

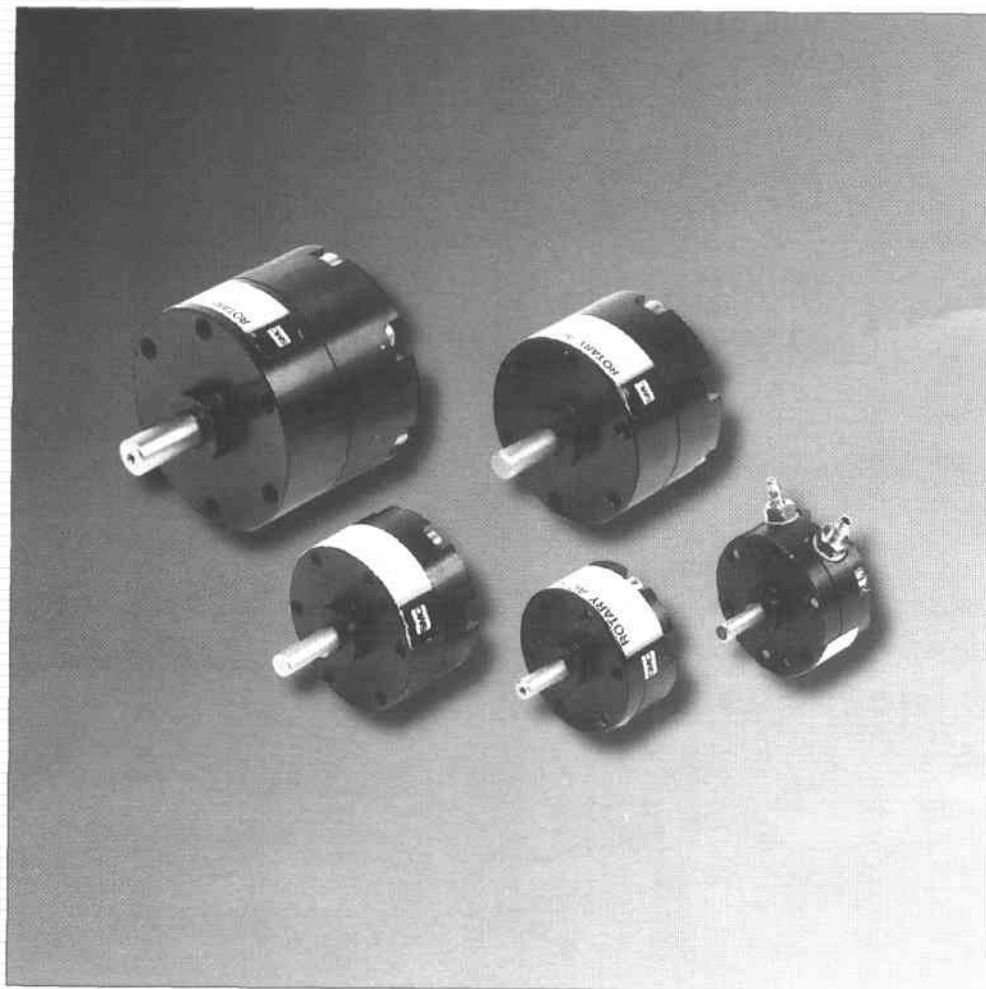


N350

Rotary Actuator

NCRB1BW Series

Single Vane / Double Shaft



Optional Rotations: 90°, 180°, 270°
Angle Adjustment Option
Compact and Light Weight
Ball Bearing Supported Shaft
2 Porting Variations (Top and Side)
Auto Switch Capable

Miniature Vane

Rotary Actuator

NCRB1○W10•15•20•30

Light Weight And Compact Size

NCRB1BW

Weight

Bore (mm)

10

15

20

30

lbs (g)

0.06 (26)

0.11 (49)

0.23 (105)

0.44 (198)

High Reliability and Long Life

Due to ballbearing support shaft and built in rubber bumpers.
(Note: NCRB1○W 10 has no bumpers)

Rotation Angle 90°, 180°, 270°

(Standard type)

Variable angle adjustment (option)

Stainless Steel Shaft And Bolts

(Note: The shaft of the NCR○1BW30 is hard chrome plated steel)

Auto Switch Available

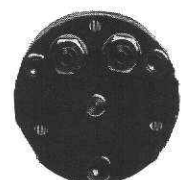
Two Porting Variations

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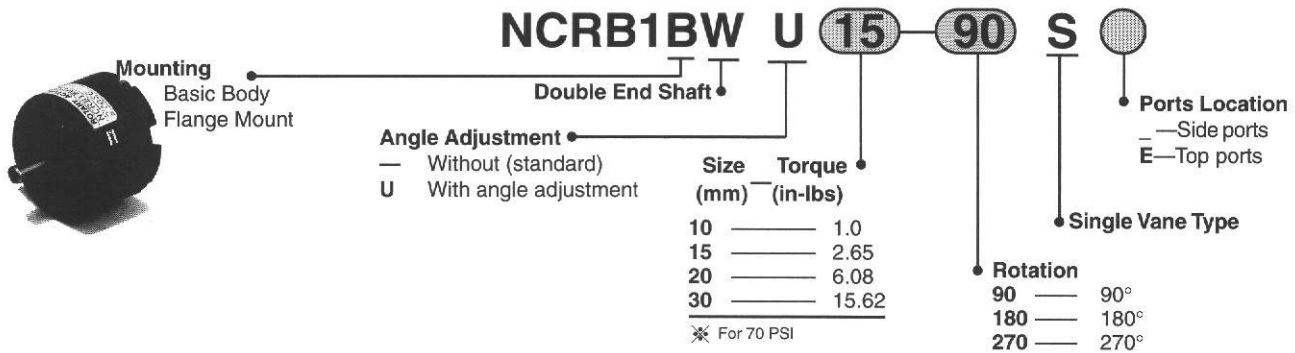


Side Porting

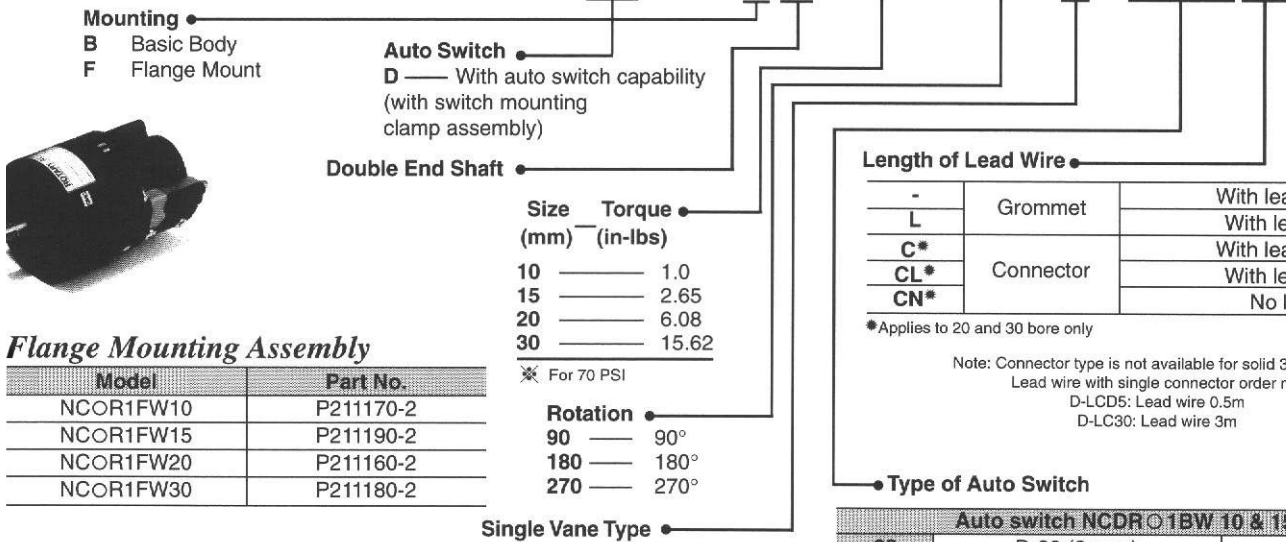


Top Porting

How To Order



With Auto Switch Capability



Flange Mounting Assembly

Model	Part No.
NCOR1FW10	P211170-2
NCOR1FW15	P211190-2
NCOR1FW20	P211160-2
NCOR1FW30	P211180-2

M3 Barb Fitting

Part No.	Use With	Applicable tubing*
M-3AU-3	NCRB1BW10- OE/-270 NCRB1BW15- OE/-270ith	Nylon Urethane

* Recommended Tubing OD 1/8", Tube Wall .023".

Switch Mounting Clamp Assembly

Model	Part No.
NCDRB1BW10	P211170-1
NCDRB1BW15	P211190-1
NCDRB1BW20	P211160-1
NCDRB1BW30	P211180-1

Angle Adjusting Unit

Applicable Model	Part No.
NCRB1BWU10	P211170-3
NCRB1BWU15	P211190-3
NCRB1BWU20	P211160-3
NCRB1BWU30	P211180-3

Auto Switch version Angle Adjusting Unit

Applicable Model	Part. No.
NCDRB1BWU10	P211170-4
NCDRB1BWU15	P211190-4
NCDRB1BWU20	P211160-4
NCDRB1BWU30	P211180-4

Type of Auto Switch

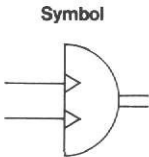
Auto switch NCDR ○ 1BW 10 & 15			
90	D-90 (2 pcs.)	Reed Type	
97	D-97 (2 pcs.)		
90A	D-90A (2 pcs.)		
93A	D-93A (2 pcs.)		
S99	D-S991, D-992 (1 pc. each)	Solid	3 wire type
T99	D-T991, D-T992 (1 pc. ea.)	Type	2 wire type
Auto Switch NCDR ○ 1BW 20 & 30			
R73	DR731, D-R732 (1 pc. ea.)	Reed Type	
R80	D-R801, D-R802 (1 pc. ea.)		
S79	D-S791, D-S792 (1 pc. ea.)	Solid	3 wire type
T79	D-T791, D-T792 (1 pc. ea.)	Type	2 wire type

Fitting Location and Rotation of Auto Switch

Mounting direction	Switch with right hand mounting	Switch with left hand mounting
Type	D-○○○1	D-○○○2

Rotary Actuator: Vane Type

NCRB1○W10•15•20•30



Specifications

Medium	Air
Operating temperature	40 – 140°F (5 ~ 60°C)
Lubrication	No lubrication required
End of shaft	Double end shaft with both square

Model	NCRB1BW10	NCRB1BW15	NCRB1BW20	NCRB1BW30
Max. Operating pressure PSI (kgf/cm ²)	100 (7.0)			140 (9.9)
Min. Operating pressure PSI (kgf/cm ²)	30 (2.0)	20 (1.5)	20 (1.5)	15 (1.0)
Allowable kinetic energy in-lbs (kgf-cm)	1.3x10 ⁻³ (1.5x10 ⁻³)	2.17 x 10 ⁻³ (2.5x10 ⁻³) 8.68 x 10 ⁻³ (10x10 ⁻³)	3.47x10 ⁻³ (4x10 ⁻³) 2.6x10 ⁻² (3x10 ⁻²)	0.13 (0.15) [0.17 (0.2)]

[] : Max. kinetic energy for rubber bumpers. (Not available on NCRB1BW10)

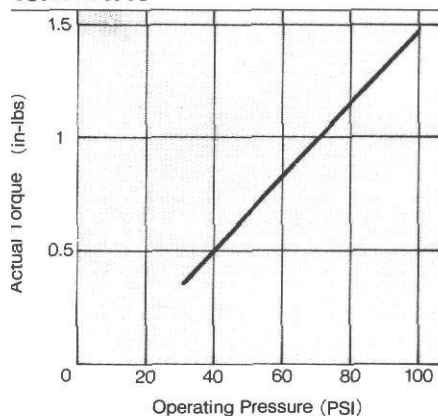
	Rotation (Degree)	Max. Operating cycle (Hz)	※ Volume (In ³)	Weight lbs (gf)	Ports location/Ports size	
					Side	Top
RB1○W10-90S-○	90 ⁺⁵ ₀	5	0.06 (0.04)	0.06 (26.3)	10-32UNF	※ ※ M3
RB1○W10-180S-○	180 ⁺⁵ ₀	3.5	0.07	0.06 (26.0)	10-32UNF	
RB1○W10-270S-○	270 ⁺⁵ ₀	2.5	0.09	0.06 (25.7)	※ ※ M3	
RB1○W15-90S-○	90 ⁺⁴ ₀	4	0.09 (0.06)	0.11 (50)	10-32UNF	※ ※ M3
RB1○W15-180S-○	180 ⁺⁴ ₀	3	0.17	0.11 (49)	10-32UNF	
RB1○W15-270S-○	270 ⁺⁴ ₀	2	0.23	0.11 (48)	※ ※ M3	
RB1○W20-90S-○	90 ⁺⁴ ₀	4	0.29 (0.22)	0.23 (106)	10-32UNF	10-32UNF
RB1○W20-180S-○	180 ⁺⁴ ₀	3	0.37	0.23 (105)		
RB1○W20-270S-○	270 ⁺⁴ ₀	2	0.48	0.23 (103)		
RB1○W30-90S-○	90 ⁺⁴ ₀	4	0.69 (0.52)	0.45 (203)	10-32UNF	10-32UNF
RB1○W30-180S-○	180 ⁺⁴ ₀	3	0.92	0.44 (198)		
RB1○W30-270S-○	270 ⁺⁴ ₀	2	1.23	0.43 (193)		

[] : When port A is pressurized.

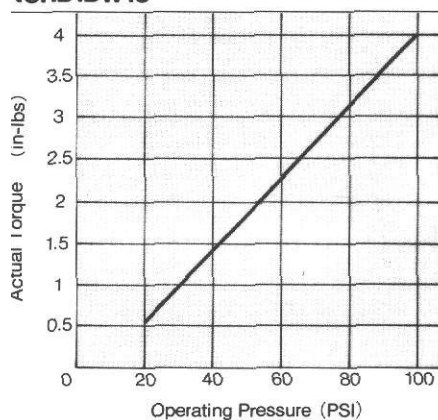
※ : Optional M3 fitting available. See how to order page

Actual Torque

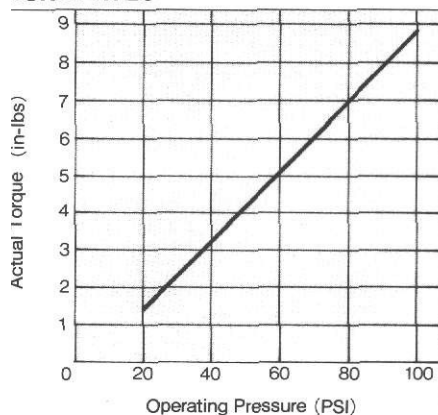
NCRB1BW10



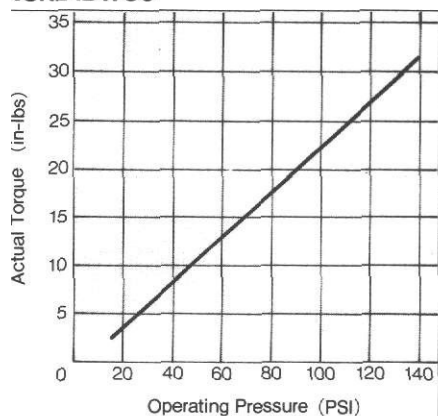
NCRB1BW15



NCRB1BW20



NCRB1BW30



Rotation Time Setting

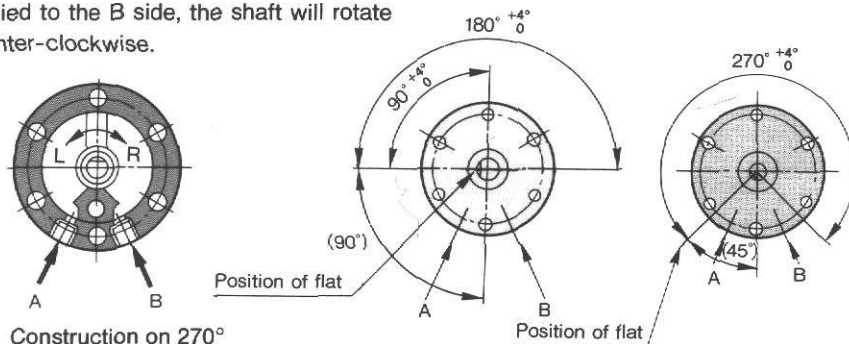
Even a small torque generated by the rotary actuator, due to inertia, can cause damage. Therefore, please control rotation time taking the moment of inertia of the load and Kinetic energy into consideration. For further details, refer to the Appendices on pages 11 and page 12.

Rotation Speed Range

Model: 10, 15, 20- 0.03~0.3 sec/90°
 Model: 30- 0.04~0.3 sec/90°
 If a rotation speed is used slower than 0.3 sec/90°, sticking may occur.

Mounting & Travel Index

When pressure is applied to the A side, the shaft will rotate clockwise. When applied to the B side, the shaft will rotate counter-clockwise.



Precautions

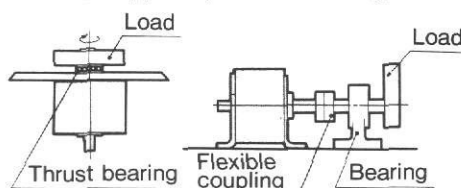
- 1 Use clean air.
- 2 Lubrication is not required. If lubrication is provided, use turbine oil #1 (ISO VG32). (If lubrication is used, do not discontinue its use.)
- 3 If the kinetic energy of the load exceeds the permissible range, use external stops to absorb load.
- 4 Connect the piping after thoroughly flushing it.
- 5 Do not use hydraulic fluid.
- 6 **Shaft Load**

If a static (i. e. non-dynamic) load only is applied to the actuator, it is possible to apply the load values shown in the table below. In order to obtain the proper operating conditions, it is recommended that the load not be applied directly to the shaft.

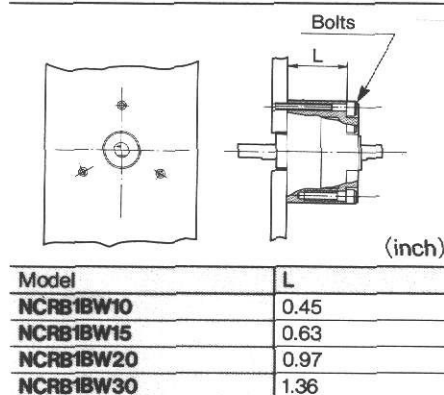
Model	lbs (kgf)	
	Fr	Fs
NCRB1○W10	3.31 (1.5)	2.20 (1.0)
NCRB1○W15	3.31 (1.5)	2.20 (1.0)
NCRB1○W20	5.51 (2.5)	4.41 (2.0)
NCRB1○W30	6.61 (3.0)	5.51 (2.5)

Recommended Mounting Methods

The values given in the above are the maximum values when the actuator is not operating. (ie. static loading) If your application requires greater load bearing capacity please use other means of support. (ie. thrust bearing)



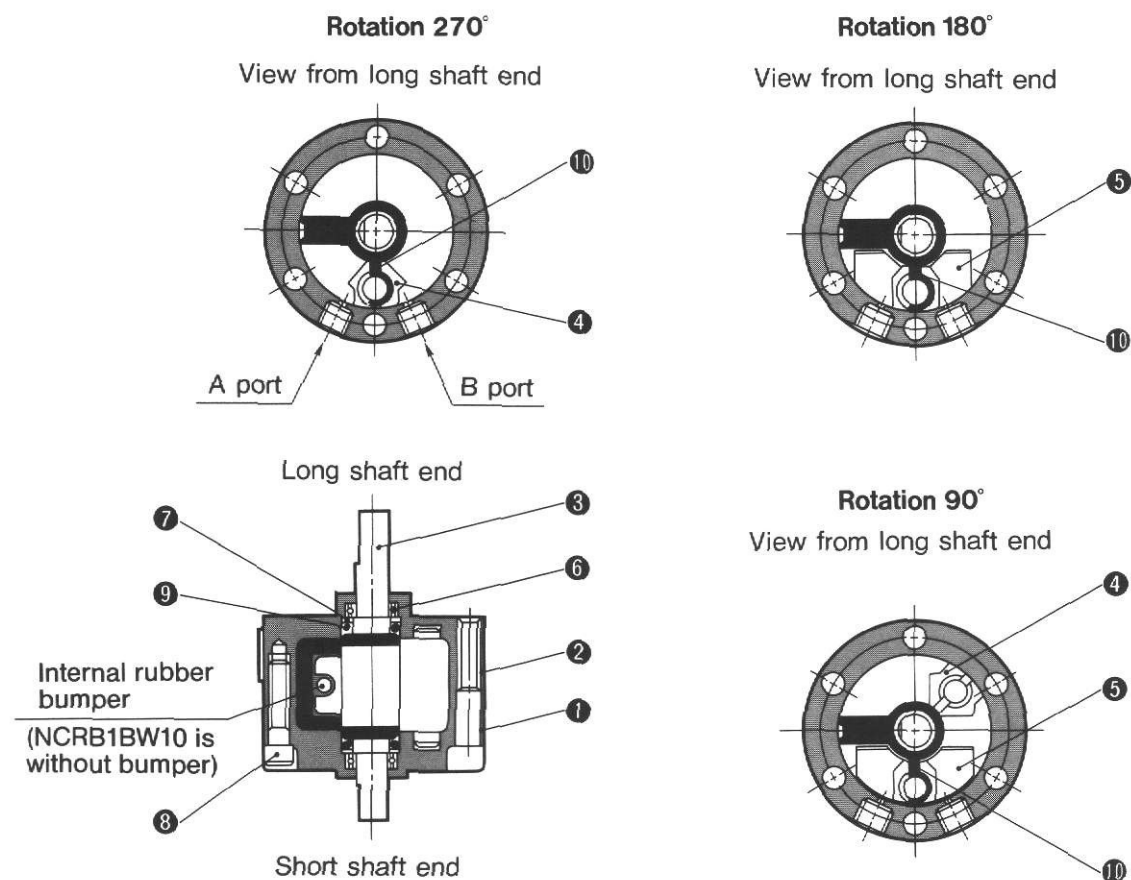
Body To Be Used As A Flange



Model	L (inch)
NCRB1BW10	0.45
NCRB1BW15	0.63
NCRB1BW20	0.97
NCRB1BW30	1.36

NCDRB1OW10•15•20•30

Construction/Parts List



Parts List

No.	Description	Material	Note
1	Body (A)	Aluminum alloy	Black alumite
2	Body (B)	Aluminum alloy	Black alumite
3	Vane shaft	Stainless steel※	NBR (Lining)
4	Stopper	Resin	Rotation 90° • 270°
5	Stopper	Resin	Rotation 90° • 180°
6	Bearing	Carbon steel	
7	Back up ring	Stainless steel	
8	Hexagon socket head cap screw	Stainless steel	
9	O-ring	NBR	
10	Stopper packing	NBR	

※ NCRB1BW 30: Carbon steel

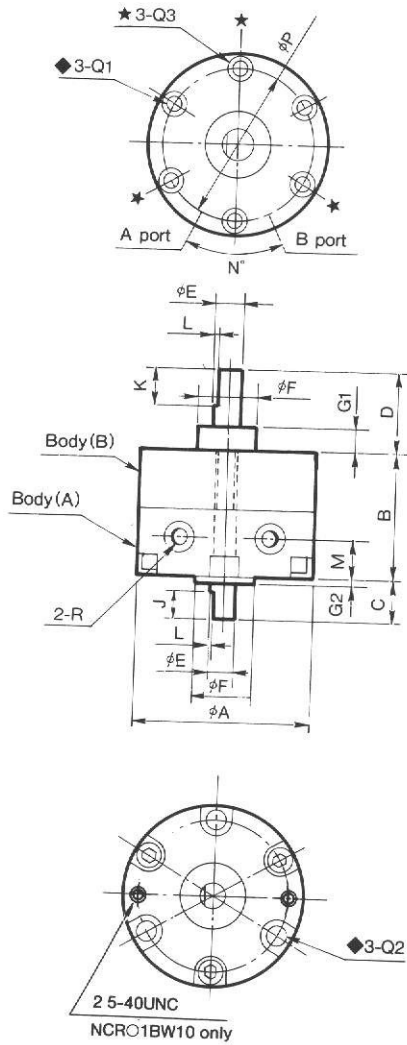
Repair Kits

NCRB1OW10	NCRB1OW15	NCRB1OW20	NCRB1OW30
KT-NCRB1BW10S	KT-NCRB1BW15S	KT-NCRB1BW20S	KT-NCRB1BW30S

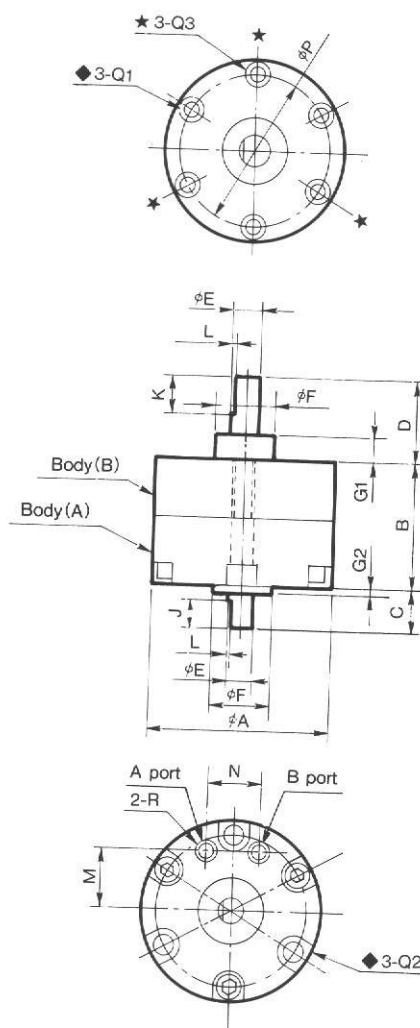
* Kits include items 3, 9, and 10.

Dimensions

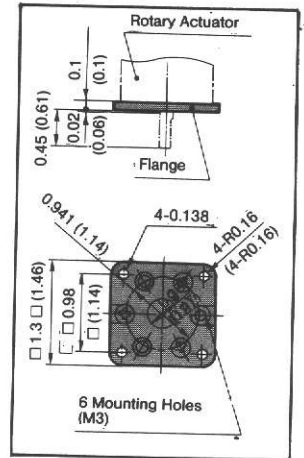
Side ports: NCRB1OW○-OS



Top ports: NCRB1OW○-OSE

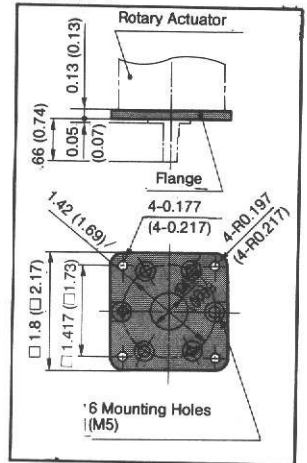


Flange ("F")



Dim. for NCRB1OW10
() : Dim for NCRB1OW15

Flange ("F")



Dim for NCRB1OW20
() : Dim for NCRB1OW30

Model	A	B	C	D	E		F		G		J	K	L	M	N	P
						Tolerances		Tolerances	G1	G2						
NCRB1OW10-OS	1.14	0.59	0.31	0.55	5/32	-0.00015 -0.00045	3/8	0 -0.0012	0.12	0.04	0.20	0.35	0.02	0.20 0.33	50 0.37	0.95
NCRB1OW10-0SE																
NCRB1OW15-OS	1.34	0.79	0.35	0.71	3/16	-0.00015 -0.00045	15/32	0 -0.0016	0.16	0.06	0.24	0.39	0.02	0.20 0.43	50 0.39	1.14
NCRB1OW15-0SE																
NCRB1OW20-OS	1.65	1.14	0.39	0.79	15/64	-0.00015 -0.00045	9/16	0 -0.0016	0.18	0.06	0.28	0.39	0.02	0.35 0.55	50 0.51	1.42
NCRB1OW20-0SE																
NCRB1OW30-OS	1.97	1.57	0.51	0.87	5/16	-0.00002 -0.00006	5/8	0 -0.0016	0.20	0.08	0.31	0.47	0.04	0.39 0.61	50 0.55	1.69
NCRB1OW30-0SE																

(Inch)

odel	Q (Depth)			R		
	Q1	Q2	Q3	90°	180°	270°
CRB1OW10-OS	5-40 UNC (0.2)	0.14 (0.26)	—	10-32 UNF	M3	
CRB1OW10-0SE				M3		
CRB1OW15-OS	5-40 UNC (0.39)	0.14 (0.24)	5-40 UNC (0.2)	10-32 UNF	M3	
CRB1OW15-0SE				M3		
CRB1OW20-OS	8-32 UNC (0.53)	0.18 (0.43)	8-32 UNC (0.3)	10-32 UNF		
CRB1OW20-0SE						
CRB1OW30-OS	10-24 UNC (0.71)	0.21 (0.65)	10-24 UNC (0.4)	10-32 UNF		
CRB1OW30-0SE						

With Auto Switch/NCDRB1○W○



NCDRB1BW30-○ S-○

NCDRB1BW20-○ S-○

Specifications

Fluid	Air
Operating temperature	40 ~ 140°F (5 ~ 60°C)
Lubrication	No lubrication required

Specifications	Model	NCDRB1○W10	NCDRB1○W15	NCDRB1○W20	NCDRB1○W30
Max. Operating pressure PSI (kgf/cm ²)		100 (7.0)	100 (7.0)	100 (7.0)	140 (9.9)
Max. Operating pressure PSI (kgf/cm ²)		30 (2.0)	20 (1.5)	20 (1.5)	15 (1.0)
Allowable kinetic energy in-lbs (kgf·cm)		1.3x10 ⁻³ (1.5x10 ⁻³)	2.17x10 ⁻³ (2.5x10 ⁻³) {8.68x10 ⁻³ (10x10 ⁻³)}	3.47x10 ⁻³ (25x10 ⁻³) {26x10 ⁻² (3x10 ⁻³)}	0.13 (0.15) 0.17 (0.2)

[] : Max. kinetic energy for rubber bumpers. (Not available on NCDRB1BW10)

Applicable Series

Applicable Series	Auto Switch Model		Electric Entry	Indicator Lamp	
CDRB1BW10 CDRB1BW15	Reed	D-90 • 90A	Grommet/2 wire type	X	X = Not available ○ = Available
		D-97 • 93A		○	
	Solid	D-S99	Grommet/3 wire type	○	
		D-T99	Grommet/2 wire	○	
CDRB1BW20 CDRB1BW30	Reed	D-R73	Grommet/2 wire	○	
		D-R80	Connector/2 wire	X	
	Solid	D-S79	Grommet/3 wire	○	
		D-T79	Grommet/2 wire, Connector/2 wire	○	

Auto Switch/Specifications

Model	Auto Switch No.		Application	Load Voltage	Max. Current and Operating Range
	Switch with right hand mounting	Switch with left hand mounting			
D-9	D-90		IC Circuit, Relay, PLC	5, 12, 24VAC/VDC	Max. 50mA
	D-90A			100VAC/VDC	Max. 20mA
	D-97		Relay, PLC	24VDC	5~40mA
	D-93A			100VAC	5~20mA
D-R7	D-R731	D-R732	Relay, PLC	24VDC	5~40mA
				100VAC	5~20mA
D-R8	D-R801	D-R802	IC Circuit, Relay, PLC	24VAC/VDC or less	Max. 50mA
				48VAC/VDC	Max. 40mA
				100VAC/VDC	Max. 20mA
D-S7	D-S791	D-S792	IC circuit, Relay, PLC	28VDC or less	Max. 40mA
D-S9	D-S991	D-S992			
D-T7	D-T791	D-T792	Relay, PLC	24VDC (10~28VDC)	5~150mA
D-T9	D-T991	D-T992			5~40mA

• Response time - 1.2ms

• Shock resistance - 300 m/s² (reed switch)

1000 m/s² (solid state switch)

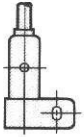
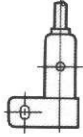
• Operating temp (5~60°C)

• Length of lead wire - 0.5m (standard)

Flange & Auto Switch Mounting Bracket Weights

Model no.	Weight oz. (gf)	
	Switch Mounting Bracket	Flange
NCDRB1○W10	1.06 (30)	0.28 (8)
NCDRB1○W15	1.06 (30)	0.35 (10)
NCDRB1○W20	1.76 (50)	0.67 (19)
NCDRB1○W30	2.12 (60)	0.99 (28)

Mounting Location And Rotation Of Auto Switch

Auto Switch model		90°, 180°
Switch with right hand mounting	Switch with left hand mounting	2 switches With right hand mounting
 D-○○○1	 D-○○○2	
 D-●991	 D-●992	270° With one each: switch with right hand mounting and left hand mounting

Rotation Time Setting

Even a small torque generated by the rotary actuator, due to inertia, can cause damage.

Therefore, please control rotation time taking the moment of inertia of the load and Kinetic energy into consideration. for further details, refer to the Appendices on pages 11 and pages 12.

Rotation Speed Range

Model 20—0.03~0.3sec/90°

Model 30—0.04~0.3sec/90°

If a rotation speed is used slower than 0.3sec/90° sticking may occur.

Rotation Sensing Range Of Auto Switch And Hysteresis

Rotation—110° (CDRB1*W10•15)

Rotation—90° (CDRB1*W20•30)

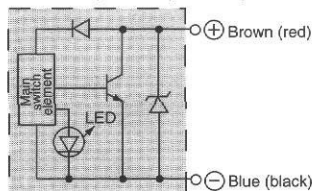
Hysteresis—20°

Position Setting

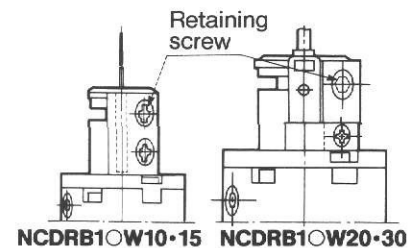
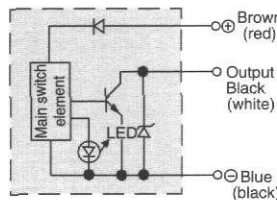
Loosen the retaining screw and shift the switch and set it at any position to suit your need. Then retighten the retaining screw. However, excessive tightening can cause damage to the screw. Be sure to use about 4.5 in—lbs (5kgf-cm) tightening torque.

Auto Switch Circuit

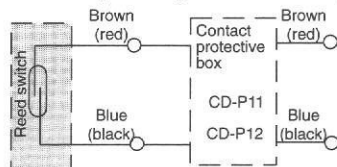
D-T791, T792, T991, T992



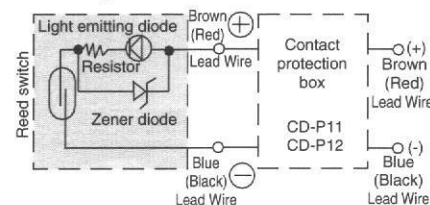
D-S791, S792, S991, S992



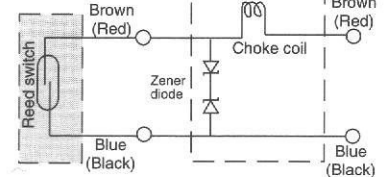
D-R801, R802, 90A



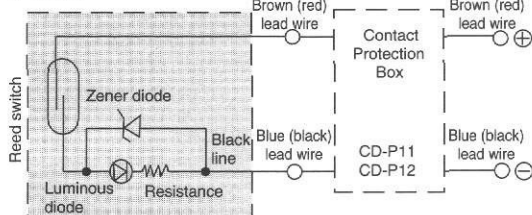
D-R731, R732



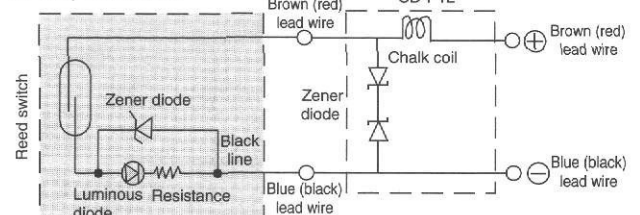
D-90



D-93A



D-97, D-R73C

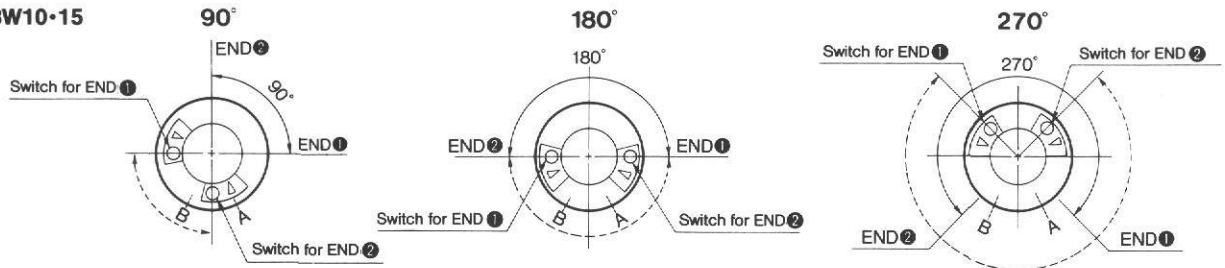


(): Previous color

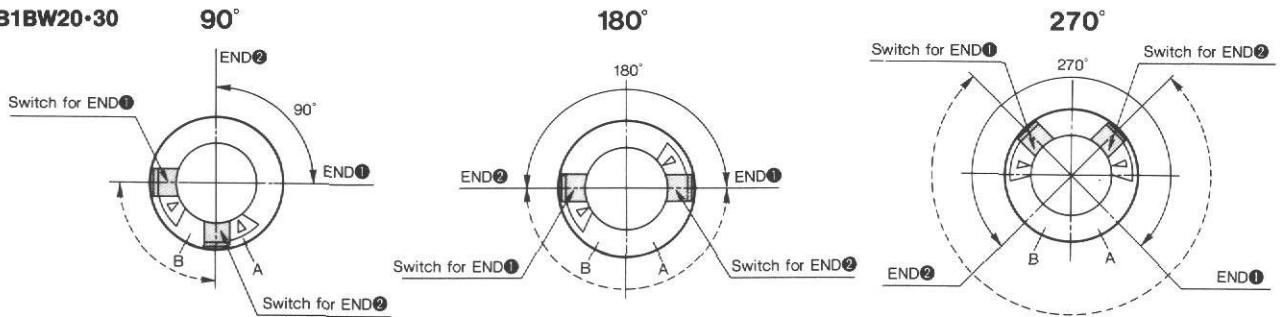
NCDRB1○W10•15•20•30

Range Of Rotation For Output Shaft With Single Wrench Flat And Position For Auto Switch

NCDRB1BW10•15

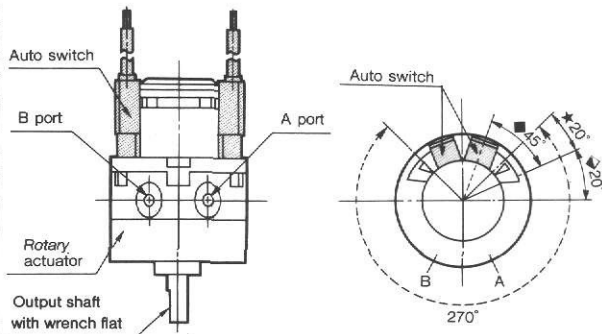
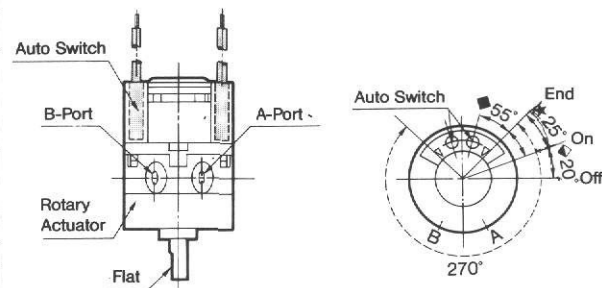


NCDRB1BW20•30



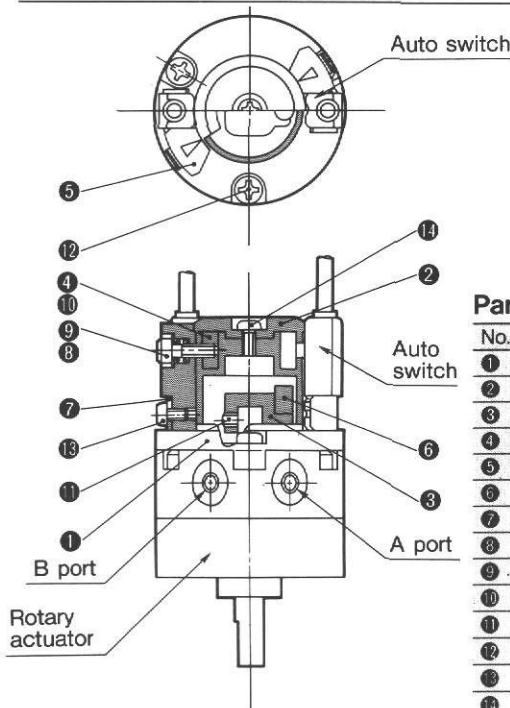
A) In the diagram showing rotation range, the arrowed solid line shows the range in which output shaft with wrench flat rotates. When single wrench flat indicates the way to END 1, switch for END 1 will operate. When it indicates the way to END 2, switch for END 2 will operate.

B) The arrowed dotted line shows the range in which built-in magnet rotates, it is possible to make rotation of switch smaller by shifting switch for END 1 clockwise and switch for END 2 counterclockwise.



Note: The rotation specification of 270°, the point of minimum rotation 20° is a limit shifting point even if the switch is shifted to make rotation of switch as shown in the left diagram. (Even if switch is shifted to the maximum, switch-on will be made at the point prior to the stopping point at 20°.)

With/ Auto Switch Construction/ Parts List

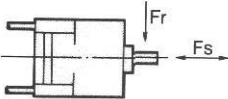


Parts List

No.	Description	Material
1	Cover "A"	Resin
2	Cover "B"	Resin
3	Magnet lever	Resin
4	Fixed block	Aluminum alloy
5	Switch block	Resin
6	Magnet	—
7	Arm	Stainless steel
8	Screw	Stainless steel
9	Plain washer	Stainless steel
10	Spring	Stainless steel
11	Screw	Stainless steel
12	Screw	Stainless steel
13	Screw	Stainless steel
14	Screw	Stainless steel

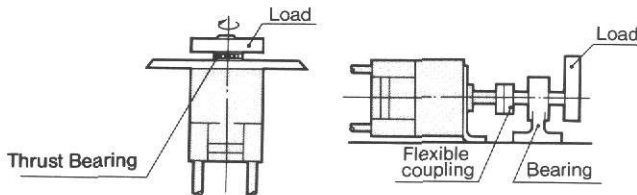
Precaution

- 1 Use clean air.
- 2 Lubrication is not required. If lubrication is provided, use turbine oil #1 (ISO VG32). If lubrication is used, do not discontinue its use.)
- 3 If the kinetic energy of the load exceeds the permissible range, use external stops to absorb load.
- 4 Connect piping after thoroughly flushing it.
- 5 Do not use hydraulic fluid.
- 6 **Shaft Load**
If a static (i.e. non-dynamic) load only is applied to the actuator, it is possible to apply the load values shown in the table below. In order to obtain the proper operating conditions, it is recommended that the load not be applied directly to the shaft.

		lbs (kgf)	
	Model	Fr	Fs
	NCDRB1○W10	3.30 (1.5)	2.20 (1.0)
	NCDRB1○W15	3.30 (1.5)	2.20 (1.0)
	NCDRB1○W20	5.51 (2.5)	4.41 (2.0)
	NCDRB1○W30	6.61 (3.0)	5.51 (2.5)

Recommended Mounting Methods

The values given in the above are the maximum values when the actuator is not operating. i.e. static loading) If your application requires greater load bearing capacity, please use other means of support (i.e. thrust bearing).

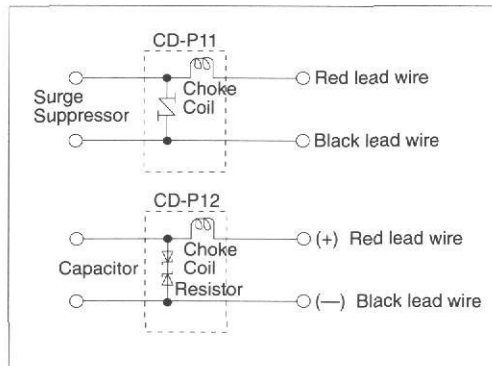


Contact Protection Box

D-R7 and D-R8 type switches have no built-in contact protection circuit. Use this box for induction loads, 1.5 ft (0.5m) or more of lead wire, or AC 100V applications.

Designation	Operating voltage	Length of lead wire
CD-P11	110VAC	Switch connecting side 1.5ft (0.5m) Load connecting side 1.5ft (0.5m)
CD-P12	24VDC	Switch connecting side 1.5ft (0.5m) Load connecting side 1.5ft (0.5m)

Contact Protection/Internal Circuit



Operational Instructions

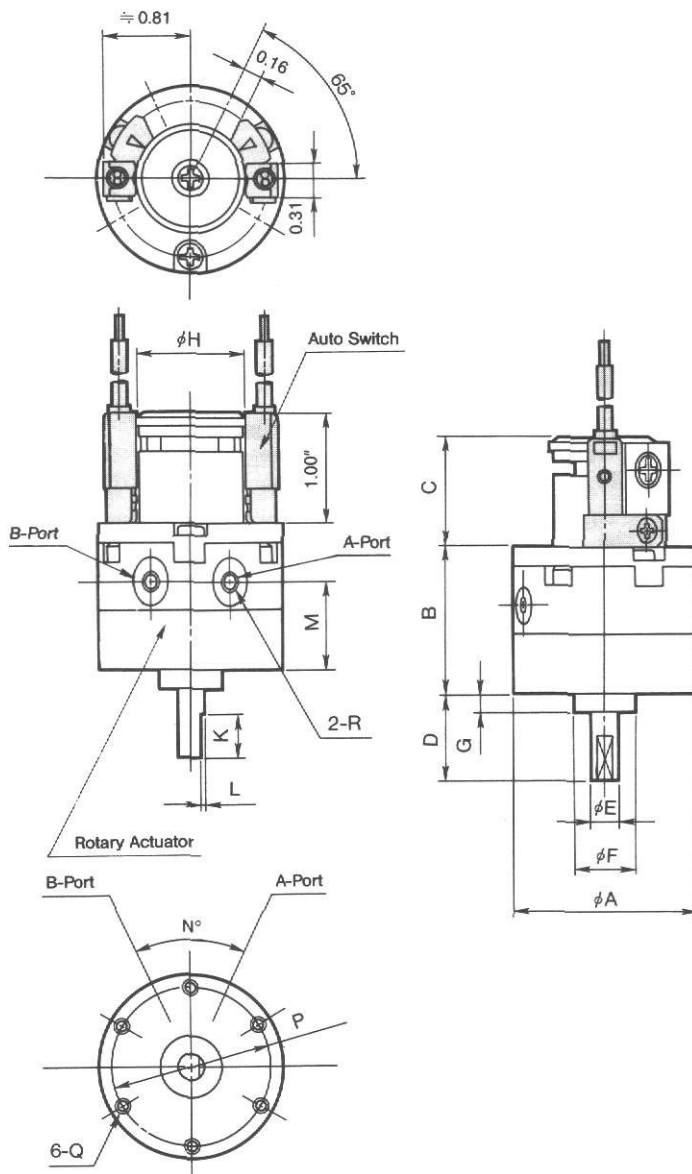
- 1 Auto switches with indicator lights, (LED's) are polarity sensitive. If using DC24V, the black lead wire is (—) side, and the red lead wire is (+) side. If connection is reversed, the light will not go on although the switch will operate.
- 2 Electric current should be kept within the operating current, the indicator light will not turn on, and if used at higher than operating current, the indicator light will be damaged.
- 3 D-R73 can be used with parallel connections, but in the case of series connection, care should be taken since the internal resistance of the light emitting diode causes a large voltage drop. (about 2V/switch)

Mounting

- 1 The Switch should always be connected to the load before connecting to the power source.
- 2 When operating, please take care to avoid damage, or excessive shock to the switch.
- 3 Never use in a magnetically contaminated environment.
- 4 When operating 2 or more actuators with auto switches in parallel, be sure that the distance between them is 1.6 (40mm) or more.

(inch)

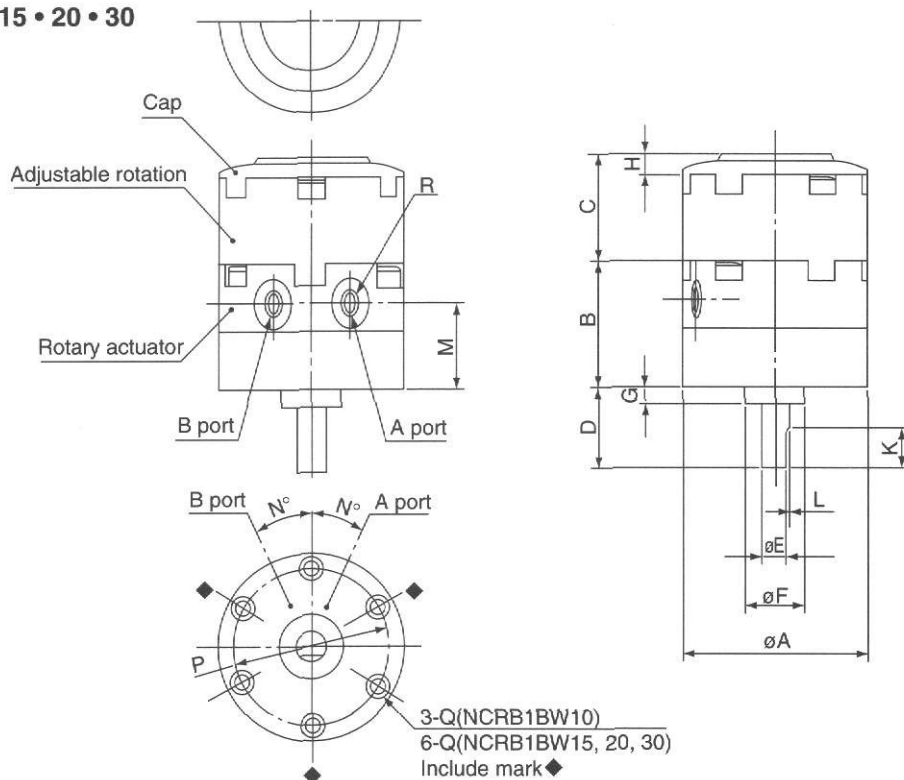
NCDRB1BW20•30

: 270° Rotation Port Size.

Angle Adjusting Unit/Dimensions

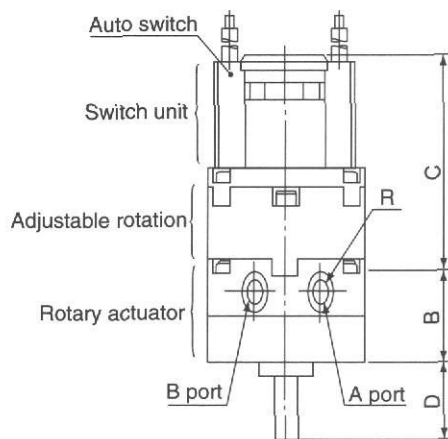
(inch)

NCRB1BWU10 • 15 • 20 • 30

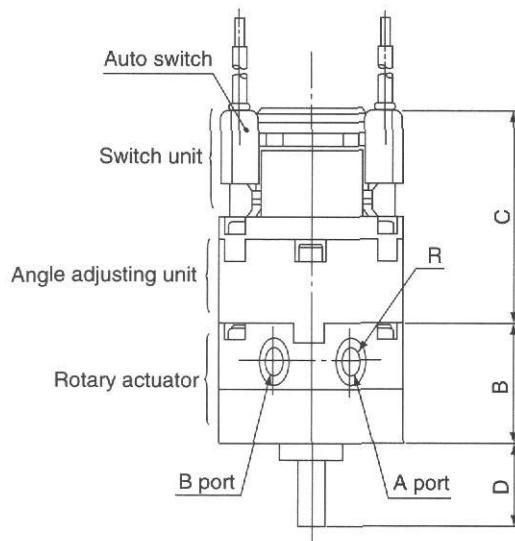


Auto Switch Compatible Type

NCDRB1BWU10 • 15



NCDRB1BWU20 • 30



Angle Adjusting Unit

Model	A	B	C	D	E		F		G	H	K	L	M	N	P	Q (Depth)	R
						Tolerances		Tolerances									
NCRB1BWU10-270S	1.14	0.59	0.77	0.55	5/32	-0.00015 -0.00047	0.35	0 -0.0014	0.12	0.12	0.35	0.02	0.39	25	0.94	M3X0.5 (.20)	M3X0.5
NCRB1BWU15-270S	1.34	0.79	0.83	0.71	3/16	-0.00001 -0.00017	0.47	0 -0.0017	0.16	0.13	0.39	0.02	0.59	25	1.14	M3X0.5 (.20)	M3X0.5
NCRB1BWU20-270S	1.65	1.14	0.98	0.79	15/64	-0.0015 -0.00045	9/16	0 -0.0016	0.18	0.16	0.39	0.02	0.79	25	1.42	8-32UNF (.28)	10-32UNF
NCRB1BWU30-270S	1.97	1.57	1.14	0.87	5/16	-0.0002 -0.0006	5/8	0 -0.0016	0.20	0.18	0.47	0.04	1.18	25	1.69	10-32UNF (.40)	10-32UNF

With Auto Switch

Model	B	C	D	R
NCDRB1BWU10-270S	0.59	1.79	0.55	M3 x 0.5
NCDRB1BWU15-270S	0.79	1.85	0.71	M3 x 0.5
NCDRB1BWU20-270S	1.14	2.01	0.79	10-32 UNF
NCDRB1BWU30-270S	1.57	2.19	0.87	10-32 UNF

Appendix 1 : How To Set Rotation Time

How To Set Rotation Time

Even a small torque generated by the rotary actuator, due to inertia of the load, can cause damage to the shaft and internal parts.

Therefore, please set rotation time taking the inertia of the load and kinetic energy into consideration. (The values of kinetic energy in lists 1, 2 and diagram 1 will be very helpful in setting the rotation time.)

List ① : Allowable Dynamic Load

Model	Kinetic energy (in·lbs)
NCRB1○W10	1.3×10^{-3}
NCRB1○W15	2.17×10^{-3} 8.68×10^{-3}
NCRB1○W20	3.47×10^{-3} 2.6×10^{-2}
NCRB1○W30	0.13 0.17

* | : Max. kinetic energy for rubber cushion.

Note 1. With internal rubber bumper, use an actuator for 90°, 180° or 270° at respective end of rotation 90°, 180° or 270°.

Note 2. Without internal rubber bumper, use an actuator for 270° (Fig. b) at 90° or 180° by external stopper making use of a single shaft instead of using end of the rotation.

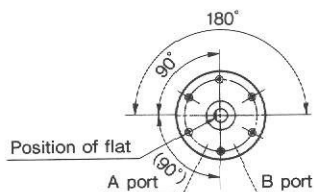


Fig. a (90°·180°)

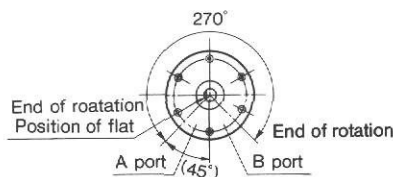


Fig. b (270°)

List ② : Stable Rotation Time Regulation Range

Model	Rotation time (sec/90°)
NCRB1○W10	0.03~0.3
NCRB1○W15	
NCRB1○W20	
NCRB1○W30	0.04~0.3

If a rotation speed is used slower than 0.3sec/90°, sticking may occur.

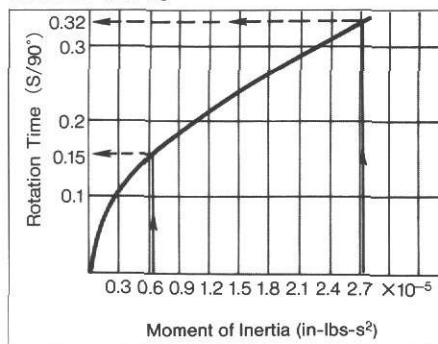
How to calculate energy of the load.

$$E = \frac{1}{2} \cdot J \cdot \omega^2$$

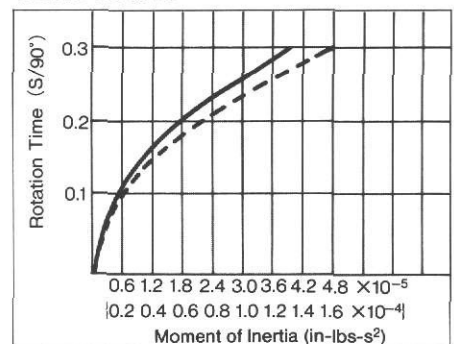
E : Kinetic energy (in·lbs)
 J : Moment of inertia (in·lbs·s²)
 ω : Rotation speed (rad/s)
 θ : Rotation (rad)
 $180^\circ = 3.14 \text{ rad}$
 t : Rotation time (s)

Fig ① : Moment of inertia and Rotation Time

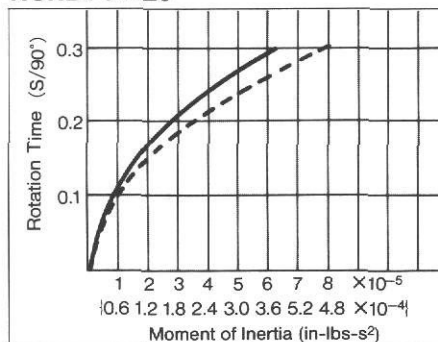
NCRB1○W10



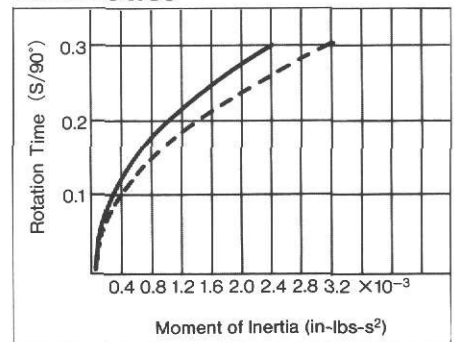
NCRB1○W15



NCRB1○W20



NCRB1○W30



| | : Indicates moment of inertia when using an internal rubber bumper.

— : No internal rubber bumper.

... : Use of an internal rubber bumper. (Using at end of rotation) (With auto switch)

Note: No internal bumper is used on NCRB1BW10.

How To Read Diagram

1. Setting rotation time of load moment of inertia $0.6 \times 10^{-5} \text{ in·lbs}$

For NCRB1BW10 (Fig. 1), with moment of inertia $0.6 \times 10^{-5} \text{ in·lbs·s}^2$ and rotation time 0.15/90° and stable rotation time regulation range 0.03~0.3/90° Max.) the rotation time will be 0.15~0.3°/90°.

2. Setting rotation time of load moment of inertia, $2.7 \times 10^{-5} \text{ in·lbs·s}^2$

For NCRB1BW10 (Fig. 1) the rotation time will be 0.32°/90°.

If rotation time of over 0.3~0.3°/90° (Max.) is needed, it's possible to use an external stop as shown in Fig. 2 below and stopping the rotation force of the load.

*When using 270° rotation it is recommended that a shock absorber be used.

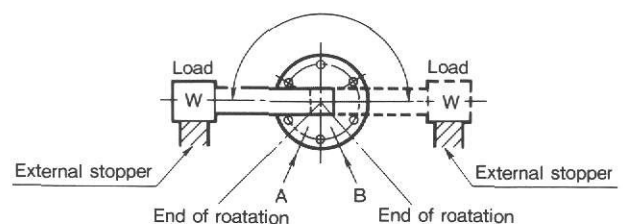


Fig. 2 (For 270°)

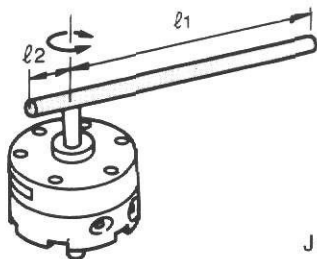
Appendix 2 : How To Calculate A Moment Of Inertia

Calculating A Moment of Inertia

J: Moment of inertia in $\text{lbs} \cdot \text{S}^2$ W: Weight of load lbs g: Acceleration due to gravity 386 in/s^2

1 Thin rod

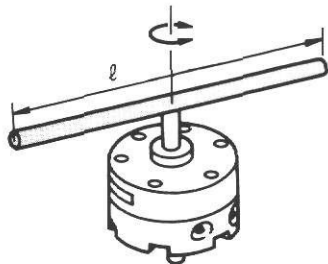
Position of pivot: Passes through one end perpendicular to the rod.



$$J = \frac{W_1}{g} \cdot \frac{l_1^2}{3} + \frac{W_2}{g} \cdot \frac{l_2^2}{3}$$

2 Thin rod

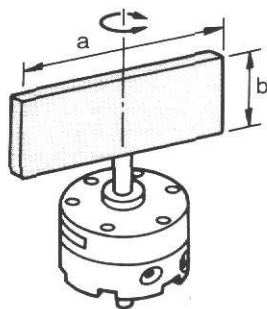
Position of pivot: Passes through the center of gravity perpendicular to the rod.



$$J = \frac{W}{g} \cdot \frac{l^2}{12}$$

3 Rectangular Plate

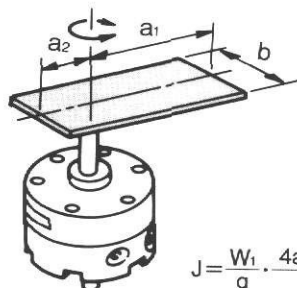
Position of pivot: Passes through the center of gravity, parallel to side b.



$$J = \frac{W}{g} \cdot \frac{a^2}{12}$$

4 Rectangular Plate

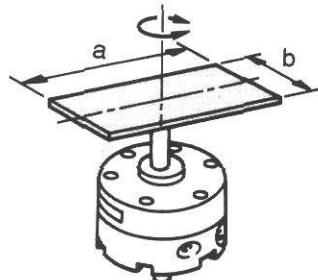
Position of pivot: Passes through one end perpendicular to the plate.



$$J = \frac{W_1}{g} \cdot \frac{4a_1^2 + b^2}{12} + \frac{W_2}{g} \cdot \frac{4a_2^2 + b^2}{12}$$

5 Rectangular Plate

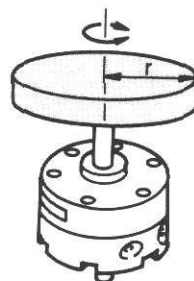
Position of pivot: Passes through the center of gravity perpendicular to the plate. (Inclusive of rectangular parallel piped)



$$J = \frac{W}{g} \cdot \frac{a^2 + b^2}{12}$$

6 Column (inclusive of thin disc)

Position of pivot: Axis



$$J = \frac{W}{g} \cdot \frac{r^2}{2}$$

7 Solid globe

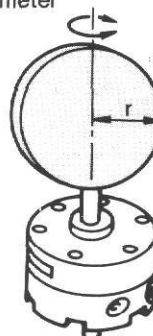
Position of pivot: Diameter



$$J = \frac{W}{g} \cdot \frac{2r^2}{5}$$

8 Thin disk

Position of pivot: Diameter



$$J = \frac{W}{g} \cdot \frac{r^2}{4}$$

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