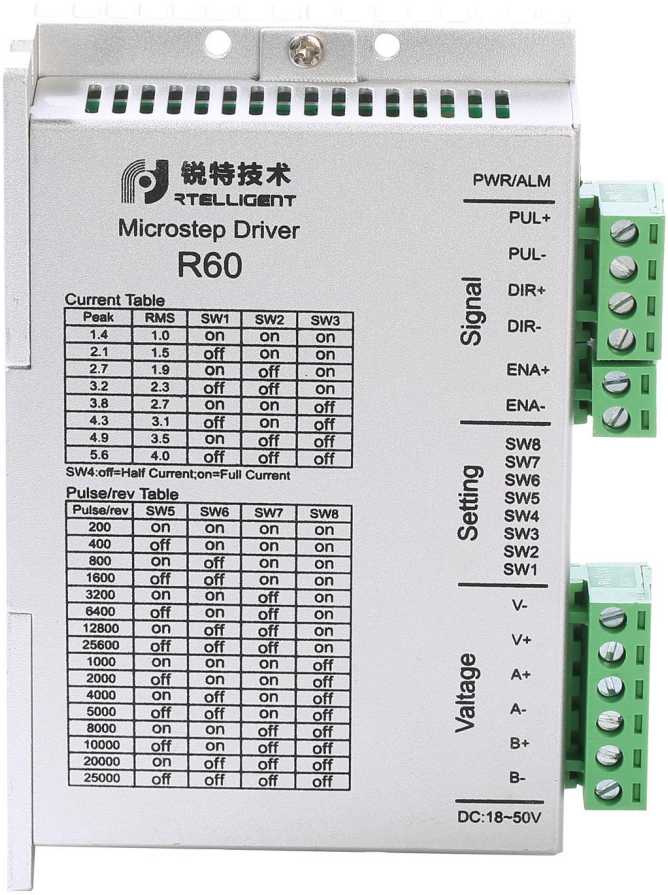
Digital Stepper Driver R60

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 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.

The R60 driver can select the running current and subdivision through the DIP switch. There are 16 subdivisions, 2 acceleration selection, and 8 current selections. It has overvoltage, undervoltage and overcurrent protection. Its input and output control signals are optically isolated.

Power supply	24 – 48VDC
Output Current	DIP switch setting, 8 options, 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 driver initialize, optimize the controlling performance
Pulse mode	Support direction & pulse, CW/CCW double pulse
Pulse filtering	2MHz digital signal filter
Idle current	The current is automatically halved after the motor stops running

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

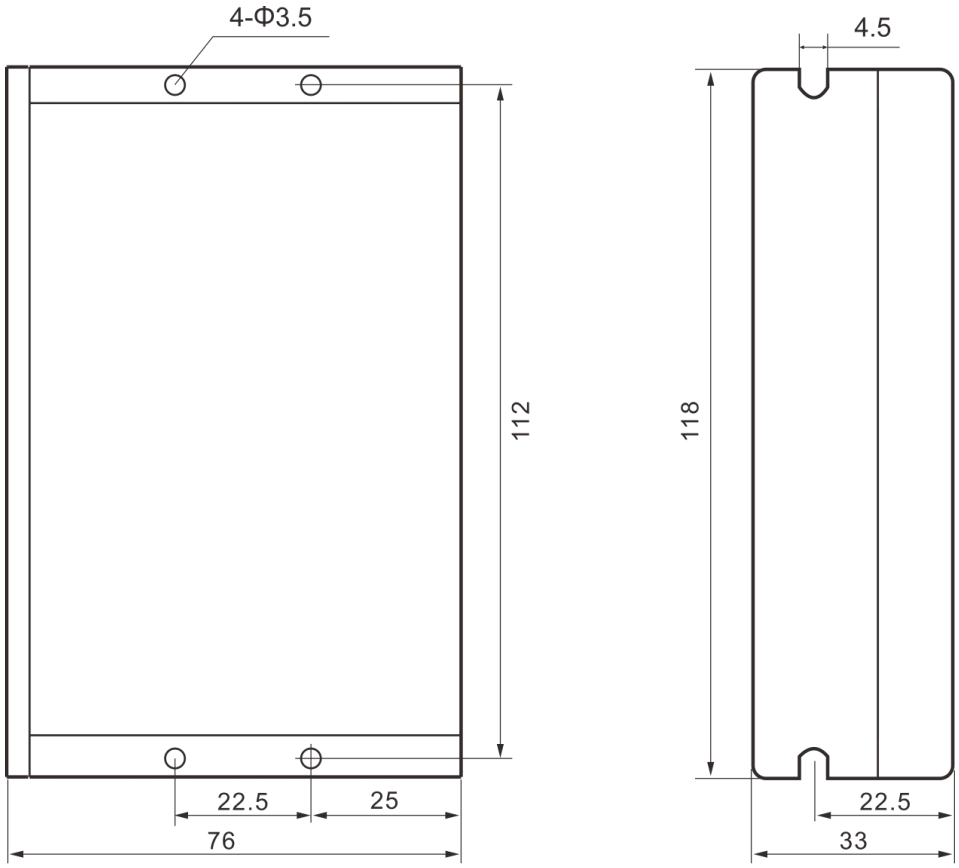
Please read this technical manual before using the products.

2. Application environment and installation

2.1 Environmental requirement

Item	Rtelligent R60
Installation environment	Avoid dust, oil and corrosive environment
Vibration	0.5G（4.9m/s^2） Max
Operating temperature/humidity	0℃ ~ 45℃ / 90% RH or less (no condensation)
Storage and transportation temperature:	-10℃ ~ 70℃
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	V+	Input DC power positive	DC 24~48V
	V-	Input DC power negative	
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-		
Pulse connection	PUL+	Pulse input interface	3.3 ~ 24V level compatible
	PUL-		
	DIR+	Direction input interface	
	DIR-		
Enable connection	ENA+	Enable control interface	
	ENA-		

3.2 Power supply input

The driver's working power is DC power, and the input voltage range is between 24V ~ 48V.

Input power polarity should not be reversed!!!

The driver’s work mode is constant current control. The driver 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 driver.

Power selection reference:

Voltage:

Stepper motor has the characteristics of torque decrease with the increase of motor speed, and the input voltage will affect the amplitude of high-speed torque reduction. Properly increasing the voltage of the input power supply can increase the output torque of the motor at high speed.

Therefore, if you want to get better high-speed performance, pls increase the power supply voltage of the driver; and for low-speed applications, choosing a slightly smaller voltage can appropriately reduce the heat of the motor.

Current:

The working process of the driver is to convert the input high-voltage and low-current power supply into the low-voltage and high-current at both ends of the motor winding. In actual use, the appropriate power supply should be selected according to the motor model, load torque and other factors.

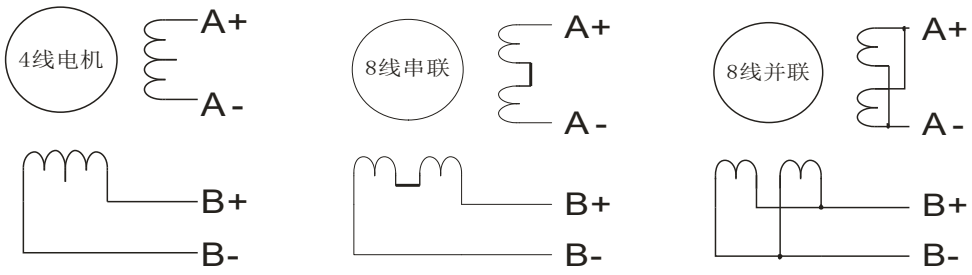
The effects of regeneration voltage:

When the stepper motor is working, it also retains the characteristics of the generator. When decelerating, the kinetic energy accumulated by the load will be converted into electrical energy and superimposed on the driver circuit and input power supply.

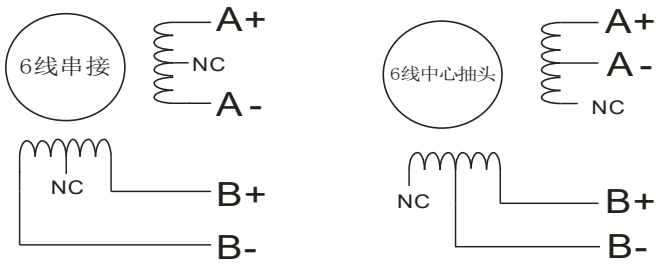
Pay attention to the setting of acceleration and deceleration time to protect the driver or power supply.

When the driver is powered off, you will see the driver's LED indicator on when the load is pulled to make the motor move, which is also affected by this.

3.3 Motor connection



4-wire motor　　8-wire series　　8-wire parallel



6-wire series　　6-wire center shaft head

The matching motor of the R60 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.

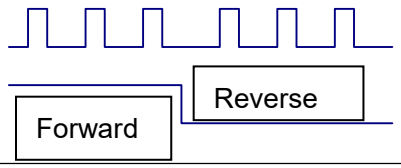
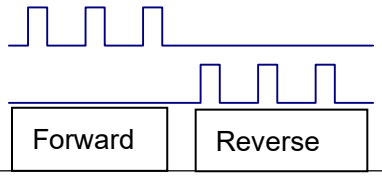
3.4 Control signal connection

3.4.1 PUL, DIR port: connection for pulse command

The standard R series driver signal interface is in the form of pulse, and R60 can receive two kinds of pulse command signals.

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

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

Pulse and direction (PUL + DIR)	
Double pulse (CW +CCW)	

3.4.2 ENA port: used to enable or disable

When the internal optocoupler is off, the driver outputs current to the motor;

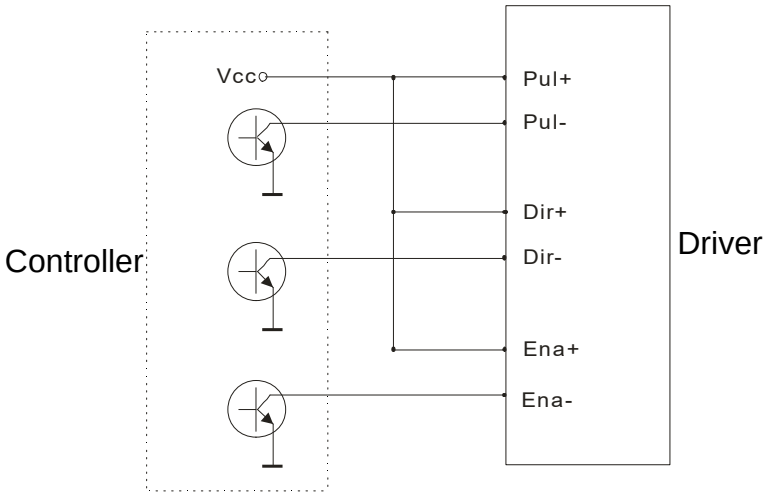
When the internal optocoupler is on, the driver will cut off the current of each phase of the motor to make the motor free, and the step pulse will not be responded.

When the motor is in error state, ENA input can be used to restart the driver. Firstly, the fault is eliminated, and then a falling edge signal is input to the ENA terminal. The driver can restart the power part and the motor is excited.

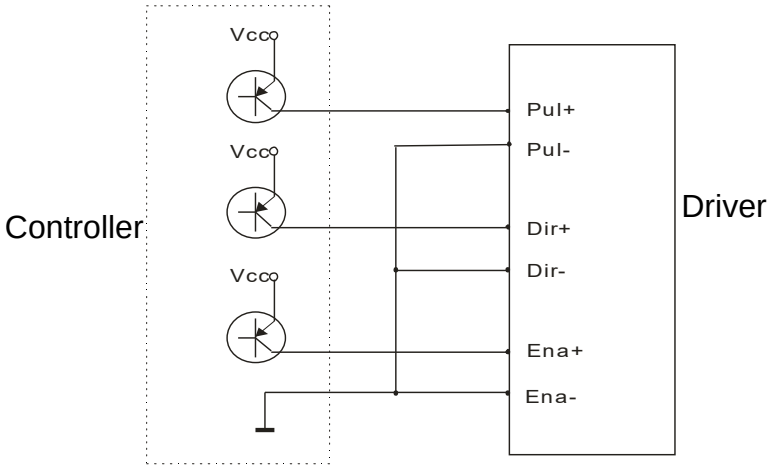
The level logic of the ENA signal can be set to the opposite, with the logic being opposite to the above.

3.4.3 Examples for control signal connection

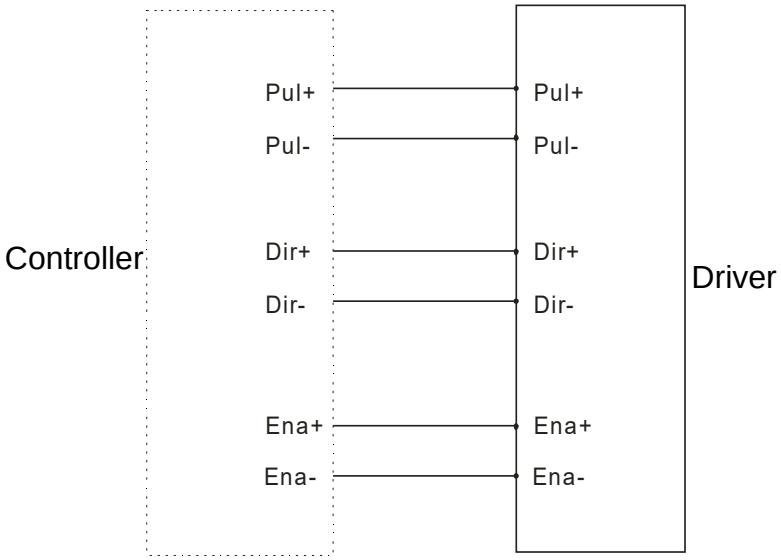
Common Anode



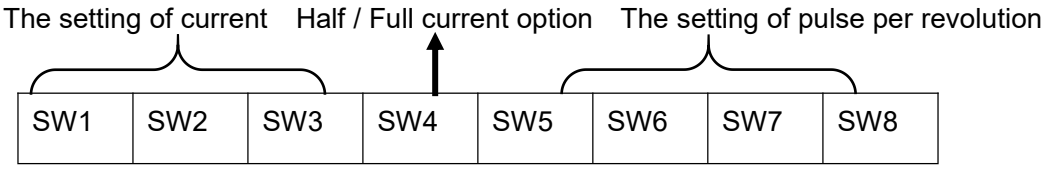
Common Cathode



Difference



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 customized.
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 driver 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

Steps/revolution	SW5	SW6	SW7	SW8	Remarks
200	on	on	on	on	Other subdivisions can be customized.
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, and SW8 are used to set the pulse per revolution required by the motor.
Motor speed = command pulse frequency / pulse per revolution
Motor stroke = number of command pulses / pulse per revolution

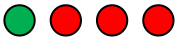
4.3 Half / full flow selection

DIP SW4 is used to set the static current value when the motor is stopped

Off means that when the driver's power-on pulse stops, the driver switches the current output to the motor to half (half current) when it is rotating;

On means that when the driver's power-on pulse stops, the driver maintains the same current output to the motor as the rotation (full current)). In general use, SW4 should be set to off, so that the heat of the motor and driver is reduced, and the reliability is improved.

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

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
	Driver is protected	Solve the alarm and re-power
	Enable signal problem	Pull up or disconnect the enable signal

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	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 driver 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

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.

7.3 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 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.: