VEICHI

Manual

SD810 Series Servo Drive

Preface

Thank you for purchasing SD810 series standard servo multidrive product designed and manufactured by our company.

This high-performance servo drive developed by VEICHI Electric adopts a series of advanced motor control algorithms and a 24-bit precise encoder, featuring high control accuracy, fast tracking response and easy debugging for various demands of middle-end and high-end general-purpose servo applications. Moreover, it has built-in rich function extensions which provides reliable and cost-effective solutions for machine tools, electronic equipment, robotics, textiles, packaging and other applications.

This manual covers safety precautions, installation and wiring, a brief list of function codes, explanations of fault codes and countermeasures, and descriptions of monitoring parameters, etc. For detailed function notes and application descriptions, please refer to the manuals of SD810 series products or consult our company. If there are any problems or special requirements in the process of use, please feel free to contact with our office or distributor, or directly with our customer service center.

We are always committed to the continuous improvement of our products, therefore, please note that the information related to this series is subject to change without prior notice. And we are sorry for any inconvenience that may cause.

Version Change Log

Date	Version	Content
2026.03	V1.0	First version released

Catalog

1 Safety Precaution

To ensure safe and proper use of this product, please fully understand the safety precautions outlined in this manual before using.

Operator Qualification

This product must be installed operated and maintained by trained professionals. "Trained professionals" means that the personnel working on this product must be trained with specialized skills and knowledge about installation, wiring, operation and maintenance of the equipment, so they can respond correctly to various emergencies that may arise during use.

Safety Guide

The safety rules and warning signs presented to prevent personal injuries and damages to the products and the associated systems. Please read this manual carefully before use and strictly follow the safety guidelines and warning signs in this manual.

- Handle and perform maintenance correctly during transportation, storage, installation for the safe operation of the servo drive. Protect the AC drive from shocks and vibrations during transportation and storage, and store it in a dry environment free of corrosive gases and conductive dust below 70℃.
- This product is equipped with hazardous voltage to control potentially dangerous motion mechanisms. Failure to observe the regulations or this manual may lead to damages to the products and associated systems, or even personal injuries and death.
- Do not perform wiring work while the power is on, as there is a risk of death by electric shock. Before performing wiring, inspection, maintenance, etc., disconnect the power supply to all associated equipment and make sure that the DC voltage in the main circuit has dropped to a safe level for 15 minutes.
- Connect the power cable, motor cable, and control cable all tight, and make sure the grounding terminal is well connected with a grounding resistance of lower than 10Ω.
- Human static electricity can seriously damage internal sensitive devices. Before performing related work, observe the measures and methods specified in the electrostatic discharge prevention measures(ESD), otherwise the servo drive may be damaged.
- Remove the installed power factor improvement capacitors, lightning protection varistors or other devices on the output side of the drive, or move them to the input side due to the pulse waveform output voltage of the servo drive.
- Do not add switching devices such as circuit breakers and contactors to the output end of the servo drive. (If it is necessary to connect switching devices to the output side, please ensure that the output current of the servo drive is zero when the switch is on or off.)
- Failure of the control device could lead to production halt and significant accidents. Therefore, take necessary external protective measures or add backup devices.
- This product is intended for the specified purposes. Unauthorized applications in such as emergency, rescue, marine, medical, aviation, or facility-related settings are seriously prohibited.
- Maintenance of this product can only be carried out by the company or by professionals authorized and licensed by the company. Unauthorized modification or use of accessories not approved by the company may result in product failure. Any defective devices during maintenance must be replaced in a timely manner.

2 Product Information

2.1 Nameplate Description and Naming Rules

Nameplate Description

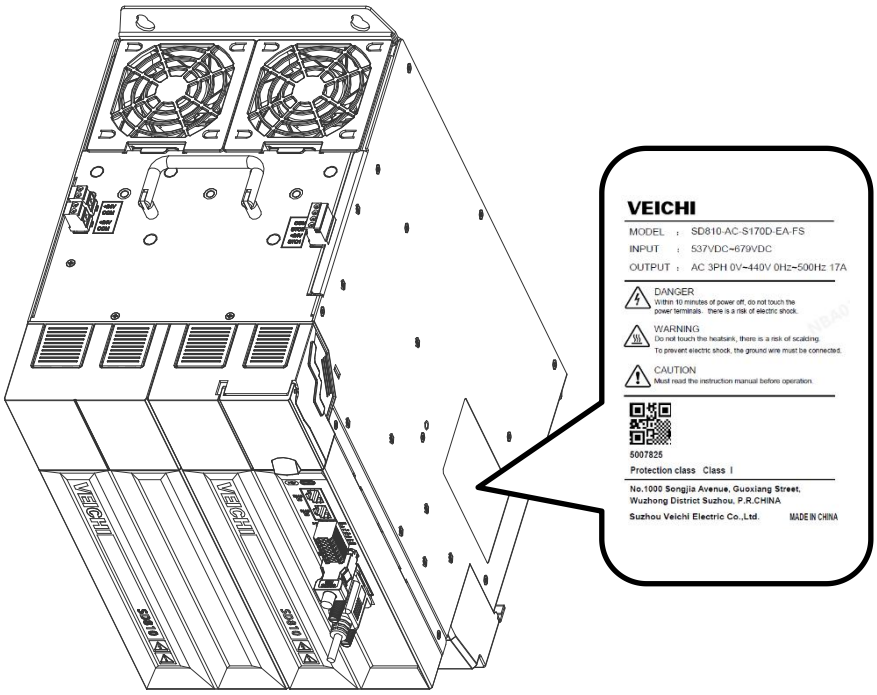


Figure 2-1 SD810 V3S Basic Inverter Module Nameplate

Naming Rules

Inverter module naming rules: product type - product series - current level

SD 810 — AC — S 3R8 D — E A — FS

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① **Product type**

SD	Servo drive

② **Product series**

810	810 multidrive

③ **Module type**

AC	Inverter unit

④ **Axis number**

S	Single
D	Dual

⑤ **Rated current (380V)**

3R8	3.8A	550	55A
6R0	6.0A	700	70A
8R4	8.4A	800	80A
110	11A	121	120A
170	17A	151	150A
240	24A	241	240A
300	30A	281	280A
400	40A		

⑥ **Input voltage**

D	540V DC

⑦ **Command type**

E	Ethercat

⑧ **1st encoder type**

A	Absolute encoder
B	BISS encoder
R	Resolver

⑨ **Safety Function**

FS	With STO
Empty	W/O STO

2.2 Model Specification

Table 2-1 Module description

Structure	Rectifier Model	Rated Power (kW)	Power Capacity (kVA)	Input Current AC (A)	Output Current DC (A)	Outer Dimension (mm)			Wright (kg)
						W	H	D	
V1S	AC810-D10-T3-0056	22	45	49	56	50	350	305	5.3
V2S	AC810-D10-T3-0110	45	81	96	110	100	350	305	9.6

V3S	AC810-D10-T3-0240	110	179	196	240	200	350	305	19.5
V4S	AC810-D10-T3-0358	160	243	292	358	300	350	305	28.5

Table 2-2 AC Fuse Specification

Model	Input Current(A)	Fuse		
		Model(BUSSMANN)	Code	Qty
AC810-D10-T3-0056-XXXX	49	FWH-100B	100A	3
AC810-D10-T3-0110-XXXX	96	FWH-125B	125A	3
AC810-D10-T3-0240-XXXX	196	FWH-325A	325A	3
AC810-D10-T3-0358-XXXX	292	FWH-500A	500A	3

Table 2-3 Current and Power Level Specifications

Model	Ratings			Current		Drive Consumption (kW)	Motor	Bus Carrying Capacity		Outer Dimension(mm)		
	Rated Power (kW)	Input Current (A)	Output Current (A)	Continuous Input Current (A)	Max Input Current (A)		(kW)	(HP)	(A)	W	H	D
SD810-AC-S3R8D	1.5	4.9	3.8	4.9	11.27	0.15	1.5	3.0	100	50	350	305
SD810-AC-S6R0D	2.2	7.5	6.0	7.5	17.25	0.22	2.2	5.0	100			
SD810-AC-S8R4D	3.7	10.5	8.4	10.5	24.15	0.37	3.7	7.5	100			
SD810-AC-S110D	5.5	14	11.0	14	32.2	0.55	5.5	10.0	100			
SD810-AC-S170D	7.5	22.0	17.0	22.0	50.6	0.75	7.5	15.0	200	100	350	305
SD810-AC-S240D	11.0	30.0	24.0	30.0	69.0	1.10	11.0	20.0	200			
SD810-AC-S300D	15.0	37.0	30.0	37.0	85.1	1.50	15.0	25.0	200			

SD810-AC-S400D	18.5	49.0	40.0	49.0	112.7	1.85	18.5	30.0	200			
SD810-AC-S550D	30.0	67.0	55.0	67.0	154.1	3.0	30.0	50.0	200			
SD810-AC-S700D	37.0	85.0	70.0	85.0	195.5	3.7	37.0	60.0	200	200	350	305
SD810-AC-S800D	45.0	97.0	80.0	97.0	223.1	4.5	45.0	70.0	200			
SD810-AC-S121D	60.0	145.0	120.0	145.0	333.5	6.0	60.0	100.0	200			
SD810-AC-S151D	75.0	172.0	150.0	172.0	395.6	7.5	75.0	100.0	200			

Table 2-4 Built-in DC Fuse Specification

Model	Fuse		
	Model	Fuse	Qty
SD810-AC-S3R8D-E*-**	VC10-16A700VACDCaR	Voltage: 700V; Current: 16A	1
SD810-AC-S6R0D-E*-**	VC10-20A700VACDCaR	Voltage: 700V; Current: 20A	1
SD810-AC-S8R4D-E*-**	VC10-16A700VACDCaR	Voltage: 700V; Current: 16A	2
SD810-AC-S110D-E*-**	VC10-20A700VACDCaR	Voltage: 700V; Current: 20A	2
SD810-AC-S170D-E*-**	RS308-HB-2H80A DC750V	Voltage: 750V; Current: 80A	1
SD810-AC-S240D-E*-**	RS308-HB-2H80A DC750V	Voltage: 750V; Current: 80A	1
SD810-AC-S300D-E*-**	RS308-HB-2H100A DC750V	Voltage: 750V; Current: 100A	1
SD810-AC-S400D-E*-**	RS308-HB-2H125A DC750V	Voltage: 750V; Current: 125A	1
SD810-AC-S550D-E*-**	RS308-HB-2H160A DC750V	Voltage: 750V; Current: 160A	1
SD810-AC-S700D-E*-**	RS308-HB-2H200A DC750V	Voltage: 750V; Current: 200A	1
SD810-AC-S800D-E*-**	HEA250	Voltage: 690V; Current: 250A	1
SD810-AC-S121D-E*-**	HEA315	Voltage: 690V; Current: 315A	1
SD810-AC-S151D-E*-**	HEA400	Voltage: 690V; Current: 400A	1

2.3 Technical Specifications

Table 2-5 Technical Parameters of SD810 Servo Drive Inverter Module

Item		Model: SD810-AC-S*R*D-EA
Control mode		IGBT as the switching device to output sinusoidal current by PWM control
Feedback	Option	Resolver/BISS encoder

	For rotatory servo motor	Serial encoder: 17-bit, 23-bit and 24-bit multi-turn absolute encoder	
	For liner servo motor	Incremental optical encoder and parallel output encoder	
Environmental condition	Environment temperature	For operating: -10℃~50℃, air temperature change <0.5℃/min. Derate by 1.5% per 1℃ increase when above 40℃. 50℃ max.	
	Storage temperature	-20℃~70℃	
	Ambient humidity	<95%RH (No freezing, no condensation)	
	Storage humidity	<95%RH (No freezing, no condensation)	
	Vibration	4.9m/s^2	
	Impact	19.6m/s^2	
	Protection level	IPX0	
	Cleanness	No corrosive or flammable gases	
		No water/oil/agent splash,	
		minor dust, salt and metal powder	
	Altitude	<1000m (derate by 1% per 100m increase among 1000m~2000m)	
	Others	No electrostatic interference, strong electric field, strong magnetic field, radiation, etc.	
Standards		IEC61800-2/-3/-5, IEC61000-2/-3/-4	
Installation method		Base mounting	Standard
		Rack mounting	Optional
Performance	Velocity control range	1:5000 (the lower limit of speed control range is the value under non-stop operation at rated torque load)	
	Velocity fluctuation rate	Load fluctuation	<±0.01% of rated speed (load fluctuation: 0%~100%)
		Voltage fluctuation	<±0.01% of rated speed (voltage fluctuation: ±10%)
		Temperature fluctuation	Below ±0.1% of rated speed (temperature fluctuation: 25℃ ± 25℃)
	Torque control accuracy (Reproducible)	±1%	
	Soft startup time	0S~30s (ACC and DEC can be set respectively)	
I/O signal	Sequence input signal	Common input	Working voltage range: DC24V±20%.
			4 × input
			Input mode: common collector input, common emitter input
		Assignable input signal	Positive over-travel (P-OT), negative over-travel (N-OT)
			Alarm reset (/ALM-RST)
			PI-P control (/P-CON)

			Torque limit control (/TLC)
			Zero position clamp (/ZCLAMP)
			Reference pulse inhibit (/INHIBIT)
			Gain selection (/G-SEL)
			Torque reference direction (/T-SIGN)
			Reference pulse multiplier selection (/PSEL)
			Home signal (/Home signal)
	Sequential output signals	Relay output	Working voltage range: DC5V～DC30V
			Qty.: 1
			Output mode: relay output (default to brake signal), can be changed to others as required
		Common output	Working voltage range: DC5V～DC30V
			Qty.: 1
			Output mode: photocoupler output (isolated), others optional
		Assignable input signal	Servo ready (/S-RDY)
			Position coincidence (/COIN)
			Velocity completion (/V-CMP)
			Rotation detection (/TGON)
			Torque limit threshold (/CLT)
			Velocity limit threshold (/VLT)
			Brake (/BK)
			Error(/ERR)
			Position near (/NEAR)
			Reference pulse multiplier switching (/PSELA)
			Torque arrival output (/TAO)
			Encoder overheat (/encovheat)
			No alarm of position coincidence (/NoAlmCoin)
Communication	Bus (CN6)	EtherCAT	Standard
	USB (CN7)	Device	Standard TYPE-C port for PC
		Specification	USB 2.0/3.0
Display		CHARGE, 8-segment LED × 5-bit	
Panel functions		Button switches × 4 pcs	
Regenerative brake		External regenerative brake resistor supported	
OT protection		Dynamic brake(DB) stop, DEC stop or coasting stop at P-OT, N-OT signal input	
Protections		Overcurrent, overvoltage, undervoltage, overload, regeneration fault, encoder disconnection, etc.	
Utility functions		Gain adjustment, alarm log, jogging, home search, etc.	

3 Installation and Wiring

3.1 Installation Dimension

Table 3-1 SD810 Servo Drive Inverter Module Dimension

Structure	Model	Outer Dimension (mm)			Installation Dimension(mm)				Installation Aperture
		W	H	D	W1	H1	A	B	
V1S	SD810-AC-S3R8D-E*-**	50	350	305	/	384	13	7	2-M6
	SD810-AC-S6R0D-E*-**								
	SD810-AC-S8R4D-E*-**								
	SD810-AC-S110D-E*-**								
V2S	SD810-AC-S170D-E*-**	100	350	305	50	384	13	7	4-M6
	SD810-AC-S240D-E*-**								
	SD810-AC-S300D-E*-**								
	SD810-AC-S400D-E*-**								
	SD810-AC-S550D-E*-**								
V3S	SD810-AC-S700D-E*-**	200	350	305	150	384	13	7	4-M6
	SD810-AC-S800D-E*-**								
	SD810-AC-S121D-E*-**								
	SD810-AC-S151D-E*-**								

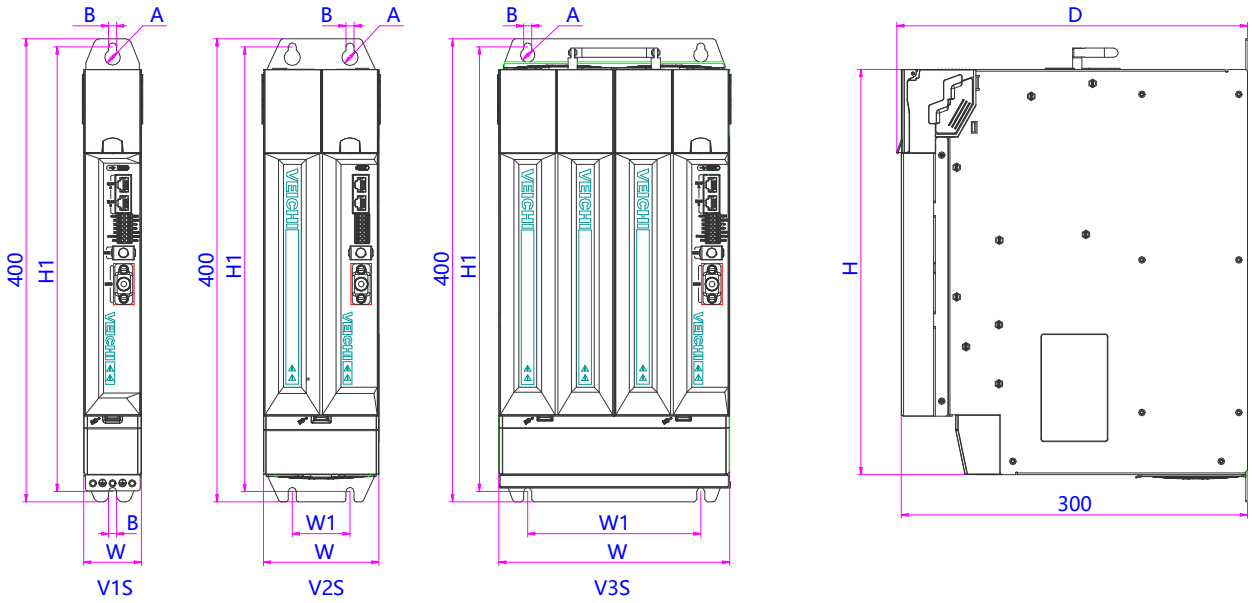


Figure 3-1 SD810 Servo Drive Inverter Module Dimension

3.2 Installation Method

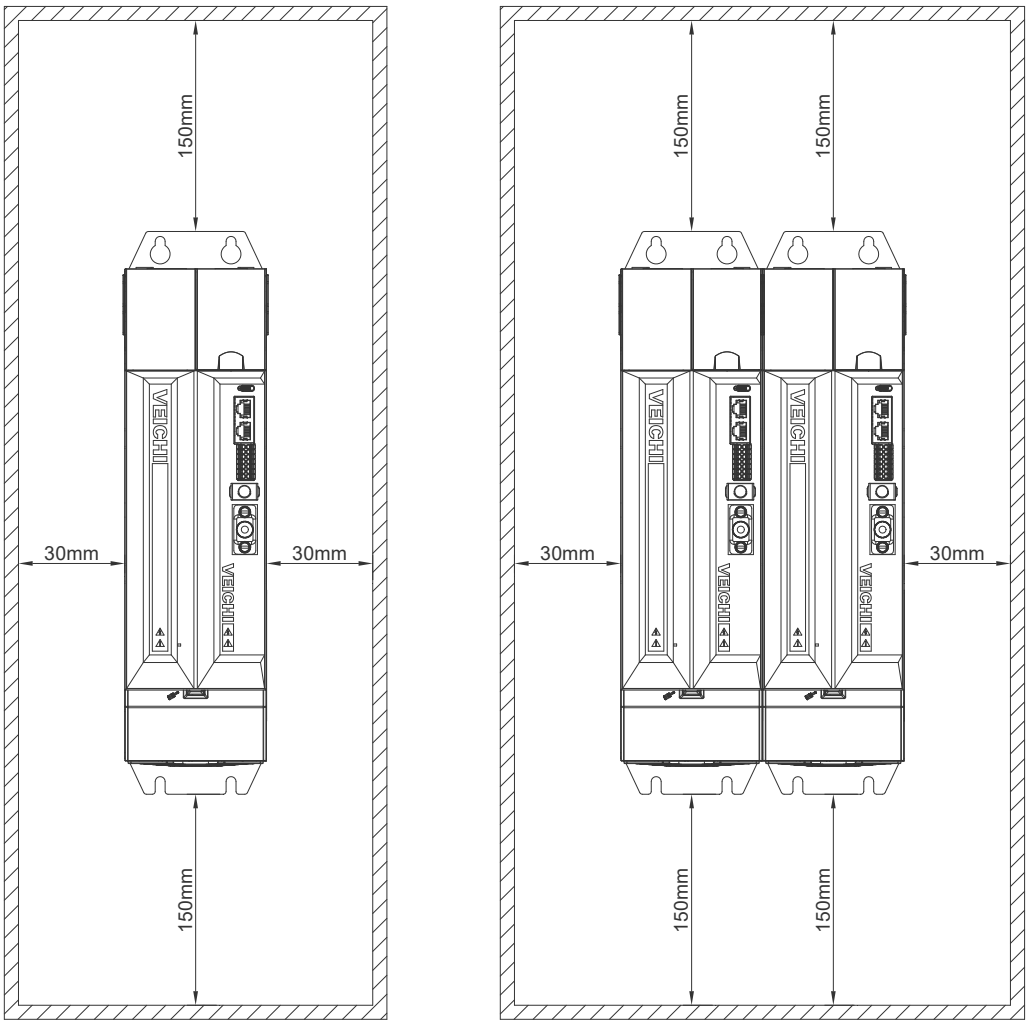


Figure 3-2 SD810 Inverter Module Installation

3.3 Overall Topology

The following diagram shows the SD810 servo inverter and rectifier module to form a system:

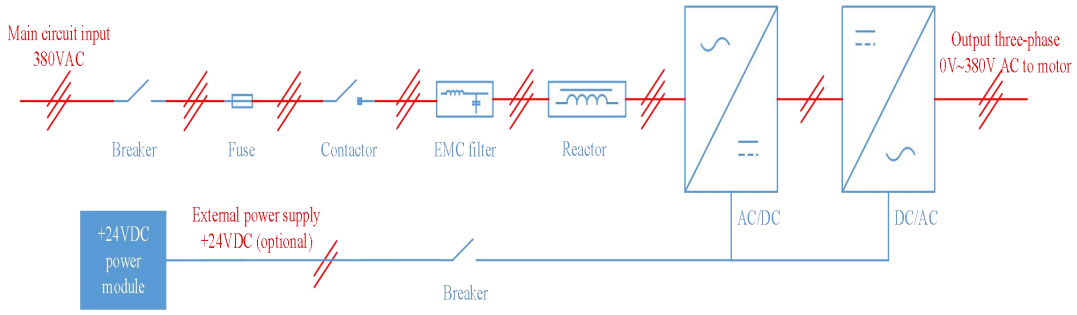


Figure 3-3 System Wiring

The following figure shows the system wiring of the rectifier module and multiple inverter modules in parallel:

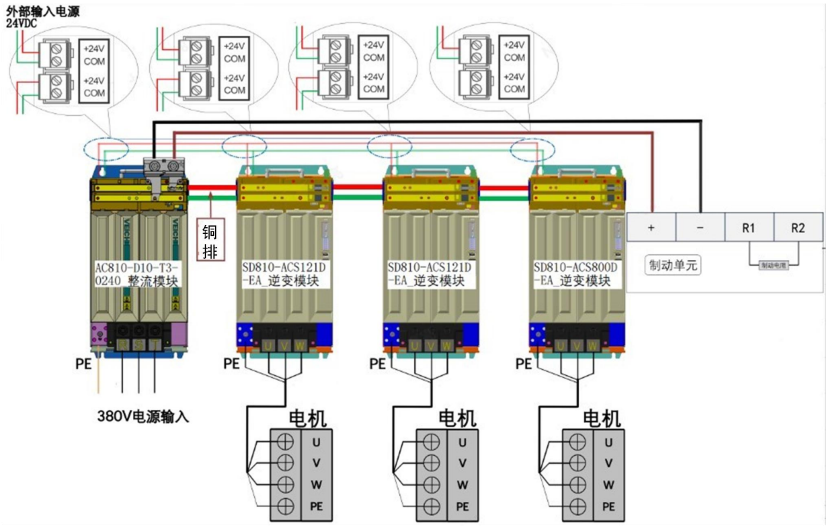


Figure 3-4 Parallel System Wiring

SD810 series are paralleled by the common bus power terminal, and we can provide two types of this terminal for customers.

The common bus power terminal is equipped by default, and it can be used to connect the adjacent modules, as shown in the figure below:

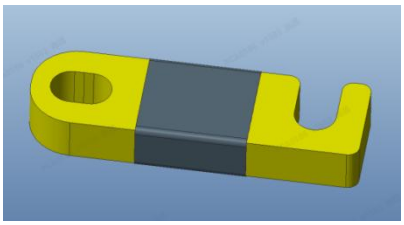


Figure 3-5 Common Bus Terminal

While the optional common bus terminal can be used to connect to non-adjacent units. There are two kinds of such terminals for three models (7.5kw, 37kw and 75kw).

Table 3-2 Optional Common Bus Terminal 1

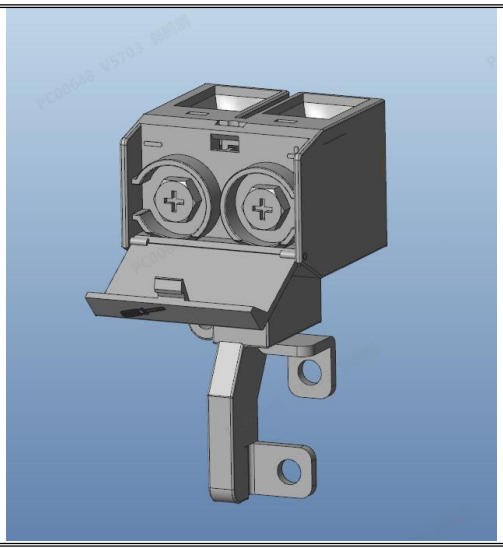
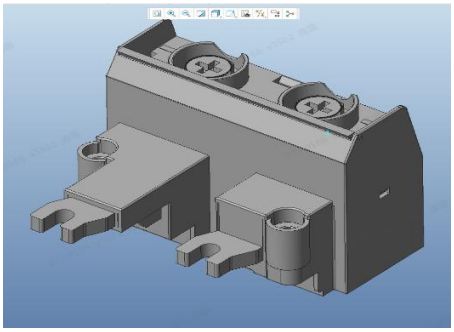
	Code	1300010166
	Rated voltage (V)	600
	Rated current (A)	125
	Rated torque (lbf·in)	45
	Max. torque (N·m)	13
	Rated connection capacity (AWG)	10~1
	Pitch (mm)	22.50
	Stripped wire length (mm)	20~25
	Contact resistance (mΩ)	≤8

Table 3-3 Optional Common Bus Terminal 2

	Code	1300010168
	Rated voltage (V)	600
	Rated current (A)	255
	Rated torque (lbf·in)	120
	Max. torque (N·m)	20
	Rated connection capacity (AWG)	6~3/0
	Pitch (mm)	38.5
	Stripped wire length (mm)	25~28
	Contact resistance (mΩ)	≤8

3.4 Structure and Terminal Definition

3.4.1 Main Circuit Terminals of SD810 Series Inverter Module

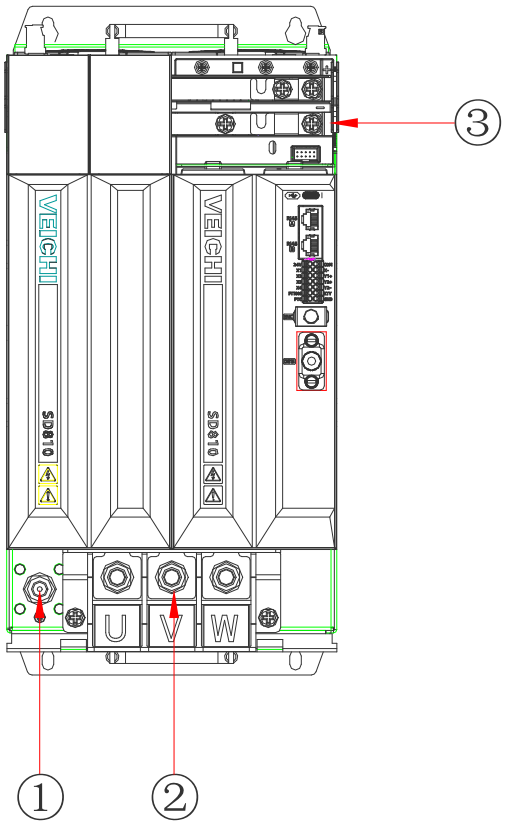


Figure 3-6 Main Circuit Terminal Layout of SD810 Series Inverter Module

Table 3-4 Main Circuit Terminal Comments 1

No.	Terminal	Description
①	PE ground hole	M10 nut for PE safety grounding
②	U/V/W-phase	400V system: 380V~460VAC
③	DC+/DC- input	400V system: 537V~679VDC

3.4.2 Inverter Module Control Terminal Definition

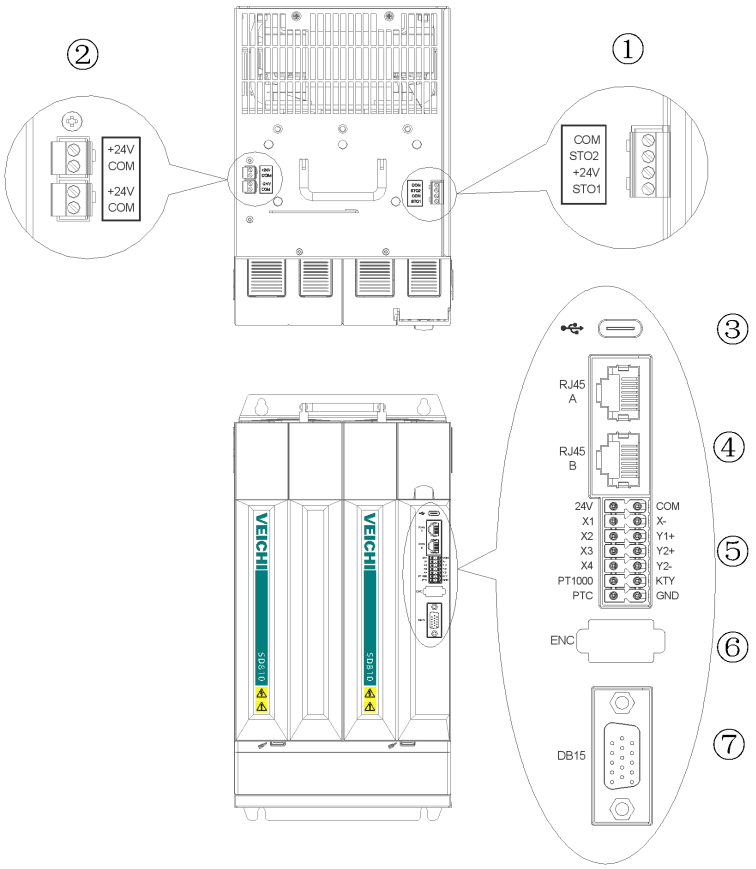


Figure 3-7 Inverter Structural Layout of SD810 Series

Table 3-5 Main Circuit Terminal Comments 2

No.	Name	Definition
①	STO Terminal	Table 3-6
②	24V external power supply terminal	Table 3-7
③	TYPE-C	-
④	Ethercat terminal	Table 3-8
⑤	Multi-function terminal	Table 3-9
⑥	Encoder terminal	Table 3-10
⑦	Extension terminal	Table 3-11

Note :

The extension port (7) can be optionally configured to support different types of encoders.

Table 3-6 STO Terminal Definition

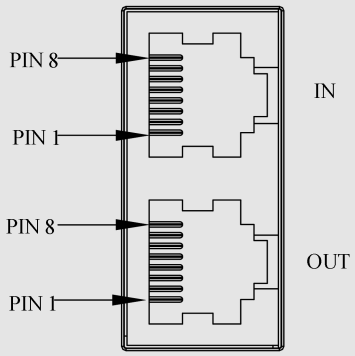
Pin No.	Name	Definition	Description
1	COM	Reference ground	24V input with dual-channel redundancy

2	STO2	STO channel 2	
3	+24V	24V power	
4	STO1	STO channel 1	

Table 3-7 External 24V Power Supply Terminal Definition

Pin No.	Name	Definition	Description
1	+24V	External 24V power supply+	External 24V power input for internal control board, with a min. input current of 1A
2	COM	External 24V power supply-	

Table 3-8 Communication Terminal Pin Definition

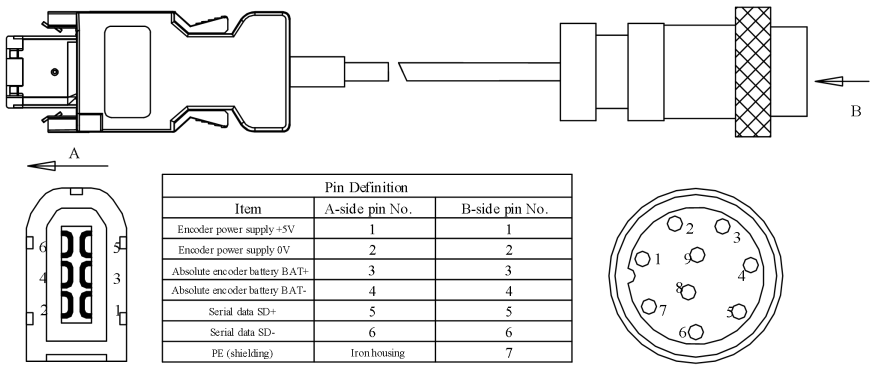
Pin No.	Name	Description	Pin
1	TX+	Receiving signal	
2	TX-	Receiving signal	
3	RX+	Sending signal	
4	-	-	
5	-	-	
6	RX-	Sending signal	
7	-	-	
8	-	-	
-	Housing	Shield	

Note:

The servo drive uses dual RJ45 terminals for the EtherCAT protocol, with the upper port for input and the lower for output.

Table 3-9 Multi-function Terminal Pin Definition

Pin	Name	Definition	Pin	Name	Definition
1	+24V	+24V power supply	2	COM	+24V power ground
3	X1	DI1	4	X-	DI ground
5	X2	DI2	6	Y1+	DO
7	X3	DI3	8	Y2+	RO signal
9	X4	DI4	10	Y2-	RO signal
11	PT1000	PT1000 temperature signal input	12	KTY	KTY84 temperature signal input
13	PTC	PTC temperature signal input	14	GND	AI ground



Pin Definition		
Item	A-side pin No.	B-side pin No.
Encoder power supply +5V	1	1
Encoder power supply 0V	2	2
Absolute encoder battery BAT+	3	3
Absolute encoder battery BAT-	4	4
Serial data SD+	5	5
Serial data SD-	6	6
PE (shielding)	Iron housing	7

Figure 3-8 Encoder Terminal Definition

Name	No.	Pin	Definition
ENC (Absolute/BISS encoder terminal)	1	+5V	Encoder +5V power supply
	2	GND	Encoder power ground
	3	ABS_CLK+	Absolute encoder battery BAT+ (BISS clock signal)
	4	ABS_CLK-	Absolute encoder battery BAT- (BISS clock signal)
	5	ABS_SDA+	Encoder serial data SD+
	6	ABS_SDA-	Encoder serial data SD-
	7	PE	Shielding layer grounded

Table 3-10 Resolver Extension Terminal Definition

Name	No.	Pin	Definition
DB15 (Resolver port)	1	SIN-	Resolver sine feedback signal-
	2	SIN+	Resolver sine feedback signal+
	3	COS-	Resolver cos feedback signal-
	6	EXC-	Resolver excitation output signal-
	7	EXC+	Resolver excitation output signal+
	14	COS+	Resolver cos feedback signal+
	15	PE	PE

3.5 Wiring and Precautions

3.5.1 DI Circuit

The SD810 servo drive inverter module contains 4 digital input channels, here let's take X1 circuit for example to display the wiring of X1~X4.

To relay:

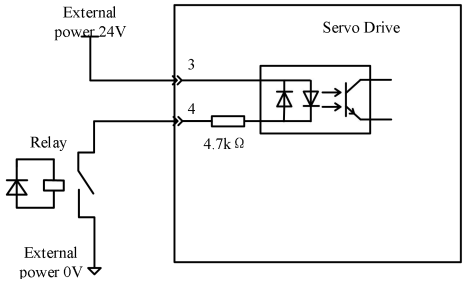


Figure 3-9 Relay Output Wiring

To open collector:

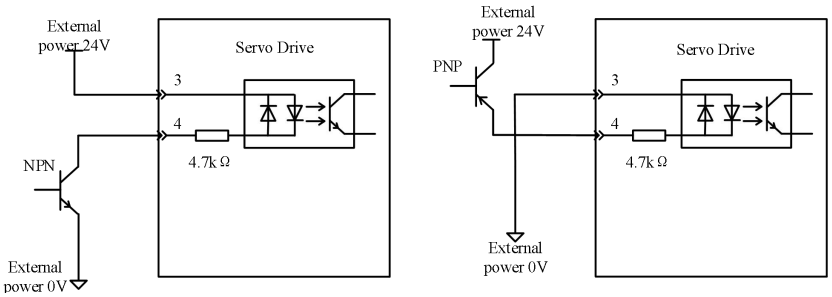


Figure 3-10 NPN/PNP Open Collector Wiring

Note	
	PNP and NPN input cannot be used together.

3.5.2 DO Circuit

SD810 servo drive inverter has two digital output channels, of which Y1 is for triode output and Y2 for relay output. Take Y1 as an example to illustrate the wiring of digital output.

To relay:

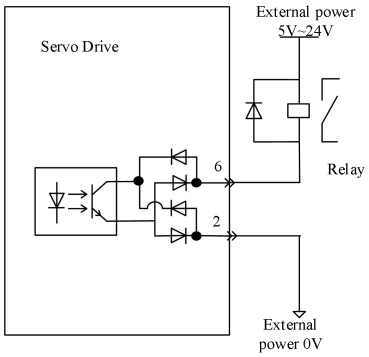


Figure 3-11 Relay Output Wiring

Note	
	When it is for relay output, be sure to connect a current-continuing diode, otherwise the Y terminal may be damaged.

To optocoupler

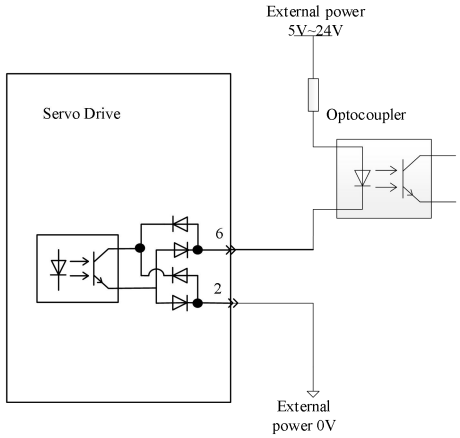


Figure 3-12 Optocoupler Output Wiring

Y2 on SD810 is supposed to be relay output, while the drive has a built-in relay already, so this can be used for the brake output. When the servo motor is used for vertical axis, the relay can be used to stop or maintain the falling speed of the load when the servo drive is powered off. The electromagnetic brake wiring is as shown below:

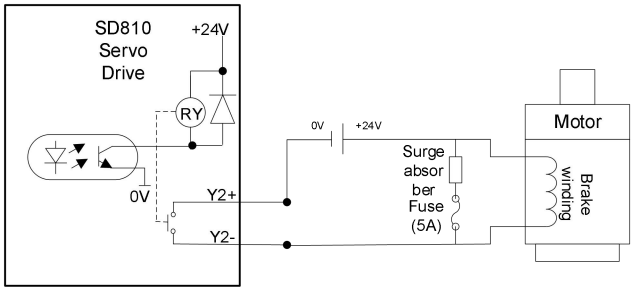


Figure 3-13 Brake Output Wiring

Note:

- Ⓡ in the picture means relay coil.
- Electromagnetic brakes are intended for holding rather than for normal stopping.
- That's why even though they can stop or hold heavy loads from falling, but we require externally mounted brake devices still.

3.5.3 Motor Temperature Sensor Wiring

The motor temperature detection circuit can support 3 types of sensors: KTY84, PT1000, and PTC, which are input through different pins of the multi-function input terminals, detection range of -40℃~200℃. This function is off by default, and different sensor types can be switched by function code Pn064; Take KTY84 as an example to illustrate the temperature sensor wiring.

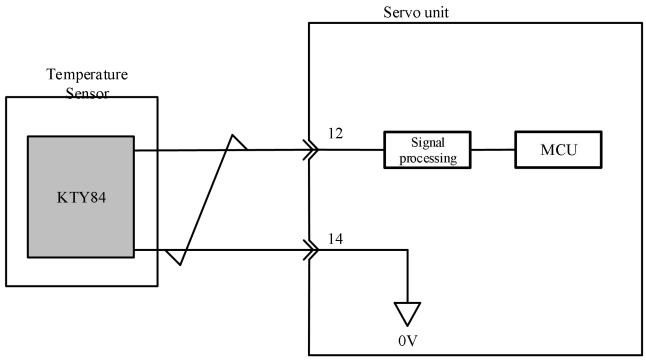
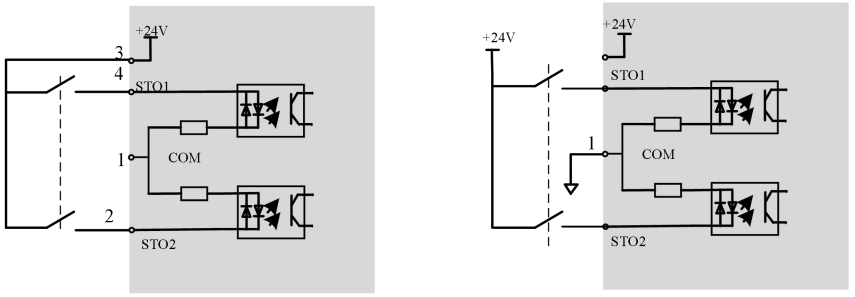


Figure 3-14 Temperature Sensor Wiring

3.5.4 STO Wiring

SD810 servo drive provides customers with STO terminals with dual-channel for redundant inputs that meet the SIL3 certification, and the definitions are shown in the table below. To be more user-friendly during debugging, there is a pin of power supply voltage (+ 24V) added. If the safety circuit is installed already, then STO function is not required at all, then connect STO1/STO2 to the internal 24V pin directly. But you need the STO function, power it on by the internal 24V power supply terminal or an external 24V power supply. Its wiring is as follows:



Wiring of Internal 24V+ Power Supply Wiring of External 24V Power Supply

Figure 3-15 STO Wiring

Wiring of Multiple STO Terminals in Cascade Sharing 24V Power Supply.

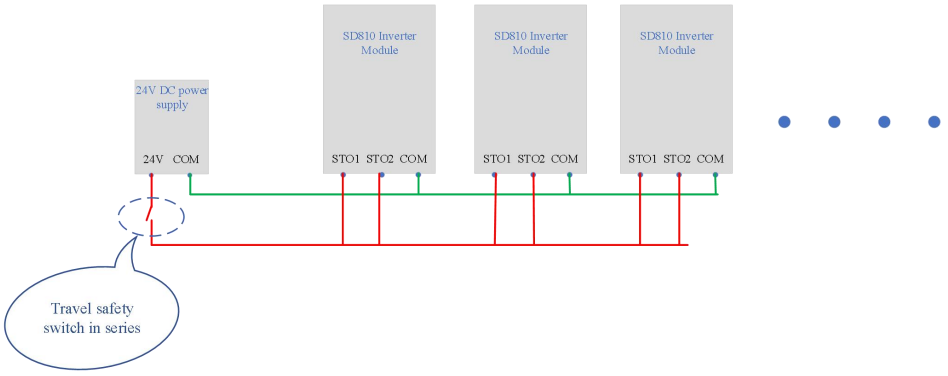


Figure 3-16 Parallel STO Wiring

3.6 Cable Selection and Recommended Torque

Figure 3-17 Main Circuit Cable Selection and Recommended Torque

Model	Power Level (kW)	Output Current (A)	Cable Diameter (mm^2)	Terminal	Tightening Torque (N·m)
SD810-AC-S3R8D-E*-**	1.5	3.8	0.75	RNB1-5	2.8
SD810-AC-S6R0D-E*-**	2.2	6.0	1	RNB1-5	2.8
SD810-AC-S8R4D-E*-**	3.7	8.4	1.5	RNB2-5	2.8
SD810-AC-S110D-E*-**	5.5	11.0	2.5	RNB2-5	2.8
SD810-AC-S170D-E*-**	7.5	17.0	4	RNB5-6	4.8
SD810-AC-S240D-E*-**	11.0	24.0	6	RNB8-6	4.8
SD810-AC-S300D-E*-**	15.0	30.0	10	RNB14-6	4.8
SD810-AC-S400D-E*-**	18.5	40.0	10	RNB14-6	4.8
SD810-AC-S550D-E*-**	30.0	55.0	16	RNB22-6	4.8
SD810-AC-S700D-E*-**	37.0	70.0	25	RNB22-6	4.8
SD810-AC-S800D-E*-**	45.0	80.0	35	RNB38-10	20
SD810-AC-S121D-E*-**	60.0	120.0	50	RNB38-10	20
SD810-AC-S151D-E*-**	75.0	150.0	70	RNB60-10	20

3.7 Installation Completion Check

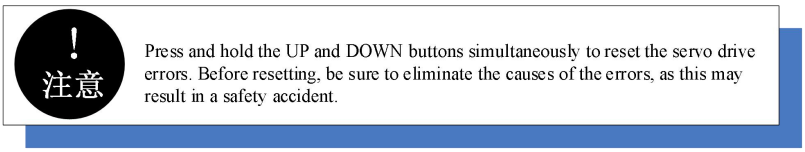
Please check against the following table after the electrical connection of the inverter module has been completed. And ensure that the electrical connection of the equipment is correct.

Table 3-11 Checklist

No.	Item
1	The input power and motor cables are connected correctly
2	The positive and negative terminals of the external 24V power supply are connected correctly
3	The cable connected to the motor shall be fixed on the provided joint terminals with the required torque
4	If EMC shielded cables are used, the shielding layer of the encoder cable is grounded only with one end to prevent signal interference

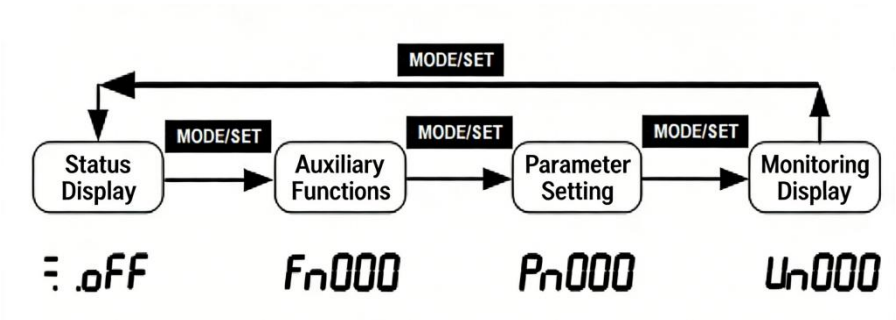
4 Keypad Layout and Function

Name	Function
MODE/SET	To switch function modes
	To confirm the set parameters (press this button to confirm the modified parameters)
	To perform utility functions
▲ UP	To select parameters upwards or increase values. For parameters displayed in multiple segments, it can be used to switch to high, medium and low segment
▼ DOWN	To select parameters downwards or reduce values. For parameters displayed in multiple segments, it can be used to switch high, medium and low segment
DATA/SHIFT	Long press and hold for about 1 second to enter or exit
	Short press to shift one bit to the left (when flashing)



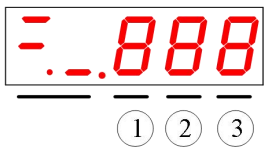
4.1 Function Shift

When you press the MODE/SET key, the functions are switched as shown below:

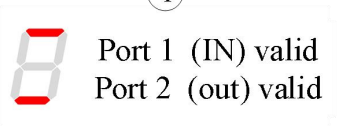


4.2 Status Display

Tell the status on display as follows:



①



②

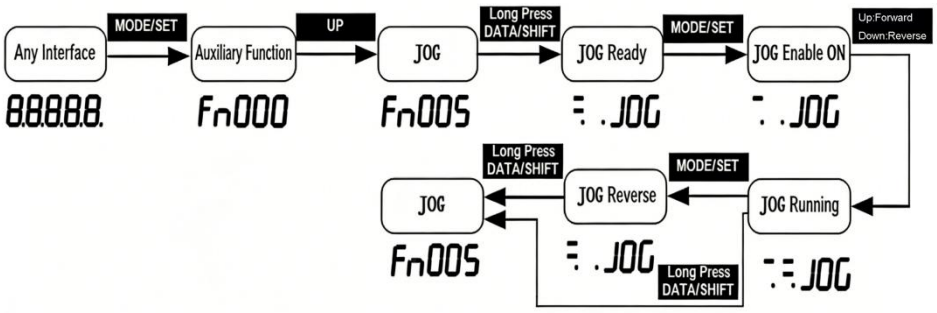
EtherCAT Status	
1	Initialization (I)
2	Pre-operation
4	Safe Operation
8	Operating

③

Control Mode	
0	Reserved
1	Profile Position Mode (PP)
3	Profile Velocity Mode (PV)
4	Profile Torque Mode (PT)
6	Home Mode(HM)
8	Cyclic Synchronous Position Mode (CSP)
9	Cyclic Synchronous Velocity Mode (CSV)
10	Cyclic Synchronous Torque Mode (CST)

4.3 Fn Parameter Group for Auxiliary Functions

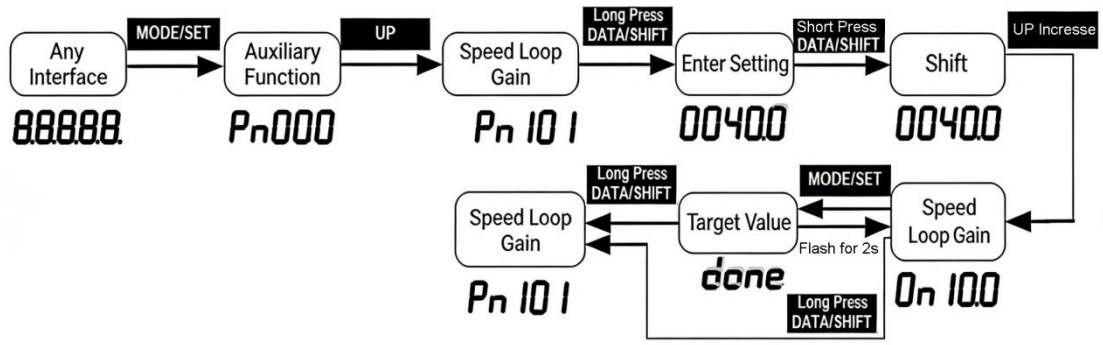
This group is used to perform functions related to the setting and adjustment of the servo drive, started by Fn on the keypad. Take the Fn005 [Jog] as an example.



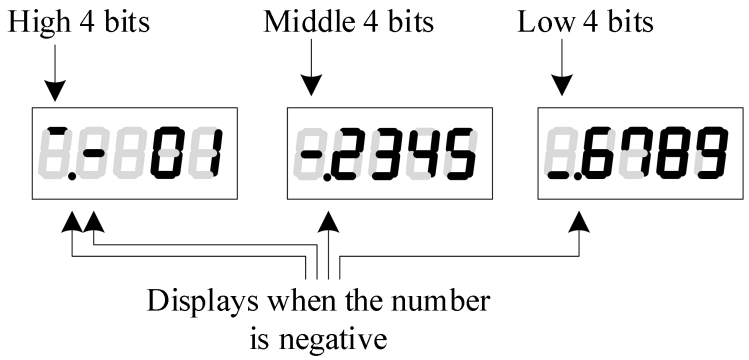
4.4 Pn Parameter Group

(1) When the setting range is fewer than 5 bits

Here is a setting example of [1st Velocity Loop Gain] from 40.0 to 100.0 to show the setting steps.



(2) When the setting range is more than 6 bits



The keypad can only display 5 digits, so when the set value is above 6 digits, it's a little different, as shown in the figure above.

4.5 Un Group Monitoring Parameters

Monitor (display) the reference value set in the servo drive, the status of input and output signals, and the internal status of the servo drive, see "Monitoring and Display" for details.

They are shown by codes starting with Un on display. And the operation method of monitoring display is explained by setting Un000 [Motor Velocity] to 3000rpm.

If you want the digital tube to automatically display relevant information after the drive is powered on every time, please set the parameter PN003(default 0xFFF) to the relevant value. For example, set PN003 to 00000 [Motor Velocity]. See "Monitoring Display" for detailed values corresponding to each monitoring information.

5 Parameter List

5.1 Pn0: Basic Control

Funcode	Name	Range	Default	Unit	Address	Enable
Pn000	Control Mode	0~16	16	-	0x0000	Restart
	0: Position control 1: Velocity control (Analog reference) 2: Torque control 3: Velocity control (Contact reference) 4: Velocity control (Contact reference)<->Velocity control (Analog reference) 5: Velocity control (Contact reference)<-> Position control 6: Velocity control (Contact reference)<->Torque control 7: Position control<->Velocity control (Analog reference) 8: Position control<->Torque control 9: Torque control<->Velocity control (Analog reference) 10: Velocity control (Analog reference) <->Zero clamp speed control 11: Position control <-> Reference Pulse Inhibit 12: CANopen control 16: EtherCat control					
Pn002	Motor Direction	0~1	0	-	0x0002	Restart
	Facing the motor: 0: Counterclockwise as positive; 1: Clockwise as positive					
Pn003	Default Monitor	0x0~0xfff	0xfff	-	0x0003	Immed.
	Set the monitoring parameters to be displayed by default after power-on, and please check the code for the specific values, 0xfff means that the monitoring parameters are not displayed, while the system status is.					
Pn004	Servo OFF and C1 Error Stop Mode	0~2	0	-	0x0004	Restart
	0: Stop the motor by DB 1: Stop the motor by DB, then release DB 2: Coasting stop					
Pn005	C2 Error Stop Mode	0x00~0x01	0	-	0x0005	Restart
	0: Zero clamp, set the speed reference to “0” to execute a sharp stop 1: The same as Pn004 setting					
Pn006	Overtravel Alarm Detection	0~1	0	-	0x0006	Restart
	0: OFF 1: ON					
Pn007	Overtravel Stop Mode	0~2	0	-	0x0007	Restart
	0: The same as Pn004 setting 1: Take the torque on Pn053 as the maximum value, and after DEC stop, the motor is clamped 2: Take the torque on Pn053 as the maximum value, and after DEC stop, the motor coasts					

Pn008	Power Delay after /BK OFF	0~50	0	10ms	0x0008	Immed.
	When the servomotor is enabled but not running yet, the brake (/BK) signal and the servo ON (/S-ON) signal are OFF at the same time, set here to change the time from when the /BK signal is OFF to when the motor power is actually cut.					
Pn009	/BK OFF Delay	10~100	50	10ms	0x0009	Immed.
	When servo OFF/alarm/main circuit OFF occurs when the motor is still running, set this parameter or Pn010 [Motor Velocity Level for /BK OFF] (either works) to adjust the output time of brake-OFF signal.					
Pn010	Motor Velocity Level for /BK OFF	0~10000	100	rpm	0x0010	Immed.
Pn012	External Regenerative Resistor Power	0~65535	0	10W	0x0012	Immed.
Pn013	External Regenerative Resistance	0~65535	0	mΩ	0x0013	Immed.
Pn015	Overload Alarm Detection Time	1~100	20	%	0x0015	Restart
	Set the overload alarm detection time, e.g. the factory default is 20% of this setting.					
Pn016	Overload Current Derating	10~100	100	%	0x0016	Restart
Pn030	Reserved	0~65535	0	-	0x0030	Immed.
Pn031	Parameter Modification Keypad Lock	0~1	0	-	0x0031	Restart
	0: OFF 1: ON					
Pn040	Absolute Encoder Mode	0~1	0	-	0x0040	Restart
	0: As an absolute encoder 1: As an incremental encoder					
Pn041	Absolute Encoder Low Battery Prompt Type	0~1	0	-	0x0041	Restart
	0: Report error when low battery 1: Report alarm when low battery					
Pn045	Undervoltage Alarm Detection	0x00~0x02	0	-	0x0045	Restart

	0: OFF 1: ON 2: ON and limit the torque					
Pn046	Torque Limit during Undervoltage Alarm	0~100	50	%	0x0046	Immed.
	Apply an internal torque limit in response to an undervoltage alarm.					
Pn047	Torque Limit Cancel Time during Undervoltage Alarm	0~1000	100	ms	0x0047	Immed.
	After the undervoltage alarm is gone, the torque limit value is controlled internally by the servo drive according to the set time here.					
Pn050	Torque Limit Mode	0~3	1	-	0x0050	Immed.
	0: Analog torque (invalid under torque control) 1: Pn051 [Max. torque limit 1] 2: Pn051 [Max. Torque Limit 1] for POS, Pn052 [Max. Torque Limit 2] for NEG 3: Pn051 [Max. Torque Limit 1] when /TLC is off, Pn052 [Max. Torque Limit 2] when /TLC is on					
Pn051	Max. Torque Limit 1	0~500	500	%	0x0051	Immed.
Pn052	Max. Torque Limit 2	0~500	500	%	0x0052	Immed.
Pn053	Emergency Stop Torque	0~800	800	%	0x0053	Immed.
Pn061	Keypad Display	0x00~0x01	1	-	0x0061	Restart
	0: Display the set parameters 1: Display all the parameters					
Pn064	Motor Temperature Input	0~3	0	-	0x0064	Immed.
	0: KTY84 1: PT1000 2: PT100 3:PTC					
Pn065	Motor Overheat Level	0~256	80	℃	0x0065	Restart
Pn066	Fan Control Mode	0~4	0	-	0x0066	Immed.
	0: Auto control according to temperature 1: Run at maximum speed >40℃ 2: Run once enabled 3: Run after power-up 4: Adjust according to Pn067 setting					
Pn080	EtherCAT Station Alias	0~0xFFFF	0x0001	-	0x0080	Restart

5.2 Pn1 Gain

Funcode	Name	Range	Default	Unit	Address	Enable
Pn100	Inertia Ratio	0~20000	100	%	0x0100	Immed.
	Inertia ratio=Load inertia converted from motor shaft/rotor inertia of servo motor * 100%					
Pn101	1st Velocity Loop Gain	1~2000	40.0	Hz	0x0101	Immed.
	Set the responsiveness of the velocity loop. A slow velocity loop will delay the outer position loop, causing overshooting or vibration to the velocity references. So, the larger this setting is, the more stable the servo system and the better the responsiveness.					
Pn102	1st Velocity Loop Integral Time Constant	0.15~512.00	20.00	ms	0x0102	Immed.
	Set to allow response to even minor inputs. The speed loop contains an integral element, which will delay the servo system, so when this setting is too large, overshoot may occur, or the positioning time may be longer, and responsiveness be slowed.					
Pn103	1st Position Loop Gain	1~2000	40.0	1/s	0x0103	Immed.
	Set to adjust the responsiveness of the position loop. The higher this gain, the faster the responsiveness, and the shorter the positioning time. But increase mechanical rigidity of the system if you want the position loop gain to be higher.					
Pn104	1st Torque Reference Filter	0.00~ 655.35	1.00	ms	0x0104	Immed.
	Set to adjust the torque reference value to eliminate oscillations caused by the servo drive. The lower this setting is, the better the responsiveness control, but its performance is limited by mechanical specifications.					
Pn105	2nd Velocity Loop Gain	1~2000	40.0	Hz	0x0105	Immed.
	Set the responsiveness of the velocity loop. A slow velocity loop will delay the outer position loop, causing overshooting or vibration to the velocity references. So, the larger this setting is, the more stable the servo system and the better the responsiveness.					
Pn106	2nd Velocity Loop Integral Time Constant	0.15~512	20.00	ms	0x0106	Immed.
	Set to allow response to even minor inputs. The velocity loop contains an integral element, which will delay the servo system, so when this setting is too large, overshoot may occur, or the positioning time may be longer, and responsiveness be slowed.					
Pn107	2nd Position Gain	1~2000	40.0	1/s	0x0107	Immed.

	Set to adjust the responsiveness of the position loop. The higher the position loop gain, the faster the responsiveness, and the shorter the positioning time. Please don't increase the position loop gain beyond the rigidity of the mechanical system and increase mechanical rigidity if you want the position loop gain to be higher					
Pn108	2nd Torque Reference Filter	0.00~655.35	1.00	ms	0x0108	Immed.
	Set to adjust the torque command to eliminate oscillations caused by the servo drive. The lower this value is, the better the responsiveness control, but its performance is limited by mechanical specifications.					
Pn110	Gain Shift Method	0x00~0x01	0	-	0x0110	Immed.
	0: Manual switching by external input signal (G-SEL) 1: Auto switching from the 1st gain to the 2nd gain when Pn111 condition is true, otherwise, it is 1st gain.					
Pn111	Gain Shift Condition	0x00~0x05	0	-	0x0111	Immed.
	0: /COIN ON 1: /COIN OFF 2: /NEAR ON 3: /NEAR OFF 4: Position reference filtered be 0 and reference pulse input OFF 5: Position reference pulse input ON Switch from the 1st gain to the 2nd gain when Pn111 setting is true, otherwise, it is the 1st gain.					
Pn112	Gain Shift Transition Time 1	0~65535	0	ms	0x0112	Immed.
	Once the switching condition is met, and the waiting time has past, the 1st gain will be switched to 2nd gain by liner change during the time set here.					
Pn113	Gain Shift Transition Time 2	0~65535	0	ms	0x0113	Immed.
	Once the switching condition is met, and the waiting time has past, the 2nd gain will be switched to 1st gain by liner change during the time set here.					
Pn114	Gain Shift Delay 1	0~65535	0	ms	0x0114	Immed.
	Set the waiting time from the 1st-to-2nd gain shift condition is met to actual switching.					
Pn115	Gain Shift Delay 2	0~65535	0	ms	0x0115	Immed.
	Set the waiting time from the 2nd-to-1st gain shift condition is met to actual switching.					
Pn121	Velocity Feedforward Gain	0~100	0	%	0x0121	Immed.
	Set to shorten the positioning time, and it is valid under position control. Note: Position overshoot may occur if the feedforward setting is too large, so please adjust it appropriately according to the response.					
Pn122	Velocity Feedforward Filter Time	0~64	0.00	ms	0x0122	Immed.
	Set the low-pass filtering time constant to mitigate position overshoot and torque fluctuation due to speed feed-forward function.					

Pn123	Analog Velocity Feedforward	0x00~0x01	0	-	0x0123	Restart
	Set this to decide if the speed feedforward can be given via external analog values to shorten the positioning time. 0: OFF 1: ON					
Pn124	Analog Torque Feedforward	0~1	0	-	0x0124	Restart
	Set this to decide if the torque feedforward can be given via external analog values to shorten the positioning time. 0: OFF 1: ON					
Pn130	PI-P Control	0~1	0	-	0x0130	Restart
	0: PI control 1: P control					
Pn131	PI-P Shift Condition	0x00~0x04	0	-	0x0131	Immed.
	0: Internal torque reference 1: Velocity reference 2: ACC reference 3: Position deviation pulse 4: Shift OFF					
Pn132	PI-P Shift Condition (Torque Reference)	0~800	200	%	0x0132	Immed.
	If the torque reference exceeds this setting, the speed loop will be under P control, otherwise, PI control.					
Pn133	PI-P Shift Condition (Velocity Reference)	0~10000	0	rpm	0x0133	Immed.
	When the speed reference exceeds this setting, the speed loop be under P control, otherwise, PI control.					
Pn134	PI-P Shift Condition (ACC Reference)	0~30000	0	rpm/s	0x0134	Immed.
	When the speed reference exceeds this setting, the speed loop be under P control, otherwise, PI control.					
Pn135	PI-P Shift Condition (Position Deviation)	0~10000	0	Reference unit	0x0135	Immed.
	If the position deviation exceeds this setting, the speed loop switches to P control, otherwise it is PI control.					
Pn140	Anti-vibration Control	0x00~0x11	0x0010	-	0x0140	Immed.
	0x1#: Auto setting ON by intelligent setting and bandwidth setting 0x#1: Pn142 [Anti-MF Vibration Frequency] setting valid 0x0#: Auto setting OFF by intelligent setting and bandwidth setting, manual only 0x#0: Pn142 [Anti-MF Vibration Frequency] setting invalid					

Pn142	Anti-MF Vibration Frequency	1~3000	100.0	Hz	0x0142	Immed.
	Set the frequency to suppress medium-frequency resonance.					
Pn143	Anti-MF Vibration Damping Gain	0~300	0	%	0x0143	Immed.
	Increase this parameter to improve the vibration suppression effect, but a large setting may aggravate the vibration. Please check the vibration suppression effect while gradually increasing the setting value by 10% each time within the range of 0% to 200%, and if the vibration suppression effect cannot be obtained even after reaching 200%, stop trying and reduce the control gain appropriately.					
Pn150	Auto Notch Filter 1	0x00~0x01	1	-	0x0150	Immed.
	0: Utility function auto adjustment off 1: Utility function auto adjustment on					
Pn151	Auto Notch Filter 2	0x00~0x01	1	-	0x0151	Immed.
	0: Utility function auto adjustment off 1: Utility function auto adjustment on					
Pn152	Auto Notch Vibration Detection Sensitivity	1~200	100	%	0x0152	Immed.
	Set the automatic detection sensitivity for resonance frequencies. The smaller the setting value, the more sensitive the resonance detection, and the easier the resonance detection, but a low setting may falsely detect the resonance frequency.					
Pn153	Notch Filter 1 Frequency	50~5000	5000	Hz	0x0153	Immed.
	Set the frequency of the 2nd notch filter to suppress resonance, if this parameter is set to 5000, the function is OFF. Note: Do not set the notch filter frequency close to the response frequency of the speed loop, but at least 4 times the gain of the speed loop, otherwise the overall system performance may be reduced.					
Pn154	Notch Filter 1 Q Factor	0.5~10	0.70	-	0x0154	Immed.
	The notch filter Q determines the width of the notch filter frequency. The larger the Q value, the greater the notch, and the narrower the width of the filter frequency.					
Pn155	Notch Filter 1 Depth	0~1	0.000	-	0x0155	Immed.
	Set the depth of the frequencies that are filtered for the notch filter frequency. which varies depending on the depth of the notch filter. The smaller the notch filter depth setting is, the deeper the notch, and the better the resonance suppression effect, but if it is too small, it will aggravate the resonance.					
Pn156	Notch Filter 2 Frequency	50~5000	5000	Hz	0x0156	Immed.
	Set the frequency of the 2nd notch filter to suppress resonance, if this parameter is set to 5000, the function is OFF.					

Pn157	Notch Filter2 Q Factor	0.5~10	0.70	-	0x0157	Immed.
	The notch filter Q determines the width of the notch filter frequency. The larger the Q value, the greater the notch, and the narrower the width of the filter frequency.					
Pn158	Notch Filter 2 Depth	0~1	0.000	-	0x0158	Immed.
	Set the depth of the notch filter frequency. which varies depending on the depth of the notch filter. The smaller the notch filter depth setting is, the deeper the notch, and the better the vibration suppression effect, but if it is too small, it will aggravate the vibration.					
Pn160	Disturbance Compensation	0x00~0x01	0	-	0x0160	Immed.
	Set the disturbance compensation function on or off.					
Pn161	Disturbance Compensation Gain	1~1000	150.0	Hz	0x0161	Immed.
	Set the disturbance compensation gain. Increase it to improve the effect of suppressing disturbance, but it may cause louder noise if it is too large.					
Pn163	Disturbance Compensation Coefficient	0~100	0	%	0x0163	Immed.
	Set the disturbance compensation coefficient to multiply the received position reference or speed reference, which is the torque compensation value to the torque reference.					
Pn165	Disturbance Observer Inertia Correction Coefficient	1~1000	100	%	0x0165	Immed.
	Set the disturbance observer inertia to adjust the recognition error caused by inaccurate inertia setting. Note: When the inertia ratio is set correctly, set this value to 100.					
Pn166	Velocity Observer	0~1	0	-	0x0166	Restart
	Set the speed observer function on or off. 0: OFF 1: ON					
Pn167	Velocity Observer Cutoff Frequency	1~500	80	Hz	0x0167	Immed.
	Set the bandwidth of the speed observer. Increase the value to raise the response of the speed feedback to track the real speed, but vibration and noise might occur if this value is too large.					
Pn170	Friction Compensation Cutoff Velocity	0~1000	20	rpm	0x0170	Immed.

	Set to compensate for viscous friction variations and fixed load variations, and take effect together with the friction compensation coefficient. Set the friction compensation coefficient to 95% or lower in the general cases, and if it's not enough, try raising the the friction compensation cut-off speed by 10% each time on the basis of no vibration.					
Pn171	Positive Friction Compensation Coefficient	0~100	0	%/100 rpm	0x0171	Immed.
	The higher the setting value, the better the result, but if it is too high, the it will be more prone to vibration, usually please set the setting value below 95%.					
Pn172	Friction Torque Reverse Compensation Coefficient	0~100	0	%/100 rpm	0x0172	Immed.
	The higher the setting value, the better the result, but if it is too high, the it will be more prone to vibration, please set it below 95%.					
Pn175	Robust	0x00~0x01	1	-	0x0175	Restart
	Set the robust function on or off. 0: OFF 1: ON					
Pn177	Robust Tuning	10~80	40.0	Hz	0x0177	Immed.
	Set the gain tuning value of the robust mode, the larger the value is, the faster the system response is, but the system overshoot and excessive noise may occur.					
Pn178	Robust Control Load Factor	0~500	0	%	0x0178	Immed.
	The larger the load factor of robust control is, the faster the response of the system will be. However, when the system noise is too loud and the inertia is large, increase this value appropriately will can address overshoot and overtravel.					
Pn185	Vibration Detection Mode	0x00~0x02	0	-	0x0185	Immed.
	0: OFF 1: ON and report alarm 2: ON and report error					
Pn186	Vibration Detection Sensitivity	50~500	100	%	0x0186	Immed.
	Set the vibration detection sensitivity, the smaller the setting, the easier it is to detect vibration, but it may lead to misdetection during normal operation.					
Pn187	Vibration Detection Level	0~5000	50	rpm	0x0187	Immed.
	Set the vibration detection threshold, the smaller the setting, the easier it is to detect vibration, but it may lead to misdetection during normal operation.					

5.3 Pn2 Position

Funcode	Name	Range	Default	Unit	Address	Enable
Pn200	Pulse Input Filter	0~2	0	-	0x0200	Restart
	0: Liner drive filter ~1MHz 1: Open collector filter 2: Line drive filter 1MHz~4MHz					
Pn201	Reference Pulse Form	0~6	0	-	0x0201	Restart
	0: Sign and pulse train, positive logic 1: CW+CCW pulse trains, positive logic 4: Two-phase pulse trains with 90° phase differential (phase A and phase B) ×4, positive logic 5: Sign and pulse train, negative logic 6: CW and CCW pulse trains, negative logic					
Pn202	Reference Pulse Direction	0~1	0	-	0x0202	Restart
	Set the direction of the input pulse. 0: Positive 1: Negative					
Pn203	Reference Pulse Multiplier	1~100	1	×1	0x0203	Immed.
	Set the pulse input multiplier, which is used in conjunction with the reference pulse multiplier switching signal ON/OFF, to switch the multiplier to 1 time or and the setting here.					
Pn204 Pn206	Electronic Gear Ratio Numerator	0~1073741824	64	-	0x0206 0x0207	Restart
	Electronic Gear Ratio Denominator	1~1073741824	1	-	0x0208 0x0209	Restart
	Invalid for full closed loop in position mode: $\frac{\text{Electronic Gear Ratio Numerator}}{\text{Electronic Gear Ratio Denominator}} = \frac{\text{Encoder Resolution}}{\text{Pulse number per turn sent from upper device}} \times \text{Reduction Ratio} \frac{N1}{N2}$ Valid for full closed loop $\frac{\text{Electronic Gear Ratio Numerator}}{\text{Electronic Gear Ratio Denominator}} = \frac{\text{Movement for 1 pulse of input reference}}{\text{Movement for 1 pulse of encoder}} = \frac{0.5}{0.5} = \frac{1}{1}$					
Pn211	Position Reference Filter Time Constant	0~655	0	ms	0x0211	Motor stop
	Set the first-order low-pass filter time constant corresponding to the position reference to reduce the mechanical shocks in case of sudden changes to the pulse reference frequency.					

Pn212	Position Reference Moving Average Filter	0~1000	0	ms	0x0212	Motor stop
	Set the moving average time constant for the position reference. to reduce the mechanical shocks in case of sudden changes to the pulse reference frequency.					
Pn230	Anti-LF Vibration	0x00~0x02	0	-	0x0230	Immed.
	0: OFF 1: ON for a specific frequency 2: ON for two specific frequencies					
Pn231	Auto Anti-Vibration	0x00~0x01	1	-	0x0231	Immed.
	0: Utility function auto adjustment off 1: Utility function auto adjustment on					
Pn232	LF Vibration Detection Sensitivity	0.1~300	40.0	%	0x0232	Immed.
	Set the sensitivity of vibration detection when positioning is complete. The smaller this setting, the easier it is to automatically detect vibration frequencies.					
Pn235	LF Vibration Level 1	1~200	200.0	Hz	0x0235	Immed.
	Set the frequency threshold of vibration suppression function 1 .					
Pn236	Anti-LF Vibration Correction 1	10~1000	100	%	0x0236	Immed.
	Set the correction factor of for vibration suppression function 1, the smaller the setting, the better the suppression, but if it is too low, it may lead to longer positioning time.					
Pn237	Anti-LF Vibration Level 2	1~200	200.0	Hz	0x0237	Immed.
	Set the frequency threshold of vibration suppression function 2 .					
Pn238	Anti-LF Vibration Correction 2	10~1000	100	%	0x0238	Immed.
	Set the correction factor of vibration suppression level 2, the smaller the setting, the better the suppression, but if it is too low, it may lead to longer positioning time.					
Pn240	Model Reference Adaptive Control (MRAC)	0x00~0x01	0	-	0x0240	Immed.
	0: OFF 1: ON					
Pn241	MRAC Gain 1	1~2000	50.0	1/s	0x0241	Immed.
	Set to determine the response time of the servo system, higher setting means faster response and shorter positioning time. When this function is valid, it determines the servo system position response and deviation instead of the position gain.					

Pn242	MRAC Damping Ratio 1	50~200	100.0	%	0x0242	Immed.
	If this setting is small, overshoot may be worse during positioning and position vibration may occur. When it's larger, overshoot will be better and position re-bounce may occur, leading to longer positioning time. Please set it to 100.					
Pn243	MRAC Velocity Feedforward Gain 1	0~1000	100.0	%	0x0243	Immed.
	Lower setting leads to slower responsiveness, but less positional overshoot, but if it is too low, it leads to positional deviations and longer positioning time.					
Pn244	MRAC Positive Torque Feedforward Gain 1	0~1000	100.0	%	0x0244	Immed.
	Use this parameter when adjusting the forward response alone. Higher setting leads to faster the torque feedforward increase and shorter positioning time.					
Pn245	MRAC Negative Torque Feedforward Gain 1	0~1000	100.0	%	0x0245	Immed.
	Set to adjust the reserve response alone. Higher setting leads to faster the torque feedforward increase and shorter positioning time.					
Pn246	MRAC Gain 2	1~2000	50.0	1/s	0x0246	Immed.
	Set the second gain when model reference adaptive control is valid.					
Pn247	MRAC Damping Ratio 2	50~200	100.0	%	0x0247	Immed.
	If this setting is small, overshoot may be worse during positioning and position vibration may occur. When it's larger, overshoot will be better and position re-bounce may occur, leading to longer positioning time. Please set it to 100.					
Pn249	Velocity/Torque Feed-forward	0x00~0x01	0	-	0x0249	Immed.
	0: Not valid with model reference adaptive control at the same time 1: Valid with model reference adaptive control at the same time					
Pn250	External Encoder Usage	0~3	0	-	0x0250	Restart
	0: OFF 1: ON for positive operation 2: ON for negative operation					
Pn252	Hybrid Position Deviation Coefficient Per Revolution	0~100	20	%	0x0252	Immed.

	Set the deviation coefficient between the dual encoders for 1 turn of the motor operation, e.g. if this parameter is set to 0%, the deviation after motor running for 1 turn is 1000, and the deviation at the start of the 2nd turn is accumulated on the basis of 1000. And set it to 20%, and the deviation at the start of the 2nd turn is accumulated on the basis of 200 ($1000 \times 20\% = 200$). If this setting is too high, Er.d10 may not be detected properly, so please set it according to the permissible error between load and motors.					
Pn253	External Encoder Resolution	4~1048576	32768	Pulse/r	0x0253 0x0254	Restart
	Set the external grating resolution of the encoder for 1 revolution of motor operation (after 4 × frequency).					
Pn257	Hybrid Position Deviation Overflow Error Level	0~1073741824	1000	Reference unit	0x0257 0x0258	Immed.
	Set the fault threshold for excessive feedback deviation between two encoders. Low setting may result in false detection of Er.d10.					
Pn260	/Near Signal Width	1~1073741824	1073741824	Reference unit	0x0260 0x0261	Immed.
	Under position control, the host device will receive the positioning near signal before the completion signal to prepare for the sequence of actions afterwards, so as to shorten the time required for the whole positioning completion process. Send this signal when the difference between the number of reference pulses from the host device and the amount of servomotor movement (position deviation) is lower than this setting.					
Pn262	/COIN Signal Width	0~1073741824	7	Reference unit	0x0262 0x0263	Immed.
	Under position control, a signal indicating completion of servo motor positioning is sent when the difference between the number of reference pulses from the upper unit and the amount of servo motor movement (position deviation) is lower than the set value of Pn262, so that the upper unit can confirm that positioning has been completed.					
Pn264	Max. Position Deviation Overflow Level	1~1073741823	5242880	Reference unit	0x0264 0x0265	Immed.
	Set the maximum threshold for position deviation to detect the abnormalities and stop the motor in the event that the motor movement does not match the reference.					
Pn266	Position Deviation Overflow Alarm Level	10~100	100	%	0x0266	Immed.
	Set the alarm threshold for position deviation overflow, and report position deviation overflow alarm when the current position deviation value is larger than the multiplication of the Pn264 [Max. Position Deviation Overflow Level] and this setting.					

Pn267	Servo ON Position Deviation Overflow Error Level	1~1073741823	5242880	Reference unit	0x0267 0x0268	Immed.
	Set the error threshold for position deviation overflow when servo is enabled, and the drive will send an error prompt when the current position deviation value is higher than this setting at the servo ON signal.					
Pn269	Servo ON Position Deviation Overflow Alarm Level	10~100	100	%	0x0269	Immed.
	Set the alarm threshold for position deviation overflow, and report position deviation overflow alarm when the current position deviation value is larger than the multiplication of Pn267 [Servo ON Position Deviation Overflow Error Level] and this setting.					
Pn270	Servo ON Velocity Limit	0~10000	10000	rpm	0x0270	Immed.
	If the position deviation accumulates when servo drive is enabled, the speed limit is executed by this parameter. And if reference pulse is input in this state, the system will display the alarm "position deviation overflow due to speed limit at servo on" when this setting exceeded.					
Pn272	Position Deviation Clear Mode	0x00~0x03	0	-	0x0272	Restart
	0: Clear at level on 1: Clear at rising edge OFF-> ON 2: Clear at level off 3: Clear at falling edge ON-> OFF					
Pn273	Position Deviation Clear Condition	0x00~0x02	0	-	0x0273	Restart
	0: Clear under Servo OFF and errors and /CLR signal 1: Clear at /CLR signal 2: Clear at errors and /CLR signal					
Pn274	/COIN Output Time	0x00~0x02	0	-	0x0274	Restart
	0: When the absolute value of the position deviation is lower than Pn262 [/COIN Signal Width] 1: When the absolute value of the position deviation is lower than Pn262 [/COIN Signal Width] and the filtered position reference is 0 2: When the absolute value of the position deviation is lower than Pn262 [/COIN Signal Width] and the position reference input is 0					

5.4 Pn3 Velocity Control Parameters

Funcode	Name	Range	Default	Unit	Address	Enable
Pn300	Analog Velocity Reference Gain	150~3000	600	0.01V/rating	0x0300	Immed.
	Set the analog voltage (T-REF) required for the servo motor to run at the rated speed. Note: Do not apply voltage beyond -10~10V, or it may cause damage to the drive.					

Pn301	V-REF Polarity	0~1	0	-	0x0301	Immed.
	Set the voltage polarity for analog speed references: 0: Positive polarity-forward speed reference 1: Negative polarity-reverse speed reference					
Pn302	V-REF Filter Time	0~655.35	0.40	ms	0x0302	Immed.
	Apply a delay filter to the analog speed reference (V-REF) to smooth it. It usually does not need to be changed, but if it is too large, the responsiveness may be lowered. Please set it while checking the responsiveness.					
Pn303	V-REF Dead Zone	0~3	0	V	0x0303	Immed.
	When it is under analog speed control, even if the input reference is 0V, the servo motor may rotate slightly due to the slight deviation from the internal reference, which can be eliminated by setting a suitable dead zone.					
Pn304	Internal Velocity 1	0~10000	100	rpm	0x0304	Immed.
	Internal Velocity 2	0~10000	200	rpm	0x0305	Immed.
	Internal Velocity 3	0~10000	300	rpm	0x0306	Immed.
Pn305 Pn306	/SPD-A /SPD-B Velocity reference OFF OFF Zero speed OFF ON Internal Velocity 1 ON ON Internal Velocity 2 ON OFF Internal Velocity 3					
Pn310	Trapezoidal ACC Time	0~10000	0	ms	0x0310	Immed.
	Set the time required to accelerate from 0r/min to the maximum speed (corresponding to the motor type). When the given speed is greater or lower than the maximum speed, the actual ACC time is calculated in proportion.					
Pn311	Trapezoidal DEC Time	0~10000	0	ms	0x0311	Immed.
	Set the time required to decelerate from the maximum speed (corresponding to the motor type) to 0r/min. When the given speed is greater or lower than the maximum speed, calculate the actual DEC time in proportion.					
Pn312	Zero Clamp Mode	0~3	3	-	0x0312	Immed.
	0: OFF 1: Velocity reference is 0, no clamp after stopping 2: Velocity reference is 0, clamp after stopping 3: When the speed reference is lower than the Pn313 [Zero Clamp Velocity Level], the speed reference is set to 0 and the clamping is applied after stopping					
Pn313	Zero Clamp Velocity Level	0~10000	10	rpm	0x0313	Immed.
	Set the zero-control switching threshold when "Zero Clamp Mode" is set to 3.					
Pn317	Motor Rotation Level	1~10000	20	rpm	0x0317	Immed.
	If the motor speed exceeds the set value here, the switching rotation detection signal(/TGON) is output.					
Pn320	Velocity Completion Range	0~100	10	rpm	0x0320	Immed.

	When the difference between the motor speed and the speed reference is below the set value, output the switching speed completion signal(/V-CMP).

5.5 Pn4 Torque Control Parameters

Funcode	Name	Range	Default	Unit	Address	Enable
Pn400	Torque Reference Source	0~1	1	-	0x0400	Immed.
	Select the torque reference source: 0: Internal setting 1: Anglog input					
Pn401	Torque Reference Filter Cutoff Frequency	100~5000	5000	Hz	0x0401	Immed.
	Set the cutoff frequency of the second-order low-pass filter. When this parameter is set to 5000, the function of the filter is invalid.					
Pn402	Torque Reference Filter Q Factor	0.5~1	0.50	1	0x0402	Immed.
	Set the Q value of the second-order low-pass filter. A larger Q value can improve the system response, but it may increase noise.					
Pn403	Torque Reference Direction	0~1	0	-	0x0403	Immed.
	0: /T-SIGN OFF 1: /T-SIGN ON					
Pn404	T-REF Filter Time	0~655.35	0.00	ms	0x0404	Immed.
	Set to apply a delay filter to the analog torque reference (T-REF) to smooth it. It does not need frequent change usually, and if the set value is too large, the responsiveness may be reduced. Please confirm the responsiveness while setting.					
Pn405	T-REF Gain	10~100	30	0.1V/Rated torque	0x0405	Immed.
	Set the analog voltage required for the servo motor to run at the rated torque(T-REF).					
Pn406	T-REF Polarity	0~1	0	-	0x0406	Immed.
	0: Negative polarity: corresponds to POS torque reference 1: Negative polarity: corresponds to NEG torque reference					
Pn407	T-REF Dead Zone	0~3	0	V	0x0407	Immed.
	In analog torque control, even if the input reference is 0V, the servo motor may rotate at a slight speed due to the slight deviation of the internal reference, which can be eliminated by setting a proper dead zone.					
Pn410	Internal Torque Reference	-500~500	0	%	0x0410	Immed.

	Set the internal torque reference when torque reference source is set to inter setting.					
Pn411	Torque Control Velocity Limit Method	0	1	-	0x0411	Restart
	0: Min(V-REF-based speed, Pn413 [Velocity Limit under Torque Control]) 1: Pn413 [Velocity Limit under Torque Control] setting					
Pn412	General Velocity Limit Level	0x00~0x01	0	-	0x0412	Restart
	0: Maximum motor speed (up to motor model) and Pn411 [Torque Control Velocity Limit Method] 1: Overspeed alarm level (up to motor model) and Pn411 [Torque Control Velocity Limit Method]					
Pn413	Velocity Limit under Torque Control	0~10000	1000	rpm	0x0413	Immed.
	Set the speed limit under torque control together with Pn411 [Velocity Limit Method under Torque Control].					

5.6 Pn5 Jogging Parameters

Funcode	Name	Range	Default	Unit	Address	Enable
Pn500	Jogging Velocity	0~1000	500	rpm	0x0500	Immed.
Pn502	Programmed Jogging Mode	0x00~0x05	0	-	0x0502	Immed.
	0: (Waiting time -> POS movement) * cycles 1: (Waiting time -> NEG movement) * cycles 2: (Waiting time -> POS movement) * cycles->(Waiting time -> NEG movement) * cycles 3: (Waiting time -> NEG movement) * cycles->(Waiting time -> POS movement) * cycles 4: (Waiting time -> POS movement -> Waiting time -> NEG movement) * cycles 5: (Waiting time -> NEG movement) * cycles->(Waiting time -> POS movement) * cycles					
Pn503	Programmed Jogging Movement	1~1073741824	32768	Reference unit	0x0503	Immed.
	Set the jogging travel distance by reference unit.					
Pn505	Programmed Jogging ACC/DEC Time	2~10000	100	ms	0x0505	Immed.
	Set the time required to accelerate the speed from 0r/min to the rated speed (up to the motor model).					
Pn506	Programmed Jogging Waiting Time	0~10000	100	ms	0x0506	Immed.
	Set the waiting time between programmed jogging segments, use together with Pn502 [Programmed Jogging Mode].					

Pn507	Programmed Jogging Movement No.	0~1000	1	Times	0x0507	Immed.
	Set the travel count of the jogging programs, use together with Pn502 [Programmed Jogging Mode].					
Pn508	Programmed Jogging Velocity	1~10000	500	rpm	0x0508	Immed.

5.7 Pn6 Switching Parameters

Funcode	Name	Range	Default	Unit	Address	Enable
Pn600	Switching Input Signal Assignment Mode	0~1	1	-	0x0600	Restart
	0: Fixed internally 1: Up to parameter settings					
Pn601 Pn602 Pn603 Pn604	CN1-X1 Configuration	0x000 0x1FF	0x000	-	0x0601	Restart
	CN1-X2 Configuration	0x000 0x1FF	0x102	-	0x0602	Restart
	CN1-X3 Configuration	0x000 0x1FF	0x103	-	0x0603	Restart
	CN1-X4 Configuration	0x000~ 0x1FF	0x1D	-	0x0604	Restart
	Hundreds-bit: Logic 0:Positive 1:Negative Ones- and tens-bit: Function 0x02: POS operation 0x03: NEG operation 0x04: Error reset 0x05: Manual P-PI control shift 0x06: Torque limit shift 0x0C: Zero clamp 0x0E: Gain shift 0x0F: Torque reference direction 0x10: Reference pulse multiplier shift 0x16: External terminal fault input 0x1D: Home signal Others: Reserved					
Pn610 Pn611 Pn612	Switching Input Internal Configuration 1	0x000~0x1FF	0x00	-	0x0610	Restart

	Switching Input Internal Configuration 2	0x000~0x1FF	0x00	-	0x0611	Restart
	Switching Input Internal Configuration 3	0x000~0x1FF	0x00	-	0x0612	Restart
	The same with X terminal functions.					
Pn613 Pn614	CN1-Y1 DO Configuration	0x000~0x109	0x006	-	0x0613	Restart
	CN1-Y2 RO Configuration	0x000~0x109	0x001	-	0x0614	Restart
	Hundreds-bit: Logic 0:Positive 1:Negative Ones- and tens-bit: Function 0x00: /S-RDY 0x01: /COIN 0x02: /V-CMP 0x03: /TGON 0x04: /CLT 0x05: /VLT 0x06: /BK 0x07: /Error 0x08: /NEAR 0x09: /PSELA 0x0A: /TAO 0x12: /encovheat 0x13: /NoAlmCoin 0X14: /STO 0X15: /Drfault Others: Reserved					
Pn622	Error Detection Mode	0x00~0x11	0x00	-	0x0622	Restart
	0X1#: ON at high level 0X0#: ON at low level 0x#1: Detection OFF 0x#0: Detection ON					

5.8 Pn7 Extension Parameters

Funcode	Name	Range	Default	Unit	Address	Enable
Pn730	Motor-free Test	0x00~0x01	0	-	0x0730	Restart
	0: OFF 1: ON					
Pn731	Motor-free Test Encoder Resolution	0~3	1	-	0x0731	Restart
	Set the encoder resolution when the motor-free test mode is selected: 0: 13-bit 1: 17-bit 2: 20-bit 3: 23-bit					
Pn732	Motor-free Test Encoder Type	0x00~0x01	0x00	-	0x0732	Restart

	Set the motor-free test encoder type. 0: Incremental encoder 1: Absolute encoder					
Pn780	Encoder Connection	0~1	0	-	0x780	Restart
	0: Encoder terminal 1: Extension terminal (RT only)					
Pn792	Absolute Encoder Function	0~2	0	-	0x0792	Restart
	0: OFF 1: Write the motor parameters to EEPROM 2: Clear the multi-turn encoder 3: Clear encoder error					

5.9 Un Monitor Display Parameters

Code	Name	Range	Unit	Address
Un000	Motor Velocity	0x80000000~0x7FFFFFFF	rpm	0xE000
Un001	Velocity Reference	0x80000000~0x7FFFFFFF	rpm	0xE001
Un002	Internal torque reference	0x80000000~0x7FFFFFFF	%	0xE002
Un003	Rotor Position Relative to Z Pulse	0x80000000~0x7FFFFFFF	pulse	0xE003
Un004	Electrical Angle	0x80000000~0x7FFFFFFF	°	0xE004
Un005	Reference Pulse Velocity	0x80000000~0x7FFFFFFF	rpm	0xE005
Un006	Reference Pulse Counter	0x80000000~0x7FFFFFFF	Reference unit	0xE006
Un007	Feedback Pulse Counter	0x80000000~0x7FFFFFFF	Reference unit	0xE007
Un008	Feedback Pulse Counter 1	0x80000000~0x7FFFFFFF	Encoder unit	0xE008
Un009	Position Offset	0x80000000~0x7FFFFFFF	Reference unit	0xE009
Un010	Absolute Encoder Single-turn Value	0x80000000~0x7FFFFFFF	Encoder unit	0xE010
Un011	Absolute Encoder Multi-turn Value	0x80000000~0x7FFFFFFF	-	0xE011
Un012	External Encoder Pulse Counter	0x80000000~0x7FFFFFFF	External encoder unit	0xE012
Un00A	Cumulative Load Ratio	0x80000000~0x7FFFFFFF	%	0xE00A
Un00B	Regenerative Load Ratio	0x80000000~0x7FFFFFFF	%	0xE00B
Un00C	DB Resistor Power Consumption	0x80000000~0x7FFFFFFF	%	0xE00C

Un00D	Effective Gain Monitoring	1~2	-	0xE00D
Un00E	Runtime	0~0xFFFFFFFF	100ms	0xE00E
Un00F	Overload Rate	0~0xFFFFFFFF	%	0xE00F
Un034	ARM Software Sub-version	0xFFFF	-	0x034
Un035	ARM Software Version	0~0xFFFF	-	0xE035
Un036	FPGA Software Version	0~0xFFFF	-	0xE036
Un089	Drive Internal Temperature	-40~600	℃	0xE089
Un091	Motor Temperature Display	-30~600	℃	0xE091
Un100	I/O Port Input Monitoring	0~0xFFFF	-	0xE100
	Ones-bit: CN1-X1 signa Tens-bit: CN1-X2 signal Hundreds-bit: CN1-X3 signal Thousands-bit: CN1-X4 signa			
Un101	I/O Port Output Monitoring	0~0xFFFF	-	0xE101
	Ones-bit: CN1-Y1 DO Tens-bit: CN1-Y2 RO			
Un102	T-REF Monitoring	0~0xFFFF	%	0xE102
Un103	V-REF Monitoring	0~0xFFFF	rpm	0xE103
Un104	Pulse Input Frequency	0~0xFFFFFFFF	Hz	0xE104
Un108	External Command Pulse Counter	0~0xFFFFFFFF	Reference unit	0xE108
Un110	Internal Signal Status Summary	0~0xFFFFFFFF	-	0xE110
Un120	Internal Input Signal Status Summary	0~0xFFFFFFFF	-	0xE120
Un130	Internal Output Signal Status Summary	0~0xFFFFFFFF	-	0xE130
Un140	DC Bus Voltage	0~0xFFFF	V	0xE140
Un141	Current Feedback RMS	0~0xFFFF	0.01A	0xE141
Un230	STO Monitoring L	0~0xFFFF	-	0xE230
Un231	STO Monitoring H	0~0xFFFF	-	0xE231
Un300	Current Error Code	0~0xFFFF	-	0xE300
Un301	Last Error Code	0~0xFFFF	-	0xE301
Un302	Error-Timestamp	0~0xFFFFFFFF	100ms	0xE302
Un303	Error-Motor Velocity	0~0xFFFF	rpm	0xE303
Un304	Error-Velocity Reference	0~0xFFFF	rpm	0xE304
Un305	Error-Internal Torque Reference	0~0xFFFF	%	0xE305
Un306	Error-Input Pulse Velocity	0~0xFFFF	rpm	0xE306
Un307	Error-Deviation Counter	0~0xFFFFFFFF	pulse	0xE307

Un308	Error-Main Circuit Bus Voltage	0~0xFFFF	V	0xE308
Un309	Error-Current Feedback RMS	0~0xFFFF	%	0xE309
Un30A	Error-Cumulative Load Rate	0~0xFFFF	%	0xE30A
Un30B	Error-Regenerative Load Rate	0~0xFFFF	%	0xE30B
Un30C	Error-DB Resistor Power Consumption	0~0xFFFF	%	0xE30C
Un30D	Error-Max. Cumulative Load Rate	0~0xFFFF	%	0xE30D
Un30E	Error-Moment of Inertia Ratio	0~0xFFFF	%	0xE30E
Un30F	Error-Serial Encoder Communication Exception Count	0~0xFFFF	-	0xE30F
Un310	Error-Internal Signal Monitor	0~0xFFFFFFFF	-	0xE310
Un313	Error-Internal Input Signal Monitor	0~0xFFFFFFFF	-	0xE313
Un317	Error-Internal Output Signal Monitor	0~0xFFFFFFFF	-	0xE317
Un320	Error Code History 1	0~0xFFFF	-	0xE320
Un321	Error Code History 2	0~0xFFFF	-	0xE321
Un322	Error Time History 3	0~0xFFFF	-	0xE322
Un323	Error Code History 4	0~0xFFFF	-	0xE323
Un324	Error Time History 5	0~0xFFFF	-	0xE324
Un325	Error Time History 6	0~0xFFFF	-	0xE325
Un326	Error Time History 7	0~0xFFFF	-	0xE326
Un327	Error Time History 8	0~0xFFFF	-	0xE327
Un328	Error Time History 9	0~0xFFFF	-	0xE328
Un329	Error Time History 10	0~0xFFFF	-	0xE329
Un330	Error Time History 1	0~0xFFFFFFFF	100ms	0xE330
Un331	Error Time History 2	0~0xFFFFFFFF	100ms	0xE331
Un332	Error Time History 3	0~0xFFFFFFFF	100ms	0xE332
Un333	Error Time History 4	0~0xFFFFFFFF	100ms	0xE333
Un334	Error Time History 5	0~0xFFFFFFFF	100ms	0xE334
Un335	Error Time History 6	0~0xFFFFFFFF	100ms	0xE335
Un336	Error Time History 7	0~0xFFFFFFFF	100ms	0xE336
Un337	Error Time History 8	0~0xFFFFFFFF	100ms	0xE337
Un338	Error Time History 9	0~0xFFFFFFFF	100ms	0xE338
Un339	Error Time History 10	0~0xFFFFFFFF	100ms	0xE339

6 Errors and Alarms

6.1 Errors and Alarms

- When Pn907=0

Display	Name	Error Code	Auxiliary Code
Er.020	Parameter checksum exception	0x6000	0x00000020
Er.021	Parameter formatting exception	0x6001	0x00000021
Er.022	System checksum exception	0x6002	0x00000022
Er.023	XML file not burned	0x6003	0x00000023
Er.030	Main circuit exception	0x6004	0x00000030
Er.040	Wrong parameter setting	0x6005	0x00000040
Er.041	Wrong pulse output setting	0x6006	0x00000041
Er.042	Parameter combination exception	0x6007	0x00000042
Er.044	Wrong semi-/full-closed loop parameter setting	0x6008	0x00000044
Er.050	Motor-drive capacity mismatch	0x6009	0x00000050
Er.051	Device connected not supported	0x600A	0x00000051
Er.080	Wrong encoder pulse distance setting	0x600B	0x00000080
Er.08A	Wrong position sensor resolution setting	0x600C	0x0000008A
Er.0B0	Invalid servo enable reference	0x600D	0x000000B0
Er.100	Overcurrent (OC)	0x600E	0x00000100
Er.300	Regenerative exception	0x600F	0x00000300
Er.320	Regenerative overload	0x6010	0x00000320
Er.330	Main circuit power wiring exception	0x6011	0x00000330
Er.400	Main circuit overvoltage(OV)	0x6012	0x00000400
Er.410	Main circuit undervoltage	0x6013	0x00000410
Er.42A	Adapter exception	0x6014	0x0000042A
Er.450	Main circuit capacitor overvoltage	0x6015	0x00000450
Er.510	Overspeed (OS)	0x6016	0x00000510
Er.511	Pulse output overspeed	0x6017	0x00000511
Er.520	Strong vibration	0x6018	0x00000520
Er.521	Auto tuning exception	0x6019	0x00000521
Er.550	Wrong max. speed setting	0x601A	0x00000550
Er.710	Overload (instantaneous max. load)	0x601B	0x00000710
Er.720	Overload (continuous max. load)	0x601C	0x00000720

Er.730	Dynamic brake (DB) overload 1	0x601D	0x00000730
Er.731	Dynamic brake (DB) overload 2	0x601E	0x00000731
Er.740	Inrush current limiter resistor overload	0x601F	0x00000740
Er.7A0	Heatsink overheat	0x6020	0x000007A0
Er.7AA	Control board overheat	0x6021	0x000007AA
Er.7AB	Built-in fan shutdown	0x6022	0x000007AB
Er.810	Encoder backup exception	0x6023	0x00000810
Er.820	Encoder checksum exception	0x6024	0x00000820
Er.830	Encoder battery exception	0x6025	0x00000830
Er.840	Encoder data exception	0x6026	0x00000840
Er.850	Encoder overspeed	0x6027	0x00000850
Er.860	Encoder overheat	0x6028	0x00000860
Er.870	Encoder write exception	0x6078	0x00000870
Er.9b0	EtherCAT sync exception	0x607D	0x000009B0
Er.B10	Velocity reference analog/digital exception	0x6031	0x00000B10
Er.B11	Velocity reference analog/digital conversion exception	0x6032	0x00000B11
Er.B20	Torque reference analog/digital exception	0x6033	0x00000B20
Er.B31	Current error 1 (U-phase)	0x6034	0x00000B31
Er.B32	Current error 2 (V-phase)	0x6035	0x00000B32
Er.B33	Current error 3 (Current detector)	0x6036	0x00000B33
Er.B40	Reserved	0x6037	0x00000B40
Er.BE0	Reserved	0x6038	0x00000BE0
Er.BF0	System error 0	0x6039	0x00000BF0
Er.BF1	System error 1	0x603A	0x00000BF1
Er.BF2	System error 2	0x603B	0x00000BF2
Er.BF3	System error 3	0x603C	0x00000BF3
Er.BF4	Hardware overcurrent	0x603D	0x00000BF4
Er.C10	Stall detected	0x603E	0x00000C10
Er.C20	Wrong phase sequence	0x603F	0x00000C20
Er.C21	Hall sensor exception	0x6040	0x00000C21
Er.C22	Phase information mismatch	0x6041	0x00000C22
Er.C50	Magnetic pole monitor failure	0x6042	0x00000C50
Er.C51	Magnetic pole monitor stop	0x6043	0x00000C51
Er.C52	Magnetic pole monitor interrupt	0x6044	0x00000C52
Er.C53	Overtravel detected during magnetic pole monitoring	0x6045	0x00000C53

Er.C54	Magnetic pole monitor failure 2	0x6046	0x00000C54
Er.C80	Encoder clear exception	0x6047	0x00000C80
Er.C90	Encoder communication exception	0x6048	0x00000C90
Er.C91	Encoder data ACC exception	0x6049	0x00000C91
Er.C92	Encoder communication timer exception	0x604A	0x00000C92
Er.CA0	Encoder parameter exception	0x604B	0x00000CA0
Er.CB0	Encoder feedback mismatch	0x604C	0x00000CB0
Er.CC0	Turn limit mismatch	0x604D	0x00000CC0
Er.CF1	Reserved	0x604E	0x00000CF1
Er.CF2	Reserved	0x604F	0x00000CF2
Er.D00	Position deviation overflow	0x6050	0x00000D00
Er.D01	Position deviation overflow when servo enabled	0x6051	0x00000D01
Er.D02	Position deviation overflow due to speed limit when servo enabled	0x6052	0x00000D02
Er.D10	Dual-encoder feedback deviation overflow	0x6053	0x00000D10
Er.D30	Position data overflow	0x6054	0x00000D30
Er.EB9	EtherCAT initialization exception	0x606C	0x00000EB9
Er.EC6	EtherCAT PDO mapping entry over-count	0x6073	0x00000EC6
Er.F10	Phase loss on main circuit three-phase power supply	0x6077	0x00000F10

- When Pn907=1

Display	Name	Error Code	Auxiliary Code
Er.020	Parameter checksum exception	0x6320	0x00000020
Er.021	Parameter formatting exception	0x6320	0x00000021
Er.022	System checksum exception	0x6320	0x00000022
Er.023	XML file not burned	0xFF00	0x00000023
Er.030	Main circuit exception found	0x3200	0x00000030
Er.040	Wrong parameter setting	0x6320	0x00000040
Er.041	Wrong pulse output setting	0x6320	0x00000041
Er.042	Parameter combination exception	0x6320	0x00000042
Er.044	Wrong semi- /full-closed loop parameter setting	0x6320	0x00000044
Er.050	Motor-drive capacity mismatch	0x7122	0x00000050
Er.051	Device connected mismatch	0xFF00	0x00000051
Er.080	Wrong encoder pulse distance setting	0x6320	0x00000080
Er.08A	Wrong position sensor resolution	0x6320	0x0000008A
Er.0B0	Invalid servo enable command	0x5441	0x000000B0

Er.100	Overcurrent (OC)	0x2312	0x00000100
Er.300	Regenerative exception	0xFF00	0x00000300
Er.320	Regenerative overload	0x3230	0x00000320
Er.330	Main circuit power wiring exception	0x6320	0x00000330
Er.400	Main circuit overvoltage (OV)	0x3210	0x00000400
Er.410	Main circuit undervoltage	0x3220	0x00000410
Er.42A	Adapter exception	0xFF00	0x0000042A
Er.450	Main circuit capacitor overvoltage	0xFF00	0x00000450
Er.510	Overspeed (OS)	0xFF00	0x00000510
Er.511	Pulse output overspeed	0xFF00	0x00000511
Er.520	Strong vibration	0xFF00	0x00000520
Er.521	Auto tuning exception	0xFF00	0x00000521
Er.550	Wrong max. speed setting	0x6320	0x00000550
Er.710	Overload (instantaneous max. load)	0x3230	0x00000710
Er.720	Overload (continuous max. load)	0x3230	0x00000720
Er.730	Dynamic brake (DB) overload 1	0x3230	0x00000730
Er.731	Dynamic brake (DB) overload 2	0x3230	0x00000731
Er.740	Inrush current limiter resistor overload	0x3230	0x00000740
Er.7A0	Heatsink overheat	0x4210	0x000007A0
Er.7AA	Control board overheat	0xFF00	0x000007AA
Er.7AB	Built-in fan shutdown	0xFF00	0x000007AB
Er.810	Encoder backup exception	0x7305	0x00000810
Er.820	Encoder checksum exception	0x7305	0x00000820
Er.830	Encoder battery exception	0x7305	0x00000830
Er.840	Encoder data exception	0x7305	0x00000840
Er.850	Encoder overspeed	0x7305	0x00000850
Er.860	Encoder overheat	0x7305	0x00000860
Er.870	Encoder write exception	0x7305	0x00000870
Er.9b0	EtherCAT sync exception	0xFF00	0x000009B0
Er.B10	Analog/Digital speed reference exception	0xFF00	0x00000B10
Er.B11	Analog/Digital speed reference conversion exception	0xFF00	0x00000B11
Er.B20	Analog/Digital torque reference exception	0xFF00	0x00000B20
Er.B31	Current error 1 (U-phase)	0x2300	0x00000B31
Er.B32	Current error 2 (V-phase)	0x2300	0x00000B32
Er.B33	Current error 3 (Current detector)	0x2300	0x00000B33

Er.B40	Reserved	0x6037	0x00000B40
Er.BE0	Reserved	0x6038	0x00000BE0
Er.BF0	System error 0	0xFF00	0x00000BF0
Er.BF1	System error 1	0xFF00	0x00000BF1
Er.BF2	System error 2	0xFF00	0x00000BF2
Er.BF3	System error 3	0xFF00	0x00000BF3
Er.BF4	Hardware overcurrent	0x2310	0x00000BF4
Er.C10	Stall detected	0xFF00	0x00000C10
Er.C20	Phase error	0xFF00	0x00000C20
Er.C21	Hall sensor exception	0x7300	0x00000C21
Er.C22	Phase mismatch	0xFF00	0x00000C22
Er.C50	Magnetic pole monitor failure	0xFF00	0x00000C50
Er.C51	Magnetic pole monitor stop	0xFF00	0x00000C51
Er.C52	Magnetic pole monitor interrupt	0xFF00	0x00000C52
Er.C53	Magnetic pole monitor overrun	0xFF00	0x00000C53
Er.C54	Magnetic pole monitor failure 2	0xFF00	0x00000C54
Er.C80	Encoder clear exception	0x7305	0x00000C80
Er.C90	Encoder communication exception	0x7305	0x00000C90
Er.C91	Encoder position ACC value exception	0x7305	0x00000C91
Er.C92	Encoder communication timer exception	0x7305	0x00000C92
Er.CA0	Encoder parameter exception	0x7305	0x00000CA0
Er.CB0	Encoder feedback mismatch	0x7305	0x00000CB0
Er.CC0	Inconsistent upper and lower encoder rotation limits	0xFF00	0x00000CC0
Er.CF1	Reserved	0x604E	0x00000CF1
Er.CF2	Reserved	0x604F	0x00000CF2
Er.D00	Position deviation overflow	0x8611	0x00000D00
Er.D01	Position deviation overflow during servo-ON	0x8611	0x00000D01
Er.D02	Position deviation overflow due to speed limit during servo-ON	0x8611	0x00000D02
Er.D10	Hybrid position deviation overflow	0x8611	0x00000D10
Er.D30	Position data overflow	0x8600	0x00000D30
Er.EB9	EtherCAT initialization exception	0xFF00	0x00000EB9
Er.EC6	EtherCAT PDO mapping entry over-count	0xFF00	0x00000EC6
Er.EC7	Phase loss	0x3130	0x00000EC7
Er.F10	Phase loss on main circuit three-phase power supply	0xFF00	0x00000F10

- When Pn907=0

Display	Name	Error Code	Auxiliary Code
AL.900	Position deviation overflow	0x900	0x700
AL.901	Position deviation overflow when servo enabled	0x901	0x701
AL.910	Overload	0x910	0x710
AL.911	Strong vibration	0x911	0x711
AL.920	Regeneration overload	0x920	0x720
AL.921	Dynamic brake overload	0x921	0x721
AL.930	Battery undervoltage	0x930	0x730
AL.931	Software position limit setting exception	0x931	0x731
AL.940	Home offset out of software position limit	0x940	0x740
AL.941	Parameter change re-powering	0x941	0x741
AL.942	EtherCAT control mode setting exception	0x942	0x742
AL.950	Position out of software position limit	0x950	0x750
AL.971	Undervoltage	0x971	0x771
AL.9A0	Over travel	0x9A0	0x7A0
AL.9B0	SYNC0 synchronization frame loss	0x9B0	0x7B0
AL.9F0	Distributed clock period setting exception (125μs integer multiples)	0x9F0	0x7F0

- When Pn907=1

Display	Name	Error Code	Auxiliary Code
AL.900	Position deviation overflow	0x8611	0x700
AL.901	Position deviation overflow when servo enabled	0x8611	0x701
AL.910	Overload	0x3230	0x710
AL.911	Strong vibration	0xFF00	0x711
AL.920	Regeneration overload	0x3230	0x720
AL.921	Dynamic brake overload	0x3230	0x721
AL.930	Battery undervoltage	0x7305	0x730
AL.931	Software position limit setting exception	0xFF00	0x731
AL.940	Home offset out of software position limit	0xFF00	0x740
AL.941	Parameter change alarms that require re-powering down	0x6320	0x741
AL.942	EtherCAT control mode setting exception	0xFF00	0x742
AL.950	Position out of software position limit	0x6320	0x750
AL.971	Undervoltage	0x3220	0x771
AL.9A0	Over travel	0x5441	0x7A0

AL.9B0	SYNC0 synchronization frame loss	0xFF00	0x7B0
AL.9F0	Distributed clock period setting exception (125us integer multiples)	0xFF00	0x7F0

6.2 Troubleshooting

Fault Code	Type	Solution	Class
Er.020	Parameter checksum exception	Renter the parameter again after initialization. Write the power level of the drive to 0 first, and then write the correct power level. Note: Perform current detection correction, analog input correction, and bus voltage correction after power level is written. Servo drive fails, replace it.	C1
Er.021	Parameter formatting exception(Inconsistent version number)	Write the power level of the drive to 0 first, and then write the correct power level. Note: Perform current detection correction, analog input correction, and bus voltage correction after power level is written. Servo drive fails, replace the servo drive.	C1
Er.022	System checksum exception	Write the power level of the drive to 0 first, and then write the correct power level. Note: Perform current detection correction, analog input correction, and bus voltage correction after power level is written. 2. Servo drive fails, replace the servo drive.	C1
Er.023	XML file not burned	Redo the XML file burning.	C1
Er.040	Wrong parameter setting	1. Check if the changed parameters are out of range. 2. Check if the setting of the electronic gear ratio is within the range (electronic gear ratio 0.001~16777216/1000). 3. Check if the servo driver matches the capacity of the servo motor. 4. I/O terminal definition repeats.	C1
Er.042	Parameter combination exception	1. Check if the electronic gear ratio is within the range. 2. Check the logic of the Jog programs.	C1
Er.044	Wrong semi-/full-closed loop parameter setting	Correctly set semi-closed loop/fully closed loop parameters.	
Er.050	Motor-drive capacity mismatch	1. Check if the drive power and motor power are correct. 2. Replace the drive or motor to make it within reasonable range.	C1

Er.0B0	Invalid servo enable reference	Re-power or perform software reset.	C1
Er.100	Overcurrent	1. Check if the motor wiring is correct. 2. Check if the motor is damaged, use a multimeter to measure whether the U/V/W ground is shorted. 3. Check if the motor's encoder angle is correct. 4. Monitor the AD value of the UV phase current sampling under the unenabled condition through the virtual oscilloscope to determine whether it is a drive hardware current sampling failure, which is around 0 under normal circumstances.	C1
Er.320	Regenerative overload	1. Set the power supply voltage within the specification range. 2. Set the resistor value and capacity correctly. 3. Servo drive fails, replace the servo drive.	C1
Er.400	Overvoltage	1. Adjust the AC/DC power supply voltage to the product specification range. 2. Re-analyze the capacity of the regenerative resistance value according to the actual situation.	C1
Er.42A	Motor overheat	1. Check whether the motor temperature is too high. 2. Check whether the motor temperature sensor is damaged. 3. Check whether the motor overheat level is correct. 4. Check whether the motor temperature sensor type is correct.	C1
Er.510	Overspeed	1. Check whether the motor and the three phases of the UVW are connected correctly. 2. Check whether the encoder is connected correctly. 3. Check whether the maximum speed setting in the motor parameters is correct. 4. Check if the input reference exceeds the overspeed value. 5. Reduce the servo gain, or set a certain smoothing time.	C1
Er.520	Strong vibration	1. Reduce the motor speed or reduce the speed loop gain if the working condition permits. 2. Set the inertia ratio correctly. 3. Set the Pn187 [Vibration Detection Level]) and Pn186 [Vibration Detection Sensitivity] appropriately.	C1
Er.550	Wrong max. speed setting	Set the max. speed appropriately.	C1

Er.710	Instantaneous overload	1. Check whether the motor is clogged. 2. Check the motor wiring (phase sequence, and connection), and encoder wiring. 3. Check the drive or motor model based on the operating conditions and loads. 4. Observe the motor during operation to see if there is a major jitter or noise, if so, adjust the gain parameters. And at the same time, use a virtual oscilloscope to monitor the output torque of the motor.	C2
Er.720	Continuous overload	1. Check the motor wiring (phase sequence, and connection), and encoder wiring. 2. Check the drive or motor model based on the operating conditions and loads. 3. Observe the motor during operation to see if there is a major jitter or noise, if so, adjust the gain parameters. And at the same time, use a virtual oscilloscope to monitor the output torque of the motor.	C1
Er.730	Dynamic brake (DB) overload 1	1. The load is too heavy during shutdown, resulting in DB resistance overload. Please reduce the running speed or reduce the load. 2. Check whether the motor is driven by external force. 3. Check whether it is necessary to choose the DB stop mode, if not, then choose other modes. 4. If the fault was reported in the last operation, re-power up and wait for some time before operation.	C1
Er.7A0	Heatsink overheat	1. Check whether the air duct is blocked and the fan is damaged if the drive is equipped with a fan. 2. Check the drive installation and heat dissipation conditions, and improve them as far as possible. 3. Check the drive with the load, if the load is too heavy, please replace the drive with higher power. 4. Reduce the carrier frequency of the drive if possible.	C2
Er.7AA	STO failure	Check Un230 and Un231 setting.	C1
Er.810	Encoder backup failure	1. Check the battery power supply of multi-turn encoder. 2. Clear the multi-turn encoder.data.	C1
Er.830	Battery undervoltage	Replace the battery for the multi-turn encoder.	C1
Er.BF4	Hardware overcurrent	Repower the servo unit up. If the error still occurs, the servo unit may be damaged, so please replace the servo drive. Or it is the power line or motor damage.	C1

Er.C10	Stall	1. Check if the motor wiring is correct. 2. Check if the motor and encoder are normal. Repower up the servo drive, and if the alarm still occurs, then it may be a servo drive failure.	C1
Er.C90	Encoder communication exception	1. Test each signal line of the encoder with a multimeter to see if there is any signal line breakage. 2. Check if the model of the encoder line is correct. 3. Check if the encoder line is too long. 4. There may be interference, ground the drive or add the magnetic ring around the encoder line. 5. Check the motor parameters setting. 6. The servo drive fails, replace it.	C1
Er.C91	Encoder data ACC exception		C1
Er.CA0	Encoder parameter exception		C1
Er.D00	Position deviation overflow	1. Set the appropriate error value for excessive position deviation. 2. Check if the encoder wire and motor wire are connected normally, and turn the motor by hand to monitor whether Un003 (rotor position relative to the Z pulse) varies between 0 and 16777216 (24-bit encoder). 3. Check if the pulse frequency input, ACC planning or electronic gear ratio settings are correct. 4. Determine the relevant parameter settings: if torque limit, speed limit, inertia ratio, position gain, speed gain are too low, or position filter is too high. 5. Check the motor power or if the ACC/DEC setting are too low, resulting in position deviation overflow.	C1
Er.D01	Position deviation overflow when servo enabled	Set Pn267 [Servo ON Position Deviation Overflow Error Level] correctly.	C1
Er.D02	Position deviation overflow due to speed limit when servo enabled	Set Pn264 [Position Deviation Overflow Level] or Pn270 [Servo ON Velocity Limit] correctly.	C2
Er.D10	Dual-encoder feedback deviation overflow	1. Set the directions of the motor and external encoder. 2. Check the mechanical installation. 3. Check Pn250 [External Encoder Usage] setrting.	C2
Er.EB9	EtherCAT initialization exception	1. Burn the configuration files. 2. Replace the servo drive. 3. Burn the FPGA code.	C1

Alarm Code	Type	Solution
AL.900	Position deviation overflow	1. Set the gear ratio, gain, position filter, torque limit and other related parameters correctly. 2. Check the encoder and motor wiring. 3. The servo drive fails, replace it.
AL.901	Position deviation overflow when servo enabled	Set Pn267 [Servo ON Position Deviation Overflow Alarm Level] correctly.
AL.910	Overload	1. Check the motor wiring and encoder wiring. 2. Replace with an appropriate motor or drive.
AL.911	Abnormal vibration	1. Reduce the motor speed or the speed loop gain. 2. Set the inertia ratio correctly.
AL.921	Dynamic brake overload	1. Reduce the speed reference of the servo motor. 2. Reduce the inertia ratio. 3. Servo drive fails, replace the servo drive.
AL.930	Battery undervoltage	Replace the battery.
AL.931	Software position limit setting exception	Set the minimum and maximum limit value on 607Dh correctly.
AL.940	Home offset out of software position limit	Set the 607Dh [Software Position Limit] and 607Ch[Home Offset] correctly.
AL.941	Parameter change re-powering	Repower up the servo drive.
AL.942	EtherCAT control mode setting exception	Set the 6060h [Control Mode] correctly.
AL.950	Position out of software position limit	Set the 607Dh[Software Position Limit] and 607Ah[Home Bias] correctly.
AL.971	Undervoltage	1. Adjust the AC/DC power supply voltage to the product specification range. 2. Increase power supply capacity.
AL.9B0	SYNC0 synchronization frame loss	2. Check network cable wiring.
AL.9F0	Distributed clock period setting exception	Set the distributed clock period to an integer multiple of 125μs.
AL.9F1	STO disconnection	Check Un230 and Un231 for details.

7 Regular Inspection and Maintenance

7.1 Inspection

The servo drives consist of semiconductor devices, passive electronic devices, and motion devices, all of which have a service life, and even under normal operating conditions, some of the devices may change in characteristics or fail if their service life is exceeded. To prevent malfunction, preventive inspections and maintenance such as daily inspections, periodic inspections, and device replacement must be performed. It is recommended that inspections be performed every 3 to 4 months after the machine is installed.

Daily Inspection

Daily inspection: To avoid damage to the spindle drive and shortening of its service life, check the following items on a daily basis.

Item	Content	Solutions
Power supply	Check if the supply voltage meets the requirements and if there is any phase loss.	Follow the instructions on the nameplate.
Surroundings	Check if the installation environment meets the requirements.	Check the cause and handle it properly.
Cooling system	Check if there is abnormal heating and discoloration of the drive and motor, and the working condition of the cooling fan.	Check if there is overload, if the heat sink is dirty,or if the fan is blocked, and tighten the screws.
Motor	Check if the motor has abnormal vibration or sound.	Tighten mechanical and electrical connections and lubricate mechanical parts.
Load	Check if the operation lasts for some time when the output current of the drive is higher than the rated value of the motor or spindle.	Check if overload occurs, and if the servo drive model is appropriate.

Regular Inspection

In general, it is appropriate to conduct periodic inspections every 3 to 4 months, however, please determine the actual inspection period for each machine based on its usage and working environment.

Item	Content	Solutions
Overall	● Insulation resistance check ● Environment check	● Tighten and replace defective parts ● Clean and improve the operating environment
Electrical connections	● Check if the wires and connections are free of discoloration, broken insulation, cracks and signs of deterioration. ● Check if the connection terminals are not worn, damaged, or loose. ● Check grounding.	● Replace the damaged wires. ● Tighten the loose terminals and replace the damaged ones. ● Measure the grounding resistance and tighten the corresponding grounding terminals.
Mechanical connections	● Check for abnormal vibrations and noises, and loose fixing.	● Tighten, lubricate, and replace defective parts.

Semiconductor devices	● Check for dirt and dust. ● Check for visible changes in appearance.	● Clean the operating environment. ● Replace the damaged parts.
Electrolytic capacitor	● Check for fluid leakage, discoloration, cracks, and exposed, expanded, ruptured, or leaked.	● Replace the damaged parts.
Peripherals protection	● Check appearance and insulation of the peripheral equipment.	● Clean the operating environment. ● Replace the damaged parts.
Printed circuit board	● Check for odor, discoloration, and severe rust, and whether connectors are correct.	● Fasten the connectors. ● Clean the printed circuit board. ● Replace the damaged printed circuit board.
Cooling system	● Check the cooling fan for damage and blockage. ● Check for dirt and dust on the cooling fin. ● Check that the air inlet and exhaust ports are not clogged or contaminated with foreign matter.	● Clean the operating environment. ● Replace the damaged parts.
Keypad	● Check the cooling fan for damage and blockage.	● ● Replace the damaged parts.
Motor	● Check whether the motor has abnormal vibration or sound.	● ● Tighten mechanical and electrical connections and lubricate mechanical parts.

Note:

Do not perform wiring work while the power is on, as there is a risk of death by electric shock. Before performing wiring, inspection, maintenance, etc., disconnect the power supply to all associated equipment and make sure that the DC voltage in the main circuit has dropped to a safe level for 15 minutes.

7.2 Maintenance

All equipment and components have a service life, proper maintenance can prolong the life, but it does not fix the damage of the equipment and devices, please replace the devices according to the requirements.

Name	Life
Fan	2 years~3 years
Electrolytic capacitor	4 years~5 years
Printed circuit board	8 years~10 years

Replacement of other devices requires maintenance techniques and product knowledge, and replacement must be strictly tested before it is put into use, so please do not replace other internal devices on your own. If replacement is indeed necessary, please contact the agent from whom you purchased the product or our sales department.

7.3 Product Warranty

If the product malfunctions during the warranty period, please see the warranty terms in the warranty card for coverage.

Primary troubleshooting will be carried out by your company, but the service can be provided by VEICHI or service network for a fee at your request. If the cause of malfunction is found to be on VEICHI, the service will be free of charge according to the mutual negotiation.

Liability exemption: The inconvenience caused to your company or your customers due to the failure of VEICHI products and the damage caused to the non-VEICHI products, regardless of whether they are within the warranty period, does not belong to VEICHI warranty.

8 EtherCAT Communication

8.1 Communication Specification

Table 8-1 Performance Parameter Description

	Name	Description
EtherCAT communication	Physical layer	100BASE-TX
	Communication port	2×RJ45
	Network structure	Connect in series
	Transmission speed	2×100Mbps(Full duplex)
	Max. data length	1484 bytes
	SyncManager	SM0: MailBox output SM1: MailBox input SM2: Cyclic data output SM3: Cyclic data input
	FMMU (Bus memory management unit)	FMMU0: Cyclic data input area FMMU1: Cyclic data output area FMMU2: MailBox status area
	Application layer protocol	COE: CANOpen Over EtherCAT
	Sync mode	DC mode (SYNC0)
	Communication object	SDO: Service data object (non-cyclic data) PDO: Process data object (cyclic data) EMCY: Emergency
	Application layer specification	IEC61800-7 CIA402 Driver Profile
CIA402 application		Profile Position Mode(PP) Profile Velocity Mode(PV) Profile Torque Mode(PT) Cyclic synchronous position mode (CSP) Cyclic synchronous velocity mode (CSV) Cyclic synchronous torque mode (CST) Home Mode(HM)

8.2 Wiring

8.2.1 Interface Information

Dual RJ45 terminals are adopted for the EtherCAT protocol, and the terminal connections are shown below: The A connector (top connector) is for input and the B connector (bottom connector) is for output.

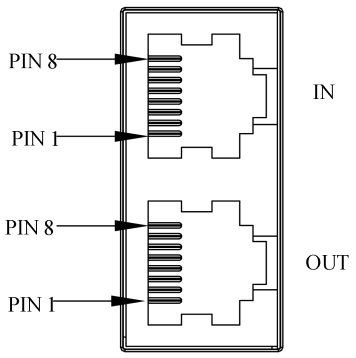


Figure 8-1 Pin Definition

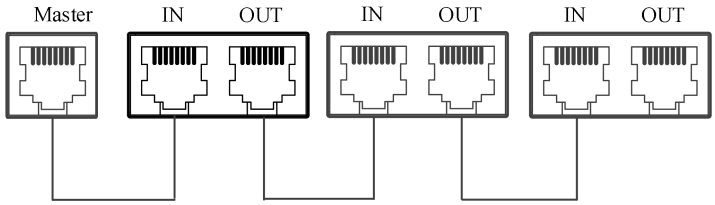
Table 8-2 Communication Connector Pin Definition

Pin No.	Name	Description
1	TX+	Transmit signal
2	TX-	Transmit signal
3	RX+	Receive signal
4	-	-
5	-	-
6	RX-	Receive signal
7	-	-
8	-	-
-	Housing	Shield

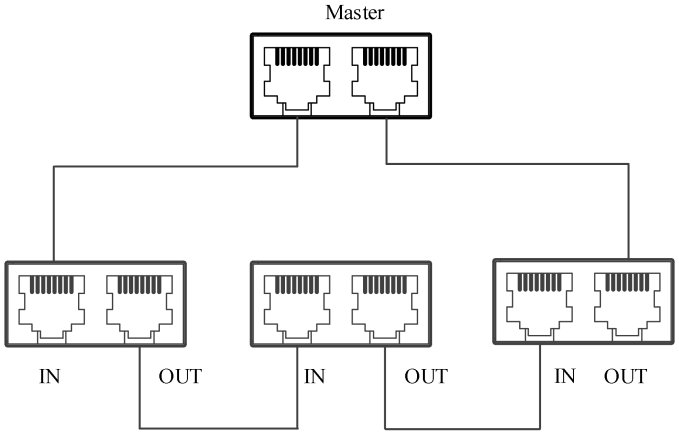
8.2.2 Topology

SD810-EtherCAT communication topology is flexible and almost unlimited. As shown below:

- Liner Connection



- Ring Redundant Connection



8.2.3 Communication Cables

Use Ethernet Category 5 (100BASE-TX) network cables or high-strength network cables with shielding for EtherCAT communication. When using the SD810-EtherCAT Servo Drive, it is also necessary to use network cables with shielding to enhance immunity to interference.

8.2.4 EMC Standards

SD810-EtherCAT Servo Drive accords to the IEC/EN61800-3:2004 (Adjustable speed electrical power drive systems-part3: EMC requirements and specific test methods) and GB/t12668.3.

8.3 EtherCAT Communication

Steps for EtherCAT communication configuration are as follows:

1. Import XML file. (Determine the import method according to the master at the field)
2. Set the EtherCAT mode parameters.(See 8.3.1EtherCAT Mode Parameters)
3. Set the EtherCAT communication parameters.
4. Start the remote node.

8.3.1 EtherCAT Mode Parameters

To connect the servo drive to the EthrCAT fieldbus network, the relevant function codes of the servo drive need to be set properly.

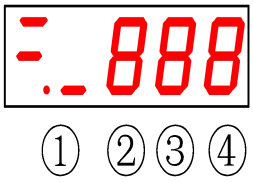
Table 8-3 Function Code

Funcode	Function	Address	Control Mode	Default (Range)
Pn000	0: Velocity mode 1: Analog speed mode 2: Torque mode 3: Internal speed mode 4: Internal speed mode <-> analog speed mode 5: Internal speed mode <-> position mode 6: Internal speed mode <-> torque mode 7: Position mode <-> analog speed mode 8: Position mode <-> torque mode 9: Torque mode <-> analog speed mode 10: Analog speed mode <-> zero speed mode 11: Position mode <-> pulse inhibit mode 16: EtherCAT mode	0x0000	PT	0000 (0000~001B)

Note:

When it is an EtherCAT-type model, the control mode selection is invalid and the control mode is decided by the master.

8.3.2 EtherCAT Status Monitoring



No.	Description
①	See table 8-4
②	Port status
③	1: Initializing 2: Pre-running 3. Safe running 8: Running
④	0: Reserved 1: Profile position mode(PP) 3: Profile velocity mode(PV) 4: Profile torque mode (PT) 6: Home mode(HM) 8: Cyclic synchronous position mode(CSP) 9: Cyclic synchronous velocity mode(CSV) A: Cyclic synchronous torque mode (CST)

Table 8-4 Status Indicator Description

Status	Description	Status	Description
	Light up when the control power supply is ON and go out when it is OFF.		Light up when the main circuit power supply is ON and go out when it is OFF.
	Velocity control: Light up at speed completion (/V-CMP) signal Position control: Light up at position coincidence (/COIN) signal Torque control: Light up all the time		Light up at (/TGON) signal
			Velocity control: Light up at speed reference input Position control: Light up at position reference input
	Light up when the servo drive is OFF and go out when it is ON		Torque control: Light up at torque reference input Position control: Light up at pulse clear signal

8.4 EtherCAT Communication Basics

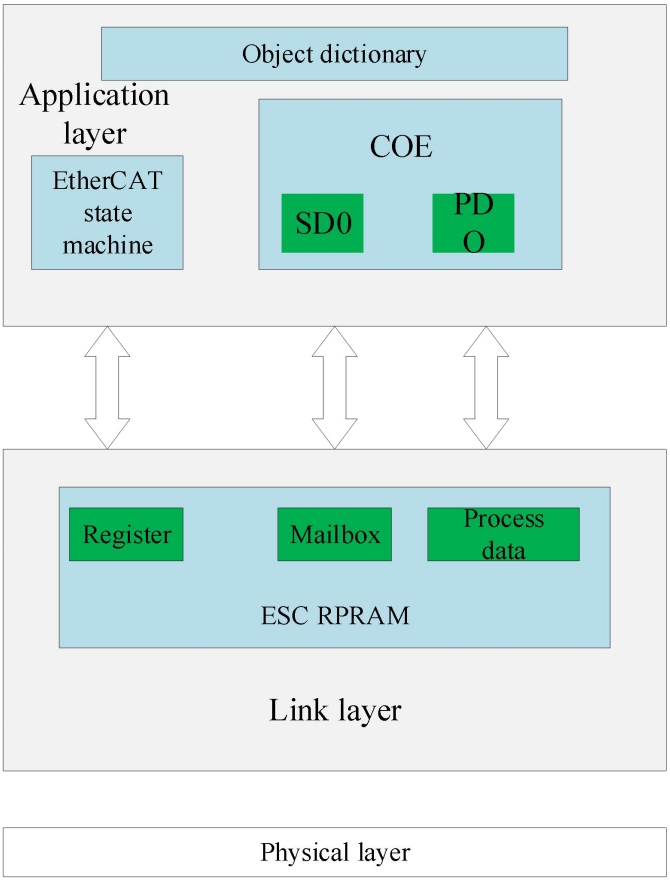
8.4.1 EtherCAT Communication Standards

Item		Specification
Communication protocol		IEC61158Type12, IEC61800-7, CiA402
Application layer	SDO	SDO Request, SDO Response
	PDO	Dynamic PDO mapping

	CiA402	Profile position mode(PP) Profile velocity mode(PV) Profile torque mode (PT) Home mode Cyclic synchronous position mode (CSP) Cyclic synchronous velocity mode (CSV) Cyclic synchronous torque mode (CST)
Physical layer	Protocol	100BASE-TX (IEEE802-3)
	Max. distance	100m
	Port	2×RJ45

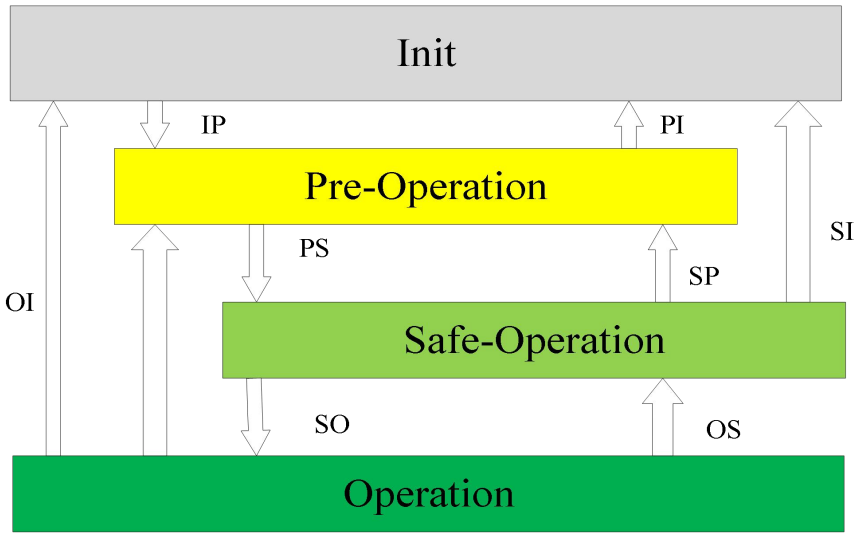
8.4.2 Communication Structure

There are several application layer protocols for EtherCAT communication, but the servo drives described in this manual use the IEC 61800-7 (CiA402)-CANopen Motion Control sub-protocol. The following figure shows the communication structure of an EtherCAT-based application.



8.4.3 EtherCAT State Machine

The following is a block diagram of the EtherCAT state transition:



The SD810-EtherCAT servo drive supports four state switches and is responsible for coordinating state transitions between master and slave from initialization to operation. The following table shows the relevant operations performed inside the servo from the initialization state to the operation state.

State or State Transition	Related Operations
Initialization (I)	No communication from application side, master only reads and writes ESC registers
Init to Pre-Op (IP)	Master configures slave registers, mailbox channel parameters, and distributed clock (DC) related registers. Master writes state control registers to request pre-operation state
Pre-operation (P)	Communicate for SDO on application layer
Pre-Op to Safe-Op (PS)	Master maps with service initialization process data Master configures SM channel for PDO, and FMMU Master writes status control register to request safe operatinon status
Safe-operation (S)	SDO on application layer Read the PDO input only rather than sending output signal
Safe-Op to Op (SO)	Master sends valid output data Master writes state control registers to request operation state
Operation (O)	Output and input both valid SDO still available

8.5 Process Data

Proccss process data (PDO) follows the producer-consumer model. And it can be divided into RPDO (Receive PDO) and TPDO (Transmit PDO). The slaves receive master references by RPDO and send their states to the master by TPDO.

8.5.1 PDO Mapping Code

PDO mapping is used to establish the mapping relationship between object dictionary and PDO. As to the SD810-EtherCAT servo drive, 1600h~1603h are RPDO and 1A00h~1A03h are TPDO. The following table shows the information about PDO mapping and mapping objects of this product, and the mapping objects can be changed as needed.

PDO	Index	Max. Mapping Count	Longest Mapping Byte	Default Mapping Entries
RPDO	1600h	10	40	6040h (Control Word) 607Ah (Target Position) 6060h (Control Mode) 60B8h (Probe Function)
	1601h	10	40	6040h (Control Word) 607Ah (Target Position) 607FF(Target Velocity)
	1602h	10	40	6040H (Control Word) 60FFh (Target Velocity)
	1603h	10	40	6040H (Control Word) 6071h (Target Torque)
TPDO	1A00h	10	40	6041h (Status Word) 6064h (Position Feedback) 60B9h (Probe Status) 60BAh (Probe 1 Rising Edge Position) 60FDh (Digital Input Status)
	1A01h	10	40	6041h (Status Word) 6064h (Position Feedback) 606Ch (Velocity Feedback)
	1A02h	10	40	6041h (Status Word) 6064h (Position Feedback) 606Ch (Velocity Feedback)
	1A03h	10	40	6041h (Status Word) 6064h (Position Feedback) 6077h (Velocity Feedback)

Note:

Servo drive performance may be reduced if RPDO and TPDO mapping bytes exceed 80 in total.

8.5.2 PDO Sync Manager Assignment Settings

During cyclic data communication, PDO can contain multiple mapping objects. The CoE protocol uses 0x1C10~0x1C2F to define the list of PDO mapping objects of the sync manager, and multiple PDOs can be mapped to different subindexes. The SD810-EtherCAT servo drive assigns only 1 RPDO and 1 TPDO as shown in the following table:

Index	Subindex	Mapping Assignment	Default
0x1C12	01h	Select one between 1600h~1603h for RPDO	1601h
0x1C13	01h	Select one between 1A00h~1A03h for TPDO	1A01h

8.5.3 PDO Configuration

The PDO mapping parameter (e.g., 1600h) contains a pointer to RPDO and TPDO, including the index of the mapping object, the subindex, and the length of that object. Among them, the mapping parameter subindex 0 records the number N of mapping objects specific to this PDO (e.g., the maximum value(N)of

SD810-EtherCAT servo drive is 8), which can map one or more objects at the same time, and subindexes 1~8 are the mapping contents (mapping objects). The mapping parameter content is defined as follows:

Bit	31	…	16	15	…	8	7	…	0
Definition	Index			Subindex			Object Length		

The index and subindex together determine the object's position in the object dictionary, and the object length specifies the bit length of that object.

Object Length	Bit Length
08h	8-bit
10h	16-bit
20h	32-bit

For example, the mapping parameter for 6040h-00 is 60400010h. The configuration flow is as follows:

1. Cancel PDO. Write 0 to the 00h subindex of 1C12h (or 1C13h).
2. Clear the original mapping contents. Write 0 to the subindex 00h of the mapping parameter (e.g., 1600h-00) to clear the original mapping contents.
3. Write PDO mapping contents. Write subindexes 1~N (N is up to 8) of the mapping parameters as defined above.
4. Write the total mapping object number of that PDO. Write the number of mapping objects N in step 3 to subindex 0 of the parameter (e.g. 1600h-00 is written to N).
5. Enable PDO Write 1 to the 00h subindex of 1C12h (or 1C13h).

8.6 Service Data Object (SDO)

SDO is used to transfer non-periodic data such as communication parameters, or servo drive operating parameters configuration etc. While SD810-EtherCAT servo drive supports RPDO and SDO.

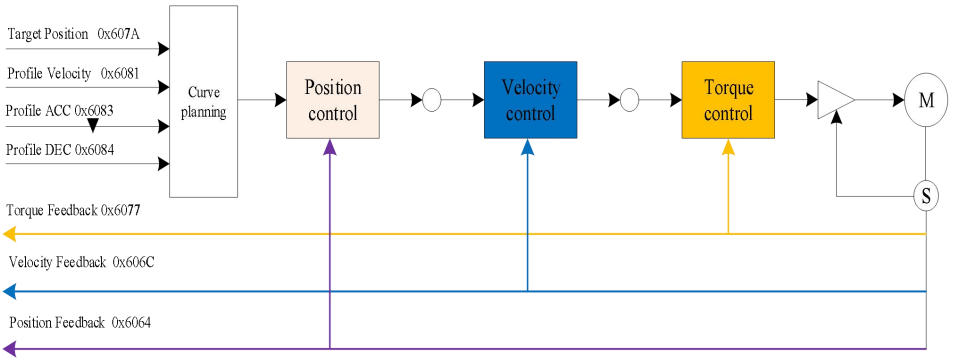
8.7 Distributed Clock

Distributed clocks enable different servo devices to use the same system clock, ensuring that different servo drives receive references and execute them at the same moment for absolute synchronization. Slave devices can generate synchronization signals based on the synchronous system time. This servo drive only supports DC synchronization mode, and the synchronization period is controlled by SYNC0, and which is an integer multiple of 125μs or 250μs.

9 Control Mode

9.1 Profile Position Mode(PP)

In the profile position mode, the master sends the target position (absolute or relative), slope of the position-time curve, ACC and DEC of the position profile and other relevant object dictionaries to the servo drive, which generates the target profile references based on the received data and references.



Here are the relevant object directories.

Control Word 6040h		
Bit	Name	Description
0	Switch On	0: OFF 1: ON
1	Enable Voltage	0: OFF 1: ON
2	Quick Stop	0: OFF 1: ON
3	Enable Operation	0: OFF 1: ON
4	New Target Position	New position triggered at rising edge
5	Change Setting Immediately	0: OFF 1: ON
6	Absolute/Relative Position Reference	0: Absolute position reference 1: Relative position reference

Status Word 6041h		
Bit	Name	Description
10	Target Status	0: Not reached 1: Reached
12	Target Position Update Status	0: ON 1: OFF
13	Position Deviation Status	0: No position deviation overflow error 1: Position deviation error
15	Home Status	0: Not completed 1: Completed

Index	Subindex	Name	R/W	Data Type	Unit	Range
0x603F	00	Error Code	RO	UINT16	-	0~65535
0x6040	00	Control Word	RW	UINT16	-	0~65535
0x6041	00	Status Word	RO	UINT16	-	0~65535
0x6060	00	Control Mode	RW	INT8	-	0~10
0x6061	00	Mode Display	RO	INT8	-	0~10
0x6062	00	Position Reference	RO	INT32	Reference unit	-
0x6063	00	Position Feedback	RO	INT32	Encoder unit	-
0x6064	00	Position Feedback	RO	INT32	Reference unit	-
0x6065	00	Position Deviation Overflow Level	RW	UINT32	Reference unit	0~(2^{32}-1)
0x6067	00	Position Coincidence Level	RW	UINT32	Reference unit	0~(2^{32}-1)
0x6068	00	Position Coincidence Time	RW	UINT16	2ms	0~65535
0x606C	00	Velocity Feedback	RO	INT32	Reference unit/s	-
0x6077	00	Torque Feedback	RO	UINT16	0.1%	-
0x607A	00	Target Position	RW	INT32	Reference unit	-2^{31}~(2^{31}-1)
0x6081	00	Profile Velocity	RW	UINT32	Reference unit/s	0~(2^{32}-1)
0x6083	00	Profile ACC	RW	UINT32	Reference unit/ S^2	0~(2^{32}-1)
0x6084	00	Profile DEC	RW	UINT32	Reference unit/ S^2	0~(2^{32}-1)
0x6091	01	Motor Resolution	RW	UINT32	-	0~(2^{32}-1)
	02	Axis Resolution	RW	UINT32	-	1~(2^{32}-1)
0x60E0	00	Positive Torque Limit	RW	UINT16	0.1%	0~65535
0x60E1	00	Negative Torque Limit	RW	UINT16	0.1%	0~65535
0x60F4	00	Position Deviation	RO	INT32	Encoder unit	-
0x60FC	00	Position Reference	RO	INT32	Encoder unit	-

Non-Immediate Update Mode of Curve Planning

The master sends the relevant information of the position reference to the slaves such as 6083h [Profile ACC], 6084h [Profile DEC], 6081h [Profile Velocity], and 607Ah [Target Position] as required.

The master sets bit4 of 6040h [Control Word] to 1, and the slave performs the position reference after detecting the rising edge signal.

First, the slave tells whether bit5 of 6040h [Control Word] is 0. If it is not 0, the relevant references are not processed.

Then it tells whether bit5 of 6040h and bit12 of 6041h are both 0, then the slave sets bit12 of 6041h to 1, and at the same time executes step 1. At this time, the slave is not available for new position references.

After the master detects that bit12 of 6041h [Status Word] is set to 1, it will release the data related to the position reference and set 6040h [Control Word] bit4 from 1 to 0.

And the slave detects that 6040h [Control Word] bit4 is 0 and sets bit12 of 6041h [Status Word] to 0 after the current position is completed, indicating that the slave is available for a new position reference.

In the non-immediate update mode, the servo drive does not process any new position reference until the current positioning is completed.

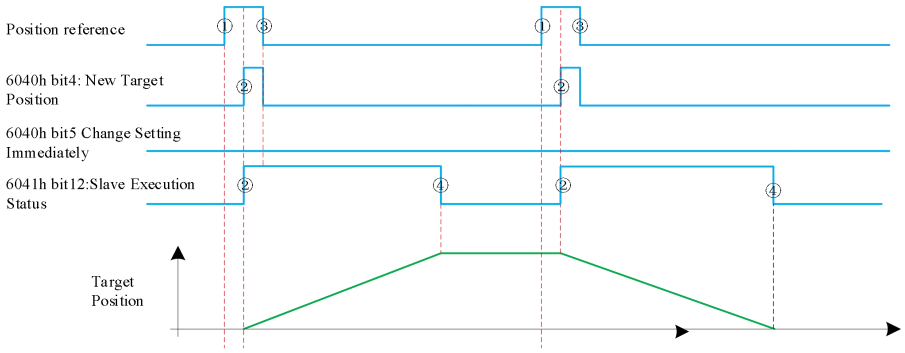


Figure 9-1 Figure Non-immediate Update Sequence

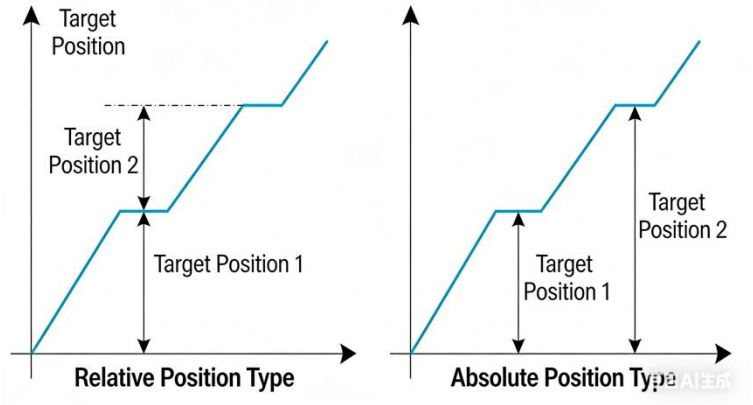


Figure 9-2 Type

When 6040h [Control Word] bit6 is 0, it is the absolute position, and when 1, it is the relative position.

Non-Immediate Update of Curve Planning

The master sends the relevant information of the position reference to the slaves such as 6083h [Profile ACC], 6084h [Profile DEC], 6081h [Profile Velocity], and 607Ah [Target Position] as required.

The master sets bit4 of 6040h [Control Word] to 1, and the slave performs the position reference after detecting the rising edge signal.

First, the slave tells whether bit5 of 6040h is 1. If it is not 1, the relevant references are not processed.

Then it tells whether bit5 of 6040h and bit12 of 6041h are both 1, then the slave sets bit12 of 6041h to 1, and

at the same time executes step 1. At this time, the slave is not available for new position references.

After the master detects that bit12 of 6041h [Status Word] is set to 1, it will release the data related to the position reference and set 6040h [Control Word] bit4 from 1 to 0.

When the slave detects that bit4 of 6040h is set from 1 to 0, it sets bit12 of 6041h to 0, indicating that it is available for new position references.

In the immediate update mode, the slave detects the rising edge of bit4 of 6040h[Control Word] is 0 and sets bit12 of 6041h[Status Word] to 0 after the current positioning is complete, indicating that the slave can receive new position references.

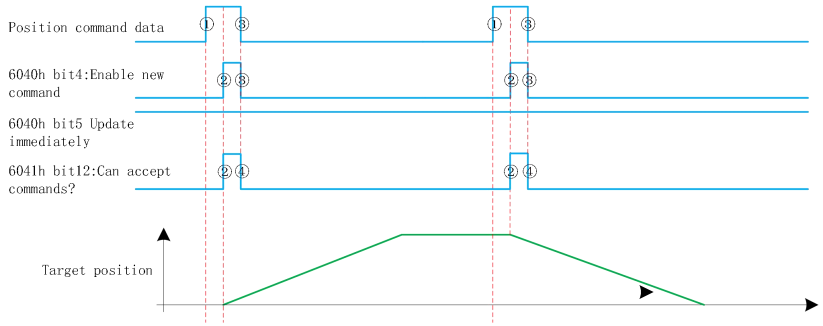
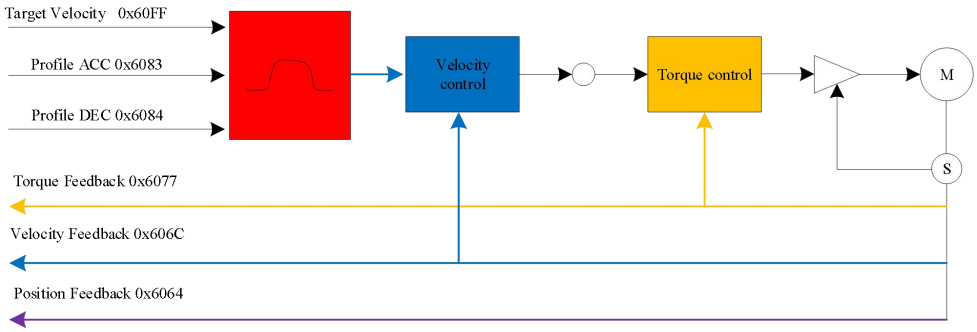


Figure 9-3 Figure Non-immediate Update Sequence

9.2 Profile Velocity Mode(PV)

When in the profile velocity mode, the master transmits the target velocity, ACC and DEC to the servo drive, which performs velocity and torque regulation.



Relevant Object Directory

Control Word 6040h		
Bit	Name	Description
0	Switch On	0: OFF 1: ON
1	Enable Voltage	0: OFF 1: ON
2	Quick Stop	0: OFF 1: ON
3	Enable Operation	0: OFF 1: ON
8	DEC Stop	0: OFF 1: ON as 605Dh setting

Status Word 6041h		
Bit	Name	Description
10	Target Status	0: Not reached 1: Reached
11	Software Limit Status (internal limit)	0: Feedback below limit 1: Feedback above limit
15	Home Status	0: Not completed 1: Completed

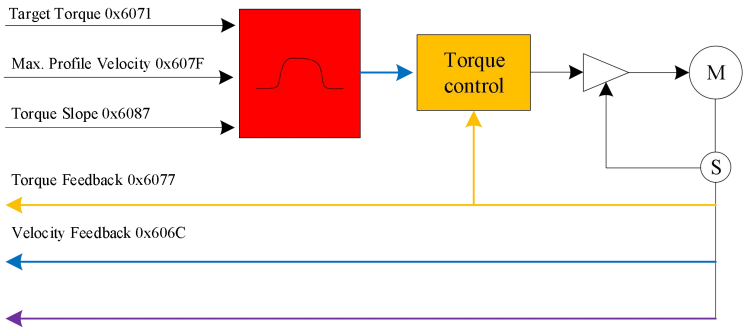
Index	Subindex	Name	R/W	Data Type	Unit	Range
0x603F	00	Error Code	RO	UINT16	-	-
0x6040	00	Control Word	RW	UINT16	-	0~65535
0x6041	00	Status Word	RO	UINT16	-	0~65535
0x6060	00	Control Mode	RW	INT8	-	0~10
0x6061	00	Mode Display	RO	INT8	-	0~10
0x6063	00	Position Feedback	RO	INT32	Encoder unit	-
0x6064	00	Position Feedback	RO	INT32	Reference unit	-
0x606C	00	Velocity Feedback	RO	INT32	Reference unit/s	-
0x6077	00	Torque Feedback	RO	UINT16	0.1%	-
0x60E0	00	Positive Torque Limit	RW	UINT16	0.1%	0~65535
0x60E1	00	Negative Torque Limit	RW	UINT16	0.1%	0~65535
0x60FF	00	Target Velocity	RW	INT32	Reference unit/s	-2^{31}~$(2^{31}-1)$
0x607F	00	Max. Profile Velocity	RW	UINT32	0.1rpm	0~$(2^{32}-1)$
0x6083	00	Profile ACC	RW	UINT32	Reference unit/s^2	0~$(2^{32}-1)$
0x6084	00	DEC	RW	UINT32	Reference unit/s^2	0~$(2^{32}-1)$

Note:

The speed limit value is determined by the smaller value between 607Fh[Max Profile Velocity] and 6080h [Max Motor Velocity].

9.3 Profile Torque Mode (PT)

In profile torque mode, the master sends the 6071h [Target Torque], 6087h [Torque Slope], and 607Fh [Velocity Limit] to the servo drive to execute the torque regulation internally. When the speed reaches 607Fh, it will enter the speed regulation stage.



Relevant Object Directory

Control Word 6040h		
Bit	Name	Description
0	Switch On	0: OFF 1: ON
1	Enable Voltage	0: OFF 1: ON
2	Quick Stop	0: OFF 1: ON
3	Enable Operation	0: OFF 1: ON
8	DEC Stop	0: OFF 1: ON as 605Dh setting

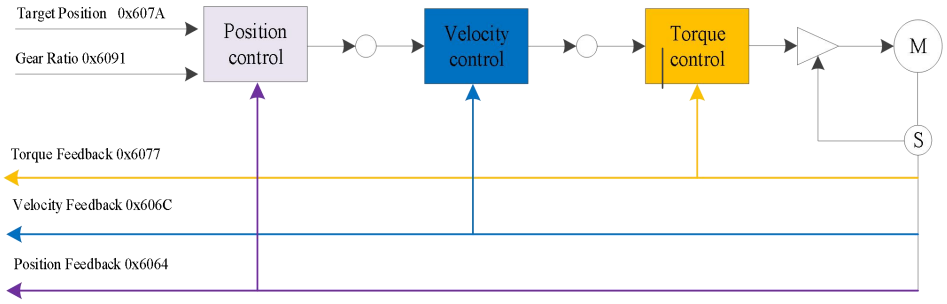
Status Word 6041h		
Bit	Name	Description
10	Target Status	0: Not reached 1: Reached
11	Software Limit Status (Internal Limit)	0: Feedback below limit 1: Feedback above limit
15	Home Status	0: Not completed 1: Completed

Index	Subindex	Name	R/W	Data Type	Unit	Range
0x603F	0x00	Error Code	RO	UINT16	-	0~65535
0x6040	0x00	Control Word	RW	UINT16	-	0~65535
0x6041	0x00	Status Word	RO	UINT16	-	0~65535
0x6060	0x00	Control Mode	RW	INT8	-	0~10
0x6061	0x00	Mode Display	RO	INT8	-	0~10
0x606C	0x00	Velocity Feedback	RO	INT32	Reference unit/s	-
0x6071	0x00	Target Torque	RW	INT16	0.1%	-3000~3000
0x6074	0x00	Torque Reference	RO	INT16	0.1%	-
0x6077	0x00	Torque Feedback	RO	UINT16	0.1%	-
0x607F	0x00	Max. Profile Velocity	RW	UINT32	0.1rpm	0~50000

0x6087	0x00	Torque Slope	RW	UINT32	ms	0~(2^{32}-1)
0x60E0	00	Positive Torque Limit	RW	UINT16	0.1%	0~65535
0x60E1	00	Negative Torque Limit	RW	UINT16	0.1%	0~65535

9.4 Cyclic Synchronous Position Mode(CSP)

In the cyclic synchronous position mode, the master sends the 607Ah [Target Position] to the servo drive based on the value of 60FFh [Target Velocity], so that it can internally perform position, speed and torque control.



Relevant Object Directory

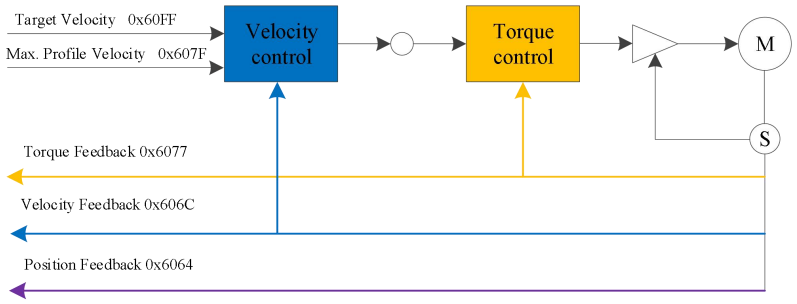
Control Word 6040h		
Bit	Name	Description
0	Switch On	0: OFF 1: ON
1	Enable Voltage	0: OFF 1: ON
2	Quick Stop	0: OFF 1: ON
3	Enable Operation	0: OFF 1: ON
8	DEC Stop	0: OFF 1: ON as 605Dh setting

Status Word 6041h		
Bit	Name	Description
10	Target Status	0: Not reached 1: Reached
11	Software limit (internal limit)	0: Feedback below limit 1: Feedback above limit
12	Slave Execution Status	0: Inconsistent with reference 1: Consistent with reference
13	Position Deviation Status	0: No position deviation overflow error 1: Position deviation error
15	Home Status	0: Not completed 1: Completed

Index	Subindex	Name	R/W	Data Type	Unit	Range
0x603F	00	Error Code	RO	UINT16	-	0~65535
0x6040	00	Control Word	RW	UINT16	-	0~65535
0x6041	00	Status Word	RO	UINT16	-	0~65535
0x6060	00	Control Mode	RW	INT8	-	0~10
0x6061	00	Control Mode Display	RO	INT8	-	0~10
0x6062	00	Position Reference	RO	INT32	Reference unit	-
0x6063	00	Position Feedback	RO	INT32	Encoder unit	-
0x6064	00	Position Feedback	RO	INT32	Reference unit	-
0x6065	00	Position Deviation Overflow Level	RW	UINT32	Reference unit	0~(2^{32}-1)
0x6067	00	Position Coincidence Level	RW	UINT32	Reference unit	0~(2^{32}-1)
0x6068	00	Position Coincidence Time	RW	UINT16	2ms	0~65535
0x606C	00	Velocity Feedback	RO	INT32	Reference unit/s	-
0x607A	00	Target Position	RW	INT32	Reference unit	-2^{31}~(2^{31}-1)
0x6091	01	Motor Resolution	RW	UINT32	-	0~(2^{32}-1)
	02	Axis Resolution	RW	UINT32	-	1~(2^{32}-1)
0x60B0	00	Position Offset	RW	INT32	Reference unit	-2^{31}~(2^{31}-1)
0x60F4	00	Position Deviation	RO	INT32	Encoder unit	-
0x60FC	00	Position Reference	RO	INT32	Encoder unit	-

9.5 Cyclic Synchronous Velocity Mode (CSV)

In the cyclic synchronous velocity mode, the master sends 60FFh [Target Velocity] to the servo drive so that the drive can perform the speed and torque regulations internally.



Here are the relevant object directories:

Control Word 6040h		
Bit	Name	Description
0	Switch On	0: OFF 1: ON
1	Enable Voltage	0: OFF 1: ON
2	Quick Stop	0: OFF 1: ON
3	Enable Operation	0: OFF 1: ON
8	DEC Stop	0: OFF 1: ON as 605Dh setting

Status Word 6041h		
Bit	Name	Description
10	Target Status	0: Not reached 1: Reached
11	Software Limit Status (internal limit)	0: Feedback below limit 1: Feedback above limit
12	Slave Execution Status	0: Inconsistent with reference 1: Consistent with reference
10	Target Status	0: Not reached 1: Reached

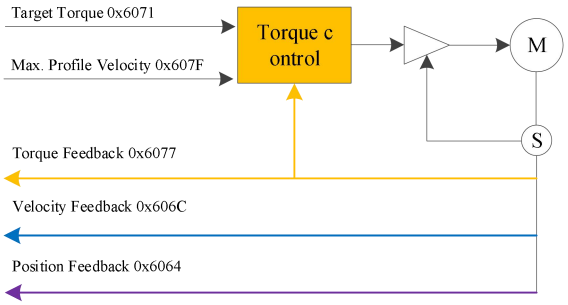
Index	Subindex	Name	R/W	Data Type	Unit	Range
0x603F	00	Error Code	RO	UINT16	-	0~65535
0x6040	00	Control Word	RW	UINT16	-	0~65535
0x6041	00	Status Word	RO	UINT16	-	0~65535
0x6060	00	Control Mode	RW	INT8	-	0~10
0x6061	00	Control Mode Display	RO	INT8	-	0~10
0x6063	00	Position Feedback	RO	INT32	Encoder unit	-
0x6064	00	Position Feedback	RO	INT32	Reference unit	
0x606C	00	Velocity Feedback	RO	INT32	Reference unit/s	-
0x607F	00	Max. Profile Velocity	RW	UINT32	0.1r/min	0~50000
0x60E0	00	Positive Torque Limit	RW	UINT16	0.1%	0~65535
0x60E1	00	Negative Torque Limit	RW	UINT16	0.1%	0~65535
0x6091	01	Motor Resolution	RW	UINT32	-	$0\sim(2^{32}-1)$
	02	Axis Resolution	RW	UINT32	-	$1\sim(2^{32}-1)$
0x60FF	00	Target Velocity	RW	INT32	Reference unit/s	$-2^{31}\sim(2^{31}-1)$

Note:

The speed limit value is determined by the smaller value between 607Fh [Max. Profile Velocity] and 6080h [Max. Motor Velocity].

9.6 Cyclic Synchronous Torque Mode (CST)

In the cyclic synchronous torque mode, the master sends the 6071h [Target Torque] to the servo drive in cyclic synchronous mode to perform torque regulation internally. When the speed reaches the limit, it will enter the speed regulation stage.



Here are the relevant object directories:

Control Word 6040h		
Bit	Name	Description
0	Switch On	0: OFF 1: ON
1	Enable Voltage	0: OFF 1: ON
2	Quick Stop	0: OFF 1: ON
3	Enable Operation	0: OFF 1: ON
8	DEC Stop	0: OFF 1: ON as 605Dh setting

Status Word 6041h		
Bit	Name	Description
10	Target Status	0: Not reached 1: Reached
11	Software Limit Status (Internal Limit)	0: Feedback below limit 1: Feedback above limit
12	Slave Execution Status	0: Inconsistent with reference 1: Consistent with reference

Index	Subindex	Name	R/W	Data Type	Unit	Range
0x603F	00	Error Code	RO	UINT16	-	0~65535
0x6040	00	Control Word	RW	UINT16	-	0~65535
0x6041	00	Status Word	RO	UINT16	-	0~65535

0x6060	00	Control Mode	RW	INT8	-	0~10
0x6061	00	Control Mode Display	RO	INT8	-	0~10
0x6064	00	Position Feedback	RO	INT32	Reference unit	-
0x606C	00	Velocity Feedback	RO	INT32	Reference unit/s	-
0x6071	00	Target Torque	RW	INT16	0.1%	-3000~3000
0x6077	00	Torque Feedback	RO	INT16	0.1%	-
0x607F	00	Max. Profile Velocity	RW	UINT32	0.1r/min	0~(2^{32}-1)
0x60E0	00	Positive Torque Limit	RW	UINT16	0.1%	0~65535
0x60E1	00	Negative Torque Limit	RW	UINT16	0.1%	0~65535

Note:

The speed limit value is determined by the smaller value between 607Fh [Max. Profile Velocity] and 6080h [Max. Motor Velocity].

9.7 Home Mode (HM)

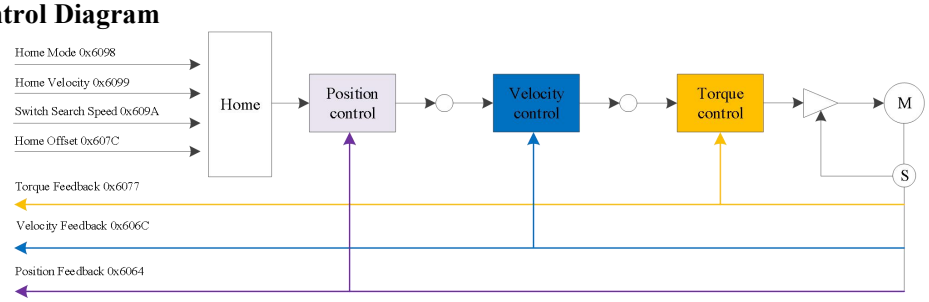
The home mode is used to find the mechanical home point and determine the positional relationship between the mechanical home point and the mechanical zero point. Mechanical Home: A fixed mechanical position that corresponds to a certain home signal switch.

Mechanical Home: Mechanical Zero+607Ch(Home Offset)

Mechanical Zero: Absolute 0 position

The motor stops at the mechanical home position after the drive performs this reference. The positional relationship between the mechanical home position and the mechanical zero point is adjusted by setting the value of the object dictionary 0x607C.

Home Control Diagram



Here are the relevant object directories:

Control Word 6040h		
Bit	Name	Description
0	Switch On	0: OFF 1: ON
1	Enable Voltage	0: OFF 1: ON
2	Quick Stop	0: OFF 1: ON
3	Enable Operation	0: OFF 1: ON

4	Enable Home	0->1: Home starts 1: Homing now 1->0: Home completed
8	DEC Stop	0: OFF 1: ON as 605Dh setting

Status Word 6041h		
Bit	Name	Description
10	Target Status	0: Not reached 1: Reached
11	Software Limit Status (Internal Limit)	0: Feedback below limit 1: Feedback above limit
12	Slave Execution Status	0: Inconsistent with reference 1: Consistent with reference
13	Position Deviation Status	0: No position deviation overflow error 1: Position deviation error
15	Home Status	0: Not completed 1: Completed

Index	Subindex	Name	R/W	Data Type	Unit	Range
0x603F	00	Error Code	RO	UINT16	-	0~65535
0x6040	00	Control Word	RW	UINT16	-	0~65535
0x6041	00	Status Word	RO	UINT16	-	0~65535
0x6060	00	Control Mode	RW	INT8	-	0~10
0x6061	00	Control Mode Display	RO	INT8	-	0~10
0x6062	00	Position Reference	RO	INT32	Reference unit	-
0x6064	00	Position Feedback	RO	INT32	Reference unit	-
0x606C	00	Velocity Feedback	RO	INT32	Reference unit/s	-
0x6067	00	Position Arrival Level	RO	UINT32	Reference unit	-
0x6068	00	Position Arrival Time	RW	UINT16	2ms	-
0x6077	00	Torque Feedback	RO	INT16	0.1%	-
0x6098	00	Home Mode	RW	INT8	-	1~35
0x6099	01	Switch Search Speed	RW	UINT32	Reference unit/s	0~(2^{32}-1)
	02	Zero Search Speed	RW	UINT32	Reference unit/s	1~(2^{32}-1)
0x609A	00	ACC	RW	UINT32	Reference unit/s^2	0~(2^{32}-1)
0x60F4	00	Position Deviation	RO	INT32	Encoder unit	-

10 Object Dictionary

10.1 Object Property Description

Term explanation

"Index": specifies the position of each object in the object dictionary, expressed in hexadecimal (h). "Subindex": specifies the bias of each object under the same index. "Data Type": see Table 5-1 for details.

Table 10-1 Data Type Description

Data Type	Data Range	Data Length	DS301 Value
Int8	-128~127	1 byte	2
Uint8	0~255	1 byte	5
Int16	-32768~+32767	2 bytes	3
Uint16	0~65535	2 bytes	6
Int32	-2147483648~+2147483647	4 bytes	4
Uint32	0~4294967295	4 bytes	7
String	ASCII	-	9

"R/W Type": see the table below for details.

Table 10-2 R/W Type Description

R/W	Description
RW	Read and write
WO	Write only
RO	Read only
CONST	Constant, RO

"Object Structure": see the table below for details.

Table 10-3 Object Structure Description

Object Structure	Description
VAR	Simple values containing the data types in Table 10-1
ARR	Multiple data field objects whose variables are all in the same data form
REC	Multiple data field objects whose variables are all in the different data forms

10.2 1000h Object List

Index	Subindex	Name	W/R	PDO Mapping	Data Type	Unit	Range	Default
1000h	00	Drive Type	RO	NO	UINT32	-	-	0x00020192
1001h	00	Error Register	RO	NO	UINT8	-	-	-

1008h	00	Drive Name	RO	NO	-	-	-	Servo Device
100Ah	00	Software Version	RO	NO	-	-	-	3764
1018h	00	Entry Number	RO	NO	UINT8	-	-	4
	01	Manufacturer ID	RO	NO	UINT32	-	-	0x850104
	02	Product Code	RO	NO	UINT32	-	-	0x26483052
	03	Revision Number	RO	NO	UINT32	-	-	0x39613708
	04	Serial Code	RO	NO	UINT32	-	-	0x20181123
1600h	00	Entry Number	RW	NO	UINT8	-	0~8	4
	01	Mapping Object 1	RW	NO	UINT32	-	0~(2^{32}-1)	0x60400010
	02	Mapping Object 2	RW	NO	UINT32	-	0~(2^{32}-1)	0x607A0020
	03	Mapping Object 3	RW	NO	UINT32	-	0~(2^{32}-1)	0x60600008
	04	Mapping Object 4	RW	NO	UINT32		0~(2^{32}-1)	0x60B80010
	05	Mapping Object 5	RW	NO	UINT32	-	0~(2^{32}-1)	0
	06	Mapping Object 6	RW	NO	UINT32	-	0~(2^{32}-1)	0
	07	Mapping Object 7	RW	NO	UINT32	-	0~(2^{32}-1)	0
	08	Mapping Object 8	RW	NO	UINT32	-	0~(2^{32}-1)	0
1601h	00	Entry Number	RW	NO	UINT8	-	0~8	2
	01	Mapping Object 1	RW	NO	UINT32	-	0~(2^{32}-1)	0x60400010
	02	Mapping Object 2	RW	NO	UINT32	-	0~(2^{32}-1)	0x607A0020

	03	Mapping Object 3	RW	NO	UINT32	-	0~(2^{32}-1)	0
	04	Mapping Object 4	RW	NO	UINT32	-	0~(2^{32}-1)	0
	05	Mapping Object 5	RW	NO	UINT32	-	0~(2^{32}-1)	0
	06	Mapping Object 6	RW	NO	UINT32	-	0~(2^{32}-1)	0
	07	Mapping Object 7	RW	NO	UINT32	-	0~(2^{32}-1)	0
	08	Mapping Object 8	RW	NO	UINT32	-	0~(2^{32}-1)	0
1602h	00	Entry Number	RW	NO	UINT8	-	0~8	2
	01	Mapping Object 1	RW	NO	UINT32	-	0~(2^{32}-1)	0x60400010
	02	Mapping Object 2	RW	NO	UINT32	-	0~(2^{32}-1)	0x60FF0020
	03	Mapping Object 3	RW	NO	UINT32	-	0~(2^{32}-1)	0
	04	Mapping Object 4	RW	NO	UINT32	-	0~(2^{32}-1)	0
	05	Mapping Object 5	RW	NO	UINT32	-	0~(2^{32}-1)	0
	06	Mapping Object 6	RW	NO	UINT32	-	0~(2^{32}-1)	0
	07	Mapping Object 7	RW	NO	UINT32	-	0~(2^{32}-1)	0
	08	Mapping Object 8	RW	NO	UINT32	-	0~(2^{32}-1)	0
1603h	00	Entry Number	RW	NO	UINT8	-	0~8	2
	01	Mapping Object 1	RW	NO	UINT32	-	0~(2^{32}-1)	0x60400010

	02	Mapping Object 2	RW	NO	UINT32	-	0~(2^{32}-1)	0x60710010
	03	Mapping Object 3	RW	NO	UINT32	-	0~(2^{32}-1)	0
	04	Mapping Object 4	RW	NO	UINT32	-	0~(2^{32}-1)	0
	05	Mapping Object 5	RW	NO	UINT32	-	0~(2^{32}-1)	0
	06	Mapping Object 6	RW	NO	UINT32	-	0~(2^{32}-1)	0
	07	Mapping Object 7	RW	NO	UINT32	-	0~(2^{32}-1)	0
	08	Mapping Object 8	RW	NO	UINT32	-	0~(2^{32}-1)	0
1A00h	00	Entry Number	RW	NO	UINT8	-	0~8	5
	01	Mapping Object 1	RW	NO	UINT32	-	0~(2^{32}-1)	0x60410010
	02	Mapping Object 2	RW	NO	UINT32	-	0~(2^{32}-1)	0x60640020
	03	Mapping Object 3	RW	NO	UINT32	-	0~(2^{32}-1)	0x60B90010
	04	Mapping Object 4	RW	NO	UINT32	-	0~(2^{32}-1)	0x60BA0020
	05	Mapping Object 5	RW	NO	UINT32	-	0~(2^{32}-1)	0x60FD0020
	06	Mapping Object 6	RW	NO	UINT32	-	0~(2^{32}-1)	0
	07	Mapping Object 7	RW	NO	UINT32	-	0~(2^{32}-1)	0
	08	Mapping Object 8	RW	NO	UINT32	-	0~(2^{32}-1)	0
1A01h	00	Entry Number	RW	NO	UINT8	-	0~8	2

	01	Mapping Object 1	RW	NO	UINT32	-	0~(2^{32}-1)	0x60410010
	02	Mapping Object 2	RW	NO	UINT32	-	0~(2^{32}-1)	0x60640020
	03	Mapping Object 3	RW	NO	UINT32	-	0~(2^{32}-1)	0
	04	Mapping Object 4	RW	NO	UINT32	-	0~(2^{32}-1)	0
	05	Mapping Object 5	RW	NO	UINT32	-	0~(2^{32}-1)	0
	06	Mapping Object 6	RW	NO	UINT32	-	0~(2^{32}-1)	0
	07	Mapping Object 7	RW	NO	UINT32	-	0~(2^{32}-1)	0
	08	Mapping Object 8	RW	NO	UINT32	-	0~(2^{32}-1)	0
1A02h	00	Entry Number	RW	NO	UINT8	-	0~8	3
	01	Mapping Object 1	RW	NO	UINT32	-	0~(2^{32}-1)	0x60410010
	02	Mapping Object 2	RW	NO	UINT32	-	0~(2^{32}-1)	0x60640020
	03	Mapping Object 3	RW	NO	UINT32	-	0~(2^{32}-1)	0x606C0020
	04	Mapping Object 4	RW	NO	UINT32	-	0~(2^{32}-1)	0
	05	Mapping Object 5	RW	NO	UINT32	-	0~(2^{32}-1)	0
	06	Mapping Object 6	RW	NO	UINT32	-	0~(2^{32}-1)	0
	07	Mapping Object 7	RW	NO	UINT32	-	0~(2^{32}-1)	0
	08	Mapping Object 8	RW	NO	UINT32	-	0~(2^{32}-1)	0

1A03h	00	Entry Number	RW	NO	UINT8	-	0~8	3
	01	Mapping Object 1	RW	NO	UINT32	-	0~(2^{32}-1)	0x60410010
	02	Mapping Object 2	RW	NO	UINT32	-	0~(2^{32}-1)	0x60640020
	03	Mapping Object 3	RW	NO	UINT32	-	0~(2^{32}-1)	0x60770010
	04	Mapping Object 4	RW	NO	UINT32	-	0~(2^{32}-1)	0
	05	Mapping Object 5	RW	NO	UINT32	-	0~(2^{32}-1)	0
	06	Mapping Object 6	RW	NO	UINT32	-	0~(2^{32}-1)	0
	07	Mapping Object 7	RW	NO	UINT32	-	0~(2^{32}-1)	0
	08	Mapping Object 8	RW	NO	UINT32	-	0~(2^{32}-1)	0
1C00h	00	Entry Number	RO	NO	UINT8	-	-	4
	01	SM0 Type	RO	NO	UINT8	-	-	1
	02	SM1 Type	RO	NO	UINT8	-	-	2
	03	SM2 Type	RO	NO	UINT8	-	-	3
	04	SM3 Type	RO	NO	UINT8	-	-	4
1C12h	00	Entry Number	RW	NO	UINT8	-	0~1	1
	01	RPDO Index	RW	YES	UINT16	-	0~65535	0x1601
1C13h	00	Entry Number	RW	NO	UINT8	-	0~1	1
	01	TPDO Index	RW	YES	UINT16	-	0~65535	0x1A01
1C32h	00	Entry Number	RO	NO	UINT8	-	-	32
	01	Sync Type	RW	NO	UINT16	-	-	2
	02	Cycle Time	RO	NO	UINT32	ns	-	0
	04	Sync Type	RO	NO	UINT16	-	-	4
	05	Min. Cycle	RO	NO	UINT32	ns	-	125000

	06	Calculation and Copy Time	RO	NO	UINT32	ns	-	0
	08	Cycle Time Access	RW	NO	UINT16	-	-	0
	09	Delay Time	RO	NO	UINT32	ns	-	0
	0A	SYN0 Time	RW	NO	UINT32	ns	-	-
	0B	Missing Event	RO	NO	UINT16	-	-	0
	0C	Cycle Oveflow Counter	RO	NO	UINT16	-	-	0
	20	Sync Error	RO	NO	BOOL	-	-	FALSE
1C33h	00	Entry Number	RO	NO	UINT8	-	-	32
	01	Sync Type	RW	NO	UINT16	-	-	2
	02	Cycle Time	RO	NO	UINT32	ns	-	0
	04	Sync Type	RO	NO	UINT16	-	-	4
	05	Min. Cycle	RO	NO	UINT32	ns	-	125000
	06	Calculation and Copy Time	RO	NO	UINT32	ns	-	0
	08	Cycle Time Access	RW	NO	UINT16	-	-	0
	09	Delay Time	RO	NO	UINT32	ns	-	0
	0A	SYN0 Time	RW	NO	UINT32	ns	-	-
	0B	Missing Event	RO	NO	UINT16	-	-	0
	0C	Cycle Overflow Counter	RO	NO	UINT16	-	-	0
	20	Sync Error	RO	NO	BOOL	-	-	0

10.3 2000h Object List

Index	Sub index	Name	W/R	PDO Mapping	Data Type	Unit	Range	Default
2000h	00	Control Mode	RO	NO	UINT16	-	-	-
2002h	00	Motor Direction	RW	NO	UINT16	-	0~1	0
2003h	00	Default Monitor Item	RW	NO	UINT16	-	0~65535	0
2004h	00	Servo OFF and Error Stop Mode	RW	NO	UINT16	-	0~2	0
2005h	00	C2 Error Stop Mode	RW	NO	UINT16	-	0~1	0
2006h	00	Overtravel Alarm Level	RW	NO	UINT16	-	0~1	0
2007h	00	Overtravel Stop Mode	RW	NO	UINT16	-	0~2	1
2008h	00	Power Delay after /BK OFF	RW	NO	UINT16	10ms	0~50	10
2009h	00	/BK OFF Delay	RW	NO	UINT16	10ms	10~100	50
2010h	00	Motor Velocity Level for /BK OFF	RW	NO	UINT16	rpm	0~10000	100
2012h	00	External Regenerative Resistor Power	RW	NO	UINT16	10W	0~65535	0
2013h	00	External Regenerative Resistance	RW	NO	UINT16	0.01Ω	0~65535	0
2015h	00	Overload Alarm Level	RW	NO	UINT16	1%	1~100	20
2016h	00	Overload Current Derating Factor	RW	NO	UINT16	1%	0~100	100

2039h	00	Multi-turn Upper Limit	RW	NO	UINT16	Rev	0~65535	65535
2040h	00	Absolute Encoder Mode	RW	NO	UINT16	-	0~1	0
2041h	00	Absolute Encoder Battery Undervoltage Alarm/Error	RW	NO	UINT16	-	0~1	0
2044h	00	Full-closed Loop Function	RW	NO	UINT16	-	0~51	1
2045h	00	Undervoltage Alarm Detection	RW	NO	UINT16	-	0~2	0
2046h	00	Torque Limit during Undervoltage Alarm	RW	NO	UINT16	1%	0~100	50
2047h	00	Torque Limit Cancel Time during Undervoltage Alarm	RW	NO	UINT16	ms	0~1000	100
2050h	00	Torque Limit Mode	RW	NO	UINT16	-	0~3	0
2051h	00	Max. Torque Limit 1	RW	NO	UINT16	1%	0~500	500
2052h	00	Max. Torque Limit 2	RW	NO	UINT16	1%	0~500	500
2053h	00	Emergency Stop Torque	RW	NO	UINT16	1%	0~800	800
2070h	00	Dividing Pulse No.	RW	NO	UINT16	-	16~4194304	2048

2072h	00	Dividing Frequency Output Direction	RW	NO	UINT16	-	0~16384	0
2080h	00	EtherCAT Station Alias (OMRON)	RO	NO	UINT16	-	1~65535	1
2100h	00	Inertia Ratio	RW	NO	UINT16	1%	0~20000	100
2101h	00	1st Velocity Loop Gain	RW	NO	UINT16	0.1Hz	10~20000	400
2102h	00	1st Velocity Loop Integral Time Constant	RW	NO	UINT16	0.01ms	15~51200	2000
2103h	00	1st Position Loop Gain	RW	NO	UINT16	0.1/s	10~20000	400
2104h	00	1st Torque Reference Filter	RW	NO	UINT16	0.01ms	0~65535	100
2105h	00	2nd Velocity Loop Gain	RW	NO	UINT16	0.1Hz	10~20000	400
2106h	00	2nd Velocity Loop Integral Time Constant	RW	NO	UINT16	0.01ms	15~51200	2000
2107h	00	2nd Position Loop Gain	RW	NO	UINT16	0.1/s	10~20000	400
2108h	00	2nd Torque Reference Filter	RW	NO	UINT16	0.01ms	0~65535	100
2110h	00	Gain Shift Method	RW	NO	UINT16	-	0~1	0
2111h	00	Gain Shift Condition	RW	NO	UINT16	-	0~5	0
2112h	00	Gain Shift Transition Time 1	RW	NO	UINT16	ms	0~65535	0

2113h	00	Gain Shift Transition Time 2	RW	NO	UINT16	ms	0~65535	0
2114h	00	Gain Shift Delay 1	RW	NO	UINT16	ms	0~65535	0
2115h	00	Gain Shift Delay 2	RW	NO	UINT16	ms	0~65535	0
2121h	00	Velocity Feedforward Gain	RW	NO	UINT16	1%	0~100	0
2122h	00	Velocity Feedforward Filter Time	RW	NO	UINT16	0.01ms	0~6400	0
2123h	00	V-REF as Speed Feedforward	RW	NO	UINT16	-	0~1	0
2124h	00	V-REF as Torque Feedforward	RW	NO	UINT16	-	0~1	0
2125h	00	Velocity Feedback Filter Time Constant	RW	NO	UINT16	0.01ms	0~65535	0
2126h	00	Velocity Feedback Average Filter Time Constant	RW	NO	UINT16	125μs	0~20	0
2130h	00	PI-P Control	RW	NO	UINT16	PI-P	0~1	0
2131h	00	PI-P Shift Condition	RW	NO	UINT16	-	0~4	0
2132h	00	Velocity Loop P/PI Shift Condition(Torque Reference)	RW	NO	UINT16	1%	0~800	200

2133h	00	Velocity Loop P/PI Shift Condition)(Velocity Reference)	RW	NO	UINT16	rpm	0~10000	0
2134h	00	Velocity Loop PI-P Shift Condition (ACC)	RW	NO	UINT16	rpm/s	0~30000	0
2135h	00	Velocity Loop PI-P Shift Condition (Position Deviation)	RW	NO	UINT16	Reference unit	0~10000	0
2140h	00	Anti-MF Vibration Control	RW	NO	UINT16	-	0~17	16
2141h	00	Anti-MF Vibration Inertia Correction	RW	NO	UINT16	1%	1~1000	100
2142h	00	Anti-MF Vibration Frequency	RW	NO	UINT16	0.1Hz	10~30000	1000
2143h	00	Anti-MF Vibration Damping Gain	RW	NO	UINT16	1%	0~300	0
2150h	00	Adaptive Notch Filter 1	RW	NO	UINT16	-	0~1	1
2151h	00	Adaptive Notch Filter 2	RW	NO	UINT16	-	0~1	1
2152h	00	Adaptive Notch Vibration Detection Sensitivity	RW	NO	UINT16	1%	1~200	100

2153h	00	Notch Filter 1 Frequency	RW	NO	UINT16	Hz	50~5000	5000
2154h	00	Notch Filter 1 Q Factor	RW	NO	UINT16	0.01	50~1000	70
2155h	00	Notch Filter 1 Depth	RW	NO	UINT16	0.001	0~1000	0
2156h	00	Notch Filter 2 Frequency	RW	NO	UINT16	Hz	50~5000	5000
2157h	00	Notch Filter2 Q Factor	RW	NO	UINT16	0.01	50~1000	70
2158h	00	Notch Filter 2 Depth	RW	NO	UINT16	0.001	0~1000	0
2160h	00	Disturbance Compensation	RW	NO	UINT16	-	0~1	0
2161h	00	Disturbance Observer Cutoff Frequency	RW	NO	UINT16	0.1Hz	10~10000	1500
2163h	00	Disturbance Compensation Coefficient	RW	NO	UINT16	1%	0~100	0
2165h	00	Disturbance Observer Inertia Correction Coefficient	RW	NO	UINT16	1%	1~1000	100
2166h	00	Velocity Observer	RW	NO	UINT16	-	0~1	0
2167h	00	Velocity Observer Cutoff Frequency	RW	NO	UINT16	Hz	1~500	80
2168h	00	Disturbance Observer Inertia Correction Coefficient	RW	NO	UINT16	1%	0~1000	100

2169h	00	Disturbance Observer Filter Time Correction	RW	NO	UINT16	0.01ms	0~65535	10
2170h	00	Friction Compensation Cutoff Velocity	RW	NO	UINT16	rpm	0~1000	20
2171h	00	Friction Torque Positive Compensation Coefficient	RW	NO	UINT16	1%/ 100rpm	0~100	0
2172h	00	Friction Torque Negative Compensation Coefficient	RW	NO	UINT16	1%/ 100rpm	0~100	0
2175h	00	Robust Control	RW	NO	UINT16	-	0~1	0
2177h	00	Robust Gain	RW	NO	UINT16	0.1Hz	100~800	400
2178h	00	Min. Load under Robust Control	RW	NO	UINT16	1%	0~500	0
2185h	00	Vibration Detection Mode	RW	NO	UINT16	-	0~2	0
2186h	00	Vibration Detection Sensitivity	RW	NO	UINT16	1%	50~500	100
2187h	00	Vibration Detection Level	RW	NO	UINT16	rpm	0~5000	50
2192h	00	Overshoot Detection Sensitivity (Relative Position Coincidence)	RW	NO	UINT16	1%	0~100	100
2193h	00	Max. Searching Gain	RW	NO	UINT16	0.1Hz	10~4000	3000

2203h	00	Reference Pulse Multiplier	RW	NO	UINT16	-	1~100	1
2204h	00	Gear Ratio Numerator	RW	NO	UINT32	-	0~1073741824	1
2206h	00	Gear Ratio Denominator	RW	NO	UINT32	-	1~1073741824	1
2211h	00	Position Reference Filter Time Constant	RW	NO	UINT16	0.1ms	0~6550	0
2212h	00	Position Reference Moving Average Filter Time	RW	NO	UINT16	0.1ms	0~10000	0
2230h	00	Anti-LF Vibration	RW	NO	UINT16	-	0~2	0
2231h	00	Auto Anti-LF Vibration	RW	NO	UINT16	-	0~1	1
2232h	00	LF Vibration Detection Sensitivity (Relative Position Coincidence)	RW	NO	UINT16	0.1%	1~3000	400
2235h	00	Anti-LF Vibration Level 1	RW	NO	UINT16	0.1Hz	10~2000	2000
2236h	00	Anti-LF Vibration Correction 1	RW	NO	UINT16	1%	10~1000	100
2237h	00	Anti-LF Vibration Level 2	RW	NO	UINT16	0.1Hz	10~2000	2000

2238h	00	Anti-LF Vibration 2 Correction	RW	NO	UINT16	1%	10~1000	100
2240h	00	Model Reference Adaptive Control (MRAC)	RW	NO	UINT16	-	0~1	0
2241h	00	MRAC Gain 1	RW	NO	UINT16	0.1/s	1~20000	500
2242h	00	MRAC Damping Ratio 1	RW	NO	UINT16	0.1%	500~2000	1000
2243h	00	MRAC Velocity Feedforward Gain 1	RW	NO	UINT16	0.1%	0~10000	1000
2244h	00	MRAC Positive Torque Feedforward Gain 1	RW	NO	UINT16	0.1%	0~10000	1000
2245h	00	MRAC Negative Torque Feedforward Gain 1	RW	NO	UINT16	0.1%	0~10000	1000
2246h	00	MRAC Gain 2	RW	NO	UINT16	0.1/s	1~20000	500
2247h	00	MRAC Damping Ratio 2	RW	NO	UINT16	0.1%	500~2000	1000
2248h	00	MRAC Type (Resolution-based)	RW	NO	UINT16	-	0~1	1
2249h	00	Velocity/Torque Feed-forward	RW	NO	UINT16	-	0~1	0
2250h	00	External Encoder Usage	RW	NO	UINT16	-	0~3	0

2252h	00	Hybrid Position Deviation Coefficient Per Revolution	RW	NO	UINT16	1%	0~100	20
2253h	00	External Encoder Resolution	RW	NO	UINT16	P/Rev	4~1048576	32768
2257h	00	Hybrid Deviation Overflow Error Level	RW	NO	UINT32	-	0~1073741824	1000
2260h	00	/Near Signal Width	RW	NO	UINT16	-	1~1073741824	1073741824
2262h	00	/COIN Signal Width	RW	NO	UINT16	-	0~1073741824	7
2264h	00	Max. Position Deviation Overflow Level	RW	NO	UINT16	-	1~1073741823	25165824
2266h	00	Position Deviation Overflow Alarm Level	RW	NO	UINT16	1%	0~100	100
2267h	00	Servo ON Position Deviation Overflow Error Level	RW	NO	UINT16	-	1~1073741823	25165824
2269h	00	Servo ON Position Deviation Overflow Alarm Level	RW	NO	UINT16	1%	10~100	100
2270h	00	Servo ON Velocity Limit	RW	NO	UINT16	rpm	0~10000	10000

2274h	00	/COIN Output Timing	RW	NO	UINT16	-	0~2	0
2310h	00	Trapezoidal ACC Time	RW	NO	UINT16	ms	0~10000	0
2311h	00	Trapezoidal DEC Time	RW	NO	UINT16	ms	0~10000	0
2312h	00	Zero Clamp Mode	RW	NO	UINT16	-	0~3	3
2313h	00	Zero Clamp Velocity Level	RW	NO	UINT16	rpm	0~10000	10
2317h	00	Motor Rotation Level	RW	NO	UINT16	rpm	1~10000	20
2320h	00	Velocity Completion Range	RW	NO	UINT16	rpm	0~100	10
2401h	00	Torque Reference 2nd-order LPF Cutoff Frequency	RW	NO	UINT16	Hz	100~5000	5000
2402h	00	Torque Reference 2nd-order LPF Q Factor	RW	NO	UINT16	0.01	50~100	50
2411h	00	Torque Control Velocity Limit Source	RW	NO	UINT16	-	0~1	1
2412h	00	General Velocity Limit	RW	NO	UINT16	-	0~1	0
2413h	00	Velocity Limit under Torque Control	RW	NO	UINT16	rpm	0~10000	1000

2600h	00	Switching Input Signal Assignment Mode	RW	NO	UINT16	-	0~1	1
2601h	00	CN1-40 Input Configuration	RW	NO	UINT16	-	0x000~0x1FFF	0x001
2602h	00	CN1-42 Input Configuration	RW	NO	UINT16	-	0x000~0x1FFF	0x102
2603h	00	CN1-43 Input Configuration	RW	NO	UINT16	-	0x000~0x1FFF	0x103
2604h	00	CN1-41 Input Configuration	RW	NO	UINT16	-	0x000~0x1FFF	0x1D
2605h	00	CN1-44 Input Configuration	RW	NO	UINT16	-	0x000~0x1FFF	0x13
2606h	00	CN1-45 Input Configuration	RW	NO	UINT16	-	0x000~0x1FFF	0x14
2607h	00	CN1-46 Input Configuration	RW	NO	UINT16	-	0x000~0x1FFF	0x007
2610h	00	Switching Input Internal Configuration 1	RW	NO	UINT16	-	0x00~0xFF	0x00
2611h	00	Switching Input Internal Configuration 2	RW	NO	UINT16	-	0x00~0xFF	0x00
2612h	00	Switching Input Internal Configuration 3	RW	NO	UINT16	-	0x00~0xFF	0x00
2613h	00	CN1-25/26 Output Configuration	RW	NO	UINT16	-	0x00~0x109	0x006
2614h	00	CN1-27/28 Output Configuration	RW	NO	UINT16	-	0x00~0x109	0x001

2615h	00	CN1-29/30 Output Configuration	RW	NO	UINT16	-	0x000~0x109	0x002
2622h	00	Error Detection Mode	RW	NO	UINT16	-	0~1	0
2791h	00	Encoder Type	RO	NO	UINT16	-	1~18	10
2792h	00	Absolute Encoder Usage	RW	NO	UINT16	-	0~2	0
2900h	00	Power-down Save	RW	NO	UINT16	-	0~1	1
2901h	00	Encoder Overflow Protection	RW	NO	UINT16	-	0~1	0
2902h	00	Home Position Save	RW	NO	UINT16	-	0~1	0
2903h	00	Linear Axis Ratio	RW	NO	UINT16	-	1~256	1
2920h	00	Home Position Offset L	RW	NO	UINT16	Com/s	0~65535	0
2921h	00	Home Position Offset H	RW	NO	UINT16	Com/s	0~65535	0
2923h	00	Encoder Multi-turn Overflow	RW	NO	UINT16	Rev	0~65535	0

10.4 6000h Object List

Index	Subindex	Name	W/R	PDO Mapping	Data Type	Unit	Range	Default
603Fh	00	Error Code	RO	TPDO	UINT16	-	0~65535	0
6040h	00	Control Word	RW	RPDO	UINT16	-	0~65535	0
6041h	00	Status Word	RO	TPDO	UINT16	-	0~65535	0
6060h	00	Control Mode	RO	RPDO	INT8	-	0~10	8

6061h	00	Control Mode Display	RO	TPDO	INT8	-	0~10	-
6062h	00	Position Reference	RO	TPDO	INT32	Reference unit	-	-
6063h	00	Position Feedback	RO	TPDO	INT32	Encoder unit	-	-
6064h	00	Position Feedback	RO	TPDO	INT32	Reference unit	-	-
6065h	00	Position Deviation Overflow Level	RW	RPDO	UINT32	Reference unit	-	-
6067h	00	Position Coincidence Level	RW	RPDO	UINT32	Reference unit	0~(2^{32}-1)	100
6068h	00	Position Coincidence Time	RW	RPDO	UINT16	2ms	0~65535	0
606Bh	00	Velocity Reference	RO	TPDO	UINT32	r/min	-	-
606Ch	00	Velocity Feedback	RO	TPDO	INT32	Reference unit /s	-	-
606Dh	00	Velocity Completion Level	RW	RPDO	UINT16	r/min	0~65535	100
606Eh	00	Velocity Completion Time	RW	RPDO	UINT16	ms	0~65535	0
606Fh	00	Zero Velocity Completion Level	RW	RPDO	UINT16	r/min	0~65535	10

6070h	00	Zero Velocity Completion Time	RW	RPDO	UINT16	ms	0~65535	0
6071h	00	Target Torque	RW	RPDO	INT16	0.1%	-3000~3000	0
6074h	00	Torque Reference	RO	TPDO	INT16	0.1%	-300~300	0
6075h	00	Motor Rated Current	RO	TPDO	UINT32	mA	0~(2^{32}-1)	-
6076h	00	Motor Rated Torque	RO	TPDO	UINT32	mNm	0~(2^{32}-1)	-
6077h	00	Torque Feedback	RO	TPDO	UINT16	0.1%	-300~300	0
607Ah	00	Target Position	RW	RPDO	INT32	Reference unit	-2^{31}~(2^{31}-1)	0
607Ch	00	Home Offset	RW	RPDO	INT32	Encoder unit	-2^{31}~(2^{31}-1)	0
607Dh	00	Entry Number	RO	NO	UINT8	-	-	2
	01	Min. Position Limit	RW	RPDO	INT32	Reference unit	-2^{31}~(2^{31}-1)	-231
	02	Max. Position Limit	RW	RPDO	INT32	Reference unit	-2^{31}~(2^{31}-1)	231-1
607Eh	00	Reference Polarity	RW	RPDO	UINT8	-	0~255	0
607Fh	00	Max. Profile Velocity	RW	RPDO	UINT32	0.1r/min	0~(2^{32}-1)	50000
6080h	00	Max. Motor Velocity	RW	RPDO	UINT32	1r/min	0~(2^{32}-1)	6000
6081h	00	Profile Velocity	RW	RPDO	UINT32	Reference unit /s	0~(2^{32}-1)	10000000

6083h	00	Profile ACC	RW	RPDO	UINT32	Reference unit /s2	0~(2^{32}-1)	200
6084h	00	Profile DEC	RW	RPDO	UINT32	Reference unit /s2	0~(2^{32}-1)	200
6086h	00	Motion Profile	RW	RPDO	INT16	-	-2^{15}~ (2^{15}-1)	0
6087h	00	Torque Slope	RW	RPDO	UINT32	ms	0~(2^{32}-1)	0
6091h	00	Entry Number	RO	NO	UINT8	-	-	2
	01	Motor Resolution	RW	RPDO	UINT32	-	1~(2^{32}-1)	1
	02	Load Axis Resolution	RW	RPDO	UINT32	-	1~(2^{32}-1)	1
6098h	00	Home Mode	RW	RPDO	INT8	-	1~35	1
6099h	00	Entry Number	RO	NO	UINT8	-	-	2
	01	Switch Search Speed	RW	RPDO	UINT32	Reference unit /s	0~(2^{32}-1)	279620266
	02	Zero Search Speed	RW	RPDO	UINT32	Reference unit /s	0~(2^{32}-1)	5592405
609Ah	00	Home ACC	RW	RPDO	UINT32	Reference unit /s^2	0~(2^{32}-1)	16000
60B0h	00	Position Offset	RW	RPDO	INT32	Reference unit	-2^{31}~ (2^{31}-1)	0
60B8h	00	Probe Mode	RW	RPDO	UINT16	-	0~65535	0
60B9h	00	Probe Status	RO	TPDO	UINT16	-	0~65535	0

60BAh	00	Probe 1 Rising Edge Position	RO	TPDO	INT32	Reference unit	-2^{31}~ (2^{31}-1)	0
60BBh	00	Probe 1 Falling Edge Position	RO	TPDO	INT32	Reference unit	-2^{31}~ (2^{31}-1)	0
60BCh	00	Probe 2 Rising Edge Position	RO	TPDO	INT32	Reference unit	-2^{31}~ (2^{31}-1)	0
60BDh	00	Probe 2 Falling Edge Position	RO	TPDO	INT32	Reference unit	-2^{31}~ (2^{31}-1)	0
60E0h	00	Positive Torque Limit	RW	RPDO	UINT16	0.1%	0~3000	3000
60E1h	00	Negative Torque Limit	RW	RPDO	UINT16	0.1%	0~3000	3000
60F4h	00	Position Deviation	RO	TPDO	INT32	Reference unit	-	-
60FCh	00	Position Reference	RO	TPDO	INT32	Encoder unit	-	-
60FDh	00	DI Status	RO	TPDO	UNT32	-	-	-
60FEh	00	Entry Number	RO	NO	UINT8	-	-	2
	01	Physical Output	RO	TPDO	UINT32	-	0~(2^{32}-1)	0
	02	-	-	-	-	-	-	-
60FFh	00	Target Velocity	RW	RPDO	INT32	Reference unit /s	-	-
6052h	00	Drive Mode	RO	NO	UINT32	-	-	0x3AD

10.5 Object Dictionary Description

10.5.1 1000h Object Description

1000h: Drive Type					
Index	1000h				
Name	Drive Type				
Object Structure	VAR	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	0x00020192
It indicates the device type of CoE.					
BIT	Name	Description			
0~15	Device sub-protocol	402(0x192): Device sub-protocol			
16~23	Type	02: Servo drive			
25~31	Mode	Manufacturer-defined			

1001h: Error Register					
Index	1001h				
Name	Error Register				
Object Structure	VAR	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	0
It indicates the error information by bit.					
BIT	Definition	BIT	Definition		
0	General error	4	Communication error		
1	Current error	5	Sub-protocol error		
2	Voltage error	6	Reserved		
3	Temperature	7	Manufacturer-defined		

1008h: Drive Name					
Index	1008h				
Name	Drive Name				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	Servo Device
It indicates the name of the device.					

100Ah: Software Version	
Index	100Ah

Name	Software Version				
Object Structure	-	Data Type	-	Data Range	-
Mapping	NO	W/R	RO	Default	3761
It indicates the software version.					

1018h: Identity					
Index	1018h				
Name	Identity				
Object Structure	REC	Data Type	-	Data Range	-
Mapping	NO	W/R	RO	Default	-

Subindex	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	4
Mapping	NO	W/R	RO	Default	4

Sub-index	01h				
Name	Manufacturer ID				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	0x850104
Uniform allocated by the ETG vendor					

Subindex	02h				
Name	Product Code				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	0x26483052
The device code corresponds to the product series and product model on the electronic label, and the correspondence is as follows:					
Bit	0~15		16~31		
Definition	Product Model		Product Series		

Subindex	03h				
Name	Revision Number				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	0x37613708

It indicates the software update logs.		
Bit	0~15	16~31
Definition	Secondary revision number	Primary revision number

Subindex	04h				
Name	Serial Number				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	-
It indicates software update time(manufacturer-defined).					

1600h: RPDO1 Mapping					
Index	1600h				
Name	RPDO1 Mapping				
Object Structure	REC	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RW	Default	-
This object can be modified only when PDO is invalid.					

Subindex	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	0~8
Mapping	NO	W/R	RW	Default	4
When it is written 0, the other sub-index objects are invalid.					

Subindex	01h				
Name	Mapping Object 1				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60400010

Subindex	02h				
Name	Mapping Object 2				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x607A0020

Subindex	03h
Name	Mapping Object 3

Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60600008

Subindex	04h				
Name	Mapping Object 4				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60B80020

Sub-index	05h~08h				
Name	Mapping Object 5~8				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	-

1601h: RPDO2 Mapping					
Index	1601h				
Name	RPDO2 Mapping				
Object Structure	REC	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RW	Default	-
This object can be modified only when PDO is invalid.					

Subindex	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	0~8
Mapping	NO	W/R	RW	Default	2
When it is written 0, the other sub-index objects are invalid.					

Subindex	01h				
Name	Mapping Object 1				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60400010

Sub-index	02h				
Name	Mapping Object 2				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295

Mapping	NO	W/R	RW	Default	0x607A0020

Sub-index	03h~08h				
Name	Mapping Object 3~8				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	-

1602h: RPDO3 Mapping					
Index	1602h				
Name	RPDO1 Mapping				
Object Structure	REC	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RW	Default	-
This object can be modified only when PDO is invalid.					

Subindex	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	0~8
Mapping	NO	W/R	RW	Default	2
When it is written 0, the other sub-index objects are invalid.					

Subindex	01h				
Name	Mapping Object 1				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60400010

Sub-index	02h				
Name	Mapping Object 2				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60FF0020

Sub-index	03h~08h				
Name	Mapping Object 3~8				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	-

1603h: RPDO4 Mapping					
Index	1603h				
Name	RPDO4 Mapping				
Object Structure	REC	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RW	Default	-
This object can be modified only when PDO is invalid.					

Subindex	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	0~8
Mapping	NO	W/R	RW	Default	2
When it is written 0, the other sub-index objects are invalid.					

Subindex	01h				
Name	Mapping Object 1				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60400010

Sub-index	02h				
Name	Mapping Object 2				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60710020

Sub-index	03h~08h				
Name	Mapping Object 3~8				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	-

1A00h: TRDO1 Mapping Entry					
Index	1A00h				
Name	TPDO1 Mapping				
Object Structure	REC	Data Type	Uint32	Data Range	-

Mapping	NO	W/R	RW	Default	-
This object can be modified only when PDO is invalid.					

Subindex	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	0~8
Mapping	NO	W/R	RW	Default	4
When it is written 0, the other sub-index objects are invalid.					

Subindex	01h				
Name	Mapping Object 1				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60410010

Sub-index	02h				
Name	Mapping Object 2				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60640020

Sub-index	03h				
Name	Mapping Object 3				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60B90010

Sub-index	04h				
Name	Mapping Object 4				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60BA0020

Sub-index	05h				
Name	Mapping Object 5				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295

Mapping	NO	W/R	RW	Default	0x60FD0020

Sub-index	06h~08h				
Name	Mapping Object 6~8				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	-

1A01h: TRDO1 Mapping					
Index	1A01h				
Name	TPDO2 Mapping				
Object Structure	REC	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RW	Default	-
This object can be modified only when PDO is invalid.					

Subindex	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	0~8
Mapping	NO	W/R	RW	Default	2
When it is written 0, the other sub-index objects are invalid.					

Subindex	01h				
Name	Mapping Object 1				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60410010

Sub-index	02h				
Name	Mapping Object 2				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60640020

Sub-index	03h~08h				
Name	Mapping Object 3~8				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	-

1A02h: TRDO3 Mapping					
Index	1A02h				
Name	TPDO3 Mapping				
Object Structure	REC	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RW	Default	-
This object can be modified only when PDO is invalid.					

Subindex	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	0~8
Mapping	NO	W/R	RW	Default	3
When it is written 0, the other sub-index objects are invalid.					

Subindex	01h				
Name	Mapping Object 1				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60410010

Sub-index	02h				
Name	Mapping Object 2				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60640020

Sub-index	03h				
Name	Mapping Object 3				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x606C0020

Sub-index	04h~08h				
Name	Mapping Object 3~8				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	-

1A03h: TRDO4 Mapping					
Index	1A03h				
Name	TPDO4 Mapping				
Object Structure	REC	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RW	Default	-
This object can be modified only when PDO is invalid.					

Subindex	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	0~8
Mapping	NO	W/R	RW	Default	3
When it is written 0, the other sub-index objects are invalid.					

Subindex	01h				
Name	Mapping Object 1				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60410010

Sub-index	02h				
Name	Mapping Object 2				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60640020

Sub-index	03h				
Name	Mapping Object 3				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	0x60770020

Sub-index	04h~08h				
Name	Mapping Object 4~8				
Object Structure	-	Data Type	Uint32	Data Range	0~4294967295
Mapping	NO	W/R	RW	Default	-

1C00h: Sync Manager(SM) Type					
Index	1C00h				
Name	Sync Manager Type				
Object Structure	REC	Data Type	-	Data Range	-
Mapping	NO	W/R	RO	Default	-

Subindex	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	4

Sub-index	01h				
Name	SM0 Communication Type				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	1
SM0 communication type: receive mailbox					

Sub-index	02h				
Name	SM1 Communication Type				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	2
SM1 communication type: send mailbox					

Sub-index	03h				
Name	SM2 Communication Type				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	3
SM2 communication type: process data output					

Sub-index	04h				
Name	SM3 Communication Type				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	4
SM3 communication type: process data input					

1C12h: SM2 RPDO Assignment					
Index	1C12h				
Name	SM2 RPDO Assignment				
Object Structure	ARR	Data Type	Uint16	Data Range	-
Mapping	NO	W/R	RW	Default	-
Set the assigned index number by RPDO.					

Sub-index	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RW	Default	1

Sub-index	01h				
Name	RPDO Assignment Index				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RW	Default	1
Set the index number assigned by RPDO: 1. Configure the indexes under pre-operation state. 2. Select the RPDO assignment with the TwinCAT software directly, otherwise: a. Write 1C12-00h to 0. b. Write C12-01h to the pre-operation RPDOx (1600h~1603h) and configure the RPDOx mapping object (e.g. 1600h). c. Write 1C12-00h to 1.					

1C13h: SM2 TPDO Assignment					
Index	1C13h				
Name	SM2 TPDO Assignment				
Object Structure	ARR	Data Type	Uint16	Data Range	-
Mapping	NO	W/R	RW	Default	-
Set the assigned index number by TPDO.					

Subindex	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RW	Default	1

Sub-index	01h				
Name	TPDO Assignment Index				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RW	Default	1
Set the index number assigned by TPDO: 1. Configure the indexes under pre-operation state. 2. Select the TPDO assignment with the TwinCAT software directly , otherwise: a. Write 1C13-00h to 0. b. Write 1C13-01h to the pre-operation TPDOx (1A00h~1A03h) and configure the TPDOx mapping object (e.g. 1A00h). c. Write 1C13-00h to 1.					

1C32h: SM2 Output Parameter					
Index	1C32h				
Name	SM2 Output Parameter				
Object Structure	REC	Data Type	-	Data Range	-
Mapping	NO	W/R	RO	Default	-
It indicates the sync manager 2 output parameter.					

Subindex	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	32

Sub-index	01h				
Name	Sync Type				
Object Structure	-	Data Type	Uint16	Data Range	-
Mapping	NO	W/R	RO	Default	2
2 indicates that the type of sync manager 2 is Distributed Clock Synchronisation 0 Mode (DC SYNC0 Mode).					

Subindex	02h				
Name	Cycle Time				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	0
It indicates the cycle of DC SYNC0.					

Subindex	04h				
Name	DC Type				
Object Structure	-	Data Type	Uint16	Data Range	-
Mapping	NO	W/R	RO	Default	4
It indicates the type of the distributed clock. 4 means Distributed Clock Synchronisation 0 Mode (DC SYNC0 Mode).					

Subindex	05h				
Name	Min. Cycle Time				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	125000
It indicates the minimum synchronisation period supported by the slave (ns).					

Subindex	06h				
Name	Calculation and Copy Time				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	-
It indicates the time (in ns) at which the microprocessor copies the data from the sync manager to the local.					

Subindex	08h				
Name	Cycle Time Access				
Object Structure	-	Data Type	Uint16	Data Range	-
Mapping	NO	W/R	RO	Default	-

Subindex	09h				
Name	Delay Time				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	-
Unit(ns)					

Subindex	0Ah				
Name	SYNC0 Time				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	-
Set the ESC register 09A0h by this parameter under DC mode.					

Subindex	0Bh				
Name	Missing Event				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	-

Subindex	0Ch				
Name	Cycle Overflow				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	-
It indicates a low cycle time setting.					

Subindex	20h				
Name	SYNC Error				
Object Structure	-	Data Type	BOOL	Data Range	-
Mapping	NO	W/R	RO	Default	-
TURE: Synchronization is valid and no any errors occur. FALSE: Synchronization is not valid or no any errors occur.					

1C32h: SM2 Input Parameter					
Index	1C33h				
Name	SM2 Input Parameter				
Object Structure	REC	Data Type	-	Data Range	-
Mapping	NO	W/R	RO	Default	-
It indicates the sync manager 2 input parameters.					

Subindex	00h				
Name	Subindex Number				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	32

Sub-index	01h				
Name	Sync Type				
Object Structure	-	Data Type	Uint16	Data Range	-
Mapping	NO	W/R	RO	Default	2

2 indicates that the type of sync manager 2 is Distributed Clock Synchronisation 0 Mode (DC SYNC0 Mode).

Subindex	02h				
Name	Cycle Time				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	0
It indicates the cycle of DC SYNC0.					

Subindex	04h				
Name	DC Type				
Object Structure	-	Data Type	Uint16	Data Range	-
Mapping	NO	W/R	RO	Default	4
It indicates the type of the distributed clock. 4 means Distributed Clock Synchronisation 0 Mode (DC SYNC0 Mode).					

Subindex	05h				
Name	Min. Cycle Time				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	125000
It indicates the minimum synchronisation period supported by the slave (ns).					

Subindex	06h				
Name	Calculation and Copy Time				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	-
It indicates the time (in ns) at which the microprocessor copies the data from the sync manager to the local.					

Subindex	08h				
Name	Cycle Time Access				
Object Structure	-	Data Type	Uint16	Data Range	-
Mapping	NO	W/R	RO	Default	-

Subindex	09h				
Name	Delay Time				
Object Structure	-	Data Type	Uint32	Data Range	-

Mapping	NO	W/R	RO	Default	-
Unit(ns)					

Subindex	0Ah				
Name	SYNC0 Cycle Time				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	-
Set the ESC register 09A0h by this parameter under DC mode.					

Subindex	0Bh				
Name	SM-Missing Event				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	-

Subindex	0Ch				
Name	Cycle Time Overflow				
Object Structure	-	Data Type	Uint32	Data Range	-
Mapping	NO	W/R	RO	Default	-
It indicates a too low cycle time setting.					

Subindex	20h				
Name	SYNC Error				
Object Structure	-	Data Type	BOOL	Data Range	-
Mapping	NO	W/R	RO	Default	-
TURE: Synchronization is valid and no any errors occur. FALSE: Synchronization is not valid or no any errors occur.					

10.5.2 2000h Object Description

2000h: Control Mode					
Index	2000h				
Name	Control Mode				
Object Structure	VAR	Data Type	Uint16	Data Range	-
Mapping	NO	W/R	RO	Default	-
The EtherCAT control mode is default on the EtherCAT models, no users do not need to set it again.					

2002h: Motor Direction					
Index	2002h				
Name	Control Mode				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
Facing the motor: 0: Counterclockwise as positive 1: Clockwise as positive					

2003h: Default Monitor Item					
Index	2003h				
Name	Default Monitor Item				
Object Structure	VAR	Data Type	Uint16	Data Range	0x000~0xfff
Mapping	NO	W/R	RW	Default	3
Set the monitoring parameters to be displayed by default after power-on, and please check the code for the specific values, 0xfff means that the monitoring parameters are not displayed, while the system status is. Note: Alarms are prioritized for display in case that the setup parameter cannot be displayed normally.					

2004h: Servo OFF and C1 Error Stop Mode					
Index	2004h				
Name	Servo OFF and C1 Error Stop Mode				
Object Structure	VAR	Data Type	Uint16	Data Range	0~2
Mapping	NO	W/R	RW	Default	0
0: Stop the motor by DB 1: Stop the motor by DB, then release DB 2: Coasting to stop without DB Note: DB (Dynamic Brake) is the function to perform an emergency stop. If the servomotor is started or stopped by direct power connection or cut, or by servo-ON/-OFF signal, DB may act frequently to cause component aging. Please control the servo motor by speed or position references.					

2005h: C2 Error Stop Mode					
Index	2005h				
Name	C2 Error Stop Mode				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
0: Zero-speed stop by setting speed reference to “0” to execute a sharp stop 1: Stop as Pn004 setting					

2006h: Overtrarvel Alarm Detection Mode					
Index	2006h				
Name	Overtravel Alarm Detection Mode				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
0: OFF 1: ON					

2007h: Overtravel Stop Mode					
Index	2007h				
Name	Overtravel Stop Mode				
Object Structure	VAR	Data Type	Uint16	Data Range	0~2
Mapping	NO	W/R	RW	Default	0
Set the stop mode under over-travel and motor status after stopping. 0: Stop as Pn004 setting 1: Stop by Pn053 setting, and the motor is locked afterwards 2: Stop by Pn053 setting, and the motor is not locked afterwards					

2008h: Power Delay after /BK OFF					
Index	2008h				
Name	Power Delay after /BK OFF				
Object Structure	VAR	Data Type	Uint16	Data Range	0~50
Mapping	NO	W/R	RW	Default	0
When the servomotor is enabled but not running, the brake (/BK) signal and the servo ON (/S-ON) signal are OFF at the same time, set here to change the time from when the /BK signal is OFF to when the motor power is actually cut. Note: The brake delay time is slightly different, and it can prevent the motor from mechanical movement caused due to self-weight of the vertical axis or external force when the brake is actuated.					

2009h: /BK OFF Delay					
Index	2009h				
Name	/BK OFF Delay				
Object Structure	VAR	Data Type	Uint16	Data Range	10~100
Mapping	NO	W/R	RW	Default	0
When /S-OFF signal, errors or main circuit power cut occur during motor operation, the power to the motor will be cut immediately. Set this parameter or Motor Velocity Level for /BK OFF (either works) to adjust the output time of /BK signal. Note: For details of the related logic, refer to “Brake Operation”.					

2010h: Motor Velocity Level for /BK OFF					
Index	2010h				
Name	/BK OFF Delay				
Object Structure	VAR	Data Type	Uint16	Data Range	0~10000
Mapping	NO	W/R	RW	Default	100
Note: For details of the related logic, refer to “Brake Operation”.					

2012h: External Regenerative Resistor Power					
Index	2012h				
Name	External Regenerative Resistor Power				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	0
When connecting an external regenerative resistor, set the power accordingly. And it varies according to the cooling condition of the external regenerative resistor. Note: For details of the related logic, refer to “Regenerative Resistor” section.					

2013h: External Regenerative Resistance					
Index	2013h				
Name	External Regenerative Resistance				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	0
Set the correct resistance value when connecting an external regenerative resistor. Note: The min. regeneration resistance allowed for each power band is different, see "Setting Regeneration Resistance" for details, otherwise the internal components of the servo unit may be damaged.					

2015h: Overload Alarm Level					
Index	2015h				
Name	External Regenerative Resistance				
Object Structure	VAR	Data Type	Uint16	Data Range	1~100
Mapping	NO	W/R	RW	Default	30
Set the overload alarm level. When the actual load detected exceeds this value and lasts for the time level, it will report overloard alarm. Note: For details, refer to “Overload Alarm” section.					

2016h: Overload Current Derating	
Index	2016h
Name	Overload Current Derating

Object Structure	VAR	Data Type	Uint16	Data Range	10~100
Mapping	NO	W/R	RW	Default	100
Set to change the motor current threshold at which overload alarms are started to be calculated, to shorten the time for overload alarms to be detected. Note: This parameter is not valid when the motor current is 200% of rated or more.					

2039h: Multi-turn Upper Limit					
Index	2039h				
Name	Multi-turn Upper Limit				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	65535
Reserved					

2040h: Absolute Encoder Mode					
Index	2040h				
Name	Absolute Encoder Mode				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
0: As an absolute encoder. Set this to 1 to use the multi-turn absolute encoder function when a multi-turn absolute encoder is used for the motor. 1: As an incremental encoder. At this time, power failure position is not recorded, and battery under-voltage and driver power failure will not trigger alarms or errors corresponding to multiple turn values.					

2041h: Absolute Encoder Undervoltage Alarm/Error					
Index	2041h				
Name	Absolute Encoder Undervoltage Alarm/Error				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
0: Error-When the drive is powered on/reset, it monitors the battery status for 4 to 9 seconds, and report Er.830 if the voltage is too low. After the timeout, it will not detect. 1: Alarm- Drive monitors the battery status always and report Al.930 for battery undervoltage(＜3V), this prompt can be lifted automatically and operation won't be interrupted.					

2044h: Full-closed Loop Function					
Index	2044h				
Name	Full-closed Loop Function				
Object Structure	VAR	Data Type	Uint16	Data Range	0~51

Mapping	NO	W/R	RW	Default	1

2045h: Undervoltage Alarm Detection					
Index	2045h				
Name	Undervoltage Alarm Detection				
Object Structure	VAR	Data Type	Uint16	Data Range	0x00~0x02
Mapping	NO	W/R	RW	Default	0
0: OFF 1: ON 2: ON with torque limit by Pn046/Pn047 settings, see 2046h [Torque Limit during Undervoltage Alarm] for details.					

2046h: Torque Limit during Undervoltage Alarm					
Index	2046h				
Name	Torque Limit during Undervoltage Alarm				
Object Structure	VAR	Data Type	Uint16	Data Range	0~100
Mapping	NO	W/R	RW	Default	50
Apply a internal torque limit in response to an undervoltage alarm.					

2047h: Torque Limit Cancel Time during Undervoltage Alarm					
Index	2047h				
Name	Torque Limit Cancel Time during Undervoltage Alarm				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1000
Mapping	NO	W/R	RW	Default	100
After the undervoltage alarm cancel signal is gone, the torque limit value is controlled internally by the servo drive according to the set time here as described in the "Undervoltage Torque Limit" section.					

2050h: Torque Limit Mode					
Index	2050h				
Name	Torque Limit Mode				
Object Structure	VAR	Data Type	Uint16	Data Range	0~3
Mapping	NO	W/R	RW	Default	1
0: Analog torque (invalid under torque control) 1: 1 as max. torque limit 2: 1 as max. torque limit for positive operation and 2 for negative operation 3: 1 as max. torque limit when torque limit switching signal(/TLC) is OFF, and 2 when ON					

2051h: Max. Torque Limit 1					
Index	2051h				
Name	Max. Torque Limit 1				
Object Structure	VAR	Data Type	Uint16	Data Range	0~500
Mapping	NO	W/R	RW	Default	500
Takes effect immediately, unit by 1%					

2052h: Max. Torque Limit 2					
Index	2052h				
Name	Max. Torque Limit 2				
Object Structure	VAR	Data Type	Uint16	Data Range	0~500
Mapping	NO	W/R	RW	Default	500
Takes effect immediately, unit by 1%					

2053h: Emergency Stop Torque					
Index	2052h				
Name	Emergency Stop Torque				
Object Structure	VAR	Data Type	Uint16	Data Range	0~800
Mapping	NO	W/R	RW	Default	800
This takes effect immediately, unit by 1%. Set the torque when motor stop mode is set to DEC stop.					

2070h: Dividing Pulse No.					
Index	2070h				
Name	Dividing Pulse No.				
Object Structure	VAR	Data Type	Uint16	Data Range	16~4194304
Mapping	NO	W/R	RW	Default	2048
Set to divide the number of pulses per turn from the encoder according to the system specifications of the drives and the upper devices. Note: This is the number of one-turn A/B quadrature output pulses limited by the encoder resolution, please refer to “Dividing Pulse Output” for details.					

2072h: Dividing Pulse Direction					
Index	2072h				
Name	Dividing Pulse Direction				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0

Set the A/B pulse logic during positive and negative operation of the encoder. 0: A leads before B in positive operation 1: B leads before A in positive operation

2080h: EtherCAT Station Alias (OMRON)					
Index	2080h				
Name	EtherCAT Station Alias (OMRON)				
Object Structure	VAR	Data Type	Uint16	Data Range	1~65535
Mapping	NO	W/R	RW	Default	1
Set the site alias for this product, usually for Omron controllers.					

2100h: Inertia Ratio					
Index	2100h				
Name	Inertia Ratio				
Object Structure	VAR	Data Type	Uint16	Data Range	0~20000
Mapping	NO	W/R	RW	Default	100
Inertia ratio=Load inertia converted from motor shaft/rotor inertia of servo motor * 100%					

2101h: 1st Velocity Loop Gain					
Index	2101h				
Name	1st Velocity Loop Gain				
Object Structure	VAR	Data Type	Uint16	Data Range	10~20000
Mapping	NO	W/R	RW	Default	400
Set the responsiveness of the velocity loop. A slow velocity loop will delay the outer position loop, causing overshooting or vibration to the velocity references. So, the larger this setting is, the more stable the servo system and the better the responsiveness.					

2102h: 1st Velocity Loop Integral Time Constant					
Index	2102h				
Name	1st Velocity Loop Integral Time Constant				
Object Structure	VAR	Data Type	Uint16	Data Range	15~51200
Mapping	NO	W/R	RW	Default	2000
Set an integral element to the speed loop to allow response to even minor inputs, but this integral element will delay the servo system. So when the time parameter is too large, overshoot will occur, or when the positioning time parameter is too large, responsiveness will be lowered.					

2103h: 1st Velocity Loop Gain					
Index	2103h				
Name	2nd Position Loop Gain				
Object Structure	VAR	Data Type	Uint16	Data Range	10~20000
Mapping	NO	W/R	RW	Default	400
Set to adjust the responsiveness of the position loop. The higher this gain, the faster the responsiveness, and the shorter the positioning time. But increase mechanical rigidity of the system if you want the position loop gain to be higher.					

2104h: 1st Velocity Loop Gain					
Index	2104h				
Name	1st Torque Reference Filter				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	100
Set to adjust the torque reference to eliminate oscillations caused by the servo drive. The lower this value is, the better the responsiveness control, but its performance is limited by mechanical specifications.					

2105h: 2nd Velocity Loop Gain					
Index	2105h				
Name	2nd Velocity Loop Gain				
Object Structure	VAR	Data Type	Uint16	Data Range	10~20000
Mapping	NO	W/R	RW	Default	400
Set the responsiveness of the velocity loop. A slow velocity loop will delay the outer position loop, causing overshooting or vibration to the velocity commands. So, the larger this setting is, the more stable the servo system and the better the responsiveness.					

2106h: 2nd Velocity Loop Integral Time Constant					
Index	2106h				
Name	2nd Velocity Loop Integral Time Constant				
Object Structure	VAR	Data Type	Uint16	Data Range	15~51200
Mapping	NO	W/R	RW	Default	2000
Set the responsiveness of the velocity loop. A slow velocity loop will delay the outer position loop, causing overshooting or vibration to the velocity commands. So, the larger this setting is, the more stable the servo system and the better the responsiveness.					

2107h: 2nd Velocity Loop Gain	
Index	2107h

Name	2nd Position Loop Gain				
Object Structure	VAR	Data Type	Uint16	Data Range	10~20000
Mapping	NO	W/R	RW	Default	400
Set to adjust the responsiveness of the position loop. The higher this gain, the faster the responsiveness, and the shorter the positioning time. But increase mechanical rigidity of the system if you want the position loop gain to be higher.					

2108h: 2nd Velocity Loop Gain					
Index	2108h				
Name	2nd Position Loop Gain				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	100
Set to adjust the responsiveness of the position loop. The higher this gain, the faster the responsiveness, and the shorter the positioning time. But increase mechanical rigidity of the system if you want the position loop gain to be higher.					

2110h: Gain Shift					
Index	2110h				
Name	Gain Shift Method				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
Manually shift gains by the external signal input, or choose the auto gain shift mode. By this function, the gain can be increased and at the same time, time is shortened during positioning, while gain and vibration is reduced when the motor is stopped. 0: Manual switching by external input signal (G-SEL) 1: Auto switching from the 1st gain to the 2nd gain when Pn111[Gain Shift Condition] is true, otherwise, it is 1st gain.					

2111h: Gain Shift Condition					
Index	2111h				
Name	Gain Shift Condition				
Object Structure	VAR	Data Type	Uint16	Data Range	0~5
Mapping	NO	W/R	RW	Default	0
0: /COIN ON 1: /COIN OFF 2: /NEAR ON 3: /NEAR OFF 4: Position reference filtered be 0 and reference pulse input OFF 5: Position reference pulse input ON Switch from the 1st gain to the 2nd gain when Pn111[Gain Shift Condition] setting is true, otherwise, it is the 1st gain.					

2112h: Gain Shift Time 1					
Index	2112h				
Name	Gain Shift Time 1				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	0
If switching condition is met and lasts for the delay time, the 2nd gain will be switched to 1st gain by liner change during the time set here.					

2113h: Gain Shift Time 2					
Index	2113h				
Name	Gain Shift Time 2				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	0
If switching condition is met and lasts for the delay time, the 2nd gain will be switched to 1st gain by liner change during the time set here.					

2114h: Gain Shift Delay 1					
Index	2114h				
Name	Gain Shift Delay 1				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	0
Set the waiting time from the 1st-to-2nd gain shift condition is met to actual switching.					

2115h: Gain Shift Delay 2					
Index	2115h				
Name	Gain Shift Delay 2				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	0
Set the waiting time from the 2nd-to-1st gain shift condition is met to actual switching.					

2121h: Velocity Feedforward Gain					
Index	2121h				
Name	Velocity Feedforward Gain				
Object Structure	VAR	Data Type	Uint16	Data Range	0~100
Mapping	NO	W/R	RW	Default	0

Set to shorten the positioning time, and it is valid under position control. Note: Position overshoot may occur if the feedforward setting is too large, so please adjust it appropriately according to the response.

2122h: Velocity Feedforward Filter Time					
Index	2122h				
Name	Velocity Feedforward Filter Time				
Object Structure	VAR	Data Type	Uint16	Data Range	0~6400
Mapping	NO	W/R	RW	Default	0
Set the low-pass filtering time constant to mitigate position overshoot and torque fluctuation due to speed feed-forward function.					

2123h: V-REF as Velocity Feedforward					
Index	2123h				
Name	V-REF as Velocity Feedforward				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
Set the speed feedforward by the external analog input V-REF to shorten the positioning time. 0: OFF 1: ON					

2124h: Velocity/Position Control (T-REF-based)					
Index	2124h				
Name	V-REF as Torque Feedforward				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
Set the torque feedforward by the external analog input V-REF to shorten the positioning time. 0: OFF 1: ON					

2125h: Velocity Feedback Filter Time Constant					
Index	2125h				
Name	Velocity Feedback Filter Time Constant				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	0

2126h: Velocity Feedback Average Filter Time Constant	
Index	2126h

Name	Velocity Feedback Average Filter Time Constant				
Object Structure	VAR	Data Type	Uint16	Data Range	0x00~0x14
Mapping	NO	W/R	RW	Default	0

2130h PI-P Control					
Index	2130h				
Name	PI-P Control				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
0: PI control 1: P control					

2131h: PI-P Shift Condition					
Index	2131h				
Name	PI-P Shift Condition				
Object Structure	VAR	Data Type	Uint16	Data Range	0~4
Mapping	NO	W/R	RW	Default	0
Set the conditions for automatic switching between P control and PI control to suppress overshooting during ACC and DEC and shorten stabilization time. 0: Internal torque reference 1: Velocity reference 2: ACC reference 3: Position bias pulse 4: Shift OFF					

2132h: PI-P Shift Condition (Torque Reference)					
Index	2132h				
Name	PI-P Shift Condition (Torque Reference)				
Object Structure	VAR	Data Type	Uint16	Data Range	0~800
Mapping	NO	W/R	RW	Default	200
If the torque reference exceeds this setting, the speed loop will switch to P control, otherwise it will be PI control.					

2133h: PI-P Shift Condition (Velocity Reference)					
Index	2133h				
Name	PI-P Shift Condition (Velocity Reference)				
Object Structure	VAR	Data Type	Uint16	Data Range	0~10000
Mapping	NO	W/R	RW	Default	0

When the velocity reference exceeds this setting, the speed loop will switch to P control, otherwise it is PI control.

2134h: PI-P Shift Condition (ACC)					
Index	2134h				
Name	PI-P Shift Condition (ACC)				
Object Structure	VAR	Data Type	Uint16	Data Range	0~30000
Mapping	NO	W/R	RW	Default	0
When the ACC reference exceeds this setting, the speed loop will switch to P control, otherwise it is PI control.					

2135h: PI-P Shift Condition (Position Deviation)					
Index	2135h				
Name	PI-P Shift Condition (Position Deviation)				
Object Structure	VAR	Data Type	Uint16	Data Range	0~10000
Mapping	NO	W/R	RW	Default	0
If the position deviation exceeds this setting, the speed loop switches to P control, otherwise it is PI control.					

2140h: Anti-MF Vibration					
Index	2140h				
Name	Anti-MF Vibration				
Object Structure	VAR	Data Type	Uint16	Data Range	0x00~0x11
Mapping	NO	W/R	RW	Default	0x10
Set to suppress the continuous vibration within 100Hz~1000Hz when the control gain is increased. 0x1#: Auto setting ON by intelligent setting and bandwidth setting 0X0#: Automatic setting OFF by intelligent setting and bandwidth setting, manual only. 0x#1: 2142h [Anti-MF Vibration Frequency] setting valid 0x#0: 2142h [Anti-MF Vibration Frequency] setting invalid					

2141h: Anti-MF Vibration Inertia Correction					
Index	2141h				
Name	Anti-MF Vibration Inertia Correction				
Object Structure	VAR	Data Type	Uint16	Data Range	1~1000
Mapping	NO	W/R	RW	Default	100

2142h: Anti-MF Vibration Frequency					
Index	2142h				
Name	Anti-MF Vibration Frequency				
Object Structure	VAR	Data Type	Uint16	Data Range	10~30000
Mapping	NO	W/R	RW	Default	1000
Set the frequency level to for anti medium-frequency oscillation.					

2143h: Anti-MF Vibration Damping Gain					
Index	2143h				
Name	Anti-MF Vibration Damping Gain				
Object Structure	VAR	Data Type	Uint16	Data Range	0~300
Mapping	NO	W/R	RW	Default	0
Increase this parameter to improve the vibration suppression effect, but a large setting may aggravate the vibration. Please check the vibration condition while gradually increasing the setting value by 10% each time within the range of 0% to 200%, and if the vibration suppression is not satisfactory even after reaching 200%, stop trying and reduce the control gain appropriately.					

2150h: Adaptive Notch Filter 1					
Index	2150h				
Name	Adaptive Notch Filter 1				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	1
0: Not controlled by utility function 1: Controlled by utility function					

2151h: Adaptive Notch Filter 2					
Index	2151h				
Name	Adaptive Notch Filter 2				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	1
0: OFF with utility function 1: ON with utility function					

2152h: Adaptive Notch Vibration Detection Sensitivity					
Index	2152h				
Name	Adaptive Notch Vibration Detection Sensitivity				
Object Structure	VAR	Data Type	Uint16	Data Range	1~200
Mapping	NO	W/R	RW	Default	100

Set the automatic detection sensitivity for resonance frequencies. The smaller the setting value, the more sensitive the resonance detection, and the easier the vibration detection, but a small setting may falsely detect the resonance frequency.

2153h: Notch Filter 1 Frequency					
Index	2153h				
Name	Notch Filter 1 Frequency				
Object Structure	VAR	Data Type	Uint16	Data Range	50~5000
Mapping	NO	W/R	RW	Default	5000
Set the frequency of the 1st notch filter to suppress resonance, if this parameter is set to 5000, this function is OFF. Note: Do not set the notch filter frequency close to the response frequency of the speed loop, but at least 4 times the gain of the speed loop, otherwise the overall system performance may be reduced.					

2154h: Notch Filter 1 Q Factor					
Index	2154h				
Name	Notch filter 1 Q Factor				
Object Structure	VAR	Data Type	Uint16	Data Range	50~1000
Mapping	NO	W/R	RW	Default	70
Set the width of the notch filter frequency. The larger the setting, the greater the notch, and the narrower the width of the filter frequency.					

2155h: Notch Filter 1 Depth					
Index	2155h				
Name	Notch Filter 1 Depth				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1000
Mapping	NO	W/R	RW	Default	0
Set the depth of the notch filter frequency, which will differ according to the filter depth. The smaller the notch filter depth setting is, the deeper the notch, and the better the resonance suppression effect, but if it is too small, it will aggravate the vibration.					

2156h: Notch Filter 2 Frequency					
Index	2156h				
Name	Notch Filter 2 Frequency				
Object Structure	VAR	Data Type	Uint16	Data Range	50~5000
Mapping	NO	W/R	RW	Default	5000
Set the width of the notch filter frequency. The larger the setting, the greater the notch, and the narrower the width of the filter frequency.					

2157h: Notch Filter 2 Q Factor					
Index	2157h				
Name	Notch filter 2 Q Factor				
Object Structure	VAR	Data Type	Uint16	Data Range	50~1000
Mapping	NO	W/R	RW	Default	70
Set the width of the notch filter frequency. The larger the setting, the greater the notch, and the narrower the width of the filter frequency.					

2158h: Notch Filter 2 Depth					
Index	2158h				
Name	Notch Filter 2 Depth				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1000
Mapping	NO	W/R	RW	Default	0
Set the depth of the notch filter frequency, which will differ according to the filter depth. The smaller the notch filter depth setting is, the deeper the notch, and the better the vibration suppression effect, but if it is too small, it will aggravate the vibration.					

2160h: Disturbance Compensation					
Index	2160h				
Name	Disturbance Compensation				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
Set the disturbance compensation function on or off. 0: OFF 1: ON					

2161h: Disturbance Compensation Gain					
Index	2161h				
Name	Disturbance Compensation Gain				
Object Structure	VAR	Data Type	Uint16	Data Range	10~10000
Mapping	NO	W/R	RW	Default	1500
Set the disturbance compensation gain. Increase it to improve the effect of suppressing disturbance, but it may cause louder noise if it is too large.					

2163h: Disturbance Compensation Factor	
Index	2163h

Name	Disturbance Compensation Factor				
Object Structure	VAR	Data Type	Uint16	Data Range	0~100
Mapping	NO	W/R	RW	Default	0
Set the disturbance compensation factor to multiply the received position reference or speed reference, which is the torque compensation value to the torque reference.					

2165h: Velocity Observer Inertia Compensation Gain					
Index	2165h				
Name	Velocity Observer Inertia Compensation Gain				
Object Structure	VAR	Data Type	Uint16	Data Range	1~1000
Mapping	NO	W/R	RW	Default	100
Set the disturbance observer inertia to adjust the recognition error caused by inaccurate inertia setting. Note: When the inertia ratio is set correctly, set this value to 100.					

2166h: Velocity Observer					
Index	2166h				
Name	Velocity Observer				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
Set the speed observer function on or off. 0: OFF 1: ON					

2167h: Velocity Observer Cutoff Frequency					
Index	2167h				
Name	Velocity Observer Cutoff Frequency				
Object Structure	VAR	Data Type	Uint16	Data Range	1~500
Mapping	NO	W/R	RW	Default	80
Set the cutoff frequency of the speed observer.					

2168h: Velocity Observer Inertia Correction Coefficient					
Index	2168h				
Name	Velocity Observer Inertia Correction Coefficient				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1000
Mapping	NO	W/R	RW	Default	100

2169h: Velocity Observer Filter Time Correction					
Index	2169h				
Name	Velocity Observer Filter Time Correction				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	10

2170h: Friction Compensation Cutoff Velocity					
Index	2170h				
Name	Friction Compensation Cutoff Velocity				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1000
Mapping	NO	W/R	RW	Default	20
The friction compensation function will compensate for viscous friction variations and fixed load variations in conjunction with the friction compensation coefficient. Set the friction compensation coefficient to 95% or lower in the general cases, and if it's not enough, try raising the the friction compensation cut-off speed by 10% each time on the basis of no vibration.					

2171h: Positive Friction Compensation Coefficient					
Index	2171h				
Name	Friction Compensation Cutoff Velocity				
Object Structure	VAR	Data Type	Uint16	Data Range	0~100
Mapping	NO	W/R	RW	Default	0
The friction compensation function will compensate for viscous friction variations and fixed load variations in conjunction with the friction compensation coefficient. Set the friction compensation coefficient to 95% or lower in the general cases, and if it's not enough, try raising the the friction compensation cut-off speed by 10% each time on the basis of no vibration.					

2172h: Negative Friction Compensation Coefficient					
Index	2172h				
Name	Negative Friction Compensation Coefficient				
Object Structure	VAR	Data Type	Uint16	Data Range	0~100
Mapping	NO	W/R	RW	Default	0
The higher the setting value, the better the result, but if it is too high, the it will be more prone to vibration, usually please set the setting value below 95%.					

2175h: Robust Control	
Index	2175h
Name	Robust Control

Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
Set the robust function on or off to obtain a stable response through automatic adjustment regardless of the type of machinery and load fluctuations. 0: OFF 1: ON					

2177h: Robust Control Gain					
Index	2177h				
Name	Robust Control Gain				
Object Structure	VAR	Data Type	Uint16	Data Range	100~800
Mapping	NO	W/R	RW	Default	400
Set the gain tuning value of the robust mode, the larger the value is, the faster the system response is, but the system overshoot and excessive noise may occur.					

2178h: Robust Control Load Factor					
Index	2178h				
Name	Robust Control Load Factor				
Object Structure	VAR	Data Type	Uint16	Data Range	0~500
Mapping	NO	W/R	RW	Default	0
Set the load factor of robust control, the larger it is, the faster the response of the system will be. However, when the system noise is too loud and the inertia is large, increase this value appropriately will can address overshoot and overtravel.					

2185h: Vibration Detection Mode					
Index	2185h				
Name	Vibration Detection Mode				
Object Structure	VAR	Data Type	Uint16	Data Range	0~2
Mapping	NO	W/R	RW	Default	0
Set to detect the vibration of the machine under normal operating conditions and then automatically report alarm or error when it's beyond this setting. Set the detection mode: 0: OFF 1: ON and report alarm 2: ON and report error					

2186h: Vibration Detection Sensitivity	
Index	2186h
Name	Vibration Detection Sensitivity

Object Structure	VAR	Data Type	Uint16	Data Range	50~500
Mapping	NO	W/R	RW	Default	100
Set the vibration detection sensitivity, the smaller the setting, the easier it is to detect vibration, but it may lead to misdetection during normal operation. Note: The detection sensitivity of vibration alarms and errors may differ depending on the status of the machinery used.					

2187h: Vibration Alarm/Error Level					
Index	2187h				
Name	Vibration Alarm/Error Level				
Object Structure	VAR	Data Type	Uint16	Data Range	0~5000
Mapping	NO	W/R	RW	Default	50
Set the vibration detection threshold, the smaller the setting, the easier it is to detect vibration, but it may lead to misdetection during normal operation. Note: The detection sensitivity of vibration alarms and errors may differ depending on the status of the machinery used.					

2192h: Overshoot Detection Sensitivity (Relative Position Coincidence)					
Index	2192h				
Name	Overshoot Detection Sensitivity (Relative Position Coincidence)				
Object Structure	VAR	Data Type	Uint16	Data Range	0~100
Mapping	NO	W/R	RW	Default	100

2193h: Max. Searching Gain					
Index	2193h				
Name	Max. Searching Gain				
Object Structure	VAR	Data Type	Uint16	Data Range	10~4000
Mapping	NO	W/R	RW	Default	3000

2203h: Reference Pulse Multiplier					
Index	2203h				
Name	Reference Pulse Multiplier				
Object Structure	VAR	Data Type	Uint16	Data Range	1~100
Mapping	NO	W/R	RW	Default	1
Set the pulse input multiplier, which is used in conjunction with the reference pulse multiplier switching signal ON/OFF, to switch the multiplier to 1 time or and the setting here. Note: If the input pulse frequency is too low and this setting is too large, the speed may not be smooth.					

2204h: Gear Ratio Numerator					
Index	2204h				
Name	Gear Ratio Numerator				
Object Structure	VAR	Data Type	Uint32	Data Range	0~1073741824
Mapping	NO	W/R	RW	Default	1
Repower to take effect.					

2206h: Gear Ratio Denominator					
Index	2206h				
Name	Gear Ratio Denominator				
Object Structure	VAR	Data Type	Uint32	Data Range	1~1073741824
Mapping	NO	W/R	RW	Default	1
Repower to take effect.					

2211h: Position Reference Filter Time Constant					
Index	2211h				
Name	Position Reference Filter Time Constant				
Object Structure	VAR	Data Type	Uint16	Data Range	0~6550
Mapping	NO	W/R	RW	Default	0
Set the first-order low-pass filter time constant corresponding to the position reference to reduce the mechanical shocks in case of sudden changes to the pulse reference frequency.					

2212h: Position Reference Moving Average Filter Time					
Index	2212h				
Name	Position Reference Moving Average Filter Time				
Object Structure	VAR	Data Type	Uint16	Data Range	0~10000
Mapping	NO	W/R	RW	Default	0
Set the moving average time constant for the position reference to reduce the mechanical shocks in case of sudden changes to the pulse command frequency.					

2230h: Anti-LF Vibration					
Index	2230h				
Name	Anti-LF Vibration				
Object Structure	VAR	Data Type	Uint16	Data Range	0~2
Mapping	NO	W/R	RW	Default	0

Use this parameter with Pn231 for auto adjustment when conditions are met. 0: OFF 1: ON for a specific frequency 2: ON for two specific frequencies

2231h: Auto Anti-LF Vibration					
Index	2231h				
Name	Auto Anti-LF Vibration				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	1
Set to select whether the low-frequency vibration suppression is automatically set under utility functions such as intelligent setting and bandwidth setting: 0: OFF 1: ON					

2132h: LF Vibration Detection Sensitivity					
Index	2232h				
Name	LF Vibration Detection Sensitivity				
Object Structure	VAR	Data Type	Uint16	Data Range	1~3000
Mapping	NO	W/R	RW	Default	400
Set the sensitivity of low-frequency vibration detection when positioning is complete. The smaller this setting, the easier it is to automatically detect vibration frequencies.					

2235h: Anti-LF Vibration Frequency 1					
Index	2235h				
Name	Anti-LF Vibration Frequency 1				
Object Structure	VAR	Data Type	Uint16	Data Range	10~2000
Mapping	NO	W/R	RW	Default	2000
Set the frequency threshold 1 of the anti-low frequency vibration.					

2236h: Anti-LF Vibration Correction 1					
Index	2236h				
Name	Anti-LF Vibration Correction 1				
Object Structure	VAR	Data Type	Uint16	Data Range	10~1000
Mapping	NO	W/R	RW	Default	100
Set the correction factor 1 for low-frequency vibration suppression, the smaller the setting, the better the suppression, but if it is too low, it may lead to longer positioning time.					

2237h: Anti-LF Vibration Frequency 2					
Index	2237h				
Name	Anti-LF Vibration Frequency 2				
Object Structure	VAR	Data Type	Uint16	Data Range	10~2000
Mapping	NO	W/R	RW	Default	2000
Set the frequency threshold 2 of the anti-low frequency vibration.					

2238h: Anti-LF Vibration Correction 2					
Index	2238h				
Name	Anti-LF Vibration Correction 2				
Object Structure	VAR	Data Type	Uint16	Data Range	10~1000
Mapping	NO	W/R	RW	Default	100
Set the correction factor of vibration suppression level 2, the smaller the setting, the better the suppression, but if it is too low, it may lead to longer positioning time.					

2240h: Model Reference Adaptive Control (MRAC)					
Index	2240h				
Name	Model Reference Adaptive Control (MRAC)				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
Set the model reference adaptive control function on or off for positioning. 0: OFF 1: ON					

2241h: MRAC Gain					
Index	2241h				
Name	MRAC Gain 1				
Object Structure	VAR	Data Type	Uint16	Data Range	10~20000
Mapping	NO	W/R	RW	Default	500
Set to determine the response time of the servo system, higher setting means faster response and shorter positioning time. When this function is valid, it determines the servo system position response and deviation instead of the position gain.					

2242h: MRAC Damping Ratio 1					
Index	2242h				
Name	MRAC Damping Ratio 1				
Object Structure	VAR	Data Type	Uint16	Data Range	500~2000

Mapping	NO	W/R	RW	Default	1000
If this setting is small, overshoot may be worse during positioning and position vibration may occur. When it's larger, overshoot will be better and position re-bounce may occur, leading to longer positioning time. Please set it to 100.					

2243h: MRAC Velocity Feedforward Gain 1					
Index	2243h				
Name	MRAC Velocity Feedforward Gain 1				
Object Structure	VAR	Data Type	Uint16	Data Range	0~10000
Mapping	NO	W/R	RW	Default	1000
Lower setting leads to slower responsiveness, but less positional overshoot, but if it is too low, it leads to positional deviations and longer positioning time.					

2244h: MRAC Positive Torque Feedforward Gain 1					
Index	2244h				
Name	MRAC Positive Torque Feedforward Gain 1				
Object Structure	VAR	Data Type	Uint16	Data Range	0~10000
Mapping	NO	W/R	RW	Default	1000
Set to adjust the forward response alone. Higher setting leads to faster torque feedforward rise and shorter positioning time.					

2245h: MRAC Negative Torque Feedforward Gain 1					
Index	2245h				
Name	MRAC Negative Torque Feedforward Gain 1				
Object Structure	VAR	Data Type	Uint16	Data Range	0~10000
Mapping	NO	W/R	RW	Default	1000
Set to adjust the reserve response alone. Higher setting leads to faster the torque feedforward increase and shorter positioning time.					

2246h: MRAC Gain 2					
Index	2246h				
Name	MRAC Gain 2				
Object Structure	VAR	Data Type	Uint16	Data Range	10~20000
Mapping	NO	W/R	RW	Default	100
Set the second gain when MRAC is valid.					

2247h: MRAC Damping Ratio 2					
Index	2247h				
Name	MRAC Damping Ratio 2				
Object Structure	VAR	Data Type	Uint16	Data Range	500~2000
Mapping	NO	W/R	RW	Default	1000
Set the second gain when MRAC is valid.					

2248h: MRAC Type (Resolution-based)					
Index	2248h				
Name	MRAC Type (Resolution-based)				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	1

2249h: Velocity/Torque Feed-forward					
Index	2249h				
Name	Velocity/Torque Feed-forward				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
0: MRAC, external speed and torque feed-forward not ON at the same time 1: MRAC, external speed and torque feed-forward ON at the same time When MRAC is used, set the optimum feedforward internally. It is usually not recommended to use both the "V-REF" and the "T-REF" from the upper device. But users can still use them at the same time if necessary. In this case, overshooting and system instability may be caused if the feedforward input is not correct.					

2250h: External Encoder Usage					
Index	2250h				
Name	External Encoder Usage				
Object Structure	VAR	Data Type	Uint16	Data Range	0~3
Mapping	NO	W/R	RW	Default	0
0: CLC OFF 1: ON for positive operation 2: ON for negative operation Set the scale direction when the motor is running forward. If it is wrong, it may lead to the stall or excessive deviation between motor and load. Before running, please move the load manually, and change this parameter. Make sure the monitoring parameter Un007 (Feedback Pulse Counter) and Un012 (External Encoder Feedback Pulse Counter) change in the same direction and then run the motor.					

2252h: Multiplier per Fully-closed Rotation					
Index	2252h				
Name	Multiplier per Fully-closed Rotation				
Object Structure	VAR	Data Type	Uint16	Data Range	0~100
Mapping	NO	W/R	RW	Default	20
Set the coefficient at which the deviation between the motor-load for 1 turn of the motor operation, e.g. if this parameter is set to 0%, the deviation after motor running for 1 turn is 1000, and the deviation at the start of the 2nd turn is accumulated on the basis of 1000. And set it to 20%, and the deviation at the start of the 2nd turn is accumulated on the basis of 200 (1000×(1-20%)=200. If this setting is too high, Er.d10 may not be detected properly, so please set it according to the permissible error between load and motors.					

2253h: External Encoder Resolution					
Index	2253h				
Name	External Encoder Resolution				
Object Structure	VAR	Data Type	Uint32	Data Range	4~1048576
Mapping	NO	W/R	RW	Default	32768
Set the external encoder resolution for 1 revolution of motor operation (after 4 × frequency).					

2257h: Hybrid Deviation Overflow Error Level					
Index	2257h				
Name	Hybrid Deviation Overflow Error Level				
Object Structure	VAR	Data Type	Uint32	Data Range	0~1073741824
Mapping	NO	W/R	RW	Default	1000
Set the error threshold for motor-load deviation. Low setting may result in false detection of Er.d10.					

2260h: /NEAR Signal Width					
Index	2260h				
Name	/NEAR Signal Width				
Object Structure	VAR	Data Type	Uint32	Data Range	1~1073741824
Mapping	NO	W/R	RW	Default	1073741824
Under position control, the host device will receive the positioning near signal before the completion signal to prepare for the sequence of actions afterwards, so as to shorten the time required for the whole positioning completion process. Send this signal when the difference between the number of reference pulses from the host device and the amount of servomotor movement (position deviation) is lower than this setting.					

2262h: /COIN Signal Width					
Index	2262h				
Name	/COIN Signal Width				
Object Structure	VAR	Data Type	Uint32	Data Range	0~1073741824
Mapping	NO	W/R	RW	Default	7
Under position control, a signal indicating completion of servo motor positioning is sent when the difference between the number of reference pulses from the upper unit and the amount of servo motor movement (position deviation) is lower than the setting here, so that the upper unit can confirm that positioning has been completed.					

2264h: Position Deviation Overflow Level					
Index	2264h				
Name	Position Deviation Overflow Level				
Object Structure	VAR	Data Type	Uint32	Data Range	1~1073741823
Mapping	NO	W/R	RW	Default	25165824
Set the appropriate threshold for position deviation to detect the abnormality and stop the motor in the event that the motor movement does not match the reference.					

2266h: Position Deviation Overflow Alarm Level					
Index	2266h				
Name	Position Deviation Overflow Alarm Level				
Object Structure	VAR	Data Type	Uint16	Data Range	10~100
Mapping	NO	W/R	RW	Default	100
Set the alarm threshold for position deviation overflow, and report an alarm when the current position deviation value is larger than the multiplication of the “Max Position Deviation Overflow Level” and this setting.					

2267h: Servo ON Position Deviation Overflow Error Level					
Index	2267h				
Name	Servo ON Position Deviation Overflow Error Level				
Object Structure	VAR	Data Type	Uint32	Data Range	1~1073741823
Mapping	NO	W/R	RW	Default	25165824
Set the error threshold for position deviation overflow at servo ON, and the drive will send an error prompt when the current position deviation value is higher than this setting.					

2269h: Servo ON Position Deviation Overflow Error Level	
Index	2269h

Name	Servo ON Position Deviation Overflow Error Level				
Object Structure	VAR	Data Type	Uint16	Data Range	10~100
Mapping	NO	W/R	RW	Default	100
Set the alarm threshold for position deviation overflow when servo drive is enabled. If the position deviation then is larger than the product of the “Servo ON Position Deviation Overflow Error Level” and this parameter, an alarm for position deviation overflow will be generated.					

2270h: Servo ON Position Deviation Overflow Error Level					
Index	2270h				
Name	Servo ON Position Deviation Overflow Error Level				
Object Structure	VAR	Data Type	Uint16	Data Range	0~10000
Mapping	NO	W/R	RW	Default	10000
Set the speed limit when the position deviation accumulates after the servo drive is enabled. At this time, if there is a reference pulse input, alarm is displayed when the set value of Pn264[Max. Position Deviation Overflow Level] is exceeded, and the alarm “Position deviation overflow due to speed limit when servo enabled” is enabled.					

2274h: /COIN Output Time					
Index	2274h				
Name	/COIN Output Time				
Object Structure	VAR	Data Type	Uint16	Data Range	0~2
Mapping	NO	W/R	RW	Default	0
Set the output sequence of Position completion signal (/COIN): 0: When the absolute value of the position deviation is lower than Pn262 [/COIN Signal Width] 1: When the absolute value of the position deviation is lower than Pn262 [Position Completion Range] and the filtered position reference is 0 2: When the absolute value of the position deviation is lower than Pn262 [Position Completion Range] and the position reference is 0					

2310h: Trapezoidal ACC Time					
Index	2310h				
Name	Trapezoidal ACC Time				
Object Structure	VAR	Data Type	Uint16	Data Range	0~10000
Mapping	NO	W/R	RW	Default	0
Set the time required to accelerate from 0r/min to the maximum speed(corresponding to the motor type). When the given speed is greater or lower than the maximum speed, the actual ACC time is calculated in proportion.					

2311h: Trapezoidal DEC Time					
Index	2311h				
Name	Trapezoidal DEC Time				
Object Structure	VAR	Data Type	Uint16	Data Range	0~10000
Mapping	NO	W/R	RW	Default	0
Set the time required to decelerate from the maximum speed(corresponding to the motor type) to 0r/min. When the given speed is greater or lower than the maximum speed, calculate the actual DEC time in proportion.					

2312h: Zero Clamp Mode					
Index	2312h				
Name	Zero Clamp Mode				
Object Structure	VAR	Data Type	Uint16	Data Range	0~3
Mapping	NO	W/R	RW	Default	3
Set the operating mode when the zero-clamping signal (/ZCLAMP) is ON under speed mode: 0: OFF 1: Speed reference is 0, no clamping after stopping 2: Speed reference is 0, clamping after shutdown 3: When the speed reference is lower than the 2313h[Zero Clamping Velocity Level], the speed reference is set to 0 and the clamping is applied after stopping					

2313h: Zero Clamping Velocity Level					
Index	2313h				
Name	Zero Clamp Velocity Level				
Object Structure	VAR	Data Type	Uint16	Data Range	0~10000
Mapping	NO	W/R	RW	Default	10
Set the switching threshold when "Zero Clamping Mode" is set to 3.					

2317h: Motor Rotation Level					
Index	2317h				
Name	Motor Rotation Level				
Object Structure	VAR	Data Type	Uint16	Data Range	1~10000
Mapping	NO	W/R	RW	Default	20
If the motor speed exceeds the set value here, the switching rotation detection signal (/TGON) is output.					

2320h: Velocity Completion Range	
Index	2320h
Name	Velocity Completion Range

Object Structure	VAR	Data Type	Uint16	Data Range	0~100
Mapping	NO	W/R	RW	Default	10
When the difference between the motor speed and the speed reference is below the set value, output the switching speed coincidence signal(/V-CMP).					

2401h: Torque Reference Filter Cutoff Frequency					
Index	2401h				
Name	Torque Reference Filter Cutoff Frequency				
Object Structure	VAR	Data Type	Uint16	Data Range	100~5000
Mapping	NO	W/R	RW	Default	5000
Set the cutoff frequency of the second-order low-pass filter for torque references. When this parameter is set to 5000, the function of the filter is invalid.					

2402h: Torque Reference Filter Q Factor					
Index	2402h				
Name	Torque Reference Filter Q Factor				
Object Structure	VAR	Data Type	Uint16	Data Range	50~100
Mapping	NO	W/R	RW	Default	50
Set the Q value of the second-order low-pass filter for torque references. A larger Q value can improve the system response, but it may increase noise.					

2411h: Velocity Limit Source under Torque Control					
Index	2411h				
Name	Velocity Limit Source under Torque Control				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	1
0: The smaller value between V-REF and Pn413[Velocity Limit under Torque Control] 1: Pn413 [Speed Limit under Torque Control] setting;					

2412h: General Velocity Limit					
Index	2412h				
Name	General Velocity Limit				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
0: Maximum motor speed (up to motor model) + Pn411 [Velocity Limit Method under Torque Control] 1: Overspeed alarm level (up to motor model) and Pn411 [Velocity Limit Method under Torque Control]					

2413h: Velocity Limit under Torque Control					
Index	2413h				
Name	Velocity Limit under Torque Control				
Object Structure	VAR	Data Type	Uint16	Data Range	0~10000
Mapping	NO	W/R	RW	Default	1000
Set the speed limit under torque control together with Pn411 [Velocity Limit Method under Torque Control].					

2600h: Switching Input Signal Assignment Mode					
Index	2600h				
Name	Switching Input Signal Assignment Mode				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	1
Set the switching input signal assignment method: 0: Fixed internally according to the pin and function fixed internally by the servo drive, see “CN1 terminal” input description for details 1: Parameter setting according to the function configured on each pin of Pn601~Pn609.					

2601h: CN1-40 Input Configuration 2602h: CN1-42 Input Configuration 2603h: CN1-43 Input Configuration 2604h: CN1-41 Input Configuration 2605h: CN1-44 Input Configuration 2606h: CN1-45 Input Configuration 2607h: CN1-46 Input Configuration					
Index	2601h, 2602h, 2603h, 2604h, 2605h, 2606h and 2607h				
Name	Input Configuration				
Object Structure	VAR	Data Type	Uint16	Data Range	0~276
Mapping	NO	W/R	RW	Default	1, 258, 259, 5, 4, 6, 7

0x00: OFF	0x101: Servo enable invert
0x01: Servo enable	0x102: POS position limit release
0x02: POS position limit	0x103: NEG position limit release
0x03: NEG position limit 0x04: Error reset	0x104: Error reset invert
0x05: Manual PI-P shift	0x105: Manual PI-P shift invert
0x06: Torque limit shift	0x106: Torque limit shift invert
0x07: Reserved	0x107: Reserved
0x08: Internal velocity reference direction	0x108: Internal velocity reference direction invert
0x09: Internal speed reference A	0x109: Internal speed reference A invert
0x0A: Internal speed reference B	0x10A: Internal speed reference B invert
0x0B: Control mode switch	0x10B: Control mode switch invert
0x0C: Zero clamp	0x10C: Zero clamp invert
0x0D: Reference pulse inhibit	0x10D: Reference pulse inhibit invert
0x0E: Gain shift	0x10E: Gain shift invert
0x0F: Torque reference direction	0x10F: Torque reference direction invert
0x10: Reference pulse multiplier shift	0x10F: Reference pulse multiplier shift invert

2610h: Switching Input Internal Configuration 1 2611h: Switching Input Internal Configuration 2 2612h: Switching Input Internal Configuration 3					
Index	2610h, 2611h, 2612h				
Name	Switching Input Internal Configuration				
Object Structure	VAR	Data Type	Uint16	Data Range	0~20
Mapping	NO	W/R	RW	Default	0
0x00: OFF 0x01: Servo ON 0x03: NEG position limit release 0x05: Manual PI-P shift 0x08: Internal velocity reference direction 0x0A: Internal velocity reference B 0x0D: Pulse input inhibit 0x0F: Torque reference direction	0x02: POS position limit release 0x04: Error reset 0x06: Torque limit shift 0x09: Internal speed reference A 0x0B: Control mode switch 0x0C: Zero clamp 0x0E: Gain shift 0x10: Reference pulse multiplier shift				

2613h: CN1-25/26 Output Configuration 2614h: CN1-27/28 Output Configuration 2615h: CN1-29/30 Output Configuration					
Index	2613h, 2614h, 2615h				
Name	Output Configuration				
Object Structure	VAR	Data Type	Uint16	Data Range	0~265
Mapping	NO	W/R	RW	Default	0, 1, 2

0x00: /S-RDY	0x100: /S-RDY_N
0x01: /COIN	0x101: /COIN_N
0x02: /V-CMP	0x102: V-CMP_N
0x03: /TGON	0x103: /TGON_N
0x04: /CLT	0x104: /CLT_N
0x05: /VLT	0x105: /VLT_N
0x06: /BK	0x106: /BK_N
0x07: /ERR	0x107: /ERR_N
0x08: /NEAR	0x108: /NEAR_N
0x09: /PSELA	0x109: /PSELA_N

2622h: Error Detection Mode					
Index	2622h				
Name	Error Detection Mode				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
Set the error detection on or off. 0: OFF 1: ON					

2792h: Absolute Encoder Usage					
Index	2792h				
Name	Absolute Encoder Usage				
Object Structure	VAR	Data Type	Uint16	Data Range	0~2
Mapping	NO	W/R	RW	Default	0
0: OFF 1: Write the motor parameters to EEPROM 2: Clear multi-turn turns: If the battery is replaced/plugged out during the first use or drive power-down, Er.810 [Encoder Backup Error] will be reported after power is resumed. Set this to 2 and power on again to clear the error.					

2900h: Power-down Save					
Index	2900h				
Name	Power-down Save				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
0: OFF for master modified parameters 1: ON for master modified parameters					

2901h: Position Feedback Overflow Protection	
Index	2901h

Name	Position Feedback Overflow Protection				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
0: OFF 1: ON					

2902h: Position Feedback Reset					
Index	2902h				
Name	Position Feedback Reset				
Object Structure	VAR	Data Type	Uint16	Data Range	0~1
Mapping	NO	W/R	RW	Default	0
Clear 6064h[Position Feedback] to 0 by rising edge.					

2903h: Linear Axis Ratio					
Index	2903h				
Name	Linear Axis Ratio				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	0
For unidirectional operation, set the axis ratio (such as 5:1 for a reduction gearbox) and use it together with 2901h.					

2920h: Lower 16-bit Value Save					
Index	2920h				
Name	Lower 16-bit Value Save				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RW	Default	0
When 6064h is 0, save the values of lower 16 bits.					

2921h: Higher 16-bit Value Save					
Index	2921h				
Name	Higher 16-bit Value Save				
Object Structure	VAR	Data Type	Uint16	Data Range	0~256
Mapping	NO	W/R	RW	Default	1
When 6064h is 0, save the values of higher 16 bits.					

2923h: Multi-turn Overflow Number					
Index	2923h				
Name	Multi-turn Overflow Number				
Object Structure	VAR	Data Type	Uint16	Data Range	0~256
Mapping	NO	W/R	RW	Default	1
Record the number of multiturn overflows and monitor the variables.					

10.5.3 6000h Object Description

603Fh: Error Code					
Index	603Fh				
Name	Error Code				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	NO	W/R	RO	Default	-
It indicates the most recent error that occurred in the drive. See the list of fault codes for details.					

6040h: Control Word					
Index	6040h				
Name	Control Word				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	RPDO	W/R	RW	Default	0
It indicates the control word definition:					

Bit	Definition	Description
0	Switch On	0: OFF 1: ON
1	Enable Voltage	0: OFF 1: ON
2	Quick Stop	0: OFF 1: ON
3	Enable operation	0: OFF 1: ON
4~6	Mode-related	-
7	Fault reset	bit7 rising edge valid bit7 held to 1, and other control references invalid
8	Pause	-
9~10	NA	Reserved
11~15	Manufacturer-defined	Manufacturer-defined

6041h: Status Word	
Index	6041h
Name	Status Word

Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	RPDO	W/R	RW	Default	0
It indicates the state of the servo drive.					

Bit	Name	Definition
0	Drive status	0: Normal 1: Error
1	Servo enable	0: Not enabled 1: Enabled
2	Operation enable	0: Normal 1: Error
3	Error	0: No error 1: Error
4	Enable voltage	0: Not enabled 1: Enabled
5	Quick stop status	0: OFF 1: ON
6	Operation status	1: OFF 0: ON
7	Alarm status	0: No alarms 1: Alarm
8	Manufacturer-defined	Reserved
9	Remote control status	0: OFF 1: ON, control word valid
10	Target status	0: Not reached 1: Reached
11	Software limit (internal limit)	0: Feedback below limit 1: Feedback above limit
12~13	Operation mode	Servo drive operation modes-related
14~15	Manufacturer-defined	Reserved

605Ah: Quick Stop Mode					
Index	605Ah				
Name	Quick Stop Mode				
Object Structure	VAR	Data Type	Int16	Data Range	0~7
Mapping	NO	W/R	RW	Default	1
Set this parameter under profile position mode:					

Setting	Stop Mode
0	Coast to stop and motor shaft not locked
1	Stop by 6084h [Profile DEC] and motor shaft not locked
2	Stop by 6085h slope setting and motor shaft not locked
3	Stop by 6072h torque setting and motor shaft not locked
4	NA
5	Stop by 6084[Profile DEC] setting and motor shaft locked
6	Stop by 6085 slope setting and motor shaft locked

7	Stop by 6072h torque setting and motor shaft locked
For CSP:	
Setting	Stop Mode
0	Coasting stop and motor shaft not locked
1, 2, 3	Stop by 6072h torque setting and motor shaft not locked
4	NA
5, 6, 7	Stop by 6072h torque setting and motor shaft locked
For CSV/PV/HM:	

CT/PT	Setting	Stop Mode
	0	Coasting stop and motor shaft not locked
	1	Stop by 6084h[Profile DEC](HM:609Ah) slope setting and motor shaft not locked
	2	Stop by 6085h slope setting and motor shaft not locked
	3	Stop by 6072h torque setting and motor shaft not locked
	4	NA
	5	Stop by 6084h[Profile DEC](HM:609Ah[Home ACC]) slope setting and motor shaft locked
	6	Stop by 6085h slope setting and motor shaft locked
	7	Stop by 6072h torque setting and motor shaft locked
	Setting	Stop Mode
	0	Coasting stop and motor shaft not locked
	1	Stop by 6087h[Torque Slope] setting and motor shaft not locked
	2	
	3	Coasting stop and motor shaft not locked
	4	NA
	5	Stop by 6087h[Torque Slope] setting and motor shaft locked
	6	
	7	Coasting stop and motor shaft locked

605Dh: DEC Stop Mode					
Index	605Dh				
Name	DEC Stop Mode				
Object Structure	VAR	Data Type	Int8	Data Range	1~3
Mapping	NO	W/R	RW	Default	1
Set this parameter under profile position mode:					
Setting	Stop Mode				

1	Stop by 6084 [Profile DEC] setting and motor shaft locked
2	Stop by 6085h slope setting and motor shaft locked
3	Stop by 6072h torque setting and motor shaft not locked
For CSP:	
Setting	Stop Mode
1	Stop by 6072h torque setting and motor shaft locked
2	
3	
For PV/ CSV/HM	
Setting	Stop Mode
1	Stop by 6084h[Profile DEC](HM:609Ah[Home ACC]) slope setting and motor shaft locked
2	Stop by 6085h slope setting and motor shaft locked
3	Stop by 6072h torque setting and motor shaft locked
For PT/CST:	
Setting	Stop Mode
1	Stop by 6087h[Torque Slope] setting and motor shaft locked
2	
3	Stop by 6072h torque setting and motor shaft locked

6060h: Control Mode					
Index	6060h				
Name	Control Mode				
Object Structure	VAR	Data Type	Int8	Data Range	0~10
Mapping	RPDO	W/R	RW	Default	8
Select the servo drive control mode:					

Setting	Description
0	NA
1	Profile position mode(PP)
2	NA
3	Profile velocity mode(PV)
4	Profile torque mode (PT)
5	NA
6	Home mode (HM)
7	NA
8	Cyclic synchronous position mode (CSP)

9	Cyclic synchronous velocity mode (CSV)
10	Cyclic synchronous torque mode (CST)

6061h: Control Mode Display					
Index	6061h				
Name	Control Mode Display				
Object Structure	VAR	Data Type	Int8	Data Range	0~10
Mapping	TPDO	W/R	RO	Default	0
Select the servo drive control mode:					
Setting	Description				
0	NA				
1	Profile position mode(PP)				
2	NA				
3	Profile velocity mode(PV)				
4	Profile torque mode (PT)				
5	NA				
6	Home mode (HM)				
7	NA				
8	Cyclic synchronous position mode (CSP)				
9	Cyclic synchronous velocity mode (CSV)				
10	Cyclic synchronous torque mode (CST)				

6062h: Position Reference					
Index	6062h				
Name	Position Reference				
Object Structure	VAR	Data Type	Int32	Data Range	-2^{31}~(2^{31}-1)
Mapping	TPDO	W/R	RO	Default	-
It indicates the required reference value by reference unit.					

6063h: Position Feedback					
Index	6063h				
Name	Position Feedback				
Object Structure	VAR	Data Type	Int32	Data Range	-2^{31}~(2^{31}-1)
Mapping	TPDO	W/R	RO	Default	-
It indicates the actual position feedback value in encoder unit.					

6064h: Position Feedback					
Index	6064h				
Name	Position Feedback				
Object Structure	VAR	Data Type	Int32	Data Range	-2^{31}~(2^{31}-1)
Mapping	TPDO	W/R	RO	Default	-
It indicates the actual position feedback value in reference unit.					

6065h: Position Deviation Overflow Level					
Index	6065h				
Name	Position Deviation Overflow Level				
Object Structure	VAR	Data Type	Int32	Data Range	-2^{31}~(2^{31}-1)
Mapping	TPDO	W/R	RW	Default	-
Set the position deviation overflow level in reference unit. The servo drive will report error when it exceeds ±6065h, synchronous with Pn264 setting.					

6067h: Position Coincidence Level					
Index	6067h				
Name	Position Coincidence Level				
Object Structure	VAR	Data Type	Uint32	Data Range	0~(2^{32}-1)
Mapping	RPDO	W/R	RW	Default	100
Set the position window threshold in reference unit. If the position deviation is within ±6067h and the time reaches 6068h, the position is considered to have been reached, and status word 6041h bit10 is turned to 1 under PP mode. It will sync with Pn262 setting.					

6068h: Position Coincidence Time					
Index	6068h				
Name	Position Coincidence Time				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	RPDO	W/R	RW	Default	0
Set the time window to judge if the position target is reached.(Unit: 2ms)					

606Bh: Velocity Reference	
Index	606Bh
Name	Velocity Reference

Object Structure	VAR	Data Type	Int32	Data Range	-2^{31}~(2^{31}-1)
Mapping	TPDO	W/R	RO	Default	0
It indicates the actual position reference value in 1rpm. It indicates the speed reference that corresponds to the output of the position controller in the position mode, or the input reference of the input of the speed controller in the speed mode.					

606Ch: Velocity Feedback					
Index	606Ch				
Name	Velocity Feedback				
Object Structure	VAR	Data Type	Int32	Data Range	-2^{31}~(2^{31}-1)
Mapping	TPDO	W/R	RO	Default	0
It indicates the actual position feedback value in reference unit.					

606Dh: Velocity Completion Level					
Index	606Dh				
Name	Velocity Completion Level				
Object Structure	VAR	Data Type	Uint16	Data Range	0~3000
Mapping	RPDO	W/R	RW	Default	100
Set the speed arrival threshold by 1rpm. If the difference between 60FFh[Target Velocity] and 606Ch[Velocity Feedback] is within ±606Dh and the time reaches 606Eh, the target speed is considered to have been reached, and bit10 of status word 6041h is set to 1 in profile speed mode. Otherwise, status word 6041h bit10 is 0.					

606Eh: Velocity Completion Time					
Index	606Eh				
Name	Velocity Completion Time				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	RPDO	W/R	RW	Default	0
Set the time level to judge if the position target is reached by unit ms. If the difference between 60FFh[Target Velocity] and 606Ch[Velocity Actual Value] is within ±606Dh and the time reaches 606Eh, the target speed is considered to have been reached, and bit10 of status word 6041h is set to 1 in profile speed mode. Otherwise, status word 6041h bit10 is 0.					

606Fh: Zero Velocity Level					
Index	606Fh				
Name	Zero Velocity Level				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535

Mapping	RPDO	W/R	RW	Default	10
Set the speed threshold to tell if the speed is 0 by unit 1rpm. Invalid					

6070h: Zero Velocity Time					
Index	6070h				
Name	Zero Velocity Time				
Object Structure	VAR	Data Type	Uint16	Data Range	0~65535
Mapping	RPDO	W/R	RW	Default	0
Set the speed time to tell if the speed is 0 by unit 2ms.					

6071h: Target Torque					
Index	6071h				
Name	Target Torque				
Object Structure	VAR	Data Type	Int16	Data Range	-3000~3000
Mapping	RPDO	W/R	RW	Default	0
Set the torque target value here by 0.1%, valid only under profile torque mode (PT).					

6074h: Torque Demand Value					
Index	6074h				
Name	Torque Reference				
Object Structure	VAR	Data Type	Int16	Data Range	-
Mapping	TPDO	W/R	RO	Default	-
It indicates the current torque reference value by unit 0.1%.					

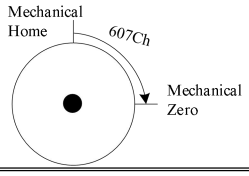
6075h: Motor Rated Current					
Index	6075h				
Name	Motor Rated Current				
Object Structure	VAR	Data Type	Uint32	Data Range	-
Mapping	TPDO	W/R	RO	Default	-
It indicates the motor rated current on the nameplate in unit mA. All current-related parameter values are tied to this parameter.					

6076h: Motor Rated Torque	
Index	6076h
Name	Motor Rated Torque

Object Structure	VAR	Data Type	Uint32	Data Range	0~(2^{32}-1)
Mapping	TPDO	W/R	RO	Default	-
It indicates the motor rated torque on the nameplate in unit mNm. All torque-related parameter values are tied to this parameter.					

6077h: Torque Feedback					
Index	6077h				
Name	Torque Feedback				
Object Structure	VAR	Data Type	Int16	Data Range	-
Mapping	TPDO	W/R	RO	Default	-
It indicates the instantaneous torque output value of the servo motor by unit 1%. 1%）。					

607Ah: Target Position					
Index	607Ah				
Name	Target Position				
Object Structure	VAR	Data Type	Int32	Data Range	-2^{31}~(2^{31}-1)
Mapping	TPDO	W/R	RO	Default	-
Set the servo target position in reference unit under the profile position mode and cyclic synchronous position mode.					

607Ch: Home Offset					
Index	607Ch				
Name	Home Offset				
Object Structure	VAR	Data Type	Int32	Data Range	-2^{31}~(2^{31}-1)
Mapping	RPDO	W/R	RW	Default	0
Set the physical position by which the mechanical zero point deviates from the motor home position in encoder unit under the position mode. Mechanical home=Mechanical Zero+ 607Ch (Home offset). When it is set to 0, then home point has no offset at all. 					

607Dh: Software Position Limit					
Index	607Dh				
Name	Software Position Limit				
Object Structure	VAR	Data Type	Int32	Data Range	-

Mapping	RPDO	W/R	RW	Default	-
Set the minimum and maximum value of the absolute position limit in the software. The min. position limit is set on 607D-1h, while the max. torque limit is set on 607D-2h. 1. It is OFF when 607D-1h and 607D-2h are default settings. 2. It reports AL.931 when 607D-1h is higher than 607D-2h. 3. When the position reference or position feedback reaches the software limit value, the servo drive will run in the position mode with the position limit as the target position, and stop at the position limit, and then report AL.950 due to over travel. And the motor will exit the overtravel state at opposite operation reference.					

Sub-index	00h				
Name	Entry Number				
Object Structure	-	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	2

Sub-index	01h				
Name	Min. Position Limit				
Object Structure	-	Data Type	Uint8	Data Range	-2^{31}~(2^{31}-1)
Mapping	RPDO	W/R	RW	Default	-2^{31}

Sub-index	02h				
Name	Max. Position Limit				
Object Structure	-	Data Type	Uint8	Data Range	-2^{31}~(2^{3}1-1)
Mapping	RPDO	W/R	RW	Default	2^{3}1-1

607Eh: Reference Polarity					
Index	607Eh				
Name	Reference Polarity				
Object Structure	VAR	Data Type	Uint8	Data Range	0~255
Mapping	RPDO	W/R	RW	Default	0

It indicates the polarity of the position, speed or torque reference.

Bit	7	6	5	4~0
Definition	Position reference polarity	Speed reference polarity	Torque reference polarity	Reserved

Bit7=1 means the position reference will be multiplied with -1 to change the motor direction in the standard position mode. Invert the position reference and target position in profile position mode and cyclic synchronous position mode.

Bit6=1 means that speed reference 60FFh+60B1h will be multiplied with -1 to change the motor direction in the speed mode. Bit5=1 means that torque reference 6071h+60B2h will be multiplied with -1 to change the polarity in the torque mode.

607Fh: Max. Profile Velocity					
Index	607Fh				
Name	Max. Profile Velocity				
Object Structure	VAR	Data Type	Uint32	Data Range	0~(2^{32}-1)
Mapping	RPDO	W/R	RW	Default	50000
Set the maximum operation speed (unit set by Pn9A0, if Pn9A0 is 0, the unit is 0.1r/min; if Pn9A0 is 1, the unit is reference unit/s). It is valid under speed and torque mode, but in the torque mode, it's related to Pn411 setting. If it is the position mode, set the max. speed by the motor parameter.					

6080h: Max. Motor Velocity					
Index	6080h				
Name	Max. Motor Velocity				
Object Structure	VAR	Data Type	Uint32	Data Range	0~(2^{32}-1)
Mapping	TPDO	W/R	RO	Default	6000
Set the maximum permissible operating speed of the motor, which can be obtained from the manual of the servomotor by unit rpm.					

6081h: Profile Velocity					
Index	6081h				
Name	Profile Velocity				
Object Structure	VAR	Data Type	Uint32	Data Range	0~(2^{32}-1)
Mapping	RPDO	W/R	RW	Default	10000000

Set the running speed by reference unit/s of the constant stage after completing the ACC in the profile position mode.

$$Motor\ Speed(rpm) = 6081h\ \times \frac{6081h \times \frac{6091:01h}{6091:02h}}{Encoder\ Resolution} \times 60$$

6083h: Profile ACC					
Index	6083h				
Name	Profile ACC				
Object Structure	VAR	Data Type	Uint32	Data Range	0~(2^{32}-1)
Mapping	RPDO	W/R	RW	Default	200
Set the ACC of the motor from 0rpm to the target speed in the profile velocity mode by unit reference/s2. This takes effect after the slave receives the position reference.					

6084h: Profile DEC					
Index	6084h				
Name	Profile DEC				
Object Structure	VAR	Data Type	Uint32	Data Range	0~(2^{32}-1)
Mapping	RPDO	W/R	RW	Default	200
Set the DEC of the motor from the current speed to 0rpm in the profile velocity mode by unit: reference/s2. This takes effect after the slave receives the position reference.					

6086h: Motion Profile Type					
Index	6086h				
Name	Motion Profile Type				
Object Structure	VAR	Data Type	Int16	Data Range	-2^{15}~(2^{15}-1)
Mapping	RPDO	W/R	RW	Default	0
It indicates the profile type of the position, speed or torque reference. 0: Linear type					

6087h: Torque Slope					
Index	6087h				
Name	Torque Slope				
Object Structure	VAR	Data Type	UInt32	Data Range	0~(2^{32}-1)
Mapping	RPDO	W/R	RW	Default	0
It indicates the time (in ms) for the torque rise from 0% to 100% of the rated torque in the profile torque mode.					

6091h: Gear Ratio					
Index	6091h				
Name	Gear Ratio				
Object Structure	VAR	Data Type	UInt32	Data Range	-
Mapping	RPDO	W/R	RW	Default	-
Set to a proportional relationship between load position and motor turns: Motor movement(Motor unit)= Load movement(user unit) × Gear ratio. And the gear ratio is related to mechanical reduction ratio, mechanical dimensions and motor resolution parameters. The calculation method is as follows: Position factor= Motor resolution*Gear ratio/Load feeding					

Subindex	00h				
Name	Entry Number				
Object Structure	VAR	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	2

Sub-index	01h				
Name	Motor Resolution				
Object Structure	VAR	Data Type	Uint32	Data Range	1~(2^{32}-1)
Mapping	RPDO	W/R	RW	Default	1

Sub-index	02h				
Name	Axis Resolution				
Object Structure	VAR	Data Type	Uint32	Data Range	1~(2^{32}-1)
Mapping	RPDO	W/R	RW	Default	1

6098h: Home Mode					
Index	6098h				
Name	Home Mode				
Object Structure	VAR	Data Type	Int8	Data Range	1~35
Mapping	RPDO	W/R	RW	Default	1
Select the home mode here.					
Value	Description				
1	Home mode starts at the negative limit switch and Z pulse signal.				

2	Home mode starts at the positive limit switch and Z pulse signal.
3, 4	Home mode starts at the positive home switch and Z pulse signal.
5, 6	Home mode starts at the negative home switch and Z pulse signal.
7~14	Home mode starts at the home switch and Z pulse signal.
15~16	Reserved
17~30	Home mode starts without Z pulse signal reference.
31~32	Reserved
33~34	Home mode starts without z pulse signal reference.
35	Reset the current position

6099h: Home Velocity					
Index	6099h				
Name	Home Velocity				
Object Structure	ARR	Data Type	-	Data Range	-
Mapping	YES	W/R	RW	Default	-
There are two speed settings under the home mode.					

Subindex	00h				
Name	Entry Number				
Object Structure	VAR	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	2

Sub-index	01h				
Name	Switch Search Speed				
Object Structure	VAR	Data Type	Uint32	Data Range	0~(2^{32}-1)
Mapping	RPDO	W/R	RW	Default	27962026

Sub-index	02h				
Name	Zero Search Speed				
Object Structure	VAR	Data Type	Uint32	Data Range	0~(2^{32}-1)
Mapping	RPDO	W/R	RW	Default	5592405

609Ah: Home ACC	
Index	609Ah

Name	Home ACC				
Object Structure	ARR	Data Type	Uint32	Data Range	0~(2^{32}-1)
Mapping	RPDO	W/R	RW	Default	16000
Set the ACC under the home mode, that is, the increment of positional references per second by reference unit/s2.					

60B0h: Position Offset					
Index	60B0h				
Name	Position Offset				
Object Structure	ARR	Data Type	Int32	Data Range	-2^{31} ~(2^{31}-1)
Mapping	RPDO	W/R	RW	Default	0
It indicates the amount of position reference offset in cyclic synchronous position mode, and the target position from the servo drive is 607Ah + 60B0h.					

60B8h: Probe Function					
Index	60B8h				
Name	Probe function				
Object Structure	VAR	Data Type	Uint16	Data Range	0
Mapping	RPDO	W/R	RW	Default	0

The probe function, that is the position latch function, which can save the position information (reference unit) at the external DI signals or the motor Z signals. This servo drive supports two channels of probe functions, which can save 4 pieces of position information. And Probe 1 can be selected to DI44 or Z-signal and Probe 2 to DI45 or Z-signal.

Probe 1 or Probe 2 description:

Bit	Description	Range
0	Probe 1 enable	0: OFF 1: ON
1	Probe 1 trigger mode	0: Single 1: Continuous
2	Probe 1 trigger signal	0: DI44 input 1: Z signal
3	NA	-
4	Probe 1 rising edge enable	0: OFF 1: ON
5	Probe 1 falling edge enable	0: OFF 1: ON
6~7	NA	-
8	Probe 2 enable	0: OFF 1: ON
9	Probe 2 trigger mode	0: Single 1: Continuous
10	Probe 2 trigger signal	0: DI45 input 1: Z signal
11	NA	-
12	Probe 2 rising edge enable	0: OFF 1: ON

13	Probe 2 falling edge enable	0: OFF 1: ON
14~15	-	-

60B8h: Probe Status					
Index	60B9h				
Name	Probe Status				
Object Structure	VAR	Data Type	Uint16	Data Range	0
Mapping	TPDO	W/R	RO	Default	0
It indicates the Probe 1 and Probe 2 status.					

Bit	Description	Comment
0	0: Probe 1 not enabled 1:Probe 1 enabled	
1	0: Probe 1 rising edge position saved 1:Probe 1 rising edge position not saved	
2	0: Probe 1 falling edge position saved 1:Probe 1 falling edge position not saved	
3~5	NA	
6	0: DI44 input 1: Z signal	
7	0: DI44 be low level 1: DI44 be high level	
8	0: Probe 2 not enabled 1:Probe 2 enabled	
9	0: Probe 2 rising edge position saved 1:Probe 2 rising edge position not saved	
10	0: Probe 2 falling edge position saved 1:Probe 2 falling edge position not saved	
11~13	NA	
14	0: DI45 input 1: Z signal	
15	0: DI45 be low level 1: DI45 be high level	

60BAh: Probe 1 Rising Edge Position					
Index	60BAh				
Name	Probe 1 Rising Edge Position				
Object Structure	VAR	Data Type	Int32	Data Range	-
Mapping	TPDO	W/R	RO	Default	-
It indicates the position feedback at the moment of the rising edge of the Probe 1 by reference unit.					

60BBh: Probe 1 Falling Edge Position					
Index	60BBh				
Name	Probe 1 Falling Edge Position				
Object Structure	VAR	Data Type	Int32	Data Range	-
Mapping	TPDO	W/R	RO	Default	-
It indicates the position feedback at the moment of the falling edge of the Probe 1 by reference unit.					

60BCh: Probe 2 Rising Edge Position					
Index	60BCh				
Name	Probe 2 Rising Edge Position				
Object Structure	VAR	Data Type	Int32	Data Range	-
Mapping	TPDO	W/R	RO	Default	-
It indicates the position feedback at the moment of the rising edge of the Probe 2 by reference unit.					

60BDh: Probe 2 Falling Edge Position					
Index	60BDh				
Name	Probe 2 Falling Edge Position				
Object Structure	VAR	Data Type	Int32	Data Range	-
Mapping	TPDO	W/R	RO	Default	-
It indicates the position feedback at the moment of the falling edge of the Probe 2 by reference unit.					

60E0h: Positive Torque Limit					
Index	60E0h				
Name	Positive Torque Limit				
Object Structure	VAR	Data Type	Uint16	Data Range	0~3000
Mapping	RPDO	W/R	RW	Default	3000
Set the limit to the positive torque by unit 0.1%.					

60E1h: Negative Torque Limit					
Index	60E1h				
Name	Negative Torque Limit				
Object Structure	VAR	Data Type	Uint16	Data Range	0~3000
Mapping	RPDO	W/R	RW	Default	3000
Set the limit to the negative torque by unit 0.1%.					

60F4h: Position Deviation					
Index	60F4h				
Name	Position Deviation				
Object Structure	VAR	Data Type	Int32	Data Range	-2^{31}~(2^{31}-1)
Mapping	TPDO	W/R	RO	Default	-
It indicates the actual position deviation in reference unit.					

60FCh: Position Reference					
Index	60FCh				
Name	Position Reference				
Object Structure	VAR	Data Type	Int32	Data Range	-2^{31}~(2^{31}-1)
Mapping	TPDO	W/R	RO	Default	-
It indicates the position actual value. Position Reference (60FCh) = Position Reference (6062h) × Gear Ratio (6091h).					

60FDh: Digital Input							
Index	60FDh						
Name	Digital Input						
Object Structure	VAR	Data Type	Uint32	Data Range	0x00~0xFFFFFFFF		
Mapping	TPDO	W/R	RO	Default	0		
It indicates the current digital output terminal logic of the drive, with 0 indicating invalid and 1 indicating valid.							
Bit	31~16	15~5	4	3	2	1	0
Description	Manufacturer-defined	Reserved	DI45 level	DI44 level	Home switch	Positive limit switch	Negative limit switch

60FEh: Digital Output					
Index	60FEh				
Name	Digital Output				
Object Structure	ARR	Data Type	Uint32	Data Range	-
Mapping	TPDO	W/R	RO	Default	-
It indicates the current digital output terminal logic of the drive, with 0 indicating invalid and 1 indicating valid.					

Sub-index	00h				
Name	Entry Number				
Object Structure	VAR	Data Type	Uint8	Data Range	-
Mapping	NO	W/R	RO	Default	2

Sub-index	01h				
Name	Physical Output				
Object Structure	VAR	Data Type	Uint32	Data Range	0x00~0xFFFFFFFF
Mapping	TPDO	W/R	RO	Default	0
The DO signals on each bit are as follows:					
Bit	Description				
0	Braking output				
1~15	NA				
16~31	Manufacturer-defined				

Sub-index	02h				
Name	Physical Output Enable				
Object Structure	VAR	Data Type	Uint32	Data Range	0x00~0xFFFFFFFF
Mapping	TPDO	W/R	RO	Default	0
Invalid					

60FFh: Target Velocity					
Index	60FFh				
Name	Target Velocity				
Object Structure	VAR	Data Type	Int32	Data Range	-2^{31}~$(2^{31}-1)$
Mapping	RPDO	W/R	RW	Default	-
Set the speed reference (unit: reference unit/s) in profile velocity mode (PV) and cyclic synchronous velocity mode(CSV).					

6052h: Drive Mode					
Index	6052h				
Name	Drive Mode				
Object Structure	VAR	Data Type	Uint32	Data Range	0~$(2^{32}-1)$
Mapping	TPDO	W/R	RO	Default	-
0 in the table means the operation modes are not available yet while 1 means available now.					

Bit	Description	Value
0	Profile position mode (PP)	1
1	Variable frequency mode	0
2	Profile velocity mode (PV)	1
3	Profile torque mode (PT)	1
4	NA	0
5	Home mode (HM)	1
6	Interpolation position mode	0
7	Cyclic synchronous position mode (CSP)	1
8	Cyclic synchronous velocity mode (CSV)	1
9	Cyclic synchronous torque mode (CST)	1
10~31	Manufacturer-defined	Reserved

11 EMC-Compliant Installation and Wiring

Environment Introduction

- First Environment: This includes civilian facilities and those, without intermediate transformer, directly connected to a low-voltage power supply network which supplies buildings used for civilian purposes.
- Second Environment: This includes all facilities other than those directly connected to a low-voltage power supply network which supplies buildings used for civilian purposes.

Equipment Introduction

- Equipment Category C1: electric drive system of rated voltage less than 1000V, intended for use in the first environment.
- Equipment Category C2: electric drive system of rated voltage less than 1000V, which is neither a plug-in device nor a movable device. When used in the first environment, it can only be installed and commissioned by the professionals.
- Equipment Category C3: electric drive system of rated voltage less than 1000V, intended for use in the second environment and not intended for use in the first environment.
- Equipment Category C4: electric drive system of rated voltage equal to or above 1000V, or rated current equal to or above 400A, or intended for use in the complex system in the second environment.

Cable Requirement

For compliance with EMC standards, cables and wirings need to meet the following requirements:

1. Use shielded cables with shielding layer. Shielded cables include those with three phase conductors and those with four phase conductors. If the conductivity of the shielding layer does not meet the requirements, it is necessary to add another separate PE wire or use a shielded cable with four phase conductors, one of which is a PE wire. In order to effectively suppress the emission and conduction of RF interference, the shielding layer of the shielded cable is composed of the coaxial copper braid. For the better shielding performance and conductivity, the shielding layer should have a braid density of more than 90%.
2. Motor cables and their PE shielding conductors (twisted shield) should be as short as possible to reduce electromagnetic radiation as well as stray and capacitive currents outside the cable. If the length of the motor cable exceeds 100m of, an output filter or dv/dt reactor is required.
3. It is recommended to use shielded cables for all control lines.
4. Motor cables should be routed away from other cables. Motor cables for multiple drives can be wired in parallel.
5. It is recommended to route the motor cable, input power cable and control cable in separate raceways. To minimize electromagnetic interference from the AC drive's rapid output voltage changes, please avoid long parallel runs between motor cables and other cables.
6. When control cables must be routed across power cables, ensure that the angle between the two cables remains as close to as 90° as possible. Do not route other cables through the drive.
7. The drive’s I/O power cables and the weak current signal lines (such as control circuit) should not be routed in parallel. If possible, please arrange them vertically.
8. Cable raceways must be well connected to each other and well grounded. Aluminum raceways can be used to improve the equal potential.
9. The filter, drive, and motor should all be well lapped to the system (machinery or device), protected by applying a spray on the mounted portion, and securely connected to the conductive metal.

Routing Recommendations

1. Route the cables that carry different signals separately. Reserve a proper distance between interference cables and sensitive cables; a distance of 30 cm is recommended. If the two types of cables must cross, arrange them at an angle of 90° to prevent interference.

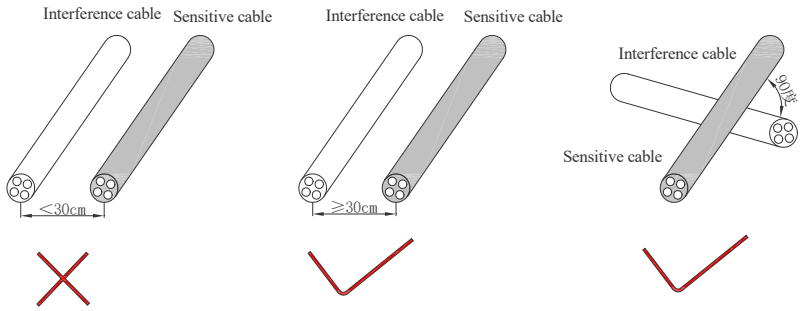


Figure 12-1 Routing of Interference Cables and Sensitive Cables

2. It is recommended to route different signal cables distinctly, and separate the signals in different types via equipotential signal. When routing cables carrying the same signal, the equipotential signal cables should be routed on the outer layers, and if possible, please consider to arrange as many as the equipotential signals in the center. Please refer to the followings:

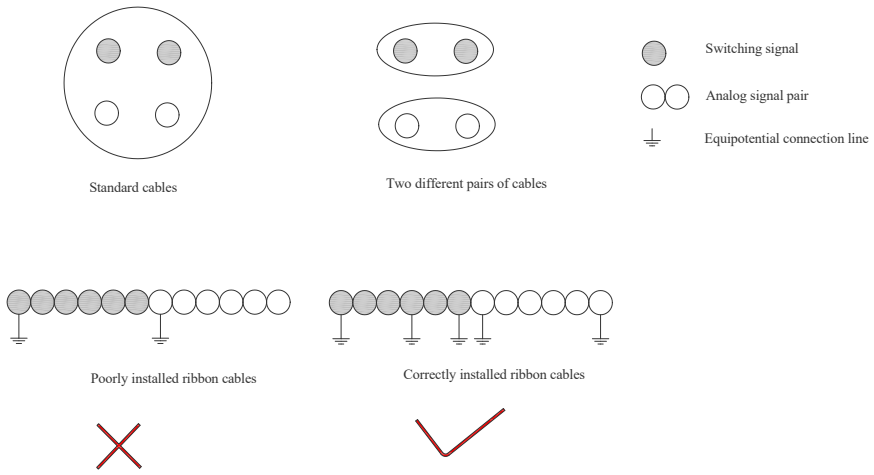


Figure 12-2 Separate Routing of Different Types of Signal Cables

3. For multi-core cables, it is recommended to use a single cable for each signal type. If different signal types must be transmitted via one cable, ensure its internal core wires are shield, as shown in the following figure:

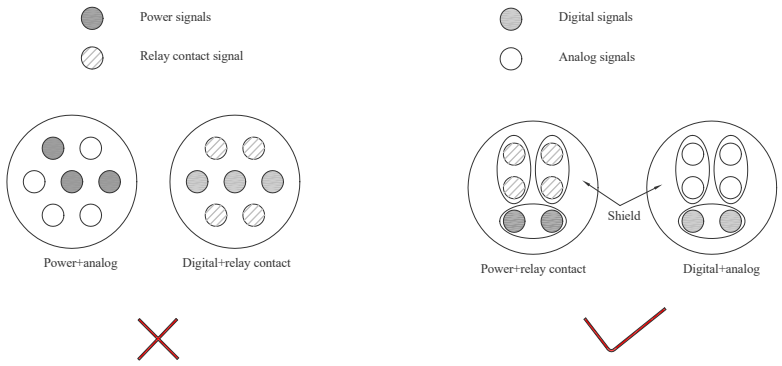


Figure 12-3 Routing of Mulitcore Cables

4. When some cores in the multicore connecting cable are not used, connect all unused (or reversed) conductors to the equipotential connection point.

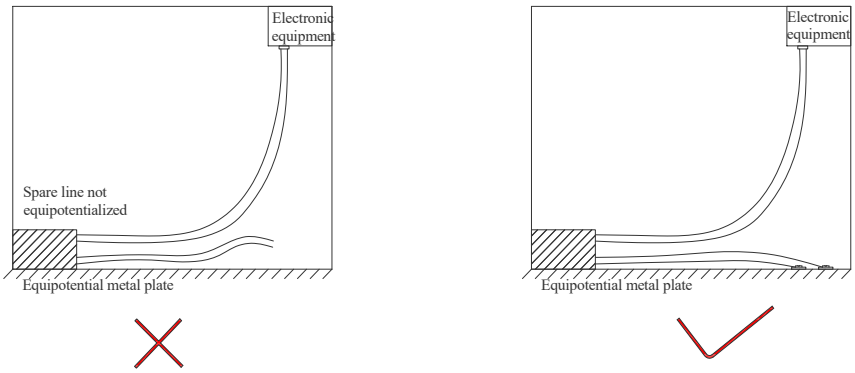


Figure 12-4 Handling of Unused Cores in the Multicore Cable

VEICHI

SUZHOU VEICHI ELECTRIC Co.,Ltd.

Address:No.1888 Songwei Road, Guoxiang Street, Wuzhong Economic and Technological Development Zone, Suzhou, Jiangsu Province, China.
Phone:+86-512-6617 1988
Facebook:https://www.facebook.com/veichiglobal/
Whatsapp:+86-138 2881 8903
E-mail:overseas@veichi.com Web:https://www.veichi.com/

Official Website

Version: V1.0