

GRC

Table Type Rotary Actuator

Size 5, 10, 20, 30, 50, 80

Swing/Rotary Type



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Bearing guide enables direct mounting of high loads and high positional accuracy



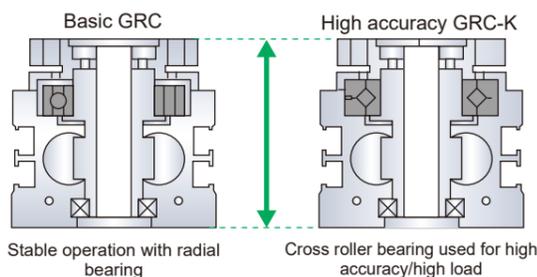
Excellent Design Freedom

Abundant Torque Sizes

6 sizes selectable from compact 0.5 N·m to 8.1 N·m.

Standard type and high-precision type selectable with the same dimensions

Product type change on lines, etc. (standard type, high-precision type) can be handled speedily.



90° specification and 180° specification available separately

When selecting 90° oscillation angle type, further compactness is achieved.

GRC Series Product System

	Basic type GRC	High-Precision Type 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)	●	●
Oscillation Angle		
90° Type	●	●
180° Type	●	●
Option		
Shock suppressor type Stopper	●	●

Excellent Installability

① Spigot joint for positioning on table top surface (4 locations) and main body bottom surface (1 location)



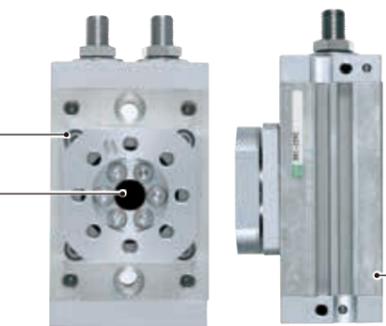
Spigot Joint for Positioning

② Large hollow hole allows for neat piping/wiring

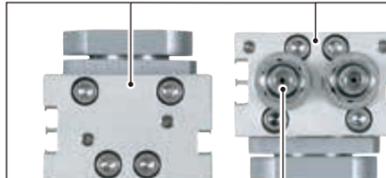
Hollow hole diameters $\phi 4$ to $\phi 17$ available.



③ Piping port extraction direction selectable from 3 faces



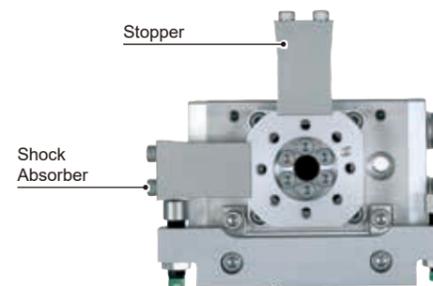
④ Angle adjustment bolt with rubber cushion for adjusting oscillation angle



Excellent Operability

Stable operation with external stopper

Smooth stopping without backlash is possible with external stopper and shock absorber (option).



Energy saving

Compared to vane type (RV3□ Series), air leakage is less, saving energy.

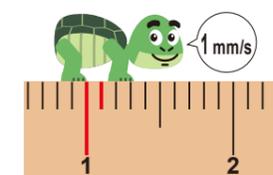
Gentle, slow-speed operation possible for workpieces

Large pinion diameter and long piston stroke achieve low-speed operation.

Variation	Model No.	Oscillation Time Adjustment Range s/90°
Basic Type/High-Precision Type	GRC, GRC-K	0.2 to 1.5
Slow-Speed Type/High-Precision Slow-Speed Type	GRC-F, GRC-KF	0.2 to 25

Ultra Low Speed Type Ultra-low speed drive up to 1 mm/s possible

No stick-slip, stable operation even at fine speeds. Ideal for conveying and positioning delicate products.

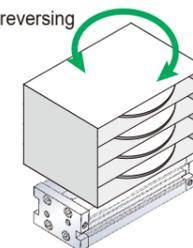


Sliding Structure

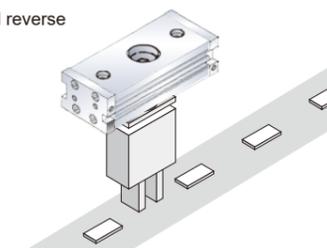
- Special treatment of tube inner surface
- Special treatment of packing surface and optimization of hardness
- Optimal grease selection

Application Example

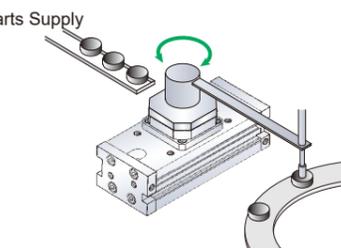
Cassette reversing



Hand reverse



Parts Supply



Variation Table

Table Type Rotary Actuator GRC Series

●: Standard, ◎Option, ■: Not Available

Variation	Model No. Circuit Diagram Code	Size										Option			Switch	Page
		5	10	20	30	50	80	90	180	With External Shock Absorber ①	With External Shock Absorber ②	With Mounting Groove Machining for Retrofitting External Shock Absorber				
										A1	A2	A3				
Basic type	GRC 	●	●	●	●			●	●	●	●	◎	◎	◎	◎	1248
High-Precision Type	GRC-K 	■	●	●	●			●	●	●	●	◎	◎	◎	◎	1248
Ultra Low Speed Type	GRC-F 	●	●	●	●			●	●	●	●	◎	◎	◎	◎	1262
High-Precision Type / Ultra Low Speed Type	GRC-KF 	■	●	●	●			●	●	●	●	◎	◎	◎	◎	1262

Note: Refer to P. 1254 for external Shock Absorbers

Swing/Rotary Type

RRC

GRC

RV3□

Swing/Rotary Type

RRC

GRC

RV3□

Cylinder Switch

Ending

Cylinder Switch

Ending



Table Type Rotary Actuator Basic Type/High-Precision Type GRC, GRC-K Series

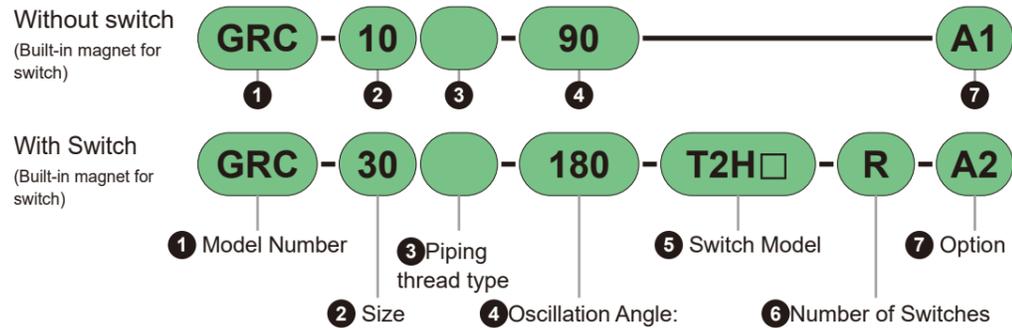
● Size: 5, 10, 20, 30, 50, 80

Circuit Diagram Code



GRC, GRC-K Series Model Number Notation

Model Number Notation



1 Model Number

Code	Content
GRC	Basic type
GRC-K	High-Precision Type

Note: The port position for basic type/high-precision type is on the side. Other ports are fitted with plugs.

2 Size

Model No.	Theoretical Torque
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

*1: For size "5", GRC-K cannot be selected.

3 Piping thread type

Code	Content
Blank	M5 (Size 5 to 30) Rc Thread (Size 50, 80)
NN	NPT Thread (Size 50 or more) (Custom Product)
GN	G Thread (Size 50 or more) (Custom Product)

4 Oscillation Angle:

Code	Content
90	90°
180	180°

5 Switch Model No.

For switch details, refer to P. 1457. Switches are shipped with the product.

Contact	Indicator LED Special Function	Wiring (Output)	Load Voltage (V)		Load Current (mA)		Lead Wire *1		Image
			AC	DC	AC	DC	Straight	L-shape	
Solid State	1-Color	2-wire	85 to 265	—	5 to 100	—	T5V□	T1V□	
			—	10 to 30	—	5 to 20 *2	T2H□	T2V□	
			—	30 or less	—	100 or less	T3H□	T3V□	
	2-Color	2-wire	—	24 ± 10%	—	5 to 20	T2WH□	T2WV□	
			—	30 or less	—	50 or less	T3WH□	T3WV□	
			—	24 ± 10%	—	5 to 20	T2WLH□	T2WLV□	
1-Color Flexible Lead Wire Type	2-wire	—	10 to 30	—	5 to 20 *2	T2HR3	T2VR3		

*Lead wire length, connector specification

Code	Content
Blank	1 m (Standard)
3	3 m (Option)
5	5 m (Option)
W	M8 Connector, 1PIN (+), 4PIN (-) Lead Wire 0.3 m

*5: Only T2WLH and T2WLV can be selected.

Example) Lead wire length
1 m T1H
3 m T1H₃
5 m T1H₅

*1: For "□" in the switch model number, enter the code selected from the "Lead wire length, connector specification" table.

*2: The maximum load current value above, 20 mA, is at 25°C. If the switch operating Ambient Temperature is higher than 25°C, it will be lower than 20 mA. (At 60°C, it will be 5 to 10 mA.)

*3: This does not guarantee the water resistance of the cylinder.

*4: Switches other than the model numbers listed above are also available. (Custom Product) For details, refer to P. 1457.

6 Number of Switches

Code	Content
R	With 1 Right Rotation Detection
L	With 1 Left Rotation Detection
D	With 2 pcs

7 Option

Code	Content	Image
Blank	Stopper, Urethane-Tipped Hexagon Socket Head Set Screw Type	
A With External Shock Absorber		
A1	Mounting Position①	
A2	Mounting Position②	
A3	For Retrofitting External Shock Absorber (With Mounting Groove Machining)	

*1: The external Shock Absorbers cannot be retrofitted onto the basic/high accuracy type. If retrofitting is possible, select A3 type as an option.

*2: A3, if an external Shock Absorbers is retrofit on the A1, will be the same. Please consult us for use with A2 type.

Clean Specification

(Catalog No. CB-033SAA)

●Dust prevention structure usable in cleanrooms

GRC - - P7□ GRC-K - - P7□

GRC - - P5□ GRC-K - - P5□

Rechargeable Battery Compatible Specification

(Catalog No. CC-1226AA)

●Design compatible with rechargeable battery manufacturing process

GRC - - P4*

*Please contact us for details.

Switch Single Unit Model No. Notation

● Switch Body Only

SW - T2H
5 Switch Model No.

Consumable Parts Kit Model No. Notation

● Set of consumable parts such as packing

GRC - 5 K
2 Size

Specifications

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 method		Rack & Pinion Type						
Operating Fluid		Compressed Air						
Max Operating Pressure	MPa	1.0						
Min Operating Pressure *2	Basic type	0.10						
	High-Precision Type	—	0.15		0.10			
	With External Shock Absorber	0.25 (36 psi)	0.20	0.15				
Proof Pressure	MPa	1.6						
Ambient Temperature	°C	0 to 60 (provided there is no freezing)						
Port Size		M5			Rc1/8			
Cushion	Basic Type/High-Precision Type	Rubber Cushion						
	With External Shock Absorber	Shock Absorber						
	Shock suppressor model number	NCK-0.3		NCK-0.7		NCK-1.2	NCK-2.6	
Allowable Absorbed Energy	Basic Type/High-Precision Type	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	mm	3.5	3.5	5	5	5.5	6.5	
Lubrication		Not Required (When lubricating, use Turbine Oil ISO VG32)						
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
Oscillation Angle Adjustment Range *4	Basic Type/High-Precision Type	90°	0° to 100°					
		180°	90° to 190°					
	With External Shock Absorber	90°	90° ±6°					
		180°	180° ±6°					
Oscillating time adjusting range *5 *8	s/90°	0.2 to 1.5						
Table Runout Accuracy (Reference Value) *6	Basic type	±0.17°		±0.23°	±0.26°	±0.32°		
	High-Precision Type	—	±0.026°					

*1: Theoretical torque is at 0.5 MPa Operating Pressure.
 *2: To fully compress the rubber cushion built into the basic type/high-precision type, the Operating Pressure must be 0.3 MPa or more.
 *3: Internal volume is at the Max oscillation angle of the oscillation angle adjustment range.
 *4: Oscillation angle adjustment range is when adjusted with stopper bolts (shock absorbers) on both sides.
 *5: Oscillation time adjustment range is at 0.5 MPa Operating Pressure.
 *6: **Technical Data (P. 1275) shows the table displacement at a point 100 mm away from the center of rotation.**
 *7: **The values in the table indicate the absorbed energy at the maximum oscillation speed. Since the absorption energy value changes with oscillation speed, refer to the graph on P. 1272 "Absorption Energy and Oscillation Time."**
 *8: For types with shock absorbers, it is the time until impact with the tip of the shock absorber (rod tip). (It is not the oscillation time to the stroke end of the shock absorber.)

Min Oscillation Angle with Switch

Size	5	10	20	30	50	80
T-type Solid State	20°	15°	17.5°	12.5°	12.5°	12.5°
T-type 2-Color Indicator						

Theoretical Torque Table

(Unit: N·m)

Size	Operating 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)

Oscillation Angle	90°		180°		External Shock Absorber Weight	Switch Weight (per piece)
	Basic type	High-Precision Type	Basic type	High-Precision Type		
Model No.						
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	

Swing/Rotary Type

Swing/Rotary Type

RRC

RRC

GRC

GRC

RV3□

RV3□

Cylinder Switch

Cylinder Switch

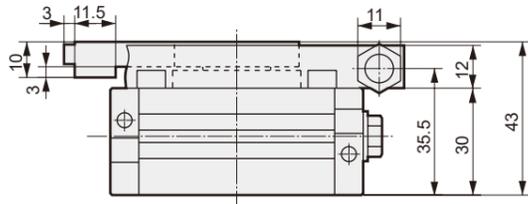
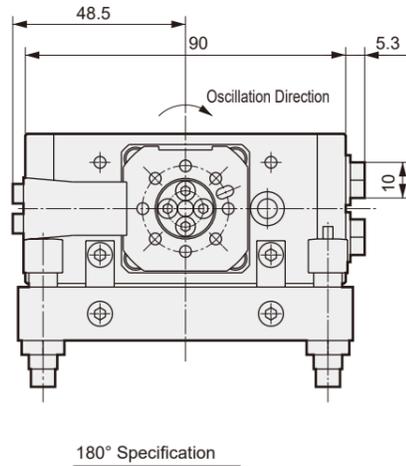
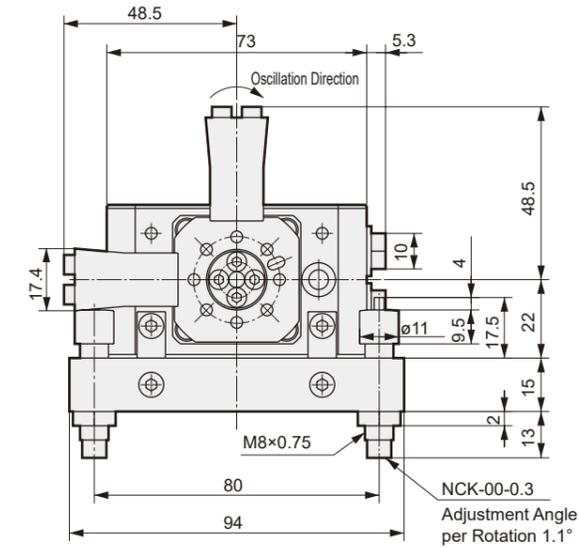
Ending

Ending

Outline Dimension Drawing with Option (With External Shock Absorber Size 5)

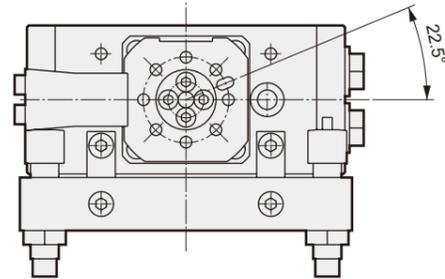
●GRC-5-□-A1/A2

Note: The drawing is for A1 type (mounting position①)

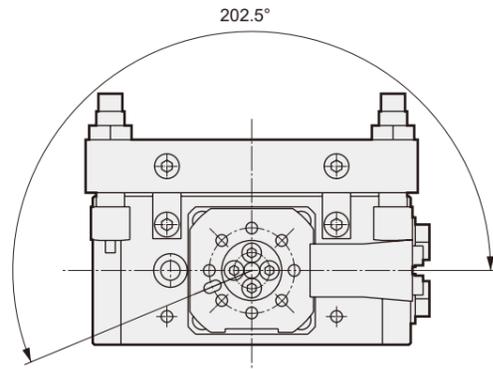


90° Specification

Note: Dimensions of the rotary actuator body are the same as the basic type, but it cannot be fixed using the 4 taps on the top of the body. Also, the position of the positioning pin hole on the top of the table varies depending on the mounting position of the external shock absorber.



For GRC-5-□-A1



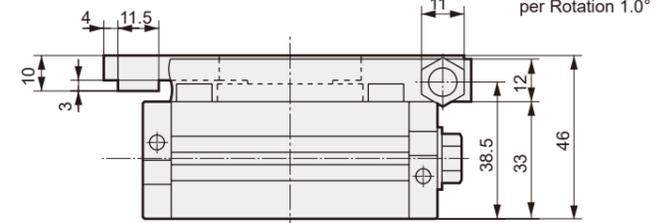
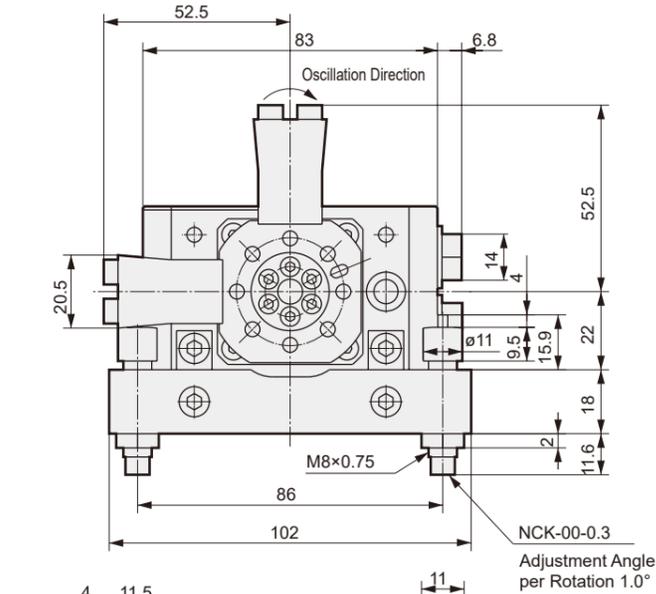
For GRC-5-□-A2

Dimensional Drawings with Option

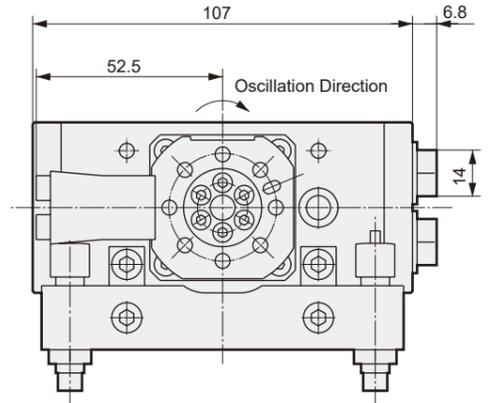
Outline Dimension Drawing with Option (With External Shock Absorber Size 10, 20)

●GRC-10-□-A1/A2

Note: The drawing is for A1 type (mounting position①)



90° Specification

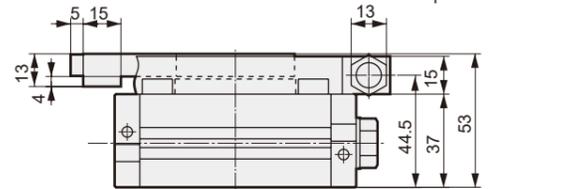
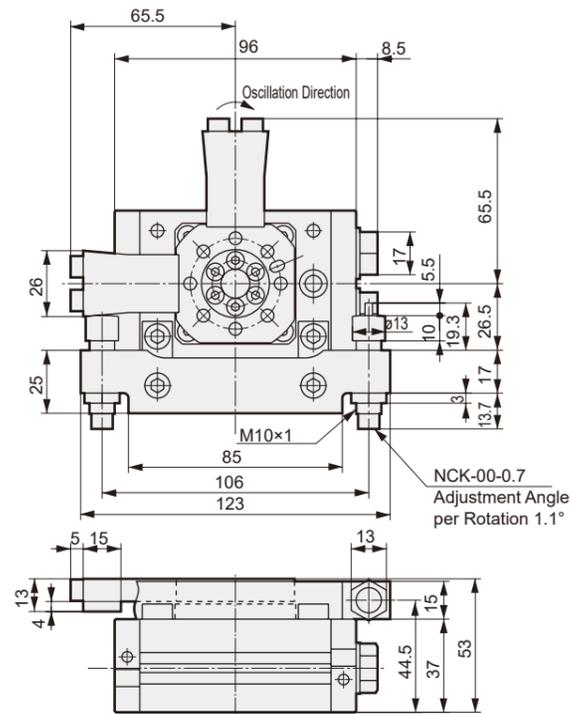


180° Specification

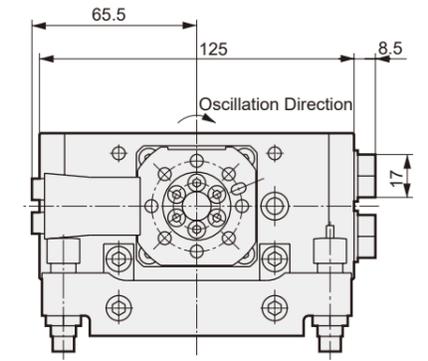
Note: Dimensions of the rotary actuator body are the same as the basic type, but it cannot be fixed using the 4 taps on the top of the body. Also, the position of the positioning pin hole on the top of the table varies depending on the mounting position of the external shock absorber. (Refer to GRC-5-□-A1/A2.)

●GRC-20-□-A1/A2

Note: The drawing is for A1 type (mounting position①)



90° Specification



180° Specification

Note: Dimensions of the rotary actuator body are the same as the basic type, but it cannot be fixed using the 4 taps on the top of the body. Also, the position of the positioning pin hole on the top of the table varies depending on the mounting position of the external shock absorber. (Refer to GRC-5-□-A1/A2.)

Swing/Rotary Type

RRC

GRC

RV3□

Swing/Rotary Type

RRC

GRC

RV3□

Cylinder Switch

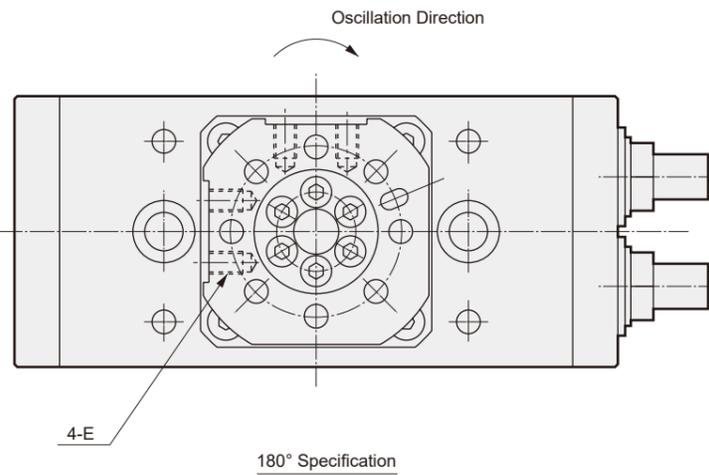
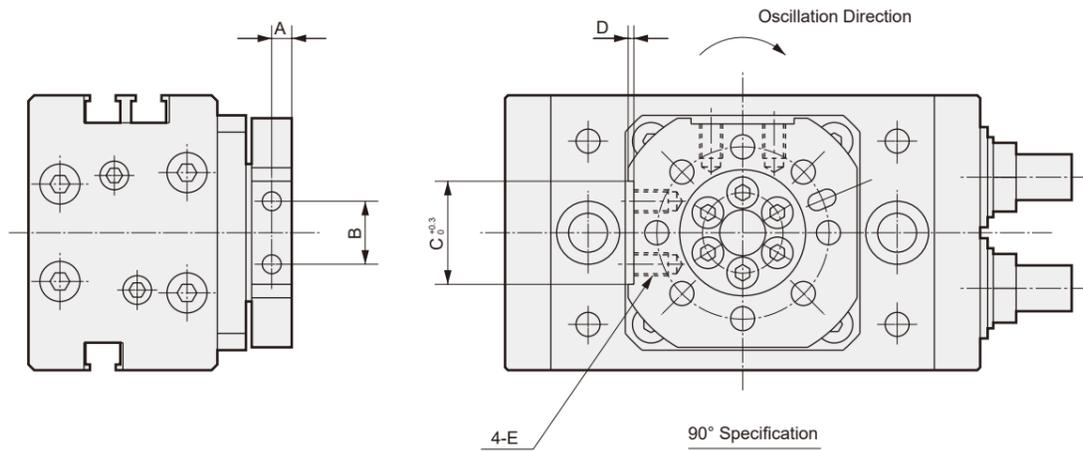
Ending

Cylinder Switch

Ending

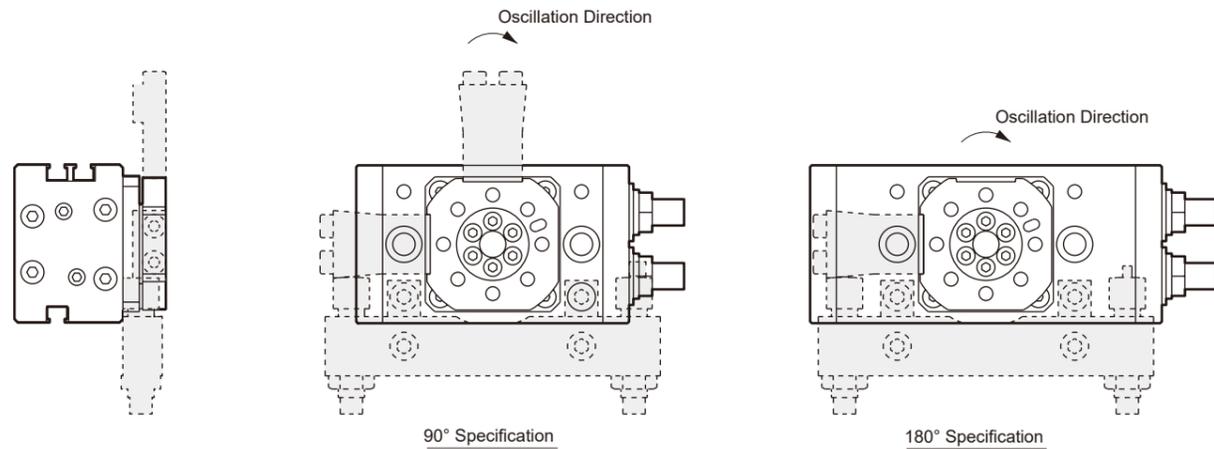
Outline Dimension Drawing with Option (For Retrofitting External Shock Absorber Size 5 to 80)

●GRC-□-A3

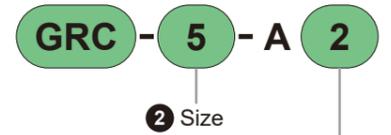


Code Size	A	B	C	D	E
5	3.5	8.4	15	1	M3 Depth 6.5
10	3.8	11	18	1	M4 Depth 6
20	4.5	13.4	23	1	M5 Depth 7.5
30	4.5	17	27	2	M5 Depth 8.5
50	6.9	18.4	32	2	M8 Depth 9
80	6.9	20	36	2	M8 Depth 9

When external shock absorber set is installed (□ part is the external shock absorber set.)
Note: If an external shock absorber set is installed on A3 type, it becomes A1 type. Please consult us if you wish to use A2 type. (Refer to P. 1254 for mounting position)



Set Model No. Notation



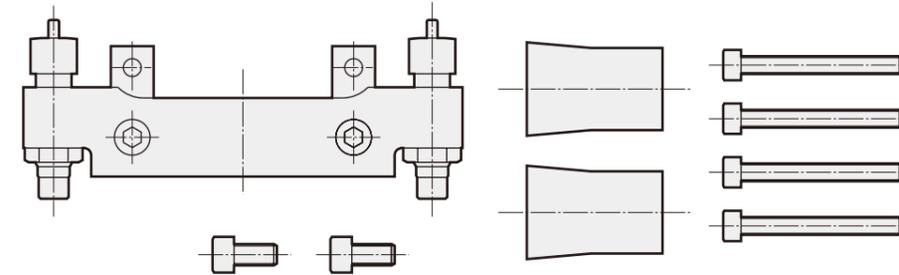
4 Oscillation Angle:

Code	Content
1	For 90° Specification
2	For 180° Specification

4 Specify 1 or 2 for the part.
 Note: Set contents differ for 90° specification and 180° specification. The figure is for 90° specification.

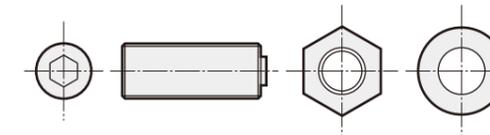
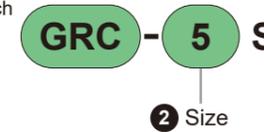
External Shock Absorber Set Model No. Notation

●Set of plate part, shock absorber, and lever
 Used when retrofitting an external shock absorber to A3 type



Angle Adjustment Stopper Bolt Set Model No. Notation

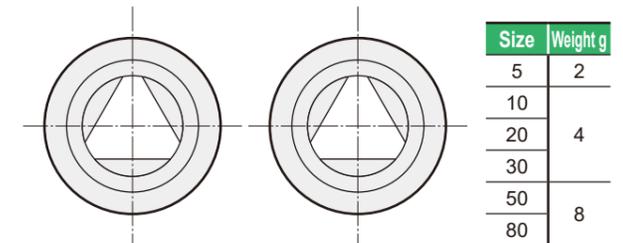
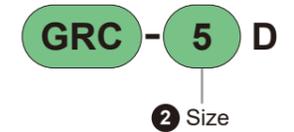
●Set of urethane-tipped Hexagon Socket head Set Screw, Hexagon Nut, and plain washer
 Used when removing the external shock absorber
 Quantity: 1 pc each



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

Seal Washer Set Model No. Notation

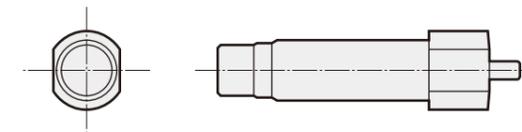
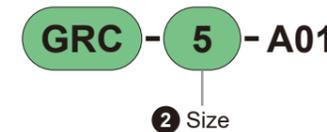
Used when replacing seal washer
 Contains 2 seal washers



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

Angle Adjustment Shock Absorber Set Model No. Notation

●Set of shock absorber and stopper
 Quantity: 1 pc

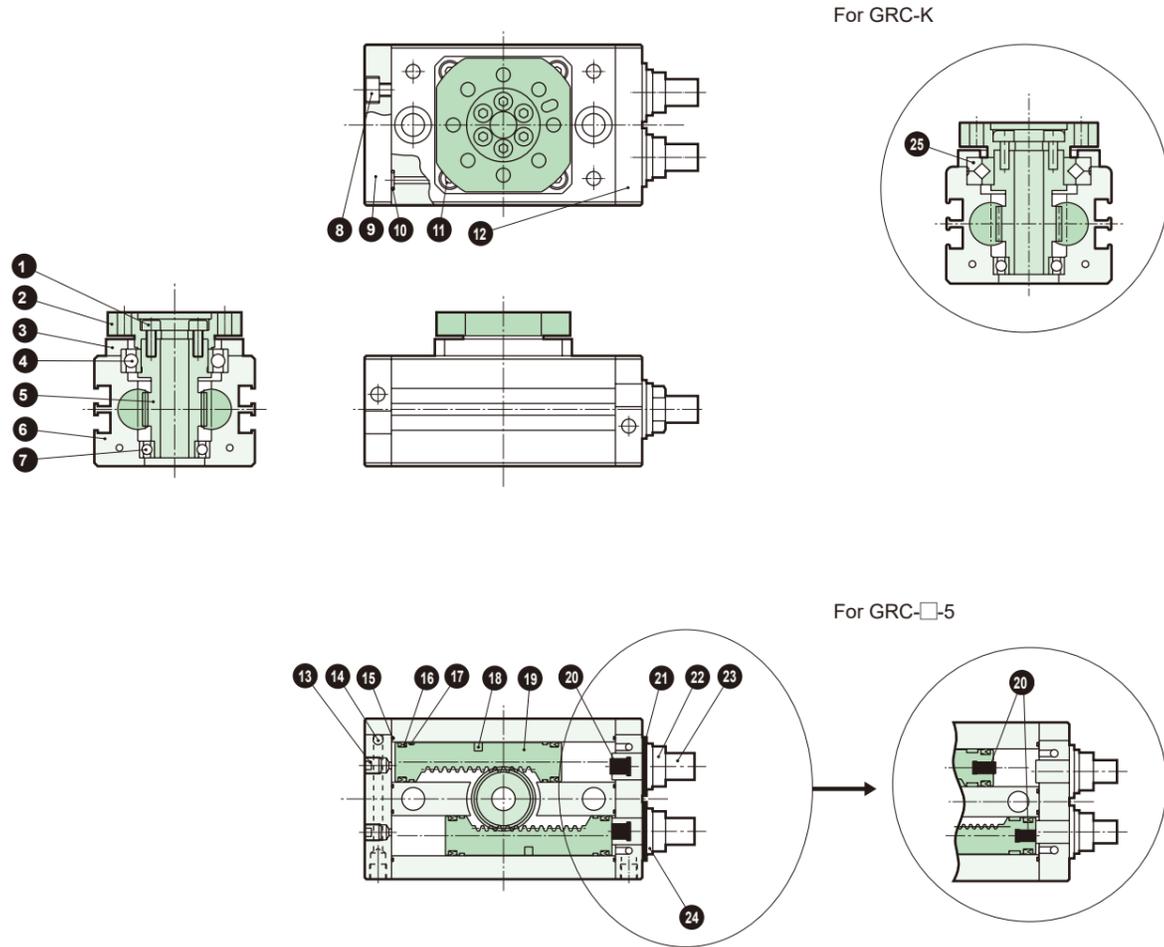


Shock suppressor model number used

Model	Shock suppressor model number	Weight g
GRC-5	NCK-00-0.3	12
GRC-10	NCK-00-0.3	
GRC-20	NCK-00-0.7	
GRC-30	NCK-00-0.7	20
GRC-50	NCK-00-1.2	
GRC-80	NCK-00-2.6	70

Internal Structure Diagram/Material

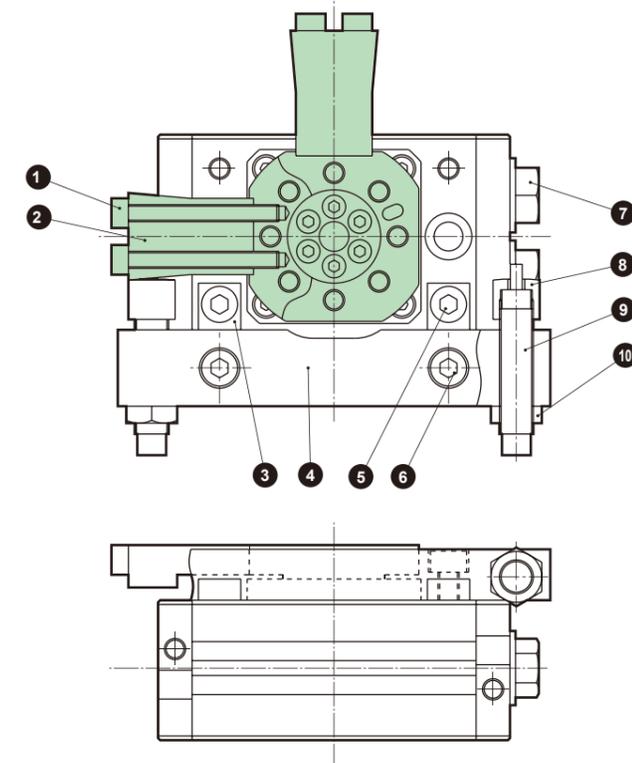
- GRC (Basic Type)
- GRC-K (High-Precision Type)



Part No.	Part Name	Material	Remarks	Part No.	Part Name	Material	Remarks
1	Hexagon Socket Head Cap Screw	Stainless Steel		14	Steel ball	Stainless Steel	
2	Table	Aluminum Alloy	Alumite	15	Cylinder Gasket	Nitrile Rubber	
3	Bearing Cover	GRC Aluminum Alloy GRC-K Stainless Steel	GRC Alumite	16	Piston Packing	Nitrile Rubber	
4	Ball Bearing (1)	Alloy Steel	GRC only	17	Wear ring	Polyacetal Resin	
5	Shaft	Alloy Steel		18	Magnet	5, 10: Special Alloy 20 to 80: Plastic	5, 10: Nickel Plating
6	Cylinder Body	Aluminum Alloy	Hard Anodized	19	Piston	Stainless Steel	
7	Ball Bearing (2)	Alloy Steel		20	Cushion Rubber	Urethane Rubber	
8	Hexagon Socket Head Cap Screw	Stainless Steel		21	Seal Washer	Steel, Nitrile Rubber	Zinc plating
9	Head Cover (1)	Aluminum Alloy	Alumite	22	Hexagon Nut	Steel	Nickel Plating
10	Gasket	Nitrile Rubber		23	Stopper bolt	Alloy Steel	Nickel Plating
11	Hexagon Socket Head Cap Screw	Stainless Steel		24	Plain Washer	Stainless Steel	
12	Head Cover (2)	Aluminum Alloy	Alumite	25	Cross Roller Bearing	Alloy Steel	GRC-K only
13	Hexagon Socket head Set Screw	Stainless Steel					

Internal Structure Diagram/Material

- GRC-□-A (with external Shock Absorbers)
- Note: Figure shows 90° spec. Materials, etc. are the same for 180° specification.



Part No.	Part Name	Material	Remarks	Part No.	Part Name	Material	Remarks
1	Hexagon Socket Head Cap Screw	Stainless Steel		6	Hexagon Socket Head Cap Screw	Stainless Steel	
2	Lever	Steel or Alloy Steel	Nickel Phosphorus Plating	7	Hexagon Bolt	Stainless Steel	
3	Connector	Steel	Nickel Plating	8	Stopper	Stainless Steel	
4	Plate	Aluminum Alloy	Alumite	9	Shock Absorber		
5	Hexagon Socket Head Cap Screw	Stainless Steel		10	Hexagon Nut	Steel	Nickel Plating

Consumable Parts Kit

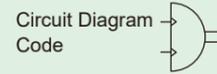
Kit Number	Replacement Part Number
GRC-5K	
GRC-10K	
GRC-20K	10 15 16 17 21
GRC-30K	
GRC-50K	
GRC-80K	

- *1: Please specify the kit number when ordering consumable parts.
 *2: Avoid disassembly/repair, since high accuracy type uses highly controlled precision parts. If repairing the high-precision type, please consult us.



Table Type Rotary Actuator Slow-Speed Type/High-Precision Slow-Speed Type GRC-F, GRC-KF Series

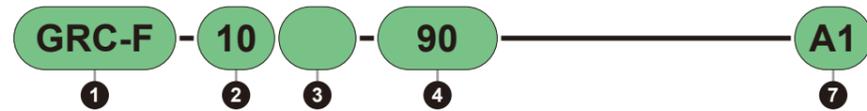
● Size: 5, 10, 20, 30, 50, 80



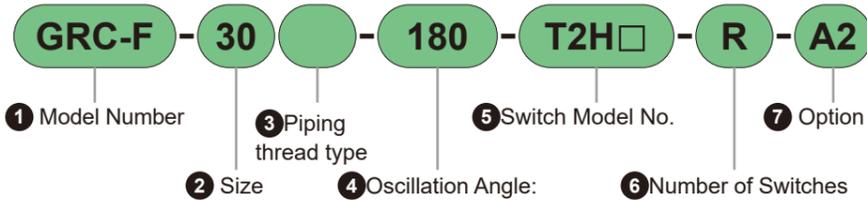
GRC-F, GRC-KF Series Model Number Notation

Model Number Notation

Without switch
(Built-in magnet for switch)



With Switch
(Built-in magnet for switch)



① Model Number ② Size ③ Piping thread type ④ Oscillation Angle: ⑤ Switch Model No. ⑥ Number of Switches ⑦ Option

① Model Number

Code	Content
GRC-F	Ultra Low Speed Type
GRC-KF	High-Precision Ultra Low Speed Type

Note: The port position for slow-speed type/high-precision slow-speed type is on the side. Other ports are fitted with plugs.

② Size

Model No.	Theoretical Torque
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

*1

*1: For size "5", GRC-KF cannot be selected.

③ Piping thread type

Code	Content
Blank	M5 (Size 5 to 30) Rc Thread (Size 50, 80)
NN	NPT Thread (Size 50 or more) (Custom Product)
GN	G Thread (Size 50 or more) (Custom Product)

④ Oscillation Angle:

Code	Content
90	90°
180	180°

⑤ Switch Model No.

For switch details, refer to P. 1457. Switches are shipped with the product.

Contact	Indicator LED Special Function	Wiring (Output)	Load Voltage (V)		Load Current (mA)		Lead Wire *1		Image
			AC	DC	AC	DC	Straight	L-shape	
Solid State	1-Color	2-wire	85 to 265	—	5 to 100	—	T5V□	T1V□	
			—	10 to 30	—	5 to 20 *2	T2H□	T2V□	
			—	30 or less	—	100 or less	T3H□	T3V□	
	2-Color	2-wire	—	24 ± 10%	—	5 to 20	T2WH□	T2WV□	
			—	30 or less	—	50 or less	T3WH□	T3WV□	
			—	24 ± 10%	—	5 to 20	T2WLH□	T2WLV□	
1-Color Flexible Lead Wire Type	2-wire	—	10 to 30	—	5 to 20 *2	T2HR3	T2VR3		

*Lead wire length, connector specification

Code	Content
Blank	1 m (Standard)
3	3 m (Option)
5	5 m (Option)
W	M8 Connector, 1PIN (+), 4PIN (-) Lead Wire 0.3 m

*5

*5: Only T2WLH and T2WLV can be selected.

Example) Lead wire length
1 m T1H
3 m T1H³
5 m T1H⁵

*1: For "□" in the switch model number, enter the code selected from the "Lead wire length, connector specification" table.

*2: The maximum load current value above, 20 mA, is at 25°C. If the switch operating Ambient Temperature is higher than 25°C, it will be lower than 20 mA. (At 60°C, it will be 5 to 10 mA.)

*3: This does not guarantee the water resistance of the cylinder.

*4: Switches other than the model numbers listed above are also available. (Custom Product) For details, refer to P. 1457.

⑥ Number of Switches

Code	Content
R	With 1 Right Rotation Detection
L	With 1 Left Rotation Detection
D	With 2 pcs

⑦ Option

Code	Content	Image
Blank	Stopper, Urethane-Tipped Hexagon Socket Head Set Screw Type	
A With External Shock Absorber		
A1	Mounting Position ^①	
A2	Mounting Position ^②	
A3	For Retrofitting External Shock Absorber (With Mounting Groove Machining)	

*1: The external Shock Absorbers cannot be retrofitted onto the basic/high accuracy type. If retrofitting is possible, select A3 type as an option.

*2: A3, if an external Shock Absorbers is retrofit on the A1, will be the same. Please consult us for use with A2 type.

Note: For switch/option single unit model numbers, refer to P. 1249, 1259. *Contact us for details.

Clean Specification (Catalog No. CB-033SAA)

●Dust prevention structure usable in cleanrooms

GRC-F - - P7□

GRC-KF - - P7□

Rechargeable Battery Compatible Specification (Catalog No. CC-1226AA)

●Design compatible with rechargeable battery manufacturing process

GRC - - P4□

Swing/Rotary Type

Swing/Rotary Type

RRC

RRC

GRC

GRC

RV3□

RV3□

Cylinder Switch

Cylinder Switch

Ending

Ending

Specifications

Item	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 method	Rack & Pinion Type					
Operating Fluid	Compressed Air					
Max Operating Pressure	MPa					
	1.0					
Min Operating Pressure *2	MPa					
	Ultra Low Speed Type					
	High-Precision Ultra Low Speed Type					
	—	0.15		0.10		
	With External Shock Absorber					
	0.25 (36 psi)	0.20	0.15			
Proof Pressure	MPa					
	1.6					
Ambient Temperature	°C					
	5 to 60					
Port Size	M5			Rc1/8		
Cushion	Slow-Speed Type/High-Precision Slow-Speed Type					
	Rubber Cushion					
	With External Shock Absorber					
	Shock Absorber					
	Shock suppressor model number		NCK-0.3	NCK-0.7	NCK-1.2	NCK-2.6
Allowable Absorption Energy	Slow-Speed Type/High-Precision Slow-Speed Type					
	0.005	0.008	0.03		0.04	0.11
	J With External Shock Absorber *6					
	0.46	0.59	1.15	1.71	2.33	2.78
Shock absorber stroke	mm					
	3.5	3.5	5	5	5.5	6.5
Lubrication	Lubrication Not Possible					
Volumetric capacity *3	cm ³					
	90°	1.3	3.5	7.0	10.5	18.1
	180°	3.4	6.6	13.4	20.0	34.4
Oscillation Angle	Slow-Speed Type/High-Precision Slow-Speed Type					
Adjustment Range *4	90° Specification	0° to 100°				
	180° Specification	90° to 190°				
	With External Shock Absorber					
	90° Specification	90° ±6°				
	180° Specification	180° ±6°				
Oscillation Time Adjustment Range *5 *7	s/90°					
	0.2 to 25					

*1: Theoretical torque is at 0.5 MPa Operating Pressure.

*2: To fully compress the built-in rubber cushion in the low speed / high precision low speed type, the Operating Pressure must be 0.3 MPa or higher.

*3: Internal volume is at the Max oscillation angle of the oscillation angle adjustment range.

*4: The angle adjustment range is when adjusted with stopper bolts (shock absorbers) on both sides. For types with shock absorber, the shock absorber part does not have slow-speed specification.

*5: Oscillation time adjustment range is at 0.5 MPa Operating Pressure.

***6: The values in the table indicate the absorbed energy at the maximum oscillation speed. Since the absorption energy value changes with oscillation speed, refer to the graph on P. 1272 "Absorption Energy and Oscillation Time."**

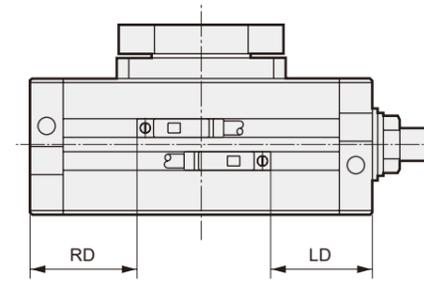
*7: For types with shock absorbers, it is the time until impact with the tip of the shock absorber (rod tip). (It is not the oscillation time to the stroke end of the shock absorber.)

Dimensional Drawings

Same as Slow-Speed GRC Series and High-Precision Slow-Speed GRC-K Series. Please refer to P. 1252 to 1258.

GRC Series Outline Dimension Drawing with Switch

- T1H/V, T2H/V, T3H/V, T3PH/V, T2WH/V, T3WH/V, T2WLH/V, T2H/VR3



Switch Mounting Position

Switch	T1, T2, T3, T3P, T2□R3				T2W, T3W, T2WL			
Code	RD		LD		RD		LD	
Size	90°	180°	90°	180°	90°	180°	90°	180°
5	22.5	25.5	21.5	25.5	25.5	28.5	24.5	28.5
10	26	30.5	24.5	30.5	29	33.5	27.5	33.5
20	31	37.5	31	37.5	34	40.5	34	40.5
30	40	49.5	38.5	49.5	43	52.5	41.5	52.5
50	51	61	48.5	61	54	64	51.5	64
80	54	64	51.5	64	57	67	54.5	67

Swing/Rotary Type

Swing/Rotary Type

RRC

RRC

GRC

GRC

RV3□

RV3□

Cylinder Switch

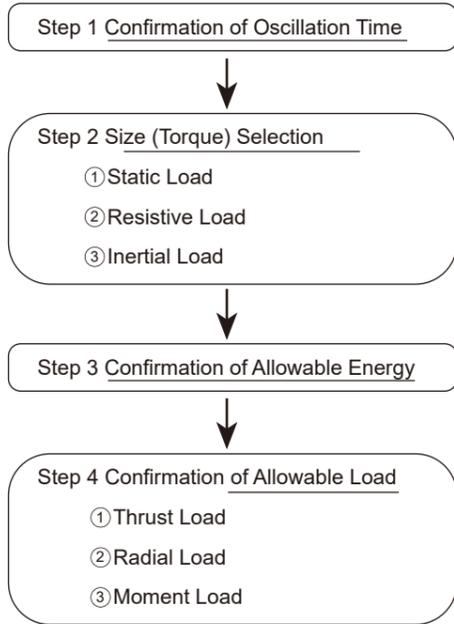
Cylinder Switch

Ending

Ending

Selection method

Select according to the following procedure.



③ Inertial Load (TA)

When rotating an object

$$T_A = 5 \times I \times \dot{\omega}$$

$$\dot{\omega} = \frac{2\theta}{t^2}$$

- T_A : Required torque (N·m)
- I : Moment of inertia (kg·m²)
- ω : Maximum angular acceleration (rad/s²)
- θ : Oscillating angle (rad)
- t : Oscillation Time (s)

Calculate moment of inertia using moment of inertia and oscillating time (P. 1272) or figure for moment of inertia calculation (P. 1273).

Step 3 Confirmation of Allowable Energy

For inertial load, if the kinetic energy of the load at the oscillation end exceeds the allowable value, it will cause damage to the actuator. Select according to Table 1 so that it is within the allowable energy value. If the energy is too large, use an external shock absorber, etc., to stop the load.

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

$$\omega = \frac{2\theta}{t}$$

- E : Kinetic energy J
- I : Moment of inertia (kg·m²)
- ω : Angular velocity at oscillating end (rad/s)
- θ : Oscillating angle (rad)
- t : Oscillation Time (s)

Calculate moment of inertia using moment of inertia and oscillation time (P. 1272) or figure for moment of inertia calculation (P. 1273).

Step 1 Confirmation of Oscillation Time

If the oscillation time is set outside the specification range, the actuator operation may become unstable or cause damage to the actuator. Be sure to use within the specified oscillation time adjustment range.

	When used at 90°	When used at 180°
Oscillation Time (S)	0.2 to 1.5	0.4 to 3.0

Step 2 Size (Torque) Selection

Load types are broadly divided into three categories. Calculate the required torque for each case. For combined loads, sum each torque to determine the required torque. Select a size that satisfies the required torque from the theoretical torque table or effective torque diagram according to the Operating Pressure.

① Static Load (Ts)

When static pushing force such as clamping is required

$$T_s = F_s \times L$$

- T_s : Required torque (N·m)
- F_s : Required thrust (N)
- L : Length from the center of rotation to the point of action (m)

② Resistive Load (TR)

When forces due to friction, gravity, and other external forces are applied

$$T_R = K \times F_R \times L$$

- T_R : Required torque (N·m)
- K : Slack coefficient [When load does not fluctuate K=2
With load fluctuation K=5
- F_R : Required thrust (N)
- L : Length from the center of rotation to the point of action (m)

Step 3 Confirmation of Allowable Energy

For inertial load, if the kinetic energy of the load at the oscillation end exceeds the allowable value, it will cause damage to the actuator. Select according to Table 1 so that it is within the allowable energy value. If the energy is too large, use an external shock absorber, etc., to stop the load.

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

$$\omega = \frac{2\theta}{t}$$

- E : Kinetic energy J
- I : Moment of inertia (kg·m²)
- ω : Angular velocity at oscillating end (rad/s)
- θ : Oscillating angle (rad)
- t : Oscillation Time (s)

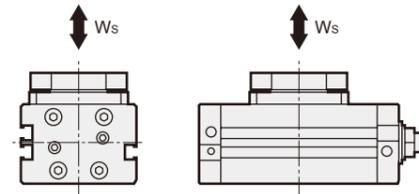
Calculate moment of inertia using moment of inertia and oscillation time (P. 1272) or figure for moment of inertia calculation (P. 1273).

Selection method

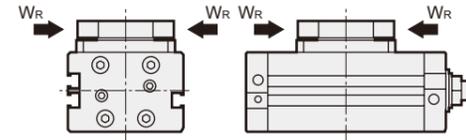
Step 4 Confirmation of Allowable Load

If the load is applied directly to the table, ensure it is within the allowable values in Table 2. In the case of combined load, ensure that the sum of the ratios to the allowable value of each load is 1.0 or less. Load is divided into the following 3 types.

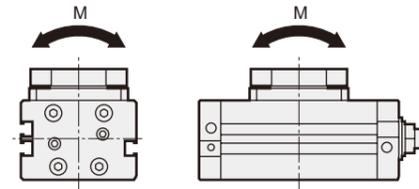
① Thrust Load (Axial Load)



② Radial Load (Lateral Load)



③ Moment Load



After calculating each load, substitute into the following formula and confirm.

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

- 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)

The allowable absorption energy value and the allowable value for each load are shown in the table below.

Table 1 Allowable Absorption Energy Value [J]

Size	5	10	20	30	50	80
Basic Type/High-Precision Type	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 type	50	80	140	200	450	580
	High-Precision Type	-	120	220	440	550	650
Radial load	Basic type	30	80	150	200	320	400
	High-Precision Type	-	100	160	240	380	480
Moment Load	Basic type	1.5	2.5	4.0	5.5	10.0	13.0
	High-Precision Type	-	3.0	5.0	7.0	12.0	15.0

Swing/Rotary Type

RRC

GRC

RV3□

Swing/Rotary Type

RRC

GRC

RV3□

Cylinder Switch

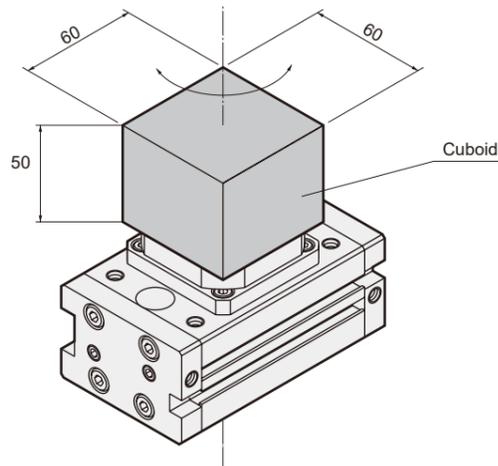
Ending

Cylinder Switch

Ending

Selection Example 1

When there is a rectangular parallelepiped load



[Operating Conditions]
 Pressure : 0.5 (MPa)
 Oscillation Angle : 90°
 Oscillation Time : 0.6 (s)
 Load (Material : Aluminum Alloy)
 [Cuboid] : 0.5 (kg)

Step 1 Confirmation of Oscillation Time

From the operating conditions, the oscillation time is 0.6 (s/90°). Since it is within the oscillation time adjustment range of 0.2 to 1.5 (s/90°), proceed to the next step.

Step 2 Size (Torque) Selection

For inertial load, first calculate the moment of inertia (I).
 [Cuboid]

$$I = 0.5 \times \frac{0.06^2}{6} = 3 \times 10^{-4} \text{ (kg} \cdot \text{m}^2) \dots \textcircled{1}$$

Next, calculate the Max angular acceleration ($\dot{\omega}$).

From the conditions $\theta=90^\circ = \frac{\pi}{2}$ (rad), $t=0.6$ (s)

Therefore,

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

Therefore, from ① and ②, the inertial load (T_A) is

$$T_A = 5 \times 3 \times 10^{-4} \times 8.73 = 0.0131 \text{ (N} \cdot \text{m)} \dots \textcircled{3}$$

From the value of ③, operating conditions, and torque at 0.5 (MPa)

GRC-5-90 ④

can be selected.

Step 3 Confirmation of Allowable Energy

Calculate the kinetic energy and confirm if it is within the allowable energy value. Calculate the angular velocity ω at the oscillation end.

From the conditions $\theta=90^\circ = \frac{\pi}{2}$ (rad), $t=0.6$ (s)

Therefore,

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

Therefore, the kinetic energy (E) is,

$$E = \frac{1}{2} \times 3 \times 10^{-4} \times 5.24^2 = 0.00412 \text{ (J)} \dots \textcircled{4}$$

From ④ and ④ selected in Step 2

GRC-5-90 ⑤

can be selected.

Step 4 Confirmation of Allowable Load

Finally, calculate the load value applied by the load to the table and confirm if it is within the allowable load value.

[Thrust Load]

Thrust load (W_s) is,

$$W_s = 0.5 \times 9.8 = 4.9 \text{ (N)} \dots \textcircled{5}$$

[Radial Load]

Since no radial load is applied,

$$W_R = 0 \text{ (N)} \dots \textcircled{6}$$

[Moment Load]

Since no moment load is applied,

$$M = 0 \text{ (N} \cdot \text{m)} \dots \textcircled{7}$$

From ⑤, ⑥, ⑦, and ⑧

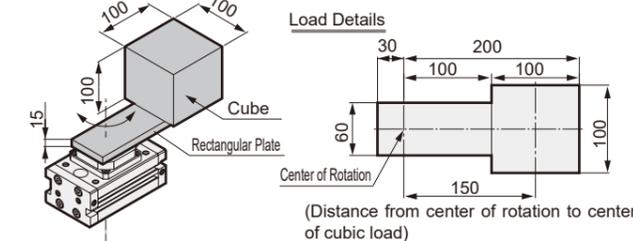
$$\frac{W_s}{W_{smax}} + \frac{W_R}{W_{Rmax}} + \frac{M}{M_{max}} = \frac{4.9}{50} + \frac{0}{30} + \frac{0}{1.5} = 0.098 \leq 1.0 \dots \textcircled{C}$$

From ⑧ and ⑨, since the total load value is within the allowable load value, **GRC-5-90**

can be selected.

Selection Example ②

When there is a rectangular parallelepiped load on a rectangular plate



[Operating Conditions]
 Pressure : 0.5 (MPa)
 Oscillation Angle : 90°
 Oscillation Time : 1.0 (s)
 Load (Material : Steel)
 [Rectangular plate on the left side of the rotation center]: 0.21 (kg)
 [Rectangular plate on the right side of the rotation center]: 1.40 (kg)
 [Cube] : 7.8 (kg)

Step 1 Confirmation of Oscillation Time

From the operating conditions, the oscillation time is 1.0 (s/90°). Since it is within the oscillation time adjustment range of 0.2 to 1.5 (s/90°), proceed to the next step.

Step 2 Size (Torque) Selection

For inertial load, first calculate the moment of inertia (I).

[Rectangular plate]

$$I_1 = 1.40 \times \frac{4 \times 0.20^2 + 0.06^2}{12} + 0.21 \times \frac{4 \times 0.03^2 + 0.06^2}{12} = 1.92 \times 10^{-2} \text{ (kg} \cdot \text{m}^2)$$

[Cube]

$$I_2 = 7.8 \times \frac{0.1^2}{6} + 7.8 \times 0.15^2 = 0.189 \text{ (kg} \cdot \text{m}^2)$$

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

$$I = I_1 + I_2 = 0.21 \text{ (kg} \cdot \text{m}^2) \dots \textcircled{1}$$

Next, calculate the Max angular acceleration ($\dot{\omega}$).

From the conditions $\theta=90^\circ = \frac{\pi}{2}$ (rad), $t=1.0$ (s)

Therefore,

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

Therefore, from ① and ②, the inertial load (T_A) is

$$T_A = 5 \times 0.21 \times 3.14 = 3.30 \text{ (N} \cdot \text{m)} \dots \textcircled{3}$$

From the value of ③ and operating conditions, from the torque at 0.5 (MPa)

GRC-50-90 ④

can be selected.

Step 3 Confirmation of Allowable Energy

Calculate the kinetic energy and confirm if it is within the allowable energy value. Calculate the angular velocity ω at the oscillation end.

From the conditions $\theta=90^\circ = \frac{\pi}{2}$ (rad), $t=1.0$ (s)

Therefore,

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

Therefore, the kinetic energy (E) is,

$$E = \frac{1}{2} \times 0.21 \times 3.14^2 = 1.035 \text{ (J)} \dots \textcircled{4}$$

GRC-50-90-A1, A2 ⑤

from ④ and ⑤ selected at Step 2

can be selected.

Step 4 Confirmation of Allowable Load

Finally, calculate the load value applied by the load to the table and confirm if it is within the allowable load value.

[Thrust Load]

Total weight is,

$$7.8 + 1.40 + 0.21 = 9.41 \text{ (kg)}$$

Therefore, the thrust load (W_s) is,

$$W_s = 9.41 \times 9.8 = 92.2 \text{ (N)} \dots \textcircled{5}$$

[Radial Load]

Since no radial load is applied,

$$W_R = 0 \text{ (N)} \dots \textcircled{6}$$

[Moment Load]

Moment load (M_1) due to rectangular plate is,

$$1.40 \times 9.8 = 13.72 \text{ (N)}$$

$$0.21 \times 9.8 = 2.06 \text{ (N)}$$

Therefore,

$$M_1 = 13.72 \times 0.1 - 2.06 \times 0.015 = 1.34 \text{ (N} \cdot \text{m)}$$

Moment load (M_2) due to rectangular parallelepiped is,

$$7.8 \times 9.8 = 76.44 \text{ (N)}$$

Therefore,

$$M_2 = 76.44 \times 0.15 = 11.47 \text{ (N} \cdot \text{m)}$$

Therefore, summing M_1 and M_2 ,

$$M = 1.34 + 11.47 = 12.81 \text{ (N} \cdot \text{m)} \dots \textcircled{7}$$

From ⑤, ⑥, ⑦, and ⑧,

$$\frac{W_s}{W_{smax}} + \frac{W_R}{W_{Rmax}} + \frac{M}{M_{max}} = \frac{92.2}{450} + \frac{0}{320} + \frac{12.8}{10} = 1.48 > 1.0$$

Since the moment load exceeds the allowable value, increase the size by one and recalculate with GRC-80-90.

$$\frac{W_s}{W_{smax}} + \frac{W_R}{W_{Rmax}} + \frac{M}{M_{max}} = \frac{92.2}{580} + \frac{0}{400} + \frac{12.8}{13} = 1.14 > 1.0$$

Still, the total load value exceeds the allowable value, so select the high-precision type and calculate,

$$\frac{W_s}{W_{smax}} + \frac{W_R}{W_{Rmax}} + \frac{M}{M_{max}} = \frac{92.2}{650} + \frac{0}{480} + \frac{12.8}{15} = 0.99 \leq 1.0 \dots \textcircled{C}$$

According to ⑨, total load value is within the allowable load value, so **GRC-K-80-90-A1, A2** can be selected.

Swing/Rotary Type

RRC

GRC

RV3□

Swing/Rotary Type

RRC

GRC

RV3□

Cylinder Switch

Ending

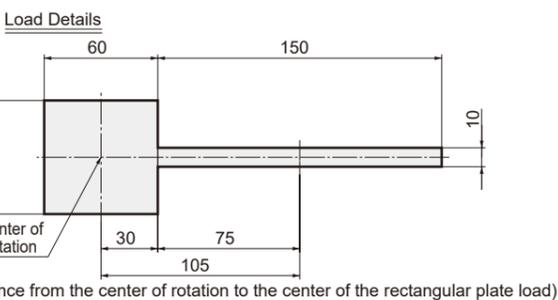
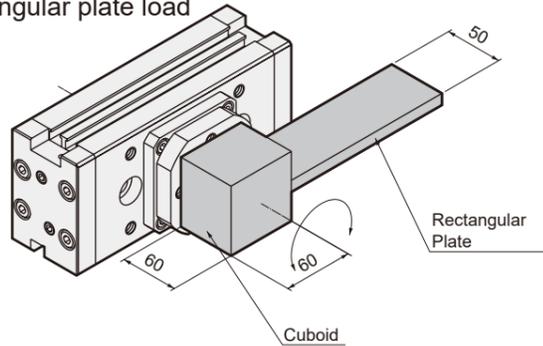
Cylinder Switch

Ending

Selection Example ③

Selection Example ③

When the rotating shaft is horizontal and there is a rectangular plate load



Therefore,
 $\dot{\omega} = \frac{2\theta}{t^2} = \frac{2\pi}{0.5^2} = 25.13 \text{ (rad/s}^2\text{)} \dots\dots\dots ③$
 Therefore, from ② and ③, the inertial load (T_A) is
 $T_A = 5 \times 2.88 \times 10^{-3} \times 25.13$
 $= 0.362 \text{ (N}\cdot\text{m)} \dots\dots\dots ④$
 From ① and ④, the total torque (T) is,
 $T = 1.03 + 0.362 = 1.39 \text{ (N}\cdot\text{m)} \dots\dots\dots ⑤$
 From the value of ⑤ and operating conditions, from the torque at 0.5 (MPa)
GRC - 20 - 180 ①
 can be selected.

Step 3 Confirmation of Allowable Energy

Calculate the kinetic energy and confirm if it is within the allowable energy value. Calculate the angular velocity ω at the oscillation end.
 From the conditions, $\theta = 180^\circ = \pi \text{ (rad)}$, $t = 0.5 \text{ (s)}$
 Therefore,
 $\omega = \frac{2\theta}{t} = \frac{2\pi}{0.5} = 12.57 \text{ (rad/s)}$
 Therefore, the kinetic energy (E) is,
 $E = \frac{1}{2} \times 2.88 \times 10^{-3} \times 12.57^2$
 $= 0.23 \text{ (J)} \dots\dots\dots ⑥$

From ⑥ and ① selected in Step 2
GRC - 20 - 180 - A1, A2 ②
 can be selected.

- [Operating Conditions]
 Pressure : 0.5 (MPa)
 Oscillation Angle : 180°
 Oscillation Time : 0.5 (s)
 Load (Material Aluminum Alloy)
 [Rectangular plate] 0.2 (kg)
 Cuboid 0.5 (kg)

Step 1 Confirmation of Oscillation Time

From the operating conditions, the oscillation time is 0.5 (s/180°). Since it is within the oscillation time adjustment range of 0.4 to 3.0 (s/180°), proceed to the next step.

Step 2 Size (Torque) Selection

For resistive load due to gravity and inertial load, calculate the resistive load (T_R) and moment of inertia (I).

[Resistive Load]
 Resistive load changes with table rotation.
 $F_R = 0.2 \times 9.8 = 1.96 \text{ (N)}$
 $R = 0.105 \text{ (m)}$
 Therefore,
 $T_R = 5 \times 1.96 \times 0.105 = 1.03 \text{ (N}\cdot\text{m)} \dots\dots ①$

[Inertial Load]
 [Rectangular Plate]
 $I_1 = 0.2 \times \frac{0.15^2}{12} + 0.2 \times 0.105^2$
 $= 2.58 \times 10^{-3} \text{ (kg}\cdot\text{m}^2\text{)}$

[Rectangular Parallelepiped Part]
 $I_2 = 0.5 \times \frac{0.06^2}{6} = 3 \times 10^{-4} \text{ (kg}\cdot\text{m}^2\text{)}$

Therefore, the overall moment of inertia (I) is as follows.
 $I = I_1 + I_2 = 2.88 \times 10^{-3} \text{ (kg}\cdot\text{m}^2\text{)} \dots\dots\dots ②$
 Next, calculate the Max angular acceleration ($\dot{\omega}$).
 From the conditions, $\theta = 180^\circ = \pi \text{ (rad)}$, $t = 0.5 \text{ (s)}$

Step 4 Confirmation of Allowable Load

Finally, calculate the load value applied by the load to the table and confirm if it is within the allowable load value.

[Thrust Load]
 Since no thrust load is applied, the thrust load (W_s) is,
 $W_s = 0 \text{ (N)} \dots\dots\dots ⑦$

[Radial Load]
 Total weight is,
 $0.2 + 0.5 = 0.7 \text{ (kg)}$

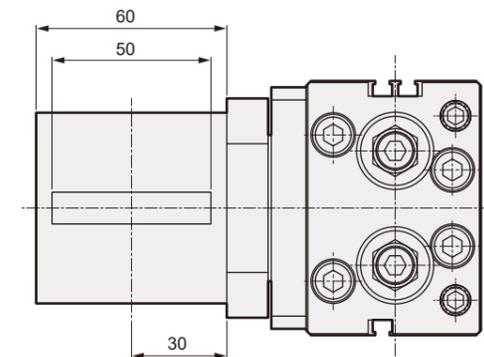
Therefore,
 $W_R = 0.7 \times 9.8 = 6.9 \text{ (N)} \dots\dots\dots ⑧$

[Moment Load]
 Moment load (M) is, from the figure below
 $M = 0.03 \times (0.2 + 0.5) \times 9.8$
 $= 0.21 \text{ (N}\cdot\text{m)} \dots\dots\dots ⑨$

From ⑦, ⑧, ⑨, ②,
 $\frac{W_s}{W_{smax}} + \frac{W_R}{W_{Rmax}} + \frac{M}{M_{max}}$
 $= \frac{0}{150} + \frac{6.9}{140} + \frac{0.21}{4.0} = 0.101 \leq 1.0 \dots ③$

From ② and ③, since the total load value is within the allowable load value,

GRC-20-180-A1, A2
 can be selected.



Swing/Rotary Type

RRC

GRC

RV3□

Swing/Rotary Type

RRC

GRC

RV3□

Cylinder Switch

Ending

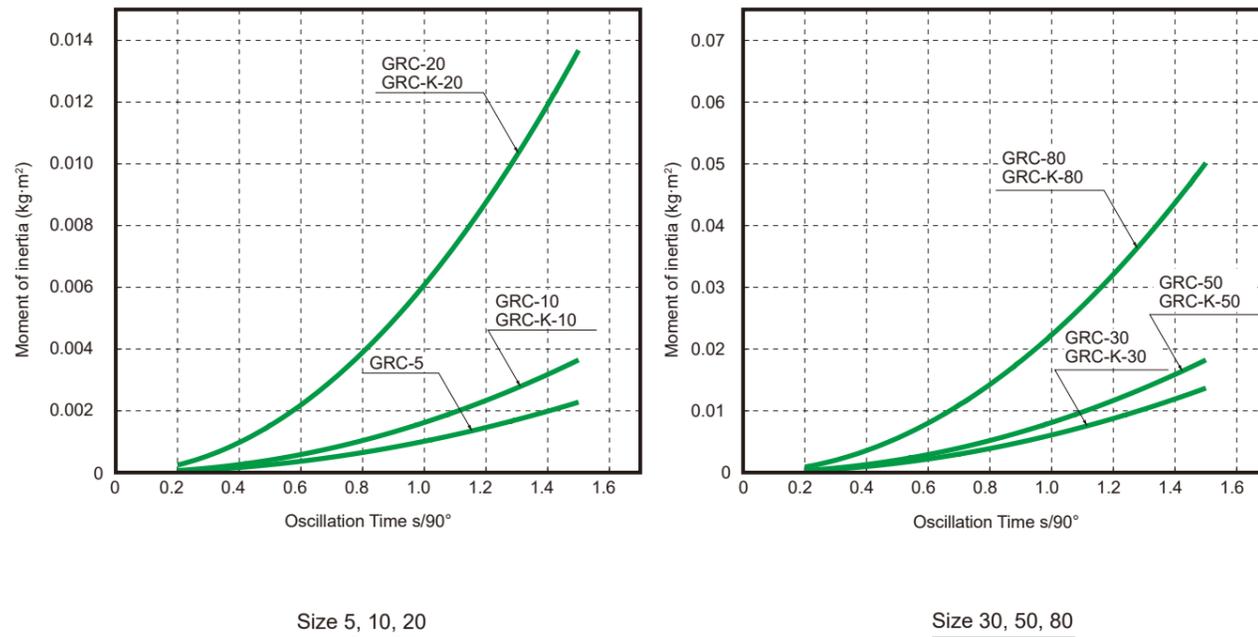
Cylinder Switch

Ending

1. Energy Absorption Capacity and Oscillation Time

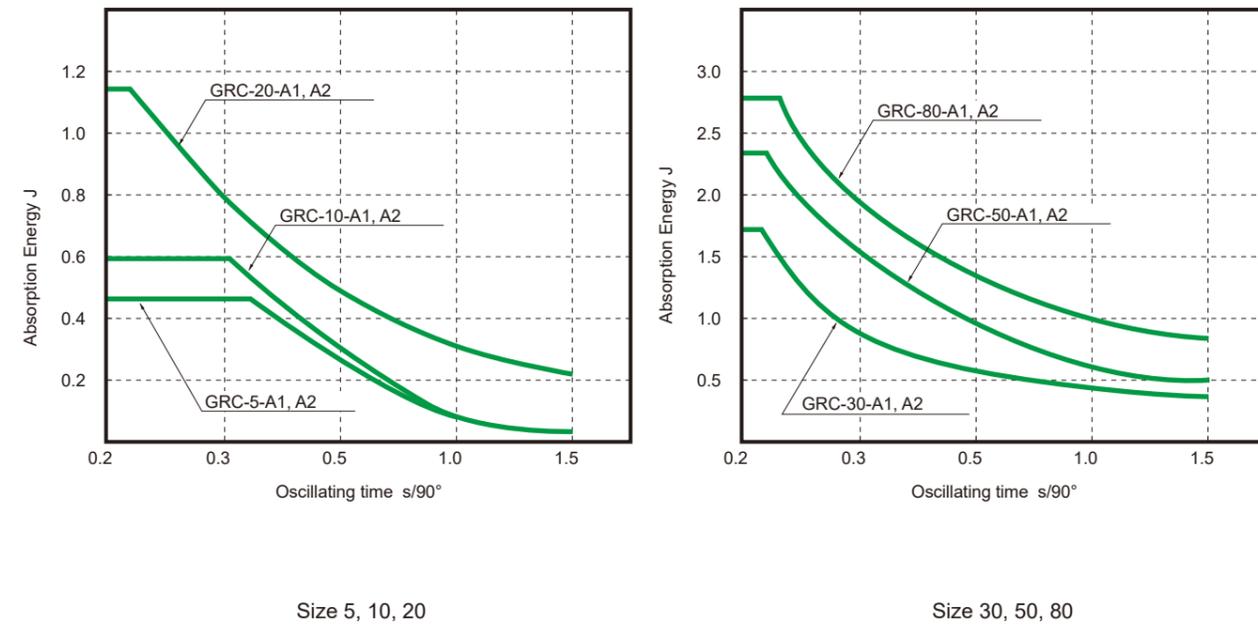
① For rubber cushion, the relationship between moment of inertia and oscillation time is shown in the diagram below. There is a risk of damage to shafts, etc., so be sure to use within the lower right area of the graph. Please refer to this for model selection.

● Basic Type/High-Precision Type



② For type with external shock absorber, the relationship between absorption energy and oscillation time is shown in the diagram below. There is a risk of damage to shafts, etc., so be sure to use within the lower left area of the graph. Please refer to this for model selection.

● Absorption Energy and Oscillation Time



2. Diagram for Calculating Moment of Inertia

When the rotating shaft passes through the workpiece

Shape	Diagram	Required Items	Moment of Inertia I kg·m ²	Radius of gyration K _r ²	Remarks
Disk		● Diameter d (m) ● Weight M (kg)	$I = \frac{Md^2}{8}$	$\frac{d^2}{8}$	● No particular mounting direction ● Consider separately when used by sliding
Stepped disk		● Diameter d ₁ (m) d ₂ (m) ● Weight d ₁ part M ₁ (kg) d ₂ part M ₂ (kg)	$I = \frac{1}{8} (M_1d_1^2 + M_2d_2^2)$	$\frac{d_1^2 + d_2^2}{8}$	● If the d ₂ part is very small compared to the d ₁ part, it can be ignored.
Rod (center of rotation is at the end)		● Rod length R (m) ● Weight M (kg)	$I = \frac{MR^2}{3}$	$\frac{R^2}{3}$	● Mounting direction is horizontal ● When the mounting direction is vertical, the oscillation time changes.
Thin rod		● Rod length R ₁ R ₂ ● Weight M ₁ M ₂	$I = \frac{M_1R_1^2}{3} + \frac{M_2R_2^2}{3}$	$\frac{R_1^2 + R_2^2}{3}$	● Mounting direction is horizontal ● When the mounting direction is vertical, the oscillation time changes.
Rod (center of rotation is at the center of gravity)		● Rod length R (m) ● Weight M (kg)	$I = \frac{MR^2}{12}$	$\frac{R^2}{12}$	● No particular mounting direction
Thin rectangular plate (cuboid)		● 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 ● When the mounting direction is vertical, the oscillation time changes.
Cuboid		● Side length a (m) b (m) ● Weight M (kg)	$I = \frac{M}{12} (a^2 + b^2)$	$\frac{a^2 + b^2}{12}$	● No particular mounting direction ● Consider separately when used by sliding
Concentrated load		● Shape of concentrated load ● Length to the center of gravity of the concentrated load R ₁ ● Arm length R ₂ (m) ● Weight of concentrated load M ₁ (kg) ● Weight of arm M ₂ (kg)	$I = M_1 (R_1^2 + k_1^2) + \frac{M_2R_2^2}{3}$	k ₁ ² is calculated based on the shape of the concentrated load	● Mounting direction is horizontal ● If M ₂ is very small compared to M ₁ , you can calculate with M ₂ =0.
Method of converting load J _L around the rotary actuator shaft when mediated by gears					
Gear		● Gear Rotary Side (Number of Teeth) a Load Side (Number of Teeth) b ● Inertia of Load Moment N·m	Moment of inertia around the rotary axis of the load $I_L = \left(\frac{a}{b}\right)^2 I_L$		● If the shape of the gear is large, it is necessary to consider the moment of inertia of the gear.

Swing/Rotary Type

RRC

GRC

RV3□

Swing/Rotary Type

RRC

GRC

RV3□

Cylinder Switch

Ending

Cylinder Switch

Ending

●When the rotating shaft is offset from the workpiece

Shape	Diagram	Required Items	Moment of inertia I kg·m ²	Remarks
Cuboid		<ul style="list-style-type: none"> ●Side length a (m) ●Distance from rotating shaft to load center b (m) ●Weight M (kg) 	$I = \frac{M}{12}(a^2+b^2) + MR^2$	●Same for cube
Hollow cuboid		<ul style="list-style-type: none"> ●Side length h1 (m) ●Distance from rotating shaft to load center h2 (m) ●Weight M (kg) 	$I = \frac{M}{12}(h_1^2+h_2^2) + MR^2$	●Cross-section is cube only
Cylinder		<ul style="list-style-type: none"> ●Diameter d (m) ●Distance from rotating shaft to load center R (m) ●Weight M (kg) 	$I = \frac{Md^2}{16} + MR^2$	
Hollow cylinder		<ul style="list-style-type: none"> ●Diameter d1 (m) ●Distance from rotating shaft to load center d2 (m) ●Weight M (kg) 	$I = \frac{M}{16}(d_1^2+d_2^2) + MR^2$	

* When determining the moment of inertia, first model the load, jigs, etc., convert the shape to a simple one, and then perform calculations. In the case of a composite load, calculate the individual moments of inertia and sum them.

3. About Table Displacement (Reference Value)

The table displacement (reference value) at a point 100 mm away from the center of rotation when a moment load is applied to GRC is shown below. (Assumes the table is in a non-rotating, stationary state.)

Measurement Method

Table Displacement

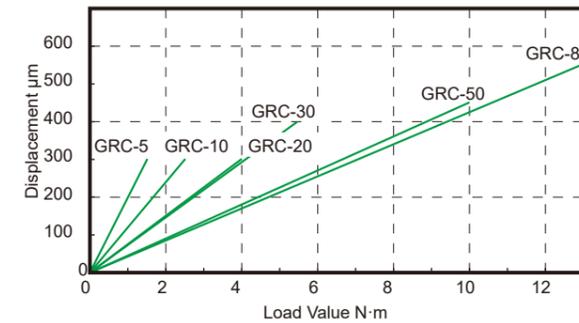
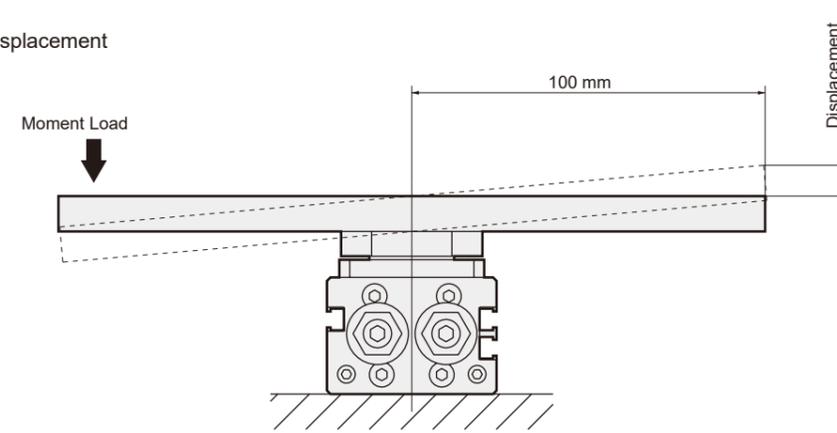


Table Displacement of GRC (Basic Type)

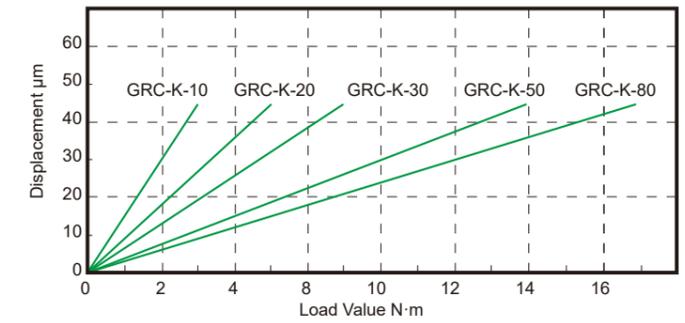


Table Displacement of GRC-K (High-Precision Type)

Swing/Rotary Type

RRC

GRC

RV3□

Swing/Rotary Type

RRC

GRC

RV3□

Cylinder Switch

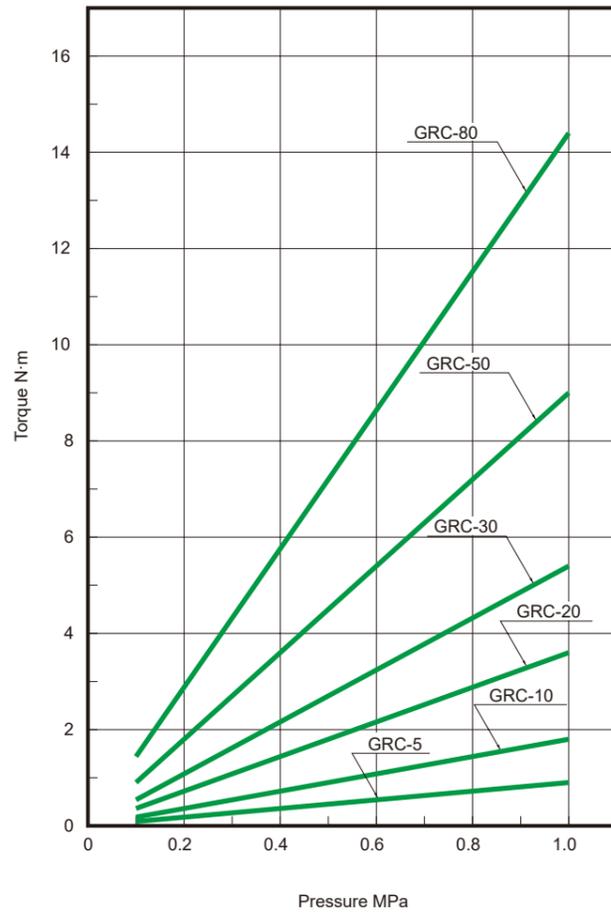
Ending

Cylinder Switch

Ending

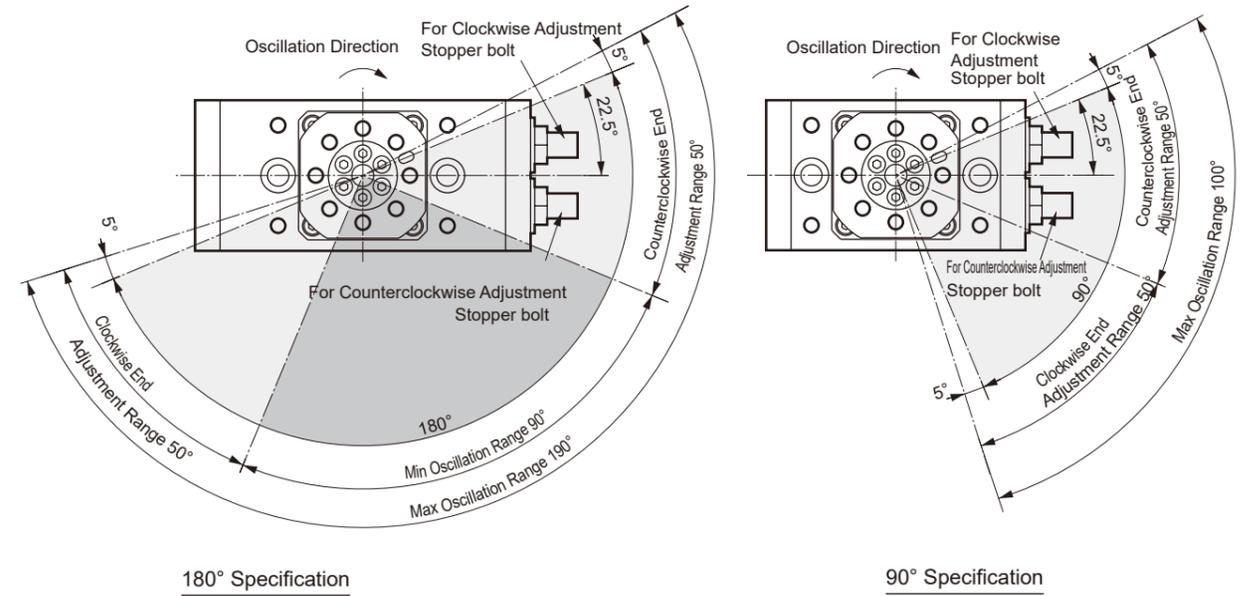
4. Effective Torque Diagram

Please note that the torque at the oscillation end will be half the value of the graph below. (If the end stopper is an external stopper (shock absorber, etc.), the torque will be as shown in the table.)

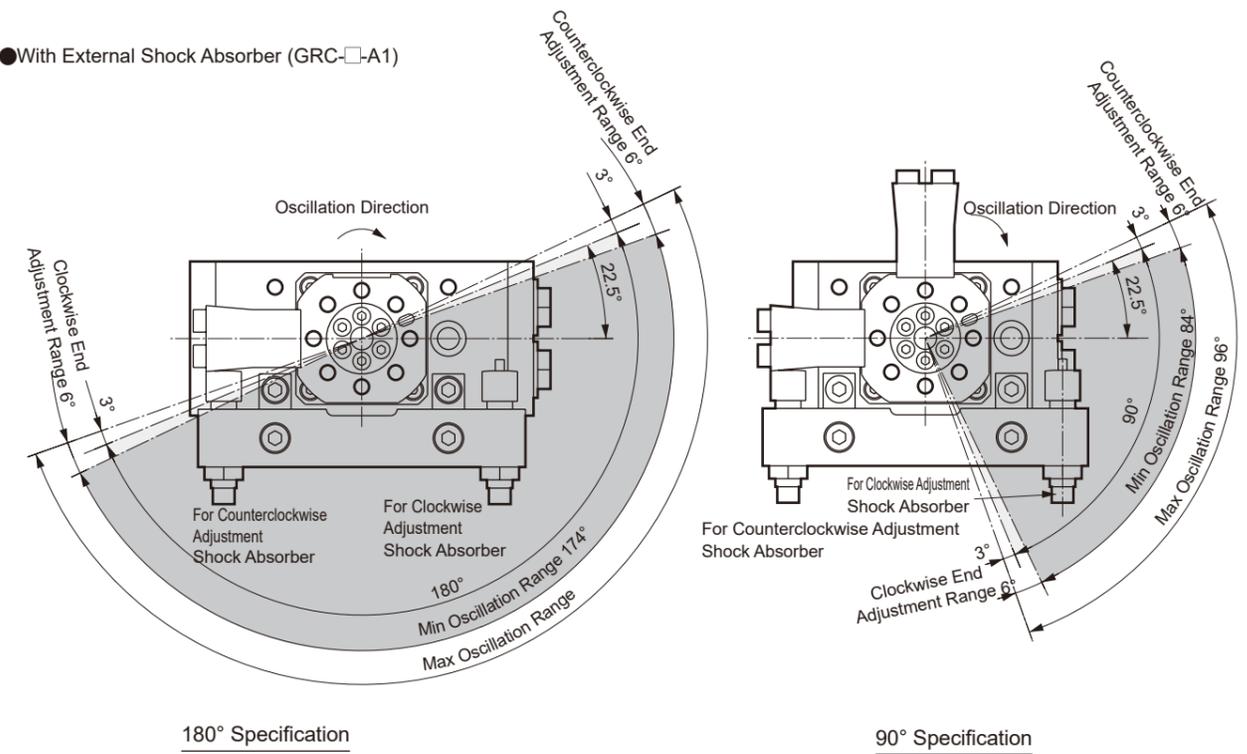


5. About Oscillation Angle Adjustment Method

● Basic Type/High-Precision Type



● With External Shock Absorber (GRC-□-A1)



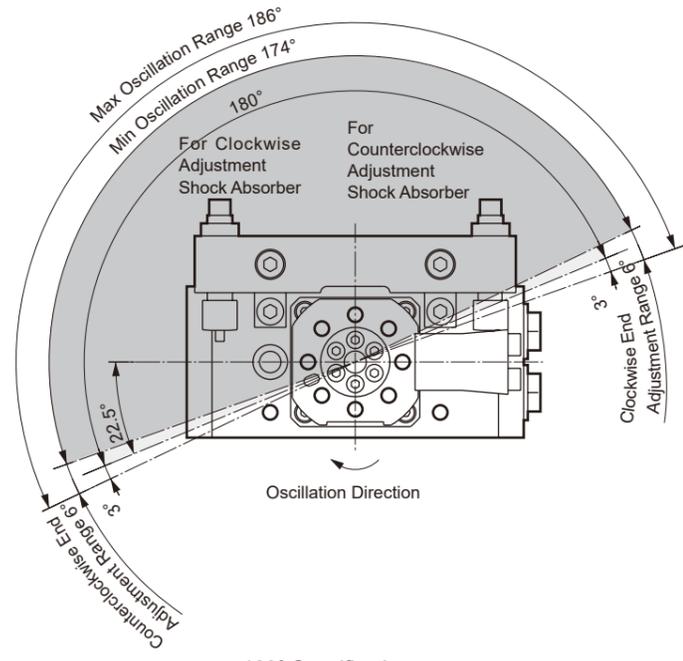
Swing/Rotary Type
RRC
GRC
RV3□

Swing/Rotary Type
RRC
GRC
RV3□

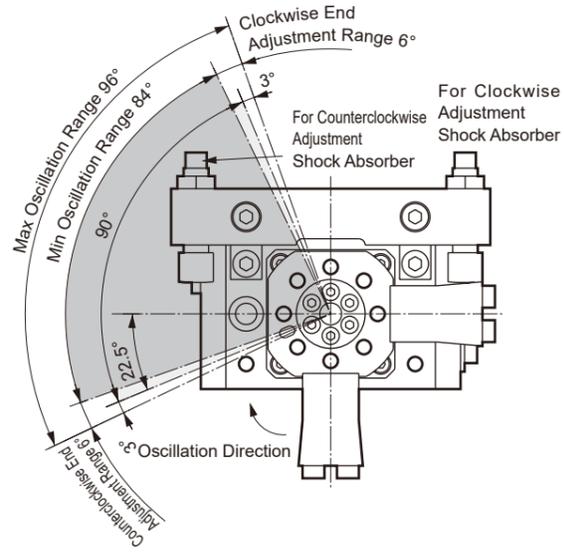
Cylinder Switch
Ending

Cylinder Switch
Ending

●With External Shock Absorber (GRC-□-A2)



180° Specification



90° Specification

MEMO

Swing/Rotary Type
RRC
GRC
RV3□

Swing/Rotary Type
RRC
GRC
RV3□

Cylinder Switch
Ending

Cylinder Switch
Ending



To Use This Product Safely

Be sure to read this before use. For general cylinder information, see Intro 41, and for cylinder switches, see P. 1512.

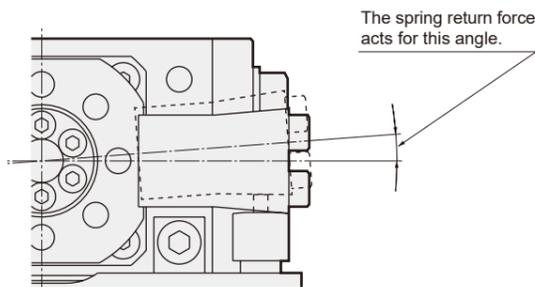
Individual Precautions: Rotary actuator GRC Series

Design / Selection

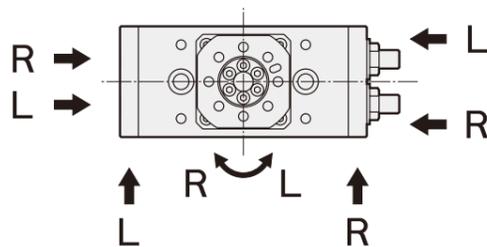
1. Common

CAUTION

- Generally, select a model so that the output torque is twice or more the torque required by the load. Since the GRC series adopts a double piston system, if the oscillation angle is adjusted with a stopper bolt, the holding torque at the oscillation end will be half the effective torque.
- Even if the required torque of the load is small during oscillating motion, the inertial force of the load may cause damage to the actuator. Be sure to consider the moment of inertia of the load, kinetic energy, and oscillation time, and use below the allowable energy.
- For types with external shock absorber, please note that the torque at the oscillation end will decrease by the return force of the shock absorber's internal spring.



- The external shock absorber is a device that absorbs the kinetic energy of the workpiece at the oscillation end and buffers the impact. Smooth stopping may not be possible depending on load conditions.
- Be sure to use a speed controller in the piping.
- The relationship between each piping port and oscillation direction is shown below.



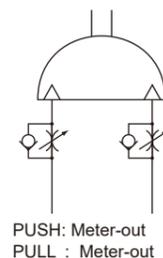
(R) Clockwise rotation (right)
L: Counterclockwise rotation (left)

- Angle adjustment screw (stopper bolt or shock absorber) that can adjust the oscillation angle is standard equipped. At shipment, the angle adjustment screw is set to an arbitrary position within the oscillation adjustment range, so please readjust to the required angle before use.
- When adjusting the angle, use within the adjustment range specified for the product. Using beyond the adjustment range will cause a malfunction and damage to the product. Refer to product specifications (P. 1250) and oscillating angle adjustment (P. 1277).
- Treat our shock suppressors as consumable parts. Replace when a decrease in energy absorption capacity is observed or when operation is no longer smooth.

2. Slow-Speed Type GRC-F

CAUTION

- Use without lubrication. (Lubrication not possible)
Lubrication may change characteristics.
- Install the speed controller near the rotary actuator. If installed far from the rotary actuator, adjustment will become unstable. Use SC-M3/M5, SC3W, SCD-M3/M5, SC3U series speed controllers.
- Generally, the higher the air pressure and the lower the load factor, the more stable the speed. Use with a load factor of 50% or less.
- Speed control with a meter-out circuit provides stability.



- Avoid use in places with vibration. Operation becomes unstable due to the influence of vibration.

During Use

CAUTION

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

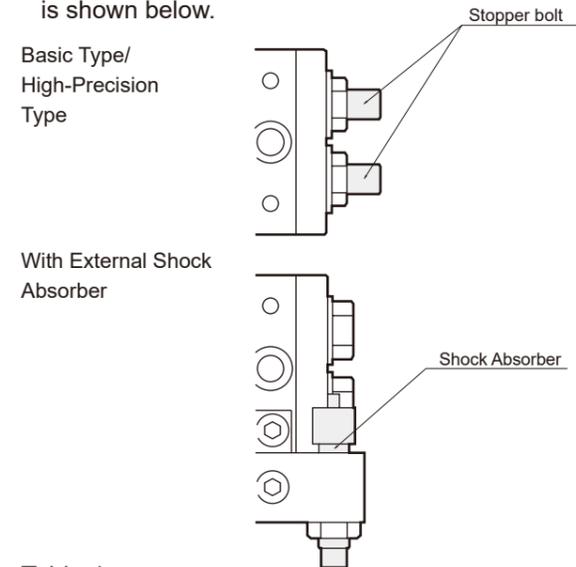


Table 1

Size	Adjustment Angle per Stopper Bolt Rotation	Adjustment Angle per Shock Absorber 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°

- When performing angle adjustment, strictly follow the next steps (1) to (5). If adjustment is not performed by this method, the seal washer will be damaged after 1 or 2 adjustments.

[Angle Adjustment Procedure]

- (1) First, loosen the Hexagon Nut to the state shown in Figure 1.
- (2) Next, release the seal washer from the head cover by hand to the state shown in Figure 2.
- (3) In that state, turn the stopper bolt, Hexagon Nut, and seal washer together as shown in Figure 3 to adjust the angle. At this time, be careful not to let the rubber part of the seal washer get caught in the threaded part.
- (4) After angle adjustment, first bring the seal washer close to the head cover by hand as shown in Figure 4.
- (5) Then, securely tighten with the Hexagon Nut as shown in Figure 5. At this time, be careful not to let the rubber part of the seal washer get caught in the threaded part.

After angle adjustment, securely tighten the Hexagon Nut according to the tightening torque in Table 2. If the tightening torque is not observed, the Hexagon Nut will loosen during use, causing external leakage.

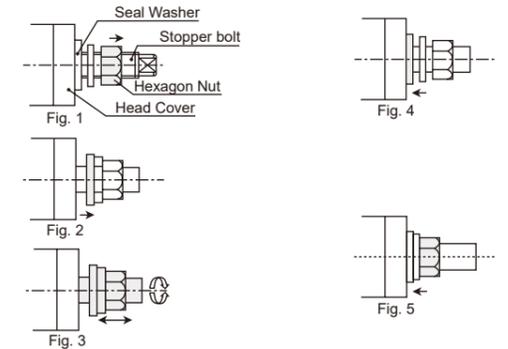


Table 2

Size	Tightening Torque (N·m)	
	Basic Type/High-Precision Type	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%

- When retrofitting an external shock absorber set to A3 type, the tightening torque for the mounting Hexagon Socket head bolt and lever mounting Hexagon Socket head bolt is shown in Table 3.

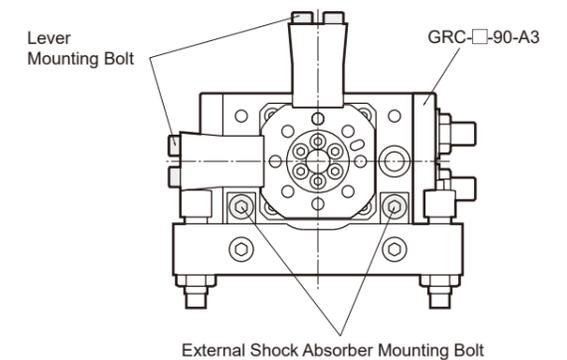


Table 3

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%

For precautions during mounting, installation, adjustment, use, and maintenance, refer to "During Use" in this catalog and the CKD Components Product website (<https://www.ckd.co.jp/kiki/en/>) -> "Model No." -> "Instruction Manual".