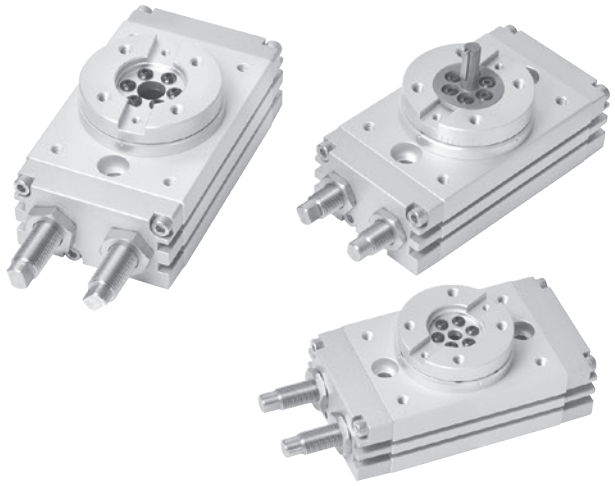
MCRB series

ROTARY ACTUATOR



Features

- Twin rack and pinion fitted as standard.
- Can be adjusted between 0 and 190 degrees.
- Simple mounting of sensors.
- Magnetic as standard.

Specification

Model		MCRB			
Acting type		Double acting			
Tube I.D. (mm)		16	20	25	32
Port size		Rc1/8			
Medium		Air			
Max. operating pressure	Adjusting bolt	1 MPa			
	Shock absorber	0.6 MPa (*1)			
Min. operating pressure		0.1 MPa (*2)			
Proof pressure		1.5 MPa			
Ambient temperature		-5~+60°C (No freezing)			
Lubrication		Not required			
Cushion		NBR spacer			
Allowable kinetic energy	Cushion pad	0.007J	0.040J	0.081J	0.32J
	Cushion	0.039J	0.116J	0.294J	1.6J
Stable rotation time regulation range		0.2~1.0 s/90°			
Sensor switch		RCD (Please refer to page 5-5)			
Weight (kg)		0.7	1.16	1.57	3.07

*1. The maximum operating pressure of the actuator is restricted by the maximum allowable thrust of the shock absorber.

*2. No-load conditions.

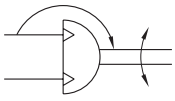
*3. The shock absorber is expendable. Replace when damping performance decrease.

Order example

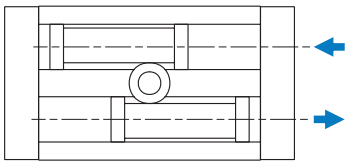
MCRB — 20R — FR — □

- MODEL
- TUBE I.D.
- ANGLE ADJUSTER
  Blank: Adjuster bolts
  R: Shock absorber
- TYPE
  Blank: Standard type
  FR: Flange rod type
- PORT THREAD
  Blank: Rc thread
  G: G thread
  NPT: NPT thread

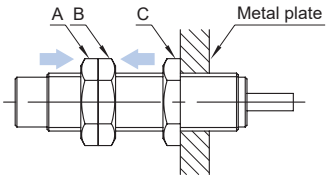
Symbol



Action profile

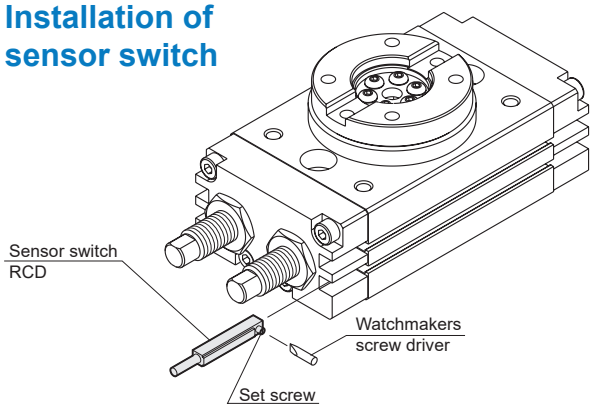


Installation guide of shock absorber

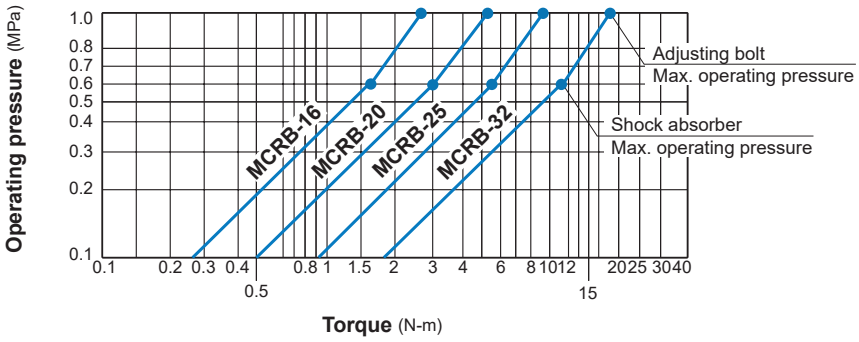


1. Install 3 nuts on the shock absorber as the picture shown.
2. Bind the A nut and B nut together via tightening them with different rotating direction.
3. Hold B nut and rotate C nut to bind the plate and C nut together.
4. Unbind the A nut and B nut. The installation is complete.

Installation of sensor switch



Torque diagram



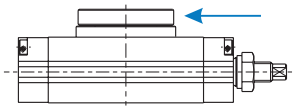
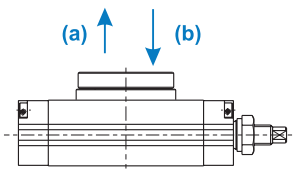
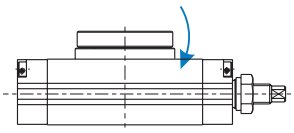
Theoretic force

Unit: N·m

Model		MCRB			
Tube I.D.		16	20	25	32
Operating pressure (MPa)	**0.1**	0.26	0.5	0.91	1.88
	0.2	0.52	1	1.81	3.78
	0.3	0.78	1.5	2.72	5.66
	0.4	1.04	2.01	3.62	7.56
	0.5	1.31	2.51	4.55	9.44
	0.6	1.57	3	5.45	11.32
	0.7	1.83	3.5	6.36	13.23
	0.8	2.09	4.02	7.26	15.12
	0.9	2.35	4.52	8.17	17.01
	1.0	2.61	5.03	9.08	18.9

Allowable load

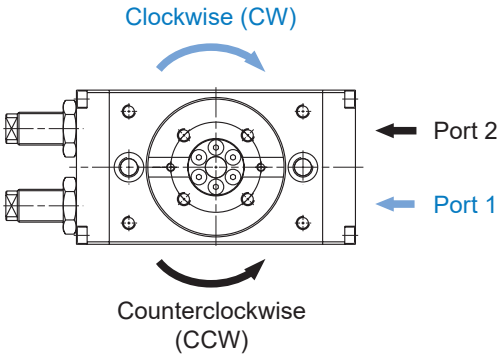
Set the load and moment to be applied to the table within the allowable values shown in the table below.
(Values outsize of limitations will cause excessive play, deteriorate accuracy, and shorten service life.)

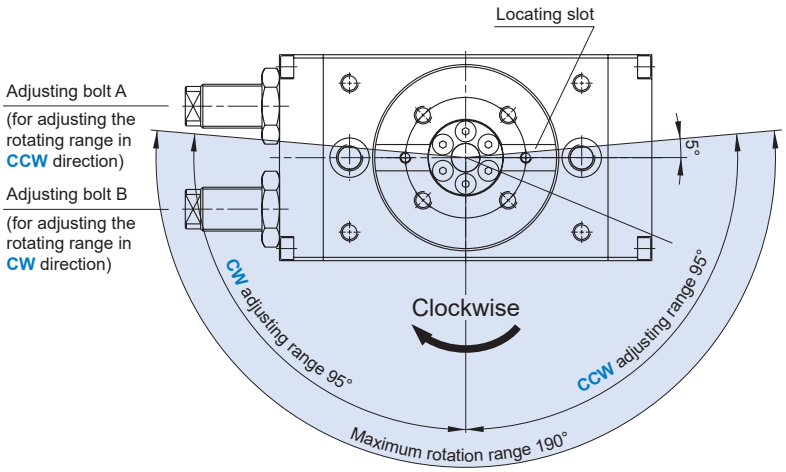
Pictures				
Tube I.D.	Allowable radial load (N)	Allowable thrust load (N)		Allowable moment (N.m)
		(a)	**(b)**	
16	78	74	78	2.4
20	196	197	363	5.3
25	314	296	451	9.7
32	390	493	708	18

Rotating direction and angle

- When the port 1 is pressurized, the flange rotates in clockwise (CW) direction.
- When the port 2 is pressurized, the flange rotates in counter-clockwise (CCW) direction.

  The rotating angle range can be adjust by the method shown as right figure.





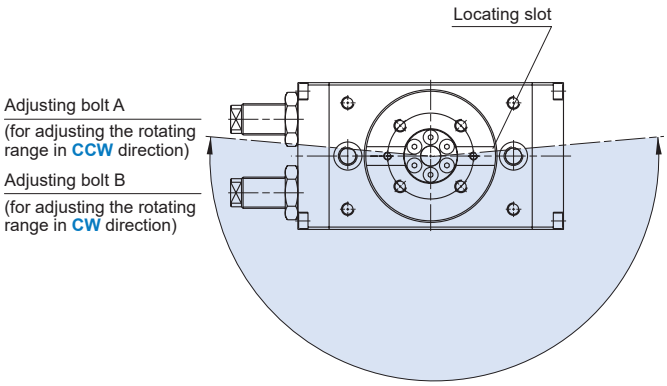
NOTE

- The figure shows the rotating range and use the pin hole as indicator.
- The locating slot in the figure locates at the situation which the CCW & CW rotating range are both adjusted at 90°.

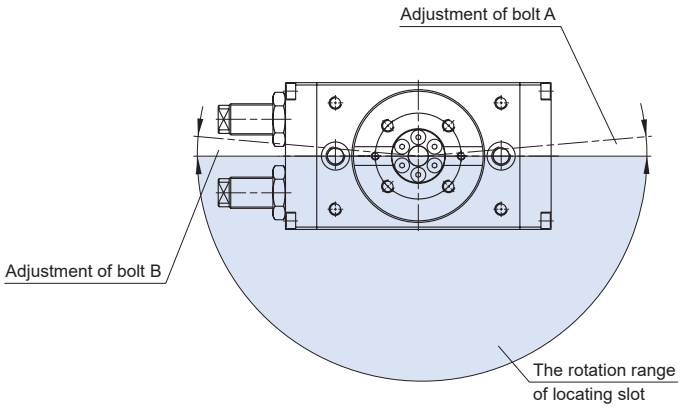
Rotating range adjusting example

- The followed figures show the rotating range of different adjustment via bolt A and B. (The drawings also show the rotation ranges of the locating slot.)

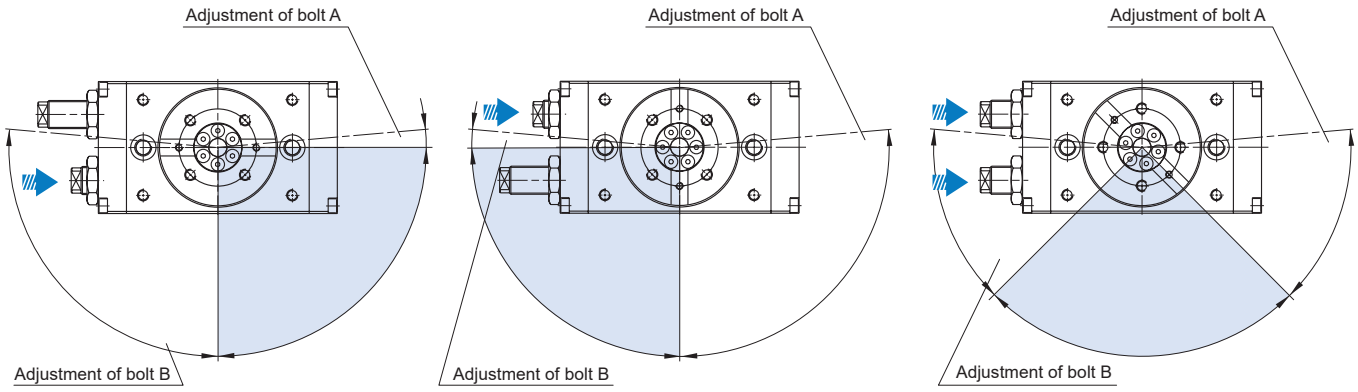
190° (Max) Rotation



180° Rotation

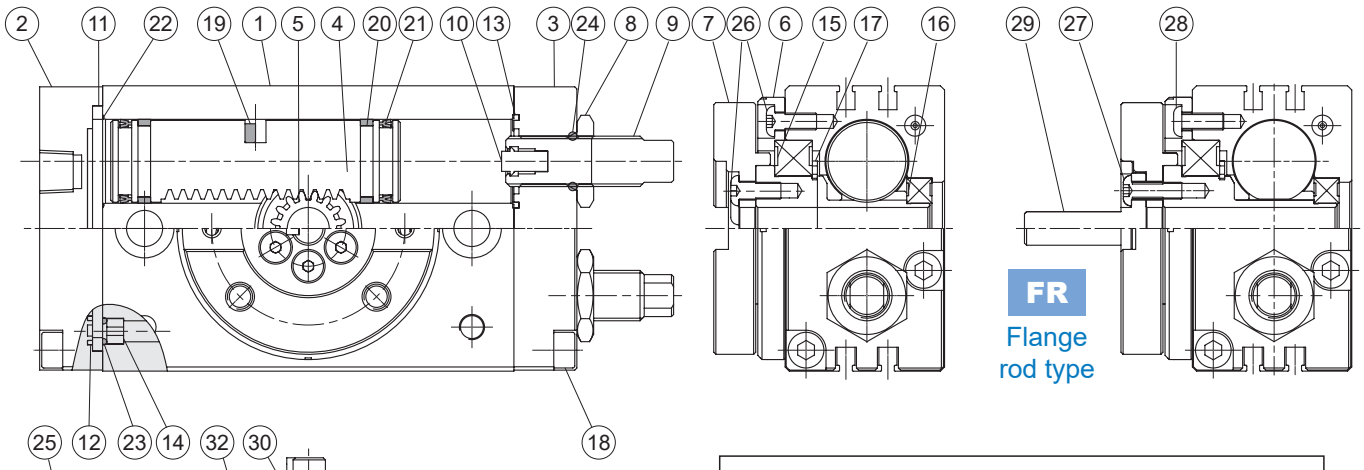


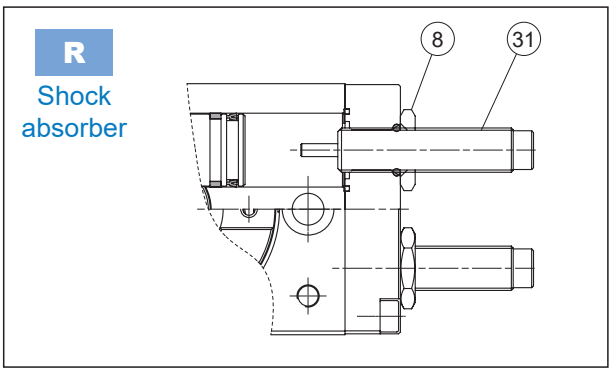
90° Rotation



MCRB Inside structure & Parts list

ROTARY ACTUATOR





Material

No.	Part name	Material	Q'y	Repair kits (inclusion)
1	Body	Aluminum alloy	1	
2	Cover	Aluminum alloy	1	
3	End cover	Aluminum alloy	1	
4	Piston	Stainless steel	2	
5	Pinion	SCM	1	
6	Bearing retainer	Aluminum alloy	1	
7	Table	Aluminum alloy	1	
8	Seal nut	Stainless steel	2	
9	Adjusting bolt *1	Stainless steel	2	
10	Cushion pad *1	NBR	2	●
11	Plate	Aluminum alloy	1	
12	Packing	NBR	1	●
13	Packing	NBR	2	●
14	Fixed	Copper	2	
15	Ball bearing	Bearing steel	1	
16	Ball bearing	Bearing steel	1	
17	Snap ring	Spring steel	1	
18	Bolt	Stainless steel	8	
19	Magnet	Magnet material	2	
20	Wear ring	Resin	4	
21	Piston packing	NBR	4	●

No.	Part name	Material	Q'y	Repair kits (inclusion)
22	O-ring	NBR	2	●
23	O-ring	NBR	2	●
24	O-ring	NBR	2	●
25	Screw	Carbon steel	2	
26	Bolt	Carbon steel	10	
27	Bolt *2	Carbon steel	6	
28	Bolt *2	Carbon steel	4	
29	Rotate shaft *2	Carbon steel	1	
30	Round key *2	Carbon steel	1	
31	Shock absorber *3	–	2	
32	Round key	Carbon steel	1	

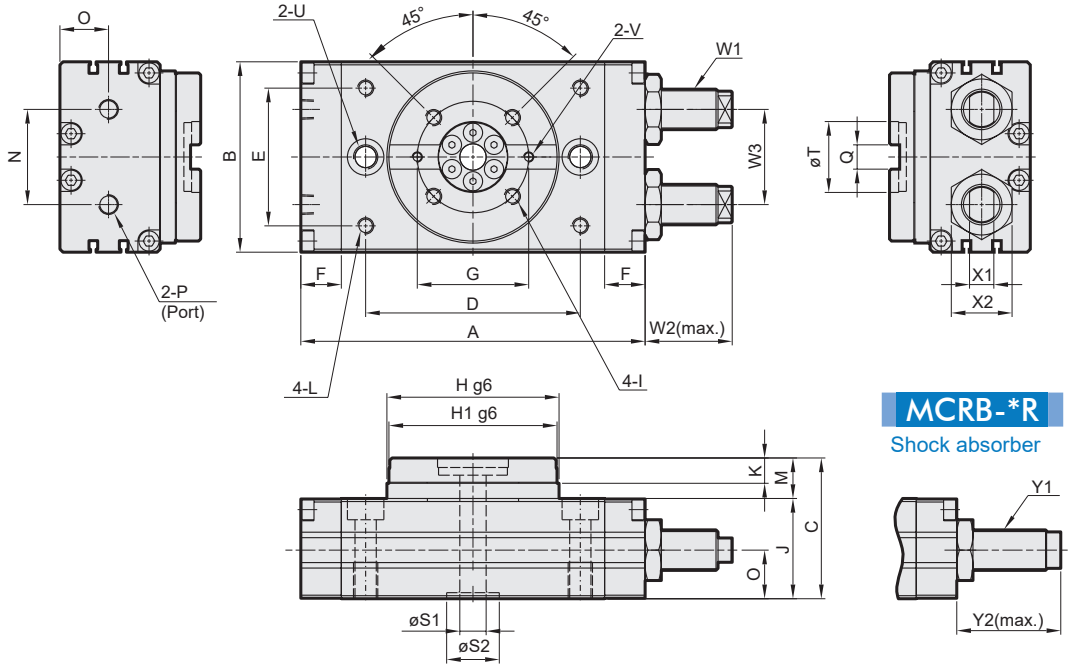
*1. Only suitable for adjuster bolts.
*2. No.27~30 for (FR) flange rod type.
*3. Only suitable for (R) shock absorber.

Order example of repair kits

Tube I.D.	Repair kits	
	Adjuster bolts	Shock absorber (R)
ø16	**PS-MCRB-16**	**PS-MCRB-16R**
ø20	**PS-MCRB-20**	**PS-MCRB-20R**
ø25	**PS-MCRB-25**	**PS-MCRB-25R**
ø32	**PS-MCRB-32**	**PS-MCRB-32R**

MCRB Dimensions ø16~ø32

ROTARY ACTUATOR



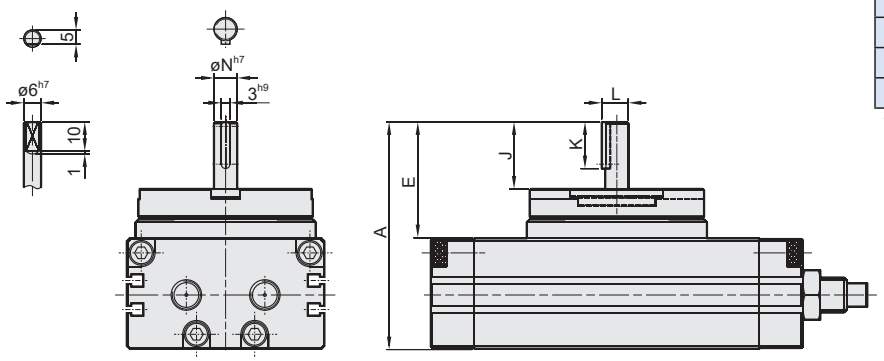
Code / Tubr I.D.	A	B	C	D	E	F	G	H	H1	I	J	K	L	M	N	O	P
16	108	58	47	62	38	15	38	50	48	M5×7dp,P.C.D38	33	8	M5×8dp	14	26	15.5	Rc1/8
20	128	68	55	78	47	15	46	62.5	60	M6×7dp,P.C.D46	38	10	M6×8dp	17	27	18.5	Rc1/8
25	135.5	77	58.5	84	55	15.5	48	67	65	M6×9dp,P.C.D48	41.5	10	M6×8dp	17	37	20	Rc1/8
32	170	94	69.5	106	68	20	55	85	83	M8×10dp,P.C.D55	49.5	12.5	M8×8.5dp	20	47	24	Rc1/8

Code / Tubr I.D.	Q	S1	S2	T	U	V	W1	W2
16	$8^{+0.03}_{-0}$ (wide)×3.3dp	6	17 $H9^{+0.043}_{0}$×2.5dp	24 $H9^{+0.052}_{0}$×3dp	2-ø6.8 thru,ø11×6.5dp,M8×12dp(sink)	M3×4dp	M10×1.0	27
20	$10^{+0.03}_{-0}$ (wide)×3.5dp	10	22 $H9^{+0.052}_{0}$×2.5dp	32 $H9^{+0.062}_{0}$×3dp	2-ø8.6 thru,ø14×8.5dp,M10×15dp(sink)	M4×6dp	M12×1.0	23
25	$12^{+0.03}_{-0}$ (wide)×4dp	13	22 $H9^{+0.052}_{0}$×3dp	32 $H9^{+0.062}_{0}$×3.7dp	2-ø8.6 thru,ø14×8.5dp,M10×15dp(sink)	M4×5dp	M14×1.5	36
32	$12^{+0.03}_{-0}$ (wide)×5dp	13	26 $H9^{+0.052}_{0}$×3dp	35 $H9^{+0.062}_{0}$×4.7dp	2-ø10.5 thru,ø18×10.5dp,M12×18dp(sink)	M5×5dp	M20×1.5	43

Code / Tubr I.D.	W3	X1	X2	Y1	Y2
16	26	7	17	FK-1008L-S	24
20	32	8	19	FK-1210L-S	36.5
25	37	8	22	FK-1412L-S	41
32	47	12	30	FK-2016L-S	55

Flange rod type

ø16 ø20~ø32

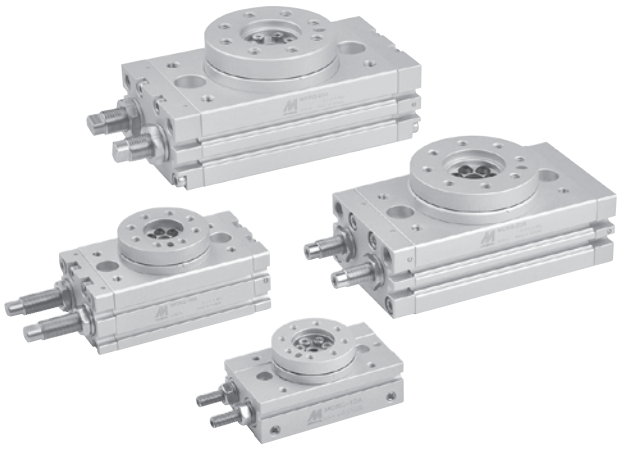


Code / Tubr I.D.	A	E	J	K	L	N
16	64.5	31.5	17.5	-	-	-
20	78	40	23	16	9.2	8
25	81.5	40	23	20	11.2	10
32	109.5	60	40	20	13.2	12

* Other dimensions are the same as standard type.

MCRQ series

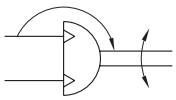
ROTARY ACTUATOR



Features

- Centering boss and locating hole for accurate positioning.
- Operating range of table is 0°~190° by angle adjusting screw
- Compact design using double rack and single pinion.
- Hollow shaft standard for wiring and piping.
- Possible to fit shock absorbers as stops.
- Ease of mounting with integral table.
- Magnetic as standard.

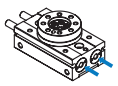
Symbol

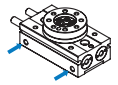


Order example

MCRQ — 20R — □ — □

- MODEL
- TUBE I.D.
- ANGLE ADJUSTER
  - **A**: With adjusting bolt
  - **R**: With shock absorber
  - * ø12 without shock absorber.
- PORT LOCATION (*)
  - Blank: End port

    
  - **E**: Front port

    
  - * ø12 only option.
  - * Port location cannot be changed after delivery.
- PORT THREAD
  - Blank: M5×0.8 (for ø12, ø16)
  - Blank: Rc thread
  - **G**: G thread
  - **NPT**: NPT thread (for ø20~ø40)

Specification

Model		MCRQ					
Acting type		Double acting					
Tube I.D. (mm)		12	16	20	25	32	40
Port size		M5×0.8		Rc1/8			
Medium		Air					
Max. operating pressure	adjusting bolt	0.7MPa	1 MPa				
	shock absorber	—	0.6 MPa (*1)				
Min. operating pressure		0.1 MPa (*2)					
Ambient temperature		0~+60°C (No freezing)					
Cushion	adjusting bolt	Rubber bumper					
	shock absorber	—	Shock absorber (*3)				
Angle adjustment range		0° to 190°(max.) (*4)					
Sensor switch (*4)	2 wire	**RDFE(V)**: Non-contact					
	3 wire	**RNFE(V)**: NPN, **RPFE(V)**: PNP					
Weight (kg)	adjusting bolt	0.25	0.60	1.24	2.10	4.18	7.67
	shock absorber	—	0.61	1.31	2.12	4.19	7.72
Minimum rotation that will not allow decrease of energy absorption ability		—	72°	58°	69°	77°	82°

*1. The maximum operating pressure of the actuator is restricted by the maximum allowable thrust of the shock absorber.

*2. No-load conditions.

*3. The shock absorber is expendable. Replace when damping performance decrease.

*4. Be careful if the rotation angle of a type with internal shock absorber is set below the value in the table below, the piston stroke will be smaller than the shock absorber's effective stroke, resulting in decreased energy absorption ability.

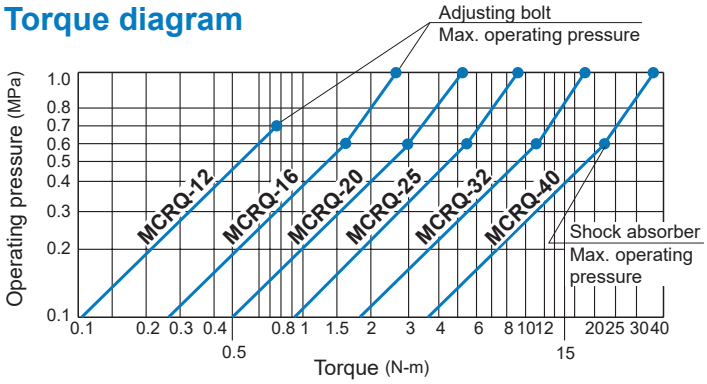
*5. R*FE(V) specification, please refer to page 5-11.

Allowable kinetic energy and rotation time adjustment range

Model	Allowable kinetic energy (J)		Rotation time adjustment range for stable operation(s/90°)	
	Adjustment bolt	Internal shock adsorber	Adjustment bolt	Internal shock adsorber
MCRQ-12	0.006	—	0.2 to 1.0	—
MCRQ-16	0.007	0.039		0.2 to 0.7
MCRQ-20	0.048	0.116		
MCRQ-25	0.081	0.294		
MCRQ-32	0.32	1.6	0.2 to 2.0	0.2 to 1.0
MCRQ-40	0.53	2.9	0.2 to 2.5	

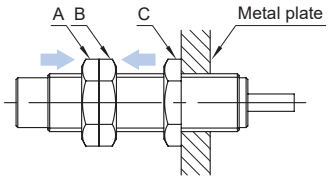
* Be careful if a type with internal absorber is used below the minimum speed, the energy absorption ability will decrease drastically.

Torque diagram



Installation guide of shock absorber

1. Install 3 nuts on the shock absorber as the picture shown.
2. Bind the A nut and B nut together via tightening them with different rotating direction.
3. Hold B nut and rotate C nut to bind the plate and C nut together.
4. Unbind the A nut and B nut. The installation is complete.
5. For the tightening torque of the fixed nut of the shock absorber, please refer to the table below.



Tube I.D.	Max. tightening torque (N.m)
16	1.67
20	3.14
25	10.8
32	23.5
40	62.8

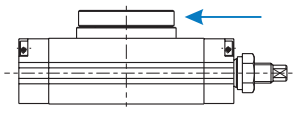
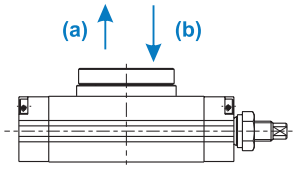
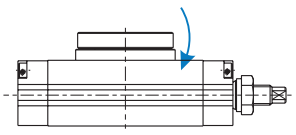
Theoretic force

Unit: N·m

Model		MCRQ					
Tube I.D.		12	16	20	25	32	40
Operating pressure (MPa)	0.1	0.1	0.26	0.5	0.91	1.88	3.78
	0.2	0.21	0.52	1	1.81	3.78	7.53
	0.3	0.31	0.78	1.5	2.72	5.66	11.31
	0.4	0.41	1.04	2.01	3.62	7.56	15.09
	0.5	0.52	1.31	2.51	4.55	9.44	18.87
	0.6	0.63	1.57	3	5.45	11.32	22.62
	0.7	0.73	1.83	3.5	6.36	13.23	26.4
	0.8	–	2.09	4.02	7.26	15.12	30.16
	0.9	–	2.35	4.52	8.17	17.01	33.93
	1.0	–	2.61	5.03	9.08	18.9	37.7

Allowable load

Set the load and moment to be applied to the table within the allowable values shown in the table below.
(Values outsize of limitations will cause excessive play, deteriorate accuracy, and shorten service life.)

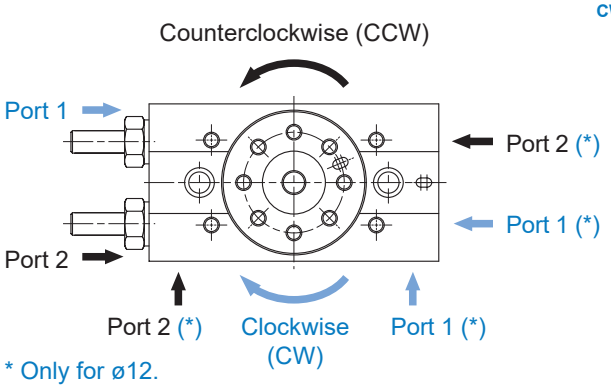
Pictures			

Tube I.D.	Allowable radial load (N)	Allowable thrust load (N)		Allowable moment (N.m)
		(a)	(b)	
12	54	71	71	1.5
16	78	74	78	2.4
20	196	197	363	5.3
25	314	296	451	9.7
32	390	493	708	18
40	543	740	1009	25

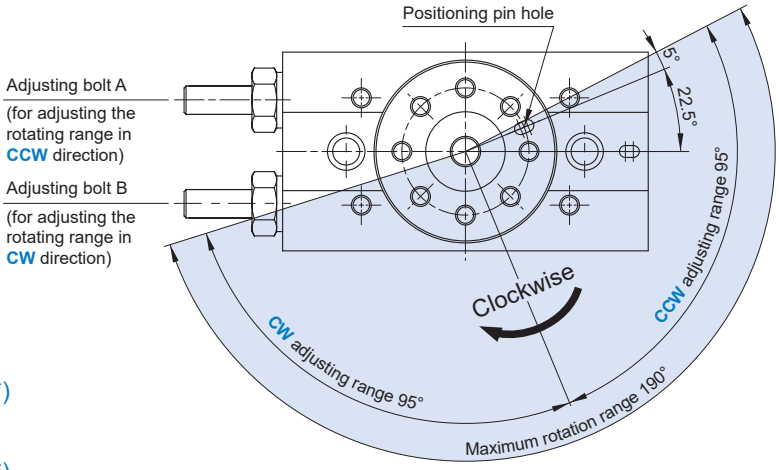
Rotating direction and angle

- When the port 1 is pressurized, the flange rotates in clockwise (CW) direction.
- When the port 2 is pressurized, the flange rotates in counter-clockwise (CCW) direction.

  The rotating angle range can be adjust by the method shown as right figure.



* Only for ø12.



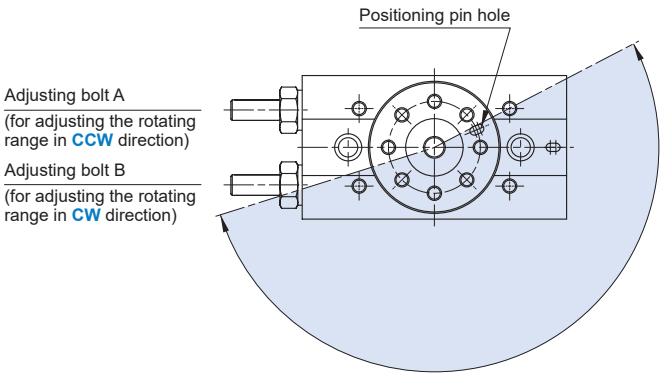
NOTE

- The figure shows the rotating range and use the pin hole as indicator.
- The pin hole position in the figure locates at the situation which the CCW & CW rotating range are both adjusted at 90°.

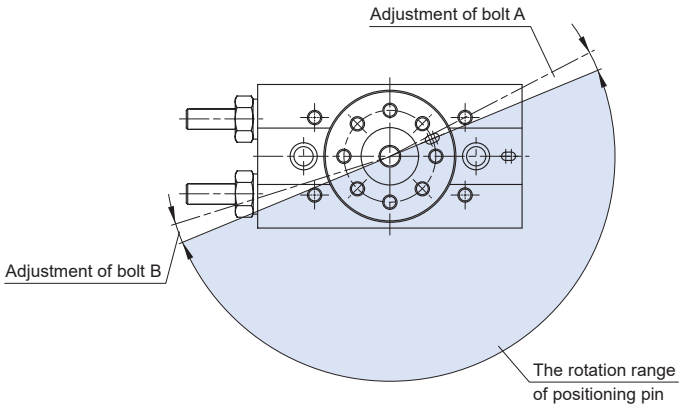
Rotating range adjusting example

- The followed figures show the rotating range of different adjustment via bolt A and B. (The drawings also show the rotation ranges of the positioning pin hole.)

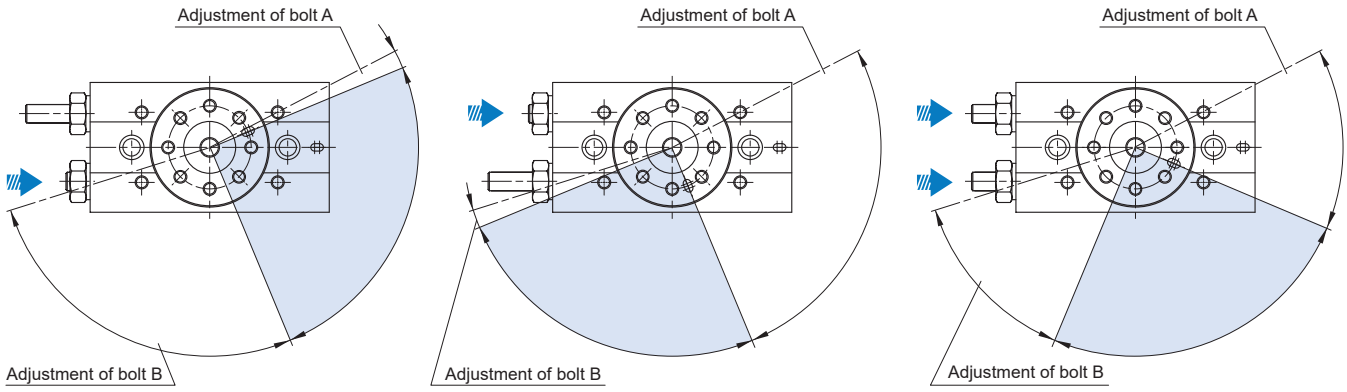
190° (Max) Rotation



180° Rotation



90° Rotation

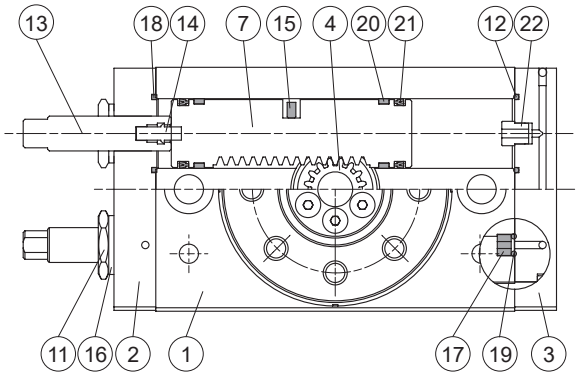


MCRQ Inside structure & Parts list

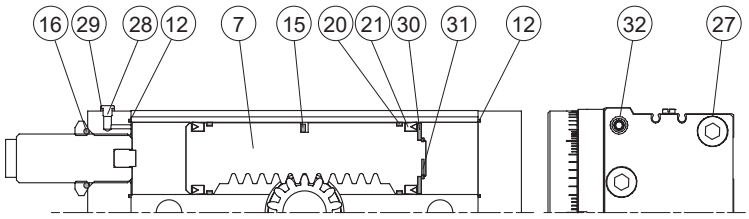
ROTARY ACTUATOR

mindman

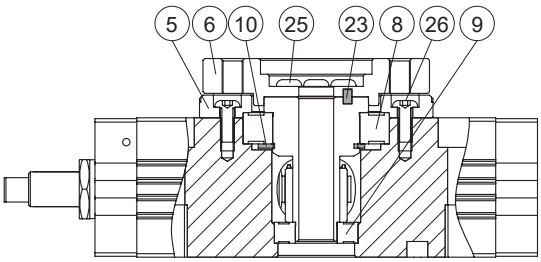
ø16~ø32

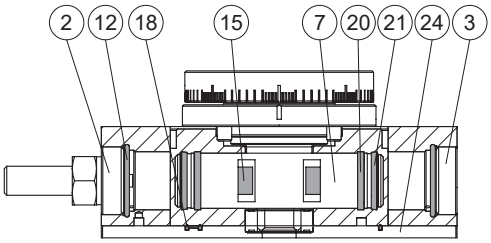


ø40



ø12





Material

A: Repair kits (inclusion)

No.	Part name	Material	Tube I.D. & Q'y				A
			12	16	20~32	40	
1	Body	Aluminum alloy	1				
2	Cover	Aluminum alloy	2	1			
3	End cover	Aluminum alloy	2	1			
4	Pinion	SCM	1				
5	Bearing retainer	Aluminum alloy	1				
6	Table	Aluminum alloy	1				
7	Piston	Stainless steel	2				
8	Rolling bearing	Bearing steel	1				
9	Rolling bearing	Bearing steel	1				
10	Snap ring	Spring steel	–	1		–	
11	Seal nut	Carbon steel	2				
12	O-ring	NBR	4		2	4	●
13	Adjusting bolt *1	Stainless steel *2	2				
	Shock absorber *3	–	–	2			
14	Cushion pad *1	NBR	2				●
15	Magnet	Magnet material	4	2			
16	Seal washer	*4	2				●
17	Fixed	Copper	–	4	2	–	
18	Piston packing	NBR	1	–	2	–	●
19	O-ring	NBR	–	4	2	–	●
20	Wear ring	Resin	4				

*1. Only suitable for (A) with adjusting bolt. *2. ø40: Carbon steel
*3. Only suitable for (R) with shock absorber.
*4. ø12~ø32: NBR+Carbon steel; ø40: NBR

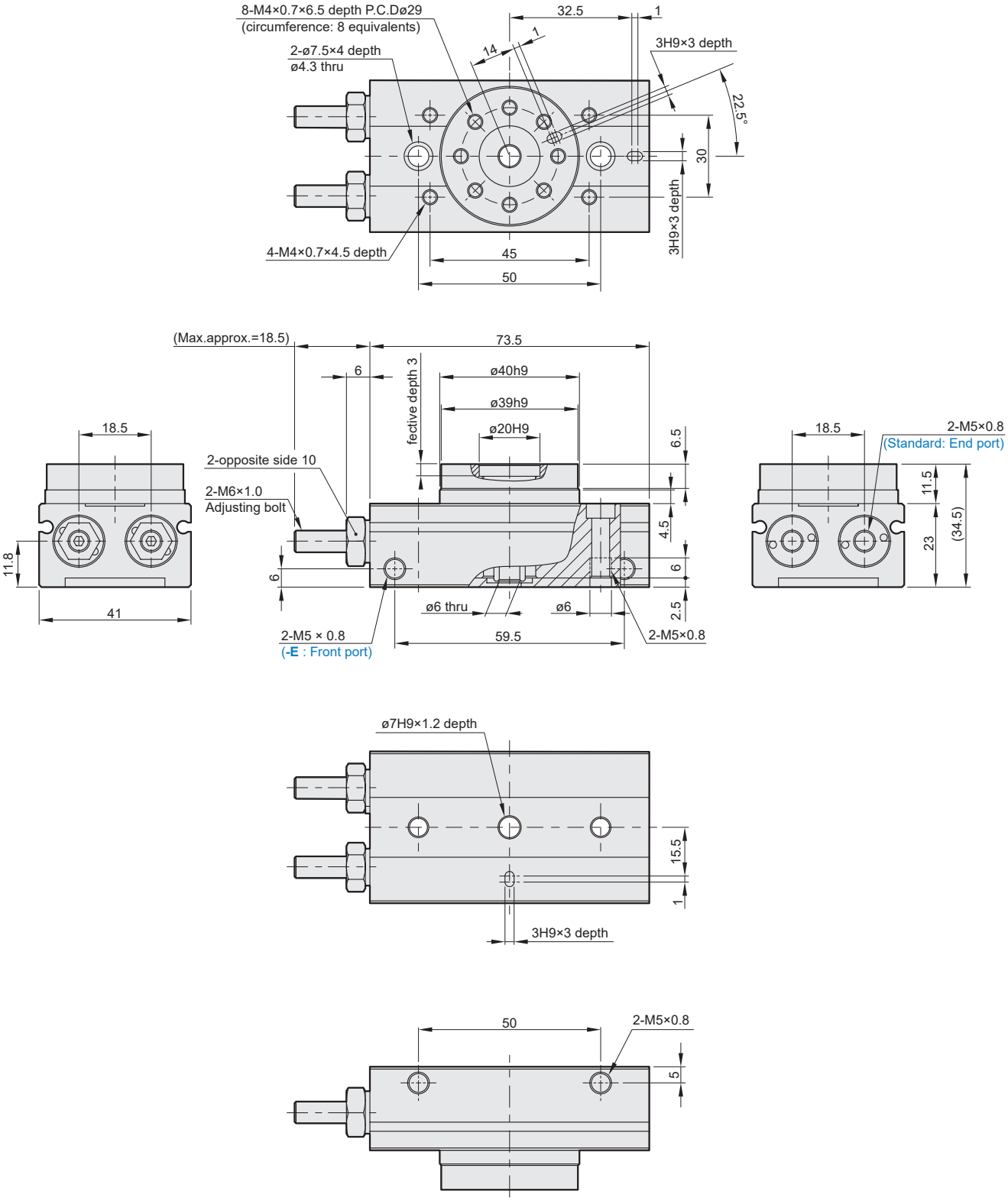
A: Repair kits (inclusion)

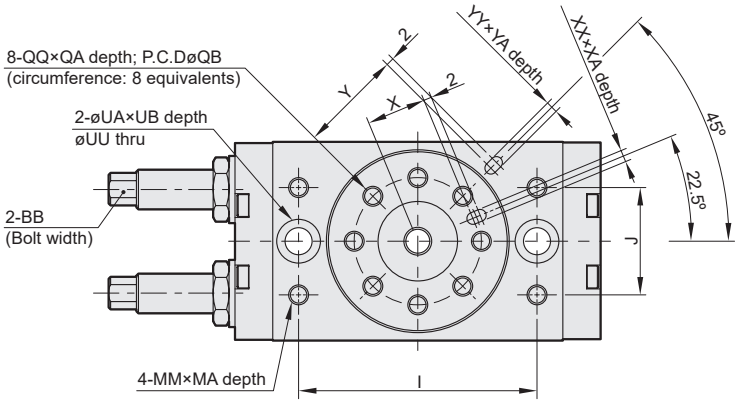
No.	Part name	Material	Tube I.D. & Q'y						A
			12	16	20	25	32	40	
21	Piston Seal	NBR	4						●
22	Stop chunk	Aluminum alloy	–	2				–	
23	Pin *5	SCM	1						
24	Plate	Aluminum alloy	1	–					
25	Bolt	Stainless steel *6	6						
26	Bolt	Carbon steel	4	6	4	6			
27	Bolt	Stainless steel	4						
28	Plug	Copper	–					1	
29	Plug washer	PET	–					1	
30	Piston retainer	Aluminum alloy	–					2	
31	Piston snap ring	Spring steel	–					2	
32	Plug	Carbon steel	–					2	

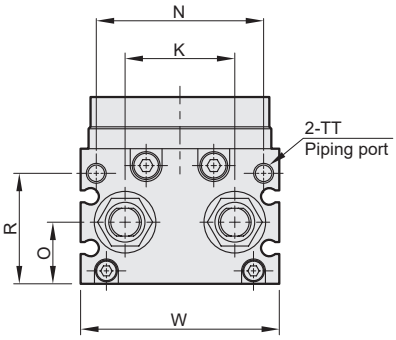
*5. ø20~ø40: Key
*6. ø16, ø20: Carbon steel

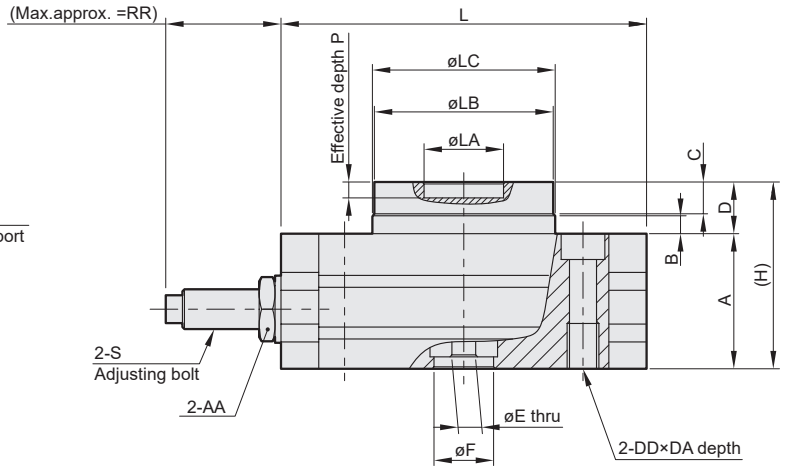
Order example of repair kits

Tube I.D.	Repair kits	
	Adjuster bolts (A)	Shock absorber (R)
ø12	**PS-MCRQ-12A**	–
ø16	**PS-MCRQ-16A**	**PS-MCRQ-16R**
ø20	**PS-MCRQ-20A**	**PS-MCRQ-20R**
ø25	**PS-MCRQ-25A**	**PS-MCRQ-25R**
ø32	**PS-MCRQ-32A**	**PS-MCRQ-32R**
ø40	**PS-MCRQ-40A**	**PS-MCRQ-40R**


8-M4×0.7×6.5 depth P.C.Dø29
(circumference: 8 equivalents)
2-ø7.5×4 depth
ø4.3 thru
32.5
1
14
1
3H9×3 depth
22.5°
30
3H9×3 depth
4-M4×0.7×4.5 depth
45
50
(Max.approx.=18.5)
73.5
6
ø40h9
ø39h9
ø20H9
fective depth 3
6.5
4.5
6
2.5
2-opposite side 10
2-M6×1.0
Adjusting bolt
18.5
11.8
41
ø6 thru
ø6
2-M5 × 0.8
(-E : Front port)
59.5
2-M5×0.8
18.5
2-M5×0.8
(Standard: End port)
11.5
23
(34.5)
ø7H9×1.2 depth
15.5
1
3H9×3 depth
50
2-M5×0.8
5

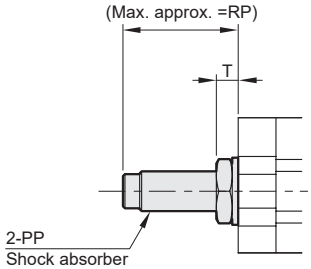


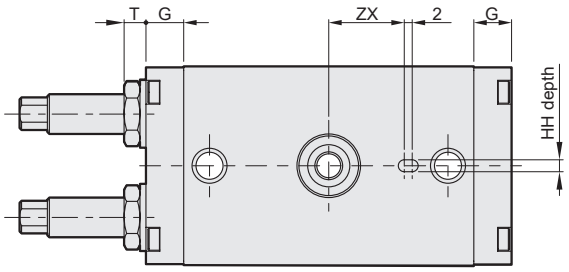




MCRQ-16~25R

With shock absorber



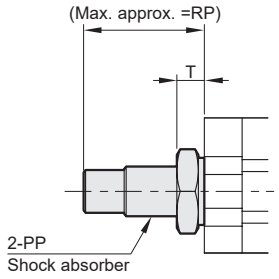


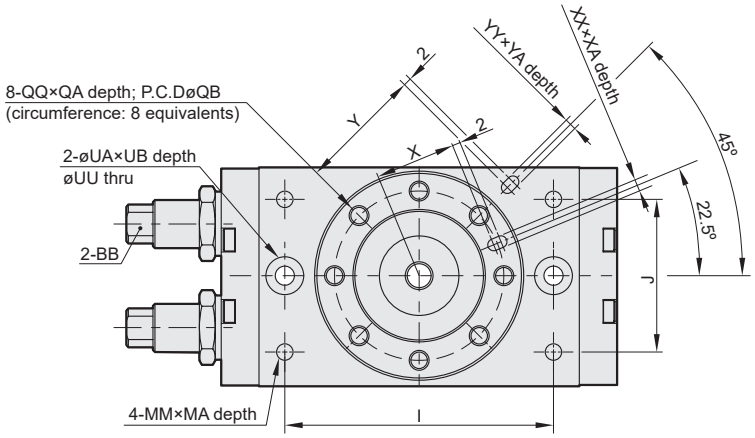
Code / Tubr I.D.	A	AA	B	BB	C	D	DA	DD	E	F	G	H	HH	I	J	K	L	LA	LB	LC	MA	MM	N
16	34	14	4.5	7	8	13	12	M8×1.25	6	15H9	9.5	47	3H9×3.5	60	27	26	92	20H9	45h9	46h9	8	M5×0.8	37
20	40	17	6.5	7	10	17	15	M10×1.5	10	22H9	12	57	4H9×4.5	84	37	32	127	32H9	65h9	67h9	8	M6×1	54
25	46	22	7.5	8	12	20	18	M12×1.75	13	26H9	15.5	66	5H9×5.5	100	50	37	152	35H9	75h9	77h9	8	M8×1.25	63

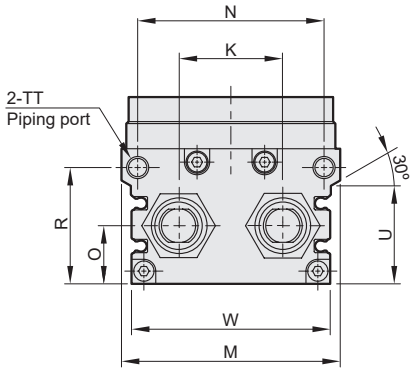
Code / Tubr I.D.	O	P	PP	QA	QB	QQ	R	RP	RR	S	T	TT	UA	UB	UU	W	X	XA	XX	Y	YA	YY	ZX
16	15.5	4	FK-1008L-S	8	32	M5×0.8	29	29	31	M10×1.0	5.5	M5×0.8	11	6.5	6.8	50	15	3.5	3H9	27	3.5	3H9	19
20	19.5	4.5	FK-1008L-S	10	48	M6×1.0	33	23.5	26	M10×1.0	4.5	Rc1/8	14	8.5	8.6	70	23	4.5	4H9	39	4.5	4H9	28
25	22	5	FK-1412L-S	12	55	M8×1.25	37.5	33	31.2	M14×1.5	7.5	Rc1/8	18	10.5	10.5	80	26.5	5.5	5H9	45	5.5	5H9	33

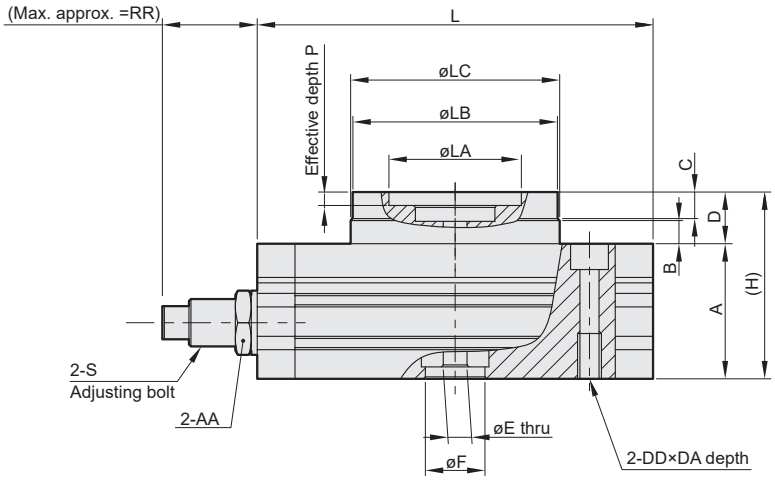
MCRQ-32R, 40R

With shock absorber

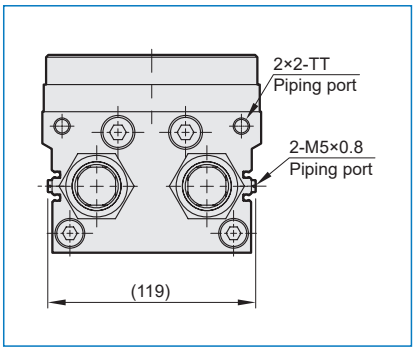


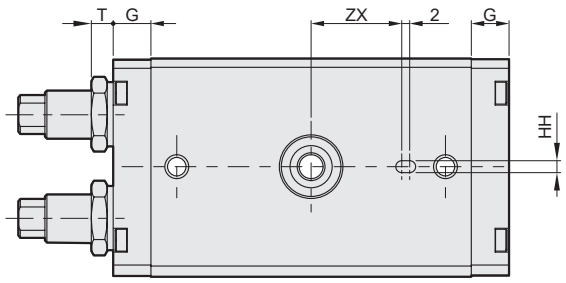






MCRQ-40





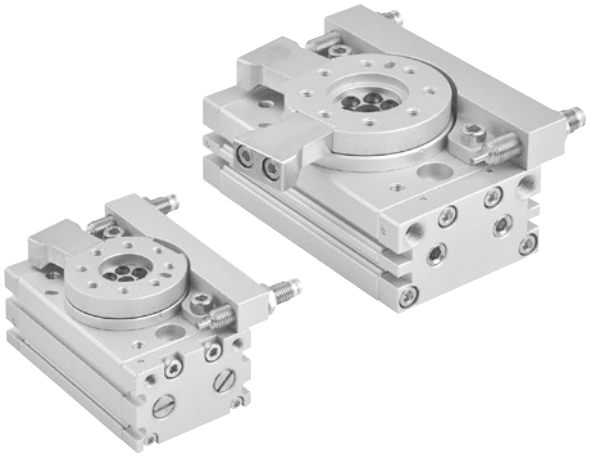
Code / Tubr I.D.	A	AA	B	BB	C	D	DA	DD	E	F	G	H	HH	I	J	K	L	LA	LB	LC	M	MA
32	59	30	12	Bolt width 12	14.5	27	18	M12×1.75	13	24H9	17	86	6H9×4.5 dp	130	66	47	189	56H9	98h9	100h9	102	10
40	74	36	15	Bolt width 21	16.5	32	25	M16×2.0	24	32H9	24	106	8H9×6.5 dp	150	80	60	240	64H9	116h9	118h9	120	13

Code / Tubr I.D.	MM	N	O	P	PP	QA	QB	QQ	R	RP	RR	S	T	TT	U	UA	UB	UU	W	X	XA
32	M8×1.25	85	27.5	6	FK-2016L-S	14.5	77	M10×1.5	50.5	46	38.1	M20×1.5	10.5	Rc1/8	42	18	10.5	10.5	95	37.5	6.5
40	M12×1.75	100	37	9	FK-2725L-S	16.5	90	M12×1.75	65.5	68	45	M27×1.5	7	Rc1/8	57	20	12.5	14.2	113	44	8.5

Code / Tubr I.D.	XX	Y	YA	YY	ZX
32	6H9	59	4.5	6H9	49
40	8H9	69	4.5	8H9	54

MCRQ-S series

ROTARY ACTUATOR



Features

- **4 to 10 times more allowable kinetic energy**
  (compared with internal shock absorber type)
- **Total length shortened**
  Longitudinal mounting space is reduced because there is no protrusion from adjustment bolts or internal shock absorbers.

Specification

Model		MCRQ-S		
Acting type		Double acting		
Tube I.D. (mm)		16	20	25
Port size		M5×0.8	Rc1/8	
Rotation		90°, 180°		
Medium		Air (Non-lube)		
Max. operating pressure		1 MPa (*1)		
Min. operating pressure		0.2 MPa		
Ambient temperature		0~+60°C (No freezing)		
Allowable kinetic energy (J)		0.231	1.21	1.82
Rotation time adjustment range (s/90°)		0.2~1.0 (*2)		
Cushion		Shock absorber		
Shock absorber type		MDSC-0806-3N	MDSC-1008-3N	MDSC-1412-3N
Angle adjustment range		Each rotation end ± 3°		
Weight (kg)	90°	0.67	1.55	2.52
	180°	0.64	1.48	2.41
Sensor switch (*3)	2 wire	**RDFE(V)**: Non-contact		
	3 wire	**RNFE(V)**: NPN, **RPFE(V)**: PNP		

*1. The maximum operating pressure of the actuator is restricted by the maximum allowable thrust of the shock absorber.

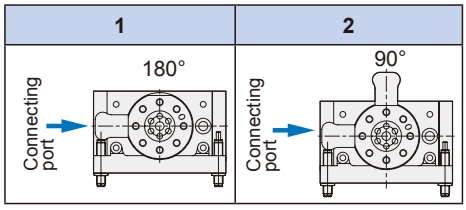
*2. For stable operation the time required for the rotary table to reach the rotation end after deceleration differs depending on the operating conditions (inertial moment of the load, rotation speed, and operating pressure), however, approximately 0.2 to 2 seconds are required.

*3. RDFE specification, please refer to page 5-10.

Order example

MCRQ — S — 20 — 1 — G

- MCRQ — MODEL
- S — EXTERNAL CUSHION TYPE
- 20 — TUBE I.D.
- 1 — CONNECTING PORT POSITION AND ROTATION
- G — PORT THREAD
  Blank: M5×0.8 (for ø16)
  Blank: Rc thread
  G: G thread
  NPT: NPT thread
  (for ø20, ø25)



Auto switch type

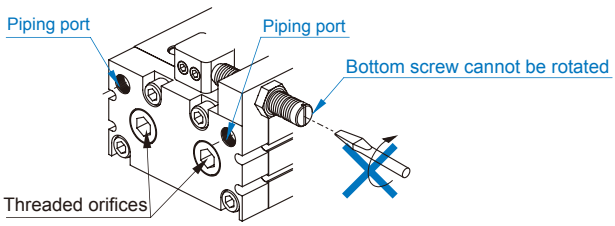
RDF × 1

- RDF — AUTO SWITCH TYPE
- 1 — NUMBER of AUTO SWITCH

perpendicular	in-line	style
RDFEV	**RDFE**	Soild state
RNFEV	**RNFE**	NPN
RPFEV	**RPFE**	PNP

Range of shock absorber operates

Model	Adjustment angle per rotation of angle adjustment screw	Range of angle the shock absorber operates (single side)
MCRQ-S-16	1.5°	12°
MCRQ-S-20	1.1°	9°
MCRQ-S-25	1.3°	11°



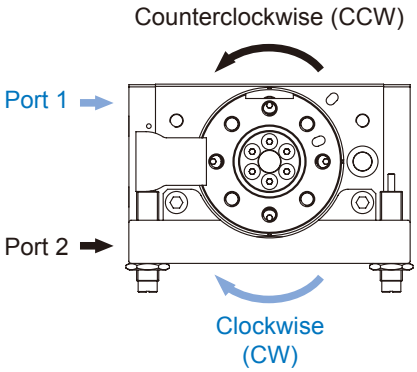
Notice for shock absorber

- The threaded orifices shown below are not connecting ports. Never remove the plugs as this will cause malfunction.
- Never rotate the bottom screw of the shock absorber. (It is not an adjustment screw.) This may cause oil leakage.

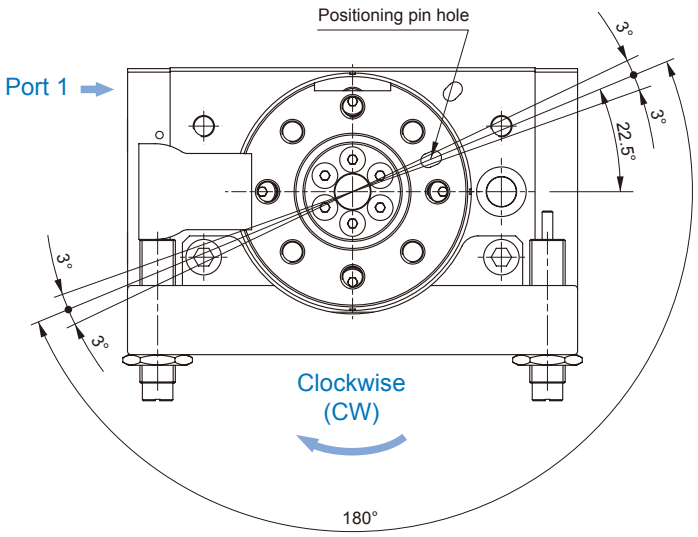
Rotating direction and angle

- When the port 1 is pressurized, the flange rotates in clockwise (CW) direction.
- When the port 2 is pressurized, the flange rotates in counter-clockwise (CCW) direction.

The rotating angle range can be adjust by the method shown as right figure.

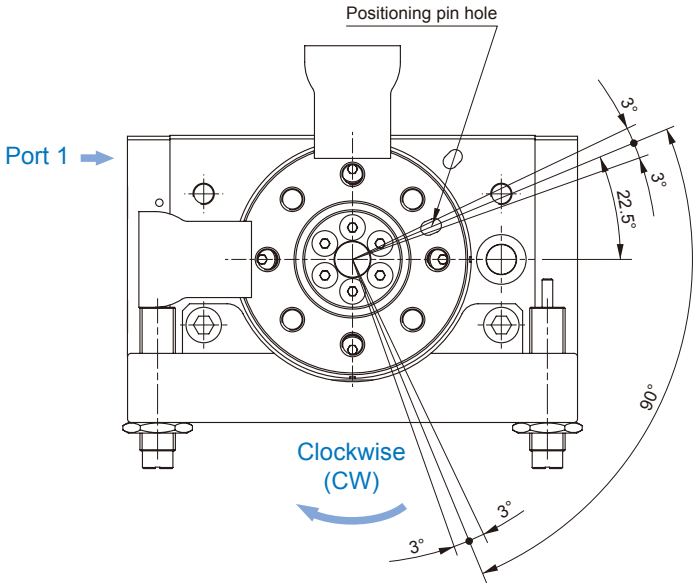


MCRQ-S-*-1 180°

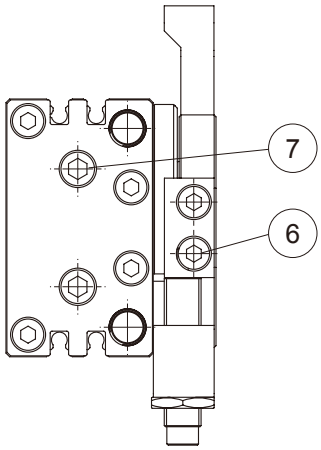


Minimum rotating range 174°
Maximum rotating range 186°

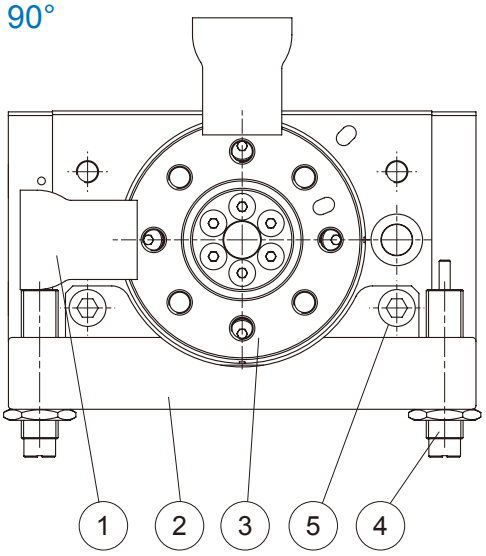
MCRQ-S-*-2 90°



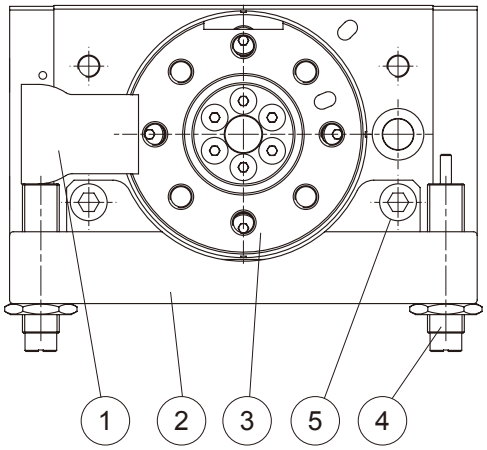
Minimum rotating range 84°
Maximum rotating range 96°



90°



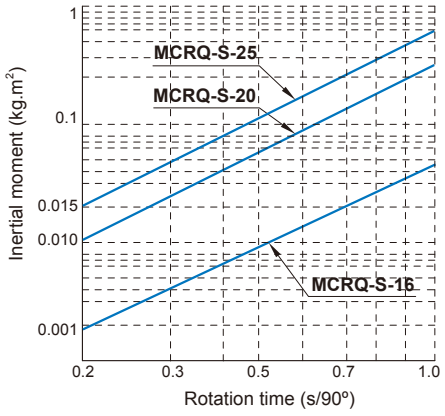
180°

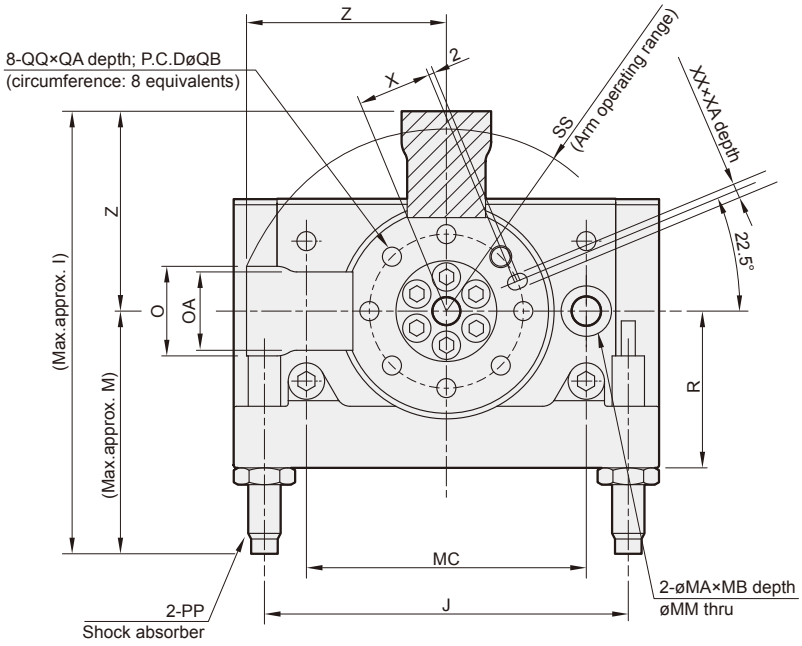


Material

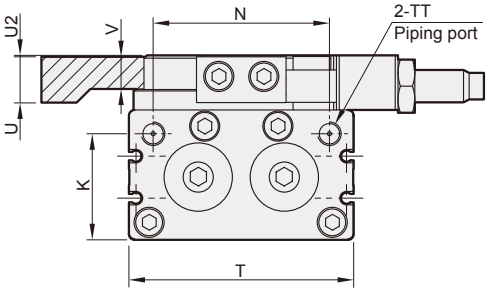
No.	Part name	Material	Rotation & Q'y	
			90°	180°
1	Fixing plate	Carbon steel	2	1
2	Cushion mount	Aluminum alloy	1	1
3	Flange table	Aluminum alloy	1	1
4	Shock absorber	–	2	2
5	Bolt	Stainless steel	2	2
6	Bolt	Stainless steel	4	2
7	Plug	Stainless steel	2	2

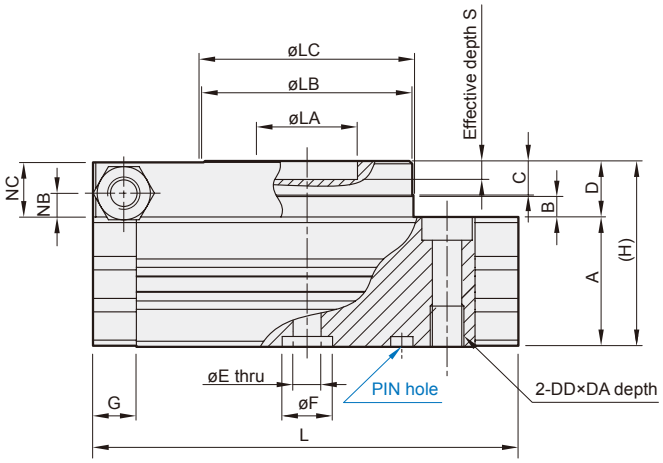
In the inertial moment and rotation time



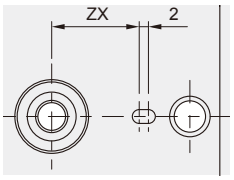


Code / Tubr I.D	PP
16	MDSC-0806-3N
20	MDSC-1008-3N
25	MDSC-1412-3N





PIN hole size



Code / Tubr I.D	HH	ZX
16	3H9×3.5	19
20	4H9×4.5	28
25	5H9×5.5	33

Unit: mm

Code / Tubr I.D	A	B	C	D	DA	DD	E	F	G	H	I	J	K	L	LA	LB	LC	M	MA	MB	MC
16	34	4.5	8	13	12	M8×1.25	6	15H9	9.5	47	92.8	80.6	29	92	20H9	45h9	46h9	48.5	11	6.5	60
20	40	6.5	10	17	15	M10×1.5	10	22H9	12	57	119.3	110	33	127	32H9	65h9	67h9	59	14	8.5	84
25	46	7.5	12	20	18	M12×1.75	13	26H9	15.5	66	154.8	130	37.5	152	35H9	75h9	77h9	83.3	18	10.5	100

Code / Tubr I.D	MM	N	NB	NC	O	OA	QA	QB	QQ	R	S	SS	T	TT	U	U2	V	X	XA	XX	Z
16	6.8	37	5.5	12.5	20	15.6	8	32	M5×0.8	33	4	45.4	50	M5×0.8	11.5	0.3	7.5	15	3.5	3H9	44.3
20	8.6	54	8	16.5	27	21.5	10	48	M6×1	46	4.5	61.8	70	Rc1/8	13.5	0.5	9	23	4.5	4H9	60.3
25	10.5	63	8.5	19.5	32	28	12	55	M8×1.25	54.5	5	73.3	80	Rc1/8	18	0.5	11	26.5	5.5	5H9	71.5