Digital Stepper Driver R60X2

User Manual

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1. Product description

Thank you for choosing Rtelligent R series digital stepper driver.

R60X2 is a two-axis stepper motor driver. The driver has two independent control signal interfaces to control two stepper motors respectively

The R60X2 driver can select the operating current and subdivision through the DIP switch. There are 8 subdivisions and 8 current options. The driver has over-voltage, under-voltage, and over-current protection. The input and output control signals are optically isolated.

Power supply	24 - 48 VDC
Output current	Up to 5.6 amps (peak)
Current control	PID current control algorithm
Segment settings	DIP switch setting, 8 options
Speed range	Use the suitable stepper motor, up to 3000rpm
Resonance suppression	Automatically calculate the resonance point and inhibit the IF vibration
Parameter adaptation	Automatically detect the motor parameter when driver initialize, optimize the controlling performance
Pulse mode	Support pulse + direction、 double pulse
Pulse filtering	2MHz digital signal filter
Idle 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.
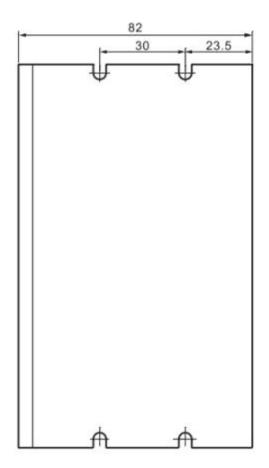
Please read this technical manual before using the products.

2. Application environment and installation

2.1 Environmental requirement

Item	Rtelligent R60X2
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

When installing, please stand the drive vertically or horizontally, with the front face up and the top face up to facilitate heat dissipation.

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

During assembly, please use M3 screw to fix.

When there is a vibration source near the installation (such as a drilling machine), please use a vibration absorber or install anti-vibration rubber gaskets.

When multiple drives are installed in the control cabinet, please note that sufficient space should be reserved in the placement to obtain sufficient heat dissipation; if necessary, a cooling fan can be configured to ensure good heat dissipation conditions in the control cabinet.

3. Driver Port and Connection

3.1 Port function description

Function	Grade	Definition	Remark
Power supply input port	V+	Input DC power positive	DC 24~48V
	V-	Input DC power negative	
Motor 1 terminal	A+	Connect both ends of Phase A winding of Motor 1	
	A-		
	B+	Connect both ends of Phase B winding of Motor 1	
	B-		
Motor 2 terminal	A+	Connect both ends of Phase A winding of Motor 2	
	A-		
	B+	Connect both ends of Phase B winding of Motor 2	
	B-		
Motor 1 pulse wiring	PUL1+	Pulse input port	Two axis independent pulse direction signal, default 5V.

R60x2-24 is a 24Vsignal. |
	PUL1-		
	DIR1+	Direction input port	
	DIR1-		
Motor 2 pulse wiring	PUL2+	Pulse input port	
	PUL2-		
	DIR2+	Direction input port	
	DIR2-		
Motor 1 enable wiring	ENA1+	Enable control port	
	ENA1-		
Motor 2 enable wiring	ENA2+	Enable control port	
	ENA2-		

3.2 Power supply input

The power supply of the driver is DC power, the input voltage range is between 18V ~ 48V.
Do not reverse the polarity of the input power！！！

The working mode of the driver is constant current control. When working, the driver outputs the input power supply to the motor in the form of PWM chopper. Therefore, the power input can affect the performance of the drive.

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, please increase the power supply voltage of the driver. 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. Therefore, the current of the power supply will be lower than the current value that the driver outputs to the motor.

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 through the drive circuit. This part of the energy will be superimposed on the driver circuit and input power supply, causing protection of the driver circuit and power supply.

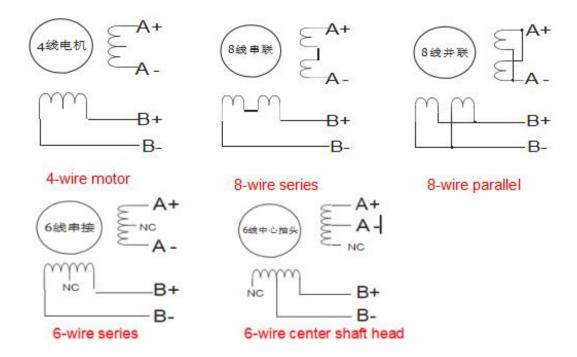When setting the motor running command, pay attention to the setting of acceleration and deceleration time.

In addition, when the driver is powered off, the driver's LED indicator will be on when the load is pulled to make the motor move. This phenomenon is also related to the above reasons.

Power selection:
The output current of the switching power supply is not less than 7A, and the power is not less than 200W.

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 R60X2 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.
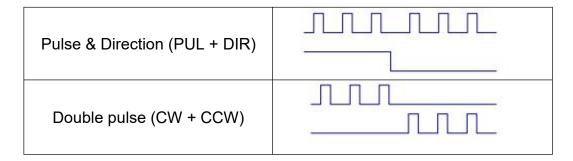
3.4 Control signal connection

3.4.1 PUL、DIR Port: connection for pulse command

The standard R series driver signal interface is in pulse form, and R60X2 can receive two kinds of pulse command signals.

The upper controller can be a pulse signal generating device such as a PLC, a single-chip microcomputer, a control card, and a controller.

The acceptable pulse level of R60X2 driver is: default 5V

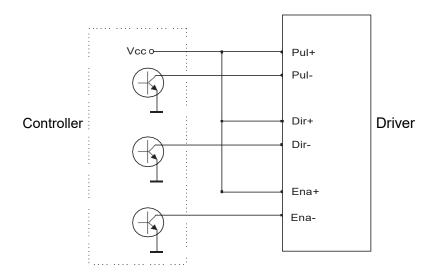|	
Pulse & Direction (PUL + DIR)	
Double pulse (CW + CCW)	

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, the ENA input can be used to restart the drive. First, remove the existing fault, and then input a falling edge signal to the ENA terminal, and the drive can re-excite.
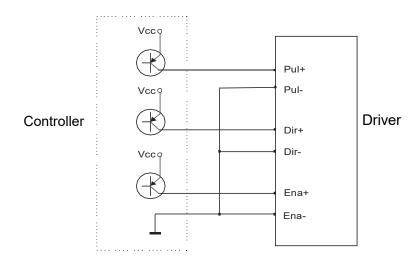
The level logic of the ENA signal can be set to the opposite, and the logic is opposite to the above.

3.4.3 Examples for control signal connection

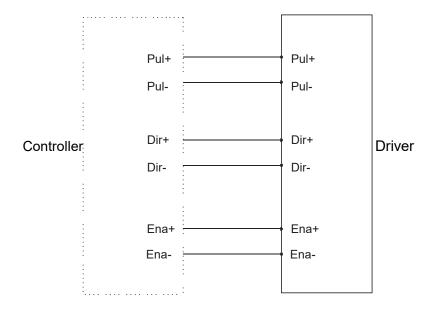**A. Common Anode：**
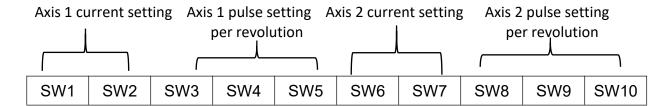
B. Common Cathode：

C. Difference：

4. Dialing code and parameter setting

Axis 1 current setting		Axis 1 pulse setting per revolution			Axis 2 current setting		Axis 2 pulse setting per revolution		
SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10

4.1 Setting of current

	AXIS-1		AXIS-2		
Peak current	SW1	SW2	SW6	SW7	Remark
2.5A	on	on	on	on	Other current values can be customized
3.5A	off	on	off	on	
4.5A	on	off	on	off	
5.6A	off	off	off	off	

DIP SW1, SW2, SW6, SW7 are used to set the current value of the driver output to the motor.

Normally, the current is set to the rated current of the motor. If your system has high requirements for heat generation, you can appropriately reduce the current to reduce the heat of the motor, but the output torque of the motor will be reduced at the same time. If you do not require the motor to run continuously, you can appropriately increase the operating current to obtain a greater torque, but be careful not to exceed 1.5 times the rated current of the motor.

4.2 Setting of pulse per revolution

	AXIS-1			AXIS-2			
Steps/revolution	SW3	SW4	SW5	SW8	SW9	SW10	Remark
1600	on	on	on	on	on	on	Other current values can be customized
3200	off	on	on	off	on	on	
6400	on	off	on	on	off	on	
12800	off	off	on	off	off	on	
1000	on	on	off	on	on	off	
3600	off	on	off	off	on	off	
4000	on	off	off	on	off	off	
8000	off	off	off	off	off	off	

DIP SW3, SW4, SW5, SW6, SW7, SW8, SW9 are used to set the number of pulses required per revolution of the motor

Motor speed = command pulse frequency ÷ pulse per revolution
Motor stroke = number of command pulses ÷ pulse per revolution

4.3 Automatic half current

The motor standby quiescent current value automatically enters a half current after the pulse stops 0.4S, which reduces the heating of the motor and the driver and improves the reliability.

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
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
	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	Change the motor wiring sequence or adjust the command direction
	The motor cable is disconnected	Check the connection
	The motor has only one direction	Pulse mode error or DIR port corruption

	The motor connection is wrong	Check the connection
Alarm indicator is on	The voltage is too high or too low	Check the power supply
	Damaged motor or driver	Replace the motor or driver
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
	Incorrect per revolution pulse setting	Check the DIP switch status and correctly connect the switches
	Motor lost step	Check if the command speed is too large and the motor selection is small
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 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: 18 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.