D800 Series Bus Servo Drive

Simple Manual

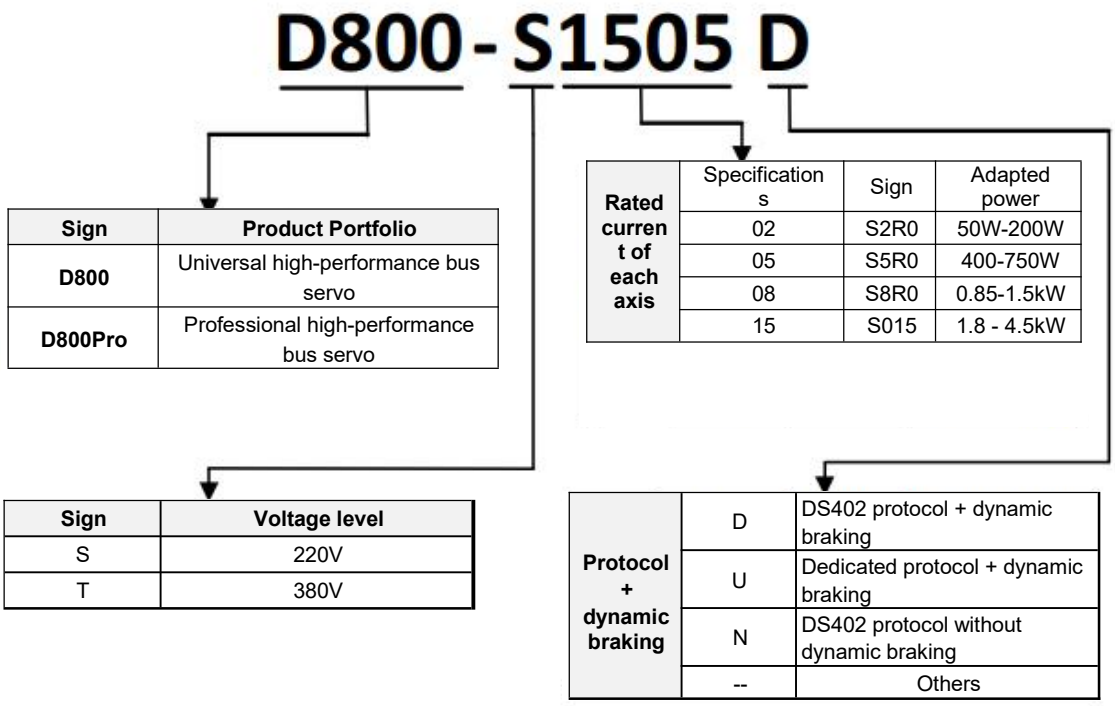
V1.4

Released: April 20, 2022

Chapter 1 Product Information

1.1Naming Rules

1.1.1Model Numbering Rules



Sign	Product Portfolio
D800	Universal high-performance bus servo
D800Pro	Professional high-performance bus servo

Rated current of each axis	Specifications	Sign	Adapted power
	02	S2R0	50W-200W
	05	S5R0	400-750W
	08	S8R0	0.85-1.5kW
	15	S015	1.8 - 4.5kW

Sign	Voltage level
S	220V
T	380V

Protocol + dynamic braking		
	D	DS402 protocol + dynamic braking
	U	Dedicated protocol + dynamic braking
	N	DS402 protocol without dynamic braking
	--	Others

Figure 1-1 Servo drive model description

1. The single-axis drive module has a power range of 50 W to 4.5 kW, and the dual-axis drive module has a total power of up to 4.5 kW.
2. The D800Pro is a professional high-performance bus servo drive equipped with dynamic braking as standard. The DS402 protocol supports Cyclic Synchronous Position (CSP) mode for robot control.

1.1.2Label Description

Figure 1-2 Servo drive label

Chapter 2 Wiring

2.1Servo Drive Terminal Definitions

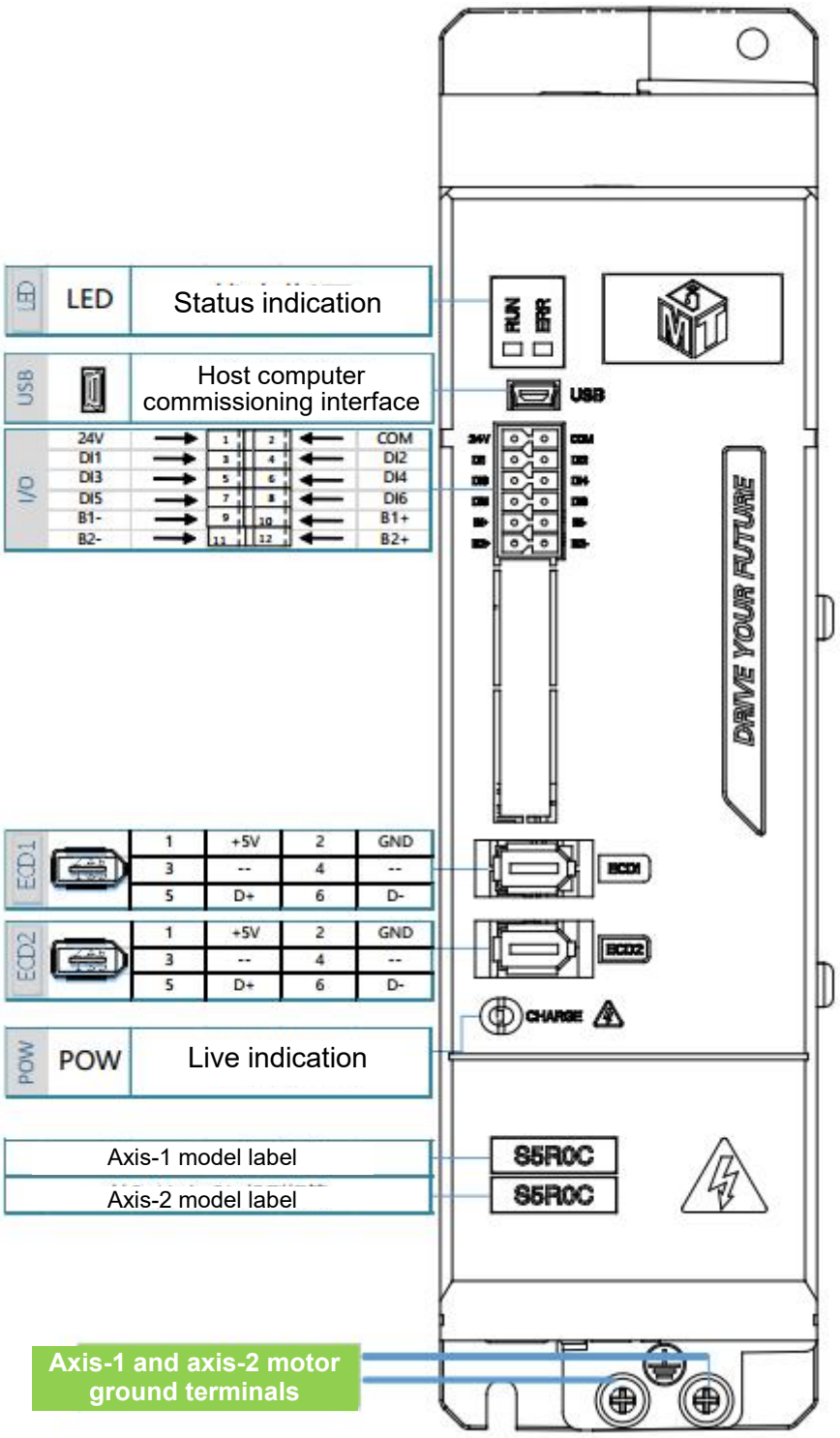


Figure 2-1 D800 servo drive terminals (front)

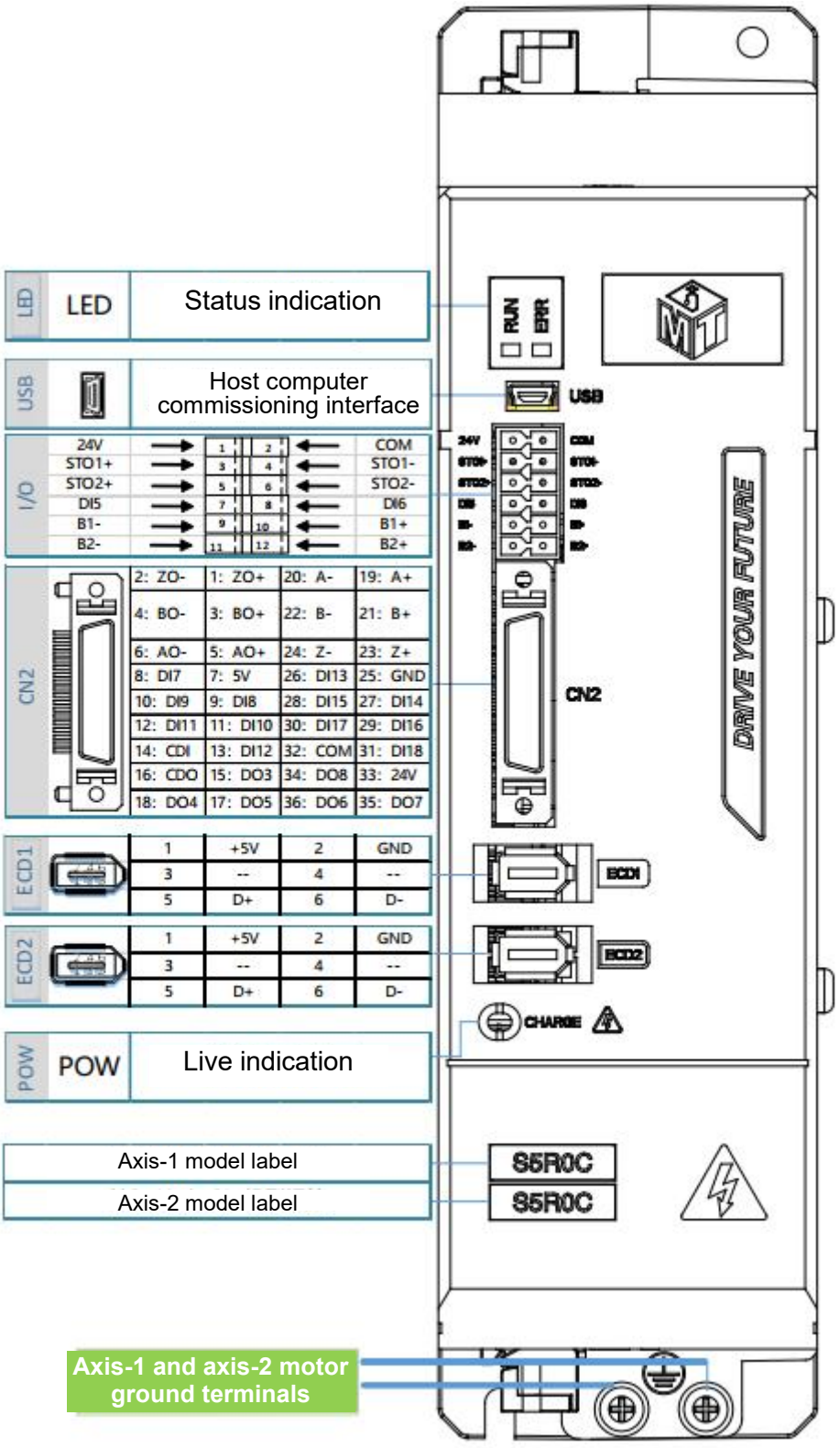


Figure 2-2 D800Pro servo drive terminals (front)

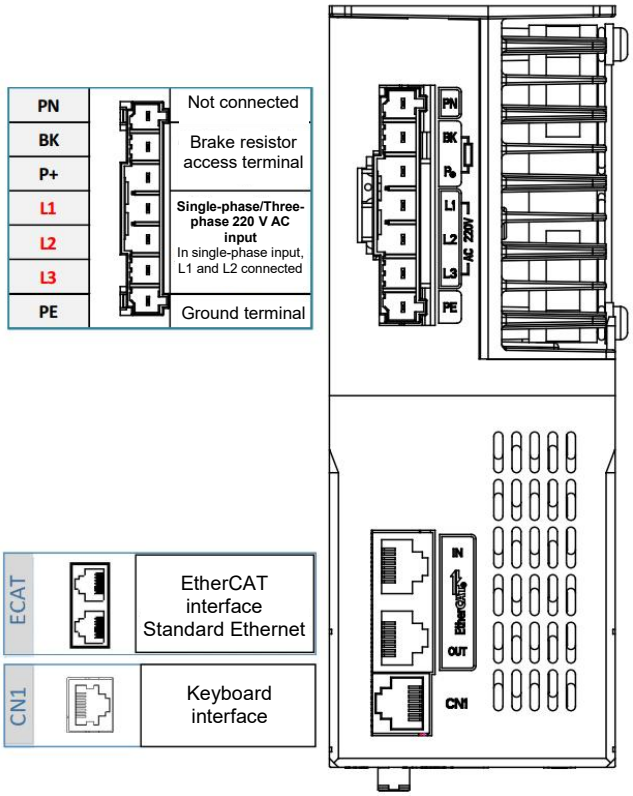


Figure 2-3 Servo drive terminals (top)

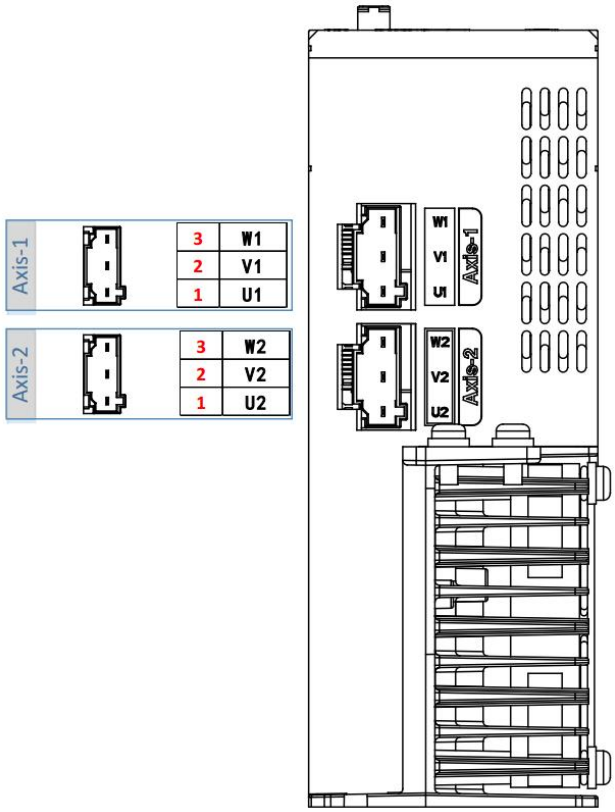


Figure 2-4 Servo drive terminals (bottom)

Note:

1. In the same drive module, ECD1 corresponds to Axis-1, and ECD2 corresponds to Axis-2.
2. The braking resistor resistance of the D800/D800Pro modular bus drive must be at least 20 ohms (20-30 ohms recommended). If the braking resistor resistance is less than 20 ohms, the braking IGBT will be damaged. The braking resistor power can be adjusted based on the overall braking duty cycle of the multi-axis system.

2.1.1Module Indicator Status Description

	ERR	RUN	CHARGE	
Indicator description	--	--	**Steady on**	The servo is powered.
	--	**Single flash**	--	The servo module axis 1 is ready
	--	**Double flash**	--	The servo module axis 2 is ready
	--	**Even flash**	--	All axes of the servo module are ready
	--	**Steady on**	--	The servo is enabled and running
	Single flash	--	--	The servo module axis 1 is not ready
	Double flash	--	--	The servo module axis 2 is not ready
	Even flash	--	--	Each axis of the module is not ready (check the power supply and encoder)
	Steady on	--	--	Fault

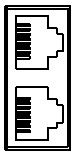
Note: '--' does not affect the current indication.

2.1.2Main Circuit Terminal Wiring

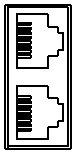
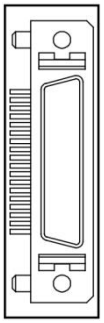
Position	Terminal marking	Terminal name	Function description	Position
Power supply terminal	PN	Reserved	**N/A**	Drive top
	BK	Braking resistor connection terminal （≥20Ω）	**External braking resistor access point**	
	P+			
	L1	Three-phase power supply input terminal	**AC single-/three-phase 220V 50/60Hz**	
	L2			
	L3			
	PE	Ground terminal	**Power supply ground terminal**	
Motor power cable terminal	U1	Axis 1 motor output terminals	**Servo motor connection:** Connect cables according to U, V, and W; otherwise, the motor may not work or may run out of control	Drive bottom
	V1			
	W1			
	PE	Ground terminal	Ground terminal of the motor	
	U2	Axis 2 motor output terminal	**Servo motor connection:** Connect cables according to U, V, and W; otherwise, the motor may not work or may run out of control	
	V2			
	W2			
	PE	Ground terminal	Ground terminal of the motor	
Warnin	**Do not connect the input power cable to the output U, V, W or input terminal of the**			

g	**braking resistor (BK, P+); otherwise, the drive will be permanently damaged!**

2.1.3D800 Control Circuit Terminal Functions

Terminal name	Function description	Terminal picture	Pin No.		Signal name	Remarks
ECAT	EtherCAT interface		1,2 3,4 5,6 7,8 --		RJ45 standard Ethernet port x2	Use a Cat 5 or higher cable
CN1	Keyboard interface		1,2 3,4 5,6		Dedicated for keypad commissioning	Use the company's special cable
USB	USB port		1,2 3,4		For the isolated USB module	Use a mini USB cable
CN5	Extended control terminal		1: 24V	2: COM	24 V drive input power supply, generally used as the operating power supply for digital inputs	
			3: DI1	4: DI2	Digital inputs 1-2	
			5: DI3	6: DI4	Digital inputs 3-4	
			7: DI5	8: DI6	Digital inputs 5-6	
			9: B1-	10: B1+	Digital optocoupler output 1	
			11: B2-	12: B2+	Digital optocoupler output 2	
ECD1	Motor 1 encoder interface		1		+5V	Encoder 5 V power supply
			2		GND	
			3,4		--	Pin reserved
			5		Data+	Encoder signal cable, twisted pair required
			6		Data-	
ECD2	Motor 2 encoder interface		1		+5V	Encoder 5 V power supply
			2		GND	
			3,4		--	Pin reserved
			5		Data+	Encoder signal cable, twisted pair required
			6		Data-	

D800Pro Control Circuit Terminal Functions

<table>
<tr><th>Terminal name</th><th>Function description</th><th>Terminal picture</th><th colspan="5">Pin No.</th><th>Signal name</th><th>Remarks</th></tr>
<tr><td rowspan="5">ECAT</td><td rowspan="5">EtherCAT interface</td><td rowspan="5">  </td><td colspan="5">1,2</td><td rowspan="5">RJ45 standard Ethernet port x2</td><td rowspan="5">Use a Cat 5 or higher shielded twisted-pair Ethernet cable</td></tr>
<tr><td colspan="5">3,4</td></tr>
<tr><td colspan="5">5,6</td></tr>
<tr><td colspan="5">7,8</td></tr>
<tr><td colspan="5">--</td></tr>
<tr><td rowspan="3">CN1</td><td rowspan="3">Keyboard interface</td><td rowspan="3">  </td><td colspan="5">1,2</td><td rowspan="3">Dedicated for keypad commissioning</td><td rowspan="3">Use the company's special cable</td></tr>
<tr><td colspan="5">3,4</td></tr>
<tr><td colspan="5">5,6</td></tr>
<tr><td rowspan="2">USB</td><td rowspan="2">USB interface</td><td rowspan="2">  </td><td colspan="5">1,2</td><td rowspan="2">For the isolated USB module</td><td rowspan="2">Use a mini USB cable</td></tr>
<tr><td colspan="5">3,4</td></tr>
<tr><td rowspan="6">CN5</td><td rowspan="6">Extended control terminal</td><td rowspan="6">  </td><td colspan="3">1: 24V</td><td colspan="2">2: COM</td><td colspan="2">24 V drive input power supply, generally used as the operating power supply for digital input terminals</td></tr>
<tr><td colspan="3">3: DI1</td><td colspan="2">4: DI2</td><td colspan="2">STO function</td></tr>
<tr><td colspan="3">5: DI3</td><td colspan="2">6: DI4</td><td colspan="2">STO function</td></tr>
<tr><td colspan="3">7: DI5</td><td colspan="2">8: DI6</td><td colspan="2">DI5-DI6: digital input 5-6</td></tr>
<tr><td colspan="3">9: B1-</td><td colspan="2">10: B1+</td><td colspan="2">digital optocoupler output 1</td></tr>
<tr><td colspan="3">11: B2-</td><td colspan="2">12: B2+</td><td colspan="2">Digital optocoupler output 2</td></tr>
<tr><td rowspan="8">CN2</td><td rowspan="8">D800 Pro dedicated port</td><td rowspan="8">  </td><td>2: ZO-</td><td>1: ZO+</td><td>20: A-</td><td>19: A+</td><td colspan="2">A+, B+, Z+, A-, B-, Z- pulse input</td></tr>
<tr><td>4: BO-</td><td>3: BO+</td><td>22: B-</td><td>21: B+</td><td colspan="2">AO+,BO+,ZO+,AO-,BO- ,ZO-pulse output</td></tr>
<tr><td>6: AO-</td><td>5: AO+</td><td>24: Z-</td><td>23: Z+</td><td colspan="2">DI7-DI18: digital inputs 7-18</td></tr>
<tr><td>8: DI7</td><td>7: 5V</td><td>26: DI13</td><td>25: GND</td><td colspan="2">CDI: input common terminal</td></tr>
<tr><td>10: DI9</td><td>9: DI8</td><td>28: DI15</td><td>27: DI14</td><td colspan="2">DO3-DO8: digital output 3-8</td></tr>
<tr><td>12: DI11</td><td>11: DI10</td><td>30: DI17</td><td>29: DI16</td><td colspan="2">CDO: output common terminal</td></tr>
<tr><td>14: CDI</td><td>13: DI12</td><td>32: COM</td><td>31: DI18</td><td colspan="2">GND, 5V: 5V output</td></tr>
<tr><td>16: CDO</td><td>15: DO3</td><td>34: DO8</td><td>33: 24V</td><td colspan="2">COM, 24V: NC (reserved)</td></tr>
<tr><td>18: DO4</td><td>17: DO5</td><td>36: DO6</td><td>35: DO7</td><td colspan="2"></td></tr>
</table>

ECD1	Motor 1 encoder interface		1	+5V	Encoder 5 V power supply
			2	GND	
			3,4	--	Pin reserved
			5	Data+	Encoder signal cable; twisted pair required
			6	Data-	
ECD2	Motor 2 encoder interface		1	+5V	Encoder 5 V power supply
			2	GND	
			3,4	--	Pin reserved
			5	Data+	Encoder signal cable; twisted pair required
			6	Data-	

2.2.1D800 Control Circuit Terminal (DI, DO) Wiring

- **When the DO (holding brake) control output current is less than or equal to 1.5 A, directly use the B1 and B2 outputs to control the motor holding brake**

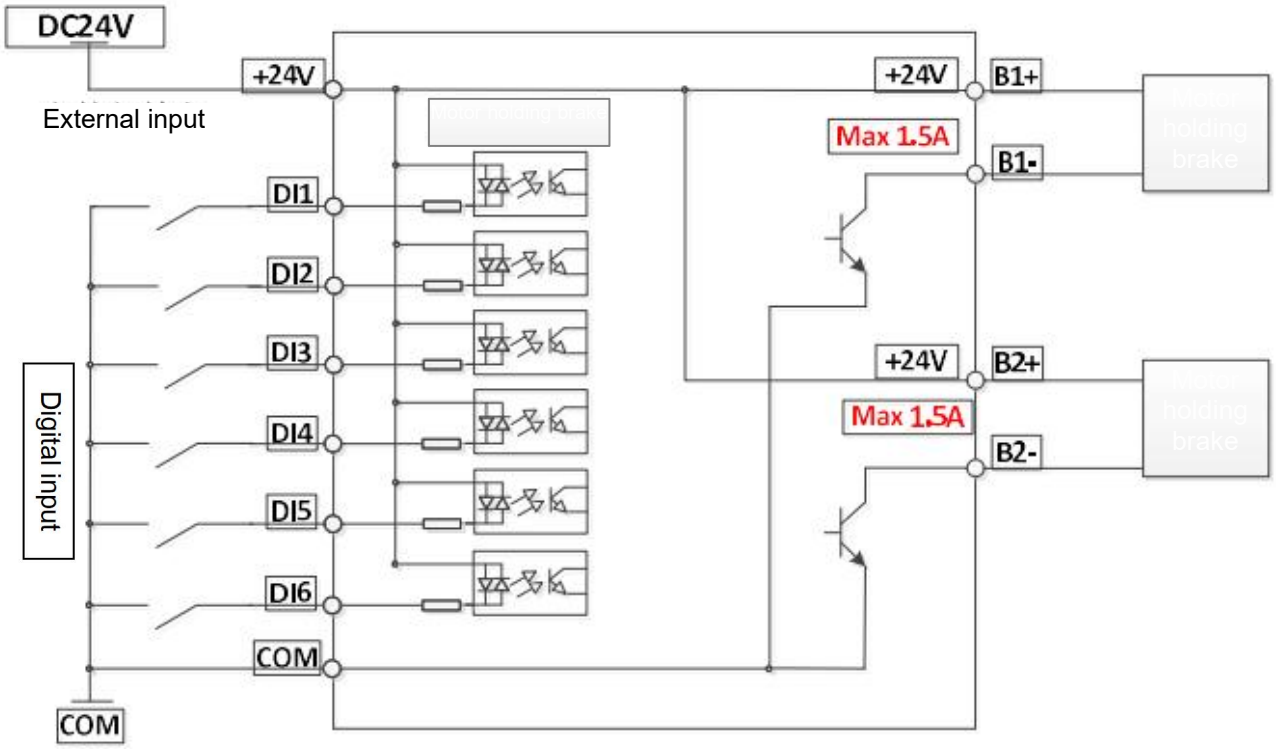


Figure 2-5 D800 digital input (DI) and output control (B1, B2) wiring diagram 1

- **When the DO (holding brake) control output current is greater than 1.5 A, use a relay to control the motor holding brake**

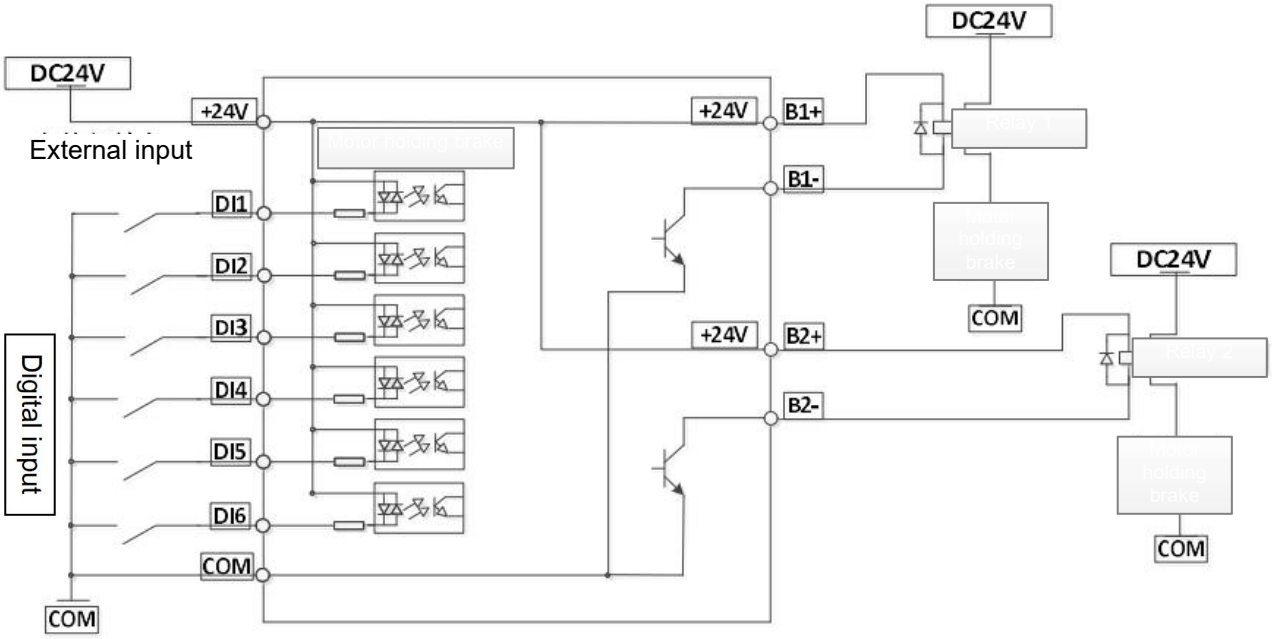


Figure 2-6 D800 digital input (DI) and output control (B1, B2) wiring diagram 2

D800Pro control circuit terminal (DI, DO) wiring

- **When the DO (holding brake) control output current is less than or equal to 1.5 A, directly use the B1 and B2 outputs to control the motor holding brake**

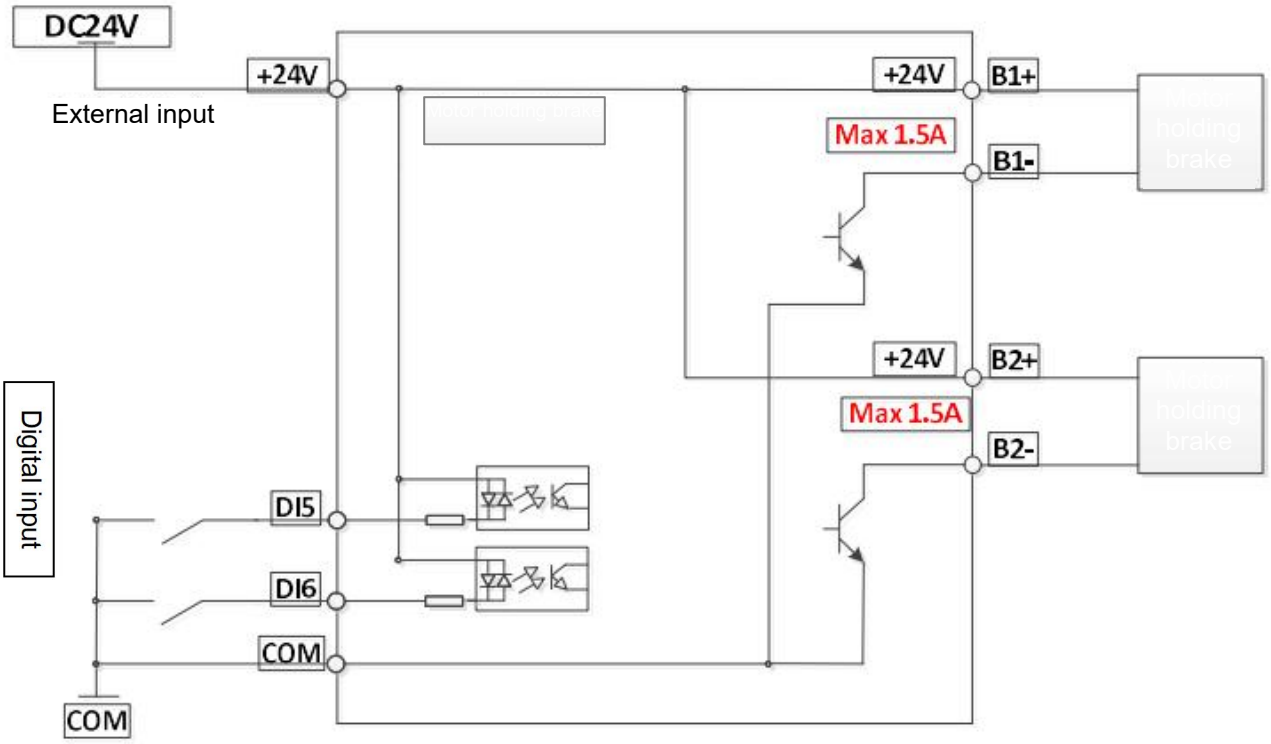


Figure 2-7 D800Pro digital input (DI) and output control (B1, B2) wiring diagram 1

- **When the DO (holding brake) control output current is greater than 1.5 A, use a relay to control the motor holding brake**

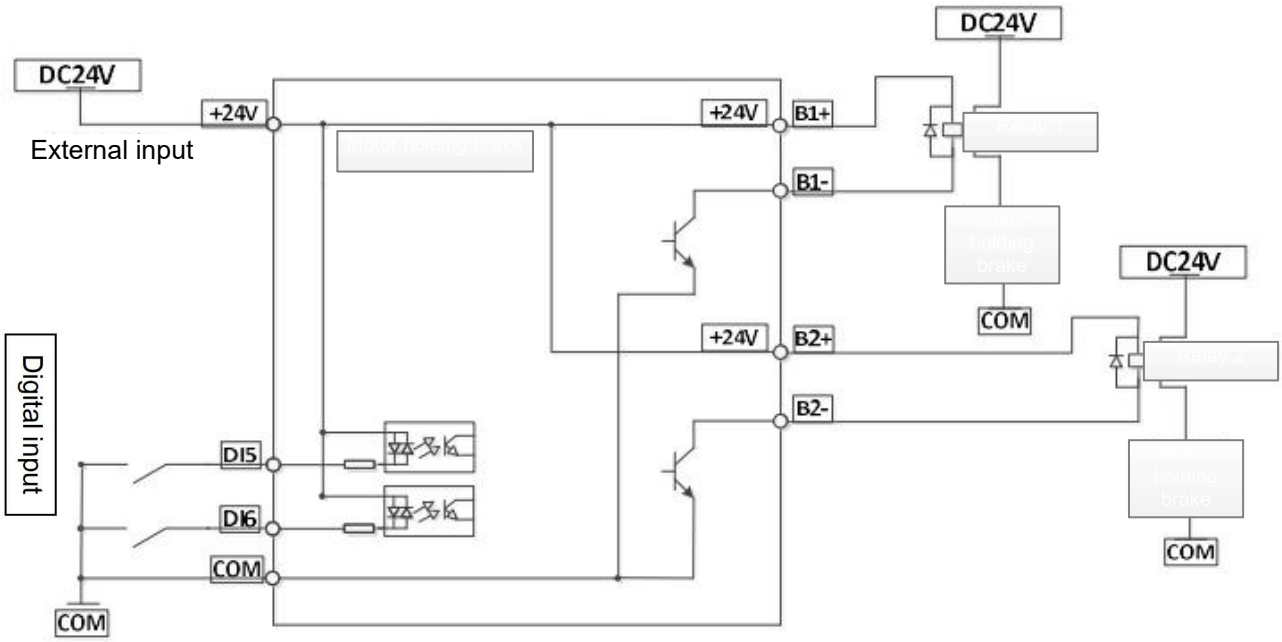


Figure 2-8 D800Pro digital input (DI) and output control (B1, B2) wiring diagram 2

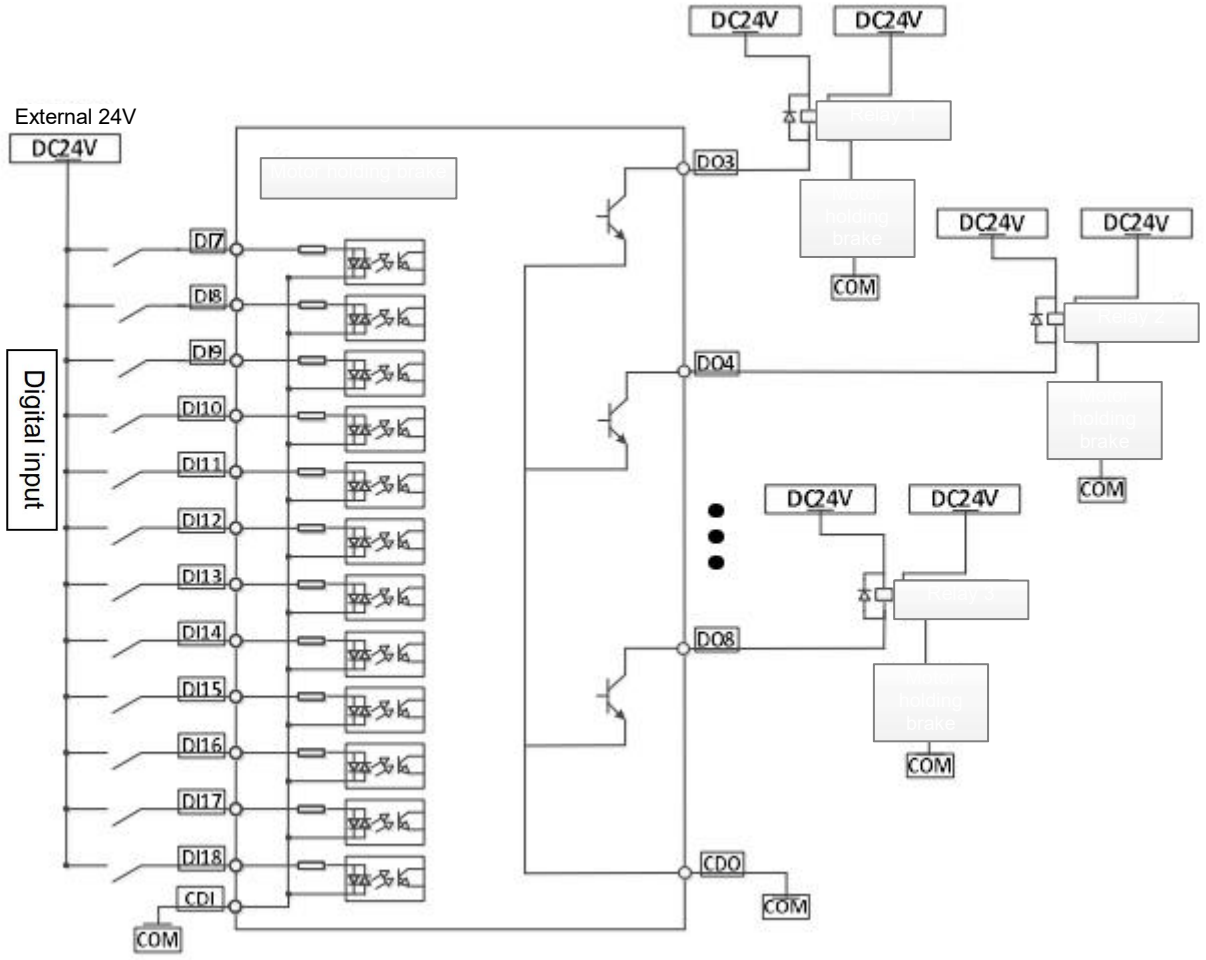


Figure 2-9 D800Pro digital input (DI) and output control (B1, B2) wiring diagram 3

Remarks: In Figure 2-9, CDI is the common terminal of DI input, and the internal optocoupler is bidirectional. It can be connected to COM or 24V based on signal requirements such as photoelectric switches.

D800Pro control circuit terminal (STO) wiring

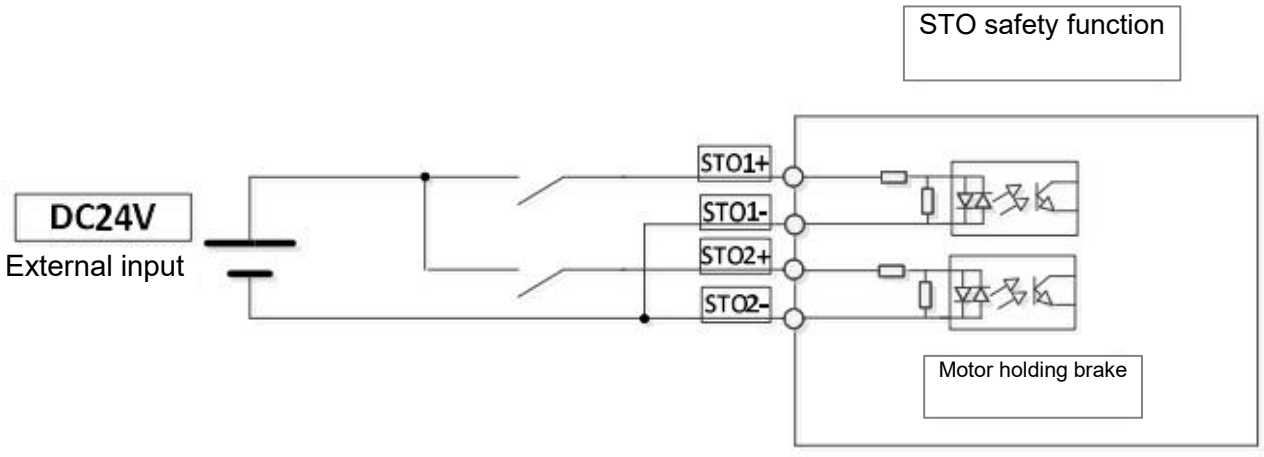


Figure 2-10 STO input control wiring diagram

D800Pro control circuit terminal (ABZ) wiring

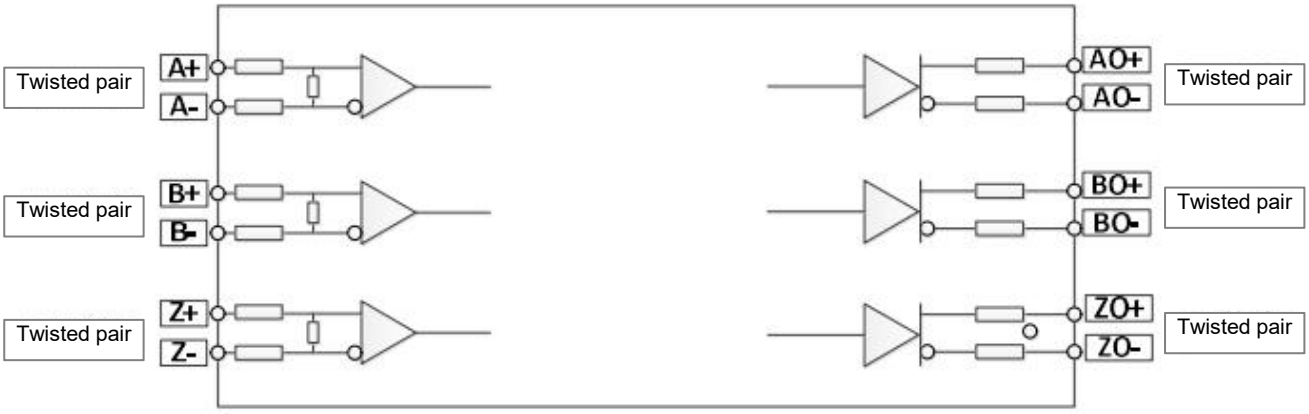
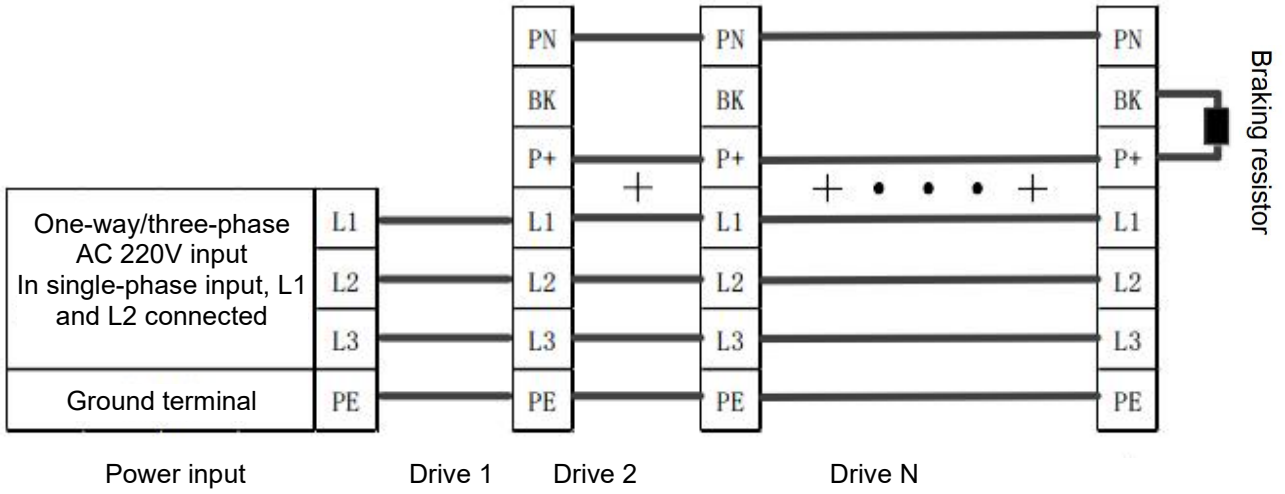


Figure 2-11 ABZ signal output/input control wiring diagram

D800 series power terminal common DC bus wiring diagram



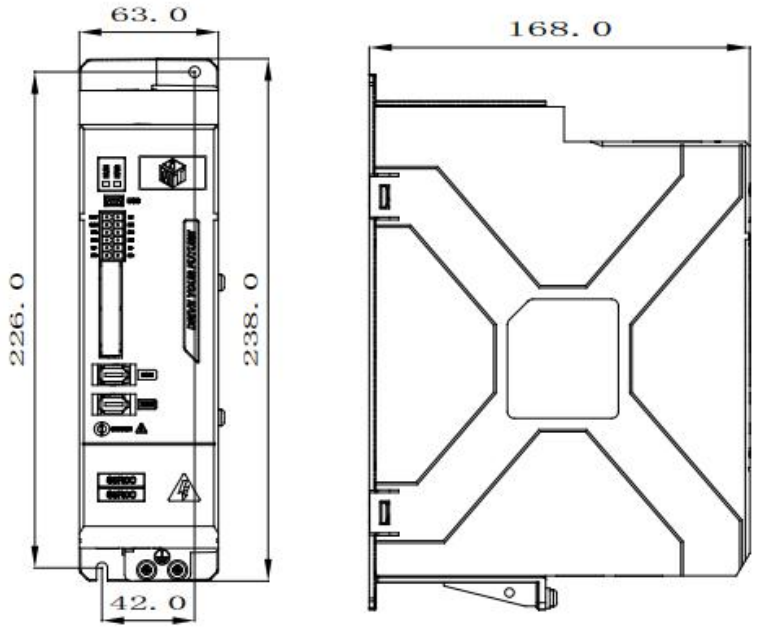
Note: When using the common DC bus connection method, only one braking resistor needs to be connected, but the L1, L2, L3 wires of all drive modules must be connected to the corresponding terminals and must not be crossed; otherwise, the drive will be damaged.

Figure 2-12 D800 series power terminal common DC bus wiring diagram

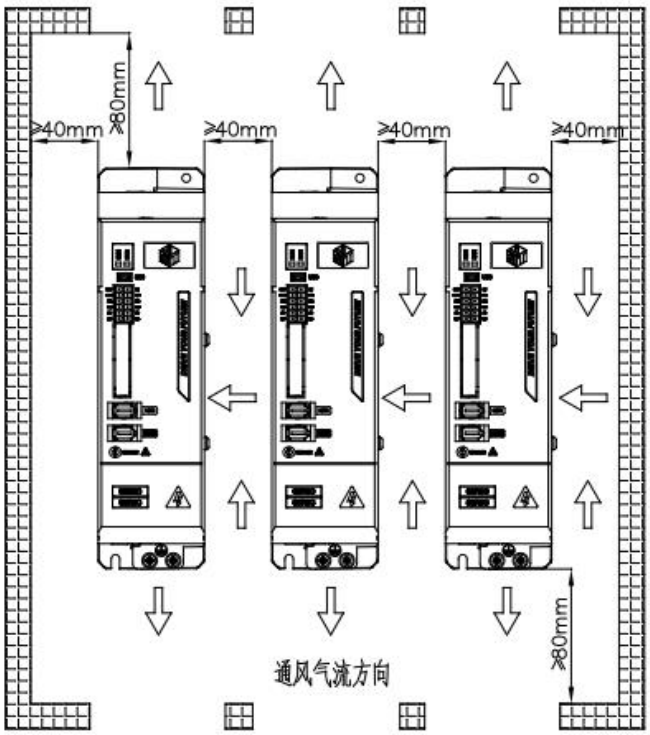
2.2.2 Communication Protocol Description

EtherCAT supports the DS402 protocol and the company's custom communication protocol (consult our technical support team). For the specific content of the communication protocol, see our D800 Series EtherCAT Communication Manual.

2.3Drive Installation Dimensions



2.4Cabinet Installation Drawing



Chapter 3 Function Codes

3.1 Function Codes

Axis 1 servo parameter group

Function code	Mapping address	Function code name	Content and scope	Resolution	Factory default	Attribute
PE00	0x2E00	Kernel version	1000-3000	1	☆	R
PE01	0x2E01	Drive model	2: S2R0 （1.5A）220V 3: S3R0 (3.0A) 220V (reserved model) 4: S5R0 （5.0A）220V 5: S8R0 （8.0A）220V 6: S015 （15A）220V 7-8: reserved 9: T012 (12A) 380V single 10: T020 (20A) 380V single	1	☆	R/■
PE02	0x2E02	Servo motor code	Motor ID: 1000-3500	1	--	■
PE03	0x2E03	Parameter management	**Ones digit and tens digit: reserved** **Hundreds digit: factory reset parameter** **0: no action** 1: Restore factory settings (automatically reset after completion) **Thousands digit: reserved**	1	0x0000	H/■
PE04	0x2E04	Reserved	--	--	--	--
PE05	0x2E05	Maximum speed threshold	0-6000rpm	1	4500	
PE06	0x2E06	Forward maximum torque limit	0-300%	1	300	
PE07	0x2E07	Reverse maximum torque limit	0-300%	1	300	
PE08	0x2E08	Motor direction logic	0: Forward CCW 1: Reverse CW	1	0	■
PE09	0x2E09	Encoder type setting	**Ones digit: encoder type** 0: Incremental, 1: Multi-turn absolute value type 2: Single-turn absolute value type **Tens and hundreds: reserved** **Thousands: motor code identification** 0: The motor code is not recognized. The PE02 value shall prevail 1: Automatically identify the motor code and write into PE02	1	1	H/■
PE10	0x2E0A	Control method	0: TRQ， 1:SPD， 2: POS， 3:EtherCAT	1	0	■
PE11	0x2E0B	Brake ON delay time	Delay after the Servo ON command before releasing the brake Delay time (100-500 ms)	1	100	■
PE12	0x2E0C	Standstill state, brake OFF-servo Serve OFF delay	Delay time (1-1000ms) from when the servo receives the Servo Off command to when the motor is not powered on	1	100	■
PE13	0x2E0D	Auxiliary gain	0-500%	1	0	
PE14	0x2E0E	Auxiliary gain type	0: Type A 1: Type B	1	0	
PE15	0x2E0F	Motor overload protection factor	10-100%	1	100	
PE17	0x2E11	Enable	0 : Servo OFF, 1 : Servo ON	1	0	■
PE18	0x2E12	External emergency stop shield	0: The external emergency stop is shielded 1: The external emergency stop is valid	1	0	■
PE20	0x2E14	Speed stiffness coefficient	Correlative adjustment speed gain 50%-300%	1	100	

PE21	0x2E15	Speed loop gain	The larger the response is, the faster the response will be. Vibration will result if the response is too large. 0-500	1	☆	
PE22	0x2E16	Speed loop integral time constant	The bigger the integral, the stronger the effect and the stronger the speed tracking ability. 0-300	1	☆	
PE23	0x2E17	Position loop gain	The larger the value, the faster the position tracking will be. Vibration will result if the value is too large. 0-100	1	12	
PE24	0x2E18	2nd speed loop gain	The larger the response is, the faster the response will be. Vibration will result if the response is too large. 0-500	1	1	
PE25	0x2E19	2nd speed loop integral time Constant	The smaller the integral, the stronger the effect and the stronger the speed tracking ability. 0-300	1	1	
PE26	0x2E1A	2nd position loop gain	The larger the value, the faster the position tracking will be. Vibration will result if the value is too large. 0-100	1	1.0	
PE27	0x2E1B	Torque speed function switch	**Ones digit: Speed feedforward selection** 0: Internal speed feedforward (PE28) 1: External command **Tens digit: Torque feedforward selection** 0: Internal torque feedforward 1: External command **Hundreds digit: multi-stage gain selection** 0: Default first group of gain parameters 1: Two sets of gains are switched according to (PE72, 73) **Thousands digit: torque limit selection** 0: Internal torque limiting (PE06,07) 1: External torque limiting-object dictionary 0x6072-axis 1	1	0x0000	H/■
PE28	0x2E1C	Speed feedforward gain	Increasing the value reduces the steady-state position deviation. If the value is too large, it will cause an overshoot of 0-100%.	1	0	
PE29	0x2E1D	Velocity feedforward smoothing filter constant	Smooth speed feedforward amount, in coordination with speed feedforward gain Adjust 0-64 damping coefficients	1	0	
PE30	0x2E1E	Damping coefficient	Position ring damping coefficient 50-500	1	100	
PE31	0x2E1F	DI1 function setting	Ones and tens digits: 00: No function 01-04: Reserved 05: Servo enable 06: Emergency stop 07: Axis 1 origin switch 08: Axis 2 origin switch 09: Axis 1 positive limit limit 0A: Axis 2 positive limit limit 0B: Axis 1 negative limit limit 0C: Axis 2 negative limit limit 0D: Axis 1 probe 1 0E: Axis 2 probe 1 0F: Axis 1 probe 2	1	0000	H/■

			10: Axis 2 probe 2 Hundreds: 0: Positive logic 1: Negative logic			
PE32	0x2E20	DI2 function settings	Same as PE31	1	0000	H/■
PE33	0x2E21	DI3 function settings	Same as PE31	1	0000	H/■
PE34	0x2E22	DI4 function setting (EMG)	Same as PE31	1	0000	H/■
PE37	0x2E25	DI terminal filter time	0-32ms	1	5	
PE38	0x2E26	Electronic gear selection	0: use the object dictionary 0x6091 to set the value 1: Use PE39 (high order) PE40 (low order) value	1	0	■
PE39	0x2E27	Position corresponding to one rotation of the motor Command pulse number (high order)	0-20000	1	0	■
PE40	0x2E28	Position corresponding to one rotation of the motor Command pulse number (low order)	0-9999	1	0	■
PE41	0x2E29	Moving average filtering constant	0-1024(x250us)	1	0	■
PE42	0x2E2A	First-order low-pass filtering constant	0-6000(x250us)	1	0	
PE49	0x2E31	Position deviation limit	0.1-50.0 circles	0.1	10.0	■
PE50	0x2E32	EtherCAT synchronization cycle	1-128 (x0.25ms)=[250us-32ms]	1	4	■
PE51	0x2E33	Quadrant bulge CCW orientation compensation Compensation	0-1000‰	1	0	
PE52	0x2E34	Quadrant bulge CW direction compensation Value	0-1000‰	1	0	
PE53	0x2E35	Quadrant bulge compensation delay	0-1000ms	1	0	
PE54	0x2E36	Quadrant bulge compensation filtering	0-100ms	1	0	
PE55	0x2E37	Gravity compensation value	0-1000‰	1	0	
PE56	0x2E38	Gravity compensation polarity	0: CCW direction compensation, 1: CW direction	1	0	
PE58	0x2E3A	Type A vibration suppression frequency	5-200Hz	1	50	
PE59	0x2E3B	Type A vibration suppression gain	0-300%	1	0	
PE61	0x2E3D	Speed mode keyboard settings PE10=1 is valid	0-6000rpm		0	
PE70	0x2E46	Speed (PE61) Polarity PE10=1 is valid	0: The speed is PE61 1: The speed is -PE61	1	0	
PE71	0x2E47	Servo adaptive rigidity	0-100 (prevent nodding during the enabling process with gravity or load)	1	30	
PE72	0x2E48	Group 1 gain speed inflection point	0-6000rpm	1	6000	
PE73	0x2E49	Group 2 gain speed inflection point	0-6000 rpm	1	6000	
PE93	0x2E5D	USB monitor interface enable	0: Disable the USB interface, 1: Enable the USB interface	1	1	

Axis 2 servo parameter group

Function code	Mapping address	Function code name	Content and scope	Resolution	Factory default	Attribute
PF00	0x2F00	Software version	0-65535	1	☆	R
PF01	0x2F01	Drive model	2: S2R0 （1.5A）220V 3: S3R0 (3.0A) 220V (reserved model) 4: S5R0 （5.0A）220V 5: S8R0 （8.0A）220V 6: S015 （15A）220V 7-8: reserved 9: T015 (15A) 380V single 10: T020 (20A) 380V single	1	☆	■
PF02	0x2F02	Servo motor code	Motor ID: 1,000-1,600	1	--	■
PF04	0x2F04	Reserved	--	--	--	
PF05	0x2F05	Maximum speed threshold	0-6000rpm	1	☆	
PF06	0x2F06	Forward maximum torque limit	0-300%	1	300	
PF07	0x2F07	Reverse maximum torque limit	0-300%	1	300	
PF08	0x2F08	Motor direction logic	0: Forward CCW 1: Reverse CW	1	0	■
PF09	0x2F09	Encoder type setting	**Ones digit: encoder type** 0: Incremental, 1: Multi-turn absolute value type 2: Single-turn absolute value type **Tens and hundreds: reserved** **Thousands: motor code identification** 0: The motor code is not recognized. The value of PF02 shall prevail 1: Automatically identify the motor code and write it into PF02	1	1	H/■
PF10	0x2F0A	Control method	0: TRQ， 1:SPD， 2: POS， 3:EtherCAT	1	0	
PF11	0x2F0B	Brake ON delay time	Delay after the Servo ON command before releasing the brake Delay time (100-500 ms)	1	100	■
PF12	0x2F0C	Standstill state, brake OFF-servo Serve OFF delay	Delay time (1-1000ms) from when the servo receives the Servo Off command to when the motor is not powered on	1	100	■
PF13	0x2F0D	Auxiliary gain	0-500%	1	0	
PF14	0x2F0E	Auxiliary gain type	0: Type A 1: Type B	1	0	
PF15	0x2F0F	Motor overload protection factor	10-100%	1	50	
PF17	0x2F11	Enable	0 : Servo OFF， 1 : Servo ON	1	0	■
PF18	0x2F12	Module-related alarm settings	0: Module-related alarms are invalid 1: Module-related alarms are valid	1	0	■
PF20	0x2F14	Speed stiffness coefficient	Correlative adjustment speed gain 50%-300%	1	100	
PF21	0x2F15	Speed loop gain	The larger the response is, the faster the response will be. Vibration will result if the response is too large. 0-500	1	☆	
PF22	0x2F16	Speed loop integral time constant	The bigger the integral, the stronger the effect and the stronger the speed tracking ability.	1	☆	

			0-300			
PF23	0x2F17	Position loop gain	The larger the value, the faster the position tracking will be. Vibration will result if the value is too large. 0-100	1	12	
PF24	0x2F18	2nd speed loop gain	The larger the response is, the faster the response will be. Vibration will result if the response is too large. 0-500	1	☆	
PF25	0x2F19	2nd speed loop integral time Constant	The smaller the integral, the stronger the effect and the stronger the speed tracking ability. 0-300	1	☆	
PF26	0x2F1A	2nd position loop gain	The larger the value, the faster the position tracking will be. Vibration will result if the value is too large. 0-100	1	☆	
PF27	0x2F1B	Torque speed function switch	**Ones digit: Speed feedforward selection** 0: Internal speed feedforward (PF28) 1: External command **Tens digit: Torque feedforward selection** 0: Internal torque feedforward 1: External command **Hundreds digit: multi-stage gain selection** 0: Default first group of gain parameters 1: Two sets of gains are switched according to (PF72,73) **Thousands digit: torque limit selection** 0: Internal torque limiting (PF06,07) 1: External torque limiting-object dictionary 0x6872-axis 2	1	0x0000	H/■
PF28	0x2F1C	Speed feedforward gain	Increasing the value reduces the steady-state position deviation. If the value is too large, it will cause an overshoot of 0-100%.	1	0	
PF29	0x2F1D	Velocity feedforward smoothing filter constant	Smooth speed feedforward amount, in coordination with speed feedforward gain Adjust 0-64 damping coefficients	1	0	
PF30	0x2F1E	Damping coefficient	Position ring damping coefficient 50-500	1	100	
PF38	0x2F26	Electronic gear selection	0: Use the object dictionary 0x6891 to set the value 1: Use PF39 (high order) PF40 (low order) value	1	0	■
PF39	0x2F27	One motor rotation corresponds to the number of position command pulses (high order)	0-20000	1	0	■
PF40	0x2F28	One motor rotation corresponds to the number of position command pulses (low order)	0-9999	1	0	■
PF41	0x2F29	Moving average filtering constant	0-1024(x250us)	1	0	■

PF42	0x2F2A	First-order low-pass filtering constant	0-6000(x250us)	1	0	
PF49	0x2F31	Position deviation limit	0.1-50.0 circles	0.1	10.0	■
PF51	0x2F33	Quadrant bulge CCW orientation compensation Compensation	0-1000‰	1	0	
PF52	0x2F34	Quadrant bulge CW direction compensation Value	0-1000‰	1	0	
PF53	0x2F35	Quadrant bulge compensation delay	0-1000ms	1	0	
PF54	0x2F36	Quadrant bulge compensation filtering	0-100ms	1	0	
PF55	0x2F37	Gravity compensation value	0-1000‰	1	0	
PF56	0x2F38	Gravity compensation polarity	0: CCW direction compensation, 1: CW direction	1	0	
PF58	0x2F3A	Type A vibration suppression frequency	5-200Hz	1	50	
PF59	0x2F3B	Type A vibration suppression gain	0-300%	1	0	
PF61	0x2F3D	Speed mode keyboard settings PF10=1 is valid	0-6000rpm		0	
PF70	0x2F46	Speed (PF61) polarity PF10=1 is valid	0: The speed is PF61 1: The speed is -PF61	1	0	
PF71	0x2F47	Servo adaptive rigidity	0-100 (prevent nodding during the enabling process with gravity or load)	1	30	
PF72	0x2F48	Group 1 gain speed inflection point	0-6000rpm	1	6000	
PF73	0x2F49	Group 2 gain speed inflection point	0-6000rpm	1	6000	

PC extended parameter set

Function code	Mapping address	Function code name	Content and scope	Resolution	Factory default	Attribute
PC00	0x2C00	Reserved		--	0x0000	R
PC01	0x2C01	Reserved		--	0x0000	R
PC02	0x2C02	Reserved		--	0x0000	R
PC03	0x2C03	Reserved		--	0x0000	R
PC04	0x2C04	Reserved		--	0x0000	R
PC05	0x2C05	Reserved		--	0x0000	R
PC06	0x2C06	Reserved		--	0x0000	R
PC07	0x2C07	Reserved		--	0x0000	R
PC08	0x2C08	Reserved		--	0x0000	R
PC09	0x2C09	Pulse output function selection	Tens digit: direction setting, ones place: output selection, 0: None, 1: 1 axis, 2: 2 axis	1	0x0000	BRW
PC10	0x2C0A	Number of output pulses when the motor rotates 1 circle	Number of ABZ output pulses when the motor rotates 1 circle	1	0x0000	BRW
PC11	0x2C0B	Reserved		--	0x0000	R
PC12	0x2C0C	Reserved		--	0x0000	R
PC13	0x2C0D	Reserved		--	0x0000	R

PC14	0x2C0E	Reserved		--	0x0000	R
PC15	0x2C0F	Reserved		--	0x0000	R
PC16	0x2C10	Reserved		--	0x0000	R
PC17	0x2C11	Reserved		--	0x0000	R
PC18	0x2C12	Reserved		--	0x0000	R
PC19	0x2C13	Reserved		--	0x0000	R
PC20	0x2C14	Axis 1 position control feedback data Source	0: Motor encoder, 1: Pulse input	1	0x0000	BRW
PC21	0x2C15	Number of pulse input pulses when the motor rotates 1 circle Number of pulses		--	0x0000	BRW
PC22	0x2C16	Reserved		--	0x0000	R
PC23	0x2C17	Reserved		--	0x0000	R
PC24	0x2C18	Reserved		--	0x0000	R
PC25	0x2C19	Reserved		--	0x0000	R
PC26	0x2C1A	Reserved		--	0x0000	R
PC27	0x2C1B	Reserved		--	0x0000	R
PC28	0x2C1C	Reserved		--	0x0000	R
PC29	0x2C1D	Reserved		--	0x0000	R
PC30	0x2C1E	Reserved		--	0x0000	R
PC31	0x2C1F	DI7 function setting	Ones and tens digits: 00-05: Reserved 06: Emergency stop 07: Axis 1 origin switch 08: Axis 2 origin switch 09: Axis 1 positive limit limit 0A: Axis 2 positive limit limit 0B: Axis 1 negative limit limit 0C: Axis 2 negative limit limit 0D: Axis 1 probe 1 0E: Axis 2 probe 1 0F: Axis 1 probe 2 10: Axis 2 probe 2 Hundreds digit: 0: Positive logic 1: Negative logic	1	0x0000	BRW
PC32	0x2C20	DI8 function settings	Same as PC31	1	0x0000	BRW
PC33	0x2C21	DI9 function settings	Same as PC31	1	0x0000	BRW
PC34	0x2C22	DI10 function settings	Same as PC31	1	0x0000	BRW
PC35	0x2C23	DI11 function settings	Same as PC31	1	0x0000	BRW
PC36	0x2C24	DI12 function settings	Same as PC31	1	0x0000	BRW
PC37	0x2C25	Reserved		--	0x0000	R
PC38	0x2C26	Reserved		--	0x0000	R
PC39	0x2C27	Reserved		--	0x0000	R
PC40	0x2C28	Reserved		--	0x0000	R
PC41	0x2C29	Reserved		--	0x0000	R
PC42	0x2C2A	Reserved		--	0x0000	R
PC43	0x2C2B	Reserved		--	0x0000	R
PC44	0x2C2C	Reserved		--	0x0000	R
PC45	0x2C2D	Reserved		--	0x0000	R
PC46	0x2C2E	Reserved		--	0x0000	R

PC47	0x2C2F	Reserved		--	0x0000	R
PC48	0x2C30	Reserved		--	0x0000	R
PC49	0x2C31	Reserved		--	0x0000	R
PC50-PC99	0x2C32 - 0x2C63	Reserved		--	0x0000	R

PD extended parameter set

Function code	Mapping Address	Function code name	Content and scope	Resolution	Factory default	Attribute
PD00	0x2F00	Reserved		--	0x0000	R
PD01	0x2F01	Reserved		--	0x0000	R
PD02	0x2F02	Reserved		--	0x0000	R
PD03	0x2F03	Reserved		--	0x0000	R
PD04	0x2F04	Reserved		--	0x0000	R
PD05	0x2F05	Reserved		--	0x0000	R
PD06	0x2F06	Reserved		--	0x0000	R
PD07	0x2F07	Reserved		--	0x0000	R
PD08	0x2F08	Reserved		--	0x0000	R
PD09	0x2F09	Reserved		--	0x0000	R
PD10	0x2F0A	Reserved		--	0x0000	R
PD11	0x2F0B	Reserved		--	0x0000	R
PD12	0x2F0C	Reserved		--	0x0000	R
PD13	0x2F0D	Reserved		--	0x0000	R
PD14	0x2F0E	Reserved		--	0x0000	R
PD15	0x2F0F	Reserved		--	0x0000	R
PD16	0x2F10	Reserved		--	0x0000	R
PD17	0x2F11	Reserved		--	0x0000	R
PD18	0x2F12	Reserved		--	0x0000	R
PD19	0x2F13	Reserved		--	0x0000	R
PD20	0x2F14	Axis 2 position control feedback data Source	0: Motor encoder, 1: Pulse input	1	0x0000	BRW
PD21	0x2F15	Number of pulse input pulses when the motor rotates 1 circle Number of pulses		1	0x0000	BRW
PD22	0x2F16	Reserved		--	0x0000	R
PD23	0x2F17	Reserved		--	0x0000	R
PD24	0x2F18	Reserved		--	0x0000	R
PD25	0x2F19	Reserved		--	0x0000	R
PD26	0x2F1A	Reserved		--	0x0000	R
PD27	0x2F1B	Reserved		--	0x0000	R
PD28	0x2F1C	Reserved		--	0x0000	R
PD29	0x2F1D	Reserved		--	0x0000	R
PD30	0x2F1E	Reserved		--	0x0000	R
PD31	0x2F1F	Reserved		--	0x0000	R
PD32	0x2F20	Reserved		--	0x0000	R
PD33	0x2F21	Reserved		--	0x0000	R
PD34	0x2F22	Reserved		--	0x0000	R
PD35	0x2F23	Reserved		--	0x0000	R
PD36	0x2F24	Reserved		--	0x0000	R

PD37	0x2F25	Reserved		--	0x0000	R
PD38	0x2F26	Reserved		--	0x0000	R
PD39	0x2F27	Reserved		--	0x0000	R
PD40	0x2F28	Reserved		--	0x0000	R
PD41	0x2F29	Reserved		--	0x0000	R
PD42	0x2F2A	Reserved		--	0x0000	R
PD43	0x2F2B	Reserved		--	0x0000	R
PD44	0x2F2C	Reserved		--	0x0000	R
PD45	0x2F2D	Reserved		--	0x0000	R
PD46	0x2F2E	Reserved		--	0x0000	R
PD47	0x2F2F	Reserved		--	0x0000	R
PD48	0x2F30	Reserved		--	0x0000	R
PD49	0x2F31	Reserved		--	0x0000	R
PD50-PD99	0x2F32 - 0x2F63	Reserved		--	0x0000	R

d0 monitoring parameter group

Function code	Communication address	Content description	Data range	Unit resolution	Attribute
d0-00	0x3000	Axis 1 motor speed	0-±6000rpm	1	R
d0-02	0x3002	DIDO status monitoring	Upper part from right to left: DI1-DI6 Lower part from right to left: DO1-DO3	--	R
d0-03	0x3003	Axis 1 encoder position feedback low	0-9999	1	R
d0-04	0x3004	Axis 1 encoder position feedback high	0-9999	1	R
d0-05	0x3005	Axis 1 position deviation (user unit)	0-65535	1	R
d0-09	0x3009	Axis 1 average load factor	0-300%	1	R
d0-10	0x300A	Encoder 1 multi-turn information feedback	0-65535	1	R
d0-15	0x300F	Axis 1 motor electrical angle feedback	0-2048	1	R
d0-16	0x3010	Drive bus voltage	0-410.0V	0.1	R
d0-17	0x3011	Lowest bus voltage in history after the motor is enabled	0-410.0V	0.1	R
d0-18	0x3012	Highest bus voltage in history	0-410.0V	0.1	R
d0-19	0x3013	Drive temperature	0-100.0℃	0.1	R
d0-20	0x3014	Axis 1 encoder communication fault count	0-65535	1	R
d0-36	0x3024	Axis 1 motor torque feedback	0-3000‰		R
d0-50	0x3032	Axis 2 motor speed	0-±6000rpm	1	R
d0-51	0x3033	EtherCAT maximum communication cycle	0-512（x62.5us）	1	R
d0-52	0x3034	EtherCAT real-time communication cycle	0-512（x62.5us）	1	R
d0-53	0x3035	Axis 2 encoder position feedback low	0-9999	1	R
d0-54	0x3036	Axis 2 encoder position feedback high	0-9999	1	R
d0-55	0x3037	Axis 2 position deviation (user unit)	0-65535	1	R
d0-59	0x303B	Axis 2 average load factor	0-300%	1	R
d0-60	0x303C	Encoder 2 multi-turn information feedback	0-65535	1	R
d0-70	0x3046	Axis 2 encoder communication fault count	0-65535	0.1	R
d0-86	0x3056	Axis 2 motor torque feedback	0-3000‰	1	R
d0-97	0x3061	Software version - Year	2018-2028	1	R
d0-98	0x3062	Software version - Month	000-1231	1	R
d0-99	0x3063	Software version - Model SN	000-1259	1	R

Er fault alarm group

1."ECAT code" is the fault code of 0x603F (axis 1) or 0x683F (axis 2) written into the PDO dictionary after the servo slave station generates an alarm.

2."Display code" is the alarm code displayed on the drive keypad.

Display code	ECAT Code	Fault name	Resettable	Fault cause
Er.001	0xFF01	Emergency stop alarm	Yes	An emergency stop signal is present at the EMG or DI terminal
Er.002	0xFF02	Axis 1 overcurrent	No	Motor code error, encoder cable does not correspond to the motor, UVW short circuit, short circuit to ground, power module drive undervoltage, drive damaged by short circuit to ground (caused by not grounding a phase of UVW). **Clear the alarm after powering on again**
Er.003	0xFF03	Axis 2 overcurrent	No	
Er.004	0xFF04	External bus disconnected	Yes	The DC bus is not connected, and the communication between the drive modules is abnormal. Check the top IBUS
Er.005	0xFF05	Axis 1 overload	Yes	The motor code is incorrect, the motor brake is not opened, the motor load is locked, the motor phase is missing, the motor selection is small, the load is heavy, etc.
Er.006	0xFF06	Axis 2 overload	Yes	
Er.007	0xFF07	Axis 1 motor initialization in progress	Yes	The motor encoder is not connected, the encoder cable is abnormal (wiring error), the encoder protocol is abnormal (the motor encoder protocol corresponding to the motor code is not the same as the actual connected encoder), the current sampling is abnormal, etc.
Er.008	0xFF08	Axis 2 motor initialization in progress	Yes	
Er.009	0xFF09	Abnormal axis 1 three-phase current	Yes	The motor is not connected, the motor phase is missing, the motor phase sequence is incorrect, the motor code setting is incorrect, the power supply voltage of the drive is low, the load exceeds the allowable value at high motor speed, and the drive gain parameters are abnormal, etc.
Er.010	0xFF0A	Abnormal axis 2 three-phase current	Yes	
Er.011	0xFF0B	DC bus undervoltage	Yes	The grid voltage is too low, the input contact of the main circuit of the drive is poor, etc.
Er.012	0xFF0C	DC bus overvoltage	Yes	The braking resistor is not connected, the resistance value of the braking resistor is large, the load feedback energy is large, etc.
Er.013	0xFF0D	The axis 1 position command is too large	Yes	The master station position command increment is large, the master station encoder unit is set incorrectly, the synchronization cycle (Px.50) is set incorrectly, the reference point is lost after power-on because the drive is not set to absolute type, and electronic gear parameter settings are incorrect
Er.014	0xFF0E	The axis 2 position command is large	Yes	
Er.015	0xFF0F	Drive overheating	Yes	The ambient temperature is high, the installation environment is not forced to ventilate, the drive fan is damaged, etc.
Er.016	0xFF10	Failed to write to EEPROM	Yes	Incorrect parameter settings, abnormal EEPROM
Er.017	0xFF11	Failed to read EEPROM	Yes	EEPROM exception
Er.018	0xFF12	The axis 1 position deviation is too large	Yes	The position gain setting is too small, the speed gain parameter setting is unreasonable, the load is too heavy, the position deviation alarm threshold setting is too small, the motor is locked, the motor line sequence is incorrect, the motor is running The torque limit is too low, etc.
Er.019	0xFF13	The axis 2 position deviation is too large	Yes	
Er.020	0xFF14	Axis 1 encoder error	Yes	The encoder communication is abnormal, the encoder wiring is unreliable, and encoder signal interference occurs
Er.021	0xFF15	The axis 1 speed measurement is abnormal	Yes	Abnormal speed measurement, encoder interference, abnormal encoder
Er.022	0xFF16	Axis 1 encoder initialization in progress	Yes	The encoder is not connected, and the encoder wiring is not reliable
Er.024	0xFF18	External bus error	Yes	External module alarm input
ER.027	0xFF1B	EEPROM parameter verification Error	Yes	EEPROM exception
Er.028	0xFF1C	Axis 2 encoder error	Yes	The encoder communication is abnormal and the interference is too large
Er.029	0xFF1D	Abnormal axis 2 speed	Yes	Abnormal speed measurement, encoder interference, abnormal

		measurement		encoder
Er.030	0xFF1E	Axis 2 encoder initialization in progress	Yes	The encoder is not connected, and the encoder wiring is not reliable
Er.031	0xFF1F	The alarm is cleared frequently	Yes	Alarm cleared too frequently
Er.032	0xFF20	Parameter initialization error	Yes	EEPROM parameters need to be initialized and reset to factory defaults
Er.033	0xFF21	EtherCAT communication error	Yes	The master station is not connected, the master station is disconnected, the EtherCAT network cable connection is unreliable, The EtherCAT network cable is disturbed, etc.
Er.034	0xFF22	Encoder 1 battery failure	Yes	The battery power is low, or the encoder battery is not connected; Note: If the battery is not replaced, an alarm is generated again after 1-minute operation after the fault is rectified.
Er.035	0xFF23	Encoder 2 battery failure	Yes	
Er.036	0xFF24	Encoder 1 multi-turn value lost	Yes	The absolute encoder is not connected to the battery, or the multi-turn information is lost due to plugging and unplugging with the battery. DS402 statusword bit3=1 when an alarm is generated, The alarm cannot be cleared when controlword is set to 0x80. The alarm cannot be cleared only when controlword bit 12 is set to 1. The statusword bit3 is 0 after the alarm is cleared
Er.037	0xFF25	Encoder 2 multi-turn value lost	Yes	
Er.038	0xFF26	Axis 1 motor code identification error	Yes	Motor/The motor code is not written, or the motor power does not match the drive power;
Er.039	0xFF27	Axis 2 motor code identification error	Yes	
Er.040	0xFF28	Axis 1 encoder speed measurement exception	Yes	The motor encoder is abnormal, or the motor code setting is incorrect
Er.041	0xFF29	Axis 2 encoder speed measurement exception	Yes	
Er.042	0xFF2A	Axis 1 motor runaway	Yes	The motor encoder is abnormal, the motor code setting is incorrect, the motor phase sequence is incorrect, and the external load is too heavy
Er.043	0xFF2B	Axis 2 motor runaway	Yes	
Er.227	0xFFE3	Drive hardware encryption error	No	The drive hardware is not authorized, or unauthorized drive hardware is used.

Chapter 4 Simple Commissioning

4.1Simple Drive Commissioning Procedure

4.1.1Wiring

Connect the power cable, motor cable, encoder cable, IO cable, braking resistor cable and other cables to the drive. After the cables are connected, check whether the power supply voltage is normal, whether the motor cables correspond to the encoder cables one by one, and whether the phase sequences of the motor cables correspond to each other.

4.1.2Power-on

Turn on the power, and check the status of the ERR and RUN indicators on the drive. When only the RUN indicator is flashing, the drive is in the ready state. If the RUN and ERR indicators flash at the same time, the drive is not ready, and you need to check the encoder wiring.

4.1.3Trial Run via Keypad

When the servo is ready, use the keypad for trial running. If the keypad is unavailable, set the motor code and perform the trial run directly via EtherCAT communication.

1> Set PE02/PF02 to the corresponding motor code;

2> Set PE04/PF04 to 1 (the maximum torque can be changed);

3> Set PE06/PF06 and PE07/PF07 to 100 (the maximum torque output is 100%);

4> Set PE10/PF10 to 1 (keyboard control);

5> Set PE61/PF61 to 100 (speed command 100 rpm);

6> Set PE17 to 1 (enable the servo);

After enabling, check whether the motor is running at a speed of 100 rpm. In case of motor runaway, motor stall and abnormal noise, check the phase sequence of the power cable or the motor code.

7> Set PE17 to 0 (disable the servo);

8> Set PE04/PF04 to 0 (the maximum torque can be changed);

9> Set PE06/PF06 and PE07/PF07 to 300 (the maximum torque output is 300%);

4.1.4EtherCAT Communication Operation

After the trial running is completed, switch to EtherCAT bus communication control:

1> Set PE10/PF10 to 3 (EtherCAT control mode);

2> Set PE50 to the same communication cycle as the master station (the unit of PE50 is 250 us). For example, if the controller communication cycle is 1 ms, set PE50 to 4; if the synchronization cycle is 2 ms, set PE50 to 8;

3> Check the electronic gear settings in the DS402 object dictionary, namely, 6091 and 6891 (Axis 2). Set it based on the requirements of the host controller, and you are advised to set it to 1:1. At this time, the pulse feedback per motor revolution is the actual number of encoder pulses.