High load, high accuracy positioning

This GRC Series table rotary actuator enables direct installation of high loads and realizes high positioning accuracy using bearing guides.

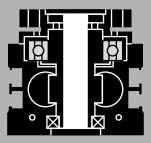
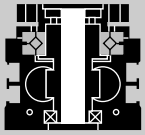
1 Excellent design freedom

Introducing the industry's smallest torque GRC-5 Torque 5 (0.5 N·m)

Six new torques are now available:
5, 10, 20, 30, 50 and 80.

Select the standard or High precision type with the same dimensions.

The product type, such as the line, is quickly changed between the standard and High precision type.

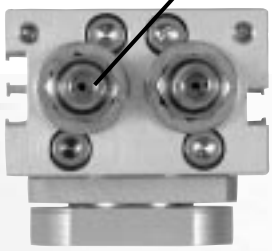
Basic type GRC	High precision type GRC-K
	
Radial bearings realize stable operation	Cross roller bearings realize high accuracy and high load

Available with either 90° specifications or 180° specifications

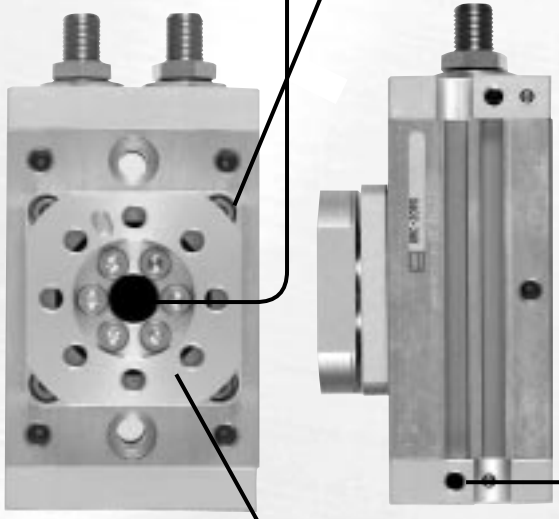
Further downsizing is possible by selecting the 90° oscillation angle.

GRC series variation

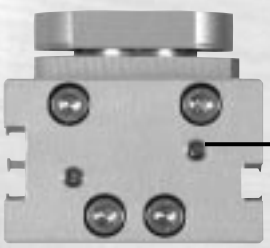
	Basic type GRC	High precision type GRC-K
With switch	●	●
Torque (torque value when 0.5MPa)		
5(0.5 N·m)	●	-
10(1.0 N·m)	●	●
20(2.0 N·m)	●	●
30(3.0 N·m)	●	●
50(5.2 N·m)	●	●
80(8.1 N·m)	●	●
Oscillating angle		
90° type	●	●
180° type	●	●



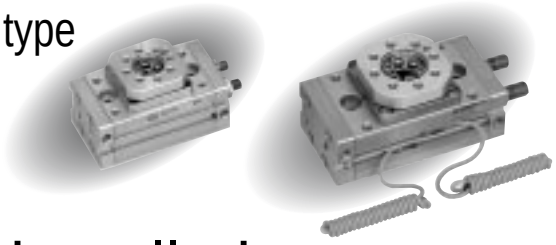
Adjust the oscillation angle using an angle adjustment bolt with a rubber cushion



Directly install the load on the rotary table



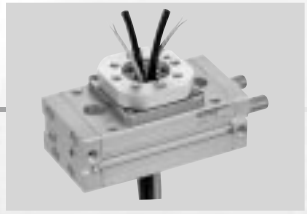
Rack and pinion type



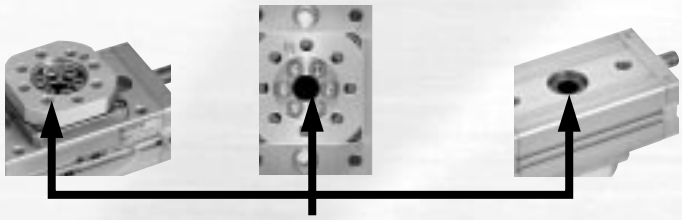
2 Easy installation

- Piping port direction is selected from three sides.
- Piping and wiring are simplified with a large hollow hole.

Hollow holder diameters between ϕ4 and ϕ17 are available.



- Socket and spigot for positioning are prepared on the table (four positions) and below the main component (one position).

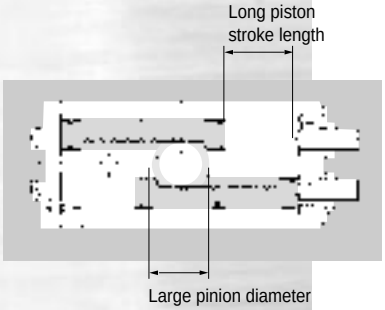


Socket and spigot for positioning

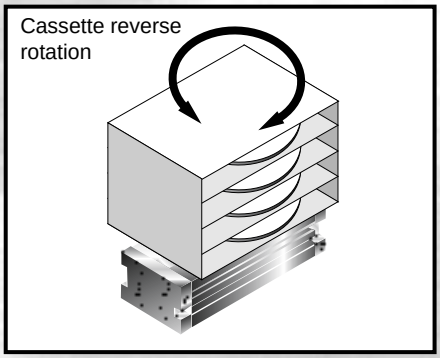
3 Outstanding operation

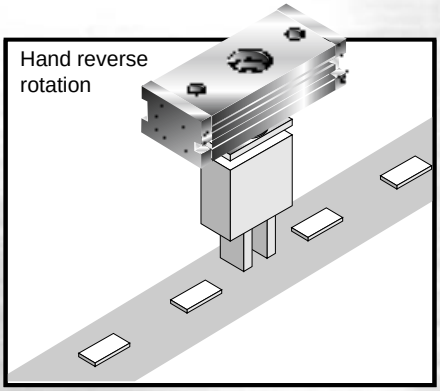
- 1.5 sec/90° low-speed operation

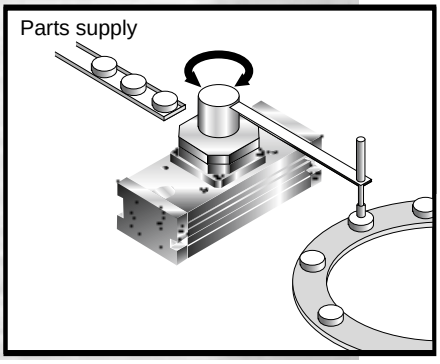
Low-speed operation is possible with large pinion diameter and long piston stroke.



Applications







Variation/option selection table

◎ : Option
○ : Custom order
△ : Available depending on conditions (Consult with CKD)
: Not available

			Clean room specifications	
			Vacuum treatment	Vacuum treatment
		Symbol	P73	P53
Variation	Basic type	Blank	◎	○
	High precision type	K	◎	○
	Fine speed type	F	◎	
Pipe thread	NPT (50,80)	N	○	○
	G (50,80)	G	○	○
Option	With external shock absorber (1)	A1		
	With external shock absorber (2)	A2		
	With external shock absorber for later installation	A3		

Safety Precautions

Always read this section before starting use.
Refer to page 2 for general details on the cylinder, and to page 230 for details on the cylinder switch.

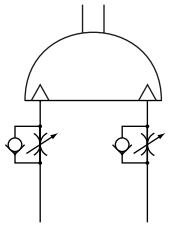
Rotary actuator GRC Series

CAUTION Design & Selection

1 Select the modal so output torque is double or over of torque required by the load.
GRC Series uses a double piston, so if the oscillation angle is adjusted by the stopper bolt, torque at the oscillation end will be half the effective torque.

2 If torque required by the load is small even during oscillation, the actuator could be damaged by load inertia. Consider the load moment of inertia, kinetic energy, and oscillation time, and use at a level below tolerable energy.

3 Precautions for fine speed (GRC-F)
- Use with oil-free specifications. (Must be oil-free)
  Features may change if the device is lubricated.
- Assemble the flow control valve near the rotary actuator.
  If the flow control valve is assembled away from the rotary actuator, oscillation speed will become unstable.
  Use the SC-M3/M5, SC3W, SCD-M3/M5 or SC3WU Series flow control valve.
- Generally, the higher the air pressure, the smaller the load result in more stable operation.
  Use a load at 50% or less.
- Operation will stabilize if speed is controlled at the meter-out circuit.



PUSH : Meter out
PULL : Meter out

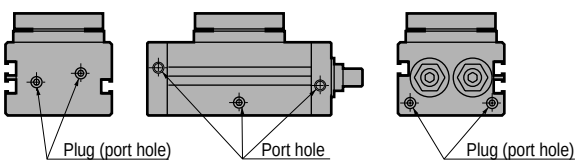
- Avoid use with vibration.
  The product will be adversely affected by vibration and operation will become unstable.

CAUTION Installation & Adjustment

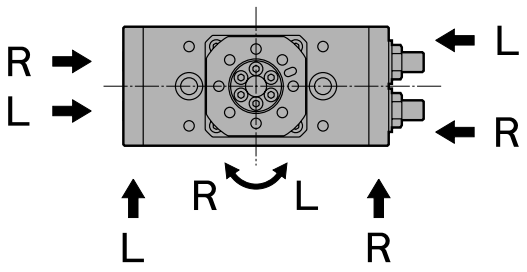
1 Do not further machine the product.
If so, strength will decrease and could lead to product damage. This may result in injury or damage to operator, component, or equipment.

2 Do not increase the fixed orifice on the piping port by re-machining, etc., or actuator operation speed and impact will increase, damaging the actuator. Install a flow control valve on piping, etc.

3 The piping port is selectable from 3 sides. 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 : Japan LOCTITE
Three Bond 1334 : Three Bond



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



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

5 An angle adjustment screw (stopper bolt) for adjustment of oscillation angle is provided as a standard. When the product is shipped, the angle adjustment screw is adjusted randomly within the oscillation adjustment range. Readjust this to the required angle before use.

6 Adjust the angle to within the adjustment range specified for the product.
If the angle is adjusted outside the adjustment range, the product could be damaged. Refer to product specifications (page 206) and oscillation angle adjustment (page 227).

Safety Precautions

Always read this section before starting use.
Refer to page 2 for general details on the cylinder, and to page 230 for details on the cylinder switch.

Table type actuator GRC series

⚠ CAUTION — Installation & Adjustment

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

Basic type, high precision type

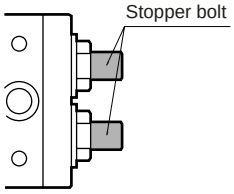


Table 1

Size	Adjustment angle per stopper bolt rotation
5	8.7°
10	4.9°
20	5.7°
30	3.8°
50	3.5°
80	3.5°

8 Observe steps (1) to (5) when adjusting the angle. If the angle is not adjusted this way, the seal washer may break after one or two adjustments.

Angle adjustment procedures:

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

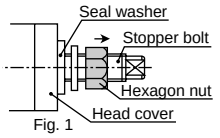


Fig. 1

(2)Separate the seal washer from the head cover as shown in Fig. 2.

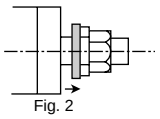


Fig. 2

(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 screw.

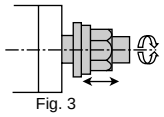


Fig. 3

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

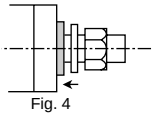


Fig. 4

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

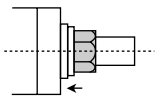


Fig. 5

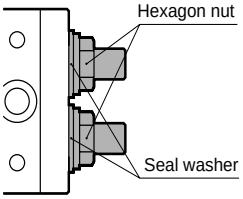
After adjusting the angle, securely tighten the hexagon nut with the tightening torque in Table 2. Otherwise, the hexagon nut may loosen and cause external leakage in prolonged use.

Table 2

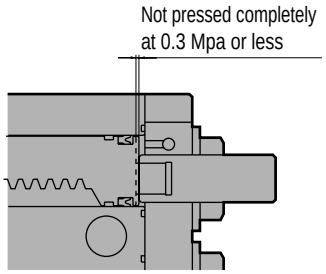
Size	Tightening torque (N·m)
5	5.9 ±10%
10	9.4 ±10%
20	11.8 ±10%
30	11.8 ±10%
50	22.1 ±10%
80	22.1 ±10%

9 When replacing the seal washer sealing the angle adjustment stopper bolt, tighten the hexagon nut with the tightening torque in Table 2. Otherwise, air may leak.

Basic type, high precision type

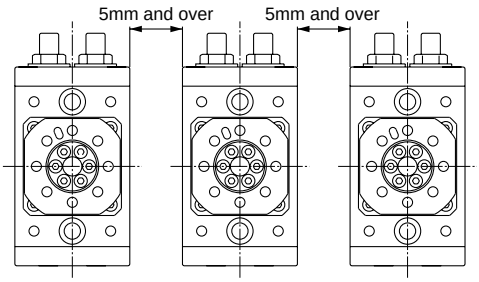


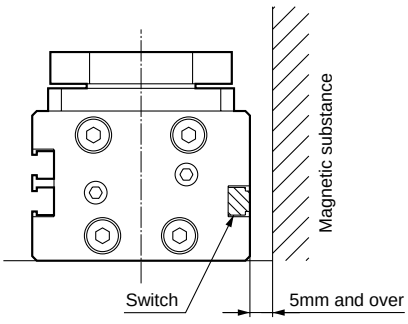
10 A rubber cushion is used in the GRC.
(Basic, high precision type)
When using at a pressure of 0.3MPa or less, the rubber cushion may not be pressed down completely. If accuracy is required at the oscillation end, use with a pressure of 0.3 MPa and over.



11 Take care when placing cylinders near each other.

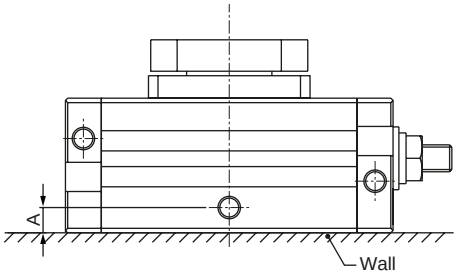
Take care when placing cylinders near each other.
When installing two or more rotary actuators with switches in parallel, or if there is a magnetic substance such as a steel plate nearby, provide the following distances from the cylinder body surface: The dimensions are the same for all size
Failure to do so may cause the switch to malfunction due to mutual magnetic force interference.



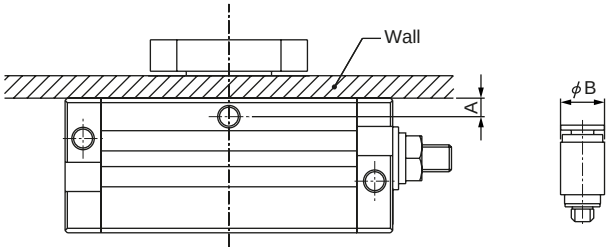


⚠ Caution Installation & adjustment

1 Joints usable with the relief port are limited, so see the following table.



GRC-5,10



GRC-20 to 80

Descriptions / Model	Port size	Port position dimension	When there is wall.			When there is no wall and 2 color indicator switches are used.		
		A	Applicable joint	Joint outer diameter ϕB	Inapplicable joint.	Applicable joint	Joint outer diameter ϕB	Inapplicable joint.
GRC-5	M5 depth 4	4.1	GWS3-M5-S GWS4-M5-S FTS4-M5 FTS6-M5	ϕ8.2 or less	GWS6-M5-S GWS*-M5	GWS3-M5-S GWS4-M5-S FTS4-M5 FTS6-M5	ϕ9 or less	GWS6-M5-S GWS*-M5
GRC-10	M5 depth 3.5	4.1	GWS3-M5-S GWS4-M5-S FTS4-M5 FTS6-M5	ϕ8.2 or less	GWS6-M5-S GWS*-M5	GWS3-M5-S GWS4-M5-S GWS6-M5-S GWS4-M5 FTS4-M5 FTS6-M5	ϕ10 or less	GWS6-M5
GRC-20	M5 depth 4	5.8	GWS3-M5-S GWS4-M5-S GWS6-M5-S GWS4-M5 FTS4-M5 FTS6-M5	ϕ11.6 or less	GWS6-M5	GWS3-M5-S GWS4-M5-S GWS6-M5-S GWS4-M5 FTS4-M5 FTS6-M5	ϕ11.6 or less	GWS6-M5
GRC-30	M5 depth 4	6.2	GWS3-M5-S GWS4-M5-S GWS6-M5-S GWS4-M5 FTS4-M5 FTS6-M5	ϕ12.4 or less (ϕ10.4 or less)	GWS6-M5	GWS3-M5-S GWS4-M5-S GWS6-M5-S GWS4-M5 FTS4-M5 FTS6-M5	ϕ10.4 or less	GWS6-M5
GRC-50	M5 depth 4	8.5	GWS3-M5-S GWS4-M5-S GWS6-M5-S GWS4-M5 GWS6-M5 FTS4-M5 FTS6-M5	ϕ17 or less (ϕ13.8 or less)		GWS3-M5-S GWS4-M5-S GWS6-M5-S GWS4-M5 GWS6-M5 FTS4-M5 FTS6-M5	ϕ13.8 or less	
GRC-80	M5 depth 4	12.9	GWS3-M5-S GWS4-M5-S GWS6-M5-S GWS4-M5 GWS6-M5 FTS4-M5 FTS6-M5	ϕ25.8 or less (ϕ14 or less)		GWS3-M5-S GWS4-M5-S GWS6-M5-S GWS4-M5 GWS6-M5 FTS4-M5 FTS6-M5	ϕ14 or less	

*Dimensions in parentheses in the joint outer diameter column apply when using the two-color indicator switch
*No special limits apply when there is no wall and a one-color indicator switch is used.

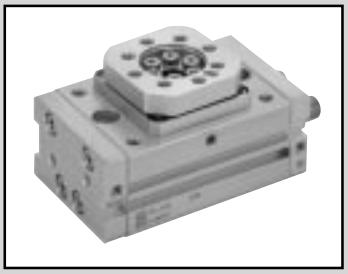


Table type rotary actuator
Basic type/high precision type

GRC/GRC-K Series

●Size: 5/10/20/30/50/80

JIS symbol 

CAD Refer to a file list of Ending 74.

Structure and materials restriction

	Structure	Material restriction			Model No.
P7 series	Vacuum treatment				P73
P5 series (Custom order)	Vacuum treatment	Copper-based unacceptable	Silicon-based unacceptable	Halogen-based unacceptable (fluorine, chlorine, oxalic)	P53

Specifications

Descriptions			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
Logical torque Note 1		N·m	0.5	1.0	2.0	3.0	5.2	8.1
Actuation			Rack & pinion type					
Working fluid			Compressed air					
Max. working pressure		MPa	1.0					
Min. working pressure Note 2	Basic type		0.10					
MPa	High precision type		–	0.15		0.10		
Withstanding pressure		MPa	1.6					
Ambient temperature		℃	0 to 60 (to be unfrozen)					
Port size			M5				Rc1/8	
Relief port size			M5					
Cushion			Rubber cushion					
Allowable energy absorption		J	0.005	0.008	0.03		0.04	0.11
Lubrication			Not permissible					
Volumetric capacity Note 3		cm³						
	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 Note 4	90°		0°to 100°					
	180°		90°to 190°					
Oscillating time adjusting range Note 5		S/90°	0.2 to 1.5					
Table deflection (reference value) Note 6	Basic type		±0.17°			±0.23°	±0.26°	±0.32°
	High precision type		–	±0.026°				

Note 1: Theoretical torque applies at a working pressure of 0.5 MPa.
Note 2: A working pressure of 0.3 MPa or more is required to press down the rubber cushion incorporated in the basic and high accuracy types.
Note 3: Volumetric capacity applies at the maximum oscillation angle in oscillation angle adjustment.
Note 4: The oscillation angle adjustment range is adjusted with stopper bolts on both sides.
Note 5: The oscillation time adjustment range applies at a working pressure of 0.5 MPa.
Note 6: Table displacement 100 mm from the rotation center is given in Technical Data (Page 225).

Switch specifications

● One color/bi-color indicator

Descriptions	Proximity 2 wire		Proximity 3 wire	
	T2H/T2V	T2YH/T2YV	T3H/T3V	T3YH/T3YV
Applications	Programmable controller		Programmable controller, relay	
Power voltage	-		10 to 28VDC	
Load voltage	10 to 30VDC		30VDC or less	
Load current	5 to 20mA (Note 1)		100mA or less	50mA or less
Light	LED (ON lighting)	Red/green LED (ON lighting)	LED (ON lighting)	Red/green LED (ON lighting)

Note 1: The maximum load current of 20 mA applies at 25℃.If the switch's ambient operating temperature exceeds 25℃, the load current becomes less than 20 mA.(5 to 10mA at 60 ℃)

● With preventive maintenance output

Descriptions		Proximity 3 wire	Proximity 4 wire	Proximity 3 wire	Proximity 4 wire
		T2YFH/V	T3YFH/V	T2YMH/V	T3YMH/V
Applications		Programmable controller	Programmable controller, relay	Programmable controller	Programmable controller, relay
Light	Installation position adjustment	Red/green LED (ON lighting)			
	Preventive maintenance output	-		Yellow LED (ON lighting)	
Output section	Current voltage	-	10V to 28VDC	-	10V to 28VDC
	Load voltage	10V to 30VDC	30VDC or less	10V to 30VDC	30VDC or less
	Load current	5 to 30mA	50mA or less	5 to 20mA	50mA or less
Preventive maintenance output	Load voltage	30VDC or less			
	Load current	20mA or less	50mA or less	5 to 20mA or less	50mA or less

Min. oscillating angle when switch is installed

Torque	5	10	20	30	50	80
T type proximity/T type 2 color indicator	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 mass

(Unit: kg)

Oscillating angle / Model No.	90°		180°		Switch mass (Per piece)
	Basic type	High precision type	Basic type	High precision type	
GRC- 5	0.39	-	0.43	-	0.02
GRC-10	0.48	0.50	0.56	0.58	
GRC-20	0.78	0.80	0.88	0.90	
GRC-30	1.05	1.30	1.25	1.50	
GRC-50	1.80	2.10	2.10	2.40	
GRC-80	2.30	2.60	2.70	3.00	

How to order

Without switch

GRC - 10 - 90 ——— P73

With switch

GRC - 30 - 180 - T2H* - R - P73

Ⓐ Model No.

Ⓑ Torque

Ⓒ Oscillating angle

Ⓓ Switch model No.

Ⓔ Switch quantity

Ⓕ Clean room specifications Note 2

Symbol	Description
Ⓐ Model No.	
GRC	Basic type
GRC-K	High precision type

Ⓑ Torque (at 0.5MPa)			
Model No.		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]	●	●

Ⓒ Oscillating angle	
90	90 ˚
180	180 ˚

Ⓓ Switch model No.				
Axial lead wire	Radial lead wire	Contact	Display	Lead wire
T2H*	T2V*	Proximity	1 color indicator	2 wire
T3H*	T3V*			3 wire
T2YH*	T2YV*		2 color indicator	2 wire
T3YH*	T3YV*			3 wire
T2YFH*	T2YFV*		2 color indicator (Without light for preventive maintenance output)	3 wire
T3YFH*	T3YFV*			4 wire
T2YMH*	T2YMV*		2 color indicator (With light for preventive maintenance output (1 color))	3 wire
T3YMH*	T3YMV*			4 wire

*Lead wire length	
Blank	1m (standard)
3	3m (option)
5	5m (option)

Ⓔ Switch quantity	
R	Clockwise rotation 1 piece
L	Counterclockwise 1 piece
D	Two

Ⓕ Clean room specifications		
	Structure	Material restriction
P73	Vacuum treatment	-
P53		Copper, silicon, halogen-based (fluorine, chlorine, oxalic) unacceptable.

⚠ Note on model no. selection

Note 1: Basic and high accuracy port positions are located on the sides.
Other ports are plugged.
Note 2: "P53" is custom order.
Note 3: Refer to Page 202 for variation/optional combination.

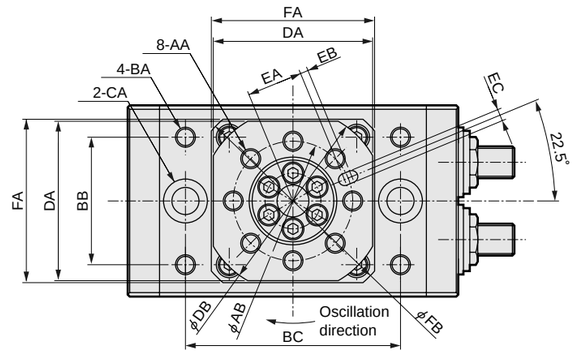
<Example of model number>

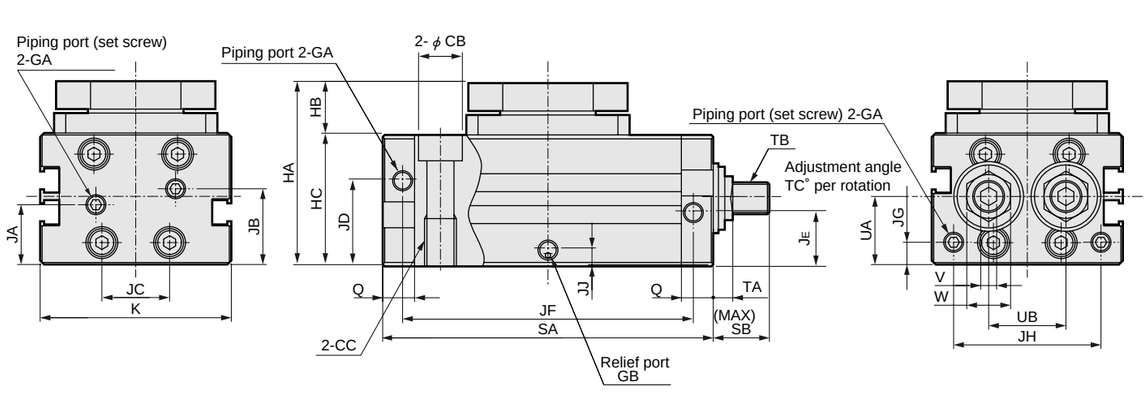
GRC-10-180-T2V-D-P73

Double acting
Ⓐ Model No. : Basic type
Ⓑ Torque : 10
Ⓒ Oscillating angle : 180˚
Ⓓ Switch model No. : Proximity/2 wire
Radial lead wire/lead wire 1m
Ⓔ Switch quantity : Two
Ⓕ Clean room specifications: Vacuum treatment

Dimensions (torque 0.5, 1.0 N·m)

- GRC-5, 10 basic type
- GRC-K-5, 10 high precision type

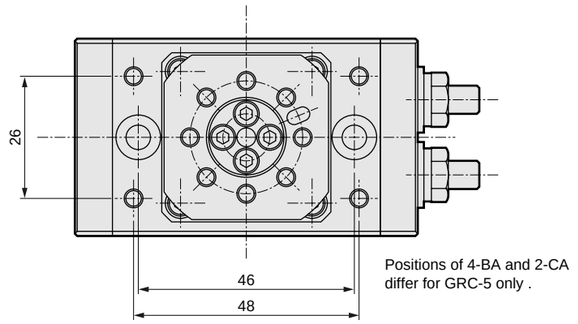




Size	AA	AB	BA	BB	BC	CA	CB	CC	DA	DB	EA	EB	EC	FA	FB	GA	GB	HA	HB	HC	JA	JB	JC	JD	JE	JF 90°	JF 180°	JG	JH	JJ	K	MA	MB	NA	NB	NC
5	M4 depth 7	24	M4 depth 6.5	26	As stated elsewhere	Spot face ϕ9.5 depth 5.4	5.2	M6 depth 12	35	42	11	2	$3^{+0.07}_{+0.02}$ depth 3.5	36	48h9	M5 depth 4	M5 depth 4	43	13	30	15	18	16	21	11.5	65	82	5.6	29	4.1	42	17H9	2	4H9	5.5	2.4
10	M5 depth 7	30	M5 depth 7	32	54	Spot face ϕ11 depth 6.5	6.6	M8 depth 12	40	46	14	2	$3^{+0.07}_{+0.02}$ depth 3.5	41	54h9	M5 depth 4	M5 depth 3.5	46	13	33	15	19	20	21.5	12	75	99	5.6	37	4.1	48	22H9	2	8H9	5.5	2.4

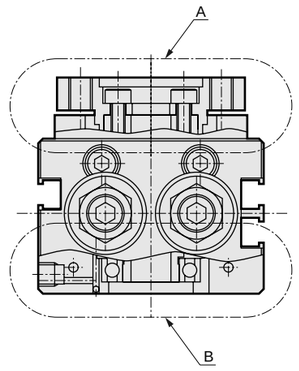
Size	PA	PB	Q	SA 90°	SA 180°	SB	TA	TB	TC	UA	UB	V	W	X	LD 90°	LD 180°	RD 90°	RD 180°
5	12H9	3.5	8	73	90	14	6.5	M6 X 1	8.7	16.6	16	3	10	12.6	21.5	25.5	22.5	25.5
10	18H9	2.5	8	83	107	15	4.9	M8 X 0.75	4.9	17.1	19.4	4	11	13.1	24.5	30.5	26	30.5

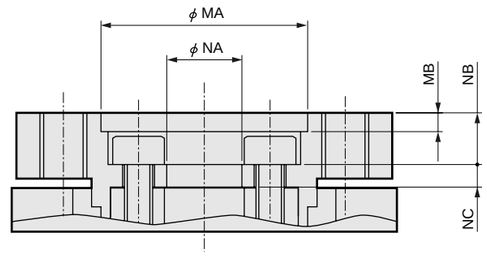
Dimensions (torque 0.5, 1.0N·m)



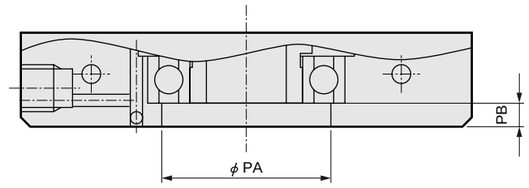
Positions of 4-BA and 2-CA differ for GRC-5 only .

- GRC-5, 10 basic type
- GRC-K-5, 10 high precision type

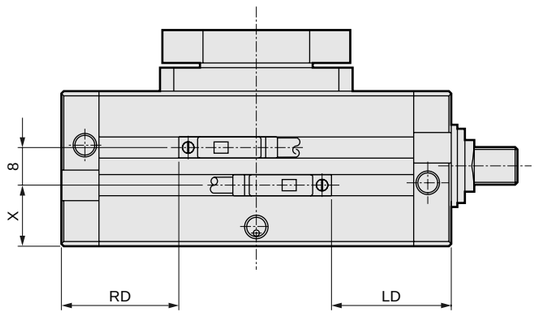




Section A details



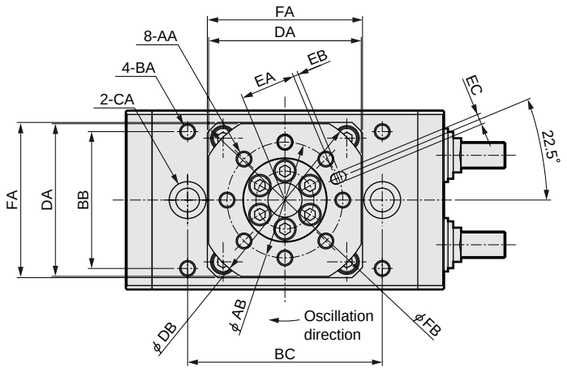
Section B details

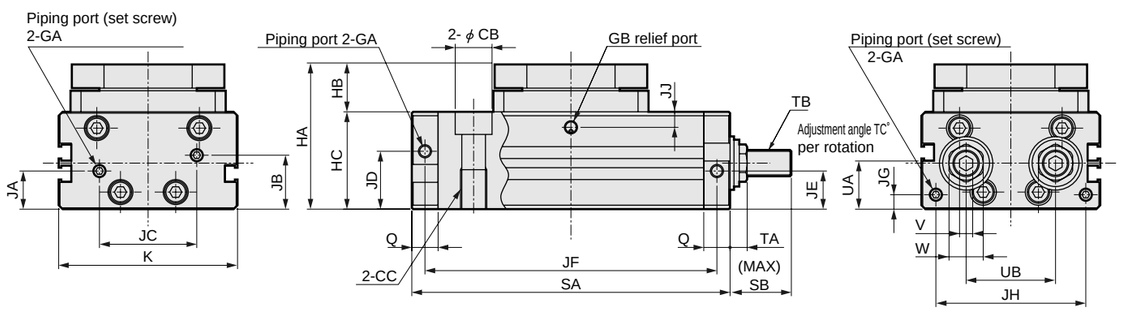


Switch installation position

Dimensions (torque 2.0 to 8.0N·m)

- GRC-20 to 80 basic type
- GRC-K-20 to 80 high precision type



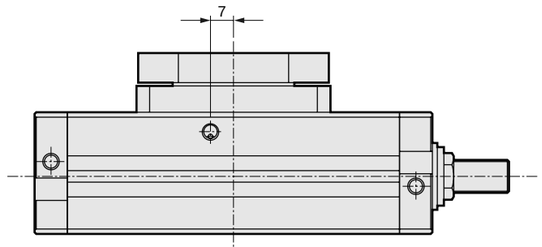


Size	AA	AB	BA	BB	BC	CA	CB	CC	DA	DB	EA	EB	EC	FA	FB	GA	GB	HA	HB	HC	JA	JB	JC	JD	JE	JF 90°	JF 180°	JG	JH	JJ	K	MA	MB	NA	NB	NC
20	M6 depth 9	36	M6 depth 8	42	62	Spot face ϕ 11 depth 6.5	6.9	M8 depth 12	47	55	17	2	$4^{+0.07}_{+0.02}$ depth 4.5	48	64h9	M5 depth 4	M5 depth 4	53	16	37	14.5	20.5	27	22	13	86	115	5.6	47	5.8	58	27H9	2	11H9	6.5	3.9
30	M6 depth 9	44	M6 depth 8	52	74	Spot face ϕ 14 depth 8.6	8.7	M10 depth 15	58	67	21	2	$4^{+0.07}_{+0.02}$ depth 4.5	59	78h9	M5 depth 4	M5 depth 4	55	18	37	14.5	20.5	37	22	13	111	155	5.6	57	6.2	68	32H9	2	13H9	7.5	2.9
50	M8 depth 13	50	M8 depth 12	60	88	Spot face ϕ 17.5 depth 10.8	10.5	M12 depth 18	66	74	24	2	$5^{+0.07}_{+0.02}$ depth 5.5	69	92h9	Rc1/8	M5 depth 4	71	23	48	21.5	27.5	36	32.5	17.5	129	177	8.1	58	8.5	75	37H9	4	14H9	10.5	5.3
80	M8 depth 13	54	M8 depth 12	66	94	Spot face ϕ 17.5 depth 10.8	10.5	M12 depth 18	69	80	26	2	$5^{+0.07}_{+0.02}$ depth 5.5	76	101h9	Rc1/8	M5 depth 4	80	25	55	24	30	40	35	19	135	183	8.1	58	12.9	80	40H9	3	17H9	9.5	4.4

Size	PA	PB	Q	SA 90°	SA 180°	SB	TA	TB	TC	UA	UB	V	W	X	LD 90°	LD 180°	RD 90°	RD 180°
20	20H9	2.5	10	96	125	17	6.1	M10 X 1	5.7	17.6	24	5	13	13.6	31	37.5	31	37.5
30	26H9	2.5	10	121	165	25	6.1	M10 X 1	3.8	17.6	34	5	13	13.6	38.5	49.5	40	49.5
50	28H9	4.5	15	144	192	29.5	7	M12 X 1	3.5	24.6	35	6	14	20.6	48.5	61	51	61
80	36H9	3.5	15	150	198	29.5	7	M12 X 1	3.5	27.1	36	6	14	23.1	51.5	64	54	64

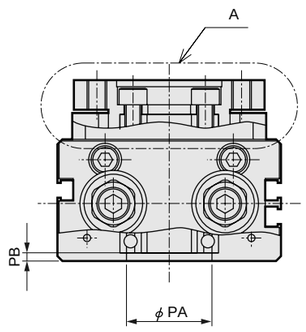
Dimensions (torque 2.0 to 8.0N·m)

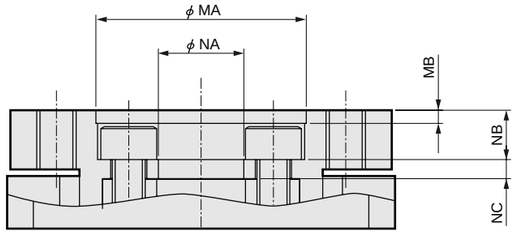
- GRC-20 to 80 basic type
- GRC-K-20 to 80 high precision type



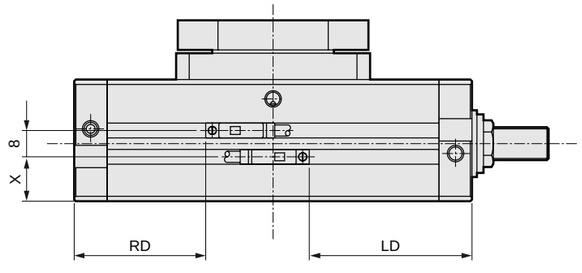
Position of GB differ for GRC-30/GRC-K-30

GRC-30/GRC-K-30





Section A details



Switch installation position

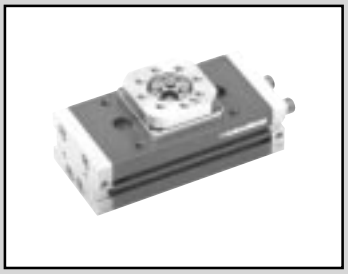


Table type rotary actuator
Fine speed type/high precision fine speed type

GRC-F/GRC-KF Series

●Size: 5/10/20/30/50/80

JIS symbol 

CAD Refer to a file list of Ending 74.

Structure and materials restriction

	Structure	Model No.
P7 series	Vacuum treatment	P73

Specifications

Descriptions		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	1.0	2.0	3.0	5.0	8.0
Logical torque Note 1	N·m	0.5	1.0	2.0	3.0	5.2	8.1
Actuation		Rack & pinion type					
Working fluid		Compressed air					
Max. working pressure		1.0					
Min. working pressure MPa	Basic type	0.10					
	High precision type	-	0.15		0.10		
Withstanding pressure	MPa	1.6					
Ambient temperature	℃	5 to 60					
Port size		M5				Rc1/8	
Relief port size		M5					
Cushion		Rubber cushion					
Allowable energy absorption	J	0.005	0.008	0.03		0.04	0.11
Lubrication		No permissible					
Volumetric capacity Note 3 cm³	90˚ specifications	1.3	3.5	7.0	10.5	18.1	28.3
	180˚ specifications	2.4	6.6	13.4	20.0	34.4	53.7
Adjustable angle	90˚ specifications	0˚ to 100˚					
	180˚ specifications	90˚ to 190˚					
Oscillating time adjusting range	S/90˚	0.2 to 25					
Table deflection (reference value)	Basic type	±0.17˚			±0.23˚	±0.26˚	±0.32˚
	High precision type	-	±0.026˚				

Note: The oscillation angle adjustment range is adjusted with stopper bolts on both sides.

Switch specifications

● One color/bi-color indicator

Descriptions	Proximity 2 wire		Proximity 3 wire	
	T2H/T2V	T2YH/T2YV	T3H/T3V	T3YH/T3YV
Applications	Programmable controller		Programmable controller, relay	
Power voltage	-		10 to 28VDC	
Load voltage	10 to 30VDC		30VDC or less	
Load current	5 to 20mA (Note 1)		100mA or less	50mA or less
Light	LED (ON lighting)	Red/green LED (ON lighting)	LED (ON lighting)	Red/green LED (ON lighting)

Note 1: The maximum load current of 20 mA applies at 25℃ .If the switch's ambient operating temperature exceeds 25℃ , the load current becomes less than 20 mA.(5 to 10mA at 60 ℃)

● With preventive maintenance output

Descriptions		Proximity 3 wire	Proximity 4 wire	Proximity 3 wire	Proximity 4 wire
		T2YFH/V	T3YFH/V	T2YMH/V	T3YMH/V
Applications		Programmable controller	Programmable controller, relay	Programmable controller	Programmable controller, relay
Light	Installation position adjustment	Red/green LED (ON lighting)			
	Preventive maintenance output	-		Yellow LED (ON lighting)	
Output section	Current voltage	-	10 to 28VDC	-	10 to 28VDC
	Load voltage	10 to 30VDC	30VDC or less	10 to 30VDC	30VDC or less
	Load current	5 to 30mA	50mA or less	5 to 20mA	50mA or less
Preventive maintenance output	Load voltage	30VDC or less			
	Load current	20mA or less	50mA or less	5 to 20mA or less	50mA or less

Dimensions

Same as basic type GRC series, high load type GRC-K.Refer to Page 210 to 213.

How to order

● Without switch

GRC-F - 10 - 90 ——— P73

● With switch

GRC-F - 30 - 180 - T2H* - R - P73

Ⓐ Model No.
Ⓑ Torque
Ⓒ Oscillating angle
Ⓓ Switch model No.
Ⓔ Switch quantity
Ⓕ Clean room specifications

Symbol	Descriptions
Ⓐ Model No.	
GRC-F	Basic type
GRC-KF	High precision type

Ⓑ Torque

Model No.		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]	●	●

Ⓒ Oscillating angle

90	90˚
180	180˚

Ⓓ Switch model No.

Axial lead wire	Radial lead wire	Contact	Indicator	Lead wire
T2H*	T2V*	Proximity	1 color indicator	2 wire
T3H*	T3V*			3 wire
T2YH*	T2YV*		2 color indicator	2 wire
T3YH*	T3YV*			3 wire
T2YFH*	T2YFV*		2 color indicator (Without light for preventive maintenance output)	3 wire
T3YFH*	T3YFV*			4 wire
T2YMH*	T2YMV*		2 color indicator (With light for preventive maintenance output (1 color))	3 wire
T3YMH*	T3YMV*			4 wire

*Lead wire length	
Blank	1m (standard)
3	3m (option)
5	5m (option)

Ⓔ Switch quantity

R	Clockwise 1 piece
L	Counterclockwise 1 piece
D	Two

Ⓕ Clean room specifications

	Structure	Material restriction
P73	Vacuum treatment	-

⚠ Note on model no. selection

Note 1: Basic and high accuracy port positions are located on the sides.Other ports are plugged.

Note 2: Refer to Page 202 for variation/optional combination.

<Example of model number>

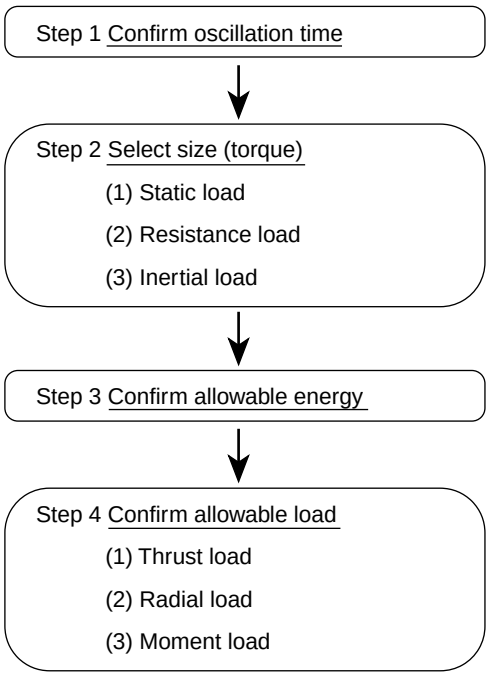
GRC-F-10-180-T2V-D-P73

Double acting

Ⓐ Model No. : Basic type
Ⓑ Torque : 10
Ⓒ Oscillating angle : 180˚
Ⓓ Switch model No. :Proximity/2 wire radial lead wire, 1m
Ⓔ Switch quantity :Two
Ⓕ Clean room specifications :Vacuum treatment

Selection method

Select the actuator in the following steps:



Step 1. Confirm oscillation time

Actuator operation may be unstable, or the actuator could be damaged if oscillation time is not within specifications. Use within the specified oscillation time adjustment range.

	When using with 90°	When using with 180°
Oscillating time (S)	0.2 to 1.5	0.4 to 3.0

Select size (torque)

There are three sizes categorized by load type.

Calculate required torque for each case. When using a compound load, use the total of each torque as the required torque.

See the theoretical torque table or effective torque curve and select a size that satisfies required torque by working pressure.

1. Static load (Ts)

When a static pressing force, such as a clamp, is required

$$Ts=Fs \times L$$

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

2. Resistance load (T_R)

When frictional force, gravity, or other external force is applied

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

T_R : Required torque (N·m)
K : Slack coefficient [No load fluctuation K=2 / 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 rotating an object

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

TA : Required torque (N·m)
I : Moment of inertia (kg·m^2)
$\dot{\omega}$: Angular acceleration (rad/s^2)
θ : Oscillating angle (rad)
t : Oscillating time (s)

Calculate the moment of inertia with the moment of inertia and oscillation time (page 22) or the moment of inertia calculation diagram (page 223), etc.

Step 3. Confirm allowable energy

When using an inertia load, the actuator could be damaged if the load's kinetic energy exceeds that allowable at the oscillation end. See Table 1, and select so that energy is within that allowable.

If energy is excessive, use an external shock killer, 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·m^2)
ω : Angular speed (rad/s)
θ : Oscillating angle (rad)
t : Oscillating time (s)

Calculate the moment of inertia with the moment of inertia and oscillation time (page 222) or the moment of inertia calculation diagram (page 223), etc.

Selection method

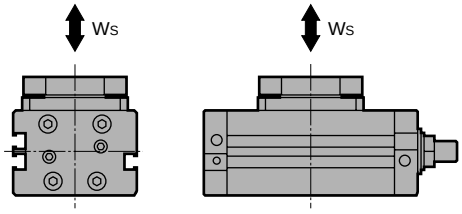
Step 4. Confirm allowable load

When the load is directly applied on the table, check that the load is within that allowable in Table 2.

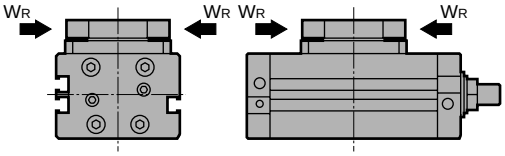
When using a compound load, check that the total rate for each allowable load is 1.0 or less.

There are three types of loads.

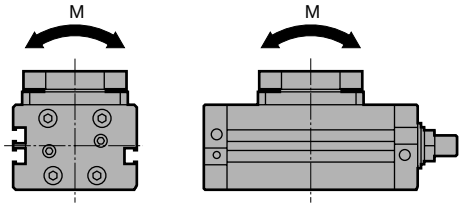
(1)Thrust load (axial load)



(2)Radial load (sideways load)



(3)Moment load



After calculating each load, substitute values in the following expression and confirm the value.

$$\frac{W_S}{W_{Smax}} + \frac{W_R}{W_{Rmax}} + \frac{M}{M_{max}} \leqq 1.0$$

Ws : Thrust load (N)
WR : Radial load (N)
M : Moment load (N·m)
Wsmax : Allowable thrust load (N)
WRmax : Allowable radial load (N)
Mmax : Allowable moment load (N·m)

Allowable energy absorption and that allowable for each load are shown below.

Table 1 Allowable energy absorption value [J]

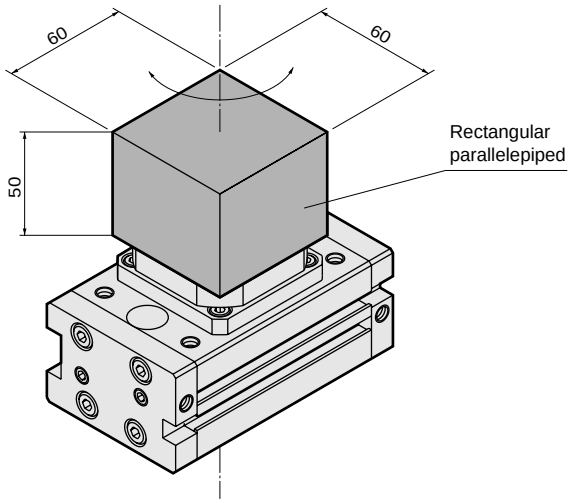
Size	5	10	20	30	50	80
Basic type/high precision type	0.005	0.008	0.03		0.04	0.11

Table 2 Allowable load values $W_{Smax.}$ $W_{Rmax.}$ M_{max}

Size		5	10	20	30	50	80
Thrust load	Basic type	50	80	140	200	450	580
WSmax [N]	High precision type	-	120	220	440	550	650
Radial load	Basic type	30	80	150	200	320	400
WRmax [N]	High precision type	-	100	160	240	380	480
Moment load	Basic type	1.5	2.5	4.0	5.5	10.0	13.0
Mmax [N·m]	High precision type	-	3.0	5.0	7.0	12.0	15.0

Selection example (1)

When the load is a rectangular parallelepiped



<Operational conditions >

Pressure	: 0.5 (MPa)
Oscillating angle	: 90˚
Oscillating time	: 0.6 (s)
Load (material	: Aluminum alloy)
<Rectangular parallelepiped >	: 0.5 (kg)

Step 1. Confirm oscillation time

Based on operation conditions, the oscillation time is 0.6 (s/90˚). This is within the oscillation time adjustment range 0.2 to 1.5(s/90˚). GO to the next step.

Step 2. Select the size

Since the load is an inertia load, calculate the moment of inertia (L) first.

<Rectangular parallelepiped >

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

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

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

Thus,

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

Therefore, baased on (1) and (2), the inertia load (T_A) is:

$$T_A=5 \times 3 \times 10^{-4} \times 8.73$$

$$=0.0131\ (N \cdot m) \cdots\cdots\cdots\cdots (3)$$

Based on the value from (3), the operation conditions, and the torque for 0.5(MPa),

GRC-5-90 ····· (A)

is selected.

Step 3. Confirm the allowable energy

Calculate the kinetic energy and confirm that it is within the allowable energy value.

Calculate the average angle speed ω.

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

Thus,

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

Therefore, the kinetic energy (E) is:

$$E=\frac{1}{2} \times 3 \times 10^{-4} \times 5.24^2$$

$$=0.00412\ (J) \quad \cdots\cdots\cdots (4)$$

Based on the value from (4), and (A) selected in Step 2

GRC-5-90 ····· (B)

is selected.

Step 4. Confirm the allowable load

Finally, calculate the load value applied on the table, and confirm that it is within the allowable load value.

<Thrust load >

The thrust load (Ws) is:

Ws=0.5 X 9.8=4.9(N) ·····(5)

<Radial load>

The radial load is not applied, so:

W_R=0(N)····· (6)

<Moment load>

The moment load is not applied, so:

M=0(N·m)····· (7)

Based on (5), (6), (7) and (B)

$$\frac{W_S}{W_{Smax}}+\frac{W_R}{W_{Rmax}}+\frac{M}{M_{max}}$$

$$=\frac{4.9}{50}+\frac{0}{30}+\frac{0}{1.5}=0.098 \leqq 1.0 \cdots\cdots (C)$$

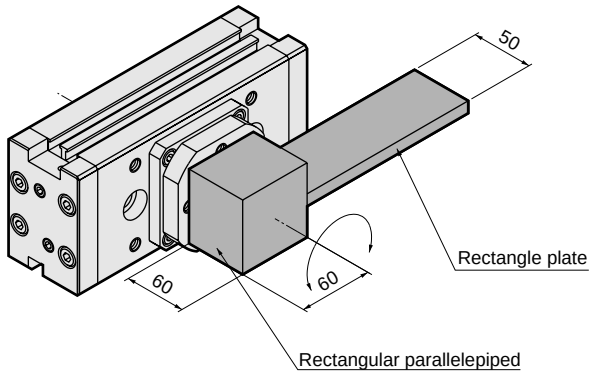
Based on (B) and (C), the total load value is within the allowable load value, so

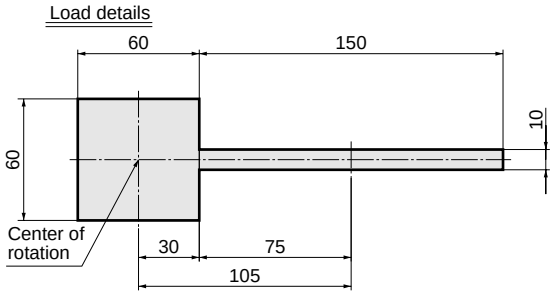
GRC-5-90

is selected.

Selection example (2)

When rotary shaft is horizontal and load is rectangular plate





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

<Operating conditions >
Pressure : 0.5 (MPa)
Oscillating angle : 180˚
Oscillating time : 2.0 (s)
Load (Material: Aluminum alloy)
<Rectangle plate > : 0.2 (kg)
<Rectangular parallelepiped >: 0.5 (kg)

Step 1. Confirm the oscillation time

Based on the operation conditions, the oscillation time is 2.0 (s/180˚). This is within the oscillation time adjustment range 0.4 to 3.0 (s/180˚), so go to the next step.

Step 2. Select the size

Resistance and inertia loads are generated by gravity, so calculate the resistance load (T_R) and moment of inertia (I).

<Resistance load >
The resistance load varies with table rotation.
F_R=0.2 X 9.8=1.96 (N)
R=0.105 (m)
Thus,
T_R=5 X 1.96 X 0.105=1.03(N·m) ····· (1)

<Inertia load>
[Rectangular 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]

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

The entire moment of inertia (I) is as follows:
$I=I_1+I_2=2.88 \times 10^{-3}\ (kg/m^2)$ ·····(2)
Next, calculate the angle acceleration ($\dot{\omega}$)
Based on conditions, θ =180˚= π (rad) and t=2.0 (s).
Thus,

$$\dot{\omega}=\frac{2\theta}{t^2}=\frac{2\pi}{2.0^2}=1.57\ (rad/s^2)$$ ·····(3)

Therefore, based on 2 and 3, inertia load (T_A) is:

$$T_A = 5 \times 2.88 \times 10^{-3} \times 1.57$$

$$= 0.023\ (N \cdot m)$$ ·····(4)

Based on (1) and (4), total torque (T) is:
T = 1.03 + 0.023 = 1.05(N·m) ·····(5)
Based on the value from (5), operation conditions, and the torque for 0.5 MPa,
GRC-20-180 ·····(A)
is selected.

Step 3. Confirm the allowable energy

Calculate kinetic energy and confirm that it is within allowable energy.
Calculate average angle speed ω .
Based on conditions, θ =180˚= π (rad) and t=2.0 (s).
Thus,

$$\omega=\frac{2\theta}{t}=\frac{2\pi}{2.0}=3.14\ (rad/s)$$

Therefore, kinetic energy (E) is:

$$E=\frac{1}{2} \times 2.88 \times 10^{-3} \times 3.14^2$$

$$=0.014\ (J)$$ ····· (6)

Based on the value from (6), and (A) selected in Step 2
GRC-20-180 ····· (B)
is selected

Step 4. Confirm the allowable load

Calculate the load applied in the table, and confirm that it is within the allowable load.

<Thrust load>
Thrust load (Ws) is not applied, so the thrust load (Ws) is:
W_S = 0(N) ····· (7)

<Radial load>
Total weight is:
0.2 + 0.5 = 0.7(kg)
Thus,
W_R = 0.7 X 9.8 = 6.9(N) ····· (8)

<Moment load>
Moment load is not applied, so moment load (M) is:
M = 0(N·m) ····· (9)
Based on (7), (8), (9), and (B)

$$\frac{W_S}{W_{Smax}}+\frac{W_R}{W_{Rmax}}+\frac{M}{M_{max}}$$

$$=\frac{6.9}{150}+\frac{0}{140}+\frac{0}{4.0}=0.046 \leqq 1.0$$ ····· (C)

Based on (B) and (C), the total load is within the allowable load, so
GRC-20-180-A1, A2
is selected.