GRC

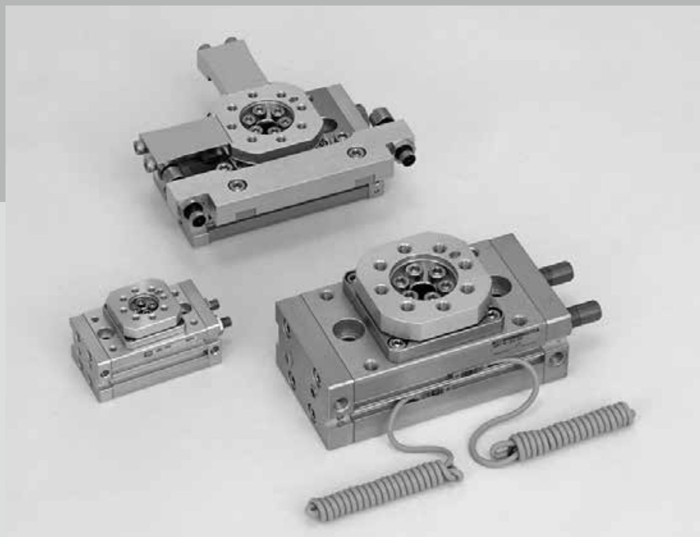
Table rotary actuator

Oscillation/rotation drive

Size 5/10/20/30/50/80

Overview

The table rotary actuator with rack and pinion realizes high load, direct mounting and high position accuracy thanks to a bearing guide.



CONTENTS

High load/high accuracy positioning.

LCM
LCR
LCG
LCW
LCX
STM
STG
STS/STL
STR2
UCA2
ULK*
JSK/M2
JSG
JSC3/JSC4
USSD
UFCD
USC
UB
JSB3
LMB
LML
HCM
HCA
LBC
CAC4
UCAC2
CAC-N
UCAC-N
RCS2
RCC2
PCC
SHC
MCP
GLC
MFC
BBS
RRC
GRC
RV3*
NHS
HRL
LN
Hand
Chuk
MecHnd/Chuk
ShkAbs
FJ
FK
SpdContr
Ending

The table rotary actuator GRC series realizes high load, direct mounting and high position accuracy thanks to a bearing guide.

1 Excellent flexibility in design

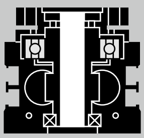
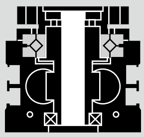
New industry-first GRC-5 Torque 5 (0.5 N·m) compact.

Unprecedented miniature size

5/10/20/30/50/80 sizes available.

Standard and high accuracy are available with the same dimensions.

Model changes for lines (standard or high accuracy) can be conducted quickly.

Basic **GRC**	High accuracy **GRC-K**
	
Stable operation with radial bearing	Cross roller bearing used for high accuracy/high load

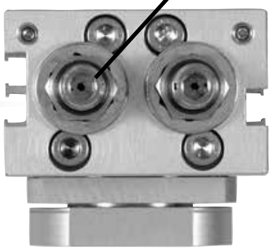
90° and 180° specifications are available.

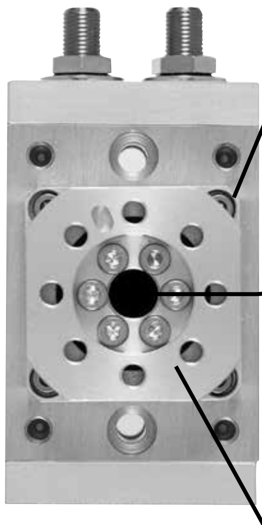
A more compact form can be achieved by selecting a 90° oscillation angle.

GRC Series variation

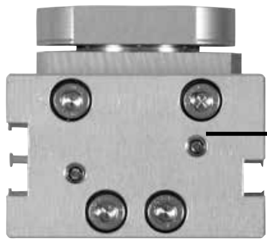
	Basic GRC	High accuracy GRC-K
With switch	●	●
Size (torque value at 0.5 MPa)		
5 (0.5 N·m)	●	—
10 (1.0 N·m)	●	●
20 (2.0 N·m)	●	●
30 (3.0 N·m)	●	●
50 (5.2 N·m)	●	●
80 (8.1 N·m)	●	●
Oscillating angle		
90°	●	●
180°	●	●
Option		
Shock absorber stopper	●	●

Comes with an angle adjustment bolt with rubber cushion for adjusting the oscillation angle.



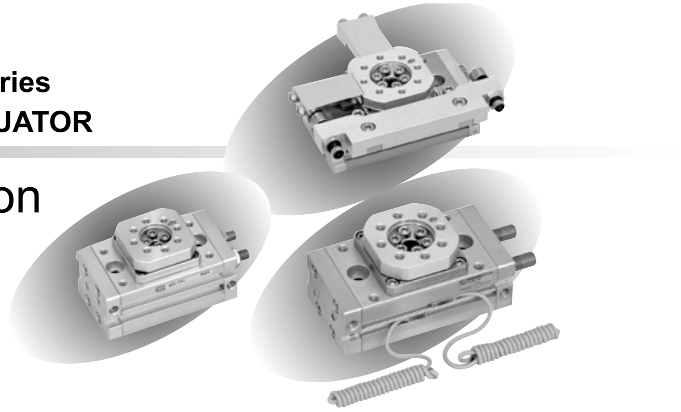


Rotary table with directly mountable load



GRC Series
TABLE ROTARY ACTUATOR

Rack and pinion

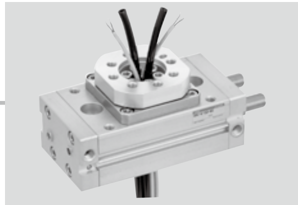


2 Superior installability

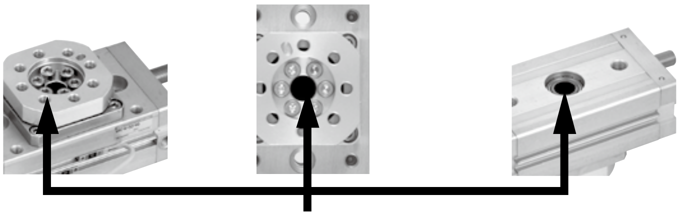
- Select among 3 surfaces for piping port leadout directions.

- Large hollow diameter keeps piping and wiring simple.

Hollow hole diameters of ø4 to ø17 are available.

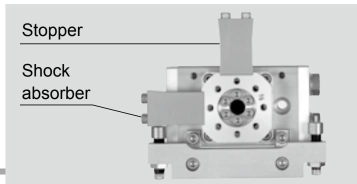


- Positioning spigots for the table top (4 positions) and the body bottom (1 position) are available.



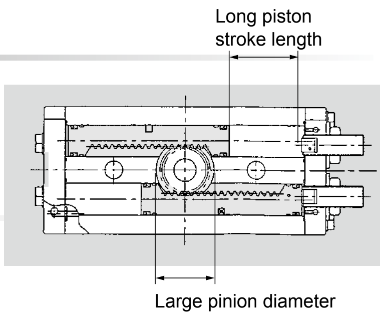
Spigot for positioning

3 Superior operability



- Stable operation with external stopper

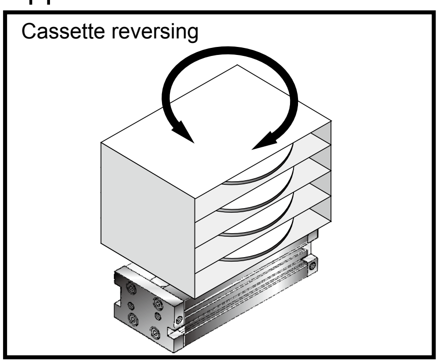
Smooth stopping is possible without backlash due to the external stopper and shock absorber (optional).

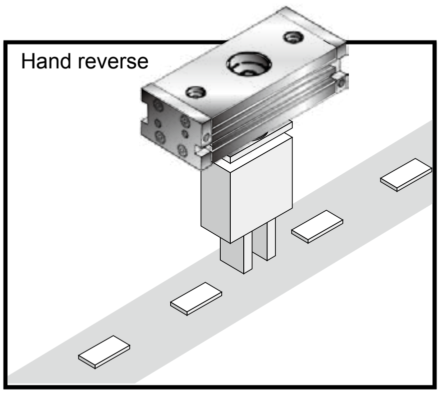


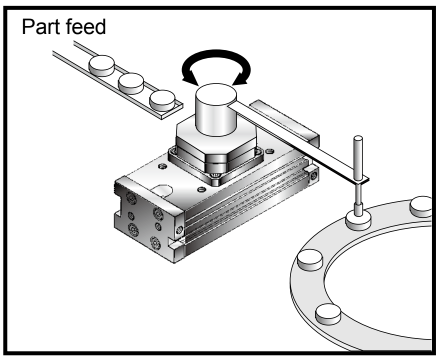
- **1.5** s/90° low speed operation

The large pinion diameter and long piston stroke length achieve low speed operation.

Applications







LCM
LCR
LCG
LCW
LCX
STM
STG
STS/STL
STR2
UCA2
ULK*
JSK/M2
JSG
JSC3/JSC4
USSD
UFCD
USC
UB
JSB3
LMB
LML
HCM
HCA
LBC
CAC4
UCAC2
CAC-N
UCAC-N
RCS2
RCC2
PCC
SHC
MCP
GLC
MFC
BBS
RRC
GRC
RV3*
NHS
HRL
LN
Hand
Chuk
MecHnd/Chuk
ShkAbs
FJ
FK
SpdContr
Ending

Table rotary actuator GRC Series

Variation	Model No. / JIS symbol	Size				
		5	10	20	30	
Basic	GRC	●	●	●	●	
High accuracy	GRC-K		●	●	●	
Fine speed	GRC-F	●	●	●	●	
High accuracy/fine speed	GRC-KF		●	●	●	

●: Standard, ◎: Option, ▢: Not available

			Max. oscillating angle (°)		Option			Switch	Page
					With external shock absorber (1)	With external shock absorber (2)	External shock absorber retrofit mounting groove machined		
	50	80	90	180	A1	A2	A3		
	●	●	●	●	◎	◎	◎	◎	1302
	●	●	●	●	◎	◎	◎	◎	1302
	●	●	●	●	◎	◎	◎	◎	1316
	●	●	●	●	◎	◎	◎	◎	1316

Note: Refer to page 1310 for external shock absorber.

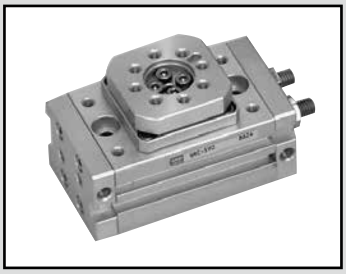
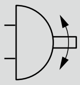


Table rotary actuator
Basic/high accuracy

GRC/GRC-K Series

● Size: 5/10/20/30/50/80

JIS symbol



RoHS CAD

Specifications

1 MPa ≈ 145.0 psi, 1 MPa = 10 bar

Item		GRC-5	GRC-10 GRC-K-10	GRC-20 GRC-K-20	GRC-30 GRC-K-30	GRC-50 GRC-K-50	GRC-80 GRC-K-80
Size		5	10	20	30	50	80
Theoretical torque *1 N·m		0.5	1.0	2.0	3.0	5.2	8.1
Actuation		Rack and pinion mechanism					
Working fluid		Compressed air					
Max. working pressure MPa		1.0 (≈150 psi, 10 bar)					
Min. working pressure *2 MPa	Basic	0.10 (≈15 psi, 1 bar)					
	High accuracy	-	0.15 (≈22 psi, 1.5 bar)		0.10 (≈15 psi, 1 bar)		
	With external shock absorber	0.25	0.20	0.15 (≈22 psi, 1.5 bar)			
Proof pressure MPa		1.6 (≈230 psi, 16 bar)					
Ambient temperature °C		0 (32°F) to 60 (140°F) (no freezing)					
Port size		M5				Rc1/8	
Cushion	Basic/high accuracy	Rubber cushion					
	With external shock absorber	Shock absorber					
	Shock absorber model No.	NCK-0.3		NCK-0.7		NCK-1.2	NCK-2.6
Allowable absorbed energy J	Basic/high accuracy	0.005	0.008	0.03		0.04	0.11
	With external shock absorber *7	0.46	0.59	1.15	1.71	2.33	2.78
Shock absorber stroke length mm		3.5	3.5	5	5	5.5	6.5
Lubrication		Not required (use turbine oil ISO VG32 if necessary for lubrication)					
Volumetric capacity *3 cm^3	90°	1.3	3.5	7.0	10.5	18.1	28.3
	180°	3.4	6.6	13.4	20.0	34.4	53.7
Oscillating angle adjusting range *4	Basic/high accuracy 90°	0° to 100°					
	Basic/high accuracy 180°	90° to 190°					
	With external shock absorber 90°	90° ± 6°					
	With external shock absorber 180°	180° ± 6°					
Oscillating time adjusting range *5 *8 s/90°		0.2 to 1.5					
Table deflection (reference value) *6	Basic	±0.17°			±0.23°	±0.26°	±0.32°
	High accuracy	-	±0.026°				

*1 : The theoretical torque is value at working pressure 0.5 MPa.
*2 : To push through the rubber cushion integrated in basic and high accuracy, 0.3 MPa and over working pressure is required.
*3 : Volumetric capacity is value within oscillating angle adjusting range when max. oscillating angle.
*4 : Oscillating angle adjusting range is value when adjusted by both side stopper bolts (shock absorber).
*5 : Oscillating time adjusting range is value at working pressure 0.5 MPa.
*6 : Displacement of table at 100 mm away from the center of rotation is shown in technical data (page 1327).
*7 : The values in the table indicate the absorbed energy at the maximum oscillation speed. The absorbed energy varies depending on the oscillation speed. Refer to the graph of "Absorbed energy and oscillating time" on page 1324 for details.
*8 : For the type with shock absorber, the time until the unit hits the end of shock absorber (end of rod). (Not the oscillating time until the unit reaches the stroke end of the shock absorber.)

Switch specifications

● 1-color/2-color display

Item	Proximity 2-wire				Proximity 3-wire			
	T1H/T1V	T2H/T2V	T2YH/T2YV	T2WH/T2WV	T3H/T3V	T3PH/T3PV	T3YH/T3YV	T3WH/T3WV
Applications	For programmable controller, relay, compact solenoid valve	Dedicated for programmable controller			For programmable controller, relay			
Output method	-				NPN output	PNP output	NPN output	
Pwr. supp. V.	-				10 to 28 VDC			
Load voltage	85 to 265 VAC	10 to 30 VDC		24 VDC ±10%	30 VDC or less			
Load current	5 to 100 mA	5 to 20 mA (*3)			100 mA or less		50 mA or less	
Indicator lamp	LED (Lit when ON)	LED (Lit when ON)	Red/green LED (Lit when ON)	Red/green LED (Lit when ON)	LED (Lit when ON)	Yellow LED (Lit when ON)	Red/green LED (Lit when ON)	
Leakage current	1 mA or less at 100 VAC 2 mA or less at 200 VAC	1 mA or less			10 μA or less			
Weight g	1 m: 33 3 m: 87 5 m:142	1 m:18 3 m:49 5 m:80	1 m: 33 3 m: 87 5 m:142	1 m:18 3 m:49 5 m:80	1 m:18 3 m:49 5 m:80		1 m: 33 3 m: 87 5 m:142	1 m:18 3 m:49 5 m:80

*1 : Refer to Ending Page 1 for detailed switch specifications and dimensions.
*2 : Switches other than the above models, such as switches with connectors, are also available. Refer to Ending Page 1.
*3 : The max. load current is 20 mA at 25°C. The current is lower than 20 mA if the operating ambient temperature around the switch is higher than 25°C. (5 to 10 mA at 60°C)

Min. oscillating angle with switch

Size	5	10	20	30	50	80
T type proximity 2-color display	20°	15°	17.5°	12.5°	12.5°	12.5°

Theoretical torque table

(Unit: N·m)

Size	Working pressure (MPa)									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
5	-	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
10	-	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
20	-	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0
30	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0
50	1.0	2.1	3.1	4.1	5.2	6.2	7.3	8.3	9.3	10.4
80	1.6	3.2	4.9	6.5	8.1	9.7	11.3	13.0	14.6	16.2

Product weight

(Unit: kg)

Oscillating angle / Model No.	90°		180°		Outer mount shock absorber weight	Switch weight (per switch)
	Basic	High accuracy	Basic	High accuracy		
GRC- 5	0.39	-	0.43	-	0.20	0.02
GRC-10	0.48	0.50	0.56	0.58	0.30	
GRC-20	0.78	0.80	0.88	0.90	0.40	
GRC-30	1.05	1.30	1.25	1.50	0.50	
GRC-50	1.80	2.10	2.10	2.40	0.60	
GRC-80	2.30	2.60	2.70	3.00	0.70	

Clean-room specifications

(Catalog No. CB-033SA)

● Anti-dust generation structure for use in cleanrooms

GRC - ······· - P73
GRC - ······· - P53
GRC-K - ······· - P73
GRC-K - ······· - P53

Specifications for rechargeable battery

(Catalog No. CC-1226A)

● Design compatible with rechargeable battery manufacturing process.

GRC - ··· - P4*

LCM
LCR
LCG
LCW
LCX
STM
STG
STS/STL
STR2
UCA2
ULK*
JSK/M2
JSG
JSC3/JSC4
USSD
UFCD
USC
UB
JSB3
LMB
LML
HCM
HCA
LBC
CAC4
UCAC2
CAC-N
UCAC-N
RCS2
RCC2
PCC
SHC
MCP
GLC
MFC
BBS
RRC
GRC
RV3*
NHS
HRL
LN
Hand
Chuk
MecHnd/Chuk
ShkAbs
FJ
FK
SpdContr
Ending

How to order

● Without switch (built-in magnet for switch)

GRC - 10 ( ) - 90 —— A1

● With switch (built-in magnet for switch)

GRC - 30 ( ) - 180 - T2H* - R - A2

Ⓐ Model No.
Ⓑ Size
Ⓒ Port thread
Ⓓ Oscillating angle
Ⓔ Switch model No.
Ⓕ Switch quantity
Ⓖ Option

Code	Description		
Ⓐ Model No.			
GRC	Basic		
GRC-K	High accuracy		
Ⓑ Size (0.5 MPa)			
Model No.	**Theoretical torque**	**GRC**	**GRC-K**
5	0.5 [N·m]	●	-
10	1.0 [N·m]	●	●
20	2.0 [N·m]	●	●
30	3.0 [N·m]	●	●
50	5.2 [N·m]	●	●
80	8.1 [N·m]	●	●
Ⓒ Port thread			
Blank	Rc thread		
NN	NPT thread (ø50 and over) (made-to-order product)		
GN	G thread (ø50 and over) (made-to-order product)		
Ⓓ Oscillating angle			
90	90°		
180	180°		

Ⓔ Switch model No.

Axial lead wire	Radial lead wire	Contact	Voltage AC	Voltage DC	Display	Lead wire
T1H*	T1V*	Proximity	●		1-color display	2-wire
T2H*	T2V*	Proximity		●	1-color display	2-wire
T3H*	T3V*	Proximity		●	1-color display	3-wire
T3PH*	T3PV*	Proximity		●	1-color display	3-wire
T2WH*	T2WV*	Proximity		●	2-color display	2-wire
T2YH*	T2YV*	Proximity		●	2-color display	2-wire
T3WH*	T3WV*	Proximity		●	2-color display	3-wire
T3YH*	T3YV*	Proximity		●	2-color display	3-wire

Code	Description
*** Lead wire length**	
Blank	1 m (standard)
3	3 m (option)
5	5 m (option)
Ⓕ Switch quantity	
R	With clockwise rotation detection 1 piece
L	With counterclockwise rotation detection 1 piece
D	2
Ⓖ Option	
Blank	Hexagon socket set screw stopper screw with urethane
A With outer mount shock absorber	
A1	Installation position (1)
A2	Installation position (2)
A3	External shock absorber retrofitting (Installation groove machined)

⚠Precautions for model No. selection

*1 : Port position of basic/high accuracy is provided on the side surface. Other ports are plugged.
*2 : The external shock absorber cannot be retrofitted onto the basic/high accuracy. Select the A3 type as an option if retrofitting.
*3 : If an external shock absorber is retrofit on the A3 type, the features will be the same as the A1 type. Consult CKD for A2 type.

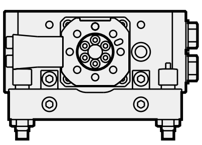
[Example of model No.]

GRC-10-180-T2V-D-A1
Double acting

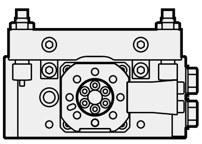
Ⓐ Model No. : Basic
Ⓑ Size : 10
Ⓒ Port thread : Rc thread
Ⓓ Oscillating angle : 180°
Ⓔ Switch model No. : Proximity/2-wire radial lead wire/lead wire 1 m
Ⓕ Switch quantity : 2
Ⓖ Option : External shock absorber mounting position (1)

Outer mount shock absorber installation drawing

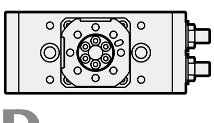
GRC-*-A1 (Installation position (1))



GRC-*-A2 (Installation position (2))



GRC-*-A3 (Installation position (3))



Clean-room specifications

(Catalog No. CB-033SA)

● Anti-dust generation structure for use in cleanrooms

GRC - ······· - P73　GRC-K - ······· - P73
GRC - ······· - P53　GRC-K - ······· - P53

Specifications for rechargeable battery

(Catalog No. CC-1226A)

● Design compatible with rechargeable battery manufacturing process.

GRC - ··· - P4*

LCM
LCR
LCG
LCW
LCX
STM
STG
STS/STL
STR2
UCA2
ULK*
JSK/M2
JSG
JSC3/JSC4
USSD
UFCD
USC
UB
JSB3
LMB
LML
HCM
HCA
LBC
CAC4
UCAC2
CAC-N
UCAC-N
RCS2
RCC2
PCC
SHC
MCP
GLC
MFC
BBS
RRC
GRC
RV3*
NHS
HRL
LN
Hand
Chuk
MecHnd/Chuk
ShkAbs
FJ
FK
SpdContr
Ending

How to order switch

- Switch body only

SW - T2H3

T2H3: Switch model No. (Item E on the previous page)

How to order repair parts kit

- Set of repair parts (packing, etc.)

GRC - 5 K

5: Size (Item B on the previous page)

How to order external shock absorber set

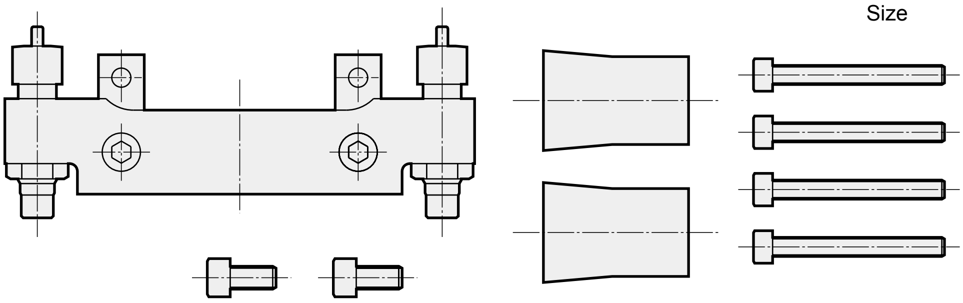
- Sets of plate, shock absorber and lever
- Used when retrofitting external shock absorber onto A3 type

GRC - 5 - A 2

5: Size

2: D Oscillating angle

D Oscillating angle	
1	For 90° specifications
2	For 180° specifications



Select 1 or 2 for D

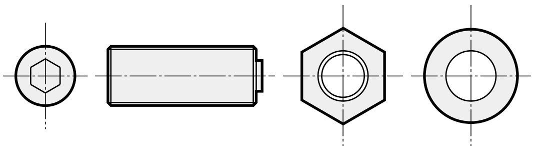
Note: Set contents differ between 90° specifications and 180° specifications. The figure shows 90° specifications.

How to order stopper bolt set for adjustable angle

- Sets of hexagon socket set screw with urethane hexagon nut and plain washer
- Used with external shock absorber removed

GRC - 5 S

5: Size (Item B on the previous page)



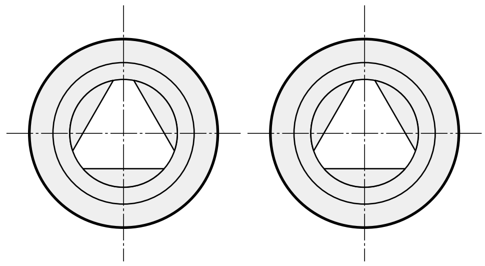
Size	Weight g
5	4
10	7
20	14
30	19
50	32
80	

How to order seal washer set

- Used at seal washer replacement
- Seal washer 2 pcs.

GRC - 5 D

5: Size (Item B on the previous page)



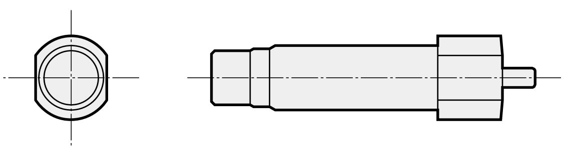
Size	Weight g
5	2
10	
20	4
30	
50	8
80	

How to order shock absorber set for adjustable angle

- Sets of shock absorber and stopper

GRC - 5 - A01

5: Size (Item B on the previous page)

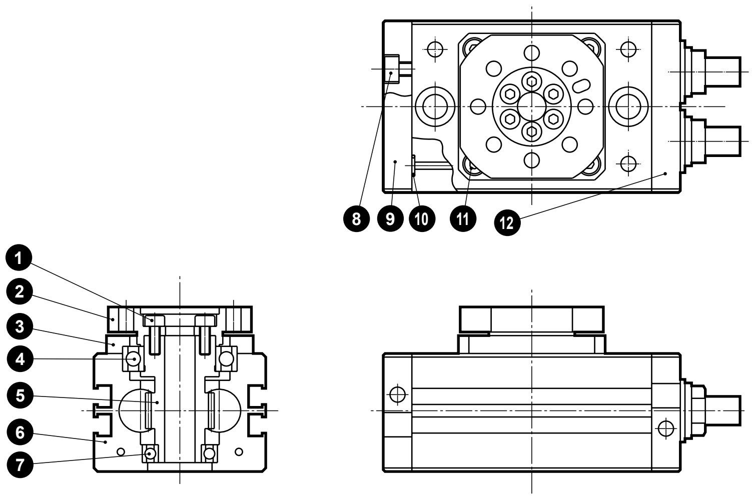


Applicable shock absorber model No.

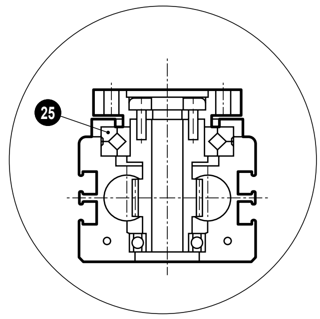
Model	Shock absorber model No.	Weight g
GRC-5	NCK-00-0.3	12
GRC-10	NCK-00-0.3	
GRC-20	NCK-00-0.7	20
GRC-30	NCK-00-0.7	
GRC-50	NCK-00-1.2	40
GRC-80	NCK-00-2.6	70

Internal structure and parts list

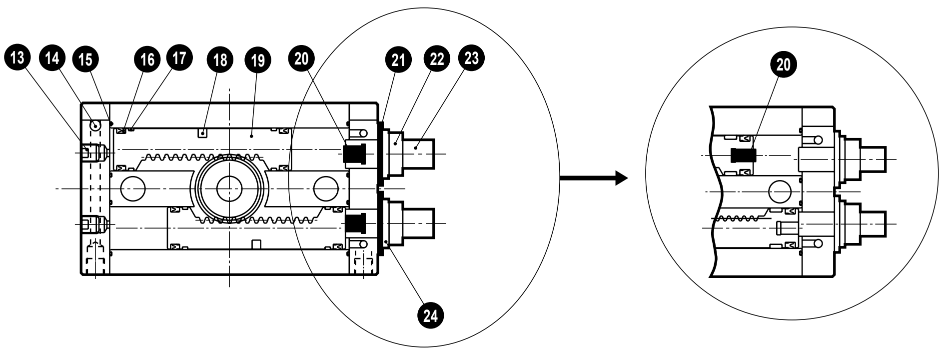
- GRC (basic)
- GRC-K (high accuracy)



Cross-section view of the high accuracy



Cushion rubber position differs for GRC-□-5.

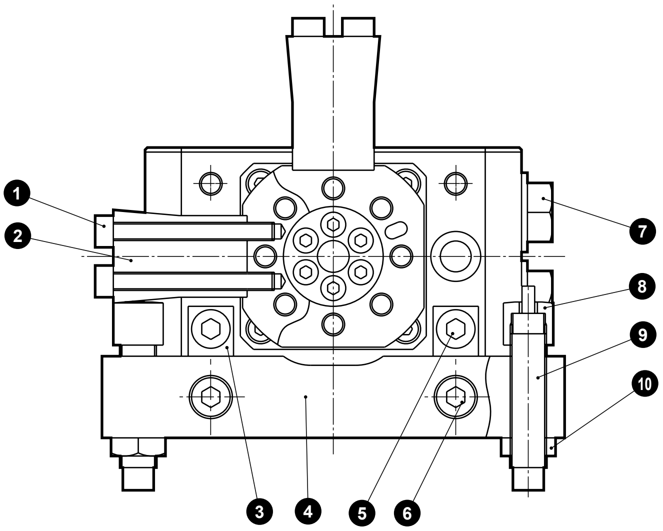


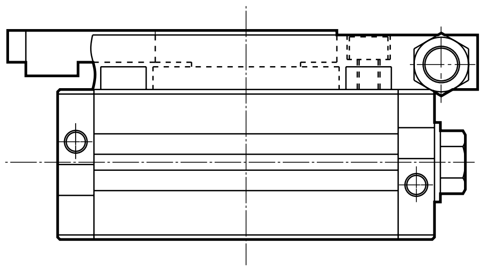
Parts list

No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Hexagon socket head cap screw	Stainless steel		13	Hexagon socket set screw	Stainless steel	
2	Table	Aluminum alloy	Alumite	14	Steel ball	Stainless steel	
3	Bearing cover	Aluminum alloy (hi accuracy uses SS)	Alumite	15	Cylinder gasket	Nitrile rubber	
4	Ball bearing (1)	Alloy steel		16	Piston packing	Nitrile rubber	
5	Shaft	Alloy steel		17	Wear ring	Acetal resin	
6	Cylinder body	Aluminum alloy	Hard alumite	18	Magnet	Plastic (5.10 is special alloy.)	
7	Ball bearing (2)	Alloy steel		19	Piston	Stainless steel	
8	Hexagon socket head cap screw	Stainless steel		20	Cushion rubber	Urethane rubber	
9	Head cover (1)	Aluminum alloy	Alumite	21	Seal washer	Steel + nitrile rubber	Zinc plated
10	Gasket	Nitrile rubber		22	Hexagon nut	Steel	Nickeling
11	Hexagon socket head cap screw	Stainless steel		23	Stopper bolt	Alloy steel	Nickeling
12	Head cover (2)	Aluminum alloy	Alumite	24	Plain washer	Stainless steel	
				25	Cross roller bearing	Alloy steel	

Internal structure and parts list

● GRC-□-A (with external shock absorber)
Note: The figure shows 90° specifications. 180° specifications use the same material, etc.





Parts list

No.	Part name	Material	Remarks
1	Hexagon socket head cap screw	Stainless steel	
2	Lever	Carbon steel or alloy steel	Nickel/phosphorous plating
3	Connector	Steel	Nickeling
4	Plate	Aluminum alloy	Alumite
5	Hexagon socket head cap screw	Stainless steel	
6	Hexagon socket head cap screw	Stainless steel	
7	Hexagon head bolt	Stainless steel	
8	Stopper	Stainless steel	
9	Shock absorber		
10	Hexagon nut	Steel	Nickeling

Repair parts kit

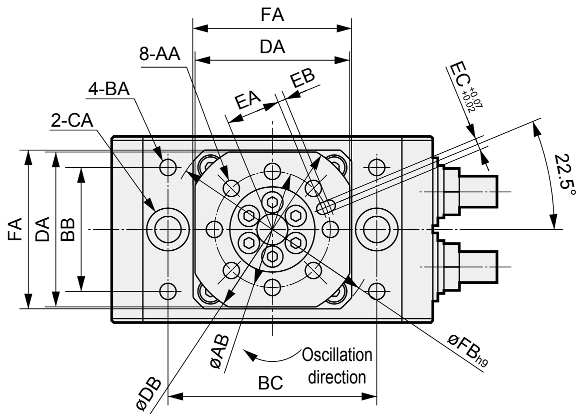
Kit No.	Repair parts No.
GRC-5K	10 15 16 17 21
GRC-10K	
GRC-20K	
GRC-30K	
GRC-50K	
GRC-80K	

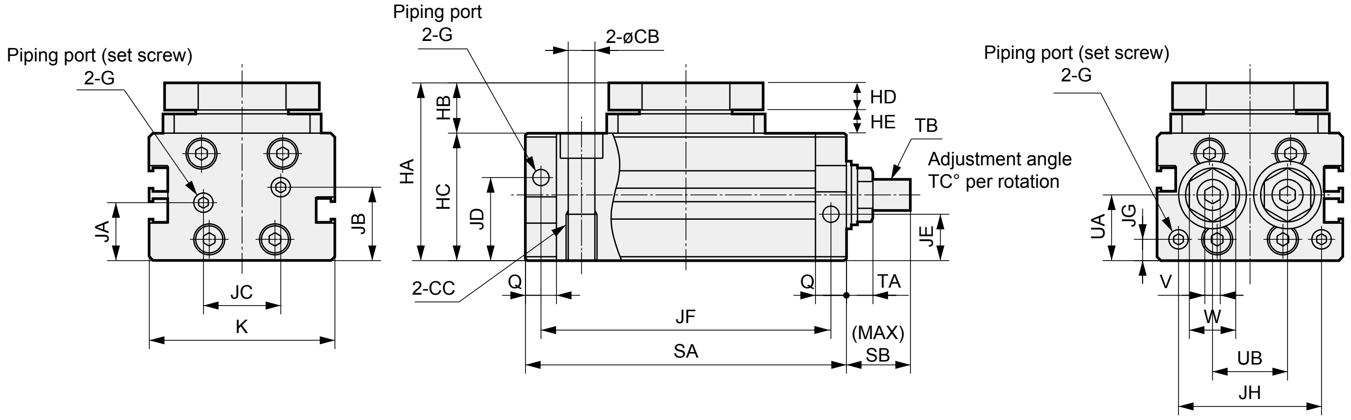
*1: Specify the kit No. when ordering repair parts.
*2: Avoid disassembly/repair, since high accuracy uses highly controlled precision parts.
When repairing high accuracy, consult with CKD.

LCM
LCR
LCG
LCW
LCX
STM
STG
STS/STL
STR2
UCA2
ULK*
JSK/M2
JSG
JSC3/JSC4
USSD
UFCD
USC
UB
JSB3
LMB
LML
HCM
HCA
LBC
CAC4
UCAC2
CAC-N
UCAC-N
RCS2
RCC2
PCC
SHC
MCP
GLC
MFC
BBS
RRC
GRC
RV3*
NHS
HRL
LN
Hand
Chuk
MecHnd/Chuk
ShkAbs
FJ
FK
SpdContr
Ending

Dimensions

- GRC basic
- GRC-K high accuracy



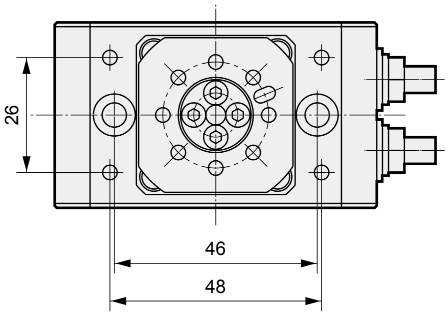


Size	AA	AB	BA	BB	BC	CA	CB	CC	DA	DB	EA	EB	EC	FA	FB	G	HA	HB
5	M4 depth 7	24	M4 depth 6.5	26	48	Spot face ø9.5 depth 5.4	5.2	M6 depth 12	35	42	11	2	3 depth 3.5	36	48	M5	43	13
10	M5 depth 7	30	M5 depth 7	32	54	Spot face ø11 depth 6.5	6.6	M8 depth 12	40	46	14	2	3 depth 3.5	41	54	M5	46	13
20	M6 depth 9	36	M6 depth 8	42	62	Spot face ø11 depth 6.5	6.9	M8 depth 12	47	55	17	2	4 depth 4.5	48	64	M5	53	16
30	M6 depth 9	44	M6 depth 8	52	74	Spot face ø14 depth 8.6	8.7	M10 depth 15	58	67	21	2	4 depth 4.5	59	78	M5	55	18
50	M8 depth 13	50	M8 depth 12	60	88	Spot face ø17.5 depth 10.8	10.5	M12 depth 18	66	74	24	2	5 depth 5.5	69	92	Rc1/8	71	23
80	M8 depth 13	54	M8 depth 12	66	94	Spot face ø17.5 depth 10.8	10.5	M12 depth 18	69	80	26	2	5 depth 5.5	76	101	Rc1/8	80	25

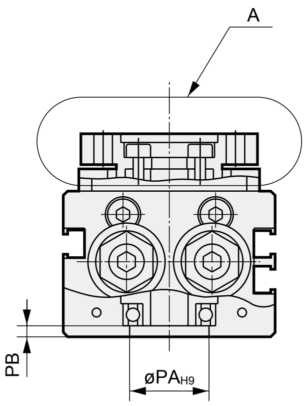
Size	SA		SB	TA	TB	TC	UA	UB	V	W	X	LD		RD	
	90°	180°										90°	180°	90°	180°
5	73	90	14	6.5	M6×1	8.7	16.6	16	3	10	12.6	21.5	25.5	22.5	25.5
10	83	107	15	4.9	M8×0.75	4.9	17.1	19.4	4	11	13.1	24.5	30.5	26	30.5
20	96	125	17	6.1	M10×1	5.7	17.6	24	5	13	13.6	31	37.5	31	37.5
30	121	165	25	6.1	M10×1	3.8	17.6	34	5	13	13.6	38.5	49.5	40	49.5
50	144	192	29.5	7	M12×1	3.5	24.6	35	6	14	20.6	48.5	61	51	61
80	150	198	29.5	7	M12×1	3.5	27.1	36	6	14	23.1	51.5	64	54	64

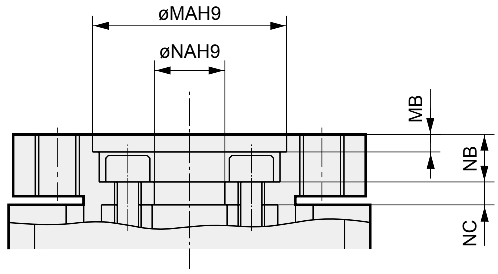
LCM
LCR
LCG
LCW
LCX
STM
STG
STS/STL
STR2
UCA2
ULK*
JSK/M2
JSG
JSC3/JSC4
USSD
UFCD
USC
UB
JSB3
LMB
LML
HCM
HCA
LBC
CAC4
UCAC2
CAC-N
UCAC-N
RCS2
RCC2
PCC
SHC
MCP
GLC
MFC
BBS
RRC
GRC
RV3*
NHS
HRL
LN
Hand
Chuk
MecHnd/Chuk
ShkAbs
FJ
FK
SpdContr
Ending

GRC-5

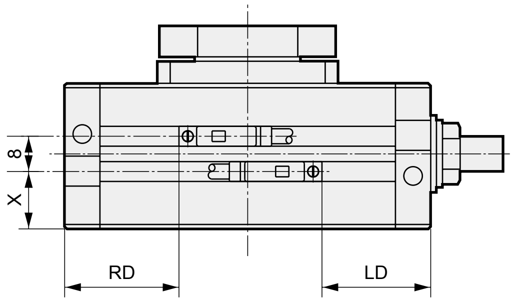


Position of 4-BA and 2-CA differ for GRC-5 only.





A section details



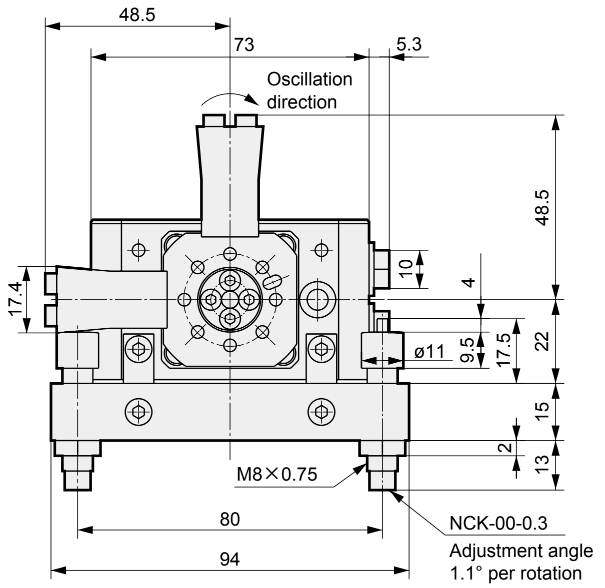
Switch mounting position

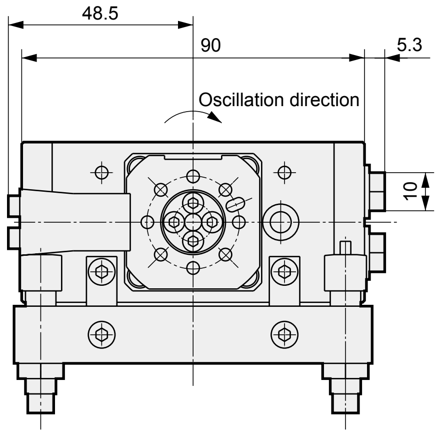
	HC	HD	HE	JA	JB	JC	JD	JE	JF 90°	JF 180°	JG	JH	K	MA	MB	NA	NB	NC	PA	PB	Q
	30	7	6	15	18	16	21	11.5	65	82	5.6	29	42	17	2	4	5.5	2.4	12	3.5	8
	33	7	6	15	19	20	21.5	12	75	99	5.6	37	48	22	2	8	5.5	2.4	18	2.5	8
	37	9	7	14.5	20.5	27	22	13	86	115	5.6	47	58	27	2	11	6.5	3.9	20	2.5	10
	37	9	9	14.5	20.5	37	22	13	111	155	5.6	57	68	32	2	13	7.5	2.9	26	2.5	10
	48	13	10	21.5	27.5	36	32.5	17.5	129	177	8.1	58	75	37	4	14	10.5	5.3	28	4.5	15
	55	13	12	24	30	40	35	19	135	183	8.1	58	80	40	3	17	9.5	4.4	36	3.5	15

Dimensions: With external shock absorber size 5

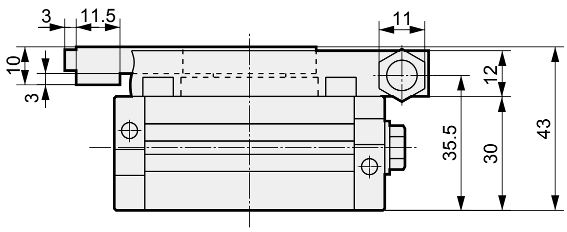
● GRC-5-*-A1/A2

Note: The drawing is for A1 type (mounting position (1))



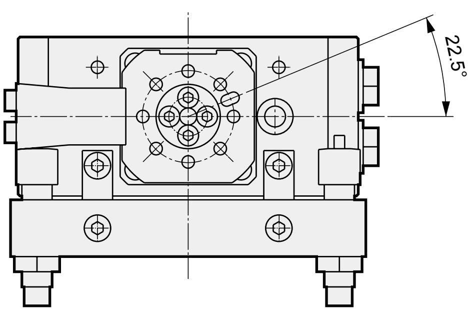


180° specifications

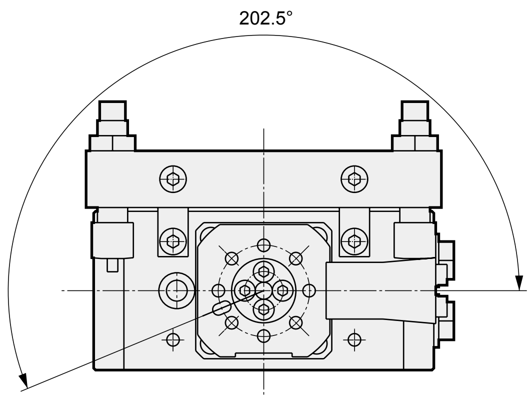


90° specifications

Note: Dimensions of rotary actuator main body are the same as the basic; however, the body cannot be fixed using the 4 screw holes on the top. As well, positioning pin hole position on tabletop differs according to external shock absorber mounting position.



GRC-5-*-A1



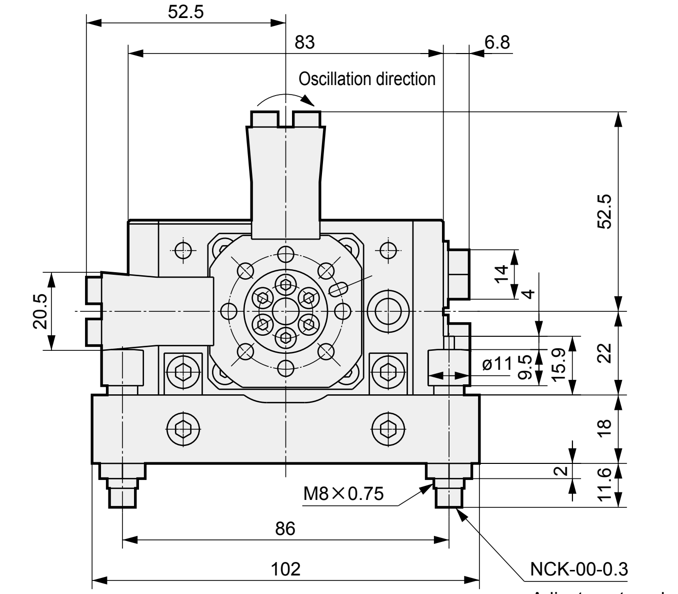
GRC-5-*-A2

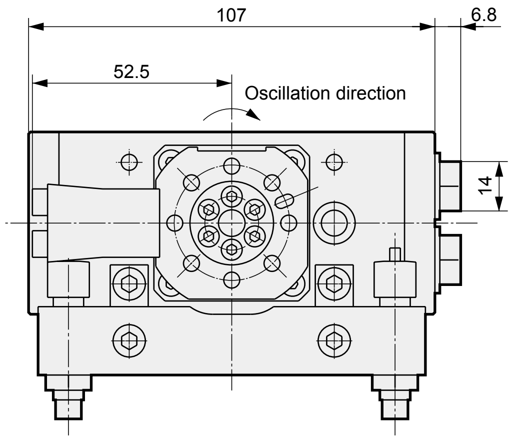
Dimensions: With external shock absorber size 10, 20

CAD

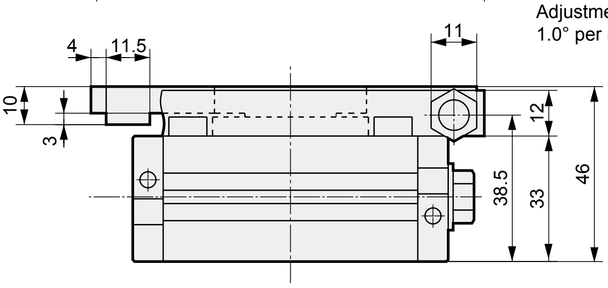
● GRC-10-*-A1/A2

Note: The drawing is for A1 type (mounting position (1))





180° specifications

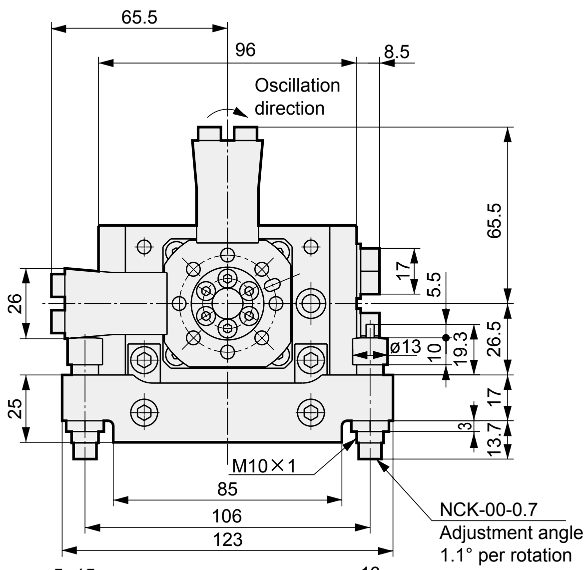


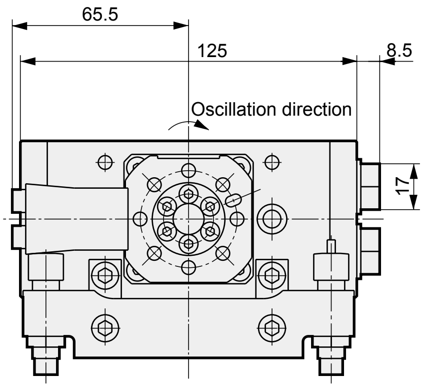
90° specifications

Note: Dimensions of rotary actuator main body are the same as the basic; however, the body cannot be fixed using the 4 screw holes on the top. As well, positioning pin hole position on tabletop differs according to external shock absorber mounting position. (Refer to GRC-5-*-A1/A2.)

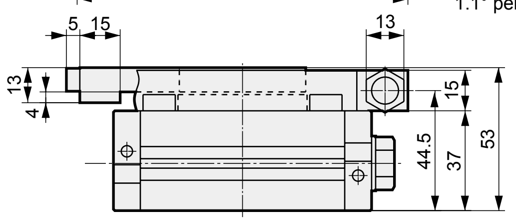
● GRC-20-*-A1/A2

Note: The drawing is for A1 type (mounting position (1))





180° specifications



90° specifications

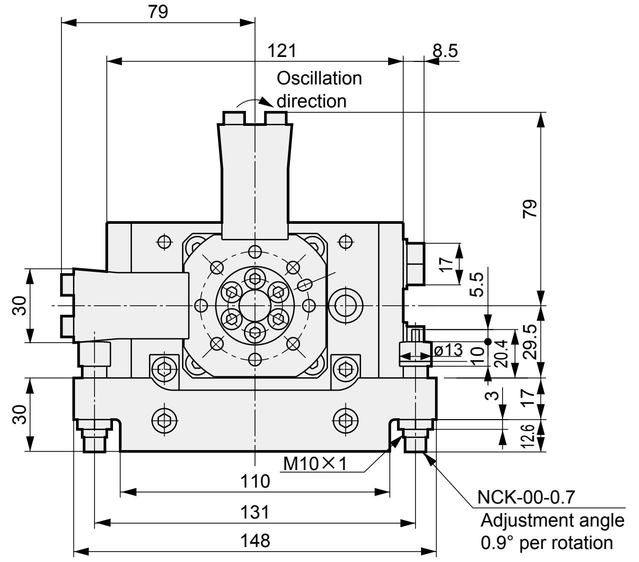
Note: Dimensions of rotary actuator main body are the same as the basic; however, the body cannot be fixed using the 4 screw holes on the top. As well, positioning pin hole position on tabletop differs according to external shock absorber mounting position. (Refer to GRC-5-*-A1/A2.)

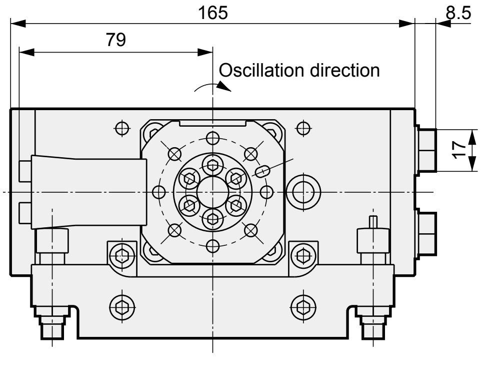
Dimensions: With external shock absorber size 30, 50

CAD

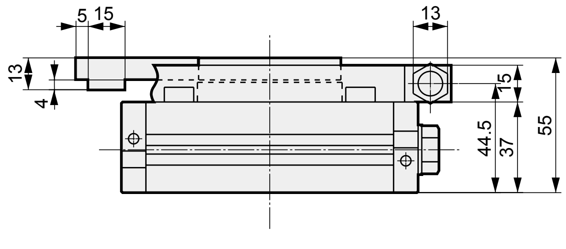
● GRC-30-*-A1/A2

Note: The drawing is for A1 type (mounting position (1))





180° specifications

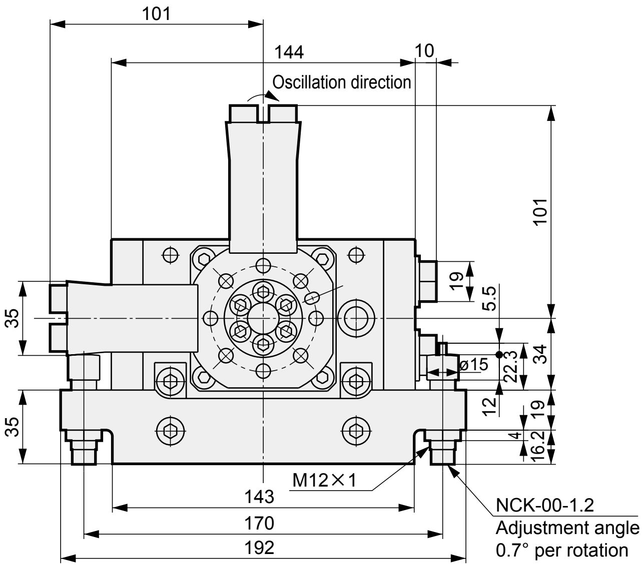


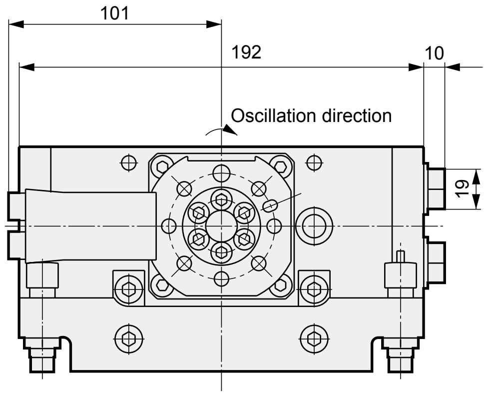
90° specifications

Note: Dimensions of rotary actuator main body are the same as the basic; however, the body cannot be fixed using the 4 screw holes on the top. As well, positioning pin hole position on tabletop differs according to external shock absorber mounting position. (Refer to GRC-5-*-A1/A2.)

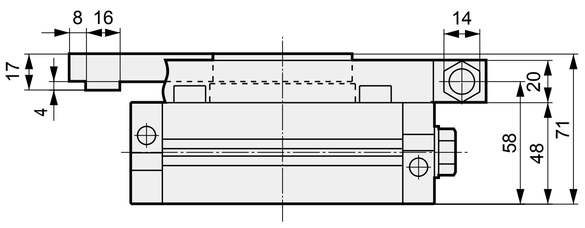
● GRC-50-*-A1/A2

Note: The drawing is for A1 type (mounting position (1))





180° specifications



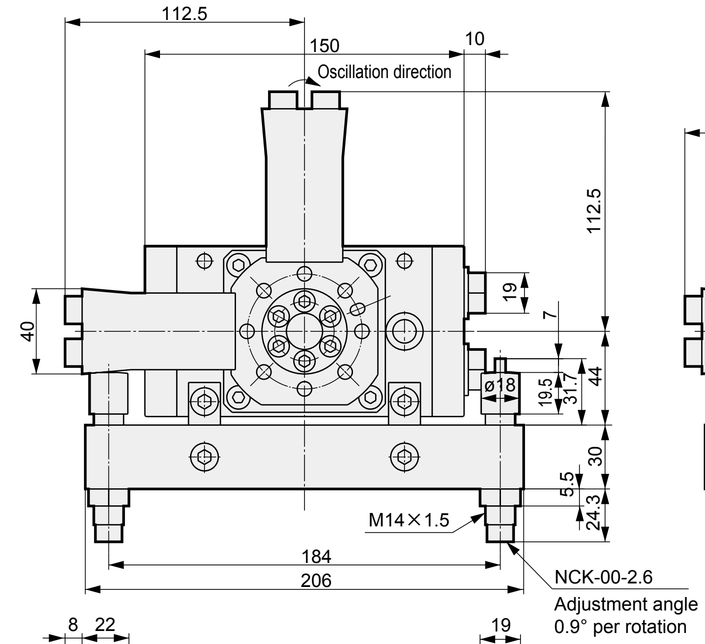
90° specifications

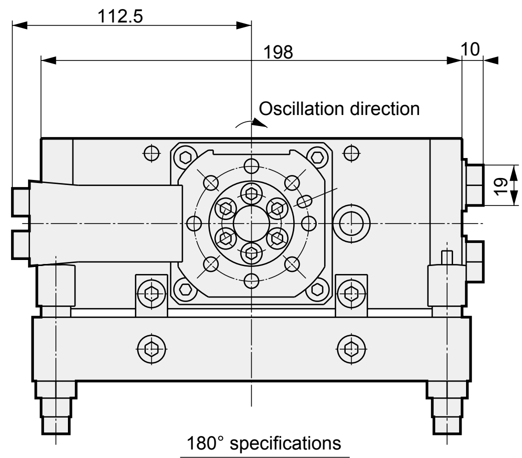
Note: Dimensions of rotary actuator main body are the same as the basic; however, the body cannot be fixed using the 4 screw holes on the top. As well, positioning pin hole position on tabletop differs according to external shock absorber mounting position. (Refer to GRC-5-*-A1/A2.)

Dimensions: With external shock absorber size 80

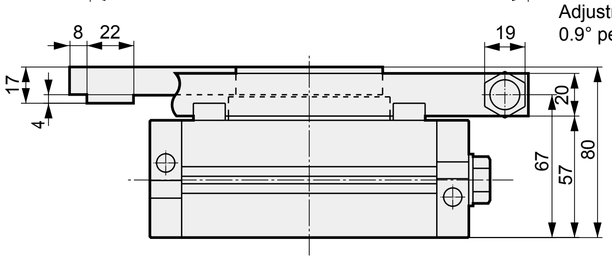
● GRC-80-*-A1/A2

Note: The drawing is for A1 type (mounting position (1))





180° specifications



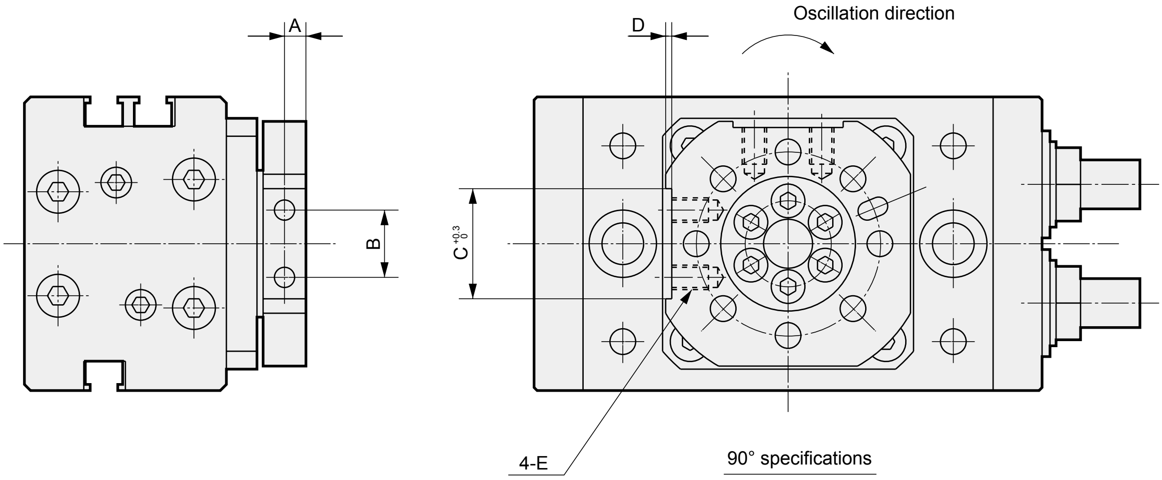
90° specifications

Note: Dimensions of rotary actuator main body are the same as the basic; however, the body cannot be fixed using the 4 screw holes on the top. As well, positioning pin hole position on tabletop differs according to external shock absorber mounting position. (Refer to GRC-5-*-A1/A2.)

LCM
LCR
LCG
LCW
LCX
STM
STG
STS/STL
STR2
UCA2
ULK*
JSK/M2
JSG
JSC3/JSC4
USSD
UFCD
USC
UB
JSB3
LMB
LML
HCM
HCA
LBC
CAC4
UCAC2
CAC-N
UCAC-N
RCS2
RCC2
PCC
SHC
MCP
GLC
MFC
BBS
RRC
GRC
RV3*
NHS
HRL
LN
Hand
Chuk
MecHnd/Chuk
ShkAbs
FJ
FK
SpdContr
Ending

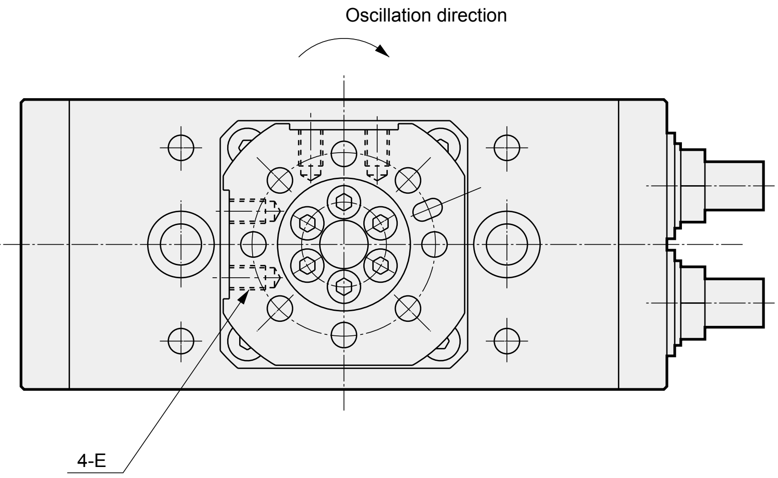
Dimensions: For retrofitting of external shock absorber size 5 to 80

● GRC-*-A3



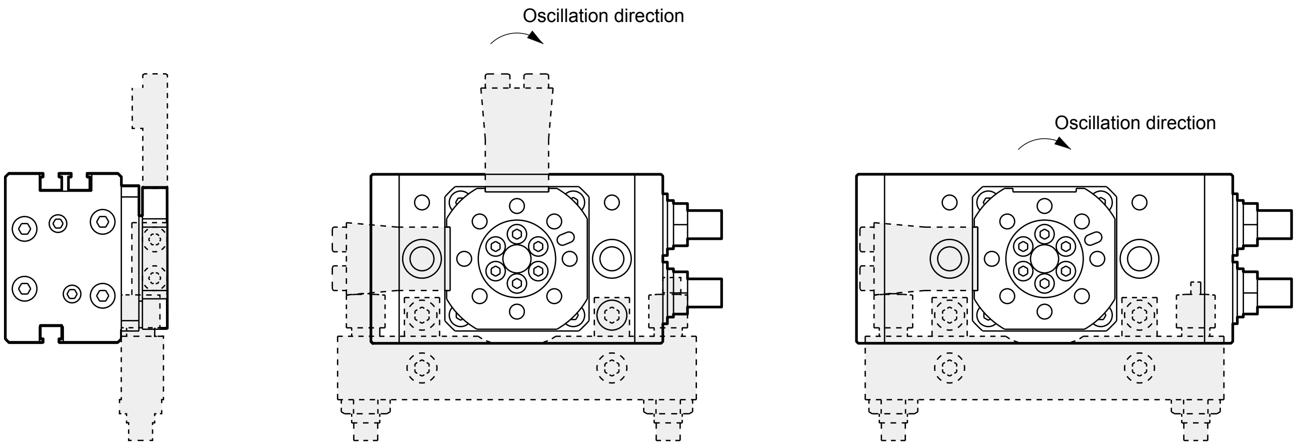
90° specifications

Size	A	B	C	D	E
5	3.5	8.4	15	1	M3 depth 6.5
10	3.8	11	18	1	M4 depth 6
20	4.5	13.4	23	1	M5 depth 7.5
30	4.5	17	27	2	M5 depth 8.5
50	6.9	18.4	32	2	M8 depth 9
80	6.9	20	36	2	M8 depth 9



180° specifications

When external shock absorber set is installed. (shows external shock absorber set.)
Note: If an external shock absorber is retrofit on the A3 type, the features will be the same as the A1 type.
Consult with CKD for A2 type. (Refer to page 1310 for mounting position)



90° specifications
180° specifications

MEMO

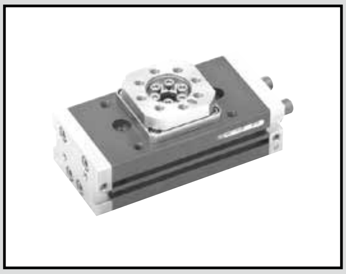
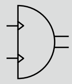


Table rotary actuator
Fine speed/high accuracy fine speed

GRC-F/GRC-KF Series

● Size: 5/10/20/30/50/80

JIS symbol



Specifications

1 MPa ≈ 145.0 psi, 1 MPa = 10 bar

Item		Unit	GRC-F-5	GRC-F-10 GRC-KF-10	GRC-F-20 GRC-KF-20	GRC-F-30 GRC-KF-30	GRC-F-50 GRC-KF-50	GRC-F-80 GRC-KF-80
Size			5	10	20	30	50	80
Theoretical torque *1		N·m	0.5	1.0	2.0	3.0	5.2	8.1
Actuation			Rack and pinion mechanism					
Working fluid			Compressed air					
Max. working pressure		MPa	1.0 (≈150 psi, 10 bar)					
Min. working pressure	Basic	MPa	0.10 (≈15 psi, 1 bar)					
	High accuracy		-	0.15 (≈22 psi, 1.5 bar)		0.10 (≈15 psi, 1 bar)		
	With external shock absorber		0.25	0.20	0.15 (≈22 psi, 1.5 bar)			
Proof pressure		MPa	1.6 (≈230 psi, 16 bar)					
Ambient temperature		°C	5 (41°F) to 60 (140°F)					
Allowable absorbed energy	Basic/high accuracy	J	0.005	0.008	0.03		0.04	0.11
	With external shock absorber *3		0.46	0.59	1.15	1.71	2.33	2.78
Cushion	Basic/high accuracy		Rubber cushion					
	With external shock absorber		Shock absorber					
	Shock absorber model No.		NCK-0.3		NCK-0.7		NCK-1.2	NCK-2.6
Oscillating angle adjusting range *2	Basic/high accuracy, 90° specifications		0° to 100°					
	Basic/high accuracy, 180° specifications		90° to 190°					
	With external shock absorber, 90° specifications		90° ±6°					
	With external shock absorber, 180° specifications		180° ±6°					
Oscillating time adjusting range		S/90°	0.2 to 25					
Port size			M5				Rc1/8	
Lubrication			Lubrication not possible					

*1 : The theoretical torque is value at working pressure 0.5 MPa.
*2 : The angle adjusting range applies when adjusted with the stopper bolts (shock absorbers) on both sides.
If a shock absorber is provided, the fine speed specifications will not apply to the shock absorber section.
*3 : The values in the table indicate the absorbed energy at the maximum oscillation speed. The absorbed energy varies depending on the oscillation speed. Refer to the graph of "Absorbed energy and oscillating time" on page 1324 for details.

Switch specifications

● 1-color/2-color display

Item	Proximity 2-wire				Proximity 3-wire			
	T1H/T1V	T2H/T2V	T2YH/T2YV	T2WH/T2WV	T3H/T3V	T3PH/T3PV	T3YH/T3YV	T3WH/T3WV
Applications	For programmable controller, relay, compact solenoid valve	Dedicated for programmable controller			For programmable controller, relay			
Output method	-				NPN output	PNP output	NPN output	
Pwr. supp. V.	-				10 to 28 VDC			
Load voltage	85 to 265 VAC	10 to 30 VDC		24 VDC ±10%	30 VDC or less			
Load current	5 to 100 mA (*3)	5 to 20 mA (*3)			100 mA or less		50 mA or less	
Indicator lamp	LED (Lit when ON)	LED (Lit when ON)	Red/green LED (Lit when ON)	Red/green LED (Lit when ON)	LED (Lit when ON)	Yellow LED (Lit when ON)	Red/green LED (Lit when ON)	
Leakage current	1 mA or less at 100 VAC 2 mA or less at 200 VAC	1 mA or less			10 μA or less			
Weight g	1 m: 33 3 m: 87 5 m:142	1 m:18 3 m:49 5 m:80	1 m: 33 3 m: 87 5 m:142	1 m:18 3 m:49 5 m:80	1 m:18 3 m:49 5 m:80		1 m: 33 3 m: 87 5 m:142	1 m:18 3 m:49 5 m:80

*1 : Refer to Ending Page 1 for detailed switch specifications and dimensions.
*2 : Switches other than the above models, such as switches with connectors, are also available. Refer to Ending Page 1.
*3 : The max. load current is 20 mA at 25°C. The current is lower than 20 mA if the operating ambient temperature around the switch is higher than 25°C. (5 to 10 mA at 60°C)

Dimensions

Dimensions are the same as the basic GRC Series or the high load GRC-K Series. Refer to pages 1308 to 1314.

How to order

● Without switch (built-in magnet for switch)

GRC-F - 10 ( ) - 90 ——— A1

● With switch (built-in magnet for switch)

GRC-F - 30 ( ) - 180 - T2H* - R - A2

Ⓐ Model No.
Ⓑ Size
Ⓒ Port thread
Ⓓ Oscillating angle
Ⓔ Switch model No.
Ⓕ Switch quantity
Ⓖ Option

Code	Description
Ⓐ Model No.	
GRC-F	Basic
GRC-KF	High accuracy

Ⓑ Size

Model No.	Theoretical torque	GRC-F	GRC-KF
5	0.5 [N·m]	●	-
10	1.0 [N·m]	●	●
20	2.0 [N·m]	●	●
30	3.0 [N·m]	●	●
50	5.2 [N·m]	●	●
80	8.1 [N·m]	●	●

Code	Description
Ⓒ Port thread	
Blank	Rc thread
NN	NPT thread (ø50 and over) (made-to-order product)
GN	G thread (ø50 and over) (made-to-order product)
Ⓓ Oscillating angle	
90	90°
180	180°

Ⓔ Switch model No.

Axial lead wire	Radial lead wire	Contact	Voltage AC	Voltage DC	Indicator	Lead wire
T1H*	T1V*	Proximity	●		1-color display	2-wire
T2H*	T2V*			●		2-wire
T3H*	T3V*			●		3-wire
T3PH*	T3PV*			●	1-color display	3-wire
T2WH*	T2WV*			●		2-wire
T2YH*	T2YV*			●	2-color display	2-wire
T3WH*	T3WV*			●		3-wire
T3YH*	T3YV*			●		3-wire

Code	Description
*** Lead wire length**	
Blank	1 m (standard)
3	3 m (option)
5	5 m (option)
Ⓕ Switch quantity	
R	With clockwise rotation detection 1 piece
L	With counterclockwise rotation detection 1 piece
D	2
Ⓖ Option	
Blank	Hexagon socket set screw stopper screw with urethane
A With outer mount shock absorber	
A1	Installation position (1)
A2	Installation position (2)
A3	External shock absorber retrofitting (Installation groove machined)

⚠ Precautions for model No. selection

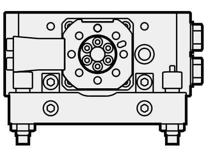
*1 : Port position of basic/high accuracy is provided on the side surface. Other ports are plugged.
*2 : The external shock absorber cannot be retrofitted onto the basic/high accuracy. Select the A3 type as an option if retrofitting.
*3 : If an external shock absorber is retrofit on the A3 type, the features will be the same as the A1 type. Consult CKD for A2 type.
*4 : For discrete switches and options, refer to page 1305.

[Example of model No.]
GRC-F-10-180-T2V-D-A1
Double acting

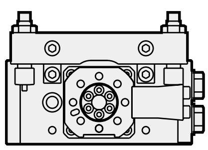
Ⓐ Model No. : Basic
Ⓑ Size : 10
Ⓒ Port thread : Rc thread
Ⓓ Oscillating angle : 180°
Ⓔ Switch model No. : Proximity/2-wire radial lead wire/ lead wire 1 m
Ⓕ Switch quantity : 2
Ⓖ Option : External shock absorber mounting position (1)

Outer mount shock absorber installation drawing

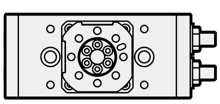
Installation position (1)
GRC-□-A1



Installation position (2)
GRC-□-A2



Retrofitting of external shock absorber
GRC-□-A3



Clean-room specifications (Catalog No. CB-033SA)

● Anti-dust generation structure for use in cleanrooms

GRC-F -······- **P73**

GRC-KF -······- **P73**

Specifications for rechargeable battery (Catalog No. CC-1226A)

● Design compatible with rechargeable battery manufacturing process.

GRC - ··· - **P4***

LCM
LCR
LCG
LCW
LCX
STM
STG
STS/STL
STR2
UCA2
ULK*
JSK/M2
JSG
JSC3/JSC4
USSD
UFCD
USC
UB
JSB3
LMB
LML
HCM
HCA
LBC
CAC4
UCAC2
CAC-N
UCAC-N
RCS2
RCC2
PCC
SHC
MCP
GLC
MFC
BBS
RRC
GRC
RV3*
NHS
HRL
LN
Hand
Chuk
MecHnd/Chuk
ShkAbs
FJ
FK
SpdContr
Ending

Selection method

Select based on the following procedures.

Step 1 Oscillating time confirmation

↓

Step 2 Size (torque) selection
(1) Static load
(2) Resistance load
(3) Inertia load

↓

Step 3 Allowable energy confirmation

↓

Step 4 Allowable load confirmation
(1) Thrust load
(2) Radial load
(3) Moment load

Step 1 Oscillating time confirmation

If the oscillating time is set outside of the specified range, the actuator's operation may become unstable, or the actuator could be damaged. Always set the oscillating time within the specified oscillating time adjusting range.

	When used at 90°	When used at 180°
Oscillating time (s)	0.2 to 1.5	0.4 to 3.0

Step 2 Size (torque) selection

Selection method is roughly categorized into three load.
In each case, the required torque must be calculated. If the load is a compound load, add each torque to calculate the required torque.
Select size from theoretical torque table or actual torque diagram per working pressure to meet required torque.

(1) Static load (Ts)
When static pushing force is required for clamp, etc.

$$\boxed{T_S = F_S \times L}$$

T_S : Required torque (N·m)
F_S : Required force (N)
L : Length from center of rotation to pressure cone apex (m)

(2) Resistance load (T_R)
When force including frictional force, gravity or other external force is applied

$$\boxed{T_R = K \times F_R \times L}$$

T_R : Required torque (N·m)
K : Slack coefficient (Non-fluctuating load coefficient K = 2; When load fluctuates K = 5)
F_R : Required force (N)
L : Length from center of rotation to pressure cone apex (m)

(3) Inertia load (TA)
When the object is rotated

$$T_A = 5 \times I \times \dot{\omega}$$
$$\dot{\omega} = \frac{2\theta}{t^2}$$

T_A : Required torque (N·m)
I : Moment of inertia (kg·m^2)
$\dot{\omega}$: Maximum angular speed (rad/s^2)
θ : Oscillating angle (rad)
t : Oscillating time (s)
Calculate moment of inertia using moment of inertia and oscillation time (page 1324) or figure for moment of inertia calculation (page 1325).

Step 3 Allowable energy confirmation

When using an inertial load, if the load's kinetic energy exceeds the allowable value at the oscillating end, the actuator could be damaged. Select one within allowable energy according to Table 1. If energy is too large, stop load with external shock absorber, etc.

$$E = \frac{1}{2} \times I \times \omega^2$$
$$\omega = \frac{2\theta}{t}$$

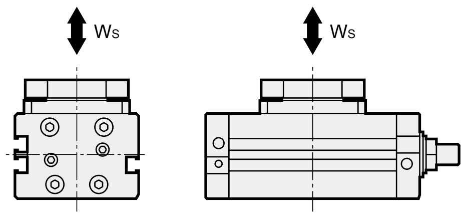
E : Kinetic energy (J)
I : Moment of inertia (kg·m^2)
ω : Angular speed at the end of oscillation (rad/s)
θ : Oscillating angle (rad)
t : Oscillating time (s)
Calculate moment of inertia using moment of inertia and oscillation time (page 1324) or figure for moment of inertia calculation (page 1325).

Selection method

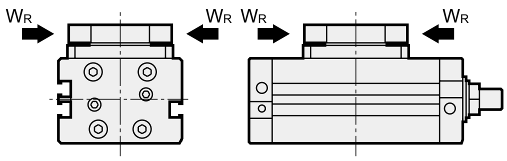
Step 4 Allowable load confirmation

If load applies to table, load is to be within allowable value on Table 2.
If combined load is applied, total of ratio for allowable value per load is to be 1.0 or less.
Load is categorized with the following 3 types.

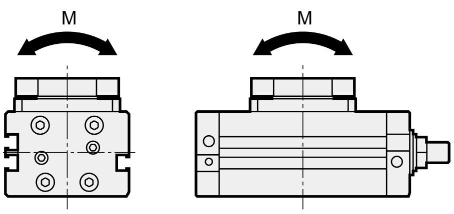
(1) Thrust load (axial load)



(2) Radial load (lateral load)



(3) Moment load



Substitute result to following formula, and check after each load is calculated.

$$\frac{W_s}{W_{smax}} + \frac{W_R}{W_{Rmax}} + \frac{M}{M_{max}} \leq 1.0$$

W_s : Thrust load (N)
W_R : Radial load (N)
M : Moment load (N·m)
W_{smax} : Allowable thrust load (N)
W_{Rmax} : Allowable radial load (N)
M_{max} : Allowable moment load (N·m)

Allowable value per allowable absorbed energy value and load is shown in the following table.

Table 1 Allowable absorbed energy value [J]

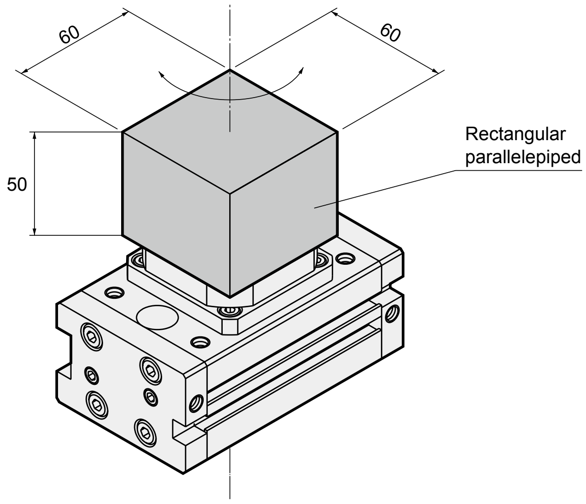
Size	5	10	20	30	50	80
Basic/high accuracy	0.005	0.008	0.03		0.04	0.11
With external shock absorber	0.46	0.59	1.15	1.71	2.33	2.78

Table 2 Allowable load value W_{Smax} W_{Rmax} M_{max}

Size		5	10	20	30	50	80
Thrust load	Basic	50	80	140	200	450	580
W_{Smax} [N]	High accuracy	-	120	220	440	550	650
Radial load	Basic	30	80	150	200	320	400
W_{Rmax} [N]	High accuracy	-	100	160	240	380	480
Moment load	Basic	1.5	2.5	4.0	5.5	10.0	13.0
M_{max} [N·m]	High accuracy	-	3.0	5.0	7.0	12.0	15.0

Selection example (1)

When rectangular parallelepiped load is applied



[Operation conditions]

Pressure	: 0.5(MPa)
Oscillating angle	: 90°
Oscillating time	: 0.6(s)
Load (material	: aluminum alloy)
[Rectangular parallelepiped]	: 0.5 (kg)

Step 1 Oscillating time confirmation

Oscillating time is 0.6 (s/90°) according to operation conditions. Since oscillating time is within adjusting range 0.2 to 1.5 (s/90°), go to next step.

Step 2 Size (torque) selection

First, calculate moment of inertia (I) due to inertia load.
[Rectangular parallelepiped]

$$I=0.5\times\frac{0.06^2}{6}=3\times10^{-4}\ (kg\cdot m^2)\ \ldots\ldots\ldots\ldots\ (1)$$

Then calculate the maximum angular speed ($\dot{\omega}$).

On conditions $\theta=90°=\frac{\pi}{2}$(rad), $t=0.6$(s)

Therefore,

$$\dot{\omega}=\frac{2\theta}{t^2}=\frac{\pi}{0.6^2}=8.73(rad/s^2)\ \ldots\ldots\ldots\ldots\ (2)$$

Therefore, inertia load (T_A) from (1) and (2)

$T_A = 5\times3\times10^{-4}\times8.73$
$= 0.0131\ (N\cdot m)$ .... (3)

According to (3) value and operational conditions and torque at 0.5 (MPa)

$\boxed{\text{GRC-5-90}}$ .... (A)

can be selected.

Step 3 Allowable energy confirmation

Check if value is within allowable energy after kinetic energy is calculated.
Calculate the angular speed at the end of oscillation ω.

On conditions $\theta=90°=\frac{\pi}{2}$(rad), $t=0.6$(s)

Therefore,

$$\omega=\frac{2\theta}{t}=\frac{\pi}{0.6}=5.24(rad/s)$$

Therefore, kinetic energy (E) is

$$E=\frac{1}{2}\times3\times10^{-4}\times5.24^2$$

$=0.00412$(J) ....(4)

From (4) and (A) selected at Step 2

$\boxed{\text{GRC-5-90}}$ ....(B)

can be selected.

Step 4 Allowable load confirmation

Finally, check if value is within allowable load range after load value that applies to table is calculated.

[Thrust load]
Thrust load (Ws),
$W_s=0.5\times9.8=4.9$(N) ....(5)

[Radial load]
Since no radial load is applied,
$W_R=0$(N) ....(6)

[Moment load]
Since no moment load is applied,
$M = 0\ (N\cdot m)$ ....(7)

According to (5), (6), (7), (B),

$$\frac{W_s}{W_{smax}}+\frac{W_R}{W_{Rmax}}+\frac{M}{M_{max}}$$

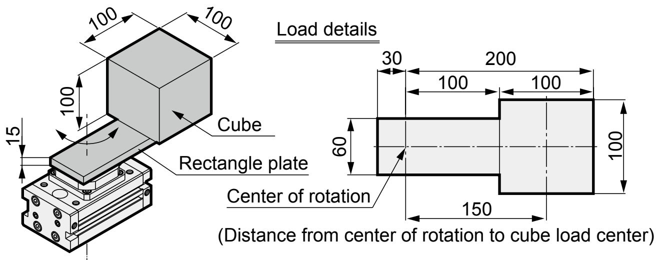
$$=\frac{4.9}{50}+\frac{0}{30}+\frac{0}{1.5}=0.098\leq1.0\ \ldots\ldots(C)$$

According to (B) and (C), total load value is within allowable load value.

$\boxed{\text{GRC - 5 - 90}}$

Selection example (2)

When rectangular parallelepiped load is applied to rectangle plate



[Operation conditions]

- Pressure : 0.5(MPa)
- Oscillating angle : 90°
- Oscillating time : 1.0(s)
- Load (material: steel)
  - [Rectangle plate on left from center of rotation] : 0.21 (kg)
  - [Rectangle plate on right from center of rotation] : 1.40 (kg)
  - [Cube] : 7.8 (kg)

Step 1 Oscillating time confirmation

Oscillating time is 1.0 (s/90°) according to operation conditions. Since oscillating time is within adjusting range 0.2 to 1.5 (s/90°), go to next step.

Step 2 Size (torque) selection

First, calculate moment of inertia (I) due to inertia load.
[Rectangle plate]

$$I_1=1.40\times\frac{4\times0.20^2+0.06^2}{12}+0.21\times\frac{4\times0.03^2+0.06^2}{12}$$

$$= 1.92 \times 10^{-2}\ (kg\cdot m^2)$$

[Cube]

$$I_2=7.8\times\frac{0.1^2}{6}+7.8\times0.15^2$$

$$= 0.189\ (kg\cdot m^2)$$

Therefore, total moment of inertia (I) is as follows.
$I = I_1 + I_2 = 0.21\ (kg\cdot m^2)$ ....(1)
Then calculate the maximum angular speed (ω).

On conditions $\theta=90°=\frac{\pi}{2}$(rad), t=1.0(s)
Therefore,

$$\dot{\omega} = \frac{2\theta}{t^2} = \frac{\pi}{1.0^2} =3.14(rad/s^2) \quad …………(2)$$

Therefore, inertia load (T_A) from (1) and (2)
$T_A = 5 \times 0.21 \times 3.14$
$= 3.30$ (N·m) ....(3)
According to (3) value and operational conditions, from torque at 0.5 (MPa)

GRC-50-90 …………………………(A)

can be selected.

Step 3 Allowable energy confirmation

Check if value is within allowable energy after kinetic energy is calculated.
Calculate the angular speed at the end of oscillation ω.

On conditions $\theta=90°=\frac{\pi}{2}$(rad), t=1.0(s)
Therefore,

$$\omega = \frac{2\theta}{t} = \frac{\pi}{1.0} =3.14(rad/s)$$

Therefore, kinetic energy (E) is

$$E= \frac{1}{2}\times0.19\times3.14^2$$

$$=0.937(J) \quad ………………………………(4)$$

From (4) and (A) selected at Step 2

GRC - 80 - 90 - A1,A2 ……………………(B)

can be selected.

Step 4 Allowable load confirmation

Finally, check if value is within allowable load range after load value that applies to table is calculated.
[Thrust load]
Total weight
7.8 + 1.40 + 0.21 = 9.41 (kg)
Thus, thrust load (Ws)
$W_s = 9.41 \times 9.8 = 92.2$(N) …………………(5)
[Radial load]
Since no radial load is applied,
$W_R = 0$(N)………………………………………(6)
[Moment load]
Moment load (M_1) of rectangle plate,
$1.40 \times 9.8 = 13.72$(N)
$0.21 \times 9.8 = 2.06$(N)
Therefore,
$M_1 = 13.72 \times 0.1 - 2.06 \times 0.015$
$= 1.34$ (N·m)
Moment load (M_2) of rectangular parallelepiped
$7.8 \times 9.8 = 76.44$(N)
Therefore,
$M_2 = 76.44 \times 0.15 = 11.47$ (N·m)
Therefore, the sum of M_1 and M_2,
$M = 1.34 + 11.47 = 12.81$ (N·m) ...………..(7)
According to (5), (6), (7), (B),

$$\frac{W_s}{W_{smax}}+\frac{W_R}{W_{Rmax}}+\frac{M}{M_{max}}$$

$$=\frac{92.2}{450}+\frac{0}{320}+\frac{12.8}{10}=1.48>1.0$$

Increase by one size and recalculate with GRC-80-90 since moment load is exceeding allowable value.

$$\frac{W_s}{W_{smax}}+\frac{W_R}{W_{Rmax}}+\frac{M}{M_{max}}$$

$$=\frac{92.2}{580}+\frac{0}{400}+\frac{12.8}{13}=1.14>1.0$$

Since total load value is still exceeding allowable value, select high accuracy, and calculate

$$\frac{W_s}{W_{smax}}+\frac{W_R}{W_{Rmax}}+\frac{M}{M_{max}}$$

$$=\frac{92.2}{650}+\frac{0}{480}+\frac{12.8}{15}=0.99\leq1.0 \quad ......(C)$$

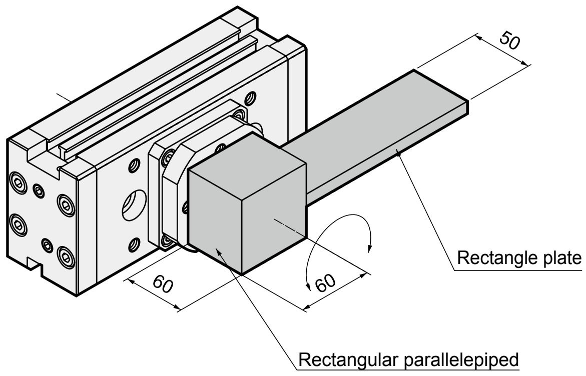
According to (C), total load value is within the allowable load value,so

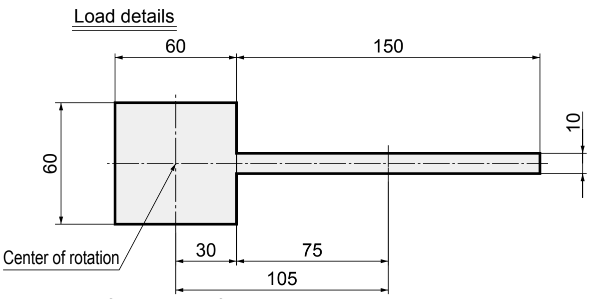
GRC - K - 80 - 90 - A1,A2

can be selected.

Selection example (3)

When load is applied to rectangle plate with rotary shaft horizontal





(Distance from center of rotation to rectangle plate load center)

[Operation conditions]
- Pressure : 0.5(MPa)
- Oscillating angle : 180°
- Oscillating time : 0.5(s)
- Load (material: aluminum alloy)
  - [Rectangle plate] : 0.2 (kg)
  - [Rectangular parallelepiped] : 0.5 (kg)

Step 1 Oscillating time confirmation

Oscillating time is 0.5 (s/180°) according to operation conditions. Since oscillating time is within adjusting range 0.4 to 3.0 (s/180°), go to next step.

Step 2 Size (torque) selection

This is a gravitational resistance load and inertial load, so calculate the resistance load (T_R) and moment of inertia (I).

[Resistance load]

Resistance load varies per rotation of table.

$F_R = 0.2 \times 9.8 = 1.96(N)$

$R = 0.105(m)$

Therefore,

$T_R = 5 \times 1.96 \times 0.105 = 1.03\ (N\cdot m)$ ......(1)

[Inertia load]

[Rectangle plate]

$$I_1 = 0.2 \times \frac{0.15^2}{12} + 0.2 \times 0.105^2$$

$$= 2.58 \times 10^{-3}\ (kg\cdot m^2)$$

[Rectangular parallelepiped section]

$$I_2 = 0.5 \times \frac{0.06^2}{6} = 3 \times 10^{-4}\ (kg\cdot m^2)$$

Therefore, total moment of inertia (I) is as follows.

$I = I_1 + I_2 = 2.88 \times 10^{-3}\ (kg\cdot m^2)$ ....(2)

Then calculate the maximum angular speed ($\dot{\omega}$).

On conditions θ = 180° = π (rad), t = 0.5 (s)

Therefore,

$$\dot{\omega} = \frac{2\theta}{t^2} = \frac{2\pi}{0.5^2} = 25.13(rad/s^2) \text{............(3)}$$

Therefore, inertia load (T_A) from (2) and (3)

$T_A = 5 \times 2.88 \times 10^{-3} \times 25.13$

$= 0.362\ (N\cdot m)$ ....(4)

According to (1), (4), total torque (T)

$T = 1.03 + 0.362 = 1.39\ (N\cdot m)$ ....(5)

According to (5) value and operational conditions, from torque at 0.5 (MPa)

$\boxed{\text{GRC - 20 - 180}}$ ....(A)

can be selected.

Step 3 Allowable energy confirmation

Check if value is within allowable energy after kinetic energy is calculated.

Calculate the angular speed at the end of oscillation ω.

On conditions θ = 180° = π (rad), t = 0.5 (s)

Therefore,

$$\omega = \frac{2\theta}{t} = \frac{2\pi}{0.5} = 12.57(rad/s)$$

Therefore, kinetic energy (E) is

$$E = \frac{1}{2} \times 2.88 \times 10^{-3} \times 12.57^2$$

$= 0.23(J)$ ....(6)

From (6) and (A) selected at Step 2

$\boxed{\text{GRC - 20 - 180 - A1,A2}}$ ....(B)

can be selected.

Selection example (3)

Step 4 Allowable load confirmation

Finally, check if value is within allowable load range after load value that applies to table is calculated.

[Thrust load]
Since no thrust load is applied, thrust load (Ws)
$W_S = 0(N)$ ....(7)

[Radial load]
Total weight
0.2 + 0.5 = 0.7 (kg)
Therefore,
$W_R = 0.7 \times 9.8 = 6.9(N)$............................(8)

[Moment load]
Moment load (M) from the figure below
$M = 0.03 \times (0.2 + 0.5) \times 9.8$
$= 0.21\ (N\cdot m)$ ....(9)
According to (7), (8), (9), (B),

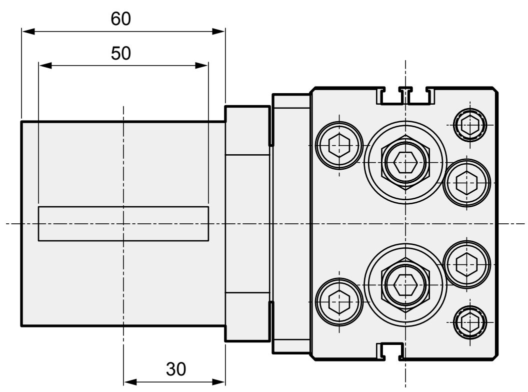
$$\frac{W_s}{W_{smax}} + \frac{W_R}{W_{Rmax}} + \frac{M}{M_{max}}$$

$$= \frac{0}{150} + \frac{6.9}{140} + \frac{0.21}{4.0} = 0.101 \leq 1.0 \text{........(C)}$$

According to (B) and (C), total load value is within the allowable load value.

GRC - 20 - 180 - A1, A2

can be selected.

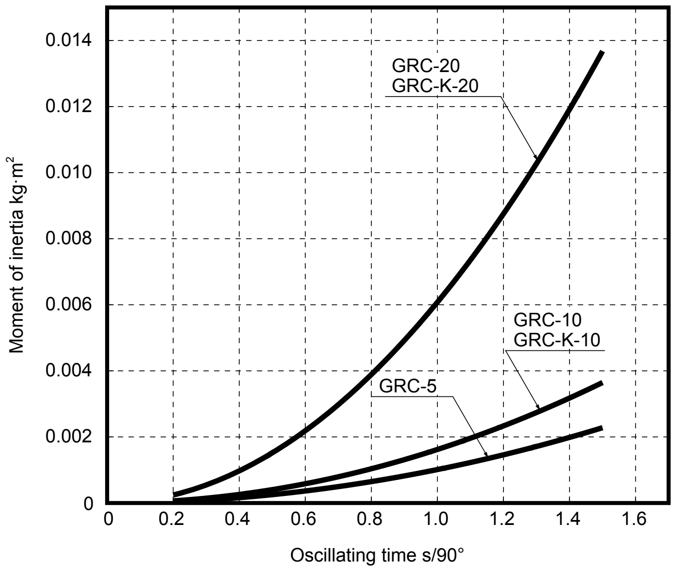


LCM
LCR
LCG
LCW
LCX
STM
STG
STS/STL
STR2
UCA2
ULK*
JSK/M2
JSG
JSC3/JSC4
USSD
UFCD
USC
UB
JSB3
LMB
LML
HCM
HCA
LBC
CAC4
UCAC2
CAC-N
UCAC-N
RCS2
RCC2
PCC
SHC
MCP
GLC
MFC
BBS
RRC
GRC
RV3*
NHS
HRL
LN
Hand
Chuk
MecHnd/Chuk
ShkAbs
FJ
FK
SpdContr
Ending

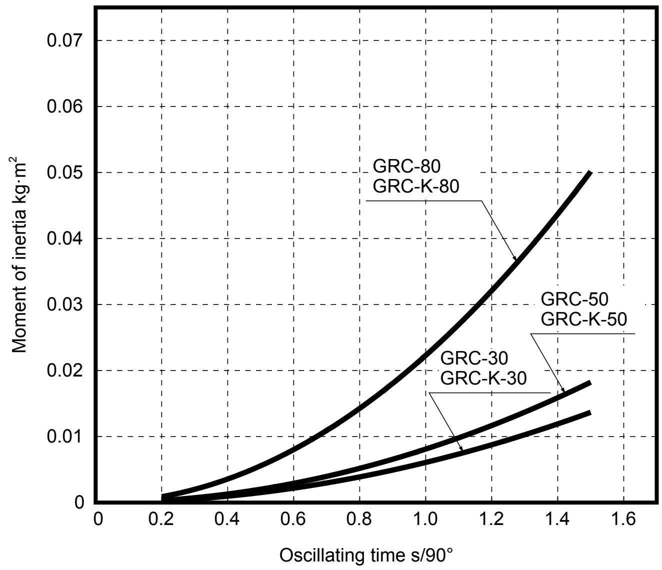
1. Energy absorbing performance and oscillating time

(1) For rubber cushion, relations between moment of inertia and oscillating time are shown in the line graph below. Always use within the lower right range of the graph as the shaft, etc., could break. Use for selection reference, etc.

● Basic/high accuracy



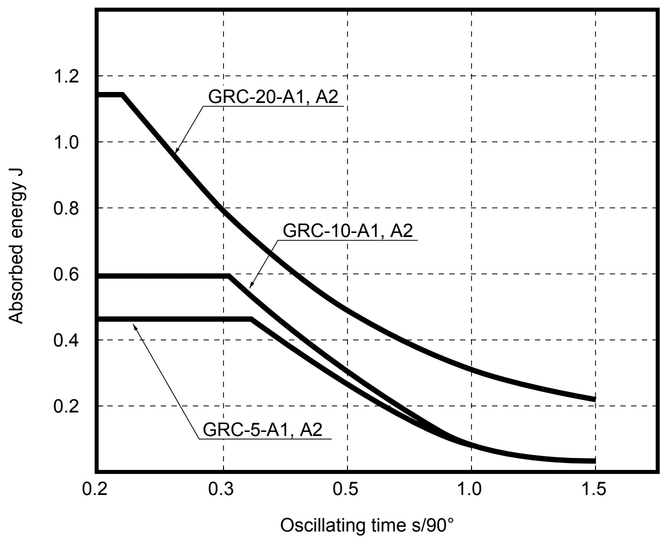
Size 5, 10, 20



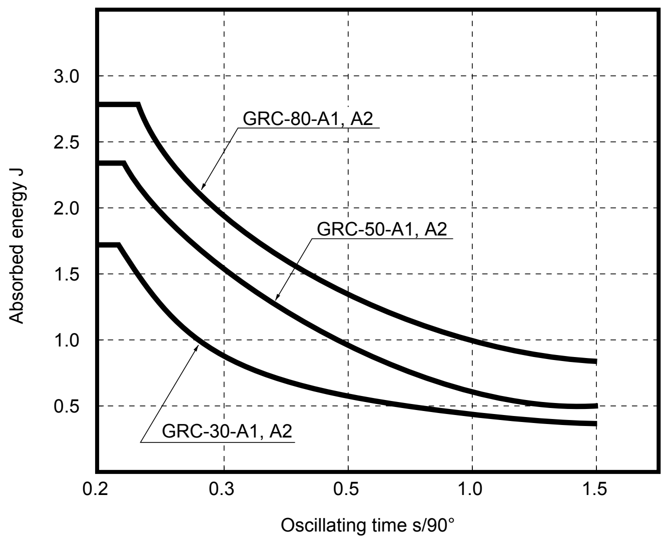
Size 30, 50, 80

(2) The relation of the absorbed energy and oscillating time when an external shock absorber is installed is shown with the following line graph. Always use within the lower left range of the graph since the shaft, etc., could break. Use for selection reference, etc.

● Absorbed energy and oscillating time



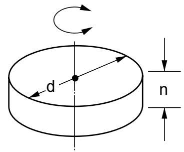
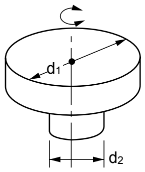
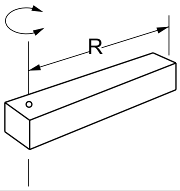
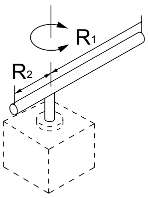
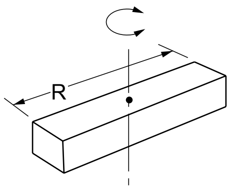
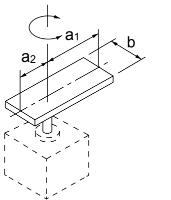
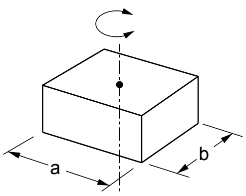
Size 5, 10, 20

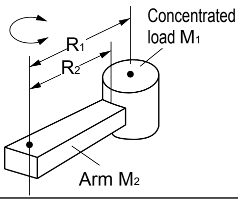


Size 30, 50, 80

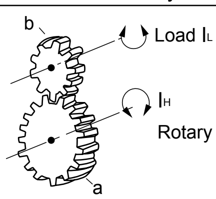
2. Figure for moment of inertia calculation

When rotary shaft passes through the workpiece

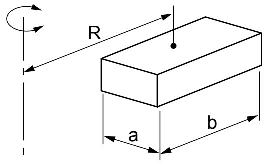
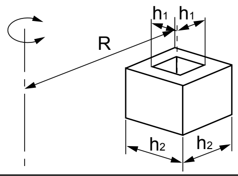
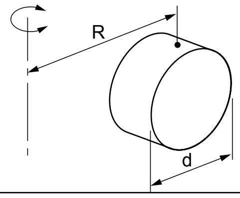
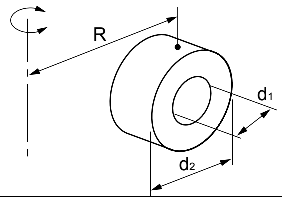
Shape	Sketch	Requirements	Moment of inertia I $kg\cdot m^2$	Radius of rotation K_1^2	Remarks
Dial plate		● Diameter d (m) ● Weight M (kg)	$I=\frac{Md^2}{8}$	$\frac{d^2}{8}$	● No mounting direction ● For sliding use, contact CKD.
Circular stepped plate		● Diameter d_1 (m), d_2 (m) ● Weight d_1 section M_1 (kg) d_2 section M_2 (kg)	$I=\frac{1}{8}(M_1d_1^2+M_2d_2^2)$	$\frac{d_1^2+d_2^2}{8}$	● Ignore when the d_2 section is extremely small compared to the d_1 section
Bar (center of rotation at end)		● Bar length R (m) ● Weight M (kg)	$I=\frac{MR^2}{3}$	$\frac{R^2}{3}$	● Mounting direction is horizontal ● Oscillating time changes when the mounting direction is vertical
Thin rod		● Bar length R_1, R_2 ● Weight M_1, M_2	$I=\frac{M_1/R_1^2}{3}+\frac{M_2/R_2^2}{3}$	$\frac{R_1^2+R_2^2}{3}$	● Mounting direction is horizontal ● Oscillating time changes when the mounting direction is vertical
Bar (center of rotation at center of gravity)		● Bar length R (m) ● Weight M (kg)	$I=\frac{MR^2}{12}$	$\frac{R^2}{12}$	● No mounting direction
Thin rectangle plate (rectangular parallelepiped)		● Plate length a_1, a_2 ● Side length b ● Weight M_1, M_2	$I=\frac{M_1}{12}(4a_1^2+b^2)+\frac{M_2}{12}(4a_2^2+b^2)$	$\frac{(4a_1^2+b^2)+(4a_2^2+b^2)}{12}$	● Mounting direction is horizontal ● Oscillating time changes when the mounting direction is vertical
Rectangular parallelepiped		● Side length a(m), b(m) ● Weight M(kg)	$I=\frac{M}{12}(a^2+b^2)$	$\frac{a^2+b^2}{12}$	● No mounting direction ● For sliding use, contact CKD.

Shape	Sketch	Requirements	Moment of inertia I $kg\cdot m^2$	Radius of rotation K_1^2	Remarks
Concentrated load		● Shape of concentrated load ● Length to center of gravity of concentrated load R_1 ● Arm length R_2(m) ● Concentrated load weight M_1(kg) ● Arm weight M_2(kg)	$I=M_1(R_1^2+k_1^2)+\frac{M_2R_2^2}{3}$	Calculate k_1^2 according to shape of concentrated load	● Mounting direction is horizontal ● When M_2 is extremely small compared to M_1, it may be calculated as $M_2=0$

How to convert load J_L to rotary actuator shaft rotation when using with gear

Shape	Sketch	Requirements	Moment of inertia I $kg\cdot m^2$	Radius of rotation K_1^2	Remarks
Gear		● Gear Rotary side (tooth number) a Load side (geartooth number) b ● Load inertia moment N·m	Load moment of inertia for the rotary actuator's shaft rotation $I_H=\left(\frac{a}{b}\right)^2 I_L$		● When gear shape is larger, gear moment of inertia should be considered.

● Rotary shaft offsets from workpiece

Shape	Sketch	Requirements	Moment of inertia I kg·m2	Remarks
Rectangular parallelepiped		● Side length a(m) ● Distance from rotary b(m) shaft to load center R(m) ● Weight M(kg)	$I=\frac{M}{12}(a^2+b^2)+MR^2$	● Same for cube
Hollow rectangular parallelepiped		● Side length h_1(m) h_2(m) ● Distance from rotary shaft to load center R(m) ● Weight M(kg)	$I=\frac{M}{12}(h_1^2+h_2^2)+MR^2$	● Cross section is for cube only
Cylinder		● Diameter d(m) ● Distance from rotary shaft to load center R(m) ● Weight M(kg)	$I=\frac{Md^2}{16}+MR^2$	
Hollow cylinder		● Diameter d_1(m) d_2(m) ● Distance from rotary shaft to load center R(m) ● Weight M(kg)	$I=\frac{M}{16}(d_1^2+d_2^2)+MR^2$	

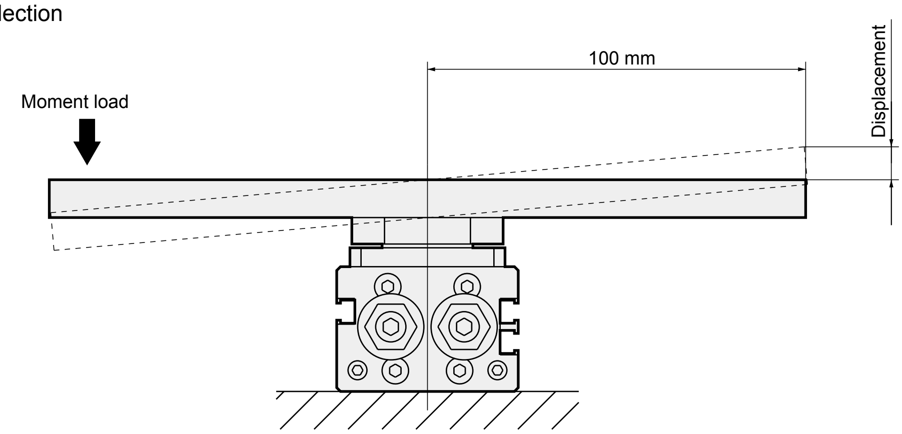
* To find moment of inertia, first convert load, jig, etc., to simple shapes with modeling, then calculate values. For the combined load, calculate each inertial moment and their total.

3. Table deflection (reference value)

Displacement (reference value) of table at 100 mm away from center of rotation when moment load is applied to GRC is shown below. (It is assumed that the table is in a non-rotating stationary state.)

Measuring method

Table deflection



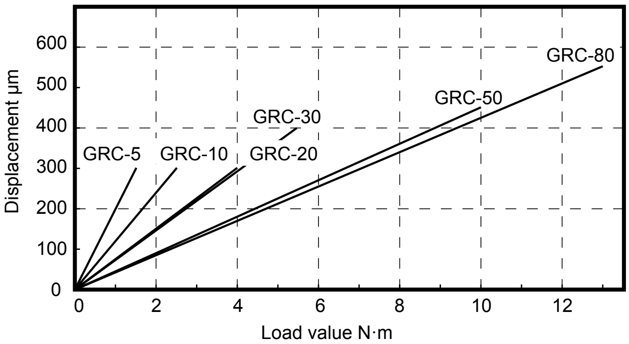


Table deflection of GRC (basic)

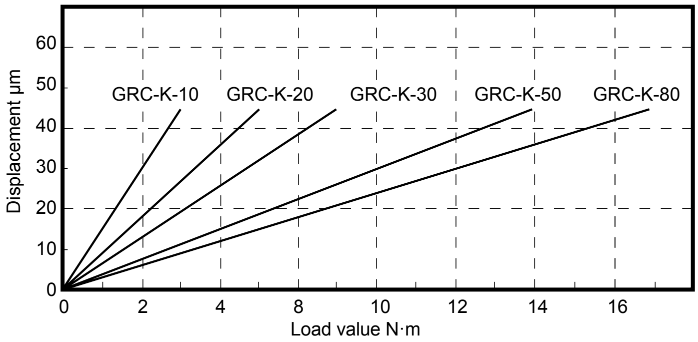
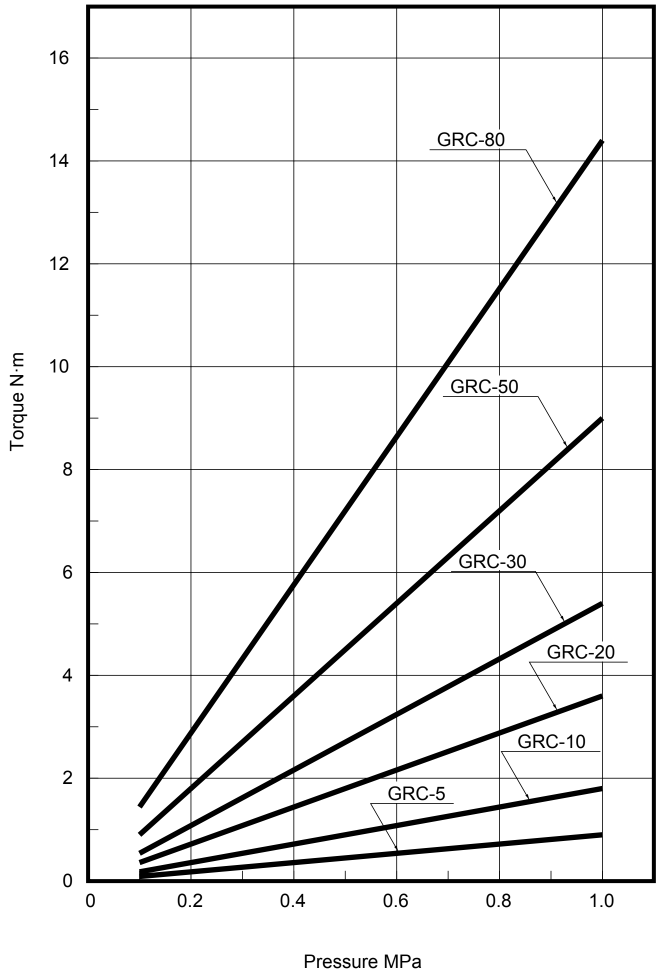


Table deflection of GRC-K (high accuracy)

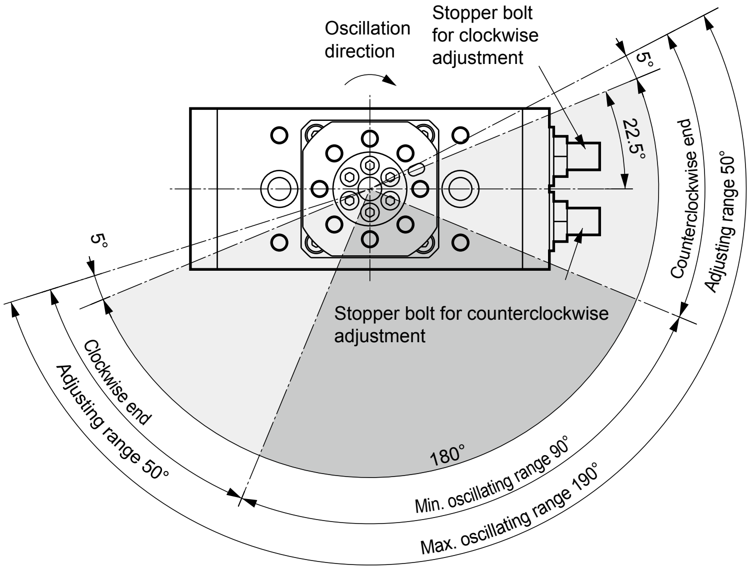
4. Effective torque diagram

Note that torque at oscillation end is half of the value in the graph below.
(The torque is as shown in the table when the end stopper is an external stopper (shock absorber, etc.).)

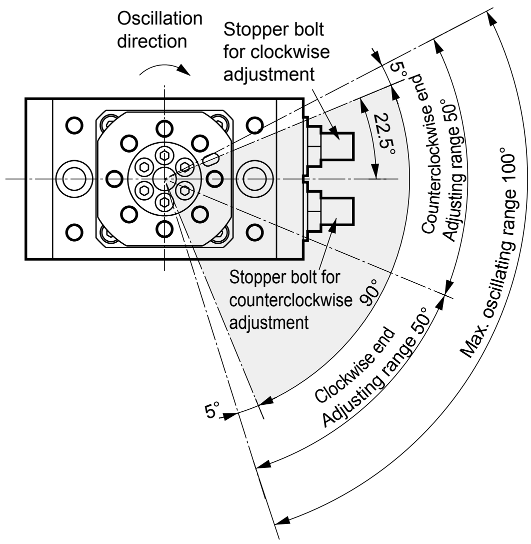


5. Oscillating angle adjustment method

● Basic/high accuracy

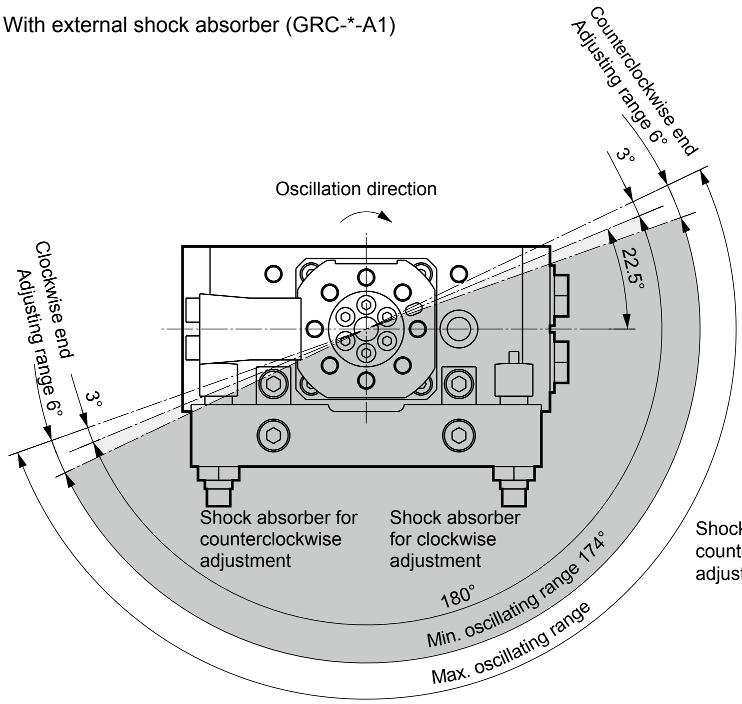


180° specifications

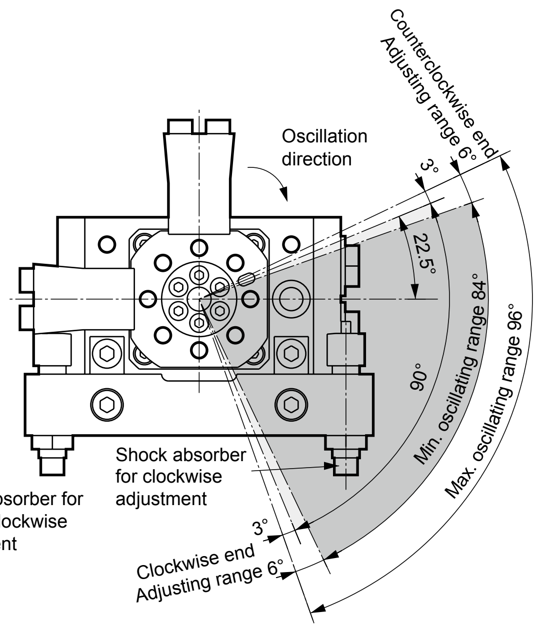


90° specifications

● With external shock absorber (GRC-*-A1)

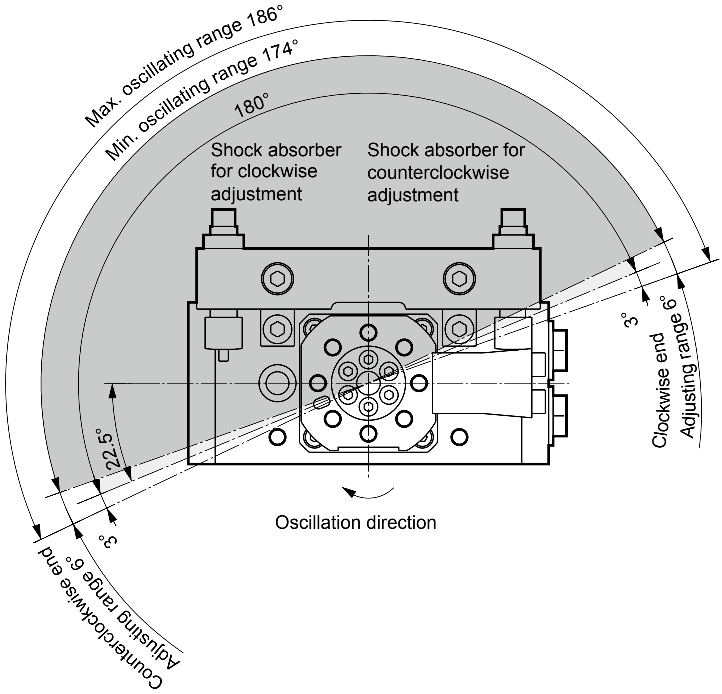


180° specifications

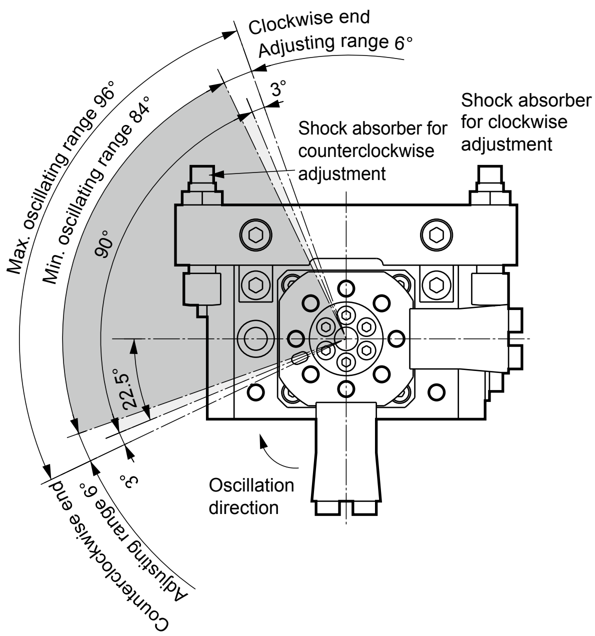


90° specifications

● With external shock absorber (GRC-*-A2)



180° specifications



90° specifications

Safety Precautions

Be sure to read this section before use.
Refer to Intro Page 73 for general information of the cylinder, and to Intro Page 80 for general information of the cylinder switch.

Product-specific cautions: Table rotary actuator GRC Series

Design/selection

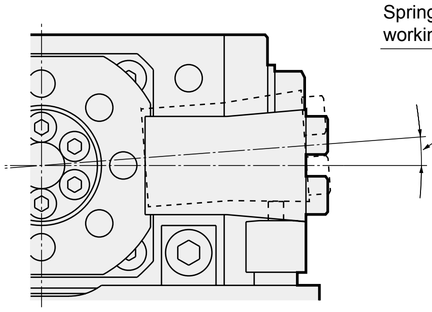
1. Common

CAUTION

- Generally, select the model so that the output torque is twice or more than that required by the load.
  The GRC Series uses a double piston, so if the oscillating angle is adjusted by the stopper bolt, torque at the oscillation end will be half the effective torque.

- Even if the required torque load is low during oscillation motion, the load inertia may lead to actuator damage. Upon consideration of moment of inertia, kinetic energy and oscillating time, be sure to use with the allowable energy or less.

- Note that when an external shock absorber is connected, torque is reduced by the return force of the spring built into the shock absorber at the oscillating end.



- The external shock absorber absorbs the kinetic energy of the workpiece at the oscillation end, buffering the impact. A smooth stop may not be achieved under certain load conditions.

2. Fine speed GRC-F

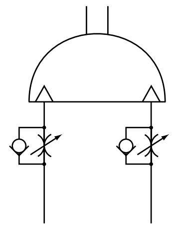
CAUTION

- Use without lubrication. (Lubrication not possible)
  Applying lubrication may cause changes in characteristics.

- Assemble the speed controller near the rotary actuator.
  When installed at a distant place from the rotary actuator, the adjustment becomes unstable.
  Use the SC-M3/M5, SC3W, SCD-M3/M5 or SC3U Series speed controller.

- At the higher air pressure and the lower load factor, the speed generally becomes more stable.
  Use at a 50% or less load factor.

- Stable speed control is achieved with a meter-out circuit.



- Avoid use in places subject to vibrations.
  The product will be adversely affected by vibration and operation will become unstable.

Mounting, installation and adjustment

1. Common

⚠CAUTION

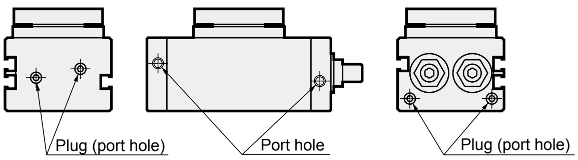
- Do not apply additional processing to the product.
  If modified, the product's strength will decrease, possibly causing product damage. This may result in injury or damage to operator, components, or equipment.

- Do not widen the fixed orifice on the piping port by re-machining, etc. If the fixed orifice is widened, the actuator operation speed and impact will increase, damaging the actuator. Moreover, be sure to attach a speed controller during piping before use.

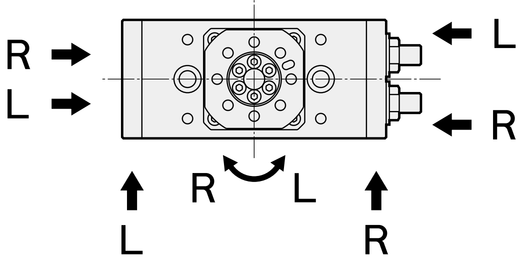
- Select among 3 surfaces for piping port. Ports other than the side piping port are plugged when the product is shipped. When changing the piping port, interchange these plugs. When changing ports for the GRC-5 to 30, apply the recommended adhesive to plugs. When changing ports for GRC- 50 or 80, apply recommended adhesive or wrap sealing tape around plugs. Failure to do so may lead to air leakage.

[Recommended adhesive]

LOCTITE 222	[Loctite Japan Corp.]
ThreeBond 1344	[ThreeBond Co., Ltd]



- The relationship of piping ports and oscillation direction is shown below.



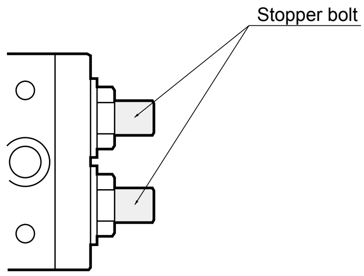
R: Clockwise rotation (right)
L: Counterclockwise rotation (left)

- An angle adjustment screw (stopper bolt or shock absorber) for adjustment of the oscillating angle is provided as standard equipment. When the product is shipped, the angle adjustment screw is adjusted randomly within the oscillation adjusting range. Readjust this to the required angle before use.

- Adjust the angle to within the adjusting range specified for the product.
  If used outside of the adjusting range, the product may be damaged or malfunction. Refer to product specifications (page 1302) and oscillating angle adjustment (page 1329).

- The adjustment angle per rotation of the angle adjusting screw (stopper bolt of shock absorber) is shown below.

Basic/high accuracy



With external shock absorber

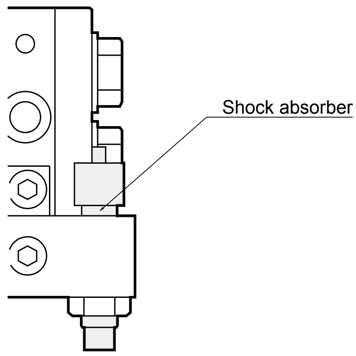


Table 1

Size	Stopper bolt adjustment angle per rotation	Shock absorber adjustment angle per rotation
5	8.7°	1.1°
10	4.9°	1.0°
20	5.7°	1.1°
30	3.8°	0.9°
50	3.5°	0.7°
80	3.5°	0.9°

■ Observe steps (1) to (5) when adjusting the angle. If adjustments are not made this way, the seal washer will be damaged after one or two adjustments.

[Angle adjustment procedure]

(1) First loosen the hexagon nut as shown in Fig.1.

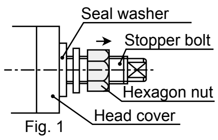


Fig. 1

(2) Second, remove the seal washer from the head cover by hand as shown in Fig.2.

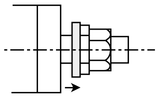


Fig. 2

(3) Turn the stopper bolt, hexagon nut, and seal washer together as shown in Fig.3, and adjust the angle. Check that the rubber section of the seal washer does not bite into the thread part.

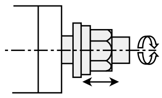


Fig. 3

(4) After adjusting the angle, move the seal washer near to the head cover by hand as shown in Fig. 4.

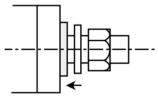


Fig. 4

(5) Tighten securely with the hexagon nut as shown in Fig. 5. Check that the rubber section of the seal washer does not bite into the thread part.

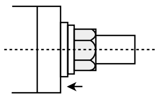
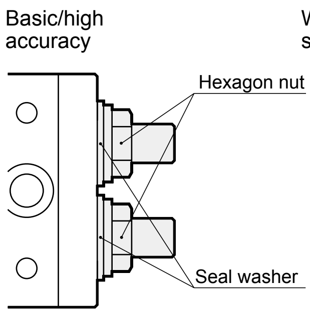


Fig. 5

After adjusting the angle, securely tighten the hexagon nut with the tightening torque in Table 2. If tightening torque is not adhered to then the hex nut could loosen in the course of usage, resulting in external leakage.

■ When replacing the stopper bolt for angle adjustment (the hex bolt if an external shock absorber is used) with a sealed washer, be sure that the hex nut (hex bolt if an external shock absorber is used) is tightened to the correct torque according to Table 2. Failure to do so may lead to air leakage.



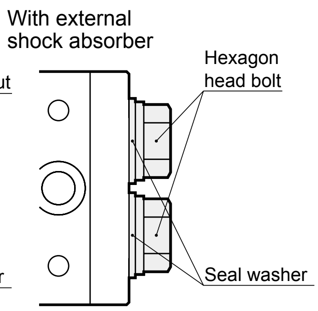


Table 2

Size	Tightening torque (N·m)	
	Basic/high accuracy	With external shock absorber
5	5.9±10%	3.4±10%
10	9.4±10%	4.9±10%
20	11.8±10%	6.9±10%
30	11.8±10%	6.9±10%
50	22.1±10%	8.8±10%
80	22.1±10%	8.8±10%

■ Make sure the tightening torque of the shock absorber nut is in accordance with Table 3. If the tightening torque exceeds the value below, the shock absorber may be damaged.

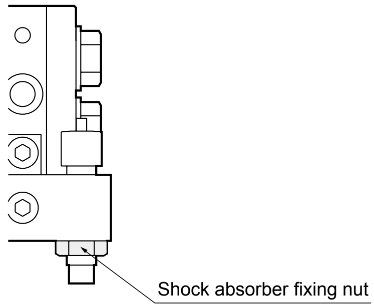


Table 3

Size	5	10	20	30	50	80
Tightening torque N·m	1.47		1.96		5.14	8.58

■ When retrofitting A3 types with an external shock absorber, the tightening torque for the mounting hex socket bolt or lever mounting hex socket bolt is shown in Table 4.

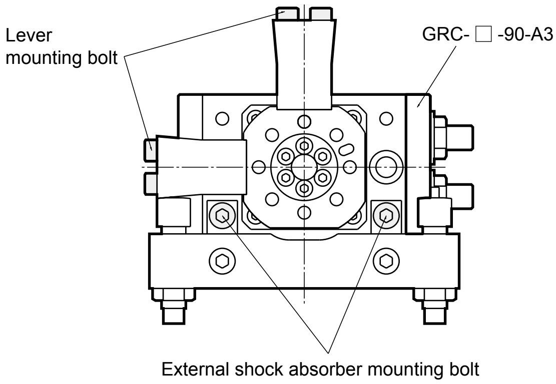


Table 4

Size	Lever mounting bolt	External shock absorber mounting bolt
	Tightening torque (N·m)	Tightening torque (N·m)
5	0.6±20%	1.4±20%
10	1.4±20%	2.9±20%
20	2.8±20%	4.8±20%
30	2.8±20%	4.8±20%
50	12.0±20%	12.0±20%
80	12.0±20%	12.0±20%

LCM
LCR
LCG
LCW
LCX
STM
STG
STS/STL
STR2
UCA2
ULK*
JSK/M2
JSG
JSC3/JSC4
USSD
UFCD
USC
UB
JSB3
LMB
LML
HCM
HCA
LBC
CAC4
UCAC2
CAC-N
UCAC-N
RCS2
RCC2
PCC
SHC
MCP
GLC
MFC
BBS
RRC
GRC
RV3*
NHS
HRL
LN
Hand
Chuk
MecHnd/Chuk
ShkAbs
FJ
FK
SpdContr
Ending

LCM
LCR
LCG
LCW
LCX
STM
STG
STS/STL
STR2
UCA2
ULK*
JSK/M2
JSG
JSC3/JSC4
USSD
UFCD
USC
UB
JSB3
LMB
LML
HCM
HCA
LBC
CAC4
UCAC2
CAC-N
UCAC-N
RCS2
RCC2
PCC
SHC
MCP
GLC
MFC
BBS
RRC
GRC
RV3*
NHS
HRL
LN
Hand
Chuk
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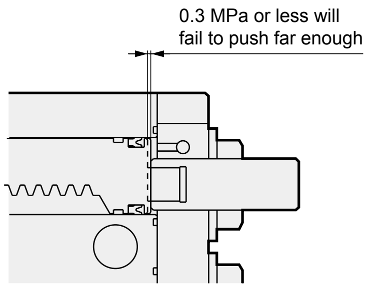
FJ
FK
SpdContr
Ending

■ A rubber cushion is built into GRC types. (Basic, high accuracy) If less than 0.3 MPa of pressure is used, the rubber cushion may not function correctly. If oscillating end accuracy is required, use at pressure of 0.3 MPa or higher.

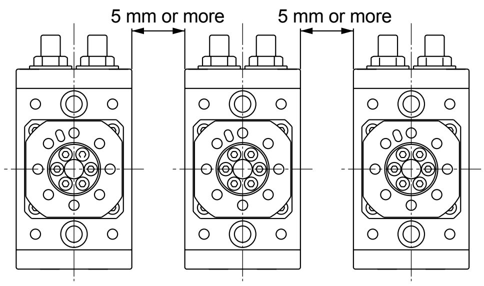
Back pressure may remain if using with all ports closed, potentially failing to push fully against the rubber cushion.

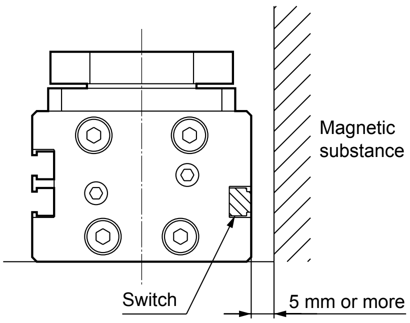


■ Pay attention to the proximity of cylinders, etc.

When installing two or more rotary actuators with switches in parallel, or if there is a magnetic substance such as a steel plate nearby, provide the following distances from the cylinder body surface. (The dimensions are the same for all sizes.)

Mutual magnetic interference may cause the switch to malfunction.





■ CKD's shock absorber is a repair part.

Replace it when the energy absorption performance has degraded or the operation is not smooth.