



R60-IO User Manual



Shenzhen Rtelligent Mechanical Electrical Technology Co., Ltd.

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1. Product Overview

Thank you for choosing Rtelligent R series digital stepper drive.

R series stepper drive, which surpasses the performance of common analog stepper drive comprehensively based on the new 32-bit DSP platform developed by TI, and adopting the micro-stepping technology and PID current control algorithm design. The R series stepper drives have the features of low noise, low vibration, low heating and high-speed high torque output, it is suitable for most stepper motors by integrated with the micro-stepping technology.

The R60-IO driver is a switch input control driver designed by Rtelligent for potentiometer speed control. The drive integrates a motion control module to support IO trigger fixed speed motion.

| | |
|-------------------------|--|
| Power supply | 24 – 48VDC |
| Output Current | Up to 5.6 amps (peak value) |
| Current control | PID current control algorithm |
| Micro-stepping settings | DIP switch settings, 16 options |
| Speed range | Use the suitable motor, up to 3000rpm |
| Resonance suppression | Automatically calculate the resonance point and inhibit the IF vibration |
| Parameter adaption | Automatically detect the motor parameter when drive initialize, optimize the controlling performance |
| Acceleration selection | Two gear selections, off is 1 gear, on is 2 gears |
| Pulse filtering | 2MHz digital signal processing filter |
| Neutral current | Automatically halve the current after the motor stopping |

We hope that our products with excellent performance can help you to complete the sports control program successfully.

Please read this technical manual before using the products.

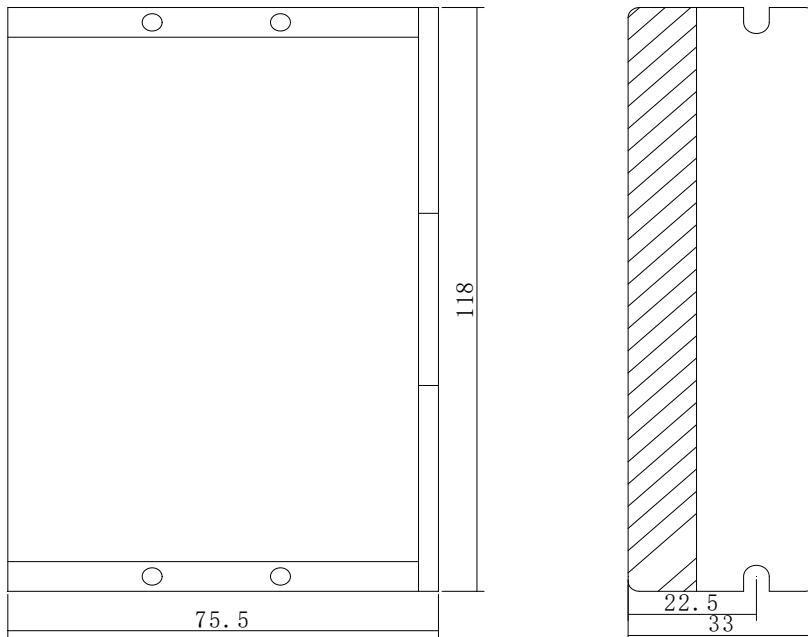
2. Application Environment and Installation

2.1 Environmental requirement

| | |
|------|-------------------|
| Item | Rtelligent R60-IO |
|------|-------------------|

| | |
|---|---|
| Installation environment | Avoid dust, oil and corrosive environment |
| Vibration | 0.5G (4.9m/s ²) Max |
| Operating temperature/humidity | 0°C ~ 45°C / 90% RH or less (no condensation) |
| Storage and transportation temperature: | -10°C ~ 70°C |
| Cooling | Natural cooling / away from the heat source |
| Waterproof grade | IP54 |

2.2 Drive installation dimensions



2.3 Drive installation requirements

Please install the drive vertically or horizontally, with its front facing forward, top facing upward to facilitate cooling.

During assembly, avoid drillings and other foreign matters falling inside the drive.

During assembly, please use M3 screw to fix.

When there is vibration source (such as a driller) close to the installation position, please use a vibrating absorber or a vibration resistant rubber gasket.

When multiple drives are installed in the control cabinet, please pay attention to reserve enough space for sufficient heat dissipation. If necessary, you can configure cooling fans to ensure good heat dissipation conditions in the control cabinet.

3. Drive Port and Connection

3.1 Port function description

| Function | Grade | Definition | Remarks |
|-------------------------|-------|--|----------------------------|
| Power supply input port | AC | Input AC power supply | DC 24~48V |
| | AC | Input AC power supply | |
| Motor connection port | B- | connect two terminals of motor's phase-B winding | |
| | B+ | | |
| | A- | connect two terminals of motor's phase-A winding | |
| | A+ | | |
| Potentiometer interface | ENA+ | Enable control interface | 3.3 ~ 24V level compatible |
| | ENA- | | |
| Pulse connection | IN1+ | Forward trigger input interface | |
| | IN1- | | |
| | IN 2+ | Reverse trigger input interface | |
| | IN 2- | | |

3.2 Power supply input

The power supply of the drive can be both AC power and DC power, and the input voltage range is 24V~48VDC.

Input power polarity should not be reversed!!!

The drive's work mode is constant current control. The drive output the voltage to motor by changing the input power into PWM chopping wave when it is working. In this case, the input power will affect the performance of drive.

Power selection reference:

Voltage:

The stepper motor has the characteristic of torque decreasing as the motor speed increases, and the voltage of the input power supply will affect the declining amplitude of the motor torque at high speed. Increasing the voltage of the input power supply appropriately can increase the output torque of the motor at high speed. And use low voltage when it is low speed required, can lower motor's heating appropriately.

Current:

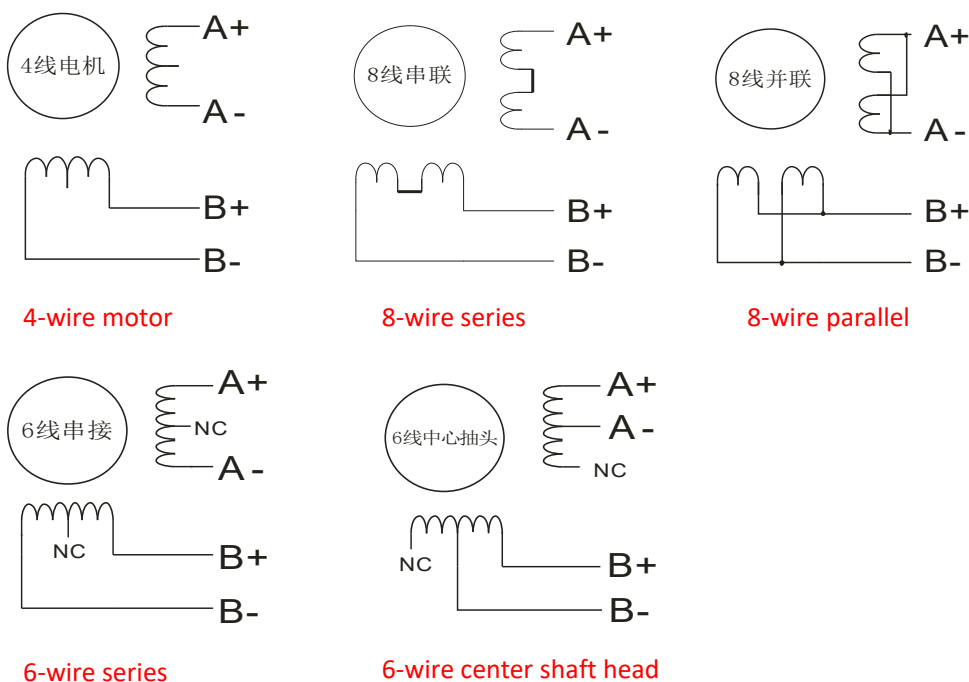
The work of the drive is to convert the input power supply with high voltage and low current to the low voltage and high current at both terminals of the motor winding. In this case, the current of power supply will be lower than the motor's.

The effects of regeneration voltage:

When the stepper motor is working, it also keeps the characteristics of the generator. At deceleration, the kinetic energy accumulated by the load is converted into electric energy, which will be superimposed on the drive circuit and the input power. In application, attention should be paid to the setting of acceleration and deceleration time to prevent the protection of the drive or power supply.

When the drive is powered off, similarly, the drive LED indicator will be on if the load is increased to allow the motor to move

3.3 Motor connection



The matching motor of the R60-IO drive is the low resistance and low inductance hybrid stepper motor.

The common 2-phase stepper motor's lead number are 4, 8 and 6.

There is only one connection mode for **4 leads motor**.

Series and parallel connection mode are used by **8 leads motor**:

When series used, the winding inductance increased. The set of drive current should be about 0.7times than before. This is suitable for low speed required.

When parallel used, the winding inductance decreased. The set of drive current should be about 1.4times than before. This is suitable for high speed required.

Parallel and central tapping connection mode are used by **6 leads motor**:

When parallel used, all the winding connected, and the inductance was higher. This is suitable for low speed required.

When central tapping used, half of the winding connected, and the inductance was lower. This is suitable for high speed required.

3.4 Control signal connection

3.4.1 IN Port: connection for pulse command

The upper controller can be the pulse signal generating device, such as PLC, MCU, control card and controller.

The pulse level that R60-IO drive can be used: 3.3V-24V (no need to connect resistor)

| | |
|--------------|---|
| Speed mode 1 | <p style="text-align: center;">Do not turn Forward Reverse Do not turn</p> |
| | <p>When IN1 is turned on and IN2 is turned off, the motor is triggered to rotate forward; when IN1 is turned off, the motor decelerates to stop.</p> <p>When IN1 is turned on and IN2 is turned on, the motor is reversed. When IN1 is turned off, the motor decelerates to a stop.</p> <p>When IN1 is off, the motor stops running. (default is this mode)</p> |
| Speed mode 2 | <p style="text-align: center;">Do not turn Forward Reverse Do not turn</p> |
| | <p>When IN1 is turned on, the motor is triggered to continue to rotate forward; when it turns from on to off, the motor decelerates and stops.</p> <p>When IN2 is turned on, the motor is triggered to continuously reverse; when it turns from on to off, the motor decelerates and stops.</p> <p>When IN1 and IN2 are both on, the motor will stop running.</p> |

Note: The IO driver defaults to mode 1. If you need to adjust, please explain to Rtelligent.

3.4.2 ENA port: used to enable or disable.

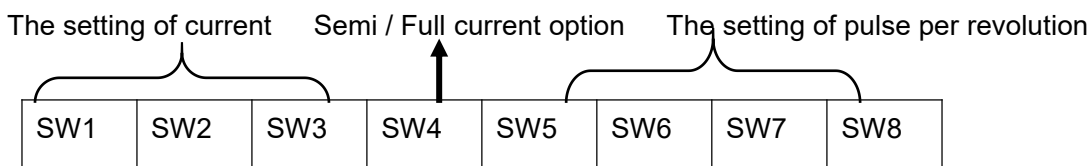
By default, the driver outputs current to the motor when the photocoupler is turned off. When the

internal photocoupler is turned on, the driver will cut off the current of each phase of the motor to make the motor in a free state. At this time, the step pulse is not responded.

When the motor is in an error state, the ENA input can be used to restart the drive. First remove the fault, then input a falling edge signal to the ENA terminal, the driver can restart the power part, and the motor excites.

The level logic of the ENA signal can be set to the opposite, and the logic is opposite to the above.

4. The setting of DIP switches and operating parameters



4.1 The setting of current

| Peak Current | Average Current | SW1 | SW2 | SW3 | Remarks |
|--------------|-----------------|-----|-----|-----|-----------------------------------|
| 1.4A | 1.0A | on | on | on | Other Current can be custom-made. |
| 2.1A | 1.5A | off | on | on | |
| 2.7A | 1.9A | on | off | on | |
| 3.2A | 2.3A | off | off | on | |
| 3.8A | 2.7A | on | on | off | |
| 4.3A | 3.1A | off | on | off | |
| 4.9A | 3.5A | on | off | off | |
| 5.6A | 4.0A | off | off | off | |

DIP SW1, SW2, SW3 are used to set current which is output from drive to motor.

Generally, the current setting is the motor rated current. If your system has high request to the heating, please decrease the current properly to lower the motor’s heating, but at the same time, the output torque will be lower. If you don’t need the motor running continuous, you can increase the current to higher the torque. But be minded that the current can not be 1.5times over than the rated current.

4.2 The setting of pulse per revolution

| Stepping count/revolution | SW5 | SW6 | SW7 | SW8 | Remarks |
|---------------------------|-----|-----|-----|-----|--|
| 200 | on | on | on | on | The DIP switch is turned to the Default state and the testing software can freely change other micro-stepping level number |
| 400 | off | on | on | on | |
| 800 | on | off | on | on | |
| 1600 | off | off | on | on | |
| 3200 | on | on | off | on | |

| | | | | |
|-------|-----|-----|-----|-----|
| 6400 | off | on | off | on |
| 12800 | on | off | off | on |
| 25600 | off | off | off | on |
| 1000 | on | on | on | off |
| 2000 | off | on | on | off |
| 4000 | on | off | on | off |
| 5000 | off | off | on | off |
| 8000 | on | on | off | off |
| 10000 | off | on | off | off |
| 20000 | on | off | off | Off |
| 25000 | off | off | off | off |

DIP SW5, SW6, SW7, SW8 are used to set the speed when the motor is triggered. Built-in S-type acceleration and deceleration.

When the switch is closed, the motor accelerates to the set speed.

When the switch is off, the motor decelerates and stops.

4.3 Acceleration selection








DIP SW4 is used to set the acceleration of the motor when it is running.

“Off” means the acceleration gear position “1” and the acceleration is moderate;

“On” means the acceleration gear position “2”, and the acceleration is large.

※ The default acceleration for the general application is gear 1.

5. Drive working status LED indication

| LED status | | Drive status |
|---|--|--|
|  | Green indicator is on for long time | Drive not enabled |
|  | Green indicator is flickering | Drive working normally |
|  | One green indicator and one red indicator | Drive overcurrent |
|  | One green indicator and two red indicators | Drive input power overvoltage |
|  | One green indicator and three red indicators | The internal voltage of the drive is wrong |
|  | One green and four red indicators | Tracking error exceeds limits |
|  | One green and five red indicators | Encoder phase error |

6. Common Faults and Troubleshooting

| Phenomenon | Possible situations | Solutions |
|---------------------------------------|---|---|
| Motor does not work | Power indicator is off | Check the power supply circuit for normal power supply |
| | The motor rotor is locked but the motor does not work | Pulse signal is weak; increase the signal current to 7-16mA |
| | The speed is too slow | Select the right micro-stepping |
| | Drive is protected | Solve the alarm and re-power |
| | Enable signal problem | Pull up or disconnect the enable signal |
| | Command pulse is incorrect | Check whether the upper computer has pulse output |
| The steering of motor is wrong | The rotary direction of motor is reverse | Adjust the DIP SW5 |
| | The motor cable is disconnected | Check the connection |
| | The motor has only one direction | Pulse mode error or DIR port damaged |
| Alarm indicator is on | The motor connection is wrong | Check the motor connection |
| | The motor connection and encoder connection are wrong | Check the sequence of encoder connection |
| | The voltage is too high or too low | Check the power supply |
| The position or speed is wrong | The signal is disturbed | Eliminate interference for reliable grounding |
| | The command input is incorrect | Check the upper computer instructions to ensure the output is correct |
| | The setting of Pulse per revolution is wrong | Check the DIP switch status and correctly connect the switches |
| | Encoder signal is abnormal | Replace the motor and contact the manufacturer |
| The drive terminal burned up | Short circuit between terminals | Check power polarity or external short circuit |

| | | |
|--------------------------------------|--|--|
| | Internal resistance between terminals is too large | Check whether there is any solder ball due to excessive addition of solder on the wire connections |
| The motor is out of tolerance | Acceleration and deceleration time is too short | Reduce command acceleration or increase drive filtering parameters |
| | Motor torque is too low | Select the motor with high torque |
| | The load is too heavy | Check the load weight and quality and adjust the mechanical structure |
| | The current of power supply is too low | Replace the appropriate power supply |

Appendix A. Guarantee Clause

A.1 Warranty period: 12 months

We provide quality assurance for one year from the date of delivery and free maintenance service for our products during the warranty period.

A.2 Exclude the following:

- Improper connection, such as the polarity of the power supply is reversed and insert/pull the motor connection when the power supply is connected.
- Beyond electrical and environmental requirements.
- Change the internal device without permission.

A.3 Maintenance process

For maintenance of products, please follow the procedures shown below:

- (1) Contact our customer service staff to get the rework permission.
- (2) The written document of the drive failure phenomenon is attached to the goods, as well as the contact information and mailing methods of the sender.

Mailing address:

Post code:

Tel.: