

Attainable magnetic forces E-Grippers

E-grippers can handle various ferromagnetic products and workpieces. The holding force achieved depends on the magnetic properties and composition of the material. Compared to the holding force on low-carbon steels, a force reduction of over 30% may occur with certain materials.

Reduction of magnetic force by material	Efficiency
Non-alloy low carbon steel (<0,3% C) like Fe 360, Fe 510	100%
Non-alloy carbon steel (0,3 – 0,5% C) like C15, C45	80 – 90%
High carbon (0,5 – 1,8% C) alloyed tool steel	70 – 80%
Magnetic stainless steel (ferritic, martensitic) like AISI430	60 - 75%
Cast-iron (> 1,8% C)	45 – 50%
Nickel	10%
Stainless steel AISI304	1 - 3%
Austenitic stainless steel like AISI316	0%
Brass, aluminium, copper	0%

Recommended forces

The table lists the forces that can be applied to workpieces when using the three types of E-Grippers. In addition, it provides information on forces corresponding to different air gaps.

A safety factor of 3 according to EN13155 has been taken into account.

Factors influencing magnetic force

Apart from the magnetic properties of the workpiece material, there are other factors that can reduce the holding force.

- Air gap between workpiece and E-Gripper:

Non-magnetic surface layers such as coatings, foils, as well as rough surfaces, rust and dirt lead to an air gap and reduce the holding force.

- Workpiece dimensions in contact with E-Gripper:

When the workpiece is fully in contact with the magnetic poles, the maximum holding force is achieved. With partial coverage or contact, e.g. because the workpiece is perforated or difficult to cover completely, the holding force will decrease.

- Thickness of the workpiece:

Thin sheet material becomes magnetically saturated, so the magnetic field cannot be fully utilized and the holding force decreases, see table.

- High temperatures reduces magnetic force:

Both higher ambient temperature (>30°C) and higher product temperature (40 - 80°C) reduce magnetic force. Frequent switching (>4 cycles / min) also leads to heating of the internal magnetic system and a reduced magnetic force.

- Acceleration forces:

When the workpiece is moved quickly, acceleration forces can occur that adversely affect the holding force. Always ensure that the acceleration forces on the workpiece are significantly lower than the holding force.

- Rigidity or ductility of the load:

Protruding parts of flexible loads may sag, resulting in a peeling effect that causes the load to come loose. Ensure an adequate number of E-Grippers at multiple engagement points to prevent sagging. Also provide a flexible attachment of the E-Grippers to compensate for sagging, preventing peeling.

Doubts about magnetic strength and limiting factors

Are you unsure about the conditions and whether they limit the magnetic force and holding power? Then conduct additional tests or consult Goudsmit's application specialists.

Recommended forces E-Grippers							
under ideal conditions - with safety factor 3 acc. EN13155							
no friction ring mounted				with friction ring mounted			
Steel thickness [mm]	HGE-SQ-052			Steel thickness [mm]	HGE-SQ-052		
	Airgap < 0,1mm	Airgap 0,1 - 0,25mm	Airgap 0,25 - 0,5mm		Airgap < 0,1mm	Airgap 0,1 - 0,25mm	Airgap 0,25 - 0,5mm
>= 1	30N	20N	20N	>= 1	25N	20N	20N
>= 2	60N	45N	30N	>= 2	50N	40N	25N
>= 3	100N	60N	40N	>= 3	90N	50N	30N
>= 4	135N	70N	40N	>= 4	130N	60N	35N
>= 5	150N	70N	40N	>= 5	140N	60N	35N
Steel thickness [mm]	HGE-SQ-070			Steel thickness [mm]	HGE-SQ-070		
	Airgap < 0,1mm	Airgap 0,1 - 0,25mm	Airgap 0,25 - 0,5mm		Airgap < 0,1mm	Airgap 0,1 - 0,25mm	Airgap 0,25 - 0,5mm
>= 3	120N	90N	60N	>= 3	110N	80N	50N
>= 4	185N	125N	70N	>= 4	175N	115N	55N
>= 5	240N	150N	75N	>= 5	220N	130N	60N
>= 6	315N	165N	80N	>= 6	260N	135N	65N
>= 8	330N	170N	80N	>= 8	300N	140N	70N
Steel thickness [mm]	HGE-SQ-090			Steel thickness [mm]	HGE-SQ-090		
	Airgap < 0,1mm	Airgap 0,1 - 0,25mm	Airgap 0,25 - 0,5mm		Airgap < 0,1mm	Airgap 0,1 - 0,25mm	Airgap 0,25 - 0,5mm
>= 5	300N	250N	180N	>= 5	300N	240N	170N
>= 6	380N	285N	185N	>= 6	375N	290N	175N
>= 8	530N	360N	190N	>= 8	520N	340N	180N
>= 10	740N	405N	200N	>= 10	710N	385N	190N
>= 12	750N	410N	200N	>= 12	720N	390N	190N