**NEWKer**

# Operation Manual

## Double Channel AC Servo Driver



**CHENGDU NEWKer CNC-TECHNOLOGY CO., LTD**

# Preface

The incorrect operation may lead to accident, please read the manual carefully before installation!

Note:

● New technique and software version will be added as time goes by, and some part of manual listed below may be amended at any time without prior notice.

● The warranty service will be invalid, If any changes in hardware or software of the product by users himself, from which NEWKer will not be responsible for any result leading.

● Please note and abide following warning mark:

**Warning**      means wrong operation may lead to grave consequence: Casualty or damage of products.

**Caution**      means wrong operation may lead to damaging of product or people.

**Attention**      means wrong operation may lead to malfunction of products or incorrect movements.

# Safety Note


Warning

- There are 2 types power input including AC220V and AC380V, please note to check. And both type should connect with transformer, besides, AC380V driver also can be connect with reactor.
- Driver terminal UVW must correspond to motor terminal UVW.
- The driver design and manufacture is not for those system which will do harm to people.
- Protection should be taken into consideration while user design machine and install this product, in case of accident leading from incorrect operation.
- Driver should be power off for more than 5 minutes before disassembling it.
- The maintenance should be done by those who is professional.


Caution

- The broken and alarm malfunction driver can not be used anymore.
- Should be stored and transported according to requirements.
- The product transported should be well packed.
- Can not be impacted by external force.
- Avoid driver from vibration and concussion.
- Must be installed in cabinet with protection level.
- Must be installed in the environment without high electromagnetic interference.
- Must be in good heat dispersion.
- Avoid dust, corrosive gas, conductive object, liquid, inflammable and explosive material from driver.
- Do not power on and off driver frequently.
- After working for a period, driver may be heated, do not touch radiator or motor.

- When connect output signal with relay, must connect free-wheeling diode with two terminal of relay.

⚠️ **Attention**

- The driver should match with motor.

- Rate torque of motor should be bigger than effectively continuous load torque.

- According to different motor, match 220V 20A, 30A, 50A driver or 380V 25A, 50A, 70A driver.

# Content

# Chapter 1 Summary

## 1.1 Production

NEWKer servo driver is a new generation full-digital AC servo driver designed and manufactured by NEWKer, adopting arithmetic unit with latest DSP (digital signal processor) technology and CPLD(programmable logical device) technique, and Intelligent power module, characterized by high respond speed, perfect protection, good reliability. Applied in such automatic field as cnc machine, automatic production line, and machine manufacturing,etc.

This servo driver is full-digital double channel ac servo driver, can fit incremental encoder motor or absolute encoder motor, featured with high integration level, small volume, it is a ideal servo system with advantages of power-saving and benefit-growth.

Compared with other model, it has following features:

- Matching 0.1kw-3.7kw motor with 220V input,.

- Double channel independent controlling, input pulse can be exchanged, or 1 channel pulse controls 2 motors.

- Being able to switch among speed, position, point-to-point position and hybrid type.

- speed, position, and jogging control mode.

- Internal brake system, suiting needs in high payload application.

- Internal four-section positioning command, user can programme point-to-point positioning control.

- Motor encoder feedback signal to driver, combining half-closed loop control system with cnc controller.

- Speed ratio is 1:5000, ensuring stability from low to high torque.

- Maximum speed of motor can reach 6000r/min.

- Positioning accuracy ±0.01%.

- Updated space vector algorithm, generating higher torque and less noise.

- 300% overload capacity, bigger payload capacity.

- Voltage range: ~220V±20%.

- Thorough protection: over current, over voltage, over heat and encoder malfunction.

- Parameter monitoring: motor speed, motor current, motor position, position offset, pulse unit, pulse frequency, linear speed, I/O point diagnosis, alarm history.

## 1.2 Driver specification

| Input Voltage | AC220V  -15%～+10% | |
|---|---|---|
| Current | 2×20A | 2×30A |
| Motor power | ≤1.2KW | ≤2.3KW |
| Input voltage | Single/Three phase AC380V  -15%～+10%   50/60HZ | |
| Temperature | Work：45℃      Storage：-40℃～55℃ | |
| Humidity | 40%~80%RH | |
| Atmosphere pressure | 86-106kpa | |
| Control mode | ①Position control  ②JOG control   ③Speed control ④Position&Speed control  ⑤Internal pulse control | |
| Position command | ①Pulse+Direction ②CW+CCW Pulse ③AB Orthogonal pulse ④Bus position | |
| Accuracy | 0.01% | |
| Response frequency | ≤200Hz | |
| Pulse frequency | ≥500kHz | |
| Speed ratio | 1：5000 | |
| Regenerate brake | Internal | |
| Electronic gear ratio | 1/30000～30000/1 | |
| Overload capacity | ≥300% | |
| Feedback pulse | Incremental: 2500p/r； Absolute：multiturn battery 33bit/39bit or single- turn17bit/23bit | |
| Parameter monitor | motor speed, motor current, motor torque, motor position, position offset, command pulse unit, pulse frequency, linear speed, I/O point diagnosis, alarm history. | |
| Protection | over current, over voltage, lower voltage, over load, tolerance exceeding,  over heat, encoder malfunction, internal chip malfunction and module malfunction | |

# Chapter 2 Driver Installation

⚠️ **Attention**

- Storage and installation of driver should meet the environment requirements.
- Driver should be protect from fire, and keep away from flammable material.
- Driver should be installed in electronic cabinet, prevent from dust, corrosive gas, conductive object, liquid and inflammable material.
- Driver and motor should avoid vibration, never strike it.
- Lighting stroke should be taken into consideration during installing servo driver.
- Do not drag motor cables, shaft and encoder.

## 2.1 Driver dimension
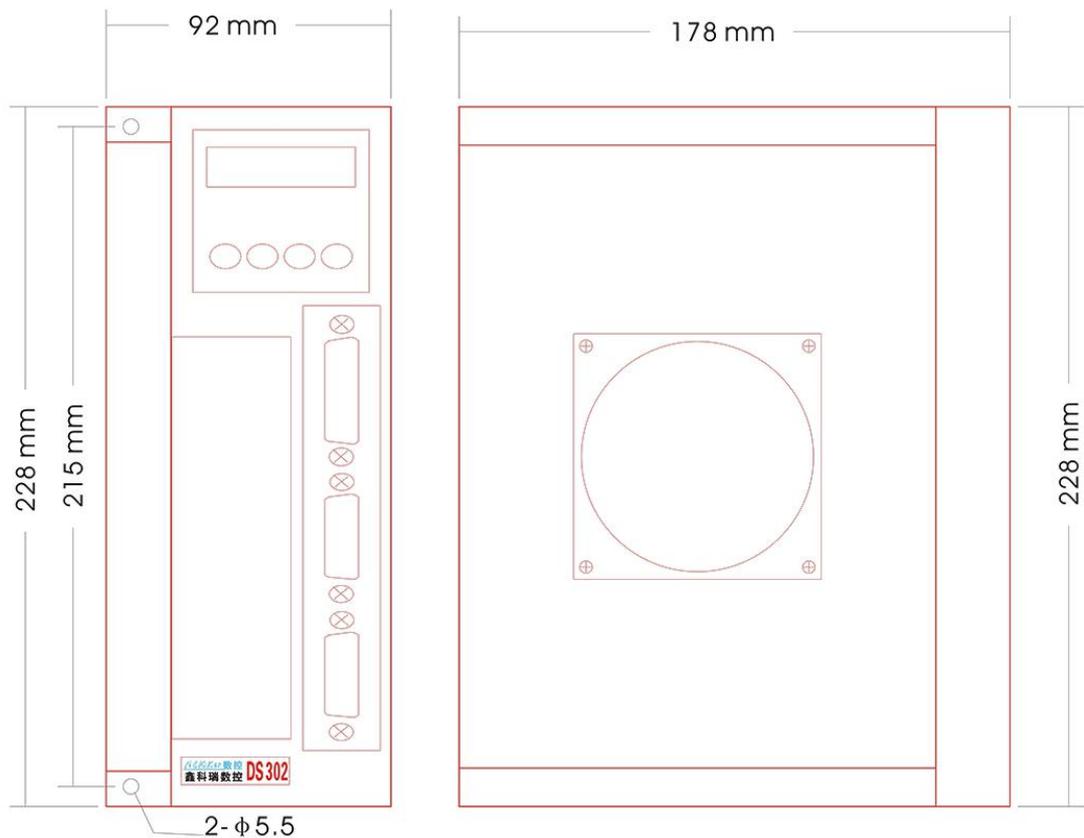
**302 series driver dimension**

## 2.2 Installation environment

### 2.2.1 Electronic cabinet

Driver working life is directly relative to environment temperature. The heat generating from other parts in cabinet, and cooling system will influence temperature around driver, so when designing cabinet, cooling system and configuration of other part in cabinet should be taken into consideration, in order to ensure the temperature around driver is under 55°C, relative humidity is under 95%. long-term working temperature should be under 45°C.

### 2.2.2 Heat-producing device around driver

If diver works in high temperature condition, its working life will be reduced obviously, and possible to malfunction. So the temperature around driver should be kept under 55°C in the heat convection and heat radiation.

### 2.2.3 Vibration device around driver

Please take vibration-proof measures as possible, to make sure driver will not be influenced by vibration, and keep vibration under 0.5G(4.9m/s²).

### 2.2.4 Severe environment

The driver working in such severe environment as erosive gas, moist, metal powder, water and liquid, will malfunction easily. So please take protection measures when install the driver to make sure driver works in good condition .

### 2.2.4 Jamming device

If there is jamming device around driver, the cables of driver will be interfered, and may lead to wrong or incorrect movement. It is recommended to add noise filter or other anti-interfere design to make sure driver works normally. However, please attention that if with noise filter, leak current will raise, in order to terminate it, please install isolated transformer. Besides, the control signal cable of driver is easy to be interfered, so please take reasonable wiring method and shield means.

## 2.3 Installation environment

⚠ **Caution**

- Driver must be installed in electrical cabinet with good protection.
- Driver must be installed with certain direction and interval, also good cooling system.
- Do not install diver near inflammable material.

## 2.3.1 Installation environment

1) Protection:

The driver itself does not have protection structure, so it must be installed in well-protected cabinet. Keep away from erosive and inflammable gas, metal powder, water and liquid, conductive material.

2) Temperature

Environment Temperature：0～55℃, long-term working temperature: <45℃, relative humidity:<=95%.

3) Vibration and impact

Please take vibration-proof measures as possible, to make sure driver will not be influenced by vibration, and keep vibration under 0.5G(4.9m/s²), and can not put heavy pressure or impact on driver.

## 2.3.2 Installation method

1) Direction of installation：servo drive's installation direction must be upright.

2) Mounting: fasten 4pcs of M5 set crew on driver.

3) Cooling: natural cooling, and cabinet should be installed with cooling fans.

⚠ **Caution**

● Do not knock on motor or shaft in case of breaking encoder when disassemble belt or gear on shaft. Please use screw drawing device to disassemble it.

● Motor can not standard big load in both axial direction and radial direction.

● Please use lock washer to fasten motor in case of coming off.

# Chapter 3 Wiring

![Warning symbol] Warning

- The driver has two type input series, AC220V and AC380V, please note to check before connect power, and must connect with isolated transformer.

- Driver UVW terminal must connect with motor UVW accordingly.

- Protection should be taken into consideration while user design machine and install this product, in case of accident leading from incorrect operation.

- Driver and motor should be grounded.

- Do not disassemble the driver before powering off for 5 minutes.

## 3.1 Wiring instruction

The signal connection is relative to motor type and control mode.

### 3.1.1 System wiring
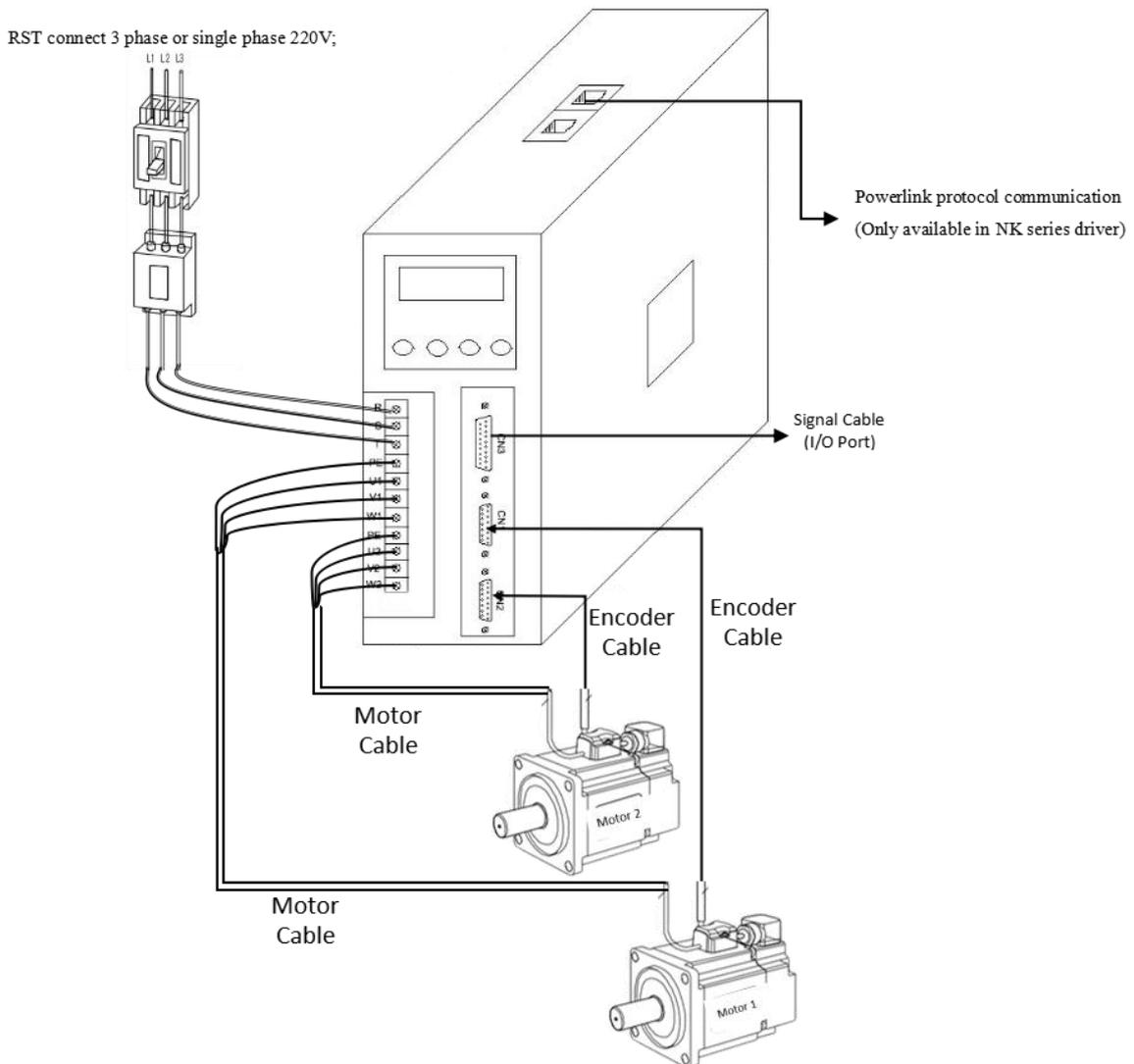
**Note:  only NK driver has Ethernet port for Powerlink communication.**

## 3.1.2 Standard wiring

### 3.1.2.1 DS series wiring signal
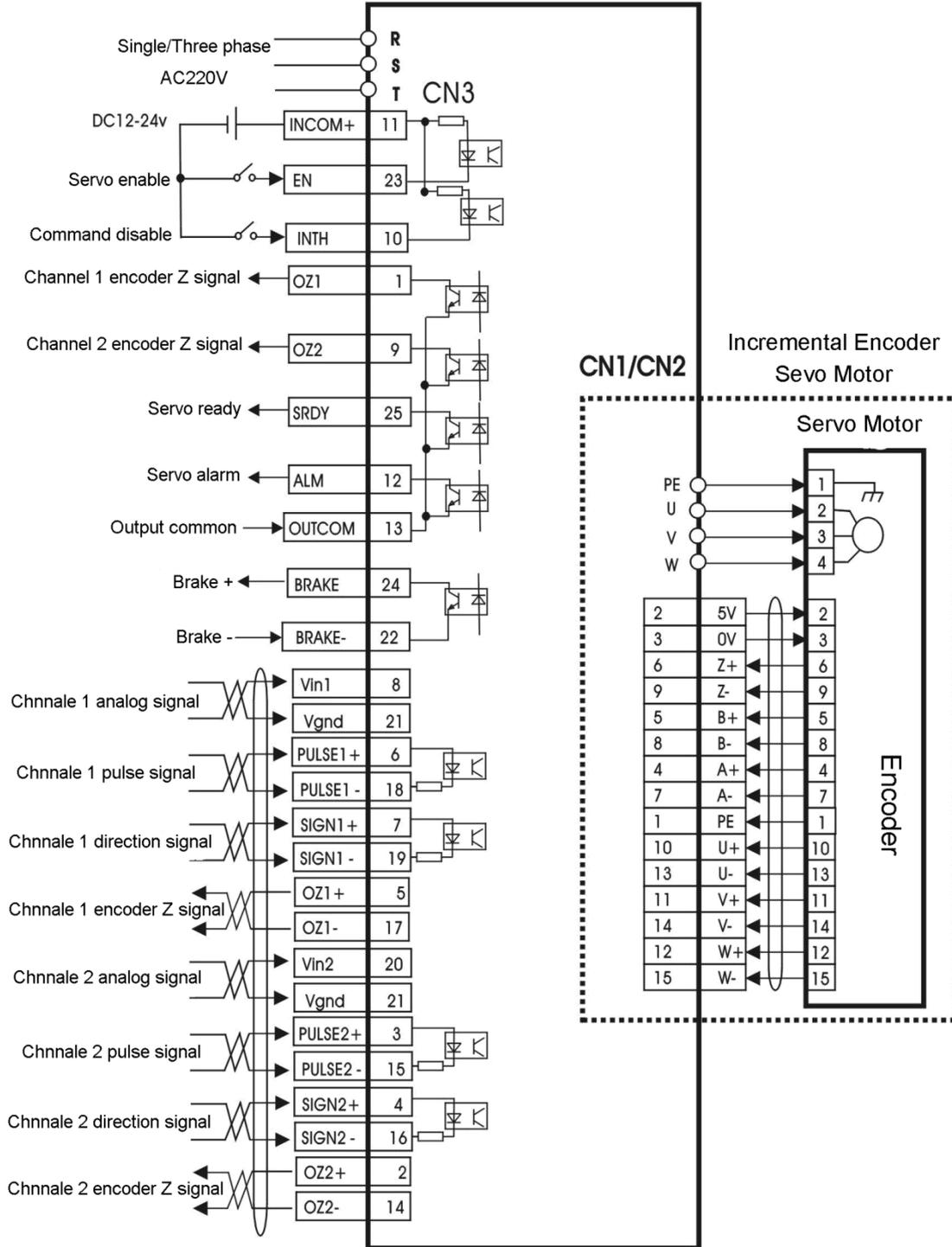


DS302 Signal

## 3.1.2.2 NEW series wiring signal
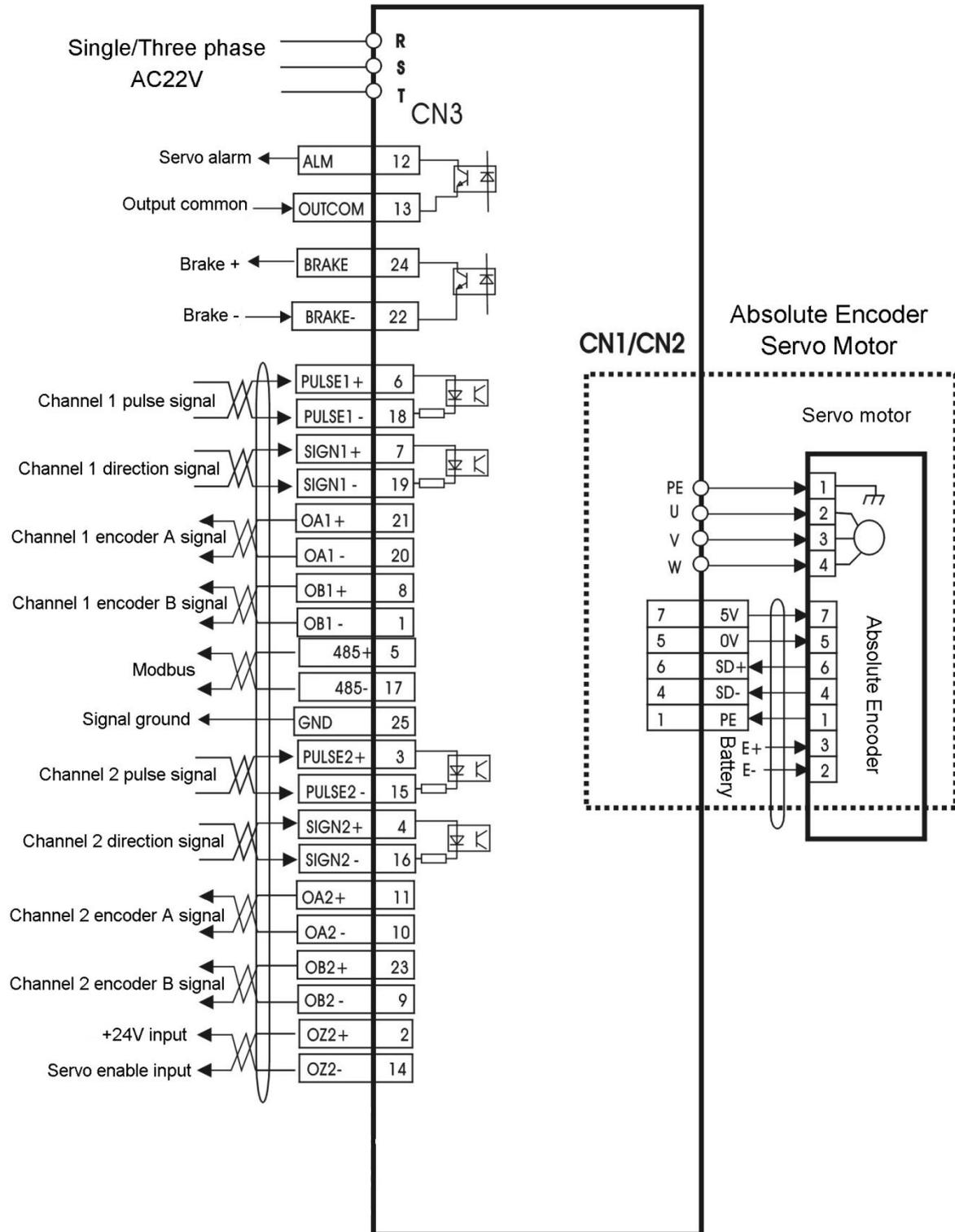


**NEW302 Signal**

### 3.1.2.3 NK series driver wiring signal



**NK302 Signal**
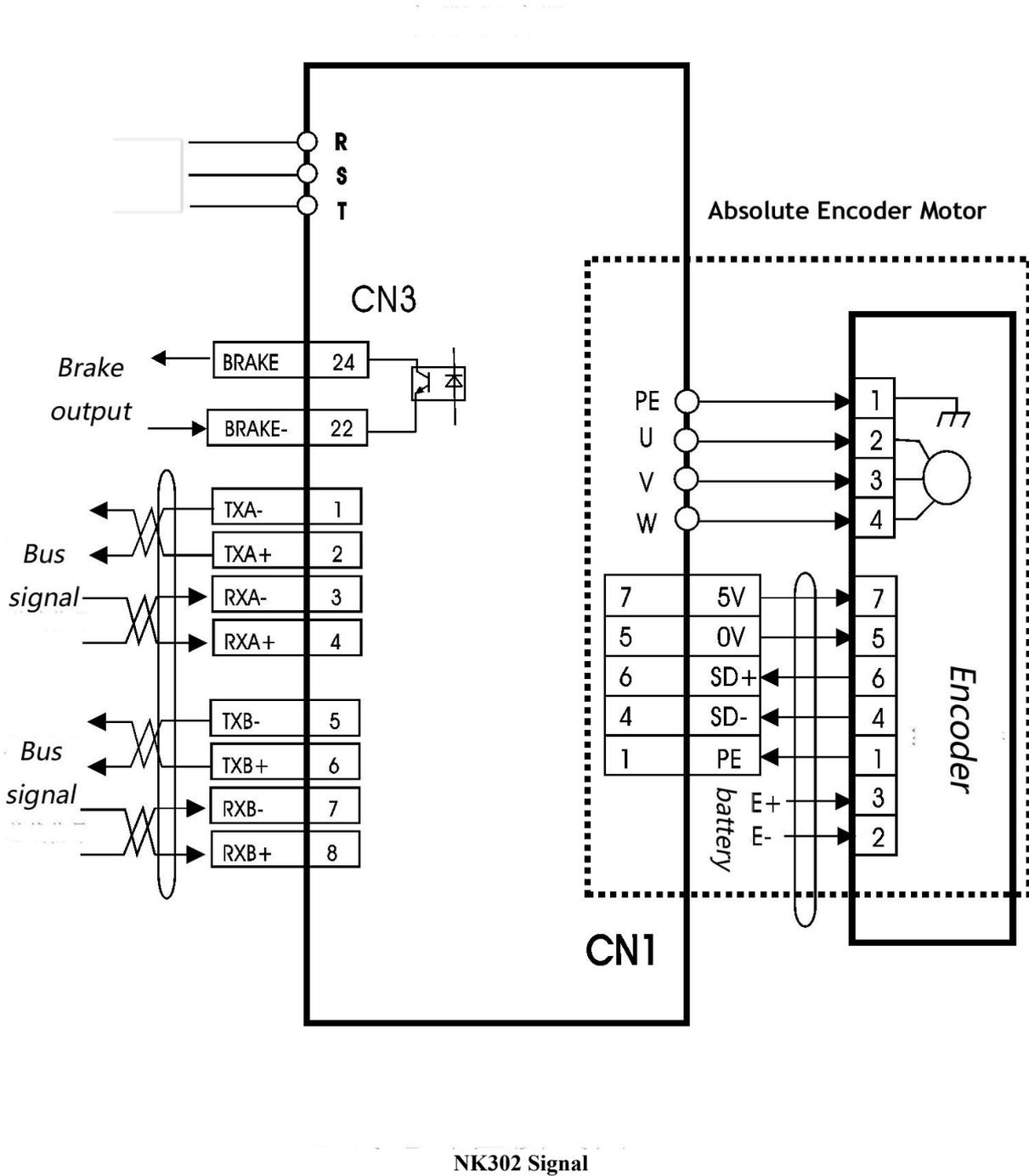
## 3.2 Cable

### 3.2.1 Power Cable

● Diameter of R,S,T,PE,U,V,W cable should be ≥1.5mm²(AWG14-16).

- Driver adopts JUT-2.5-4 cold-pressed terminal, make sure connect confirmed.

- Suggest to connect 3 phase isolate transformer, in order to prevent user. Suggest to install noise filter between electric supply and transformer, to reduce the interference.

- Please install NFB(no fuse breaker), in order that cut power supply if driver malfunction.

### 3.2.2 Signal control CN3, and feedback CN1 Cable

- Cable diameter: suggest to use twisted double-shield cable, diameter ≥0.12mm, shield layer need to connect with PE.

- Cable length: the length should be shorter as possible, control signal CN3 cable should not >3m, feedback signal CN1 should not >20m.

- Cabling: keep signal cable away from power and motor cable, in case of interference.

- Please add surge suppressor for inductance compensate(coil): DC coil anti-parallel connection with FWD(free-wheeling diode), DC coil parallel connects with CR(resistance-capacitance) to absorb loop.

## 3.3  Terminal function

### 3.3.1 Power terminal

| Pin | Sign | Signal name | Function |
|---|---|---|---|
| 1 | R | Single-phase or three-phase AC220V | AC220V 50HZ, Cannot connect with motor UVW |
| 2 | S | | |
| 3 | T | | |
| 4 | PE | Ground | Ground terminal |
| 5 | U1 | Channel 1 servo motor | Connect with UVW of motor 1 |
| 6 | V1 | | |
| 7 | W1 | | |
| 8 | PE | Ground | Ground terminal |
| 9 | U2 | Channel 2 servo motor | Connect with UVW of motor 2 |
| 10 | V2 | | |
| 11 | W2 | | |

## 3.3.2 I/O signal terminal CN3(25pin)

| Pin | Incremental / Absolute | Sign | Signal | I/O | Function |
|---|---|---|---|---|---|
| 1 | DS302 | OZ1 | Channel 1 encoder Z signal | Output | Open-collector output, common terminal is OUTCOM |
| | NEW302 | OB1- | Channel 1 encoder B- signal | Output | Channel 1 encoder B- signal output |
| 9 | DS | OZ2 | Channel 2 encoder Z signal | | Open-collector output, common terminal is OUTCOM |
| | NEW | OB2- | Channel 2 encoder B- signal | | Channel 2 encoder B- signal output |
| 11 | DS | INCOM+ | Input Power positive | Input | Positive terminal of input signal, used to drive photoelectric coupler, DC12-24V,≥100mA |
| | NEW | OA2+ | Channel 2 encoder A+ signal | Output | Channel 2 encoder A+ signal output |
| 23 | DS | EN | Servo enable; Frequency dividing numerator 2 selecting in channel 1 | Input | ①Servo enable signal, EN on means driver can work, and motor is powered; EN off means driver is closed, and motor is not powered, in free status. P0.6=1 will hide this function. Note: 1. when switch EN off to EN on, motor should keep still. 2. after EN on, wait for at least 50ms before input command. ② Frequency dividing numerator 2 selecting in channel 1; ③ Inner speed control switch signal in channel 1; ④ Speed control switch signal in channel 1. |
| | NEW | OB2+ | Absolute encoder B+ signal | Output | Channel 2 motor encoder B+ signal output |
| 10 | DS | EN/INTH | Command pulse disable and Alarm clear; Frequency dividing numerator 2 selecting in channel 1 | Input | ①the disable terminal of pulse input. Pa.30=0, 1, 2 set this function. 0: invalid,not detect EN/INTH; 1: detect EN/INTH signal valid; 2: detect EN/INTH signal valid, and clear afterpulse. 3: when detect the second pulse, driver output alarm signal. ②when driver alarm, input |

| | | | | INTH will clear alarm and reset servo.<br>③Frequency dividing numerator 2 selecting in channel 1<br>④ Inner speed control switch signal in channel 1;<br>⑤Speed control switch signal in channel 1. |
|---|---|---|---|---|
| | NEW | OA2- | Absolute encoder A- signal | Output | Channel 2 Absolute encoder A- signal |
| 13 | DS/NEW | OUTCOM | Output Common terminal | Output | Common terminal of output signal.**used to drive photoelectric coupler, ≥200mA** |
| 25 | DS | SRDY/485- | Servo ready output/Modbus negative signal | Output | When servo is ready and no alarm, SRDY output is valid.(modbus negative signal in NEW series driver) |
| | NEW | 0V | Signal ground | Output | 485 signal ground |
| 12 | DS/NEW | ALM | Servo alarm | Output | When driver is alarming, ALM is valid. |
| 24 | DS/NEW | BRAKE+ | Positive terminal of brake signal | Output | ①When servo work normally and motor is enabled, brake signal will output valid.<br>② after run inner pulse, output is valid. Pa.50=1 set this function.<br>Channel 1 and Channel 2 share the same brake signal, please note that. P1.55=0, it is orientation ready output, P1.55=0 means brake output. |
| 22 | DS/NEW | BRAKE- | negative terminal of brake signal | Output | |
| 6 | DS/NEW | PULSE1+ | Channel 1 Pulse signal + | Input | Channel 1 external position control command, P14 sets mode:<br>0: Pulse+Sign(pulse and direction);<br>1: CW+CCW(forward and backward control);<br>2: A+B (90° Orthogonal pulse) |
| 18 | DS/NEW | PULSE1- | Channel 1 Pulse signal - | Input | |
| 7 | DS/NEW | SIGN1+ | Channel 1 Direction signal + | Input | |
| 19 | DS/NEW | SIGN1- | Channel 1 Direction signal - | Input | |
| 8 | DS | Vin | Analog input | Input | External Speed control command 0-±10V |
| | NEW | OB1+ | Channel 1 encoder B+ signal | Output | Channel 1 absolute encoder B+ signal output |
| 21 | DS | Vgnd | Signal ground | Input | Ground of analog signal/RS485 |
| | NEW | OA1+ | Channel 1 encoder A+ signal | Output | Channel 1 absolute encoder A+ signal output |

| 5 | DS | OZ1+ | Encoder Z signal + | Output | Channel 1 encoder Z+ signal output |
|---|---|---|---|---|---|
| | NEW | 485+ | Modbus signal | | Modbus signal + |
| 17 | DS | OZ1- | Channel 1 encoder Z signal - | Output | Channel 1 encoder Z- signal output |
| | NEW | 485- | Modbus signal | | Modbus signal - |
| 3 | DS/NEW | PULSE2+ | Channel 2 pulse signal + | Input | Channel 1 external position control command, P14 sets mode: |
| 15 | DS/NEW | PULSE2 1 | Channel 2 pulse signal - | Input | 0: Pulse+Sign(pulse and direction); |
| 4 | DS/NEW | SIGN2+ | Channel 2 direction signal + | Input | 1: CW+CCW(forward and backward control); |
| 16 | DS/NEW | SIGN2- | Channel 2 direction signal - | Input | 2: A+B (90° Orthogonal pulse) |
| 20 | DS | Vin2 | Channel 2 analog input | Input | Channel 2 external speed control command 0-±10V |
| | NEW | OA1- | Channel 1 encoder A signal- | Output | Channel 1 encoder A- signal output |
| 2 | DS/NEW | OZ2+ | Channel 2 encoder Z+ signal output | Output | Channel 2 encoder Z signal output |
| 14 | DS/NEW | OZ2- | Channel 2 encoder Z- signal output | Output | |

### 3.3.3 Incremental Encoder feedback terminal CN1/CN2(DB15)

The connection of DS series driver CN1

| Pin | Sign | Signal | I/O | Function |
|---|---|---|---|---|
| 2 | VCC | Power +5V | Output | Power+5V |
| 3 | GND | Signal ground | Output | Signal ground |
| 6 | OZ+ | Encoder Z+ | Input | Z pulse + |
| 9 | OZ- | Encoder Z- | Input | Z pulse - |
| 5 | OB+ | Encoder B+ | Input | B pulse + |
| 8 | OB- | Encoder B- | Input | B pulse - |
| 4 | OA+ | Encoder A+ | Input | A pulse + |
| 7 | OA- | Encoder A- | Input | A pulse - |
| 1 | PE | Earth(ground) | Ground | System ground |
| 10 | OU+ | Encoder U+ | Input | U pulse + |
| 13 | OU- | Encoder U- | Input | U pulse - |
| 11 | OV+ | Encoder V+ | Input | V pulse + |
| 14 | OV- | Encoder V- | Input | V pulse - |
| 12 | OW+ | Encoder W+ | Input | W pulse + |
| 15 | OW- | Encoder W- | Input | W pulse - |

### 3.3.4 Absolute Encoder feedback terminal CN1(DB15)

The connection of NEW/NK series driver CN1

| Pin | Sign | Signal | I/O | Function |
|-----|------|--------|-----|----------|
| 7 | VCC | Power +5V | Output | Power+5V |
| 5 | GND | Signal ground | Output | Signal ground |
| 6 | SD+ | SD+ | | Bus signal positive |
| 5 | SD- | SD- | | Bus signal negative |
| 3 | | | | |
| 2 | | | | |
| 1 | PE | Eather(Ground) | | System ground |

# 3.4 I/O interface principle

## 3.4.1 output interface of switching value ALM, BRAKE
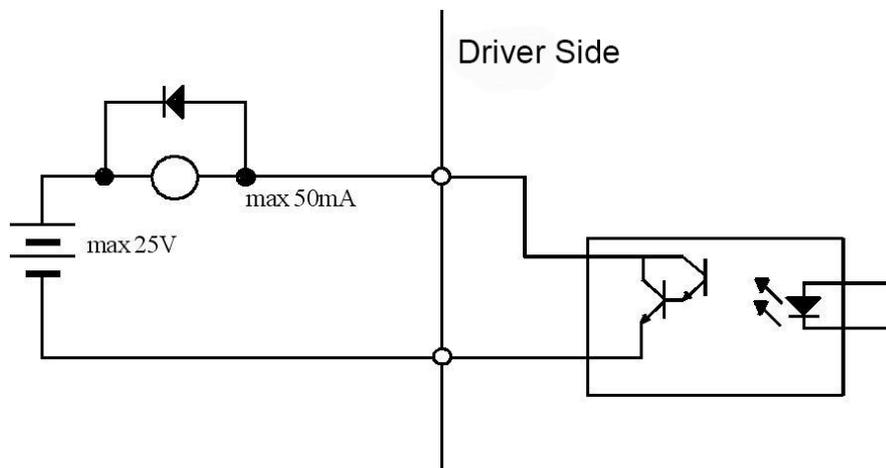


1) external power is provided by user, but attention, if current polarity inverse connected, will lead to malfunction of driver.

2) it is open-collector output, the max current of ALM signal is 20mA, the max current of BRAKE signal is 50mA, so BRAKE signal can connect external relay directly, while SRDY, and ALM signal cannot. The max voltage of external power supply is 25V, therefor load of switching signal must be under this limit. If over the limit or connect driver with power supply directly, will lead to malfunction of driver.

The channel 1 and channel 2 share the same BRAKE signal, please pay attention.

3) if load is such inductive objects as relay, it is necessary to connect antiparallel freewheel diode between both sides of load. If diodes connected inverse, will lead to malfunction of driver.

## 3.4.2 Input interface of pulse signal
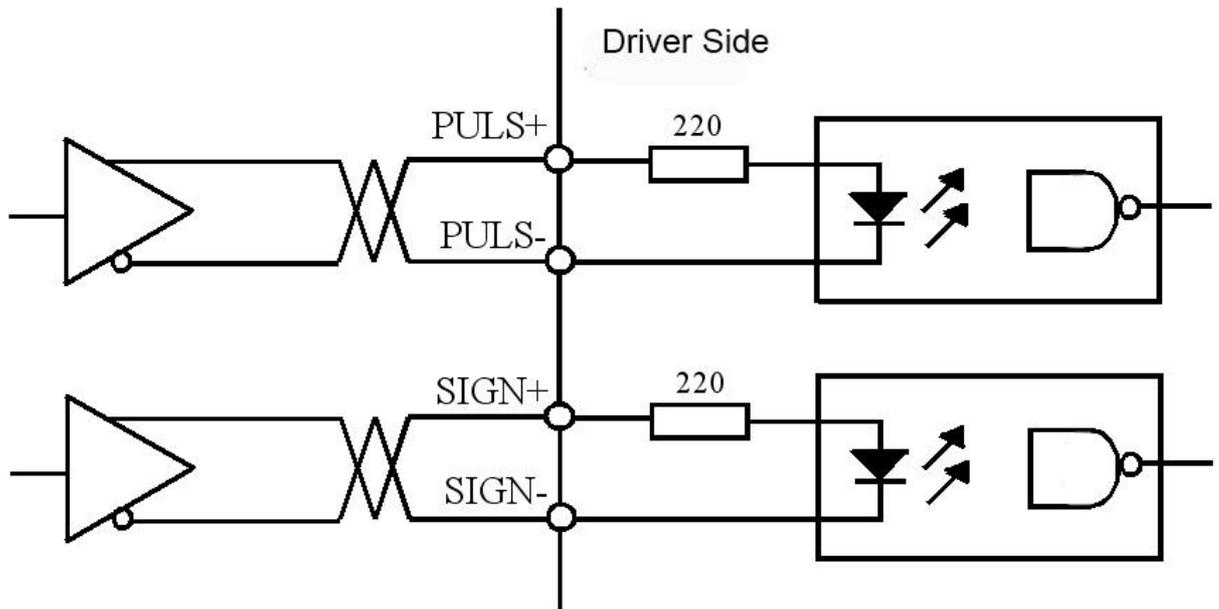
Differential drive mode in pulse input interface
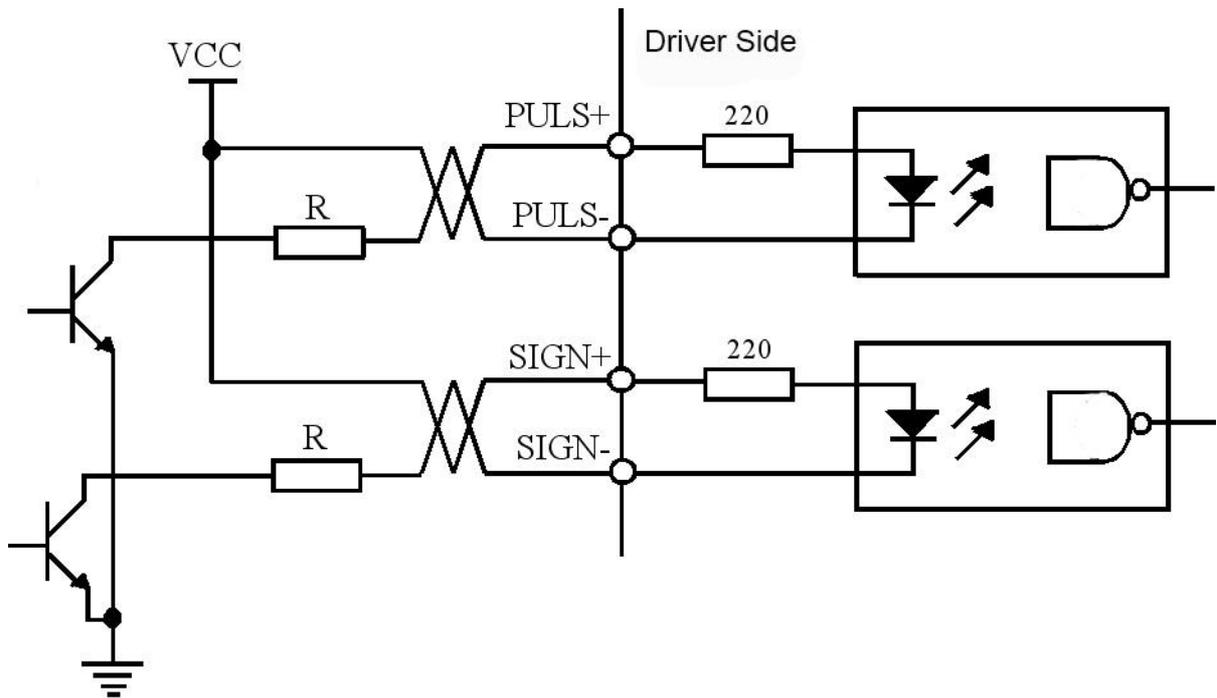


Single-ended drive mode in pulse input interface

1) in order to transfer pulse data correctly, suggest to use differential driver mode;

2) under differential mode, adopt AM26LS31、MC3487 so similar driver like RS422;

3) single-ended mode will lower movement frequency. According to pulse input circuit, and condition that driver current is 10-15mA, 25V max voltage of external power supply, to define value of resistance R.

Experience data: VCC＝24V, R＝1.3～2k;VCC＝12V, R＝510～820Ω;

VCC＝5V, R＝82～120Ω.

4) under single-ended mode, user offer external power. And attention that if current polarity inverse connected, will lead to malfunction of driver.

5) Pulse input mode is as follow diagram, pulse frequency should be ≤500kHz.

**Attention**

● The pulse input mode of both channel 1 and channel 2 is defined by P1.14, P2.14 is invalid.

Pulse Input Mode

| Pulse Command | CW | | CCW | P14 Value |
|---|---|---|---|---|
| Pulse+Sign | PULS | | | 0 Pulse+Sign |
| | SIGN | | | |
| CCW Pulse CW Pulse | PULS | | | 1 CW+CCW Pulse |
| | SIGN | | | |
| A+B Pulse | PULS | | | 2 A+B90° Orthogonal pulse |
| | SIGN | | | |
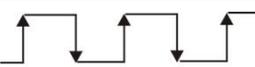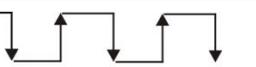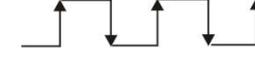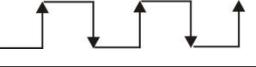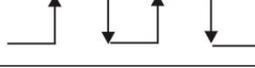
Pulse input sequence parameter

| Parameter | Differential | Single-end |
|---|---|---|
| tck | >2uS | >5uS |
| th | >1uS | >2.5uS |
| tl | >1uS | >2.5uS |
| trh | <0.2uS | <0.3uS |
| trl | <0.2uS | <0.3uS |
| ts | >1uS | >2.5uS |
| tqck | >8uS | >10uS |
| tqh | >4uS | >5uS |
| tql | >4uS | >5Us |
| tqrh | <0.2uS | <0.3uS |
| tqrl | <0.2uS | <0.3Us |
| tqs | >1uS | >2.5Us |
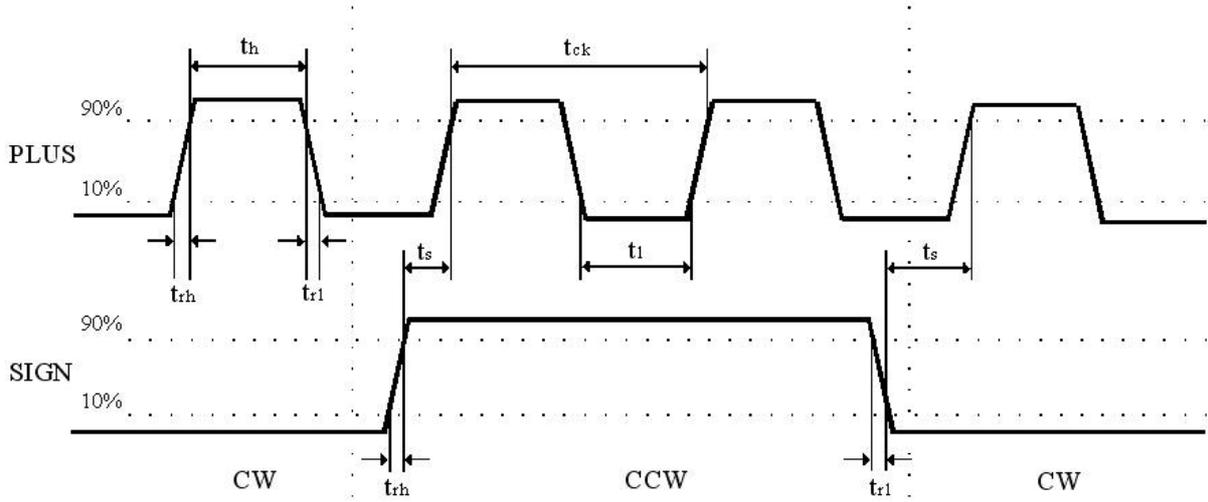
PULS+SIGN input interface sequence(pulse frequency≤ 500kHz)
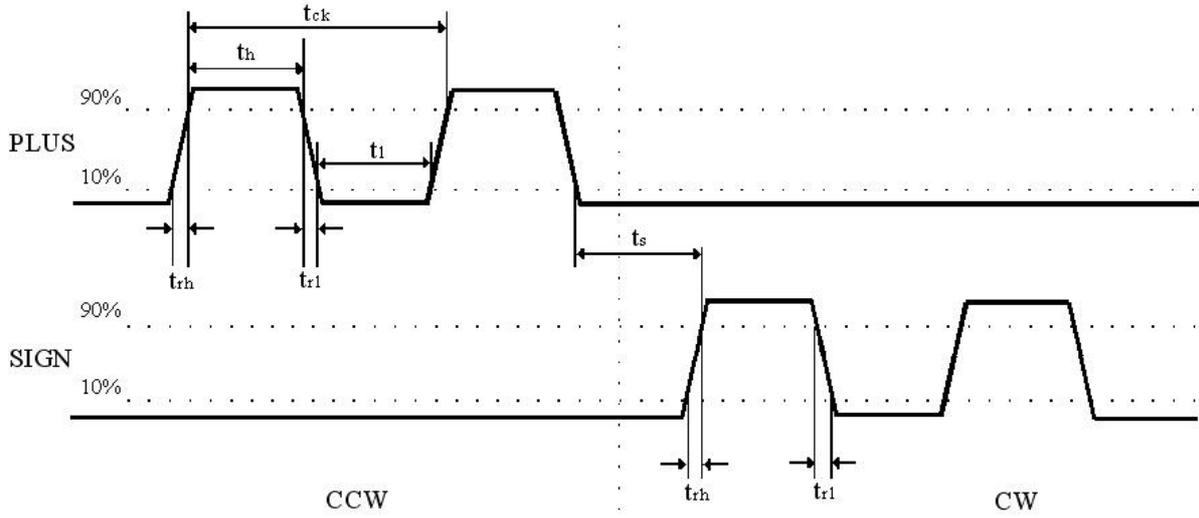


CW+CCW pulse input interface sequence(pulse frequency≤ 500kHz)
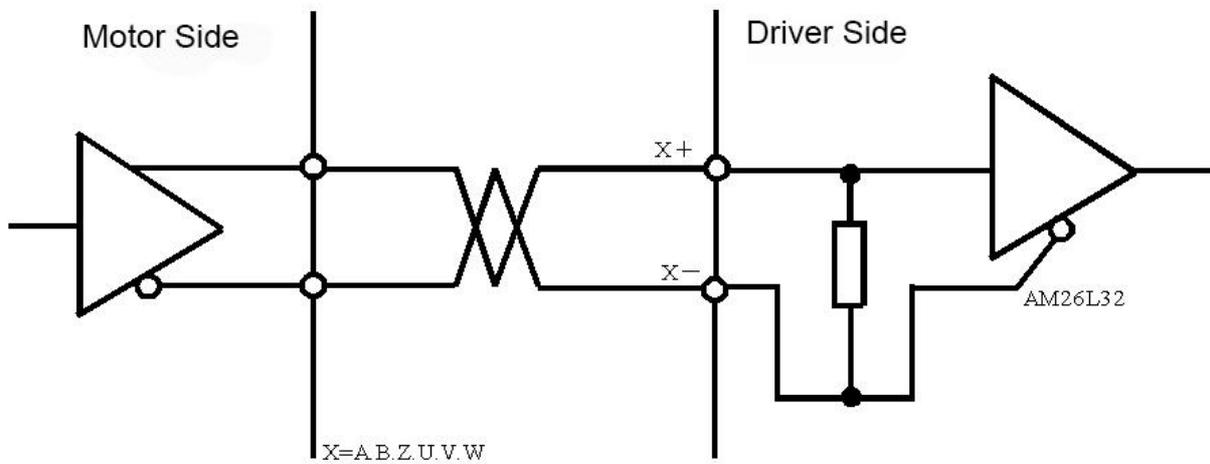


Servo motor optical encoder input interface

# Chapter 4 Parameter



**Caution**

- The operator should learn about parameters meaning, wrong setting will lead to malfunction of driver and casualty.
- Suggest to adjust parameter when motor is still.

Pa.xx, a=1, means channel 1, a=2 means channel 2.

| Parameter No. | Parameter Name | Function | Range | Default |
|---|---|---|---|---|
| P0.1 | Parameter password | ①in case of misoperation parameter changing, once password is set, need to input password each time before parameter modification. Default password is 1. <br> ②when password is 9999, no need to input password each time before parameter modification. <br> ③no need to input password if modify P0.2, P0.3 only. <br> ④if forget password, please contact supplier. <br> ⑤if P1=12345, alarm history will be cleared. | 1~9999 | 1 |
| P0.2 | Default display channel | 1: display channel 1 information; <br> 2: display channel 2 information. | 1-2 | 1 |
| P0.3 | Default monitor display | 0: Motor rotation speed (r/min)(communication address: 283); <br> 1: Motor current(A)(communication address: 284); <br> 2: Motor torque(NM)(communication address: 435); <br> 3: Motor position(pulse); <br> 4: Counter deviation(pulse); <br> 5: Low 4 bit of pulse count(pulse); <br> 6: High 4 bit of pulse count (*1000pulse); <br> 7: Linear speed(mm/min); <br> 8: Input pulse frequency(kHz); <br> 9: Input port status; <br> 10: Output port status; <br> 11: Alarm number; <br> 12: No display(except for alarm); | 0~17 | 0 |

| | | | | |
|---|---|---|---|---|
| | | 15: Encoder signal-turn low 16 bit<br>  (1) display 0~±32767<br>  (2) communication value 0~65536<br>  (3) communication address 90<br>16:  Encoder signal-turn high 16 bit<br>  (1) display 0~1<br>  (2) single-turn value=low 16 bit value<br>  + this value*65536<br>  (3) communication address 91<br>17: Encoder multi-turn low 16 bit<br>  (1) display 0~±32767<br>  (2) communication value 0~65536<br>  (3) multi-turn value=this value*131072<br>  (4) communication address 90 | | |
| P0.4 | Driver model | Read only | | |
| P0.5 | Software version | Read only | | |
| P0.6 | External EN signal instruction | 0: Valid, if EN input signal is effective, motor will be enabled;<br>1: Invalid, not detect EN input, once driver power on, motor will be enabled;<br>Note: NEW series driver does not have this function. | 0~1 | 1 |
| Pa.7 | Control Mode | 0: Position control mode, external input pulse signal, pulse+sign;<br>1: JOG mode, controlled by button;<br>2: Speed control mode, external input 0~±10V controls speed;<br>3: Torque control, external input 0~±10V controls torque(not available in 302 driver);<br>4: Position and Speed control mode.<br>In channel 1, if EN signal is valid, switch into speed control mode.<br>In channel 2, if INTH is valid, then switch into speed control mode.<br>5: inner pulse control mode;<br>6: Automatic backlash compensation, compensation value is Pa.60.<br>Note: NEW and NK do not have 2/3/4/5 control mode. | 0~5 | 0 |
| Pa.8 | Current loop proportional gain | ①Used to set Current loop proportional gain;<br>②the bigger value is, the faster current gain is;<br>③when motor squeals or vibrates, please increase P8;<br>④when connect small motor and it becomes heated, decrease P8;<br>Special function: if P8 value mantissa is 1, | 1~600 | 430 |

| | | When motor stops, it will be half-current locked, lock coefficient defined by P59. | | |
|---|---|---|---|---|
| Pa.9 | Speed loop proportional gain | ①Used to set speed loop proportional gain;<br>②the bigger value means means higher gain and stronger rigidity, but motor is easier to noise;<br>③P8 should increase as load grows;<br>④the bigger value is better if without noise. | 1~400 | 80 |
| Pa.10 | Position control position loop feedforward gain | ①used to set position loop feedforward gain;<br>②the bigger value means means higher gain and stronger rigidity, but motor is easier to vibrate;<br>③P10 value should decrease as load grows;<br>④the bigger value is better if without vibration.<br>Special function: when motor is still(no pulse input), P59 can replace P8(P59≠100 valid). | 1~400 | 100 |
| Pa.11 | Position loop proportional gain | ①used to set position loop proportional gain;<br>②smaller value means motor is more smooth, but rigidity is less;<br>③the bigger P11 value is, the faster positioning speed is, the stronger rigidity becomes, and following counting deviation is smaller, but motor is easier to vibrate or overshoot;<br>④the bigger value is better if without vibration and overshoot. | 1~8000 | 110 |
| Pa.12 | Numerator 1 of position command pulse division | ①motor pulse unit per revolution =10000* Pa.12/P13;<br>②electronic gear G = Pa.12/P13<br>1/30000<G<30000. | 1~30000 | 1 |
| Pa.13 | Denominator of position command pulse division | | 1~30000 | 1 |
| Pa.14 | Input pulse Mode | 0: Pulse+Sign;<br>1: CW+CCW;<br>2: A+B, 90° Orthogonal pulse<br>P2.14 does not work, and NEW/NK driver P1.14 is 0 only. | 0~2 | 0 |
| Pa.15 | Pulse mode direction | 0: not reverse direction;<br>1: reverse direction; | 0~1 | 0 |
| Pa.16 | Speed mode direction | 0: not reverse direction;<br>1: reverse direction;<br>Note: NEW302 series driver does not this | 0~1 | 0 |

| | | function | | |
|---|---|---|---|---|
| Pa.17 | Position tolerance value | When deviation counting is smaller than or equal to Pa.17, it means positioning is finished. | 0~30000 | 2 |
| Pa.18 | Detection range of positioning over tolerance | When deviation counting is bigger than Pa.18, it will alarm position over tolerance. | 0~30000 | 30000 |
| Pa.19 | Positioning over tolerance alarm | 0: Positioning over tolerance alarm valid; 1: Positioning over tolerance alarm invalid. | 0~1 | 0 |
| Pa.20 | Position control mode pulse source selection | 0: choose current channel pulse input as position command; 1: choose another channel pulse input as position command; 2: when EN(Channel 1), INTH(channel 2) are valid, the same as function 1. | 0~2 | 0 |
| Pa.21 | JOG mode speed selection | Choose inner speed 1~4 | 1~4 | 1 |
| Pa.22 | Speed mode speed selection | Choose inner speed 1~4 | 1~4 | 1 |
| Pa.23 | Inner speed 1 | For JOG mode, speed mode, inner pulse mode control speed selection | 0~±6000 r/min | 10 |
| Pa.24 | Inner speed 2 | For JOG mode, speed mode, inner pulse mode control speed selection | 0~±6000 r/min | 100 |
| Pa.25 | Inner speed 3 | For JOG mode, speed mode, inner pulse mode control speed selection | 0~±6000 r/min; | 200 |
| Pa.26 | Inner speed 4 | For JOG mode, speed mode, inner pulse mode control speed selection | 0~±6000 r/min; | 500 |
| Pa.27 | Motor max speed | Motor max speed | 0~6000r /min | 3600 |
| Pa.28 | Zero point offset of analog voltage input | Used to set 0V voltage adjust in speed control mode and torque control mode; Set as "12345" to do zero set automatically, but it need to be saved manually. | 0~±4000 | 0 |
| Pa.29 | The max torque compensation in torque control mode; | Used to adjust torque compensation hen input voltage is 10V in torque control mode. | 0~±4000 | 0 |
| Pa.30 | Input signal EN/INTH mode | 0: invalid, not detect INTH signal; 1: valid, if EN/INTH is effective, not clear afterpulse; 2: valid, if EN/ INTH is effective, and clear afterpulse. Channel 1 detects EN, channel 2 detect INTH. 3: when detect the second unit pulse, driver will output ALM. | 0~3 | 0 |

| | | Note for 3:<br>1) NEW/NK302 does not have this function;<br>2) bus type driver works in 0-2;<br>3) bus closed-loop control: 1 means close closed-loop, 2 means reverse direction. | | |
|---|---|---|---|---|
| Pa.31 | Overlaod alarm percentage | Driver will alarm ERa-10 when load is over rate torque*Pa.31 percentage. | 1~300% | 200 |
| Pa.32 | Motor rate current | The motor rate current<br>Example: if motor rate current is 5A, then Pa.32=50. | 1~800 *0.1A | 100 |
| Pa.33 | Motor rate torque | The motor rate torque<br>Example: if motor rate torque is 15Nm, then Pa.33=150. | 1~800 *0.1Nm | 100 |
| Pa.34 | Zero offset of motor encoder | Changes according to motor specification, details refer to debugging section. | 1~10000 /P35 | 2360 |
| Pa.35 | Pole pairs of motor | Changes according to motor specification, details refer to motor catalog. | 2~5 | 4 |
| Pa.36 | Acceleration time constant in position control mode | The bigger value it is, the shorter acceleration time is, and the faster positioning speed. | 0~30000 | 1000 |
| Pa.37 | Deceleration time constant in position control mode | The bigger value it is, the shorter deceleration time is, and the faster portioning speed. | 0~30000 | 1000 |
| Pa.38 | Acceleration time constant in speed control mode | The bigger value it is, the shorter acceleration time is, and the faster respond speed. | 0~30000 | 30 |
| Pa.39 | Deceleration time constant in speed control mode | The bigger value it is, the shorter deceleration time is, and the faster respond speed. | 0~30000 | 30 |
| Pa.40 | Inner pulse number 1 | The 1st part pulse number in inner pulse control mode. | 0~30000 | 10000 |
| Pa.41 | Inner pulse number 2 | The 2nd part pulse number in inner pulse control mode. | 0~30000 | 10000 |
| Pa.42 | Inner pulse number 3 | The 3rd part pulse number in inner pulse control mode. | 0~30000 | 10000 |
| Pa.43 | Inner pulse number 4 | The 4th part pulse number in inner pulse control mode. | 0~30000 | 10000 |
| Pa.44 | Current loop filtering constant | ①set current loop filtering constant;<br>②noise will grow up as the vale raise;<br>③when connect with small motor, P5 should be smaller.<br>④when load inertia is big, if motor vibrates, user can increase Pa.44; | 1~300 | 36 |
| Pa.45 | Inner pulse | 0: the 1st, 2nd, 3rd, 4th part is negative | 0~15 | 5 |

| | | direction; 1: the 1st part is positive direction; 2: the 2nd part is positive direction; 3:the 1st and 2nd part is positive direction; 4: the 3rd part is positive direction; 5: the 1st and 3rd part is positive direction; 6: the 2nd and 3rd part is positive direction; 7: the 1st, 2nd, 3rd part is positive direction; 8: the 4th part is positive direction; 9: the 1st and 4th part is positive direction; 10: the 2nd 4th part is positive direction; 11: the 1st, 2nd, 4th part is positive direction; 12: the 3rd and 4th part is positive direction; 13: the 1st, 3rd, 4th part is positive direction; 14: the 2nd, 3rd, 4th part is positive direction; 15: 0: the 1st, 2nd, 3rd, 4th part is positive direction; | | |
|---|---|---|---|---|
| control direction | | | | |
| Pa.46 | Inner time 1 | Pause time after running 1st part; | 0~5000 ms | 500 |
| Pa.47 | Inner time 2 | Pause time after running 2nd part; | 0~5000 ms | 500 |
| Pa.48 | Inner time 3 | Pause time after running 3$^{rd}$ part; | 0~5000 ms | 500 |
| Pa.49 | Inner time 4 | Pause time after running 4$^{th}$ part; | 0~5000 ms | 500 |
| Pa.50 | Inner pulse control outputs ready signal | 0: not output BRAKE signal; 1: output BRAKE signal after run each part. | 0~1 | 0 |
| Pa.51 | Encoder alarm | 0: valid, detect encoder alarm; 1: invalid, not detect encoder alarm. | 0~1 | 0 |
| P1.52 | Alarm history display | 0: display current alarm number; 1~10: display last 10 times alarm number, if P1=12345, alarm history will be cleared. P2.52 does not work. | 0~11 | 0 |
| P1.53 | Delay time before brake | The delay time between motor power on and output BRAKE signal. | 0~30000 ms | 200 |
| P1.54 | Delay time after brake | The delay time between close BRAKE signal and power off | 0~30000 ms | 0 |
| P1.55 | Driver ready or brake selection; | 0: BRAKE signal is motor orientation finish output(both channel finish); 1: BRAKE signal is brake output; | 0~3 | 1 |

| | | | | |
|---|---|---|---|---|
| | (must be 1 in NEW/NK302) | 2: BRAKE signal is channel 1 motor orientation output;<br>3: BRAKE signal is channel 2 motor orientation output. | | |
| Pa.56 | Numerator 2 of position command pulse division | 0: Numerator 2 of pulse division is invalid;<br>Non-0: valid.<br>Channel 1 EN is valid, select P1.56;<br>Channel 2 INTH is valid, choose P2.56;<br>Note:<br>1. if Pa.56 is non-0, choose Numerator 2 of pulse division, method is the same as Pa.12;<br>2. P0.6=1, P1.30=P2.30=0;<br>3. other function of EN/INTH is invalid. | 0-30000 | 0 |
| | Station number | 1-8 corresponds to XYZABCXsYs | 1~255 | 1 |
| P1.57 | Encoder line number | 1) Incremental encoder line number:<br>1024, 1000, 2000, 2048, 2500, 3000, 5000, 6000;<br>2) Absolute encoder resolution: if single turn, without battery.<br>0: 17bit single turn;<br>23: 23 bit single turn;<br>2500: 17 bit multi turn;<br>2523: 23 bit multi turn. | | 2500 |
| P1.58 | Modbus baud rate and data format | 4800, 9600, 14400, 19200,3840x10, 5670x10;<br>Data format: RTU;<br>1) Mantissa=0: 1start+8data+1odd+1stop;<br>Mantissa=1:1start+8data+1even+1stop. | 0~1 | 0 |
| Pa.59 | Current lock coefficient | if Pa.8 mantissa=1, half current lock coefficient when motor stops. | 1~800 | 100 |
| Pa.60 | Backlash value | When Pa.7=6, backlash compensation value | 0 | 0 |
| P1.61 | ALM alarm signal output mode | 0: normally open;<br>1: normally close; | 0~1 | 0 |

⚠ **Caution**

● Suggest to adjust parameter when motor keep still.

● Parameter Pa.20 setting or modify only can be done when power on driver;

● All parameter setting(except for Pa.34) can be done through pressing "Enter", not need to restart driver. But if user want to save the parameter setting, the parameter writing operation is necessary.

- a in parameter number mans channel number, a=1 means channel 1, a=2 means channel 2.

- After powering off driver, must wait for more that 30 seconds before power on again.

- When driver is used in cnc machine, and without connection with NEWKer cnc controller, P12 and P13 can be set as follows:

$$\frac{P12}{P13} = \frac{\text{machine reduction ratio} \times \text{controller pulse equivalent} \times 10000}{\text{ballscrew pitch(mm)}}$$

Note: pulse equivalent of general cnc controller is 0.001mm.

# Chapter 5 Display and Parameter operation

## 5.1 Driver display

Servo driver panel includes 6pcs of LED digital display, 4 buttons. Digital display is used showing status and parameters of servo driver; buttons are used to read and modify driver parameter.

The normal display of driver includes following 12 types:

1) Motor speed: P0.3=0, unit:r/min

    "r1." means channel 1, P0.2=1;
    "r2." means channel 2, P0.2=2;

2) Motor current:P0.3=1, unit: A

    "I1." means channel 1, P0.2=1;
    "I2." means channel 2, P0.2=2;

3) Motor torque: P0.3=2, unit:NM

    "I1." means channel 1, P0.2=1;
    "I2." means channel 2, P0.2=2;

4) Motor position: P0.3=3, unit:pulse

    "P1." means channel 1, P0.2=1;
    "P2." means channel 2, P0.2=2;

5) Position deviation: P0.3=4, unit: pulse

    "D1." means channel 1, P0.2=1;
    "D2." means channel 2, P0.2=2;

6) Input pulse low 4 bit: P0.3=5, unit:pulse

    "L1." means channel 1, P0.2=1;
    "L2." means channel 2, P0.2=2;

7) Input pulse high 4 bit: P0.3=6, unit:×1000pulse

    "H1." means channel 1, P0.2=1;
    "H2." means channel 2, P0.2=2;

8) Motor linear speed: P0.3=7, unit:mm/min

  0.001mm per pulse input

    "F1." means channel 1, P0.2=1;
    "F2." means channel 2, P0.2=2;
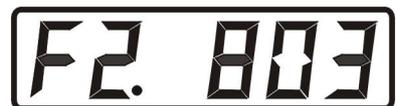
8) Input pulse frequency: P0.3=8, unit:kHz

    "c1." means channel 1, P0.2=1;
    "c2." means channel 2, P0.2=2;

10) Input port status: P0.3=9,

    Display number is hex code:

D0=1 means EN input is valid;

D1=1 means INTH input is valid;

11) Output port status: P0.3=10

Display number is hex code:

D0=1 means SRDY output is valid;

D1=1 means ALM output is valid;

D2=1 means BRAKE output is valid;

```
oU        5
```

12) Motor alarm display: P0.3=11,

Set P1.52 to display last 10 times alarm number,

if P0.1=12345, alarm history will be cleared.

```
Er 0-00
```

13) No display(except for alarm), P0.3=12.
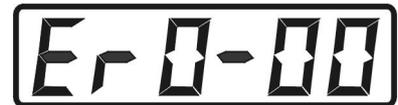

## 5.2 Button operation

The buttons contain "↑", "↓", "**Mode**", "**Enter**", used to read and set parameter.

"↑": parameter number or value increase, or motor rotates forward in JOG mode.

"↓": parameter number or value decrease, or motor rotates backward in JOG mode

"**Mode**": function switch, or current cursor move left.

"**Enter**": function enter, or value input enter.

In normal display, press "**Mode**" to switch among ①"Main Parameter", ② "Channel 1 parameter" ③"Channel 2 parameter", ④ "Parameter write", ⑤"Parameter initialize".

During switch, press "↑" to back monitoring display.

① "Main Parameter": P0.1~P0.6

```
P0.       1
```

② "Channel 1 parameter": P1.7~P1.56

```
P 1.      7
```

③ "Channel 2 parameter": P2.7~P2.56

```
P2.       7
```

④ "Parameter write":

```
EP-
```

⑤ "Parameter initialize"

```
rd-
```

⚠️ **Attention**

● Before input driver password, user only can switch among ①"Parameter", ② "Channel 1 parameter" ③"Channel 2 parameter", only able to read parameter, input password and modify P0.3 and P0.3, can not modify other parameters.

## 5.3 Parameter setting

### 5.3.1 Parameter choose

1) under normal display, press "Mode" Button to enter into ①" Main Parameter" or ② "Channel 1 parameter" or ③"Channel 2 parameter"

```
P            1
```

2) press "↑" or "↓" to switch parameter number, press "Enter".

```
             0.
```

3) press "↑" to increase 1, or "↓" to decrease 1, press "Mode", cursor will move left, press "Enter" to confirm or enter setting.

```
           2.0
```

⚠️ **Attention**

● Enter into P0.1, it just show 0, namely not show password.

● Before input password, all parameter setting is invalid, and going to back monitor display.

### 5.3.2 Password input and modify

Every time when power on driver, it is necessary to input password before modify parameter, namely set P0.1 parameter, default value is 1.

Before modifying password, user need to input original password. If user forgets password, please contact supplier.

When set P0.1=9999, it will be unnecessary to input password after next time power on.

### 5.3.3 Parameter writing

In monitoring display, press "Mode" switch into "Parameter writing" mode.

```
EP-
```
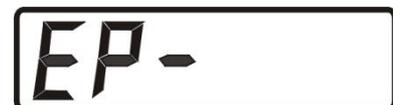
If user want to save the parameter, need to do parameter writing operation. After switch into Parameter writing mode, press "Enter" for 3~5 seconds, parameter will be written into inner EERPROM, after finishing writing, display will show:

$$End$$

## 5.3.4 Parameter initialize

In monitoring display, press "Mode" to switch into "Parameter initialize" status.

$$rd-$$

When user need to set driver parameter back to default value, please press "Enter" for 3~5 seconds, display will show "End". then all parameter except for password will be set as default value, but still did not write into EEPROM, please do parameter writing(5.3.3) again. Press "Enter" back to monitor display.

$$End$$

⚠ **Attention**

P0.1, Pa34, Pa.35 parameter can not be initialized.

# Chapter 6 Debug

⚠ **Attention**

- Driver and motor should connect with earth, PE terminal should be grounded..
- Driver power should be supplied by isolated transformer, in order to make sure safety and anti-jamming capability.
- Only after make sure correct connection, can power on driver.
- If driver alarms, make sure trouble removal before power on driver again.
- After power off driver and motor, do not touch them within 5 minutes, in case of electric shock.
- After running for a period, driver and motor may be heated, careful of burns.

## 6.1 Sequence diagram

### 6.1.1 Power connection

Power connection refers to diagram 7-1, and connect power as following steps:

1) connect power into main circuit power input terminal(R,S,T) through electromagnetic contractor;

2) delay for 1.5 seconds after power on, Servo ready signal(SRDY) is on, now driver is ready to receive enable signal(EN), if detect EN valid, driver output is effective, motor is under excitation and powers on. If detect EN invalid or alarm on, close motor excitation, motor is in free status.

3) when servo enable and power are switched on together, motor excitation will be on in 1.5 seconds.

4) frequently power on and off, may damage soft start circuit and energy consumption braking circuit, the frequency of switching on and off should be limited 5 times within 1 hour, under 30 times every day. If driver or motor malfunctioned because of over heat, please wait for 30 minutes to cool it before power on again.
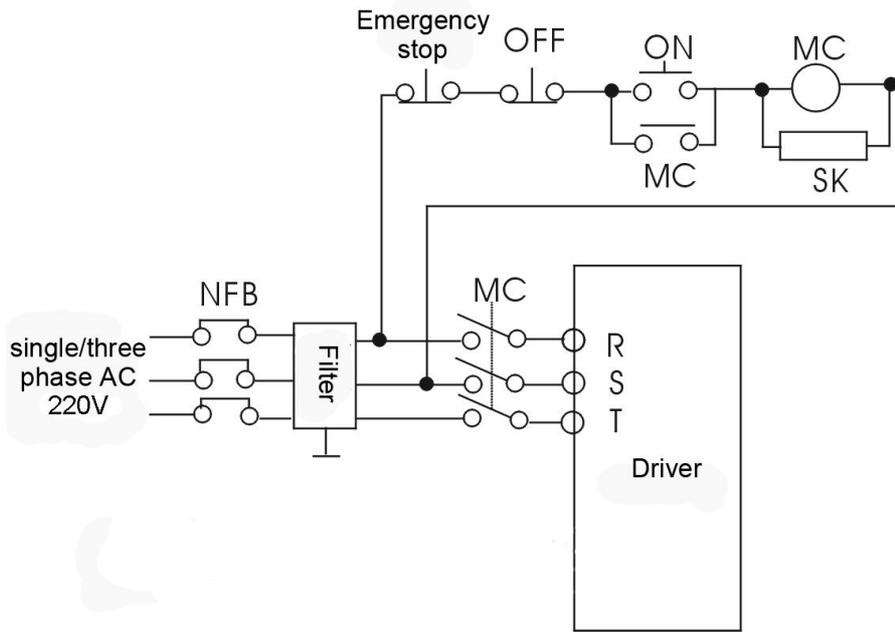
Power connection diagram 7-1

## 6.1.2 Power sequence diagram
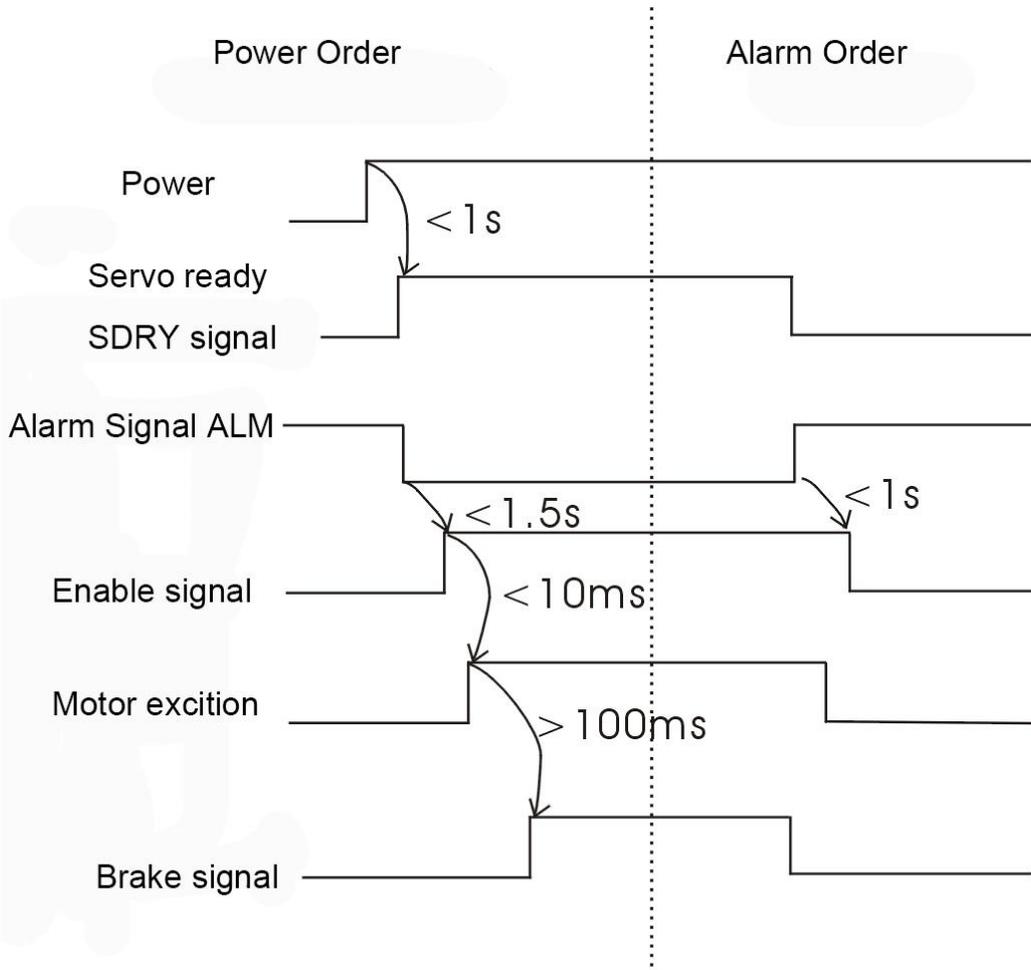
## 6.2 Brake connection

Mechanical brake is used to lock the vertical or slant platform which connects with motor, preventing it from dropping off for gravity after power off. The brake function requires the motor with brake.

Driver BRAKE signal controls intermediate reply which is used to control brake supply(offered by user). when driver powers on and motor excitation, BRAKE signal will be on after the delay time defined by P53. if power off or servo alarms, BRAKE signal will be off automatically, and cut off motor excitation after delay time by P53.

When connect BRAKE signal, please make sure capacity of brake supply, and must connect free-wheeling diode as surge absorber, as following picture:
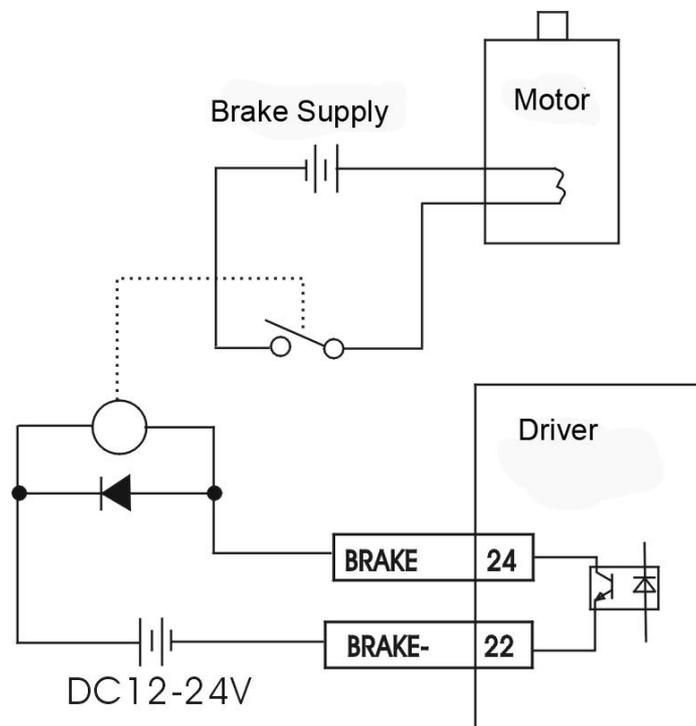


## 6.3 Running

### 6.3.1 Checking before running

After connection, please check following items before powering on:

● **Are power terminals connected well? Is input voltage correct?**

● **Is power cable or motor cable is short circuited or grounded?**

●**Is control signal terminal connected well? Are power polarity and sie correct?**

●**Are driver and motor fixed well?**

●**Does motor shaft connect without load?**

● **Check if Pa.32(rate current) and Pa.33(rate torque) corresponds to configuration on motor label**

## 6.3.2 JOG control mode

When driver parameter Pa.7=1, driver is in JOG control mode.

When Pa.7=1, press "↑", motor will rotate forward, release button, motor will stop. Speed is set by Pa.21.

When Pa.7=1, press "↓", motor will rotate backward, release button, motor will stop. Speed is set by Pa.21 .

Acceleration time constant in JOG mode can be adjusted by Pa.38; Deceleration time constant in JOG mode can be adjusted by Pa.39.

## 6.3.3 Position control mode

When Pa.7=0, or Pa.7=4, driver is in position control mode. The speed is controlled by input pulse frequency, running direction is set by input direction and Pa.15, input pulse mode is set by P1.14 while P2.14 is invalid; pulse input channel is defined by Pa.20.

When P30=1 or 2, and INTH signal is valid, the position control mode is disabled. electronic gear is defined by Pa.12 and Pa.13.

**Note:**

Acceleration time constant in position control mode can be adjusted by Pa.36; Deceleration time constant in position control mode can be adjusted by Pa.37.

## 6.3.4 Speed control mode

When Pa.7=2, or Pa.7=4( channel 1 EN signal is valid, channel 2 INTH is valid ), driver is in position control mode.The max speed is defined by Pa.22. Th max speed refers to running speed when input 10V analog voltage.

Running speed is defined by voltage of Vin1or Vin2; direction is defined by Vin1,Vin2 sign and Pa.16.

Negative dead area voltage in speed control mode can be adjusted by Pa.57; Positive dead area voltage in speed control mode can be adjusted by Pa.58.

 Acceleration time constant in speed control mode can be adjusted by Pa.38; Deceleration time constant in speed control mode can be adjusted by Pa.39.

When controller requires encoder feedback, connect encoder signal, signal ground(except for +5V) to controller system parallel.

## 6.3.5 Four-part inner pulse control mode

When Pa.7=5, driver is in four-part inner pulse control mode. This function is applied to fixed-length processing in automation.

After start automatically, driver will do loop from the first part to the fourth part, as following chart:

| Program part | Pulse number | Speed | Pause number after running pulse | Direction(defined by P45 hex code) | Output BRAKE or not after pulse running out |
|---|---|---|---|---|---|
| 1st part | Pa.40 | Pa.23 | Pa.46 | D0=1, rotates CW | When Pa.50=2, not output; when Pa.50=1, output BRAKE. |
| 2nd part | Pa.41 | Pa.24 | Pa.47 | D1=1, rotates CW | |
| 3rd part | Pa.42 | Pa.25 | Pa.48 | D2=1, rotates CW | |
| 4th part | Pa.43 | Pa.26 | Pa.49 | D3=1, rotates CW | |

**Attention**

1. please pay attention to that: channel 1 and channel 2 share the BRAKE signal.

2. The width by inner pulse control= pulse number×electron gear G.

# 6.4 Debug

**Caution**

- Mistaken parameter setting may cause driver malfunction, please check parameter validity before start driver.
- Suppose to do debug without load before debug with load.

## 6.4.1 Motor encoder zero position setting

When motor zero position offset, it is necessary to correct it, method is as following:

Open motor rear cover, set driver parameter Pa.7=1, Pa.3=1 to show motor current, rotate motor CW, CCW through JOG mode(speed from low to high), adjust motor encoder, to make the motor positive and negative current are the same and the lowest when motor is in max speed.

In case of over current alarm, speed can be adjusted from low to high step by step.

## 6.4.2 Servo motor encoder zero position debug

The encoder zero position in different brand motor may be different, parameter P34 is used to match encoder home position.

Set driver parameter Pa.7=1, Pa.3=1 to show motor current, rotate motor CW, CCW through JOG mode(speed from low to high), adjust Pa.34, to make the motor positive and negative current are the same and the lowest when motor is in max speed.

Every time when P34 is changed, must do writing operation and restart driver.

In case of over current alarm, speed can be adjusted from low to high step by step.

## 6.4.3 Rigidity and gain adjustment

**Speed loop proportional gain parameter Pa.9**: the bigger value means means higher gain and stronger rigidity, but motor is easier to noise; the bigger value is better if without noise.

**Current loop proportional gain Pa.8:** the bigger value means the faster current gain; when motor vibrates, please increase Pa.8; when connect small motor and it becomes heated, please decrease Pa.8; Unless higher requirement, please do not change Pa.8.

**Position loop proportional gain Pa.11:** smaller value means motor is more smooth, but rigidity is less;the bigger Pa.11 value is, the faster positioning speed is, the stronger rigidity becomes, and following counting deviation is smaller, but motor is easier to vibrate or overshoot;the bigger value is better if without vibration and overshoot.

**Position control position loop feedforward gain Pa.10:**the bigger value means means higher gain and stronger rigidity, but motor is easier to vibrate; Pa.10 value should decrease as load grows; the bigger value is better if without vibration.

**Attention:**

**1. if motor squeals or noise, please increase Pa.8 value incrementally;**

**2. when motor connects with ballscrew and squeals, please decrease Pa.9 value incrementally.**

**3. when connects ballscrew, and motor vibrates, please decrease Pa.10 value incrementally. And if vibration is severe, while decreasing Pa.10 does not work, please decrease Pa.11.**

## 6.4.4 Basic parameter setting diagram
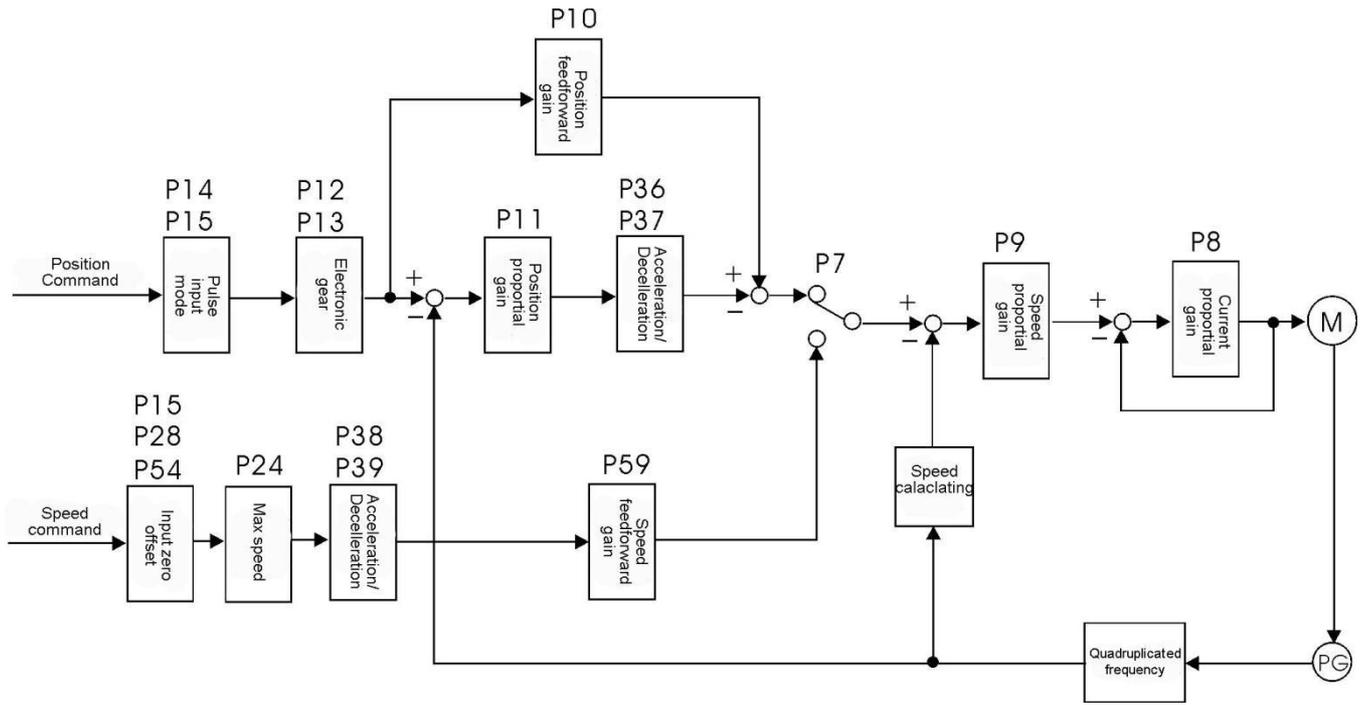
Position, Speed control diagram

## 6.4.5 Position resolution and Electronic gear

Position resolution(one unit pulse travel) depends on motor per turn travel and pulse feedback Pt of encoder per turn, as following formula:

$$\Delta 1 = \frac{\Delta s}{P_t}$$

Δ1: 1 unit pulse travel(mm);

ΔS: servo motor travel per turn(mm/turn);

Pt: feedback pulse of encoder per turn(pulse/turn)

Besides, there is quadruplicated frequency circuit in driver, so

Pt=4×C

C is encoder line number. In NEWker driver, C=2500 lines per turn, then Pt=10000 unit pule per turn.

Command pulse needs to multiply electronic gear G before converting into position control pulse, so one unit command pulse travel is:

Command pulse numberator

$$\Delta 1^* = \frac{\Delta S}{Pt} \times G$$

$$G = \frac{--------------------------------------}{\text{Command pulse denominator}}$$

When the driver is used in cnc machine, parameter P12 and P13 is as following:

$$\frac{Pa.12}{Pa.13} = \frac{\text{machine reduction ratio} \times \text{controller pulse equivalent} \times 10000}{\text{ballscrew pitch(mm)}}$$

Normally, cnc controller pulse equivalent is 0.001mm.

# 6.4.6 Servo start and stop character debug

Start and stop character means acceleration and deceleration time, depending on load inertia, stop frequency, and performance of servo driver with motor. Frequent start and stop, short acceleration and deceleration time, big load inertia will heat driver and motor up, lead to overload alarm, therefore used need to adjust parameter according to real situation.

1) load inertia and start/stop frequency

For high start/stop frequency application, user need to confirm if it is within limit. The frequency varies along motor type, capacity, load inertia, motor speed differ. If load inertia is M times than motor inertia, allowed motor start/top frequency and advised acceleration are as following:

| M times of load inertia | Allowed frequency |
|---|---|
| M$\leqq$3 | >100 times/minute; acceleration time constant$\leqq$500 |
| M$\leqq$5 | 60~100 times/minute; acceleration time constant$\leqq$150 |
| M>5 | <60 times/minute; acceleration time constant$\leqq$50 |

2) Servo motor

Various motors start/stop frequency and acceleration time differs according to load condition, running time, load rate, condition temperature etc, please refer to motor manual and real condition to adjust parameter, in case of overheat alarm or work life decrease.

3) Adjustment

Normally, the load inertia should be within the value which is 5 times than motor rate inertia. If used in big load inertia always, it is easier that main circuit is over voltage or brake malfunction during deceleration, then solution is as follows:

● Increase acceleration and deceleration time, it can be set bigger, and decrease incrementally to suitable value.

● Decrease inner torque limit, and current limit value.

● Decrease motor max speed.

● Exchange bigger power, higher inertia motor.

# Chapter 7 Alarm

Warning

- After power off driver and motor, do not touch them within 5 minutes, in case of electric shock.
- After alarm, please do not use driver before fault is solved.
- During alarm happens, driver will display ERa-xx and flicker, a=0 means driver general alarm, a=1 means channel 1 alarm, a=2 means channel 2 alarm, xx is alarm code.
- Set P1.52, P0.3=11 to check alarm history, in order to analyse source.
- After alarm, driver parameter still can be checked or modified.

## Alarm Code List

| Alarm Code | Alarm Information | Causes |
|---|---|---|
| ER0-00 | Normal | |
| ER1-01 | Channel 1 Motor overspeed | 1) Encoder cable connection is wrong;<br>2) Encoder is broken;<br>3) Encoder cable is too long, voltage supply to encoder is too low;<br>4) Motor sun speed is too fast; |
| ER2-01 | Channel 2 Motor overspeed | 5) Input pulse frequency is too high;<br>6) Electronic gear is too big;<br>7) Servo system is not stable and causes overshoot;<br>8) Circuit board is broken |
| ER0-02 | Main circuit power Overvoltage | 1) Power voltage is too high (Over+20%);<br>2) Brake resistor cable is cut off;<br>3) Inner regenerative brake transistor is broken;<br>4) Inner regenerative brake loop capacity |

| | | is too small; |
|---|---|---|
| | | 5) Circuit board is broken. |
| ER0-03 | Main circuit voltage low or Driver overheat | 1) Power voltage is tool low (lower than -20%); 2) Temporary interruption over 200mS; 3) Power start circuit loop fault; 4) Circuit board is broken; 5) Driver is overheated; |
| ER1-04 | Channel 1 Out of tolerance | 1) Mechanical part is chucked; 2) Input pulse frequency is too high; 3) Encoder zero position changes; 4) Encoder cable connection fault; |
| ER2-04 | Channel 2 Out of tolerance | 5) Position loop gain P11 is too small; 6) Torque is not enough; 7) Pa.18 value is too small; 8) Pa.19=1 will hide this alarm; |
| ER0-05 | Driver overheat | 1) Condition temperature is too high; 2) Cooling fan is broken; 3) Temperature sensor is broken; 4) Motor current is too big; 5) Inner regenerative brake transistor is broken; 6) Inner regenerative brake loop capacity is too small; 7) Circuit board is broken. |
| ER0-06 | Driver writing EEPROM storage fault | U19 chip is broken, need to changing. |
| ER0-07 | FPGA chip fault | U30 chip is broken, need to changing |

| ER1-09 | Channel 1 Encoder fault | 1) Encoder is broken;<br><br>2) Encoder cable is cut off;<br><br>3) Pa.51=1 will hide this alarm; |
|---|---|---|
| ER2-09 | Channel 2 Encoder fault | 4) Encoder cable is too long, voltage supply to encoder is too low;<br><br>5) Absolute encoder: communication fault, over speed, connection cable fault; |
| ER1-10 | Channel 1 Motor overload | When load is over rate torque×P16 percentage, driver alarm ER0-10; |
| ER2-10 | Channel 2 Motor overload | |
| ER1-11 | Channel 1 Module fault | 1) Current is too big;<br><br>2) Voltage is too low;<br><br>3) Motor isolation is broken;<br><br>4) Gain parameter setting is incorrect;<br><br>5) Overload; |
| ER2-11 | Channel 2 Module fault | 6) Temperature is too high;<br><br>7) Module is broken;<br><br>8) Driver is interfered;<br><br>9) Motor cable UVW are short circuit; |
| ER1-12 | Channel 1 Over current | 1) Motor cable UVW are short circuit;<br><br>2) Bad grounding;<br><br>3) Motor isolation is broken; |
| ER2-12 | Channel 2 Over current | 4) Overload;<br><br>5) Over 300% rate current for above 100ms;<br><br>6) Continually over 30% rate current for above 15s;<br><br>7) Gain parameter setting is incorrect, decrease P8 value to reduce current loop |

| | | gain;<br><br>8) Circuit board is broken; |
|---|---|---|
| ER0-13 | Driver discharge fault | 1) Power voltage is too high;<br><br>2) Power discharge loop circuit fault;<br><br>3) Circuit board is broken; |
| ER1-15 | Channel 1 Absolute encoder battery fault | 1) Battery voltage is low(the battery voltage is 3.6V, capacity is 7500mAH, when battery voltage is lower than 3.2V, driver will alarm), please exchange battery.(must exchange battery during driver powering on, otherwise the multiturn data will lose!!!) |
| ER2-15 | Channel 2 Absolute encoder battery fault | 2) Battery connection cable poor contact;<br><br>3) When P1.57=0, ERa-15 will be hidden. |

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