

# ROTARY CLAMP CYLINDER

## Series A01R2

Cat No A01R2 - 01 - 01 - B

### ROTARY CLAMP CYLINDER - Double Acting (Ø12, 16, 20, 25, 32, 40, 50, 63mm)

#### Features

- ❑ For ease of loading & unloading workpiece at restriction
- ❑ High speed operation : 0.2 sec/stroke
- ❑ Compact cylinders with strong clamping force, Ø12 to 63mm
- ❑ Reed switches can be mounted on cylinder surfaces as input signals to controllers
- ❑ Improved mounting accuracy. Guide bush and positioning pin hole ensure high-precision mounting
- ❑ Body machined from extruded aluminium that mounts directly to equipment for rigid, secure mounting in small space
- ❑ Compact equipment design is possible. Suited for electronic parts inspection clamps. Ideal for use in small mounting space
- ❑ A built-in magnet is standard, sensor can be directly mounted. Mounting from 3 surfaces (Ø12 to 16mm) (4 surfaces for Ø20 to 63mm)

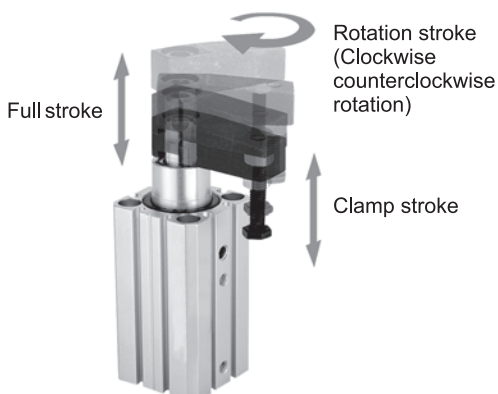


#### Technical Specifications

Bore size Ø	mm	12	16	20	25	32	40	50	63
Angle of swing		90° ±5°							
Direction of swing (From piston rod end during clamping)		R: Clockwise; L: Anti-clockwise							
Swing stroke	mm	8.5		11		13		18	
Clamp stroke	mm	10 / 20						20 / 50	
Overall stroke (Swing + Clamp)	mm	18.5 / 28.5		21 / 31		23 / 33		38 / 68	
Allowable torque	Nm	1	3.8	7	13	27	47	107	182
Theoretical clamping force	N *	40	75	100	185	300	525	852	1400
Medium		Compressed air - Filtered - Lubricated							
Working pressure	bar (kgf/cm <sup>2</sup> )	1 to 10							
Piston speed #	mm/sec	50 - 200							
Ambient temperature	°C	-10 to +60							
Medium temperature	°C	+5 to +50							
Materials of construction		Aluminium, Brass, Nitrile, Steel, Polyurethane							
Mountings		Rear flange							

\* Where the operating pressure is 5 bar (5.1 kgf/cm<sup>2</sup>)

# Control the piston speed with flow control valve



#### Standard Stroke

Bore \ Stroke	12	16	20	25	32	40	50	63
10	●	●	●	●	●	●		
20	●	●	●	●	●	●	●	●
50							●	●

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### Theoretical Output Table

Model	Piston rod (mm)	Swing Direction	Effective area (cm <sup>2</sup> )	Operating pressure kgf / cm <sup>2</sup>			
				3	5	7	10
A01R2-12	6	R	0.8	2.4	4	5.6	8
		L	1.1	3.3	5.5	7.7	11
A01R2-16	8	R	1.5	4.5	7.5	10.5	15
		L	2	6	10	14	20
A01R2-20	12	R	2	6	10	14	20
		L	3	9	15	21	30
A01R2-25	12	R	3.7	11.1	18.5	25.7	37
		L	4.9	14.7	24.5	34.3	49
A01R2-32	16	R	6	18	30	42	60
		L	8	24	40	56	80
A01R2-40	16	R	10.5	31.5	52.5	73.5	105
		L	12.5	37.5	62.5	87.5	125
A01R2-50	20	R	16.5	49.5	82.5	115.5	165
		L	19.6	58.8	98	137.2	196
A01R2-63	20	R	28	84	140	196	280
		L	31.2	93.6	156	218.4	312

### Weight Table

Unit : (g)

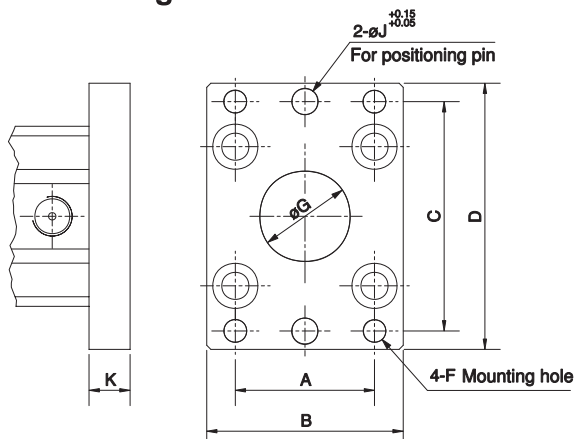
Stroke \ Bore	12	16	20	25	32	40	50	63
10	70	100	250	280	500	595	-	-
20	87	123	290	320	525	640	1100	1520
50	-	-	-	-	-	-	1350	1805

### Table of Extra Weight

Unit : (g)

Accessories \ Bore	12	16	20	25	32	40	50	63
Arm	13	32	100	100	200	200	350	350
Rear flange	-	-	133	153	166	198	345	531

### Rear Flange



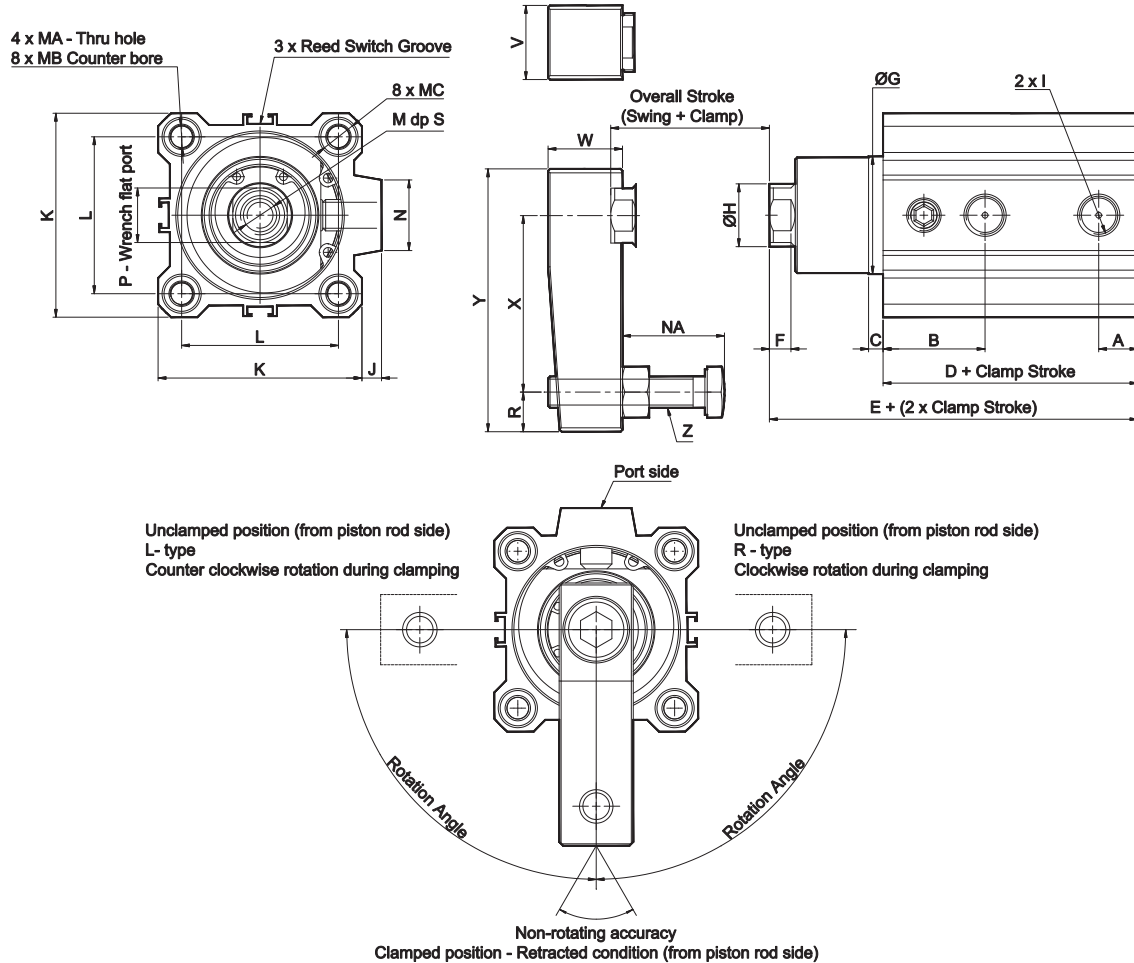
Ordering No.	A	B	C	D	F	G	J	K
MR6020	25.5	38	48	60	6.3	13	6.6	8
MR6025	28	42	52	64	6.3	15	6.6	8
MR6032	34	48	56	65	5.5	21	6.3	10
MR6040	40	56	62	72	5.5	28	6.3	10
MR6050	50	67	76	89	6.6	35	6.3	10
MR6063	60	80	92	108	9	35	6.3	10

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### External Dimensions



Model	A	B	C	D	E	F	G	H	I	J	K	L	M	S
A01R2-12	5	14	2	43.2	64.2	2.5	-	6	M5 x 0.8	-	25	15.5	M3 x 0.5	8.5
A01R2-16	5	14	2	45.8	67.4	2.5	-	8	M5 x 0.8	-	29	20	M5 x 0.8	10
A01R2-20	7.5	27	3	62	72.5	3	20	12	M5 x 0.8	-	36	25.5	M8 x 1.25	12
A01R2-25	8	28	3	63	73.5	3	23	12	M5 x 0.8	-	40	28	M8 x 1.25	12
A01R2-32	9	33	4	72	94	5.5	30	16	G1/8	4.5	45	34	M10 x 1.5	15
A01R2-40	10	26	4	65	94	5.5	30	16	G1/8	5	52	40	M10 x 1.5	15
A01R2-50	10	30	4	77	112	5.5	37	20	G1/8	7	64	50	M12 x 1.75	20
A01R2-63	12	31	4	80	114	5.5	48	20	G1/8	7	77	60	M12 x 1.75	20

Model	MA	MB	MC	N	NA	P	R	V	W	X	Y	Z
A01R2-12	Ø3.5	Ø6 dp 5.5	M4 x 0.7 Thread dp 10	-	18	5	4	8	8	20	29	M4 x 0.7
A01R2-16	Ø3.5	Ø6 dp 5.5	M4 x 0.7 Thread dp 10	-	18	7	5	11	11	25	36	M4 x 0.7
A01R2-20	Ø5.5	Ø9 dp 7	M6 x 1 Thread dp 10	-	9 to 22	9.9	7.5	16	16	35	51	M6 x 1
A01R2-25	Ø5.5	Ø9 dp 7	M6 x 1 Thread dp 10	-	9 to 22	9.9	7.5	16	16	35	51	M6 x 1
A01R2-32	Ø5.5	Ø9 dp 7	M6 x 1 Thread dp 10	18	12 to 25	13.9	10	19	19	45	67	M8 x 1.25
A01R2-40	Ø5.5	Ø9 dp 7	M6 x 1 Thread dp 10	18	12 to 25	13.9	10	19	19	45	67	M8 x 1.25
A01R2-50	Ø6.6	Ø10.5 dp 8	M8 x 1.25 Thread dp 15	22	15 to 40	16.9	10	22	22	65	88	M10 x 1.5
A01R2-63	Ø9	Ø13.5 dp 10	M10 x 1.5 Thread dp 18	22	15 to 40	16.9	10	22	22	65	88	M10 x 1.5

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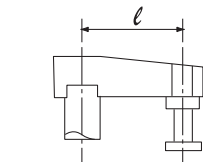
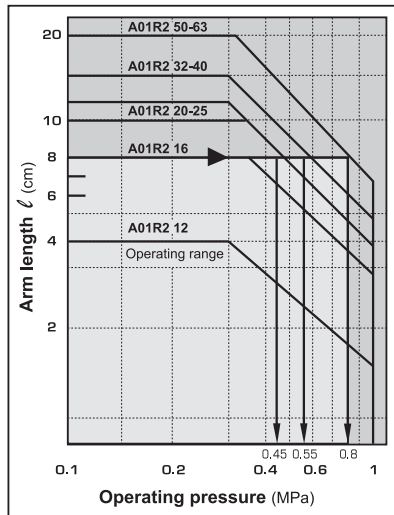
### Precautions for designing and mounting arms

When arms are to be made separately, their length and weight should be within the following range.

#### 1. Allowable bent moment

Use the arm length and operating pressure within graph 1 due to allowable bent moment loaded piston rod.

Graph 1

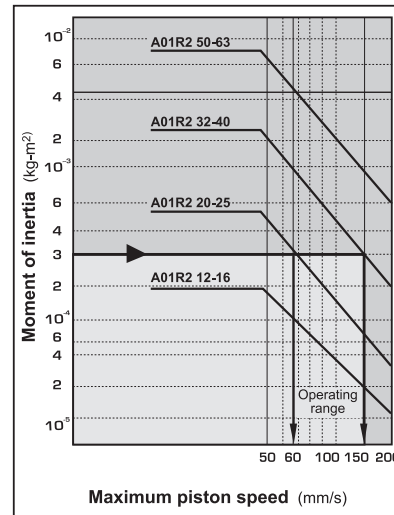


Example:  
When arm length is 8cm,  
pressure should be less than.  
A01R2 20 - 25 : 0.45MPa  
A01R2 32 - 40 : 0.55MPa  
A01R2 50 - 63 : 0.8MPa

#### 2. Inertia moment

When the arm is long and heavy, damage of internal parts may be caused due to inertia. Use the inertia moment and cylinder speed within graph 2 based on arm requirements.

Graph 2



Example:  
When arm inertia moment is  
 $3 \times 10^{-4}$  kg-m<sup>2</sup>, cylinder speed  
be less than.  
A01R2 20 - 25 : 65 mm/s  
A01R2 32 - 40 : 150 mm/s

To attach and detach the arm to and from the piston rod, fix the arm with a wrench or vise and then tighten the bolt. (Excessive force in the direction of rotation applied to the piston rod may damage the internal mechanism). Refer to the following table for the tightening torque for mounting.

Bore size (mm)	Standard tightening torque (Nm)
12	0.4 - 0.6
16	2 - 2.4
20, 25	4 - 6
32, 40	8 - 10
50, 63	14 - 16

### Precautions

- ❑ Flush piping thoroughly before the connection in order to prevent dust or chips from entering the cylinder
- ❑ Make sure that no scratches or dents are made on the slide part of the piston rod. Otherwise, seals may be damaged, resulting in leaks
- ❑ Mount the cylinder so that the clamping piston will be approximately in the center of the clamp stroke
- ❑ Do not apply clamping and other loads when the piston rod is turning



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### Moment of Inertia

Calculation example:

Cylinder bore size = Ø40

A = 0.067 m      D = 0.02 m  
B = 0.019 m      m1 = 0.15 kg  
C = 0.012 m      m2 = 0.12 kg  
L = 0.045 m

Moment of Inertia of the arm:

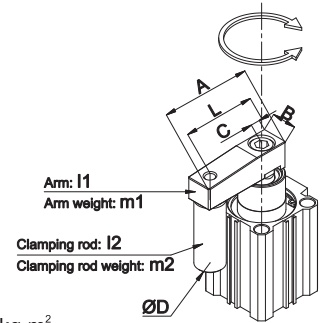
$$I_1 = m_1 * \left[ \frac{A^2 + B^2}{12} \right] + m_1 * \left[ \frac{A}{2} - C \right]^2 \quad I_1 = 0.15 * \left[ \frac{0.067^2 + 0.019^2}{12} \right] + 0.15 * \left[ \frac{0.067}{2} - 0.012 \right]^2 = 1.29 * 10^{-4} \text{ kg.m}^2$$

Moment of Inertia of the clamping rod:

$$I_2 = m_2 * \left[ \frac{D^2}{8} \right] + m_2 * L^2 \quad I_2 = 0.12 * \left[ \frac{0.02^2}{8} \right] + 0.12 * 0.045^2 = 2.49 * 10^{-4} \text{ kg.m}^2$$

Total Moment of Inertia:

$$I = I_1 + I_2 = (1.29 + 2.49) * 10^{-4} = 3.78 * 10^{-4} \text{ kg.m}^2$$



Model	Maximum allowable piston speed #1	Average piston speed #2	Total stroke #3	Stroke time #4
A01R2	170 mm/s	106 mm/s	20 mm	0.18 sec

#1 - Maximum allowable piston speed selected from chart

#2 - Average piston speed = Maximum piston speed ÷ 1.6

#3 - Total stroke = Clamp stroke + Swing stroke

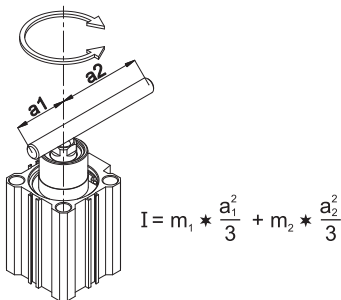
#4 - Stroke time = Total stroke ÷ Average piston speed

### Calculation equation list for Moment of Inertia:

If arms other than standard are used, be sure to calculate the Moment of Inertia of the arm before selecting it.

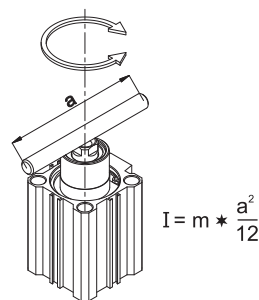
#### Thin shaft

Position of rotational axis:  
Perpendicular to the shaft and attached near one end.



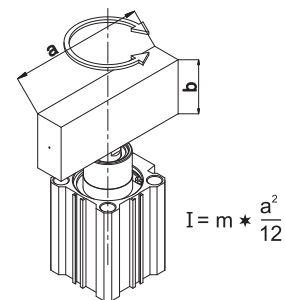
#### Thin shaft

Position of rotational axis:  
Perpendicular to the shaft and attached at the center of gravity.



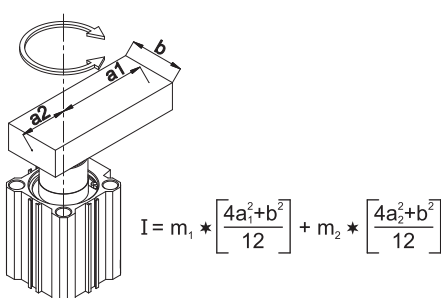
#### Thin rectangular plate

Position of rotational axis:  
Parallel to side "b" and attached at the center of gravity.



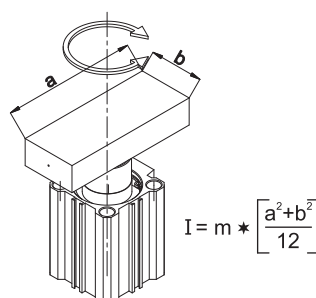
#### Thin rectangular plate

Position of rotational axis:  
Perpendicular to the plate and attached near one end.



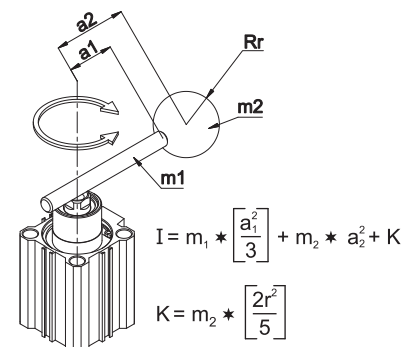
#### Thin rectangular plate

Position of rotational axis:  
Perpendicular to the plate and attached at the center of gravity.



#### Load at the end of lever arm

Position of rotational axis:  
Perpendicular to the plate and attached at the center of gravity.



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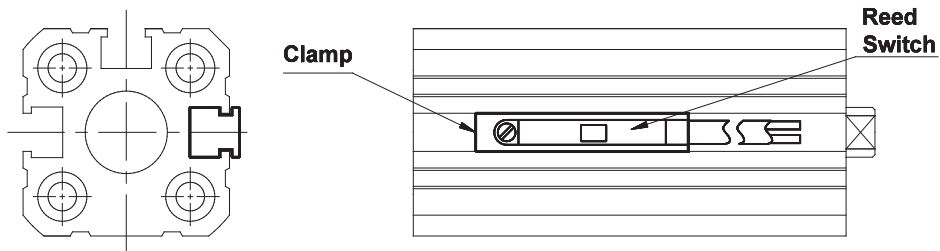
### ACCESSORIES FOR ROTARY CLAMP CYLINDER

#### REED SWITCH



#### Function

The reed switch and clamp assembly is mounted on the Air cylinder (Series A01R2), for proximity sensing. The piston of the cylinder is equipped with a permanent magnet which activates the reed switch on approaching it. The reed switch closes the circuit giving an electrical signal, which could be used further as required. The accuracy of the sensing distance depends on the speed of operation of the piston.

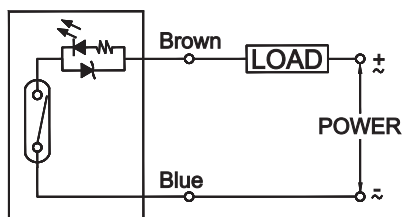


#### Technical Specifications - Reed Switch

Model	<b>AM2012 / AM2032</b>
Suitable cylinder	A01R2 Series
Operating voltage	5 ~ 120V DC/AC
Switching current	100mA max
Switching rating	6W max.
Voltage drop	3.5V max.
Switching logic	SPST, Normally open
Operating temperature	- 10° to 70° C
Shock	30 G
Vibration	9 G
Type of protection	IEC 529, IP67
Colour of LED	Red
Cable	Ø2.8, 2C, PVC, 2Meter

Bore Dia	Ordering no. for Reed switch & Clamp
Ø12, Ø16, Ø20, Ø25	AM2012
Ø32, Ø40, Ø50, Ø63	AM2032

#### Circuit and connect diagram



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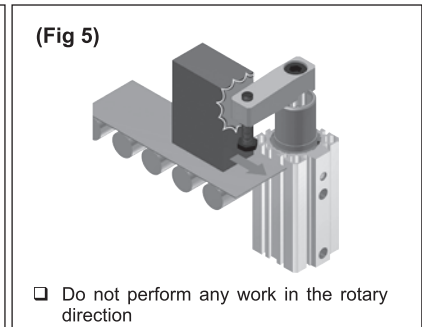
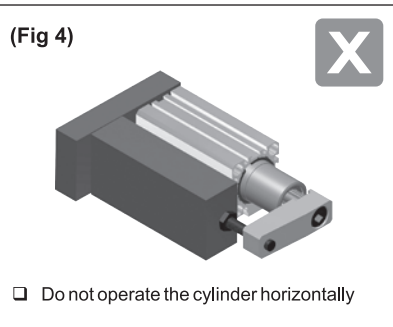
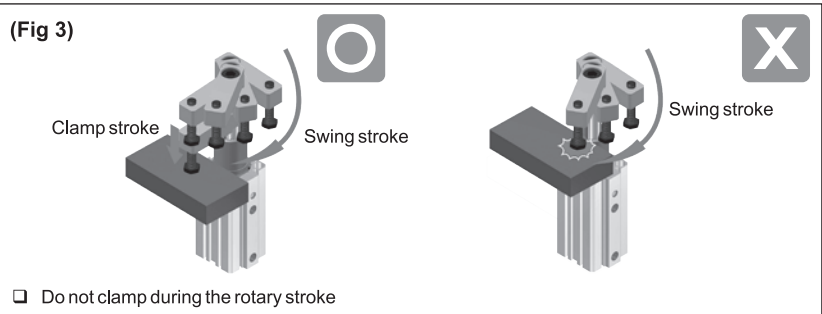
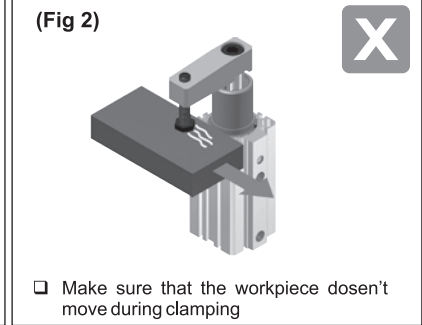
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### Warning

The cylinder could malfunction or the non-rotating accuracy could be affected if a rotational force is applied to the piston rod. Therefore, read the particulars given below before operating the cylinder.

- Make sure to mount the cylinder vertically (Fig 4)
- Do not absolutely perform any work in the rotary direction (Fig 5)
- To clamp, make sure to do within the clamp stroke (straight-line stroke) range (Fig 3)
- Make sure that the clamping surface of the workpiece is vertical to the cylinder's axial line (Fig 1)
- While being clamped, do not operate the cylinder in such a way that an external force causes the work piece to move (Fig 2)
- Furthermore, do not operate the cylinder when a rotational force is applied to the piston rod



### How to order

<b>A01R2</b>	<b>040</b>	<b>20</b>	<b>R</b>	<b>F</b>
<b>Bore (mm)</b>		<b>Stroke (mm)</b>		<b>Direction of swing</b>
012	- Ø12	Ø12 - 40	10 & 20mm	R - Clockwise
016	- Ø16	Ø50 - 63	20 & 50mm	L - Anti-clockwise
020	- Ø20			
025	- Ø25			
032	- Ø32			
040	- Ø40			
050	- Ø50			
063	- Ø63			
				<b>Mountings</b>
				B - Basic
				F - Rear Flange

### Example:

Ordering no. for cylinder with 40 dia bore, 20 mm stroke, Clockwise direction of swing with flange mounting :  
**A01R2 040 20 R F**