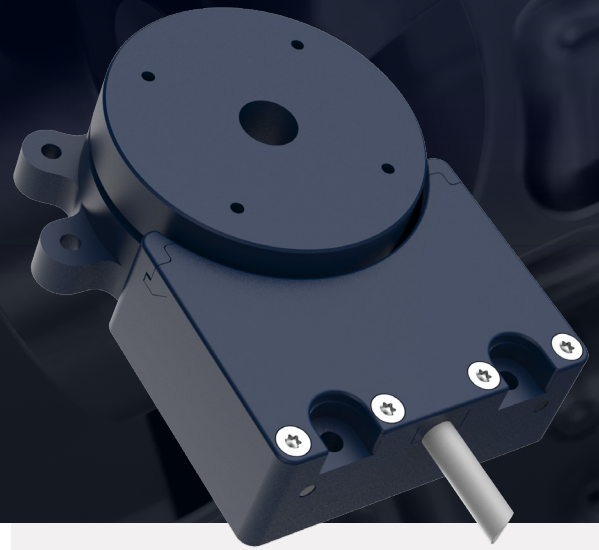


Rotary Piezomotor **RBS Series**

Piezo Motion's novel series of rotary piezoelectric motors represent a quantum leap in the design and construction of compact, high-precision performance rotary motor technologies. Manufactured from modern lightweight, reinforced thermoplastics, this new range of rotary motors combine superior angular precision and ultrafast response.



Performance and Benefits of RBS Series Rotary Motors

1,000 TIMES GREATER PRECISION

While most stepper motors have a maximum of 400 steps per revolution, a Piezo Motion rotary piezo motor has ~625,000 steps in a single rotation with each at full torque, stepping in $<10 \mu\text{rad}$ increments.

FORM FACTOR

Our piezo resonator design allows for a low profile Z-height for our rotary motors.

FAST RESPONSE

Within 30 to 50 μs , the piezo motor has made its first step and motion has commenced, compared to a stepper motor with a typical 15 to 20 ms to start motion.

ZERO POWER TO HOLD

Piezo Motion's rotary motors consume zero power at holding torque and very low power at slow speed (0.1 W at 1 RPM); yielding the possibility of very efficient overall duty.

SPECIAL PROPERTIES

Piezo Motion motors are immune to EMI and RF interference and have no emissions, making them ideal for a range of sensitive applications. For specialized applications (including MRI) please contact our technical team.

LIGHTWEIGHT

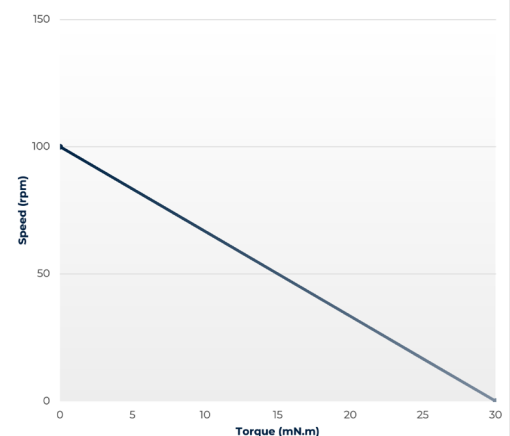
Piezo Motion motors contain no copper windings, magnets, or ferrous laminations making them ideally suited to weight-critical applications. Our motor housings are lightweight, reinforced thermoplastic, and they will operate at ultrasonic frequencies, making them virtually silent.

RELIABLE

Our reduced part count means fewer failures. With no bi-material joints to delaminate or multilayer stack joints to crack, there is no susceptibility to moisture or shorting.

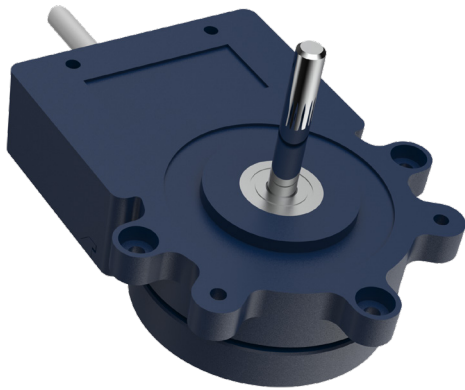
UNIQUE PROPERTIES

- Lightweight
- Low voltage
- 625,000 steps per rotation
- Superior precision and resolution
- Direct drive with range of torques
- Six orders of magnitude speed dynamic range
- Yields high resolution without sacrificing the torque output
- Designed for direct drive applications
- 100 rpm max speed
- Silent operation in continuous mode
- Ultra-Fast response time with superior start-stop characteristics
- High torque for size
- Energy efficient, zero power consumption in hold mode
- Stepping and Continuous mode of operation

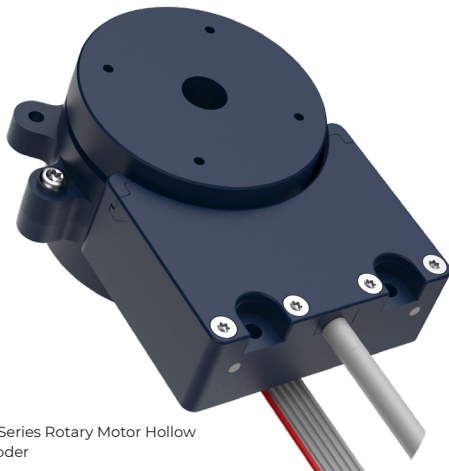


Speed-Force Curve for RBS Series Rotary Motor

RBS Series



RBS030032S Series Rotary Motor Solid Shaft



RBSS030032H Series Rotary Motor Hollow Shaft with Encoder

Principle of operation

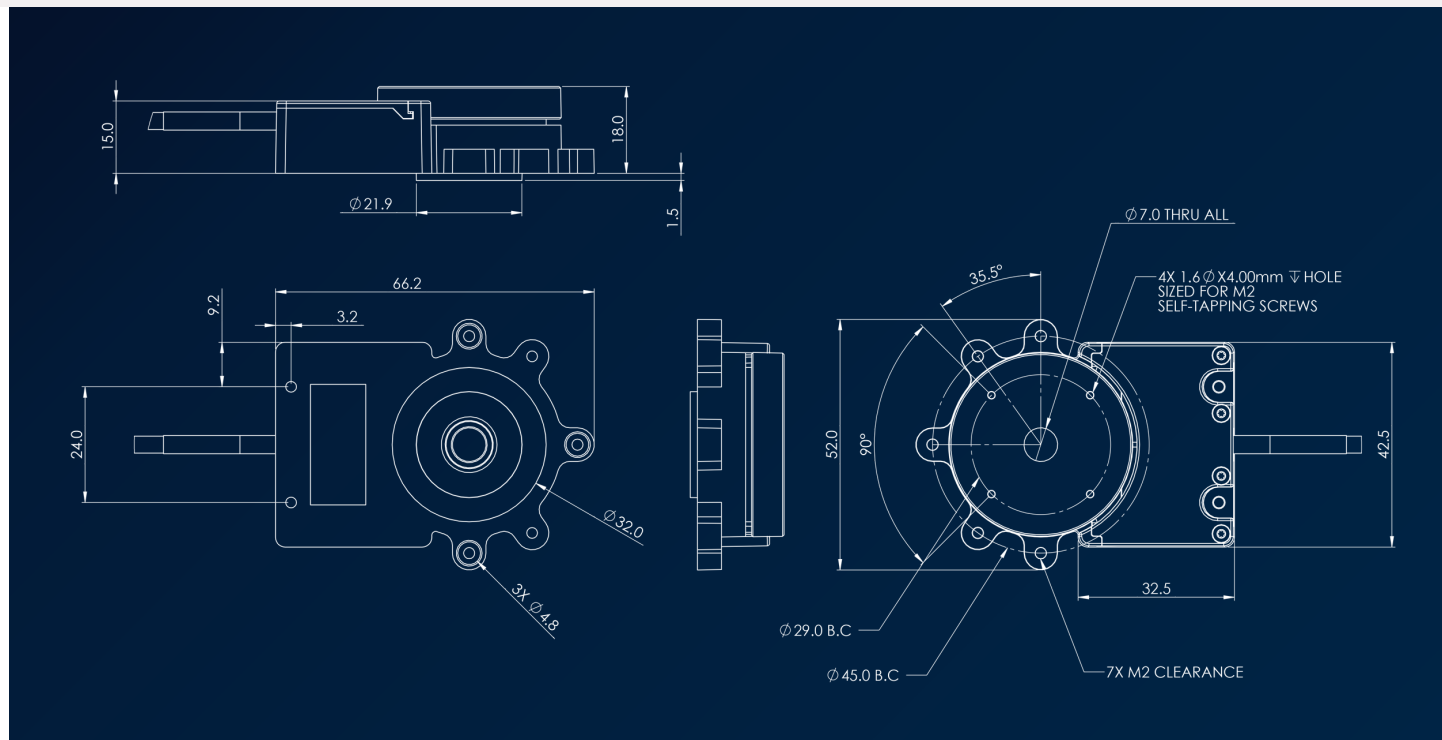
Piezo Motion's rotary piezo motors work on a patented principle of excitation of ultrasonic standing waves within a piezoelectric resonator. The resulting superposition of two orthogonal ultrasonic waves causes elliptical movement of the resonator tip which drives the rotor (for more details visit piezomotion.com). Piezo Motion's electronic driver's have been designed to provide an economical user-control interface. Each driver PCB is pre-programmed for the specific motor model and is software configurable to provide optimization of drive signals and integrated controls. Closed-loop control of the motor is achieved via an encoder mounted on the motor.

MOTOR SPECIFICATIONS

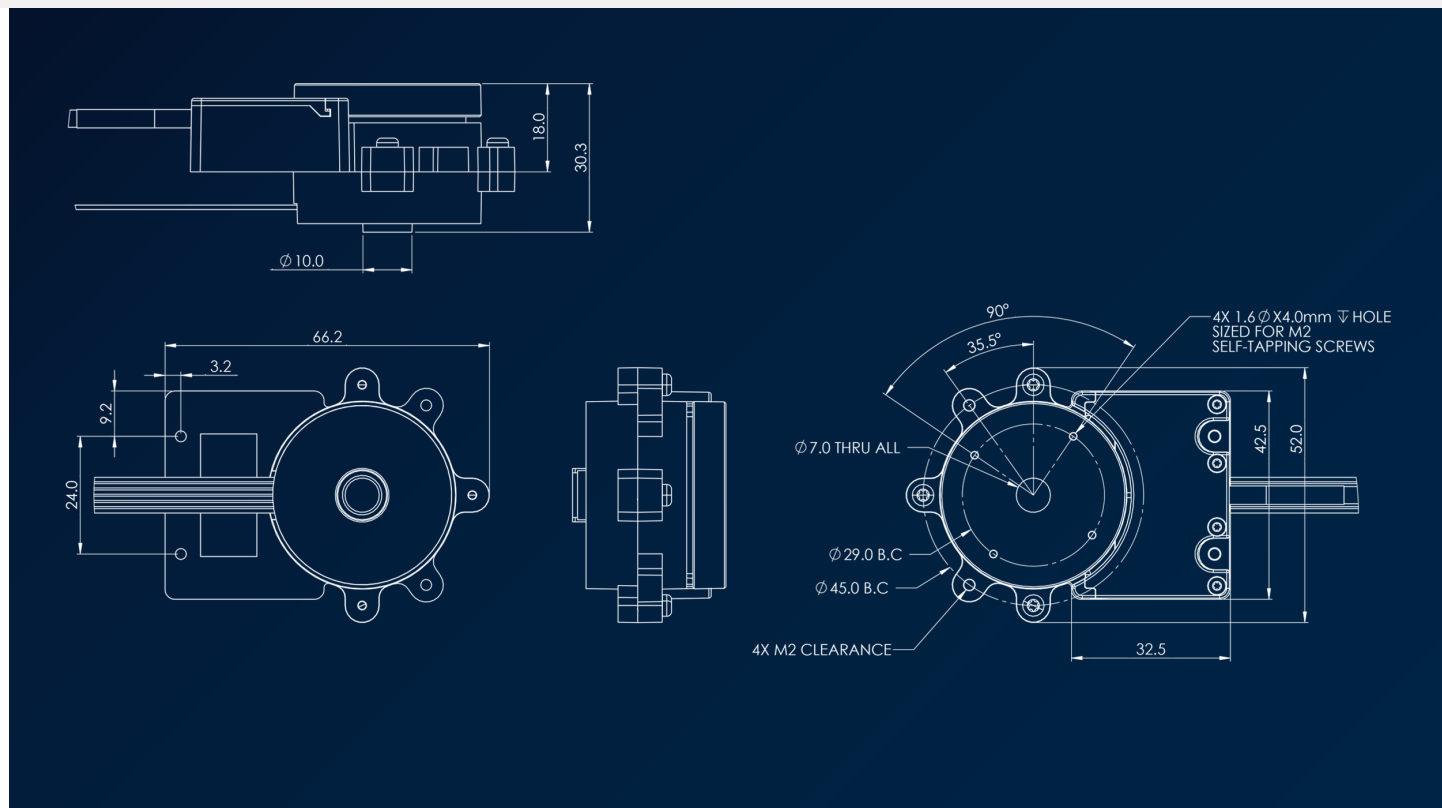
Motor	Solid Shaft		Hollow Shaft	
	Standard	Encoder	Standard	Encoder
Driver Board P/N	EDB60V006BB	EDB60V006BB	EDB60V006BB	EDB60V006BB
Power Supply Voltage	12 V	12 V	12 V	12 V
Stall Torque	≥ 30 mNm	≥ 30 mNm	≥ 30 mNm	≥ 30 mNm
Self-Braking Torque	≥ 40 mNm	≥ 40 mNm	≥ 40 mNm	≥ 40 mNm
Motor Response Time	$\approx 30\mu\text{s}$	$\approx 30\mu\text{s}$	$\approx 30\mu\text{s}$	$\approx 30\mu\text{s}$
Max Speed	>100 rpm	>100 rpm	>100 rpm	>100 rpm
Minimum Angular Step	30 μrad	30 μrad	30 μrad	30 μrad
Encoder Resolution (after quadrature)	N/A	196 μrad	N/A	196 μrad
Minimum Controlled Angular Step	N/A	196 μrad	N/A	196 μrad
Uni-directional Repeatability	N/A	196 μrad	N/A	196 μrad
Angular Backlash	<30 μrad	<30 μrad	<30 μrad	<30 μrad
Angular Hysteresis	<10 μrad	<10 μrad	<10 μrad	<10 μrad
Frequency Response	4 kHz	4 kHz	4 kHz	4 kHz
Operating Temperature	-20 to 80 °C	-20 to 80 °C	-20 to 80 °C	-20 to 80 °C
Maximum Axial Load	1000 g	1000 g	1000 g	1000 g
Maximum Radial Load	1000 g	1000 g	1000 g	1000 g
Moment Inertia (with metal rotor)	82 g·mm ²	82 g·mm ²	82 g·mm ²	82 g·mm ²
Moment Inertia (with plastic rotor)	70 g·mm ²	70 g·mm ²	70 g·mm ²	70 g·mm ²
Max Current over velocity range	350 mA	350 mA	350 mA	350 mA
Motor Runout (with metal rotor)	$\leq 50\mu\text{m}$	$\leq 50\mu\text{m}$	$\leq 50\mu\text{m}$	$\leq 50\mu\text{m}$
Motor Runout (with plastic rotor)	$\leq 80\mu\text{m}$	$\leq 80\mu\text{m}$	$\leq 80\mu\text{m}$	$\leq 80\mu\text{m}$
Motor Weight	69 g	85.5 g	69 g	85.5 g
Motor Dimensions	66x52x20 mm	66x52x31 mm	66x52x20 mm	66x52x31 mm
Driver PCB Dimensions	48x63x15 mm	48x63x15 mm	48x63x15 mm	48x63x15 mm
Driver PCB Weight	25 g	25 g	25 g	25 g

RBS030032H Series Hollow Shaft dimensional drawings

STANDARD MODEL



ENCODER MODEL



Motor **control**

The control of the RBS Rotary Motor is straightforward, each motor requires a driver board. This board will convert desired motion input instructions to the necessary electrical processes using specific frequency and amplitude values. This creates excitation of the piezo resonator and makes the motor perform the desired motion. For motors with an encoder, a daughter board is attached to the driver board to provide both closed-loop feedback as well as serial interfacing for external programming capabilities via Piezo Motion's software or serial commands.

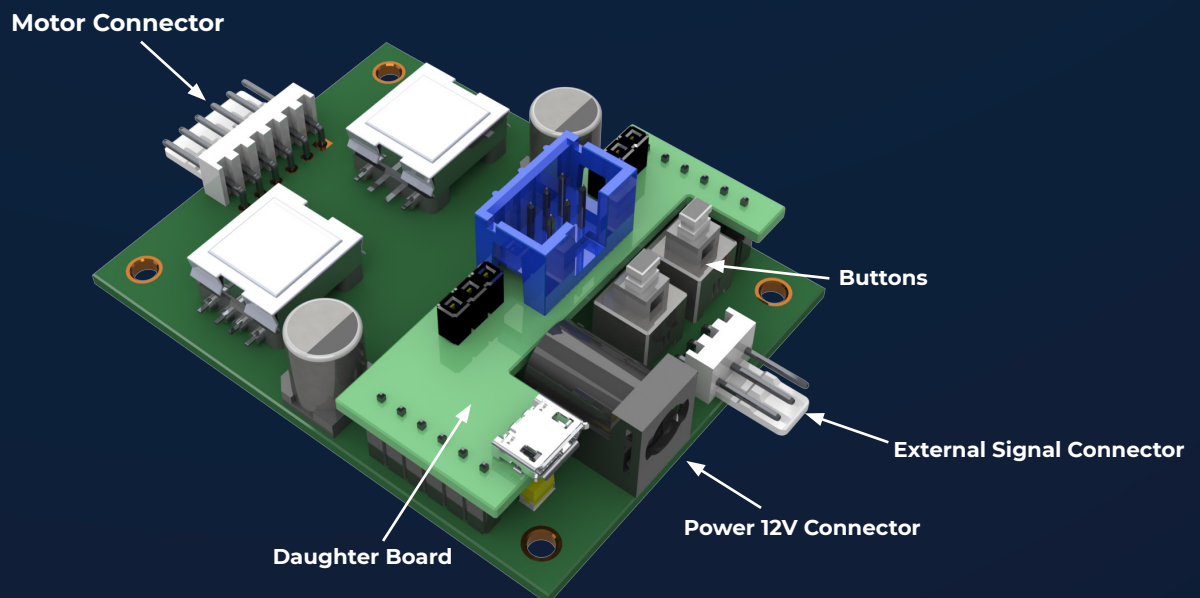
OPEN LOOP

The driver board can be controlled using an external signal source PWM (Pulse Width Modulation) mode. Control signals are applied to the External Signal Connector to generate the desired rotation and speed. Control of speed using PWM is implemented by varying the pulse duration and repetition rate of input signals onto the two directional control pins. Size of step is determined by the pulse duration, and speed is determined by pulse rate. The minimum pulse duration is approximately 30 μ s.

CLOSED-LOOP

Pre-programmed motion control algorithms enable the implementation of several commands for specific motion control. The key commands are for defining the speed and the movement to a defined position. These commands are resident within a library which can be accessed using either Piezo Motion's control software or via the serial port using TTL serial commands. Motor Control can also be implemented with Python commands using Piezo Motion's Motor API.

Electronic PCB Driver for **RBS Series Piezo Motors**



ELECTRONIC DRIVERS

EDB60V006BB Electronic PCB Driver - Open Loop board only

Control architecture & options

Piezo Motion motors are available as a basic motor or with a fitted encoder. Piezo Motion electronic drivers are available as open-loop or closed-loop drivers which are fitted with an encoder daughter board. Motors can be simply controlled in open-loop mode with several options for achieving closed-loop motion control. To learn more, visit piezomotion.com/products/motors/ or scan the QR code below.

	Open-Loop Driver	Closed-Loop Driver with Encoder board
Base Motor	Open-Loop Control or third party controller command motor with PWM control and close control loop with external sensor	
Motor with Encoder	Open-Loop Control or third party controller command motor with PWM control and close control loop Piezo Motion Encoder output	Motor Control with: Piezo Motion Control Software on Windows OS device or Piezo Motion Python API on third party controller or TTL Serial Port Commands

Evaluation Kits

ORDERING INFORMATION

Full range of evaluation kits available. Each kit includes motor, driver board pcb, cables, 5 VDC or 7.5 VDC power adapter & user manual. Encoder kit version also includes factory-fitted magnetic encoder with cable and connector.

Motor Type - HOLLOW SHAFT	RBS030032HAC30-K	RBS030032HAC30-EK
Description	Evaluation kit for RBS series piezo rotary motor with a plain hollow shaft and a maximum speed >100 rpm. The motor has a driving torque >30 mN.m. It has a 30 cm cable terminated with a Molex connector. Evaluation kit includes electronic driver board, 120/220 VAC to 12 VDC power adapter, cables and manual.	Evaluation kit closed-loop for RBS series piezo rotary motor with a plain hollow shaft and a maximum speed > 100 rpm. This motor has a driving torque >30 mN.m and is fitted with an optical encoder (32,000 ppr, 196 µrad). It has a 30 cm cable terminated with a Molex connector. This close-loop evaluation kit includes electronic driver board, motion control software, 120/220 V to 12 VDC power adapter, cable and manual.
Maximum Torque (mN.m)	>40	>40
Max Speed (rpm)	100	100
Max Current (mA)	350	350
Motor Type - SOLID SHAFT	RBS030032SAC30-K	RBS030032SAC30-EK
Description	Evaluation kit for RBS series piezo rotary motor with a plain hollow shaft and a maximum speed >100 rpm. The motor has a driving torque >30 mN.m. It has a 30 cm cable terminated with a Molex connector. Evaluation kit includes electronic driver board, 120/220 VAC to 12 VDC power adapter, cables and manual.	Evaluation kit closed-loop for RBS series piezo rotary motor with a plain hollow shaft and a maximum speed > 100 rpm. This motor has a driving torque >30 mN.m and is fitted with an optical encoder (32,000 ppr, 196 µrad). It has a 30 cm cable terminated with a Molex connector. This close-loop evaluation kit includes electronic driver board, motion control software, 120/220 V to 12 VDC power adapter, cable and manual.
Maximum Torque (mN.m)	>40	>40
Max Speed (rpm)	100	100
Max Current (mA)	350	350

For OEM and custom inquiries, contact us at info@piezomotion.com or scan the QR code below.

About Piezo Motion

Piezo Motion is a leader in piezo motor technology with multi-million dollar investments in research and development of affordable piezoelectric motors to meet, and exceed, the needs of today's global markets.

The company is committed to developing innovative piezoelectric technology and motion products that enhance their functionality in a multitude of applications.

Piezo Motion partners with startups, OEMs, research institutions, and industrial companies worldwide; empowering the visionaries behind their products.

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