Rotary Clamp Cylinder: Heavy Duty Type

Series MK2

ø20, ø25, ø32, ø40, ø50, ø63

How to Order

MK2 B 20 – 10 R F – M9BW

Rotary clamp cylinder
Heavy duty type

Mounting bracket

B	Through-hole/Both ends tapped common (Standard)
G	Head end flange

∗ Head end flange is equipped with a boss mounting. Be sure to specify body option "F".

Bore size

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

Port thread type

Nil	M thread	ø20, ø25
	Rc	ø32 to ø63
TN	NPT	
TF	G	

Clamp stroke

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

Rotary direction (Unclamp → Clamp)

R	Clockwise
L	Counterclockwise

Body option

Nil	Standard (Female thread)
F	With boss on head end
N	With arm

Auto switch type

Nil	Without auto switch (Built-in magnet)

∗ For applicable auto switch models, refer to the below table.

Number of auto switches

Nil	2 pcs.
S	1 pc.

Applicable Auto Switches/Refer to pages 1719 to 1827 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage DC	Load voltage AC	Auto switch model: Perpendicular	Auto switch model: In-line ø20 to ø32	Auto switch model: In-line ø40 to ø63	Lead wire length (m): 0.5 (Nil)	1 (M)	3 (L)	5 (Z)	None (N)	Pre-wired connector	Applicable load	
Solid state switch	—	Grommet	Yes	3-wire (NPN)	5 V, 12 V	—	M9NV	M9N		●	—	●	○	—	○	IC circuit	Relay, PLC
				3-wire (PNP)			M9PV	M9P		●	—	●	○	—	○		
				2-wire	12 V		M9BV	M9B		●	—	●	○	—	○	—	
		Connector					J79C	—		●	—	●	●	●	—		
	Diagnostic indication (2-color indication)	Grommet		3-wire (NPN)	5 V, 12 V		M9NWV	M9NW		●	●	●	○	—	○	IC circuit	
				3-wire (PNP)			M9PWV	M9PW		●	●	●	○	—	○		
				2-wire	12 V		M9BWV	M9BW		●	●	●	○	—	○	—	
	Water resistant (2-color indication)			3-wire (NPN)	5 V, 12 V		M9NAV	M9NA		○	○	●	○	—	○	IC circuit	
				3-wire (PNP)			M9PAV	M9PA		○	○	●	○	—	○		
				2-wire	12 V		M9BAV	M9BA		○	○	●	○	—	○	—	
	Diagnostic output (2-color indication)			4-wire	5 V, 12 V		—	F79F		●	—	●	○	—	○	IC circuit	
	Magnetic field resistant (2-color indication)			2-wire (No polarity)	—		—	—	P4DW**	—	—	●	●	—	○	—	
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	A96V	A96	●	—	●	—	—	—	IC circuit	—
				2-wire		—	200 V	A72	A72H	●	—	●	—	—	—	—	Relay, PLC
					24 V	12 V	100 V	A93V	A93	●	—	●	—	—	—		
			No			5 V, 12 V	100 V or less	A90V	A90	●	—	●	—	—	—	IC circuit	
		Connector	Yes			12 V	—	A73C	—	●	—	●	●	●	—	—	
			No			5 V, 12 V	24 V or less	A80C	—	●	—	●	●	●	—	IC circuit	
	Diagnostic indication (2-color indication)	Grommet	Yes			—	—	A79W	—	●	—	●	—	—	—	—	

∗ Lead wire length symbols: 0.5 m ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ
None ····· N (Example) J79CN

∗ Solid state auto switches marked with "○" are produced upon receipt of order.
∗∗ For D-P4DW, ø40 to ø63 are available.
∗∗ Only D-P4DW type is assembled at the time of shipment.

∗ Since there are other applicable auto switches than listed, refer to page 1253 for details.
∗ For details about auto switches with pre-wired connector, refer to pages 1784 and 1785.
∗ When mounting models D-M9□(V), M9□W(V), M9□A(V), and A9□(V) with between ø32 and ø50 on sides other than the port side, please order a switch mounting bracket separately as per the instructions on page 1252.
∗ Auto switches are shipped together (not assembled).

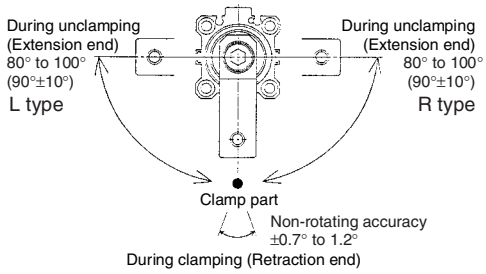
GENTLE AUTOMATIC SOLUTION SDN BHD
No.36, Jalan Industri USJ 1/13, Taman Perindustrian USJ 1, 47600 Subang Jaya, Selangor.
TEL: 603-8023 7743 / 8743 FAX: 603-8023 9743 email:sales@gentle.com.my / gpauto@tm.net.my

Specifications

Bore size (mm)	20	25	32	40	50	63
Action	Double acting					
Rotation angle Note 1)	90° ±10°					
Rotary direction Note 2)	Clockwise, Counterclockwise					
Rotary stroke (mm)	9.5		15		19	
Clamp stroke (mm)	10, 20				20, 50	
Theoretical clamp force (N) Note 3)	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					
Piping port size	M5 x 0.8		Rc1/8, NPT1/8, G1/8		Rc1/4, NPT1/4, G1/4	
Mounting	Through-hole/Both ends tapped common, Head end flange					
Cushion	Rubber bumper					
Stroke length tolerance	$^{+0.6}_{-0.4}$					
Piston speed	50 to 200 mm/s					
Non-rotating accuracy (Clamp part)	±1.2°		±0.9°		±0.7°	

Note 1) Refer to "Rotary Angle" figure.
Note 2) Direction of rotation viewed from the rod end when the piston rod is retracting.
Note 3) At 0.5 MPa.

Rotary Angle



Theoretical Output

Unit: N

Bore size (mm)	Rod size (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 output (N) = Pressure (MPa) x Piston area (cm^2) x 100

Operating direction
R: Rod end (Clamp)
H: Head end (Unclamp)

Option/Arm

Bore size (mm)	Part no.	Accessories
20	**MK-A020**	Clamp bolt, Hexagon socket head cap screw, Hexagon nut, Spring washer
25		
32	**MK-A032**	
40		
50	**MK-A050**	
63		

Mounting Bracket/Flange

Bore size (mm)	Part no.	Accessories
20	**MK2-F020**	Centering location ring, Set pin, Bolt for cylinder body
25	**MK2-F025**	
32	**MK2-F032**	
40	**MK2-F040**	
50	**MK2-F050**	
63	**MK2-F063**	

Mass/Through-hole 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 Mass

Unit: g

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

Calculation: (Example) **MK2G20-10RFN**

- Standard calculation: MK2B20-10R 260 g
- Extra mass calculation:
  - Head end flange 133 g
  - With boss on head end 2 g
  - With arm 100 g
  - 495 g

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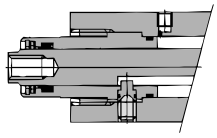
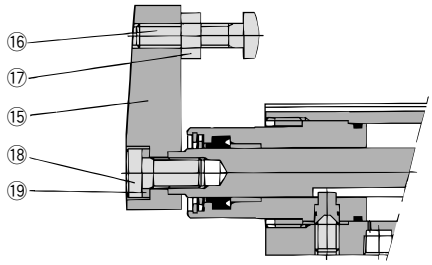
TEL: 603-8023 7743 / 8743 FAX: 603-8023 9743 email:sales@gentle.com.my / gpauto@tm.net.my

Construction

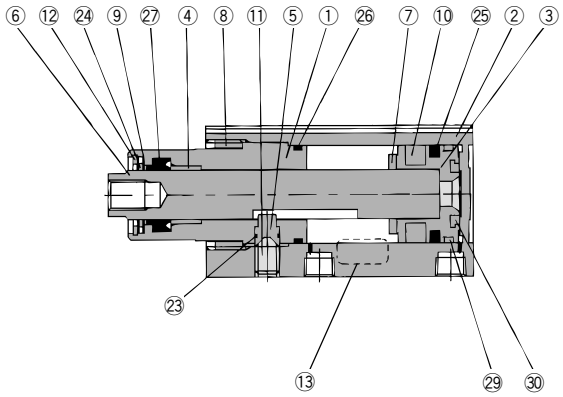
MK2□20, 25



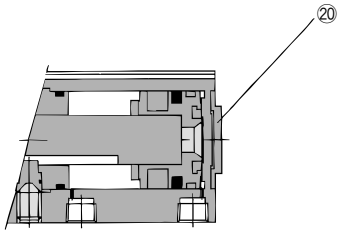
With arm (N)



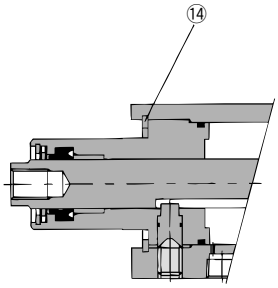
MK2□32



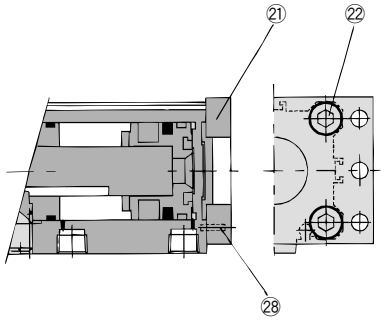
With boss on head end (F)



MK2□40 to 63



Head end 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	ø32 to ø63 only
5	**Guide pin**	Stainless steel	Nitriding
6	**Piston rod**	Stainless steel	ø20, ø25 Nitriding
		Carbon steel	ø32 to ø63 Heated, Nickel plated
7	**Bumper**	Urethane	
8	**Ring nut**	Copper alloy	ø20 to ø32 only
9	**Scraper pressure**	Stainless steel	
10	**Magnet**	—	
11	Hexagon socket head set screw	Chromium molybdenum steel	Sharp end section: 90°
12	Round R-type retaining ring	Spring steel	
13	**Name plate**	Aluminum	
14	Type C retaining ring	Carbon tool steel	ø40 to ø63 only
15	**Arm**	Rolled steel	

Component Parts

No.	Description	Material	Note	
16	**Clamp bolt**	Chromium molybdenum steel		
17	**Hexagon nut**	Rolled steel		
18	Hexagon socket head cap screw	Chromium molybdenum steel		
19	**Spring washer**	Hard steel		
20	Centering location ring	Aluminum alloy		
21	**Flange**	Rolled steel		
22	**Hexagon socket head cap screw**	Chromium molybdenum steel	Qty.	ø20, ø25: 2
				ø32 to ø63: 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 Kit

Bore size (mm)	20	25	32	40	50	63
Kit no.	Not able to disassemble			MK2-40-PS	MK2-50-PS	MK2-63-PS
Content	Set of nos. above ㉓ ㉔ ㉕ ㉖ ㉗					

∗ Seal kit includes ㉓ to ㉗. Order the seal kit, based on each bore size.
∗ Since the seal kit does not include a grease pack, order it separately.
Grease pack part no.: GR-S-010 (10g)

⚠ Precautions

Be sure to read before handling.
Refer to front matters 42 and 43 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

⚠ Caution

Clamp Arm Mounting

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

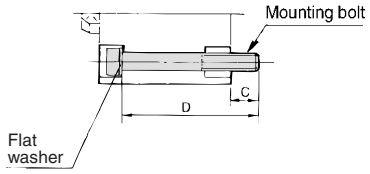
1. If one side of the piston is pressurized by supplying air with the clamp arm attached, the piston will move vertically while the clamp arm rotates. This operation could be hazardous to personnel, as their hands or feet could get caught by the clamp arm, or could lead to equipment damage. Therefore, 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 20 mm as its height.

Installation and Adjustment/ 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 MK2B

Mounting: Mounting bolt for through-hole type is available.
Ordering: Add the word "MK2B" to the mounting bolt size.
Example) **M5 x 75 L (MK2B)**



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

Cylinder model	C	D	Mounting bolt size
MK2B20-10	8.5	75	**M5 x 75 L**
MK2B20-20		85	**M5 x 85 L**
MK2B25-10	10.5	80	**M5 x 80 L**
MK2B25-20		90	**M5 x 90 L**
MK2B32-10	10	90	**M5 x 90 L**
MK2B32-20		100	**M5 x 100 L**
MK2B40-10	6	80	**M5 x 80 L**
MK2B40-20		90	**M5 x 90 L**
MK2B50-20	10.5	105	**M6 x 105 L**
MK2B50-50	10.5	135	**M6 x 135 L**
MK2B63-20	9	105	**M8 x 105 L**
MK2B63-50		135	**M8 x 135 L**

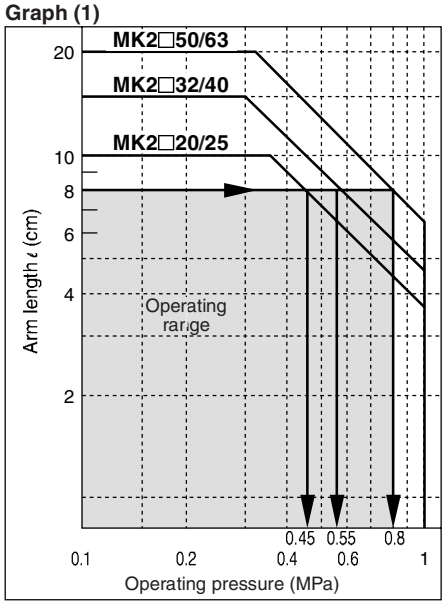
Precautions for Designing and Mounting Arms

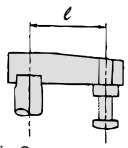
When arms are to be made separately, their length and mass should be within the following range.

1. Allowable bending moment

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

Graph (1)



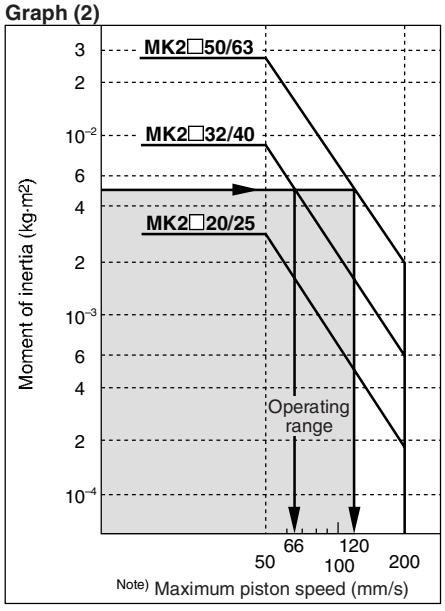


When arm length is 8 cm, pressure should be less than
MK2□20/25: 0.45 MPa
MK2□32/40: 0.55 MPa
MK2□50/63: 0.8 MPa.

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)



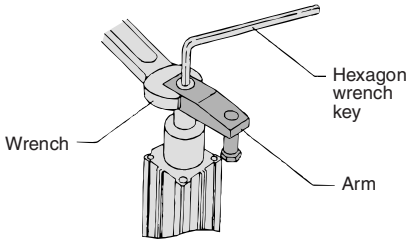
When arm's moment of inertia is 5 x 10^{-3} kg·m², cylinder speed should be less than
MK2□32/40: 66 mm/s
MK2□50/63: 120 mm/s.
For calculating moment of inertia, refer to pages 1234, 1235 and 1264.

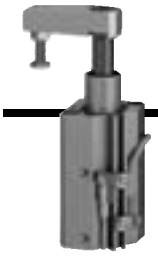
Note) Maximum piston speed is equivalent to approximately 1.6x the average piston speed. (Rough indication)

- 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.
(If an excessive force is applied in the rotary direction, it may bring about the damage to the internal mechanism.)
Refer to the following table for the tightening torque for mounting.

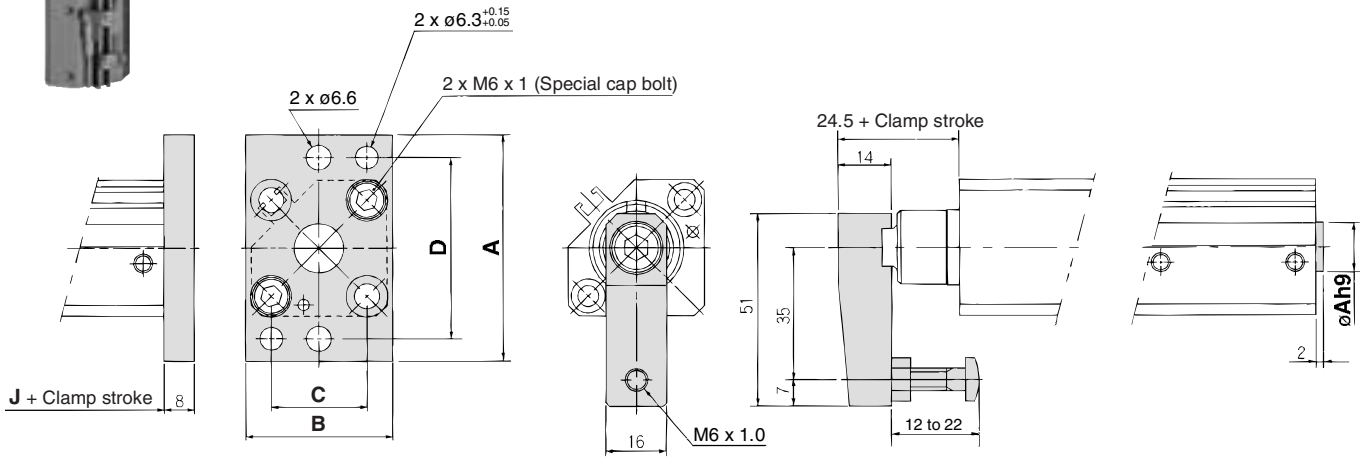
(N·m)

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





Dimensions: ø20, ø25



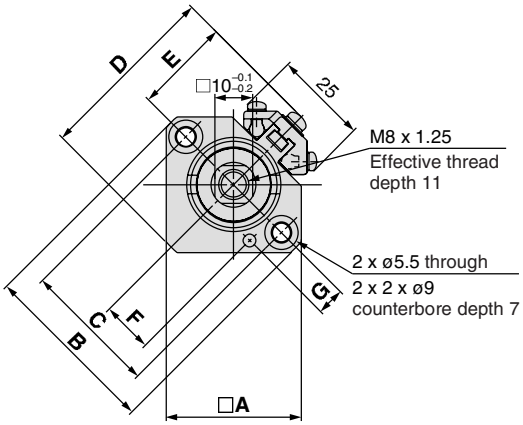
With arm

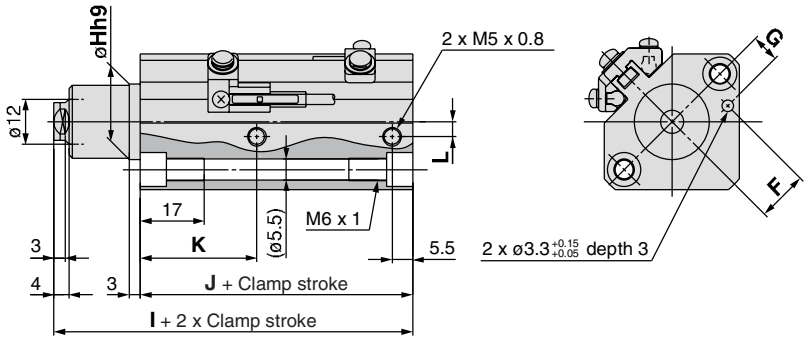
Head End Flange (mm)

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

With Boss on Head End (mm)

Model	ø**Ah9**
MK2□20-□□F	13 0 −0.043
MK2□25-□□F	15 0 −0.043





Through-hole/Both Ends Tapped Common (Standard) (mm)

Model	□A	B	C	D	E	F	G	øHh9	I	J	K	L
MK2B20	36	46.8	36	49	25.5	13.5 ±0.15	7.5 ±0.15	20 0 −0.052	75.5	62.5	31	4
MK2B25	40	52	40	54.5	28.5	16 ±0.15	8 ±0.15	23 0 −0.052	78.5	65.5	32	5

Note) Dimension when the rod is extended is to be added to clamp stroke plus rotary stroke.

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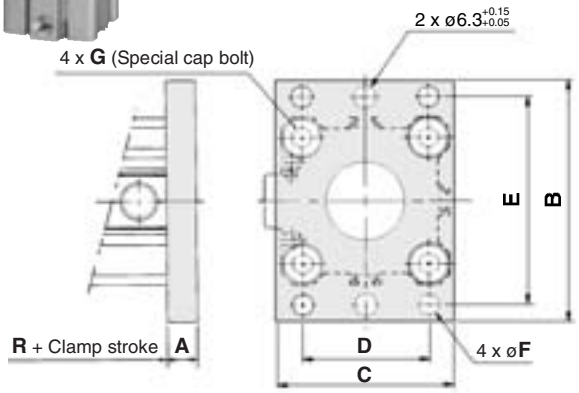
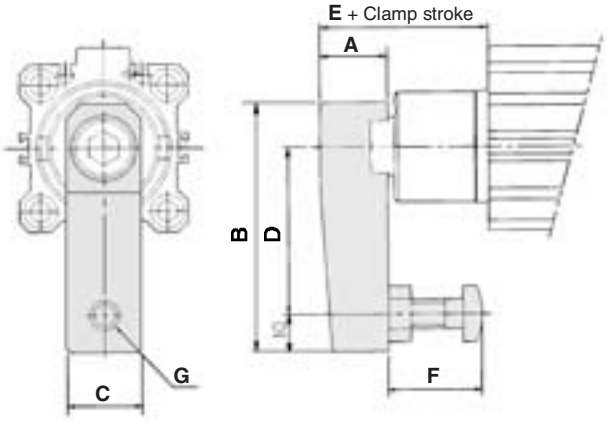
Dimensions: ø32, ø40, ø50, ø63





Head End Flange

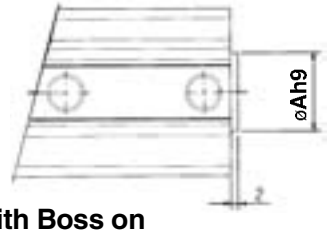
(mm)

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

(mm)

Model	A	B	C	D	E	F	G
MK2□32-□□N	18	67	20	45	39	15 to 25	M8 x 1.25
MK2□40-□□N	18	67	20	45	46		M8 x 1.25
MK2□50-□□N	22	88	22	65	58	30 to 40	M10 x 1.5
MK2□63-□□N	22	88	22	65	57.5		M10 x 1.5

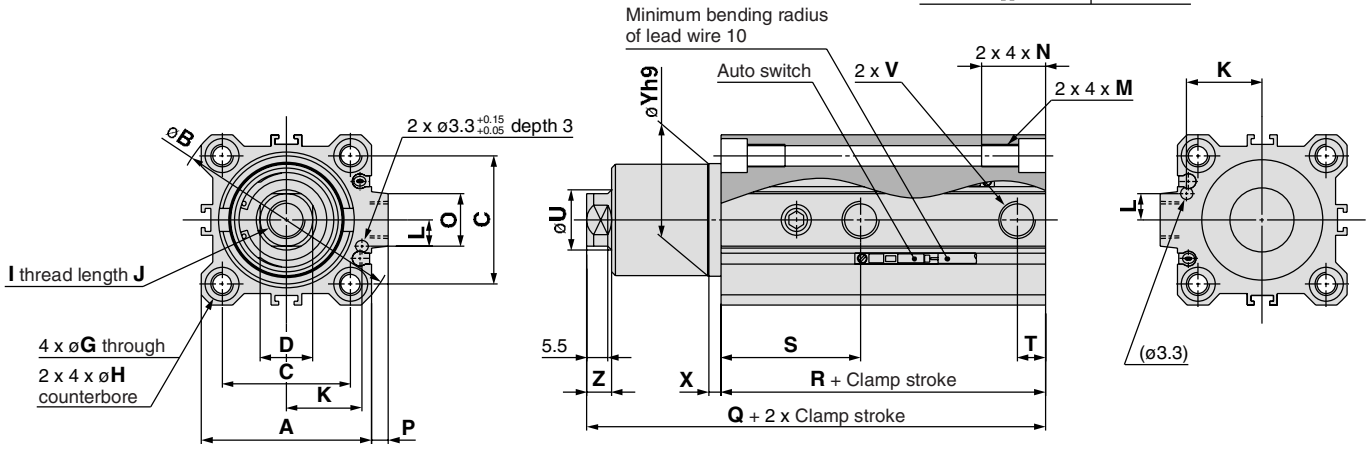


With Boss on Head End

(mm)

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) The below figures illustrate auto switches D-M9□, M9□W, M9□A, and A9□.



Through-hole/Both Ends Tapped Common (Standard)

(mm)

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
																						—	TN	TF			
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	Rc 1/8	NPT 1/8	G 1/8	3	30 $^{0}_{-0.062}$	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	Rc 1/8	NPT 1/8	G 1/8	3	30 $^{0}_{-0.062}$	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	Rc 1/4	NPT 1/4	G 1/4	3.5	37 $^{0}_{-0.062}$	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	Rc 1/4	NPT 1/4	G 1/4	3.5	48 $^{0}_{-0.062}$	7.5

Note 1) The cylinder rod is retracted.
Note 2) Rotary direction is viewed from the rod end when the piston rod is retracting.
Note 3) Dimension when the rod is extended is to be added to clamp stroke plus rotary stroke.

GENTLE AUTOMATIC SOLUTION SDN BHD
No.36, Jalan Industri USJ 1/13, Taman Perindustrian USJ 1, 47600 Subang Jaya, Selangor.
TEL: 603-8023 7743 / 8743 FAX: 603-8023 9743 email:sales@gentle.com.my / gpauto@tm.net.my