

# Digital Stepper Driver R130-IO

---

## User Manual

# Contents

|  |   |
|--|---|
| 1. Product overview.....                                     | 1 |
| 2. Application environment and installation.....             | 2 |
| 2.1 Environmental requirement.....                           | 2 |
| 2.2 Driver installation dimensions.....                      | 2 |
| 2.3 Driver installation requirements.....                    | 2 |
| 3. Driver port and connection.....                           | 3 |
| 3.1 Port function description.....                           | 3 |
| 3.2 Power supply input.....                                  | 4 |
| 3.3 Motor connection.....                                    | 4 |
| 3.4 Control signal connection.....                           | 5 |
| 3.4.1 Switch port: connection for switch signal.....         | 5 |
| 3.4.2 ENA port: enable/disable.....                          | 5 |
| 3.4.3 Input IO signal: IN2, IN3.....                         | 5 |
| 3.4.4 Output IO signal: ALM, RDY.....                        | 5 |
| 4. The setting of DIP switches and operating parameters..... | 6 |
| 4.1 The setting of current.....                              | 6 |
| 4.2 The setting of speed level.....                          | 6 |
| 5. Driver working status LED indication.....                 | 7 |
| 6. Common faults and troubleshooting.....                    | 7 |
| 7. Guarantee Clause.....                                     | 9 |

## 1. Product overview

Thank you for choosing Rtelligent R series digital stepper driver.

R series stepper driver, which surpasses the performance of common analog stepper driver 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 drivers 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.

R130 driver has built-in pulse command S-type acceleration/deceleration function and limit frequency optional function, which is set by DIP switches.

In addition, you can select the current and subdivision through the DIP switch. There are 16 subdivisions and 16 current selections. It has over-voltage, under-voltage, and over-current protection. Its input and output control signals are optically isolated.

|                         |   |
|-------------------------|---|
| Power supply            | 110 - 230 VAC   |
| Output Current          | Up to 7.0 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 driver initialize, optimize the controlling performance |
| Pulse mode              | Direction & pulse, CW/CCW double pulse  |
| 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.

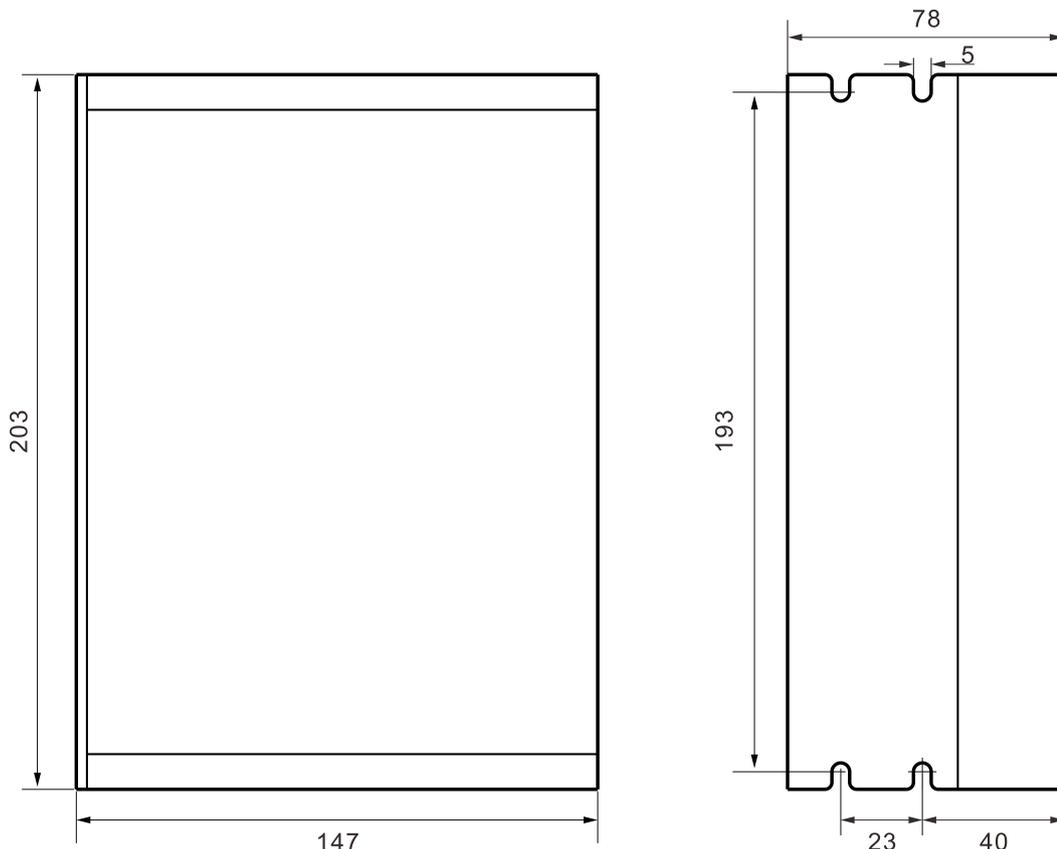
Please read this technical manual before using the products.

## 2. Application environment and installation

### 2.1 Environmental requirement

|   |   |
|---|---|
| Item                                    | Rtelligent R130-IO                            |
| Installation environment                | Avoid dust, oil and corrosive environment     |
| Vibration                               | 0.5G (4.9m/s <sup>2</sup> ) 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 Driver installation dimensions



### 2.3 Driver installation requirements

Please install the driver 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 driver. 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 drivers 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. Driver port and connection

#### 3.1 Port function description

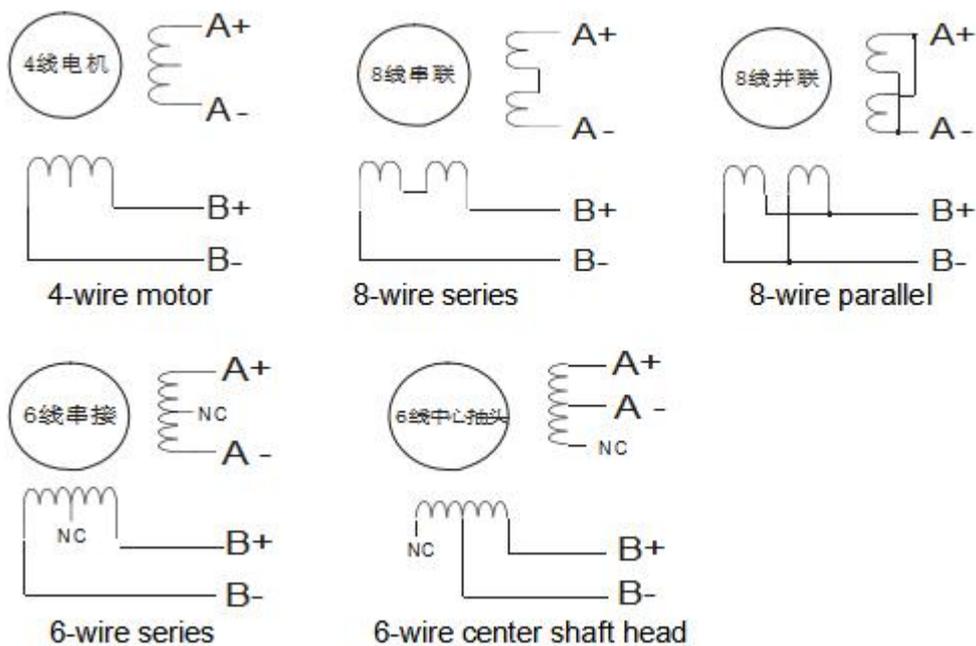
| Function                | Grade |      | Definition                                       | Remarks                    |
|-------------------------|-------|------|--|----------------------------|
| Power supply input port | AC    |      | AC power supply input                            | AC 110~230V                |
|                         | AC    |      | AC power supply input                            |                            |
|                         | PE    |      | Earth Wire                                       |                            |
| Motor connection port   | A+    |      | connect two terminals of motor's phase-A winding |                            |
|                         | A-    |      |  |                            |
|                         | B+    |      | connect two terminals of motor's phase-B winding |                            |
|                         | B-    |      |  |                            |
| IO port wiring          | 1     | IN1+ | Start trigger input interface                    | 3.3 ~ 24V level compatible |
|                         | 2     | IN1- |  |                            |
|                         | 3     | IN2+ | Reversing trigger input interface                |                            |
|                         | 4     | IN2- |  |                            |
| Enable connection       | 7     | ENA+ | Enable control interface                         |                            |
|                         | 8     | ENA- |  |                            |
| Input signal            | 5     | IN3+ | Universal input 1                                | 3.3 ~ 24V level compatible |
|                         | 6     | IN3- |  |                            |
|                         | 13    | IN2+ | Universal input 2                                |                            |
|                         | 14    | IN2- |  |                            |
| Output signal           | 9     | ALM+ | Alarm Output                                     | 24V, below 40mA            |
|                         | 10    | ALM- |  |                            |
|                         | 11    | RDY+ | Ready output                                     |                            |
|                         | 12    | RDY- |  |                            |
|                         | 15    | NC   | No definition                                    |                            |

### 3.2 Power supply input

The driver's working power is AC power, and the input voltage range is between 110V ~ 230V. Please pay attention to confirm the local grid voltage, and do not exceed the maximum voltage of the driver.

The specifications of power supply are single-phase AC power. Please install an EMI device in front of the driver terminals to filter out electromagnetic interference from the power grid.

### 3.3 Motor connection



The matching motor of the R130-IO driver 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 driver 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 driver 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.

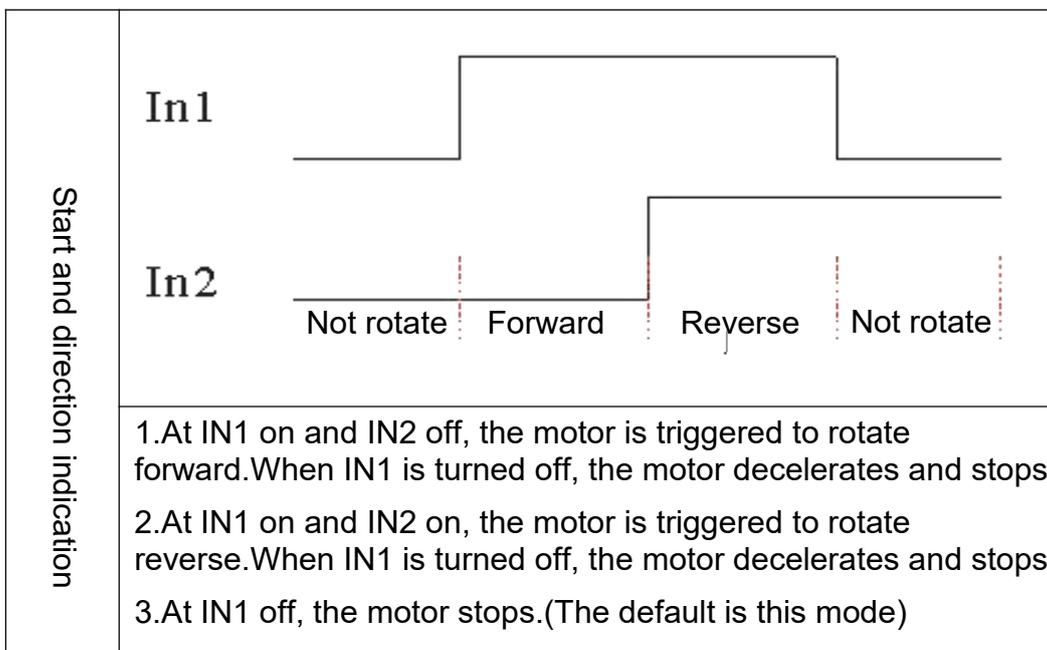
### 3.4 Control signal connection

#### 3.4.1 Switch port: connection for switch signal.

The signal interface of standard R-IO series driver is in the form of switching value.

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

The pulse level that R130-IO driver can be used: 3.3V-24V (**no need to connect resistor**)



#### 3.4.2 ENA port: enable/disable

By default, when the internal optocoupler is off, the driver outputs current to the motor;

When the internal optocoupler is on, the driver will cut off the current of each phase of the motor to make the motor free, and the step pulse will not be responded.

When the motor is in an error state, it is automatically turned off. The level logic of the enable signal can be set to the opposite.

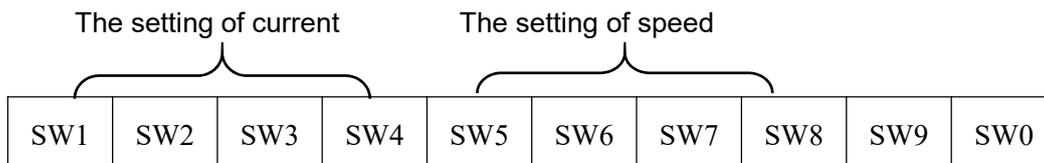
#### 3.4.3 Input IO signal: IN2, IN3

IN2, IN3 are input signals with optocoupler isolation and can accept differential or single-ended switch value inputs. This signal is the input logic and input pin of the driver, which increases the trigger condition of the driver motion. For specific use, please contact Rtelligent engineer.

#### 3.4.4 Output IO signal: ALM, RDY

ALM and RDY are logic output pins of the driver. By default, they are defined as ALM alarm output and RDY ready signal output. The alarm state and ready state of the driver can be output to the external upper computer system. The output signal can also be defined as other logic outputs. For specific use, please contact Rtelligent engineer.

## 4. The setting of DIP switches and operating parameters



### 4.1 The setting of current

| Average Current | SW1 | SW2 | SW3 | SW4 | Remarks                           |
|-----------------|-----|-----|-----|-----|-----------------------------------|
| 0.7A            | on  | on  | on  | on  | Other Current can be custom-made. |
| 1.1A            | off | on  | on  | on  |                                   |
| 1.6A            | on  | off | on  | on  |                                   |
| 2.0A            | off | off | on  | on  |                                   |
| 2.4A            | on  | on  | off | on  |                                   |
| 2.8A            | off | on  | off | on  |                                   |
| 3.2A            | on  | off | off | on  |                                   |
| 3.6A            | off | off | off | on  |                                   |
| 4.0A            | on  | on  | on  | off |                                   |
| 4.5A            | off | on  | on  | off |                                   |
| 5.0A            | on  | off | on  | off |                                   |
| 5.4A            | off | off | on  | off |                                   |
| 5.8A            | on  | on  | off | off |                                   |
| 6.2A            | off | on  | off | off |                                   |
| 6.6A            | on  | off | off | off |                                   |
| 7.0A            | off | off | off | off |                                   |

DIP SW1, SW2, SW3, SW4 are used to set current which is output from driver to motor.

Generally, the current is set to not exceed the rated current of the motor (effective value). If your system has high request to the heating, please decrease the current properly to lower the motor's heating.

### 4.2 The setting of speed level

| Speed level RPM | SW5 | SW6 | SW7 | SW8 | Remarks                        |
|-----------------|-----|-----|-----|-----|--------------------------------|
| 10              | on  | on  | on  | on  | Customizable other speed level |
| 20              | off | on  | on  | on  |                                |
| 30              | on  | off | on  | on  |                                |
| 50              | off | off | on  | on  |                                |
| 60              | on  | on  | off | on  |                                |
| 80              | off | on  | off | on  |                                |
| 100             | on  | off | off | on  |                                |
| 150             | off | off | off | on  |                                |
| 200             | on  | on  | on  | off |                                |
| 250             | off | on  | on  | off |                                |
| 300             | on  | off | on  | off |                                |
| 400             | off | off | on  | off |                                |

|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| 500 | on  | on  | off | off |
| 600 | off | on  | off | off |
| 700 | on  | off | off | off |
| 800 | off | off | off | off |

### 5. Driver working status LED indication

| LED Status   | Driver Status                               |
|--|---|
|  Green indicator is on for long time          | Driver not enabled                          |
|  Green indicator is flickering                | Driver working normally                     |
|  One green indicator and one red indicator    | Driver overcurrent                          |
|  One green indicator and two red indicators   | Driver input power overvoltage              |
|  One green indicator and three red indicators | The internal voltage of the driver is wrong |
|  One green indicator and seven red indicators | Motor phase loss                            |

### 6. Common faults and troubleshooting

| Phenomenon                            | Possible situations                                   | Solutions   |
|---------------------------------------|---|---|
| <b>Motor does not work</b>            | 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                             |
|                                       | Driver 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           |
| <b>The steering of motor is wrong</b> | 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                        |

|                                       |   |  |
|---------------------------------------|---|--|
| <b>Alarm indicator is on</b>          | 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   |
| <b>The position or speed is wrong</b> | 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   |
| <b>The driver terminal burned up</b>  | 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 |
| <b>The motor is out of tolerance</b>  | Acceleration and deceleration time is too short       | Reduce command acceleration or increase driver 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   |

## 7. Guarantee Clause

### 7.1 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.

### 7.2 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.

- Maintenance process

### 7.3 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 driver failure phenomenon is attached to the goods, as well as the contact information and mailing methods of the sender.

Mailing address: Post code:

Tel.