RGA Low Profile Rotation Stage

The RGA150 is the latest world class rotation stage from MKS that adds to the breadth of readily-available, standard, precision stages. The RGA150 was designed to move fast, with a low-profile and a large aperture. It addresses the need for quick angle adjustments of wafers and vacuum chucks. Although specifically tailored to semiconductor applications, the RGA150 can also be utilized in other industrial applications, such as through hole imaging/inspection or laser processing, automation or any general positioning application that requires fast positioning response.

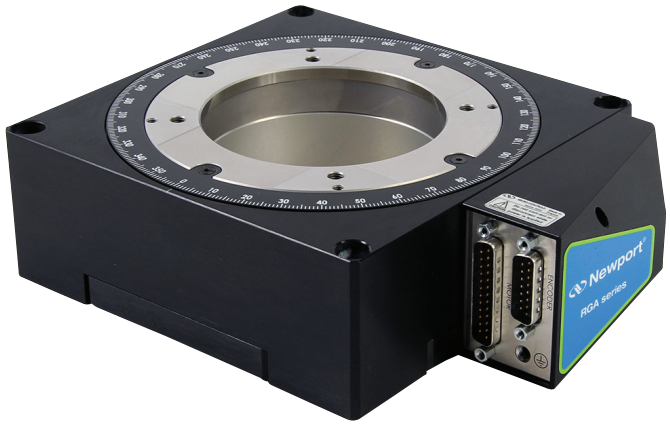
With a sub-mdeg MIM, the RGA150 is at the same level of positioning precision as the industry-proven RGV with faster speeds, similar MIM and loads up to the typical weight of the chuck and wafer in semiconductor wafer applications.

The excellent repeatability and mapped sub-mdeg accuracy of the RGA150 are a result of MKS' experience in design and precise manufacturing. Tolerances down to micron level, enable almost perfect fit on various machined or ground components of motor and encoder bearings and mounting surfaces.

The design, features and resulting performance of the RGA150 ensures fast and reproducible processes. Reliability also increases due to the non-contact components. All these reduces the risks in a production setting and overall operating cost.

Product Benefits

With a high peak torque direct drive motor, the RGA150 can achieve high accelerations needed to minimize move times. The single row bearing design is manufactured to exacting tolerances, ensuring low wobble and eccentricity, resulting in lower geometry-induced errors. This single row bearing design is an improved version of those found in other MKS rotation stages. The high resolution, non-contact encoder, enables the precise



Features and Benefits

- Fast rotation, low profile, large aperture
- All steel construction for high stiffness and thermal stability
- Non-migrating ball cage design
- Plug and Play - ESP compatibility

MIM and repeatability needed for semiconductor wafer applications, coupled with the high reliability required in industrial settings.

Mounting pads are included in the RGA in case the mounting surfaces are not as flat as required. These pads distribute the weight and overcome the flatness found in most commercially available isolation tables, leading to performance close to what is achieved under ideal conditions.

Unique features:

A number of features sets the RGA apart from other direct drive rotation stages, including MKS products: low profile, large aperture for chuck utilities, fast rotation,

The RGA150's low profile enables the lowest possible position of the wafer relative to the XY stages. This reduces the effect of geometrical errors from the XY and also the RGA150, which eventually improves accuracy and repeatability at the wafer level, providing better confidence in the measurements or the process. With more accurate placement of the wafer, the need to correct for geometric errors is reduced, resulting in a reduction is process times.

The RGA150's large aperture allows more utilities through the stage and connected to the wafer chuck. More vacuum zones can be designed, ensuring a flatter wafer. With more room the strain or drag from hoses and/or cables are minimized, which increases reliability and reduces the torque/power required to accelerate. For through hole applications, this simply means larger samples can be inspected or processed.

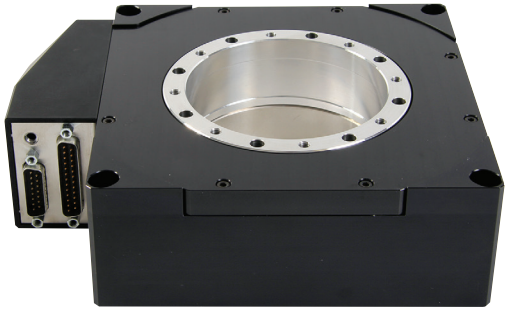
The high torque, direct drive motor enables high accelerations for fast positioning or alignment of the wafer. High torque can overcome the friction introduced by the hoses and cable. A non-contact motor means no wear of the motor components, ensuring reliable operation for years. Fine magnet pitch enables higher MIM capability for those precise positioning application needs.

Fast rotation and high acceleration enables faster completion of the process, whether this is patterning, testing, inspection or repair of the wafer. The response and settling times are also optimized with the structural design of the RGA150. All these enable faster throughput.

The RGA150 uses non-contact motor and encoders, which not only provides the speed, MIM and repeatability, but also improves reliability, since there is no wear in these components. This minimizes the long term operating costs.

ESP technology, plug and play for quick and safety setup contributes to the lower Cost of Ownership. Since stage parameters are already configured in the XPS controller, there is minimal need to adjust the operating parameters to begin using the stage quickly and more importantly, in a safe manner.

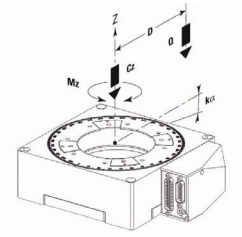
Like all MKS motorized products, each RGA150 is shipped with a free test report that documents the positioning performance of each individual unit meeting the published specifications. For higher accuracy, a mapped version RGA150MAP is available.



Design Details

Base Materal	Aluminum body
Bearings	Large diameter steel ball bearings
Drive mechanism	High torque & speed brushless DC motor with rare earth magnet
Feedback	On-axis encoder
Limit swtiches	None: continuous movement
Origin	Optical index pulse, fixed at position 0°

Load Characteristics and Stiffness



Load Characteristics and Stiffness

	RGA150
Cz, Normal centered load capacity	50 (N)
kα, Transversal compliance	5 (µrad/Nm)
Max, transverse dynamic moment	11 (Nm)
Mz, Maximum torque @ 0 deg/s	2.25 (Nm)
Q, Off-center load Where D=Cantilever distance in mm	Q≤Cz÷(1+D/55)

Specifications

	RGA150
Travel range (deg)	360 continuous
Minimum Incremental Motion typical [1][3] (mdeg)	0.01
Uni-directional repeatability, typical [1][3] (mdeg)	±0.035
Bi-directional repeatability, typical [1][3] (mdeg)	±0.0975
Accuracy, typical (guaranteed) [1][3] (mdeg)	±4 (±8)
Mapped accuracy, guaranteed [1][3][4] (mdeg)	±1
Maximum speed [3] (deg/s-rpm)	1800
Inertia (no load) (kg.m^2)	0.0062
Static Bearing Drag Torque [5] (N.m)	0.4
Dynamic Bearing Drag Torque [5] (N.m/deg/s)	0.001
Wobble, typical (guaranteed) [1] [2] (µrad)	±12 (±26)
Ecentricity, typical (guaranteed) [1] (µm)	±0.5 (±1)
MTBF (1800 deg/s, 25% load capacity, 30% duty cycle) (h)	20,000

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

3) With XPS-DRV11 Drive, maximum value is driver dependant. Contact Newport for additional information

4) Require ordering RGA150MAP

5) Total Drag Torque = 0.4 + Speed/1000

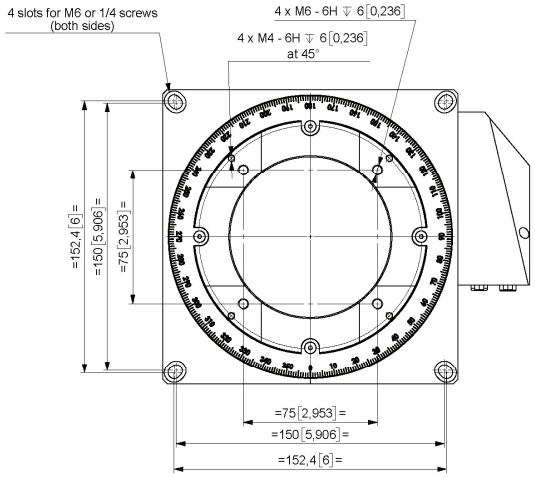
Order Information

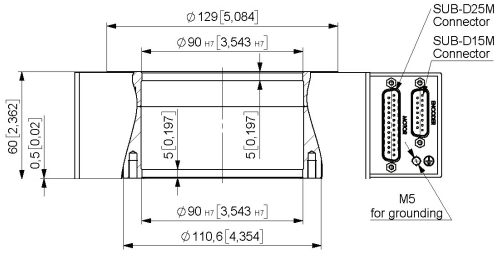
MODEL	DESCRIPTION
RGA150	Low profile fast rotation stage
RGA150MAP	Low profile fast rotation stage, mapped

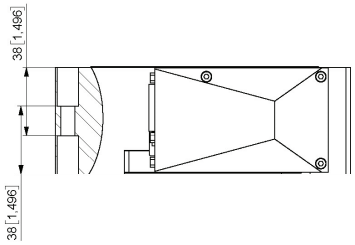
Recommended Controllers/Drivers

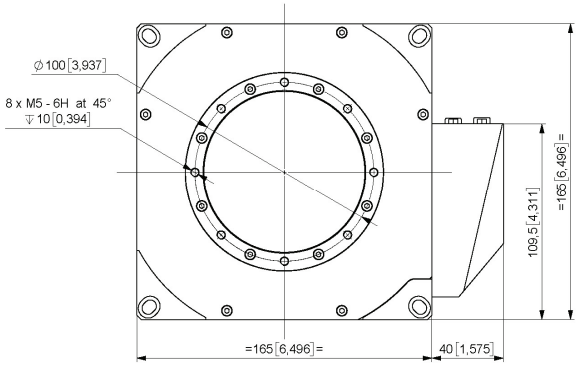
Model	Description
XPS-Dx	1- to 8-axis universal high-performance motion controller/driver
XPS-DRV11	Universal digital driver card for stepper, DC and direct motors

Dimensional Drawing









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