

# Compact Cylinder with Air Cushion

The new standard  
for the future!



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!



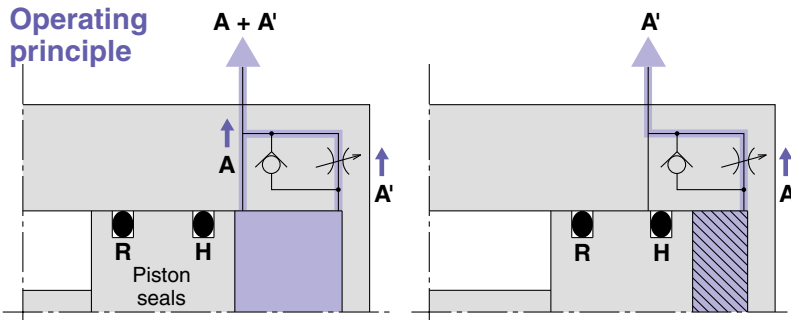
## New Debut of the air cushion series!!



### 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



- ① When the piston is retracting, exhaust is discharged from both A and A' until piston seal H passes the air passage A.
- ② 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.
- ③ 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

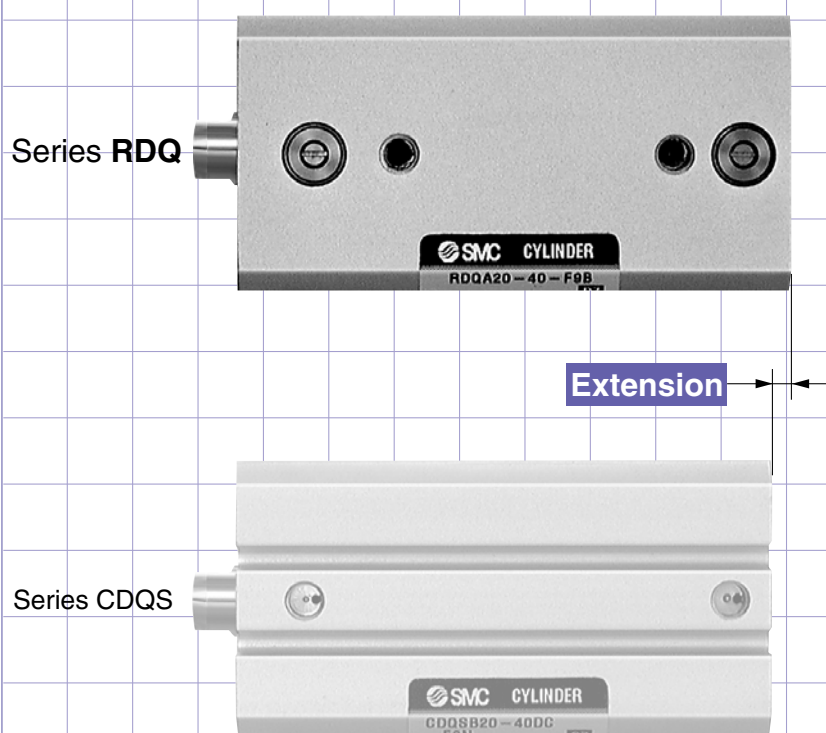
| Model           | Counting             | Rod end configuration | Standard stroke          | Auto switch |
|-----------------|----------------------|-----------------------|--------------------------|-------------|
| R(D)Q□20        |                      |                       | 15 20 25 30 40 50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

\*Size ø20 and ø25 have through holes and double end taps in common.

# 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)

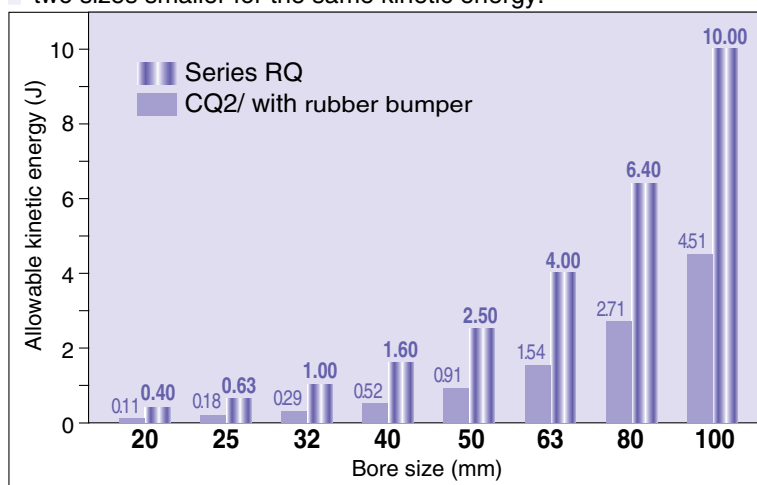


| Series     | Bore size | Extended dimension | Comparable cylinder |
|------------|-----------|--------------------|---------------------|
| Series RDQ | 20        | +2.5mm             | Series CDQS         |
|            | 25        | +4mm               |                     |
|            | 32   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

## Nearly three times the allowable kinetic energy

(Compared to CQS/CQ2 with rubber bumper)

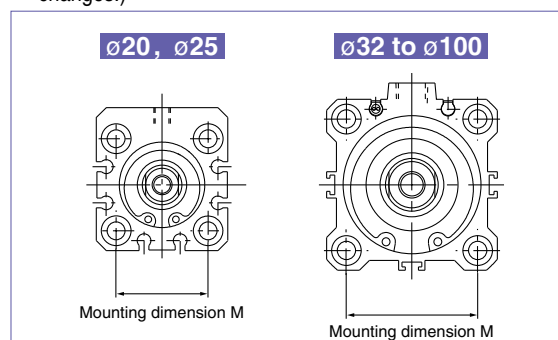
Improved energy absorption allows selection of a cylinder that is two sizes smaller for the same kinetic energy.



## 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

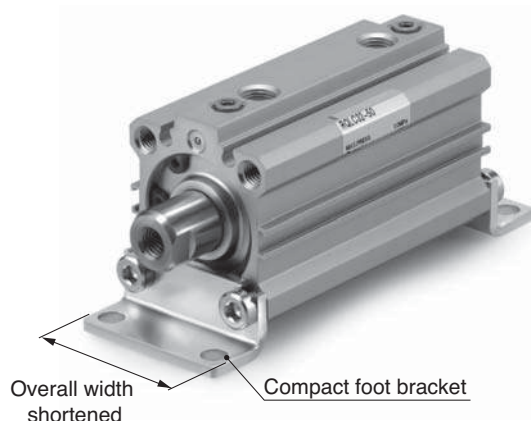
The piston contact surface at the stroke end is metal, providing improved repeatability for the stopping position as compared with a rubber bumper.

## 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)

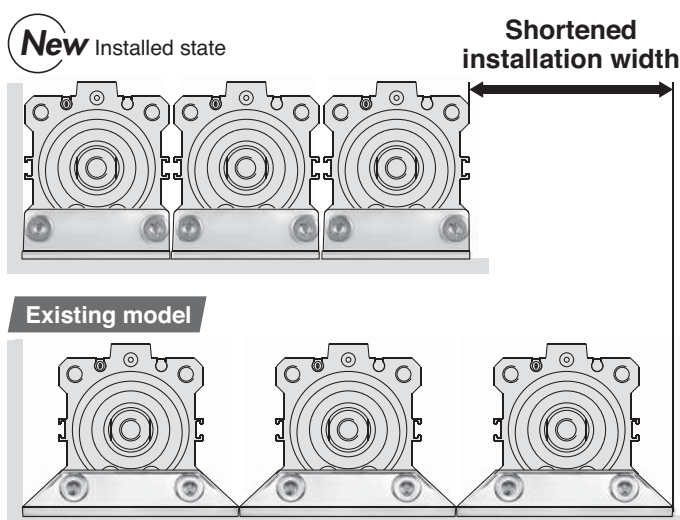
# Added compact type foot brackets

- Compact foot bracket has the same width as the cylinder. Overall width reduced by up to **42%** (for  $\phi 20$ )



## ■ More compact installation space possible

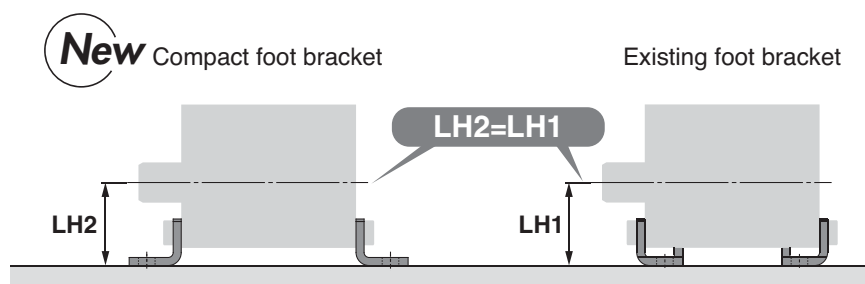
- Short pitch mounting is possible. ● Allows installation close against a wall.



| Bore size [mm] | New Compact foot type width A [mm] | Existing foot type width B [mm] | Reduced width for short pitch mounting [mm] |         |         |
|----------------|------------------------------------|---------------------------------|---------------------------------------------|---------|---------|
|                |                                    |                                 | 1 unit                                      | 2 units | 3 units |
| 20             | 36                                 | 62                              | 26                                          | 52      | 78      |
| 25             | 40                                 | 66                              | 26                                          | 52      | 78      |
| 32             | 45                                 | 71                              | 26                                          | 52      | 78      |
| 40             | 52                                 | 78                              | 26                                          | 52      | 78      |
| 50             | 64                                 | 95                              | 31                                          | 62      | 93      |
| 63             | 77                                 | 113                             | 36                                          | 72      | 108     |
| 80             | 98                                 | 140                             | 42                                          | 84      | 126     |
| 100            | 117                                | 162                             | 45                                          | 90      | 135     |

\* Short pitch mounting is possible only without auto switch. Consult with SMC for mounting with auto switch.

## ■ Height from the bottom of brackets to the center of a cylinder is the same as the existing model.



# Compact Cylinder with Air Cushion

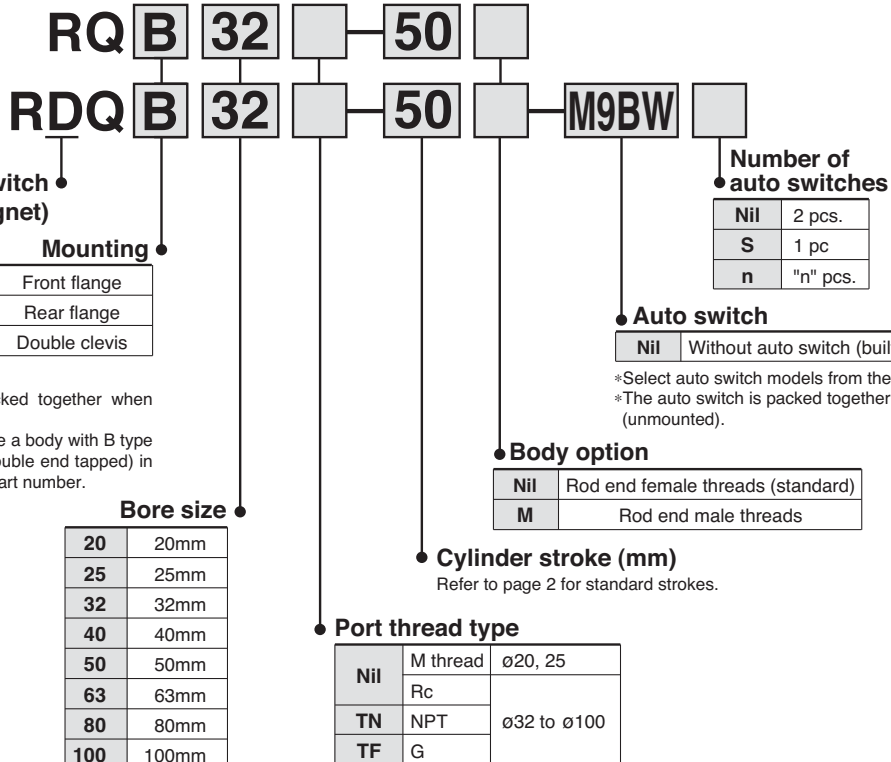
## Series *RQ*

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

### How to Order

Without auto switch

With auto switch



**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   |              | 0.5 (Nil) | 3 (L)                 | 5 (Z) | None (N) |   |                     |                 |            |
|                    |                                          |                  |                 |                     |              |      | Perpendicular | In-line    | Perpendicular | In-line      |           |                       |       |          |   |                     |                 |            |
| Reed switch        | —                                        | Grommet          | Yes             | 3-wire (NPN equiv.) | —            | 5V   | —             | —          | A76H          | A96V         | A96       | ●                     | ●     | —        | — | —                   | IC circuit      | Relay, PLC |
|                    |                                          | 2-wire           |                 | —                   | —            | 200V | A72           | A72H       | —             | —            | ●         | ●                     | —     | —        | — |                     |                 |            |
|                    |                                          |                  |                 | 24V                 | 100V         | A73  | A73H          | —          | —             | ●            | ●         | ●                     | —     | —        | — |                     |                 |            |
|                    |                                          |                  |                 |                     | —            | —    | A73C          | —          | —             | —            | ●         | ●                     | ●     | ●        | — | —                   |                 |            |
|                    | Connector                                | Grommet          |                 | —                   |              | —    | A79W          | —          | —             | —            | ●         | ●                     | —     | —        | — | —                   |                 |            |
| Solid state switch | —                                        | Grommet          | Yes             | 3-wire (NPN)        | 5V, 12V      | —    | F7NV          | F79        | M9NV          | M9N          | ●         | ●                     | ○     | —        | ○ | IC circuit          | Relay, PLC      |            |
|                    |                                          | 3-wire (PNP)     |                 | F7PV                |              |      | F7P           | M9PV       | M9P           | ●            | ●         | ○                     | —     | ○        |   |                     |                 |            |
|                    |                                          | Connector        |                 | 2-wire              | 12V          |      | F7BV          | J79        | M9BV          | M9B          | ●         | ●                     | ○     | —        | ○ |                     |                 |            |
|                    |                                          | Grommet          |                 | 3-wire (NPN)        | 5V, 12V      |      | F7NVV         | F79W       | M9NVV         | M9NW         | ●         | ●                     | ○     | —        | ○ |                     |                 |            |
|                    | 3-wire (PNP)                             |                  |                 | 5V, 12V             | —            |      | F7PW          | M9PWV      | M9PW          | ●            | ●         | ○                     | —     | ○        |   |                     |                 |            |
|                    | 2-wire                                   |                  |                 | 12V                 | F7BWV        |      | J79W          | M9BWV      | M9BW          | ●            | ●         | ○                     | —     | ○        |   |                     |                 |            |
|                    |                                          |                  |                 | —                   | F7BA         |      | —             | M9BA       | —             | ●            | ○         | —                     | ○     |          |   |                     |                 |            |
|                    | 4-wire (NPN)                             |                  |                 | 5V, 12V             | F7BAV        |      | —             | —          | —             | —            | ●         | ●                     | ○     | —        | ○ |                     |                 |            |
|                    |                                          |                  |                 | —                   | —            |      | F79F          | —          | —             | ●            | ●         | ○                     | —     | ○        |   |                     |                 |            |
|                    | Diagnostic indication (2-colour display) | —                |                 | —                   | —            |      | 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.

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

# Series RQ



## 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)<br>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       | $\begin{smallmatrix} +1.0 \\ 0 \end{smallmatrix}$                                                            |
| 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

|              |                                                                                       |              |
|--------------|---------------------------------------------------------------------------------------|--------------|
| Method       | Special body type                                                                     |              |
| Ordering     | Refer to "How to Order" for standard part numbers.                                    |              |
| Method       | Available in stroke increments of 1mm, using a special body for the specified stroke. |              |
| Stroke range | Bore size                                                                             | Stroke range |
|              | 20, 25                                                                                | 16 to 49     |
|              | 32, 40                                                                                | 21 to 99     |
|              | 50, 63                                                                                | 31 to 99     |
| Example      | 80, 100                                                                               | 41 to 99     |
|              | Part number: RQB32-47<br>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) | Note 1)<br>Foot | Compact Foot | Flange   | Note 3)<br>Double clevis |
|----------------|-----------------|--------------|----------|--------------------------|
| 20             | CQS-L020        | CQS-LC020    | CQS-F020 | CQS-D020                 |
| 25             | CQS-L025        | CQS-LC025    | CQS-F025 | CQS-D025                 |
| 32             | CQ-L032         | CQ-LC032     | CQ-F032  | CQ-D032                  |
| 40             | CQ-L040         | CQ-LC040     | CQ-F040  | CQ-D040                  |
| 50             | CQ-L050         | CQ-LC050     | CQ-F050  | CQ-D050                  |
| 63             | CQ-L063         | CQ-LC063     | CQ-F063  | CQ-D063                  |
| 80             | CQ-L080         | CQ-LC080     | CQ-F080  | CQ-D080                  |
| 100            | CQ-L100         | CQ-LC100     | CQ-F100  | CQ-D100                  |

Note 1) When ordering foot, compact foot brackets, order 2 pieces per cylinder.

Note 2) The following parts are included with each bracket.  
Foot, Compact 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 |

## Weights

### Basic weights

Unit: g

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

### Additional weights

Unit: g

| Bore size (mm)                                    | 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                              | Male threads | 6   | 12  | 26  | 27  | 53  | 53   | 120  |
|                                                   | Nut          | 4   | 8   | 17  | 17  | 32  | 32   | 49   |
| Foot (including bolt)                             | 159          | 181 | 143 | 155 | 243 | 324 | 696  | 1062 |
| Compact foot style (Including bolt)               | 97           | 116 | 99  | 114 | 177 | 241 | 501  | 770  |
| 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

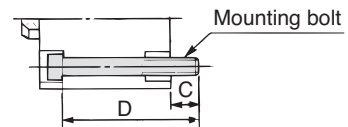
|                     |                      |      |
|---------------------|----------------------|------|
| •Basic weight       | : RQB32-20           | 271g |
| •Additional weight: | Double end tapped    | 6g   |
|                     | Rod end male threads | 43g  |
|                     | Double 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 |
|-------------|-----|-----|---------------|
| R(D)QB20-15 | 9   | 50  | M5 x 50ℓ      |
| -20         |     | 55  | x 55ℓ         |
| -25         |     | 60  | x 60ℓ         |
| -30         |     | 65  | x 65ℓ         |
| -40         |     | 75  | x 75ℓ         |
| -50         |     | 85  | x 85ℓ         |
| R(D)QB25-15 |     | 55  | M5 x 55ℓ      |
| -20         | 9.5 | 60  | x 60ℓ         |
| -25         |     | 65  | x 65ℓ         |
| -30         |     | 70  | x 70ℓ         |
| -40         |     | 80  | x 80ℓ         |
| -50         |     | 90  | x 90ℓ         |
| R(D)QB32-20 |     | 60  | M5 x 60ℓ      |
| -25         | 10  | 65  | x 65ℓ         |
| -30         |     | 70  | x 70ℓ         |
| -40         |     | 80  | x 80ℓ         |
| -50         |     | 90  | x 90ℓ         |
| -75         |     | 115 | x 115ℓ        |
| -100        |     | 140 | x 140ℓ        |

| Model        | C    | D   | Mounting bolt |
|--------------|------|-----|---------------|
| R(D)QB40-20  | 8    | 65  | M5 x 65ℓ      |
| -25          |      | 70  | x 70ℓ         |
| -30          |      | 75  | x 75ℓ         |
| -40          |      | 85  | x 85ℓ         |
| -50          |      | 95  | x 95ℓ         |
| -75          |      | 120 | x 120ℓ        |
| -100         |      | 145 | x 145ℓ        |
| R(D)QB50-30  | 13.5 | 85  | M6 x 85ℓ      |
| -40          |      | 95  | x 95ℓ         |
| -50          |      | 105 | x 105ℓ        |
| -75          |      | 130 | x 130ℓ        |
| -100         |      | 155 | x 155ℓ        |
| R(D)QB63-30  | 15.5 | 90  | M8 x 90ℓ      |
| -40          |      | 100 | x 100ℓ        |
| -50          |      | 110 | x 110ℓ        |
| -75          |      | 135 | x 135ℓ        |
| -100         |      | 160 | x 160ℓ        |
| R(D)QB80-40  | 15   | 105 | M10 x 105ℓ    |
| -50          |      | 115 | x 115ℓ        |
| -75          |      | 140 | x 140ℓ        |
| -100         |      | 165 | x 165ℓ        |
| R(D)QB100-40 | 17.5 | 120 | M10 x 120ℓ    |
| -50          |      | 130 | x 130ℓ        |
| -75          |      | 155 | x 155ℓ        |
| -100         |      | 180 | x 180ℓ        |

# Series RQ

## Replacement Parts/Seal Kits

| Series | Bore size | Order number | Contents                                         |
|--------|-----------|--------------|--------------------------------------------------|
| RQ     | 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    |                                                  |

## Auto Switch Mounting Bracket Part Nos.

| 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)</li> <li>•Switch spacer</li> <li>•Switch mounting nut</li> </ul> | D-A7□, A80<br>D-A73C, A80C<br>D-A7□H, A80H<br>D-A79W | D-F7□, J79<br>D-F7□V<br>D-J79C<br>D-F7□W, J79W<br>D-F7□WV<br>D-F7BAL<br>D-F7BAVL<br>D-F7□F<br>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.)

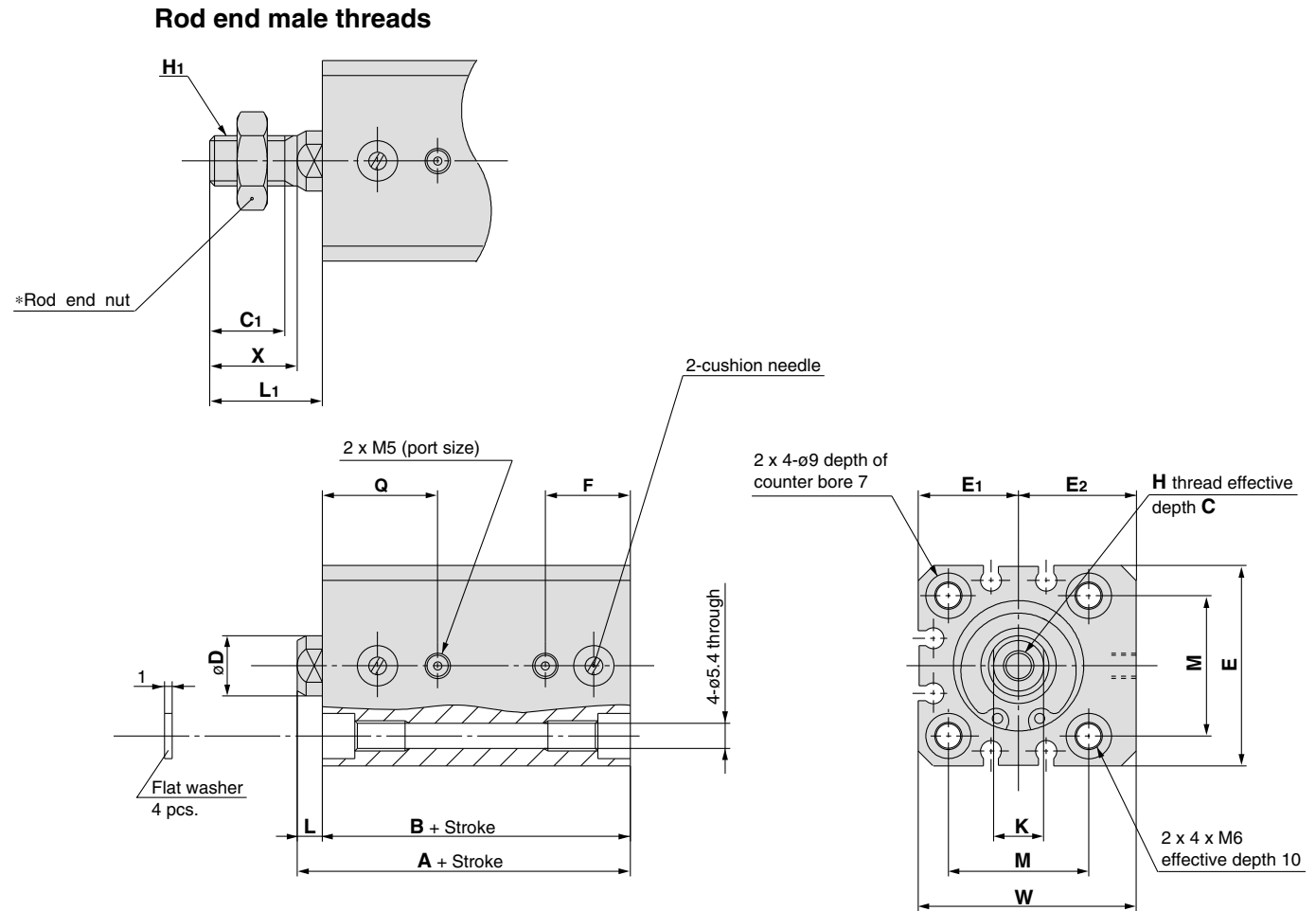
**BBA2:** For D-A7/A8/F7/J7

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.

## Dimensions/ $\phi 20$ , $\phi 25$

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

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



### Rod end male threads

| Bore size (mm) | C <sub>1</sub> | X    | H <sub>1</sub> | L <sub>1</sub> |
|----------------|----------------|------|----------------|----------------|
| 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 <sub>1</sub> | E <sub>2</sub> | 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.

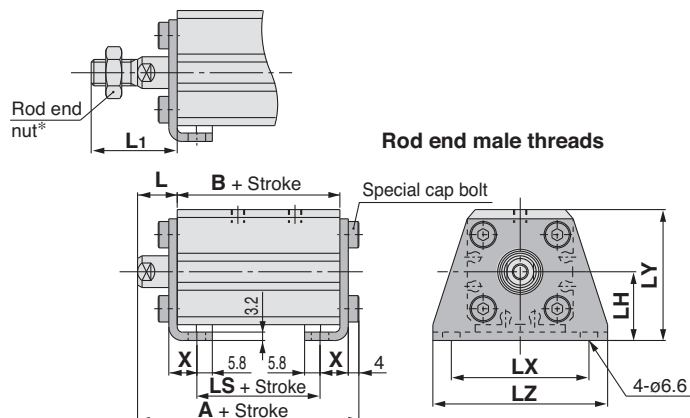


• Add the stroke to calculate the length of intermediate strokes.

# Series RQ

## Mounting Bracket Dimensions

### Foot type/RQL, RDQL



#### Foot type

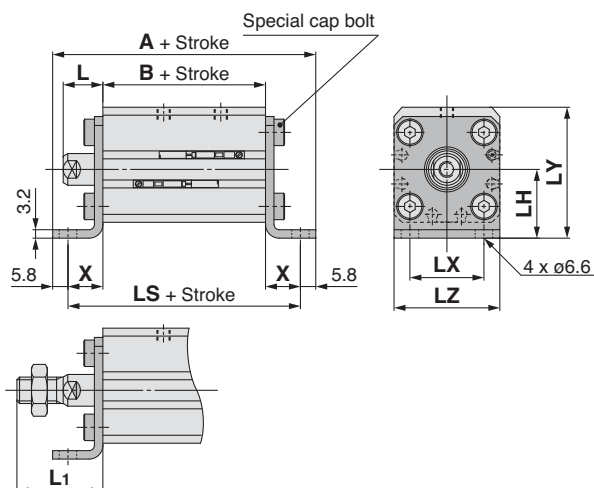
| Bore size (mm) | Stroke range (mm) | A    | LS   | L    | L1   |
|----------------|-------------------|------|------|------|------|
| 20             | 15 to 50          | 53.7 | 20   | 14.5 | 28.5 |
| 25             | 15 to 50          | 58.7 | 21.5 | 15   | 32.5 |

| 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

### Compact foot style: RQLC/RDQLC



#### Compact foot style

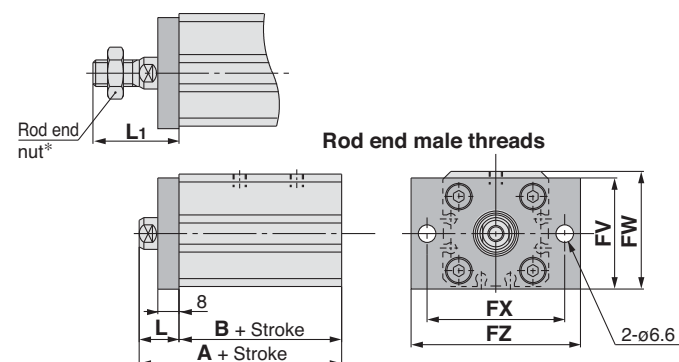
| Bore size (mm) | Stroke range (mm) | A    | B    | LS   | L    |
|----------------|-------------------|------|------|------|------|
| 20             | 15 to 50          | 70   | 32   | 58.4 | 14.5 |
| 25             | 15 to 50          | 74.5 | 36.5 | 62.9 | 15   |

| Bore size (mm) | L1   | LH | LX   | LY   | LZ | X    |
|----------------|------|----|------|------|----|------|
| 20             | 28.5 | 24 | 25.5 | 45   | 36 | 13.2 |
| 25             | 32.5 | 26 | 28   | 49.5 | 40 | 13.2 |

Foot bracket material: Carbon steel

Surface treatment: Zinc chromated

### 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.)

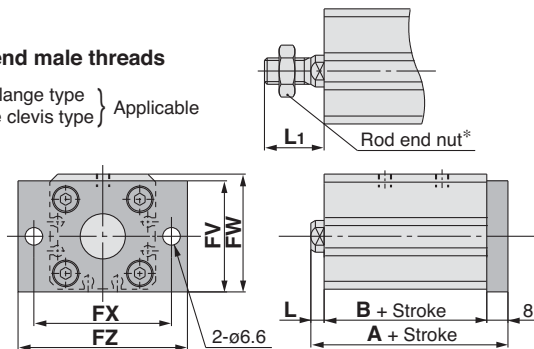
Flange material: Carbon steel

## Mounting Bracket Dimensions

### Rear flange type/RQG, RDQG

#### Rod end male threads

Rear flange type } Applicable  
Double clevis type }



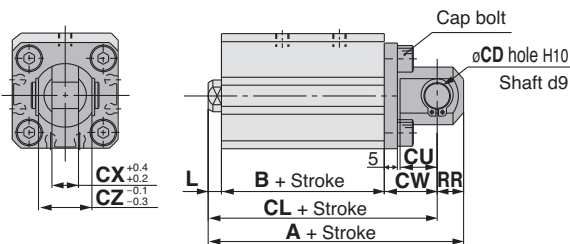
#### Rear flange type

| 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

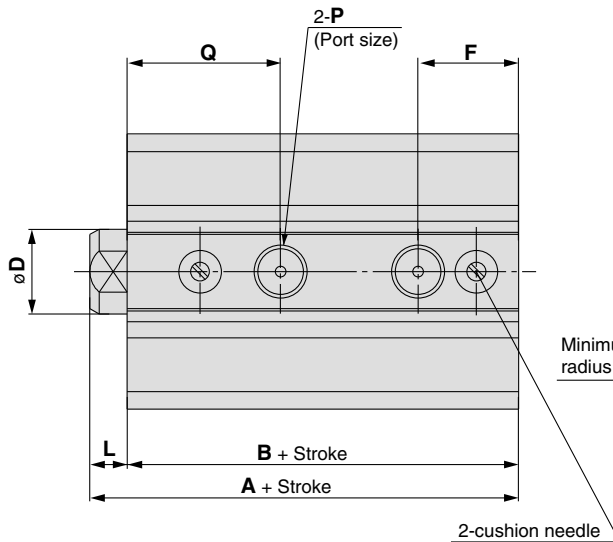
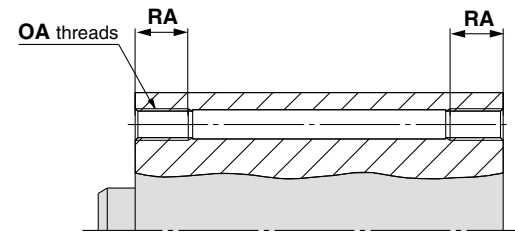
# Series RQ

## Dimensions/ø32, ø40, ø50

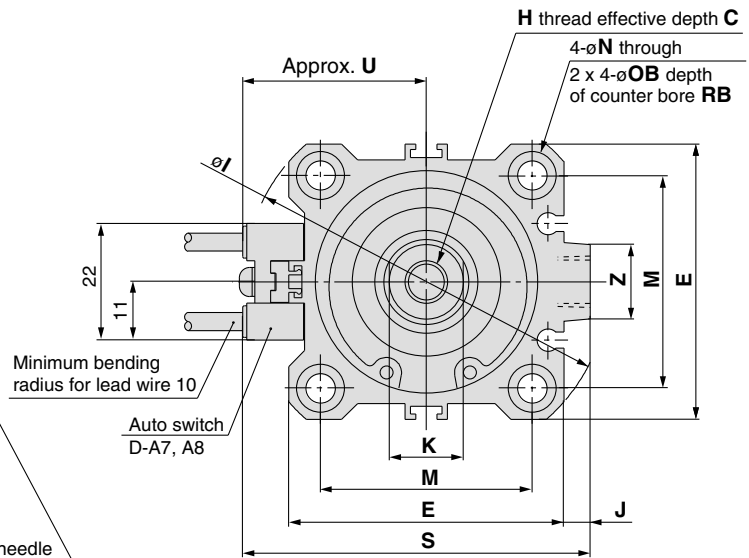
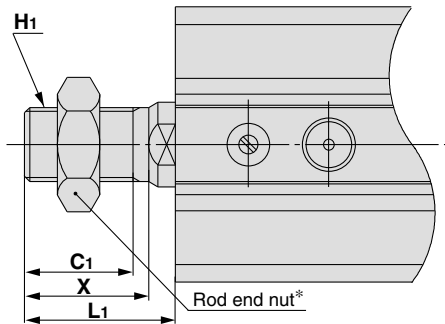
\*Refer to pages 13 and 14 for proper auto switch mounting positions and height.

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

### Double end tapped type: RQA, RDQA



#### Rod end male threads



#### Double end tapped

| Bore size (mm) | OA | RA |
|----------------|----|----|
| 32             | M6 | 10 |
| 40             | M6 | 10 |
| 50             | M8 | 14 |

#### 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 |

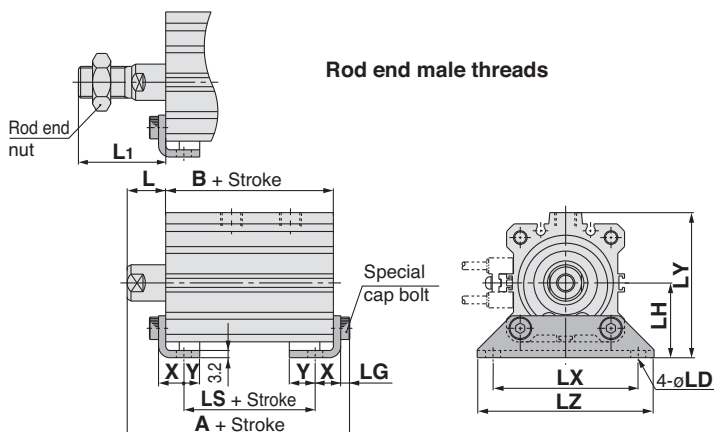
\*Refer to page 11 for details on rod end nut and accessories.



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

## Mounting Bracket Dimensions

### Foot type/RQL, RDQL



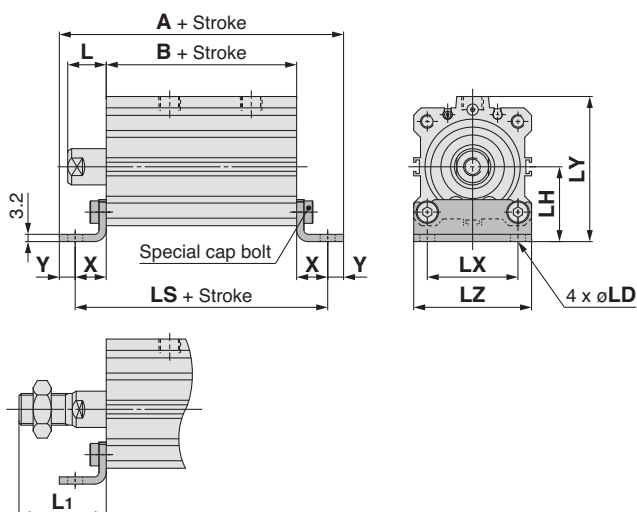
#### Foot type

| Bore size (mm) | Stroke range (mm) | A    | B    | LS   | L  | L <sub>1</sub> | 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

### Compact foot style: RQLC/RDQLC



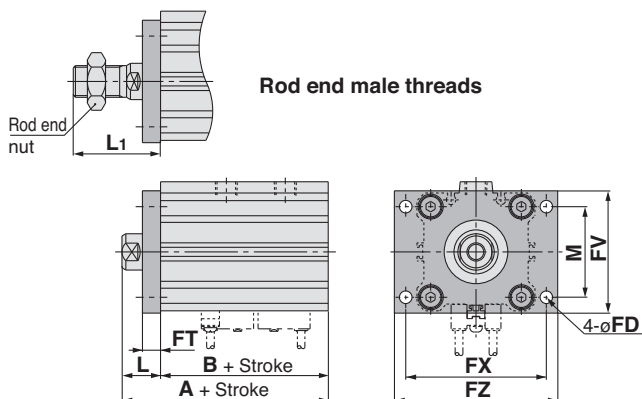
#### Compact foot style

| Bore size (mm) | Stroke range (mm) | A    | B    | LS   | L  | L <sub>1</sub> | LD  |
|----------------|-------------------|------|------|------|----|----------------|-----|
| 32             | 20 to 100         | 76   | 37   | 64.4 | 17 | 38.5           | 6.6 |
| 40             | 20 to 100         | 85.4 | 44   | 71.4 | 17 | 38.5           | 6.6 |
| 50             | 30 to 100         | 98.9 | 49.5 | 82.9 | 18 | 43.5           | 9   |

| Bore size (mm) | LH | LX | LY | LZ | X    | Y   |
|----------------|----|----|----|----|------|-----|
| 32             | 30 | 34 | 57 | 45 | 13.7 | 5.8 |
| 40             | 33 | 40 | 64 | 52 | 13.7 | 7   |
| 50             | 39 | 50 | 78 | 64 | 16.7 | 8   |

Foot bracket material: Carbon steel  
Surface treatment: Zinc chromated

### 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  | L <sub>1</sub> | M  |
|----------------|----|----|----|----------------|----|
| 32             | 56 | 65 | 17 | 38.5           | 34 |
| 40             | 62 | 72 | 17 | 38.5           | 40 |
| 50             | 76 | 89 | 18 | 43.5           | 50 |

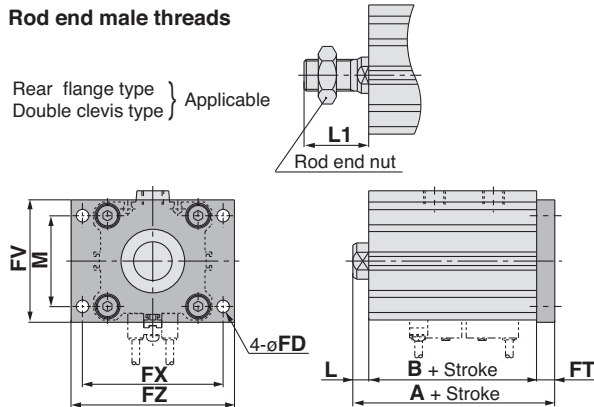
Flange material: Carbon steel

## Mounting Bracket Dimensions

### Rear flange type/RQG, RDQG

Rod end male threads

Rear flange type } Applicable  
Double clevis type }



### Rear flange type

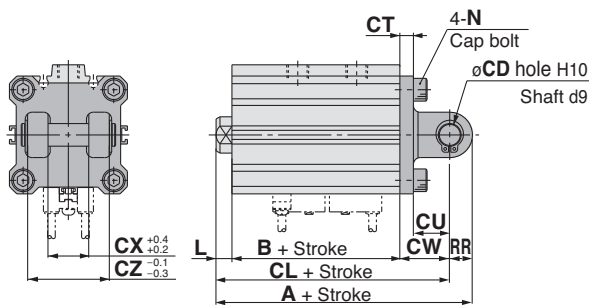
mm

| 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

mm

| 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 |

mm

| 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.

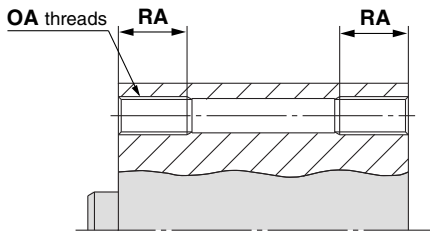
\*Clevis pins and snap rings are included in the package.

Double clevis bracket material: carbon steel

## Dimensions/ø63 to ø100

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

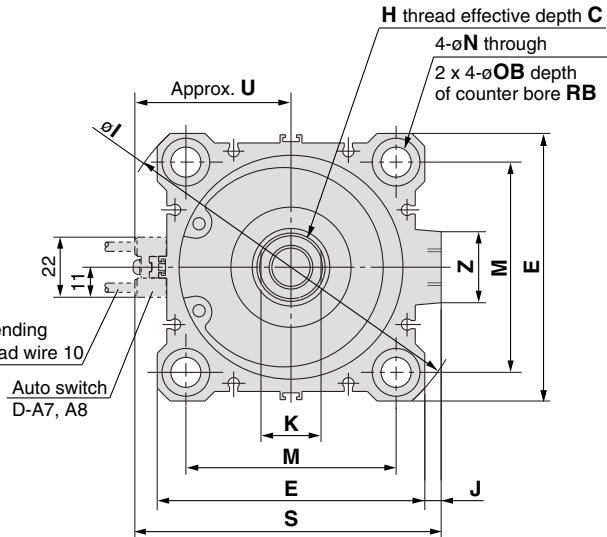
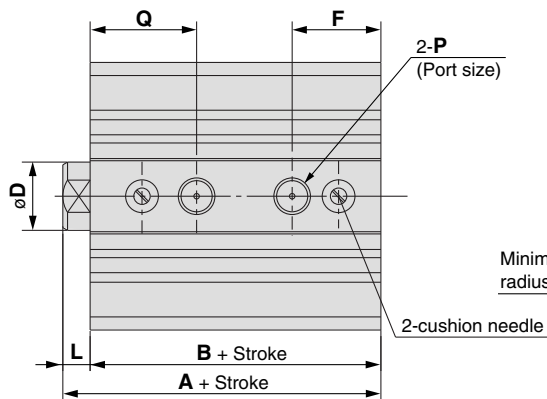
### Standard type (through hole type)



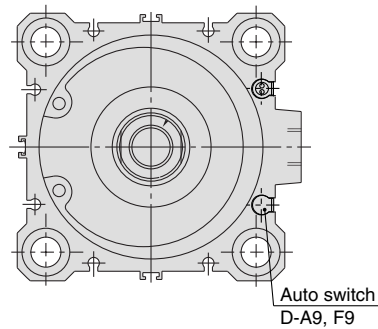
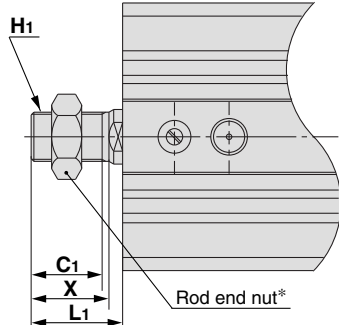
### Double end tapped type: RQA, RDQA

#### 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.

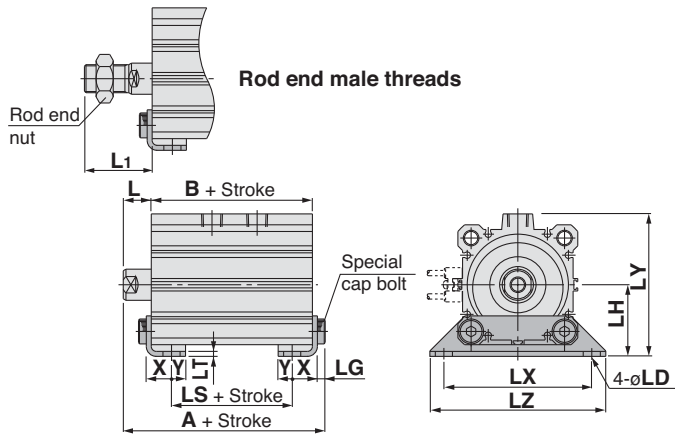


• Add the stroke to calculate the length of intermediate strokes.

# Series RQ

## Mounting Bracket Dimensions

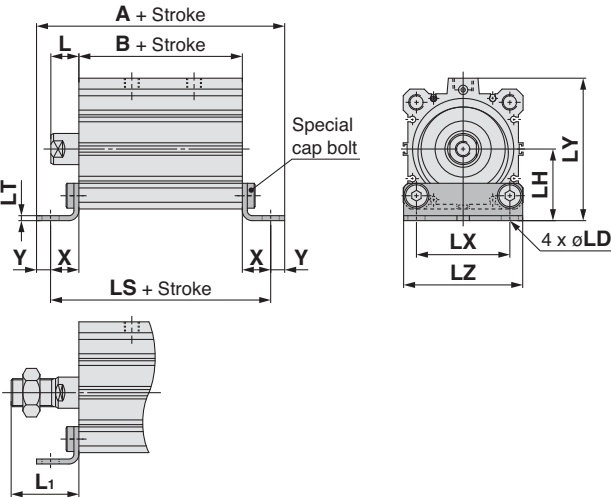
### Foot type/RQL, RDQL



| Foot type      |                   |      |      |      |    |      |    |    |    | mm  |
|----------------|-------------------|------|------|------|----|------|----|----|----|-----|
| 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<br>75, 100 | 95  | 91.5 | 113 | 16.2 | 9    |
| 80             | 10 to 50<br>75, 100 | 118 | 114  | 140 | 19.5 | 11   |
| 100            | 10 to 50<br>75, 100 | 137 | 136  | 162 | 23   | 12.5 |

### Compact foot style: RQLC/RDQLC

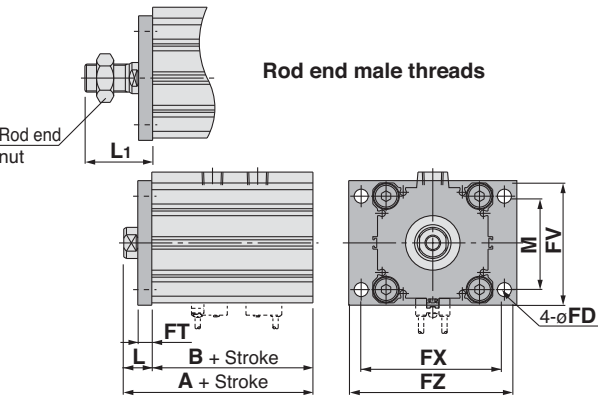


| Compact foot style |                   |       |      |       |    |                |    |    | mm  |
|--------------------|-------------------|-------|------|-------|----|----------------|----|----|-----|
| Bore size (mm)     | Stroke range (mm) | A     | B    | LS    | L  | L <sub>1</sub> | LD | LH | LT  |
| 63                 | 30 to 100         | 109.4 | 55   | 91.4  | 18 | 43.5           | 11 | 46 | 3.2 |
| 80                 | 40 to 100         | 130.5 | 63.5 | 108.5 | 20 | 53.5           | 13 | 59 | 4.5 |
| 100                | 40 to 100         | 149   | 76   | 124   | 22 | 53.5           | 13 | 71 | 6   |

| Bore size (mm) | LX | LY   | LZ  | X    | Y    |
|----------------|----|------|-----|------|------|
| 63             | 60 | 91.5 | 77  | 18.2 | 9    |
| 80             | 77 | 114  | 98  | 22.5 | 11   |
| 100            | 94 | 136  | 117 | 24   | 12.5 |

Foot bracket material: Carbon steel  
Surface treatment: Zinc chromated

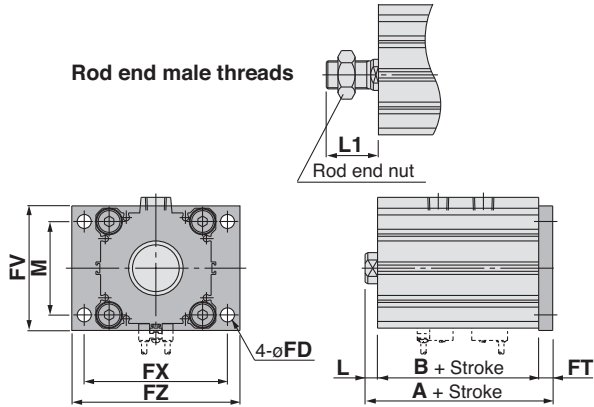
### Front flange type/RQF, RDQF



| Front flange type |                      |      |      |    |    |     |     |     |    |      | mm |
|-------------------|----------------------|------|------|----|----|-----|-----|-----|----|------|----|
| Bore size<br>(mm) | Stroke range<br>(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 |

## Mounting Bracket Dimensions

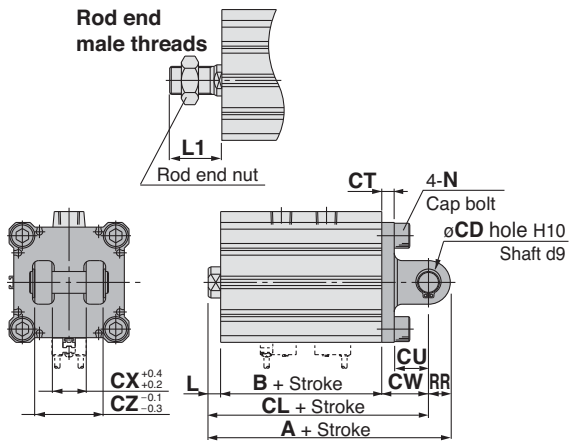
### Rear flange type/RQG, RDQG



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/RQD, RDQD



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<br>75, 100 | 33.5 | M10 | 14 |
| 80             | 10 to 50<br>75, 100 | 43.5 | M12 | 18 |
| 100            | 10 to 50<br>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.

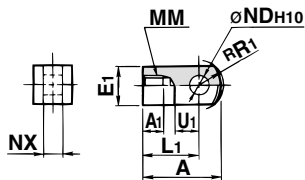
# Series RQ

## Accessories

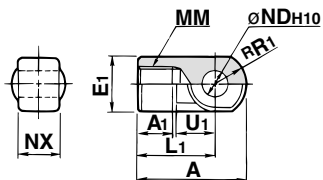
### Single Knuckle Joint

For I-G02, I-G03

For I-G04, I-G05



Material: Carbon steel



Material: Cast iron

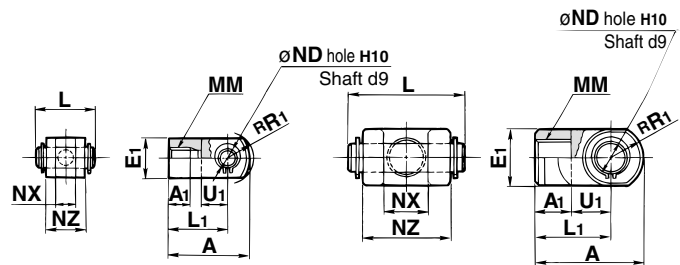
| Part no. | Applicable bore size (mm) | A  | A1   | E1  | L1 | MM         | R <sub>R1</sub> | U1   | ND                                | NX                                 |
|----------|---------------------------|----|------|-----|----|------------|-----------------|------|-----------------------------------|------------------------------------|
| 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>-0.4</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>-0.4</sub> |
| I-G04    | 32, 40                    | 42 | 14   | ø22 | 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   | ø28 | 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   | ø38 | 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   | ø44 | 55 | M26 x 1.5  | 24              | 31   | 22 <sup>+0.084</sup> <sub>0</sub> | 32 <sup>-0.3</sup> <sub>-0.5</sub> |

mm

### Double Knuckle Joint

For Y-G02, Y-G03

For Y-G04, Y-G05



Material: Carbon steel

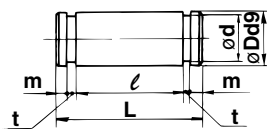
Material: Cast iron

| Part no. | Applicable bore size (mm) | A  | A1   | E1  | L1 | MM         | R <sub>R1</sub> | 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   | ø22 | 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   | ø28 | 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   | ø38 | 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   | ø44 | 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             |

mm

\*Knuckle pin and snap ring are included.

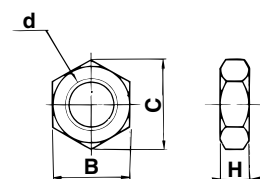
### Knuckle Pin (common with double clevis pin)



Material: Carbon steel  
mm

| Part no. | Applicable bore size (mm) | D                                      | L    | d    | ℓ    | m    | t    | Snap ring          |
|----------|---------------------------|----------------------------------------|------|------|------|------|------|--------------------|
| IY-G02   | 20                        | 8 <sup>-0.040</sup> <sub>-0.076</sub>  | 21   | 7.6  | 16.2 | 1.5  | 0.9  | C8 type for pivot  |
| IY-G03   | 25                        | 10 <sup>-0.040</sup> <sub>-0.076</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>-0.076</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>-0.093</sub> | 50.6 | 13.4 | 44.2 | 2.05 | 1.15 | C14 type for pivot |
| IY-G08   | 80                        | 18 <sup>-0.050</sup> <sub>-0.093</sub> | 64   | 17   | 56.2 | 2.55 | 1.35 | C18 type for pivot |
| IY-G10   | 100                       | 22 <sup>-0.065</sup> <sub>-0.117</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



### Joint and mounting bracket (A type, B type) part no.

**YA** — **03**

• **Mounting bracket**

|           |                         |
|-----------|-------------------------|
| <b>YA</b> | A type mounting bracket |
| <b>YB</b> | B type mounting bracket |
| <b>YU</b> | Joint                   |

• **Applicable air cylinder bore size**

|           |          |
|-----------|----------|
| <b>03</b> | ø32, ø40 |
| <b>05</b> | ø50, ø63 |
| <b>08</b> | ø80      |
| <b>10</b> | ø100     |

### Allowable eccentricity

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

<Ordering method>

- Joints are not included with A type and B type mounting brackets. Order them separately.

(Example)

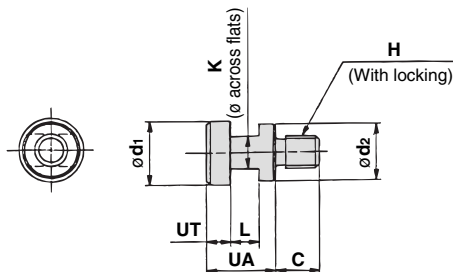
Bore size ø40 Part number

• A type mounting bracket ..... YA-03

• Joint ..... YU-03

### Joint part no.

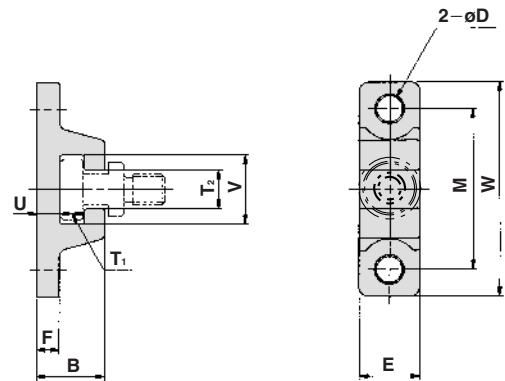
| Bore size (mm) | Joint | Applicable mounting bracket |                         | Weight (g) |
|----------------|-------|-----------------------------|-------------------------|------------|
|                |       | A type mounting bracket     | B type mounting bracket |            |
| 32, 40         | 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        |

### A type mounting bracket

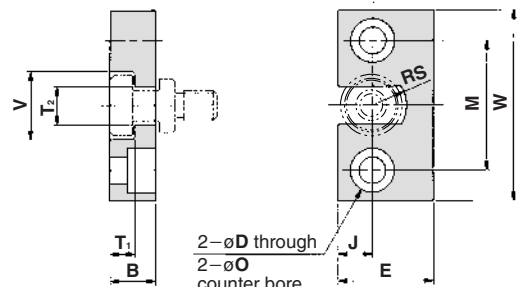


Material: Chrome molybdenum steel (nickel plated)  
mm

| Part no. | Bore size (mm) | B  | D   | E  | F  | M  | T1   | T2 |
|----------|----------------|----|-----|----|----|----|------|----|
| YA-03    | 32, 40         | 18 | 6.8 | 16 | 6  | 42 | 6.5  | 10 |
| YA-05    | 50, 63         | 20 | 9   | 20 | 8  | 50 | 6.5  | 12 |
| YA-08    | 80             | 26 | 11  | 25 | 10 | 62 | 8.5  | 16 |
| YA-10    | 100            | 31 | 14  | 30 | 12 | 76 | 10.5 | 18 |

| Part no. | Bore size (mm) | U  | V  | W   | Weight (g) |
|----------|----------------|----|----|-----|------------|
| YA-03    | 32, 40         | 6  | 18 | 56  | 55         |
| YA-05    | 50, 63         | 8  | 22 | 67  | 100        |
| YA-08    | 80             | 10 | 28 | 83  | 195        |
| YA-10    | 100            | 12 | 36 | 100 | 340        |

### B type mounting bracket



Material: Carbon steel (nickel plated)  
mm

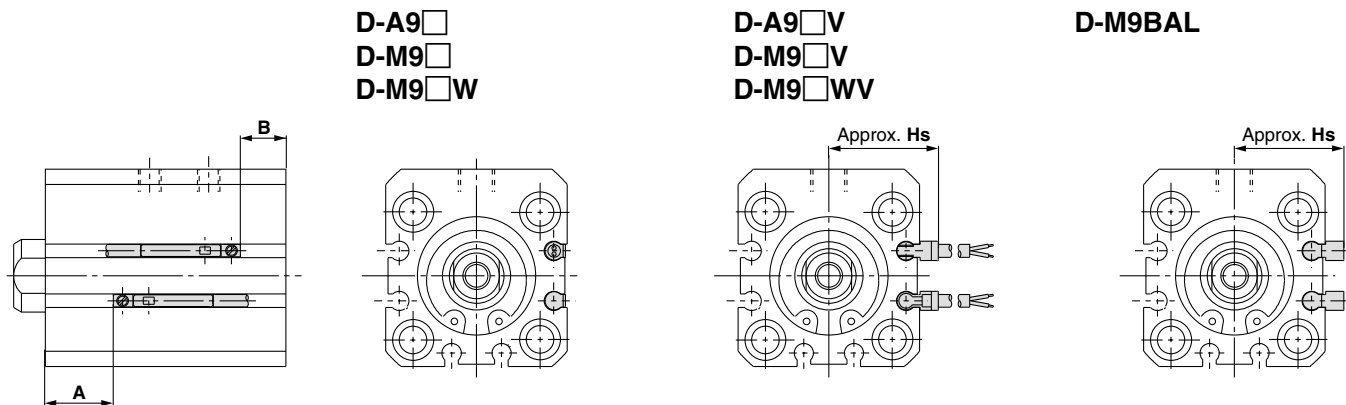
| Part no. | Bore size (mm) | B  | D  | E  | J  | M  | O              |
|----------|----------------|----|----|----|----|----|----------------|
| YB-03    | 32, 40         | 12 | 7  | 25 | 9  | 34 | 11.5 depth 7.5 |
| YB-05    | 50, 63         | 12 | 9  | 32 | 11 | 42 | 14.5 depth 8.5 |
| YB-08    | 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 | 9  | 80         |
| YB-05    | 50, 63         | 6.5  | 12 | 22 | 60 | 11 | 120        |
| YB-08    | 80             | 8.5  | 16 | 28 | 75 | 14 | 230        |
| YB-10    | 100            | 10.5 | 18 | 36 | 90 | 18 | 455        |

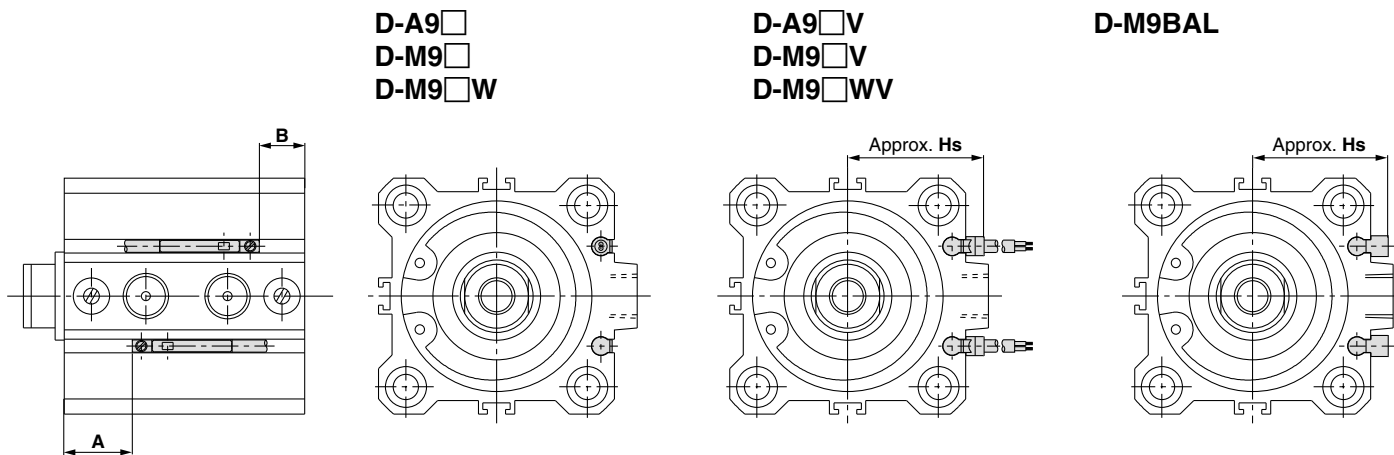
## Series RQ

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

**Ø20, Ø25**



**Ø32 to Ø100**



### Proper auto switch mounting positions

| Bore size<br>(mm) | <b>D-A9</b><br><b>D-A9</b> |          | <b>D-M9</b><br><b>D-M9</b><br><b>D-M9</b><br><b>D-M9</b> |          | <b>D-M9BAL</b> |          |
|-------------------|----------------------------|----------|----------------------------------------------------------|----------|----------------|----------|
|                   | <b>A</b>                   | <b>B</b> | <b>A</b>                                                 | <b>B</b> | <b>A</b>       | <b>B</b> |
| <b>20</b>         | 9.5                        | 3        | 13.5                                                     | 7        | 12.5           | 6        |
| <b>25</b>         | 11                         | 5.5      | 15                                                       | 9.5      | 14             | 8.5      |
| <b>32</b>         | 12.5                       | 4.5      | 16.5                                                     | 8.5      | 15.5           | 7.5      |
| <b>40</b>         | 17                         | 7        | 21                                                       | 11       | 20             | 10       |
| <b>50</b>         | 17                         | 12.5     | 21                                                       | 16.5     | 20             | 15.5     |
| <b>63</b>         | 19.5                       | 15.5     | 23.5                                                     | 19.5     | 22.5           | 18.5     |
| <b>80</b>         | 24.5                       | 19       | 28.5                                                     | 23       | 27.5           | 22       |
| <b>100</b>        | 31                         | 25       | 35                                                       | 29       | 34             | 28       |

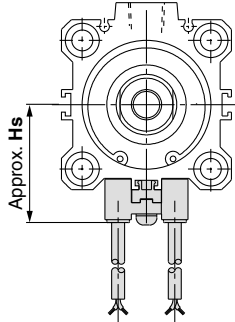
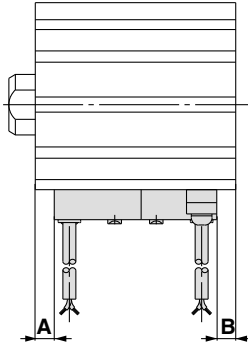
**Auto switch mounting height** mm

| Bore size<br>(mm) | D-A9□V | D-M9□V<br>D-M9□WV | D-M9BAL |
|-------------------|--------|-------------------|---------|
|                   | 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    |

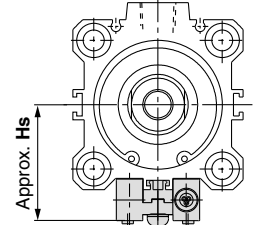
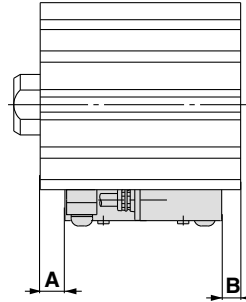
## Auto Switches/Proper Mounting Positions and Height for Stroke End Detection

ø32 to ø100

D-A7□  
D-A80

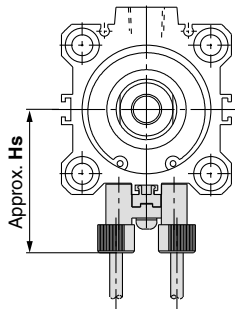
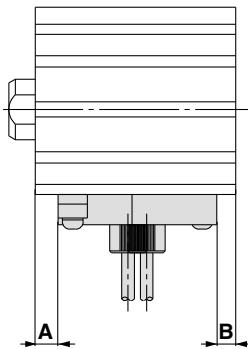


D-A7□H  
D-A80H  
D-F7□  
D-J79  
D-F7□W  
D-J79W  
D-F7□F  
D-F7NTL  
D-F7BAL

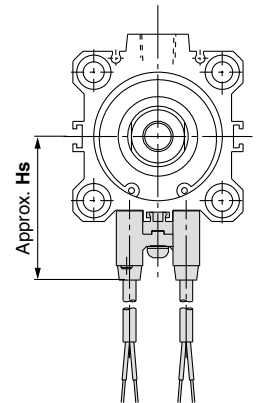
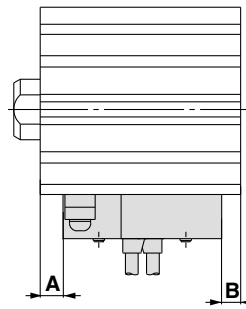


ø32 to ø100

D-A73C  
D-A80C  
D-J79C



D-A79W  
D-F7□V  
D-F7□WV  
D-F7BAVL



Proper auto switch mounting position

mm

| Bore size<br>(mm) | D-A7□, A80 |      | D-A7□H, A80H<br>D-A73C, A80C<br>D-F7□, F7□V<br>D-F79F, J79<br>D-J79C, F7□W<br>D-F7□WV, J79W<br>D-F7BAL, F7BAVL |      | D-A79W |      | D-F7LF |      | D-F7NTL |      |
|-------------------|------------|------|----------------------------------------------------------------------------------------------------------------|------|--------|------|--------|------|---------|------|
|                   | A          | B    | A                                                                                                              | B    | A      | B    | A      | B    | A       | B    |
| 20                | —          | —    | —                                                                                                              | —    | —      | —    | —      | —    | —       | —    |
| 25                | —          | —    | —                                                                                                              | —    | —      | —    | —      | —    | —       | —    |
| 32                | 13.5       | 5.5  | 14                                                                                                             | 6    | 11     | 3    | 18     | 10   | 19      | 11   |
| 40                | 18         | 8    | 18.5                                                                                                           | 8.5  | 15.5   | 5.5  | 22.5   | 12.5 | 23.5    | 13.5 |
| 50                | 18         | 13.5 | 18.5                                                                                                           | 14   | 15.5   | 11   | 22.5   | 18   | 23.5    | 19   |
| 63                | 20.5       | 16.5 | 21                                                                                                             | 17   | 18     | 14   | 25     | 21   | 26      | 22   |
| 80                | 25.5       | 20   | 26                                                                                                             | 20.5 | 23     | 17.5 | 30     | 24.5 | 31      | 25.5 |
| 100               | 32         | 26   | 32.5                                                                                                           | 26.5 | 29.5   | 23.5 | 36.5   | 30.5 | 37.5    | 31.5 |

Auto switch mounting height

mm

| Bore size<br>(mm) | D-A7□<br>D-A80 | D-A7□H<br>D-A80H<br>D-F7□<br>D-J79<br>D-F7□W | D-J79W<br>D-F7BAL<br>D-F7□F<br>D-F7NTL | D-A73C<br>D-A80C | D-F7□V<br>D-F7□WV<br>D-F7BAVL | D-J79C | D-A79W |
|-------------------|----------------|----------------------------------------------|----------------------------------------|------------------|-------------------------------|--------|--------|
|                   | Hs             | Hs                                           | Hs                                     | 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     | —      |

## Operation Range

| Switch model                                                                   | Bore size<br>mm |    |     |     |     |      |     |      |
|--------------------------------------------------------------------------------|-----------------|----|-----|-----|-----|------|-----|------|
|                                                                                | 20              | 25 | 32  | 40  | 50  | 63   | 80  | 100  |
| D-A7□, A80<br>D-A7□H, A80H<br>D-A73C, A80C                                     | 12              | 12 | 12  | 11  | 10  | 12   | 12  | 13   |
| D-A79W                                                                         | 13              | 13 | 13  | 14  | 14  | 16   | 15  | 17   |
| D-A9□, A9□V                                                                    | —               | —  | 9.5 | 9.5 | 9.5 | 11.5 | 9   | 11.5 |
| D-F7□, F7□V<br>D-J79, J79C, J79W<br>D-F7□W, F7□WV<br>D-F79F, F7BAL<br>D-F7BAVL | 5.5             | 5  | 6   | 6   | 6   | 6.5  | 6.5 | 7    |
| D-F7LF                                                                         | 7               | 7  | 8   | 7   | 8   | 8.5  | 8   | 9    |
| D-M9□, M9□V<br>D-M9□W, M9□WV<br>D-M9BAL                                        | —               | —  | 5.5 | 5.5 | 5.5 | 6.5  | 5.5 | 6.5  |

\*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          | D-A80    | Grommet (perpendicular)   | Without indicator light | ø32 to ø100          |
|                      | D-A80H   | Grommet (in-line)         |                         |                      |
|                      | D-A80C   | Connector (perpendicular) |                         | ø20 to ø100          |
|                      | D-A90    | Grommet (in-line)         |                         |                      |
| Solid state (switch) | D-A90V   | Grommet (perpendicular)   | With timer              | ø32 to ø100          |
|                      | D-F7NTL  | Grommet (in-line)         |                         |                      |

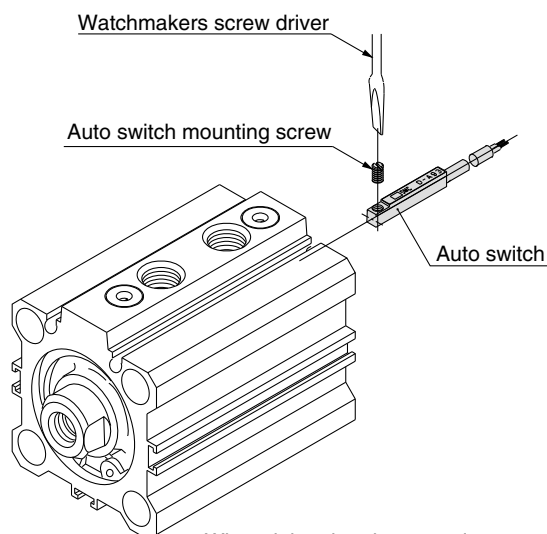
\*D-F7NTL is also available with prewire connector.

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

## Auto switch mounting

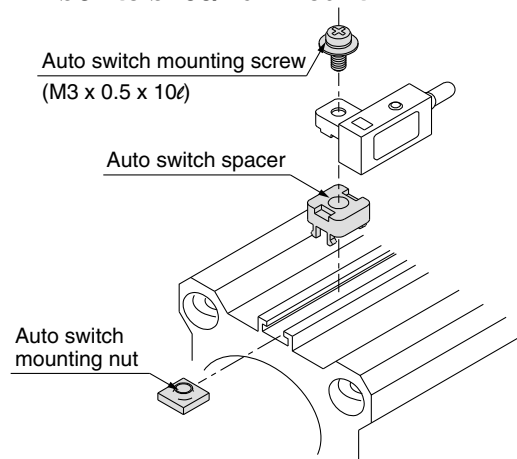
Follow the procedures below to mount auto switches.

### ø20 to ø100/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.

### ø32 to ø100/Rail mount



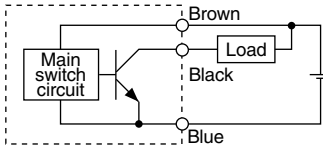
- Use a tightening torque of 0.5 to 0.7 N·m for auto switch mounting screws.

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

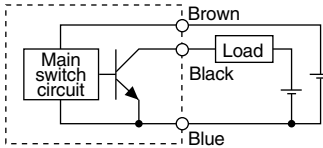
# Series RQ Auto Switch Connections and Examples

## Basic Wiring

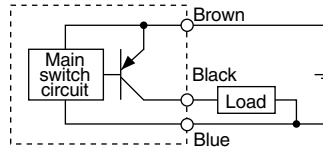
### Solid state 3-wire, NPN



(Power supplies for switch and load are separate.)

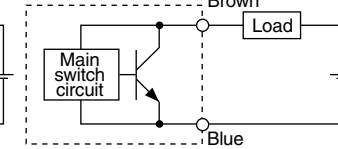


### Solid state 3-wire, PNP



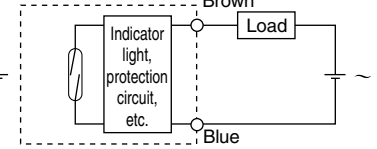
### 2-wire

#### <Solid state>



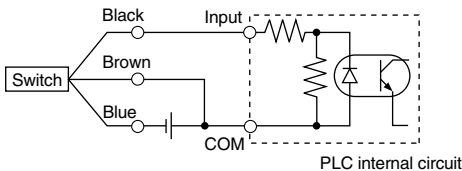
### 2-wire

#### <Reed switch>

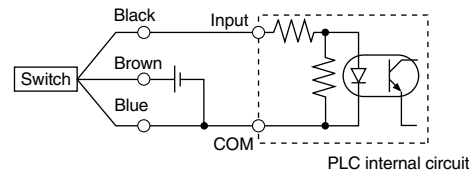


## Examples of Connection to PLC

### Sink input specifications 3-wire, NPN

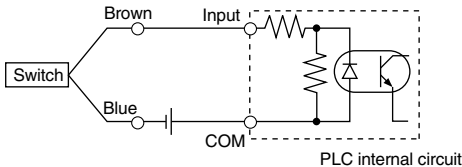


### Source input specifications 3-wire, PNP

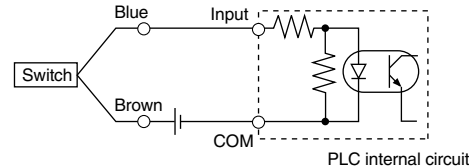


Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

### 2-wire



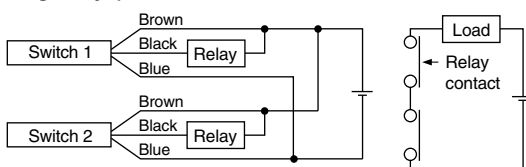
### 2-wire



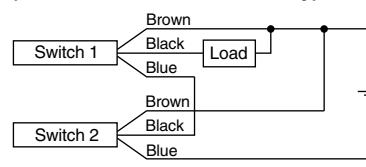
## Connection Examples for AND (Series) and OR (Parallel)

### 3-wire

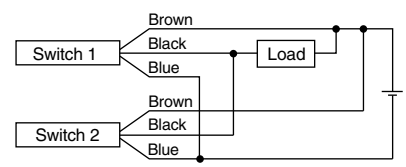
#### AND connection for NPN output (Using relays)



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

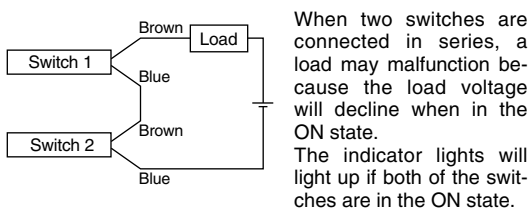


#### OR connection for NPN output



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

### 2-wire with 2 switch AND connection

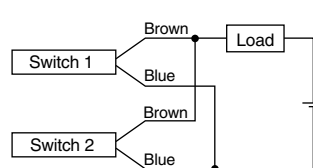


When two switches are connected in series, a load may malfunction because the load voltage will decline when in the ON state. The indicator lights will light up if both of the switches are in the ON state.

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

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.

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

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

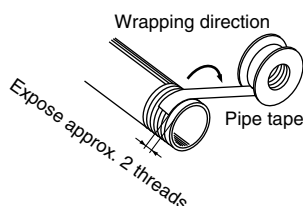
##### 1. Preparation before piping

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.

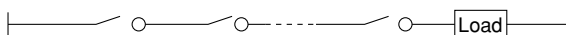
##### <Reed switches>

- 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.

$$\text{Operating current of load (OFF condition)} > \text{Leakage current}$$

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-M9BAL 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 ( $300\text{m/s}^2$  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

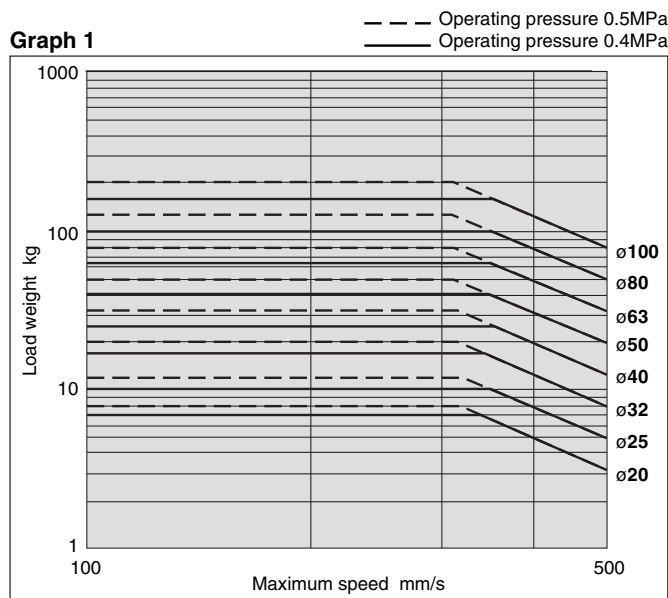
1. Use appropriate pliers (C type snap ring installing tool) for installation and removal.
2. Even when using appropriate pliers (C type snap ring installing tool), proceed with caution as there is a danger of the snap ring flying off the end of the pliers (C type snap ring installing tool) and causing 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.

Table 1. Allowable kinetic energy at piston impact

Unit: [J]

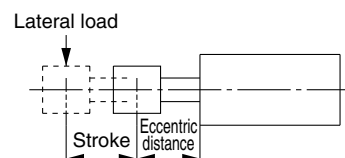
|                          | 20            | 25   | 32   | 40   | 50   | 63   | 80   | 100  |
|--------------------------|---------------|------|------|------|------|------|------|------|
| Piston speed             | 50 to 500mm/s |      |      |      |      |      |      |      |
| Allowable kinetic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

### Selection

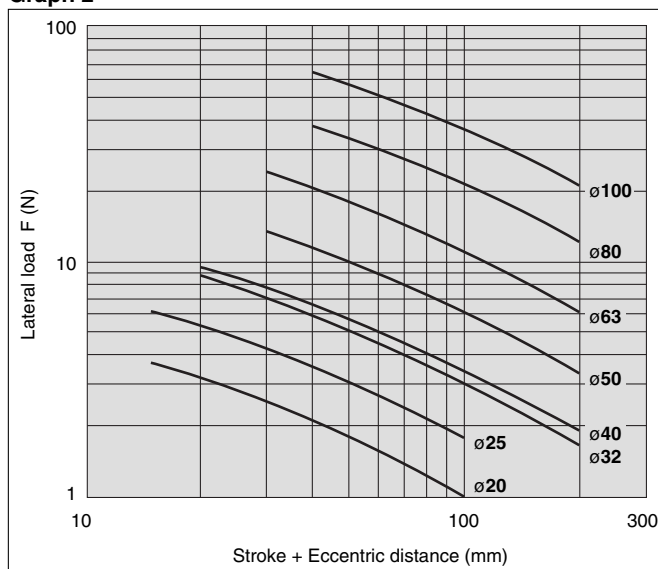
#### ⚠ Caution

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.



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