



# Leadshine

## Datasheet

### MX4660

4-Axis Stepper Drive with Breakout Board & I/O's



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## Record of Revisions

Revision	Date	Description of Release
1.0	05/23/2014	<i>Preliminary released for the MX4650.</i>
1.1	08/07/2014	<i>Increase the maximum current from 6.0A to 6.0A based on the testing of the prototypes, and use new output current settings/table. The drive model was changed to MX4660.</i>
1.2	02/04/2015	<i>Update description for the connections of the power supply, digital inputs and outputs</i>

## Features

- Full control for up to 4 stepper motors of NEMA 17, 23, 24, or 34
- Sophisticated stepper motor control based on the latest DSP technology
- Built-in breakout board and I/O's
- Step & direction control
- Input pulse smoothing for less jittering, higher torque, and quicker response
- Extra low motor heating & noise
- Extra smooth motor movement
- Easy setup and quick configuration
- Compact size & easy setup
- 200 KHz maximum frequency for each axis
- 20-60 VDC operating voltage
- Convenient individual setting for each axis via DIP switches
- 8 micro step settings of 200-12,800 (full to 1/64) for each axis
- 8 output current settings of 1.41 - 6.0A for each axis
- E-Stop input
- Fault output
- 8 general digital inputs including 4 high-speed (200 kHz) ones for 5th and 6th axis control
- 6 general digital outputs
- Two 12 VDC auxiliary power outputs
- Automatic idle current reduction to 50%

## 1. Introduction

Leadshine MX4660 is a 4-axis stepper drive with built-in breakout board and I/O's. It is specially designed to allow **EASY** and **RAPID** implementation for full control of 4 stepper motors of frame sizes 17, 23, 24, or 34. By taking step & direction commands, the MX4660 can be easily controlled by motion controllers, PLC's, CNC software (e.g. Mach 3/4, EMC)... This makes it ideal for many applications in industries such as CNC machinery (CNC routers, plasma, mills, laser welders, machining centers, jewelry mills...), electronics, semi-conductor, medical, textile, etc. for easy, quick and cost-effective implementation.

Based on the latest DSP technology and Leadshine's advance stepper control algorithm, the MX4660 adopts features such as anti-resonance, multi-stepping, input pulse smoothing, automatic idle current reduction ... It offers high precision, excellent torque, extra low noise, very low motor heating, and smooth driven motor movement. With the working voltage of 20-60VDC and output current up to 6.0A, the MX4660 can drive 4 two-phases stepper motors from NEMA 17 to 34 in full power with high reliability.

The MX4660 is easy to configure without the use of software. With the four DIP switches (one for each axis), a user can easily configure the output current to one of the eight 1.41-6.0A settings, and the micro stepping resolution to one of the eight 200-12,800 (full to 1/64 step) settings. Each axis can have its configurations different from any of other axes to meet its own control requirements.

A Leadshine MX4660 stepper drive has one E-Stop input, one analog input (0-10 VDC), one fault output, 8 general digital inputs, and 6 general digital outputs. This allows quick and easy I/O connections such as E-Stop, home/limit

switches, VFD..., to save installation space & time, minimize wiring, increase system reliability, and cut costs. Through the 4 high-speed general digital outputs (200 kHz), the MX4660 also allows control expansion for 2 additional axes, which is ideal to control 5-axis and 6-axis machines/devices.

The MX4660 adopts modular design with 4 individual stepper drive boards. If any the drive boards malfunctions, a user can easily replace it with a SDM660 stepper drive module at minimal cost.

*\* **Note:** The MX4660 can also be used to power 4-phase (0.9°) stepper motors. In this case, there will be 400 full steps needed for each revolution. You need to make sure that the settings in your controller (motion controller, PLC, CNC control system...) are properly configured to reflect this requirement.*

## **2. Applications**

The Leadshine MX4660 4-axis stepper drive can be easily and rapidly implemented in stepper control systems for OEM applications such as CNC routers / engravers, CNC mills, CNC Cutters, Laser Welders, CNC waterjets, X-Y tables, dispensing machines, medical equipment, scientific instruments...

Its unique design with built-in breakout board and I/O's fits seamlessly in many applications powered by many popular CNC systems such as Mach3, Mach4, EMC, WinCNC, etc.

### 3. Specification Summary

<i>Model</i>	MX4660
<i>Axis No.</i>	4
<i>Phase</i>	2 (also works for 4-phase 0.9° stepper motors)
<i>Control Type</i>	Step & Direction
<i>Supply Voltage</i>	20 - 60 VDC
<i>Supply Voltage Type</i>	DC
<i>Suggested power supply voltage</i>	24-54 VDC
<i>Output Current</i>	1.41 - 6.00 A
<i>Max Input Frequency (Per Axis)</i>	200KHz
<i>Micro Step</i>	Full, Half, 1/4, 1/8, 1/10, 1/16, 1/32, 1/64
<i>Output Current (Per Axis)</i>	1.41A, 2.12A, 2.83A, 3.54A, 3.96A, 4.24A, 4.95A, 6.0A(corresponding RMS current settings: 1.0A, 1.5A, 2.0A, 2.5A, 2.8A, 3.0A, 3.5A, 4.25A)
<i># of Digital Inputs</i>	8
<i># of Digital Outputs</i>	6
<i># of Analog Input</i>	1
<i># of E-Stop Input</i>	1
<i># of Fault Output</i>	1
<i># of 12 VDC Auxiliary Outputs</i>	2
<i>DB 25 Signal Voltage</i>	3.3-5 VDC
<i>Digital Input Voltage</i>	0-12 VDC
<i>Digital Output Voltage</i>	0-24 VDC
<i>Analog Output Signal Voltage</i>	0-10 VDC
<i>Minimum Step Width</i>	2.5 μs
<i>Minimum Direction Setup Time</i>	4μs
<i>Idle Current Percentage</i>	50%
<i>Protection</i>	Over current & over-voltage
<i>Dimension</i>	220 X 77.5 X 40 mm (8.66 X 3.05 X 1.57 Inch)
<i>Weight</i>	660 g
<i>Compliance / Certification</i>	RoHS

## 4. Electrical Specifications

### 4.1. Stepper Drive Module

Parameter	Min	Typical	Max	Unit
Input Voltage	20	48	60	VDC
Continuous Current	0	-	6.0(Peak)	A
Pulse Input Frequency	0	-	200	kHz
Pulse Voltage	0	5	5	V
Logic Signal Current	7	10	16	mA
Isolation Resistance	100	-	-	MΩ

### 4.2. Break out Board

Input Voltage	20-60VDC
ESTOP, Input1, Input2, Input 3, Input4, Input5, Input6, Input 7, Input 8	Optical Isolation. <b>ESTOP, Input5, 6, 7, 8 are 12V sourcing (10mA MAX)</b> ; Pulled up voltage or the power voltage of the opto-couplers for <b>Input1, Input2, Input3, Input4</b> is <b>adjustable</b> , depending on the input voltage of OPTO1 and OPTO2.
Output 1, Output 2, Output 3, Output 4, Output 5, Output 6	Optical Isolation, 5 - 24V, 70mA MAX Output1, 2, 3, 4 ( 200 kHz Max), Output5, 6 ( 20 kHz Max)
+10Vdc ( input for generating 0-10V output	5-15 VDC, 50mA MIN
0-10V out	0 to <u>approaches to input voltage of "+10Vdc In" - 1.1V</u> ; 20mA MAX For example, if the "+10Vdc In" input is connected to a +10V DC supply, then the maximum output of "0-10V out" approaches to 8.9V.

## 5. Operating Environment

Cooling	Natural Cooling or Forced cooling	
Operating Environment	Environment	Avoid dust, oil fog and corrosive gases
	Ambient Temperature	0°C - 40°C (32- 104°F)
	Humidity	40 - 90%RH
	Operating Temperature (Heat Sink)	70°C (158°F) Max
Storage Temperature	-20- 65°C (-4°- 149°F)	

## 6. Mechanical Specifications

Unit: mm (1 inch = 25.4 mm)

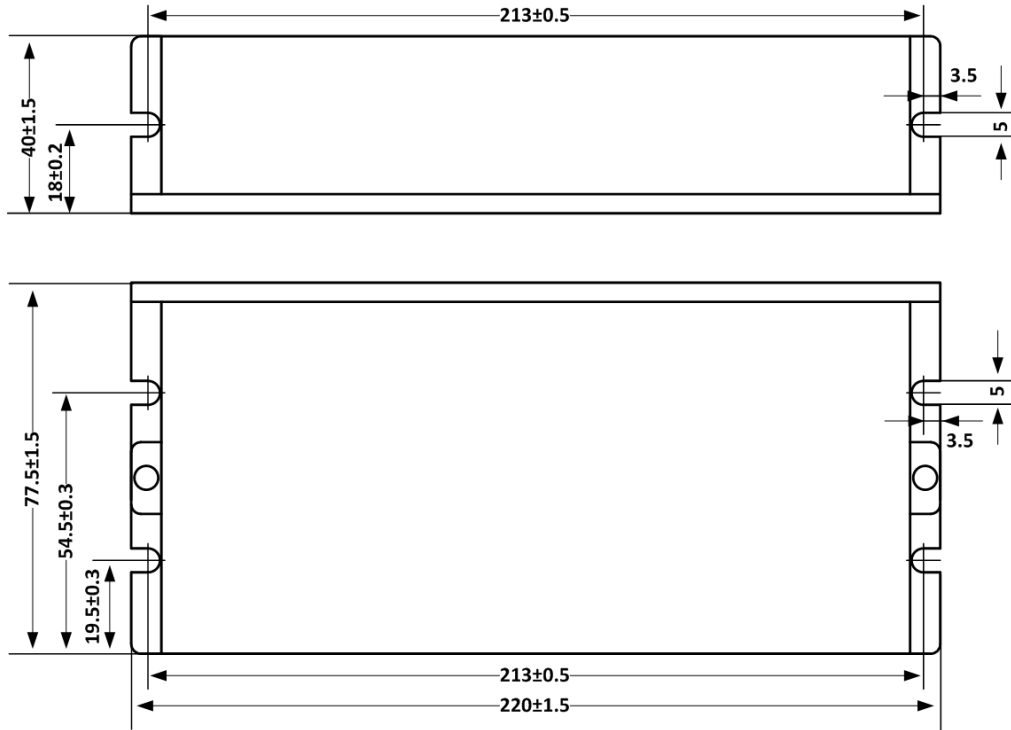


Figure 1 MX4660 mechanical dimensions

## 7. LED Lights

### 7.1. Led Light Location

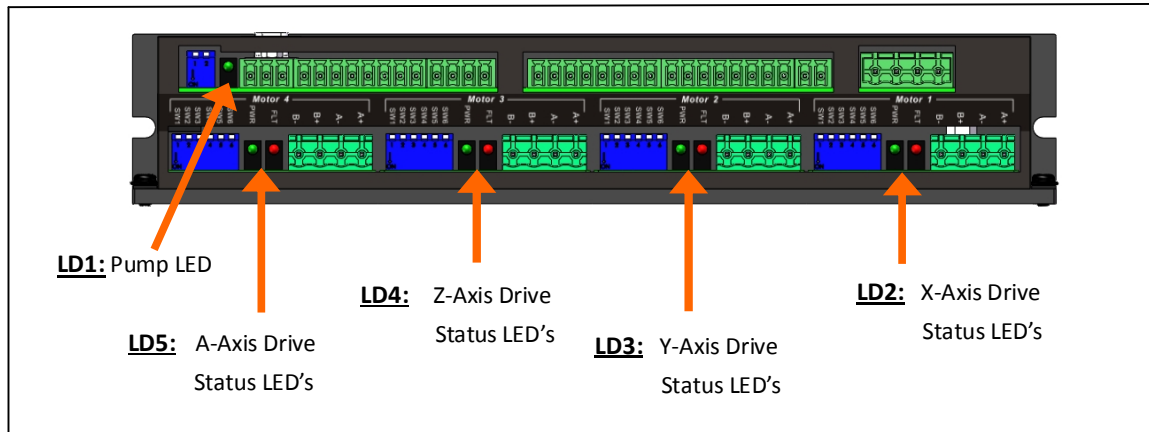


Figure2 MX4660 LED lights

### 7.2. LED Light Indication

#### 7.2.1. LD1 -Pump LED

This green LED light is specially designed for easy “WORKING STATUS INDICATION” for the connected CNC control system or motion controller. To turn on this LED light, it requires the signal receiving at PIN 16 - “WATCHDOG” - of DB25 connector (Figure4 on page 8). Otherwise, this LED light will be off.

For example, in Mach3 CNC control system, there is a feature called “CHARGE PUMP”. When MX4660 is connected, the green light will be automatically turned on if Mach3 is in working mode and functions properly. Otherwise, this LED light will be turned off and MX4660 will stop working if “CHARGE PUMP” DIP switch on the MX4660 is set to OFF position.

#### 7.2.2. LD2 / LD3 / LD4 / LD5-Drive Status LED's

There are two LED lights for each stepper drive module (Figure2), a green one and a red one.

- After a MX4660 4-axis stepper drive is powered on, the green LED light on a drive module should be in solid green and the red LED light off, to indicate that the drive module functions properly.
- If the red LED light of a drive model blinks periodically every 4 seconds, it indicates that protection for that drive module has been activated. In this case, a fault output signal will be outputted from pin 15 of the DB25 connector to notify the motion controller that MX4660 protection has been activated and stopped working. Read Section 11 on page 12 for MX4660 protection.



## 8. Connectors and Pin Assignments

### 8.1. Connector Location

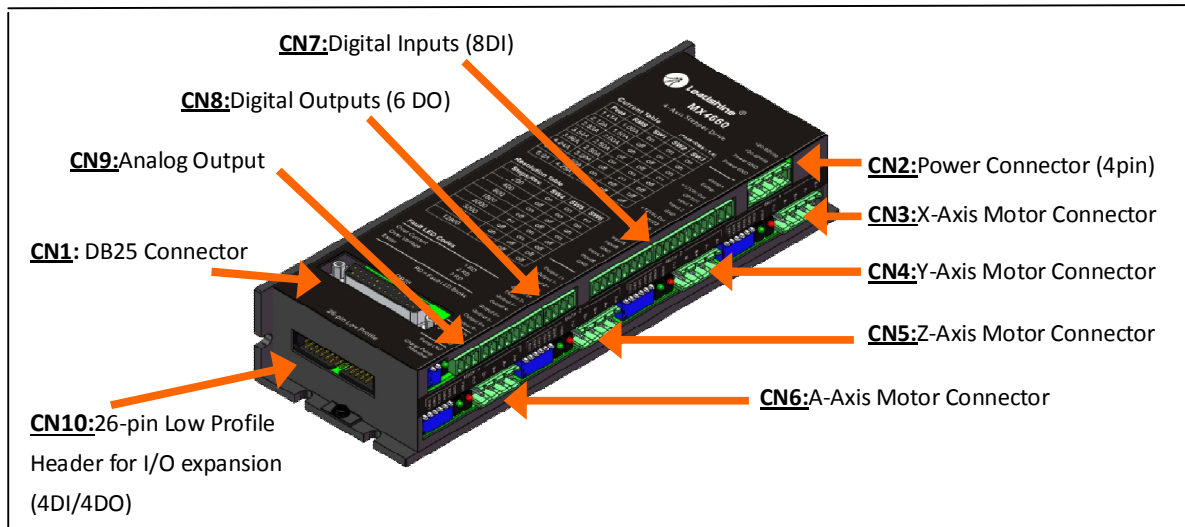


Figure 3 MX4660 connectors

### 8.2. Connectors and Pin Assignments

#### 8.2.1. CN1 -DB25 Connector

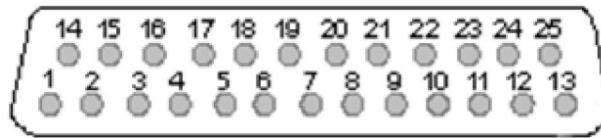


Figure 4 DB25 connector pin assignments

Pin	Name	Description
1	INPUT 2	<u>General purpose digital input</u> . It is connected to “Output 2” of the digital output connector (CN8 on Figure3). Used to forward an input signal sent from the connected motion controller to the device connected at “Output 2”.Its maximum frequency up to 200 kHz.
2	X-AXIS STEP	<u>Input step signal</u> for the X-axis stepper drive board.
3	X-AXIS DIRECTION	<u>Input direction signal</u> for the X-axis stepper drive board.
4	Y-AXIS STEP	<u>Input step signal</u> for the Y-axis stepper drive board.
5	Y-AXIS DIRECTION	<u>Input direction signal</u> for the Y-axis stepper drive board.
6	Z-AXIS STEP	<u>Input step signal</u> for the Z-axis stepper drive board.
7	Z-AXIS DIRECTION	<u>Input direction signal</u> for the Z-axis stepper drive board.
8	A-AXIS STEP	<u>Input step signal</u> for the A-axis stepper drive board.
9	A-AXIS DIRECTION	<u>Input direction signal</u> for theA-axis stepper drive board.

**8.2.1. CN1 -DB25 Connector (Continued)**

Pin	Name	Description
10	OUTPUT 1	<u>General purpose digital output.</u> It is connected to "Input 1" of the digital input connector (CN7 on Figure3). Used to forward an output signal from the device connected at "Input 1", to the motion controller.
11	OUTPUT2	<u>General purpose digital output.</u> It is connected to "Input 2" of the digital input connector (CN7 on Figure3). Used to forward an output signal from the device connected at "Input 3", to the motion controller.
12	OUTPUT3	<u>General purpose digital output.</u> It is connected to "Input 3" of the digital input connector (CN7 on Figure3). Used to forward an output signal sent from the device connected at "Input 3", to the motion controller.
13	OUTPUT4	<u>General purpose digital output.</u> It is connected to "Input 4" of the digital input connector (CN7 on Figure3). Used to forward an output signal sent from the device connected at "Input 4", to the motion controller.
14	PWM	<u>PWM pulse input.</u> Used to get the PWM signal from the controller which will be then transformed into ananalog signal to an external device connected at "0-10V out" pin of the analog output connector (CN8 on Figure 3), such as a VFD for spindle speed control.
15	FAULT	<u>Fault signal output</u> back to a motion controller. It will beactivated (voltage high) when one of the following events occurs: (1) a signal from ESTOP; (2) any of the 4 built stepper drive modules fails, or is activated for protection.
16	CHARGE PUMP	<u>General digital input.</u> A watchdog timer to disable/enable the MX4660. When "Charge Pump" (Figure5) is set to "OFF" position (Charge pump feature <b>NOT</b> turned off), the MX4660 will be only enabled with 10 KHz signal receiving at this PIN. Otherwise (no such signal received), the MX4660 will be disabled. For example, in Mach3 controlled CNC applications, MX4660's enabling/disabling will depend on the receiving of "Charge Pump" signal from Mach 3.
17	INPUT 1	<u>General purpose digital input.</u> It is connected to "Output 1" of the digital output connector (CN8 on Figure3). Used to forward an input signal sent from the connected motion controller to the device connected at "Output1".Its maximum frequency up to 200 kHz.
18	GND	Ground
19	GND	Ground
20	GND	Ground
21	GND	Ground
22	GND	Ground
23	GND	Ground
24	GND	Ground
25	GND	Ground

### 8.2.2. CN2 -Power Connector

Name	Description
+20-60Vdc	<u>DC Power input</u> for both the MX4660 including the breakout board and four stepper drive modules. A 20- 54 VDCpower supply is recommended to leave room for power line voltage fluctuation, and back EMF voltage chargeback during controlled motor deceleration. Two pins design for up to 20A applications. <b>For higher reliability</b> , it is suggested to add a shunt regulator with the DC power supply to discharge the energy/ back-EMF generated during rapid deceleration or in case of emergency when have to push the E-stop button when the motors are running. Or even add 2 big capacitors between +20-60VDC and Power GND will be helpful if a shunt regulator is not available. See more information in its hardware manual please.
+20-60Vdc	
Power GND	<u>Power supply ground.</u> Two pins design for up to 20A applications.
Power GND	

### 8.2.3. CN3/CN4/CN5/CN6- Motor Connectors

Name	Description
A+	Connection for motor coil phase A+
A-	Connection for motor coil phase A-
B+	Connection for motor coil phase B+
B-	Connection for motor coil phase B-

### 8.2.4. CN7- Digital Inputs

Name	Description
Estop+	<u>Emergency stop input</u> (12V Sourcing). When activated, all four drive boards will be shut down and the MX4660 will stop working. The red LED of each drive module will blink three times periodically every 4 seconds to indicate an emergency event signal received. In this case, a fault output will be sent to pin 15 - "Fault"- of the DB25 connector to notify the connected motion controller.
Estop-	Common ground
OPTO1	Power Input for opto-couplers for Input1 and Input2. Defaut is +12VDC and a +12Vdc Out is available on board. <b>A resistor isrequired for current limit when inputvoltage is higher than +12 VDC.</b> See more information in Section 12 or its hardware manual. This design makes digital inputs can work with external devices NOT only rated at 12 VDC with higher reliability and more flexibility, such as working with proximity sensors rated at different voltages.  <b>Do remember to connect the power grounds together (common ground) if use two different power supplies for OPTO1 and OPTO2. Or else, it may damage the drive because gounds (GNDs) for Input1, Input2, Input3, Input4 inside of the MX46660 are NON-isolated.</b>

Name	Description
Input 1	<u>General Purpose Input</u> . This pin is connected to pin 10 - "Output 1" - of the DB25 connector. Used to forward the digital output signal, sent from the connected external device here, to the motion controller connected through the DB25 connector.
Input 2	<u>General purpose Input</u> . This pin is connected to pin 11 - "Output 2" - of the DB25 connector. Used to forward the digital output signal, sent from the connected external device here, to the motion controller connected through the DB25 connector.
GND	Common ground.
OPTO2	Power Input for opto-couplers for Input1 and Input2. Default is +12VDC and a +12Vdc Out is available on board. <b>A resistor is required for current limit when input voltage is higher than +12 VDC.</b> See more information in Section 12 or in its hardware manual. This design makes digital inputs can work with external devices NOT only rated at 12 VDC with higher reliability and more flexibility, such as working with proximity sensors rated at different voltages.  Do remember to connect the power grounds together (common ground) if use two different power supplies for OPTO1 and OPTO2. Or else, it may damage the drive because grounds (GNDs) for Input1, Input2, Input3, Input4 inside of the MX46660 are NON-isolated.
Input 3	<u>General Purpose Input</u> . This pin is connected to pin 12 - "Output 3" - of the DB25 connector. Used to forward the digital output signal, sent from the connected external device here, to the motion controller connected through the DB25 connector.
Input 4	<u>General purpose Input</u> . This pin is connected to pin 13 - "Output 4" - of the DB25 connector. Used to forward the digital output signal, sent from the connected external device here, to the motion controller connected through the DB25 connector.
GND	Common ground
+12Vdc Out	Auxiliary power output (+12V @ 100mA). This auxiliary power outputs can be used as an input for OPTO1 or OPTO2.
Input 5	<u>General purpose Input</u> (12V sourcing). This pin is connected to pin 10 - "Output 5" - of the 26-pin low-profile header. Used to forward the digital output signal, sent from the connected external device here, to the motion controller connected through the 26-pin low-profile header. A 2 <sup>nd</sup> parallel port or an external device like SmoothStepper is required for this function.
Input 6	<u>General purpose Input</u> (12V sourcing). This pin is connected to pin 11 - "Output 6" - of the 26-pin low-profile header. Used to forward the digital output signal, sent from the connected external device here, to the motion controller connected through the 26-pin low-profile header. A 2 <sup>nd</sup> parallel port or an external device like SmoothStepper is required for this function.

Name	Description
GND	Common ground
+12Vdc Out	Auxiliary power output (+12V @ 100mA). This auxiliary power outputs can be used as an input for OPTO1 or OPTO2.
Input 7	<u>General purpose Input</u> (12V sourcing). This pin is connected to pin 12 - "Output 7" - of the 26-pin low-profile header. Used to forward the digital output signal, sent from the connected external device here, to the motion controller connected through the 26-pin low-profile header. A 2 <sup>nd</sup> parallel port or an external device like SmoothStepper is required for this function.
Input 8	<u>General purpose Input</u> (12V sourcing). This pin is connected to pin 13 - "Output 8" - of the 26-pin low-profile header. Used to forward the digital output signal, sent from the connected external device here, to the motion controller connected through the 26-pin low-profile header. A 2 <sup>nd</sup> parallel port or an external device like SmoothStepper is required for this function.
GND	Common ground

### 8.2.5. CN8 - Digital Outputs

Name	Description
Output 1 +	<p><u>General purpose output</u> (max 24V@70mA). This pin is connected to pin 17 - "Input 1" - of the DB25 connector. Used to output the digital signal, sent through DB25 "Input 1" from the motion controller, to the connected external device here. Its maximum frequency is 200 kHz.</p> <p><b>Do remember to connect the power grounds together (common ground) if use two or more different power supplies (pull up ) for Output 1+, Output 2+, Output 3+ and Output 4+. Or else, it may damage the drive because grounds (Output 1-, Output 2-, Output 3- and Output 4-) for Output 1, Output 2, Output 3 and Output 4 inside of the MX46660 are NON-isolated.</b></p>
Output 1-	<u>General purpose output-</u> for Output 1
Output 2 +	<u>General purpose output</u> (max 24V@70mA). The pin is connected to pin 1 - "Input 2" - of the DB25 connector. Used to output the digital signal, sent through DB25 "Input 2" from the motion controller, to the connected external device here. Its maximum frequency is 200 kHz. See "description for Output 1+" above for more information.
Output 2-	<u>General purpose output -</u> for Output 3
Output 3 +	<u>General purpose output</u> (max 24V@70mA). This pin is connected to pin 8- "Input 3" - of the 26-pin low-profile header.Used to output the digital signal, sent through 26-pin low-profile header "Input 3" from the motion controller, to the connected external device here. A 2 <sup>nd</sup> parallel port or an external device like SmoothStepper is required for this function. Its maximum frequency is 200 kHz. See "description for Output 1+" above for more information.

Name	Description
Output 3-	<u>General purpose output</u> -for Output 3
Output4 +	<u>General purpose output</u> (max 24V@70mA). This pin is connected to pint 9-“Input 4” - of the 26-pin low-profile header.Used to output the digital signal, sent through 26-pin low-profile header “Input 4” from the motion controller, to the connected external device here. A 2 <sup>nd</sup> parallel port or an external device like SmoothStepper is required for this function. Its maximum frequency is 200 kHz. See “description for Output 1+” above for more information.
Output 4-	<u>General purpose output</u> - for Output 4
Output 5+	<u>General purpose output</u> (max 24V@70mA). This pin is connected to pin 17 - “Input 5 - of the 26-pin low-profile header. Used to output the digital signal, sent through 26-pin low-profile header “Input 5 from the motion controller, to the connected external device here. A 2 <sup>nd</sup> parallel port or an external device like SmoothStepper is required for this function.
Output 5	<u>General purpose output</u> - for Output 5
Output 6+	<u>General purpose output</u> (max 24V@70mA). This pin is connected to pint 1 - “Input 6 - of the 26-pin low-profile header. Used to output the digital signal, sent through 26-pin low-profile header “Input 6 from the motion controller, to the connected external device here. A 2 <sup>nd</sup> parallel port or an external device like SmoothStepper is required for this function.
Output 6-	<u>General purpose output</u> - for Output 6

### 8.2.6. CN9- Analog Output

Name	Description
+10Vdc	<u>External +10V power input.</u> Used for power supply connection for the external device (e.g. a VFD) connected at “0-10V” pin.
0-10V out	<u>Analog 0-10V output.</u> This pin is connected to Pin 14 of the DB25 connector. Used to forward the PWM signal, sent from the motion controller, to the connected external device. Read pin 14 - “PWM” - of the DB25 Connector for more information
EGND	<u>External +10V ground</u>

### 8.2.7. CN10- 26-pin Low-profile Connector

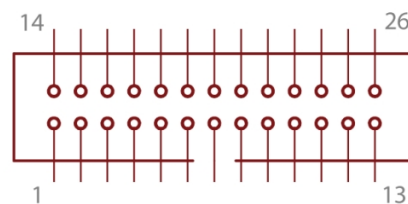


Figure 5 Pin assignments of the 26-pin low-profile connector

Pin	Name	Description
1	INPUT 6	<u>General purpose digital input.</u> It is connected to “Output 6” of the digital output connector (CN7 on Figure3). Used to forward an input signal sent from the connected motion controller to the device connected at “Output6”. Its maximum frequency up to 20 kHz.
2	NC	<u>Not connected.</u>
3	NC	<u>Not connected.</u>
4	NC	<u>Not connected.</u>
5	NC	<u>Not connected.</u>
6	NC	<u>Not connected.</u>
7	NC	<u>Not connected.</u>
8	INPUT3	<u>General purpose digital input.</u> It is connected to “Output 3” of the digital output connector (CN8 on Figure3). Used to forward an input signal sent from the connected motion controller to the device connected at “Output3”. Its maximum frequency up to 200 kHz.
9	INPUT 4	<u>General purpose digital input.</u> It is connected to “Output 4” of the digital output connector (CN7 on Figure3). Used to forward an input signal sent from the connected motion controller to the device connected at “Output4”. Its maximum frequency up to 200 kHz.
10	OUTPUT5	<u>General purpose digital output.</u> It is connected to “Input 5” of the digital input connector (CN7 on Figure3). Used to forward an output signal from the device connected at “Input 5”, to the motion controller.
11	OUTPUT6	<u>General purpose digital output.</u> It is connected to “Input 6” of the digital input connector (CN7 on Figure3). Used to forward an output signal from the device connected at “Input 6”, to the motion controller.
12	OUTPUT7	<u>General purpose digital output.</u> It is connected to “Input 7” of the digital input connector (CN7 on Figure3). Used to forward an output signal sent from the device connected at “Input 7”, to the motion controller.
13	OUTPUT8	<u>General purpose digital output.</u> It is connected to “Input 8” of the digital input connector (CN7 on Figure3). Used to forward an output signal sent from the device connected at “Input 8”, to the motion controller.
14	NC	<u>Not connected.</u>
15	NC	<u>Not connected.</u>
16	NC	<u>Not connected.</u>
17	INPUT 5	<u>General purpose digital input.</u> It is connected to “Output 5” of the digital output connector (CN7 on Figure3). Used to forward an input signal sent from the connected motion controller to the device connected at “Output5”. Its maximum frequency up to 20 kHz.
18	GND	Ground
19	GND	Ground



20	GND	Ground
21	GND	Ground
22	GND	Ground
23	GND	Ground
24	GND	Ground
25	GND	Ground
26	GND	Ground

## 9. DIP Switches

### 9.1. DIP Switch Locations

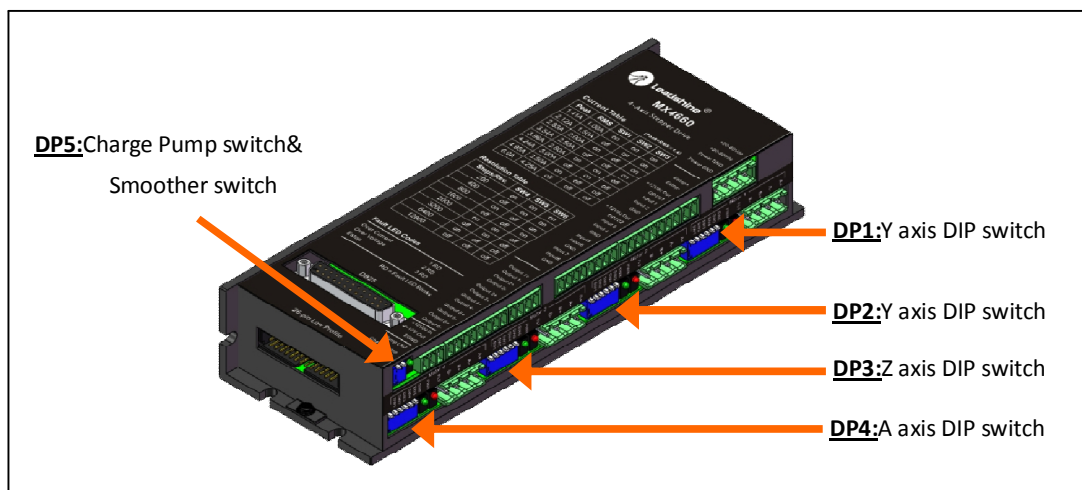


Figure6 MX4660 DIP switch locations

### 9.2. DIP Switch Definition

#### 9.2.1. DP1 / DP2 / DP3 / DP4- X/Y/Z/A Drive DIP Switch

DP1, DP2, DP3 and DP4 are DIP switches used to configure micro step resolution and output current configurations of X-axis, Y-axis, Z-axis and A-axis drive modules. Read details for their configuration definition in Section 11 on page 17.

#### 9.2.2. DP5- Charge Pump Switch & Smoother switch

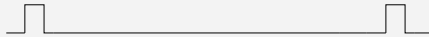
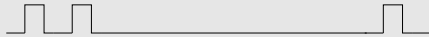

Switch	Name	Description
1	Smoother Switch	<p><u>Digital Smoother Switch</u>. This switch is used to enable / disable the MX4660 built-in digital smoother.</p> <p>When an input pulse emulated by the connected motion controller or CNC control system are not in linear or equivalent width, called “noise pulse”, it will cause erratic motion and additional motor/drive noise. Turning on the built-in digital smoother in a MX4660 could potentially (application dependent) improve motion performance such as less jittering, higher torque, and quicker response.</p> <p>Set this switch to “ON” position to enable, and “OFF” position to disable the digital smoother.</p>



Switch	Name	Description
2	Charge Pump Switch	<p><u>Charge Pump Disable/Enable Switch</u>. A switch to enable/disable the "Charge Pump" feature of the MX4660. Read pin 16 description of the DB25 connector (page 10).</p> <p>Set this switch to <b>"ON" position</b> to disable the "Charge Pump" feature <b>for no 10KHz signal</b> receiving verification at pin 16 of DB25, and the MX4660 is enabled.</p> <p>Set it to <b>"OFF" position</b> (means "Charge Pump" is ON/ENABLED) <b>for only enabling the MX4660 with a 10KHz signal receiving at PIN 16 of the DB25 connector</b>.</p> <p>By default, this switch is set to "OFF" position. A 10KHz signal receiving at PIN 16 of the DB25 connector is need to enable the MX4660. <b>When the MX4660 is enabled, Charge Pump LED will be on.</b></p>

## 10. Protection Indications

When powered on, the green light of all 4 stepper drive modules will be on and red light off to indicate MX4660 function properly. When protection is activated, the red light of a drive module will blink periodically every 4 seconds to indicate the error type. For each blink, red light lasts for 0.2 second and then off for 0.3 second.

Priority	Time(s) of Blink	Sequence wave of red LED	Description
1st	1		Over-current protection activated
2nd	2		Over-voltage protection activated
3rd	3		Emergency stop activated

## 11. Drive DIP Switch Settings

### 11.1. Current Setting (SW1-SW3)

Use pin 1-3 of the DIP switch of a drive module to configure the output current referred in the following table.

Peak	RMS	SW1	SW2	SW3
1.41A	1.00A	ON	ON	ON
2.12A	1.50A	OFF	ON	ON
2.83A	2.00A	ON	OFF	ON
3.54A	2.50A	OFF	OFF	ON
3.96A	2.80A	ON	ON	OFF
4.24A	3.00A	OFF	ON	OFF
4.95A	3.50A	ON	OFF	OFF
6.0A	4.25A	OFF	OFF	OFF

### 11.2. Micro Step Resolution Setting (SW4-SW6)

Use pin 4- 6 of the DIP switch of a drive module to configure the micro step referred in the following table.

Micro Step	Steps/Rev	SW4	SW5	SW6
Full	200	ON	ON	ON
Half	400	OFF	ON	ON
1 / 4	800	ON	OFF	ON
1 / 8	1600	OFF	OFF	ON
1 / 10	2000	ON	ON	OFF
1 / 16	3200	OFF	ON	OFF
1 / 32	6400	ON	OFF	OFF
1 / 64	12800	OFF	OFF	OFF

## 12. Connection Diagram

When implemented properly, the MX4660 can be used to power four 2 phase (1.8°) stepper motors of NEMA 17, 23, 24, and 34. In addition, it can also allow controls of optional external devices via the built-in digital inputs, digital outputs, and the opto-isolated analog output. Figure 7 illustrates the MX4660 connection diagram with 4 stepper motors. External devices through MX4660 I/O connections are optional at a user's choice. **If you need to use input5, input6, input7, input8, output3, output4, output5 and output6, a 2<sup>nd</sup> parallel port or an external device like SmoothStepper is required.**

**NOTE:** For higher reliability, it is suggested to add a shunt regulator with the DC power supply to discharge the energy/ back-EMF generated during rapid deceleration or in case of emergency when have to push the E-stop button when the motors are running. Or even add 2 big capacitors between +20-60VDC and Power GND will be helpful if a shunt regulator is not available. See more information in Page 8 of the hardware manual for the MX4660.

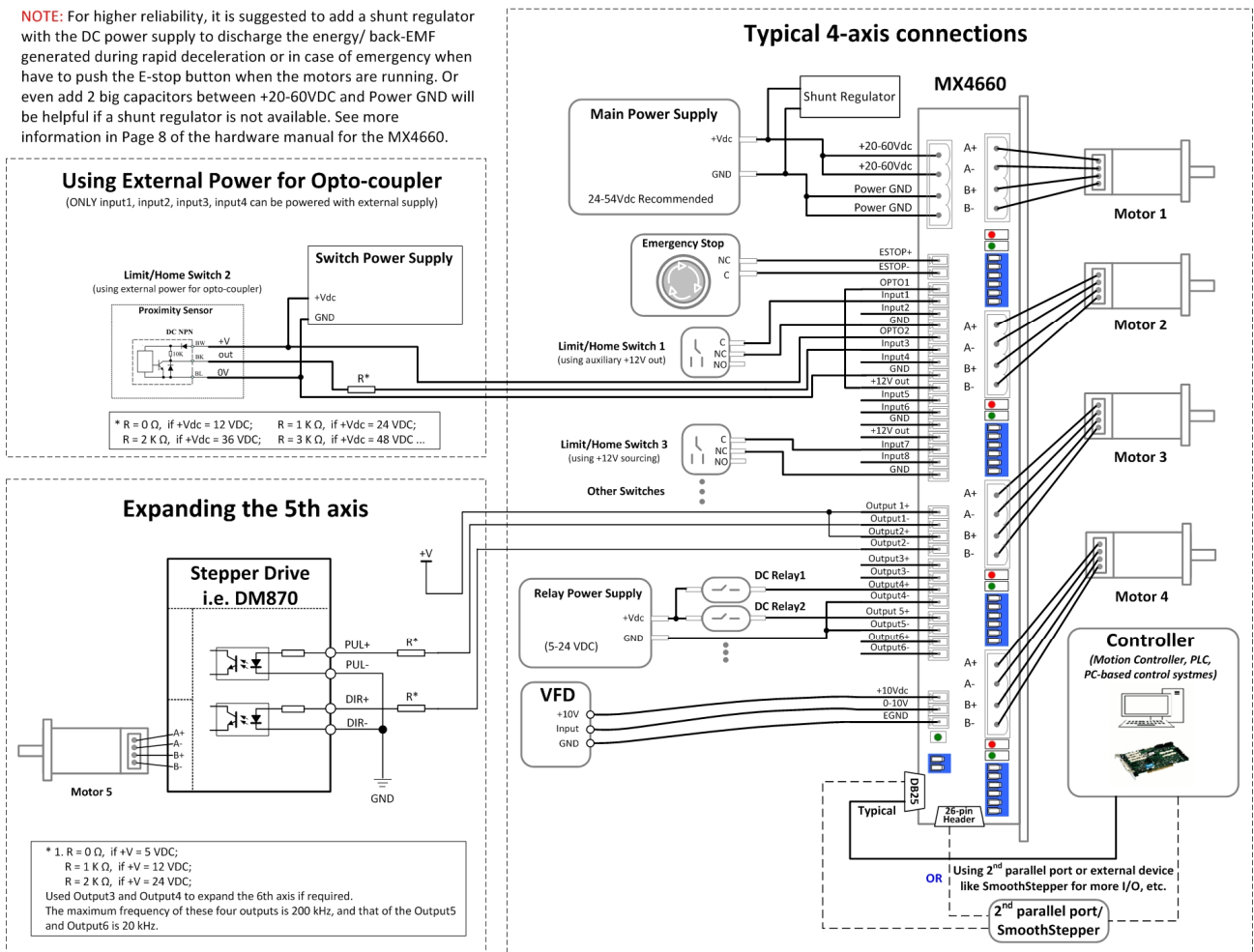


Figure 7 MX4660 connection diagram

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