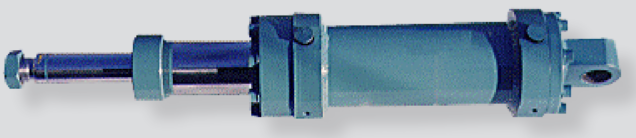
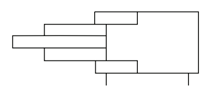
# KTC70HP series



## Features

- Telescopic single acting constant speed cylinder.
- 2-room stroke cylinder requires less room for installation in the axial direction.
- Both stroke ends are provided with fixed cushions.

Symbol



## How to Order

KTC 70HP - LA 20 - A 1500 [ ] [ ]

① ② ③ ④ ⑤ ⑥ ⑦

### ① Series

| | |
|---|---|
| KTC 70HP | Telescopic cylinder |

### ② Mounting style

| | | | |
|---|---|---|---|
| LA | Axial angle of foot | CA | Single clevis |
| LT | Base mounting axial angle of foot | TA | Rod side trunnion |
| FA | Rod side flange | TB | Head side trunnion |
| FB | Head side flange | | |

### ③ Type

| Type | | Bore size | |
|---|---|---|---|
| | | 1 room | 2 room |
| 10 | Type 10 | Ø63 | Ø45 |
| 20 | Type 20 | Ø90 | Ø65 |
| 30 | Type 30 | Ø110 | Ø80 |
| 40 | Type 40 | Ø125 | Ø90 |
| 50 | Type 50 | Ø140 | Ø100 |

### ④ Rod end thread length(dimension A)

| Type | A | B |
|---|---|---|
| | (Standard) | (Semi-standard) |
| Type 10 | 25mm | 35mm |
| Type 20 | 35mm | 45mm |
| Type 30 | 40mm | 55mm |
| Type 40 | 45mm | 60mm |
| Type 50 | 52mm | 72mm |

### ⑤ Cylinder stroke

| Type | Stroke |
|---|---|
| Type 10 | 50~1700 |
| Type 20 | 50~2500 |
| Type 30 | 50~3100 |
| Type 40 | 50~3100 |
| Type 50 | 50~3100 |

※ Check buckling, as it varies depending on mounting style.
※ Contact us for longer stroke.
※ Max. stroke is 50mm.

### ⑥ Port position

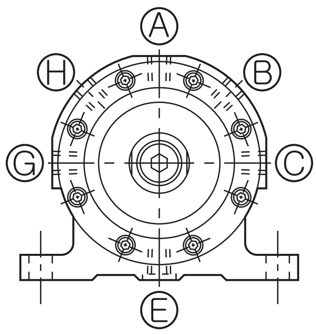
| | |
|---|---|
| Nil | C, G (Standard) |
| A,B,D,E,F,H | Refer to figure below according to mounting style. |

### ⑦ Air vent position

| | |
|---|---|
| Nil | A (Standard) |
| B,C,D,E,F,G,H | Refer to figure below according to mounting style. |

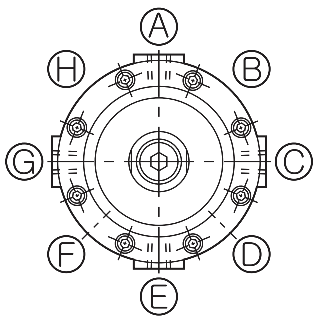
### Mounting style LA, LT

The standard port positions are C and G, and the standard air vent position is A.



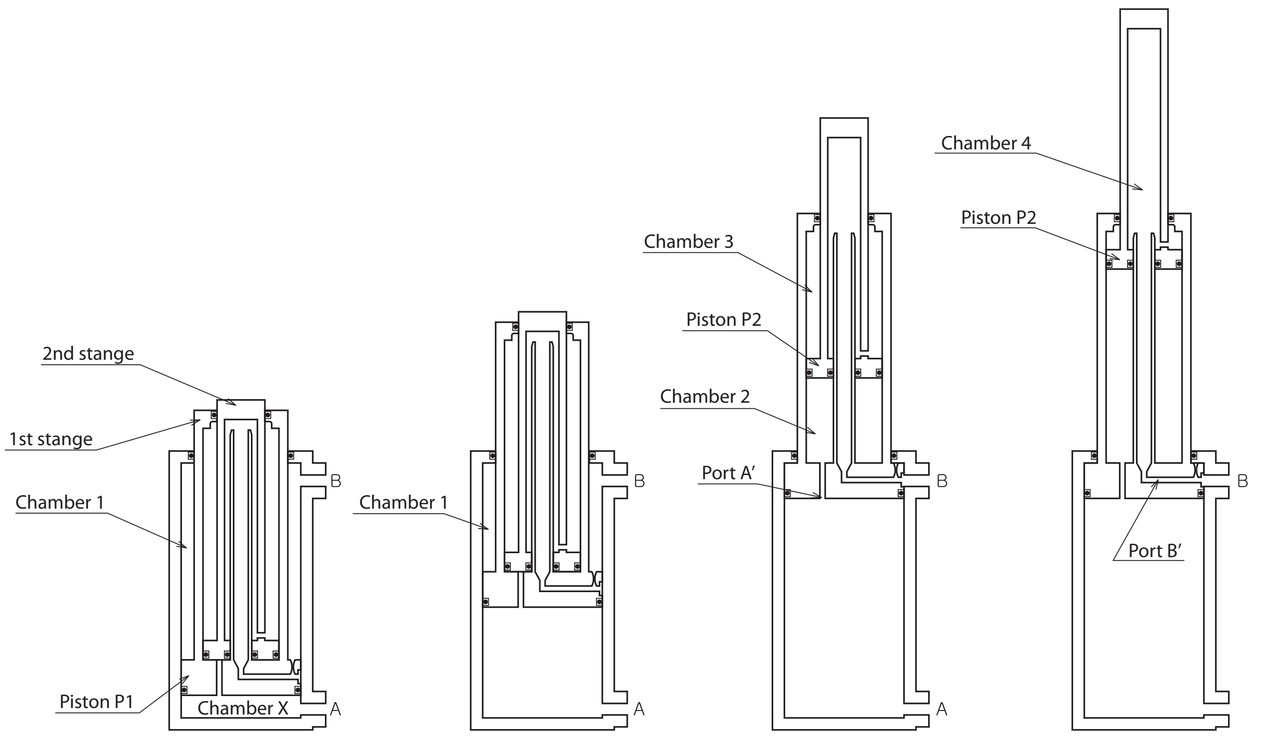

### Mounting style FA, FB, CA, TA, TB

The standard port positions are A and E, and the standard air vent position is C.




Note) Locate the ports and air vent at a distance of 90°or 180° from one another.

## Principle of Operation




### Extension

The hydraulic fluid flowing through port A enters chamber X and gives pushing force to piston P1 to actuate the 1st stage. At the same time, the fluid in chamber 1 is discharged through port B.
When piston P1 reaches the end on the rod cover side, the hydraulic fluid enters chamber 2 through port A' of piston P1 and gives force to piston P2 to actuate the 2nd stage. At the same time, the fluid in chamber 3 flows into chamber 4 through the hole in the rod connected to piston P2 and is discharged to port B as return fluid through port B' piston P1.

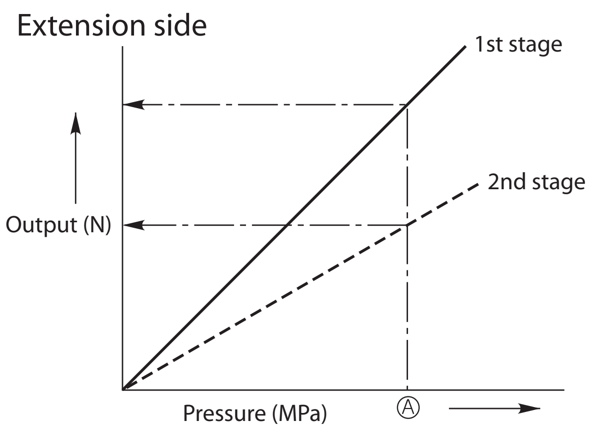
### Retraction

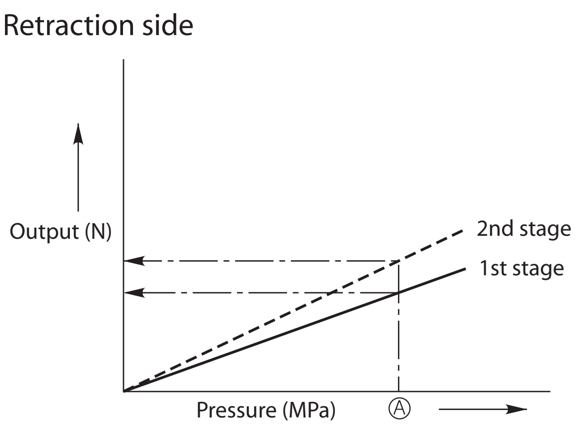
The hydraulic fluid flowing through port B enters chamber 4 through port B' of piston P1 and flows into chamber 3 through the hole in the rod connected to piston P2. The hydraulic fluid flowing into chamber 3 gives force to the rod cover side of piston P2 to actuate the 2nd stage. At the same time, the fluid in chamber 2 is discharged from port A through port A'. When piston P2 reaches the cap cover side, the hydraulic fluid enters chamber 1 and gives force to the rod cover side of piston P1 to actuate the 1st stage. At the same time, the fluid in the chamber X is discharged from port A.

## Output Characteristic Diagrams

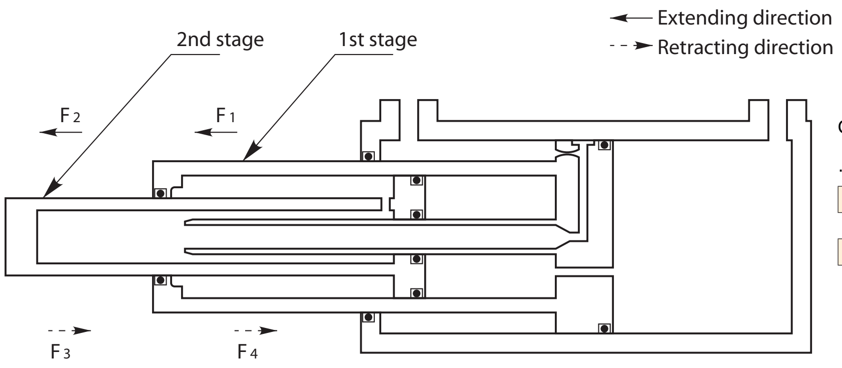
The diagrams below show the output at the 1st and 2nd stages on the extension side and retraction side. At the pressure point A, there is an obvious difference in output between the 1st and 2nd stages. This difference is caused by a difference in sectional area.

It is clear that the ouput at the 1st stage is larger on the extension side and the output at the 2nd stage is larger on the retraction side. Therefore, the cylinder operations can be confirmed. On the extension side, the 1st stage operates, and the 2nd stage operates. On the retraction side, the 2nd stage operates, and then the 1st stage operates.



## Calculation of Cylinder Force




Cylinder operation

| ·Extending direction | ·Retracting direction |
|---|---|
| 1 Stage | 2 Stage |
| ↓ | ↓ |
| 2 Stage | 1 Stage |

●Cylinder force in extending direction
-1st stage: $F_1=A_1 \times P \times \beta$(kgf)
-2nd stage: $F_2=A_2 \times P \times \beta$(kgf)

●Cylinder force in retracting direction
-1st stage: $F_3=A_3 \times P \times \beta$(kgf)
-2nd stage: $F_4=A_4 \times P \times \beta$(kgf)

A1: Effective sectional area at 1st stage in extending direction ($cm^2$)
A2: Effective sectional area at 2nd stage in extending direction ($cm^2$)
A3: Effective sectional area at 1st stage in retracting direction ($cm^2$)
A4: Effective sectional area at 2nd stage in retracting direction ($cm^2$)
P : Working pressure (kgf/$cm^2$)
β : Load rate

The actual cylinder output should be determined in consideration of the resistance of cylinder sliding sections and the pressure loss of the piping and equipment.
The load rate refers to the ratio of the actual force applied to the cylinder to the theoretical force (theoretical cylinder force) calculated from the circuit set pressure. Generally, the load rate should be in the following range.
When the inertia force is low: 60 to 80%
When the inertia force is high: 25 to 35%
(For the calculation examples shown in this catalogue, a load rate of 80% is used.)

Table of Piston Effective Sectional Area Unit:$cm^2$

| Type \ Direction | Extending direction | | Retracting direction | |
|---|---|---|---|---|
| | 1 stage | 2 stage | 1 stage | 2 stage |
| Type 10 | 31.17 | 15.12 | 9.11 | 9.39 |
| Type 20 | 63.62 | 31.42 | 19.44 | 20.07 |
| Type 30 | 95.03 | 47.72 | 31.42 | 31.82 |
| Type 40 | 122.72 | 61.07 | 39.40 | 39.84 |
| Type 50 | 153.94 | 76.00 | 48.25 | 48.66 |

<Example>
Determine the cylinder force at the 1st and 2nd stages in the extending and retracting directions when type 10 double acting telescopic cylinder is used at a set pressure of 70kgf/$cm^2$.

<Answer>
Cylinder force in extending direction (kgf)
-1st stage = Set pressure(kgf/$cm^2$) x Piston effective sectional area at 1st stage in extending direction($cm^2$) x Load rate
= 70 x 31.2 x 0.8 = 1.747(kgf)
-2nd stage = Set pressure(kgf/$cm^2$) x Piston effective sectional area at 2nd stage in extending direction($cm^2$) x Load rate
= 70 x 15.1 x 0.8 = 845(kgf)

Cylinder force on retracting direction (kgf)
-2nd stage = Set pressure(kgf/$cm^2$) x Piston effective sectional area at 2nd stage in retracting direction($cm^2$) x Load rate
= 70 x 9.4 x 0.8 = 526(kgf)
-1st stage = Set pressure(kgf/$cm^2$) x Piston effective sectional area at 1st stage in retracting direction($cm^2$) x Load rate
= 70 x 9.1 x 0.8 = 509(kgf)

<Example>
Select an optimum type of double acting telescopic cylinder to obtain a cylinder force of 1000kgf at the 1st stage in the retracting direction at a set pressure of 7 kgf/$cm^2$.
Determine the cylinder force at the 1st and 2nd stages in the extending and retracting directions when the selected cylinder is used.

<Answer>

$$\text{Piston effective sectional area } (cm^2) = \frac{\text{Cylinder force}(kgf/cm^2)}{\text{Set pressure}(kgf/cm^2)\times\text{Load rate}} = \frac{1{,}000}{70\times0.8} \fallingdotseq 17.86$$

When you select a cylinder bore larger than 17.86 from the rod cover side 1st stage column in the table of piston effective sectional area, then type 20 is selected.

Cylinder Force at Each Stage
Extending direction:
Cylinder force at 1st stage= 70 x 63.62 x 0.8=3,562.72kgf
Cylinder force at 2nd stage= 70 x 31.42 x 0.8=1,759.52kgf

Retracting direction:
Cylinder force at 2nd stage= 70 x 19.44 x 0.8=1,088.64kgf
Cylinder force at 1st stage= 70 x 20.07 x 0.8=1,123.92kgf

## How To Read Buckling Chart

### How to determine the max. working load according to the telescopic cylinder type

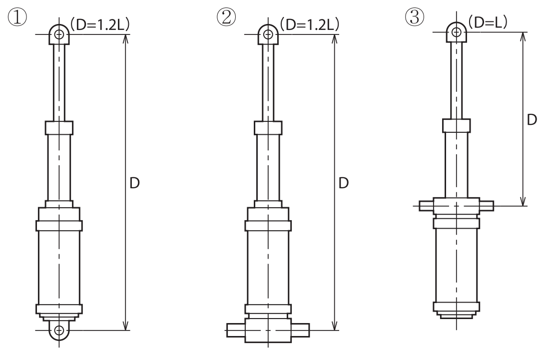
1. Determine in which condition the telescopic cylinder is mounted among ① to ⑨ shown below.
2. After determining the mounting condition, obtain the value L for the condition.
3. Determine the max. working load according to the value L and the telescopic cylinder type from the buckling chart.

### How to determine the max. stroke according to the telescopic cylinder type

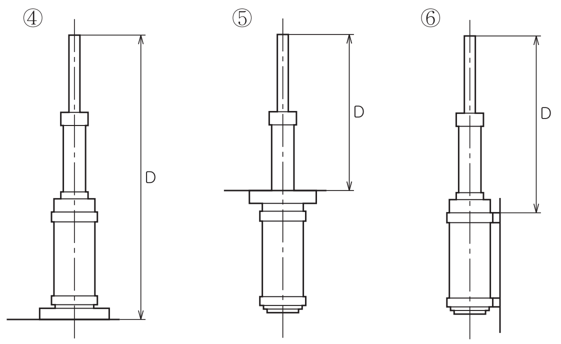
1. Determine in which condition the telescopic cylinder is mounted among ① to ⑨ shown below.
2. Determine the value L according to the max. working load and the telescopic cylinder type from the buckling chart.
3. After the mounting condition is determined, the stroke can be obtained from the value L.

## Mounting Conditions

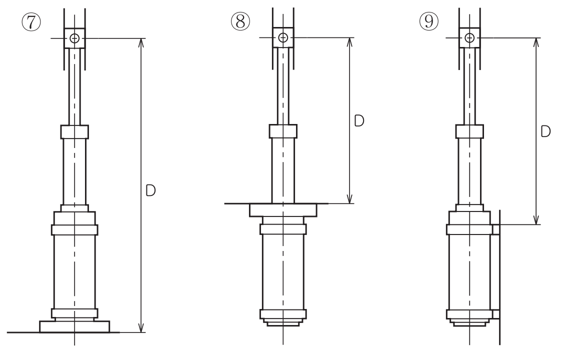
### Pin Joint at Both Ends




### Fixed Telescopic Cylinder and Free Rod End(D=L/1.45)



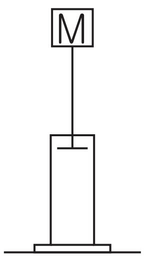
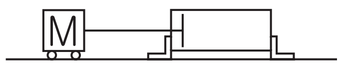

### Fixed Telescopic Cylinder and Rod End Guide(D=1.6L)



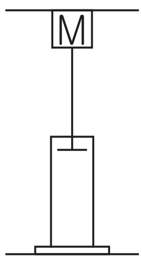
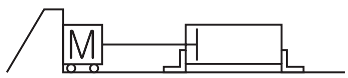

### Notes on calculation of piston rod buckling

Before calculating the piston rod buckling, it is necessary to examine the method of stopping the cylinder. There are two ways to stop a cylinder: the cylinder stopping method, where the cylinder is stopped at the cylinder stroke end, and the external stopping method, where the cylinder is stopped by an external stopper. The way of determining the load varies depending on the method.

#### Way of determining the load in the case of cylinder stopping method

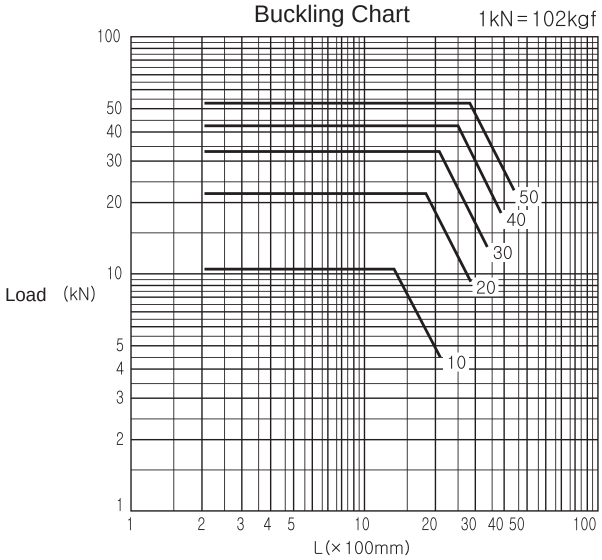
| Case ① | Case ② |
|---|---|
|  |  The cylinder is stopped at the stroke end as shown in the figure. Determine the load necessary for buckling calculation as stated below. Case ① Load=W Case ② Load=μW μ: Friction coefficient |

#### Way of determining the load in the case of external stopping method

| Case ① | Case ② |
|---|---|
|  |  The cylinder is stopped in the middle by an external stopper as shown in the figure. In this case, the load necessary for buckling calculation is not W, but the theoretical cylinder force [Set relief pressure($kgf/cm^2$) x Piston area($mm^2$)] |

### Buckling Chart

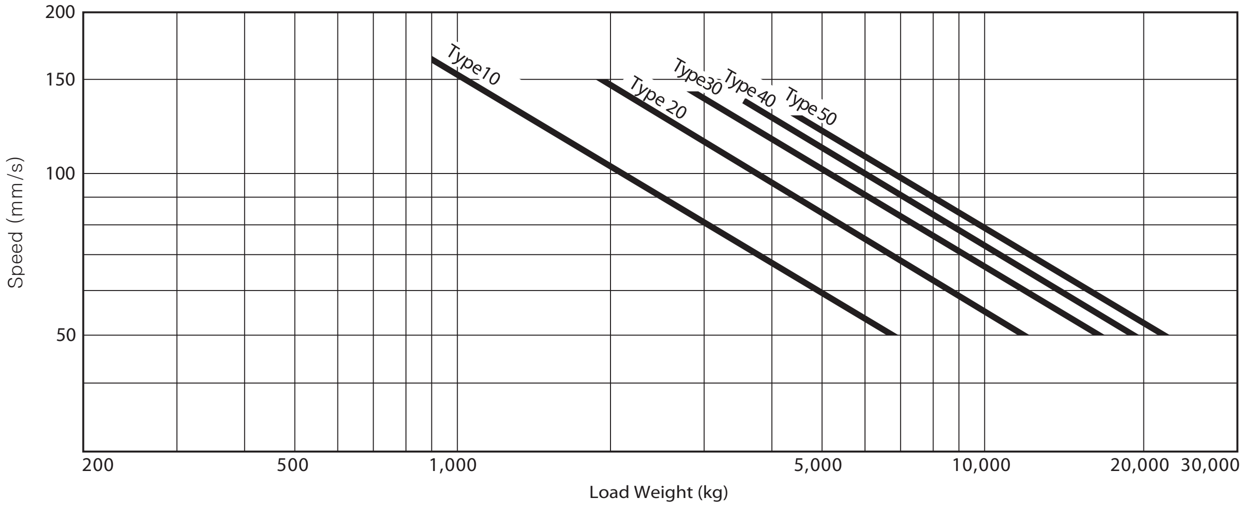
1kN=102kgf



## Load Weight-Speed Diagram of Each Series Based on Cushioning Characteristics

The above diagram shows the target speed on a uniform speed circuit in the extending direction.
On an ununiform speed circuit, the speed of the 2nd stage piston rod conforms to the above diagram. In the retracting direction, a load weight 1.5 times higher can be applied at the speed of the 1st stage piston rod.

·Load Weight-Speed Diagram (for horizontal transfer)




· For selection of a hydraulic cylinder, the relationship between load weight and speed is a key point.
· The above diagram is a speed diagram based on the characteristics of the rod cover side(ISO type:head side) cushion in the telescopic cylinder.

## Calculation of Cylinder Stroke & Most Retracted Size

The cylinder stroke and most retracted size can be calculated from the most extended size of a telescopic cylinder.
<Calculation>
· (Most extended size-Fixed length)/3+(Fixed length)=Most retracted size (mm)
· (Most retracted size-Fixed length)×2+Cylinder stroke (mm)

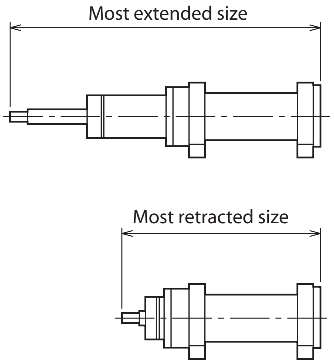
Fixed Length

Unit:mm

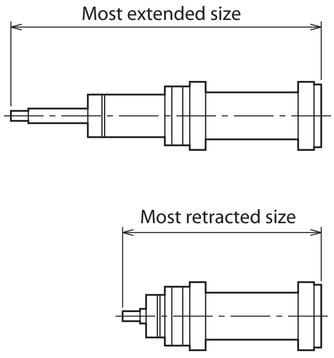
| Mounting style / Type | LA, LT. FA . TA | FB | TB | CA |
|---|---|---|---|---|
| Type 10 | 170 | 180 | 191 | 222 |
| Type 20 | 235 | 250 | 260 | 310 |
| Type 30 | 275 | 295 | 305 | 368 |
| Type 40 | 315 | 335 | 355 | 425 |
| Type 50 | 355 | 377 | 399 | 475 |

※The fixed length is obtained by subtracting the stroke/2 from the maximum external size of the cylinder in a retracted state.

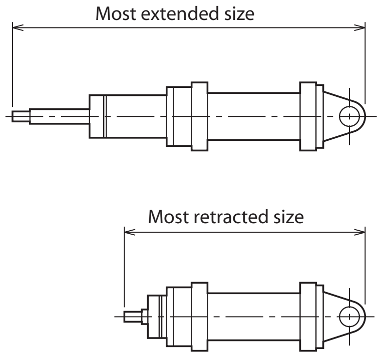
LA




FA




CA




For LT, FB, TA and TB styles, calculate the size in the same method.

## Confirmation of Port Diameter According to Cylinder Speed

The cylinder speed depends on the amount of fluid flowing into the cylinder. Therefore, it is necessary to confirm that the standard port diameter is appropriate. The cylinder speed V is determined by the following formula.

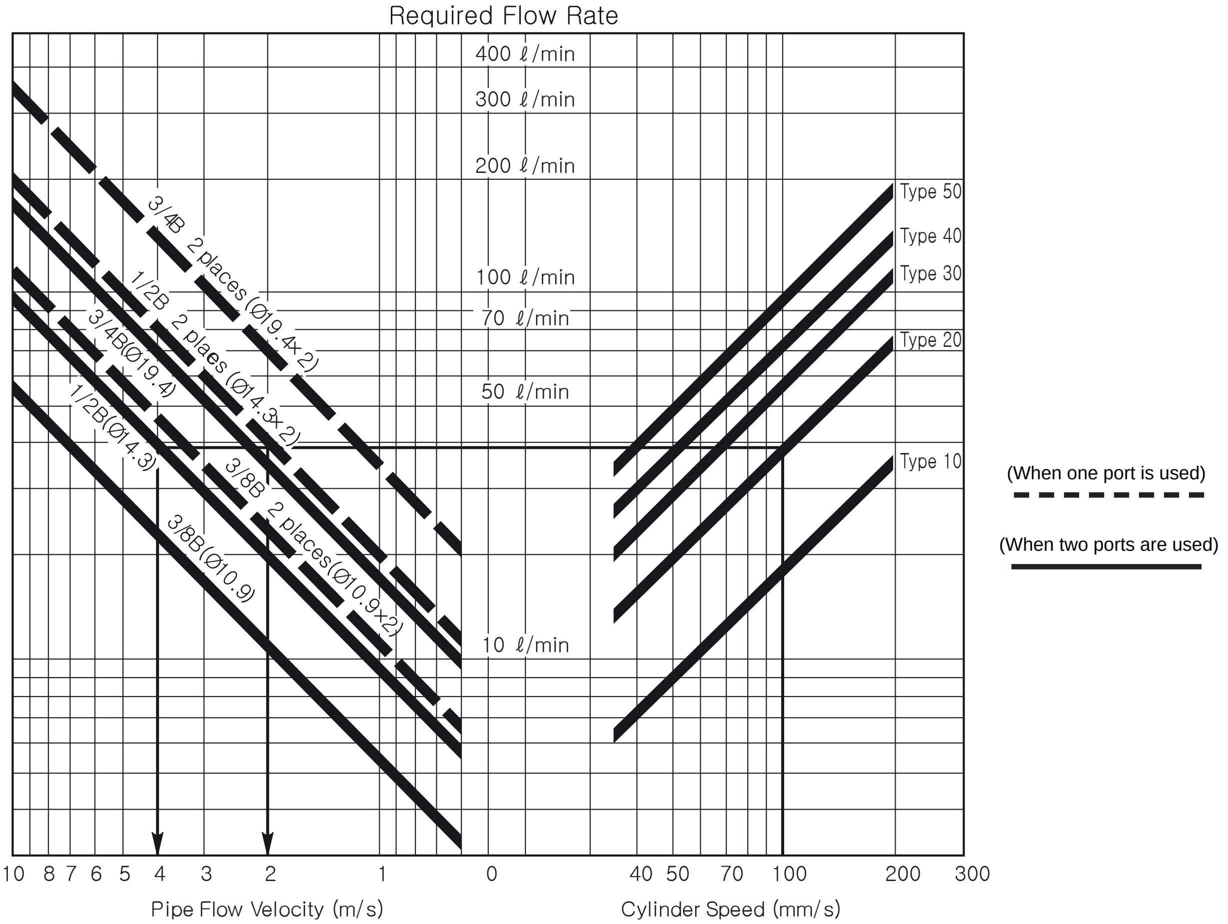
$$V=1.67x10^4xQC/A(mm/s)$$

Qc: Amount of fluid supplied into cylinder(ℓ/min)
A : Piston effective sectional area($mm^2$)
1st stage in extending direction
2nd stage in retracting direction

<Example>
Ascertain whether type 20 double acting telescopic cylinder with the standard port diameter can be used when the speed in the extending direction is 100 mm/s. Determine the pipe flow velocity (m/s). Ascertain whether the cylinder can be used when the speed in the retracting direction is 100 mm/s.

<Answer>
Draw a line parallel to the horizontal axis from the intersection of the line of cylinder speed of 100 mm/s with the line of type 20, and connect the line with the line of port 1/2B (Type 20 double acting telescopic cylinder with standard port diameter).
Since the intersection of the port diameter with the cylinder speed and type is within the usable range, the cylinder can be used. The pipe flow velocity indicated by the vertical line from the intersection of the port diameter is 4.0 m/s. In the retracting direction, the velocity is 2.0m/s when two ports are used.

### Cylinder Speed -Required Flow Rate-Pipe Flow Velocity Diagram




The above diagram shows the relationship between speed and required flow rate for each size of double acting telescopic cylinder and the relationship between required flow rate and pipe flow velocity for each port diameter.
(※The pressure loss can be reduced by using one size larger piping. The flow velocity was calculated with Sch80 steel pipe for piping.)

### Min. Required Amount of Fluid for Cylinder

Unit:ℓ

| Type | Min. required amount of fluid |
|---|---|
| Type 10 | $1.39x10^{-3}$ × Stroke(mm) |
| Type 20 | $2.78x10^{-3}$ × Stroke(mm) |
| Type 30 | $3.98x10^{-3}$ × Stroke(mm) |
| Type 40 | $5.23x10^{-3}$ × Stroke(mm) |
| Type 50 | $6.65x10^{-3}$ × Stroke(mm) |

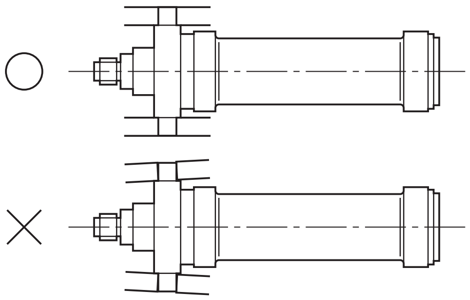
### Telescopic Cylinder Port Diameter

| Series | Type 10 | Type 20 | Type 30 | Type 40 | Type 50 |
|---|---|---|---|---|---|
| Port dia. Rc(PT) | 3/8 | 1/2 | 1/2 | 3/4 | 3/4 |

·The minimum required amount of fluid for cylinder refers to the amount of fluid obtained by subtracting the amount of fluid on the outlet side of the cylinder from the amount of fluid on the supply side at the maximum cylinder stroke.
·In the usable range, the pipe flow velocity is less than 7 m/s. Normally, when the pipe flow velocity exceeds 7 m/s, the piping resistance and the pressure loss are increased, and, as the result of this, the output is decreased when the cylinder operates, and the speed is reduced.
·When the cylinder is used at 60kgf/$cm^2$ in the retracting direction, the discharge flow rate on the cap cover side should be less than 3.5 m/s. When it is used at 140kgf/$cm^2$ in the retracting direction, the discharge flow rate should be less than 5.5 m/s.
·Please select Rc(PT)3/4 head side port size for Ø30 cylinder in case of cylinder retracting speed is over 80mm/s.

## Precautions

· Do not apply load to the ram tube end at the 1st stage. Doing so may cause operation failure.
· Avoid applying side load to the piston rod when operating.
Doing so can cause operation failure or damage to the cylinder. If side load is applied, provide guides or protect the rod end threads.
In such case, consult KCC.
· Correctly center the piston rod axis in the load moving direction. Incomplete centering can cause operation failure and damage to the cylinder.
· In the case of mounting style TA, TB or CA, center the rotation axis and the mating mount.
· Correctly fit the mounting bracket of mounting style TA or TB as shown below.



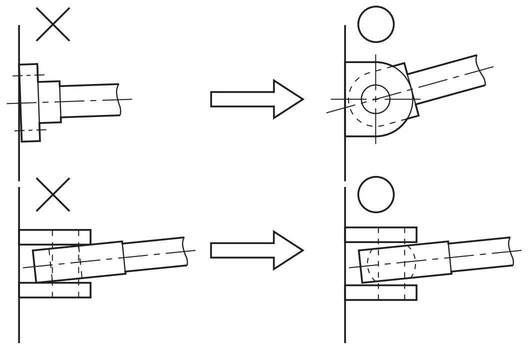
· Ensure that the mounting block has a sufficient rigidity to prevent occurrence of deflection from the cylinder thrust force.
· Use mounting bolts of strength class of JIS8.8 or more. For the tightening torque, see the following table. Incomplete tightening can cause looseness and damage of the bolts.

### Tightening Torque Table

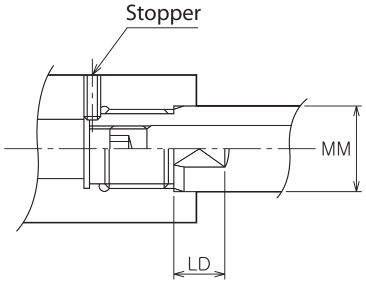
Unit: N·m

| Thread dia. | Strength class | M8 | M10 | M12 | M14 | M16 |
|---|---|---|---|---|---|---|
| Tightening torque | 10.9 | 36 | 72 | 125 | 198 | 305 |
| | 8.8 | 25 | 51 | 89 | 141 | 216 |
| Thread dia. | Strength class | M18 | M20 | M22 | M24 | |
| Tightening torque | 10.9 | 420 | 590 | 800 | 1020 | |
| | 8.8 | 290 | 410 | 560 | 720 | |

· Take care that eccentric load is not applied to the piston rod when connecting the rod end attachment and load.



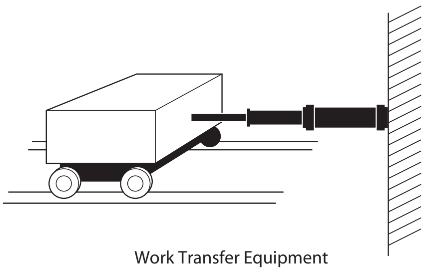
· The piston rod is made from a hollow pipe. Therefore, when fitting a rod end attachment, provide a stopper on the spigot of the thread end as shown in the figure.



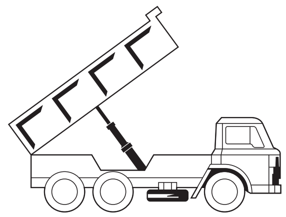

### Precautions for piping

· When the cylinder is used by meter-out control on the rod side(ISO type: head side), the pressure resistance of the piping (rubber hose, etc.) used and the rod side(ISO type: head side) should be three times or more higher than the max. working pressure on the cap side(ISO type: cap side).
· Before connecting the piping, flush the inside of the piping.
· When connecting with a rubber hose, do not bend the hose at an angle less than the specified radius.
· Take care that air is not collected in the middle of the piping.

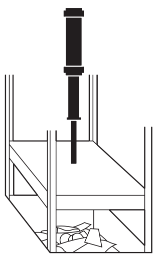
## Applications



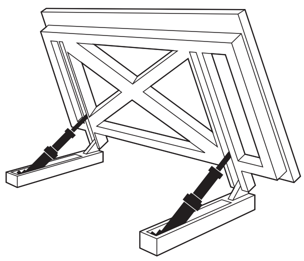
Work Transfer Equipment



Platform Hoisting Machine



Pressing Machine



Building Material Hoisting Machine

## Specifications

| Type | | Type 10 | Type 20 | Type 30 | Type 40 | Type 50 |
|---|---|---|---|---|---|---|
| Bore size | 1 Stage | Ø63 | Ø90 | Ø110 | Ø125 | Ø140 |
| | 2 Stage | Ø45 | Ø65 | Ø80 | Ø90 | Ø100 |
| Operating pressure | | 70kgf/cm² (7MPa) | | | | |
| Max. operating pressure | | Rod side:150kgf/cm² (15.3MPa) | | | Head side:90kgf/cm² (9.2MPa) | |
| Proof pressure | | Rod side:210kgf/cm² (21.4MPa) | | | Head side:140kgf/cm² (14.3MPa) | |
| Min. operating pressure | | Rod side:6kgf/cm² (0.61MPa) | | | Head side:3kgf/cm² (0.31MPa) | |
| Operating piston speed | | 10m/min | 9m/min | 8.4m/min | 7.7m/min | 7.1m/min |
| Min.operating piston speed | | 0.06m/min | | | | |
| Fluid temperature | | -5 ~ 80℃ (No freezing) | | | | |
| Ambient temperature | | -10 ~ 50℃ | | | | |
| Working oil | | Petroleum-based fluid | | | | |
| Tolerance of thread | | KS class 2 | | | | |
| Tolerance of stroke | | 0~1000 $^{+2.8}_{0}$ | 1001~1600 $^{+3.2}_{0}$ | 1601~2500 $^{+3.6}_{0}$ | 2501~3100 $^{+4.0}_{0}$ | |
| Mounting style | | LA, LT, FA, FB, CA, TA, TB | | | | |

※ 60kgf/cm² is standard pressure when cylinder is in reverse operation with common speed.
※ Operating pressure: Max. allowable setting pressure for a relief valve while cylinder is operating.
※ Max. operating pressure: Maximum allowable pressure generated in a cylinder (surge pressure, etc.)
※ Proof pressure: Test pressure a cylinder can withstand without unreliable performance when returning to operating pressure.
※ Min. operating pressure: Minimum pressure for a cylinder installed horizontally and operating without load.

## Mass

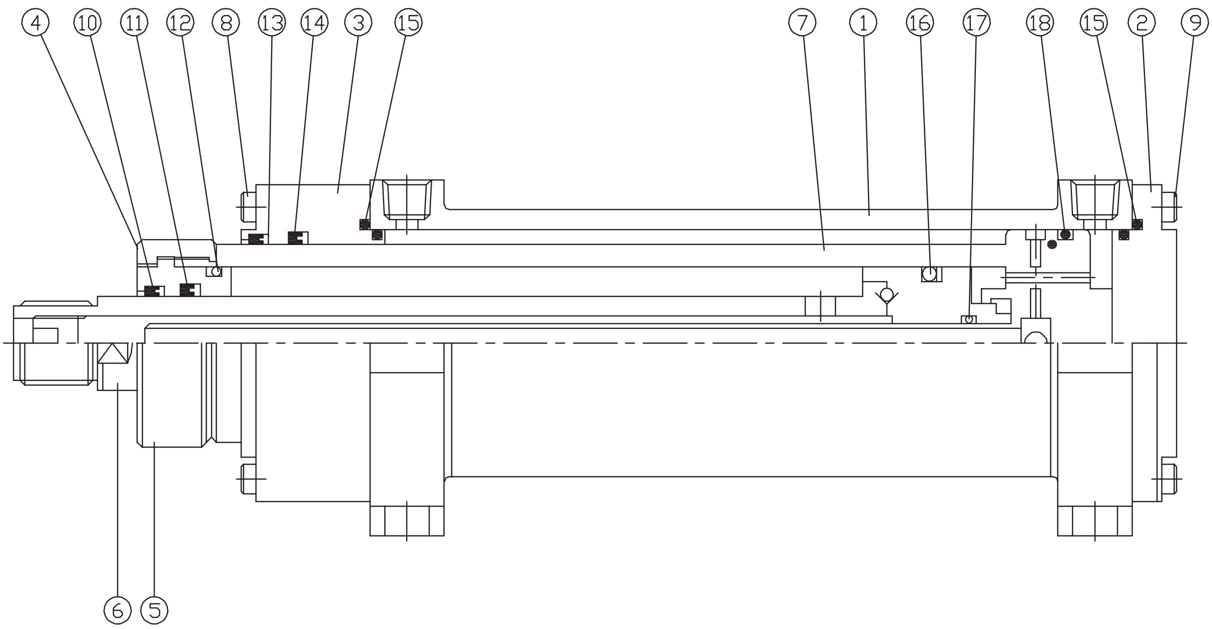
Unit : kg

| Type | Basic mass (SD) | Mounting mass | | | | | | | Additional mass for each 1mm stroke |
|---|---|---|---|---|---|---|---|---|---|
| | | LA | LT | TA | TB | FA | FB | CA | |
| Type 10 | 5.7 | 0.44 | 0.37 | 1.08 | 1.08 | 0.93 | 0.93 | 0.32 | 0.0084 |
| Type 20 | 15.4 | 1.25 | 1.05 | 3.06 | 3.06 | 2.85 | 2.85 | 0.91 | 0.0169 |
| Type 30 | 27.0 | 2.29 | 1.93 | 5.61 | 5.61 | 4.88 | 4.88 | 1.66 | 0.0212 |
| Type 40 | 41.4 | 3.52 | 2.22 | 8.64 | 8.64 | 7.43 | 7.43 | 2.56 | 0.0313 |
| Type 50 | 57.2 | 4.92 | 4.14 | 11.99 | 11.99 | 10.24 | 10.24 | 3.55 | 0.0431 |

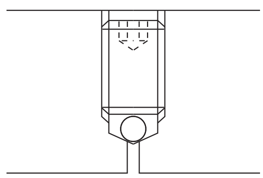
Calculation:

Ex) KTC70HP-FB30-A1500
Basic mass: 27.0 / Additional mass: 0.0212 / Cylinder stroke: 1,500mm / FB type: 4.88
27.0 + (0.0212 X 1500) + 4.88 = 63.68 kg

## Structure




Hole of Air Vent



## Part List

| Part no. | Parts | Material | Quantity |
|---|---|---|---|
| 1 | Tube | STKM13C | 1 |
| 2 | Head Cover | S45C | 1 |
| 3 | Rod Cover | S45C | 1 |
| 4 | Bush | BC3 | 1 |
| 5 | Bush Cover | S45C | 1 |

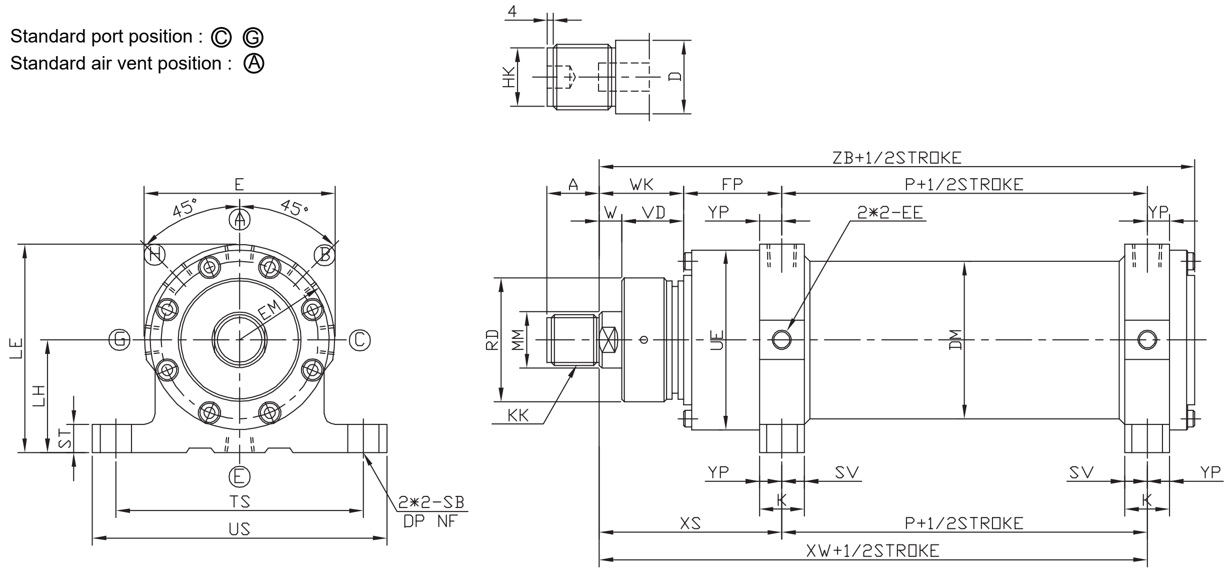
| Part no. | Parts | Material | Quantity |
|---|---|---|---|
| 6 | Piston & Rod | S45C | 1 |
| 7 | Piston & Rod | S45C(STPG38) | 1 |
| 8 | Socket Bolt | SCM440 | 8 |
| 9 | Socket Bolt | SCM440 | 8 |

## Packing List

| Part no. | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|
| Parts | DUST SEAL | R/PACKING | O-RING | DUST SEAL | R/PACKING | O-RING | O-RING & PACKING | R/PACKING | O-RING & PACKING |
| Material | N.B.R | N.B.R | N.B.R | N.B.R | N.B.R | N.B.R | N.B.R | N.B.R | N.B.R |
| Quatity / Type | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 |
| Type 10 | SDR28 | SKY28 | G40 | SDR53 | SKY53 | G58/G63 | P39 | 16x24x5 | P53 |
| Type 20 | SDR40 | SKY40 | G60 | SDR75 | SKY75 | G85/G90 | 65x49x20.5 | 16x24x5 | 90x70x22.4 |
| Type 30 | SDR45 | SKY45 | G75 | SDR90 | SKY90 | G105/G110 | 80x60x22.4 | 16x24x5 | 110x85x22.4 |
| Type 40 | SDR53 | SKY53 | G85 | SDR106 | SKY106 | G120/G115 | 90x70x22.4 | 16x24x5 | 125x100x25.4 |
| Type 50 | SDR60 | SKY60 | G95 | SDR118 | SKY118 | G135/G140 | 100x75x22.4 | 16x24x5 | 140x115x22.4 |

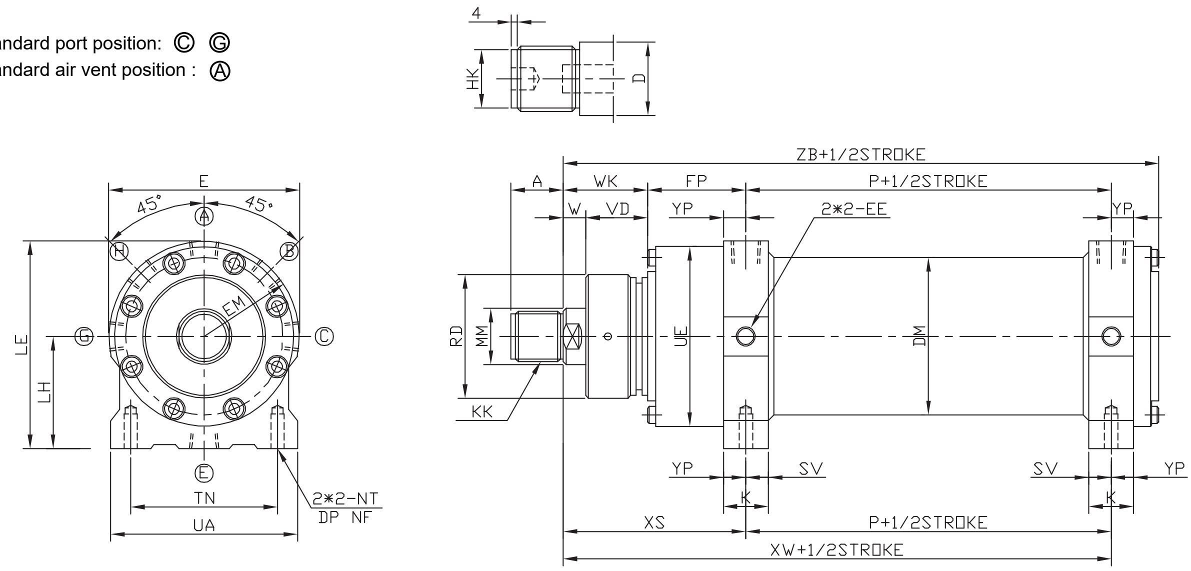
## Dimensions-Axial Angle of Foot (LA)

Standard port position : Ⓒ Ⓖ
Standard air vent position : Ⓐ




## Dimensions-Base Mounting Axial Angle of Foot (LT)

Standard port position: Ⓒ Ⓖ
Standard air vent position : Ⓐ



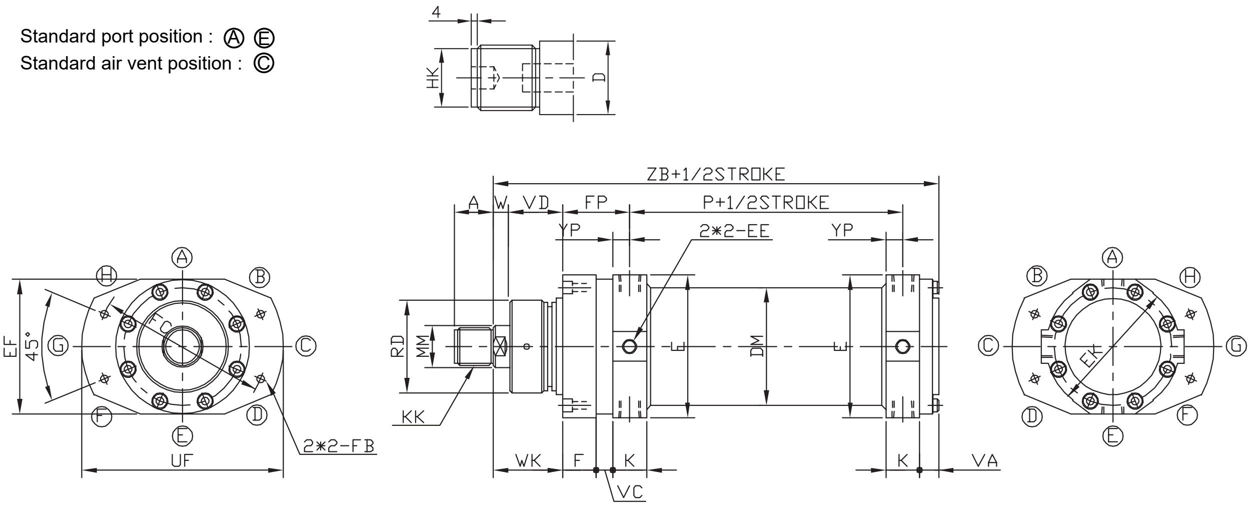

Unit : mm

| Type | A | D | DM | E | EE | EM | FP | HK | K | KK | LE | LH | MM | NF | NT | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type 10 | 25 | 24 | Ø73 | 98 | Rc(PT)3/8 | 51 | 48 | Ø21$^{H9}$ | $26^{0}_{-0.1}$ | M24×2 | 99 | $50^{\pm0.2}$ | Ø28 | 18 | M12 | 25 |
| Type 20 | 35 | 32 | Ø105 | 138 | Rc(PT)1/2 | 71 | 67 | Ø30$^{H9}$ | $34^{0}_{-0.1}$ | M33×2 | 139 | $70^{\pm0.2}$ | Ø40 | 24 | M16 | 38 |
| Type 30 | 40 | 41 | Ø125 | 158 | Rc(PT)1/2 | 81 | 80 | Ø36$^{H9}$ | $42^{0}_{-0.1}$ | M39×2 | 164 | $85^{\pm0.2}$ | Ø45 | 30 | M20 | 40 |
| Type 40 | 45 | 46 | Ø145 | 178 | Rc(PT)3/4 | 92 | 93 | Ø42$^{H9}$ | $47^{0}_{-0.1}$ | M45×2 | 184 | $95^{\pm0.2}$ | Ø53 | 36 | M24 | 45 |
| Type 50 | 52 | 55 | Ø165 | 196 | Rc(PT)3/4 | 100 | 107 | Ø49$^{H9}$ | $48^{0}_{-0.1}$ | M52×2 | 203 | $105^{\pm0.2}$ | Ø60 | 36 | M24 | 50 |

| Type | RD | SB | ST | SV | TN | TS | UA | UE | US | VD | W | WK | XS | XW | YP | ZB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type 10 | Ø59 | Ø13.5 | 10 | 13 | 75 | 110 | 98 | Ø89.5 | 130 | 32 | 13 | 45 | 93 | 118 | 13 | 145 |
| Type 20 | Ø84 | Ø18 | 16 | 17 | 105 | 150 | 138 | Ø129 | 180 | 43 | 17 | 60 | 127 | 162 | 17 | 200 |
| Type 30 | Ø100 | Ø22 | 20 | 22 | 115 | 175 | 158 | Ø155 | 210 | 50 | 20 | 70 | 150 | 190 | 20 | 235 |
| Type 40 | Ø112 | Ø24 | 22 | 23 | 130 | 205 | 178 | Ø177 | 240 | 57 | 23 | 80 | 173 | 218 | 24 | 270 |
| Type 50 | Ø128 | Ø26 | 24 | 23 | 150 | 230 | 196 | Ø193 | 270 | 65 | 25 | 90 | 197 | 247 | 25 | 303 |

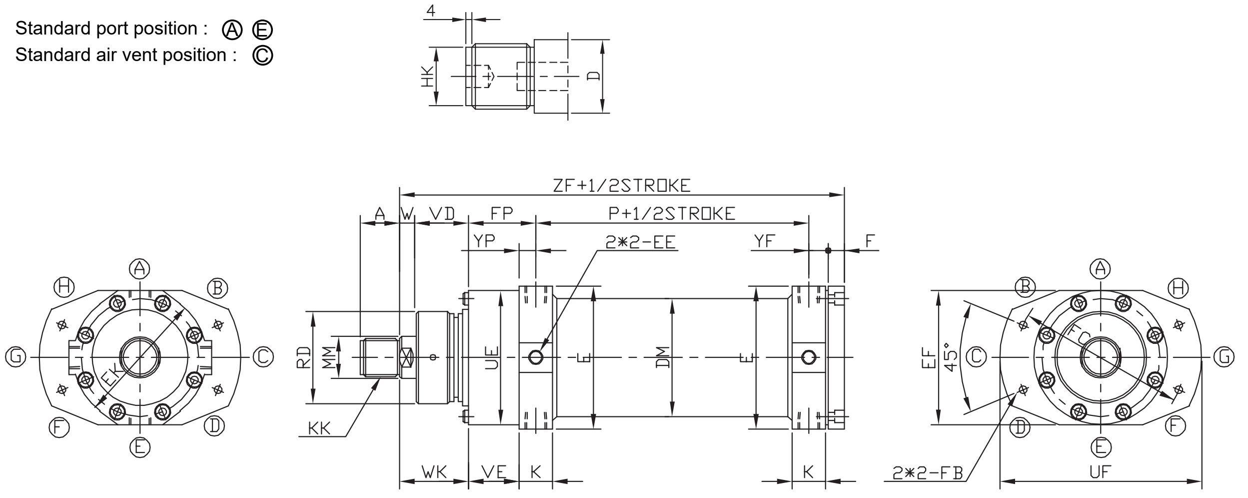
## Dimensions-Rod Side Flange (FA)

Standard port position : Ⓐ Ⓔ
Standard air vent position : Ⓒ




## Dimensions-Head Side Flange (FB)

Standard port position : Ⓐ Ⓔ
Standard air vent position : Ⓒ



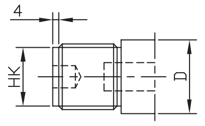

Unit : mm

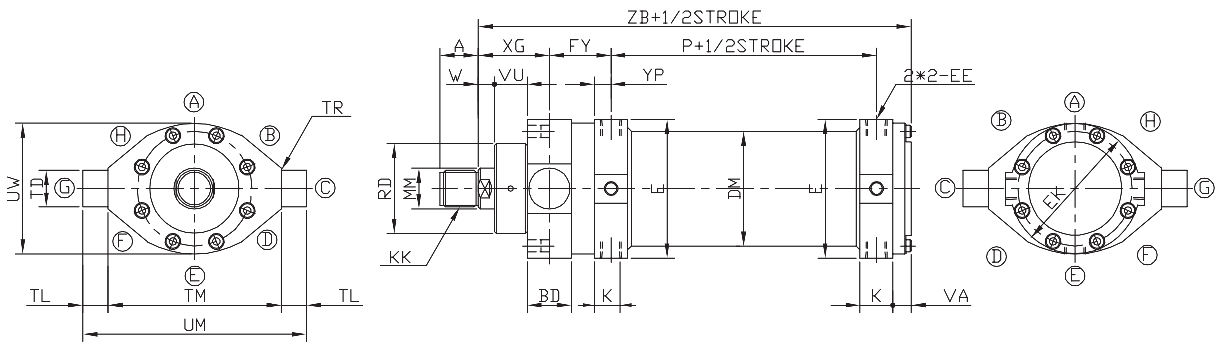
| Type | A | D | DM | E | EE | EF | EK | F | FB | FC | FP | HK | K | KK | MM | P | RD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type 10 | 25 | 24 | Ø73 | 98 | Rc(PT)3/8 | 98 | 95 | 20 | Ø9 | Ø120 | 48 | Ø21$^{H9}$ | $26^{0}_{-0.1}$ | M24×2 | Ø28 | 25 | Ø59 |
| Type 20 | 35 | 32 | Ø105 | 138 | Rc(PT)1/2 | 138 | 136 | 30 | Ø13.5 | Ø170 | 67 | Ø30$^{H9}$ | $34^{0}_{-0.1}$ | M33×2 | Ø40 | 35 | Ø84 |
| Type 30 | 40 | 41 | Ø125 | 158 | Rc(PT)1/2 | 165 | 161 | 35 | Ø16 | Ø195 | 80 | Ø36$^{H9}$ | $42^{0}_{-0.1}$ | M39×2 | Ø45 | 40 | Ø100 |
| Type 40 | 45 | 46 | Ø145 | 178 | Rc(PT)3/4 | 190 | 183 | 40 | Ø18 | Ø225 | 93 | Ø42$^{H9}$ | $47^{0}_{-0.1}$ | M45×2 | Ø53 | 45 | Ø112 |
| Type 50 | 52 | 55 | Ø165 | 196 | Rc(PT)3/4 | 205 | 200 | 45 | Ø20 | Ø245 | 107 | Ø49$^{H9}$ | $48^{0}_{-0.1}$ | M52×2 | Ø60 | 50 | Ø128 |

| Type | UE | UF | VA | VC | VD | VE | W | WK | YF | YP | ZB | ZF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type 10 | Ø89.5 | 135 | 14 | 15 | 32 | 35 | 13 | 45 | 17 | 13 | 145 | 155 |
| Type 20 | Ø129 | 195 | 21 | 20 | 43 | 50 | 17 | 60 | 23 | 17 | 200 | 215 |
| Type 30 | Ø155 | 225 | 25 | 25 | 50 | 60 | 20 | 70 | 32 | 20 | 235 | 255 |
| Type 40 | Ø177 | 260 | 28 | 29 | 57 | 69 | 23 | 80 | 32 | 24 | 270 | 290 |
| Type 50 | Ø193 | 285 | 31 | 37 | 65 | 82 | 25 | 90 | 33 | 25 | 303 | 325 |

## Dimensions-Rod Side Trunnion (TA)

Standard port position : Ⓒ Ⓔ
Standard air vent position : Ⓐ

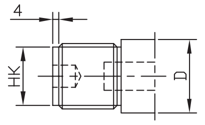


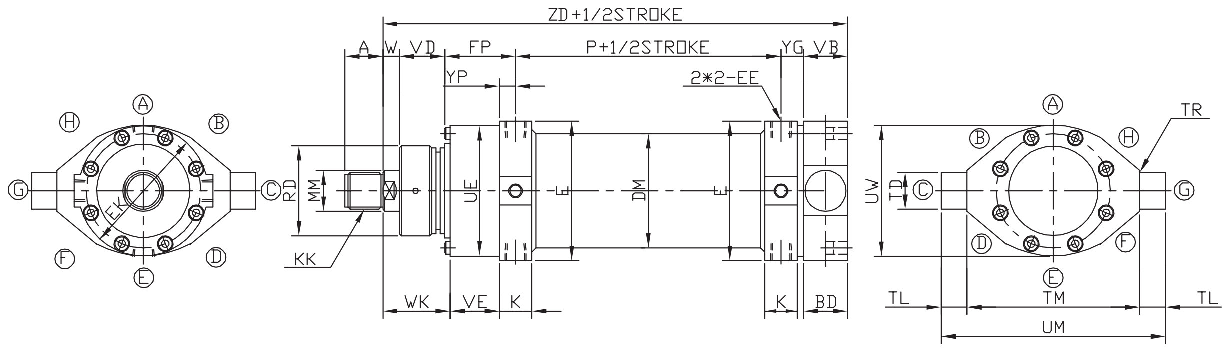




※ For cylinder (stroke over 600mm) installed in horizontal direction, please support the weight of cylinder head.

## Dimensions-Head Side Trunnion (TB)

Standard port position : Ⓒ Ⓔ
Standard air vent position : Ⓐ




※ For cylinder (stroke over 1200mm) installed in horizontal direction, please support the weight of rod side of cylinder.

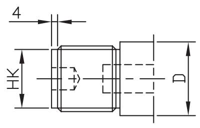
Unit : mm

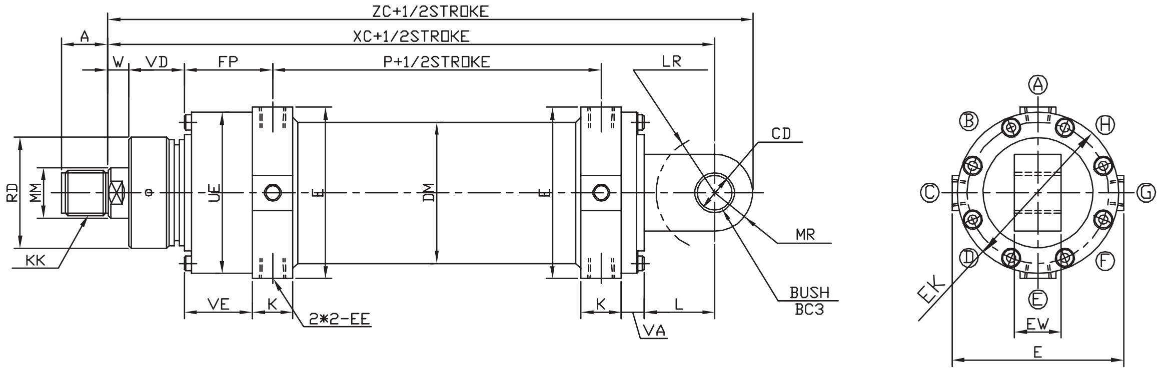
| Type | A | BD | D | DM | E | EE | EK | FY | FP | HK | K | KK | MM | P | RD | TD | TL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type 10 | 25 | 31 | 24 | Ø73 | 98 | Rc(PT)3/8 | 95 | 43 | 48 | Ø21$^{H9}$ | $26^{0}_{-0.1}$ | M24×2 | Ø28 | 25 | Ø59 | Ø28$^{e9}$ | 20 |
| Type 20 | 35 | 38 | 32 | Ø105 | 138 | Rc(PT)1/2 | 136 | 55 | 67 | Ø30$^{H9}$ | $34^{0}_{-0.1}$ | M33×2 | Ø40 | 35 | Ø84 | Ø35$^{e9}$ | 25 |
| Type 30 | 40 | 48 | 41 | Ø125 | 158 | Rc(PT)1/2 | 161 | 68 | 80 | Ø36$^{H9}$ | $42^{0}_{-0.1}$ | M39×2 | Ø45 | 40 | Ø100 | Ø45$^{e9}$ | 30 |
| Type 40 | 45 | 58 | 46 | Ø145 | 178 | Rc(PT)3/4 | 183 | 81 | 93 | Ø42$^{H9}$ | $47^{0}_{-0.1}$ | M45×2 | Ø53 | 45 | Ø112 | Ø55$^{e9}$ | 30 |
| Type 50 | 52 | 63 | 55 | Ø165 | 196 | Rc(PT)3/4 | 200 | 93 | 107 | Ø49$^{H9}$ | $48^{0}_{-0.1}$ | M52×2 | Ø60 | 50 | Ø128 | Ø60$^{e9}$ | 35 |

| Type | TM | TR | UE | UM | UW | VA | VB | VD | VE | VU | W | WK | XC | XG | YG | YP | ZB | ZD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type 10 | $100^{0}_{-0.35}$ | R3 | Ø89.5 | 140 | 95 | 14 | 16 | 32 | 35 | 21 | 13 | 45 | 150 | 50 | 32 | 13 | 145 | 166 |
| Type 20 | $145^{0}_{-0.4}$ | R3 | Ø129 | 195 | 135 | 21 | 20 | 43 | 50 | 35 | 17 | 60 | 205 | 72 | 43 | 17 | 200 | 225 |
| Type 30 | $175^{0}_{-0.4}$ | R3 | Ø155 | 235 | 160 | 25 | 25 | 50 | 60 | 37 | 20 | 70 | 240 | 82 | 50 | 20 | 235 | 265 |
| Type 40 | $200^{0}_{-0.46}$ | R3 | Ø177 | 260 | 185 | 28 | 30 | 57 | 69 | 39 | 23 | 80 | 280 | 92 | 62 | 24 | 270 | 310 |
| Type 50 | $220^{0}_{-0.46}$ | R3 | Ø193 | 290 | 205 | 31 | 32 | 65 | 82 | 47 | 25 | 90 | 315 | 104 | 68 | 25 | 303 | 347 |

## Dimensions-Single Clevis (CA)

Standard port position : Ⓐ Ⓔ
Standard air vent position : Ⓒ




※ For cylinder (stroke over 1200mm) installed in horizontal direction, please support the weight of rod side of cylinder.

Unit : mm

| Type | A | CD | D | DM | E | EE | EK | EW | FP | HK | K | KK | L | LR | MM | MR | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type 10 | 25 | Ø25$^{H10}$ | 24 | Ø73 | 98 | Rc(PT)3/8 | 95 | $28^{0}_{-0.1}$ | 48 | Ø21$^{H9}$ | $26^{0}_{-0.1}$ | M24×2 | 30 | R27 | Ø28 | R22 | 25 |
| Type 20 | 35 | Ø35$^{H10}$ | 32 | Ø105 | 138 | Rc(PT)1/2 | 136 | $40^{0}_{-0.1}$ | 67 | Ø30$^{H9}$ | $34^{0}_{-0.1}$ | M33×2 | 45 | R44 | Ø40 | R30 | 35 |
| Type 30 | 40 | Ø45$^{H10}$ | 41 | Ø125 | 158 | Rc(PT)1/2 | 161 | $50^{0}_{-0.1}$ | 80 | Ø36$^{H9}$ | $42^{0}_{-0.1}$ | M39×2 | 55 | R54 | Ø45 | R38 | 40 |
| Type 40 | 45 | Ø55$^{H10}$ | 46 | Ø145 | 178 | Rc(PT)3/4 | 183 | $55^{0}_{-0.1}$ | 93 | Ø42$^{H9}$ | $47^{0}_{-0.1}$ | M45×2 | 65 | R64 | Ø53 | R45 | 45 |
| Type 50 | 52 | Ø60$^{H10}$ | 55 | Ø165 | 196 | Rc(PT)3/4 | 200 | $63^{0}_{-0.1}$ | 107 | Ø49$^{H9}$ | $48^{0}_{-0.1}$ | M52×2 | 70 | R69 | Ø60 | R50 | 50 |

| Type | RD | UE | VA | VD | VE | W | XC | ZC |
|---|---|---|---|---|---|---|---|---|
| Type 10 | Ø59 | Ø89.5 | 14 | 32 | 35 | 13 | 175 | 197 |
| Type 20 | Ø84 | Ø129 | 21 | 43 | 50 | 17 | 245 | 275 |
| Type 30 | Ø100 | Ø155 | 25 | 50 | 60 | 20 | 290 | 328 |
| Type 40 | Ø112 | Ø177 | 28 | 57 | 69 | 23 | 335 | 380 |
| Type 50 | Ø128 | Ø193 | 31 | 65 | 82 | 25 | 373 | 423 |