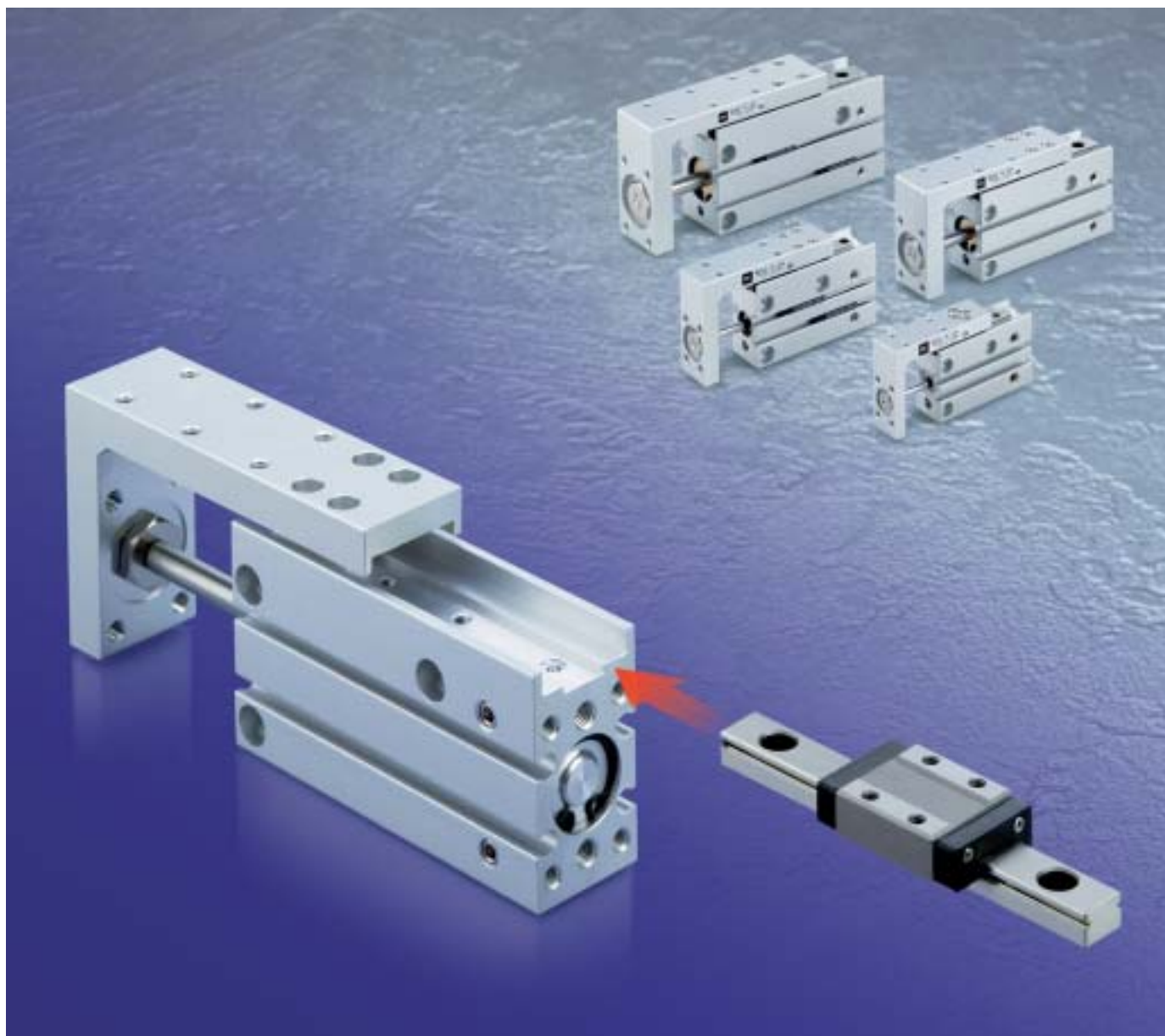


Compact Slide

Series MXH

ø6, ø10, ø16, ø20



The use of an endless track linear guide produces a table cylinder having excellent rigidity, linearity and non-rotating accuracy.

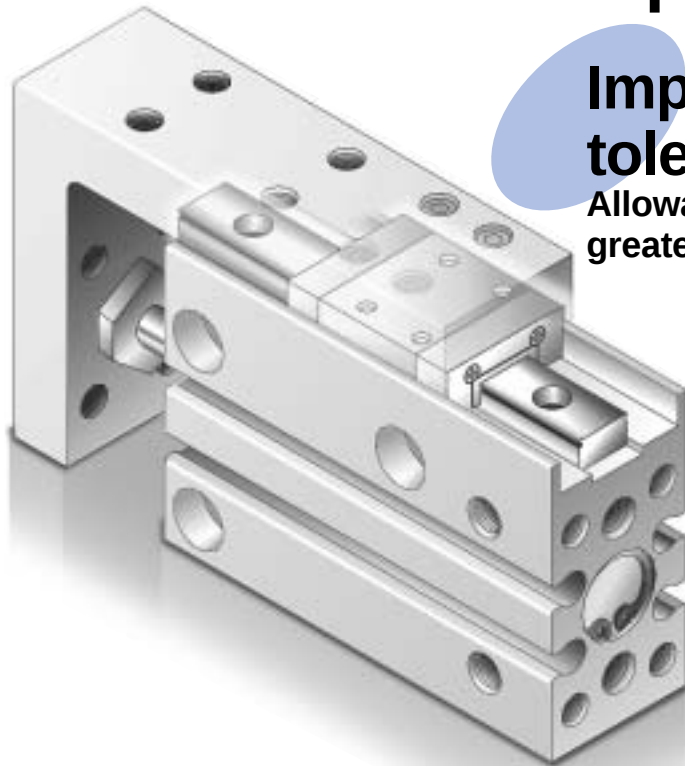
The use of an endless track linear guide having excellent rigidity, linearity and

Compact Slide *Series*

Improved moment tolerance

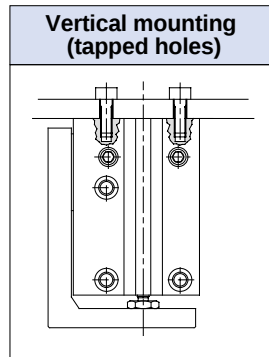
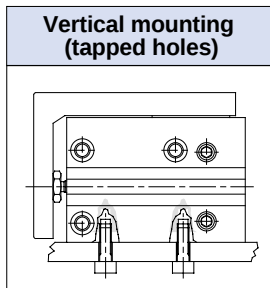
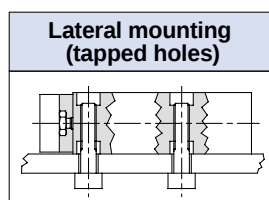
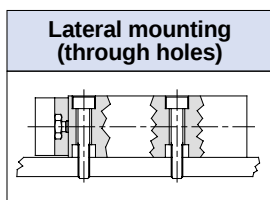
Allowable moment is approximately 6 times greater than the Series MXU

Long strokes up to 60mm are now standard

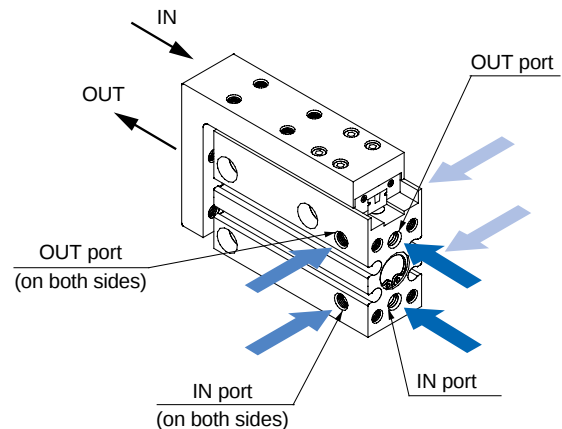


Running parallelism	Stroke (mm)	
	5 to 30	40 to 60
	0.05mm or less	0.1mm or less

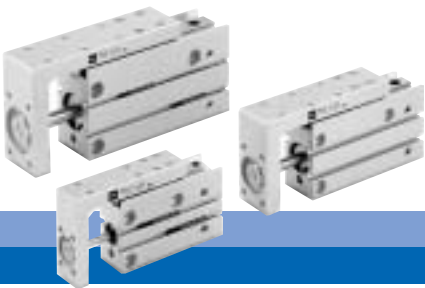
Mounting is possible from 4 directions



Piping is possible from 3 directions



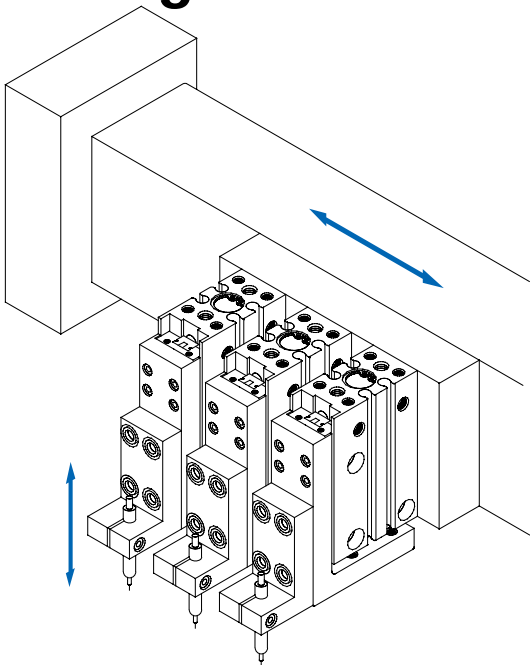
produces a table cylinder
non-rotating accuracy



MXH / ø6, ø10, ø16, ø20

A table cylinder suitable for short pitch mounting

Application example



Auto switches offer numerous variations

Reed switches, solid state switches and 2 colour indicator type
solid state switches can be mounted

ø20 bore size is now standard

Series variations

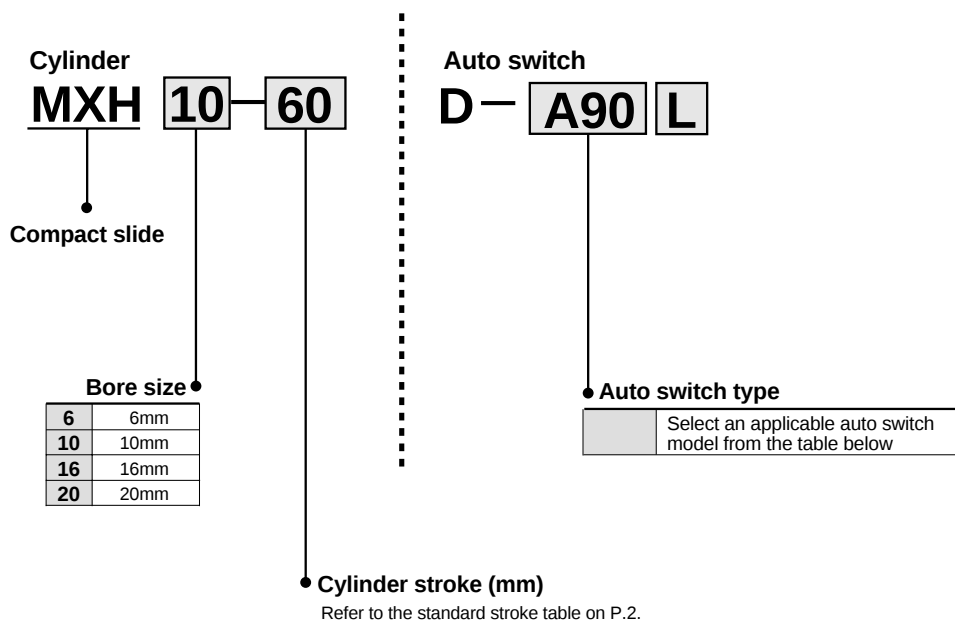
Model	Bore size (mm)	Standard stroke (mm)								
		5	10	15	20	25	30	40	50	60
MXH6	6	•	•	•	•	•	•	•	•	•
MXH10	10	•	•	•	•	•	•	•	•	•
MXH16	16	•	•	•	•	•	•	•	•	•
MXH20	20	•	•	•	•	•	•	•	•	•

Compact
Slide

Series MXH

ø6, ø10, ø16, ø20

How to Order



Applicable auto switch types

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage			Auto switch model*		Applicable load		Detailed specifications
					Electrical entry direction							
					DC	AC	Vertical	Lateral				
Reed switch	—	Grommet	No	2 wire	24V	5V 12V	100V or less	D-A90VL	D-A90L	IC circuit	Relay PLC	P.14
			Yes	3 wire (NPN equiv.)	—	5V	—	D-A93VL	D-A93L	—	—	
								D-A96VL	D-A96L	IC circuit		
Solid state switch	—	Grommet	Yes	3 wire (NPN)	24V	12V	—	D-F9NVL-Q	D-F9NL-Q	—	Relay PLC	P.15
				3 wire (PNP)				D-F9PVL-Q	D-F9PL-Q			
				2 wire				D-F9BVL-Q	D-F9BL-Q			
	3 wire (NPN)			D-F9NWWL-Q				D-F9NWL-Q	P.16			
	3 wire (PNP)			D-F9PWWL-Q				D-F9PWL-Q				
	2 wire			D-F9BWWL-Q				D-F9BWL-Q				
	Diagnostic indication (2 colour indicator)											

* Lead wire length 3m

* Refer to pages 12 through 17 for sections related to auto switches.

Compact Slide Series *MXH*



Specifications

1MPa: Approx. 10.2kgf/cm²				
Bore size (mm)	6	10	16	20
Guide rail width (mm)	5	7	9	12
Fluid	Air			
Action	Double acting type			
Piping port size	M5 x 0.8			
Minimum operating pressure	0.12MPa {1.2kgf/cm²}	0.06MPa {0.61kgf/cm²}		0.05MPa {0.51kgf/cm²}
Maximum operating pressure	0.7MPa{7.1kgf/cm²}			
Proof pressure	1.05MPa{10.7kgf/cm²}			
Ambient and fluid temperature	Without auto switch: -10 to 70°C (without freezing) With auto switch: -10 to 60°C (without freezing)			
Piston speed	50 to 500mm/s			
Allowable kinetic energy J (kgf·cm)	0.0125(0.127)	0.025(0.25)	0.05(0.5)	0.1(1.0)
Lubrication	Non-lube			
Cushion	Rubber bumpers at both ends			
Stroke length tolerance	+1.0 0			
Auto switches (optional)	Reed switch D-A9□L-Q Solid state switch D-F9□L-Q			

Standard Stroke Table

Bore size (mm)	Standard strokes (mm)
6, 10, 16, 20	5, 10, 15, 20, 25, 30, 40, 50, 60

Theoretical Output Table

Bore size (mm)	Rod diameter (mm)	Operating direction	Piston area (mm ²)	Operating pressure MPa		
				0.3	0.5	0.7
6	3	OUT	28.3	8.49	14.2	19.8
		IN	21.2	6.36	10.6	14.8
10	4	OUT	78.5	23.6	39.3	55.0
		IN	66.0	19.8	33.0	46.2
16	6	OUT	201	60.3	101	141
		IN	172	51.6	86.0	121
20	8	OUT	314	94.2	157	220
		IN	264	79.2	132	185

Minimum Stroke for Mounting of Auto Switches

Number of auto switches mounted	Applicable auto switch models		
	D-A9□L D-A9□VL	D-F9□L-Q D-F9□VL-Q	D-F9□WL-Q D-F9□WVL-Q
1pc.	5	5	5
2pcs.	10	5	10

Weight Table

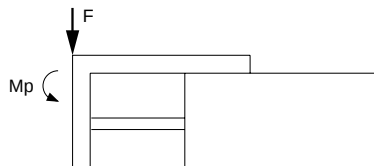
Model	Stroke (mm)								
	5	10	15	20	25	30	40	50	60
MXH6	62	67	76	81	91	96	111	125	140
MXH10	117	125	140	148	162	170	192	215	238
MXH16	216	227	247	258	279	290	323	353	386
MXH20	437	455	486	505	542	560	597	656	700

Series MXH

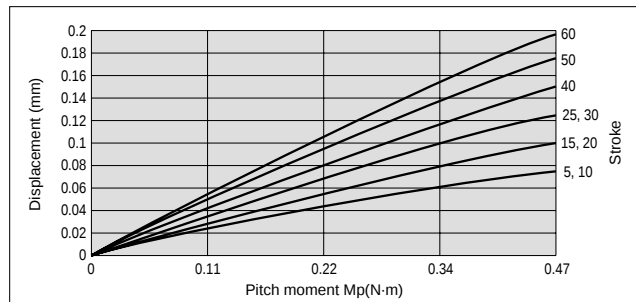
Table Displacement

Table displacement due to pitch moment

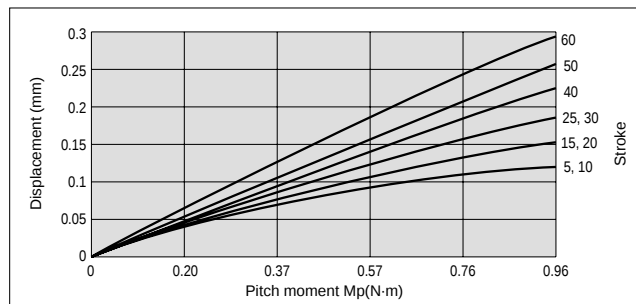
Table displacement (arrow) when a load acts upon the section marked with the arrow at the full stroke of the compact slide



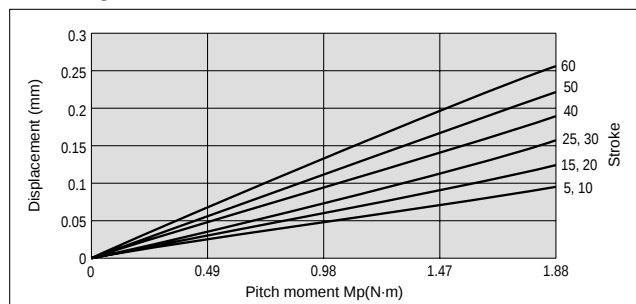
MXH6



MXH10



MXH16



MXH20

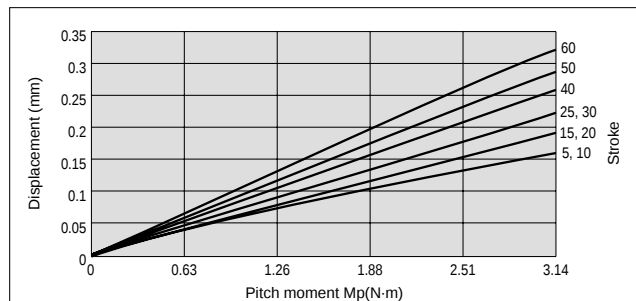
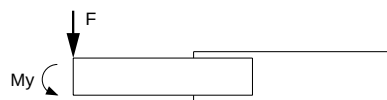
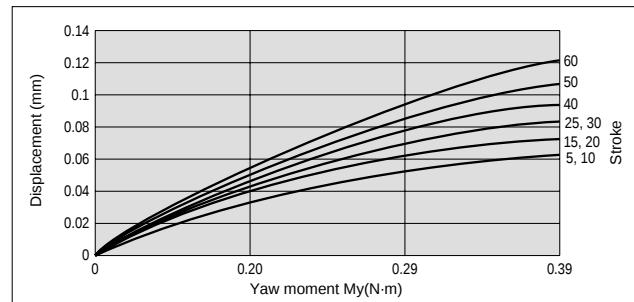


Table displacement due to yaw moment

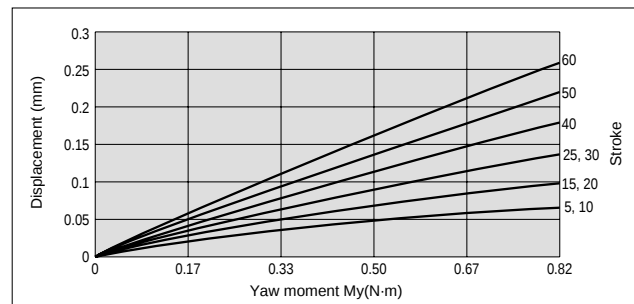
Table displacement (arrow) when a load acts upon the section marked with the arrow at the full stroke of the compact slide



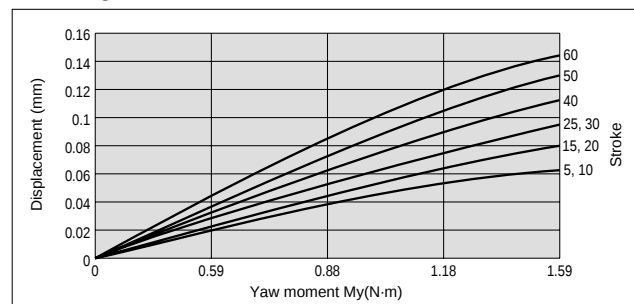
MXH6



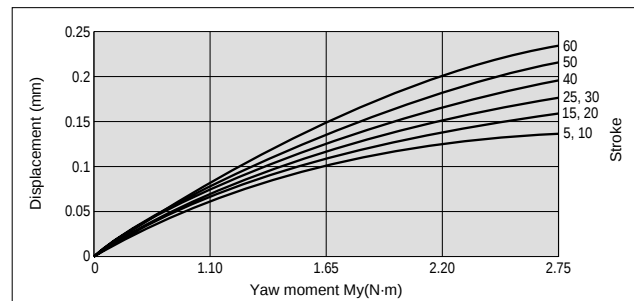
MXH10



MXH16



MXH20



Design Precautions

! Caution

- ① Bore size selections cannot be made with the above graphs alone. Perform bore size selections with the model selection method provided on pages 5 and 6.
- ② The displacement may increase after the action of an impact load. When the table is subjected to an impact load, there may be permanent distortion of the guide unit and increased displacement.

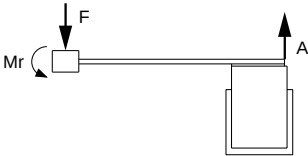
Table Accuracy

Running parallelism	Stroke (st)	
	5 to 30	40 to 60
	0.05mm or less	0.1mm or less

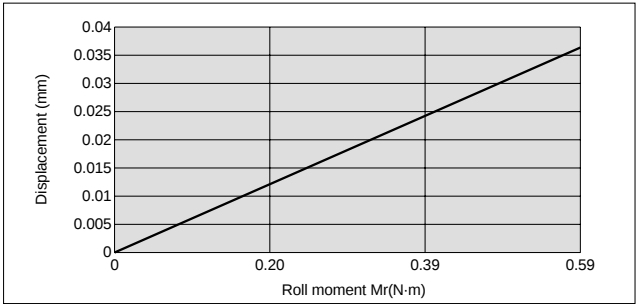
Model	Allowable moment (N·m)		
	Pitch moment	Yaw moment	Roll moment
	Mp	My	Mr
MXH6	0.47	0.39	0.59
MXH10	0.96	0.82	1.37
MXH16	1.88	1.59	2.75
MXH20	3.14	2.75	5.49

Table displacement due to roll moment

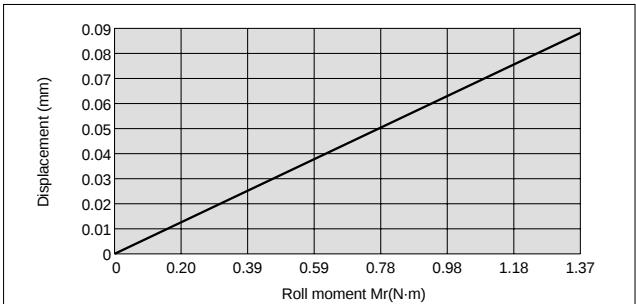
Table displacement (at A) when a load acts upon section F at the full stroke of the compact slide



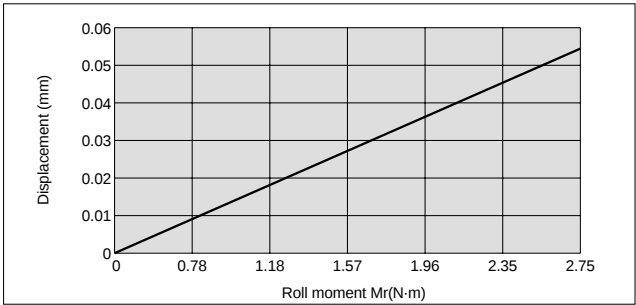
MXH6



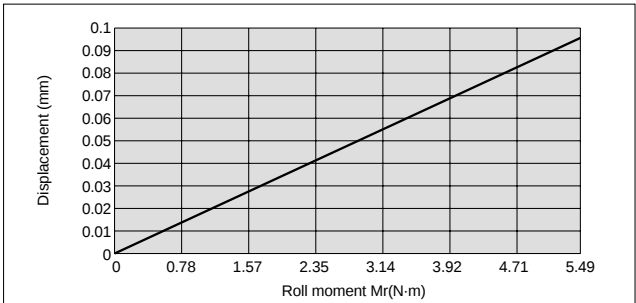
MXH10



MXH16



MXH20

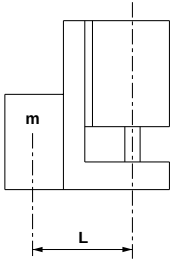
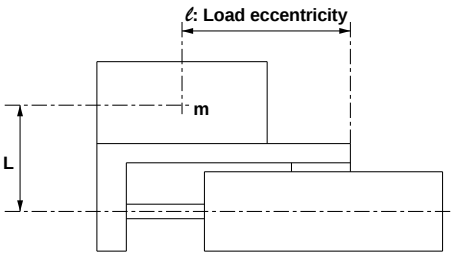


Series MXH

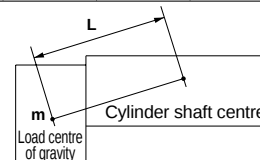
Model Selection Method

⚠ Caution Separate confirmation of the theoretical output is necessary. Refer to the theoretical output table on page 2.

Selection Conditions: Determine the selection conditions in order, starting from the upper row in the table below, and choose one of the selection graphs to be used.

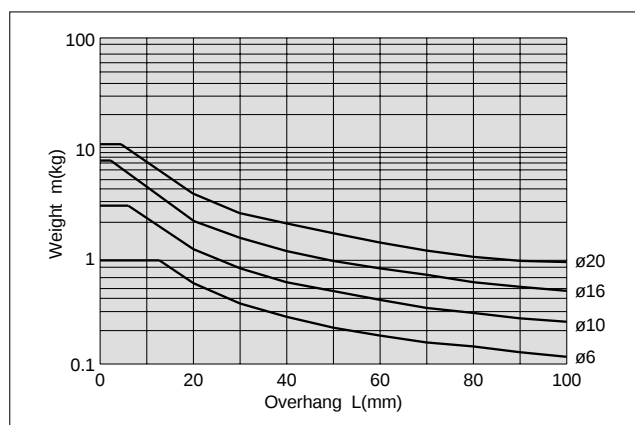
Mounting position	Vertical			Horizontal								
												
Maximum speed mm/s	to 100	to 300	to 500	to 100			to 300			to 500		
Load eccentricity e mm	—			50	100	200	50	100	200	50	100	200
Selection graph	1	2	3	4	5	6	7	8	9	10	11	12

* L: Overhang (the distance from the cylinder shaft centre to the load centre of gravity)
The direction of L can also be a diagonal direction .
(See drawing at right)

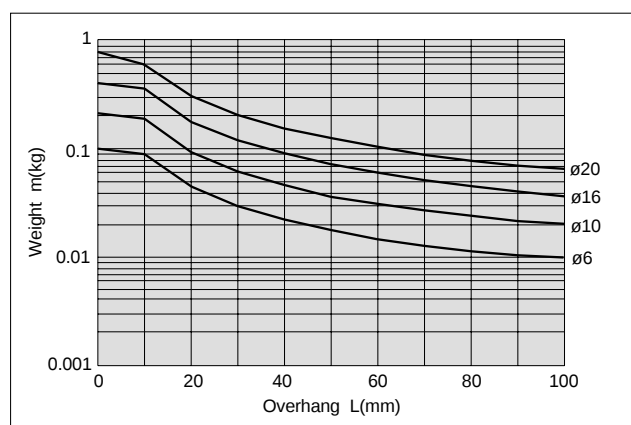


Selection Graphs 1 to 3 (Vertical Mounting)

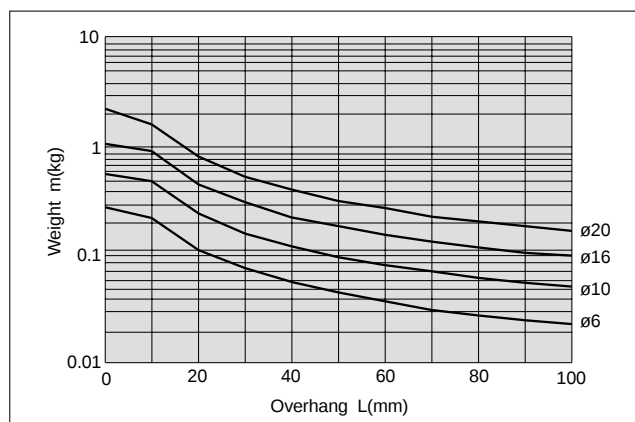
Graph 1 Maximum speed 100(mm/s) or less



Graph 3 Maximum speed 500(mm/s) or less



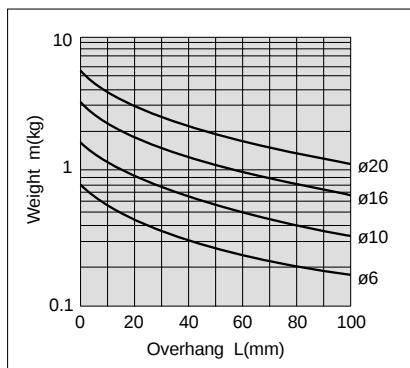
Graph 2 Maximum speed 300(mm/s) or less



Selection Graphs 4 to 12 (Horizontal Mounting)

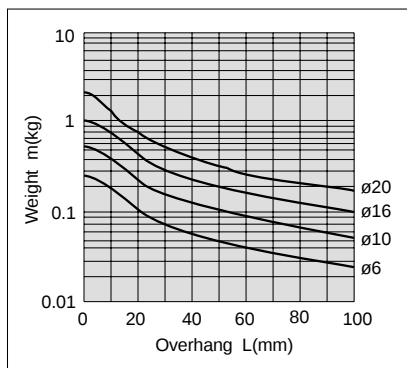
Maximum speed 100mm/s or less

Graph 4 Load eccentricity 50mm



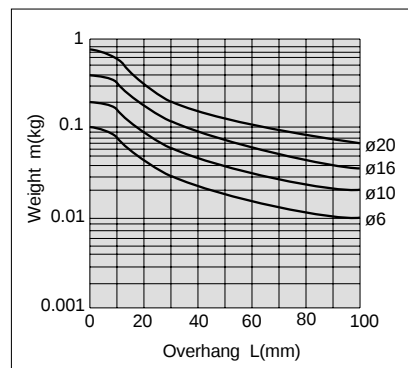
Maximum speed 300mm/s or less

Graph 7 Load eccentricity 50mm

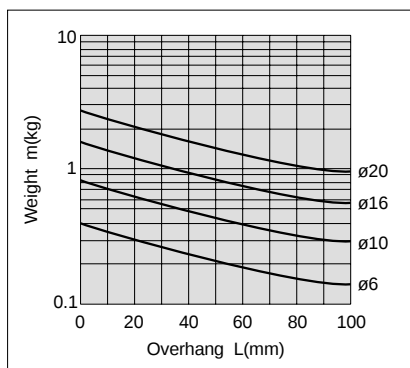


Maximum speed 500mm/s or less

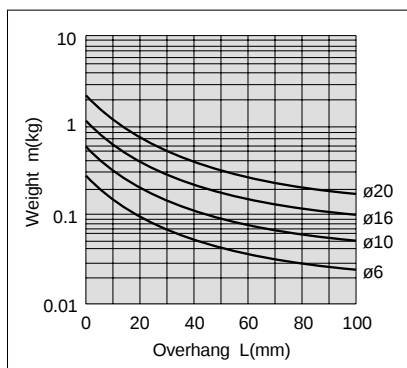
Graph 10 Load eccentricity 50mm



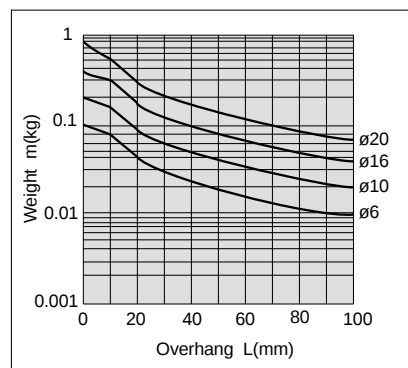
Graph 5 Load eccentricity 100mm



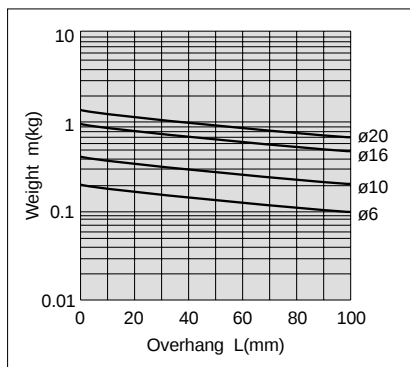
Graph 8 Load eccentricity 100mm



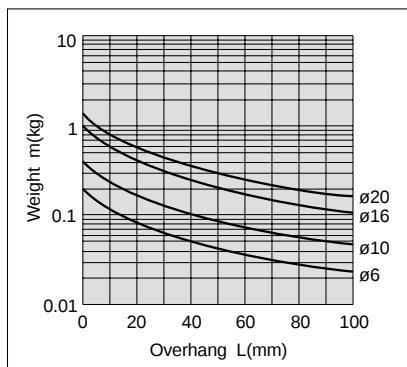
Graph 11 Load eccentricity 100mm



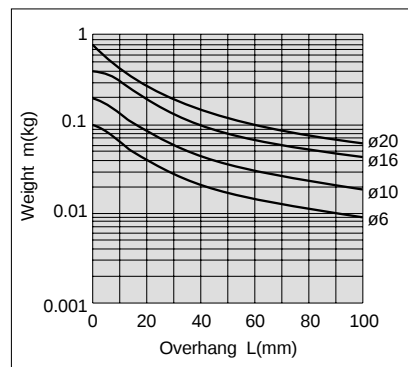
Graph 6 Load eccentricity 200mm



Graph 9 Load eccentricity 200mm



Graph 12 Load eccentricity 200mm



Selection Examples

- ① Selection conditions
- Mounting: Vertical
 - Maximum speed: 500mm/s
 - Overhang: 40mm
 - Load weight: 0.1Kg

Refer to Graph 3 based on vertical mounting and a speed of 500mm/s.
In Graph 3, find the intersection of a 40mm overhang and load weight of 0.1Kg, which results in a determination of ø20.

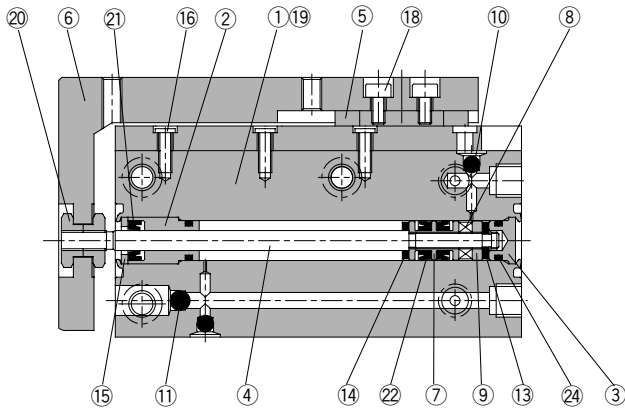
- ② Selection conditions
- Mounting: Horizontal
 - Maximum speed: 500mm/s
 - Load eccentricity: 50mm
 - Overhang: 30mm
 - Load weight: 0.1Kg

Refer to Graph 10 based on horizontal mounting, a speed of 500mm/s and load eccentricity of 50mm.
In Graph 10, find the intersection of a 30mm overhang and load weight of 0.1Kg, which results in a determination of ø16.

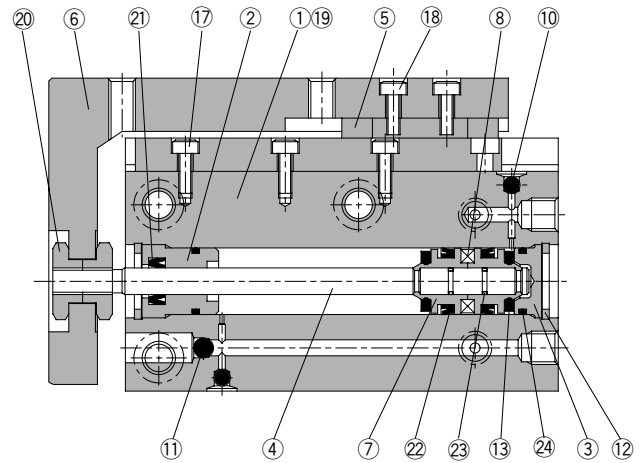
Series MXH

Construction

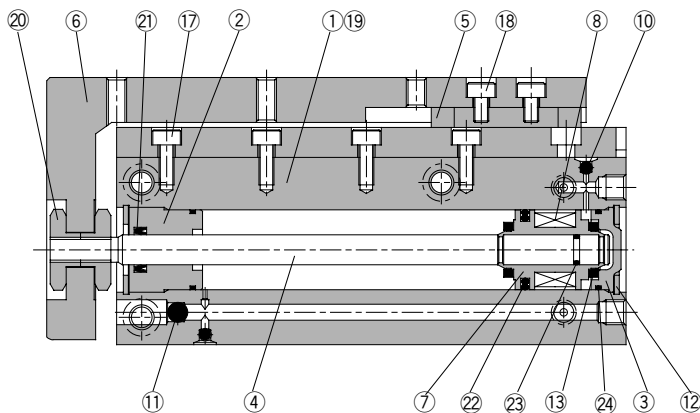
MXH6 (ø6)



MXH10 (ø10)



MXH16, 20 (ø16, ø20)



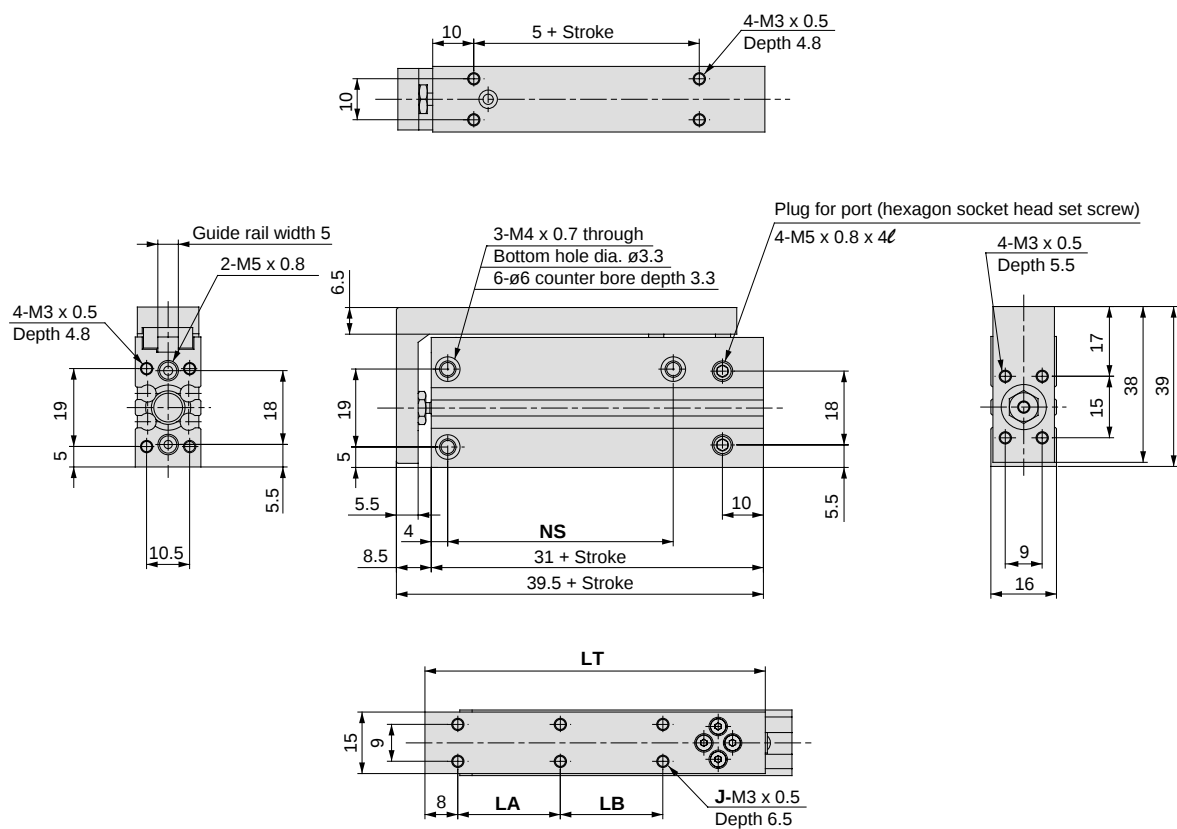
Parts list

No.	Description	Material	Note
1	Cylinder tube	Aluminium alloy	Hard anodized
2	Rod cover	Brass	
3	Head cover	Brass	ø6, ø10 electroless nickel plated
		Aluminium alloy	ø16, ø20 white chromated
4	Piston rod	Stainless steel	
5	Linear guide	—	
6	Table	Aluminium alloy	Hard anodized
7	Piston	Brass	ø6, ø10
		Aluminium alloy	ø16, ø20
8	Magnet	Magnet material	ø6, ø10 nickel plated
		Synthetic rubber	ø16, ø20
9	Magnet holder	Brass	ø6
10	Steel ball A	High carbon chrome bearing steel	
11	Steel ball B	High carbon chrome bearing steel	

Parts list

No.	Description	Material	Note
12	C type snap ring for hole	Carbon tool steel	ø10, ø16, ø20
13	Bumper	Urethane	
14	Bumper	Urethane	
15	Seal retainer	Stainless steel	ø6
16	Round head Phillips screw	Carbon steel	ø6 black zinc chromated
17	Hexagon socket head cap screw	Chrome molybdenum steel	ø10, ø16, ø20 nickel plated
18	Hexagon socket head cap screw	Chrome molybdenum steel	Nickel plated
19	Hexagon socket head plug	Chrome molybdenum steel	Nickel plated
20	Nut	Brass	Nickel plated
21	Rod seal	NBR	
22	Piston seal	NBR	
23	Piston gasket	NBR	ø10, ø16, ø20
24	Gasket	NBR	

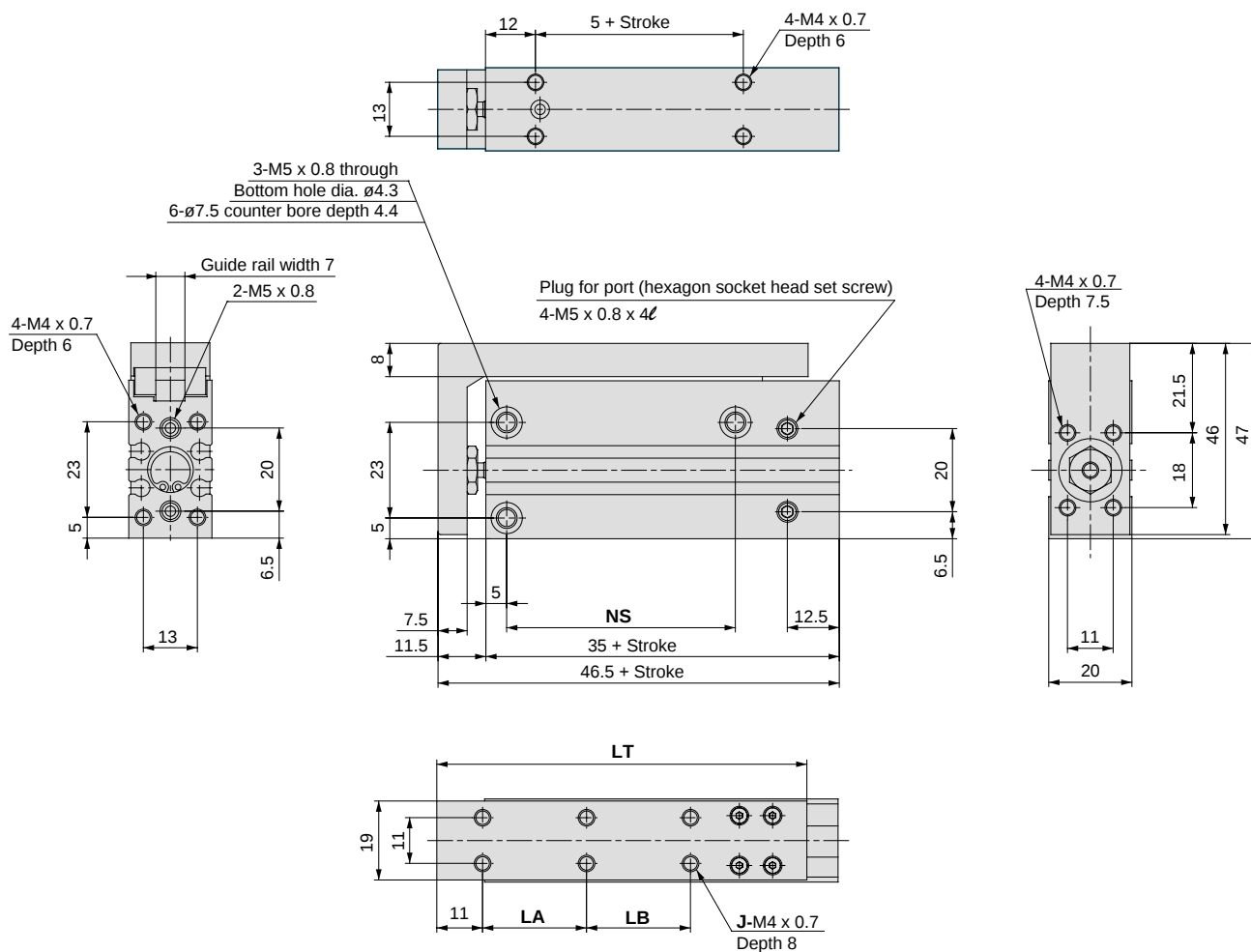
Dimensions/ø6



Stroke (mm)	J	LA	LB	LT	NS
5	4	10	—	42	14
10	4	10	—	42	14
15	4	20	—	52	24
20	4	20	—	52	24
25	4	30	—	62	30
30	4	30	—	62	30
40	6	20	20	72	45
50	6	25	25	82	55
60	6	30	30	92	60

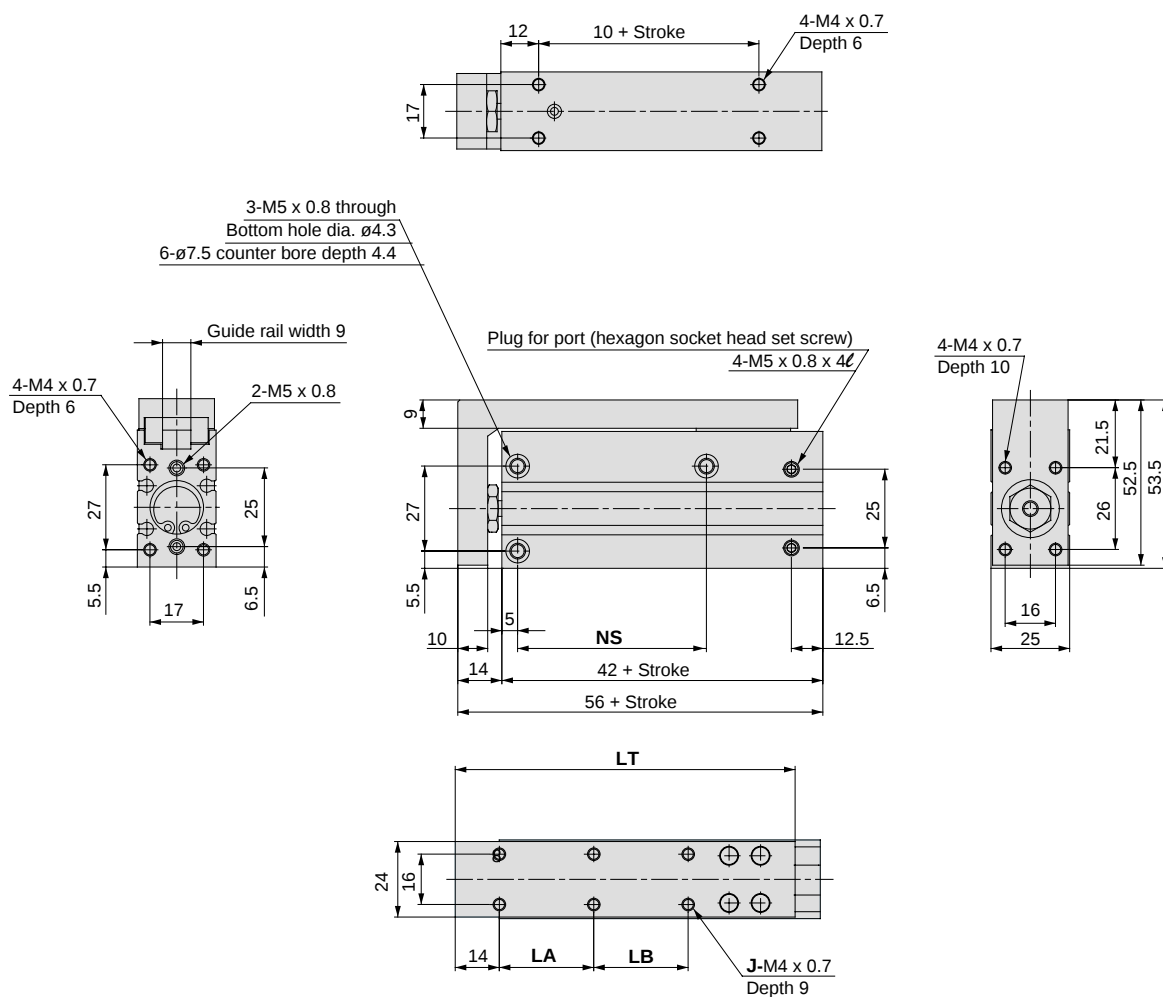
Series MXH

Dimensions/ø10



Stroke (mm)	J	LA	LB	LT	NS
5	4	10	—	49	14
10	4	10	—	49	14
15	4	20	—	59	24
20	4	20	—	59	24
25	4	30	—	69	30
30	4	30	—	69	30
40	6	20	20	79	45
50	6	25	25	89	55
60	6	30	30	99	60

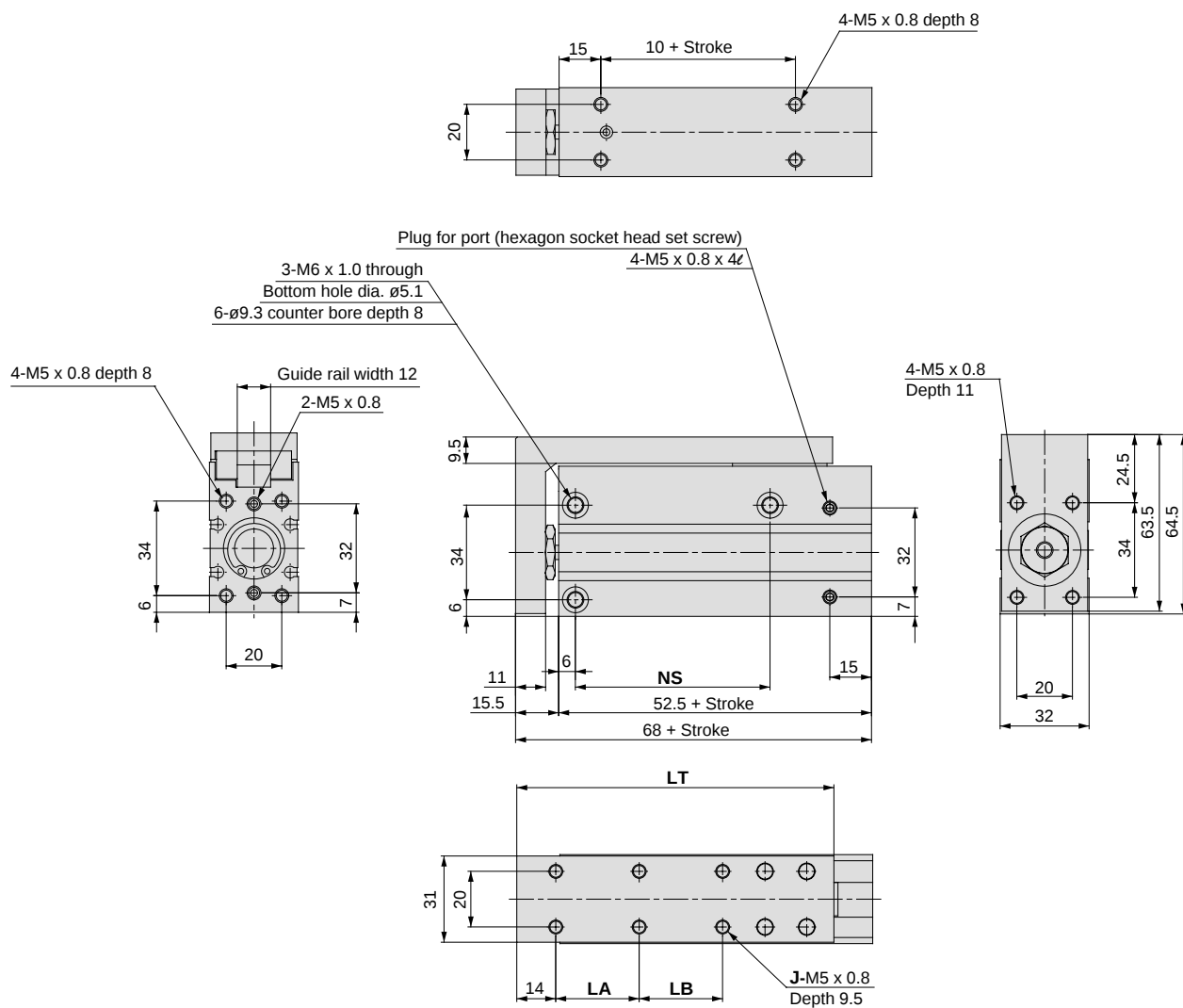
Dimensions/ø16



Stroke (mm)	J	LA	LB	LT	NS
5	4	10	—	58	20
10	4	10	—	58	20
15	4	20	—	68	30
20	4	20	—	68	30
25	4	30	—	78	40
30	4	30	—	78	40
40	6	20	20	88	50
50	6	25	25	98	60
60	6	30	30	108	60

Series MXH

Dimensions/ø20

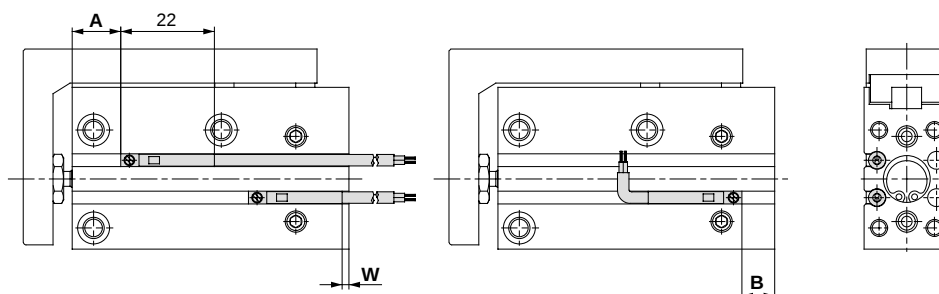


Stroke (mm)	J	LA	LB	LT	NS
5	4	10	—	64	20
10	4	10	—	64	20
15	4	20	—	74	25
20	4	20	—	74	25
25	4	30	—	84	40
30	4	30	—	84	40
40	6	20	20	94	50
50	6	25	25	104	70
60	6	30	30	114	70

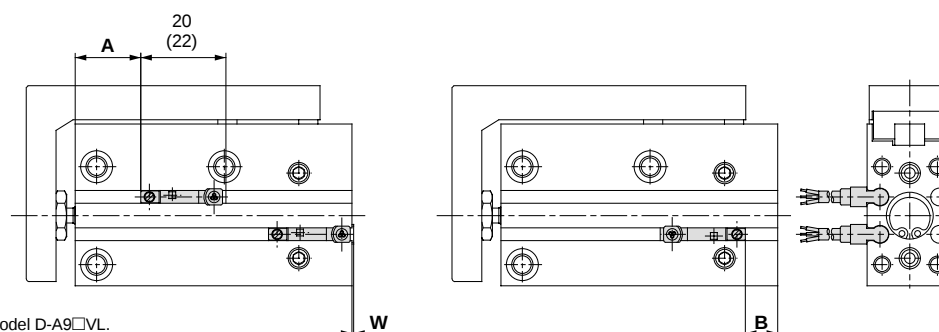
Series MXH Auto Switch Specifications

Auto Switches/Proper Mounting Position for Stroke End Detection

D-A9□L
D-F9□L-Q
D-F9□WL-Q



D-A9□VL
D-F9□VL-Q
D-F9□WVL-Q



Dimension inside () is for model D-A9□VL.

Double acting type

(mm)

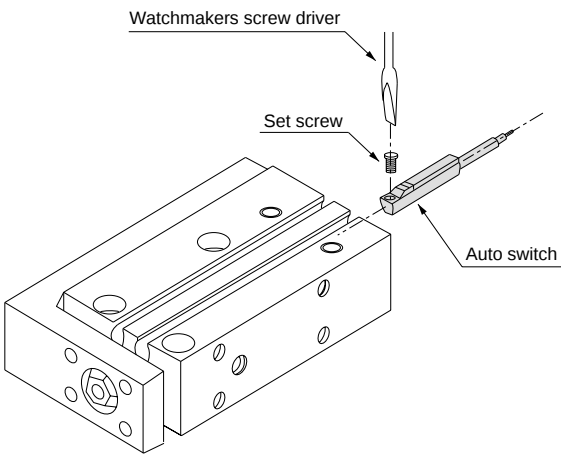
Bore size (mm)	D-A9□L-Q, D-A9□VL-Q			D-F9□WL-Q, D-F9□L-Q			D-F9□WVL-Q, D-F9□VL-Q		
	A	W	B	A	W	B	A	W	B
6	12.5	3.5	2.0	16.5	7.5	-2.5	16.5	5.5	-2.5
10	11.0	-2.0	-3.5	15.0	2.0	-7.5	15.0	0	-7.5
16	18.0	-2.0	-4.0	22.0	2.0	-8.0	22.0	0	-8.0
20	26.0	-4.5	-6.5	30.0	-0.5	-10.5	30.0	-2.5	-10.5

Note 1) Negative dimensions in the chart are for mountings which do not extend beyond the cylinder body.

Note 2) In the case of 5mm and 10mm strokes, there may be times when a switch does not turn OFF or when 2 switches turn ON at the same time, etc., due to the operating range. When setting up switches, set them about 1 to 4mm beyond the values shown in the table above.

Series MXH

Auto Switch Mounting



⚠ Caution

Auto switch mounting tool

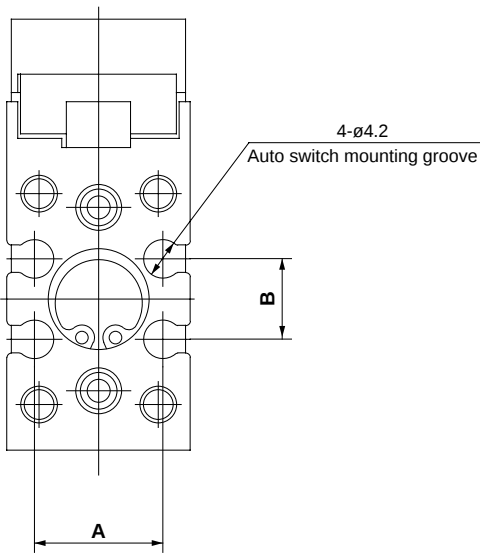
- When fastening the auto switch set screw (included with auto switch), use a watchmakers screw driver with a handle 5 to 6mm in diameter.

Fastening torque

- Fasten with a torque of 0.10 to 0.20N·m.

Note) When used with side piping, it is not possible to mount a D-F9□V type auto switch on the side to which the piping is connected.

Auto switch groove positions



(mm)		
Bore size (mm)	A	B
6	10	6.9
10	14	8.8
16	19	13.7
20	26	17.1

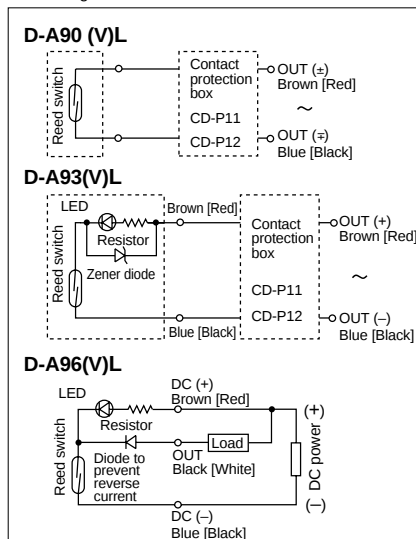
Reed switches

D-A9 3 wire/2 wire



Auto switch internal circuits

Lead wire colours inside [] are old colours not conforming to IEC standards.



Auto Switch Specifications

Auto switch part no.	D-A90L	D-A90VL	D-A93L	D-A93VL	D-A96L	D-A96VL
Electrical entry direction	Lateral	Vertical	Lateral	Vertical	Lateral	Vertical
Wiring system	2 wire				3 wire	
Applicable load	IC circuit, Relay, PLC		Relay, PLC		IC circuit	
Load voltage/ Load current range and maximum load current	24V ^{AC} _{DC} or less/50mA 48V ^{AC} _{DC} or less/40mA 100V ^{AC} _{DC} or less/20mA		24VDC/5 to 40mA 100VAC/5 to 20mA		4 to 8VDC/20mA	
Contact protection circuit	None					
Internal voltage drop	1Ω or less (including 3m lead wire length)		2.7V or less		0.8V or less	
Indicator light	None		Red LED lights up when ON			

- Lead wires** Oil resistant vinyl cabtire cord, ø2.7, 3m
 D-A90(V), D-A93(V) 0.18mm² x 2 wire (brown, blue [red, black])
 D-A96(V) 0.15mm² x 3 wire (brown, black, blue [red, white, black])
- Insulation resistance** 50MΩ or more with a 500VDC megohmmeter (between lead wire and case)
- Withstand voltage** 1000VAC for 1min. (between lead wire and case)
- Ambient temp.** -10 to 60°C
- Leakage current** 0
- Operating time** 1.2ms
- Impact resistance** 300m/s² {30.6G}
- Enclosure** IEC529 Standard IP67 (JISC0920) watertight type
- "L" appears at the end of the part number when the lead wire length is 3m.**
 Example) D-A90L

Auto Switch Weight Table

Unit: g

Model	D-A90L	D-A90VL	D-A93L	D-A93VL	D-A96L	D-A96VL
Lead wire length 3m	41	41	41	41	41	41

Contact Protection Boxes

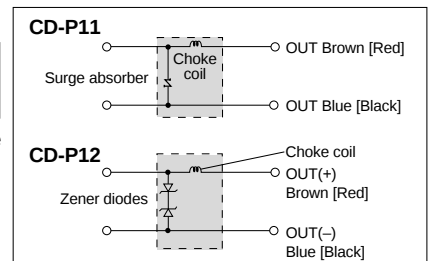
D-A9 type switches do not have internal contact protection circuits. Use a contact protection box when operating an induction load, when the lead wire length is 5m or more, and with 100VAC.

Part No.	Voltage	Lead wire length
CD-P11	100VAC	Switch connection side 0.5m Load connection side 0.5m
CD-P12	24VDC	

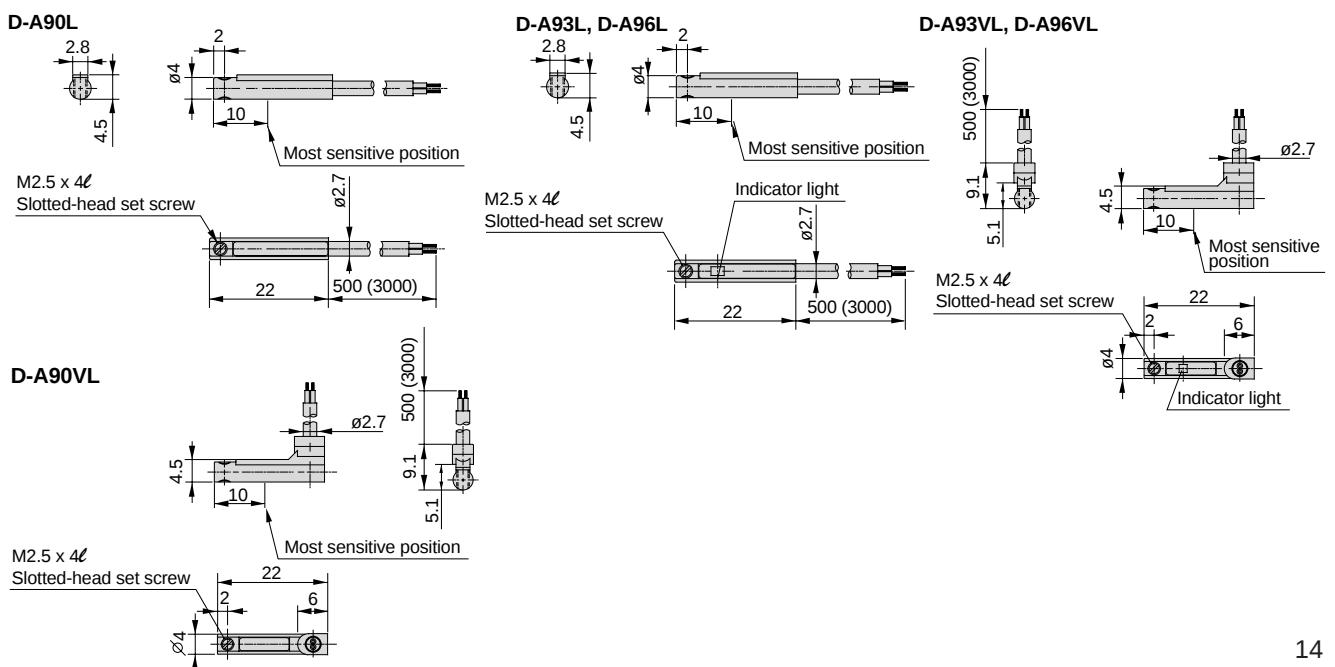
Since D-A90(V) switches have no particular voltage specification below 100VAC, select a contact protection box based on the level of voltage to be used.

Contact protection box internal circuits

Lead wire colors inside [] are old colours not conforming to IEC standards.



Auto Switch Dimensions



Solid State Switches

D-F9 3 wire/2 wire



Auto Switch Specifications

Auto switch part no.	D-F9NL-Q	D-F9NVL-Q	D-F9PL-Q	D-F9PVL-Q	D-F9BL-Q	D-F9BVL-Q
Electrical entry direction	Lateral	Vertical	Lateral	Vertical	Lateral	Vertical
Wiring system	3 wire				2 wire	
Output system	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		5 to 40mA	
Internal voltage drop	1.5V or less (0.8 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** Oil resistant vinyl cabtire cord, $\phi 2.7$, 3m
D-F9N(V), D-F9P(V) 0.15mm² x 3 wire (brown, black, blue [red, white, black])
D-F9B(V) 0.18mm² x 2 wire (brown, blue [red, black])
- **Insulation resistance** ... 50M Ω or more with a 500VDC megohmmeter (between lead wire and case)
- **Withstand voltage** 1000VAC for 1min. (between lead wire and case)
- **Indicator light** Lights up when ON
- **Ambient temp.** -10 to 60°C
- **Operating time** 1ms or less
- **Impact resistance** 1000m/s² (102G)
- **Enclosure** IEC529 Standard IP67 (JISC0920) watertight type
- **"L" appears at the end of the part number when the lead wire length is 3m.**
Example) D-F9NL

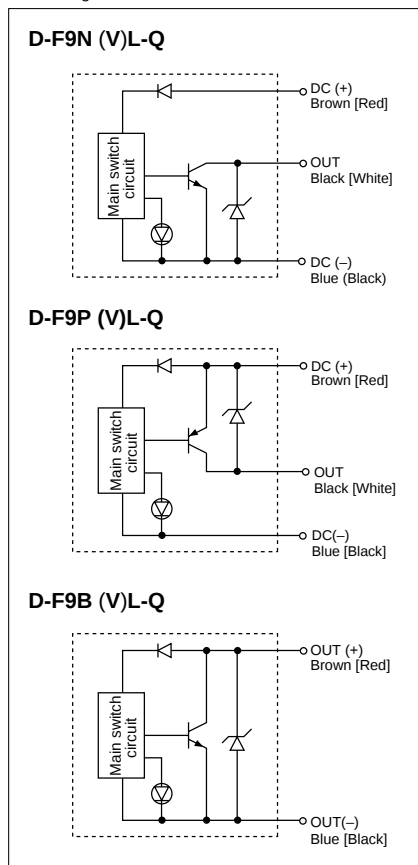
Auto Switch Weight Table

Unit: g

Model	D-F9NL-Q	D-F9PL-Q	D-F9BL-Q	D-F9NVL-Q	D-F9PVL-Q	D-F9BVL-Q
Lead wire length 3m	36.5	36.5	31	37	37	31

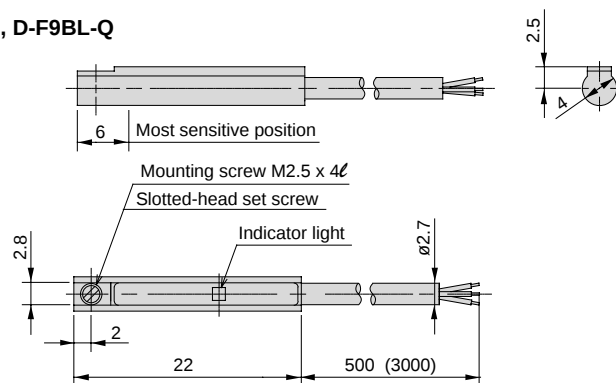
Auto switch internal circuits

Lead wire colours inside [] are old colours not conforming to IEC standards.

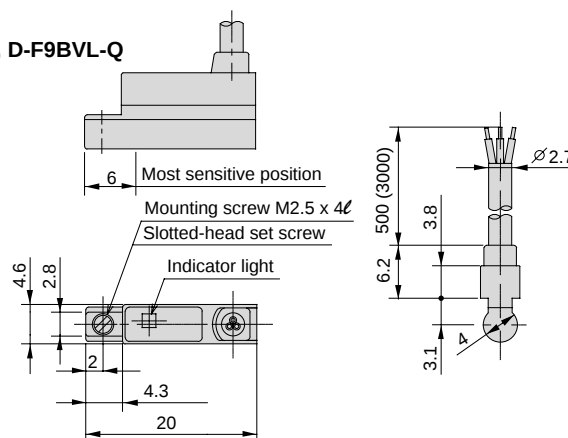


Auto Switch Dimensions

D-F9NL-Q, D-F9PL-Q, D-F9BL-Q



D-F9NVL-Q, D-F9PVL-Q, D-F9BVL-Q



2 Color Indicator Type Solid State Switches

D-F9□W 3 wire/2 wire



Auto Switch Specifications

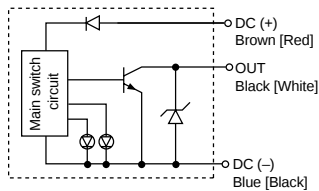
Auto switch part no.	D-F9NWL-Q	D-F9NWWL-Q	D-F9PWL-Q	D-F9PWWL-Q	D-F9BWL-Q	D-F9BWWL-Q
Electrical entry direction	Lateral	Vertical	Lateral	Vertical	Lateral	Vertical
Wiring system	3 wire				2 wire	
Output system	NPN type		PNP type		—	
Applicable load	IC circuit, 24VDC Relay, PLC				24VDC Relay, PLC	
Power 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		5 to 40mA	
Internal voltage drop	1.5V or less (0.8 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	Operating position: Red LED lights up Optimum operating position: Green LED lights up					

- **Lead wires** Oil resistant vinyl cabtire cord, ø2.7, 3m
D-F9NW (V), D-F9PW (V) 0.15mm² x 3 wire (Brown, Black, Blue) [Red, White, Black]
D-F9BW(V) 0.18mm² x 2 wire (Brown, Blue) [Red, Black]
- **Insulation resistance** 50MΩ or more with a 500VDC megohmmeter (between lead wire and case)
- **Withstand voltage** 1000VAC for 1min. (between lead wire and case)
- **Ambient temp.** -10 to 60°C • **Operating time** ...1ms or less • **Impact resistance** ...1000m/s² {102G}
- **Enclosure** IEC529 Standard IP67 (JISC0920) watertight type
- "L" appears at the end of the part number when the lead wire length is 3m. Example) D-F9NWL

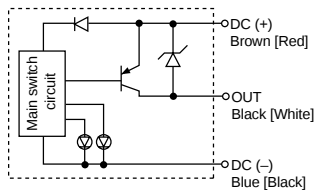
Auto switch internal circuits

Lead wire colours inside [] are old colours not conforming to IEC standards.

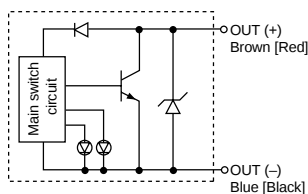
D-F9NW(V)L-Q 3 wire



D-F9PW(V)L-Q 3 wire



D-F9BW(V)L-Q 2 wire



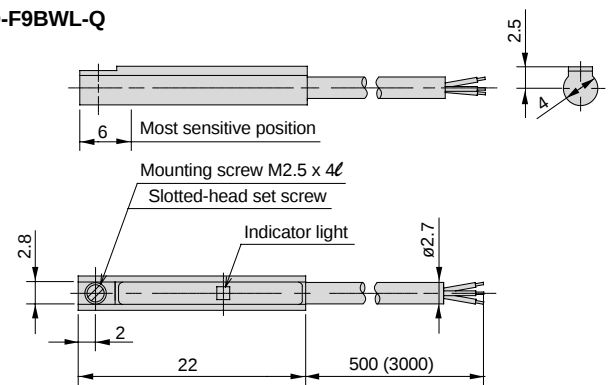
Auto Switch Weight Table

Unit: g

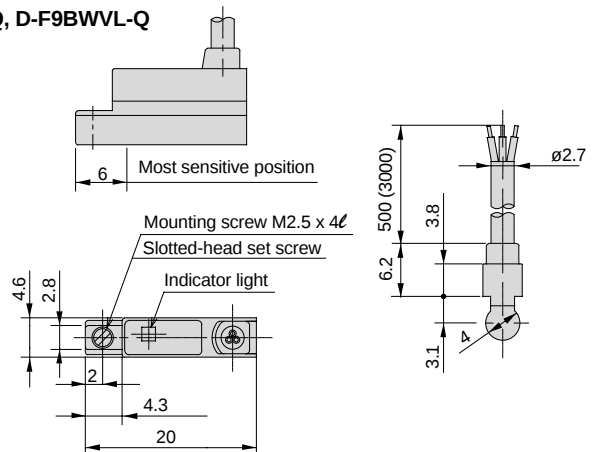
Model	D-F9NWL-Q	D-F9NWL-VL-Q	D-F9PWL-Q	D-F9PWL-VL-Q	D-F9BWL-Q	D-F9BWL-VL-Q
Lead wire length 3m	36.5	37	36.5	37	31	31

Auto Switch Dimensions

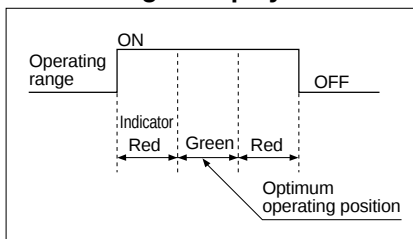
D-F9NWL-Q, D-F9PWL-Q, D-F9BWL-Q



D-F9NWL-VL-Q, D-F9PWL-VL-Q, D-F9BWL-VL-Q



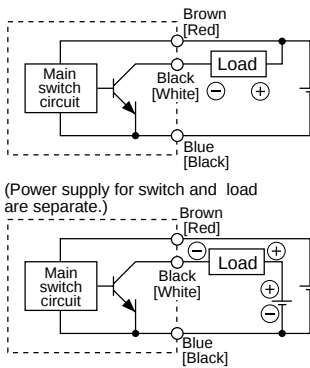
Indicator light/Display method



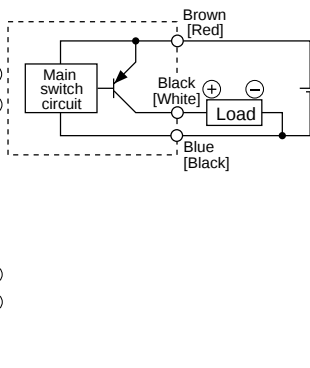
Series MHX Auto Switch Connections and Examples

Basic Wiring

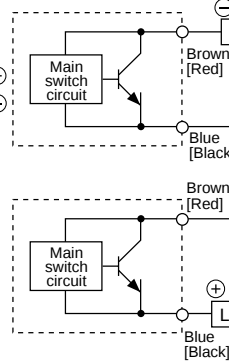
Solid state 3 wire, NPN



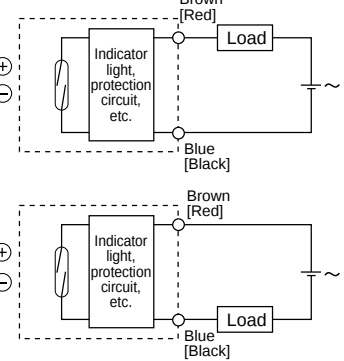
Solid state 3 wire, PNP



2 wire <Solid state>



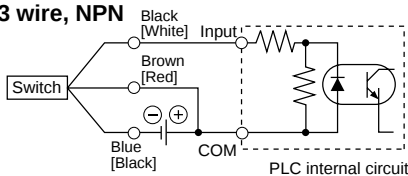
2 wire <Reed switch>



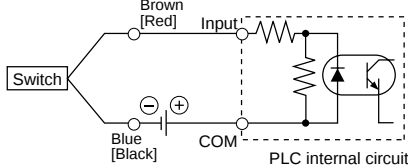
Examples of Connection to PLC (Sequence Controller)

Specification for sink input

3 wire, NPN

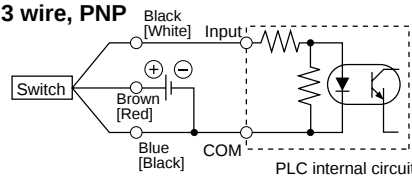


2 wire

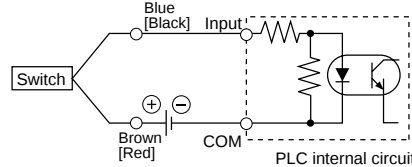


Specification for source input

3 wire, PNP



2 wire

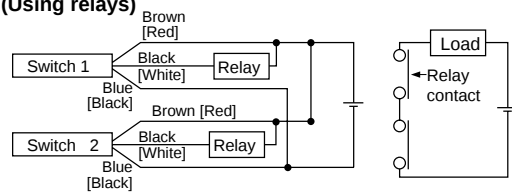


Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

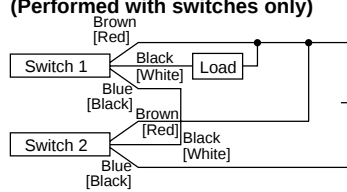
Connection Examples for AND (Series) and OR (Parallel)

3 wire

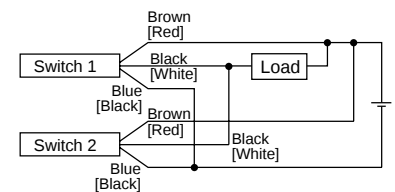
AND connection for NPN output (Using relays)



AND connection for NPN output (Performed with switches only)

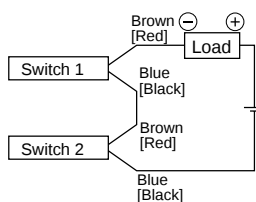


OR connection for NPN output



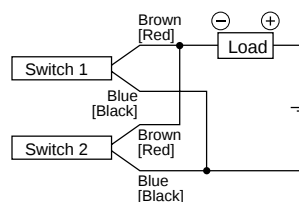
The indicator lights will light up when both switches are turned ON.

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.

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, but due to the number of switches in the ON state, the indicator lights will sometimes get dark or not light up, because of dispersion and reduction of the current flowing to the switches.

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

Example: Power supply is 24VDC
Voltage decline in switch is 4V

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

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



Series MXH

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 : Pneumatic system axiom.

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 an operator is unfamiliar with it. 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 MXH Actuator Precautions 1

Be sure to read before handling.

Precautions on design

Warning

1. **There is a possibility of dangerous sudden action by air cylinders if sliding parts of machinery are twisted due to external forces, etc.**

In such cases, human injury may occur; e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be designed to avoid such dangers.

2. **A protective cover is recommended to minimize the risk of personal injury.**

If a stationary object and moving parts of a cylinder are in close proximity, personal injury may occur. Design the structure to avoid contact with the human body.

3. **Securely tighten all stationary parts and connected parts so that they will not become loose.**

When a cylinder operates with high frequency or a cylinder is installed where there is a lot of vibration, ensure that all parts remain secure.

4. **A deceleration circuit or shock absorber, etc., may be required.**

When a driven object is operated at high speed or the load is heavy, a cylinder's cushion will not be sufficient to absorb the shock. Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the shock. In this case, the rigidity of the machinery should also be examined.

5. **Consider a possible drop in operating pressure due to a power outage, etc.**

When a cylinder is used in a clamping mechanism, there is a danger of work dropping if there is a decrease in clamping force due to a drop in circuit pressure caused by a power outage, etc. Therefore, safety equipment should be installed to prevent damage to machinery and human injury. Suspension mechanisms and lifting devices also require consideration for drop prevention.

6. **Consider a possible loss of power source.**

Measures should be taken to protect against human injury and equipment damage in the event that there is a loss of power to equipment controlled by air pressure, electricity or hydraulics, etc.

7. **Design circuitry to prevent sudden lurching of driven objects.**

When a cylinder is driven by an exhaust centre type directional control valve or when starting up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will lurch at high speed if pressure is applied to one side of the cylinder because of the absence of air pressure inside the cylinder. Therefore, equipment should be selected and circuits designed to prevent sudden lurching, because there is a danger of human injury and/or damage to equipment when this occurs.

8. **Consider emergency stops.**

Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions, a power outage or a manual emergency stop.

9. **Consider the action when operation is restarted after an emergency stop or abnormal stop.**

Design the machinery so that human injury or equipment damage will not occur upon restart of operation. When the cylinder has to be reset at the starting position, install manual safety equipment.

Selection

Warning

1. **Check the specifications.**

The products advertised in this catalog are designed according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use in these conditions.

Consult SMC if you use a fluid other than compressed air.

2. **Intermediate stops.**

When intermediate stopping of a cylinder piston is performed with a 3 position closed centre type directional control valve, it is difficult to achieve stopping positions as accurate and minute as with hydraulic pressure, due to the compressibility of air.

Furthermore, since valves and cylinders, etc. are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time. Contact SMC in case it is necessary to hold a stopped position for an extended period.

Caution

1. **Operate the piston within a range such that collision damage will not occur at the end of the stroke.**

Operate within a range such that damage will not occur when the piston having inertial force stops by striking the cover at the stroke end. Refer to the cylinder type selection procedure for the range within which damage will not occur.

2. **Use a speed controller to adjust the cylinder drive speed, gradually increasing from a low speed to the desired speed setting.**



Series MXH Actuator Precautions 2

Be sure to read before handling.

Mounting

⚠ Caution

1. **Be certain to match the rod shaft centre with the load and direction of movement when connecting.**

When not properly matched, problems may arise with the rod and tubing, and damage may be caused due to friction on areas such as the inner surface of the tubing, bushings, rod surface and seals.

2. **Do not scratch or dent the sliding parts of the cylinder tube or piston rod, etc., by striking or grasping them with other objects.**

Cylinder bores are manufactured to precise tolerances, so that even a slight deformation may cause faulty operation. Moreover, scratches or dents, etc. in the piston rod may lead to damaged seals and cause air leakage.

3. **Do not use until you verify that the equipment can operate properly.**

After mounting, repair or modification, etc., connect the air supply and electric power, and then confirm proper mounting by means of appropriate function and leak inspections.

4. **Instruction manual.**

The product should be mounted and operated after thoroughly reading the manual and understanding its contents.

Keep the instruction manual where it can be referred to as needed.

Piping

⚠ Caution

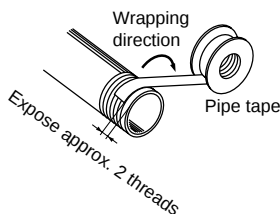
1. **Preparation before piping.**

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove cutting 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 cutting chips from the pipe threads and sealing material do not get inside the piping.

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



Lubrication

⚠ Caution

1. **Lubrication of non-lube type cylinder.**

The cylinder is lubricated at the factory and can be used without any further lubrication.

However, in the event that it will be lubricated, use class 1 turbine oil (with no additives) ISO VG32.

Stopping lubrication later may lead to malfunction due to the loss of the original lubricant. Therefore, lubrication must be continued once it has been started.

Air Supply

⚠ Warning

1. **Use clean air.**

If compressed air includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., it can cause damage or malfunction.

⚠ Caution

1. **Install air filters.**

Install air filters at the upstream side of valves. The filtration degree should be 5µm or finer.

2. **Install an air dryer, after cooler, etc.**

Air that includes much condensate causes malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer or after cooler, etc.

3. **Use the product within the specified range of fluid and ambient temperature.**

Take measures to prevent freezing, since moisture in circuits will be frozen under -5°C, and this may cause damage to seals and lead to malfunction.

Refer to the "Air Cleaning Equipment" catalogue for details on compressed air quality.

Operating Environment

⚠ Warning

1. **Do not use in environments where there is a danger of corrosion.**

Refer to the construction drawings regarding cylinder materials.

2. **In dirty areas, such as dusty locations or where water, oil, etc. splash on the equipment, take suitable measures to protect the rod.**

Maintenance

⚠ Warning

1. **Maintenance should be done according to the procedure indicated in the instruction manual.**

If handled improperly, malfunction and damage of machinery or equipment may occur.

2. **Machine maintenance, and supply and exhaust of compressed air.**

When machinery is serviced, first confirm measures to prevent dropping of driven objects and run-away of equipment, etc. Then cut off the supply pressure and electric power, and exhaust all compressed air from the system.

When machinery is restarted, confirm that operation is normal with actuators in the proper positions.

⚠ Caution

1. **Drain flushing.**

Remove condensate from air filters regularly. (Refer to specifications.)



Series MXH Specific Product Precautions 1

Be sure to read before handling.

Refer to pages 18 through 20 for safety instructions and precautions.

Auto Switch Mounting Precautions

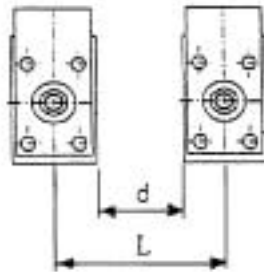
When installing in close proximity

⚠ Caution

- ① In compact slides with D-A9□ or D-F9□ type auto switches, there is a danger of auto switch malfunction if the mounting pitch is less than the dimensions shown in Table 1. Be sure to allow at least the indicated interval. If it is not possible to maintain the intervals shown below, shielding will be necessary. Attach a steel plate or magnetic shielding plate (MU-S025), etc. to the relative position on a cylinder which will be close to an auto switch. (Inquire regarding details.) Auto switch malfunction will result if shielding plates are not used.

Table 1 (mm)

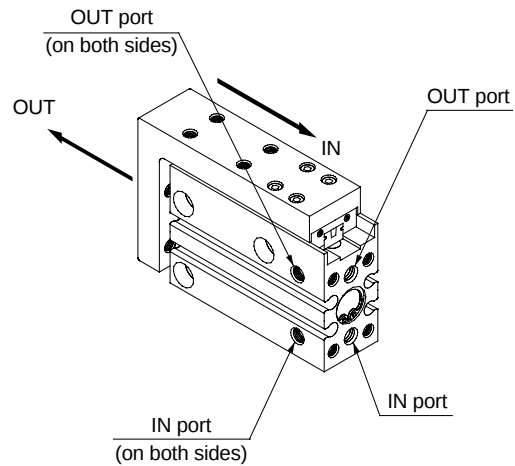
Bore size (mm)	d	L
MXH6	5	21
MXH10	5	25
MXH16	10	35
MXH20	15	47



Operating Direction with Different Pressure Ports

⚠ Caution

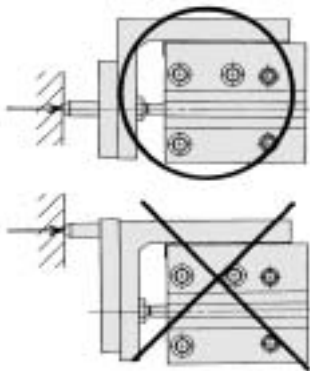
- ① The compact slide can be piped from 3 directions. Confirm the pressure ports and operating direction. (See drawing below.)



Operating Precautions

⚠ Caution

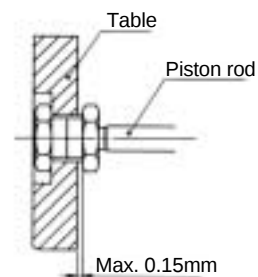
- ① Positively do not put fingers between the table and cylinder tube, as they can be caught when the piston rod retracts, If fingers are caught in a cylinder, there is a danger of injury due to the strong cylinder output, and therefore caution must be exercised.
- ② Operate within the limits of the maximum movable weight and allowable moment.
- ③ When the output of the compact slide will be directly applied to the table, it should be applied along the rod axis. (See drawing below.)



Stroke Direction Backlash

⚠ Caution

- Since the connection between the piston rod and table is a floating structure, there is a maximum table backlash of 0.15mm in the stroke direction. (See drawing below.)



Piston rod and table connection

- ④ Be sure to attach a speed controller, and adjust the speed to 500mm/s or less.



Series MXH Specific Product Precautions 2

Be sure to read before handling.

Refer to pages 18 through 20 for safety instructions and precautions.

Mounting

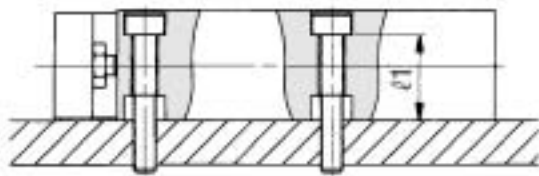
⚠ Caution

① When mounting a compact slide, tighten the screws properly at a torque value within the limiting range.

Compact Slide Mounting

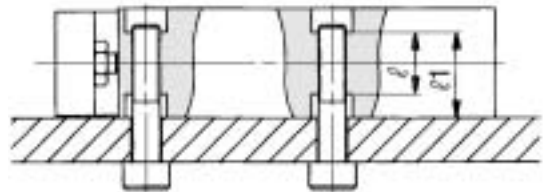
A compact slide can be mounted from 4 directions. Make a selection suitable for the applicable machinery and work pieces, etc.

Lateral Mounting (Through Holes)



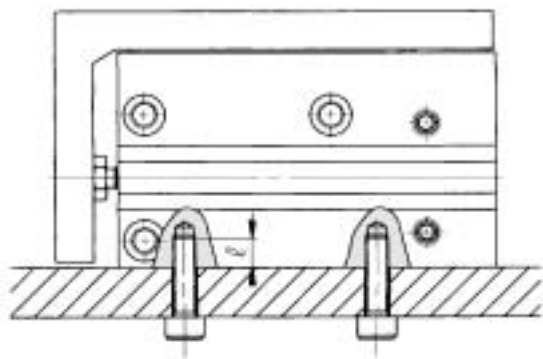
Model	Bolts	Max. fastening torque N·m{kgf·cm}	ℓ1
MXH6	M3 x 0.5	1.1 {11}	12.7
MXH10	M4 x 0.7	2.5 {25}	15.6
MXH16	M4 x 0.7	2.5 {25}	20.6
MXH20	M5 x 0.8	5.1 {52}	24.0

Lateral Mounting (Tapped Holes)



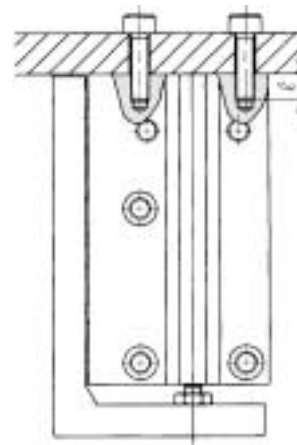
Model	Bolts	Max. fastening torque N·m{ kgf·cm}	ℓ1	ℓ
MXH6	M4 x 0.7	2.5 {25}	12.7	9.4
MXH10	M5 x 0.8	5.1 {52}	15.6	11.2
MXH16	M5 x 0.8	5.1 {52}	20.6	16.2
MXH20	M6 x 1	8.1 {83}	24.0	16.0

Vertical Mounting (Tapped Holes)



Model	Bolts	Max. fastening torque N·m {kgf·cm}	ℓ
MXH6	M3 x 0.5	1.1 {11}	4.8
MXH10	M4 x 0.7	2.5 {25}	6
MXH16	M4 x 0.7	2.5 {25}	6
MXH20	M5 x 0.8	5.1 {52}	8

Axial Mounting (Tapped Holes)



Model	Bolts	Max. fastening torque N·m{ kgf·cm}	ℓ
MXH6	M3 x 0.5	1.1 {11}	4.8
MXH10	M4 x 0.7	2.5 {25}	6
MXH16	M4 x 0.7	2.5 {25}	6
MXH20	M5 x 0.8	5.1 {52}	8



Series MXH Specific Product Precautions 3

Be sure to read before handling.
Refer to pages 18 through 20 for safety instructions and precautions.

Mounting

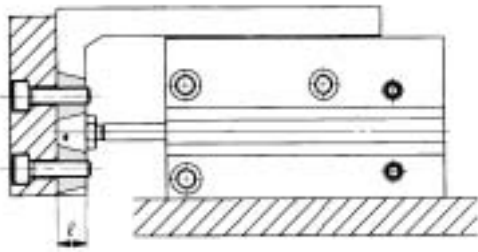
⚠ Caution

- ① When mounting a compact slide, tighten the screws properly at a torque value within the limiting range.

Work Piece Mounting

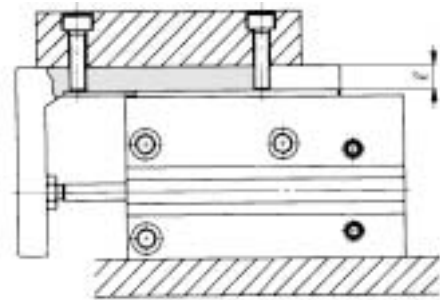
Work pieces can be mounted on 2 surfaces of the compact slide.

Front Mounting



Model	Bolts	Max. fastening torque N·m {kgf·cm}	ℓ
MXH6	M3 x 0.5	1.1 {11}	5.5
MXH10	M4 x 0.7	2.5 {25}	7.5
MXH16	M4 x 0.7	2.5 {25}	10
MXH20	M5 x 0.8	5.1 {52}	11

Top Mounting

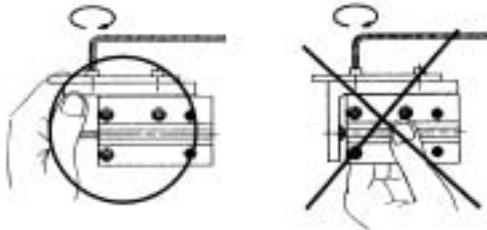


Model	Bolts	Max. fastening torque N·m {kgf·cm}	ℓ
MXH6	M3 x 0.5	1.1 {11}	6.5
MXH10	M4 x 0.7	2.5 {25}	8
MXH16	M4 x 0.7	2.5 {25}	9
MXH20	M5 x 0.8	5.1 {52}	9.5

Work piece mounting

Work pieces can be mounted on 2 surfaces of the compact slide.

- Since the table is supported by the linear guide, take care not to apply strong impact or large moment, etc. when mounting work pieces.
- Hold the table when fastening work pieces to it with bolts, etc. If the body is held while tightening bolts, etc., the guide section will be subjected to large moment, and there may be a loss of precision.



- For connection with a load having an external support/guide mechanism, select an appropriate connection method and perform careful alignment.
- Use caution, as scratches or nicks, etc. on the sliding parts of the piston rod can cause malfunction and air leakage.

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