

# Heavy Duty Metric Hydraulic Cylinder

140H-8

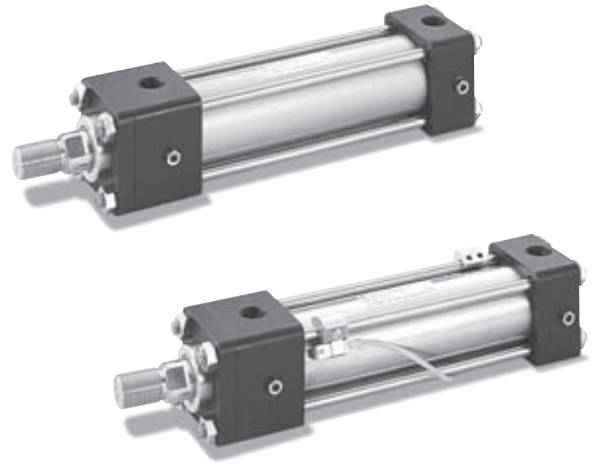
JIS

Catalog HY08-T1151-1/NA



## High-performance cushion built in hydraulic cylinders

- Double acting hydraulic cylinders for 14 MPa with bore from 32 mm to 125 mm.
- High-performance cushion reduces a shock at stroke-end.
- Newly designed cushion valve allows easy cushion adjustment.
- The drop prevention mechanism and looseness preventive lock nut have been adopted as safety measures for the cushion valve.
- Wide variety of new-type small sensors for better maintainability.



In line with our policy of continuing product improvement, specifications and information contained in this catalog are subject to change.

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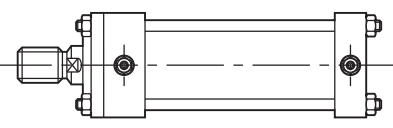
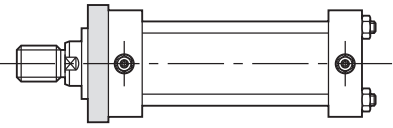
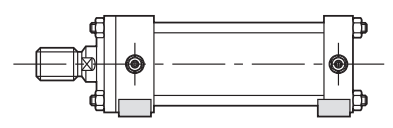
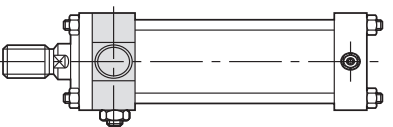
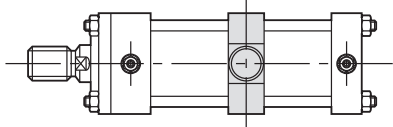
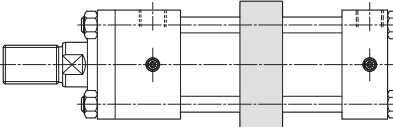
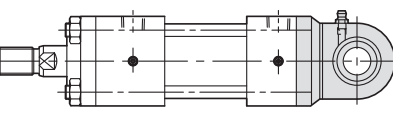
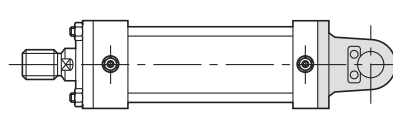
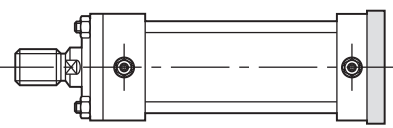
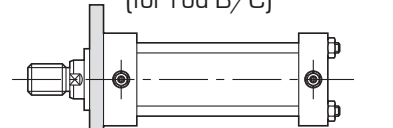
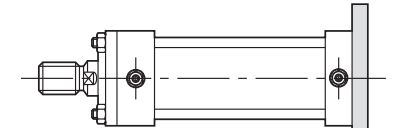
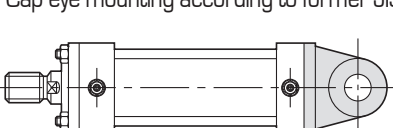
### Offer of Sale

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**Available Mountings and Where To Find Them**

|  |  |   |
|--|--|---|
| <p>SD style (basic style)</p>  <p>Page 9</p>                            | <p>FY style (rod rectangular flange)<br/>FE style (for rod A)</p>  <p>Pages 10 &amp; 11</p> | <p>LA style (side lugs)</p>  <p>Page 12</p>  |
| <p>TA style (rod trunnion)</p>  <p>Page 13</p>                        | <p>TC style (intermediate trunnion)</p>  <p>Page 14</p>                                   | <p>FK style (intermediate flange)</p>  <p>Page 15</p>                                  |
| <p>CS style (cap eye with spherical bearing)</p>  <p>Page 16</p>      | <p>CB style (cap clevis)</p>  <p>Page 17</p>  | <p>FZ style (cap rectangular flange)</p>  <p>Page 18</p>                               |
| <p>FC style (rod square flange)<br/>(for rod B/C)</p>  <p>Page 19</p> | <p>FD style (cap square flange)</p>  <p>Page 20</p>                                       | <p>CA style (cap eye)<br/>Cap eye mounting according to former JIS</p>  <p>Page 21</p> |

| Type  | Specifications   |
|---|--|
| Nominal pressure                                | 14 MPa   |
| Maximum allowable pressure                      | Cap side : 18 MPa<br>Rod side : (A) 18 MPa<br>(B) 18 MPa<br>(C) 14 MPa   |
| Proof test pressure                             | 21 MPa   |
| Minimum operating pressure                      | Cap side : 0.3 MPa or less<br>Rod side : (A) 0.6 MPa or less<br>(B) 0.45 MPa or less<br>(C) 0.4 MPa or less  |
| Working speed range                             | φ32 to φ63 : 8 to 400mm/s φ80 to φ125 : 8 to 300mm/s   |
| Working temperature range (ambient temperature) | Standard type ..... -10°C/14°F to +80°C/176°F (Notes)<br>Switch Set AX type ..... -10°C/14°F to +70°C/158°F  |
| Cushioning                                      | Metal to Metal   |
| Adaptable fluid                                 | Petroleum-based fluid<br>(When using another fluid, refer to the table of fluid adaptability.)   |
| Tolerance for thread                            | JIS 6g/6H  |
| Tolerance of stroke                             | 0 to 100mm <sup>+0.8</sup> <sub>0</sub> 101 to 250mm <sup>+1.0</sup> <sub>0</sub> 251 to 630mm <sup>+1.25</sup> <sub>0</sub><br>631 to 1000mm <sup>+1.4</sup> <sub>0</sub> 1001 to 1600mm <sup>+1.6</sup> <sub>0</sub> 1601 to 2000mm <sup>+1.8</sup> <sub>0</sub> |
| Tube material                                   | Standard type ..... ● Carbon steel for machine structural use<br>Switch Set ..... ● Stainless steel  |
| Mounting style                                  | SD • LA • FD • FE • FK • FY • FC<br>FZ • CA • CB • CD • TA • TC  |
| Accessories                                     | ● Rod eye (T-end), rod eye with spherical bearing (S-end), rod clevis (Y-end) with pin, lock nut<br><br>● Boots : Only general purpose type<br>Standard : Neoprene coated nylon<br>Semi-standard : Gortite, Hi-temp  |

**Nominal pressure**

Pressure given to a cylinder for convenience of naming.

It is not always the same as the working pressure (rated pressure) that guarantees performance under the specified conditions.

**Maximum allowable pressure**

The maximum allowable pressure generated in a cylinder. (surge pressure, etc.)

**Proof test pressure**

Test pressure against which a cylinder can withstand without unreliable performance at the return to nominal pressure.

**Minimum operating pressure**

The minimum pressure that a cylinder placed horizontally without a load can work.

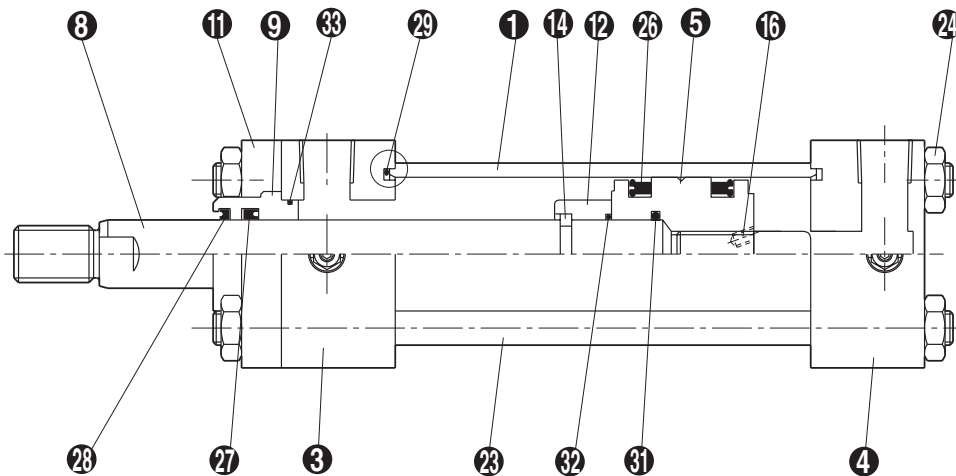
**Notes)**

- The hydraulic pressure generated in a cylinder due to the inertia of load must be lower than the maximum allowable pressure.
- The selection of packing material depends upon the working temperature range. For details, refer to page 33.
- The standard type cylinders can be used up to the working temperature range shown in the selection materials by using seal material ⑥, HNBR.
- In case that the lock nut is attached to the piston rod end thread part, increase the thread length (dimension A).
- The FE style in the mounting style column can be used only for the rod A.
- For the internal structure, refer to the sectional drawings at the end of this catalog.

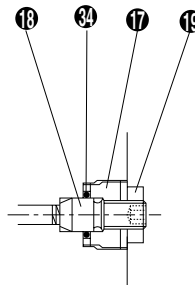
**Design Features**

**14 MPa Double Acting Hydraulic Cylinder**

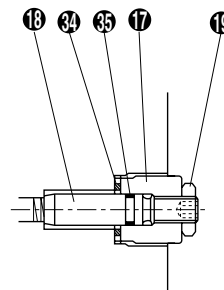
Double acting single rod / Standard type (Rods A, B and C)



Cushion valve  
Bore Ø32 to Ø100



Cushion valve  
Bore Ø125



| No. | Name                     | Material  | Qty. |
|-----|--------------------------|---|------|
| 1   | Cylinder tube            | Carbon steel for machine structural use (Ø32 to Ø80)  | 1    |
| 3   | Rod cover                | Carbon steel for machine structural use (Ø32 to Ø80)<br>Rolled steel for general structure (Ø100 to Ø125) | 1    |
| 4   | Cap cover                | Carbon steel for machine structural use (Ø32 to Ø80)<br>Rolled steel for general structure (Ø100 to Ø125) | 1    |
| 5   | Piston                   | Grey cast iron  | 1    |
| 8   | Piston rod               | Carbon steel for machine structural use   | 1    |
| 9   | Bush                     | Copper alloy  | 1    |
| 11  | Retainer                 | Carbon steel for machine structural use (Ø32 to Ø80)<br>Rolled steel for general structure (Ø100 to Ø125) | 1    |
| 12  | Cushion ring             | Cast iron   | 1    |
| 14  | Stop ring                | Carbon steel for machine structural use (Ø32 to Ø125)   | (1)  |
| 15  | Set screw                | Chrome molybdenum steel   | 1    |
| 17  | Cushion plug             | Carbon steel for machine structural use   | 2    |
| 18  | Cushion valve            | Chrome molybdenum steel   | 2    |
| 19  | Cushion lock nut         | Rolled steel for general structure  | 2    |
| 20  | Check plug               | Carbon steel for machine structural use   | 4    |
| 22  | Check ball               | High-carbon chromium bearing steel  | 4    |
| 23  | Tie rod                  | Chrome molybdenum steel   | 4    |
| 24  | Tie rod nut (2 kinds)    | Carbon steel for machine structural use   | 8    |
| 26  | Piston packing           | Urethane rubber   | 2    |
| 27  | Rod packing              | Urethane rubber   | 1    |
| 28  | Dust wiper               | Urethane rubber   | 1    |
| 29  | Cover seal               | Nitrile rubber  | 2    |
| 33  | O-ring for bush          | Nitrile rubber  | 1    |
| 34  | Valve seal               | HNBR with metallic ring   | 2    |
| 35  | O-ring for cushion valve | HNBR  | 2    |

- The quantities shown in the table above are applicable to the type with both ends cushioned.
- The quantity of parts in parentheses may not be used depending on the bore and rod diameter.

**General Purpose Type**

The item enclosed by broken line needs not to be entered, if unnecessary.   Semi-standard specification

● Standard type    140H-8   2   LA   80   B   B   200 - Rc: A B

● Switch Set    140H-8R   2   LA   80   B   B   200 - Rc: A B AH 2 T L X

1 Type  
2 Seal material  
3 Mounting style  
4 Cylinder bore  
5 Rod type  
6 Cushioning  
7 Stroke  
8 Port position  
9 Cushion valve position  
10 Sensor symbol  
11 Sensor quantity  
12 Rod end attachment

● Standard type  
 ● Switch Set

A Rod A  
B Rod B  
C Rod C

None Rc thread  
G G thread (order made)  
N NPT thread (order made)

T T-end (Rod end eye)  
S S-end (Eye joint with spherical bearing)  
Y Y-end (Rod end clevis)

X Special rod end  
L - With lock nut

Sensor quantity (1, 2, to n)  
 ● Sensor symbol  
 1) Note) Select applicable sensors out of the Sensor List: AF, AG, AH, AJ & AE

**⚠ Notes on ordering Switch Set**  
 ● When no sensor is required, specify 0 for the sensor symbol **11** and the sensor quantity **12**.  
 ● Sensors are not mounted on cylinders at delivery.

Cushion valve position (A, B, C, D, O)  
 Port position (A, B, C, D)  
 Cylinder stroke (mm)

1 Nitrile rubber  
2 Urethane rubber  
3 Fluorocarbon  
6 HNBR  
8 Slipper seal (Ø32 to Ø100)

Notes) The material of Slipper seal is nitrile rubber except for the piston. Switch Set Cylinders are not provided with Slipper seals.

Mounting style  
 Rod A  
 \*Standard type : (Ø40 to Ø125)  
 Switch Set : (Ø40 to Ø125)  
 Rod B/C  
 \*Standard type : (Ø32 to Ø125)  
 Switch Set : (Ø32 to Ø125)

Note) The available minimum dia. of the rod C is  $\phi$  18.

B With cushions on both ends  
R With cushion on the rod side  
H With cushion on the cap side  
N No cushion

\* Larger bore sizes are available up to 250mm. Consult the manufacturer.  
 \* Double rod and boots options are also available.  
 1) For more sensor options, consult the manufacturer.

**Mounting Style Information**

**14 MPa Double Acting Hydraulic Cylinder**

| Mounting Styles: SD, LA, TC, FK ,CB, FZ, FD, CA, TA |     |     |     |         |      |    |    |    |
|---|-----|-----|-----|---------|------|----|----|----|
| Bore Ø  | Rod | A   | B   | KK      | MM Ø | S  | SL | VD |
| 32  | B   | 25  | 34  | M16x1.5 | 18   | 14 | 10 | 10 |
| 40  | A   | 35  | 43  | M24x1.5 | 28   | 24 | 14 | 17 |
|   | B   | 30  | 40  | M20x1.5 | 22.4 | 19 | 11 | 10 |
|   | C   | 25  | 36  | M16x1.5 | 18   | 14 | 10 | 10 |
| 50  | A   | 45  | 50  | M30x1.5 | 35.5 | 30 | 16 | 17 |
|   | B   | 35  | 46  | M24x1.5 | 28   | 24 | 14 | 10 |
|   | C   | 30  | 40  | M20x1.5 | 22.4 | 19 | 11 | 10 |
| 63  | A   | 60  | 65  | M39x1.5 | 45   | 41 | 20 | 19 |
|   | B   | 45  | 55  | M30x1.5 | 35.5 | 30 | 16 | 10 |
|   | C   | 35  | 46  | M24x1.5 | 28   | 24 | 14 | 10 |
| 80  | A   | 75  | 80  | M48x1.5 | 56   | 50 | 23 | 20 |
|   | B   | 60  | 65  | M39x1.5 | 45   | 41 | 20 | 10 |
|   | C   | 45  | 55  | M30x1.5 | 35.5 | 30 | 16 | 9  |
| 100   | A   | 95  | 95  | M64x2   | 71   | 65 | 27 | 23 |
|   | B   | 75  | 80  | M48x1.5 | 56   | 50 | 23 | 10 |
|   | C   | 60  | 65  | M39x1.5 | 45   | 41 | 20 | 10 |
| 125   | A   | 120 | 115 | M80x2   | 90   | 85 | 33 | 17 |
|   | B   | 95  | 95  | M64x2   | 71   | 65 | 27 | 10 |
|   | C   | 75  | 80  | M48x1.5 | 56   | 50 | 23 | 10 |

| Mounting Style: FE |     |     |     |         |      |    |    |    |
|--------------------|-----|-----|-----|---------|------|----|----|----|
| Bore Ø             | Rod | A   | B   | KK      | MM   | S  | SL | VD |
| 40                 | A   | 35  | 43  | M24x1.5 | 28   | 24 | 14 | 10 |
| 50                 | A   | 45  | 50  | M30x1.5 | 35.5 | 30 | 16 | 10 |
| 63                 | A   | 60  | 65  | M39x1.5 | 45   | 41 | 20 | 10 |
| 80                 | A   | 75  | 80  | M48x1.5 | 56   | 50 | 23 | 8  |
| 100                | A   | 95  | 95  | M64x2   | 71   | 65 | 27 | 11 |
| 125                | A   | 120 | 115 | M80x2   | 90   | 85 | 33 | 10 |

| Mounting Styles: FY, FC |     |    |    |         |      |    |    |    |
|-------------------------|-----|----|----|---------|------|----|----|----|
| Bore Ø                  | Rod | A  | B  | KK      | MM Ø | S  | SL | VD |
| 32                      | B   | 25 | 34 | M16x1.5 | 18   | 14 | 10 | 10 |
| 40                      | B   | 30 | 40 | M20x1.5 | 22.4 | 19 | 11 | 10 |
|                         | C   | 25 | 36 | M16x1.5 | 18   | 14 | 10 | 10 |
| 50                      | B   | 35 | 46 | M24x1.5 | 28   | 24 | 14 | 10 |
|                         | C   | 30 | 40 | M20x1.5 | 22.4 | 19 | 11 | 10 |
| 63                      | B   | 45 | 55 | M30x1.5 | 35.5 | 30 | 16 | 10 |
|                         | C   | 35 | 46 | M24x1.5 | 28   | 24 | 14 | 10 |
| 80                      | B   | 60 | 65 | M39x1.5 | 45   | 41 | 20 | 10 |
|                         | C   | 45 | 55 | M30x1.5 | 35.5 | 30 | 16 | 9  |
| 100                     | B   | 75 | 80 | M48x1.5 | 56   | 50 | 23 | 10 |
|                         | C   | 60 | 65 | M39x1.5 | 45   | 41 | 20 | 10 |
| 125                     | B   | 95 | 95 | M64x2   | 71   | 65 | 27 | 10 |
|                         | C   | 75 | 80 | M48x1.5 | 56   | 50 | 23 | 10 |

| Mounting Style: CS |     |     |     |         |      |    |    |    |
|--------------------|-----|-----|-----|---------|------|----|----|----|
| Bore Ø             | Rod | A   | B   | KK      | MM Ø | S  | SL | VD |
| 40                 | A   | 35  | 43  | M24x1.5 | 28   | 24 | 14 | 17 |
|                    | B   | 30  | 40  | M20x1.5 | 22.4 | 19 | 11 | 10 |
|                    | C   | 25  | 36  | M16x1.5 | 18   | 14 | 10 | 10 |
| 50                 | A   | 45  | 50  | M30x1.5 | 35.5 | 30 | 16 | 17 |
|                    | B   | 35  | 46  | M24x1.5 | 28   | 24 | 14 | 10 |
|                    | C   | 30  | 40  | M20x1.5 | 22.4 | 19 | 11 | 10 |
| 63                 | A   | 60  | 65  | M39x1.5 | 45   | 41 | 20 | 19 |
|                    | B   | 45  | 55  | M30x1.5 | 35.5 | 30 | 16 | 10 |
|                    | C   | 35  | 46  | M24x1.5 | 28   | 24 | 14 | 10 |
| 80                 | A   | 75  | 80  | M48x1.5 | 56   | 50 | 23 | 20 |
|                    | B   | 60  | 65  | M39x1.5 | 45   | 41 | 20 | 10 |
|                    | C   | 45  | 55  | M30x1.5 | 35.5 | 30 | 16 | 9  |
| 100                | A   | 95  | 95  | M64x2   | 71   | 65 | 27 | 23 |
|                    | B   | 75  | 80  | M48x1.5 | 56   | 50 | 23 | 10 |
|                    | C   | 60  | 65  | M39x1.5 | 45   | 41 | 20 | 10 |
| 125                | A   | 120 | 115 | M80x2   | 90   | 85 | 33 | 17 |
|                    | B   | 95  | 95  | M64x2   | 71   | 65 | 27 | 10 |
|                    | C   | 75  | 80  | M48x1.5 | 56   | 50 | 23 | 10 |

The tolerance of B is h8, and that of MM is f8.

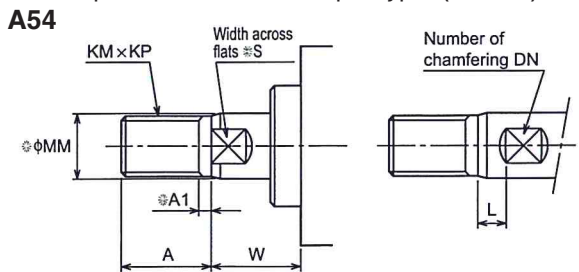


**Change of Rod End Shape**

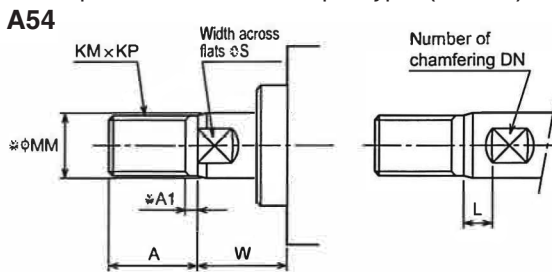
You can specify the shape and dimension of the rod end as shown below using the semi-standard symbols and dimension symbols. (No need to specify the dimension symbol if you order a cylinder with the basic dimension. Specify only the semi-standard symbol.)

How to order   - x

Special rod end shape type (Rod B)



Special rod end shape type (Rod C)



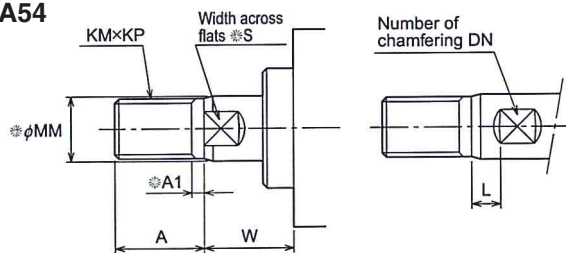
**Basic dimensional table**

| Bore | A  | *A1 | DN | KM  | KP  | L | *MM   | *S | W  |
|------|----|-----|----|-----|-----|---|-------|----|----|
| Ø32  | 25 | 4   | 2  | M16 | 1.5 | 0 | Ø18   | 14 | 30 |
| Ø40  | 30 | 4   | 2  | M20 | 1.5 | 0 | Ø22.4 | 19 | 30 |
| Ø50  | 35 | 4   | 2  | M24 | 1.5 | 0 | Ø28   | 24 | 30 |
| Ø63  | 45 | 4   | 2  | M30 | 1.5 | 0 | Ø35.5 | 30 | 35 |
| Ø80  | 60 | 4   | 2  | M39 | 1.5 | 0 | Ø45   | 41 | 35 |
| Ø100 | 75 | 4   | 2  | M48 | 1.5 | 0 | Ø56   | 50 | 40 |
| Ø125 | 95 | 5   | 2  | M64 | 2   | 0 | Ø71   | 65 | 45 |

**Basic dimensional table**

| Bore | A  | *A1 | DN | KM  | KP  | L | *MM   | *S | W  |
|------|----|-----|----|-----|-----|---|-------|----|----|
| Ø32  | 25 | 4   | 2  | M16 | 1.5 | 0 | Ø18   | 14 | 30 |
| Ø40  | 30 | 4   | 2  | M20 | 1.5 | 0 | Ø22.4 | 19 | 30 |
| Ø50  | 35 | 4   | 2  | M24 | 1.5 | 0 | Ø28   | 24 | 30 |
| Ø63  | 45 | 4   | 2  | M30 | 1.5 | 0 | Ø35.5 | 30 | 35 |
| Ø80  | 60 | 4   | 2  | M39 | 1.5 | 0 | Ø45   | 41 | 35 |
| Ø100 | 75 | 4   | 2  | M48 | 1.5 | 0 | Ø56   | 50 | 40 |
| Ø125 | 95 | 5   | 2  | M64 | 2   | 0 | Ø71   | 65 | 45 |

**A54**



Special rod end shape type (Rod A)

**Basic dimensional table**

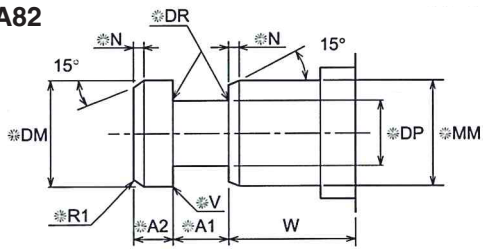
| Bore | A   | *A1 | DN | KM  | KP  | L | *MM   | *S | W  |
|------|-----|-----|----|-----|-----|---|-------|----|----|
| Ø40  | 35  | 4   | 2  | M24 | 1.5 | 0 | Ø28   | 24 | 35 |
| Ø50  | 45  | 4   | 2  | M30 | 1.5 | 0 | Ø35.5 | 30 | 41 |
| Ø63  | 60  | 4   | 2  | M39 | 1.5 | 0 | Ø45   | 41 | 48 |
| Ø80  | 75  | 4   | 2  | M48 | 1.5 | 0 | Ø56   | 50 | 51 |
| Ø100 | 95  | 5   | 2  | M64 | 2   | 0 | Ø71   | 65 | 57 |
| Ø125 | 120 | 5   | 2  | M80 | 2   | 0 | Ø90   | 85 | 57 |

Dimensions indicated by \* mark are fixed as our semi-standard. You are requested to consult us if you would like to change fixed dimensions.



Special rod end shape type (Rod A)

**A82**



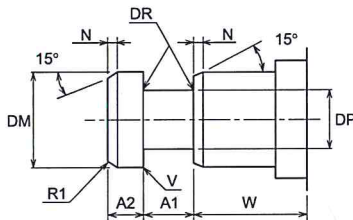
\*Exclusive M joint on the following pages.

**Basic dimensional table**

| Bore | *<br>A1 <sup>+0.5</sup><br>+0.3 | *<br>A2 <sup>-0.2</sup><br>-0.3 | *<br>DM | *<br>DP <sup>-0.2</sup><br>-0.3 | *<br>DR | *<br>MM | *<br>N | *<br>V | W  |
|------|---------------------------------|---------------------------------|---------|---------------------------------|---------|---------|--------|--------|----|
| Ø40  | 12.5                            | 12.5                            | Ø28     | Ø21                             | 1.5     | Ø28     | 3      | C0.2   | 35 |
| Ø50  | 15                              | 15                              | Ø35.5   | Ø26                             | 2.0     | Ø35.5   | 3      | C0.2   | 41 |
| Ø63  | 15                              | 15                              | Ø45     | Ø31                             | 2.0     | Ø45     | 3      | C0.2   | 48 |
| Ø80  | 20                              | 20                              | Ø56     | Ø38                             | 3.0     | Ø56     | 3      | C0.2   | 51 |
| Ø100 | 25                              | 25                              | Ø71     | Ø49                             | 3.5     | Ø71     | 3      | R1     | 57 |
| Ø125 | 30                              | 30                              | Ø90     | Ø60                             | 5.0     | Ø90     | 6      | R1     | 57 |

MM is rod dia.

Special rod end shape type (Rod B)



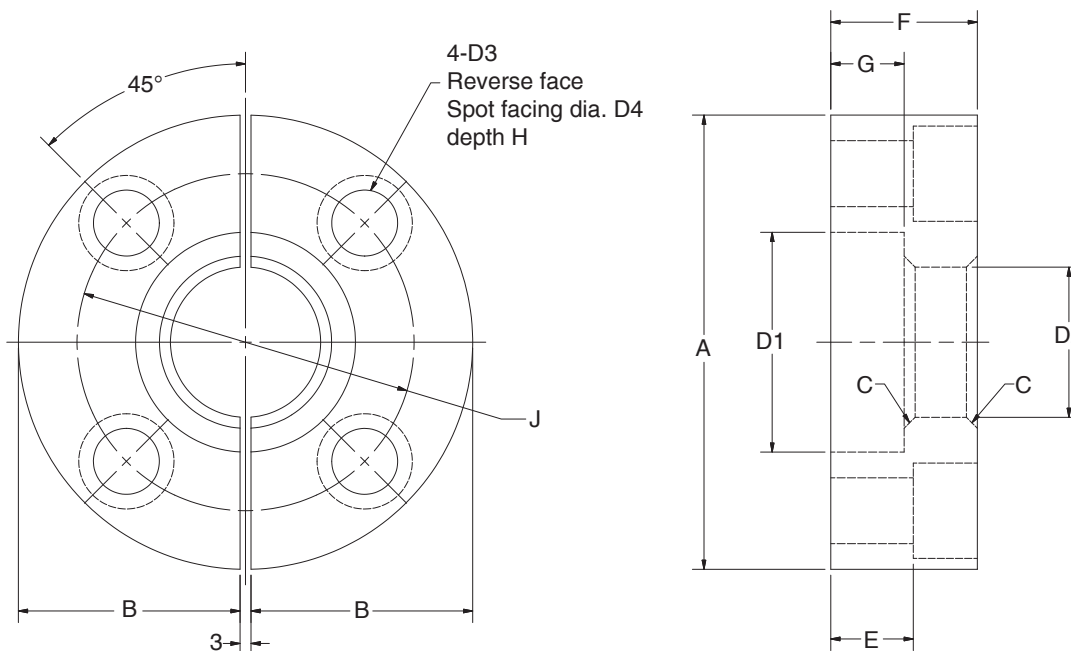
\*Exclusive M joint on the following pages.

**Basic dimensional table**

| Bore | *<br>A1 <sup>+0.5</sup><br>+0.3 | *<br>A2 <sup>-0.2</sup><br>-0.3 | *<br>DM | *<br>DP <sup>-0.2</sup><br>-0.3 | *<br>DR | *<br>MM | *<br>N | *<br>V | W  |
|------|---------------------------------|---------------------------------|---------|---------------------------------|---------|---------|--------|--------|----|
| Ø32  | 12.5                            | 12.5                            | Ø18     | Ø13                             | 1.0     | Ø18     | 3      | C0.2   | 30 |
| Ø40  | 12.5                            | 12.5                            | Ø22.4   | Ø16                             | 1.5     | Ø22.4   | 3      | C0.2   | 30 |
| Ø50  | 12.5                            | 12.5                            | Ø28     | Ø21                             | 1.5     | Ø28     | 3      | C0.2   | 30 |
| Ø63  | 15                              | 15                              | Ø35.5   | Ø26                             | 2.0     | Ø35.5   | 3      | C0.2   | 35 |
| Ø80  | 15                              | 15                              | Ø45     | Ø31                             | 2.0     | 45      | 3      | C0.2   | 35 |
| Ø100 | 20                              | 20                              | Ø56     | Ø38                             | 3.0     | Ø56     | 3      | C0.2   | 40 |
| Ø125 | 25                              | 25                              | Ø71     | Ø49                             | 3.5     | Ø71     | 3      | R1     | 45 |

Note: Other rod end shapes - A00, A51, A53, A55 and A81 are available. Please consult the manufacturer for these options.

Separate Flange Joint (M-end): Only for piston rod end shape A82



Additional order for this item is needed. Specify as RHM-\* \*

Dimensional Table / Rod B

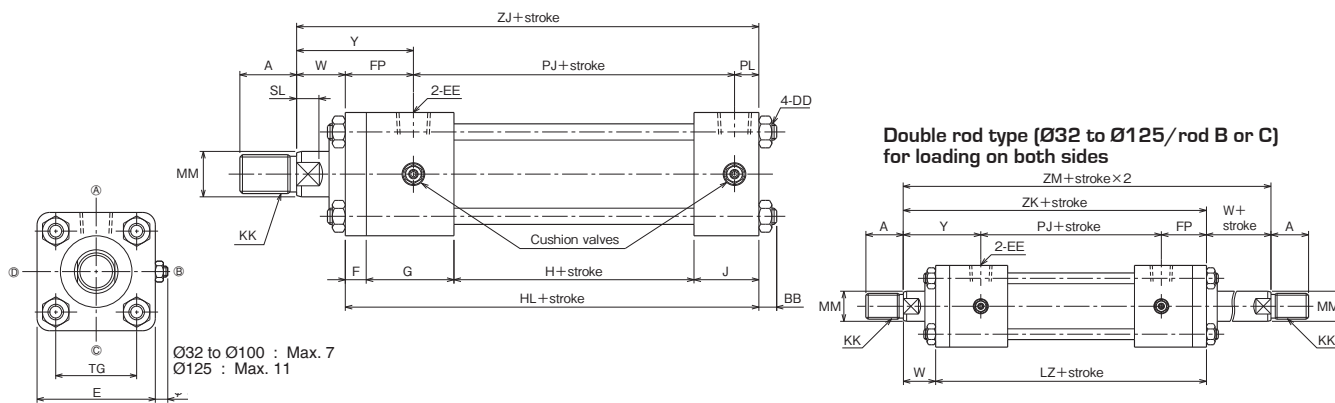
| Bore Ø | Part Number | A Ø | B    | C   | D1 Ø | D2 Ø | D3 Ø | D4 Ø | E    | F  | G    | H    | J Ø | X  |
|--------|-------------|-----|------|-----|------|------|------|------|------|----|------|------|-----|----|
| 32     | RMH-18      | 49  | 23   | 1   | 19   | 13.5 | 6.6  | 11   | 18.5 | 25 | 12.5 | 6.5  | 34  | -  |
| 40     | RMH-22      | 57  | 27   | 1.5 | 23   | 16.5 | 9    | 14   | 16.4 | 25 | 12.5 | 8.6  | 40  | -  |
| 50     | RMH-28      | 71  | 34   | 1.5 | 29   | 21.5 | 11   | 17.5 | 14.2 | 25 | 12.5 | 10.8 | 50  | -  |
| 63     | RMH-36      | 77  | 37   | 2   | 38   | 27   | 11   | 17.5 | 19.2 | 30 | 15   | 10.8 | 55  | -  |
| 80     | RMH-45      | 100 | 48.5 | 2   | 48   | 33   | 14   | 20   | 17   | 30 | 15   | 13   | 76  | 16 |
| 100    | RMH-56      | 124 | 60.5 | 3   | 60   | 41   | 18   | 26   | 22.5 | 40 | 20   | 17.5 | 92  | 7  |
| 125    | RMH-70      | 150 | 73.5 | 3.5 | 74   | 53   | 22   | 32   | 28.5 | 50 | 25   | 21.5 | 112 | 14 |
| 140    | RMH-80      | 174 | 85.5 | 4   | 84   | 60   | 26   | 39   | 24.5 | 50 | 25   | 25.5 | 129 | 40 |
| 150    | RMH-85      | 180 | 88.5 | 5   | 90   | 62   | 26   | 39   | 34.5 | 60 | 30   | 25.5 | 135 | 26 |
| 160    | RMH-90      | 193 | 95   | 5   | 95   | 64   | 30   | 43   | 31   | 60 | 30   | 29   | 144 | 9  |

Note) In the case of LC mounting and rod B, add dimension X as the lower limit to dimension W of the cylinder body.

Dimensional Table / Rod A

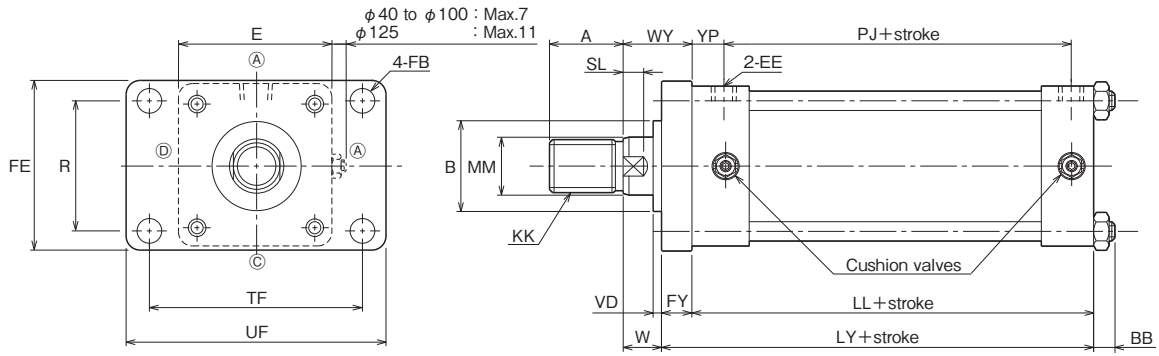
| Bore Ø | Part Number | A Ø | B    | C   | D1 Ø | D2 Ø | D3 Ø | D4 Ø | E    | F  | G    | H    | J Ø | X  |
|--------|-------------|-----|------|-----|------|------|------|------|------|----|------|------|-----|----|
| 40     | RMH-28      | 71  | 34   | 1.5 | 29   | 21.5 | 11   | 17.5 | 14.2 | 25 | 12.5 | 10.8 | 50  | 15 |
| 50     | RMH-36      | 77  | 37   | 2   | 38   | 27   | 11   | 17.5 | 19.2 | 30 | 15   | 10.8 | 55  | -  |
| 63     | RMH-45      | 100 | 48.5 | 2   | 48   | 33   | 14   | 20   | 17   | 30 | 15   | 13   | 76  | 17 |
| 80     | RMH-56      | 124 | 60.5 | 3   | 60   | 41   | 18   | 26   | 22.5 | 40 | 20   | 17.5 | 92  | 24 |
| 100    | RMH-70      | 150 | 73.5 | 3.5 | 74   | 53   | 22   | 32   | 26.5 | 50 | 25   | 21.5 | 112 | 26 |
| 125    | RMH-90      | 193 | 95   | 5   | 95   | 64   | 30   | 43   | 31   | 60 | 30   | 29   | 144 | 43 |

Note) In the case of LB mounting and rod A, add dimension Y as the lower limit to dimension W of the cylinder body.



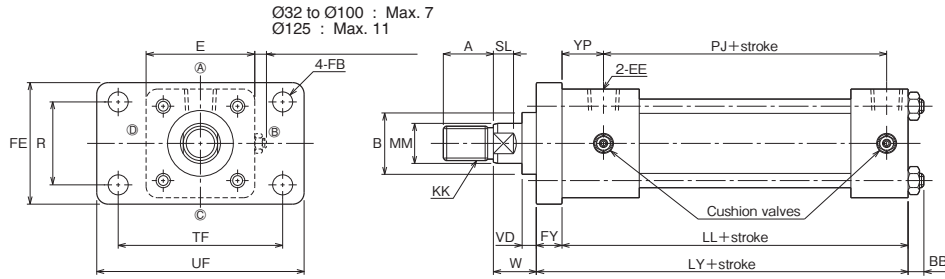
| Bore<br>Ø | BB | DD       | E   | EE    | F  | FP | G  | H  | HL  | J  | LZ  | PJ  | PL | TG  | W   |    | Y   |     | ZJ  |     | ZK  | ZM  |
|-----------|----|----------|-----|-------|----|----|----|----|-----|----|-----|-----|----|-----|-----|----|-----|-----|-----|-----|-----|-----|
|           |    |          |     |       |    |    |    |    |     |    |     |     |    |     | B-C | A  | B-C | A   | B-C | A   |     |     |
| 32        | 11 | M10×1.25 | 58  | Rc3/8 | 11 | 38 | 50 | 44 | 141 | 36 | 166 | 90  | 13 | 38  | 30  | —  | 68  | —   | 171 | —   | 196 | 226 |
| 40        | 11 | M10×1.25 | 65  | Rc3/8 | 11 | 38 | 50 | 44 | 141 | 36 | 166 | 90  | 13 | 45  | 30  | 35 | 68  | 73  | 171 | 176 | 196 | 226 |
| 50        | 11 | M10×1.25 | 76  | Rc1/2 | 13 | 42 | 54 | 48 | 155 | 40 | 182 | 98  | 15 | 52  | 30  | 41 | 72  | 83  | 185 | 196 | 212 | 242 |
| 63        | 13 | M12×1.5  | 90  | Rc1/2 | 15 | 46 | 56 | 52 | 163 | 40 | 194 | 102 | 15 | 63  | 35  | 48 | 81  | 94  | 198 | 211 | 229 | 264 |
| 80        | 16 | M16×1.5  | 110 | Rc3/4 | 18 | 56 | 66 | 54 | 184 | 46 | 222 | 110 | 18 | 80  | 35  | 51 | 91  | 107 | 219 | 235 | 257 | 292 |
| 100       | 18 | M18×1.5  | 135 | Rc3/4 | 20 | 58 | 66 | 60 | 192 | 46 | 232 | 116 | 18 | 102 | 40  | 57 | 98  | 115 | 232 | 249 | 272 | 312 |
| 125       | 21 | M22×1.5  | 165 | Rc1   | 24 | 67 | 76 | 64 | 220 | 56 | 264 | 130 | 23 | 122 | 45  | 57 | 112 | 124 | 265 | 277 | 309 | 354 |

- When using the SD style, be sure to see Cylinder Safety Guide at the end of this catalog.
- For the thread length (dimension A) in case of using the lock nut, refer to “Accessories.”
- For the mounting of sensors, refer to the dimensional drawing of “Switch Set.” All the contents other than “Sensor mounting dimensions” are the same.
- If the port size exceeds 1 inch, it is recommended to order G thread or pipe flange. In such a case, contact us. (Order made)
- The Switch Set (Ø32 to Ø125) is also within the standard stroke range.

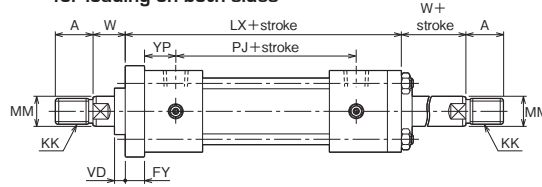


• For dimensions not shown in these figures, refer to the SD style (basic style).

| Bore Ø | BB | E   | EE    | FB | FE  | FY | LL  | LY  | PJ  | R   | TF  | UF  | WF | WY | YP |
|--------|----|-----|-------|----|-----|----|-----|-----|-----|-----|-----|-----|----|----|----|
| 40     | 11 | 65  | Rc3/8 | 11 | 69  | 18 | 130 | 148 | 90  | 46  | 95  | 118 | 35 | 53 | 27 |
| 50     | 11 | 76  | Rc1/2 | 14 | 85  | 20 | 142 | 162 | 98  | 58  | 115 | 145 | 41 | 61 | 29 |
| 63     | 13 | 90  | Rc1/2 | 18 | 98  | 24 | 148 | 172 | 102 | 65  | 132 | 165 | 48 | 72 | 31 |
| 80     | 16 | 110 | Rc3/4 | 18 | 118 | 30 | 166 | 196 | 110 | 87  | 155 | 190 | 51 | 81 | 38 |
| 125    | 21 | 165 | Rc1   | 26 | 175 | 41 | 196 | 237 | 130 | 130 | 224 | 272 | 57 | 98 | 43 |



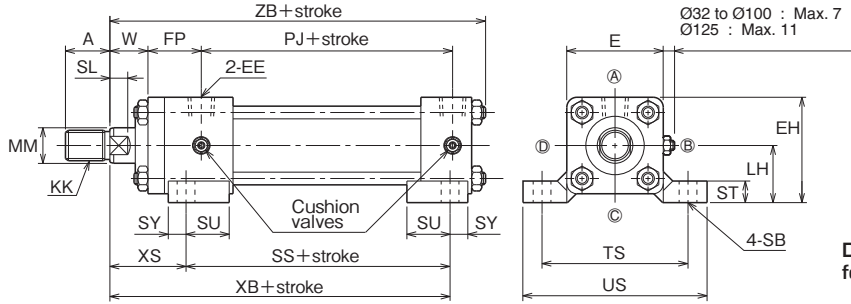
**Double rod type (Ø32 to Ø125/rod B or C)  
for loading on both sides**



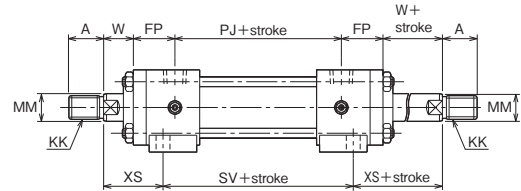
| Bore Ø | BB | E   | EE    | FB | FE  | FY | LL  | LX  | LY  | PJ  | R   | TF  | UF  | W  | YP |
|--------|----|-----|-------|----|-----|----|-----|-----|-----|-----|-----|-----|-----|----|----|
| 32     | 11 | 58  | Rc3/8 | 11 | 62  | 13 | 130 | 168 | 143 | 90  | 40  | 88  | 109 | 30 | 27 |
| 40     | 11 | 65  | Rc3/8 | 11 | 69  | 13 | 130 | 168 | 143 | 90  | 46  | 95  | 118 | 30 | 27 |
| 50     | 11 | 76  | Rc1/2 | 14 | 85  | 18 | 142 | 187 | 160 | 98  | 58  | 115 | 145 | 30 | 29 |
| 63     | 13 | 90  | Rc1/2 | 18 | 98  | 20 | 148 | 199 | 168 | 102 | 65  | 132 | 165 | 35 | 31 |
| 80     | 16 | 110 | Rc3/4 | 18 | 118 | 24 | 166 | 228 | 190 | 110 | 87  | 155 | 190 | 35 | 38 |
| 100    | 18 | 135 | Rc3/4 | 22 | 150 | 28 | 172 | 240 | 200 | 116 | 109 | 190 | 230 | 40 | 38 |
| 125    | 21 | 165 | Rc1   | 26 | 175 | 33 | 196 | 273 | 229 | 130 | 130 | 224 | 272 | 45 | 43 |

- For dimensions not shown in the figures above, refer to the SD style (basic style).
- For the mounting of sensors, refer to the dimensional drawings of "Switch Set." All the contents other than "Sensor mounting dimensions" are the same.
- If the port size exceeds 1 inch, it is recommended to order G thread or pipe flange. In such a case, contact us. (Order made)
- The Switch Set (Ø32 to Ø125) is also within the standard stroke range.

• Bore Ø32 to Ø125

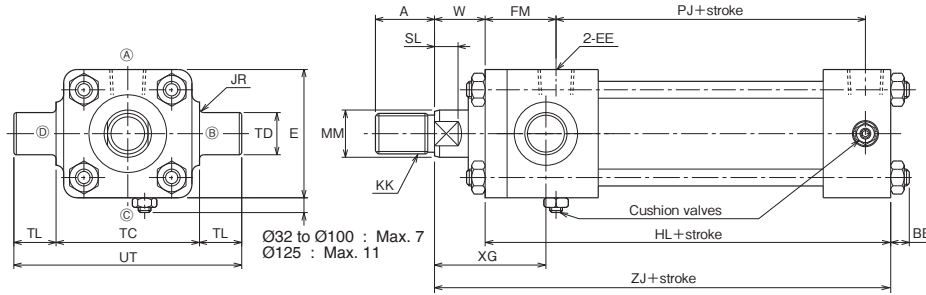


Double rod type (Ø32 to Ø125/rod B or C) for loading on both sides

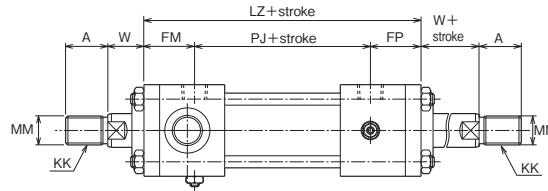


| Bore Ø | E   | EE    | EH    | P  | LH        | PJ  | SB | SS  | ST | SU | SV  | SW | SX | SY | TS  | US  | W   |    | XB  |     | XS  |     | ZB  |     |
|--------|-----|-------|-------|----|-----------|-----|----|-----|----|----|-----|----|----|----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|
|        |     |       |       |    |           |     |    |     |    |    |     |    |    |    |     |     | B-C | A  | B-C | A   | B-C | A   | B-C | A   |
| 32     | 58  | Rc3/8 | 64    | 38 | 35±0.15   | 90  | 11 | 98  | 12 | 31 | 112 | -  | -  | 13 | 88  | 109 | 30  | -  | 155 | -   | 57  | -   | 182 | -   |
| 40     | 65  | Rc3/8 | 70    | 38 | 37.5±0.15 | 90  | 11 | 98  | 14 | 31 | 112 | -  | -  | 13 | 95  | 118 | 30  | 35 | 155 | 160 | 57  | 62  | 182 | 187 |
| 50     | 76  | Rc1/2 | 83    | 42 | 45±0.15   | 98  | 14 | 108 | 17 | 34 | 122 | -  | -  | 14 | 115 | 145 | 30  | 41 | 168 | 179 | 60  | 71  | 196 | 207 |
| 63     | 90  | Rc1/2 | 95    | 46 | 50±0.15   | 102 | 18 | 106 | 19 | 32 | 122 | -  | -  | 18 | 132 | 165 | 35  | 48 | 177 | 190 | 71  | 84  | 211 | 224 |
| 80     | 110 | Rc3/4 | 115   | 56 | 60±0.25   | 110 | 18 | 124 | 25 | 42 | 144 | -  | -  | 18 | 155 | 190 | 35  | 51 | 198 | 214 | 74  | 90  | 235 | 251 |
| 100    | 135 | Rc3/4 | 138.5 | 58 | 71±0.25   | 116 | 22 | 122 | 27 | 38 | 142 | -  | -  | 22 | 190 | 230 | 40  | 57 | 207 | 224 | 85  | 102 | 250 | 267 |
| 125    | 165 | Rc1   | 167.5 | 67 | 85±0.25   | 130 | 26 | 136 | 32 | 41 | 156 | -  | -  | 25 | 224 | 272 | 45  | 57 | 235 | 247 | 99  | 111 | 286 | 298 |

- For dimensions not shown in the figures above, refer to the SD style (basic style).
- For the mounting of sensors, refer to the dimensional drawings of "Switch Set." All the contents other than "Sensor mounting dimensions" are the same.
- If the port size exceeds 1 inch, it is recommended to order G thread or pipe flange. In such a case, contact us. (Order made)
- The Switch Set (Ø32 to Ø125) is also within the standard stroke range.



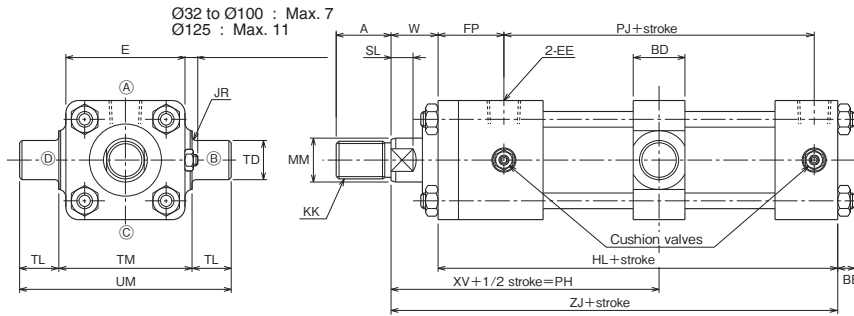
Double rod type (rod B or C)  
 for loading on both sides



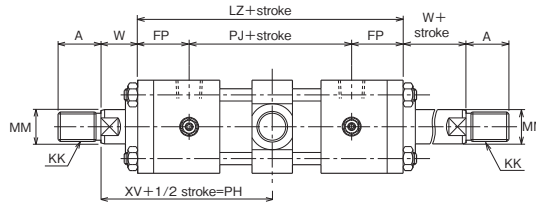
| Bore Ø | BB | E   | EE    | FM | FP | HL  | JR   | LZ  | PJ  | TC                                | TD Ø   | TL   | UT  | W   |    | XG  |     | ZJ  |     |
|--------|----|-----|-------|----|----|-----|------|-----|-----|-----------------------------------|--------|------|-----|-----|----|-----|-----|-----|-----|
|        |    |     |       |    |    |     |      |     |     |                                   |        |      |     | B-C | A  | B-C | A   | B-C | A   |
| 32     | 11 | 58  | Rc3/8 | 38 | 38 | 141 | R2   | 166 | 90  | 58 <sup>0</sup> <sub>-0.3</sub>   | 20e9   | 20   | 98  | 30  | -  | 62  | -   | 171 | -   |
| 40     | 11 | 65  | Rc3/8 | 38 | 38 | 141 | R2   | 166 | 90  | 69 <sup>0</sup> <sub>-0.3</sub>   | 20e9   | 20   | 109 | 30  | 35 | 62  | 67  | 171 | 176 |
| 50     | 11 | 76  | Rc1/2 | 42 | 42 | 155 | R2.5 | 182 | 98  | 85 <sup>0</sup> <sub>-0.35</sub>  | 25e9   | 25   | 135 | 30  | 41 | 66  | 77  | 185 | 196 |
| 63     | 13 | 90  | Rc1/2 | 46 | 46 | 163 | R2.5 | 194 | 102 | 98 <sup>0</sup> <sub>-0.35</sub>  | 31.5e9 | 31.5 | 161 | 35  | 48 | 74  | 87  | 198 | 211 |
| 80     | 16 | 110 | Rc3/4 | 56 | 56 | 184 | R2.5 | 222 | 110 | 118 <sup>0</sup> <sub>-0.35</sub> | 31.5e9 | 31.5 | 181 | 35  | 51 | 82  | 98  | 219 | 235 |
| 100    | 18 | 135 | Rc3/4 | 58 | 58 | 192 | R3   | 232 | 116 | 145 <sup>0</sup> <sub>-0.4</sub>  | 40e9   | 40   | 225 | 40  | 57 | 89  | 106 | 232 | 249 |
| 125    | 21 | 165 | Rc1   | 67 | 67 | 220 | R3   | 264 | 130 | 175 <sup>0</sup> <sub>-0.4</sub>  | 50e9   | 50   | 275 | 45  | 57 | 103 | 115 | 265 | 277 |

- For dimensions not shown in the figures above, refer to the SD style (basic style).
- For the mounting of sensors, refer to the dimensional drawings of "Switch Set." All the contents other than "Sensor mounting dimensions" are the same.
- The cushion valve and air vent of the TA style are positioned on C for structural reasons (rod cover side).
- If the port size exceeds 1 inch, it is recommended to order G thread or pipe flange. In such a case, contact us. (Order made)
- The Switch Set (Ø32 to Ø125) is also within the standard stroke range.



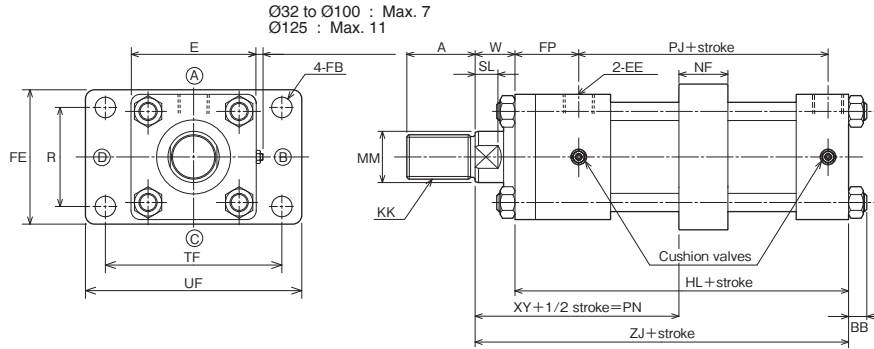


**Double rod type (Ø32 to Ø125/rod B or C)  
 for loading on both sides**



| Bore<br>Ø | BB | BD | E   | EE    | FP | HL  | JR   | LZ  | Min. PH |       | PJ  | TD<br>Ø | TL   | TM                                | UM  | W   |    | XV  |     | ZJ  |     |
|-----------|----|----|-----|-------|----|-----|------|-----|---------|-------|-----|---------|------|-----------------------------------|-----|-----|----|-----|-----|-----|-----|
|           |    |    |     |       |    |     |      |     | B·C     | A     |     |         |      |                                   |     | B-C | A  | B-C | A   |     |     |
| 32        | 11 | 28 | 58  | Rc3/8 | 38 | 141 | R2   | 166 | 105     | —     | 90  | 20e9    | 20   | 58 <sup>0</sup> <sub>-0.3</sub>   | 98  | 30  | —  | 113 | —   | 171 | —   |
| 40        | 11 | 28 | 65  | Rc3/8 | 38 | 141 | R2   | 166 | 105     | 110   | 90  | 20e9    | 20   | 69 <sup>0</sup> <sub>-0.3</sub>   | 109 | 30  | 35 | 113 | 118 | 171 | 176 |
| 50        | 11 | 33 | 76  | Rc1/2 | 42 | 155 | R2.5 | 182 | 113.5   | 124.5 | 98  | 25e9    | 25   | 85 <sup>0</sup> <sub>-0.35</sub>  | 135 | 30  | 41 | 121 | 132 | 185 | 196 |
| 63        | 13 | 43 | 90  | Rc1/2 | 46 | 163 | R2.5 | 194 | 127.5   | 140.5 | 102 | 31.5e9  | 31.5 | 98 <sup>0</sup> <sub>-0.35</sub>  | 161 | 35  | 48 | 132 | 145 | 198 | 211 |
| 80        | 16 | 43 | 110 | Rc3/4 | 56 | 184 | R2.5 | 222 | 140.5   | 156.5 | 110 | 31.5e9  | 31.5 | 118 <sup>0</sup> <sub>-0.35</sub> | 181 | 35  | 51 | 146 | 162 | 219 | 235 |
| 100       | 18 | 53 | 135 | Rc3/4 | 58 | 192 | R3   | 232 | 152.5   | 169.5 | 116 | 40e9    | 40   | 145 <sup>0</sup> <sub>-0.40</sub> | 225 | 40  | 57 | 156 | 173 | 232 | 249 |
| 125       | 21 | 58 | 165 | Rc1   | 67 | 220 | R3   | 264 | 174     | 186   | 130 | 50e9    | 50   | 175 <sup>0</sup> <sub>-0.40</sub> | 275 | 45  | 57 | 177 | 189 | 265 | 277 |

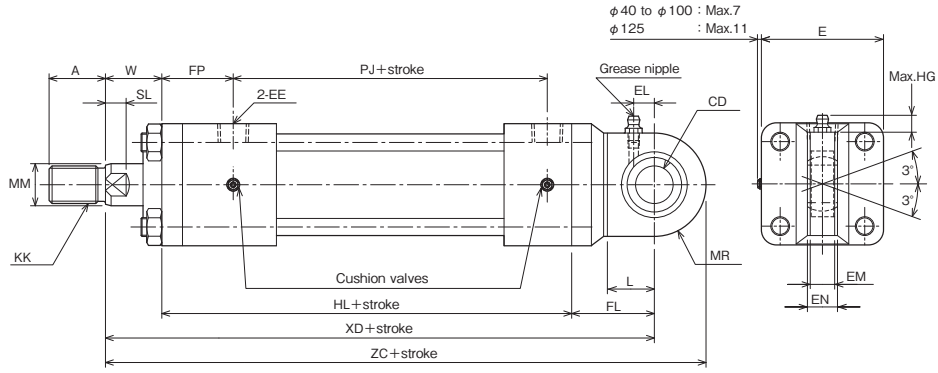
- For dimensions not shown in the figures above, refer to the SD style (basic style).
- For the mounting of sensors, refer to the dimensional drawings of “Switch Set.” All the contents other than “Sensor mounting dimensions” and “Minimum dimension PH of Switch Set Cylinders” are the same.
- To change the position of TC accessory, specify dimension PH.
- If the port size exceeds 1 inch, it is recommended to order G thread or pipe flange. In such a case, contact us. (Order made)
- The Switch Set (Ø32 to Ø125) is also within the standard stroke range.



- For dimensions not shown in these figures, refer to the SD style (basic style).
- For the mounting of sensors, refer to the dimensional drawings of "Switch Set." All the contents other than "Sensor mounting dimensions" and "Minimum dimension PN of Switch Set Cylinders" are the same.

| Bore Ø | BB | E   | EE    | FB Ø | FE  | FP | HL  | NF | PJ  | Min. PN |     | R   | TF  | UF  | W   |    | XY    |       | ZJ  |     |
|--------|----|-----|-------|------|-----|----|-----|----|-----|---------|-----|-----|-----|-----|-----|----|-------|-------|-----|-----|
|        |    |     |       |      |     |    |     |    |     | B-C     | A   |     |     |     | B-C | A  | B-C   | A     | B-C | A   |
| 32     | 11 | 58  | Rc3/8 | 11   | 62  | 38 | 141 | 28 | 90  | 91      | -   | 40  | 88  | 109 | 30  | -  | 99    | -     | 171 | -   |
| 40     | 11 | 65  | Rc3/8 | 11   | 69  | 38 | 141 | 28 | 90  | 91      | 96  | 46  | 95  | 118 | 30  | 35 | 99    | 104   | 171 | 176 |
| 50     | 11 | 76  | Rc1/2 | 14   | 85  | 42 | 155 | 33 | 98  | 97      | 108 | 58  | 115 | 145 | 30  | 41 | 104.5 | 115.5 | 185 | 196 |
| 63     | 13 | 90  | Rc1/2 | 18   | 98  | 46 | 163 | 43 | 102 | 106     | 119 | 65  | 132 | 165 | 35  | 48 | 110.5 | 123.5 | 198 | 211 |
| 80     | 16 | 110 | Rc3/4 | 18   | 118 | 56 | 184 | 43 | 110 | 119     | 135 | 87  | 155 | 190 | 35  | 51 | 124.5 | 140.5 | 219 | 235 |
| 100    | 18 | 135 | Rc3/4 | 22   | 150 | 58 | 192 | 53 | 116 | 126     | 143 | 109 | 190 | 230 | 40  | 57 | 129.5 | 146.5 | 232 | 249 |
| 125    | 21 | 165 | Rc1   | 26   | 175 | 67 | 220 | 58 | 130 | 145     | 157 | 130 | 224 | 272 | 45  | 57 | 148   | 160   | 265 | 277 |

- For dimensions not shown in the figures above, refer to the SD style (basic style).
- For the mounting of sensors, refer to the dimensional drawings of "Switch Set." All the contents other than "Sensor mounting dimensions" and "Minimum dimension PH of Switch Set Cylinders" are the same.

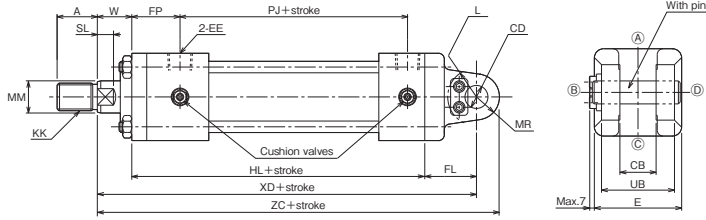


- The spherical bearings are not filled with grease. Lubricate appropriately through the grease nipple.
- The bearing inner diameter and mounting width conform to JIS B8367-2 MP5 type regulation. (Same standard with 160H-1 Series)

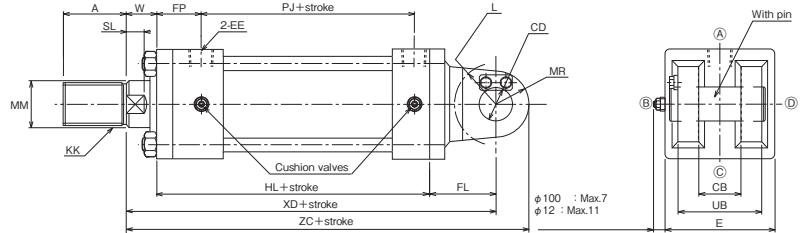
| Bore Ø | CD                               | E   | EE    | EN                               | EM | FL  | FP | HL  | L  | MR    | PJ  | W   |    | XD  |     | ZC    |       | Grease nipple  |    |    |
|--------|----------------------------------|-----|-------|----------------------------------|----|-----|----|-----|----|-------|-----|-----|----|-----|-----|-------|-------|----------------|----|----|
|        |                                  |     |       |                                  |    |     |    |     |    |       |     | B-C | A  | B-C | A   | B-C   | A     | Type           | EL | HG |
| 40     | 20 <sup>0</sup> <sub>-0.12</sub> | 65  | Rc3/8 | 16 <sup>0</sup> <sub>-0.12</sub> | 13 | 44  | 38 | 141 | 25 | R27.5 | 90  | 30  | 35 | 215 | 220 | 242.5 | 247.5 | JISAtype MT6×1 | 11 | 11 |
| 50     | 25 <sup>0</sup> <sub>-0.12</sub> | 76  | Rc1/2 | 20 <sup>0</sup> <sub>-0.12</sub> | 17 | 53  | 42 | 155 | 31 | R32.5 | 98  | 30  | 41 | 238 | 249 | 270.5 | 281.5 | JISAtype MT6×1 | 14 | 11 |
| 63     | 30 <sup>0</sup> <sub>-0.12</sub> | 90  | Rc1/2 | 22 <sup>0</sup> <sub>-0.12</sub> | 19 | 64  | 46 | 163 | 38 | R40   | 102 | 35  | 48 | 262 | 275 | 302   | 315   | JISAtype Rc1/8 | 15 | 15 |
| 80     | 40 <sup>0</sup> <sub>-0.12</sub> | 110 | Rc3/4 | 28 <sup>0</sup> <sub>-0.12</sub> | 23 | 81  | 56 | 184 | 48 | R50   | 110 | 35  | 51 | 300 | 316 | 350   | 366   | JISAtype Rc1/8 | 20 | 15 |
| 100    | 50 <sup>0</sup> <sub>-0.12</sub> | 135 | Rc3/4 | 35 <sup>0</sup> <sub>-0.12</sub> | 30 | 96  | 58 | 192 | 58 | R60   | 116 | 40  | 57 | 328 | 345 | 388   | 405   | JISAtype Rc1/8 | 24 | 15 |
| 125    | 60 <sup>0</sup> <sub>-0.12</sub> | 165 | Rc1   | 44 <sup>0</sup> <sub>-0.12</sub> | 38 | 117 | 67 | 220 | 72 | R75   | 130 | 45  | 57 | 382 | 394 | 457   | 469   | JISAtype Rc1/8 | 28 | 15 |

- For dimensions not shown in the figures above, refer to the SD style (basic style).
- For the mounting of sensors, refer to the dimensional drawings of "Switch Set." All the contents other than "Sensor mounting dimensions" and "Minimum dimension PH of Switch Set Cylinders" are the same.
- The spherical bearings are not filled with grease. Lubricate appropriately through the grease nipple.
- The bearing inner diameter and mounting width conform to JIS B8367-2 MP5 type regulation. (Same standard with 160H-1 Series).

- Bore  $\phi 32$  to  $\phi 80$

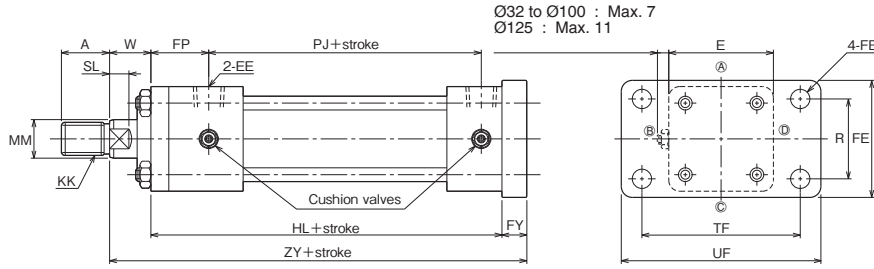


- Bore  $\phi 100$  to  $\phi 125$



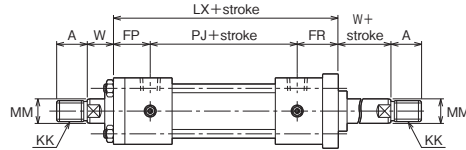
| Bore $\phi$ | CB <sup>+0.4</sup> / <sub>+0.1</sub> | CD $\frac{H9}{f8}$ | E   | EE    | FL  | FP | HL  | L   | MR    | PJ  | UB   | W   |    | XD  |     | ZC    |       |
|-------------|--------------------------------------|--------------------|-----|-------|-----|----|-----|-----|-------|-----|------|-----|----|-----|-----|-------|-------|
|             |                                      |                    |     |       |     |    |     |     |       |     |      | B-C | A  | B-C | A   | B-C   | A     |
| 32          | 25                                   | 16                 | 58  | Rc3/8 | 38  | 38 | 141 | R20 | R16   | 90  | 50   | 30  | —  | 209 | —   | 225   | —     |
| 40          | 25                                   | 16                 | 65  | Rc3/8 | 38  | 38 | 141 | R20 | R16   | 90  | 50   | 30  | 35 | 209 | 214 | 225   | 230   |
| 50          | 31.5                                 | 20                 | 76  | Rc1/2 | 45  | 42 | 155 | R25 | R20   | 98  | 63.5 | 30  | 41 | 230 | 241 | 250   | 261   |
| 63          | 40                                   | 31.5               | 90  | Rc1/2 | 63  | 46 | 163 | R40 | R31.5 | 102 | 80   | 35  | 48 | 261 | 274 | 292.5 | 305.5 |
| 80          | 40                                   | 31.5               | 110 | Rc3/4 | 72  | 56 | 184 | R40 | R31.5 | 110 | 80   | 35  | 51 | 291 | 307 | 322.5 | 338.5 |
| 100         | 50                                   | 40                 | 135 | Rc3/4 | 84  | 58 | 192 | R50 | R40   | 116 | 98   | 40  | 57 | 316 | 333 | 356   | 373   |
| 125         | 63                                   | 50                 | 165 | Rc1   | 100 | 67 | 220 | R62 | R50   | 130 | 126  | 45  | 57 | 365 | 377 | 415   | 427   |

- For dimensions not shown in the figures above, refer to the SD style (basic style).
- For the mounting of sensors, refer to the dimensional drawings of "Switch Set." All the contents other than "Sensor mounting dimensions" are the same.
- Material of CB accessory for cylinders with bores from 32 to 125 mm: Nodular graphite cast iron.
- If the port size exceeds 1 inch, it is recommended to order G thread or pipe flange. In such a case, contact us. (Order made)



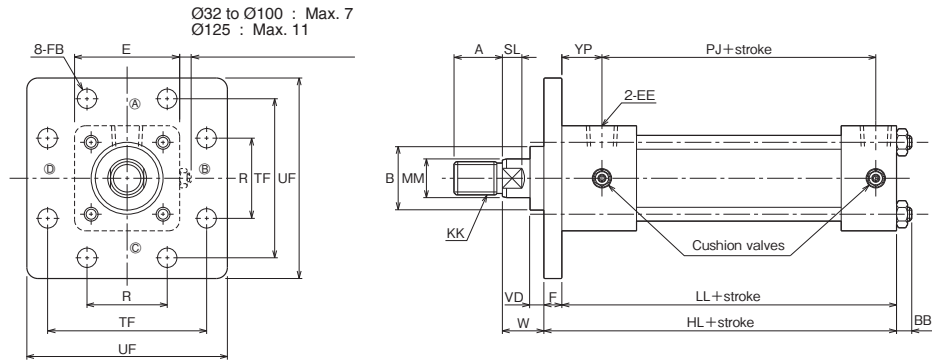
Ø32 to Ø100 : Max. 7  
 Ø125 : Max. 11

**Double rod type (Ø32 to Ø125/rod B or C)  
 for loading on both sides**

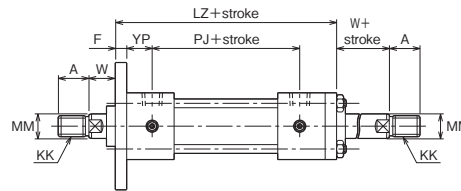


| Bore Ø | E   | EE    | FB | FE  | FP | FR | FY | HL  | LX  | PJ  | R   | TF  | UF  | W   |    | ZY  |     |
|--------|-----|-------|----|-----|----|----|----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|
|        |     |       |    |     |    |    |    |     |     |     |     |     |     | B-C | A  | B-C | A   |
| 32     | 58  | Rc3/8 | 11 | 62  | 38 | 40 | 13 | 141 | 168 | 90  | 40  | 88  | 109 | 30  | —  | 184 | —   |
| 40     | 65  | Rc3/8 | 11 | 69  | 38 | 40 | 13 | 141 | 168 | 90  | 46  | 95  | 118 | 30  | 35 | 184 | 189 |
| 50     | 76  | Rc1/2 | 14 | 85  | 42 | 47 | 18 | 155 | 187 | 98  | 58  | 115 | 145 | 30  | 41 | 203 | 214 |
| 63     | 90  | Rc1/2 | 18 | 98  | 46 | 51 | 20 | 163 | 199 | 102 | 65  | 132 | 165 | 35  | 48 | 218 | 231 |
| 80     | 110 | Rc3/4 | 18 | 118 | 56 | 62 | 24 | 184 | 228 | 110 | 87  | 155 | 190 | 35  | 51 | 243 | 259 |
| 100    | 135 | Rc3/4 | 22 | 150 | 58 | 66 | 28 | 192 | 240 | 116 | 109 | 190 | 230 | 40  | 57 | 260 | 277 |
| 125    | 165 | Rc1   | 26 | 175 | 67 | 76 | 33 | 220 | 273 | 130 | 130 | 224 | 272 | 45  | 57 | 298 | 310 |

- For dimensions not shown in the figures above, refer to the SD style (basic style).
- For the mounting of sensors, refer to the dimensional drawings of "Switch Set." All the contents other than "Sensor mounting dimensions" are the same.
- If the port size exceeds 1 inch, it is recommended to order G thread or pipe flange. In such a case, contact us. (Order made)
- The Switch Set (Ø32 to Ø125) is also within the standard stroke range.

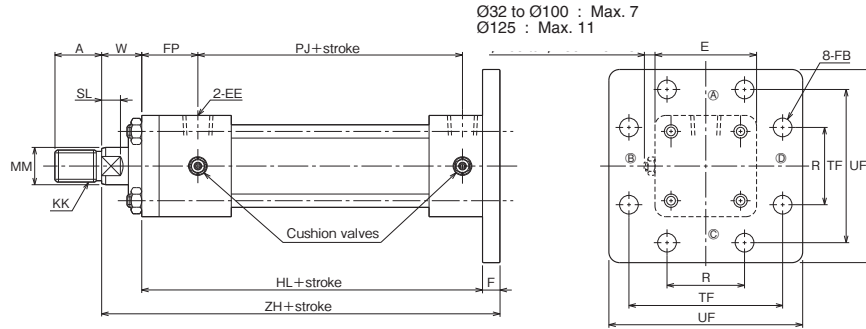


**Double rod type (Ø32 to Ø125/rod B or C)  
 for loading on both sides**

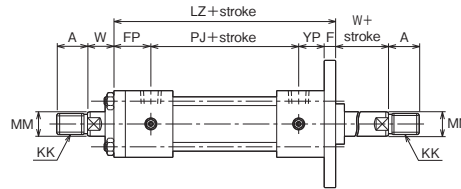


| Bore Ø | BB | E   | EE    | F  | FB | HL  | LL  | LZ  | PJ  | R   | TF  | UF  | W  | YP |
|--------|----|-----|-------|----|----|-----|-----|-----|-----|-----|-----|-----|----|----|
| 32     | 11 | 58  | Rc3/8 | 11 | 11 | 141 | 130 | 166 | 90  | 40  | 88  | 109 | 30 | 27 |
| 40     | 11 | 65  | Rc3/8 | 11 | 11 | 141 | 130 | 166 | 90  | 46  | 95  | 118 | 30 | 27 |
| 50     | 11 | 76  | Rc1/2 | 13 | 14 | 155 | 142 | 182 | 98  | 58  | 115 | 145 | 30 | 29 |
| 63     | 13 | 90  | Rc1/2 | 15 | 18 | 163 | 148 | 194 | 102 | 65  | 132 | 165 | 35 | 31 |
| 80     | 16 | 110 | Rc3/4 | 18 | 18 | 184 | 166 | 222 | 110 | 87  | 155 | 190 | 35 | 38 |
| 100    | 18 | 135 | Rc3/4 | 20 | 22 | 192 | 172 | 232 | 116 | 109 | 190 | 230 | 40 | 38 |
| 125    | 21 | 165 | Rc1   | 24 | 26 | 220 | 196 | 264 | 130 | 130 | 224 | 272 | 45 | 43 |

- For dimensions not shown in the figures above, refer to the SD style (basic style).
- For the mounting of sensors, refer to the dimensional drawings of "Switch Set." All the contents other than "Sensor mounting dimensions" are the same.
- If the port size exceeds 1 inch, it is recommended to order G thread or pipe flange. In such a case, contact us. (Order made)
- The Switch Set (Ø32 to Ø125) is also within the standard stroke range.



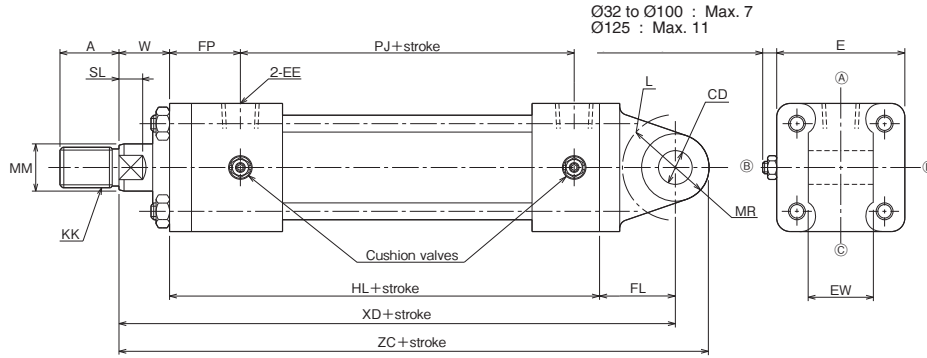
**Double rod type (Ø32 to Ø125/rod B or C)  
 for loading on both sides**



| Bore Ø | E   | EE    | F  | FB | FP | HL  | FP  | PJ  | R   | TF  | UF  | W   |    | YP | ZH  |     |
|--------|-----|-------|----|----|----|-----|-----|-----|-----|-----|-----|-----|----|----|-----|-----|
|        |     |       |    |    |    |     |     |     |     |     |     | B-C | A  |    | B-C | A   |
| 32     | 58  | Rc3/8 | 11 | 11 | 38 | 141 | 166 | 90  | 40  | 88  | 109 | 30  | —  | 27 | 182 | —   |
| 40     | 65  | Rc3/8 | 11 | 11 | 38 | 141 | 166 | 90  | 46  | 95  | 118 | 30  | 35 | 27 | 182 | 187 |
| 50     | 76  | Rc1/2 | 13 | 14 | 42 | 155 | 182 | 98  | 58  | 115 | 145 | 30  | 41 | 29 | 198 | 209 |
| 63     | 90  | Rc1/2 | 15 | 18 | 46 | 163 | 194 | 102 | 65  | 132 | 165 | 35  | 48 | 31 | 213 | 226 |
| 80     | 110 | Rc3/4 | 18 | 18 | 56 | 184 | 222 | 110 | 87  | 155 | 190 | 35  | 51 | 38 | 237 | 253 |
| 100    | 135 | Rc3/4 | 20 | 22 | 58 | 192 | 232 | 116 | 109 | 190 | 230 | 40  | 57 | 38 | 252 | 269 |
| 125    | 165 | Rc1   | 24 | 26 | 67 | 220 | 264 | 130 | 130 | 224 | 272 | 45  | 57 | 43 | 289 | 301 |

- For dimensions not shown in the figures above, refer to the SD style (basic style).
- For the mounting of sensors, refer to the dimensional drawings of “Switch Set.” All the contents other than “Sensor mounting dimensions” are the same.
- If the port size exceeds 1 inch, it is recommended to order G thread or pipe flange. In such a case, contact us. (Order made)
- The Switch Set (Ø32 to Ø125) is also within the standard stroke range.

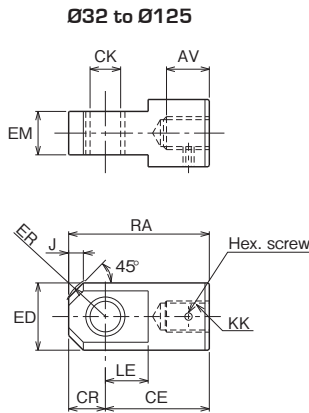




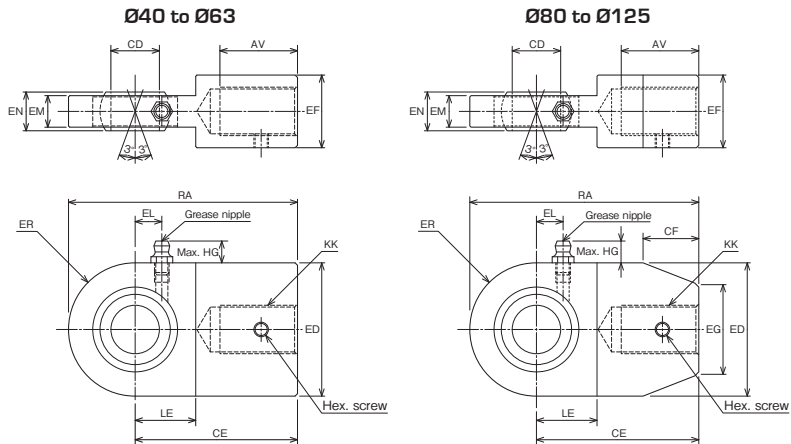
| Bore Ø | CD     | E   | EE    | EW <sup>+0.4</sup> / <sub>+0.1</sub> | FL  | FP | HL  | L   | MR    | PJ  | W   |    | XD  |     | ZC    |       |
|--------|--------|-----|-------|--------------------------------------|-----|----|-----|-----|-------|-----|-----|----|-----|-----|-------|-------|
|        |        |     |       |                                      |     |    |     |     |       |     | B-C | A  | B-C | A   | B-C   | A     |
| 32     | 16H9   | 58  | Rc3/8 | 25                                   | 38  | 38 | 141 | R20 | R16   | 90  | 30  | —  | 209 | —   | 225   | —     |
| 40     | 16H9   | 65  | Rc3/8 | 25                                   | 38  | 38 | 141 | R20 | R16   | 90  | 30  | 35 | 209 | 214 | 225   | 230   |
| 50     | 20H9   | 76  | Rc1/2 | 31.5                                 | 45  | 42 | 155 | R25 | R20   | 98  | 30  | 41 | 230 | 241 | 250   | 261   |
| 63     | 31.5H9 | 90  | Rc1/2 | 40                                   | 63  | 46 | 163 | R46 | R31.5 | 102 | 35  | 48 | 261 | 274 | 292.5 | 305.5 |
| 80     | 31.5H9 | 110 | Rc3/4 | 40                                   | 72  | 56 | 184 | R52 | R31.5 | 110 | 35  | 51 | 291 | 307 | 322.5 | 338.5 |
| 100    | 40H9   | 135 | Rc3/4 | 50                                   | 84  | 58 | 192 | R62 | R40   | 116 | 40  | 57 | 316 | 333 | 356   | 373   |
| 125    | 50H9   | 165 | Rc1   | 63                                   | 100 | 67 | 220 | R73 | R50   | 130 | 45  | 57 | 365 | 377 | 415   | 427   |

- For dimensions not shown in the figures above, refer to the SD style (basic style).
- For the mounting of sensors, refer to the dimensional drawings of "Switch Set." All the contents other than "Sensor mounting dimensions" are the same.
- If the port size exceeds 1 inch, it is recommended to order G thread or pipe flange. In such a case, contact us. (Order made)

Rod eye (T-end)



Rod eye with spherical bearing (S-end)



Notes)  
 ● The spherical bearings are not filled with grease. Lubricate appropriately through the grease nipple.  
 ● The bearing inner diameter and mounting width conform to JIS B8369.

Rod eye (T-end)

| Bore Ø | Part number |            | AV    |       | CE  | CK Ø    | CR | ED Ø | E | EM $_{-0.1}^{-0.4}$ | ER  | J  | KK      |         | LE | RA  |
|--------|-------------|------------|-------|-------|-----|---------|----|------|---|---------------------|-----|----|---------|---------|----|-----|
|        | Rod B       | Rod C      | Rod B | Rod C |     |         |    |      |   |                     |     |    | Rod B   | Rod C   |    |     |
| 32     | RTH-16-H    | —          | 27    | —     | 60  | 16H10   | 20 | 39   | — | 25                  | R23 | 8  | M16×1.5 | —       | 23 | 80  |
| 40     | RTH-20-H    | RTH-16-H   | 32    | 27    | 60  | 16H10   | 20 | 39   | — | 25                  | R23 | 8  | M20×1.5 | M16×1.5 | 23 | 80  |
| 50     | RTH-24-H    | RTH-20-1-H | 37    | 32    | 70  | 20H10   | 25 | 49   | — | 31.5                | R29 | 10 | M24×1.5 | M20×1.5 | 28 | 95  |
| 63     | RTH-30-H    | RTH-24-1-H | 47    | 37    | 115 | 31.5H10 | 35 | 62   | — | 40                  | R39 | 15 | M30×1.5 | M24×1.5 | 43 | 150 |
| 80     | RTH-39-H    | RTH-30-H   | 62    | 47    | 115 | 31.5H10 | 35 | 62   | — | 40                  | R39 | 15 | M39×1.5 | M30×1.5 | 43 | 150 |
| 100    | RTH-48-H    | RTH-39-1-H | 77    | 62    | 145 | 40H10   | 40 | 79   | — | 50                  | R45 | 20 | M48×1.5 | M39×1.5 | 55 | 185 |
| 125    | RTH-64-H    | RTH-48-1-H | 97    | 77    | 180 | 50H10   | 50 | 100  | — | 63                  | R54 | 30 | M64×2   | M48×1.5 | 65 | 230 |

Rod eye with spherical bearing (S-end)

| Bore Ø | Part number |          | AV    |       | CD Ø             | CE  | CF | ED  | EF | EG  | EM | EN               | ER    | KK      |         | LE | RA    |
|--------|-------------|----------|-------|-------|------------------|-----|----|-----|----|-----|----|------------------|-------|---------|---------|----|-------|
|        | Rod B       | Rod C    | Rod B | Rod C |                  |     |    |     |    |     |    |                  |       | Rod B   | Rod C   |    |       |
| 40     | RSH-20      | RSH-16   | 32    | 27    | 20 $_{-0.012}^0$ | 67  | —  | 55  | 30 | —   | 13 | 16 $_{-0.012}^0$ | R27.5 | M20×1.5 | M16×1.5 | 25 | 94.5  |
| 50     | RSH-24      | RSH-20-1 | 37    | 32    | 25 $_{-0.012}^0$ | 78  | —  | 65  | 35 | —   | 17 | 20 $_{-0.012}^0$ | R32.5 | M24×1.5 | M20×1.5 | 31 | 110.5 |
| 63     | RSH-30      | RSH-24-1 | 47    | 37    | 30 $_{-0.012}^0$ | 98  | —  | 80  | 45 | —   | 19 | 22 $_{-0.012}^0$ | R40   | M30×1.5 | M24×1.5 | 38 | 138   |
| 80     | RSH-39      | RSH-30-1 | 62    | 47    | 40 $_{-0.012}^0$ | 125 | 60 | 100 | 55 | 69  | 23 | 28 $_{-0.012}^0$ | R50   | M39×1.5 | M30×1.5 | 48 | 175   |
| 100    | RSH-48      | RSH-39-1 | 77    | 62    | 50 $_{-0.012}^0$ | 152 | 50 | 120 | 70 | 93  | 30 | 35 $_{-0.012}^0$ | R60   | M48×1.5 | M39×1.5 | 58 | 212   |
| 125    | RSH-64      | RSH-48-1 | 97    | 77    | 60 $_{-0.015}^0$ | 187 | 72 | 150 | 90 | 105 | 38 | 44 $_{-0.015}^0$ | R75   | M64×2   | M48×1.5 | 72 | 262   |

Grease nipple

| Bore Ø | Rod B              |    |    | Rod C              |    |    |
|--------|--------------------|----|----|--------------------|----|----|
|        | Grease nipple type | EL | HG | Grease nipple type | EL | HG |
| 40     | JIS A type MT6×1   | 11 | 11 | JIS A type MT6×1   | 11 | 11 |
| 50     | JIS A type MT6×1   | 14 | 11 | JIS A type MT6×1   | 14 | 11 |
| 63     | JIS A type Rc1/8   | 15 | 15 | JIS A type Rc1/8   | 15 | 15 |

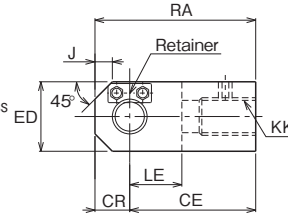
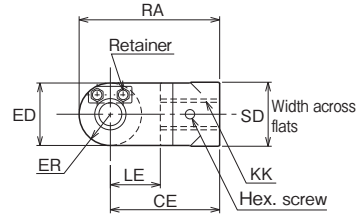
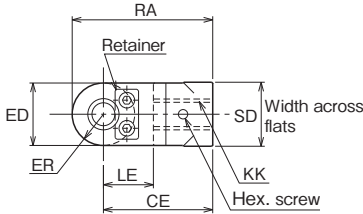
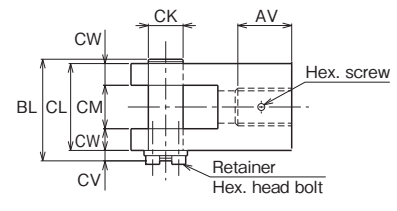
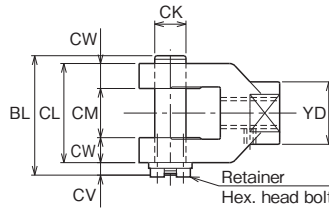
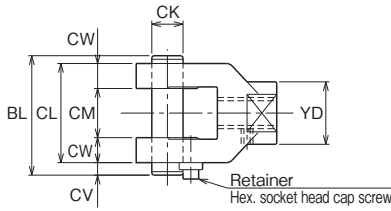
| Bore Ø | Rod B              |    |    | Rod C              |    |    |
|--------|--------------------|----|----|--------------------|----|----|
|        | Grease nipple type | EL | HG | Grease nipple type | EL | HG |
| 80     | JIS A type Rc1/8   | 20 | 15 | JIS A type Rc1/8   | 20 | 15 |
| 100    | JIS A type Rc1/8   | 24 | 15 | JIS A type Rc1/8   | 24 | 15 |
| 125    | JIS A type Rc1/8   | 28 | 15 | JIS A type Rc1/8   | 28 | 15 |

Rod clevis (Y-end) with pin

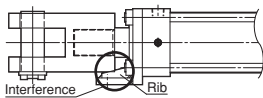
φ32 to φ80

φ100

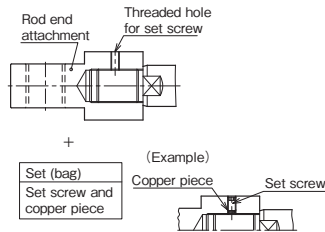
Ø125



| Bore<br>Ø | Part number |            | AV    |       | BL   | CE  | CK <sup>H10</sup> <sub>T8</sub> | CL   | CM <sup>+0.4</sup> <sub>+0.1</sub> | CR | CV | CW   | ED  | ER  | J  | KK      |         | LE | RA  | SD | YD |
|-----------|-------------|------------|-------|-------|------|-----|---------------------------------|------|------------------------------------|----|----|------|-----|-----|----|---------|---------|----|-----|----|----|
|           | Rod B       | Rod C      | Rod B | Rod C |      |     |                                 |      |                                    |    |    |      |     |     |    | Rod B   | Rod C   |    |     |    |    |
| 32        | RYH-16-H    | -          | -     | -     | 62   | 60  | 16                              | 50   | 25                                 | -  | 7  | 12.5 | 32  | R16 | -  | M16×1.5 | -       | 27 | 76  | 32 | 32 |
| 40        | RYH-20-H    | RYH-16-H   | -     | -     | 62   | 60  | 16                              | 50   | 25                                 | -  | 7  | 12.5 | 32  | R16 | -  | M20×1.5 | M16×1.5 | 27 | 76  | 32 | 32 |
| 50        | RYH-24-H    | RYH-20-1-H | -     | -     | 76.5 | 70  | 20                              | 63.5 | 31.5                               | -  | 8  | 16   | 40  | R20 | -  | M24×1.5 | M20×1.5 | 32 | 90  | 41 | 40 |
| 63        | RYH-30-H    | RYH-24-1-H | -     | -     | 93   | 115 | 31.5                            | 80   | 40                                 | -  | 8  | 20   | 60  | R30 | -  | M30×1.5 | M24×1.5 | 50 | 145 | 60 | 60 |
| 80        | RYH-39-H    | RYH-30-H   | -     | -     | 93   | 115 | 31.5                            | 80   | 40                                 | -  | 8  | 20   | 60  | R30 | -  | M39×1.5 | M30×1.5 | 50 | 145 | 60 | 60 |
| 100       | RYH-48-H    | RYH-39-1-H | -     | -     | 117  | 145 | 40                              | 100  | 50                                 | -  | 12 | 25   | 80  | R40 | -  | M48×1.5 | M39×1.5 | 60 | 185 | 80 | 80 |
| 125       | RYH-64-H    | RYH-48-1-H | 97    | 77    | 143  | 180 | 50                              | 126  | 63                                 | 50 | 12 | 31.5 | 100 | R54 | 30 | M64×2   | M48×1.5 | 70 | 230 | -  | -  |



■ Rod end attachments (T, Y, S) with a set screw and a copper piece (φ32 to φ125)



No need to specify the material/dimension/position symbol.

Example 1)

When it is required to deliver the cylinder with a set screw and a copper piece attached to the Y-end (to be finally tightened by the customer) without a drill hole. 140H-8R 2CB80BB100-ABAH2-T-X MDC

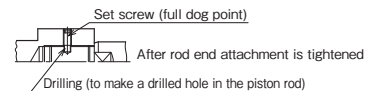
CAUTION

The cylinder will be delivered with the rod end attachment temporarily mounted on the rod.

After making the final adjustment, firmly tighten the rod end attachment, fit the copper piece into the set screw hole, and tighten the set screw.

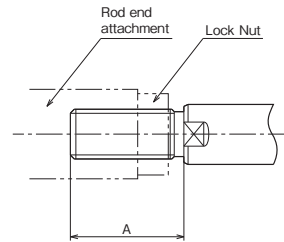
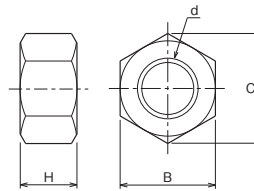
★ Adhesive has been applied to the set screw for prevention of loosening. However, the effect of the adhesive varies depending on the conditions of use, etc. Confirm the effect by yourself.

(Reference) Standard cylinders (without specifying the symbol 'MDC') will be delivered in the following state.



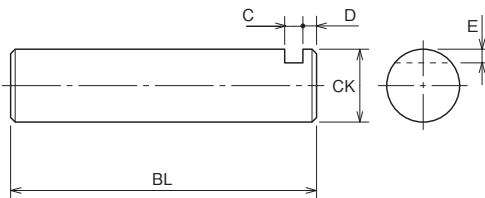
**Lock nut**

| Bore Ø | Rod | Part number | B   | C    | d       | H  | Dimension A |
|--------|-----|-------------|-----|------|---------|----|-------------|
| 32     | B   | LNH-16F-H   | 22  | 25.4 | M16x1.5 | 10 | 40          |
| 40     | A   | LNH-24F-H   | 32  | 37.0 | M24x1.5 | 14 | 50          |
|        | B   | LNH-20F-H   | 27  | 31.2 | M20x1.5 | 12 | 45          |
|        | C   | LNH-16F-H   | 22  | 25.4 | M16x1.5 | 10 | 40          |
| 50     | A   | LNH-30F-H   | 41  | 47.3 | M30x1.5 | 17 | 60          |
|        | B   | LNH-24F-H   | 32  | 37.0 | M24x1.5 | 14 | 50          |
|        | C   | LNH-20F-H   | 27  | 31.2 | M20x1.5 | 12 | 45          |
| 63     | A   | LNH-39F-H   | 55  | 63.5 | M39x1.5 | 20 | 80          |
|        | B   | LNH-30F-H   | 41  | 47.3 | M30x1.5 | 17 | 60          |
|        | C   | LNH-24F-H   | 32  | 37.0 | M24x1.5 | 14 | 50          |
| 80     | A   | LNH-48F-H   | 70  | 80.8 | M48x1.5 | 26 | 95          |
|        | B   | LNH-39F-H   | 55  | 63.5 | M39x1.5 | 20 | 80          |
|        | C   | LNH-30F-H   | 41  | 47.3 | M30x1.5 | 17 | 60          |
| 100    | A   | LNH-64F-H   | 90  | 104  | M64x2   | 35 | 125         |
|        | B   | LNH-48F-H   | 70  | 80.8 | M48x1.5 | 26 | 95          |
|        | C   | LNH-39F-H   | 55  | 63.5 | M39x1.5 | 20 | 80          |
| 125    | A   | LNH-80F-H   | 110 | 127  | M80x2   | 43 | 155         |
|        | B   | LNH-64F-H   | 90  | 104  | M64x2   | 35 | 125         |
|        | C   | LNH-48F-H   | 70  | 80.8 | M48x1.5 | 26 | 95          |



The standard fitting length of the rod end attachment and piston rod is about 80% of the thread diameter. If the fitting length is insufficient due to the use of the lock nut, it is necessary to increase the thread length (dimension A) as shown above.

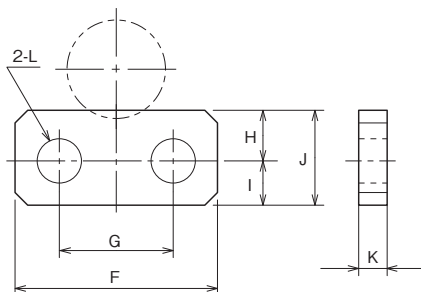
**Parallel Pin**



| Bore Ø | BL   | C | CK   | D | E    |
|--------|------|---|------|---|------|
| 32     | 62   | 4 | 16   | 3 | 3    |
| 40     | 62   | 4 | 16   | 3 | 3    |
| 50     | 76.5 | 5 | 20   | 3 | 3    |
| 63     | 93   | 5 | 31.5 | 3 | 4.75 |
| 80     | 93   | 5 | 31.5 | 3 | 4.75 |
| 100    | 117  | 7 | 40   | 5 | 5    |
| 125    | 143  | 7 | 50   | 5 | 5    |

• The tolerance of CK is f8.

**Retainer**

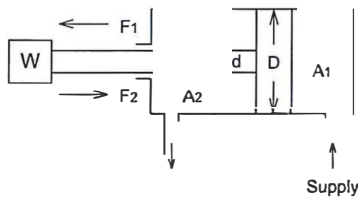


| Bore Ø | F  | G  | H   | I   | J  | K   | L Ø | Retainer mounting bolt size |
|--------|----|----|-----|-----|----|-----|-----|-----------------------------|
| 32     | 25 | 14 | 7   | 7   | 14 | 3   | 6.5 | M6                          |
| 40     | 25 | 14 | 7   | 7   | 14 | 3   | 6.5 | M6                          |
| 50     | 32 | 18 | 7.5 | 7.5 | 15 | 4.5 | 7   | M6                          |
| 63     | 32 | 18 | 7.5 | 7.5 | 15 | 4.5 | 7   | M6                          |
| 80     | 32 | 18 | 7.5 | 7.5 | 15 | 4.5 | 7   | M6                          |
| 100    | 50 | 30 | 10  | 10  | 20 | 6   | 10  | M8                          |
| 125    | 65 | 40 | 12  | 10  | 22 | 6   | 12  | M10                         |

**Standard and Semi-standard type 140H-8  
for Double acting single rod cylinders**

| Type   | Q'ty     | Parts code         |                    |                    |                    |                    |                    |                    |
|--|----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|  |          | Ø32                | Ø40                | Ø50                | Ø63                | Ø80                | Ø100               | Ø125               |
| Nitrile rubber (rod B)   | 1<br>set | NH8/PKS1<br>-032B  | NH8/PKS1<br>-040B  | NH8/PKS1<br>-050B  | NH8/PKS1<br>-063B  | NH8/PKS1<br>-080B  | NH8/PKS1<br>-100B  | NH8/PKS1<br>-125B  |
| Nitrile rubber (rod B) with switch                               |          | NH8R/PKS1<br>-032B | NH8R/PKS1<br>-040B | NH8R/PKS1<br>-050B | NH8R/PKS1<br>-063B | NH8R/PKS1<br>-080B | NH8R/PKS1<br>-100B | NH8R/PKS1<br>-125B |
| Urethane rubber (rod B)  |          | NH8/PKS2<br>-032B  | NH8/PKS2<br>-040B  | NH8/PKS2<br>-050B  | NH8/PKS2<br>-063B  | NH8/PKS2<br>-080B  | NH8/PKS2<br>-100B  | NH8/PKS2<br>-125B  |
| Urethane rubber (rod B) with switch                              |          | NH8R/PKS2<br>-032B | NH8R/PKS2<br>-040B | NH8R/PKS2<br>-050B | NH8R/PKS2<br>-063B | NH8R/PKS2<br>-080B | NH8R/PKS2<br>-100B | NH8R/PKS2<br>-125B |
| Fluoric rubber<br>(rod B/semi-standard)                          |          | NH8/PKS3<br>-032B  | NH8/PKS3<br>-040B  | NH8/PKS3<br>-050B  | NH8/PKS3<br>-063B  | NH8/PKS3<br>-080B  | NH8/PKS3<br>-100B  | NH8/PKS3<br>-125B  |
| Fluoric rubber<br>(rod B/semi-standard) with switch              |          | NH8R/PKS3<br>-032B | NH8R/PKS3<br>-040B | NH8R/PKS3<br>-050B | NH8R/PKS3<br>-063B | NH8R/PKS3<br>-080B | NH8R/PKS3<br>-100B | NH8R/PKS3<br>-125B |
| Hydrogenated nitrile rubber<br>(rod B/semi-standard)             |          | NH8/PKS6<br>-032B  | NH8/PKS6<br>-040B  | NH8/PKS6<br>-050B  | NH8/PKS6<br>-063B  | NH8/PKS6<br>-080B  | NH8/PKS6<br>-100B  | NH8/PKS6<br>-125B  |
| Hydrogenated nitrile rubber<br>(rod B/semi-standard) with switch |          | NH8R/PKS6<br>-032B | NH8R/PKS6<br>-040B | NH8R/PKS6<br>-050B | NH8R/PKS6<br>-063B | NH8R/PKS6<br>-080B | NH8R/PKS6<br>-100B | NH8R/PKS6<br>-125B |
| Nitrile rubber (rod C)   |          | —                  | NH8/PKS1<br>-040C  | NH8/PKS1<br>-050C  | NH8/PKS1<br>-063C  | NH8/PKS1<br>-080C  | NH8/PKS1<br>-100C  | NH8/PKS1<br>-125C  |
| Nitrile rubber (rod C) with switch                               |          | —                  | NH8R/PKS1<br>-040C | NH8R/PKS1<br>-050C | NH8R/PKS1<br>-063C | NH8R/PKS1<br>-080C | NH8R/PKS1<br>-100C | NH8R/PKS1<br>-125C |
| Urethane rubber (rod C)  |          | —                  | NH8/PKS2<br>-040C  | NH8/PKS2<br>-050C  | NH8/PKS2<br>-063C  | NH8/PKS2<br>-080C  | NH8/PKS2<br>-100C  | NH8/PKS2<br>-125C  |
| Urethane rubber (rod C) with switch                              |          | —                  | NH8R/PKS2<br>-040C | NH8R/PKS2<br>-050C | NH8R/PKS2<br>-063C | NH8R/PKS2<br>-080C | NH8R/PKS2<br>-100C | NH8R/PKS2<br>-125C |
| Fluoric rubber<br>(rod C/semi-standard)                          |          | —                  | NH8/PKS3<br>-040C  | NH8/PKS3<br>-050C  | NH8/PKS3<br>-063C  | NH8/PKS3<br>-080C  | NH8/PKS3<br>-100C  | NH8/PKS3<br>-125C  |
| Fluoric rubber<br>(rod C/semi-standard) with switch              |          | —                  | NH8R/PKS3<br>-040C | NH8R/PKS3<br>-050C | NH8R/PKS3<br>-063C | NH8R/PKS3<br>-080C | NH8R/PKS3<br>-100C | NH8R/PKS3<br>-125C |
| Hydrogenated nitrile rubber<br>(rod C/semi-standard)             |          | —                  | NH8/PKS6<br>-040C  | NH8/PKS6<br>-050C  | NH8/PKS6<br>-063C  | NH8/PKS6<br>-080C  | NH8/PKS6<br>-100C  | NH8/PKS6<br>-125C  |
| Hydrogenated nitrile rubber<br>(rod C/semi-standard) with switch |          | —                  | NH8R/PKS6<br>-040C | NH8R/PKS6<br>-050C | NH8R/PKS6<br>-063C | NH8R/PKS6<br>-080C | NH8R/PKS6<br>-100C | NH8R/PKS6<br>-125C |
| Nitrile rubber (rod A)   |          | —                  | NH8/PKS1<br>-040A  | NH8/PKS1<br>-050A  | NH8/PKS1<br>-063A  | NH8/PKS1<br>-080A  | NH8/PKS1<br>-100A  | NH8/PKS1<br>-125A  |
| Nitrile rubber (rod A) with switch                               |          | —                  | NH8R/PKS1<br>-040A | NH8R/PKS1<br>-050A | NH8R/PKS1<br>-063A | NH8R/PKS1<br>-080A | NH8R/PKS1<br>-100A | NH8R/PKS1<br>-125A |
| Urethane rubber (rod A)  |          | —                  | NH8/PKS2<br>-040A  | NH8/PKS2<br>-050A  | NH8/PKS2<br>-063A  | NH8/PKS2<br>-080A  | NH8/PKS2<br>-100A  | NH8/PKS2<br>-125A  |
| Urethane rubber (rod A) with switch                              |          | —                  | NH8R/PKS2<br>-040A | NH8R/PKS2<br>-050A | NH8R/PKS2<br>-063A | NH8R/PKS2<br>-080A | NH8R/PKS2<br>-100A | NH8R/PKS2<br>-125A |
| Fluoric rubber<br>(rod A/semi-standard)                          | —        | NH8/PKS3<br>-040A  | NH8/PKS3<br>-050A  | NH8/PKS3<br>-063A  | NH8/PKS3<br>-080A  | NH8/PKS3<br>-100A  | NH8/PKS3<br>-125A  |                    |
| Fluoric rubber<br>(rod A/semi-standard) with switch              | —        | NH8R/PKS3<br>-040A | NH8R/PKS3<br>-050A | NH8R/PKS3<br>-063A | NH8R/PKS3<br>-080A | NH8R/PKS3<br>-100A | NH8R/PKS3<br>-125A |                    |
| Hydrogenated nitrile rubber<br>(rod A/semi-standard)             | —        | NH8/PKS6<br>-040A  | NH8/PKS6<br>-050A  | NH8/PKS6<br>-063A  | NH8/PKS6<br>-080A  | NH8/PKS6<br>-100A  | NH8/PKS6<br>-125A  |                    |
| Hydrogenated nitrile rubber<br>(rod A/semi-standard) with switch | —        | NH8R/PKS6<br>-040A | NH8R/PKS6<br>-050A | NH8R/PKS6<br>-063A | NH8R/PKS6<br>-080A | NH8R/PKS6<br>-100A | NH8R/PKS6<br>-125A |                    |

The bore of a hydraulic cylinder depends on the required cylinder force.



- Push side cylinder force  
 $F_1 = A_1 \times P \times \beta$  (N)
- Pull side cylinder force  
 $F_2 = A_2 \times P \times \beta$  (N)

$A_1$  : push side piston pressurized area (mm<sup>2</sup>)  $A_1 = \frac{\pi}{4} D^2$

$A_2$  : pull side piston pressurized area (mm<sup>2</sup>)  $A_2 = \frac{\pi}{4} (D^2 - d^2)$

$D$  : cylinder bore (mm)  $d$  : piston rod dia. (mm)

$P$  : set pressure (MPa)

$\beta$  : load rate

When deciding the actual cylinder output, the resistance in the cylinder slipping part and the pressure loss in piping and machines must be considered.

The load rate is the ratio of the actual force loaded onto the cylinder to the theoretical force (theoretical cylinder force) calculated from the circuit set pressure. The general set points are shown below.

For low speed working ..... 60 to 80%

For high speed working ..... 25 to 35%

The hydraulic cylinder theoretical output table is based on the calculation results of the formula above.

**Pushed hydraulic cylinder theoretical output table (load rate 100%)**

Unit: kN (1kN = 102kgf)

| Bore mm<br>Ø | Pressurized<br>area mm <sup>2</sup> | Set pressure MPa |       |       |       |        |        |        |        |
|--------------|-------------------------------------|------------------|-------|-------|-------|--------|--------|--------|--------|
|              |                                     | 1.0              | 3.5   | 5.0   | 7.0   | 10.0   | 14.0   | 17.0   | 21.0   |
| 32           | 804                                 | 0.80             | 2.81  | 4.02  | 5.63  | 8.04   | 11.26  | 12.86  | 16.89  |
| 40           | 1257                                | 1.26             | 4.40  | 6.28  | 8.80  | 12.27  | 17.59  | 20.11  | 26.39  |
| 50           | 1963                                | 1.96             | 6.87  | 9.82  | 13.74 | 19.63  | 27.49  | 31.40  | 41.23  |
| 63           | 3117                                | 3.12             | 10.91 | 15.59 | 21.82 | 31.17  | 43.64  | 49.87  | 65.46  |
| 80           | 5027                                | 5.03             | 17.59 | 25.13 | 35.19 | 50.27  | 70.37  | 80.43  | 105.56 |
| 100          | 7854                                | 7.85             | 27.49 | 39.27 | 54.98 | 78.54  | 109.96 | 125.66 | 164.93 |
| 125          | 12272                               | 12.27            | 42.95 | 61.36 | 85.90 | 122.72 | 171.81 | 196.35 | 257.71 |

**Pulled hydraulic cylinder theoretical output table (load rate 100%)**

Unit: kN (1kN = 102kgf)

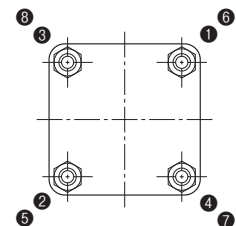
| Rod Type | Bore Ø mm | Bore dia.<br>Ø mm | Pressurized area<br>mm <sup>2</sup> | Set pressure MPa |       |       |       |       |        |
|----------|-----------|-------------------|-------------------------------------|------------------|-------|-------|-------|-------|--------|
|          |           |                   |                                     | 0.55             | 1.92  | 2.75  | 3.85  | 5.50  | 7.70   |
| B        | 32        | 18                | 550                                 | 0.55             | 1.92  | 2.75  | 3.85  | 5.50  | 7.70   |
|          | 50        | 28                | 1348                                | 1.35             | 4.72  | 6.74  | 9.43  | 13.48 | 18.87  |
|          | 80        | 45                | 3436                                | 3.44             | 12.03 | 17.18 | 24.05 | 34.36 | 48.11  |
|          | 100       | 56                | 5391                                | 5.39             | 18.87 | 26.95 | 37.74 | 53.91 | 75.47  |
| C        | 40        | 18                | 1002                                | 1.00             | 3.51  | 5.01  | 7.02  | 10.02 | 14.03  |
|          | 63        | 28                | 2501                                | 2.50             | 8.76  | 12.51 | 17.51 | 25.01 | 35.02  |
|          | 100       | 45                | 6264                                | 6.26             | 21.92 | 31.32 | 43.84 | 62.64 | 87.69  |
|          | 125       | 56                | 9809                                | 9.81             | 34.33 | 49.04 | 68.66 | 98.09 | 137.32 |
| A        | 40        | 28                | 641                                 | 0.64             | 2.24  | 3.20  | 4.49  | 6.41  | 8.97   |
|          | 63        | 45                | 1527                                | 1.53             | 5.34  | 7.63  | 10.69 | 15.27 | 21.38  |
|          | 80        | 56                | 2564                                | 2.56             | 8.97  | 12.82 | 17.94 | 25.64 | 35.89  |
|          | 125       | 90                | 5910                                | 5.91             | 20.69 | 29.55 | 41.37 | 59.10 | 82.74  |

- When deciding the actual cylinder output, consider the resistance in the cylinder slipping part and the pressure loss in piping and machines.
- Remember that the output at start may be decreased when the piston comes to a close contact status at the stroke end due to a load.

**Specified Tie Rod Tightening Torque Table**

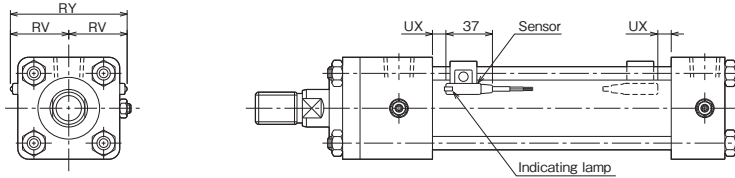
| Bore Ø (mm)             | 32       | 40       | 50       | 63      | 80      | 100     | 125     |     |
|-------------------------|----------|----------|----------|---------|---------|---------|---------|-----|
| Tie rod screw           | M10×1.25 | M10×1.25 | M10×1.25 | M12×1.5 | M16×1.5 | M18×1.5 | M22×1.5 |     |
| Tightening torque (N-m) | 140H-8   | 20       | 41       | 41      | 70      | 170     | 250     | 460 |

- Tightening of the rods: DO NOT tighten only one tie rod at a time, but tighten them gradually in the order show in the right diagram. Uneven tightening of the tie rods can cause operation failure or stick-slip.



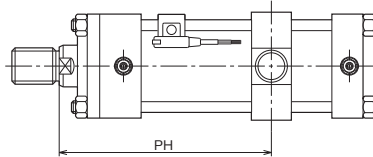
140H-8R 2 SD Bore B B 200 - A B Sensor symbol Sensor quantity

AX type (Reed sensor), AX type (Solid state sensor)

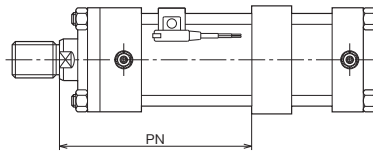


Minimum dimensions PH and PN of Switch Set Cylinders 140H-8R

· TC style



· FK style



- The minimum dimensions PH and PN of a Switch Set Cylinder are the dimensions obtained when the sensor is mounted on the rod side and the trunnion is moved toward the rod side as far as possible.

When boots are provided, dimension W changes. Specify dimension PH or PN.

| Bore Ø | RV                | RY                | UX                | Min. dimension PH | Min. dimension PN |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|
|        | AX type<br>AX205W | AX type<br>AX205W | AX type<br>AX205W | AX type<br>AX205W | AX type<br>AX205W |
| 32     | 36                | 72                | 13                | 171               | 157               |
| 40     | 40                | 80                | 14                | 171               | 157               |
| 50     | 43                | 86                | 15                | 178.5             | 162               |
| 63     | 50                | 100               | 17                | 196.5             | 175               |
| 80     | 60                | 120               | 19                | 211.5             | 190               |
| 100    | 70                | 140               | 21                | 224.5             | 198               |
| 125    | 83                | 166               | 23                | 250               | 221               |

Note) Dimension UX indicates the optimum sensor mounting position for detection of stroke end.



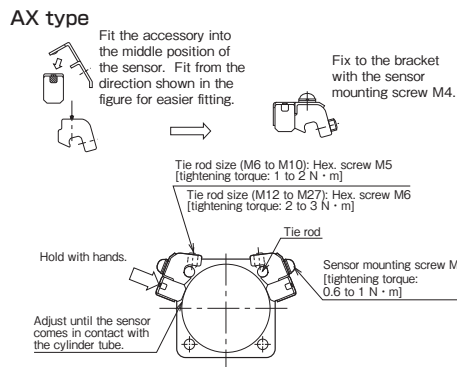
| Type        | Sensor Symbol | Load voltage range                  | Load current range                   | Max. switching capacity | Protective circuit | Indicating Lamp                     | Wiring method   | Cord length | Applicable load                      |
|-------------|---------------|-------------------------------------|--------------------------------------|-------------------------|--------------------|-------------------------------------|---|-------------|--------------------------------------|
| Reed sensor | AF AX101CE    | DC:5 to 30V<br>AC:5 to 120V         | DC:5 to 40mA<br>AC:5 to 20mA         | DC: 1.5W<br>AC:2VA      | None               | LED<br>(Lights in red when sensing) | 0.3 MM <sup>2</sup> .<br>2-core, outer dia. ø4mm<br>Rear wiring | 1.5m        | Small relay, programmable controller |
|             | AG AX105CE    |                                     |                                      |                         |                    |                                     |   | 5m          |                                      |
|             | AH AX111CE    |                                     |                                      |                         | 1.5m               |                                     |   |             |                                      |
|             | AJ AX115CE    | 5m                                  |                                      |                         |                    |                                     |   |             |                                      |
|             | AE AX125CE    | DC: 30V or less<br>AC: 120V or less | DC: 40mA or less<br>AD: 20mA or less |                         | None               | None                                |   | 5m          |                                      |

- Notes
- For the sensors without a protective circuit, be sure to provide a protective circuit (SK-100) with the load when using any induction load (relay, etc.).
  - The output logic of AX is B contact. When the piston is detected, the sensor contact turns off (the lamp turns on).
  - For the details of sensors, be sure to read the sensor specifications.

● **Standard type**  
**AX type**  
**(rear wiring)**



**Setting method of sensor detection position**



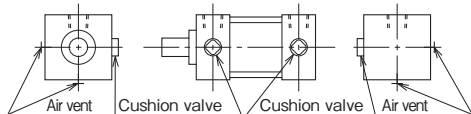
1. Loosen the two hex. screws with a hex. wrench, and move them along the tie rod.
2. Adjust the detecting position [for the 2-LED type, the position where the green lamp lights up] 2 to 5 mm (about half of the operating range is appropriate) before the required position where the sensor indicator lamp starts to light up (ON). Then, gently hold the top of the sensor so that the cylinder tube contacts the detecting face of the sensor, and clamp the hex. screw to an appropriate tightening torque. Note) Inappropriate tightening torque may cause the off-center off-center of the sensor position.
3. The indicating lamp lights up when the sensor is set to the ON position.
4. Sensors can be mounted to any of four tie rods on the most suitable position depending on the mounting space of the cylinder and wiring method.
5. Mount a sensor to the most suitable position to detect the stroke end with the "sensor mounting dimension" [dimension UX].

| Bore<br>Ø mm | Mounting style  | Styles other than TC |                  | TC style        |                  |
|--------------|-----------------|----------------------|------------------|-----------------|------------------|
|              | Sensor quantity | With one sensor      | With two sensors | With one sensor | With two sensors |
|              | Sensor type     | AX type              | AX type          | AX type         | AX type          |
| 32           |                 | 20                   | 25               | 50              | 110              |
| 40           |                 | 20                   | 25               | 50              | 115              |
| 50           |                 | 20                   | 25               | 50              | 115              |
| 63           |                 | 20                   | 25               | 60              | 125              |
| 80           |                 | 20                   | 25               | 60              | 130              |
| 100          |                 | 20                   | 25               | 65              | 135              |
| 125          |                 | 20                   | 25               | 70              | 150              |

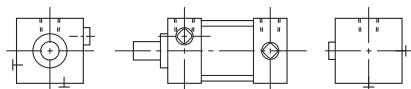
| Bore<br>Ø mm | Reed sensor     |            | Solid state sensor |            |                 |            |
|--------------|-----------------|------------|--------------------|------------|-----------------|------------|
|              | AX1**           |            | AX2**              |            | AX2**W          |            |
|              | Operating range | Hysteresis | Operating range    | Hysteresis | Operating range | Hysteresis |
| 32           | 4 to 14         | 2 or less  | 3 to 8             | 1 or less  | 9 to 12         | 2 or less  |
| 40           |                 |            |                    |            |                 |            |
| 50           |                 |            |                    |            |                 |            |
| 63           |                 |            |                    |            |                 |            |
| 80           |                 |            |                    |            |                 |            |
| 100          | 11 to 18        |            | 4 to 10            |            | 17 to 21        |            |
| 125          | 5 to 15         |            |                    |            |                 |            |

Cushion valve and air vent positions depending on cylinder bore (for rod A only)

Bore  $\phi 40, \phi 50, \phi 100$

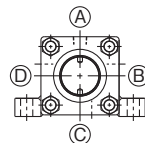


Bore  $\phi 63, \phi 80, \phi 125$

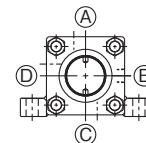


Port, cushion and air vent positions for LA style

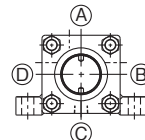
Port position ①



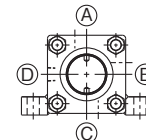
Port position ②



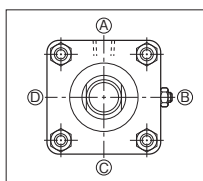
Port position ③



Port position ④



★ Standard specifications



- With cushions on both ends
- Port position ①, cushion valve position ②

Notes) There are check valves on two sides out of the four outer sides of cap and rod cover except the port and cushion sides. The check valve is concurrently used with air vent.

★ Semi-standard range

- With Boots
- Change in TC accessory position (dimensional symbol: PH)
- Change in dimension PN of the FK style
- Plated cylinder tube [hard chrome plating thickness: 0.02mm]
- Change in piston rod end (dimensional symbol: W, A, KK) Refer to page 6.

★ Change of port and cushion valve positions

The standard port position is ①, and the standard cushion valve position is ②.

When modifying the positions, enter the symbol shown in the dimensional drawings.

Example) 140H-8R 2SD80BB100-② ③ AH2

Port position (A, B, C, D)

Cushion valve position (A, B, C, D, O)

- For the TA style, the standard port position and cushion valve position are ① and ③ on the rod side and ① and ② on the cap side.
- In case that the cushion is not equipped, the cushion valve position is "O".

★ Delivery of rod end attachment (T-end or Y-end)

A delivery method for a cylinder provided with a lock nut and a rod end attachment differs from that for a cylinder provided with a rod end attachment only (without a lock nut). For details, refer to the dimensional drawings of rod end attachments.

| Order contents  | ① Standard symbol | Position  |  | Dimension |             | Material |             |
|---|-------------------|---|--|-----------|-------------|----------|-------------|
|   |                   | ② Symbol  | Description  | ② Symbol  | Description | ② Symbol | Description |
| <p>■ Change of port and cushion valve positions on the cap side</p> | PPC               | PC-□□   | □□ indicates the port and cushion valve positions on the cap side. | —         | —           | —        | —           |
| Example   |                   | To change the port and cushion valve positions from the cap side to the rod side (AB on rod side, BC on cap side)<br>140H-8 2LA80BB100-AB-X PPC PC-BC |  |           |             |          |             |

★ **Port G (ISO 1179-1) or NPT (order made)**

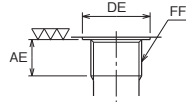
For a port G thread type cylinder, make an order in accordance with the following procedure.

(Example) 140H-8 2LA50BB100-G A B

G: Port G thread type N: NPT thread type

Port position

Cushion valve position



Thread Dimension Table

Unit: mm

| Bore | G thread |       |      | NPT thread |
|------|----------|-------|------|------------|
|      | AE       | DE    | FF   |            |
| φ32  | 12       | φ25.5 | G3/8 | NPT3/8     |
| φ40  | 12       | φ25.5 | G3/8 | NPT3/8     |
| φ50  | 14       | φ30   | G1/2 | NPT1/2     |
| φ63  | 14       | φ30   | G1/2 | NPT1/2     |
| φ80  | 16       | φ36.9 | G3/4 | NPT3/4     |
| φ100 | 16       | φ36.9 | G3/4 | NPT3/4     |
| φ125 | 18       | φ46.1 | G1   | NPT1       |

| Order contents  | Semi-standard symbol  | Position              |             | Dimension  |             | Material |             |    |     |     |     |     |     |
|---|---|-----------------------|-------------|--|-------------|----------|-------------|----|-----|-----|-----|-----|-----|
|   |   | ②Symbol               | Description | ③Symbol  | Description | ④Symbol  | Description |    |     |     |     |     |     |
| <p>■ Additional port of bushing</p> <p>Notes 1) Select a reduced port size after mounting a bushing.<br/>                     2) For reduction by more than two steps by using a bushing, consult us.</p>   | PBS   | —                     | —           | RC-1.00  | Rc1/8       | —        | —           |    |     |     |     |     |     |
|   |   |                       |             | RC-2.00  | Rc1/4       |          |             |    |     |     |     |     |     |
|   |   |                       |             | RC-3.00  | Rc3/8       |          |             |    |     |     |     |     |     |
|   |   |                       |             | RC-4.00  | Rc1/2       |          |             |    |     |     |     |     |     |
|   |   |                       |             | RC-6.00  | Rc3/4       |          |             |    |     |     |     |     |     |
|   |   |                       |             | RC-8.00  | Rc1         |          |             |    |     |     |     |     |     |
|   |   |                       |             | RC-10.00   | Rc1 1/4     |          |             |    |     |     |     |     |     |
|   |   |                       |             | RC-12.00   | Rc1 1/2     |          |             |    |     |     |     |     |     |
| Example   | To reduce the port size to Rc1/2 by mounting a bushing to 140H-8 CA style 80-mm bore cylinder (standard port size Rc3/4)<br>140H-8 2CA80BB300-AB-X PBS RC-4.00    |                       |             |  |             |          |             |    |     |     |     |     |     |
| <p>■ Reduction of Rc thread port size (φ32 to φ125)</p> <p>★ Specify the size to reduce the port size without using a bushing.</p> <p>Inapplicable to: ● All types of rod A<br/>                     ● Rod B or C with LA style</p> <p>Note) Increasing the port diameter changes the dimensions. Consult us.</p> | PRT   | Specify the size only |             | Port size selectable for cylinder bore (◎: Standard port size) |             |          |             |    |     |     |     |     |     |
|   |   | ③Symbol               | Description | 32   | 40          | 50       | 63          | 80 | 100 | 125 | 140 | 150 | 160 |
|   |   | RC-1.00               | Rc1/8       | ○  | ○           | ×        | ×           | ×  | ×   | ×   | ×   | ×   | ×   |
|   |   | RC-2.00               | Rc1/4       | ○  | ○           | ○        | ○           | ×  | ×   | ×   | ×   | ×   | ×   |
|   |   | RC-3.00               | Rc3/8       | ◎  | ◎           | ○        | ○           | ○  | ○   | ×   | ×   | ×   | ×   |
|   |   | RC-4.00               | Rc1/2       | ×  | ×           | ◎        | ◎           | ○  | ○   | ○   | ○   | ○   | ○   |
|   |   | RC-6.00               | Rc3/4       | ×  | ×           | ×        | ×           | ◎  | ◎   | ○   | ○   | ○   | ○   |
|   |   | RC-8.00               | Rc1         | ×  | ×           | ×        | ×           | ×  | ×   | ◎   | ◎   | ◎   | ◎   |
| RC-10.00  | Rc1 1/4   | ×                     | ×           | ×  | ×           | ×        | ×           | ×  | ×   | ×   | ×   |     |     |
| Note  | To reduce the cover port directly to Rc3/8 without mounting a bushing to 63-mm bore cylinder (standard port size Rc1/2)<br>140H-8R 2CA80BB100-ABAH2-X PRT RC-3.00 |                       |             |  |             |          |             |    |     |     |     |     |     |
| <p>■ Reduction of NPT thread port size (φ32 to φ125)</p> <p>Note) Select a standard port size and a reduced port size.</p> <p>Inapplicable to: ● All types of rod A<br/>                     ● Rod B or C with LA style</p> <p>Note) Increasing the port diameter changes the dimensions. Consult us.</p>         | PTN   | Specify the size only |             | Port size selectable for cylinder bore (◎: Standard port size) |             |          |             |    |     |     |     |     |     |
|   |   | ③Symbol               | Description | 32   | 40          | 50       | 63          | 80 | 100 | 125 | 140 | 150 | 160 |
|   |   | N-1.00                | NPT1/8      | ○  | ○           | ×        | ×           | ×  | ×   | ×   | ×   | ×   | ×   |
|   |   | N-2.00                | NPT1/4      | ○  | ○           | ○        | ○           | ×  | ×   | ×   | ×   | ×   | ×   |
|   |   | N-3.00                | NPT3/8      | ◎  | ◎           | ○        | ○           | ○  | ○   | ×   | ×   | ×   | ×   |
|   |   | N-4.00                | NPT1/2      | ×  | ×           | ◎        | ◎           | ○  | ○   | ○   | ○   | ○   | ○   |
|   |   | N-6.00                | NPT3/4      | ×  | ×           | ×        | ×           | ◎  | ◎   | ○   | ○   | ○   | ○   |
|   |   | N-8.00                | NPT1        | ×  | ×           | ×        | ×           | ×  | ×   | ◎   | ◎   | ◎   | ◎   |
| N-10.00   | NPT1 1/4  | ×                     | ×           | ×  | ×           | ×        | ×           | ×  | ×   | ×   | ×   |     |     |
| Cap side  | To order the standard port size (◎), see the following.   |                       |             |  |             |          |             |    |     |     |     |     |     |
| Note  | To reduce the port size for a cylinder bore of 50 mm (standard size 1/2) to NPT 3/8<br>140H-8 2CB50BB100-NAB-X PTN N-3.00   |                       |             |  |             |          |             |    |     |     |     |     |     |

**Weight Table/General purpose type**

**Unit: kg**

| Bore (mm) Ø | Rod type | Basic weight (SD style)  |                 | Additional weight per mm of stroke |                 | Mounting accessory weight |     |     |     |      |      |     |      |     |      |      |     |     |
|-------------|----------|--------------------------|-----------------|------------------------------------|-----------------|---------------------------|-----|-----|-----|------|------|-----|------|-----|------|------|-----|-----|
|             |          | Standard type Switch Set | Double rod type | Standard type Switch Set           | Double rod type | LA                        | FA  | FB  | FC  | FD   | FK   | FY  | FZ   | CA  | CS   | CB   | TA  | TC  |
| 32          | B        | 3.3                      | 4.1             | 0.006                              | 0.008           | 0.3                       | 0.1 | 0.6 | 0.6 | 0.9  | 1.1  | 0.2 | 0.7  | 0.4 | -    | 0.5  | 0.1 | 0.5 |
| 40          | A        | 3.8                      | -               | 0.013                              | -               | 0.5                       | -   | 0.7 | 0.7 | 1.1  | -    | 0.3 | 0.8  | 0.5 | 0.6  | 0.6  | 0.1 | 0.6 |
|             | B        | 3.5                      | 4.4             | 0.011                              | 0.014           |                           | 0.2 |     |     |      | 1.2  |     |      |     |      |      |     |     |
|             | C        | 3.4                      | 4.3             | 0.010                              | 0.012           |                           | 0.2 |     |     |      | 1.2  |     |      |     |      |      |     |     |
| 50          | A        | 5.5                      | -               | 0.017                              | -               | 0.9                       | -   | -   | 1.5 | 2.0  | -    | 1.1 | 1.6  | 1.0 | 1.1  | 1.2  | 0.4 | 1.0 |
|             | B        | 5.0                      | 6.4             | 0.014                              | 0.019           | 0.9                       | 0.7 | 1.2 | 1.5 | 2.0  | 2.2  | 1.1 | 1.6  | 1.0 | 1.1  | 1.2  | 0.4 | 1.0 |
|             | C        | 4.9                      | 6.2             | 0.012                              | 0.014           | 0.9                       | 0.7 | 1.2 | 1.5 | 2.0  | 2.2  | 1.1 | 1.6  | 1.0 | 1.1  | 1.2  | 0.4 | 1.0 |
| 63          | A        | 9.1                      | -               | 0.024                              | -               | 1.0                       | -   | 1.8 | 2.2 | 3.0  | -    | 1.6 | 2.4  | 2.0 | 1.9  | 2.6  | 0.6 | 1.2 |
|             | B        | 7.9                      | 10.2            | 0.019                              | 0.027           |                           | 1.0 |     |     |      | 3.6  |     |      |     |      |      |     |     |
|             | C        | 7.6                      | 9.8             | 0.017                              | 0.022           |                           | 1.0 |     |     |      | 3.6  |     |      |     |      |      |     |     |
| 80          | A        | 18.0                     | -               | 0.039                              | -               | 1.8                       | -   | 3.0 | 2.8 | 4.7  | -    | 2.1 | 4.0  | 3.0 | 3.6  | 3.6  | 0.6 | 2.1 |
|             | B        | 16.2                     | 20.3            | 0.032                              | 0.045           | 1.8                       | 1.1 | 3.0 | 2.8 | 4.7  | 4.7  | 2.1 | 4.0  | 3.0 | 3.6  | 3.6  | 0.6 | 2.1 |
|             | C        | 15.5                     | 19.4            | 0.027                              | 0.035           | 1.8                       | 1.1 | 3.0 | 2.8 | 4.7  | 4.7  | 2.1 | 4.0  | 3.0 | 3.6  | 3.6  | 0.6 | 2.1 |
| 100         | A        | 29.6                     | -               | 0.060                              | -               | 2.1                       | 1.8 | 4.8 | 4.6 | 7.4  | 8.9  | 3.9 | 6.9  | 5.5 | 6.7  | 6.7  | 1.0 | 3.8 |
|             | B        | 26.0                     | 32.7            | 0.048                              | 0.067           | 2.1                       | 1.8 | 4.8 | 4.6 | 7.4  | 8.9  | 3.9 | 6.9  | 5.5 | 6.7  | 6.7  | 1.0 | 3.8 |
|             | C        | 24.9                     | 31.1            | 0.042                              | 0.055           | 2.1                       | 1.8 | 4.8 | 4.6 | 7.4  | 8.9  | 3.9 | 6.9  | 5.5 | 6.7  | 6.7  | 1.0 | 3.8 |
| 125         | A        | 49.2                     | -               | 0.096                              | -               | 3.2                       | -   | 8.4 | 8.0 | 13.0 | -    | 6.2 | 12.1 | 9.9 | 12.8 | 12.1 | 2.1 | 6.2 |
|             | B        | 42.9                     | 53.6            | 0.077                              | 0.107           |                           | 2.9 |     |     |      | 12.6 |     |      |     |      |      |     |     |
|             | C        | 42.5                     | 52.7            | 0.065                              | 0.084           |                           | 2.9 |     |     |      | 12.6 |     |      |     |      |      |     |     |

**Sensor Additional Weight**

**Unit: kg**

| Sensor Bore Ø mm | AX/AX205W type    |                 |                |
|------------------|-------------------|-----------------|----------------|
|                  | Cord length 1.5 m | Cord length 5 m | Connector type |
| 32 to 50         | 0.05              | 0.13            | 0.04           |
| 63               | 0.07              | 0.14            | 0.06           |
| 80 100           | 0.07              | 0.15            | 0.06           |
| 125              | 0.09              | 0.16            | 0.07           |

**Calculation formula**

Cylinder weight (kg)=basic weight+(cylinder stroke (mm)Xadditional weights per mm of stroke)+(sensor additional weightXsensor quantity)+mounting accessory weight+rod end attachment weight.

**Calculation example**

140H-8R, bore Ø80, rod B, cylinder stroke 200 MM, 2 pcs of AX214 (cord length 5 m), LA style.

| Bore (mm) Ø | Rod type | Rod end attachment weight |                 |                           |          |
|-------------|----------|---------------------------|-----------------|---------------------------|----------|
|             |          | Rod eye (T-end)           | Rod eye (S-end) | Rod clevis (Y-end) w/ pin | Lock nut |
| 32          | B        | 0.5                       | -               | 0.7                       | 0.02     |
| 40          | A        | -                         | -               | -                         | 0.05     |
|             | B        | 0.5                       | 0.7             | 0.7                       | 0.03     |
|             | C        | 0.5                       | 0.7             | 0.7                       | 0.02     |
| 50          | A        | -                         | -               | -                         | 0.11     |
|             | B        | 1.0                       | 1.1             | 1.2                       | 0.05     |
|             | C        | 1.0                       | 1.2             | 1.2                       | 0.03     |
| 63          | A        | -                         | -               | -                         | 0.24     |
|             | B        | 2.7                       | 2.1             | 3.9                       | 0.11     |
|             | C        | 2.7                       | 2.3             | 3.9                       | 0.05     |
| 80          | A        | -                         | -               | -                         | 0.52     |
|             | B        | 2.2                       | 3.2             | 3.7                       | 0.24     |
|             | C        | 2.2                       | 3.6             | 3.7                       | 0.11     |
| 100         | A        | -                         | -               | -                         | 1.10     |
|             | B        | 4.2                       | 6.7             | 7.7                       | 0.52     |
|             | C        |                           | 7.3             |                           | 0.24     |
| 125         | A        | -                         | -               | -                         | 1.93     |
|             | B        | 8.0                       | 12.4            | 14.6                      | 1.10     |
|             | C        | 8.0                       | 13.7            | 14.6                      | 0.52     |

|  |         |                                  |   |   |   |       |                              |
|--|---------|----------------------------------|---|---|---|-------|------------------------------|
| <p>■ Water-glycol working fluid</p> <p>Notes)</p> <p>1) Iron tubing (standard type) is plated with hard chrome and tested with water-glycol fluid.</p> <p>2) Stainless steel tubing (Switch Set) is not plated in conformity with the standard and tested with water-glycol fluid.</p> | FWF     | —                                | — | — | — | WF-WG | WF-WG:<br>Water-glycol fluid |
|  | Example | 14OH-8 6LB80BB100-AB-X FWF WF-WG |   |   |   |       |                              |

**Adaptability of Fluid to Seal Material**

| Seal material     | Adaptable fluid       |                    |                       |                    |                    |
|-------------------|-----------------------|--------------------|-----------------------|--------------------|--------------------|
|                   | Petroleum-based fluid | Water-glycol fluid | Phosphate ester fluid | Water in oil fluid | Oil in water fluid |
| ① Nitrile rubber  | ○                     | ○                  | ×                     | ○                  | ○                  |
| ② Urethane rubber | ◎                     | ×                  | ×                     | △                  | △                  |
| ③ Fluorocarbon    | ○                     | ×                  | ○                     | ○                  | ○                  |
| ⑥ HNBR            | ○                     | ◎                  | ×                     | ◎                  | ◎                  |

Notes) 1. ◎○: Applicable ×: Inapplicable  
 Consult us before using the △-marked items.  
 2. The ◎-marked items are recommended seal materials in case of giving the first priority to abrasion resistance.

**Working temperature range of packing material depending on working oil type**

| Working oil           | Packing material            | -10°C                | 0°C                  | Temperature (°C)     |  | 80°C                 | 100°C | 120°C |
|-----------------------|-----------------------------|----------------------|----------------------|----------------------|--|----------------------|-------|-------|
|                       |                             | 14°F                 | 32°F                 | Temperature (°F)     |  | 176°F                | 212°F | 248°F |
| Petroleum-based fluid | Nitrile rubber              | ████████████████████ |                      |                      |  |                      |       |       |
|                       | Urethane rubber             | ████████████████████ |                      |                      |  |                      |       |       |
|                       | Fluoric rubber              |                      | ████████████████████ | ████████████████████ |  |                      |       |       |
|                       | Hydrogenated nitrile rubber | ████████████████████ |                      | ████████████████████ |  | ████████████████████ |       |       |
| Water-glycol fluid    | Nitrile rubber              | ████████████████████ |                      |                      |  |                      |       |       |
|                       | Hydrogenated nitrile rubber | ████████████████████ |                      | ████████████████████ |  |                      |       |       |
| Phosphate ester fluid | Fluoric rubber              |                      | ████████████████████ | ████████████████████ |  |                      |       |       |
| Water in oil fluid    | Nitrile rubber              | ████████████████████ |                      |                      |  |                      |       |       |
|                       | Hydrogenated nitrile rubber | ████████████████████ |                      | ████████████████████ |  |                      |       |       |
| Oil in water fluid    | Nitrile rubber              | ████████████████████ |                      |                      |  |                      |       |       |
|                       | Hydrogenated nitrile rubber | ████████████████████ |                      | ████████████████████ |  |                      |       |       |

- Notes) ● Use the packings applicable to working oil used within the working temperature range. Otherwise, substantial abrasion and inferiority may occur to the packings.
- The temperature range shown in the table above is applicable to each packing material. For the switch sets, use them within the working temperature range applicable to the switches.

**Adaptability of working oil to packing material**

| Packing material              | Adaptable working oil |                    |                       |                    |                    |
|-------------------------------|-----------------------|--------------------|-----------------------|--------------------|--------------------|
|                               | Petroleum-based fluid | Water-glycol fluid | Phosphate ester fluid | Water in oil fluid | Oil in water fluid |
| 1 Nitrile rubber              | ○                     | ○                  | ×                     | ○                  | ○                  |
| 2 Urethane rubber             | ◎                     | ×                  | ×                     | △                  | △                  |
| 3 Fluoric rubber              | ○                     | ×                  | ○                     | ○                  | ○                  |
| 6 Hydrogenated nitrile rubber | ○                     | ◎                  | ×                     | ◎                  | ◎                  |

- Notes) \* The ◎ and ○ -marked items are applicable, while the × -marked items are inapplicable. For the use of the △ -marked items, contact us.
- \* The ◎ -marked items are the recommended packing materials in case of giving the first priority to abrasion resistance.

## Safety Guide for Selecting and Using Hydraulic, Pneumatic Cylinders and Their Accessories

**WARNING: ⚠ FAILURE OF THE CYLINDER, ITS PARTS, ITS MOUNTING, ITS CONNECTIONS TO OTHER OBJECTS, OR ITS CONTROLS CAN RESULT IN:**

- Unanticipated or uncontrolled movement of the cylinder or objects connected to it.
- Falling of the cylinder or objects held up by it.
- Fluid escaping from the cylinder, potentially at high velocity.

**THESE EVENTS COULD CAUSE DEATH OR PERSONAL INJURY BY, FOR EXAMPLE, PERSONS FALLING FROM HIGH LOCATIONS, BEING CRUSHED OR STRUCK BY HEAVY OR FAST MOVING OBJECTS, BEING PUSHED INTO DANGEROUS EQUIPMENT OR SITUATIONS, OR SLIPPING ON ESCAPED FLUID.**

Before selecting or using Parker Hannifin Corporation (the Company) cylinders or related accessories, it is important that you read, understand and follow the following safety information. Training is advised before selecting and using the Company's products.

### 1.0 General Instructions

**1.1 Scope** – This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) cylinder products. This safety guide is a supplement to and is to be used with the specific Company publications for the specific cylinder products that are being considered for use.

**1.2 Fail Safe** – Cylinder products can and do fail without warning for many reasons. All systems and equipment should be designed in a fail-safe mode so that if the failure of a cylinder product occurs people and property won't be endangered.

**1.3 Distribution** – Provide a free copy of this safety guide to each person responsible for selecting or using cylinder products. Do not select or use the Company's cylinders without thoroughly reading and understanding this safety guide as well as the specific Company publications for the products considered or selected.

**1.4 User Responsibility** – Due to very wide variety of cylinder applications and cylinder operating conditions, the Company does not warrant that any particular cylinder is suitable for any specific application. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The hydraulic and pneumatic cylinders outlined in this catalog are designed to the Company's design guidelines and do not necessarily meet the design guideline of other agencies such as American Bureau of Shipping, ASME Pressure Vessel Code etc. The user, through its own analysis and testing, is solely responsible for:

- Making the final selection of the cylinders and related accessories.
- Determining if the cylinders are required to meet specific design requirements as required by the Agency(s) or industry standards covering the design of the user's equipment.
- Assuring that the user's requirements are met, OSHA requirements are met, and safety guidelines from the applicable agencies such as but not limited to ANSI are followed and that the use presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the cylinders are used.

**1.5 Additional Questions** – Call the appropriate Company technical service department if you have any questions or require any additional information. See the Company publication for the product being considered or used, or call 1-847-298-2400, or go to [www.parker.com](http://www.parker.com), for telephone numbers of the appropriate technical service department.

### 2.0 Cylinder and Accessories Selection

**2.1 Seals** – Part of the process of selecting a cylinder is the selection of seal compounds. Before making this selection, consult the "seal information page(s)" of the publication for the series of cylinders of interest.

The application of cylinders may allow fluids such as cutting fluids, wash down fluids etc. to come in contact with the external area of the cylinder. These fluids may attack the piston rod wiper and or the primary seal and must be taken into account when selecting and specifying seal compounds.

Dynamic seals will wear. The rate of wear will depend on many operating factors. Wear can be rapid if a cylinder is mis-aligned or if the cylinder has been improperly serviced. The user must take seal wear into consideration in the application of cylinders.

**2.2 Piston Rods** – Possible consequences of piston rod failure or separation of the piston rod from the piston include, but are not limited to are:

- Piston rod and or attached load thrown off at high speed.
- High velocity fluid discharge.
- Piston rod extending when pressure is applied in the piston retract mode.

Piston rods or machine members attached to the piston rod may move suddenly and without warning as a consequence of other conditions occurring to the machine such as, but not limited to:

- Unexpected detachment of the machine member from the piston rod.

- Failure of the pressurized fluid delivery system (hoses, fittings, valves, pumps, compressors) which maintain cylinder position.
- Catastrophic cylinder seal failure leading to sudden loss of pressurized fluid.
- Failure of the machine control system.

Follow the recommendations of the "Piston Rod Selection Chart and Data" in the publication for the series of cylinders of interest. The suggested piston rod diameter in these charts must be followed in order to avoid piston rod buckling.

Piston rods are not normally designed to absorb bending moments or loads which are perpendicular to the axis of piston rod motion. These additional loads can cause the piston rod to fail. If these types of additional loads are expected to be imposed on the piston rod, their magnitude should be made known to our engineering department.

The cylinder user should always make sure that the piston rod is securely attached to the machine member.

On occasion cylinders are ordered with double rods (a piston rod extended from both ends of the cylinder). In some cases a stop is threaded on to one of the piston rods and used as an external stroke adjuster. On occasions spacers are attached to the machine member connected to the piston rod and also used as a stroke adjuster. In both cases the stops will create a pinch point and the user should consider appropriate use of guards. If these external stops are not perpendicular to the mating contact surface, or if debris is trapped between the contact surfaces, a bending moment will be placed on the piston rod, which can lead to piston rod failure. An external stop will also negate the effect of cushioning and will subject the piston rod to impact loading. Those two (2) conditions can cause piston rod failure. Internal stroke adjusters are available with and without cushions. The use of external stroke adjusters should be reviewed with our engineering department.

The piston rod to piston and the stud to piston rod threaded connections are secured with an anaerobic adhesive. The strength of the adhesive decreases with increasing temperature. Cylinders which can be exposed to temperatures above +250°F (+121°C) are to be ordered with a non studded piston rod and a pinned piston to rod joint.

**2.3 Cushions** – Cushions should be considered for cylinder applications when the piston velocity is expected to be over 4 inches/second.

Cylinder cushions are normally designed to absorb the energy of a linear applied load. A rotating mass has considerably more energy than the same mass moving in a linear mode. Cushioning for a rotating mass application should be reviewed by our engineering department.

**2.4 Cylinder Mountings** – Some cylinder mounting configurations may have certain limitations such as but not limited to minimum stroke for side or foot mounting cylinders or pressure de-ratings for certain mounts. Carefully review the catalog for these types of restrictions.

Always mount cylinders using the largest possible high tensile alloy steel socket head cap screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

**2.5 Port Fittings** – Hydraulic cylinders applied with meter out or deceleration circuits are subject to intensified pressure at piston rod end.

The rod end pressure is approximately equal to:

$$\frac{\text{operating pressure} \times \text{effective cap end area}}{\text{effective rod end piston area}}$$

Contact your connector supplier for the pressure rating of individual connectors.

### 3.0 Cylinder and Accessories Installation and Mounting

#### 3.1 Installation

**3.1.1** – Cleanliness is an important consideration, and cylinders are shipped with the ports plugged to protect them from contaminants entering the ports. These plugs should not be removed until the piping is to be installed. Before making the connection to the cylinder ports, piping should be thoroughly cleaned to remove all chips or burrs which might have resulted from threading or flaring operations.



**3.1.2** – Cylinders operating in an environment where air drying materials are present such as fast-drying chemicals, paint, or weld splatter, or other hazardous conditions such as excessive heat, should have shields installed to prevent damage to the piston rod and piston rod seals.

**3.1.3** – Proper alignment of the cylinder piston rod and its mating component on the machine should be checked in both the extended and retracted positions. Improper alignment will result in excessive rod gland and/or cylinder bore wear. On fixed mounting cylinders attaching the piston rod while the rod is retracted will help in achieving proper alignment.

**3.1.4** – Sometimes it may be necessary to rotate the piston rod in order to thread the piston rod into the machine member. This operation must always be done with zero pressure being applied to either side of the piston. Failure to follow this procedure may result in loosening the piston to rod-threaded connection. In some rare cases the turning of the piston rod may rotate a threaded piston rod gland and loosen it from the cylinder head. Confirm that this condition is not occurring. If it does, re-tighten the piston rod gland firmly against the cylinder head.

For double rod cylinders it is also important that when attaching or detaching the piston rod from the machine member that the torque be applied to the piston rod end of the cylinder that is directly attaching to the machine member with the opposite end unrestrained. If the design of the machine is such that only the rod end of the cylinder opposite to where the rod attaches to the machine member can be rotated, consult the factory for further instructions.

### 3.2 Mounting Recommendations

**3.2.1** – Always mount cylinders using the largest possible high tensile alloy steel socket head screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

**3.2.2** – Side-Mounted Cylinders – In addition to the mounting bolts, cylinders of this type should be equipped with thrust keys or dowel pins located so as to resist the major load.

**3.2.3** – Tie Rod Mounting – Cylinders with tie rod mountings are recommended for applications where mounting space is limited. The standard tie rod extension is shown as BB in dimension tables. Longer or shorter extensions can be supplied. Nuts used for this mounting style should be torqued to the same value as the tie rods for that bore size.

**3.2.4** – Flange Mount Cylinders – The controlled diameter of the rod gland extension on head end flange mount cylinders can be used as a pilot to locate the cylinders in relation to the machine. After alignment has been obtained, the flanges may be drilled for pins or dowels to prevent shifting.

**3.2.5** – Trunnion Mountings – Cylinders require lubricated bearing blocks with minimum bearing clearances. Bearing blocks should be carefully aligned and rigidly mounted so the trunnions will not be subjected to bending moments. The rod end should also be pivoted with the pivot pin in line and parallel to axis of the trunnion pins.

**3.2.6** – Clevis Mountings – Cylinders should be pivoted at both ends with centerline of pins parallel to each other. After cylinder is mounted, be sure to check to assure that the cylinder is free to swing through its working arc without interference from other machine parts.

### 4.0 Cylinder and Accessories Maintenance, Troubleshooting and Replacement

**4.1 Storage** – At times cylinders are delivered before a customer is ready to install them and must be stored for a period of time. When storage is required the following procedures are recommended.

**4.1.1** – Store the cylinders in an indoor area which has a dry, clean and noncorrosive atmosphere. Take care to protect the cylinder from both internal corrosion and external damage.

**4.1.2** – Whenever possible cylinders should be stored in a vertical position (piston rod up). This will minimize corrosion due to possible condensation which could occur inside the cylinder. This will also minimize seal damage.

**4.1.3** – Port protector plugs should be left in the cylinder until the time of installation.

**4.1.4** – If a cylinder is stored full of hydraulic fluid, expansion of the fluid due to temperature changes must be considered. Installing a check valve with free flow out of the cylinder is one method.

**4.1.5** – When cylinders are mounted on equipment that is stored outside for extended periods, exposed unpainted surfaces, e.g. piston rod, must be coated with a rust-inhibiting compound to prevent corrosion.

### 4.2 Cylinder Trouble Shooting

#### 4.2.1 – External Leakage

**4.2.1.1** – Rod seal leakage can generally be traced to worn or damaged seals. Examine the piston rod for dents, gouges or score marks, and replace piston rod if surface is rough.

Rod seal leakage could also be traced to gland wear. If clearance is excessive, replace rod bushing and seal. Rod seal leakage can also be traced to seal deterioration. If seals are soft or gummy or brittle, check compatibility of seal material with lubricant used if air cylinder, or operating fluid if hydraulic cylinder. Replace with seal material, which is compatible with these fluids. If the seals are hard or have lost elasticity, it is usually due to exposure to temperatures in excess of 165°F. (+74°C). Shield the cylinder from the heat source to limit temperature to 350°F. (+177°C.) and replace with fluorocarbon seals.

**4.2.1.2** – Cylinder body seal leak can generally be traced to loose tie rods. Torque the tie rods to manufacturer's recommendation for that bore size.

Excessive pressure can also result in cylinder body seal leak. Determine maximum pressure to rated limits. Replace seals and retorque tie rods as in paragraph above. Excessive pressure can also result in cylinder body seal leak. Determine if the pressure rating of the cylinder has been exceeded. If so, bring the operating pressure down to the rating of the cylinder and have the tie rods replaced.

Pinched or extruded cylinder body seal will also result in a leak. Replace cylinder body seal and retorque as in paragraph above.

Cylinder body seal leakage due to loss of radial squeeze which shows up in the form of flat spots or due to wear on the O.D. or I.D. – Either of these are symptoms of normal wear due to high cycle rate or length of service. Replace seals as per paragraph above.

#### 4.2.2 – Internal Leakage

**4.2.2.1** – Piston seal leak (by-pass) 1 to 3 cubic inches per minute leakage is considered normal for piston ring construction. Virtually no static leak with lipseal type seals on piston should be expected. Piston seal wear is a usual cause of piston seal leakage. Replace seals as required.

**4.2.2.2** – With lipseal type piston seals excessive back pressure due to over-adjustment of speed control valves could be a direct cause of rapid seal wear. Contamination in a hydraulic system can result in a scored cylinder bore, resulting in rapid seal wear. In either case, replace piston seals as required.

**4.2.2.3** – What appears to be piston seal leak, evidenced by the fact that the cylinder drifts, is not always traceable to the piston. To make sure, it is suggested that one side of the cylinder piston be pressurized and the fluid line at the opposite port be disconnected. Observe leakage. If none is evident, seek the cause of cylinder drift in other component parts in the circuit.

#### 4.2.3 – Cylinder Fails to Move the Load

**4.2.3.1** – Pneumatic or hydraulic pressure is too low. Check the pressure at the cylinder to make sure it is to circuit requirements.

**4.2.3.2** – Piston Seal Leak – Operate the valve to cycle the cylinder and observe fluid flow at valve exhaust ports at end of cylinder stroke. Replace piston seals if flow is excessive.

**4.2.3.3** – Cylinder is undersized for the load – Replace cylinder with one of a larger bore size.

#### 4.3 Erratic or Chatter Operation

**4.3.1** – Excessive friction at rod gland or piston bearing due to load misalignment – Correct cylinder-to-load alignment.

**4.3.2** – Cylinder sized too close to load requirements – Reduce load or install larger cylinder.

**4.3.3** – Erratic operation could be traced to the difference between static and kinetic friction. Install speed control valves to provide a back pressure to control the stroke.

**4.4 Cylinder Modifications, Repairs, or Failed Component** – Cylinders as shipped from the factory are not to be disassembled and or modified. If cylinders require modifications, these modifications must be done at company locations or by the Company's certified facilities. The Cylinder Division Engineering Department must be notified in the event of a mechanical fracture or permanent deformation of any cylinder component (excluding seals). This includes a broken piston rod, tie rod, mounting accessory or any other cylinder component. The notification should include all operation and application details. This information will be used to provide an engineered repair that will prevent recurrence of the failure.

It is allowed to disassemble cylinders for the purpose of replacing seals or seal assemblies. However, this work must be done by strictly following all the instructions provided with the seal kits.

## Offer of Sale

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods, services or work described will be referred to as "Products".

**1. Terms and Conditions.** Seller's willingness to offer Products, or accept an order for Products, to or from Buyer is subject to these Terms and Conditions or any newer version of the terms and conditions found on-line at [www.parker.com/saleterms/](http://www.parker.com/saleterms/). Seller objects to any contrary or additional terms or conditions of Buyer's order or any other document issued by Buyer.

**2. Price Adjustments; Payments.** Prices stated on Seller's quote or other documentation offered by Seller are valid for 30 days, and do not include any sales, use, or other taxes unless specifically stated. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). Payment is subject to credit approval and is due 30 days from the date of invoice or such other term as required by Seller's Credit Department, after which Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.

**3. Delivery Dates; Title and Risk; Shipment.** All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon placement of the products with the shipment carrier at Seller's facility. Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferral of shipment at Buyers' request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.

**4. Warranty.** Seller warrants that the Products sold hereunder shall be free from defects in material or workmanship for a period of eighteen months from the date of delivery to Buyer. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

**5. Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 30 days after delivery. Buyer shall notify Seller of any alleged breach of warranty within 30 days after the date the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for an amount due on any invoice) must be commenced within 12 months from the date of the breach without regard to the date breach is discovered.

**6. LIMITATION OF LIABILITY.** UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. **IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.**

**7. User Responsibility.** The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

**8. Loss to Buyer's Property.** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, will be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer ordering the items manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

**9. Special Tooling.** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

**10. Buyer's Obligation; Rights of Seller.** To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

**11. Improper use and Indemnity.** Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright

infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

**12. Cancellations and Changes.** Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

**13. Limitation on Assignment.** Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

**14. Force Majeure.** Seller does not assume the risk and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

**15. Waiver and Severability.** Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

**16. Termination.** Seller may terminate this agreement for any reason and at any time by giving Buyer thirty (30) days written notice of termination. Seller may immediately terminate this agreement, in writing, if Buyer: (a) commits a breach of any provision of this agreement (b) appointments a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or by a third party (d) makes an assignment for the benefit of creditors, or (e) dissolves or liquidates all or a majority of its assets.

**17. Governing Law.** This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement.

**18. Indemnity for Infringement of Intellectual Property Rights.** Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If a Product is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

**19. Entire Agreement.** This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

**20. Compliance with Law, U. K. Bribery Act and U.S. Foreign Corrupt Practices Act.** Buyer agrees to comply with all applicable laws and regulations, including both those of the United Kingdom and the United States of America, and of the country or countries of the Territory in which Buyer may operate, including without limitation the U. K. Bribery Act, the U.S. Foreign Corrupt Practices Act ("FCPA") and the U.S. Anti-Kickback Act (the "Anti-Kickback Act"), and agrees to indemnify and hold harmless Seller from the consequences of any violation of such provisions by Buyer, its employees or agents. Buyer acknowledges that they are familiar with the provisions of the U. K. Bribery Act, the FCPA and the Anti-Kickback Act, and certifies that Buyer will adhere to the requirements thereof. In particular, Buyer represents and agrees that Buyer shall not make any payment or give anything of value, directly or indirectly to any governmental official, any foreign political party or official thereof, any candidate for foreign political office, or any commercial entity or person, for the purpose of influencing such person to purchase products or otherwise benefit the business of Seller.

**Notes**

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