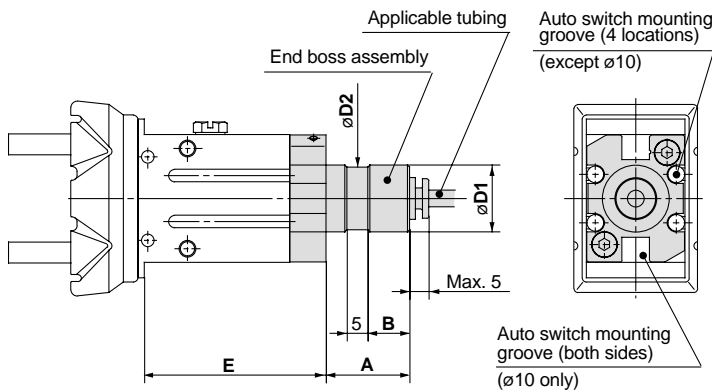


With Dust Cover/Series MHZJ2

Body Options: End Boss Type

Axial Port (with One-touch Fitting) [K]



- * Refer to the dimension table.
- * When auto switches are used on ø10, side mounting with through holes is not possible.

Unit: mm

Model	A	B	D1	D2	E
MHZJ2-10□□	15	7	12f8 ^{-0.016} _{-0.043}	11	40
MHZJ2-16□□	20	10	16f8 ^{-0.016} _{-0.043}	15	43.5
MHZJ2-20□□	22	12	20f8 ^{-0.020} _{-0.053}	19	51.7
MHZJ2-25□□	25	15	25f8 ^{-0.020} _{-0.053}	24	61.3

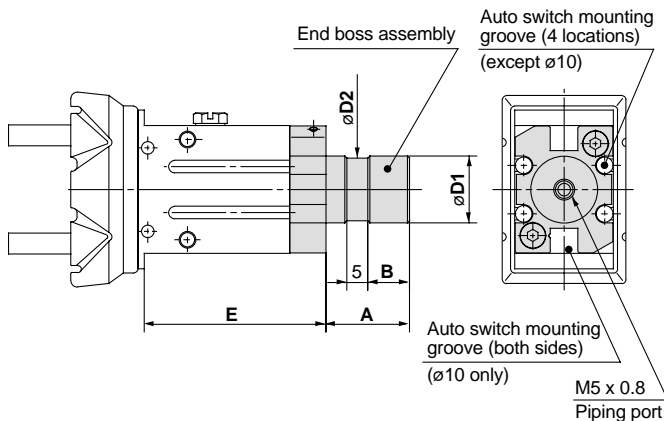
Other dimensions and specifications correspond to the standard type.

Applicable tubing

Description/ Model	Nylon tubing	Soft nylon tubing	Polyurethane tubing	Polyurethane coiled tubing
	T0425	TS0425	TU0425	TCU0425B-1
Outside diameter mm	4	4	4	4
Max. operating pressure MPa	1.0	0.8	0.5	0.5
Min. bending radius mm	13	12	10	—
Operating temperature °C	-20 to 60	-20 to 60	-20 to 60	-20 to 60
Material	Nylon 12	Nylon 12	Polyurethane	Polyurethane

Refer to catalog CAT. E501-B "Air Fittings and Tubing" regarding One-touch fittings and tubing.

Axial Port (M5 Port) [M]



- * Refer to the dimension table.
- * When auto switches are used on ø10, side mounting with through holes is not possible.

Unit: mm

Model	A	B	D1	D2	E
MHZJ2-10□□	15	7	12f8 ^{-0.016} _{-0.043}	11	40
MHZJ2-16□□	20	10	16f8 ^{-0.016} _{-0.043}	15	43.5
MHZJ2-20□□	22	12	20f8 ^{-0.020} _{-0.053}	19	51.7
MHZJ2-25□□	25	15	25f8 ^{-0.020} _{-0.053}	24	61.3

Other dimensions and specifications correspond to the standard type.

Weights

Unit: g

Model	End boss type (symbol)			
	E	W	K	M
MHZJ2-10□□	70	70	70	70
MHZJ2-16□□	165	165	165	165
MHZJ2-20□□	290	290	290	290
MHZJ2-25□□	525	525	525	525

Auto Switch Specifications

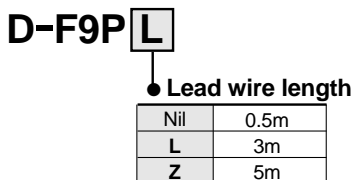
Auto Switch Common Specifications

Type	Solid state switch
Operating time	1ms or less
Impact resistance	1000m/s ²
Insulation resistance	50MΩ or more at 500VDC (between lead wire and case)
Withstand voltage	1000VAC for 1min. (between lead wire and case)
Ambient temperature	-10 to 60°C
Enclosure	IEC529 standard IP67, JISC0920 watertight construction

Lead Wire Lengths

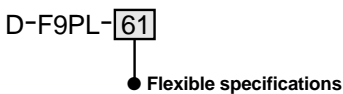
Indication of lead wire length

(Example)



- Note 1) Lead wire length Z: Auto switch applicable to 5m length
Solid state switches: All models produced upon receipt of order (standard procedure).
- Note 2) The standard lead wire length is 3m for water resistant 2 color indication solid state switches. (0.5m is not available.)
- Note 3) For solid state with flexible wire specifications, enter -61 after the lead wire length.

(Example)



Lead Wire Color Changes

Lead wire colors of SMC auto switches have been changed in order to meet standard IEC947-5-2 for production beginning September, 1996 and thereafter, as shown in the tables below.
Take special care regarding wire polarity during the time that the old colors still coexist with the new colors.

2 wire

	Old	New
Output (+)	Red	Brown
Output (-)	Black	Blue

3 wire

	Old	New
Power supply (+)	Red	Brown
Power supply GND	Black	Blue
Output	White	Black

Solid state with diagnostic output

	Old	New
Power supply (+)	Red	Brown
Power supply GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

Solid state with latch type diagnostic output

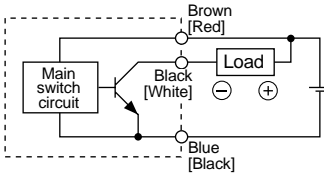
	Old	New
Power supply (+)	Red	Brown
Power supply GND	Black	Blue
Output	White	Black
Latch type diagnostic output	Yellow	Orange

Series MHZ Auto Switches Connections and Examples

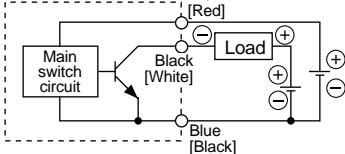
Basic Wiring

Lead wire colors inside [] are those prior to conformity with IEC standards.

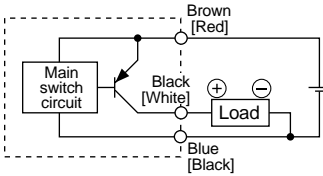
Solid state 3 wire, NPN



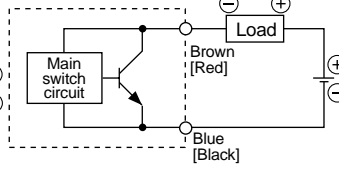
(Power supplies for switch and load are separate.)



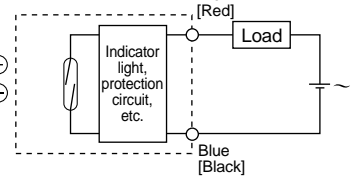
Solid state 3 wire, PNP



2 wire <Solid state>



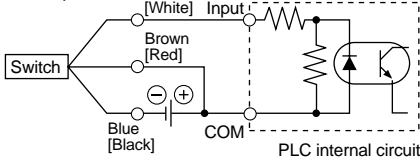
2 wire <Reed switch>



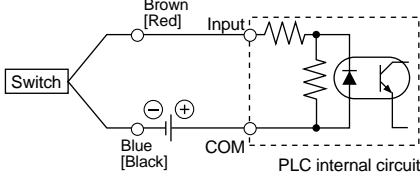
Examples of Connection to PLC

Sink input specifications

3 wire, NPN

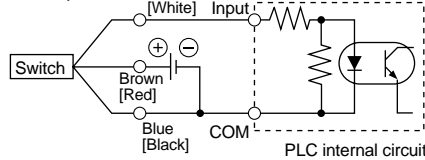


2 wire

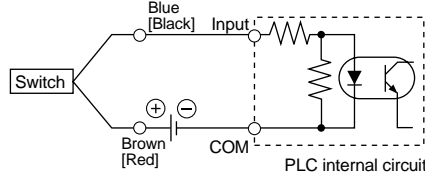


Source input specifications

3 wire, PNP



2 wire

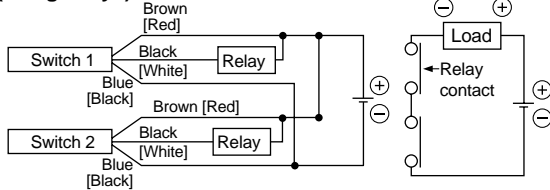


Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

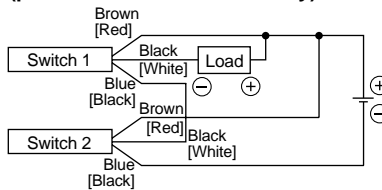
Connection Examples for AND (Series) and OR (Parallel)

3 wire

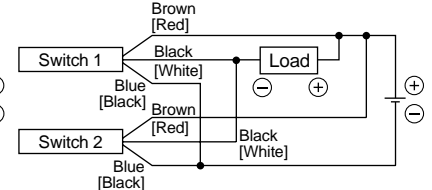
AND connection for NPN output (using relays)



AND connection for NPN output (performed with switches only)

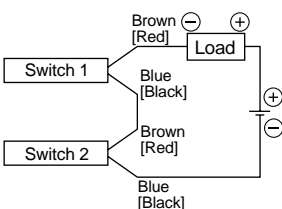


OR connection for NPN output



The indicator lights will light up when both switches are turned ON.

2 wire with 2 switch AND connection

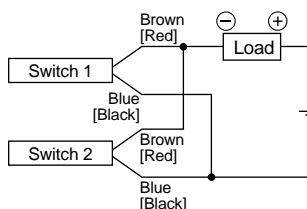


When two switches are connected in series, a load may malfunction because the load voltage will decline when in the ON state. The indicator lights will light up if both of the switches are in the ON state.

$$\begin{aligned} \text{Load voltage at ON} &= \text{Power supply voltage} - \text{Internal voltage drop} \times 2 \text{ pcs.} \\ &= 24\text{V} - 4\text{V} \times 2 \text{ pcs.} \\ &= 16\text{V} \end{aligned}$$

Example: Power supply is 24VDC
Internal voltage drop in switch is 4V

2 wire with 2 switch OR connection



<Solid state>

When two switches are connected in parallel, malfunction may occur because the load voltage will increase when in the OFF state.

<Reed switch>

Because there is no current leakage, the load voltage will not increase when turned OFF. However, depending on the number of switches in the ON state, the indicator lights may sometimes dim or not light up, because of dispersion and reduction of the current flowing to the switches.

$$\begin{aligned} \text{Load voltage at OFF} &= \text{Leakage current} \times 2 \text{ pcs.} \times \text{Load impedance} \\ &= 1\text{mA} \times 2 \text{ pcs.} \times 3\text{k}\Omega \\ &= 6\text{V} \end{aligned}$$

Example: Load impedance is 3kΩ
Leakage current from switch is 1mA

Solid State Switches/Direct Mount Type D-F9N(V), D-F9P(V), D-F9B(V)

Compact Series
MHZA2-6/MHZAJ2-6

Standard Type
MHZ2

Long Stroke
MHZL2

With Dust Cover
MHZJ2

Auto Switches

Order Made

Model Selection

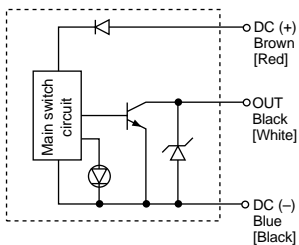
Precautions

Grommet

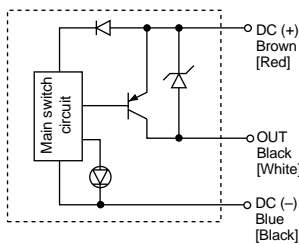


Auto switch internal circuits
Lead wire colors inside [] are those prior to conformity with IEC standards.

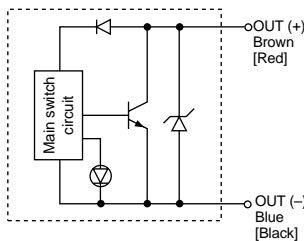
D-F9N(V)



D-F9P(V)



D-F9B(V)



Auto Switch Specifications

D-F9□, D-F9□V (with indicator light)						
Auto switch part no.	D-F9N	D-F9NV	D-F9P	D-F9PV	D-F9B	D-F9BV
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring	3 wire				2 wire	
Output	NPN type		PNP type		—	
Applicable load	IC circuit, Relay, PLC				24VDC relay, PLC	
Power supply voltage	5, 12, 24VDC (4.5 to 28VDC)				—	
Current consumption	10mA or less				—	
Load voltage	28VDC or less		—		24VDC (10 to 28VDC)	
Load current	40mA or less		80mA or less		5 to 40mA	
Internal voltage drop	1.5V or less (0.8V or less at a load current of 10mA)		0.8V or less		4V or less	
Leakage current	100μA or less at 24VDC				0.8mA or less	
Indicator light	Red LED lights up when ON					

• Lead wires—Heavy duty oil resistant vinyl cord, ø2.7, 3 wire (Brown, Black, Blue [Red, White, Black]), 0.15mm², 2 wire, (Brown, Blue [Red, Black]), 0.18mm², 0.5m

Note 1) Refer to page 48 for auto switch common specifications.

Note 2) Refer to page 48 for lead wire lengths.

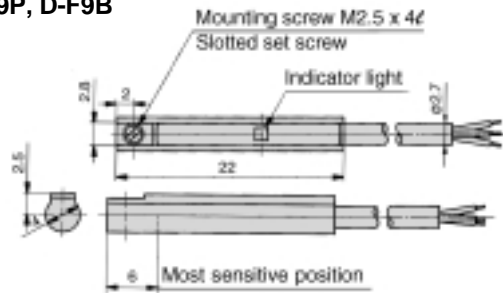
Auto Switch Weights

Unit: g

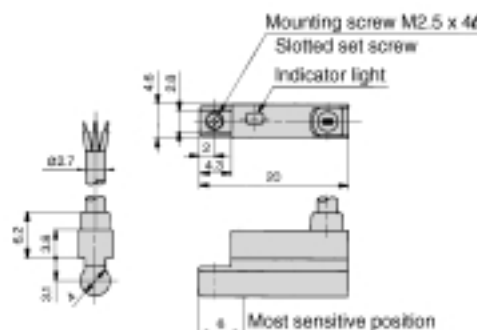
Model	D-F9N	D-F9P	D-F9B	D-F9NV	D-F9PV	D-F9BV
Lead wire length 0.5m	7	7	6	7	7	6
Lead wire length 3m	37	37	31	37	37	31

Auto Switch Dimensions

D-F9N, D-F9P, D-F9B



D-F9NV, D-F9PV, D-F9BV



Solid State Switches/Direct Mount Type D-F8N, D-F8P, D-F8B

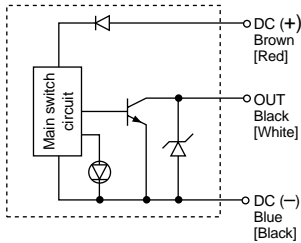
Grommet



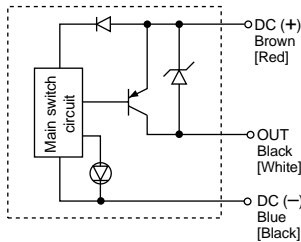
Auto switch internal circuits

Lead wire colors inside [] are those prior to conformity with IEC standards.

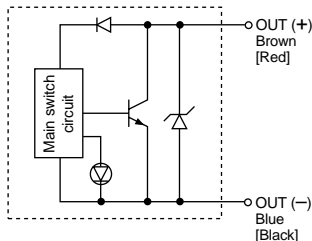
D-F8N



D-F8P



D-F8B



Auto Switch Specifications

D-F8□ (with indicator light)			
Auto switch part no.	D-F8N	D-F8P	D-F8B
Electrical entry direction	Perpendicular	Perpendicular	Perpendicular
Wiring	3 wire		2 wire
Output	NPN type	PNP type	—
Applicable load	IC circuit, 24VDC relay, PLC		24VDC relay, PLC
Power supply voltage	5, 12, 24VDC (4.5 to 28VDC)		—
Current consumption	10mA or less		—
Load voltage	28VDC or less	—	24VDC (10 to 28VDC)
Load current	40mA or less	80mA or less	2.5 to 40mA
Internal voltage drop	1.5V or less (0.8V or less at a load current of 10mA)	0.8V or less	4V or less
Leakage current	100μA or less at 24VDC		0.8mA or less at 24VDC
Indicator light	Red LED lights up when ON		

• Lead wires—Heavy duty oil resistant vinyl cord, $\phi 2.7$, 0.5m

D-F8N, D-F8P 0.15mm² x 3 wire (Brown, Black, Blue [Red, White, Black])

D-F8B 0.18mm² x 2 wire (Brown, Blue [Red, Black])

Note 1) Refer to page 48 for auto switch common specifications.

Note 2) Refer to page 48 for lead wire lengths.

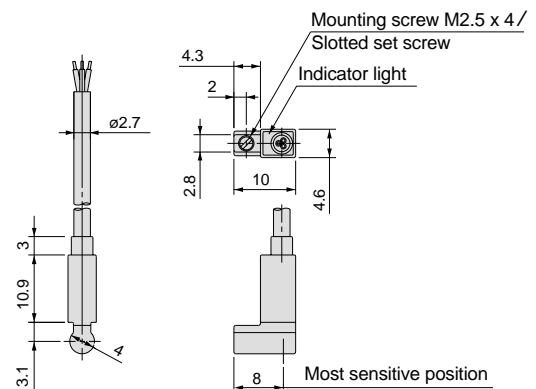
Auto Switch Weights

Unit: g

Model	D-F8N	D-F8P	D-F8B
Lead wire length 0.5m	7		
Lead wire length 3m	32		

Auto Switch Dimensions

D-F8N, D-F8P, D-F8B



2 Color Indication Solid State Switches Direct Mount Type D-F9NW(V), DY-F9PW(V), D-F9BW(V)

Compact Series
MHZA2-6/MHZAJA2-6

Standard Type
MHZ2

Long Stroke
MHZL2

With Dust Cover
MHZJ2

Auto Switches

Order Made

Model Selection

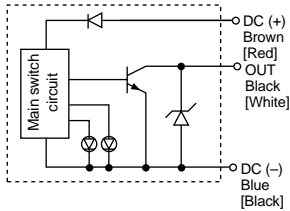
Precautions

Grommet

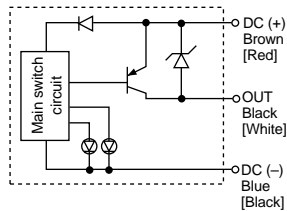


Auto switch internal circuits
Lead wire colors inside [] are those prior to conformity with IEC standards.

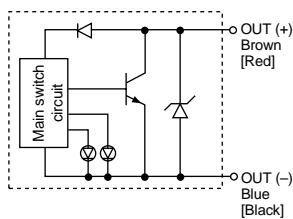
D-F9NW(V)



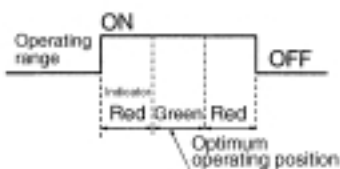
D-F9PW(V)



D-F9BW(V)



Indicator light/Display method



Auto Switch Specifications

D-F9□W, D-F9□ WV (with indicator light)						
Auto switch part no.	D-F9NW	D-F9NWV	D-F9PW	D-F9PWV	D-F9BW	D-F9BWV
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring	3 wire			2 wire		
Output	NPN type		PNP type		—	
Applicable load	IC circuit, Relay IC, PLC				24VDC relay, PLC	
Power supply voltage	5, 12, 24VDC (4.5 to 28VDC)				—	
Current consumption	10mA or less				—	
Load voltage	28VDC or less		—		24VDC (10 to 28VDC)	
Load current	0.4mA or less		80mA or less		5 to 40mA	
Internal voltage drop	1.5V or less (0.8V or less at a load current of 10mA)		0.8V or less		4V or less	
Leakage current	100μA or less at 24VDC				0.8mA or less	
Indicator light	Actuated position Red LED lights up Optimum operating position Green LED lights up					

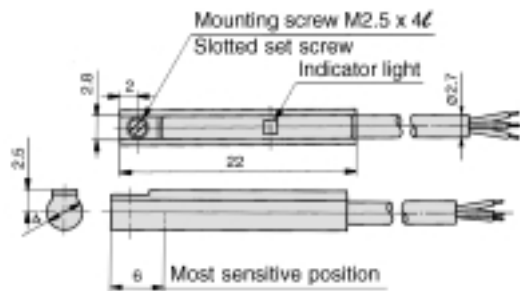
* Lead wires—Heavy duty oil resistant vinyl cord, $\phi 2.7$, 3 wire (Brown, Black, Blue [Red, White, Black]), 0.15mm², 2 wire (Brown, Blue [Red, Black]), 0.18mm², 0.5mm²
Note 1) Refer to page 48 for auto switch common specifications.
Note 2) Refer to page 48 for lead wire lengths.

Auto Switch Weights

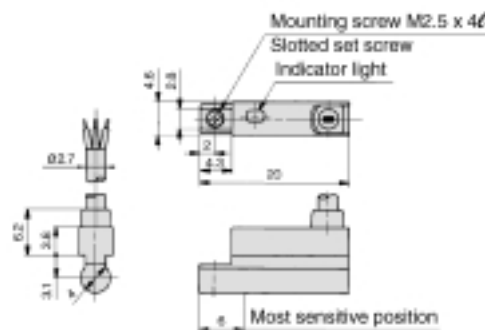
Model	Unit: g					
	D-F9NW	D-F9NWV	D-F9PW	D-F9PWV	D-F9BW	D-F9BWV
Lead wire length 0.5m	7	7	7	7	7	7
Lead wire length 3m	34	34	34	34	32	32

Auto Switch Dimensions

D-F9NW, D-F9PW, D-F9BW



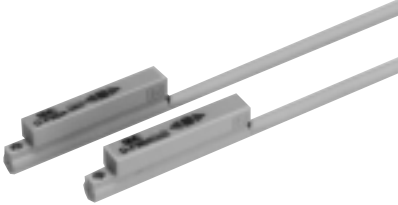
D-F9NWV, D-F9PWV, D-F9BWV



Water Resistant 2 Color Indication Solid State Switches/Direct Mount Type D-F9BAL

Grommet

Water (coolant) resistant type



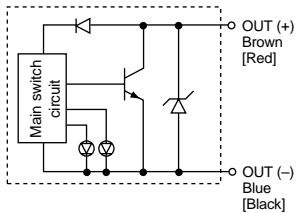
Caution

Precautions on Usage

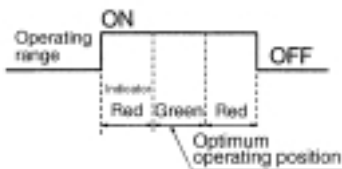
Contact SMC if solutions other than water will be used.

Auto switch internal circuits

Lead wire colors inside [] are those prior to conformity with IEC standards.



Indicator light/Display method



Auto Switch Specifications

D-F9BAL (with indicator light)	
Auto switch part no.	D-F9BAL
Wiring	2 wire
Output	—
Applicable load	24VDC relay, PLC
Power supply voltage	—
Current consumption	—
Load voltage	24VDC (10 to 28VDC)
Load current	5 to 30mA
Internal voltage drop	5V or less
Leakage current	1mA or less at 24VDC
Indicator light	Actuated position Red LED lights up Optimum operating position Green LED lights up

• Lead wires—Heavy duty oil resistant vinyl cord, $\phi 2.7$, 2 wire (Brown, Blue [Red, Black]), 0.18mm², 0.5m

Note 1) Refer to page 48 for auto switch common specifications.

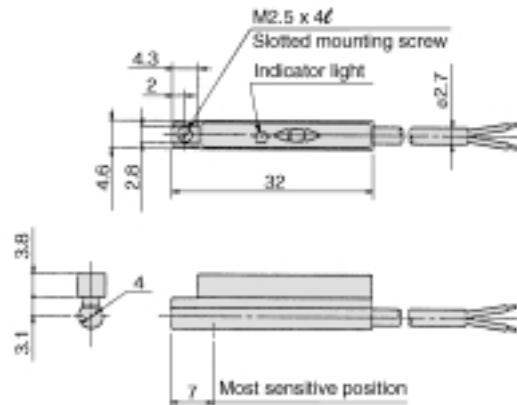
Note 2) Refer to page 48 for lead wire lengths.

Auto Switch Weights

Unit: g

Model	D-F9BAL
Lead wire length 3m	37

Auto Switch Dimensions



Solid State Switches/Direct Mount Type D-Y59, D-Y69, D-Y7P(V)

Compact Series
MHZA2-6/MHZAJ2-6

Standard Type
MHZ2

Long Stroke
MHZL2

With Dust Cover
MHZJ2

Auto Switches

Order Made

Model Selection

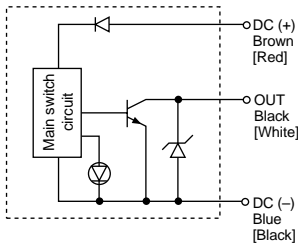
Precautions

Grommet

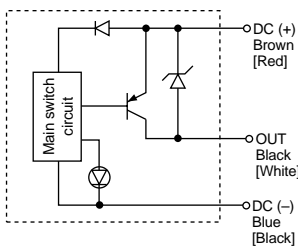


Auto switch internal circuits
Lead wire colors inside [] are those prior to conformity with IEC standards.

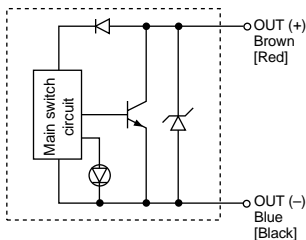
D-Y59A, D-Y69A



D-Y7P (V)



D-Y59B, D-Y69B



Auto Switch Specifications

D-Y5, D-Y6, D-Y7P, D-Y7PV (with indicator light)						
Auto switch part no.	D-Y59A	D-Y69A	D-Y7P	D-Y7PV	D-Y59B	D-Y69B
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring	3 wire				2 wire	
Output	NPN type		PNP type		—	
Applicable load	IC circuit, Relay, PLC				24VDC relay, PLC	
Power supply voltage	5, 12, 24VDC (4.5 to 28VDC)				—	
Current consumption	10mA or less				—	
Load voltage	28VDC or less		—		24VDC (10 to 28VDC)	
Load current	40mA or less		80mA or less		5 to 40mA	
Internal voltage drop	1.5V or less (0.8V or less at a load current of 10mA)		0.8V or less		4V or less	
Leakage current	100μA or less at 24VDC				0.8mA or less at 24VDC	
Indicator light	Red LED lights up when ON					

• Lead wires—Heavy duty oil resistant flexible vinyl cord, ø3.4, 0.15mm², 3 wire (Brown, Black, Blue [Red, White, Black]), 2 wire (Brown, Blue [Red, Black]), 0.5m

Note 1) Refer to page 48 for auto switch common specifications.

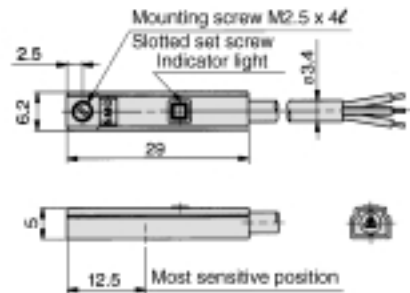
Note 2) Refer to page 48 for lead wire lengths.

Auto Switch Weights

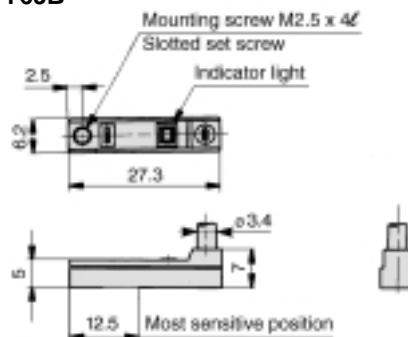
Model	Unit: g		
	D-Y59A/Y69A	D-Y59B/Y69B	D-Y7P/Y7PV
Lead wire length 0.5m	10	9	10
Lead wire length 3m	53	50	53

Auto Switch Dimensions

D-Y59A, D-Y7P, D-Y59B



D-Y69A, D-Y7PV, D-Y69B



2 Color Indication Solid State Switches Direct Mount Type

D-Y7NW(V), D-Y7PW(V), D-Y7BW(V)

Grommet

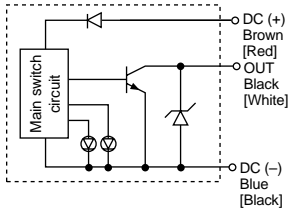
The optimum operating position can be determined by the color of the light.
(Red→Green←Red)



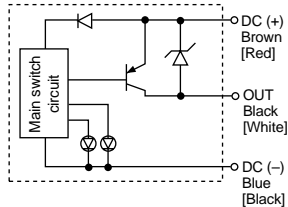
Auto switch internal circuits

Lead wire colors inside [] are those prior to conformity with IEC standards.

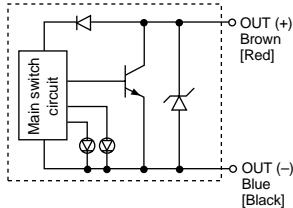
D-Y7NW(V)



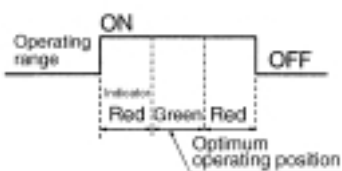
D-Y7PW(V)



D-Y7BW(V)



Indicator light/Display method



Auto Switch Specifications

D-Y7□W, D-Y7□WV (with indicator light)						
Auto switch part no.	D-Y7NW	D-Y7NWV	D-Y7PW	D-Y7PWV	D-Y7BW	D-Y7BWV
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring	3 wire				2 wire	
Output	NPN type		PNP type		—	
Applicable load	IC circuit, Relay, PLC				24VDC relay, PLC	
Power supply voltage	5, 12, 24VDC (4.5 to 28VDC)				—	
Current consumption	10mA or less				—	
Load voltage	28VDC or less		—		24VDC (10 to 28VDC)	
Load current	40mA or less		80mA or less		5 to 40mA	
Internal voltage drop	1.5V or less (0.8V or less at a load current of 10mA)		0.8V or less		4V or less	
Leakage current	100μA or less at 24VDC				0.8mA or less at 24VDC	
Indicator light	Actuated position Red LED lights up Optimum operating position Green LED lights up					

* Lead wires—Heavy duty oil resistant flexible vinyl cord, $\phi 3.4$, 0.15mm², 3 wire (Brown, Black, Blue [Red, White, Black]), 2 wire (Brown, Blue [Red, Black]), 0.5m

Note 1) Refer to page 48 for auto switch common specifications.

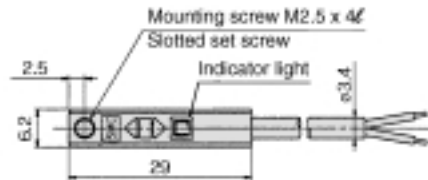
Note 2) Refer to page 48 for lead wire lengths.

Auto Switch Weights

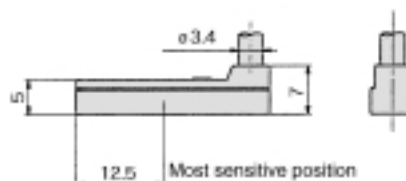
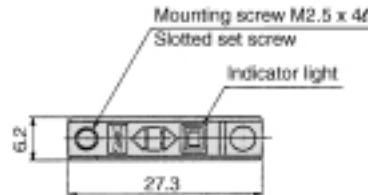
Model	Unit: g		
	D-Y7NW	D-Y7PW	D-Y7BW
Lead wire length 0.5m	11	11	11
Lead wire length 3m	54	54	54

Auto Switch Dimensions

D-Y7□W

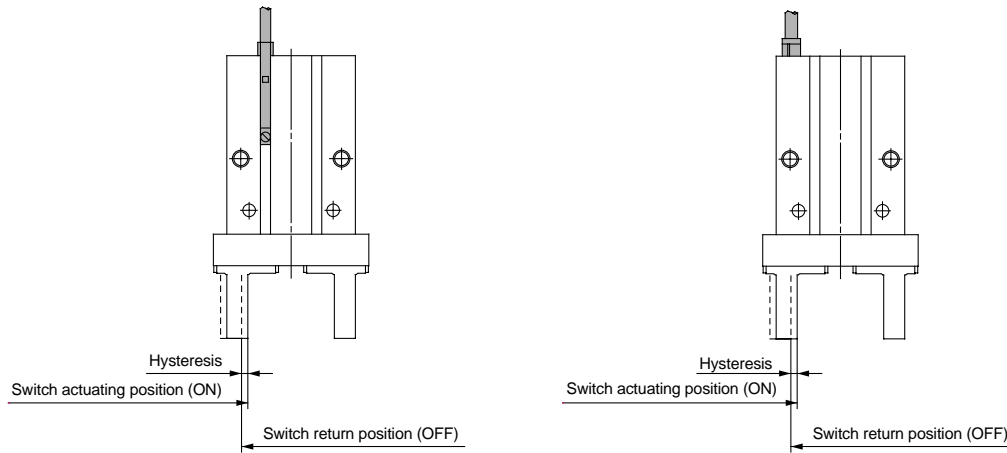


D-Y7□WV



Auto Switch Hysteresis

Auto switches have hysteresis similar to micro switches. The adjustment of switch positions should be performed using the table below as a guide.

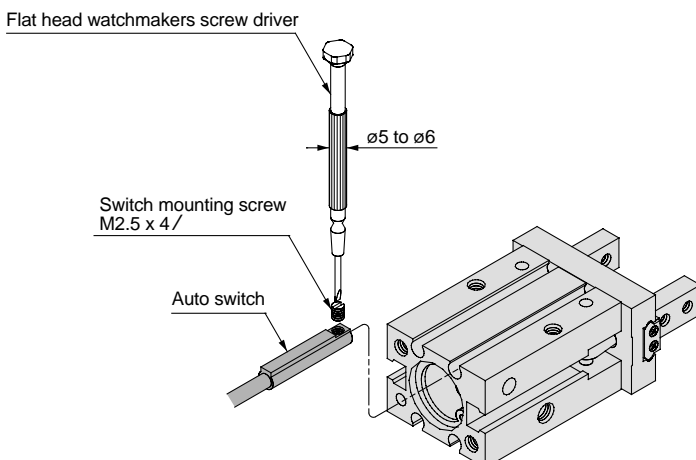


Hysteresis

	D-Y59A, B D-Y69A, B D-Y7P(V)	D-F9□(V) D-F8□	D-Y7□W(V)		D-F9□W(V)		D-F9BAL	
			Red light ON	Green light ON	Red light ON	Green light ON	Red light ON	Green light ON
MHZ2-6□	No setting	0.5	No setting		No setting		No setting	
MHZ2-10□, MHZL2-10□	0.4	No setting						
MHZ2-16□, MHZL2-16□	0.4	0.5						
MHZ2-20□, MHZL2-20□	0.4	0.5	0.5	1	0.5	1		
MHZ2-25□, MHZL2-25□	0.4	0.5	0.5	1	0.5	1		
MHZ2-32□	0.4	0.5	0.5	1	0.5	1		
MHZ2-40□	0.4	0.5	0.5	1	0.5	1		
MHZJ2-6□	No setting	0.5	No setting		No setting		0.4	0.8
MHZJ2-10□		0.5					0.4	0.8
MHZJ2-16□		0.5					0.4	0.8
MHZJ2-20□		0.5			0.5	1	0.4	0.8
MHZJ2-25□		0.5			0.5	1	0.4	0.8

Auto Switch Mounting

When mounting auto switches, insert them into one of the air gripper's switch mounting grooves from the direction shown in the figure below. After setting in the desired mounting position, tighten the switch mounting screw (included) using a flat head watchmakers screw driver.



Note) When tightening the auto switch mounting screw, use a watchmakers screw driver with a handle diameter of about 5 to 6mm. The tightening torque should be about 0.05 to 0.1N·m. As a rule, it should be turned about 90° beyond the point at which tightening can be felt.

Auto Switch Protrusion from the Body End Surface

- The amount of auto switch protrusion from the body's end surface is as shown in the table below.
- Use this as a guide when mounting, etc.
- With D-F8□, there is no auto switch protrusion from the body's end surface.

Standard body

Lead wire type	In-line					Perpendicular						
	Illustration		Illustration		Illustration		Illustration		Illustration			
Model	D-Y59□ D-Y7P	D-Y7□W	D-F9□	D-F9□W	D-F9BAL	D-Y69□ D-Y7PV	D-Y7□WV	D-F9□V	D-F9□WV			
Standard	MHZ2-6□	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	11		
		Closed								13		
	MHZ2-10□	Open	1	No setting	No setting	No setting	No setting	No setting	No setting	No setting	6.5	
		Closed	7.5									
	MHZ2-16□	Open	—	No setting	No setting	No setting	No setting	No setting	No setting	No setting	1	
		Closed	6								4	
	MHZ2-20□	Open	—	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—	
		Closed	4								4	2
	MHZ2-25□	Open	—	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—	
		Closed	1								1	—
	MHZ2-32□	Open	—	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—	
		Closed	3								3	—
	MHZ2-40□	Open	—	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—	
		Closed	2								2	—
With dust cover	MHZJ2-6□	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	16		
		Closed								11	18	
	MHZJ2-10□	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	12	
		Closed									5	7
	MHZJ2-16□	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	9	
		Closed									2	5
	MHZJ2-20□	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	3	
		Closed									3	3
	MHZJ2-25□	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—	
		Closed									2	2
Long stroke	Double acting	MHZL2-10D	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	0.5	
			Closed								8.5	
		MHZL2-16D	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—
			Closed									8
	MHZL2-20D	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—	
		Closed									7	7
	MHZL2-25D	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—	
		Closed									5.5	5.5
	Single acting (normally open)	MHZL2-10S	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—
			Closed									—
		MHZL2-16S	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—
			Closed									3
	MHZL2-20S	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—	
		Closed									1	1
MHZL2-25S	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—		
	Closed									—	—	
Single acting (normally closed)	MHZL2-10C	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—	
		Closed									5.5	3.5
	MHZL2-16C	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—	
		Closed									5.5	1.5
MHZL2-20C	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—		
	Closed									3.5	3.5	1.5
MHZL2-25C	Open	No setting	No setting	No setting	No setting	No setting	No setting	No setting	No setting	—		
	Closed									1.5	1.5	—

Note) There is no protrusion for sections of the table with no values entered.

End boss type

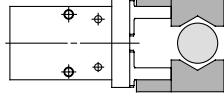
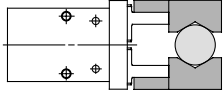
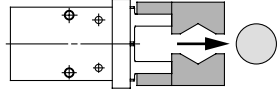
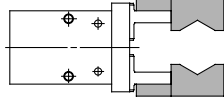
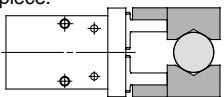
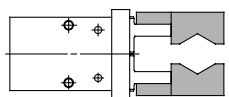
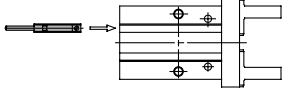
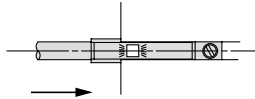
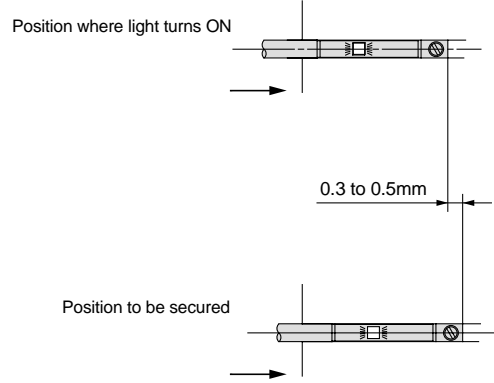
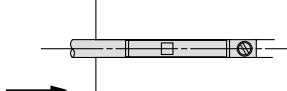
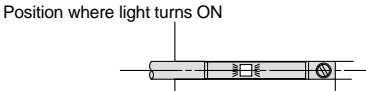
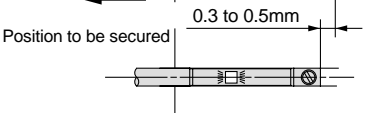
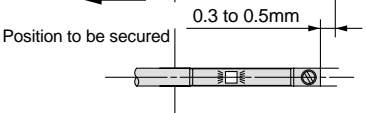
Lead wire type			In-line					Perpendicular																																								
			Illustration					Illustration																																								
Model			D-Y59□ D-Y7P	D-Y7□W	D-F9□	D-F9□W	D-F9BAL	D-Y69□ D-Y7PV	D-Y7□WV	D-F9□V	D-F9□WV																																					
With dust cover	MHZJ2-10□□□	Open	No setting	—	—	—	—	No setting	—	—	—																																					
		Closed																																														
	MHZJ2-16□□□	Open										No setting	—	—	—	—	No setting	—	—	—																												
		Closed																																														
	MHZJ2-20□□□	Open																			No setting	—	—	—	—	No setting	—	—	—																			
		Closed																																														
	MHZJ2-25□□□	Open																												No setting	—	—	—	—	No setting	—	—	—										
		Closed																																														
																																										4						
																																										8						
																																										1				No setting		
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						1.5																																										

Note) There is no protrusion for sections of the table with no values entered.

Series MHZ Auto Switch Positioning and Examples

Various auto switch applications are possible through different combinations of auto switch quantity and detecting positions.

1) Detection when gripping exterior of work piece

Detection example		1. To confirm that fingers have returned	2. To confirm that work piece has been gripped	3. To confirm that work piece has not been gripped
Detection position		Position of fingers fully opened 	Position when gripping work piece 	Position of fingers fully closed 
Operation of auto switch		Switch turns ON when fingers return. (Light ON)	Switch turns ON when gripping work piece. (Light ON)	When gripping work piece (normal): Switch OFF (Light OFF) When not gripping work piece (abnormal): Switch ON (Light ON)
Detection combinations	Capable with one auto switch	●	●	●
	Two auto switches required	●—●	●—●	●—●
How to determine the auto switch installation position		Step 1) Fully open fingers. 	Step 1) Position fingers for gripping work piece. 	Step 1) Fully close fingers. 
<p>"Connect switch to power supply and mount as directed with no pressure or low pressure."</p>		Step 2) Insert the auto switch into the auto switch mounting groove in the direction of the arrow as shown in the figure. 		
		<p>Step 3) Move the auto switch in the direction of the arrow indicated below until the indicator light turns ON.</p> 	<p>Step 3) Move the auto switch in the direction of the arrow and secure it at a position 0.3 to 0.5mm beyond the point at which the indicator light turns ON.</p> 	
		<p>Step 4) Keep moving in the direction of the arrow and confirm that the indicator light turns OFF.</p> 		
		<p>Step 5) Move the auto switch in the opposite direction, and secure it at a position 0.3 to 0.5mm in the direction of the arrow beyond the point at which the indicator light turns ON again.</p> 	<p>Position where light turns ON</p> <p>0.3 to 0.5mm</p> <p>Position to be secured</p> 	
		<p>Position where light turns ON</p> <p>0.3 to 0.5mm</p> <p>Position to be secured</p> 		

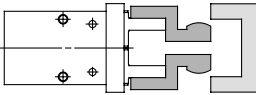
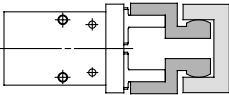
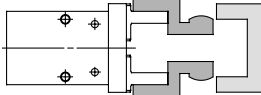
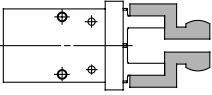
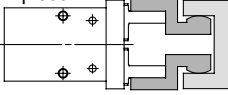
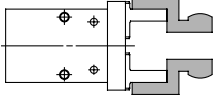
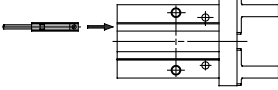
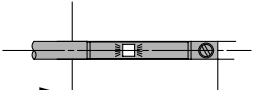
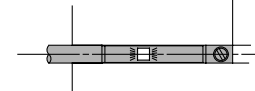
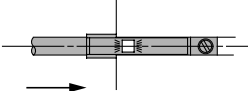
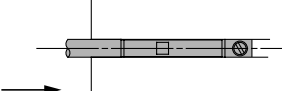
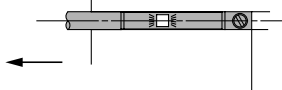
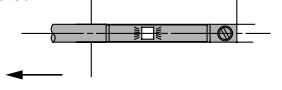
Notes) • It is recommended that gripping of the work piece be performed close to the center of the finger stroke.

• The detection combinations shown above may be limited when gripping of the work piece is performed at the end of the opening/closing stroke of the fingers, due to auto switch hysteresis, etc.

Series MHZ Auto Switch Positioning and Examples

Various auto switch applications are possible through different combinations of auto switch quantity and detecting positions.

2) Detection when gripping interior of work piece

Detection example		1. To confirm that fingers have returned	2. To confirm that work piece has been gripped	3. To confirm that work piece has not been gripped
Detection position		Position of fingers fully closed 	Position when gripping work piece 	Position of fingers fully opened 
Operation of auto switch		Switch turns ON when fingers return. (Light ON)	Switch turns ON when gripping work piece. (Light ON)	When gripping work piece (normal): Switch OFF (Light OFF) When not gripping work piece (abnormal): Switch ON (Light ON)
Detection combinations	Capable with one auto switch	•	•	•
	Two auto switches required	●—————●		●—————●
How to determine the auto switch installation position		Step 1) Fully close fingers. 	Step 1) Position fingers for gripping work piece. 	Step 1) Fully open fingers. 
"Connect switch to power supply and mount as directed with no pressure or low pressure."		Step 2) Insert the auto switch into the auto switch mounting groove in the direction of the arrow as shown in the figure. 		
		Step 3) Move the auto switch in the direction of the arrow, and secure it at a position 0.3 to 0.5mm beyond the point at which the indicator light turns ON. Position where light turns ON  0.3 to 0.5mm Position to be secured 	Step 3) Move the auto switch in the direction of the arrow indicated below until the indicator light turns ON.  Step 4) Keep moving in the direction of the arrow and confirm that the indicator light turns OFF.  Step 5) Move the auto switch in the opposite direction, and secure it at a position 0.3 to 0.5mm in the direction of the arrow beyond the point at which the indicator light turns ON again. Position where light turns ON  0.3 to 0.5mm Position to be secured 	

Notes) • It is recommended that gripping of the work piece be performed close to the center of the finger stroke.

• The detection combinations shown above may be limited when gripping of the work piece is performed at the end of the opening/closing stroke of the fingers, due to auto switch hysteresis, etc.

Series MHZ Order Made Specifications

Contact SMC for detailed dimensions, specifications and lead times.

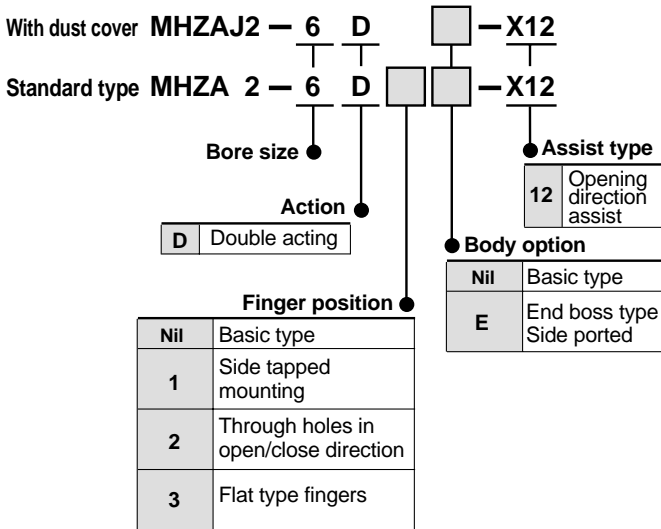


Symbol

X7
- X12

1 Spring Assisted Type

Compact Type/MHZA2-6, MHZAJ2-6

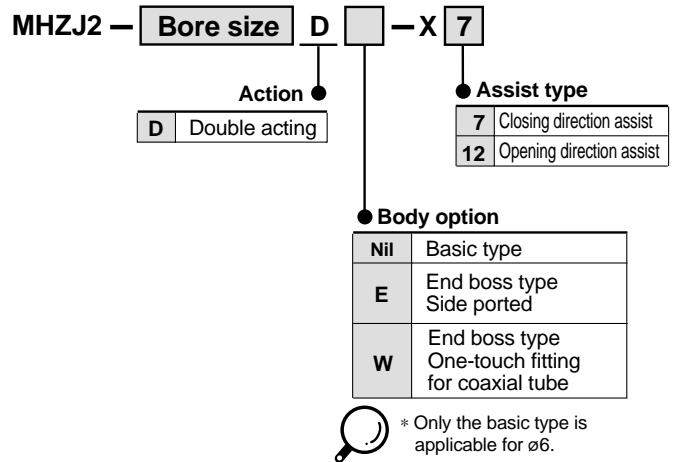


Specifications

Type	Spring assisted type
Bore size	6
Action	Double acting
Fluid	Air

Note) Dimensions are the same as the standard type.

With Dust Cover/MHZJ2

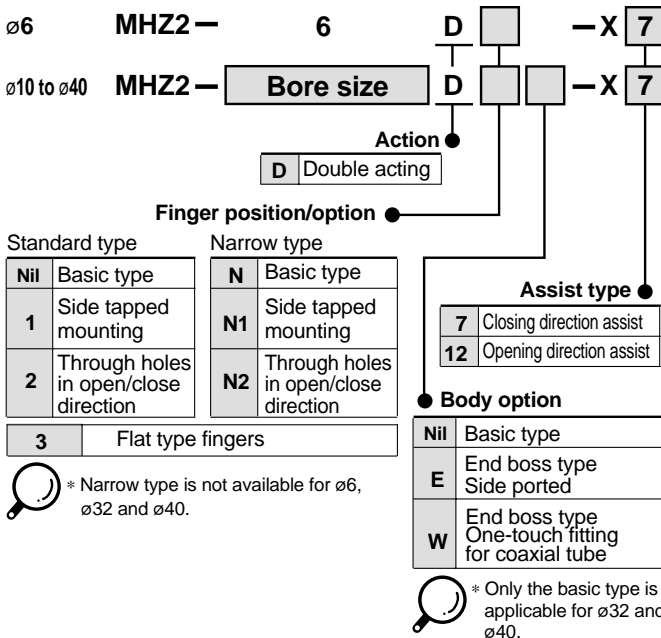


Specifications

Type	Spring assisted type
Bore size	6, 10, 16, 20, 25
Action	Double acting
Fluid	Air

Note) Dimensions are the same as the standard type.

Standard Type/MHZ2

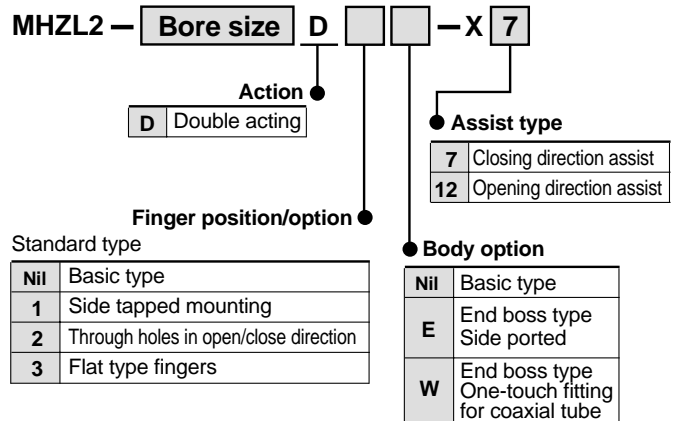


Specifications

Type	Spring assisted type
Bore size	6, 10, 16, 20, 25, 32, 40
Action	Double acting
Fluid	Air

Note) Dimensions of ø6 to ø25 are the same as the standard type.
Dimensions of ø32 and ø40 are the same as the standard single acting type.

Long Stroke/MHZL2



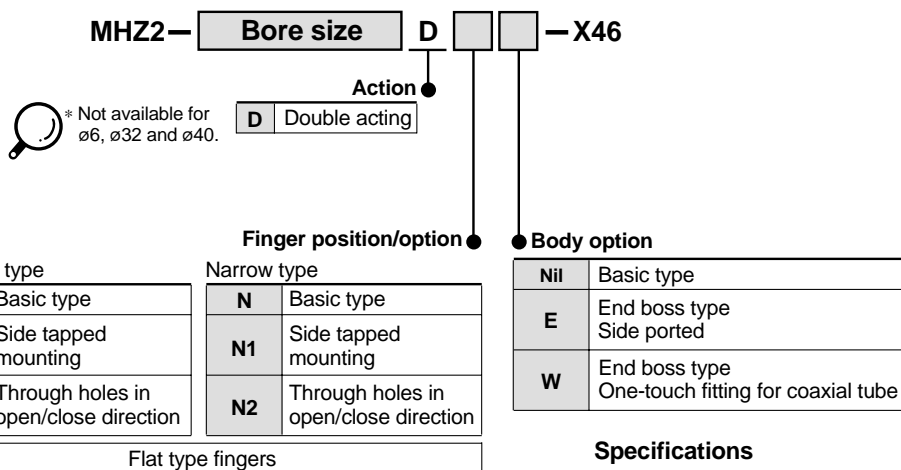
Specifications

Type	Spring assisted type
Bore size	10, 16, 20, 25
Action	Double acting
Fluid	Air

Dimensions are the same as the single acting type.

2 With Needle (with Variable Throttle)

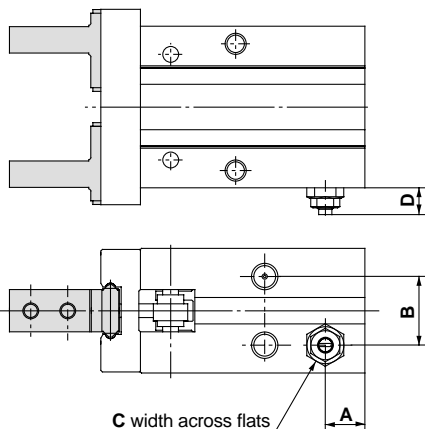
Installation of a variable throttle allows adjustment of the finger opening/closing speed.



Specifications

Type	With needle
Bore size	10, 16, 20, 25
Action	Double acting
Fluid	Air

Dimensions



Model	A	B	C	D*
MHZ2-10D□□-X46	9	11	4.5	5.2
MHZ2-16D□□-X46	7.5	13	7	5.8
MHZ2-20D□□-X46	10	15	7	6
MHZ2-25D□□-X46	10.7	20	7	6.2

Dimensions other than the above are identical to the standard type; refer to pages 18 through 21.

* Reference values to establish criteria for needle adjustment.

Adjust so that the finger opening/closing speed will be no greater than necessary. If the finger opening/closing speed is greater than necessary, impact forces acting on the fingers and other parts will increase. This can cause a loss of repeatability when gripping work pieces and have an adverse effect on the life of the unit.

Guide for internal needle adjustment

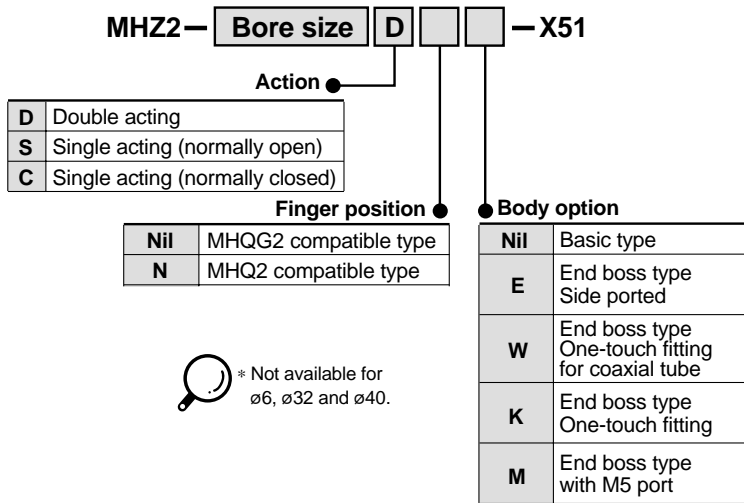
Model	Number of rotations from fully closed needle condition ^{Note 1)}
MHZ2-10D□□-X46	1/4 to 1/2
MHZ2-16D□□-X46	1/2 to 1
MHZ2-20D□□-X46	1 to 1 1/2
MHZ2-25D□□-X46	1 1/2 to 2

Note 1) The condition in which the needle is tightened gently until it stops.

Compact Series
MHZA2-6/MHZAJ2-6
Standard Type
MHZ2
Long Stroke
MHZL2
With Dust Cover
MHZJ2
Auto Switches
Order Made
Model Selection
Precautions

3 MHQ2/MHQG2 Compatible Flat Finger Type

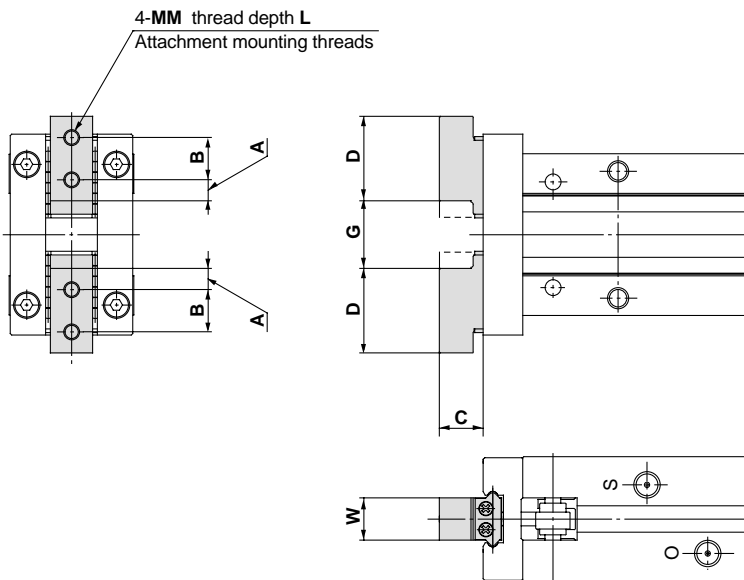
The flat finger type can be selected depending on the intended application.



Specifications

Type	Flat finger type
Bore size	10, 16, 20, 25
Action	Double acting, Single acting (normally open, normally closed)
Fluid	Air

Dimensions



Unit: mm

Model		A	B	C	D	G		MM	L	W
						Open	Closed			
MHZ2-10 □□□-X51	MHQG2 compatible	3	6	5.2	12	9.7 ^{+2.2} ₀	5.7 ⁰ _{-0.4}	M2 x 0.4	3.6	5 ⁰ _{-0.05}
	MHQ2 compatible	2	5	5.2	9	9.7 ^{+2.2} ₀	5.7 ⁰ _{-0.4}	M2 x 0.4	3.6	5 ⁰ _{-0.05}
MHZ2-16 □□□-X51	MHQG2 compatible	4	8	8.3	16	12.6 ^{+2.2} ₀	6.6 ⁰ _{-0.4}	M3 x 0.5	6	8 ⁰ _{-0.05}
	MHQ2 compatible	2.5	7	8.3	12	12.6 ^{+2.2} ₀	6.6 ⁰ _{-0.4}	M3 x 0.5	6	8 ⁰ _{-0.05}
MHZ2-20 □□□-X51	MHQG2 compatible	5	10	10.5	20.8	17.2 ^{+2.2} ₀	7.2 ⁰ _{-0.4}	M4 x 0.7	8	10 ⁰ _{-0.05}
	MHQ2 compatible	3.3	9	10.5	15.5	17.2 ^{+2.2} ₀	7.2 ⁰ _{-0.4}	M4 x 0.7	8	10 ⁰ _{-0.05}
MHZ2-25 □□□-X51	MHQG2 compatible	6.5	12	13.1	25	22.8 ^{+2.5} ₀	8.8 ⁰ _{-0.4}	M5 x 0.8	10	12 ⁰ _{-0.05}
	MHQ2 compatible	3.5	12	13.1	19	22.8 ^{+2.5} ₀	8.8 ⁰ _{-0.4}	M5 x 0.8	10	12 ⁰ _{-0.05}

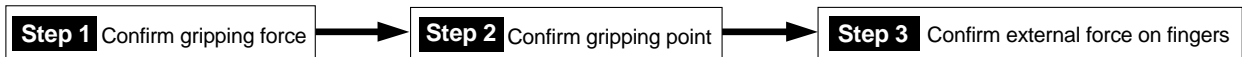
Dimensions other than the above are identical to the standard type; refer to pages 18 through 21.

Compact Series MHZA2-6/MHZAJ2-6	Standard Type MHZ2	Long Stroke MHZL2	With Dust Cover MHZJ2	Auto Switches	Order Made	Model Selection	Precautions
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Series MHZ Model Selection

Model Selection

Selection procedure



Step 1 Confirmation of gripping force



Example Work piece weight: 0.1kg

Gripping method: External gripping

Model selection criteria with respect to work piece weight

- Although differences will exist depending upon factors such as shape and the coefficient of friction between the attachments and the work pieces, select a model which will provide a gripping force at least 10 to 20 times ^{Note)} greater than the work piece weight.
- Note) For further details, refer to the model selection illustration.
- Furthermore, in cases with high acceleration or impact, etc., it is necessary to allow an even greater margin of safety.

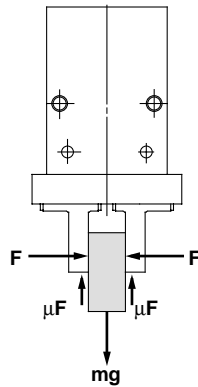
Example: When it is desired to set the gripping force at 20 times or more above the work piece weight.
 Required gripping force = 0.1kg x 20 x 9.8m/s² (approx.) 19.6N or more

Gripping point distance: L = 30mm

Operating pressure: 0.4MPa

- Selecting MHZ□2-16D. A gripping force of 24N is obtained from the intersection point of gripping point distance L = 30mm and pressure of 0.4MPa.
- The gripping force is 24.5 times greater than the work piece weight, and therefore satisfies a gripping force setting value of 20 times or more.

Model selection illustration



When gripping a work piece as in the figure to the left, and with the following definitions,

- F: Gripping force (N)
 - μ: Coefficient of friction between the attachments and the work piece
 - m: Work piece mass (kg)
 - g: Gravitational acceleration (= 9.8m/s²)
 - mg: Work piece weight (N)
- the conditions under which the work piece will not drop are

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

Number of fingers

and therefore,

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

With "a" representing the safety margin, F is determined by the following formula:

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

"Gripping force at least 10 to 20 times the work piece weight"

The "10 to 20 times or more of the work piece weight" recommended by SMC is calculated with a safety margin of a=4, which allows for impacts that occur during normal transportation, etc.

When μ = 0.2	When μ = 0.1
$F = \frac{mg}{2 \times 0.2} \times 4$ $= 10 \times mg$	$F = \frac{mg}{2 \times 0.1} \times 4$ $= 20 \times mg$

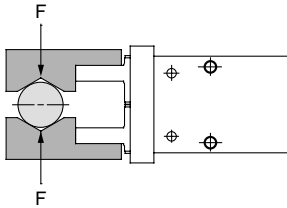
10 x work piece weight

20 x work piece weight

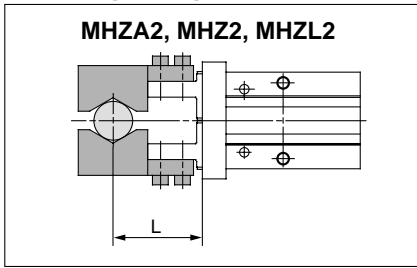
Note) Even in cases where the coefficient of friction is greater than μ=0.2, for reasons of safety, select a gripping force which is at least 10 to 20 times greater than the work piece weight, as recommended by SMC. It is necessary to allow a greater safety margin for high accelerations and strong impacts, etc.

Step 1 Effective gripping force: Series MHZ 2/Double acting/External gripping force

- Expressing the effective gripping force
The effective gripping force shown in the graphs to the right is expressed as F, which is the impellent force of one finger, when both fingers and attachments are in full contact with the work piece as shown in the figure below.

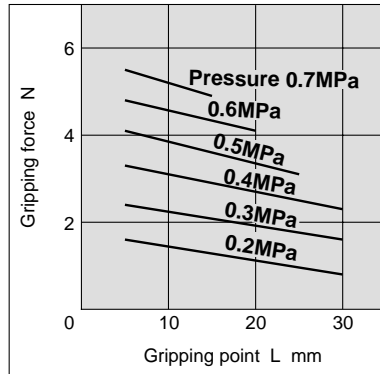


External gripping



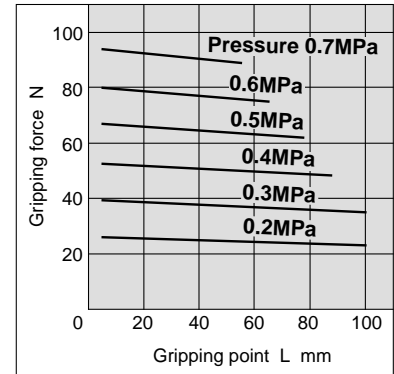
External gripping force

MHZ2-6D/MHZA2-6D

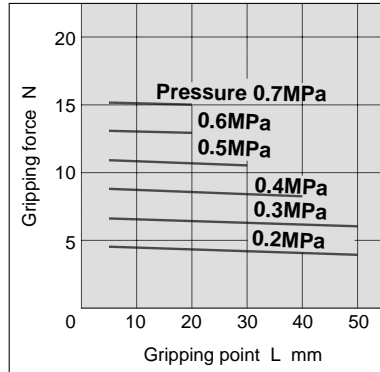


External gripping force

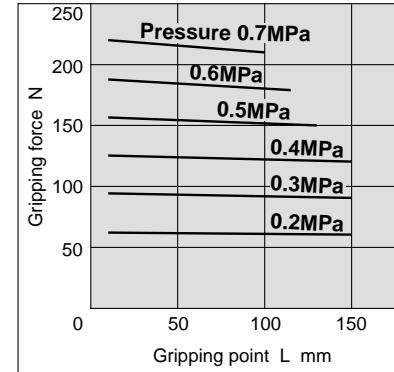
MHZ2-25D/MHZL2-25D



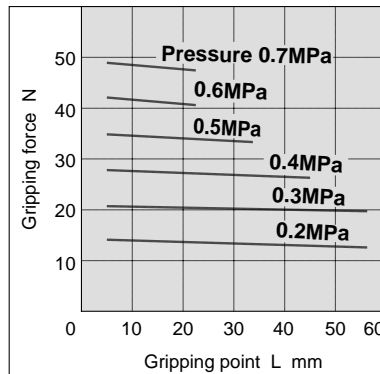
MHZ2-10D/MHZL2-10D



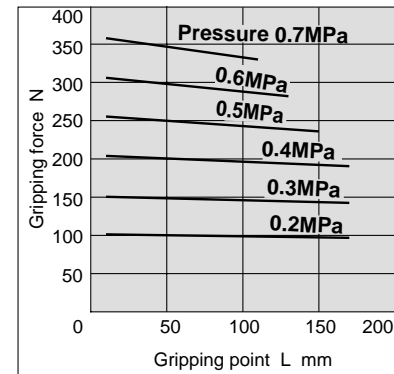
MHZ2-32D



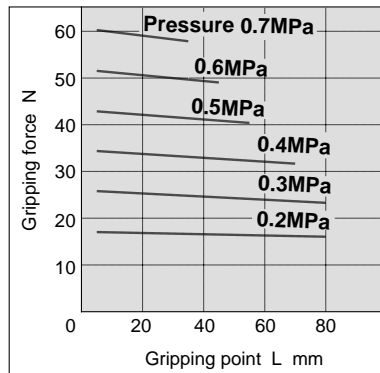
MHZ2-16D/MHZL2-16D



MHZ2-40D



MHZ2-20D/MHZL2-20D

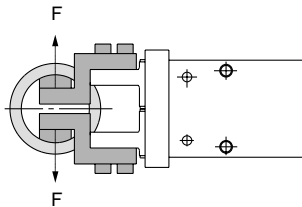


Model Selection

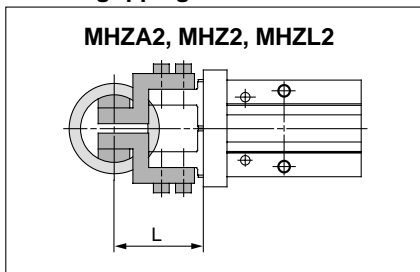
Step 1 Effective gripping force: Series MHZ 2/Double acting/Internal gripping force _____

- Expressing the effective gripping force

The effective gripping force shown in the graphs to the right is expressed as F, which is the impellent force of one finger, when both fingers and attachments are in full contact with the work piece as shown in the figure below.

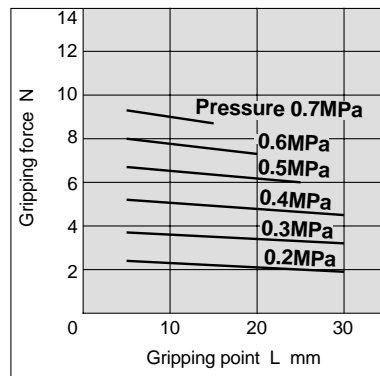


Internal gripping



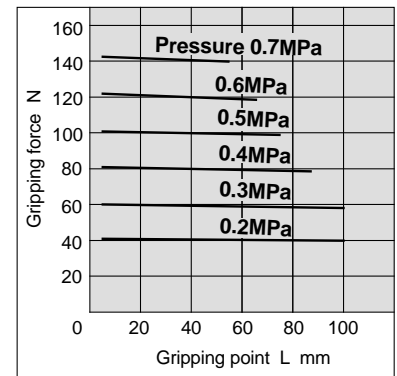
Internal gripping force

MHZ2-6D/MHZA2-6D

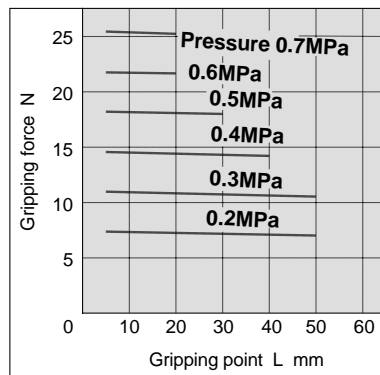


Internal gripping force

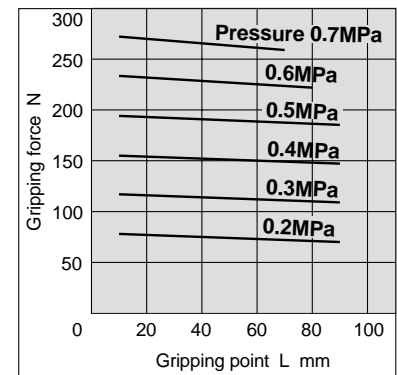
MHZ2-25D/MHZA2-25D



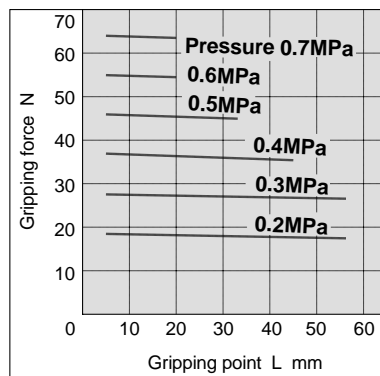
MHZ2-10D/MHZA2-10D



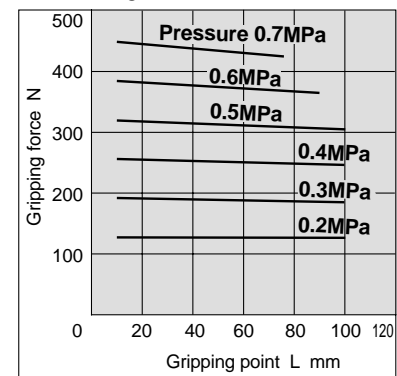
MHZ2-32D



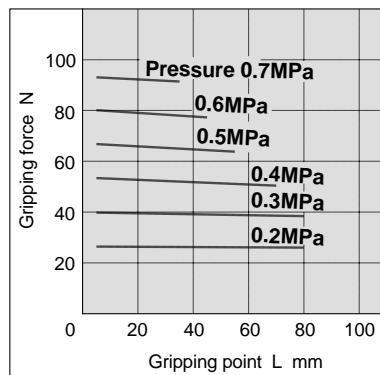
MHZ2-16D/MHZA2-16D



MHZ2-40D



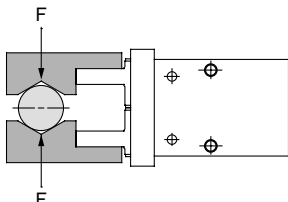
MHZ2-20D/MHZA2-20D



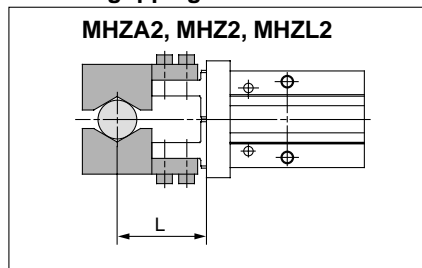
Step 1 Effective gripping force: Series MHZ 2/Single acting/External gripping force _____

- Expressing the effective gripping force

The effective gripping force shown in the graphs to the right is expressed as F, which is the impellent force of one finger, when both fingers and attachments are in full contact with the work piece as shown in the figure below.

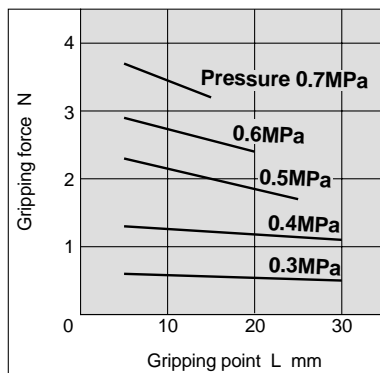


External gripping



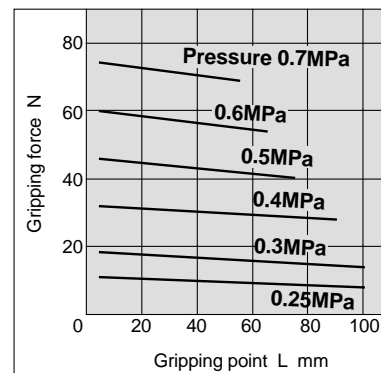
External gripping force

MHZ2-6S/MHZA2-6S

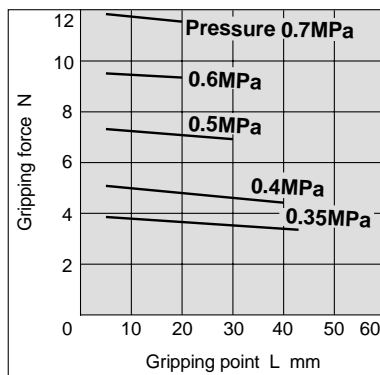


External gripping force

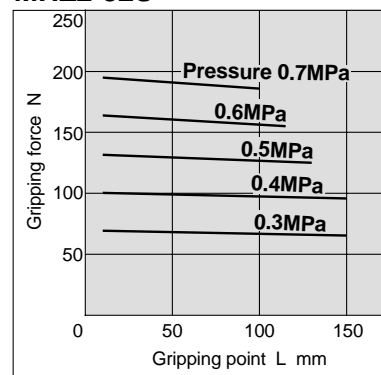
MHZ2-25S/MHZL2-25S



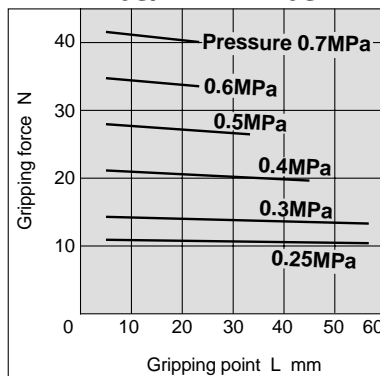
MHZ2-10S/MHZL2-10S



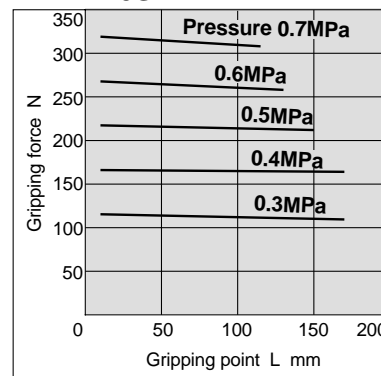
MHZ2-32S



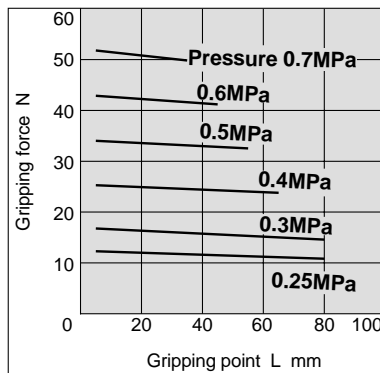
MHZ2-16S/MHZL2-16S



MHZ2-40S



MHZ2-20S/MHZL-20S

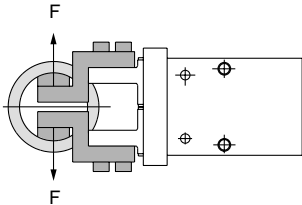


Model Selection

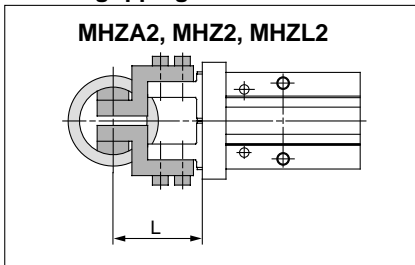
Step 1 Effective gripping force: Series MHZ 2/Single acting/Internal gripping force

- Expressing the effective gripping force

The effective gripping force shown in the graphs to the right is expressed as F, which is the impellent force of one finger, when both fingers and attachments are in full contact with the work piece as shown in the figure below.

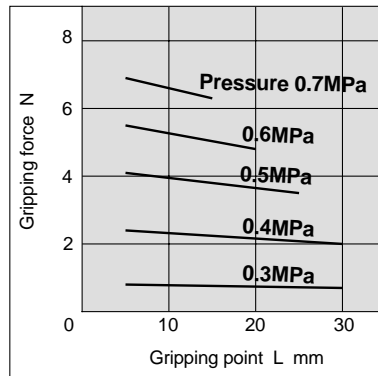


Internal gripping



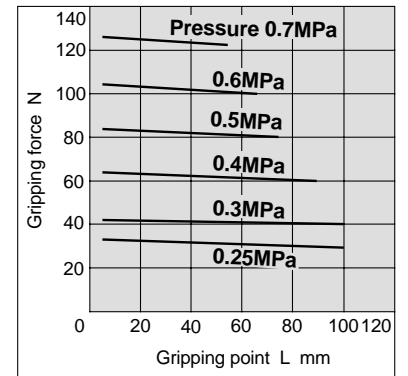
Internal gripping force

MHZ2-6C/MHZA2-6C

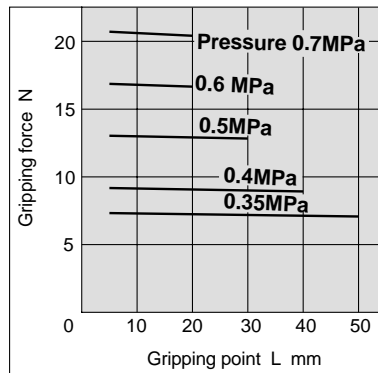


Internal gripping force

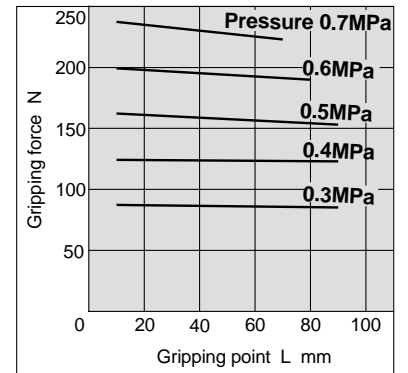
MHZ2-25C/MHZA2-25C



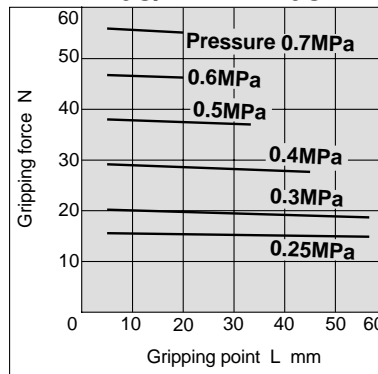
MHZ2-10C/MHZA2-10C



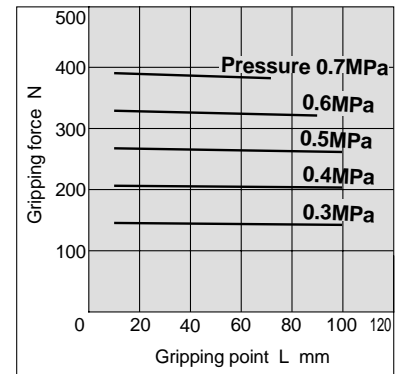
MHZ2-32C



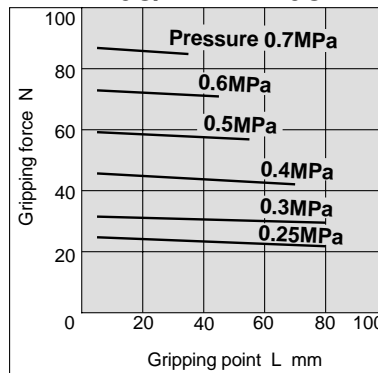
MHZ2-16C/MHZA2-16C



MHZ2-40C

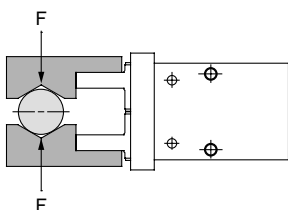


MHZ2-20C/MHZA2-20C

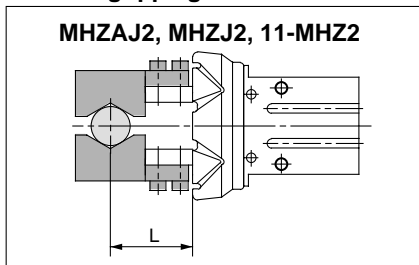


Step 1 Effective gripping force: Series MHZ 2/Double acting/External gripping force _____

- Expressing the effective gripping force
The effective gripping force shown in the graphs to the right is expressed as F, which is the impellent force of one finger, when both fingers and attachments are in full contact with the work piece as shown in the figure below.

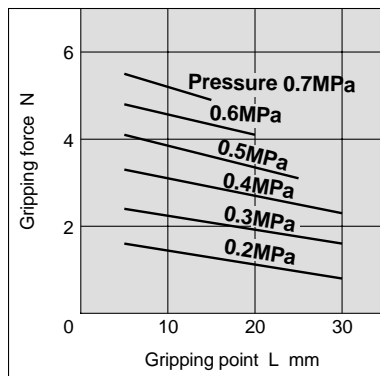


External gripping



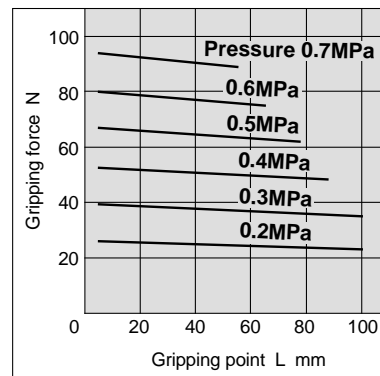
External gripping force

MHZJ2-6D/MHZA2-6D

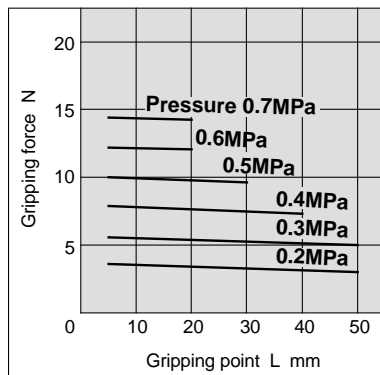


External gripping force

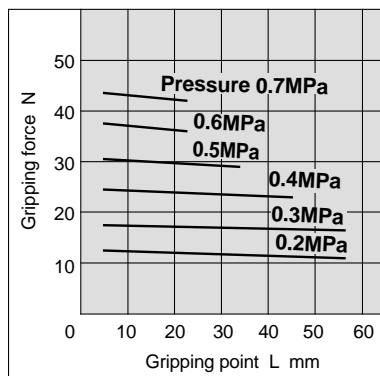
MHZJ2-25D/11-MHZ2-25D



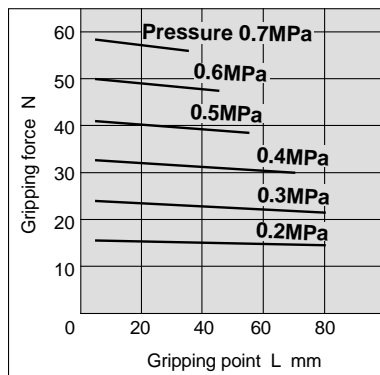
MHZJ2-10D/11-MHZ2-10D



MHZJ2-16D/11-MHZ2-16D



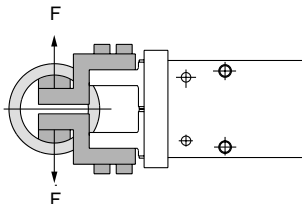
MHZJ2-20D/11-MHZ2-20D



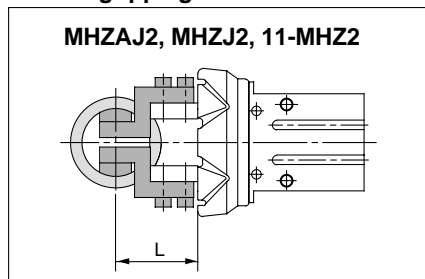
Model Selection

Step 1 Effective gripping force: Series MHZ 2/Double acting/Internal gripping force _____

- Expressing the effective gripping force
The effective gripping force shown in the graphs to the right is expressed as F, which is the impellent force of one finger, when both fingers and attachments are in full contact with the work piece as shown in the figure below.

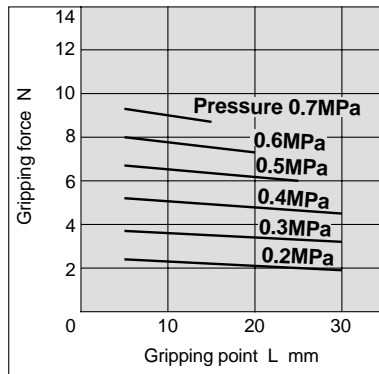


Internal gripping



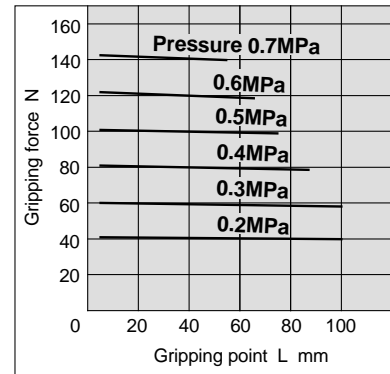
Internal gripping force

MHZJ2-6D/MHZAJ2-6D

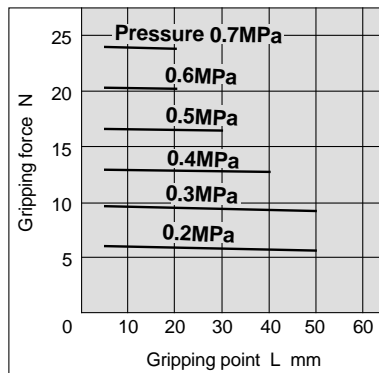


Internal gripping force

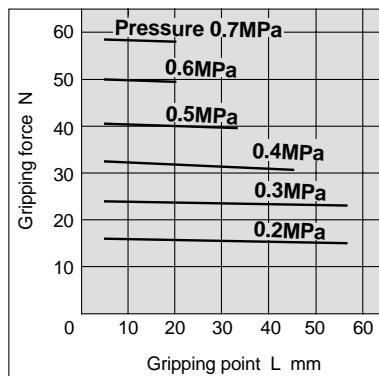
MHZJ2-25D/11-MHZ2-25D



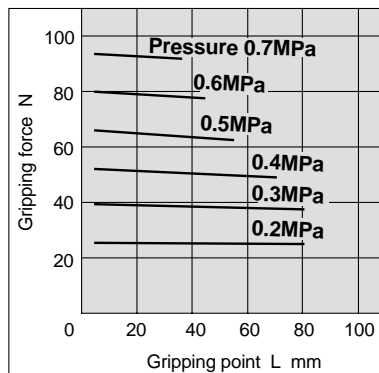
MHZJ2-10D/11-MHZ2-10D



MHZJ2-16D/11-MHZ2-16D

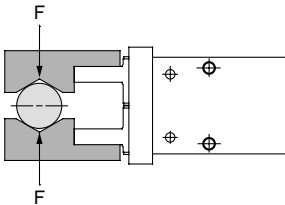


MHZJ2-20D/11-MHZ2-20D

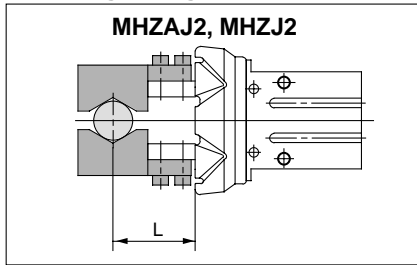


Step 1 Effective gripping force: Series MHZ 2/Single acting/External gripping force _____

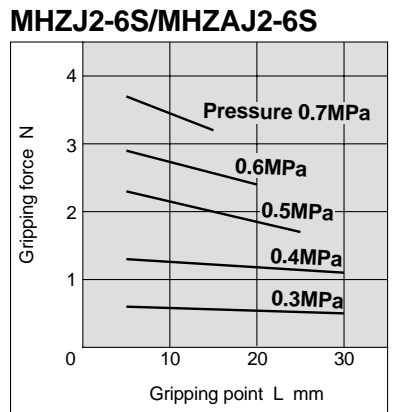
• Expressing the effective gripping force
The effective gripping force shown in the graphs to the right is expressed as F, which is the impellent force of one finger, when both fingers and attachments are in full contact with the work piece as shown in the figure below.



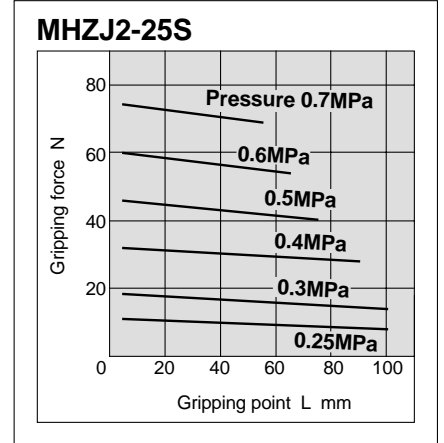
External gripping



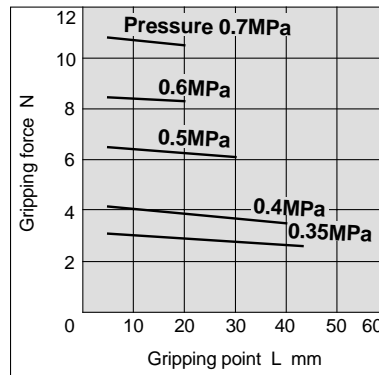
External gripping force



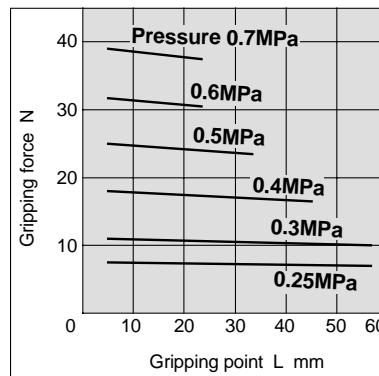
External gripping force



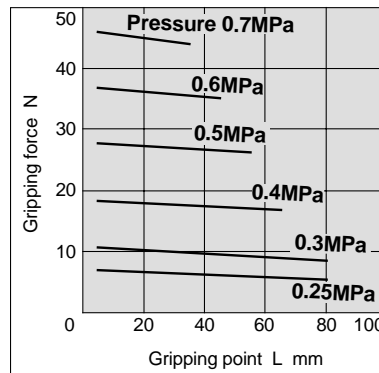
MHZJ2-10S



MHZJ2-16S



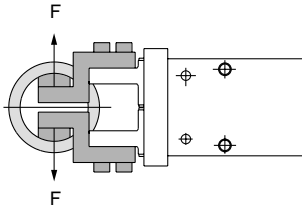
MHZJ2-20S



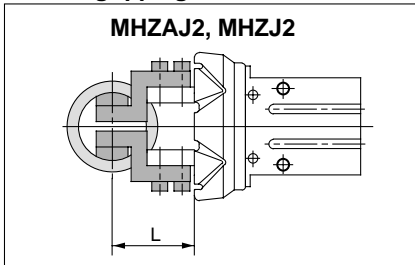
Model Selection

Step 1 Effective gripping force: Series MHZ 2/Single acting/Internal gripping force _____

- Expressing the effective gripping force
The effective gripping force shown in the graphs to the right is expressed as F, which is the impellent force of one finger, when both fingers and attachments are in full contact with the work piece as shown in the figure below.

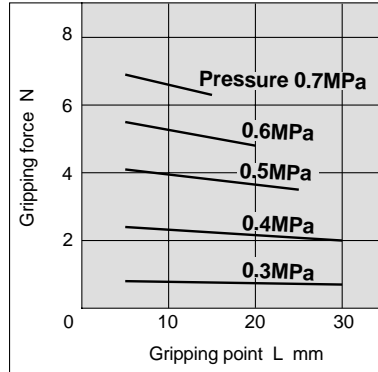


Internal gripping



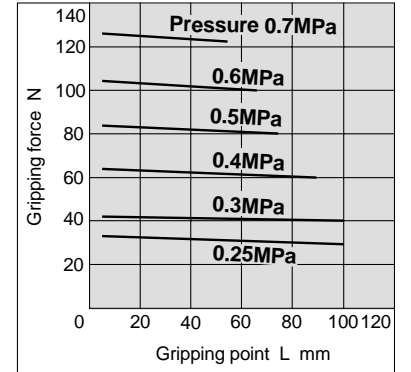
Internal gripping force

MHZJ2-6C/MHZAJ2-6C

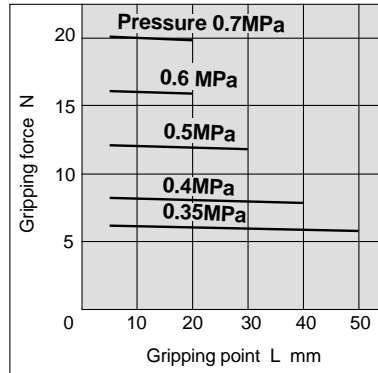


Internal gripping force

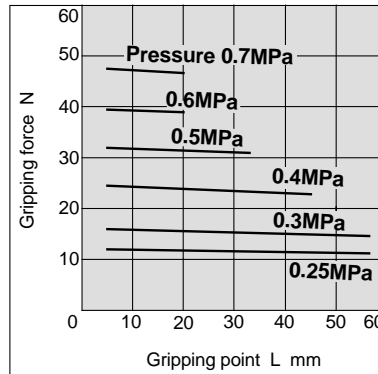
MHZJ2-25C



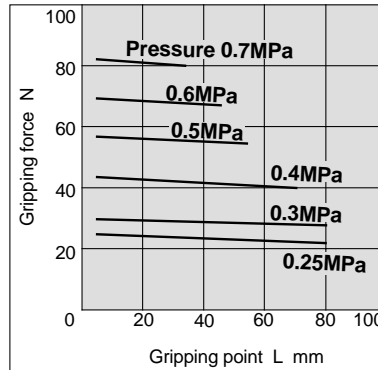
MHZJ2-10C



MHZJ2-16C

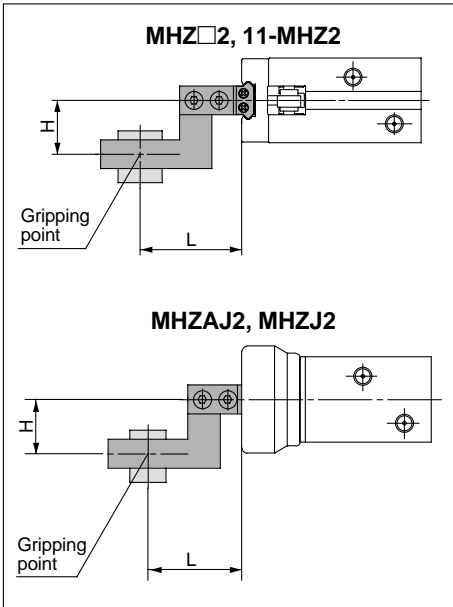


MHZJ2-20C



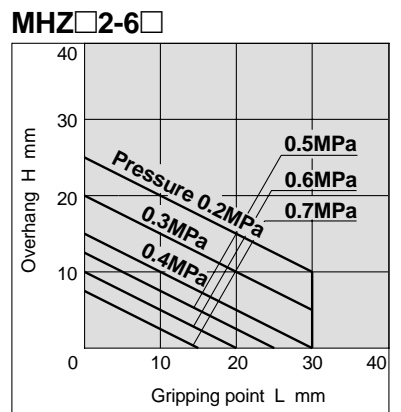
Step 2 Confirmation of gripping point: Series MHZ □/External gripping

External gripping

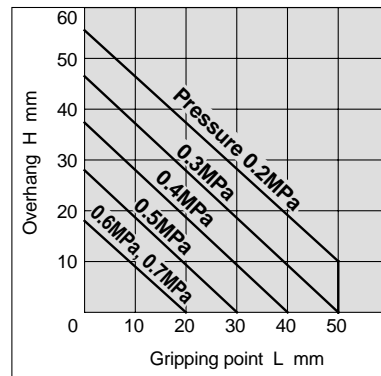


- The air gripper should be operated so that the work piece gripping point "L" and the amount of overhang "H" stay within the range shown for each operating pressure given in the graphs to the right.
- If the work piece gripping point goes beyond the range limits, this will have an adverse effect on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

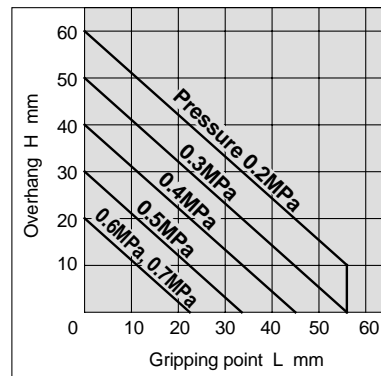
External gripping



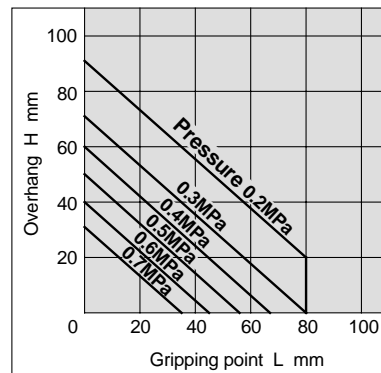
MHZ □2-10 □/11-MHZ2-10 □



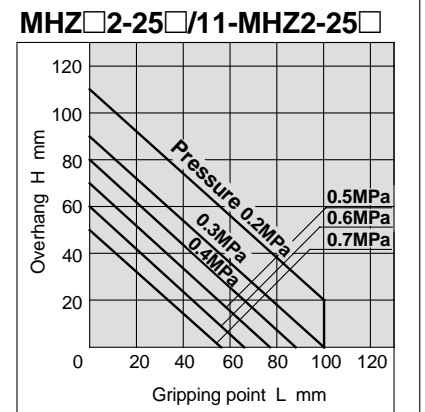
MHZ □2-16 □/11-MHZ2-16 □



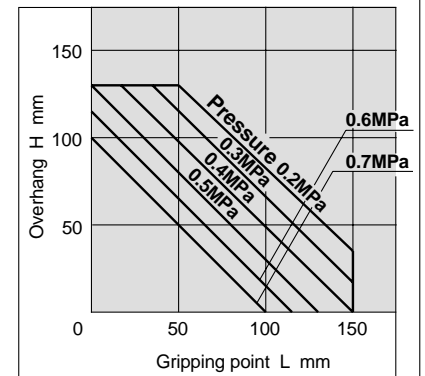
MHZ □2-20 □/11-MHZ2-20 □



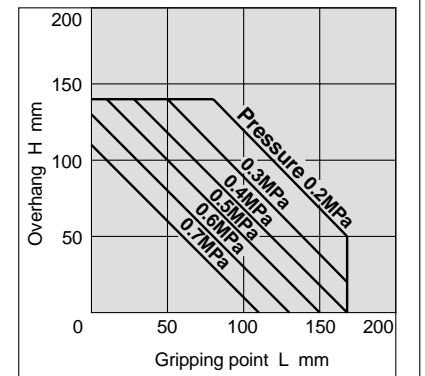
External gripping



MHZ2-32 □



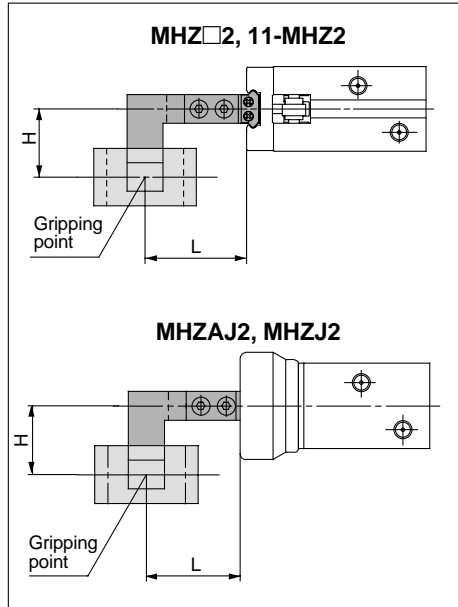
MHZ2-40 □



Model Selection

Step 2 Confirmation of gripping point: Series MHZ □/Internal gripping

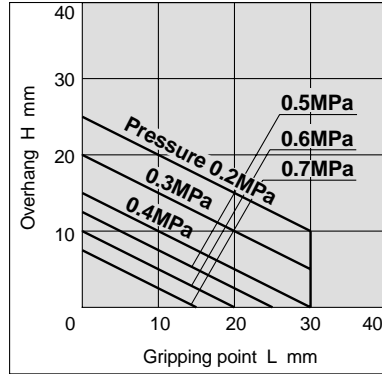
Internal gripping



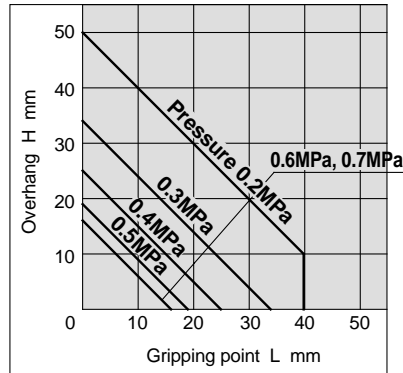
- The air gripper should be operated so that the work piece gripping point "L" and the amount of overhang "H" stay within the range shown for each operating pressure given in the graphs to the right.
- If the work piece gripping point goes beyond the range limits, this will have an adverse effect on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

Internal gripping

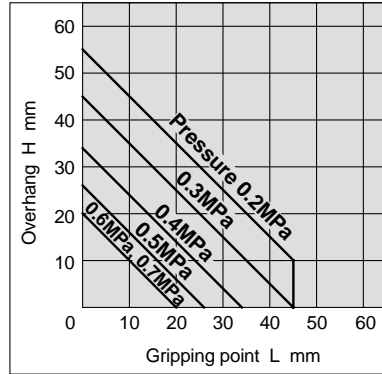
MHZ □2-6 □



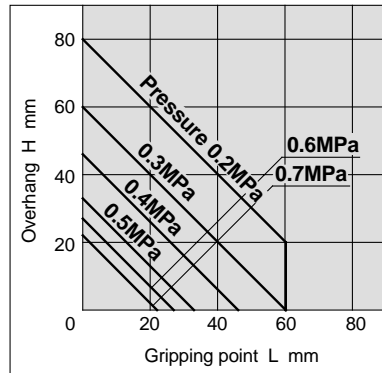
MHZ □2-10 □/11-MHZ2-10 □



MHZ □2-16 □/11-MHZ2-16 □

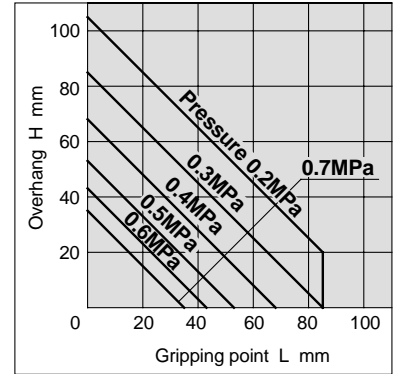


MHZ □2-20 □/11-MHZ2-20 □

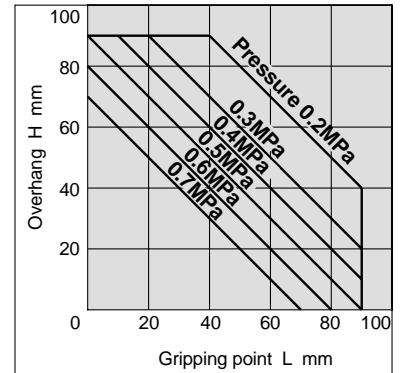


Internal gripping

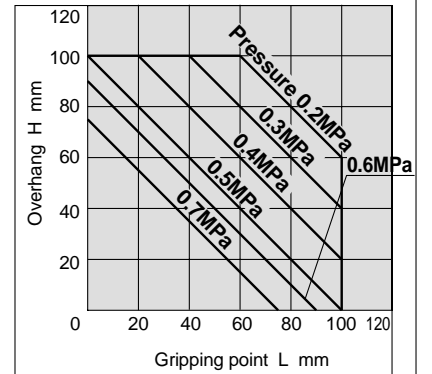
MHZ □2-25 □/11-MHZ2-25 □



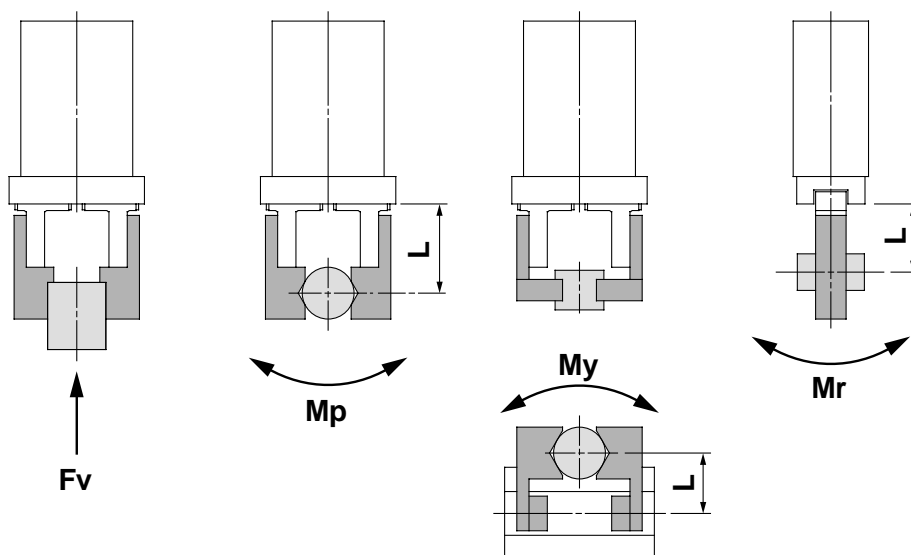
MHZ2-32 □



MHZ2-40 □



Step 3 Confirmation of external force on fingers: Series MHZ 2



L: Distance to the point at which the load is applied (mm)

Model	Allowable vertical load Fv (N)	Maximum allowable moment		
		Pitch moment: Mp (N·m)	Yaw moment: My (N·m)	Roll moment: Mr (N·m)
MHZ <input type="checkbox"/>2-6	10	0.04	0.04	0.08
MHZ <input type="checkbox"/>2-10	58	0.26	0.26	0.53
MHZ <input type="checkbox"/>2-16	98	0.68	0.68	1.36
MHZ <input type="checkbox"/>2-20	147	1.32	1.32	2.65
MHZ <input type="checkbox"/>2-25	255	1.94	1.94	3.88
MHZ <input type="checkbox"/>2-32	343	3	3	6
MHZ <input type="checkbox"/>2-40	490	4.5	4.5	9


Note) Values for load and moment in the table indicate static values.


Calculation of allowable external force (when moment load is applied)	Calculation example
$\text{Allowable load } F \text{ (N)} = \frac{M \text{ (maximum allowable moment) (N·m)}}{L \times 10^{-3}}$ <p>(* Unit conversion constant)</p>	<p>When a static load of $f = 10\text{N}$ is operating, which applies pitch moment to point $L = 30\text{mm}$ from the MHZ <input type="checkbox"/>2-16D guide.</p> $\text{Allowable load } F = \frac{0.68}{30 \times 10^{-3}}$ $= 22.7 \text{ (N)}$ <p>Load $f = 10 \text{ (N)} < 22.7 \text{ (N)}$ Therefore, it can be used.</p>




Series MHZ Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of "**Caution**", "**Warning**" or "**Danger**". To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

 **Caution** : Operator error could result in injury or equipment damage.

 **Warning** : Operator error could result in serious injury or loss of life.

 **Danger** : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems

Note 2) JIS B 8370: General Rules for Pneumatic Equipment

Warning

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

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if handled incorrectly. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

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

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back pressure.)

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.



Series MHZ Air Gripper Precautions 1

Be sure to read before handling.

Design

Warning

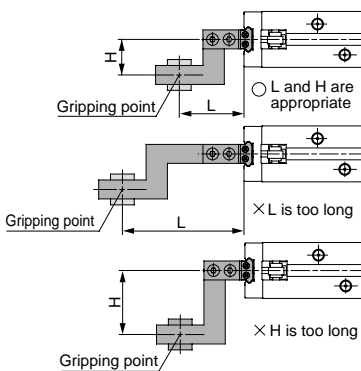
1. When moving work pieces pose a danger to personnel, or there is a danger of fingers being caught in a gripper, etc., implement safety measures such as mounting of protective covers.
2. If circuit pressure drops due to a power failure or trouble with the air supply, etc., there is a danger of work pieces dropping because of reduced gripping force. Implement drop prevention measures to avoid human injury and damage to machinery.

Selection



1. Keep the gripping point within the limits of the specified range.

When the limiting range is exceeded, an excessively large load is applied to the finger slide section, possibly causing premature failure. Refer to the graph of the specified gripping distance range for each series.



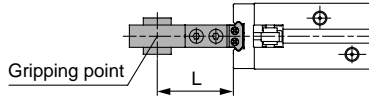
2. Design attachments to be as light and short as possible.

1. Long and heavy attachments increase the inertial force when opening and closing the fingers. This may cause unsteady movement of the fingers and have an adverse effect on product life.

Selection

Warning

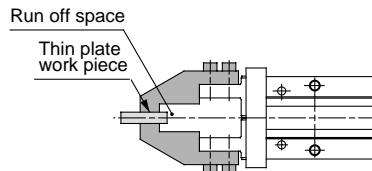
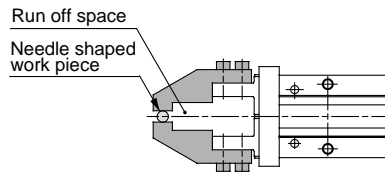
2. Even with the gripping point within the limits of the range, make the attachment as light and short as possible.



3. Select a larger size gripper or use multiple grippers for handling long and large work pieces.

3. Provide run off space in the attachments when using for very small or thin work pieces.

If run off space is not provided, gripping becomes unstable, and it may fail to grip properly or the position may slip, etc.



4. Select a model which has sufficient gripping force for the work piece weight.

Incorrect selection may lead to dropping of work pieces, etc. Refer to the model selection criteria for each series pertaining to effective gripping force and work piece weight.

5. Do not use in applications where excessive external force or impact force will be applied to the gripper.

This may cause malfunction. Contact SMC for further information.

6. Select a model having a sufficient finger opening width for the work piece.

< In case of insufficient width >

1. Gripping becomes unstable due to variations in opening width or work piece diameter.

Selection

Warning

2. Causes detection failure when using an auto switch. Ensure a stroke sufficient to allow for hysteresis, after referring to the information on auto switch hysteresis for each series. Refer to auto switch hysteresis especially when using a 2 color indication auto switch, because the stroke may be limited by the light color setting at the time of detection.

7. Consult with SMC in case of a single acting type, gripping with spring force only.

This can cause unstable gripping in some cases or return malfunction, due to faulty operation, etc.

Mounting

Warning

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

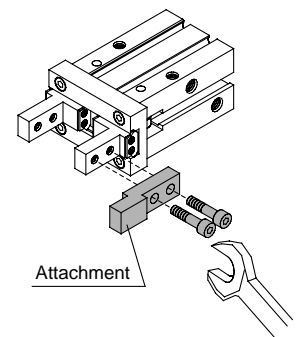
Even a slight deformation can cause inaccuracy or malfunction.

2. Tighten screws within the specified torque range when mounting the attachments.

Tightening with a higher torque than specified may cause malfunction, while tightening with a lower torque may allow slipping of the gripping position or dropping of work pieces.

Mounting attachments to the fingers

Mount attachments by inserting bolts, etc., into the female mounting threads on the fingers and tightening with the torque shown in the table below.



Model	Bolt	Maximum torque N-m
MHZ□2-6	M2 x 0.4	0.15
MHZ□2-10	M2.5 x 0.45	0.31
MHZ□2-16	M3 x 0.5	0.59
MHZ□2-20	M4 x 0.7	1.4
MHZ□2-25	M5 x 0.8	2.8
MHZ□2-32	M6 x 1	4.9
MHZ□2-40	M8 x 1.25	11.8



Series MHZ Air Gripper Precautions 2

Be sure to read before handling.

Mounting

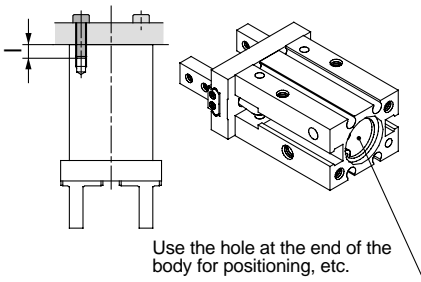
Warning

3. When mounting the air gripper, tighten screws properly at a torque value within the limits of the specified range.

Tightening at a torque above the limits of the range can cause malfunction, while tightening at a lower torque can cause slipping or dropping of work pieces, etc.

Mounting of air gripper

Axial mount type (tapped holes)

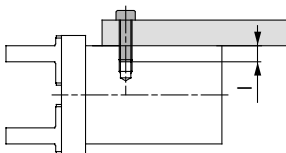


Model	Bolt	Max. tightening torque N·m	Max. screw-in depth / mm
MHZ□2-6	M2 x 0.4	0.15	4.5
MHZ□2-10	M3 x 0.5	0.88	6
MHZ□2-16	M4 x 0.7	2.1	8
MHZ□2-20	M5 x 0.8	4.3	10
MHZ□2-25	M6 x 1	7.3	12
MHZ□2-32	M6 x 1	7.9	13
MHZ□2-40	M8 x 1.25	17.7	17

Note) Series MHZ2-6 and MHZJ2-6 are not available in axial mount type.

Model	Hole diameter mm	Hole depth mm
MHZ□2-6	∅7H8 ^{+0.022} ₀	1.5
MHZ□2-10	∅11H9 ^{+0.043} ₀	2
MHZ□2-16	∅17H9 ^{+0.043} ₀	2
MHZ□2-20	∅21H9 ^{+0.052} ₀	3
MHZ□2-25	∅26H9 ^{+0.052} ₀	3.5
MHZ□2-32	∅34H9 ^{+0.062} ₀	4
MHZ□2-40	∅42H9 ^{+0.062} ₀	4

Vertical mount type (tapped holes)

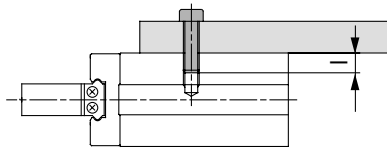


Model	Bolt	Max. tightening torque N·m	Max. screw-in depth / mm
MHZ□2-6	M2 x 0.4	0.15	4
MHZ□2-10	M3 x 0.5	0.9	6
MHZ□2-16	M4 x 0.7	1.6	4.5
MHZ□2-20	M5 x 0.8	3.3	8
MHZ□2-25	M6 x 1	5.9	10
MHZ□2-32	M6 x 1	5.9	10
MHZ□2-40	M8 x 1.25	13.7	13

Note) Except MHZ2-6 and MHZJ2-6

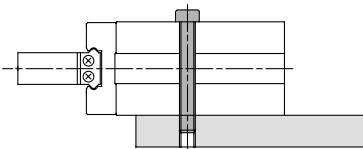
Mounting of air gripper

Side mount type (tapped holes through holes) • Using tapped holes



Model	Bolt	Max. tightening torque N·m	Max. screw-in depth / mm
MHZ□2-6	M3 x 0.5	0.88	10
MHZ□2-10	M3 x 0.5	0.69	5
MHZ□2-16	M4 x 0.7	2.1	8
MHZ□2-20	M5 x 0.8	4.3	10
MHZ□2-25	M6 x 1	7.3	12
MHZ□2-32	M6 x 1	7.9	13
MHZ□2-40	M8 x 1.25	17.7	16

• Using through holes



Model	Bolt	Max. tightening torque N·m
MHZ□2-6	M2.5 x 0.45	0.49
MHZ□2-10	M2.5 x 0.45	0.49
MHZ□2-16	M3 x 0.5	0.88
MHZ□2-20	M4 x 0.7	2.1
MHZ□2-25	M5 x 0.8	4.3
MHZ□2-32	M5 x 0.8	4.3
MHZ□2-40	M6 x 1	7.3

Note) When mounting D-Y59, D-Y69 and D-Y7P type auto switches, only the tapped hole type is applicable.

The screw-in depth should follow the table below so that the end of the bolt does not press the body of the auto switch.

Model	Max. screw-in depth / mm
MHZ□2-6	—
MHZ□2-10	5
MHZ□2-16	8
MHZ□2-20	10
MHZ□2-25	12
MHZ□2-32	13
MHZ□2-40	16

Caution

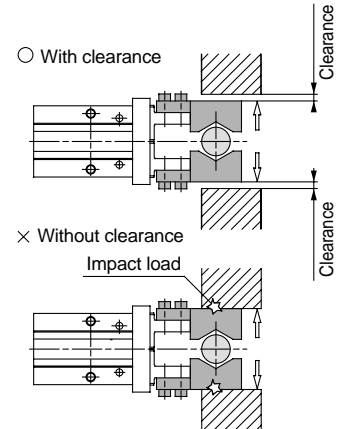
1. Avoid twisting the fingers when mounting the attachments.

This may cause looseness and loss of accuracy.

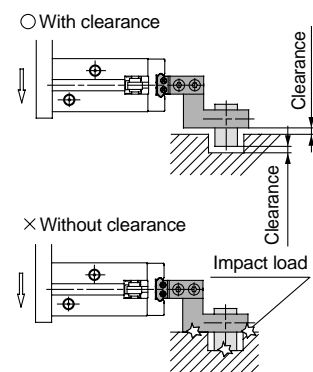
2. Adjust and confirm that external forces are not applied to the fingers.

Fingers may become loose or be damaged by continual lateral or impact load. Provide clearance to prevent the work piece or attachments from striking against any objects at the stroke end.

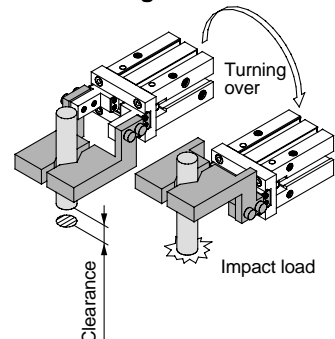
1) Stroke end with fingers open



2) Stroke end with air gripper moving



3) When turning over





Series MHZ Air Gripper Precautions 3

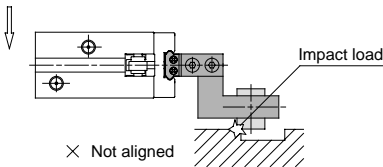
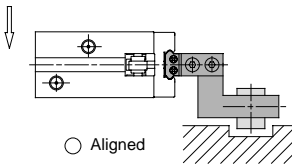
Be sure to read before handling.

Mounting

⚠ Caution

3. Perform thorough alignment so that excessive force is not applied to the fingers during the work piece gripping operation.

Particularly when performing a trial run, operation should be done manually or with low cylinder pressure and speed, while confirming that there is no impact or other unsafe conditions.



4. If the closing speed of the fingers is greater than necessary, backlash and damage can occur due to the inertia of the fingers and attachments. Therefore, a speed controller should be installed and adjusted so that there is no impact.

Applicable speed controllers

Air gripper direct coupling type: AS1200-M5 AS2200-01, etc.

In-line type: Series AS1000 AS1001F, AS2051F, etc.

Piping

⚠ Caution

1. 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.

2. Wrapping of pipe tape

When screwing together pipes and fittings, etc., be certain that chips from the pipe threads and sealing material do not get inside the product.

Also, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.

Operating Environment

⚠ Warning

1. In an environment where adverse effects appear to be especially likely, contact SMC before operating in a location having an atmosphere of corrosive gases, chemicals, sea water, water or water vapor, or where contact with any of these may occur.

There can be adverse effects on dust covers and seals, etc., causing malfunction or reducing the product's life. After confirming the nature of the environment, contact SMC regarding any questions which you may have.

2. Provide shading in locations which receive direct sunlight.
3. Do not use in locations where vibration or impact occurs.
4. Do not use in locations near heat sources where radiated heat will be received.
5. Attach a cover or other protection in locations where there will be exposure to excessive amounts of dust or cutting oil.

Operating Environment

⚠ Warning

6. Contact SMC before using in an environment where adverse effects appear particularly likely.

Lubrication

⚠ Caution

1. The non-lube type air gripper is lubricated at the factory, and can be used without any further lubrication.

In the event that lubrication will be applied, use Class 1 turbine oil (without additives) ISO VG32. Moreover, once lubrication is applied, it must be continued.

If lubrication is later stopped, malfunction can occur due to loss of the original lubricant.

Maintenance

⚠ Warning

1. Do not allow personnel to enter or place objects into the carrying path of the air gripper.

This can cause injury or accidents, etc.

2. Do not put hands, etc., in between the air gripper fingers or attachments.

This can cause injury or accidents, etc.

3. When removing the air gripper, first confirm that no work pieces are being held and then release the compressed air before removing the air gripper.

If a work piece is still being held, there is a danger of it being dropped.



Series MHZ

Auto Switch Precautions 1

Be sure to read before handling.

Design and Selection

Warning

1. Confirm the specifications.

Read the specifications carefully and use this product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications for load current, voltage, temperature or impact.

2. Take precautions when multiple air grippers are used close together.

When multiple auto switch air grippers are used in close proximity, magnetic field interference may cause the switches to malfunction. Maintain a minimum air gripper separation of 40mm. (When the allowable separation is indicated for each air gripper series, use the specified value.)

3. Pay attention to the length of time that a switch is ON at an intermediate stroke position.

When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate, but if the speed is too great the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:

$$V(\text{mm/s}) = \frac{\text{Auto switch operating range (mm)}}{\text{Load operating time (ms)}} \times 1000$$

4. Keep wiring as short as possible.

<Solid state switch>

Although wire length should not affect switch function, use a wire 100m or shorter.

5. Take precautions for the internal voltage drop of the switch.

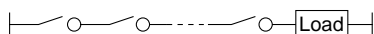
<Solid state switch>

Generally, the internal voltage drop will be greater with a 2 wire solid state auto switch than with a reed switch.

- Take note that there will be a large voltage drop if auto switches are connected in series as shown below. (Refer to internal voltage drop in the auto switch specifications.)

[The voltage drop will be "n" times larger when "n" auto switches are connected.]

Even though auto switches operate normally, the load may not operate.



- In the same way, when operating below a specified voltage, although an auto switch may operate normally, the load may not operate. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

$$\text{Supply voltage} - \text{Internal voltage drop of switch} > \text{Minimum operating voltage of load}$$

Also, note that a 12VDC relay is not applicable.

6. Pay attention to leakage current.

<Solid state switch>

With a 2 wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.

$$\text{Operating current of load (OFF condition)} > \text{Leakage current}$$

If the criteria given in the above formula are not met, it will not reset correctly (stays ON). Use a 3 wire switch if this specification will not be satisfied.

Moreover, leakage current flow to the load will be "n" times larger when "n" auto switches are connected in parallel.

7. Do not use a load that generates surge voltage.

<Solid state switch>

Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly. When a load, such as a relay or solenoid, which generates surge is directly driven, use a type of switch having a built-in surge absorbing element.

8. Cautions for use in an interlock circuit.

When an auto switch is used for an interlock signal requiring high reliability, devise a double interlock system to avoid trouble by providing a mechanical protection function, or by also using another switch (sensor) together with the auto switch. Also perform periodic maintenance and confirm proper operation.

9. Ensure sufficient clearance for maintenance activities.

When designing an application, be sure to allow sufficient clearance for maintenance and inspections.

Mounting and Adjustment

Warning

1. Do not drop or bump.

Do not drop, bump or apply excessive impacts (1000m/s² or more for solid state switches) while handling.

Although the body of the switch may not be damaged, the inside of the switch could be damaged and cause a malfunction.

2. Do not carry a cylinder by the auto switch lead wires.

Never carry a cylinder by its lead wires. This may not only cause broken lead wires, but it may cause internal elements of the switch to be damaged by the stress.

3. Mount switches using the proper fastening torque.

When a switch is tightened beyond the range of fastening torque, the mounting screws, mounting bracket or switch may be damaged. On the other hand, tightening below the range of fastening torque may allow the switch to slip out of position. (Refer to page 56 regarding switch mounting, movement and fastening torque, etc.)

Wiring

Warning

1. Avoid repeatedly bending or stretching lead wires.

Broken wires will result from applying repeated bending stress or stretching force to the lead wires.

2. Be sure to connect the load before power is applied.

<2 wire type>

If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged because of excess current.

3. Confirm proper insulation of wiring.

Be certain that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

4. Do not run wiring near power lines or high voltage lines.

Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits containing auto switches may malfunction due to noise from these other lines.



Series MHZ Auto Switch Precautions 2

Be sure to read before handling.

Wiring

Warning

* Lead wire color changes

Lead wire colors of SMC switches have been changed in order to meet NECA Standard 0402 for production beginning September, 1996 and thereafter. Please refer to the tables provided.

Special care should be taken regarding wire polarity during the time that the old colors still coexist with the new colors.

2 wire

	Old	New
Output (+)	Red	Brown
Output (-)	Black	Blue

Solid state with diagnostic output

	Old	New
Power supply (+)	Red	Brown
Power supply GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

3 wire

	Old	New
Power supply (+)	Red	Brown
Power supply GND	Black	Blue
Output	White	Black

Solid state with latch type diagnostic output

	Old	New
Power supply (+)	Red	Brown
Power supply GND	Black	Blue
Output	White	Black
Latch type diagnostic output	Yellow	Orange

5. Do not allow short circuit of loads.

<Solid state switch>

Models D-F9□(V), F9□W(V) and all models of PNP output type switches do not have built-in short circuit protection circuits. If loads are short circuited, the switches will be instantly damaged.

Take special care to avoid reverse wiring with the power supply line (brown) and the output line (black) on 3 wire type switches.

6. Avoid incorrect wiring.

<Solid state switch>

- 1) If connections are reversed on a 2 wire type switch, the switch will not be damaged if protected by a protection circuit, but the switch will always stay in an ON state. However, it is still necessary to avoid reversed connections, since the switch could be damaged by a load short circuit in this condition.
- 2) If connections are reversed (power supply line + and power supply line -) on a 3 wire type switch, the switch will be protected by a protection circuit. However, if the power supply line (+) is connected to the blue wire and the power supply line (-) is connected to the black wire, the switch will be damaged.

Operating Environment

Warning

1. Never use in an atmosphere of explosive gases.

The construction of auto switches is not intended to prevent explosion. Never use in an atmosphere with an explosive gas since this may cause a serious explosion.

2. Do not use in an area where a magnetic field is generated.

Auto switches will malfunction or magnets inside air grippers will become demagnetized.

3. Do not use in an environment where the auto switch will be continually exposed to water.

Although switches, except for a few models, conform to IEC standard IP67 construction (JIS C 0920: watertight construction), do not use switches in applications where continually exposed to water splash or spray. Poor insulation or swelling of the potting resin inside switches may cause malfunction.

4. Do not use in an environment with oil or chemicals.

Consult SMC if auto switches will be used in an environment with coolant, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.

5. Do not use in an environment with temperature cycles.

Consult SMC if switches are used where there are temperature cycles other than normal air temperature changes, as they may be adversely affected internally.

6. Do not use in locations where surge is generated.

<Solid state switch>

When there are units (solenoid type lifter, high frequency induction furnace, motor, etc.) which generate a large amount of surge in the area around air grippers with solid state auto switches, this may cause deterioration or damage to the switches. Avoid sources of surge generation and crossed lines.

Operating Environment

Warning

7. Avoid accumulation of iron waste or close contact with magnetic substances.

When a large amount of ferrous waste such as machining chips or spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with an auto switch air gripper, it may cause the auto switch to malfunction due to a loss of the magnetic force inside the air gripper.

Maintenance

Warning

1. Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.

- 1) Securely tighten switch mounting screws.

If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.

- 2) Confirm that there is no damage to lead wires.

To prevent faulty insulation, replace switches or repair lead wires, etc., if damage is discovered.

- 3) Confirm the lighting of the green light on 2 color indication switches.

Confirm that the green LED is on when stopped at the established position. If the red LED is on, the mounting position is not appropriate. Readjust the mounting position until

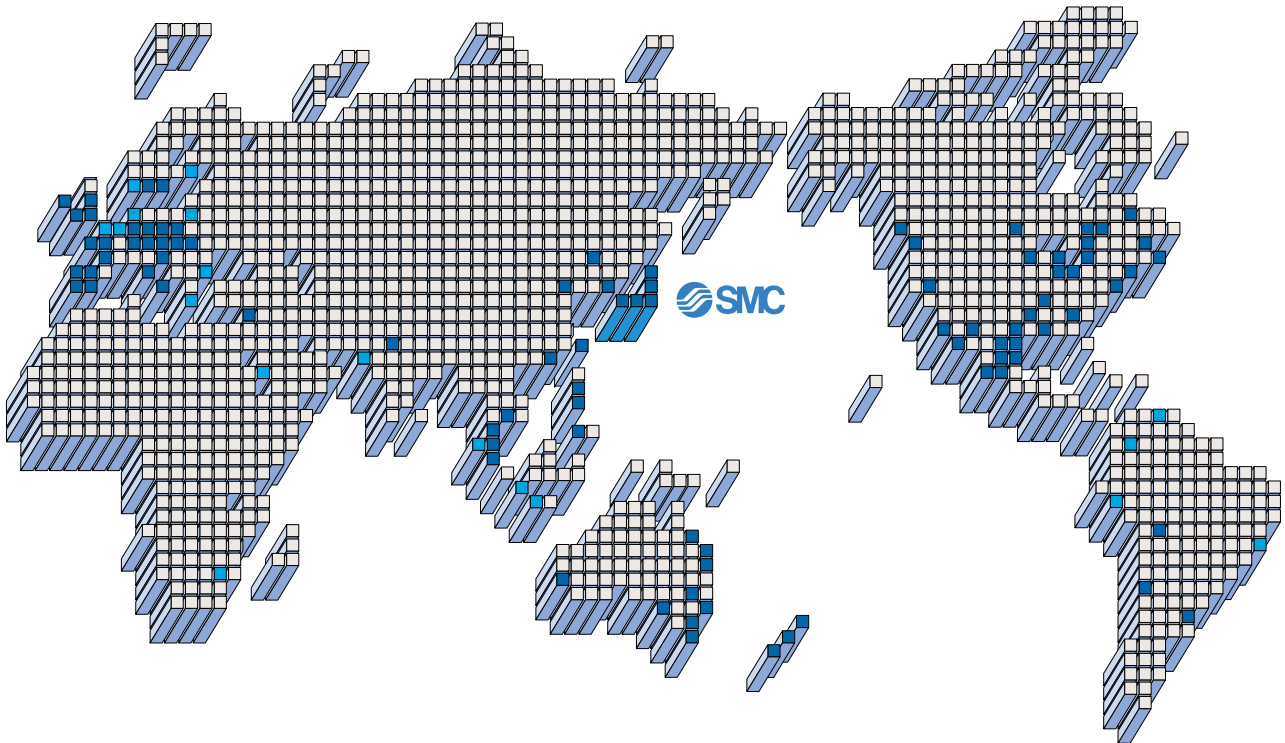
Other

Warning

1. Consult SMC concerning water resistance, elasticity of lead wires, and usage at welding sites, etc.



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