

ORION ELECTRONICS

Operation Manual

for

Stepper motor drive: MSD-6A-016-80

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STEPPER MOTOR DRIVE

1. Introduction

Stepper motor drive has now become a commonly used device, for various motion control applications. Stepper motors, along with good drives; present many unique abilities and features. For example-

- Good stopping accuracy.
- Instant start / stop and direction reversal at least up to 60 rpm.
- Constant speed even if supply voltage changes.
- Good power efficiency.

Compact, economic and reliable stepper drives is the need of many automation products.

This model **MSD-6A-016-80**, presents all the above advantages. A convenient Chassis (default), or din rail mounting, which is ideal for control panels, can be opted for.

MODEL MSD-6A-016-80:

This is a very compact drive, which includes appropriate power supply and universal interface, so that any external controller can be connected. The current setting of the drive can be adjusted, as per requirement of the motor to be connected. The maximum capacity of the drive is 6 Amp per phase.

2. Specifications:

2.1 Technical:

1. Control supply: 230 VAC, 1 ph, 50 Hz as input to the transformer
(48 to 95 VAC) from transformer output to drive
Or 80VDC external supply voltage to the drive
2. Current capacity: Up to 6 Amps settings from Potentiometer.
3. Drive type: Bipolar, Step setting $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$.
4. External control: TTL or NPN / PNP up to 24 VDC
5. Size: 170 X 90 X 45 mm

2.2 Electrical Specifications (Tj = 25 deg.)

Parameter	Min	Typical	Max	Unit
1. Output current	1	-	6 (5.6 RMS)	A
2. Supply voltage	48	60	80	VAC
3. Logic signal current	7	10	16	mA
4. Pulse input frequency	0	-	300	KHz
5. Isolation resistance	500			MOhms

2.3 Operating Environment:

1. Cooling:Natural Cooling or Forced cooling
2. Operating Environment:Avoid dust, oil fog and corrosive gases
3. Ambient Temperature:0 deg — 50 deg.
4. Humidity:40%RH — 90%RH
5. Operating Temperature:70 deg. Max
6. Vibration:.....5.9m/s² Max
7. Storage Temperature:20 deg-65 deg.
8. Weight:Approx. 570g (20.10 oz)

3. Current and Micro-stepping Setting

3.1 Current Settings

For a given motor, higher driver current will make the motor to produce more torque at the output, but at the same time causes more heating in the motor and driver. Therefore, output current is generally set to be such that the motor will not overheat for long time operation. Since parallel and series connections of motor coils will significantly change the resulting inductance and resistance, it is therefore important to set driver output current depending on motor phase current, motor leads and connection methods. Phase current rating supplied by motor manufacturer is important in selecting driver current; however the selection also depends on leads and connections.

We have incorporated a Blue-colored preset to change the current setting, with test points TP1 and TP2. If I_d is the desired current and R is the max. value of the preset resistor, then multiplying V across TP1 and TP2 is: $V=I_d*R$. Turn the preset knob, with a screwdriver, such that multi-meter reads this value of voltage across TP1 and TP2.

3.2 Drive Resolution setting:

The resolution (steps/revolution) setting is adjustable by means of Jumpers or Header switches on the drive PCB. Due to the industry feedback that the DIP switch setting is easily tampered (for current and micro-steps), we have removed the DIP switches and incorporated the header switches.

A Jumper has three pins, and at a time, two adjacent pins are shorted. There are a total of 4 such Jumpers. The micro-step setting combination of Jumper switches is explained at the bottom of the top drive enclosure.

4. Installation Procedure and Precautions:

4.1 INSPECTION OF MATERIAL

To start with inspect the material visually and see whether any damage has occurred in the transport. Every care is taken while packing the unit, so that it withstands transport vibrations and shocks. However, sometimes mishandling in the transport is of such level that it can cause damage. If such damage is evident, kindly inform us immediately and also complain to the delivering agency.

4.2 READ THE MANUAL BEFORE CONNECTING DRIVE AND CONTROLLER

The connections to and from the drive are all very important. Improper connections to the controller or motor will not make your endeavor, a success. On the other hand it can damage the drive or controller. So it is advisable to carefully understand the contents of this manual and then proceed for wiring and commissioning.

4.3 CHOOSING THE RIGHT LOCATION FOR MOUNTING

The output devices of the drive emit heat, and so get heated up. We have provided cooling fan on the front, which intakes air from the surrounding and forces it onto the hot parts. There are slots on the other side of the box, for escape of air. Taking this into account, the drive box should be mounted in a well-ventilated place. This will ensure long life and reliable performance.

5. WIRING UP THE DRIVE

There are three destinations where the wire bunches lead.

1. Mains power, 230 VAC
2. Control signals
3. Motor

The mains power should be stable and the voltage should be between 48 to 95VAC to the drive via a suitable step-down transformer. The wiring should be firm. Any loose contact at these points will badly affect the performance of the drive.

The cable used for control signals, should be shielded cable, especially when the length is more. This cable should not be bunched with power or motor cable.

Each pair of motor cable (A1-A2 and B1-B2) should be individually twisted once every 5 centimeters of length. Each core of the motor cable should be at least 0.5 mm. Sq. If the length is more than 2 meters, it is advisable to use 0.75 mm. Sq.

5.1 Starting Up:

After ascertaining that all the connections are correct, put the power on. The LED on the front plate will glow. This indicates the presence of the motor power supply.

5.2 Mode Operation:

- Make sure that the signal connections are proper, considering the voltage level and type (PNP or NPN) of signals from controller. Refer the connection options shown in the 'connection details' section of the manual.
- Ensure that TOGGLE is in ENABLE position.
- Now put the controller into action.

6. Clues for Fault finding: Symptoms and Solutions

Q. None of the front plate LED's glows, the drive does not power up.

1. Check whether 80 VDC supply is present.
2. Confirm that the power cord is okay and is connected properly.

Q. The LED is of the motor does not get energized.

Check the fuse integral to the mains inlet. An extra fuse-link is supplied, which is adjacent to the fuse socket, inside the mains inlet. The rating of this fuse is 3 Amps.

Do not use a higher rating fuse-link. If the fuse blows repeatedly, confirm that there is no shorting at the motor output connections. If not, contact ORION.

Q. The motor heats up too much within a span of 2 to 3 minutes.

It has been already mentioned working temperature of stepper motors may rise to 75°C or more depending on ambient temperature. As such they are rated for a case temperature of 95°C or more. However, the current setting should never exceed the rated value. Check the current setting of the drive, referring 'DIP SWITCH details' section, for how to set it. If you are using a **4** lead motor, the current setting should equal the rated per phase current. If the motor is a **6** lead motor, the current setting should be 0.7 times the rated per phase current. If you are using a **8** lead motor, in series mode, again the current setting should be 0.7 times the rated per phase current. For a **8** lead motor used in parallel mode, the current setting should be 1.4 times the rated per phase current.

Q. The motor vibrates or makes sound but does not move properly.

1. Check motor connections for proper pairing. Pin no 1 and 2 of motor connector is one pair and pin no 3 and 4 is the other.
2. Confirm that the motor is not overloaded mechanically.

9. A Few Points worth noting:

- Generally, the stepper motors get heated up, to about 75°C. It is a good practice to provide heat sinking by way of a well-machined mounting plate, made of good conducting material. Providing good air flow with a cooling fan is necessary for machine with long working cycles.
- The cables running from the drive to the motor should be of proper size. Unnecessary lengths of this cable should be avoided. While designing the panel cabling layout, make it a point, not to bunch the signal and motor cables together.
- Use shielded cable for signals, especially when you are using higher lengths.

It is critically important that the stepper motor shafts are not machined at customer's end. The motor may get permanently damaged. Similarly, in case there is some problem with the motor, **do not try to open the motor and do not put oil**. Instead, the manufacturer should be informed and motor should be sent for repairs.