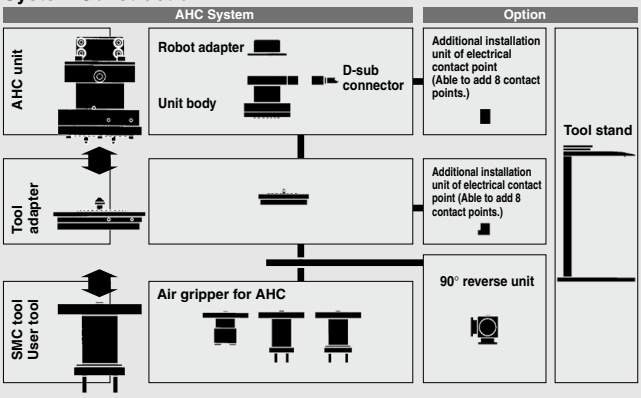
Automatic exchange of robot hand tools, FMS (flexible manufacturing system) implemented for assembly lines.

The robot hand tools change automatically to accommodate workpieces of different shapes, thus making it possible to adopt the FMS (flexible manufacturing system) in the assembly line.

Specifications

Series	MA210	MA310	MA311	MA320	MA321
Positioning	Ball coupling			Curved coupling	
Max. work load	3 kg	5 kg			
Handling	Single acting/Air supply at separation		Double acting	Single acting/ Air supply at separation	Double acting
Handling air pressure	0.4 to 0.7 MPa				
Proof pressure	1.05 MPa				
Ambient and fluid temperature	0 to 60°C				
Positioning repeatability	±0.01 mm				

System Construction



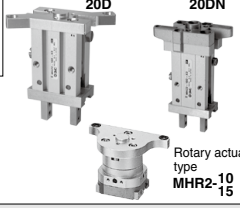
Variations

Adapter for assembling robot
MA2 Series
ø8, ø10, ø11, ø14, ø15, ø20
MA3 Series
ø10, ø11, ø14, ø15, ø20, ø24, ø25

Air grippers for AHC (ø10 to ø20)

Standard type
10D
MHZ2-16D
20D

Narrow type
10DN
MHZ2-16DN
20DN



Rotary actuated type
MHR2-10
15

Additional installation unit of electrical contact point
(Able to add 8 contact points)

Added to the standard AHC unit

Added to the standard tool adapter

(MA3 series only)

90° reverse unit
By attaching 2 tools, a single robot can perform 2 types of tasks.
An auto switch for detecting the location can be mounted.

(MA3 series only)

Tool stand

The height for setting a tool can be adjusted.
An auto switch for detecting a tool can be mounted.

Auto Hand Changing System

MA210 Series (Compact type)

Max. work load: 3 kg
Compact/Lightweight
O.D.: 52 mm, Weight: 360 g

MA3□1 Series (Double acting type)

Ideal for carrying heavy loads.
2.5 times the moment resistance and torque resistance of the current series.

No adjustment or teaching necessary when replacing tools

All attachment and removal during tool replacement is carried out automatically, allowing for elimination of the onerous labor of the replacement process, and a major reduction of time needed for changing setups.

Quicker launch of assembly lines

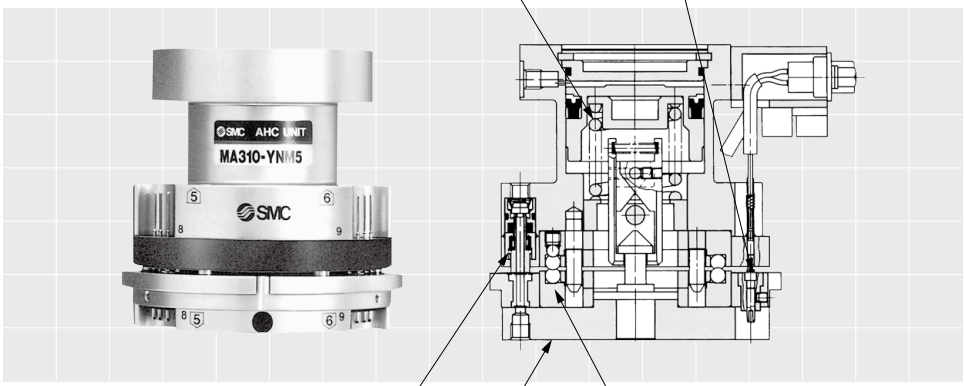
Use of the AHC system makes it possible to design the equipment layout more quickly, and reduces the time required for manufacturing.

Electric interface

MA2 Series: 8 power systems
(Contact points: gold plated)
MA3 Series: 12 power systems
(Contact points: gold plated)
Additional installation unit, 8 power systems (option)
D-sub connector, with robot cable (option)

Failsafe mechanism

Prevents tools from dropping due to reductions in air pressure



Air interface

MA2 Series: 4 power systems, self-seal mechanism, built-in check valve
MA3 Series: 6 power systems, self-seal mechanism, built-in check valve

Repeatable high-precision ±0.01 mm

MA210 Series
MA31□ Series
Ball coupling

MA32□ Series
Curved coupling

(For high torque resistance)

Max. work load:

MA2 Series: 3 kg
MA3 Series: 5 kg

AHC System/Model/Specifications

Series			MA2 Series	MA3 Series			
			MA210	MA310	MA311	MA320	MA321
Positioning			Ball coupling	Ball coupling		Curved coupling	
Handling			Single acting	Single acting	Double acting	Single acting	Double acting
AHC unit	Electric specifications	Soldering	●	●	●	●	●
		D-sub connector	—	●	●	●	●
		D-sub connector (With socket side connector)	—	●	●	●	●
		D-sub connector (With socket side connector with 3 m cable)	—	●	●	●	●
	Robot adapter Applicable shaft diameter	**Nil**	●	●	●	●	●
		ø8	●	—	—	—	—
		ø10	●	●	●	●	●
		ø11	●	●	●	●	●
		ø14	●	●	●	●	●
		ø15	●	●	●	●	●
		ø20	●	●	●	●	●
		ø24	—	●	●	●	●
		ø25	—	●	●	●	●
Tool adapter	Air pressure port	**M3**	●	●		●	
		M5	—	●		●	
Air gripper for AHC *1	MHR2	**ø10**	●	●		●	
		ø12	●	●		●	
	MHZ2	**ø10**	●	—		—	
		ø16	●	●		●	
		ø20	—	●		●	
90° reverse unit			—	●		●	
Tool stand			●	●		●	
Additional installation unit of electrical contact point	For AHC unit		—	●		●	
	For tool adapter		—	●		●	

*1) This air gripper for AHC is prepared as an optional air gripper that provides the air passage in the attachment to eliminate the fittings piping when mounting. As the mounting attachment and air piping are prepared, there is no problem even when other air gripper or vacuum pad is mounted. However, make sure that the axial force, moment, and torque due to a load are 1/2 or less of their allowable values. (For details about allowable values, refer to the specifications.)

AHC System

Auto Hand Changing System

MA2 Series

Specifications

Series			MA210
Positioning			Ball coupling
Max. work load			3 kg
Handling			Single acting/Air supply at disconnection
Handling air pressure			0.4 to 0.7 MPa
Proof pressure			1.05 MPa
Ambient and fluid temperature			0 to 60°C
Positioning repeatability			±0.01 mm
Combined axial force W*			150 N
Moment resistance M*			2 N·m
Torque resistance T*			2 N·m
Interface	Air	Max. operating pressure	0.7 MPa
		Operating vacuum pressure	–100 kPa or more (10 Torr or more)
		Cv value	0.056
		Number of circuits	4
	Electricity	Contact point capacity	2 A/interface
		Number of contact points	8

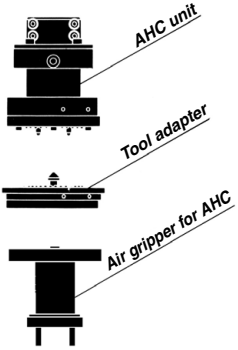
* Values given on the table for combined axial force, moment resistance, and torque resistance are the values for when the AHC unit and tool adapter begin to separate. During use, make sure the axial force, moment and torque from load are 1/2 or less than those shown above, for safety reasons.

Option Part No.

Robot adapter

Part no.	Applicable shaft diameter	Note
MA210-CS1	ø8	Hexagon socket head cap screw M3 x 8 (4 pcs.) M3 x 10 (4 pcs.)
MA210-CR1	ø10	
MA210-CR2	ø11	
MA210-CR3	ø14	
MA210-CR4	ø15	
MA210-CR5	ø20	

How to Order



AHC unit

MA 210 – Y N M3 – R3

- 210: Work load
  - 2: Work load 3 kg
- Y: AHC unit
- N: Electric specifications
  - N: Soldering
- M3: Air connection size
  - M3: M3 x 0.5
- R3: Robot adapter

Nil	Without robot adapter	
S1	ø8	Applicable shaft diameter
R1	ø10	
R2	ø11	
R3	ø14	
R4	ø15	
R5	ø20	

Tool adapter

MA 210 – A M3

- 210: Work load
  - 2: Work load 3 kg
- A: Tool adapter
- M3: Air connection size
  - M3: M3 x 0.5

Air gripper for AHC

<ø10/ø15>

MHR2 – 10 – A210

- 10: Cylinder bore
  - 10: 10 mm
  - 15: 15 mm
- A210: For MA2 With adapter

<ø10/ø16>

MHZ2 – 16 D N – A210 – Y69A

- 16: Cylinder bore
  - 10: 10 mm
  - 16: 16 mm
- D: For MA2 With adapter
- N: Finger position
  - Nil: Standard
  - N: Narrow type
- Y69A: Auto switch type

Nil	Without auto switch	
Y69A	D-Y69A (3-wire)	Solid state auto switch Lead wire: Right angle entry Lead wire length: 0.5 m
Y69B	D-Y69B (2-wire)	

- Auto switch additional symbol

Nil	2 pcs.
S	1 pc.

Tool stand

MA210 – S1 – Y59A

- S1: Tool stand
- Y59A: Auto switch type

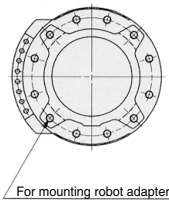
Nil	Without auto switch	
Y59A	D-Y59A (3-wire)	Solid state auto switch Lead wire: Axial direction entry
Y59B	D-Y59B (2-wire)	

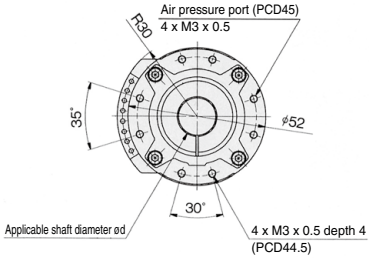
- Lead wire length

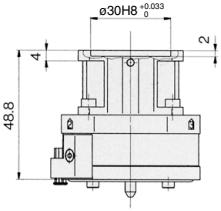
Nil	Grommet	With 0.5 m lead wire
L		With 3 m lead wire

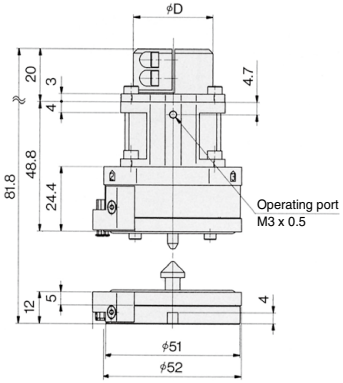
AHC Unit and Tool Adapter

AHC Unit/MA210-YNM3 (Without robot adapter)
AHC Unit/MA210-YNM3-□ (With robot adapter)
Tool adapter/MA210-AM3

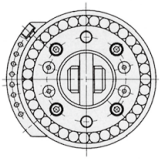


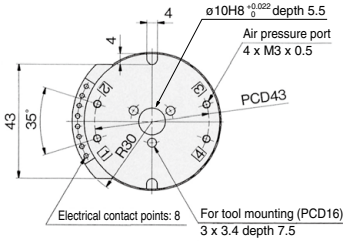






AHC unit junction

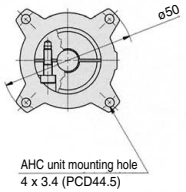


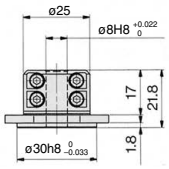


Model		Applicable shaft diameter ø**d**	ø**D**	Weight (g)
AHC unit	**MA210-YNM3**	—	—	260
	MA210-YNM3-S1	8	25	300
	MA210-YNM3-R1	10	30	
	MA210-YNM3-R2	11		
	MA210-YNM3-R3	14		
	MA210-YNM3-R4	15		
	MA210-YNM3-R5	20	35	
Tool adapter	**MA210-AM3**	—	—	100

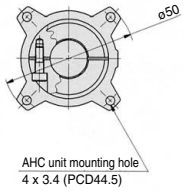
Robot adapter
MA210-C□□

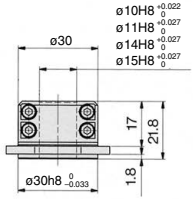
MA210-CS1



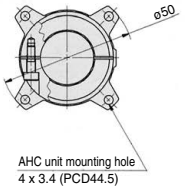


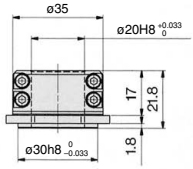
MA210-CR1, 2, 3, 4





MA210-CR5



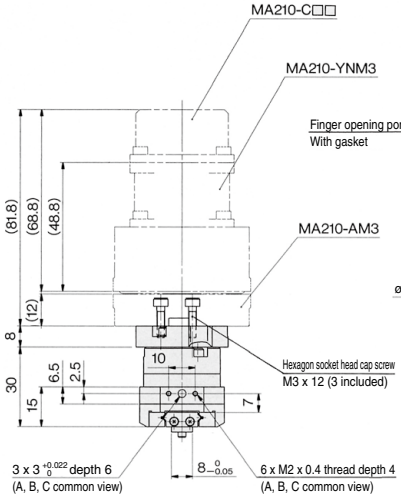


Part no.	Applicable shaft diameter	Weight (g)
MA210-CS1	ø8	40
MA210-CR1	ø10	
MA210-CR2	ø11	
MA210-CR3	ø14	
MA210-CR4	ø15	
MA210-CR5	ø20	

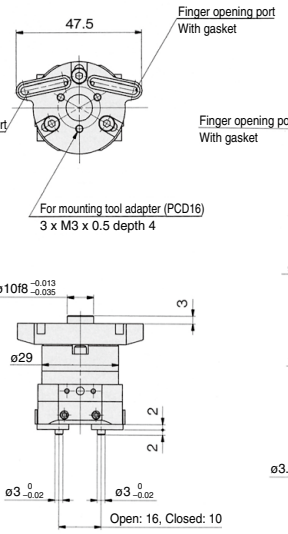
ø10/ø15 Air Gripper: Rotary Actuated Type

ø10/ø15: MHR2-$^{10}_{15}$-A210

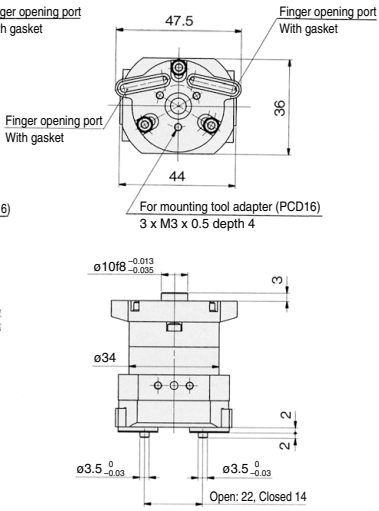
ø10
MHR2-10-A210



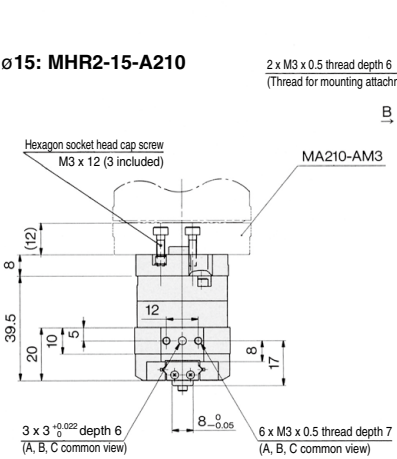
ø10
MHR2-10-A210

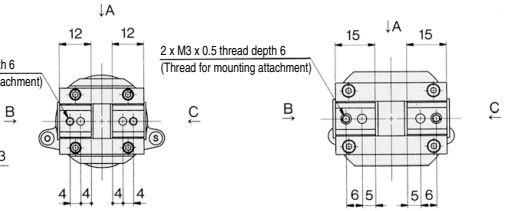


ø15
MHR2-15-A210



ø15: MHR2-15-A210

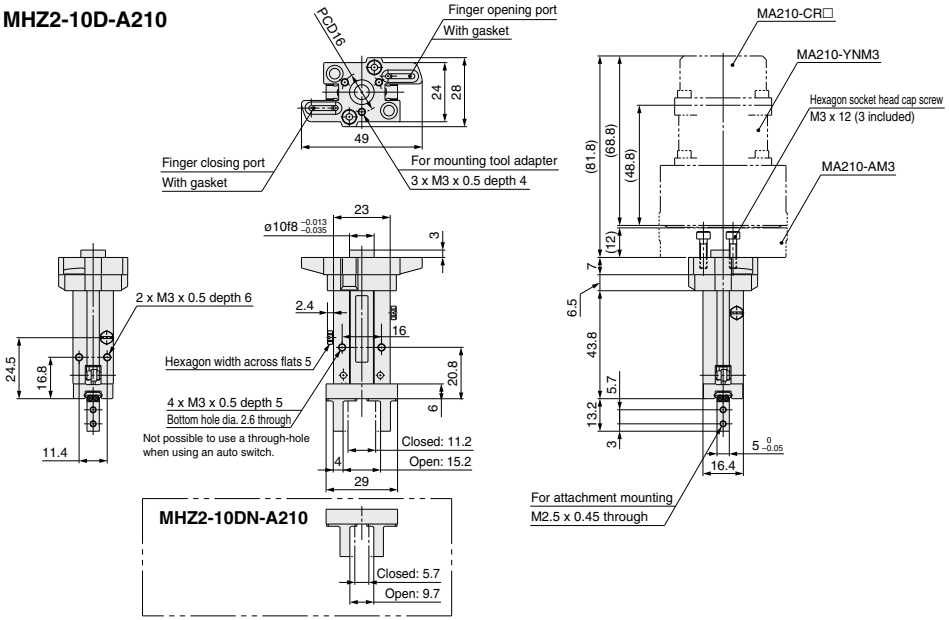




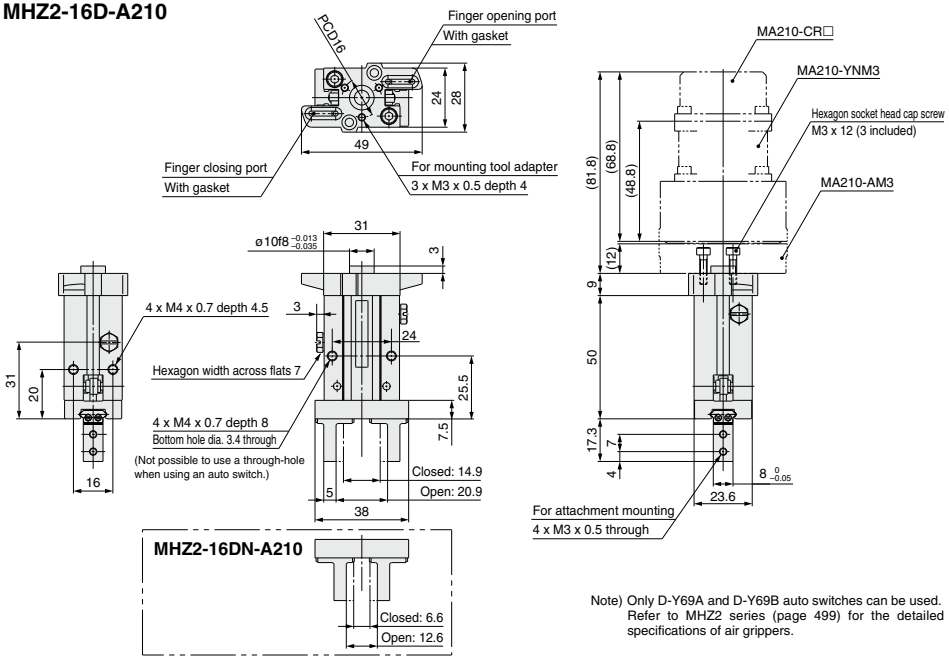
Note) Refer to Series MHR2 (page 644) for the detailed specifications of air grippers.

ø10/ø16 Air Gripper: Standard Type

MHZ2-10D-A210



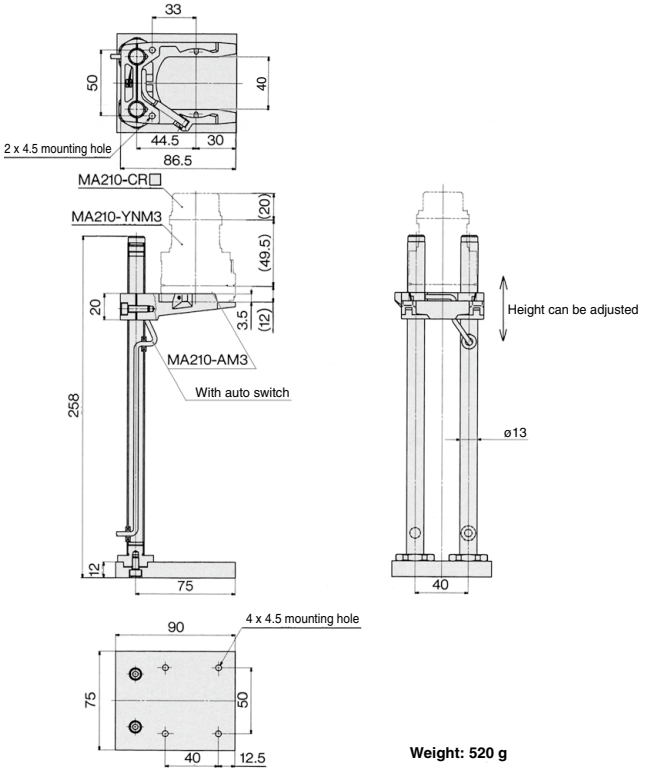
MHZ2-16D-A210



Note) Only D-Y69A and D-Y69B auto switches can be used. Refer to MHZ2 series (page 499) for the detailed specifications of air grippers.

Tool Stand

MA210-S1-□



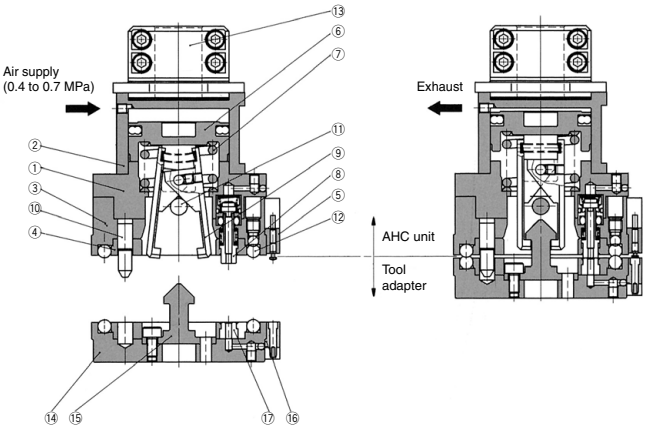
Weight: 520 g

Construction: Component Parts

Single acting type

When disconnected

When connected



Component Parts

No.	Description	Material	Note
1	**Unit body**	Aluminum alloy	Hard anodized
2	**Head cap**	Aluminum alloy	Hard anodized
3	**Ball base**	Aluminum alloy	Hard anodized
4	**Ball cover**	Carbon steel	Electroless nickel plating
5	**Contact probe assembly**		
6	**Piston**	Stainless steel	
7	**Clamp spring**	Steel wire	Zinc chromated
8	**Check valve assembly**		
9	**Lever**	Carbon steel	Special black thin membrane anti-corrosive treated
10	**Pilot pin**	Carbon steel	Special black thin membrane anti-corrosive treated

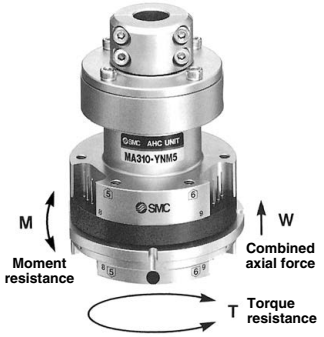
Component Parts

No.	Description	Material	Note
11	**Parallel pin**	Stainless steel	
12	**Steel ball**	Stainless steel	
13	**Robot adapter**	Aluminum alloy	Hard anodized
14	**Tool adapter**	Aluminum alloy	Hard anodized
15	**Hook**	Carbon steel	Special black thin membrane anti-corrosive treated
16	**Contact block assembly**		Contact point gold plated
17	**Passage seal**	Synthetic rubber	

AHC System

Auto Hand Changing System

MA3 Series



Specifications

Series			MA310	MA311	MA320	MA321
Positioning			Ball coupling		Curved coupling	
Max. work load			5 kg			
Handling			Single acting/ Air supply at disconnection	Double acting	Single acting/ Air supply at disconnection	Double acting
Handling air pressure			0.4 to 0.7 MPa			
Proof pressure			1.05 MPa			
Ambient and fluid temperature			0 to 60°C			
Positioning repeatability			±0.01 mm			
Combined axial force W *			200 N	500 N (0.5 MPa)	200 N	500 N (0.5 MPa)
Moment resistance M *			3 N·m	7.5 N·m (0.5 MPa)	3 N·m	7.5 N·m (0.5 MPa)
Torque resistance T *			3 N·m	7.5 N·m (0.5 MPa)	12 N·m	30 N·m (0.5 MPa)
Interface	**Air**	**Max. operating pressure**	0.7 MPa			
		Operating vacuum pressure	–100 kPa or more (10 Torr or more)			
		Cv value	0.072			
	Electricity	**Number of circuits**	6			
		Contact point capacity	2 A/interface			
		Number of contact points	12			

* Values given on the table for combined axial force, moment resistance, and torque resistance are the values for when the AHC unit and tool adapter begin to separate. During use, make sure the axial force, moment and torque from load are 1/2 or less than those shown above, for safety reasons.

Option Part No.

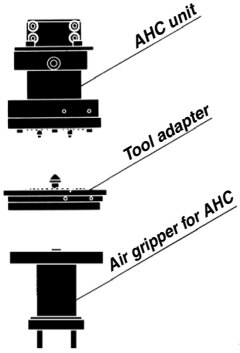
Robot adapter

Part no.	Applicable shaft diameter	Note
MA310-CR1	ø10	Hexagon socket head cap screw M4 x 10 (4 pcs.) M4 x 14 (4 pcs.)
MA310-CR2	ø11	
MA310-CR3	ø14	
MA310-CR4	ø15	
MA310-CR5	ø20	
MA310-CS6	ø24	
MA310-CR6	ø25	

Additional Installation Unit of Electrical Contact Point

Part no.	Additional installation unit	Application	Note
MA310-EY1	8 contact points	AHC unit	Hexagon socket head cap screw M2.5 x 10 (2 pcs.)
MA310-EA1		Tool adapter	

How to Order



MA 3 1 0 – Y A M5 – R3

Auto hand changer

Work load

3	Work load 5 kg

Positioning

1	Ball coupling
2	Curved coupling

Operation

0	Single acting
1	Double acting

AHC unit

Electric specifications

Symbol	Soldering	D-sub connector
N	●	—
A	—	●
B	—	● (With socket side connector)
C	—	● (With socket side connector with 3 m cable)

∗ Refer to page 920 "D-sub connectors" for details.

Air connection size

M5	M5 x 0.8

Robot adapter

Nil	Without robot adapter	
R1	ø10	Applicable shaft diameter
R2	ø11	
R3	ø14	
R4	ø15	
R5	ø20	
S6	ø24	
R6	ø25	

Tool adapter

MA 3 10 – A M5

Auto hand changer

Work load

3	Work load 5 kg

Series

10	Ball coupling
20	Curved coupling

Tool adapter

Air connection size

M3	M3 x 0.5
M5	M5 x 0.8

Air gripper for AHC

<ø10/ø15>

MHR2 – 10 – A310

Cylinder bore

10	10 mm
15	15 mm

For MA3 With adapter

<ø16/ø20>

MHZ2 – 16 D N – A310 – Y69A

Cylinder bore

16	16 mm
20	20 mm

For MA3 With adapter

Finger position

Nil	Standard
N	Narrow type

Auto switch type

Nil	Without auto switch	
Y69A	D-Y69A (3-wire)	Solid state auto switch Lead wire: Right angle entry Lead wire length: 0.5 m
Y69B	D-Y69B (2-wire)	

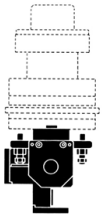
Auto switch additional symbol

Nil	2 pcs.
S	1 pc.

∗ When using an air gripper for AHC, use tool adapter MA3^{1}_{2}0-AM3

90° reverse unit

MA310 – R1 – 90A



90° reverse unit

Auto switch type

Nil	Without auto switch	—		Lead wire length: 0.5 m
90	D-90 (2 pcs.)	Reed auto switch		
90A	D-90A (2 pcs.)			
S99	D-S991, D-S992 (1 pc. each)	Solid state auto switch	3-wire	
T99	D-T991, D-T992 (1 pc. each)		2-wire	

∗ Can also be used for MA320 series.

Tool stand

MA310 – S1 – Y59A

Tool stand

Lead wire length

Nil	Grommet	With 0.5 m lead wire
L		With 3 m lead wire

Auto switch type

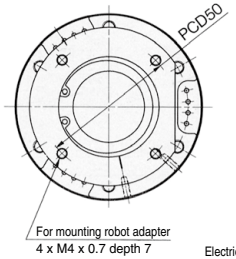
Nil	Without auto switch	
Y59A	D-Y59A (3-wire)	Solid state auto switch Lead wire: Axial direction entry
Y59B	D-Y59B (2-wire)	

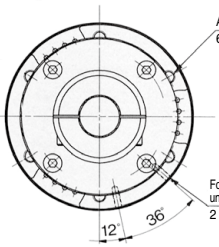
∗ Can also be used for MA320 series.

AHC Unit and Tool Adapter/Single Acting Type

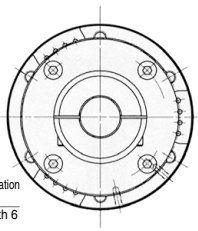
AHC Unit/MA3$\frac{1}{2}$0-YNM5 (Without robot adapter)
AHC Unit/MA3$\frac{1}{2}$0-YNM5-□ (With robot adapter)
Tool adapter/MA3$\frac{1}{2}$0-A□

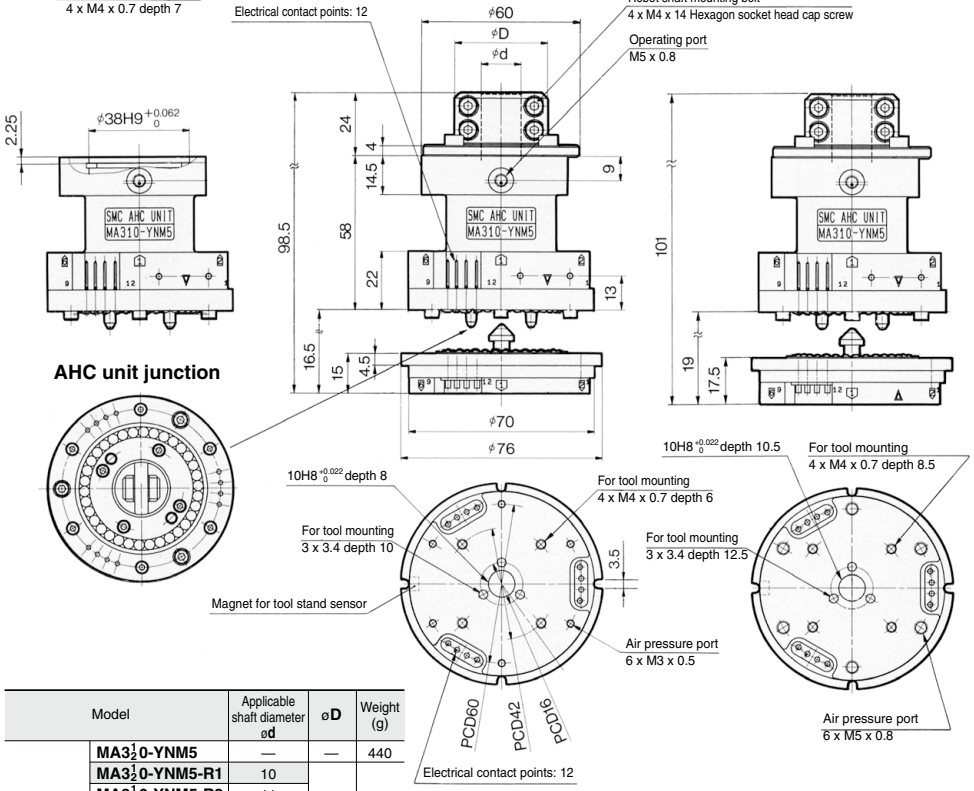
When mounting MA3$\frac{1}{2}$0-AM3





When mounting MA3$\frac{1}{2}$0-AM5





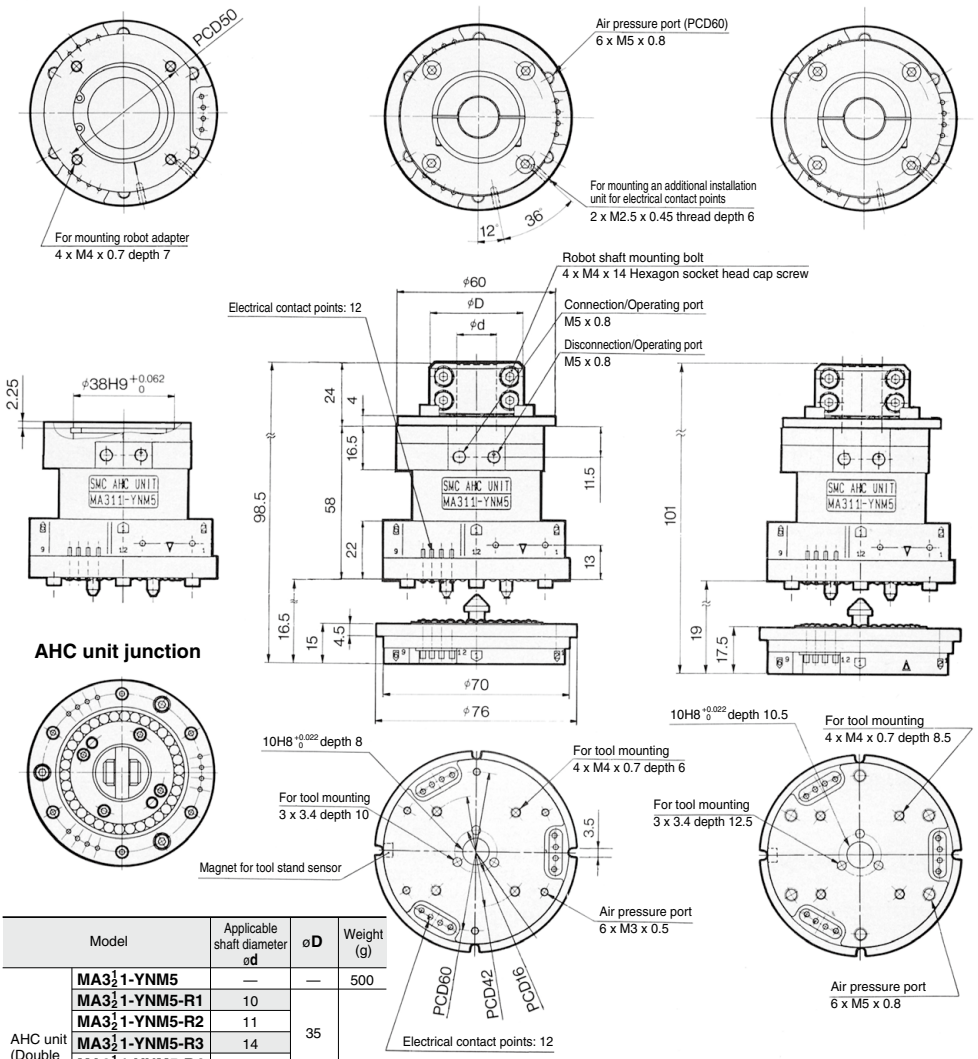
AHC unit junction

Model		Applicable shaft diameter ø**d**	ø**D**	Weight (g)
AHC unit	**MA3$\frac{1}{2}$0-YNM5**	—	—	440
	MA3$\frac{1}{2}$0-YNM5-R1	10	35	520
	MA3$\frac{1}{2}$0-YNM5-R2	11		
	MA3$\frac{1}{2}$0-YNM5-R3	14		
	MA3$\frac{1}{2}$0-YNM5-R4	15		
	MA3$\frac{1}{2}$0-YNM5-R5	20	41	
	MA3$\frac{1}{2}$0-YNM5-S6	24		
	MA3$\frac{1}{2}$0-YNM5-R6	25		
Tool adapter	**MA3$\frac{1}{2}$0-AM3**	—	—	250
	MA3$\frac{1}{2}$0-AM5			270

AHC Unit and Tool Adapter/Double Acting Type

AHC Unit/MA3$\frac{1}{2}$1-YNM5 (Without robot adapter)
AHC Unit/MA3$\frac{1}{2}$1-YNM5-□ (With robot adapter)
Tool adapter/MA3$\frac{1}{2}$0-A□

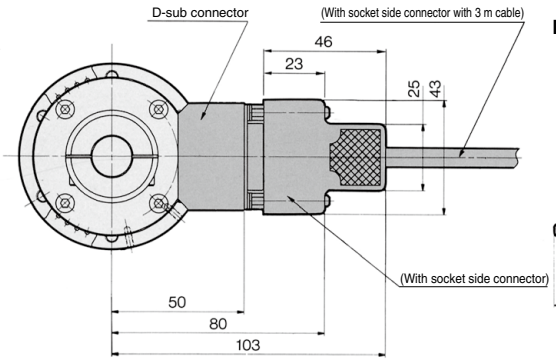
When mounting MA3$\frac{1}{2}$0-AM3 **When mounting MA3$\frac{1}{2}$0-AM5**



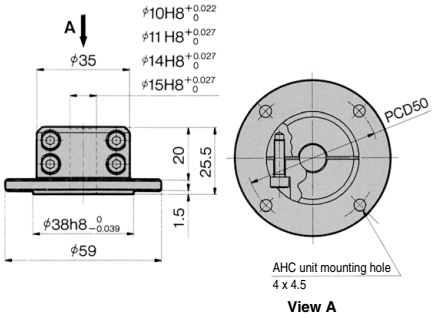
Model		Applicable shaft diameter ød	øD	Weight (g)
AHC unit (Double Acting)	**MA3$\frac{1}{2}$1-YNM5**	—	—	500
	MA3$\frac{1}{2}$1-YNM5-R1	10	35	580
	MA3$\frac{1}{2}$1-YNM5-R2	11		
	MA3$\frac{1}{2}$1-YNM5-R3	14		
	MA3$\frac{1}{2}$1-YNM5-R4	15		
	MA3$\frac{1}{2}$1-YNM5-R5	20	41	
	MA3$\frac{1}{2}$1-YNM5-S6	24		
	MA3$\frac{1}{2}$1-YNM5-R6	25		
Tool adapter	**MA3$\frac{1}{2}$0-AM3**	—	—	250
	MA3$\frac{1}{2}$0-AM5			270

With D-sub connector
MA3□□-Y□M5-□□

Robot adapter
MA310-C□□

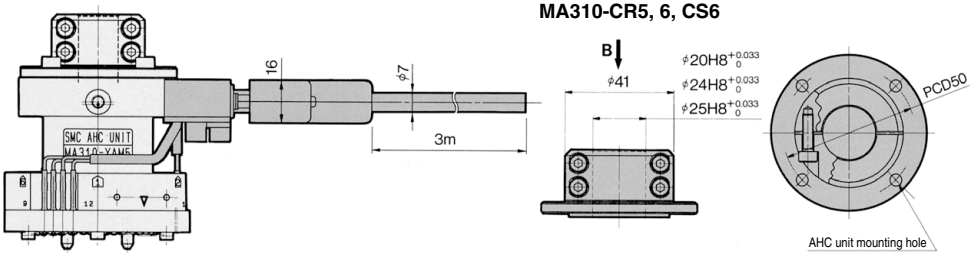


MA310-CR1, 2, 3, 4



View A

MA310-CR5, 6, CS6



View B

AHC unit with D-sub connector	Weight (g)
MA3$\frac{1}{2}$0-YAM5-□□	600
MA3$\frac{1}{2}$0-YBM5-□□	620
MA3$\frac{1}{2}$0-YCM5-□□	890
MA3$\frac{1}{2}$1-YAM5-□□	660
MA3$\frac{1}{2}$1-YBM5-□□	680
MA3$\frac{1}{2}$1-YCM5-□□	950

Model	Applicable shaft diameter	Weight (g)
MA310-CR1	ø10	80
MA310-CR2	ø11	
MA310-CR3	ø14	
MA310-CR4	ø15	
MA310-CR5	ø20	
MA310-CS6	ø24	
MA310-CR6	ø25	

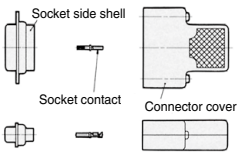
D-sub connectors

D-sub connector specifications

		AHC unit main body side	Cable side
D-sub connector	Contact classification	Pin	Socket
	Shell size	A	
	No. of cores	15	
	Connector type	Crimping connection type	
Robot cable	Effective area	—	0.2 mm²
	No. of cores	—	12

MA3□□-YAM5-□□ with a D-sub connector
Since the AHC unit main body is compatible with a pin contact, prepare a socket contact.

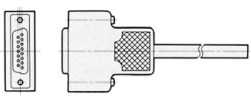
MA3□□-YBM5-□□ with a socket side connector
A pin contact is comprised of 12 crimping connection type pins as standard.
For a crimping tool, we recommend the CT150-2-D•C made by Japan Aviation Electronics Industry, Inc.



MA3□□-YCM5-□□ with a socket side connector with 3 m cable
The combination of the electric contact point number and cables of the AHC unit is shown in the table below.

Electrical Contact Point No./Cable Wiring

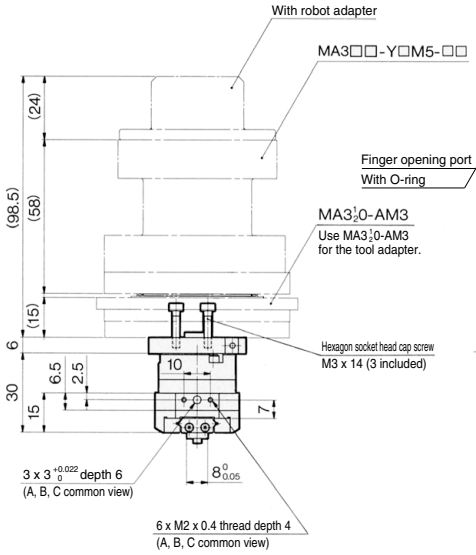
Electrical contact point no.	1	2	3	4	5	6	7	8	9	10	11	12
Insulation color	Red	White	Black	Pink	Light blue	Purple	Gray	Orange	Green	Yellow	Brown	Blue



ø10/ø15 Air Gripper: Rotary Actuated Type

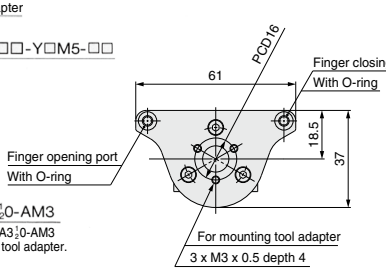
ø10/ø15: MHR2-$^{10}_{15}$-A310

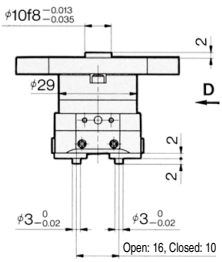
ø10
MHR2-10-A310



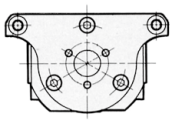
View D

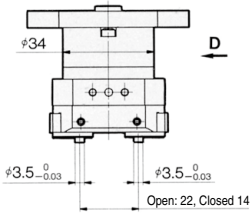
ø10
MHR2-10-A310



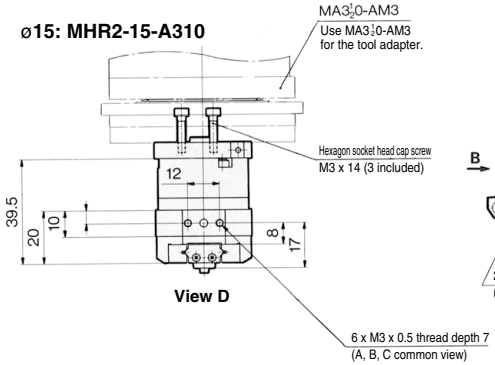


ø15
MHR2-15-A310

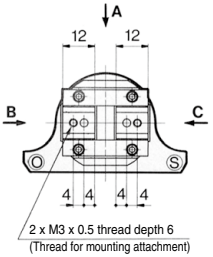




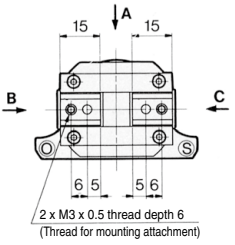
ø15: MHR2-15-A310



View D



Weight: 130 g

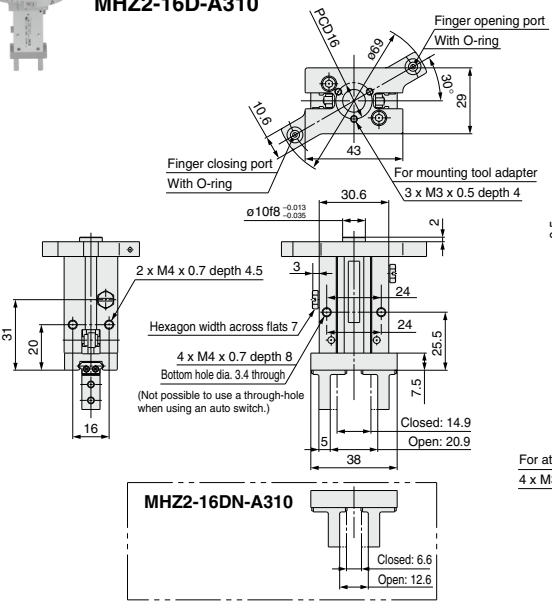


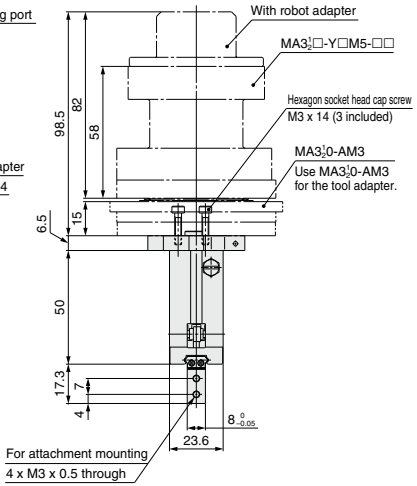
Weight: 210 g

Note) Refer to MHR2 series (page 644) for the detailed specifications of air grippers.

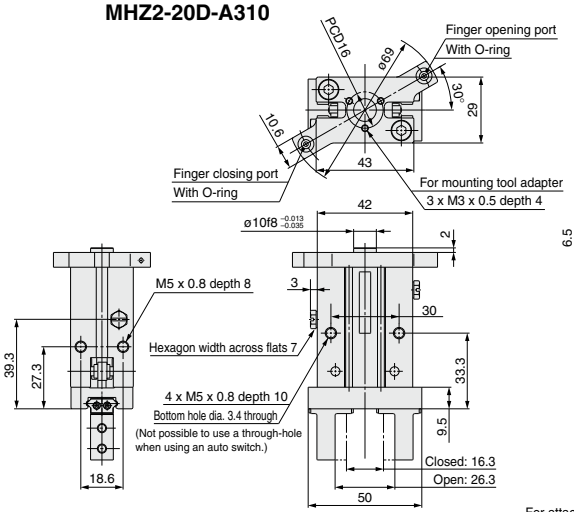
ø16/ø20 Air Gripper: Standard Type

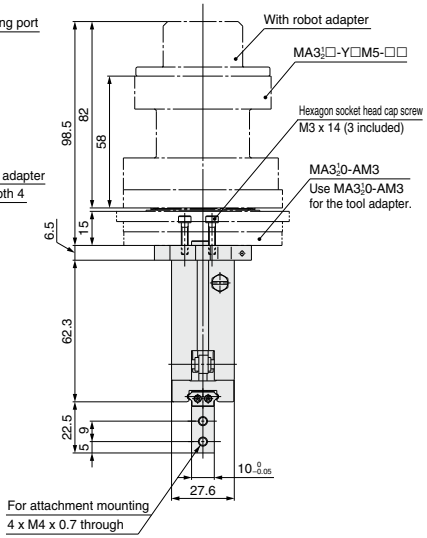
MHZ2-16D-A310

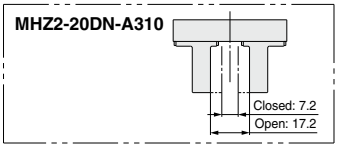




MHZ2-20D-A310



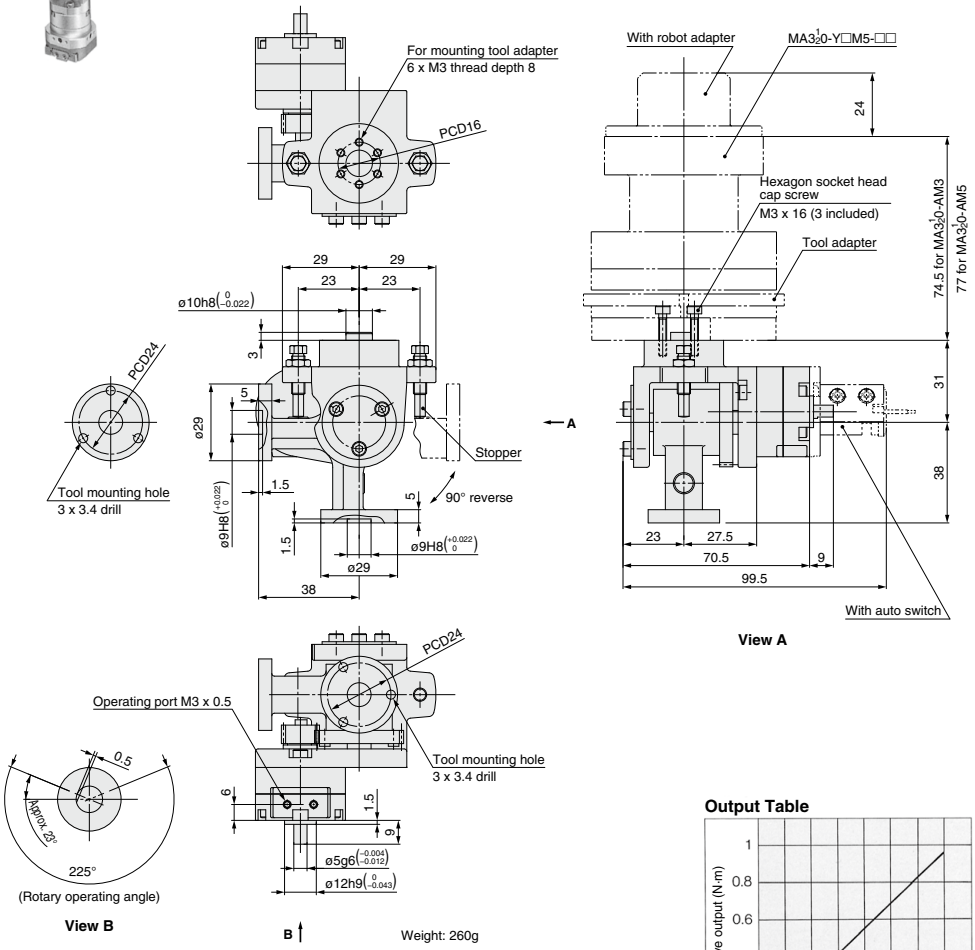




Note) Only D-Y69A and D-Y69B auto switches can be used. Refer to MHZ2 series (page 499) for the detailed specifications of air grippers.

90° Reverse Unit

MA310-R1-□

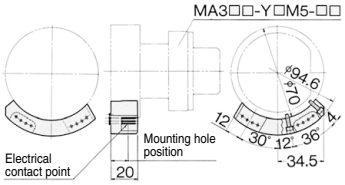


Output Table

Please consult SMC regarding operating conditions (load, speed, etc.) before using.

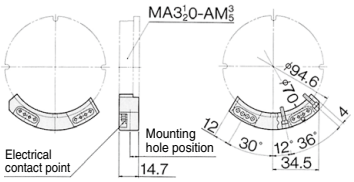
Additional Installation Unit of Electrical Contact Point

MA310-EY1: For AHC unit



Accessory	Hexagon socket head cap screw M2.5 x 10
	Flat washer, Compact round washer, Nominal size 2.5
Weight	20 g

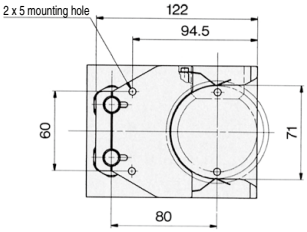
MA310-EA1: For tool adapter

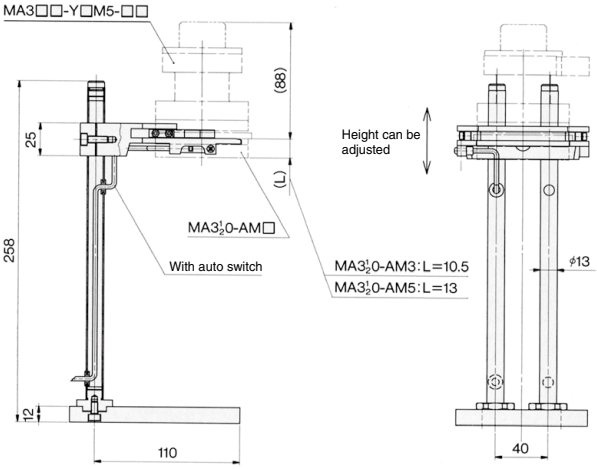


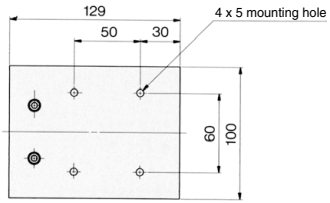
Accessory	Hexagon socket head cap screw M2.5 x 10
Weight	25 g

Tool Stand

MA310-S1-□



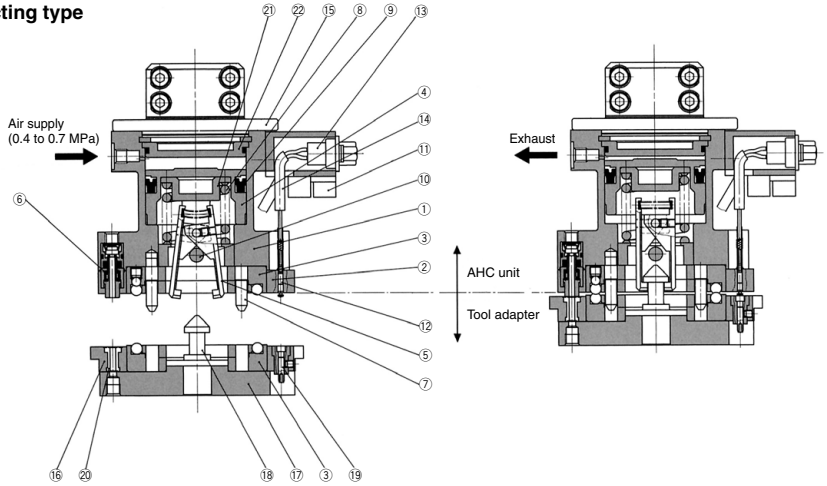




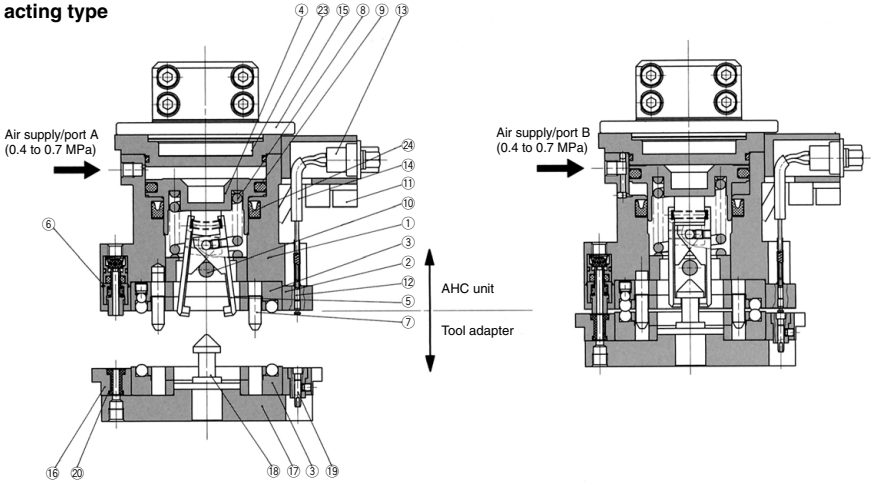
Weight: 950 g

Construction: Component Parts

Single acting type



Double acting type



Component Parts

No.	Description	Material	Note
1	**Body**	Aluminum alloy	Hard anodized
2	**Insulation ring**	Synthetic resin	Black
3	**Coupling**	Carbon steel	Special black thin membrane anti-corrosive treated
4	**Piston**	Aluminum alloy	Chromated
5	**Lever**	Carbon steel	Special black thin membrane anti-corrosive treated
6	**Check valve assembly**	Brass, steel wire, synthetic rubber	
7	**Pilot pin**	Carbon steel	Special black thin membrane anti-corrosive treated
8	**Clamp spring**	Steel wire	Zinc chromated
9	**Seal**	Synthetic rubber	
10	**Parallel pin**	Stainless steel	
11	**Multi-tube holder**	Synthetic resin	Black
12	**Contact probe**		
13	**D-sub connector assembly**		

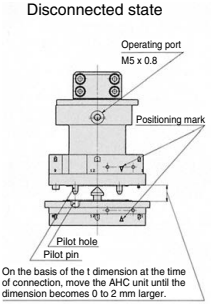
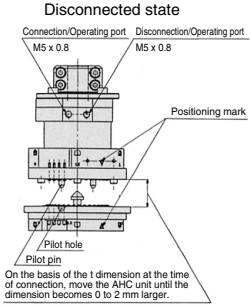
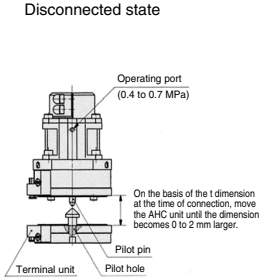
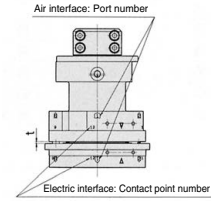
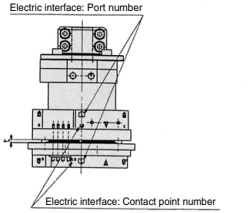
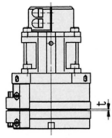
Component Parts

No.	Description	Material	Note
14	**Cable**		
15	**Robot adapter**	Aluminum alloy	Hard anodized
16	**Connecting base**	Aluminum alloy	Hard anodized
17	**Tool plate**	Aluminum alloy	Hard anodized
18	**Hook**	Carbon steel	Special black thin membrane anti-corrosive treated
19	**Contact block assembly**	Beryllium copper, synthetic resin	Contact point gold plated
20	**Passage seal**	Synthetic rubber	
Single acting type			
21	**Bearing**	Stainless steel	
22	**Cap**	Aluminum alloy	Chromated
Double acting type			
23	**Head cap**	Aluminum alloy	Hard anodized
24	**Rod seal**	Synthetic rubber	

MA Series
Specific Product Precautions 1

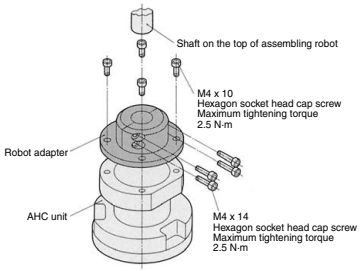
Be sure to read this before handling the products. Refer to page 7 for safety instructions and pages 14 to 22 for air gripper and auto switch precautions.

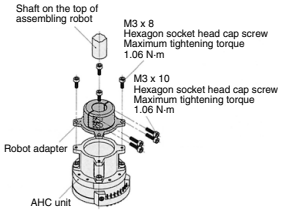
Connection and disconnection procedures

Series	MA3$^{1}_{2}$0	MA3$^{1}_{2}$1	MA210
Connection procedures	1. Supply compressed air: 0.4 to 0.7 MPa to the operating port.	1. Supply compressed air: 0.4 to 0.7 MPa to the disconnection port.	1. Supply compressed air: 0.4 to 0.7 MPa to the operating port.
	2. Align the positions of the AHC unit and tool adapter as shown below, move the AHC unit to within 0.5 mm of the tool adapter, with the centers aligned, and insert the pilot pin into the pilot hole on the tool adapter side. Move the AHC unit toward until the t dimension in the figure below attains 0 to 2 mm larger than the value at the time of connection.		
	3. Release the compressed air from the operating port.	3. Release the compressed air from the disconnection port, and at the same time supply compressed air (0.4 to 0.7 MPa) to the connection port.	3. Release the compressed air from the operating port.
Disconnection procedures	1. Supply compressed air: 0.4 to 0.7 MPa to the operating port. 2. Pull up the AHC unit 12 mm or more.	1. Release the compressed air from the connection port, and at the same time supply compressed air (0.4 to 0.7 MPa) to the disconnection port. 2. Pull up the AHC unit 12 mm or more.	1. Supply compressed air: 0.4 to 0.7 MPa to the operating port. 2. Pull up the AHC unit 12 mm or more.
	Disconnected state 	Disconnected state 	Disconnected state 
	Connected state 	Connected state 	Connected state 

Robot Adapter Mounting

[Mounting the robot adapter to the AHC unit]
Attach the robot adapter to the AHC unit by evenly tightening the 4 hexagon socket head cap screws with the maximum tightening torque mentioned in the figures below.
[Mounting the robot adapter to an assembling robot]
Mount the AHC unit to the shaft of the assembling robot by evenly tightening the 4 hexagon socket head cap screws with the maximum tightening torque mentioned in the figures below





MA Series
Specific Product Precautions 2

Be sure to read this before handling the products. Refer to page 7 for safety instructions and pages 14 to 22 for air gripper and auto switch precautions.

Series	MA3□□	MA210

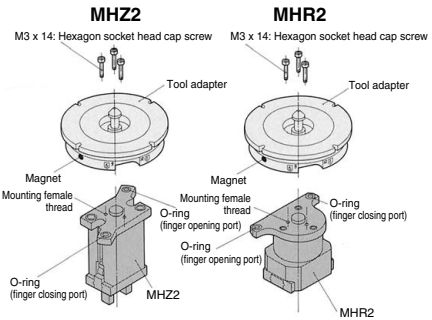
How to use dedicated air grippers

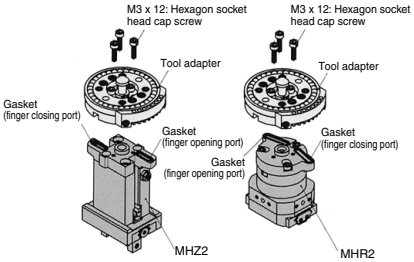
Mounting procedures

1. Based on the positioning of the tool adapter and the air gripper shown in the figures below, note that it is possible to rotate them every 120° and in three different directions. Mount them accordance with your operating conditions.

1. Mount the tool adapter and the air gripper using the positioning shown in the figures below.

2. Evenly tighten 3 hexagon socket head cap screws with a maximum tightening torque of 1.06 N·m.
3. Before mounting, confirm that the O-ring or gasket of the air gripper is mounted properly, and make sure there is no dust or debris on the sheet surface of the tool adapter.





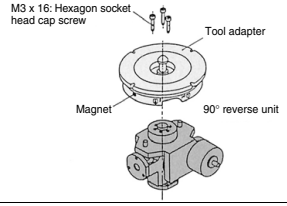
Piping and wiring procedures

1. The bracket is fitted with a fluid passage, so there is no need for piping except for on the AHC unit side. The bracket also has a mark for the position of the piping port, which can be referred to while work is taking place.
   • Finger closing port: "S" mark • Finger opening port: "O" mark
2. When using an auto switch, solder it to the terminal on the tool adapter.

90° reverse unit

Mounting procedures

1. Based on the positioning shown in the figure below, note that it is possible to rotate the tool adapter and the air gripper every 60° and in six different directions.
2. Mount the 90° reverse unit to the tool adapter, and evenly tighten the 3 hexagon socket head cap screws (M3 x 16) with a maximum tightening torque of 1.06 N·m.

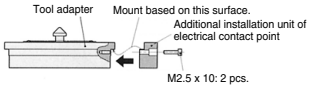


Piping and wiring procedures

1. Pipe the driving air for tools or the rotary actuator to the air port of the tool adapter.
2. When wiring for use with an auto switch, etc., solder it to the terminal on the tool adapter.

Additional installation unit of electrical contact point

1. As shown in the figure below, determine the position in accordance with the leveled part of the AHC unit and tool adapter, and evenly tighten the 2 hexagon socket head cap screws (M2.5 x 10) with a maximum tightening torque of 0.3 N·m.



MA Series
Specific Product Precautions 3

Be sure to read this before handling the products. Refer to page 7 for safety instructions and pages 14 to 22 for air gripper and auto switch precautions.

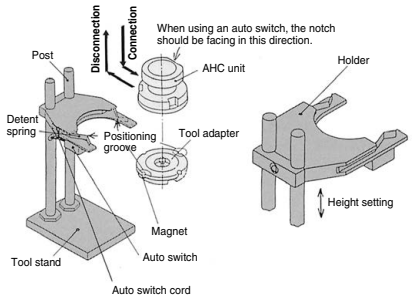
Series	MA3□□	MA210

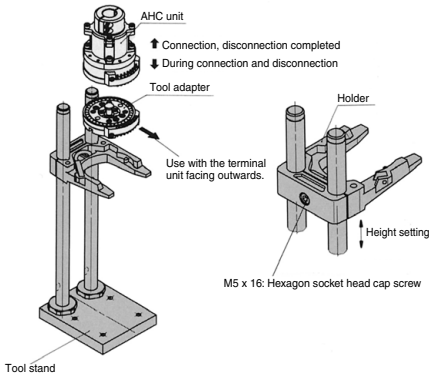
How to use the tool stand

1. Align the positions of the tool adapter positioning groove and the tool stand detent spring.
   When using an auto switch, position the auto switch in relation to the magnet fitted on the tool adapter in accordance with the figure below.
   By changing the auto switch mounting position to the right side, it is possible to use it by turning it around 180°. When doing so, be sure the auto switch cable is coming out of the post side.
   Tighten the auto switch mounting screws with a maximum tightening torque of 0.1 N·m.
2. Connect or disconnect the AHC unit and tool adapter only after attaching the AHC unit in a horizontal direction.

1. Use the tool adapter and tool stand based on the positioning shown in the figure below.
2. Connect or disconnect the AHC unit and tool adapter in a direction perpendicular to the AHC unit.

3. When positioning the holder, loosen the hexagon socket head cap screws shown in the figure below right, and set it at the desired height, then tighten with a maximum tightening torque of 5 N·m.





Piping and wiring precautions

1. Use SMC compact One-touch fittings, one-touch mini (M3, M5), or miniature fittings (M3, M5).
   Thoroughly flush out the connector piping and be sure that dirt and chips, etc., do not get inside the equipment.
2. When wiring, except for the D-sub connector entry, solder to the probe socket of the AHC unit, or the terminal of the tool adapter.
   We recommend insulating the connection points with heat shrinking tube, etc.
3. During piping and wiring, be sure that there is no external forces such as pulling and twisting at work.