Chapter 1
Safety operation

1.1Cautions before use

1.2 Cautions for cabling and service

1.3 Notices on operating ambient

1.4 Product installation

1.5 Criteria for part replacement

1 Safety Operation

To avoid personal injury and property damage, please read the following information before installation.
The following safety rules must be strictly observed at all times.

1.1 Cautions before use

- Please read operating manual!
- Observe safety guidelines strictly.
- Comply with electrical installation standards, e.g. cross sectional area of wires and earthing.
- Do not touch the electronic components and contactor (Static electricity can damage electronic components.)
- To avoid personal injury and property damage, only qualified electrical engineers can operate the servo system.
- Disassembling or servicing of the drive is prohibited.

Icons in operating manual

Safety prompts will map the following danger levels.

Danger levels indicate the risks caused by nonobservance of safety prompts.

	Danger	Non-compliance will result in serious consequences.
	Warning	Non-compliance may have dangerous consequences.
	Caution	Indicate the operation must be performed.

1.2 Cautions for cabling or servicing

Wiring or repair work

- Disconnect the power source before cabling or servicing.
- In 10 minutes after cut-off of power source, the drive still exists the risk of high voltage.It should wait for more than 10 minutes until the charge indicator (CHG) goes off to start wire disconnection or service for the drive and motor, or it may cause damage of the drive or personal injury;
- Do not perform earthing work when drive and motor are running to avoid possible risk of electric shocks；

- Before connection and check of the drive, use a multi-meter to measure the drive's voltage and make sure it is in a safe range.
- Servo drive and servo motor must have reliable earthing.
- The wire diameter of ground lead should be greater than(or equal to) the wire diameter applied to main loop. If it is not available to adopt dedicated earthing, an alternative way is to connect its earth connection point to the common earthing terminal for the machine.

- Connection and service should be done by qualified technicians.
- Correct and reliable wiring should be provided , or it will damage or cause malfunction of servo drive.

Connection of main power circuit

- Wires of main power circuit（R, S, T）and the signal wire should be laid separately, they can not pass through the same conduit or bundle together.
- All wiring should be connected in the shortest distance, the shorter the better.
- It is recommended to fix noise filter to avoid malfunction caused by interference and pay attention to the followings:
  - Noise filter should be fixed nearby the servo drive.
  - Surge suppressor should be installed in the coils of relay, electromagnetic contactor and brake.
- Insulating transformer should be applied to the input supply to avoid malfunction due to interference in case there are intensive interference sources （such as welding machine, EDM machine etc.）are located nearby. If the power grid condition is quite poor, in addition to the use of insulating transformer, an alternating current filter should be added at the input terminal.
- None burnt-out breaker（ NFB）should be installed to enable on-time cutoff of external power supply in case of drive error.
- All inductive units around same power line such as relay, contactor, solenoid etc. should take measures to avoid generation of surging(e.g. add R-C absorb loop or absorber diode at side of DC coil).

- Lead-in switch should be fixed at the input side of the main loop.
- KT270 - H - 20 allows single-phase or 3-phase AC 220V main input. KT270 - H - 30、KT270-H-50、KT270-H-75 allows 3-phase AC 220V main input only.
- KT270-H–20 、 KT270-H-30 、 KT270-H-50 are provided with internal regenerative discharge resistor, so there is no need to connect external ones.

Wiring of motor power line

- No external voltage is allowed to be accessed to the output terminals (U, V, W,) to prevent the servo drive from damage.
- Special attention should be paid to make correct connection at terminal R, S, T at input side and terminal U, V, W at output side.

- Do not try to connect any electronic or electric element（such as contactor, absorber, inductor etc.) in series or in parallel to the power lines（i.e. U、V、W、E）between the drive and the motor.
- Connect outlet terminal U, V, W and the terminal U, V, W of servo motor with right phase sequence. Unlike the asynchronous motor, you are not allowed to reverse the motor by changing over 3-phase terminals.

Input / output wiring for control

- Signal line of the control should not input the voltages exceeding their respective specifications, or the drive will damage.

- Wiring for all control signals should be as short as possible (.
- All signal wires should be laid out in separation of the motor power line to avoid inductive interference.
- In case of long distance wiring, small signal relay can be employed for transfer.
- Cable shielding layer should be connected correctly.

Wiring of encoder

- The power lines of the motor encoder should be connected correctly, or the motor encoder and drive will damage.
- Encoder plugs should not be connected or disconnected when the drive is powered on.

- To avoid induction interference, the encoder signal lines and power lines to separate, not parallel layout.
- If there is a difficulty to separate the power line and signal line, the signal line should be shielded by threading it through metallic conduit.
- Phase sequence on the encoder should be same as that on the motor. In case of phase sequence error, the motor may run in reversal rotation or with malfunction.

1.3 Notices on operating ambient

Environmental extremes nearby the drive

In case of operation at environmental extremes, the servo drive may contact corrosion gases, moisture, metallic dust, water and processing liquid leading to malfunction. During setup, protective measures should be taken to guarantee the working environment for the drive. Product KT270-H-20-V、KT270-H-30-V、KT270-H-50-V、KT270-H-75-V 或 KT270-H-20-A、KT270-H-30-A、KT270-H-50-A、KT270-H-75-A are available.

Higher ambient temperature nearby the drive

Ambient temperature has great relationship with the service life of the driver. The heating generated by the electric devices and the heat dissipation conditions in the electric control cabinet will impact the ambient temperature nearby the servo drives. For cabinet design, heat sink cooling for servo drive and arrangement within the cabinet should be under full consideration to ensure an ambience temperature within 50℃ and relative humidity below 90% for the servo drive.

Heat-generating equipment nearby the servo drive

Working at hot conditions will reduce the service life of the servo drive and bring malfunctions. Due to that, if the servo drive is working under thermal convection and thermal-radiating conditions, an ambient temperature below 50℃ should be guaranteed.

Jamming equipment nearby the servo drive

If the servo drive is located nearby jamming equipment, great interference effect will impact the power line and control line of servo drives leading to malfunction. Additional noise filter and different kinds of anti-jamming measures may be employed to ensure proper working of servo drives. It should be noted that the drain current will increase when noise filter is added. To avoid this situation, insulating transformer may be applied. Special attention should be paid to the disturberance applied to the control signal line of the servo drive, reasonable cabling and shield measure are recommended.

Ionic radiation and non-ionic radiation nearby the drive

If radiation sources(i.e. microwave, ultraviolet radiation laser, x-ray） exist around the drive, isolation measures should be adopted to the drive to avoid drive malfunction or accelerated ageing of insulation.

Poor quality of power grid for the drive

Too low or too high mains voltage will lead to malfunction of the drive, it is recommended to add 3-phase voltage stabilizer to guarantee proper performance of the drive.

Drives with fans

If running in the environment with cotton wool and other debris , the users should clear the debris regularly, so as not to affect the normal operation of the drive.

Shaker apparatus nearby the servo drive

All measures should be taken to protect the servo drive from vibration effect while the vibration effect should be controlled within 0.5G (4.9m/S2).

1.4 Product installation

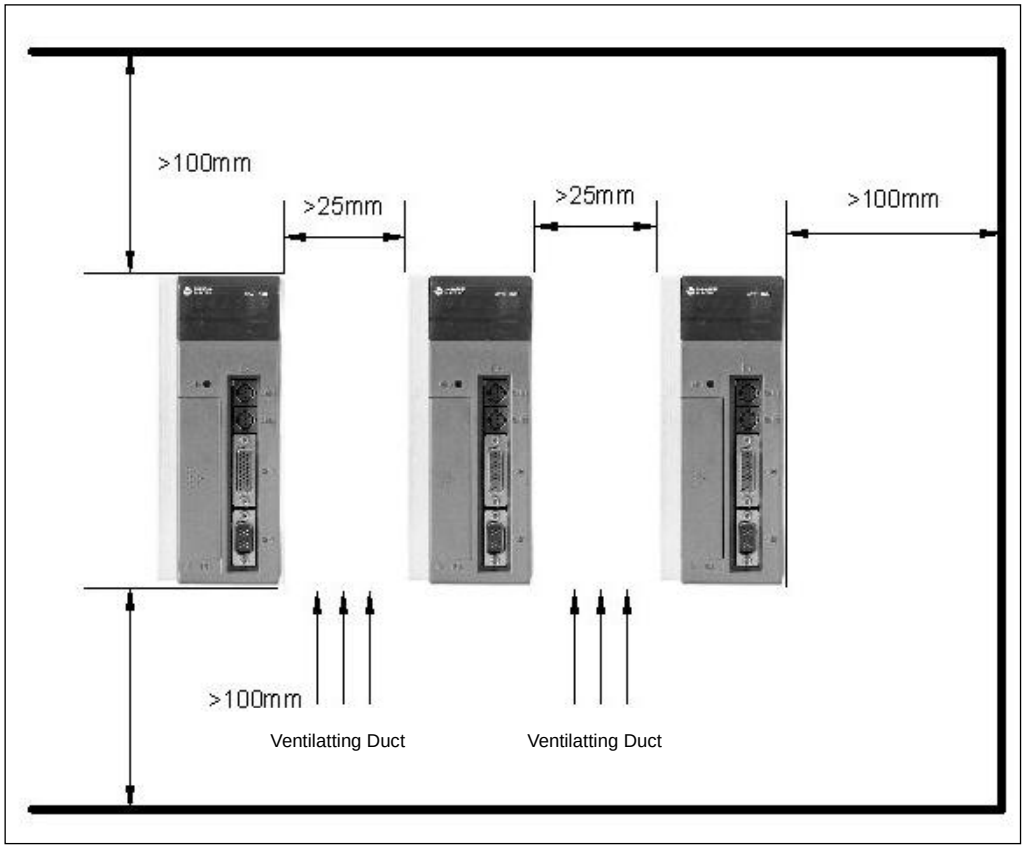


Fig. 1.1 Installation diagram for the drive

Setup of servo drives

- Please use this product in the stated application environment.
- Please install the product in the site that is able to carry the weight of the product.
- The product should be installed on a non-flammable substance to ensure that no flammable and easy conductive material surrounding it.

- Do not let the screws, drilled debris or other conductive substances fall into the product.
- Do not infiltrate liquid substances such as water, oil etc. into the product.
- Do not install this product on the moving objects to prevent products from shocks.
- If this product needs to be installed in a special or dangerous environment, please consult our company.

- Normal install orientation of the servo drive should be in vertical erection.
- Use three M5 screws for installation of drives KT270-H-20 & KT270-H-30；Use four M5 screws for installation of drives KT270-H-50 & KT270-H-75
- Make sure the vents are always unblocked.
- If the servo drive is installed in electric cabinet, it is recommended to install radiator fan in the cabinet to guarantee a wind blowing in vertical direction to the radiator of servo drive for sound heat emission.
- For cabinet mounting, special devices should be applied to keep the servo drive free of dust, cotton wool or iron chips.
- The spacing distance between the servo drives and other devices may be referred to Fig. 1.1. Note that the marked size is the min. value. To ensure a long service life and performance of the servo drives, it is recommended to reserve sufficient spaces during installation.
- For installed drive the min. level above the floor should be 0.5 M to facilitate wiring.

Setup of servo motors

- Servo motor should be fixed to the machine firmly.
- Do not knock the shaft of servo motor and encoder enclosure to avoid damage of encoder.
- The motor shaft of servo motor should not be overloaded, or the motor shaft may be damaged.
- Try to connect terminals of the motor in facedown direction, so that it may prevent liquid from flowing into the motor along the cable.

1.5 Criteria for part replacement

The parts in Table 1.1 may have mechanical wornout and/or aging. Please replace them periodically to lock the safe.

Table 1.1 Periodic replacement of the parts

Part name	Standard period for replacement	Method for replacement
Cooling fan	2～3 Y	New part
Relays	100K trigger	New part
Electrolytic capacitor on PCB	2～3 Y	New part

Chapter 2
Product Type and Specification

2 Product type and specification

2.1 Product confirmation

Read the following description upon receipt of the product

- Make sure that the servo drive and motor model are identical to that for ordering.
- After unpacking of the product, make sure the product has no abnormal phenomena. For instance, breakage or part missing etc.
- Make sure all screws on the motor and drive are tightening.

If you have unusual problems, please contact our company immediately.

2.2 Description on drive and motor types

2.2.1 Description of drive model

KT	270	—	H	D	—	20	Z	ZS	—	V	—	SEC
①	②		③	④		⑤	⑥	⑦		⑧		⑨

①	Name of company	Abbreviation of company name（Capital)
②	Servo drive type	270: Main power supply R、S、T should be 220VAC supply voltage
③	Modification serial number	H: Serial number for modification （E,F,G,H etc.）
④	Software type	None: General purpose drive A: Enhancements C: Single axis NC controller D: Control for servo turret M: Control for gate hoist
⑤	Specification of drive	20: Maximum output 1.2KW 30: Maximum output 2.2KW 50: Maximum output 3.7KW 75: Maximum output 5.5KW
⑥	Functional classification	None or Z: standard configuration
⑦	Special hardware	None or Z: Standard configuration L: 8-line photoelectric encoder interface (line-save type) D/ZD: With dynamic brake function R: a pair of pole resolver S/ZS: Special power requirement RA: Possess the delay function upon power-cut of control power and a pair of pole resolver

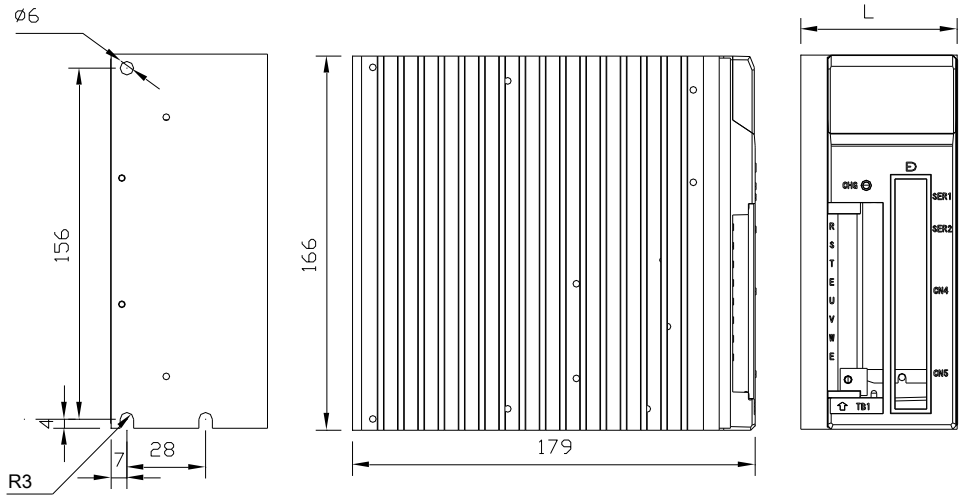
⑧	Moisture-proofing and dust-proofing	None: No special treatment V: Varnish paint for PCB only A: Seal treatment for drive enclosure
⑨	Application type	No: General purpose SEC: Apply to SEC brand name

2.2.2 Description on servo motor types

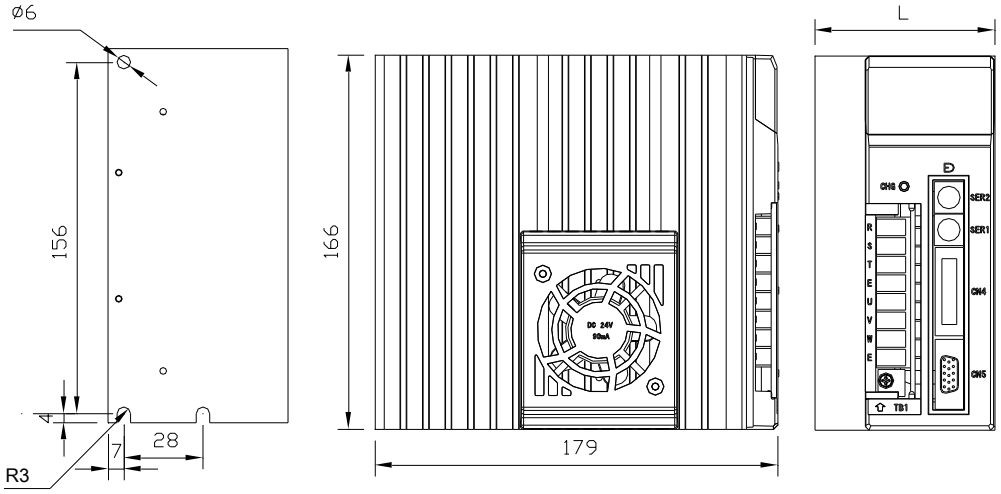
80	SM	—	4	M	013	30	X	—	F	E	6	—	b	XXX
(1)	(2)		(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)		(11)	(12)

(1)	Motor OD	Unit: mm
(2)	Servo motor type	DM,HM,SM， CM series
(3)	Number of motor poles	4: 4 poles 6: 6 poles 8: 8 poles 10: 10 poles
(4)	Voltage class	M: 300V
(5)	Motor torque	Expressed in three digits ×0.1，Unit：Nm
(6)	Rated motor speed	Expressed in 2 digits ×100，Unit：rpm
(7)	Serial number of motor modification	No indicated no upgrading (each upgrade will be denoted as A, B, C, D, ... in sequence)
(8)	Feedback element	F: optical encoder (2500P/R) L: line-saving optical encoder R: a pair of pole resolver
(9)	Brake	B: with brake E: without brake
(10)	Motor installation	N/A: IM B5 6: IM B35
(11)	Extended shaft	N/A or a: plain shaft B: Shaft with enclosed keyway，with standard flat key C: Shaft with forelock keyway，with standard flat key Y: Nonstandard shaft with keyway (customized)
(12)	Special requirement	

2.3 Physical dimension of drives



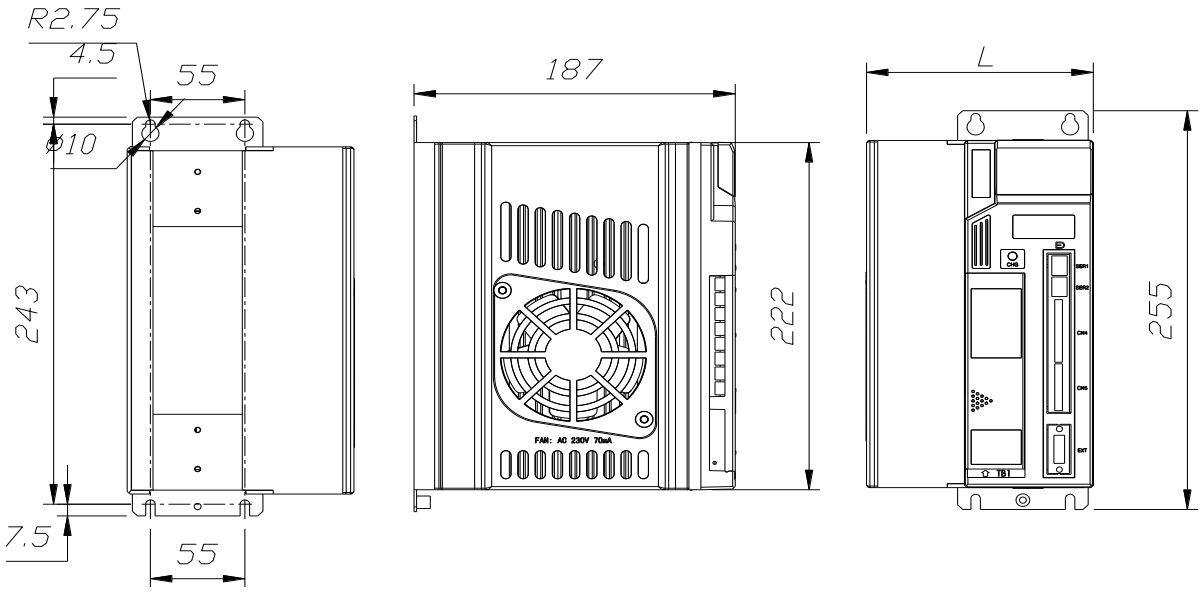
KT270-H-20



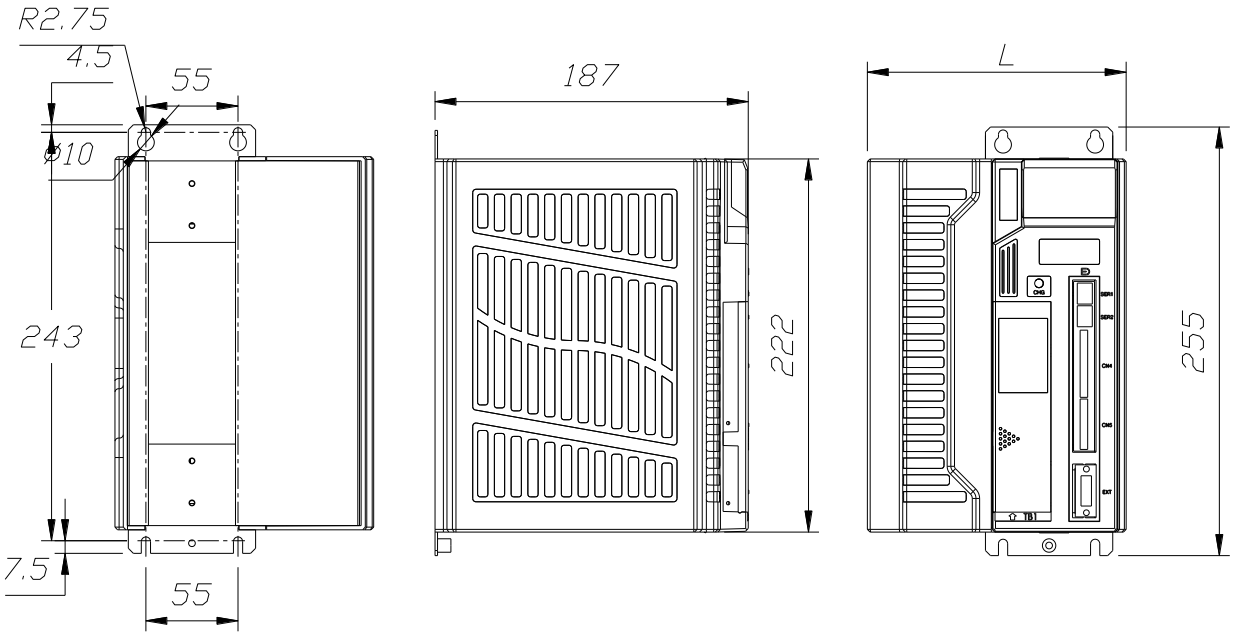
KT270-H-30

Servo drive type	L(mm)
KT270-H-20	70
KT270-H-30	90

2 Product type and specification



KT270-H-50



KT270-H-75

Servo drive type	L(mm)
KT270-HX-50	132
KT270-HX-75	154.5

2.4 Specification of drive

Servo drive type		KT270-HX-20	KT270-HX-30	KT270-HX-50	KT270-HX-75
Power output （KW）		**1.2**	**2.2**	**3.7**	**5.5**
Current output （A）		**6.0**	**9.0**	**16.0**	**25.0**
Applied motor type		See Chapter 8 for motor specification			
Input power supply		Single-phase or three phase	Tree phase		
		AC220V (-15%~+10%) 50~60Hz			
Operating ambient	Temperature	Service:0~50 °C Storage:-20 ℃ ~65 ℃			
	Humidity	Less than 90%(Without moisture condensation)			
	Altitude	≤1,000M			
	Vibration	Less than 0.5G(4.9m/S2),10~60Hz(Discontinuous operation)			
Feature	Speed frequency response	200 Hz or higher			
	Velocity fluctuation rate	<0.03(load 0~100%); <±0.02(power supply -15~+10%)(Value is mapping to rated speed)			
	Speed regulation ratio	1：5000			
	Pulse frequency	≤500kHz（Differential ）200kHz（Single end ）			
Control method		Adopt digitalized AC sine wave control method and PWM control is realized by optimized PID algorithm			
Control mode		① Position control ②Speed control ③Trial run ④JOG movement（Refer to description on parameter PA4 ）			
Position control	Instruction source selection	PP（Programmable single axis NC function ）、PR（Selection of internal location register ）、PT（External impulse terminal ）			
	Pt Input mode	①Command impulse + sign ②Positive run/reverse run pulse ③Diphase orthogonal instructed impulse			
	Input electronic gear	1~32767/1~32767			
Speed control	Instruction source selection	External simulation speed instruction / 4 built-in speeds			
	Acceleration/deceleration control	Parameter setting 1~10000ms/1000r/min			

2 Product type and specification

Servo drive type	KT270-HX-20	KT270-HX-30	KT270-HX-50	KT270-HX-75
Input interface signal	①Servo startup ②Alarm cleanup ③Positive rotation disable ④Reverse rotation disable ⑤Bias counter "0" reset ⑥Command impulse disable ⑦Speed selection 1 ⑧Speed selection 2 Etc, customized by parameter setting.			
Output interface signal	①Servo ready ②Servo alarm ③Achieve positioning ④Reach speed Etc. can be customized by parameter setting.			
Position output signal	Electronic gear output available to set output impulse multiplying factor, and open collector output mode for Z phase in addition			
Communication function	RS485（According to MODBUS RTU protocol））			
Motor position feedback interface	14-line incremental optical encoder 2500P / R with U、V、W position signal (standard) 8-line line-saving optical encoder (applied to KT270 - XX - XXZL drive） a pair of pole resolver (applied to KT270-HX-XXZR drive）			
Protection function	Overcurrent, short circuit, overload overvoltage / undervoltage of main power circuit, abnormal brake, abnormal encoder, overspeed, out-ranged position etc.			
Monitor function	Rotation rate, current position, position instruction, position deviation, motor torque, motor current, linear speed, position command impulse frequency, rotor absolute position, input/output terminal signal, running status etc.			
Regenerative braking resistor	Built-in(60W,40Ω)		Built-in(20Ω /150W)	Built-out(22Ω /300W)
Applied load inertia	Less than five times of motor inertia (note2)			
Operation	6-digit LED nixie tube, 4 keys			
Weight	2kg		4kg	5kg

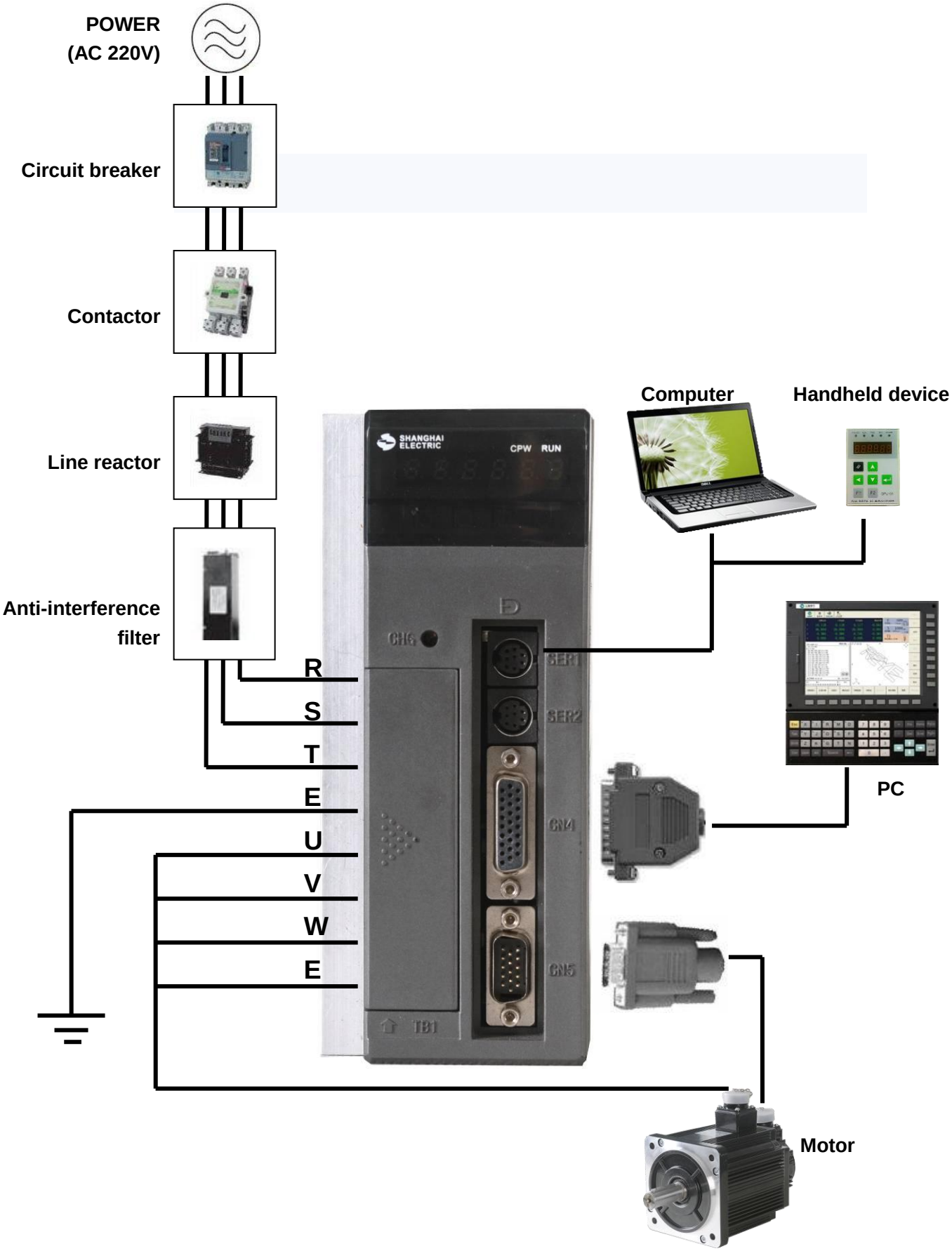
Note1：Product model "X" represents any letter or number.

Note2：When 400W and 750W motor are adopted, the applied load inertia may be less than 15 times of motor inertia.

Chapter 3
Signal and Wiring

3 Signal and Wiring

3.1 Peripheral device wiring description



3.2 Cable specifications and length

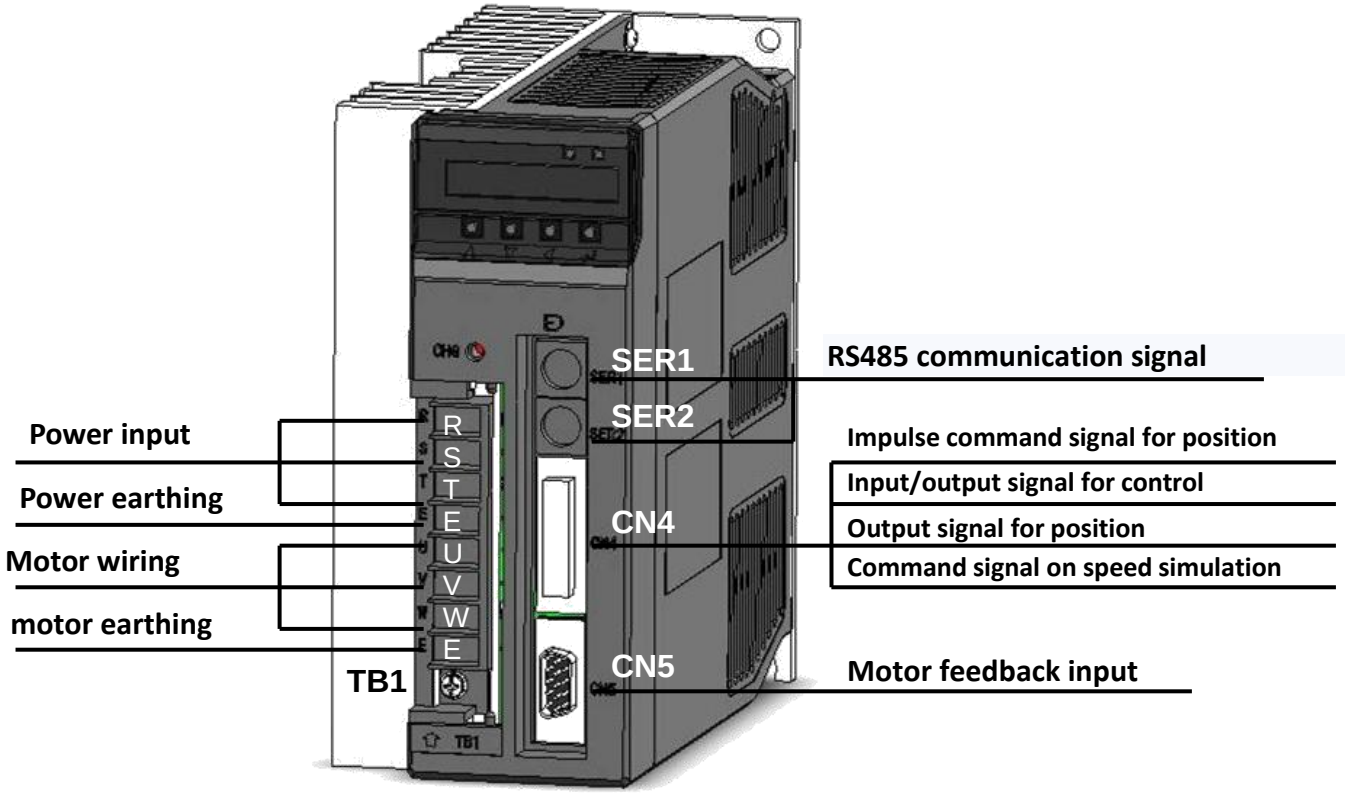


Table 3.1 Size of line diameter

Terminal	Item	Recommended length(m)	Line diameter applied (mm^2) KT270-H				remarks
			-20	-30	-50	-75	
TB1	Power input	-	1.5	2	2.5	4	The diameter of wire can be calculated according to 30 M wiring distance. Adopt the wire that can withstand over 600V voltage.
	Motor wiring						
	earthing						
	External regeneration discharge resister	Max. 1	-	-	-	2.5	
	Control power	-	-	-	Over 0.5		
CN4	Impulse command signal for position	-	more than 0.3				4-core twisted shielded line
	Input/output signal for control	Max. 10	more than 0.2				Shielded line
	Output signal for position	Max. 5	more than 0.2				Twisted shielded line
	Command signal on speed simulation	Max. 5	more than 0.3				2-core twisted shielded line
CN5	Motor feedback input	Max. 30	more than 0.2				Twisted shielded line
SER	RS485 communication signal	Max. 5	more than 0.2				Twisted shielded line

3.3 Signal wiring description

1. In the form hereinafter, (P mode) indicates position control mode, (S mode) indicates speed control mode.

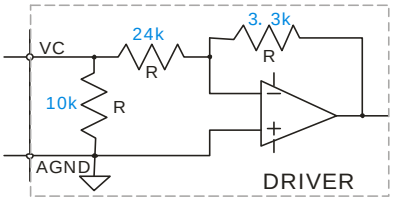
2. Positive rotation indicates counter clockwise rotation in view of axial direction of servo motor.
Reversal rotation indicates clockwise rotation in view of axial direction of servo motor.

1) Power/motor terminal (**TB1**)

KT270-H			TB1	Description	Interface	
-20/30	-50	75			Input	Output
	L11	L11	L11、L21	Control power input	●	
	L21	L21				
R	R	R	R、S、T	Three-phase AC supply input	●	○
S	S	S				
T	T	T	P、B	External regeneration discharge resister		
E		P				
		B				
U	E	E	U、V、W	Wiring of motor power line	○	●
V						
W	U	U				
E	V	V				
	W	W	E	Power ground or motor ground		
	E	E				

Single-phase AC220V power input should be connected to TB1- R, TB1- S. This method is applied only for KT270 - H - 20 driver.

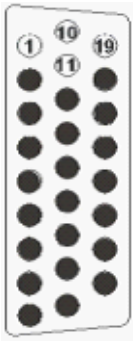
2) Analog input interface (**CN4**)

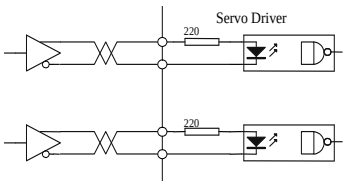
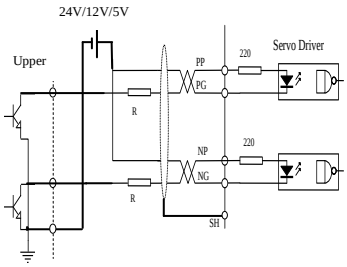
CN4	Definition	Description	Mode		Interface		Type of interface
			P	S	Input	Output	
9	VC	Speed command	○	●	●	○	
18	AGND-	Signal common port	—	—	—	—	

Notices:

The scope of analog input voltage is ±10V. Its corresponding r.p.m should be defined by parameter PA43，direction of rotation should be defined by parameter PA44 while zero deviation should be compensated by parameter PA45.

3) Impulse input signal interface for position (**CN4**)



CN4	Definition	Description	Mode		Interface		Type of interface
			P	S	Input	Output	
1	PULS+	External impulse/ Positive pulse	●	○	●	○	
11	PULS-		●	○	●	○	
10	SIGN+		●	○	●	○	
19	SIGN -	External impulse direction/ Reverse pulse	●	○	●	○	Differential drive mode of impulse input interface  Single-ended drive mode of impulse input interface

Notices:

(1) It is recommended to adopt differential driver mode to transmit impulse data correctly.

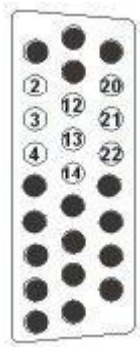
(2) In differential driver mode, it should adopt AM26LS31, MC3487 or similar RS422 line driver;

(3) Single-ended drive mode will reduce the action frequency. Define the value of resistance R as per to the conditions i.e. impulse input circuit, 10- 15mA driver current and max. 25 V of external power supply. Empirical data: VCC=24V, R=1.3~2k; VCC=12V, R=510~820Ω; VCC=5V, R=82~120Ω.

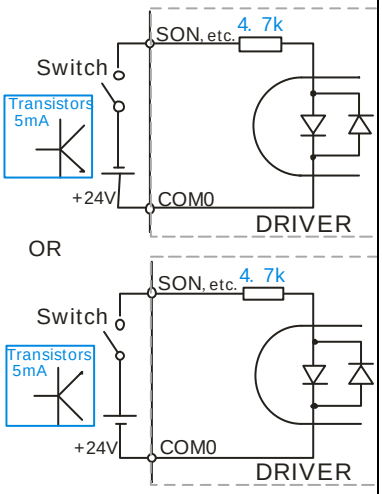
(4) When Single-ended drive mode is adopted, external power supply should be provided by the user. However, attentions should be paid to correct connection of the power polarity, or the servo driver may be damaged.

(5) Detailed impulse input forms may refer to Chapter IV parameters PA14.

4) Input signal interface for control (**CN4**)

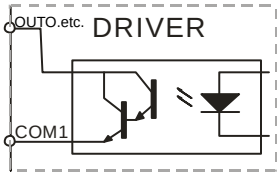


CN4	Definition	Meaning	Description		Mode P	Mode S	Interface Input	Interface Output	Type of interface
2	IN0	SON	PB46		●	●	●	○	
12	IN1	RES	PB47		●	●	●	○	
3	IN2	LSP	PB48		●	●	●	○	
13	IN3	LSN	PB49		●	●	●	○	
4	IN4	CLE	PB50		●	○	●	○	
		SC1			○	●	●	○	
14	IN5	INH	PA53=0	PB51	●	○	●	○	
		DEG	PA53=1		●	○	●	○	
		SC2			○	●	●	○	
21	IN6	TL+	PA55=0	PB52	●	●	●	○	
		ST1	PA55=1		○	●	●	○	
		ISC	PA55=2		○	●	●	○	
		CMC	PA55=3		●	●	●	○	
22	IN7	TL-	PA55=0	PB53	●	●	●	○	
		ST2	PA55=1		○	●	●	○	
		RDC	PA55=2		●	●	●	○	
20	COM0	COM0	Input common terminal		—	—	—	—	



5) Output signal interface for control (**CN4**)

CN4	Definition	Meaning	Description		Mode P	Mode S	Interface Input	Interface Output	Type of interface
5	OUT0	RD	PB56		●	●	○	●	
15	OUT1	ALM	PB57		●	●	○	●	
24	OUT2	INP	PB58		●	○	○	●	
		SA			○	●	○	●	
6	OUT3	CDO	PA56=0	PB59	●	●	○	●	
		TDO	PA56=1		●	●	○	●	
		ZSP	PA56=2		●	●	○	●	
		OUT_Z	PA56=3		●	●	○	●	
		MBR	PA56=4		●	●	○	●	
23	COM1	COM1	Output common terminal		—	—	—	—	



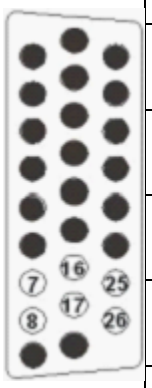
Notices:

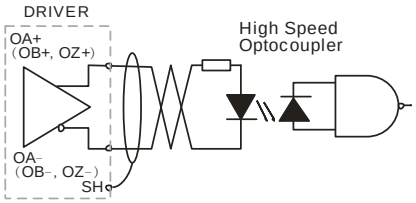
(1) The user should provide external power supply DC+24V with current ≥ 200mA. When the power source is connected to the digital output interface, if the polarity of the power source is connected in reverse, it will damage the servo driver.

(2) The output adopts open collector format. Each output point can withstand max. 50mA current and max. 25V voltage. Therefore, the load of digital output signal should meet with the restricted requirement. If it exceeds the requirement or the output is connected to the power source directly, the servo driver may be damaged.

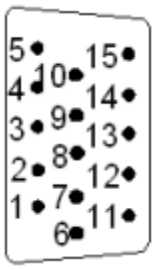
(3) If the load is of inductive load from relays, both ends of the load should connect a free-wheeling diode in parallel. In case of reversed connection of free-wheeling diode, the servo driver may be damaged.

6) Encoder signal output interface (**CN4**)

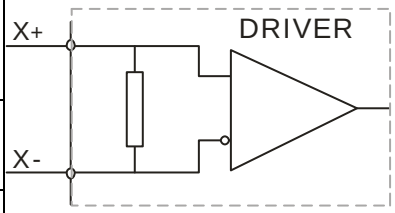


CN4	Definition	Description	Mode		Interface		Type of interface
			P	S	Input	Output	
7	OA+	A-phase pulse (differential line driver)	●	●	○	●	
16	OA-		●	●	○	●	
8	OB+	B-phase pulse (differential line driver)	●	●	○	●	
17	OB-		●	●	○	●	
25	OZ+	Z-phase pulse (differential line driver)	●	●	○	●	
26	OZ-		●	●	○	●	
Metal shell	SH	Shield	—	—	——	——	

7) Motor encoder feedback interface : Photoelectric encoder 2500 P/R(at driver) (**CN5)**

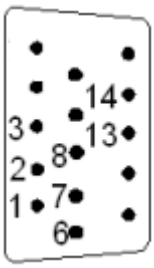


CN5	Definition	Description	Mode		Interface		Type of interface
			P	S	Input	Output	
1	PHA	Phase A impulse of encoder	●	●	●	○	
6	PHAR						
2	PHB	Phase B impulse of encoder	●	●	●	○	
7	PHBR						
3	PHZ	Phase Z impulse of encoder	●	●	●	○	
8	PHZR						
4	PHU	Phase U signal for position detection	●	●	●	○	
9	PHUR						
5	PHV	Phase V signal for position detection	●	●	●	○	
10	PHVR						
11	PHW	Phase W signal for position detection	●	●	●	○	
12	PHWR						
13	+5V	Power source	—	—	○	●	
14	DGND	Digital signal earthing	—	—	○	●	
Metal shell	SH	Shield	—	—	—	——	

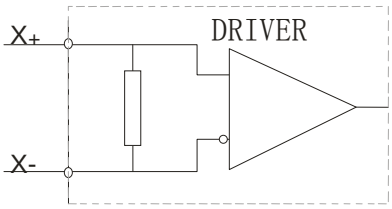


X=A,B,Z,U,V,W

8) Motor encoder feedback interface : Line-saving photoelectric encoder (at driver) (**CN5**)(only applicable to KT270-HX-XXZL)

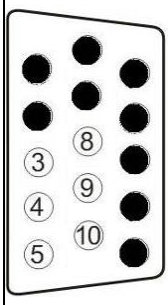


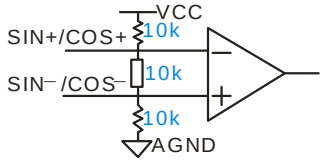
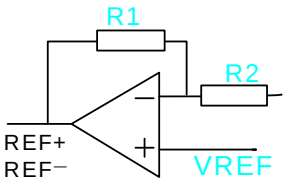
CN5	Definition	description	Mode		Interface		Type of interface
			P	S	Input	Output	
1	PHA	Phase A pulse of encoder	●	●	●	○	
6	PHAR						
2	PHB	Phase B pulse of encoder	●	●	●	○	
7	PHBR						
3	PHZ	Phase Z pulse of encoder	●	●	●	○	
8	PHZR						
13	+5V	Power source	—	—	○	●	
14	DGND	Digital signal earthing	—	—	○	●	
Metal shell	SH	Shield	—	—	—	—	



X=A,B,Z

9) Motor position feedback interface: Resolver (at driver) (CN5) (only applicable to KT270-HX-XXZR)



CN5	Definition	Description	Mode		Interface		Type of interface
			P	S	Input	Output	
9	SIN+	Resolver feedback SIN signal	●	●	●	○	
4	SIN-		●	●	●	○	
8	COS+	Resolver feedback COS signal	●	●	●	○	
3	COS-		●	●	●	○	
10	REF+	Resolver excitation signal	●	●	○	●	
5	REF-		●	●	○	●	

10) RS485 communication signal (SER)

SER	Definition	Description	Mode		Interface	
			P	S	Input	Output
7	DATA+	RS485 signals	●	●	●	●
8	DATA-		●	●	●	●
4	DGND	Digital signal earthing	—	—	—	—

The above-mentioned 5 signals i.e. E, COM0 COM1, AGND can not be interconnected, or it will impact the anti-interference feature in the system.

3.4 Input signal description

number	Definition	Description	Mode		Related parameters	remarks
			P	S		
0	STAND	Standard input	●	●		
1	SON	Servo-on	●	●	PA20	
2	RES	Reset (effective for some alarms)	●	●		
3	LSP	Forward rotation stroke end	●	●	PA20	
4	LSN	Reverse rotation stroke end	●	●	PA20	
5	CLE	Counter reset for position deviation	●	○		
6	INH	Input disable of impulse instruction	●	○		
7	TL+	Torque limitation at forward rotation	●	●	PA36	
8	TL-	Torque limitation at reverse rotation	●	●	PA37	
9	SC1	Internal speed selection 1	○	●	PA24~PA27、PA42	
10	SC2	Internal speed selection 2	○	●	PA24~PA27、PA42	
11	DEG1	Electron gear function selection 1	●	○	PA12、PA13、PA54	
12	DEG2	Electron gear function selection 2	●	○		Under development
13	ST1	Forward rotation start	●	●	PA55	
14	ST2	Reverse rotation start	●	●	PA55	
15	ISC	Inside and outside speed selector switch	○	●	PA55	
16	RDC	Change of rotation direction	●	●	PA55	
17	CMC	Changeover switch for control mode	●	●	PA55	

Note：Signal code is defined in Chapter III PB parameter list.

0：STAND　Standard input port

Function: without definition of special features.

1：SON　Servo-on

Function: Open the servo motor into the power state (there is a current into the motor).
After SON effective, please wait at least 100ms before the input pulse command.
Do not use the SON signal switching to control motor starts and or stops.

2：RES　Reset

Function: Clear alarm signal.
Some of the alarm signal can not be removed with this.

3：LSP **Forward rotation stroke end**

Function: The stroke switch can be connected to this signal and is used to determine whether the moving object is out of range, LSP and LSN are respectively at both ends of the range.

When LSP signal is invalid, the motor has no torque or speed in the direction (determined by the PA20).

When LSP and LSN are invalid and PA20 = 0, warning 7 appears.

4：LSN **Reverse rotation stroke end**

Function: Refer to LSP

5：CLE **Counter reset for position deviation**

Function: When CLE is effective, clear the position deviation counter.

6：INH **Input disable of impulse instruction**

Function: When INH is effective, forbid the impulse instruction input.

7：TL+ **Torque limitation at forward rotation**

Function: When the TL + is effective, Torque limitation at forward rotation of the motor is determined by PA36.

8：TL- **Torque limitation at reverse rotation**

Function: When the TL – is effective, Torque limitation at forward rotation of the motor is determined by PA37.

9：SC1 **Internal speed selection 1**

Function: When PA42 = 0 or the external input signal ISC is effective, the motor speed is determined by setting the internal parameters.

There are 4 internal parameters determined by SC1, SC2.

SC1	SC2	Speed command	Parameter No.
0	0	Internal speed 1	PA24
0	1	Internal speed 2	PA25
1	0	Internal speed 3	PA26
1	1	Internal speed 4	PA27

Note: “0” is invalid; “1” is valid.

10：SC2 **Internal speed selection 2**

Function: Refer to SC1

11：DEG1 **Electronic gear function selection 1**

Function: When DEG1 is not effective, position command pulse ratio(electronic gear) is PA12/PA13.

When DEG1 is effective, position command pulse ratio(electronic gear) is PA54/PA13.

Before or after switching of DEG1 signal do not send instructions within at least 10ms time.

12：DEG2 electronic gear function selection 2

Function: Software is under development.

13：ST1 Forward start

Function: Used to select the motor start and the direction of the motor.

ST2	ST1	The startup direction of the motor
0	0	Stop（Servo lock）
0	1	Forward start
1	0	Reverse start
1	1	Stop（Servo lock）

Note: “0” is invalid; “1” is valid.

14：ST2 Reverse start

Function: Refer to ST1

15：ISC Internal speed selector switch

Function: When ISC is effective, speed command switches to internal speed command from external analog input, it is determined by parameter PA24 ~ PA27(refer to Table SC1).

This function is the same as the function of PA42.

When this function is selected, parameter PA42 is invalid.

ISC	Speed selection
0	External speed command
1	Internal speed command

Note: “0” is invalid; “1” is valid.

16：RDC Change of rotation direction

Function: When the RDC is effective, you can change the rotation direction of the motor.

RDC	Change of rotation direction
0	No change
1	Change

Note: e0o is invalid; a1i is valid.

17：CMC Control mode switching

Function: When CMC is effective, you can change the control mode of the driver.

CMC	Control mode switching
0	Position control mode
1	Speed control mode

Note: “0” is invalid; “1” is valid.

3.5 Output signal description

Signal code	Definition	Description	Mode		Related parameters	remarks
			P	S		
0	STAND	Standard output port	●	●		
1	ALM	Servo alarm	●	●		
2	RD	Servo ready	●	●		
3	INP	Position arrived	●	○	PA16	
4	SA	Speed reached	○	●	PA28	
5	CDO	Measuring output of motor current	●	●	PA39、PA56	
6	TDO	Limiting torque	●	●	PA34~PA37、PA56	
7	ZSP	Zero speed arrived	○	●	PA29、PA56	
8	OUT_Z	Motor encoder， Z-phase pulse output	●	●	PA56	
9	MBR	Motor mechanical brake ， control output	●	●	PA50、PA56	

Note: The signal code is defined in Chapter III PB parameter list.

0：STAND　Standard output port

Function: No special function definition. Function is defined by the internal position control procedures,

1：ALM　Servo alarm

Function: Regardless the main circuit undervoltage alarm (Err-03), alarming for abnormalities found by the drive during running or self-test .
When in normal state, the output transistor turns on (PA57 = 0).
See "Power On sequence diagram" and "alarm timing diagram".

2：RD　Ready

Function: Normal operation of the drive, no abnormality detected .
When in normal state, the output transistor turns on (PA57 = 0).
See "Power On sequence diagram" and "alarm sequence diagram".

3：INP　Position arrived

Function: Real-time detection of drive’s position deviation, when the position deviation pulse is less than the preset value of parameter PA16(completed positioning range) , INP output is effective. while the output transistor turns on (PA57 = 0).

4：SA　Speed arrived

Function: Real-time detection of drive’s motor speed, when exceeding the setting value of parameter PA28 (arrival speed), SA output is effective.
When it is effective, the output transistor turns on (PA57 = 0).

5：CDO **Output of detected motor current**

Function: Real-time detection of drive's motor current, when exceeding the setting value of parameter PA39 (threshold for motor current detection) , CDO is effective.
When it is effective, the output transistor turns on (PA57 = 0).

6：TDO **Limiting torque**

Function: If the motor torque is limited by parameter PA34, PA35 or PA36, PA37 (valid TL +, TL-), TDO is valid.
When it is effective, the output transistor turns on (PA57 = 0).

7：ZSP **Zero speed arrived**

Function: Real-time detection of drive's motor speed, when it is less than the setting value of parameter PA29 (zero speed) , ZSP output is valid.
When it is effective, the output transistor turns on (PA57 = 0).

8：OUT_Z **Motor encoder Z-phase pulse output**

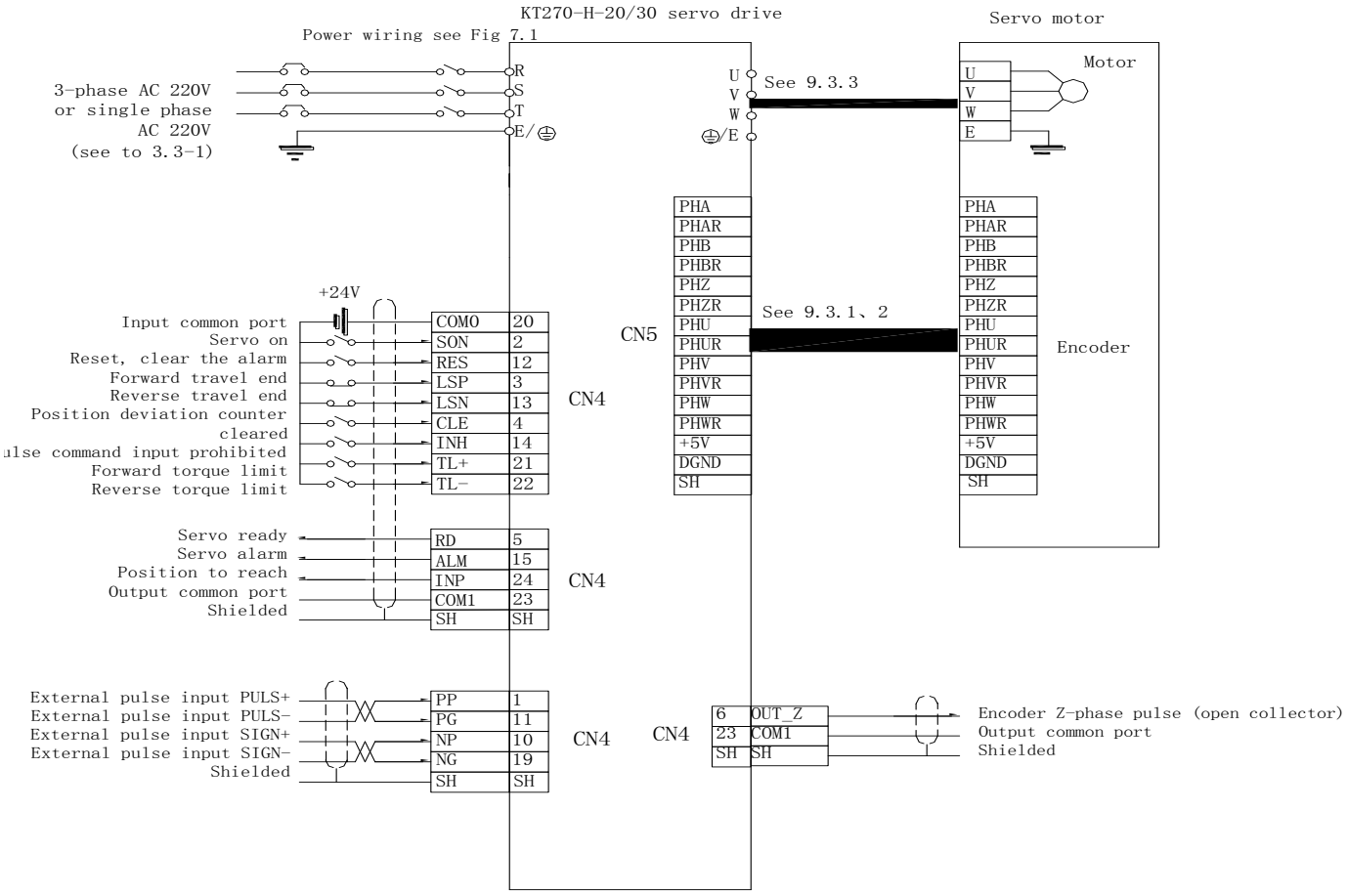
Function: Open collector output of motor encoder Z-phase pulse , the output pulse width is 1ms.

9：MBR **control output of motor's mechanical brake**

Function: Driver receives the drive enable signal (SON), and in 2ms after power-on of the motor valid MBR signal outputs .
When driver has an alarm or drive enable signal (SON) is off, take the minimum value of PA50 parameter (delay time of MBR) and the minimum time to slow down the motor speed to 30 rev / min with a delayed output of the signal -MBR is invalid .
When it is effective, the output transistor turns on (PA57 = 0).
In order to ensure the motor mechanical brake has been fully opened, the driver should be delayed by 50ms to receive instructions after power-on of the motor .

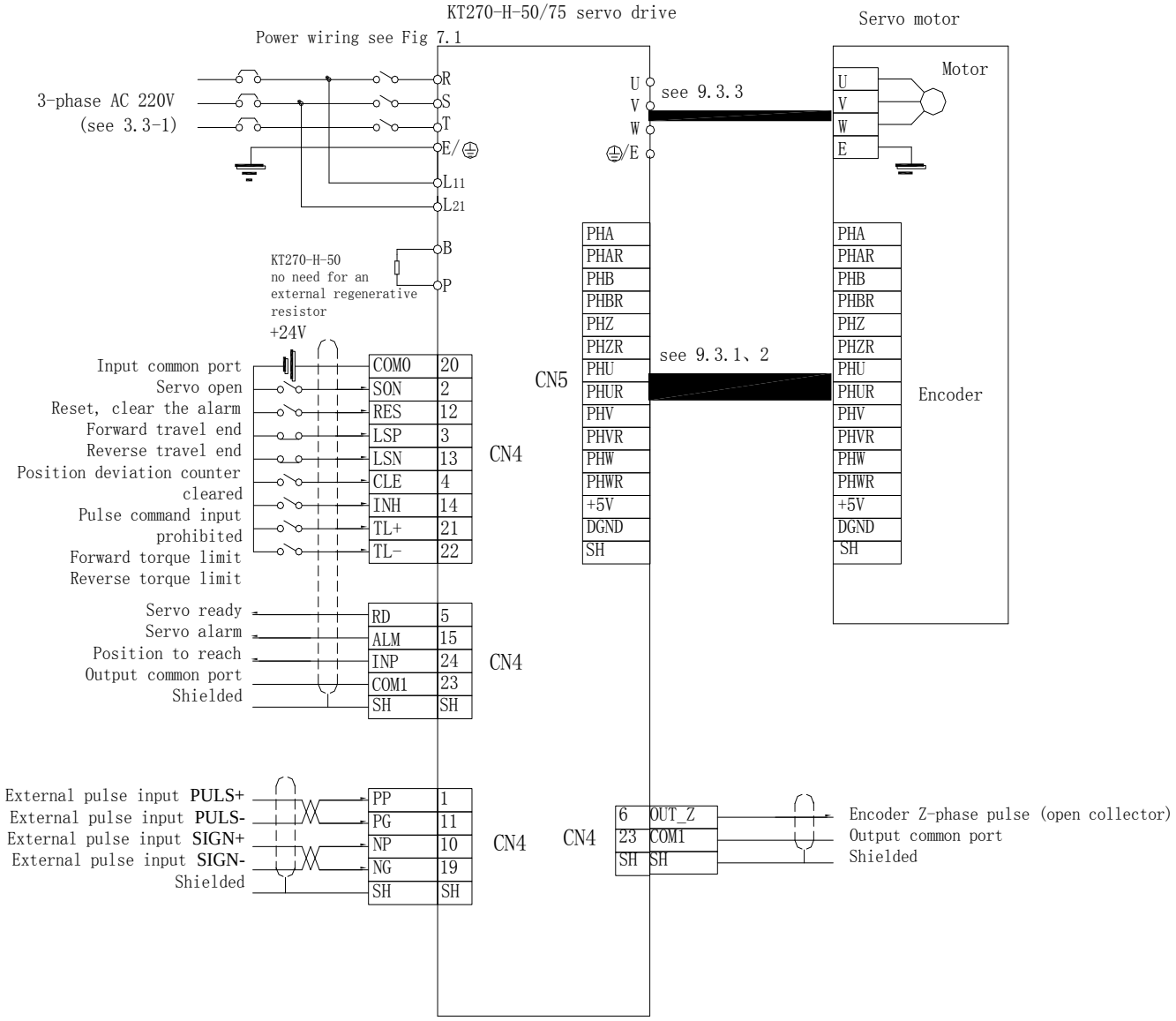
3.6 Standard wiring example

3.6.1 Case of position control wiring



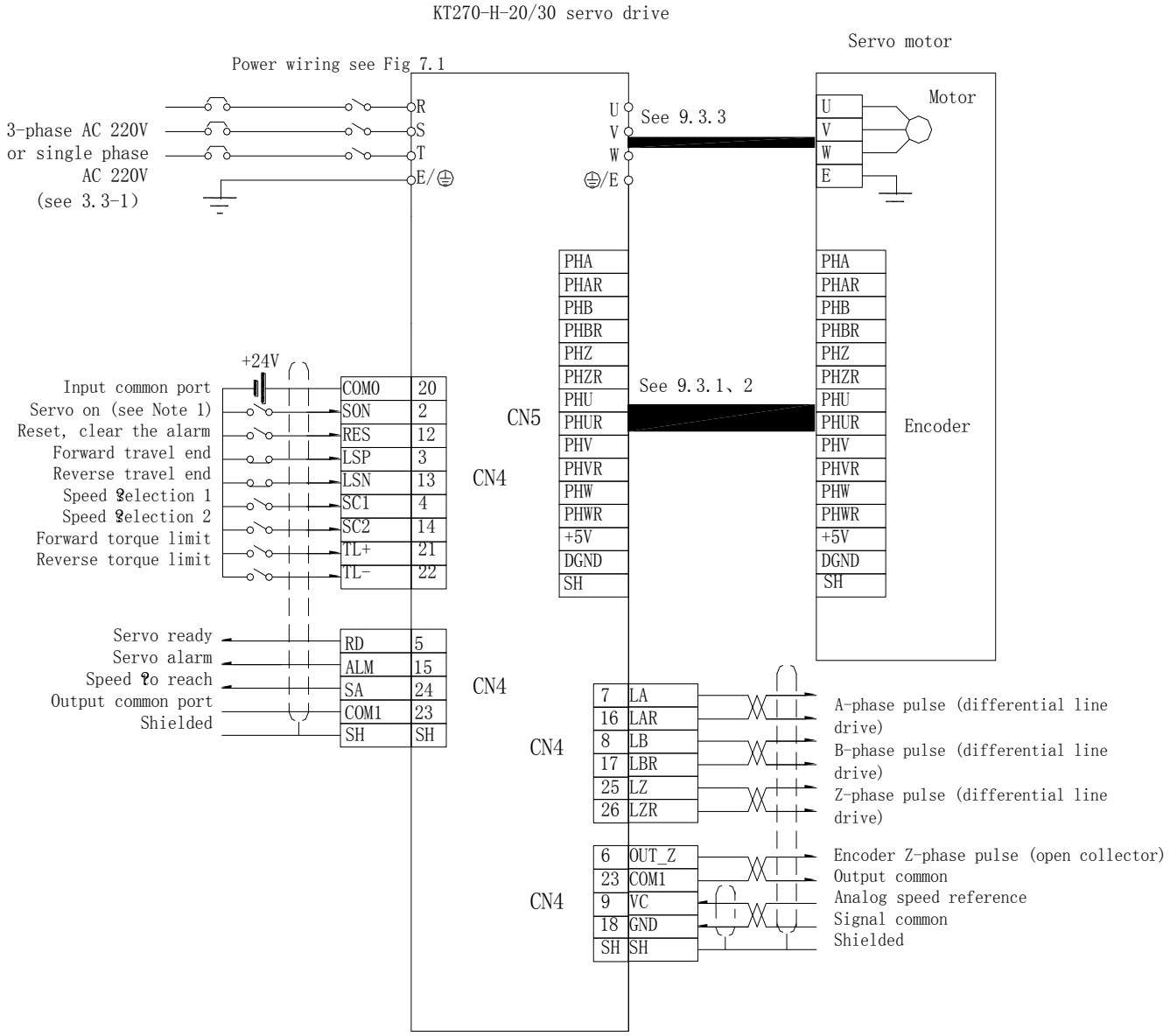
Note: “SH" in the figure indicates the metal shell for cable plug. The shielded line of the cable should be connected to the shell.

For connection, untie the mesh shielding to neat condition. Take partial shielding as twisted terminal and cut off the rest. After that fit the thimble over the twisted terminal while one stub should be exposed for soldering to the metal shell of the plug. Pay attention to avoiding over-soldering for proper closing of the plug guard.

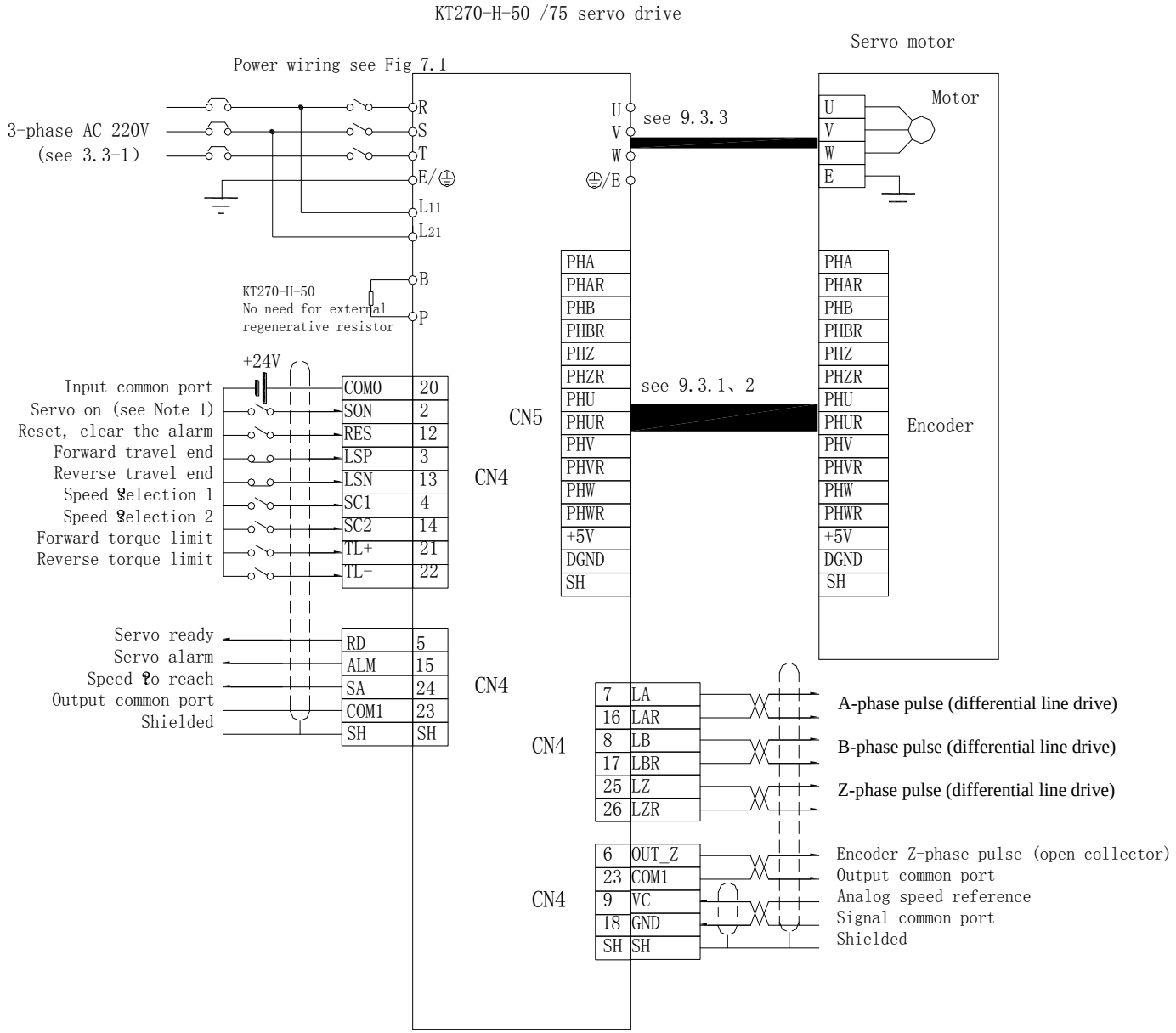


Please refer to the note in page 3-13 for explanation on "SH" in the figure.

3.6.2 Case of speed control wiring



Please refer to the note in page 3-13 for explanation on "SH" in the figure.



Please refer to the note in page 3-13 for explanation on "SH" in the figure.

Chapter 4
Parameter

4 Parameter

4.1 PA Parameter list

Description of control mode：

P－position control mode

S－speed control mode

Table 4.1 PA user parameter

Number	Name	Parameter scope	Factory setting	Unit	Control Mode		Read-only	Effective immediately
					P	S		
PA00	Password	0~9999	315	—	●	●	○	●
PA 01	Matching parameter	0~59	0*	—	●	●	●	○
PA 02	Software version	*	*	—	●	●	●	○
PA 03	Initial display status	0~21	0	—	●	●	○	●
PA 04	Control mode selection	0~6	0	—	●	●	○	●
PA 05	Proportional gain of speed	5~2000	150*	Hz	●	●	○	●
PA 06	Integrating time constant of speed	1~1000	10*	mS	●	●	○	●
PA 07	Time constant for acceleration/deceleration	0~10000	0*	mS	○	●	○	●
PA 08	Low-pass filter for speed measurement	20~500	100*	%	●	●	○	●
PA 09	Proportional gain on positioning	1~1000	40*	1/S	●	○	○	●
PA 10	Feed-forward gain on positioning	0~100	0	%	●	○	○	●
PA 11	Cut-off frequency of low-pass filter for position feed-forward	1~1200	300*	Hz	●	○	○	●
PA 12	Numerator of multiplying factor for positioning command impulse	1~32767	1	—	●	○	○	●
PA 13	Denominator of multiplying factor for positioning command impulse	1~32767	1	—	●	○	○	●
PA 14	Input mode for positioning command impulse	0~2	0	—	●	○	○	●
PA 15	Negative orientation of positioning command impulse	0~1	0	—	●	○	○	●
PA 16	Scope of achieved positioning	0~30000	20	Impulse	●	○	○	●
PA 17	Detection range of out-ranged positioning	0~30000	200	×100 Impulse	●	○	○	●
PA 18	Invalid error of out-ranged positioning	0~1	0	—	●	○	○	●

4 Parameter

Number	Name	Parameter scope	Factory setting	Unit	Control Mode		Read-only	Effective immediately
					P	S		
PA 19	Position command smoothing filter	0~31	0	Level	●	○	○	●
PA 20	Setting of input at travel end	0~3	3		●	●	○	●
PA 21	JOG speed	-3000~3000	120	r/min	○	●	○	●
PA 22	Negative orientation of input signal level	0~255	0	—	●	●	○	○
PA 23	Max. speed limit	0~4000	2400*	r/min	●	●	○	●
PA 24	Internal speed 1	-3000~3000	0	r/min	○	●	○	●
PA 25	Internal speed 2	-3000~3000	100	r/min	○	●	○	●
PA 26	Internal speed 3	-3000~3000	300	r/min	○	●	○	●
PA 27	Internal speed 4	-3000~3000	-100	r/min	○	●	○	●
PA 28	Achieved speed	20~3000	500	r/min	○	●	○	●
PA 29	Zero speed	5~200	50	r/min	●	●	○	●
PA 30	Conversion numerator of linear speed	1~32767	10	—	●	●	○	●
PA 31	Conversion denominator of linear speed	1~32767	1	—	●	●	○	●
PA 32	Decimal location of linear speed	0~5	3	—	●	●	○	●
PA 33	Bus-bar over-voltage threshold under non-braking condition	0~10000	100	—	●	●	○	●
PA 34	Internal torque limit for positive run	0~300	250*	%	●	●	○	●
PA 35	Internal torque limit for reversal run	-300~0	-250*	%	●	●	○	●
PA 36	External torque limit for positive run	0~300	100	%	●	●	○	●
PA 37	External torque limit for reversal run	-300~0	-100	%	●	●	○	●
PA 38	Torque limit for trial run and JOG mode	0~300	100	%	○	●	○	●
PA 39	Measuring threshold of motor current	3~240	100	%	●	●	○	●
PA 40	Numerator of multiplying factor of output electron gear	1~16383	1	—	●	●	○	○
PA 41	Denominator of multiplying factor of output electron gear	1~16383	1	—	●	●	○	○
PA 42	Selection of internal/external speed instruction	0~1	1	—	○	●	○	●
PA 43	Input gain of speed command	10~3000	200*	(r/min) / V	○	●	○	●

4 Parameter

Number	Name	Parameter scope	Factory setting	Unit	Control Mode		Read-only	Effective immediately
					P	S		
PA 44	Negative direction of speed command	0~1	0	—	○	●	○	●
PA 45	Zero bias compensation for speed instruction	-5000~5000	0	—	○	●	○	●
PA 46	Low-pass filter for simulation speed command input	1~20000	1000	Hz	○	●	○	●
PA 47	Simulation instruction gain for external torque (only available for KT290)	1~25	1	(%)/V	●	●	○	●
PA 48	Simulation instruction bias for external torque (only available for KT290)	-100~100	0	—	●	●	○	●
PA 49	Analog of minimum external input speed	0~100	0	r/min	○	●	○	●
PA 50	Delay time of mechanical brake MBR action	0~200	0	mS	●	●	○	●
PA 51	Communication address of drive	0~31	1	—	●	●	○	●
PA 52	Communication speed	0~5	1	—	●	●	○	●
PA 53	Multi-function software selection function	0~16383	0	—	●	●	○	●
PA 54	Numerator of multiplying factor for 2nd position command impulse	1~32767	1	—	●	○	○	●
PA 55	Selection of multifunction input interface	0~9	0	—	●	●	○	●
PA 56	Selection of multifunction output interface	0~4	0	—	●	●	○	●
PA 57	Alternated level of output signal	0~255	0	—	●	●	○	●
PA 58	De-wobble time constant at input terminal	1~1000	3	0.1mS	●	●	○	●
PA 59	Motor parameter list	—	—	—	○	○	●	○
PA60	Internal use	—	—	—	○	○	○	○
PA61	Internal use	—	—	—	○	○	○	○
PA62	Internal use	—	—	—	○	○	○	○
PA63	Internal use	—	—	—	○	○	○	○
PA64	Internal use	—	—	—	○	○	○	○
PA65	Speed integral separation point	0~3000	200	r/min	●	●	○	●

4 Parameter

Number	Name	Parameter scope	Factory setting	Unit	Control Mode		Read-only	Effective immediately
					P	S		
PA66	Changing rate of speed reduction time	1～1000%	100	%	●	●	○	●
PA67	Turning point of position deviation 0	0~3000	20	Pulse	●	○	○	●
PA68	Turning point of position deviation 1	0~3000	2500	Pulse	●	○	○	●
PA69	Changing rate of proportional position gain at the turning point of the position deviation 0	1～10000	100	%	●	○	○	●
PA70	Changing rate of proportional position gain at the turning point of the position deviation 1	5~500	100	%	●	○	○	●

NOTE：

- The factory setting parameter values marked with " * " in Table 4.1 should be different，when using different type of motors.
- Please refer to following list for detailed description on relative parameters.
- Positive rotation indicates counter-clockwise rotation in view of axial direction of servo motor.

  Reversal rotation indicates clockwise rotation in view of axial direction of servo motor.

After modification of parameter PA40 and PA41, EE-SET operation should be executed and it will be valid after power-on again.

4.2 PA parameter description

PA00 Password(0~9999)

Function: ① Designed to prevent parameter from modification by accident. In general situation, whenever there is a need to set parameter, set required password for the parameter prior to parameter setting. Upon completion of debugging, set the parameter to 0 to ensure no more parameter modification by accident.

② Password is authorized into different levels. The password for user's parameter setting is 315. The password to modify PA1 or PA59 is 385.

PA 01 Matching parameter(0~59)

Function: Used to specify the motor model selected by the PA59 in the motor table and the driver matching parameters.

① Please set PA0 to 385 to modify the parameters.

② For drivers and motors with different power level but in same series.

③ Detailed meaning of the parameter is shown in Chapter 8 Electrical Specification.

It will be valid after power-on again.

Be sure to ensure that this parameter is set correctly, otherwise it will cause malfunction of the drive system and probably lead to serious consequences.

When the unit restarts after power-off due to EEPROM alarm (Err-20), the parameter should be checked for any change. If it is changed, the servo driver should be replaced. In case of no change, the parameter could be modified after restore the default parameter.

PA 02 Software version

Note: DSP Software version, it can be viewed, but no modification is allowed.

PA 03 Initial display status(0~21)

Function: Select display status at the display when driver is energized.

Number	Display	Number	Display
0	Display motor speed	15	Display state of input terminal
1	Display current position (5 low-level bits)	16	Display state of output terminal
2	Display current position (5 high-level bits)	17	Display input signal from encoder
3	Display position instruction (accumulated command impulse, 5 low-level bits)	18	Display running status
4	Display position instruction (accumulated command impulse, 5 high-level bits)	19	Display error code

Number	Display	Number	Display
5	Display position deviation (5 low-level bits)	20	Reserved
6	Display position deviation (5 high-level bits)	21	Reserved
7	Display motor torque		
8	Display motor current		
9	Display linear speed		
10	Display control mode		
11	Display pulse frequency of position instruction		
12	Display speed instruction		
13	Display torque instruction		
14	Display absolute rotor location in one turn		

PA 04 Control mode selection(0~6)

Function: This parameter is used for setup of drive's control mode.

<table>
<tr><th>Number</th><th>Control mode selection</th><th>Description</th></tr>
<tr><td>0</td><td>Positioning control mode</td><td>Driver drives the motor to rotate to the angle defined by the positioning command.</td></tr>
<tr><td>1</td><td>Speed control mode</td><td>Driver drives motor to revolve in accordance with the requirements of speed command.
Speed command has two input modes (determined by ISC input function or parameter PA42):
① Input directly via VC.
② Select internal speed via control input terminal (SC1, SC2).
Select different internal speed，combination of SC1 and SC2 is shown in following table:
<table>
<tr><th>ISC or PA42</th><th>SC1</th><th>SC2</th><th>Speed command</th><th>Parameter</th></tr>
<tr><td rowspan="4">0</td><td>Open</td><td>Open</td><td>Internal speed 1</td><td>PA24</td></tr>
<tr><td>Close</td><td>Open</td><td>Internal speed 2</td><td>PA25</td></tr>
<tr><td>Open</td><td>Close</td><td>Internal speed 3</td><td>PA26</td></tr>
<tr><td>Close</td><td>Close</td><td>Internal speed 4</td><td>PA27</td></tr>
<tr><td>1</td><td>Unrelated</td><td>Unrelated</td><td colspan="2">Decided by VC, AGND</td></tr>
</table></td></tr>
<tr><td>2</td><td>Trial run control mode</td><td>Input speed command can be regulated by ↑ and ↓ , and it is applied to test the driver and motor.</td></tr>
</table>

Number	Control mode selection	Description
3	JOG run control mode (i.e. jogging)	In JOG mode, pressing and holding [↑] key will enable the motor running at JOG speed (parameter PA21). Release the key to stop the motor and keep it at zero speed. Press and hold [↓] key to enable the motor running in reversal direction at JOG speed (parameter PA21). Release the key to stop the motor and keep it at zero speed.
4	Reserved	
5	Reserved	
6	Torque control mode	Torque control

PA 05 Proportional gain of speed(5~2000 Hz)

Function:
① Set proportional gain of the adjuster at speed loop.
② The larger value is set, the greater gain and higher rigidity is available. Parameter value should be set as per to actual servo driver system and loading condition. In general, larger load inertia requires greater set value.
③ Set it to higher value provided no oscillatory occurs.

PA 06 Integrating time constant of speed(1~1000 mS)

Function:
① Set integrating time constant of the adjuster at speed loop.
② The smaller setting value, the greater integrating rate and higher rigidity. Parameter value should be set as per to actual type of servo driver system and loading condition. In general, larger load inertia requires greater set value.
③ Set it to lower value provided no oscillatory occurs.

PA 07 Time constant for acceleration/deceleration(0~10000 mS)

Function:
① The set value indicates the time for motor acceleration from 0-1000 r/min or for motor deceleration from 1000-0 r/min.
② Acceleration and deceleration should be in linear type.
③ When speed control mode is adopted (parameter PA4=1) with position ring at upper unit, the recommended value is 0.
④ In the position control mode (PA4 = 0), this parameter does not work.

PA 08 Low-pass filter for speed measurement(20~500 %)

Function:
① The set speed checks performance of low-pass filter.
② The smaller value is set, the lower cut-off frequency is available and the smaller noise is generated by the motor. In case of large load inertia, the set value can be reduced accordingly. If the set value is too small, it will slow down the response with possible oscillation.
③ The larger value is set, the high cut-off frequency is available and the quicker response is given by speed feedback. If fair speed response is required, the set value can be increased accordingly.

PA 09 **Proportional gain on positioning(1~1000 1/S)**

Function: ① Set proportional gain of the adjuster at positioning loop.

② The larger value is set , the greater gain and higher rigidity，and smaller position lag under the command impulse with same frequency. Too big value may lead to oscillation or overshot.

③ Parameter value should be set as per to actual type of servo driver system and loading condition.

• PA 10 **Feed-forward gain on positioning(0~100 %)**

Function: ① Set feed-forward gain of positioning loop.

② When the set value is 100%, it indicates the positioning lag is always 0 under the command impulse with any frequency.

③ The greater feed-forward gain of positioning loop is set, the higher speed response in control system will be performed. However, it will lead to instable positioning loop in the system with possible oscillation.

④ The feed-forward gain of positioning loop is usually set to 0 unless extreme response character is required.

PA 11 **Cut-off frequency of low-pass filter for position feed-forward(1~1200 Hz)**

Function: ① Set cut-off frequency for low-pass filter of position feed-forward.

② The function of the filter is used to increase the stability of compound positioning.

PA 12 **Numerator of multiplying factor for positioning command impulse(1~32767)**

Function: ① Set multiplying factor for position command pulse (electron gear).

② In positioning control mode, it is convenient to match different impulse sources to realize ideal control resolution (i.e. angle / impulse) via setting of parameter PA12 and PA13.

③ Formula： $P \times G = N \times C \times 4$

P:	Pulse number of input command
G:	Electron gear ratio: G= Numerator of multiplying factor / denominator of multiplying factor Recommended scope of electron gear ratio: $\frac{1}{50} \le G \le 50$
N:	Turns of running motor
C:	Line number per turn of photoelectric encoder, where in this system C=2500.

〖Example〗When input command pulse is 6000 with one turn of servo motor,

$$G = \frac{N \times C \times 4}{P} = \frac{1 \times 2500 \times 4}{6000} = \frac{5}{3}$$

Parameter PA12 is set to 5 and parameter PA13 is set to 3.

When the multi-function input DEG1 (electronic gear switch) is effective, you can select the second electronic gear function. Position command pulse rate of molecular parameters is determined by PA54.

PA 13 **Denominator of multiplying factor for positioning command impulse(1~32767)**

Function: See parameter PA12.

PA 14 **Input mode for positioning command impulse(0~2)**

Function: Set the input mode for position command impulse (Refer to Table 4.2). One of 3 input modes can be selected via the parameter：

0： Pulse + sign

1： Positive run/reverse run pulse

2： Two-phase orthogonal impulse input

Table 4.2 Form of impulse input

Pulse Train Form	Forward Rotation Command	Reverse Rotation Command	Parameter (NO.14)	Max pulse frequency (KHZ)	Driver Mode
Pulse train	PULSE_F		0 Signed pulse train	500	Differential
Sign	PLUSE_R			200	Sole end
Forward rotation pulse train	PULSE_F		1 Forward /Reverse rotation pulse train	500	Differential
Reverse rotation pulse train	PLUSE_R			200	Sole end
A-phase pulse train	PULSE_F		2 A/B phase pulse train	125	Differential
B-phase pulse train	PLUSE_R			100	Sole end

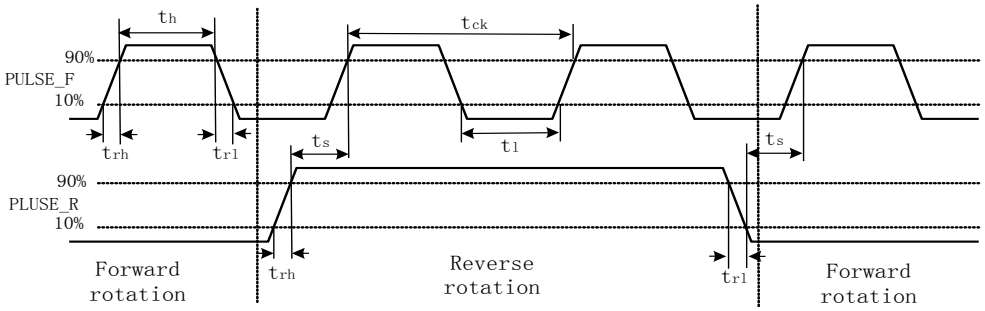


Fig. 4.1 Sequence chart for impulse + sign input interface

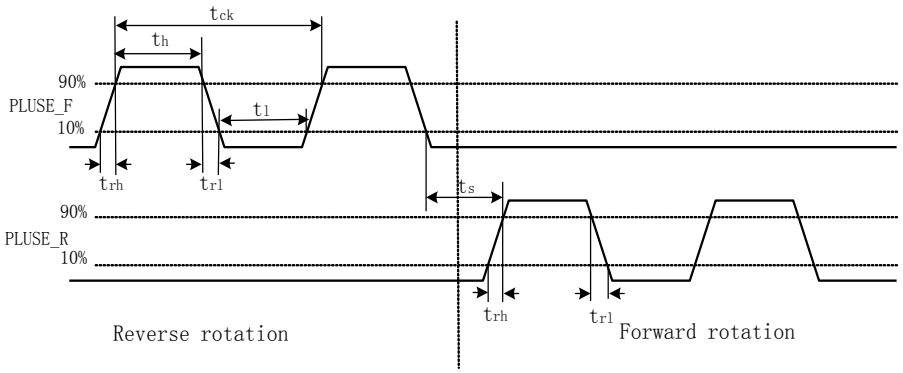


Fig. 4.2 Sequence chart for positive/reverse impulse input interface

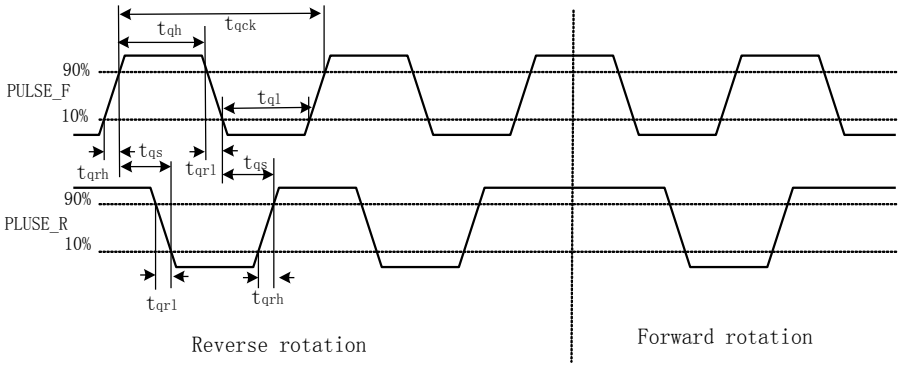


Fig. 4.3 Sequence chart for input interface with two-phase orthogonal instruction impulse

Table 4.3 Time sequence and parameter of impulse input

Parameter	Differential driver input	Sole-end driver input
t_{ck}	>2μS	>5μS
t_h	>1μS	>2.5μS
t_l	>1μS	>2.5μS
t_{rh}	<0.2μS	<0.3μS
t_{rl}	<0.2μS	<0.3μS
t_s	>1μS	>2.5μS
t_{qck}	>8μS	>10μS
t_{qh}	>4μS	>5μS
t_{ql}	>4μS	>5μS
t_{qrh}	<0.2μS	<0.3μS
t_{qrl}	<0.2μS	<0.3μS
t_{qs}	>1μS	>2.5μS

PA 15 Negative orientation of positioning command impulse(0~1)

Function: 0: Normal

1: Reverse orientation of position command impulse

PA 16 Scope of achieved positioning(0~30000)

Function: ① In positioning mode, set the scope for the arrived position signal.

② This parameter will provide the reference for driver's estimation if positioning is completed in positioning mode. When the residual impulse number in the position deviation counter is equal or less than the set value of the parameter, the driver will deem that positioning is completed and send out location arrived signal INP.

PA 17 Detection range of out-ranged positioning(0~30000)

Function: ① Set detection range for out-ranged positioning.

② In positioning mode, when the count value in position deviation counter exceeds the set value of the parameter, the servo driver will send out alarm for out-ranged positioning (Err-4).

PA 18 Invalid error of out-ranged positioning(0~1)

Function: 0: Valid detection for out-ranged positioning

1: Invalid detection of out-ranged positioning, stop to detect error for out-ranged positioning

PA 19 Position command smoothing filter(0~31 levels)

Function: ① Smoothing of the command pulse with exponential acceleration and deceleration, the value indicates the level.

② Filter input pulse is not lost, but the instruction will delay.

③ The filter used in the following cases can lead to sudden change of motor speed and the machine will wear easily:

- Host controller without acceleration and deceleration function
- Higher sub-octave in electronic gear (> 10)
- Rough input commands with jump running of the motor

④ When 0 is set, the filter does not work.

PA 20 Invalid input at travel end(0~3)

Function:

Number	Meaning	Description
0:	Valid LSP, LSN for positive run/reverse run at travel end.	Allow positive run when LSP switch is closed and disable positive run when LSP switch is open (held torque in positive run is 0); Same for LSN. If both LSP and LSN are open, abnormal alarm (Err-7) will be generated to disable driver. It is applied to limit control of horizontal moving object.
1:	Invalid LSP, LSN for positive run/reverse run at travel end.	Both positive run and reverse run are enabled in despite of the status of LSP and LSN switches. At the same time if both LSP and LSN are open, abnormal alarm (Err-7) will not be gen erated to disable driver.
2:	Invalid LSP and LSN for positive run and reverse run at travel end while SON is forced to be enabled.	Note: Valid SON enforcement is applied to motor debugging only. In normal service, it is recommended to control SON status by the input port.
3:	Valid LSP, LSN for positive run/reverse run at travel end.	Enable positive run when LSP switch is closed and disable positive run when LSP switch is open (Holding speed in positive run is 0 , but the torque is not 0); Same rule for LSN. If both LSP and LSN are open, abnormal alarm (Err-7) will not be generated to disable driver. It is applied to limit control of vertical moving object.

PA 21 **JOG speed(-3000~3000 r/min)**

Function: Set running speed in JOG mode.

PA 22 **Negative orientation of input signal level(0~255)**

Function: Used to change the input signal level, each input is corresponding to one bit of an eight-bit binary number, set the value in decimal number, the initial value is 0.

Interface definition	Binary	Decimal
IN0	00000001	1
IN1	00000010	2
IN2	00000100	4
IN3	00001000	8
IN4	00010000	16
IN5	00100000	32
IN6	01000000	64
IN7	10000000	128

〖Example〗To change the signal level of IN0 and IN3 at the same time , simply add the corresponding decimal number (1 +8 = 9) and write the value in the parameter.

As the parameter is set it will be valid after EE-SET operation and power-on again.

PA 23 **Max. speed limit(0~4000 r/min)**

Function: ① Set max. speed limit for servo motor.

② It has no relation to running direction. If the set value exceeds rated r.p.m. the actual max. speed limit should be the rated speed.

PA 24 **Internal speed 1(-3000~3000 r/min)**

Function: Set internal speed 1 (Refer to description on parameter PA4)

PA 25 **Internal speed 2(-3000~3000 r/min)**

Function: Set internal speed 2 (Refer to description on parameter PA4)

PA 26 **Internal speed 3(-3000~3000 r/min)**

Function: Set internal speed 3 (Refer to description on parameter PA4)

PA 27 **Internal speed 4(-3000~3000 r/min)**

Function: Set internal speed 4 (Refer to description on parameter PA4)

PA 28 **Achieved speed(20~3000 r/min)**

Function: ① Set achieved speed.

② In none positioning mode, if the motor speed exceeds this set value, SA signal will be sent out.

Note: Comparator has delay character.

③ Unrelated to running direction.

PA 29 **Zero speed(5~200 r/min)**

Function: ① Set zero speed range.
In normal operation of the motor， the servo driver will measure the motor speed in real time and compare it with the set value in parameter PA29. If it exceeds the set value, output port (CN4-6) is conducted (when parameter PA57=0)； If it is under the set value, output port (CN4-6) is disabled.
② To avoid too frequent action at output port in case of disturbance at the motor speed, a lag function via software is provided with a defined lag interval as ±2.
③ Effective when parameter PA56=2.

PA 30 **Conversion numerator of linear speed(1~32767)**

Function: ① Design to display linear running speed of the system.
$Linearspeed = motorspeed\ (r/\min)$
②
$$\times \frac{\text{Conversion numerator for linear speed}}{\text{Conversion denominator of linear speed}}$$
The location of the decimal point for the linear speed is decided by parameter PA32. 0 means no decimal point, 1 means the decimal point is at ten's place, 2 means the decimal point is set at hundred place and the like.
〖Sample〗If the servo motor driver has a 10 mm lead screw with a register ratio of 1:1, the set conversion numerator for linear speed is 10 while the set conversion denominator of linear speed is 1. The decimal location of linear speed should be 3. The linear speed may be shown on the display with a unit of m/ min. When motor speed is 500 r.p.m. the displayed linear speed is 5,000 m / min.

PA 31 **Conversion denominator of linear speed(1~32767)**

Function: See parameter PA30.

PA 32 **Decimal location of linear speed(0~5)**

Function: See parameter PA30.

PA 33 **Bus-bar over-voltage threshold under non-braking condition(0~10000)**

Function: ① Set maximum continuous regenerative braking time at none deceleration state.
② When continuous regenerative braking time in the servo driver exceeds the set value, Err-35 alarm will be sent out (brake line works also at none deceleration state).
Factory setting, no more modification.

PA 34 **Internal torque limit for positive run (0~300 %)**

Function: ① Set internal torque limit for positive run of servo motor.
② The setting value should be the percentage of nominal torque, e.g. if it requires 2 times of nominal torque, set the value as 200.
③ This value is valid at any time.
If the set value exceeds the max. overload capacity allowed by the system, the actual torque limit will be the max. allowable overload capacity.

PA 35 **Internal torque limit for reversal run (-300~0 %)**

Function:
① Set internal torque limit for reverse run of servo motor.
② The setting value should be the percentage of nominal torque，e.g. if it requires 2 times nominal torque, set the value as -200.
③ This value is valid at any time.
If the set value exceeds the max. overload capacity allowed by the system, the actual torque limit will be the max. Allowable overload capacity.

PA 36 **External torque limit for positive run (0~300 %)**

Function:
① Set external torque limit for positive run of servo motor.
② The setting value should be the percentage of nominal torque，e.g. if it requires 1 times of nominal torque, set the value as 100.
③ This limit is valid upon input terminal (TL+) for torque limit at positive run is closed.
④ When the limit is valid, the actual torque limit should be the minimum value among three absolute values in the system i.e. max. overload capacity, internal torque limit for positive run and external torque limit for positive run.

PA 37 **External torque limit for reversal run (-300~0 %)**

Function:
① Set external torque limit for reversal run of servo motor.
② The setting value should be the percentage of nominal torque，e.g. if it requires 1 times of nominal torque, set the value as -100.
③ This limit is valid upon input terminal (TL-) for torque limit at reversal run is closed.
④ When the limit is valid the actual torque limit should be the minimum value among three absolute values in the system, i.e. max. overload capacity, internal torque limit for reverse run and external torque limit for reverse run

PA 38 **Torque limit for trial run and JOG mode(0~300 %)**

Function:
① Set torque limitation in trial run and JOG modes.
② Unrelated to direction of rotation，bidirectional is valid.
③ The setting value should be the percentage of nominal torque，e.g. if it requires 1 times of nominal torque, set the value as 100.
④ Internal and external torque limitations still keep valid.

PA 39 **Measuring threshold of motor current (3~240 %)**

Function:
① During normal operation of the motor, the servo driver will check the real time current of the motor (equivalent value) by dynamic measurement and make comparison with the set value of parameter PA39. If it exceeds the set value in parameter PA39, output port of CDO function will be enabled (when parameter PA57=0) . If it is under the set value of parameter PA39, the port is disabled (when parameter PA57=0).
② To avoid too frequent action at output port in case of current turbulence in the motor, a lag function via software is provided with a defined lag interval as $\pm$2.
③ Effective when parameter PA56=0.

PA 40 **Numerator of multiplying factor of output electron gear(1~16383)**

Function: ① Set multiplying factor for feedback impulse from encoder (electron gear).
② By setting of parameter PA40 & PA41, the pulse number of encoder's signal output can be defined.
③ Parameter PA40 must be ≤parameter PA41, or alarm will appear.
When parameter PA40 and PA41 is modified, it will be valid after EE-SET operation and power-on again.

PA 41 **Denominator of multiplying factor of output electron gear(1~16383)**

Function: See parameter PA40

PA 42 **Selection of internal/external speed instruction(0~1)**

Function: See parameter PA4
(when selecting ISC input function, this parameter is invalid, see parameter PA55.)

PA 43 **Input gain of speed command (10~3000)**

Function: Set the proportional relation between input voltage of speed instruction and actual speed of the motor.

PA 44 **Negative direction of speed command(0~1)**

Function: 16-bit binary number

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

PA44	Description	Value	Function
Bit 0	Polarity selection of external analog speed command	0	Unchanged
		1	Negate
Bit 1	Direction selection of the encoder upon reset to zero	0	Unchanged
		1	Negate

If the position loop is in the upper computer, and PA44.0 value changes, position feedback polarity needs to be changed.

PA 45 **Zero bias compensation for speed instruction(-5000~5000)**

Function: When input speed command is zero, the analogue bias of speed command can be eliminated and realize zero motor speed by altering this parameter.

PA 46 **Low-pass filter for simulation speed command input(1~20000)**

PA 47 **Simulation instruction gain for external torque (only available for KT290)(1~25 %)/v)**

PA 48 **Simulation instruction bias for external torque (only available for KT290)(-100~100)**

PA 49 **Analog of the external minimum input speed(0~100)**

Function: ① It works only in speed mode when inputting the external analog speed command .

② In the course of normal operation of the motor, servo driver real-time detects the external analog speed command, and compared with the value set by PA49. If it is less than the set value, the speed command changes to zero automatically; if it is more than the set value, the speed command is the set value by analog speed command.

PA 50 **Delay time of mechanical brake MBR action(0~200 mS)**

Function: When the drive has an alarm or the enable signal (SON) is off, Smaller value of PA50 and time needed for motor speed down to 30 r/min, as the delayed time to output valid brake (MBR) signals.

Motor brake (MBR) function is opened by PA56 = 4.

PA 51 **Communication address(0~31)**

Function: Used to set the address for communication between a host driver and multiple drivers.

0: Broadcast mode

1~31: Communication address

PA 52 **Communication speed(0~6)**

Function: 0: No communication function

1: Baud Rate 9600

2: Baud Rate 19200

3: Baud Rate 38400

4: Baud Rate 57600

5: Baud Rate 115200

PA 53 **Multi-function software selection function(0~16383)**

Function: 16-bit binary number

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

PA53	Value	Function
Bit 0	0	IN5 select INH function
	1	IN5select DEG function
Bit 1	0	When enable rising edge is effective, the command pulse, the current position and the position deviation immediately are cleared without delay.
	1	When enable rising edge is effective, the command pulse, the current position and the position deviation are not cleared.
Bit 2	0	When enable signal is cancelled, it has nothing to do with the setting of parameter 29.
	1	When enable signal is cancelled, it should be effective only if the value is less than the setting of parameter 29.

PA53	Value	Function
Bit 3	0	When enable signal opens, DB dynamic brake (Relay) opens. When enable signal closes or has an alarm, it delays to close. (rotate speed must be less than zero speed of PA29 setting) (only KT270-FX-XXZD series has corresponding function in hardware)
	1	DB dynamic brake (Relay) opens upon power-on and will not close.
Bit 4	0	When enable signal is cancelled, pulse input instruction is not prohibited.
	1	When enable signal is cancelled, pulse input instruction is prohibited immediately, without delay.
Bit 5	0	Reserved. The default is 0.
	1	
Bit 6	0	When the motor is not excited, the command pulse, the current position and the position deviation are not cleared.
	1	When the motor is not excited, the command pulse, the current position and the position deviation are cleared.
Bit 7	X	Internal use
Bit 8	X	
Bit 9	X	
Bit10	X	
Bit 11	X	
Bit 12	X	
Bit 13	X	
Bit 14	X	
Bit 15	0	Reserved. The default is 0.

〖Example〗If you want to make following two functions valid simultaneously,

a. Input terminal IN5 (CN4-14) should select DEG function (bit 0)

b. To cancel enable signal , it should be valid only when it is less than the set value of parameter 29 (bit 2),

In this case, the binary value is

0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1

Conversion to decimal is 5, write value 5 to this parameter.

PA 54 **Numerator of multiplying factor for 2nd position command impulse(1~32767)**

Function: ① Set numerator of sub-octave (electronic gear) for 2nd position command impulse

② See parameter PA12

PA 55 **Selection of multifunction input interface(0~9)**

Function: Multifunction selection parameter for input terminal IN6 (CN4-21), IN7 (CN4－22).

PA55	IN6	IN7	Function declaration
0	TL+	TL-	Torque limit function at positive run and reverse run
1	ST1	ST2	Forward and reverse start-up
2	ISC	RDC	Selection function for internal speed command and RDC function
3	CMC		Switching function for control mode
4			Reserved
5			Reserved
6			Reserved
7			Reserved
8			Reserved
9			Reserved

After parameter is set, it needs to perform EE-SET operations, and will be valid upon power-on again.

PA 56 **Selection of multifunction output interface(0~4)**

Function: Multifunction selection parameter for output terminal OUT3 (CN4-6).

PA56	OUT3	Function declaration
0	CDO	Output of motor current measurement
1	TDO	Output during torque limitation
2	ZSP	Zero speed arrival output
3	CZ	Z pulse output of collector
4	MBR	Action of electric mechanical brake

PA 57 **Alternated level of output signal(0~255)**

Function: Design to alter output signal level, each output will map certain digit of a four binary number, the set value adopts decimal number，initial value is 0.

Mapping interface	Binary number	Decimal number
OUT0	0001	1
OUT1	0010	2
OUT2	0100	4
OUT3	1000	8

〖Example〗If it is required to alter signal level for CN4-11 and CN4-14 at the same time, just sum the corresponding decimal numbers (1+8=9), and write the value in the parameter.

PA 58 **De-wobble time constant at input terminal (1~1000)**

Function: Delay time for input interface signal

PA 59 **Motor parameter list**

Function: it needs to set the corresponding range of parameters against different motors in the driver. The driver has built in some canned parameters that match the common-used motor parameters in parameter tables for different motors. Each motor parameter table stores 60 sets of motor parameters. Currently there are total 5 parameters tables, i.e. 2700, 2701, 2702, 2703 and 2906.

① Please set PA0 to 385 to modify the parameter.

② specified motor should be selected by joint decision of PA01 and PA59.

③ Detailed meaning of the parameter is shown in chapter 8 Motor Specification.

It will be valid after power-on again,after set the parameter.

Be sure to set this parameter correctly, otherwise it will cause improper work of the drive system leading serious consequences.

PA 65 **Speed integration separation point(0~3000 r/min)**

Function: ① Set the integral separation point of speed loop PI regulator .

② The speed overshoot could be reduced by PI regulator with integral separation.

③ When the speed error exceeds the set value, the speed regulator will change from PI regulator to P regulator.

PA 66 **Change rate of deceleration time 1～1000％）**

Function: The parameter is usually set to 100％.

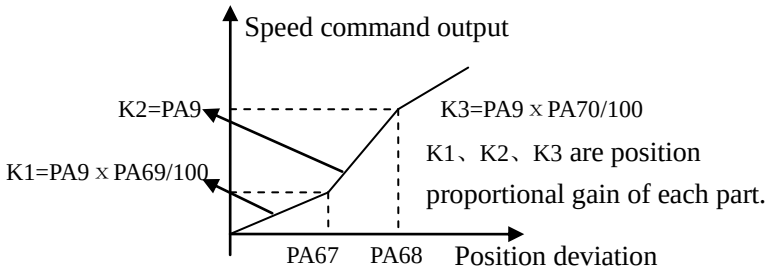
Deceleration time＝No.7× parameter 66/100

PA 67 **the turning point of position deviation 0（0~3000）**

Function: ① In order to improve the position control characteristics while taking into account the positioning, processing, high-speed mobile, you can use the variable position loop gain, i.e. in case of position deviation, different gains could be used.

② Parameter PA67≤parameter PA68 must be satisfied.

Position deviation scope	Position proportional gain
Position deviation≤PA67	$No.9 \times \frac{No.69}{100}$
PA67＜Position deviation≤PA68	PA9
Position deviation＞PA68	$No.9 \times \frac{No.70}{100}$



PA68	**the turning point 1 of position deviation（0~3000）**

Function: See parameter PA67.

PA 69	**Change rate of position proportional gain at the turning point of position deviation 0（0~10000%）**

Function: ① See parameter PA67.

： ② Usually 100%.

PA 70	**Change rate of position proportional gain at the turning point of position deviation 1（5~500%）**

Function: ① See parameter PA67.

② Usually 100%.

4.3 PB Parameter List

表 4.1.2 PB Parameter for users

Number	Name	Scope	Factory setting	Unit	Control mode		Read-only	Effective immediately
					P	S		
PB00	Parameter password	0~9999	315	—	●	●	○	●
PB01	Setting of input source of control command	0~4	0	—	●	○	○	●
PB02	Selection of programming coordinates of position instruction	0~1	0	—	●	○	○	●
PB03	Numerator of position unit conversion factor / mechanical teeth of turret	1~32767	1	—	●	○	○	●
PB04	Denominator of position unit conversion factor / turret teeth at motor side	1~32767	1	—	●	○	○	●
PB05	EEPROM parameter version	0~9999	*	*	●	●	○	○
PB06	Internal position command speed 1	0～3000	0	r/min	●	○	○	●
PB07	Internal position command speed 2	0～3000	0	r/min	●	○	○	●
PB08	Internal position command speed 3	0～3000	0	r/min	●	○	○	●
PB09	Internal position command speed 4	0～3000	0	r/min	●	○	○	●
PB10	Internal position command PO1 high position	-9999～9999	0	×1	●	○	○	●
PB11	Internal position command PO1 low position	-9999～9999	0	×10000	●	○	○	●
PB12	Internal position command PO2 high position	-9999～9999	0	×1	●	○	○	●
PB13	Internal position command PO2 low position	-9999～9999	0	×10000	●	○	○	●
PB14	Internal position command PO3 high position	-9999～9999	0	×1	●	○	○	●
PB15	Internal position command PO3 low position	-9999～9999	0	×10000	●	○	○	●
PB16	Internal position command PO4 high position	-9999～9999	0	×1	●	○	○	●
PB17	Internal position command PO4 low position	-9999～9999	0	×10000	●	○	○	●
PB18	Internal position command PO5 high position	-9999～9999	0	×1	●	○	○	●
PB19	Internal position command PO5 low position	-9999～9999	0	×10000	●	○	○	●

Number	Name	Scope	Factory setting	Unit	Control mode		Read-only	Effective immediately
					P	S		
PB20	Internal position command PO6 high position	-9999～9999	0	×1	●	○	○	●
PB21	Internal position command PO6 low position	-9999～9999	0	×10000	●	○	○	●
PB22	Internal position command PO7 high position	-9999～9999	0	×1	●	○	○	●
PB23	Internal position command PO7 low position	-9999～9999	0	×10000	●	○	○	●
PB24	Internal position command PO8 high position	-9999～9999	0	×1	●	○	○	●
PB25	Internal position command PO8 low position	-9999～9999	0	×10000	●	○	○	●
PB26	Soft-limit value in positive direction, high position	0～9999	9999	×10000	●	○	○	●
PB27	Soft-limit value in positive direction, low position	0～9999	9999	×1	●	○	○	●
PB28	Soft-limit value in negative direction, high position	-9999～0	-9999	×10000	●	○	○	●
PB29	Soft-limit value in negative direction, low position	-9999～0	-9999	×1	●	○	○	●
PB30	Reserved	—	—	—	○	○	○	○
PB31	Reserved	—	—	—	○	○	○	○
PB32	Backlash	0～9999	0	×1 pulse	●	○	○	●
PB33	Exchange of motor encoder feedback signal SASB	0~1	0	—	●	○	○	○
PB34	Back to the origin (reference point), start mode	0~1	0	—	●	○	○	●
PB35	Back to the origin (reference point), operation mode	0~1	0	—	●	○	○	●
PB36	Back to the origin (reference point), speed (high speed: the speed just before touching the proximity switch)	-2000～2000	500	r/min	●	○	○	●
PB37	Back to the origin (reference point) speed (low speed: the speed after touching the proximity switch)	-200～200	100	r/min	●	○	○	●
PB38	The origin (reference point) offset position (high position)	-9999～9999	0	×10000 pulse	●	○	○	●

Number	Name	Scope	Factory setting	Unit	Control mode		Read-only	Effective immediately
					P	S		
PB39	The origin (reference point) offset position (low position)	-9999～9999	0	×1 pulse	●	○	○	●
PB40	The origin (reference point) location setting value (high position)	-9999～9999	0	×10000 pulse	●	○	○	●
PB41	The origin (reference point) location setting value (low position)	-9999～9999	0	×1 pulse	●	○	○	●
PB42	Startup mode	0~3	0	—	●	○	○	●
PB43	Stop Mode	0~2	0	—	●	○	○	●
PB44	Reserved	—	—	—				
PB45	Customized input and output functions and valid input mode are decided by PB parameters for their validity.	0~3	0	—	●	●	○	●
PB46	IN0 signal definition	0～34	1	—	●	●	○	●
PB47	IN1 signal definition	0～34	2	—	●	●	○	●
PB48	IN2 signal definition	0～34	3	—	●	●	○	●
PB49	IN3 signal definition	0～34	4	—	●	●	○	●
PB50	IN4 signal definition	0～34	5	—	●	●	○	●
PB51	IN5 signal definition	0～34	6	—	●	●	○	●
PB52	IN6 signal definition	0～34	7	—	●	●	○	●
PB53	IN7 signal definition	0～34	8	—	●	●	○	●
PB54	Internal use	—	—	—	○	○	○	○
PB55	Internal use	—	—	—				
PB56	OUT0 signal definition	0~11	2	—	●	●	○	●
PB57	OUT1 signal definition	0~11	1	—	●	●	○	●
PB58	OUT2 signal definition	0~11	3	—	●	●	○	●
PB59	OUT3 signal definition	0~11	5	—	●	●	○	●
PB60	Internal use	—	—	—	○	○	○	○
PB61	Internal use	—	—	—	○	○	○	○
PB62	Internal use	—	—	—	○	○	○	○
PB63	Internal use	–	–	–	○	○	○	○
PB64	Internal use	–	–	–	○	○	○	○
PB65	Internal use	–	–	–	○	○	○	○
PB66	Internal use	–	–	–	○	○	○	○
PB67	Internal use	–	–	–	○	○	○	○
PB68	Internal use	–	–	–	○	○	○	○
PB69	Internal use	–	–	–	○	○	○	○
PB70	Reserved	–	–	–	○	○	○	○

Number	Name	Scope	Factory setting	Unit	Control mode		Read-only	Effective immediately
					P	S		
PB71	Reserved	—	—	—	○	○	○	○
PB72	Reserved	—	—	—	○	○	○	○
PB73	Reserved	—	—	—	○	○	○	○
PB74	Internal position command speed 5	0~3000	0	r/min	○	●	○	●
PB75	Internal position command speed 6	0~3000	0	r/min	○	●	○	●
PB76	Internal position command speed 7	0~3000	0	r/min	○	●	○	●
PB77	Internal position command speed 8	0~3000	0	r/min	○	●	○	●
PB78	Internal position command PO9 high position	-9999～9999	0	×10000 pulse	●	●	○	●
PB79	Internal position command PO9 low position	-9999～9999	0	×1 pulse	●	●	○	●
PB80	Internal position command PO10 high position	-9999～9999	0	×10000 pulse	●	●	○	●
PB81	Internal position command PO10 low position	-9999～9999	0	×1 pulse	●	●	○	●
PB82	Internal position command PO11 high position	-9999～9999	0	×10000 pulse	●	●	○	●
PB83	Internal position command PO11 low position	-9999～9999	0	×1 pulse	●	●	○	●
PB84	Internal position command PO12 high position	-9999～9999	0	×10000 pulse	●	●	○	●
PB85	Internal position command PO12 low position	-9999～9999	0	×1 pulse	●	●	○	●
PB86	Internal position command PO13 high position	-9999～9999	0	×10000 pulse	●	●	○	●
PB87	Internal position command PO13 low position	-9999～9999	0	×1 pulse	●	●	○	●
PB88	Internal position command PO14 high position	-9999～9999	0	×10000 pulse	●	●	○	●
PB89	Internal position command PO14 low position	-9999～9999	0	×1 pulse	●	●	○	●
PB90	Internal position command PO15 high position	-9999～9999	0	×10000 pulse	●	●	○	●
PB91	Internal position command PO15 low position	-9999～9999	0	×1 pulse	●	●	○	●
PB92	Internal position command PO16 high position	-9999～9999	0	×10000 pulse	●	●	○	●
PB93	Internal position command PO16 low position	-9999～9999	0	×1 pulse	●	●	○	●

Number	Name	Scope	Factory setting	Unit	Control mode		Read-only	Effective immediately
					P	S		
PB94	Internal use	—	—	—	○	○	○	○
PB95	Internal use	—	—	—	○	○	○	○
PB96	Internal use	—	—	—	○	○	○	○
PB97	Internal use	—	—	—	○	○	○	○
PB98	Internal use	—	—	—	○	○	○	○
PB99	Internal use	—	—	—	○	○	○	○
PB100	Reserved	—	—	—	○	○	○	○
PB101	Reserved	—	—	—	○	○	○	○
PB102	Internal use	—	—	—	○	○	○	○
PB103	Internal use	—	—	—	○	○	○	○
PB104	Internal use	—	—	—	○	○	○	○
PB105	Internal use	—	—	—	○	○	○	○
PB106	Internal use	—	—	—	○	○	○	○
PB107	Internal use	—	—	—	○	○	○	○
PB108	Internal use	—	—	—	○	○	○	○
PB109	Internal use	—	—	—	○	○	○	○
PB110	Internal use	—	—	—	○	○	○	○
PB111	Internal use	—	—	—	○	○	○	○
PB112	Internal use	—	—	—	○	○	○	○
PB113	Internal use	–	–	–	○	○	○	○
PB114	Internal use	–	–	–	○	○	○	○
PB115	Reserved	–	–	–	○	○	○	○
PB116	Reserved	–	–	–	○	○	○	○
PB117	Reserved	–	–	–	○	○	○	○
PB118	Output port Z pulse width	1~200	1	ms	●	●	○	●
PB119	Reserved	–	–	–	○	○	○	○
PB120	Reserved	–	–	–	○	○	○	○
PB121	Reserved	–	–	–	○	○	○	○
PB122	Reserved	–	–	–	○	○	○	○
PB123	Reserved	–	–	–	○	○	○	○
PB124	PP command unit selection	0~5	0	–	●	●	○	●

4.4 PB Parameter Description

PB00 Parameter code

PB01 Setting of control command input source （0~4）

Function: 0: Pt mode (external pulse)
1: Pr mode (internal registers)
2:Pp mode (programming mode)

PB02 Selection of position command programming coordinate (absolute / relative) (0~1)

Function: 0: absolute coordinate
1: relative coordinate

PB03 Numerator of position unit conversion factor / mechanical teeth of turret (1 ~ 32767)

Function: ① PB101=0: standard application
② PB101=1: servo turret application

PB 04 denominator of position unit conversion factor / teeth at turret motor side (1 ~ 32767)

Function: See parameter PB03

PB05 EEPROM parameter version

Function: See EEPROM parameter version from 《Description on KT270 software version》

PB06 Internal position command speed 1 (0~3000 r/min)

PB1	Input function			Internal position frequency	Number
	PSC1	PSC2	PSC3		
1	Open	Open	Open	Internal position frequency 1	PB06
	Close	Open	Open	Internal position frequency 2	PB07
	Open	Close	Open	Internal position frequency 3	PB08
	Close	Close	Open	Internal position frequency 4	PB09
	Open	Open	Close	Internal position frequency 5	PB74
	Close	Open	Close	Internal position frequency 6	PB75
	Open	Close	Close	Internal position frequency 7	PB76
	Close	Close	Close	Internal position frequency 8	PB77

PB07 Internal position command speed 2 (0~3000 r/min)

See PB06 parameter description

PB08 Internal position command speed 3 (0~3000 r/min)

See PB06 parameter description

PB09 Internal position command speed 4 (0~3000 r/min)

See PB06 parameter description

PB10 Internal position commandPO1 high position（-9999~9999）

Function: ① When internal position command is “9999” both in high position and low position , it means the infinity in the positive direction(without end);

② When both of them are “-9999” , it means the infinity in the negative direction.

PB1	Input function				Internal position command	Parameter Number	
	POS1	POS2	POS3	POS4		high position	low position
1	Open	Open	Open	Open	Internal position command 1	PB10	PB11
	Close	Open	Open	Open	Internal position command 2	PB12	PB13
	Open	Close	Open	Open	Internal position command 3	PB14	PB15
	Close	Close	Open	Open	Internal position command 4	PB16	PB17
	Open	Open	Close	Open	Internal position command 5	PB18	PB19
	Close	Open	Close	Open	Internal position command 6	PB20	PB21
	Open	Close	Close	Open	Internal position command 7	PB22	PB23
	Close	Close	Close	Open	Internal position command 8	PB24	PB25
	Open	Open	Open	Close	Internal position command 9	PB78	PB79
	Close	Open	Open	Close	Internal position command 10	PB80	PB81
	Open	Close	Open	Close	Internal position command 11	PB82	PB83
	Close	Close	Open	Close	Internal position command 12	PB84	PB85
	Open	Open	Close	Close	Internal position command 13	PB86	PB87
	Close	Open	Close	Close	Internal position command 14	PB88	PB89
	Open	Close	Close	Close	Internal position command 15	PB90	PB91
	Close	Close	Close	Close	Internal position command 16	PB92	PB93

PB11 Internal position command PO1 low position（-9999~9999）

Function: See parameter PB10

PB12 Internal position command PO2 high position（-9999~9999）

Function: See parameter PB10

PB13 Internal position command PO2 low position（-9999~9999）

Function: See parameter PB10

PB14 Internal position command PO3 high position（-9999~9999）

Function: See parameter PB10

PB15 Internal position command PO3 low position（-9999~9999）

Function: See parameter PB10

PB16 Internal position command PO4 high position（-9999~9999）

Function: See parameter PB10

PB17 Internal position command PO4 low position（-9999~9999）

Function: See parameter PB10

PB18	**Internal position command PO5 high position（-9999~9999）**

Function: See parameter PB10

PB19	**Internal position command PO5 low position（-9999~9999）**

Function: See parameter PB10

PB20	**Internal position command PO6 high position（-9999~9999）**

Function: See parameter PB10

PB21	**Internal position command PO6 low position（-9999~9999）**

Function: See parameter PB10

PB22	**Internal position command PO7 high position（-9999~9999）**

Function: See parameter PB10

PB23	**Internal position command PO7 low position（-9999~9999）**

Function: See parameter PB10

PB24	**Internal position command PO8 high position（-9999~9999）**

Function: See parameter PB10

PB25	**Internal position command PO8 low position（-9999~9999）**

Function: See parameter PB10

PB26	**Positive direction software limit values high position（0~9999）**

PB27	**Positive direction software limit values low position (0~9999)**

PB28	**Negative direction software limit values high position (-9999~0)**

PB29	**Negative direction software limit values low position (-9999~0)**

PB32	**Backlash（0~9999）**

PB33	**Exchange of motor encoder feedback signal SASB （0~1）**

Function: ①0: Constant

②1: Negated

PB34	**Back to the origin (reference point) start mode（0~1）**

Function: ①0: Do not return to the reference point automatically when SON is valid for the first time

②1: Return to the reference point automatically when SON is valid for the first time

PB35	**Operation mode of back to the origin (reference point) （0~1）**

Function: ①0: Looking for Z pulse

②1: Located at the origin of the detector without looking for Z pulse

PB36	**Back to the origin (reference point) speed (high speed: speed before touching proximity switches)（-2000~2000）**

Function: Determine the direction and speed for back to the origin

PB37	**Back to the origin (reference point) speed (low speed: speed after touching proximity switches)（-200~200）**

Function: Determine the direction and speed when looking for Z pulse

PB38	**The origin (reference point)offset position（high position）(-9999~9999)**

PB39	**The origin (reference point)offset position（low position）(-9999~9999)**

PB40	**The origin (reference point)position setting value（high position）(-9999~9999)**

PB41	**The origin (reference point)position setting value（low position）(-9999~9999)**

PB42	**Start mode（0~3）**

Function: BIT1=0: SON=1 is valid; =1: Nothing to do with SON signal

PB43	**Stop mode(selection of operation stop signal STOP function)（0~2）**

Function: 0: Stop immediately (Pp and Pr mode)

PB45	**Selection of customized input and output functions and valid input mode are determined by PB parameters(0~3)**

Function: ①Bit0=0: IN0~IN3 mandatory functions are “SON”, “RES”, “LSP” and “LSN” functions. IN4~IN7 functions are determined by PA4, PA53 and PA5. Other physical input interface.

②Bit0=1: IN0~IN7 functions are determined by PB46~PB53.

③Bit1=0：out0~out2 mandatory functions are “RD”, “ALM” and “INP or SA（determined by PA4）” functions. out3 function is determined by PA56.

④Bit1=1：out0~out3 functions are determined by PB56~PB59.

⑤Bit2=0：in0~in7 signal input effective mode function is determined by PA22.

⑥Bit2=1：in0~in9、in10~in15 signal input effective mode function is determined by PB60~69 and PB94~99.

Note: IN8~IN9 definitions are determined by PB54, PB55. IN10~IN15 definitions are determined by PB94~PB99. out4~out10 definitions are determined by PB102~PB108.

PB46 IN0 signal definition（0~34）

Function: See input interface selection table (IN4~IN7 functions are determined by PB50~PB53 only when PB45bit0=1）

Interface selection table:

Number	Abbreviation	Definition	Work mode				Valid signal			
			Pt	Pr	Pp	S	1	0	↑	↓
0	STAND	Standard input pot			*		√	√	√	√
1	SON	Servo on	*	*		*	√	√		
2	RES	Reset, clear alarm	*	*			√	√		
3	LSP	Forward travel end	*	*		*	√	√		
4	LSN	Reverse travel end	*	*		*	√	√		
5	CLE	Position deviation counter cleared	*	*			√	√		
6	INH	Pulse command input prohibited	*				√	√		
7	TL+	Forward torque limit	*	*		*	√	√		
8	TL-	Reverse torque limit	*	*		*	√	√		
9	SC1	Internal speed selection 1				*	√	√		
10	SC2	Internal speed selection 2				*	√	√		
11	DEG1	Electronic gear function selection 1	*	*			√	√		
12	DEG2	Electronic gear function selection 2	*	*			√	√		
13	ST1	Positive start	*	*		*	√	√		
14	ST2	Reverse start	*	*		*	√	√		
15	ISC	Internal and external speed selection switch				*	√	√		
16	RDC	Change rotation direction	*	*		*	√	√		
17	CMC	Control mode switch	*	*		*	√	√		
18	POS1	Internal position command selection 1		*			√	√		
19	POS2	Internal position command selection 2		*			√	√		
20	POS3	Internal position command selection 3		*			√	√		
21	POS4	Internal position command selection 4		*			√	√		
22	PSC1	Internal position command speed selection 1		*			√	√		
23	PSC2	Internal position command speed selection 2		*			√	√		
24	PSC3	Internal position command speed selection 3	*				√	√		
25	START	Operation start	*				√	√	√	√
26	DOORG	Start origin operation	*				√	√	√	√
27	ORGIN	Origin sensor input	*				√	√	√	√
28	STOP	Operation stop signal	*		*		√	√	√	√

PB47 IN1 signal definition（0~34）

Function: See input interface selection table(see parameter PB46)

PB48 IN2 signal definition（0~34）

Function: See input interface selection table(see parameter PB46)

PB49 IN3 signal definition（0~34）

Function: See input interface selection table(see parameter PB46)

PB50 IN4 signal definition（0~34）

Function: See input interface selection table(see parameter PB46)

PB51 IN5 signal definition（0~34）

Function: See input interface selection table(see parameter PB46)

PB52 IN6 signal definition（0~34）

Function: See input interface selection table(see parameter PB46)

PB53 IN7 signal definition（0~34）

Function: See input interface selection table(see parameter PB46)

PB56 OUT0 signal definition（0~11）

Function: See output interface selection table (as below)

Number	Abbreviation	Definition	Work mode			
			Pt	Pr	Pp	S
0	STAND	Standard output port			*	
1	ALM	Servo alarm	*	*	*	*
2	RD	Servo ready	*	*	*	*
3	INP	Position arrival	*	*	*	
4	SA	Speed arrival			*	*
5	CDO	Motor current detection output	*	*	*	*
6	TDO	Torque limit	*	*	*	*
7	ZSP	Zero speed arrival	*	*	*	*
8	OUT_Z	Motor encoder Z pulse delays 1ms to output	*	*	*	*
9	MBR	Motor mechanical brake control output	*	*	*	*

PB57 OUT1 signal definition（0~11）

Function: See output interface selection table (see parameter PB56)

PB58 OUT1 signal definition（0~11）

Function: See output interface selection table (see parameter PB56)

PB59 OUT1 signal definition（0~11）

Function: See output interface selection table (see parameter PB56)

PB74 Internal position command speed 5（0~3000 r/min）

Function: See No. PB06 parameter description

PB75	**Internal position command speed 6（0~3000 r/min）**
PB76	**Internal position command speed 7（0~3000 r/min）**
PB77	**Internal position command speed 8（0~3000 r/min）**
PB78	**Internal position command PO9 high position（-9999~9999）**

Function: See No. PB10 parameter description

PB79	**Internal position command PO9 low position（-9999~9999）**
PB80	**Internal position command PO10 high position（-9999~9999）**
PB81	**Internal position command PO10 low position（-9999~9999）**
PB82	**Internal position command PO11 high position（-9999~9999）**
PB83	**Internal position command PO11 low position（-9999~9999）**
PB84	**Internal position command PO12 high position（-9999~9999）**
PB85	**Internal position command PO12 low position（-9999~9999）**
PB86	**Internal position command PO13 high position（-9999~9999）**
PB87	**Internal position command PO13 low position（-9999~9999）**
PB88	**Internal position commandPO14 high position（-9999~9999）**
PB89	**Internal position command PO14 low position（-9999~9999）**
PB90	**Internal position command PO15 high position（-9999~9999）**
PB91	**Internal position command PO15 low position（-9999~9999）**
PB92	**Internal position command PO16 high position（-9999~9999）**
PB93	**Internal position command PO16 low position（-9999~9999）**
PB118	**Width of output port Z pulse (0~200 ms)**

Function: Used for setting the width, of output port Z pulse and is valid upon opening the specified output port Z pulse function.

PB124	**PP command unit selection（0~3）**

Function: ① Selection of SPD command unit : BIT1BIT0：00-r/min；01-0.1*r/min

② Selection of POS_H command unit: BIT3BIT2: 00- correspond to the number of motor turns (i.e. 4 * PA89 (encoder line number))

01-10000 pulses.

Chapter 5
Alarm and Remedy

5.1 Alarm List

5.2 Alarm remedy

5.3 Analyses on frequent failures

5 Alarm and Remedy

5.1 Alarm List

RES validity means the RES signal can clear the alarm when current alarm conditions are not satisfied.

- 1 RES valid.
- 0 RES invalid.

Table 5.1 Alarm List

Alarm code	Alarm Item	Description	RES effective
--	Normal		1
1	Over-speed	Speed of servo motor exceeds set value	1
2	Over-voltage of main circuit	Over-voltage of main circuit power supply	1
3	Under-voltage of main circuit	Under-voltage of main circuit power supply	1
4	Out-ranged positioning	Counter value for position deviation exceeds set value	1
6	Saturated malfunction of speed amplifier	Speed controller is saturated for a long time	1
7	Abnormal drive disable	Input of travel ends for positive run and reverse run are open	1
8	Counter overflow for position deviation	Absolute counter value for position deviation exceeds 2^{30}	1
9	ABZ signal malfunction of photoelectric encoder	ABZ signal error in the encoder	1
11	IPM Module malfunction	Malfunction of IPM Intelligent module	0
12	Over-current	Over-current of motor	0
13	Overload	Servo drive and motor are overloaded (instant overheat)	0
14	Braking malfunction	Malfunction of braking circuit	1
15	Miscount of encoder	Abnormal counting of encoder	0
16	Thermal overload of motor	Electro-heat value of motor exceeds set value (checked by I^2t)	0
17	Speed response malfunction	Vital speed alarm in long-term	0
18	UVW signal malfunction of photoelectric encoder	UVW signal error in encoder	1
19	Thermal reset	System has a thermal reset	0
20	EEPROM alarm	EEPROM alarm	0
21	FPGA chip alarm	FPGA chip alarm	0
22	PLD chip alarm	PLD chip alarm	0
23	A/D chip alarm	A/D chip alarm or current sensor alarm	0
24	RAM chip alarm	RAM chip alarm	0
25	Zero offset of external speed analog exceeds the tolerance	Zero offset of external speed analog is out of the rang	0

5 Alarm and Remedy

Alarm code	Alarm Item	Description	RES effective
26	Setting alarm of electron gear output	Numerator of multiplying factor is greater than denominator	0
27	Default phase alarm	Open-phase of 3-phase input supply	0
28	Parameter setting conducts an overflow in calculation	Overflow error of parameter setting	0
29	Error on broken lines of resolver	Broken lines of resolver	0
30	Missing of Z impulse of encoder	Z impulse error of encoder	0
31	UVW signal error of encoder	UVW signal error in encoder or encoder mismatching	0
32	Code violation of encoder UVW signal	Full high level or low level is present in UVW signal	0
33	An error on too high input signal voltage of resolver's conversion chip	Input signal voltage of resolver's conversion chip is too high	0
34	An error on tracking input signal of resolver's conversion chip	Abnormal tracking of input signal of resolver's conversion chip	0
35	Brake line is working during none falling-rate period	Over voltage of major loop power supply	0
36	Faulty operation	Illegal operation is executed	1
37	Wrong magnification setting of input position command	Wrong parameter setting	1
38	Overflow alarm of smoothing filter	Wrong parameter setting	1
39	Communication alarm	Communication alarm	1
40	Overflow of NC program pointer and stack	PC pointer used by PP program exceeds the program scope, the stack pointer for PP program exceeds the scope,	1
41	RDC Chip malfunction	Abnormal reading of numerical values which exceeds the normal range	1
42	Misreading of PP parameters from EEPROM	When reading PP parameters from EEPROM (PP procedures, PJ parameters, interrupt entrance address table, interrupt priority tables) , an alarm occurs due to inconsistent accumulated sum	1
43*	Internal use		1
44*	Internal use		0
45	The error when calling corresponding motor’s default parameters to modify PA1 or PA59	When calling motor’s default parameters to modify PA1 or PA59, calculated accumulative value is discrepant with received accumulative value.	1

5 Alarm and Remedy

Alarm code	Alarm Item	Description	RES effective
46	Version of drive software is too low	This version does not support PP instruction function required by the user and needs to be upgraded.	0
47	External analog input is too large as AU-ADJ operation is performed	If the external analog reference input is higher than the alarm threshold during AU-ADJ operation, an alarm occurs.	1
48	First reading from line-saving encoder UVW is wrong	Only effective to UVW line-saving encoder: 3 consecutive readings from encoder UVW are not the same upon power-on	0
49	An alarm on too low software version of EEPROM	Read and compare the EEPROM version number in the initialization phase to guarantee exact realization of DSP software function in relation of EEPROM data	0
60	Parameter reading error	Cumulative sum error of calculated parameters during initialization and the implementation of EE-rd operation	0
64	EMG alarm	An alarm to indicate that the external EMG input interface is valid	1
70	RS485 communication checksum error	3 consecutive errors of CRC checksum	1
71	RS485 communication data frame length is out of range	A data frame has more than 50 bytes	1

5.2 Alarm remedy

1	Over-speed	
Running status:	**Cause**	**Remedy**
The control power is turned on	Malfunction of control circuit board	Replace servo drive
	Encoder malfunction	Replace servo motor
During motor running	Too high pulse frequency of input command	Set input command impulse correctly
	Too low time constant for acceleration and deceleration, leading to too high speed overshooting	Enlarge acceleration and deceleration time constant
	Too high input of electron gear ratio	Set correctly
	Poor encoder cable	Correct the cabling
	Overshot is created due to instable servo system	Reset respective gain If the gain fails to be set to proper value, reduce the rate of loaded rotary inertia
	Encoder malfunction	Replace servo motor
Upon start-up of motor	Wrong wiring of U、V、W leads of motor	Correct the wiring
	Wrong wiring of encoder leads.	
	Too much load inertia	Reduce load inertia Replaced drive and motor with higher power
	Alarm on zero reference of encoder	Replace servo motor

2	Over-voltage of main circuit	
Running status:	**Cause**	**Remedy**
The control power is turned on	Malfunction of circuit board	Replace servo drive
Upon switching on primary source	Over supply voltage	Check power supply
	Abnormal waveform of supply voltage	
During motor running	Regenerative discharge resistance is disconnected	Afresh wiring
	Brake transistor is damaged	Replace servo drive
	Internal regenerative discharge resistance is damaged	
	Insufficient capacity of braking loop	Reduce t on-off frequency Increase time constant for acceleration and deceleration Reduce the value for torque limitation Cut load inertia Replaced drive and motor with higher power

3	Under-voltage of main circuit	
Running status :	**Cause**	**Remedy**
The control power is turned on	Three-phase AC input voltage is too low	Test if R, S, T input is below AC220V-25%
	Malfunction of servo drive	Replace servo drive
During motor running	Insufficient power supply capacity Instant power down	Check power supply

4	Out-ranged positioning	
Running status :	**Cause**	**Remedy**
The control power is turned on	Malfunction of circuit board	Replace servo drive
Motor fails to run when primary source and control line are switched on and command impulse is input.	Wrong wiring of U、V、W leads of motor	Correct the wiring.
	Wrong wiring of encoder cable	
	Encoder fault	Replace servo motor
During motor running	Too small range for detection of out-ranged positioning	Increase the range for detection of out-ranged positioning.
	Too small proportional gain for positioning	Increase gain
	Too high command impulse frequency	Reduce frequency
	Insufficient torque	Check the value for torque limitation Cut load capacity Replace drive and motor with higher power

6	Saturated malfunction of speed amplifier	
Running status:	**Cause**	**Remedy**
During motor running	Motor has mechanical jam	Inspect mechanical part under load
	Overloaded	Cut load Replace drive and motor with higher power

7	Abnormal drive disable	
Running status:	**Cause**	**Remedy**
The control power is turned on	Input terminal of travel ends for positive run and reverse run are open.	Inspect the power source for wiring and input terminal

8	Counter overflow for position deviation	
Running status:	**Cause**	**Remedy**
Motor fails to run when primary source and control line are switched on and command impulse is input.	Motor has mechanical jam	Inspect mechanical part under load
	Abnormal input command impulse	Check command impulse Check if the motor runs against command impulse

9	Photoelectric encoder ABZ signal malfunction	
Running status:	**Cause**	**Remedy**
The control power is turned on	Breaks of PHA、PHB、PHZ、PHAR、PHBR、PHCR encoder wires	Motor encoder to the drive cable has partial disconnection or connection is not reliable (can be judged by observing the encoder input signal (dp_Cod).
	The encoder cable is not plugged in	Plug the cable
	Encoder wiring error	Check wiring or replace cables
	Over-length of encoder cable	Cut cable length or adopt parallel supply with multi-core cable
	External interference signal	Please use shielded twisted pair cables and check whether shielded wires connect the connector shell. Don’t make it parallel with strong electricity or line it in the same conduit with strong electricity
	Damaged encoder	Replace servo motor
	Drive interface circuit damaged	Replace servo drive

11	IPM Module malfunction	
Running status:	**Cause**	**Remedy**
The control power is turned on	Fan doesn't turn or is damaged	First check whether it is clogged and clear the debris. Replace servo drive cooling fan
	Malfunction of circuit board	Replace servo drive
During motor running	Drive and motor parameters mismatch	Confirm whether PA1 and PA59 parameters are correct
	Short-circuit among motor power lines U, V and W	Check wiring
	Poor connection of motor power line U, V, W	Verify firm connection by screw between the motor power line and the drive. Reliable soldering of electrical power lines and motor. The motor power cord and motor outlet muse be reliable connection.
	Poor earthing	Check the drive and motor for reliable earthing and check if the line diameter of ground line is too small
	Affected by interference	Check the line filter case whether the contactor, relays, electromagnetic valves have taken measures by adding some inductive parts to prevent the impact of voltage (e.g., r-c absorbing circuit, absorbing diode at dc coil side). Check whether the control signal wiring is as short as possible, and try to separate wiring from power lines to avoid inductive interference. Far from the interference.
	Destruction of motor insulation	Replace servo motor
	Drive is damaged	Replace servo drive

12	Over-current	
Running status:	**Cause**	**Remedy**
The control power is turned on	Malfunction of circuit board	Replace the drive
During motor running	Short circuit between U, V, W in the drive	Check wiring
	Imperfect earthing	Correct the earthing
	Motor insulation damage.	Replace the drive

13	Overload	
Running status:	**Cause**	**Remedy**
The control power is turned on	Malfunction of circuit board	Replace servo drive
During motor running	One phase breakage among U, V, W	Check wiring
	Encoder wiring Alarm	
	Holding brake is not opened	Check holding brake
	Unstable motor with oscillation	Adjust gain Increase time constant for acceleration and deceleration Cut load inertia
	Running at an over-ranged torque	Check load Cut on-off frequency Reduce the value for torque limitation Replace drive and motor with higher power

14	Braking malfunction	
Running status:	**Cause:**	**Remedy**
The control power is turned on	Malfunction of circuit board	Replace servo drive
During motor running	Disconnection of regeneration discharge resistance	Rewiring
	Over-voltage of main circuit power supply	Check main power supply
	Insufficient capacity of braking loop	Cut on-off frequency Increase time constant for acceleration and deceleration Reduce the value for torque limitation Cut load inertia Replaced drive and motor with higher power
Upon switching on SON signal	Brake transistor is damaged	Replace servo drive
	Internal regeneration discharge resistance is damaged	

15	Miscount of encoder	
Running status:	**Cause**	**Remedy**
During motor running	Encoder wiring error	Check wiring
	Imperfect earthing	Correct the earthing
	Number of encoder lines is wrong	Make sure parameters PA1 and PA59 are correct
	Encoders and motor pole pairs don't match	
	False Z signal presented in encoder (several Z impulses in one turn)	Please use shielded twisted pair cables and check whether shielded wire touches connector shell. Don’t make it parallel with strong electricity or line it in the same conduit with strong electricity.
	Damaged encoder	Replace servo motor

16	Thermal overload of motor	
Running status:	**Cause**	**Remedy**
The control power is turned on	Malfunction of circuit board	Replace servo drive
During motor running	Long-term running at an over-ranged torque	Check load Reduce on-off frequency Reduce the value for torque limitation Replace drive and motor with higher power
	Poor mechanical transmission	Inspect mechanical part

17	Speed response malfunction	
Running status:	**Cause**	**Remedy**
The control power is turned on	Chip or circuit board malfunction	Replace servo drive
During motor running	Overloaded, locked rotor	Check load condition
	Loose connection between encoder and motor shaft	Replace motor

18	UVW signal malfunction of photoelectric encoder	
Running status:	**Cause**	**Remedy**
The control power is turned on	Encoder wiring alarm	Check wiring
	Damaged encoder	Replace servo motor
	Poor encoder cable	Replace cable
	Low power supply voltage for encoder due to over-length of encoder cable	Cut cable length Use parallel operation supply power with multi-core cable
	Damaged drive interface	Replace servo drive
	Wrong setting of motor parameter Use parameters for non line-saving motor to run the motor with line-saving encoder	Properly set motor parameters

19	Thermal reset	
Running status:	**Cause**	**Remedy**
The control power is turned on	Instable power supply for input control	Check control power supply
	Affected by interference	Add line filter Far from interference source

20	EEPROM Chip Alarm	
Running status:	**Cause**	**Remedy**
The control power is turned on	Reading error of Memory parameters	Reset power Reset the drive type (parameter PA1), and then restore the default parameters. **Need to reset the user parameters**
	Drive damaged	Replace servo drive

21	FPGA Chip Alarm	
Running status:	**Cause**	**Remedy**
The control power is turned on	Damaged chip or circuit board	Replace servo drive

22	PLD Chip Alarm	
Running status:	**Cause**	**Remedy**
The control power is turned on	Damaged chip or circuit board	Replace servo drive

23	A/D Chip Alarm	
Running status:	**Cause**	**Remedy**
The control power is turned on	Damaged chip or circuit board	Replace servo drive
	Damaged current sensor	
	Improper power supply	

24	RAM Chip Alarm	
Running status:	**Cause**	**Remedy**
The control power is turned on	Damaged chip or circuit board	Replace servo drive
	Damaged PLD chip	

25	Zero deviation of external speed analog is out of range.	
Running status:	**Cause**	**Remedy**
Reset of analogue	Zero deviation of external speed analog is out of range.	Check the input analog if it exceeds the range of (-58mv-+23 mv) during zero setting of the analog
		Check the system for correct earthing.
		Replace servo drive.

26	Wrong setting of electron gear output	
Running status:	**Cause**	**Remedy**
The control power is turned on	Numerator of multiplying factor is greater than denominator	Reset numerator and denominator parameters

27	Lack-phase alarm	
Running status:	**Cause**	**Remedy**
The control power is turned on	Poor power supply wiring	Correct the wiring
	Lack-phase of input 3-phase supply	Check power

28	Parameter setting conducts an overflow in calculation	
Running status:	**Cause**	**Remedy**
The control power is turned on	Overflow of parameter setting	Correct setting of parameter 。

29	Error on broken lines of resolver	
Running status:	**Cause**	**Remedy**
The control power is turned on	Wiring error of resolver	Correct wiring（ priority check： actuating signal REF+（CN5-10）,REF-(CN5-5)）。
	Poor connecting cable between resolver and drive.	
	Over-length of connecting cable of the resolver resulting in low power supply voltage in resolver	Cable length for connection should be within 30 M.
	Damaged conversion chip of drive's resolver	Replace servo drive.

30	Missing of encoder Z impulse	
Running status:	**Cause**	**Remedy**
During motor running	Poor cable	Correct the wiring
	Poor cable shielding	
	Poor connection of shielding earth	
	Absence of Z impulse, encoder is damaged	Replace servo drive

31	Encoder UVW signal Alarm	
Running status:	**Cause**	**Remedy**
The control power is turned on	Poor cable	Correct the wiring
	Poor cable shielding	
	Poor connection of shielding earth	
	Encoder UVW signal damaged	Replace servo drive
	Damaged Z signal in encoder	

32	Code violation of UVW signals in encoder	
Running status:	**Cause**	**Remedy**
The control power is turned on	Poor cable Poor cable shielding Poor connection of shielding earth	Correct the wiring
	Damaged UVW signals in encoder	Replace servo drive

33	Alarm on too high input signal voltage of resolver's conversion chip	
Running status:	**Cause**	**Remedy**
The control power is turned on	Wiring error or no wiring of the resolver	Correct the wiring 。
	Poor connecting cable between resolver and drive.	
	Damaged conversion chip of drive's resolver	Replace servo drive.

34	An error on tracking input signal of resolver's conversion chip	
Running status:	**Cause**	**Remedy**
The control power is turned on	Wiring error of resolver	Correct wiring（ priority check： Signal Sin+(CN5-9),Sin-(CN5-4) ； Cos+(CN5-8),Cos-(CN5-3)）。
	Poor connecting cable between resolver and drive.	
	Damaged conversion chip of drive's resolver	Replace servo drive.

35	Brake line is working during none falling-rate period	
Running status:	**Cause**	**Remedy**
Upon switching on main source or during motor running	Over voltage of power supply	Measure R, S, T input voltage and check if they are normal Appropriately increase PA33 parameter value **(Note: If the parameter value is overset , it may damage the drive)**
	Damaged servo drive	Replace servo drive

36	Faulty operation	
Running status:	**Cause:**	**Remedy**
During abnormal operation	Execute EE-DEF operation when drive is enabled in SON.	Reset it manually or by power-off

37	Input position instructions multiplying factor set wrong	
Running status:	**Cause**	**Remedy**
During motor running	High value of PA12/PA13	Reduce PA12 / PA13 values.
	Too high frequency of input command	Reduce the frequency of input command

38	Smoothing filter overflow alarm	
Running status:	**Cause**	**Remedy**
During motor running	High value of PA12/PA13	Reduce PA12 / PA13 values.
	Too high frequency of input command	Reduce the frequency of input command
	High value of PA19	Reduce the value of PA19

39	Communication Alarm	
Running status:	**Cause**	**Remedy**
Upon switching on control source	Imperfect earthing	Correct the earthing
	Wrong wiring of communication lines	Replace communication lines.
	Incorrect setting of communication parameters (stack number , communication speed)	Set the communications address of the drive (PA51) and the communication speed (PA52) correctly according to communication address and communication speed of upper computer
	Damaged drive hardware	Replace servo drive

40	NC program pointer and stack overflow	
Running status	**Cause**	**Remedy**
The control power is turned on	NC program interrupt nested calls are more than three levels.	Reduce NC interrupt nested calls within three levels.
	NC program too large	Reduce the instructions of the NC program

41	RDC chip Alarm	
Running status	**Cause**	**Remedy**
The control power is turned on	The D-value of two adjacent interrupt data that are read from the resolver can not exceed 27（1 pair poles）.Corresponding motor is impossible to reach the highest speed of 8000 rpm. $\Delta PULSE_{ERROE} = \frac{n_{max} \times 2^{rdc} \times PA108}{60 \times f_{sample}}$	Check the motor resolver if it is damaged Revolve signal is reliably connected. Replace servo drive

42	PP parameters read Alarm in EEPROM	
Running status	**Cause**	**Remedy**
The control power is turned on	EEPROM version is too old.	Upgrade EEPROM program

43	Internal use

44	Internal use

45	Modify PA1 or PA59 calls corresponding motor default parameters was wrong	
Running status:	**Cause**	**Remedy**
The control power is turned on	When modifying PA1 or PA59 and calling motor default parameters, calculated accumulative sum is not same as the received accumulative sum	Reset PA1 or PA59 Replace servo drive

46	Drive software version is too low	
Running status:	**Cause**	**Remedy**
Upon switching on control source	This version does not support PP instruction function. Be required by the user. Please upgrade it.	Upgrade drive program

47	External analog input is too large as AU-ADJ operation is performed	
Running status:	**Cause**	**Remedy**
Execute AU-ADJ operation	If the external analog reference input is higher than the alarming threshold during AU-ADJ operation, an alarm occurs.	Check external analogue input if it is abnormal. The absolute value of analogue input can not exceed 375mv.

48	First reading performed by line-saving encoder UVW is wrong	
Running status:	**Cause**	**Remedy**
The control power is turned on	Only effective to UVW line-saving encoder: 3 consecutive readings from encoder UVW are not the same upon power-on	Check the wiring of motor encoder if it is correct; Check the connection of motor encoder if it is reliable.

49	An alarm on too low software version of EEPROM	
Running status:	**Cause**	**Remedy**
The control power is turned on	EEPROM (PB5) version number does not match the software version number (PA2) when reading during the initialization phase.	Upgrade drive program.

60	Parameter reading error	
Running status:	**Cause**	**Remedy**
The control power is turned on	Cumulative sum error of calculated parameters during initialization and the implementation of EE-rd operation	Power on again Reinstall drive type (parameter PA1) and restore default parameter thereafter. **Need to reinstall customized parameters excluding default parameters.**
	Damaged servo drive	Replace servo drive.
64	**EMG alarm**	
Running status:	**Cause**	**Remedy**
The control power is turned on	It has EMG signal input for emergency stop.	Check for any input of interfering signals. Check for satisfied condition for input of EMG signal.
	Damaged servo drive	Replace servo drive.

70	RS485 communication checksum error	
Running status:	**Cause**	**Remedy**
Upon switching on control source	3 consecutive errors of CRC checksum	Correct the earthing
		Check for correct wiring.
		Correct setting of parameter （ PA51 ） for drive's communication stack number and parameter（PA52）for communication speed rate.
	Damaged servo drive	Replace servo drive.

71	RS485 communication data frame length is out of range	
Running status:	**Cause**	**Remedy**
Upon switching on control source	A data frame has more than 50 bytes	Correct the earthing
		Check for correct wiring.
		Correct setting of parameter （ PA51 ） for drive's communication stack number and parameter（PA52）for communication speed rate.
	Damaged servo drive	Replace servo drive.

5.3 Analyses on frequent failures

1) Insufficient output torque of the motor

Number	Cause	Remedy
1	Drive parameters don't match the motor	Check parameters PA1 and PA59.
2	Torque limit	Check parameters PA34 and PA35（Judged by checking (DP_Trq)） Check whether external TL + and TL - have input （Judged by checking the I/O monitoring interface (DP_In)）
3	JOG or trial run mode	In this case the default parameter should be 100% while you can modify PA38 or change parameter PA4
Notes	In the course of processing the variation of torque value can be observed in real time by monitoring the display interface (DP_trq) for practical torque in order to make a direct estimation on the loading condition. If the load is too large, it is required to check the loading conditions. If the loading condition is fine, use more powerful drive to replace it.	

2) Motor fails to run without any alarm

Number	Cause	Remedy
1	drive is not enabled	Check if external input SON signal is valid(By checking if the 'Run' light of the operation panel is on or by checking the I/O monitoring interface (dp_In)）
2	Drive and motor power lines do not have reliable connection	Check motor power line
3	Fail to rotate in one direction	Check if external input LSP or LSN signal is valid(By checking the I/O monitoring interface (dp_In)）
4	PA20=3 while LSP and LSN are invalid	Make external input LSP and LSN be valid, or modify PA20 , so it is not equal to 3
5	Wrong setting of pulse input mode parameter	Set parameter PA4=0
6	Wrong setting of pulse input mode parameter	Set parameter PA14 correctly
7	Reset position deviation counters to zero	Make external input CLE signal be invalid. It may be judged by checking of monitoring interface (dp_In) at I/O ports.）
8	Position impulse instructions input banned	Make external input INH signal be invalid（It may be judged by checking of monitoring interface (dp_In) at I/O ports.）

Number	Cause	Remedy
9	No input of position impulse command	Check if the interface connector is in poor contact.（It can be estimated by observing the display interface for speed instruction (dp_CP_O)）
10	Wrong setting of parameters for input mode of external analog speed	Set PA4=1
11	Choose internal speed mode	Make external input ISC signal invalid or set parameter PA42=0
12	No input of analog speed command	Check if the interface connector is in poor contact（It can be judged by observing the display interface for speed instruction (dp_CS)）

3) Fail to increase motor speed or motor is in creeping run.

Number	Cause	Remedy
1	Drive parameter don't match the motor	Estimated by checking of parameter PA1 and PA59
2	Max. speed limitation	Judged by checking of max. Speed limitation (parameter PA23),the parameter value should be greater than required motor speed. The set value could not exceed the rated maximum speed indicated on motor nameplate.
3	Wrong setting of motor power line sequence	Make sure that UVW connection between drive and motor is correct（it can not be remedied by simple alternation of phase sequence to realize reversal run of the motor）
4	Speed analogue gain is too low	If the motor speed fails to reach its expectation when the external analogue instruction for speed reaches 10V and the drive is in speed control mode (parameter PA4=1), The motor speed can be increased by changing the command input gain for speed variation (parameter PA43), however it is prohibited to raise the analog voltage to the value greater than ±10V.

Chapter 6
Display and Keyboard Operation

6 Display and Keyboard Operation

6.1 Keyboard operation

Display panel of KT270-H series is composed of 6 LED digitrons and 4 keys ↑、↓、←、↵. They are employed for display of various states and parameters setting.

The display panel adopts slider design that needs to move up the transparent cover by sliding upward at both sides simultaneously, as shown in Figure 6.1.

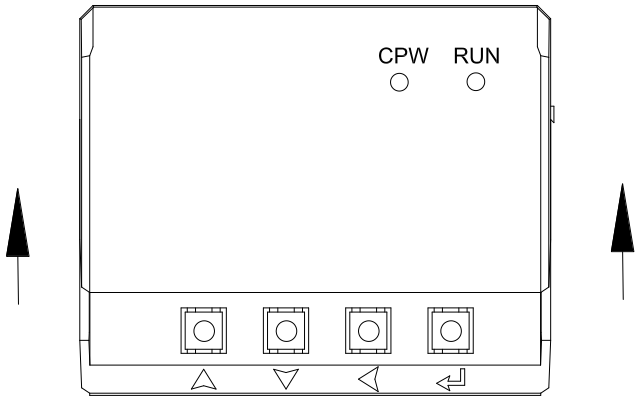


Fig. 6.1 Operating diagram for slider of KT270-H series

It is operated in multiple layers. ←、↵ keys are used for backward and forward of layers. ↵ key is used to enter and confirm while ← key is used to exit and cancel. ↑、↓ keys can be used to increase or decrease code numbers or values. By pressing and holding ↑、↓keys it can repeat the current operation. The longer the key is hold, the higher of repetition rate is got.

Notes

If 6 digitrons or the digitron at right-hand for decimal point are blinking it indicates there is an alarm.

The first layer is used for mode selection with altogether 9 modes to be selected by ↑ or ↓ keys. Press ↵ key to access the 2nd layer while pressing of ← key can exit the 2nd layer and return to the 1st layer.

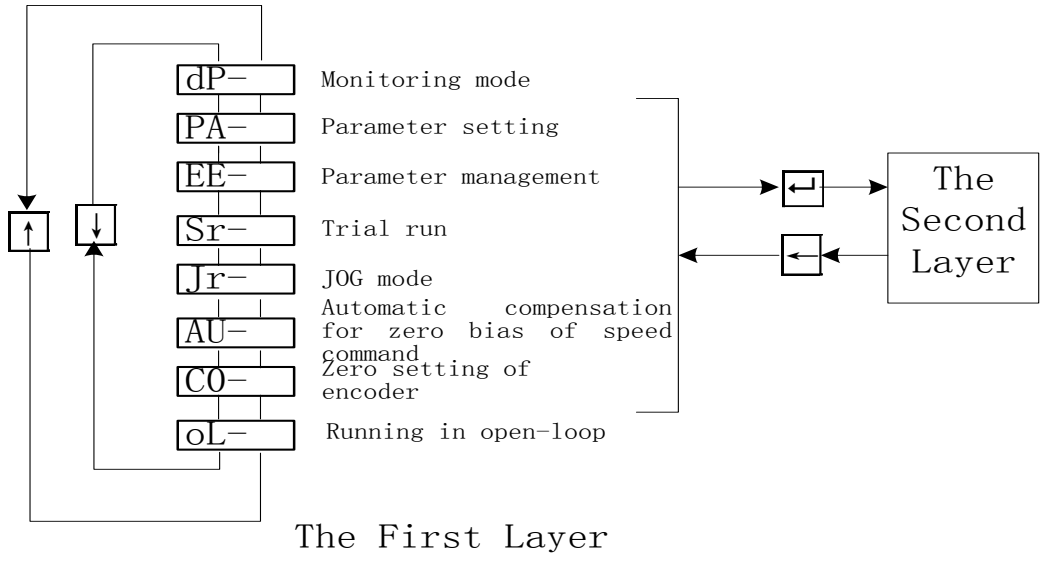


Fig. 6.2 Diagram for operation mode selection

6 Display and Keyboard Operation

6.2 Monitoring mode

Select “dP -” in the 1st layer and press ↵ key to enter monitoring mode.

24 display statuses are available for user to select with ↑ , ↓ keys. Pressing ↵ key can enter specific display status.

Monitoring mode	Select mode	Name
dP-	dP-SPd	Motor speed (r/min)
	dP-Pos	Current position, 5 digits lower (pulse)
	dP-PoS.	Current position, 5 digits higher (X 100000 pulse)
	dP-CPo	Position command, 5 digits lower (pulse)
	dP-CPo.	Position command, 5 digits higher (X 100000 pulse)
	dP-EPo	Position offset, 5 digits lower (pulse)
	dP-EPo.	Position offset, 5 digits higher (X 100000 pulse)
	dP-tr-9	Motor torque (%)
	dP- I	Motor current (A)
	dP-LSP	Linear speed (m/min)
	dP-Cnt	Current control mode
	dP-Fr-9	Position command pulse frequency (kHz)
	dP-CS	Speed command (r/min)
	dP-Ct	Torque command (%)
	dP-APo	Absolute position of the rotor in one turn (pulse)
	dP- In	Input plug state
	dP-oUt	Output plug state
	dP-Cod	Input signal of encoder
	dP-rn	Run mode
	dP-Err	Error NO.
	dP-tL	Command torque (%)
	dP- IA	A phase current (A)
	dP- IC	C phase current (C)
	dP-rES	Reserved

6 Display and Keyboard Operation

Mode	Display	Setting examples
		Enter specific display status
		Exit to mode selection
dP-SPd	dP-SPd r 1000	Motor speed 1000r/min
dP-PoS	dP-PoS P45806	Current position 1245806 pulse
dP-PoS.	dP-PoS. P. 12	
dP-CPo	dP-CPo C458 10	Position command 1245810 pulse
dP-CPo.	dP-CPo. C. 12	

Note: The input pulse means the impulse processed by input electron gear.

Impulse unit is the impulse unit within the system. In this system each turn will have 10000 impulses. Impulse can be expressed by 5 digits at high level + 5 digits at low level, the calculation procedure is:

Impulse = 5-digit value in high level*10000 + 5-digit value in low level

dP-EPo	dP-EPo	E 4	Position offset 4 pulse
dP-EPo.	dP-EPo.	E. 0	
dP-trq	dP-trq	t 70	Motor torque 70%
dP-I	dP- I	I 2.3	Motor current 2.3A

Note: Calculation procedure for motor current I is:

$$I = \sqrt{\frac{2}{3}(I_U^2 + I_V^2 + I_W^2)}$$

It expresses the amplitude value of the phase current. At high frequency, virtual value of phase current can be calculated by multiplying the value with 0.707.

dP-LSP	dP-LSP	L 5.000	Linear speed 5.000m/min

Note: If the displayed number reaches 6 digits (e.g. display of -12345), no more prompt character will be displayed.

dP-Cnt	dP-Cnt	Cnt 0	Current control mode is position control

Note:

0	Position control
1	Speed control
2	Trial run
3	JOG mode

dP-Frq	dP-Frq	F 126	Position command pulse frequency 12.6kHz

Note: The impulse frequency for positioning command indicates the actual input pulse frequency before processing by electron gear. Minimum unit of 0.1 KHz

Positive number means positive direction, negative number means reversal direction.

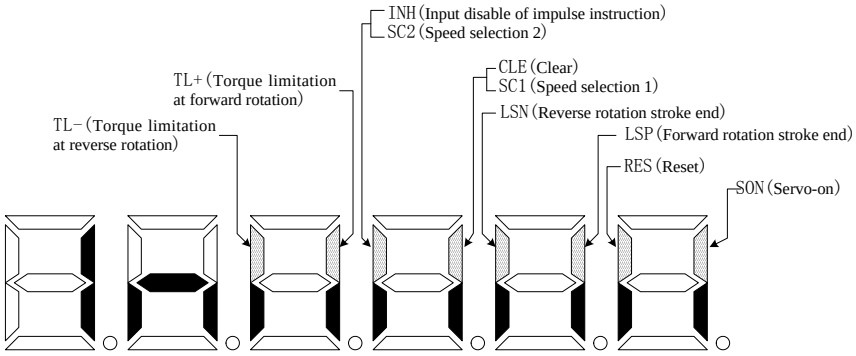
6 Display and Keyboard Operation

Mode	Display	Setting examples
		Enter specific display status
		Exit to the mode selection
dP-CS	dP-CS	r. -35 Speed command -35r/min
dP-Ct	dP-Ct	t. -20 Torque command -20%
dP-APo	dP-APo	A 3265 Absolute position of rotor 3265

Note: The absolute rotor position in one turn expresses the stator's relative position in one turn. It takes one turn as a complete alternation at a range of 0- 9999.

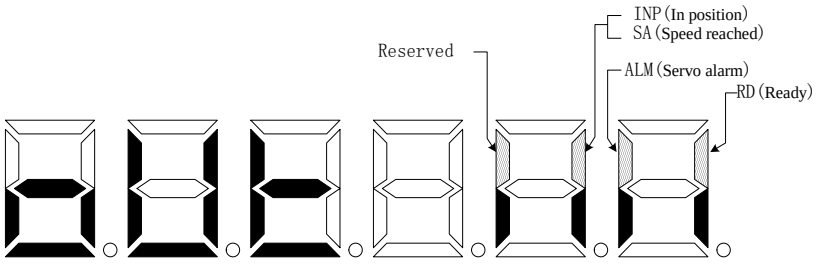
dP-In	dP- In	Input plug

Note: Display of input terminal is shown as following figure (illuminated stroke means close, extinguished stroke means open)



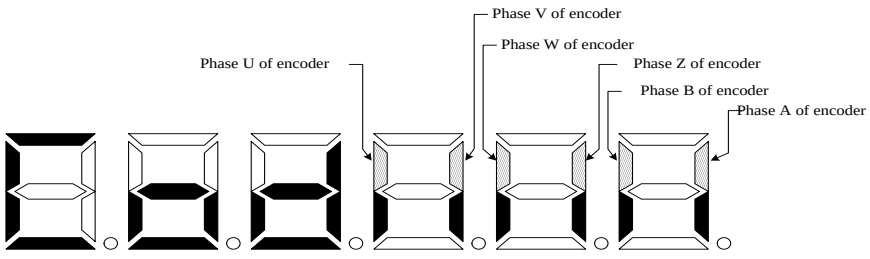
dP-oUt	dP-oUt	Output plug

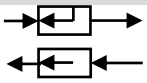
Note: Display of output terminal is shown as following figure (illuminated stroke means close，extinguished means open)



dP-Cod	dP-Cod	Signal of encoder

Note: Display of encoder signal is shown as following figure (illuminated stroke means close，extinguished means open)



Mode	Display		Setting examples
			Enter specific display status Exit to mode selection
dP-rn	dP-rn	rn- on	Run mode: running

Note:

rn-oFF	No charging in main circuit, no operation of servo system.
rn- CH	Main circuit is charged while servo system does not function (servo on signal is not closed or system is at fault alarm).
rn- on	Main circuit is charged while servo system is functioning.

dP-Err	dP-Err	Err 9	Error NO. 9

Note: Display of alarm code "Err - -" means in normal function with no alarm.

dP-tL	dP-tL	tL 60	Command torque 60%
dP-IA	dP- IA	IA 2	A phase current 2A
dP-IC	dP- IC	IC 1.5	C phase current 1.5A
dP-rES	dP-rES	U 0	

6.3 Parameter setting

Select "PA -" in the 1st layer and press ↵ key to enter parameter setting mode. Select parameter number with ↑, ↓ keys, press ↵ key to display the parameter value and modify the parameter value with ↑, ↓ keys. Press ↑ or ↓ key once to increase or decrease the parameter value by 1, press and hold ↑or ↓ key to increase or decrease the value continuously. When the parameter is under modification, the LED digitron for decimal point at the right side is lit. Press ↵ key to confirm and valid the modified value while the LED digitron for decimal point at the right side goes off. The modified value will reflect in the control at once (except parameter PA40, PA41). By pressing of ↑ or ↓ key the parameter could be modified again. Upon completion of modification, press ← key to return to parameter selection state. In case of dissatisfaction of value under modification, do not press ↵ key for confirmation, but in stead , press ← key to cancel the modification by restoring the original parameter value and return to parameter selection state.

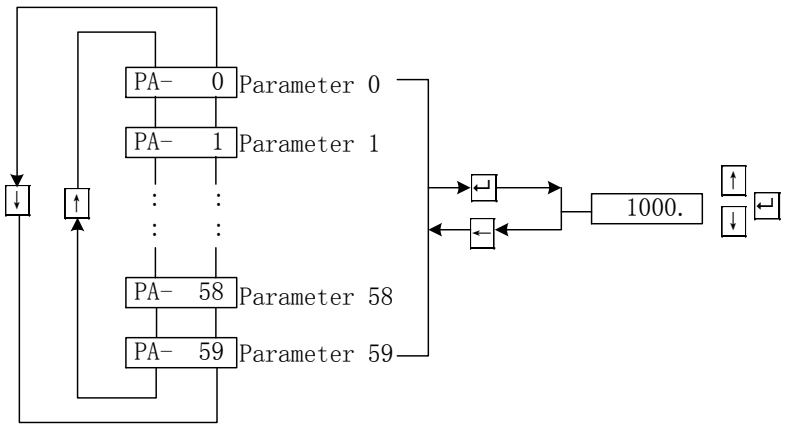


Fig. 6.3 Diagram of parameter setting operation

1. Parameter PA0 should be set to 315 to enable modification of other parameters. (for modification of parameter PA1 and PA59, set PA0 to 385).

2. Parameter setting will be effective immediately (See table 4.1). Wrong setting may result in accident due to device malfunction.

6.4 Parameter management

The main purpose of parameter management is to handle the operation between memory and EEPROM. Select “EE -” in the 1st layer and press ↵ key to enter parameter management mode. The next step is to select operation mode out of 5 modes with ↑, ↓ keys. For instance of “parameter write-in”, select “EE - Set”, press and hold ↵ key for over 3 seconds until “StArt” is shown on display that indicates the parameter is writing in the EEPROM. After 1-2 seconds “FInISH” is displayed for successful write-in operation or “Error” is displayed for failed write-in operation. Press ← key again to return to selection state for operation mode.

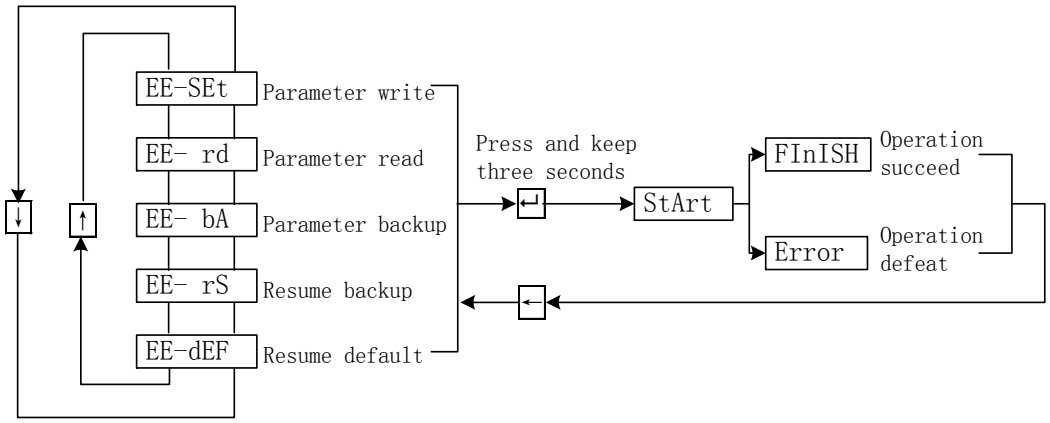


Fig. 6.4 Diagram of parameter management

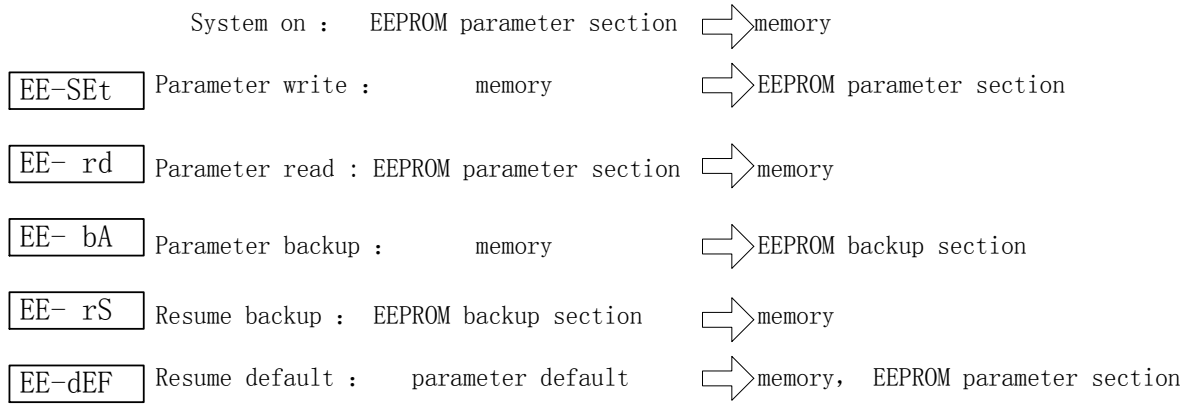


Fig. 6.5 Meaning of parameter management

Parameter management	Select mode	Name
EE-	EE-SEt	parameter write-in
		It means to write the parameter in memory to the parameter section in EEPROM.
	Note:	When the parameter is modified by the user, the value is only changed in the memory. After power-on next time, the original value will be restored. For permanent modification of parameter value, it requires a write-in operation of the parameter value from memory to the parameter section in EEPROM, so that the modified parameter will be valid for use in next power-on.
	EE- rd	Parameter read-out
		It means to read the value in parameter section of EEPROM to the memory.
	Note:	This read-out operation will execute once upon power-on to keep the same parameter value both in memory and parameter section of EEPROM. When the user has modified the parameter value, the value in memory will be changed. If the user dissatisfy the modified value or the value is modified in confusion, parameter read-out operation can be executed to download the value in parameter section of EEPROM to the memory to recover the value same as that upon power-on.
	EE- bA	Parameter backup
		It means to write the parameter in memory to the backup section in EEPROM.

Note: Full EEPROM is divided into two sections i.e. parameter section and backup section for storage of two sets of parameters. When the system is powered on, the parameter section in EEPROM is used for parameter write-in and parameter read-out while the backup section in EEPROM is used for parameter backup and restoration. During the course of parameter setting, if the user satisfies a set of parameters with an attempt to continue the modification, he can execute a backup operation first to save the parameter in memory to the backup section in EEPROM and then, continue the operation for parameter modification. If the user dissatisfies the modification, he can restore the backup to read out the parameter saved in the backup section of EEPROM to the memory for further modification or to terminate the modification. In addition, when the user has set up the parameter, he can execute the operation both for write-in and back-up to maintain same data both in parameter section and backup section in EEPROM. This will help to avoid the risk by accident parameter modification. Backup restore operation can be applied to read the data from backup section in EEPROM to the memory and write the data in memory to parameter section in EEPROM by write-in operation.

EE- rS	Parameter restoration

It means to read the value in backup section of EEPROM to the memory.

Note: Note that this operation is not a write-in operation. In next power-on it needs to repeat data read-out operation from parameter section in EEPROM to the memory. One more write-in operation of parameter value is required if the user intends to use the parameter in backup section of EEPROM permanently.

EE-dEF	Reset to default value

It means to restore all default parameter values (factory setting) into the memory and write the default value to the parameter section in EEPROM in order to use the default setting in future power-on.

Note: If the system fails to work properly due to confused parameter setting by the user, this operation can restore all parameters that are same as that in ex-works state. Owing to that various motor have different default parameter values, whenever restoration of default parameter is applied, please justify the driver type (parameter PA1).

NOTE

1. **If the modified parameter fails to execute write-in operation, the parameter will not be saved after power down and the modification will be invalid.**

2、Execute EE operation and cut the power upon "FInISH" is displayed on the screen.

6.5 Trial run（parameter PA4=2）

Select "Sr -" in the 1st layer and press ↵ key to enter trial run mode. Prompt sign for speed trial run is "S" with r/min as unit of value. The system should be in speed control mode. Speed command is provided by keystrokes. ↑, ↓ key are applied to change speed command. If parameter PA20=2 or external input signal SON is enabled, the motor will run at given speed.

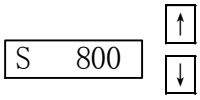


Fig. 6.6 Diagram of speed trial-run operation

6.6 JOG mode（parameter PA4=3）

Select "Jr -" in the 1st layer and press ↵ key to enter JOG mode for jogging. Prompt sign for JOG mode is "J" with r / min as unit of value. The system should be in speed control mode while the speed command is provided by keystrokes. In JOG mode, press and hold ↑ key to run the motor at JOG speed provided parameter PA20=2 or external input signal SON is enabled. The motor will stop and keep running at 0 speed when the key is released. Press and hold ↓ key to let the motor run in reversal direction at JOG speed. The motor will stop and keep running at 0 speed when the key is released. JOG speed is set by parameter PA21.

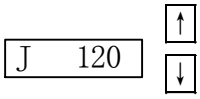


Fig 6.7 Diagram of JOG operation

6.7 AU operation（automatic compensation for zero bias of speed command)

Due to the inherent shortcoming in analogous circuit, when the input analog voltage is at zero, the output voltage will not be at zero with zero bias in general cases, so that this should be corrected via software. Parameter PA45 is designed for this zero bias compensation.

In favor of setting parameter PA45 for zero bias compensation, an automatic setting function is provided in the system. The procedures are shown as follows:

①Select and enter AU menu from main menu.

②Upon display of A0－ADJ press ENTER key for 3 seconds until FINISH is displayed that means automatic zero setting is completed.

③After automatic zero setting is completed use EE－SET to save all parameters.

6.8 Miscellaneous

- Zero setting of encoder (factory use)
- Running in open-loop (factory use)

Chapter 7
Power-on and Running

7 Power-on and Running

- Drive and motor should have reliable earthing, and terminal E in connecting terminal TB1 of KT270-H series should be connected firmly to the ground terminal of the equipment.
- It is recommended to provide the power supply via isolation transformer and power filter to ensure its safety and enhance its interference-free feature.
- Turn on the power after all wirings are checked and confirmed.
- An emergent shunt-down circuit should be set in the system to ensure immediate power-cut upon accidents.
- Turn on the power again after at least 10 seconds if the drive power is turned off.
- In case of malfunction alarm of the drive, troubles should be confirmed and remedied while SON signal is disconnected before restart.
- After power-off of the drive and motor, do not attempt to disassemble them in minimum 10 minutes to avoid the possible electric shock.
- High temperature rise may exist at drive and motor after running for a while. Caution should be taken to avoid heat injury.

7.1 Earthing

Servo drive and motor should have reliable earthing. To avoid electric shock, the protective ground terminal on servo drive and the protective grounding at the cabinet should be connected all the time. Owing to that the servo drive adopts PWM technology to supply the servo motor with power via power transistor, the servo drive and the connecting wire may be impacted by the switching noise. In order to meet with EMC standard, the diameter of grounding line should be as large as possible while the earth resistance should be as small as possible.

7.2 Work sequence

7.2.1Power-on sequence

1) The electromagnetic contactor is used to supply the power to power input terminals R, S, T in the main circuit. Power supply L11, L21 for KT270-H-50、KT270-H-75 control circuit should be energized at the same time or before the connection of main circuit power supply R, S, T . If only power control circuit is switched on, the servo ready signal (RD) is invalid (output transistor is disconnected).
2) With 1.5 seconds of delay after power-on of main circuit, ready signal (RD) is enabled and servo on signal (SON) is ready to be received. The motor is excited in operating state when valid SON signal is detected by the drive. The motor will not be excited and remains at free state if invalid SON signal or an alarm is detected.
3) The motor will be excited after 1.5 seconds if both servo on signal (SON) and power supply are switched on together.
4) Frequent on/off switching of power supply may damage the circuits for soft startup and dynamic braking. **After power-off it should be power on after 10 seconds in minimum.**
5) If the drive and motor show malfunction due to overheating, the fault should be removed and wait 30 minutes for cooling down before power-on again.

7 Power-on and Running

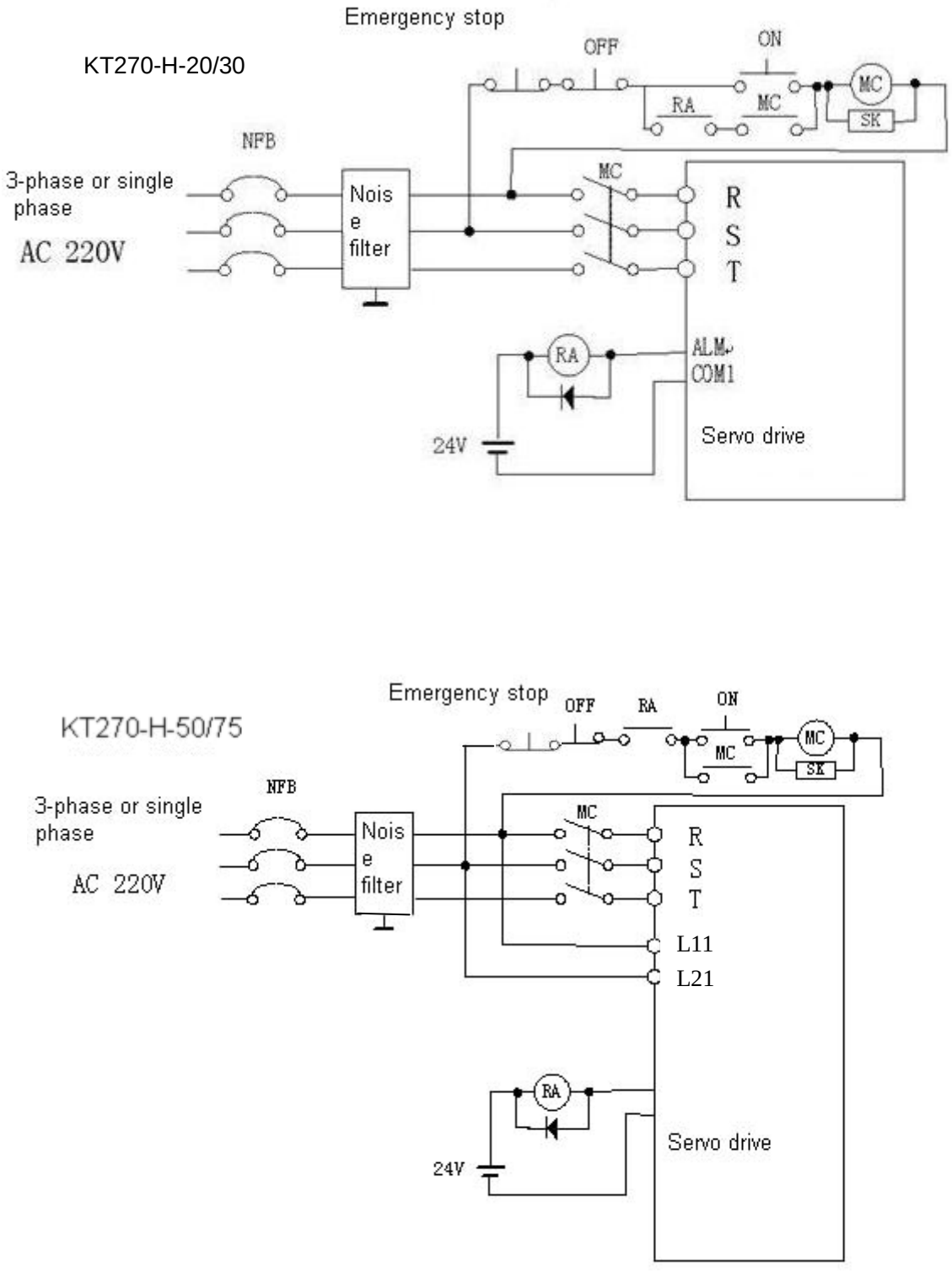
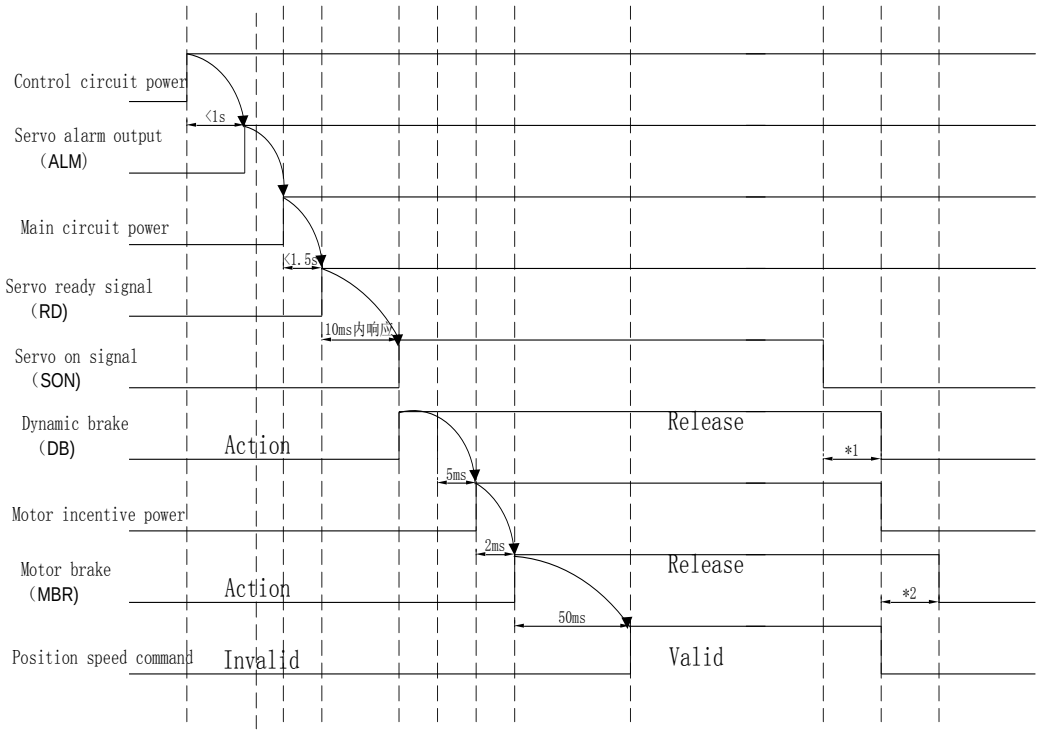


Fig. 7.1 Diagram of power wiring

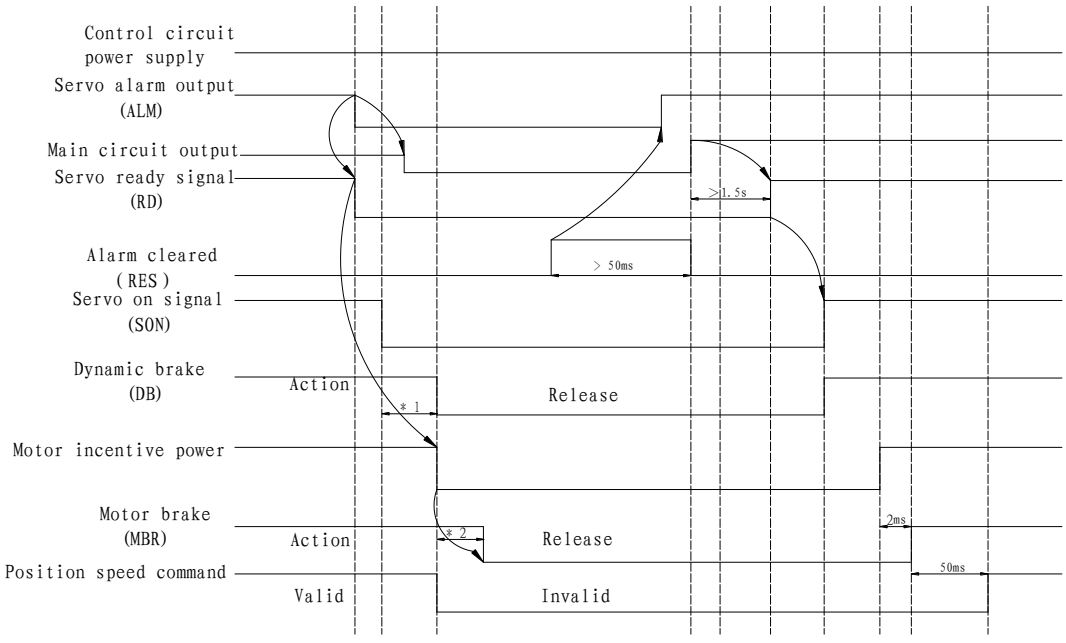
7.2.2 Sequence chart



*1："Enabling" may be shut off and dynamic brake functions when rotation speed is less than PA29.

*2：Take the smaller values between PA50 parameter（delay time for action of mechanical brake (MBR）and the time to reduce the motor speed to 30 rpm.

Fig. 7.2 Sequence chart for power-on of KT270 - H



*1："Enabling" may be shut off and dynamic brake functions when rotation rate is less than PA29.

*2：Take the smaller values between PA50 parameter（delay time for action of mechanical brake MBR）and the time to reduce the motor speed to 30 rpm.

Fig. 7.3 Sequence chart for alarm of KT270 - H

7.3 Notices

Notes: Frequency of start-up and shut-down is restricted by both factors i.e. the servo drive and the motor. Both conditions should be satisfied.

1) Allowable On/Off frequency of servo drive

In case of high On/Off frequency, make sure if it is within the allowable frequency range. The allowable frequency range is varied according to different types of motors, capacities, load inertias and motor speeds. First of all the time constant (parameter PA7) for acceleration and deceleration should be set to avoid too high regenerated energy. Under the condition in which the load inertia is m times of motor inertia, the allowed On/Off frequency for the servo motor will be as follows:

Multiplying factor of load inertia	Allowable On/Off frequency
m≤3	>100 C.P.M., 60mS acceleration/deceleration time or even less
m≤5	60 ~ 100 C.P.M., 60mS to 150mS acceleration/deceleration time
m>5	<60 C.P.M., over 150mS acceleration/deceleration time

If these setting can not meet with the requirement, an alternative solution is to reduce internal torque limitation (parameter PA34, PA35). motor speed (parameter PA23).

2) The allowable On/Off frequency of the servo motor varies due to other factors such as loading condition, runtime etc.

Notes: In general the multiplying factor of load inertia should be within 5. In applications under large load inertia, overvoltage in main circuit and abnormal braking may occur frequently at deceleration. Following measures can be adopted to deal with such cases:

1) Reduce internal torque limitation (parameter PA34, PA35).
2) Cut maximum motor speed (parameter PA23).
3) Increase the time for acceleration and deceleration (parameter PA7).
4) Replace drive and motor with more powerful ones.
5) Fix external regeneration discharge resister.

Notes: Servo drive has an internal power supply for encoder. In order to guarantee proper performance of encoder, the output voltage should be maintained at 5V5v±5%. In case of long cable is used, drop of voltage may occur. In this instance, it is recommended to use multi-core cable for encoder's power supply to minimize voltage drop in the cable conductor.

7.4 Trial run

7.4.1 Preoperative check

Upon completion of setup and wiring, following items should be checked prior to start-up:

- Check if the wiring is correct? Any loose connection exists especially at terminal L11,L21, R, S, T and U, V, W.
- Check if input voltage is right.

- Check if there is any short circuit.
- Check if there is any short circuit or the earthing in the connected motor cables.
- Check for proper connection of encoder cable.
- Check for right polarity connection and adequate sizes at input terminals of power supply.

7.4.2 Trial run by power-on

Cautions before power-on:

- No load, applied to motor shaft for idling motor.
- Due to impact applied to the motor during acceleration and deceleration, the motor should be fixed.

Procedures of trial run by power-on:

1) Connect pin CN4 and make sure servo ON (SON) is disconnected, travel end for reversal run (LSN) is closed and travel end for positive run (LSP) is closed.
2) Switch on power supply for control circuit (no power supply applied to main circuit for the moment), the display on the drive is illuminated. If alarm occurs, check the wiring.
3) Select the control mode (parameter PA4) to trial run mode (set to 2).
4) Power on the supply for main circuit.
5) If it is confirmed there is no alarm and abnormal circumstance, servo ON (SON) should be closed to excite the motor at a zero speed state.
6) Access the operating status in trial run mode by keystroke operation. Prompt sign for trial run is “Sr” in unit r/min. The system should be in speed control mode while the speed command is provided by keystrokes. Use ↑ , ↓ keys to change the speed command and the motor will run at given speed.

7.5 Adjustment

7.5.1 Basic gain adjustment

- Speed control
  1) Under the condition of no oscillating ,speed proportional gain (parameter PA5) should be set to a larger value. In general case larger load inertia requires higher set value of [speed proportional gain.
  2) Speed integrating time constant (parameter PA6) should be set to a smaller value according to given conditions. When speed integrating time constant is set to a small value, response speed will be enhanced however oscillation is liable to be generated. So that the value should be set as small as possible provided no oscillating will be generated. [If set value of speed integrating time constant] is too high, the speed will have great variations under load fluctuation. In general case larger load inertia requires higher set value of [speed integrating time constant].
- Position control
  1) Set appropriate values for speed proportional gain and speed integrating time constant following the procedures mentioned above.
  2) The value for [position feedforward gain] (parameter PA10) is set to 0%.
  3) Position proportional gain (parameter PA9) should be set to a larger value within a stable

range. Too high set value of [position proportional gain will facilitate a tracking feature for the positioning command with less lag error, however when stop the positioning is ceased oscillation may occur. Smaller set value of position proportional gain will make the system at a stable state, but the position tracking feature will become poorer with large lag error. **To have a higher position proportional gain], the set value of time constant for acceleration/deceleration] (parameter PA7) may be increased but attention should be paid to avoid over modulation.**

Set values of position proportional gain can be referred to following table:

Rigidity	[Proportional gain for positioning]
Low	10~20/S
Medium	30~50/S
High	50~70/S

4) If it is required to have particular high tracking feature, the set value for position feedforward gain can be increased, but too high value will lead to over modulation. **When a higher [position feedforward gain is set with unstable system, the set value of time constant for acceleration/deceleration may be increased to avoid over modulation.**

7.5.2 Diagram for basic parameter setting

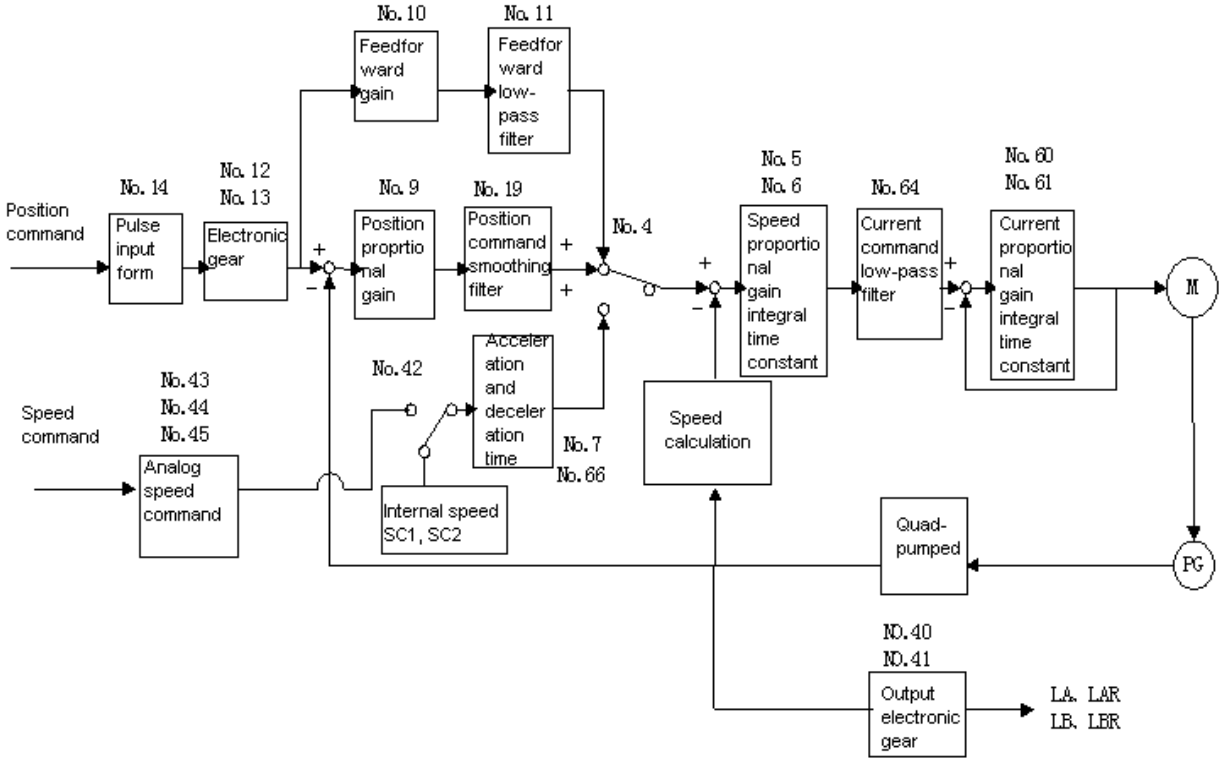


Fig. 7.4 Diagram for basic parameter setting

7.6 Associated knowledge

7.6.1 Setting of position resolution and electron gear

Positioning resolution (one impulse stroke △l) is decided by travel per turn of servo motor △S and feedback impulse per turn of encoder Pt and can be expressed by the following equation:

$$\Delta l = \frac{\Delta S}{P_t}$$

where

△*l*：One impulse stroke (mm),

△*S*：Travel per turn of servo motor (mm / turn),

P_t：Number of feedback pulses per turn of encoder (impulse / turn).

Since the system contains a quadruple circuit, so $P_t = 4 \times C$， C is the line number per turn of the encoder. In the system, C = 2500 lines/turn, so , Pt = 10000 impulses/turn.

The command impulse should multiply the electron gear ratio G to translate into positioning impulse. Hence, one command impulse travel △l * can be expressed as:

$$\Delta l^* = \frac{\Delta S}{P_t} \times G$$

Where, $G = \frac{\text{Numerator of command impulse frequency division}}{\text{denominator of command impulse frequency division}}$

7.6.2 Lag impulse during position control

When the servo motor is controlled by impulse train, the D-value between command impulse and feedback impulse is called as lag impulse. This value will be accumulated in position deviation counter and has following relations with command impulse frequency, electron gear ratio and proportional gain for positioning:

$$\varepsilon = \frac{f^* \times G}{K_p}$$

Where

ε：Lag impulse (impulse),

f^*：Command impulse frequency (Hz),

K_p：Position proportional gain (1 / S),

G：Electron gear ratio

Notes: The above-mentioned relation will be valid if position feedforward gain is 0%. If position feedforward gain is >0%，the lag impulse will be less than the calculated value with above equation.

Chapter 8
Motor Specification

8 Motor Specification

8.1 DM series servo motors specifications

60、80DM Motor	Power（KW）	Static torque（Nm）	Rated speed（rpm）	Rated current（A）	Rotor inertia（$kgm^2 \times 10^{-3}$）	Weight（KG）
60DM-8M00830-F□	0.25	0.8	3000	1.25	0.078	2.3
60DM-8M01630-F□	0.48	1.6	3000	2.5	0.086	2.5
80DM-8M03230-F□	0.96	3.2	3000	3.5	0.131	5

96DM Motor	Power（KW）	Static torque（Nm）	Rated speed（rpm）	Rated current（A）	Rotor inertia（$kgm^2 \times 10^{-3}$）	Weight（KG）
96DM-6M01620-F□	0.32	1.6	2000	1.5	0.187	3.7
96DM-6M02530-F□	0.75	2.5	3000	4.2	0.267	4.3
96DM-8M02530-F□	0.75	2.5	3000	3.4	0.267	4.3
96DM-6M03220-F□	0.64	3.2	2000	3	0.347	5
96DM-6M03230-F□	0.96	3.2	3000	4.5	0.347	5

110DM Motor	Power（KW）	Static torque（Nm）	Rated speed（rpm）	Rated current（A）	Rotor inertia（$kgm^2 \times 10^{-3}$）	Weight（KG）
110DM-6M02030-F□	0.6	2	3000	3.5	0.173	4.5
110DM-6M03030-F□	0.9	3	3000	4.5	0.3	5.5
110DM-6M04020-F□	0.8	4	2000	4	0.427	6.5
110DM-6M04030-F□	1.2	4	3000	5	0.427	6.5
110DM-6M05020-F□	1	5	2000	5	0.555	7.5
110DM-6M05030-F□	1.5	5	3000	6	0.555	7.5
110DM-6M06020-F□	1.2	6	2000	6	0.683	8.5

126DM Motor	Power（KW）	Static torque（Nm）	Rated speed（rpm）	Rated current（A）	Rotor inertia（$kgm^2 \times 10^{-3}$）	Weight（KG）
126DM-6M03020-F□	0.6	3	2000	2.5	0.44	8.5
126DM-6M04520-F□	0.9	4.5	2000	3.7	0.67	9.5
126DM-6M06020-F□	1.2	6	2000	5.5	0.87	10.6
126DM-6M06030-F□	1.8	6	3000	8.3	0.87	10.6
126DM-6M07515-F□	1.125	7.5	1500	5.8	1.29	12.8
126DM-6M07520-F□	1.5	7.5	2000	6.2	1.29	12.8
126DM-6M07530-F□	2.25	7.5	3000	9.3	1.29	12.8
126DM-6M11020-F□	2.2	11	2000	9	1.7	14.5
126DM-6M11030-F□	3.3	11	3000	13.5	1.7	14.5

8 Motor Specification

130DM Motor	Power (KW)	Static torque (Nm)	Rated speed (rpm)	Rated current (A)	Rotor inertia ($kgm^2 \times 10^{-3}$)	Weight (KG)
130DM-6M03020-F□	0.6	3	2000	2.5	0.44	8.5
130DM-6M06020-F□	1.2	6	2000	5.5	0.87	10.6
130DM-6M06030-F□	1.8	6	3000	8.3	0.87	10.6
130DM-6M07515-F□	1.125	7.5	1500	5.8	1.29	12.8
130DM-6M07520-F□	1.5	7.5	2000	6.2	1.29	12.8
130DM-6M07530-F□	2.25	7.5	3000	9.3	1.29	12.8
130DM-6M11020-F□	2.2	11	2000	9	1.7	14.5
130DM-6M11030-F□	3.3	11	3000	13.5	1.7	14.5

155DM Motor	Power (KW)	Static torque (Nm)	Rated speed (rpm)	Rated current (A)	Rotor inertia ($kgm^2 \times 10^{-3}$)	Weight (KG)
155DM-6M16006-F□	0.96	16	600	4.8	2.67	16.5
155DM-6M16020-F□	3.2	16	2000	16	2.67	16.5
155DM-6M16030-F□	4.8	16	3000	24	2.67	16.5
155DM-6M21003-F□	0.6	21	300	3.7	3.57	19.5
155DM-6M21012-F□	2.52	21	1200	12.2	3.57	19.5
155DM-6M21020-F□	4.2	21	2000	20	3.57	19.5
155DM-6M27012-F□	3.24	27	1200	16.2	4.46	22.5
155DM-6M27020-F□	5.4	27	2000	26.5	4.46	22.5
155DM-6M33012-F□	3.96	33	1200	19.8	5.35	25.5

□: They can be B, E. B: With brake E: Without brake

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Table 8.1 DM series servo motor adaptive drive（* is recommended specification）

DM series motor	Adaptive drive				Motor parameter table (PA59)		Matching parameter (PA1)	Overload factor
	KT270-H							
	-20	-30	-50	-75	2700	2702		
60DM-8M00830-F□	●	○	○	○	○	●	25	2.5
60DM-8M01630-F□	●	○	○	○	○	●	26	2.5
80DM-8M03230-F□	●	○	○	○	○	●	23	2.5
96DM-6M01620-F□	●	○	○	○	●	○	1*	2.5
96DM-6M02530-F□	●	○	○	○	○	●	27	2.3
96DM-8M02530-F□	●	○	○	○	○	●	29	2.5
96DM-6M03220-F□	●	○	○	○	●	○	2	2.5
96DM-6M03230-F□	●	○	○	○	●	○	24	2.2
110DM-6M02030-F□	●	○	○	○	●	○	52	2.5
110DM-6M03030-F□	●	○	○	○	●	○	53	2.2
110DM-6M04020-F□	●	○	○	○	●	○	54	2.4
110DM-6M04030-F□	○	●	○	○	●	○	55	2.5
110DM-6M05020-F□	●	○	○	○	●	○	56	1.9
	○	●	○	○	●	○	57	2.5
110DM-6M05030-F□	○	●	○	○	●	○	58	2.4
110DM-6M06020-F□	○	●	○	○	●	○	59	2.4
126DM-6M03020-F□	●	○	○	○	●	○	3*	2.5
126DM-6M04520-F□	●	○	○	○	●	○	26	2.5
126DM-6M06020-F□	●	○	○	○	●	○	4*	1.8
	○	●	○	○	●	○	5	2.5
126DM-6M06030-F□	○	●	○	○	●	○	6*	1.7
	○	○	●	○	●	○	7	2.5
126DM-6M07515-F□	○	●	○	○	●	○	28	2.5
126DM-6M07520-F□	○	●	○	○	●	○	8*	2.3
126DM-6M07530-F□	○	●	○	○	●	○	9*	1.5
	○	○	●	○	●	○	10	2.5
126DM-6M11020-F□	○	●	○	○	●	○	11*	1.6
	○	○	●	○	●	○	12	2.5
126DM-6M11030-F□	○	○	●	○	●	○	13*	1.8
	○	○	○	●	●	○	14	2.3
130DM-6M03020-F□	●	○	○	○	●	○	3	2.5
130DM-6M06020-F□	●	○	○	○	●	○	4	1.8
	○	●	○	○	●	○	5	2.5
130DM-6M06030-F□	○	●	○	○	●	○	6	1.7
	○	○	●	○	●	○	7	2.5

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DM series motor	Adaptive drive				Motor parameter table (PA59)		Matching parameter (PA1)	Overload factor
	KT270-H							
	-20	-30	-50	-75	2700	2702		
130DM-6M07515-F□	○	●	○	○	●	○	28	2.5
130DM-6M07520-F□	○	●	○	○	●	○	8	2.3
130DM-6M07530-F□	○	●	○	○	●	○	9	1.5
	○	○	●	○	●	○	10	2.5
130DM-6M11020-F□	○	●	○	○	●	○	11	1.6
	○	○	●	○	●	○	12	2.5
130DM-6M11030-F□	○	○	●	○	●	○	13	1.8
	○	○	○	●	●	○	14	2.3
155DM-6M16006-F□	●	○	○	○	●	○	18	2
155DM-6M16020-F□	○	○	●	○	●	○	15*	1.5
	○	○	○	●	●	○	16	1.9
155DM-6M16030-F□	○	○	○	●	●	○	17*	1.3
155DM-6M21003-F□	●	○	○	○	●	○	22	2.5
155DM-6M21012-F□	○	○	●	○	●	○	19	2
	○	○	○	●	●	○	20*	2.5
155DM-6M21020-F□	○	○	○	●	●	○	21*	1.5
155DM-6M27012-F□	○	○	○	●	●	○	23*	1.9
155DM-6M27020-F□	○	○	○	●	●	○	25*	1.2
155DM-6M33012-F□	○	○	○	●	●	○	27*	1.6

8.2 HM series servo motors specifications

110HM Motor	Power (KW)	Static torque (Nm)	Rated speed (rpm)	Rated current (A)	Rotor inertia ($kgm^2 \times 10^{-3}$)	Weight (KG)
110HM-8M02030-F□	0.6	2	3000	4	0.33	4.2
110HM-8M04030-F□	1.2	4	3000	5	0.65	5.2
110HM-8M05030-F□	1.5	5	3000	6	0.82	5.8
110HM-8M06020-F□	1.2	6	2000	6	1	6.4
110HM-8M06030-F□	1.6	6	3000	8	1	6.4

130HM Motor	Power (KW)	Static torque (Nm)	Rated speed (rpm)	Rated current (A)	Rotor inertia ($kgm^2 \times 10^{-3}$)	Weight (KG)
130HM-8M04025-F□	1	4	2500	4	0.85	7.4
130HM-8M05025-F□	1.3	5	2500	5	1.06	7.9
130HM-8M06025-F□	1.5	6	2500	6	1.26	8.6
130HM-8M07720-F□	1.6	7.7	2000	6	1.58	9.5
130HM-8M07730-F□	2.4	7.7	3000	9	1.58	9.5
130HM-8M10015-F□	1.5	10	1500	6	2.14	11.1
130HM-8M10025-F□	2.6	10	2500	10	2.14	11.1
130HM-8M15015-F□	2.3	15	1500	9.5	3.24	14.3

150HM Motor	Power (KW)	Static torque (Nm)	Rated speed (rpm)	Rated current (A)	Rotor inertia ($kgm^2 \times 10^{-3}$)	Weight (KG)
150HM-8M15025-F□	3.75	15	2500	16.5	5.2	15.2
150HM-8M27020-F□	5.5	27	2000	20.5	9.4	23.7

□: They can be B, E. B: with brake E: without brake

Table 8.2 HM series servo motor adaptive drive (* is recommended specification)

HM series motor	Adaptive drive				Motor parameter table (PA59)		Matching parameter (PA1)	Overload factor
	KT270-H							
	-20	-30	-50	-75	2700	2702		
110HM-8M02030-F□	●	○	○	○	●	○	30*	2.4
	○	●	○	○	●	○	34	3
110HM-8M04030-F□	●	○	○	○	●	○	31*	1.9
	○	●	○	○	●	○	35	2.5
110HM-8M05030-F□	●	○	○	○	●	○	32*	1.6
	○	●	○	○	●	○	36	2.4

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HM series motor	Adaptive drive				Motor parameter table (PA59)		Matching parameter (PA1)	Overload factor
	KT270-H							
	-20	-30	-50	-75	2700	2702		
110HM-8M06020-F□	●	○	○	○	●	○	33*	1.6
	○	●	○	○	●	○	37	2.4
110HM-8M06030-F□	○	●	○	○	●	○	38*	1.8
130HM-8M04025-F□	●	○	○	○	●	○	39*	2.4
	○	●	○	○	●	○	44	3
130HM-8M05025-F□	●	○	○	○	●	○	40*	1.9
	○	●	○	○	●	○	45	2.5
130HM-8M06025-F□	●	○	○	○	●	○	41*	1.6
	○	●	○	○	●	○	46	2.4
130HM-8M07720-F□	●	○	○	○	●	○	42*	1.6
	○	●	○	○	●	○	47	2.4
130HM-8M07730-F□	○	●	○	○	●	○	48*	1.6
130HM-8M10015-F□	●	○	○	○	●	○	43*	1.6
	○	●	○	○	●	○	49	2.4
130HM-8M10025-F□	○	●	○	○	●	○	50*	1.4
130HM-8M15015-F□	○	●	○	○	●	○	51*	1.5
150HM-8M15025-F□	○	○	●	○	○	●	10	1.5
150HM-8M27020-F□	○	○	○	●	○	●	12	1.8

8.3 SM series servo motors specifications

80、90SM Motor	Power (KW)	Static torque (Nm)	Rated speed (rpm)	Rated current (A)	Rotor inertia ($kgm^2 \times 10^{-3}$)	Weight (KG)
80SM-4M01330-F□	0.4	1.3	3000	2.3	0.072	3
80SM-4M02530-F□	0.75	2.5	3000	3.3	0.098	3.6
90SM-8M02430-F□	0.75	2.4	3000	4	0.26	3.25

110SM Motor	Power (KW)	Static torque (Nm)	Rated speed (rpm)	Rated current (A)	Rotor inertia ($kgm^2 \times 10^{-3}$)	Weight (KG)
110SM-4M02020-F□	0.4	2	2000	2	0.246	4.3
110SM-4M04020-F□	0.8	4	2000	3.3	0.42	5.6
110SM-4M04030-F□	1.2	4	3000	5	0.42	5.85
110SM-4M06020-F□	1.2	6	2000	5	0.718	7.25

130SM Motor	Power (KW)	Static torque (Nm)	Rated speed (rpm)	Rated current (A)	Rotor inertia ($kgm^2 \times 10^{-3}$)	Weight (KG)
130SM-4M05020-F□	1	5	2000	4.2	0.74	7.35
130SM-4M06020-F□	1.2	6	2000	5.8	0.85	7.25
130SM-4M07520-F□	1.5	7.5	2000	5.8	1.31	8.9
130SM-4M10010-F□	1	10	1000	4.5	0.99	14
130SM-4M10015-F□	1.5	10	1500	6.8	1.74	14.3
130SM-4M10020-F□	2	10	2000	8.6	1.358	15
130SM-8M15010-F□	1.5	15	1000	6.5	3.5	17.6
130SM-4M15015-F□	2.25	15	1500	8.6	2.37	17.6
130SM-8M15017-F□	2.3	15	1700	11	3.5	20
130SM-4M21020-F□	4.2	21	2000	19	2.18	19.5

180SM Motor	Power (KW)	Static torque (Nm)	Rated speed (rpm)	Rated current (A)	Rotor inertia ($kgm^2 \times 10^{-3}$)	Weight (KG)
180SM-8M12715-F□	1.905	12.7	1500	13	3.76	17
180SM-8M15020-F□	3	15	2000	14.3	4.745	20
180SM-6M15030-F□	4.5	15	3000	20	5.7	17.6
180SM-8M19115-F□	2.865	19.1	1500	12	5.87	20.3
180SM-8M19115-F□	2.865	19.1	1500	21	6.9	20.3
180SM-8M19120-F□	3.82	19.1	2000	16	7.22	20.5
180SM-8M19120-F□	3.82	19.1	2000	16	6.988	20.5
180SM-8M23820-F□	4.76	23.8	2000	21	10.2	23.3
180SM-6M28620-F□	5.72	28.6	2000	24.5	9.5	25.7
180SM-6M35020-F□	7	35	2000	27	8.837	28

□: They can be B, E. B: with brake E: without brake

Table 8.3 SM series servo motor adaptive drive（* is recommended specification）

SM series Motor	Adaptive drive				Motor parameter table (PA59)	Matching parameter (PA1)	Overload factor
	KT270-H						
	-20	-30	-50	-75	2701		
80SM-4M01330-F□	●	○	○	○	●	41	2.5
80SM-4M02530-F□	●	○	○	○	●	42	2.5
90SM-8M02430-F□	●	○	○	○	●	43	2.4
110SM-4M02020-F□	●	○	○	○	●	1	2.5
110SM-4M04020-F□	●	○	○	○	●	2	2.5
110SM-4M04030-F□	●	○	○	○	●	23	1.9
110SM-4M06020-F□	●	○	○	○	●	3	1.9
	○	●	○	○	●	4	2.5
130SM-4M05020-F□	●	○	○	○	●	15	2.3
130SM-4M06020-F□	●	○	○	○	●	52	1.7
130SM-4M07520-F□	●	○	○	○	●	6	1.7
	○	●	○	○	●	7	2.5
130SM-4M10010-F□	●	○	○	○	●	28	2.2
130SM-4M10015-F□	○	●	○	○	●	8	2.1
	○	○	●	○	●	9	2.5
130SM-4M10020-F□	○	●	○	○	●	24	1.7
130SM-8M15010-F□	○	●	○	○	●	54	2.2
130SM-4M15015-F□	○	●	○	○	●	10	1.7
	○	○	●	○	●	11	2.5
130SM-8M15017-F□	○	○	●	○	●	51	2.2
130SM-4M21020-F□	○	○	●	○	●	12	1.3
180SM-8M12715-F□	○	○	●	○	●	18	1.9
180SM-8M15020-F□	○	○	○	●	●	46	2.5
180SM-6M15030-F□	○	○	○	●	●	16	1.9
180SM-8M19115-F□	○	○	●	○	●	19	1.8
180SM-8M19115-F□	○	○	○	●	●	53	1.8
180SM-8M19120-F□	○	○	●	○	●	17	1.5
180SM-8M19120-F□	○	○	○	●	●	27	2.4
180SM-8M23820-F□	○	○	○	●	●	20	1.7
180SM-6M28620-F□	○	○	○	●	●	26	1.5
180SM-6M35020-F□	○	○	○	●	●	47	1.4

8.4 CM series servo motors specifications

60、80CM Motor	Power（KW）	Static torque（Nm）	Rated speed（rpm）	Rated current（A）	Rotor inertia（$kgm^2 \times 10^{-3}$）	Weight（KG）
60CM-8M00730-FE	0.2	0.64	3000	1.9	0.042	0.85
60CM-8M00730-FB	0.2	0.64	3000	1.9	0.045	1.6
60CM-8M01330-FE	0.4	1.27	3000	2.6	0.067	1.25
60CM-8M01330-FB	0.4	1.27	3000	2.6	0.07	2.0
80CM-8M02430-FE	0.75	2.39	3000	4	0.151	2.45
80CM-8M02430-FB	0.75	2.39	3000	4	0.161	3.5

130CM Motor	Power（KW）	Static torque（Nm）	Rated speed（rpm）	Rated current（A）	Rotor inertia（$kgm^2 \times 10^{-3}$）	Weight（KG）
130CM-10M05020-FE	1	4.77	2000	4.46	0.39	4.9
130CM-10M07220-FE	1.5	7.16	2000	6.98	0.46	6.4
130CM-10M10020-FE	2	9.55	2000	8.31	0.67	6.5
130CM-10M15020-FE	3	14.3	2000	11.3	1.05	12

NOTE □: They can be B, E. B: with brake E: without brake

Table 8.4 CM series servo motor adaptive drive

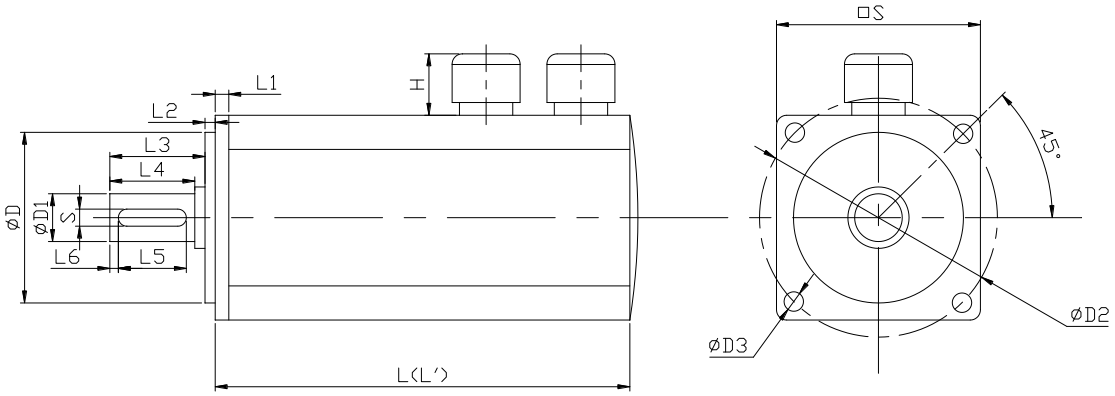
CM series Motor	Adaptive drive				Motor parameter table (PA59)	Matching parameter (PA1)	Overload factor
	KT270-H						
	-20	-30	-50	-75	2701		
60CM-8M01330-FE	●	○	○	○	●	45	2.5
80CM-8M02430-FE	●	○	○	○	●	46	2.4
130CM-10M05020-FE	●	○	○	○	●	40	2.2
130CM-10M07220-FE	○	●	○	○	●	43	2.1
130CM-10M10020-FE	○	●	○	○	●	44	1.7

NOTE: when PB5≥1240，the curing parameter of motor could be used.

8.5 Appearance and size of the servo motor

8.5.1 DM Series appearance and size of servo motor

Figure of 60DM, 80DM appearance and size



Motor model	L1	L2	L3	L4	L5	L6	L（L'）	H	S	D	D1	D2	D3	□S
60DM-8M008	4	3	28	25	20	2	102（141）	18	5	Φ50	Φ14	Φ70	Φ5.7	60
60DM-8M016	4	3	28	25	20	2	122（161）	18	5	Φ50	Φ14	Φ70	Φ5.7	60
80DM-8M032	8	3	32	29	—	—	136（179）	18	—	Φ70	Φ19	Φ90	Φ6	80

Note: The value of L column in brackets is the length with brake.

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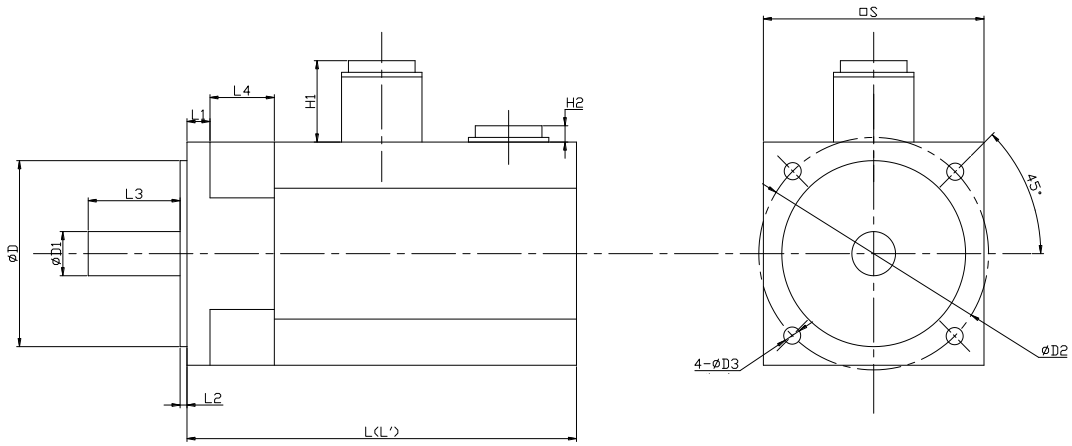
Figure of 96DM, 110DM, 126DM, 130DM, 155DM appearance and size

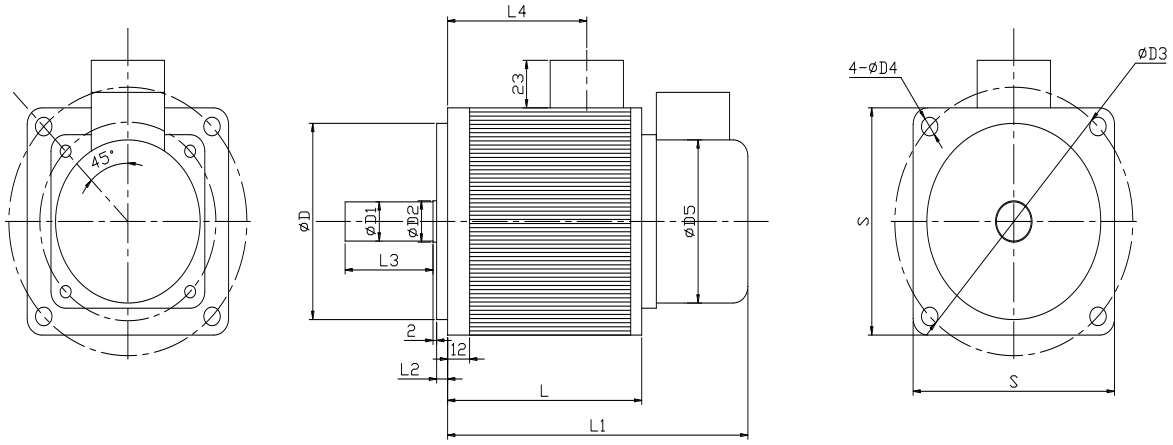


Motor model	L1	L2	L3	L4	L（L'）	H1	H2	D	D1	D2	D3	□S
96DM-6M016	10	3	40	28	169.5（176）	35	15	Φ80	Φ19	Φ100	Φ7	96
96DM-6M025	10	3	40	28	185.5（192）	35	15	Φ80	Φ19	Φ100	Φ7	96
96DM-6M032	10	3	40	28	201.5（208）	35	15	Φ80	Φ19	Φ100	Φ7	96
110DM-6M020	12	3	40	18	154（166）	35	15	Φ95	Φ19	Φ130	Φ9	110
110DM-6M030	12	3	40	18	169（181）	35	15	Φ95	Φ19	Φ130	Φ9	110
110DM-6M040	12	3	40	18	184（196）	35	15	Φ95	Φ19	Φ130	Φ9	110
110DM-6M050	12	3	40	18	199（201）	35	15	Φ95	Φ19	Φ130	Φ9	110
110DM-6M060	12	3	40	18	214（226）	35	15	Φ95	Φ19	Φ130	Φ9	110
126DM-6M030	10	3.5	50	31	167.5（182.5）	40	15	Φ110	Φ24	Φ130	Φ9	126
126DM-6M045	10	3.5	50	31	180（195）	40	15	Φ110	Φ24	Φ130	Φ9	126
126DM-6M060	10	3.5	50	31	192.5（207.5）	40	15	Φ110	Φ24	Φ130	Φ9	126
126DM-6M075	10	3.5	50	31	217.5（232.5）	40	15	Φ110	Φ24	Φ130	Φ9	126
126DM-6M110	10	3.5	50	31	242.5（257.5）	40	15	Φ110	Φ24	Φ130	Φ9	126
130DM-6M030	10	3.5	50	31	167.5（182.5）	40	15	Φ110	Φ22	Φ145	Φ9	126
130DM-6M060	10	3.5	50	31	192.5（207.5）	40	15	Φ110	Φ22	Φ145	Φ9	126
130DM-6M075	10	3.5	50	31	217.5（232.5）	40	15	Φ110	Φ22	Φ145	Φ9	126
130DM-6M110	10	3.5	50	31	242.5（257.5）	40	15	Φ110	Φ22	Φ145	Φ9	126
155DM-6M160	13	3.5	58	33	251.5（251.5）	50	15	Φ130	Φ32	Φ165	Φ11	155
155DM-6M210	13	3.5	58	33	276.5（276.5）	50	15	Φ130	Φ32	Φ165	Φ11	155

Note: The value of the L column in brackets is the length with brake.

8.5.2 HM Series appearance and size of servo motor

Figure of 110HM, 130HM appearance and size

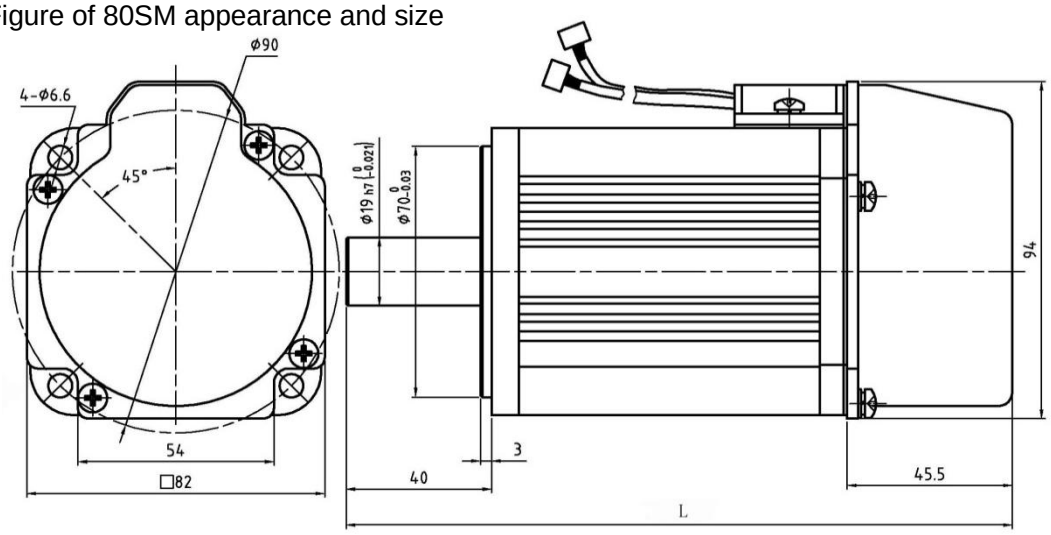


Motor model	L1	L2	L3	L4	L	D	D1	D2	D3	D4	D5	S
110HM-8M020	158（205）	6	48	76	106	Φ 95	Φ 19	Φ 20	Φ 130	Φ 9	Φ 79	110
110HM-8M040	184（231）	6	48	102	132	Φ 95	Φ 19	Φ 20	Φ 130	Φ 9	Φ 79	110
110HM-8M050	200（247）	6	48	118	148	Φ 95	Φ 19	Φ 20	Φ 130	Φ 9	Φ 79	110
110HM-8M060	217（263）	6	48	134	164	Φ 95	Φ 19	Φ 20	Φ 130	Φ 9	Φ 79	110
130HM-8M040	162(209)	7	50	80	110	Φ 110	Φ 22	Φ 25	Φ 145	Φ 9	Φ 85	130
130HM-8M050	171(218)	7	50	89	119	Φ 110	Φ 22	Φ 25	Φ 145	Φ 9	Φ 85	130
130HM-8M060	180(227)	7	50	98	128	Φ 110	Φ 22	Φ 25	Φ 145	Φ 9	Φ 85	130
130HM-8M077	194(241)	7	50	112	142	Φ 110	Φ 22	Φ 25	Φ 145	Φ 9	Φ 85	130
130HM-8M100	218(265)	7	50	136	166	Φ 110	Φ 22	Φ 25	Φ 145	Φ 9	Φ 85	130
130HM-8M150	267(313)	7	50	184	214	Φ 110	Φ 22	Φ 25	Φ 145	Φ 9	Φ 85	130
150HM-8M150	279	6	72	247	228	Φ 130	Φ 28	Φ 35	Φ 154	Φ 11	Φ 103	150
150HM-8M270	355	6	72	323	204	Φ 130	Φ 28	Φ 35	Φ 154	Φ 11	Φ 103	150

Note: The value of the L1 column in brackets is the length with power-off brake.

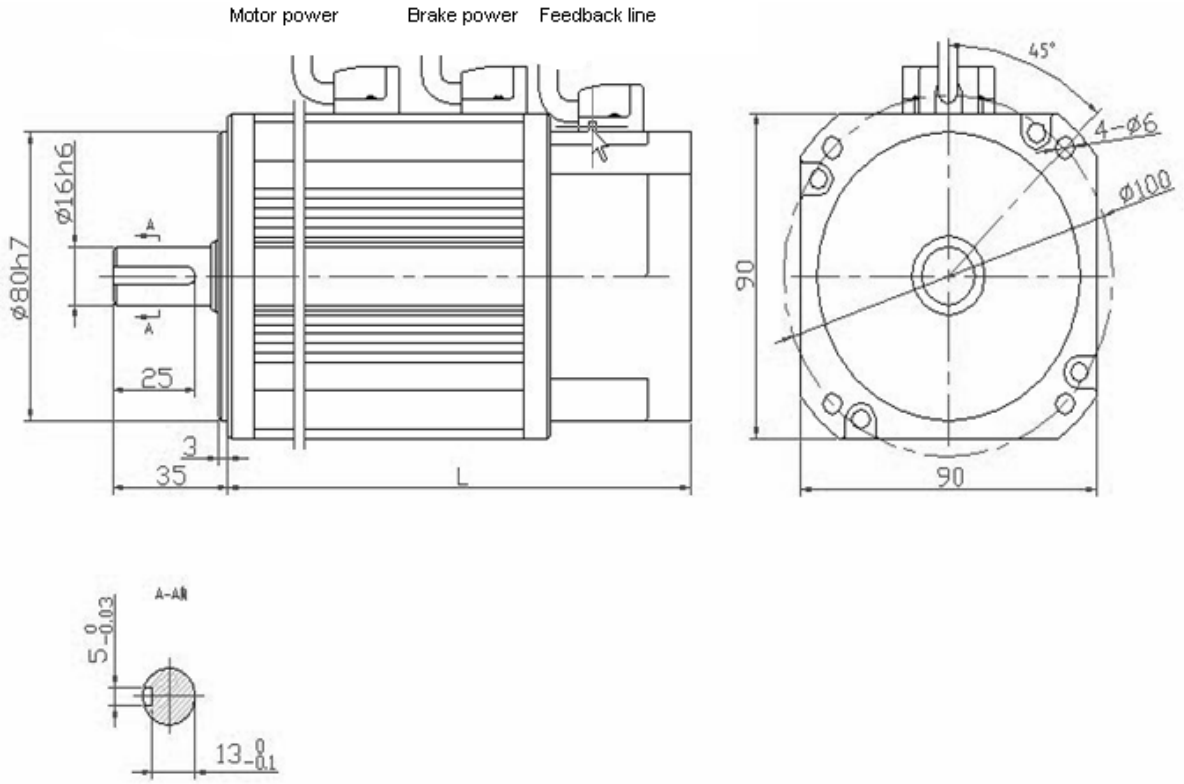
8.5.3 SM Series appearance and size of servo motor

Figure of 80SM appearance and size



Motor model	L
80SM-4M01330-F□	183.5
80SM-4M02530-F□	203.5

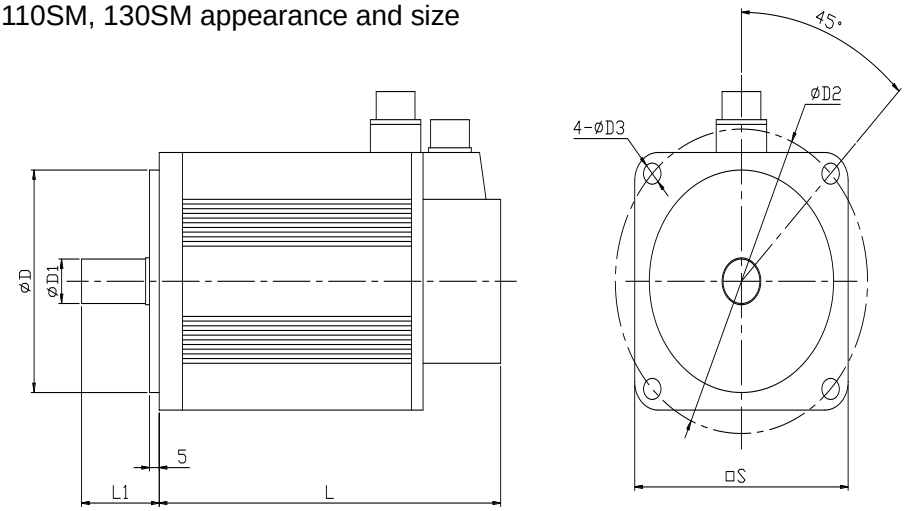
Figure of 90SM appearance and size



Motor model	L
90SM-8M02430-F□	139(199)

8 Motor Specification

Figure of 110SM, 130SM appearance and size

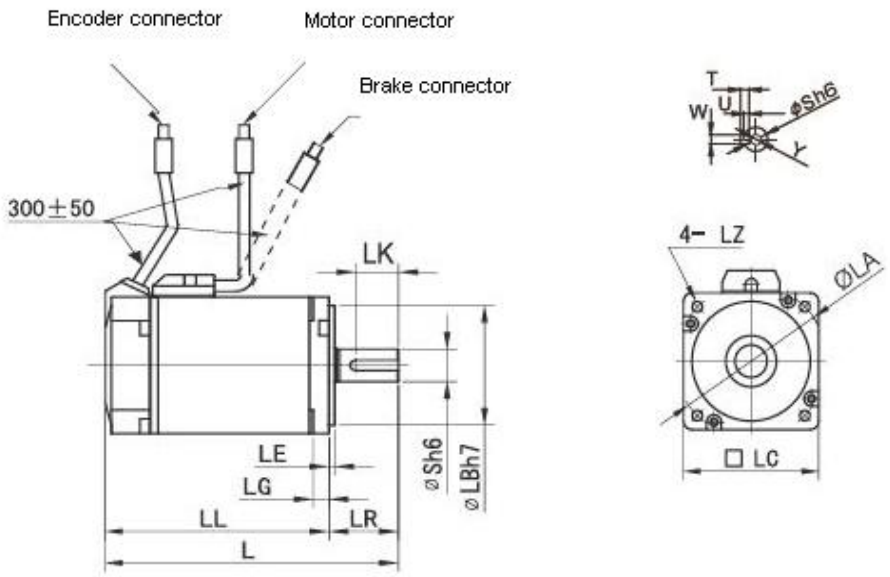


Motor model	L1	L	D	D1	D2	D3	□S
110SM-4M02020- F□	40	156(216)	Φ 95	Φ 19	Φ 130	Φ 9	□110
110SM-4M04020- F□	40	182(216)	Φ 95	Φ 19	Φ 130	Φ 9	□110
110SM-4M04030- F□	40	182(242)	Φ 95	Φ 19	Φ 130	Φ 9	□110
110SM-4M06020- F□	40	212(272)	Φ 95	Φ 19	Φ 130	Φ 9	□110
130SM-4M05020- F□	57	169(229)	Φ 110	Φ 22	Φ 145	Φ 9	□130
130SM-4M06020- F□	57	180(260)	Φ 110	Φ 22	Φ 145	Φ 9	□130
130SM-4M07520- F□	57	189(249)	Φ 110	Φ 22	Φ 145	Φ 9	□130
130SM-4M10010- F□	57	218(278)	Φ 110	Φ 22	Φ 145	Φ 9	□130
130SM-4M10015- F□	57	218(278)	Φ 110	Φ 22	Φ 145	Φ 9	□130
130SM-4M10020- F□	57	218(278)	Φ 110	Φ 22	Φ 145	Φ 9	□130
130SM-4M15010- F□	57	276(336)	Φ 110	Φ 22	Φ 145	Φ 9	□130
130SM-4M15015- F□	57	276(336)	Φ 110	Φ 22	Φ 145	Φ 9	□130
130SM-8M15017- F□	57	270(330)	Φ 110	Φ 22	Φ 145	Φ 9	□130
130SM-4M21020- F□	57	313(393)	Φ 110	Φ 22	Φ 145	Φ 9	□130
180SM-8M12715- F□	82	227(296)	Φ 114	Φ 42	Φ 200	Φ 11	□180
180SM-6M15030- F□	82	227(336)	Φ 114	Φ 42	Φ 200	Φ 11	□180
180SM-8M19115- F□	82	259(338)	Φ 114	Φ 42	Φ 200	Φ 11	□180
180SM-8M19120- F□	82	259(306)	Φ 114	Φ 42	Φ 200	Φ 11	□180
180SM-8M23820- F□	82	281(356)	Φ 114	Φ 42	Φ 200	Φ 11	□180
180SM-8M28620- F□	82	289(394)	Φ 114	Φ 42	Φ 200	Φ 11	□180
180SM-8M35020- F□	82	319	Φ 114	Φ 42	Φ 200	Φ 11	□180

Note: The value of the L column in brackets is the length with power-off brake.

8.5.4 CM Series appearance and size of servo motor

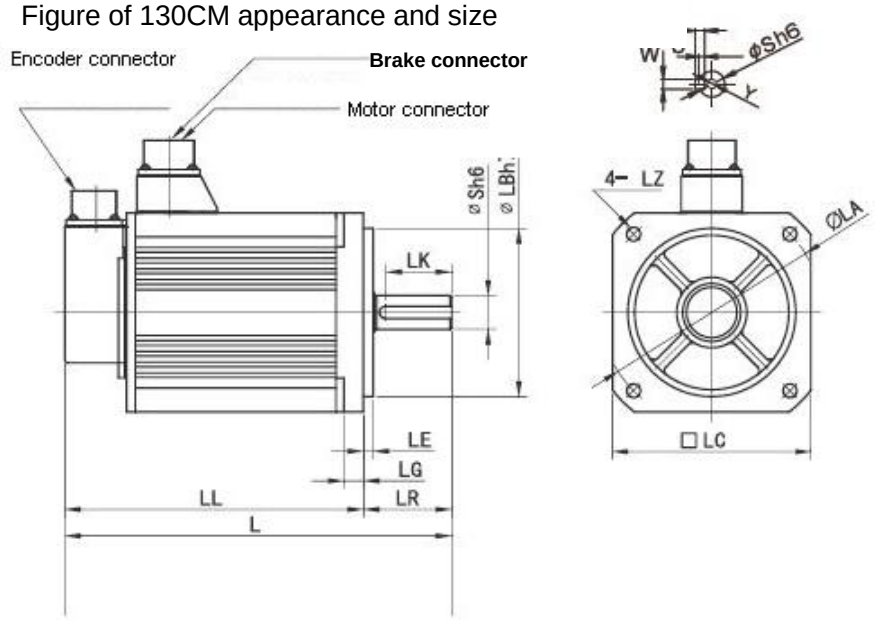
Figure of 60CM, 80CM appearance and size



Model	L	LL	LA	LC	LE	LG	LR	LZ	S	LB	T	U	W	LK	Y
60CM-8M00730-FE	144	114	70	60	3	6.5	30	4.5	11	50	4	2.5	4	20	M4X8L
60CM-8M00730-FB	190.5	160.5	70	60	3	6.5	30	4.5	11	50	4	2.5	4	20	M4X8L
60CM-8M01330-FE	164	134	70	60	3	6.5	30	4.5	14	50	5	3	5	25	M5X10L
60CM-8M01330-FB	210.5	180.5	70	60	3	6.5	30	4.5	14	50	5	3	5	25	M5X10L
80CM-8M02430-FE	177.5	142.5	90	80	3	8	35	6	19	70	6	3.5	6	25	M5X10L
80CM-8M02430-FB	216.5	181.5	90	80	3	8	35	6	19	70	6	3.5	6	25	M5X10L

8 Motor Specification

Figure of 130CM appearance and size



Model	L	LL	LA	LC	LE	LG	LR	LZ	S	LB	T	U	W	LK	Y
130CM-10M05020-FE	195.5	140.5	145	130	6	12	55	9	22	110	7	4	8	45	M8X15L
130CM-10M05020-FB	232	177	145	130	6	12	55	9	22	110	7	4	8	45	M8X15L
130CM-10M07220-FE	213	158	145	130	6	12	55	9	22	110	7	4	8	45	M8X15L
130CM-10M07220-FB	249.5	194.5	145	130	6	12	55	9	22	110	7	4	8	45	M8X15L
130CM-10M10020-FE	237.5	182.5	145	130	6	12	55	9	22	110	7	4	8	45	M8X15L
130CM-10M10020-FB	274	219	145	130	6	12	55	9	22	110	7	4	8	45	M8X15L
130CM-10M15020-FE	293.5	228.5	145	130	6	12	65	9	24	110	7	4	8	45	M8X15L
130CM-10M15020-FB	330	265	145	130	6	12	65	9	24	110	7	4	8	45	M8X15L