-voltage 06: Direction switching
TPDO2	Running frequency(Hz)	0.01Hz
TPDO3	Setting frequency(Hz)	0.01Hz
TPDO4	Bus voltage(V)	0.1V
TPDO5	Output voltage(V)	1V
TPDO6	Bus current(A)	0.1A
TPDO7	Output power(kW)	0.1%
TPDO8	Output torque(%)	0.1%
TPDO9	DI Input state	
TPDO10	DO Output state	

1.4.4 Profinet Protocol bus communication

A.Terminal configuration



B.The connection topology when multi-machine connections are used



C.Profinet communication description

① At present, Profinet protocol bus communication Expansion module supports PZD2/2,PZD4/4 message form.

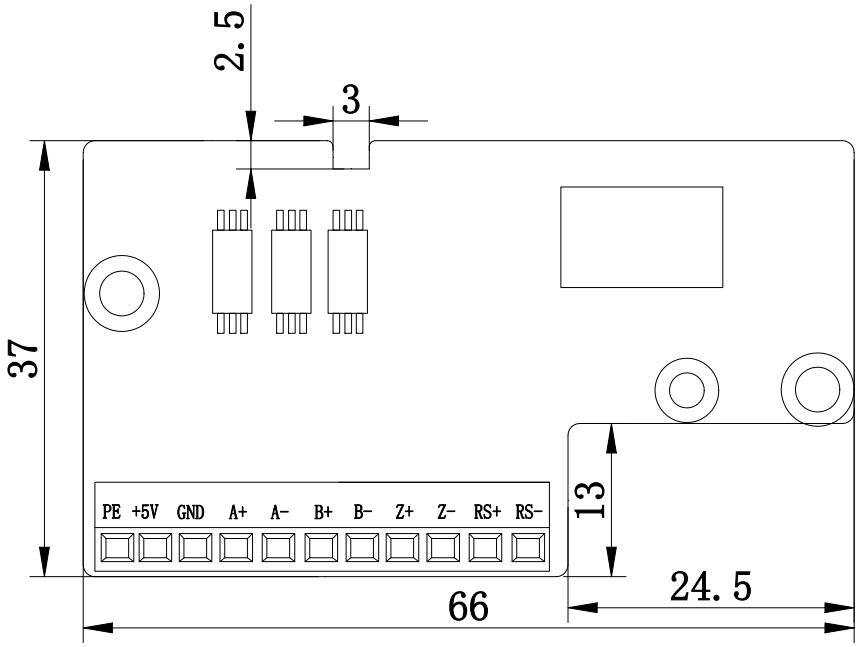
PZD2/2 fixed two monitoring parameters, one is the current Status of the inverter and Running Frequency, the other is the run command and set the start frequency.

PZD4/4 In addition to the two fixed monitoring parameters and setting parameters of PZD2/2, two sets of variable setting parameters and monitoring parameters are added. Users can add and modify them based on addresses.

※ If necessary, more parameters can be customized later.

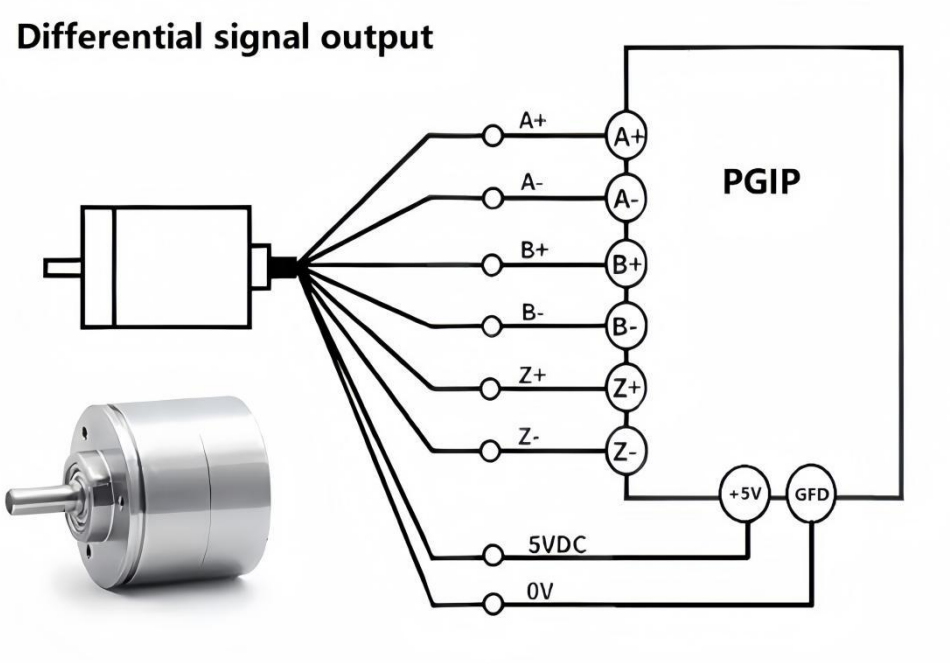
1.4.5 PGIP Incremental photoelectric encoder expansion module

A.Terminal configuration

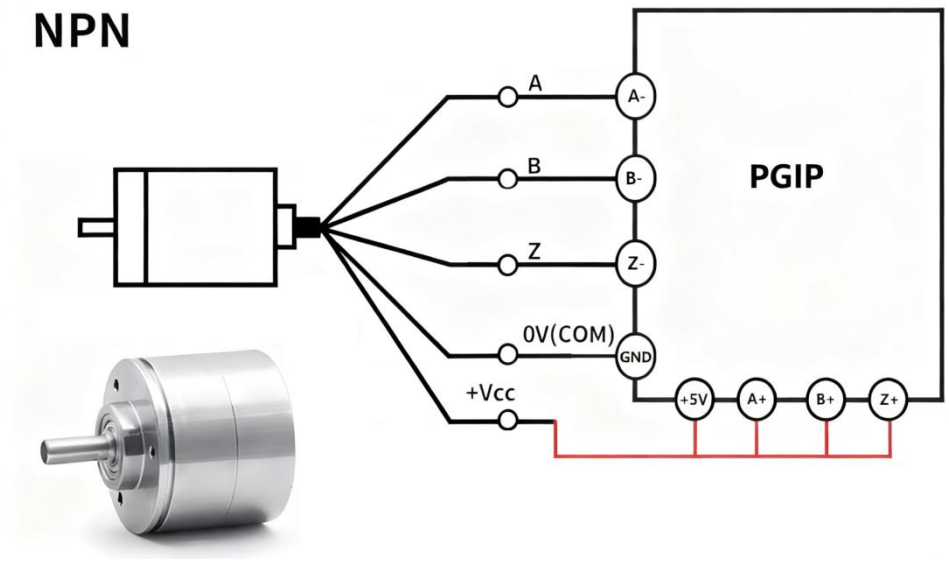


No.	Identification	Terminal function	Correlation description
1	PE	Grounding	Same as COM with inverter
2	+5V	5V Power Supply	Internal isolation of 5V power supply, ≤200mA, isolation scheme can significantly reduce the motor side to the encoder power supply interference.
3	GND	Grounding	It is the same as the GND delivered with the inverter
4	A+	Encoder A phase signal+	Connect to the A phase of the encoder. See remarks for connection of different output schemes
5	A-	Encoder A phase signal-	
6	B+	Encoder B phase signal+	Connect to the B phase of the encoder. See remarks for connection of different output schemes
7	B-	Encoder B phase signal-	
8	Z+	Encoder Z phase signal+	Connect to the Z phase of the encoder. See remarks for connection of different output schemes
9	Z-	Encoder Z phase signal-	

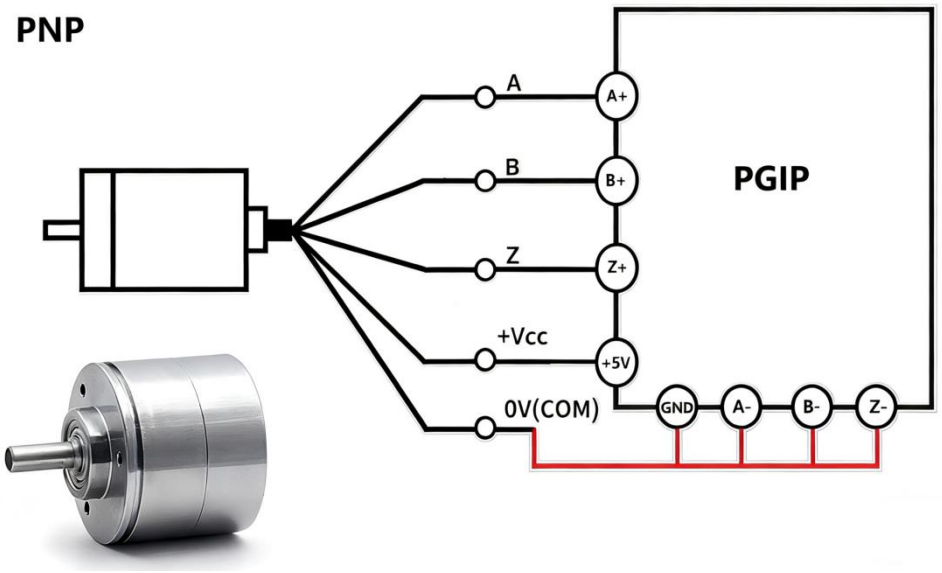
※For ABZ terminals, the encoder needs to connect the corresponding (+) (-) terminal for differential output;



If the encoder is also an NPN output, the corresponding (+) terminal needs to be short-circuited to the 5V terminal. The corresponding terminal of the encoder is connected to the Expansion module (-) terminal;



If the encoder is PNP output at the same time, the corresponding (-) terminal needs to be short-connected to the GND terminal. The corresponding terminal of the encoder is connected to the Expansion module (+) terminal;



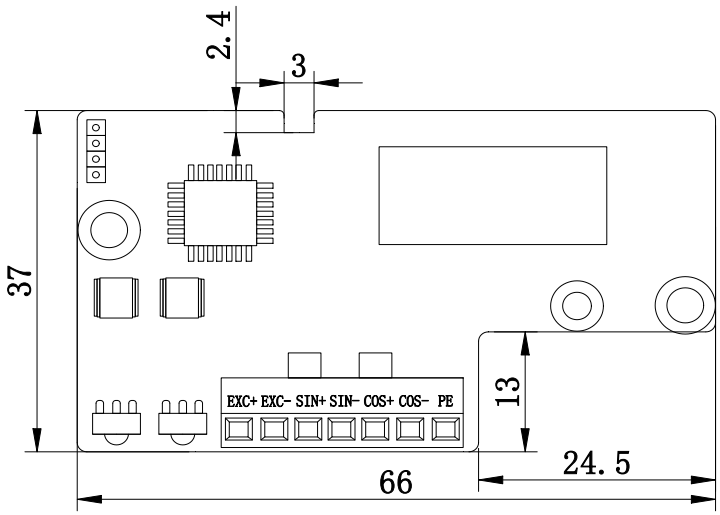
B.Related parameter setting

Function code	Name	Setting range & description	Factory default	Status	Communication address
F0.00	Motor control mode	0: Speed sensorless vector control(SVC) 1: V/F Control 2: Closed loop vector control(FVC)	1	●	0x0000
F2.00	Motor type	0: Asynchronous motor 1: Permanent magnet synchronous motor 2: Single-phase induction machine(FVC)	0	●	0x0200
F2.16	Speed feedback or encoder type	Units: encoder type 0: Ordinary ABZ encoder 1: Rotary encoder 2: UVW encoder 3: Provincial line UVW encoder Tens place: encoder direction 0: The direction is the same. 1: The direction is reversed. Hundred digit: line break detection 0: Off 1: Enable	0	●	0x0210

Function code	Name	Setting range & description	Factory default	Status	Communication address
		Thousands: Reserved			
F2.17	Number of wire in photoelectric encoder	0 - 60000	2500	●	0x0211
F2.18	PG break detection time	0.000 - 60.000s	0.100sec	○	0x0212
F2.19	Number of rotary encoder poles	2 - 128	2	●	0x0213
F2.20	Encoder mounting reduction ratio	0.100 - 50.000	1.000	●	0x0214
F2.21	Encoder filtering time	1 - 1000ms	10ms	●	0x0215
D0.50	Encoder feedback frequency	0.01Hz			0xD10A
D0.51	Encoder position				0xD10B
D0.52	Spin feedback data				0xD10C

1.4.6 PGRT Rotary resolver expansion module

A.Terminal configuration



No.	Identification	Terminal function	Description
1	EXC+	Excitation terminal +	Connected to the drive end of the rotary transformer, the standard version output is 6VRMS,10kHz, if other parameters need to be customized
2	EXC-	Excitation terminal -	
3	SIN+	Feedback segment +	Connected to the feedback end of the rotary transformer, the ratio is 1: 2
4	SIN-	Feedback segment -	
5	COS+	Feedback segment +	
6	COS-	Feedback segment -	
7	PE	Grounding	Ground terminal

B.Set related parameters

For parameter Settings, see 12.4.5 Parameter Settings of PGIP Incremental Optical Encoder Expansion module -B