

# MSD48220

## Microstep Drive

### Hardware Manual



---

---

# Contents

1. Introduction.....	2
1.1 Features.....	2
1.2 Block Diagram.....	3
2. Getting Started.....	3
3. Mounting the Drive.....	4
4. Connections.....	4
4.1 Connecting the Power Supply.....	4
4.2 Connecting the Motor.....	4
4.3 Connecting Input Signals.....	5
4.3.1 Connection Examples : STEP & DIR.....	5
4.4 Connection Examples : EN input.....	6
4.5 Fault Output.....	7
5. Switch Selecting.....	8
5.1 Selecting a Motor and Setting the Current.....	8
5.2 Setting Idle Current.....	8
5.3 Microstepping.....	9
5.4 Self Test.....	9
5.5 Command Signal Smoothing.....	10
5.6 Load Inertia.....	10
5.7 Digital Signal Filter.....	10
6. LED Error Codes.....	10
7. Reference Materials.....	11
7.1 Mechanical Outline.....	11
7.2 Technical Specifications.....	11
7.2.1 Electrical Specifications.....	11
7.2.2 Environmental Specifications.....	11

---

---

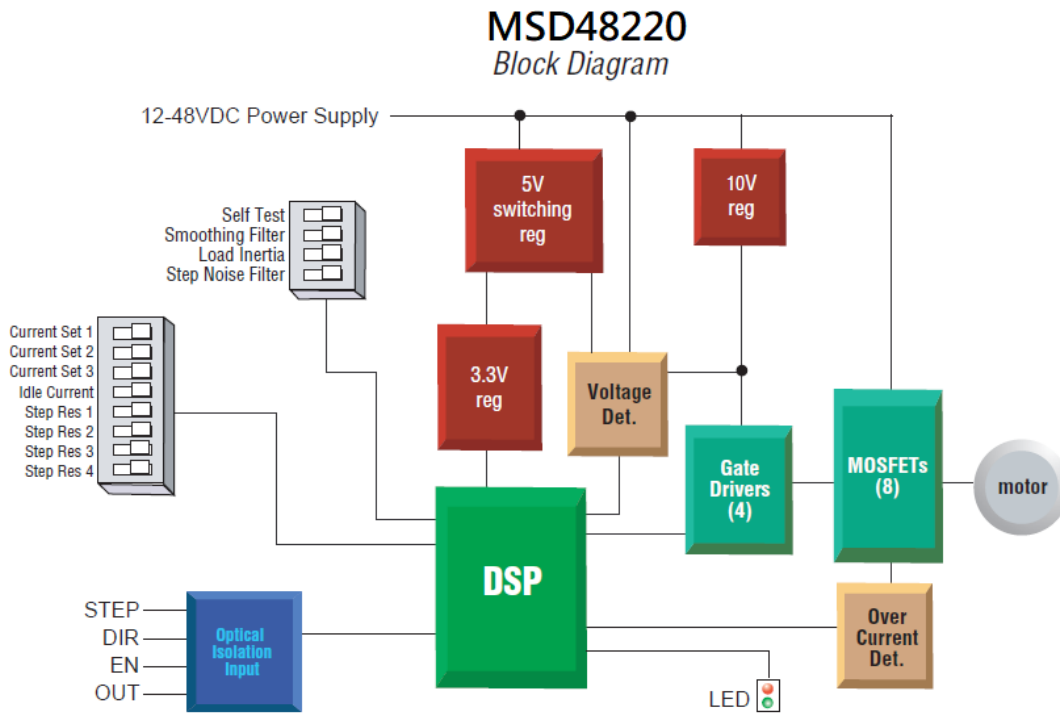
## 1. Introduction

Thank you for selecting a MSD48220. We hope our dedication to performance, quality and economy will make your motion control project successful.

### 1.1 Features

- Power Supply - operates from a 12 to 48 volt DC power supply.
- Output Power - switch selectable, 8 settings, maximum 2.2 amps peak.
- Current Control - advanced digital current control provides excellent high speed torque.
- Microstep Resolution - switch selectable, 16 settings : 200, 400, 800, 1600, 3200, 6400,12800, 25600, 1000, 2000, 4000, 5000, 8000, 10000, 20000, 25000 step/rev.
- Speed Range - speeds up to 3000 rpm.
- Anti-Resonance - raises the system-damping ratio to eliminate midrange instability and allow stable operation throughout the speed range of the motor.
- Auto Setup – measures motor parameters and configures motor current control and anti-resonance gain settings.
- Microstep Emulation – performs high resolution stepping by synthesizing coarse steps into fine micro-steps.
- Control Modes - Step & Direction or CW/CCW pulse.
- Input Digital Filters – 150kHz or 2MHz digital filter for high speed inputs.
- Load Inertia Select - as part of the motor database each motor can be selected for use with low or high load inertia.
- Idle Current - switch selectable for 50% or 90% idle running current reduction 1 second after the motor stops.
- Self Test - switch selectable, the drive will perform a 2 rev, 1 rps, CW/CCW move test.
- Signal Smoothing – switch selectable, firmware configurable filtering removes spectral components from the command sequence, reducing jerk, limiting excitation of system resonance.

## 1.2 Block Diagram

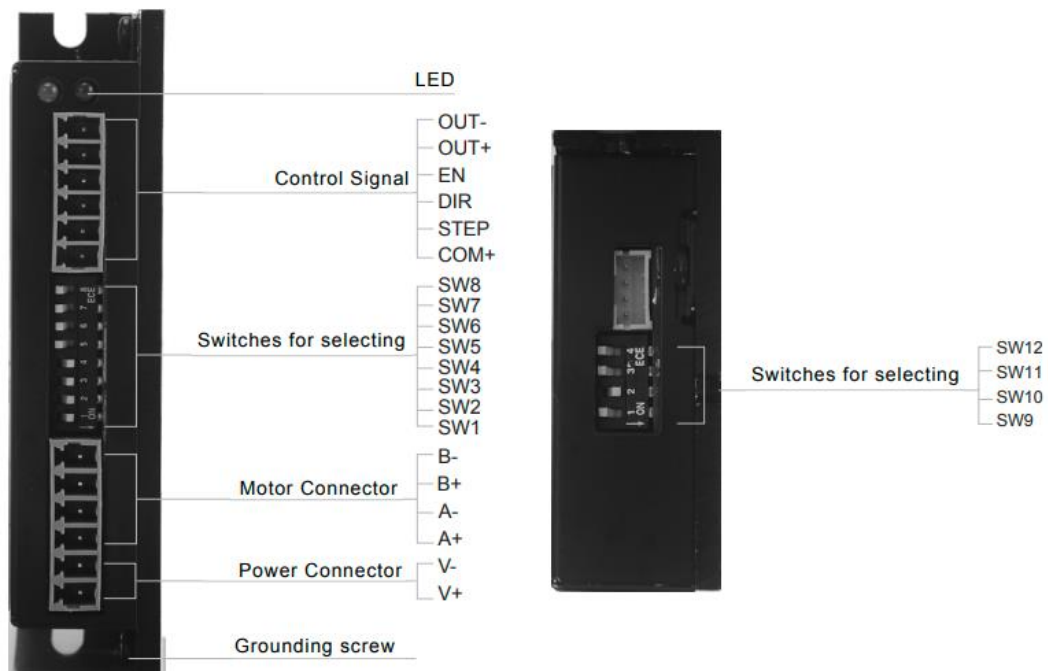


## 2. Getting Started

To use your MSD48220 step motor drive, you'll need the following :

- a 12 to 48 volt DC power supply. Please read the section Choosing a Power Supply for help in choosing the right power supply.
- a small flat blade screwdriver for tightening the connectors.
- a source of step signals, such as a PLC or motion controller.

The connectors and other points of interest are illustrated below.



### 3. Mounting the Drive

You can mount your drive on the wide or the narrow side of the chassis using M3 screws. If possible, the drive should be securely fastened to a smooth, flat metal surface that will help conduct heat away from the chassis. If this is not possible, then forced airflow from a fan may be required to prevent the drive from overheating. Never use your drive in a space where there is no air flow or where other devices cause the surrounding air to be more than 40°C.

Never put the drive where it can get wet or where metal or other electrically conductive particles can get on the circuitry.

Always provide air flow around the drive. When mounting multiple drives near each other, maintain at least one half inch of space between drives.

### 4. Connections

#### 4.1 Connecting the Power Supply

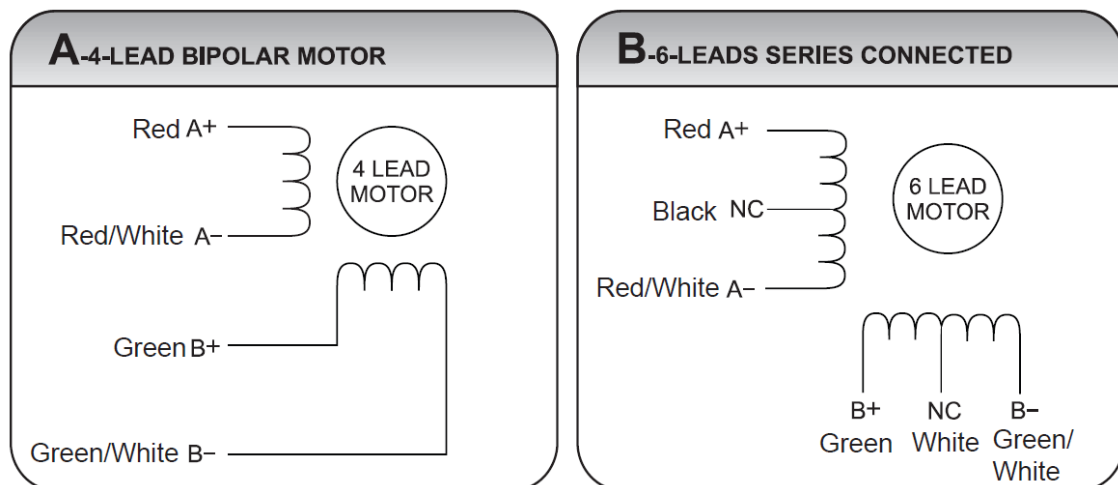
If you need information about choosing a power supply, please read the section Choosing a Power Supply.

- Connect the power supply “+” terminal to the connector terminal labeled “V+”.
- Connect power supply “-” to the connector terminal labeled “V-”.
- The green ground screw on the corner of the chassis should be connected to earth ground.

**Be careful not to reverse the wires.**

The MSD48220 drives contain an internal fuse that connects to the power supply + terminal. This fuse is not user replaceable. If you want to install a user serviceable fuse in your system install a fast acting 3 amp fuse in line with the + power supply lead.

#### 4.2 Connecting the Motor



### 4.3 Connecting Input Signals

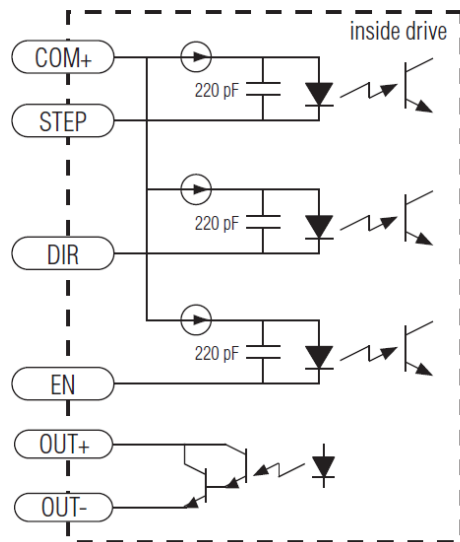
The MSD48220 Step Drive has two high speed optically isolated inputs called STEP and DIR that accept 5 to 24 volt single-ended signals, up to 2MHz. The maximum voltage that can be applied to the input is 28V.

The motor executes one step with the falling edge of the STEP signal.

The direction of rotation is controlled by the DIR signal level. A low level signal (0 level) will result in clockwise rotation, and a high level signal (1 level) will result in counterclockwise rotation

Note : STEP and DIR inputs can be converted to STEP CW and STEP CCW by moving the internal jumper.

#### Internal Circuit Diagram

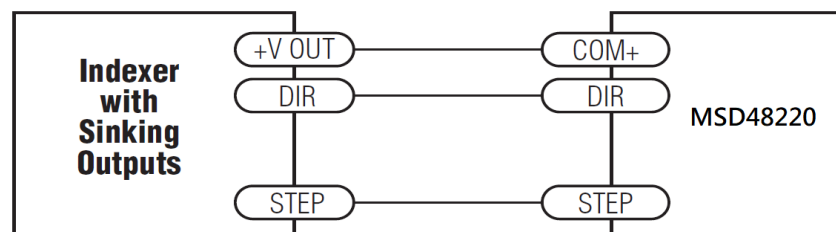


Step & Direction



STEP CW & STEP CCW

#### 4.3.1 Connection Examples : STEP & DIR



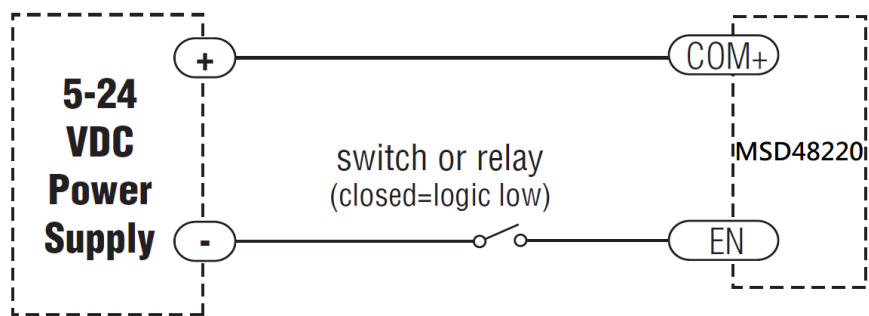
Connecting to Indexer with Sinking Outputs

#### 4.4 Connection Examples : EN input

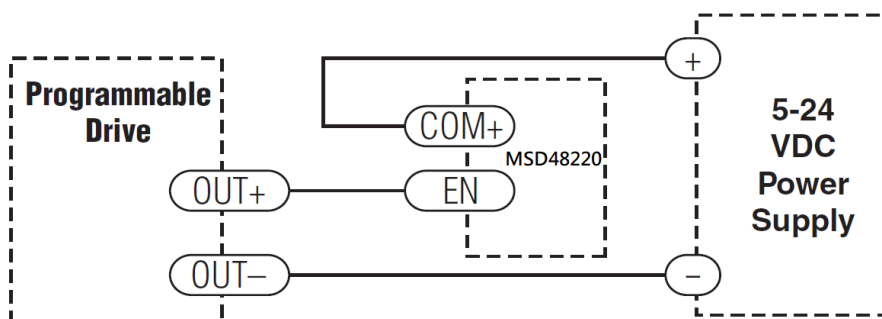
The EN input enables or disables the drive amplifier. It is an optically isolated input that accepts a 5 to 24 volt single-ended signal. The maximum voltage that can be applied to the input is 28V.

When EN input is closed, the drive amplifier is deactivated. All the MOSFETs will shut down, and the motor will be free. When EN input is open, the drive is activated.

When the drive has encountered an error and the fault is removed from system, a falling signal into the EN input will reset the error status and activate the drive amplifier again.

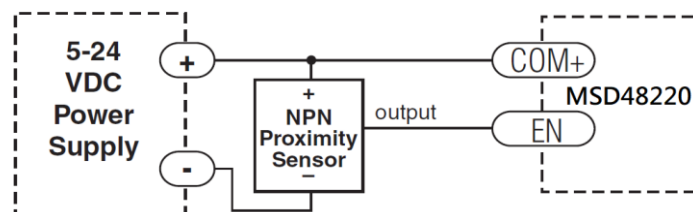


**Connecting an Input to a Switch or Relay**



**Connecting another drive to EN**

*(When output closes, input closes)*



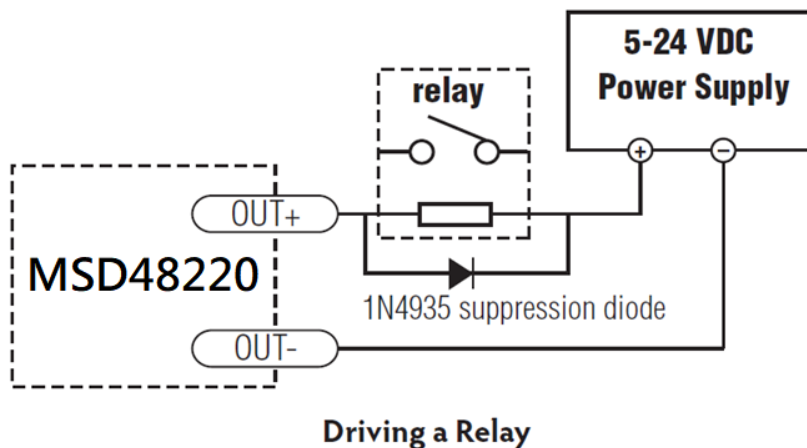
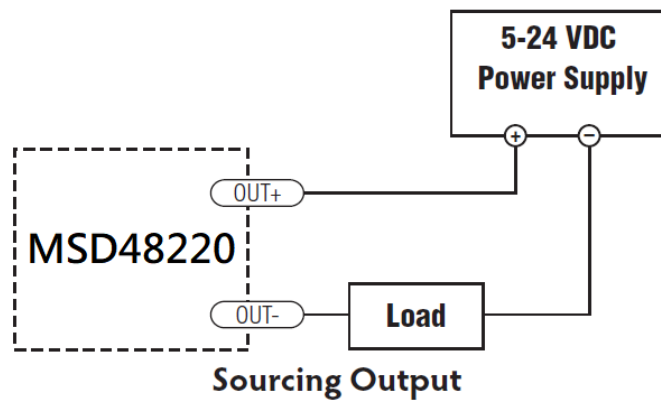
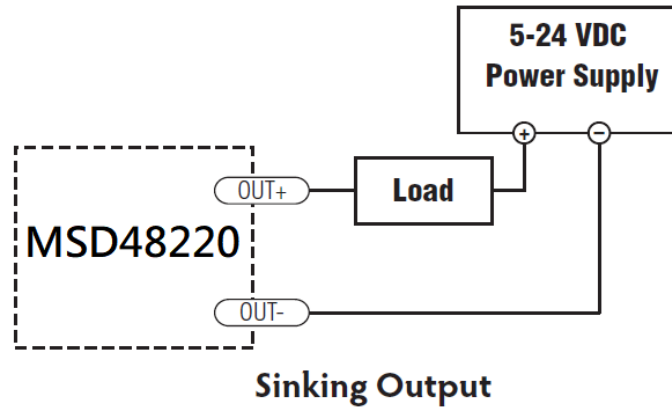
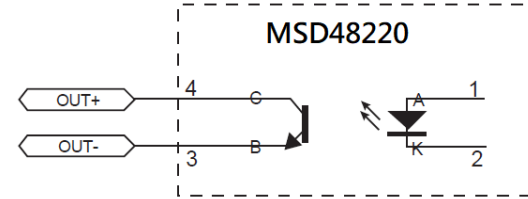
**Connecting an NPN Type Proximity Sensor to an input**

*(When prox sensor activates, input closes)*

## 4.5 Fault Output

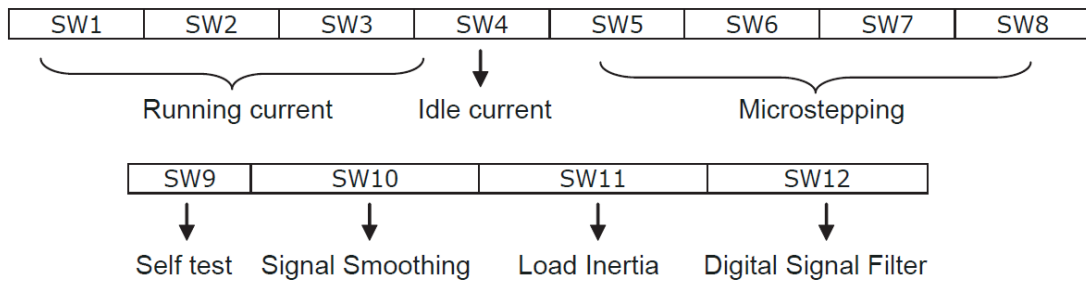
The MSD48220 features a digital fault output., whose terminals are labeled OUT+ and OUT-. This output closes to signal a fault condition.

This output can be used to drive LEDs, relays and the inputs of other electronic devices like PLCs. The “+” (collector) and “-” (emitter) terminals of the output transistor are available at the connector. This allows you to configure the output for current sourcing or sinking.





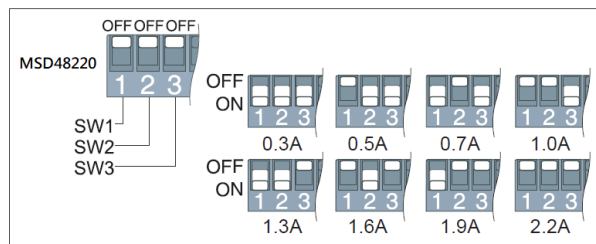
## 5. Switch Selecting



### 5.1 Selecting a Motor and Setting the Current

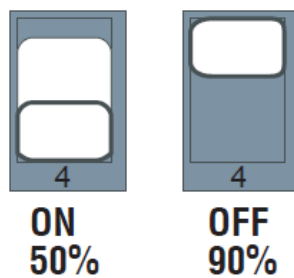
The MSD48220 is optimized for use with carefully selected motors. To select a motor, simply move switches SW1, SW2 and SW3 to the setting that corresponds to the motor of your choice. You can do this while power is on, but it is safer to select the motor before applying power to the drive so that you do not risk applying too much current to your motor.

Peak	SW1	SW2	SW3
0.3A	ON	ON	ON
0.5A	OFF	ON	ON
0.7A	ON	OFF	ON
1.0A	OFF	OFF	ON
1.3A	ON	ON	OFF
1.6A	OFF	ON	OFF
1.9A	ON	OFF	OFF
2.2A	OFF	OFF	OFF



### 5.2 Setting Idle Current

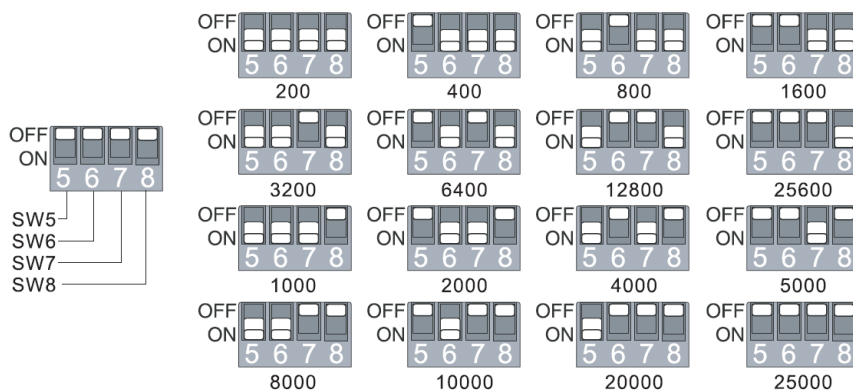
Motor heating and power consumption can also be reduced by lowering the motor current when it is not moving. The MSD48220 will automatically lower the motor current when it is idle to either 50% or 90% of the running current. The 50% idle current setting will lower the holding torque to 50%, which is enough to prevent the load from moving in most applications. This reduces motor heating by 75%. In some applications, such as those supporting a vertical load, it is necessary to provide a high holding torque. In such cases, the idle current can be set to 90% as shown below. The idle current switch is located in switch SW4.



### 5.3 Microstepping

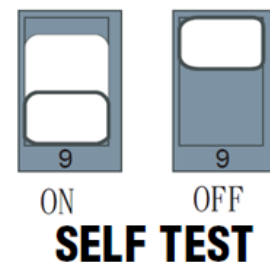
The microstep resolution is set by the SW5, SW6, SW7, and SW8 switches. There are 16 settings.

Microstep(steps/rev)	SW5	SW6	SW7	SW8
200	ON	ON	ON	ON
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



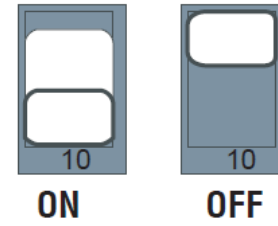
### 5.4 Self Test

If you are having trouble getting your motor to turn, you may want to try the built-in self test. Anytime switch SW9 is moved to the ON position, the drive will automatically rotate the motor back and forth, 2 turns in each direction. This feature can be used to confirm that the motor is correctly wired, selected and otherwise operational.



## 5.5 Command Signal Smoothing

Setting switch SW10 to ON selects this function; setting it to OFF will disable it. Command signal smoothing can soften the effect of immediate changes in velocity and direction, making the motion of the motor less jerky. An added advantage is that it reduces wear on mechanical components. This function can cause a short delay in following the control signal, and should be used with that in mind.



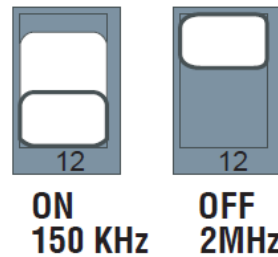
## 5.6 Load Inertia

Switch SW11 selects the load inertia. Set it to ON for high inertia applications and to OFF for low inertia applications. The load inertia selection can help the MSD48220 drive to calculate the current control parameter, which is used in Anti-Resonance. If the load inertia is close to that of the motor rotor, select the low (OFF) setting. If the load inertia is higher than that of the motor rotor, select the high (ON) setting.



## 5.7 Digital Signal Filter

Switch SW12 sets the digital signal filter. The STEP and DIR signal inputs have built-in digital filters and this setting will reduce external noise. If the system works on the low microstep, select the 150 KHz (ON) setting. If the system works on the high microstep, select the 2 MHz (OFF) setting.



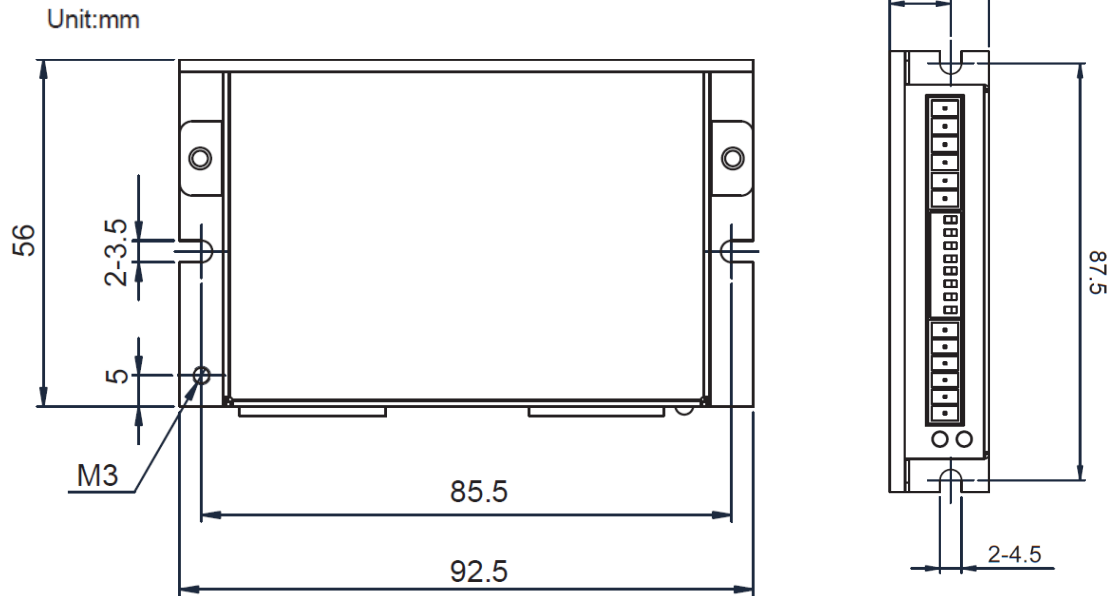
## 6. LED Error Codes

In the event of a drive fault or alarm, the green LED will flash one or two times, followed by a series of red flashes. The pattern repeats until the alarm is cleared.

	Code	Error
	Solid green	Motor disabled
	Flashing green	Motor enabled
	3 red, 1 green	Over temperature
	3 red, 2 green	Bad internal voltage
	4 red, 1 green	Over voltage
	4 red, 2 green	Under voltage
	5 red, 1 green	Over current/short circuit
	6 red, 1 green	Open motor winding

## 7. Reference Materials

### 7.1 Mechanical Outline



### 7.2 Technical Specifications

#### 7.2.1 Electrical Specifications

Parameter	Min.	Typ.	Max.	Unit
Power Supply	12	-	48	VDC
Output Current (Peak)	0.3	-	2.2	A
Step Frequency	2	-	2M	Hz
STEP Minimum Pulse Width Hi and Low	250	-	-	ns
DIR Minimum Pulse Width	62.5	-	-	us
Under Voltage Protection	-	10	-	VDC
Over Voltage Protection	-	60	-	VDC
STEP/DIR Input Signal Voltage	4.0	-	28	VDC
OUT mximum output current	-	-	100	mA
OUT maximum voltage	-	-	30	VDC

#### 7.2.2 Environmental Specifications

Heat Sinking Method	Natural cooling or fan-forced cooling
Surrounding Air Conditions	Avoid dust, oily mist and corrosive air
Operating Temperature	0 - 40°C (32 - 104°F)
Maximum Ambient Humidity	90% non-condensing
Shock	5.9m/s <sup>2</sup> maximum
Storage Temperature	-10 - 70°C (14 - 158°F)

**MONTROL** 敏石系統有限公司  
www.montrol.com.tw

330桃園市同德11街58號10樓之2 tel: 03-358-6008 fax: 03-358-6009

e-mail: info@montrol.com.tw