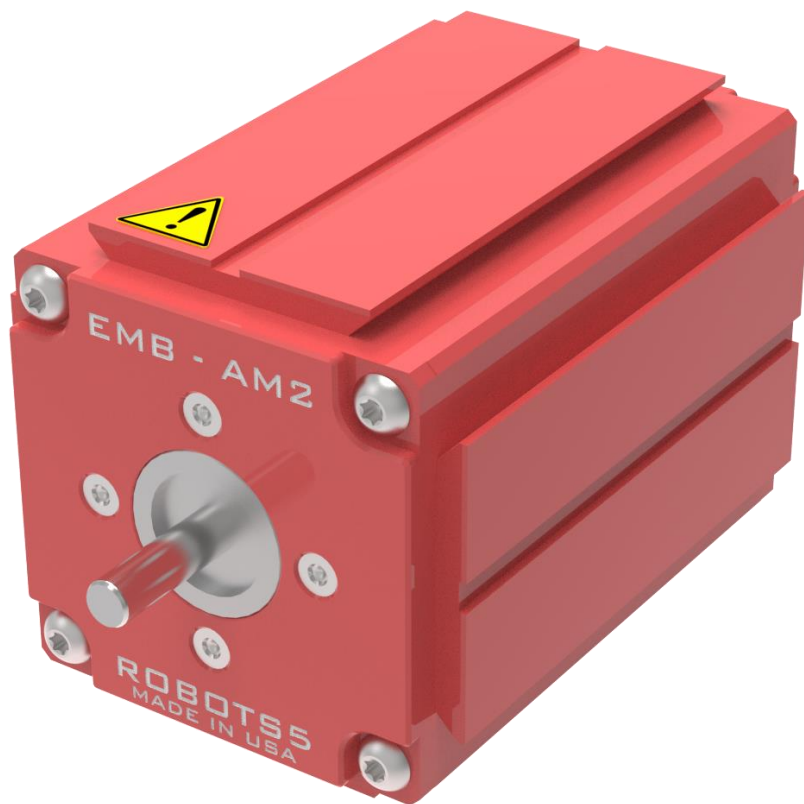


# ROBOTS5

## ELECTRO-MECHANICAL BREADBOARD (EMB) AM2 USER MANUAL



Version 1.10 - Feb.2026

ROBOTS5 LLC, USA



# Disclaimer

- Be sure to read this document carefully and fully understand it, before using this product
- Be sure to read the “EMB Safety Document” carefully and fully understand it, before using this product
- Robots5 LLC is not responsible for any damage or injury caused by misuse, misunderstanding, or abuse of this product
- The user is solely responsible for the implementation of the controller and safety system used with our products
- This document was generated and completed to the best ability of Robots5 LLC. The information on this manual are presented in good faith and believed to be correct however, Robots5 LLC makes no warranties as to the completeness or accuracy of the information
- Never use our products in any application where failure of the product could result in personal injury. Failure to comply with these instructions could result in death or serious injury
- This equipment should not be used by inexperienced users, unless if they are under close supervision of experienced users. Safety operation must be ensured by experienced users
- Robots5 LLC reserves the right to make changes to this document or to the products described herein without further notice
- Make sure to always use the latest version of this document

## **Contact Information:**

Email: [info@robots5.com](mailto:info@robots5.com)  
Website: [www.robots5.com](http://www.robots5.com)  
Location: Oviedo, FL USA

© 2026 Robots5 LLC., All Rights Reserved.

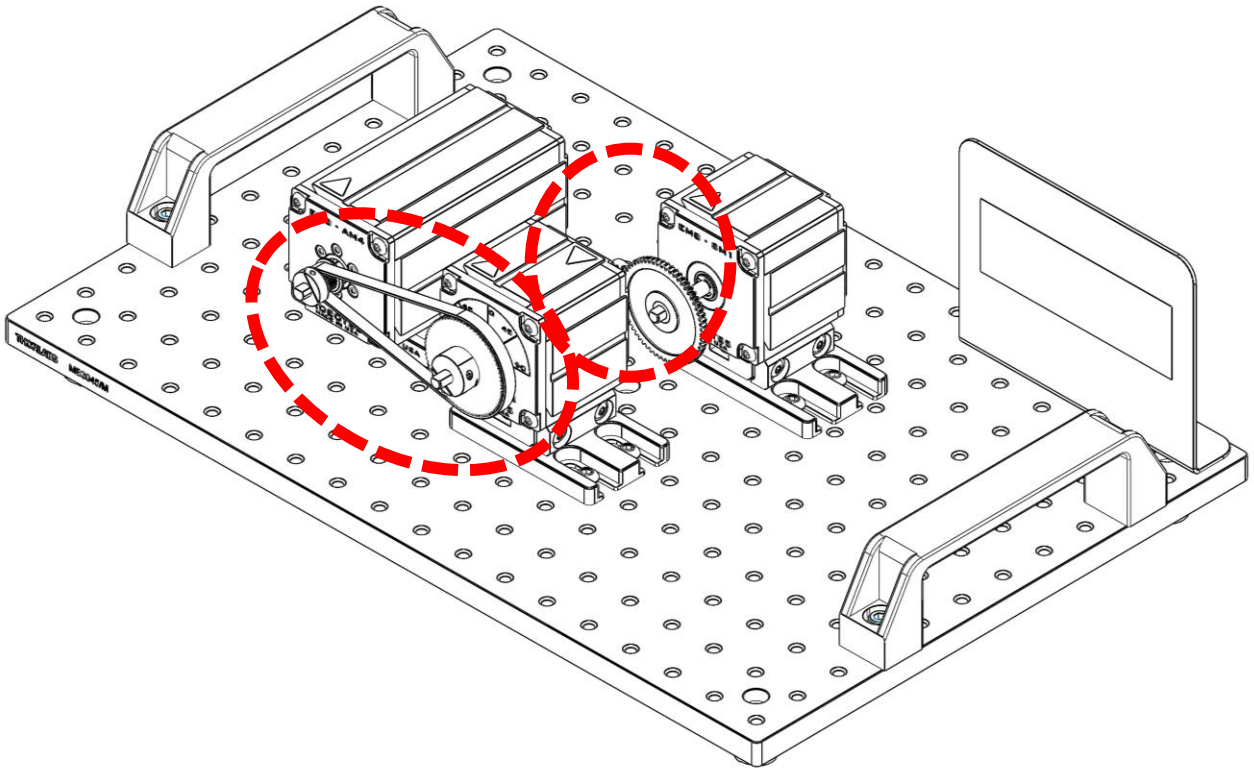


# Safety

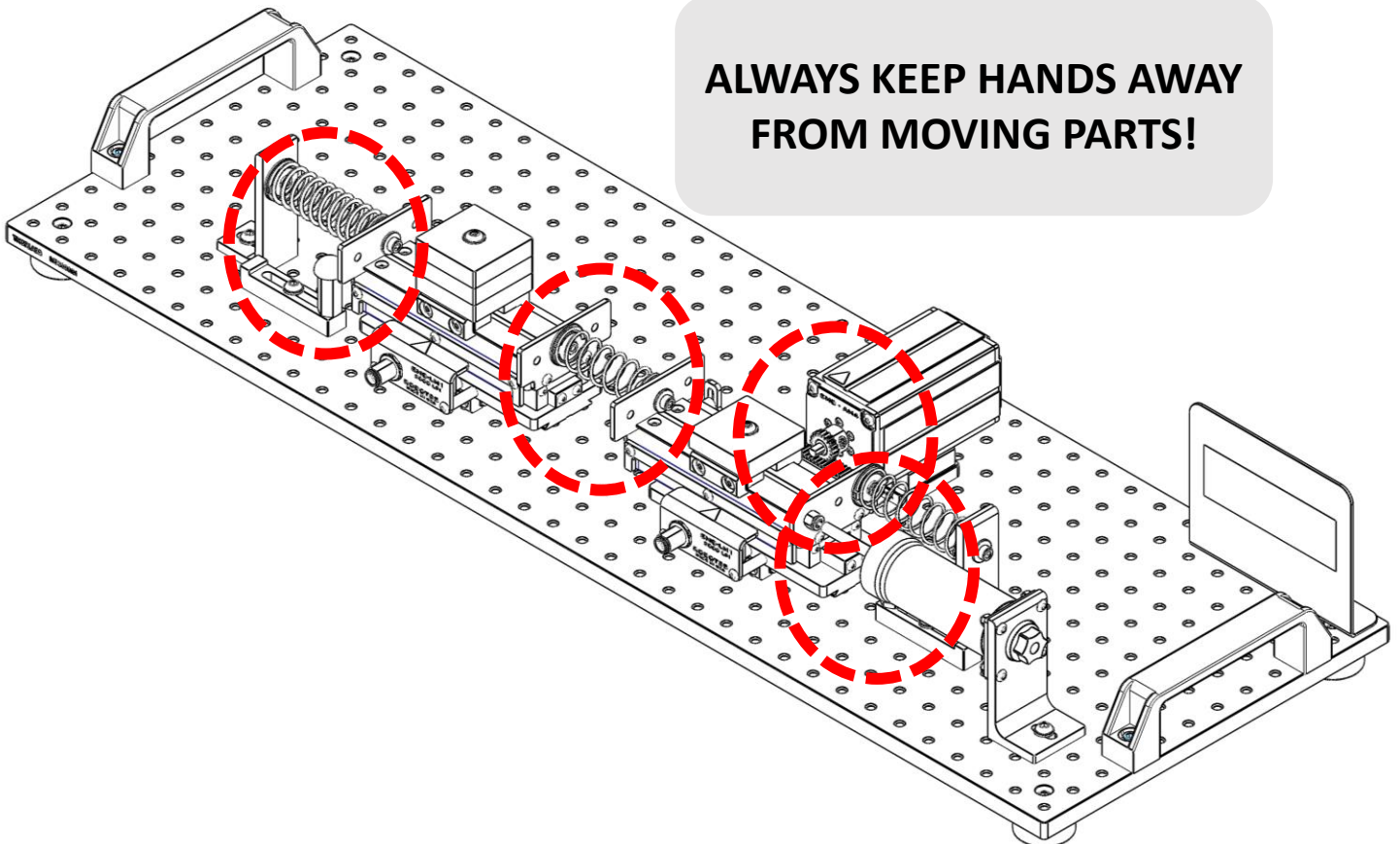
- If improperly used, EMB can cause injury or death
- Never touch any moving parts! Always stay clear from gears, sprockets, belts, chains, linkages, and any components in motion
- Follow all information and recommendations from this document and from the “EMB Safety Document”
- Do not disassemble or modify this device
- Responsible use of EMB is crucial to prevent dangerous conditions
- Make sure to disconnect power when handling this device
- Only use this device in indoor applications, with no water/oil splash or contact. Never operate EMB near explosive gases or flammable liquids
- Treat this device with care, it is a precision unit. Do not throw, hit, or drop it
- If you notice the unit getting warm or hot or making abnormal noises or vibrations, or sense smoke, immediately stop all motion and turn the power completely off. Assess the situation to completely understand the issue before attempting to resume operation
- Never stall the motor, this will damage the unit
- Do not operate outside the specifications of the unit
- Always have an effective way to cut power to the actuator, such as an emergency stop button (E-Stop). Check this feature before every use
- Always limit the actuator current to a safe level



**Fingers may break or get amputated if caught in moving parts!**



**ALWAYS KEEP HANDS AWAY FROM MOVING PARTS!**



# Introduction

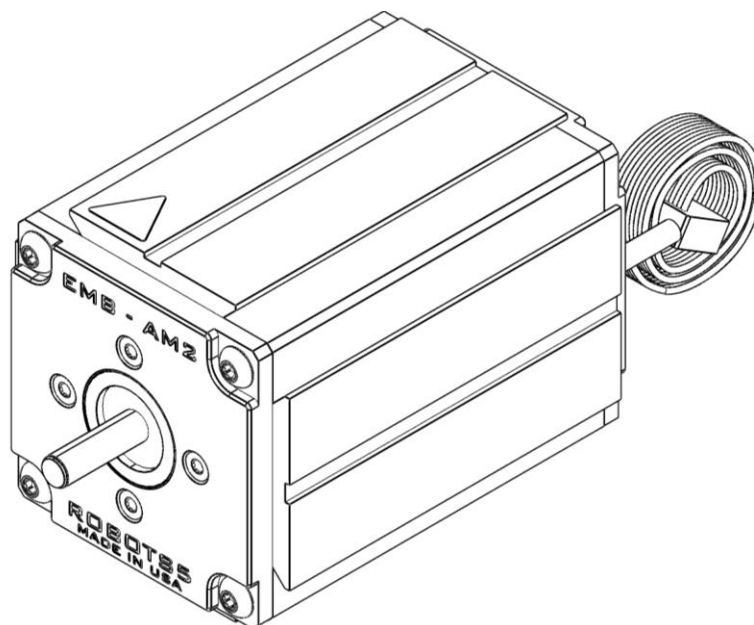
The EMB-AM2 is an actuator module, powered by a premium quality, high efficiency and low inductance brushless DC motor.

The module is equipped with integrated Hall sensors and an optical encoder (HEDL 5540) providing 500 counts per turn (CPT). This encoder is typically used only for electrical commutation when paired with an ESCON or ESCON2 amplifier.

There is no internal gearing, the system is direct drive.

The module is designed to interface seamlessly with other EMB modules through components mounted directly to the drive shaft. Compatible components include gears, pulleys, sprockets, shaft couplers, and shaft collar hubs.

The red anodized aluminum housing incorporates a precision dovetail mounting system. This design enables accurate alignment and secure attachment to a dovetail rail, breadboard, or other EMB modules and accessories.



*Figure 1: EMB-AM2 Module*

The key features of the EMB-AM2 are presented bellow:

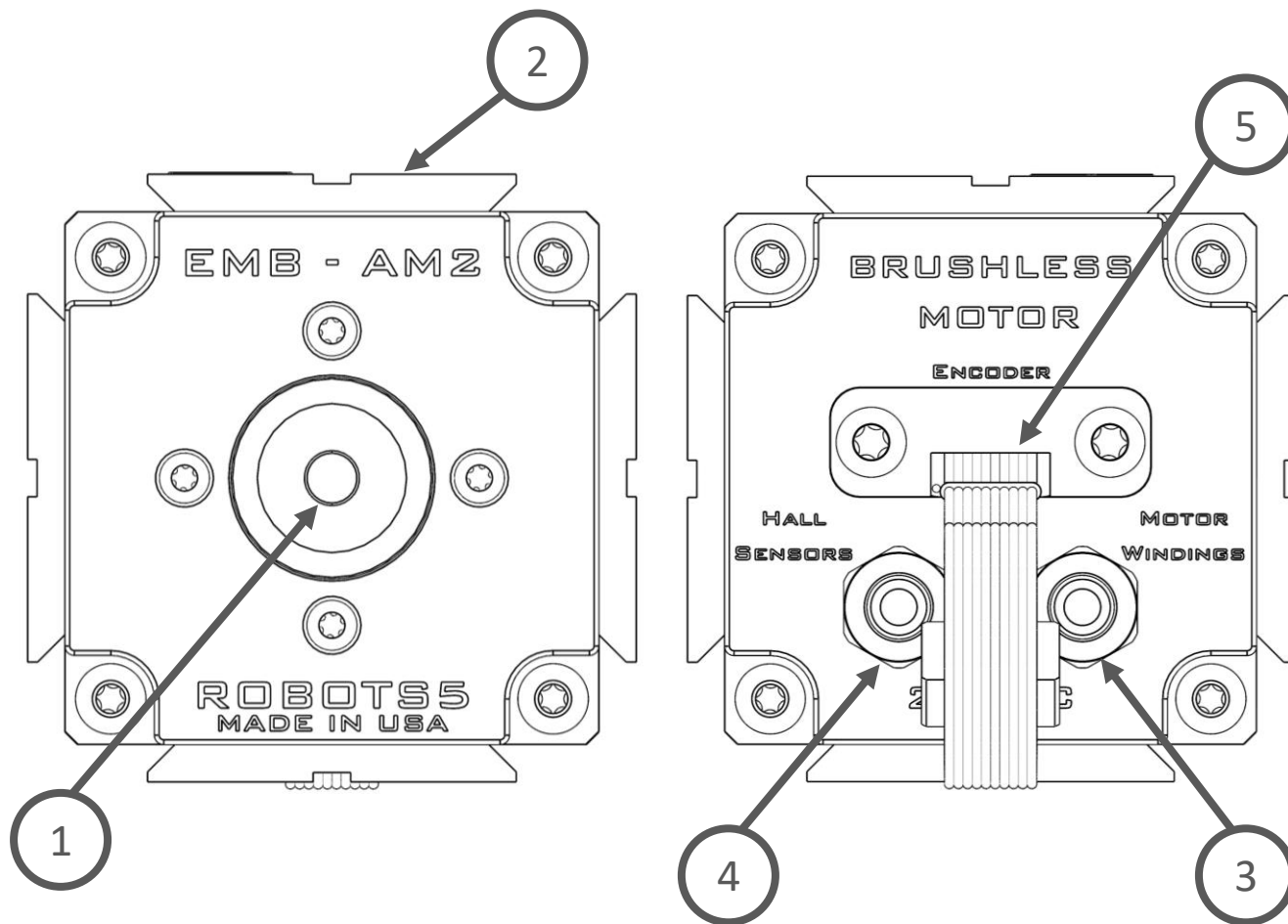


Figure 2: EMB-AM2, front and rear views

Item	Feature
1	Driving Shaft
2	Dovetail Mount, 4 sides
3	Motor Winding Connection (pigtail with ferrules)
4	Hall Sensors Connection (pigtail with ferrules)
5	Encoder Connection (10 position IDC connector)

Table 1: Key features of the EMB-AM2

# Specifications

The EMB-AM2 module is powered by a maxon EC-max 40 brushless motor. Table 2 describes the motor data.

Although the nominal voltage of the motor is 24V, we strongly recommend keeping the speed under 4000 rpm, to keep EMB use safe.

Similarly, we strongly recommend limiting the current to a safe level. For general EMB use, 2A is a good start, assess if lowering or increasing this current limit is necessary for your experiment.

Motor Data		
<b>Values at nominal voltage</b>		
1 Nominal voltage	V	24
2 No load speed	rpm	8040
3 No load current	mA	292
4 Nominal speed	rpm	6520
5 Nominal torque	mNm	89.6
6 Nominal current (max. continuous current)	A	3.44
7 Stall torque	mNm	497
8 Stall current	A	17.8
9 Max. efficiency	%	77
<b>Characteristics</b>		
10 Terminal resistance phase to phase	$\Omega$	1.35
11 Terminal inductance phase to phase	mH	0.186
12 Torque constant	mNm/A	28
13 Speed constant	rpm/V	341
14 Speed/torque gradient	rpm/mNm	16.5
15 Mechanical time constant	ms	8.82
16 Rotor inertia	gcm <sup>2</sup>	51.2

*Table 2: maxon EC-max 40 motor data, from maxon*

$$\text{Torque Constant: } 28 \text{ [mNm/A]} = \mathbf{28 \times 10^{-3} \text{ [Nm/A]}}$$

$$\text{Speed Constant: } 341 \text{ [rpm/V]} = \frac{1 \text{ [V.min]}}{341 \text{ [rev]}} * \frac{1 \text{ [rev]}}{2\pi \text{ [rad]}} * \frac{60 \text{ [s]}}{1 \text{ [min]}} = \mathbf{28 \times 10^{-3} \text{ [V-s/rad]}}$$

Table 3 describes thermal data, mechanical data ball bearings, and other specifications:

<b>Specifications</b>		
<b>Thermal data</b>		
17	Thermal resistance housing-ambient	4.63 K/W
18	Thermal resistance winding-housing	0.542 K/W
19	Thermal time constant winding	3.78 s
20	Thermal time constant motor	1060 s
21	Ambient temperature	-40...+100°C
22	Max. winding temperature	+155°C
<b>Mechanical data (preloaded ball bearings)</b>		
23	Max. speed	12 000 rpm
24	Axial play at axial load	< 10 N      0 mm
		> 10 N      0.14 mm
25	Radial play	preloaded
26	Max. axial load (dynamic)	8 N
27	Max. force for press fits (static) (static, shaft supported)	211 N
		5000 N
28	Max. radial load, 5 mm from flange	80 N
<b>Other specifications</b>		
29	Number of pole pairs	1
30	Number of phases	3
31	Weight of motor	460 g

*Table 3: maxon EC-mx 40 additional motor data, from maxon*

Figure 3, shows the general dimensions of the module:

Units:  
mm, [in]

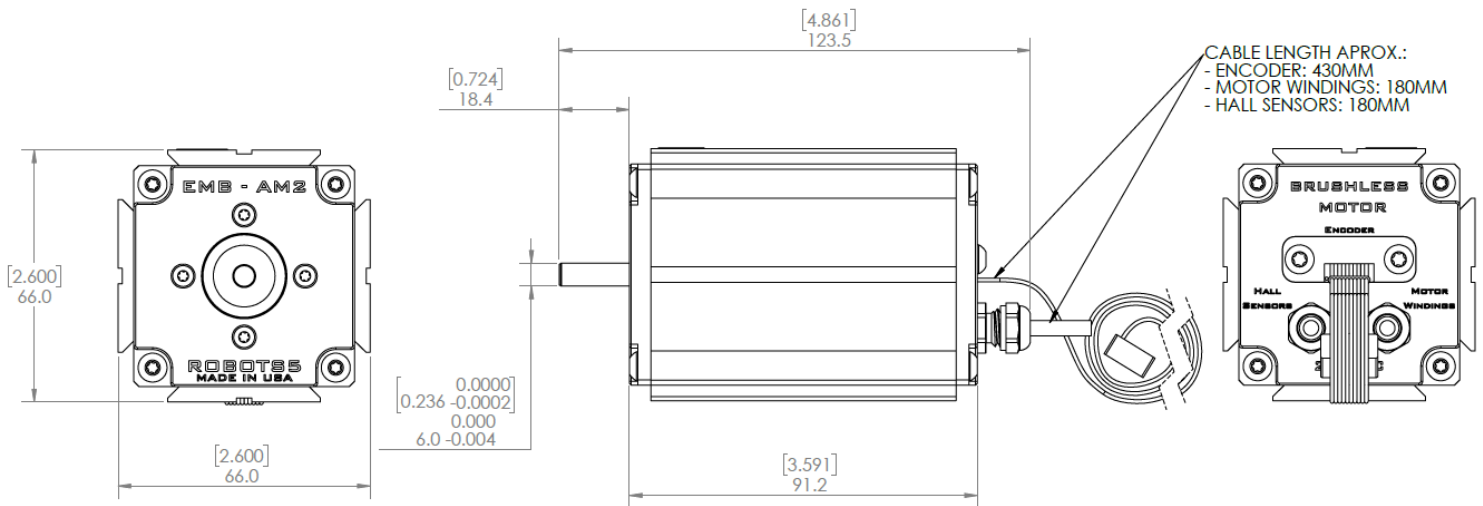


Figure 3: EMB-AM2, general dimensions

Note the shaft tolerance. Never press fit components to the shaft.

The dovetail profile matches the XT66 66mm optical construction rails from Thorlabs.

There are several mounting options to interface with the dovetail, including XT66C4, XT66C2, and XT66P3 from Thorlabs.

The motor winding and Hall Sensors connections are done via the pigtail wires with ferrules.

For the electrical connections, we recommend the use of ferrule or solder dip to the wire leads. We discourage the use of bare wires into the terminal connector.

The following tables illustrate motor winding and hall sensors wiring color:

<b>Sensor Signal</b>	<b>Wire Color</b>
Hall Sensor 1	Yellow
Hall Sensor 2	Brown
Hall Sensor 3	Grey
GND	Blue
V <sub>Hall</sub> 3...24 VDC	Green

*Table 4: maxon EC-mx 40 Hall Sensors wiring information*

<b>Motor Winding</b>	<b>Wire Color</b>
Motor Winding 1	Red
Motor Winding 2	Black
Motor Winding 3	White

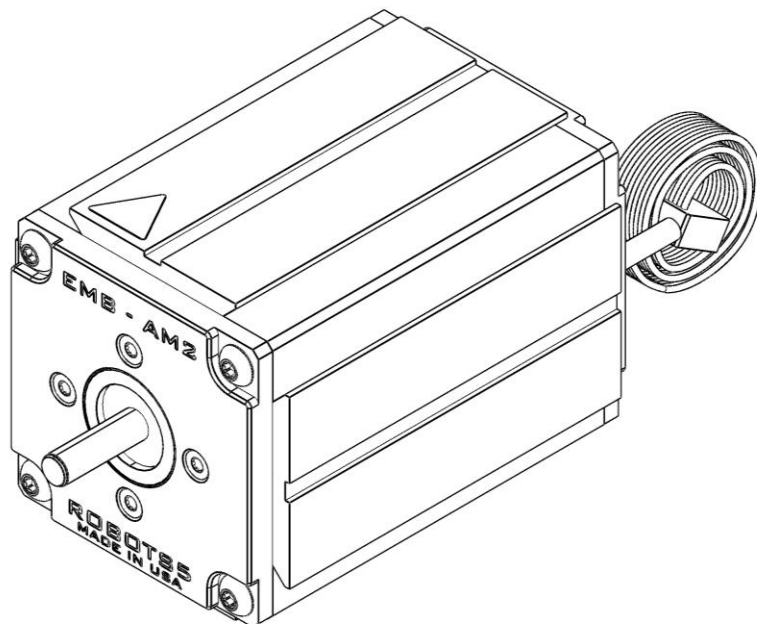
*Table 5: maxon EC-mx 40 Motor Winding wiring information*

Have questions or need additional support?

Contact us at:

Web: [www.robots5.com](http://www.robots5.com)

Email: [info@robots5.com](mailto:info@robots5.com)



**ROBOTS5**