CTB TECHNOLOGY

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Data No.: ZL-14-808-IBCN

CTB TECHNOLOGY

GH DRIVER

Operating manual

AC servo driver

Model: BKSC-□ □ □ □ GHX

Class 400V, 1.5 ~ 315KW (2.5 ~ 460KVA)

Please send the manual to final user, and keep it properly.

BEIJING CTB SERVO CO.,LTD.

Data No.: Z L-14-808-I B C N

Preface

Thank you for purchasing GH series servo driver produced by Beijing CTB Servo Co., Ltd. The GH series AC servo driver is a high-quality, multi-functional and low-noise AC servo driver that was researched, developed and manufactured by Beijing CTB Servo Co., Ltd. The driver is servo driver for AC induction motor (IM) and AC permanent magnet synchronous motor (PM). It can control the position, speed, acceleration and output torque of various AC servo motor appropriately.

In command to achieve control functions of various machine tools, GH series AC servo driver is equipped with dual 32-bit CPU and abundant control function module. It can be conveniently connected with various domestic and foreign CNC systems through standard control interfaces to allow full play for function of CNC system. The characteristics of torque, acceleration and deceleration, precision and efficiency of machine tool which is equipped with GH series AC servo driver are remarkable, and accurate stop, C-axis, rigid tapping, electronic shift, multi-axis synchronization and other functions can be realized easily.

As the first choice of driving product of various machine tool power shaft, GH series AC servo driver can be widely used for drive of product such as CNC milling machine, vertical machining center, horizontal machining center, CNC boring machine, CNC lathe, vertical lathe, heavy horizontal lathe and gantry machine tool.

For proper application, please read the manual carefully before using the GH series AC servo driver. Abnormal operation, fault or reduction of service life, and even personal injury accident may be caused by inappropriate use. Therefore, the manual shall be read repeatedly before use, and operate in strict accordance with the instructions. The manual is attachment with the equipment. Please keep it properly after using for future repair and maintenance of the driver.

Safety -related symbol description

The following symbols are used for safety-related content in the manual. Sentences marked by the safety symbols describe important content, and must be abided. If the requirements in the safety-related content are not abided, application of the product may lead to abnormal product operation, damage to the product, even danger and personal injury.

	Use the symbol where danger, even personal injury or death when wrong about the described content.
	Use the symbol where danger, even mild or moderate personal injury and equipment damage when wrong about the described content.
	Prohibited matters (matters that cannot do).
	Certain matters do not belong to "danger", and "caution", but they are required to be abided by user. They are marked in the relevant sections.

Safety precautions

◆ Unpacking inspection

 **Caution**
● For risk of injury, please do not install damaged or part missing driver.

◆ Installation

 **Caution**
● For risk of fire, please install the equipment on nonflammable metal plate without combustible materials around. ● Please be sure to tighten the mounting screws of the driver. Falling and damage of the driver or personal injury may be caused by mounting screws loosing. ●Please do not install the equipment in environment with flammable gas where an explosion is caused easily.

◆ Wiring

 **Danger**
● For risk of electric shock and fire, please make sure that the input power supply is in the OFF state before wiring. ●For risk of electric shock, the operation on main circuit terminal of the controller shall be conducted after the power is cut off for five minutes, and the power charge indicator CHARGE in the controller completely extinguished. ●For risk of electric shock and fire, the wiring shall be carried by professional electrical engineering personnel. ●For risk of electric shock and fire, the ground terminal must be grounded reliably. (earth resistance shall be lower than 4Ω) ● It's prohibited to directly connect terminals of P / PB and N, or connect the zero line or the earth wire to the N terminal. Otherwise, the rectifier bridge will be shorted and the main loop will be burned. ●It's prohibited to connect the high-voltage line to control terminal of the driver. Otherwise, the control board will be burned. ●For risk of injury, please set emergency stop and locking circuit at the outside of the controller (user is responsible for the wiring) . ● There is a risk of electric shock and short circuit.

◆ Wiring

 **Caution**
●For risk of injury and fire, please ensure that the voltage of the main circuit AC input power and the

rated voltage of the driver are consistent.

● Please do not conduct withstand voltage and insulation test to the controller arbitrarily. Otherwise, the semiconductor and other components in the controller may be damaged.

●For risk of fire, please connect braking resistor and braking unit according to the wiring diagram.

● Please do not connect the AC input power cord to the output U, V, W terminals. Otherwise, damage to inside of the controller may be caused.

●For risk of fire and malfunction of the controller, please tighten the terminals of main loop and control circuit with appropriate torque.

●Please do not connect the phase shifting electrolytic capacitor and LC / RC noise filter to the output circuit. Otherwise, damage to inside of the controller may be caused.

●Please do not connect the electromagnetic switch and electromagnetic contactor to the output circuit to connect or disconnect the load. During loaded operation of the controller, the surge current will cause protection circuit action of the controller.

◆ Trial run

Danger

●For risk of electric shock and short circuit, please do not touch the terminals of the main circuit directly after power-on.

●Please confirm the input and output signals to guarantee safe operation. Malfunction of the system will cause casualties and damage to the work piece and nearby equipment..

●For risk of injury, alarm reset only can be done after ensuring that the operating signal is cut off. Alarm reset with operating signal will lead to suddenly re-start.

●For risk of driver burning, the inside of long term stored driver shall be checked for water and condensation.

●For risk of electric shock and burning the equipment, it's prohibited to touch the terminals of the driver with hand during operating.

Caution

●For risk of scalding, the running servo driver and motor may have a high temperature rise, please do not touch.

●For risk of scalding and electric shock as the braking resistor has a high temperature rise for discharging, please do not touch.

●For risk of damage to the equipment and accident, please do not change the settings of the drive arbitrarily.

◆ Maintenance and inspection

Danger

●For risk of electric shock, please do not directly touch terminals of the controller. Some of them have high voltage and very dangerous.

●For risk of electric shock, please do install the housing before power-on; and must disconnect the power firstly before removing the housing.

●For risk of electric shock and fire, please confirm that the power source is in the OFF state or not before wiring.

● Inspection and maintenance only can be carried out after cut off the main circuit input power and confirm that the power charge indicator CHARGE completely extinguished. There is a risk of electric shock as residual power in electrolytic capacitor.

●Please make designated professional electrical engineering personnel to conduct inspection and maintenance. Before work, please take off metal object (watch, rings etc.), and use tools with insulation protection during operation. Otherwise, it may cause electric shock.

●For risk of explosion and fire, used battery, circuit printing plate must not be throw into fire. Otherwise, it may cause explosion.

 Caution

●CMOS IC integrated circuit is installed on main control panel. Full attention shall be paid during operating. The electrostatic induction due to direct touching of finger on the main control panel may cause damage to the main control panel.

●For risk of electric shock, please do not conduct wiring and removing terminal when the equipment is energized.

●For risk of damage to the equipment, the appropriate parameter settings must be carried out before running after control panel replacing.

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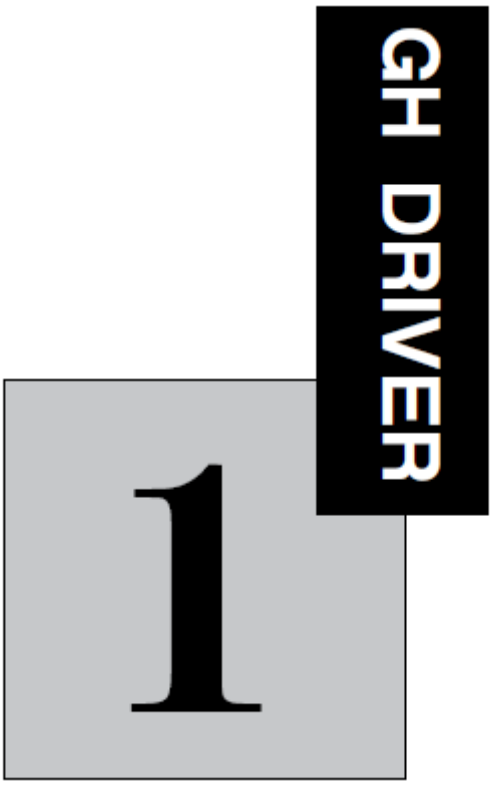


Installation

The chapter describes matters to be confirmed and installation requirements for the user after getting the GH DRIVER.

Introduction to GH DRIVER

GH DRIVER is a type of driver that specifically designed for machine tool. Precise control of position, speed, acceleration and output torque of AC induction servo motor and AC inverter motor is allowed through the driver. It can be used for control of motor of machining center, CNC milling machine, CNC drilling machine, CNC lathe, CNC grinder, and feed motor of large gantry equipment and vertical lathe. To achieve the best operation effect, please complete wiring with CNC system by the " CTB servo application manual ", and carry out installation and commissioning in accordance to the manual.

Model description (taking 7.5kW as example)

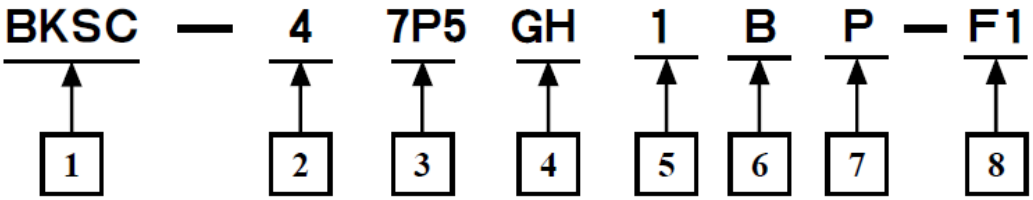


Table 1-1 Detailed description of motor model designation

Code	Item	Description	Illustrated model meaning
1	Manufacturer code	BKSC: code for driver product of the manufacturer	Manufactured by BEIJING CTB SERVO CO., LTD.
2	Voltage level	2: level 200V 4: level 400V	level 400V
3	Power code	See power code list for detail	7.5kW
4	Product series	GS: GS series driver GH: GH series driver	GH series driver
5	Encoder model	None: incremental 10 driver 0:without encoder 1: incremental encoder 2: rotary transformer 3: Sin-Cos encoder 4: absolute value encoder 5: magnetic encoder	incremental encoder
6	Product model	None: standard type (CP1000A1/C1) B: general type(CP1000B1/D1) T:special type (CP1000AT1/CT1)	general type(CP1000B1)
7	Production upgrading identification	None: conventional design P: new energy-saving design	new energy-saving design for main board of the driver
8	Non-standard identification	None: standard product F1: Non-standard requirements to main board F2: Non-standard requirements to driver F3: Non-standard requirements to housing Other: special customer	Non-standard requirements to main board of driver

● GH DRIVER series applies for 21 types with a motor capacity of 1.5kW to 315kW. Please see table 1-2 for detail

Table 1-2 GH DRIVER model (rated voltage: 400v)

Driver model	Rated capacity(KVA)	Rated input current (A)	Rated output current (A)	Adapt motor power (kW)	Built-in brake unit
BKSC-41P5GHX	2.5	4	3	1.5	Yes
BKSC-42P2GHX	3	6	5	2.2	Yes
BKSC-43P7GHX	5.5	9	8	3.7	Yes
BKSC-45P5GHX	8.5	14.2	13	5.5	Yes
BKSC-47P5GHX	11	18	17	7.5	Yes
BKSC-4011GHX	17	26	25	11	Yes
BKSC-4015GHX	21	35	32	15	Yes
BKSC-4018GHX	24	38.5	37	18.5	Yes
BKSC-4022GHX	30	46.5	45	22	Yes
BKSC-4030GHX	40	62	60	30	Yes
BKSC-4037GHX	50	76	75	37	Yes
BKSC-4045GHX	60	92	90	45	Yes
BKSC-4055GHX	72	113	110	55	Yes
BKSC-4075GHX	100	157	152	75	Yes
BKSC-4090GHX	116	190	185	90	Yes
BKSC-4110GHX	138	236	230	110	Yes
BKSC-4132GHX	167	288	280	132	Yes
BKSC-4160GHX	200	345	336	160	Yes
BKSC-4200GHX	250	420	370	200	No
BKSC-4250GHX	300	530	460	250	No
BKSC-4315GHX	360	680	570	315	No

Unpacking inspection

Please confirm the following items when you get the product. Please contact directly with the dealer or manufacturer that purchased from for any adverse situation. Please see Table 1-3 for detail.

Table 1-3 Confirm items

Confirm item	Confirm method
Confirm that the materials listed on the packing list are complete.	Check the materials in the packing against the packing list stuck to the external packing.
Are they in line with the ordered merchandise?	Please confirm the label at the side of the driver.
Is there any damage?	Check the overall appearance for damage during transportation.

Standard specifications and performance parameters

Please see Table 1-4 for standard specifications and performance parameters of 3-phase Class 400V driver

Table 1-4 Standard specifications and performance parameters of GH DRIVER

Model BKSC-××××GHX		41P5	42P2	43P4	45P5	47P5	4011	4015	4018	4022	4030	4037	4045	4055	4075	4090	4110	4132	4160	4200	4250	4315
Adapt motor power kW		1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	200	250	315
Output	Capacity KVA	2.5	3	5.5	8.5	11	17	21	24	30	40	50	60	72	100	116	138	167	200	250	300	360
	Current A	3	5	8	13	17	25	32	37	45	60	75	90	110	152	185	230	280	336	370	460	570
	Maximum output voltage V	3-phase 380/400/415/440V corresponding input voltage																				
	Maximum output speed rpm	4-pole motor 15000rpm: 500Hz																				
Power	Rated voltage and frequency	3-phase 380/400/415/440V: 50/60Hz±5%																				
	Allowed voltage pulsation	+10%, −15%																				
Control characteristics	Control mode	Sine wave PWM modulation, entirely closed-loop vector control																				
	Torque feather	200% rated torque output below the fundamental frequency. Accuracy: ±5%																				
	Range of speed regulation	1: 15000																				
	Speed control accuracy	±0.1%																				
	Frequency set resolution	Digital quantity: : 0.01Hz; Analog: Unipolar, maximum output frequency is /4092; bipolar, maximum output frequency is / 2046																				
	Position control accuracy	±1PULSE																				
	Acceleration	0.05～3000Hz/s																				
	Brake mode	dynamic braking. 125% rated torque: built-in braking unit (external braking resistor)																				

	Overload capacity	200% rated current 30s
Input and output interface	Digital quantity input	7-channel isolation photo-coupler input; input mode: PNP, NPN optional
	Digital quantity output	2-channel isolation photo-coupler output; 24V, 10mA
	Analog input	2-channel; －10V～+10V　1 channel, 0～10V 1-channel
	Analog output	2-channel; －10V～+10V
	Relay output	1 channel: a group of N.O/N.C contact: AC250V/DC30V, 1A
	Fault output relay	1 channel: a group of N.O/N.C contact: AC250V/DC30V, 1A
	Encoder input interface	two: maximum receive frequency is 300KHz: cable driven receive mode: RS422 standard
	PULSE input interface	One: direction PULSE or orthotropic PULSE
	Encoder output interface	One: maximum output frequency is 300KHz: cable driven output mode: RS422 standard
	Bus interface	None
function	Speed control	Range: 0～15000rpm; turning: positive and negative; speed order: Analog, PULSE frequency
	Accurate stop	Accuracy: ±1PULSE; position adjustment: set by user's parameter
	Rigid tapping	May be connected to several domestic and foreign systems. Tapping error: ±2％
	Other function	C-axis control, thread cutting, electronic gear, reaming, swing control
Protection function	motor over-current	Greater than 200% rated current output
	Motor overload	Specified time of exceeding overload alarm value. Alarm output: set by parameters
	Overvoltage	The voltage of main circuit bus is higher than 800V. Alarm output
	Low voltage	The voltage of main circuit bus is lower than 400V. Alarm output
Service environment	Service site	Free of dust, corrosive gas and inflammable gas
	Temperature	－10～45℃
	Humidity	Lower than 95％RH (no condensation)
	Vibration	vibration frequency≤20Hz: 9.8m/s^2； 20Hz≤vibration frequency≤50Hz: 2m/s^2；

Driver nameplate description

Nameplate which indicates model and rated values of the driver is affixed to the lower right of housing of the driver. The content of the nameplate is shown in Figure 1-1.

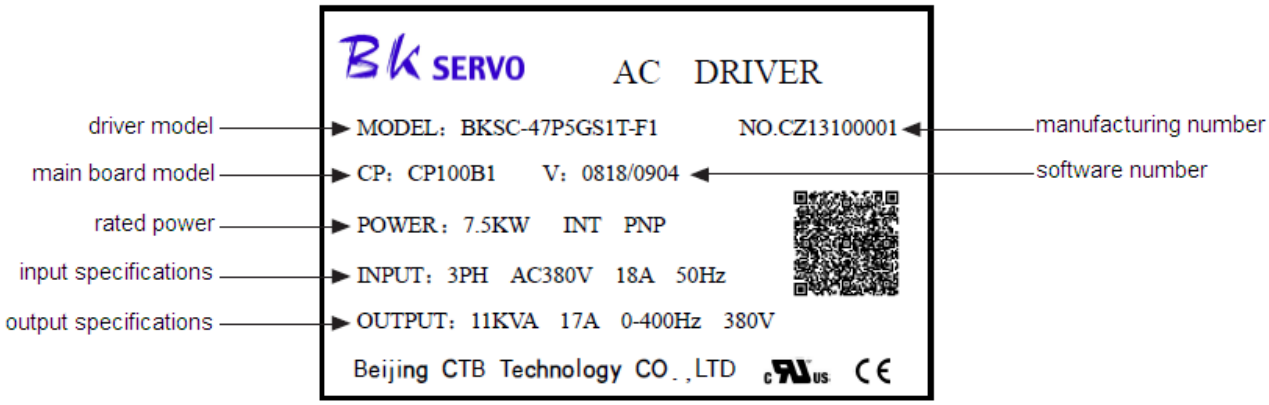


Figure 1-1 AC Servo driver nameplate

Note: the two-dimension code includes manufacturing number of the driver; customer name of the driver (take BEIJING CTB SERVO CO., LTD. as an example); contract number; driver model; main board model; software number; non-standard (take standard as an example) and other description.

External dimensions and installation dimensions

1. 1.5-3.7kw driver

Please see diagram 1-2 for external dimensions and installation dimensions

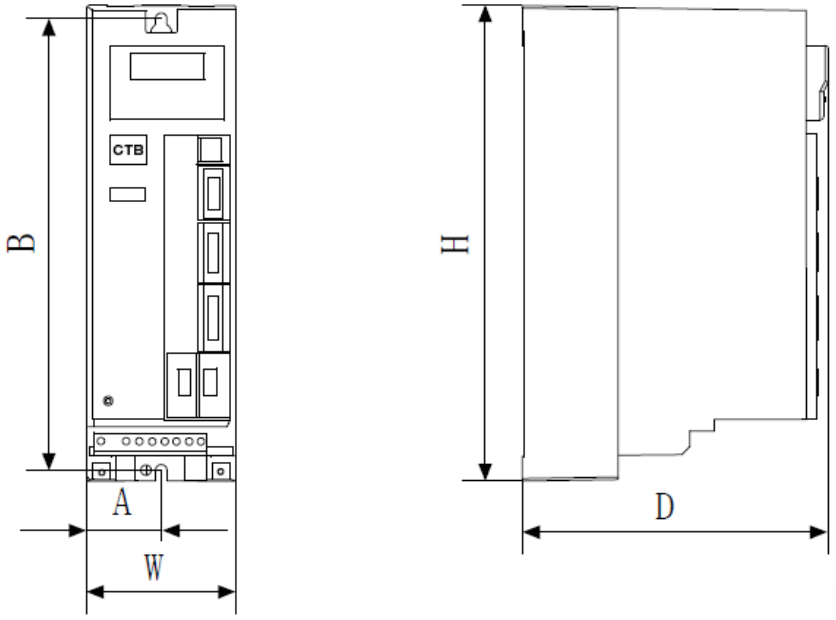


Figure 1-2

Table 1-5 Dimensions (mm) and weight (kg) of GH DRIVER (1.5-3.7kw) driver

Dimension / Model	A	B	W	H	D	Connecting terminal screw	Installation screw	Weight (kg)
BKSC-41P5GHX	45.5	276	91	290	200	Wire nail width 3mm	M6	3
BKSC-42P2GHX								
BKSC-43P7GHX								

2. 5.5～11kw driver

Please see diagram 1-3 for external dimensions and installation dimensions

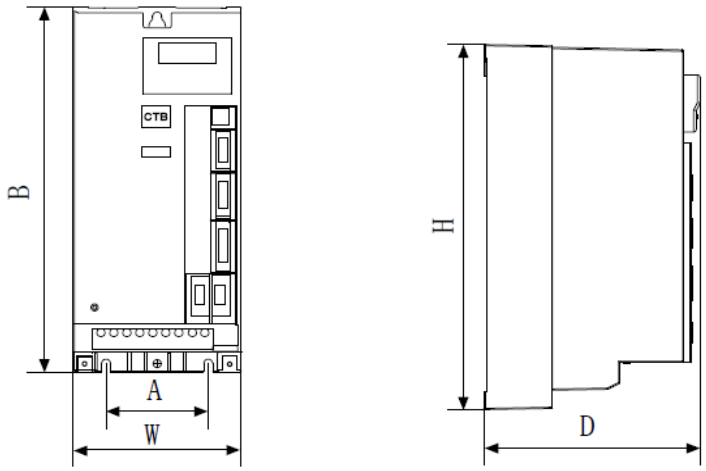


Figure 1-3

Table 1-6 Dimensions (mm) and weight (kg) of GH DRIVER (5.5-11kw) driver

Dimension / Model	A	B	W	H	D	Connecting terminal screw	Installation screw	Weight (kg)
BKSC-45P5GHX	80	276	132	290	200	Wire nail width 3mm	M6	5
BKSC-47P5GHX								
BKSC-4011GHX								

3. 15～45kw driver

Please see diagram 1-4 for external dimensions and installation dimensions.

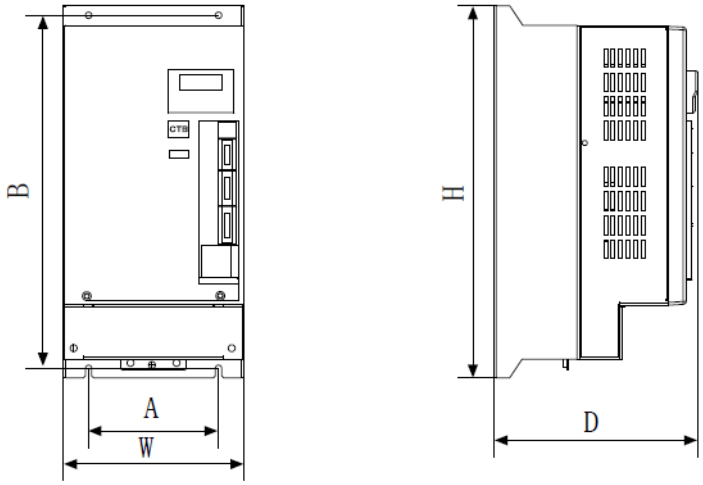


Figure 1-4

Table 1-7 Dimensions (mm) and weight (kg) of GH DRIVER (15-45kw) driver

Dimension / Model	A	B	W	H	D	Connecting terminal screw	Installation screw	Weight (kg)
BKSC-4015GHX	140	376	194	390	228	M6	M6	14
BKSC-4018GHX								
BKSC-4022GHX	236	376	282	390	228	M6	M8	20
BKSC-4030GHX								

BKSC-4037GHX	300	376	380	390	269	M8	M8	26
BKSC-4045GHX								

4. 55～160kw driver

Please see diagram 1-5 for external dimensions and installation dimensions

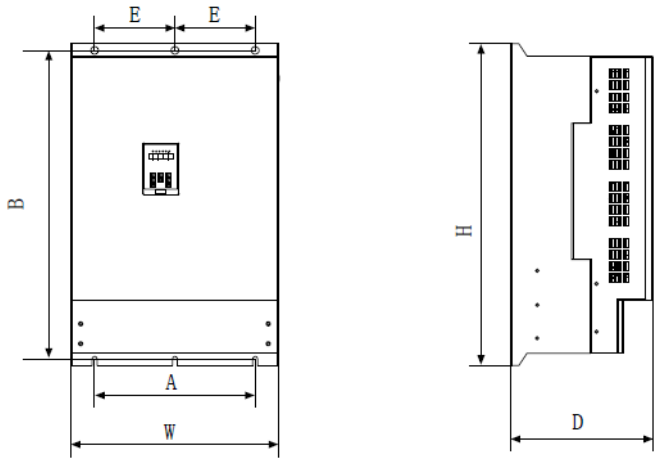


Figure 1-5

Table 1-8 Dimensions (mm) and weight (kg) of GH DRIVER (55-160kw) driver

Dimension / Model	A	B	W	H	D	E	Connecting terminal screw	Installation screw	Weight (kg)
BKSC-4055GHX	392	376	472	390	269	196	M10	M8	33
BKSC-4075GHX									
BKSC-4090GHX	360	690	464	720	320	180	M10	M16	90
BKSC-4110GHX									
BKSC-4132GHX									
BKSC-4160GHX									

5.200 ~ 315kw driver

Please see diagram 1-6 for external dimensions and installation dimensions

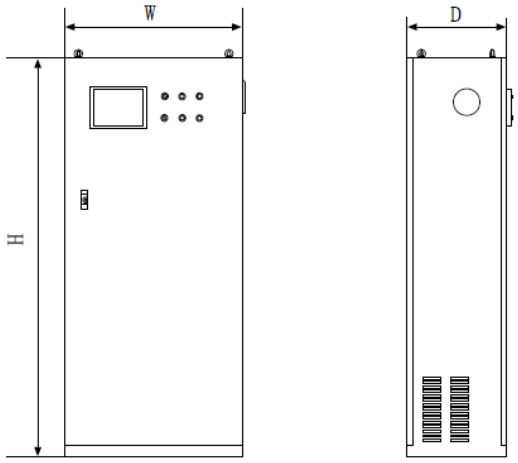


Figure 1-6

Table 1-9 Dimensions (mm) and weight (kg) of GH DRIVER (200-315kw) driver

Dimension / Model	A	B	W	H	D	Connecting terminal screw	Installation screw	Weight (kg)
BKSC-4200GHX	-	-	800	1800	450	-	-	230
BKSC-4250GHX								
BKSC-4315GHX								

Confirmation and requirements of the installation space

Installation environment

The following items shall be noted when selecting the installation environment:

1. Ambient temperature: operate in -10℃ ~ 45℃; if the ambient temperature is higher than 45℃, the equipment shall be used with 30% derating for each 5℃ temperature rise.

★ Note: If the ambient temperature is higher than 45℃, the ventilation shall be strengthened, and use by the specified derating.

2. The humidity of the installation site shall lower than 95%, and free of condensing;

3. Do not install the equipment in place with dust or metal powder;

4. The equipment shall be installed at place without corrosive, explosive gas;

5. The equipment shall be installed at place that meets the requirements of vibration. The vibration frequency ≤ 20Hz: 9.8m/s^2; 20Hz ≤ vibration frequency ≤ 50Hz: 2m/s^2;

6. The equipment shall be installed at place away from direct sunlight.

Installation direction and space

●Installation spacing and distance requirements of single driver are shown in Figure 1-7.

● Generally, abreast installation mode is adopted when multiple drivers are installed in the control cabinet, and air inlet, outlet and dedicated cooling fan shall be equipped; if up and down installation mode is adopted, stream guidance clapboard shall be added between drivers to guarantee good cooling effect as shown in Figure 1-8.

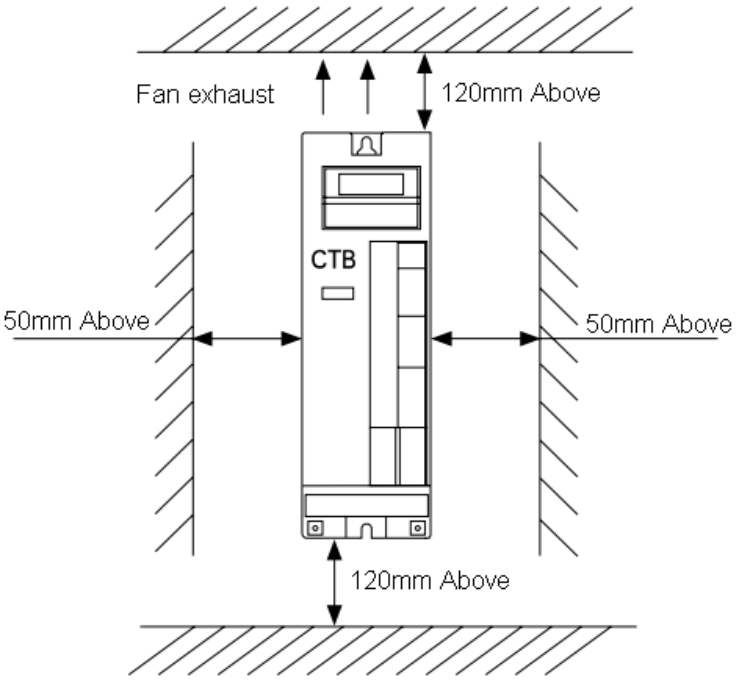


Figure 1-7 Single controller installation

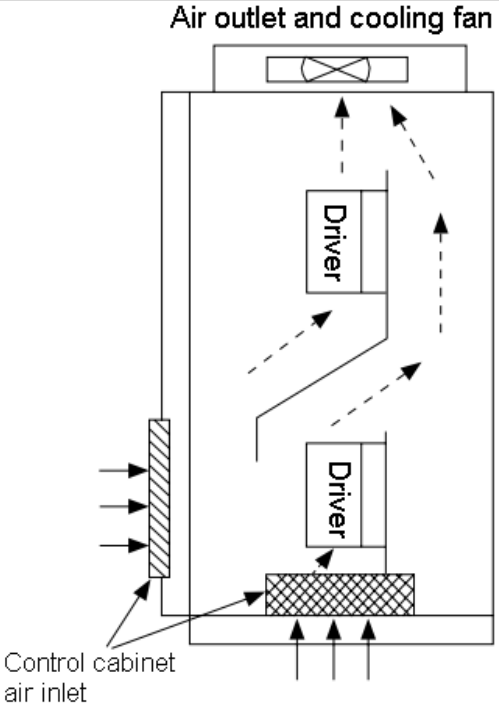


Figure 1-8 Multiple controllers installation

Notes on motor and load

Compared with frequency conversion operation

GH DRIVER is full closed-loop vector servo driver. It adjusts output voltage and current automatically according to the load change. It's more energy-efficient than inverter with higher speed control accuracy and wider speed regulation range. As the controlled motor and driver are closed loop, the control of position, speed and torque can be achieved conveniently.

Constant torque operation

When motor works in constant torque area, the output torque of the motor is required by the mechanical operation instead of the rated torque of the motor. However, the maximum continuous output torque of the motor must not exceed the rated torque.

High-speed operation in constant power area

For high-speed operation in constant power area, the increased vibration and noise shall be considered, and the service speed range of motor bearing and mechanical devices must be confirmed, and consulted in advance. It's strictly prohibited to make the machine operate above the rated speed.

Lubrication of the mechanical device

For reduction box and gear head motor and other mechanical device that requires lubrication, damage may be caused due to deterioration of lubricating effect in long-term low-speed operation. It must be consulted in advance.

Negative torque load

Negative torque load occurs frequently for load such as lifting. The driver will generate over-current and overvoltage alarm and trip. Equipping of brake components or mechanical safety devices shall be considered.

Reciprocating load

Please pay attention to unstable phenomenon in output current when the driver is driving piston reciprocating load. The phenomenon is more prominent in long-term low-frequency operation. The capacity of driver shall be increased.

Mechanical resonance point of the load device

The driver may encounter the mechanical resonance point of the load device in certain output frequency range. It can be avoided by setting jump frequency.

Notes on the driver

Applications not in rated voltage

The servo driver shall not be used in voltage that not in the working voltage range. Please conduct voltage transformation with appropriate step-up or step-down unit as required.

Note on the drive 3 phase input into 2-phase input

The device shall not be changed into 2-phase input, otherwise, default phase protection will occur.

Capacitor or pressure-sensitive device to improve power factor

As shown in Figure 1-9, the output of the driver is PULSE wave, drive failure tripping or damage to the device will be caused due to capacitor or pressure-sensitive device for lightning to improve power factor installed at the output side. They must be removed.

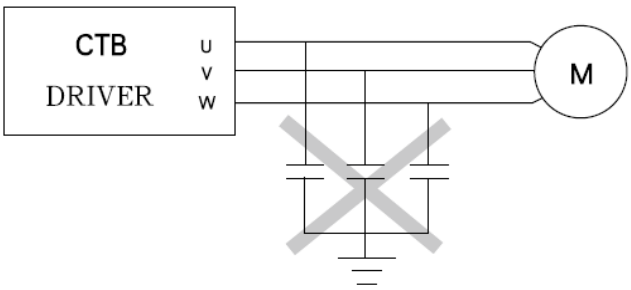


Figure 1-9 Capacitor is prohibited at the output end of controller

Lightning attack protection

lightning over-current device is equipped in the driver for self-protection to induction stroke

Altitude and derating operation

For areas with altitude over 1000 m, derating operation is necessary due to deterioration of cooling effect of the drive caused by thin air. The relationship curve of rated current of driver and altitude is shown in Figure 1-10.

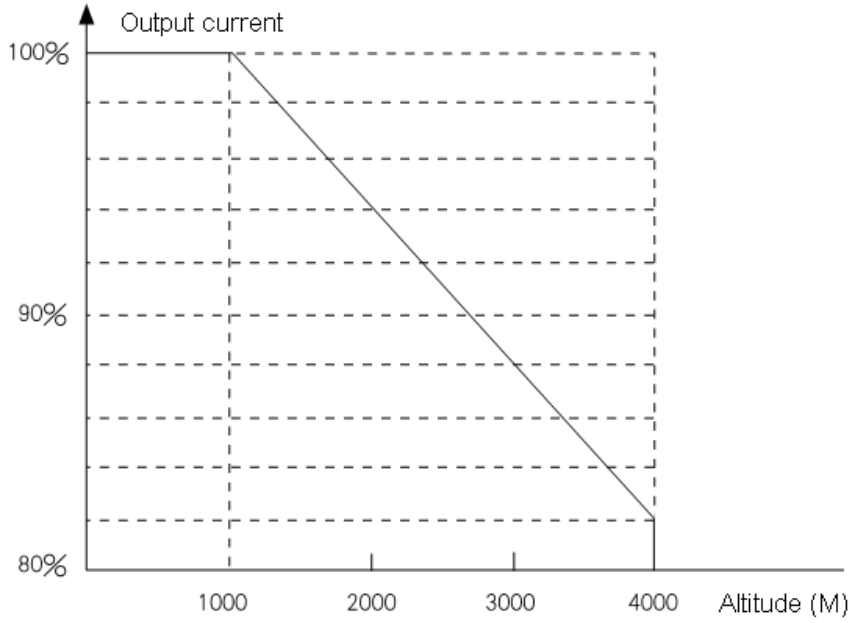


Figure 1-10 Derating curve of rated current of driver and altitude

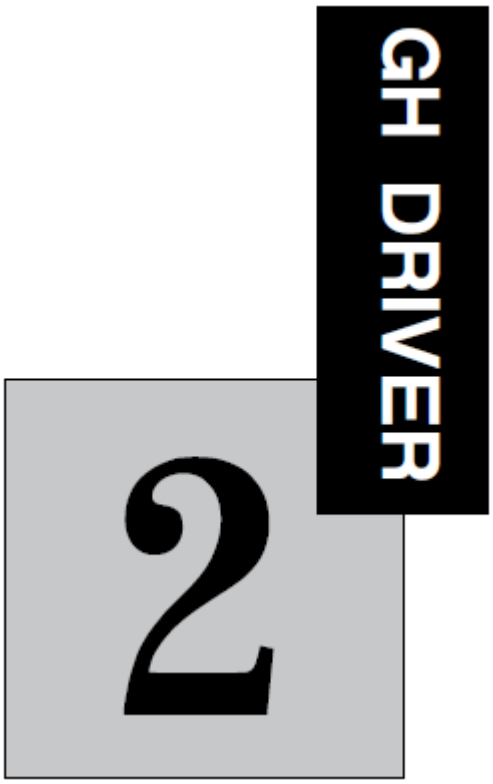
Notes on scrapping:

Explosion of electrolytic capacitor: the electrolytic capacitors on main circuit and printed panel may explode when incinerated.

Plastic incineration waste gas: toxic gases will be generated in incineration of front panel and other plastic parts.

Processing method: please process the waste as industrial waste.

★ Description: The contents of the manual are subject to change due to product upgrade or optimize. The new version shall prevail.



Wiring

The chapter describes the wiring specifications of power supply terminals and control circuit terminals, and install wiring specifications of control board jumpers and expansion interface board.

Selection and connection of peripheral devices

Driver and peripheral devices connection diagram taking 7.5kw drives as an example in Figure 2-1.

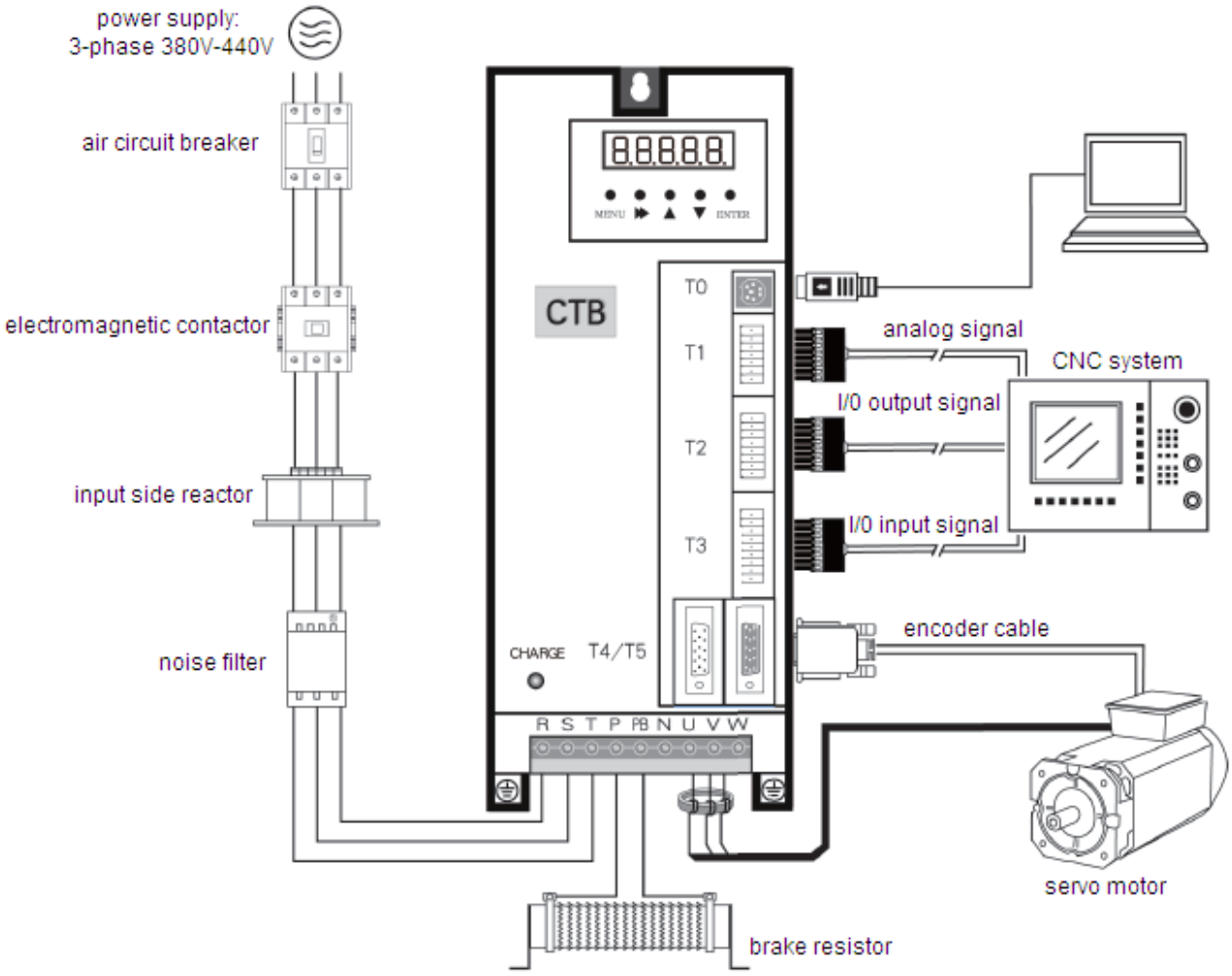


Figure 2-1 driver and peripheral devices connection diagram

Parts selection description

Item	Usage	Selection note	Remarks
Air circuit breaker	Turn on or off driver power	Select by 150% of rated current of the driver	Refer to Table 2 - 3
Electromagnetic contactor	For automatic power on of driver	Select by 150% of rated current of the driver	Refer to Table 2 - 3
Input side reactor	Improve power factor of power grid	Select by 100% of rated current of the driver	
Input noise filter	Suppress interference of driver to power supply	Select by 150% of rated current of the driver	
Braking resistor	Consume regenerated energy of the driver	Select by standard provided by the factory	Refer to Table 2 - 2
Filtering magnet ring	Suppress wireless interference of the driver to outside	Select by standard provided by the factory	Refer to GH model selection sample

Wiring of the main circuit terminals

The structure of the main circuit

See Figure 2-2A, 2-2B, 2-2C and 2-2D for internal structure diagram of the main circuit.

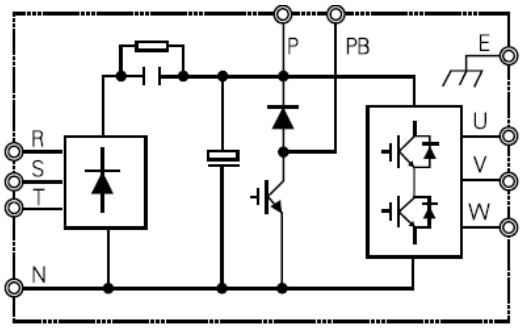


Figure 2-2A 1.5～11kw main circuit composition

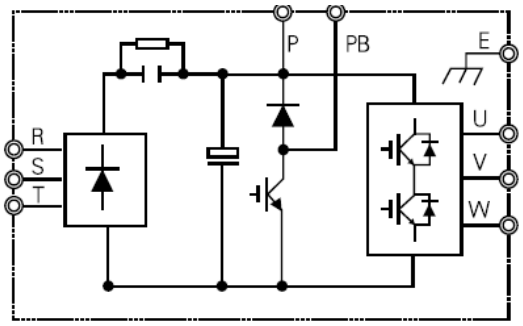


Figure 2－2B 15～30kw main circuit composition

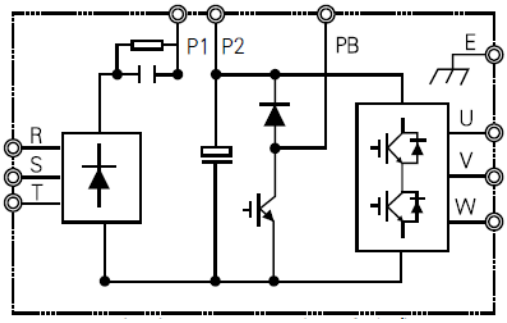


Figure 2－2C 37～75kw main circuit composition

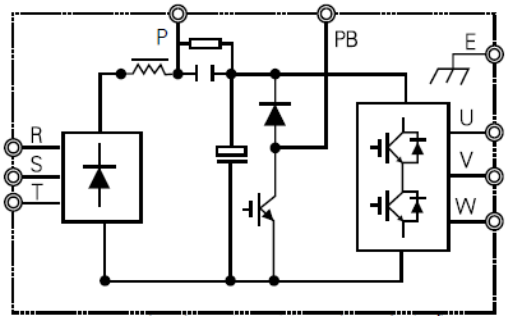
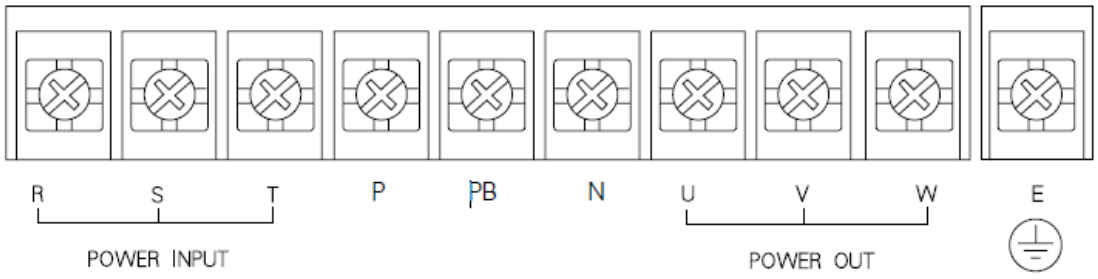


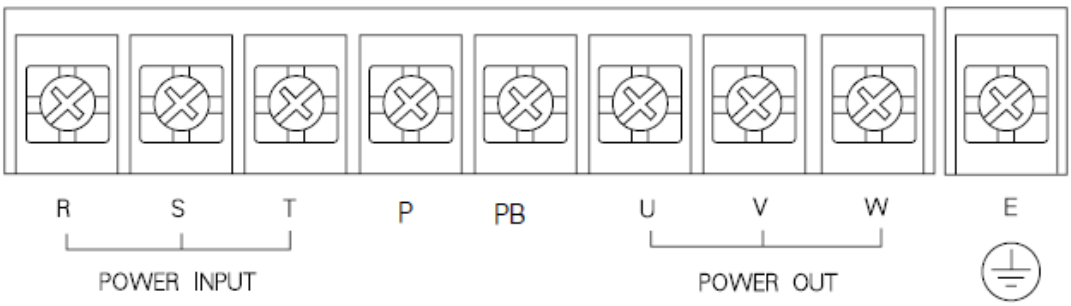
Figure 2－2D 90～160kw main circuit composition

Main circuit terminals composition

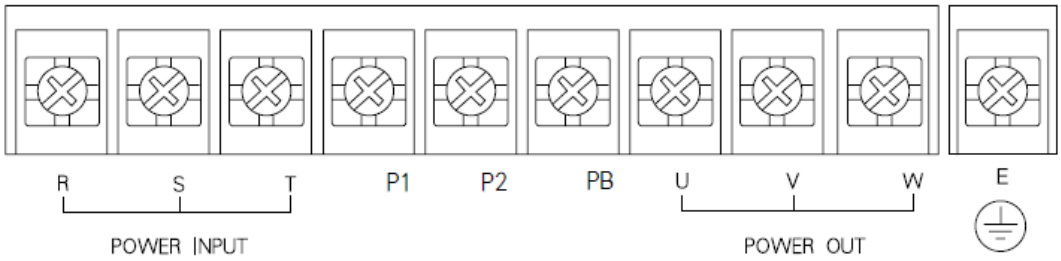
1.5～11kw main circuit terminals composition



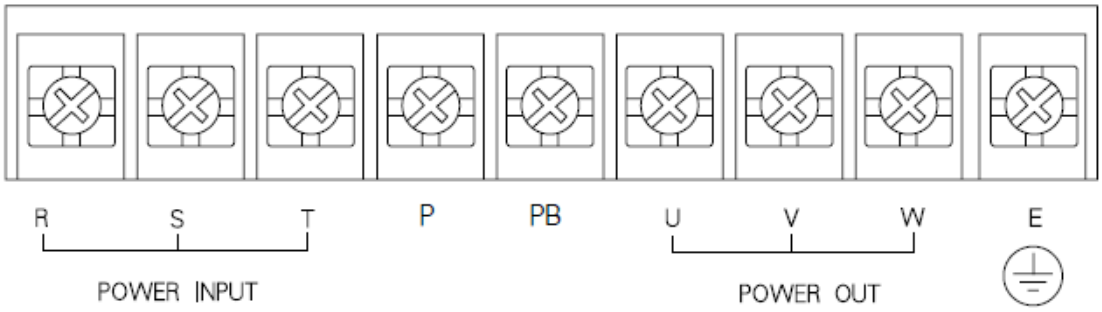
1.5～30kw main circuit terminals composition



37～75kw main circuit terminals composition



90～160kw main circuit terminals composition



Main circuit terminals and functional description

Item	Function	Notes
R S T	3-phase AC supply input terminal. 380~440V, 50/60Hz	Need to install breaker for protection
P P1	DC bus positive pole	P and N are for input of external braking unit or DC power input
P2	DC reactor wiring terminal	P1 and P2 are for external DC reactor
PB	Braking resistor wiring terminal	P, P2 and PB are for external braking resistor
N	DC bus negative pole	N and P are for external braking unit or DC power input
U V W	Driver output terminal	Consistent with the phase sequence of the motor during wiring
E	Earth terminal	C type grounding, the grounding resistance≤ 4Ω

Wiring of input side of the main circuit

Please pay attention to the following items for wiring of input side of the main circuit. See2-3

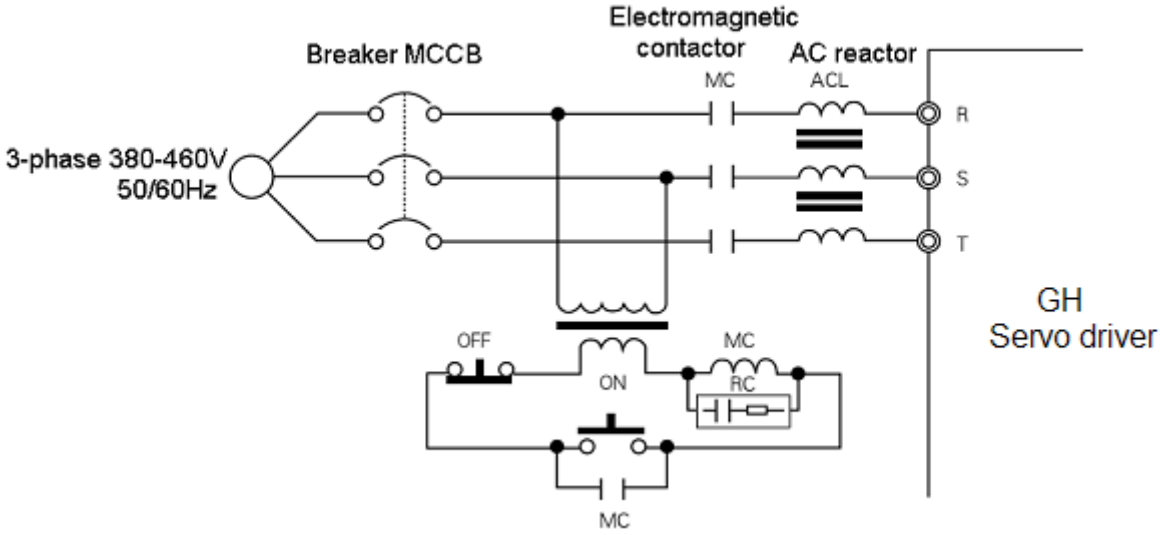


Figure 2-3 Standard wiring diagram for incoming line

Incoming line circuit breaker (MCCB)

The main circuit power input terminals (R, S, T) must be connected to 3-phase AC power through line protection circuit breaker (MCCB).

● The selection of MCCB must be in accordance with requirements in Table 2-3.

● The time characteristics of MCCB must take overload characteristics (rated output current 200%/min) and time characteristics of the servo driver into account.

● Each AC servo driver shall be equipped with independent breaker; when multiple drivers share a circuit breaker, to cut off the power supply and prevent the failure expansion during driver failure, it's recommended to control the incoming line electromagnetic contactor with the fault output relay of the driver to ensure safety.

Installation of the residual current circuit breaker

The output of the servo driver is a high frequency PULSE wave so that there is high-frequency leakage current generated. Residual current circuit breaker can be used at the incoming line side of the driver to remove high-frequency leakage current, and only inspect channel current that dangerous to human body. Please select special residual current circuit breaker for servo (inverter) for wiring.

● When select special residual current circuit breaker, please select model for control of one driver with an induction current over 30ma.

●When select normal residual current circuit breaker, please select model for control of one driver with an induction current over 200ma, and a time over 0.1s.

●Installing isolation transformer between normal residual current circuit breaker and AC servo driver can effectively avoid malfunction of the breaker.

Incoming line electromagnetic contactor

Incoming line electromagnetic contactor may be used to cut off the power in sequential control. It cannot be used as start of AC servo driver. When cut off power of AC servo driver compulsorily with incoming line electromagnetic contactor, AC servo driver is in power-off alarm state, motor only can slide freely and stop.

● Frequent turning on/off incoming line magnetic contactor may cause heating, even burning of charging

resistor of the driver (driver interior).

● The time interval of turning on/off incoming line magnetic contactor shall be longer than 10 minutes.

AC reactor

Installing AC reactor at the incoming line side of the servo driver can effectively suppress the surge of power, avoid burning of rectification part of the driver, and also can improve the power factor of the power supply side. Please see Figure 2-3 for connection of AC reactor, see Table 2-1 for selection of AC reactor.

DC reactor

External DC reactor can be connected to GH AC servo driver of 37 to 75KW. It can effectively suppress the surge of power, avoid burning of rectification part of the driver, and also can improve the power factor of the power supply side. Please see Figure 2-4 for connection of DC reactor.

If external DC reactor is not connected, P1, P2 or D C + terminals shall be shorted as shown in Figure 2-5.

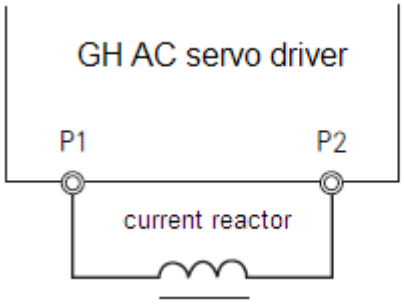


Figure 2-4 DC reactor connection diagram

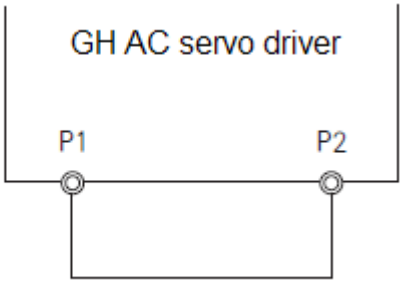


Figure 2-5 Connection diagram without DC reactor

Precautions for wiring of DC reactor

1. Please do not connect DC reactor to any main circuit terminal except P1, P2, otherwise, it may cause internal short circuit of the driver, and burn the driver.

2. Please see Table 2-3 for specifications of DC driver connecting cable, the standard of the main circuit cable.

3. Please see Table 2-1 for selection standard of DC reactor.

4. With external DC reactor, the P2 terminal shall be multiplex terminal, and one end of braking resistor also shall be connected to the terminal.

Table 2-1 Selection of AC reactor, DC reactor and input filter

Driver model		41P5	42P2	43P7	45P5	47P5	4011	4015	4018	4022	4030	4037	4045	4055	4075	4090	4110	4132	4160
AC reactor	Current (A)	5	7	10	15	20	30	40	50	60	80	90	120	150	200	230	250	290	330
	Model ACL	0005	0007	0010	0015	0020	0030	0040	0050	0060	0080	0090	0120	0150	0200	0230	0250	0290	0490
DC reactor	Current (A)	Without connection to DC reactor										90	110	150	180	Built-in driver			
	Model DCL											090	0110	0150	0180				

Input filter	Current (A)	6	6	6	10	16	25	30	50	50	65	80	100	120	150	200	250	250	320
	Model EMI	06	06	06	010	016	025	030	050	050	065	080	0100	0120	0150	0200	0250	0250	0320

Power side noise filter

In command to reduce high-frequency interference noise from power line coupling to the driver, and suppress the noise feedback to power from the driver, noise filter with appropriate model and specifications at the power input side of the driver.

Set and connect the incoming line filter correctly as shown in Figure 2-6.

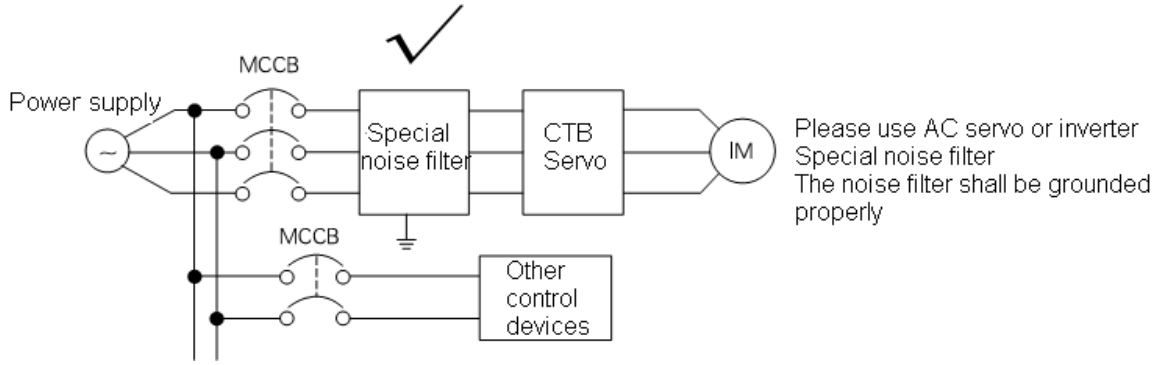


Figure 2-6 Correct installation of noise filter at the input side of the power supply

Please see Figure 2-7 for examples of incorrect settings and connection

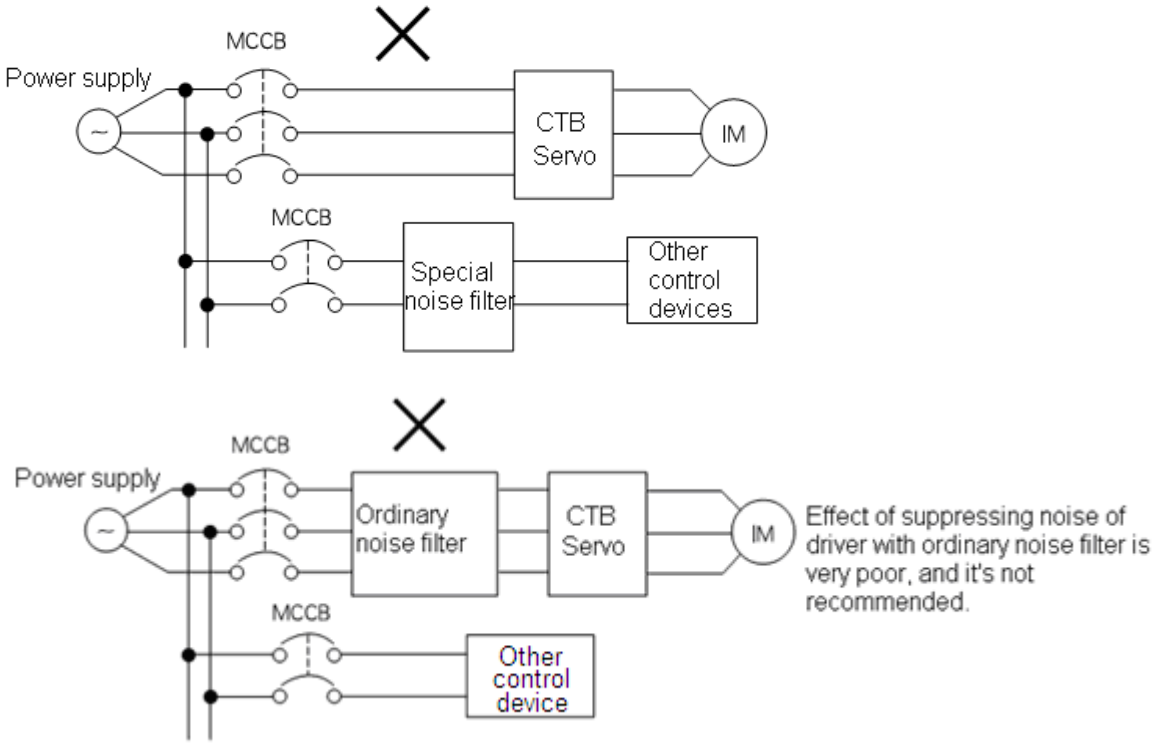


Figure 2-7 Incorrect settings and connection of noise filter at the input side of the power supply

The wiring of output side of main circuit

The output terminals of U, V, and W of the driver shall be connected to the connecting terminals of U, V, and W of three-phase AC motor by correct phase sequence; if the phase sequence is connected wrongly, the driver will raise the wrong phase sequence alarm with an alarm number of E.PV. To solve the problem, exchange phase sequence of any two phases. Please see Figure 2-8 for standard wiring of the output side.

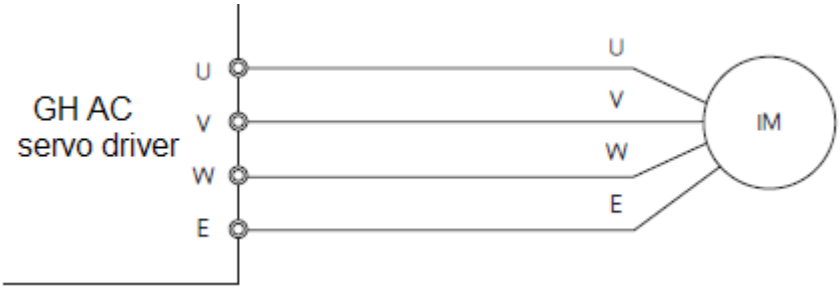


Figure 2-8 Output side wiring

Caution The AC servo driver and motor must be well grounded, otherwise it may make the driver not functioning properly, even burn the driver.

Forbid
● It's strictly prohibited to connect the input power cord to the output terminal. Never connect the input power cord to the output terminal, otherwise, it will lead to damage to internal components of the controller. ● It's strictly prohibited to connect make the output terminal shorted and grounded. Never touch the output terminal directly, or make the output line touch the controller housing for risk of electric shock. In addition, never short the output line. ● It's strictly prohibited to use phase shift electrolytic capacitor, LC / RC noise filter. Never connect phase shift electrolytic capacitor, LC / RC noise filter in output circuit. Damage to internal components of the controller may be caused when use these components. ● It's strictly prohibited to connect or disconnect load with electromagnetic switch. Never connect electromagnetic switch, electromagnetic contactor to connect or disconnect the load in output circuit. During load operation, the protection circuit action of the controller will be acurated by the surge current. surge current will arose ● It's strictly prohibited to connect fan of motor to U / V / W output terminals of the driver. It may burn the fan, and short-circuit the driver.

Wiring distance between the driver and motor

Generally, the wiring distance between the AC servo driver and motor shall be shorter than 50 m. For longer distance, please contact the manufacturer to select wire with smaller resistivity.

Inductive interference countermeasures

Three methods of suppressing radio interference and inductive interference are provided in the information: filter magnetic ring, shielded cable and output filter.

Filter magnetic ring

Installing filter magnetic ring at the output side near to the driver can suppress common code interference at the output side effectively, as shown in Figure 2-9.

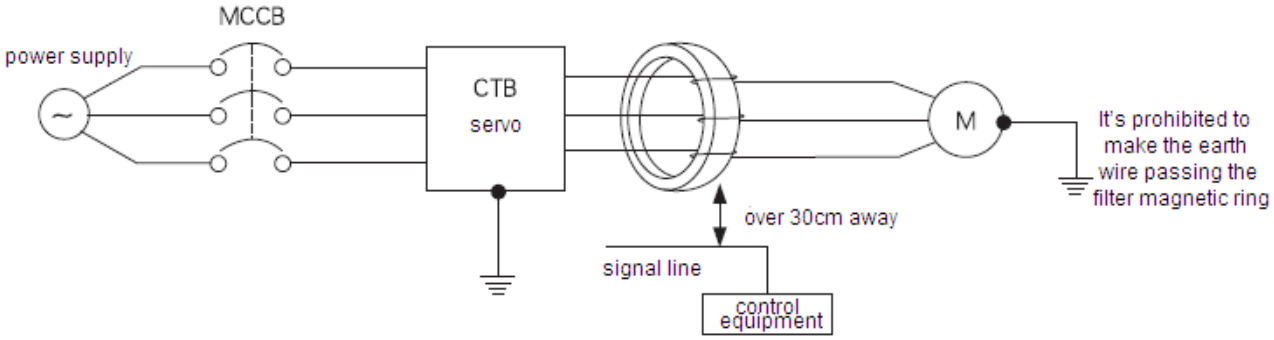


Figure 2-9 Filtering magnetic ring installation diagram

Output shielded cable

Use shielded cable for output line of the AC servo driver can effectively suppress radio interference and inductive interference. The ends of shielding layer of the shielded cable shall be grounded separately as shown in Figure 2-10.

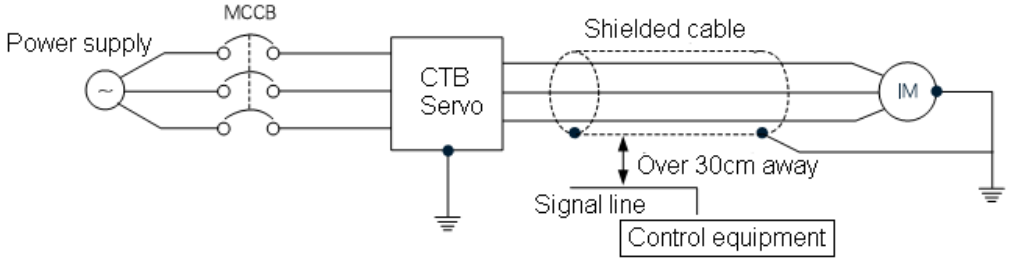


Figure 2-10 Connecting method of shielded cable

For applications of input and output filters in occasions with relatively large radio interference, output filter can be used to suppress interference. The input side and the drive generate radio interference so that the effect is best by using the input, output filter at the same time, as shown in Figure 2-11.

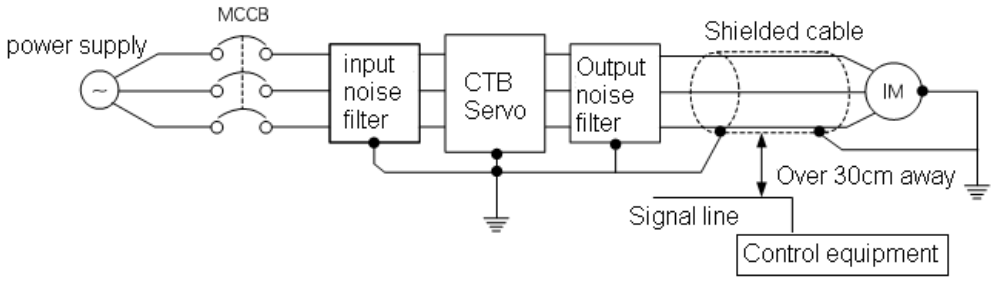


Figure 2-11 Suppress radio interference with output filter

Connection of the grounding wire

● The ground terminal is identified as E or ⏚, please do ground.

● Earth resistance: below 4Ω.

● Do not share grounding wire with welder and other power equipment.

● Please select wire diameter specification for grounding wire as specification in technical standards of electrical equipment, and as short as possible.

● Please make grounding wire forming a loop where more than two drivers are used.

● Example: as shown in Figure 2-12

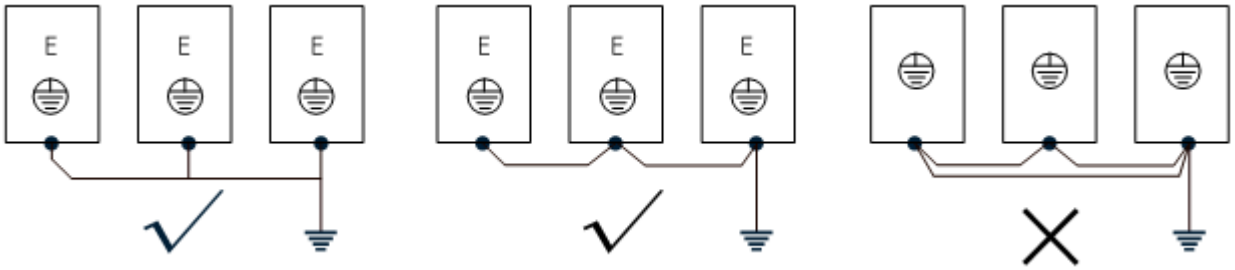


Figure 2-12 Connection of grounding wire

Connection of braking resistor

The P, PB terminals on main circuit block of AC servo driver are for connection with braking resistor. Please do not connect braking resistor to other terminals, otherwise, the braking resistor will heat up and burn out, or cause damage to the driver. Please see Table 2-2 for braking resistor selection.

Table 2-2 Specification of braking resistor

BKSC-XXXX GHX			41P5	42P2	43P7	45P5	47P5	4011	4015	4018	4022	4030	4037	4045	4055	4075	4090	4110	4132	4160	4200	4250	4315
Braking resistor	ripple	Power W	-	-	600	800	1000	600	800	1000	1000	1500	2000	2000	2500	2500	2500	2500	2000	2000	2500	2500	2500
		Resistance Ω	-	-	50	40	32	50	40	32	32	32	20	20	20	20	20	20	20	20	20	20	20
		Qty.	-	-	1	1	1	2	2	2	2	2	2	2	2	3	3	3	4	4	6	6	8
	aluminum housing	Power W	200	300	600	800	1000	600	800	1000	1000	Same parameters for ripple resistor											
		Resistance Ω	150	100	50	40	32	50	40	32	32												
		Qty.	1	1	1	1	1	2	2	2	2												
Filtering magnet ring	inside diameter φ(mm)		15	15	15	18	18	23	23	23	27	27	38	38	38	38	38	44	44	44	—	—	—
	Thickness H(mm)		13	13	13	13	13	15	15	15	15	15	24	24	24	24	24	15	15	15	—	—	—

Note: above accessories data is standard data recommended by the manufacturer. For special applications, please contact your supplier.

● The connection of braking resistor shall be in strict accordance with Figure 2-13.

● The length of connecting wire between driver and braking resistor shall be less than 50 m.

● Please pay particular attention to: external braking unit may be connected to p (+) / DC +, N (-) / DC side of the driver, but direct connecting with braking resistor is not allowed, otherwise, damage to driver or fire may be caused.

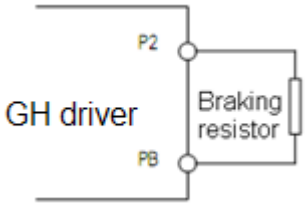


Figure 2-13 Connection of braking resistor

Selection of breaker, contactor and cable

Please see Table 2-3 for selection of breaker, contactor and input and output cable

Table 2-3 Specification of breaker, contactor and cable

Model BKSC	Power (kW)	Breaker (air switch) (A)	Main circuit cable (copper conductor cable) (mm^2)	Contactor Voltage: 380V. Current:(A)
41P5GHX	1.5	10	2.5	9
42P2GHX	2.2	10	2.5	9
43P7GHX	3.7	16	4	16
45P5GHX	5.5	32	4	18
47P5GHX	7.5	40	6	25
4011GHX	11	63	6	32
4015GHX	15	63	10	50
4018GHX	18.5	100	16	63
4022GHX	22	100	16	80
4030GHX	30	125	25	95
4037GHX	37	160	35	115
4045GHX	45	200	35	115
4055GHX	55	200	50	150
4075GHX	75	225	70	185
4090GHX	90	250	70	250
4110GHX	110	400	95	250
4132GHX	132	400	120	315
4160GHX	160	400	150	400
4200GHX	200	630	185	400
4250GHX	250	630	240	500
4315GHX	315	800	300	630

Main circuit wiring precautions

● Please do connect breaker or fuse between power supply and power input terminals (R, S, T) of the driver.

● Please do connect to earth wire at E terminal of the driver. Copper core cable over 4mm^2 shall be used for earth wire with a grounding resistance lower than 4Ω.

● Please ensure the high reliability of wiring.

● Please check the following items after circuit wiring.

(1) Are all connections correct?

(2) Is there connection missing?

(3) Is there short circuit between terminals and connecting line or shorted to ground?

Control circuit wiring

Input and output signals of GH Series AC servo driver include: switching value input signal, switching value output signal, Analog input signal, PULSE input signal, encoder input / output signal.

Specifications of input and output signal cable

As the control signals are different, the requirements to cable for connector are strict. Specifications of cable for different signal connectors are listed in Table 2-4. User shall follow the standard for wiring.

Table 2-4 Specifications of input and output signal cable

Signal	Signal name	Cable	Cable(mm2) specification
switching value input /output	I1～I6 Q1～Q2 PV SC	common cable or shielded cable	0.2～2
Relay output	M0A/M0B/M0C M1A/M1B/M1C	common cable or shielded cable	0.2～2
Analog signal	FI FV FS FC FS FT	shielded cable	0.2～1
Encoder signal	PV1 G1 A+ A- B+ B- Z+ Z- PV2 G2 OA+ OA- OB+ OB- OZ+ OZ-	Shielded twisted twin cable	0.2～1
PULSE signal	SA+ SA- PB+ PB- DZ+ DZ-	Shielded twisted twin cable	0.2～1
enable reset signal	ST PV SC	common cable or shielded cable	0.2～1

GH DRIVER control panel specifications

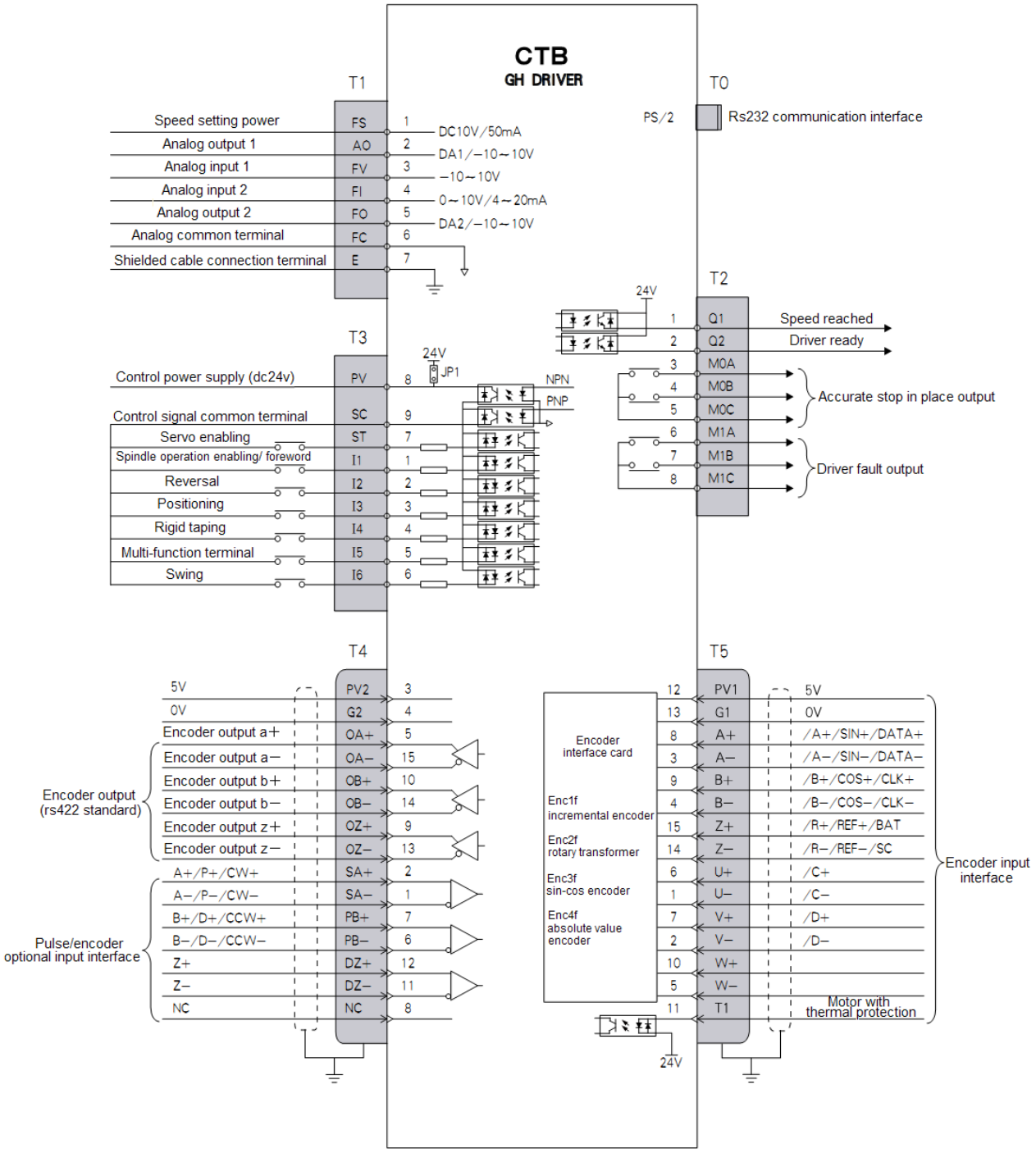
GH Series driver provides six kinds of control board according to different power and function of GH Series driver. Please see Table 2-5 for interface characteristics and applicable model.

Table 2-5 GH DRIVER main board specifications

Control panel model	switching value input	switching value output	Analog input	Analog output	PULSE input	Communication interface	Encoder input	Encoder output
CP100A1/ CP100C1	7	4	2	2	○	RS232	○	○

CTB							GH DRIVER	
CP100B1/ CP100D1	14	8	2	2	○	RS232 RS485 CAN TCP/IP	○	○
CP100AT1/ CP100CT1	8	4	3	-	○	RS232	○	○

Standard version control wiring diagram (taking 7.5kW GH X driver as an example)



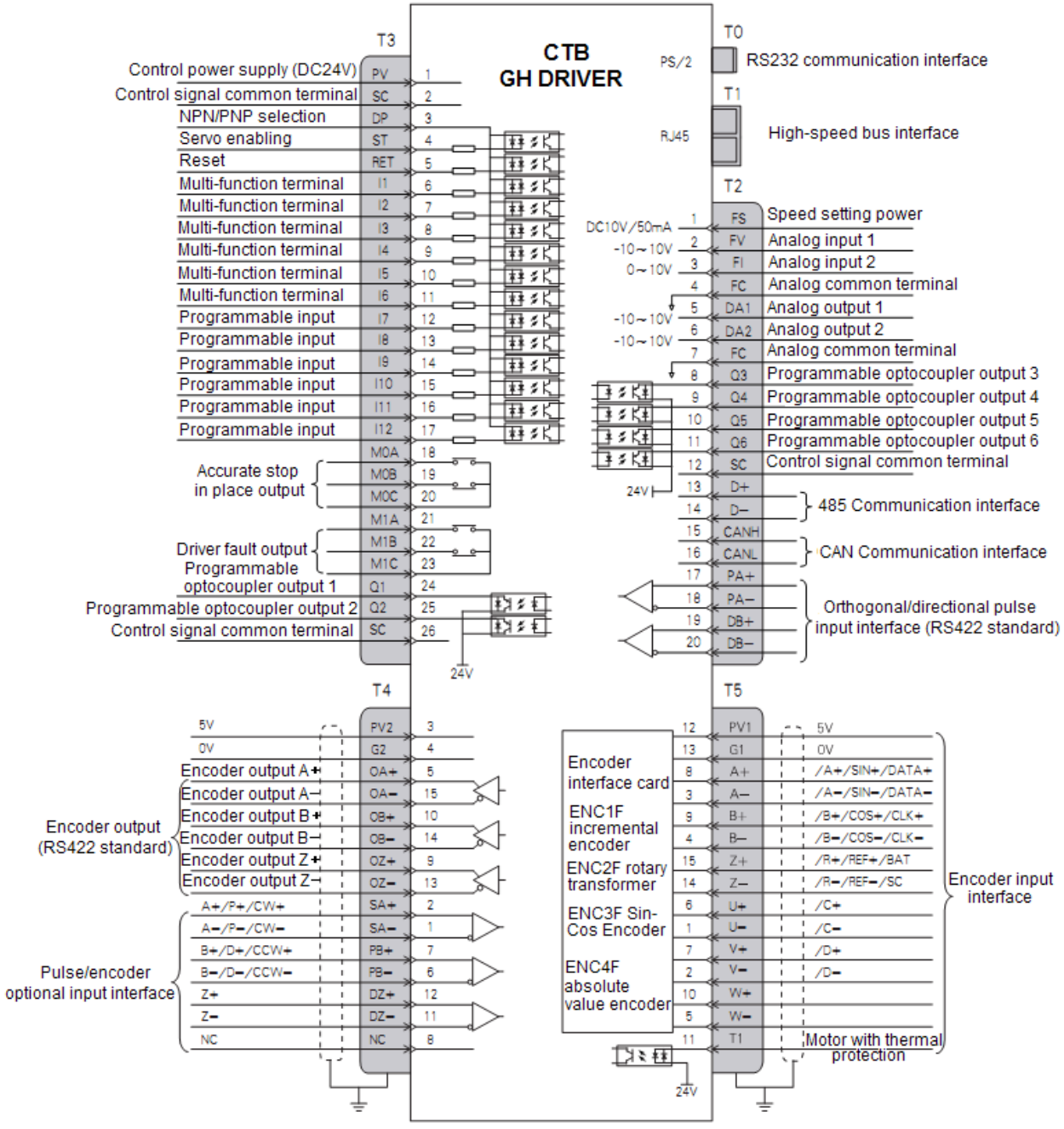
Input and output signals description (GHX Series)

Table 2-6 Input and output signal function description

Port	Type	Pin	Name	Function	Signal standard
T0	Communication			communicate with computer	RS232
T1	Analog input	1	FS	10V power for speed setting is provided inside common port	DC10V 50mA
		6	FC	analog input /output common terminal	0V
		3	FV	-10V～+10V analog input, input impedance: 20KΩ	Analog signal
		4	FI	Analog input impedance may be selected for 0～10V , 4～20mA impedance: 20K/500Ω	
	Analog output	2	AO	-10～10V output	
		5	FO	-10～10V output	
T2	Programmable optocoupler output	1	Q1	speed reached	24V optocoupler output 10mA
		2	Q2	driver ready	
	Relay output	3/4/5	MOA/MOb/MOc	output accurate stop end (in place) output	Ac250V 1A Dc30 1A
		6/7/8	MIA/MIB/MIC	driver fault output	
T3	Control signal input	7	ST	control enabling and reset	PNP: 0V input effective NPN:24V input effective Input mode of PNP or NPN Shall be selected by software parameter setting
		1	I1	Foreword/ operation enabling	
		2	I 2	reverse	
		3	I 3	accurate stop, close: start accurate stop and maintain; open: cancel accurate stop	
		4	I 4	rigid tapping signal, close : enter rigid tapping state	
		5	I 5	multifunctional terminal	
		6	I 6	Swing	
	Control power	8	PV	DC24V power terminal, it's 24V output when JP1 is turned on, and 24V input when JP1 is shut down.	DC24V 100mA
		9	SC	D 24V power 0V terminal /control signal common port	
T4	Encoder output	3/4	PV2/G2	Preset power, provided by digital system, system without electrify inspection may go without.	DC5V,200mA
		5/15	OA + /OA－	encoder A phase output	line driver output RS 422 standard
		10/14	OB +/ OB-	encoder B phase output	
		9/13	OZ + /OZ－	encoder Z phase output	
	Encoder	2/1	SA + /SA－	encoder A phase/orthogonal PULSE A phase input /single PULSE train	RS422 standard

	PULSE input			input P	
		7/6	PB + /PB—	encoder B phase/orthogonal PULSE B phase input /single PULSE direction input D	
		12/11	DZ +/ DZ-	encoder Z phase	
T5	Communication encoder input	12/13	PV1/G1	encoder power supply provides terminal /power common port	Dc5V 200mA
		8/3	A +/ A—	A/A/SIN/DATA INCRE/SIN-COS/Rotary/ABSOLUTE	Corresponding encoder standard
		9/4	B + /B—	B/B/COS/CLK incre/SIN-COS/Rotary/ABSOLUTE	
		15/14	z +/ z—	Z/R/REF INCRE/SIN-COS/ROTARY	
		6/1	U+/U-	U/C increment/ sine and cosine	
		7/2	V+/V-	V/D increment/ sine and cosine	
		10/5	W+/W-	W increment	
	Thermal protection input	11	T1	Motor thermal protection signal input	N.C./ N.O.

General version control wiring diagram (taking 7.5kW GHXB driver as an example)



Input and output signals description (GHXB Series)

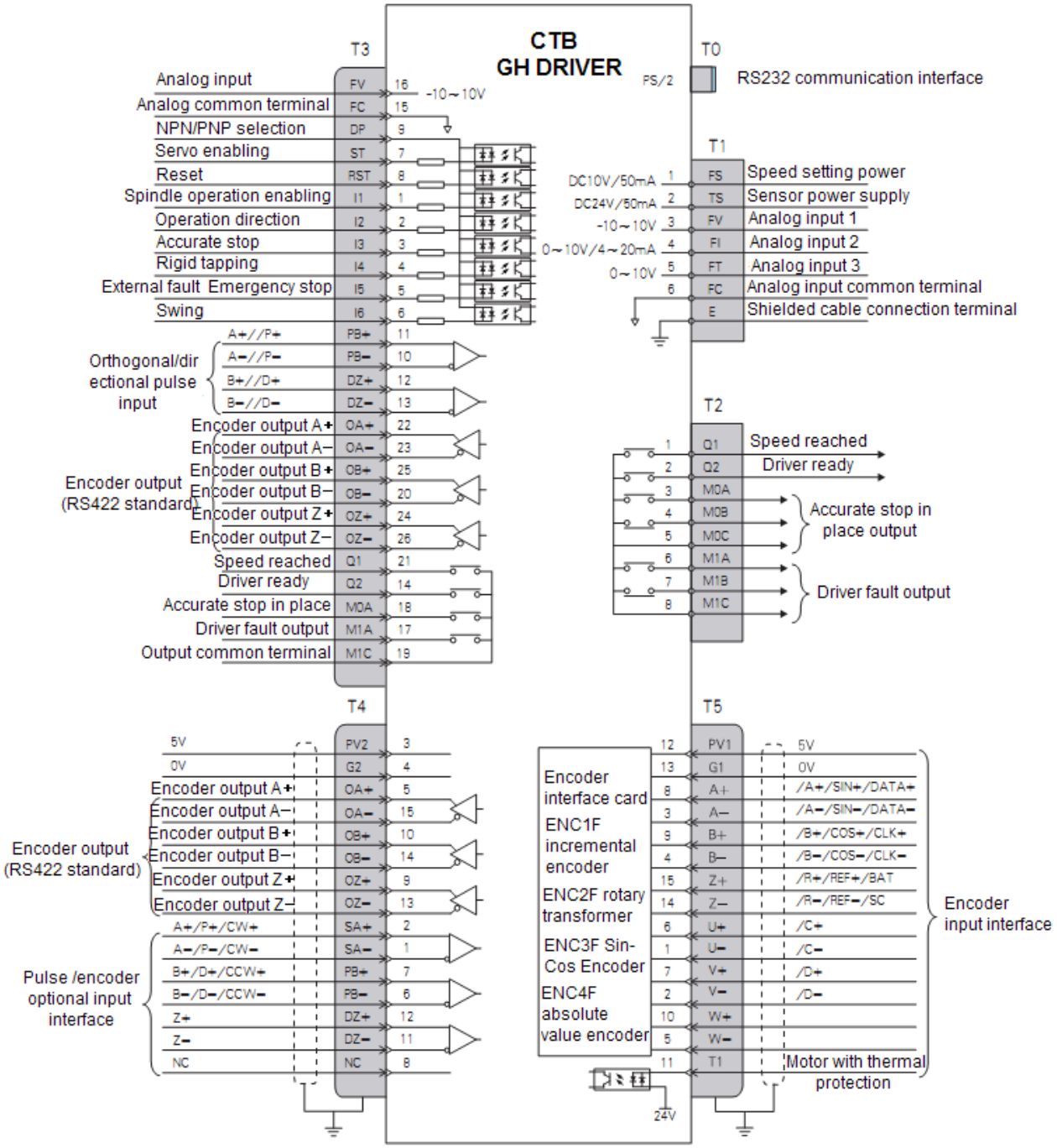
Table 2-7 Input and output signal function description

Port	Type	Pin	Name	Function	Signal standard
T0	Communication			communicate with computer	RS232
T1	High-speed bus interface				
T2	Analog input	1	FS	10V power for speed setting is provided inside common port	DC10V 50mA
		4/7	FC	analog input /output common terminal	0V
		2	FV	-10V～+10V analog input, input impedance: 20KΩ	Analog signal
		3	FI	Analog input impedance may be selected for 0～10V , 4～20mA impedance: 20K/500Ω	
	Analog output	5/6	DA1/DA2	-10～10V output	
	Programmable optocoupler output	8/9/10/11	Q3/Q4/Q5/Q6	Programmable output	24V optocoupler output 10mA
	Control power	12	SC	Control signal common terminal	DC24V 100mA
	485 communication interface	13/14	D+/D-	485 communication interface	RS485 standard
	CAN communication interface	15/16	CANH/CANL	CAN communication interface	CAN communication standard
	orthogonal/directional pulse input interface	17/18	PA+/PA-	orthogonal/directional pulse input interface	RS422 standard
		19/20	DB+/DB-	orthogonal/directional pulse input interface	
T3	Control power supply	1	PV	DC24V power supply terminal	DC 4V 100mA
		2	SC	DC24V power supply 0V terminal /control signal public terminal	
	NPN/PNP select	3	DP	NPN/PNP select	DP connections to PV is NPN, and DP connecting to SC is PNP
	Control signal input	4	ST	Control enabling and reset	PNP: 0V input effective NPN:24V input effective
		5	RET	Reset	
		6	I1	Multi-function terminal	
		7	I 2	Multi-function terminal	
		8	I 3	Multi-function terminal	
		9	I 4	Multi-function terminal	

		10	I 5	Multi-function terminal	
		11	I 6	Multi-function terminal	
		12	I 7	Programmable input	
		13	I 8	Programmable input	
		14	I 9	Programmable input	
		15	I 10	Programmable input	
		16	I 11	Programmable input	
		17	I 12	Programmable input	
	Programmable optocoupler output	24	Q1	Speed reached	24V optocoupler output 10mA
		25	Q2	Driver is ready	
	Relay output	18/19/20	M0A/M0B/M0C	Output accurate stop ends (in place) output	AC 250V 1A DC30 1A
		21/22/23	M1A/M1B/M1C	Driver fault output	
T4	Encoder output	3/4	PV2/G2	Preset power, provided by digital system, system without electrify inspection may go without.	DC5V，200mA
		5/15	OA + /OA—	encoder A phase output	line driver output RS 422 standard
		10/14	OB +/ OB-	encoder B phase output	
		9/13	OZ + /OZ—	encoder Z phase output	
	Encoder PULSE input	2/1	SA + /SA—	encoder A phase/orthogonal PULSE A phase input /single PULSE train input P	RS422 standard
		7/6	PB + /PB—	encoder B phase/orthogonal PULSE B phase input /single PULSE direction input D	
		12/11	DZ +/ DZ-	encoder Z phase	
T5	Communication encoder input	12/13	PV1/G1	encoder power supply provides terminal /power common port	Dc5V 200mA
		8/3	A +/ A—	A/A/SIN/DATA increment /sine and cosine / resolver / absolute value	Corresponding encoder standard
		9/4	B+ /B—	B /B/COS/CLK increment /sine and cosine / resolver / absolute value	
		15/14	z +/ z—	Z /R/REF increment /sine and cosine / resolver	
		6/1	U+/U-	U/C increment/ sine and cosine	
		7/2	V+/V-	V/D increment/ sine and cosine	

		10/5	W+/W-	W increment	
	Thermal protection input	11	T1	Motor thermal protection signal input	N.C./ N.O.

Special version control wiring diagram (taking 7.5kW GHXT driver as an example)



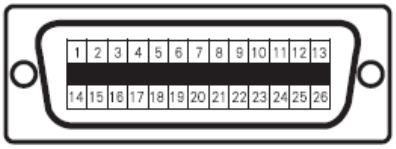
Input and output signals description (GHXT Series)

Table 2-8 Input and output signal function description

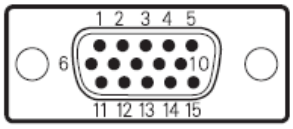
Port	Type	Pin	Name	Function	Signal standard
T0	Communication			communicate with computer	RS232
T1	Analog input	1	FS	10V power for speed setting is provided inside	DC10V 50mA
		6	FC	analog input common terminal	0V
		3	FV	-10V～+10V analog input, input impedance: 20KΩ	Analog signal
		4	FI	Analog input impedance may be selected for 0～10V , 4～20mA impedance: 20K/500Ω	
		2	AO	-10V～+10V analog quantity output	
		5	FO	-10V～+10V analog quantity output	
T2	Relay output	1	Q1	Speed reached	AC 250V 1A DC30 1A
		2	Q2	Driver ready	
		3/4/5	M0A/M0B/M0C	Output accurate stop ends (in place) output	
		6/7/8	M1A/M1B/M1C	Driver fault output	
T3	Analog input	16	FV	-10～10V analog quantity input	Analog signal
		15	FC	Analog input common terminal	
	NPN/PNP selection	9	DP	NPN/PNP selection	DP is NPN when connected to PV. DP is PNP when connected to SC.
		7	ST	Control enabling and reset	PNP: 0V input effective NPN:24V input effective
		8	RET	Reset	
		1	I1	Forward/operation enabling	
		2	I2	Reversal	
		3	I 3	Accurate stop, close: start accurate stop and hold; switch off: cancel the accurate stop	
		4	I 4	Rigid tapping signal, close; enter rigid tapping state	
		5	I 5	Multi-function terminal	
		6	I 6	Swing	

	Orthogonal/directional pulse input interface	11/10	PB + /PB—	Orthogonal/directional pulse input interface	RS422 standard
		12/13	DZ +/ DZ-	Orthogonal/directional pulse input interface	
	Encoder output	22/23	OA + /OA—	encoder A phase output	line driver output RS 422 standard
		25/20	OB +/ OB-	encoder B phase output	
		24/26	OZ + /OZ—	encoder Z phase output	
	Relay output	21	Q1	Speed reached	AC 250V 1A DC30 1A
		14	Q2	Driver ready	
		18/17/19	M0A/M1A/M1C	Output accurate stop ends (in place) output	
T4	Encoder output	3/4	PV2/G2	Preset power, provided by digital system, system without electrify inspection may go without.	DC5V，200mA
		5/15	OA + /OA—	encoder A phase output	line driver output RS 422 standard
		10/14	OB +/ OB-	encoder B phase output	
		9/13	OZ + /OZ—	encoder Z phase output	
	Encoder PULSE input	2/1	SA + /SA—	encoder A phase/orthogonal PULSE A phase input /single PULSE train input P	RS422 standard
		7/6	PB + /PB—	encoder B phase/orthogonal PULSE B phase input /single PULSE direction input D	
		12/11	DZ +/ DZ-	encoder Z phase	
T5	Communication encoder input	12/13	PV1/G1	encoder power supply provides terminal /power common port	Dc5V 200mA
		8/3	A +/ A—	A/A/SIN/DATA increment /sine and cosine / resolver / absolute value	Corresponding encoder standard
		9/4	b + /b—	B /B/COS/CLK increment /sine and cosine / resolver / absolute value	
		15/14	z +/ z—	Z /R/REF increment /sine and cosine / resolver	
		6/1	U+/U-	U/C increment/ sine and cosine	
		7/2	V+/V-	V/D increment/ sine and cosine	
		10/5	W+/W-	W increment	
	Thermal protection input	11	T1	Motor thermal protection signal input	N.C./ N.O.

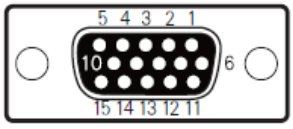
Connector terminal arrangement



T3 26-pin high density plug



T4 D-type 15-pin plug (pin)



T5 D-type 15-pin plug (hole)

Control power supply wiring

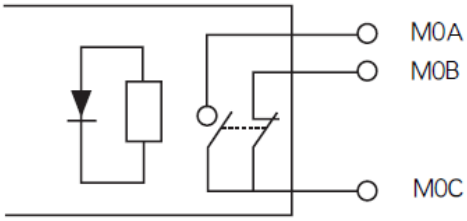
In addition to analog control terminal, all of other control terminals of GH series AC servo driver are equipped with optocoupler isolation. Power of the optocoupler isolation may select from internal of the driver or external power provided by the user according to the actual requirements. To ensure better isolation effect, it is recommended to use external DC24V isolation power provided by user.

The wiring of relay output signal

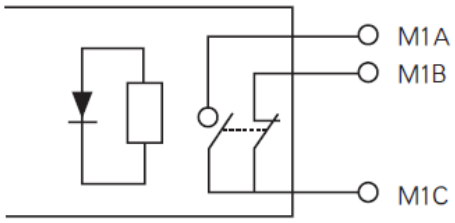
GH AC servo driver provides two relay output points.

Output standard: AC250V 1A DC30V 1A

Accurate stop relay output schematic diagram



Fault relay output schematic diagram



Transistor output wiring precautions

● The maximum oad capacity of output tape of transistor output QI/Q2 is 20 mA, and the output voltage is DC24V.

● If the output terminal needs 0V, intermediate relay may be installed for switching as shown in Figure 2-14.

● If the output terminal drives inductive load (e.g., electromagnetic relay, intermediate relay), surge voltage absorbing circuit shall be added as shown in Figure 2-14.

If follow current diode is installed in surge absorption circuit (for DC electromagnetic circuit), attention must be paid to polarity during installation.

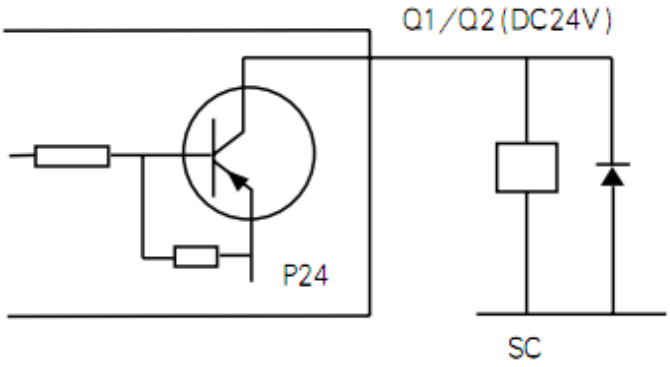


Figure 2-14 Transistor output circuit

Wiring of analog input signal

GH AC servo driver selects two analog input interfaces of FI and FV, as well as a group of power interface FS and FC for analog input. Please see Table 2-9 for signal function description.

Table 2-9 Analog interface signal description

Signal	Function	Signal standard
FI	Unipolarity analog input terminal A2-01=1	0～10V, input impedance: 20KΩ
FV	Bipolarity analog input terminal A2-01＝0	-10V～+10V analog input, input impedance: 20KΩ
FS	inside provided speed setting power	DC10V，50mA,
Fc	analog common port	0V
E	Shielding layer connecting terminal	

Wiring requirements

● Connect to signal source or control signal with multi-core shielded cable or stranded shielded wire.

● The near-end of shielding layer of the case (end near the driver) shall be connected to the connector housing.

● During wiring, the control cables shall be arranged more than 30cm away from the main circuit and strong power line (including power line, motor line, relay, contactor connecting cable), and avoid parallel layout. Vertical wiring is recommended to prevent malfunction of the driver due to interference.

●Filter magnetic ring provided by the manufacturer shall be used for long distance wiring. It shall be installed at the side near the driver.

FI terminal wiring example

Use internal power for speed setting. The input signal is 0 ~ 10V/4-20mA as shown in Figure 2-15.

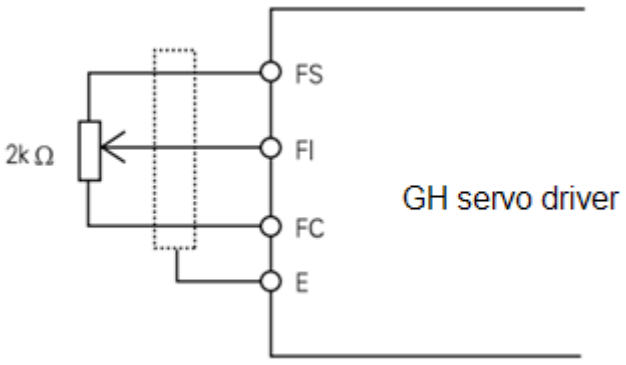


Figure 2-15 Conduct speed setting with internal power

FV terminal wiring example

CNC system uses bipolar (-10V ~ +10 V) analog output. The speed is determined by the value of the analog, the direction of rotation is determined by polarity of the analog as shown in Figure 2-16.

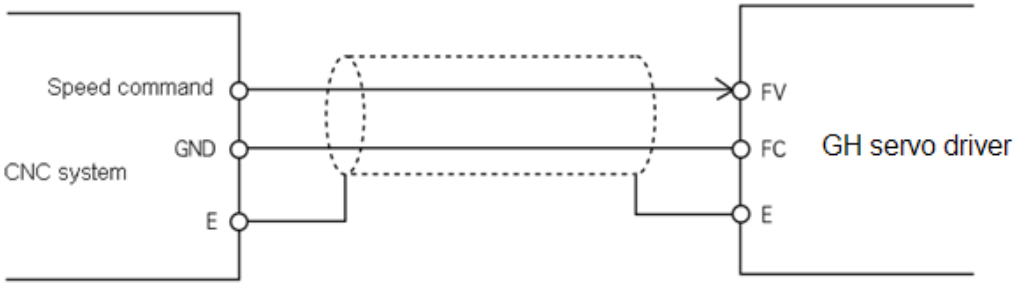


Figure 2-16 Bipolar speed setting is conducted by CNC system

Forbid
● It's prohibited to connect the signal line and OV reversely. The signal line is likely to be burned, and reverse operation may be caused for bipolar. ● It's prohibited to connect high-voltage to analog signal terminal. The driver may be burned.

Connection of the encoder interface

A group of encoder input interface T5 and encoder input interface T4 are provided on main board of GH series AC servo driver. Please see Table 2-10 and Table 2-11 for interface definition.

Table 2-10 Encoder input interface T5

Signal	Description	Signal standard
PV1	Encoder power supply DC5V	DC5V/200mA
G1	Encoder power ground 0V	
A+	A phase PULSE same-phase input (+)	Line drive mode RS422 standard
A-	A phase PULSE reverse -phase input (-)	
B+	B phase PULSE same-phase input (+)	
B-	B phase PULSE reverse -phase input (-)	
Z+	Z phase PULSE same-phase input (+)	
Z-	Z phase PULSE reverse-phase input (-)	
T1	Motor thermal protection input terminal	NC/NO

Table 2-11 Encoder output interface T4

Signal	Description		Signal standard
PV2	Encoder power supply DC5V	Or external sensor power supply	DC5V/200mA Note: the connection is not required when used as speed/position feedback of the CNC system
G2	Encoder power ground 0V		
OA+	A phase PULSE same-phase input (+)		Line drive mode RS422 standard
OA-	A phase PULSE reverse-phase input (-)		

CTB		GH DRIVER
OB+	B phase PULSE same-phase input (+)	
OB-	B phase PULSE reverse-phase input (-)	
OZ+	Z phase PULSE same-phase input (+)	
OZ-	Z phase PULSE reverse-phase input (-)	
SA+	Pulse/encoder A-phase input (+)	Line drive mode RS422 standard
SA-	Pulse/encoder A-phase input (-)	
PB+	Pulse/encoder B-phase input (+)	
PB-	Pulse/encoder B-phase input (-)	
DZ+	Pulse/encoder Z-phase input (+)	
DZ-	Pulse/encoder Z-phase input (-)	

Encoder wiring precautions

● The encoder cable must be shielded twisted pair cable.

● The shielding layer shall be connected to the connector housing.

Forbid

●It's prohibited to connect the DC5V power reversely. It's likely to burn the DC5V power or encoder of the driver.

●It's prohibited to reverse the A, B phase sequence. Otherwise, the motor will not function properly, or even burn the motor or driver.

Connection of serial communication port

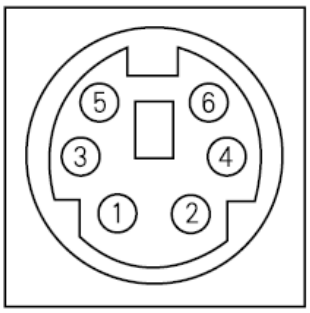
GH DRIVER provides users with a R S232A serial communication interface T0 for connection with computer to realize transmission of program and parameters. The port is connected with computer through RS232-P1 cable.

Please see Table 2-12 for definition of serial communication interface T0

Table 2-12 T0 interface definition

Pin	Name	Description	Pin	Name	Description
1	VCC	DC5V	4	NC	Used by manufacturer
2	GND	0V	5	TX	Send terminal
3	RX	Receive terminal	6	NC	Used by manufacturer

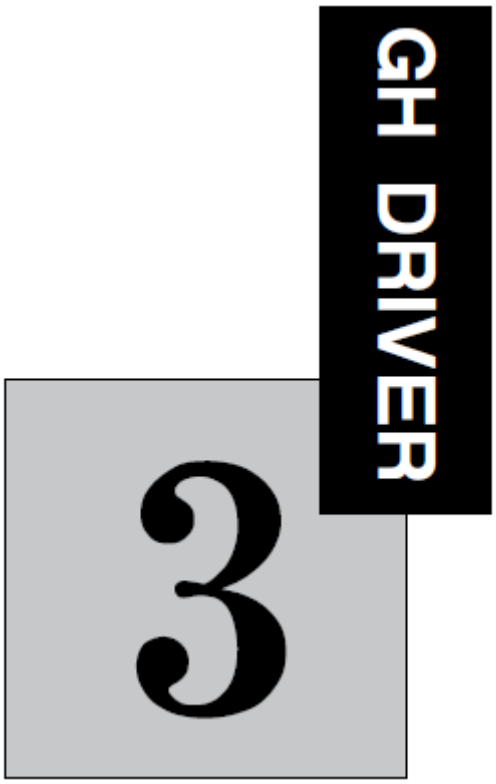
T0 interface diagram



General Purpose cable model: RS 232-p1

Caution

● Please select the standard cable provided by the manufacturer for communication.



Manipulator application

The chapter describes the functions and methods of application of the manipulator.

Digital tube display

0.4 ~ 18.5kw driver:

22 ~ 315kw driver:

LCD display

0.4 ~ 18.5kw driver:

22 ~ 315kw driver:

Configuration and key functions of the 0.4 ~ 18.5kw driver digital tube manipulator

The chapter defines and describes terms and phrases for operation and state of 0.4 ~ 18.5kw driver manipulator, defines the operation methods of driver and manipulator. Please read carefully. It's very helpful for proper use of the 0.4 ~ 15kw driver.

Manipulator

The manipulator is one of the standard equipment of 0.4 ~ 18.5kw driver. User may carry out parameter setting, state monitoring, operation control and other operations to the driver through the manipulator. It's very important to be familiar with function and operation of the manipulator for proper application of 0.4 ~ 18.5kw series driver. Please read the manual carefully before using.

Manipulator appearance diagram

Manipulator of 0.4 ~ 18.5kw driver is mainly composed of two parts of LED digital tube and keys. The appearance and functional zones are shown in Figure 3-1.

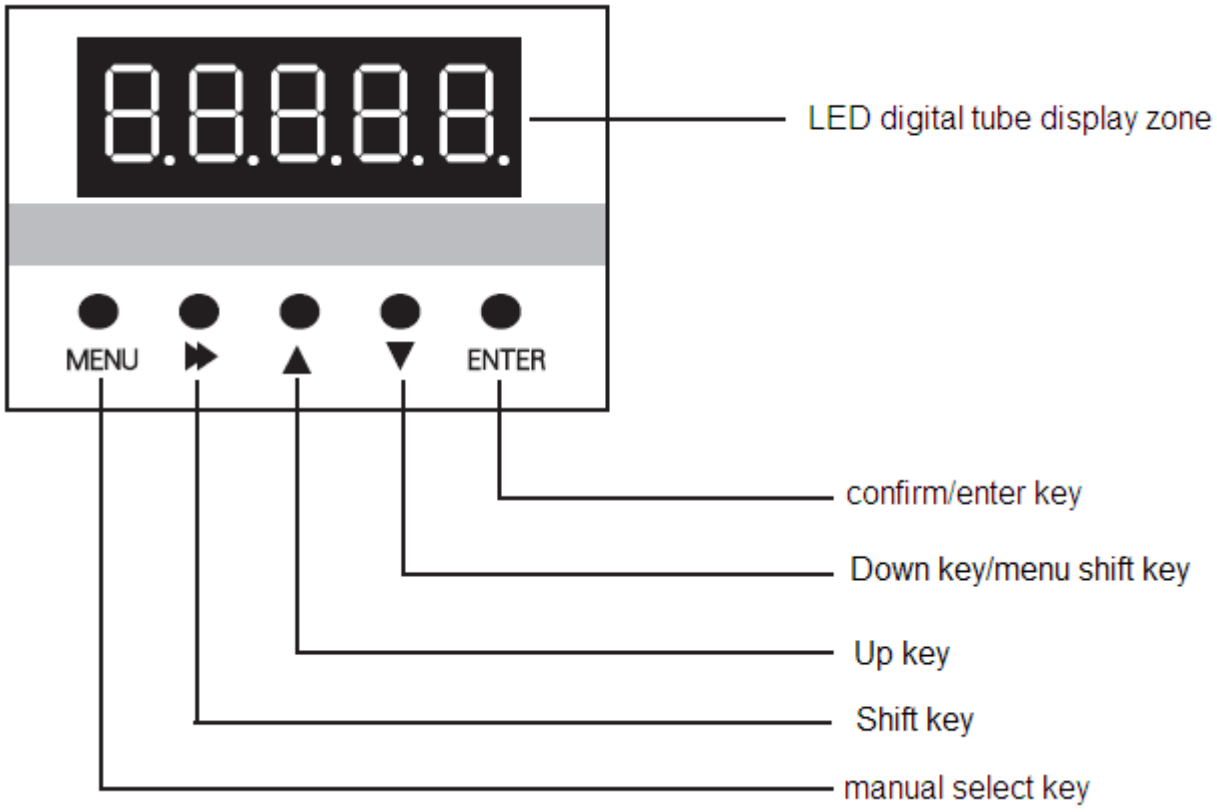


Figure 3-1 Manipulator diagram

Manipulator key function description

Please see Table 3-1 for function description of the manipulator key

Table 3-1 Manipulator key function

Key	Name	Function
Menu	Menu selection switching key	switching key of each menu item;
▶▶	Shift key	It's used to switch data bit of the parameter number when browse parameter items; When modifying data in program state, it can be used to modify the modified bit of the modified data.
▲	up key	Increase menu item, parameter item or modified parameter value progressively.
▼	down key	Decrease menu item, parameter item or modified parameter value progressively.
Enter	Confirm / enter key	Press the key in program state to return to the previous menu. Enter the next level menu; Complete selection of the parameter group in1-level menu; Complete parameter value checking operation in 2-level menu; Complete modification and storage operation of the parameter value in 3-level menu;

The operating state of the driver

0.4 ~ 18.5kw driver has four operating states after power-on: standby, operating, programming and fault alarm. They are described as follows:

Standby state

0.4 ~ 18.5kw driver is in standby state after power-on and before receiving any operating control order. The default standby state display function code of LED digital tube is F.0. User may make LED circling switch display U1, U2, U3, A1, A2 and A3 parameter groups by press MENU key. After press ENTER key, user may make LED circling switch display monitoring parameters defined in function parameter group by pressing ▲, ▼ and ▶ key, and then press ENTER key to check /monitor its value.

It will be limited by functional parameter A1.00 when user want to check / modify the content of parameter groups other than U1, U2, U3, A1, A2 and A3 during operation. All of the parameters may be checked when A1.00=1.

Operating state

When 0.4 ~ 18.5kw driver in standby and no-fault state, it will enter operating state after receiving operating order.

User may make LED circling switch display U1, U2, U3, A1, A2 and A3 parameter groups by press MENU key. After press ENTER key, user may make LED circling switch display monitoring parameters defined in function parameter groups by pressing ▲ , ▼.and ▶ key, and then press ENTER key to check /monitor its value.

Setting, modifying or editing state

For 0.4 ~ 18.5kw driver, user may switch to the state in which function code parameters can be modified through MENU, ▶, ▲,▼.and ENTER on the operator panel. The state is programming state.

Function parameter value is displayed in programming state, and the bit to be modified is flashing.

Fault alarm state

In the state, 0.4 ~ 18.5kw driver fails and displays the fault code.

LED displays fault code in fault state, and user may conduct fault reset operation by ⏭,.

Operative mode of the manipulator

Standby state:

The state of the manipulator is shown in Figure 3-2 when the driver is in standby state. The LED digital tube default display F. 0. At this point, user may press MENU to enter menu items, and check or modify parameters.

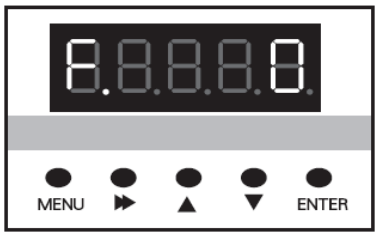


Figure 3-2 Standby state

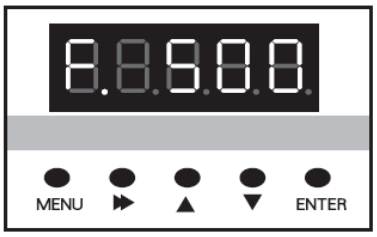


Figure 3-3 Operating state

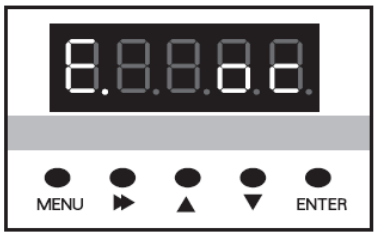


Figure 3-4 Fault alarm state

Operating state:

The driver enters operating state after receiving correct operation command in standby state. As shown in Figure 3-3, the LED digital tube default displays the set speed of the driver, e.g F. 500. In this state, user may press MENU to enter menu items, and check or modify parameters.

Fault alarm state

When fault is detected as the driver is in operating, standby or programming state, the driver will stop and enter fault state immediately as shown in Figure 3-4.

When a fault occurs, user may enable conduct drive reset through ⏭ key. If the fault has disappeared, it returns to the standby state; if the fault still exists, the fault code will be displayed again.

Use method of the manipulator

The section mainly introduces use of the manipulator, and basic operations of functions.

Parameter setting operation process

Parameter setting method of manipulator of 0.4 ~ 18.5kw driver adopts three-level menu structure. Parameter value of menu items can be checked and modified conveniently.

The three-level menu: menu item (1-level menu), parameter tem (2-level menu) and parameter setting (3-level menu). The operation process is shown in Figure 3-5.

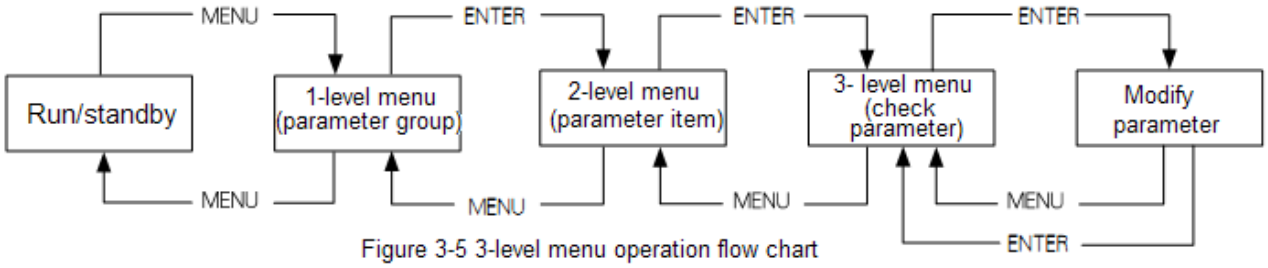
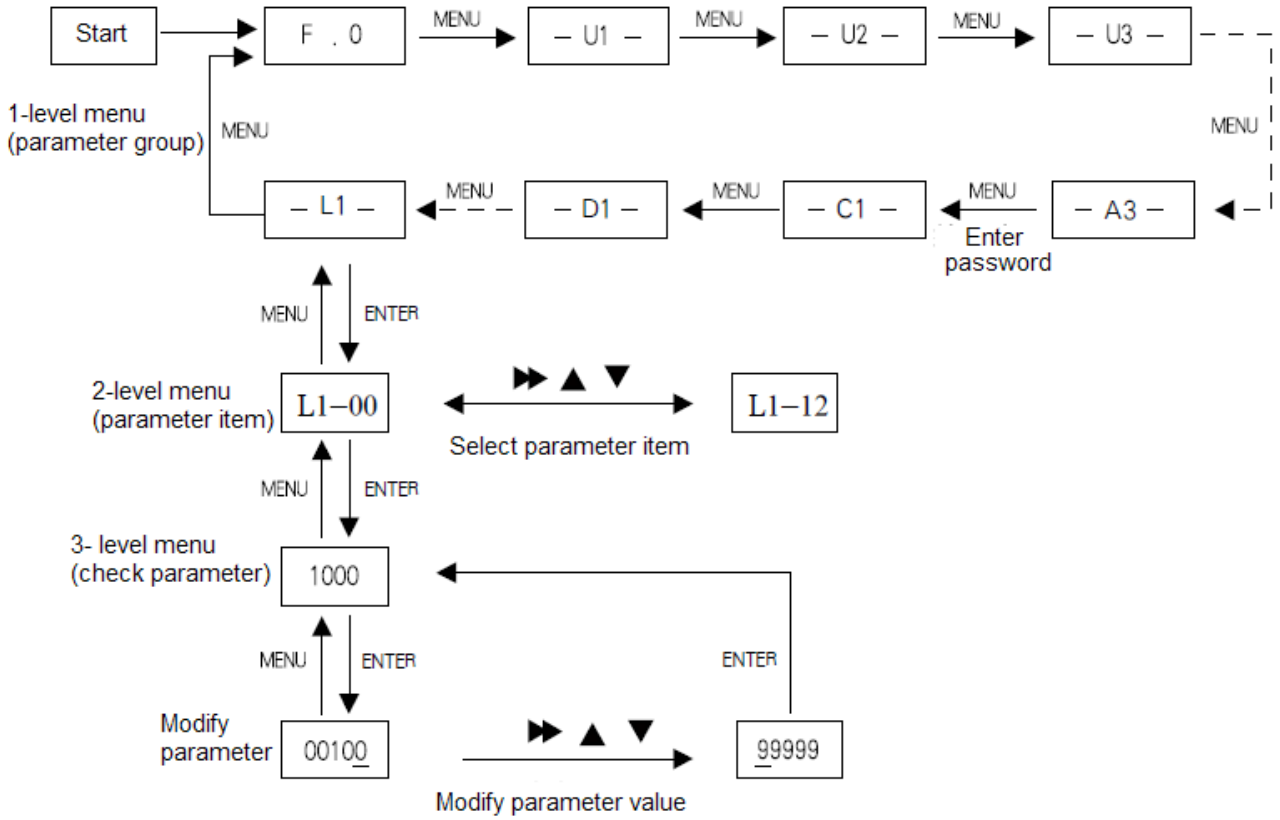


Figure 3-5 3-level menu operation flow chart

During operation in 3-level menu, user may return to 2-level menu by pressing MENU or ENTER (see Figure 3-5 and Figure 3-6). The difference between the two operations: after press ENTER key, the set parameter value will be saved to the controller, and then return to 2-level menu; it will return to 2-level menu directly without saving the parameter value by pressing MENU. The detail operational procedures of 3-level menu are shown in Figure 3-6.

Modify the parameters with the manipulator

The flow chart of modify the parameters with the manipulator is shown in Figure 3-6.



★ Description:

Ten menu items are included in 1-level menu: U1menu, U2 menu, U3 menu, A1 menu, A2 menu, A3 menu, C1 menu, D1 menu, E1 menu, P1 menu, T1 menu and L1 menu.

Please see parameter description for specific functions in 2-level menu.

Monitor operating state with the manipulator

Operation state, interface state and fault information of the driver can be monitored respectively through U1, U2 and U3 of the manipulator

Operation state monitoring

Operation state monitoring includes set speed F, output speed O, feedback speed b, output current A, output torque T and DC bus voltage U of the driver. Please see Figure 3-7 for monitoring method.

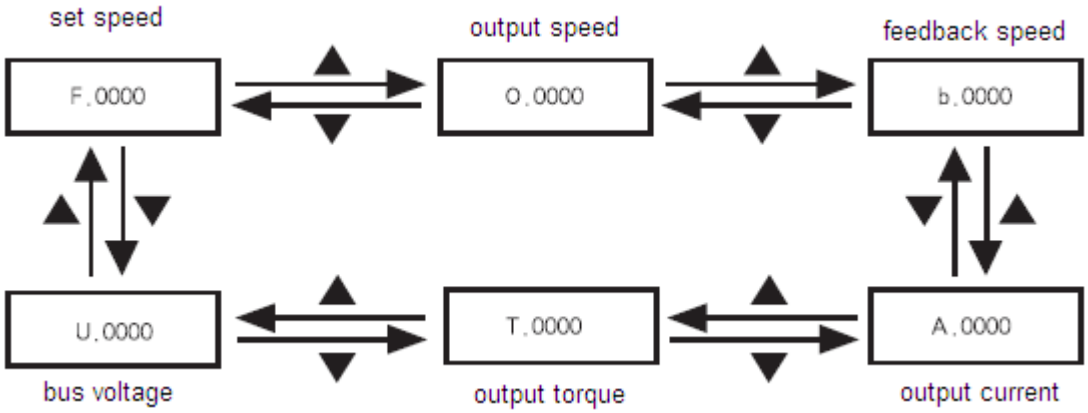


Figure 3-7 Driver operation state monitoring flowchart

Interface state monitoring

Interface state includes driver's encoder input interfaces U2-00, U2-01; switching value input terminals U2-02, U2-03; switching value output terminal U2-04, analog input interfaces U2-05, U2-06; output terminals U2-07, U2-08. The monitoring method is same with monitoring parameter, only needs to select corresponding parameter in U2. Please see U2 parameter monitoring table 2 for parameter number.

Fault information monitoring

The control panel will display the current fault message code when the driver is in fault state. The fault record of the driver can be checked through U3. The check operation is same with monitoring parameter, only needs to select corresponding parameter in U3. Please see fault state recording parameter table U3 for parameter number.

22～315k w driver: Configuration and key functions of the 22～315kw driver digital tube manipulator

The chapter defines and describes terms and phrases for operation and state of 22～315kw driver manipulator, defines the operation methods of the driver and manipulator. Please read carefully. It's very helpful for proper use of the 22～315kw driver.

Manipulator

The manipulator is one of the standard equipment of 22～315kw driver. User may carry out parameter setting, state monitoring, operation control and other operations to the driver through the manipulator. It's very important to be familiar with function and operation of the manipulator for proper application of 22～315kw series driver. Please read the manual carefully before using.

Manipulator appearance diagram

Manipulator of 22～315kw driver is mainly composed of three parts of LED digital tube, LED indicator and key. The appearance and functional zones are shown in Figure 3-8.

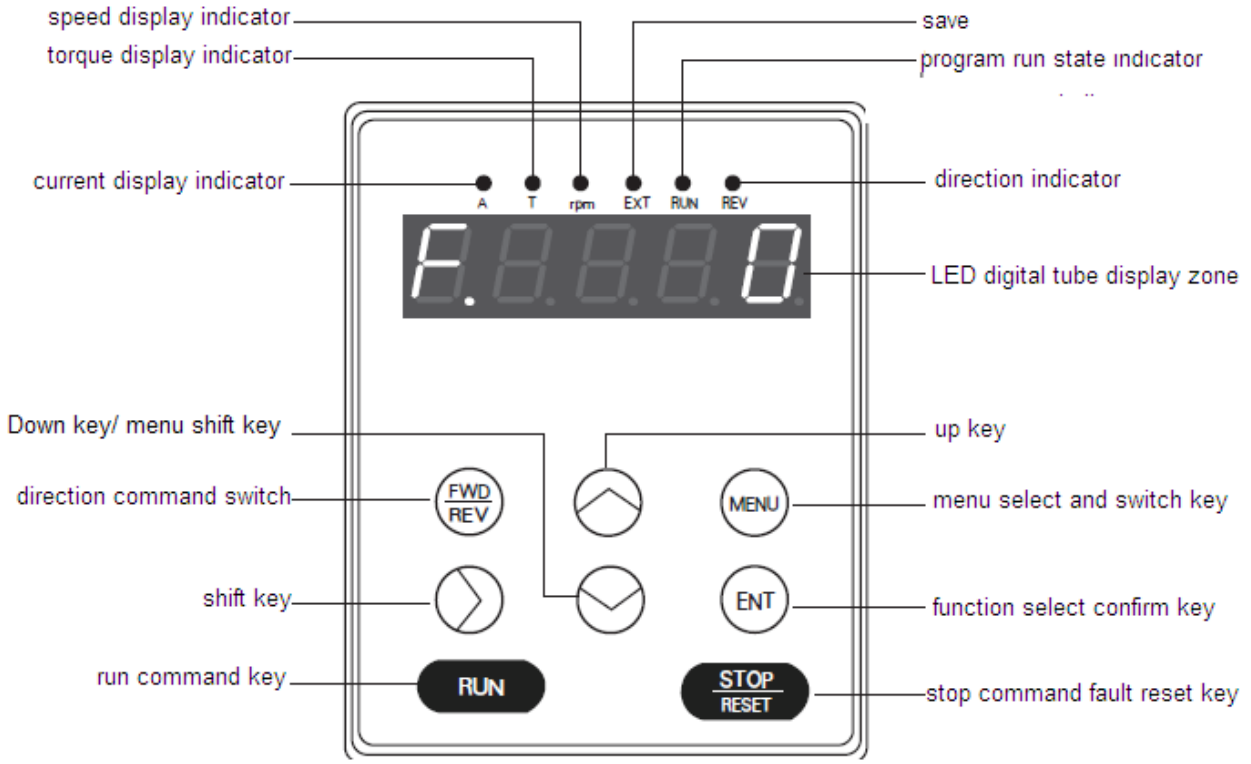


Figure 3-8 Manipulator diagram

Manipulator key function description

Please see Table 3-2 for function description of the manipulator key

Table 3-2 Manipulator key function

Key	Name	Function
MENU	Menu select and switch key	switching key of each menu item;
ENT	Confirm / enter key	Press the key in program state to return to the previous menu. Enter the next level menu; Complete selection of the parameter group in 1-level menu; Complete parameter value checking operation in 2-level menu; Complete modification and storage operation of the parameter value in 3-level menu;
∧	up key	Increase menu item, parameter item or modified parameter value progressively.
∨	down key	Decrease menu item, parameter item or modified parameter value progressively.
>	Shift key	It's used to switch data bit of the parameter number when browse parameter items. It may change the bit to be modified of the modified data when modify data in the program state.
RUN	run command key	It's used to start the driver in driver control mode;
STOP/RESET	fault reset key	It's used to reset driver reset when the driver is in fault alarm state.
FWD/REV	direction	It's used to select rotation direction of the driver in manipulator

	command switch key	command control mode.

Manipulator LED indicator description

There are six LED indicators on the manipulator. They are on or off in various states. The detail description is as follows:

Current display indicator A:

It has two states of on and off which indicates that the data displayed in the current LED digital tube display zone is current parameter or not. On means current parameter is displayed in the LED digital tube display zone; off means that it's not current parameter displayed in the LED digital tube display zone.

Torque display indicator T:

It has two states of on and off which indicates that the data displayed in the current LED digital tube display zone is torque parameter or not. On means torque parameter is displayed in the LED digital tube display zone; off means that it's not torque parameter displayed in the LED digital tube display zone.

Speed display indicator rpm:

It has two states of on and off which indicates that the data displayed in the current LED digital tube display zone is speed parameter or not. On means speed parameter is displayed in the LED digital tube display zone; off means that it's not speed parameter displayed in the LED digital tube display zone.

Indicator EXT

Save;

Run state indicator RUN:

It has two states of on and off which indicates the run state of the system under various operating control orders. On means the driver is in operating state; off means the driver is shutdown.

Operating direction indicator REV:

It has two states of on and off which indicates the current operating direction of the driver. On means reverse operation of the driver; off means forward operation of the driver.

The operating state of the driver

22～315kw driver has four operating states after power-on: standby, operating, setting, modifying or editing and fault alarm. They are described as follows:

Standby state

22～315kw driver is in standby state after power-on and before receiving any operating control order. The Run state indicator (RUN) on operation panel is off, and the default tandby state display function code of LED digital tube is F.0. User may make LED circling switch display U1, U2, U3, A1,2 A2 and A3 parameter groups by press MENU key.After pressing ENT to make LED circling switch display monitoring parameters defined in function parameter group, and then press ENT to check /monitor its value.

It will be limited by selection functional parameter A1-00=1 when the user wants to check / modify the content of parameter groups other than U1, U2, U3, A1,2 A2 and A3 during operation. All of the parameters may be checked with A1-00=1.

Operating state

When 22～315kw driver in standby and no-fault state, it will enter operating state after receiving operating order.

In normal operating state, the Run state indicator (RUN) on operation panel is on. User may make LED circling switch display U1, U2, U3, A1,2 A2 and A3 parameter groups by press MENU key. Press ∧,∨ and > after pressing ENT to make LED circling switch display monitoring parameters defined in function parameter groups, and then press ENT to check /monitor its value.

Setting, modifying and editing state

For 22～315kw driver, user may switch to the state in which function code parameters can be modified through MENU, ENT, ∧, ∨and > on the operator panel. The state is programming state.

Function parameter value is displayed in programming state, and the bit to be modified is flashing.

Fault alarm state

In the state, 22～315kw driver fails and displays the fault code.

LED displays fault code in fault state, and > may enable user conducting fault reset operation.

Operative mode of the manipulator

Standby state:

The state of the manipulator is shown in Figure 3-9 when the driver is in standby state. The LED digital tube default display F. 0. At this point, user may press MENU to enter menu items, and check or modify parameters.

Figure 3-9 Standby state Figure 3-10 Operating state Figure 3-11 Fault alarm state

Operating state:

The driver enters operating state after receiving correct operation command in standby state. As shown in Figure 3-10, the LED digital tube default displays the set speed of the driver, e.g F. 500. In this state, user may press MENU to enter menu items, and check or modify parameters.

Fault alarm state

When fault is detected as the driver is in operating, standby or programming state, the corresponding fault information will be displayed immediately as shown in Figure 3-11.

When a fault occurs, the driver may enable driver reset through >. If the fault has disappeared, it returns

to the standby state; if the fault still exists, the fault code will be displayed again.

Use method of the manipulator

The section mainly introduces use of the manipulator, and basic operations of functions.

Parameter setting operation process

Parameter setting method of manipulator of 22～315kw driver adopts three-level menu structure. Parameter value of menu items can be checked and modified conveniently.

The three-level menu: menu item (1-level menu), parameter tem (2-level menu) and parameter setting (3-level menu). The operation process is shown in Figure 3-12.

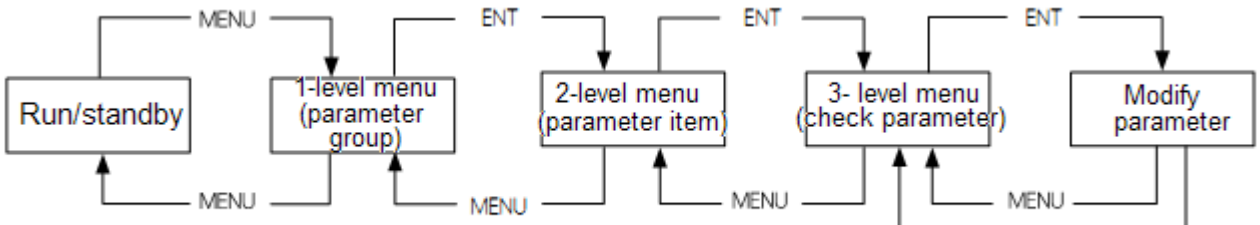


Figure 3-12 3-level menu operation flow chart

During operation in 3-level menu, user may return to 2-level menu by pressing MENU or ENTER (see Figure 3-12 and Figure 3-13). The difference between the two operations: after press ENTER key, the set parameter value will be saved to the controller, and then return to 2-level menu; it will return to 2-level menu directly without saving the parameter value by pressing MENU. The detail operational procedures of 3-level menu are shown in Figure 3-13.

Modify the parameters with the manipulator

The flow chart of modify the parameters with the manipulator is shown in Figure 3-13.

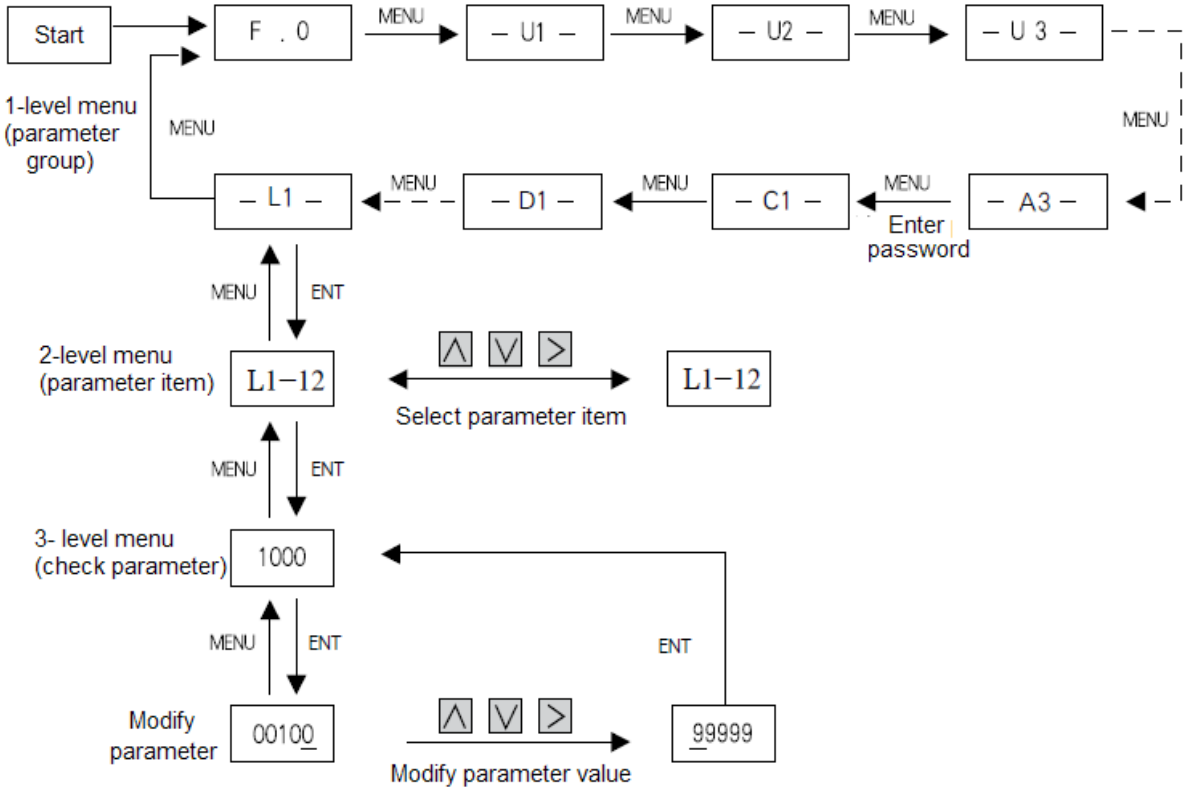


Figure 3-13 3-level menu operation flow chart

★ **Description:**

10 menu items are included in 1-level menu: U1menu, U2 menu, U3 menu, A1 menu, A2 menu, A3 menu, C1 menu, D1 menu, E1 menu, P1 menu, T1 menu and L1 menu.

Please see parameter description for detailed function in 2-level menu.

Monitor operating state with the manipulator

Operation state, interface state and fault information of the driver can be monitored respectively through U1, U2 and U3 of the manipulator

Operation state monitoring

Operation state monitoring includes set speed F, output speed O, feedback speed b, output current A, output torque T and DC bus voltage U of the driver. Please see Figure 3-14 for monitoring method.

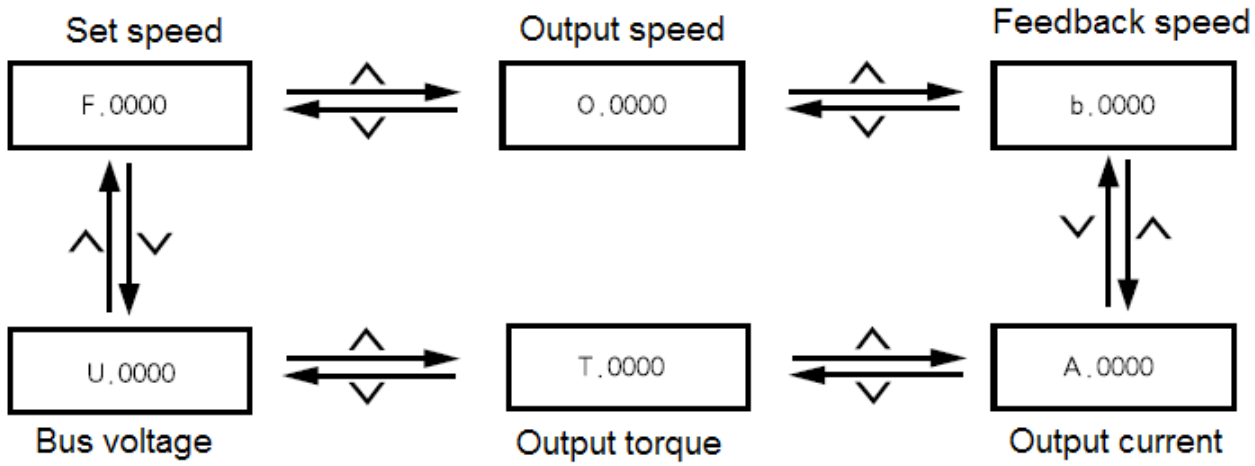


Figure 3-14 Driver operation state monitoring flowchart

Interface state monitoring

Interface state includes driver's encoder input interfaces U2-00, U2-01; switching value input terminals U2-02, U2-03; switching value output terminal U2-04, analog input interfaces U2-05, U2-06; output terminals U2-07, U2-08. The monitoring method is the same as monitoring parameter, only needs to select corresponding parameter in U2. Please see U2 parameter monitoring table 2 for parameter number.

Fault information monitoring

The control panel will display the current fault message code when the driver is in fault state. The fault record of the driver can be checked through U3. The check operation is the same as monitoring parameter, only needs to select corresponding parameter in U3. Please see parameter table of parameter number.

Configuration and key functions of the 0.4～18.5kw driver LCD manipulator

The chapter defines and describes terms and phrases for operation and state of 0.4～18.5kw driver manipulator, defines the operation methods of the driver and manipulator. Please read carefully. It's very helpful for proper use of the 0.4～18.5kw driver.

Manipulator

The manipulator is one of the standard equipment of 0.4～18.5kw driver. User may carry out parameter setting, state monitoring, operation control and other operations to the driver through the manipulator. It's very important to be familiar with function and operation of the manipulator for proper application of 0.4～18.5kw series driver. Please read the manual carefully before using.

Manipulator appearance diagram

Manipulator of 0.4～18.5kw driver is mainly composed of two parts of LCD display zone and keys. The appearance and functional zones are shown in Figure 3-15.

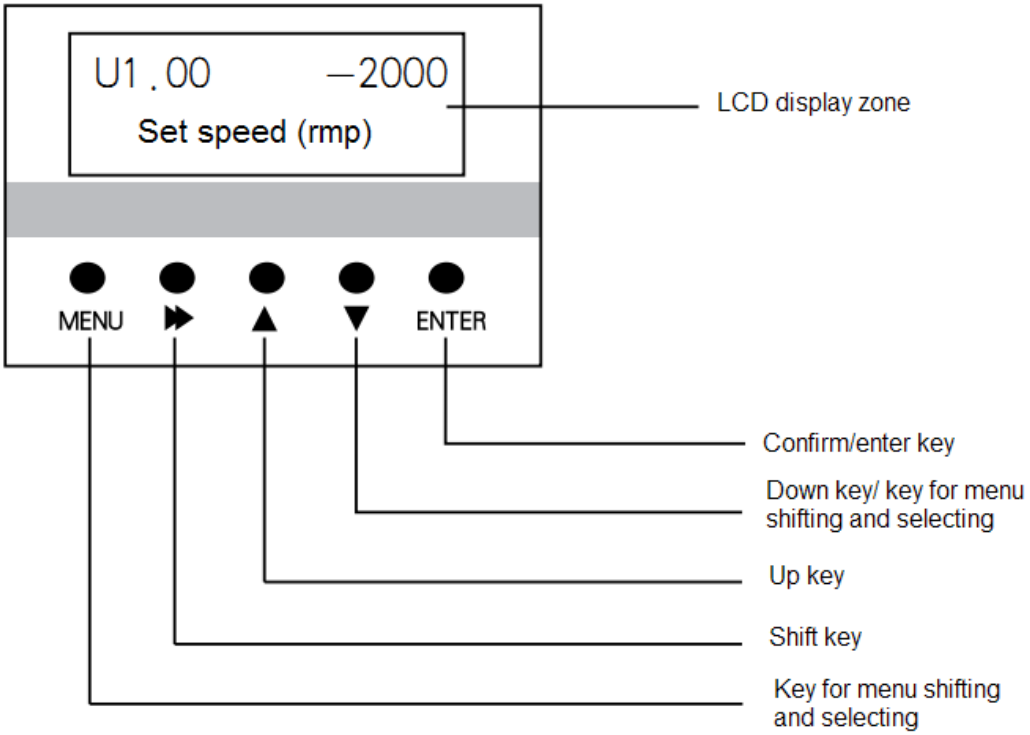


Figure 3-15 PO-S6 Manipulator diagram

Manipulator key function description

Please see Table 3-3 for function description of the manipulator key

Table 3-3 Manipulator key function

Key	Name	Function
MENU	Menu select and switch key	switching key of each menu item;
▶▶	Shift key	It's used to switch data bit of the parameter number when browse parameter items; The low order of the data may be displayed when displaying 32-bit data. When modifying data in program state, it can be used to modify the modified bit of the modified data.
▲	up key	Increase menu item, parameter item or modified parameter value progressively.
▼	down key	Decrease menu item, parameter item or modified parameter value progressively； shift among monitoring menu and menu item.

ENTER	Confirm / enter key	Press the key in menu state to enter parameter modifying interface; Complete modification and storage operation of the parameter value in the parameter modifying interface.

The operating state of the driver

0.4～18.5kw driver has four operating states after power-on: standby, operating, programming and fault alarm. They are described as follows:

Standby state

0.4～18.5kw driver is in standby state after power-on and before receiving any operating control order. The default standby state display function code of LCD digital tube is F.0. User may make LCD circling switch display U1, U2. U3, A1, A2 and A3 monitoring function parameter groups by pressing MENU key. Press ▲ , ▼ and ▶▶ after pressing ENTER to make LCD circling switch display monitoring parameters defined in function parameter group, and may check/monitor the value. Then press ENTER to modify its value.

It will be limited by selection functional parameter A1-00 when user want to check / modify the content of parameter groups other than U1, U2. U3, A1, A2 and A3 during operation. All of the parameters may be checked with A1-00=1.

Operating state

When 0.4～18.5kw driver in standby and no-fault state, it will enter operating state after receiving operating order.

User may make LCD circling switch display U1, U2. U3, A1, A2 and A3 monitoring function parameter groups by pressing MENU key. Press ▲ , ▼ and ▶▶ after pressing ENTER to make LCD circling switch display monitoring parameters defined in function parameter group, and may check/monitor the value. Then press ENTER to modify its value.

Setting, modifying and editing state

For 0.4～18.5kw driver, user may switch to the state in which function code parameters can be modified through MENU, ▲ , ▼ , ▶▶ and ENTER on the operator panel. The state is programming state.

Function parameter value is displayed in programming state, and the bit to be modified is displayed in inverse color.

Fault alarm state

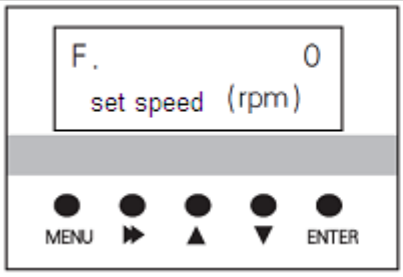
In the state, 0.4～18.5kw driver fails and displays the fault code.

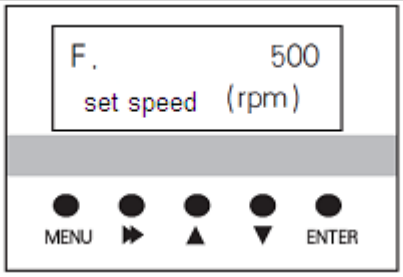
LCD displays fault code in fault state, and ▶▶ may enable user conducting fault reset operation.

Operative mode of the manipulator

Standby state:

The state of the manipulator is shown in Figure 3-16 when the driver is in standby state. The LCD digital tube default display F. 0. At this point, user may press MENU to enter menu items, and check or modify parameters.





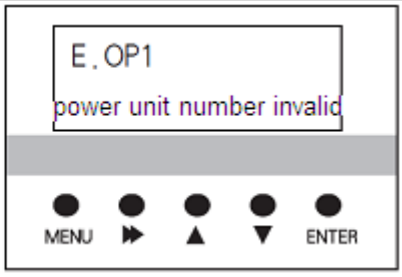


Figure 3-16 Standby state Figure 3-17 Operating state Figure 3-18 Fault alarm state

Operating state:

The driver enters operating state after receiving correct operation command in standby state. As shown in Figure 3-17, the LCD digital tube default displays the set speed of the driver, e.g F. 500. In this state, user may press MENU, ▲ , ▼ , ⏭ and ENTER to enter menu items, and check or modify parameters.

Fault alarm state

When fault is detected as the driver is in operating, standby or programming state, the corresponding fault information will be displayed immediately as shown in Figure 3-18.

When a fault occurs, the driver may enable driver reset through ⏭. If the fault has disappeared, it returns to the standby state; if the fault still exists, the fault code will be displayed again.

Use method of the manipulator

Parameter setting operation process

Parameter setting method of manipulator adopts three-level menu structure. Parameter value of menu items can be checked and modified conveniently.

The three-level menu: menu item (1-level menu), parameter tem (2-level menu) and parameter setting (3-level menu). The operation process is shown in Figure 3-19.

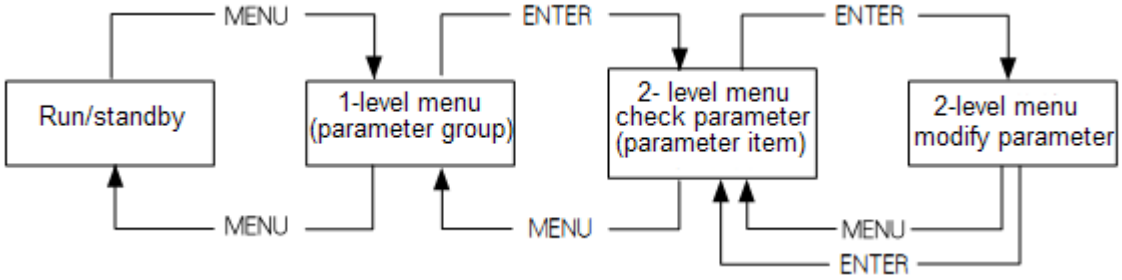


Figure 3-19 2-level menu operation flow chart

During operation in 2-level menu, user may return to 2-level menu by pressing MENU or ENTER. The difference between the two operations: after press ENTER key, the set parameter value will be saved to the controller, and then return to 2-level menu; it will return to 2-level menu directly without saving the parameter value by pressing MENU. The detail operational procedures of 2-level menu are shown in Figure 3-20.

Modify the parameters with the manipulator

The flow chart of modify the parameters with the manipulator is shown in Figure 3-20.

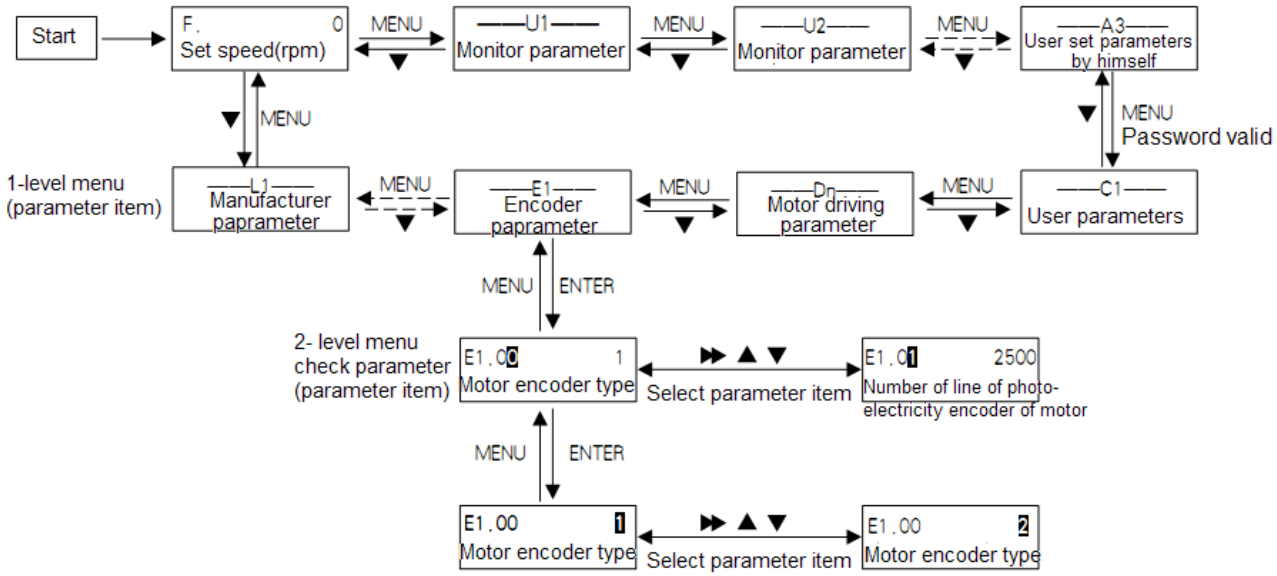


Figure 3-20 2-level menu operation flow chart

★ **Description:**

10 menu items are included in 1-level menu: U1 menu, U2 menu, U3 menu, A1 menu, A2 menu, A3 menu, C1 menu, D1 menu, E1 menu, P1 menu, T1 menu and L1 menu.

Please see parameter description for detailed function in 2-level menu.

Monitor operating state with the manipulator

Operation state, interface state and fault information of the driver can be monitored respectively through U1, U2 and U3 of the manipulator

Operation state monitoring

Operation state monitoring includes set speed F, output speed O, feedback speed b, output current A, output torque T and DC bus voltage U of the driver. Please see Figure 3-21 for monitoring method.

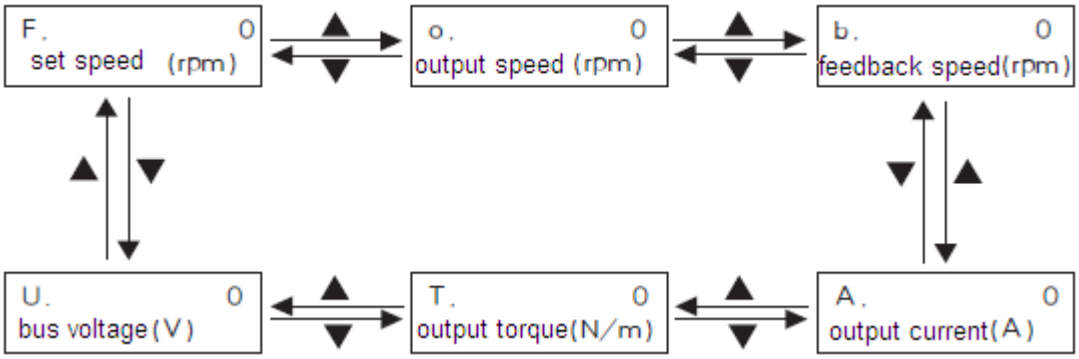


Figure 3-21 Driver operation state monitoring flowchart

Interface state monitoring

Interface state includes driver's encoder input interfaces U2-00, U2-01; switching value input terminals U2-02, U2-03; switching value output terminal U2-04, analog input interfaces U2-05, U2-06; output terminals U2-07, U2-08. The monitoring method is same with monitoring parameter, only needs to select corresponding parameter in U2. Please see U2 parameter monitoring table 2 for parameter number.

Fault information monitoring

The control panel will display the current fault message code when the driver is in fault state. The fault record of the driver can be checked through U3. The check operation is same with monitoring parameter, only needs to select corresponding parameter in U3. Please see fault state recording parameter table U3 for parameter number.

Configuration and key functions of the 22～315kw driver LCD manipulator

The chapter defines and describes terms and phrases for operation and state of 22～315kw driver manipulator, defines the operation methods of the driver and manipulator. Please read carefully. It's very helpful for proper use of the 22～315kw driver.

Manipulator

The manipulator is one of the standard equipment of 22～315kw driver. User may carry out parameter setting, state monitoring, operation control and other operations to the driver through the manipulator. It's very important to be familiar with function and operation of the manipulator for proper application of 22～315kw series driver. Please read the manual carefully before using.

Manipulator appearance diagram

Manipulator of 22～315kw driver is mainly composed of three parts of LED indicator, LCD display zone and keys. The appearance and functional zones are shown in Figure 3-22.

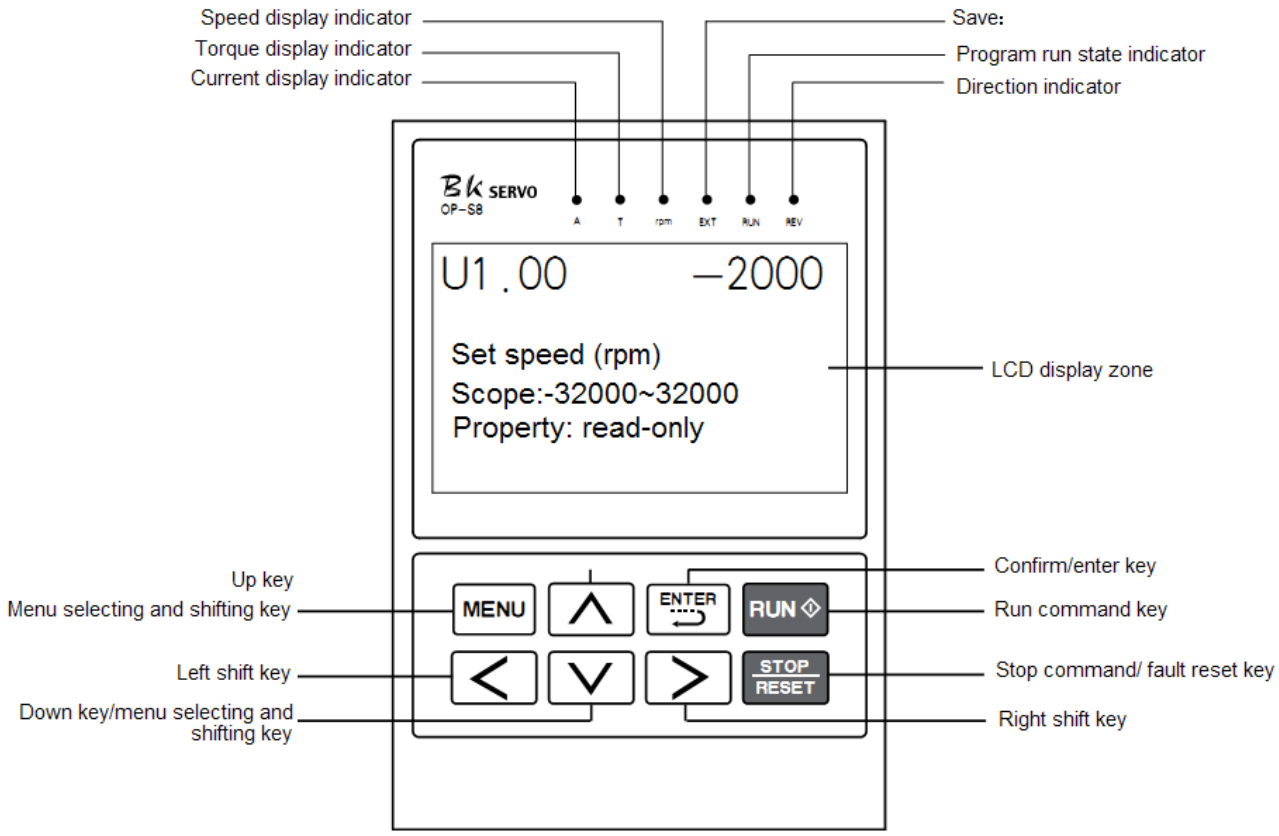


Figure 3-22 PO-S8 Manipulator diagram

Manipulator key function description

Please see Table 3-4 for function description of the manipulator key

Table 3-4 Manipulator key function

Key	Name	Function
MENU	Menu select and switch key	Switching key of each menu item;
>	Right shift key	It's used to switch data bit of the parameter number when browse parameter items; It's used to change the modified bit of the modified data when change parameter.
<	left shift key	It's used to change the modified bit of the modified data when change parameter.
∧	up key	Increase menu item, parameter item or modified parameter value progressively.
∨	down key	Decrease menu item, parameter item or modified parameter value progressively.
ENTER	Confirm / enter key	Press the key in menu state to enter parameter modifying interface; Complete modification and storage operation of the parameter value in the parameter modifying interface.
STOP/RESET	Fault reset key	It's used for reset of driver fault when the driver is in fault alarm state.

FWD/REV	Direction command switch key	It's used to select the run operation of the driver when the driver is in command control mode; the key indicator automatically displays the run direction of the driver during terminal control.

Manipulator LED indicator description

There are six LED indicators on the manipulator. They are on or off in various states. The detail description is as follows:

Current display indicator A:

It has two states of on and off which indicates that the data displayed in the current LCD display zone is current parameter or not. On means current parameter is displayed in the LCD display zone; off means that it's not current parameter displayed in the LCD display zone.

Torque display indicator T:

It has two states of on and off which indicates that the data displayed in the current LCD display zone is torque parameter or not. On means torque parameter is displayed in the LCD display zone; off means that it's not torque parameter displayed in the LCD display zone.

Speed display indicator rpm:

It has two states of on and off which indicates that the data displayed in the current LCD display zone is speed parameter or not. On means speed parameter is displayed in the LCD display zone; off means that it's not speed parameter displayed in the LCD display zone.

Indicator EXT

Save;

Run state indicator RUN:

It has two states of on and off which indicates the run state of the system under various operating control orders. On means the driver is in operating state; off means the driver is shutdown.

Operating direction indicator REV:

It has two states of on and off which indicates the current operating direction of the driver. On means reverse operation of the driver; off means forward operation of the driver.

The operating state of the driver

22～315kw driver has four operating states after power-on: standby, operating, programming and fault alarm. They are described as follows:

Standby state

22～315kw driver is in standby state after power-on and before receiving any operating control order. The default standby state display function code of LCD is F.0. User may make LCD circling switch display U1, U2，U3, A1, A2 and A3 monitoring function parameter groups by pressing MENU key. Press ∧, ∨, > and < after pressing ENTER to make LCD circling switch display monitoring parameters defined in function parameter group, and may check/monitor the value. Then press ENTER to modify its value.

It will be limited by selection functional parameter A1.00 when user want to check / modify the content of

parameter groups other than U1, U2，U3, A1, A2 and A3 during operation. All of the parameters may be checked with A1-00=1.

Operating state

When 22～315kw driver in standby and no-fault state, it will enter operating state after receiving operating order.

User may make LCD circling switch display U1, U2，U3, A1, A2 and A3 monitoring function parameter groups by pressing MENU key. Press ∧, ∨, > and < after pressing ENTER to make LCD circling switch display monitoring parameters defined in function parameter group, and may check/monitor the value. Then press ENTER to modify its value.

Setting, modifying and editing state

For 22～315kw driver, user may switch to the state in which function code parameters can be modified through MENU, ENTER, ∧, ∨, > and < on the operator panel. The state is programming state.

Function parameter value is displayed in programming state, and the bit to be modified is displayed in inverse color.

Fault alarm state

In the state, 22～315kw driver fails and displays the fault code.

LCD displays fault code in fault state, and > may enable user conducting fault reset operation.

Operative mode of the manipulator

Standby state:

The state of the manipulator is shown in Figure 3-23 when the driver is in standby state. The LCD default displays F. 0. At this point, user may press MENU to enter menu items, and check or modify parameters.

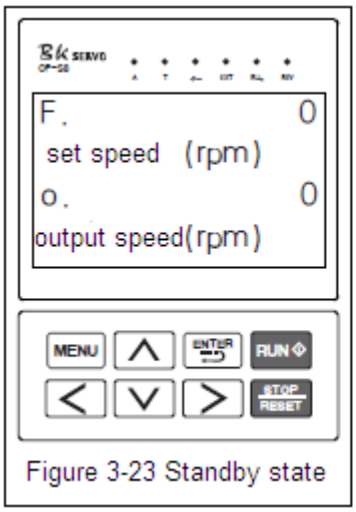


Figure 3-23 Standby state

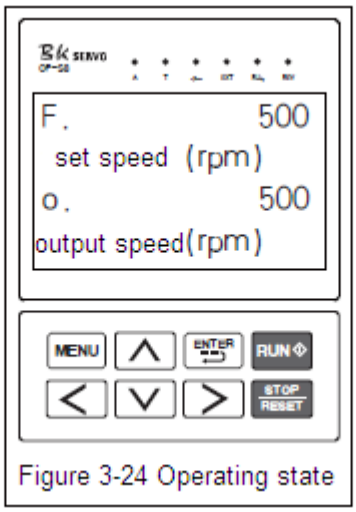


Figure 3-24 Operating state

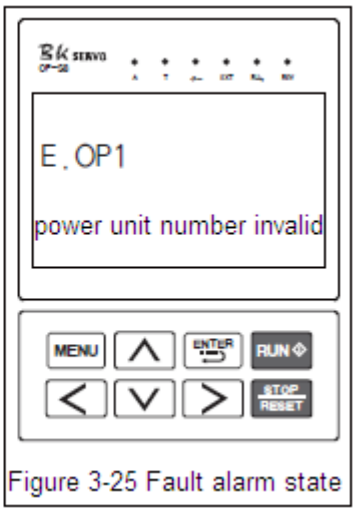


Figure 3-25 Fault alarm state

Operating state:

The driver enters operating state after receiving correct operation command in standby state. As shown in Figure 3-24, the LCD digital tube default displays the set speed of the driver, e.g F. 500. In this state, user may press MENU, ENTER, ∧, ∨, > and < to enter menu items, and check or modify parameters.

Fault alarm state

When fault is detected as the driver is in operating, standby or programming state, the corresponding fault information will be displayed immediately as shown in Figure 3-25.

When a fault occurs, the driver may enable driver reset through disconnection. If the fault has disappeared, it returns to the standby state; if the fault still exists, the fault code will be displayed again.

Use method of the manipulator

Parameter setting operation process

Parameter setting method of manipulator adopts 2-level menu structure. Parameter value of menu items can be checked and modified conveniently.

The 2-level menu: menu item (1-level menu), parameter and parameter setting value tem (2-level menu).

The operation process is shown in Figure 3-26.

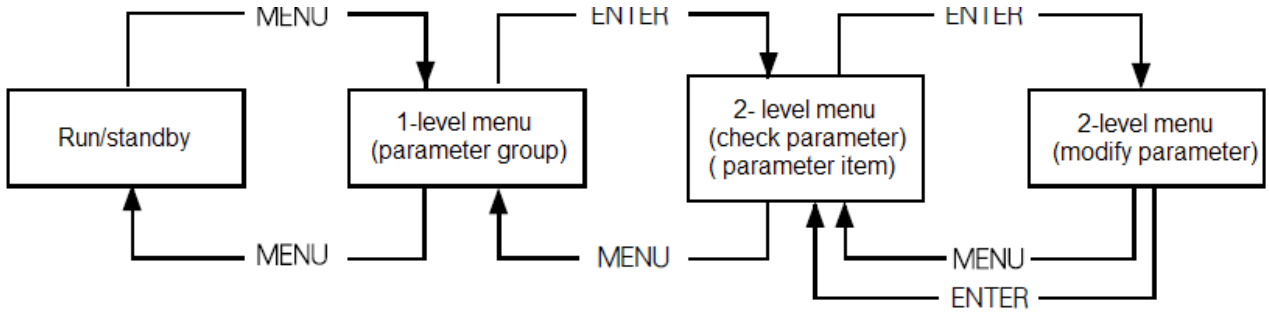


Figure 3-26 2-level menu operation flow chart

During operation in 2-level menu, user may return to 2-level menu by pressing MENU or ENTER. The difference between the two operations: after press ENTER key, the set parameter value will be saved to the controller, and then return to 2-level menu; it will return to 2-level menu directly without saving the parameter value by pressing MENU. The detail operational procedures of 2-level menu are shown in Figure 3-27.

Modify the parameters with the manipulator

The flow chart of modify the parameters with the manipulator is shown in Figure 3-27.

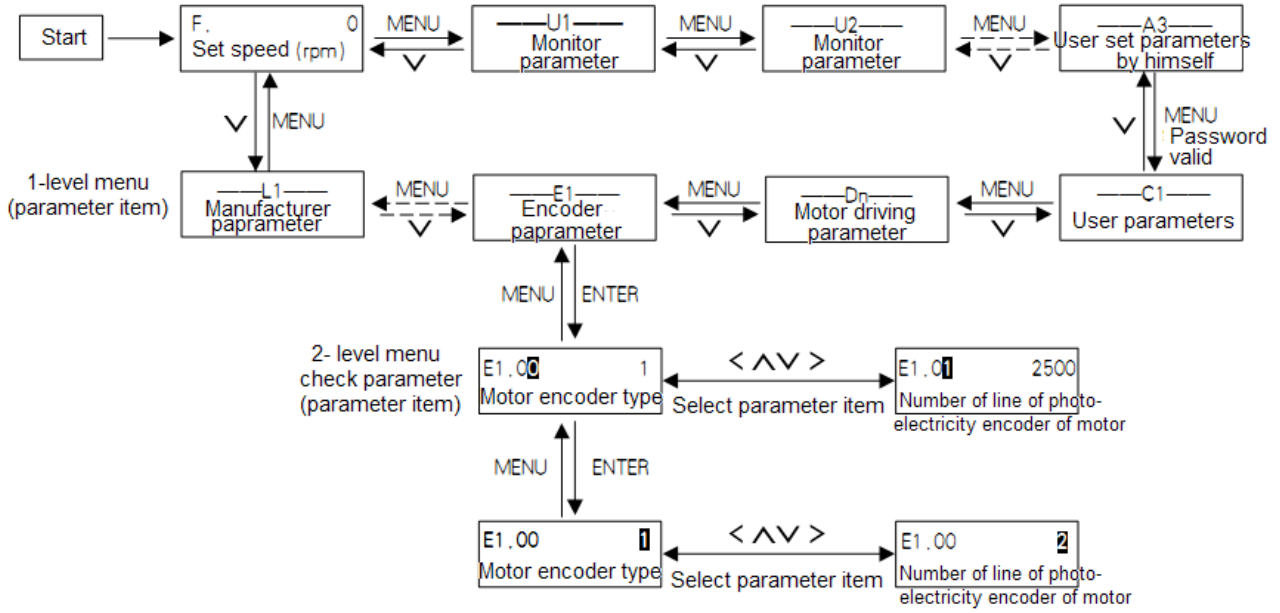


Figure 3-27 2-level menu operation flow chart

★ **Description:**

10 menu items are included in 1-level menu: U1 menu, U2 menu, U3 menu, A1 menu, A2 menu, A3 menu, C1 menu, D1 menu, E1 menu, P1 menu, T1 menu and L1 menu.

Please see parameter description for detailed function in 2-level menu.

Monitor operating state with the manipulator

Operation state, interface state and fault information of the driver can be monitored respectively through U1, U2 and U3 of the manipulator

Operation state monitoring

Operation state monitoring includes set speed F, output speed O, feedback speed b, output current A, output torque T and DC bus voltage U of the driver. Please see Figure 3-21 for monitoring method.

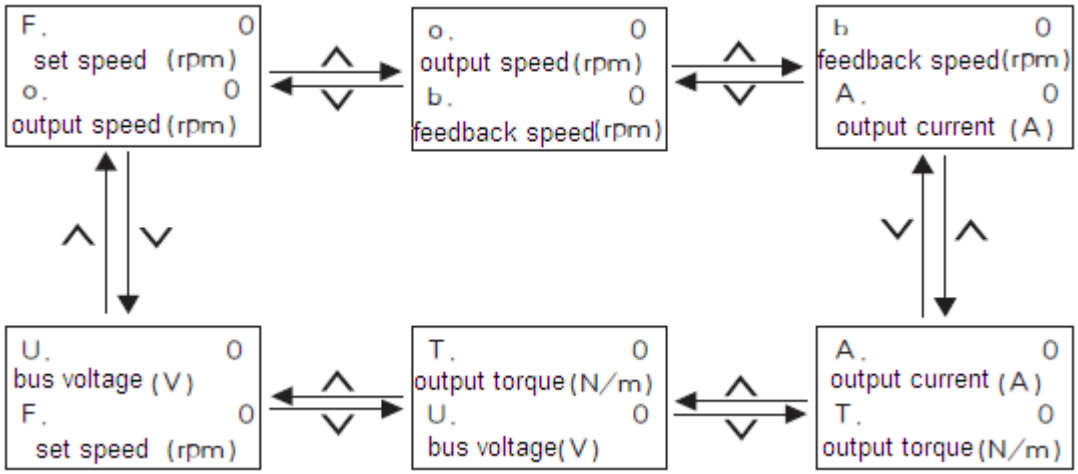


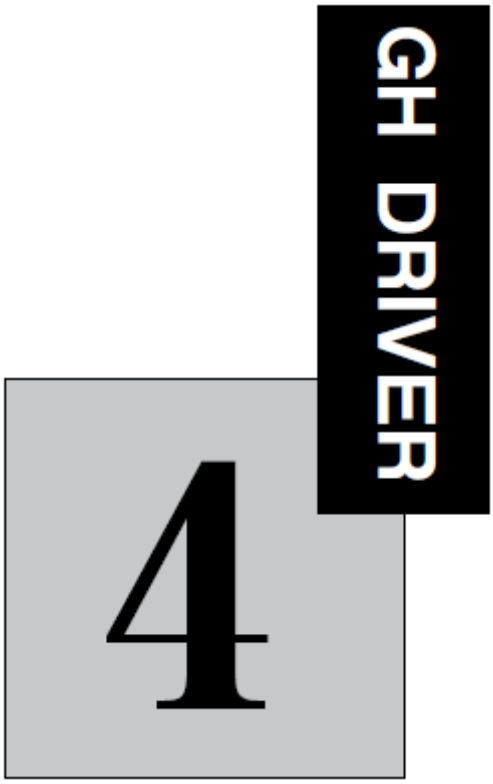
Figure 3-28 Driver operation state monitoring flowchart

Interface state monitoring

Interface state includes driver's encoder input interfaces U2-00, U2-01; switching value input terminals U2-02, U2-03; switching value output terminal U2-04, analog input interfaces U2-05, U2-06; output terminals U2-07, U2-08. The monitoring method is same with monitoring parameter, only needs to select corresponding parameter in U2. Please see U2 parameter monitoring table 2 for parameter number.

Fault information monitoring

The control panel will display the current fault message code when the driver is in fault state. The fault record of the driver can be checked through U3. The check operation is same with monitoring parameter, only needs to select corresponding parameter in U3. Please see fault state recording parameter table U3 for parameter number.

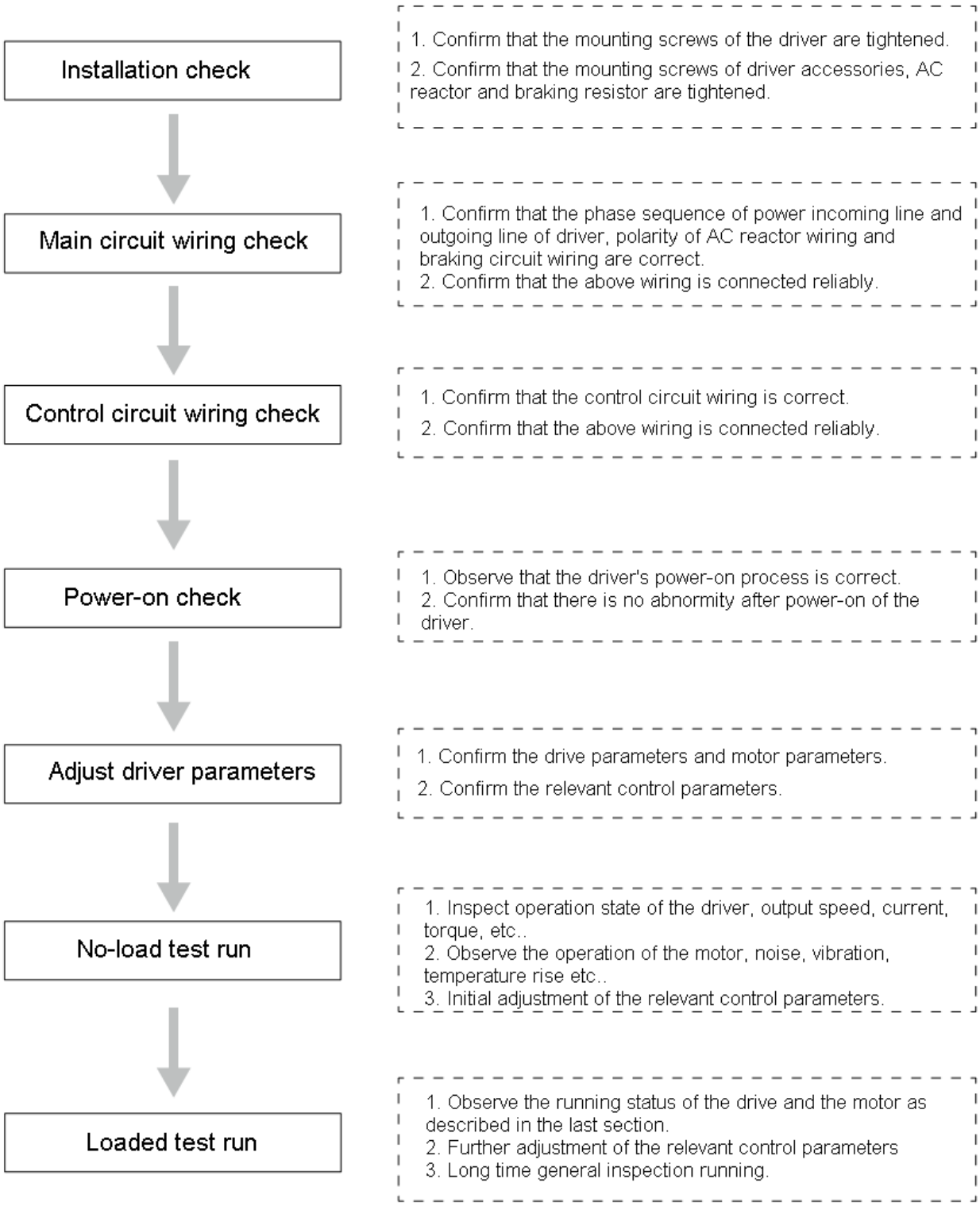


Test run

The chapter describes methods and precautions for initial test run of the driver

Basic procedure of test run

The initial power-on operation of the driver shall be carried out by the following procedures, otherwise, accident, damage to equipment or other hazards are likely to happen.



Confirmation of the connection of the main circuit

Please confirm the following contents in connection of the main circuit

1. Connect the connecting wire on driver R / S / T to 3-phase power frequency power supply. The voltage of the power supply shall meet the requirements of the drive.

2. The driver is equipped with built-in braking unit. The braking resistor is connected to P / PB. Do not connect any connect wire to N terminal.

3. When the output terminal of the driver is connected to the motor, it shall be ensured that their phase sequences are same, otherwise, he motor cannot operate normally, and prone to burn the equipment. If shield cable is used for output cable, the shielding layer at the ends of the cable shall be connected respectively to ground terminal of the drive and motor.

4. When filtering magnet ring is installed on the output line, it shall be close to the driver side as possible. The shielding layer and ground line cannot pass through the magnet ting, and the magnet ting cannot be in contact with the U / V / W terminal.

5.The driver and motor must be well grounded.

6. Confirm all connecting wire are connected reliably.

Caution

● The wire connection must be inspected carefully before initial power-on of the driver, otherwise, it's prone to accidents

Motor and driver parameters confirmation

The initial parameters of GH series AC servo driver shall be basically in conformity with the practical application. Most of the parameters do not need modification. For initial application, user shall modify or confirm part of the parameters as required.

Parameters need to be confirmed in test run

● Motor and driver parameters: D1, D1-00 ~ D1-05.

● Basic control parameters:A2, A2-00~ A2-35.

● Control relevant parameter:A3, A3-00~ A3-69.

Loaded test run

Attention shall be paid to the following contents during loaded test run of the driver:

1. Loading gradually from small to large. Please inspect or contact with the manufacturer for over loading.

2. Monitor feedback speed, output current and output torque of the driver constantly during loading; observe motor vibration and noise and temperature rise continuously. The equipment shall be shutdown timely for any abnormalities.

3. To avoid accident, the motor shall be stopped before adjusting motor parameters. The parameter regulating quantity shall not be too big.

4. Do not make overload test or destructive test to avoid burning of the driver and motor.

Caution

If the following situations occur, please shut down immediately and inspect, or contact the manufacturer.

1. Major fluctuation of feedback speed, output current and output torque of the driver, or reach the limit.

2. The motor operation is abnormal with abnormal vibration and noise.

3. Mechanical equipment abnormalities

Parameter list

The chapter describes all of parameters of the driver.

Parameter list description

The contents of the parameter list are described as follows:

Function code: Code of parameter group and parameter number;

Name: Name of the parameter;

Description: Detailed description about function and effective setting value of the parameter;

Setting range: The range of effective setting value of parameter;

Unit: Parameter setting unit;

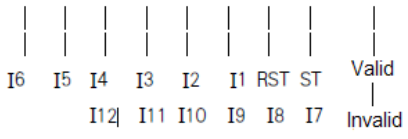
Factory setting: Original factory parameter setting;

Change: Parameter changing properties (ie, allow changing or not and change condition) are as follows:

Monitoring parameter U1

Function code	PLC address	Name	Description	Unit	Parameter scope	original value	Property
U1-0	D6291+D6292	Speed setting	Speed setting	rpm	0 to 20000	0	On line
U1-1	D6293+D6294	Speed output	Speed output	rpm	0 to 20000	0	Read only
U1-2	D6303+D6304	Speed feedback	Speed feedback	rpm	0 to 20000	0	Read only
U1-3	D6302	Current	Current	A	0 to 2000	0	Read only
U1-4	D6301	Torque current	Torque current	A	0 to 2000	0	Read only
U1-5	D6319	Bus voltage	Bus voltage	V	0 to 1000	0	Read only
U1-6	D6320	following error	following error	pulse	0 to 10000	0	Read only

Monitoring parameter U2

Function code	PLC address	Name	Description	Unit	Parameter scope	original value	Property
U2-0	D6311	First coded disc counting	First coded disc counting accumulation	Pulse	0 to 65535	0	Read only
U2-1	D6313	Second coded disc counting	Second coded disc counting accumulation T2 pulse port pulse accumulation counting	Pulse	0 to 32768	0	Read only
U2-2	D6445	State of input points I1-I6, ST, RST		-	-	0	Read only
U2-3	D6446	State of input points I7 to I12					
U2-4	D6447	state of M0, M1, Q0 to Q6	M1 M0 Q6 Q5 Q4 Q3 Q2 Q1	-	-	0	Read only
U2-5	D6448	FI after filtering	AD value of unipolar analog quantity of the first circuit	-	0 to 4095	0	Read only
U2-6	D6449	FV after filtering	AD value of bipolar analog quantity	-	0 to 4095	0	Read

							only
U2-7	D6454	DA1	DA1 output digital quantity	-	0 to 4095	0	Read only
U2-8	D6455	DA2	DA2 output digital quantity	-	0 to 4095	0	Read only
U2-9	D6456	Temperature of driver module	Temperature of driver module	-	0 to 100	0	Read only
U2-10	D6457	Temperature of CPU	Temperature of CPU	-	0 to 100	0	Read only
U2-11	D6325	Pulse number of the first coded disc distance Z	Pulse number of single circle position distance	Pulse	0 to 60000	0	Read only
U2-12	D6315	Pulse 1 counting	Pulse 1 counting	Pulse	0 to 60000	0	Read only
U2-13	D6317	Pulse 2 counting	Pulse 2 counting	Pulse	0 to 60000	0	Read only
U2-14	D6332	Angle of the second coded disc distance Z	Pulse number of single circle position distance Z	0.01 degre e	0 to 36000	0	Read only
U2-15	D6333-D5 334	Pulse of the first coded disc distance Z	Pulse 1 counting	Pulse	32bit	0	Read only
U2-16	D6335-D5 336	Pulse of the second coded disc distance Z	Pulse 2 counting	Pulse	32bit	0	Read only
U2-17	D6337	Temperature of the motor	Display of temperature of the motor	℃	25-150	0	Read only

Monitoring parameter U3

Function code	PLC address	Name	Description	Unit	Parameter scope	original value	Property
U3-0	D6420	Current fault code	See fault description for detail	-	-	-	Read only
U3-1	D6421	last 1st fault code		-	-	-	Read only
U3-2	D6422	last 2nd fault code		-	-	-	Read only
U3-3	D6423	last 3rd fault code		-	-	-	Read only
U3-4	D6424	last 4th fault code		-	-	-	Read only
U3-5	D6425	last 5th fault code		-	-	-	Read only

Initialization parameter A1

Function code	PLC address	Name	Description	Unit	Parameter scope	original value	Property
A1-00	D6000	Password protection	Start parameters after group C when it is set as 1	-	0-1	0	On line
A1-01	D6001	Base power	Base power	KW	0-1000	0	Read only

A1-02	D6002	Power code	Power code read from base	-	-	0	Read only
A1-03	-	Save	-	-	-	-	-
A1-04							
A1-05	D6005	Clear user's parameters for next power-on	Restore default setting of parameters for next power-on non-0 restore default setting	-	0-10000	0	Power on again
A1-06	D6006	Restore default setting of parameters for next power-on	Restore default setting of parameters for next power-on non-0 restore default setting	-	0-10000	0	Power on again
A1-07	D6007	PLC version number	PLC version number	-	0-30000	0	Read only
A1-08	D6008	Control program version number	Control program software version number	-	0-30000	0	Read only
A1-09	D6009	Application program version number	Application program software version number	-	0-30000	0	Read only
A1-10	-	Save	--	-	-	-	-
A1-11							
A1-12							
A1-13	D6013	Minimum calibration value limit	Calibration is invalid when the analog quantity calibration speed is lower than the value	-	0-10000	0	On line
A1-14	D6014	Calibration error scope	Allowed error scope percent of the analog quantity calibration		0-10	0	On line
A1-15	D6015	Auto/manual	0: automatic calibration 1: manual calibration	-	0-1	0	On line
A1-16	D6016	Calibration positive bias	Set manual calibration positive bias of analog quantity	LSB	0-65520	0	On line
A1-17	D6017	Calibration negtive bias	Set manual calibration negtive bias of analog quantity	LSB	0-65520	0	On line
A1-18	D6018	FI analog quantity sampling	FV analog quantity input voltage value monitoring	0.1V	0-10	0	Read only

		value					
A1-19	D6019	FV analog quantity sampling value	FV analog quantity input voltage value monitoring	0.1V	-20	0	Read only
A1-20	D6020	FV calibration order	Set FV analog quantity calibration speed	rmp	0-65535	0	On line
A1-21	D6021	FI calibration order	Set FI analog quantity calibration speed	rmp	0-65535	0	On line
A1-22	D6022	FT calibration order	Set FT analog quantity calibration speed	rmp	0-65535	0	On line
A1-23	D6023	Analog quantity channel selection	0: no selection 1: FV 2： FI 3：FV FI FT	-	0-3	0	On line
A1-24	D6024	Analog quantity filtering times	Set analog quantity filtering times	Times	0-4000	2000	On line
A1-25	D6025	Analog zero speed deadzone	It is considered as 0 speed when the analog quantity is less than the value	LSB	0-65520	0	On line
A1-26	D6026	Analog maximum speed	The analog quantity corresponding to the maximum speed	rmp	0-30000	1000	On line
A1-27	-	Save	-	-	-	-	-
A1-28							
A1-29							
A1-30	D6030	Input filtering time	Calculation method: A1-30*0.5ms	0.5ms	0-30000	0	On line
A1-31		Save	-	-	-	-	-
A1-32							
A1-33	D6033	The middle value function of the analog quantity under initial calibration is started or not ?	0: do not start 1: start	-	0-1	1	On line
A1-34	D6034	Time of section A of curve S	set time of section A of curve S	ms	0-2000	10	On line
A1-35	D6035	Time of section B of	set time of section B of curve S	ms	0-2000	10	On line

		curve S					
A1-36	D6036	Time of section C of curve S	set time of section C of curve S	ms	0-2000	10	On line
A1-37	D6037	Time of section D of curve S	set time of section D of curve S	ms	0-2000	10	On line
A1-38	D6038	PLC control Q6 enabling	Q6 is controlled by free programming of PLC when this value is 1, instead of z output	-	0-1	0	On line
A1-39	D6039	Port com1 function selection	0: PLC communication 1: upper computer communication	-	0-1	0	Non-enabling

User self-defined parameter A2

Function code	PLC address	Name	Description	Unit	Parameter scope	original value	Property
A2-01	D1201	Analog quantity polarity selection	0：±10V 1：0-10V	-	0-1	0	Non-enabling
A2-02	-	Save	-	-	-	-	-
A2-03	D1203	Positioning mode	0：motor encoder positioning 1：spindle encoder positioning 2：approach switch positioning	-	0-2	-	Non-enabling
A2-04 - A2-11	-	Save	-	-	-	-	-
A2-12	D1212	ST function selection	0：no function 1：communication control enabling	-	0-1	0	Non-enabling
A2-13	D1213	Positioning mode	0：positioning according to current speed direction 1： positioning according to fixed direction	-	0-1	0	Non-enabling
A2-14	D1214	Positioning direction selection	0：positive positioning 1： negative positioning	-	0-1	0	Non-enabling
A2-15	D1215	I1 function selection	0：analog quantity speed 1： pulse speed		0-1	-	Non-enabling

A2-16	-	Save	-	-	-	-	-
A2-17	D1217	Pulse port selection	0：T4 input 5V differential pulse 1：T2 input 5V differential pulse 2： T3 input 24V pulse	-	0-2	-	Non-enabling
A2-18	D1218	Feedback source at pulse position	0：motor encoder 1：spindle encoder	-	0-1	0	Non-enabling
A2-19	D1219	I4 function selection	0：analog quantity rigid tapping 1： pulse rigid tapping	-	0-1	-	Non-enabling
A2-20 - A2-99	-	Save	-	-	-	-	-

User self-defined parameter A3

Function code	PLC address	Name	Description	Unit	Parameter scope	original value	Property
A3-00 - A3-07	-	Save	-	-	-	-	-
A3-08	D1308	Withdraw I0 port 0 speed spindle locking time	Set Withdraw I0 port 0 speed spindle locking time	ms	0-30000	300	Non-enabling
A3-09	D1309	Withdraw I0 port deceleration time	Set Withdraw I0 port deceleration time	0.01s	0-30000	-	Non-enabling
A3-10 A3-11	-	Save	-	-	-	-	-
A3-12	D1312	Speed setting during MODBUS communication control	Set speed setting during MODBUS communication control	rmp	±30000	0	Non-enabling
A3-13 - A3-18	-	Save	-	-	-	-	-
A3-19	D1319	Corresponding speed when analog voltage DA1 outputs 10V	Set corresponding speed when analog voltage DA1 outputs 10V	rmp	±65535	-	Non-enabling

A3-20	-	Save	-	-	-	-	-
A3-21	D1321	Corresponding speed when analog voltage DA2 outputs 10V	Set corresponding speed when analog voltage DA2 outputs 10V	0.1A	±65535	-	Non-enabling
A3-22	-	Save	-	-	-	-	-
A3-23	D1323	Corresponding maximum speed of speed control of 10V	Input corresponding speed when 10V analog voltage is input	rmp	0-20000	-	Non-enabling
A3-24	D1324	speed control acceleration time	Set speed control acceleration time	0.01s	0-20000	100	Non-enabling
A3-25	D1325	speed control deceleration time	Set speed control deceleration time	0.01s	0-20000	100	Non-enabling
A3-26	-	Save	-	-	-	-	-
A3-27	D1327	Speed control scale gain	Set speed loop regulator scale gain. The gain is higher and the rigidity is bigger with greater value. Set the value as high as possible without vibration in the system	-	0-30000	-	Non-enabling
A3-28	D1328	Speed control integral time	Set speed ring PI regulator integral time. The rigidity is higher with lower value	-			Non-enabling
A3-29	-	save	-	-	-	-	-
A3-30	D1330	Rigid tapping/ pulse position maximum speed time	Set the maximum speed of motor during Rigid tapping/ pulse position control	rmp	0-20000	1500	Non-enabling
A3-31	D1331	Rigid tapping/ pulse position acceleration time	Set Rigid tapping/ pulse position acceleration time	0.01s	0-20000	100	Non-enabling
A3-32	D1332	Rigid tapping/ pulse position deceleration time	Set Rigid tapping/ pulse position deceleration time	0.01s	0-20000	100	Non-enabling
A3-33	D1333	Position loop feed-forward at Rigid tapping/	The position ring response is faster when the value is	-	0-100	-	Non-enabling

		pulse position	greater				
A3-34	D1334	Position loop scale gain at Rigid tapping/ pulse position	The position ring rigidity is higher when the value is greater	-	0-30000	-	Non-enabling
A3-35	D1335	speed loop scale gain at Rigid tapping/ pulse position	Set speed loop scale gain at Rigid tapping/ pulse position. The gain is higher and the rigidity is bigger with greater value. Set the value as high as possible without vibration in the system	-	0-30000	-	Non-enabling
A3-36	D1336	speed loop integral time at Rigid tapping/ pulse position	Set speed loop integral time at Rigid tapping/ pulse position. The rigidity is higher with lower value	-	0-30000	-	Non-enabling
A3-37	-	save	-	-	-	-	-
A3-38	D1338	First positioning bais	Set First positioning bais	Pulse	0-65535	0	Non-enabling
A3-39	-	save	-	-	-	-	-
A3-40	D1340	Positioning speed	Look for encoder phase Z pulse or speed of the approach switch	rmp	0-20000	100	Non-enabling
A3-41	D1341	Positioning position ring acceleration tmie	Set Positioning position ring acceleration tmie	0.01s	0-20000	100	Non-enabling
A3-42	D1342	Positioning acceleration tmie	Set Positioning acceleration tmie	0.01s	0-20000	100	Non-enabling
A3-43	D1343	Positioning deceleration tmie	Set Positioning deceleration tmie	0.01s	0-20000	100	Non-enabling
A3-44	D1344	Positioning position ring scale gain	Set positioning position ring scale gain. the response to the position order gain is faster and the rigidity is higher with higher set value. A too high value may cause position overshoot when	-	0-30000	-	Non-enabling

			start stops. The effect is slower and the error increases with lower value.				
A3-45	D1345	Positioning speed ring scale gain	Set positioning speed ring PI regulator scale gain. the gain is greater and the rigidity is higher with higher set value	-	0-30000	-	Non-enabling
A3-46	D1346	Positioning speed ring integeral time	Set positioning speed ring PI regulator integral time. the integrating speed is greater and the rigidity is higher with smaller set value	-	0-30000	-	Non-enabling
A3-47	D1347	Second positioning bias	Set second positioning bias	Pulse	0-65535	1000	Non-enabling
A3-48 - A3-62	-	save	-	-	-	-	-
A3-63	D1363	Inching forward speed	Set Inching forward speed	Rmp	0-20000	200	Non-enabling
A3-64	D1364	Inching reverse speed	Set Inching reverse speed	Rmp	0-20000	200	Non-enabling
A3-65	D1365	Inching acceleration time	Set Inching acceleration time	0.01s	0-20000	100	Non-enabling
A3-66	D1366	Inching deceleration time	Set Inching deceleration time	0.01s	0-20000	100	Non-enabling
A3-67 - A3-99	-	Save	-	-	-	-	-

User parameters C1

Function code	PLC address	Name	Description	Unit	Parameter scope	original value	Property
C1-00	D6040	speed reverse order	0: do not reverse 1: reverse	-	0～1	0	on line
C1-01	D6041	speed ring acceleration	speed ring acceleration	0.01s/Krpm	0～20000	100	on line
C1-02	D6042	speed ring	speed ring	0.01s/Krp	0～20000	100	on line

		deceleration	deceleration	m			
C1-03	D6043	position operation feedback source	0: first code wheel (T5) 1: second code wheel (T4) 2: first pulse port (T2) 3: second pulse port (T3-24V)	-	0～3	0	non-enab ling
C1-04	D6044	position operation order source	0: invalid 1: first code wheel (T5) 2: second code wheel (T4) 3: first pulse port (T2) 4: second pulse port (T3-24V) 5: interior order	-	0～5	0	non-enab ling
C1-05	D6045	pulse speed order source	2:T4 3:T2 4:T3 other :invalid	-	0-5	0	non-enab ling
C1-06	D6046	positioning speed	positioning execute process maximum limit speed	rpm	0～30000	100	on line
C1-07	D6047	T-type positioning acceleration		0.01s/Krp m	0～30000	100	on line
C1-08	D6048	positioning direction	0: forward 1: reverse	-	0～1	0	on line
C1-09	D6049	first positioning gain	first gain during positioning, the gain is greater	-	0～30000	2	on line
C1-10	D6050	second positioning gain	second gain during positioning , the gain is smaller	-	0～30000	1	on line
C1-11	D6051	positioning gain switch speed threshold	positioning first gain and second gain switch threshold , when the residue distance is smaller than the value, switch to second gain , otherwise, use first gain	-	0～30000	100	on line
C1-12	D6052	positioning minimum speed	positioning crawlin end minimum speed	rpm	0～30000	1	on line

C1-13	D6053	third section positioning distance threshold	third section positioning distance threshold , when the residue distance is smaller than the parameter, conduct third section positioning operation	0.01R	0-30000	0.01	on line
C1-14	D6054	positioning reach scope	When positioning residue distance is smaller than the value, it is determined that the positioning is reached, and output positioning reach signal	pulse	0～30000	2	on line
C1-15	-	save	-	-	-	-	-
C1-16	D6056	precise positioning scope	When positioning residue distance is smaller than the value, it is determined that the precise positioning is reached, and output precise positioning reach signal	pulse	0～30000	1	on line
C1-17	D6057	swing forward scope	swing forward position	pulse	0～30000	100	on line
C1-18	D6058	swing reverse scope	swing reverse position	pulse	0～30000	100	on line
C1-19	D6059	swing speed upper limit	maximum speed during swing	rpm	0～6000	50	on line
C1-20	D6060	swing acceleration	acceleration during swing	s/krpm	0～30000	1	on line
C1-21	D6061	swing deceleration	deceleration during swing	s/krpm	0～30000	1	on line
C1-22	D6062	swing current	swing current	A	0～30000	0.5	on line
C1-23	D6063	phase to z phase positioning zero point source	0: select according to position order source 1: exterior I/O is taken as z phase signal	-	0, 1	0	non-enab ling
C1-24	D6064	z phase positioning positive and negative	Solve inconsistent issue of z phase large pulse width positive and	-	0-65535	0	enabling

		compensation	negative positioning position				
C1-25	D6065	positioning maximum deceleration	Take the deceleration as lower limit of deceleration after entering positioning module	-	0-20000	0.5	enabling
C1-26	-	save	-	-	-	-	-
～							
C1-28							
C1-29	D6069	order mode select	0: terminal operation mode 1: panel operation mode 2: mechatrolink bus order control 3: ethercat bus	-	0～3	0	non-enab ling
C1-30	D6070	control mode	0: speed control 1: position control 2: torque control	-	0～2	0	on line
C1-31	D6071	current ring KP	current ring scale parameter (KP)	-	0～30000	100	on line
C1-32	D6072	current ring TI	current ring integral time constant (TI)	-	0～30000	8	on line
C1-33	D6073	speed ring KP	speed ring scale parameter (KP)	-	0～30000	140	on line
C1-34	D6074	speed ring TI	speed ring integral time constant (TI)	-	0～30000	15	on line
C1-35	D6075	speed ring second set parameter valid threshold	second set PI parameter valid speed threshold , when the given speed is smaller than the maximum speed times the value percent, use second set parameter	-	0～1000	0	on line
C1-36	D6076	speed ring second KP	second speed gain (KP2)	-	0～30000	140	on line
C1-37	D6077	speed ring second TI	second speed integral time constant (TI2)	-	0～30000	15	on line
C1-38	D6078	position ring KP	second speed gain (KP2)	-	0～30000	300	on line
C1-39	D6079	position ring	position ring	-	0～100	100	on line

		feedforward	speed feedforward (kW)				
C1-40	D6080	d shaft current ring KP	current ring scale parameter (Kp)	-	0-30000	100	on line
C1-41	D6081	d shaft current ring TI	current ring integral time constant (Ti)	-	0-30000	800	on line
C1-42	D6082	voltage ring KP	voltage ring scale parameter (Kp)	-	0-30000	400	on line
C1-43	D6083	voltage ring TI	voltage ring integral time constant (Ti)	-	0-30000	40	on line

Motor driving parameter D1

Function code	PLC address	Name	Description	Unit	Parameter scope	original value	Property	Recommend motor
D1-00	D6090	rated current	motor rated current	A	0 ~ 60000	1100	non-enabling	synchronous / asynchronous
D1-01	D6091	rated speed	motor rated speed	rpm	0 ~ 30000	1500	non-enabling	synchronous / asynchronous
D1-02	D6092	rated voltage	motor rated voltage	V	0 ~ 3000	380	non-enabling	synchronous / asynchronous
D1-03	D6093	rated power	motor rated power	KW	0 ~ 30000	55	non-enabling	synchronous / asynchronous
D1-04	D6094	power factor	motor power factor angle	-	0 ~ 100	83	non-enabling	asynchronous
D1-05	D6095	rated frequency	motor rated frequency	HZ	0 ~ 30000	50	non-enabling	asynchronous
D1-06	D6096	stator resistance	the parameter is save parameter , shall not be used	-	0-30000	0	non-operational	asynchronous
D1-07	D6097	Sigma inductor	the parameter is save parameter , shall not be used	-	0-30000	0	non-operational	asynchronous
D1-08	D6098	rotor resistance	the parameter is save parameter , shall not be used	-	0-30000	0	non-operational	asynchronous
D1-09	D6099	number of pole-pairs	motor number of pole-pairs	pairs	0 ~ 30000	2	non-enabling	synchronous /asynchronous
D1-10	D6100	magnetic head inductor	the parameter is save parameter , shall not be used	-	0-30000	0	non-operational	asynchronous

D1-11	D6101	motor protect mode	the parameter is save parameter , shall not be used	-	0-30000	0	non-operational	asynchronous
D1-12	D6102	motor protect rated current	motor protect point current	A	0 ~ 60000	1100	non-enabling	synchronous /asynchronous
D1-13	D6103	magnetization current	the parameter is save parameter , shall not be used	-	0-30000	0	non-operational	asynchronous
D1-14	D6104	rated torque	motor rated torque	nm	0 ~ 30000	35	non-enabling	synchronous /asynchronous
D1-15	D6105	FU maximum torque	the parameter is save parameter , shall not be used	-	0-30000	0	non-operational	asynchronous
D1-16	D6106	maximum torque angular speed	the parameter is save parameter , shall not be used	-	0-30000	0	non-operational	asynchronous
D1-17	D6107	maximum torque speed	the parameter is save parameter , shall not be used	-	0-30000	0	non-operational	asynchronous
D1-18	D6108	weak field area speed	the parameter is save parameter , shall not be used	-	0-30000	0	non-operational	asynchronous
D1-19	D6109	magnetic flux adaptation factor	the parameter is save parameter , shall not be used	-	0-30000	0	non-operational	asynchronous
D1-20	D6110	weak field area current curve	Qd current maximum scale	-	0 ~ 30000	10	non-enabling	asynchronous
D1-21	D6111	rotating-speed difference compensation multiplying power coefficient	rotating-speed difference compensation multiplying power coefficient, multiply by 256	-	0 ~ 30000	224	non-enabling	asynchronous
D1-22	D6112	rotor time constant	rotor time constant	-	0 ~ 30000	50	non-enabling	asynchronous
D1-23	D6113	rotating-speed difference maximum compensation	rotating-speed difference compensation upper limit	-	0 ~ 30000	65	non-enabling	asynchronous

D1-24	D6114	synchronous motor counter potential per 1000 turns	synchronous motor no-load counter potential per 1000 turns	V	0 ~ 30000	110	non-enabling	synchronous
D1-25	D6115	Allowed output maximum speed	Allowed output maximum speed	rpm	0 ~ 30000	6000	non-enabling	synchronous /asynchronous
D1-26	D6116	Allowed output maximum current	Allowed output maximum torque current	A	0 ~ 60000	1100	on line	synchronous /asynchronous
D1-27	D6117	Constant power zone maximum speed	Interface speed between Constant power zone and falling power zone	rpm	0 ~ 30000	3000	non-enabling	asynchronous
D1-28	D6118	pre-excitation time	motor pre-excitation time	ms	0 ~ 30000	300	non-enabling	asynchronous
D1-29	D6119	minimum excitation current	excitation current lower limt	0.01A	0 ~ 30000	100	non-enabling	
D1-30	D6120	motor type select	0: synchronous motor 1: asynchronous motor	-	0, 1	1	non-enabling	synchronous /asynchronous
D1-31	D6121	brake torque limit	brake torque current limit	-	0-60000	100	non-enabling	synchronous /asynchronous
D1-32	D6122	PMflux-weakening curve	Suitable for k curve slope during flux-weakening of embeddedpermanent magnet motor flux-weakening	-	0-10000	100	non-enabling	synchronous
D1-33	D6123	PM flux-weakening direction	Suitable fordirection control during flux-weakening of embeddedpermanent magnet motor	-	0-1	0	non-enabling	synchronous
D1-34 ~ D1-37	-	save	-	-	-	-	-	-
D1-38	D6128	brake torque limit enabling	0: do not use brake torque single parameter	-	0-1	0	non-enabling	synchronous /asynchronous

			1: use smart torque single parameter					
D1-39	D6129	carrier wave cycle	0: 8k 1: 4k 2: 2k	-	0～2	0	power on again	synchronous /asynchronous

Encoder parameter E1

Function code	PLC address	Name	Description	Unit	Parameter scope	Original value	Property
E1-00	D6130	Motor encoder type (T5)	0: TTL 1: resolver 2: Tamagawa multiple turns encoder 3: bissprotocol 4: only increment encoderof ABZ is used for synchronous motor	-	0～4	0	Power on again
E1-01	D6131	Motor optoelectronic code wheel line number (T5)	Motor TTL encoder line number	Pulse	0～10000	2500	Power on again
E1-02	D6132	Encoder counting direction (T5)	0: anticlockwise adding counting 1: anticlockwise minus counting	-	0～1	0	On line
E1-03	D6133	Encoder reduction ratio numerator (T5)	一 code wheel reduction ratio numerator	-	0～30000	1	Non-enabling
E1-04	D6134	Encoder reduction ratio denominator (T5)	一 code wheel reduction ratio denominator	-	0～30000	1	Non-enabling
E1-05	D6135	Speed feedback filtering times (T5)	Speed feedback filtering times	-	0～256	60	Non-enabling
E1-06	D6136	Encoder angle forward offset value (T5)	Angle forward offset	Pulse	0～30000	0	Non-enabling
E1-07	D6137	Encoder angle reverse offset value (T5)	Angle reverse offset	Pulse	0～30000	0	Non-enabling
E1-08	D6138	Motor absolute value encoder single round bits / resolver single round bits (T5)	Motor absolute value encoder /resolver single round bits	-	0～32	17	Power on again
E1-09	D6139	Motor absolute value encoder multiple turns bits (T5)	Multiple turns absolute value encoder multiple turns bits	-	0～32	16	Power on again
E1-10	D6140	Resolver /absolute value encoder initial angle record lower 16 bits (T5)	Motor resolver initial phase angle lower 16 bits	-	0～65535	0	Read only

E1-11	D6141	Resolver /absolute value encoder initial angle record higher 16 bits (T5)	Motor resolver initial phase angle higher 16 bits	-	0～65535	0	Read only
E1-12	D6142	Driver encoder self-learning order (T5)	If the Feed shaft has absolute value encoder , self-learning initial angle function , modify it to 123, and may start self-learning	-	0～200	0	Non-enabling
E1-13	D6143	Encoder self-learning time	Set self-learning time , the learing effect is better for longer learing time, and minimum time is 1s	S	0-20	5	Non-enabling
E1-14	D6144	Encoder power on automatic learning	Suitable for E1-00=4 situation set as 1: valid 0: invalid	-	0-1	0	Power on again
E1-15	D6145	Second code wheel types (T4)	0: invalid 1: orthogonal 2: PULSE+DIR 3: CW+CCW	-	0 ~ 3	0	Power on again
E1-16	D6146	Second encoder line number (T4)	External tow code wheel line number	Pulse	0 ~ 30000	1024	Power on again
E1-17	D6147	Second encoder counting direction (T4)	0: anticlockwise adding counting 1: anticlockwise minus counting	-	0 ~ 1	0	On line
E1-18	D6148	Second encoder reduction ratio numerator (T4)	Second code wheel reduction ratio numerator	-	1 ~ 30000	1	Non-enabling
E1-19	D6149	Second encoder reduction ratio denominator (T4)	Second code wheel reduction ratio denominator	-	1 ~ 30000	1	Non-enabling
E1-20	D6150	Second encoder filtering time (T4)	Second code wheel speed feedback filtering times	Ms	0 ~ 10000	1	Non-enabling
E1-21	D6151	Pulse input port 1type (T2)	0: invalid 1: orthogonal 2: PULSE+DIR 3: CW+CCW	-	0 ~ 3	0	Power on again
E1-22	D6152	Pulse 1line number (T2)	For calculating input speed	Pulse	0 ~ 30000	1024	Power on again
E1-23	D6153	Pulse 1encoder counting direction (T2)	0: anticlockwise adding counting 1: anticlockwise minus counting	-	0 ~ 1	0	On line
E1-24	D6154	Pulse 1 electronic gear ratio numerator (T2)	First pulse port reduction ratio numerator	-	1 ~ 30000	1	Non-enabling
E1-25	D6155	Pulse 1 electronic gear ratio denominator (T2)	First pulse port reduction ratio denominator	-	1 ~ 30000	1	Non-enabling
E1-26	D6156	Pulse 1 speed feedback filtering time	First pulse port speed feedback filtering times	Ms	0 ~ 10000	1	Non-enabling

		(T2)					
E1-27	D6157	Pulse input port 2type (T3-24V)	0: iomode 1: orthogonal 2: PULSE+DIR 3: CW+CCW	-	0 ~ 3	0	Power on again
E1-28	D6158	Pulse 2 encoder line number (T3-24V)	For calculating input speed	Pulse	0 ~ 30000	1024	Power on again
E1-29	D6159	Pulse 2 encoder counting direction (T3-24V)	0: anticlockwise adding counting 1: anticlockwise minus counting	-	0 ~ 1	0	On line
E1-30	D6160	Pulse 2 electronic gear ratio numerator (T3-24V)	Second pulse port reduction ratio numerator	-	1 ~ 30000	1	Non-enabling
E1-31	D6161	Pulse 2 electronic gear ratio denominator (T3-24V)	Second pulse port reduction ratio denominator	-	1 ~ 30000	1	Non-enabling
E1-32	D6162	Pulse 2 speed feedback filtering time (T3-24V)	Second pulse port speed feedback filtering times	Ms	0 ~ 10000	1	Non-enabling
E1-33	D6163	1 code wheel absolute value encoder pulse output bits	Output bits =17 - E1.32	-	0 ~ 9	2	On line
E1-34	D6164	1 code wheel passing Z times lower 16 bits (T5)	Record 1 code wheel passing z times , add 1 to the value each time the 1 code wheel passing, counting lower 16 bits	-	0 ~ 65535	0	Read only
E1-35	D6165	1 code wheel passing Ztimes higher 16 bits (T5)	Record 1 code wheel passing z times , add 1 to the value each time the 1 code wheel passing, counting higher 16 bits	-	0 ~ 65535	0	Read only
E1-36	D6166	2 code wheel passing Z times lower 16 bits (T4)	Record 2 code wheel passing z times , add 1 to the value each time the 2 code wheel passing, counting lower 16 bits	-	0 ~ 65535	0	Read only
E1-37	D6167	2 code wheel passing Z times higher 16 bits (T4)	Record 2 code wheel passing z times , add 1 to the value each time the 2 code wheel passing,higher 16 bits	-	0 ~ 65535	0	Read only
E1-38	D6168	Interior synchronous order reduction ratio numerator	Interior synchronous order reduction ratio numerator	-	1 ~ 30000	1	Non-enabling
E1-39	D6169	Interior synchronous order reduction ratio denominator	Interior synchronous order reduction ratio denominator	-	1 ~ 30000	1	Non-enabling
E1-40	D6170	2 code wheel speed reduction ratio numerator	2 code wheel speed reduction ratio numerator	-	1-30000	1	Non-enabling
E1-41	D6171	2 code wheel	2 code wheel speed	-	1-30000	1	Non-enabling

		speed reduction ratio denominator	reduction ratio denominator				
E1-42	D6172	3 code wheel speed reduction ratio numerator	3 code wheel speed reduction ratio numerator	-	1-30000	1	Non-enabling
E1-43	D6173	3 code wheel speed reduction ratio denominator	3 code wheel speed reduction ratio denominator	-	1-30000	1	Non-enabling
E1-44	D6174	4 code wheel speed reduction ratio numerator	4 code wheel speed reduction ratio numerator	-	1-30000	1	Non-enabling
E1-45	D6175	4 code wheel speed reduction ratio denominator	4 code wheel speed reduction ratio denominator	-	1-30000	1	Non-enabling
E1-46	D6176	Absolute value underclocking use	Absolute value encoder underclocking use fractional frequency parameter , set as fractional frequency number	-	0-32	0	Power on again

Protection parameter P1

Function code	PLC address	Name	Description	Unit	Parameter scope	original value	Property
P1-00	D6180	single shaft fault shielding	0: invalid 1: shielding	-	0, 1	0	non-enabling
P1-01	D6181	bus voltage overvoltage alarm point	When bus voltage exceeds the value , alarm overvoltage OV1	V	0～1000	800	non-enabling
P1-02	D6182	bus voltage undervoltage alarm point	When bus voltage is lower than the value , alarm undervoltage UV1	V	0～1000	400	non-enabling
P1-03	D6183	encoder alarm shielding	0: start 1: shielding EL EB EC	-	0, 1	0	non-enabling
P1-04	D6184	PUalarm shielding	0: start 1: shielding PU	-	0, 1	0	non-enabling
P1-05	D6185	motor overheating alarm	0: normally closed 1: normally open 2: Do not alarm OH3	-	0～2	0	non-enabling
P1-06	D6186	motor speed alarm point	speed protect alarm upper limit	rpm	0～30000	2000	non-enabling
P1-07	D6187	overspeed alarm shielding	0: start 1: shielding OS	-	0, 1	0	non-enabling
P1-08	D6188	speed error oversize alarm shielding	0: start 1: shielding SE	-	0, 1	0	non-enabling
P1-09	D6189	follow-up error overproof alarm shielding	0: start 1: shielding OP	-	0, 1	0	non-enabling
P1-10	D6190	position follow-up error overproof threshold	position pulse counter overproof	pulse	0～30000	24	non-enabling
P1-11	D6191	overload alarm time setting	When overload signal lasting time is longer than the value,alarm OL2	s	0～10000	30	on line
P1-12	D6192	speed error alarm threshold	When speed error is over the value, alarm SE	rpm	0～30000	20	on line
P1-13	D6193	resolver fault determining filtering time	When resolver fault signal is kept over the time, alarm EL	ms	0-20000	5	on line
P1-14	-	save	-	-	-	-	-
P1-15	D6195	Big and small CPU heartbeat detection start	0: shielding 1: start	-	0-1	0	on line
P1-16	D6196	encoder communication calibration error counting	encoder communication calibration error counting display	-	-	0	read only
P1-17	D6197	resolver fault error counting	resolver fault error counting display	-	-	0	read only

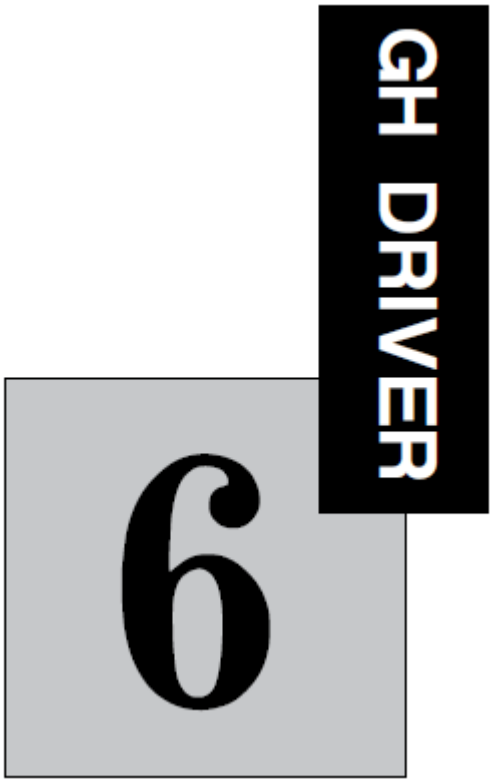
Communication parameter T1

Function code	PLC address	Name	Description	Unit	Parameter scope	original value	Property
T1-00	D6210	modbus communication station No.	modbus station No. setting	-	0～255	1	power on again
T1-01	D6211	modbus Baud rate communication	For example 38400-->38.4	-	0～65535	0	power on again
T1-02	D6212	modbus odd-even check	0: none check 1: even check 2: odd check	-	0～2	0	power on again
T1-03	D6213	modbus high-low bytes select	0: lower at front 1: higher at front	-	0, 1	0	power on again
T1-04	D6214	485 terminal resistance select	0: none 1: select	-	0, 1	0	power on again
T1-05	-	save	-	-	-	-	-
T1-06	D6216	ETHERCAT protocol select	0: Feiyang 1: ZTE	-	0-1	0	power on again
T1-07	-	save	-	-	-	-	-
T1-08	D6218	ECAT bus brake turn off delay	brake turn off delay	ms	0-1	0	on line
T1-09	D6219	ECATbus external sudden stop enabling	0: turn off 1: turn on	-	0-2	0	on line
T1-10	-	save	-	-	-	-	-
～							
T1-19							
T1-20	D6230	Mechatrolinkstation No.set	Mechatrolinkstation No.set	-	0～255	1	power on again
T1-21	D6231	Mechatrolink protocol select	0: old protocol 1: new protocol	-	0-1	0	on line
T1-22	D6232	Mechatrolink latch real-time	0: real-time 1:non- real-time updating	-	0-1	0	on line
T1-23	D6233	Mechatrolink feedback source	0: T5 1: T4	-	0-1	0	on line
T1-24 ～ T1-49	-	save	-	-	-	-	-
T1-50	D6260	CAN station No.set	CANstation No.set	-	0～255	1	power on again
T1-51	D6261	CAN terminal resistance select	CAN terminal resistance select	-	0, 1	0	on line
T1-52	D6262	CAN slave station number select	slave station number select , for example, 5 indicates 5 slave stations, 0 indicates 0 slave stations	-	0～9	1	on line
T1-53	D6263	CAN communication task cycle set	When the value is 0, adjust cycle operation by the default 2ms. And set time resolution as 0.1ms, I.e. it is 1ms when set as 10 and the minimum set is 0.5ms.	0.1ms	0-30000	0	non-enabling

Manufacturer parameter L1

Function code	PLC address	Name	Description	Unit	Parameter scope	original value	Property
L1-00	D6430	base power modification password	base EE modify power number permission password , password is 6533, it may only be modified by professional	-	0～60000	0	non-enabling
L1-01	D6431	base power number	base EE read power number , the value is generally read only , however, it may be modified when L1-00 equals to 6533, and saved to EE	-	0～255	0	power on again
L1-02	D6432	enabling valid	When the value is 1, it may be enabled , otherwise, it may not be enabled	-	0, 1	1	on line
L1-03	D6433	I11 I12 function select	0: common I/O 1: 24V pulse port	-	0, 1	0	power on again
L1-04	D6434	interior position order	interior position order	pulse	0～65535		
L1-05	D6435	driver current sampling coefficient	current sampling coefficient, key parameter during current ring current calculation , for example , for 15A Hall module, the value is 150, for 50A Hall module, it is 500, the parameter read EE through main CPU, and then transfer the corresponding Hall value to assign	-	0～50000	0	read only
L1-06	D6436	driver alarm code	alarm code , refer to alarm table	-	0～255	0	read only
L1-07	D6437	driver d shaft current feedback	D shaft current feedback	A	0～1000	0	read only
L1-08	D6438	driver U phase current sampling value	U phase current sampling AD value	-	0～4095	0	read only
L1-09	D6439	driver V phase current sampling value	V phase current sampling ADvalue	-	0～4095	0	read only
L1-10	D6440	driver temperature curve	0: by power code 1: 0No.temperature curve 2: 1No.temperature curve 3: 2No.temperature curve	-	0-3	0	power on again
L1-11	D6441	driver voltage grade	380v, 220v are optional	V	0-2000	380	on line
L1-12	D6442	small CPU 下 program order	When the value is set as 200, etner the small CPU download program	-	0～200	0	power on again
L1-13	D6443	smart card use select	0: do not use 1: use	-	0, 1	0	non-enabling
L1-14	D6444	small CPU fault code	0: none alarm Refer to alarm table for others	-	0～30000	0	read only
L1-15	D6445	input point state L	input point state lower 8 bits	-	0～30000	0	read only
L1-16	D6446	input point state H	input point state higher 8 bits	-	0～30000	0	read only
L1-17	D6447	output point state	output point state	-	0～30000	0	read only
L1-18	D6448	Data after FI	digital quantity af 0-10V	-	0～4095	0	read only

		calibration	analog quantity calibration				
L1-19	D6449	Data after FV calibration	digital quantity after ambipolar V analog quantity calibration	-	0～4095	0	read only
L1-20	D6450	multiple turns absolute value encoder multiple turns counting clearing	multiple turns encoder turn number clearing order , when the value is 1, clear the turn number, the parameter clears automatically after clearing	-	0, 1	0	只写
L1-21	D6295	qshaft current order	qshaft current order , resolution 0.01A	A	0～30000	0	on line
L1-22	D6452	current filtering times	set current filtering times	-	0-200	0	on line
L1-23	D6453	increment position order	During manual adjustment , increment position order	pulse	0～30000	0	on line
L1-24	D6454	DA1	DA1output digital quantity	-	0～4095	0	read only
L1-25	D6455	DA2	DA2output digital quantity	-	0～4095	0	read only
L1-26	D6456	driver module temperature	driver module temperature	℃	0～100	0	read only
L1-27	D6457	CPU temperature	CPU temperature	℃	0～100	0	read only
L1-28	D6458	multiple turns absolute value encoder reset value lower 16 bits	absolute value save the reset value during encoder reset and use for next powering on , lower 16 bits	-	0～65535	0	read only
L1-29	D6459	multiple turns absolute value encoder reset value higher 16 bits	absolute value save the reset value during encoder reset and use for next powering on ,higher 16 bits	-	0～65535	0	read only
L1-30	D6460	PLC scan cycle	PLC operation cycle	us	0～65535	0	read only
L1-31	D6461	A2, A3properties	0: writing and reading of A2, A3 are positivery constant values 1: writing and reading of A2, A3 are addresses of the correspongding parameter	-	0, 1	0	on line
L1-32	D6462	use time limit enabling	0: turn off the function 1: start function	-	0, 1	0	on line
L1-33	D6463	use time limit		h	0～30000	0	on line
L1-34	D6464	ETHECATsudden stop deceleration	Deceleration when sudden stop is pressed in EHTECAT mode	s/krpm	0～60000	1	on line
L1-35	D6465	PLC minimum execute cycle	record minimum execute cycle during PLC during operation	us	-	0	read only
L1-36	D6466	PLC maximum execute cycle	record maximum execute cycle during PLC operation	us	-	0	read only
L1-37	D6467	IO interruption edge configuration	Configuration by bit : 0: fall 1: rise bit0 : I2 bit1 : I3 bit2 : I4 bit3 : I5	-	-	0	on line
L1-38	D6468	IO INTERRUPTION enabling	start by bit , 0: none 1: enabling bit0 : I2 bit1 : I3 bit2 : I4 bit3 : I5	-	-	0	on line



Set parameter by function

The chapter helps user for parameter setting and debugging by function of use

6.1 Analog speed control

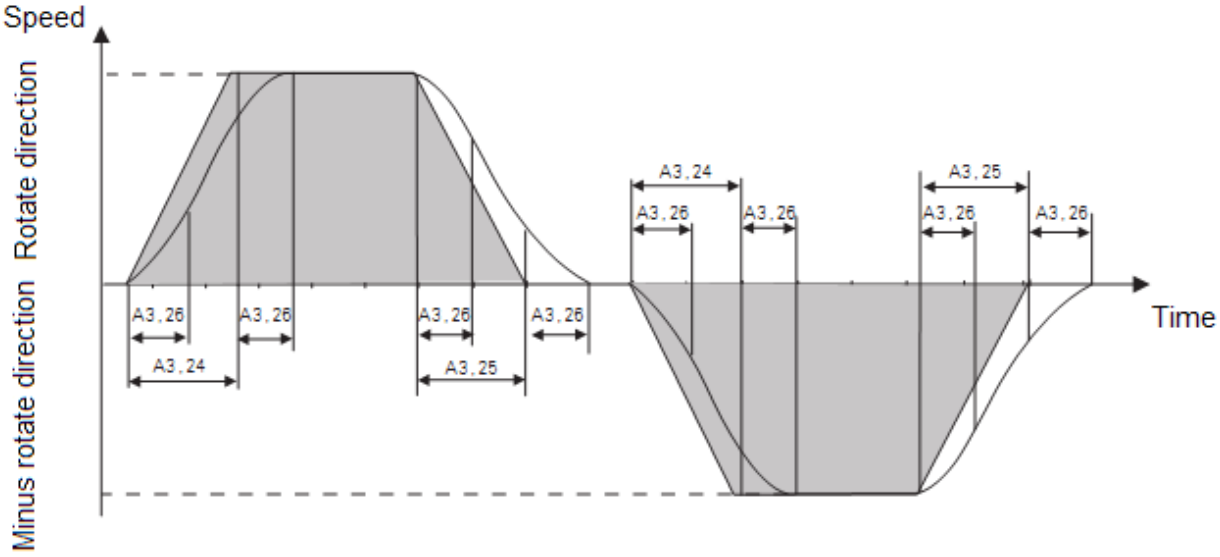
6.1.1 Terminal definition and function parameters

Analog value	Port	Signal	Function	position control parameter needs to be modified
±10V analog voltage	T2	FV	±10V analog voltage input	A2-01=0 A2-15=0
		FC	Analog voltage input common terminal	
	T3	ST	Servo enabling	
		I1	Operation enabling (forward or reverse is determined by polarity of the analog voltage)	
0~10V analog voltage	T2	FI	0~10V analog voltage input	A2-01=0 A2-15=0
		FC	Analog voltage input common terminal	
	T3	ST	Servo enabling	
		I1	Forward	
		I2	Reverse	

6.1.2 Relevant parameters of analog speed control

Function parameter	Item	Description	Set range	Unit	Factory setting
A3-23	maximum output speed during speed control	input corresponding speed for 10V analog voltage	0～16000	rpm	—
A3-24	Acceleration time during speed control	set motor acceleration time during speed control	0～300	0.01s	-
A3-25	Deceleration time during speed control	set motor deceleration time during speed control	0～300	0.01s	-
A3-27	speed ring ratio proportional gain during speed control	set speed ring ratio PI regulator proportional gain, the value is higher, the gain is higher and the rigidity is greater. Set the parameter as high adapt possible without vibration generated by the system.	0～30000	—	—
A3-28	Speed integral gain during speed control	set speed ring ratio PI regulator integral gain, the value is higher, the integral speed is higher and the rigidity is greater.	0～30000	—	—

6.1.3 Acceleration and deceleration control curve



6.1.4 Analog calibration and relevant parameter

Function code	Item	Description	Set range	Unit	Factory setting
A1-13	Minimum calibration value limit	Calibration is invalid when the analog quantity calibration speed is lower than the value	0-10000	-	0
A1-14	Calibration error scope	Allowed error scope percent of the analog quantity calibration	0-100	-	0
A1-15	Auto/manual	0: automatic calibration 1: manual calibration	0-1	-	0
A1-16	Calibration positive bias	Set manual calibration positive bias of analog quantity	0-65520	LSB	0
A1-17	Calibration negtive bias	Set manual calibration negtive bias of analog quantity	0-65520	LSB	0
A1-18	FI analog quantity sampling value	FV analog quantity input voltage value monitoring	0-10	0.1V	0
A1-19	FV analog quantity sampling value	FV analog quantity input voltage value monitoring	-20	0.1V	0
A1-20	FV calibration order	Set FV analog quantity calibration speed	0-65535	rmp	0
A1-21	FI calibration order	Set FI analog quantity calibration speed	0-65535	rmp	0
A1-22	FT calibration order	Set FT analog quantity calibration speed	0-65535	rmp	0
A1-23	Analog quantity channel selection	0: no selection 1: FV 2： FI 3：FV FI FT	0-3	-	0
A1-24	Analog quantity filtering times	Set analog quantity filtering times	0-4000	Times	2000
A1-25	Analog zero speed deadzone	It is considered as 0 speed when the analog quantity is less than the value	0-65520	LSB	0
A1-26	Analog maximum speed	The analog quantity corresponding to the maximum speed	0-30000	rmp	1000

A1-30	Input filtering time	Calculation method: A1-30*0.5ms	0-30000	0.5ms	0
A1-33	The middle value function of the analog quantity under initial calibration is started or not ?	0: do not start 1: start	0-1	-	1

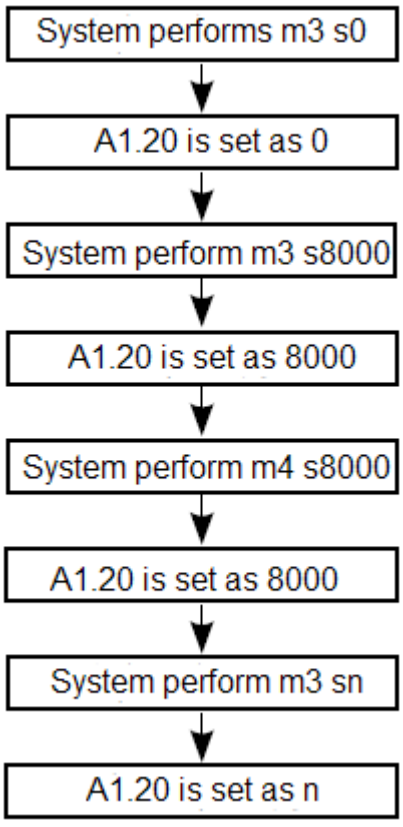
6.1.5 Analog calibration description

Analog calibration is a function for keeping the speed performed by driver consistent with the speed orders issued by the CNC system, and reduce speed deviation as possible. When deviation occurs between the speed performed by driver and the speed orders issued by the CNC system, analog calibration is required.

Unit of analog calibration is rpm. The system input 0 speed order in MDI mode, A1.20 is set as 0, and the calibration begins, and then corresponding speed order shall be issued by the system for the point want to be calibrated, and the A1.20 shall be set as the corresponding data. Each time A1.20 is updated, driver automatically calculates calibration factor again, and the detail practice is as follows:

For example: the system executes M3 S3000 order, the drive displays F. 2990, the deviation between actual operating speed and order issued by the system is 10 rounds. At this time, set parameter A1.20=3000 (the method of reverse calibration is same as forward calibration. The parameter is set as A1.20=3000 when the system execute M3 S3000).

The calibration operation flow chart is as follows(taking maximum speed A3.23=8000rpm as sample) :



Note: during first calibration (i.e., A1.20=0), the maximum speed corresponding to ±10V must be set before setting the other speeds.

6.2 Pulse speed control

6.2.1 Terminal definition and function parameters

Pulse	Port	Signal	Function	Position control parameter needs to be modified
Orthogonal pulse	T3	ST	Servo enabling	
		I1	Pulse speed enabling (forward or reverse is determined by direction of the pulse)	
		I11	High speed pulse phase A input	A2-15=1 A2-17=2 E1-27=1
		I12	High speed pulse phase B input	
	T4	SA+	Orthogonal Pulse phase A input	A2-15=1 A2-17=0 E1-15=1
		SA-		
		PB+	Orthogonal Pulse phase B input	
		PB-		
	T2	PA+	Orthogonal Pulse phase A input	A2-15=1 A2-17=1 E1-17=1
		PA-		
		DB+	Orthogonal Pulse phase B input	
		DB-		
Direction + pulse	T3	ST	Servo enabling	
		I1	Pulse speed enabling (forward or reverse is determined by direction of the pulse)	
		I11	Pulse signal input	A2-15=1 A2-17=2 E1-27=2
		I12	Direction signal input	
	T4	SA+	Pulse signal input	A2-15=1 A2-17=0 E1-15=2
		SA-		
		PB+	Direction signal input	
		PB-		
	T2	PA+	Pulse signal input	A2-15=1 A2-17=1 E1-17=2
		PA-		
		DB+	Direction signal input	
		DB-		

6.2.2 Relevant parameters of pulse speed control

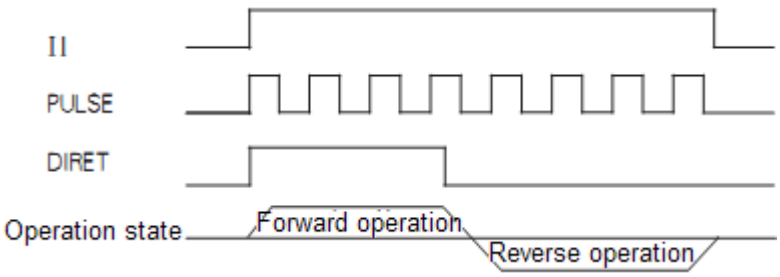
Function parameter	Item	Description	Set range	Unit	Factory setting
A3-24	speed control acceleration time	Set speed control acceleration time	0-300	0.01s	-
A3-25	speed control deceleration time	Set speed control deceleration time	0-300	0.01s	-
A3-27	Speed control scale gain	Set speed loop regulator scale gain. The gain is higher and the rigidity is bigger with greater value. Set the value as high as possible without vibration in the system	0-30000	-	-
A3-28	Speed control integral time	Set speed ring PI regulator integral time. The rigidity is higher with lower value	0-30000	-	-

6.2.3 Pulse control sequence chart

Please see the following table for single pulse control interface, and see the right diagram for control sequence.

Control terminal	Function
SA+	PULSE +
SA-	PULSE -
PB+	DIR+
PB-	DIR-

Pulse interface of CNC system and GH X series

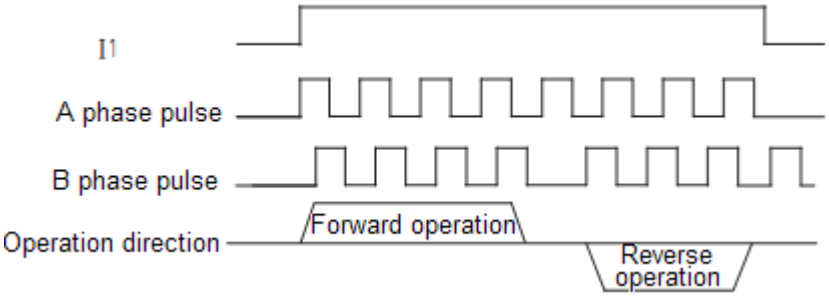


Single pulse input sequence chart

Please see the following table for dual pulse control interface, and see the right diagram for control sequence.

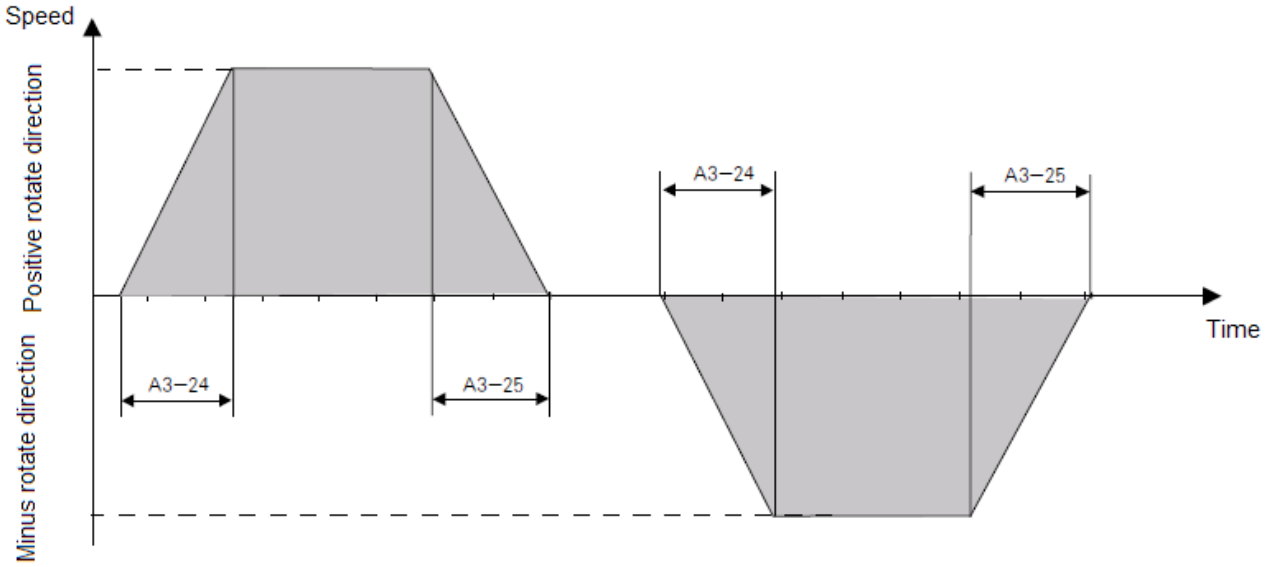
Control terminal	Function
SA+	PA+
SA-	PA -
PB+	PB+
PB-	PB -

Pulse interface of CNC system and GH X series



Dual pulse input sequence chart

6.2.4 Acceleration and deceleration control curve



6.3 Analog rigid tapping

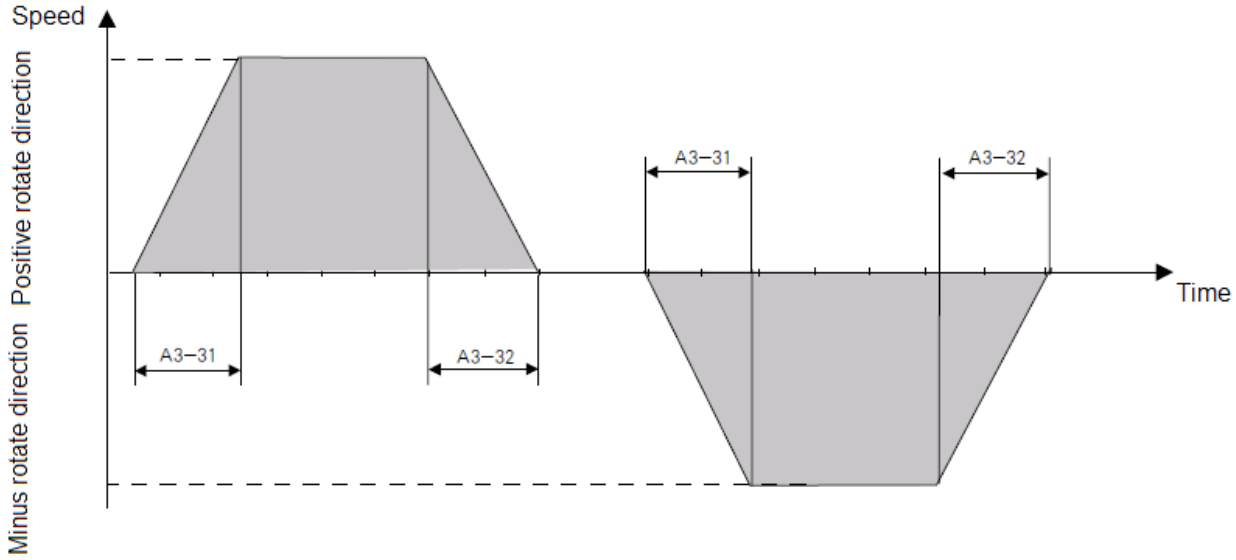
6.3.1 Terminal definition and function parameters

Pulse	Port	Signal	Function	position control parameter needs to be modified
±10V analog voltage	T1	FV	±10V analog voltage input	A2-01=0 A2-19=0
		FC	Analog voltage input common terminal	
	T3	ST	Servo enabling	
		I4	Rigid tapping (forward or reverse is determined by polarity of the analog voltage)	

6.3.2 Relevant parameters of analog rigid tapping

Function parameter	Item	Description	Set range	Unit	Factory setting
A3-30	maximum speed during rigid tapping	set maximum speed of motor during rigid tapping /pulse position control	0～16000	rpm	1500
A3-31	acceleration time during rigid tapping	Set acceleration time of motor during rigid tapping /pulse position control	0～300	0.01s	-
A3-32	deceleration time during rigid tapping	set deceleration time of motor during rigid tapping	0～300	0.01s	-
A3-35	speed ring integral gain during rigid tapping	set speed ring integral gain during rigid tapping, the value is higher, the integral speed is higher and the rigidity is greater.	0～32767	—	-
A3-36	zero speed gain during rigid tapping	set speed ring regulator proportional gain during rigid tapping，the value is higher, the gain is higher and the rigidity is greater.	0～32767	—	-

6.3.3 Acceleration and deceleration control curve



6.4 Pulse rigid tapping /pulse position

6.4.1 Terminal definition and function parameters

Pulse	Port	Signal	Function	Position control parameter needs to be modified
Orthogonal pulse	T3	ST	Servo enabling	
		I4	Pulse position enabling	
		I11	High speed pulse phase A input	A2-19=1 A2-17=2 E1-27=1
		I12	High speed pulse phase B input	
	T4	SA+	Orthogonal Pulse phase A input	A2-19=1 A2-17=0 E1-15=1
		SA-		
		PB+	Orthogonal Pulse phase B input	
		PB-		
	T2	PA+	Orthogonal Pulse phase A input	A2-19=1 A2-17=1 E1-17=1
		PA-		
		DB+	Orthogonal Pulse phase B input	
		DB-		
Direction + pulse	T3	ST	Servo enabling	
		I4	Pulse position enabling	
		I11	Pulse signal input	A2-19=1 A2-17=2 E1-27=2
		I12	Direction signal input	
	T4	SA+	Pulse signal input	A2-19=1 A2-17=0 E1-15=2
		SA-		
		PB+	Direction signal input	
		PB-		
	T2	PA+	Pulse signal input	A2-19=1 A2-17=1
		PA-		

		DB+	Direction signal input	E1-17=2
		DB-		

6.4.2 Relevant parameters of pulse rigid tapping /pulse position

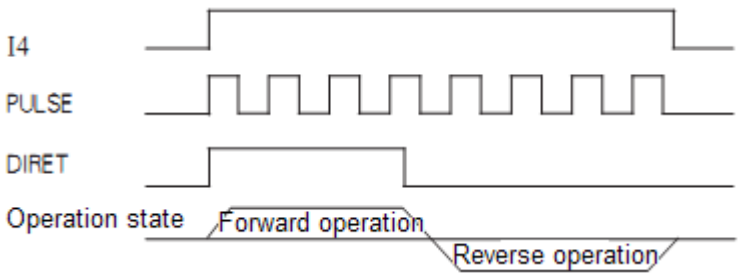
Function parameter	Item	Description	Set range	Unit	Factory setting
A3-30	Rigid tapping/ pulse position maximum speed time	Set the maximum speed of motor during Rigid tapping/ pulse position control	0-16000	rmp	1500
A3-33	Position loop feed-forward at Rigid tapping/ pulse position	The position ring response is faster when the value is greater	0-100	-	-
A3-34	Position loop scale gain at Rigid tapping/ pulse position	The position ring rigidity is higher when the value is greater	0-30000	-	-
A3-35	speed loop scale gain at Rigid tapping/ pulse position	Set speed loop scale gain at Rigid tapping/ pulse position. The gain is higher and the rigidity is bigger with greater value. Set the value as high as possible without vibration in the system	0-30000	-	-
A3-36	speed loop integral time at Rigid tapping/ pulse position	Set speed loop adjuster integral time at Rigid tapping/ pulse position. The rigidity is higher with lower value	0-30000	-	-

6.4.3 Pulse control sequence chart

Please see the following table for single pulse control interface, and see the right diagram for control sequence.

Control terminal	Function
SA+	PULSE +
SA-	PULSE -
PB+	DIR+
PB-	DIR-

Pulse interface of CNC system and GH X series

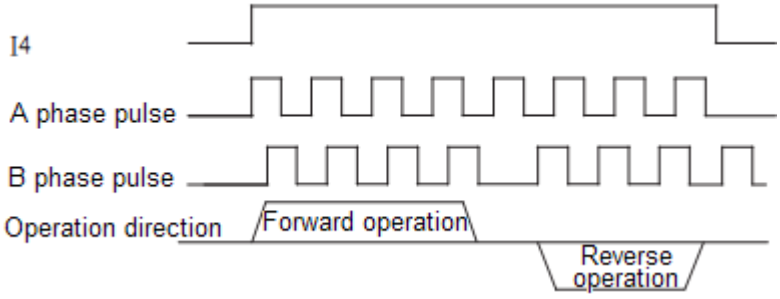


Single pulse input sequence chart

Please see the following table for dual pulse control interface, and see the right diagram for control sequence.

Control terminal	Function
SA+	PA+
SA-	PA -
PB+	PB+
PB-	PB -

Pulse interface of CNC system and GH X series



Dual pulse input sequence chart

6.5 Accurate stop

6.5.1 Terminal definition and function parameters

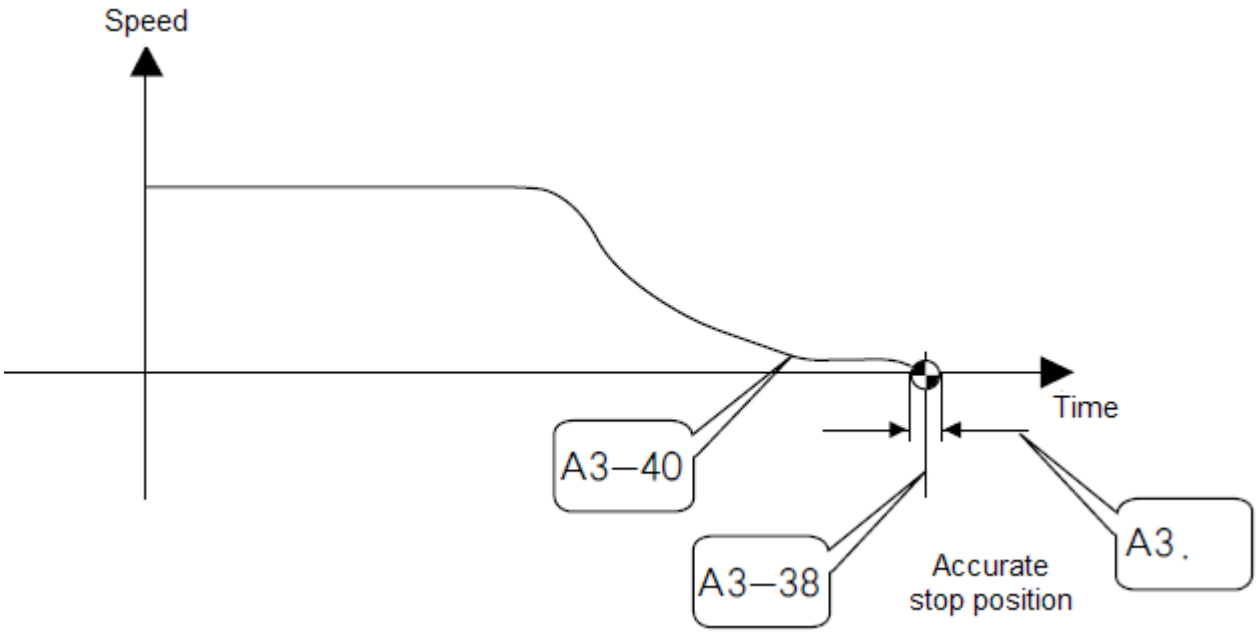
Accurate stop	Port	Signal	Function	position control parameter needs to be modified
Built-in encoder accurate stop	T3	ST	Servo enabling	A2.03=0
		I3	accurate stop	
External encoder accurate stop	T3	ST	Servo enabling	A2.03=1
		I3	accurate stop	
Second accurate stop	T3	ST	Servo enabling	A2.03=0/1/2
		I3	accurate stop	
		I5	Approach switch input point	
		I9	Second accurate stop symbol	
Approach switch accurate stop	T3	ST	Servo enabling	A2.03=2
		I3	accurate stop	
		I5	Approach switch input point	

6.5.2 Relevant parameter of accurate stop

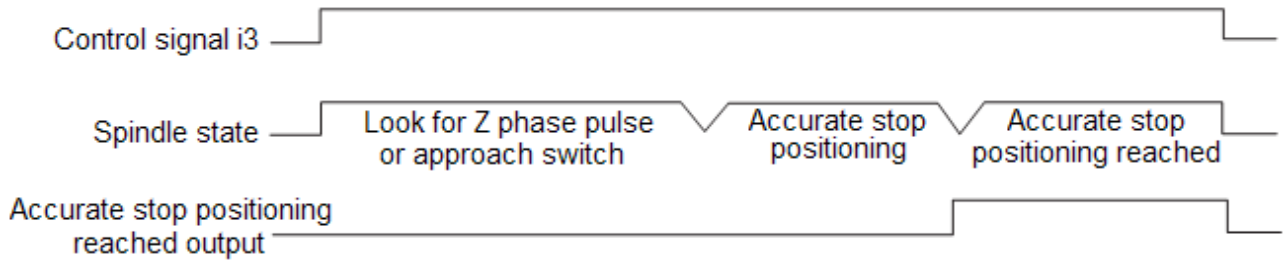
Function parameter	Item	Description	Set range	Unit	Factory setting
A3-38	First positioning bais	Set First positioning bais	0-65535	Pulse	0
A3-40	Positioning speed	Look for encoder phase Z pulse or speed of the approach switch	0-20000	rmp	100
A3-41	Positioning position ring acceleration tmie	Set Positioning position ring acceleration tmie	0-20000	0.01s	100
A3-42	Positioning acceleration tmie	Set Positioning acceleration tmie	0-20000	0.01s	100
A3-43	Positioning deceleration tmie	Set Positioning deceleration tmie	0-20000	0.01s	100
A3-44	Positioning position ring scale gain	Set positioning position ring scale gain. the response to the position order gain is faster and the rigidity is higher with higher set value. A too high value may cause position overshoot when start stops. The effect is slower and the error increases with lower value.	0-30000	-	-
A3-45	Positioning speed ring scale gain	Set positioning speed ring PI regulator scale gain. the gain is greater and the rigidity is higher with higher set value	0-30000	-	-
A3-46	Positioning speed	Set positioning speed ring PI	0-30000	-	-

	ring integeral time	regulator integral time. the integrating speed is greater and the rigidity is higher with smaller set value			
A3-47	Second positioning bias	Set second positioning bias	0-65535	Pulse	1000

6.5.3 Accurate stop curve

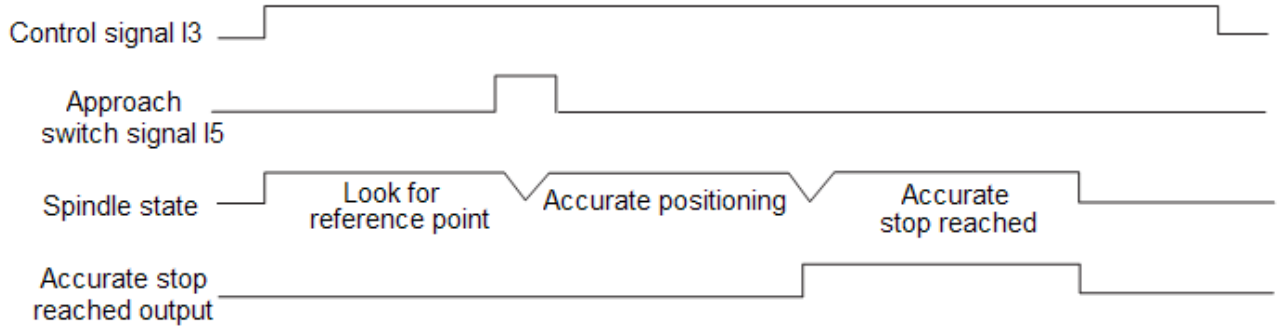


6.5.4 Accurate stop sequence chart



6.5.5 Approach switch accurate stop function

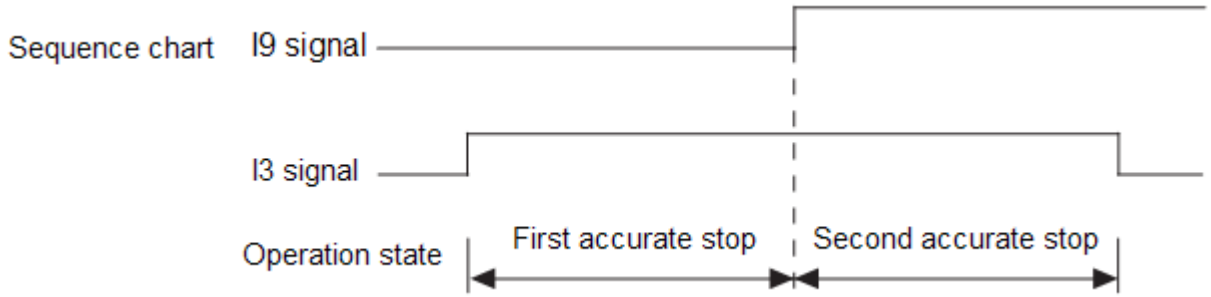
Approach switch accurate stop is a positioning method when spindle motor and non-spindle motor are not rotating by 1:1, and external encoder can not be mounted due to mechanical structure. It's suggested to adopt boss sensing mode. Please see the following figure for control sequence of approach switch.
Note: when set accurate stop function of approach switch, set A2.03=2 firstly, and then set A2.30=5



6.5.6 Second accurate stop function

The second accurate stop function is used for the second fixed point positioning as required by the user.

Note: when the second accurate stop is used, the function of I5 will change to first, second accurate stop select signal.



6.6 Swing

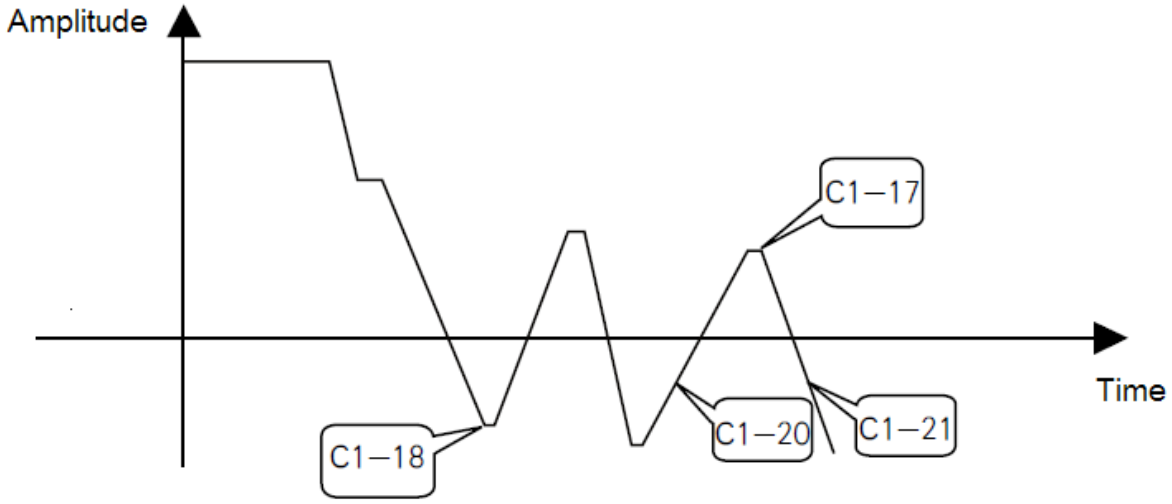
6.6.1 port definition

Port	Signal	Function
T3	ST	Servo enabling
	I6	Swing, for auto shifting of mechanical gear of the spindle system

6.6.2 Relevant parameter of swing

Function parameter	Item	Description	Set range	Unit	Factory setting
C1-17	swing forward scope	swing forward position	0～30000	pulse	100
C1-18	swing reverse scope	swing reverse position	0～30000	pulse	100
C1-19	swing speed upper limit	maximum speed during swing	0～6000	rpm	50
C1-20	swing acceleration	acceleration during swing	0～30000	s/krpm	1
C1-21	swing deceleration	deceleration during swing	0～30000	s/krpm	1
C1-22	swing current	swing current	0～30000	A	0.5

6.6.3 Swing process curve



6.7 Operation panel operation

The practice method is as follows:

1. The parameters that need to be modified: C1-29=1，C1-30=0.

2.In F 0000 menu, press the ENT key on the operation panel and enter digital input state, and then use the ∧ and ＞＞ keys on the panel to input the operating speed, and press ENT key again, and press ＞＞ key to make the motor run.

3. press ＞＞ key again, and the motor decelerates and stop running.

During operation of the motor, step 2 may be repeated at any time to change operation speed of the motor. If the operation direction of the motor needs to be changed, parameter A2.45 may be set to realize.

Caution

Operation panel operation is only a simple operation mode which is generally for test. It's suggested that the speed of the motor shall not be set too high during operation of operation panel. The C1-29，C1-30 shall recover their original values after test of operation panel, namely, C1-29=0，C1-30=0.

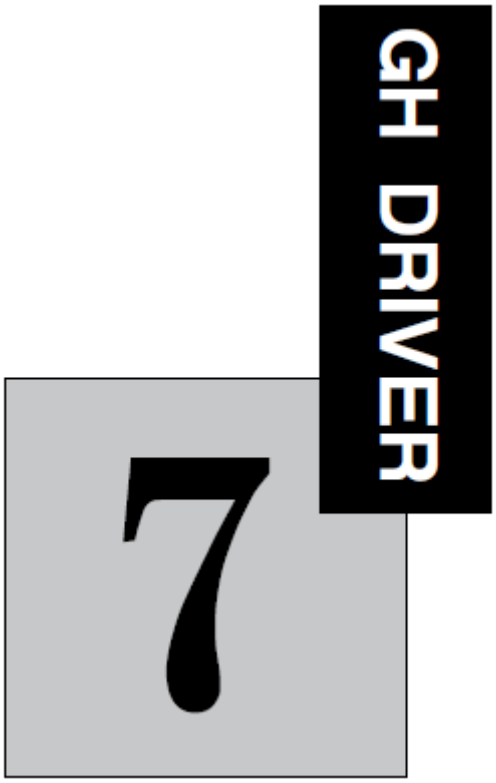
6.8 Modbus communication settlement

6.8.1 485 communication relevant parameter setting

Function parameter	Item	Description	Set range	Unit	Factory setting
T1-00	modbus communication station No.	modbus station No. setting	0～255	-	1
T1-01	modbus Baud rate communication	For example 38400-->38.4	0～4	-	0
T1-02	modbus odd-even check	0: none check 1: even check	0～2	-	0

		2: odd check			
T1-03	modbus high-low bytes select	0: lower at front 1: higher at front	0, 1	-	0
T1-04	485 terminal resistance select	0: none 1: select	0, 1	-	0

Note: the driver shall be restarted after modbus 485 communication check selection .



PLC functions introduction

This chapter describes the functions and use method of PLC

7.1 Introduction to system software resourse

7.1.1 type and code of general softwares of programmable controller

Item	Element code	Quantity
Input relay X	X0 ~ X7、X10 ~ X14、X177	14 points
Output relay Y	Y0 ~ Y7	8 points
Auxiliary relay M	M0 ~ M1535	1536 points
State S	S0 ~ S999	1000 points
Timer T	T0 ~ T63	64 points
Counter C	C0 ~ C63	64 points
Data register D	D0 ~ D8255	8256 points

7.1.2 I0 port mapping

Terminal	Element code
ST	X0
I1 ~ I7	X1 ~ X7
I8 ~ I12	X10 ~ X14
RST	X177
Q1 ~ Q6	Y0 ~ Y5
M0 ~ M1	Y6, Y7

7.1.3 Special auxiliary function M relay

Relay number	Function
M774	Positive limit point triggerring
M775	Negative limit point triggerring
M782	Swing order
M783	Positioning order
M797	Bias counter clearing
M798	Servo reset
M799	Motor power on

7.1.4 Initial signal functions

Relay number	Function
M8000	Start normal close, stop normal open
M8001	Start normal open, stop normal close
M8002	Initial positive pulse
M8003	Initial negative pulse

7.1.4 Interruption function

Interruption	Element code	Function
Configure register interruption	D6467	bit0 ~ bit1 control input interruption rising edge (1) or falling edge (0) triggering
Control register interruption	D6468	Control enabling (1) and disabling (0) of input interruption
I2, I3 input interruption	I0, I2	IO port input interruption

Caution: after starting interruption, the interruption service T map of the corresponding code as well as the interruption service program for interruption code less than the current activated code. Otherwise, unpredictable issues may occur.

7.2 PLC CAN communication

7.2.1 Overview

It is set as main station when T1-50 is set as 0 and it is a slave station when T1-50 is set as non-0. 9 slave stations may be supported at most, and the code scope of slave stations is 1 to 9.

Data register number	Item	Function
D8203	Function code	3：PDO, 11：SDO
D8204	SDO command code	2：SDO download 4：SDO upload

Note: D8203 needs to be set as 3 for sending PDO data frame, and D8203 needs to be set as 11 for sending SDO data .

SDO object dictionary has not be finished and can not be used for now.

7.2.2 Communication state monitoring

The main station monitors the communication state of the slave stations from M8032 to M8040 which correspond to the communication state No.1 to 9 slave stations. Closed coil indicates normal communication, otherwise the communication fails.

The main station monitoring the communication state of the slave stations is indicated by D8039. The register is cleared if data sent by the main station is received. The counting is started from the finish of the last receiving and takes 1ms as time unit. The maximum counting is up to 30000. It keeps 30000 until data is received.

7.2.3 Main station communication address

The communication address of the main station is a data storing address designate by the main station to the slave stations. The data may be send out after put the data to be send into the communication addresses of the axis, and the data returned from the stations may be obtained by reading the receiving address.

Note: PDO0 SDO0 is broadcast data frame. All of the slave stations may receive the data frame and need not to response.

PDOTx: real-time data frame send from the main station to corresponding slave station

SDOTx: non-real-time data frame send from the main station to corresponding slave station

PDORx: real-time data frame received by the main station from corresponding slave station

SDORx: non-real-time data frame received by the main station from corresponding slave station

Main station	Data register code			
PDO0(broadcast)	D8050	D8051	D8052	D8053
SDO0(broadcast)	D8054	D8055	D8056	D8057
PDOT1	D8058	D8059	D8060	D8061
PDOT2	D8062	D8063	D8064	D8065
PDOT3	D8066	D8067	D8068	D8069
PDOT4	D8070	D8071	D8072	D8073
PDOT5	D8074	D8075	D8076	D8077
PDOT6	D8078	D8079	D8080	D8081
PDOT7	D8082	D8083	D8084	D8085
PDOT8	D8086	D8087	D8088	D8089
PDOT9	D8090	D8091	D8092	D8093
SDOT1	D8094	D8095	D8096	D8097
SDOT2	D8098	D8099	D8100	D8101
SDOT3	D8102	D8103	D8104	D8105
SDOT4	D8106	D8107	D8108	D8109
SDOT5	D8110	D8111	D8112	D8113
SDOT6	D8114	D8115	D8116	D8117
SDOT7	D8118	D8119	D8120	D8121
SDOT8	D8122	D8123	D8124	D8125
SDOT9	D8126	D8127	D8128	D8129
PDOR1	D8130	D8131	D8132	D8133
PDOR2	D8134	D8135	D8136	D8137
PDOR3	D8138	D8139	D8140	D8141
PDOR4	D8142	D8143	D8144	D8145
PDOR5	D8146	D8147	D8148	D8149
PDOR6	D8150	D8151	D8152	D8153
PDOR7	D8154	D8155	D8156	D8157

PDOR8	D8158	D8159	D8160	D8161
PDOR9	D8162	D8163	D8164	D8165
SDOR1	D8166	D8167	D8168	D8169
SDOR2	D8170	D8171	D8172	D8173
SDOR3	D8174	D8175	D8176	D8177
SDOR4	D8178	D8179	D8180	D8181
SDOR5	D8182	D8183	D8184	D8185
SDOR6	D8186	D8187	D8188	D8189
SDOR7	D8190	D8191	D8192	D8193
SDOR8	D8194	D8195	D8196	D8197
SDOR9	D8198	D8199	D8200	D8201

7.2.3 slave station communication address

	Data register code			
Slave station sending address PDOT	D8100	D8101	D8102	D8103
Slave station receiving address PDOR	D8104	D8105	D8106	D8107

7.2.4 Example 1: PDO broadcast, sending 4 data: 1, 2, 3, 4

```
LD      M8000
MOV     K3      D8023     //write function code
MOV     K1      D8050     // write data 1
MOV     K2      D8051     // write data 2
MOV     K3      D8052      // write data 3
MOV     K4      D8053      // write data 4
```

The main station will send the 4 data of 1, 2, 3 and 4 circularly. D8104，D8105，D8106 and D8107 of each slave station may read the 4 data.

7.2.5 Example 2: PDO broadcast, sending 4 data: 1, 2, 3, 4

```
LD      M8000
MOV     K3      D8023     //write function code
MOV     K1      D8050     // write data 1
MOV     K2      D8051     // write data 2
MOV     K3      D8052      // write data 3
MOV     K4      D8053      // write data 4
```

The main station will send the 4 data of 1, 2, 3 and 4 circularly. D8104，D8105，D8106 and D8107 of No. 1 slave station may read the 4 data.

7.3 PLC modbus communication

7.3.1 Overview

The PLC is a Modbus slave and supports the following Modbus functions:

Function code	Function description	Range
01 (0x01)	Read coil	1 ~ 512
02 (0x02)	Read discrete magnitude input	1 ~ 512
03 (0x03)	Read holding register	1 ~ 32
04 (0x04)	Read input register	1 ~ 32
05 (0x05)	Write single coil	1
06 (0x06)	Write single register	1
15 (0x0F)	Write multiple coils	1 ~ 512
16 (0x10)	Write multiple registers	1 ~ 32

7.3.2 Corresponding address number of PLC registers during Modbus communication

Decimal address number	Hexadecimal address number	Register
0 ~ 7999	0000 ~ 1F3fF	D0 ~ D7999
8000 ~ 8255	1F40 ~ 203F	D8000 ~ D8255
41280 ~ 41535	A140 ~ A23F	T0 ~ T63
41792 ~ 41991	A340 ~ A407	C0 ~ C63

7.3.2 Corresponding address number of PLC bit element during Modbus communication

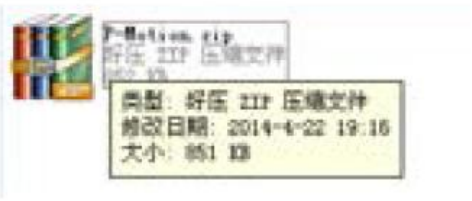
Decimal address number	Hexadecimal address number	Bit element
0 ~ 1535	0000 ~ 05FF	M0 ~ M1535
7680 ~ 7935	1E00 ~ 1EFF	M8000 ~ M8255
8192 ~ 9191	2000 ~ 23E7	S0 ~ S999
12288 ~ 12543	3000 ~ 30FF	T0 ~ T63
12800 ~ 13055	3200 ~ 32FF	C0 ~ C63
13056 ~ 13239	3300 ~ 33B7	Y0 ~ Y267
13312 ~ 13495	3400 ~ 34B7	X0 ~ X267

7.4 Pmotion program software description

Step 1: obtain installation software

Obtain software package as shown in Fig. 7-1.

Obtain website: http: //www.ctb.com.cn



7.1 software package

7.2 creat new project

Step 2: create a new project

1. The software is a green software. Please start *.exe after unpacking, and click the part in the red circle shown in the following figure to create a new project as shown in Fig.7-2.
2. Select FX1N, and click enter as shown in Fig.7-3.
3. Click the save icon as shown in Fig.7-4.

7-3 PLC type setting

7-4 click to save

4. change project name and document save content directories, and click to confirm, as shown in Fig.7-5.
5. change document title, click to save, as shown in Fig.7-6.
6.write T type map program, and save again, as in Fig.7-7.

7-5 change project name and document save content directories

7-6 change document title

7-7write T type map program

7-8 set communication port and Baud rate

Step3 running project

1, download T map to the driver, and first of all, set communication port and Baud rate, as shown in Fig.7-8.

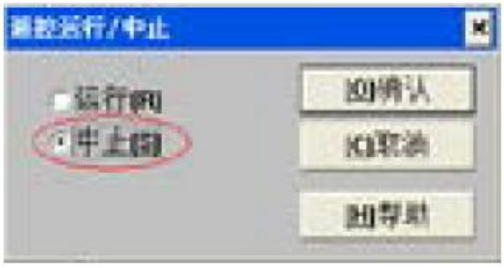
2, select a Baud rate of 19200bps, as shown in Fig.7-9.

3, stop currently running program, as shown in Figs.7-10, 7-11.

4, click “yes” as shown in Fig.7-12.

7-9 select communication port, Baud rate

7-10 stop currently running program



7-11 select program to be stopped

7-12 confirm to stop the program

5, click PLC, and click write in the transfer list, as shown in Fig.7-13.

6, set write scope of program, the step of the program may be seen from the lower right corner of the T map monitoring view. Wait till the download progress bar is full, and the T map downloading is completed after checking that the progress bar is full, as shown in Fig.7-14.

7, turn on the driver again, or operate by the following process to run the T map program, as shown in Figs.7-15, 7-16.

7-13select write program

7-14 select write program scope

7-15 run, stop program selection

7-16 select program to be run

7.5 speed contrl

7.5.1 internal control speed

Tmap

Order list

LD X001 I1	signal input
OUT M799	motor power on
MOV K0 D6070	control mode set as speed control
MOV K0 D6323	speed order source set as PLC internal order
DMOV K10000 D6291	speed set as 100 turn/min.

program description :

when I1 has input, motor operates with a speed of 100 turn/min.

7.5.2 0-10V simulated voltage control speed

T map

order list

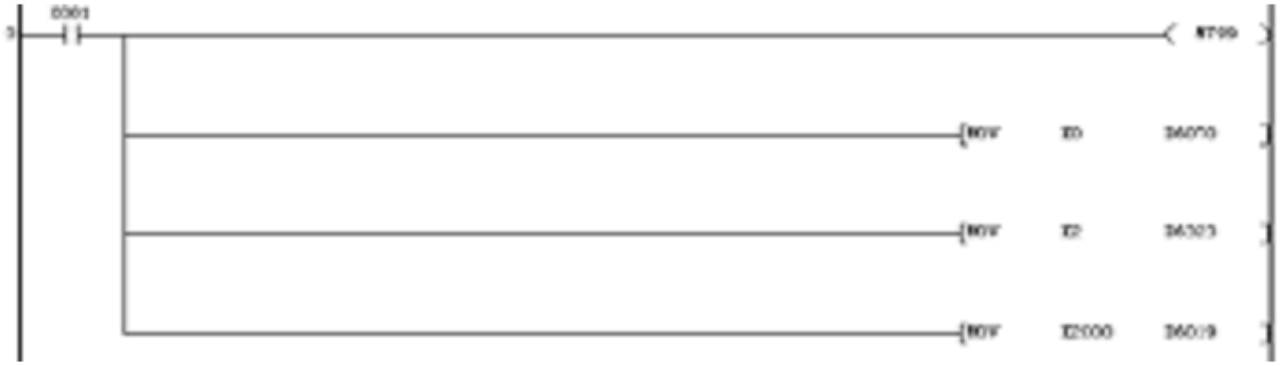
LD X001 I1	signal input
OUT M799	motor power on
MOV K0 D6070	control mode set as speed control
MOV K1 D6323	speed order source set as 0-10V simulated voltage control
MOV K3000 D6019	set 10V corresponding maximum speed as 3000 turn/min.

program description :

when I1 has input, input 0-10V simulated voltage through FI port to adjust speed

7.5.3 ±10V simulated voltage control speed

T map



order list

LD X001 I1	signal input
OUT M799	motor power on
MOV K0 D6070	control mode set as speed control
MOV K2 D6323	speed order source set as ±10V simulated voltage control
MOV K2000 D6019	set 10Vcorresponding maximum speed as 2000 turn/min.

program description :

when I1 has input , input 0-10V simulated voltage through FI port to adjust speed

7.5.4 T4 port pulse control speed

T map

order list

LD X001 I1	signal input
OUT M799	motor power on
MOV K0 D6070	control mode set as speed control
MOV K3 D6323	speed order source set as T4 port pulse speed

program description :

when I1 has input, input pulse adjusting speed through T4 pulse port

7.5.5 T2 port pulse control speed

T map

Order list

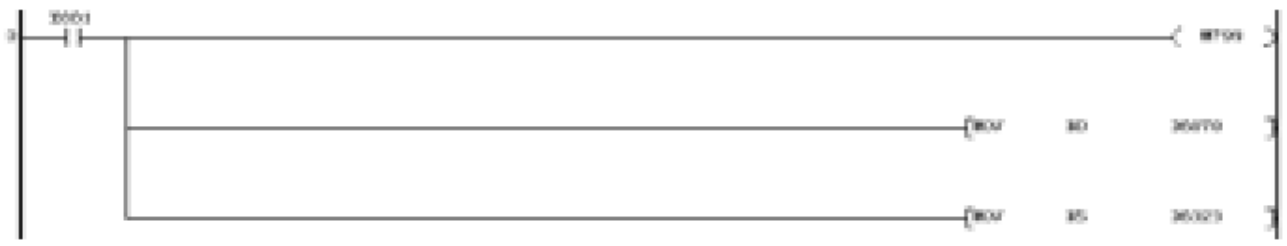
LD X001 I1	signal input
OUT M799	motor power on
MOV K0 D6070	control mode set as speed control
MOV K4 D6323	speed order source set as T2 port pulse speed

program description :

when I1 has input , input pulse adjusting speed through T2 pulse port

7.5.6 T3 port pulse control speed

T map



Order list

LD X001 I1 signal input

OUT M799 motor power on

MOV K0 D6070 control mode set as speed control

MOV K5 D6323 speed order source set as T3 port pulse speed

program description :

when I1 has input, input pulse adjusting speed through T3 pulse port

7.6 positioning control

7.6.1 absolute positioning

T map

Order list

LD X001 I1 signal input

OUT M799 motor power on

MOV K1 D6070 control mode set as position control

MOV K0 D6322 positioning mode set as absolute positioning

MOV K0 D6043 position feedback source set as motor encoder

MOV K1000 D6297 set position as 1000

OUT M783 positioning start

program description :

when I1 has input, motor is positioned to 1000 position

7.6.2 relative positioning

T map

order list

LD X001 I1	signal input
OUT M799	motor power on
MOV K1 D6070	control mode set as position control
MOV K1 D6322	positioning mode set as relative positioning
MOV K0 D6043	position feedback source set as motor encoder
MOV K1000 D6297	set positioning position as 1000
OUT M783	positioning start

program description :

when I1 has input, motor runs to 1000 position by taking the present position as original point.

7.6.3 relative phase Z positioning

T map

Order list

LD X001 I1 signal input

OUT M799 motor power on

MOV K1 D6070 control mode set as position control

MOV K2 D6322 positioning mode set as relative Z phase positioning

MOV K0 D6043 position feedback source set as motor encoder

MOV K1000 D6297 set positioning position as relative Z phase offset 1000position

OUT M783 positioning start

program description :

when I1 has input, motor is positioned to a position that 1000 away from Z phase

7.6.4 real-time positioning

T map

Order list

LD X001 I1 signal input

OUT M799 motor power on

MOV K1 D6070 control mode set as position control

MOV K4 D6322 positioning mode set as real time positioning

MOV K0 D6043 position feedback source set as motor encoder

MOV K1000 D6297 set positioning position as 1000

OUT M783 positioning start

program description :

when I1 has input, motor is positioned to 1000 position

7.7 pulse position synchronous control

7.7.1 T4 receiving pulse

T map

Order list

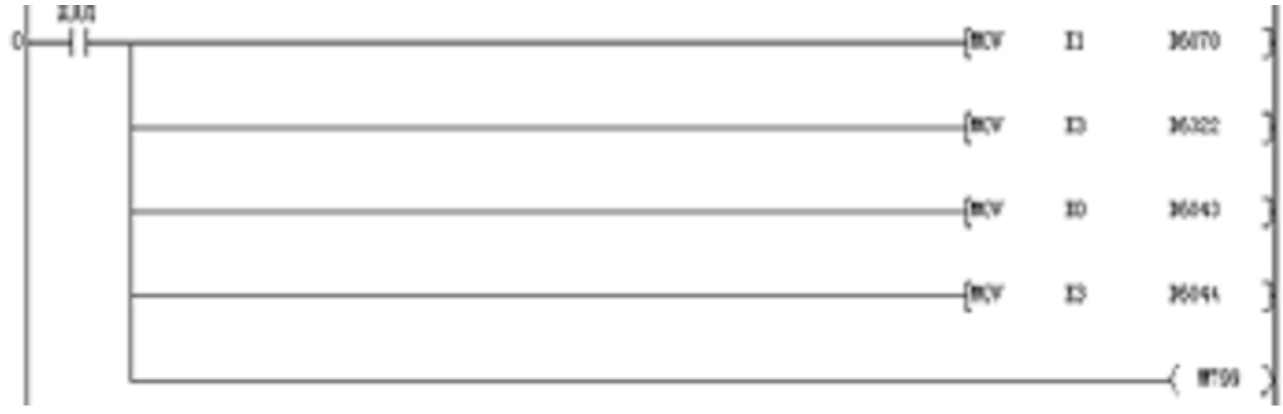
LD X001 I1	signal input
OUT M799	motor power on
MOV K1 D6070	control mode set as position control
MOV K4 D6322	positioning mode set as real time positioning
MOV K0 D6043	position feedback source set as motor encoder
MOV K1000 D6297	set positioning position as 1000
OUT M783	positioning start

program description :

when I1 has input,enter pulse position synchronization status. Input pulse from T4 port.

7.7.2 T2 receiving pulse

T map



Order list

LD X001 I1	signal input
MOV K1 D6070	control mode set as position control
MOV K3 D6322	positioning mode set as real time positioning
MOV K0 D6043	position feedback source set as motor encoder
MOV K3 D6044	position order source set as T2 port
OUT M799	motor power on

program description :

when I1 has signal input , enter pulse position synchronous state , and input pulse by T2 port

7.7.3 T3 receiving pulse

T map

Order list

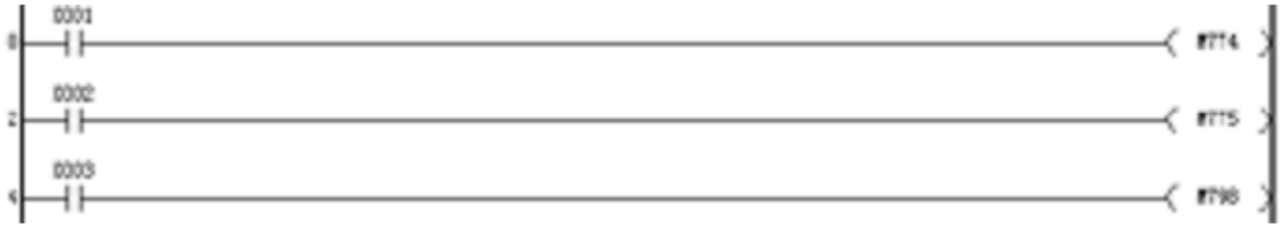
LD X001 I1	signal input
MOV K1 D6070	control mode set as position control
MOV K3 D6322	positioning mode set as real time positioning
MOV K0 D6043	position feedback source set as motor encoder
MOV K4 D6044	position order source set as T3 port
OUT M799	motor power on

program description :

when I1 has signal input , enter pulse position synchronous state , input pulse by T3 port

7.8 position limit and reset

T map

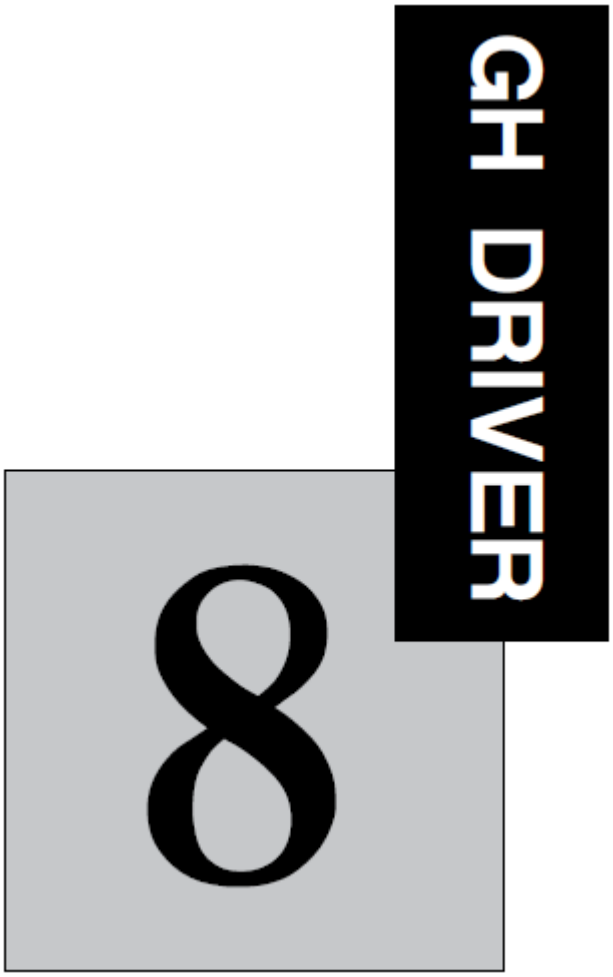


Order list

LD X001	signal input
OUT M774	reverse limit trigger
LD X002	signal input
OUT M775	forward limit trigger
LD X003	signal input
OUT M798	driver reset

Program description :

when I1 has signal input , reverse limit is triggered ; when I2 has signal input , forward limit is triggered ; when I3 has signal input , driver reset



Trouble shooting

The chapter introduces common faults and remedies of the driver.

List of fault alarm and remedies

Protection function is activated, and LED digital tube displays fault information, fault output relay is activated and driver stops the output when fault occurs.

Please see Table 7-1 for faults and remedies of GH DRIVER.

For technical support, please contact the manufacturer.

Table 7-1 Faults and remedies

Fault code	Fault	Possible reason	Remedies
E1. ouI	overvoltage	Alarm when the bus voltage is detected over the upper limit threshold (P1-01) , and may be reset	● check brake resistance ● reduce acceleration and deceleration ● check incoming line RST AC voltage ● observe bus voltage value (U. 0 or U1-5)
E1. uuI	Undervoltage	Alarm when the bus voltage is detected exceeding the lower limit threshold, and may be reset	● check incoming line RST AC voltage ● observe bus voltage value (U. 0 or U1-5)
E1. oc	overcurrent	driver 316J detects high current signal , and through I O point to CPU. It may not be reset	● power off to test driving module ● check motor parameter setting ● observe current during operation (A. 0or U1-3)
E1. ocI	overcurrent	The effective current of the motor is higher than the set alarm point current and lower than 1.3 times of the set alarm point current. The state lasts for 60 mins. and alarm. It may be reset.	● check that driving current alarm point (D1-12) is appropriate or not ● check motor parameter setting ● observe current during operation (A. 0or U1-3)

E1. oc2	overcurrent	● The effective current of the motor is higher than 1.3 times of the set alarm point current and lower than 1.5 times of the set alarm point current. The state lasts for 30 mins. and alarm. It may be reset. ● The effective current of the motor is higher than 1.5 times of the set alarm point current and lower than 1.6 times of the set alarm point current. The state lasts for 15 mins. and alarm. It may be reset. ● The effective current of the motor is higher than 1.6 times of the set alarm point current and lower than 1.7 times of the set alarm point current. The state lasts for 7.5 mins. and alarm. It may be reset. ● The effective current of the motor is higher than 1.7 times of the set alarm point current and lower than 1.8 times of the set alarm point current. The state lasts for 5 mins. and alarm. It may be reset. ● The effective current of the motor is higher than 1.8 times of the set alarm point current and lower than 1.9 times of the set alarm point current. The state lasts for 3 mins. and alarm. It may be reset. ● The effective current of the motor is higher than 1.9 times of the set alarm point current and lower than 2 times of the set alarm point current. The state lasts for 1 mins. and alarm. It may be reset. ● The effective current of the motor is higher than 2 times of the set alarm point current . The state lasts for 30 s. and alarm. It may be reset.	● check that driving current alarm point (D1-12) is appropriate or not ● check motor parameter setting ● observe current during operation (A. 0or U1-3)
E1. oc3	overcurrent	Alarm when Hall sampling reaches Hall calibration current, and it may be reset	● power off to test driving module ● check motor parameter setting ● observe current during operation (A. 0 or U1-3)
E1. oc4	overcurrent	The current comparator on the mainboard detects a large current and outputs FOUVW signal to cpu input point. Alarm and may not be reset	● power off to test driving module ● check motor parameter setting ● observe current during operation (A. 0 or U1-3)

E1. oH1	Module overheatingal arm	Inspect through temperature module AD, alarm if the actual temperature is higher than 90℃, and it may be reset	● observe current during operation （A. 0 or U1-3） ● observe actual module temperature（U2-9）
E1. oH3	motor overheating alarm	Provide input point state determination through motor internal thermoswitch, and it may be reset	● check motor fan ● check NO and NC of the motor overheating alarm parameter （P1-5）
E1. EL	encoder disconnection	Temporarily only photoelectric encoder inspection, alarm when photoelectric encoder UVW signals are both high or both low , and it may be reset	● check connection of driver and motor encoder port ● check the used cables, such as 9-core and 15-core ● check the UVW signal in the cables for welding error and disconnection
E1. E8	encoder line number error	Inspect encoder passing z time encoder counting , alarm if the difference is greater than 10 two times in succession, and it may be reset	● check encoder line number （E1-1 for Photoelectric, E1-8 for absolute value or revolver ）; ● check encoder Z signal（the sixth state counting from the right in the U2-4）;
E1. EC	Z signal fault	encoder count increases continuously. the accumulated value will be cleared when encounters a zero position signal. Compare the accumulated value, and alarm if it exceeds the set theoretical count per turn of the encoder 2 times in succession, and it may be reset	● check encoder line number （E1-1 for Photoelectric, E1-8 for absolute value or revolver ）; ● check encoder Z signal（the sixth state counting from the right in the U2-4）;
E1. PU	motor cables phase sequence error	● the alarm may be inspected for only one time after powering on ● when motor is synchronous motor, alarm when there is speed setting but without speed feedback or there is speed feedback but without speed setting and lasts for 50ms, and it may be reset ● when motor is asynchronous motor , alarm when the direction of the speed setting is opposite to that of the speed feedback and lasts for 50ms, and it may be reset	● check motor power cables for error connection ● check motor number of pole-pairs for error （D1-9）

E1. oS	Overspeed alarm	Alarm when the actual speed exceeds the alarm threshold （P1-06） for 40ms, and it may be reset	● check overspeed alarm threshold （P1-6） ● check encoder counting
E1. oP	following error overproof	The actual following error exceeds the alarm threshold （P1-10） for 50ms, and it may be reset	● check following error threshold （P1-10） ● check motor rigidity, and position ring gain （C1-38）, speed ring gain (C1-33 and C1-36), speed ring integral （C1-34 and C1-37） may be adjusted
E1. 5E	Too large speed error alarm	alarm when the difference between the output speed and feedback speed is greater than the speed error alarm threshold （P1-12）, and it may be reset	● check speed error alarm threshold （P1-12） ● check the difference between feedback speed （b.0 or U1-2） and the set speed ● adjusting speed ring gain （C1-33 and C1-36）and speed ring integral （C1-34and C1-37） to improve speed fluctuation
E1. rA	Hall monitoring fault	● the alarm may be inspected for only one time after powering on; ● when driver power on , inspect after AD initialization Hall samples the middle value, alarm if the value has a difference of 600 number, i.e., 0.5V, and it may be reset	● check that Hall sampling values （L1-8 and L1-9） is around 2048 ● check the connection of the control board the main loop port ● check the Hall element in the main loop unit
E1. oL2	Overload	The current comparator on the mainboard detects a large current and outputs FOU,FOV,FOW signals to cpu input point. Alarm if the signal lasting time exceeds the set overloading time （P1-12）, and it may not be reset	● check overloading time is too small or not ● check motor parameter setting ● observe current during operation （A. 0 or U1-3）
E1. EE2	Base EE read failure	● the alarm may be inspected for only one time after powering on ● read power code for driver EE, and alarm if the power code is not in the driver power code table , and it may be reset	● set through power code parameter （L1-1）
E1. CPU	Small cpu fault	Determine through inspection to the heartbeat of the small cpu. Alarm if it lasts for 50ms, and it may be reset ;	● check version of the small cpu（A1-8）;
E1. Co	Communication error	Alarm for abnormal communication between the big and small cpus, and it may be reset ;	● check version of the small cpu（A1-8）;

Common fault analysis

The drive and the motor may fail to operate to the design requirements due to parameter setting or wiring error during system startup. As no alarm code output from the driver, please make appropriate treatment referring to the section.

■ No display on drive after power-on

Trouble: the manipulator has no display after power-on of the driver. The trouble may be caused by several reasons, and shall be checked carefully. please remove all control lines before inspection.

Reason: drive rectifier bridge failure, inverter bridge failure, switching power supply failure or starting resistance failure.

◆ Main circuit indicator inspection

For situation which indicator is on, rectifier bridge is normal, charging resistor is normal and switching power supply failure, please contact manufacturer for repair or professional maintenance;

Please make further inspection when the indicator is off.

◆ Check the driver input power is normal or not.

Measure three-phase AC voltage of R / S / T terminal of the driver with multimeter and check for normality. Normal power supply: 330V <power <440V.

No voltage indicates power failure;

Please make further inspection when it's normal.

◆ Rectifier bridge inspection

Measure the rectifier bridge with multimeter by the method specified in " CTB product maintenance manual ".

If the rectifier bridge is normal and the charging resistor is burned, please contact manufacturer for repair or professional maintenance;

If the rectifier bridge is damaged, please replace the rectifier bridge. Manufacturer repair is recommended.

■ cannot run

Trouble: does not rotate when driver power-on and displays f. 0 and CNC system sends operation order.

Reason: CNC system fails to send frequency command or operation order, control logic error and improper parameter setting may lead to non-operation. It shall be inspected carefully.

◆ Inspect the speed setting value on the driver, namely the displayed value of F.

Make the CNC system execute S1000 M3, and observe the display on driver is F. 1000 or not.

If it is F. 1000, check driver's output frequency U1-01, feedback frequency U1-02;

If it is not F. 1000, please inspect that the CNC system sent frequency command and operation command correctly or not.

◆ Test driver's output frequency O and feedback frequency b

If U1-01 is same with U1.00, the U1-02 is 0, please inspect motor and wiring, and contact manufacturer for repair or professional maintenance;

If U1-01 is not same with U1-00, or equals to 0, please inspect acceleration parameter A3.24, or contact with the manufacturer.

◆ Inspect that has the CNC system sent frequency command and operation command correctly

Monitor analog input value U2-05 or U-06, as well as switching value input state U2-02 with monitoring parameter of U2. As normal, the analog value is about 100% (the maximum speed of is 8000rpm), and other switching value input signals are 0.

Step 1: check the corresponding analog values on the driver terminals with multimeter. If they are not correct, check the system and connection cable; if they are correct, proceed to the next step.

Step 2: monitor analog input value U2.05 or U2.06 (select the channel of the analog to be monitored according to the specific plan), if it displays 100%: check analog input terminal select relevant parameters (A2-01). If the problem cannot be solved, please contact the manufacturer; if it's not 100%, proceed to the next step.

Step 3: calibrate the analog again, please refer to chapter 6 for detailed operation. check U2-05 or U2-06 again (select the channel of the analog to be monitored according to the specific plan). If it displays 100%: please contact the manufacturer if the problem cannot be solved; if it doesn't display 100%, please contact the manufacturer.

◆ Measure command signal sent by CNC system

If it's normal, the driver control panel receive signal falsely, please replace control panel or contact manufacturer for repair.

If it's not normal, check the CNC system interface and driver wiring as well as valid electrical level of driver signal.

◆ Check motor and wiring

Remove motor connection wire from driver, and measure insulation against ground of U, V, W of the motor by tramegger. Measure with the minimum ohms range of a multimeter to check the resistance among the 3-phase is in balance or not. Judge the motor and wiring is normal or not.

If it's normal, the driver module is burned;

If it's not normal, replace the motor or wiring.

■ runs in low speed

Trouble: adjust set speed (frequency), the U1-00 set speed (frequency) on the manipulator is shown normal. However, the speed is very low (about dozens rpm), and does not change with the set speed.

Reason: motor encoder feedback abnormal or motor sequence error.

◆ Check the motor and encoder wiring

Normal wiring: U / V / W of motor and driver are connected correspondingly, and the wiring of encoder is correct.

Abnormal: adjust wiring;

Normal: inspect that the encoder line and physical line number of encoder are in conformity with A3-06.

◆ Inspect encoder signal

Method: driver power-on, respectively measure A + and A-, B + and B-, Z +and the Z- on control panel of the driver in standby state with DC 20V gear of multimeter.

The normal value is about +3 V or-3V.

Abnormal: inspect encoder cable, and monitor the countering of U2-00.

Normal: encoder failure, replace the encoder.

◆ Inspect encoder cable

Method: Remove both ends of the encoder cable respectively from the motor and driver, measure the core cables respectively with ohm gear of multimeter to check conduction.

Abnormal: encoder cable failure, replace the cable;

Normal: encoder failure, replace the encoder.

■ speed setting error

Trouble: great deviation between the set speed (frequency) of U1-00 on driver and set speed of S command on CNC system.

Reason: the parameter setting on driver or CNC system does not match, or analog interface failure.

◆ Adjust parameter setting of driver and CNC system

Check the drive parameters: A2-01 analog type A3-23 maximum output speed

Check the CNC system parameter setting:

If the settinGH are normal, measure voltage of analog port with multimeter.

◆Check analog port voltage

Normal port voltage = set speed / maximum speed× 10 (V)

Take the maximum speed 8000 rpm of for example, it shall be inspected by the following table, and error within 0.1% is normal.

CNC system set speed rpm		400	800	1000	2000	4000	8000
analog port	Unipolar	0.50	1.00	1.25	2.50	5.00	10.00
Voltage	Bipolar	0.50	1.00	1.25	2.50	5.00	10.00
Driver displays set speed		400	800	1000	2000	4000	8000

Correct detection value: driver analog port failure, replace driver control panel;

Wrong detection value: CNC system analog output port failure, replace interface boardof the CNC system.

■ accurate stop position is not accurate

Common phenomenon of inaccurate accurate stop:

The accurate stop angle has deviation with tool magazine in initial use or after replacement of spindle, motor and synchronous belt;

Change of accurate stop position after a certain time operation;

Occasional inaccurate accurate stop position during operation.

◆ Initial use or replacement of components

Re-adjust accurate stop angle and adjust parameter: A3-39. accurate stop offset

◆ Change of accurate stop position after a certain time operation

Phenomenon: deviation is stable after change of accurate stop position, and does not recover.

Inspect: the synchronous belt is loose or not; the synchronous belt wheel of motor is loose or not; the encoder of motor is loose or not.

Treatment: please make corresponding repair if the above phenomenon occurs, or contact with the manufacturer to replace encoder.

◆Occasional inaccurate accurate stop position during operation

Please contact with the manufacturer to replace encoder after confirming the following situation.

- ○ The cables of encoder are connected reliably, and the shielding layer are well grounded.
- ○ The logic of accurate stop program of the CNC system is correct.
- ○ The fault still occasionally occurs after carrying out manual accurate stop in MDI mode several times.

■ Over voltage alarm during deceleration

Driver displays E.ou or E.Uul alarm.

Reason: deceleration parameter of driver is set inappropriately and driver brake circuit fails or braking resistor burned.

◆ Check acceleration and deceleration parameters of the driver

Stop the driver, and increase setting value of A3.25. Increase 0.5 each time, and restart again to observe. Make further inspection if the alarm still exists.

◆ Inspect braking resistor

When the display is power off, measure resistance at both ends of the braking resistor with ohm gear of multimeter. If the resistance is infinite, the braking resistor is burned. If it's same with nominal resistor, the braking resistor is normal.

◆ Confirm driver fault

Make the driver run, and then measure DC bus (between P (+) and N) voltage during deceleration of the driver with DC 1000V gear of multimeter. Measured value greater than 750V indicates fault in brake circuit of the driver, or external brake unit, please contact with the manufacturer for repair.

■ Trouble due to encoder failure

- ○ Rotates in low speed smaller than 100 rpm, the operating current exceeds the rated current, and torque reaches100%, the speed setting dose not work.
- ○ During high-speed operation (greater than 3000 rpm), the speed cannot reach the set speed, and the torque reaches 100%.
- ○ During low-speed operation, it has obvious mechanical noise, the speed is non-uniform, the operation is not stable, and not in control of operating signal.
- ○ E.oc3, e.ol, e.ea1, e.ea2, e.enc alarm appear.
- ○ The rotates in high speed and not in control of operation signal.

■E. PL、E. UuI faults occur frequently

Fault cause: instable power voltage or power supply line failure

Check contents:

- Instantaneous under voltage may be caused by thunderstorm weather, or time section with large power supply voltage fluctuation or start of large equipment.
- Poor contact in power supply circuit. Please check contact of breaker, contactors, fuses in power supply circuit carefully for poor contact (shall be judged only by measurement of multimeter).

Treatment method:

- Add regulated power supply for region with grid with unstable voltage.
- Solve line fault.
- Replace faulty low voltage electrical appliances

■ Leakage protection switch is actuated

Phenomenon: when the servo starts, the leakage protection switch trips.

Reason: the leakage protection switch is not the special type for servo (or transducer), the leakage protection value is set too small.

Remedies:

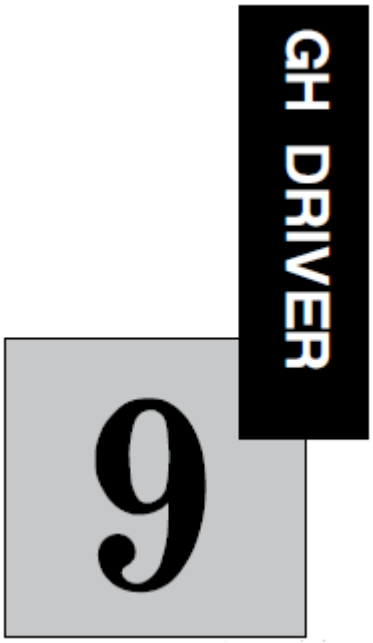
- For common leakage protection switch, the recommended leakage protection value is 200ma, or cancel the leakage protection switch.
- For special leakage protection switch for servo (or transducer), the leakage protection value is 30ma.
- Add isolation transformer between common leakage protection switch and servo driver.

Alarm reset method

Alarm reset includes the following methods:

○ Enable signal again.

○ Turn off the driver, and power on again after driver power indicator is off



Maintenance

The chapeter introduces the basic requirements and methods of routine maintenance of the driver.

Prompt

Hidden fault of the driver may be caused by effect of temperature, humidity, pH, dust, vibration and other factors of the service environment, as well as aging, wear of internal components of the driver and many other reasons. Therefore, routine inspection must be conducted to the driver and driving system during storage and application, and make maintenance regularly.

Caution

★Dangerous high voltage exists during operation of the driver. Inappropriate operation may result in serious personal injury. Dangerous high voltage still exists for a period of time after the power is turned off.

★Only trained and authorized qualified professionals can conduct driver maintenance.

★Watch, ring and other metal objects of maintenance personnel must be removed before operation. Clothing and tools that meet insulation requirements must be applied during operation. Fail to observe the above requirements may lead to electric shock.

Danger

When inspect or maintain the driver, never touch the main circuit terminals or other components in the driver directly or through metal tools before confirm the following four items completely; otherwise there is a risk of electric shock.

Shut off the drive power supply reliably, and wait at least 5 minutes;

● Open cover plate of the driver after all LED indicators on the operating panel are off;

●Charging indicator (CHARGE light) at the right lower of internal of the driver is off;

●Measure voltage between main circuit terminal P (+), n (-) and confirm that the voltage is lower than 36VDC

Danger

● Don't leave screw, wire, tools and other metal items in the driver. Otherwise, the driver may be damaged.

●Never make unauthorized modification to the internal of the driver. Otherwise, the normal operation of the driver will be affected.

● There is electrostatic sensitive IC elements on the control panel in the driver. Do not touch IC elements on the control panel directly.

● Maintenance to main board of the driver shall be conducted only by manufacturer.

Routine maintenance

Routine maintenance shall be carried out during regular operation of the driver to guarantee excellent operating environment; and record daily operation data, parameter setting data, parameter changing and so on, establish and improve equipment application file.

Through routine maintenance and inspection, various abnormal situations may be found timely and find out causes, and eliminate hidden fault, ensure normal operation of equipment, and prolong service life of the driver.

List of routing maintenance item

Inspect object	Inspection main point and judge standard			Judge standard
	Inspection content	Cycle	Inspection method	
Service environment	(1) temperature, humidity (2) dust, moisture and dribbling (3) gas	Any time	(1)digimite, hygrometer (2) observation (3)observation and nasil	(1) Ambient temperature is lower 45℃, otherwise, derating operation. Humidity meets application requirements. (2) no accumulated dust, water leakage mark and condensation. (3) no abnormal color and foreign odor. Ambient temperature is lower 45℃, otherwise, derating operation. Humidity meets application requirements.
Driver	(1)vibration (2)radiating and heating (3) noise	Any time	(1) comprehensive observation (2) digimite and comprehensive observation (3) hearing	(1) stable operation without vibration. (2) fan works normally, wind speed and quantity are normal; no abnormal heating. (3)no abnormal noise.
Motor	(1)vibration (2)heating (3) noise	Any time	(1) comprehensive observation and hearing (2) digimite (3) hearing	(1) no abnormal vibration and abnormal sound. (2)no abnormal heating. (3) no abnormal noise.
Operating state parameter	(1)power supply input voltage (2)driving output voltage (3) driving output current (4) internal temperature	Any time	(1) voltmeter (2) rectifier type voltmeter (3)ammeter (4)digimite	(1) meet requirement of specifications. (2) meet requirement of specifications. (3) meet requirement of specifications. (4) temperature rise lower than 40℃.

Regular maintenance

To eliminate hidden fault, and guarantee long term table operation of high performance, user shall carry out a regular inspection to the driver every 3～ 6 months or shorter interval according to the service environment.

Regular inspection content

1. The connector is loose or not;
2. Check main circuit terminals for poor contact, and copper row connection for mark of overheat;
3. Check power cable, control cable for damage, especially cutting mark on skin which in contact with metal surface;
4. Check insulation binder of power cable nose for falling off;
5. Clean dust on printed circuit board and air passage completely. It is best to use the cleaner;
6. Before insulation test to the driver, all connections between driver, power supply and motor, and short all of main circuit input and output terminals with wire reliably, and then test against ground.

---------- Insulation precautions ----------

Please use qualified 500V Meg-ohmmeter (or corresponding gear of insulation tester). Do not use defective instrument.

- It's strictly prohibited to conduct insulation test against ground with only single main circuit terminal connected, or there will be a risk of damage to driver.
- Never make insulation test to control terminals, otherwise driver will be damaged.
- Do remove all of wires which short main circuit terminals after test.

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7. For insulation test to motor, the connections between the motor and driver must be disconnected completely, and then test the motor separately.

Wearing parts of the driver

Wearing parts of the driver mainly includes cooling fan and electrolytic capacitor for filtering. Their service life are closely related with operating environment and maintenance status. In most cases, service life of fan is 30-40 thousand hours; service life of electrolytic capacitor is 40-50 thousand hours. The normal replacement age limit shall be determined referring to service life of wearing parts and on the basis of working time of the driver. Component shall be replaced when abnormalities is found during inspection. When replace wearing part, it's shall be ensured that the model and electrical parameter of the components are identical or very close to each other.

Routine inspection of common wearing parts

1. Fan

Damage cause: bearing wear, blade aging.

Criteria: check fan blades and other parts for cracks or other abnormalities when the driver is turned off; check operation of the fan for abnormal vibration, noise and so on when the driver is started.

2. Electrolytic capacitor

Damage cause: high ambient temperature, large PULSE power, electrolyte aging.

Criteria: frequent over-current, over-voltage in load operation of the driver; liquid leakage and safety valve protruding; the measured insulation resistance of static capacitance is abnormal or not.

Driver storage

1. Storage environment

Drive storage environment requirement

Environment characteristics	Requirement	Remarks
Ambient temperature	- 40∽+70	The driver shall be stored in long term in environment with temperature lower than 30℃ to avoid condensation and freezing due to temperature variation
Ambient humidity	5∽95% rh	Plastic film enclosure and desiccant and other measures may be applied
Other conditions	No direct sunlight, dust, corrosive or combustible gas, oil mist, steam, gas, dropping water, vibration and little salt.	

2. For long-term idle, it's recommended to turn the driver on for more than half an hour every 6 months during storage to prevent failure of electronic components, or conduct no-load operation to the driver.

Drive warranty

1. For fault or damage of the driver under normal application conditions, the warranty is valid within 12 months from the date of delivery. A reasonable repair cost shall be paid for fault or damage after 12 months;

2. A certain of repair cost shall be paid for the following situations even within the 12 months.

(1). Machine damage due to wiring and operation that not in accordance with the user manual;

(2). Damage caused by fire, floods and abnormal voltage;

(3). Damage caused when use the driver in abnormal function application;

Appendix

List of motor code

Motor Model	Code	Motor Model	Code	Motor Model	Code
CTB-40P5ZXA07-15XXX	11132	CTB-40P5ZXA07-15XXXP	21132	CTB-41P8ZXB07-15XXX	12132
CTB-40P7ZXA10-20XXX	11142	CTB-40P7ZXA10-20XXXP	21142	CTB-42P2ZXB10-20XXX	12142
CTB-40P7ZXA10-30XXX	11143	CTB-40P7ZXA10-30XXXP	21143	CTB-42P2ZXB10-30XXX	12143
CTB-40P7ZXA10-40XXX	11144	CTB-40P7ZXA10-40XXXP	21144	CTB-42P2ZXB10-40XXX	12144
CTB-41P1ZXA15-30XXX	11162	CTB-41P1ZXA15-30XXXP	21162	CTB-43P7ZXB15-30XXX	12162
CTB-41P1ZXA15-45XXX	11163	CTB-41P1ZXA15-45XXXP	21163	CTB-43P7ZXB15-45XXX	12163
CTB-41P1ZXA15-60XXX	11164	CTB-41P1ZXA15-60XXXP	21164	CTB-43P7ZXB15-60XXX	12164
CTB-41P5ZXA20-40XXX	11172	CTB-41P5ZXA20-40XXXP	21172	CTB-45P5ZXB20-40XXX	12172
CTB-41P5ZXA20-60XXX	11173	CTB-41P5ZXA20-60XXXP	21173	CTB-45P5ZXB20-60XXX	12173
CTB-41P5ZXA20-80XXX	11174	CTB-41P5ZXA20-80XXXP	21174	CTB-45P5ZXB20-80XXX	12174
CTB-42P2ZXA30-60XXX	11192	CTB-42P2ZXA30-60XXXP	21182	CTB-47P5ZXB30-60XXX	12182
CTB-42P2ZXA30-90XXX	11193	CTB-42P2ZXA30-90XXXP	21183	CTB-47P5ZXB30-90XXX	12183
CTB-42P2ZXA30-A2XXX	11194	CTB-42P2ZXA30-A2XXXP	21184	CTB-47P5ZXB30-A2XXX	12184
CTB-40P7ZXA07-15XXX	11232	CTB-40P7ZXA07-15XXXP	21232	CTB-42P8ZXB07-15XXX	12232
CTB-41P1ZXA10-20XXX	11242	CTB-41P1ZXA10-20XXXP	21242	CTB-43P7ZXB10-20XXX	12242
CTB-41P1ZXA10-30XXX	11243	CTB-41P1ZXA10-30XXXP	21243	CTB-43P7ZXB10-30XXX	12243
CTB-41P1ZXA10-40XXX	11244	CTB-41P1ZXA10-40XXXP	21244	CTB-43P7ZXB10-40XXX	12244
CTB-41P5ZXA15-30XXX	11262	CTB-41P5ZXA15-30XXXP	21262	CTB-45P5ZXB15-30XXX	12262
CTB-41P5ZXA15-45XXX	11263	CTB-41P5ZXA15-45XXXP	21263	CTB-45P5ZXB15-45XXX	12263
CTB-41P5ZXA15-60XXX	11264	CTB-41P5ZXA15-60XXXP	21264	CTB-45P5ZXB15-60XXX	12264
CTB-42P2ZXA20-40XXX	11272	CTB-42P2ZXA20-40XXXP	21272	CTB-47P5ZXB20-40XXX	12272
CTB-42P2ZXA20-60XXX	11273	CTB-42P2ZXA20-60XXXP	21273	CTB-47P5ZXB20-60XXX	12273
CTB-42P2ZXA20-80XXX	11274	CTB-42P2ZXA20-80XXXP	21274	CTB-47P5ZXB20-80XXX	12274
CTB-43P7ZXA30-60XXX	11292	CTB-43P7ZXA30-60XXXP	21282	CTB-4011ZXB30-60XXX	12282
CTB-43P7ZXA30-90XXX	11293	CTB-43P7ZXA30-90XXXP	21283	CTB-4011ZXB30-90XXX	12283
CTB-43P7ZXA30-A2XXX	11294	CTB-43P7ZXA30-A2XXXP	21284	CTB-4011ZXB30-A2XXX	12284
CTB-41P1ZXA07-15XXX	11332	CTB-41P1ZXA07-15XXXP	21332	CTB-43P8ZXB07-15XXX	12332
CTB-41P5ZXA10-20XXX	11342	CTB-41P5ZXA10-20XXXP	21342	CTB-45P5ZXB10-20XXX	12342
CTB-41P5ZXA10-30XXX	11343	CTB-41P5ZXA10-30XXXP	21343	CTB-45P5ZXB10-30XXX	12343
CTB-41P5ZXA10-40XXX	11344	CTB-41P5ZXA10-40XXXP	21344	CTB-45P5ZXB10-40XXX	12344
CTB-42P2ZXA15-30XXX	11362	CTB-42P2ZXA15-30XXXP	21362	CTB-47P5ZXB15-30XXX	12362
CTB-42P2ZXA15-45XXX	11363	CTB-42P2ZXA15-45XXXP	21363	CTB-47P5ZXB15-45XXX	12363
CTB-42P2ZXA15-60XXX	11364	CTB-42P2ZXA15-60XXXP	21364	CTB-47P5ZXB15-60XXX	12364
CTB-43P7ZXA20-40XXX	11372	CTB-43P7ZXA20-40XXXP	21372	CTB-4011ZXB20-40XXX	12372
CTB-43P7ZXA20-60XXX	11373	CTB-43P7ZXA20-60XXXP	21373	CTB-4011ZXB20-60XXX	12373
CTB-43P7ZXA20-80XXX	11374	CTB-43P7ZXA20-80XXXP	21374	CTB-4011ZXB20-80XXX	12374
CTB-45P5ZXA30-60XXX	11392	CTB-45P5ZXA30-60XXXP	21382	CTB-4015ZXB30-60XXX	12382
CTB-45P5ZXA30-90XXX	11393	CTB-45P5ZXA30-90XXXP	21383	CTB-4015ZXB30-90XXX	12383
CTB-45P5ZXA30-A2XXX	11394	CTB-45P5ZXA30-A2XXXP	21384	CTB-4015ZXB30-A2XXX	12384
CTB-41P8ZXA07-15XXX	11432	CTB-41P8ZXA07-15XXXP	21432	CTB-44P8ZXB07-15XXX	12432
CTB-42P2ZXA10-20XXX	11442	CTB-42P2ZXA10-20XXXP	21442	CTB-47P0ZXB10-20XXX	12442
CTB-42P2ZXA10-30XXX	11443	CTB-42P2ZXA10-30XXXP	21443	CTB-47P0ZXB10-30XXX	12443
CTB-42P2ZXA10-40XXX	11444	CTB-42P2ZXA10-40XXXP	21444	CTB-47P0ZXB10-40XXX	12444
CTB-43P7ZXA15-30XXX	11462	CTB-43P7ZXA15-30XXXP	21462	CTB-49P5ZXB15-30XXX	12462

CTB-43P7ZXA15-45XXX	11463	CTB-43P7ZXA15-45XXXP	21463	CTB-49P5ZXB15-45XXX	12463
CTB-43P7ZXA15-60XXX	11464	CTB-43P7ZXA15-60XXXP	21464	CTB-49P5ZXB15-60XXX	12464
CTB-45P5ZXA20-40XXX	11472	CTB-45P5ZXA20-40XXXP	21472	CTB-4013ZXB20-40XXX	12472
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CTB-45P5ZXA20-80XXX	11474	CTB-45P5ZXA20-80XXXP	21474	CTB-4013ZXB20-80XXX	12474
CTB-47P5ZXA30-60XXX	11492	CTB-47P5ZXA30-60XXXP	21482	CTB-4018ZXB30-60XXX	12482
CTB-47P5ZXA30-90XXX	11493	CTB-47P5ZXA30-90XXXP	21483	CTB-4018ZXB30-90XXX	12483
CTB-47P5ZXA30-A2XXX	11494	CTB-47P5ZXA30-A2XXXP	21484	CTB-4018ZXB30-A2XXX	12484
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CTB-42P2ZXB10-30XXXP	22143	CTB-49P5ZXC15-60XXX	13164	CTB-4015ZXC20-60XXXP	23173
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CTB-43P7ZXB15-45XXXP	22163	CTB-4013ZXC20-80XXX	13174	CTB-47P5ZXC07-20XXXP	23233
CTB-43P7ZXB15-60XXXP	22164	CTB-4018ZXC30-60XXX	13192	CTB-47P5ZXC07-30XXXP	23234
CTB-45P5ZXB20-40XXXP	22172	CTB-45P5ZXC07-15XXX	13232	CTB-4011ZXC10-20XXXP	23242
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CTB-45P5ZXB20-80XXXP	22174	CTB-45P5ZXC07-30XXX	13234	CTB-4011ZXC10-40XXXP	23244
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CTB-47P5ZXB20-80XXXP	22274	CTB-47P5ZXC07-20XXX	13333	CTB-4013ZXC10-40XXXP	23344
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CTB-45P5ZXB10-30XXXP	22343	CTB-4015ZXC15-30XXX	13362	CTB-4026ZXC20-60XXXP	23373
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CTB-45P0ZXC07-15XXX	13132	CTB-45P5ZXC07-30XXXP	23134	CTB-4015ZXD10-40XXX	14144
CTB-45P0ZXC07-20XXX	13133	CTB-47P5ZXC10-20XXXP	23142	CTB-4022ZXD15-30XXX	14162
CTB-45P0ZXC07-30XXX	13134	CTB-47P5ZXC10-30XXXP	23143	CTB-4022ZXD15-45XXX	14163
CTB-47P0ZXC10-20XXX	13142	CTB-47P5ZXC10-40XXXP	23144	CTB-4022ZXD15-60XXX	14164
CTB-47P0ZXC10-30XXX	13143	CTB-4011ZXC15-30XXXP	23162	CTB-49P0ZXD05-10XXX	14222
CTB-47P0ZXC10-40XXX	13144	CTB-4011ZXC15-45XXXP	23163	CTB-49P0ZXD05-15XXX	14223
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CTB-4013ZXD07-20XXX	14233	CTB-4045ZXE15-45XXX	15263	CTB-4090ZXF10-40XXX	16344
CTB-4013ZXD07-30XXX	14234	CTB-4022ZXE05-10XXX	15322	CTB-4132ZXF15-30XXX	16362
CTB-4018ZXD10-20XXX	14242	CTB-4022ZXE05-15XXX	15323	CTB-4132ZXF15-45XXX	16363
CTB-4018ZXD10-30XXX	14243	CTB-4022ZXE05-20XXX	15324	CTB-4055ZXF05-10XXX	16422
CTB-4018ZXD10-40XXX	14244	CTB-4030ZXE07-15XXX	15332	CTB-4055ZXF05-15XXX	16423
CTB-4026ZXD15-30XXX	14262	CTB-4030ZXE07-20XXX	15333	CTB-4055ZXF05-20XXX	16424
CTB-4026ZXD15-45XXX	14263	CTB-4030ZXE07-30XXX	15334	CTB-4080ZXF07-15XXX	16432
CTB-4026ZXD15-60XXX	14264	CTB-4045ZXE10-20XXX	15342	CTB-4080ZXF07-20XXX	16433
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CTB-4015ZXD07-15XXX	14332	CTB-4060ZXE15-45XXX	15363	CTB-4110ZXF10-40XXX	16444
CTB-4015ZXD07-20XXX	14333	CTB-4026ZXE05-10XXX	15422	CTB-4160ZXF15-30XXX	16462
CTB-4015ZXD07-30XXX	14334	CTB-4026ZXE05-15XXX	15423	CTB-4160ZXF15-45XXX	16463
CTB-4022ZXD10-20XXX	14342	CTB-4026ZXE05-20XXX	15424	CTB-4062ZXG05-10XXX	17122
CTB-4022ZXD10-30XXX	14343	CTB-4037ZXE07-15XXX	15432	CTB-4062ZXG05-15XXX	17123
CTB-4022ZXD10-40XXX	14344	CTB-4037ZXE07-20XXX	15433	CTB-4062ZXG05-20XXX	17124
CTB-4030ZXD15-30XXX	14362	CTB-4037ZXE07-30XXX	15434	CTB-4093ZXG07-15XXX	17132
CTB-4030ZXD15-45XXX	14363	CTB-4050ZXE10-20XXX	15442	CTB-4093ZXG07-20XXX	17133
CTB-4030ZXD15-60XXX	14364	CTB-4050ZXE10-30XXX	15443	CTB-4093ZXG07-30XXX	17134
CTB-4013ZXD05-10XXX	14422	CTB-4050ZXE10-40XXX	15444	CTB-4123ZXG10-20XXX	17142
CTB-4013ZXD05-15XXX	14423	CTB-4075ZXE15-30XXX	15462	CTB-4123ZXG10-30XXX	17143
CTB-4013ZXD05-20XXX	14424	CTB-4075ZXE15-45XXX	15463	CTB-4185ZXG15-30XXX	17162
CTB-4018ZXD07-15XXX	14432	CTB-4030ZXF05-10XXX	16122	CTB-4065ZXG05-10XXX	17222
CTB-4018ZXD07-20XXX	14433	CTB-4030ZXF05-15XXX	16123	CTB-4065ZXG05-15XXX	17223
CTB-4018ZXD07-30XXX	14434	CTB-4030ZXF05-20XXX	16124	CTB-4065ZXG05-20XXX	17224
CTB-4026ZXD10-20XXX	14442	CTB-4045ZXF07-15XXX	16132	CTB-4100ZXG07-15XXX	17232
CTB-4026ZXD10-30XXX	14443	CTB-4045ZXF07-20XXX	16133	CTB-4100ZXG07-20XXX	17233
CTB-4026ZXD10-40XXX	14444	CTB-4045ZXF07-30XXX	16134	CTB-4100ZXG07-30XXX	17234
CTB-4037ZXD15-30XXX	14462	CTB-4065ZXF10-20XXX	16142	CTB-4132ZXG10-20XXX	17242
CTB-4037ZXD15-45XXX	14463	CTB-4065ZXF10-30XXX	16143	CTB-4132ZXG10-30XXX	17243
CTB-4037ZXD15-60XXX	14464	CTB-4065ZXF10-40XXX	16144	CTB-4200ZXG15-30XXX	17262
CTB-4013ZXE05-10XXX	15122	CTB-4090ZXF15-30XXX	16162	CTB-4080ZXG05-10XXX	17322
CTB-4013ZXE05-15XXX	15123	CTB-4090ZXF15-45XXX	16163	CTB-4080ZXG05-15XXX	17323
CTB-4013ZXE05-20XXX	15124	CTB-4037ZXF05-10XXX	16222	CTB-4080ZXG05-20XXX	17324

CTB GH DRIVER

CTB-4018ZXE07-15XXX	15132	CTB-4037ZXF05-15XXX	16223	CTB-4120ZXG07-15XXX	17332
CTB-4018ZXE07-20XXX	15133	CTB-4037ZXF05-20XXX	16224	CTB-4120ZXG07-20XXX	17333
CTB-4018ZXE07-30XXX	15134	CTB-4055ZXF07-15XXX	16232	CTB-4120ZXG07-30XXX	17334
CTB-4026ZXE10-20XXX	15142	CTB-4055ZXF07-20XXX	16233	CTB-4160ZXG10-20XXX	17342
CTB-4026ZXE10-30XXX	15143	CTB-4055ZXF07-20XXX	16234	CTB-4160ZXG10-30XXX	17343
CTB-4026ZXE10-40XXX	15144	CTB-4075ZXF10-20XXX	16242	CTB-4250ZXG15-30XXX	17362
CTB-4037ZXE15-30XXX	15162	CTB-4075ZXF10-30XXX	16243	CTB-4100ZXG05-10XXX	17422
CTB-4037ZXE15-45XXX	15163	CTB-4075ZXF10-40XXX	16244	CTB-4100ZXG05-15XXX	17423
CTB-4015ZXE05-10XXX	15222	CTB-4110ZXF15-30XXX	16262	CTB-4100ZXG05-20XXX	17424
CTB-4015ZXE05-15XXX	15223	CTB-4110ZXF15-45XXX	16263	CTB-4160ZXG07-15XXX	17432
CTB-4015ZXE05-20XXX	15224	CTB-4045ZXF05-10XXX	16322	CTB-4160ZXG07-20XXX	17433
CTB-4022ZXE07-15XXX	15232	CTB-4045ZXF05-15XXX	16323	CTB-4160ZXG07-30XXX	17434
CTB-4022ZXE07-20XXX	15233	CTB-4045ZXF05-20XXX	16324	CTB-4200ZXG10-20XXX	17442
CTB-4022ZXE07-30XXX	15234	CTB-4065ZXF07-15XXX	16332	CTB-4200ZXG10-30XXX	17443
CTB-4030ZXE10-20XXX	15242	CTB-4065ZXF07-20XXX	16333	CTB-4315ZXG15-30XXX	17462
CTB-4030ZXE10-30XXX	15243	CTB-4065ZXF07-30XXX	16334		