



# Compact Cylinder with Air Cushion

The new standard  
for the future!

New  
AIR  
CUSHION



New Air Cushion Cylinder



Uses a unique air cushion mechanism with no cushion ring.  
Size ø63, ø80 and ø100 newly introduced to Series RQ.

**Series RQ**  
ø20, ø25, ø32, ø40, ø50, ø63, ø80, ø100

# Future new standard for shock elimination,

Employs a new construction  
for the air cushion mechanism.

Compact Cylinder with Air Cushion

**Series RQ**

Ø63, Ø80 and Ø100  
newly introduced!



New

## Debut of the air cushion series!!

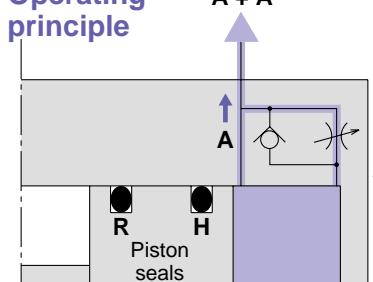
New  
**AIR  
CUSHION**

### Unique air cushion construction with no cushion ring

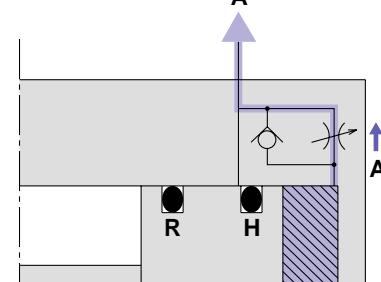
Elimination of the cushion ring used in conventional cushion ring type air cushions has made it possible to reduce the overall length of the cylinder. This produces an air cushion cylinder which retains the merits of a compact design.

Operating principle

A + A'



A'



- When the piston is retracting, exhaust is discharged from both A and A' until piston seal H passes the air passage A.
- After piston seal H has passed the air passage A, exhaust is discharged only from A'. The section marked with diagonal lines becomes a cushion chamber, and a cushioning effect is achieved.
- When air is supplied for piston extension, the check seal opens and the piston starts with no delay.

### Wide size variations from Ø20 to Ø100

Model	Counting	Rod end configuration	Standard stroke							Auto switch
			15	20	25	30	40	50	75	
R(D)Q□20										
R(D)Q□25										
R(D)Q□32	•Through hole •Double end tapped									
R(D)Q□40	•Foot type •Front flange type •Rear flange type •Double clevis type	•Female threads •Male threads								
R(D)Q□50										
New R(D)Q□63										
New R(D)Q□80										
New R(D)Q□100										

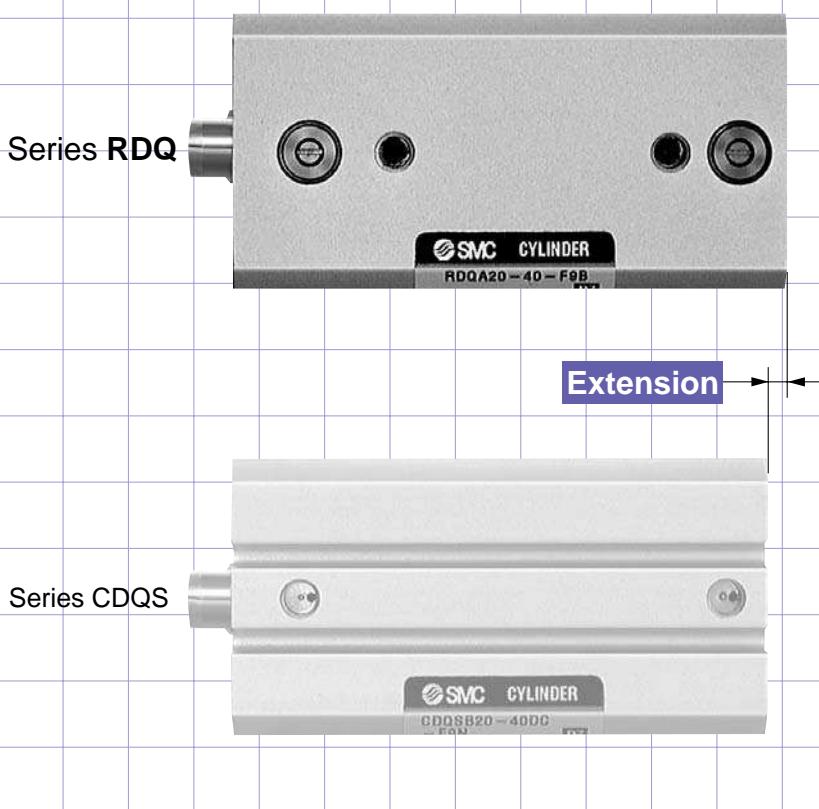
\*Size Ø20 and Ø25 have through holes and double end taps in common.

- Ø20 to Ø100  
Direct mount auto switch
- Ø32 to Ø100  
Rail mount auto switch

# noise reduction and improvement in repeatability

Minimal extended dimensions from **+2.5mm** to **13mm**

(Compared with series CDQS/CDQ2 of the same bore size with auto switches)

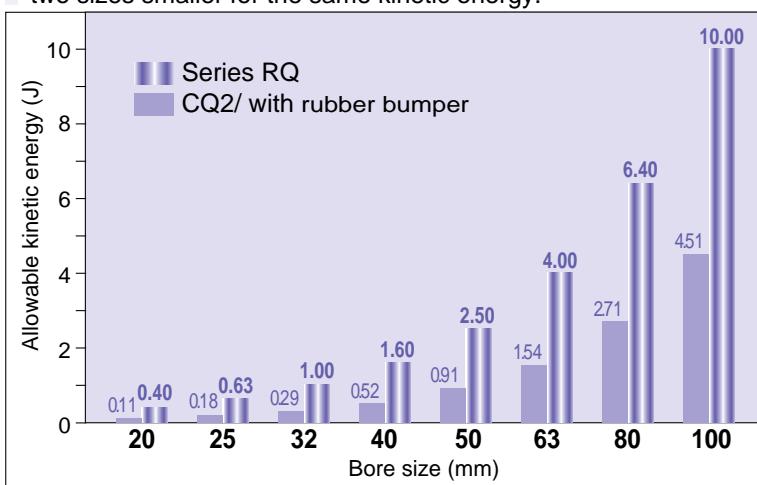


Series	Bore size	Extended dimension	Comparable cylinder
Series RDQ	20	+2.5mm	Series CDQS
	25	+4mm	
	32	+4mm	
	40	+4.5mm	
	50	+9mm	Series CDQ2
	63	+9mm	
	80	+10mm	
	100	+13mm	

## Nearly three times the allowable kinetic energy

(Compared to CQS/CQ2 with rubber bumper)

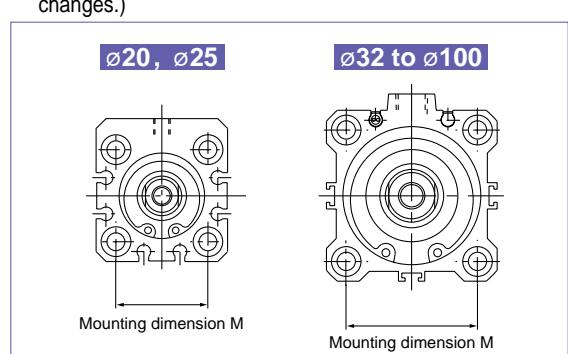
Improved energy absorption allows selection of a cylinder that is two sizes smaller for the same kinetic energy.



## Interchangeable mounting

The mounting dimension "M" is the same as compact cylinder series CQS/CQ2.

(CQS/CQ2 mounting brackets can be used without any changes.)



## Improved repeatability

The piston contact surface at the stroke end is metal, providing improved repeatability for the stopping position as compared with a rubber bumper.

## Improved noise reduction (Stroke end impact noise reduced)

- Decrease of 19dB or more (compared with CQ2 without cushion)
- Decrease of 14dB or more (compared with CQ2 with rubber bumper)

# Compact Cylinder with Air Cushion

## Series **RQ**

ø20, ø25, ø32, ø40, ø50, ø63, ø80, ø100

### How to Order

Without auto switch

**RQ** **B** **32** **50**

With auto switch

**RDQ** **B** **32** **50** **F9BW**

With auto switch  
(built-in magnet)

Mounting

<b>B</b>	Through hole (standard)	<b>F</b>	Front flange
<b>A</b>	Double end tapped	<b>G</b>	Rear flange
<b>L</b>	Foot	<b>D</b>	Double clevis

Note 1) Mounting brackets are packed together when shipped (unassembled).

Note 2) Since sizes ø20 and ø25 have a body with B type (through hole) and A type (double end tapped) in common, there is no A type part number.

Example) RQA 20-30 does not exist.

**Bore size**

<b>20</b>	20mm
<b>25</b>	25mm
<b>32</b>	32mm
<b>40</b>	40mm
<b>50</b>	50mm
<b>63</b>	63mm
<b>80</b>	80mm
<b>100</b>	100mm

Nil	2 pcs.
<b>S</b>	1 pc
<b>n</b>	"n" pcs.

• **Auto switch**  
Nil Without auto switch (built-in magnet)

\*Select auto switch models from the table below.

\*The auto switch is packed together when shipped (unmounted).

• **Body option**

Nil	Rod end female threads (standard)
<b>M</b>	Rod end male threads

• **Cylinder stroke (mm)**

Refer to page 2 for standard strokes.

• **Port thread type**

Nil	M thread	ø20, 25
	Rc	ø32 to ø100
TN	NPT	
	TF	G

**Applicable auto switches**/For detailed specifications of applicable auto switches, refer to pages 5.3-2 through 5.3-75 of "Best Pneumatics vol.2".

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Rail mount		Direct mount		Lead wire length (m)*	Pre-wired connector	Applicable load				
					DC	AC	ø32 to ø100	ø20 to ø100	Perpendicular	In-line							
Reed switch	—	Grommet	Yes	3-wire (NPN equiv.)	—	5V	—	A76H	A96V	A96	●	●	—	—	—	IC circuit	—
				2-wire	—	200V	A72	A72H	—	—	●	●	—	—	—	Relay, PLC	
				24V	12V	100V	A73	A73H	—	—	●	●	●	—	—		
	Diagnostic indication (2-colour display)	Grommet	—	—	—	A73C	—	—	—	—	●	●	●	—	—		
				—	—	A79W	—	—	—	—	●	●	●	—	—		
				—	—	—	—	—	—	—	—	—	—	—	—		
Solid state switch	—	Grommet	Yes	3-wire (NPN) 3-wire (PNP)	5V, 12V	12V	F7NV	F79	F9NV	F9N	●	●	○	—	○	IC circuit	—
				2-wire	12V		F7PV	F7P	F9PV	F9P	●	●	○	—	○	Relay, PLC	
				3-wire (NPN) 3-wire (PNP)	5V, 12V		F7BV	J79	F9BV	F9B	●	●	●	○	—		
	Diagnostic indication (2-colour display)	Grommet	—	2-wire	24V	12V	J79C	—	—	—	●	●	●	●	—		
				3-wire (NPN) 3-wire (PNP)	—		F7NWV	F79W	F9NWV	F9NW	●	●	●	○	—	IC circuit	—
				2-wire	24V		F7PW	F9PWV	F9PW	F9PW	●	●	●	○	—		
	Water resistance (2-colour display)	Grommet	—	2-wire	—	5V, 12V	F7BWV	J79W	F9BWV	F9BW	●	●	●	○	—	—	
				2-wire	—		F7BA	—	—	—	—	●	●	○	—		
				4-wire (NPN)	—		F7BAV	—	—	—	—	●	●	○	—		
	With diagnostic output (2-colour display)	Grommet	—	—	—	5V, 12V	F79F	—	—	—	●	●	○	—	○	IC circuit	
				—	—		F7LF	—	—	—	●	●	○	—	○	—	

\*Lead wire length symbols 0.5m..... Nil (Example) A73C  
3 m..... Z (Example) A73CL  
5 m..... L (Example) A73CZ  
None..... N (Example) A73CN

\*Solid state auto switches marked with a "○" are produced upon receipt of order.

These auto switches have been changed  
Contact SMC or view www.smeworld.com

F9N→M9N	F9NV→M9NV
F9P→M9P	F9PV→M9PV
F9B→M9B	F9BV→M9BV

• Besides the models in the above catalog, there are some other auto switches that are applicable.  
For more information, refer to page 15.

## Specifications



Type	Pneumatic (non-lube) type
Fluid	Air
Proof pressure	1.5MPa
Maximum operating pressure	1.0MPa
Minimum operating pressure	0.05MPa
Ambient and fluid temperature	Without auto switch: -10°C to 70°C (with no freezing) With auto switch : -10°C to 60°C (with no freezing)
Rod end threads	Female threads
Rod end thread tolerance	JIS class 2
Stroke length tolerance	+1.0 0
Mounting	Through hole
Piston speed	50 to 500mm/s

## Standard Strokes

Bore size (mm)	Standard stroke (mm)
20, 25	15, 20, 25, 30, 40, 50
32, 40	20, 25, 30, 40, 50, 75, 100
50, 63	30, 40, 50, 75, 100
80, 100	40, 50, 75, 100

## Manufacture of Intermediate Strokes

<b>Method</b>	Special body type	
	Refer to "How to Order" for standard part numbers.	
	Available in stroke increments of 1mm, using a special body for the specified stroke.	
	Bore size	Stroke range
	20, 25	16 to 49
	32, 40	21 to 99
<b>Stroke range</b>	50, 63	31 to 99
	80, 100	41 to 99
<b>Example</b>	Part number: RQB32-47 A special tube is manufactured for a 47mm stroke.	

## Allowable kinetic energy

Refer to "Selection" on page 24 regarding the allowable kinetic energy.

## Effective Cushion Length

Bore size (mm)	20	25	32	40	50	63	80	100
Effective cushion length (mm)	5.8	6.1	6.6	6.6	7.1	7	7.5	8

## Mounting Bracket Part No.

Bore size (mm)	Foot Note 1)	Flange	Double clevis Note 3)
20	CQS-L020	CQS-F020	CQS-D020
25	CQS-L025	CQS-F025	CQS-D025
32	CQ-L032	CQ-F032	CQ-D032
40	CQ-L040	CQ-F040	CQ-D040
50	CQ-L050	CQ-F050	CQ-D050
63	CQ-L060	CQ-F060	CQ-D060
80	CQ-L080	CQ-F080	CQ-D080
100	CQ-L100	CQ-F100	CQ-D100

Note 1) When ordering foot brackets, order 2 pieces per cylinder.  
Note 2) The following parts are included with each bracket.

Foot/Flange : Body mounting bolts.

Double clevis: Clevis pins, C set ring for axis, and Body mounting bolts.

Note 3) Clevis pins and snap rings are included with the double clevis type.

## Theoretical Output



Unit: N

Bore size (mm)	Operating direction	Operating pressure (MPa)		
		0.3	0.5	0.7
20	IN	71	118	165
	OUT	94	157	220
25	IN	113	189	264
	OUT	147	245	344
32	IN	181	302	422
	OUT	241	402	563
40	IN	317	528	739
	OUT	377	628	880
50	IN	495	825	1150
	OUT	589	982	1370
63	IN	841	1400	1960
	OUT	935	1560	2180
80	IN	1360	2270	3170
	OUT	1510	2510	3520
100	IN	2140	3570	5000
	OUT	2360	3930	5500

# Series RQ

## Weights

### Basic weights

Bore size (mm)	Standard stroke (mm)								Unit: g
	15	20	25	30	40	50	75	100	
<b>20</b>	141	156	171	186	216	245	—	—	
<b>25</b>	203	221	239	258	294	331	—	—	
<b>32</b>	—	271	291	312	353	394	496	598	
<b>40</b>	—	390	413	436	482	528	643	758	
<b>50</b>	—	—	—	731	803	875	1055	1235	
<b>63</b>	—	—	—	940	1019	1099	1297	1495	
<b>80</b>	—	—	—	—	1819	1950	2278	2606	
<b>100</b>	—	—	—	—	2859	3038	3483	3928	

### Additional weights

Bore size (mm)	Unit: g							
	20	25	32	40	50	63	80	100
Magnet	5	6	11	13	14	22	24	35
Double end tapped	—	—	6	6	6	19	45	45
Rod end male threads	6	12	26	27	53	53	120	175
Nut	4	8	17	17	32	32	49	116
Foot (including bolt)	159	181	143	155	243	324	696	1062
Front flange (including bolt)	143	180	180	214	373	559	1056	1365
Rear flange (including bolt)	137	171	165	198	348	534	1017	1309
Double clevis (including pin, snap ring and bolt)	92	127	151	196	393	554	1109	1887

Calculation example) RQD32-20M

- Basic weight : RQB32-20 271g
- Additional weight: Double end tapped 6g
- Rod end male threads 43g
- Double clevis 151g

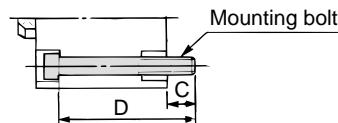
471g

## Mounting

Through hole type mounting bolts for RQB are available.

How to order: Add "Bolt" in front of the bolts to be used.

Example) Bolt M5 x 50ℓ 4 pcs.



Model	C	D	Mounting bolt
<b>R(D)QB20-15</b>	9	50	M5 x 50ℓ
		55	x 55ℓ
		60	x 60ℓ
		65	x 65ℓ
		75	x 75ℓ
		85	x 85ℓ
<b>R(D)QB25-15</b>	9.5	55	M5 x 55ℓ
		60	x 60ℓ
		65	x 65ℓ
		70	x 70ℓ
		80	x 80ℓ
		90	x 90ℓ
<b>R(D)QB32-20</b>	10	60	M5 x 60ℓ
		65	x 65ℓ
		70	x 70ℓ
		80	x 80ℓ
		90	x 90ℓ
		115	x 115ℓ
		140	x 140ℓ

Model	C	D	Mounting bolt
<b>R(D)QB40-20</b>	8	65	M5 x 65ℓ
		70	x 70ℓ
		75	x 75ℓ
		85	x 85ℓ
		95	x 95ℓ
		120	x 120ℓ
<b>R(D)QB50-30</b>	13.5	145	x 145ℓ
		85	M6 x 85ℓ
		95	x 95ℓ
		105	x 105ℓ
		130	x 130ℓ
		155	x 155ℓ
<b>R(D)QB63-30</b>	15.5	90	M8 x 90ℓ
		100	x 100ℓ
		110	x 110ℓ
		135	x 135ℓ
		160	x 160ℓ
<b>R(D)QB80-40</b>	15	105	M10 x 105ℓ
		115	x 115ℓ
		140	x 140ℓ
		165	x 165ℓ
<b>R(D)QB100-40</b>	17.5	120	M10 x 120ℓ
		130	x 130ℓ
		155	x 155ℓ
		180	x 180ℓ

**Replacement Parts/Seal Kits****Auto Switch Mounting Bracket Part Nos.**

Series	Bore size	Order number	Contents
<b>RQ</b>	20	RQB20-PS	Kits consist of piston seal, rod seal and gasket
	25	RQB25-PS	
	32	RQB32-PS	
	40	RQB40-PS	
	50	RQB50-PS	
	63	RQB63-PS	
	80	RQB80-PS	
	100	RQB100-PS	

Bore size (mm)	Bracket no.	Note	Applicable switch	
			Reed switch	Solid state switch
32, 40, 50, 63, 80, 100	BQ-2	<ul style="list-style-type: none"> <li>• Switch mounting screw (M3 x 0.5 x 10<math>\ell</math>)</li> <li>• Switch spacer</li> <li>• Switch mounting nut</li> </ul>	D-A7□, A80 D-A73C, A80C D-A7□H, A80H D-A79W	D-F7□, J79 D-F7□V D-J79C D-F7□W, J79W D-F7□WV D-F7BAVL D-F7BAVL D-F7□F D-F7NTL

[Stainless steel mounting screw kit]  
 Use the following stainless steel mounting screw kit (includes nut) depending on the operating environment.  
 (Auto switch spacer must be ordered separately.)  
**BBA2:** For D-A7/A8/F7/J7

The above stainless steel screw kit is used for water resistant auto switch types D-F7BAL and D-F7BAVL when they are shipped mounted on a cylinder.  
 Also, BBA2 is included when an auto switch alone is shipped.

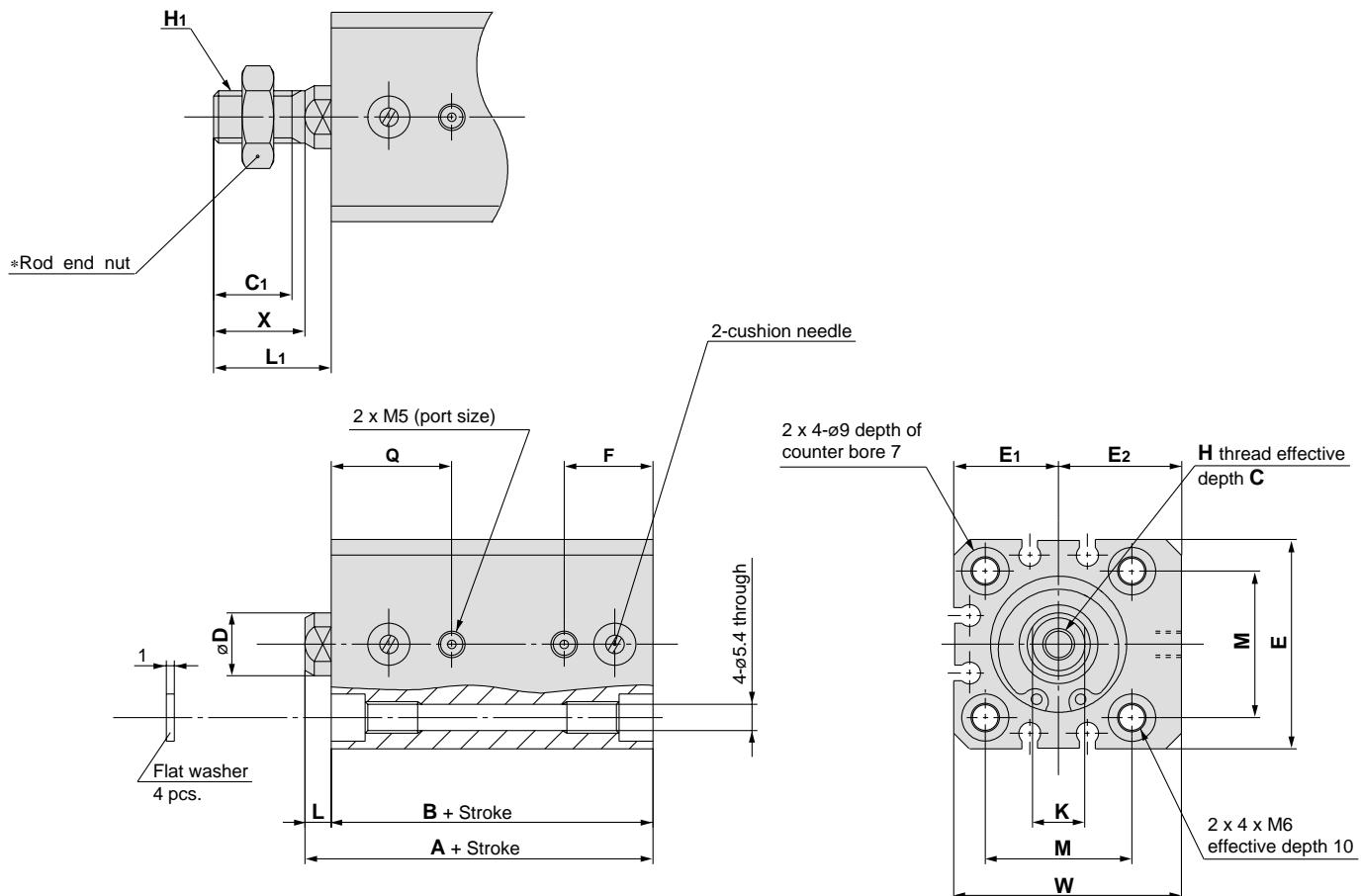
# Series RQ

## Dimensions/ Ø20, Ø25

\*Refer to page13 for proper auto switch mounting positions and height.

### Standard type (through hole, double end tapped common)/RQB, RDQB

#### Rod end male threads



#### Rod end male threads

Bore size (mm)	$C_1$	$X$	$H_1$	$L_1$
20	12	14	M8	18.5
25	15	17.5	M10 x 1.25	22.5

#### Standard type

Bore size (mm)	Stroke range (mm)	$A$	$B$	$C$	$D$	$E$	$E_1$	$E_2$	$F$	$H$	$K$	$L$	$M$	$Q$	$W$
20	15 to 50	36.5	32	7	10	36	18	21	15.5	M5	8	4.5	25.5	21	39
25	15 to 50	41.5	36.5	12	12	40	20	23.5	17	M6	10	5	28	23	43.5

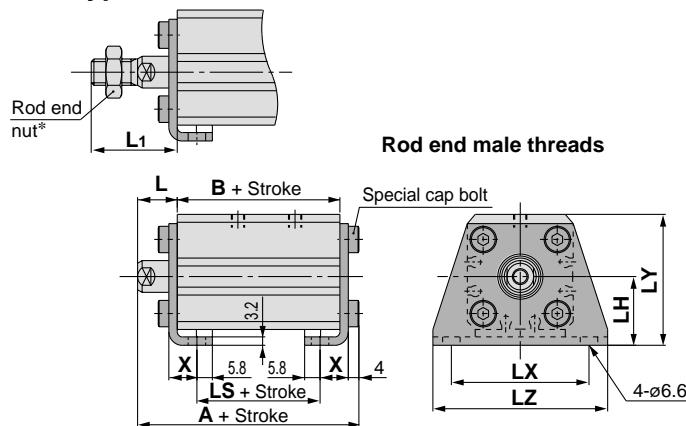
\*Refer to page 11 for details on rod end nut and accessories.



• Add the stroke to calculate the length of intermediate strokes.

## Mounting Bracket Dimensions

### Foot type/RQL, RDQL



### Foot type

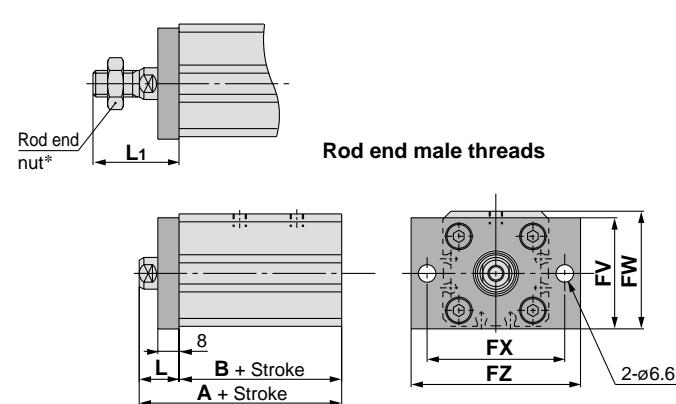
Bore size (mm)	Stroke range (mm)	A	LS	L	L1
20	15 to 50	53.7	20	14.5	28.5
25	15 to 50	58.7	21.5	15	32.5

Bore size (mm)	B	LH	LX	LY	LZ	X
20	32	24	48	45	62	9.2
25	36.5	26	52	49.5	66	10.7

(All dimensions but A, LS, L and L1 are identical to those of the standard type.)

Foot bracket material: Carbon steel

### Front flange type/ RQF, RDQF



### Front flange type

Bore size (mm)	Stroke range (mm)	A	L	L1
20	15 to 50	46.5	14.5	28.5
25	15 to 50	51.5	15	32.5

Bore size (mm)	B	FV	FW	FX	FZ
20	32	39	40.5	48	60
25	36.5	42	44.5	52	64

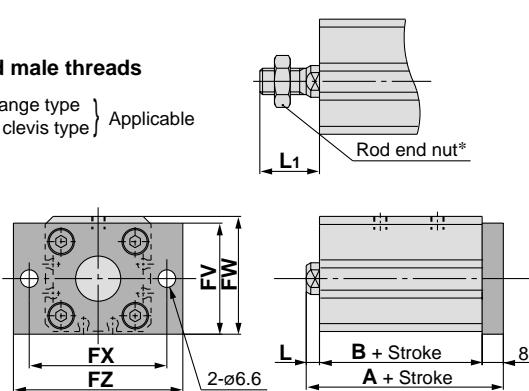
(All dimensions but A, L and L1 are identical to those of the standard type.)

Flange material: Carbon steel

### Rear flange type/RQG, RDQG

#### Rod end male threads

Rear flange type  
Double clevis type  
Applicable



### Rear flange type

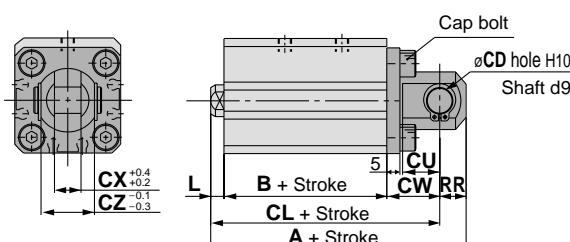
Bore size (mm)	Stroke range (mm)	A
20	15 to 50	44.5
25	15 to 50	49.5

Bore size (mm)	B	L	FV	FW	FX	FZ
20	32	4.5	39	40.5	48	60
25	36.5	5	42	44.5	52	64

(All dimensions but A is identical to those of the standard type.)

Flange material: Carbon steel

### Double clevis/RQD, DQD



### Double clevis type

Bore size (mm)	Stroke range (mm)	A	CL
20	15 to 50	63.5	54.5
25	15 to 50	71.5	61.5

Bore size (mm)	B	L	L1	CD	CU	CW	CX	CZ	RR
20	32	4.5	18.5	8	12	18	8	16	9
25	36.5	5	22.5	10	14	20	10	20	10

(All dimensions but A and CL are identical to those of the standard type.)

\*Refer to page 11 for details on rod end nut and accessories.

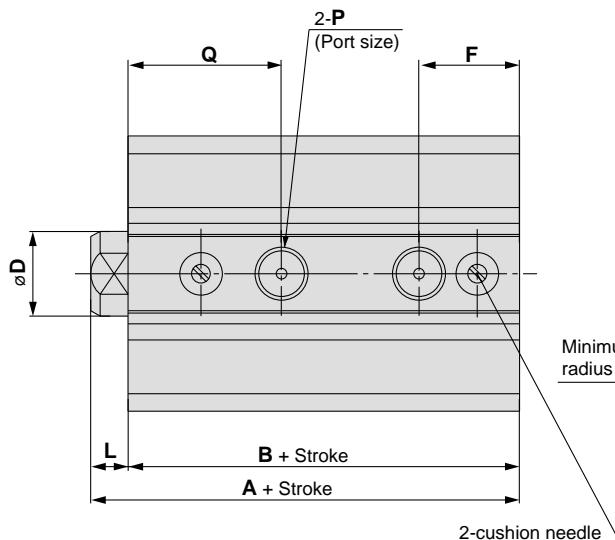
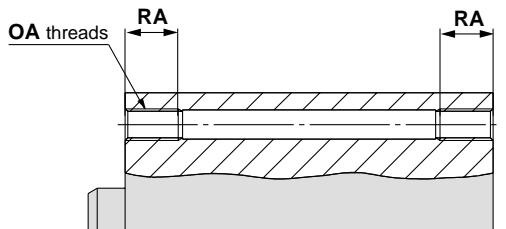
Double clevis bracket material: Carbon steel

# Series RQ

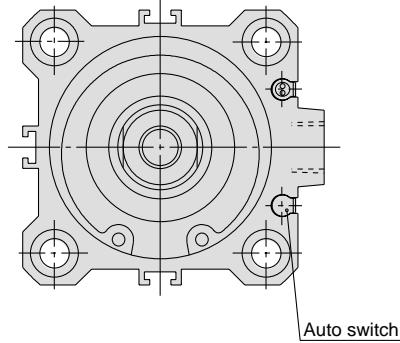
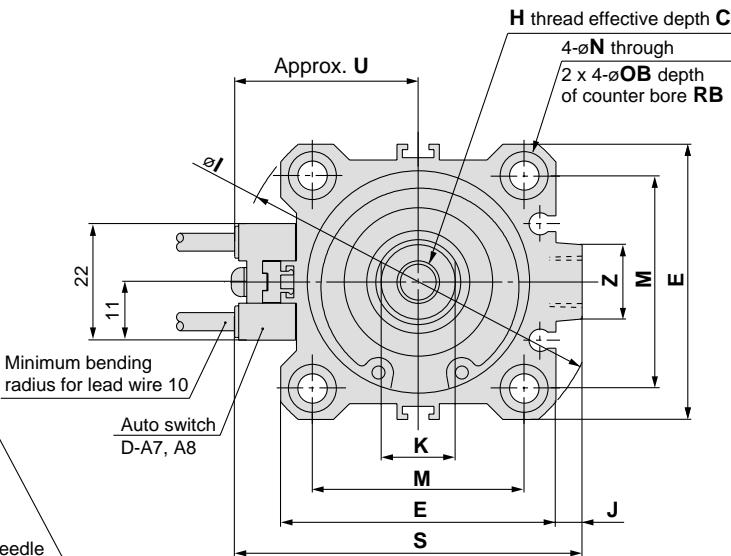
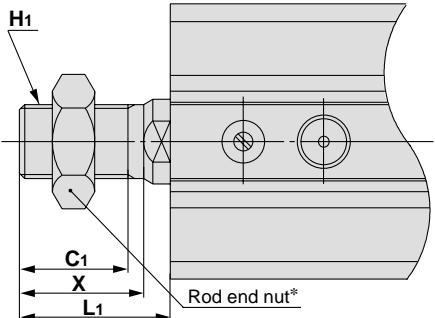
## Dimensions/Ø32, Ø40, Ø50

\*Refer to pages 13 and 14 for proper auto switch mounting positions and height.

### Standard type (through hole type)/RQB, RDQB



#### Rod end male threads



#### Rod end male threads

Bore size (mm)	C1	X	H1	L1
32	20.5	23.5	M14 x 1.5	28.5
40	20.5	23.5	M14 x 1.5	28.5
50	26	28.5	M18 x 1.5	33.5

### Standard type

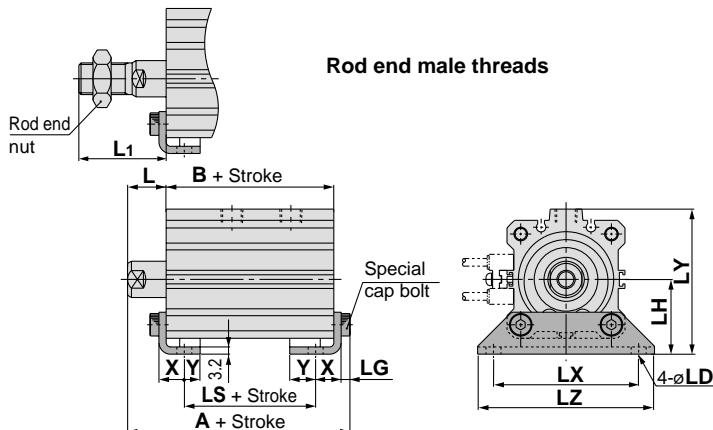
Bore size (mm)	Stroke range (mm)	A	B	C	D	E	F	H	I	J	K	L	M	N
32	20 to 100	44	37	13	16	45	18.5	M8	60	4.5	14	7	34	5.5
40	20 to 100	51	44	13	16	52	20	M8	69	5	14	7	40	5.5
50	30 to 100	57.5	49.5	15	20	64	28.5	M10	86	7	17	8	50	6.6

Bore size (mm)	OB	P	Q	RB	S	U	Z
32	9	1/8	23	7	58.5	31.5	14
40	9	1/8	28	7	66	35	14
50	11	1/4	31.5	8	80	41	19

\*Refer to page 11 for details on rod end nut and accessories.



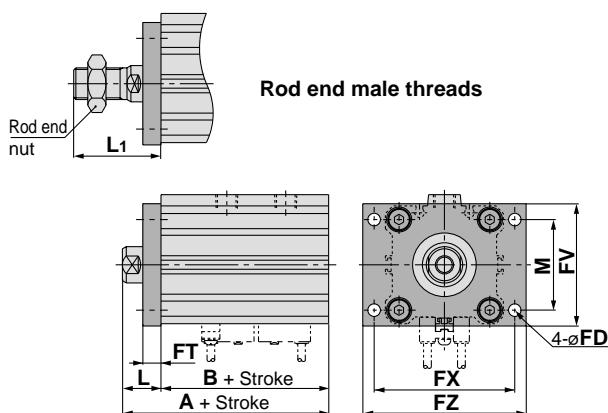
• Add the stroke to calculate the length of intermediate strokes.

**Mounting Bracket Dimensions**
**Foot type/RQL, RDQL**

**Foot type**

Bore size (mm)	Stroke range (mm)	A	B	LS	L	L1	LD
32	20 to 100	61.2	37	21	17	38.5	6.6
40	20 to 100	68.2	44	28	17	38.5	6.6
50	30 to 100	75.7	49.5	26.5	18	43.5	9

Bore size (mm)	LG	LH	LX	LY	LZ	X	Y
32	4	30	57	57	71	11.2	5.8
40	4	33	64	64	78	11.2	7
50	5	39	79	78	95	14.7	8

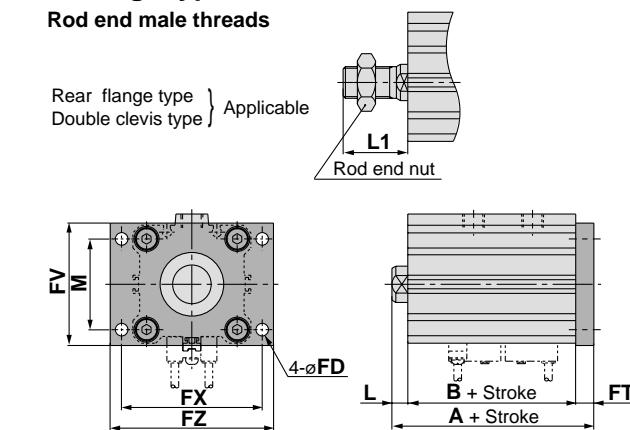
Foot bracket material: Carbon steel

**Front flange type/RQF, RDQF**

**Front flange type**

Bore size (mm)	Stroke range (mm)	A	B	FD	FT	FV
32	20 to 100	54	37	5.5	8	48
40	20 to 100	61	44	5.5	8	54
50	30 to 100	67.5	49.5	6.6	9	67

Bore size (mm)	FX	FZ	L	L1	M
32	56	65	17	38.5	34
40	62	72	17	38.5	40
50	76	89	18	43.5	50

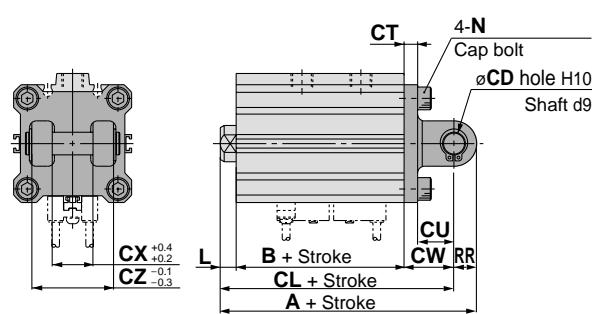
Flange material: Carbon steel

**Rear flange type/RQG, RDQG**

**Rear flange type**

Bore size (mm)	Stroke range (mm)	A	L	L1
32	20 to 100	52	7	28.5
40	20 to 100	59	7	28.5
50	30 to 100	66.5	8	33.5

(\*All dimensions but A, L and L1 are identical to those of the front flange type.)

Flange material: Carbon steel

**Double clevis type/RQD, RDQD**

**Double clevis type**

Bore size (mm)	Stroke range (mm)	A	B	CL	CD	CT	CU
32	20 to 100	74	37	64	10	5	14
40	20 to 100	83	44	73	10	6	14
50	30 to 100	99.5	49.5	85.5	14	7	20

Bore size (mm)	CW	CX	CZ	L	L1	N	RR
32	20	18	36	7	28.5	M6	10
40	22	18	36	7	28.5	M6	10
50	28	22	44	8	33.5	M8	14

\*Refer to page 11 for details on rod end nut and accessories.

\*Clevis pins and snap rings are included in the package.

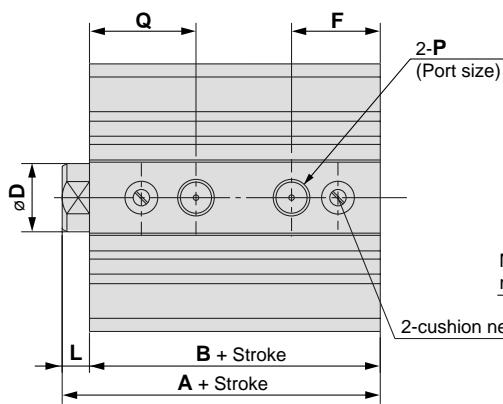
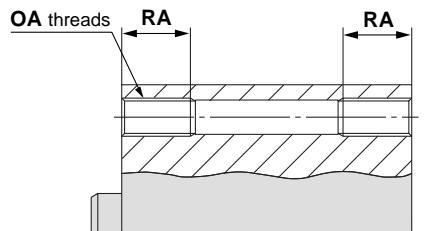
Double clevis bracket material: carbon steel

# Series RQ

## Dimensions/Ø63 to Ø100

\*Refer to pages 13 and 14 for proper auto switch mounting positions and height.

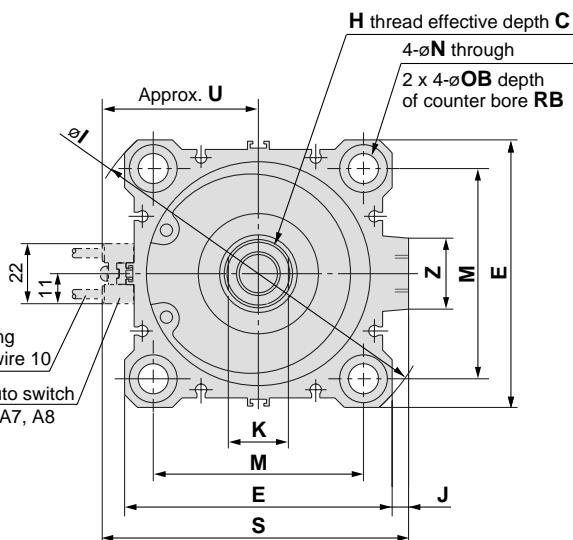
### Standard type (through hole type)



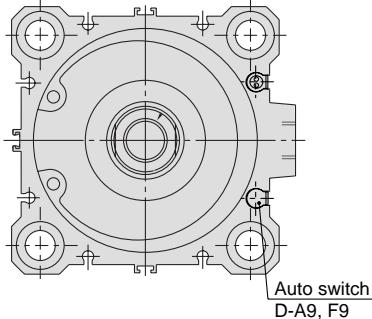
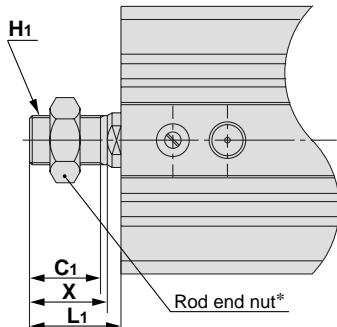
### Double end tapped type: RQA, RDQA

#### Double end tapped

Bore size (mm)	OA	RA
63	M10	18
80	M12	22
100	M12	22



#### Rod end male thread



#### Rod end male threads

Bore size (mm)	C1	X	H1	L1
63	26	28.5	M18 x 1.5	33.5
80	32.5	35.5	M22 x 1.5	43.5
100	32.5	35.5	M26 x 1.5	43.5

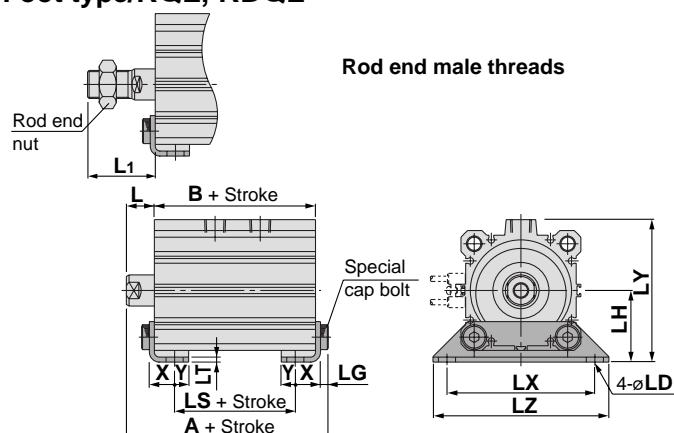
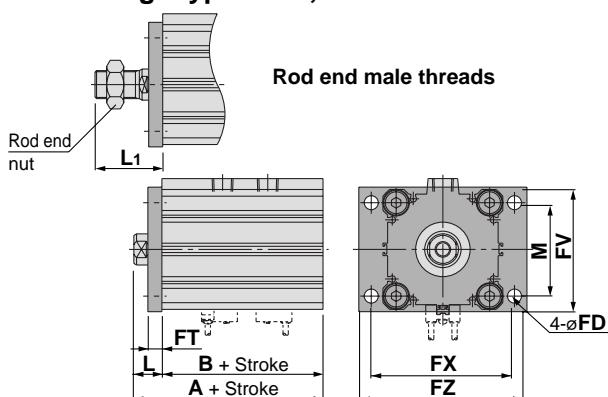
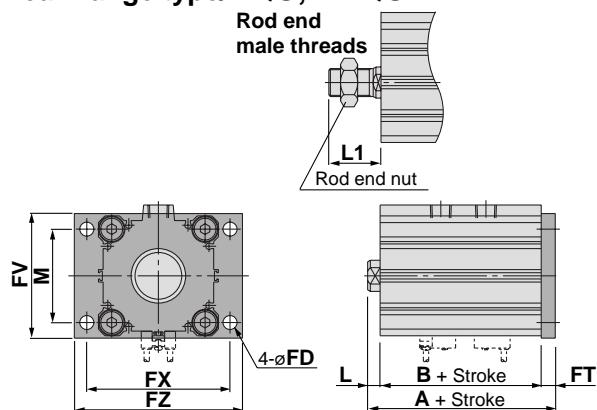
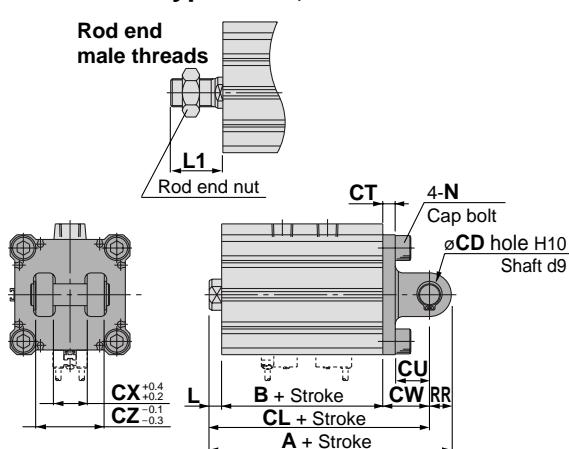
### Standard type

Bore size (mm)	Stroke range (mm)	A	B	C	D	E	F	H	I	J	K	L	M	N	OB	P
63	30 to 100	63	55	15	20	77	31	M10	103	7	17	8	60	9	14	1/4
80	40 to 100	73.5	63.5	21	25	98	35.5	M16	132	6	22	10	77	11	17.5	3/8
100	40 to 100	88	76	27	30	117	40	M20	156	6.5	27	12	94	11	17.5	3/8

Bore size (mm)	Q	RB	S	U	Z
63	34	10.5	93	47.5	19
80	39	13.5	112.5	57.5	26
100	43	13.5	132.5	67.5	26

\*Refer to page 11 for details on rod end nut and accessories.

 Add the stroke to calculate the length of intermediate strokes.

**Mounting Bracket Dimensions**
**Foot type/RQL, RDQL**

**Front flange type/RQF, RDQF**

**Rear flange type/RQG, RDQG**

**Double clevis type/RQD, RDQD**

**Foot type**

Bore size (mm)	Stroke range (mm)	A	B	LS	L	L1	LD	LG	LH	LT
63	30 to 100	81.2	55	29	18	43.5	11	5	46	3.2
80	40 to 100	95	63.5	33.5	20	53.5	13	7	59	4.5
100	40 to 100	111	76	42	22	53.5	13	7	71	6

Bore size (mm)	Stroke range (mm)	LX	LY	LZ	X	Y
63	10 to 50 75, 100	95	91.5	113	16.2	9
80	10 to 50 75, 100	118	114	140	19.5	11
100	10 to 50 75, 100	137	136	162	23	12.5

**Front flange type**

Bore size (mm)	Stroke range (mm)	A	B	FD	FT	FV	FX	FZ	L	L1	M
63	30 to 100	73	55	9	9	80	92	108	18	43.5	60
80	40 to 100	83.5	63.5	11	11	99	116	134	20	53.5	77
100	40 to 100	98	76	11	11	117	136	154	22	53.5	94

**Rear flange type**

Bore size (mm)	Stroke range (mm)	A	L	L1
63	30 to 100	72	8	33.5
80	40 to 100	84.5	10	43.5
100	40 to 100	99	12	43.5

**Double clevis type**

Bore size (mm)	Stroke range (mm)	A	B	CL	CD	CT	CU	CW	CX	CZ	L
63	30 to 100	107	55	93	14	8	20	30	22	44	8
80	40 to 100	129.5	63.5	111.5	18	10	27	38	28	56	10
100	40 to 100	155	76	133	22	13	31	45	32	64	12

Bore size (mm)	Stroke range (mm)	L1	N	RR
63	10 to 50 75, 100	33.5	M10	14
80	10 to 50 75, 100	43.5	M12	18
100	10 to 50 75, 100	43.5	M12	22

\*Refer to page 11 for details on rod end nut and accessories.

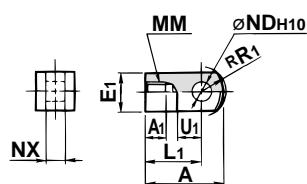
\*Clevis pins and snap rings are included in the package.

# Series RQ

## Accessories

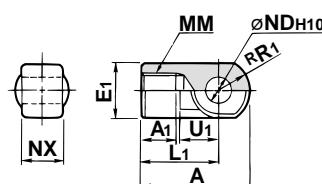
### Single Knuckle Joint

For I-G02, I-G03



Material: Carbon steel

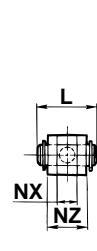
For I-G04, I-G05



Material: Cast iron

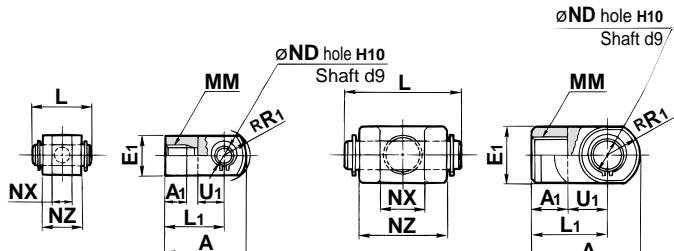
### Double Knuckle Joint

For Y-G02, Y-G03



Material: Carbon steel

For Y-G04, Y-G05



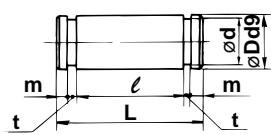
Material: Cast iron

Part no.	Applicable bore size (mm)	A	A1	E1	L1	MM	RR1	U1	ND	NX	mm
I-G02	20	34	8.5	16	25	M8	10.3	11.5	8 <sup>+0.058</sup> <sub>0</sub>	8 <sup>-0.2</sup> <sub>0</sub>	
I-G03	25	41	10.5	20	30	M10 x 1.25	12.8	14	10 <sup>+0.058</sup> <sub>0</sub>	10 <sup>-0.2</sup> <sub>0</sub>	
I-G04	32, 40	42	14	22	30	M14 x 1.5	12	14	10 <sup>+0.058</sup> <sub>0</sub>	18 <sup>-0.3</sup> <sub>0.5</sub>	
I-G05	50, 63	56	18	28	40	M18 x 1.5	16	20	14 <sup>+0.070</sup> <sub>0</sub>	22 <sup>-0.3</sup> <sub>0.5</sub>	
I-G08	80	71	21	38	50	M22 x 1.5	21	27	18 <sup>+0.070</sup> <sub>0</sub>	28 <sup>-0.3</sup> <sub>0.5</sub>	
I-G10	100	79	21	44	55	M26 x 1.5	24	31	22 <sup>+0.084</sup> <sub>0</sub>	32 <sup>-0.3</sup> <sub>0.5</sub>	

Part no.	Applicable bore size (mm)	A	A1	E1	L1	MM	RR1	U1	ND	NX	NZ	L	Applicable pin no.
Y-G02	20	34	8.5	16	25	M8	10.3	11.5	8 <sup>+0.058</sup> <sub>0</sub>	8 <sup>+0.4</sup> <sub>0.2</sub>	16	21	IY-G02
Y-G03	25	41	10.5	20	30	M10 x 1.25	12.8	14	10 <sup>+0.058</sup> <sub>0</sub>	10 <sup>+0.4</sup> <sub>0.2</sub>	20	25.6	IY-G03
Y-G04	32, 40	42	16	22	30	M14 x 1.5	12	14	10 <sup>+0.058</sup> <sub>0</sub>	18 <sup>+0.5</sup> <sub>0.3</sub>	36	41.6	IY-G04
Y-G05	50, 63	56	20	28	40	M18 x 1.5	16	20	14 <sup>+0.070</sup> <sub>0</sub>	22 <sup>+0.5</sup> <sub>0.3</sub>	44	50.6	IY-G05
Y-G08	80	71	23	38	50	M22 x 1.5	21	27	18 <sup>+0.070</sup> <sub>0</sub>	28 <sup>+0.5</sup> <sub>0.3</sub>	56	64	IY-G08
Y-G10	100	79	24	44	55	M26 x 1.5	24	31	22 <sup>+0.084</sup> <sub>0</sub>	32 <sup>+0.5</sup> <sub>0.3</sub>	64	72	IY-G10

\*Knuckle pin and snap ring are included.

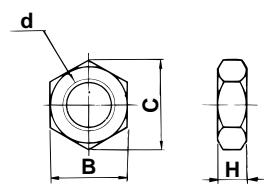
### Knuckle Pin (common with double clevis pin)



Material: Carbon steel  
mm

Part no.	Applicable bore size (mm)	D	L	d	e	m	t	Snap ring
IY-G02	20	8 <sup>-0.040</sup> <sub>0.040</sub>	21	7.6	16.2	1.5	0.9	C8 type for pivot
IY-G03	25	10 <sup>-0.040</sup> <sub>0.040</sub>	25.6	9.6	20.2	1.55	1.15	C10 type for pivot
IY-G04	32, 40	10 <sup>-0.040</sup> <sub>0.040</sub>	41.6	9.6	36.2	1.55	1.15	C10 type for pivot
IY-G05	50, 63	14 <sup>-0.050</sup> <sub>0.050</sub>	50.6	13.4	44.2	2.05	1.15	C14 type for pivot
IY-G08	80	18 <sup>-0.050</sup> <sub>0.050</sub>	64	17	56.2	2.55	1.35	C18 type for pivot
IY-G10	100	22 <sup>-0.065</sup> <sub>0.065</sub>	72	21	64.2	2.55	1.35	C22 type for pivot

### Rod End Nut



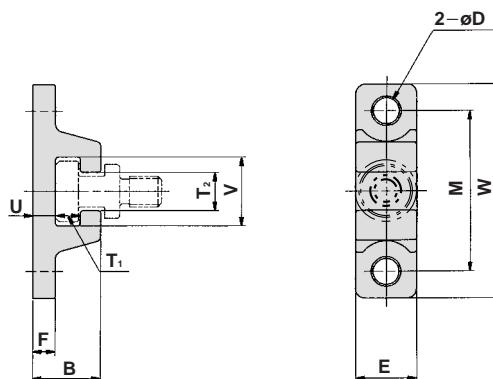
Material: Carbon steel  
mm

Part no.	Applicable bore size (mm)	d	H	B	C
NT-02	20	M8	5	13	15.0
NT-03	25	M10 x 1.25	6	17	19.6
NT-04	32, 40	M14 x 1.5	8	22	25.4
NT-05	50, 63	M18 x 1.5	11	27	31.2
NT-08	80	M22 x 1.5	13	32	37.0
NT-10	100	M26 x 1.5	16	41	47.3

## Simple Joint/Ø32 to Ø100



## A type mounting bracket



Material: Chrome molybdenum steel (nickel plated)  
mm

YA	03	Applicable air cylinder bore size
● Mounting bracket		
03	Ø32, Ø40	
05	Ø50, Ø63	
08	Ø80	
10	Ø100	
YA	A type mounting bracket	
YB	B type mounting bracket	
YU	Joint	

## Allowable eccentricity

mm

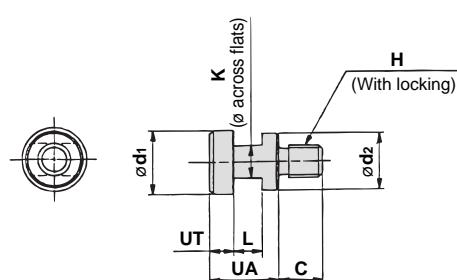
Bore size	32	40	50	63	80	100
Eccentricity tolerance		±1		±1.5	±2	
Backlash			0.5			

## &lt;Ordering method&gt;

- Joints are not included with A type and B type mounting brackets.
- Order them separately.
- (Example)
- Bore size Ø40 Part number
- A type mounting bracket ..... YA-03
- Joint ..... YU-03

## Joint part no.

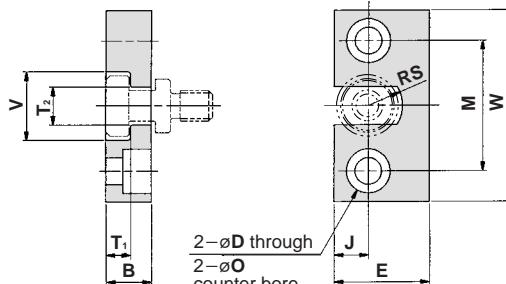
Bore size (mm)	Joint	Applicable mounting bracket		Weight (g)
		A type mounting bracket	B type mounting bracket	
32, 40	YU-03	YA-03	YB-03	25
50, 63	YU-05	YA-05	YB-05	40
80	YU-08	YA-08	YB-08	90
100	YU-10	YA-10	YB-10	160



Material: Chrome molybdenum steel (nickel plated)

Part no.	Applicable bore size (mm)	UA	C	d1	d2	H	K	L	UT	Weight (g)
YU-03	32, 40	17	11	15.8	14	M8	8	7	6	25
YU-05	50, 63	17	13	19.8	18	M10	10	7	6	40
YU-08	80	22	20	24.8	23	M16	13	9	8	90
YU-10	100	26	26	29.8	28	M20	14	11	10	160

## B type mounting bracket



Material: Carbon steel (nickel plated)  
mm

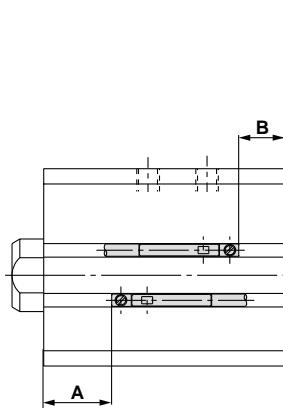
Part no.	Bore size (mm)	B	D	E	J	M	O
YB-03	32, 40	12	7	25	9	34	11.5 depth 7.5
YB-05	50, 63	12	9	32	11	42	14.5 depth 8.5
YB-08	80	16	11	38	13	52	18 depth 12
YB-10	100	19	14	50	17	62	21 depth 14

Part no.	Bore size (mm)	T1	T2	V	W	RS	Weight (g)
YB-03	32, 40	6.5		10	18	50	80
YB-05	50, 63	6.5		12	22	60	120
YB-08	80	8.5		16	28	75	14
YB-10	100	10.5		18	36	90	455

# Series RQ

## Auto Switches/Proper Mounting Positions and Height for Stroke End Detection

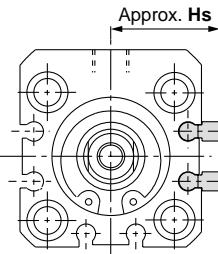
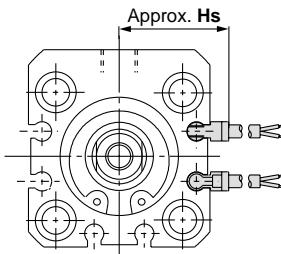
$\varnothing 20, \varnothing 25$



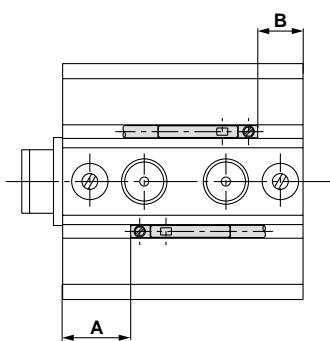
D-A9□  
D-F9□  
D-F9□W

D-A9□V  
D-F9□V  
D-F9□WV

D-F9BAL



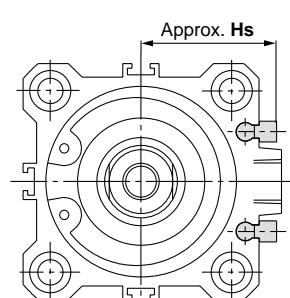
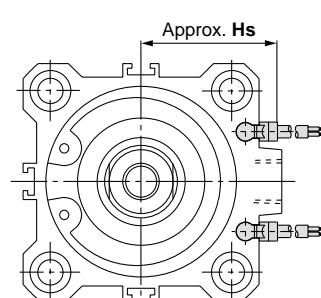
$\varnothing 32$  to  $\varnothing 100$



D-A9□  
D-F9□  
D-F9□W

D-A9□V  
D-F9□V  
D-F9□WV

D-F9BAL

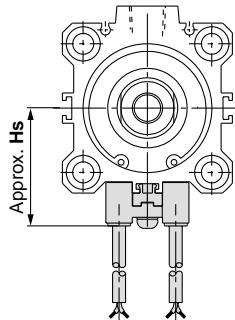
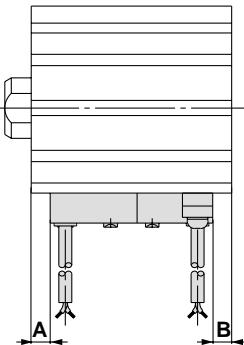
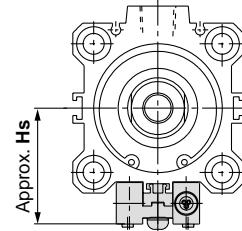
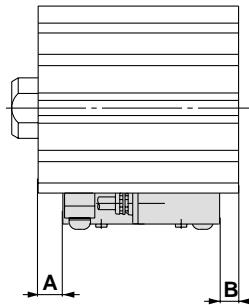
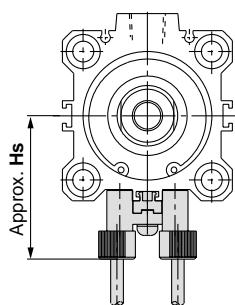
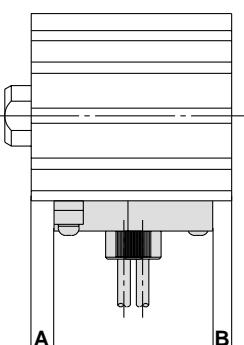
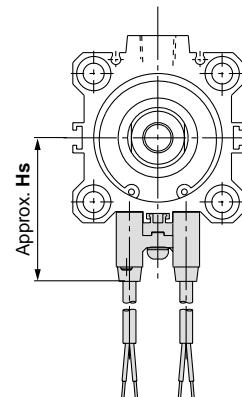
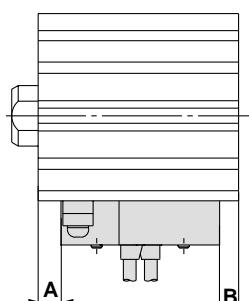


### Proper auto switch mounting positions

Bore size (mm)	D-A9□ D-A9□V		D-F9□ D-F9□V D-F9□W D-F9□WV		D-F9BAL	
	A	B	A	B	A	B
20	9.5	3	13.5	7	12.5	6
25	11	5.5	15	9.5	14	8.5
32	12.5	4.5	16.5	8.5	15.5	7.5
40	17	7	21	11	20	10
50	17	12.5	21	16.5	20	15.5
63	19.5	15.5	23.5	19.5	22.5	18.5
80	24.5	19	28.5	23	27.5	22
100	31	25	35	29	34	28

### Auto switch mounting height

Bore size (mm)	D-A9□V	D-F9□V D-F9□WV	D-F9BAL
	Hs	Hs	Hs
20	22.5	24.5	22
25	24.5	26.5	24
32	27	29	26.5
40	30.5	32.5	30
50	36.5	38.5	36
63	40	42	39.5
80	50	52	49.5
100	60	62	59.5

**Auto Switches/Proper Mounting Positions and Height for Stroke End Detection**
**Ø32 to Ø100**
**D-A7□  
D-A80**

**D-A7□H  
D-A80H  
D-F7□  
D-J79  
D-F7□W  
D-J79W  
D-F7□F  
D-F7NTL  
D-F7BAL**

**Ø32 to Ø100**
**D-A73C  
D-A80C  
D-J79C**

**D-A79W  
D-F7□V  
D-F7□WV  
D-F7BAVL**

**Proper auto switch mounting position**

Bore size (mm)	D-A7□, A80	D-A7□H, A80H		D-A79W		D-F7LF		D-F7NTL	
		A	B	A	B	A	B	A	B
20	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—
32	13.5	5.5	14	6	11	3	18	10	19
40	18	8	18.5	8.5	15.5	5.5	22.5	12.5	23.5
50	18	13.5	18.5	14	15.5	11	22.5	18	23.5
63	20.5	16.5	21	17	18	14	25	21	26
80	25.5	20	26	20.5	23	17.5	30	24.5	31
100	32	26	32.5	26.5	29.5	23.5	36.5	30.5	37.5
									31.5

**Auto switch mounting height**

Bore size (mm)	D-A7□ D-A80	D-A7□H		D-J79W		D-A73C		D-F7□V		D-J79C		D-A79W	
		Hs	Hs	Hs	Hs								
20	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—	—
32	31.5	—	32.5	—	38.5	—	35	—	38	—	34	—	—
40	35	—	36	—	42	—	38.5	—	41.5	—	37.5	—	—
50	41	—	42	—	48	—	44.5	—	47.5	—	43.5	—	—
63	47.5	—	48.5	—	54.5	—	51	—	54	—	50	—	—
80	57.5	—	58.5	—	64.5	—	61	—	64	—	60	—	—
100	67.5	—	68.5	—	74.5	—	71	—	74	—	70	—	—

# Series RQ

## Operation Range

Switch model	Bore size								mm
	20	25	32	40	50	63	80	100	
<b>D-A7□, A80</b>	12	12	12	11	10	12	12	13	
<b>D-A7□H, A80H</b>									
<b>D-A73C, A80C</b>									
<b>D-A79W</b>	13	13	13	14	14	16	15	17	
<b>D-A9□, A9□V</b>	—	—	9.5	9.5	9.5	11.5	9	11.5	
<b>D-F7□, F7□V</b>	5.5	5	6	6	6	6.5	6.5	7	
<b>D-J79, J79C, J79W</b>									
<b>D-F7□W, F7□WV</b>									
<b>D-F79F, F7BAL</b>									
<b>D-F7BAVL</b>									
<b>D-F7LF</b>	7	7	8	7	8	8.5	8	9	
<b>D-F9□, F9□V</b>	—	—	5.5	5.5	5.5	6.5	5.5	6.5	
<b>D-F9□W, F9□WV</b>									
<b>D-F9BAL</b>									

\*Hysteresis specifications are given as a guide, it is not a guaranteed range. (Tolerance  $\pm 30\%$ )  
Hysteresis may fluctuate due to the operating environment.

Besides the models listed in "How to Order" the following auto switches can be mounted.  
For detailed specifications, refer to pages 5.3-2 through 5.3-75 of "Best Pneumatics vol.2".

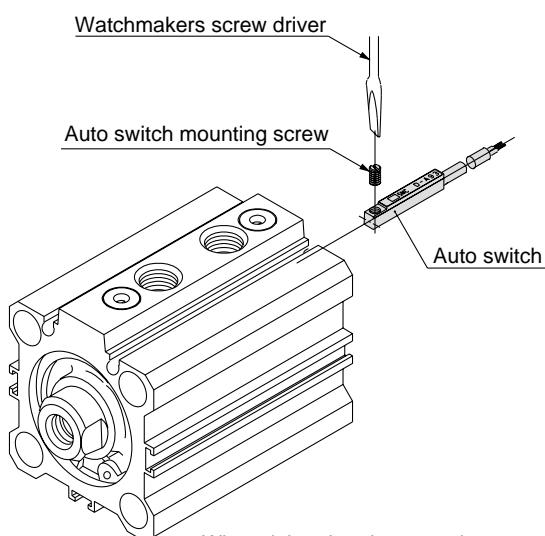
Auto switch type	Part no.	Electrical entry	Features	Applicable bore size
Reed switch	<b>D-A80</b>	Grommet (perpendicular)	Without indicator light	<b><math>\varnothing 32</math> to <math>\varnothing 100</math></b>
	<b>D-A80H</b>	Grommet (in-line)		
	<b>D-A80C</b>	Connector (perpendicular)		
	<b>D-A90</b>	Grommet (in-line)		<b><math>\varnothing 20</math> to <math>\varnothing 100</math></b>
	<b>D-A90V</b>	Grommet (perpendicular)	With timer	<b><math>\varnothing 32</math> to <math>\varnothing 100</math></b>
Solid state (switch)	<b>D-F7NTL</b>	Grommet (in-line)		

\*D-F7NTL is also available with prewire connector.  
\*Normally closed type (NC = b contact) solid state auto switches are also available (D-F9G, F9H).

## Auto switch mounting

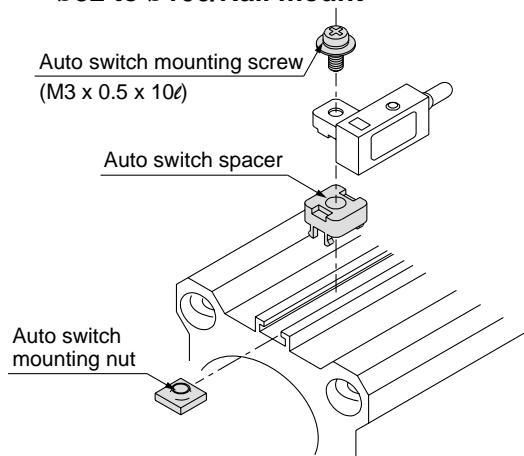
Follow the procedures below to mount auto switches.

### $\varnothing 20$ to $\varnothing 100$ /Direct mount



- When tightening the mounting screw, use a watchmakers screw driver with a handle 5 to 6 mm in diameter.
- Tighten with a torque of 0.10 to 0.20 N·m.

### $\varnothing 32$ to $\varnothing 100$ /Rail mount



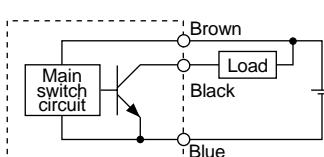
- Use a tightening torque of 0.5 to 0.7 N·m for auto switch mounting screws.

\*Auto switch mounting brackets are packed together for cylinders with built-in magnets.

# Series RQ Auto Switch Connections and Examples

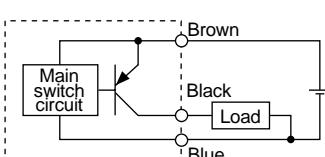
## Basic Wiring

### Solid state 3-wire, NPN



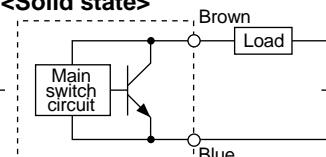
(Power supplies for switch and load are separate.)

### Solid state 3-wire, PNP



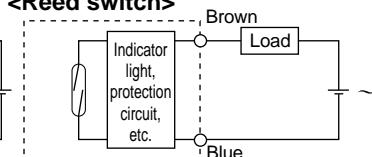
### 2-wire

#### <Solid state>



### 2-wire

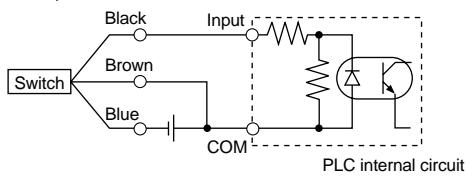
#### <Reed switch>



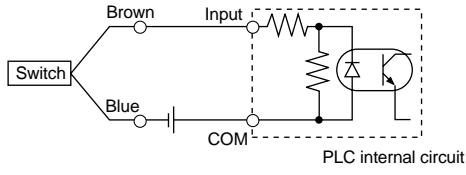
## Examples of Connection to PLC

### Sink input specifications

#### 3-wire, NPN

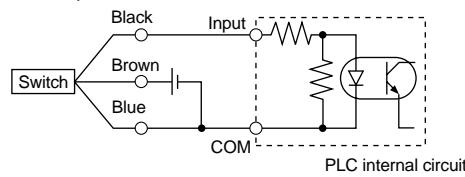


#### 2-wire

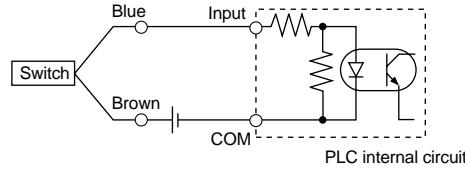


### Source input specifications

#### 3-wire, PNP



#### 2-wire

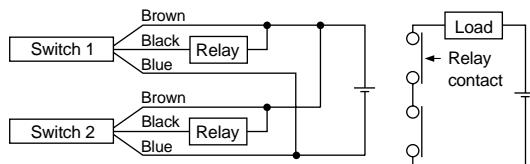


Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

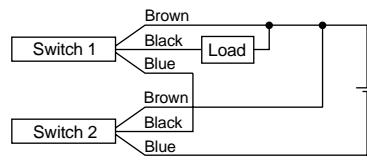
## Connection Examples for AND (Series) and OR (Parallel)

### 3-wire

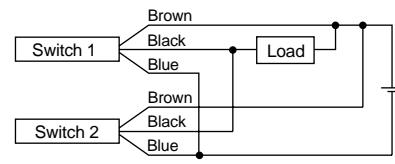
#### AND connection for NPN output (Using relays)



#### AND connection for NPN output (Performed with switches only)

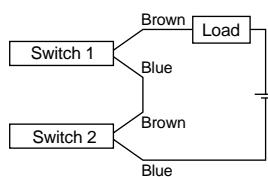


#### OR connection for NPN output



The indicator lights will light up when both switches are turned ON.

### 2-wire with 2 switch AND connection



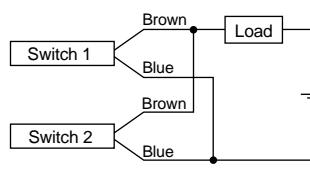
When two switches are connected in series, a load may malfunction because the load voltage will decline when in the ON state.

The indicator lights will light up if both of the switches are in the ON state.

$$\begin{aligned} \text{Load voltage at ON} &= \text{Power supply voltage} - \text{Internal voltage drop} \times 2 \text{ pcs.} \\ &= 24V - 4V \times 2 \text{ pcs.} \\ &= 16V \end{aligned}$$

Example: Power supply is 24VDC  
Internal voltage drop in switch is 4V

### 2-wire with 2 switch OR connection



<Solid state>  
When two switches are connected in parallel, malfunction may occur because the load voltage will increase when in the OFF state.

<Reed switch>  
Because there is no current leakage, the load voltage will not increase when turned OFF. However, depending on the number of switches in the ON state, the indicator lights may sometimes dim or not light up, because of dispersion and reduction of the current flowing to the switches.

$$\begin{aligned} \text{Load voltage at OFF} &= \text{Leakage current} \times 2 \text{ pcs.} \times \text{Load impedance} \\ &= 1mA \times 2 \text{ pcs.} \times 3k\Omega \\ &= 6V \end{aligned}$$

Example: Load impedance is 3kΩ  
Leakage current from switch is 1mA



# Series RQ

# Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of **"Caution"**, **"Warning"** or **"Danger"**. To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

**⚠ Caution :** Operator error could result in injury or equipment damage.

**⚠ Warning :** Operator error could result in serious injury or loss of life.

**⚠ Danger :** In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems.

Note 2) JIS B 8370: General Rules for Pneumatic Equipment

## ⚠ Warning

**1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.**

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified. Referring to the latest catalogue information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

**2. Only trained personnel should operate pneumatically operated machinery and equipment.**

Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

**3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.**

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back pressure.)

**4. Contact SMC if the product is to be used in any of the following conditions:**

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.



# Series RQ Actuator Precautions 1

Be sure to read before handling.

## Design

### ⚠ Warning

#### 1. There is a danger of sudden action by air cylinders if sliding parts of machinery are twisted, etc., and changes in forces occur.

In such cases, human injury may occur; e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be designed to avoid such dangers.

#### 2. Attach a protective cover to minimize the risk of human injury.

If a driven object and moving parts of a cylinder pose a danger of human injury, design the structure to avoid contact with the human body.

#### 3. Securely tighten all stationary parts and connected parts so that they will not become loose.

Especially when a cylinder operates with high frequency or is installed where there is a lot of vibration, ensure that all parts remain secure.

#### 4. A deceleration circuit or shock absorber, etc., may be required.

When a driven object is operated at high speed or the load is heavy, a cylinder's cushion will not be sufficient to absorb the impact. Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the impact. In this case, the rigidity of the machinery should also be examined.

#### 5. Consider a possible drop in circuit pressure due to a power outage, etc.

When a cylinder is used in a clamping mechanism, there is a danger of work pieces dropping if there is a decrease in clamping force due to a drop in circuit pressure caused by a power outage, etc. Therefore, safety equipment should be installed to prevent damage to machinery and/or human injury. Suspension mechanisms and lifting devices also require consideration for drop prevention.

#### 6. Consider a possible loss of power source.

Measures should be taken to protect against human injury and equipment damage in the event that there is a loss of power to equipment controlled by air pressure, electricity or hydraulics, etc.

#### 7. Design circuitry to prevent sudden lurching of driven objects.

When a cylinder is driven by an exhaust center type directional control valve or when starting up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will lurch at high speed if pressure is applied to one side of the cylinder because of the absence of air pressure inside the cylinder. Therefore, equipment should be selected and circuits designed to prevent sudden lurching because, there is a danger of human injury and/or damage to equipment when this occurs.

#### 8. Consider emergency stops.

Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions, a power outage or a manual emergency stop.

#### 9. Consider the action when operation is restarted after an emergency stop or abnormal stop.

Design the machinery so that human injury or equipment damage will not occur upon restart of operation. When the cylinder has to be reset at the starting position, install safe manual control equipment.

## Selection

### ⚠ Warning

#### 1. Confirm the specifications.

The products advertised in this catalog are designed according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use in these conditions. (Refer to specifications.)

Consult SMC if you use a fluid other than compressed air.

#### 2. Intermediate stops

When intermediate stopping of a cylinder piston is performed with a 3 position closed center type directional control valve, it is difficult to achieve stopping positions as accurate and minute as with hydraulic pressure due to the compressibility of air. Furthermore, since valves and cylinders are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time. Consult SMC if it is necessary to hold a stopped position for an extended period.

### ⚠ Caution

#### 1. Operate within the limits of the maximum usable stroke.

The piston rod will be damaged if operated beyond the maximum stroke. Operate within the standard stroke range.

#### 2. Operate the piston within a range such that collision damage will not occur at the stroke end.

#### 3. Use a speed controller to adjust the cylinder drive speed, gradually increasing from a low speed to the desired speed setting.

## Mounting

### ⚠ Caution

#### 1. Be certain to align the rod axis with the load and direction of movement when connecting.

When not properly aligned, twisting may occur in the rod and tube, and damage may be caused due to friction on the inner tube surface, bushings, rod surface and seals, etc.

#### 2. When an external guide is used, connect the rod end and the load in such a way that there is no interference at any point within the stroke.

#### 3. Do not scratch or gouge the sliding parts of the cylinder tube or piston rod, etc., by striking or grasping them with other objects.

Cylinder bores are manufactured to precise tolerances, so that even a slight deformation may cause malfunction. Also, scratches or gouges, etc., in the piston rod may lead to damaged seals and cause air leakage.

#### 4. Prevent the seizure of rotating parts.

Prevent the seizure of rotating parts (pins, etc.) by applying grease.



# Series RQ Actuator Precautions 2

Be sure to read before handling.

## Mounting

### ⚠ Caution

#### 5. Do not use until you can verify that equipment can operate properly.

Following mounting, maintenance or conversions, verify correct mounting by suitable function and leakage tests after compressed air and power are connected.

#### 6. Instruction manual

The product should be mounted and operated after thoroughly reading the manual and understanding its contents.

Keep the instruction manual where it can be referred to as needed.

## Piping

### ⚠ Caution

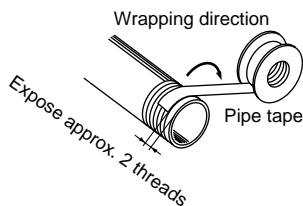
#### 1. Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

#### 2. Wrapping of pipe tape

When screwing together pipes and fittings, etc., be certain that chips from the pipe threads and sealing material do not get inside the piping.

Also, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



## Cushion

### ⚠ Caution

#### 1. Readjust using the cushion needle.

Cushions are adjusted at the time of shipment, however, the cushion needle on the cylinder tube should be readjusted when the product is put into service, based upon factors such as the size of the load and the operating speed. When the cushion needle is turned clockwise, the cushion contracts and its effectiveness is increased.

#### 2. Do not operate with the cushion needle in a fully closed condition.

#### 3. Adjust the cushion needle by gradually opening from the closed condition and set it at a designated cushion speed.

## Lubrication

### ⚠ Caution

#### 1. Lubrication of non-lube type cylinder.

The cylinder is lubricated at the factory and can be used without any further lubrication.

However, in the event that it will be lubricated, use class 1 turbine oil (without additives) ISO VG32.

Stopping lubrication later may lead to malfunction due to the loss of the original lubricant. Therefore, lubrication must be continued once it has been started.

## Air Supply

### ⚠ Warning

#### 1. Use clean air.

Do not use compressed air that includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.

### ⚠ Caution

#### 1. Install air filters.

Install air filters at the upstream side of valves. The filtration degree should be 5µm or finer.

#### 2. Install an after-cooler, air dryer or water separator, etc.

Air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an after-cooler, air dryer or water separator, etc.

#### 3. Use the product within the specified range of fluid and ambient temperature.

Take measures to prevent freezing, since moisture in circuits can be frozen below 5°C, and this may cause damage to seals and lead to malfunction.

Refer to SMC's "Best Pneumatics vol. 4" for further details on compressed air quality.

## Operating Environment

### ⚠ Warning

#### 1. Do not use in environments where there is a danger of corrosion.

#### 2. In dusty locations or where water, oil, etc., splash on the equipment, take suitable measures to protect rod.

#### 3. When using auto switches, do not operate in an environment with strong magnetic fields.



# Series RQ Actuator Precautions 3

Be sure to read before handling.

## Maintenance

### ⚠ Warning

#### 1. Perform maintenance according to the procedure indicated in the instruction manual.

If handled improperly, malfunction and damage of machinery or equipment may occur.

#### 2. Removal of equipment, and supply/exhaust of compressed air.

When equipment is removed, first check measures to prevent dropping of driven objects and run-away of equipment, etc. Then cut off the supply pressure and electric power, and exhaust all compressed air from the system. When machinery is restarted, proceed with caution after confirming measures to prevent cylinder lurching.

### ⚠ Caution

#### 1. Drain flushing

Remove drainage from air filters regularly.



# Series RQ Auto Switch Precautions 1

Be sure to read before handling.

## Design and Selection

### ⚠ Warning

#### 1. Confirm the specifications.

Read the specifications carefully and use this product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications for load current, voltage, temperature or impact.

#### 2. Take precautions when multiple cylinders are used close together.

When multiple auto switch cylinders are used in close proximity, magnetic field interference may cause the switches to malfunction. Maintain a minimum cylinder separation of 40mm.

#### 3. Pay attention to the length of time that a switch is ON at an intermediate stroke position.

When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate, but if the speed is too great the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:

$$V \text{ (mm/s)} = \frac{\text{Auto switch operating range (mm)}}{\text{Load operating time (ms)}} \times 1000$$

In case of high piston speed, the operating time of the load can be extended by using an auto switch (D-F7NT) with built-in OFF delay timer (approx. 200ms).

#### 4. Keep wiring as short as possible.

##### <Reed switches>

As the length of the wiring to a load gets longer, the rush current at switching ON becomes greater, and this may shorten the product's life. (The switch will stay ON all the time.)

Use a contact protection box when the wire length is 5m or longer.

##### <Solid state switches>

Although wire length should not affect switch function, use a wire 100m or shorter.

#### 5. Pay attention to the internal voltage drop of the switch.

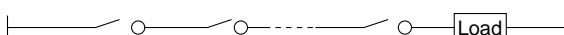
##### <Reed switches>

1) Switches with an indicator light (except D-A76H, A96, A96V)

- If auto switches are connected in series as shown below, take note that there will be a large voltage drop because of internal resistance in the light emitting diodes. (Refer to internal voltage drop in the auto switch specifications.)

[The voltage drop will be "n" times larger when "n" auto switches are connected.]

Even though an auto switch operates normally, the load may not operate.



- In the same way, when operating below a specified voltage, although an auto switch may operate normally, the load may not operate. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

$$\text{Supply voltage} - \text{Internal voltage drop of switch} > \text{Minimum operating voltage of load}$$

- 2) If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (model D-A80, A80H, A90, A90V).

##### <Solid state switches>

- 3) Generally, the internal voltage drop will be greater with a 2-wire solid state auto switch than with a reed switch. Take the same precautions as in 1).

Also, note that a 12VDC relay is not applicable.

#### 6. Pay attention to leakage current.

##### <Solid state switches>

With a 2-wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.

Operating current of load (OFF condition) > Leakage current

If the criteria given in the above formula are not met, it will not reset correctly (stays ON). Use a 3-wire switch if this specification will not be satisfied.

Moreover, leakage current flow to the load will be "n" times larger when "n" auto switches are connected in parallel.

#### 7. Do not use a load that generates surge voltage.

##### <Reed switches>

If driving a load such as a relay that generates a surge voltage, use a contact protection box.

##### <Solid state switches>

Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly. When a load such as a relay or solenoid which generates surge is directly driven, use a type of switch with a built-in surge absorbing element.

#### 8. Cautions for use in an interlock circuit

When an auto switch is used for an interlock signal requiring high reliability, devise a double interlock system to avoid trouble by providing a mechanical protection function, or by also using another switch (sensor) together with the auto switch.

Also perform periodic maintenance and confirm proper operation.

#### 9. Ensure sufficient clearance for maintenance activities.

When designing an application, be sure to allow sufficient clearance for maintenance and inspections.



# Series RQ Auto Switch Precautions 2

Be sure to read before handling.

## Mounting and Adjustment

### ⚠ Warning

#### 1. Do not drop or bump.

Do not drop, bump or apply excessive impacts (300m/s<sup>2</sup> or more for reed switches and 1000m/s<sup>2</sup> or more for solid state switches) while handling. Although the body of the switch may not be damaged, the inside of the switch could be damaged and cause a malfunction.

#### 2. Do not carry a cylinder by the auto switch lead wires.

Never carry a cylinder by its lead wires. This may not only cause broken lead wires, but it may cause internal elements of the switch to be damaged by the stress.

#### 3. Mount switches using the proper tightening torque.

If a switch is tightened beyond the range of tightening torque, the mounting screws, mounting brackets or switch may be damaged. On the other hand, tightening below the range of tightening torque may allow the switch to slip out of position. (Refer to page 15 for switch mounting instructions and tightening torque.)

#### 4. Mount a switch at the center of the operating range.

Adjust the mounting position of an auto switch so that the piston stops at the center of the operating range (the range in which a switch is ON). (The mounting position shown in the catalog indicates the optimum position at stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), operation may be unstable.

## Wiring

### ⚠ Warning

#### 1. Avoid repeatedly bending or stretching lead wires.

Broken lead wires can result from wiring patterns which repeatedly apply bending stress or stretching force to the lead wires.

#### 2. Be sure to connect the load before power is applied.

<2-wire system>

If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged because of excess current.

#### 3. Confirm proper insulation of wiring.

Be certain that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.) Damage may occur due to excess current flow into a switch.

#### 4. Do not wire with power lines or high voltage lines.

Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits containing auto switches may malfunction due to noise from these other lines.

## Wiring

### ⚠ Warning

#### 5. Do not allow short circuit of loads.

<Reed switches>

If the power is turned ON with a load in a short circuited condition, the switch will be instantly damaged because of excess current flow into the switch.

<Solid state switches>

D-F9BAL and all models of PNP output type switches do not have built-in short circuit protection circuits.

Note that if a load is short circuited, the switch will be instantly damaged as in the case of reed switches.

\*Take special care to avoid reverse wiring of the brown [red] power supply line and the black [white] output line on 3-wire type switches.

#### 6. Avoid incorrect wiring.

<Reed switches>

A 24VDC switch with indicator light has polarity. The brown [red] lead wire is (+), and the blue [black] lead wire is (-).

1) If connections are reversed, a switch will operate, however, the light emitting diode will not light up.

Also note that a current greater than that specified will damage a light emitting diode and it will no longer operate.

Applicable models: D-A73/A73H/A73C/A93/A93V

2) Note however, that in the case of 2-color display auto switches (D-A79W), the switch will be in a normally ON condition if the wiring is reversed.

<Solid state switches>

1) If connections are reversed on a 2-wire type switch, the switch will not be damaged if protected by a protection circuit, but the switch will always stay in an ON state. However, it is still necessary to avoid reversed connections, since the switch could be damaged by a load short circuit in this condition.

\*2) If connections are reversed (power supply line + and power supply line -) on a 3-wire type switch, the switch will be protected by a protection circuit. However, if the power supply line (+) is connected to the blue [black] wire and the power supply line (-) is connected to the black [white] wire, the switch will be damaged.

#### \* Lead wire colour changes

Lead wire colours of SMC switches have been changed in order to meet NECA Standard 0402 for production beginning September, 1996 and thereafter. Please refer to the tables provided.

Special care should be taken regarding wire polarity during the time that the old colours still coexist with the new colours.

#### 2-wire

	Old	New
Output (+)	Red	Brown
Output (-)	Black	Blue

#### Solid state with diagnostic output

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

#### 3-wire

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black

#### Solid state with latch type diagnostic output

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black
Latch type diagnostic output	Yellow	Orange



# Series RQ Auto Switch Precautions 3

Be sure to read before handling.

## Operating Environment

### ⚠ Warning

#### 1. Never use in an atmosphere of explosive gases.

The construction of auto switches is not intended to prevent explosion. Never use in an atmosphere with an explosive gas since this may cause a serious explosion.

#### 2. Do not use in an area where a magnetic field is generated.

Auto switches can malfunction or magnets inside cylinders can become demagnetized. (Consult SMC regarding the availability of a magnetic field resistant auto switch.)

#### 3. Do not use in an environment where the auto switch will be continually exposed to water.

Although switches satisfy IEC standard IP67 construction (JIS C 0920: watertight construction), avoid using switches in applications where continually exposed to water splash or spray. Poor insulation or swelling of the potting resin inside switches may cause malfunction.

#### 4. Do not use in an environment with oil or chemicals.

Consult SMC if auto switches will be used in an environment with coolant, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.

#### 5. Do not use in an environment with temperature cycles.

Consult SMC if switches are used where there are temperature cycles other than normal air temperature changes, as there may be adverse effects inside the switches.

#### 6. Do not use in an environment where there is excessive impact shock.

##### <Reed switches>

When excessive impact (300m/s<sup>2</sup> or more) is applied to a reed switch during operation, the contact point will malfunction and generate or cut off a signal momentarily (1ms or less). Consult SMC regarding the need to use a solid state switch depending upon the environment.

#### 7. Do not use in an area where surges are generated.

##### <Solid state switches>

When there are units (solenoid type lifter, high frequency induction furnace, motor, etc.) which generate a large amount of surge in the area around cylinders with solid state auto switches, this may cause deterioration or damage to the switches. Avoid sources of surge generation and crossed lines.

#### 8. Avoid accumulation of iron waste or close contact with magnetic substances.

When a large amount of iron waste such as machining chips or spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with an auto switch cylinder, it may cause auto switches to malfunction due to a loss of the magnetic force inside the cylinder.

## Maintenance

### ⚠ Warning

#### 1. Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.

1) Securely tighten switch mounting screws.

If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.

2) Confirm that there is no damage to lead wires.

To prevent faulty insulation, replace switches or repair lead wires, etc., if damage is discovered.

3) Confirm the lighting of the green light on the 2-color display type switch.

Confirm that the green LED is on when stopped at the established position. If the red LED is on, the mounting position is not appropriate. Readjust the mounting position until the green LED lights up.

## Other

### ⚠ Warning

#### 1. Consult SMC concerning water resistance, elasticity of lead wires, and usage at welding sites, etc.



# Series RQ

## Specific Product Precautions

Be sure to read before handling.

Refer to pages 17 through 23 for safety instructions, actuator precautions and auto switch precautions.

### Installation and Removal of Snap Ring

#### ⚠ Caution

1. Use appropriate pliers (C type snap ring installing tool) for installation and removal.
2. Even when using appropriate pliers (C type snap ring installing tool), proceed with caution as there is a danger of the snap ring flying off the end of the pliers (C type snap ring installing tool) and causing human injury or damage to nearby equipment. After installation, confirm that the snap ring is securely seated into the snap ring groove before supplying air.

### Selection

#### ⚠ Caution

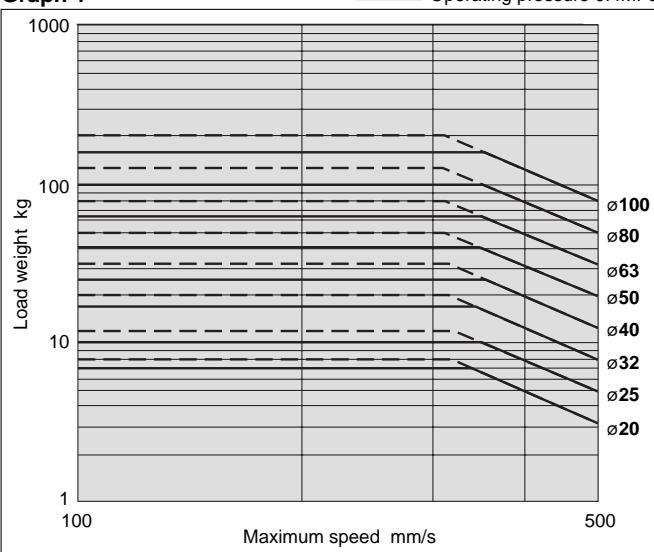
1. Operate the cylinder to the stroke end.

When the stroke is restricted by an external stopper or a clamped work piece, satisfactory cushioning and noise reduction may not be achieved.

2. Strictly observe the limiting ranges for load weight and maximum speed (graph 1). Also, the limiting ranges are based on operation of the cylinder to the stroke end and proper adjustment of the cushion needle.

If operated beyond the limiting ranges, excessive impact will occur and this may cause damage to equipment.

Graph 1



3. Adjust the cushion needle to reduce excessive kinetic energy from the piston impact at the stroke end by absorbing enough kinetic energy during the cushion stroke.

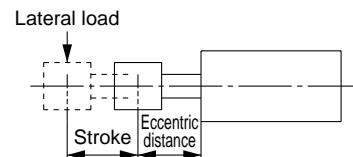
If the piston impacts the stroke end with excessive kinetic energy (values in Table 1 or more), an excessive impact will occur and this may cause damage to equipment.

### Selection

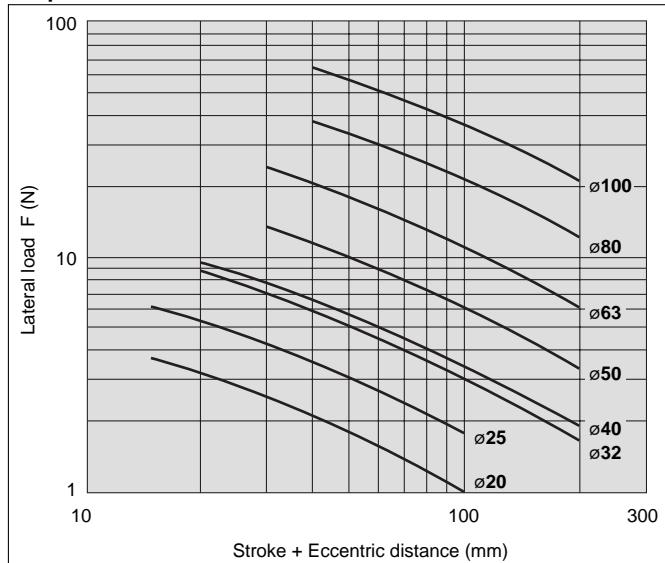
#### ⚠ Caution

4. Strictly observe the limiting ranges for the piston rod lateral load (graph 2).

If operated beyond the limiting ranges, this may cause the equipment life to be reduced or damage to equipment may occur.



Graph 2



### Cushion Needle Adjustment

#### ⚠ Caution

1. Keep the adjustment range for the cushion needle between the closed position and the rotations shown below.

Rotations	
ø20 to ø100	2.5 rotations or less

Use a 3mm flat head watchmakers screw driver to adjust the cushion needle. The adjustment range for the cushion needle must be between the closed position and the open position ranges above. A retaining mechanism prevents the cushion needle from coming out, however, it may spring out during operation if it is rotated beyond the ranges shown above.

Table 1. Allowable kinetic energy at piston impact Unit: [J]

	20	25	32	40	50	63	80	100
Piston speed 50 to 500mm/s								
Allowable kinetic energy	0.055	0.09	0.15	0.26	0.46	0.77	1.30	2.27