IxLII/IxLs/IxH

Low&High Voltage Servo Drive Manual

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I. Product Specifications and Installation Precautions

1.1 Confirmation on Arrival of Products

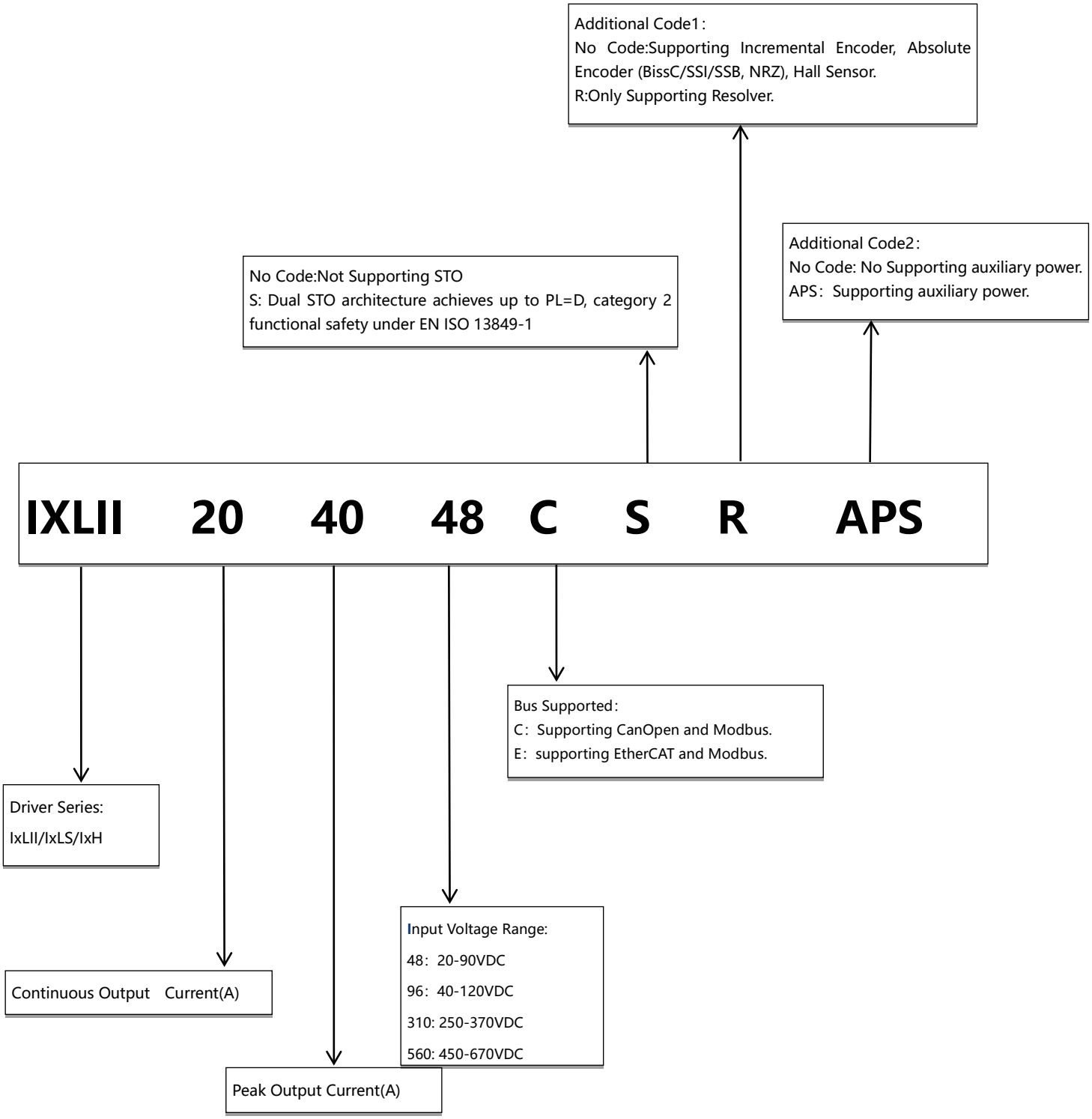
When unpacking, check the following items carefully:

- Is there any damage during shipment
- Is the driver model consistent with your order
- Are all the accessories included? The packing box shall contain the following parts:

Item Name	Quantity
Driver	1
26-core signal interface terminal	1
15-core encoder interface terminal	1
6-core MX3.0 terminal and pin	1
Main circuit terminal block	1
Power-off brake terminal block	1

Note: If you find any inconsistencies or omission, contact us immediately.

1.2 Driver Model and Specification



1.2.1 IxLII Series Low-Voltage Servo Drive

1.2.1.1 IxLII Series Servo Driver Electrical Features

Electrical characteristics of IxLII series low-voltage servo drivers									
Model		**IxLII 20.40**	**IxLII 25.50**	**IxLII 30.60**	**IxLII 35.70**	**IxLII 40.80**	**IxLII**	**IxLII**	**IxLII**
Input Voltage Range		20-110VDC	40-120VDC	20-90VDC	40-120VDC	20-90VDC	20-90VDC	40-120VDC	20-90VDC
Maximum Continuous Output Current(A)		20	25	30	35	40	80	70	80
Peak Output Current(A)		40	50	60	70	80	160	140	160
PWM Frequency		10KHz							
Motors Supported		Three phase(BLDC、PMSM)、Single phase(Brushed)							
Inputs& Outputs	Analogy Input	2AI, -10V—+10V							
	Digital Input	8DO,12—30VDC							
	Digital Output	8DI,12—30VDC							
Bus Supported	Modbus	RS485 interface、Standard Modbus Protocol							
	CanOpen	Standard CanOpen Protocol，CiA301/402							
	EtherCAT	Standard CoE Protocol							
Feedback Supported		Incremental Encoder,Absolute Encoder(SSI/BISSB/BISSC,NRZ), Hall Sensors,Resolver							
Control	Control Mode	PV、PT、PP、IP、CSP、CSV、CST							
	SBC&STO	No							
Ambient Parameters	Operation Place	Indoor, places free from direct sunlight, dust, corrosive gases, flammable gases, oil mist, anhydrous vapors, etc							
	Ambient Operating	-40℃—50℃，Derating for use above 40 ℃							
	Altitude	The altitude is below 1000m. Derating usage above 1000m							
	Relative Humidity	Below 95% RH, No condensation of water droplets							
	Vibration	Less than 0.5G (4.9m/s2), less than 10Hz							
	Storage Temperature	-40℃—70℃							
	Cooling	Natural Cooling							
Size Model		2040	3060(2530)	3060(2530)	4080(3570)	4080(3570)	2040	3060(2530)	3060(2530)
Weight(KG)		0.6	0.7	0.7	0.8	0.8	0.6	0.7	0.7

Electrical characteristics of IxLII series low-voltage servo drivers									
Model		**IxLII 95.200**	**IXLII100.2**	**IxLII150.30**	**IxLII250.500**				
Input Voltage Range		20-90VDC	20-90VDC	20-120VDC	20-120VDC				
Maximum Continuous Output		95	100	150	250				
Peak Output Current(A)		200	200	300	500				
PWM Frequency		10KHz							
Motors Supported		Three phase(BLDC、PMSM)、Single phase(Brushed)							
Inputs&Outputs	Analogy Input	2AI, -10V—+10V							
	Digital Input	8DO,12—30VDC							
	Digital Output	8DI,12—30VDC							
Bus Supported	Modbus	RS485 interface、Standard Modbus Protocol							
	CanOpen	Standard CanOpen Protocol，CiA301/402							
	EtherCAT	Standard CoE Protocol							
Feedback Supported		Incremental Encoder,Absolute Encoder(SSI/BISSB/BISSC,NRZ), Hall Sensors,Resolver							
Control	Control Mode	PV、PT、PP、IP、CSP、CSV、CST							
	SBC&STO	No							
Ambient Parameters	Operation Place	Indoor, places free from direct sunlight, dust, corrosive gases, flammable gases, oil mist, anhydrous vapors, etc							
	Ambient	-40℃—50℃，Derating for use above 40 ℃							
	Altitude	The altitude is below 1000m. Derating usage above 1000m							
	Relative	Below 95% RH, No condensation of water droplets							
	Vibration	Less than 0.5G (4.9m/s2), less than 10Hz							
	Storage	-40℃—70℃							
	Cooling	Natural Cooling							
Size Model		95200(70140)	100200	150300	250500				

Weight(KG)	2	2	2.7	4.5				

1.2.1.2 IxLII Series Servo Driver Ordering Model

IxLII Series Servo Driver Ordering Model(CanOpen Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxLII 20.40.48.C	20-90VDC	20	40	Incremental Encoder, Absolute Encoder (SSI/BISSB/BISSC,NRZ), Hall Sensors	Analog Input Pulse Modbus CanOpen	No	-40°-50°	2040
IxLII 20.40.96.C	40-120VDC							
IxLII 25.50.96.C	40-120VDC	25	50					3060
IxLII 30.60.48.C	20-90VDC	30	60					
IxLII 35.70.96.C	40-120VDC	35	70					4080
IxLII 40.80.48.C	20-90VDC	40	80					
IxLII 50.100.48.C	20-90VDC	50	100					80160
IxLII 70.140.96.C	40-120VDC	70	140					95200
IxLII 80.160.48.C	20-90VDC	80	160					80160
IxLII 95.200.48.C	20-90VDC	95	200					95200
IxLII 100.200.48.C	20-90VDC	100	200					100200
IxLII 150.300.48.C	20-90VDC	150	300					150300
IxLII 150.300.96.C	40-120VDC							
IxLII 250.500.48.C	20-90VDC	250	500					250500
IxLII 250.500.96.C	40-120VDC							

IxLII Series Servo Driver Ordering Model(EtherCAT Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxLII 20.40.48.E	20-90VDC	20	40	Incremental Encoder, Absolute Encoder (SSI/BISSB/BISSC,NRZ), Hall Sensors	Analog quantity Pulse Modbus EtherCAT	No	-40°-50°	2040
IxLII 20.40.96.E	40-120VDC							
IxLII 25.50.96.E	40-120VDC	25	50					3060
IxLII 30.60.48.E	20-90VDC	30	60					
IxLII 35.70.96.E	40-120VDC	35	70					4080
IxLII 40.80.48.E	20-90VDC	40	80					
IxLII 50.100.48.E	20-90VDC	50	100					80160
IxLII 70.140.96.E	40-120VDC	70	140					95200
IxLII 80.160.48.E	20-90VDC	80	160					80160
IxLII 95.200.48.E	20-90VDC	95	200					95200
IxLII 100.200.48.E	20-90VDC	100	200					100200
IxLII 150.300.48.E	20-90VDC	150	300					150300
IxLII 150.300.96.E	40-120VDC							
IxLII 250.500.48.E	20-90VDC	250	500					250500
IxLII 250.500.96.E	40-120VDC							

IxLII Series Servo Driver Ordering Model(CanOpen&Resolver Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxLII 20.40.48.C.R	20-90VDC	20	40	Resolver	Analog quantity	No	-40°-50°	2040

IxLII 20.40.96.C.R	40-120VDC				Pulse Modbus CanOpen			
IxLII 25.50.96.C.R	40-120VDC	25	50					3060
IxLII 30.60.48.C.R	20-90VDC	30	60					
IxLII 35.70.96.C.R	40-120VDC	35	70					4080
IxLII 40.80.48.C.R	20-90VDC	40	80					
IxLII 50.100.48.C.R	20-90VDC	50	100					80160
IxLII 70.140.96.C.R	40-120VDC	70	140					95200
IxLII 80.160.48.C.R	20-90VDC	80	160					80160
IxLII 95.200.48.C.R	20-90VDC	95	200					95200
IxLII 100.200.48.C.R	20-90VDC	100	200					100200
IxLII 150.300.48.C.R	20-90VDC	150	300					150300
IxLII 150.300.96.C.R	40-120VDC							
IxLII 250.500.48.C.R	20-90VDC	250	500					250500
IxLII 250.500.96.C.R	40-120VDC							

IxLII Series Servo Driver Ordering Model(EtherCAT&Resolver Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxLII 20.40.48.E.R	20-90VDC	20	40	Resolver	Analog quantity Pulse Modbus EtherCAT	No	-40°-50°	2040
IxLII 20.40.96.E.R	40-120VDC							
IxLII 25.50.96.E.R	40-120VDC	25	50					3060
IxLII 30.60.48.E.R	20-90VDC	30	60					
IxLII 35.70.96.E.R	40-120VDC	35	70					4080
IxLII 40.80.48.E.R	20-90VDC	40	80					
IxLII 50.100.48.E.R	20-90VDC	50	100					80160
IxLII 70.140.96.E.R	40-120VDC	70	140					95200
IxLII 80.160.48.E.R	20-90VDC	80	160					80160
IxLII 95.200.48.E.R	20-90VDC	95	200					95200
IxLII 100.200.48.E.R	20-90VDC	100	200					100200
IxLII 150.300.48.E.R	20-90VDC	150	300					150300
IxLII 150.300.96.E.R	40-120VDC							
IxLII 250.500.48.E.R	20-90VDC	250	500					250500
IxLII 250.500.96.E.R	40-120VDC							

1.2.1.3 IxLII Series Safety Servo Driver Electrical Features

Electrical characteristics of IxLII Series Safety Servo Drivers						
Model		**IxLII 20.40**	**IxLII 30.60**	**IxLII 40.80**	**IxLII 100.200**	**IxLII 150.300**
Input Voltage Range		20-72VDC	20-72VDC	20-72VDC	20-72VDC	20-72VDC
Maximum Continuous Output Current(A)		20	30	30	100	150
Peak Output Current(A)		40	60	60	200	300
PWM Frequency		10KHz				
Motors Supported		Three phase(BLDC、PMSM)、Single phase(Brushed)				
Inputs&Outputs	Analogy Input	2AI, -10V—+10V				
	Digital Input	8DO,12—30VDC				
	Digital Output	8DI,12—30VDC				
Bus Supported	Modbus	RS485 interface、Standard Modbus Protocol				
	CanOpen	Standard CanOpen Protocol，CiA301/402				
	EtherCAT	Standard CoE Protocol				
Feedback Supported		Incremental Encoder,Absolute Encoder(SSI/BISSB/BISSC,NRZ), Hall Sensors,Resolver				

Control	Control Mode	PV、PT、PP、IP、CSP、CSV、CST				
	SBC&STO	Dual STO architectures up to PL=D, category 2 functional safety under EN ISO 13849-1				
Ambient Parameters	Operation Place	Indoor, places free from direct sunlight, dust, corrosive gases, flammable gases, oil mist, anhydrous vapors,				
	Ambient Operating	-40℃—50℃，Derating for use above 40 ℃				
	Altitude	The altitude is below 1000m. Derating usage above 1000m				
	Relative Humidity	Below 95% RH, No condensation of water droplets				
	Vibration	Less than 0.5G (4.9m/s2), less than 10Hz				
	Storage Temperature	-40℃—70℃				
	Cooling	Natural Cooling				
Size Model		2040	3060(2530)	3060(2530)	95200(60120)	150300
Weight (KG)		0.6	0.7	0.8	1.95	2.75

1.2.1.4 IxLII Series Safety Servo Driver Ordering Model

IxLII Series Safety Driver Ordering Model(CanOpen Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxLII 20.40.48.C.S	20-72VDC	20	40	Incremental Encoder, Absolute Encoder (SSI/BISSB/BISSC,NRZ), Hall Sensors	Analog Input Pulse Modbus CanOpen	ISO13849-1, PL d	-40°-50°	2040
IxLII 30.60.48.C.S	20-72VDC	30	60					3060
IxLII 40.80.48.C.S	20-72VDC	40	80					4080
IxLII 100.200.48.C.S	20-72VDC	100	200					95200
IxLII 150.300.48.C.S	20-72VDC	150	300					150300

IxLII Series Safety Driver Ordering Model(EtherCAT Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxLII 20.40.48.E.S	20-72VDC	20	40	Incremental Encoder, Absolute Encoder (SSI/BISSB/BISSC,NRZ), Hall Sensors	Analog Input Pulse Modbus EtherCAT	ISO13849-1, PL d	-40°-50°	2040
IxLII 30.60.48.E.S	20-72VDC	30	60					3060
IxLII 40.80.48.E.S	20-72VDC	40	80					4080
IxLII 100.200.48.E.S	20-72VDC	100	200					95200
IxLII 150.300.48.E.S	20-72VDC	150	300					150300

IxLII Series Safety Driver Ordering Model(CanOpen&Resolver Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxLII 20.40.48.C.R.S	20-72VDC	20	40	Resolver	Analog Input Pulse Modbus CanOpen	ISO13849-1, PL d	-40°-50°	2040
IxLII 30.60.48.C.R.S	20-72VDC	30	60					3060
IxLII 40.80.48.C.R.S	20-72VDC	40	80					4080
IxLII 100.200.48.C.R.S	20-72VDC	100	200					95200
IxLII 150.300.48.C.R.S	20-72VDC	150	300					150300

IxLII Series Safety Driver Ordering Model(EtherCAT&Resolver Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxLII 20.40.48.E.R.S	20-72VDC	20	40	Resolver	Analog Input Pulse Modbus EtherCAT	ISO13849-1, PL d	-40°-50°	2040
IxLII 30.60.48.E.R.S	20-72VDC	30	60					3060
IxLII 40.80.48.E.R.S	20-72VDC	40	80					4080
IxLII100.200.48.E.R.S	20-72VDC	100	200					95200
IxLII150.300.48.E.R.S	20-72VDC	150	300					150300

1.2.2 IxLs Series Low-Voltage Servo Drive

1.2.2.1 IxLs Series Servo Driver Electrical Features

Electrical characteristics of IxLs series low-voltage servo drivers						
Model		**IxLs 15.30**	**IxLs 30.60**			
Input Voltage Range		20-90Vdc				
Maximum Continuous Output Current(A)		15	30			
Peak Output Current(A)		30	60			
PWM Frequency		10KHz				
Motors Supported		Three phase(BLDC、PMSM)、Single phase(Brushed)				
Inputs&Outputs	Analogy Input	2AI, -10V—+10V				
	Digital Input	8DO,12—30VDC				
	Digital Output	8DI,12—30VDC				
Bus Supported	Modbus	RS485 interface、Standard Modbus Protocol				
	CanOpen	No				
	EtherCAT	Standard CoE Protocol				
Feedback Supported		Incremental Encoder,Absolute Encoder(SSI/BISSB/BISSC,NRZ), Hall Sensors.				
Control	Control Mode	PV、PT、PP、IP、CSP、CSV、CST				
	SBC&STO	NO				
Ambient Parameters	Operation Place	Indoor, places free from direct sunlight, dust, corrosive gases, flammable gases, oil mist, anhydrous vapors, etc				
	Ambient Operating	-40℃—50℃，Derating for use above 40 ℃				
	Altitude	The altitude is below 1000m. Derating usage above 1000m				
	Relative Humidity	Below 95% RH, No condensation of water droplets				
	Vibration	Less than 0.5G (4.9m/s2), less than 10Hz				
	Storage Temperature	-40℃—70℃				
	Cooling	Natural Cooling				
Size Model		IxLS15030	IxLS3060			
Weight (KG)		0.25	0.4			

1.2.2.1 IxLs Series Servo Driver Ordering Model

IxLs Series Servo Driver Ordering Model(CanOpen&Resolver Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxLs 15.30.48.C.S	20-90VDC	15	30	Incremental Encoder, Absolute Encoder (SSI/BISSB/BISSC,NRZ), Hall Sensors	Analog Input Pulse Modbus CanOpen	No	-40°-50°	IxLS15030
IxLs 30.60.48.C.S	20-90VDC	30	60					IxLS3060

1.2.3 IxH Series High-Voltage Servo Drive

1.2.3.1 IxLs Series Servo Driver Electrical Features

Electrical characteristics of IxH series high-voltage servo drivers						
Model		**IxH 06.12.310**	**IxH 15.30.310**	**IxH 06.12.560**	**IxH 15.30.560**	
Input Voltage Range		250-370Vdc/AC220V		450-670Vdc/AC380V		
Maximum Continuous Output Current(A)		6	15	6	15	
Peak Output Current(A)		12	30	12	30	
PWM Frequency		10KHz				
Motors Supported		Three phase(BLDC、PMSM)、Single phase(Brushed)				
Inputs& Outputs	Analogy Input	2AI, -10V—+10V				
	Digital Input	8DO,12—30VDC				
	Digital Output	8DI,12—30VDC				
Bus Supported	Modbus	RS485 interface、Standard Modbus Protocol				
	CanOpen	Standard CanOpen Protocol，CiA301/402				
	EtherCAT	Standard CoE Protocol				
Feedback Supported		Incremental Encoder,Absolute Encoder(SSI/BISSB/BISSC,NRZ), Hall Sensors, Resolver				
Control	Control Mode	PV、PT、PP、IP、CSP、CSV、CST				
	SBC&STO	No				
Ambient Parameters	Operation Place	Indoor, places free from direct sunlight, dust, corrosive gases, flammable gases, oil mist, anhydrous vapors, etc.				
	Ambient Operating	-40℃—50℃，Derating for use above 40 ℃				
	Altitude	The altitude is below 1000m. Derating usage above 1000m				
	Relative Humidity	Below 95% RH, No condensation of water droplets				
	Vibration	Less than 0.5G (4.9m/s2), less than 10Hz				
	Storage	-40℃—70℃				
	Cooling	Natural Cooling				
Size Model		IxH0612	IxH1530	IxH0612	IxH1530	
Weight (KG)		4.15	4.5	4.15	4.5	

1.2.3.2 IxH Series Servo Driver Ordering Model

IxH Series Servo Driver Ordering Model(CanOpen Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxH 06.12.310.C	250-370VDC	6	12	Incremental Encoder, Absolute Encoder (SSI/BISSB/BISSC,NRZ), Hall Sensors	Analog Input Pulse Modbus CanOpen	NO	-40°-50°	IXH0612
	220VAC							
IxH 06.12.560.C	450-670VDC							
	380VAC							
IxH 15.30.310.C	250-370VDC	15	30					IXH1530
	220VAC							
IxH 15.30.560.C	450-670VDC							
	380VAC							

IxH Series Servo Driver Ordering Model(EtherCAT Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxH 06.12.310.E	250-370VDC	6	12	Incremental Encoder, Absolute Encoder (SSI/BISSB/BISSC,NRZ),	Analog Input Pulse Modbus	NO	-40°-50°	IXH0612
	220VAC							
IxH 06.12.560.E	450-670VDC							

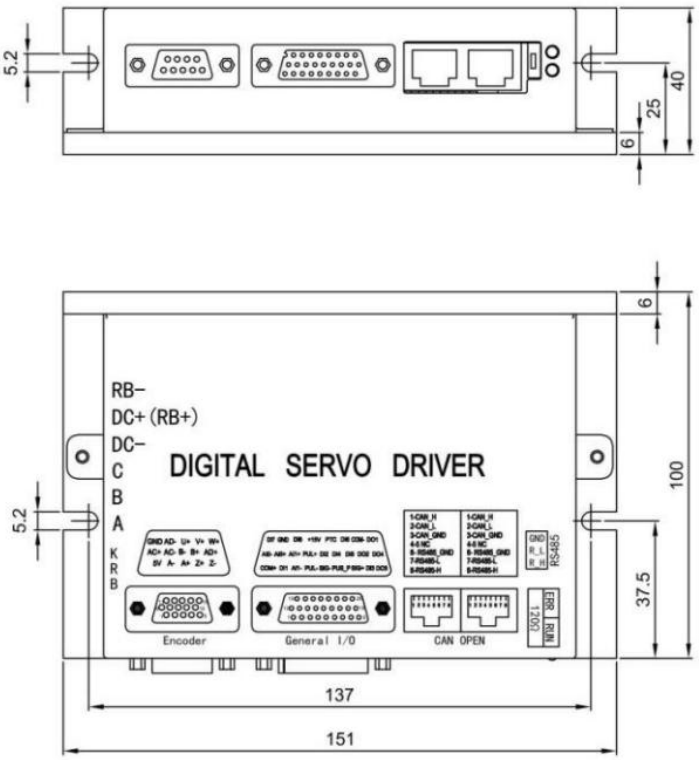
	380VAC			Hall Sensors	EtherCAT			
IxH 15.30.310.E	250-370VDC	15	30					IXH1530
	220VAC							
IxH 15.30.560.E	450-670VDC							
	380VAC							

IxH Series Servo Driver Ordering Model(CanOpen&Resolver Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxH06.12.310.C.R	250-370VDC	6	12	Resolver	Analog Input Pulse Modbus CanOpen	NO	-40°-50°	IXH0612
	220VAC							
IxH 06.12.560.C.R	450-670VDC							
	380VAC							
IxH 15.30.310.C.R	250-370VDC	15	30					IXH1530
	220VAC							
IxH 15.30.560.C.R	450-670VDC							
	380VAC							

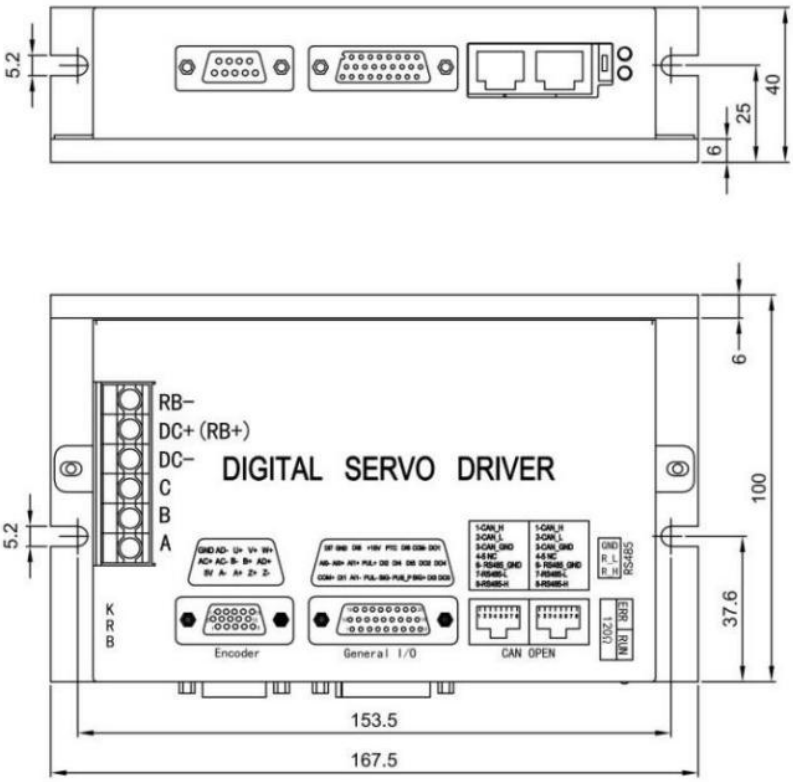
IxH Series Servo Driver Ordering Model(EtherCAT&Resolver Supported)								
Ordering Model	**Input Voltage**	**Continuous Current(A)**	**Peak Current(A)**	**Feedback Supported**	**Control Sources**	**Functional Safety (SBC&STO)**	**Operating Temperature**	**Size Model**
IxH 06.12.310.E.R	250-370VDC	6	12	Resolver	Analog Input Pulse Modbus EtherCAT	NO	-40°-50°	IXH0612
	220VAC							
IxH 06.12.560.E.R	450-670VDC							
	380VAC							
IxH 15.30.310.E.R	250-370VDC	15	30					IXH1530
	220VAC							
IxH 15.30.560.E.R	450-670VDC							
	380VAC							

1.4 Driver Shape and Size

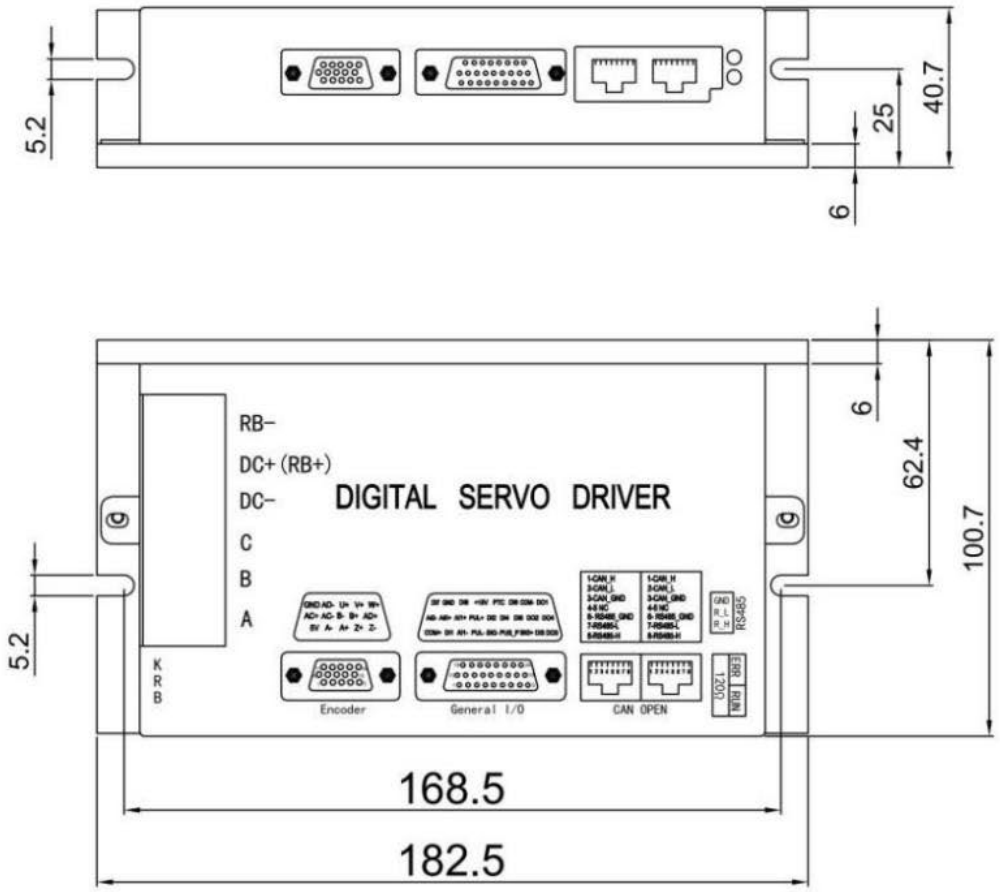
1.4.1 Size: 2040



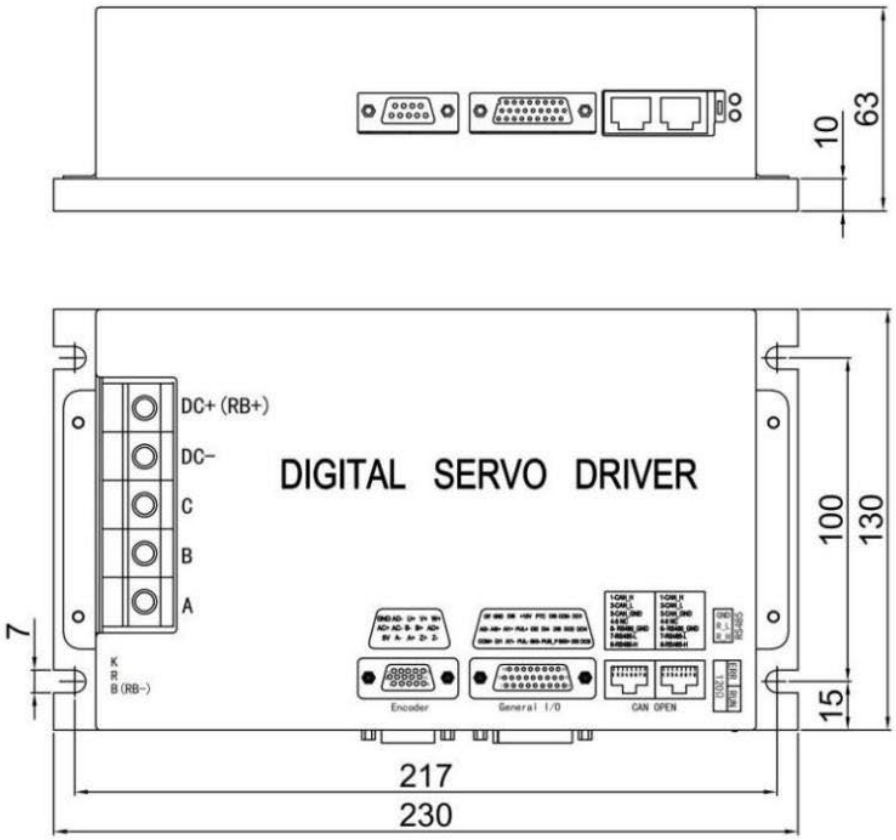
1.4.2 Size: 3060(2550)



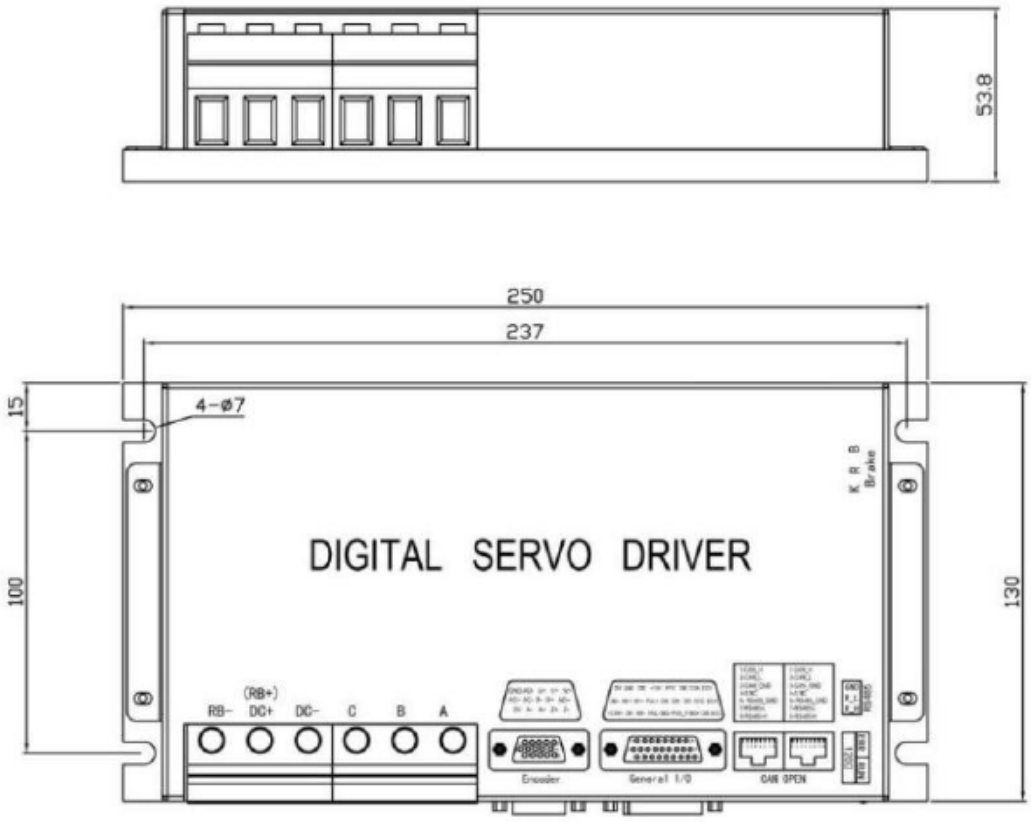
1.4.3 Size: 4080(3570)



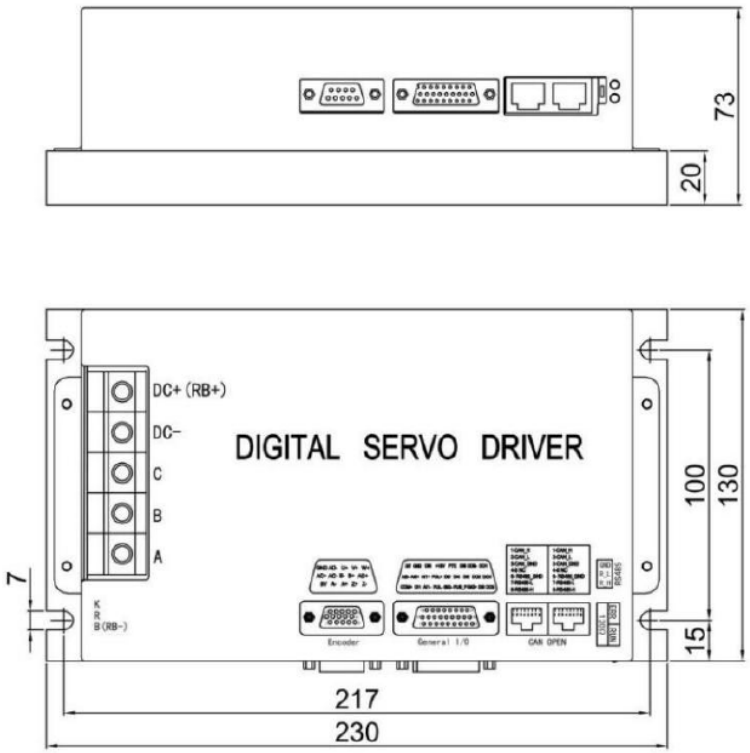
1.4.4 Size: 80160(50100)



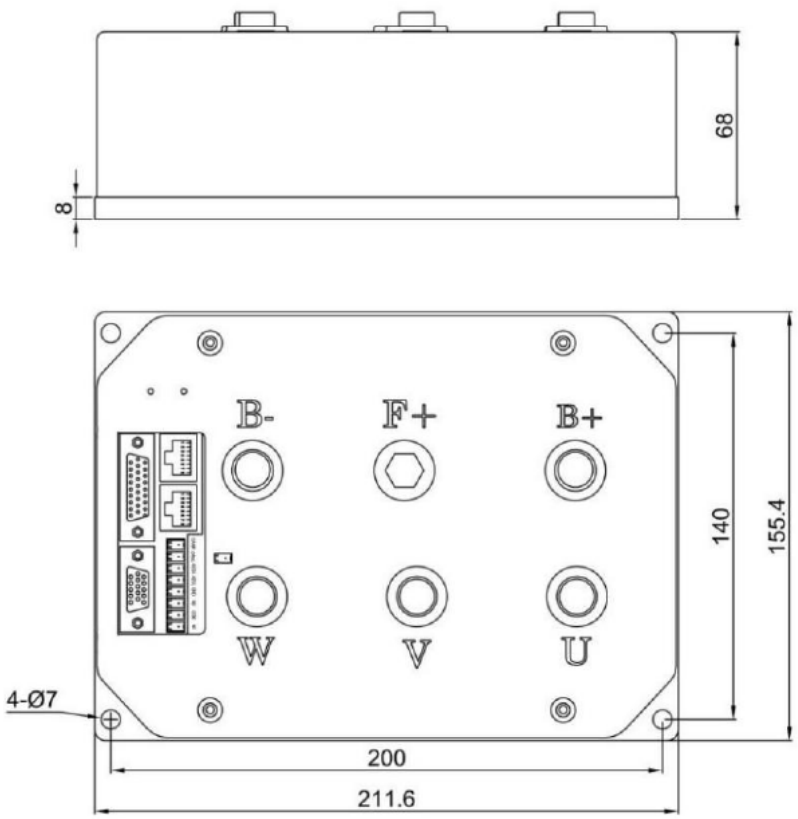
1.4.5 Size: 95200(70140)



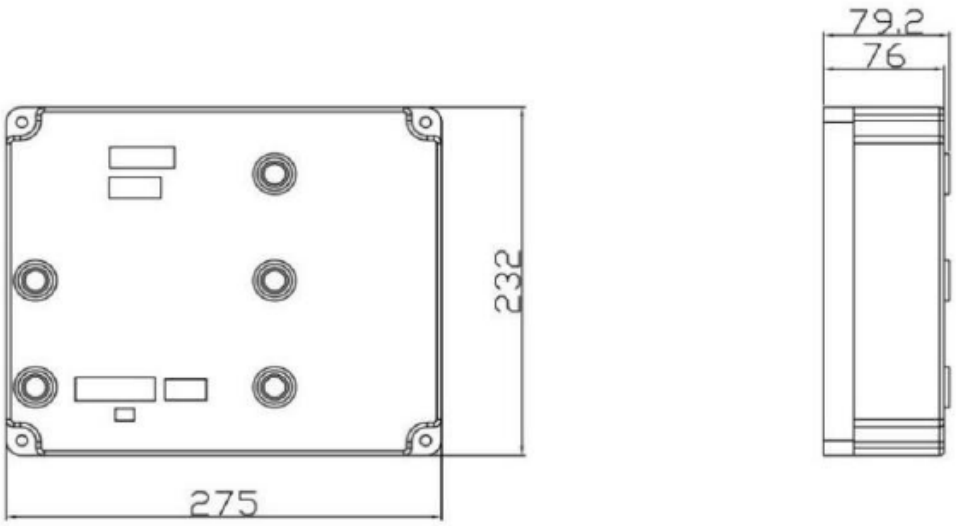
1.4.6 Size: 100200

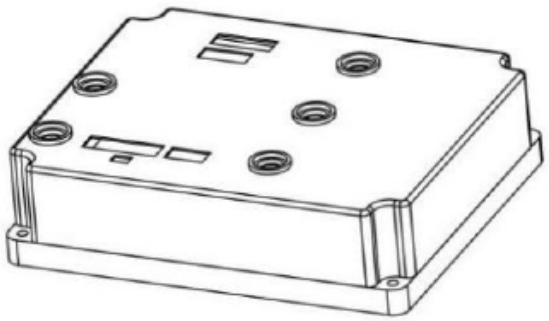


1.4.7 Size: 150300

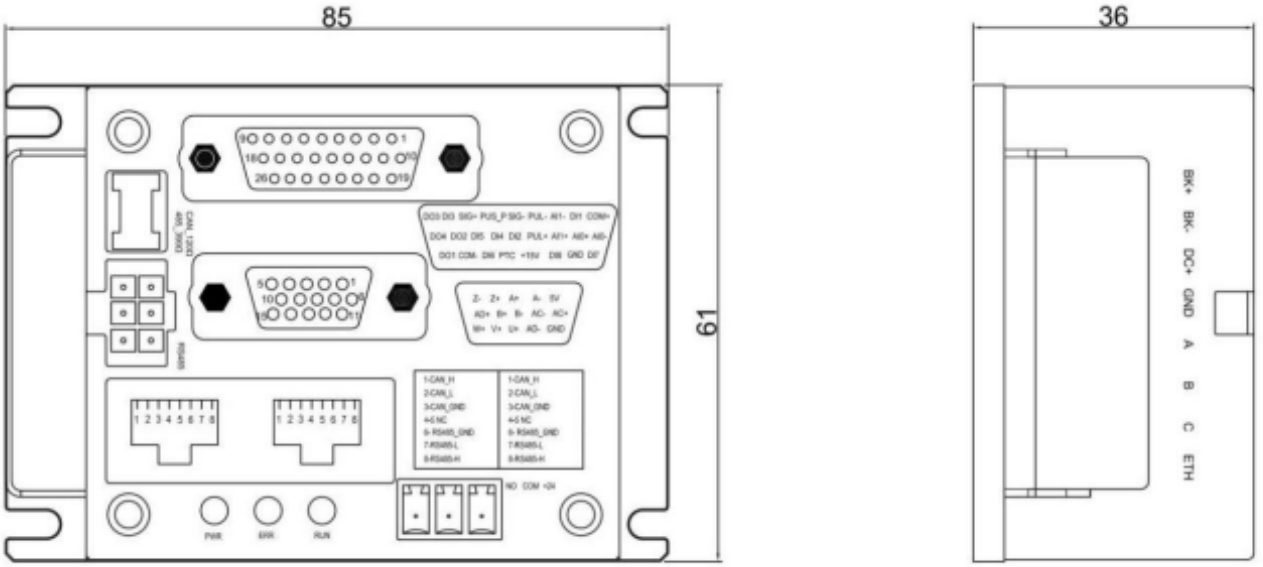


1.4.8 Size: 250500

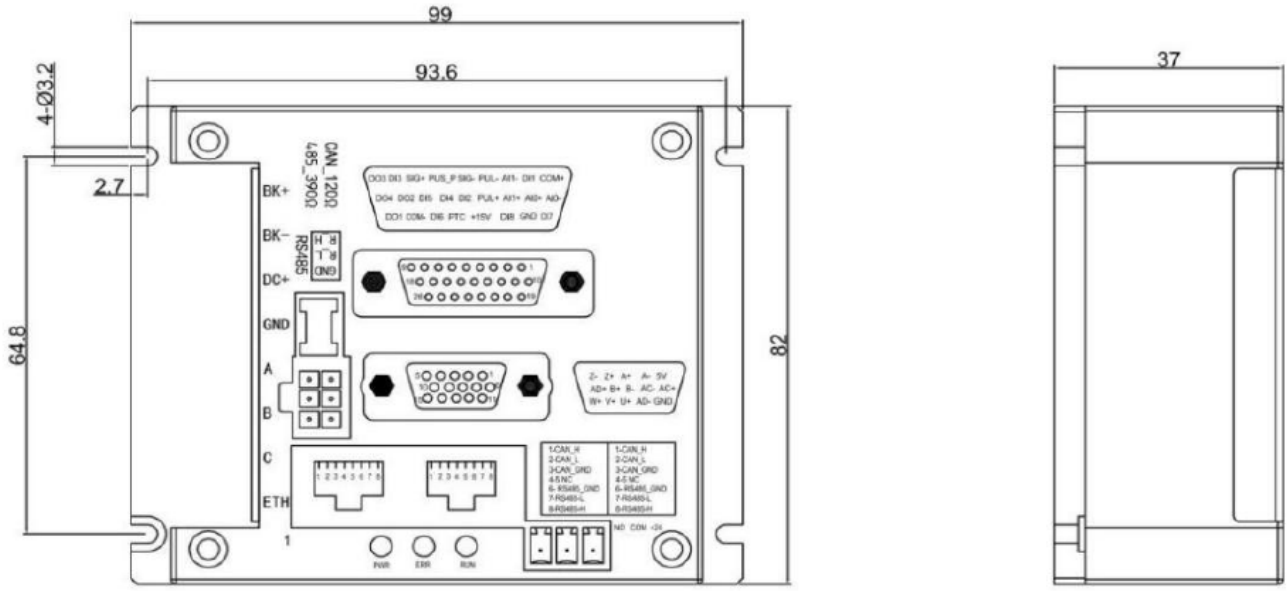




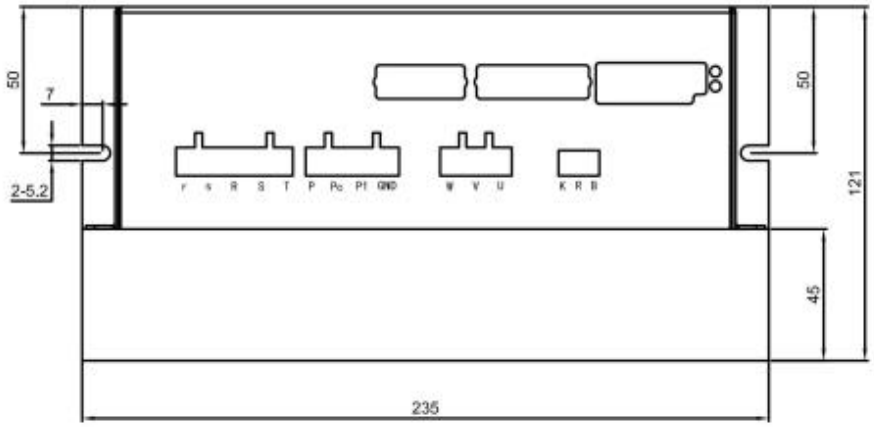
1.4.9 Size: IxLs1530

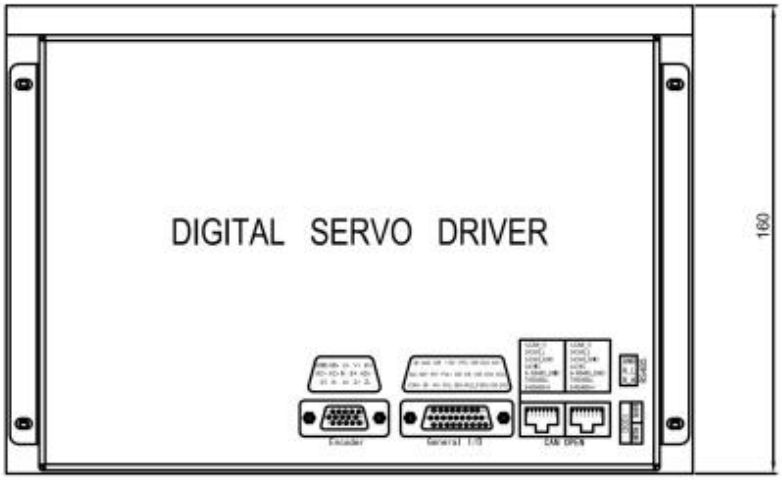


1.4.10 Size: IxLs3060

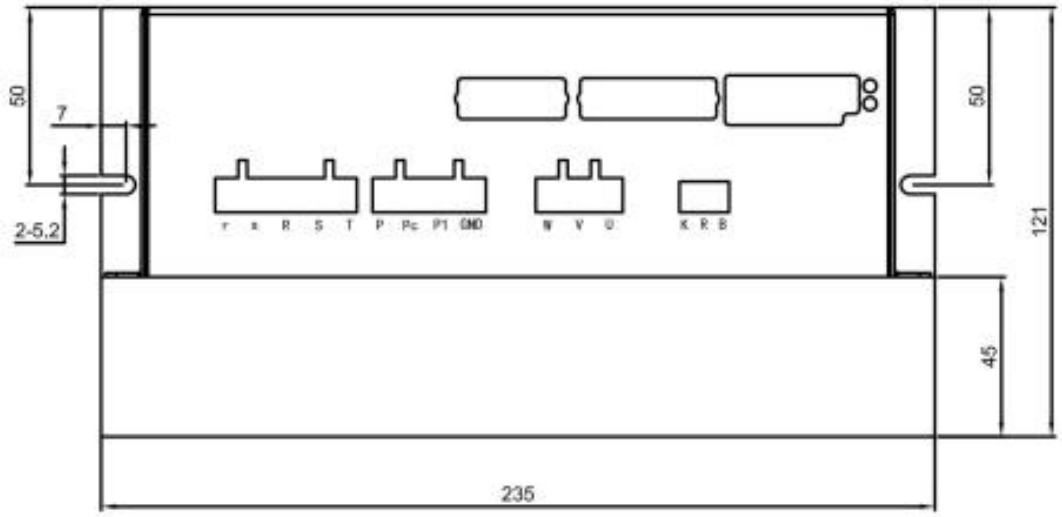


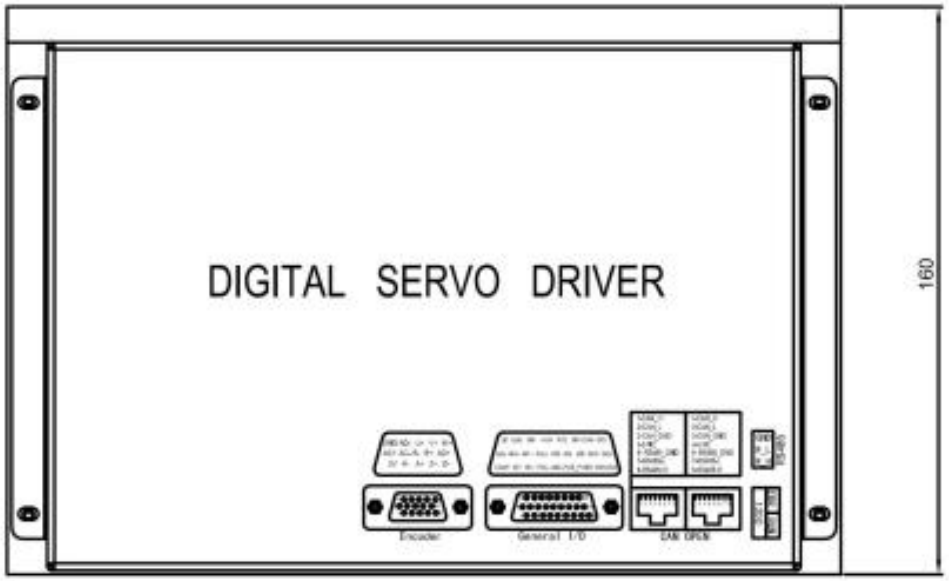
1.4.11 Size: IxH0612





1.4.12 Size: IxH1530





1.5 Installation Precautions

The servo driver is base-mounted. Improper installation may lead to malfunction. Please install correctly according to the following precautions.

(1) Please install it in a well-ventilated place. To facilitate the heat dissipation of the driver, vertical installation is generally adopted;

(2) The allowable ambient temperature for operation of the driver is 0℃~50℃, but if the ambient temperature is higher than 40℃, the maximum continuous output current should be reduced by 20% for every increase of 10℃, and ventilation and heat dissipation should be strengthened;

(3) The humidity requirement of the installation place is lower than 95%, with no condensation;

(4) It is not allowed to install the driver where there is a lot of dust and metal powder;

(5) It is not allowed to install the driver where there are corrosive and explosive gases;

(6) Install the driver where the vibration is less than 0.5G (4.9 m/s^2), and the vibration frequency is lower than 10Hz;

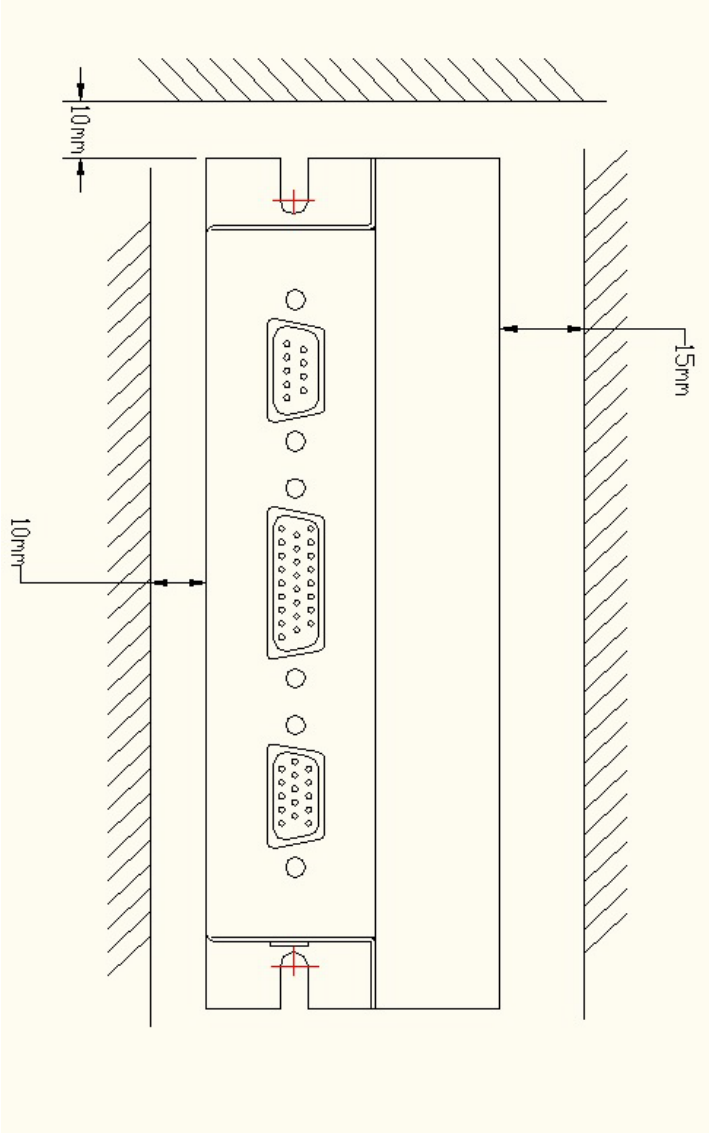
(7) Install the driver where there is no direct sunlight;

(8) The altitude is preferably lower than 1,000m . If it is higher than 1,000m , the maximum continuous output current of the driver shall be reduced by 3% for each increase of 100m.

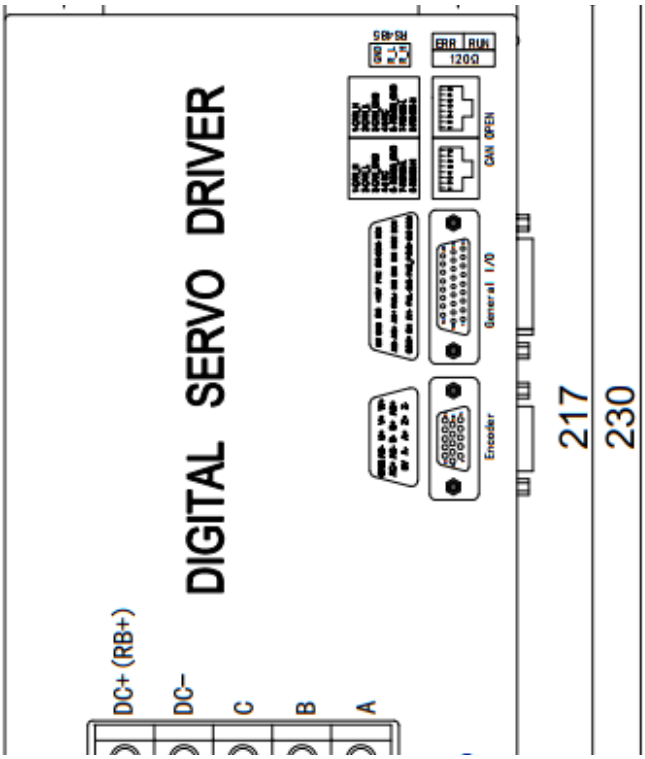
(9) If the continuous running current of SIZE1/SIZE2 drivers exceeds 15A, the continuous current of SIZE3 drivers exceeds 30A, and that of SIZE4 drivers exceeds 50A, it is necessary to provide an external radiator or install the drivers on metal shells, and apply heat-radiating silica gel or cooling pads between the drivers and the shells.

1.6 Installation of the Driver

The space requirements for installation of one SIZE:2040/3060(2550)/4080(3570) driver are shown in the following figure:



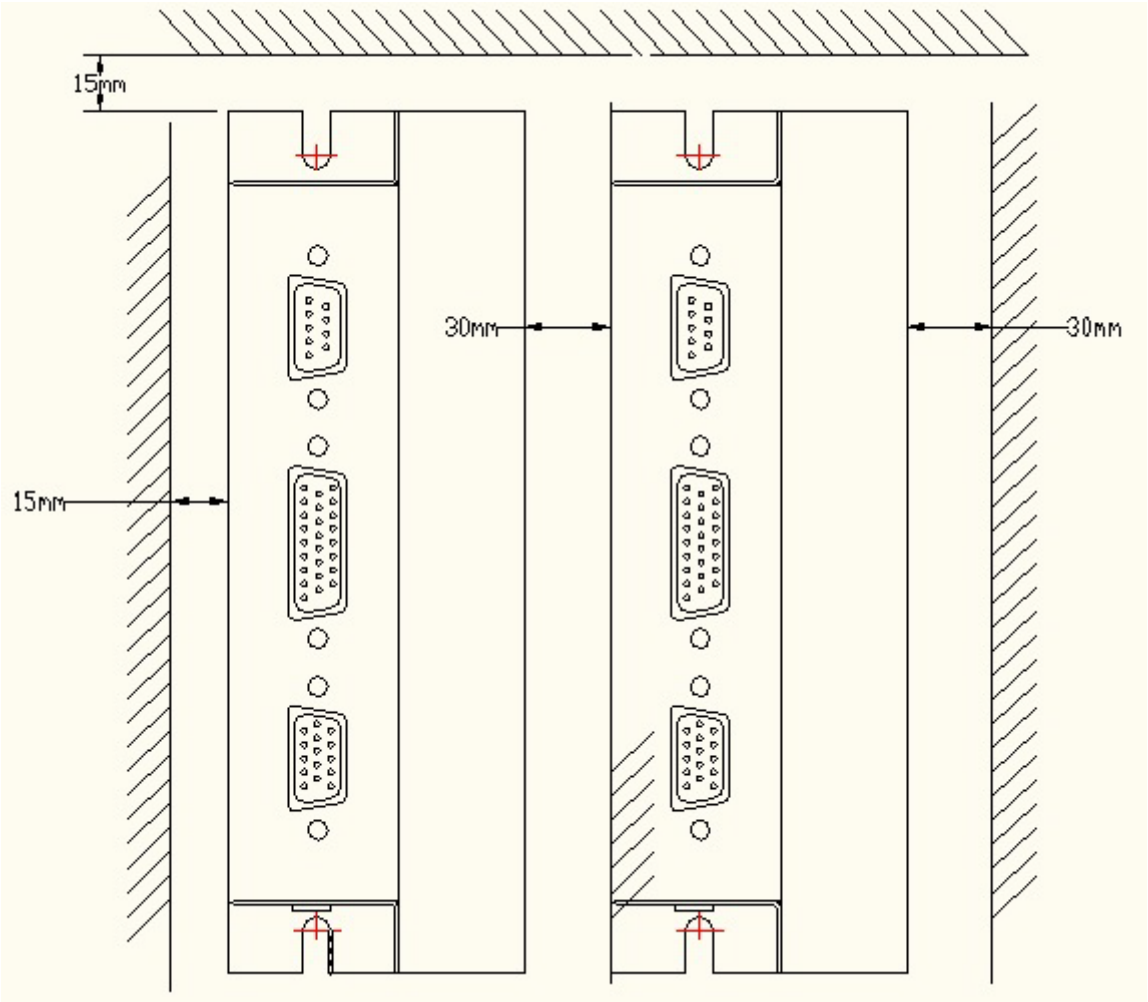
The space requirements for installation of one SIZE:80160(50100) driver are shown in the following figure:



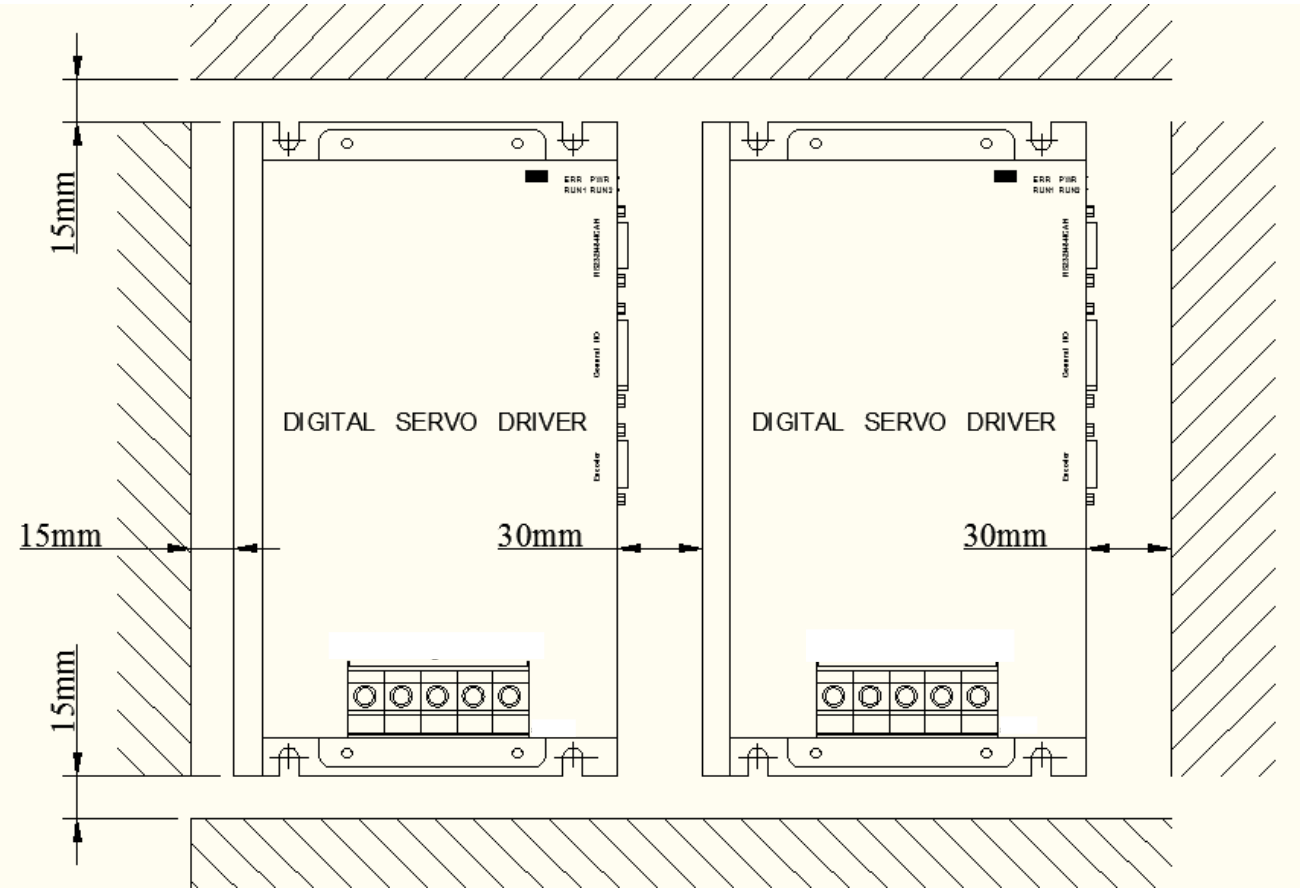
Note: SIZE:80160(50100)/150300 drivers need to use an external radiator or external casing for heat dissipation due to their large current. Pay attention to installing an external radiator during the installation of the driver, and apply heat-radiating silica gel or cooling pads between the driver and the external radiator.

If there are multiple controllers installed in the mechanism, they should be installed side by side, and equipped with air inlets, air outlets and special cooling fans.

SIZE:2040/3060(2550) drivers are shown in the following figure:



SIZE:80160(50100)/150300 drivers are shown in the following figure:



Note: SIZE:80160(50100)/150300 drivers need to use an external radiator or external casing for heat dissipation due to their large current. Pay attention to installing an external radiator during the installation of the driver, and apply heat-radiating silica gel or cooling pads between the driver and the external radiator.

II. Wiring

2.1 Wiring Precautions

2.1. 1 Safety Precautions for Wiring

(1) The wiring must be completed by professionally qualified personnel, otherwise there is a danger of electric shock;

(2) Ensure that the input power supply is completely disconnected before wiring, otherwise there is a danger of electric shock;

(3) The grounding terminal of the controller must be firmly connected with the grounding wire of the corresponding device (copper core wires above 2.5 mm^2 should be used as the grounding wire, and the grounding resistance should be less than 10 Ω), otherwise there is a danger of electric shock;

(4) Ensure that there is no short circuit between the wires, otherwise there is a danger of fire and damage to the equipment;

(5) It is strictly forbidden to connect the input power supply to the output side of the driver, otherwise there is a danger of damage to the equipment;

(6) All wires must be reliably and firmly connected, otherwise there is a danger of damage to the equipment;

(7) The power supply of the controlling terminal block shall not exceed the specified range (22V-90VDC), otherwise there is a danger of damage to the equipment;

(8) The exposed parts of wires at each wiring connection must be wrapped with insulating tape, otherwise there is a danger of short circuit and damage to the equipment;

(9) Check if the connections are correct after the wiring is completed.

2.1.2 Electrical Precautions for Wiring

(1) It is not advisable to let the power wire and the signal wire pass through the same pipe, or bind them together. When wiring, it is preferable to set aside a distance of 10cm and above between the power wire and the signal wire.

(2) Twisted-pair wires with integral shielding shall be used for the signal wire and the encoder feedback wire, and the shielding layer shall be connected to the connector housing. Wiring length: The maximum length of instruction signal input wires is 3m, and that of encoder feedback wires is 20m.

(3) Even if the power supply is turned off, there may still be high voltage in the servo driver, so start the wiring or inspection 5 minutes after turning off the power supply.

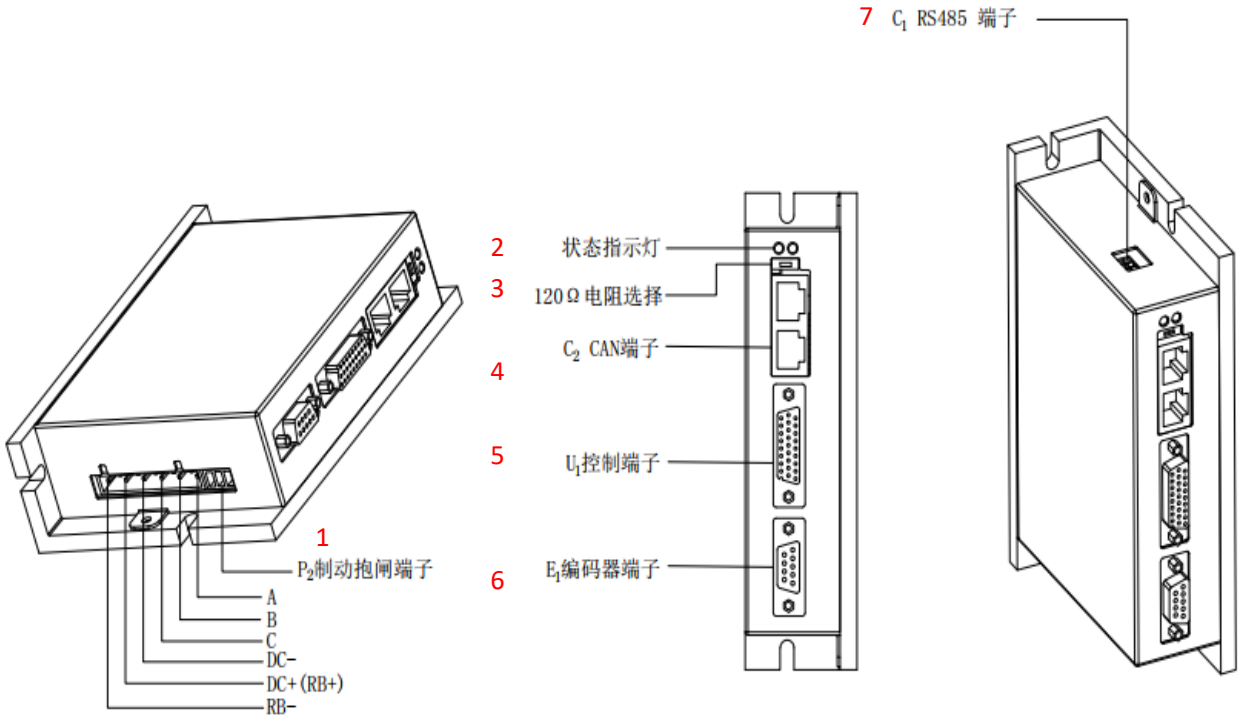
(4) Do not turn on and off the power supply frequently. If you need to turn on and off the power supply repeatedly, you should control the frequency below once per minute. A capacitor is installed inside the servo driver, and when the power supply is turned on, a large charging current will flow through the driver (the charging time is tens of milliseconds). Therefore, if the power supply is frequently turned on/off, the aging of components inside the servo driver will be accelerated.

2.1. 3 Recommended Specifications for Wiring Wires

Driver Model	Main Circuit Cable (mm^2)	Remarks
IxL-II 1020	2	It is advisable to use heat-resistant wires for the main circuit
IxL-II 2040	4	
IxL-II 3060	6	
IxL-II 4080	8	
IxL-II 50100	10	
IxL-II 80160	16	
IxL-II 100200	20	
IxL-II 150300	25	

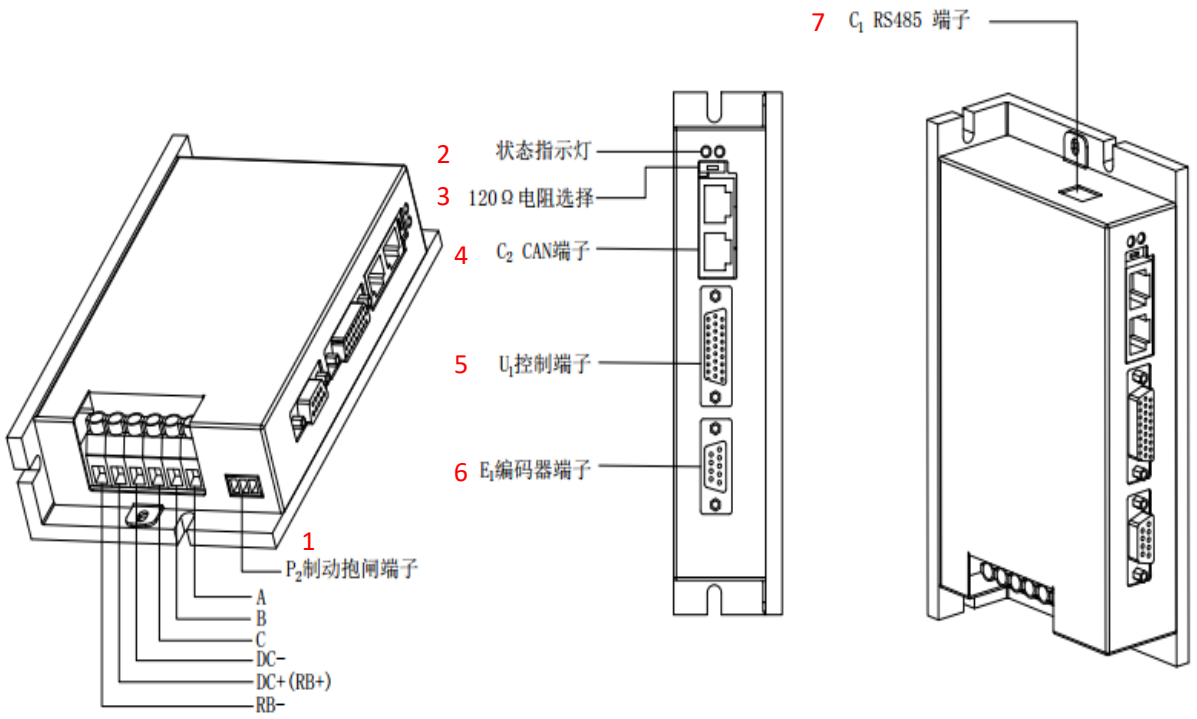
2.2 Schematic Diagram of Electrical Wiring

2.2. 1 Definition of Size:2040/3060(2550)/4080(3570) External Terminals



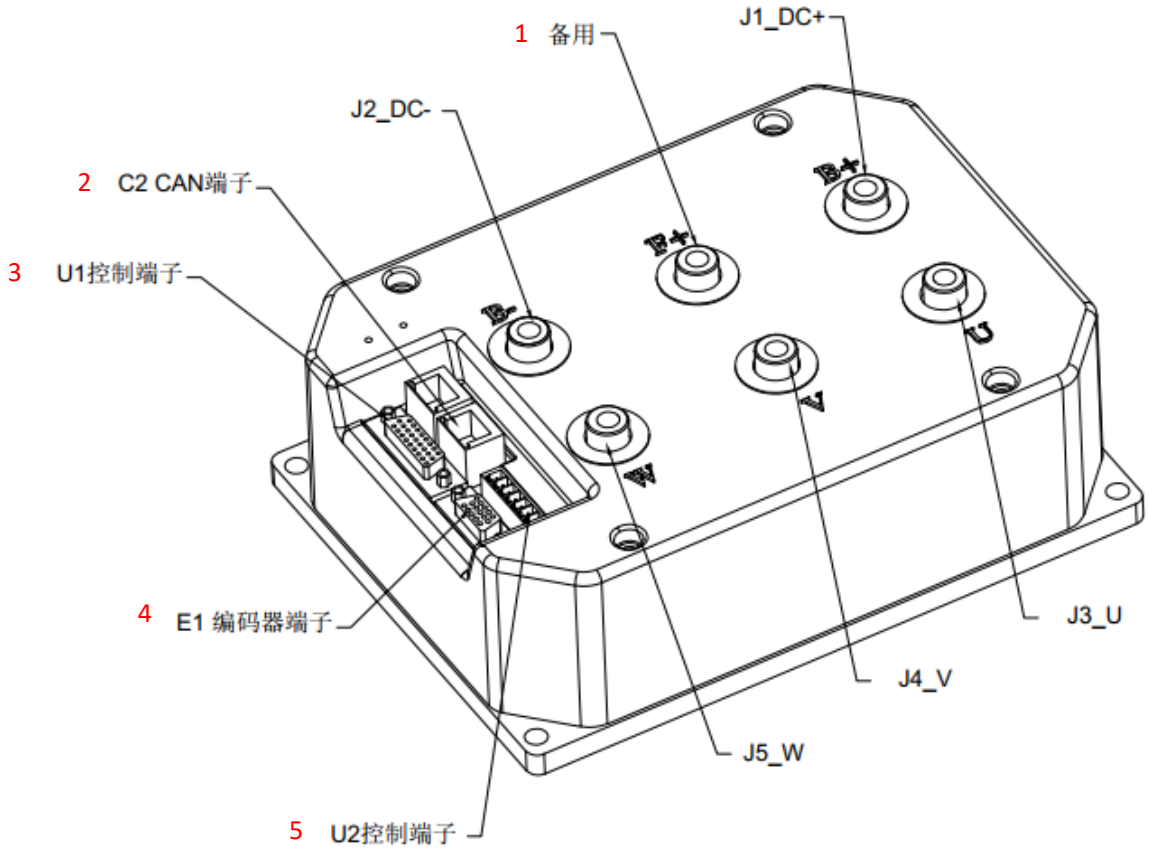
No.	Chinese	English
1.	P2 制动抱闸端子	P2Brake terminal
2.	状态指示灯	Status indicator
3.	120Ω 电阻选择	120Ω resistance option
4.	C2 CAN 端子	C2 CAN terminal
5.	U1 控制端子	U1 Control terminal
6.	E1 编码器端子	E1 Encoder terminal
7.	C1 RS485 端子	C1 RS485 terminal

2.2. 2 Definition of Size:80160(50100)/100200/95200(70140) External Terminals



No.	Chinese	English
1.	P2 制动抱闸端子	P2Brake terminal
2.	状态指示灯	Status indicator
3.	120Ω 电阻选择	120Ω resistance option
4.	C2 CAN 端子	C2 CAN terminal
5.	U1 控制端子	U1 Control terminal
6.	E1 编码器端子	E1 Encoder terminal
7.	C1 RS485 端子	C1 RS485 terminal

2.2. 4 Definition of Size:150300 External Terminals

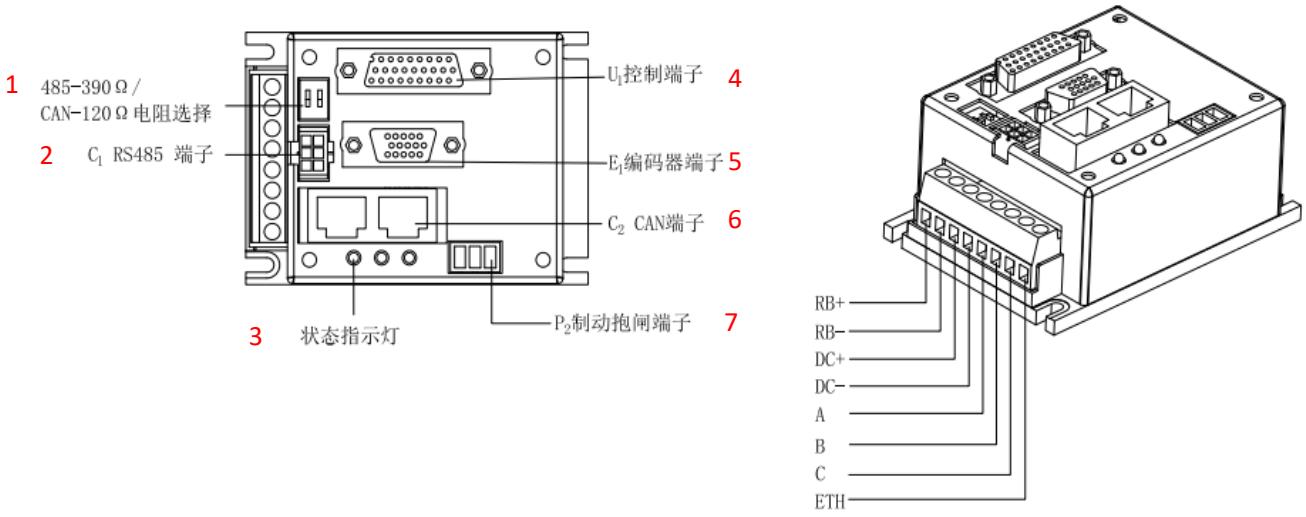


No.	Chinese	English
1.	备用	Standby
2.	C2 CAN 端子	C2 CAN terminal
3.	U1 控制端子	U1 Control terminal
4.	E1 编码器端子	E1 Encoder terminal
5.	U2 控制端子	U2 Control terminal

2.2.5 Size:150300 U2 Control Terminal

PIN	Name	Function	Description
U1	Can_R		Can_R and Can_L are short-circuited to 120 ohm terminal resistance
U2	Can_L		
U3	485H		
U4	485L		
U5	GND		
U6	N.O		**Relays are normally open**
U7	COM		**The common terminal of relays**
U8	POW +		**Brake Power Supply +**

2.2.5 Definition of Size:IxLs1530/IxLs3060 External Terminals



No.	Chinese	English
1.	485-390Ω/CAN-120Ω 电阻选择	485-390Ω/CAN-120Ω Resistance option
2.	C1 RS485 端子	C1 RS485 terminal
3.	状态指示灯	Status indicator
4.	U1 控制端子	U1 Control terminal
5.	E1 编码器端子	E1 Encoder terminal
6.	C2 CAN 端子	C2 CAN terminal
7.	P2 制动抱闸端子	P2Brake terminal

2.3 Main Circuit Terminal P1

SIZE1/2 Drive Main Circuit Terminal:

PIN	Name	Function	Description
J1	RB-	Braking Resistance-	
J2	DC+ (RB+)	Power Supply+ (Braking Resistance+)	20-90VDC
J3	DC-	Power Supply-	
J4	C	Motor U-phase input/Brushed (forward)	
J5	B	Motor V-phase input	
J6	A	Motor W-phase input/Brushed (reverse)	

SIZE3 Drive Main Circuit Terminal:

PIN	Name	Function	Description
J1	DC+ (RB+)	Power Supply+ (Braking Resistance+)	20-90VDC

J2	DC-	Power Supply-	
J3	C	Motor U-phase input/Brushed (forward)	
J4	B	Motor V-phase input	
J5	A	Motor W-phase input/Brushed (reverse)	

SIZE4 Drive Main Circuit Terminal:

PIN	Name	Function	Description
J1	B+	Power Supply+	20-90VDC
J2	B-	Power Supply-	
J3	F+	Standby	
J4	U	Motor U-phase input/Brushed (forward)	
J5	V	Motor V-phase input	
J6	W	Motor W-phase input/Brushed (reverse)	

IxLS15030/IxLs3060 Drive Main Circuit Terminal:

PIN	Name	Function	Description
J1	RB+	Braking Resistance+	
J2	RB-	Braking Resistance-	
J3	DC+	Power Supply+	20-90VDC
J4	DC-	Power Supply-	
J5	A	Motor W-phase input/Brushed (reverse)	
J6	B	Motor V-phase input	
J7	C	Motor U-phase input/Brushed (forward)	
J8	ETH	Chassis ground	

2.4 Brake Terminal P2

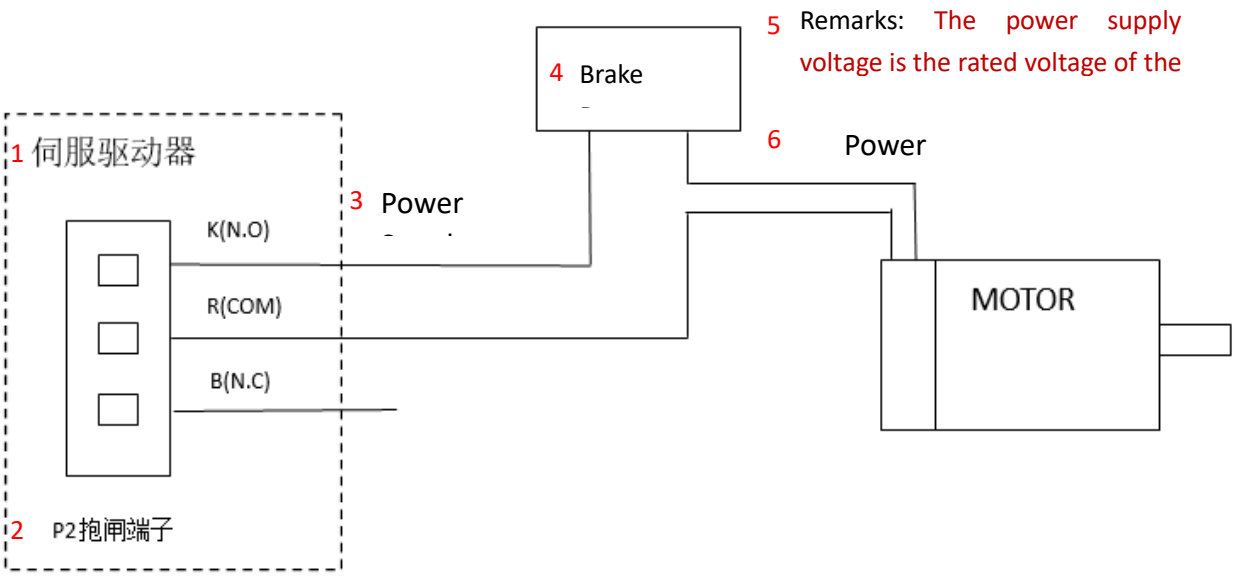
SIZE1/2 Brake Terminal

PIN	Name	Type	Function
1	K (N.O)	Interfaces with normally open relays	If power-off braking is needed, connect the power-off brake of the motor
2	R (Com)	The common terminal of relays	
3	B (N.C)	Interfaces with normally closed relays	

SIZE3 Brake Terminal

PIN	Name	Type	Function
1	K (N.O)	Interfaces with normally open relays	If power-off braking is needed, connect the power-off brake of the motor
2	R (Com)	The common terminal of relays	
3	RB-	Braking Resistance-	

Note: The maximum endurable current of the internal brake relay is 2A. If the continuous current of a brake is greater than 2A, use an external relay for connection, otherwise there is a risk of damage to the internal brake relay.



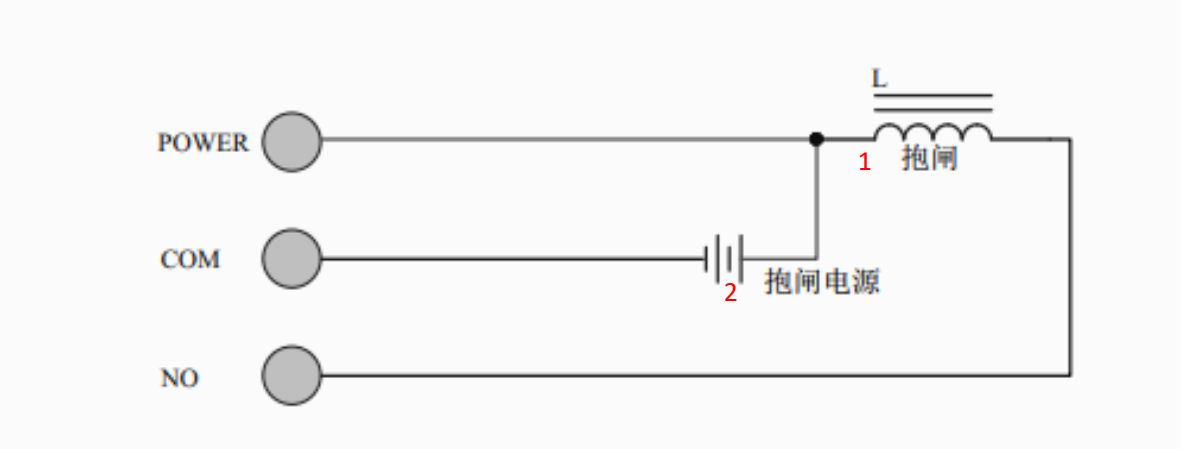
Schematic Diagram of Internal Brake Relay Wiring

No.	Chinese	English
1.	伺服驱动器	Servo driver
2.	P2 抱闸端子	P2 Brake terminal
3.	电源正	Power Supply+

4.	抱闸电源	Brake Power Supply
5.	备注：电源电压为抱闸额定电压	Remarks: The power supply voltage is the rated voltage of the brake
6.	电源负	Power Supply-

SIZE5/6 Brake Terminal

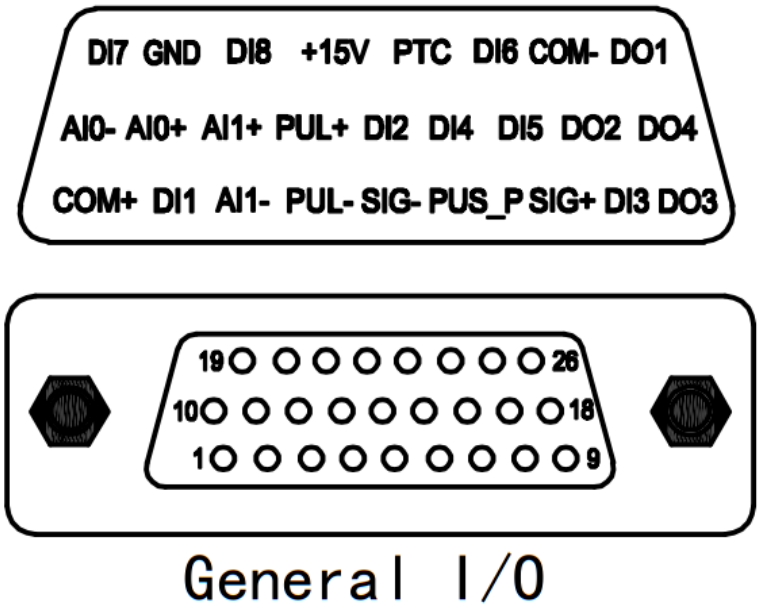
PIN	Name	Type	Function
1	K (N.O)	Normally open contacts	
2	R (Com)	Power Supply-	
3	POW +	Power Supply+	



Schematic Diagram of MINI Drive Brake Wiring

No.	Chinese	English
1.	抱闸	Brake
2.	抱闸电源	Brake Power Supply

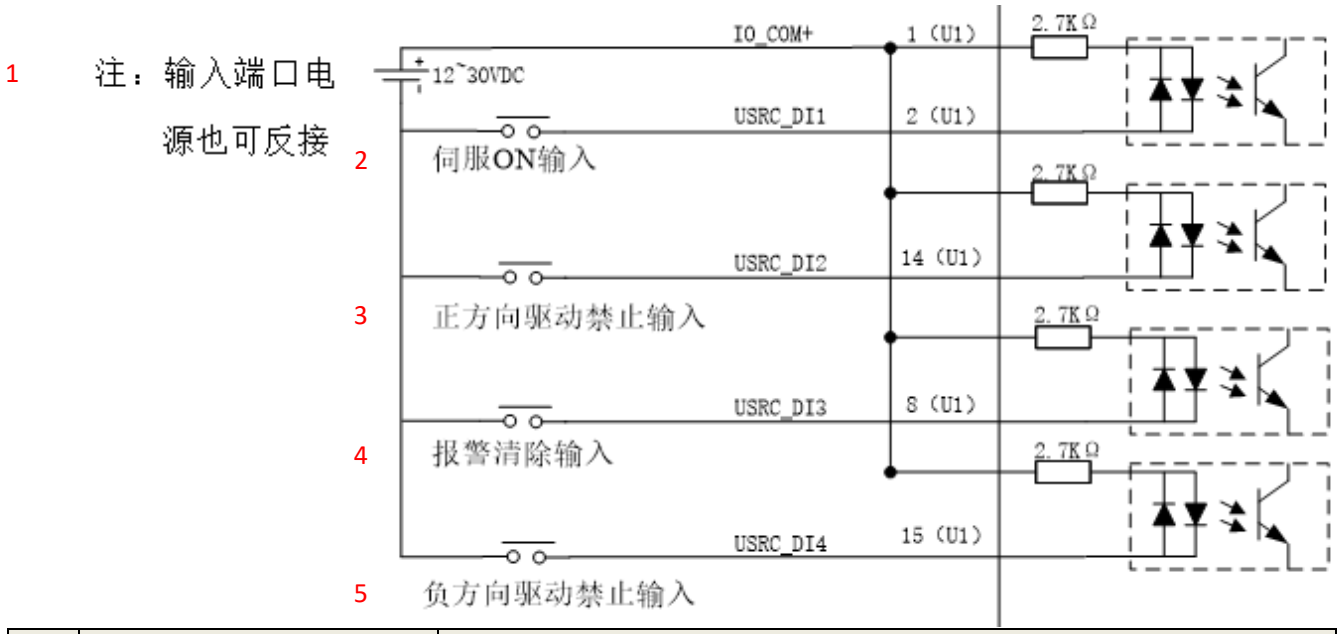
2.5 Control Signal Terminal U1



PIN	Name	Type	Function
01	IO_COM+	IO input power supply	Input Common Terminal
02	USRC_DI1	Digital input	Servo ON; External DI enabled effectively
03	USRC_AI1_N	Analog input (negative)	Torque/speed limit input
12	USRC_AI1_P	Analog input (positive)	
04	ORD_PUL_L	Pulse input interface	Command pulse signal input; Input current: > 10mA
05	ORD_SIG_L	Pulse input interface	
06	ORD_PUS_POW	Pulse input power supply	
07	ORD_SIG_H	Pulse input interface	
13	ORD_PUL_H	Pulse input interface	
08	USRC_DI3	Digital input	Alarm reset; External DI enabled effectively
09	USRC_DO3	Digital output	Servo alarm output; < 50mA
10	USRC_AI0_N	Analog input (negative)	Current reference input/Speed reference input
11	USRC_AI0_P	Analog input (positive)	
14	USRC_DI2	Digital input	POT input
15	USRC_DI4	Digital input	NOT input
16	USRC_DI5	Digital input	Home origin signal; External DI enabled effectively
17	USRC_DO2	Digital output	Positioning completed/Speed reached output; < 50mA

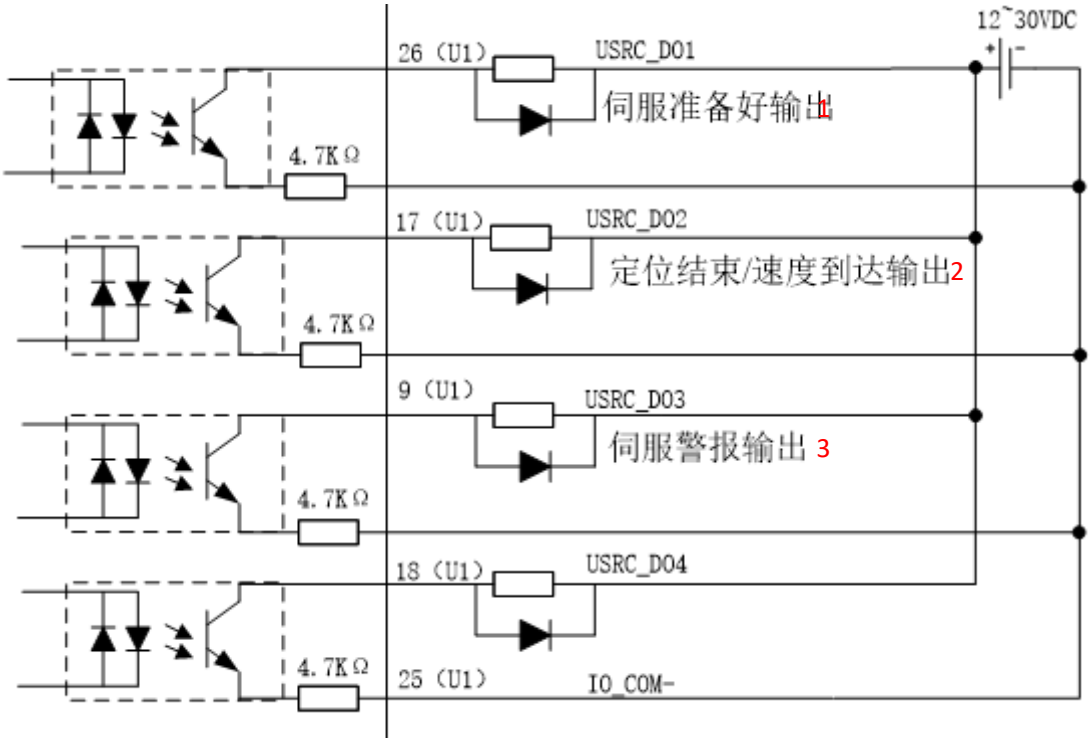
18	USRC_DO4	Digital output	Servo enabled output
19	USRC_DI7	Digital input	Quick stop of the motor
20	GND_DIG	Digital ground	
21	USRC_DI8	Digital input	Motor homing activated; External DI enabled effectively
22	+15V_DIG	Power supply output	< 100mA
23	MOTOR_PTC	Analog input	Motor temperature sensor (positive)
24	USRC_DI6	Digital input	Control mode switching
25	IO_COM-	IO output power supply	Output common terminal
26	USRC_DO1	Digital output	Servo readiness output; < 50mA

2.5.1 Digital DI Wiring



No.	Chinese	English
1.	注：输入端口电源也可反接	Note: The power supply of the input port is also suitable for reverse connection.
2.	伺服 ON 输入	Servo ON input
3.	正方向驱动禁止输入	POT input
4.	报警清除输入	Alarm reset input
5.	负方向驱动禁止输入	NOT input

2.5.2 Digital DO Wiring



No.	Chinese	English
1.	伺服准备好输出	Servo readiness for output
2.	定位结束/速度到达输出	Positioning completed/Speed reached output;
3.	伺服警报输出	Servo alarm output

2.5.3 Analog AI Wiring

+/-10V Analog instruction wiring method:

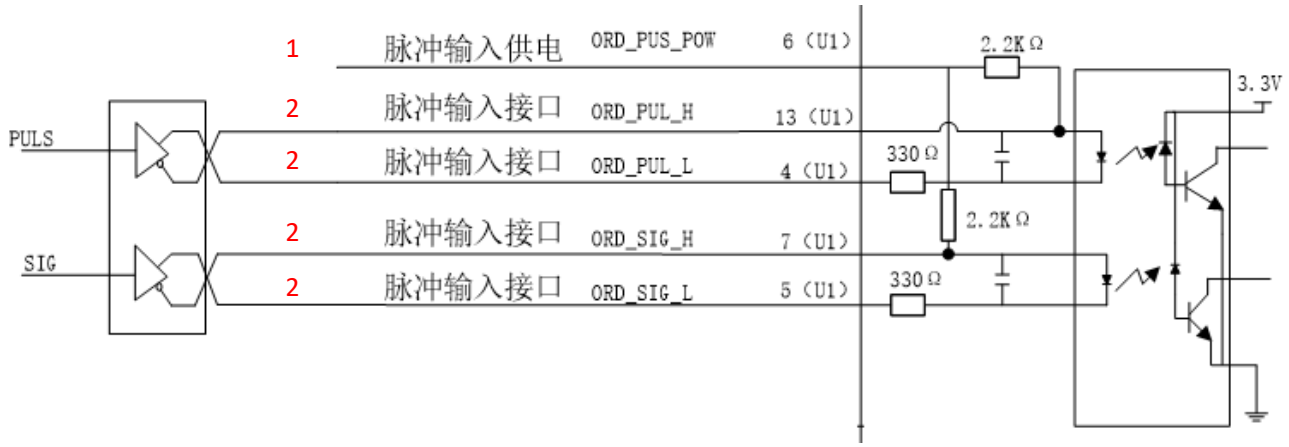
No.	Chinese	English
1.	速度/力矩模拟量指令	Speed/Torque analog instruction
2.	模拟限制量指令	Analog limited quantity instruction
3.	模拟量输入	Analog input

0-10V Analog + direction signal instruction wiring method:

No.	Chinese	English
1.	速度/力矩模拟量指令	Speed/Torque analog instruction
2.	模拟量输入	Analog input

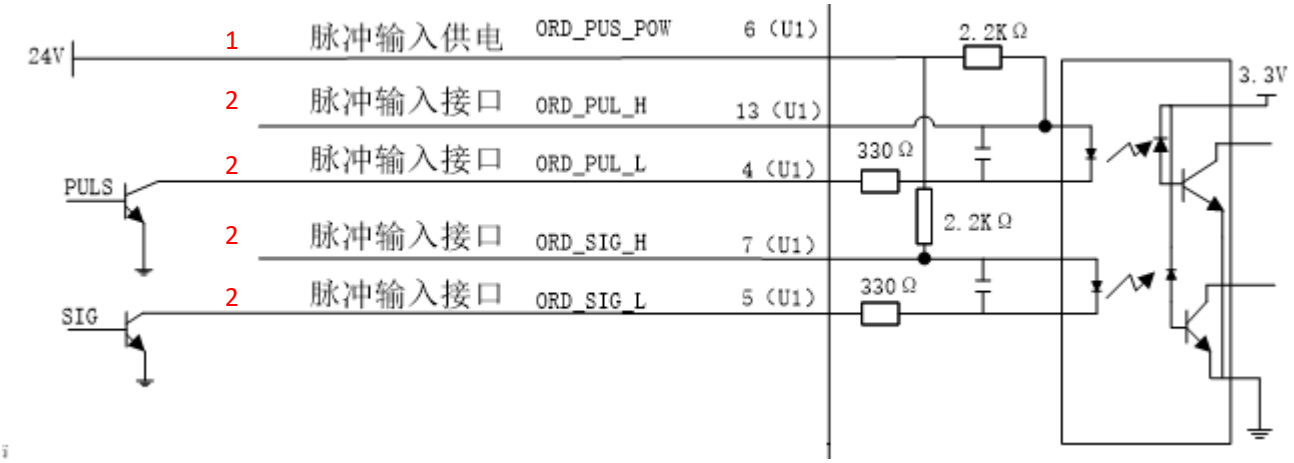
2.5.4 Pulse Input Wiring

Differential pulse input wiring:



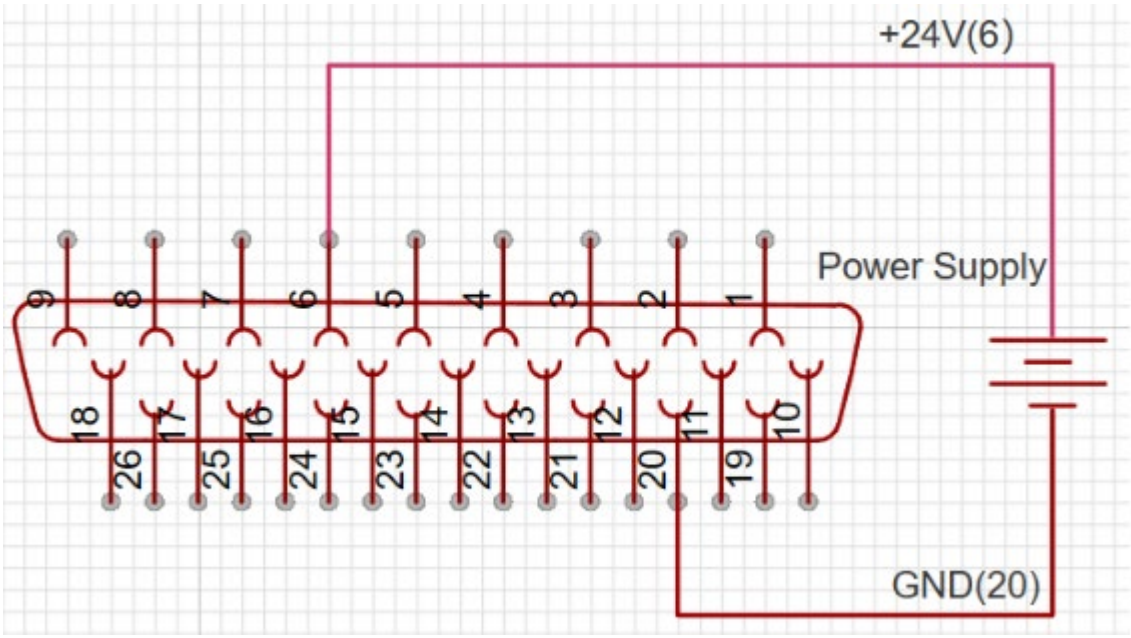
No.	Chinese	English
1.	脉冲输入供电	Pulse input power supply
2.	脉冲输入接口	Pulse input interface

Open collector pulse input wiring:



No.	Chinese	English
1.	脉冲输入供电	Pulse input power supply
2.	脉冲输入接口	Pulse input interface

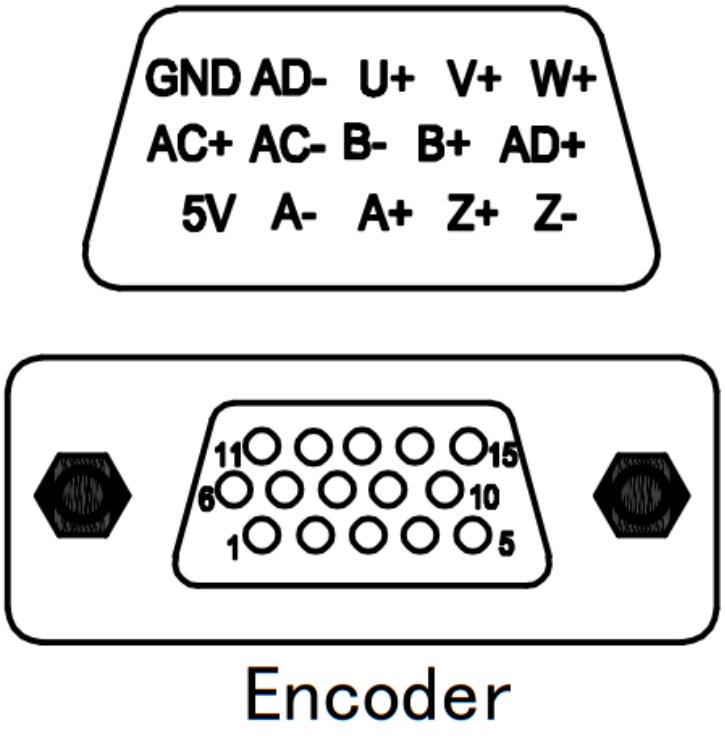
2.5.5 Auxiliary Power Supply Wiring (Driver Model: IxL-II. **.**.AP)



Auxiliary power supply wiring: Drive U1, Port 6 and Pin 20 are connected to 24V power supply

(The wiring of other parts is the same as normal drivers)

2.6 Encoder Terminal E1

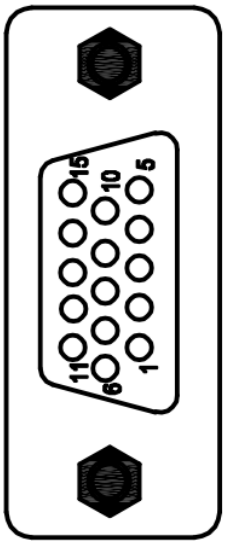


PIN	Name	Type	Function
01	VDD_5V		5V power supply for encoders
02	IPHA_N	Input	Incremental encoder A with a negative difference /Single-ended incremental encoders are connected to VDD_5V Resolver SIN-
03	IPHA_P	Input	Incremental encoder A with a positive difference /Single-ended incremental encoder with A signals Rotary encoder SIN +
04	IIDX_P	Input	Incremental encoder; Z differential input (positive) /Single-ended incremental encoder with Z signals Resolver excitation (positive), EXC+
05	IIDX_N	Input	Incremental encoder; Z differential input (negative) /Single-ended incremental encoders are connected to VDD_5V Resolver excitation (negative), EXC-
06	ABS_ECLK_P	Output	Absolute encoder; clock output (positive)
07	ABS_ECLK_N	Output	Absolute encoder; clock output (negative)
08	IPHB_N	Input	Incremental encoder B with a negative difference /Single-ended incremental encoders are connected to VDD_5V Resolver COS-
09	IPHB_P	Input	Incremental encoder B with a positive difference /Single-ended incremental encoder with B signals Resolver COS+
10	ABS_DATA_P	Input/Output	Absolute encoder; Data (positive)
11	GND_DIG		Digital ground
12	ABS_DATA_N	Input/Output	Absolute encoder; Data (negative)
13	HULL_U	Input	Hull U
14	HULL_V	Input	Hull V
15	HULL_W	Input	Hull W

2.6. 1 Incremental Encoder Wiring

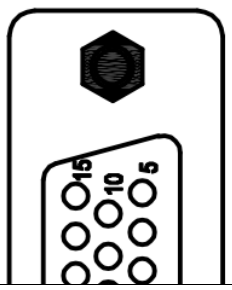
	Driver pin		Differential incremental encoder

	01. VDD_5V		+5V
	11. GND_DIG		GND
	03. IPHA_P		A+
	02. IPHA_N		A-
	09. IPHB_P		B+
	08. IPHB_N		B-
	04. IIDX_P		Z+
	05. IIDX_N		Z-
	13. HULL_U		HULL_U+
	14. HULL_V		HULL_V+
	15. HULL_W		HULL_W+
			HULL_U- (not connected)
			HULL_V- (not connected)
			HULL_W- (not connected)



Encoder

Driver pin		Single-ended incremental encoder
01. VDD_5V		+5V
11. GND_DIG		GND
03. IPHA_P		A
02. IPHA_N		
09. IPHB_P		B
08. IPHB_N		
04. IIDX_P		Z
05. IIDX_N		
13. HULL_U		HULL_U
14. HULL_V		HULL_V
15. HULL_W		HULL_W

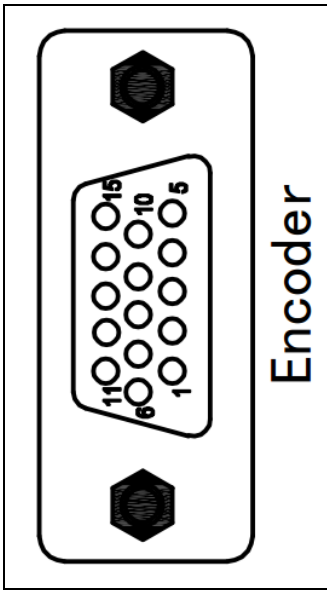


oder

Driver pin		Single-ended incremental encoder without Z signals
01. VDD_5V		+5V
11. GND_DIG		GND
03. IPHA_P		A
02. IPHA_N		
09. IPHB_P		B

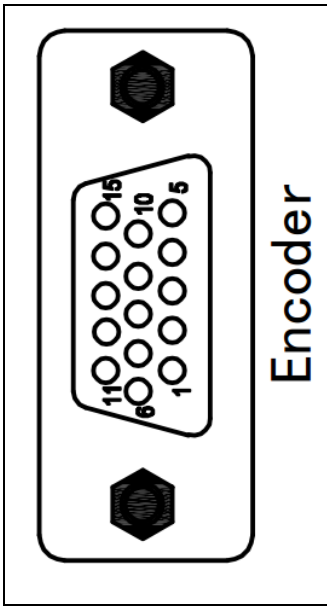
	08. IPHB_N		
	04. IIDX_P		
	05. IIDX_N	—	
	13. HULL_U		HULL_U
	14. HULL_V		HULL_V
	15. HULL_W		HULL_W

2.6.2 SSI/BISS Encoder Wiring



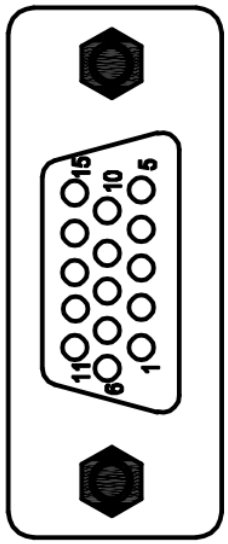
Driver pin		SSI/BISS Encoder
01. VDD_5V		+5V
11. GND_DIG		GND
10. ABS_DATA_P		DATA+
12. ABS_DATA_N		DATA-
06. ABS_ECLK_P		CLK +
07. ABS_ECLK_N		CLK-

2.6. 3 TAMAGAWA NRZ Encoder Wiring



Driver pin		TAMAGAWA Absolute NRZ Encoder
01. VDD_5V		+5V
11. GND_DIG		GND
10. ABS_DATA_P		DATA+
12. ABS_DATA_N		DATA-

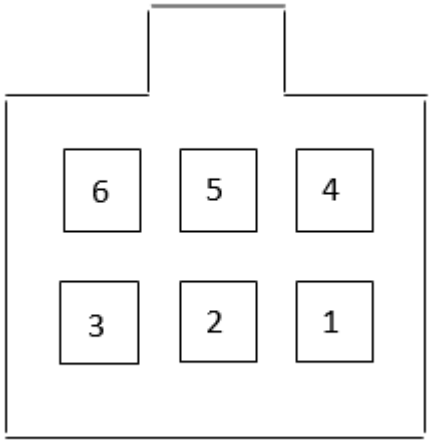
2.6. 4 Resolver Wiring



Driver pin		Resolver
2. IPHA_N		SIN-
3. IPHA_P		SIN+
4. IIDX_P		EXC+
5. IIDX_N		EXC-
8. IPHB_N		COS-
9. IPHB_P		COS+

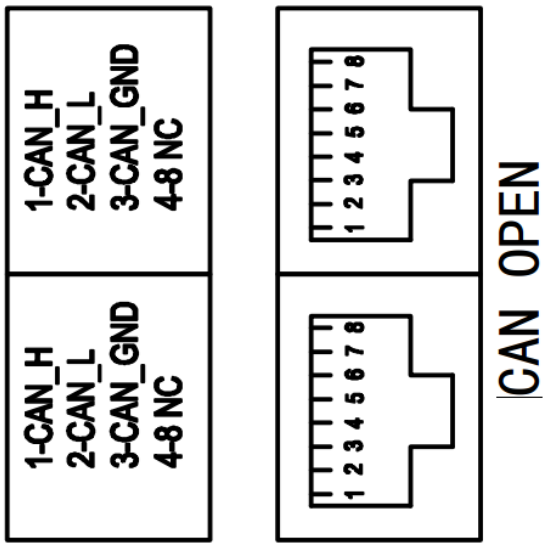
2.7 RS485 Communication Terminal C1

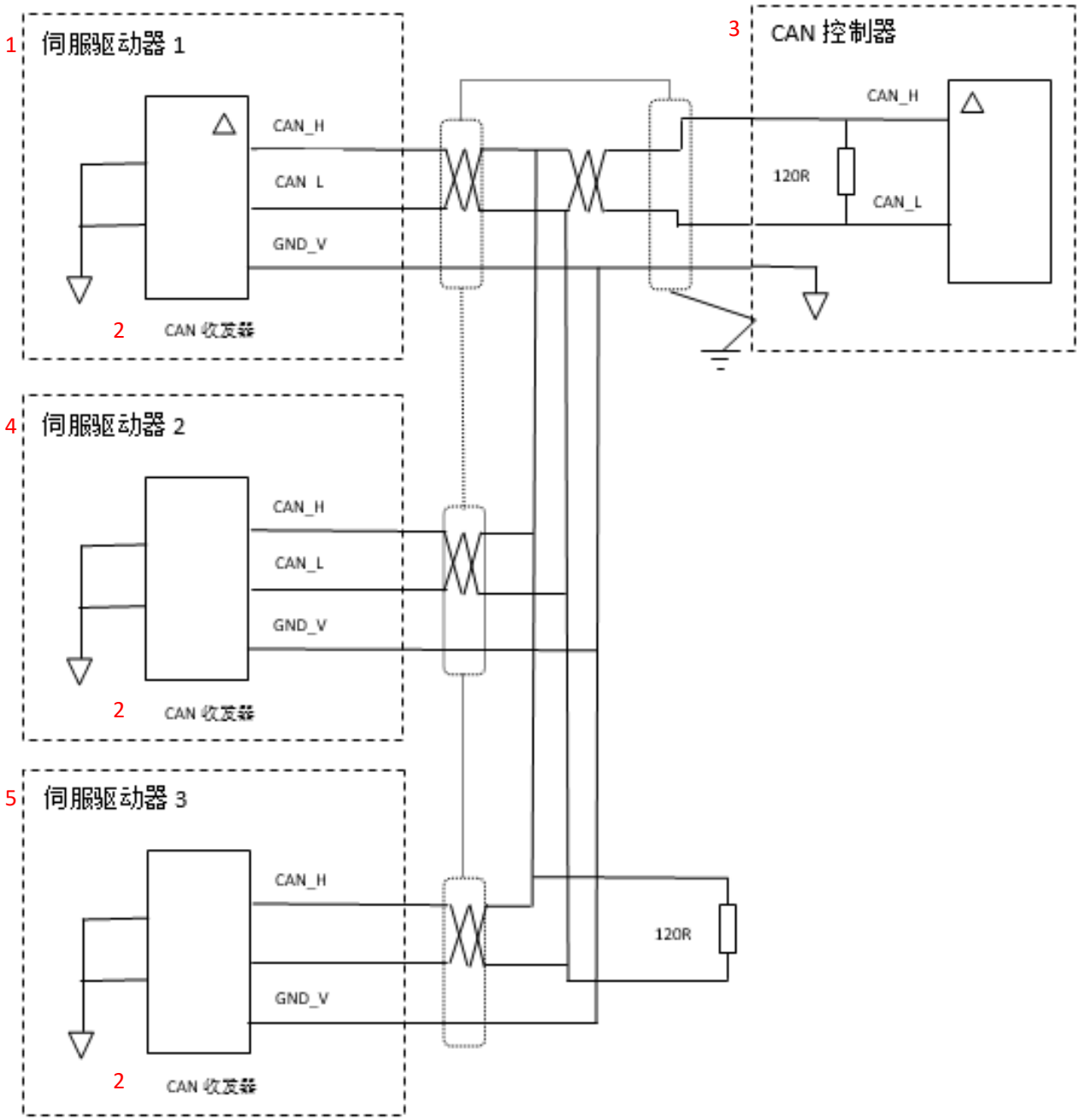
Definition of RS485 Communication Terminal C1 Port:

PIN	Name	Function
01	RS485_H	
02	RS485_L	
03	COM_GND	
04	RS485_ H	
05	RS485_L	
06	COM_GND	

2.8 CAN Communication Terminal C2

Definition of CAN Communication Terminal C2 Interface

PIN	Name	Schematic Diagram
01	CAN_H	
02	CAN_L	
03	CAN_GND	
04	NC	
05	NC	
06	COM_GND	
07	RS485_ L	
08	RS485_ H	

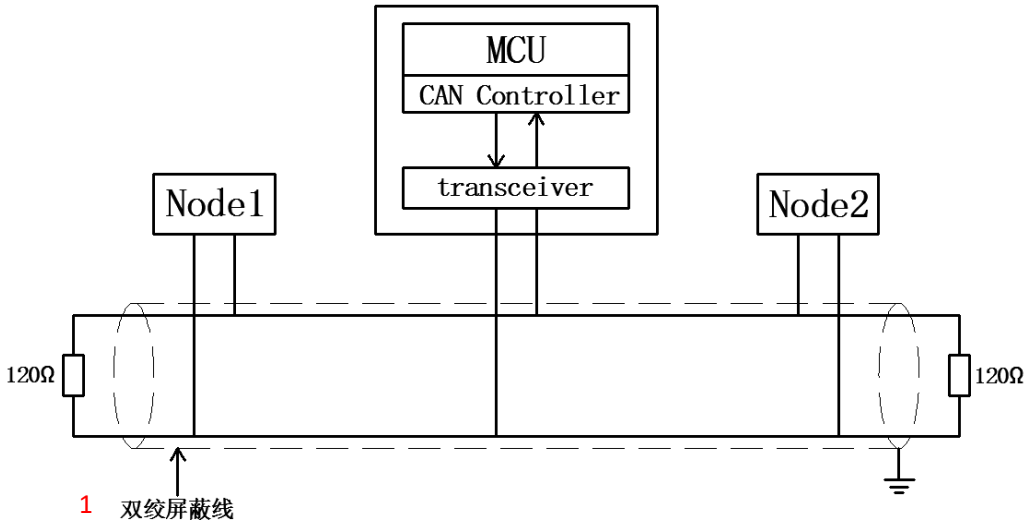


No.	Chinese	English
1.	伺服驱动器 1	Servo driver 1
2.	CAN 收发器	CANTransceiver
3.	CAN 控制器	CANController
4.	伺服驱动器 2	Servo driver 2
5.	伺服驱动器 3	Servo driver 3

Note: When multiple drivers are connected to the bus, it is necessary to set each driver at a unique address, otherwise there will be communication failure.

CAN Bus Connection and Performance Features

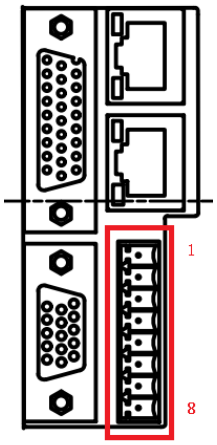
CAN bus control is a local control network and a communication protocol of real-time control. Its running speed reaches 1MHZ, and for typical applications, the speed is 500KHZ. The two terminals of CAN bus must be connected with 120R resistance, and the total resistance between CAN buses is 60R.



No.	Chinese	English
1.	双绞屏蔽线	Twisted-pair shielded wire

Note: To enhance the anti-interference ability of the bus, it is recommended to use twisted-pair shielded wires for CAN connecting wires, and the shielding layer shall be connected to reliable ground wires.

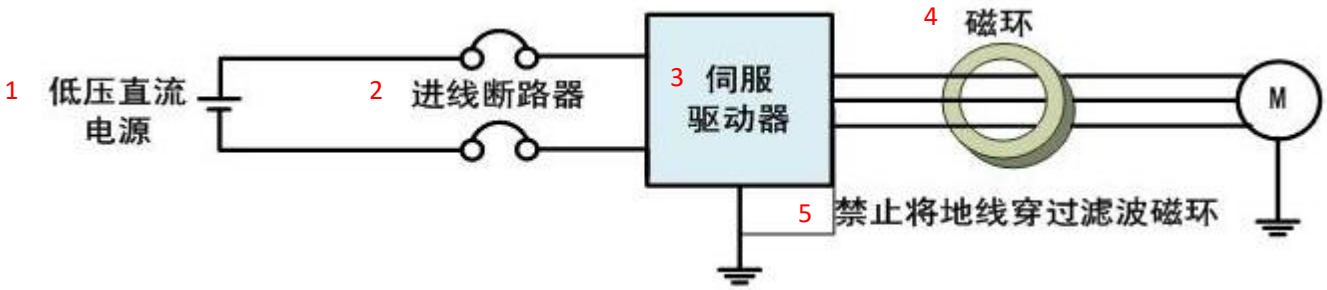
2.9 SIZE4 Control Terminal U2

PIN	Name	Description	Schematic Diagram
01	CAN_120R_R	CAN Bus 120R terminal resistance options are available after short-circuiting	
02	CAN_120R_L		
03	RS485_H	RS485 port for MODBUS communication and connection with debugging software	
04	RS485_L		
05	GND		
06	K (N.O)	Driver brake port; Refer to Section 2.4 for port description	
07	R (Com)		
08	NC	Null	

2.10 Anti-interference Measures of Wiring

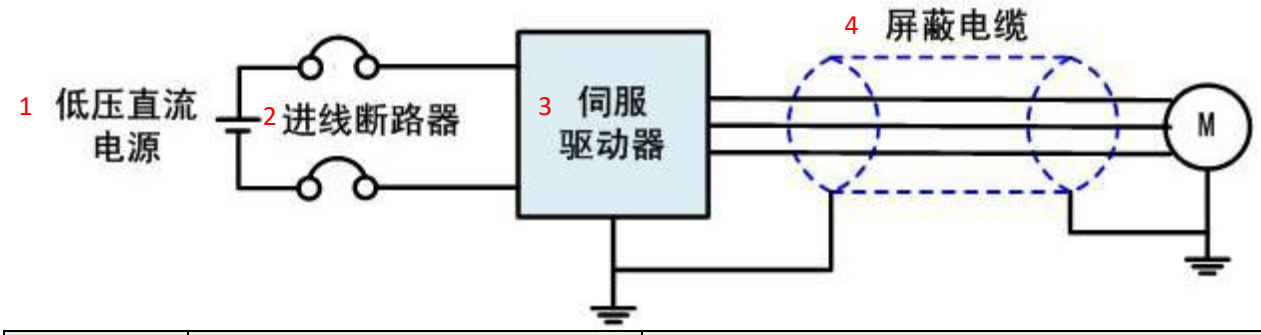
1、 The wiring of logic circuits such as control signals and encoder signals must be separated from the power wires of the power supply and those of motors. Cross wiring is recommended to minimize interference.

2、 The filtering magnetic ring is installed on the output side near the driver, which can effectively suppress the common mode interference on the output side.



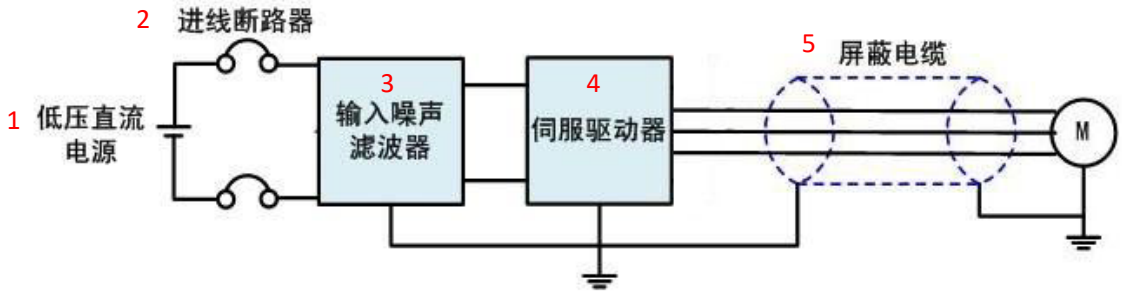
No.	Chinese	English
1.	低压直流电源	Low voltage DC power supply
2.	进线断路器	Incoming circuit breaker
3.	伺服驱动器	Servo driver
4.	磁环	Magnetic ring
5.	禁止将地线穿过滤波磁环	Do not let the ground wire pass through the filter magnetic ring.

3、 The output wires of servo drivers are shielded cables, which can effectively suppress radio interference and inductive interference. When using shielded cables, both ends of the shielding layer should be grounded.



No.	Chinese	English
1.	低压直流电源	Low voltage DC power supply
2.	进线断路器	Incoming circuit breaker
3.	伺服驱动器	Servo driver
4.	屏蔽电缆	Shielded cable

4、Input side interference of the driver can be resisted by using an input filter.



No.	Chinese	English
1.	低压直流电源	Low voltage DC power supply
2.	进线断路器	Incoming circuit breaker
3.	输入噪声滤波器	Input noise filter
4.	伺服驱动器	Servo driver
5.	屏蔽电缆	Shielded cable

III. MODBUS and EASYDRIVE Debugging Software

3.1 Options of Communication Modes

The driver adopts the MODBUS-RTU protocol, supporting RS485 communication mode.

Baud rate setting

The driver supports three baud rates: 9600, 19200 and 38400. The baud rate of driver communication can be changed by setting the parameter of sysPRM.uwMbusBaudRate, and the initial baud rate of the driver is 9600. See Table 3-1 for details.

Modbus Communication address	Parameter No.	Name and description	Setting range	Default setting
0x4670	sysPRM.uwMbusBaudRate	Communication baud rate	9600, 19200, 38400	9600

Communication address setting

The driver can set 1-127 communication addresses, and 0 is the common address. In the entire network, each driver needs to set a unique address, otherwise it will cause communication failure. Set driver addresses by setting the parameter of sysPRM.uwMbusStaAdd, and the initial value is 0. See Table 3-2 for details.

Modbus Communication address	Parameter No.	Name and description	Setting range	Default setting
0x466C	sysPRM.uwMbusStaAdd	Communication address	0-127	0

Note: To use MODBUS to control the operation of motors, you need to set the enabling status of CANOpen to disabled. If the CANOpen is in the enabled status, MODBUS can only be used for monitoring.

No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	力矩控制模式	Profiled torque mode
28.	I/O 控制	I/O control
29.	CANopen 参数配制	CANopen parameter configuration
30.	驱动系统控制参数	Drive system control parameter
31.	电机复位控制	Motor reset control

3.2 Introduction of Modbus Communication Protocol

3.2.1 The driver supports the following Modbus function codes

0x03: Read the holding register. Get the current binary value in one or more holding registers. Maximum of 125 register data can be read at a time.

0x10: Preset multiple registers. Load specific binary values into a series of continuous holding registers.

The CRC syndrome formula is: g(x)=x^16+x^15+x^2+1→(C005)

Note: The driver does not support the read-write function of continuous address registers.

3.2.2 Description of MODBUS Function Code Commands

Write holding register (function code 0x10)

Controller command	Address	Function code	Register address		Number of registers		Number of bytes	Data written in	Check code
			Address (high)	Address (low)	High order	Low order		2/4	CRC16
	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2/4 Bytes	2 Bytes
Driver response	Address	Function code	Register address		Number of registers written in				Check code
			Address (high)	Address (low)	Number of registers (high)		Number of registers (low)		CRC16
	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte		1 Byte		2 Bytes

For example: Controller Write Commands: (32-bit data write operation)

Address	Function code	Register address		Number of write registers		Number of written bytes	Low 16-bit data		High 16-bit data		CRC check	
1st B	2nd B	High order	Low order	High order	Low order	7th B	High order	Low order	High order	Low order	Low order	High order
0x00	0x10	0x43	0xC6	0x00	0x02	0x04	0x80	0x00	0x00	0x0A	0xF7	0xDD
Description												

Driver response

Address	Function code	Register address		Number of registers		CRC check	
1st B	2nd B	3rd B	4th B	5th B	6th B	7th B	8th B
0x00	0x10	0x43	0xC6	0x00	0x02	0xB5	0xa0
Description							

For example: Controller Write Commands: (16-bit data write operation)

Address	Function code	Register address		Number of write registers		Number of written bytes	16-bit data		CRC check	
1st B	2nd B	High order	Low order	High order	Low order	7th B	High order	Low order	Low order	High order
0x00	0x10	0x43	0xBE	0x00	0x01	0x02	0x00	0x02	0x43	0xDB
Description										

Driver response

Address	Function code	Register address		Number of registers		CRC check	
1st B	2nd B	3rd B	4th B	5th B	6th B	7th B	8th B
0x00	0x10	0x43	0xBE	0x00	0x01	0x75	0xb8
Description							

Read holding register (function code 0x03)

Controller command	Address code	Function code	Register address		Number of read registers		Check code
			Address (high)	Address (low)	High byte	Low byte	CRC16
	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

Driver response	Address code	Function code	Number of bytes	Data segment				Check code
			2/4	Data1	Data2	Data3	Data4	CRC16
	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

For example: Controller Read Commands: (32-bit data operation)

Address	Function code	Register address		Number of registers		CRC check	
1st B	2nd B	3rd B	4th B	5th B	6th B	Low order	High order
0x00	0x03	0x43	0xC6	0x00	0x02	0x30	0x63
Description							

Driver response

	Address	Function code	Number of bytes	Read data				CRC check	
				Low 16-bit data		High 16-bit data			
Order	1st B	2nd B	3rd B	4th B	5th B	6th B	7th B	8th B	9th B
Command	0x00	0x03	0x04	0x80	0x00	0x00	0x0A	0x43	0x34
Description									

For example: Controller Read Commands: (16-bit data operation)

	Address	Function code	Register address		Number of registers		CRC check	
Order	1st B	2nd B	3rd B	4th B	5th B	6th B	Low order	High order
Command	0x00	0x03	0x43	0xBE	0x00	0x01	0xF0	0x7B
Description								

Driver response

	Address	Function code	Number of bytes	Read data		CRC check	
Order	1st B	2nd B	3rd B	4th B	5th B	6th B	7th B
Command	0x00	0x03	0x02	0x00	0x02	0x04	0x45

Description	

3.3 Connection between EasyDRIVE Debugging Software and the Driver

3.3.1 Introduction to EasyDRIVE Debugging Software

EasyDRIVE software is a type of application software integrating debugging, running, and monitoring for WIN XP/7/10, and its installation process is the same as that of other Windows application software.

1） It is used to adjust driver parameters and adopts the MODBUS-RTU protocol.

2） It can simulate the peripheral control circuit of the driver to control the operation of motors.

3） It can also monitor the operating state of drivers and motors.

3.3.2 Installation of EasyDRIVE Software

EasyDrive software is green-version software, so it can be run directly. The debugging process needs to be completed together with xxx.XML configuration files.

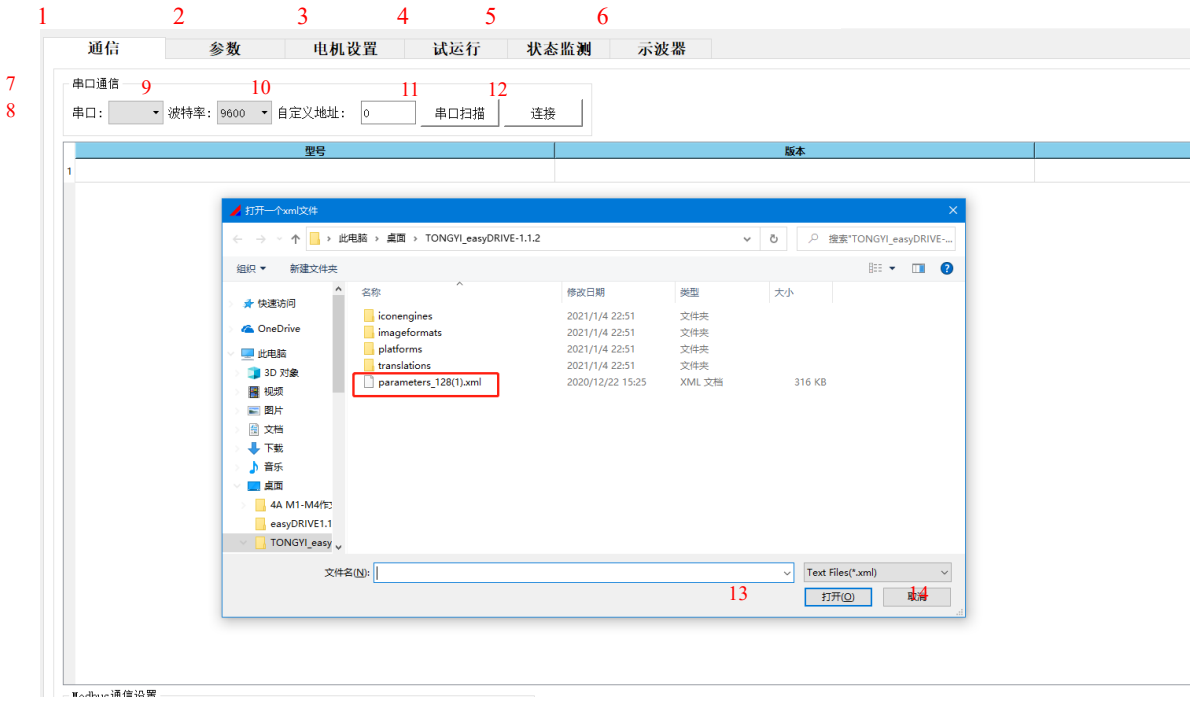
No.	Chinese	English
1.	名称	Name
2.	修改日期	Date of Revision
3.	类型	Type
4.	大小	Size
5.	XML 文档	XML document
6.	应用程序	Application

3.3. 3 Parameter File Import of EasyDRIVE

EasyDRIVE software needs to import xxx.XML parameter files before communicating with the driver, and the version of parameter files with different firmware versions may vary.

Start the EasyDrive software, and the message “Import XML parameter configuration files” will pop up. You may also manually click “Import files” and select xxx.XML parameter configuration files.

No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	串口通信	Serial port communication
8.	串口	Serial port
9.	波特率	Baud rate
10.	自定义地址	Custom address
11.	串口扫描	Serial port scanning
12.	连接	Connection
13.	文件操作	File operation
14.	导入文件	Import File
15.	保存文件	Save File
16.	文件另存为	Save As
17.	导入	Yes
18.	跳过	Skip
19.	波特率	Baud rate
20.	地址	Address
21.	保存	Save
22.	驱动器参数	Driver parameter
23.	批量写入参数	Batch entry of parameters
24.	Modbus 通信设置	Modbus Communication Settings



No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	串口通信	Serial port communication
8.	串口	Serial port
9.	波特率	Baud rate
10.	自定义地址	Custom address
11.	串口扫描	Serial port scanning
12.	连接	Connection
13.	打开	Open
14.	取消	Cancel

After starting the software, the interface is as follows, and the installation boot-up of EasyDRIVE is completed:

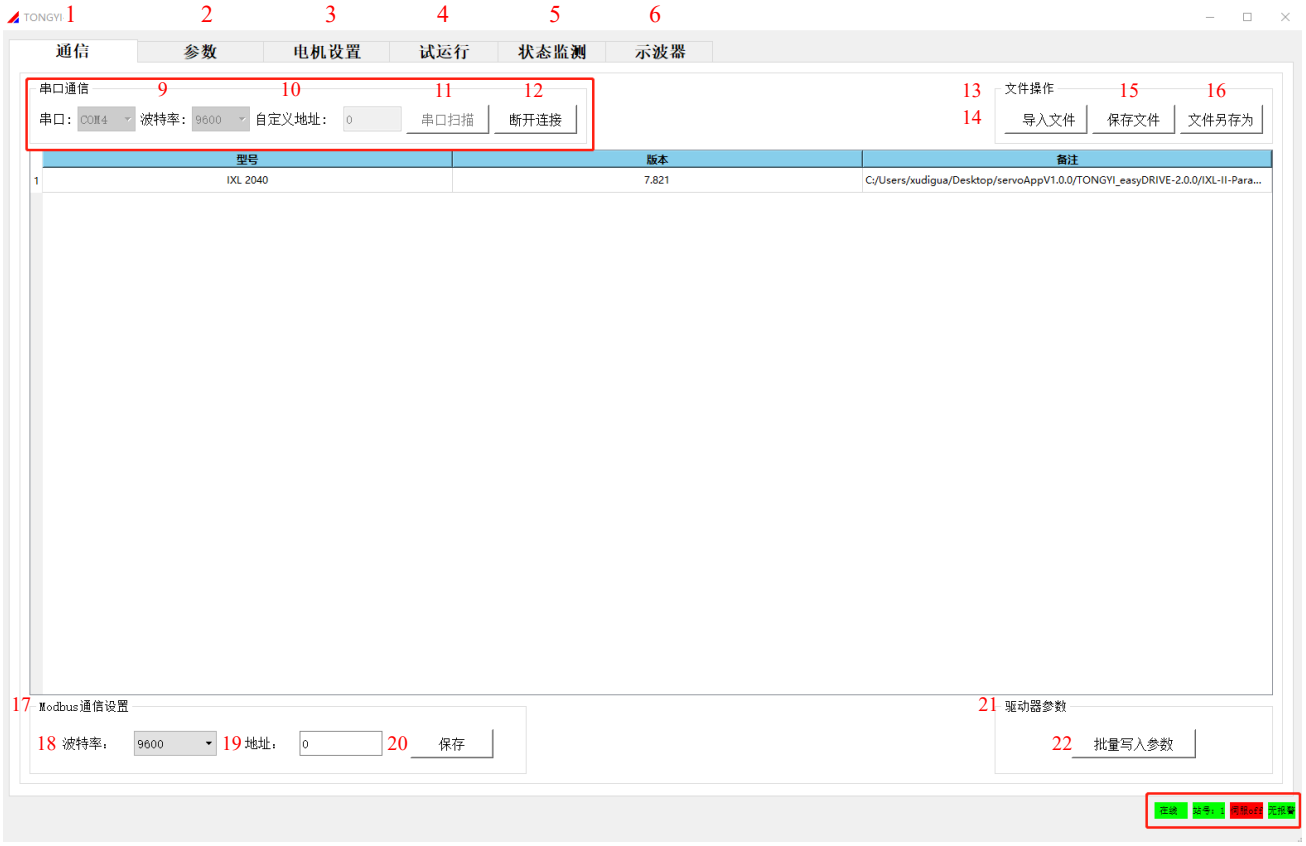
No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	串口通信	Serial port communication
8.	串口	Serial port
9.	波特率	Baud rate
10.	自定义地址	Custom address
11.	串口扫描	Serial port scanning
12.	连接	Connection
13.	文件操作	File operation
14.	导入文件	Import File
15.	保存文件	Save File
16.	文件另存为	Save As
17.	Modbus 通信设置	Modbus Communication Settings
18.	波特率	Baud rate
19.	地址	Address
20.	保存	Save
21.	驱动器参数	Driver parameter
22.	批量写入参数	Batch write-in of parameters

3.3.4 EasyDRIVE Establishes Communication Connection with the Driver

In hardware communication, the driver and the upper computer are linked by RS485 asynchronous serial communication, using the MODBUS-RTU protocol. In this case, the communication wires are RS485-USB cables, which connects the RS485 cables on the driver, and the other end of the communication

wires is connected to the USB port of a PC.

Then set the baud rate and the address. Click “Serial port scanning” in the communication interface of EasyDRIVE software or manually select the corresponding serial port number. After the setting is completed, click “Connect”. If the communication is successful, the status of the driver will be displayed as online at the lower right of the software.



No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	串口通信	Serial port communication
8.	串口	Serial port
9.	波特率	Baud rate
10.	自定义地址	Custom address
11.	串口扫描	Serial port scanning
12.	断开连接	Disconnect
13.	文件操作	File operation
14.	导入文件	Import File
15.	保存文件	Save File
16.	文件另存为	Save As
17.	Modbus 通信设置	Modbus Communication Settings
18.	波特率	Baud rate
19.	地址	Address

20.	保存	Save
21.	驱动器参数	Driver parameter
22.	批量写入参数	Batch entry of parameters

3.4 Parameter Configuration and Debugging of EasyDRIVE

3.4.1 Interface Functions and Parameter Settings of EasyDRIVE

On the left side of the upper computer are configurable parameter categories and observable parameter categories. Among them, the red boxes shown in the following figure are “Motor Overload Setting”, “Motor and Load Setting”, “Encoder Feedback Setting”, “Profiled Velocity Parameter”, “Profiled Current Parameter” and “Drive System Control Parameter”. To simply adjust the speed loop, you only need to pay attention to these parameter settings.

No.	Chinese	English
1.	电机与驱动参数	Motor and the driver parameters
2.	驱动状态监测	Driver condition monitoring
3.	电机状态监测	Motor condition monitoring
4.	电机过载设置	Motor overload settings
5.	电机与负载设置	Motor and load settings
6.	编码器反馈设置	Encoder feedback settings
7.	电机自学习功能	Motor self-learning function
8.	位置控制模式	Profiled position mode
9.	位置控制参数	Profiled position parameter
10.	位置接点控制参数	Position contact control parameter
11.	速度控制模式	Profiled velocity mode
12.	速度控制参数	Profiled velocity parameter

13.	速度参数自整定	Velocity parameter auto-tuning
14.	力矩控制模式	Profiled torque mode
15.	电流控制参数	Profiled current parameter
16.	电流状态检测	Current state detection
17.	电流参数自整定	Current parameter auto-tuning
18.	I/O 控制	I/O control
19.	CANopen 参数配置	CANopen Parameter Configuration
20.	RPDO1 参数配置	RPDO1 Parameter Configuration
21.	RPDO2 参数配置	RPDO2 Parameter Configuration
22.	RPDO3 参数配置	RPDO3 Parameter Configuration
23.	RPDO4 参数配置	RPDO4 Parameter Configuration
24.	TPDO1 参数配置	TPDO1 Parameter Configuration
25.	TPDO2 参数配置	TPDO2 Parameter Configuration
26.	TPDO3 参数配置	TPDO3 Parameter Configuration
27.	TPDO4 参数配置	TPDO4 Parameter Configuration
28.	驱动系统控制参数	Drive system control parameter
29.	电机复位控制	Motor reset control
30.	通信	Communication
31.	参数	Parameter

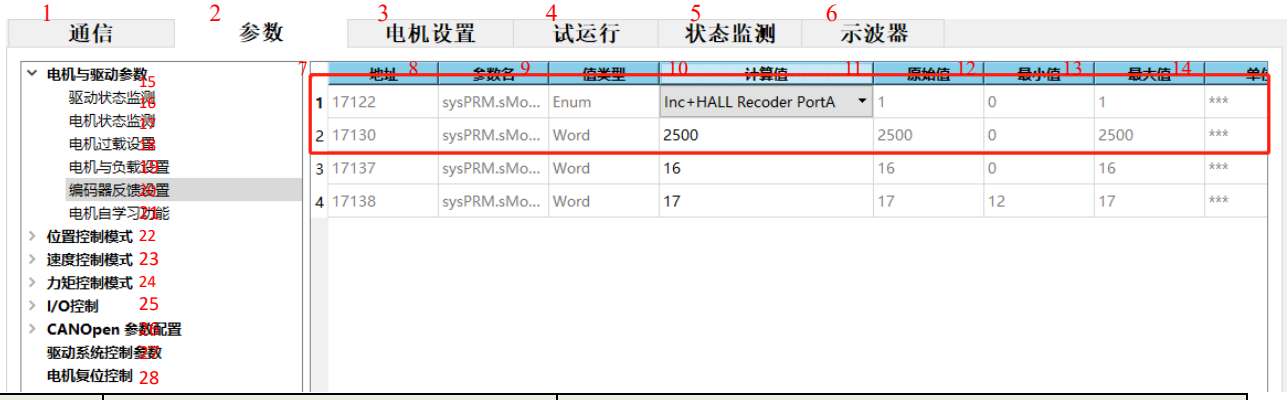
Classification explains the parameters required to be set internally.

"Motor and Load Setting": We mainly set the inherent parameters of motors in it, such as **"Motor Type", "Number of Motor Pole Pairs (Number of Poles/2)", "Motor Rated Speed", "Motor Rated Current", "Motor Overload Ratio".** According to the Motor Manual, fill in the following red boxes with these parameters correspondingly. After you write in a parameter, Enter to confirm it.

No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value

11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	速度控制模式	Profiled velocity mode
25.	力矩控制模式	Profiled torque mode
26.	I/O 控制	I/O control
27.	CANopen 参数配制	CANopen parameter configuration
28.	驱动系统控制参数	Drive system control parameter
29.	电机复位控制	Motor reset control

“Encoder Feedback Setting”: For example, for a servo motor using an ordinary 2500-wire incremental encoder, “Inc + HALL Recoder PortA”, the number of incremental encoder wires on the motor side shall be “2500”.



No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	电机与驱动参数	Motor and the driver parameters

16.	驱动状态监测	Driver condition monitoring
17.	电机状态监测	Motor condition monitoring
18.	电机过载设置	Motor overload settings
19.	电机与负载设置	Motor and load settings
20.	编码器反馈设置	Encoder feedback settings
21.	电机自学习功能	Motor self-learning function
22.	位置控制模式	Profiled position mode
23.	速度控制模式	Profiled velocity mode
24.	力矩控制模式	Profiled torque mode
25.	I/O 控制	I/O control
26.	CANopen 参数配制	CANopen parameter configuration
27.	驱动系统控制参数	Drive system control parameter
28.	电机复位控制	Motor reset control

Reference Table for Settings of Other Encoders

Inc+Hall Recorder	Standard Incremental Encoder	
SSI Abs Recoder	SSI Protocol Absolute Encoder	
BISSC Abs Recoder	BISSC Protocol Absolute Encoder	
BISSB Abs Recoder	BISSB Protocol Absolute Encoder	
NRZ abs Recoder	TAMAGAWA Absolute Encoder	
Resolver	TAMAGAWA Resolver	

3.4.2 EasyDRIVE Activates the Self-learning Function of Motors

When users use the motor, to achieve normal driving, they need to accurately enter the number of motor pole pairs and the electrical angle offset, and accurately complete the wiring. If they are unfamiliar with a motor or do not know the above two parameters of the motor, and the phase sequence of the power wire and Hall signals of the motor are unknown, the self-learning function of the motor can be used to automatically match the driver with the motor.

Note: Before activating the self-learning function of motors, the parameter setting specified in the preceding section must be completed with correct wiring. Ensure that the wiring of encoders and power wires of motors are correct.

Change the value of InsidelOCg_Enable to ON and press Enter.

No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	力矩控制模式	Profiled torque mode
28.	I/O 控制	I/O control
29.	CANopen 参数配制	CANopen parameter configuration
30.	驱动系统控制参数	Drive system control parameter
31.	电机复位控制	Motor reset control

Select **“Self-learning Function of Motor”**in the left menu bar, change the value of “sMotoSchPRM.uwSchStart” to ON, and press Enter. Then the servo is enabled, the motor starts to rotate slowly, and generally the self-learning can be completed within 1min, after which the value of “sMotoSch PRM.uwSchStart” will be automatically changed to OFF.

No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	力矩控制模式	Profiled torque mode
28.	I/O 控制	I/O control
29.	CANopen 参数配制	CANopen parameter configuration
30.	驱动系统控制参数	Drive system control parameter
31.	电机复位控制	Motor reset control

After the self-learning is completed successfully, the following two important parameters will appear in the interface:

No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	力矩控制模式	Profiled torque mode
28.	电流控制参数	Profiled current parameter
29.	电流状态检测	Current state detection
30.	电流参数自整定	Current parameter auto-tuning
31.	I/O 控制	I/O control
32.	CANopen 参数配置	CANopen Parameter Configuration
33.	驱动系统控制参数	Drive system control parameter
34.	电机复位控制	Motor reset control

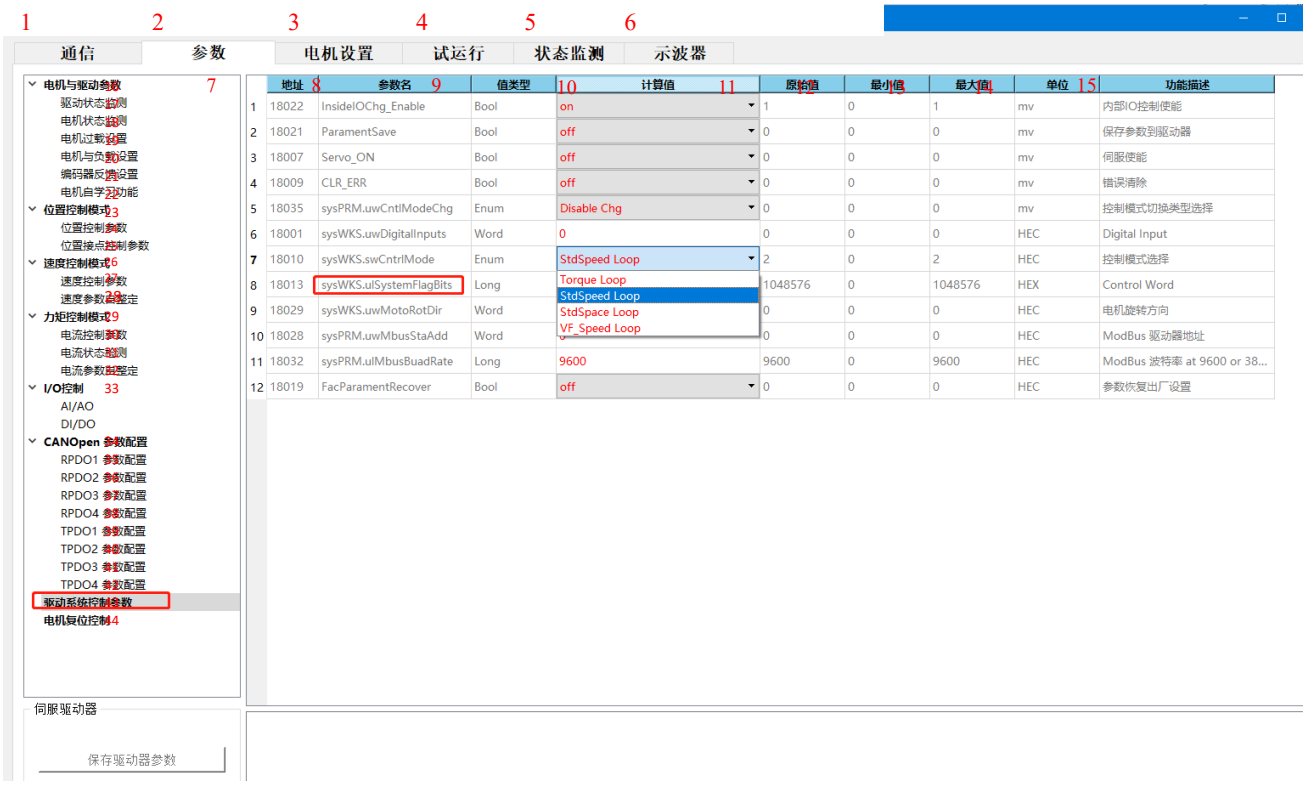
Then change the parameter of “sMotoSchPRM.uwParaSaveToUse” to ON, press Enter, and load the parameters you just learned into the driver. Disconnect the power supply and restart the driver to bring the parameters into effect.

1 2 3 4 5 6

No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	力矩控制模式	Profiled torque mode
28.	电流控制参数	Profiled current parameter
29.	电流状态检测	Current state detection
30.	电流参数自整定	Current parameter auto-tuning
31.	I/O 控制	I/O control
32.	CANopen 参数配置	CANopen Parameter Configuration
33.	驱动系统控制参数	Drive system control parameter
34.	电机复位控制	Motor reset control

3.4.3 EasyDRIVE Controls the Operation of Motors

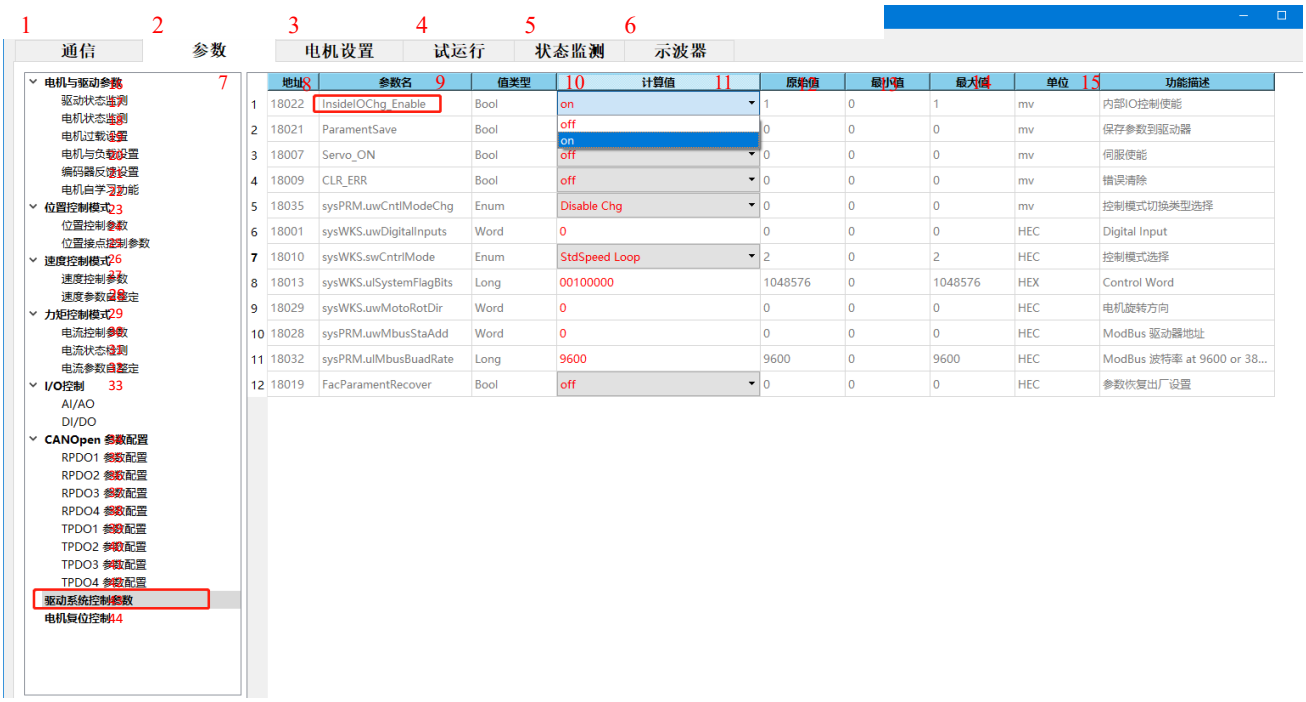
Mode selection: Select **“Drive System Control Parameter”** in the left menu bar, and change the value of “sysWKS.swCntrlMode” to “StdSpeed Loop”, i.e. the velocity mode.



No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter

25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	速度控制参数	Profiled velocity parameter
28.	速度参数自整定	Velocity parameter auto-tuning
29.	力矩控制模式	Profiled torque mode
30.	电流控制参数	Profiled current parameter
31.	电流状态检测	Current state detection
32.	电流参数自整定	Current parameter auto-tuning
33.	I/O 控制	I/O control
34.	CANopen 参数配置	CANopen Parameter Configuration
35.	RPDO1 参数配置	RPDO1 Parameter configuration
36.	RPDO2 参数配置	RPDO2 Parameter configuration
37.	RPDO3 参数配置	RPDO3 Parameter configuration
38.	RPDO4 参数配置	RPDO4 Parameter configuration
39.	TPDO1 参数配置	TPDO1 Parameter configuration
40.	TPDO2 参数配置	TPDO2 Parameter configuration
41.	TPDO3 参数配置	TPDO3 Parameter configuration
42.	TPDO4 参数配置	TPDO4 Parameter configuration
43.	驱动系统控制参数	Drive system control parameter
44.	电机复位控制	Motor reset control

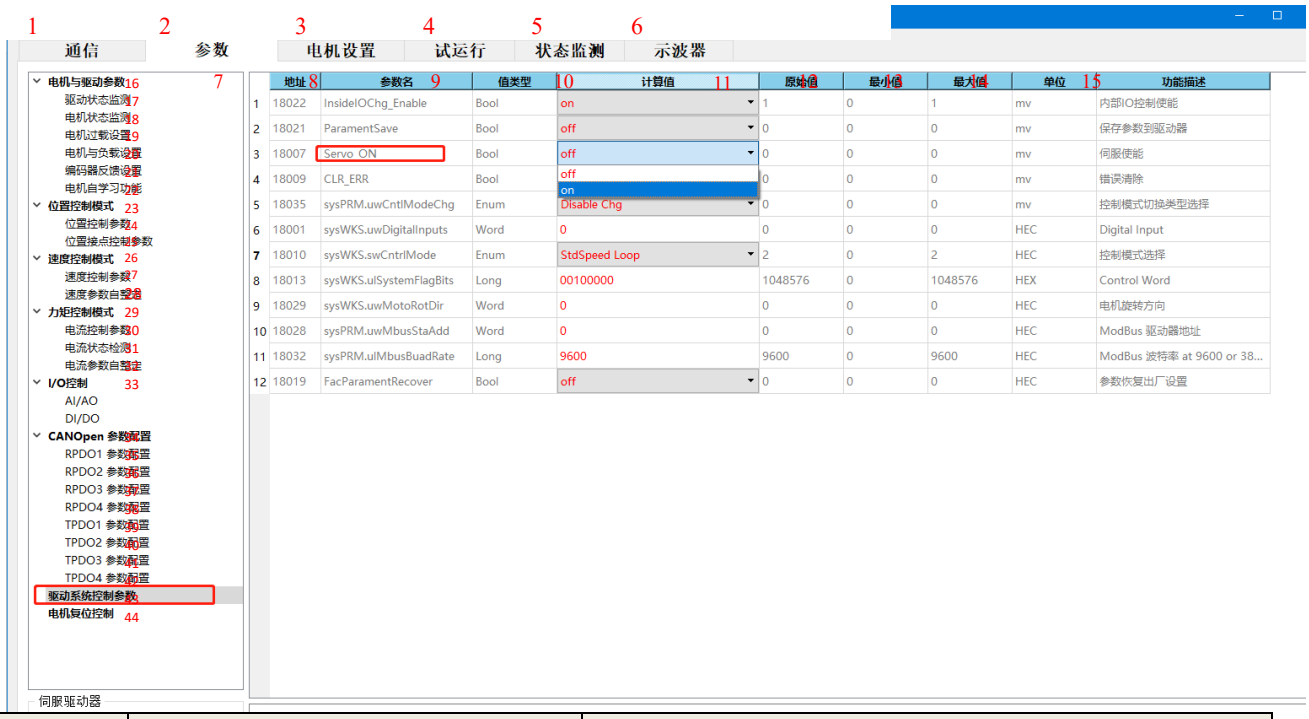
Change the internal IO control to active and the value of “InsideIOChg_Enable” to ON, and then press Enter.



No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name

9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	速度控制参数	Profiled velocity parameter
28.	速度参数自整定	Velocity parameter auto-tuning
29.	力矩控制模式	Profiled torque mode
30.	电流控制参数	Profiled current parameter
31.	电流状态检测	Current state detection
32.	电流参数自整定	Current parameter auto-tuning
33.	I/O 控制	I/O control
34.	CANopen 参数配置	CANopen Parameter Configuration
35.	RPDO1 参数配置	RPDO1 Parameter configuration
36.	RPDO2 参数配置	RPDO2 Parameter configuration
37.	RPDO3 参数配置	RPDO3 Parameter configuration
38.	RPDO4 参数配置	RPDO4 Parameter configuration
39.	TPDO1 参数配置	TPDO1 Parameter configuration
40.	TPDO2 参数配置	TPDO2 Parameter configuration
41.	TPDO3 参数配置	TPDO3 Parameter configuration
42.	TPDO4 参数配置	TPDO4 Parameter configuration
43.	驱动系统控制参数	Drive system control parameter
44.	电机复位控制	Motor reset control

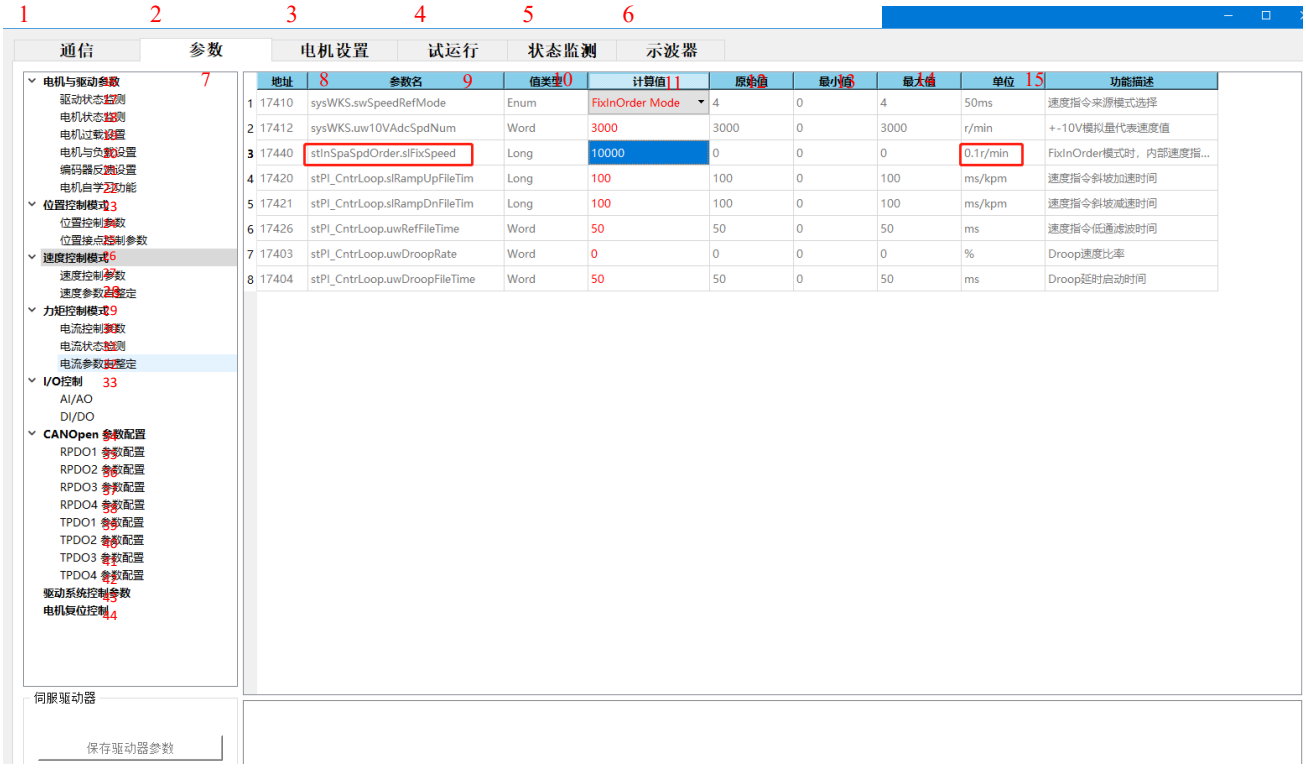
Change the value of “Servo_On” to ON and press Enter. Then the motor will be powered on and ready to run.



No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	速度控制参数	Profiled velocity parameter
28.	速度参数自整定	Velocity parameter auto-tuning
29.	力矩控制模式	Profiled torque mode
30.	电流控制参数	Profiled current parameter

31.	电流状态检测	Current state detection
32.	电流参数自整定	Current parameter auto-tuning
33.	I/O 控制	I/O control
34.	CANopen 参数配置	CANopen Parameter Configuration
35.	RPDO1 参数配置	RPDO1 Parameter configuration
36.	RPDO2 参数配置	RPDO2 Parameter configuration
37.	RPDO3 参数配置	RPDO3 Parameter configuration
38.	RPDO4 参数配置	RPDO4 Parameter configuration
39.	TPDO1 参数配置	TPDO1 Parameter configuration
40.	TPDO2 参数配置	TPDO2 Parameter configuration
41.	TPDO3 参数配置	TPDO3 Parameter configuration
42.	TPDO4 参数配置	TPDO4 Parameter configuration
43.	驱动系统控制参数	Drive system control parameter
44.	电机复位控制	Motor reset control

Select **"Profiled Velocity Mode"** in the menu bar and enter the expected speed to be set in "stlnSpaSpdOrder.slFixSpeed". For example, if you enter 1000 as the value, it means that the set speed is 1000 x 0.1 r/min = 100 r/min. (Note: The unit is 0.1 r/min) The motor rotates at the set speed.



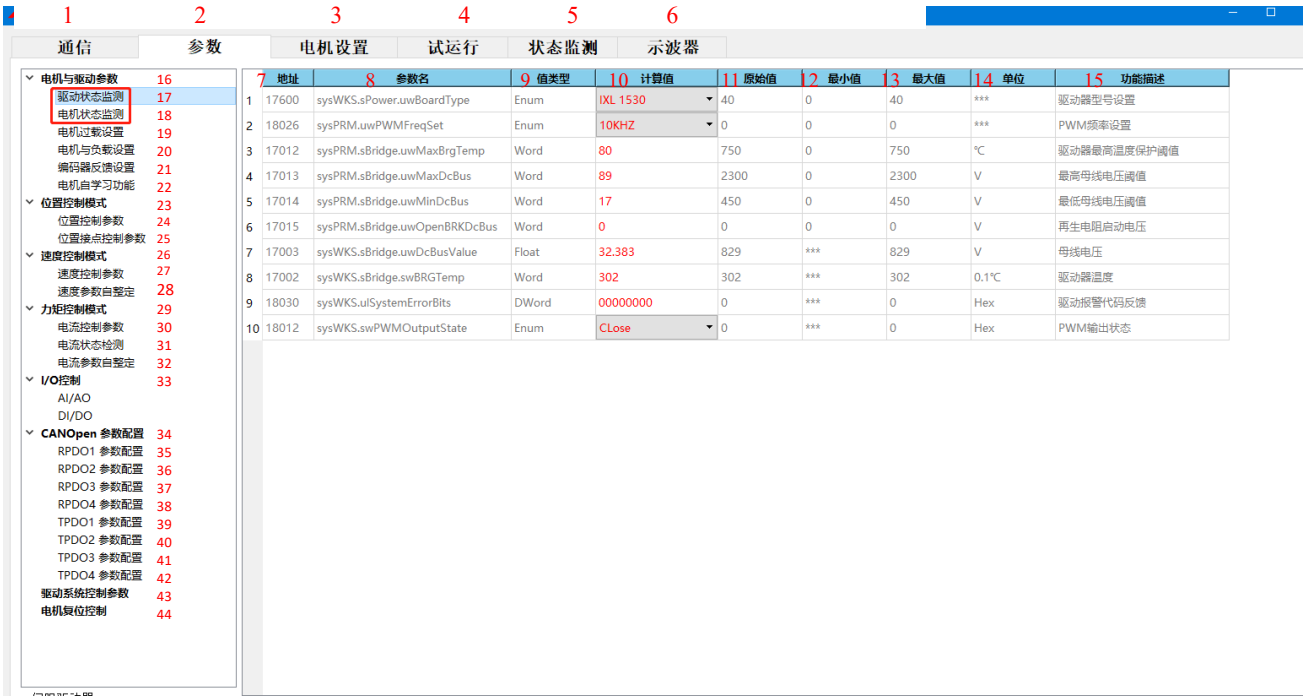
No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address

8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	速度控制参数	Profiled velocity parameter
28.	速度参数自整定	Velocity parameter auto-tuning
29.	力矩控制模式	Profiled torque mode
30.	电流控制参数	Profiled current parameter
31.	电流状态检测	Current state detection
32.	电流参数自整定	Current parameter auto-tuning
33.	I/O 控制	I/O control
34.	CANopen 参数配置	CANopen Parameter Configuration
35.	RPDO1 参数配置	RPDO1 Parameter configuration
36.	RPDO2 参数配置	RPDO2 Parameter configuration
37.	RPDO3 参数配置	RPDO3 Parameter configuration
38.	RPDO4 参数配置	RPDO4 Parameter configuration
39.	TPDO1 参数配置	TPDO1 Parameter configuration
40.	TPDO2 参数配置	TPDO2 Parameter configuration
41.	TPDO3 参数配置	TPDO3 Parameter configuration
42.	TPDO4 参数配置	TPDO4 Parameter configuration
43.	驱动系统控制参数	Drive system control parameter
44.	电机复位控制	Motor reset control

Note: Before testing, ensure that the motor is in a state available for free operation.

3.4.4 EasyDRIVE Monitors the Condition of Motors and Drivers

Through the monitoring of the condition of drivers and motors, you can see the temperature of the driver, the voltage, the current of the motor, motor speed, motor position, error code, and other information during operation.



No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	速度控制参数	Profiled velocity parameter
28.	速度参数自整定	Velocity parameter auto-tuning
29.	力矩控制模式	Profiled torque mode
30.	电流控制参数	Profiled current parameter

31.	电流状态检测	Current state detection
32.	电流参数自整定	Current parameter auto-tuning
33.	I/O 控制	I/O control
34.	CANopen 参数配置	CANopen Parameter Configuration
35.	RPDO1 参数配置	RPDO1 Parameter configuration
36.	RPDO2 参数配置	RPDO2 Parameter configuration
37.	RPDO3 参数配置	RPDO3 Parameter configuration
38.	RPDO4 参数配置	RPDO4 Parameter configuration
39.	TPDO1 参数配置	TPDO1 Parameter configuration
40.	TPDO2 参数配置	TPDO2 Parameter configuration
41.	TPDO3 参数配置	TPDO3 Parameter configuration
42.	TPDO4 参数配置	TPDO4 Parameter configuration
43.	驱动系统控制参数	Drive system control parameter
44.	电机复位控制	Motor reset control

IV. Parameter Setting and Function Description

4.1 Parameter Configuration of Motors

4.1.1 Matching Parameter Settings of Motors

Before using the driver to control the motor, the parameters of the target motor should be input into the driver according to the specifications and be saved. Then restart the driver to bring the parameters into effect. Motor parameter configuration can be modified under the page "Motor and Load Settings" in the supporting EASYDRIVE software of the driver. The main parameters of driver and motor parameter settings are as follows:

Basic Motor Parameters:

0x42EB	sysPRM.sMotor.uwMotoType	Motor Type	16 bits	0 Brushless servo motor 2 DC brushed motor
0x42E2	sysPRM.sMotor.uwRecoderSelect	Selected by the encoder	16 bits	1 Incremental + HULL encoder 2 Incremental (without HULL) encoder 4 SSI absolute encoder 8 BISS-C absolute encoder 16 BISS-B absolute encoder 32 NRZ absolute encoder
0x42EA	sysPRM.sMotor.uwRecLineNum	Number of wires of the incremental encoder	16 bits	Encoder resolution
0x42F1	sysPRM.sMotor.uwAbsRecTurnNum	Digit of number of circles in the absolute encoder	16 bits	Digit of number of circles in the absolute encoder

0x42F2	sysPRM.sMotor.uwAbsRecAngleNum	Angle digit of the absolute encoder	16 bits	Angle digit of the absolute encoder
0x42E5	sysPRM.sMotor.uwNomCurrent	Rated current	16 bits	Motor RMS current (Unit: 0.1 A)
	Note: The parameter is the rated current (RMS current) of the motor. The entered parameter can not exceed the output range of the rated current of the driver.			
0x42E3	sysPRM.sMotor.swMotorLoadMax	Overload multiple	16 bits	Percentage of the rated current
	Note: The result of the rated current multiplied by the overload multiple cannot exceed the maximum current output range of the driver.			
0x42E8	sysPRM.sMotor.swNomSpeed	Rated speed	16 bits	Unit: 0.1 PRM
	Note: The driver does not have any over-speed function, and the motor will run below the rated speed.			

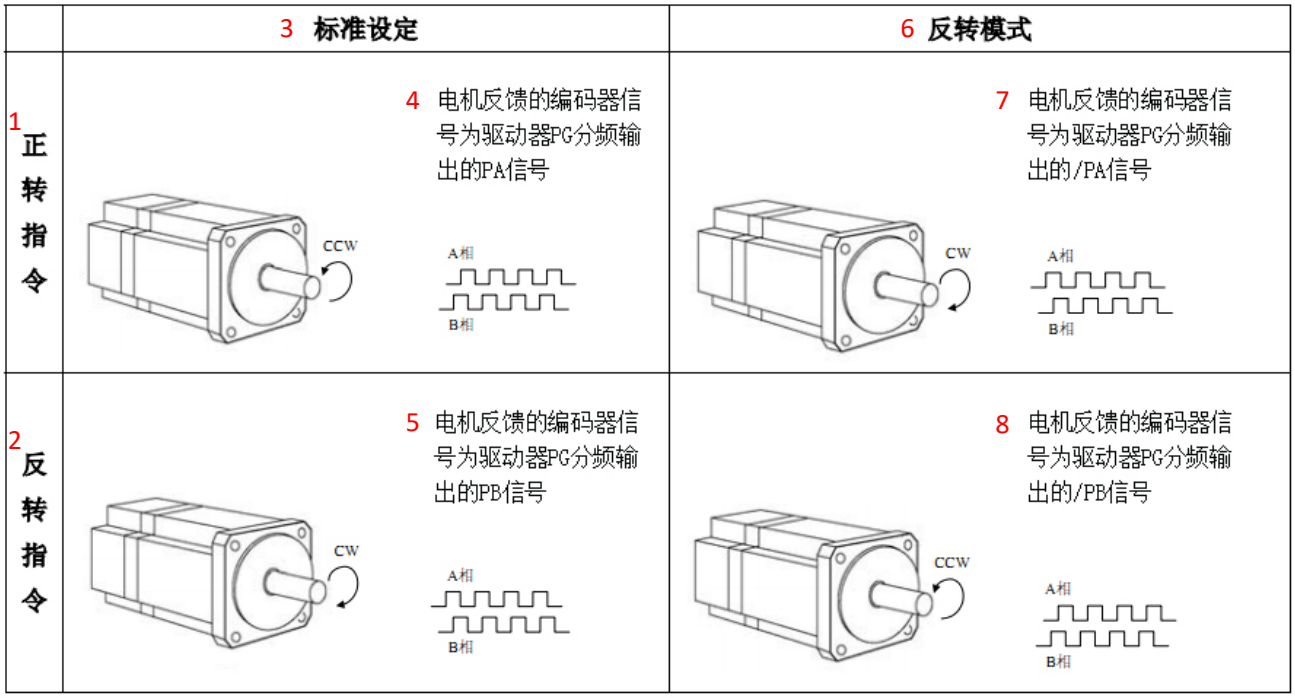
Motor parameter:

0x42E0	sysPRM.sMotor.uwPoleNumbers	Number of motor pole pairs	16 bits	Number of motor poles/2
0x42E1	sysPRM.sMotor.uwPhaseOffset	Electric angle offset	16 bits	65536=360°
0x42EC	sysPRM.sMotor. uwRotorInertia	Motor rotor inertia	16 bits	Unit: 0.01 kg/cm
0x42ED	sysPRM.sMotor.uwMotoKv	Back electromotive force constant	16 bits	Unit: 0.1 V/Krpm
0x42EE	sysPRM.sMotor.uwMotoLs	Wire inductance	16 bits	Unit: 0.01 mH
0x42EF	sysPRM.sMotor.uwMotoRs	Wire resistance	16 bits	Unit: 0.01 R
0x42F0	sysPRM.sMotor.uwMotoKt	Torque coefficient	16 bits	Unit: 0.01 Nm/A
	0x42EC - 0x42F0 are optional parameters. You may use them when performance debugging is required.			

Note: 0x42E0\0x42E1 can be automatically matched with the motor self-learning function of the driver.

4.1. 2 Switching of Motor Rotation Direction

The servo driver allows the rotation direction of the servo motor to be in a “reverse rotation mode”, namely the reverse rotation, without changing the servo motor wiring. The standard setting of “forward rotation direction” is the direction of “counterclockwise rotation” as seen from the load side of the servo motor. The “reverse rotation mode” only changes the rotation direction of the motor. In this case, the movement direction of the axis (+, -) is the negative direction, and the rest is unchanged.



No.	Chinese	English
1.	正转指令	Forward rotation instruction
2.	反转指令	Reverse rotation instruction
3.	标准设定	Standard setting
4.	电机反馈的编码器信号为驱动器 PG 分频输出的 PA 信号	The encoder signal fed back by the motor is the PA signal of the PG frequency dividing output of the driver
5.	电机反馈的编码器信号为驱动器 PG 分频输出的 PB 信号	The encoder signal fed back by the motor is the PB signal of the PG frequency dividing output of the driver
6.	反转模式	Reverse rotation mode
7.	电机反馈的编码器信号为驱动器 PG 分频输出的/PA 信号	The encoder signal fed back by the motor is the /PA signal of the PG frequency dividing output of the driver
8.	电机反馈的编码器信号为驱动器 PG 分频输出的/PB 信号	The encoder signal fed back by the motor is the /PB signal of the PG frequency dividing output of the driver

The encoder signals fed back by the motor in the above figure are the PA, /PA, PB, and /PB signals of the PG frequency dividing output of the driver.

■ How to set the "Reverse Rotation Mode"

Select the rotation direction of the motor by setting the following parameters. The reverse rotation mode is only valid for PV and PP, but not valid for PT.

MODBUS Communication Address	Parameter	Content	Parameter Range	Default Setting
0x466D	sysWKS.uwMotoRotDir	Select the rotation direction [0] If you look from the load side of the motor, the direction of CCW is forward rotation. (Standard setting) [1] If you look from the load side of the motor, the direction of CW is forward rotation. (Reverse rotation mode)	0-1	0

4.1.3 Motor Overtravel Setting

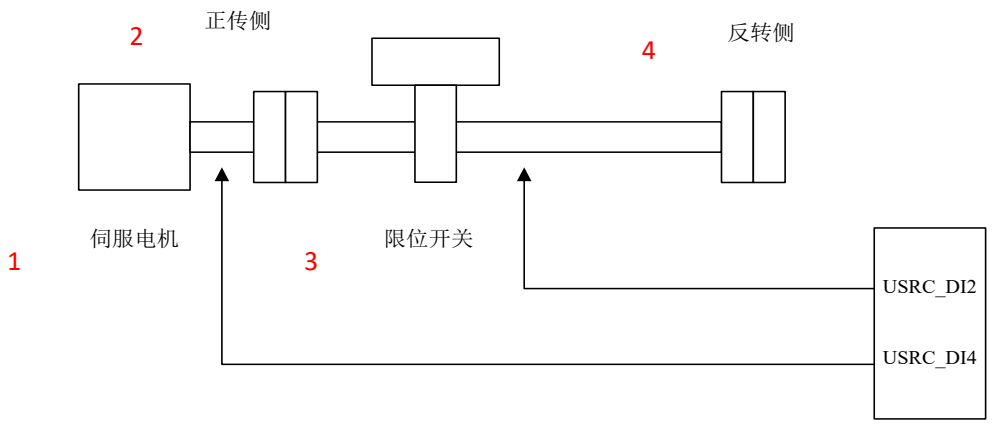
The overtravel setting is a function that forces the movable part of a machine to stop when it exceeds the allowable range of movement. This function is only available in the standard position control mode and the hybrid position control mode.

■Use of the overtravel function

To use the overtravel function, correctly connect the input signals of the overtravel limit switch with the corresponding pin numbers of the servo drive connectors USR_DI2 and USR_DI4.

USRC_DI2	Disable forward rotation (positive overtravel, POT)
USRC_DI4	Disable reverse rotation (negative overtravel, NOT)

In cases such as linear movement, it is essential to connect the limit switch as shown in the figure below to prevent damage to the mechanism.



No.	Chinese	English
1.	伺服电机	Servo motor
2.	正传侧	Forward rotation side
3.	限位开关	Limit switch
4.	反转侧	Reverse rotation side

MODBUS Communication Address	**Parameter**	**Content**	**Parameter Range**	**Default Setting**
0x439E	sysWKS.uwStopPosMode	Options of the limit mode	0, 1, 2	0
	0: Subsequent instructions are accumulated and valid in case of positive or negative limits. 1: Subsequent instructions are masked and invalid in case of positive or negative limits. Subsequent instructions are masked but remain valid in case of positive or negative limits.			

Notes:

(1) When the motor stops running due to overtravel during position control, whether to retain the residual pulse or not depends on the setting of 0x439E.

(2) After the overtravel stops, the motor is in the energized state.

(3) When using the overtravel function, determine the overtravel direction first (forward and reverse directions are subject to the defined directions). After setting the parameters, it is advisable to check if the overtravel motion is correct at a low speed.

(4) When using the overtravel function, be noted that overtravel signals only function during position

control.

(5) During mechanical motion, if an overtravel signal occurs, the mechanism may not immediately come to a stop due to inertia and other factors, resulting in some displacement. If the signal is canceled during this process, the motor will continue running in its original operation mode. When using the overtravel function, pay attention to the duration of the overtravel signal (i.e., ensure that the overtravel signal has a certain duration on the mechanism).

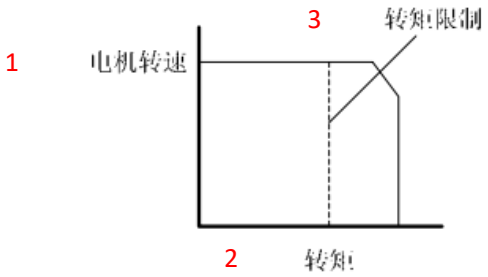
4.1.4 Motor Torque Limit

To protect the mechanical structure, the driver can adjust the maximum values of the forward and reverse rotation torques to limit the maximum output torque by setting the following parameters.

MODBUS Communication Address	Parameter	Content	Parameter range (1%)	Default setting
0x42E3	sysPRM.sMotor.swMotorLoadMax	Positive output torque limit	0-300	150
0x42E4	sysPRM.sMotor.swMotorLoadMin	Negative output torque limit	0-300	150

● Set the maximum torque values of forward and reverse rotation, and use them when the torque needs to be limited according to mechanical requirements.

● If the current maximum torque value exceeds the maximum torque allowed by the motor, the latter shall prevail.



No.	Chinese	English
1.	电机转速	Motor speed
2.	转矩	Torque
3.	转矩限制	Torque limit

4.1.5 Motor Overload Setting

The motor overload setting is used to set the time from motor overload operation to alarm generation. The delay of each overload multiple can be set through stOverLoad.uw25OverTqTime ~ stOverLoad.uw11OverTqTime. The maximum overload multiple of the motor is 3 times, and an overload alarm will be generated if the maximum is exceeded.

MODBUS Communication	Parameter	Content	Parameter Range (*10ms)	Default Setting

Address				
0x4306	stOverLoad.uw25OverTqTime	Time of 2.5x overload	1-65535	500 (5s)
0x4305	stOverLoad.uw20OverTqTime	Time of 2.0x overload	1-65535	1500 (15s)
0x4304	stOverLoad.uw15OverTqTime	Time of 1.5x overload	1-65535	3000 (30s)
0x4303	stOverLoad.uw12OverTqTime	Time of 1.2x overload	1-65535	6000 (60s)
0x4302	stOverLoad.uw11OverTqTime	Time of 1.1x overload	1-65535	12000 (120s)

4.1.6 Setting of Current-limiting Output Function of the Motor

In AGVs or some special application cases, the motor is not allowed to have the overload alarm. In such cases, the internal overload current-limiting output protection function of the driver can be set. When the motor overload time exceeds 80% of the set overload time, the driver can output current according to the output current-limiting value set by the overload protection function to ensure that the current is below the rated value when the motor rotation is blocked. When the motor load decreases, the motor resumes normal operation, and after 180s, the overload current-limiting output timing value will be reset, and the motor can set the current output according to the overload again.

MODBUS Communication Address	Parameter	Content	Parameter Range	Default Setting
0x4307	stOverLoad.uwOverCurOutRatio	Overload current-limiting ratio	30-100 (%)	80
0x4308	stOverLoad.uwOverLoadProtectEN	Enabled	0-1	0

4.1.7 EasyDRIVE Sets and Monitors Motor Parameters

1) Open the EasyDRIVE_xxx.par file with EasyDRIVE, and set motor-related parameters in the columns of “Motor and Feedback Settings” and “Motor Overload Settings” after the communication with the driver is established.

No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring

6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	力矩控制模式	Profiled torque mode
28.	电流控制参数	Profiled current parameter
29.	电流状态检测	Current state detection
30.	电流参数自整定	Current parameter auto-tuning
31.	I/O 控制	I/O control
32.	CANopen 参数配置	CANopen Parameter Configuration
33.	驱动系统控制参数	Drive system control parameter
34.	电机复位控制	Motor reset control

No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address

8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	力矩控制模式	Profiled torque mode
28.	电流控制参数	Profiled current parameter
29.	电流状态检测	Current state detection
30.	电流参数自整定	Current parameter auto-tuning
31.	I/O 控制	I/O control
32.	CANopen 参数配置	CANopen Parameter Configuration
33.	驱动系统控制参数	Drive system control parameter
34.	电机复位控制	Motor reset control

After motor parameters are set, the revised parameters need to be saved to the internal memory of the driver, and the parameters will be effective only after the driver is restarted. Save parameters: Select the parameter of "ParamentSave" under the "Drive System Control Parameter", change OFF to ON, and press Enter or click the save button on the lower left to save driver parameters.

2) EasyDRIVE can be used to monitor the running status of motors at any time. Use EasyDRIVE to open the EasyDRIVE_xxx.par file and monitor the motor condition in the “Motor Condition Monitoring” column after the communication with the driver is established.

No.	Chinese	English
1.	通信	Communication

2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	力矩控制模式	Profiled torque mode
28.	电流控制参数	Profiled current parameter
29.	电流状态检测	Current state detection
30.	电流参数自整定	Current parameter auto-tuning
31.	I/O 控制	I/O control
32.	CANopen 参数配置	CANopen Parameter Configuration
33.	驱动系统控制参数	Drive system control parameter
34.	电机复位控制	Motor reset control

4.2 Self-learning of Motor Parameters

4.2.1 Introduction of the Motor Self-learning Function

When users use the motor as a **servo motor** (sysPRM.sMotor.uwMotoType is set to 0), to achieve normal driving, they need to accurately enter the number of motor pole pairs and the electrical angle offset, and accurately complete the wiring. If they are unfamiliar with a motor or do not know the above two parameters of the motor, and the phase sequence of the power wire and Hall signals of the motor are unknown, the self-learning function of the motor can be used to automatically match the driver with the motor.

Before starting the self-learning of motor parameters, you need to accurately enter the basic parameters of motor configuration parameters first. After the parameters are saved, the driver needs to be restarted, and then the self-learning function can be started. To enable parameter self-learning, enable the internal IO control function first, open the EASYDRIVE software, set InsideIOChg_Enable to ON in the page of drive system control parameters, and the parameter self-learning function can be operated under the motor self-learning function page of the supporting EASYDRIVE software of the driver.

Motor self-learning parameters:

0x4312	sMotoSchPRM.uwSchStart	Enable self-learning	16 bits	0 OFF 1 ON
0x4313	sMotoSchPRM.uwParaSaveToUse	Write in parameters	16 bits	0 OFF 1 ON
0x4314	sMotoSchPRM.ulSchOffsetAngle	Encoder offset angle	32bits	Unit: Degree
0x4315	sMotoSchPRM.uwSchPoleNum	Number of motor pole pairs	16 bits	Number of pole pairs
0x431E	sysPRM.sMotoSch.uwEncoderDir	Encoder direction	16 bits	Current wiring encoder direction
0x4318	sysPRM.sMotoSch.uwHULL30	Hall value of 30 degrees	16 bits	Hall signals identified under corresponding motor electrical angles are related to the wiring modes
0x4319	sysPRM.sMotoSch.uwHULL90	Hall value of 90 degrees	16 bits	
0x431A	sysPRM.sMotoSch.uwHULL150	Hall value of 150 degrees	16 bits	
0x431B	sysPRM.sMotoSch.uwHULL210	Hall value of 210 degrees	16 bits	
0x431C	sysPRM.sMotoSch.uwHULL270	Hall value of 270 degrees	16 bits	
0x431D	sysPRM.sMotoSch.uwHULL330	Hall value of 330 degrees	16 bits	

Steps of motor self-learning:

1) The motor is the in no-load state;
2) The motor encoder (including Hall signals) is connected to the motor power wire correctly;
3) Select servo motor as the motor type (this function is invalid for other motor types), and set parameters such as motor current and motor speed correctly;
4) Open EASYDRIVE, in the page of driver system control parameters, set InsideIOChg_Enable to ON;
5) Set sMotoSchPRM.uwSchStart to ON to enable self-learning;
6) When the self-learning is completed, sMotoSchPRM.uwSchStart is automatically changed to OFF, sMotoSchPRM.uwParaSaveToUse is set to ON, and the learned parameters are written into the driver;

7) Save the parameters and restart the driver;

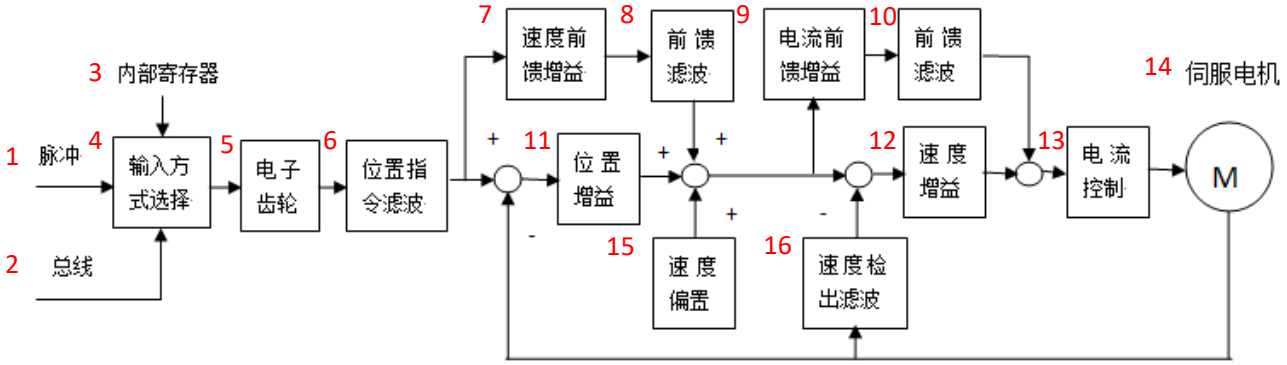
After the above steps, motor parameter self-learning is completed, and users can carry out self-learning for many times to check if the learned parameters are consistent. If consistent, they will be written into the driver, and users may restart the driver.

If the driver fails to learn about motor parameters after more than two minutes, it will report an alarm of motor angle search failure. One of the possible causes of this alarm is the loss of the origin signal (Z signal) of the encoder. Check the wiring and try again.

4.3 Profiled Position (PP)

PP Block Diagram

The standard PP block diagram is as follows:



No.	Chinese	English
1.	脉冲	Pulse
2.	总线	Bus
3.	内部寄存器	Internal register
4.	输入方式选择	Input mode selection
5.	电子齿轮	Electronic gear
6.	位置指令滤波	Position instruction filtering
7.	速度前馈增益	Velocity feed-forward gain
8.	前馈滤波	Feed-forward filtering
9.	电流前馈增益	Current feed-forward gain
10.	前馈滤波	Feed-forward filtering
11.	位置增益	Position gain
12.	速度增益	Speed gain
13.	电流控制	Current control
14.	伺服电机	Servo motor
15.	速度偏置	Speed offset
16.	速度检出滤波	Speed detection filtering

4.3.1 Selection of Control Modes

Choose different control modes by setting the following parameters.

MODBUS Communication Address	Parameter	Name and description	Setting range	Default setting

0x465A	sysWKS.swCntrlMode	[1] Standard PT [2] Standard PV [3] Standard PP	1 - 5	3

Summary of Control Modes

A summary of each control mode described in the above table is as follows:

Control mode	Function description
Standard PT	Torque instructions are given by analog quantity. The motor outputs the specified torque according to the instruction, and has software speed limit settings.
Standard PV	Constant speed control according to the speed given by the instruction; The instructions are set according to parameters, which may come from the analog quantity, pulse, internal specific parameters, internal variable multi-segment parameters, or PC written-in parameters (debugging mode). In the standard PV, PT will be carried out at the same time to form a serial control structure.
Standard PP	The servo driver accepts the pulse train sent by the upper device and achieves the control mode of speed or positioning according to the requirements of the upper device. Instructions are set according to parameters, which may come from pulse or PC written-in parameters (debugging mode). In the standard PP, PV and PT will be carried out at the same time to form a serial control structure.

4.3.2 Settings of Position Instruction Input

Choose different position instruction sources by setting the following parameters.

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x4394	sysWKS.swPositionRefMode	[0] Pulse given [1] Bus speed given [2] Internal parameter (position contact control) [3] Position interpolation control given	0 - 3	0

Pulse Setting

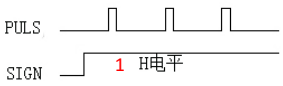
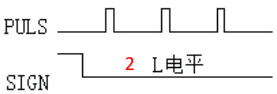
The upper device controls the speed and position of the servo system by sending a series of pulse sequences.

This interface supports open collector input or differential pulse input. The electrical features of the interface are shown in the following figure:

No.	Chinese	English
1.	差分指令输入	Differential instruction input
2.	脉冲输入供电	Pulse input power supply
3.	脉冲输入接口	Pulse input interface
4.	伺服驱动器	Servo driver

No.	Chinese	English
1.	集电极指令输入	Collector instruction input
2.	脉冲输入供电	Pulse input power supply
3.	脉冲输入接口	Pulse input interface
4.	伺服驱动器	Servo driver

Pulse form selection

Instruction form	Parameter settings	Forward rotation instruction	Reverse rotation instruction
Symbol + Pulse train (positive logic)	0x□□□0		

No.	Chinese	English
1.	H 电平	H level
2.	L 电平	L level

Bus Speed Given

Bus PV (Control mode parameter sysWKS.swPositionRefMode = 1): Motor running speed is controlled by setting the value of the parameter sysWKS.slBusInputRef in the bus mode.

Motor speed (r/min) = (sysWKS.slBusInputRef*4000/65536) * 60

Internal parameter (position contact) control

Instructions of position contact control (Control mode parameter sysWKS.swPositionRefMode = 2) are from the values of internal parameters of the servo driver, i.e. stInSpaSpdOrder.slPusNumZro ~ stInSpaSpdOrder.slPusNumThr.

Parameters stInSpaSpdOrder.slPusNumZro ~ stInSpaSpdOrder.slPusNumThr are the internal 8 groups of position instruction registers.

Setting of position contact control parameters

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x43BC	sysPRM.Inside_PosOrder. uwPosOrdMod	Select the step change signal 0: Step change for multi-segment cycle delay 1: Step change for single-segment relative positions 2: Step change for single-segment absolute positions	0-2	0
0x43BD	sysPRM.Inside_PosOrder. uwCycOpeMod	Select the operation mode 0: Cycle operation 1: Halt after one loop is completed	0-1	0
0x43BE	sysPRM.Inside_PosOrder. uwProStepNum	Selection of valid segments of instructions	0-3	0
0x43BF	sysWKS.Inside_PosOrder. uwStepStart	Activate contact control; 2: Activate instructions and update immediately 1: Activate instructions and update later 0: End of update	0-2	0
0x43C0	sysWKS.Inside_PosOrder. uwStepOver;	1: This loop is over 0: Running Reset automatically when the control is activated	0-1	1
0x43C1	SysPRM.Inside_PosOrder. uwStepClr	Clear the remaining instructions	0-1	0

● Step change for single-segment absolute positions (sysPRM.Inside_PosOrder. uwPosOrdMod=2)

When selecting the step change in a single-segment absolute position mode (sysPRM.Inside_PosOrder. uwPosOrdMod = 2), you need to reset the driver first, and the absolute mode will run normally after resetting. In this mode, the position instruction defaults to the value of stInSpaSpdOrder.slPusNumZro in segment 0, and the instruction will be processed and run as the absolute position instruction by default by the driver.

● Step change for single-segment relative positions (sysPRM.Inside_PosOrder. uwPosOrdMod=1)

When the step change for single-segment relative positions is selected for the step change signal (sysPRM.Inside_PosOrder. uwPosOrdMod = 1), set the value of sysPRM.Inside_PosOrder.uwProStepNum

to determine the current effective position segment. When the control is activated, the driver will read the current instruction value of the position segment, and then generate an instruction to send to the position controller according to the speed and acceleration values of the current segment.

● Step change for multi-segment cycle delay (sysPRM.Inside_PosOrder.uwPosOrdMod=0)

As for the step change for multi-segment cycle delay, before starting the operation, users need to set the instruction values of segments 0-4 in advance. When the control is activated, the driver automatically runs according to the preset instructions. The value of sysPRM.Inside_PosOrder.uwCycOpeMod allows users to set whether continuous operation is required.

● Activate contact control (sysWKS.Inside_PosOrder.uwStepStart)

If SysWKS.Inside_PosOrder.uwStepStart=2, it means that the instruction shall be updated immediately. The current latest instruction will be updated immediately, and unperformed instructions will be overwritten.

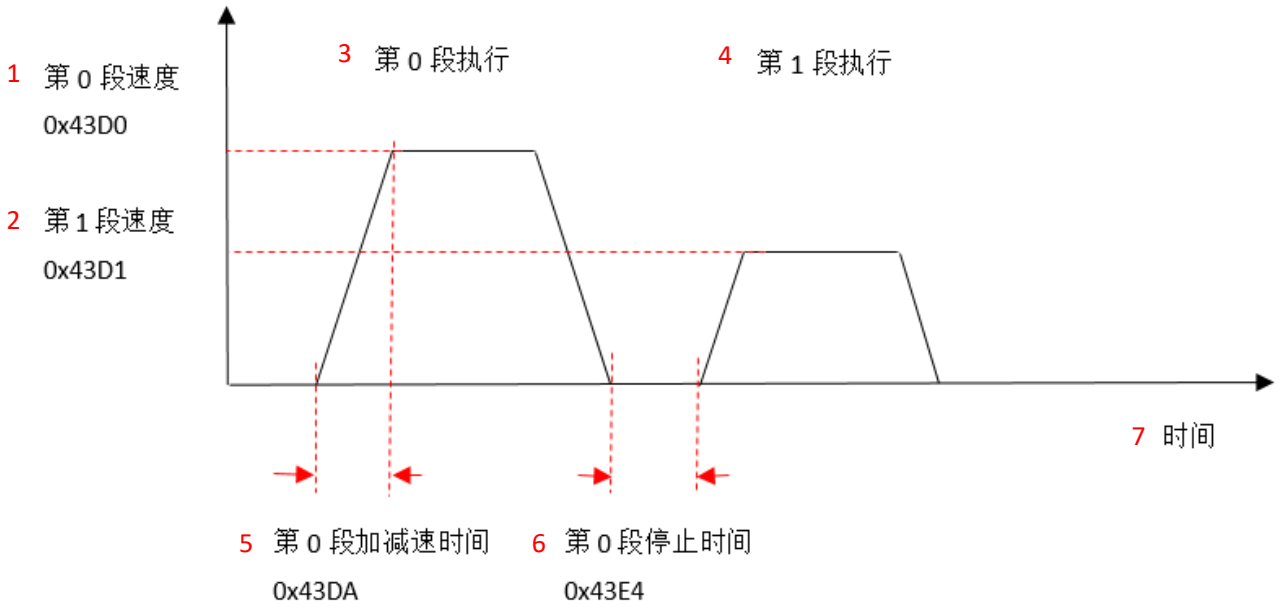
If SysWKS.Inside_PosOrder. uwStepStart=1, it means that the instruction shall be updated later, and the instruction will be updated only after the operation of its previous instruction is over.

After the data is updated, sysWKS.Inside_PosOrder.uwStepStart is reset.

Setting of position instruction signals and operation condition parameters:

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x43C6	stInSpaSpdOrder.slPusNumZro	Displacement equivalent to 0	-32767 ~ 32767 (r), 65535 (p)	0
0x43C7	stInSpaSpdOrder.slPusNumOne	Displacement equivalent to 1	-32767 ~ 32767 (r), 65535 (p)	0
0x43C8	stInSpaSpdOrder.slPusNumTwo	Displacement equivalent to 2	-32767 ~ 32767 (r), 65535 (p)	0
0x43C9	stInSpaSpdOrder.slPusNumThr	Displacement equivalent to 3	-32767 ~ 32767 (r), 65535 (p)	0
0x43D0	stInSpaSpdOrder.slSpeedZro	Velocity when the displacement is 0	0-30000 (0.1 r/min)	0
0x43D1	stInSpaSpdOrder.slSpeedOne	Velocity when the displacement is 1	0-30000 (0.1 r/min)	0
0x43D2	stInSpaSpdOrder.slSpeedTwo	Velocity when the displacement is 2	0-30000 (0.1 r/min)	0
0x43D3	stInSpaSpdOrder.slSpeedThr	Velocity when the displacement is 3	0-30000 (0.1 r/min)	0
0x43DA	stInSpaSpdOrder.swFiltimeZro	Acceleration and deceleration time on the ramp when the displacement is 0	0-10000 (ms/kpm)	10
0x43DB	stInSpaSpdOrder.swFiltimeOne	Acceleration and deceleration time on the ramp when the displacement is 1	0-10000 (ms/kpm)	10
0x43DC	stInSpaSpdOrder.swFiltimeTwo	Acceleration and deceleration time on the ramp when the displacement is 2	0-10000 (ms/kpm)	10

0x43DD	stInSpaSpdOrder.swFiltimeThr	Acceleration and deceleration time on the ramp when the displacement is 3	0-10000 (ms/kpm)	10
0x43E4	stInSpaSpdOrder.uwStoptimeZro	Stop time when the displacement is 0	0-32767 (50ms)	10
0x43E5	stInSpaSpdOrder.uwStoptimeOne	Stop time when the displacement is 1	0-32767 (50ms)	10
0x43E6	stInSpaSpdOrder.uwStoptimeTwo	Stop time when the displacement is 2	0-32767 (50ms)	10
0x43E7	stInSpaSpdOrder.uwStoptimeThr	Stop time when the displacement is 3	0-32767 (50ms)	10



No.	Chinese	English
1.	第 0 段速度	Velocity in Segment 0
2.	第 1 段速度	Velocity in Segment 1
3.	第 0 段执行	Implementation of Segment 0
4.	第 1 段执行	Implementation of Segment 1
5.	第 0 段加减速时间	Acceleration and deceleration time in Segment 0
6.	第 0 段停止时间	Stop time in Segment 0
7.	时间	Time

Position contact control is equivalent to a simple point controller, and users can easily complete periodic operation by using this function. Note:

● In the position contact control, displacement equivalent and displacement velocity direction need to be unified;

● In the position contact control, the electronic gear does not work, and this can be regarded as the fact that the electronic gear ratio is always 1:1.

● In the position contact control, position control parameters have an impact on motor operation.

Interpolation Control of Position Instructions

Position interpolation control is given (Control mode parameter sysWKS.swPositionRefMode = 3). The

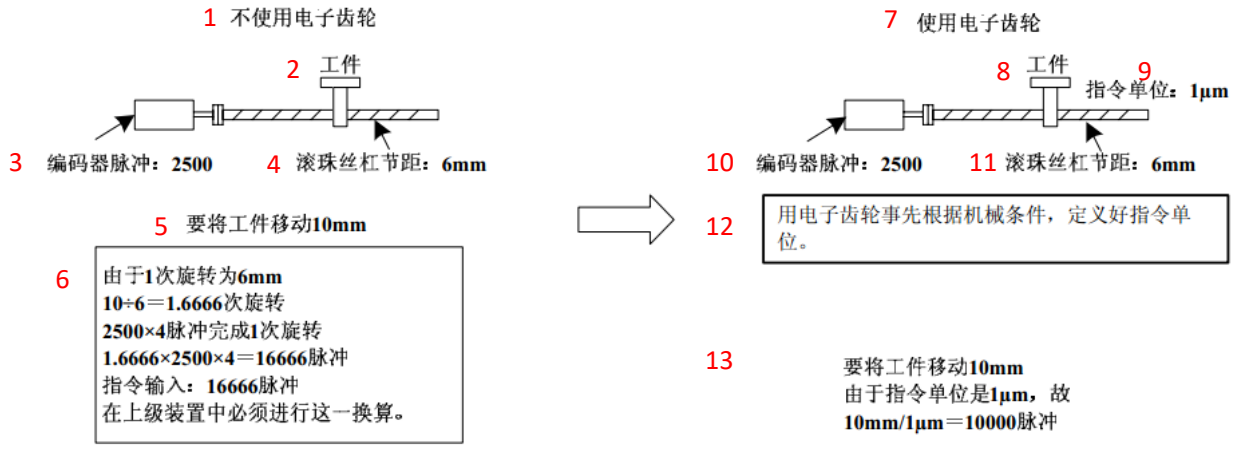
controller continuously gives the value of sysWKS.slBusInputRefParameter through the high-speed bus (CANPen\ Modbus). The driver reads the data values sent by the controller and accumulates them into the drive position instruction. Each time the position instruction parameter is read, it will be reset, thus realizing continuous control of the motor.

When the electronic gear ratio is set to 1, the driver regards 65,536 instructions as one turn of the motor by default, and users can flexibly set the number of instructions per turn according to the electronic gear ratio.

The frequency of reading sysWKS.slBusInputRefCDE inside the driver is 4KHZ. If the rate sent by the controller is greater than 4KHZ, it will cause instruction loss.

4.3.3 Electronic Gear

Using the "electronic gear" function, the workpiece movement amount equivalent to the input instruction pulse can be set to any value. The "upper device" that sends the instruction pulse can be controlled regardless of the mechanical deceleration ratio and the number of encoder pulses, which simplifies the control calculation.



No.	Chinese	English
1.	不使用电子齿轮	No use of electronic gears
2.	工作	Work
3.	编码器脉冲：2500	Encoder pulse: 2500
4.	滚珠丝杠节距：6mm	Ball screw pitch: 6 mm
5.	要将工作移动 10mm	To move the workpiece by 10 mm
6.	由于 1 次旋转为 6mm 10/6=1. 6666 次旋转 2500*4 脉冲完成 1 次旋转 1. 6666*2500*4=16666 脉冲 指令输入：16666 脉冲 在上级装置中必须进行这一换算	One turn is 6 mm, 10/6=1.6666 turns, and it takes 2500*4 pulses to complete one turn, so 1.6666*2500*4=16666 pulses, and the instruction input shall be 16666 pulses. The calculation must be done in the upper device.
7.	使用电子齿轮	Use of electronic gears
8.	工作	Work
9.	指令单位：1μm	Instruction unit: 1 μm
10.	编码器脉冲：2500	Encoder pulse: 2500
11.	滚珠丝杠节距：6mm	Ball screw pitch: 6 mm

12.	用电子齿轮实现根据机械条件，定义好指令单位	Use of electronic gears for implementation shall be based on the definition of instruction units according to mechanical conditions.
13.	要将工作移动 10mm 由于指令单位是 1μm，故 10mm/1μm=1000 脉冲	To move the workpiece by 10 mm, since the instruction unit is 1μm, the number of pulses is 10 mm/1μm=1000.

How to set electronic gears

Calculate the electronic gear ratio (B/A) as follows and set the value in the user parameters sysWKS.uwGearB and sysWKS.uwGearA.

1. Determine the mechanical form and the related elements of electronic gears

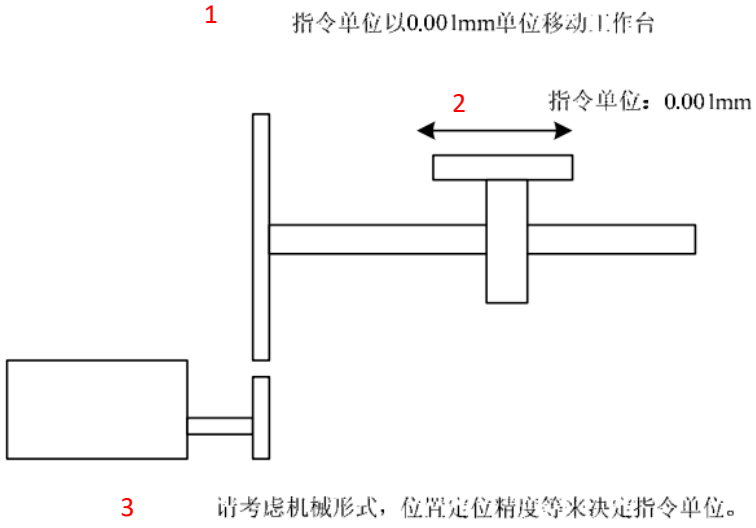
Deceleration ratio

Ball screw pitch

Pulley radius

2. Determine pulse equivalent

Pulse equivalent refers to the minimum displacement unit that the load needs to move. (Or the smallest instruction unit of the upper device)



No.	Chinese	English
1.	指令单位以 0. 001mm 单位移动工作台	Set the instruction unit as 0.001mm to move the workbench
2.	指令单位：0. 001mm	Instruction unit: 0.001 mm
3.	请考虑机械形式，位置定位精度等来决定指令单位	Consider the mechanical form, position accuracy, etc. to determine the instruction unit.

For example:

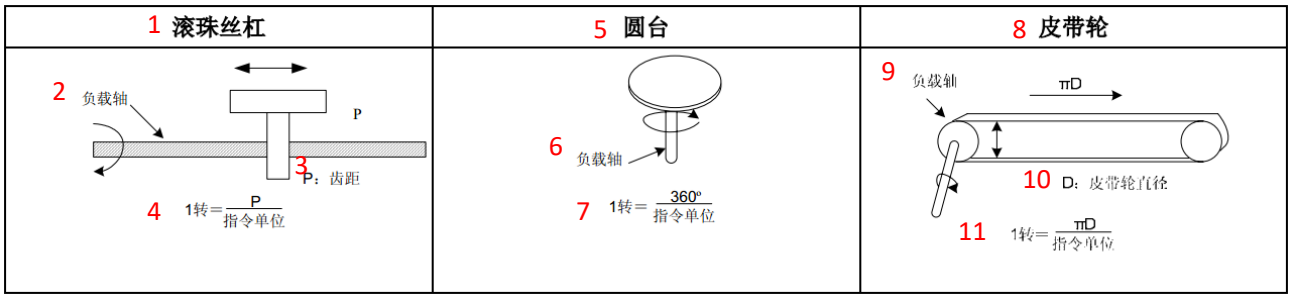
The pulse equivalent can be set as 0.01 mm, 0.001 mm, 0.1°, and 0.01 inch. Input the instruction of 1 pulse, and move the workbench by the distance or angle equivalent to 1 pulse.

If the pulse equivalent is 1 μm, and the input instruction pulse is 50000, the movement amount shall be 50000 × 1 μm = 50mm.

3. Use the pulse equivalent to calculate the load movement amount of the load shaft rotating 1 circle.

The movement amount (instruction unit) of the load shaft rotating 1 circle = The movement amount of the load shaft rotating 1 circle/pulse equivalent.

• If ball screw pitch is 5mm and pulse equivalent is 0.001 mm, 5mm/0.001 m = 5000 (instruction unit)



No.	Chinese	English
1.	滚珠丝杠	Ball screw
2.	负载轴	Load shaft
3.	P1 齿距	P1 Pitch
4.	1 转=P/指令单位	1 turn = P/Instruction unit
5.	圆台	Round platform
6.	负载轴	Load shaft
7.	1 转=360°/指令单位	1 turn = 360°/Instruction unit
8.	皮带轮	Pulley
9.	负载轴	Load shaft
10.	D:皮带轮直径	D: Pulley diameter
11.	1 转=πD/指令单位	1 turn = π D/Instruction unit

4. Calculate the electronic gear ratio (B/A)

If the deceleration ratio between the motor shaft and the load shaft is n/m (the motor rotates m circles, the load shaft rotates n circles),

then the electronic gear ratio (B/A) = [65536/corresponding movement amount of the load shaft rotating 1 circle] × (m/n)

5. Set parameters

Divide (B/A) to get A and B, and choose the nearer integer value lower than 65536.

At this point, the setting of electronic gear ratio is over.

MODBUS Communication Address	Parameter	Content	Parameter Range	Default Setting
0x439C	sysWKS.uwGearA	Electronic gear A (denominator)	1-65535	1
0x439D	sysWKS.uwGearB	Electronic gear B (numerator)	1-65535	1

4.3.4 Settings of Position in Place/Position Out-of-tolerance

Position in place

When the position instruction is given, the motor will follow the position instruction to run. When the difference between the actual position of the motor and the instruction position is lower than the set threshold, the motor in-place flag is set, and the positioning completes the DO output, the upper computer

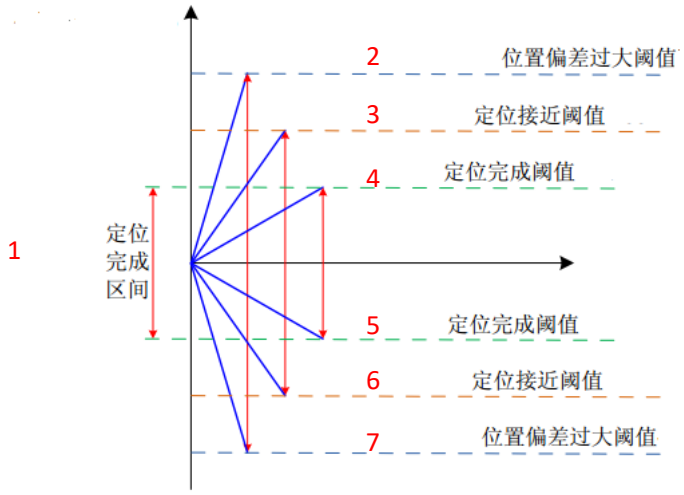
can confirm the completion of servo driver positioning after receiving the positioning completion signal.

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x43AC	stStdPosition.uwPosMinInPlace	Position-in-place threshold	10-65535	200
	Parameter description: Minimum deviation of the in-place position; position error less than the set value; the in-place flag is set. (65536 = 360° mechanical rotation)			

Position out-of-tolerance

When the difference between the actual position of the motor and the position instruction exceeds the set threshold, it will be considered that the motor cannot follow the instruction, the driver will report "position out-of-tolerance error" and be disabled, and the motor will halt.

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x433C	stPosition.slPosErrMax	Position out-of-tolerance threshold	0-0xffffff	0xffff
	Parameter description: Position out-of-tolerance threshold; When the position deviation is greater than the threshold, the driver will report "position out-of-tolerance error", the servo system will be disabled, and the motor will halt. (0xffff= 360° mechanical rotation)			



No.	Chinese	English
1.	定位完成区间	Positioning completion interval
2.	位置偏差过大阈值	Excessive position deviation threshold
3.	定位接近阈值	Positioning proximity threshold
4.	定位完成阈值	Positioning completion threshold
5.	定位完成阈值	Positioning completion threshold
6.	定位接近阈值	Positioning proximity threshold
7.	位置偏差过大阈值	Excessive position deviation threshold

4.3.5 Position Gain Parameter

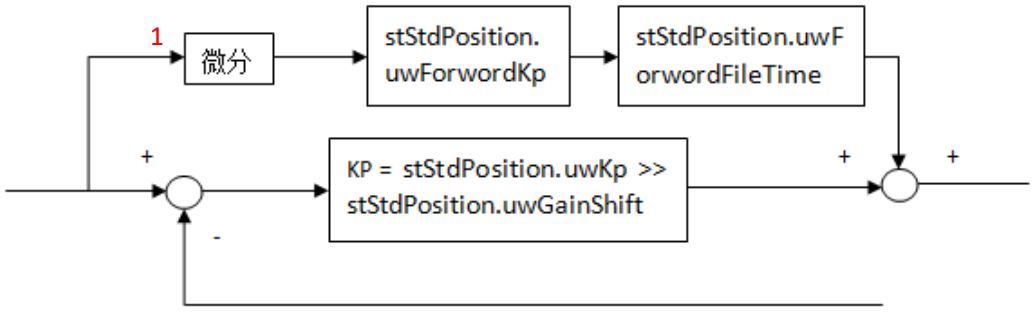
Standard setting of position gains

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x43A8	stStdPosition.uwKp	Forward coefficient of position gains	1 - 500	50
0x43AA	stStdPosition. uwFrdKp	Velocity feed-forward gain coefficient	0-100 (%)	60
0x43AB	stStdPosition. uwFrdFileTime	Velocity feed-forward filtering time	0-1000 (ms)	0

The larger the position loop gain, the more responsive PP with less offset can be carried out, but it is restricted by mechanical features. Due to the influence of the load, if the gain is set too large, it is easy to cause oscillation and overshoot.

Note: In the servo unit, to shorten the positioning time, feed-forward compensation is done to the PP. But if the speed feed-forward gain stStdPosition. uwFrdKp is set too large, it may cause overshoot and machine vibration. For general machines, please set it below 80 %. It is recommended to set the velocity feed-forward filtering time stStdPosition.uwFrdKp to 0. If the velocity feed-forward filtering time is set too large, the position will be overshot.

Parameter block diagram of standard positions:



No.	Chinese	English
1.	微分	Differential

Position gain: $KP = stStdPosition.uwKp \gg stStdPosition.uwGainShift$,stStdPosition. uwGainShift is set to 12 by default.

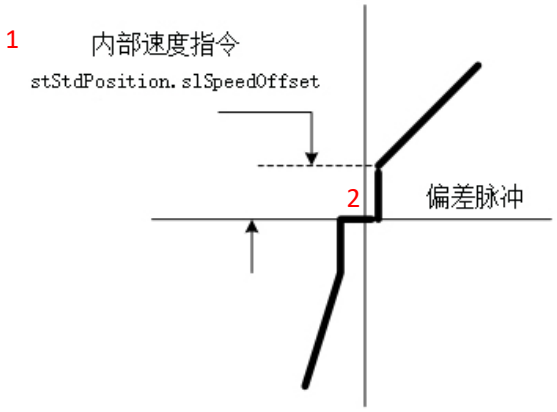
4.3.6 Speed Offset Setting

After the following user constants are set, the adjustment time of positioning control can be shortened by setting the speed instruction offset in the servo unit.

MODBUS Communication	Parameter	Name	Setting range	Default setting

Address				
0x43AE	stStdPosition.slSpeedOffset	Speed offset	0-3000 (0.1 r/min)	0

In the servo unit, the speed instruction offset (in the PP mode) is given to shorten the positioning time. Set it according to the corresponding mechanical conditions.



No.	Chinese	English
1.	内部速度指令	Internal speed instruction
2.	偏差脉冲	Offset pulse

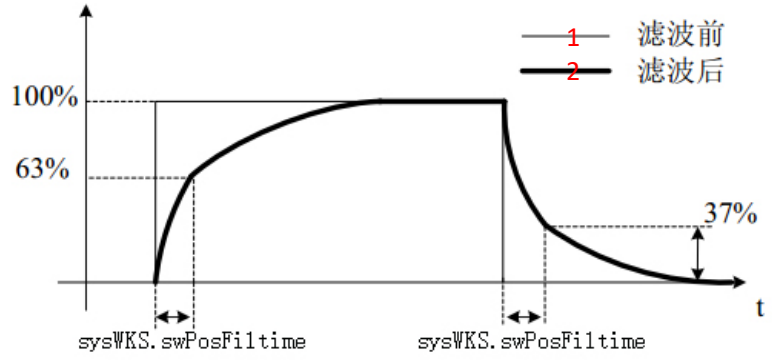
4.3.7 Position Instruction Filtering

(1) One-time filtering of the position instruction can improve the response stability of the system to a given instruction pulse.

(2) If the instruction input is rough (when the frequency division or multiplication setting is large or the pulse input frequency is low), the control of the servo system can be more stable.

(3) If the “time constant of one-time filtering of the position instruction (sysWKS.swPosFiltime)” is set too large, the dynamic performance of the servo system will be reduced.

MODBUS Communication Address	Parameter	Name	Unit	Setting range	Default setting
0x4397	sysWKS. uwPosFiltime	First-order low-pass filtering time constant	ms	0-10000	0



3 阶跃指令输入的响应波形

No.	Chinese	English
1.	滤波前	Before filtering
2.	滤波后	After filtering
3.	阶跃指令输入的响应波形	Response waveform of step change instruction input

4.3.8 PP Operation with EasyDRIVE

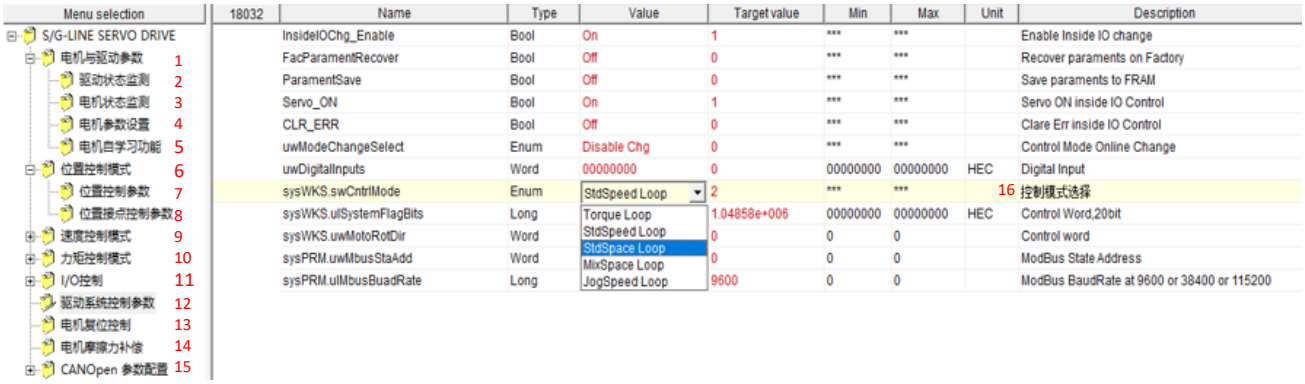
Step 1: In the column of “Drive System Control Parameter”,

(1) Select the sysWKS.swCntrMode.Value column in the above figure to select the required mode (the position mode)

(2) In the InsideIOChg_Enable line, click Value to change Off to On

(3) In the Servo_On line, click Value to change Off to On and press Enter

Then the driver enters the servo enabled state

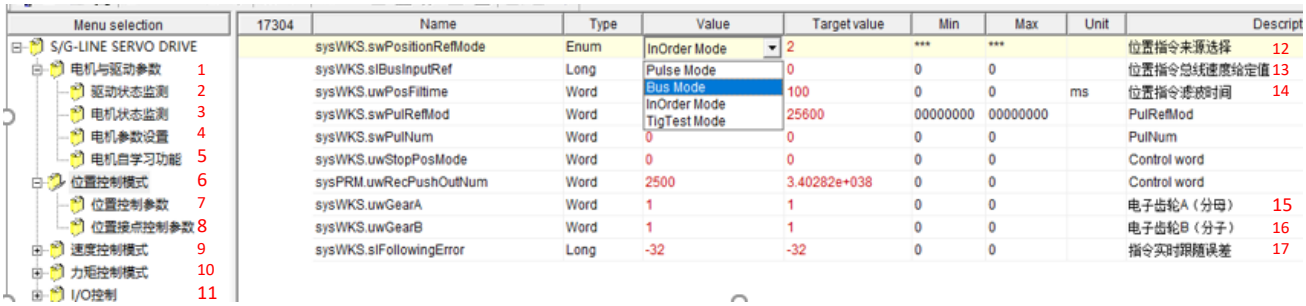


No.	Chinese	English
1.	电机与驱动参数	Motor and the driver parameters
2.	驱动状态监测	Driver condition monitoring
3.	电机状态监测	Motor condition monitoring
4.	电机参数设置	Motor parameter settings
5.	电机自学功能	Motor self-learning function
6.	位置控制模式	Profiled position mode
7.	位置控制参数	Profiled position parameter
8.	位置接点控制参数	Position contact control parameter
9.	速度控制模式	Profiled velocity mode
10.	力矩控制模式	Profiled torque mode
11.	I/O 控制	I/O control
12.	驱动系统控制参数	Drive system control parameter

13.	电机复位控制	Motor reset control
14.	电机摩擦力补偿	Motor friction compensation
15.	CANopen 参数配置	CANopen Parameter Configuration
16.	控制模式选择	Control Mode Selection

Step 2: Under the “Profiled Position Mode” column, you can select the instruction source and input parameters for motor control through relevant instructions.

（1） **When the simple bus mode is used in the position mode**, the position instruction source is set to Bus Mode by clicking the Value column in the sysWKS.swPositionRefMode line, as shown in the above figure. Enter a value in the Value column of the sysWKS.slBusInputRef line, and the motor will move according to the set value. The data is updated in real time, and the data position instruction always adds the corresponding value according to the data update cycle, so the motor will keep moving until the value is set to zero. The value entered in sysWKS.slBusInputRef shall not be too large. It is recommended to enter 10 at the beginning and increase it slowly. The motor speed can be fed back by selecting sysWKS.smotor.slAvgMotoSpeed (motor speed feedback) in the “Motor Condition Detection” menu bar on the left.

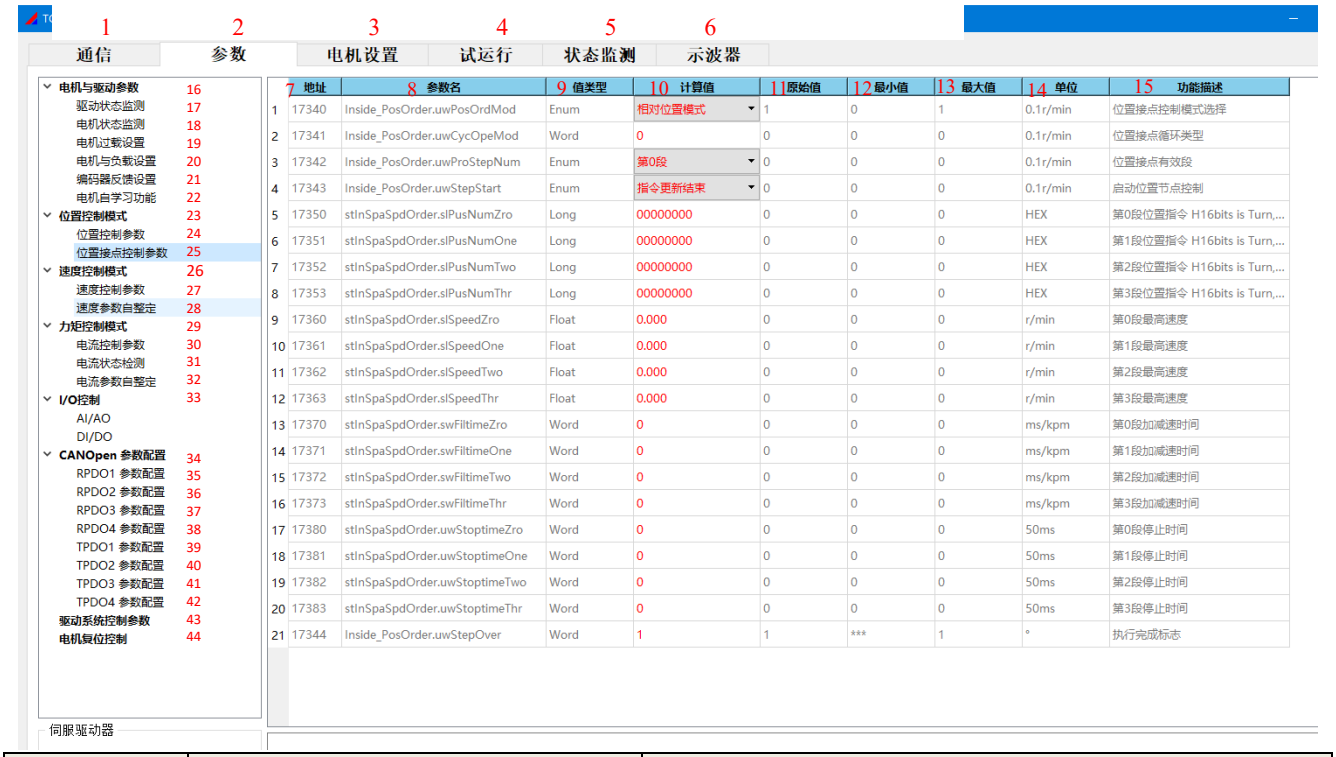


No.	Chinese	English
1.	电机与驱动参数	Motor and the driver parameters
2.	驱动状态监测	Driver condition monitoring
3.	电机状态监测	Motor condition monitoring
4.	电机参数设置	Motor parameter settings
5.	电机自学功能	Motor self-learning function
6.	位置控制模式	Profiled position mode
7.	位置控制参数	Profiled position parameter
8.	位置接点控制参数	Position contact control parameter
9.	速度控制模式	Profiled velocity mode
10.	力矩控制模式	Profiled torque mode
11.	I/O 控制	I/O control
12.	位置指令来源选择	Position instruction source selection
13.	位置指令总线速度给定值	Given value of position instruction bus speed
14.	位置指令滤波时间	Position instruction filtering time
15.	电子齿轮 A（分母）	Electronic gear A (denominator)
16.	电子齿轮 B（分子）	Electronic gear B (numerator)
17.	指令实时跟随误差	Real-time following errors of instructions

(2) Position mode uses internal instruction mode (position contact mode):

The position instruction source is in sysWKS.swPositionRefMode line. Click on the Value column to set the InOrder Mode.

Select the menu bar of “Position Contact Control Parameter” on the left of the software, as shown in the following figure: stInSpaSpdOrder. sIPusNumZro-NumThr represent segments 0~3, and each segment can set the position amount of motor rotation, where the upper four bits are the number of turns and the lower four bits are the rotation angle less than one turn. StInSpaSpdOrder. sISpeedZro-SpeedThr represent the corresponding speed of each segment. StInSpaSpdOrder. swFiltimeZro-FiltimeSev represent the corresponding acceleration time for each segment.
StInSpaSpdOrder. uwStoptimeZro-StoptimeSev represent the corresponding stop time for each segment. After the value is set, Inside_PosOrder. uwProStepNum represents any of the segments 0~3 required to run. For example, when you write in 1 Motor, it runs the set position amount of NumOne segment. Change the value of Inside_PosOrder. uwStepStart to 1, and the motor starts to run to the end according to the set segments.



No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description

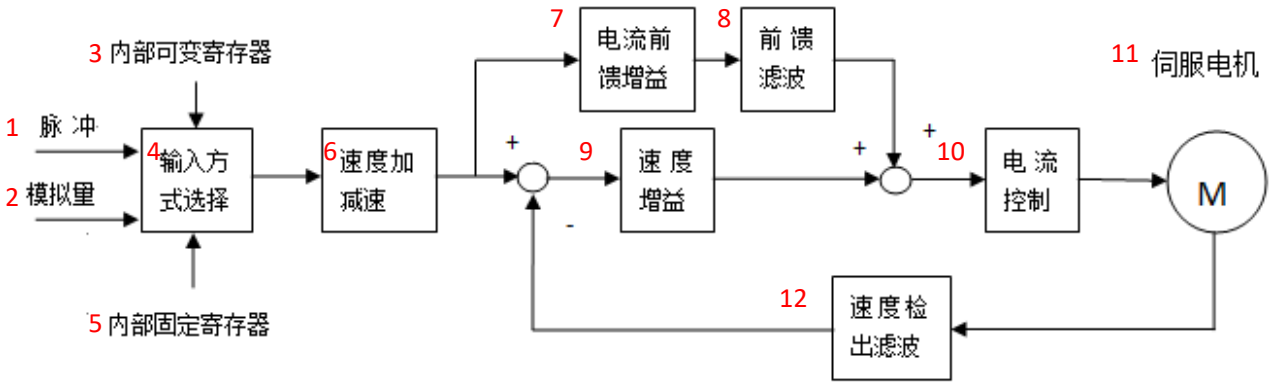
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	速度控制参数	Profiled velocity parameter
28.	速度参数自整定	Velocity parameter auto-tuning
29.	力矩控制模式	Profiled torque mode
30.	电流控制参数	Profiled current parameter
31.	电流状态检测	Current state detection
32.	电流参数自整定	Current parameter auto-tuning
33.	I/O 控制	I/O control
34.	CANopen 参数配置	CANopen Parameter Configuration
35.	RPDO1 参数配置	RPDO1 Parameter configuration
36.	RPDO2 参数配置	RPDO2 Parameter configuration
37.	RPDO3 参数配置	RPDO3 Parameter configuration
38.	RPDO4 参数配置	RPDO4 Parameter configuration
39.	TPDO1 参数配置	TPDO1 Parameter configuration
40.	TPDO2 参数配置	TPDO2 Parameter configuration
41.	TPDO3 参数配置	TPDO3 Parameter configuration
42.	TPDO4 参数配置	TPDO4 Parameter configuration
43.	驱动系统控制参数	Drive system control parameter
44.	电机复位控制	Motor reset control

For a more detailed introduction, please check the relevant contents of the position instruction source.

4.4 Profiled Velocity (PV)

Standard PV Block Diagram

The standard PV block diagram is as follows:



No.	Chinese	English
1.		Pulse

2.		Analog quantity
3.		Internal variable register
4.		Input mode selection
5.		Internal fixed register
6.		Acceleration and deceleration
7.		Current feed-forward gain
8.		Feed-forward filtering
9.		Speed gain
10.		Current control
11.		Servo motor
12.		Speed detection filtering

4.4.1 Input Settings of Speed Instructions

Speed instruction source setting

Choose different speed instruction sources by setting the following parameters.

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x4402	sysWKS.swSpeedRefMode	[1] Pulse frequency given [2] Analog quantity given mode 1 [4] Fixed internal parameter given [5] Analog quantity given mode 2	1 - 5	1

Pulse Setting

According to the pulse frequency given by the upper computer, the speed instruction is formed, and the pulse frequency of 100KHZ is 100% of the rated speed of the motor.

Speed instruction = Rated speed * (pulse frequency/100KHZ);

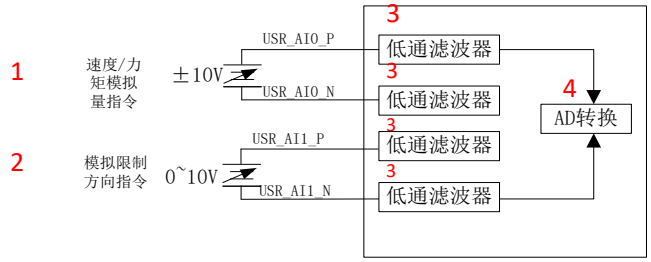
Analog quantity given mode 1 (+/-10V analog instruction)

The analog voltage signal output by the upper computer or other equipment is used as a speed instruction after processing.

Analog input terminal

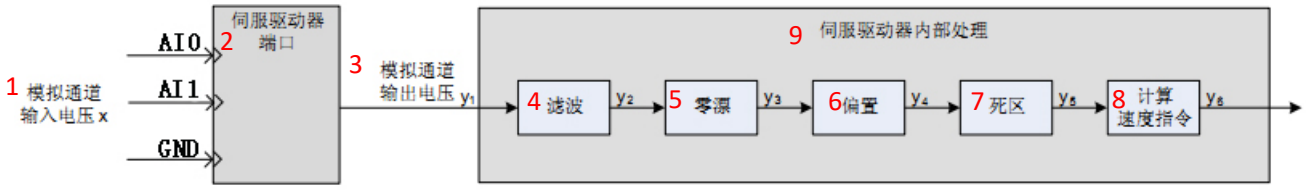
The servo driver has 2 analog input channels, the maximum input voltage is +-10Vdc , and the input resistance is 9KΩ .

Analog input circuit:



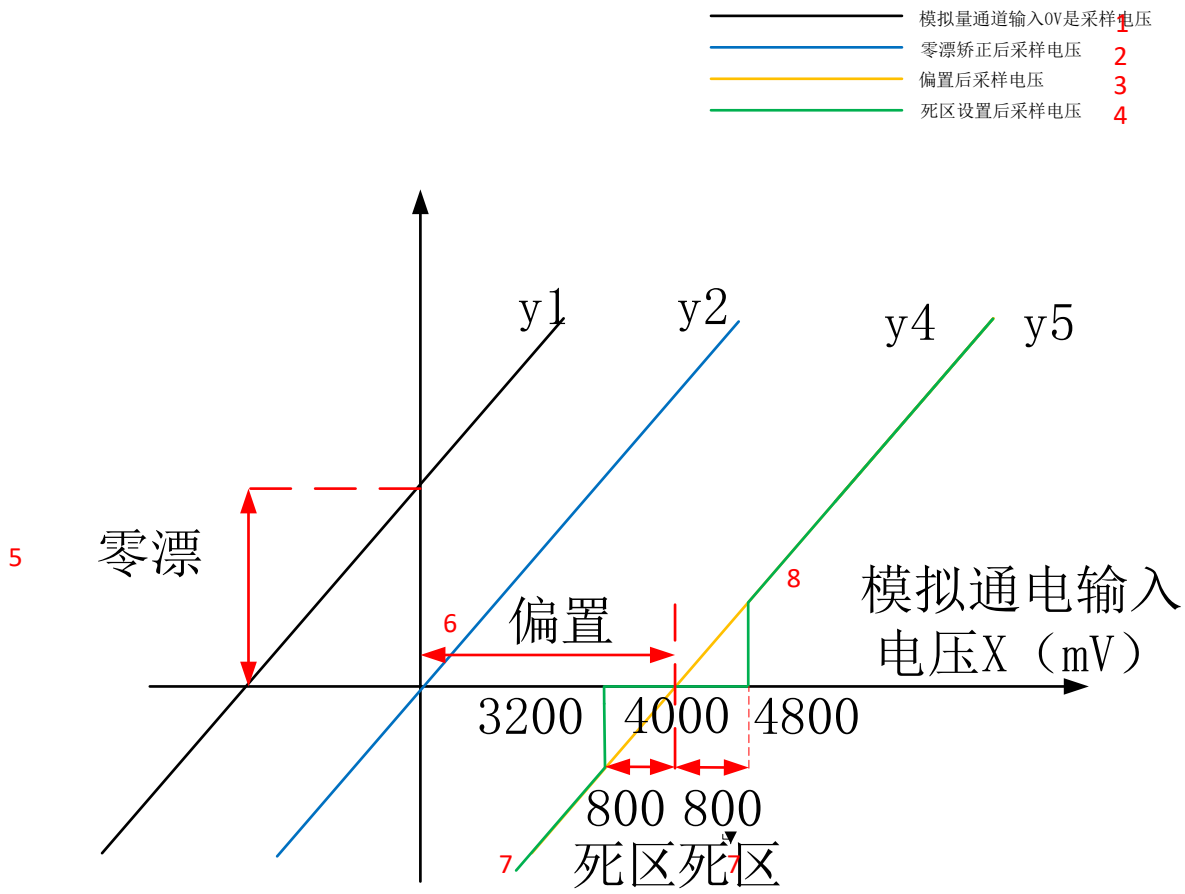
No.	Chinese	English
1.	速度/力矩模拟量指令	Speed/Torque analog instruction
2.	模拟限制方向指令	Analog limited direction instruction
3.	低通滤波器	Low-pass filter
4.	AD 转换	AD conversion

The output voltage of the unprocessed analog channel is shown in the figure below. After being processed by the servo driver, the output instruction is finally obtained.



No.	Chinese	English
1.	模拟通道输入电压 x	Analog channel input voltage x
2.	伺服驱动器端口	Servo driver port
3.	模拟通道输出电压 y1	Analog channel output voltage y1
4.	滤波	Filtering
5.	零漂	Zero drift
6.	偏置	Offset
7.	死区	Dead band
8.	计算速度指令	Calculation of speed instructions
9.	伺服驱动器内部处理	Servo driver internal processing

Servo driver AI processing flow



No.	Chinese	English
1.	模拟量通道输入 0V 是采样电压	Analog channel input is OV (sampling voltage)
2.	零漂矫正后采样电压	Sampling voltage after zero drift correction
3.	偏置后采样电压	Sampling voltage after offsetting
4.	死区设置后采样电压	Sampling voltage after dead band setting
5.	零漂	Zero drift
6.	偏置	Offset
7.	死区	Dead band
8.	模拟通电输入电压 x	Analog power-on input voltage x

An example of the servo driver AI processing of corresponding sampling voltage

Zero drift correction

Zero drift refers to the value of the servo driver sampling voltage relative to the analog ground when the input voltage of the analog channel is zero.

Correct the deviation of the analog channel output voltage from 0V when the actual input voltage is 0V.

Manually set sysPRM.sAngPar.swAngOneZeroDrift to correct the zero drift of analog input 1, and manually set sysPRM.sAngPar.swAngTwoZeroDrift to correct the zero drift of analog input 2.

Offset setting

Offset refers to the input voltage value of the analog channel when the sampling voltage is zero after zero drift correction.

The corresponding actual input voltage value when the sampling voltage is 0.

Manually set sysPRM.sAngPar.swAngOneSetOff to set the offset value of analog channel 1, and manually set sysPRM.sAngPar.swAngTwoSetOff to set the offset value of analog channel 2. .

Dead band correction

Dead band refers to the voltage range of the corresponding analog channel input when the specified sampling voltage is zero.

The effective input voltage range when the driver sampling voltage is not 0.

After the offset setting is completed, set the dead band of the analog channel 1by setting sysPRM.sAngPar.swAngOneDeadTime, and set the dead zone of the analog channel 2 by setting sysPRM.sAngPar.swAngTwoDeadTime.

Calculation of the analog speed instruction range

After completing all the above settings, set the corresponding speed instruction of 10V (10000mv) by setting sysWKS.uw10VdcSpdNum . The actual speed instruction is the input value of USR_AI0:

$$\text{RelSpeed} = \frac{y5}{10000} * \text{sysWKS.uw10VdcSpdNum}$$

Analog setting parameters:

MODBUS Communication Address	Parameter	Name and description	Setting range	Default value
0x4404	sysWKS.uw10VAdcSpdNum	Speed value	0-6000 (r/min)	3000
0x4526	sysPRM.sAngPar.swAngOneZeroDrift	Zero drift value	-1000 ~ 1000 (10mv)	0
0x4525	sysPRM.sAngPar.swAngOneSetOff	Offset value	-1000 ~ 1000 (10mv)	0
0x4527	sysPRM.sAngPar.swAngOneDeadTime	Dead band value	0-1000 (10mv)	0
0x4529	sysPRM.sAngPar.swAngTwoZeroDrift	Zero drift value	-1000 ~ 1000 (10mv)	0
0x4528	sysPRM.sAngPar.swAngTwoSetOff	Offset value	-1000 ~ 1000 (10mv)	0
0x452A	sysPRM.sAngPar.swAngTwoDeadTime	Dead band value	0-1000 (10mv)	0

Setting of Fixed internal parameters

Set sysWKS.swSpeedRefMode to 4 under the PV mode. The controller runs on a fixed internal parameter, and the speed instruction is given by stInSpdOrder.slFixSpeed.

Set speed parameters according to actual working conditions:

MODBUS Communication Address	Parameter	Name and description	Setting range (0.1 r/min)	Default value
0x4420	stInSpdOrder.slFixSpeed	Fixed speed	0 - 30000	0

Analog quantity given mode 2 (0-10V analog quantity + direction signal)

Calculation of speed instructions

After completing all the above settings, set the corresponding speed instruction of 10V (10000mv) by setting sysWKS.uw10VdcSpdNum . The actual speed instruction is the value of USR_AI0:

$$\text{RelSpeed} = \frac{y5}{10000} * \text{sysWKS.uw10VdcSpdNum}$$

USR_AI1 input is direction signal. When the AI1>3V speed instruction is positive, the AI1<1V speed instruction is negative, and the intermediate voltage maintains the original direction.

4.4.2 Speed Instruction Filtering

MODBUS Communication Address	Parameter	Name	Setting range (ms/kpm)	Default value
0x43F9	StPI_CntrLoop. slRampUpFileTime	Acceleration time on the ramp	0-10000	100
0x440D	StPI_CntrLoop. slRampDnFileTime	Deceleration time on the ramp	0-10000	100
0x4412	StPI_CntrLoop. uwRefFileTime	First-order low-pass filtering time of the speed instruction	0-1000	50

·The servo driver internally sets the acceleration and deceleration time according to these parameters, and performs the acceleration and deceleration control of the speed.

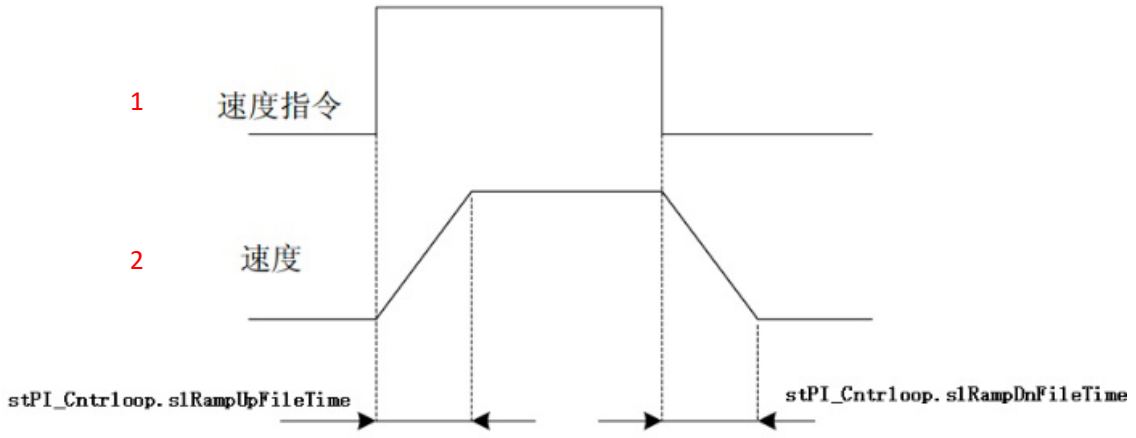
·The soft boot-up function is valid in the PV mode. In the PP mode, the soft boot-up function is invalid.

·When the input speed instruction is stepped, the speed can be smoothly controlled by setting “Soft Boot-up Time”.

The meaning of the parameters are as follows:

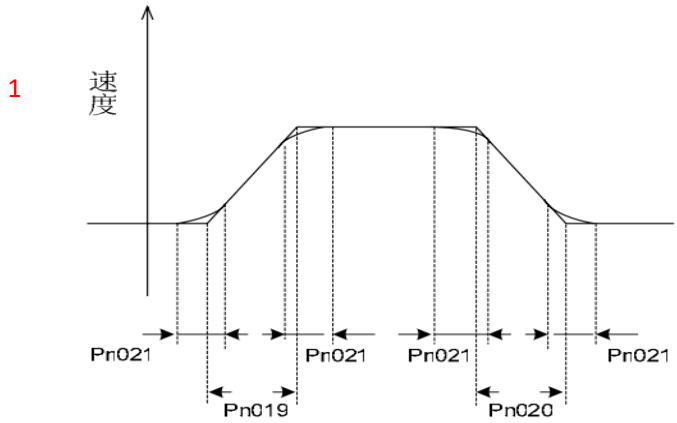
StPI_CntrLoop. slRampUpFileTime: Time of the conversion from the stop state to the speed of 1000r/min

StPI_CntrLoop. slRampDnFileTime: Time of the conversion from the speed of 1000r/min to the stop state



No.	Chinese	English
1.	速度指令	Speed instruction
2.	速度	Speed

stPI_CntrLoop.slRampUpFileTime and stPI_CntrLoop.slRampDnFileTime are the time of linear acceleration and deceleration respectively.In cases where linear acceleration and deceleration can produce large impact, you may select and set stPI_CntrLoop. uwRefFileTime to get smooth operation.



No.	Chinese	English
1.	速度	Speed

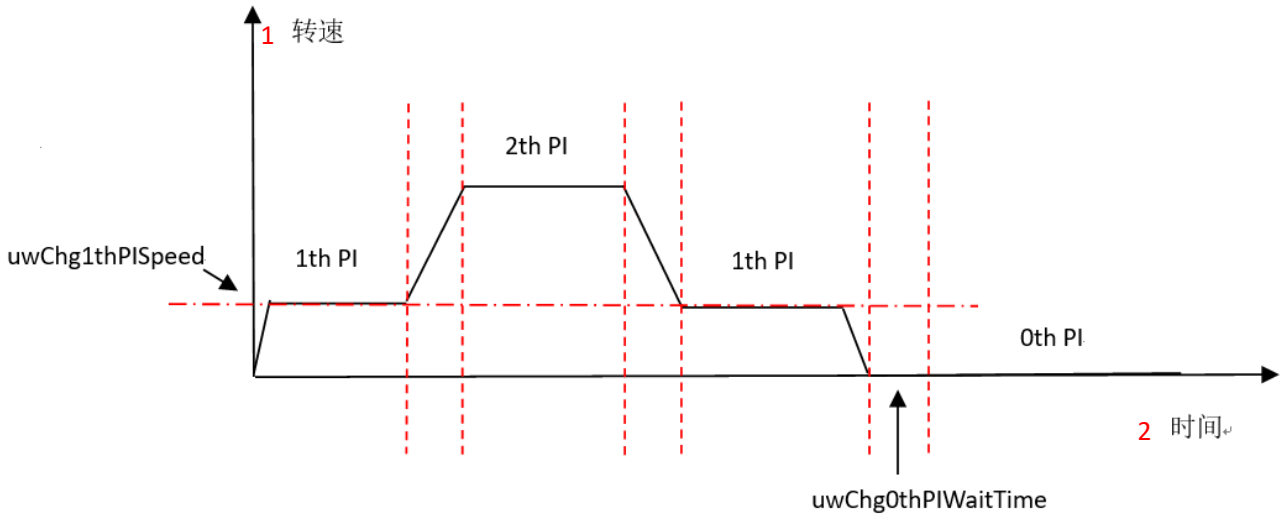
Note: In the case that two filters are superimposed, they also need to be added when the delay of the instruction is calculated, and are used to set the filter parameters according to the actual application.

4.4.3 Speed Gain Parameter

Speed Gain Settings

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x443E	sysPRM.sSpdCntl.sl0thKP	Zero speed KP	100 – 100000	30000
0x443F	sysPRM.sSpdCntl.uw0thKI	Zero speed KI	1 – 1000	300
0x4421	sysPRM.sSpdCntl.sl1thKP	First speed KP	100 – 100000	20000
0x4422	sysPRM.sSpdCntl.uw1thKI	First speed KI	1 – 1000	200
0x4423	sysPRM.sSpdCntl.sl2thKP	Second speed KP	100 – 100000	6000
0x4424	sysPRM.sSpdCntl.uw2thKI	Second speed KI	1 – 1000	20
0x4425	sysPRM.sSpdCntl.uwKvfr	PDFF factor	0-100	100
0x4426	sysPRM.sSpdCntl.uwFrdKp	Current feed-forward	0-100	0
0x4427	sysPRM.sSpdCntl.uwFrdFileTime	Current feed-forward filtering time	0-1000 (10us)	0
0x4440	uwChg0thPIWaitTime	Zero-speed PI switching time	1-10000 (ms)	2000
0x4441	uwChg1thPISpeed	PI switching speed of the first segment	1-10000 (0.1rpm)	1000

The PI parameter of the speed loop consists of three segments of PI settings, namely, zero speed KP/KI in the stop segment, the first speed KP/KI in the low speed segment, and the second speed KP/KI in the high speed segment. The switching threshold between the first speed PI and the second can be determined by setting the switching speed uwChg1st PISPEED, and how long it takes to switch to zero speed PI after the motor stops is determined by setting the parameter uwChg0thPIWaitTime.



No.	Chinese	English
1.	转速	Speed
2.	时间	Time

The larger the KP gain set value of the speed loop or the larger the value of the KI speed loop integral parameter, the more highly responsive PV can be performed. However, due to the constraints of mechanical features, setting an excessively large value of the speed loop integral time is likely to cause system vibration.

Generally, the first PI in the low speed segment is set with a larger gain, while the second PI in the high speed segment is set with a smaller gain. In the gain transition zone, the actual control gain transitions linearly and smoothly with the motor speed. When the motor stops, the zero-speed PI value in the stop segment is set according to the rigidity required by the system.

Setting the current feed-forward gain can increase the response speed of the inner loop and improve the rigidity of the system. Increasing this value is beneficial to improve the inner loop response of the system, so it should be adjusted according to the actual use situation. Excessive values can easily cause tiny vibration of the motor.

4.4.4 Velocity Feedback Filtering Parameter

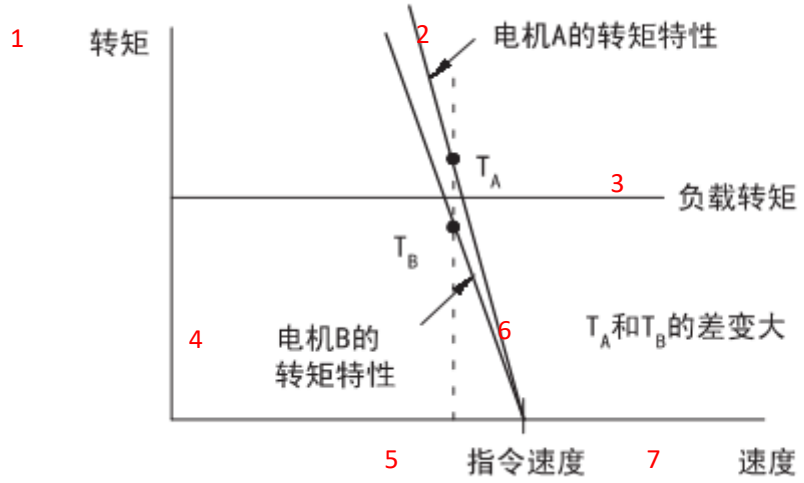
Adjusting the “speed feedback filtering time constant” can eliminate or mitigate the mechanical vibration caused by the servo system.

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x4413	StPI_CntrLoop. uwFbkFileTime	First-order low-pass filter coefficient for speed detection	0-1000 (10us)	50

The smaller the time constant of the filter, the better the responsiveness of the control, and the actual situation will be restricted by the mechanical structure. If mechanical vibration occurs when the default setting is used, the parameter can be increased, which is usually effective in suppressing vibration.

4.4.5 Function of Speed Droop Control

The Droop function can balance load distribution when multiple sets of drives run at the same time. The Droop function can soften the mechanical properties of motors. The Droop control can set the slip of motors at will. When two or more motors are used to pull a load together, this function can keep the load of each motor balanced. The Droop control will slow down the motor when the torque instruction is too high, and accelerate the motor when the torque instruction is too low, thus adjusting the load balance. The Droop function is only effective when the driver is running in the velocity mode.



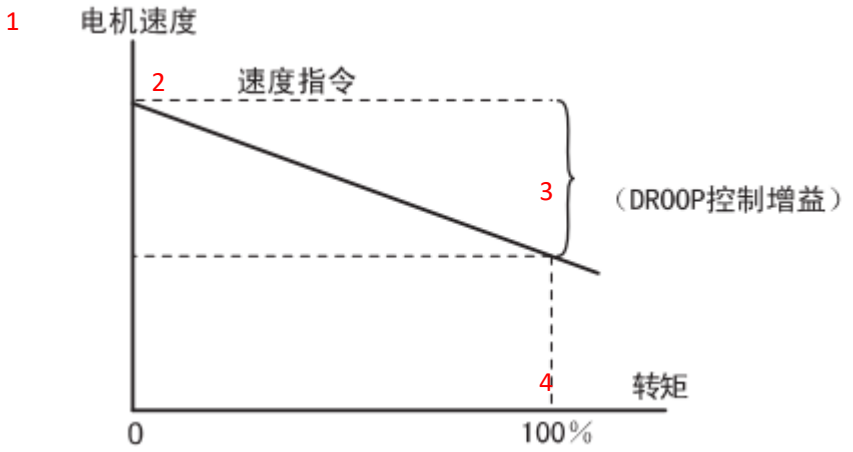
No.	Chinese	English
1.	转矩	Torque
2.	电机 A 的转矩特性	Torque characteristics of Motor A
3.	负载转矩	Load torque
4.	电机 B 的转矩特性	Torque characteristics of Motor B
5.	指令速度	Instruction speed
6.	TA 和 TB 的差变大	The difference between TA and TB becomes larger
7.	速度	Speed

Motor load imbalance

DROOP control gain

According to the set torque instruction with a maximum torque output capacity of 100% , the deceleration value is a certain proportion (%) of the given speed instruction, which is the Droop control gain. It is recommended that the gain parameter be set to no more than 30%.

MODBUS Communication Address	**Parameter No.**	**Name and description**	**Setting range**	**Default setting**
0x43FB	StPI_CntrLoop. uwDroopRate	Droop gain	0-100%	0



No.	Chinese	English
1.	电机速度	Motor speed
2.	速度指令	Speed instruction
3.	DROOP 控制增益	DROOP control gain
4.	转矩	Torque

Droop control gain

Filtering time of DROOP control

Users may adjust the response performance of Droop control. For slow response, users may reduce the filtering time; when vibration and imbalance occur, they may increase the set value.

MODBUS Communication Address	**Parameter No.**	**Name and description**	**Setting range**	**Default setting**
0x43FC	StPI_CntrLoop. uwDroopFileTime	DROOP filtering time	30-2000 (ms)	50

4.4.6 PV Operation with EasyDRIVE

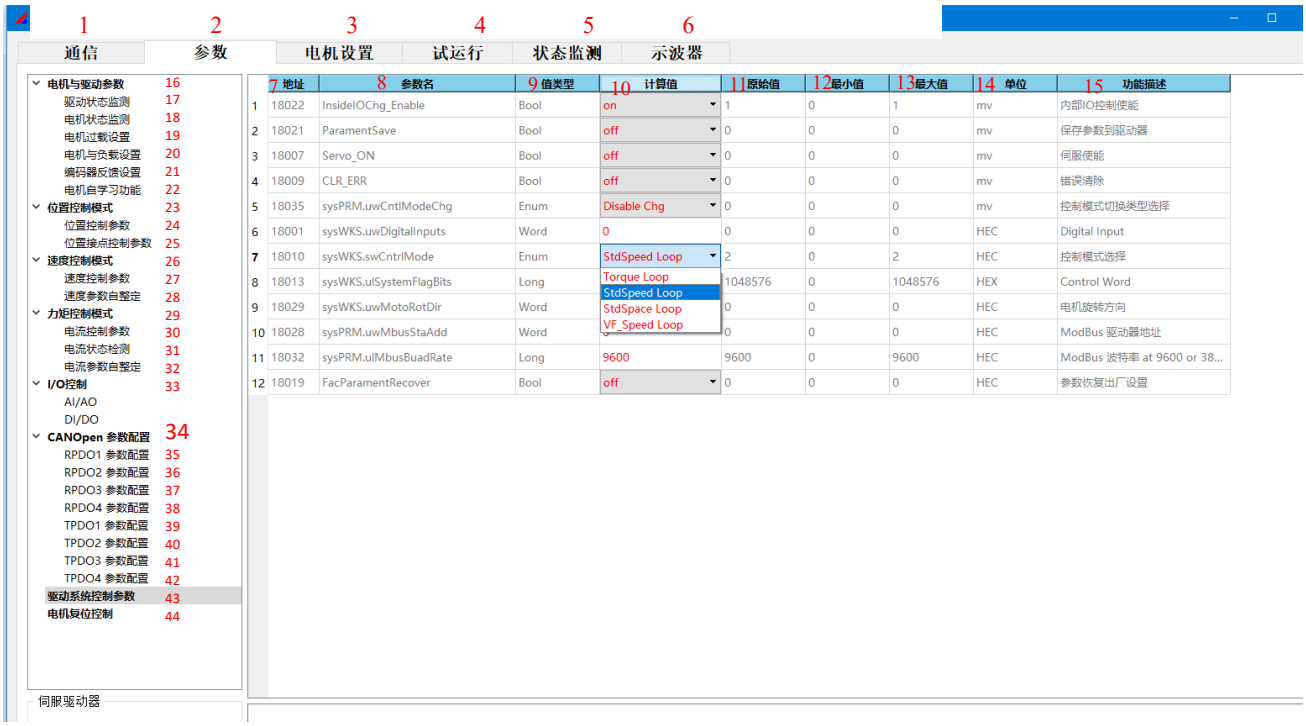
Step 1: In the column of “Drive System Control Parameter”,

(1) Select the sysWKS.swCntrMode.Value column in the above figure to select the required mode (the velocity mode)

(2) In the InsideIOChg_Enable line, click Value to change Off to On

(3) In the Servo_On line, click Value to change Off to On and press Enter

Then the driver enters the servo enabled state



No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	速度控制参数	Profiled velocity parameter
28.	速度参数自整定	Velocity parameter auto-tuning
29.	力矩控制模式	Profiled torque mode

30.	电流控制参数	Profiled current parameter
31.	电流状态检测	Current state detection
32.	电流参数自整定	Current parameter auto-tuning
33.	I/O 控制	I/O control
34.	CANopen 参数配置	CANopen Parameter Configuration
35.	RPDO1 参数配置	RPDO1 Parameter configuration
36.	RPDO2 参数配置	RPDO2 Parameter configuration
37.	RPDO3 参数配置	RPDO3 Parameter configuration
38.	RPDO4 参数配置	RPDO4 Parameter configuration
39.	TPDO1 参数配置	TPDO1 Parameter configuration
40.	TPDO2 参数配置	TPDO2 Parameter configuration
41.	TPDO3 参数配置	TPDO3 Parameter configuration
42.	TPDO4 参数配置	TPDO4 Parameter configuration
43.	驱动系统控制参数	Drive system control parameter
44.	电机复位控制	Motor reset control

Step 2: Select the instruction source under the “PV Mode” column, and input parameters for motor control through relevant instructions.

(1) **Select fixed internal parameters for speed instruction sources**. In the sysWKS.swSpeedRefMode line, click the Value bar to set it to FixInOrder Mode, as shown in the following figure. Enter a value in the Value column of the stInSpaSpdOrder.slFixSpeed line, and the motor will move at the set speed. The actual speed of the motor can be fed back by selecting sysWKS. Smotor.slAvgMotoSpeed (motor speed feedback) in the “Motor Condition Detection” menu bar on the left.

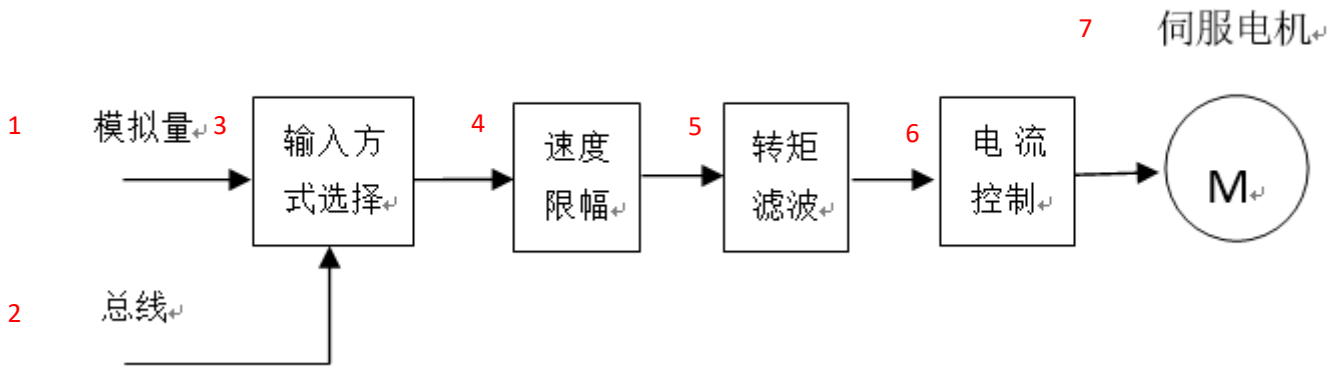
No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value

12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	速度控制参数	Profiled velocity parameter
28.	速度参数自整定	Velocity parameter auto-tuning
29.	力矩控制模式	Profiled torque mode

4.5 Profiled Torque (PT)

Standard PT Block Diagram

The standard PT block diagram is as follows:



No.	Chinese	English
1.	模拟量	Analog quantity
2.	总线	Bus
3.	输入方式选择	Input mode selection
4.	速度限幅	Speed limit
5.	转矩滤波	Torque filtering
6.	电流控制	Current control
7.	伺服电机	Servo motor

4.5.1 Settings of Torque Instruction Input

Torque instruction source setting

Choose different torque instruction sources by setting the following parameters.

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x445F	sysWKS.uwCurrentRefMode	[0] Analog quantity given [1] Bus mode given	0 - 1	0

Analog quantity given

The torque instruction is given by the A0 input, and the speed limit is given by the A1 input.

Bus mode given

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x445E	sysWKS.swIqRef2Use	Torque instruction given	+30000 ~ -30000	0
	Parameter description: The given value of the rated current of the motor (unit: 0.01A);			

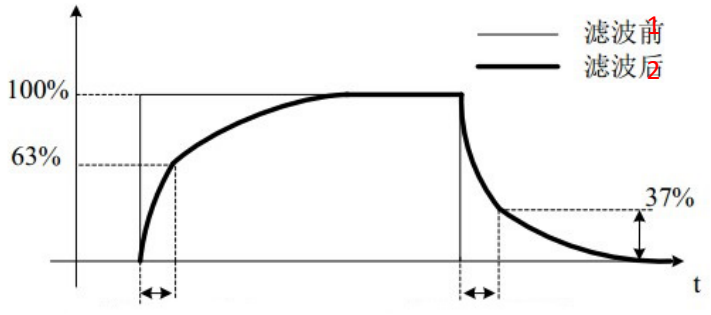
4.5.2 Torque Instruction Filtering

When the machine produces high-frequency vibration, it is often caused by an excessively large servo driver gain. In this case, the “torque instruction filtering time constant” can be adjusted to eliminate vibration while maintaining the current gain.

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x4460	sysWKS.uwCurFiltime	First-order filter constant of the torque instruction	0-10000 ms	0

The filter is a first-order low-pass filter. The smaller the time constant value, the better the response control. When the value is set to 0, the filter is turned off, but the actual situation will be subject to mechanical conditions.

When the mechanical vibration caused by the servo occurs during standard setting, the vibration can also be suppressed by increasing this time constant. (The vibration may be caused by gain adjustment errors, mechanical problems, etc.)



No.	Chinese	English

1.	滤波前	Before filtering
2.	滤波后	After filtering

4.5.3 Speed Limit for PT

In PT mode, the torque output of the motor is controlled by instructions, but motor speed is not controlled, so overspeed may occur under light load. To protect the mechanism, the speed must be limited. When overspeed occurs, negative speed feedback will be connected inside the driver to reduce the actual torque, thus reducing the actual speed, but the actual speed will be slightly higher than the speed limit. The maximum internal speed of the driver is limited to the rated speed of the motor.

4.5.4 Torque Gain Parameter

The current controller is composed of the PID controller, which can increase or decrease the tracking performance of the current instruction by adjusting the following parameters.

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x4466	sysWKS.mcCurUCntlParam.KPGain	Q-axis current KP	10-10000	500
0x4467	sysWKS.mcCurUCntlParam.KIGain	Q-axis current KI	0-1000	10
0x4464	sysWKS.mcCurUCntlParam.KDGain	Q-axis current KD	0-100	0
0x4468	sysWKS.mcCurVCntlParam.KPGain	D-axis current KP	10-10000	100
0x4469	sysWKS.mcCurVCntlParam.KIGain	D-axis current KI	0-1000	10
0x4465	sysWKS.mcCurVCntlParam.KDGain	D-axis current KD	0-100	0

The parameter adjustment of the current loop is recommended to adopt the default value. If the motor control is unstable at high speed, the Q-axis current KP value can be appropriately adjusted to speed up the following performance of the current.

4.5.5 PT Operation with EasyDRIVE

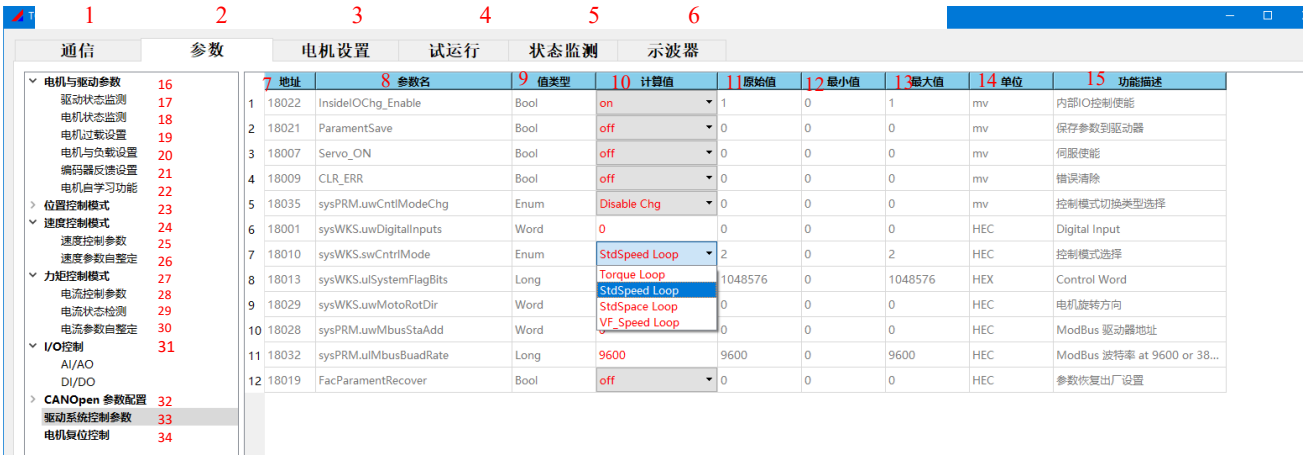
Step 1: In the column of “Drive System Control Parameter”,

(1) Select the sysWKS.swCntrMode.Value column in the above figure to select the required mode (the torque mode: Torque Loop)

(2) In the InsideIOChg_Enable line, click Value to change Off to On

(3) In the Servo_On line, click Value to change Off to On and press Enter

Then the driver enters the servo enabled state

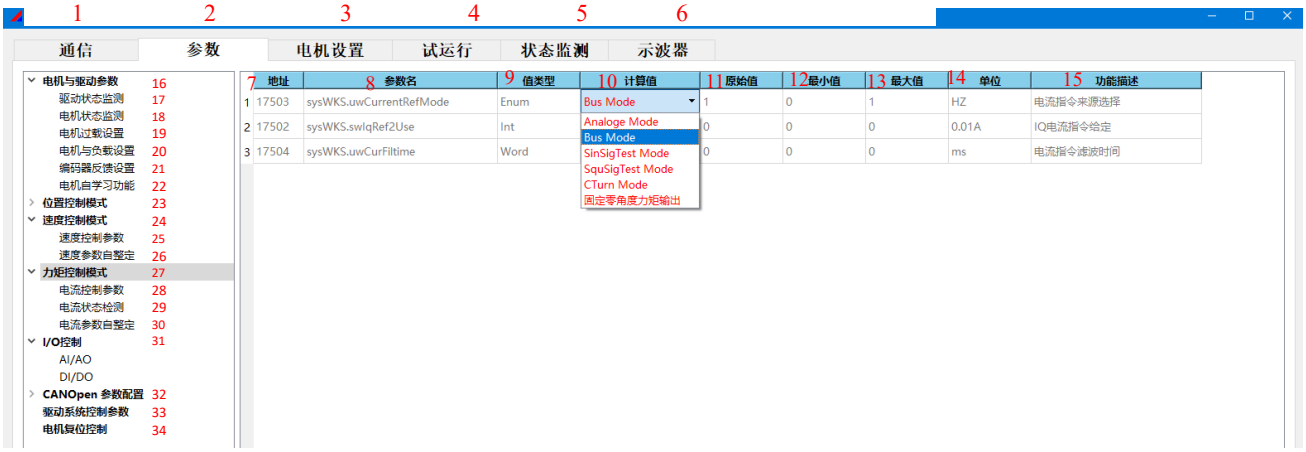


No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	速度控制模式	Profiled velocity mode
25.	速度控制参数	Profiled velocity parameter
26.	速度参数自整定	Velocity parameter auto-tuning
27.	力矩控制模式	Profiled torque mode
28.	电流控制参数	Profiled current parameter
29.	电流状态检测	Current state detection
30.	电流参数自整定	Current parameter auto-tuning
31.	I/O 控制	I/O control
32.	CANopen 参数配置	
33.	驱动系统控制参数	
34.	电机复位控制	

Step 2: select the instruction source Under the “PT Mode” column, and input parameters for motor control

through relevant instructions.

(1) Select Buse Mode Given for torque instruction sources. In the sysWKS.uwCurrentRefMode line, click the Value bar to set it to Bus Mode, as shown in the following figure. Enter a value in the Value column of the sysWKS.swIqRef2Use line, and the motor will output current at the set value. The actual speed of the motor can be fed back by selecting sysWKS. Smotor. slAvgMotoSpeed (motor speed feedback) in the "Motor Condition Detection" menu bar on the left.



No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	速度控制模式	Profiled velocity mode
25.	速度控制参数	Profiled velocity parameter
26.	速度参数自整定	Velocity parameter auto-tuning
27.	力矩控制模式	Profiled torque mode
28.	电流控制参数	Profiled current parameter

29.	电流状态检测	Current state detection
30.	电流参数自整定	Current parameter auto-tuning
31.	I/O 控制	I/O control
32.	CANopen 参数配置	CANopen Parameter Configuration
33.	驱动系统控制参数	Drive system control parameter
34.	电机复位控制	Motor reset control

4.6 Homing Operation

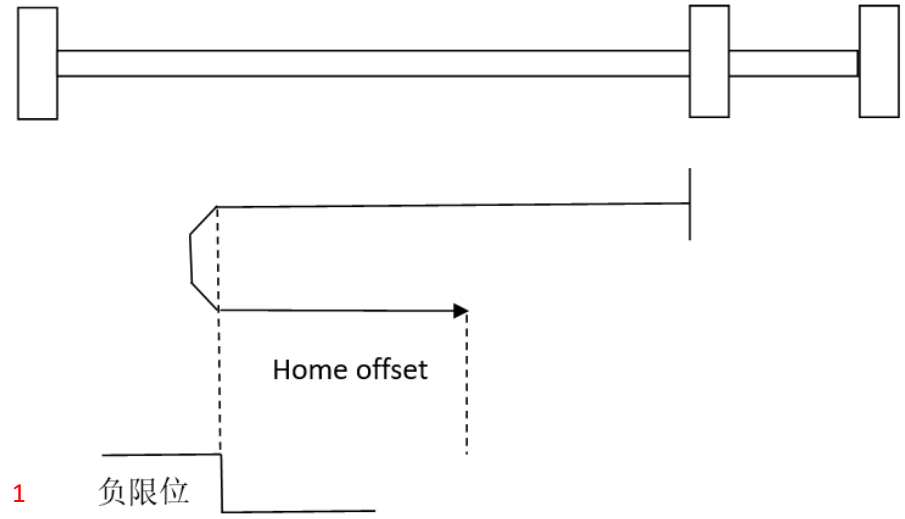
Related parameters of homing

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x448E	SelfSofRst.uwRstMode	Home	0 - Disable the homing operation 1-37	1
0x448F	SelfSofRst.uwRstStart	Start homing	0 - Disable the homing operation 1 - Enable the homing operation	--
0x4490	SelfSofRst.uwRstEnd	Homing process	0 - Homing process 1 - End of homing	--
0x4491	SelfSofRst.uwRstErr	Homing error	0 - Normal homing 1 - Homing error	--
0x4492	SelfSofRst.uwRstStarSpd	Homing speed	0-10000 (0.1 rpm)	1000
0x4494	SelfSofRst.uwSpdFilTime	Homing acceleration	0-10000 (ms)	100
0x4495	SelfSofRst.slHomeOffset	Homing offset	0-0x1fffffff	0
0x4496	SelfSofRst.uwHomeSet	Set home point	1 - Set the current position as home	0

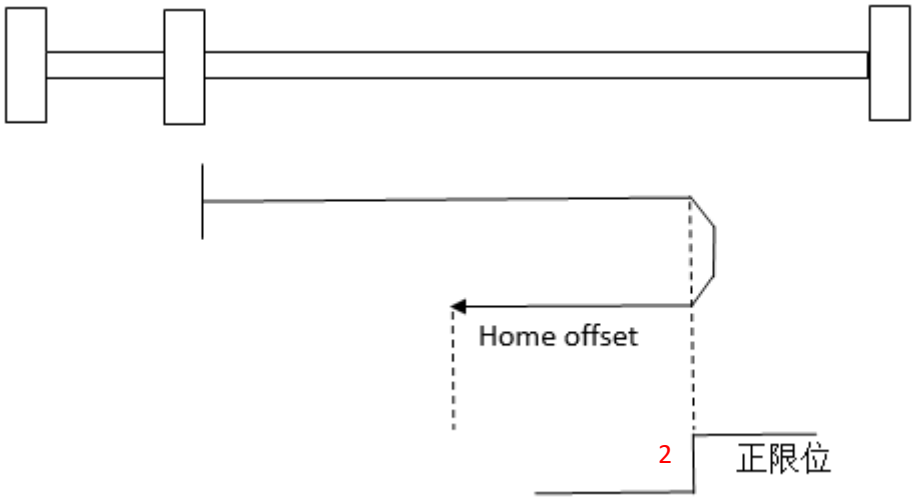
Home 1: The home point is the negative limit triggering signal

Home 2: The home point is the positive limit triggering signal

In Home 1 and Home 2, for the homing mode with the limit input as the home signal, the driver needs to run in the PP mode to be valid. The driver treats the limit input (DI4/DI2) as the home point by default, and the resetting is triggered by the upper controller software. When the motor is already in the resetting position, the resetting is triggered again, and the driver directly outputs the resetting end signal. If the homing time exceeds more than 120S continuously, the homing stops and homing errors are reported: SelfSofRst.uwRstErr=1;



Home 1



No.	Chinese	English
1.	负限位	Negative limit
2.	正限位	Positive limit

Home 2

Case: Home 1 Operation Process

Ready for homing: SelfSofRst.uwRstMode = 1;

SelfSofRst.uwRstStarSpd = 1000; (Reset at 100rpm)

Home offset: SelfSofRst.slHomeOffset = 0x0000ffff; (Home offset is set to 1 turn)

Start homing: Write SelfSofRst.uwRstStart = 1; SelfSofRst.uwRstEnd is automatically reset. The motor rotates in the reverse direction according to the set speed of 100rpm to find the home signal. When the home signal is found, the motor decelerates and stops, and the homing process ends.

End of homing: SelfSofRst.uwRstEnd becomes 1, and this position is considered as the origin.

Home 07: The home point is the Z pulse on the outer negative edge of the origin signal, and the initial

movement direction is positive

Home 08: The home point is the Z pulse on the inner negative edge of the origin signal, and the initial movement direction is positive

Home 09: The home point is the Z pulse on the inner positive edge of the origin signal, and the initial movement direction is positive

Home 10: The home point is the Z pulse on the outer positive edge of the origin signal, and the initial movement direction is positive

Home 11: The home point is the Z pulse on the outer positive edge of the origin signal, and the initial movement direction is negative

Home 12: The home point is the Z pulse on the inner positive edge of the origin signal, and the initial movement direction is negative

Home 13: The home point is the Z pulse on the inner negative edge of the origin signal, and the initial movement direction is negative

Home 14: The home point is the Z pulse on the outer negative edge of the origin signal, and the initial movement direction is negative

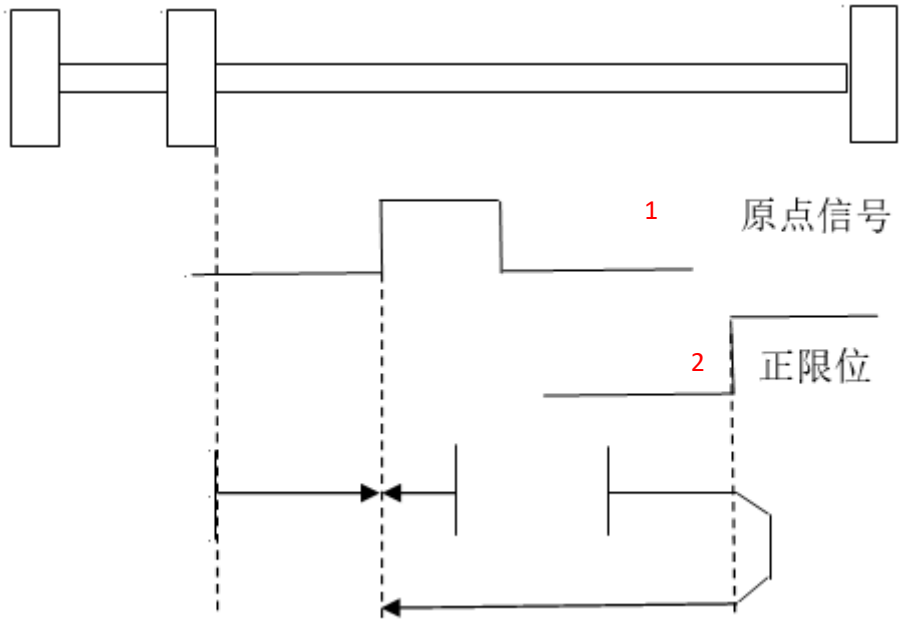
Home 17: The home point is the negative limit Z pulse

Home 18: The home point is the positive limit Z pulse

Not available.

Home 23, 24: With double limits, the home point is the negative edge of the origin signal, and the initial movement direction is positive

In Home 23 and 24, the homing mode with the negative edge of the origin signal input as the home signal is used, and the initial speed of homing is positive. The homing of the driver runs under the PP mode. The driver treats the negative edge of the origin input (DI5) as the home point by default, and the resetting is triggered by the upper controller software. When the motor is already in the resetting position, the resetting is triggered again, and the driver directly outputs the resetting end signal. If the homing time exceeds more than 120S continuously, the homing stops and homing errors are reported: SelfSofRst.uwRstErr=1;

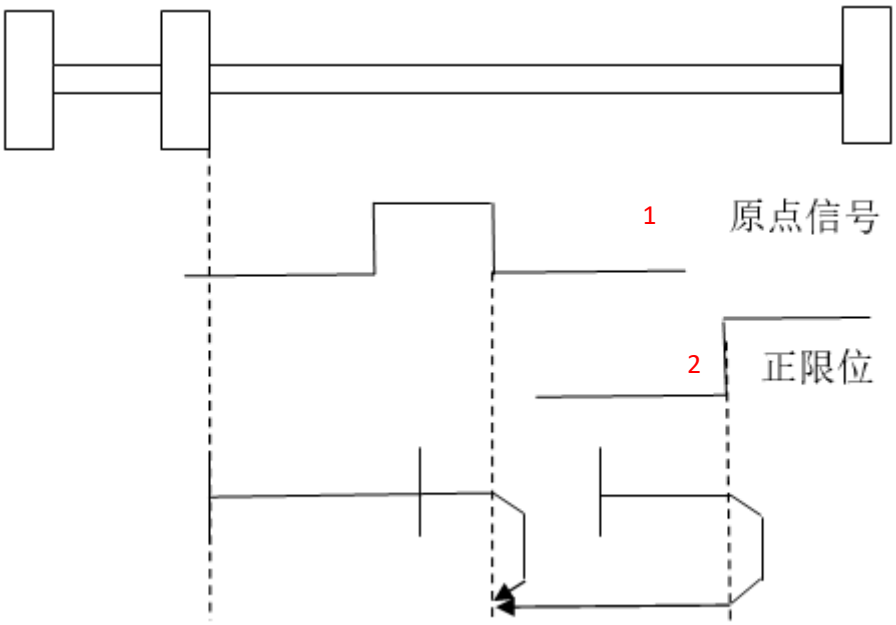


No.	Chinese	English
1.	原点信号	Origin signal
2.	正限位	Positive limit

Home 23, 24

Home 25, 26: With double limits, the home point is the positive edge of the origin signal, and the initial movement direction is positive

In Home 25 and 26, the homing mode with the positive edge of the origin signal input as the home signal is used, and the initial speed of homing is positive. When the homing of the driver runs under the PP mode, the driver treats the positive edge of the origin input (DI5) as the home point by default, and the resetting is triggered by the upper controller software. When the motor is already in the resetting position, the resetting is triggered again, and the driver directly outputs the resetting end signal. If the homing time exceeds more than 120S continuously, the homing stops and homing errors are reported: SelfSofRst.uwRstErr=1;

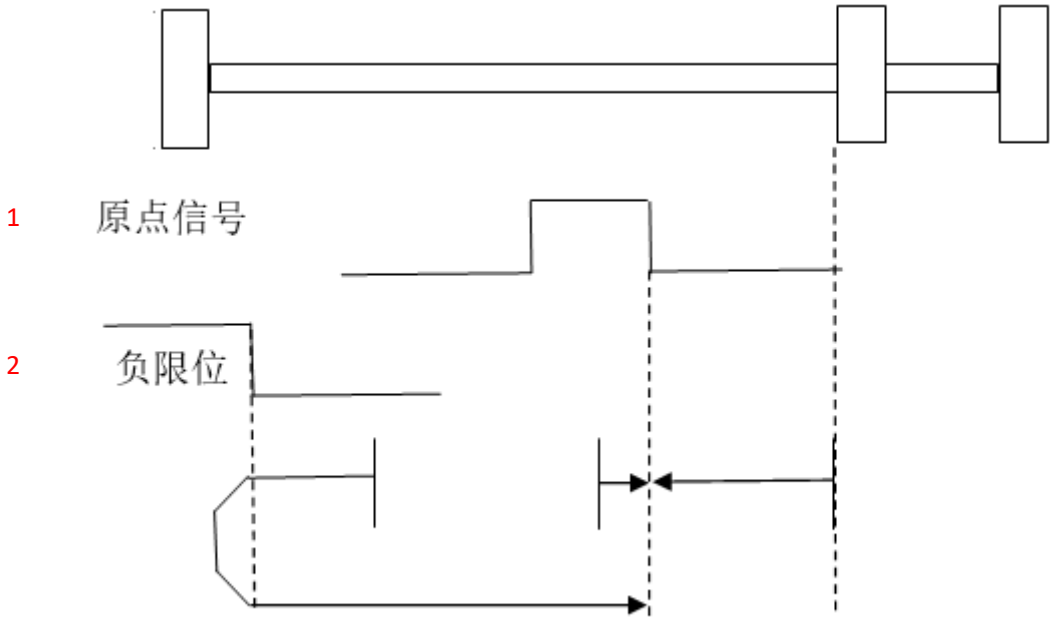


No.	Chinese	English
1.	原点信号	Origin signal
2.	正限位	Positive limit

Home 25, 26

Home 27, 28: With double limits, the home point is the positive edge of the origin signal, and the initial movement direction is negative

In Home 27 and 28, the homing mode with the positive edge of the origin signal input as the home signal is used, and the initial speed of homing is negative. The homing of the driver runs under the PP mode. The driver treats the positive edge of the origin input (DI5) as the home point by default, and the resetting is triggered by the upper controller software. When the motor is already in the resetting position, the resetting is triggered again, and the driver directly outputs the resetting end signal. If the homing time exceeds more than 120S continuously, the homing stops and homing errors are reported: SelfSofRst.uwRstErr=1;

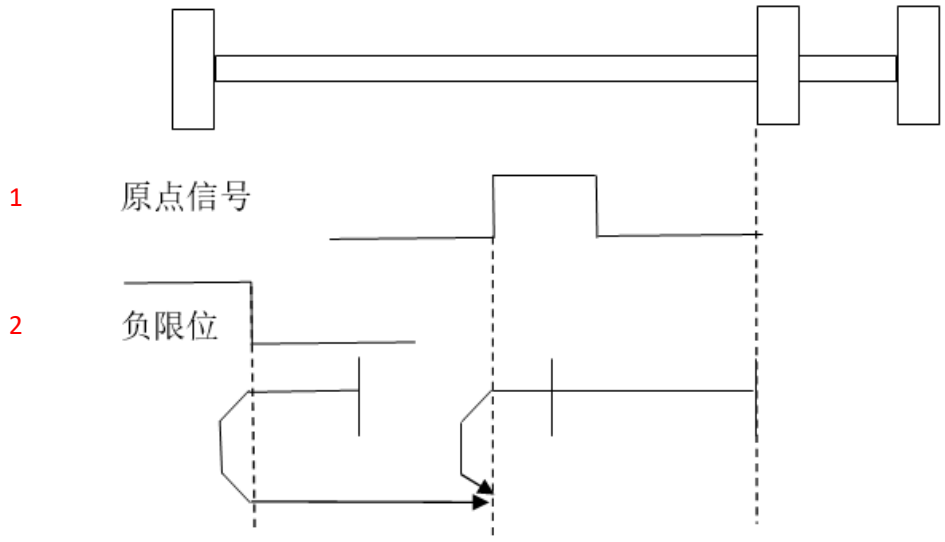


No.	Chinese	English
1.	原点信号	Origin signal
2.	负限位	Negative limit

Home 27, 28

Home 29, 30: With double limits, the home point is the negative edge of the origin signal, and the initial movement direction is negative

In Home 29 and 30, the homing mode with the negative edge of the origin signal input as the home signal is used, and the initial speed of homing is negative. The homing of the driver runs under the PP mode. The driver treats the negative edge of the origin input (DI5) as the home point by default, and the resetting is triggered by the upper controller software. When the motor is already in the resetting position, the resetting is triggered again, and the driver directly outputs the resetting end signal. If the homing time exceeds more than 120S continuously, the homing stops and homing errors are reported: SelfSofRst.uwRstErr=1;



No.	Chinese	English
1.	原点信号	Origin signal
2.	负限位	Negative limit

Home 29, 30

Home 35: The home point is the current position

When the parameter SelfSofRst.uwRstMode is set to 35, the driver records the current motor position as the home position, sets the current angle to zero, and reset the value of SelfSofRst.uwRstMode to 0.The secondary function can run multiple times, and it is only effective when the motor is powered on.

Home 36: The home point is the negative mechanical limit position

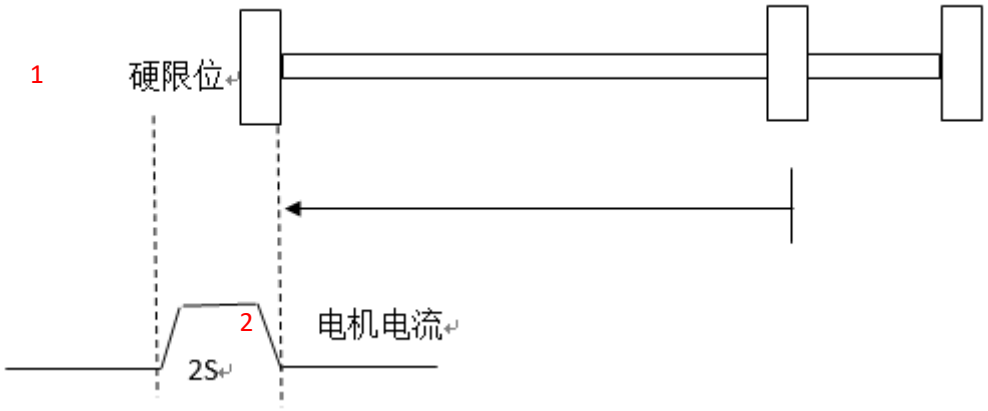
Home 37: The home point is the positive mechanical limit position

Home 36 and 37 are used in the system when there is no external home point, and mechanical limit points are used as a special way of the home point.

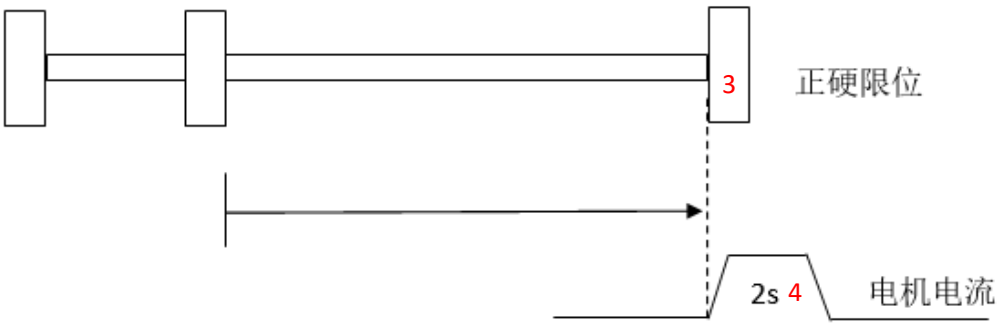
The homing method with the mechanical limit as the home signal is used. After the homing is activated, the motor starts homing at the speed set by SelfSofRst.uwRstStarSpd. In this moment, the limit is in a disabled state. When the motor reaches the mechanical hard limit, its current increases to the set rated current value, and its speed feedback is zero. This will last 2s, then the motor current returns to zero, and the homing process ends.

If the homing time exceeds more than 120S continuously with the origin not found, the homing stops and homing errors are reported: SelfSofRst.uwRstErr=1;

Note: In Home 36 and 37, the homing offset function is invalid.



Home 36



No.	Chinese	English
1.	硬限位	Hard limit
2.	电机电流	Motor current
3.	正硬限位	Positive hard limit
4.	电机电流	Motor current

Home 37

Case: Home 36 Operation Process

Ready for homing: SelfSofRst.uwRstMode = 36;

SelfSofRst.uwRstStarSpd = 1000; (Reset at 100rpm)

Start homing: Write SelfSofRst.uwRstStart = 1; SelfSofRst.uwRstEnd is automatically reset. The motor rotates in the reverse direction at the set speed of 100rpm. When the motor reaches the mechanical limit, it outputs rated current for 2s and ends. Then the homing process ends.

End of homing: SelfSofRst.uwRstEnd becomes 1, and this position is considered as the origin.

4.7 Switching of Dynamic Control Modes

The following combination of control modes can be selected. Use them according to your purposes.

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x4673	sysPRM.uwCntlModeChg	[0] Off mode switching [1] Position <-> Velocity [2] Position <-> Torque [3] Velocity <-> Torque	0-3	0

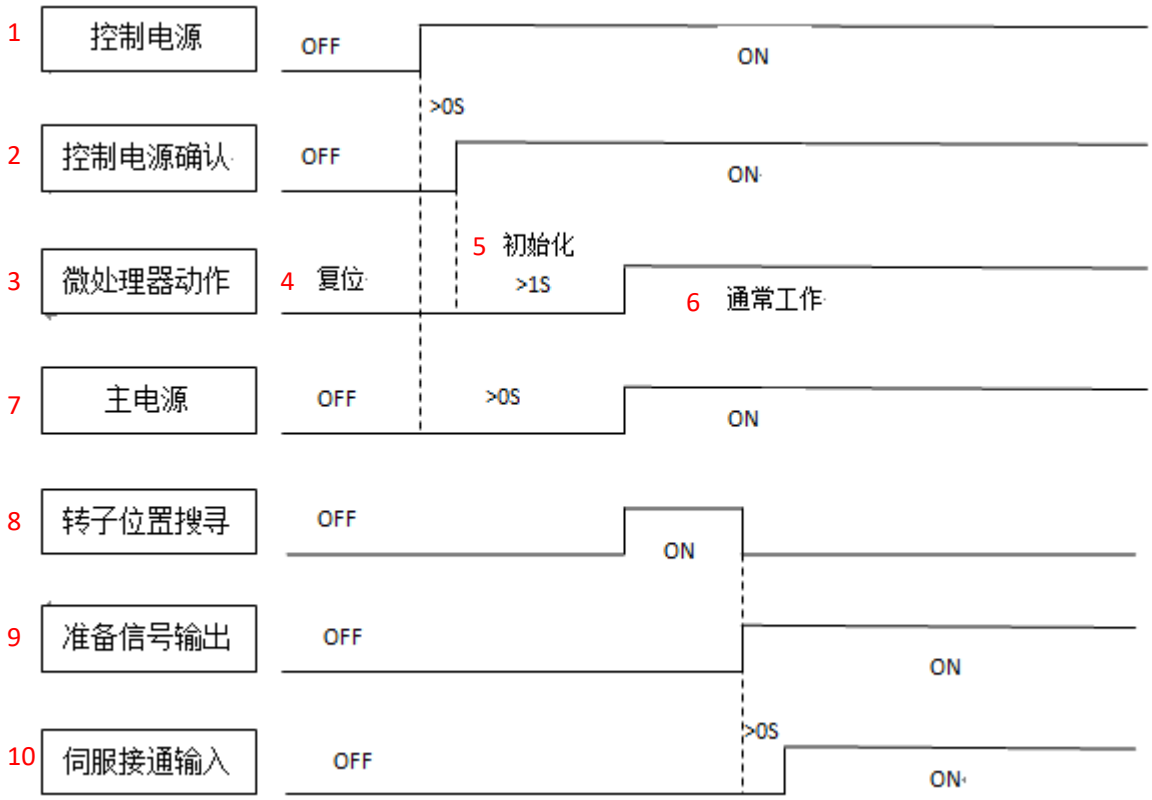
Mode switching is carred out through the bit5 state of sysWKS.swDI_StateBCD;

MODBUS Communication Address	Parameter No.	Name and description	Setting range	Default setting
0x465B	sysWKS.swDI_State	Digital quantity input status	--	--

An example of control mode switching

Parameter 1	Parameter 2	Control mode
sysPRM.uwCntlModeChg	sysWKS.swDI_State	
1	0x□□0□	Velocity→Position
	0x□□2□	Position→Velocity
2	0x□□0□	Torque→Position
	0x□□2□	Position→Torque
3	0x□□0□	Torque→Velocity
	0x□□2□	Velocity→Torque

4.7.1 Connection Time Sequence of Servo Control Power

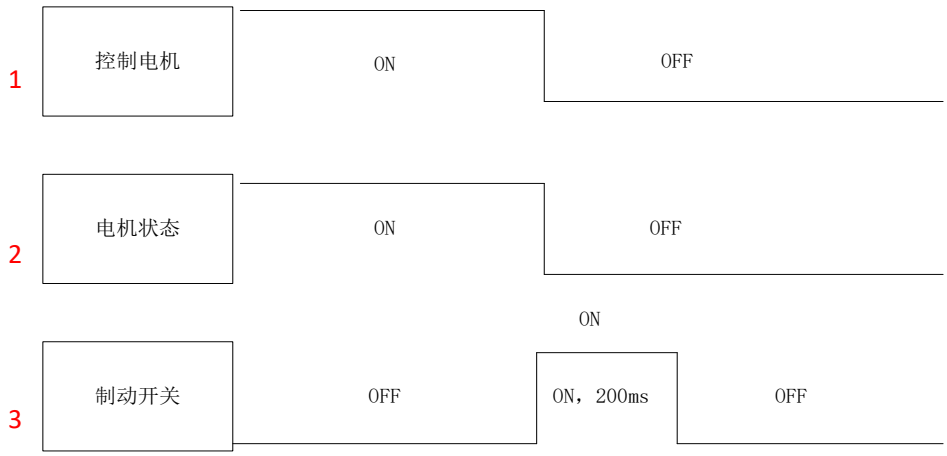


No.	Chinese	English
1.	控制电源	Control power
2.	控制电源确认	Control power confirmation
3.	微处理器动作	Microprocessor motion
4.	复位	Reset
5.	初始化	Initialize
6.	通常工作	Work normally
7.	主电源	Master power supply
8.	转子位置搜寻	Rotor position search
9.	准备信号输出	Prepare signal output
10.	伺服接通输入	Servo ON input

・The above figure shows the time sequence from turning on the +24V power supply to inputting instructions.

・Input servo ON signals and external instructions according to the time sequence shown in the above figure.

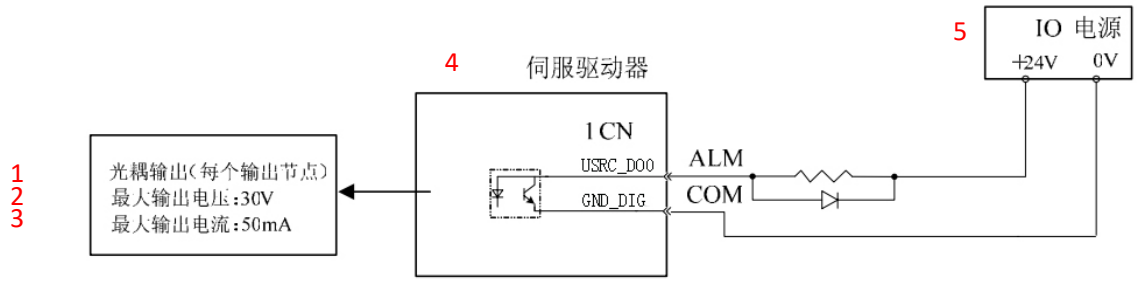
4.7.2 Undervoltage Time Sequence of Servo Control Power



No.	Chinese	English
1.	控制电机	Control motor
2.	电机状态	Motor condition
3.	制动开关	Brake switch

4.7.3 Servo Alarm Output and Resetting

The connection method of alarm output is shown in the following figure:



No.	Chinese	English
1.	光耦输入（每个输出节点））	Optocoupler input (for each output node)
2.	最大输出电压：30V	Maximum output voltage: 30V
3.	最大输出电流：50mA	Maximum output current: 50mA
4.	伺服驱动器	Servo driver
5.	IO 电源	IOPower Supply

The+24V I/O power supply shall be prepared externally. The +24V power supply shall not be provided internally in the servo driver.

Port No.	Port Name	Specification	Remarks
USRC_DO1	Servo ready to output signals	Active low	--

The external circuit composed of USRC_DO1 should usually shut down the power supply of the servo driver.

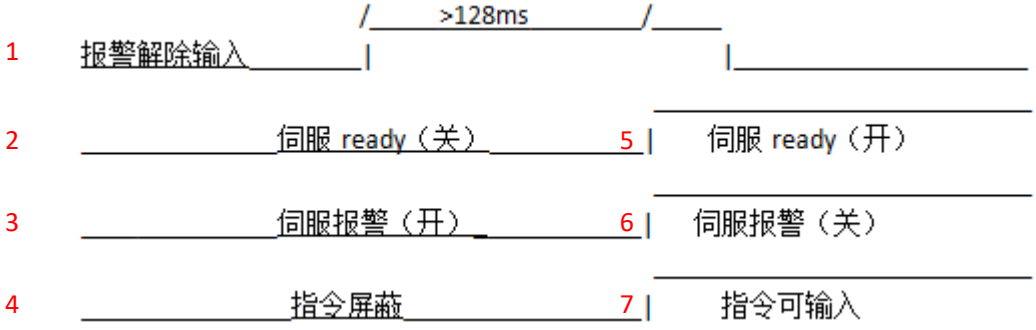
Time sequence of alarm servo (except electrical power alarm) actions

No.	Chinese	English
1.	伺服正常	Servo OK
2.	电机正常（PWM 正常）	Motor OK (PWM OK)
3.	伺服 ready（开）	Servo Ready (On)
4.	伺服报警（关）	Servo alarm (Off)
5.	指令可输入	Instruction input available
6.	伺服报警	Servo alarm
7.	电机失电（PWM 关）	Motor power loss (PWM Off)
8.	伺服 ready（关）	Servo ready (Off)
9.	伺服报警（开）	Servo alarm (On)
10.	指令屏蔽	Instruction masking
11.	清除指令	Reset the instruction

When the “servo alarm” occurs, the fault cause should be eliminated, and then the input signal “USRC_DI3” should be set to “ON” to reset the alarm state.

Port No.	Port Name	Specification	Remarks
USRC_DI3	All-clear input	Active low	--

Time sequence of all-clear (except electrical power alarm) actions



No.	Chinese	English
1.	报警解除输入	All-clear input
2.	伺服 ready（关）	Servo ready (Off)
3.	伺服报警（开）	Servo alarm (On)
4.	指令屏蔽	Instruction masking
5.	伺服 ready（开）	Servo ready (On)
6.	伺服报警 9（关）	Servo alarm 9 (Off)

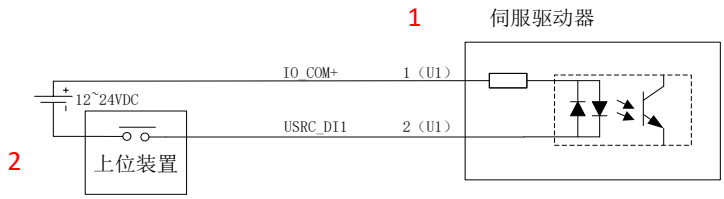
7.	指令可输入	Instruction input available

The usual peripheral circuit can automatically reset the alarm after the power supply of the servo driver is restarted when the alarm occurs, so there is usually no need to connect the all-clear signal specially. In addition, you can also read the alarm information and reset the alarm state by connecting the computer.

4.7.4 Servo Enabling Signal (/S-ON)

To control the enabling state of the servo driver with an external IO, first you need to set InsideIOChg_Enable to OFF.

The connection method of /S-ON is shown in the following figure:



No.	Chinese	English
1.	伺服驱动器	Servo driver
2.	上位装置	Upper device

Port No.	Port Name	Specification	Remarks
USRC_DI1	Servo ON input	Active high	--

4.8 Parameter Import and Export Functions

4.8.1 Parameter Import

1. When the software is connected, click “Import File” and select the XML file required to be imported.

2. After importing the file, “Batch Entry of Parameters” in the lower right corner changes from gray to black, and then click “Batch Entry of Parameter”.

3. If you are sure that you need to overwrite the driver parameter, click OK.

4. When the progress bar in the lower left corner reaches 100%, the parameter is successfully written in, saved to the driver, and imported.

4.8.2 Parameter Export

1. Wait for a few seconds after the software is connected, and the refresh button of parameters changes from red to black.

2. Click “Save File and Save As” in the communication interface. When the progress bar in the lower left corner reaches 100%, the parameter is saved successfully. Users may select the location to save the

exported parameter file, and the export is completed.

V. Status Display and Fault Diagnosis

5.1 Description of LED Indicators

When turning on the power supply of the driver, first check the display status of the status indicators on the driver, and then operate the driver. The display status of each indicator is described in detail as follows:

Indicator status	**Description**
RUN LED is normally on	Output running
RUN LED is normally flashing	Standby
ERR LED is rapidly flashing	The driver has a fault alarm

After the power supply is turned on, users should first check if the driver is working in a normal state. If there is a fault alarm, users should first eliminate the cause of the fault alarm before operating the driver to prevent driver accidents.

5.2 Fault Code List

The servo driver will give an alarm when it detects an abnormality.

The alarm can be observed by the indicators of the driver, and the indicator on the driver panel displays the fault code of the driver. The servo driver will automatically stop the operation of the motor when the fault alarm occurs, and shut down the enabling signal of the motor. Users should find out the cause of the fault and eliminate it as soon as possible. Please refer to the instructions in Section 4.3 for specific fault information and solutions.

Fault Code	**Fault Name**	**Error Flag**	**Description**
1	DCBUS overvoltage	ulSystemErrorBits (0)	Servo ON detection
2	DCBUS undervoltage	ulSystemErrorBits (1)	Servo ON detection
3	Motor overcurrent	ulSystemErrorBits (2)	
4	Encoder fault	ulSystemErrorBits (3)	
5	Control power undervoltage	ulSystemErrorBits (4)	
6	Driver overheating	ulSystemErrorBits (5)	
7	Motor overheating	ulSystemErrorBits (6)	
8	Motor overload alarm	ulSystemErrorBits (7)	
9	Hall signal anomaly	ulSystemErrorBits (8)	Servo ON detection
10	Encoder disconnection fault	ulSystemErrorBits (9)	Servo ON detection
11	Motor overspeed	ulSystemErrorBits (10)	
12	Motor position/speed out of	ulSystemErrorBits (11)	Valid PP/PV

	tolerance		
13	Storage parameter verification error	ulSystemErrorBits (12)	
14	Power module overcurrent (hardware)	ulSystemErrorBits (13)	Non-removable
15	Motor braking error	ulSystemErrorBits (14)	
16	Encoder offset angle search error	ulSystemErrorBits (15)	
17	Current detection reference error	ulSystemErrorBits (16)	
18	Phase loss alarm	ulSystemErrorBits (17)	
19	Communication timeout	ulSystemErrorBits (18)	
20	Watchdog reset error	ulSystemErrorBits (19)	Disconnect the power, restart, and reset

Note: When an alarm occurs, find its cause first, then eliminate the alarm fault, and finally reset the alarm.

5.3 Alarm Causes and Solutions

After the servo alarm, find out the cause of the alarm according to its alarm code.

Servo drivers of the IXL series save the last 8 historical alarm records, and the alarm history can be viewed with PC communication software.

Code	Fault Name	Possible cause	Solution
1	DCBUS overvoltage	The DC input voltage of the driver is too large	Check if the power supply input side is greater than the maximum input value
2	DCBUS undervoltage	The DC input voltage of the driver is too small	Check if the power supply input side is smaller than the minimum input value
3	Motor overcurrent	The output current of the driver has reached the peak, but still can not meet the load demand	Check if the proportion value of the driver current loop is too large; if the motor connection load is blocked; and if the driver model selected is too small
4	Encoder fault		
5	Control power undervoltage	Logical power failure	Internal logical power failure and hardware fault of the driver

6	Driver overheating	The internal temperature of the driver is too high	Add an external radiator or a casing for heat dissipation
7	Motor overheating		
8	Motor overload alarm	Motor overload	Check if the load is too large and exceed the rated power of the motor, and adjust the setting of the motor overload protection time
9	Hall signal anomaly	Hall signal anomaly	The Hall signal is broken or lose phases, and the Hall wiring is detected
10	Encoder disconnection		
11	Motor overspeed	Motor overspeed alarm	Check if the motor running speed exceeds the speed limit
12	Motor position/speed out of tolerance	The position instruction and the actual value of the motor are out of the allowable range (the position mode is valid) The speed instruction and the actual speed are out of the allowable range (the velocity mode is valid)	Increase the gain of the position loop or the allowable out-of-tolerance value of the position
13	Storage parameter verification error	FRAM parameter verification error	Restart the driver. If this error remains, restore the parameters to the default settings and adjust them again.
14	Power module overcurrent (hardware)	Hardware protection of MOS/IGBT overcurrent	
15	Motor braking error		Not open
16	Encoder offset angle search error	The encoder offset angle search fails, which may be caused by Z signal loss of the encoder or wrong connection of the U/W phase of the motor	Check the encoder and motor wires. Power off and restart the driver.
17	Current detection reference error	Current reference error	Hardware fault
18	Phase loss alarm	Motor phase loss alarm	Check the power wiring of the

			motor
19	Reserved	Reserved	Reserved
20	Watchdog timer reset error	Watchdog timeout	Disconnect the power, restart, and reset the alarm

5.4 Reset the Alarm

There are three ways to reset the fault alarm:

First, turn off the power supply of the driver and then restart it.

Second, reset the error alarm through the bus or use reset instructions in EASYDRIVE to reset the driver.

Third, reset the current alarm with the external digital input ALM_RST signals.

Note: Only alarms marked as removable can be reset. Eliminate the cause of the alarm, and then enter the alarm reset signal ALM_RST. The system will immediately reset the current alarm. While the alarm reset signal ALM_RST is active, the motor is a free state, equivalent to the servo OFF state.

VI. CANOpen Communication Protocol and Instructions for Use

6.1 Communication Mode Selection and Configuration

CANopen baud rate setting

The driver supports the baud rate in the range of 10kbps ~ 1Mbps. For CANopen baud rate, the parameter can_Para_CHANGED. BAUDRATE is set with EasyDRIVE debugging software through Modbus protocol interface to change the CANopen communication baud rate of the driver. After setting, select CANopen communication mode and restart to complete the setting. The parameter setting interface in EasyDRIVE debugging software is shown in the following figure. The default baud rate of the driver is 500kbps.

No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	速度控制模式	Profiled velocity mode
25.	速度控制参数	Profiled velocity parameter
26.	速度参数自整定	Velocity parameter auto-tuning
27.	力矩控制模式	Profiled torque mode
28.	电流控制参数	Profiled current parameter
29.	电流状态检测	Current state detection
30.	电流参数自整定	Current parameter auto-tuning
31.	I/O 控制	I/O control
32.	CANopen 参数配置	CANopen Parameter Configuration

33.	RPDO1 参数配置	RPDO1 Parameter configuration
34.	RPDO2 参数配置	RPDO2 Parameter configuration
35.	RPDO3 参数配置	RPDO3 Parameter configuration
36.	RPDO4 参数配置	RPDO4 Parameter configuration
37.	TPDO1 参数配置	TPDO1 Parameter configuration
38.	TPDO2 参数配置	TPDO2 Parameter configuration
39.	TPDO3 参数配置	TPDO3 Parameter configuration
40.	TPDO4 参数配置	TPDO4 Parameter configuration
41.	驱动系统控制参数	Drive system control parameter
42.	电机复位控制	Motor reset control

Modbus Communication address	Parameter No.	Name and description	Setting range	Default setting
0x4670	can_Para_CHANGED.BAUDRATE	Communication baud rate	0—1Mbps 1—800Kbps 2—500Kbps 3—250Kbps 4—125Kbps	2

Communication address setting of the device

The driver can set 1-127 communication addresses, and 0 is generally used as the address of the master station. In the entire network, each driver needs to set a unique address, otherwise it will cause communication failure. For CANopen, the device address of the driver is changed by setting can_Para_CHANGED.NODE_IDCDE with EasyDRIVE debugging software through Modbus protocol interface. After setting, select CANopen communication mode and restart to complete the setting. The parameter setting interface in EasyDRIVE debugging software is the same with that of baud rate setting. The initial value is 10.

Modubs Communication address	Parameter No.	Name and description	Setting range	Default setting
0x466C	can_Para_CHANGED.NODE_ID	Communication address	1-127	10

The bus CANOpen setting is valid

Before using the CANOpen bus, can_Para_CHANGED.CANOpen_EN must be set to Enable in EasyDRIVE first. After the parameter is saved, restart the driver, and then it can be used normally.

Modbus Communication address	Parameter No.	Name and description	Setting range	Default setting
0x4675	can_Para_CHANGED.CANOpen_EN	Enable CANOpen	0- Invalid 1- Valid	0

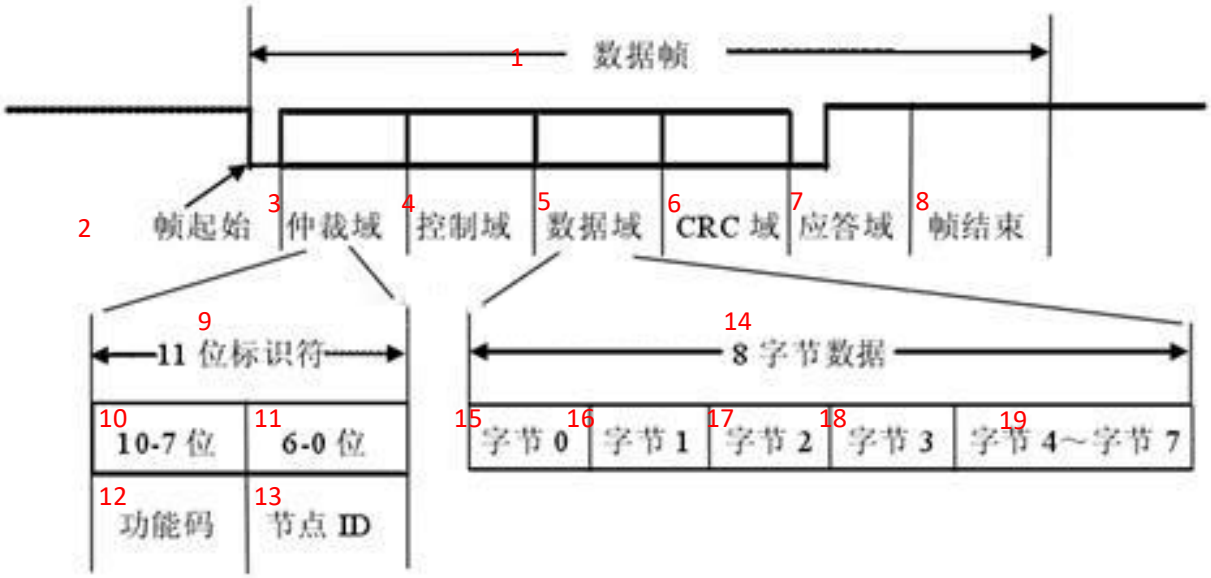
TPDO Communication Quantity Settings

You can set the TPDO upload data of the driver by setting can_Para_CHANGED. TPDONumber.

Modbus Communication address	Parameter No.	Name and description	Setting range	Default setting
0x4677	can_Para_CHANGED. ChangeNumber	TPDO Quantity	0- Close all TPDO 1- TPDO1 is valid 2- TPDO1-2 is valid 3- TPDO1-3 is valid 4- TPDO1-4 is valid	4

6.2 Introduction of CANopen Communication

The CAN message consists of 7 different bit fields, and CANopen specifies the usage of the arbitration field (11-bit identifier) and data field (8-byte data). The positions of the 11-bit identifier and 8-byte data in the CAN frame are shown in the following figure:



No.	Chinese	English
1.	数据帧	Data Frame
2.	帧起始	Start
3.	仲裁域	Arbitration field
4.	控制域	Control field
5.	数据域	Data field
6.	CRC 域	CRC field
7.	应答域	Response field
8.	帧结束	End
9.	11 位标识符	11-bit identifier
10.	10-7 位	Bits 10-7
11.	6-0 位	Bits 6-0
12.	功能码	Function code
13.	节点 ID	Node ID
14.	8 字节数据	8-byte data
15.	字节 0	Byte 0
16.	字节 1	Byte 1
17.	字节 2	Byte 2
18.	字节 3	Byte 3
19.	字节 4-字节 7	Bytes 4-7

Figure 8-2 Position of CANopen Identifier and Data in CAN frame

Various communication objects in CANopen protocol are distinguished by the function code part (Bits 10-7) in the 11-bit identifier. For example, the function code of the NMT control instruction sent by the master node is 0000, and the function code of SDO is 1011 (transmission) and 1100 (receipt). The ID of

each slave node in CAN network is represented by Node-ID (Bits 6-0), and there can be up to 127 slave nodes.

The CANopen communication model defines the following types of messages (communication object):

Communication Object	Function code (Bin)	COB-ID (Hex)	Index (Hex)
NMT	0000	000H	
SYNC	0001	080H	1005H, 1006H, 1007H
Time_Stamp	0010	100H	1012H, 1013H
EMCY	0001	081H ~ 0FFH	1024H, 1015H
TPDO1	0011	181H ~ 1FFH	1800H
RPDO1	0100	201H ~ 27FH	1400H
TPDO2	0101	281H ~ 2FFH	1801H
RPDO2	0110	301H ~ 37FH	1401H
TPDO3	0111	381H ~ 3FFH	1802H
RPDO3	1000	401H ~ 47FH	1402H
TPDO4	1001	481H ~ 4FFH	1803H
RPDO4	1010	501H ~ 57FH	1403H
SDO (T)	1011	581H ~ 5FFH	1200H
SDO (R)	1100	601H ~ 67FH	1200H
Heartbeat	1110	701H ~ 77FH	1016H, 1017H

CANopen operation - SDO data message:

SDO is used to access the object dictionary of a device. The visitor is called the Client, the object dictionary is accessed, and the CANopen device providing the requested service is called the Server. The Client's CAN messages and the Server's response CAN messages always contain 8 bytes of data (although not all data bytes are necessarily meaningful). The request of a Client must have an answer from the Server.

The basic structure of an SDO message is as follows:

Byte0	Byte1	Byte2	Bytes 4 ~ 7
SDO instruction word	Index	Sub-index	Data

The basic structure of SDO messages in terms of parameter reading/writing format is shown in Figure 8-3:

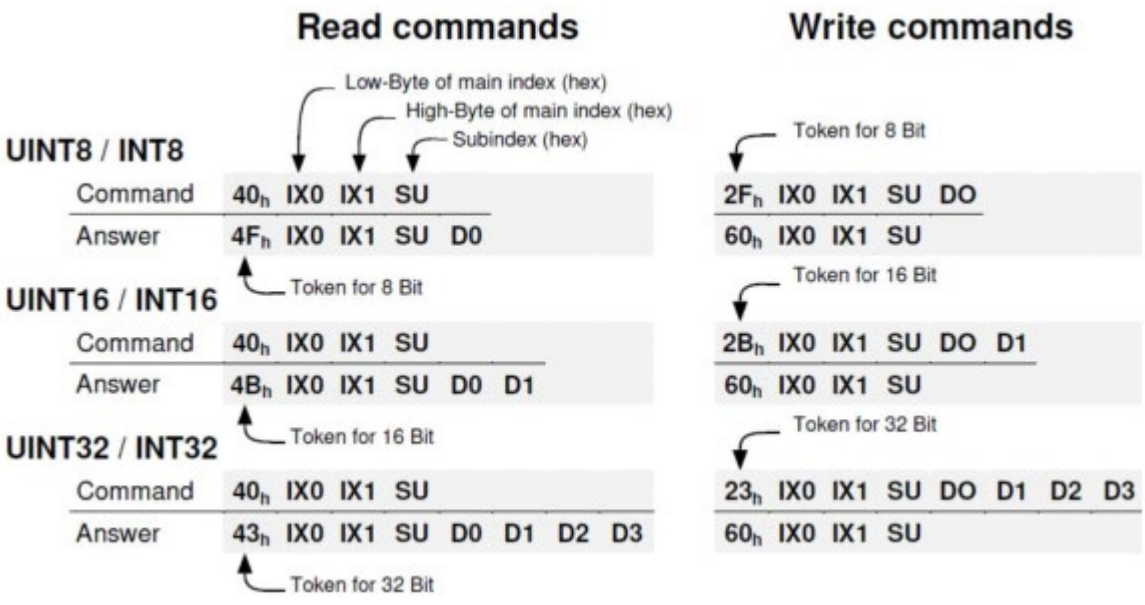


Figure 8-3 CANopen SDO Message Reading and Writing

The format of SDO parameter reading/writing error messages is as follows:

Byte0	Byte1	Byte2	Bytes 4 ~ 7
80H	Index	Sub-index	Error_Code

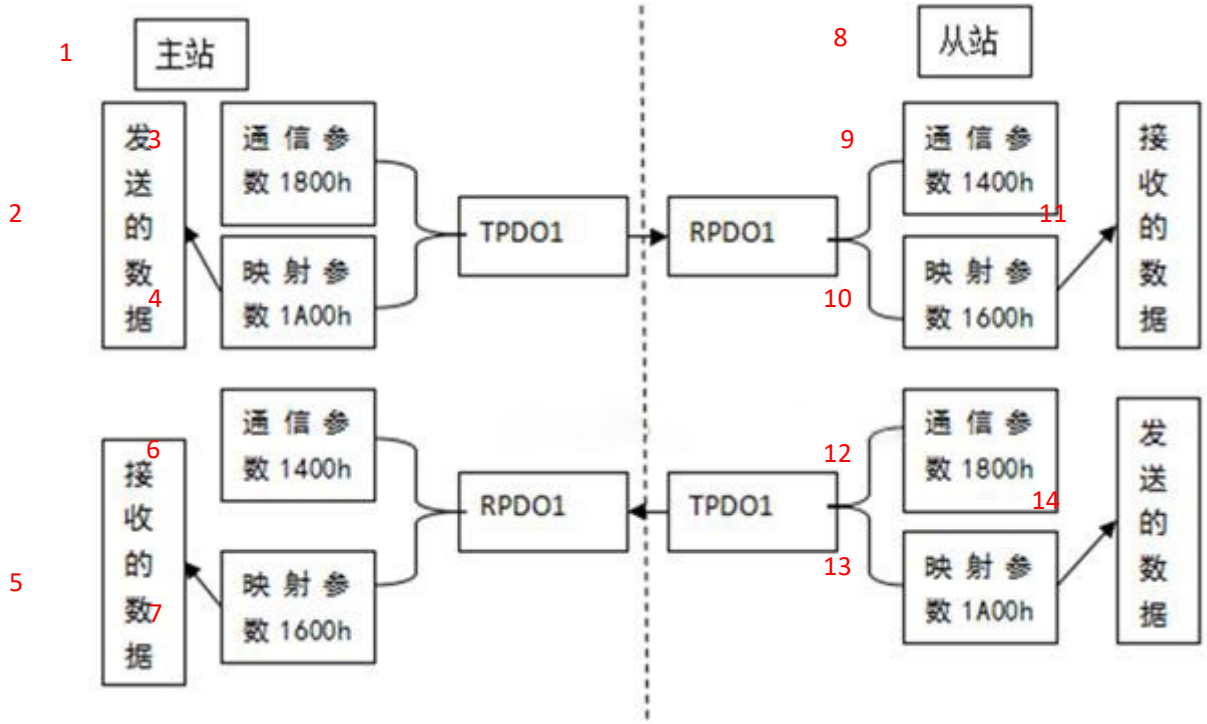
CANopen operation - PDO data message:

The process data object (PDO) is used to transmit real-time data. It provides a direct access channel to device application objects and is used to transmit real-time short frame data, so it has high priority. The data transmitted by PDO must be less than or equal to 8 bytes, and every byte in the CAN message data field of PDO is used for data transmission. Therefore, the transmission control information is not included in the application layer, and the message use rate is extremely high.

PDO communication is based on the communication mode of producers/consumers. Each PDO has a unique identifier and can be sent through one node, but they can be received by multiple nodes. PDO sent by producers is called transmission PDO (TPDO), and PDO received by consumers is called receipt PDO (RPDO). PDO receipt does not require the confirmation of consumers.

Each PDO is described in the object dictionary by two objects: a communication parameter object and a mapping parameter object. PDO communication parameter objects indicate which COB-ID to use, transmission type, disabling time, and timing time; PDO mapping parameter objects are used to set the data mapping relation in PDO messages and determine the position of the data to be transmitted in the data field of CAN messages. PDO mapping parameter objects allow PDO producers and consumers to know what information is being transmitted without adding additional protocol control information in CAN messages, so as to achieve the highest transmission efficiency. A PDO can map up to 8 objects.

The “commander in chief” of PDO transmission is the object dictionary. What data PDO sends, what data it receives, when it sends and receives data, and where it stores the data it has sent and received all have object dictionary configuration. From the view of the CAN controller, this is the interaction of a series of frames. The following simple schematic diagram can describe the transmission and receipt model of a pair of master and slave stations PDO1.



No.	Chinese	English
1.	主站	Master station
2.	发送的数据	Data sent
3.	通信参数 1800h	Communication parameter 1800h
4.	映射参数 1A00h	Mapping parameter 1A00h
5.	接收的数据	Data received
6.	通信参数 1400h	Communication parameter 1400h
7.	映射参数 1600h	Mapping parameter 1600h
8.	从站	Slave station
9.	通信参数 1400h	Communication parameter 1400h
10.	映射参数 1600h	Mapping parameter 1600h
11.	接收的数据	Data received
12.	通信参数 1800h	Communication parameter 1800h
13.	映射参数 1A00h	Mapping parameter 1A00h
14.	发送的数据	Data sent

6.3 Bus Management NMT Message

Note: By sending NMT message control, CANopen master nodes control the status switching of slave nodes, such as Boot-Up, Stopped, and Operational. Master nodes send the NMT control instruction function code 000.

The format of the NMT message frame is as follows:

	CAN identifier	Number of bytes	Byte 0	Byte 1
NMT message	0x000H	2	Instruction word	Slave node ID

Meanings of specific control messages:

CAN identifier	Byte 0	Byte 1	Status
000H	**01**	**ID**	**Start**
	Note: The node is activated, the drive bus starts working, and the PDO is deemed effective by default;		
000H	**02**	**ID**	**Stop**
	Note: Disable the node;		
000H	**80**	**ID**	Enter Pre-Operational State
000H	**81**	**ID**	**Reset**
	Note: The node is reset. All parameters are restored to the initial state; servo OFF; reset the error alarm; **Note:** After the node is reset, PDO parameters originally set through MODBUS will be lost, so PDO needs the controller to configure new parameters.		
000H	**82**	**ID**	Reset Communication

6.4 Heartbeat Protection and Node Protection

6.4.1 Heartbeat

CAN identifier	Byte 0
0x700 + Node-ID	Slave node status

A node may be configured to generate a periodic heartbeat.

The status values of heartbeat are defined as follows:

Status	Meaning
0	Boot-Up
4	Stopped
5	Operational
127	Pre-operational

The Boot-Up message is the first heartbeat when a node is powered on and activated.

The driver can also be set to send heartbeat to upper devices at a fixed time period by writing the sending period to the following parameters. The sending period is the set number*ms, and the sending of heartbeat is stopped when it is set to 0.

SDO index	Sub-index	Object Type	Name	Data Type	Attribute	Mapping
1017	0	RECORD	Producer Heartbeat Time	UINT16	RW	NO
			Parameter Description: Set the heartbeat sending cycle, unit: ms			

6.4.2 Heartbeat Protection

Heartbeat protection refers to that the slave station periodically sends messages to the master station according to the “heartbeat generation time” during operation. If the master station fails to receive the next heartbeat from the slave station after a certain time (set in the master station), it will decide that the slave station malfunctions and will take countermeasures according to the fault.

Slave station heartbeat -- 0x700 + Node number + Status;

Heartbeat status -- 0: Boot-Up; 4: Stopped; 5: Operational; 127: Pre-operational;

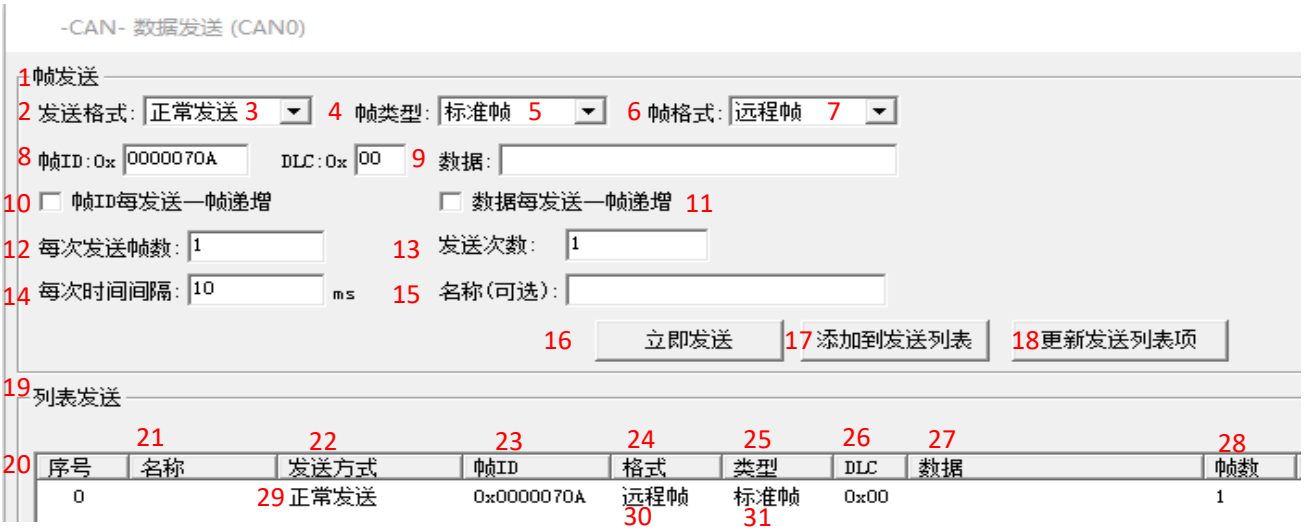
6.4.3 Node Protection

The driver has automatic halt protection function (entering the HALT status) with communication interruption. To enable this function, two parameters, “Monitoring Time” and “Life Time Factor”, need to be set for the slave station first. When the master station sends a request message to detect the status of the slave station, the driver will activate the automatic protection function with communication interruption. If the master station does not send a request message, the slave station will not activate the protection function.

If the monitoring time and any parameter of the life time factor are set to zero, this function will not be activated.

When the communication is interrupted or the master station stops sending request messages, and the driver fails to receive the request messages sent by the master station after more than a period of "monitoring time*life time factor", then the driver will enter the HALT state and halt automatically, without powering off the motor.

Request messages of the master station -- 0x700 + Node number; (The frame format is remote frame)



No.	Chinese	English
1.	帧发送	Frame Sending
2.	发送格式	Sending Format
3.	正常发送	Normal Sending
4.	帧类型	Frame Type
5.	标准帧	Standard Frame
6.	帧格式	Frame Format
7.	远程帧	Remote Frame
8.	帧 ID	Frame ID
9.	数据	Data
10.	帧 ID 每发送一帧递增	Frame ID increment with each frame sent
11.	数据每发送一帧递增	Data increment with each frame sent
12.	每次发送帧数	Number of frames sent each time
13.	发送次数	Number of sending times
14.	每次时间间隔	Time interval each time
15.	名称（可选）	Name (optional)
16.	立即发送	Send now
17.	添加到发送列表	Add to the sending list
18.	更新发送到列表项	Send update to the list
19.	列表发送	Send the list
20.	序号	No.
21.	名称	Name
22.	发送方式	Sending Method
23.	帧 ID	Frame ID

24.	格式	Format
25.	类型	Type
26.	DLC	DLC
27.	数据	Data
28.	帧数	Number of Frames
29.	正常发送	Normal Sending
30.	远程帧	Remote Frame
31.	标准帧	Standard Frame

Slave station response message -- 0x700 + Node number + Status;

Data of the slave station response status -- Bit7, the trigger bit. Each node protection response is alternately set to “1” or “0”; The trigger bit is set to “0” upon the first node protection request.

Data of the slave station response status -- Bit 0 - Bit 6 are node statuses: 0-Boot-Up; 4-Stopped; 5-Operational; 127-Pre-operational;

Index	Sub-index	Object Type	Name	Data Type	Attribute	Mapping
100C	0	RECORD	Guard Time	UINT16	RW	NO
			Parameter Description: Monitoring Time: unit: ms			
100D	0	RECORD	Life Time factor	UINT8	RW	NO
			Parameter Description: Life Time Factor			

6.5 Device Flag Message of Manufacturers

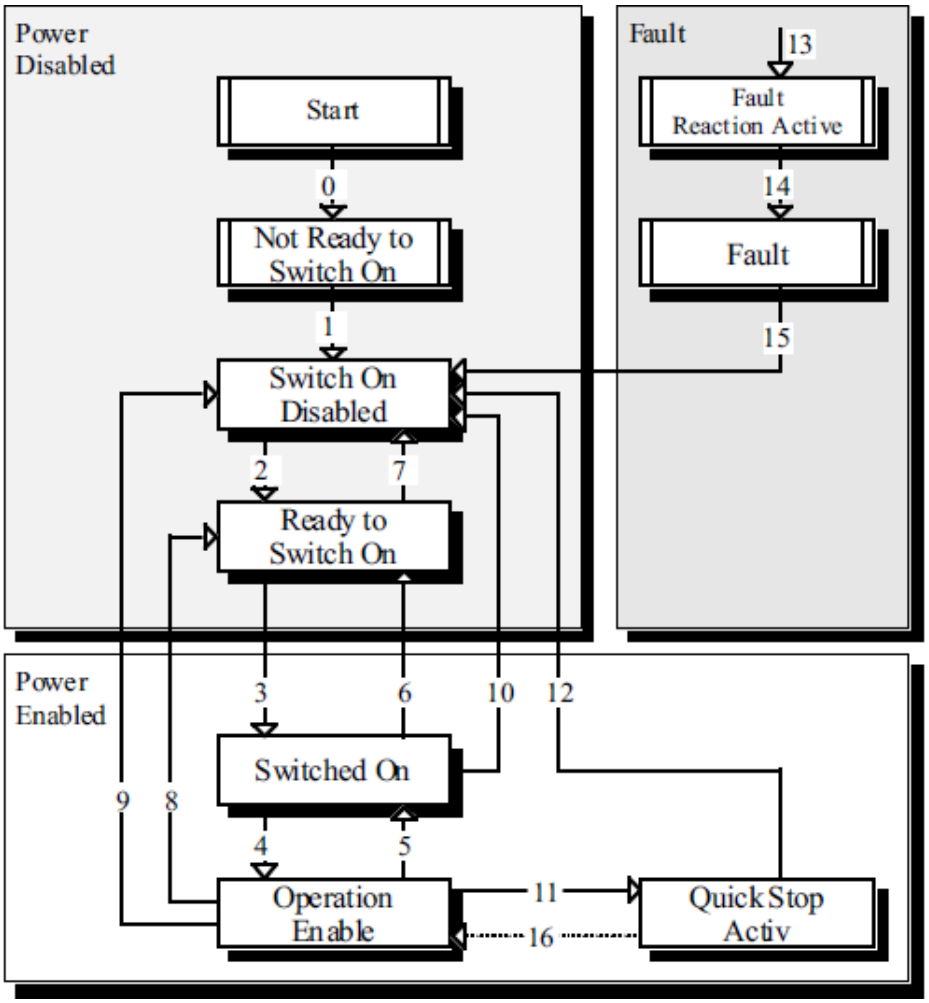
The master station can read the manufacturer identification parameter through SDO to identify the manufacturer directory, and hardware and software version numbers.

SDO index	Sub-index	Object Type	Name	Data Type	Attribute	Mapping
1008	0	RECORD	Manufacturer device name	UINT32	RW	NO
			Parameter Description: Manufacturer ID; the return value is “TYA”			
1009	0	RECORD	Manufacturer device name	UINT32	RW	NO
			Parameter Description: Hardware ID; the return value is “IXL”			
100A	0	RECORD	Manufacturer software version	UINT32	RW	NO
			Parameter Description: Software ID; the return value is “C09”			

Note: The return values are ASCII codes.

6.6 CANopen Device Control and Modes of Operation

The master station controls the driver through the controlword and can know the current state of the driver by reading its statusword. The state transition diagram is shown in the figure.



As shown above, the state can be divided into three parts: “Power Disabled”, “Power Enabled”, and “Fault”. All states will become “Fault” after an alarm. After being powered on, the driver completes initialization and then enters the SWITCH_ON_DISABLED state. In this state, CAN communication is available, and the driver can be configured (e.g., set the operational mode of the driver to the “PP” mode). At this point, the main power supply is still turned off and the motor is not excited. After State Transition 2, 3 and 4, the driver enters the OPERATION ENABLE state. At this point, the main power supply is turned on, and the driver works according to the configured operational mode. Therefore, before this state, users must confirm that the parameter of the driver has been correctly configured and the corresponding input value is zero. After State Transition 9, the main power of the circuit is turned off. Once an alarm occurs on the driver, the state of the driver becomes Fault. Each state description of the state controller is shown in the following table:

Status name	Description of hardware execution	Description of software execution
Not Ready to	The power supply of the control part is	Read the parameter of EEProm --> Global

Switch On	switched on, the driver is in the process of initialization, CAN communication is not available, and the driving function is not enabled	Parameter Initialization --> Read AD Baseline --> System Self-Test --> Serial Port Initialization --> CANopen Port Initialization --> PWM Enabled Output
Switch On Disabled	The driver initialization is completed, CAN communication is available, and the driving function is not enabled	Wait for the upper computer to change the parameter through communication
Ready to Switch On	The driver waits to enter the state of “Switch On”, the motor is not excited, and the driving function is not enabled	Wait for the completion of setting driver parameters
Switched On	Driver Servo Ready, Power Enabled	Wait for the servo enabling instruction
Operation Enable	The driver servo inputs excitation signals to the motor, and control the motor according to the modes of operation	Servo enable
Quick Stop Active	The driver will halt according to the set mode	When the driver parameters change, perform a quick shutdown servo output
Fault Reaction Active	The driver detects that the there is an alarm and halt according to the set mode, and the motor still have excitation signals.	Servo alarm
Fault	The motor does not have excitation signals	

The controller state is switched by an internal event of the device or a transition instruction sent by the host with the controlword. The controller state switching mechanism is as follows:

• Status 0: START ⇒ Not Ready to Switch On

Event: Reset

Operation: The driver conducts a self-test and initializes parameters.

• Status 1: Not Ready to Switch On ⇒ Switch On Disabled

Event: The driver completes the self-test and parameter initialization.

Operation: Activate communication.

• Status 2: Switch On Disabled ⇒ Ready to Switch On

Event: The “Shutdown” instruction from the master station is received

Operation: None

• Status 3: Ready to Switch On ⇒ Switch On

Event: The “Boot-Up” instruction from the master station is received

Operation: If the power supply is not switched on, switch it on.

• Status 4: Switch On ⇒ Operation Enable

Event: The “Enable Operation” instruction from the master station is received

Operation: The driver function is turned on.

• Status 5: Operation Enable ⇒ Switch On

Event: The “Disable Operation” instruction from the master station is received

Operation: Disable the driver.

• Status 6: Switch On ⇒ Ready to Switch On

Event: The “Shutdown” instruction from the master station is received

Operation: Power off the motor.

• Status 7: Ready to Switch On ⇒ Switch On Disabled

Event: The “Quick Stop” and “Disable Voltage” instructions from the master station are received

Operation: None

• Status 8: Operation Enable ⇒ Ready to Switch On

Event: The “Shutdown” instruction from the master station is received

Operation: Switch off the power supply immediately. When the motor is not braked, it rotates freely

• Status 9: Operation Enable ⇒ Switch On Disabled

Event: The “Disable Voltage” instruction from the master station is received

Operation: Switch off the power supply immediately. When the motor is not braked, it rotates freely

• Status 10: Switch On ⇒ Switch On Disabled

Event: The “Disable Voltage” or “Quick Stop” instruction from the master station is received

Operation: Switch off the power supply immediately. When the motor is not braked, it rotates freely

• Status 11: Operation Enable ⇒ Quick Stop Active

Event: The “Quick Stop” instruction from the master station is received

Operation: The driver stops quickly

• Status 12: Quick Stop Active ⇒ Switch On Disabled

Event: The “Disable Voltage” from the master station is received, or the “Quick Stop” instruction completes

Operation: The power supply is switched off.

• Status 13: All states ⇒ Fault Reaction Active

Event: The driver has a fault

Operation: Perform appropriate fault response

• Status 14: Fault Reaction Active ⇒ Fault

Event: The fault response is completed, the driver is in the Fault state

Operation: The driving function is disabled, and the power supply is switched off.

• Status 15: Fault ⇒ Switch On Disabled

Event: The “Fault Reset” instruction from the master station is received

Operation: If the driver has no fault currently, the Fault state is reset

After leaving the Fault state, the host needs to clear the “Fault Reset” bit of the controlword.

• Status 16: Quick Stop Active ⇒ Operation Enable

Event: If “Quick-Stop-Option-Code” is set to 5, 6, 7, and 8 after receiving the “Enable Operation” instruction from the master station, this state switch can be performed

Operation: Enable the driving function

Data Objects Related to Device Control

Index	Object	Name	Type	Attr
6040h	VAR	Controlword	UINT16	RW
6041h	VAR	Statusword	UINT16	RO
605Ah	VAR	Quick_stop_option_code	INT16	RW
605Bh	VAR	Shutdown_option_code	INT16	RW
605Ch	VAR	Disabled_operation_option_code	INT16	RW
605Dh	VAR	Halt_option_code	INT16	RW
605Eh	VAR	Fault_reaction_option_code	INT16	RW

6.6.1 Controlword (0x6040)

Controller can control the state switching and operation mode switching of the driver. The functions of each bit are described as follows:

Bit8	Bit7	Bits 6 ~ 4	Bit3	Bit2	Bit1	Bit0
Halt	Fault Reset	Operation Mode specific	Enable Operation	Quick stop	Enable voltage	Switch on

Bit 15	Bits 11 ~ 14	Bits 9 ~ 10
Reset Home	Manufacturer Specific	Reserved

The transmission of the state machine is triggered by the corresponding control instructions composed of five bits, Bit0 ~ Bit3 and Bit7.

Command	Bit of the Control					Transitions
	Bit 7- Fault Reset	Bit 3- Enable	Bit 2- Quick	Bit 1- Enable	Bit0- Switch On	

		Operation	Stop	voltage		
Shutdown	**0**	*	**1**	**1**	**0**	**2, 6, 8**
Switch On	**0**	**0**	**1**	**1**	**1**	**3**
Switch On	**0**	**1**	**1**	**1**	**1**	**3**
Disable Voltage	**0**	*	*	**0**	*	**7, 9, 10, 12**
Quick Stop	**0**	*	**0**	**1**	*	**7, 10, 11**
Disable Operation	**0**	**1**	**1**	**1**	**1**	**5**
Enable Operation	**0**	**1**	**1**	**1**	**1**	**4, 16**
Fault Reset	**Rising edge**	*	*	*	*	**15**

Bit4, Bit5, Bit6, and Bit8 are specific operation mode bits, described in the respective control mode sections, and an overview is given in the following table:

	Operation Mode			
	Velocity Mode	**Position Mode (PP Mode)**	Velocity mode (PV Mode)	Torque Mode (PT Mode)
Bit 4	Rfg enable	**New set-point**	Reserved	Reserved
Bit 5	Rfg unlock	**Change Set Immediately**	Reserved	Reserved
Bit 6	Rfg use ref	**1-Relative Position Mode 0-Absolute Position Mode**	Reserved	Reserved
Bit 8	Halt	**Halt**	Halt	Halt

Bit15: Reset Home is the motor homing activation bit. When this bit is set to 1, the homing operation is activated, and this bit will be reset automatically. Bit15 of the statusword is set to 0 during homing, and it will be set to 1 after the homing is finished.

6.6.2 Statusword (0x6041)

Statusword can indicate the current state of the driver, and it mainly includes the driver state and the mode running state. The functions of each bit are described as follows:

Bit	Description
Bit0	Ready to switch on
Bit1	Switched on
Bit2	Operation enabled

Bit3	Fault
Bit4	Voltage enabled
Bit5	Quick stop
Bit6	Switch on disabled
Bit7	Warning
Bit8	Reserve
Bit9	Remote
Bit10	Target reached
Bit11	Internal limit active
Bit 12 ~ Bit 13	Operation mode specific
Bit14	Reserve
Bit15	Home attend

The state of the driver is represented by the combination of Bit0 ~ 3, Bit5, and Bit6, as shown in the following table:

Value (Bin)	State
*0** 0000	Not ready to switch on
*1** 0000	Switch on disabled
01 0001	Ready to switch on
01 0011	Switched on
01 0111	Operation enabled
00 0111	Quick stop active
*0** 1111	Fault reaction active
*0** 1000	Fault

Bit4: Voltage Enabled

When this bit is 1, it means that the main power supply has been switched on.

Bit5: Quick Stop

When this bit is 0, the driver will halt according to the setting (605Ah: quick_stop_option_code).

Bit7: Warning

When this bit is 1, it means that the driver has detected an alarm.

Bit10: Target Reached

This bit has different meanings in different control modes. In the Profile Position Mode, when the set position is reached, this bit will be set; When the Halt state is activated, and the speed decelerates to zero,

this bit will be set; When a new position is set, this bit will be reset. Bit11: Internal limit active

When this bit is 1, it means that the speed reaches the maximum speed limit in the torque mode, or the motor reaches the forward or reverse limit position in the position mode.

Bit 12-13: Operation mode specific

This bit has different meanings in different modes, as shown in the table below.

Bit	Velocity mode	PP Mode	PV Mode	PT Mode	Interpol Position Mode
12	Reserved	Setpoint knowledge	Speed = 0	Reserved	Ip-mode active
13	Reserved	Following error	Max slippage error	Reserved	Reserved

Bit15: Home attend

When this bit is 1, it indicates the end of homing, and when homing is actived, this bit will be reset.

6.6.3 Modes of Operation (0x6060)

Index	Object	Name	Type	Attr
6060h	VAR	Modes_of_operation	INT8	RW
6061h	VAR	Modes_of_operation_display	INT8	RO

The control mode of the driver is determined by the parameter, Modes_of_operation -->6060hCDE, which corresponds to the control mode as follows:

Value	Description
1	Profiled Position Mode
3	Profiled Velocity Mode
4	Profiled Torque Mode
7	Interpolated Position Mode
8	Cyclic Synchronization Position (CSP)
9	Cyclic Synchronization Velocity (CSV)
10	Cyclic Synchronization Torque (CST)

The current control mode of the servo driver can be known by reading the modes_of_operation_display -->6061hCDE.

6.6.4 Error Code (0x603F)

CANOPEN fault code	Fault Name	Description
0x603F (0x0001)	DCBUS overvoltage	Servo ON detection

0x603F (0x0002)	DCBUS undervoltage	Servo ON detection
0x603F (0x0004)	Motor overcurrent	
0x603F (0x0008)	Encoder fault	
0x603F (0x0010)	Control power undervoltage	
0x603F (0x0020)	Driver overheating	
0x603F (0x0040)	Motor overheating	
0x603F (0x0080)	Motor overload alarm	
0x603F (0x0100)	Hall signal anomaly	Servo ON detection
0x603F (0x0200)	Encoder disconnection fault	Servo ON detection
0x603F (0x0400)	Motor overspeed	
0x603F (0x0800)	Instruction of out-of-tolerance error	Valid PP/PV
0x603F (0x1000)	Storage parameter verification error	
0x603F (0x2000)	Power module overcurrent (hardware)	Non-removable
0x603F (0x4000)	Motor brake overload error	
0x603F (0x8001)	Motor self-learning error	
0x603F (0x8002)	Current detection reference error	
0x603F (0x8004)	Motor phase loss alarm	
0x603F (0x8005)	Communication timeout	

The servo driver will give an alarm when it detects an abnormality.

The alarm can be observed by the indicators of the driver, and the indicator on the driver panel displays the fault code of the driver. The servo driver will automatically stop the operation of the motor when the fault alarm occurs, and shut down the enabling signal of the motor. Users should find out the cause of the fault and eliminate it as soon as possible.

Code	Fault Name	Possible cause	Solution
0x603F (0x0001)	DCBUS overvoltage	The DC input voltage of the driver is too large	Check if the power supply input side is greater than the maximum input value

0x603F (0x0002)	DCBUS undervoltage	The DC input voltage of the driver is too small	Check if the power supply input side is smaller than the minimum input value
0x603F (0x0004)	Motor overcurrent	The output current of the driver has reached the peak, but still can not meet the load demand	Check if the proportion value of the driver current loop is too large; if the motor connection load is blocked; and if the driver model selected is too small
0x603F (0x0008)	Encoder fault		
0x603F (0x0010)	Control power undervoltage	Logical power failure	Internal logical power failure and hardware fault of the driver
0x603F (0x0020)	Motor overheating		
0x603F (0x0040)	Driver overheating	The internal temperature of the driver is too high	Add an external radiator or a casing for heat dissipation
0x603F (0x0080)	Motor overload alarm	Motor overload	Check if the load is too large and exceed the rated power of the motor, and adjust the setting of the motor overload protection time
0x603F (0x0100)	Hall signal anomaly	Hall signal anomaly	The Hall signal is broken or lose phases, and the Hall wiring is detected
0x603F (0x0200)	Encoder disconnection		
0x603F (0x0400)	Motor overspeed	Motor overspeed alarm	Check if the motor running speed exceeds the speed limit
0x603F (0x0800)	Instruction of out-of-tolerance error	The position/speed instruction and the actual value of the motor are out of the allowable range	Increase the gain or the allowable out-of-tolerance value
0x603F (0x1000)	Storage parameter verification error	FRAM parameter verification error	Restart the driver. If this error remains, restore the parameters to the default settings and adjust them again.
0x603F (0x2000)	Power module overcurrent (hardware)	Hardware protection of MOS/IGBT overcurrent	
0x603F (0x4000)	Motor brake overload error		Not open
0x603F (0x8001)	Motor self-learning error	The encoder offset angle search fails, which may be caused by Z signal loss of the encoder or wrong connection of the U/W phase of the motor	Check the encoder and motor wires. Power off and restart the driver.

0x603F (0x8002)	Current detection reference error	Current reference error	Hardware fault
0x603F (0x8004)	Motor phase loss alarm	Motor phase loss alarm	Check the power wiring of the motor

6.7 SDO Communication

SDO is mainly used to transmit low-priority objects between devices. It is typically used to configure and manage slave devices. For example, the PID parameter, the PDO configuration parameter, etc., are used to modify the current loop, speed loop, and position loop. This data transmission is the same as MODBUS, that is, after the master station sends data, the slave station needs to return a data response. This communication mode is only suitable for setting parameters, but not for data transmission with high real-time requirements.

SDO communication is divided into upload and download. The upper computer can read and write the servo internal OD according to the special SDO read and write instructions. In the CANopen protocol, the content of the object dictionary can be modified by SDO (Service Data Object). The structure of SDO instructions and the guidelines are described as follows.

6.7.1 SDO Reading

Send SDO messages

COB-ID	DLC	Data length							
		0	1	2	3	4	5	6	7
0x600 + Node_ID	8	Instruction word	Object index (low bit)	Object index (high bit)	Object sub-index	Data			

When the SDO message request reading the data, the instruction word is 0x40

If the data is 1 byte, the instruction word received by data feedback is 0x4F

If the data is 2 bytes, the instruction word received by data feedback is 0x4B

If the data is 3 bytes, the instruction word received by data feedback is 0x47

If the data is 4 bytes, the instruction word received by data feedback is 0x43

6.7.2 SDO Writing

Send SDO messages

COB-ID	DLC	Data length							
		0	1	2	3	4	5	6	7
0x600 + Node_ID	8	Instruction word	Object index (low bit)	Object index (high bit)	Object sub-index	Data			

If the data is 1 byte, the sending instruction word is 0x2F

If the data is 2 bytes, the sending instruction word is 0x2B

If the data is 3 bytes, the sending instruction word is 0x27

If the data is 4 bytes, the sending instruction word is 0x23

When the SDO message request writing the data, the instruction word is 0x60

The following test is based on the situation when communication connection is normal, and the driver address is 10. All message data are hexadecimal numbers, and all data messages adopt the little-endian mode.

Write 0x0006 into the controlword 0x6040 using SDO and then read: (60Ah--> The upper computer sends 58Ah--> The lower computer sends data)

(1) SDO writing of the master station:

Device	COB-ID	Function code	Index (Index_L)	Index (Index_H)	Sub-index	DATA1	DATA2	DATA3	DATA4
Master send	60A	2B	40	60	00	06	00	00	00
Slave respond	58A	60	40	60	00	00	00	00	00

(2) SDO reading of the master station:

Device	COB-ID	Function code	Index (Index_L)	Index (Index_H)	Sub-index	DATA1	DATA2	DATA3	DATA4
Master send	60A	40	40	60	00	00	00	00	00
Slave respond	58A	4B	40	60	00	06	00	00	00

6.8 PDO Communication

Design Flow of Master Station Programs:

1. Set the PDO communication parameter of the master station;

2. The master station initializes PDO when it enters the pre-processing stage, and configures the PDO communication parameter and mapping parameter of the slave station through SDO.

3. Send the NMT instruction of START, and activate the slave state machine. At this point, PDO communication between the master and slave stations has been established.

4. Modify the object dictionary of the master station, and map the receiving and sending parameters of PDO to the area defined by the manufacturer to facilitate the reading and modification of the program. Before the PDO communication between the master station and the slave station, we should modify the object dictionary of the master station first. Finally, data exchange is carried out according to the mapping parameters of the PDO of the master station and the slave station.

6.8.1 PDO Communication Mode

Each group of PDO communication includes TPDO and RPDO, and each PDO communication is triggered by an event. The trigger mode TPDO is set by Sub-index 2 of 0x1800 ~ 0x1803, and RPDO is set by Sub-index 2 of 0x1400 ~ 0x1403. The ID number corresponding to PDO (Note: the smaller the ID number, the higher its priority), TPDO1 (181h ~ 1ffh), RPDO1 (201h ~ 27Fh), TPDO2 (281h ~ 2ffh), RPDO2 (301h ~ 37Fh), TPDO3 (381h ~ 3ffh), RPDO3 (401h ~ 47Fh), TPDO4 (481h ~ 4ffh), and RPDO4 (501h ~ 57Fh) have been initialized and predefined when the IXL servo internal RPDO and TPDO leave the factory, and users may modify them as required.

PDO communication methods are as follows:

0	Synchronous communication mode: every SYNC synchronous message triggers PDO communication once
1-240	Synchronous communication mode: every 1-240 SYNC synchronous messages trigger PDO communication once
254	Asynchronous communication mode: defined by the manufacturer
255	Asynchronous communication mode: RPDO is updated every time it is received; TPDO is sent when the content changes and is not within the “Inhibit time”, and if the content of TPDO fails to send the change after a period longer than the “Event Time”, it will also be sent once.

Note: For PDO communication, CANOpen node needs to be activated to achieve it. The activation of CANOpen node can be completed through “NMT MASTER” in the network.

RPDO message settings:

SDO index	Sub-index	Object Type	Name	Data Type	Attribute	Mapping
0x1400h ~ 0x1403h	0	RECORD	Number of entries	UINT8	RW	NO
			Parameter Description: Number of indexes, initial value is 2			
	1	RECORD	COB-ID used by RPDO	UINT32	RW	NO
			arameter Description: 0x1400h: Setting RPDO1 0x0200 0x1401h: Setting RPDO2 0x0300 0x1402h: Setting RPDO3 0x0400 0x1403h: Setting RPDO4 0x0500			
	2	RECORD	Transmission type	UINT8	RW	NO
			Parameter Description: Transmission Type, initial value is 255			

TPDO message settings:

SDO index	Sub-index	Object Type	Name	Data Type	Attribute	Mapping
0x1800h ~ 0x1803h	0	RECORD	Number of entries	UINT8	RW	NO
			Parameter Description: Number of indexes, initial value is 4			
	1	RECORD	COB-ID used by TPDO	UINT32	RW	NO
			Parameter Description: 0x1800h: Setting TPDO1 0x0180 0x1801h: Setting TPDO2 0x0280 0x1802h: Setting TPDO3 0x0380 0x1803h: Setting TPDO4 0x0480			
	2	RECORD	Transmission type	UINT8	RW	NO
			Parameter Description: Transmission Type, initial value is 255			
	3	RECORD	Inhibit time	UINT16	RW	NO
			Parameter Description: Inhibit Time, 0-No Inhibit Time, Unit: 100us			
	5	RECORD	Event time	UINT16	RW	NO
			Parameter Description: Event Time, 0-Not Used, Unit: ms			

6.8.2 PDO Parameter Mapping

The mapping parameter of TPDO can be set by SDO configuration 0x1A00 ~ 0x1A03, and the mapping parameter of RPDO can be set by 0x1600 ~ 0x1603.

RPDO parameter mapping

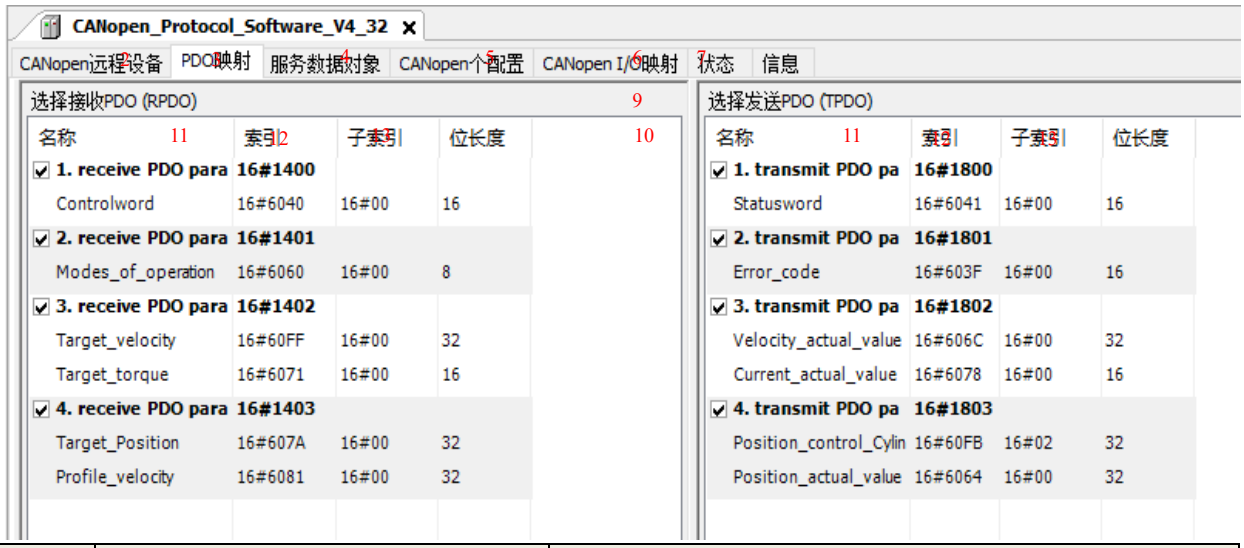
SDO index	Sub-index	Object Type	Name	Data Type	Attribute	Mapping
0x1600h ~ 0x1603h	0	RECORD	Number of mapped entries	UINT8	RW	NO
	1-8	RECORD	RPDO Mapping 1-8	UINT32	RW	NO
	0x1600h: RPDO1 0x1601h: RPDO2 0x1602h: RPDO3 0x1603h: RPDO4					

TPDO mapping parameter

SDO index	Sub-index	Object Type	Name	Data Type	Attribute	Mapping
0x1A00h	0	RECORD	Number of mapped entries	UINT8	RW	NO
	1-8	RECORD	TPDO Mapping 1-8	UINT32	RW	NO
~ 0x1A03h	0x1A00h: TPDO1 0x1A01h: TPDO2 0x1A02h: TPDO3 0x1A03h: TPDO4					

6.8.3 Default PDO Mapping of the Driver

The driver meets the standard CANOPEN 301/402 protocol. Users can dynamically configure the required PDO through SDO according to the protocol, and then carry out PDO communication. For the default settings of the driver, the following PDO is set by default for most applications:



No.	Chinese	English
1.	CANopen 远程设备	CANopen Remote Device
2.	PDO 映射	PDO Mapping
3.	服务数据对象	Service Data Objects
4.	CANopen 个配置	CANopen Configuration
5.	CANopen I/O 映射	CANopen I/O Mapping
6.	状态	Status
7.	信息	Information
8.	选择接收 PDO(RPDO)	Selective Reception PDO (RPDO)
9.	选择发送 PDO(TPDO)	Selective Transmittal PDO (TPDO)
10.	名称	Name
11.	索引	Index
12.	子索引	Sub-index
13.	位长度	Bit Length

The use method and protocol analysis of each mapping parameter of the default setting of RPDO are as follows:

RPDO	CAN identifier	Number of bytes	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5/6	Byte 7/8
RPDO1	0x200 + Node-ID	2	06	00	Switch the state to Ready to Switch On			
			07	00	Switch the state to Switched On			
			0F	00	Switch the state to Operation Enable; enable the servo			
			05	00	Switch the state to Disable Operation; disable the servo			
			SDO address: 0x6040					
RPDO2	0x300 + Node-ID	1	01		Set the mode to Profile Position Mode			
			03		Set the mode to Profiled Velocity Mode			
			04		Set the mode to Profiled Torque Mode			
			07		Interpolated Position Mode			
			SDO address: 0x6060					
RPDO3	0x400 + Node-ID	6	E8	03	00	00	E8 03	
			Speed instruction: 1000 (1000*0.1 = 100 rpm)				Current instruction: 1000	
			SDO address: 0x67FF				SDO address: 0x6071	
RPDO4	0x500 + Node-ID	8	FF	7F	01	00	E8 03	00 00
			Position instruction (the angle of 16 low bits + the turns of 16 high bits) The current setting value is 0x00017fff (180 degrees per turn)				Motor Speed: 1000 (100 rpm) Hex: 0x000003E8	
			SDO address: 0x607A				SDO address: 0x6081	

The use method and protocol analysis of the default TPDO mapping parameter are as follows: In the default setting of IXL-II drivers, the following TPDO mapping parameter is set for most applications:

	CAN identifier	Number of bytes	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

<table>
<tr><td rowspan="3">TPDO1</td><td rowspan="3">0x180 +
Node-ID</td><td rowspan="3">2</td><td>00</td><td>00</td><td colspan="6"></td></tr>
<tr><td colspan="8">Feedback of CANOPEN control state, SDO address: 0x6041</td></tr>
<tr><td colspan="8">Inhibit time: 20 (2ms); Event time: 50ms</td></tr>
<tr><td rowspan="3">TPDO2</td><td rowspan="3">0x280 +
Node-ID</td><td rowspan="3">2</td><td>00</td><td>00</td><td colspan="6"></td></tr>
<tr><td colspan="8">Error code feedback, SDO address: 0x603F</td></tr>
<tr><td colspan="8">Inhibit time: 20 (2ms); Event time: 50ms</td></tr>
<tr><td rowspan="3">TPDO3</td><td rowspan="3">0x380 +
Node-ID</td><td rowspan="3">6</td><td>00</td><td>00</td><td>00</td><td>00</td><td>00</td><td>00</td><td></td><td></td></tr>
<tr><td colspan="4">Motor speed feedback, 0x606C</td><td colspan="4">Motor current feedback, 0x6078</td></tr>
<tr><td colspan="8">Inhibit time: 200 (20ms); Event time: 50ms</td></tr>
<tr><td rowspan="3">TPDO4</td><td rowspan="3">0x480 +
Node-ID</td><td rowspan="3">8</td><td>00</td><td>00</td><td>00</td><td>00</td><td>00</td><td>00</td><td>00</td><td>00</td></tr>
<tr><td colspan="4">Feedback of the turns of the motor,
0x60FB 02</td><td colspan="4">Motor real-time angle feedback,
0x6064
(The angle of 16 low bits + the turns of 16 high bits)</td></tr>
<tr><td colspan="8">Inhibit time: 200 (20ms); Event time: 50ms</td></tr>
</table>

Note: The default PDO mapping parameter of the motor can be set by EASYDRIVE upper computer software. Refer to Section 7.18 for the setting method.

6.8.4 Default PDO Mapping Parameter in Torque Mode

The default configuration PDO mapping parameter of the driver is shown in the following table:

No.	Chinese	English
1.	CANopen 远程设备	CANopen Remote Device
2.	PDO 映射	PDO Mapping
3.	服务数据对象	Service Data Objects
4.	CANopen 个配置	CANopen Configuration
5.	CANopen I/O 映射	CANopen I/O Mapping
6.	状态	Status
7.	信息	Information
8.	选择接收 PDO(RPDO)	Selective Reception PDO (RPDO)

9.	选择发送 PDO(TPDO)	Selective Transmittal PDO (TPDO)
10.	名称	Name
11.	索引	Index
12.	子索引	Sub-index
13.	位长度	Bit Length

The torque mode configuration process is as follows: (the configuration process of using the default PDO to directly manipulate the data object)

Setting Procedure		Meaning
Step 01	Message: 000(ID) 01 0A //01 is the boot-up node instruction and 0A is the node number	Send StartNMT message
Step 02	Message: 30A(ID) 04 //6060h is 4 (torque control)	RPDO2 data

Step 03	Message: 20A (ID) 06 00
	//Set 6040h to 06 and switch to “ready to switch on” state
	Message: 20A (ID) 07 00
	//Set 6040h to 07 and switch to “switch on” state
	Message: 20A (ID) 0F 00
	//Set 6040h to 0F and switch to “operation enable” state servo enable motor;
	Note: The above switching process is based on the assumption that the switching succeeds immediately after receiving the instruction and the initial state is “switch on disabled”. In actual operation, it is necessary to read back the status word to confirm the current state of the driver before sending the switching instruction.
		RPDO1 data

Step 04	Message: 40A (ID) 00 00 00 00 C8 00 //Set 6081h to 200 and torque to 200	RPDO3 data
Step 05	Message: 20A(ID) 03 00 //6040--->0x03 Pause Message: 20A(ID) 0F 00 //6040--->0x0F Recovery Message: 20A(ID) 05 00 //6040--->0x05 Stop	RPDO1 data

The torque mode configuration process is as follows: (the configuration process of using the SDO to directly manipulate the data object)

Setting Procedure	Index	Sub-index	Data Type	Setting Value	Meaning
Step 01	0x6060 Mode Setting	00	INT8	4	1: Position Mode 3: Velocity mode 4: Torque Mode
	Message: 60A 2F 60 60 00 04 00 00 00 // Drive set to torque mode				
Step 02	0x6040 Controlword	00	UINT16	0x0006	Switch to “Read to Switch ON”

	Message: 60A 2B 40 60 000 06 00 000 00 // Drive switch to “ready to switch on” state				
Step 03	0x6040 Controlword	00	UINT16	0x0007	Switch to “Switch On” state
	Message: 60A 2B 40 60 000 07 00 000 00 // Drive switch to “switch on” state				
Step 04	0x6040 Controlword	00	UINT16	0x000F	Switch to “operation enable” motor servo enable
	Message: 60A 2B 40 60 00 0F 00 00 00 // Drive switch to “operation enable” state				
Step 05	0x6071 Target Torque	00	INT16	HEX: (0x03E8) DEC: 1000	Target torque set to 1000
	Message: 60A 2B 71 60 00 E8 03 00 00 // Set current instruction to 1000				

The interface of torque mode that debugging PDO instruction with CAN card is as follows:

No.	Chinese	English
1.	帧发送	Frame Sending
2.	发送格式	Sending Format
3.	正常发送	Normal Sending
4.	帧类型	Frame Type
5.	标准帧	Standard Frame
6.	帧格式	Frame Format
7.	数据帧	Data Frame
8.	帧 ID	Frame ID
9.	数据	Data
10.	帧 ID 每发送一帧递增	Frame ID increment with each frame sent
11.	数据每发送一帧递增	Data increment with each frame sent
12.	每次发送帧数	Number of frames sent each time
13.	发送次数	Number of Sending
14.	每次时间间隔	Time interval each time
15.	名称（可选）	Name (optional)

16.	立即发送	Send now
17.	添加到发送列表	Add to Sending List
18.	更新发送列表项	Update Sending List Items
19.	上移	Move Up
20.	下移	Move Down
21.	保存为文件	Save as file
22.	从文件加载	Load from file
23.	删除数据	Delete data
24.	历史记录	History
25.	发送	Send
26.	发送次数	Number of Sending

6.8.5 Default PDO Mapping Parameter in Velocity Mode

The default configuration PDO mapping parameter of the driver is shown in the following table:

No.	Chinese	English
1.	CANopen 远程设备	CANopen Remote Device
2.	PDO 映射	PDO Mapping
3.	服务数据对象	Service Data Objects
4.	CANopen 个配置	CANopen Configuration
5.	CANopen I/O 映射	CANopen I/O Mapping
6.	状态	Status
7.	信息	Information
8.	选择接收 PDO(RPDO)	Selective Reception PDO (RPDO)
9.	选择发送 PDO(TPDO)	Selective Transmittal PDO (TPDO)
10.	名称	Name
11.	索引	Index
12.	子索引	Sub-index
13.	位长度	Bit Length

The velocity mode configuration process is as follows: (the configuration process of using the default PDO to directly manipulate the data object)

Setting Procedure		Meaning
Step 01	Message: 000(ID) 01 0A //01 is the boot-up node instruction and 0A is the node	Send StartNMT message

	number	
Step 02	Message: 30A(ID) 03 //6060h is 3 (PV)	RPDO2 data

Step 03	Message: 20A (ID) 06 00
	//Set 6040h to 06 and switch to “ready to switch on” state
	Message: 20A (ID) 07 00
	//Set 6040h to 07 and switch to “switch on” state
	Message: 20A (ID) 0F 00
	//Set 6040h to 0F and switch to “operation enable” state servo enable motor;
	Note: The above switching process is based on the assumption that the switching succeeds immediately after receiving the instruction and the initial state is “switch on disabled”. In actual operation, it is necessary to read back the status word to confirm the current state of the driver before sending the switching instruction.
		RPDO1 data

Step 04	Message: 40A (ID) E8 03 00 00 00 00 //Set 60FFh to 1000 and speed to 1000	RPDO3 data
Step 05	Message: 20A(ID) 03 00 //6040--->0x03 Pause Message: 20A(ID) 0F 00 //6040--->0x0F Recovery Message: 20A(ID) 05 00 //6040--->0x05 Stop	RPDO1 data

The velocity mode configuration process is as follows: (the configuration process of using the default SDO to directly manipulate the data object)

Setting Procedure	Index	Sub-index	Data Type	Setting Value	Meaning
Step 01	0x6060 Mode Setting	00	INT8	3	1: Position Mode 3: Velocity mode 4: Torque Mode
	Message: 60A 2F 60 60 000 03 00 000 00 // Drive set to velocity mode				
Step 02	0x6040 Controlword	00	UINT16	0x0006	Switch to “Read to Switch ON”
	Message: 60A 2B 40 60 000 06 00 000 00 // Drive switch to “ready to switch on” state				
Step 03	0x6040 Controlword	00	UINT16	0x0007	Switch to “Switch On” state
	Message: 60A 2B 40 60 000 07 00 000 00 // Drive switch to “switch on” state				
Step 04	0x6040 Controlword	00	UINT16	0x000F	Switch to “operation enable” motor servo enable
	Message: 60A 2B 40 60 00 0F 00 00 00 // Drive switch to “operation enable” state				
Step 05	0x60FF Target Speed	00	INT32	HEX: (0x000003E8)	Target Speed =

					100r/min
	Message: 60A 23 FF 60 00 E8 03 00 00 // Speed Instruction 1000 (100r/min)				

The interface of velocity mode that debugging PDO instruction with CAN card is as follows:

No.	Chinese	English
1.	帧发送	Frame Sending
2.	发送格式	Sending Format
3.	正常发送	Normal Sending
4.	帧类型	Frame Type
5.	标准帧	Standard Frame
6.	帧格式	Frame Format
7.	数据帧	Data Frame
8.	帧 ID	Frame ID
9.	数据	Data
10.	帧 ID 每发送一帧递增	Frame ID increment with each frame sent
11.	数据每发送一帧递增	Data increment with each frame sent
12.	每次发送帧数	Number of frames sent each time
13.	发送次数	Number of Sending
14.	每次时间间隔	Time interval each time
15.	名称（可选）	Name (optional)
16.	立即发送	Send now
17.	添加到发送列表	Add to Sending List
18.	更新发送列表项	Update Sending List Items
19.	上移	Move Up
20.	下移	Move Down
21.	保存为文件	Save as file
22.	从文件加载	Load from file
23.	删除数据	Delete data
24.	历史记录	History
25.	发送	Send
26.	发送次数	Number of Sending

6.8.6 Default PDO Mapping Parameter in Location Mode

The default configuration PDO mapping parameter of the driver is shown in the following table:

No.	Chinese	English
1.	CANopen 远程设备	CANopen Remote Device
2.	PDO 映射	PDO Mapping
3.	服务数据对象	Service Data Objects
4.	CANopen 个配置	CANopen Configuration
5.	CANopen I/O 映射	CANopen I/O Mapping
6.	状态	Status
7.	信息	Information
8.	选择接收 PDO(RPDO)	Selective Reception PDO (RPDO)
9.	选择发送 PDO(TPDO)	Selective Transmittal PDO (TPDO)
10.	名称	Name
11.	索引	Index
12.	子索引	Sub-index
13.	位长度	Bit Length

The configuration process of location mode is as follows: (the configuration process of using the default PDO to directly manipulate the data object)

Setting Procedure		Meaning
Step 01	Message: 000(ID) 01 0A //01 is the boot-up node instruction and 0A is the node number	Send StartNMT message
Step 02	Message: 30A(ID) 01 //6060h is 1 (position mode is PP)	RPDO2 data

Step 03	as follows
	Message: 20A (ID) 06 00
	//Set 6040h to 06 and switch to “ready to switch on” state
	Message: 20A (ID) 07 00
	//Set 6040h to 07 and switch to “switch on” state
	Message: 20A (ID) 0F 00
	//Set 6040h to 0F and switch to “operation enable” state servo enable motor;
	Note: The above switching process is based on the assumption that the switching succeeds immediately after receiving the instruction and the initial state is “switch on
		RPDO1 data

	disabled". In actual operation, it is necessary to read back the status word to confirm the current state of the driver before sending the switching instruction.	
Step 04	Message: 50A (ID) AC 0D 00 00 E8 03 00 00 //Absolute position instruction = 0x00000DAC Speed instruction = 0x03E8	RPDO4 data
Step 05	Message: 20A (ID) 3F 00 //Set 6040h to 3F and execute absolute position instruction;	RPDO1 data
Step 06	Message: 20A(ID) 03 00 //6040--->0x03 Pause Message: 20A(ID) 0F 00 //6040--->0x0F Recovery Message: 20A(ID) 05 00 //6040--->0x05 Stop	RPDO1 data

The configuration process of location mode is as follows: (the configuration process of using the default SDO to directly manipulate the data object)

Setting Procedure	Index	Sub-index	Data Type	Setting Value	Meaning
Step 01	0x6060 Mode Setting	00	INT8	1	1: Position Mode 3: Velocity mode 4: Torque Mode
	Message: 60A 2F 60 60 00 01 00 00 00 // Drive set to position mode				
Step 02	0X6040 Controlword	00	UINT16	0x0006	Switch to "Read to Switch ON"
	Message: 60A 2B 40 60 000 06 00 000 00 // Drive switch to "ready to switch on" state				
Step 03	0X6040 Controlword	00	UINT16	0x0007	Switch to "Switch On" state
	Message: 60A 2B 40 60 000 07 00 000 00 // Drive switch to "switch on" state				
Step 04	0X6040 Controlword	00	UINT16	0x000F	Switch to "operation enable" motor servo enable
	Message: 60A 2B 40 60 00 0F 00 00 00 // Drive switch to "operation enable" state				
Step 05	0x6081 speed	00	INT32	Speed = 0x00001388	Speed: 500r/min
	Message: 60A 23 81 60 00 88 13 00 00 // Speed 5000 (500r/min) in position mode				
Step 06	0x607A Position	00	INT32	Position = 0x000F8000	The default is that the motor rotates 1 turn every 6 pulses
	Message: 60A 23 7A 60 000 00 80 0F 00 // Position Instruction Motor rotates 15.5 laps				
Step 07	0X6040 Controlword	00	UINT16	0x001F	Position and

					Velocity Quantity of Executing Writing
	Message: 60A 2B 40 60 00 3F 00 00 00 // Drive Boot-Up to execute absolute position instruction				

The interface of position mode that debugging PDO instruction with CAN card is as follows:

No.	Chinese	English
1.	帧发送	Frame Sending
2.	发送格式	Sending Format
3.	正常发送	Normal Sending
4.	帧类型	Frame Type
5.	标准帧	Standard Frame
6.	帧格式	Frame Format
7.	数据帧	Data Frame
8.	帧 ID	Frame ID
9.	数据	Data
10.	帧 ID 每发送一帧递增	Frame ID increment with each frame sent
11.	数据每发送一帧递增	Data increment with each frame sent
12.	每次发送帧数	Number of frames sent each time
13.	发送次数	Number of Sending
14.	每次时间间隔	Time interval each time
15.	名称（可选）	Name (optional)
16.	立即发送	Send now
17.	添加到发送列表	Add to Sending List
18.	更新发送列表项	Update Sending List Items
19.	上移	Move Up
20.	下移	Move Down
21.	保存为文件	Save as file
22.	从文件加载	Load from file
23.	删除数据	Delete data
24.	历史记录	History

25.	发送	Send
26.	发送次数	Number of Sending

6.9 Home

Index	Sub-index	Object Type	Name	Data Type	Attribute	Mapping
60FB	4	RECORD	RstStart	UINT8	RW	YES
			Parameter Description: 0-Reset off, 1-Reset on			
6098	0	VAR	Homing method	INT8	RW	YES
			Parameter Description: 0-Home off, 1-37 Home 1-37			
6099	0	VAR	Homing Speeds	UINT32	RW	YES
			Parameter Description: Reset speed setting, unit 0.1r/min			
607C	0	VAR	Homing offset	INT32	RW	YES
			Parameter Description: Origin Offset, 65536 corresponds to a lap of the motor			
609A	0	VAR	Homing acceleration	UINT32	RW	YES
			Parameter Description: Origin acceleration, unit ms			
6041	0	VAR	Statusword	UINT16	RO	YES
			Parameter Description: The Bit15 of Statusword is an indication of the return to zero mode status. If the return-to-zero operation is being executed, it means in the process of homing: Bit15=0, homing completed: Bit15=1.			

Mode	Name	Description
Home 01	Origin is the negative limit trigger signal	Refer to section 4.6 for home action, and 0x607C is valid
Home 02	Origin is the positive limit trigger signal	Refer to section 4.6 for home action, and 0x607C is valid
Home 3-6		Reserved
Home 07	Origin is the Z pulse on the outer negative edge of the origin signal, which initially moves in the positive direction	Not open
Home 08	Origin is the Z pulse on the inner negative edge of the origin signal, which initially moves in the positive direction	Not open
Home 09	Origin is the Z pulse on the inner positive edge of the origin signal, which initially moves in the positive direction	Not open
Home 10	Origin is the Z pulse on the outer positive edge of the origin signal, which initially moves in the positive direction	Not open
Home 11	Origin is the Z pulse on the outer positive edge of the origin signal, which initially moves in the negative direction	Not open

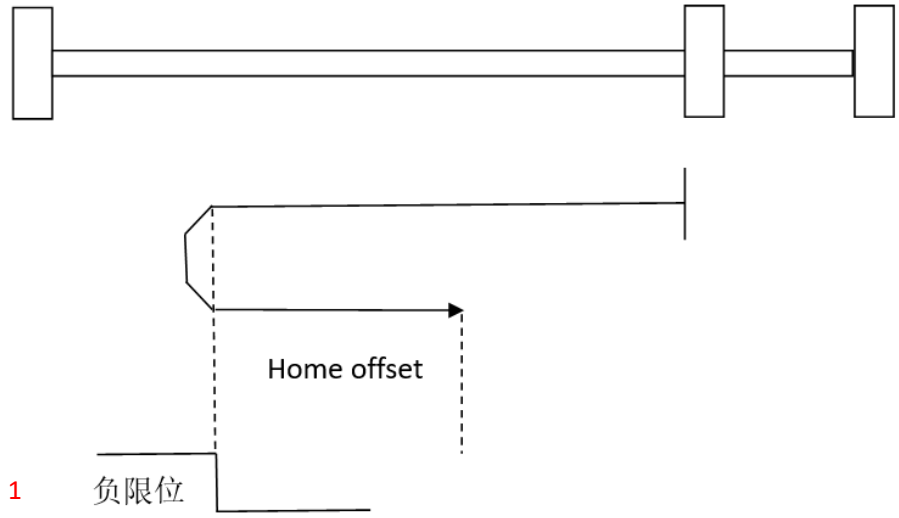
Home 12	Origin is the Z pulse on the inner positive edge of the origin signal, which initially moves in the negative direction	Not open
Home 13	Origin is the Z pulse on the inner negative edge of the origin signal, which initially moves in the negative direction	Not open
Home 14	Origin is the Z pulse on the outer negative edge of the origin signal, which initially moves in the negative direction	Not open
Home 15-16		Reserved
Home 17	Origin is the nagative limit Z pulse	Not open
Home 18	Origin is the positive limit Z pulse	Not open
Home 19-22		Reserved
Home 23, 24	With double limits, origin is the negative edge of the origin signal, which initially moves in the positive direction	Refer to section 4.6 for home action
Home 25, 26	With double limits, origin is the positive edge of the origin signal, which initially moves in the positive direction	Refer to section 4.6 for home action
Home 27, 28	With double limits, origin is the positive edge of the origin signal, which initially moves in the negative direction	Refer to section 4.6 for home action
Home 29, 30	With double limits, origin is the negative edge of the origin signal, which initially moves in the negative direction	Refer to section 4.6 for home action
Home 31-34		Reserved
Home 35	Origin is the current position	Refer to section 4.6 for home action
Home 36	Origin is the negative mechanical limit	Refer to section 4.6 for home action

	position	
Home 37	Origin is the positive mechanical limit position	Refer to section 4.6 for home action

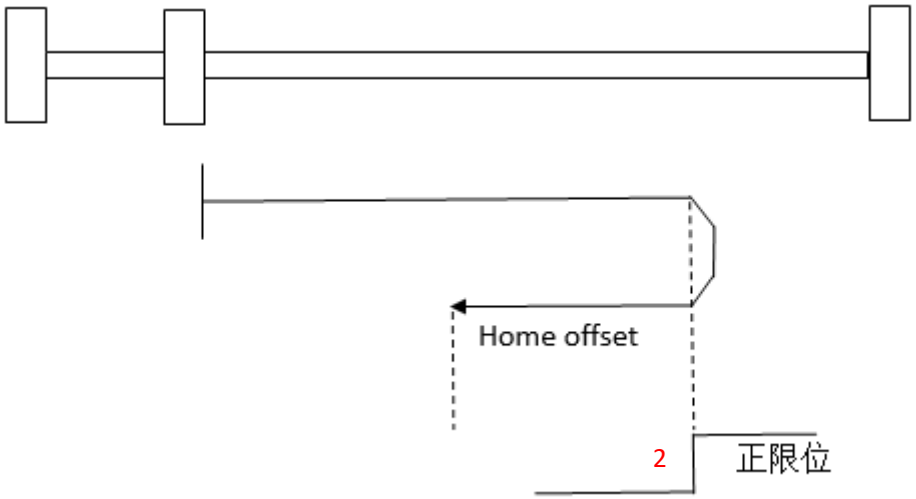
Home 1: The home point is the negative limit triggering signal

Home 2: The home point is the positive limit triggering signal

In Home 1 and Home 2, for the homing mode with the limit input as the home signal, the driver needs to run in the PP mode to be valid. The driver treats the limit input (DI4/DI2) as the home point by default, and the resetting is triggered by the upper controller software. When the motor is already in the resetting position, the resetting is triggered again, and the driver directly outputs the resetting end signal. If the homing time exceeds more than 120S continuously, the homing stops and homing errors are reported: SelfSofRst.uwRstErr=1;



Home 1



No.	Chinese	English
1.	负限位	Negative limit
2.	正限位	Positive limit

Home 2

Case: Home 1 Operation Process

Home Preparation: Homing method = 1;

SelfSofRst.uwRstStarSpd = 1000; (Reset at 100rpm)

Home offset: SelfSofRst.slHomeOffset = 0x0000ffff; (Home offset is set to 1 turn)

Start homing: Write SelfSofRst.uwRstStart = 1; SelfSofRst.uwRstEnd is automatically reset. The motor rotates in the reverse direction according to the set speed of 100rpm to find the home signal. When the home signal is found, the motor decelerates and stops, and the homing process ends.

End of homing: SelfSofRst.uwRstEnd becomes 1, and this position is considered as the origin.

Home 07: The home point is the Z pulse on the outer negative edge of the origin signal, and the initial movement direction is positive

Home 08: The home point is the Z pulse on the inner negative edge of the origin signal, and the initial movement direction is positive

Home 09: The home point is the Z pulse on the inner positive edge of the origin signal, and the initial movement direction is positive

Home 10: The home point is the Z pulse on the outer positive edge of the origin signal, and the initial movement direction is positive

Home 11: The home point is the Z pulse on the outer positive edge of the origin signal, and the initial movement direction is negative

Home 12: The home point is the Z pulse on the inner positive edge of the origin signal, and the initial movement direction is negative

Home 13: The home point is the Z pulse on the inner negative edge of the origin signal, and the initial movement direction is negative

Home 14: The home point is the Z pulse on the outer negative edge of the origin signal, and the initial movement direction is negative

Home 17: The home point is the negative limit Z pulse

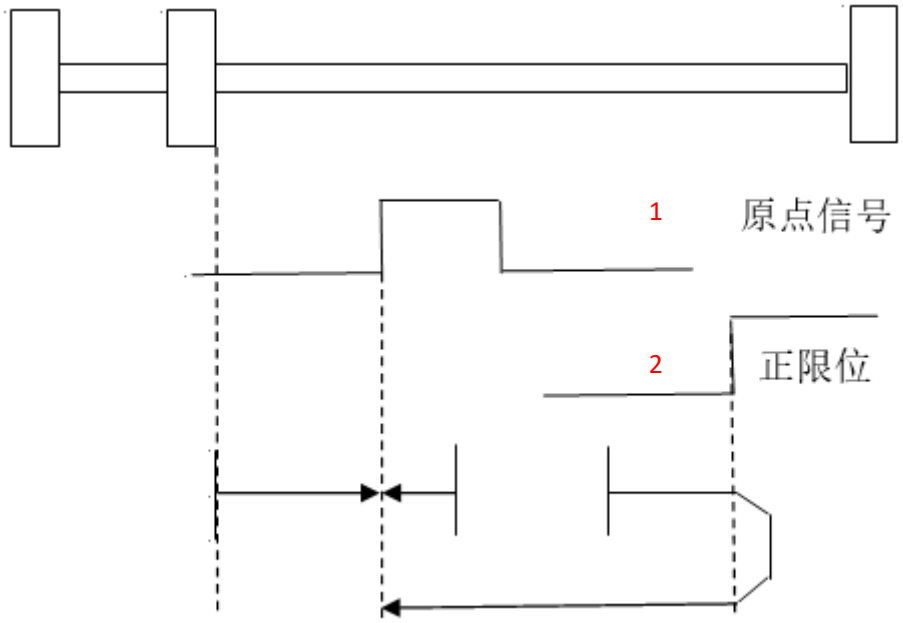
Home 18: The home point is the positive limit Z pulse

Not available.

Home 23, 24: With double limits, the home point is the negative edge of the origin signal, and the initial movement direction is positive

In Home 23 and 24, the homing mode with the negative edge of the origin signal input as the home signal is used, and the initial speed of homing is positive. The homing of the driver runs under the PP mode. The driver treats the negative edge of the origin input (DI5) as the home point by default, and the resetting is triggered by the upper controller software. When the motor is already in the resetting position, the resetting

is triggered again, and the driver directly outputs the resetting end signal. If the homing time exceeds more than 120S continuously, the homing stops and homing errors are reported: SelfSofRst.uwRstErr=1;

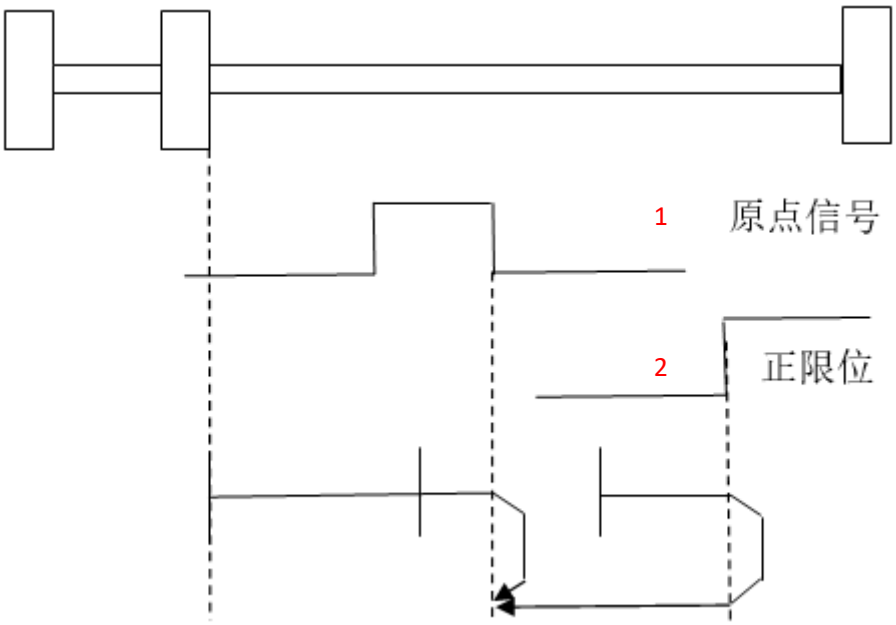


No.	Chinese	English
1.	原点信号	Origin signal
2.	正限位	Positive limit

Home 23, 24

Home 25, 26: With double limits, the home point is the positive edge of the origin signal, and the initial movement direction is positive

In Home 25 and 26, the homing mode with the positive edge of the origin signal input as the home signal is used, and the initial speed of homing is positive. The homing of the driver runs under the PP mode. The driver treats the positive edge of the origin input (DI5) as the home point by default, and the resetting is triggered by the upper controller software. When the motor is already in the resetting position, the resetting is triggered again, and the driver directly outputs the resetting end signal. If the homing time exceeds more than 120S continuously, the homing stops and homing errors are reported: SelfSofRst.uwRstErr=1;

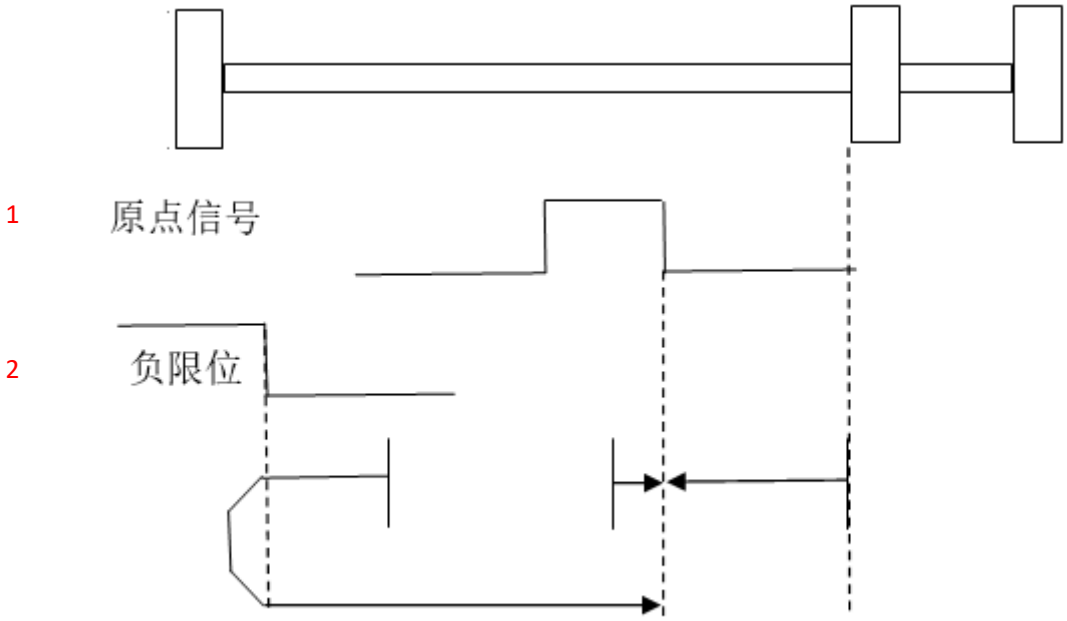


No.	Chinese	English
1.	原点信号	Origin signal
2.	正限位	Positive limit

Home 25, 26

Home 27, 28: With double limits, the home point is the positive edge of the origin signal, and the initial movement direction is negative

In Home 27 and 28, the homing mode with the positive edge of the origin signal input as the home signal is used, and the initial speed of homing is negative. The homing of the driver runs under the PP mode. The driver treats the positive edge of the origin input (DI5) as the home point by default, and the resetting is triggered by the upper controller software. When the motor is already in the resetting position, the resetting is triggered again, and the driver directly outputs the resetting end signal. If the homing time exceeds more than 120S continuously, the homing stops and homing errors are reported: SelfSofRst.uwRstErr=1;

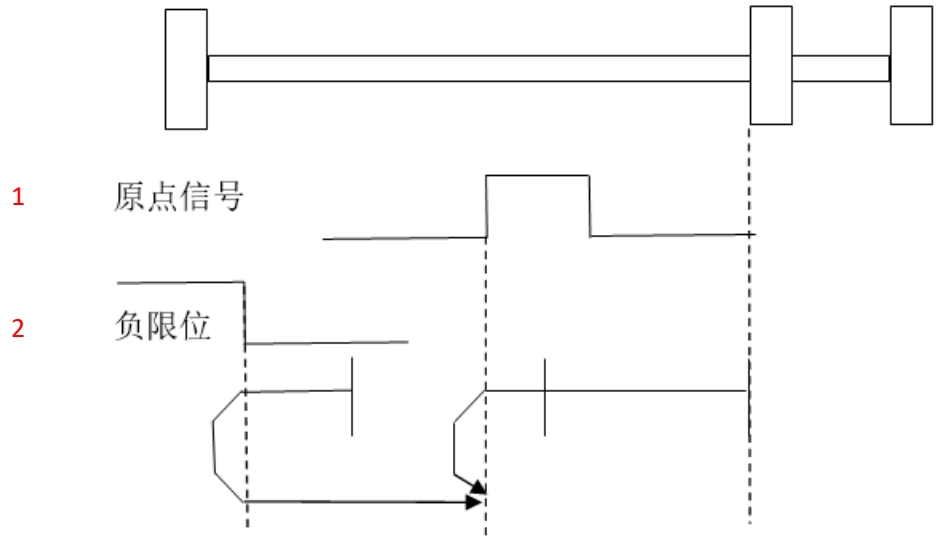


No.	Chinese	English
1.	原点信号	Origin signal
2.	负限位	Negative limit

Home 27, 28

Home 29, 30: With double limits, the home point is the negative edge of the origin signal, and the initial movement direction is negative

In Home 29 and 30, the homing mode with the negative edge of the origin signal input as the home signal is used, and the initial speed of homing is negative. The homing of the driver runs under the PP mode. The driver treats the negative edge of the origin input (DI5) as the home point by default, and the resetting is triggered by the upper controller software. When the motor is already in the resetting position, the resetting is triggered again, and the driver directly outputs the resetting end signal. If the homing time exceeds more than 120S continuously, the homing stops and homing errors are reported: SelfSofRst.uwRstErr=1;



No.	Chinese	English
1.	原点信号	Origin signal
2.	负限位	Negative limit

Home 29, 30

Home 35: The home point is the current position

When the parameter SelfSofRst.uwRstMode is set to 35, the driver records the current motor position as the home position, sets the current angle to zero, and reset the value of SelfSofRst.uwRstMode to 0.The secondary function can run multiple times, and it is only effective when the motor is powered on.

Home 36: The home point is the negative mechanical limit position

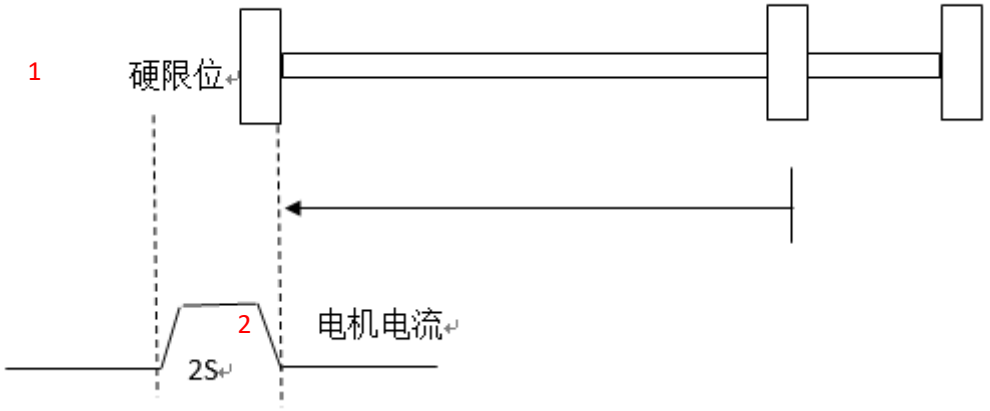
Home 37: The home point is the positive mechanical limit position

Home 36 and 37 are used in the system when there is no external home point, and mechanical limit points are used as a special way of the home point.

The homing method with the mechanical limit as the home signal is used. After the homing is activated, the motor starts homing at the speed set by SelfSofRst.uwRstStarSpd. In this moment, the limit is in a disabled state. When the motor reaches the mechanical hard limit, its current increases to the set rated current value, and its speed feedback is zero. This will last 2s, then the motor current returns to zero, and the homing process ends.

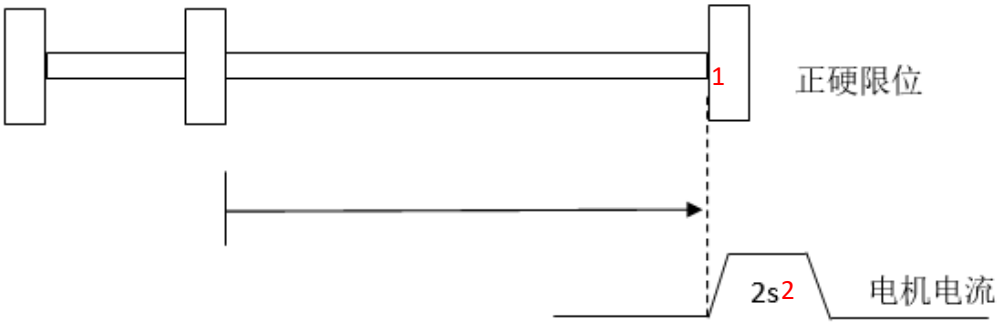
If the homing time exceeds more than 120S continuously with the origin not found, the homing stops and homing errors are reported: SelfSofRst.uwRstErr=1;

Note: In Home 36 and 37, the homing offset function is invalid.



No.	Chinese	English
1.	硬限位	Hard limit
2.	电机电流	Motor current

Home 36



No.	Chinese	English
1.	正硬限位	Positive hard limit
2.	电机电流	Motor current

Home 37

Case: Home 36 Operation Process

Home Preparation: Homing method = 36;

SelfSofRst.uwRstStarSpd = 1000; (Reset at 100rpm)

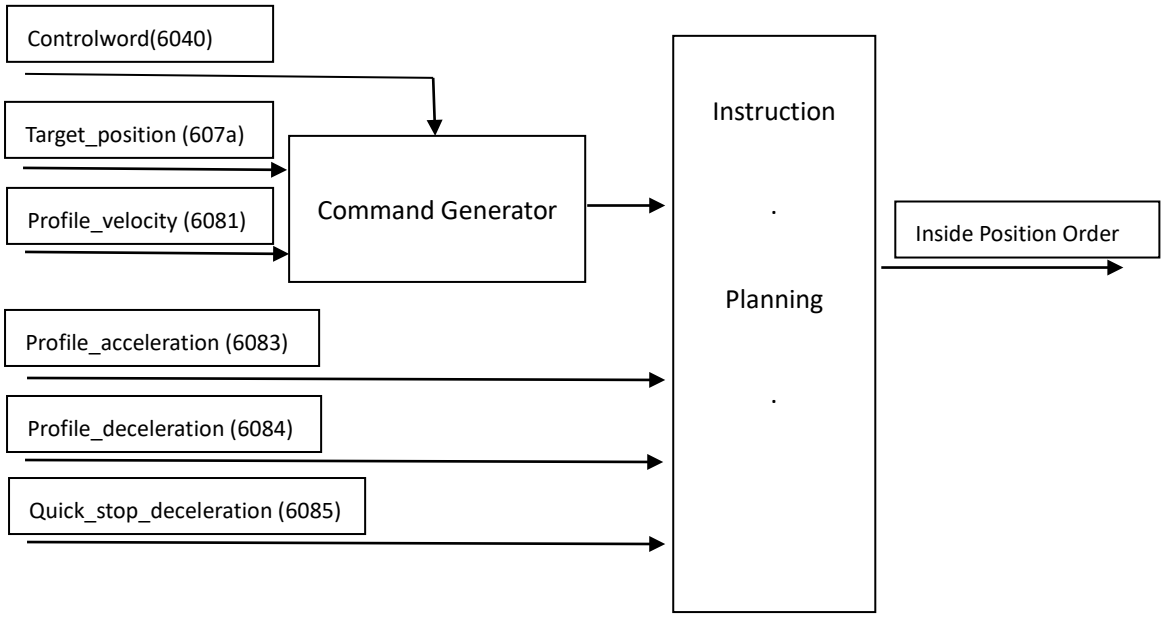
Start homing: Write SelfSofRst.uwRstStart = 1; SelfSofRst.uwRstEnd is automatically reset. The motor rotates in the reverse direction at the set speed of 100rpm. When the motor reaches the mechanical limit, it outputs rated current for 2s and ends, and the homing process ends.

End of homing: SelfSofRst.uwRstEnd becomes 1, and this position is considered as the origin.

6.10 Profiled Position

Index	Sub-index	Object Type	Name	Data Type	Attribute	PDO mapping
607A	**0**	**VAR**	**Target_position**	**INT32**	**RW**	**YES**
			Parameter Description: given PP position instruction, 32-bit signed number, 65536 represents 1 lap of the motor; For example: 0x18000 = 1.5 laps, 0xfffe8000 = -1.5 laps;			
6081	**0**	**VAR**	**Profile_velocity**	**INT32**	**RW**	**YES**
			Parameter Description: PP Speed Instruction Unit: 0.1 r/min;			
6083	**0**	**VAR**	**Profile_acceleration**	**UINT32**	**RW**	**YES**
			Parameter Description: PP Acceleration Time Unit: ms			
6084	**0**	**VAR**	**Profile_deceleration**	**UINT32**	**RW**	**YES**
			Parameter Description: PP Deceleration Time Unit: ms			
6085	0	VAR	Quick_stop_deceleration	**UINT32**	**RW**	**YES**
			Parameter Description: Quick Stop Deceleration Time Unit: ms			

The Profiled Position(PP) mentioned in this chapter is a point-to-point Profiled Position. The user can accurately control the operation process of motor by giving the target position, operating speed and acceleration and deceleration time, and can change the target position and target speed during the operation of motor, thus realizing flexible and dynamic control. The operation of motor is limited by the maximum rotational speed and current of the motor.

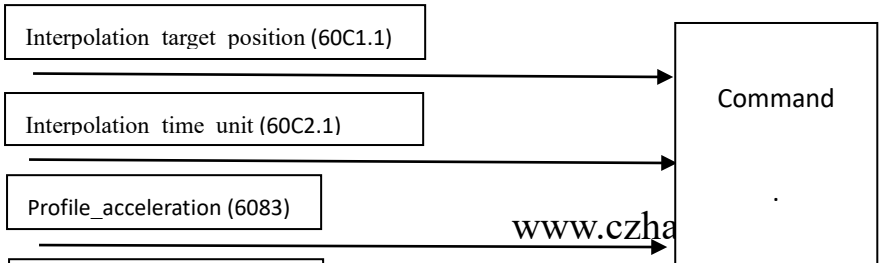


6.11 Interpolated Position

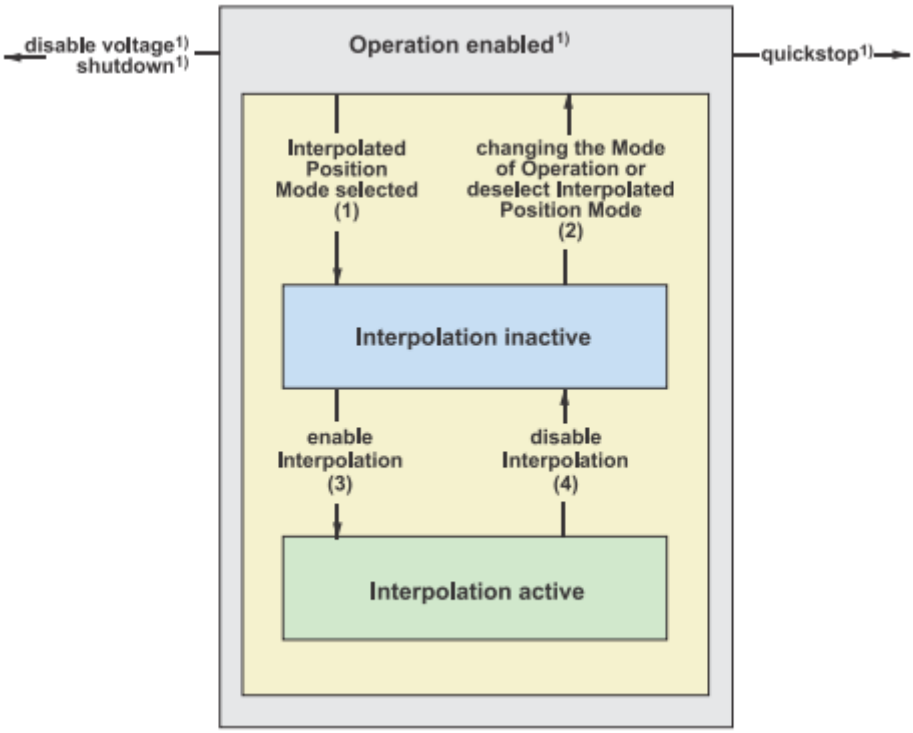
Index	Sub-index	Object Type	Name	Data Type	Attribute	PDO mapping
60C0	0	VAR	Interpolation_sub_mode	INT16	RW	NO
60C1		**VAR**	Interpolation_data_recoder			
	0		Number_of_entries	UINT8	RO	NO
	1		**Interpolation_target_position**	**INT32**	**RW**	**YES**
			Parameter Description: position interpolation mode, given PP position instruction, 32-bit signed number, 65536 represents 1 lap of the motor; For example: 0x18000 = 1.5 laps, 0xfffe8000 = -1.5 laps;			
	2		Interpolation_target_velocity	INT32	RW	YES
60C2		**VAR**	Interpolation_time_period			
	0		Number_of_entries	UINT8	RO	NO
	1		**Interpolation_time_unit**	**INT8**	**RW**	**YES**
			Parameter Description: Interpolation time; Unit: ms			
	2		**Interpolation_time_index**	**INT8**	**RW**	**NO**
			Parameter Description: Interpolation time unit; Default-3s			
60C4		**VAR**	Interpolation_data_configuration			
	0		Number_of_entries	UINT8	RO	NO
	1		Interpolation_max_buffer_size	INT32	RO	NO
	2		Interpolation_actual_buffer_size	INT32	RW	NO
	3		Interpolation_buffer_org	INT8	RW	NO
	4		Interpolation_buffer_position	INT16	RW	YES
	5		Interpolation_recoder_size	INT8	RW	NO
	6		Interpolation_buffer_clear	INT8	WO	NO

In position interpolation (IP) mode, controller sends the target position to drive continuously according to the frequency set by interpolation period, and each target position needs to move a smaller position value to ensure the smooth operation of motor and good follow-up of instructions. Under the default linear interpolation mode in drive, linear interpolation is instructed in the interpolation period to achieve the goal of smooth operation. The operation of motor is limited by the maximum rotational speed and current of the motor.

Note: Drive does not support the Interpolation buffer function for the time being. Controller needs to send the target position according to the interpolation frequency in real time. Commands less than the interpolation period will be ignored. Commands longer than the interpolation period will lead to discontinuous instructions and unstable motor operation.



Interpolation mode internal state switching:



（1）	Set Modes_of_operation (6060) to 7
（2）	Don’t set Modes_of_operation (6060) to 7
（3）	Set Bit 4 of Control (6040) to 1 To run the interpolation mode, Bit4 of controlword must be set to 1, otherwise the interpolation instruction will not be executed and motor will not operate.
（4）	Set Bit 4 of Control (6040) to 0 When controlword switches from 1 to 0, drive will exit interpolation execution, interpolation instruction will not be operated, and motor will stop at the fastest speed.

When bit8 of the controlword is set to 1, drive will enter HALT mode, motor will stop at the predetermined quick stop acceleration, and interpolation mode will be in an invalid state.

When the motor is stopped due to an internal error in the drive, the interpolation mode will not be operated even if it is in an valid state.

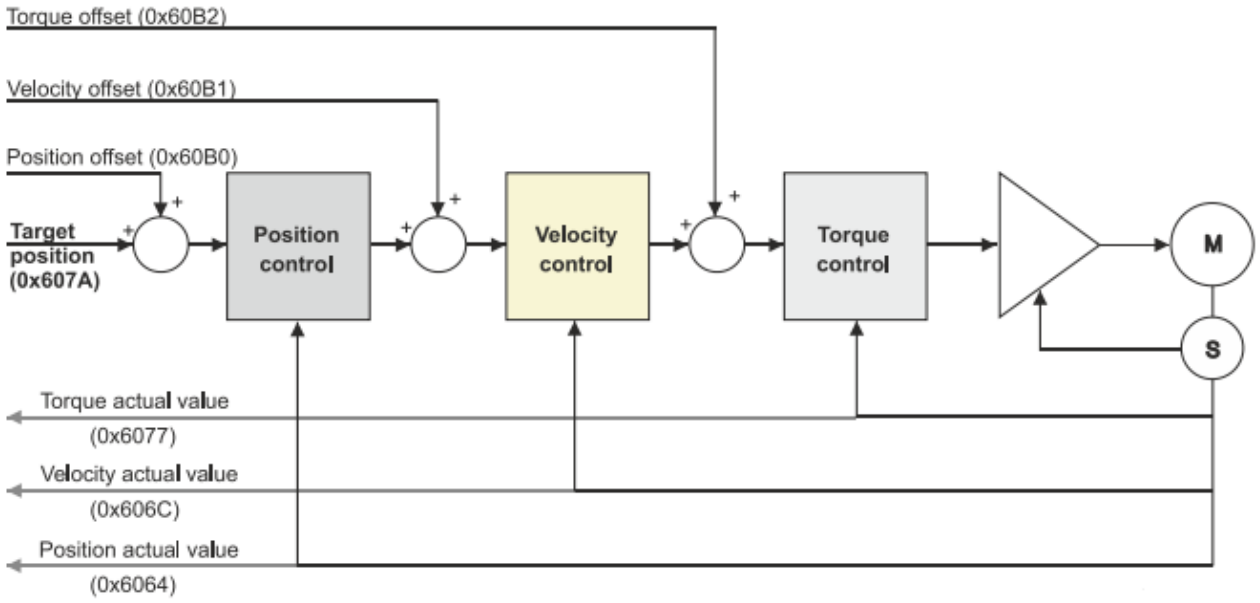
6.12 Cyclic Synchronous Position (CSP)

Index	Sub-index	Object Type	Name	Data Type	Attribute	PDO mapping
60B0	0	VAR	Position_offset	INT32	RW	YES
			Parameter Description: Cyclic Synchronous Mode Position Offset			
60B1	0	VAR	Velocity_offset	INT32	RW	YES
			Parameter Description: Cyclic Synchronous Mode Speed Offset, unit: 0.1 rpm			
60B2	0	VAR	Torque_offset	INT16	RW	YES
			Parameter Description: Cyclic Synchronous Mode Torque Offset, unit: 0.01 A			

Cyclic Synchronous Position (CSP), Controller continuously gives the target position instruction according to the frequency set by the interpolation period, and drive continuously runs according to the given instruction. Each target position needs to move a smaller position value to ensure the smooth operation of motor and good follow-up of instructions. In CSP mode, the position instruction given by controller must be an absolute position instruction. Under the default linear interpolation mode in drive, linear interpolation is instructed in the interpolation period to achieve the goal of smooth operation. The operation of motor is limited by the maximum rotational speed and current of the motor.

Controller can give position/speed/torque feedforward in real time according to the control requirements to achieve higher control requirements, but controller needs to dynamically obtain the whole mathematical model of the system to generate each feedforward instruction.

Note: Controller needs to send the target position according to the interpolation frequency in real time. Commands less than the interpolation period will be ignored. Commands longer than the interpolation period will lead to discontinuous instructions and unstable motor operation. When compared to IP mode, under CSP mode, ControlWord(6040)-bit4 will not be required, while other operation is similar to that under IP mode.



Note: Torque actual value (0x6077) is not open yet, please read the Current_actual_Value (0x6078) value.

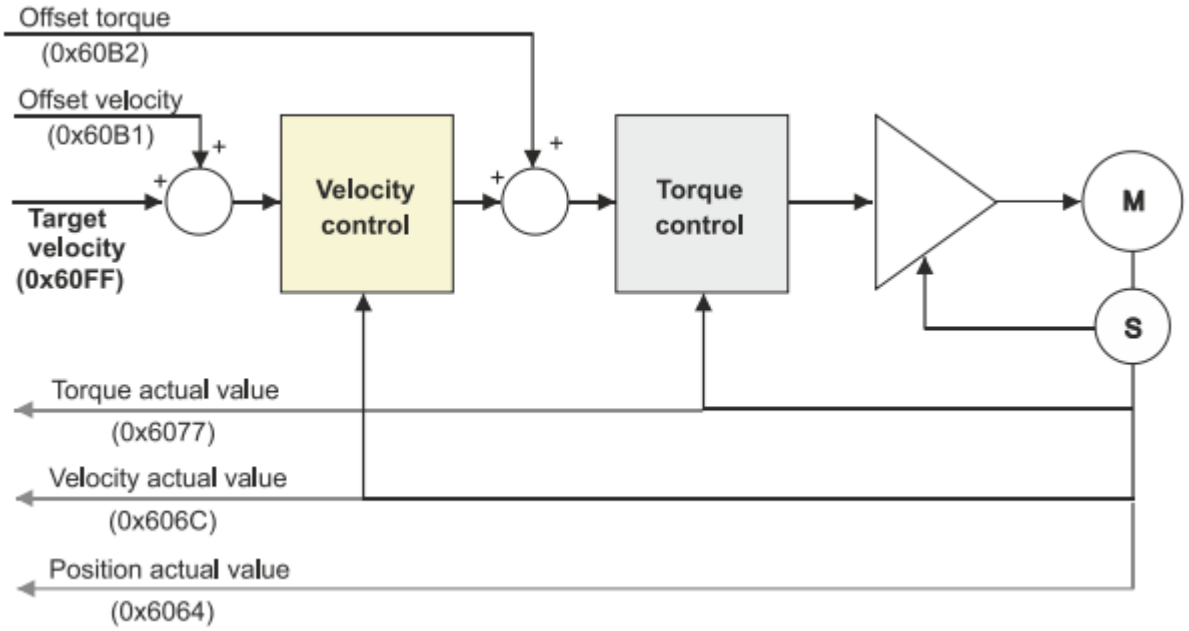
When bit8 of the controlword is set to 1, the driver will enter HALT mode, motor will stop at the predetermined quick stop acceleration, and CSP mode will be in an invalid state.

When the motor is stopped due to an internal error in the driver, the CSP instruction will not be operated even if it is continuously sent.

6.13 Cyclic Synchronous Velocity (CSV)

60B1	0	VAR	Velocity_offset	INT32	RW	YES
			Parameter Description: Cyclic Synchronous Mode Speed Offset, unit: 0.1 rpm			
60B2	0	VAR	Torque_offset	INT16	RW	YES
			Parameter Description: Cyclic Synchronous Mode Torque Offset, unit: 0.01 A			

Cyclic Synchronous Velocity (CSV), controller sends the target speed instruction to drive in real time, and drive runs according to the received instruction. The controller should avoid excessive deviation of two consecutive speed instructions, which will lead to speed overshoot, and even control failure. The operation of motor is limited by the maximum rotational speed and current of the motor. Controller can give speed/torque feedforward in real time according to the control requirements to achieve higher control requirements.

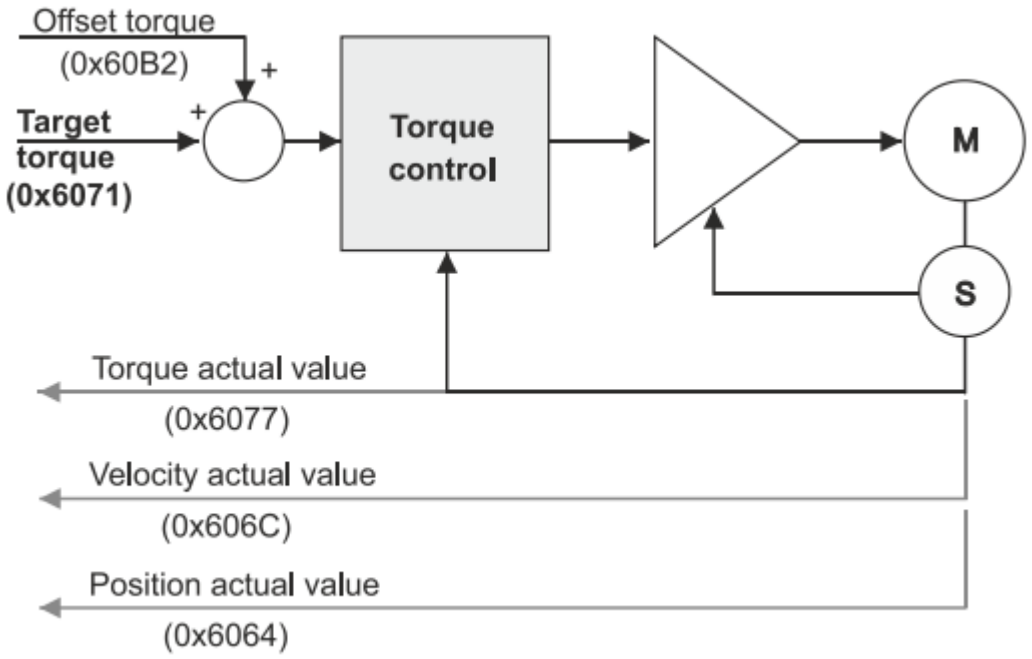


Note: Torque actual value (0x6077) is not open yet, please read the Current_actual_Value (0x6078) value.

6.14 Cyclic Synchronous Torque (CST)

60B2	0	VAR	Torque_offset	INT16	RW	YES
			Parameter Description: Cyclic Synchronous Mode Torque Offset, unit: 0.01 A			

Cyclic Synchronous Torque (CST), controller sends the target current instruction to drive in real time, and drive runs according to the received instruction. The operation of motor is limited by the maximum rotational speed and current of the motor. Controller can give torque feedforward in real time according to the control requirements to achieve higher control requirements.

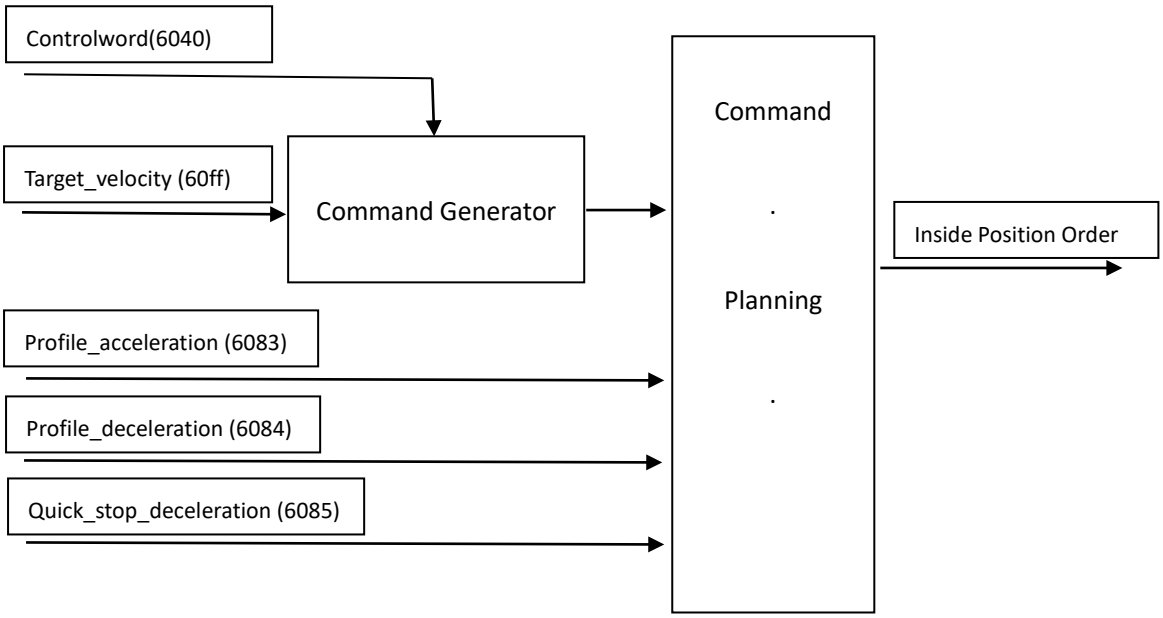


Note: Torque actual value (0x6077) is not open yet, please read the Current_actual_Value (0x6078) value.

6.15 Profiled Velocity

Index	Sub-index	Object Type	Name	Data Type	Attribute	PDO mapping
606C	**0**	**VAR**	**Velocity_actual_value**	**INT32**	**RO**	**YES**
			Parameter Description: Feedback motor real-time speed; Actual speed = Velocity_actual_value (0.1 r/min)			
60FF	**0**	**VAR**	**Target_velocity**	**INT32**	**RW**	**YES**
			Parameter Description: PV Speed Instruction; Unit: 0.1 r/min			
6083	**0**	**VAR**	**Profile_acceleration**	**UINT32**	**RW**	**YES**
			Parameter Description: PV Acceleration Time Unit: ms/kpm			
6084	**0**	**VAR**	**Profile_deceleration**	**UINT32**	**RW**	**YES**
			Parameter Description: PV Deceleration Time Unit: ms/kpm			

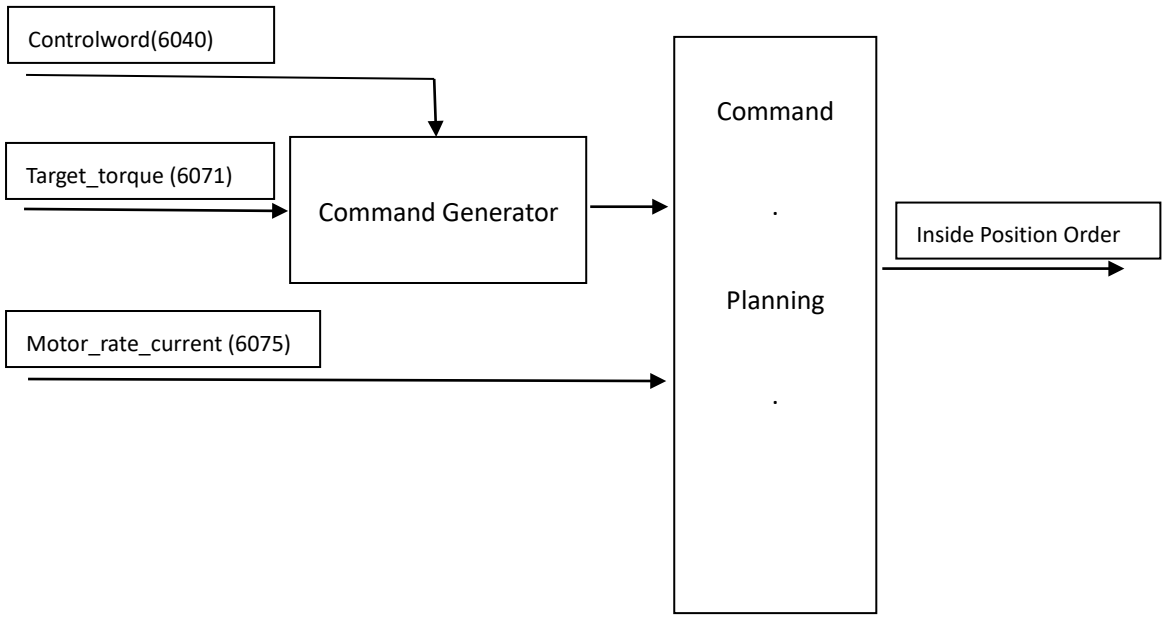
Profiled Velocity (PV) mentioned in this chapter, controller gives the target speed instruction, drive runs according to the given acceleration and deceleration time, and feeds back the real-time motor speed and current. The operation of motor is limited by the maximum rotational speed and current of the motor.



6.16 Profiled Torque

Index	Sub-index	Object Type	Name	Data Type	Attribute	PDO mapping
6071	**0**	**VAR**	**Target_torque**	**INT16**	**RW**	**YES**
			Parameter Description: current mode, given current instruction; Unit: 0.01 A			
6075	**0**	**VAR**	**Motor_rate_ current**	**UINT32**	**RW**	**YES**
			Parameter Description: current instruction acceleration and deceleration; Unit: ms			
6078	**0**	**VAR**	**Current_actual_Value**	**UINT16**	**RO**	**YES**
			Parameter Description: motor output current rms value; Unit: 1mA			

Profiled Torque (PT) mentioned in this chapter, controller gives the target current instruction, drive runs according to the given acceleration and deceleration time, and feeds back the real-time motor current. The operation of motor is limited by the maximum rotational speed and current of the motor.



6.17 Dynamic Configuration of PDO Mapping Parameter with EasyDRIVE

The produced drive is set according to the manufacturer's default PDO mapping parameters. Users can add the required PDO mapping parameters in a upper-computer debugging software, EasyDRIVE, according to the configuration format of the Value column in the following figure (the mapping parameters added in the Value column are hexadecimal numbers). (Note: The configuration should be filled in strictly according to the format of Index + Sub-Index + Data Length)

The method is as follows: first refer to the dictionary list of the CANOPEN device object to find the corresponding data object, and then fill in the corresponding PDO according to “Index + Sub-Index + Data Length”. Since each PDO can hold up to 8 bytes, please carefully check that the length of the mapping parameter under the same PDO is less than or equal to 8 bytes after filling out the mapping parameter. For example, the combined length of DATA1 and DATA2 mapping parameters of RPDO3 is already 8 bytes, so the two parameters of DATA3 and DATA4 can no longer be added and are invalid.

For example:

RPDO1DATA1=6040, 00 10 where 6040 is the controlword index, 00 is the sub-index, and 10 is the data object length representing 2 bytes or 16bits.

RPDO1DATA2=6060, 00 08 where 6060 is the index, 00 is the sub-index, and 08 is the data object length representing 1 byte or 8 bits.

RPDO2DATA1=60FF 00 20, where 60FF is the target speed index of the speed loop, 00 is the sub-index, and 20 is the data object length representing 4 bytes or 32bits.

RPDO4DATA2=6071 00 10 where 6071 is the index, 00 is the sub-index, and 10 is the data object length representing 2 bytes or 16bits.

Note: If all the mapping parameters of a PDO have not been modified (if not modified, the default display is 00000000), for example, the DATA1 ~ DATA4 of TPDO4 are all 00000000, then TPDO4 should still return data to the master station according to the mapping parameter set by the manufacturer by default.

After setting PDO mapping parameter, methods of returning to the system parameter setting interface to save parameter are as follows: after modifying the drive parameter, you need to save the modified parameter to the internal memorizer of the drive, and the parameters are valid only after the next power-on and restart. To save parameter, you can select “ParamentSave” parameter under the column “SysCntrl Paramenters”, change OFF to ON, and then click enter.

No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	位置控制模式	Profiled position mode
18.	速度控制模式	Profiled velocity mode
19.	力矩控制模式	Profiled torque mode
20.	I/O 控制	I/O control
21.	CANopen 参数配置	CANopen Parameter Configuration
22.	RPDO1 参数配置	RPDO1 Parameter configuration
23.	RPDO2 参数配置	RPDO2 Parameter configuration
24.	RPDO3 参数配置	RPDO3 Parameter configuration
25.	RPDO4 参数配置	RPDO4 Parameter configuration
26.	TPDO1 参数配置	TPDO1 Parameter configuration
27.	TPDO2 参数配置	TPDO2 Parameter configuration
28.	TPDO3 参数配置	TPDO3 Parameter configuration
29.	TPDO4 参数配置	TPDO4 Parameter configuration
30.	驱动系统控制参数	Drive system control parameter
31.	电机复位控制	Motor reset control

No.	Chinese	English
1.	通信	Communication
2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	位置控制模式	Profiled position mode
18.	速度控制模式	Profiled velocity mode
19.	力矩控制模式	Profiled torque mode
20.	I/O 控制	I/O control
21.	CANopen 参数配置	CANopen Parameter Configuration
22.	RPDO1 参数配置	RPDO1 Parameter configuration
23.	RPDO2 参数配置	RPDO2 Parameter configuration
24.	RPDO3 参数配置	RPDO3 Parameter configuration
25.	RPDO4 参数配置	RPDO4 Parameter configuration
26.	TPDO1 参数配置	TPDO1 Parameter configuration
27.	TPDO2 参数配置	TPDO2 Parameter configuration
28.	TPDO3 参数配置	TPDO3 Parameter configuration
29.	TPDO4 参数配置	TPDO4 Parameter configuration
30.	驱动系统控制参数	Drive system control parameter
31.	电机复位控制	Motor reset control

Appendix I: Dictionary of CANOPEN Device Object

Index Index	Sub-Index Sub-index	Object Type Object Type	Name Name	Data Type Data Type	Attribute Attribute	PDO Map Mapping	Support PP	 PV
603F	**0**	**VAR**	**Error_Code**	**UINT16**	**RO**	**YES**	●	●
			Parameter Description: drive error code, please refer to Section 6.6.4 for relevant error explanation;					
6040	**0**	**VAR**	**Controlword**	**UINT16**	**RW**	**YES**	●	●
			Instruction Description: 0x0006: “Read to switch on” state; 0x0007: “switch on” state; 0x000F: “Operation enable” state, servo enable, motor power up; 0x0005: Exit servo enable, motor power off; 0x 0002: “QuickStop”, quick stop of the motor, motor power-on status; 0x010F: “Halt” state, motor power-on state 0x001F-> 0x000F: Absolute position delayed execution 0x003F-> 0x000F: Absolute position instant execution 0x005F-> 0x004F: Relative position delay execution 0x007F-> 0x004F: Relative position instant execution 0x800F: Start home operation 0x0080: Clear alarm messages					
6041	**0**	**VAR**	**Statusword**	**UINT16**	**RO**	**YES**	●	●
			Statusword Function Description: Bit0: Ready to switch on Bit1:Switch on Bit2:Operation enable Bit3:Fault Bit4:Volage enable Bit5:Reserve Bit6: Switch on disabled Bit7: Reserve Bit8: Reserve Bit9:Remote Bit10: Target reached Bit11: Internal limit active Bit12: Reserve Bit14: Battery alarm Bit15: Home attained (1) The Bit10 of statusword is an indication of location mode position status. If the location instruction is being executed, it means in the process of positioning: Bit10=0, positioning completed: Bit10=1. (2) The Bit15 of statusword is an indication of homing status. If the homing operation is being executed, it means in the process of homing: Bit15=0, homing completed: Bit15=1.					
605A	0	VAR	Quick_stop_option_Code	INT16	RW	NO	●	●
605B	0	VAR	Shutdown_option_Code	INT16	RW	NO	●	●
605C	0	VAR	Disable_operation_option_Code	INT16	RW	NO	●	●
605D	0	VAR	Stop_option_Code	INT16	RW	NO	●	●
605E	0	VAR	Fault_reaction_option_code	INT16	RW	NO	●	●
6060	**0**	**VAR**	**Modes_of_operation**	**INT8**	**RW**	**YES**	●	●

			Parameter Description: Control Mode Selection; 1-Position Mode, 3-Velocity mode, 4-Torque Mode, 7-Interpolation Mode, 8-Cyclic Synchronous Position, 9-Cyclic Synchronous Velocity, 10-Cyclic Synchronous Torque					
6061	**0**	**VAR**	**Modes_of_operation_display**	**INT8**	**RO**	**YES**	●	●
			Parameter Description: Control Mode Display; 1-Position Mode, 3-Velocity mode, 4-Current Mode, 7-Position Interpolation Mode, 8-Cyclic Synchronous Position, 9-Cyclic Synchronous Velocity, 10-Cyclic Synchronous Torque					
6071	**0**	**VAR**	**Target_torque**	**INT16**	**RW**	**YES**		
			Parameter Description: current mode, given current instruction; Unit: 0.01 A					
6073	**0**	**VAR**	**Max_Current**	**UINT16**	**RW**	**YES**	●	●
			Parameter Description: the maximum effective value of current output to the motor, no change in accordance with the default parameters of the motor output current; Unit: 0.01 a (rms current)					
6075	**0**	**VAR**	**Motor_rate_ current**	**UINT32**	**RW**	**YES**		
			Parameter Description: current instruction acceleration and deceleration; Unit: ms					
6078	**0**	**VAR**	**Current_actual_Value**	**INT16**	**RO**	**YES**		
			Parameter Description: current value of the motor output; Unit: 0.01 A					
6079	**0**	**VAR**	**DC_link_voltage**	**UINT32**	**RO**	**YES**	●	●
			Parameter Description: Bus Supply Voltage Value; Actual Voltage (V) = DC_link_voltage * 0.001 V					
606C	**0**	**VAR**	**Velocity_actual_value**	**INT32**	**RO**	**YES**	●	●
			Parameter Description: Feedback motor real-time speed; Actual speed = Velocity_actual_value (0.1 r/min)					
60FF	**0**	**VAR**	**Target_velocity**	**INT32**	**RW**	**YES**		●
			Parameter Description: PV Speed Instruction, unit: 0.1r/min					
607A	**0**	**VAR**	**Target_position**	**INT32**	**RW**	**YES**	●	
			Parameter Description: given PP position instruction, 32-bit signed number, 65536 represents 1 lap of the motor; For example: 0x18000 = 1.5 laps, 0xfffe8000 = -1.5 laps					
6081	**0**	**VAR**	**Profile_velocity**	**INT32**	**RW**	**YES**	●	
			Parameter Description: PP Velocity Command Unit: 0.1 r/min					
6083	**0**	**VAR**	**Profile_acceleration**	**UINT32**	**RW**	**YES**	●	●
			Parameter Description: PP/PV Acceleration Time Unit: ms/kpm					
6084	**0**	**VAR**	**Profile_ deceleration**	**UINT32**	**RW**	**YES**	●	●
			Parameter Description: PP/PV Deceleration Time Unit: ms/kpm					
6064	**0**	**VAR**	**Position_actual_Angle_value**	**INT32**	**RO**	**YES**	●	
			Parameter description: motor angle feedback, high 16bit for the number of laps, low 16bit for the angle within a lap; Example: 0x00018000 = 1 lap 180 degrees (1.5 laps)					
60FB	0	RECORD	Number_of_entries	UINT8	RO	NO		●
	1		Position_KP	UINT32	RW	YES		●

	2		**Position_actual_Turn_value**	**INT32**	**RO**	**YES**		
			Parameter Description: motor lap feedback, feedback of motor lap. Example: 6064=0x00008000; 60FB_2=0x00000001; Actual motor angle = 1.5 laps;					
	3		**slAbsAngle**	**INT32**	**RO**	**YES**		
			Parameter Description: motor real-time position feedback, 32bit signed number, high 16bit for the number of laps, low16bit for the angle of a lap					
	4		**RstStart**	**UINT8**	**RW**	**YES**		
			Parameter Description: 0-Reset off, 1-Reset on					
6098	**0**	**VAR**	**Homing method**	**INT8**	**RW**	**YES**		
			Parameter Description: 0-Reset function off, 1-35Reset mode 1-35					
6099	**0**	**VAR**	**Homing Speeds**	**UINT32**	**RW**	**YES**		
			Parameter Description: Reset speed setting, unit 0.1r/min					
607C	**0**	**VAR**	**Homing offset**	**INT32**	**RW**	**YES**		
			Parameter Description: Origin Offset, 65536 corresponds to a lap of the motor					
609A	**0**	**VAR**	**Homing acceleration**	**UINT32**	**RW**	**YES**		
			Parameter Description: Origin acceleration, unit ms					
60F9		RECORD	Velocity_control_parameter_Set					
	0		Number_of_entries	UINT8	RO	NO		
	1		Velocity_control_parameter _Set_Gain	UINT16	RW	YES		
	2		Velocity_control_parameter_set_TI _V_integration_time_constant	UINT16	RW	YES		
	3		**Velocity_acceleration**	**UINT16**	**RW**	**YES**		
			Parameter Description: Speed instruction acceleration time is equal to 0x6083, unit: ms/kpm					
	4		**Velocity_ deceleration**	**UINT16**	**RW**	**YES**		
			Parameter Description: Speed Instruction deceleration time is equal to 0x6084, unit: ms/kpm					
60C0	0	VAR	Interpolation_sub_mode	INT16	RW	NO		
60C1		**VAR**	Interpolation_data_recoder					
	0		Number_of_entries	UINT8	RO	NO		
	1		**Interpolation_target_position**	**INT32**	**RW**	**YES**		
			Parameter Description: position interpolation mode, given PP position instruction, 32-bit signed number, 65536 represents 1 lap of the motor; For example: 0x18000 = 1.5 laps, 0xfffe8000 = -1.5 laps;					
	2		Interpolation_target_velocity	INT32	RW	YES		
60C2		**VAR**	Interpolation_time_period					
	0		Number_of_entries	UINT8	RO	NO		
	1		**Interpolation_time_unit**	**INT8**	**RW**	**YES**		
			Parameter Description: Interpolation time; Unit: ms					
	2		Interpolation_time_index	INT8	RW	NO		
60C4		**VAR**	Interpolation_data_configuration					
	0		Number_of_entries	UINT8	RO	NO		
	1		Interpolation_max_buffer_size	INT32	RO	NO		
	2		Interpolation_actual_buffer_size	INT32	RW	NO		
	3		Interpolation_buffer_org	INT8	RW	NO		
	4		Interpolation_buffer_position	INT16	RW	YES		
	5		Interpolation_recoder_size	INT8	RW	NO		
	6		Interpolation_buffer_clear	INT8	WO	NO		
60B0	**0**	**VAR**	**Position_offset**	**INT32**	**RW**	**YES**		

			Parameter Description: Cyclic Synchronous Mode Position Offset					
60B1	0	**VAR**	**Velocity_offset**	**INT32**	**RW**	**YES**		
			Parameter Description: Cyclic Synchronous Mode Speed Offset, unit: 0.1 rpm					
60B2	**0**	**VAR**	**Torque_offset**	**INT16**	**RW**	**YES**		
			Parameter Description: Cyclic Synchronous Mode Torque Offset, unit: 0.01 A					
6000		ARRAY	Digtal_Input	UINT32	RO	YES	●	●
	0		Number of Input	UINT8	RO	YES	●	●
	1		**Read Input 1h to 8h State**	**UINT8**	RW	YES	●	●
			Parameter Description: ParameterBit0-Bit3 = DI0-DI3 input status, default value (0xBF); Bit0: Servo Enable State Bit1: Positive Limit State Bit2: Alarm State Bit3: Negative Limit State					
6200		ARRAY	Write Output 8 Bit		RW		●	●
	0		Number of Ouput	UINT8			●	●
	1		Write Output 1h to 8h	UINT8			●	●
	2		Write Output 9h to 16h	UINT8			●	●
6401		ARRAY	Read Analogue Input		RO		●	●
	0		Number of Analogue Input	UINT8			●	●
	1		Analogue Input 1h	UINT16			●	●
	2		Analogue Input 2h	UINT16			●	●
1008	**0**	RECORD	Manufacturer device name	**UINT32**	**RW**	**NO**		
			Parameter Description: Manufacturer ID, return value is “TYA”					
1009	**0**	RECORD	Manufacturer Hardware name	**UINT32**	**RW**	**NO**		
			Parameter Description: Hardware ID, return value is “IXL”					
100A	**0**	RECORD	Manufacturer Software version	**UINT32**	**RW**	**NO**		
			Parameter Description: Software ID, return value is “C09”					
100C	**0**	RECORD	Guard Time	**UINT16**	**RW**	**NO**		
			Parameter Description: Monitoring Time: unit: ms					
100D	**0**	RECORD	Life Time factor	**UINT8**	**RW**	**NO**		
			Parameter Description: Life Time Factor					
1017	**0**	RECORD	Producer Heartbeat Time	**UINT16**	**RW**	**NO**		
			Parameter Description: Set the heartbeat sending cycle, unit: ms					
1400 ~ 1403	0	RECORD	Number of entries	UINT8	RW	NO		
			Parameter Description: Number of indexes, initial value is 2					
	1	RECORD	COB-ID used by RPDO	UINT32	RW	NO		
			arameter Description: 0x1400h: Setting RPDO1 0x0200 0x1401h: Setting RPDO2 0x0300 0x1402h: Setting RPDO3 0x0400 0x1403h: Setting RPDO4 0x0500					
	2	RECORD	Transmission type	UINT8	RW	NO		
			Parameter Description: Transmission Type, initial value is 255					
1800 ~	0	RECORD	Number of entries	UINT8	RW	NO		
			Parameter Description: Number of indexes, initial value is 4					
	1	RECORD	COB-ID used by TPDO	UINT32	RW	NO		
			arameter Description: 0x1800h: Setting TPDO1 0x0180 0x1801h: Setting TPDO2 0x0280 0x1802h: Setting TPDO3 0x0380 0x1803h: Setting TPDO4 0x0480					

1803	2	RECORD	Transmission type	UINT8	RW	NO		
			Parameter Description: Transmission Type, initial value is 255					
	3	RECORD	Inhibit time	UINT16	RW	NO		
			Parameter Description: Inhibit Time, 0-No Inhibit Time, Unit: 100us					
	5	RECORD	Event time	UINT16	RW	NO		
			Parameter Description: Event Time, 0-Not Used, Unit: ms					
1600 ~ 1603	0	RECORD	Number of mapped entries	UINT8	RW	NO		
	1-8	RECORD	RPDO Mapping 1-8	UINT32	RW	NO		
			arameter Description: 0x1600h: Setting RPDO1 0x1601h: Setting RPDO2 0x1602h: Setting RPDO3 0x1603h: Setting RPDO4					
1A00 ~ 1A03	0	RECORD	Number of mapped entries	UINT8	RW	NO		
	1-8	RECORD	TPDO Mapping 1-8	UINT32	RW	NO		
			arameter Description: 0x1A00h: Setting TPDO1 0x1A01h: Setting TPDO2 0x1A02h: Setting TPDO3 0x1A03h: Setting TPDO4					
2300	0	RECORD	Temperature	UINT	R	YES		
			Parameter Description: Driver Temperature					
2301	0	RECORD	MotoTemp	UINT	R	YES		
			Parameter Description: Motor Temperature					

Appendix II: MODBUS Common Communication Data Address

Common Servo Drive Control Parameter Description

Address	Parameter Name	Function description	Data Length	Remarks
Motor Basic Settings of Parameter				
0x42EB	sysPRM.sMotor.uwMotoType	Motor Type	16 bits	0 Servo Motor (PMSM) Brushless Motor 2 DC brushed motor
0x42E2	sysPRM.sMotor.uwRecoderSelect	Selected by the encoder	16 bits	1 Incremental + HULL encoder 2 Incremental 4 SSI absolute encoder 8 BISS-C absolute encoder 16 BISS-B absolute encoder 32 NRZ absolute encoder
0x42EA	sysPRM.sMotor.uwRecLineNum	Encoder line counts	16 bits	Encoder resolution
0x42F1	sysPRM.sMotor.uwAbsRecTurnNum	Digit of number of circles in the absolute encoder	16 bits	Digit of number of circles in the absolute encoder

0x42F2	sysPRM.sMotor.uwAbsRecAngleNum	Angle digit of the absolute encoder	16 bits	Angle digit of the absolute encoder
0x42E5	sysPRM.sMotor.uwNomCurrent	Rated current	16 bits	RMS current, unit: 0.1 A
0x42E3	sysPRM.sMotor.swMotorLoadMax	Overload multiple	16 bits	Percentage of the rated current
0x42E8	sysPRM.sMotor.swNomSpeed	Rated speed	16 bits	Unit: 0.1 PRM
Motor Electric Parameter				
0x42E0	sysPRM.sMotor.uwPoleNumbers	Number of motor pole pairs	16 bits	Number of motor poles/2
0x42E1	sysPRM.sMotor.uwPhaseOffset	Electric angle offset	16 bits	65536=360°
0x42EC	sysPRM.sMotor. uwRotorInertia	Motor rotor inertia	16 bits	Unit: 0.01 kg/cm
0x42ED	sysPRM.sMotor.uwMotoKv	Back electromotive force constant	16 bits	Unit: 0.1 V/Krpm
0x42EE	sysPRM.sMotor.uwMotoLs	Wire inductance	16 bits	Unit: 0.01 mH
0x42EF	sysPRM.sMotor.uwMotoRs	Wire resistance	16 bits	Unit: 0.1 r
0x42F0	sysPRM.sMotor.uwMotoTs	Electromagnetic time constant	16 bits	Unit: 0.1 ms
Motor self-learning Parameter				
0x4312	sMotoSchPRM.uwSchStart	Enable self-learning	16 bits	0 OFF 1 ON
0x4313	sMotoSchPRM.uwParaSaveToUse	Write in parameters	16 bits	0 OFF 1 ON
0x4314	sMotoSchPRM.ulSchOffsetAngle	Encoder offset angle	32bits	Unit: Degree
0x4315	sMotoSchPRM.uwSchPoleNum	Number of motor pole pairs	16 bits	Number of motor poles/2
0x431E	sysPRM.sMotoSch.uwEncoderDir	Encoder direction	16 bits	Current wiring encoder direction
0x4318	sysPRM.sMotoSch.uwHULL30	Hall value of 30 degrees	16 bits	Hall signals identified under corresponding motor electrical angles are related to the wiring modes
0x4319	sysPRM.sMotoSch.uwHULL90	Hall value of 90 degrees	16 bits	
0x431A	sysPRM.sMotoSch.uwHULL150	Hall value of 150 degrees	16 bits	
0x431B	sysPRM.sMotoSch.uwHULL210	Hall value of 210 degrees	16 bits	
0x431C	sysPRM.sMotoSch.uwHULL270	Hall value of 270 degrees	16 bits	
0x431D	sysPRM.sMotoSch.uwHULL330	Hall value of 330 degrees	16 bits	
Motor Rotation Direction Parameter				
0x466D	sysWKS.uwMotoRotDir	Motor	16 bits	0 Viewed from the load side of

		Rotation Direction		motor, the CCW direction is forward rotation. (Standard setting) 1 Viewed from the load side of motor, the CW direction is forward rotation. (Reverse rotation mode)
Motor Limit Mode Parameter				
0x439E	sysWKS.uwStopPosMode	Options of the limit mode	16 bits	0 Add up subsequent instructions when encountering positive or negative limits, and the subsequent instructions are valid; 1 Shield subsequent instructions when encountering positive or negative limits, and the subsequent instructions are invalid; 2 Shield subsequent instructions when encountering positive or negative limits, and the subsequent instructions are valid;
Motor Output Torque Limit Parameter				
0x42E3	sysPRM.sMotor.swMotorLoadMax	Positive output torque limit	16 bits	Motpr torque output limit: 0-300%
0x42E4	sysPRM.sMotor.swMotorLoadMin	Negative output torque limit	16 bits	Motpr torque output limit: 0-300%
Motpr Overload Protection Parameter				
0x4306	stOverLoad.uw25OverTqTime	2.5 times overload time	16 bits	Overload 2.5 times protection time, unit: 10ms
0x4305	stOverLoad.uw20OverTqTime	2.0 times overload time	16 bits	Overload 2.0 times protection time, unit: 10ms
0x4304	stOverLoad.uw15OverTqTime	1.5 times overload time	16 bits	Overload 1.5 times protection time, unit: 10ms
0x4303	stOverLoad.uw12OverTqTime	1.2 times overload time	16 bits	Overload 1.2 times protection time, unit: 10ms
0x4302	stOverLoad.uw11OverTqTime	1.1 times overload time	16 bits	Overload 1.1 times protection time, unit: 10ms
0x4307	stOverLoad.uwOverCurOutRatio	Overload current-limiting ratio	16 bits	Motor current-limiting ratio
0x4308	stOverLoad.uwOverLoadProtectEN	Overload protection enabled	16 bits	0 function off 1 function on
Control Mode Selection Parameter				
0x465A	sysWKS.swCntrlMode	Selection of System Control Mode	16 bits	1 standard torque mode; 2 standard velocity mode; 3 standard position mode;

Position Instruction Parameter				
0x4394	sysWKS.swPositionRefMode	Position Instruction Given mode	16 bits	0 pulse given 1 bus speed given 2 internal parameter (position contact control) 3 bus control given
0x439C	sysWKS.uwGearA	Electronic gear A	16 bits	Denominator
0x439D	sysWKS.uwGearB	Electronic gear B	16 bits	Molecular
0x4397	sysWKS. uwPosFiltime	Time constant of primary filtering of position instruction	16 bits	Unit: ms
0x433C	stPosition.slPosErrMax	Position out-of-toleranc e threshold	32bits	Position out-of-tolerance threshold, when the position following error exceeds the setting, report the position following error
0x43AC	stStdPosition.uwPosMinInPlace	Position-in-pla ce threshold	16 bits	The minimum deviation of position in place, the position error is less than the setting, set position in-place logo
Position contact control parameter				
0x43BC	sysPRM.Inside_PosOrder.uwPosOrd Mod	Select the step change signal	16 bits	0: Delayed step change 1: Relative position signal step change 2: Absolute position signal step change
0x43BD	sysPRM.Inside_PosOrder.uwCycOpe Mod	Selection of cycle operation	16 bits	0: Multi-point cycle operation 1: Multi-point single operation
0x43BE	sysPRM.Inside_PosOrder.uwProStep Num	Step instructions in step-changing mode	16 bits	Command 0-3 group number selection
0x43BF	sysWKS.Inside_PosOrder.uwStepSta rt	Activate contact control;	16 bits	2: Activate instant update 1: Activate delayed update 0: End of update
0x43C0	sysWKS.Inside_PosOrder.uwStepOv er;	ending mark of executing the instruction	16 bits	1: This loop is over 0: Running Automatically reset when activating control
0x43C1	SysPRM.Inside_PosOrder.uwStepClr	Write 1 to clear internal remaining instructions;	16 bits	Automatically reset after clearing;
0x43C6	stInSpaSpdOrder.slPusNumZro	Displacement equivalent to 0	32bits	Position instructions in segment 0;

				High 16 bits: number of laps Low 16 bits: pulse of one lap
0x43C7	stInSpaSpdOrder.slPusNumOne	Displacement equivalent to 1	32bits	Position instructions in segment 1;
0x43C8	stInSpaSpdOrder.slPusNumTwo	Displacement equivalent to 2	32bits	Position instructions in segment 2;
0x43C9	stInSpaSpdOrder.slPusNumThr	Displacement equivalent to 3	32bits	Position instructions in segment 3;
0x43D0	stInSpaSpdOrder.slSpeedZro	Velocity when the displacement is 0	32bits	Displacement 0 speed instruction, unit: 0.1 rpm
0x43D1	stInSpaSpdOrder.slSpeedOne	Velocity when the displacement is 1	32bits	Displacement 1 speed instruction, unit: 0.1 rpm
0x43D2	stInSpaSpdOrder.slSpeedTwo	Velocity when the displacement is 2	32bits	Displacement 2 speed instruction, unit: 0.1 rpm
0x43D3	stInSpaSpdOrder.slSpeedThr	Velocity when the displacement is 3	32bits	Displacement 3 speed instruction, unit: 0.1 rpm
0x43DA	stInSpaSpdOrder.swFiltimeZro	Displacement 0 smoothing time	16 bits	Displacement 0 acceleration and deceleration time, Unit: ms/kpm
0x43DB	stInSpaSpdOrder.swFiltimeOne	Displacement 1 smoothing time	16 bits	Displacement 1 acceleration and deceleration time, Unit: ms/kpm
0x43DC	stInSpaSpdOrder.swFiltimeTwo	Displacement 2 smoothing time	16 bits	Displacement 2 acceleration and deceleration time, Unit: ms/kpm
0x43DD	stInSpaSpdOrder.swFiltimeThr	Displacement 3 smoothing time	16 bits	Displacement 3 acceleration and deceleration time, Unit: ms/kpm
0x43E4	stInSpaSpdOrder.uwStoptimeZro	Stop time when the displacement is 0	16 bits	Stop time when the displacement is 0 segments (unit: 50ms)
0x43E5	stInSpaSpdOrder.uwStoptimeOne	Stop time when the displacement is 1	16 bits	Stop time when the displacement is 1 segment (unit: 50ms)
0x43E6	stInSpaSpdOrder.uwStoptimeTwo	Stop time when the displacement is 2	16 bits	Stop time when the displacement is 2 segments (unit: 50ms)
0x43E7	stInSpaSpdOrder.uwStoptimeThr	Stop time	16 bits	Stop time when the displacement

		when the displacement is 3		is 3 segments (unit: 50ms)
Profiled position parameter				
0x43A8	stStdPosition.uwKp	Forward coefficient of position gains	16 bits	Position KP value
0x43AA	stStdPosition. uwFrdKp	Velocity feed-forward gain coefficient	16 bits	Velocity feed-forward gain
0x43AB	stStdPosition. uwFrdFileTime	Velocity feed-forward filtering time	16 bits	Velocity feed-forward filtering time
0x43AE	stStdPosition.slSpeedOffset	Speed offset	32bits	Unit: 0.1 r/min
Speed instruction parameter				
0x4402	sysWKS.swSpeedRefMode	Speed given mode selection	16 bits	1 Pulse frequency given 2 Analog given mode 1 3 Variable internal parameter given 4 Fixed internal parameter given 5 Analog given mode 2
0x4420	stInSpdOrder.slFixSpeed	Fixed speed	32bits	Fixed internal parameter given instruction, unit: 0.1 r/min
0x43F9	StPI_CntrLoop. slRampUpFileTime	Acceleration time	32bits	Trapezoidal acceleration time, unit: ms
0x440D	StPI_CntrLoop. slRampDnFileTime	Deceleration time	32bits	Trapezoidal deceleration time, unit: ms
0x4412	StPI_CntrLoop. uwRefFileTime	S-shaped acceleration and deceleration time	16 bits	Unit: ms
0x4413	StPI_CntrLoop. uwFbkFileTime	Velocity detected filter coefficient	16 bits	Unit: ms
Profiled velocity modulation parameter				
0x443E	sysPRM.sSpdCntl.sl0thKP	Zero speed KP	32bits	Stop segment KP
0x443F	sysPRM.sSpdCntl.uw0thKI	Zero speed KI	16 bits	Stop segment KI
0x4421	sysPRM.sSpdCntl.sl1thKP	First speed KP	32bits	Low speed KP
0x4422	sysPRM.sSpdCntl.uw1thKI	First speed KI	16 bits	Low speed KI
0x4423	sysPRM.sSpdCntl.sl2thKP	Second speed KP	32bits	High speed KP
0x4424	sysPRM.sSpdCntl.uw2thKI	Second speed KI	16 bits	High speed KI
0x4425	sysPRM.sSpdCntl.uwKvfr	PDFF factor	16 bits	
0x4426	sysPRM.sSpdCntl.uwFrdKp	Current feed-forward	16 bits	Current feedforward KP value
0x4427	sysPRM.sSpdCntl.uwFrdFileTime	Current	16 bits	Current feed-forward filtering

		feed-forward filtering time		time
0x4440	uwChg0thPIWaitTime	Zero-speed PI switching time	16 bits	Waiting time for switching to zero-speed
0x4441	uwChg1thPISpeed	PI switching speed of the first segment	16 bits	1/2 segment PI value switching speed threshold
Analog setting parameter				
0x4404	sysWKS.uw10VAdcSpdNum	Velocity value	16 bits	10V analog voltage Speed instruction value, unit: rpm
0x4526	sysPRM.sAngPar.swAngOneZeroDrift	Zero drift value	16 bits	Analog 1 zero shift, unit: 10mV
0x4525	sysPRM.sAngPar.swAngOneSetOff	Offset value	16 bits	Analog 1 offset, unit: 10mV
0x4527	sysPRM.sAngPar.swAngOneDeadTime	Dead band value	16 bits	Analog 1 dead zone, unit: 10mV
0x4529	sysPRM.sAngPar.swAngTwoZeroDrift	Zero drift value	16 bits	Analog 2 zero shift, unit: 10mV
0x4528	sysPRM.sAngPar.swAngTwoSetOff	Offset value	16 bits	Analog 2 offset, unit: 10mV
0x452A	sysPRM.sAngPar.swAngTwoDeadTime	Dead band value	16 bits	Analog 2 dead zone, unit: 10mV
0x4653	sysWKS.swAngOneValue	AI1	16 bits	Analog 1 input value
0x4654	sysWKS.swAngTwoValue	AI2	16 bits	Analog 2 input value
DROOP (Droop) control function parameter				
0x43FB	StPI_CntrLoop. uwDroopRate	Droop gain	16 bits	Unit: %
0x43FC	StPI_CntrLoop. uwDroopFileTime	DROOP filtering time	16 bits	Unit: ms
Profiled current parameter				
0x445F	sysWKS.uwCurrentRefMode	Current given mode selection	16 bits	0 Analog given 1 Bus mode given
0x445E	sysWKS.swIqRef2Use	Torque instruction given	16 bits	Unit: 0.01 A
0x4460	sysWKS.uwCurFiltime	Torque instruction filter coefficient	16 bits	Unit: ms
0x4466	sysWKS.mcCurUCntlParam.KPGain	Q-axis current KP	16 bits	Range: 10-10000
0x4467	sysWKS.mcCurUCntlParam.KIGain	Q-axis current KI	16 bits	Range: 0-1000
0x4464	sysWKS.mcCurUCntlParam.KDGain	Q-axis current KD	16 bits	Range: 0-100
0x4468	sysWKS.mcCurVCntlParam.KPGain	D-axis current KP	16 bits	Range: 10-10000
0x4469	sysWKS.mcCurVCntlParam.KIGain	D-axis current KI	16 bits	Range: 0-1000
0x4465	sysWKS.mcCurVCntlParam.KDGain	D-axis current KD	16 bits	Range: 0-100
Motor home operation parameter				

0x448E	SelfSofRst.uwRstMode	Home	16 bits	0-37
0x448F	SelfSofRst.uwRstStart	Start homing	16 bits	0 - Disable the homing operation 1-Boot-Up
0x4490	SelfSofRst.uwRstEnd	Homing process	16 bits	0 - Homing process 1 - End of homing
0x4491	SelfSofRst.uwRstErr	Homing error	16 bits	0 - Normal homing 1 - Homing error
0x4492	SelfSofRst.uwRstStarSpd	Homing speed	16 bits	0-10000 (0.1 rpm)
0x4494	SelfSofRst.uwSpdFilTime	Homing acceleration	16 bits	0-10000 (ms)
0x4495	SelfSofRst.slHomeOffset	Homing offset	16 bits	0-0x1fffffff
MODBUS communication parameter				
0x4670	sysPRM.uwMbusBaudRate	Communication baud rate	16 bits	9600/19200/38400
0x466C	sysPRM.uwMbusStaAdd	Communication address	16 bits	0-127
CANOPEN configuration parameter				
0x4670	can_Para_CHANGED.BAUDRATE	CAN communication baud rate	16 bits	0—1Mbps 1—800Kbps 2—500Kbps 3—250Kbps 4—125Kbps
0x466C	can_Para_CHANGED.NODE_ID	CAN communication address	16 bits	1-127
0x4674	can_Para_CHANGED.Change_PDO_Times	PDO communication cycle	16 bits	10-100 (ms)
0x4674	can_Para_CHANGED.CANEnable	set CANOPEN to be valid	16 bits	
System state and motor feedback parameter				
0x465D	sysWKS.ulSystemFlagBits	System status display	32bits	Bit29: 1=Battery alarm NRZ encoder battery alarm Bit28: 1=Battery error NRZ encoder battery error Bit21: 1=CAN absolute instruction instant update enabled; Bit20: 1 = bus control enabled; Bit19: 1 = Watchdog timer reset; Bit17: 1=Parameter save; Bit16: 1 = Software parameter recovery; Bit15: 1 = Restore default setting; Bit3: 1 = Command zero-speed detection mark Bit2: 1 = Zero-speed detection mark

				Bit1: 1 = Speed arrival mark Bit0: 1 = Position/velocity arrival mark
0x4651	sysWKS.uwDigitalInputs	IO input signal Servo control signal	16 bits	Bit0: Servo ON input Bit1: Position positive direction prohibited Bit2: Alarm clearing signal Bit3: Position negative direction prohibited Bit4: Origin signal input
0x466E	sysWKS.ulSystemErrorBits	System error alarm mark	32bits	Error code please refer to the instruction manual
0x426B	sysWKS.sBridge.uwDCBusValue	Bus voltage	16 bits	Power supply voltage value Actual Voltage = DCUS*10/256 (V)
0x4673	sysPRM.uwCntlModeChg	Mode switching	16 bits	0 Close mode switching 1 position <-> velocity 2 position <-> torque 3 velocity <-> torque
0x426A	sysWKS.sBridge.swBRGTemp	Drive temperature	16 bits	Unit: 0.1 ℃
0x465C	sysWKS.swPWMOutputState	Motor power-up state	16 bits	0 Motor off 1 Motor power-up
0x4657	Servo_ON	Servo enable	16 bits	
Motor feedback parameter				
0x42FD	SysPRM.sMotor.slAbsAngle	Absolute motor angle	32bits	High 16-bit number of laps, low 16-bit angle
0x42FE	SysWKS.sAbsEnc.sqMechAbsPos.h0	Relative motor angle	32bits	Motor angle value, 0Xffffffff=360 °
0x42FF	SysWKS.sAbsEnc.sqMechAbsPos.hi	Relative motor laps	32bits	Motor lap value
0x42D1	SysWKS.sMotor.slAvgMotSpeed	Motor actual rotational speed	32bits	Unit: 0.1 r/min
0x42D2	sysWKS.sMotor.uwHullState	Motor hall signal	16 bits	Bit0-2 corresponds to Hall UVW
0x42D3	sysWKS.swMotoCurBek	Motor effective current	16 bits	Unit: 0.01 A
Commonly-used read-only data continuous address (after program version: IXL-II-CODE_20220615, others all have continuous reading function)				
0x5A3C	UlsystemErrorBitsLo	Error code low 16 bits	16 bits	Error code can be viewed in Chapter 5
0x5A3D	ulsystemErrorBitsHi	Error code high 16 bits	16 bits	
0x5A3E	slAbsAngleLo	Absolute position low 16 bits	16 bits	Motor angle value, 0Xffffffff=360 °
0x5A3F	slAbsAngleHi	Absolute	16 bits	Motor Laps

		position high 16 bits		
0x5A40	slAvgMotorspeedLo	Motor rotational speed feedback low 16 Bits	16 bits	Motor rotational speed unit 0.1 RPM
0x5A41	slAvgMotorspeedHi	Motor rotational speed feedback high 16 Bits	16 bits	
0x5A42	uwDigitalInputs	Motor current feedback	16 bits	Motor current unit 0.01 A
0x5A43	swMotorCurBek	Digital signal input	16 bits	
0x5A44	uwRstend	Home completion	16 bits	0 - Homing process 1 - End of homing
0x5A45	uwRsterr	Homing error	16 bits	0 - Normal homing 1 - Homing error
0x5A46	swTempValue	Drive temperature	16 bits	Unit: 0.1 ℃
0x5A47	swDcbusValueRead	Bus voltage	16 bits	Power supply voltage value = rounded (actual voltage)
Commonly-used writing data continuous address (after program version: IXL-II-CODE_20230203, others all have continuous writing function)				
0x5AA0	sysWKS.swCntrlMode	Selection of System Control Mode	16 bits	1 Standard Torque Mode 2 Standard Velocity Mode 3 Standard Position Mode
0x5AA1	Servo ON	Servo enable	16 bits	
0x5AA2	Err CLr	Error Clearing	16 bits	
0x5AA3	stlnSpdOrder.slFixSpeed	Velocity loop velocity Low 16 bits	16 bits	Fixed internal parameter given instruction, unit 0.1 r/min
0x5AA4	stlnSpdOrder.slFixSpeed	Velocity loop velocity High 16 bits	16 bits	
0x5AA5	SelfSofRst.uwRstStart	Start homing	16 bits	0-Close home 1 - Enable the homing operation
0x5AA6	stlnSpaSpdOrder.slSpeedZro	Displacement 0 Velocity low 16 bits	16 bits	Displacement 0 speed instruction, unit 0.1rpm
0x5AA7	stlnSpaSpdOrder.slSpeedZro	Displacement 0 velocity high 16 Bits	16 bits	
0x5AA8	stlnSpaSpdOrder.slPusNumZro	Displacement 0 equivalent low 16 bits	16 bits	Position instruction in segment 0; High 16 digits: Number of laps Low 16 bits: Pulse of one lap
0x5AA9	stlnSpaSpdOrder.slPusNumZro	Displacement 0 equivalent	16 bits	

		high 16 bits		
0x5AAA	sysWKs.Inside PosOrder.uwStepstart	Activate contact control	16 bits	2: Activate instant update 1: Activate delayed update 0: End of update

Appendix 3: Brake Resistance Wiring and Selection

The energy generated by the servo motor in the braking state will be fed back to the drive DC bus. When the DC bus voltage value exceeds the protection range, the drive will report that overvoltage fault. At this time, excessive energy needs to be consumed by an external braking resistor. The resistance value of the optional braking resistor shall not be lower than the recommended resistance value. Connect the braking resistor through RB + and RB-at the power end. And correctly set the starting voltage of the regenerative resistor (it is recommended to set 62V and read-in 1600 for the 48V bus drive, and set 82V and read-in 2100 for the 72V bus drive). (IxL-II 150300 drive does not have a brake port. To add a brake resistance, you need to add it in other drives.)

Driver Model	Brake resistance type	Braking resistance value (Ω)	Brake resistance power (W)	Brake resistance withstand voltage (VDC) (minimum)
IxL-II 1020	T-3R-300	3	300	500
IxL-II 2040	T-3R-300	3	300	500
IxL-II 3060	T-3R-300	3	300	500
IxL-II 4080	T-3R-300	3	300	500
IxL-II 50100	T-5R-400	5	400	500
IxL-II 80160	T-5R-400	5	400	500
IxL-II 100200	T-5R-400	5	400	500

No.	Chinese	English
1.	通信	Communication

2.	参数	Parameter
3.	电机设置	Motor settings
4.	试运行	Trial operation
5.	状态监测	Condition monitoring
6.	示波器	Oscilloscope
7.	地址	Address
8.	参数名	Parameter name
9.	值类型	Value type
10.	计算值	Calculated value
11.	原始值	Original value
12.	最小值	Minimum
13.	最大值	Maximum
14.	单位	Unit
15.	功能描述	Function description
16.	电机与驱动参数	Motor and the driver parameters
17.	驱动状态监测	Driver condition monitoring
18.	电机状态监测	Motor condition monitoring
19.	电机过载设置	Motor overload settings
20.	电机与负载设置	Motor and load settings
21.	编码器反馈设置	Encoder feedback settings
22.	电机自学习功能	Motor self-learning function
23.	位置控制模式	Profiled position mode
24.	位置控制参数	Profiled position parameter
25.	位置接点控制参数	Position contact control parameter
26.	速度控制模式	Profiled velocity mode
27.	力矩控制模式	Profiled torque mode
28.	I/O 控制	I/O control
29.	CANopen 参数配置	CANopen Parameter Configuration
30.	驱动系统控制参数	Drive system control parameter
31.	电机复位控制	Motor reset control
32.	监控参数	Monitor Parameter