EtherCAT Bus-Type Step Drive

User Manual

Contents

Chapter I Product Introduction

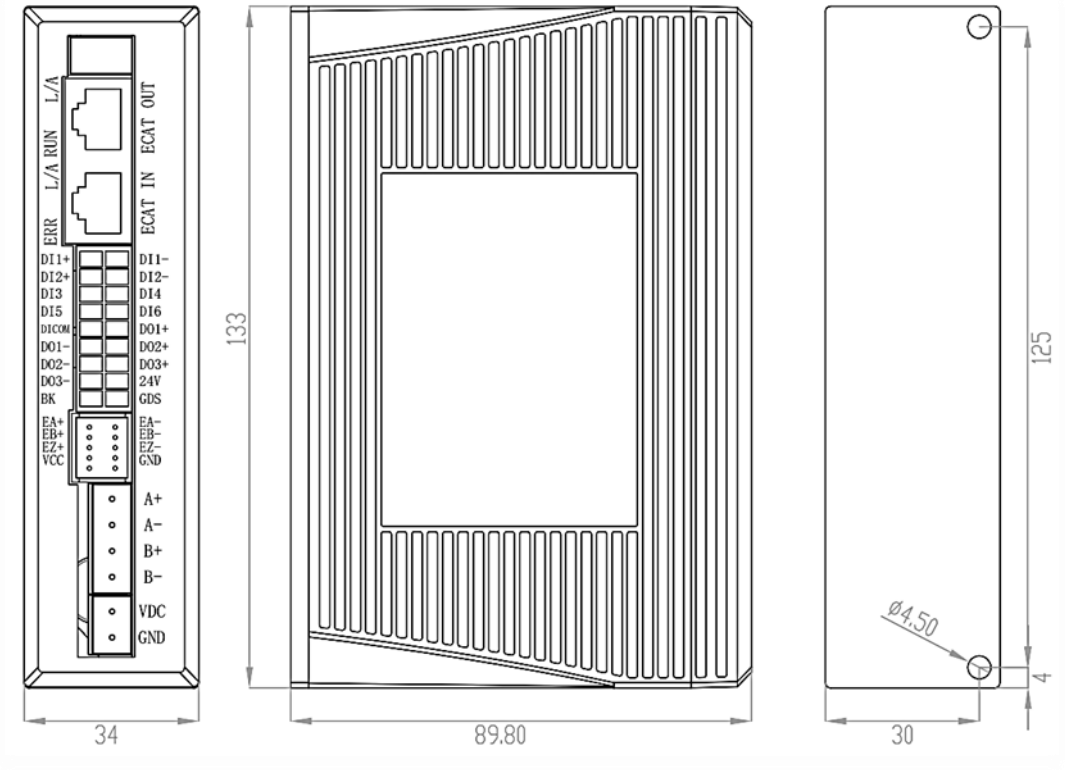
1.1 Communication specifications

EtherCAT Communication specifications	Physical layer	100BASE-TX
	Communication connector	RJ45 × 2 (input: CN6A; output: CN6B)
	Network architecture	Serial connection
	Transmission rate	2 x 1 Mbps (full-duplex)
	Length of data frame	Max. 1484 bytes
	Application layer protocol	CoE：CANopen over EtherCAT
	Synchronous mode	DC synchronous mode (SYNC0) Asynchronous mode (Free Run)
	Communication object	SDO: aperiodic data object PDO: periodic data object EMCY: emergency object
	Application layer specification	CiA402 Drive Profile
	Supported control modes	Profile Position Mode(PP) Profile Velocity Mode(PV) Homing Mode(HM) Cycle Synchronized Position Mode(CSP)

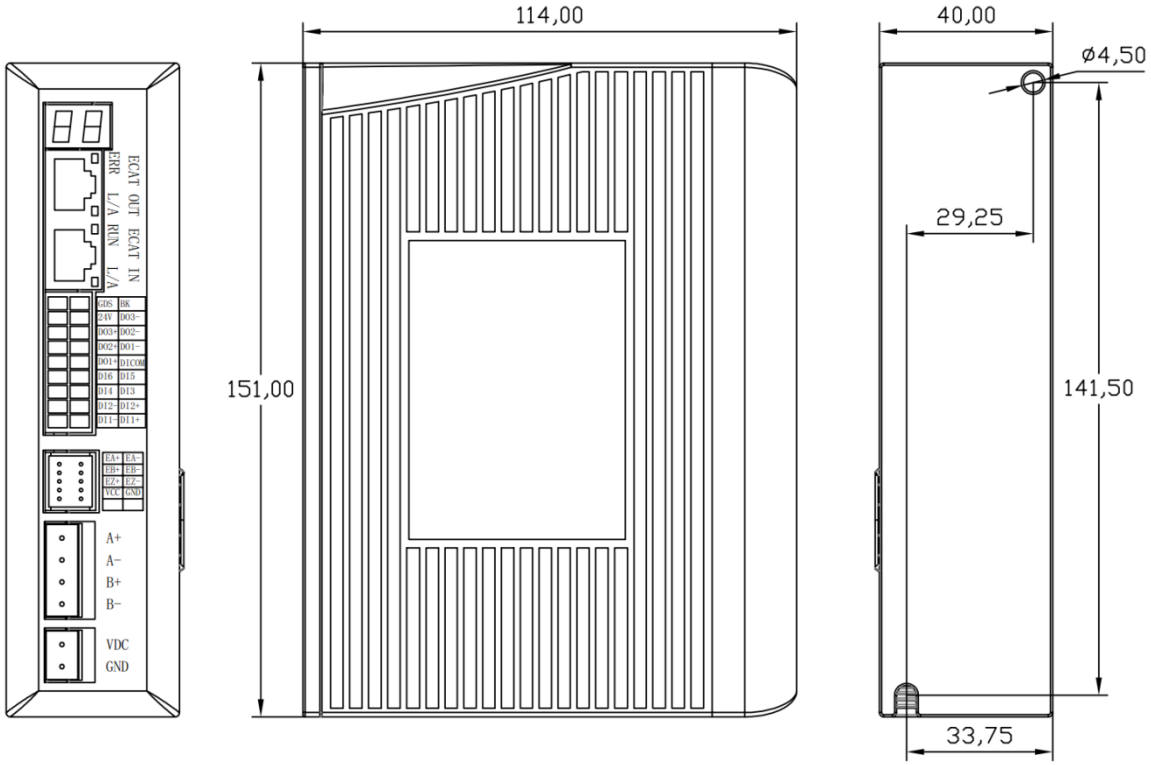
1.2 Product specifications

Drive model / Parameter	OL3-E57H	CL3-E57H	OL3-E86H	CL3-E86H
Matched motor	42/57/60	42/57/60	86	86
Supply voltage	24～48V DC	24～48V DC	24～80V AC	24～80V AC
Output current	5A	5A	8A	8A
Drive size	133*34*90	133*34*90	151*40*114	151*40*114
Drive weight				

1.3 Drive mounting dimensions

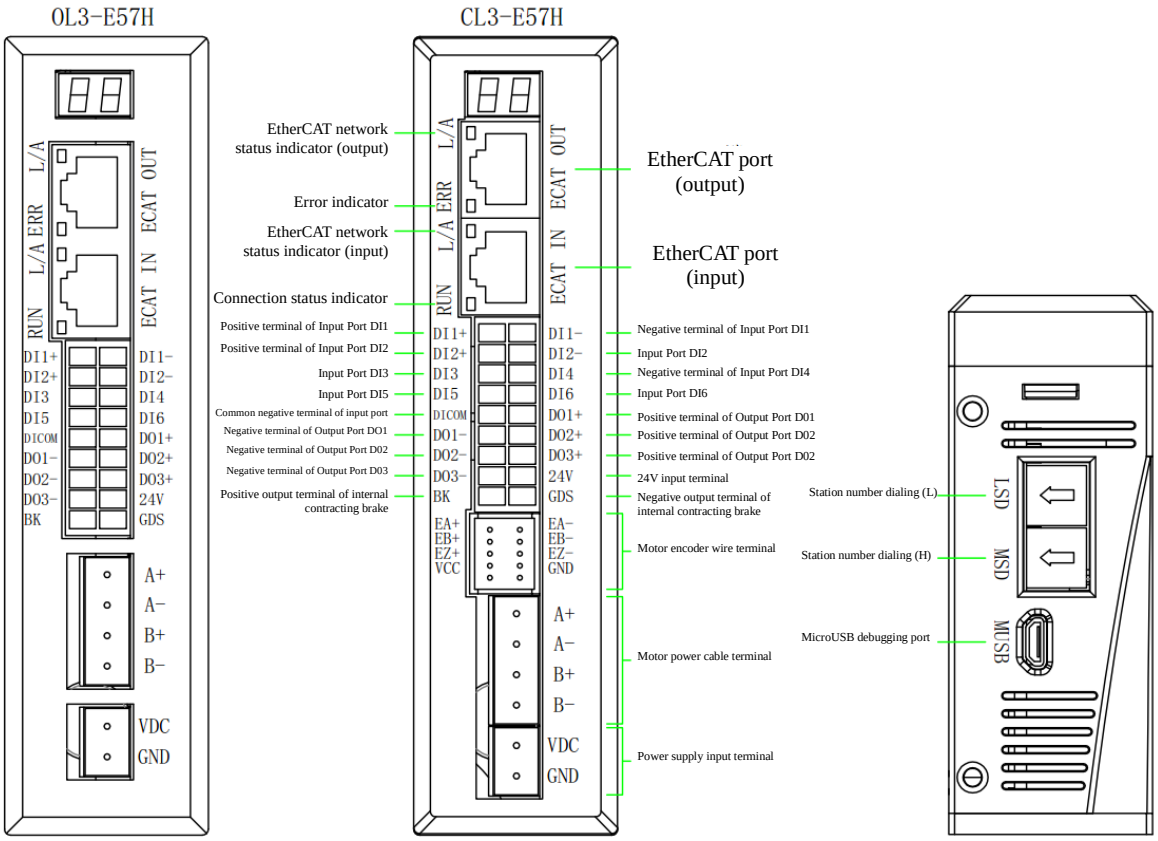


OL3-E57H/CL3-E57H mounting dimensions

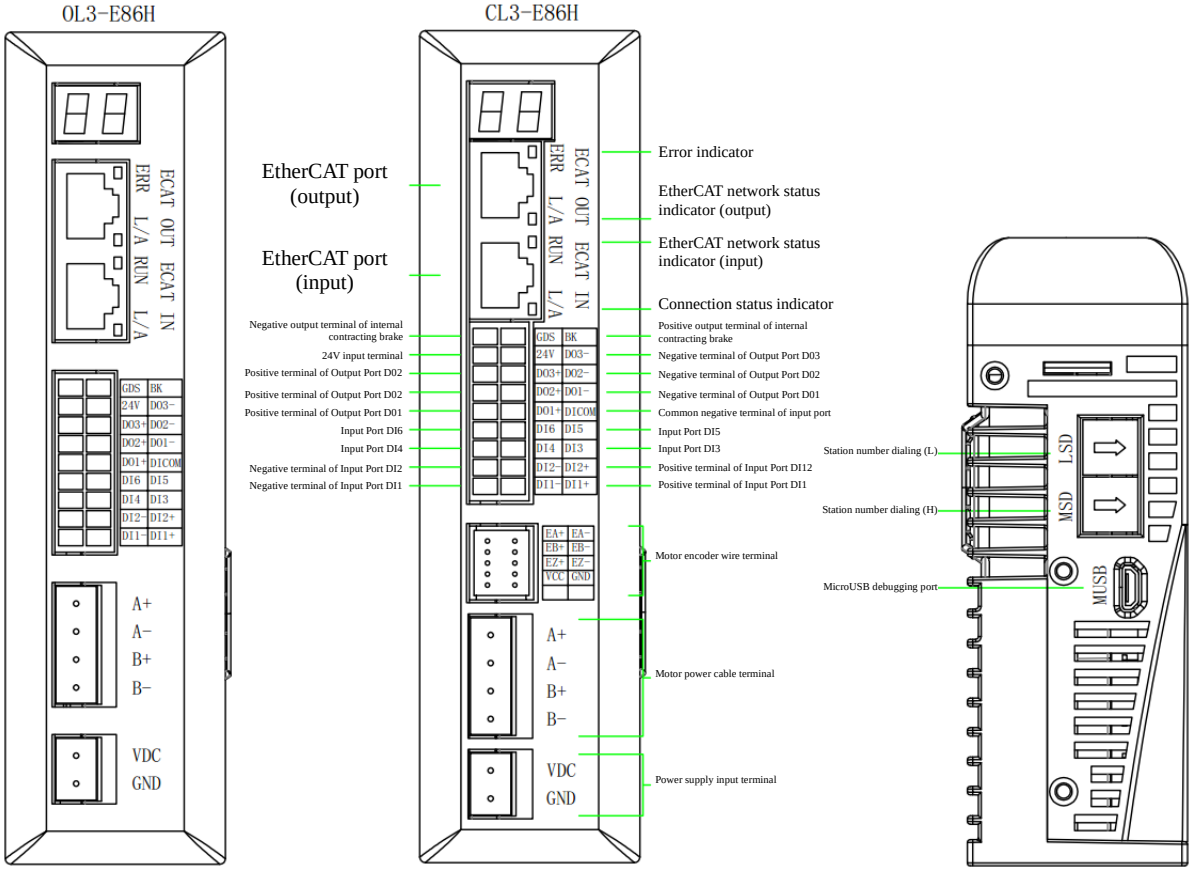


OL3-E86H/CL3-E86H mounting dimensions

1.4 Description of each drive part

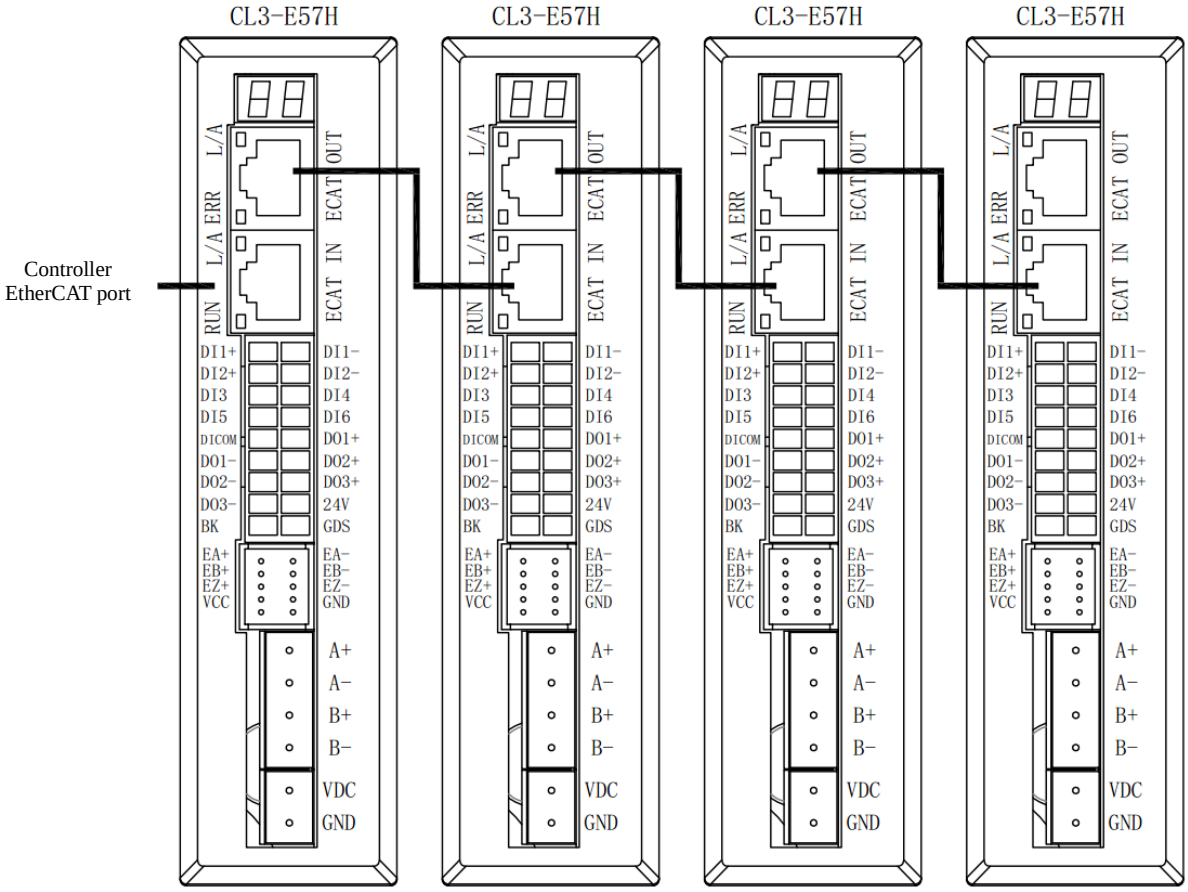


Part description of drive of 57-series



Part description of drive of 86-series

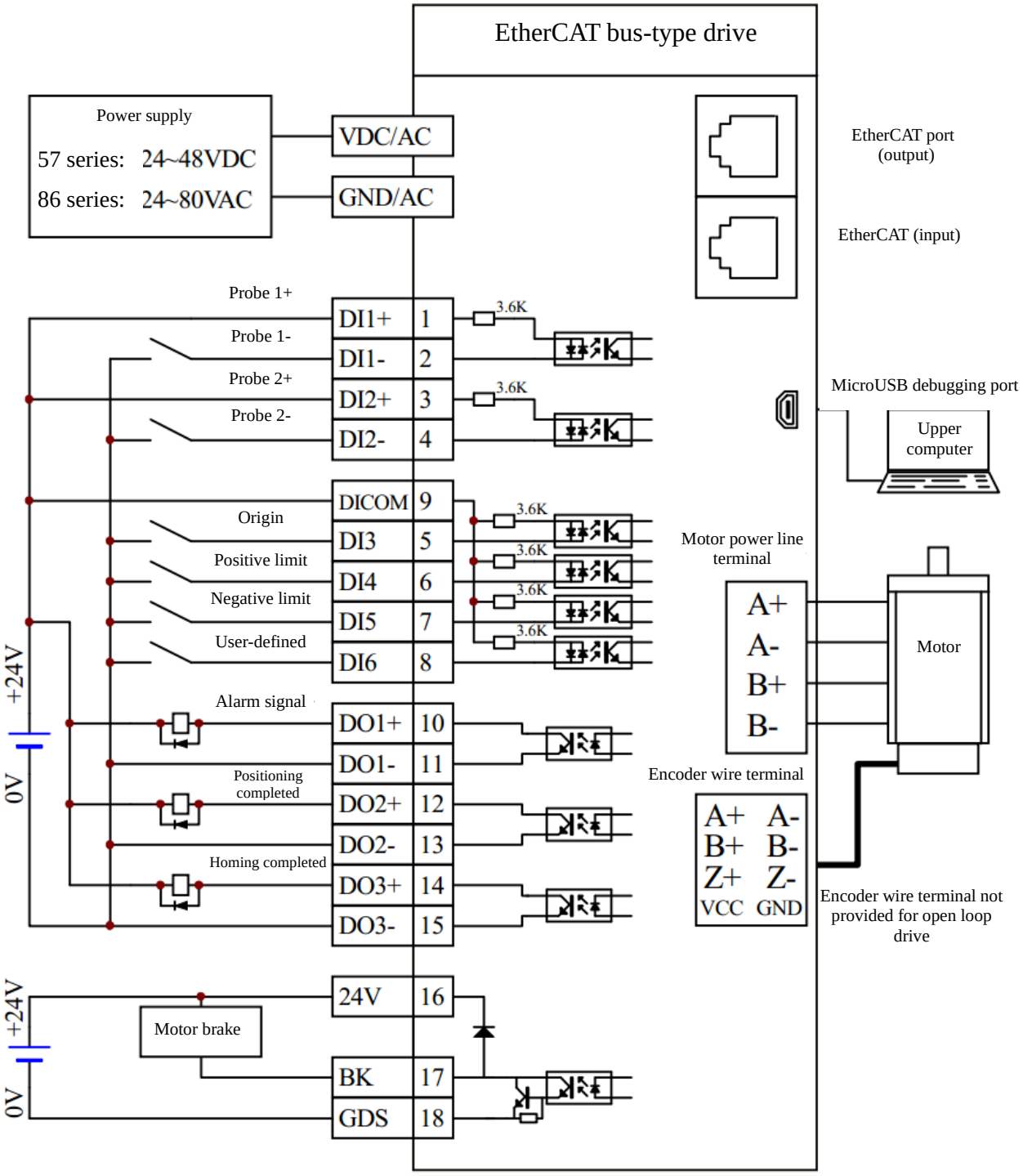
1.5 EtherCAT connection mode of drive



Note: The length of the cable between EtherCAT nodes shall not be longer than 100m. It is recommended to use a Cat. 5 100-MB Ethernet cable with shielding layer or a better one to connect the network.

Chapter II Wiring

2.1 Wiring diagram of EtherCAT bus-type drives



Note: 1. DI/DO port functions can be configured freely through the upper computer software. The marks shown in the figure above are default function definitions;

2. The common anode or common cathode connection method is supported for DI3 to DI4 inlets. The above figure shows the common anode connection method;

3. The internal contracting brake output signal BK can be used to directly control the internal contracting brake coil of the motor without using an intermediate relay;

2.2 Port and dial function description

2.2.1 Power supply terminal

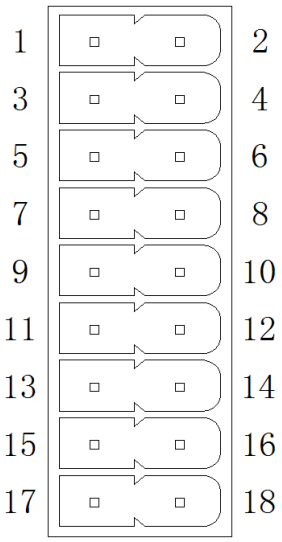
Drive model	Terminal name	Description
OL3-E57H CL3-E57H	**VDC**	DC voltage: 24V~48V Recommended power supply: 36V, 5A
	GND	
OL3-E86H CL3-E86H	**AC**	AC voltage: 24V~80V DC voltage: 36V~110V
	AC	

2.2.2 Motor winding terminal

Terminal name	Description
A+	A phase winding of motor
A-	
B+	B phase winding of motor
B-	

2.2.3 DI/DO terminal

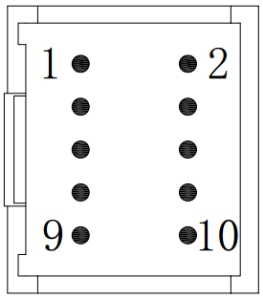
Pin No.	Signal	Description
1	DI1+	Differential Input Signal DI1, effective within 12V ～ 24V. The maximum input frequency is 500K. The signal function can be configured freely. The default function is Probe Input Signal 1.
2	DO1-	
3	DI2+	Differential Input Signal DI2, effective within 12V ～ 24V. The maximum input frequency is 500K. The signal function can be configured freely. The default function is Probe Input Signal 2.
4	DI2-	
5	DI3	Single end input signal, effective within 12V~24V. The origin signal is the default.
6	DO4	Single end input signal, effective within 12V~24V. The positive limit signal is the default.
7	DI5	Single end input signal, effective within 12V~24V. The negative limit signal is the default.
8	DI6	Single end input signal, effective within 12V~24V, default function not defined.
9	DICOM	Common terminal for single end input signals. The common anode or common cathode connection method can be adopted.
10	DO1+	Differential output signal DO1, max. current: 100mA. The alarm output signal is the default.
11	DO1-	
12	DO2+	Differential output signal DO2, max. current: 100mA. The positioning completion signal is the default.
13	DO2-	
14	DO3+	Differential output signal DO3, max. current: 100mA. The homing completion signal is the default.
15	DO3-	
16	+24V	Positive input terminal of the 24V power supply for the internal contracting brake signal.
17	BK	Internal contracting brake control signal. The internal contracting brake can be connected directly without using relay.
18	GDS	Negative input terminal of the 24V power supply for the internal contracting brake signal.



Pins for IO terminal block

2.2.4 Encoder wire terminal

Pin No.	Signal	Color	Pin No.	Signal	Color
1	EA+	Black	**2**	EA-	Blue
3	EB+	Yellow	**4**	EB-	Green
5	EZ+	Brown	**6**	EZ-	Orange
7	VCC	Red	**8**	GND	White
9			**10**		



Pins for terminal block

2.2.5 EtherCAT bus port

Pin No.	Signal	Description
1,9	TX+	Positive sending terminal for EtherCAT data
2,10	TX-	Negative sending terminal for EtherCAT data
3,11	RX+	Positive receiving terminal for EtherCAT data
4,12	-	-
5,13	-	-
6,14	RX-	Negative receiving terminal for EtherCAT data
7,15	-	-
8,16	-	-
PE	PE	Shield ground
LED1	LA/OUT	Link/Activity OUT status indicator
LED2	ERR	Communication error status indicator
LED3	LA/IN	Link/Activity IN status indicator
LED4	RUN	Communication operation status indicator

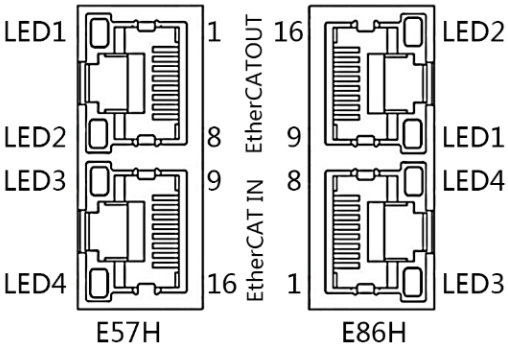


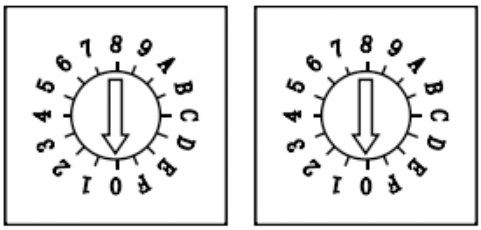
Illustration of EtherCAT port

Description of EtherCAT bus port indicator

Name	Color	Status	Description
RUN	Tangerine	OFF	Initialization status
		Flash	Pre-operation status
		Single-flash	Safe operation status
		ON	Operation status
ERR	Tangerine	OFF	Error-free
		Slow flash	Communication setting error
		Single-flash	Synchronization error or communication data error
		Double-flash	Watchdog request timeout
L/A IN	Green	OFF	Physical layer link not established
		ON	Physical layer link established
		Flash	Data interaction supported in physical layer link
L/A OUT	Green	OFF	Physical layer link not established
		ON	Physical layer link established
		Flash	Data interaction supported in physical layer link

2.2.6 Rotary dial at EtherCAT station

Name	Description
MSD	Two 16-bit rotary codes, which can be used to set the slave station addresses. The address range is kept within 0x00~0xFF. If LSD rotates to 1 and MSD, to 2, the slave station address will be =LSD+MSD*16=33; This address will be configured to the station alias register 0012h-0013h for use by the master station;
LSD	



MSD (high bit) LSD (low bit)

Note: After the station number is set by the rotary dial, it will be effective only after being restarted.

2.2.7MicroUSB debugging port

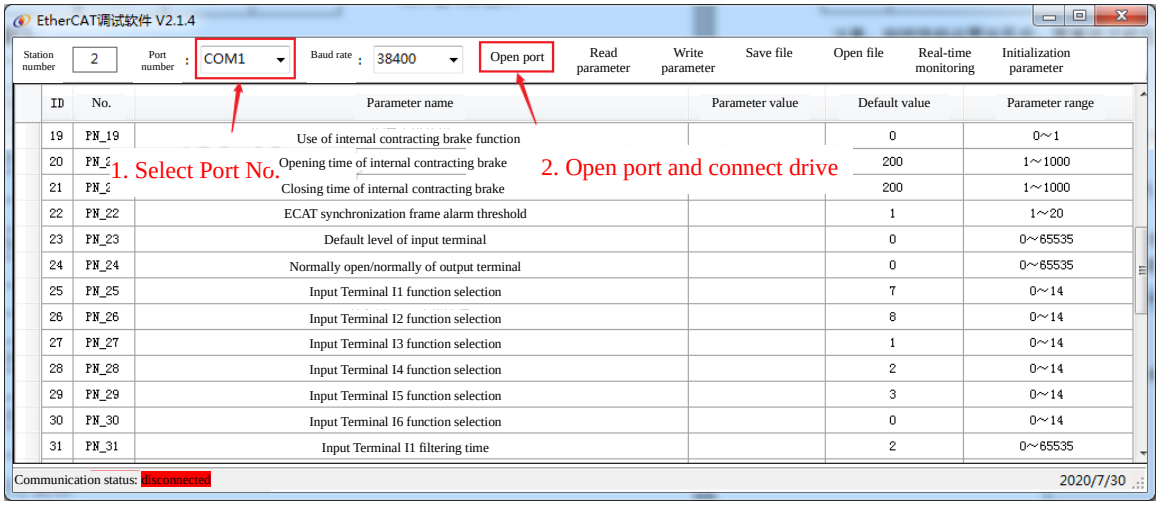
Each EtherCAT bus-type drive of this series can be used to set the drive parameters through this USB port by using the Lichuan drive upper computer debugging software,

1. First, connect the drive to the computer with an Android cable, and the computer will automatically install the drive. If the installation fails, you can use the drive wizard to help install the drive.

2. After the drive is installed, you can view the port number in the Device Manager.

3. Open the debugging software, select the EtherCAT model, and then click OK.

4. Select the port number, and then click Open Port.



5. After the connection, you can read and modify the parameters through the software. After the modification, you can write the parameters to save them in the drive.

Chapter III Parameter Description

3.1 Communication parameters

Object Dictionary	Subindex	Name	Property	Type	Range	Default value	Unit	Description
1000h	00	Device type	R	UINT	0～32767	0x40192	-	CIA standard
1001h	00	Error register	R	USINT	0～255	0	-	CIA specified error register
1008h	00	Device name	R	UINT	0～32767	ECAT-DR	-	Device name
1009h	00	Hardware version	R	UINT	0～32767	V1.0	-	Hardware version
100Ah	00	Software version	R	UINT	0～32767	V1.0	-	Software version
1018h	00	Number of sub-indexes	R	UINT	0～32767	4	-	None
	01	Manufacture ID	R	UINT	0～32767	0xA79	-	None
	02	Product code	R	UINT	0～32767	0x1000	-	None
	03	Modification code	R	UINT	0～32767	0x1	-	None
	04	Serial No.	R	UINT	0～32767	0x1	-	None
1600h	00	Number of sub-indexes	R/W	UINT	0～32767	12	-	None
	01～12	RxPDO Mapping Object Group 1	R/W	UDINT	0～0xFFFFFFFF	-	-	Default RxPDO Mapping Group 1
1601h	00	Number of sub-indexes	R/W	UINT	0～32767	12		None
	01～12	RxPDO Mapping Object Group 2	R/W	UDINT	0～0xFFFFFFFF	-	-	Default RxPDO Mapping Group 2
1A00h	00	Number of sub-indexes	R/W	UINT	0～32767	12	-	None
	01～12	TxPDO Mapping Object Group 1	R/W	UDINT	0～0xFFFFFFFF	-	-	Default TxPDO Mapping Group 1
1A01h	00	Number of sub-indexes	R/W	UINT	0～32767	12		None
	01～12	TxPDO Mapping Object Group 2	R/W	UDINT	0～0xFFFFFFFF	-	-	Default TxPDO Mapping Group 2
1C12	00～02	RxPDO allocation	R/W	UINT	0～32767	-	-	None
1C13	00～02	TxPDO allocation	R/W	UINT	0～32767	-	-	None
1C32	00～0A	RxPDO management parameter	R	UINT	0～32767	-	-	None
1C33	00～0A	TxPDO management parameter	R	UINT	0～32767	-	-	None

3.2 Basic parameters

Object Dictionary	Subindex	Name	Property	Type	Range	Default value	Unit	Description

2000h	00	Drive ID Number	R	UINT	0~65535	0x40192	-	ID set by the drive manufacturer
2001h	00	Drive software version	R	UINT	0~65535	0	-	Drive software version
2100h	00	Input IO status	R	UINT	0~65535	0	-	Connection signal status of input terminal hardware, 0: Signal not connected; 1: Signal connected; Bit0: I1 signal status; Bit1: I2 signal status; Bit2: I3 signal status; Bit3: I4 signal status; Bit4: I5 signal status; Bit5: I6 signal status;
2101h	00	Output IO status	R	UINT	0~65535	0	-	Output status of output terminal hardware, 0: Effective output; 1: Noneffective output; Bit0: O1 signal status; Bit1: O2 signal status; Bit2: O13 signal status;
2200h	00	Factory parameter resetting command	R/W	UINT	0~1	0	-	The factory parameter resetting function can be triggered by writing 0->1, and the 0->1 rising edge of this object dictionary can be detected internally by the drive;
2201h	00	Factory parameter saving command	R/W	UINT	0~1	0	-	The factory parameter saving function can be triggered by writing 0->1, and the 0->1 rising edge of this object dictionary can be detected internally by the drive;
2300h	00	Default orientation of drive	R/W	UINT	0~1	0	-	Default orientation of drive, 0: Default; 1: Neg;
2301h	00	Drive operation mode	R/W	UINT	1~2	0	-	1: Open loop; 2: Closed loop; This parameter is only effective for CL product series;
2302h	00	Subdivision setting	R/W	UINT	400~51200	10000	pulse	Drive subdivision, the number of pulses required for one operation cycle of motor;
2303h	00	Peak current	R/W	UINT	0~6000	5000	mA	The specific peak value is dependent on the drive model: OL3-E57H：5000mA CL3-E57H：5000mA OL3-E86H：6000mA CL3-E86H：6000mA

2304h	00	Basic holding current percentage	R/W	UINT	0~100	40	%	The basic current when the motor is running, namely the product of this ratio and the set value of 2303h;
2305h	00	Closed loop holding current percentage	R/W	UINT	0~100	100	%	The rated current when the motor is running under closed loop, namely the product of this ratio and the set value of 2303h;
2306h	00	Open loop holding current percentage	R/W	UINT	0~100	100	%	The rated current when the motor is running under open loop, namely the product of this ratio and the set value of 2303h;
2307h	00	Axle locking current percentage	R/W	UINT	0~100	40	%	The current required for stopping the motor and locking the axle, namely the product of this ratio and the set value of 2303h;
2308h	00	Axle locking time	R/W	UINT	0~2000	200	ms	Axle locking state time;
2309h	00	Number of in-place pulses	R/W	UINT	0~1000	5	pulse	Allowable error value for in-place motor;
230Ah	00	In-place delay time	R/W	UINT	0~1000	200	ms	Delay jitter removal of motor in place;
230Bh	00	Command filtering coefficient	R/W	UINT	0~1024	5	-	Command smoothing filtering coefficient, the lower the coefficient, the better the filtering effect;
230Ch	00	Encoder resolution	R/W	UINT	4000~10000	4000	pulse	Encoder resolution, fourfold frequency by default;
230Dh	00	Position out-of-tolerance value	R/W	UINT	0~65535	4000	pulse	Position out-of-tolerance value;
2400h	00	Limit alarm	R/W	UINT	0~1	0	-	Limit setting under Csp mode: 0: Processing not required; 1: Stop and report an error;
2401h	00	Homing offset clearing	R/W	UINT	0~1	0	-	When the internal homing function (Home mode) of the drive is used and the set 607C value is not zero, 0: Offset clearing not required; 1: Offset clearing required;

2402h	00	Limit stop setting	R/W	UINT	0~2	0	-	Limit processing methods under the pp/pv mode of the drive: 0: Stop; 1: Emergency stop; 2: Processing not required;
2403h	00	Internal contracting brake enabling	R/W	UINT	0~1	0	-	Internal contracting brake output enabling 0: Disabling; 1: Enable;
2404h	00	Open delay of internal contracting brake	R/W	UINT	1~65535	200	ms	Opening delay time of internal contracting brake;
2405h	00	Closing delay of internal contracting brake	R/W	UINT	1~65535	200	ms	Closing delay time of internal contracting brake;
2600h	00	ESC synchronization frame alarm threshold	R/W	UINT	1~65535	1	-	--
2700h	00	Gain multiple of Current Loop Kp	R/W	UINT	1~65535	6144	-	--
2701h	00	Gain of Current Loop Kp	R/W	UINT	1~65535	1024	-	--
2702h	00	Gain of Current Loop Ki	R/W	UINT	1~65535	655	-	--
2703h	00	Gain of Current Loop Kc	R/W	UINT	1~65535	71	-	--
2704h	00	LA Velocity Kp1	R/W	UINT	1~65535	2560	-	--
2705h	00	LA Velocity Kv1	R/W	UINT	1~65535	114	-	--
2706h	00	LA Velocity Kp2	R/W	UINT	1~65535	2560	-	--
2707h	00	LA Velocity Kv2	R/W	UINT	1~65535	1024	-	--
2708h	00	Gain of LA Position Loop Ki	R/W	UINT	1~65535	0	-	--
2709h	00	Gain of LA Velocity Feedforward Kvf	R/W	UINT	1~65535	20	-	--

3.3 IO function configuration

Object Dictionary	Subin dex	Name	Property	Type	Range	Default value	Unit	Description
2500h	00	Default level of input terminal	R/W	UINT	0~65535	0	-	Bit0: I1 terminal; Bit1: I2 terminal; Bit2: I3 terminal; Bit3: I4 terminal; Bit4: I5 terminal; Bit5: I6 terminal; 0: Normally open; 1: Normally closed;
2501h	00	Resistance state of output terminal	R/W	UINT	0~65535	0	-	Bit0: O1 terminal; Bit1: O2 terminal; Bit2: O3 terminal; 0: Normally open; 1: Normally closed;
2510h	00	I1 function setting	R/W	UINT	0~255	7	-	Function definition of input terminal: 0: Undefined; 1: Origin; 2: Positive limit; 3: Negative limit; 4: Stop; 5: Emergency stop; 6: Release; 7: Probe 1; 7: Probe 2; 9: User Definition 1; 10: User Definition 2; 11: User Definition 3; 12: User Definition 4; 13: User Definition 5; 14: User Definition 6;
2511h	00	I2 function setting	R/W	UINT	0~255	8	-	
2512h	00	I3 function setting	R/W	UINT	0~255	1	-	
2513h	00	I4 function setting	R/W	UINT	0~255	2	-	
2514h	00	I5 function setting	R/W	UINT	0~255	3	-	
2515h	00	I6 function setting	R/W	UINT	0~255	0	-	
2520h	00	O1 function setting	R/W	UINT	0~255	0	-	Function definition of output terminal: 0: Undefined; 1: Alarm signal; 2: In place signal; 3: Homing completed 9: User Definition 1; 10: User Definition 2; 11: User Definition 3;
2521h	00	O2 function setting	R/W	UINT	0~255	0	-	
2522h	00	O3 function setting	R/W	UINT	0~255	0	-	
2530h	00	I1 terminal filtering coefficient	R/W	UINT	0~65535	2	-	Terminal filtering coefficient, the higher the coefficient, the better the filtering effect;
2531h	00	I2 terminal filtering coefficient	R/W	UINT	0~65535	2	-	Terminal filtering coefficient, the higher the coefficient, the better the filtering effect;
2532h	00	I3 terminal filtering coefficient	R/W	UINT	0~65535	2	-	Terminal filtering coefficient, the higher the coefficient, the better the filtering effect;
2533h	00	I4 terminal filtering coefficient	R/W	UINT	0~65535	2	-	Terminal filtering coefficient, the higher the coefficient, the better the filtering effect;

2534h	00	I5 terminal filtering coefficient	R/W	UINT	0~65535	2	-	Terminal filtering coefficient, the higher the coefficient, the better the filtering effect;
2535h	00	I6 terminal filtering coefficient	R/W	UINT	0~65535	2	-	Terminal filtering coefficient, the higher the coefficient, the better the filtering effect;

3.4 Motion parameter

Object Dictionary	Subindex	Name	Property	Type	Range	Default value	Unit	Description
603Fh	00	Drive fault code	R	UINT	0~65535	0	-	Drive error description: 0x00h: Without error; 0x FF01h: Overcurrent; 0x FF02h: Overvoltage; 0x FF03h: Undervoltage; 0x FF04h: Phase dislocation; 0x FF05h: Out-of-tolerance;
6040h	00	Control word	R/W	UINT	0~65535	0	-	--
6041h	00	Status word	R	UINT	0~65535	0	-	--
605Dh	00	Halt control register	R/W	UINT	0~65535	0	-	Drive processing mode under Halt command of control word 0: Stop; 1: Emergency stop;
6060h	00	Operation mode control register	R/W	USINT	0~255	0	-	0: Undefined; 1: pp mode; 3: pv mode; 6: Home mode; 8: csp mode;
6061h	00	Operation mode status register	R	USINT	0~255	0	-	--
6064h	00	Actual position	R	DINT	-2147483648 ~2147483647	0	pulse	Actual motor position;
606Ch	00	Actual velocity	R	DINT	-2147483648 ~2147483647	0	Pulse/s	Actual motor velocity;
607Ah	00	Target position	R/W	DINT	-2147483648 ~2147483647	0	pulse	Target position given by master station;
607Ch	00	Homing offset	R/W	DINT	-2147483648 ~2147483647	0	pulse	Homing offset under Home mode;
6081h	00	Position mode velocity	R/W	UDINT	0~0xFFFFFFFF	0	Pulse/s	Operation velocity under pp mode;
6083h	00	Acceleration	R/W	UDINT	0~0xFFFFFFFF	0	Pulse/s^2	Acceleration under pp/pv mode;
6084h	00	Deceleration	R/W	UDINT	0~0xFFFFFFFF	0	Pulse/s^2	Deceleration under pp/pv mode;
6098h	00	Homing mode	R/W	USINT	0~255	0	-	Homing mode, the drive can support 6 modes i.e. 17/18/24/29/35/ 37;
6099h	01	Homing velocity	R/W	DINT	-2147483648 ~2147483647	0	Pulse/s	Homing velocity under Home mode;
6099h	02	Queried homing velocity	R/W	DINT	-2147483648 ~2147483647	0	Pulse/s	Queried homing velocity under Home mode;

609Ah	00	Homing acceleration / deceleration	R/W	UDINT	0~0xFFFFFFFF	0	Pulse/s^2	Acceleration / deceleration under Home mode;
60B8h	00	Probe control	R/W	UINT	0~65535	0	-	Probe control;
60B9h	00	Probe status	R	UINT	0~65535	0	-	Probe status;
60BAh	00	Probe latching	R	DINT	-2147483648 ~2147483647	0	-	Latching position of rising edge of Probe 1;
60BBh	00	Probe latching	R	DINT	-2147483648 ~2147483647	0	-	Latching position of falling edge of Probe 1;
60BCh	00	Probe latching	R	DINT	-2147483648 ~2147483647	0	-	Latching position of rising edge of Probe 2;
60BDh	00	Probe latching	R	DINT	-2147483648 ~2147483647	0	-	Latching position of falling edge of Probe 2;
60D5h	00	Probe latching counter	R	UDINT	0~0xFFFFFFFF	0	-	Latching count at rising edge of Probe 1;
60D6h	00	Probe latching counter	R	UDINT	0~0xFFFFFFFF	0	-	Latching count at falling edge of Probe 1;
060D7h	00	Probe latching counter	R	UDINT	0~0xFFFFFFFF	0	-	Latching count at rising edge of Probe 2;
60D8h	00	Probe latching counter	R	UDINT	0~0xFFFFFFFF	0	-	Latching count at falling edge of Probe 2;
60F4h	00	Position error	R	DINT	-2147483648 ~2147483647	0	-	Position error
60FDh	00	Input IO status	R	DINT	-2147483648 ~2147483647	0	-	Mapping correspondence of input signal: Bit0: Negative limit signal status; Bit1: Positive limit signal status; Bit2: Origin signal status; Bit16: Status of User Definition 1; Bit17: Status of User Definition 2; Bit18: Status of User Definition 3; Bit19: Status of User Definition 4; Bit20: Status of User Definition 5; Bit21: Status of User Definition 6;
60FEh	01	Physical output On	R/W	UDINT	0~0xFFFFFFFF	0	-	Mapping correspondence of output signals. When using this register, the corresponding terminal of Output IO should be set as a user-defined function: Bit16: User Definition 1 On; Bit17: User Definition 2 On; Bit18: User Definition 3 On;

60FEh	02	Physical output enabling	R/W	UDINT	0~0xFFFFFFFF	0	-	Mapping correspondence of output signals. When using this register, the corresponding terminal of Output IO should be set as a user-defined function: Bit16: User Definition 1 enabling; Bit17: User Definition 2 enabling; Bit18: User Definition 3 enabling;
60FFh	00	Target velocity	R/W	DINT	-2147483648 ~2147483647	0	-	Operation velocity under pv mode;
6502h	00	Operation mode supported	R	UDINT	0~0xFFFFFFFF	165	-	--

3.5 Debugging software parameters

No.	Parameter name	Parameter description	Setting range Note: Other values are noneffective	Default value
PA_001	Default direction of motor	0: Default; 1: Negative;	0~1 （RW）	0
PA_002	Drive operation mode	1: Open loop mode; 2: Closed loop mode;	0~2 （RW）	1
PA_003	Subdivision setting	Number of pulses per circle of motor rotation;	400~51200 （RW）	0
PA_004	Max. effective current	Unit: mA;	0~5000 （RW）	0
PA_005	Basic current percentage	Basic current during operation, unit: %;	0~100 （RW）	0
PA_006	Max. closed loop current percentage	Max. current during closed loop operation, unit: %;	0~150 （RW）	0
PA_007	Max. open loop current percentage	Max. current during open loop operation, unit: %;	0~100 （RW）	0
PA_008	Locking current percentage	Current during locking, unit: %;	0~100 （RW）	0
PA_009	Locking time	Locking time, unit: ms;	0~5000 （RW）	0
PA_010	Positioning error range	Positioning error range	0~100 （RW）	0
PA_011	In-place end time	In-place end time	1~65535 （RW）	0
PA_012	Pulse command filtering coefficient	Pulse command filtering coefficient	1~65535 （RW）	512
PA_013	In-place algorithm	0: Algorithm 0; 1: Algorithm 1;	0~1 （RW）	0
PA_014	Encoder resolution	Encoder resolution	4000	4000
PA_015	Position out-of-tolerance alarm threshold	Position out-of-tolerance alarm threshold	0~4000 （RW）	4000
PA_016	Limit alarm under CSP mode	0: Error report not required; 1: Error report required;	0~1 （RW）	0
PA_017	607C offset clearing	0: Clearing not required; 1: Clearing required;	0~1 （RW）	0
PA_018	Limit setting under pp/pv mode	0: Stop; 1: Emergency stop;	0~1 （RW）	0

PA_019	Internal contracting brake function enabling	0: Noneffective; 1: Effective;	0~1 （RW）	0
PA_020	Opening time of internal contracting brake	Unit: ms	1~1000 （RW）	200
PA_021	Closing time of internal contracting brake	Unit: ms	1~1000 （RW）	200
PA_022	ECAT synchronization frame alarm threshold	ECAT synchronization frame alarm threshold	1~20 （RW）	1
PA_023	Default level of input terminal	Bit0: I1 terminal; Bit1: I2 terminal; Bit2: I3 terminal; Bit3: I4 terminal; Bit4: I5 terminal; Bit5: I6 terminal; 0: Normally open; 1: Normally closed;	0~65535 （RW）	0
PA_024	Normally open/normally of output terminal	Bit0: O1 terminal; Bit1: O2 terminal; Bit2: O3 terminal; 0: Normally open; 1: Normally closed;	0~65535 （RW）	0
PA_025	Input Terminal I1 function selection	0: Undefined; 1: Origin; 2: Positive limit; 3: Negative limit; 4: Stop; 5: Emergency stop; 6: MF signal; 7: Probe 1; 7: Probe 2; 9: User Definition 0; 10: User Definition 1; 11: User Definition 2; 12: User Definition 3; 13: User Definition 4; 14: User Definition 5;	0~14 （RW）	0
PA_026	Output Terminal I2 function selection		0~14 （RW）	0
PA_027	Input Terminal I3 function selection		0~14 （RW）	0
PA_028	Input Terminal I4 function selection		0~14 （RW）	0
PA_029	Input Terminal I5 function selection		0~14 （RW）	0
PA_030	Input Terminal I6 function selection		0~14 （RW）	0
PA_031	Input Terminal I1 filtering time	Input Terminal I1 filtering time	0~65535 （RW）	0
PA_032	Input Terminal I2 filtering time	Input Terminal I2 filtering time	0~65535 （RW）	0
PA_033	Input Terminal I3 filtering time	Input Terminal I3 filtering time	0~65535 （RW）	0
PA_034	Input Terminal I4 filtering time	Input Terminal I4 filtering time	0~65535 （RW）	0
PA_035	Input Terminal I5 filtering time	Input Terminal I5 filtering time	0~65535 （RW）	0
PA_036	Input Terminal I6 filtering time	Input Terminal I6 filtering time	0~65535 （RW）	0
PA_037	Output Terminal O1 function selection	0: Undefined; 1: Alarm signal; 2: In place signal; 3: Homing completion signal; 9: User Definition 0; 10: User Definition 1; 11: User Definition 2;	0~65535 （RW）	0
PA_038	Output Terminal O2 function selection		0~65535 （RW）	0
PA_039	Output Terminal O3 function selection		0~65535 （RW）	0
PA_040	Gain multiple of Current Loop Kp	Gain multiple of Current Loop Kp	0~65535 （RW）	0

PA_041	Gain of Current Loop Kp	Gain of Current Loop Kp	0~65535 （RW）	0
PA_042	Gain of Current Loop Ki	Gain of Current Loop Ki	0~65535 （RW）	0
PA_043	Gain of Current Loop Kc	Gain of Current Loop Kc	0~65535 （RW）	0
PA_044	LA Velocity Kp1	LA Velocity Kp1	0~65535 （RW）	0
PA_045	LA Velocity Kv1	LA Velocity Kv1	0~65535 （RW）	0
PA_046	LA Velocity Kp2	LA Velocity Kp2	0~65535 （RW）	0
PA_047	LA Velocity Kv2	LA Velocity Kv2	0~65535 （RW）	0
PA_048	Gain of LA Position Loop Ki	Gain of LA Position Loop Ki	0~65535 （RW）	0
PA_049	Gain of LA Velocity Feedforward Kvf	Gain of LA Velocity Feedforward Kvf	0~65535 （RW）	0
PA_050	High target position	Positioning given target H, unit: p;	0~65535 （RW）	0
PA_051	Low target position	Positioning given target L, unit: p;	0~65535 （RW）	0
PA_052	High positioned velocity	Positioning given velocity H, unit: p/s;	0~65535 （RW）	0
PA_053	Low positioned velocity	Positioning given velocity L, unit: p/s;	0~65535 （RW）	0
PA_054	Acceleration H	Acceleration H, unit: p/s^2;	0~65535 （RW）	0
PA_055	Acceleration L	Acceleration L, unit: p/s^2;	0~65535 （RW）	0
PA_056	Deceleration H	Deceleration H, unit: p/s^2;	0~65535 （RW）	0
PA_057	Deceleration L	Deceleration L, unit: p/s^2;	0~65535 （RW）	0
PA_058	JOG velocity H	JOG velocity H, unit: p/s;	0~65535 （RW）	0
PA_059	JOG velocity L	JOG velocity L, unit: p/s;	0~65535 （RW）	0

3.6 IO port configuration

The IO parameters can be configured through EtherCAT master station or Lichuan upper computer software. After the drive parameters should be saved after being configured, which will be effective after the drive is restarted.

3.6.1 DI port function description

DI port	DI6	DI5	DI4	DI3	DI2	DI1
DI function index number setting	2515h	2514h	2513h	2512h	2511h	2510h
DI filter setting	2535h	2534h	2533h	2532h	2531h	2530h
DI input resistance state setting: 2500h	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
DI input status monitoring: 2100h	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0

1) The DI port of the drive can be used to set the normally open / normally closed status of DI1~DI6 through Bit0~Bit5 of index 2500h. For example, when the Bit0 of 2500h is 1, the DI1 status will be subject to normally closed input.

2) The input filtering time of the DI port can be set through 2530h~2535h. The higher the set parameter is, the slower the response of the DI port is, and the stronger the anti-interference capability is.

3) The DI1~DI6 input status can be monitored by index 2100h. When the corresponding bit is 1, input will be allowed, and when being 0, it will be disconnected.

4) As shown in the second line of the above table, the functions of the DI interface can be set through the corresponding index number, and **the current status of the corresponding functions can be monitored through 60FDh (which is different from the status of the DI interface corresponding to 2100h monitoring)**. The functions are as follows:

Parameter value	Function description	DI port function status monitoring: 60FDh
0	N/A	
1	origin	Bit2 (this bit being 1 indicates that the origin signal is connected, and so on)
2	Positive limit	Bit1
3	Negative limit	Bit0
4	Stop	
5	Emergency stop	
6	Yes	
7	Probe 1	
8	Probe 2	
9	User Definition 0	Bit16
10	User Definition 1	Bit17
11	User Definition 2	Bit18
12	User Definition 3	Bit19
13	User Definition 4	Bit20
14	User Definition 5	Bit21

3.6.2 DO port function description

DO port	DO3	DO2	DO1
DI function index number setting	2522h	2521h	2520h
DO output resistance state setting: 2501h	Bit2	Bit1	Bit0
DO port function status monitoring: 2101h	Bit2	Bit1	Bit0

1) The DO port of the drive can be used to set the normally open / normally closed status of DO1~DO2 through Bit0~Bit2 of index 2501h. For example, when the Bit0 of 2501h is 1, the DO1 status will be subject to normally closed output.

2) The DO1~DO2 input status can be monitored by index 2101h. When the corresponding bit is 1, output will be allowed, and when being 0, it will be disconnected.

3) The DO port functions can be set through the corresponding index number of the second line in the above table. The functions are as follows:

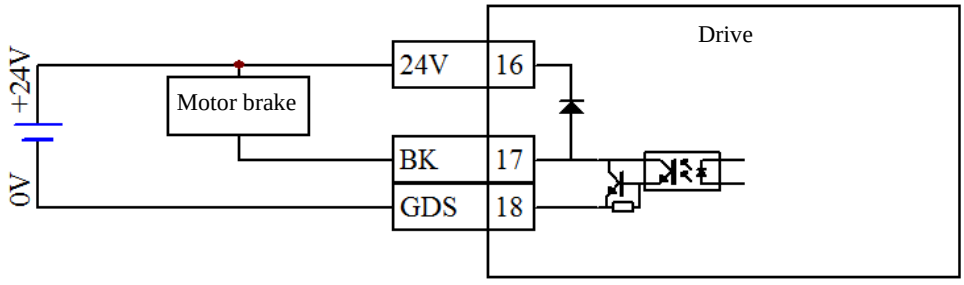
Parameter value	Function description
0	N/A
1	Alarm signal
2	Positioning completion signal
3	Homing completion signal
9	User Definition 1
10	User Definition 2
11	User Definition 3

4) When the DO port is configured as a user-defined output signal, the status of the output port can be set through the indexes 60FE+01h and 60FE+02h, see the following table:

DO □	Physical output On 60FE-01h	Physical output enabling 60FE-02h	Description
DO1	Bit16	Bit16	When 0x10000 is written into 60FE-01h and 60FE-02h at the same time (namely, Bit16 is 1), DO1 output will be allowed
DO2	Bit17	Bit17	When 0x20000 is written into 60FE-01h and 60FE-02h at the same time (namely, Bit17 is 1), DO2 output will be allowed
DO3	Bit18	Bit18	When 0x40000 is written into 60FE-01h and 60FE-02h at the same time (namely, Bit18 is 1), DO3 output will be allowed

3.6.3 Description of internal contracting brake output signal

Each drive of this series has a special output signal port for the internal contracting brake, and the output current can reach up to 500mA for direct driving the motor internal contracting brake without using intermediate relays. The wiring diagram is as follows:



Chapter IV Common Functions

4.1 Description of control word and status word

4.1.1 Control word 6040h

mode / Data bit	CSP mode	PP mode	PV mode	HM mode
Bit0	Start			
Bit1	Power on			
Bit2	Quick stop			
Bit3	Enable			
Bit4	Noneffective	0->1: Triggering a new target position	Noneffective	0->1: Homing started 1->0: Homing interrupted
Bit5	Noneffective	0: Updating position after positioning 1: Updating position immediately	Noneffective	Noneffective
Bit6	Noneffective	0: Absolute position 1: Relative position	Noneffective	Noneffective
Bit7	1: Error reset			
Bit8	1: Deceleration stop			
Bit9～Bit15	N/A			

4.1.2 Status word 6041h

<table>
<tr><th colspan="2">mode / Data bit</th><th>CSP mode</th><th>PP mode</th><th>PV mode</th><th>HM mode</th></tr>
<tr><td rowspan="7">Low bit</td><td>Bit0</td><td colspan="4">Ready to start</td></tr>
<tr><td>Bit1</td><td colspan="4">Start</td></tr>
<tr><td>Bit2</td><td colspan="4">Enable</td></tr>
<tr><td>Bit3</td><td colspan="4">Error</td></tr>
<tr><td>Bit4</td><td colspan="4">Power on</td></tr>
<tr><td>Bit5</td><td colspan="4">Quick stop</td></tr>
<tr><td>Bit6</td><td colspan="4">Not started</td></tr>
<tr><td rowspan="4">High bit</td><td>Bit9</td><td colspan="4">Remote</td></tr>
<tr><td>Bit10</td><td colspan="3">0: Halt=0: Target position/velocity not reached;
Halt=1: Axle decelerates and stops;
1: Halt=0: Target position/velocity reached;
Halt=1: Axle velocity: 0;</td><td>0: Halt=0: Origin position not reached;
Halt=1: Axle decelerates and stops;
1: Halt=0: Origin position reached;
Halt=1: Axle velocity: 0;</td></tr>
<tr><td>Bit12</td><td>0: Slave station not follow command;
1: Slave station follows command;</td><td>0: Target position updateable;
1: Non-updatable target position;</td><td>0: Velocity not 0;
1: Velocity: 0;</td><td>0: HOME mode not completed;
1: HOME mode completed;</td></tr>
<tr><td>Bit13</td><td>Noneffective</td><td>Noneffective</td><td>Noneffective</td><td>Origin error</td></tr>
</table>

Note: The Halt shown in the above table refers to Bit8 of the control word 6040h.

4.2 Operating mode

Modes supported by this drive series:

Index	Subindex	Name	Description
6060h	00	Operating mode	0: Undefined; 1: Profile position mode (PP); 3: Velocity mode (PV); 6: HOME mode; 8: Cyclic synchronous position mode (CSP);

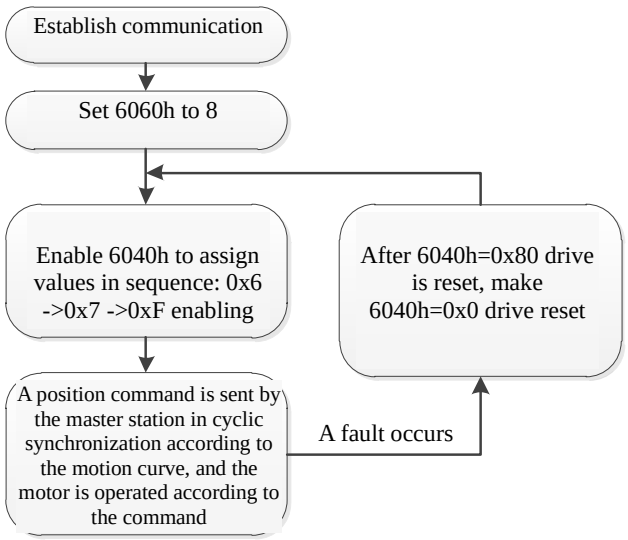
4.2.1 CSP mode (cyclic synchronous position mode)

When using the CSP mode, 6060h should be set to 8. When the 6061h register of the operating mode status object is read to 8, the operations related to the CSP operating mode will be allowed.

Under the CSP mode, the master station can be used to complete the position command planning, output the planned target position 607Ah, and at the same time, send the target position to the drive in a cyclic synchronization manner. The drive receives the planned commands from the master station in a synchronized cycle to achieve position and velocity control. This mode is suitable for multi-axis synchronous motion control. For the common object dictionary under the CSP mode, see the following table:

Index	Subindex	Name	Access Type	Data Type	Unit	Configuration suggestion	
6040h	00h	Control word	R/W	UINT	-	PDO	Necessary
607Ah	00h	Target position	R/W	DINT	Pulse	PDO	Necessary
6041h	00h	Status word	R	UINT	-	PDO	Necessary
6064h	00h	Actual position	R	DINT	Pulse	PDO	Necessary
603Fh	00h	Latest error code	R	UINT	-	PDO/SDO	Suggested
6060h	00h	Operation mode control	R/W	USINT	-	PDO/SDO	Configuring when required
6061h	00h	Operation mode status	R	USINT	-	PDO/SDO	Configuring when required
606Ch	00h	Actual velocity	R	DINT	Pulse/s	PDO/SDO	Configuring when required
60FDh	00h	Input IO status	R	DINT	-	PDO/SDO	Configuring when required
60B8h	00h	Probe control	R/W	UINT	-	PDO	Configuring when required
60B9h	00h	Probe status	R	UINT	-	PDO	Configuring when required
60BAh	00h	Latching position of Probe 1;	R	DINT	Pulse	PDO	Configuring when required

CSP mode control process



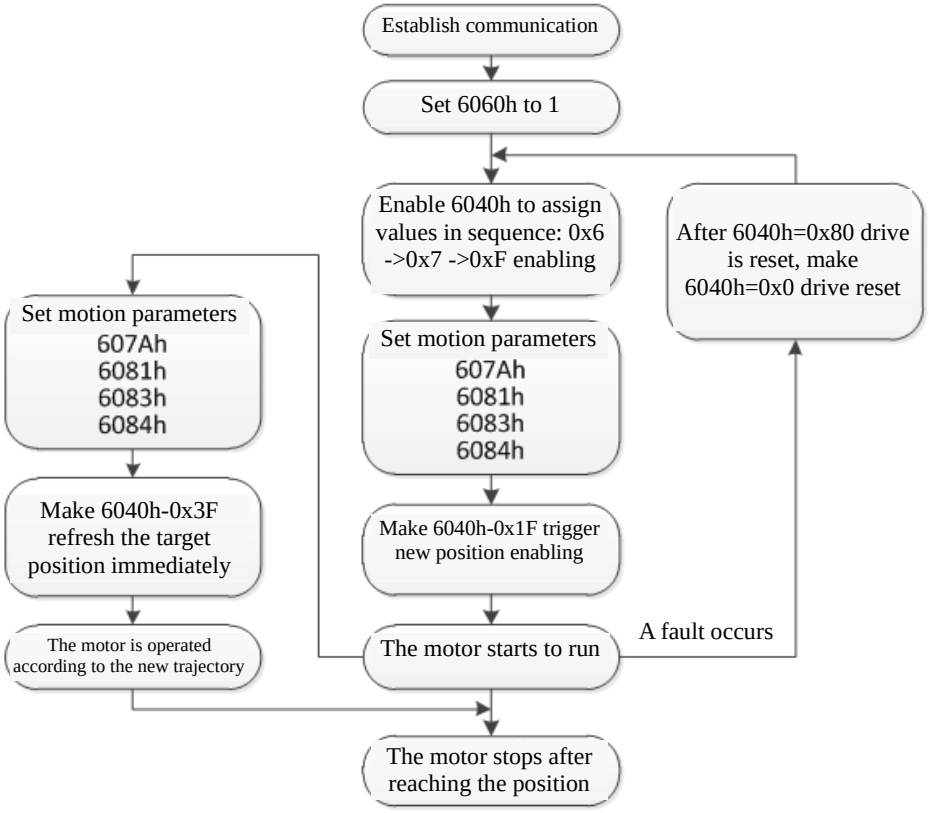
4.2.2 PP mode (profile position mode)

When using the PP mode, 6060h should be set to 1. When the 6061h register of the operating mode status object is read to 1, the operations related to the PP operating mode will be allowed.

This mode is mainly used for point positioning motion. Under this mode, the controller gives the parameters such as target position 607Ah, target velocity 6081h, acceleration 6083h and deceleration 6084h. The drive completes the trajectory planning according to the received motion parameters. For the common object dictionary under the PP mode, see the following table:

Index	Subindex	Name	Access Type	Data Type	Unit	Configuration suggestion	
6060h	00h	Operation mode control	R/W	USINT	-	PDO/SDO	Necessary
6061h	00h	Operation mode status	R	USINT	-	PDO/SDO	Necessary
6040h	00h	Control word	R/W	UINT	-	PDO	Necessary
607Ah	00h	Target position	R/W	DINT	Pulse	PDO	Necessary
6081h	00h	Position mode velocity	R/W	UDINT	Pulse/s	PDO	Necessary
6083h	00h	Acceleration	R/W	UDINT	Pulse/s^2	PDO/SDO	Necessary
6084h	00h	Deceleration	R/W	UDINT	Pulse/s^2	PDO/SDO	Necessary
6041h	00h	Status word	R	UINT	-	PDO	Necessary
6064h	00h	Actual position	R	DINT	Pulse	PDO	Necessary
603Fh	00h	Latest error code	R	UINT	-	PDO/SDO	Suggested
606Ch	00h	Actual velocity	R	DINT	Pulse/s	PDO/SDO	Configuring when required
60FDh	00h	Input IO status	R	DINT	-	PDO/SDO	Configuring when required
60B8h	00h	Probe control	R/W	UINT	-	PDO	Configuring when required
60B9h	00h	Probe status	R	UINT	-	PDO	Configuring when required
60BAh	00h	Latching position of Probe 1;	R	DINT	Pulse	PDO	Configuring when required

PP mode control process



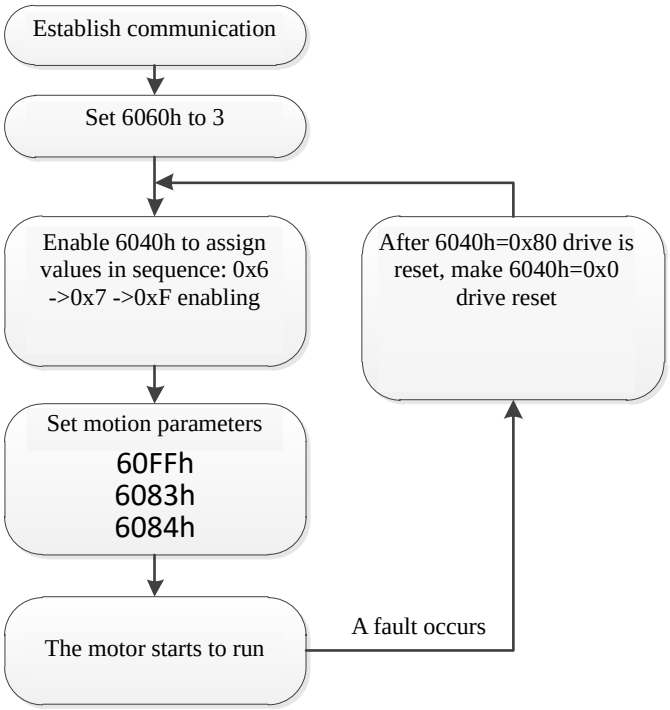
4.2.3 PV mode (velocity mode)

When using the PP mode, 6060h should be set to 3. When the 6061h register of the operating mode status object is read to 3, the operations related to the PP operating mode will be allowed.

The controller can send the target velocity 60FFh, acceleration time 6083h and deceleration time 6084h to the drive for completing the velocity curve planning internally. For the common object dictionary under the PV mode, see the following table:

Index	Subindex	Name	Access Type	Data Type	Unit	Configuration suggestion	
6060h	00h	Operation mode control	R/W	USINT	-	PDO/SDO	Necessary
6061h	00h	Operation mode status	R	USINT	-	PDO/SDO	Necessary
6040h	00h	Control word	R/W	UINT	-	PDO	Necessary
60FFh	00h	Target velocity	R/W	DINT	Pulse/s	PDO	Necessary
6083h	00h	Acceleration	R/W	UDINT	Pulse/s^2	PDO/SDO	Necessary
6084h	00h	Deceleration	R/W	UDINT	Pulse/s^2	PDO/SDO	Necessary
6041h	00h	Status word	R	UINT	-	PDO	Necessary
603Fh	00h	Latest error code	R	UINT	-	PDO/SDO	Suggested
606Ch	00h	Actual velocity	R	DINT	Pulse/s	PDO/SDO	Configuring when required
60FDh	00h	Input IO status	R	DINT	-	PDO/SDO	Configuring when required
60B8h	00h	Probe control	R/W	UINT	-	PDO	Configuring when required
60B9h	00h	Probe status	R	UINT	-	PDO	Configuring when required
60BAh	00h	Latching position of Probe 1;	R	DINT	Pulse	PDO	Configuring when required

PV mode control process



4.2.4 HOME mode (Return-to-origin mode)

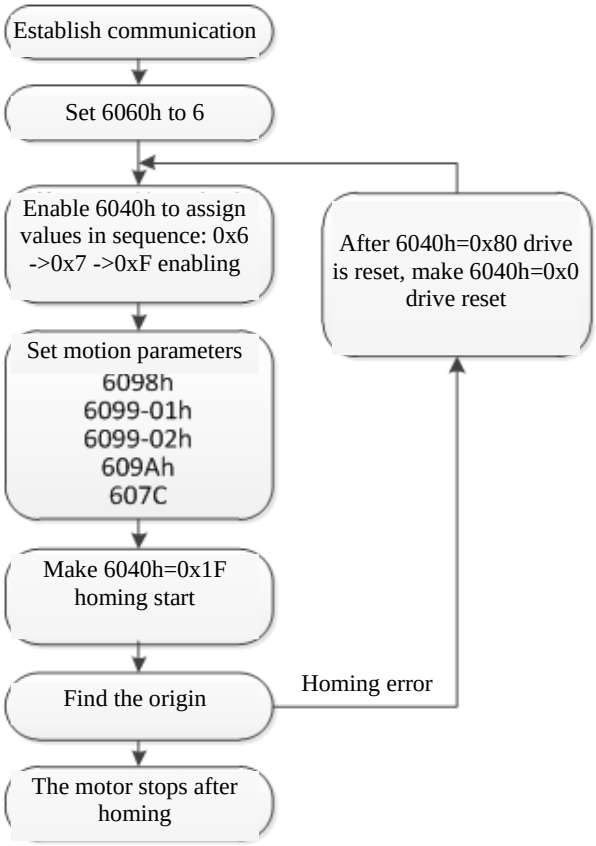
When using the HOME mode, 6060h should be set to 6. When the 6061h register of the operating mode status object is read to 6, the operations related to the HOME operating mode will

be allowed.

Under the HOME mode, the origin signal should be connected to the input terminal of the drive. The controller can be used to send the homing mode 6098h, homing high-velocity 6099-01h, homing creep velocity 6099-02h, and homing acceleration/deceleration 609Ah to the drive for searching and positioning the mechanical origin internally. At present, the drives support 6 homing methods, for the common object dictionary under the HOME mode, see the following table:

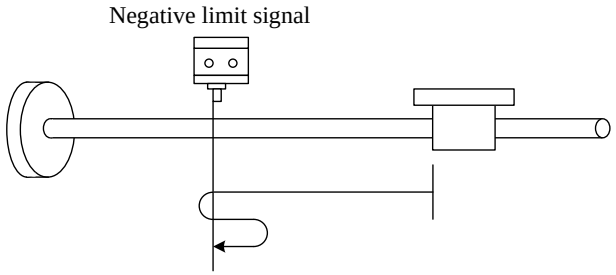
Index	Subindex	Name	Access Type	Data Type	Unit	Configuration suggestion	
6060h	00h	Operation mode control	R/W	USINT	-	PDO/SDO	Necessary
6061h	00h	Operation mode status	R	USINT	-	PDO/SDO	Necessary
6040h	00h	Control word	R/W	UINT	-	PDO	Necessary
6098h	00h	Homing mode	R/W	USINT	-	PDO/SDO	Necessary
6099h	01h	Homing high-velocity	R/W	DINT	Pulse/s	PDO/SDO	Necessary
6099h	02h	Homing creep velocity	R/W	DINT	Pulse/s	PDO/SDO	Necessary
607Ch	00h	Homing offset	R/W	DINT	Pulse	PDO/SDO	Necessary
609Ah	00h	Homing acceleration / deceleration	R/W	UDINT	Pulse/s^2	PDO/SDO	Necessary
6041h	00h	Status word	R	UINT	-	PDO	Necessary
6064h	00h	Actual position	R	DINT	Pulse	PDO	Suggested
603Fh	00h	Latest error code	R	UINT	-	PDO/SDO	Suggested
606Ch	00h	Actual velocity	R	DINT	Pulse/s	PDO/SDO	Configuring when required
60FDh	00h	Input IO status	R	DINT	-	PDO/SDO	Configuring when required
60B8h	00h	Probe control	R/W	UINT	-	PDO	Configuring when required
60B9h	00h	Probe status	R	UINT	-	PDO	Configuring when required
60BAh	00h	Latching position of Probe 1;	R	DINT	Pulse	PDO	Configuring when required

HOME mode control process

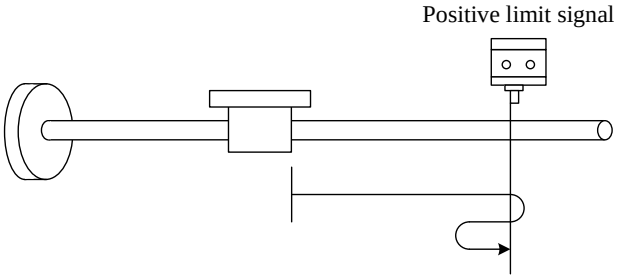


Homing mode description:

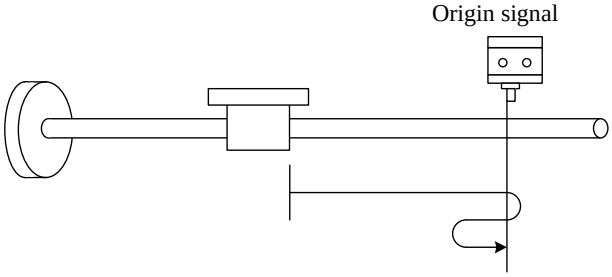
1. 6098h=17: Searching the negative limit signal in the negative direction. When a negative limit signal is found, just decelerate and stop and go back for a certain distance, and then search the negative limit signal in the negative direction at a slow velocity. When it is found, just stop, and now the homing operation can be considered as completed.



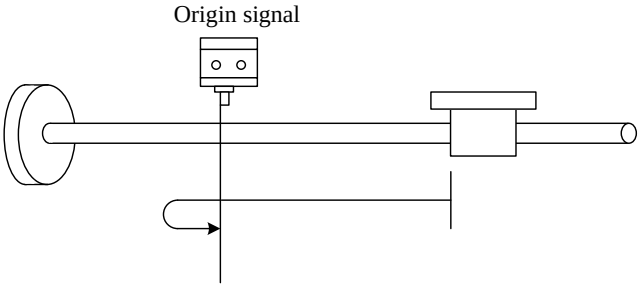
2. 6098h=18: Searching the positive limit signal in the positive direction. When a positive limit signal is found, just decelerate and stop and go back for a certain distance, and then search the positive limit signal in the positive direction at a slow velocity. When it is found, just stop, and now the homing operation can be considered as completed.



3. 6098h=24: Searching the origin in the positive direction. When the origin is found, just decelerate and stop and go back for a certain distance, and then search the origin in the positive direction at a slow velocity. When it is found, just stop, and now the homing operation can be considered as completed. When the positive limit is found during homing, go on to search the origin in the negative direction.



4. 6098h=29: Searching the origin in the negative direction. When the origin is found, just decelerate and stop and go back for a certain distance, and then search the origin in the positive direction at a slow velocity. When it is found, just stop, and now the homing operation can be considered as completed. When the negative limit is found during homing, go on to search the origin in the negative direction.



5. 6098 = 35 /6098 = 37. The current position is the origin. When using these two methods for homing, take the current position as the origin.

4.3 Position capturing function

The position capturing function can be triggered by a special probe signal (only DI1 and DI2 are high-velocity input ports, and the response can reach up to 5uS) to save the current position of the motor in the corresponding register. This function is usually used in high-velocity measurement or packaging applications. Each drive of this series is provided with two probe functions, which can be enabled at the same time. The related object dictionary is as follows:

Index	Subindex	Name	Access Type	Data Type	Unit
60B8h	00h	Probe configuration	R/W	UINT	-
60B9h	00h	Probe status	R	UINT	-
60BAh	00h	Latching position of rising edge of Probe 1	R	DINT	Pulse
60BBh	00h	Latching position of falling edge of Probe 1	R	DINT	Pulse
60BCh	00h	Latching position of rising edge of Probe 2	R	DINT	Pulse
60BDh	00h	Latching position of falling edge of Probe 2	R	DINT	Pulse
60D5h	00h	Latching counter of rising edge of Probe 1	R	UDINT	-
60D6h	00h	Latching counter of falling edge of Probe 1	R	UDINT	-
60D7h	00h	Latching counter of rising edge of Probe 2	R	UDINT	-
60D8h	00h	Latching counter of falling edge of Probe 2	R	UDINT	-

Before using the probe function, configure DO1 or DI2 as the probe function firstly, which can be completed through the following registers.

Index	Subindex	Name	Description	Configuration value	Parameter range
2310h	00	Terminal function	Input Terminal DI1 function selection	7	0~65535
2311h	00	Terminal function	Input Terminal DI2 function selection	8	0~65535

The probe function can be set through the probe configuration object dictionary, and the current operating status of the probe can be checked through the probe status object dictionary. The following table describes the specific configurations of the 60B8h object dictionary and the 60B9h object dictionary.

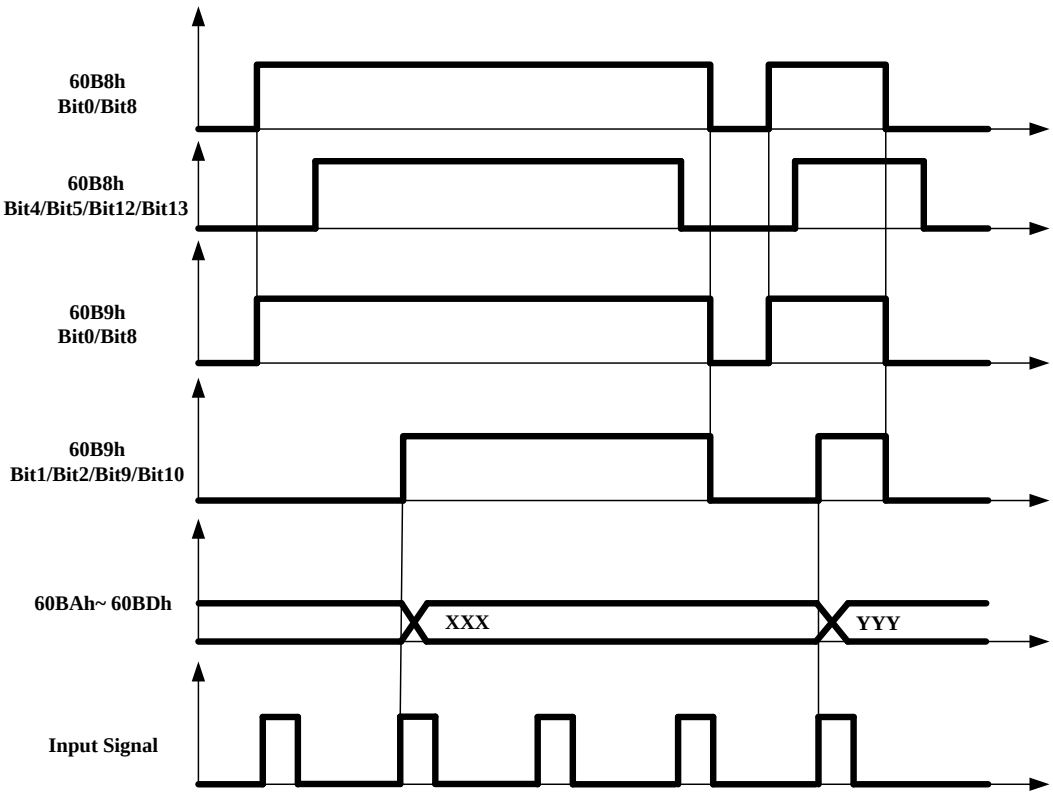
Index	Subindex	Function description	
60B8h	00h	Bit0	0: Disable Probe 1; 1: Enable Probe 1;
		Bit1	0: Single mode of Probe 1; 1: Continuous mode of Probe 1;
		Bit2~ Bit3	Reserved
		Bit4	0: Disable rising edge of Probe 1; 1: Enable rising edge of Probe 1;
		Bit5	0: Disable falling edge of Probe 1; 1: Enable falling edge of Probe 1;
		Bit6~ Bit7	Reserved
		Bit8	0: Disable Probe 2; 1: Enable Probe 2;
		Bit9	0: Single mode of Probe 2; 1: Continuous mode of Probe 2;
		Bit10~ Bit11	Reserved
		Bit12	0: Disable rising edge of Probe 2; 1: Enable rising edge of Probe 2;

		Bit13	0: Disable falling edge of Probe 2; 1: Enable falling edge of Probe 2;
		Bit14~ Bit15	Reserved
Index	**Subindex**	**Function description**	
60B9h	00h	Bit0	0: Probe 1 not in operation; 1: Probe 1 in operation;
		Bit1	0: Rising edge capture of Probe 1 uncompleted; 1: Rising edge capture of Probe 1 completed;
		Bit2	0: Falling edge capture of Probe 1 uncompleted; 1: Falling edge capture of Probe 1 completed;
		Bit3~Bit7	Reserved
		Bit8	0: Probe 1 not in operation; 1: Probe 1 in operation;
		Bit9	0: Rising edge capture of Probe 1 uncompleted; 1: Rising edge capture of Probe 1 completed;
		Bit10	0: Falling edge capture of Probe 1 uncompleted; 1: Falling edge capture of Probe 1 completed;
		Bit11~Bit15	Reserved

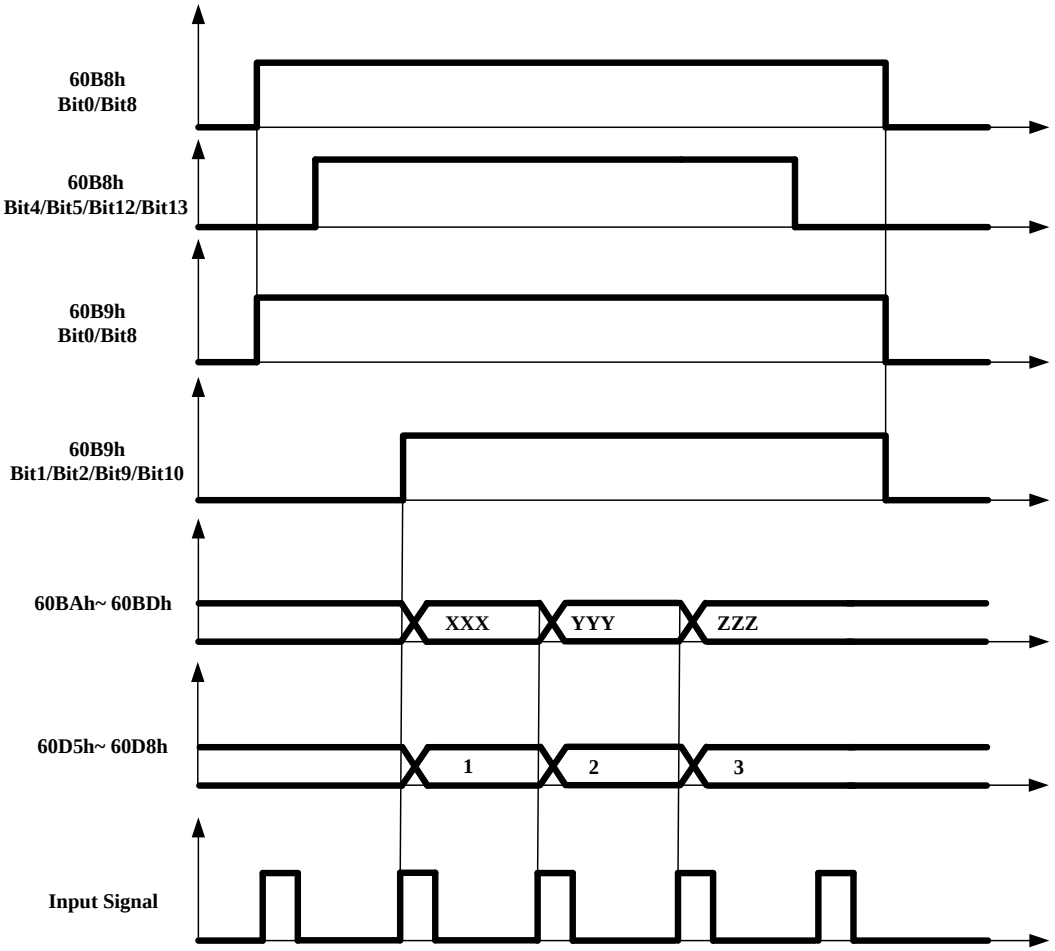
The probe has two operating modes: single mode and continuous mode, which can be controlled by Bit1/Bit9 of 60B8h. Under the single mode, the probe only captures the rising edge or falling edge signal once and latches the real-time position information into the 60BAh~60BDh object dictionary. Under the continuous mode, the probe captures each rising edge or falling edge signal, latches the real-time position information into the 60BAh~60BDh object dictionary and the number of captured signals into the 60D5h~60D8h object dictionary.

The enabling of the probe function is controlled by Bit0/Bit8 of 60B8h. The enabling command is: write "0" first, and then write "1" to allow a command trigger. When the probe function needs to be enabled again, use the command again. The following figure describes the operating diagram of the probe under single and continuous modes.

The operating mode of the probe under the single mode is as follows:



The operating mode of the probe under the continuous mode is as follows:



The above diagram only shows that the rising edge can trigger latching, the falling edge has a similar function, the difference is that latching can only be completed at the falling edge.

Chapter V Alarm processing

The alarm information is divided into drive alarm and communication alarm information.

The drive alarm information is shown in the following table:

Failure Code	Fault information	Fault cause	Solution
E1	Overcurrent	1. The motor power line is wrongly connected or short circuited. 2. The motor is damaged. 3. The internal circuit of the drive is faulty.	1. Check the motor power line. 2. Measure whether the A / B phase resistance of the motor is normal, and whether A and B phase are conductive to the motor housing. 3. Drive failure, send it back to the factory for maintenance.
E2	Overvoltage	1. The power supply voltage is too high. 2. The internal circuit of the drive is faulty.	1. Check the power supply and replace it if necessary. 2. Drive failure, send it back to the factory for maintenance.
E3	Undervoltage	1. The power supply voltage is too low. 2. The internal circuit of the drive is faulty.	1. Check the power supply and replace it if necessary. 2. Drive failure, send it back to the factory for maintenance.
E5	Out-of-tolerance	1. The motor power line is wrongly connected or subject to loose contact. 2. The encoder wire is disconnected or subject to loose contact. 3. The set position deviation limit 230Dh is too low. 4. Too fast motor velocity. 5. Too heavy load or seized up.	1. Check the motor power line for being disconnected or subject to loose contact. 2. Check the encoder wire for being disconnected or subject to loose contact. 3. Set the position deviation limit 230Dh to a higher value. 4. Lower the motor velocity. 5. Check whether the device is seized up, or whether an alarm occurs during the idle motor operation test.

The communication alarm information is shown through LED, see the following table:

Name	Color	Status	Description
ERR	Tangerine	OFF	Error-free
		Slow flash	Communication setting error
		Single-flash	Synchronization error or communication data error
		Double-flash	Watchdog request timeout