

The art of Magnetic Gravity Compensation is well known in terms of biased or non-biased magnetic bearings. The technology used in this area is usually based on reluctance forces and yields a high passive or active stiffness. For high end 6-DOF controlled Mechatronic applications however it is sometimes more beneficial to obtain a low stiffness between the static and the moving part, since this avoids direct cross talk of parasitic forces from the environment disturbing the accurate controlled moving part. To obtain this Magnetic Innovations developed a patented Magnetic Gravity Compensator series, which has proven itself in various high-end industrial equipment. The MGC can be applied where high speed, high force density and a high reliability & lifetime are required both in normal industrial and in vacuum environments.

The working principle of the MGC is that the moving part is a magnet and that the coils combined with the second magnet assembly form the static part of the actuator which enables a good thermal path (beneficial for high force densities). Both magnet assemblies produce a continuous force with very low parasitic stiffness, which compensates for gravity. The coil assembly yields any accurate Lorentz control forces needed. Water cooling of coils is optional. The absence of moving wires leads to a very high reliability and lifetime and does not limit the achievable accelerations and speeds.



Left: static part consisting of coil and housing  
Right: moving part on which driving and bias force acts

**Key Features:**

- Magnetic bias force compensates gravity and eliminates static dissipation of coils
- High reliability and lifetime due to the absence of moving wires
- Low (contactless) stiffness between static and moving magnet parts
- No heat load on the moving part, single phase actuator, water cooling possible
- Suitable for vacuum environments
- Radial clearance for 6-DOF control
- High peak and continuous force possible
- A=including Z-actuator, P=only Bias force

Technical Data					
Parameter [unit]	Note	Preliminary models (no water cooling)			
		A4025_6	P6040_30	A6550-75	A16095_800
OD [mm]	1)	40	60	65	150
Height [mm]	1)	25	40	50	90
Vertical stroke [mm]	1)	3	3	3	4
Radial stroke [mm]	1)	1.2	3	2	2
F-Bias [N]	1)	6	30	75	800
F continuous [N]	2)	1.5	-	15	100
F peak [N]	3)	4	-	40	400
Cz,x,y stiffness max. (N/m)	1)	30	175	600	6000
Moving mass [kg]		0.024	0.040	0.115	2.85

**Notes (The specifications above are preliminary values. No rights can be derived from this specification)**

- 1) Standard range at 22°C. Other dimensions and force ranges available upon request
- 2) Continuous force at 25°C ambient and 155 °C coil temperature, depending on thermal path
- 3) Peak force for 10 sec. at 25°C ambient and 155 °C coil temperature

\*Mechanical drawings are available upon request. Please contact [info@magneticinnovations.com](mailto:info@magneticinnovations.com)