IO57

一体集成式脉冲开环步进驱动电机

Integrated Pulse open-loop stepper motor User's Manual

摩川技术(深圳）有限公司

Moschon Technology (Shenzhen) Co. , Ltd.

目录

前言/Foreword

感谢您使用本公司开环步进驱动器。

Thank you for using our open step drive.

在使用本产品前，请务必仔细阅读本手册，了解必要的安全信息、注意事项以及操作方法等。错误的操作可能引发极其严重的后果。

Before using this product, please read this manual carefully to understand the necessary safety information, precautions, and operation methods.Incorrect operation can have extremely serious consequences.

本产品的设计和制造不具备保护人身安全免受机械系统威胁的能力，请用户在机械系统设计和制造过程中考虑安全防护措施，防止因不当的操作或产品异常造成事故。

This product is designed and manufactured without the ability to protect personal safety from mechanical system threats. Users are advised to consider safety precautions during mechanical system design and manufacturing to prevent accidents caused by improper operation or product abnormalities.

由于产品的改进，手册内容可能变更，恕不另行通知。用户对产品的任何改装我公司将不承担任何责任。

阅读时，请注意手册中的以下标示：

Due to product improvements, the contents of this manual are subject to change without notice. Our company will not be responsible for any modification of the product by the user.

When reading, please pay attention to the following signs in the manual:

注意：提醒您注意文字中的要点。

小心：表示错误的操作可能导致人身伤害和设备损坏。

本产品经过国家强制 3C 认证，CE 认证，ROHS 认证

This product has passed the national mandatory 3C certification, CE certification, ROHS certification

1 概述/Overview

1.1 产品介绍/Product Introduction

IO57 是我公司新推出的数字式一体步进驱动器，驱动器采用 32 位 DSP 数字处理技术，变电流技术，低发热技术等技术设计完成，具有低振动，运行平稳，低发热，高可靠性等优点。用户可以通过串口设置驱动器 200-51200 内的任意细分和额定电流内的任意电流值输出，能够满足大多数场合的应用需要。由于采用内置微细分技术，即使在低细分的条件下，也能够达到高细分的效果，低中高速运行都很平稳，噪音超小。驱动器内部集成了上电自动适应电机的功能，能够针对不同电机自动生成最优运行参数，最大限度发挥电机的性能。

IO57 is a new digital Integrated stepper driver, which is designed by 32-bit DSP digital processing technology, variable current technology and low heating technology. It has the advantages of low vibration, stable operation, low heating and high reliability. Users can set the driver through the serial port 200-51200 within the arbitrary subdivision and rated current value output, to meet the needs of most applications. Due to the use of built-in micro-subdivision technology, even in the conditions of low subdivision, but also can achieve high subdivision effect, low, medium and high-speed operation is very smooth, ultra-low noise. The driver has the function of power-on auto-adaptive motor, which can automatically generate the optimal operating parameters for different motors and maximize the performance of the motor.

1.2 特性/Characteristics

●全新 32 位 DSP 技术
New 32 Bit DSP Technology
●低振动，低噪声，运行平稳
Low vibration, low noise, smooth operation
●内置高细分和平滑滤波功能
Built-in high-resolution and smooth filtering function
●参数上电自动匹配电机功能
Automatic parameter power-on setting function
●变电流控制使电机发热大为降低
Variable current control greatly reduces the heat generation of the motor.
●静止时电流自动减半
Automatic halving of current at rest
●可驱动 4,6,8 线两相步进电机
Can drive 4,6,8-wire tow-phase stepping motor
●光电隔离单端信号输入（脉冲，方向和使能）
Photoelectric isolation of single-ended signal input (pulse, direction and enable)
●脉冲响应频率最高可达 500KHz（出厂默认 200KHz）
Impulse response frequency up to 500KHz (factory default 200KHz)
●电流设定方便，可在 1.0-5.6A 之间任意选择
The current setting is convenient and can be selected between 0.1-5.6 A
●细分设定范围为 200-51200，更高细分可定制
sub-set range 200-51200, higher sub-customizable
●具有过压、欠压、过流等保护功能
It has the protection functions of overvoltage, undervoltage and overcurrent.

1.3 应用领域/Application areas

适合各种中小型自动化设备和仪器，例如：雕刻机、打标机、切割机、医疗设备、激光照排、绘图仪、数控机床、自动装配设备等。在用户期望低噪声、低振动，低发热和高速度的设备中应用效果特佳。

Suitable for a variety of small and medium-sized automatic equipment and instruments, such as: Engraving Machine, marking machine, cutting machine, medical equipment, laser phototypesetting, plotter, CNC machine tools, automatic assembly equipment. Ideal for applications where the user expects low noise, low vibration, low heat and high speed.

2 性能指标/Performance Index

2.1 电气特性/Electrical characteristics

说明 Explanation	IO57			
	最小值 Minimum Value	典型值 Typical Value	最大值 Maximal Value	单位 Unit
连续输出电流 Continuous output current	1.0	-	5.6	A
电源电压（直流） Power Supply Voltage (DC)	15	24/36	50	Vdc
控制信号输入电流 Control signal input current	6	10	16	mA
控制信号输入电流 Control signal input current	-	5	-	Vdc
脉冲高电平最小时间宽度 Minimum time width of pulse high level	1.5	-	-	US
过压电压点 Overvoltage point	52			Vdc
步进脉冲频率 Step frequency	0	-	200	KHz
绝缘电阻 Insulation Resistance	100			MΩ

2.2 适配标准电机/Suitable for standard motor

该一体化驱动器能适配各大电机厂商不同规格的 57 开环混合式步进电机和直线丝杆步进电机，驱动器可以单独对外销售。如果需要采购我司驱动器和电机整套产品，我司一般推荐如下两种标准规格型号，其它规格型号的步进电机或适配丝杆步进电机可以根据客户需求定制。

The integrated driver can be used for 57 open-loop hybrid stepper motor and linear screw stepper motor of different specifications, and the driver can be sold separately. If you need to purchase our driver and motor complete set of products, we generally recommend the following two standard models, other models of stepper motor or suitable screw stepper motor can be customized according to customer needs.

型号 (Model No.)	保持转矩 Holding Torque	电机机身长度 Length	驱动器厚度 Drive thickness	重量 Weight
	N.M	mm	mm	kg
IO57-10	1.2	56±1	21.5±1	0.9
IO57-22	2.4	80±1	21.5±1	1.2
IO60-40	3.6	88±1	21.5±1	2.2
IO86-85	8.5	114±1	21.5±1	3.9

注：该驱动器可定做匹配任意规格的 57 开环步进电机和 57 开环直线丝杆电机

Note: The driver can be customized to match any specifications of 57 open-loop stepper motor and 57 open-loop linear screw motor

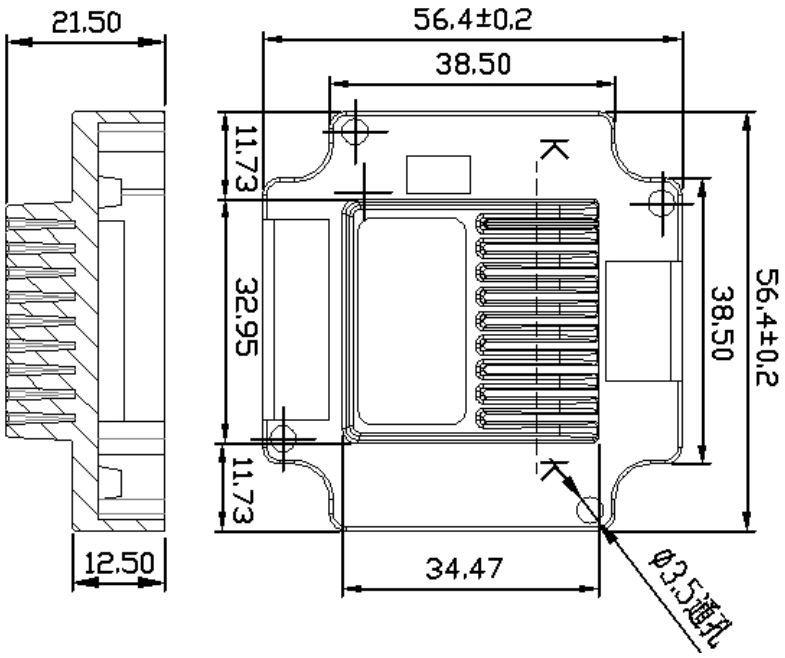
2.3 使用环境/Use environment

冷却方式 Cooling Mode		自然冷却或强制风冷 Natural Cooling or forced air cooling
使用环境 Service Environment	场合 Occasion	不能放在其它发热的设备旁，要避免粉尘、油雾、腐蚀性气体，湿度太大及强振动场所，禁止有可燃气体和导电灰尘。 Can not be placed next to other heating equipment, to avoid dust, oil mist, corrosive gases, humidity is too large and strong vibration sites, prohibited combustible gases and conductive dust。
	温度 Temperature	-10℃ ～ +50℃
	湿度 Humidity	40 ～ 90%RH
	振动 Vibration	5.9m/s2MAX
保存温度 Storage temperature		-20℃～60℃
使用海拔 Use Elevation		1000 米以下 Below 1000 meters
重量 Weight		0.2KG

3 安装/Installation

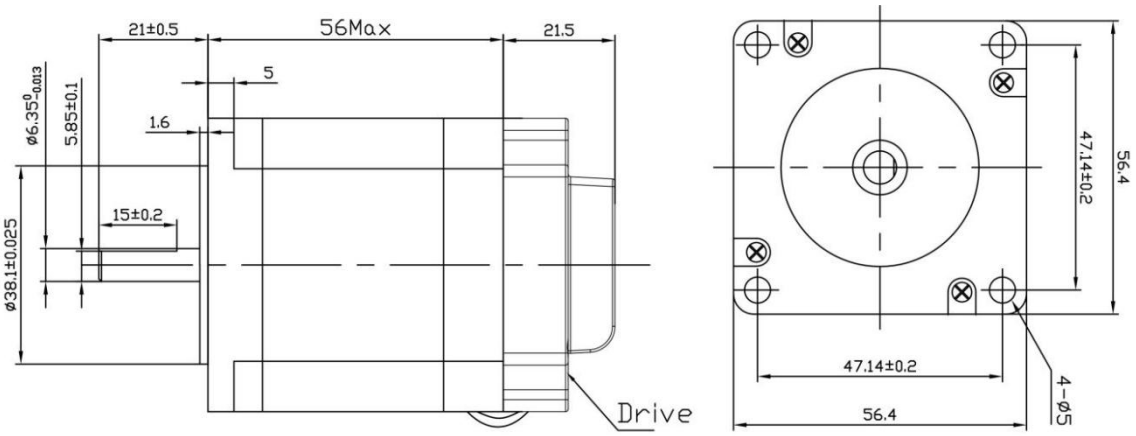
3.1 安装尺寸/Mounting dimensions

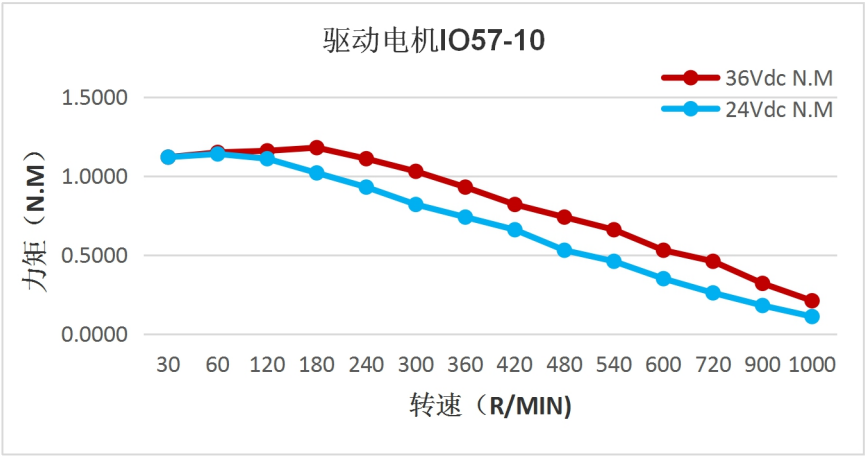
IO57 驱动器规格尺寸
IO57 drive dimensions



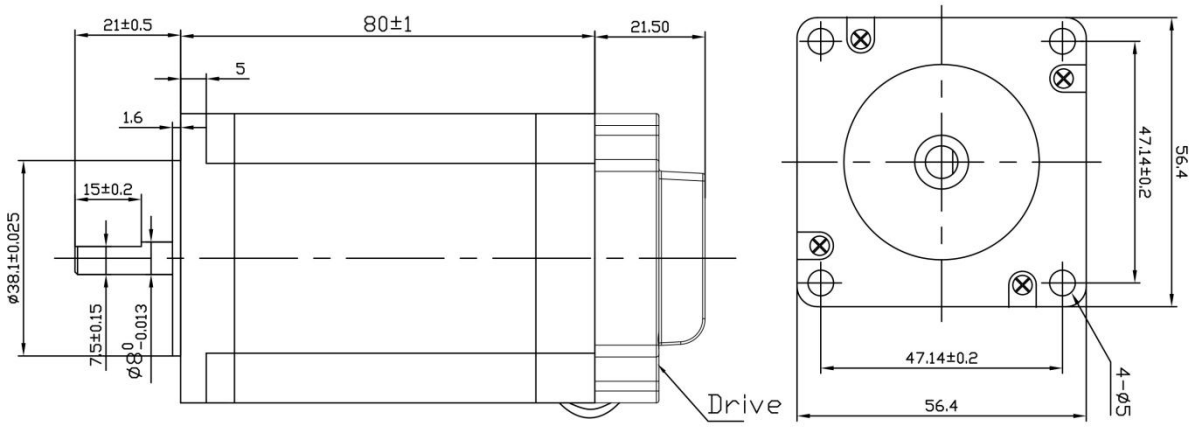
IO57-10 驱动器规格尺寸及电机矩频特性曲线

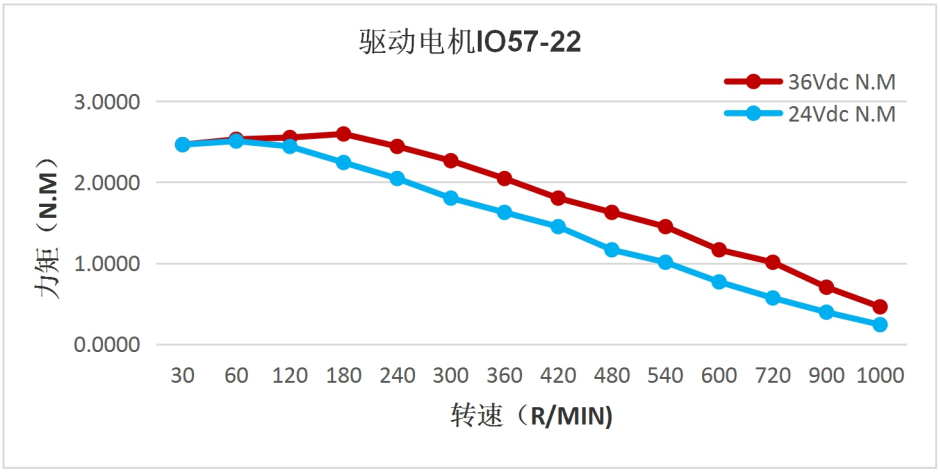
IO57-10 driver size and motor torque-frequency characteristic curve



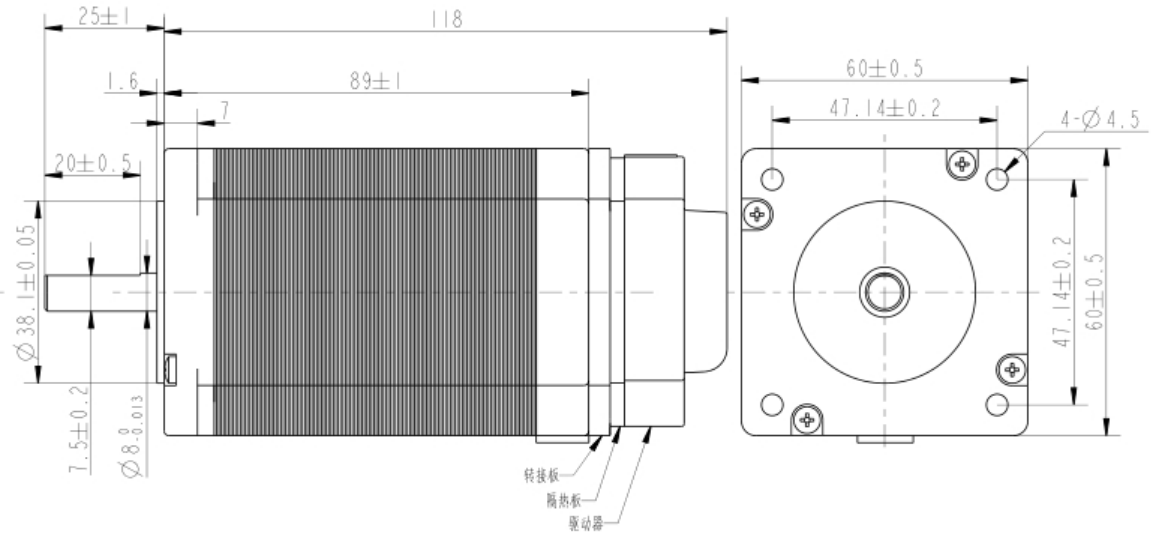


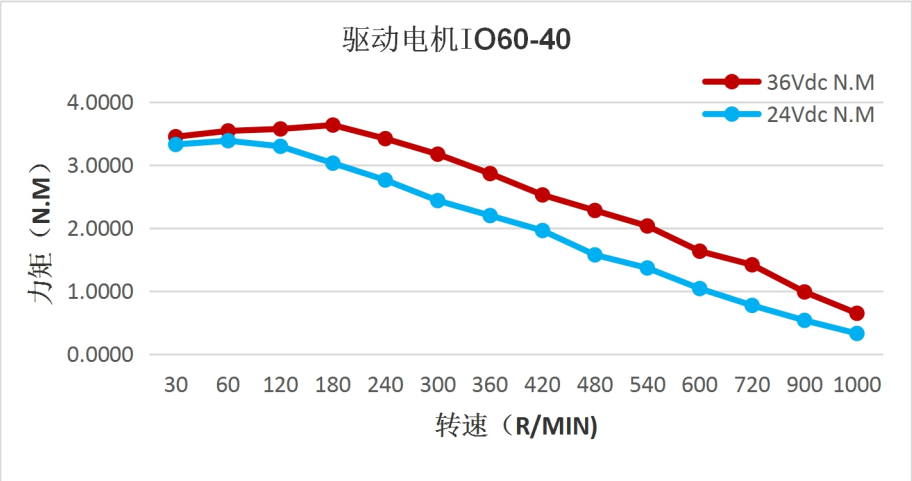
IO57-22 驱动器规格尺寸及电机矩频特性曲线
IO57-22 driver size and motor torque-frequency characteristic curve





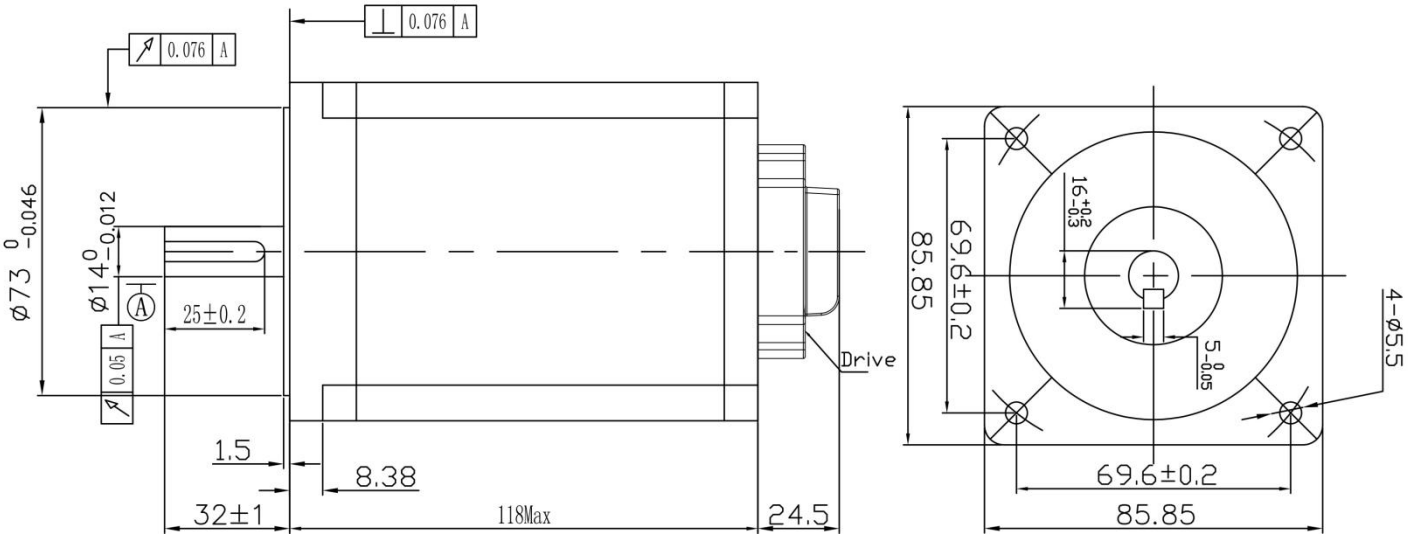
IO60-40 驱动器规格尺寸及电机矩频特性曲线
IO60-40 driver size and motor torque-frequency characteristic curve

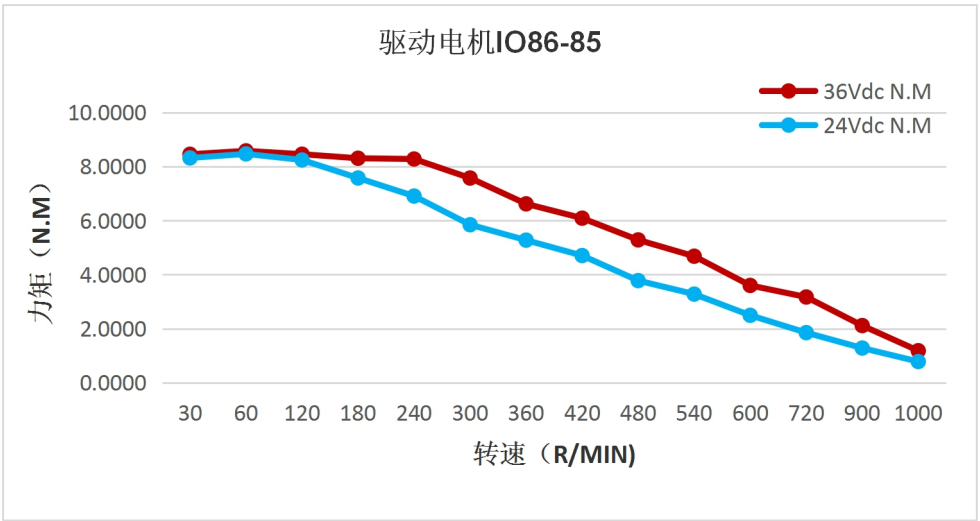




IO86-85 驱动器规格尺寸及电机矩频特性曲线

IO86-85 driver size and motor torque-frequency characteristic curve





3.2 安装方法/Installation method

驱动器的可靠工作温度通常在60℃以内，电机工作温度为80℃以内。

The reliable operating temperature of the driver is usually within 60℃, and the motor operating temperature is within 80℃。

建议使用时选择自动半流方式，马达停止时电流自动减一半，以减少电机和驱动器的发热。

It is recommended to use the automatic semi-flow mode when using the motor. When the motor stops, the current is automatically reduced by half to reduce the heat of the motor and the drive。

安装驱动器时请采用竖着侧面安装，使散热齿形成较强的空气对流。

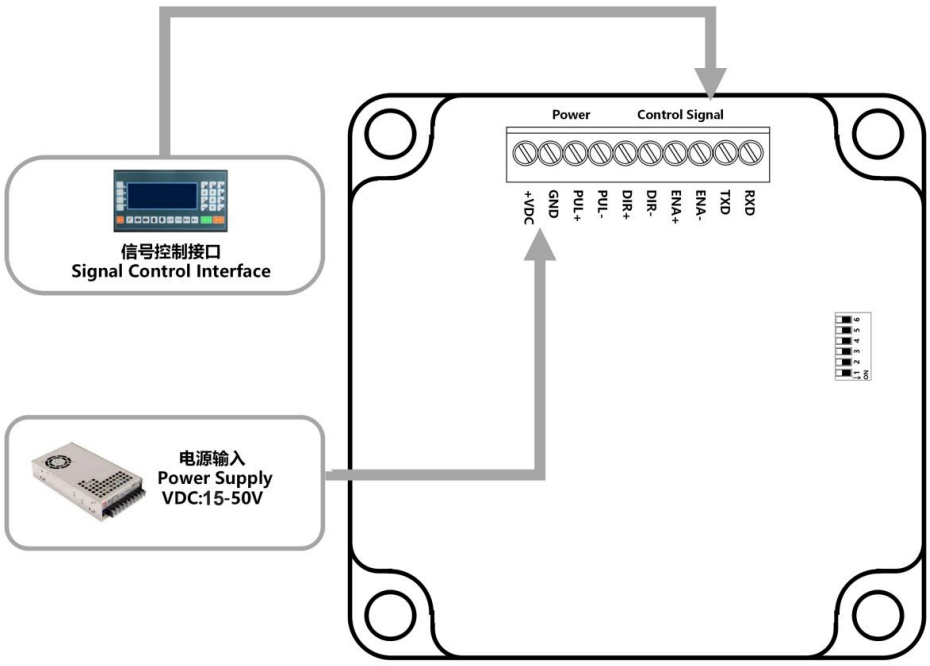
Install the drive with vertical side mounting so that the heat dissipating teeth form a strong air convection。

必要时机内靠近驱动器处安装风扇，强制散热，保证驱动器在可靠工作温度范围内工作。

Install a fan near the drive when necessary to force heat dissipation to ensure that the drive works within a reliable operating temperature range。

4 驱动器端口与接线/Driver ports and wiring

4.1 接线示意图/Schematic diagram of wiring



4.2 端口定义/Port Definition

4.2.1 LED 灯状态指示/Lamp status indication

绿色 LED 为电源指示灯，当驱动器接通电源时，该 LED 常亮；当驱动器切断电源时或驱动器发生故障时，该 LED 熄灭。

Green LED is the power indicator, when the driver is connected to the power, the LED is always bright; when the driver cut off the power or when the driver failure, the LED extinguished.

序号 Serial number	闪烁次数 SCINTILLATION number	红色 LED 闪烁波形 Red Led flashing waveform	故障说明 Failure description
1	1		过流或相间短路故障 Overcurrent or interphase short circuit fault
2	2		过压故障（电压>52VDC） Overvoltage fault (Voltage & GT; 52VDC)

4.2.2 控制信号输入端口/Control Signal Input Port

控制信号接口/Control Signal interface

控制信号和电源输入端口采用 10Pin 的 2.5mm 端子。
The control signal and the power supply input port uses the 10Pin 2.0 mm terminal.

名称 Name	功能 Function
+VDC	驱动器供电电源正极：15-50Vdc,推荐电压 24V 和 36V Driver supplied power positive: 15-50VDC, recommended voltages 24V and 36V
GND	驱动器供电电源负极 Driver power supply negative pole
PUL+（+5V）	脉冲控制信号：脉冲上升沿有效；PUL-高电平时 4～5V，低电平时 0～0.5V。为了可靠响应脉冲信号，脉冲宽度应大于 1.2μs。如采用+12V 或+24V 时需串电阻。 Pulse control signal: the pulse rising edge is effective; PUL- 4 ~ 5V at high

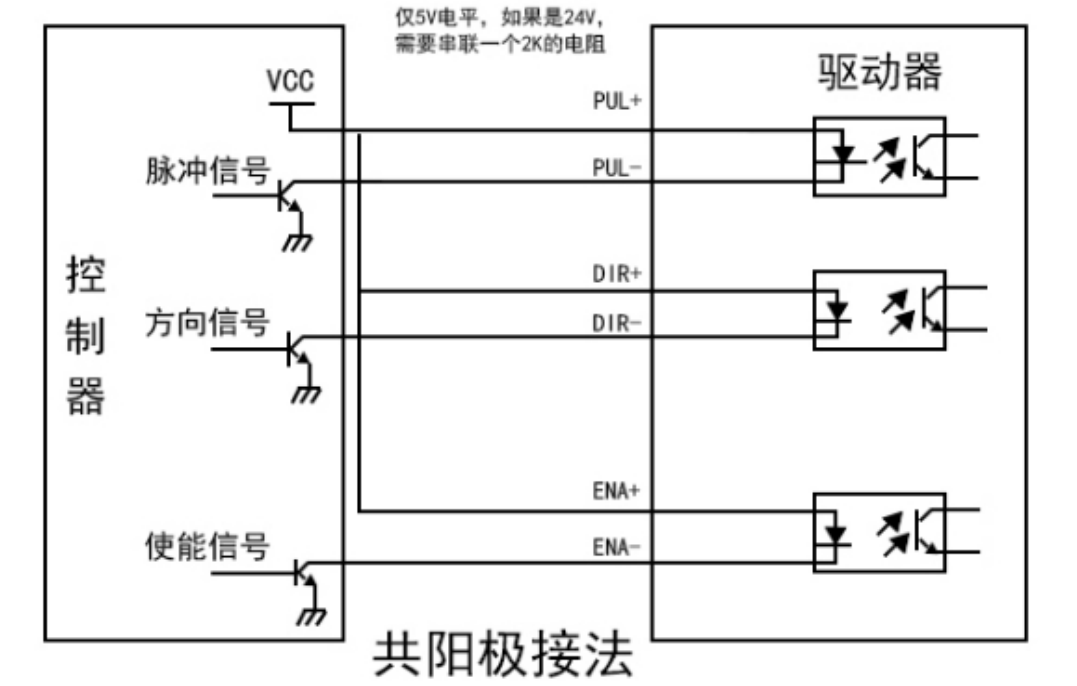
PUL-（PUL）	level, 0 ~ 0.5V at low level. In order to reliably respond to the pulse signal, the pulse width should be greater than 1.2μs. If 12V or 24V is used, series resistance is needed.
DIR+（+5V）	方向信号：高/低电平信号，为保证电机可靠换向，方向信号应先于脉冲信号至少 5μs 建立。电机的初始运行方向与电机的接线有关，互换任一相绕组（如 A+、A-交换）可以改变电机初始运行的方向，DIR-高电平时 4～5V，低电平时 0～0.5V。 Direction Signal: high/low level signal, in order to ensure the motor reliable commutation, the direction signal should be established at least 5 seconds before the pulse signal. The initial running direction of the motor is related to the connection of the motor. Changing any phase winding (such as a + , a-switch) can change the initial running direction of the motor, DIR-high level 4 ~ 5V, low level 0 ~ 0.5V.
DIR-（DIR）	
ENA+（+5V）	使能信号：此输入信号用于使能或禁止。ENA+ 接+5V，ENA-接低电平（或内部光耦导通）时，驱动器将切断电机各相的电流使电机处于自由状态，此时步进脉冲不被响应。当不需用此功能时，使能信号端悬空即可。 Enabling Signal: This input signal is used for enabling or disabling. When ENA + + + 5V, ENA-connected with low level (or internal optocoupler on) , the driver will cut off the current of each phase of the motor and make the motor in the free state, then the step pulse will not respond. When this function is not needed, the signal can be suspended.
ENA-（ENA）	
TXD	RS232-TTL(3.3V)发送端 RS232-TTL (3.3 v) sender
RXD	RS232-TTL(3.3V)接收端 RS232-TTL (3.3 v) receiver

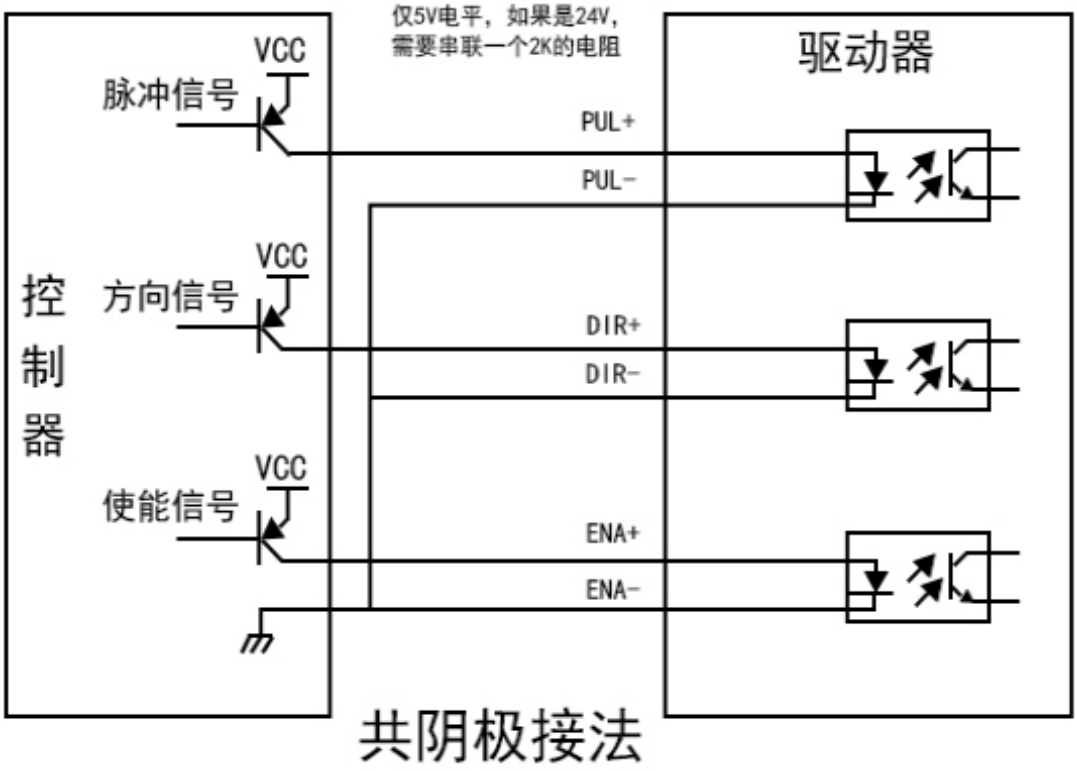
注：脉冲，方向和使能接口信号电平只能接受 5V TTL 电平，如果需要 24V，需要在信号输入端口前串联 2KΩ/1W 的限流电阻，或在订货时通知我司定制为只能接受 24V TTL 信号电平的产品。

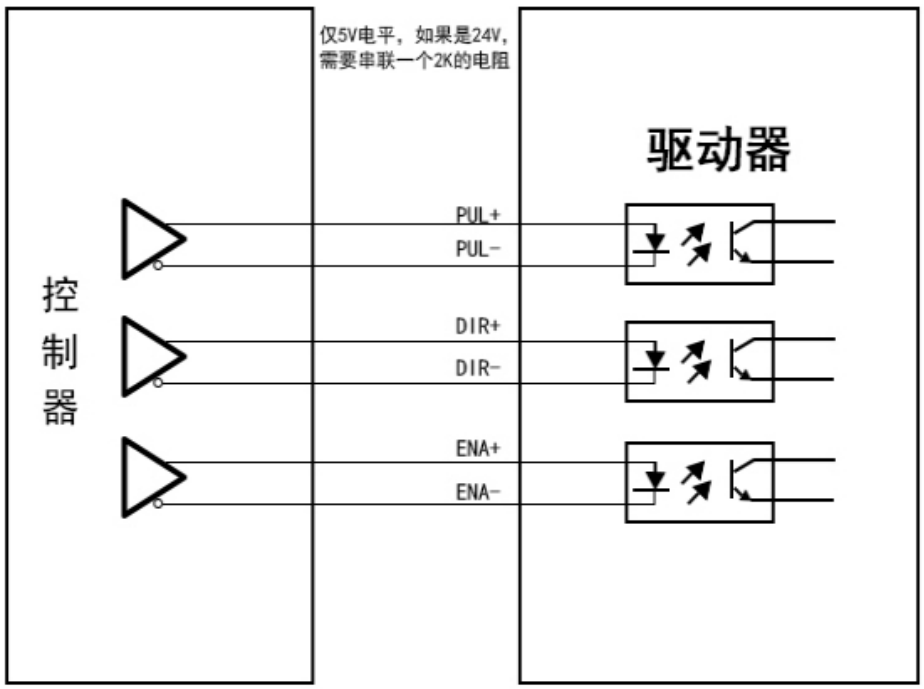
Note: The pulse, Direction and enable interface signal level can only accept 5 v TTL level, if 24V is needed, the current limiting resistor of 2k/1w should be connected in series before the signal input port, or inform us at the time of ordering to order products which can only accept 24V TTL signal level.

控制信号接口电路

A control signal interface circuit







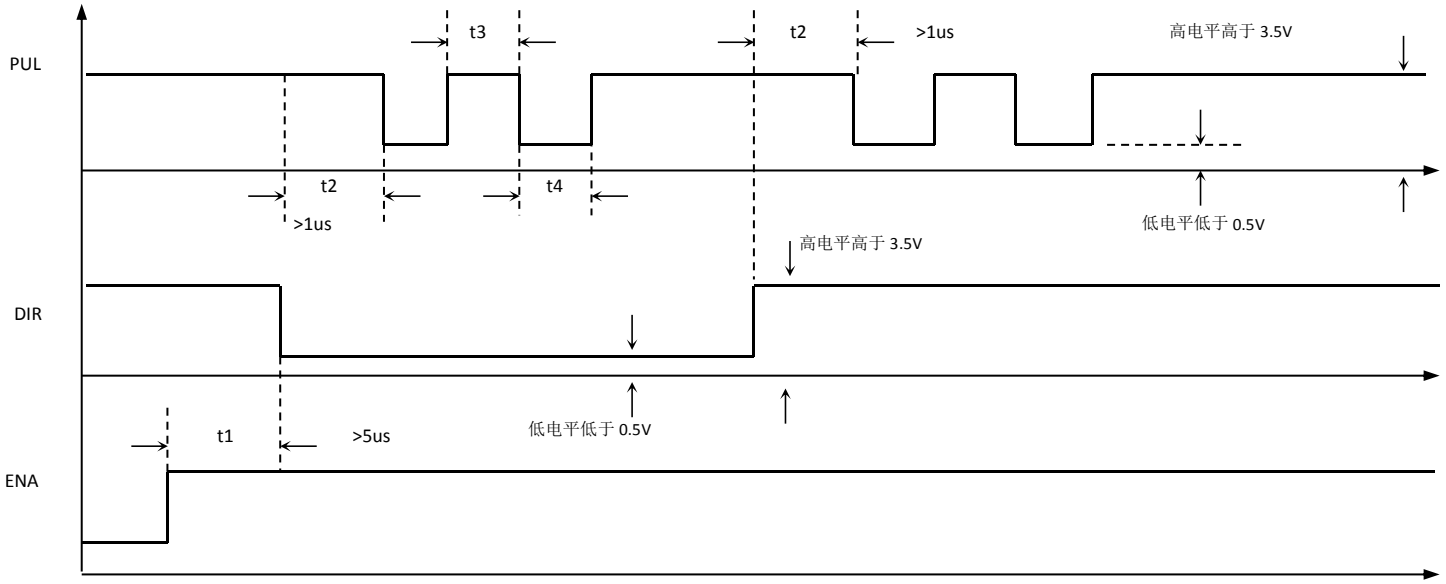
差分方式控制信号接口接线图

控制信号时序图

A control signal timing in FIG.

为了避免一些误动作和偏差，PUL-、DIR-和 ENA-应满足一定要求，如下图所示：

In order to avoid malfunctions and deviations, PUL-, DIR- ENA- should meet certain requirements, and, as shown below:



注释/Comment：

t1：ENA（使能信号）应提前 DIR 至少 5μs，确定为高。一般情况下建议悬空即可；

t1: ENA (enable signal) DIR should advance at least 5μs, determined to be high. In general recommendations can be suspended;

t2：DIR 至少提前 PUL 下降沿 1μs 确定其状态高或低；

t2: DIR PUL falling 1μs determined in advance of at least a high or low state;

t3：脉冲宽度至少不小于 1.5μs；

t3: at least a pulse width of not less than 1.5 us;

t4：低电平宽度不小于 1.5μs。
t4: low level width not less than 1.5μs.

4.2.3 电源及电机输出端口/Output ports of power supply and motor

电机接口/Motor interface

电机接线端口采用 4Pin 的 3.5mm 端子
4 Pin 3.5 mm terminal is used as motor connection port

引脚号 Pin Number	信号名称 Signal name	功能说明 Function description
1	A+	两相步进电机 A+相 Two-phase stepping motor A-phase
2	A-	两相步进电机 A-相 Two-phase stepper motor a-phase
3	B+	两相步进电机 B+相 Two-phase stepping motor B phase
4	B-	两相步进电机 B-相 Two-phase stepping motor b-phase

电源电压在规定范围之间都可以正常工作，驱动器最好采用非稳压型直流电源供电，也可以采用变压器降压＋桥式整流＋电容滤波。但注意应使整流后电压纹波峰值不超过其规定的最大电压。建议用户使用低于最大电压的直流电压供电，避免电网波动超过驱动器电压工作范围。

The power supply voltage can work normally between the specified ranges. The driver is preferably powered by an unregulated DC power supply, or a transformer buck + bridge rectifier + capacitor filter. Note, however, that the peak voltage ripple after rectification should not exceed its specified maximum voltage. It is recommended that the user supply power with a DC voltage lower than the maximum voltage to prevent the grid from fluctuating beyond the operating range of the driver voltage.

如果使用稳压型开关电源供电，应注意开关电源的输出电流范围需设成最大。
If using a regulated switching power supply, be aware that the output current range of the switching power supply must be set to maximum.
请注意：
Please note:
接线时要注意电源正负极切勿反接；

When wiring, pay attention to the positive and negative poles of the power supply, do not reverse connection;
最好用非稳压型电源；
It is better to use an unstable power supply;
采用非稳压电源时，电源电流输出能力应大于驱动器设定电流的 60%即可；
The output capacity of the power supply current should be greater than 60% of the set current of the driver when an unstable power supply is used;
采用稳压开关电源时，电源的输出电流应大于或等于驱动器的工作电流；
When a regulated switching power supply is adopted, the output current of the power supply shall be greater than or equal to the working current of the driver;
为降低成本， 两三个驱动器可共用一个电源，但应保证电源功率足够大。

To reduce costs, two or three drives can share a power supply, but the power supply should be large enough.

5 拨码定义/Dial definition

5.1 电流设定/The current setting

Peak	RMS	SW1	SW2	SW3
Default[1.5A]PK		on	on	on
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

注：如上电流为标准产品 I057 电流，其它电流可以根据客户需求派生，能设定的电流范围为 0.1-5.6A 之间的任意值。

Note: If the current is standard product I057 current, other current can be derived according to customer demand, can set the current range between 0.1-5.6 arbitrary value.

5.2 细分设定/Subdivision setting

Pulse/rew	SW4	SW5	SW6
Default[400]	on	on	on
800	off	on	on
1600	on	off	on
3200	off	off	on
4000	on	on	off
5000	off	on	off
6400	on	off	off
12800	off	off	off

注：如上细分为标准产品 I057 细分，其它细分可以根据客户需求派生，能设定的细分范围为 200~51200 之间的任意值。

Note: The above subdivides into the standard product I057 subdivides, other subdivides

may according to the customer demand derivation, can set subdivides the scope between 200-51200any value.

5.3 参数自整定功能/Parameter self-tuning function

驱动器为开环步进驱动时，驱动器能上电自动匹配电机参数。注意此时不能输入脉冲，方向信号也不应变化，使能信号不能接入。

When the driver is open-loop step-by-step drive, the driver can power up to match the motor parameters automatically. Note that at this time can not input pulse, direction signal should not change, so that the signal can not access.

6 保修及售后服务 /Warranty and after-sales service

请保留好包装箱以便运输、储存或需要退回本公司维修时使用。一年保修期：

Please keep the packing box for transportation, storage or need to return to the company for maintenance.One year warranty period:

来自本驱动器使用一年内因为产品自身的原因造成的损坏，负责保修。

From the use of this drive within one year because of the product itself caused by the damage, responsible for the warranty.

不在保修之列：/Not covered by warranty:

不恰当的接线、电源电压和用户外围配置造成的损坏。/Damage caused by improper wiring, power supply voltage and user peripheral configuration.

无本公司书面授权条件下，用户擅自对产品进行更改。/Without the written authorization of the company, users make changes to the products without authorization.

超出电气和环境的要求使用。/Use beyond electrical and environmental requirements.

驱动器序列编号被撕下或无法辨认。/The drive serial number has been torn off or is unreadable.

外壳被明显破坏。/The outer shell was visibly damaged.

不可抗拒的灾害。/An irresistible disaster.6.2 售后服务 /Aftersales Service

添加微信或者拨打电话

（+86）18926788846

Email：Tech@TQKTEC.COM

您拨打电话之前，请先记录以下信息：

Before you call, please record the following information:

故障现象/Fault phenomenon

产品型号和序列号/Product model and serial number

安装日期或者生产日期/Installation date or production date