Rotary Clamp Cylinder

Series MK/Standard

ø12, ø16, ø20, ø25, ø32, ø40, ø50, ø63

Series MK2/Heavy Duty

ø20, ø25, ø32, ø40, ø50, ø63

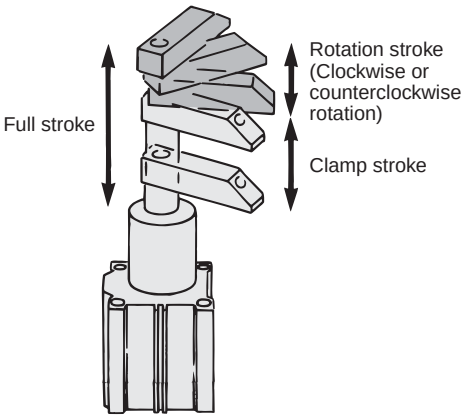
Series MK

Series MK2

Max. operating pressure: 1MPa

Compact equipment design is possible.

Suited for electronic parts inspection clamps. Ideal for use in small mounting space.



Auto switch is attachable

A built-in magnet is standard, an auto switch can be directly mounted.

- A solid state auto switch that is designed to be used in a strong magnetic fields is available. (ø40, ø50, ø63) Suitable for welding applications.

Made to Order

Heat resistant **Max. 150°C**

Refer to to p.5.4-1 regarding detailed specifications.

Series MK/MK2 Precautions

⚠ Precautions

Be sure to read before handling. Refer to p.0-39 to 0-46 for Safety Instructions and actuator and auto switch precautions.

Environment

⚠ Warning

Do not use the cylinder under following environments:

①An area in which fluids such as cutting oil splash on the piston rod.
②An area in which foreign matter such as particles, cutting chips, dust, or spatter is present.
③An area in which the ambient temperature exceeds the operating range.
④An area exposed to direct sunlight.
⑤An environment that poses the risk of corrosion.

Removing and Reinstalling The Clamp Arm

⚠ Warning

To remove and reinstall the arm on the piston rod, instead of securing the cylinder body, use a wrench to secure the arm to loosen or to tighten the bolt (Fig. 1). An excessive amount of rotational force will be applied to the piston rod if the bolt is tightened by securing the cylinder body, which could damage the internal parts. To fabricate an arm, make sure to machine a detect portion that corresponds to the parallel section at the rod end.

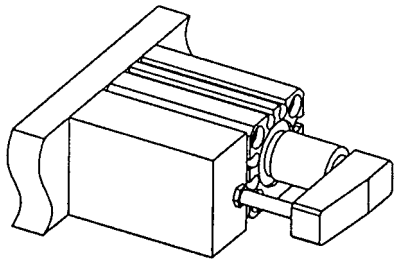


Figure 1

Speed Adjusting

⚠ Warning

Make sure to connect a speed controller to the cylinder and adjust it so that the cylinder speed will be within a range of 50 to 200mm/s.
If a clamp arm other than the available options is used, make sure to select an appropriate arm after calculating the inertial moment of the arm.
To operate a speed controller, make sure that the valve is fully closed, and gradually open the valve to adjust the speed.

How to Operate

⚠ Warning

The MK cylinder could malfunction or the non-rotating accuracy could be affected if a rotational force is applied to the piston rod. Therefore, observe the particulars given below before operating the cylinder.

① Make sure to mount the cylinder vertically (Fig. 3).
② Never perform work (such as clamping or stopping) in a rotational direction (Fig. 4).
③ To clamp, make sure to do so within the clamp stroke (straight-line stroke) range (Fig. 5).
④ Make sure that the clamping surface of the workpiece is perpendicular to the cylinder's axial line (Fig. 6).
⑤ Do not operate the cylinder in such a way that an external force causes the workpiece to move while being clamped (Fig. 7).
⑥ Furthermore, do not operate the cylinder in an application in which a rotational force will be applied to the piston rod.

① Do not operate the cylinder horizontally. ×

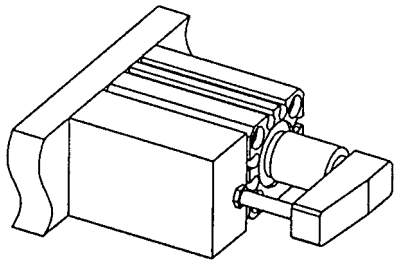


Figure 3

② Do not perform work in the rotational direction.

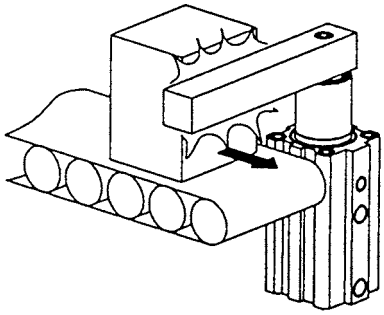
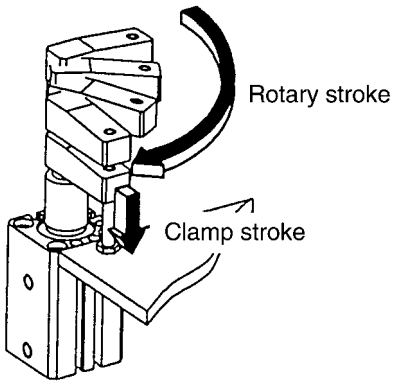


Figure 4

③ Do not clamp during a rotational stroke.

○



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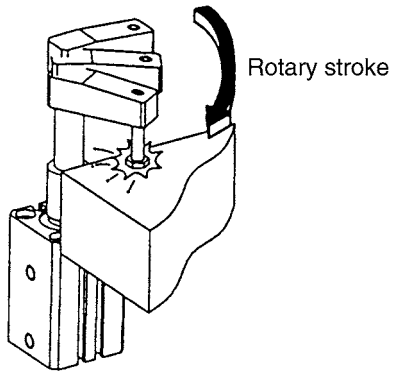


Figure 5

④ Do not clamp on a slanted surface.

×

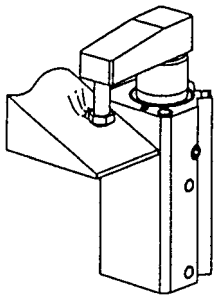


Figure 6

⑤ Make sure that the workpiece does not move during clamping.

×

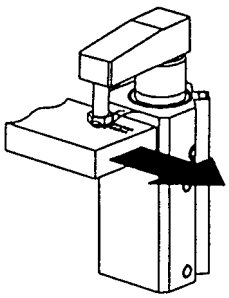


Figure 7

Rotary Clamp Cylinder/Standard

Series MK

ø12, ø16, ø20, ø25, ø32, ø40, ø50, ø63

How to Order

MK **A** **20** — **10** **R** **F** — **A73** **S**

Rotary clamp cylinder

Mounting

Symbol	Style	Bore size
B	Through hole & both ends tapped (Standard)	ø12, ø16
A	Both ends tapped	ø20 to ø63
B	Through hole	
G	Rear flange*	

* The rear flange is equipped with a boss mounting, so be sure to specify body option "F".

Bore size

12	12mm	**32**	32mm
16	16mm	**40**	40mm
20	20mm	**50**	50mm
25	25mm	**63**	63mm

Clamp stroke

Symbol	Clamp stroke	Bore size
10	10mm	ø12 to ø40
20	20mm	ø12 to ø63
50	50mm	ø50 to ø63

Rotation direction (Release → Clamp)

R	Clockwise
L	Counterclockwise

Auto switch

—	Without auto switch (Built-in magnet)

* Refer to the table below regarding auto switch model no.

Number of auto switches

—	2
S	1

Body option

—	Standard (Female thread)
M	Rod end width across flats*
F	Rear boss mounting*
N	With arm

* Refer to the table regarding production range of body option.

Option Part No./Arm

Bore size (mm)	Part No.	Accessories
12	**MK-A012**	Clamp bolt Hexagonal socket head cap screw Hexagonal nut Spring seat
16	**MK-A016**	
20	**MK-A020**	
25		
32	**MK-A032**	
40		
50	**MK-A050**	
63		

Mounting Bracket Part No./Flange

Bore size (mm)	Part No.	Accessories
20	**MK-F020**	Boss mounting ring Set pin Bolt for cylinder body
25	**MK-F025**	
32	**MK-F032**	
40	**MK-F040**	
50	**MK-F050**	
63	**MK-F063**	

Applicable Auto Switches/ Refer to p.5.3-2 for further information on auto switch.

Style	Special function	Electrical entry	Indicator	Wiring (Output)	Load voltage DC	Load voltage DC	Load voltage AC	Rail mounting ø20 to ø63 Perpendicular	Rail mounting ø20 to ø63 In-line	Direct mounting ø12, ø16, ø32 to ø63 Perpendicular	Direct mounting ø12, ø16, ø32 to ø63 In-line	Lead wire* (m) 0.5 (—)	3 (L)	5 (Z)	— (N)	Applicable load	
Reed switch	—	Grommet	Yes	3 wire (NPN Equiv.)	—	5V	—	—	**A76H**	**A96V**	**A96**	●	●	—	—	IC	—
				2 wire	—	—	200V	**A72**	**A72H**	—	—	●	●	—	—	—	Relay PLC
					24V	12V	100V	**A73**	**A73H**	—	—	●	●	●	—		
								—	—	**A93V**	**A93**	●	●	—	—		
			No			5V, 12V	≤100V	**A80**	**A80H**	**A90V**	**A90**	●	●	—	—	IC	
		Connector	Yes			12V	—	**A73C**	—	—	—	●	●	●	●	—	
			No			5V, 12V	≤24V	**A80C**	—	—	—	●	●	●	●	IC	
	Diagnostic indication (2 colour)	Grommet	Yes			—	—	**A79W**	—	—	—	●	●	—	—	—	
Solid state switch	—	Grommet	Yes	3 wire (NPN)	24V	5V, 12V	—	**F7NV**	**F79**	—	—	●	●	○	—	IC	Relay PLC
						12V		—	—	**F9NV**	**F9N**	●	●	—	—	—	
				3 wire (PNP)		5V, 12V		**F7PV**	**F7P**	—	—	●	●	○	—	IC	
								—	—	**F9PV**	**F9P**	●	●	—	—		
				2 wire		12V		**F7BV**	**J79**	—	—	●	●	○	—		
								—	—	**F9BV**	**F9B**	●	●	—	—	—	
		Connector						**J79C**	—	—	—	●	●	●	●		
	Diagnostic indication (2 colour)			3 wire (NPN)		5V, 12V		—	—	**F9NWV**	**F9NW**	●	●	○	—		
								F7NWV	**F79W**	—	—	●	●	○	—	IC	
				3 wire (PNP)				—	**F7PW**	—	—	●	●	○	—		
						12V		—	—	**F9PWV**	**F9PW**	●	●	○	—		
				2 wire				**F7BWV**	**J79W**	**F9BWV**	**F9BW**	●	●	○	—	—	
	Water resistant (2 colour)							—	**F7BA**	—	**F9BA**	—	●	○	—		
	With timer			3 wire (NPN)		5V, 12V		—	**F7NT**	—	—	—	●	○	—		
	Diagnostic output (2 colour)			4 wire (NPN)				—	**F79F**	—	—	●	●	○	—	IC	
	Latching with diagnostic output (2 colour)					—		—	**F7LF**	—	—	●	●	○	—	—	
	Strong magnetic field resistant (2 colour)			2 wire				—	**P5DW****	—	—	—	●	●	—	—	

* Lead wire 0.5m ····· — (Example) A80C 5m ····· Z (Example) A80CZ
3m ····· L (Example) A80CL — ····· N (Example) A80CN

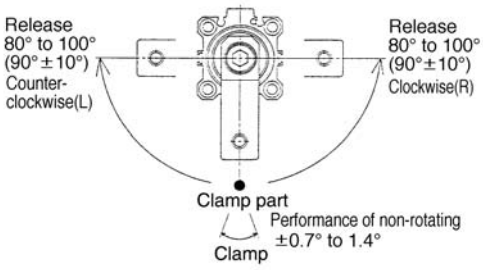
* Solid state auto switches marked with a "○" are manufactured upon receipt of order.

** D-P5DWL can be mounted for ø40, ø50 and ø63.

With arm

Rear flange
With arm

Rotary Angle



Made to Order

Refer to the p.5.4-1 regarding made to order for series MK.

Availability of Body Options

Bore size	—	M	F	N	MF	FN
ø12, ø16	●	—	—	●	—	—
ø20 to ø63	●	●	●	●	●	●

Specifications

Bore size (mm)	12	16	20	25	32	40	50	63
Operation	Double acting							
Rotary angle (4)	90° ± 10°							
Rotary direction (3)	R: Clockwise L: Counterclockwise							
Rotary stroke (mm)	7.5		9.5		15		19	
Clamp stroke (mm)	10, 20						20, 50	
Allowable moment Nm (1)	1	3.8	7	13	27	47	107	182
Theoretical clamp force N (2)	40	75	100	185	300	525	825	1400
Fluid	Air							
Proof pressure	1.5 MPa							
Operating pressure range	0.1 to 1 MPa							
Ambient and fluid temperature	Without auto switch –10 to +70°C (No freezing)							
	With auto switch –10 to +60°C (No freezing)							
Lubrication	Non-lube							
Port size	M5 X 0.8				Rc(PT) 1/8		Rc(PT) 1/4	
Mounting	Through hole & Both ends tapped		Both ends tapped, Through hole, Rear flange					
Cushion	Rubber bumper							
Stroke tolerance (mm)	$^{+0.6}_{-0.4}$							
Piston speed	50 to 200 mm/s							
Non-rotating accuracy (4)	±1.4°		±1.2°		±0.9°		±0.7°	

Note 1) Max. bending moment applied to the piston rod side
Note 2) At 0.5 MPa
Note 3) Direction of rotation viewed from the rod side when the piston rod retracting.
Note 4) Refer to "Rotary angle" diagram.

Theoretical Force

Unit: N

Bore size (mm)	Rod dia. (mm)	Operating direction	Piston area (cm^2)	Operating pressure (MPa) 0.3	0.5	0.7	1.0
12	6	R	0.8	24	40	56	80
		H	1.1	33	55	77	110
16	8	R	1.5	45	75	105	150
		H	2	60	100	140	200
20	12	R	2	60.8	100	139	200
		H	3	90.2	149	208	298
25	12	R	3.7	112	185	258	370
		H	4.9	149	245	341	490
32	16	R	6	182	300	418	600
		H	8	243	400	557	800
40	16	R	10.5	319	525	731	1050
		H	12.5	380	625	870	1250
50	20	R	16.5	502	825	1149	1648
		H	19.6	596	980	1365	1961
63	20	R	28	851	1400	1950	2801
		H	31.2	948	1560	2172	3121

Note) Theoretical force (N)=Pressure (MPa) X Piston area (cm^2) X 100 Operation direction R: Rod side (Clamp)
H: Head side (Release)

Weight/Mounting Through Hole

Unit: g

Clamp stroke (mm)	Bore size (mm) 12	16	20	25	32	40	50	63
10	70	100	250	280	500	595	—	—
20	87	123	290	320	525	640	1100	1520
50	—	—	—	—	—	—	1350	1805

Additional Weight

Unit: g

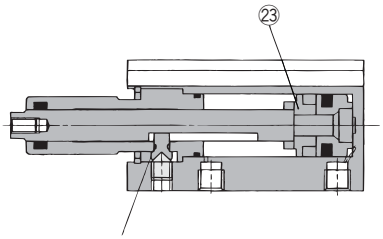
Bore size (mm)	12	16	20	25	32	40	50	63
Both ends tapped	—	—	6	7	7	6	7	17
Rod end width across flats	—	—	10	10	21	21	46	46
Rear boss mounting	—	—	2	3	5	7	13	25
With arm	13	32	100	100	200	200	350	350
Rear flange	—	—	133	153	166	198	345	531

Calculation method/Example MKG20-10RFN

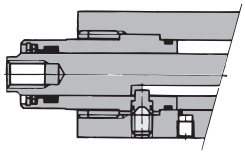
- Standard calculation: MKB20-10R 250g
- Extra weight calculation: Both ends tapped 6g
  Rear flange 133g
  Rear boss mounting 2g
  With arm 100g
  491g

Construction

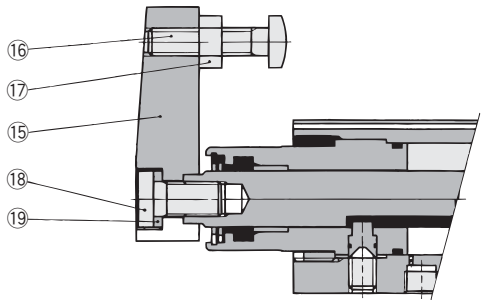
MK□12, 16



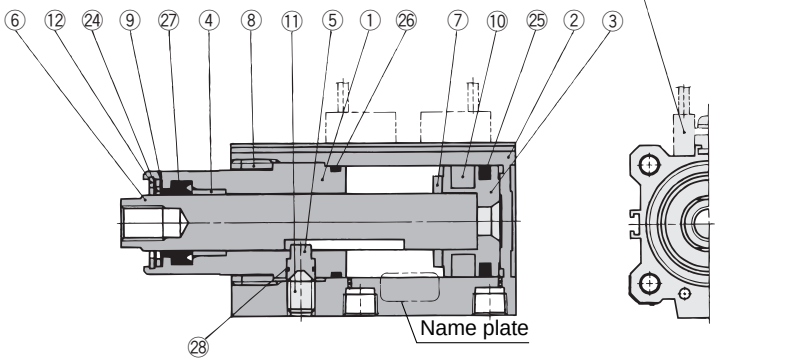
MK□20, 25



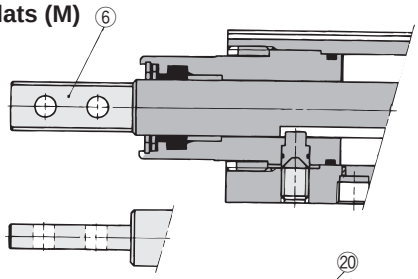
With arm (N)



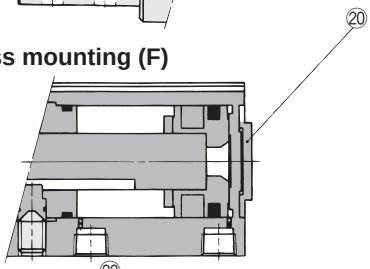
MK□32



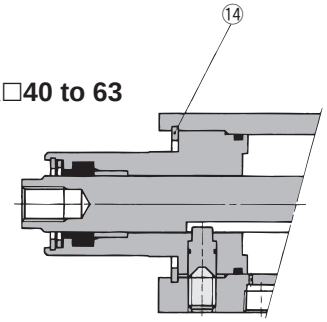
Rod end width across flats (M)



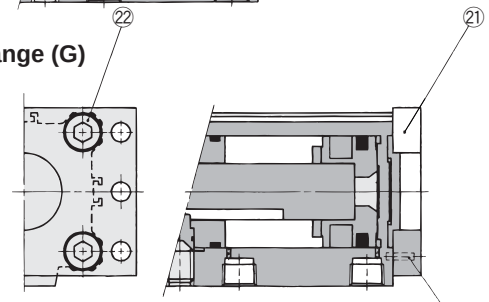
Rear boss mounting (F)



MK□40 to 63



Rear flange (G)



Component Parts

No.	Description	Material	Note
①	Rod cover	Aluminum alloy	Hard anodized
②	Cylinder tube	Aluminum alloy	Hard anodized
③	Piston	Aluminum alloy	
④	Bushing	Copper bearing material	Only ø32 to ø63
⑤	Guide pin	Stainless steel	Nitrided
⑥	Piston rod	Carbon steel	Heated, Nickel plated
⑦	Bumper	Urethane	
⑧	Ring nut	Copper alloy	Only ø20 to ø32
⑨	Scraper pressure	Stainless steel	Except for ø12, ø16
⑩	Rubber magnet	Synthetic rubber	
⑪	Hex. socket head cap screw	Chrome molybdenum steel	Sharp end section: 90°
⑫	R-shape snap ring	Spring steel	
⑬	Parallel pin	Stainless steel	

Component Parts

No.	Description	Material	Note
⑭	C type retaining ring	Carbon tool steel	Only ø40 to ø63
⑮	Arm	Rolled steel	
⑯	Clamp bolt	Chrome molybdenum steel	
⑰	Hexagonal nut	Rolled steel	
⑱	Hex. socket head cap bolt	Chrome molybdenum steel	
⑲	Spring washer	Hard steel	
⑳	Boss mount ring	Aluminum alloy	Except for ø12, ø16
㉑	Flange	Rolled steel	Except ø12, ø16
㉒	Hex. socket head cap bolt	Chrome molybdenum steel	Quantity: ø25, 25: 2; ø32 to 63: 4
㉓	Spacer for switch	Aluminum alloy	Only ø12, ø16
㉔	Coil scraper	Phosphor bronze	
㉕	Piston seal	NBR	
㉖	Gasket	NBR	
㉗	Rod seal	NBR	
㉘	O ring	NBR	

Replacement Parts: Seal Kits

Bore size (mm)	ø12	ø16	ø20 to ø32	ø40	ø50	ø63
Part no.	MK-12-PS	MK-16-PS	Not disassembled	MK-40-PS	MK-50-PS	MK-63-PS
Contents	Set of above ㉔, ㉕, ㉖, ㉗ and ㉘					

∗Seal Kit includes coil scraper ㉔, piston seal ㉕, gasket ㉖, rod seal ㉗ and O ring ㉘.
Order a seal kit according to applicable bore size.

⚠ Precautions

Be sure to read before handling. Refer to p.0-39 to 0-46 for Safety Instructions and common precautions on the products mentioned in this catalog.

⚠ Caution

Mounting of Clamp Arm

① Use a clamp arm that is available as an option. To fabricate a clamp arm, make sure that the allowable bending moment and the inertial moment will be within the specified range. If a clamp arm that exceeds the specified value is installed, the internal mechanism in the cylinder could become damaged.

Ensuring Safety

① If one side of the piston is pressurized by supplying air with the clamp arm attached, the piston will move vertically while the clamp arm rotates. This operation could be hazardous to personnel, as their hands or feet could get caught by the clamp arm, or could lead to equipment damage. Therefore, it is important to secure as a danger zone a cylindrical area with the length of the clamp arm as its radius, and the stroke plus 20mm as its height.

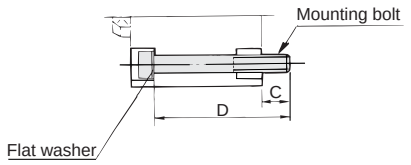
Installation and Adjustment/ Regarding Clamp Arm Removal and Reinstallation

① During the removal or reinstallation of the clamp arm, make sure to use a wrench or a vise to secure the clamp arm before removing or tightening the bolt. This is to prevent the bolt tightening torque from being applied to the piston rod, which could damage the cylinder's internal mechanism.

Mounting bolt for MKB

Mounting method: A through hole mounting bolt is available.
How to order: Suffix "**(MKB)**" to the size of bolts to be used.

Example) M5 X 75ℓ **(MKB)**



Note) Be sure to use a flat washer to mount ø12 and ø16 cylinders via through holes.

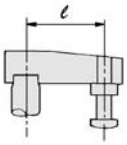
Part No.	C	D	Mounting bolt
MKB12-10	8	50	M3 X 50ℓ
MKB12-20	8	60	M3 X 60ℓ
MKB16-10	8.5	50	M3 X 50ℓ
MKB16-20	8.5	60	M3 X 60ℓ
MKB20-10	10	75	M5 X 75ℓ
MKB20-20		85	M5 X 85ℓ
MKB25-10	9	75	M5 X 75ℓ
MKB25-20		85	M5 X 85ℓ
MKB32-10	10.5	85	M5 X 85ℓ
MKB32-20		95	M5 X 95ℓ
MKB40-10	7	75	M5 X 75ℓ
MKB40-20		85	M5 X 85ℓ
MKB50-20	6.5	95	M6 X 95ℓ
MKB50-50	11.5	130	M6 X 130ℓ
MKB63-20	10.5	100	M8 X 100ℓ
MKB63-50		130	M8 X 130ℓ

Precautions for Designing and Mounting Arms

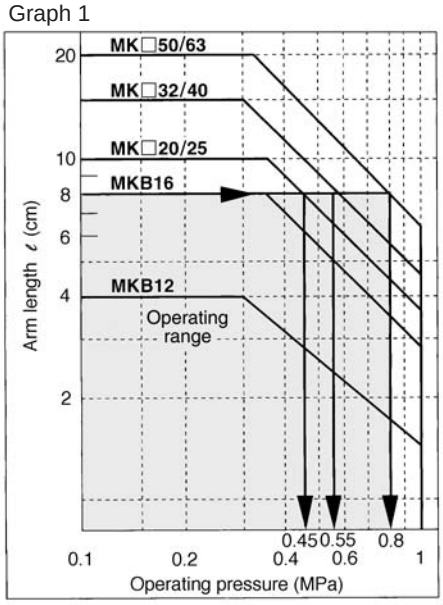
When arms are to be made separately, their length and weight should be within the following range.

1. Allowable bending moment

Use the arm length and operating pressure within graph 1 for allowable bending moment loaded piston rod.



Graph 1

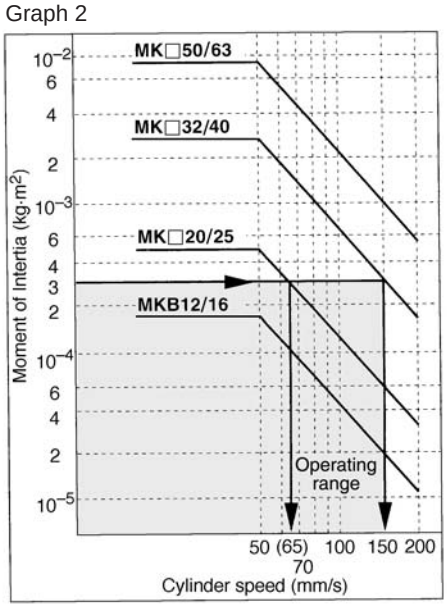


When arm length is 8cm, pressure should be less than
MK□20/25: 0.45MPa
MK□32/40: 0.55MPa
MK□50/63: 0.8MPa

2. Moment of inertia

When the arm is long and heavy, damage of internal parts may be caused due to inertia. Use the inertia moment and cylinder speed within graph 2 based on arm requirements.

Graph 2

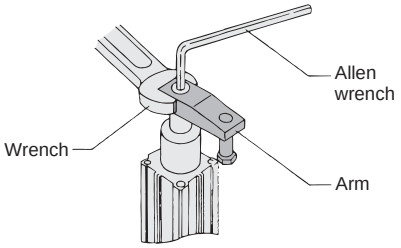


When arm's inertia is 3 X 10^{-4}kg·m^2, cylinder speed should be less than
MK□20/25: 65mm/s
MK□32/40: 150mm/s
Refer to p.4.1-21 for calculating moment of inertia.

●To attach and detach the arm to and from the piston rod, fix the arm with a wrench or vise and then tighten the bolt. (Excessive force in the direction of rotation applied to the piston rod may damage the internal mechanism.)
Refer to the following table for the tightening torque for mounting.

Nm

Bore size (mm)	Standard tightening torque
12	0.4 to 0.6
16	2 to 2.4
20, 25	4 to 6
32, 40	8 to 10
50, 63	14 to 16

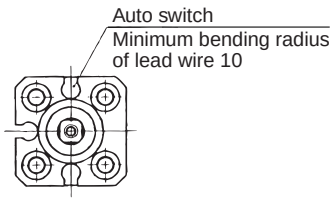


ø12, ø16, ø20, ø25

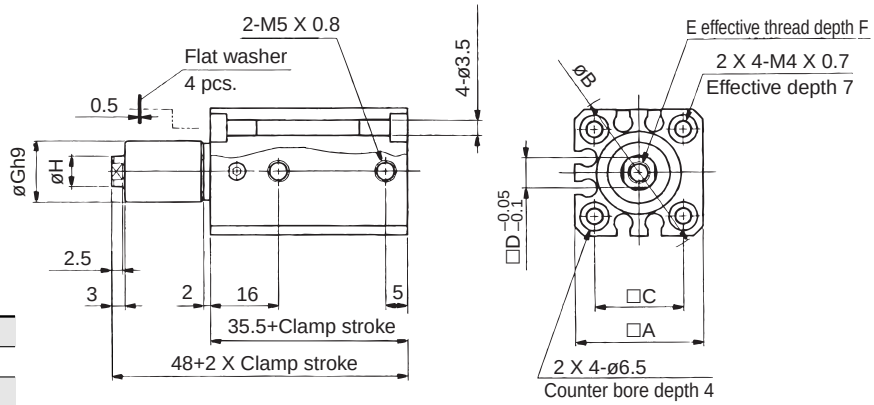
Through hole (Basic)/MKB

Note: Actuators are drawn/shown in their retractesor clamping position.

ø12

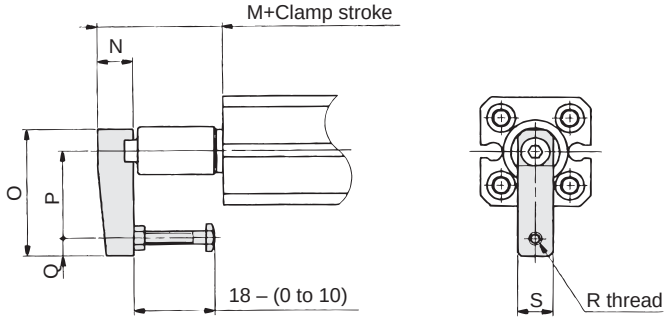


ø16



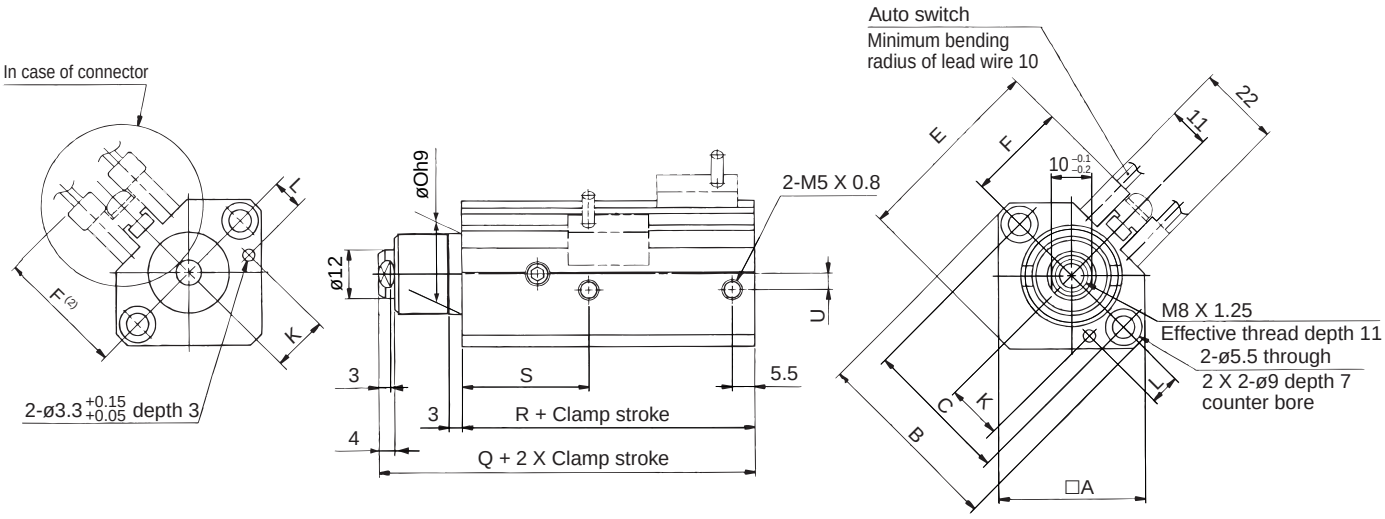
Model	A	B	C	D	E	F	G	H
MKB12	25	32	15.5	5	M3 X 0.5	5.5	$11h9_{-0.043}^{0}$	6
MKB16	29	38	20	7	M5 X 0.8	6.5	$14h9_{-0.043}^{0}$	8

With arm/MK□$^{12}_{16}$-□□N

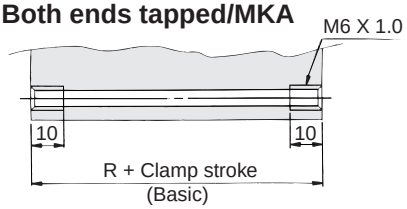


Model	M	N	O	P	Q	R	S
MKB12-□□N	18.5	8	29	20	4	M3 X 0.5	8
MKB16-□□N	21.5	11	36	25	5	M4 X 0.7	11

ø20, ø25



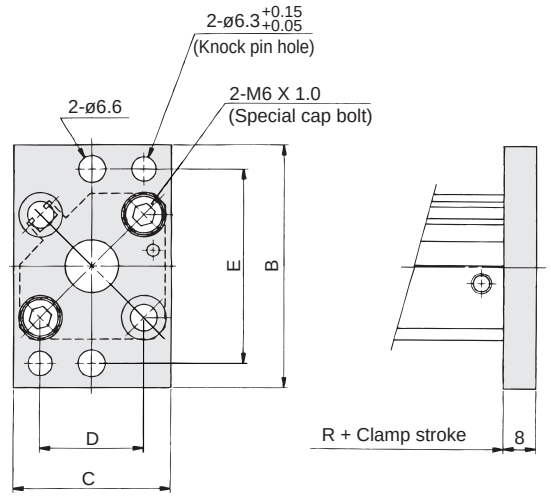
Both ends tapped/MKA



Model	A	B	C	E	F	K	L	Oh9	Q	R	S	U
MKB20	36	46.8	36	48	24.5	$13.5^{\pm 0.15}$	$7.5^{\pm 0.15}$	$20_{-0.052}^{0}$	72.5	62	31	4
MKB20	40	52	40	53.8	27.5	$16^{\pm 0.15}$	$8^{\pm 0.15}$	$23_{-0.052}^{0}$	73.5	63	32	5

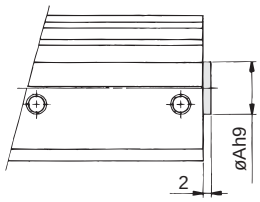
Note 1) Above figure is for D-A73, A80.
Note 2) Dimensions E and F are 7 mm longer for the auto switches with connector (D-A7□C, A80C, J79C).
Note 3) When the rod is extended, the clamp stroke and rotary stroke are added to the appropriate dimensions.

Rear flange/MKG



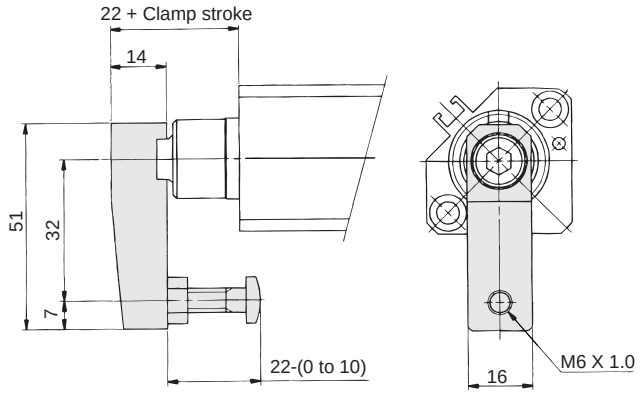
Model	B	C	D	E
MKG20	60	39	$25.5^{\pm0.1}$	$48^{\pm0.15}$
MKG25	64	42	$28^{\pm0.1}$	$52^{\pm0.15}$

Rear boss mounting



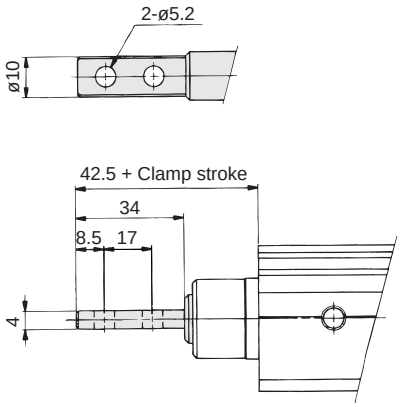
Model	Ah9
MK□20-□□F	$13\ ^{0}_{-0.043}$
MK□25-□□F	$15\ ^{0}_{-0.043}$

With arm/MK□ 20/25 -□□N

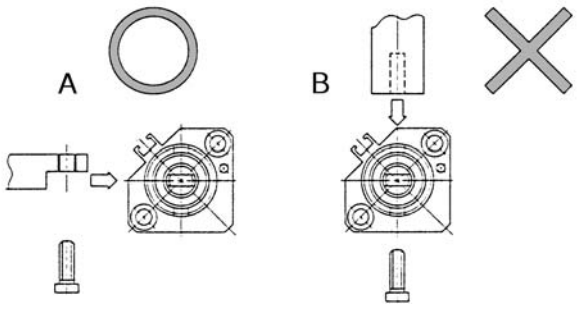


Arm for width across flats

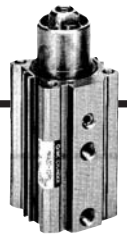
Rod end width across flats/MK□ 20/25 -□□M



Mounting arms for width across flats



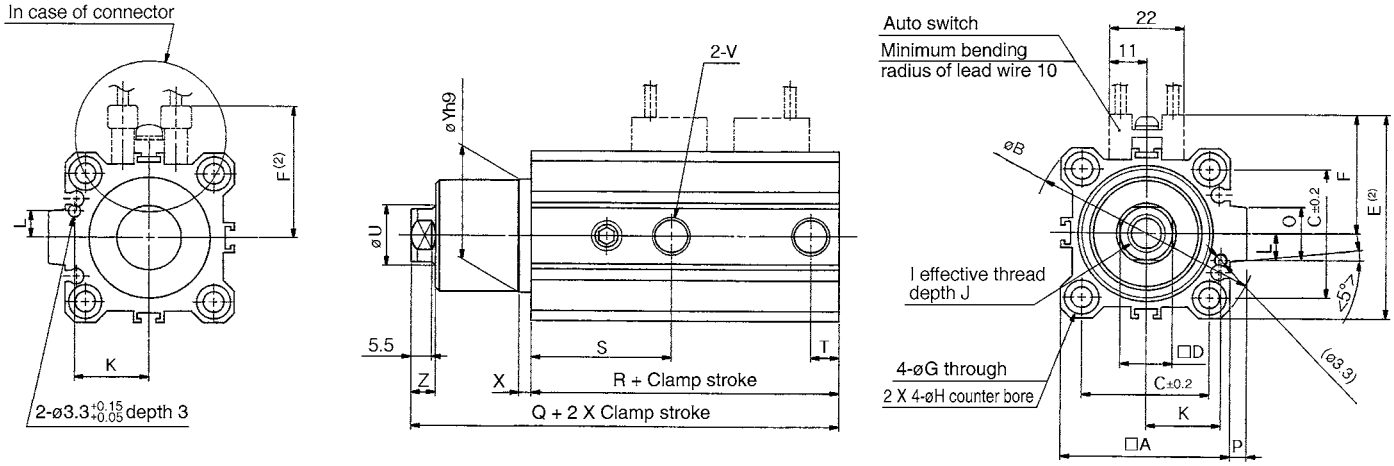
∗When installing the arm for the parallel section at the rod end, the strength of the piston rod may be insufficient depending on the direction in which the arm is installed. Therefore, make sure to install the arm in the direction indicated in diagram A.



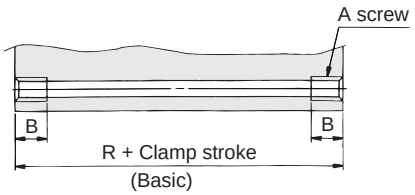
ø32, ø40, ø50, ø63

Through hole (Basic)/MKB

Note: Actuators are drawn/shown in their retractesor clamping position.



Both ends tapped/MKA

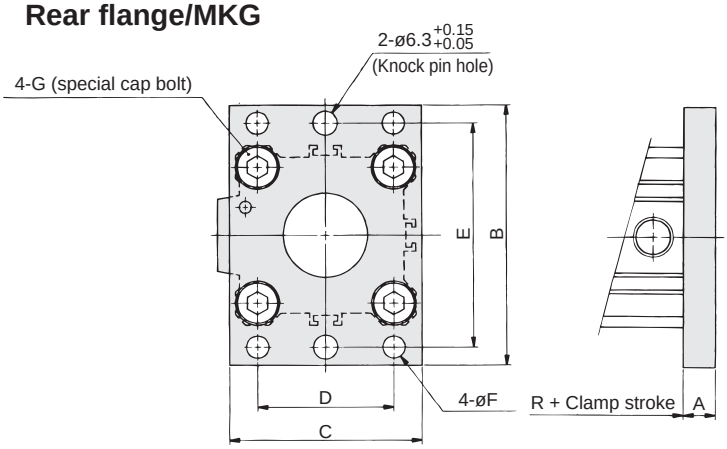


Model	A	B
MKA 32 40	M6 X 1.0	10
MKA50	M8 X 1.25	14
MKA63	M10 X 1.5	18

Model	A	B	C	D	E	F	G	H	I	J	K	L	O	P	Q	R	S	T	U	V	X	Yh9	Z
MKB32	45	60	34	$14^{-0.1}_{-0.2}$	54	31.5	5.5	9 Depth 7	M10 X 1.5	12	$20^{\pm0.15}$	$7^{\pm0.15}$	18	4.5	93.5	71.5	37	7.5	16	Rc(PT)1/8	3	$30^{0}_{-0.062}$	6.5
MKB40	52	69	40	$14^{-0.1}_{-0.2}$	61	35	5.5	9 Depth 7	M10 X 1.5	12	$24^{\pm0.15}$	$7^{\pm0.15}$	18	5	94.5	65	29.5	8	16	Rc(PT)1/8	3	$30^{0}_{-0.062}$	6.5
MKB50	64	86	50	$17^{-0.1}_{-0.2}$	73	41	6.6	11 Depth 8	M12 X 1.75	15	$30^{\pm0.15}$	$8^{\pm0.15}$	22	7	112	76.5	34	10.5	20	Rc(PT)1/4	3.5	$37^{0}_{-0.062}$	7.5
MKB63	77	103	60	$17^{-0.1}_{-0.2}$	86	47.5	9	14 Depth 10.5	M12 X 1.75	15	$35^{\pm0.15}$	$9^{\pm0.15}$	22	7	115	80	35	10.5	20	Rc(PT)1/4	3.5	$48^{0}_{-0.062}$	7.5

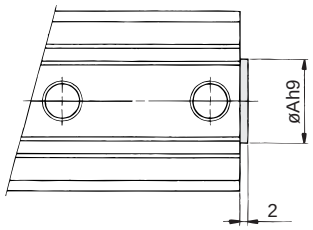
Note 1) Above figure is for D-A73, A80.
Note 2) Dimensions E and F are 7 mm longer for the auto switches with connector (D-A7□C, A80C, J79C).
Note 3) When the rod is extended, the clamp stroke and rotary stroke are added to the appropriate dimensions.

Rear flange/MKG



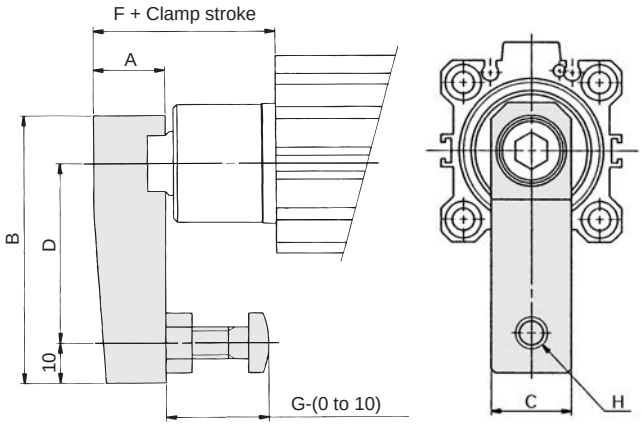
Model	A	B	C	D	E	F	G
MKG32	8	65	48	$34^{\pm0.1}$	$56^{\pm0.15}$	5.5	M6 X 1.0
MKG40	8	72	54	$40^{\pm0.1}$	$62^{\pm0.15}$	5.5	M6 X 1.0
MKG50	9	89	67	$50^{\pm0.1}$	$76^{\pm0.15}$	6.6	M8 X 1.25
MKG63	9	108	80	$60^{\pm0.1}$	$92^{\pm0.15}$	9	M10 X 1.5

Rear boss mounting



Model	Ah9
MK□32-□□F	$21\ ^{0}_{-0.052}$
MK□40-□□F	$28\ ^{0}_{-0.052}$
MK□ 50/63 -□□F	$35\ ^{0}_{-0.062}$

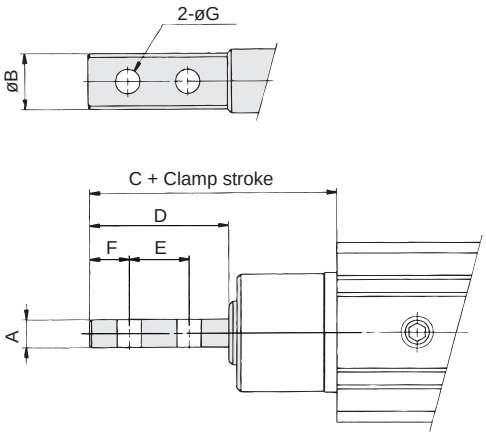
With arm



Model	A	B	C	D	F	G	H
MK□32-□□N	18	67	20	45	35.5	25	M8 X 1.25
MK□40-□□N	18	67	20	45	43	25	M8 X 1.25
MK□50-□□N	22	88	22	65	53	40	M10 X 1.5
MK□63-□□N	22	88	22	65	52.5	40	M10 X 1.5

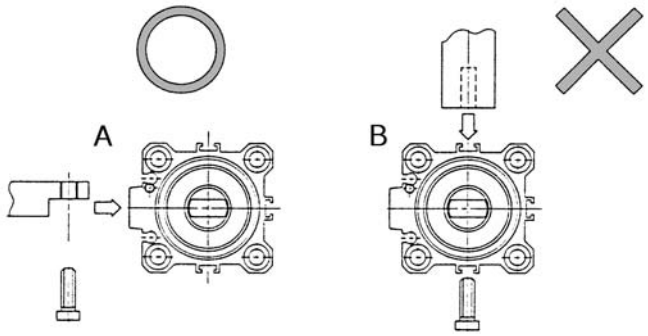
Arm for width across flats

Rod end width across flats



Model	A	B	C	D	E	F	G
MK□32-□□M	6	14	53.5	36	18	9	6.2
MK□40-□□M	6	14	61	36	18	9	6.2
MK□50-□□M	8	18	77	46	23	11.5	8.2
MK□63-□□M	8	18	76.5	46	23	11.5	8.2

Mounting arms for width across flats



∗When installing the arm for the parallel section at the rod end, the strength of the piston rod might be insufficient depending on the direction in which the arm is installed. Therefore, make sure to install the arm in the direction indicated in diagram A.

Series MK
Auto Switch Specifications

Refer to the p.5.3-2 for details of auto switch.

Auto Switch Mounting

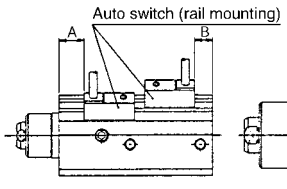
Refer to p.5.3-74 regarding how to mount auto switch.

Applicable Auto Switch

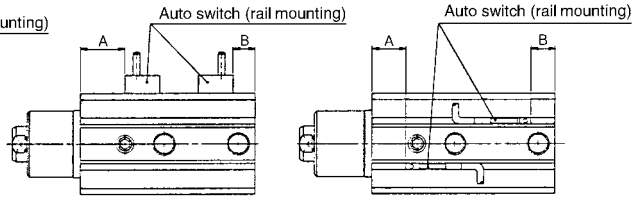
Style	Auto Switch Model	Electrical entry (Function)	Bore size	Page
Reed switch	**D-A7, A8**	Grommet (Perpendicular)	**ø20 to ø63**	5.3-14
	D-A7□H, A80H	Grommet (In-line)		5.3-15
	D-A73C, A80C	Connector		5.3-16
	D-A79W	Grommet (2 colour indication, perpendicular)		5.3-26
	D-A9□	Grommet (In-line)	**ø12, ø16**	5.3-19
	D-A9□V	Grommet (Perpendicular)	**ø32 to ø63**	5.3-20
Solid state switch	**D-F7□, J79**	Grommet (In-line)	**ø20 to ø63**	5.3-34
	D-F7□V	Grommet (Perpendicular)		5.3-35
	D-J79C	Connector		5.3-36
	D-F7□W, J79W	Grommet (2 colour indication, in-line)		5.3-44
	D-F7□WV	Grommet (2 colour indication, perpendicular)		5.3-45
	D-F7BAL	Grommet (2 colour, water resistant, in-line)		5.3-57
	D-F7□F	Grommet (2 colour, diagnostic output, in-line)		5.3-53
	D-F7NTL	Grommet (With timer, in-line)		5.3-60
	D-F9□	Grommet (In-line)	**ø12, ø16 ø32 to ø63**	5.3-39
	D-F9□V	Grommet (Perpendicular)		5.3-39
	D-F9□W	Grommet (2 colour, in-line)		5.3-66
	D-F9□WV	Grommet (2 colour, perpendicular)		5.3-66
	D-F9BAL	Grommet (2 colour, water resistant, in-line)		5.3-67
	D-F5DWL	Grommet (2 colour, strong magnetic field resistant, in-line)	**ø40 to ø63**	5.3-64

Auto Switch Mounting Position (Stroke end)

ø20, ø25



ø32 to ø63



Mounting	Rail mounting										Direct mounting					
Model	D-A7, A8		D-A7□H, A80H D-A73C, A80C D-F7□, J79 D-F7□V, J79C		D-A79W		D-F7BAL D-F7PW D-F7□F D-J79W D-F7□WV		D-P5DW		D-A9□ D-A9□V		D-F9□ D-F9□V D-F9□WV		D-F9□W D-F9BAL	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
MK□20	28	6.5	28.5	7	25.5	4	32.5	11	—	—	—	—	—	—	—	—
MK□25	28.5	7	29	7.5	26	4.5	33	11.5	—	—	—	—	—	—	—	—
MK□32	32.5	6	33	6.5	30	3.5	37	10.5	—	—	31.5	5	35.5	9	34.5	8
MK□40	23.5	8.5	24	9	21	6	28	13	19.5	4.5	22.5	7.5	26.5	11.5	25.5	10.5
MK□50	28	11.5	28.5	12	25.5	9	32.5	16	24	7.5	27	10.5	31	14.5	30	13.5
MK□63	28	14.5	28.5	15	25.5	12	32.5	19	24	10.5	27	13.5	31	17.5	30	16.5

Auto Switch Mounting Bracket Part No.

Bore size (mm)	Mounting bracket	Note	Applicable switch	
			Reed switch	Solid state switch
20/25	BQ-1	●Auto switch mounting screw (M3 X 0.5 X 8ℓ) ●Square nut	**D-A7, A8 D-A73C, A80C D-A7□H, A80H D-A79W**	**D-F7□, J79 D-F7□V D-J79C D-F7□W, J79W D-F7□WV D-F7BAL D-F7□F D-F7NTL**
32/40 50/63	BQ-2	●Auto switch mounting screw (M3 X 0.5 X 10ℓ) ●Auto switch spacer ●Auto switch mounting nut		
40/50 63	BQP1-050	●Switch mounting bracket ●Auto switch mounting nut ●Cross-recessed panhead small screw (M3 X 0.5 X 16ℓ) ●Hexagon socket head cap bolt (M3 X 0.5 X 14ℓ)	———	**D-P5DW□**

Stainless steel mounting screw set

The set of stainless steel mounting screws (with nuts) described below is available and can be used depending on the operating environment. (The spacers for auto switches must be ordered separately, as they are not included.)

BBA2: For D-A7/A8/F7/J7 types

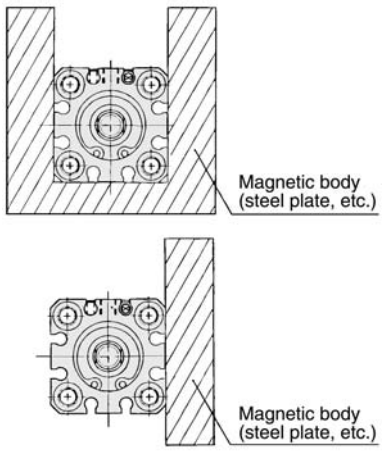
The stainless steel screws described above are used when the D-F7BAL switch is shipped mounted on to the cylinder. When the switches are shipped as individual parts, the BBA2 set is included.

⚠ Precautions

Be sure to read before handling. Refer to p.0-44 to 0-46 for common precautions.

Mounting

- As shown in the drawing below, when a magnetic body is in close contact with the cylinder body periphery (including the case where only one side is in contact), the function of the auto switch may be unstable. Contact SMC if this occurs.



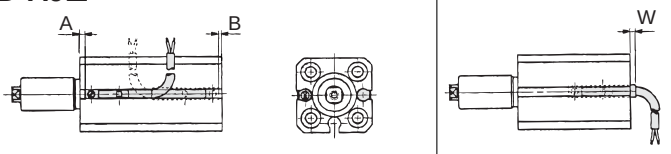
Auto Switch Mounting Position and Mounting Height

ø12

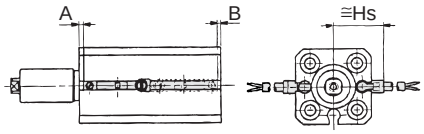
Mounting condition

a) b)

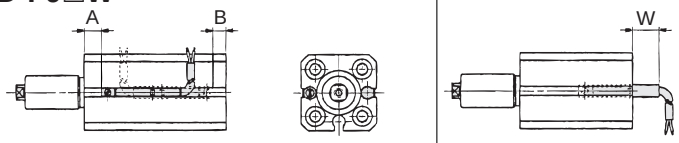
D-A9□



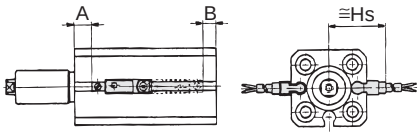
D-A9□V



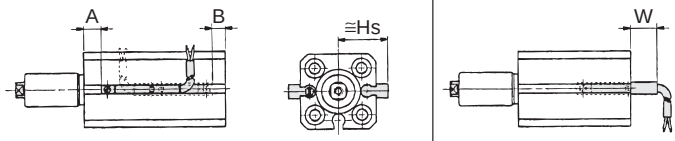
D-F9□
D-F9□W



D-F9□V
D-F9□WV



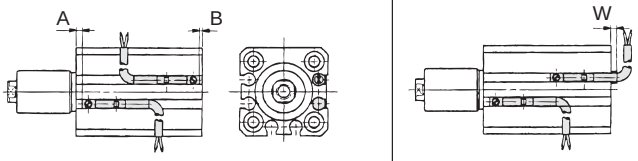
D-F9BAL

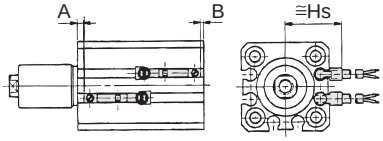


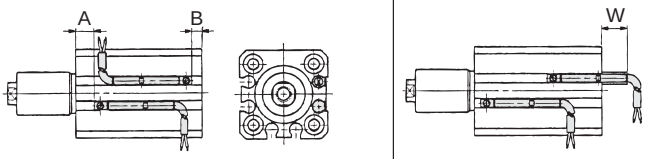
ø16

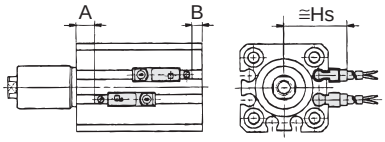
Mounting condition

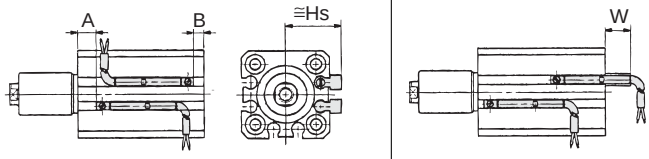
a) b)











(mm)

Model		D-A9□			D-A9□V			D-F9N/D-F9B D-F9P/D-F9□W			D-F9□V/D-F9□WV		
Symbol		A	B	W	A	B	Hs	A	B	W	A	B	W
Bore size (mm)	**12**	7.5	0	1.5(4)	7.5	0	17	11.5	4.5	5.5	11.5	4.5	19.5
	16	8	0	2(4.5)	8	0	19	12	4	6	12	4	21.5

Model		D-F9BAL			
Symbol		A	B	W	Hs
Bore size (mm)	**12**	10.5	3.5	14.5	17
	16	11	3	15	19

Rotary Clamp Cylinder/Heavy Duty

Series MK2

ø20, ø25, ø32, ø40, ø50, ø63

How to Order

E MK2 B 20 – 10 R F – A73 S

Thread Port (ø32 to ø63)

—	Rc(PT)
E	G(PF)

Rotary clamp cylinder

Mounting

Symbol	Style
B	Through hole & both ends tapped (Standard)
G	Rear flange*

* The rear flange is equipped with boss mounting, so be sure to specify body option "F".

Bore size

20	20mm	40	40mm
25	25mm	50	50mm
32	32mm	63	63mm

Clamp stroke

Symbol	Clamp stroke	Bore size
10	10mm	ø20 to ø40
20	20mm	ø20 to ø63
50	50mm	ø50 to ø63

Rotation direction (Release → Clamp)

R	Clockwise
L	Counterclockwise

Body option

—	Standard (Female thread)
F	Rear boss mounting
N	With arm

Auto switch

—	Without auto switch (Built-in magnet)

* Refer to table below regarding auto switch model no.

Number of auto switches

—	2
S	1

Option Part No./Arm

Bore size (mm)	Part No.	Accessories
20	MK-A020	Clamp bolt Hexagonal socket head cap screw Hexagonal nut Spring seat
25		
32	MK-A032	
40		
50	MK-A050	
60		

Mounting Bracket Part No./Flange

Bore size (mm)	Part No.	Accessories
20	MK2-F020	Boss mounting ring Set pin Bolt for cylinder body
25	MK2-F025	
32	MK2-F032	
40	MK2-F040	
50	MK2-F050	
63	MK2-F063	

Applicable Auto Switches/ Refer to the p.5.3-2 for further information on auto switch.

Style	Special function	Electrical entry	Indicator	Wiring (output)	Load voltage DC	Load voltage AC	Rail mounting ø20 to ø63 Perpendicular	Rail mounting ø20 to ø63 In-line	Direct mounting ø32 to ø63 Perpendicular	Direct mounting ø32 to ø63 In-line	Lead wire* (m) 0.5 (—)	3 (L)	5 (Z)	— (N)	Applicable load	
Reed switch	—	Grommet	Yes	3 wire (NPN Equiv.)	5V	—	—	**A76H**	**A96V**	**A96**	●	●	—	—	IC	—
				2 wire	—	200V	**A72**	**A72H**	—	—	●	●	—	—	—	Relay PLC
					12V	100V	**A73**	**A73H**	—	—	●	●	●	—		
							—	—	**A93V**	**A93**	●	●	—	—		
			No		24V 5V, 12V	≤100V	**A80**	**A80H**	**A90V**	**A90**	●	●	—	—	IC	
		Connector	Yes		12V	—	**A73C**	—	—	—	●	●	●	●	—	
			No		5V, 12V	≤24V	**A80C**	—	—	—	●	●	●	●	IC	
	Diagnostic indicator (2 colour)	Grommet	Yes		—	—	**A79W**	—	—	—	●	●	—	—	—	
Solid state switch	—	Grommet	Yes	3 wire (NPN)	24V 5V, 12V	—	**F7NV**	**F79**	—	—	●	●	○	—	IC	Relay PLC
					12V		—	—	**F9NV**	**F9N**	●	●	—	—	—	
				3 wire (PNP)	5V, 12V		**F7PV**	**F7P**	—	—	●	●	○	—	IC	
					12V		—	—	**F9PV**	**F9P**	●	●	—	—	—	
				2 wire			**F7BV**	**J79**	—	—	●	●	○	—		
							—	—	**F9BV**	**F9B**	●	●	—	—		
		Connector					**J79C**	—	—	—	●	●	●	●		
	Diagnostic indicator (2 color)	Grommet		3 wire (NPN)	5V, 12V		—	—	**F9NWV**	**F9NW**	●	●	○	—		
							F7NWV	**F79W**	—	—	●	●	○	—	IC	
				3 wire (PNP)			—	**F7PW**	—	—	●	●	○	—		
					12V		—	—	**F9PWV**	**F9PW**	●	●	○	—	—	
				2 wire			**F7BWV**	**J79W**	**F9BWV**	**F9BW**	●	●	○	—		
	Water resistant (2 colour)						—	**F7BA**	—	**F9BA**	—	●	○	—		
	With timer			3 wire (NPN)	5V, 12V		—	**F7NT**	—	—	—	●	○	—		
	Diagnostic output (2 colour)			4 wire (NPN)			—	**F79F**	—	—	●	●	○	—	IC	
	Latching with diagnostic output (2 colour)				—		—	**F7LF**	—	—	●	●	○	—	—	
	Strong magnetic field (2 colour)			2 wire			—	**P5DW****	—	—	—	●	●	—	—	

* Lead wire 0.5m····· – (Example) A80C 5m·····Z (Example) A80CZ
3m····· L (Example) A80CL – ·····N (Example) A80CN

* Solid state auto switches marked with a "○" are manufactured upon receipt of order.

** D-P5DW can be mounted for only ø40, ø50 and ø63.

With arm

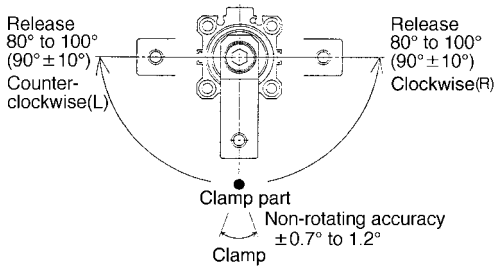
Head side flange

Specifications

Bore size (mm)	20	25	32	40	50	63
Operation	Double acting					
Rotary angle (4)	90° ± 10°					
Rotary direction (3)	R: Clockwise L: Counterclockwise					
Rotary stroke (mm)	9.5		15		19	
Clamp stroke (mm)	10·20				20·50	
Allowable moment Nm (1)	7	13	27	47	107	182
Theoretical clamp force N (2)	100	185	300	525	825	1400
Fluid	Air					
Proof pressure	1.5MPa					
Operating pressure range	0.1 to 10MPa					
Ambient and fluid temperature	Without auto switch –10 to +70°C (No freezing)					
	With auto switch –10 to +60°C (No freezing)					
Lubrication	Non-lube					
Port size	M5 X 0.8		1/8		1/4	
Mounting	Through hole/Both ends tapped (Common), Rear flange					
Cushion	Rubber bumper					
Stoke tolerance (mm)	$^{+0.6}_{-0.4}$					
Piston speed	50 to 200 mm/s					
Non-rotating accuracy	±1.2°		±0.9°		±0.7°	

Note 1) Max. bending moment applied to the piston rod side.
Note 2) At 0.5 MPa.
Note 3) Direction of rotation viewed from the rod side when the piston rod is retracting.
Note 4) Refer to "Rotary angle" diagram.

Rotary Angle



Theoretical Force

Unit: N

Bore size (mm)	Rod dia. (mm)	Operating direction	Piston area (cm^2)	Operating pressure (MPa) 0.3	0.5	0.7	1.0
20	**12**	R	2	60.8	100	139	200
		H	3	90.2	149	208	298
25	**12**	R	3.7	112	185	258	370
		H	4.9	149	245	341	490
32	**16**	R	6	182	300	418	600
		H	8	243	400	557	800
40	**16**	R	10.5	319	525	731	1050
		H	12.5	380	625	870	1250
50	**20**	R	16.5	502	825	1149	1648
		H	19.6	596	980	1365	1961
63	**20**	R	28	851	1400	1950	2801
		H	31.2	948	1560	2172	3121

Note) Theoretical force (N)=Pressure (MPa) X Piston area (cm^2) X 100 Operation direction R: Rod side (Clamp)
H: Head side (Release)

Made to Order

Refer to the p.5.4-1 regarding made to order for series MK2.

Weight/Mounting

Unit: g

Clamp stroke (mm)	Bore size (mm) 20	25	32	40	50	63
10	260	295	353	635	—	—
20	300	335	555	680	1170	1620
50	—	—	—	—	1420	1890

Additional Weight

Unit: g

Bore size (mm)	20	25	32	40	50	63
Rear boss mounting	2	3	5	7	13	25
With arm	100	100	200	200	350	350
Rear flange	133	153	166	198	345	531

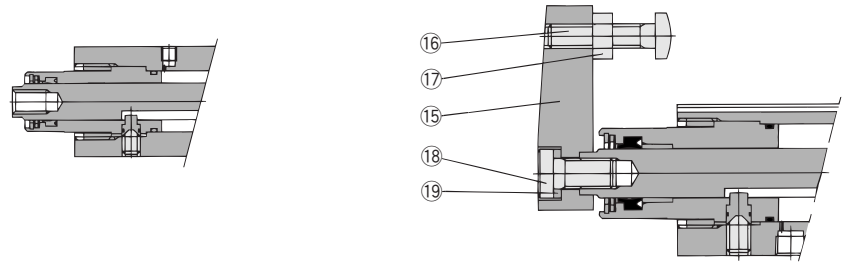
Calculation method (Example) MK2G20-10RFN

- Standard calculation: MK2B20-10R 260g
- Extra weight calculation: Rear flange 133g
  Rear boss mounting 2g
  With arm 100g
  495g

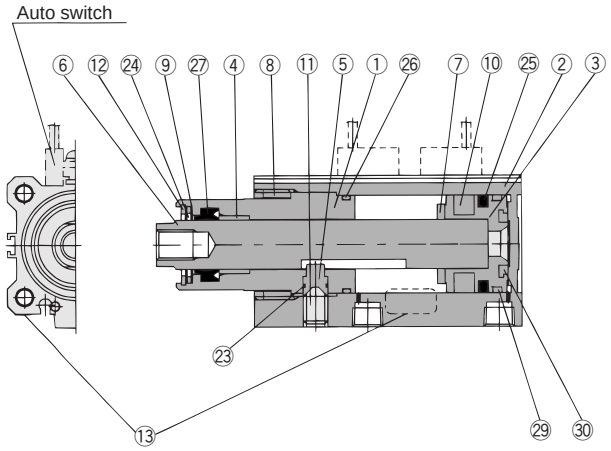
Construction

With arm (N)

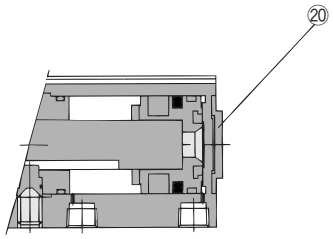
MK2□20, 25



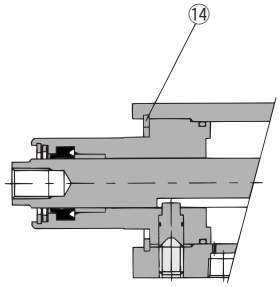
MK2□32



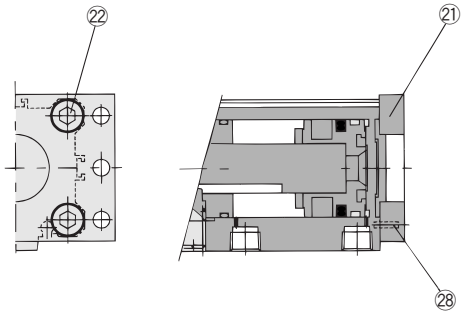
Rear boss mounting (F)



MK2□40 to 63



Rear flange (G)



Component Parts

No.	Description	Material	Note
①	Rod cover	Aluminum alloy	
②	Cylinder tube	Aluminum alloy	
③	Piston	Aluminum alloy	
④	Bushing	Copper bearing material	Only ø32 to ø63
⑤	Guide pin	Stainless steel	
⑥	Piston rod	Stainless steel	
⑦	Bumper	Urethane	
⑧	Ring nut	Copper alloy	Only ø20 to ø32
⑨	Scraper pressure	Stainless steel	
⑩	Magnet		
⑪	Hex. socket head cap screw	Chrome molybdenum steel	Sharp end section: 90°
⑫	R-shape snap ring	Spring steel	
⑬	Plate	Aluminum	
⑭	C type retaining ring	Carbon tool steel	Only ø40 to ø53
⑮	Arm	Rolled steel	
⑯	Clamp bolt	Chrome molybdenum steel	

Component Parts

No.	Description	Material	Note	
⑰	Hexagonal nut	Rolled steel		
⑱	Hex. socket head cap bolt	Chrome molybdenum steel		
⑲	Spring washer	Hard steel		
⑳	Boss mount ring	Aluminum alloy		
㉑	Flange	Rolled steel		
㉒	Hex. socket head cap bolt	Chrome molybdenum steel	Quantity	ø20, 25: 2 ø32 to 63: 4
㉓	O ring	NBR		
㉔	Coil scraper	Phosphor bronze		
㉕	Piston seal	NBR		
㉖	Gasket	NBR		
㉗	Rod seal	NBR		
㉘	Parallel pin	Stainless steel		
㉙	Wear ring	Resin		
㉚	Bumper B	Urethane		

Replacement Parts: Seal Kits

Bore size (mm)	ø20	ø25	ø32	ø40	ø50	ø63
Part No.	Not disassembled			MK2-40-PS	MK2-50-PS	MK2-63-PS
Contents	Set of above ㉓ ㉔ ㉕ ㉖ ㉗					

∗Seal kit includes O ring ㉓, coil scraper ㉔, piston seal ㉕, gasket ㉖ and rod seal ㉗.
Order a seal kit according to applicable bore size.

⚠ Precautions

Be sure to read before handling. Refer to p.0-39 to 0-46 for Safety Instructions and common precautions on the products mentioned in this catalog.

⚠ Caution

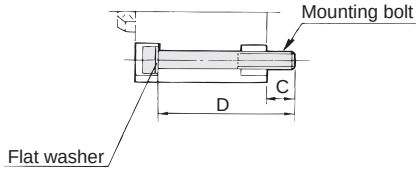
Handling

① Mount the cylinder so that the clamping piston will be approximately in the centre of the clamp stroke.
② The auto switch is temporarily mounted for shipment, so adjust its position when mounting the cylinder. (See the auto switch mounting position on p.4.1-20.)
③ Do not apply clamping and other loads when the piston rod is turning.

Mounting bolt for MK2B

Mounting method: A through hole mounting bolt is available.
How to order: Suffix "**(MK2B)"** to the size of bolts to be used.

Example) M5 X 75ℓ **(MK2B)**



Note) Be sure to use a flat washer to mount cylinders via through holes.

Part No.	C	D	Mounting bolt
MK2B20-10	8.5	75	M5 X 75ℓ
MK2B20-20		85	M5 X 85ℓ
MK2B25-10	10.5	80	M5 X 80ℓ
MK2B25-20		90	M5 X 90ℓ
MK2B32-10	10	90	M5 X 90ℓ
MK2B32-20		100	M5 X 100ℓ
MK2B40-10	6	80	M5 X 80ℓ
MK2B40-20		90	M5 X 90ℓ
MK2B50-20	10.5	105	M6 X 105ℓ
MK2B50-50	10.5	135	M6 X 135ℓ
MK2B63-20	9	105	M8 X 105ℓ
MK2B63-50		135	M8 X 135ℓ

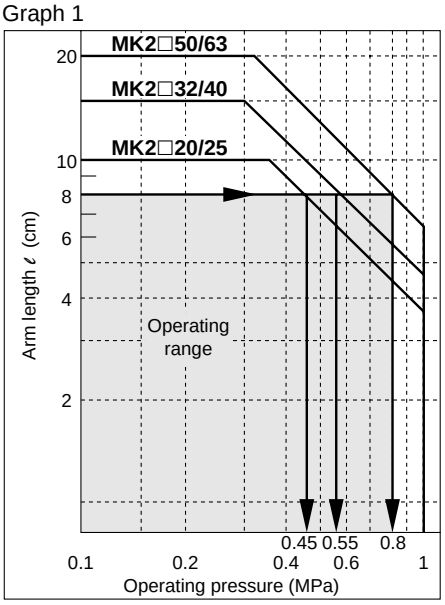
Precautions for Designing and Mounting Arms

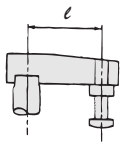
When arms are to be made separately, their length and weight should be within the following range.

1. Allowable bending moment

Use the arm length and operating pressure within graph 1 for allowable bending moment loaded piston rod.

Graph 1



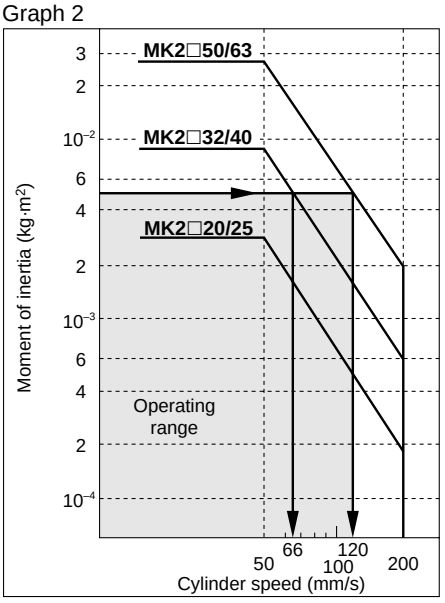


When arm length is 8cm, pressure should be less than
MK2□20/25: 0.45MPa
MK2□32/40: 0.55MPa
MK2□50/63: 0.8MPa

2. Moment of inertia

When the arm is long and heavy, damage of internal parts may be caused due to inertia. Use the inertia moment and cylinder speed within graph 2 based on arm requirements.

Graph 2

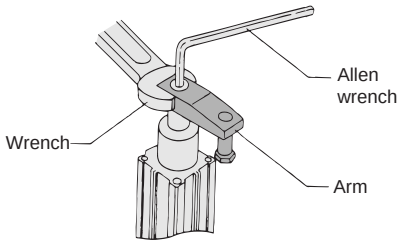


When arm's moment of inertia is 5×10^{-3}kg/m², cylinder speed should be less than
MK2□32/40: 66mm/s
MK2□50/63: 120mm/s
Refer to p.4.1-21 for calculating moment of inertia.

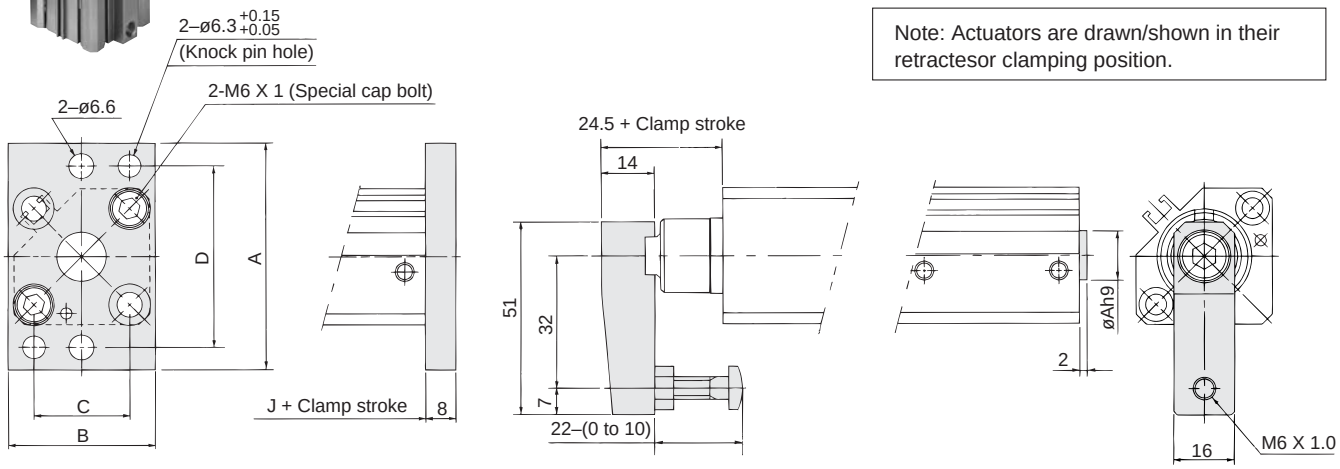
●To attach and detach the arm to and from the piston rod, fix the arm with a wrench or vise and then tighten the bolt. (Excessive force in the direction of rotation applied to the piston rod may damage the internal mechanism.)
Refer to the following table for the tightening torque for mounting.

Nm

Bore size (mm)	Standard tightening torque
20, 25	4 to 6
32, 40	8 to 10
50, 63	14 to 16



ø20, ø25



Note: Actuators are drawn/shown in their retractesor clamping position.

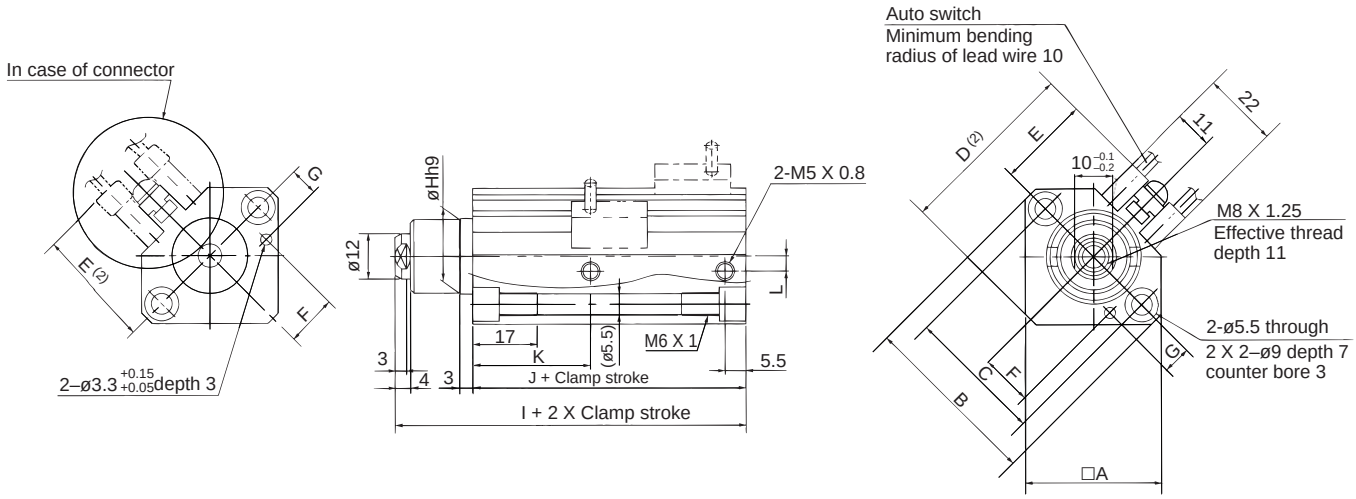
With arm

Rear flange

Model	A	B	C	D
MK2G20	60	39	25.5 ±0.1	48 ±0.15
MK2G25	64	42	28 ±0.1	52 ±0.15

Rear boss mounting

Model	øAh9
MK2□20-□□F	13 0 −0.043
MK2□25-□□F	15 0 −0.043

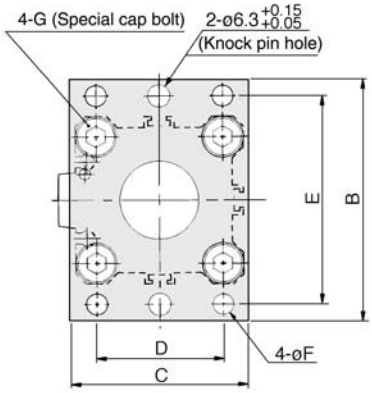


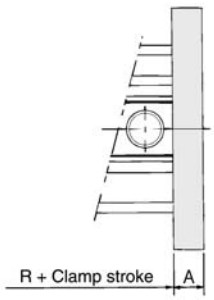
Through hole & both ends tapped (standard)

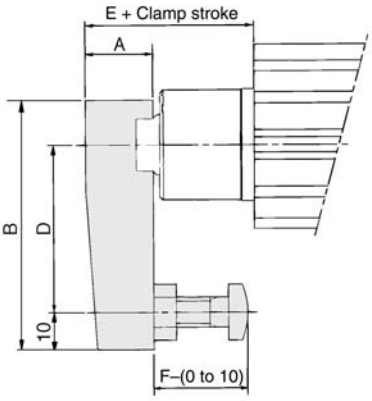
Model	□A	B	C	D	E	F	G	øHh9	I	J	K	L
MK2B20	36	46.8	36	48	24.5	13.5 ±0.15	7.5 ±0.15	20 0 −0.052	75.5	62.5	31	4
MK2B25	40	52	40	53.8	27.5	16 ±0.15	8 ±0.15	23 0 −0.052	78.5	65.5	32	5

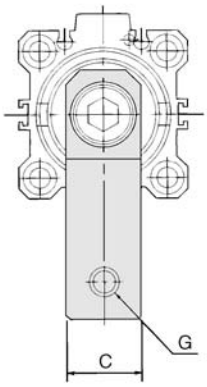
Note 1) Above figure is for D-A73, A80
Note 2) Dimensions E and F are 7mm longer for the auto switches with connector (D-A7□C, A80C, J79C).
Note 3) When the rod is extended, the clamp stroke and rotary stroke are added to the appropriate dimensions.

ø32, ø40, ø50, ø63







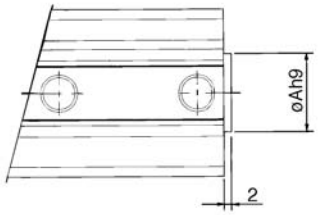


Rear flange

Model	A	B	C	D	E	øF	G
MK2G32	8	65	48	34 ±0.1	56 ±0.15	5.5	M6 X 1.0
MK2G40	8	72	54	40 ±0.1	62 ±0.15	5.5	M6 X 1.0
MK2G50	9	89	67	50 ±0.1	76 ±0.15	6.6	M8 X 1.25
MK2G63	9	108	80	60 ±0.1	92 ±0.15	9	M10 X 1.5

With arm

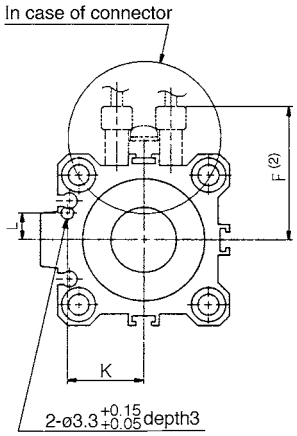
Model	A	B	C	D	E	F	G
MK2□32-□□N	18	67	20	45	39	25	M8 X 1.25
MK2□40-□□N	18	67	20	45	46	25	M8 X 1.25
MK2□50-□□N	22	88	22	65	58	40	M10 X 1.5
MK2□63-□□N	22	88	22	65	57.5	40	M10 X 1.5

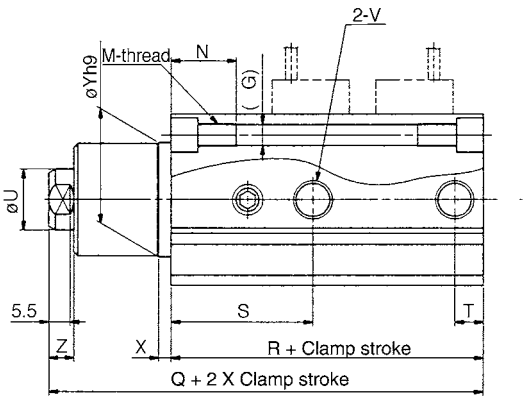


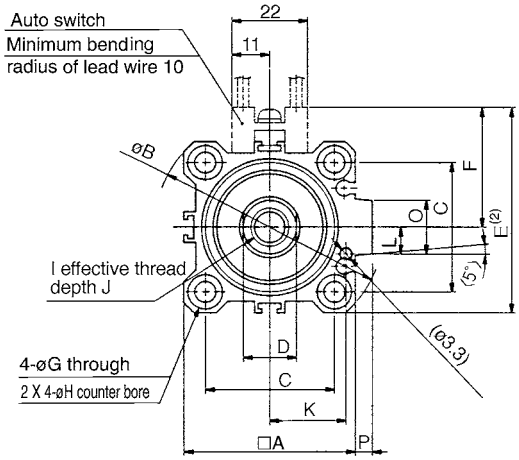
Rear boss mounting

Model	øAh9
MK2□32-□□F	21 $^{0}_{-0.052}$
MK2□40-□□F	28 $^{0}_{-0.052}$
MK2□$^{50}_{63}$-□□F	35 $^{0}_{-0.062}$

Note 1) Below figure is for D-A73, A80.
Note 2) Dimensions E and F are 7mm longer for the auto switches with connector (D-A7□C, A80C, J79C).







Through hole & both ends tapped (standard)

Model	□A	B	C	D	E	F	øG	øH	I	J	K	L	M	N	O	P	Q	R	S	T	øU	V	X	øYh9	Z
MK2B32	45	60	34	14 $^{-0.1}_{-0.2}$	54	31.5	5.5	9 Depth 7	M10 X 1.5	12	20 ±0.15	7 ±0.15	M6 X 1.0	17	14	4.5	101.5	76	37	7.5	16	1/8	3	30 $^{0}_{-0.62}$	6.5
MK2B40	52	69	40	14 $^{-0.1}_{-0.2}$	61	35	5.5	9 Depth 7	M10 X 1.5	12	24 ±0.15	7 ±0.15	M6 X 1.0	17	14	5	102.5	70	29.5	8	16	1/8	3	30 $^{0}_{-0.62}$	6.5
MK2B50	64	86	50	17 $^{-0.1}_{-0.2}$	73	41	6.6	11 Depth 8	M12 X 1.75	15	30 ±0.15	8 ±0.15	M8 X 1.25	22	19	7	122	81.5	34	10.5	20	1/4	3.5	37 $^{0}_{-0.62}$	7.5
MK2B63	77	103	60	17 $^{-0.1}_{-0.2}$	86	47.5	9	14 Depth 10.5	M12 X 1.75	15	35 ±0.15	9 ±0.15	M10 X 1.5	28.5	19	7	125	85	35	10.5	20	1/4	3.5	48 $^{0}_{-0.62}$	7.5

Note 1) This cylinder rod is retracted.
Note 2) Rotation direction is in the retracted direction from the rod side.
Note 3) When the rod is extended, the clamp stroke and rotary stroke are added to the appropriate dimensions.

Series MK2
Auto Switch Specifications (ø20 to ø63)

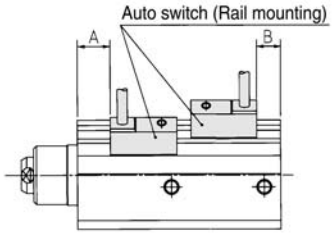
Refer to the p.5.3-2 for details of auto switch.

Applicable Auto Switch

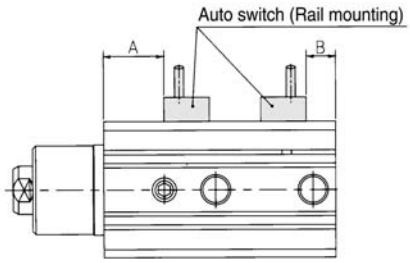
Style	Auto switch model	Electrical entry (Function)	Bore size	Page
Reed switch	**D-A7, A8**	Grommet (Perpendicular)	**ø20 to ø63**	5.3-14
	D-A7□H, A80H	Grommet (In-line)		5.3-15
	D-A73C, A80C	Grommet (Connector)		5.3-16
	D-A79W	Grommet (2 colour indication, Perpendicular)		5.3-26
	D-A9□	Grommet (In-line)	**ø32, ø63**	5.3-19
	D-A9□V	Grommet (Perpendicular)		5.3-20
Solid state switch	**D-F7□, J79**	Grommet (In-line)	**ø20 to ø63**	5.3-34
	D-F7□V	Grommet (Perpendicular)		5.3-35
	D-J79C	Grommet (Connector)		5.3-36
	D-F7□W, J79W	Grommet (2 colour indication, in-line)		5.3-44
	D-F7□WV	Grommet (2 colour indication, Perpendicular)		5.3-45
	D-F7BAL	Grommet (2 colour, water resistant, in-line)		5.3-57
	D-F7□F	Grommet (2 colour, diagnostic output, in-line)		5.3-53
	D-F7NTL	Grommet (With timer, in-line)		5.3-60
	D-F9□	Grommet (In-line)	**ø32, ø63**	5.3-39
	D-F9□V	Grommet (Perpendicular)		5.3-39
	D-F9□W	Grommet (2 colour indication, in-line)		5.3-66
	D-F9□WV	Grommet (2 colour indication, Perpendicular)		5.3-66
	D-F9BAL	Grommet (2 colour, water resistant, in-line)		5.3-67
	D-P5DWL	Grommet (2 colour, strong magnetic field resistant, in-line)	**ø40 to ø63**	5.3-64

Auto Switch Mounting Position (Stroke end)

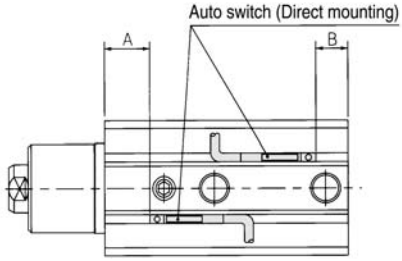
ø20, ø25



ø32 to ø63



ø32 to ø63



Mounting	Rail mounting										Direct mounting					
Model	**D-A7, A8**		**D-A7□H, A80H D-A73C, A80C D-F7□, J79 D-F7□V, J79C**		**D-A79W**		**D-F7BA D-F7□W D-F7□F D-J79W D-F7□WV**		**D-P5DW**		**D-A9□ D-A9□V**		**D-F9□ D-F9□V**		**D-F9□W D-F9□WV D-F9BAL**	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
MK2□20	28.5	6	29	6.5	26	3.5	33	10.5	–	–	–	–	–	–	–	–
MK2□25	29	6.5	29.5	7	26.5	4	33.5	11	–	–	–	–	–	–	–	–
MK2□32	32.5	10.5	33	11	30	8	37	15	–	–	31.5	9.5	35.5	13.5	34.5	12.5
MK2□40	23.5	13.5	24	14	21	11	28	18	19.5	9.5	22.5	12.5	26.5	16.5	25.5	15.5
MK2□50	28	16.5	28.5	17	25.5	14	32.5	21	24	12.5	27	15.5	31	19.5	30	18.5
MK2□63	28.5	19.5	29	20	26	17	33	24	24.5	15.5	27.5	18.5	31.5	22.5	30.5	21.5

Auto Switch Mounting Bracket Part No.

Bore size (mm)	Mounting bracket No.	Note	Applicable auto switch	
			Reed switch	Solid state switch
20/25	BQ-1	●Auto switch mounting screw (M3 X 0.5 X 8ℓ) ●Square nut	**D-A7, A8 D-A73C, A80C D-A7□H, A80H D-A79W**	**D-F7□, J79, D-F7□V D-J79C D-F7□W, J79W, D-F7□WV D-F7BAL, D-F7□F, D-F7NTL**
32/40 50/63	BQ-2	●Auto switch mounting screw (M3 X 0.5 X 10ℓ) ●Auto switch spacer ●Auto switch mounting nut		
40/50 63	BQP1-050	●Switch mounting bracket ●Auto switch mounting nut ●Cross-recessed panhead small screw (M3 X 0.5 X 16ℓ) ●Hexagon socket head cap bolt (M3 X 0.5 X 14ℓ)	—	**D-P5DW**

The set of stainless steel mounting screws (with nuts) described below is available and can be used depending on the operating environment. (The spacers for auto switches must be ordered separately, as they are not included.)

BBA2: For D-A7/A8/F7/J7 types

The stainless steel screws described above are used when the D-F7BAL switch is shipped mounted on to the cylinder.
When the switches are shipped as individual parts, the BBA2 set is included.

Caution/Precautions for Handling

Be sure to read before handling.

Refer to p.0.44 to 0-46 for common auto switch precautions.

When equipped with strong magnetic resistant auto switch D-P5DWL

If welding cables or welding gun electrodes are in the vicinity of the cylinder, the magnets in the cylinder could be affected by the external magnetic fields. (Contact SMC if the welding amperage exceeds 20,000A.) If the source of strong magnetism comes in contact with the cylinder or an auto switch, make sure to install the cylinder away from the source of the magnetism.

If the cylinder is to be used in an environment in which spatter will come in direct contact with the lead wires, cover the lead wires with a protective tube. For the protective tube, use a tube with a bore of ø7 or more, which excels in heat resistance and flexibility.

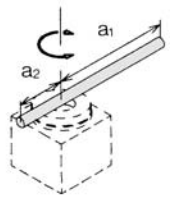
Contact SMC if an inverter welder or a DC welder will be used.

Calculation for Moment of Inertia

I: Moment of Inertia (kg·m^2) m: Load weight (kg)

qThin bar

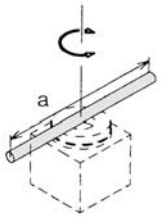
Position of rotary axis: Vertical to the bar and through the end



$$I = m_1 \cdot \frac{a_1^2}{3} + m_2 \cdot \frac{a_2^2}{3}$$

wThin bar

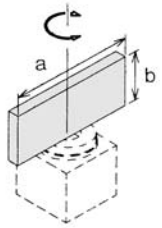
Position of rotary axis: Vertical to the bar and through the centre of gravity



$$I = m \cdot \frac{a^2}{12}$$

eThin rectangular plate

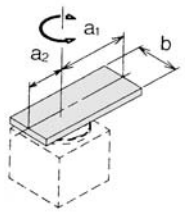
Position of rotary axis: Parallel to side b and through the centre of gravity



$$I = m \cdot \frac{a^2}{12}$$

rThin rectangular plate

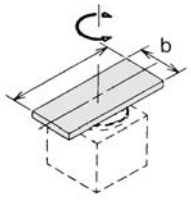
Position of rotary axis: Vertical to the plate and through the end



$$I = m_1 \cdot \frac{4a_1^2+b^2}{12} + m_2 \cdot \frac{4a_2^2+b^2}{12}$$

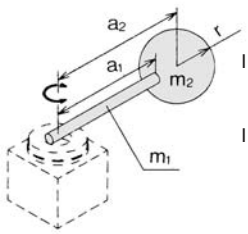
tThin rectangular plate

Position of rotary axis: Through the centre of gravity and vertical to the plate (Same as also thick rectangular plate)



$$I = m \cdot \frac{a^2+b^2}{12}$$

yLoad at the end of lever arm



$$I = m_1 \cdot \frac{a_1^2}{3} + m_2 \cdot a_2^2 + K$$

$$I = m_2 \cdot \frac{2r^2}{5}$$