



# User Manual

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**UIM243XXA/B**

**Voltage Control**

**Miniature Integrated Stepper Motor Controller**

**Boxer Models A2, A4, A4p**

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# UIM243XXA/B

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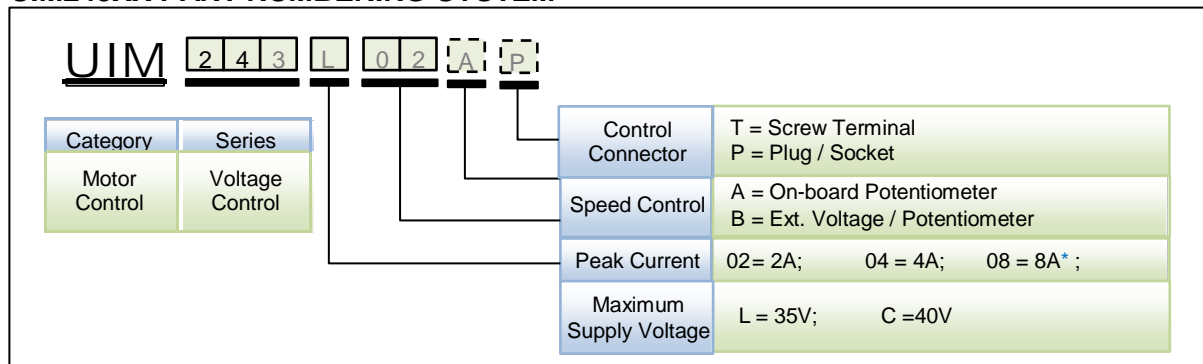
**[Trade Mark/ Layout-design/Patent]**

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**[ UIM243XXA/B Ordering Information ]**

In order to serve you quicker and better, please provide the product number in following format.

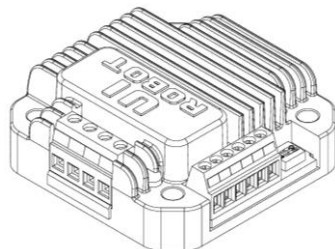
**UIM243XX PART NUMBERING SYSTEM**



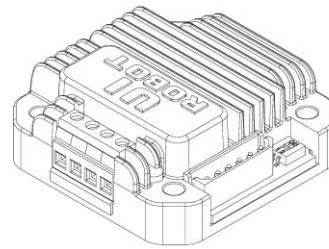
Examples: UIM243C04BP;UIM243L02B;UIM243L02AT

\*Note: when the Peak Current is 8A, the stepper controller equipped with Regeneration-discharge modular.

Examples of Control Connector options:



**T:** Screw Terminal



**P:** Rectangular Plug / Socket

**Boxer Equivalent Part Numbers**

Boxer	Uirobot	Notes
A2	UIM24302BT	-
A4	UIM24304BT	-
A4p	UIM24304BT	Controller & 10K Potentiometer Supplied

# **UIM243 Miniature Integrated Stepper Motor Controller**

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## **UIM243XX A / B Voltage Control Miniature Integrated Stepper Motor Controller**

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### **Miniature Integral Design**

- Miniature size 42.3mm x 42.3mm x 16.5mm (L x W x H)
- Integrally designed to fit onto motors seamlessly, as well as work standalone
- Die-cast aluminum enclosure, improved heat dissipation and durability

### **Motor Driver Features**

- 10 - 40VDC \*input voltage, Max 2A ~ 4A adjustable phase current
- 16th micro-stepping
- Dual full H-bridge with PWM constant current control

\*UIM243L02: 10 - 30VDC, UIM243C04: 10 - 40VDC

### **Control Features**

- Embedded microcontroller
- Self pulse generation, automatic run on power-up
- Speed control through on-board trimmer 0.15 - 1900 RPM (UIM243XXA)
- Speed control through external potentiometer 0.15 - 1900 RPM (UIM243XXB)
- Speed control through 0 - 5V voltage input 0.15 - 1900 RPM (UIM243XXB)
- 0.3 seconds acceleration period
- Switch control run/stop, direction, enable/shutdown
- Automatic current reduction / power saving

## **GENERAL DESCRIPTION**

UIM243XXA/B stepper motor controller is a microprocessor embedded, voltage control, miniature stepper motor controller. UIM243XX is integrally designed to fit onto stepper motors, and is simple to control. With UIM243XXA/B, the motor speed can be controlled by an analog voltage. It is simple, stable and low cost. UIM24302 can provide 0 - 2A adjustable phase current through 10 ~ 30VDC input voltage. UIM24304 can provide 0 - 4A adjustable phase current through 10 ~ 40VDC input voltage.

The microprocessor of the UIM243XXA/B is capable to ramp up the current speed to the desired speed. It is possible to jump to 1900 rpm in 0.3 seconds. This feature makes the sudden increase of the desired speed become possible. With the UIM243XX, the motor speed can be controlled by an analog voltage in three optional ways: 1) the on-board trimmer (UIM243XXA), 2) an external potentiometer (UIM243XXB) or, 3) an external voltage (UIM243XXB). UIM243XX controllers can run the motor without user control device. At the same time, with the high-speed current compensation function, UIM243XX can compensate the effects caused by counter electromotive force, which is produced in high-speed motor turning.

## UIM243XXB

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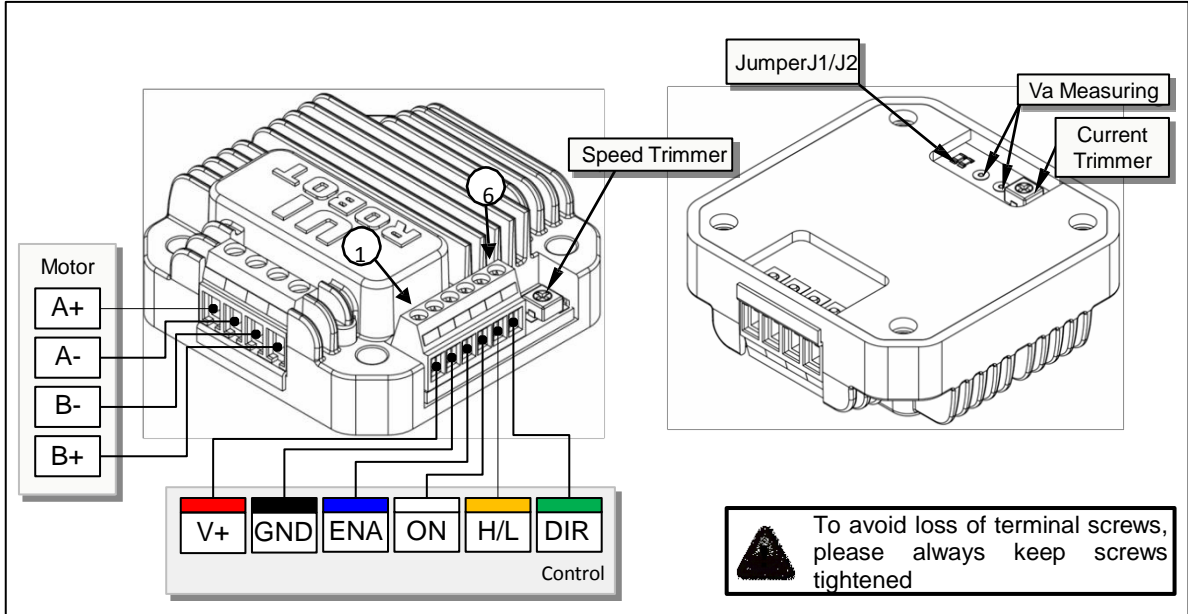
UIM243XX can be mounted onto NEMA 17 / 23 series stepper motor seamlessly through adapting flanges. The enclosure is made of die-cast aluminum which provides a rugged durable protection and improves the heat dissipation.

# UIM243 Miniature Integrated Stepper Motor Controller

## TERMINAL DESCRIPTION

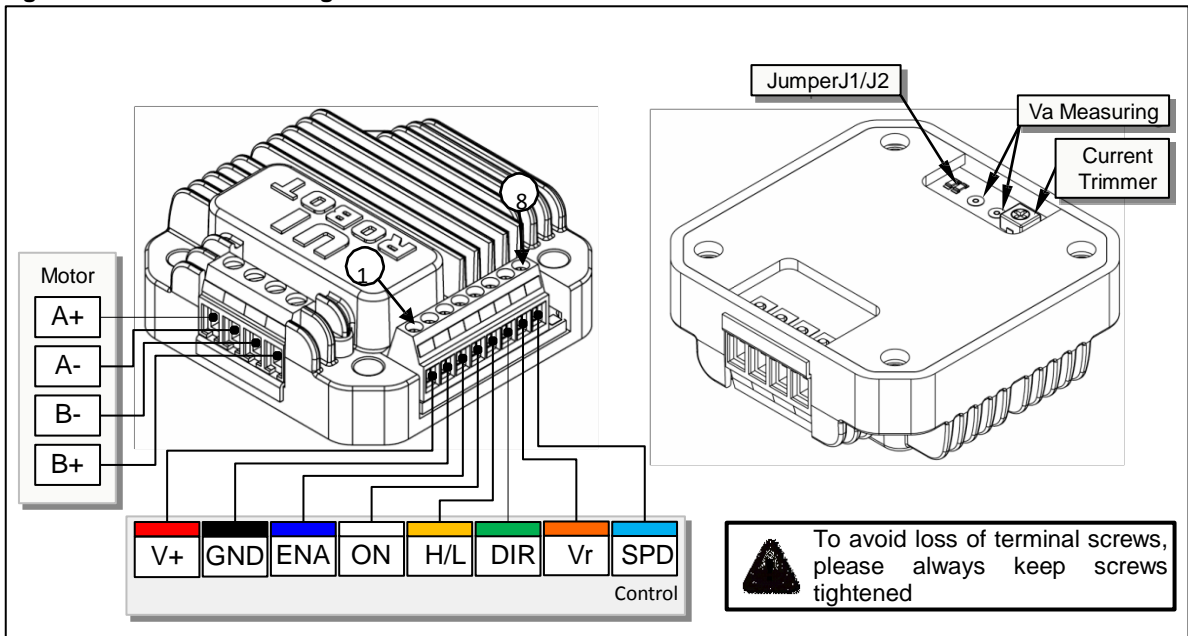
### UIM243XXA Wiring Terminal

Figure0-1: UIM243XXA wiring terminal



### UIM243XXB Wiring Terminal

Figure0-2: UIM243XXB wiring terminal



# UIM243XXA/B

## Control Terminals

Terminal No.	Designator	Description
1	V+	Supply voltage 10 – 40 VDC*
2	GND	Supply voltage ground
3	ENA	Enable/Disable H-bridge. Low-level (shorten to GND): rotor is in free state High-level/dangling: motor is in controlled state
4	ON	Run/Stop. Low-level (shorten to GND): motor is locked High-level/dangling: motor is in controlled state
5	H/L	Speed Range selection. Low-level (shorten to GND): low speed High-level/dangling: high speed
6	DIR	Direction input. Controlled by H/L level. Dangling is regarded as high level.
7 †	Vr	5V Reference Voltage output
8 †	SPD	Speed Control Voltage input (0 – 5V)

NOTICE: \* UIM243L02: 10 - 30VDC, UIM243C04: 10 - 40VDC

† Only UIM243XXB provides this port.

## Motor Terminals

Designator	Description
A+ / A-	Connect to the stepper motor phase A
B+ / B-	Connect to the stepper motor phase B



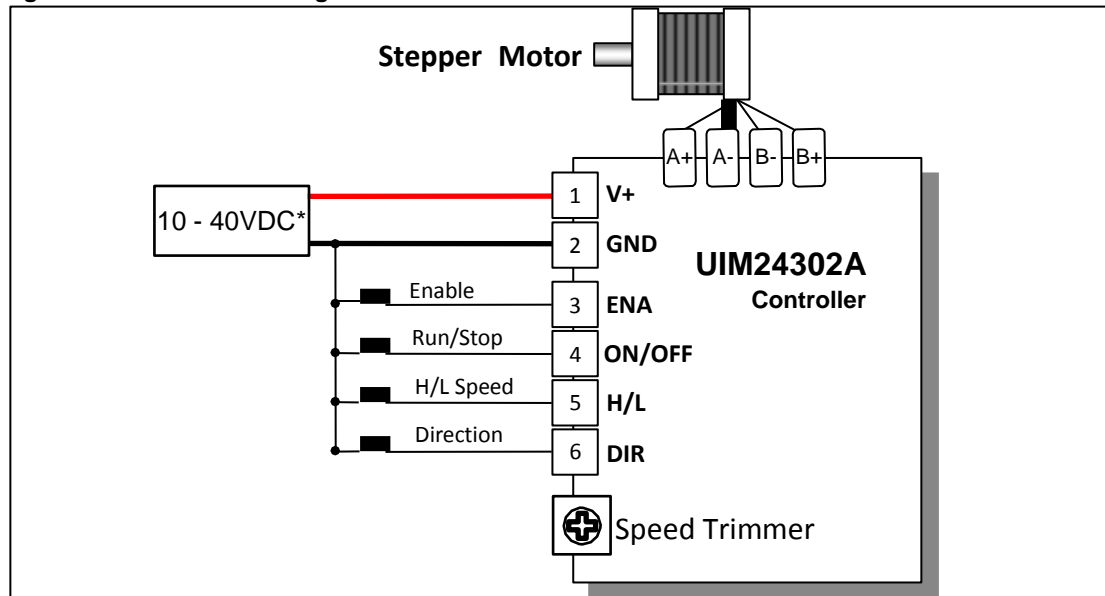
**WARNING:** Incorrect connection of phase winds will permanently damage the controller!

# UIM243 Miniature Integrated Stepper Motor Controller

## TYPICAL APPLICATION

UIM24302A controller is equipped with a million-cycle speed adjusting trimmer. UIM24302B allows the user to use an external potentiometer or external voltage to control the speed. Run/stop, direction, high/low speed range and, enable/disable can be controlled simply by shorting the corresponding terminal to the ground. UIM24302 controllers can run the motor without user control device.

Figure1-1: UIM243XXA using Onboard Trimmer



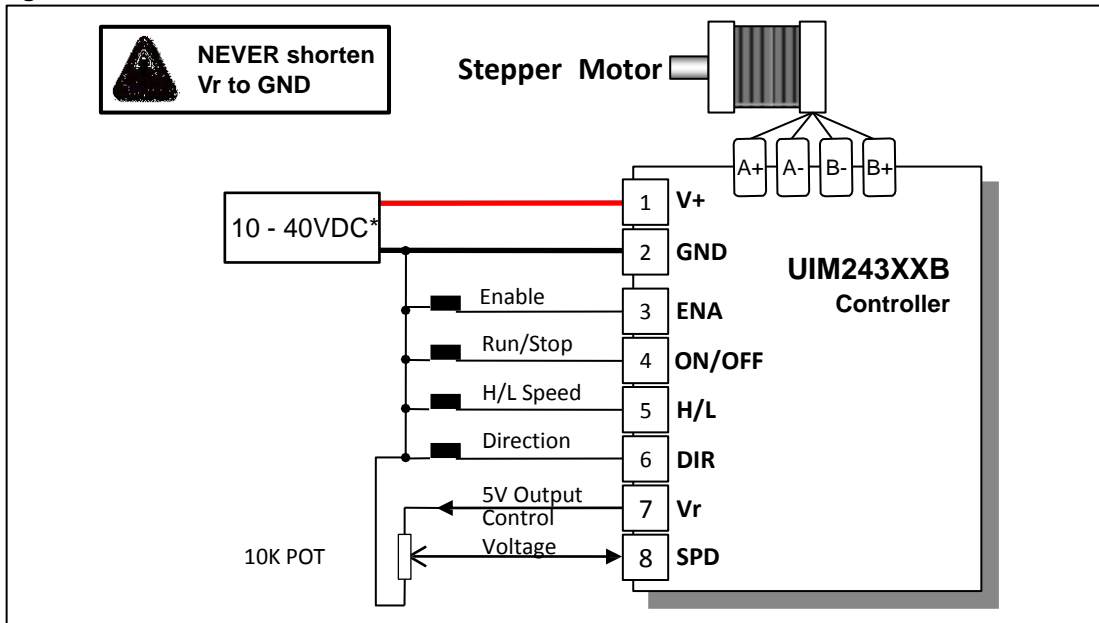
\* UIM243L02: 10 - 30VDC, UIM243C04: 10 - 40VDC

## UIM243XXB with External POT

For users need to use external potentiometer (POT) to control the speed, UIM24302B provides a 5V reference voltage output, and a speed control voltage input port. The resistance of the POT should be between 5K and 10K ohms. Less than 5K will result in excessive power consumption, and larger than 10K will cause inaccurate measurement.

# UIM243XXA/B

Figure1-2: UIM243XXB with External POT



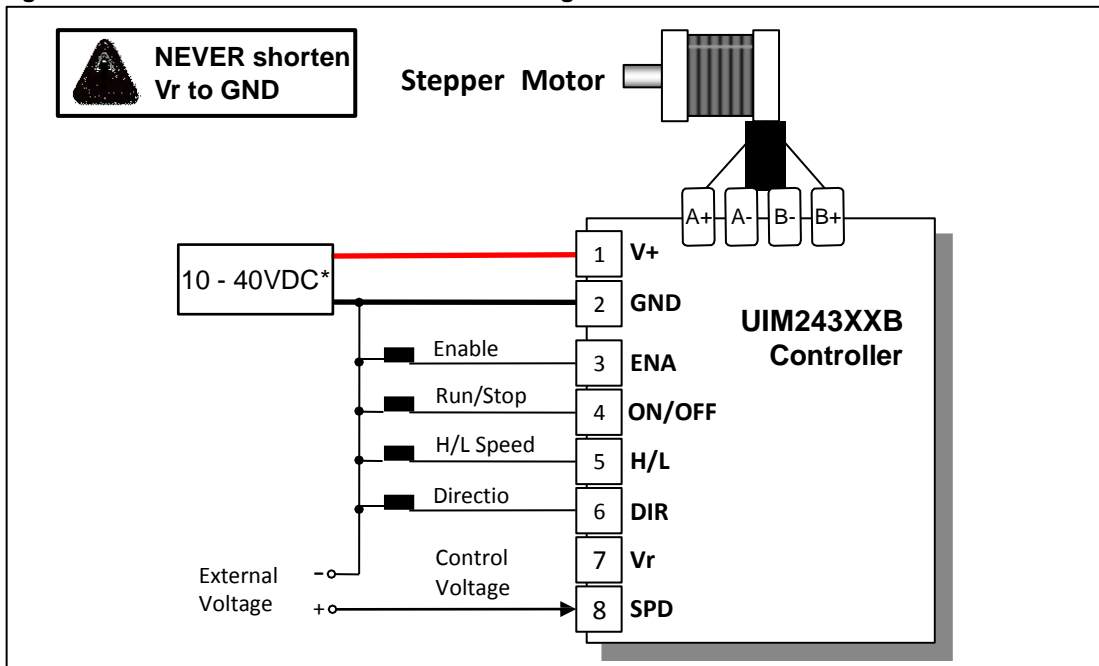
\* UIM243L02: 10 - 30VDC, UIM243C04: 10 - 40VDC

## UIM243XXB with External Control Voltage

For users want to use an external voltage to control the speed to facilitate the needs such as microprocessor D/A control, UIM24302B provides a speed control voltage input port. The external control voltage must share the common ground with the UIM24302B controller. In other words, the ground of the external control voltage must be linked to the terminal 2

*The external control range must between -0.3V and 5.3V. Voltage outside the range will only produce smoke.*

Figure1-3: UIM243XXB with External Control Voltage



\* UIM243L02: 10 - 30VDC, UIM243C04: 10 - 40VDC



# **UIM243Miniature Integrated Stepper Motor Controller**

## **CHARACTERISTICS**

### **Absolute Maximum Ratings <sup>(†)</sup>**

Supply Voltage(243L02).....	-0.3V to 30V
Supply Voltage(243C04).....	-0.3V to 40V
Ambient temperature under bias .....	-40℃ to +85℃
Storage temperature.....	-50℃ to +150℃

†NOTICE: Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

### **Electrical Characteristics ( Ambient Temperature 25℃ )**

Supply Power Voltage	10 - 30VDC (243L02); 10 - 40VDC (243C04);
Motor Output Current	Max 2A per phase (Adjustable through on-board trimmer)
Driving Mode	PWM constant current
Stepping Resolution	16 <sup>th</sup> fixed
Insulation Resistance	>100MΩ
Dielectric Strength	0.5KV in one minute
Speed Range	8 Hz – 102K Hz, 0.15 - 1912.5 RPM (1.8°Motor)

### **Environment Requirements**

Cooling	Free air
Working environment	Avoid dust, oil mist and corrosive gases
Working temperature	-40℃ ~ 85℃
Humidity	<80%RH, no condensation, no frosting
Vibration	3G Max
Storage temperature	-50℃ ~ 150℃

### **Size and Weight**

Size	42.3mm x 42.3mm x 16.5mm
Wight	0.1 kg

# UIM243XXA/B

## FUNCTIONAL DESCRIPTION

### Supply Voltage

Because of the design of power supply, UIM243XX accepts a wide range input voltage.

UIM243L02A/B controller accepts a wide range input voltage from 10 to 30VDC.

UIM243C04A/B controller accepts a wide range input voltage from 12 to 40VDC.

### Output Phase Current

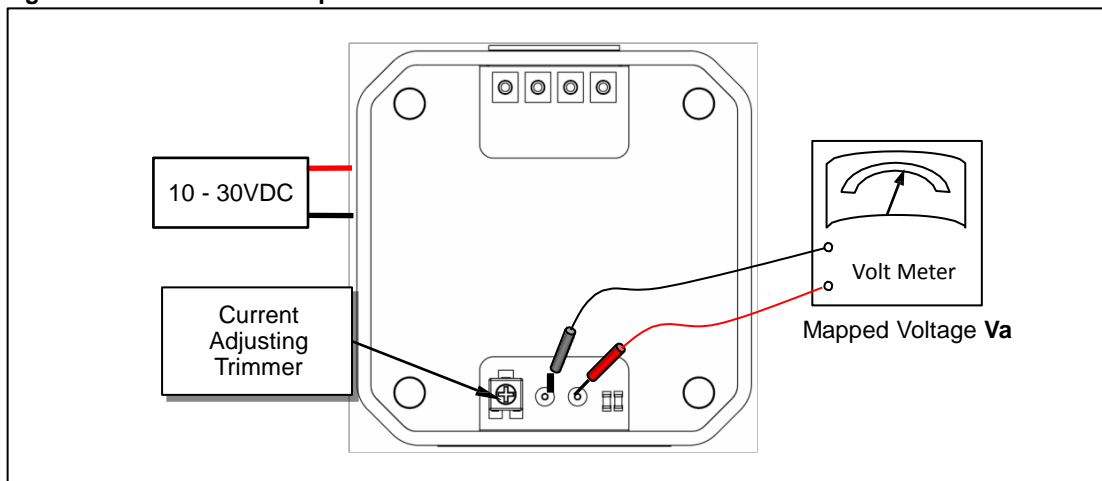
UIM243XX is capable of providing a maximum 2A / 4A phase output current. In specific application, the peak output current needs to be adjusted to meet the rated motor current. A trimmer (potentiometer) is provided to serve this purpose at the bottom of the controller, as shown in the figure 3-1.

UIM243L02: A mapped voltage “Va” of 0 - 4V proportionally represents 0 ~ 2A.

UIM243C04: A mapped voltage “Va” of 0 - 4V proportionally represents 0 ~ 4A.

Please note that, the controller needs to be powered before mapped voltage “Va” can be measured. Reboot of the controller is required after the setup the phase current.

Figure3-1: UIM243XXB Setup Phase Current



### Speed Control

UIM243XX onboard processor is able to produce 8 Hz – 102 KHz step driving pulses. Under 16th micro stepping, that pulse rate equal to 0.15 – 1900 RPM speed for a 1.8 degree stepper motor.

UIM243XX provides three methods to adjust the speed:

#### Onboard trimmer

For UIM243XXA, adjusting the onboard trimmer will give the desired motor speed.

#### External potentiometer

For users who need to use external potentiometer (POT) to control the speed, UIM243XXB provides a 5V reference voltage output, and a speed control voltage input port. The resistance of the POT should be between 5K and 10K ohms. Less than 5K will result in excessive power consumption, and larger than 10K will cause inaccurate measurement.

# **UIM243 Miniature Integrated Stepper Motor Controller**

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## **External control voltage**

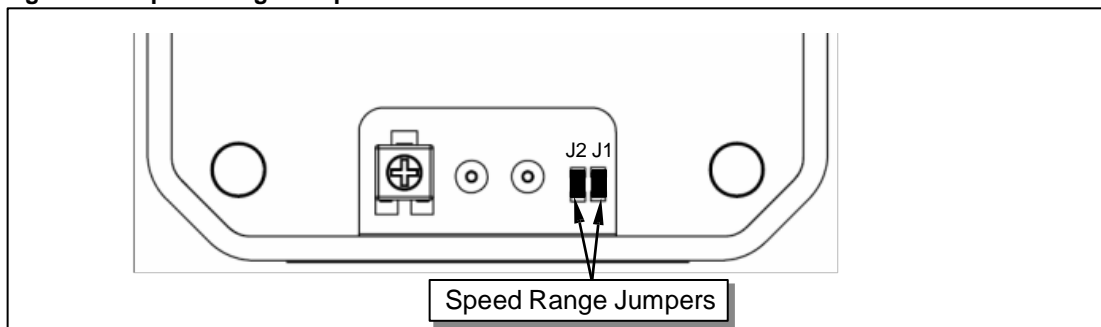
For users want to use an external voltage to control the speed to facilitate the needs such as microprocessor D/A control, UIM243XXB provides a speed control voltage input port. The external control voltage must share the common ground with the UIM243XXB controller. In other words, the ground of the external control voltage must be linked to the terminal 2. In addition, the external control range must between -0.3V and 5.3V. Voltage outside the range will only produce smoke.

# UIM243XXA/B

## Speed Range Selection

To preserve the accuracy of the measurement of the speed control voltage, the user should select the proper speed range. Since the voltage measurement accuracy is 8bit, (UIM243XX uses a 10bit A/D converter, and abandon the last 2 digits to suppress the noise), the speed adjusting is not continuous, but has an incremental of 1/255 of the max speed. Selecting the proper speed range can improve the accuracy of the speed.

Figure3-2: Speed Range Jumper J1/J2



### High Speed Range

When the desired speed is high, the high speed range should be selected, by leaving the terminal 5 open (i.e., not connected) or linking to 5V. In the high speed range, there are two jumpers at the bottom of the controller, which can further limit the range of the speed. The relationship between the two jumpers and the speed range is given in the following table:

J1	J2	Pulse Frequency(Hz)	Speed for 1.8° stepper(RPM)	Note
open	open	100 - 102K	1.875 – 1912.5	
short	short	100 - 102K	1.875 – 1912.5	Factory Default
open	short	100 - 51K	1.875 – 956.25	
short	open	100 – 25.5K	1.875 – 478.125	

### Low Speed Range

When the desired speed is low, the low speed range should be selected, by linking the terminal 5 to ground (i.e., terminal 2). In the low speed range, there are two jumpers at the bottom of the controller, which can further limit the range of the speed. The relationship between the two jumpers and the speed range is given in the following table:

J1	J2	Pulse Frequency(Hz)	Speed for 1.8° stepper(RPM)	Note
open	open	8 – 8.16K	0.15 – 153	
short	short	8 – 8.16K	0.15 – 153	Factory Default
open	short	8 – 4.08K	0.15 – 76.5	
short	open	8 – 1.04K	0.15 – 38.25	

NOTICE: Please provide your speed range when ordering, if you want the jumpers to be set by the factory.

## Acceleration Deceleration

The microprocessor of the UIM24302A/B is capable to ramp up the current speed to the desired speed in 0.3 seconds, even when the speed control voltage is changing. This feature makes the sudden increase of the desired speed become possible.

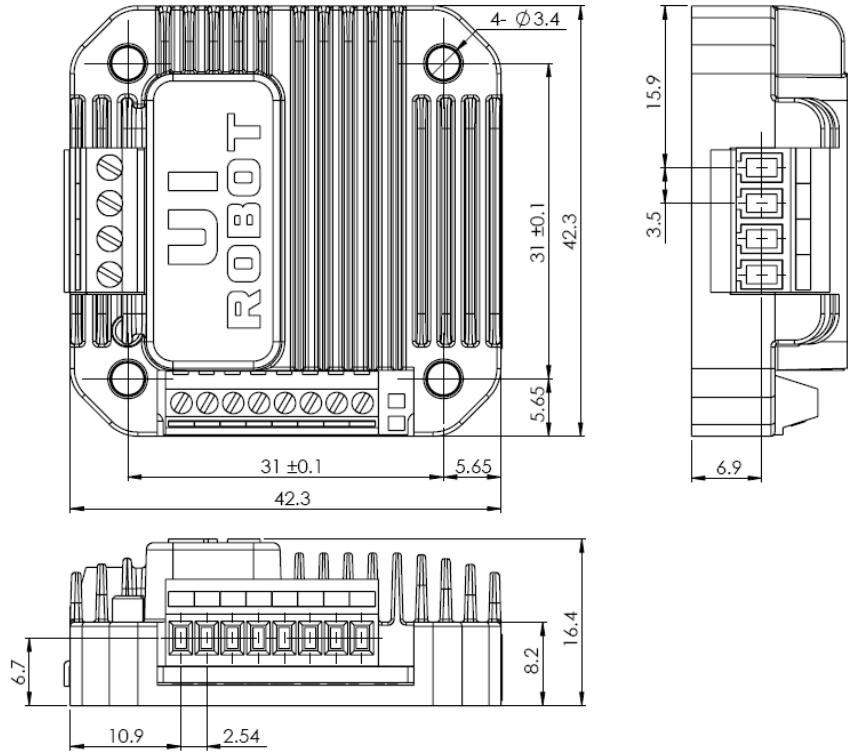
## **UIM243 Miniature Integrated Stepper Motor Controller**

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To guarantee the motor can stop as quickly as possible the deceleration rate is set to infinity which means the motor will output a desired speed (lower than current speed) immediately

# UIM243XXA/B

## APPENDIX A DIMENSIONS



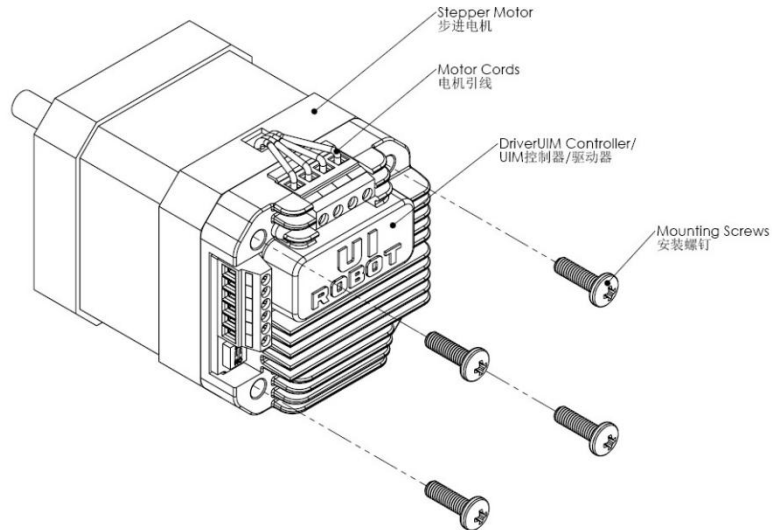
Units: mm

# UIM243 Miniature Integrated Stepper Motor Controller

## APPENDIX B INSTALLATION

### NEMA 17 Stepper Installation (without adapting flange)

1. Screw mount UIM controller / driver onto the motor
2. Wire the motor leads.



### NEMA 23 and Larger Stepper Installation (with adapting flange)

1. Screw mount the adapting flange onto the motor
2. Screw mount UIM controller / driver onto the adapting flange
3. Wire the motor leads.

