

# Air Grippers for Collaborative Robots

Unitization of the peripheral devices required for gripper driving

Operation is possible simply by connecting 1 air supply tube and 1 electrical wire.

Built-in

Solenoid valve

Exhaust throttle valve with silencer

Auto switch

Fitting



New



RoHS

\* The attachment should be ordered separately by the customer.

## 3 types of grippers available for use with a variety of workpieces

Standard Type



RMHZ2 Series

3-Finger Type



RMHS3 Series

Long Stroke Type



RMHF2 Series

Can be used with the collaborative robots of 12 companies

UNIVERSAL ROBOTS, OMRON/TECHMAN ROBOT, FANUC, YASKAWA Electric, Mitsubishi Electric, HAN'S ROBOT, KUKA, DOOSAN ROBOTICS, SIASUN, JAKA, AUBO, ABB

Manual changer built in as standard

- Allows for easy tool changing and labor saving
- Tools can be secured by simply tightening the 2 clamber bolts.

Clamber bolt



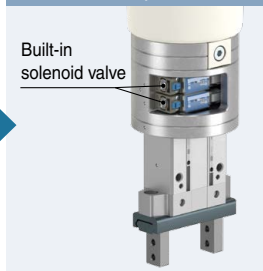
Air consumption reduced by up to 80%

Product with a separate solenoid valve



Unitized product

Built-in solenoid valve



**RMH** □ Series



CAT.ES160-7A

## Standard Type

### *RMHZ2 Series*

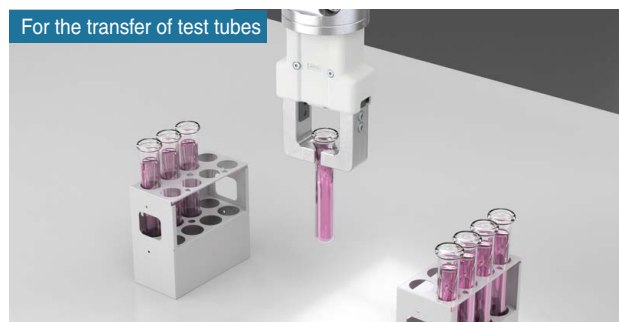
- High rigidity and precision are achieved by integrating the guide and finger.
- With high-precision linear guide

#### Specifications

Gripping force*1 Effective value per finger	External	54.2 N
	Internal	72.2 N
Opening/Closing stroke (Both sides)		14 mm
Weight		638 g*2

\*1 Gripping force is measured at a pressure of 0.5 MPa.

\*2 This is the value excluding the weights of the protective cover and connector cable.



## 3-Finger Type

### *RMHS3 Series*

- Suitable for axial gripping of cylindrical workpieces

#### Specifications

Gripping force*1 Effective value per finger	External	118 N
	Internal	130 N
Opening/Closing stroke (Both sides)		8 mm
Weight		776 g*2

\*1 Gripping force is measured at a pressure of 0.5 MPa.

\*2 This is the value excluding the weights of the protective cover and connector cable.



## Long Stroke Type p. 25

### RMHF2 Series

- The 64 mm long stroke is ideal for a variety of workpieces.
- Height reduced by approx. 35%  
(Compared with the standard type)
- Actuator position sensor mountable

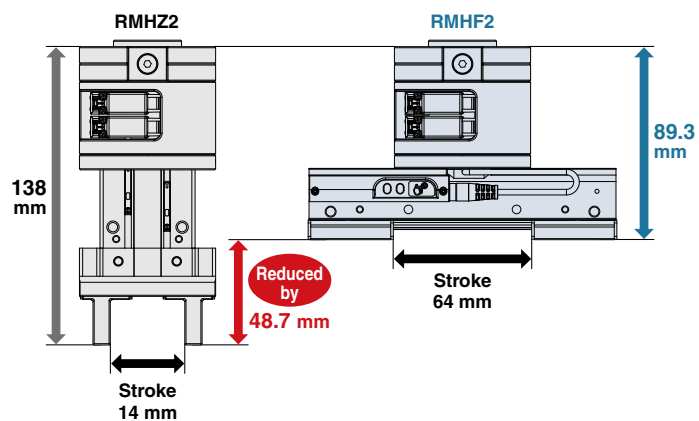
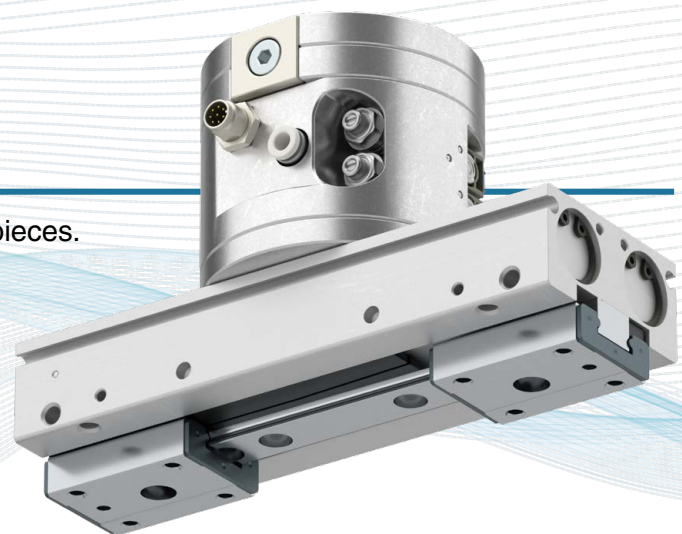
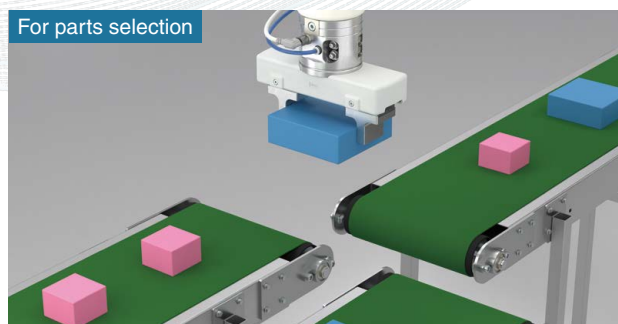
#### Specifications

Gripping force*1 Effective value per finger	90 N
Opening/Closing stroke (Both sides)	64 mm
Weight	945 g*2

\*1 Gripping force is measured at a pressure of 0.5 MPa.

\*2 This is the value excluding the weights of the protective cover and connector cable.

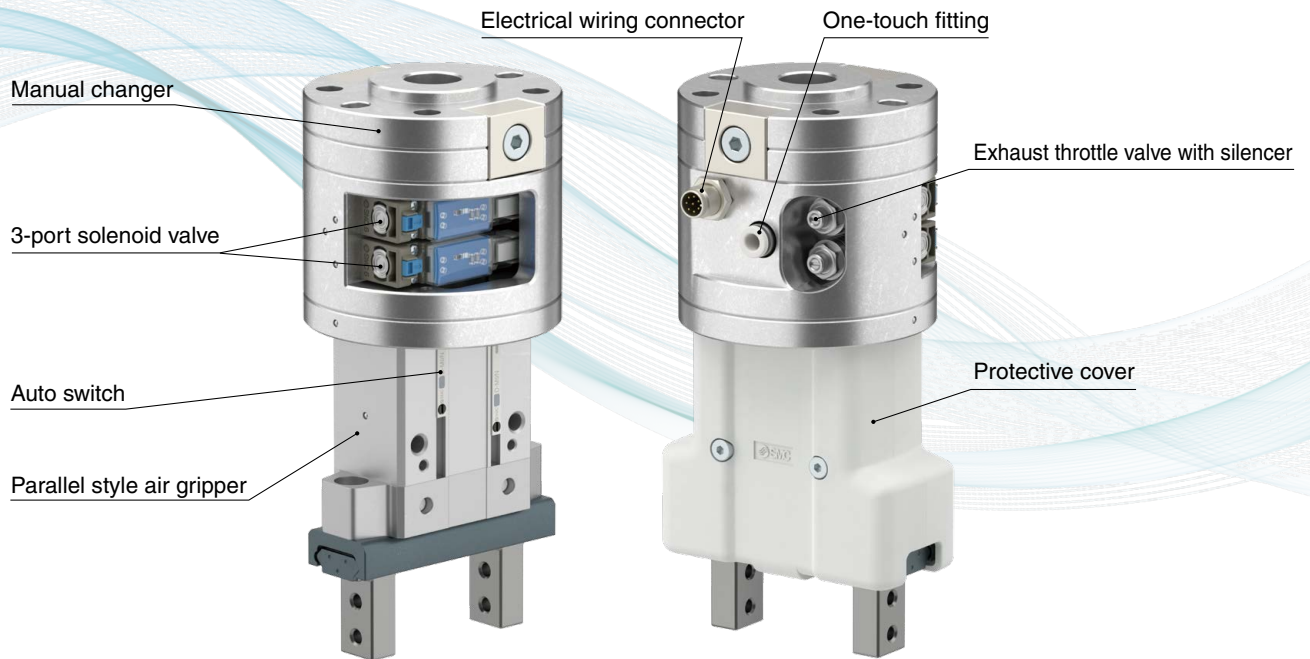
For parts selection



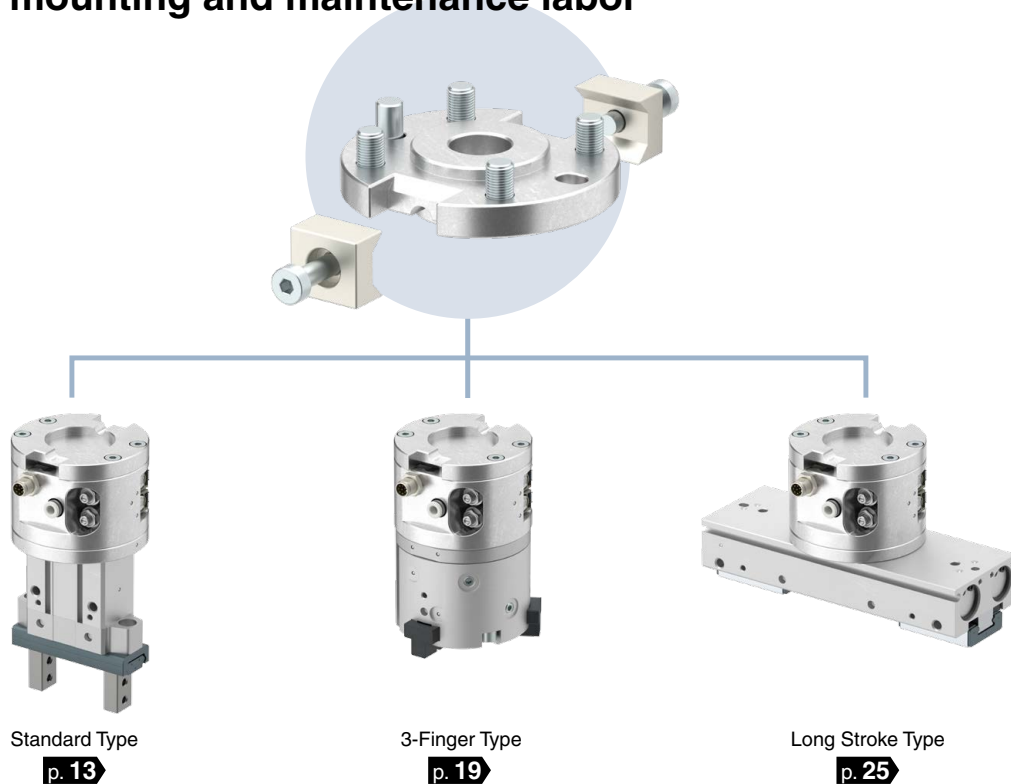


## ■ Easier mounting and maintenance

- A split protective cover for easy air gripper maintenance
- Standards: ISO 9409-1-50-4-M6



## ■ Easy tool changing via the manual changer Reduced mounting and maintenance labor





## ■ Air consumption reduced by up to 80%

- Air consumption is significantly reduced compared to when the solenoid valve is installed separately for the same type of model.

Product with a separate solenoid valve

Solenoid valve

Unitized product

Consumption air can be reduced because long piping is not required.

Built-in solenoid valve

Air Consumption Reduction by Model (Per stroke)

Model	Air consumption reduction
<b>RMHZ2</b>	80%
<b>RMHS3</b>	60%
<b>RMHF2</b>	20%

\* Conditions

- Piping I.D.:  $\phi 2.5$  mm
- Piping length: 2 m
- Number of pipes: 2
- Supply pressure: 0.5 MPa

## ■ An actuator position sensor can be mounted on the RMHF2. (Option)

(Collaborative robot manufacturer: Compatible with robots from UNIVERSAL ROBOTS and FANUC CORPORATION)

Workpiece length measurement and discrimination can be performed.

- The stroke position is output with an analog signal.
- Repeatability: 0.1 mm



## Series Variations

		Standard Type RMHZ2 Series	3-Finger Type RMHS3 Series	Long Stroke Type RMHF2 Series
Number of fingers		2	3	2
Gripping force	External gripping force [N]	54.2	118	90
	Internal gripping force [N]	72.2	130	90
Opening/Closing stroke (Both sides) [mm]		14	8	64
Piping diameter [mm]		4	4	4
Weight [g]		638	776	945
Options	Protective cover	●	●	●
	Connector cable	●	●	●
	Actuator position sensor	—	—	●
	Built-in valve	●	●	●
	Manual changer	●	●	●
	Plug-in software	●	●	●
Compatible robot manufacturer		12 companies	12 companies	12 companies

## Options

### Protective covers



For RMHZ2



For RMHS3



For RMHF2

### Connector cable



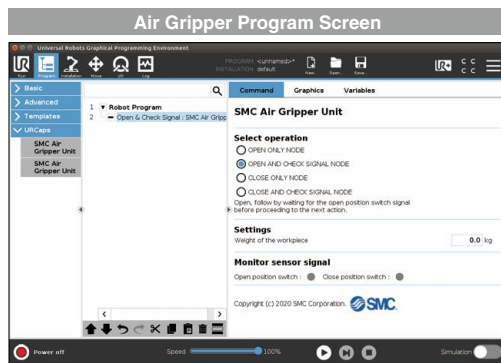
For applicable robots, refer to page 32.

## Plug-in Software

Compatible with robots from UNIVERSAL ROBOTS, OMRON Corporation/TECHMAN ROBOT, FANUC CORPORATION, and YASKAWA Electric Corporation

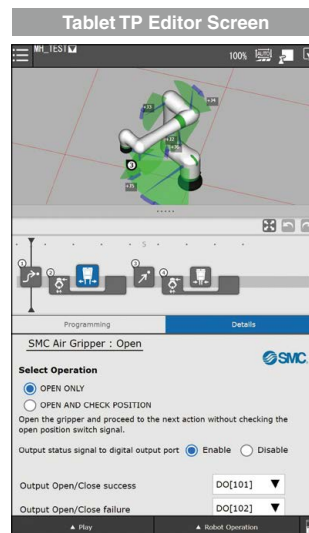
### UNIVERSAL ROBOTS

URCap



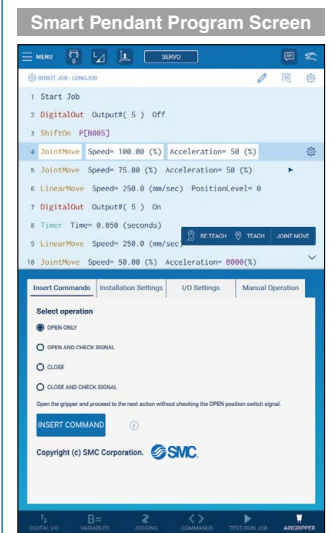
### FANUC

CRX Plug-in



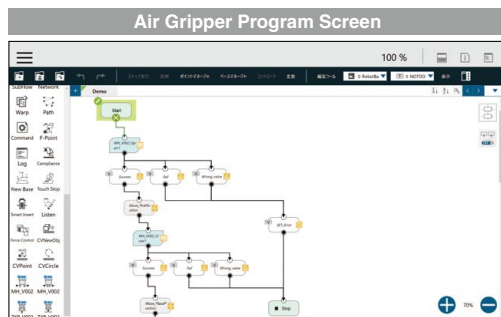
### YASKAWA Electric

YASKAWA Plug and Play Kit



### OMRON/TECHMAN ROBOT

TMComponent



## Compatible with the robots of 12 robot manufacturers

UNIVERSAL ROBOTS, OMRON/TECHMAN ROBOT, FANUC, YASKAWA Electric, Mitsubishi Electric, HAN'S ROBOT, KUKA, DOOSAN ROBOTICS, SIASUN, JAKA, AUBO, ABB

# C O N T E N T S

## Air Grippers for Collaborative Robots *RMH□ Series*

Model Selection ..... p. 7



### Air Gripper for Collaborative Robots/Standard Type

RMHZ2 Series

p. 13

How to Order ..... p. 13  
Specifications ..... p. 15  
Component Parts ..... p. 16  
Dimensions ..... p. 17  
Specific Product Precautions ..... p. 18

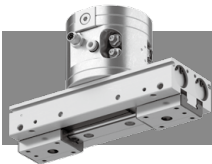


### Air Gripper for Collaborative Robots/3-Finger Type

RMHS3 Series

p. 19

How to Order ..... p. 19  
Specifications ..... p. 21  
Component Parts ..... p. 22  
Dimensions ..... p. 23  
Specific Product Precautions ..... p. 24



### Air Gripper for Collaborative Robots/Long Stroke Type

RMHF2 Series

p. 25

How to Order ..... p. 25  
Specifications ..... p. 27  
Component Parts ..... p. 28  
Dimensions ..... p. 29  
Specific Product Precautions ..... p. 31

Options ..... p. 32  
RMH□ Series/Precautions ..... p. 34

RMHZ2 Series

RMHS3 Series

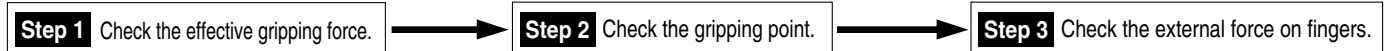
RMHF2 Series



# RMH□ Series Model Selection

## Checking whether a workpiece can be transferred

### Selection Procedure



### Step 1 Check the gripping force.



### Example

Workpiece mass: 0.2 kg → Guidelines for gripping force with respect to workpiece mass

Gripping method: External gripping → Guidelines for gripping force with respect to workpiece mass

Gripping point: 30 mm → Guidelines for gripping force with respect to workpiece mass

Operating pressure: 0.2 MPa → Guidelines for gripping force with respect to workpiece mass

**Guidelines for gripping force with respect to workpiece mass**

- Although conditions vary depending on the coefficient of friction between the attachment and the workpiece as well as the shape, adjust so that the gripping force is at least 5 to 10 times<sup>(\*)</sup> greater than the workpiece weight.
- \*1 Refer to the gripping force calculation explanatory drawing for more information.
- Further allowance should be provided when great acceleration or impact is expected during workpiece transfer.

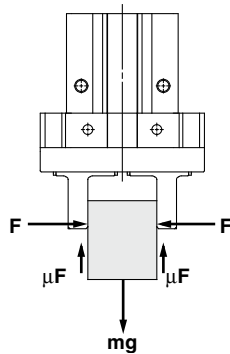
Example) For setting the gripping force to be at least 10 times greater than the workpiece weight:  
Required gripping force = 0.2 kg x 10 x 9.8 m/s<sup>2</sup> ≈ 19.6 N or more

**RMHZ2-20D External Gripping Force**

• When the RMHZ2-20D is used  
A gripping force of 20 N is obtained from the intersection point of gripping point L = 30 mm and a pressure of 0.2 MPa.

• Since a gripping force of 20 N satisfies the required gripping force of 19.6 N or more, the workpiece can be transferred by the RMHZ2-20D.

### Gripping force calculation explanatory drawing



#### “Gripping force at least 5 to 10 times greater than the workpiece weight”

• The “at least 5 to 10 times greater than the workpiece weight” recommended by SMC is calculated with a margin of “a” = 2, which allows for impacts that occur during transfer by collaborative robots, etc.

When $\mu = 0.2$	When $\mu = 0.1$
$F = \frac{mg}{2 \times 0.2} \times 2$	$F = \frac{mg}{2 \times 0.1} \times 2$
$= 5 \times mg$	$= 10 \times mg$
↑ 5 x Workpiece weight	↑ 10 x Workpiece weight

When gripping a workpiece as in the figure to the left, and with the following definitions,  
**F** : Gripping force [N]  
 $\mu$  : Coefficient of friction between the attachments and the workpiece  
**m** : Workpiece mass [kg]  
**g** : Gravitational acceleration (= 9.8 m/s<sup>2</sup>)  
**mg** : Workpiece weight [N]

the conditions under which the workpiece will not drop are

$$2 \times \mu F > mg$$

↑  
Number of fingers

and therefore,

$$F > \frac{mg}{2 \times \mu}$$

With “a” representing the margin, “F” is determined by the following formula:

$$F = \frac{mg}{2 \times \mu} \times a$$

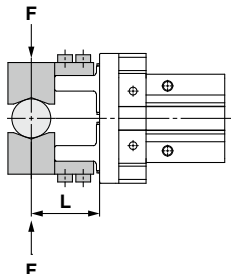
- (\*) - Even in cases where the coefficient of friction is greater than  $\mu = 0.2$ , or the number of fingers is 3, for safety reasons, select a gripping force which is at least 5 to 10 times greater than the workpiece weight, as recommended by SMC.
- This product has a smaller margin than our standard grippers as it is designed for use with a collaborative robot (acceleration 1000 mm/s<sup>2</sup>, speed 250 mm/s). However, the gripping force margin should be increased in the following cases.
  - For large accelerations or impacts exceeding the above, a larger margin should be considered.
  - If the finger and workpiece contact surfaces are small, even if the gripping force is 5 to 10 times the workpiece weight, there is a risk of the workpiece falling. A material with a high coefficient of friction such as rubber is recommended for the end of the finger.
  - To check whether a workpiece can be transferred under the actual conditions (such as the finger shape, material, grip method, amount of acceleration, and ambient environment), the customer must conduct a workpiece transfer test.

## Checking whether a workpiece can be transferred/**RMHZ2**

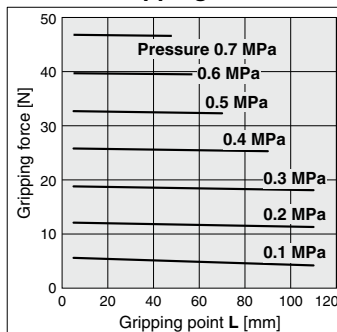
### Step 1 Check the effective gripping force.

The gripping force shown in the graphs represents the gripping force of one finger when all fingers and attachments are in contact with the workpiece.  
 F = One finger thrust

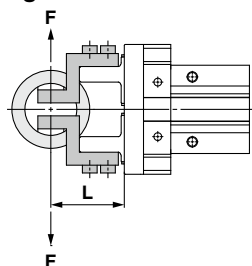
#### External gripping state



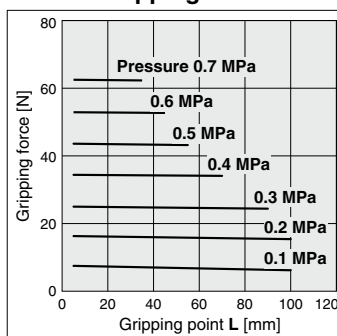
#### External Gripping Force



#### Internal gripping state



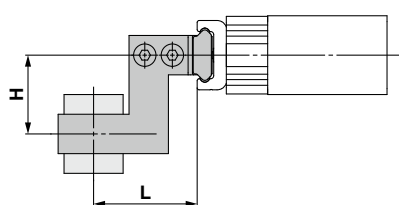
#### Internal Gripping Force



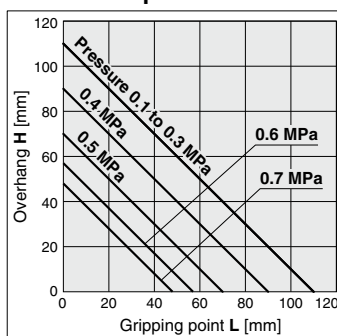
### Step 2 Check the gripping point.

- The air gripper should be operated so that the workpiece gripping point "L" and the amount of overhang "H" stay within the range shown for each operating pressure given in the graphs below.
- If the workpiece gripping point goes beyond the range limits, this will have an adverse effect on the life of the air gripper.

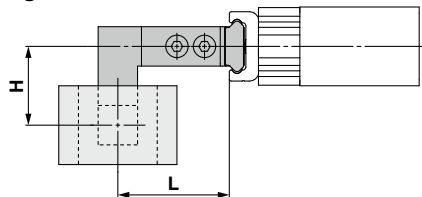
#### External gripping state



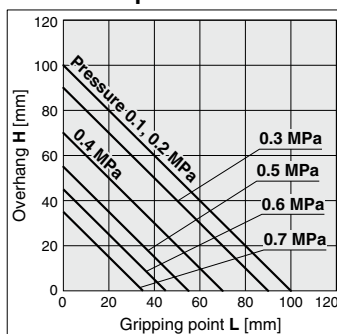
#### External Grip



#### Internal gripping state



#### Internal Grip



RMHZ2 Series

RMHS3 Series

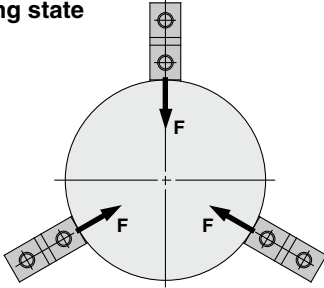
RMHF2 Series

## Checking whether a workpiece can be transferred/RMHS3

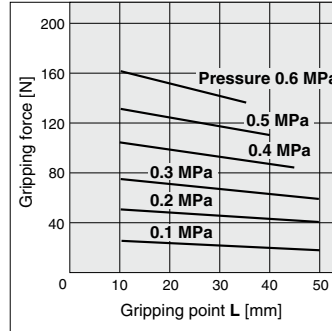
### Step 1 Check the effective gripping force.

The gripping force shown in the graphs represents the gripping force of one finger when all fingers and attachments are in contact with the workpiece.  
 $F$  = One finger thrust

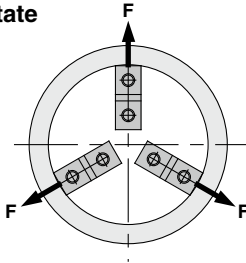
#### External gripping state



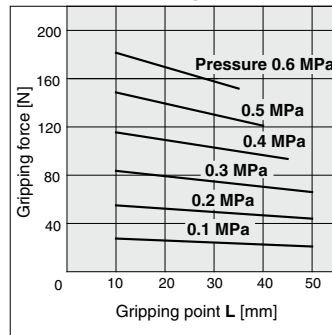
#### External Gripping Force



#### Internal gripping state



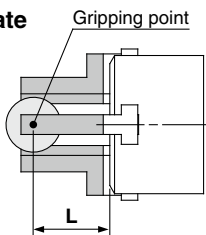
#### Internal Gripping Force



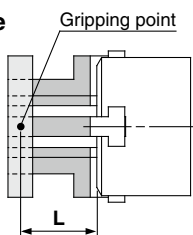
### Step 2 Check the gripping point.

The workpiece gripping point distance should be within the gripping force ranges given for each pressure in the effective gripping force graphs (Step 1).  
 If operated with the workpiece gripping point beyond the indicated ranges, an excessive offset load will be applied to the sliding section of the fingers, which can have an adverse effect on the service life of the product.

#### External gripping state



#### Internal gripping state



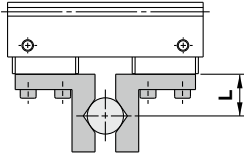


## Checking whether a workpiece can be transferred/**RMHF2**

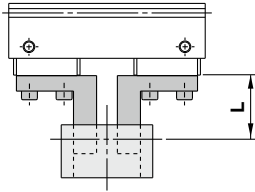
### Step 1 Check the effective gripping force.

The gripping force shown in the graph represents the gripping force of one finger when all fingers and attachments are in contact with the workpiece.  
F = One finger thrust

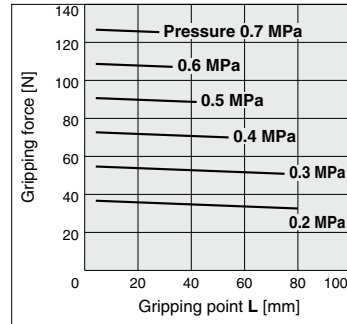
#### External gripping state



#### Internal gripping state



#### External/Internal Grip

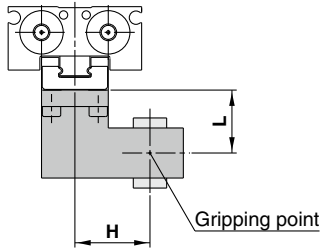


### Step 2 Check the gripping point.

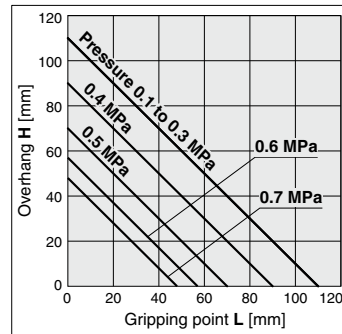
The air gripper should be operated so that the workpiece gripping point "L" and the amount of overhang "H" stay within the range shown for each operating pressure given in the graphs below.

If the workpiece gripping point goes beyond the range limits, this will have an adverse effect on the life of the air gripper.

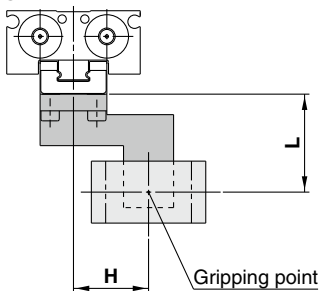
#### External gripping state



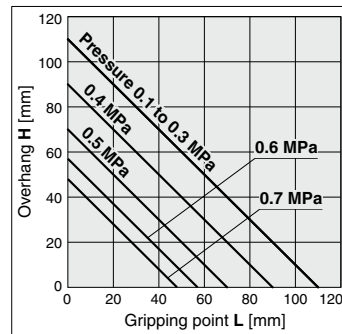
#### External Grip



#### Internal gripping state

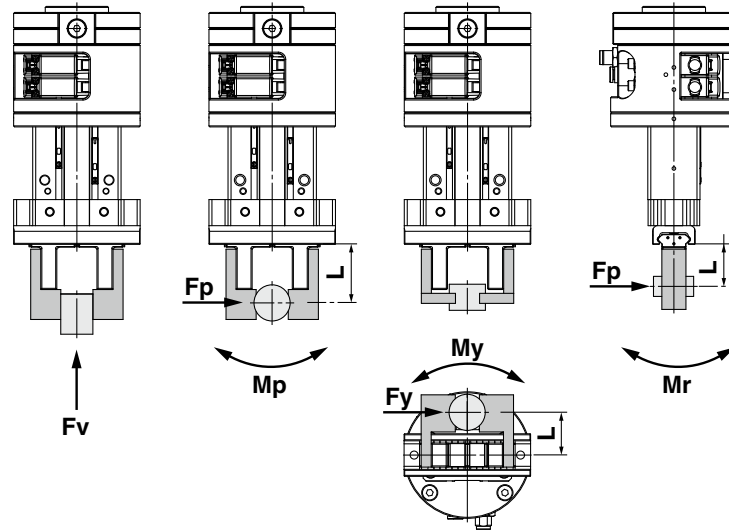


#### Internal Grip



## Checking whether a workpiece can be transferred

### Step 3 Check the external force on fingers.



Model	Max. allowable moment/load*1, *2			
	Vertical load <b>Fvmax</b> [N]	Pitch moment <b>Mpmax</b> [N·m]	Yaw moment <b>Mymax</b> [N·m]	Roll moment <b>Mrmax</b> [N·m]
<b>RMHZ2-20</b>	176	2.1	2.1	4.2
<b>RMHF2-16</b>	176	1.4	1.4	2.8

\*1 Inertial loads will be generated at the stroke end when the product is used for transportation. Consider the rate of acceleration.

\*2 Ensure moments and loads are the allowable values or less.

\* When combining a vertical load and moment, make sure the load factor is 1 or less according to the equation below.

$F_v/F_{vmax} + M_p/M_{pmax} + M_y/M_{ymax} + M_r/M_{rmax} \leq 1$  (Load factor)

\* For the RMHS, the above definition of moment does not apply. After confirming the workpiece weight and gripping force, check whether the workpiece can be transferred using the actual device.

#### For the RMHZ2 and RMHF2

\* The allowable values in the table vary from those of the single unit air gripper. For more information on single unit air grippers, refer to the JMHZ2-20D and MHF2-16D2 standard product catalogs.

**RMHZ2 Series**

**RMHS3 Series**

**RMHF2 Series**



# Air Gripper for Collaborative Robots Standard Type

# RMHZ2 Series



## How to Order

RMHZ2-20D- NO-NDE

1
2
3
4
5
6

### 1 Compatible robot

Refer to the "Table 1 Compatible Robot List."

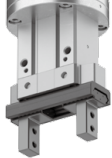

### 2 Switch selection

<b>N</b>	Auto switch (NPN)
<b>P</b>	Auto switch (PNP)

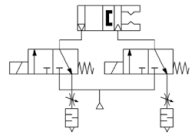
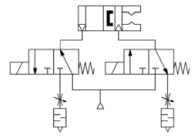
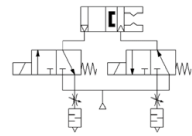
### 4 Robot connection cable

<b>Nil</b>	With connector cable
<b>N</b>	Without connection cable



### 5 Protective cover

<b>Nil</b>	Without protective cover	
<b>D</b>	With protective cover	

### 3 Valve option

Nil	O	C
Basic type	Normally open	Normally closed
		

### 6 Manual changer

<b>E</b>	With main plate assembly	
<b>F</b>	Without main plate assembly	

Refer to page 32 for how to mount the manual changer.

The main plate assembly is required to mount the gripper to the robot. In addition, when the main plate assembly is mounted to the robot, several different tool models can be used with the robot. Customers who already have a main plate assembly can select option "F" (Without main plate assembly).



**Table 1 Compatible Robot List**

Identification symbol	Switch selection	Robot manufacturer	Supported model	Switch output	Valve polarity	Identification symbol	Switch selection	Robot manufacturer	Supported model	Switch output	Valve polarity	
011	P	UNIVERSAL ROBOTS	UR3e	PNP	-COM	081	P	SIASUN	SCR3	PNP	-COM	
			UR5e						SCR5			
			UR10e						GCR3-620			
			UR16e						GCR5-910			
	GCR10-1300											
	GCR14-1400											
021	N	OMRON/TECHMAN ROBOT	TM5	NPN	+COM	091	N	JAKA	JAKA Zu3	NPN	+COM	
			TM12						JAKA Zu7			
			TM14						JAKA Zu12			
031	N	Mitsubishi Electric*1	MELFA ASSISTA (RV-5AS-D)	NPN	+COM	101	N	AUBO	AUBO-i3	NPN	+COM	
	P			PNP	-COM				AUBO-i5			
041	N	YASKAWA Electric*1	MOTOMAN-HC10	NPN	+COM	111	P	HAN'S ROBOT	E03	PNP	-COM	
	P				PNP				-COM			E05
042	N		MOTOMAN-HC10DT	NPN	+COM	121	P	ABB	Gofa	PNP	-COM	
	P				PNP				-COM			
043	N		MOTOMAN-HC10(S)DTP	NPN	+COM	071	P	DOOSAN ROBOTICS	H2017	PNP	-COM	
									P			MOTOMAN-HC20(S)DTP
	MOTOMAN-HC10(S)DTP			PNP	-COM							
									MOTOMAN-HC20(S)DTP			PNP
			M1013									
			M1509									
051	P	FANUC	CRX-5iA	PNP	-COM							
			CRX-10iA(L)									
			CRX-20iA									
			CRX-25iA									
061	P	KUKA	LBR-iiwa (Media flange: I/O Pneumatic only)	PNP	-COM							

\*1 When a Mitsubishi Electric Corporation or YASKAWA Electric Corporation product is selected, a dedicated flange is included. Refer to page 33 for details.

\* Please contact our nearest sales office for the compatibility with robots not listed in the compatible robot list.

RMHZ2 Series

RMHS3 Series

RMHF2 Series

# RMHZ2 Series

## Specifications

Item		Specification	
Common	Standards	Compliant with ISO 9409-1-50-4-M6*1	
	Fluid	Air	
	Operating pressure	0.1 to 0.7 MPa	
	Ambient and fluid temperatures	-10 to 50°C*2	
	Repeatability	±0.01 mm	
	Max. operating frequency	120 C.P.M.	
	Lubricant	Non-lube	
	Action	Double acting	
	Gripping force Effective value per finger	External	54.2 N*3
		Internal	72.2 N*3
	Opening/Closing stroke (Both sides)	14 mm	
	Weight	638 g*4	
	Connector type	M8, 8-pin (Plug)	
	Air pressure supply (P) port	One-touch fitting (ø4)	
Power supply voltage	24 VDC ±10%*2		
Solenoid valve	Model	V114	
Auto switch	Model	D-M9N/D-M9P	
Exhaust throttle valve	Model	ASN2-M5-X937	

\*1 Robots whose end effector mounting standard differs are equipped with a dedicated mounting flange. (Refer to page 14.)

\*2 Only when the compatible robot is KUKA's LBR-iiwa, the power supply voltage is 24 VDC (-15%/+20%) and the max. operating temperature is 40°C.

\*3 These are values at the stroke center when the pressure is 0.5 MPa and the gripping point distance L is 20 mm.

\*4 This is the value excluding the weights of the protective cover and connector cable.

## Valve Specifications

Operating temperature	-10 to 50°C (40°C*1) No freezing
Manual override	Non-locking push type
Mounting orientation	Unrestricted (Based on gripper mounting orientation)
Enclosure	Dust-protected

\*1 For robot identification symbol 061P

## Solenoid Specifications

Coil rated voltage	24 VDC
Allowable voltage fluctuation	-10 to +10% (-15% to +20%*1)
Power consumption	0.4 W (0.55 W*1)
Surge voltage suppressor	Varistor

\*1 For robot identification symbol 061P

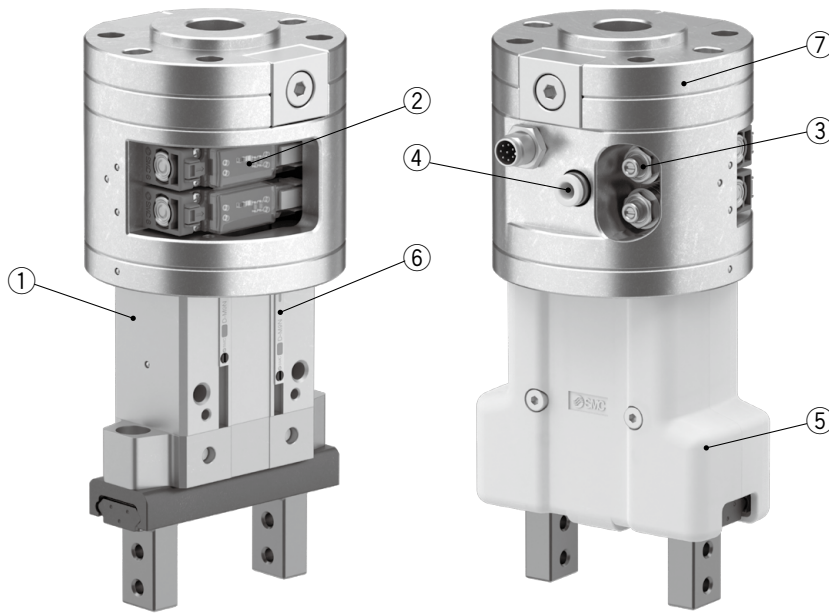
## Auto Switch Specifications

Output type	NPN/PNP (Depends on the robots)
Power supply voltage	24 VDC
Current consumption	10 mA or less
Load voltage	28 VDC or less (NPN)
Load current	40 mA or less
Internal voltage drop	0.8 V or less at 10 mA (2 V or less at 40 mA)
Leakage current	100 µA or less at 24 VDC

Refer to page 8 for more information on model selection using the effective "gripping force" and "gripping point."



## Component Parts



No.	Description
1	Gripper assembly
2	3-port solenoid valve
3	Exhaust throttle valve with silencer
4	One-touch fitting
5	Cover assembly
6	Auto switch assembly
7	Manual changer (Main plate assembly)

## Replacement Parts

Description		Order number	Included parts	
<b>Gripper assembly</b>		RMH-A13-01	①	
<b>Cover assembly</b>		RMH-A13-08	⑤, Mounting screw	
<b>Dedicated flange</b>	Mitsubishi Electric: 031N, 031P	JMHZ-A16-X7400-BRK-01	Dedicated flange, Mounting bolt	
	YASKAWA Electric: 041N, 041P	JMHZ-A16-X7400-BRK-02	Dedicated flange, Mounting bolt	
	YASKAWA Electric: 042N, 042P	JMHZ-A16-X7400-BRK-03		
<b>Auto switch assembly*1</b>	PNP	RMH-A00-05-P	⑥	
	NPN	RMH-A00-05-N		
<b>3-port solenoid valve</b>	Normally open*2	V124-5MOU	②	
	Normally closed	V114-5MOU		
	KUKA 061P	Normally open*2, *3		V114-5MOU-X647
		Normally closed*3		V124-5MOU-X647
<b>Main plate assembly</b>	Other than the following	RMH-A00-09-A	⑦	
	Identification symbol 071P, 081P, 101N	RMH-A00-09-B		
	Identification symbol 091N, 091P, 121P	RMH-A00-09-C		
<b>Connector cable</b>		Refer to page 32.		
<b>Piping plate assembly*2</b>		RMH-A00-06	Piping plate, Mounting bolt, O-ring	
<b>One-touch fitting</b>		KQ2S04-M5N	④	
<b>Exhaust throttle valve with silencer</b>		ASN2-M5-X937	③	

\*1 An auto switch assembly is an assembly part in which 2 auto switches are integrated into one part. When replacing an auto switch, replacement is conducted in units of auto switch assembly. An individual auto switch cannot be replaced.

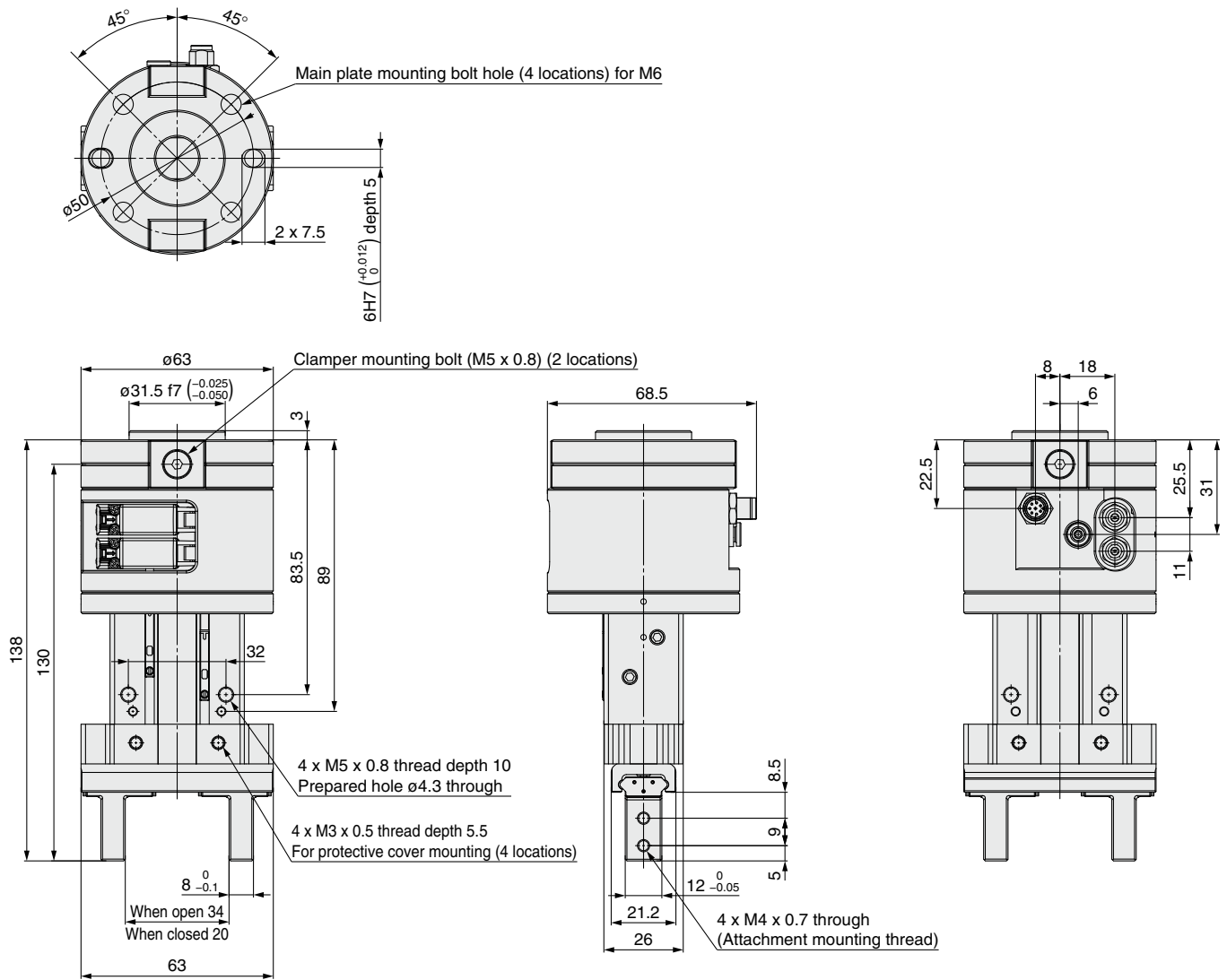
\*2 When installing a normally-open valve, a piping plate assembly is necessary. For details, refer to the operation manual.

\*3 When KUKA is used, a 3-port solenoid valve is available as a special order.

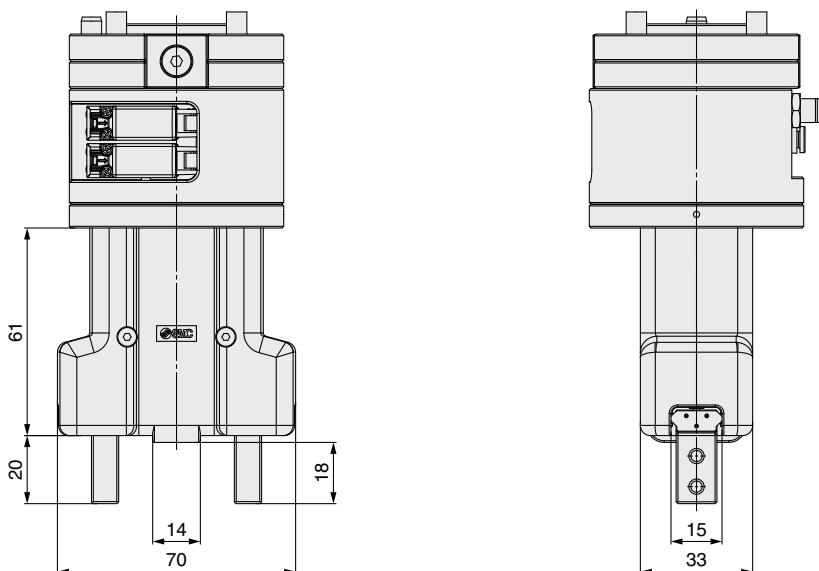
# RMHZ2 Series

## Dimensions

\* For Mitsubishi Electric Corporation and YASKAWA Electric Corporation collaborative robots, a dedicated flange is required for mounting. For details, refer to page 33.



### With protective cover mounted





# RMHZ2 Series Specific Product Precautions

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For air gripper and auto switch precautions, refer to the “Handling Precautions for SMC Products” and the “Operation Manual” on the SMC website: <https://www.smcworld.com>

## Operating Environment

### ⚠ Caution

Use caution for the anti-corrosiveness of the linear guide unit.

Martensitic stainless steel is used for the finger guide. However, the anti-corrosiveness of this steel is inferior to that of austenitic stainless steel. In particular, rust may be generated in environments where waterdrops are likely to adhere to the product due to condensation, etc.

## How to Use Body Tapped Holes

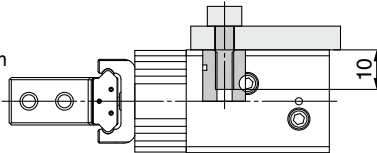
1. Do not scratch or dent the air gripper by dropping or bumping it when mounting.

Even a slight deformation can cause inaccuracy or malfunction.

### Body tapped hole

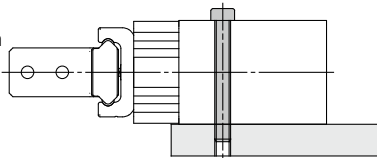
#### ● Body tapped

Applicable bolt: M5 x 0.8  
Tightening torque: 2.7 to 3.3 N·m  
Max. screw-in depth: 10 mm



#### ● Body through-holes

Applicable bolt: M4 x 0.7  
Tightening torque: 1.35 to 1.65 N·m



## Handling

### ⚠ Caution

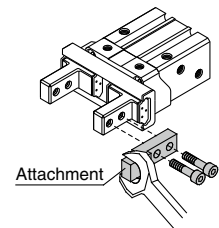
Finite orbit type guide is used in the actuator finger part. By using this, when there are inertial force which cause by movements or rotation to the actuator, steel ball will move to one side and this will cause a large resistance and degrade the accuracy. When there are inertial force which cause by movements or rotation to the actuator, operate the finger to full stroke.

## How to Mount Attachments

1. Tighten the screw within the specified torque range when mounting the attachment.

Tightening with a torque above the limit can cause malfunction, while insufficient tightening can cause slippage and dropping.

Make sure to mount the attachments on fingers with the tightening torque in the table below by using bolts, etc., for the female threads on fingers.



Applicable bolt	Tightening torque [N·m]
M4 x 0.7	1.35 to 1.65

# Air Gripper for Collaborative Robots 3-Finger Type

# RMHS3 Series



## How to Order

RMHS3-40D- NO-NDE

1
2
3
4
5
6

### 1 Compatible robot

Refer to the "Table 1 Compatible Robot List."

### 2 Switch selection

<b>N</b>	Auto switch (NPN)
<b>P</b>	Auto switch (PNP)

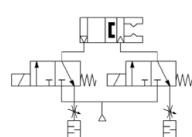
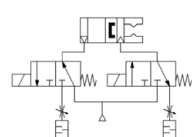
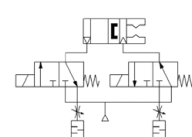
### 4 Robot connection cable

<b>Nil</b>	With connector cable
<b>N</b>	Without connection cable

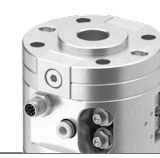

### 5 Protective cover

<b>Nil</b>	Without protective cover	
<b>D</b>	With protective cover	

### 3 Valve option

<b>Nil</b>	<b>O</b>	<b>C</b>
Basic type	Normally open	Normally closed
		

### 6 Manual changer

<b>E</b>	With main plate assembly	
<b>F</b>	Without main plate assembly	

Refer to page 32 for how to mount the manual changer.

The main plate assembly is required to mount the gripper to the robot. In addition, when the main plate assembly is mounted to the robot, several different tool models can be used with the robot. Customers who already have a main plate assembly can select option "F" (Without main plate assembly).



**Table 1 Compatible Robot List**

Identification symbol	Switch selection	Robot manufacturer	Supported model	Switch output	Valve polarity	Identification symbol	Switch selection	Robot manufacturer	Supported model	Switch output	Valve polarity					
011	P	UNIVERSAL ROBOTS	UR3e	PNP	-COM	081	P	SIASUN	SCR3	PNP	-COM					
			UR5e						SCR5							
			UR10e						GCR3-620							
			UR16e						GCR5-910							
	GCR10-1300															
	GCR14-1400															
021	N	OMRON/TECHMAN ROBOT	TM5	NPN	+COM	091	N	JAKA	JAKA Zu3	NPN	+COM					
			TM12						JAKA Zu7							
			TM14						JAKA Zu12							
	JAKA Zu3															
031	N	Mitsubishi Electric*1	MELFA ASSISTA (RV-5AS-D)	NPN	+COM	101	N	AUBO	AUBO-i3	NPN	+COM					
	P			PNP	-COM				AUBO-i5							
041	N	YASKAWA Electric*1	MOTOMAN-HC10	NPN	+COM	111	P	HAN'S ROBOT	E03	PNP	-COM					
	P			PNP	-COM				E05							
042	N		MOTOMAN-HC10DT	NPN	+COM				121			P	ABB	Gofa	PNP	-COM
	P			PNP	-COM											
043	N		MOTOMAN-HC10(S)DTP	NPN	+COM											
						P	MOTOMAN-HC20(S)DTP	PNP	-COM							
051	P	FANUC	CRX-5iA	PNP	-COM											
			CRX-10iA(L)													
			CRX-20iA													
			CRX-25iA													
061	P	KUKA	LBR-iiwa (Media flange: I/O Pneumatic only)	PNP	-COM											
071	P	DOOSAN ROBOTICS	H2017	PNP	-COM											
			H2515													
			M0609													
			M0617													
			M1013													
			M1509													

\*1 When a Mitsubishi Electric Corporation or YASKAWA Electric Corporation product is selected, a dedicated flange is included. Refer to page 33 for details.

\* Please contact our nearest sales office for the compatibility with robots not listed in the compatible robot list.

RMHZ2 Series

RMHS3 Series

RMHF2 Series



# RMHS3 Series

## Specifications

Item		Specification	
Common	Standards	Compliant with ISO 9409-1-50-4-M6*1	
	Fluid	Air	
	Operating pressure	0.1 to 0.6 MPa	
	Ambient and fluid temperatures	-10 to 50°C*2	
	Repeatability	±0.01 mm	
	Max. operating frequency	60 C.P.M.	
	Lubricant	Non-lube	
	Action	Double acting	
	Gripping force Effective value per finger	External	118 N*3
		Internal	130 N*3
	Opening/Closing stroke (Both sides)	8 mm	
	Weight	776 g*4	
	Connector type	M8, 8-pin (Plug)	
	Air pressure supply (P) port	One-touch fitting (ø4)	
	Power supply voltage	24 VDC ±10%*2	
Solenoid valve	Model	V114	
Auto switch	Model	D-M9N/D-M9P	
Exhaust throttle valve	Model	ASN2-M5-X937	

\*1 Robots whose end effector mounting standard differs are equipped with a dedicated mounting flange. (Refer to page 20.)

\*2 Only when the compatible robot is KUKA's LBR-iiwa, the power supply voltage is 24 VDC (-15%/+20%) and the max. operating temperature is 40°C.

\*3 These are values at the stroke center when the pressure is 0.5 MPa and the gripping point distance L is 30 mm.

\*4 This is the value excluding the weights of the protective cover and connector cable.

## Valve Specifications

Operating temperature	-10 to 50°C (40°C*1) No freezing
Manual override	Non-locking push type
Mounting orientation	Unrestricted (Based on gripper mounting orientation)
Enclosure	Dust-protected

\*1 For robot identification symbol 061P

## Solenoid Specifications

Coil rated voltage	24 VDC
Allowable voltage fluctuation	-10 to +10% (-15% to +20%*1)
Power consumption	0.4 W (0.55 W*1)
Surge voltage suppressor	Varistor

\*1 For robot identification symbol 061P

## Auto Switch Specifications

Output type	NPN/PNP (Depends on the robots)
Power supply voltage	24 VDC
Current consumption	10 mA or less
Load voltage	28 VDC or less (NPN)
Load current	40 mA or less
Internal voltage drop	0.8 V or less at 10 mA (2 V or less at 40 mA)
Leakage current	100 µA or less at 24 VDC

Refer to page 9 for more information on model selection using the effective "gripping force" and "gripping point."

## Component Parts



No.	Description
1	Gripper assembly
2	3-port solenoid valve
3	Exhaust throttle valve with silencer
4	One-touch fitting
5	Cover assembly
6	Auto switch assembly
7	Manual changer (Main plate assembly)

## Replacement Parts

Description		Order number	Included parts	
Gripper assembly		RMH-A26-01	①	
Cover assembly		RMH-A26-08	⑤, Mounting screw	
Dedicated flange	Mitsubishi Electric: 031N, 031P	JMHZ-A16-X7400-BRK-01	Dedicated flange, Mounting bolt	
	YASKAWA Electric: 041N, 041P	JMHZ-A16-X7400-BRK-02	Dedicated flange, Mounting bolt	
	YASKAWA Electric: 042N, 042P	JMHZ-A16-X7400-BRK-03		
Auto switch assembly*1	PNP	RMH-A00-05-P	⑥	
	NPN	RMH-A00-05-N		
3-port solenoid valve	Normally open*2	V124-5MOU	②	
	Normally closed	V114-5MOU		
	KUKA 061P	Normally open*2, *3		V114-5MOU-X647
		Normally closed*3		V124-5MOU-X647
Main plate assembly	Other than the following	RMH-A00-09-A	⑦	
	Identification symbol 071P, 081P, 101N	RMH-A00-09-B		
	Identification symbol 091N, 091P, 121P	RMH-A00-09-C		
Connector cable		Refer to page 32.		
Piping plate assembly*2		RMH-A00-06	Piping plate, Mounting bolt, O-ring	
One-touch fitting		KQ2S04-M5N	④	
Exhaust throttle valve		ASN2-M5-X937	③	

\*1 An auto switch assembly is an assembly part in which 2 auto switches are integrated into one part. When replacing an auto switch, replacement is conducted in units of auto switch assembly. An individual auto switch cannot be replaced.

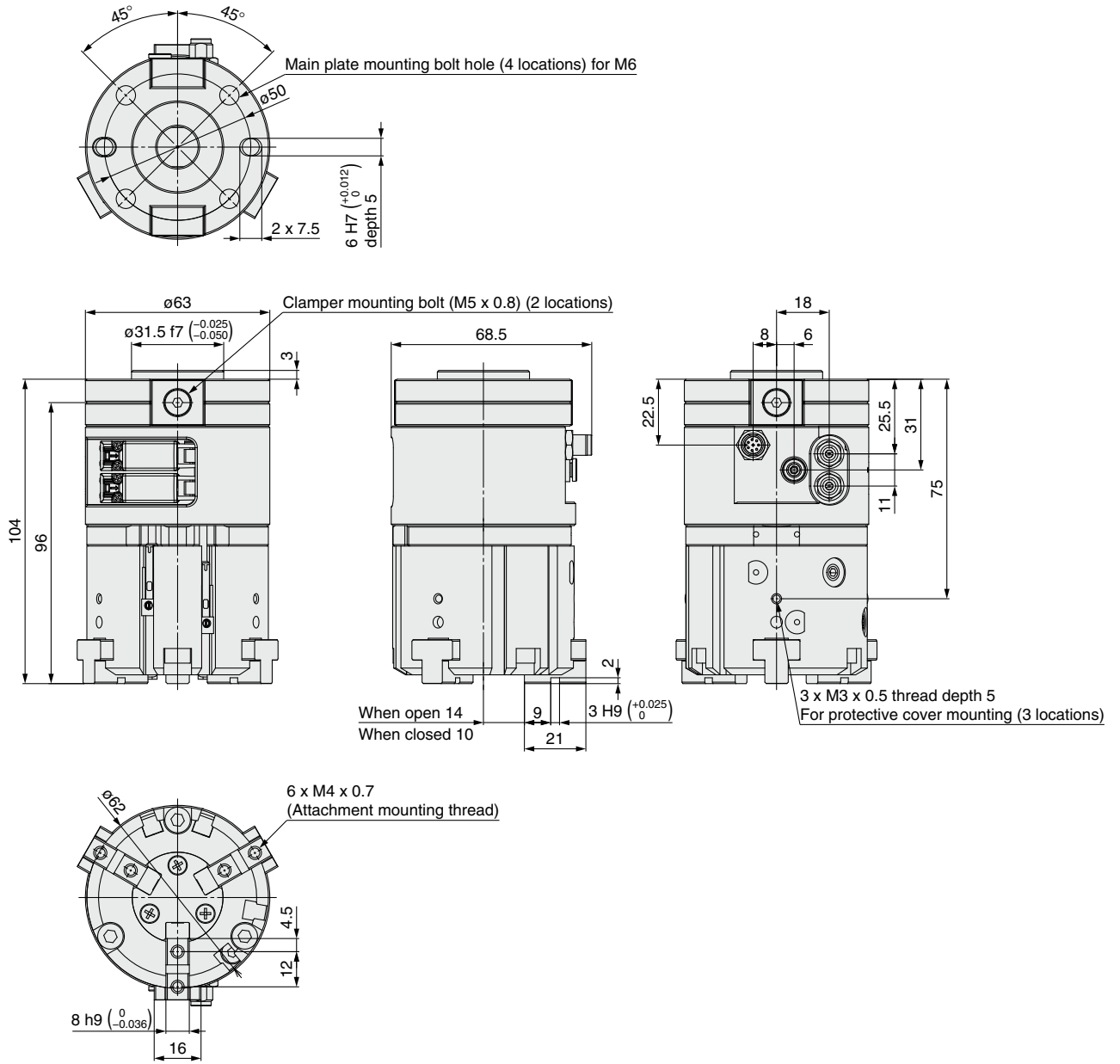
\*2 When installing a normally-open valve, a piping plate assembly is necessary. For details, refer to the operation manual.

\*3 When KUKA is used, a 3-port solenoid valve is available as a special order.

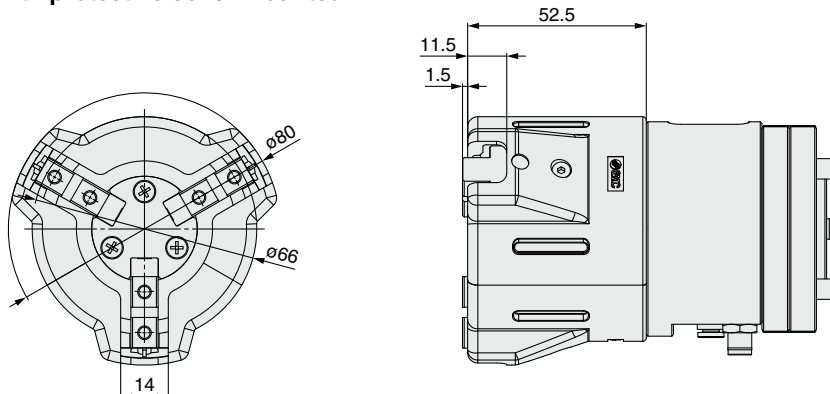
# RMHS3 Series

## Dimensions

\* For Mitsubishi Electric Corporation and YASKAWA Electric Corporation collaborative robots, a dedicated flange is required for mounting. For details, refer to page 33.



### With protective cover mounted





## RMHS3 Series

# Specific Product Precautions

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For air gripper and auto switch precautions, refer to the “Handling Precautions for SMC Products” and the “Operation Manual” on the SMC website: <https://www.smcworld.com>

### How to Mount Attachments

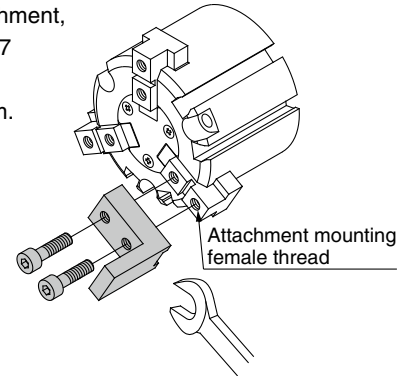
**1. Do not scratch or dent the air gripper by dropping or bumping it when mounting.**

Even a slight deformation can cause inaccuracy or malfunction.

**2. Tighten the screw within the specified torque range when mounting the attachment.**

Tightening with a torque above the limit can cause malfunction, while insufficient tightening can cause slippage and dropping.

When mounting the attachment, make sure to use M4 x 0.7 screws and a tightening torque of 1.35 to 1.65 N·m.



RMHZ2 Series

RMHS3 Series

RMHF2 Series

# Air Gripper for Collaborative Robots Long Stroke Type

# RMHF2 Series



## How to Order

RMHF2-16D2-  NO-NDE

1
2
3
4
5
6

### 1 Compatible robot

Refer to the "Table 1 Compatible Robot List."

### 2 Switch selection

<b>N</b>	Auto switch (NPN)
<b>P</b>	Auto switch (PNP)
<b>A</b>	Actuator position sensor (D-MP)

### 3 Valve option

Nil	O	C
Basic type	Normally open	Normally closed

### 4 Robot connection cable

<b>Nil</b>	With connector cable
<b>N</b>	Without connection cable

### 5 Protective cover

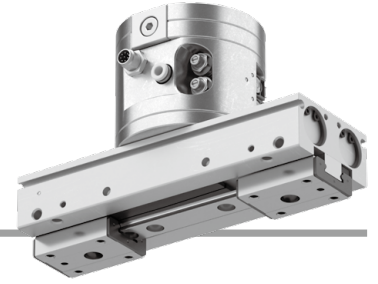
<b>Nil</b>	Without protective cover	
<b>D</b>	With protective cover	

### 6 Manual changer

<b>E</b>	With main plate assembly	
<b>F</b>	Without main plate assembly	

Refer to page 32 for how to mount the manual changer.

The main plate assembly is required to mount the gripper to the robot. In addition, when the main plate assembly is mounted to the robot, several different tool models can be used with the robot. Customers who already have a main plate assembly can select option "F" (Without main plate assembly).



**Table 1 Compatible Robot List**

Identification symbol	Switch selection	Robot manufacturer	Supported model	Switch output	Valve polarity	Identification symbol	Switch selection	Robot manufacturer	Supported model	Switch output	Valve polarity		
011	A	UNIVERSAL ROBOTS	UR3e	Analog	-COM	071	P	DOOSAN ROBOTICS	H2017	PNP	-COM		
			UR5e						H2515				
			UR10e						M0609				
			UR16e						M0617				
	P		UR3e	M1013									
			UR5e	M1509									
			UR10e										
			UR16e										
021	N	OMRON/TECHMAN ROBOT	TM5	NPN	+COM	081	P	SIASUN	SCR3	PNP	-COM		
			TM12						GCR3-620				
			TM14						GCR5-910				
031	N	Mitsubishi Electric*1	MELFA ASSISTA (RV-5AS-D)	NPN	+COM				GCR10-1300				
	P								GCR14-1400				
041	N	YASKAWA Electric*1	MOTOMAN-HC10	NPN	+COM				GCR20-1100				
	P											JAKA Zu3	
042	N		MOTOMAN-HC10DT	NPN	+COM				-COM			JAKA Zu7	
	P												JAKA Zu12
043	N		MOTOMAN-HC10(S)DTP	NPN	+COM				PNP			-COM	JAKA Zu3
													P
	MOTOMAN-HC10(S)DTP			PNP	-COM	JAKA Zu12							
						MOTOMAN-HC20(S)DTP	NPN	+COM					
051	A		FANUC	CRX-5iA	Analog				-COM	101	N	AUBO	NPN
				CRX-10iA(L)		AUBO-i3							
		CRX-20iA		AUBO-i5									
	P	CRX-25iA		PNP	-COM	AUBO-i10							
		CRX-5iA				PNP	-COM	E03					
		CRX-10iA(L)						E05					
CRX-20iA	E10												
CRX-25iA													
061	P	KUKA	LBR-iiwa (Media flange: I/O Pneumatic only)	PNP	-COM	111	P	HAN'S ROBOT	Gofa	PNP	-COM		
						121	P	ABB					

\*1 When a Mitsubishi Electric Corporation or YASKAWA Electric Corporation product is selected, a dedicated flange is included. Refer to page 33 for details.

\* Please contact our nearest sales office for the compatibility with robots not listed in the compatible robot list.

RMHZ2 Series

RMHS3 Series

RMHF2 Series



# RMHF2 Series

## Specifications

Item		Specification	
Common	Standards	Compliant with ISO 9409-1-50-4-M6*1	
	Fluid	Air	
	Operating pressure	0.1 to 0.7 MPa	
	Ambient and fluid temperatures	-10 to 50°C*2	
	Repeatability	±0.05 mm	
	Max. operating frequency	60 C.P.M.	
	Lubricant	Non-lube	
	Action	Double acting	
	Gripping force	90 N*3	
	Effective value per finger	External	90 N*3
		Internal	90 N*3
	Opening/Closing stroke (Both sides)	64 mm	
	Weight	945 g*4	
	Connector type	M8, 8-pin (Plug)	
Air pressure supply (P) port	One-touch fitting (ø4)		
Power supply voltage	24 VDC ±10%*2		
Solenoid valve	Model	V114	
Auto switch	Model	D-M9N/D-M9P	
Position sensor	Model	D-MP	
Exhaust throttle valve	Model	ASN2-M5-X937	

\*1 Robots whose end effector mounting standard differs are equipped with a dedicated mounting flange. (Refer to page 26.)

\*2 Only when the compatible robot is KUKA's LBR-iiwa, the power supply voltage is 24 VDC (-15%/+20%) and the max. operating temperature is 40°C.

\*3 These are values at the stroke center when the pressure is 0.5 MPa and the gripping point distance L is 20 mm.

\*4 This is the value excluding the weights of the protective cover and connector cable.

## Valve Specifications

Operating temperature	-10 to 50°C (40°C*1) No freezing
Manual override	Non-locking push type
Mounting orientation	Unrestricted (Based on gripper mounting orientation)
Enclosure	Dust-protected

\*1 For robot identification symbol 061P

## Solenoid Specifications

Coil rated voltage	24 VDC
Allowable voltage fluctuation	-10 to +10% (-15% to +20%*1)
Power consumption	0.4 W (0.55 W*1)
Surge voltage suppressor	Varistor

\*1 For robot identification symbol 061P

## Auto Switch Specifications

Output type	NPN/PNP (Depends on the robots)
Power supply voltage	24 VDC
Current consumption	10 mA or less
Load voltage	28 VDC or less (NPN)
Load current	40 mA or less
Internal voltage drop	0.8 V or less at 10 mA (2 V or less at 40 mA)
Leakage current	100 µA or less at 24 VDC

Refer to page 10 for more information on model selection using the effective "gripping force" and "gripping point."

## Actuator Position Sensor

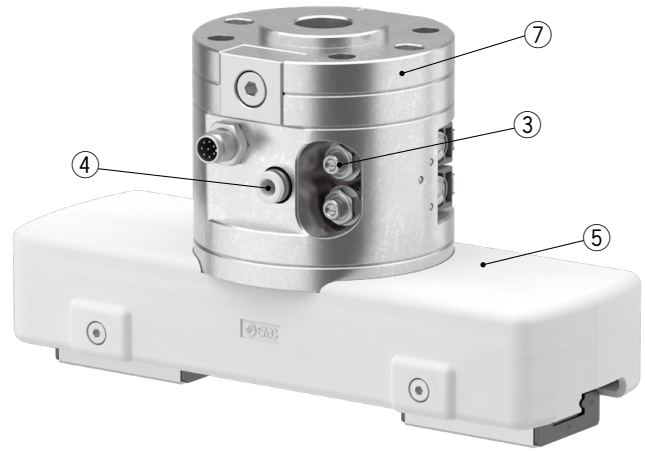
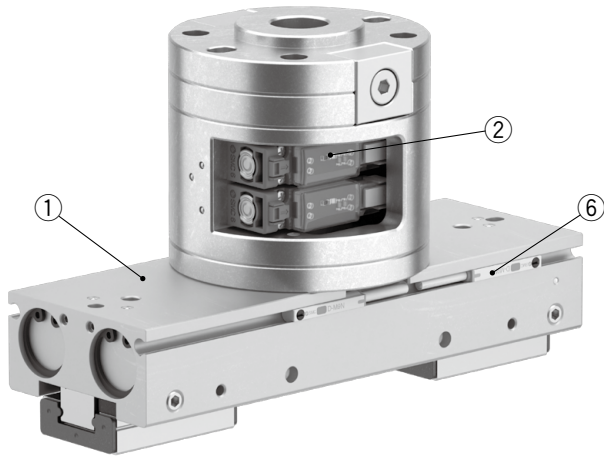
Model		D-MP050□
Power supply voltage	15 to 30 VDC, Ripple (p-p) 10% or less (with power supply polarity protection)	
Current consumption	48 mA or less (when no load is applied)	
Repeatability*1	0.1 mm (Ambient temperature: 25°C)	
Resolution	0.05 mm	
Linearity	±0.3 mm (Ambient temperature: 25°C)	
Analog voltage output	Output voltage	0 to 10 V
	Min. load resistance	2 kΩ

\*1 Repeatability of magnetic movement in one direction

\* For details on the actuator position sensor (D-MP series), refer to the operation manual on the SMC website.



## Component Parts



No.	Description
1	Gripper assembly
2	3-port solenoid valve
3	Exhaust throttle valve with silencer
4	One-touch fitting

No.	Description
5	Cover assembly
6	Auto switch assembly
7	Manual changer (Main plate assembly)

## Replacement Parts

Description		Order number	Included parts	
Gripper assembly		RMH-A32-01	①	
Cover assembly	Other than the following	RMH-A32-08	⑤, Mounting screw	
	Identification symbol: 011A, 051A	RMH-A32-08-B		
Dedicated flange	Mitsubishi Electric: 031N, 031P	JMHZ-A16-X7400-BRK-01	Dedicated flange, Mounting bolt	
	YASKAWA Electric: 041N, 041P	JMHZ-A16-X7400-BRK-02	Dedicated flange, Mounting bolt	
	YASKAWA Electric: 042N, 042P	JMHZ-A16-X7400-BRK-03		
Auto switch assembly*1	PNP	RMH-A00-05-P	⑥	
	NPN	RMH-A00-05-N		
3-port solenoid valve	Normally open*2	V124-5MOU	②	
	Normally closed	V114-5MOU		
	KUKA 061P	Normally open*2, *3		V114-5MOU-X647
		Normally closed*3		V124-5MOU-X647
Main plate assembly	Other than the following	RMH-A00-09-A	⑦	
	Identification symbol: 071P, 081P, 101N	RMH-A00-09-B		
	Identification symbol: 091N, 091P, 121P	RMH-A00-09-C		
Connector cable		Refer to page 32.		
Piping plate assembly*2		RMH-A00-06	Piping plate, Mounting bolt, O-ring	
One-touch fitting		KQ2S04-M5N	④	
Exhaust throttle valve		ASN2-M5-X937	③	

\*1 An auto switch assembly is an assembly part in which 2 auto switches are integrated into one part. When replacing an auto switch, replacement is conducted in units of auto switch assembly. An individual auto switch cannot be replaced.

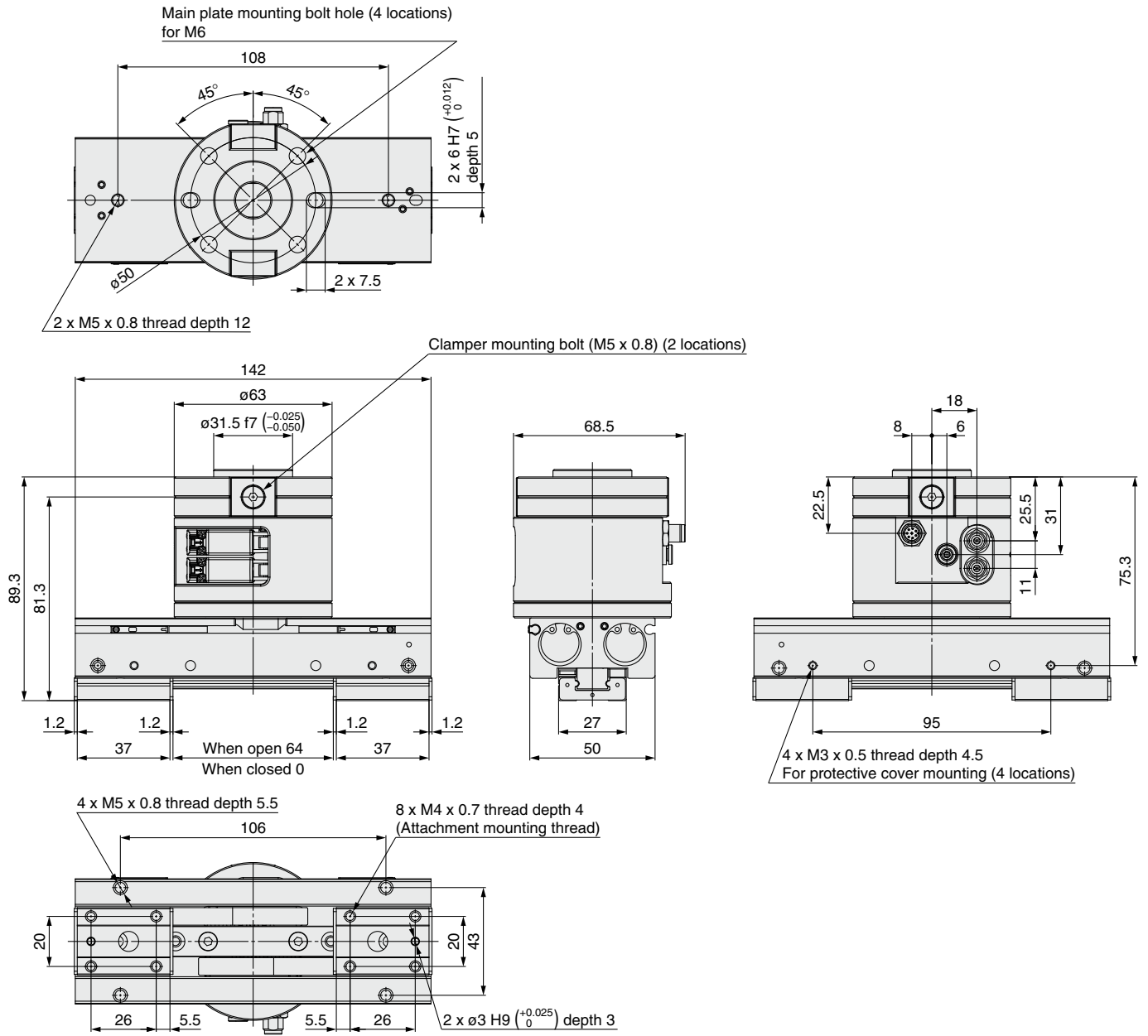
\*2 When installing a normally-open valve, a piping plate assembly is necessary. For details, refer to the operation manual.

\*3 When KUKA is used, a 3-port solenoid valve is available as a special order.

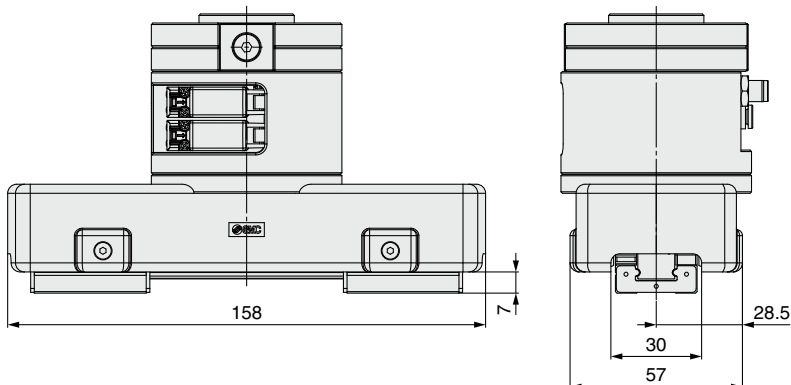
# RMHF2 Series

## Dimensions

\* For Mitsubishi Electric Corporation and YASKAWA Electric Corporation collaborative robots, a dedicated flange is required for mounting. For details, refer to page 33.

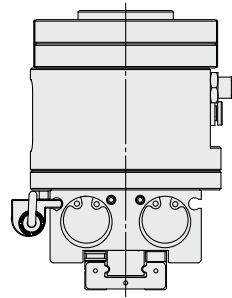
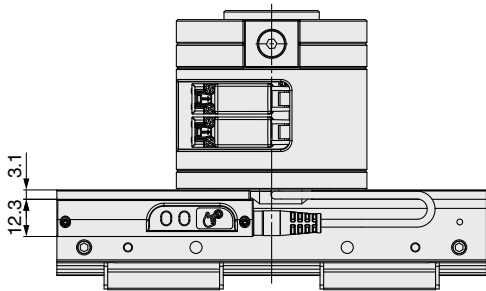
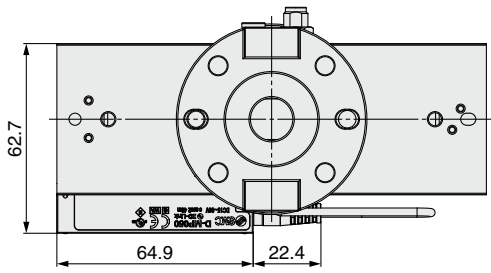


### With protective cover mounted

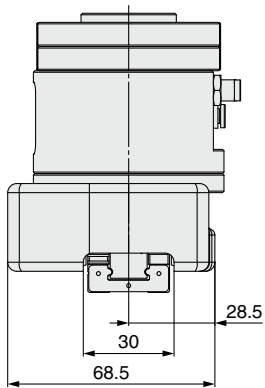
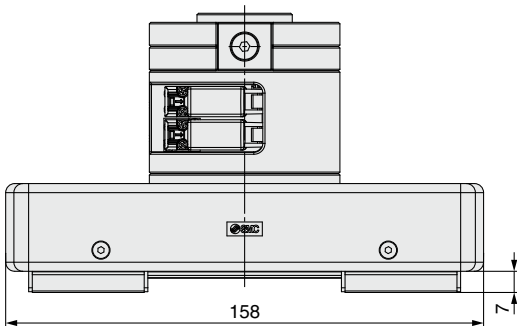


### Dimensions: With Actuator Position Sensor

\* Dimensions other than those shown below are the same as those shown on page 29.



With protective cover mounted



RMHZ2 Series

RMHS3 Series

RMHF2 Series



# RMHF2 Series Specific Product Precautions

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For air gripper and auto switch precautions, refer to the "Handling Precautions for SMC Products" and the "Operation Manual" on the SMC website: <https://www.smcworld.com>

## How to Use Body Tapped Holes

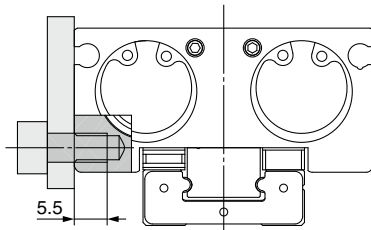
1. Do not scratch or dent the air gripper by dropping or bumping it when mounting.

Even a slight deformation can cause inaccuracy or malfunction.

### Body tapped hole

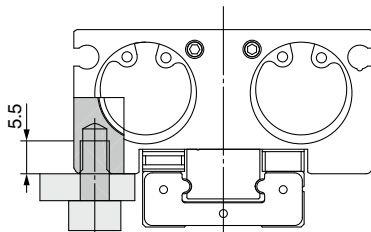
#### ● Lateral mounting (Body tapped)

Applicable bolt: M5 x 0.8  
Tightening torque: 2.7 to 3.3 N·m  
Max. screw-in depth: 5.5 mm



#### ● Bottom mounting (Body tapped)

Applicable bolt: M5 x 0.8  
Tightening torque: 2.7 to 3.3 N·m  
Max. screw-in depth: 5.5 mm



## Handling

### ⚠ Caution

Finite orbit type guide is used in the actuator finger part. By using this, when there are inertial force which cause by movements or rotation to the actuator, steel ball will move to one side and this will cause a large resistance and degrade the accuracy. When there are inertial force which cause by movements or rotation to the actuator, operate the finger to full stroke.

## How to Mount Attachments

1. Tighten the screw within the specified torque range when mounting the attachment.

Tightening with a torque above the limit can cause malfunction, while insufficient tightening can cause slippage and dropping.

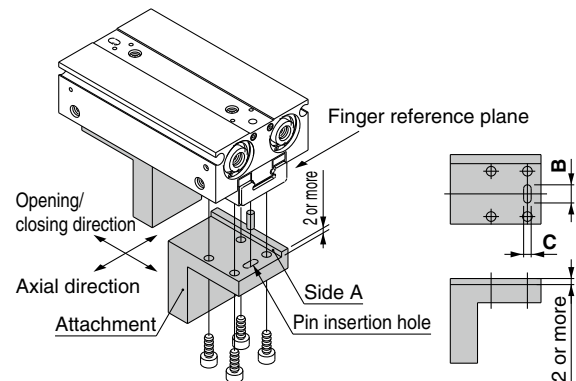
#### ● Positioning in the finger's open/close direction

Position the finger and the attachment by inserting the finger's pin into the attachment's pin insertion hole.

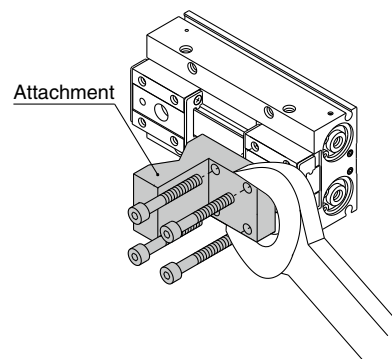
Provide the following pin insertion hole dimensions: shaft-basis fitting dimension **C** for the open/close direction; slotted hole with relief **B** for the axial direction.

#### ● Positioning in the finger's axial direction

Perform the positioning from the reference plane of the finger and the side A of the attachment.

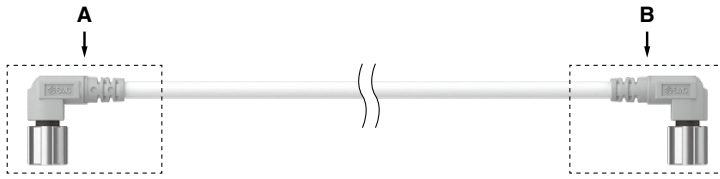


Make sure to mount the attachments on fingers with a tightening torque of 1.35 to 1.65 N·m by using M4 x 0.7 bolts, etc., for the female threads on fingers.



# RMH□ Series Options

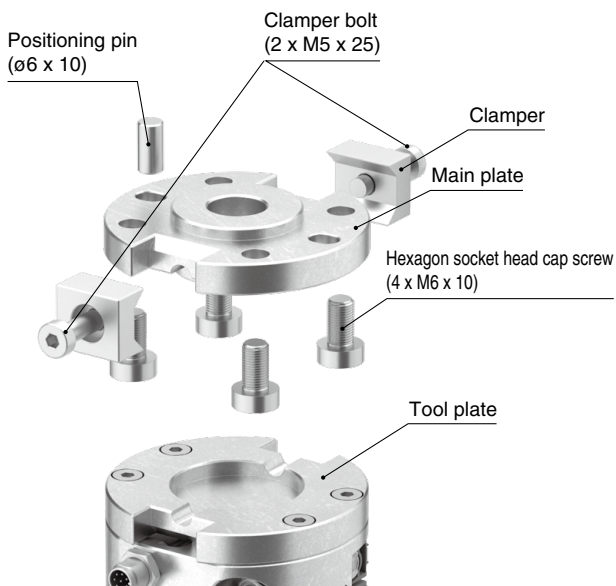
## Robot Compatible Connector Cable



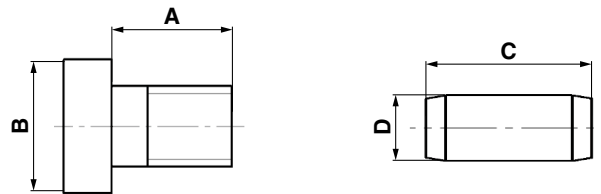
Identification symbol	Robot manufacturer	A Air gripper side	B Robot side	Part no.			
011P, 011A	UNIVERSAL ROBOTS	M8 8-pin connector (Socket)	M8 8-pin connector (Socket)	RMH-A00-11-A			
021N	OMRON/TECHMAN ROBOT		M8 8-pin connector (Plug)	RMH-A00-11-B			
031N	Mitsubishi Electric		M8 8-pin connector (Socket)	M12 8-pin connector (Plug)	RMH-A00-11-C		
031P				51227-0800 made by MOLEX	MH-7400-ADP-D-01		
041N	YASKAWA Electric					M8 8-pin connector (Socket)	RMH-A00-11-A
041P							
042N							
042P							
043N							
043P							
051P, 051A	FANUC					M8 8-pin connector (Socket)	RMH-A00-11-A
061P	KUKA			M8 8-pin connector (Plug)	RMH-A00-11-B		
071P	DOOSAN ROBOTICS			M8 8-pin connector (Socket)	RMH-A00-11-B		
081P	SIASUN			M8 8-pin connector (Socket)	RMH-A00-11-A		
091N	JAKA			M8 8-pin connector (Plug)	RMH-A00-11-B		
091P							
101N	AUBO			M8 8-pin connector (Socket)	RMH-A00-11-A		
101P							
111P	HAN'S ROBOT			M12 12-pin connector (Plug)	RMH-A00-11-D		
121P	ABB			M8 3-pin, M8 4-pin connector (Plug)	RMH-A00-11-E		

## How to Mount the Manual Changer

1. Insert the positioning pin into the robot arm, and tighten the main plate with the hexagon socket head cap screws. (Tightening torque: 4.7 to 5.7 N·m)
2. Loosen the clamber bolt, and align it with the tool plate groove on the air gripper.
3. Tighten the clamber bolts. (Tightening torque: 2.7 to 3.3 N·m)



## Replacement Parts



Main plate assembly mounting bolt

Positioning pin

### Dimensions

Part no.	Description	A	B	C	D
RMH-A00-14	Hexagon socket head	10	10	—	—
RMH-A00-15	cap screw	8	10	—	—
RMH-A00-16	Positioning pin	—	—	10	6h8
RMH-A00-17		—	—	15	6h8

\* Bolts and positioning pins for main plate assembly are included with the main plate assembly, but can be ordered in quantities of 1 or more by the part numbers listed below.

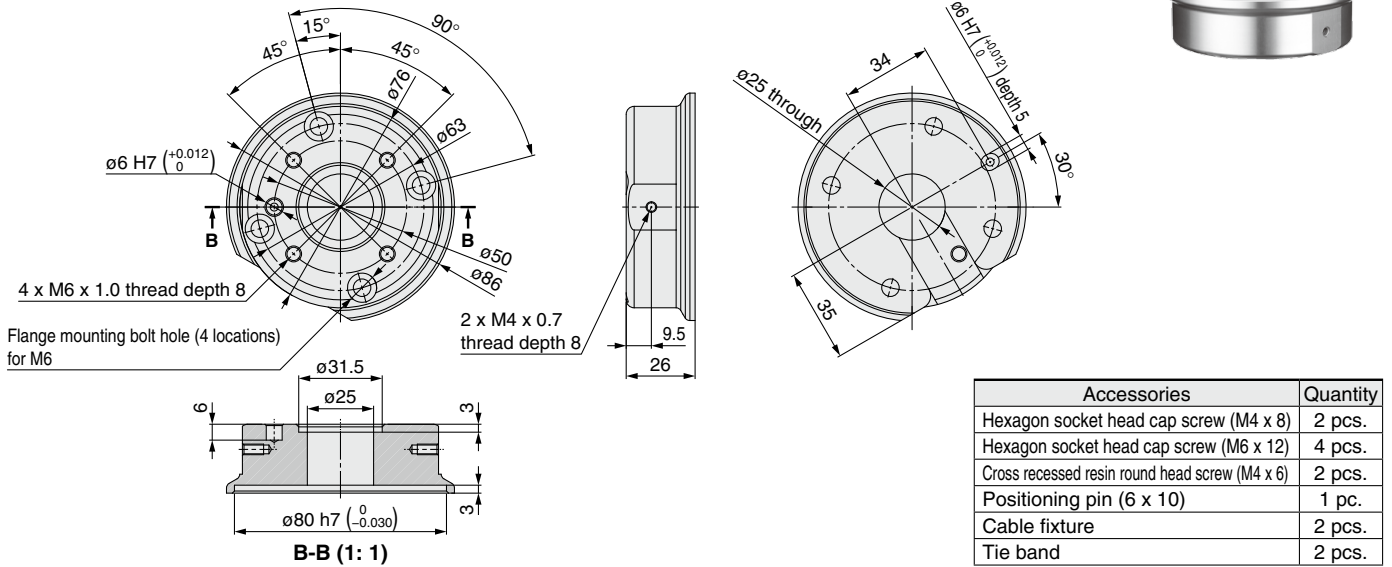
Compatible robot identification symbol	Hexagon socket thin head cap screw		Positioning pin	
	Part no.	Quantity	Part no.	Quantity
011	RMH-A00-14	4 pcs./unit	RMH-A00-16	1 pc./unit
021	RMH-A00-14	4 pcs./unit	RMH-A00-16	1 pc./unit
031	RMH-A00-14	4 pcs./unit	RMH-A00-16	1 pc./unit
041	RMH-A00-14	4 pcs./unit	RMH-A00-16	1 pc./unit
042	RMH-A00-14	4 pcs./unit	RMH-A00-16	1 pc./unit
043	RMH-A00-14	4 pcs./unit	RMH-A00-16	1 pc./unit
051	RMH-A00-14	4 pcs./unit	RMH-A00-16	1 pc./unit
061	RMH-A00-14	4 pcs./unit	RMH-A00-16	1 pc./unit
071	RMH-A00-15	4 pcs./unit	RMH-A00-16	1 pc./unit
081	RMH-A00-15	4 pcs./unit	RMH-A00-16	1 pc./unit
091	RMH-A00-14	4 pcs./unit	RMH-A00-17	1 pc./unit
101	RMH-A00-15	4 pcs./unit	RMH-A00-16	1 pc./unit
111	RMH-A00-14	4 pcs./unit	RMH-A00-16	1 pc./unit
121	RMH-A00-14	4 pcs./unit	RMH-A00-17	1 pc./unit



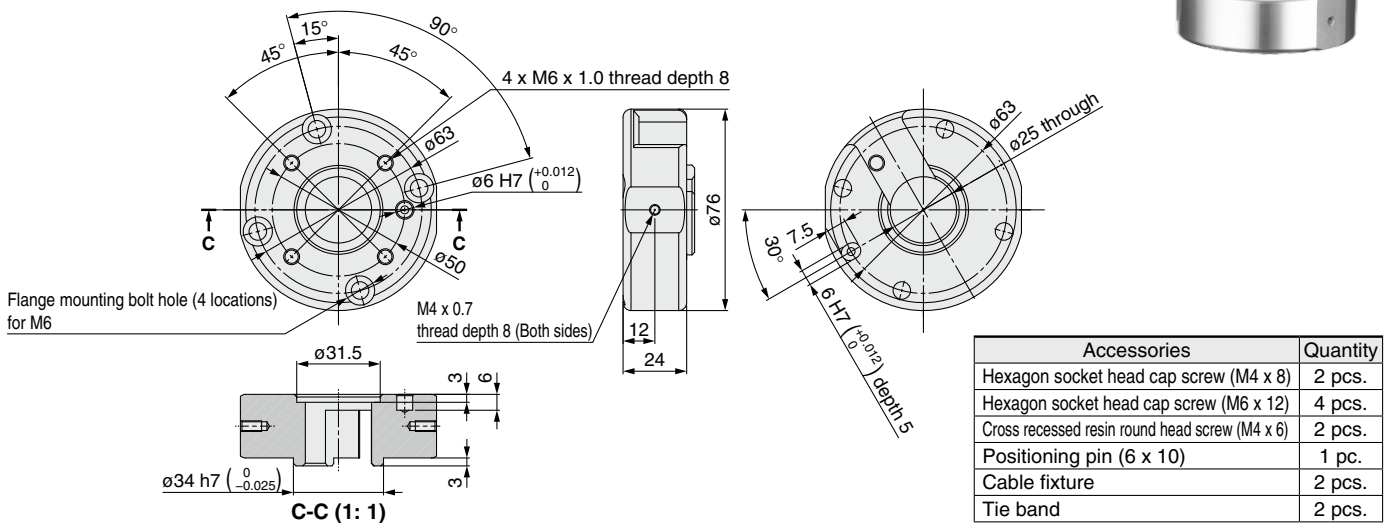
## Robot Manufacturer Dedicated Flanges

By selecting a robot identification symbol and the manual changer option "E" (With main plate assembly), a dedicated flange for the corresponding robot will be shipped with the product.

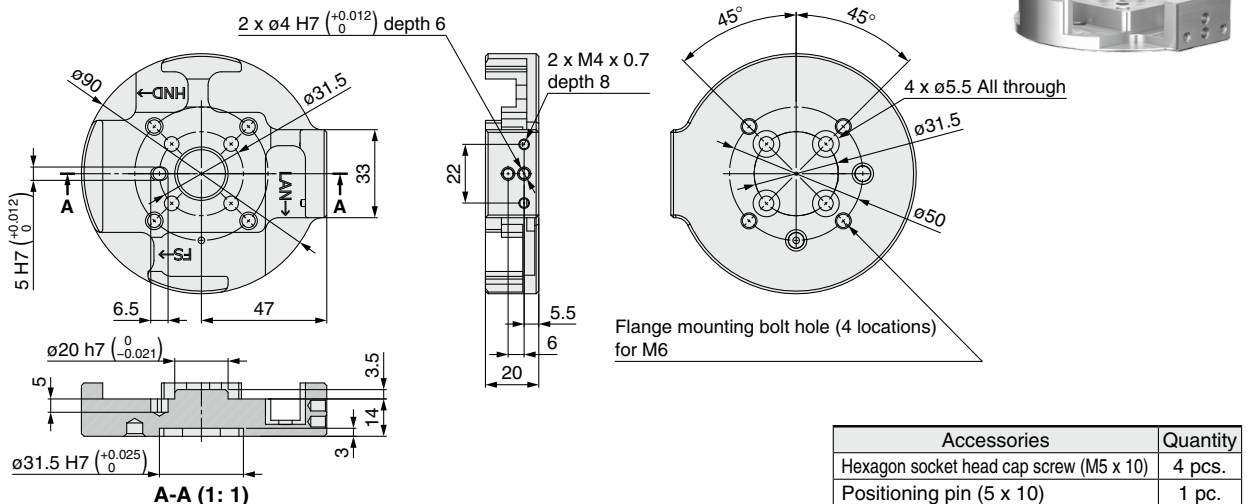
### ■ Flange for MOTOMAN-HC10 from YASKAWA Electric (Robot identification symbol: 041N, 041P)



### ■ Flange for MOTOMAN-HC10DT from YASKAWA Electric (Robot identification symbol: 042N, 042P)



### ■ Flange for ASSISTA from Mitsubishi Electric (Robot identification symbol: 031N, 031P)





# RMH□ Series Precautions

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For air gripper and auto switch precautions, refer to the “Handling Precautions for SMC Products” and the “Operation Manual” on the SMC website: <https://www.smcworld.com>

## Mounting

### ⚠ Caution

- For details on the mounting method, refer to the Operation Manual.
- Tighten to the specified tightening torque. If the tightening torque is exceeded, the body and the mounting screws may break. However, insufficient torque may cause displacement of the body and loosening of the mounting screws.
- Do not drop, strike, or apply excessive impact to this product.  
Doing so may result in damage to the internal parts of the body, solenoid valve, or auto switch. In some cases, this damage may result in a malfunction.
- Hold the body when handling the product. Do not pull excessively on the connector cable or pinch the cable when lifting the body. Failure to do so may result in damage to the solenoid valve or auto switch. In some cases, this damage may result in a failure or malfunction.
- The bolts may loosen due to the operating conditions and environment. Be sure to conduct maintenance such as tightening the bolts periodically.

## Wiring

### ⚠ Caution

- Avoid repeatedly bending or stretching the connector cable as well as applying force to it.
- Do not wire while energizing the product. Doing so may result in damage to the internal parts of the solenoid valve or auto switch. In some cases, this damage may result in a malfunction.
- Do not disassemble the connector cable or make any modifications, including additional machining. Doing so may cause human injury and/or an accident.

## Piping

### ⚠ Caution

- Preparation before piping**  
Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil, and other debris from inside the pipe.
- Installation and removal of tubing for One-touch fittings**
  - Installation of tubing**
    - Cut the tubing perpendicularly, being careful not to damage the outside surface. Use an SMC tube cutter TK-1, 2, 3, 5 or 6. Do not cut the tubing with pliers, nippers, scissors, etc., otherwise, the tubing will be deformed and trouble may result.
    - The outside diameter of the polyurethane tubing swells when internal pressure is applied to it. Therefore, it may be possible that the tubing cannot be re-inserted into the One-touch fitting. Check the tubing outside diameter, and when the accuracy of the outside diameter is +0.07 mm or larger for ø2, +0.15 mm or larger for other sizes, insert into the One-touch fitting again, without cutting the tubing to use it. When the tubing is re-inserted into the One-touch fitting, confirm that the tubing goes through the release button smoothly.

## Piping

### ⚠ Caution

- Grasp the tubing, slowly push it straight (0 to 5°) into the One-touch fitting until it comes to a stop.
- Pull the tubing back gently to make sure it has a positive seal. Insufficient installation may cause air to leak or the tubing to release.  
As a guide for checking the tubing is not pulled out, refer to the following table.

Tubing size	Tensile force of tubing [N]
ø2, 3.2, 1/8"	5
ø4, 5/32", 3/16"	8
ø6, 1/4"	12
ø8, 5/16"	20
ø10, 3/8"	30
ø12, 1/2"	35
ø16	50

#### 2) Removal of tubing

- Push the release button flange evenly and sufficiently to release the tube. Do not push in the tubing before pressing the release button.
- Pull out the tubing while keeping the release button depressed. If the release button is not held down sufficiently, the tubing cannot be withdrawn.
- To reuse the tubing, remove the previously lodged portion of the tubing. If the lodged portion is left on without being removed, it may result in air leakage and removal of the tubing difficult.

#### 3. When using a tubing other than from SMC, be careful of the tolerance of the tubing O.D. and tubing material.

- Nylon tubing Within ±0.1 mm
- Soft nylon tubing Within ±0.1 mm
- Polyurethane tubing Within +0.15 mm, Within -0.2 mm

Do not use the tubing which does not satisfy the specified tubing O.D. accuracy, or if the tubing has a different I.D., material, hardness, or surface roughness from those of SMC's tubing. Please consult SMC if there is anything unclear. It may cause difficulty in connecting the tubing, leakage, disconnection of the tubing, or fitting damage. When used with tubing other than those from SMC, due to their properties, the products listed below are not subject to warranty.


KQG2, KQB2, KFG2, KF, ø2M


#### 4. Piping


- Do not apply unnecessary forces, such as twisting, pulling, moment loads, vibration, impact, etc., on fittings or tubing. This will cause damage to fittings and will crush, burst, or release tubing.
- Do not lift the product by the piping after the tube is connected. Doing so may result in damage to the One-touch fitting. For details, refer to the “Handling Precautions for SMC Products” on the SMC website: <https://www.smcworld.com>

## 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)\*1), and other safety regulations.

 **Caution:** **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

 **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.

\*1) 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: Manipulating industrial robots – Safety.  
etc.

### Warning

#### 1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

#### 2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

#### 3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

#### 4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

### Caution

#### 1. The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries.  
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.  
If anything is unclear, contact your nearest sales branch.

### Limited warranty and Disclaimer/ Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

Read and accept them before using the product.

#### Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.\*2)  
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.  
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

##### \*2) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.  
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

#### Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

### Caution

#### SMC products are not intended for use as instruments for legal metrology.

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country. Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

## Safety Instructions

Be sure to read the “Handling Precautions for SMC Products” (M-E03-3) and “Operation Manual” before use.

## SMC Corporation

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Specifications are subject to change without prior notice  
and any obligation on the part of the manufacturer.

D-G