GOUDSMIT MAGNETICS

User instructions E-Gripper

Bi-stable Electro-Permanent Magnetic Gripper

Product key: HGE-SQ-xxx-FR-EP-P-I

Thank you for purchasing a Goudsmit HGE-SQ series E-Gripper. Read this manual carefully before operating the product and make sure you understand its capabilities and limitations. Keep this manual handy for future reference.



Intended use

HGE-SQ family E-Grippers are designed as so-called "End Of Arm Tool" for robots and manipulators to grab ferromagnetic products and workpieces by means of magnetism to manipulate them, for example by placing those workpieces in a processing machine or taking them out of a machine.

Safety, standards and guidelines

Take into account steel parts being attracted to the magnetic field as a projectile if they come within 10 cm of the magnetic gripper.

There is a risk of interference with the functioning of active implanted devices, e.g. pacemakers. Maintain a safety distance of at least 25 cm.

Observe the general hazards that can occur when lifting loads. Do not use the magnetic grippers in places where falling workpieces may injure persons. Provide adequate guards and instructions to users.

The CE mark confirms that the device complies with all EU regulations (ISO/IEC) applicable for this marking, including the EMC & RoHS directive.

Credit cards, watches, etc. may be damaged beyond repair if they come close to the magnet.

Ensure that all electrical connections are carried out by qualified personnel in accordance with all applicable laws and directives.

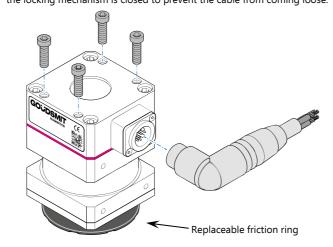
Technical specifications

For detailed specifications such as drawings, working load and tear off force, see website: www.goudsmitmagnets.com

- Magnetic on-off control: electrically switched with
 integrated electronic control.
- Sensors/detection: inductive sensors for product presence detection / temperature monitoring.
- Min./max. ambient temperature: min. 5°C / max. 40°C.
- Dust/water protection class: IP53.
- Coil insulation class B.
- Rated supply voltage: 24V DC (protected <21,6V / >29V).
- Peak current consumption during switching time: max 6A for 350msec.
- Duty cycle: 12x "on" & 12x "off" / min.
- Material of replaceable friction ring: NBR 70 shore A.
- Maximum permitted acceleration forces with friction ring installed: 20m/s² in all directions and positions provided there are no limiting factors that reduce magnetic force.

Installation and commissioning

Mount the E-Gripper to your robot arm or manipulator with 4 threaded bolts. The E-Gripper is equipped with an integrated microprocessor, electronics and sensors and is connected with only one "power & logic" cable to the power supply and PLC line control. Make sure the cable is securely connected and the locking mechanism is closed to prevent the cable from coming loose.



The connection cable is not part of the delivery and must be ordered separately. Cables are available with straight and angled plugs in various lengths. See website: www.goudsmitmagnets.com. The black NBR friction ring can be replaced when worn out, for spare parts see website: www.goudsmitmagnets.com.

Wiring

Caution: Only qualified personnel should perform electrical connections following European standards and guidelines. Prior to making any connections, ensure the power supply is switched off. It is crucial to connect the copper cable shield to ground.

Wire	Size	Туре	Function / Signal	Note
Red	2,5mm²	Power +	Power supply +24VDC/6A	Switching max 6A / 250ms Nominal 30mA
Black	2,5mm²	Power -	Power supply 0VDC	
White	0,25mm ²	Digital input 1 DI1	Magnet ON 24V/1mA	24V 10ms pulse
Green	0,25mm²	Digital input 2 DI2	Magnet OFF 24V/1mA	24V 10ms pulse
Yellow	0,25mm ²	Analog input 1 AI1	Optional Force setting 1 – 10V / 1mA	0V = 100% 1V - 10V 10% - 100%
Grey	0,25mm ²	Digital output 1 DO1	Feedback magnet state 24V / 1mA	24V = OFF 0V = ON
Pink	0,25mm ²	Digital output 2 DO2	Feedback product presence 24V / 1mA	24V = undetected 0V = detected
Purple	0,25mm ²	Digital output 3 DO3	Feedback malfunction 24V / 1mA	24V = no error 0V = error
Blue	0,25mm ²	Digital input 3 DI3	Reserve	Reserve
Brown	0,25mm ²	Digital output 4 DO4	Reserve	Reserve
Braiding sleeve	2,5mm²	Shielding	Grounding	

Operating cycle

The E-Gripper is equipped with all-round LED lighting that indicates the gripper's status through various colours and or flashing signals. Further in this manual, you will find an operational flowchart that provides additional clarification.

Explanation of the successive stages that the E-Gripper may go through during normal operation:

Stage	Switching state description	Light signal		
0	Power off, magnet off, no product detected.	off		
Α	Action: Switch on power			
	Power on, magnet off, no product detected.	continuous		
В	Action: Move the gripper to the workpiece location to detect the product.			
	Power on, magnet off, product presence is detected.	continuous		
С	Action: Switch gripper on. (DI1)			
	Power on, magnet on, product detected.	continuous		
D	Action : Move the workpiece to the location for the ne operation.	ext		
E	Action: Switch off the gripper (DI2) (the light signal ch green to light blue as long as the product is detected)	2		
	Power on, magnet off, product still detected.	continuous		
В	Action: Move the gripper away from the workpiece to the next location.			
	Power on, magnet off, no product detected.	continuous		
	Repeat cycle			

When the gripper is placed on a product and the light signal does not turn light blue, this may be due to too large air gap or excessive perforations in the workpiece. To resolve this issue, improve the gripper's touch.

Trouble shooting

Description of the stages the E-Gripper may encounter during a fault.

If a grabbed product is lost during the operating cycle, the feedback signal "product presence" drops and the gripper goes into failure.

Fault	Fault description	Light signal	
Product lost	Product has released while magnet is on.	blinking	
	Action: Remove the lost product and reset the E-Gripper		
	by switching off the magnet. (DI2)		

Check if the product was lost due to a blockage or if there were other factors that led to insufficient magnetic force. Read the manual to examine possible causes.

In exceptional cases, the internal temperature of the E-Gripper may become too high due to excessive ambient temperature and/or exceptionally frequent switching. Wait for the gripper to cool down. Once cooled down, the gripper will revert to its previous stage.

Temperature	Internal temperature too high.	blinking	
Action: Wait for the gripper to cool down. Or down, the E-Gripper will return to its previous			
The second state of the se			

Tip, at ambient temperatures above 30°C do not switch on and off the E-Gripper more often than 12 times per minute.

Power	Voltage is too low or too high	blinking
	Action: If there is a voltage drop during swi recommend raise the supply voltage or usin power supply.	
	After power is restored, the gripper returns stage.	to the previous

Attainable magnetic force

The E-gripper 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.



<10cm

<25cm

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%

Advised working loads

Workpieces with the weights listed here can be lifted under ideal conditions. A safety factor of 3 according to EN13155 has been taken into account.

no	friction	ring mou	nted	with	frictio	n ring mo	ounted
Charal	HGE-SQ-052				HGE-SQ-052		
Steel thickness	Airgap [mm]			Steel thickness	Airgap [mm]		
[mm]	Airgap < 0,1	Airgap 0,1 - 0,25	Airgap 0,25 - 0,5	[mm]	Airgap < 0,1	Airgap 0,1 - 0,25	Airgap 0,25 - 0,5
>= 1 >= 3 >= 5	The HGE-SQ-052 will be launched at the end of 2023			>= 1 >= 3 >= 5	The HGE-SQ-052 will be launched at the end of 2023		
Steel	HGE-SQ-070		Steel	HGE-SQ-070			
thickness [mm]	Airgap < 0,1	Airgap 0,1 - 0,25	Airgap 0,25 - 0,5	thickness [mm]	Airgap < 0,1	Airgap 0,1 - 0,25	Airgap 0,25 - 0,5
>= 3 >= 5	16kg 28kg	13kg 22kg	10kg 15kg	>= 3	14kg 22kg	12kg 17kg	10kg 12kg
>= 8	32kg	24kg	16kg	>= 8	25kg	20kg	13kg
Steel	HGE-SQ-090			Steel	HGE-SQ-090		90
thickness [mm]	Airgap < 0,1	Airgap 0,1 - 0,25	Airgap 0,25 - 0,5	thickness [mm]	Airgap < 0,1	Airgap 0,1 - 0,25	Airgap 0,25 - 0,5
>= 5 >= 8 >= 12	The HGE-SQ-090 will be launched at the end of 2023			>= 5 >= 8 >= 12	The HGE-SQ-090 will be launched at the end of 2023		

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, films, 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, for example because the workpiece is perforated or difficult to touch, 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 heats up the internal magnetic system.

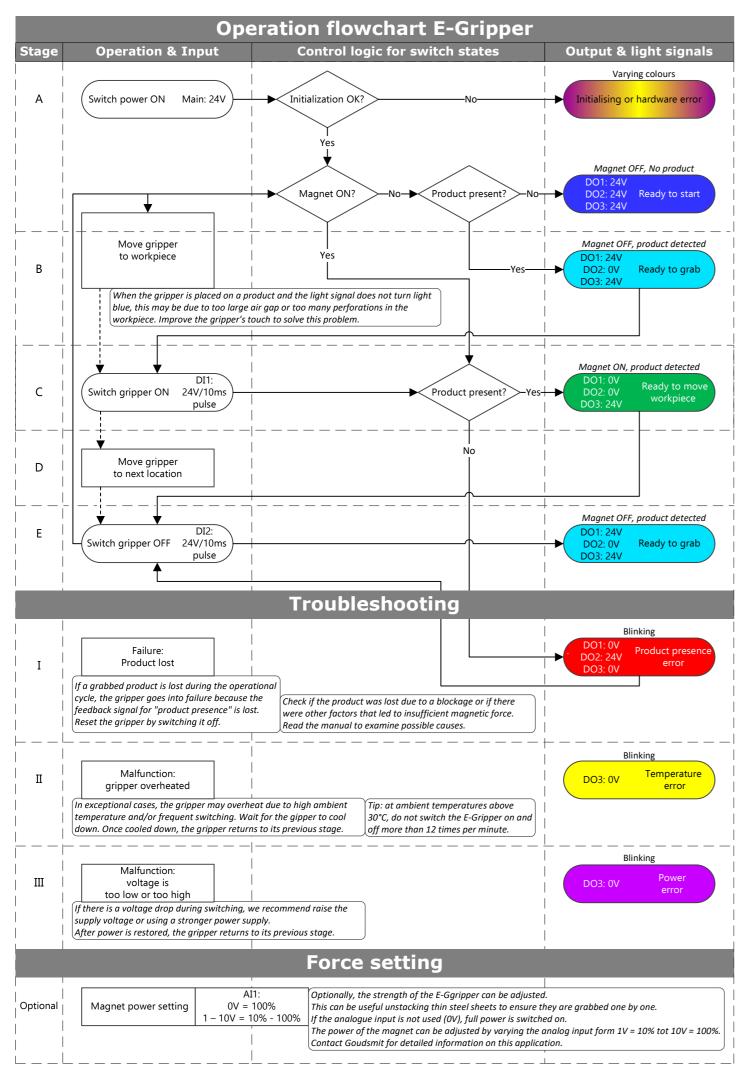
Acceleration forces:

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 flexibility of the load:

Protruding parts of flexible loads may sag, creating a peeling effect that significantly reduces holding force. Provide enough magnetic grippers at multiple engagement points to prevent sagging. Also provide flexible suspension of the magnetic grippers to accommodate any sagging.

• Doubts about magnetic strength and limiting factors: In doubt about the conditions and whether they will limit magnetic forces and holding power? Then do additional tests or consult Goudsmit's application specialists.

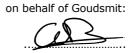




EU Declaration of	Conformity	
Manufacturer:		Ce
Goudsmit Magnetic Sy Petunialaan 19 5582 HA Waalre The Netherlands	stems B.V.	
Herewith we declare, on our	own responsibility, that the device:	
	E-gripper / bistable electro-permanent magnet gripper HGE(Z)-SQ- <i>xxx-xx-xx-x-x</i>	
Meets the requirements of th - EMC Directive 201	ne following European Directives: 4/30/EU	
Applied harmoniz	ed standard(s):	
– IEC EN	61000-6-4(2007)	
	2011/65/EU + RoHS-3 (EU) 2015/863	
UK Declaration of	Conformity	
Manufacturer:		UK CA
Goudsmit Magnetic Sy Petunialaan 19 5582 HA Waalre The Netherlands	stems B.V.	
Authorized representative:		
Goudsmit Magnetics (U 1st Floor, Riverview The Green Tullynacross Road Lisburn, BT27 5SR UK	JK) Ltd	
Herewith we declare, on our	own responsibility, that the device:	
Article description: Product key(s):	E-gripper / bistable electro-permanent magnet gripper HGE(Z)-SQ- <i>xxx-xx-xx-x-x</i>	
Meets the requirements of th	ne following Regulations:	
- Electromagnetic C	ompatibility Regulations 2016	
Applied designate	1 , 5	
	00-6-4(2007)	
- Restriction of the	Use of Certain Hazardous Substances in Ele uipment Regulations 2012 (as amended) (Re	

Waalre, The Netherlands, 19-10-2023

Signature manufacturer:



Alwin de Bruine, Compliance Engineer

Warranty

The warranty on your magnetic gripper is void if it has been improperly refurbished, modifications have been made, the nameplate has been removed or if the magnetic gripper is used improperly, incorrectly or other than for magnetic handling of ferromagnetic products. If in doubt about maintenance or use, please contact Goudsmit Magnetics.