

RGV-S Series

High-Speed Precision Rotation Stages



The RGV can be used in applications like semiconductor wafer inspection, microrobotics, precision metrology and motion simulators, specifically for MEMS, gyros and accelerometer testing.



High Efficiency, Brushless DC Torque Motor

A high efficiency brushless DC torque motor with rare earth magnets supplies an optimum ratio of torque per inertia for high acceleration, with minimal stage heating. At maximum continuous torque, the temperature of the motor increases by only 30 °C.

High-Resolution Glass Scale Encoder

To ensure precision, the glass encoder is mounted on a ground reference surface. For example, the RGV160's 28,800 pt encoder allows for outstanding MIM. It is perfectly aligned with the stage's rotation axis to minimize position errors induced by eccentricity, wobble, or axial runout.

Direct Drive Technology

Due to direct-drive technology, the RGV series gains superior speeds and enhanced positioning. The direct-drive motor is non-contact, providing no wear and boosted reliability.



Key Features

- Direct drive for outstanding speed of up to 1000 °/s and high reliability
- Large diameter, steel ball bearings for stiffness, low runout and high load capacity
- Precision glass scale encoder for high position repeatability, MIM, and high accuracy
- High torque DC brushless motor with a maximum torque of 112 Nm

Design Details

- Base Material Aluminum
- Bearings Large diameter steel ball bearings
- Motor High-torque brushless DC motor with rare earth magnets
- Motor Initialization Done by the XPS controller by a patented process that avoids major motion during initialization and does not require Hall effect sensors
- Motor Commutation Done by the XPS controller on encoder signals
- Feedback Glass scale encoder
RGV100: 15,000 line pairs per revolution, 1 Vpp, 32,768-fold signal subdivision
RGV160: 28,800 line pairs per revolution, 1 Vpp, 1,250-fold signal subdivision
- Limit Switches RGV100: Two optical limit switches at approx. $\pm 168^\circ$, disabled by external switch
RGV160: None
- Origin Optical, fixed at position 0°, including mechanical zero signal
- Cable Length The appropriate 5 m cable kit must be ordered separately

Large Diameter Through Hole

A 30 mm or 110 mm diameter through-hole allows convenient routing of cables and vacuum lines through the stage.

Compact Design

The RGV series features a proprietary 4-point contact ball bearing and a 2-piece design which integrates multiple functions, like the bearing ways and the direct drive motor, minimizing the number of parts. The result is a more compact rotation stage with superior stiffness, high reliability and outstanding wobble and eccentricity specifications.

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Specifications

	RGV100BL-S	RGV100HL-S	RGV160BL-S
Travel Range (°)		360 continuous	
Minimum Incremental Motion (mdeg)	0.10	0.10	0.04
Uni-directional Repeatability, Typical (Guaranteed) ⁽¹⁾ (mdeg)	±0.08 (±0.15)	±0.10 (±0.15)	±0.05 (±0.15)
Bi-directional Repeatability, Typical ⁽¹⁾ (mdeg)	±0.15	±0.15	±0.15
Accuracy, Typical (Guaranteed) ⁽¹⁾ (mdeg)	±3.0 (±5.0)	±3.0 (±5.0)	±3.0 (±7.5)
Maximum Speed [no load] (°/s)	720	720	1,000
Inertia [no load] (kg.m ²)	0.00104	0.00123	0.02411
Bearing Drag Torque (Nm)	0.3	0.3	0.35
Wobble, Typical (Guaranteed) ⁽¹⁾⁽²⁾ (μrad)	±5.0 (±10)	±7.0 (±20)	±5.0 (±10)
Eccentricity, Typical (Guaranteed) ⁽¹⁾ (μm)	±1.0 (±1.5)	±1.0 (±1.5)	±0.8 (±2.0)
MTBF (h)	20,000 with 5 kg load, 720 °/s speed and a duty cycle of 30%	20,000 with 5 kg load, 720 °/s speed and a duty cycle of 30%	20,000 with 90 kg load, 1,000 °/s speed and a duty cycle of 30%

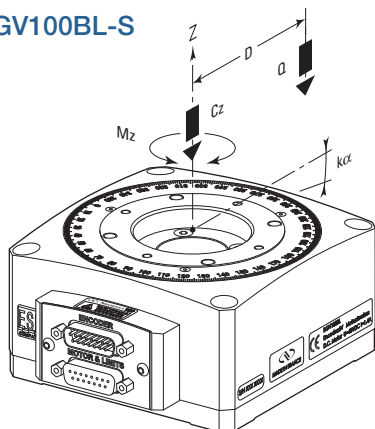
¹⁾ For the definition of Typical and Guaranteed specifications see "Motion Basics Terminology & Standards" Tutorial at www.newport.com

²⁾ To obtain arcsec units, divide μrad value by 4.8.

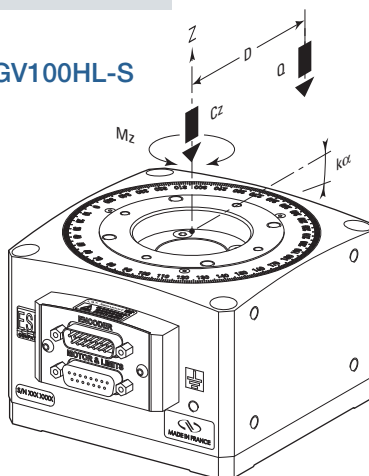
Note: The following specifications are controller/drive dependent: MIM, Accuracy, Repeatability, Max. Speed and Max. Acceleration. Refer to the RGV pages on www.newport.com for specifications achievable with specific Newport controller/drive combination.

Load Characteristics and Stiffness

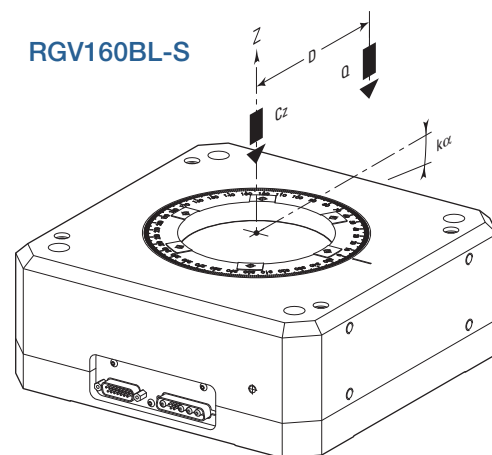
RGV100BL-S



RGV100HL-S



RGV160BL-S



Cz,	Normal centered load capacity	100 N
Kα,	Transversal compliance	15 μrad/Nm
Mz,	Maximum torque	0.42 Nm @ 0 °/s
Jz,	Maximum Inertia	0.032 kg.m ²
Q,	Off-center load (N)	$Q \leq Cz \div (1 + D/35)$ and $Q \leq (Jz - Jq)/D^2$

Where D = Cantilever distance (mm)

Jq = Inertia of payload

Cz,	Normal centered load capacity	100 N
Kα,	Transversal compliance	15 μrad/Nm
Jz,	Maximum Inertia	0.032 kg.m ²
Q,	Off-center load (N)	$Q \leq Cz \div (1 + D/35)$ and $Q \leq (Jz - Jq)/D^2$

Where D = Cantilever distance (mm)

Jq = Inertia of payload

Cz,	Normal centered load capacity	2700 N
Kα,	Transversal compliance	1 μrad/Nm
Q,	Off-center load (N)	$Q \leq Cz \div (1 + D/50)$ Where D = Cantilever distance (mm)

RGV-S Series High-Speed Precision Rotation Stages

Metrology Report Included at No Additional Cost

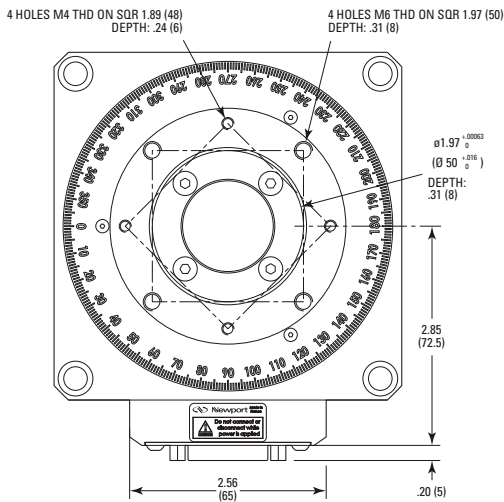
Newport guarantees specification values which are measured and recorded following ASME B5.57 and ISO 230-2 standards. The typical performance values are two times better than the guaranteed specifications.

Dimensions

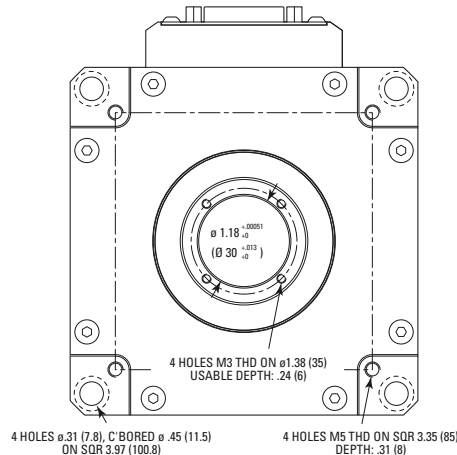
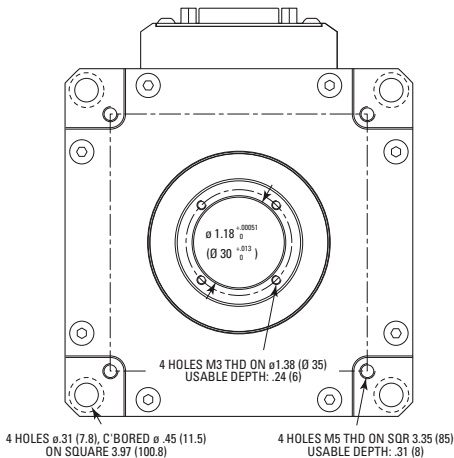
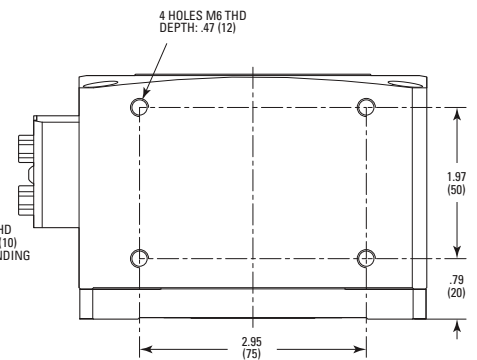
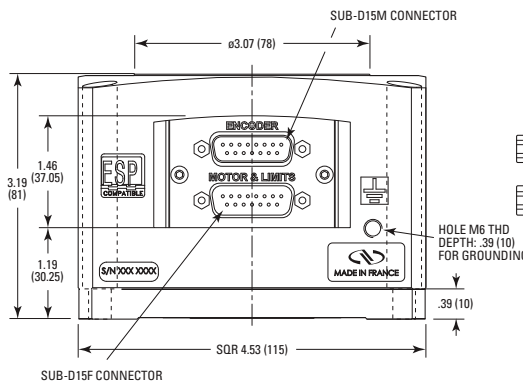
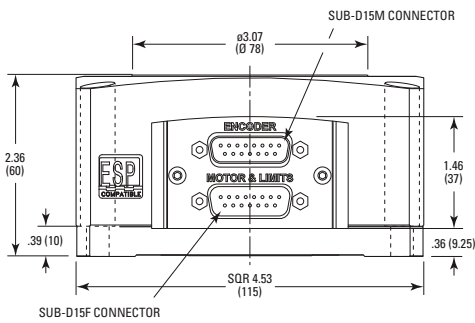
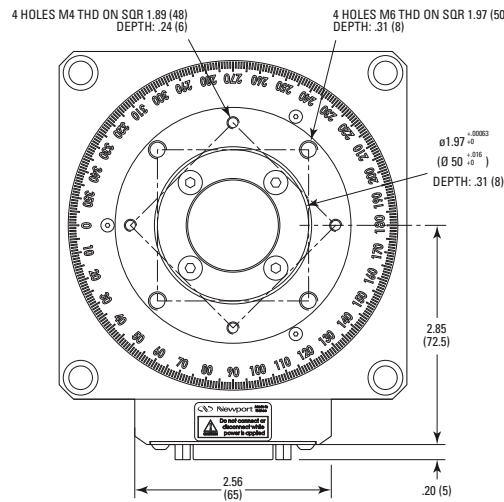
Error Mapping Services

For critical positioning applications, Newport offers error mapping services to improve stage position accuracy.

RGV100BL-S

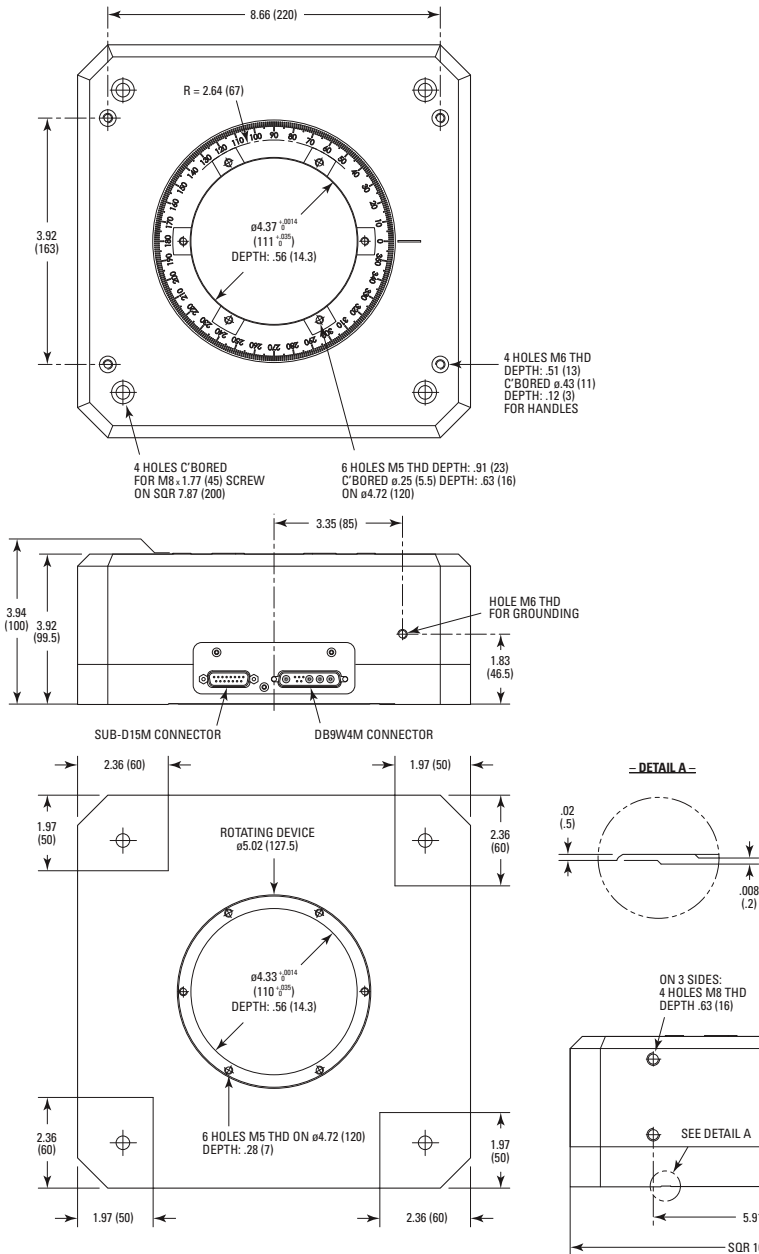


RGV100HL-S



RGV-S Series High-Speed Precision Rotation Stages

RGV160BL-S



Ordering Information

Stages	Code
High Speed 360° Rotation Stage, Brushless Direct, Ultra-Compact without cables	RGV100BL-S
High Precision & Torque Rotation Stage, 360°, Brushless, Ultra-Compact without cables	RGV100HL-S
High Speed, High Load Rotation Stage, 360°, Brushless Direct, Compact without cables	RGV160BL-S

Recommended Controllers/Drivers

1- to 8-axis universal high-performance motion controller/driver	XPS-D
Universal digital driver card for stepper, DC and direct motors	XPS-DRV11
1- to 4-axis universal high-performance motion controller/driver	XPS-RL
High-power, 3-phase, sinusoidal DC brushless motor driver	XPS-EDBL
PWM drive module for brushless motors, 5 A/44 VPP max.	XPS-DRV02

Cable Kits

Motorized stage cable kit, for stages ILS-LM-S, RGV100BL-S, RGV100HL-S and XPS-DRV02 driver module	XPS-RK11
Motorized stage cable kit, for stages ILS-LM-S, RGV100HL-S and XPS-EDBL driver module	XPS-RK13
Motorized stage cable kit, for stages ILS-LM-S, RGV100HL-S, RGV100BL-S, and XPS-DRV11 driver module	XPS-DK21
Motorized stage cable kit, for stages ILS-LM-S, RGV100HL-S, and XPS-EDBL driver	XPS-DK23

Newport's 2-axis motion simulators provide high speed, precision rotation and positioning for test and calibration in aerospace and defense, industrial and research markets. Constructed with RGV100HL-S in Elevation and custom RGV160BL-S in Azimuth, the motion simulators addresses high acceleration, high torque needs in various applications such as stability, accuracy test and measurement for accelerometers, MEMS devices, Inertial Guidance Sensors and Gyroscopes.

High-Speed Motion Simulators

