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.

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**RGV-S Series**
High-Speed Precision Rotation Stages

**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. ±168°, 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

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**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

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**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.
**Specifications**

<table>
<thead>
<tr>
<th></th>
<th>RGV100BL-S</th>
<th>RGV100HL-S</th>
<th>RGV160BL-S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Travel Range (°)</strong></td>
<td>360</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Minimum Incremental Motion (mdeg)</strong></td>
<td>0.10</td>
<td>0.10</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Uni-directional Repeatability, Typical (Guaranteed) (mdeg)</strong></td>
<td>±0.08 (±0.15)</td>
<td>±0.10 (±0.15)</td>
<td>±0.05 (±0.15)</td>
</tr>
<tr>
<td><strong>Bi-directional Repeatability, Typical (mdeg)</strong></td>
<td>±0.15</td>
<td>±0.15</td>
<td>±0.15</td>
</tr>
<tr>
<td><strong>Accuracy, Typical (Guaranteed) (mdeg)</strong></td>
<td>±3.0 (±5.0)</td>
<td>±3.0 (±5.0)</td>
<td>±3.0 (±7.5)</td>
</tr>
<tr>
<td><strong>Maximum Speed [no load] (°/s)</strong></td>
<td>720</td>
<td>720</td>
<td>1,000</td>
</tr>
<tr>
<td><strong>Inertia [no load] (kg.m²)</strong></td>
<td>0.00104</td>
<td>0.00123</td>
<td>0.02411</td>
</tr>
<tr>
<td><strong>Bearing Drag Torque (Nm)</strong></td>
<td>0.3</td>
<td>0.3</td>
<td>0.35</td>
</tr>
<tr>
<td><strong>Wobble, Typical (Guaranteed) (µrad)</strong></td>
<td>±5.0 (±10)</td>
<td>±7.0 (±20)</td>
<td>±5.0 (±10)</td>
</tr>
<tr>
<td><strong>Eccentricity, Typical (Guaranteed) (µm)</strong></td>
<td>±1.0 (±1.5)</td>
<td>±1.0 (±1.5)</td>
<td>±0.8 (±2.0)</td>
</tr>
<tr>
<td><strong>MTBF (h)</strong></td>
<td>20,000 with 5 kg load, 720 °/s speed and a duty cycle of 30%</td>
<td>20,000 with 5 kg load, 720 °/s speed and a duty cycle of 30%</td>
<td>20,000 with 90 kg load, 1,000 °/s speed and a duty cycle of 30%</td>
</tr>
</tbody>
</table>

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**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.

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**Load Characteristics and Stiffness**

<table>
<thead>
<tr>
<th></th>
<th>RGV100BL-S</th>
<th>RGV100HL-S</th>
<th>RGV160BL-S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cz</strong></td>
<td>Normal centered load capacity 100 N</td>
<td>100 N</td>
<td>2700 N</td>
</tr>
<tr>
<td><strong>Kc</strong></td>
<td>Transversal compliance 15 µrad/Nm</td>
<td>15 µrad/Nm</td>
<td>1 µrad/Nm</td>
</tr>
<tr>
<td><strong>Mz</strong></td>
<td>Maximum torque 0.42 Nm @ 0 °/s</td>
<td>0.42 Nm @ 0 °/s</td>
<td>0.42 Nm @ 0 °/s</td>
</tr>
<tr>
<td><strong>Jz</strong></td>
<td>Maximum Inertia 0.032 kg.m²</td>
<td>0.032 kg.m²</td>
<td>0.032 kg.m²</td>
</tr>
<tr>
<td><strong>Q</strong></td>
<td>Off-center load (N)</td>
<td>Q ≤Cz + (1 + D/35) and Q ≤ Jz - Jq/D²</td>
<td></td>
</tr>
<tr>
<td><strong>Where D = Cantilever distance (mm)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Jq</strong></td>
<td>Inertia of payload</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

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.
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.
**RGV-S Series** High-Speed Precision Rotation Stages

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### Ordering Information

#### Stages

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Speed 360° Rotation Stage, Brushless Direct, Ultra-Compact without cables</td>
<td>RGV100BL-S</td>
</tr>
<tr>
<td>High Precision &amp; Torque Rotation Stage, 360°, Brushless, Ultra-Compact without cables</td>
<td>RGV100HL-S</td>
</tr>
<tr>
<td>High Speed, High Load Rotation Stage, 360°, Brushless Direct, Compact without cables</td>
<td>RGV160BL-S</td>
</tr>
</tbody>
</table>

#### 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

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**High-Speed Motion Simulators**

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 address high acceleration, high torque needs in various applications such as stability, accuracy test and measurement for accelerometers, MEMS devices, Inertial Guidance Sensors and Gyroscopes.

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Evy and Beaune-la-Rolande, France and Wuxi, China have all been certified compliant with ISO 9001 by the British Standards Institution. Santa Clara, California is DNV certified.