

ORIGINAL INSTRUCTIONS

# Instruction Manual

# Magnet Gripper for Collaborative Robots MHM-25D-X7400A-ASSISTA(-P)



The intended use of this magnet gripper is to convert the potential energy provided by compressed air into a force which causes mechanical movement of a magnet which can then attract a suitable workpiece.

## **1 Safety Instructions**

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) <sup>\*1</sup>, and other safety regulations.

 <sup>(1)</sup> ISO 4414: Pneumatic fluid power - General rules relating to systems.
 ISO 4413: Hydraulic fluid power - General rules relating to systems.
 IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)

ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

A Caution	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
A Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
▲ Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

#### Warning

- Always ensure compliance with relevant safety laws and standards.
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

## 2 Specifications

#### 2.1 Product Specifications

Medium		Air
Action		Double Acting
Operating Pressure [MPa]		0.2 to 0.6
Proof Pressure [MPa]		0.9
Ambient and Operating Temperature [C]		-10 to +50 (No Freezing)
Gripping Force	Workpiece = 2mm	160 N
(0.5 MPa)	Workpiece = 6mm	200 N
Residual Holding F	Force	0.3 N or less
Lubrication		Not Required
Mass [grams]		780
Auto Switch Mode		D-M9P,D-M9N
Cable Type		M8 8-Pin Connector (Socket) M12 8-Pin Connector (Plug)

# 2.2 Individual Specifications

## 2.2.1 Magnet Gripper

Medium		Air
Action		Double Acting
Operating Pressur	e [MPa]	0.2 to 0.6
Proof Pressure [M	Pa]	0.9
Ambient and Operating Temperature [C]		-10 to +60 (No Freezing)
Gripping Force	Workpiece = 2mm	160 N
(0.5 MPa)	Workpiece = 6mm	200 N
Residual Holding F	orce	0.3 N or less

2 Specifications - continued	
Lubrication	Not Required
Mass [grams]	244

 Mass [grams]
 244

 Note: The gripping force is a theoretical holding force when a low carbon steel plate is held by a surface attraction surface.

#### 2.1.1 3-Port Solenoid Valve (V114-5LU)

Fluid	Air
Ambient and Fluid Temperature [C]	-10 to +50 (No Freezing)
Response time (DC) [ms]	ON: 5 or less
	OFF: 4 or less
Maximum Operating Frequency [Hz]	20
Lubrication	Not Required
Mounting Position	Unrestricted
Impact / Vibration Resistance [m/s2]	150 / 30
Enclosure Rating	Dust proof
Electrical Entry	L-plug connector
Coil Rated Voltage [V]	24
Allowable Voltage Fluctuation	-10 to +10%
Power Consumption [W]	0.4 [Starting 0.4, Hold. 0.1]
Indicator LED	L ED

#### 2.1.2 Auto Switch (D-M9N or D-M9P)

D-M9N	D-M9P
In-line	
3-wire	
NPN type	PNP type
IC Circuit, Relay, PLC	
DC5 • 12 • 24V (4.5 to 28V)	
10 mA or less	
DC28V or less	-
40 mA or less	
0.8 V or less at 10 mA (2 V or less at 40 mA)	
100 µA or less at 24 VDC	
Red LED illuminates when turned ON.	
	D-M9N In-line 3-wire NPN type IC Circuit, Relay, PLC DC5 • 12 • 24V (4.5 to 10 mA or less DC28V or less 40 mA or less 0.8 V or less at 10 mA ( 100 µA or less at 24 VE Red LED illuminates wh

# **3 Installation**

3.1 Installation

#### Caution

- Do not install the product unless the safety instructions have been read and understood.
- · Allow sufficient space for maintenance and inspection.
- When the magnet moves towards the magnetic attraction surface, holding force is generated on the attraction surface. Make sure that the holding force is not generated when working around the magnetic gripper so that your fingers do not get caught in the magnet gripper.

## Warning

- Do not scratch or dent the magnet gripper by dropping or bumping it when mounting. Even a slight deformation can cause malfunction.
- Be careful with the magnetic attraction of parts of objects around the magnet gripper when mounting the magnet gripper while it is in its holding position (the piston is on the attraction side).
- When mount the product, tighten it with screws of appropriate length at an appropriate torque. Tightening with a torque greater than the specified torque can cause malfunction, while insufficient torque will cause slippage and dropping.
- Do not apply impact load to the centre of the magnetic attraction surface, as it may result in breakage or malfunction.



#### 3.1.1 How to mount magnet gripper

• Set the three connectors at the end of the robot hand according to the characters printed on the flange. The connectors are set in the direction of the arrows, see **Figure 1**.

# **3 Installation - continued**



 Make sure to adjust the robot arm position before mounting so that the mounting is easier to access, and mount using the Hexagon Socket Head Cap Screws (M5x10) and tighten to a maximum 6.3 N.m torque, see Figure 2.



 Mount to the robot arm using Hexagon Socket Head Cap Screws (M6x23) and tighten to a maximum 6.3 N.m torque. It is important to use a positioning pin to ensure all mounting holes align, see Figure 3.
 Mount the conversion cable to the M8 Connector, see Figure 4.



- 3.1.1 Mounting the One-touch fitting and coil tubing
- Remove one of the outlet piping plugs (No.1 to No.4) and mount a Onetouch fitting (KQ2L04-M3G1), see Figure 5.

# 3 Installation - continued



- Connect the One-touch fitting and magnet gripper with a coil tube (TCU0425B-1).
- Remove four cross recessed round head screws (M4) on the robot body base and remove the base cover slowly. The robot body interferes with the base cover during removal due to its position, so change the robot body position with the jog operation so that the base cover can be removed smoothly, see **Figure 6**.



- Remove Ø4 tubing (No.1 to No.4) and Ø6 tubing (white) from the opening.
- Connect Ø4 tubing {tubing No. should be the same as the air port No. to which the One-touch fitting is connected in step 1 above)} and white Ø6 tubing with a One-touch fitting (KQ2H04-06A1), see Figure 7.



Figure 7

# 3.1.2 Connector and Pin Layout



PIN #	Function	Description
1	GND	Power Supply for 0 VDC
2	+24V	Power Supply for 24 VDC
3	Valve ON/OFF (For released position)	-
4	Valve ON/OFF (For holding position)	-
5	-	NC
6	-	NC
7	Auto Switch (For holding position)	-
8	Auto Switch (For released position)	-

## 3 Installation - continued

#### 3.1.3 Gripping Force – Holding Conditions

• To lift workpieces **vertically**, be sure to take into consideration; acceleration rate, air pressure, impact etc in addition to workpiece mass.



• Consider the **centre of gravity** of the workpiece to avoid moments being applied to the magnet gripper, as much as possible.



• If using **multiple magnet grippers** to transfer a workpiece with a large surface area, ensure they are distributed evenly.



• Horizontal movement of the magnet gripper may cause "sideslip" of the workpiece depending on the acceleration or friction coefficient between pad and workpiece. In cases like this minimize the acceleration rate to reduce/prevent the lateral movement.



• Use the magnet gripper in a **horizontal** orientation, if using in an inclined or vertical orientation, use an adequate safety factor.



#### 3.2 Environment

#### **Warning**

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.
- Do not use this product in an area that is dusty or in an environment in which water or oil splashes on the product.

## 3.3 Piping

# **Caution**

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1 thread exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

#### 3.4 Lubrication

## **Caution**

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, refer to catalogue for details.

# 4 Settings

 The piston operating time during workpiece holding/release can be adjusted by adjusting the opening of the metering speed controller valve.



 $\textcircled$  Workpiece holding time: This represents the time required when the piston and magnet travel from the workpiece release position to the workpiece holding position.

<sup>(2)</sup> Workpiece release time: Time required when the piston and magnet travel from the workpiece holding position to the workpiece release position.



- Use a flat head blade screwdriver for adjusting the restriction of the metering valves.
- Keep the restriction of the two metering valves approximately the same. If they are different by too much, the operation is likely to become unstable.

#### 5 How to Order

Refer to customer drawing for 'How to Order'

# 6 Outline Dimensions

Refer to customer drawing for outline dimensions.

#### 7 Maintenance

#### 7.1 General Maintenance

Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.
- Do not allow people to enter or place objects in the carrying path of the air gripper.
- Do not put hands, etc, in between the air gripper fingers or attachments.

#### 7 Maintenance - continued

- When removing the air gripper, first confirm that no workpieces are being held and then release the compressed air before removing the air gripper.
- 7.2 Replacement Pad
- Remove the old pad.
- Place the new pad over the groove.
- Ensure that the pad is correctly in place and does not lift off the surface.



# 8 Limitations of Use

**8.1 Limited warranty and Disclaimer/Compliance Requirements** Refer to Handling Precautions for SMC Products.

## 9 Product Disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose this product correctly, in order to reduce the impact on human health and the environment.

## **10 Contacts**

Refer to <u>www.smcworld.com</u> or <u>www.smc.eu</u> for your local distributor/importer.

# **SMC** Corporation

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