# TE Series

# 2-Phase Digital Stepper Drive

# User Manual

## For models of DM542TE, DM556TE, DM860TE




Address: 15-4, #799 Hushan Road, Jiangning, Nanjing, China

Tel: 0086-2587156578

Web: www.omc-stepperonline.com

Sales: sales@stepperonline.com

Support: technical@stepperonline.com

## Notice

Read this manual carefully before any assembling and using. Incorrect handling of products in this manual can result in injury and damage to persons and machinery. Strictly adhere to the technical information regarding installation requirements.



- **Thank you for purchasing Stepperonline TE series products**
- **Please read this manual carefully before operating**
- **Please keep this manual appropriately**

## Record of Revisions

| Manual Reversion | Data | Description of Release |
|---|---|---|
| V1.0 | 05/20/2024 | Initial Release |
| V1.1 | 18/06/2025 | Supplement DM-860TE part |

# Safety Precautions

## Overall Notes


- Do not remove the housing with the drive powered on. Cables. Connectors and optional equipment.
- Please disconnect the power supply for at least 2 minutes and make sure the power indicator is off before wiring and checking. Even if the power is disconnected, voltage may remain inside the drive. Therefore, do not touch the power terminals while the power indicator is on.


- Please use the power supply specifications (number of phases.) that match the product. Voltage. Frequency. AC/DC).
- Be sure to connect the ground terminal of the driver (mounting surface) and motor to the ground pole.
- Do not damage or drag the cable, do not overstress the cable, do not hang heavy objects on the cable, or get caught in the cabinet door.
- Please do not disassemble the product yourself. Repair or modification.
- When the machine is connected to the machine and starts to operate make sure that the machine is ready for emergency stop.
- Do not touch the inside of the drive.


- The heat sink of the driver may be hot when the power is on or when the power is just cut off. The motor, etc. may be in a high temperature. Take safety measures such as installing a cover to prevent accidental touching by hands and parts (cables, etc.).
- Use double-insulated or reinforced insulation for control power.
- Do not use in places where water can be splashed. Corrosive environments. Do not use the product in the vicinity of flammable gases and combustible materials.
- Do not use damaged. Drivers and motors with missing parts.
- Please set up an emergency stop circuit externally to ensure that the power can be cut off and the operation can be stopped immediately in case of an abnormality.
- If the product is used under poor power conditions, install protection equipment (AC reactor, etc.) to ensure that the input power is supplied within the specified voltage variation range.
- Please use a noise filter to reduce the influence of electromagnetic interference.
- The driver and motor should be used in the specified combination.

### Precautions for Storage and Transportation


- Please follow the Commands on the packaging for storage and do not overload the product.
- Please place this product in the following environment:
  →No direct sunlight in the place.
  →Ambient temperature does not exceed the product specification.
  →Humidity does not exceed product specifications. Without condensation.
  →No corrosive gases. Place of flammable gas.
  →Dust. The place where there is less salt and metal powder.
  →No water. Oil. The place where the splash of medicine, etc. occurs.
  →Vibration or shock does not exceed product specifications.
  →No equipment generating strong magnetic fields in the vicinity.

## Precautions for Installation


- Please install the drive in a cabinet that provides fire protection. Electrical protection in the control cabinet.
- Please install the driver and motor in a position with sufficient weight resistance.
- Please install this product in the following environment:
  →No direct sunlight in the place.
  →Ambient temperature does not exceed the product specification.
  →Humidity does not exceed product specifications. Without condensation.
  →No corrosive gases. Place of flammable gas.
  →Dust. Dust. The place where there is less salt and metal powder.
  →No water. Oil. The place where the splash of medicine, etc. occurs.
  →Vibration or shock does not exceed product specifications.
  →No equipment generating strong magnetic fields in the vicinity.
- Do not block the air inlet and exhaust ports, and do not allow foreign objects to enter the drive and motor.
- Do not step on the product or place heavy objects on the drive.
- Please install the driver in the specified direction.
- Make sure to keep the specified intervals between the inner surfaces of the drive control cabinet and other machines.

## Precautions for Wiring


- Do not pass the magnetic contactor in the wiring between the drive and the motor.
- Please connect the power terminal and motor terminal firmly.
- Keep a minimum distance of 10mm between the drive and the control cabinet or other equipment.
- Allow at least 30mm of wiring space above and below the driver.
- Signal cable. The encoder cable should be a twisted shielded cable with the shield grounded at both ends.
- The wiring length of the encoder is up to 20m.
- Reduce the frequency of power on/off as much as possible.

## Precautions during operation


- To prevent accidents, perform a test run of the servo motor at no load (without the driver connected).
- When you install the machine and start operation, please set the user parameters in advance to match the machine.
- Positive limit (POT) during JOG operation and zero return operation. The signal of negative limit (NOT) is not valid.
- When using the motor on a vertical axis, please provide a safety device to avoid dropping the work-piece in case of alarm or over travel.
- When an alarm occurs, please reset it after investigating the cause and making sure it is safe.
- Do not use the brake of the holding motor for normal braking.

# Table of Contents

# 1. Introduction

## 1.1 Product Introduction

TE series are a new generation of general-purpose pulsed two-phase stepper drives from Stepperonline . The driver adopts the latest open-loop stepper drive control algorithm.

With more than 20 years of persistent pursuit, Leisai Intelligent has a more complete supply chain system and a more sound production guarantee. The whole series of TE has passed RoHS and CE certification, and the product quality is more reliable and assured.

## 1.2 Features

- Step & direction (PUL/DIR) control
- Input voltage 20-50VDC (recommended 24-48VDC), DM860TE supports Input voltage AC 20~80V / DC 30~100V
- 200 KHz max pulse input frequency
- 15 microstep resolutions of 400-25000 via DIP switches
- 7 output current settings of 1.0-7.2A via DIP Switches
- Idle current reduction to 50% or 90% selection via SW4
- Auto-tuning to match wide-range NEMA 11, 17, 23,24,34 and 42stepper motors
- Anti-Resonance for optimal torque, extra smooth motion, low motor heating and noise
- Optically isolated inputs with 5V to 24V
- Over-voltage and over-current protections

## 1.3 Check Product

### 1.3.1 Arrival inspection

- Check whether the surface of the product is damaged or not during transportation.
- Check the nameplate models of the drive and motor are what you have ordered.
- Cheek if it is fully equipped with accessories. Accessories include power supply and motor output connector, control I/O signal connector.

CAUTION

- Neither the damaged nor missing accessories of stepper system are allowed to install.
- Contact Stepperonline or local distributor if any failure was found.

# 2. Production Specifications

## 2.1 Electrical and Specifications

| Drive model | DM542TE | DM556TE | DM860TE |
|---|---|---|---|
| Dimension (L*W*H) | 118*75.5*25.5 | | 151*95*53 |
| Matching Motors (Frame Size) | 57 | 57/60 | 86/110 |
| Input Voltage | 24~50Vdc | 24~50Vdc | 20~80VAC/<br>30~100VDC |
| Max. Continuous Current Output | 4.2A | 5.6A | 7.2A |
| Pulse Voltage Input | 5~24Vdc | | |
| Max. Pulse Frequency | 200kHz | | |

## 2.2 Environment

| Cooling | Natural Cooling or Forced cooling | |
|---|---|---|
| Operating Environment | Environment | Avoid dust, oil fog and corrosive gases |
| | Humidity | 40%RH—90%RH |
| | Operating Temperature | 0°C — 40°C (32°F - 109°F) |
| | Vibration | 10-50Hz / 0.15mm |
| Storage Temperature | -20°C — 65°C (-4°F - 149°F) | |
| Weight | Approx. 230g (0.51 lbs) | |

## 2.3 Mechanical Specifications

(unit: mm [1inch=25.4mm])

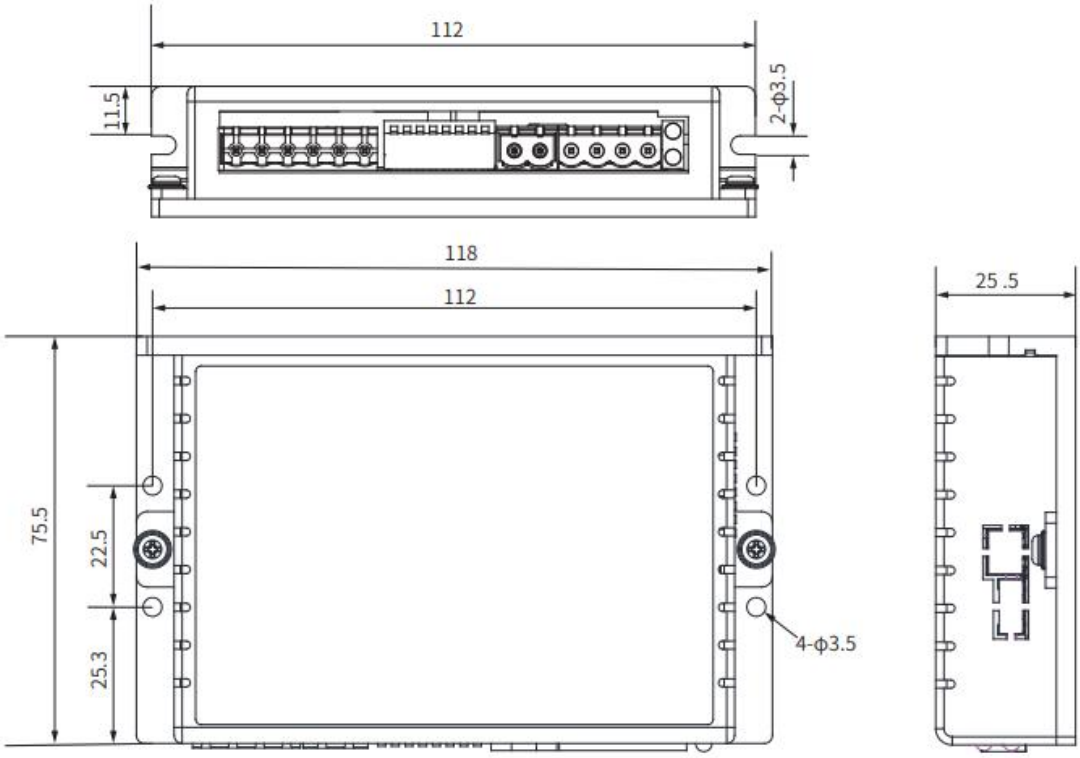



**Figure 1 DM542TE, DM556TE Installation Dimension Drawing**

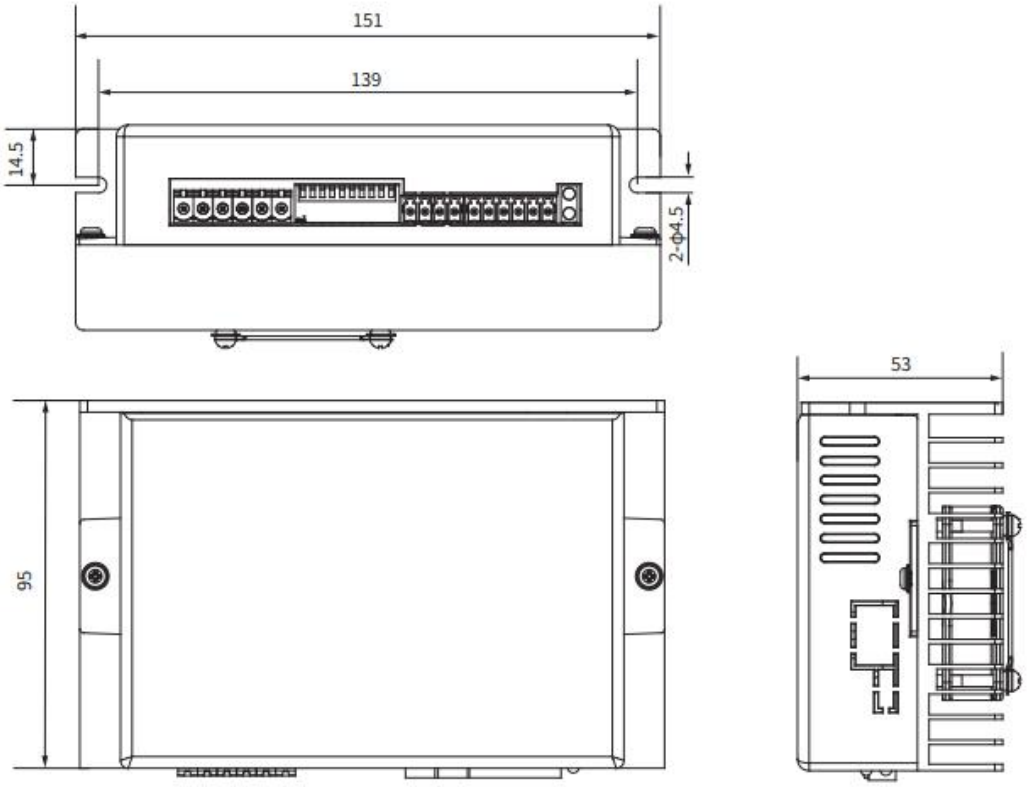



**Figure 2 DM860TE Installation Dimension Drawing**

### 2.4 Elimination of Heat

- TE reliable working temperature should be < 40℃ (109°F)
- It is recommended to use automatic idle-current mode to reduce motor heating. That means set the SW4 pin of DIP switch at “OFF” position.
- It is recommended to mount the drive vertically to maximize heat sink area. Use forced cooling method to cool if necessary

## 3. Connection Pin Assignments and LED Indication

DM542TE/DM556TE

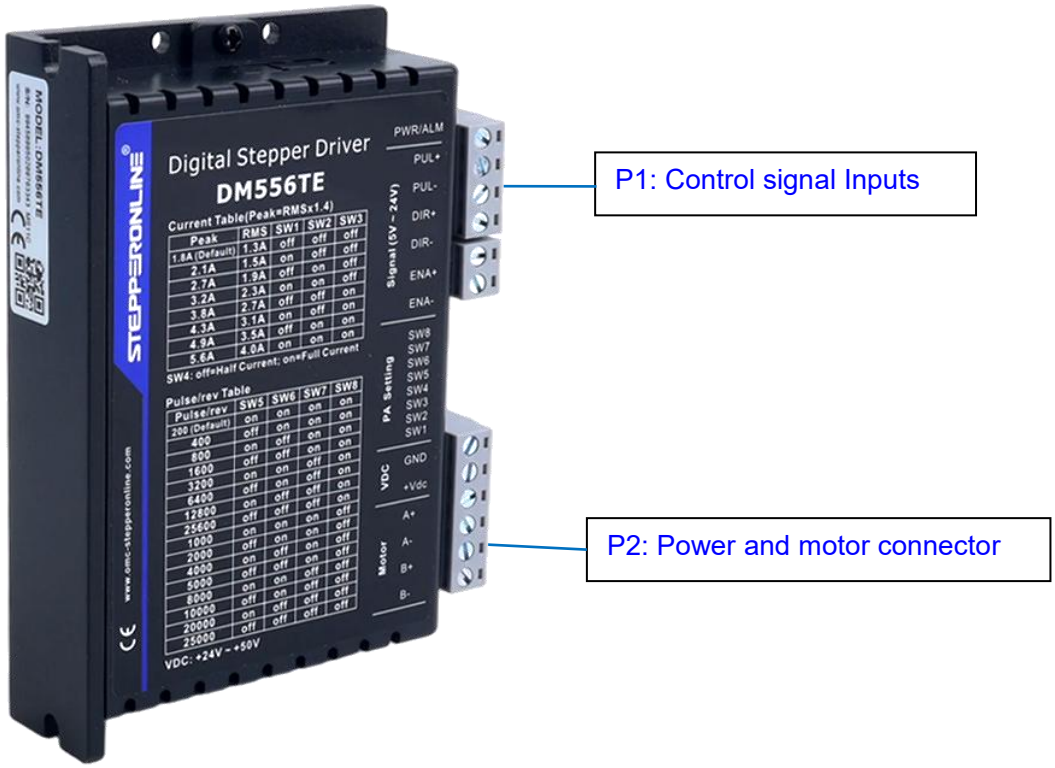



**Figure 3 Connectors, DIP switches, and LED locations**

The TE has two connector blocks P1&P2(see above picture). P1 is for control signals connections, and P2 for power and motor connections. The following tables are brief descriptions of the three connectors.

### 3.1 P1 - Control Connector

| PIN | Details |
|---|---|
| PUL+ | Pulse and Direction Connection:<br>**(1)** The pulse signal supports 5~24V compatible, when connected to a 24V pulse signal input,there is no need to connect a resistor, and falling edgeis effective the factory default<br>**(2)** Maximum 200 KHz input frequency<br>**(3)** The width of PUL signal is at least 2.5μs, duty cycle is recommended 50%<br>**(4)** DIR signal requires advance PUL signal minimum 5 μs in single pulse mode |
| PUL- | |
| DIR+ | |
| DIR- | |
| ENA+ | Enable Connection: (default no connection)<br>**(1)** supports 5~24V compatible<br>**(2)** When ENA+ connected to 5V, ENA- connected to GND, the motor is in power-off no response for pulse input<br>**(3)** ENA signal requires advance DIR signal minimum 5μs in single pulse mode<br>**(4)** Enable time to be at least 200ms |
| ENA- | |

Notes:

(1) Shield cables are required for P1;

(2) Don't tie P1 and P2 cables together.

### 3.2 P2 - Motor and Power Supply Connector

| Pin Function | Details |
|---|---|
| GND | Power supply ground connection. |
| +Vdc | Power supply positive connection. Suggest 24-48VDC power supply voltage |
| A+, A- | Motor Phase A connections. Connect motor A+ wire to A+ Pin; motor A- wire to A- |
| B+, B- | Motor Phase B connections. Connect motor B+ wire to B+ Pin; motor B- wire to B- |

Warning: Don't plug or unplug the P1 & P2 terminal block to avoid drive damage or injury when DM-TE is powered on.

DM860TE

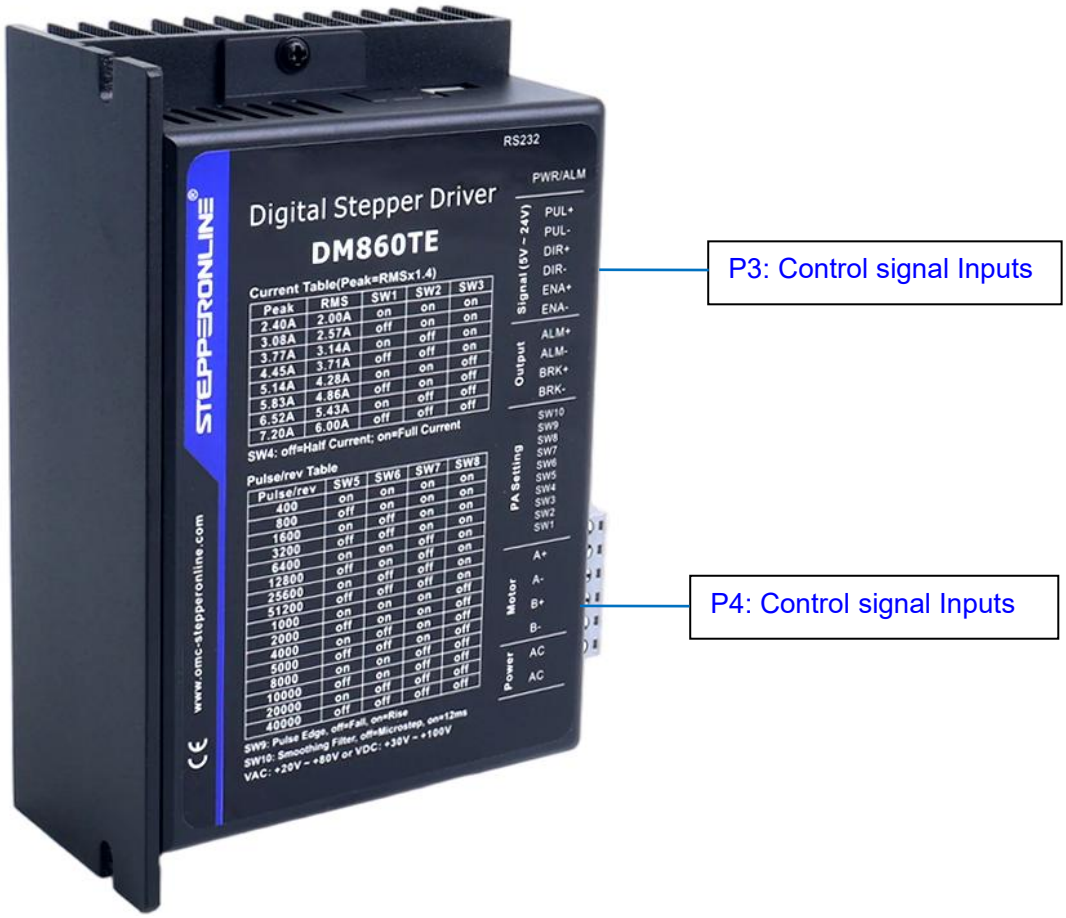



**Figure 4 Connectors, DIP switches, and LED locations**

### 3.3 P3 - Control Connector

| PIN | Details |
|---|---|
| **PUL+** | Pulse and Direction Connection:<br>**(1)** The pulse signal supports 5~24V compatible, when connected to a 24V pulse signal input,there is no need to connect a resistor, and falling edgeis effective the factory default<br>**(2)** Maximum 200 KHz input frequency<br>**(3)** The width of PUL signal is at least 2.5μs, duty cycle is recommended 50%<br>**(4)** DIR signal requires advance PUL signal minimum 5 μs in single pulse mode |
| **PUL-** | |
| **DIR+** | |
| **DIR-** | |
| **ENA+** | Enable Connection: (default no connection)<br>**(1)** supports 5~24V compatible<br>**(2)** When ENA+ connected to 5V, ENA- connected to GND, the motor is in power-off no response for pulse input<br>**(3)** ENA signal requires advance DIR signal minimum 5μs in single pulse mode<br>**(4)** Enable time to be at least 200ms |
| **ENA-** | |
| **ALM+** | **(1)** Maximum 30Vdc/100mA output<br>**(2)** Sinking or sourcing<br>**(3)** The resistance between ALM+ and ALM- is low impedance as default, and will change to high when the drive goes into error protection.<br>**(4)** Fault connection refer to chapter 4.2 |
| **ALM-** | |
| **BRK+** | **(1)** Maximum 30V/100mA output<br>**(2)** Brake connection refer to chapter 4.2 |
| **BRK-** | |

Notes:

(1) Shield cables are required for P3;

(2) Don't tie P3 and P4 cables together.

### 3.4 P4 - Motor and Power Supply Connector

| Pin Function | Details |
|---|---|
| AC | Power supply input 20-80VAC or 30-100 VDC;<br>No polarity |
| AC | |
| A+, A- | Motor Phase A connections. Connect motor A+ wire to A+ Pin; motor A- wire to A- |
| B+, B- | Motor Phase B connections. Connect motor B+ wire to B+ Pin; motor B- wire to B- |


Warning: Don't plug or unplug the P3 & P4 terminal block to avoid drive damage or injury when DM-TE is powered on.

### 3.5 LED Light Indication

There are two LED lights for TE. The GREEN one is the power indicator which will be always on generally. The RED one is a protection indicator which will flash 1-2 times in a 3-second period, when protection enabled for a TE. Different number of flashes indicates different protection type (read section 11 for detail).

# 4. Control Signal and Output Signal

## 4.1 Control Signal Connection

The TE can only accept single-ended control signals (pulse, direction, and enable) in open-collector or PNP connection through the P1 connector (figure 2). It is recommend to add an EMI line filter between the power supply and the drive to increase noise immunity for the drive in interference environments.

Single-ended connection method:

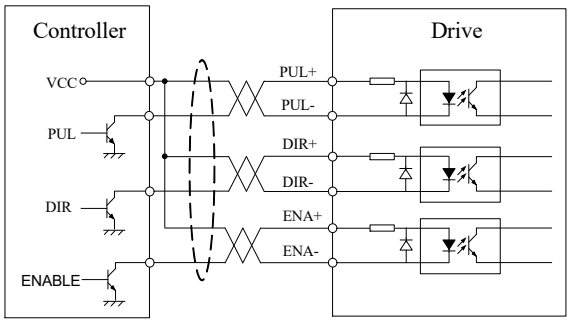



**Figure 5 Connections to open-collector signal (common-anode)**

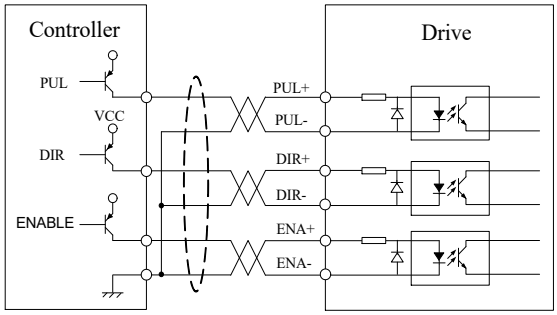



**Figure 6 Connections to PNP signal (common-cathode)**

Notes:

(1) ENA signal is no-connected as default;

(2) Control signal amplitude is 24 V as default.When connect to a 24V pulse signal, there is no need to string resistor, and the factory default is effective on the falling edge.

## 4.2 Fault and Brake Output Connection

- *Fault Output*

When over voltage or over current protection happens, DM860TE red status LED light will blink and the impedance state between ALM+ and ALM- will change (from low to high or high to low depending on configuration) and can thus be detected. Fault output connection is optional, and it can be connected either in sinking or sourcing.

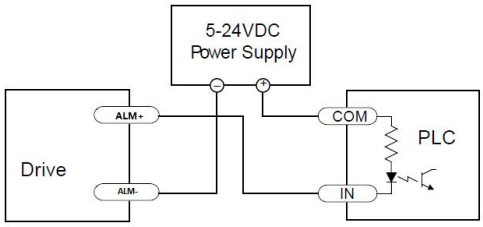



**Figure 7 Sinking output**

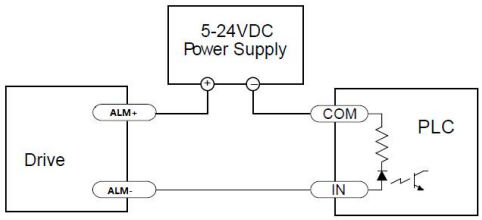



**Figure 8 Sourcing output**

- *Brake Control*

It is recommended to connect a fly-wheel diode in parallel to a 24VDC relay and brake coil connection. Refer to the following figure for brake connection.

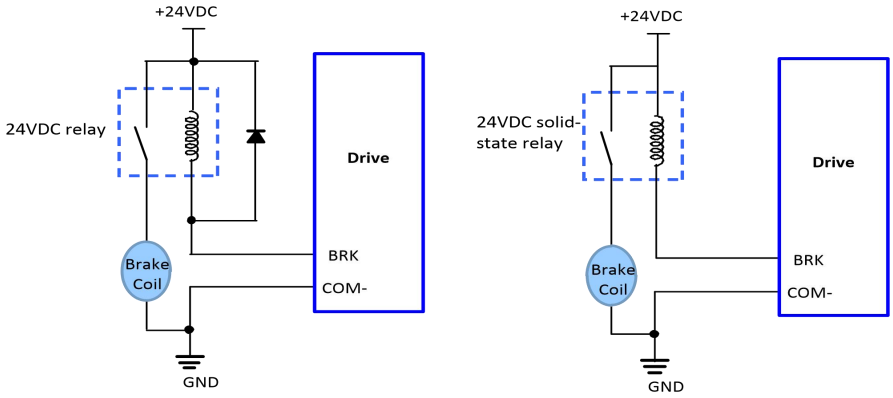



**Figure 9 Brake output**

## 5. Motor Connection

The TE can drive 2-phase and 4-pahse bipolar hybrid stepper motors.

The 4 lead motors are the least flexible and easy to connect. The output current from drive that is multiply the specified phase current by 1.4 to determine the peak output current.

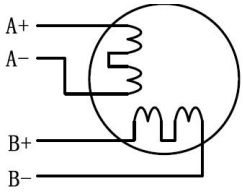



**Figure 10 4-lead Motor Connections**

## 6. Power Supply Selection

The TE can power medium and large size stepping motors (frame size from NEMA 11 to 42). To get good driving performances, it is important to select supply voltage and output current properly. Generally speaking, supply voltage determines the high speed performance of the motor, while output current determines the output torque of the driven motor (particularly at lower speed). Higher supply voltage will allow higher motor speed to be achieved, at the price of more noise and heating. If the motion speed requirement is low, it's better to use lower supply voltage to decrease noise, heating and improve reliability.

### 6.1Power Supply Sharing

Multiple TE drives can share one power supply to reduce cost, if that power supply has enough power capacity. To avoid cross interference, connect each stepper drive directly to the shared power supply separately. To avoid cross interference, DO NOT daisy-chain connect the power supply input pins of the drivers. Instead connect them to power supply separately.

### 6.2 Selecting Supply Voltage

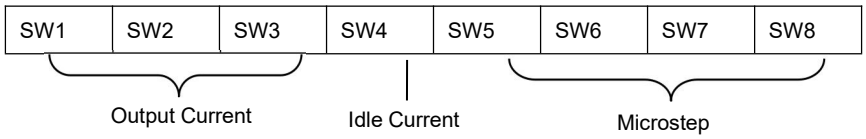
The TE is designed to operate within 20 - 50VDC voltage input. When selecting a power supply, besides voltage from the power supply power line voltage fluctuation and back EMF voltage generated during motor deceleration needs also to be taken into account. Please make sure leaving enough room for power line voltage fluctuation and back-EMF voltage charge back.

Higher supply voltage can increase motor torque at higher speeds, thus helpful for avoiding losing steps. However, higher voltage may cause bigger motor vibration at lower speed, and it may also cause over-voltage protection or even drive damage. Therefore, it is suggested to choose only sufficiently high supply voltage for intended applications.

## 7. DIP Switch Configurations

The TE has one set of DIP switches. It is used to configure settings of micro step resolution, output current, motor standstill current and smoothing time as shown below. The second set can be used to set filter time, double pulse mode, limit pulse frequency 500 kHz (default 200 kHz), etc

### 7.1 Dip switches 1




1) driver output current setting (DIP Switches SW1~SW3)

■ DM542TE

| SW1 | SW2 | SW3 | Drive current Peak (A) | Drive current RMS (A) |
|---|---|---|---|---|
| OFF | OFF | OFF | 1.0 (default) | 0.7 |
| ON | OFF | OFF | 1.5 | 1.1 |
| OFF | ON | OFF | 1.9 | 1.4 |
| ON | ON | OFF | 2.4 | 1.7 |
| OFF | OFF | ON | 2.8 | 2.0 |
| ON | OFF | ON | 3.3 | 2.4 |
| OFF | ON | ON | 3.8 | 2.7 |
| ON | ON | ON | 4.2 | 3.0 |

■ DM556TE

| SW1 | SW2 | SW3 | Drive current Peak (A) | Drive current RMS (A) |
|---|---|---|---|---|
| OFF | OFF | OFF | 1.8 (default) | 1.3 |
| ON | OFF | OFF | 2.1 | 1.5 |
| OFF | ON | OFF | 2.7 | 1.9 |
| ON | ON | OFF | 3.2 | 2.3 |
| OFF | OFF | ON | 3.8 | 2.7 |
| ON | OFF | ON | 4.3 | 3.1 |
| OFF | ON | ON | 4.9 | 3.5 |
| ON | ON | ON | 5.6 | 4.0 |

■ DM860TE

| SW1 | SW2 | SW3 | Drive current Peak (A) | Drive current RMS (A) |
|---|---|---|---|---|
| ON | ON | ON | 2.40 (default) | 2.00 |
| OFF | ON | ON | 3.08 | 2.57 |
| ON | OFF | ON | 3.77 | 3.14 |
| OFF | OFF | ON | 4.45 | 3.71 |
| ON | ON | OFF | 5.14 | 4.28 |
| OFF | ON | OFF | 5.83 | 4.86 |
| ON | OFF | OFF | 6.52 | 5.43 |
| OFF | OFF | OFF | 7.20 | 6.00 |

Note:
When SW1~3 are OFF, the driving current can be set by the debugging software.

2) Idle Current Configuration

SW4 is used to set motor idle current percentage. At OFF position it means the standstill current is set to be 50% of the

selected output current. At ON position it means standstill current is set to be 90%.

The current automatically reduced to 50% of the selected dynamic current 0.4 second after the last pulse.

3) Microstep Resolution Configurations
Microstep resolution is set by SW5, 6, 7, 8 of the DIP switches as shown in the following table.

Note: “default” means the parameters can be set by Stepperonline software.

DM542TE / DM556TE

| Microstep | Steps/rev.(for 1.8°motor) | SW5 | SW6 | SW7 | SW8 |
|---|---|---|---|---|---|
| 1 | 200 (default) | ON | ON | ON | ON |
| 2 | 400 | OFF | ON | ON | ON |
| 4 | 800 | ON | OFF | ON | ON |
| 8 | 1600 | OFF | OFF | ON | ON |
| 16 | 3200 | ON | ON | OFF | ON |
| 32 | 6400 | OFF | ON | OFF | ON |
| 64 | 12800 | ON | OFF | OFF | ON |
| 128 | 25600 | OFF | OFF | OFF | ON |
| 5 | 1000 | ON | ON | ON | OFF |
| 10 | 2000 | OFF | ON | ON | OFF |
| 20 | 4000 | ON | OFF | ON | OFF |
| 25 | 5000 | OFF | OFF | ON | OFF |
| 40 | 8000 | ON | ON | OFF | OFF |
| 50 | 10000 | OFF | ON | OFF | OFF |
| 100 | 20000 | ON | OFF | OFF | OFF |
| 125 | 25000 | OFF | OFF | OFF | OFF |

DM860TE

| Microstep | Steps/rev.(for 1.8°motor) | SW5 | SW6 | SW7 | SW8 |
|---|---|---|---|---|---|
| 1 | 400 | ON | ON | ON | ON |
| 2 | 800 | OFF | ON | ON | ON |
| 4 | 1600（default） | ON | OFF | ON | ON |
| 8 | 3200 | OFF | OFF | ON | ON |
| 16 | 6400 | ON | ON | OFF | ON |
| 32 | 12800 | OFF | ON | OFF | ON |
| 64 | 25600 | ON | OFF | OFF | ON |
| 128 | 51200 | OFF | OFF | OFF | ON |
| 5 | 1000 | ON | ON | ON | OFF |
| 10 | 2000 | OFF | ON | ON | OFF |
| 20 | 4000 | ON | OFF | ON | OFF |
| 25 | 5000 | OFF | OFF | ON | OFF |
| 40 | 8000 | ON | ON | OFF | OFF |
| 50 | 10000 | OFF | ON | OFF | OFF |
| 100 | 20000 | ON | OFF | OFF | OFF |
| 125 | 40000 | OFF | OFF | OFF | OFF |

### 7.2 Automatic Motor Matching & Self Configuration

When powered on a TE will automatically configure itself with the best settings to match the driven stepper motor for optimal performance. No action is needed.

## 8. Wiring Notes

- In order to improve anti-interference performance of the drive, it is recommended to use twisted pair shield cable.
- To prevent noise incurred in PUL/DIR signal, pulse/direction signal wires and motor wires should not be tied up together. It is better to separate them by at least 10 cm, otherwise the disturbing signals generated by motor will easily disturb pulse direction signals, causing motor position error, system instability and other failures.
- If only one power supply serves multiple TE drives, separately connecting the drives to the power supply is recommended instead of daisy-chaining.
- It is prohibited to pull and plug connector P2 while the drive is powered ON, because there is high current flowing through motor coils (even when motor is at standstill). Pulling or plugging connector P2 with power on will cause extremely high back-EMF voltage surge, which may damage the drive.

## 9. Typical Connection

A complete stepping system should include stepping motor, stepping drive, power supply and controller (pulse generator). A typical connection is shown as below.

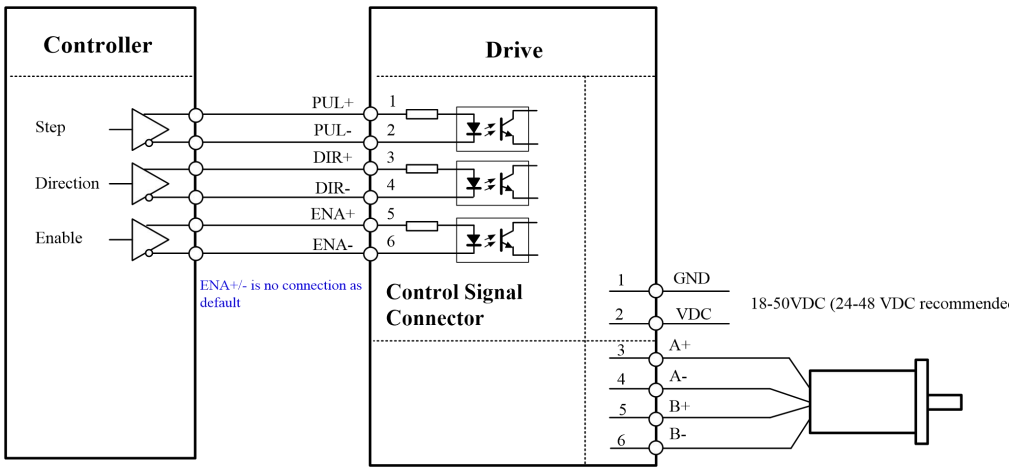



**Figure 11 Typical Connections**

## 10. Sequence Chart of Control Signals

In order to avoid some fault operations and deviations, PUL, DIR and ENA should abide by some rules, shown as following diagram:

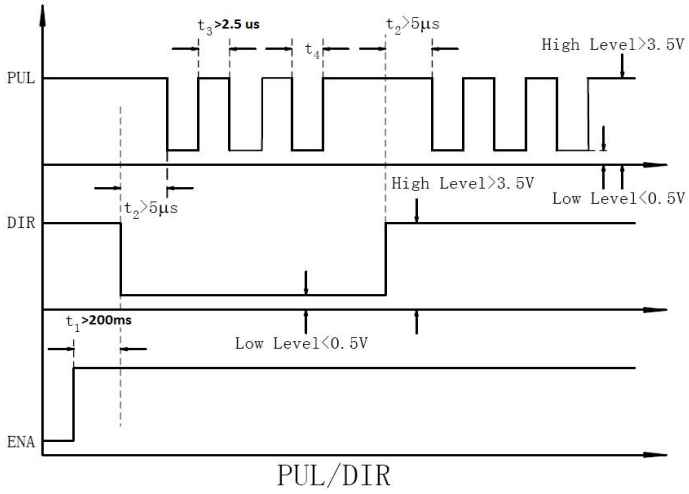



**Figure 12 Sequence chart of control signals**

Note:

t1: ENA must be ahead of DIR by at least 200ms. Usually, ENA+ and ENA- are NC (not connected). See “Connector P1 Configurations” for more information.

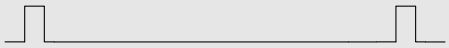
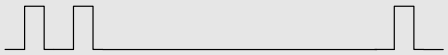
t2: DIR must be ahead of PUL effective edge by 5μs to ensure correct direction;

t3: Pulse width not less than 2.5μs;

t4: Low level width not less than 2.5μs;
Duty cycle of Pulse signal is recommend 50%.

# 11. Protection Functions

To improve reliability, the drive incorporates some built-in protections features.

| Priority | Time(s) of Blink | Sequence wave of red LED | Description |
|---|---|---|---|
| **1st** | 1 |  | Over-current protection activated when peak current exceeds the limit. |
| **2nd** | 2 |  | Over-voltage protection activated when drive working voltage is greater than 60VDC |
| **3nd** | 3 |  | Reserved. |

When above protections are active, the motor shaft will be free or the red LED blinks. Reset the drive by repowering it to make it function properly after removing above problems.

# 12. Troubleshooting

In the event that your drive doesn't operate properly, the first step is to identify whether the problem is electrical or mechanical in nature. The next step is to isolate the system component that is causing the problem. As part of this process you may have to disconnect the individual components that make up your system and verify that they operate independently. It is important to document each step in the troubleshooting process. You may need this documentation to refer back to at a later date, and these details will greatly assist our Technical Support staff in determining the problem should you need assistance.

Many of the problems that affect motion control systems can be traced to electrical noise, controller software errors, or mistake in wiring.

**Problem Symptoms and Possible Causes**

| Symptoms | Possible Problems |
|---|---|
| **Motor is not rotating** | No power |
| | Microstep resolution setting is wrong |
| | DIP switch current setting is wrong |
| | Fault condition exists |
| | The drive is disabled |
| **Motor rotates in the wrong direction** | Motor phases may be connected in reverse |
| **The drive in fault** | DIP switch current setting is wrong |
| | Something wrong with motor coil |
| **Erratic motor motion** | Control signal is too weak |
| | Control signal is interfered |
| | Wrong motor connection |
| | Something wrong with motor coil |
| | Current setting is too small, losing steps |
| **Motor stalls during acceleration** | Current setting is too small |
| | Motor is undersized for the application |
| | Acceleration is set too high |
| | Power supply voltage too low |
| **Excessive motor and drive heating** | Inadequate heat sinking / cooling |
| | Automatic current reduction function not being utilized |
| | Current is set too high |