

## Designed to ISO 6020-2/JIS B8367-2 cylinder

- ◆ Compact design and lightweight (Compared to previous JIS standard.)
- ◆ New floating cushion provides effective cushioning and quick start of each stroke.
- ◆ Switches can be used to all bore sizes in standard, 32 mm to 160 mm.
- ◆ Seals in sliding sections were designed to ISO standard.

**NEW** CAT. A 11-523a



# NEW

## Suggestion of new hydraulic cylinder era

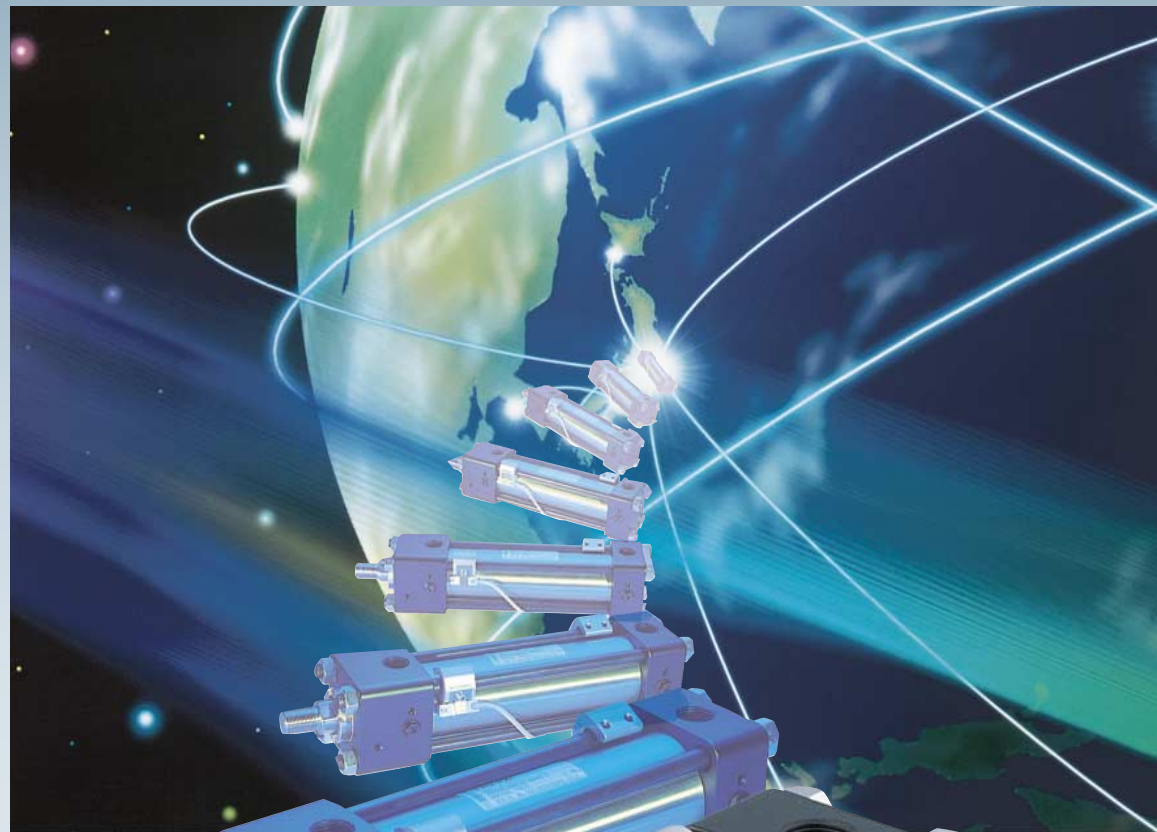
### 160H-1 SERIES

16 MPa double-acting type hydraulic cylinder with bores from 32 mm to 160 mm

Conformance to both ISO and JIS standards is enhanced, with the spread of global standards for hydraulic cylinders.

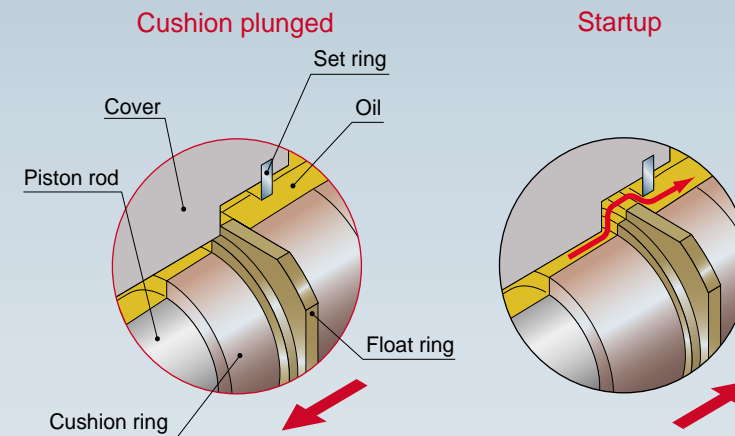
160H-1 Series are designed to ISO 6020-2/JIS B8367-2 cylinder

- Designed to JIS B8367-2
- New floating cushion
- High-performance cushion
- Various models
- Switches set



### Features

- Designed to ISO 6020-2/JIS B8367-2 cylinder.
- New floating cushion provides effective cushioning and quick start of each stroke.

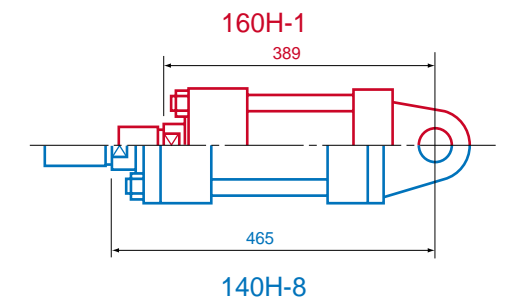


- Switches can be used to all bore sizes in standard, 32 mm to 160 mm.
- Seals in sliding sections were designed to ISO standard.
- Various models
  - 9 types of bores from 32 mm to 160 mm, 8 types of mounting styles
  - Double-rod type is also available
  - Oversize rod is available
  - Piping ports are applicable to Rc (tapered thread) and G (straight thread)
  - Cylinders with boots or rod end attachment are available
- Succeeded features of 140H-8 Series
  - Normally equipped high-performance cushion
  - Cushion valve easy to adjust
  - Small switches AX and AZ, with great variety and improved maintainability

### Comparison to 140H-8 Series

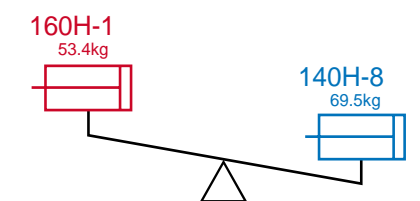
#### 1. Compact body

- CA type with 125 mm bore and 100 mm stroke
- Mounting length: Reduced by 16%



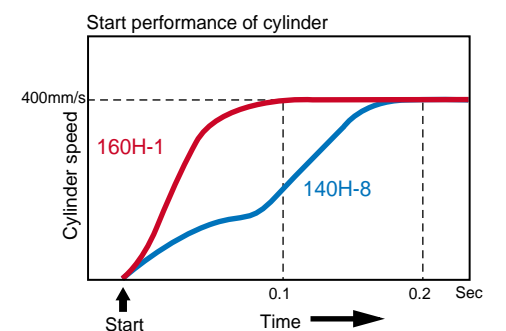
#### 2. Weight

- SD type with 140 mm bore and 100 mm stroke
- Weight: Reduced by 23%



#### 3. Improved start performance by new floating cushion

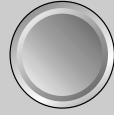
- With 63 mm bore, 500 kg load



#### 4. Output

- Theoretical outputs when 16 MPa pressure is applied to 160H-1 and 14 MPa is applied to 140H-8

Output: Increased by 14%



# 16 MPa double-acting type hydraulic cylinder 160H-1 SERIES

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Inappropriate handling of the products may lead to the unreliable performance or serious accidents. In order to prevent any accident, be sure to read carefully this catalogue, and fully understand the contents for safety handling.

Remember that your special attention must be paid to the messages with the words "DANGER", "WARNING", "CAUTION", and "NOTES". Non-observance of these messages may pose dangers to operators or machines. These are important safety messages and require your strict observance, adding to ISO4413, JIS B 8361 and other safety rules.

### Related laws and rules

- High-pressure gas preservation law
- Labor safety and hygiene law
- Fire laws
- ISO 4413 : Hydraulic fluid power-General rules for the application of equipment to transmission and control systems
- ISO 7425-1 : Hydraulic fluid power-Housings for elastomer-energized, plastic-faced seals-Dimensions and tolerances- (applicable to the piston packings for 160H-1 Series)
- ISO 5597 : Hydraulic fluid power-Cylinders-Housings for piston and rod seals in reciprocating applications- Dimensions and tolerances- (applicable to the piston packings (U-packings) and rod packings for 160H-1 Series)
- ISO 6195 : Fluid power systems and components-Cylinders-Housing for rod wiper rings in reciprocating applications- Dimensions and tolerances (applicable to the wiper rings for 160H-1 Series)
- JIS B 8361 : General rules for hydraulic system
- JIS B 8367 : Hydraulic cylinder
- JIS B 8243 : Structure of pressure container
- NAS 1638 : Classification of contamination particles levels

### Instructions in this catalogue

The instructions in this catalogue are classified into "DANGER", "WARNING", "CAUTION", and "NOTES", according to the degree of risk and hindrance.



## DANGER

Imminent hazardous situation. Unless the situation is avoided, loss of life or serious injury may occur.



## WARNING

Potential hazardous situation. Unless the situation is avoided, loss of life or serious injury may occur.



## CAUTION

Potential hazardous situation. Unless the situation is avoided, slight or medium injury, or physical damages may occur.



## NOTES

Instructions which are required to be followed for appropriate use of the products.

- These products have been designed and manufactured as a general industrial machine component.

### Warning

- Operators with sufficient knowledge and experiences should operate the equipment.

The assembly, operation, and maintenance of machines and devices using hydraulic equipment must be performed by only the persons with sufficient knowledge and experiences.

- Keep away from fire.  
Since highly ignitable working oil is used for hydraulic equipment, the possibility of fires is inevitable.
- Do not handle the machines and devices or remove the hydraulic cylinder until safety is confirmed.
  - Prior to removal of hydraulic cylinders, ensure that safety countermeasures are provided, the hydraulic power supply is stopped, and the pressure in the hydraulic circuit is lost.
  - Ensure the safety of prevention against the drop of matters to be driven before maintenance and service of machines and devices.
  - The temperature of a cylinder is very high right after operation is stopped. Ensure that the temperature of the cylinder and oil is low before removing the cylinder.
  - When restarting the machines and devices, ensure that there is no abnormality in the bolts and other components, and slowly increase the pressure of the hydraulic source from low pressure to the set pressure.
- Mount protect covers if any danger may occur to operator's body.  
If there is any danger to operator's body by matters to be driven or the movable part of the cylinder, try to consider the structure so that any part of operator's body cannot touch them.
- Deceleration circuit or shock absorber may be required.  
When the speed of matters to be driven is excessively high, or the weight of them is excessively heavy, shock absorption by only the cylinder cushion may be difficult. In such a case, the provision of the deceleration circuit in front of the cushion or the external shock absorber is required as countermeasures against shocks. Also, take the hardness of machines and devices into consideration.
- Securely connect so that the fixed part and connecting part of the cylinder will not be loosened.
  - Use the bolts with the specified size and strength class for fixing the cylinder attachments, and clamp them with the specified clamping

torque. For rotary attachments, use the pin of the specified size.

If the connection is inappropriate or the bolts or the pin with the size other than the specified may lead to the slackened or damaged bolts due to the driving force and reaction force of the cylinder.

- Use mounting components made of the material with sufficient hardness.
- Do not loosen the air vent valve excessively during air vent.  
Excessive loosening of the air vent valve may lead to coming-off or jumping of the air vent valve from the cylinder, causing spouted oil, leading to injury or malfunction of the cylinder.
- Consider the movements at an emergency stop.  
Consider the design without a risk of injuries of the operator or damages on machines and devices due to the cylinder movement, preparing for the case that the safety device is actuated to stop the machines at the emergency stop or system abnormalities due to power suspension.
- Check the specifications.
  - The products in this catalogue have been designed and manufactured as general industrial machine components. DO NOT use them under the pressure, temperature, or operating environment out of the specified range. Otherwise, the breakage or malfunctions of the machines may occur.
  - For electric components, such as switches, carefully check the specifications, including those of load current, temperature, and shocks. Otherwise, malfunction, breakage, or inflammable damages may occur.
- DO NOT make any modification on the products.  
Otherwise, injury, electric shocks, fires due to malfunctions may occur.
- Take safety countermeasures into consideration, and contact us before using the products under the conditions and environment shown below.
  - The use of the products under the environment or conditions other than specified and the use of them outdoors.
  - Applications related to public safety (Ex.: machines or devices used for atomic, railway, aeronautics, car, medical, and entertainment industries, emergency shutdown circuit, brake circuit, and machines and devices which contact drinks and foods)
    - Use in safety equipment.
    - Applications requiring reliable safety.

- If you have any question, contact us.



## ⚠ Caution

### (General precautions)

- When the weight of the cylinder exceeds 15 kg, use a lifting tool or a carrier.
- Keep good arrangement and cleanliness of the working site. The slippage due to oil leak may lead to a turnover. Keep clean, and try to find oil leak soon.
- When mounting a cylinder, be sure to perform centering. Otherwise, the rod and tube may be disordered, causing the wear and breakage of the tube inside, surfaces of bush or rod, and packings. The rod may not move smoothly, causing stick slip or noise.
- When using the external guide, adjust it so that it is not disordered in any position of the stroke, or connect considering the connection of the rod end and loads.
- Use the working oil applicable to the material of the packings for the cylinder, and DO NOT mix working oil of other types. The recommended cleanliness of working oil is the grade NAS 12 or higher.

### (Piping)

- Perform flushing before piping to reduce chips, cutting oil, dusts in the pipes. Remove the cylinder before flushing to avoid the ingress of flushing fluid into the cylinder.
- Application of sealing tape  
When connecting pipings with sealing tape, apply the tape with one or two threads on the thread tip left.  
When screwing pipings and fittings in, take care to avoid the ingress of chips or sealing material of the piping screw into the piping. When applying liquid packing to the fittings, similarly pay attention. Scraps of sealing tape or chips may cause oil leak or other malfunctions.
- When piping, take care to avoid air accumulation.
- When using steel pipe for piping, select proper size and avoid rusts and corrosion.
- If welding is required for piping, ground in other safety location to avoid ground current in the cylinder. The ground current between the bush and rod, cylinder tube and piston may lead to a spark, causing the damages on surfaces and malfunctions.

### (Adjustment of air vent and cushion)

- Excessive loosening of the air vent valve during air vent may lead to coming-off or jumping of the air vent valve from the cylinder, causing spouted oil.
  - Feed oil under a low pressure (such that the cylinder can move at a low speed of approximately 10 mm/s), and loosen the air vent valve by one or two turns (counterclockwise) to vent air in the oil from the air vent valve.
  - For cylinders without air vent valves, install throttle valves to vent air.
- The initial increase of the piston speed during the cushion adjustment may lead to abnormal surge pressures, causing the damaged cylinder or machines.
  - Slowly increase the piston speed from the low speed of approx. 50 mm/s or lower to adjust the cushion. When adjusting the cushion, adjust depending on matters to be driven (loads).
  - If the cushioning is excessive, the cylinder may not reach the stroke end due to the contained oil in the cushion.

### (Notes on trial run and operation)

- Ensure that the machines and devices are correctly mounted. DO NOT start without the confirmation of no oil leak.
- Run with the minimum pressure to start the piston rod (the piston speed must be approx. 50 mm/s or lower), and ensure that it is worked smoothly.

### (Maintenance and service)

- Perform maintenance and service (daily and regular inspection) to use cylinders safely for a long period.

- Prior to the maintenance and service, be sure to shut down the pressure source. Completely relieve the pressure in a cylinder.
- When relieving the pressure in a cylinder after shutting down the pressure source, the rod may be actuated with a load. Pay attention to the unexpected movement, and try to provide reliable safety countermeasures against it.

### (Storage)

- DO NOT pile up cylinders. If any vibration is applied to the piled cylinders, they may become unfastened, causing an extreme danger and the damaged parts.
- DO NOT apply a vibration nor a shock to the stored cylinders, causing the damaged parts.
- Provide rust preventive measures to avoid rust occurrence to the stored cylinders.

### (Wiring and connection)

- Prior to wiring, be sure to shut down the power supply to the electric circuit of the connection side. Otherwise, the operator may get an electric shock during working, or the switches or load devices may be damaged.
- Pay attention to avoid bending, pulling, twist of the switch cord, causing broken wires. Especially, provide appropriate measures to avoid any load applied to the end of the switch cord, including the fixing of the switch cord. When fixing the cord, do not clamp the cord excessively. Otherwise, the cord may be damaged, causing broken wires (of the cord). Any load applied to the end of the cord may lead to the damaged electric circuit boards in the switches.
- The larger bending radius is better. If it is excessively small, the cord may be damaged. The recommended bending radius is twice of the cord dia. or larger.

### (Wiring)

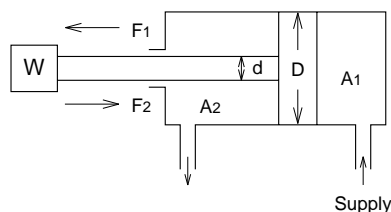
- If the connection distance is long, fix the cord every 20 cm to avoid a sag in the cord.
- When laying the cord on the floor, protect it by covering with metallic tubes to avoid direct treading on it or a crush under machines. Otherwise, the coating of the cord may be damaged, leading to the broken wires or short-circuit.
- The distance between the switches and load devices or power supply must be 10 m or shorter. Otherwise, inrush current may occur to the switches during operation, causing the damaged switches.
- DO NOT bind the cord with high-voltage cables for other electric appliances, the power supply, nor with the power supply cord. NEVER perform wiring near these cables. Otherwise, noises may enter the switch cord from the high-voltage cables and power source or power supply cable, causing the malfunctioned switches or load devices. It is recommended that the cord is protected with a shield tube.

### (Connection)

- DO NOT directly connect the switches to the power supply. Be sure to connect them with the specified load devices, such as small relays and programmable controllers. Otherwise, short-circuit may occur, causing the inflammable damage of the switches.
- Carefully check the switches used, voltage of power supply and load devices, and current specifications. Inappropriate voltage or current specifications may lead to the malfunctioned or damaged switches.
- Perform wiring correctly according to the colors of lead wires. Prior to wiring, be sure to shut down the power supply to the electric circuit of the connection side. Operation, wrong wiring, and short-circuit of load devices with electric current supplied may lead to the damaged switches and electric circuit in the load devices. Even if the short-circuit is momentary, it causes the inflammable damage of the main circuit or output circuit.

## Selection of cylinder bore

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



- Out stroke cylinder force  
 $F_1 = A_1 \times P \times \beta$  (N)
- Retract stroke cylinder force  
 $F_2 = A_2 \times P \times \beta$  (N)

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

$A_2$  : Retract stroke 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.

## Theoretical output table at out stroke (load rate 100%)

Unit : kN (1kN  $\approx$  102kgf)

Bore mm	Pressurized area mm <sup>2</sup>	Set pressure MPa						
		1.0	3.5	5.0	7.0	10.0	14.0	16.0
φ32	804	0.80	2.81	4.02	5.63	8.04	11.26	12.86
φ40	1257	1.26	4.40	6.28	8.80	12.57	17.59	20.11
φ50	1963	1.96	6.87	9.82	13.74	19.63	27.49	31.40
φ63	3117	3.12	10.91	15.59	21.82	31.17	43.64	49.88
φ80	5027	5.03	17.59	25.13	35.19	50.27	70.37	80.42
φ100	7854	7.85	27.49	39.27	54.98	78.54	109.96	125.66
φ125	12272	12.27	42.95	61.36	85.90	122.72	171.81	196.35
φ140	15394	15.39	53.88	76.97	107.76	153.94	215.51	246.30
φ160	20106	20.11	70.37	100.53	140.74	201.06	281.49	321.70

## Theoretical output table at retract stroke (load rate 100%)

Unit : kN (1kN  $\approx$  102kgf)

Series type	Bore mm	Rod dia. mm	Pressurized area mm <sup>2</sup>	Set pressure MPa						
				1.0	3.5	5.0	7.0	10.0	14.0	16.0
160H-1 Rod B	φ32	φ18	550	0.55	1.92	2.75	3.85	5.50	7.70	8.80
	φ40	φ22	877	0.88	3.07	4.38	6.14	8.77	12.27	14.02
	φ50	φ28	1348	1.35	4.72	6.74	9.43	13.48	18.87	21.56
	φ63	φ36	2099	2.10	7.35	10.50	14.70	20.99	29.39	33.59
	φ80	φ45	3436	3.44	12.03	17.18	24.05	34.36	48.11	54.98
	φ100	φ56	5391	5.39	18.87	26.95	37.74	53.91	75.47	86.26
	φ125	φ70	8423	8.42	29.48	42.12	58.96	84.23	117.93	134.77
	φ140	φ80	10367	10.37	36.29	51.84	72.57	103.67	145.14	165.88
φ160	φ90	13744	13.74	48.11	68.72	96.21	137.44	192.42	219.91	
160H-1 Rod A	φ40	φ28	641	0.64	2.24	3.20	4.49	6.41	8.97	10.25
	φ50	φ36	946	0.95	3.31	4.73	6.62	9.46	13.24	15.13
	φ63	φ45	1527	1.53	5.34	7.63	10.69	15.27	21.38	24.43
	φ80	φ56	2564	2.56	8.97	12.82	17.94	25.64	35.89	41.02
	φ100	φ70	4006	4.01	14.02	20.03	28.04	40.06	56.08	64.09
	φ125	φ90	5910	5.91	20.69	29.55	41.37	59.10	82.74	94.56

Notes) • 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.

**Calculation of cylinder buckling**

- 1) Be sure to calculate the cylinder buckling.
- 2) In the case of using a hydraulic cylinder, the stress and buckling must be considered depending on the cylinder stroke.  
The strength in the case that the piston rod is regarded as a long column, the buckling strength, cannot be enhanced by adopting highly tension-proof steel or heat treatment. The only way to improve the buckling strength of a cylinder is to widen the piston rod dia., and therefore, the selection of the piston rod is the very important point.  
The buckling chart shown in the next page, based on the Euler's equation that is applicable to an upright long column, indicates the maximum safe L values against the piston rod dia. when the cylinder is used with the compressive load that is most frequently applied.
- 3) When buckling occurs to a cylinder, the cylinder rod may be bent, causing malfunctions or serious accidents.

**Calculation method of cylinder buckling (use of buckling chart)**

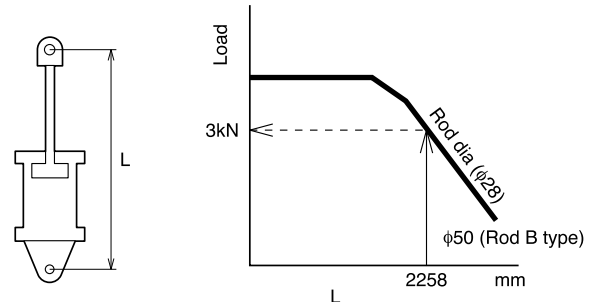
1. Find the L value (distance between the cylinder mounting position and load mounting position) with a cylinder fully extended.
2. Select any buckling chart depending on the mounting style, and find the maximum working load.

< Exercise >

Find the maximum working load for the 160C-1, φ50, rod B (rod dia. φ28), in case that the stroke is 1000 mm, CA type with the rod end eye.

< Answer >

1. Find the L value with the cylinder fully extended.  
From the dimensional drawings in this catalogue, the L value can be calculated by the formula below.  
 $L = 191 + 67 + 1000 + 1000 = 2258$  mm
2. From the buckling chart of the both ends pin joints, the load can be found as below.  
 $W = 3$  kN (  $\approx 306$  kgf)



**Notes on piston rod buckling**

Prior to the calculation of the piston rod buckling, consider the cylinder stopping method. The stopping methods of a cylinder include the cylinder stopping method, in which a cylinder is stopped at the stroke end, and the external stopping method, in which a cylinder is stopped with the external stopper. The definition of load differs depending on the selection of the stopping method as shown below.

- Definition of a load when the cylinder stopping method is selected

In the case of ①

In the case of ②

The state of stopping at the cylinder stroke end as shown in the figure. For the load required for the buckling calculation, apply the formula below.

In the case of ① : load =  $M \cdot g$   
 In the case of ② : load =  $\mu \cdot M \cdot g$

$\mu$  : frictional coefficient  
 $g$  : gravity acceleration 9.8 m/s<sup>2</sup>  
 $M$  : load weight (kg)

- Definition of load when the external stopping method is selected

The state of halfway stopping with the external stopper as shown in the figure. The load required for the buckling calculation in this case is not the M, but the cylinder theoretical output (Relief set pressure MPa × Piston area mm<sup>2</sup>).

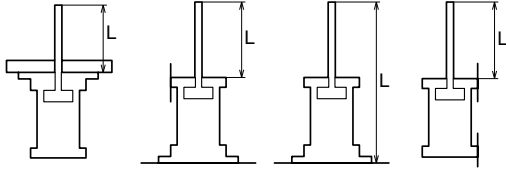
**Rod diameter list**

Unit: mm

Cylinder bore	φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
Series name									
160H-1, rod B	φ18	φ22	φ28	φ36	φ45	φ56	φ70	φ80	φ90
160H-1, rod A	—	φ28	φ36	φ45	φ56	φ70	φ90	—	—

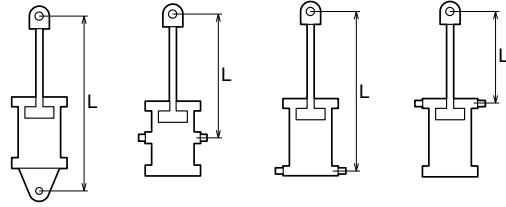
### Buckling chart by cylinder mounting style

Fixed cylinder, rod end free

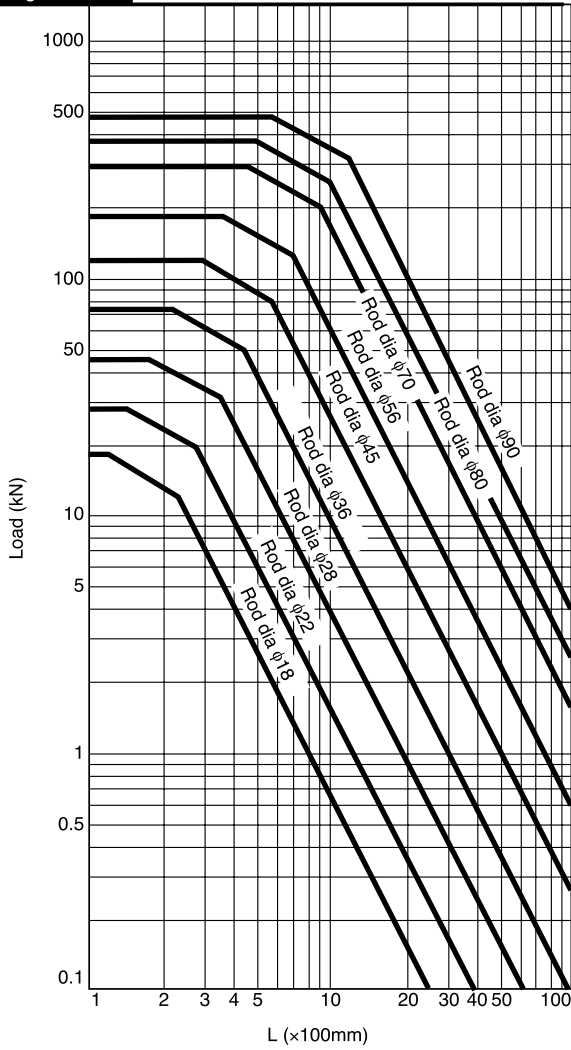


### Buckling chart by cylinder mounting style

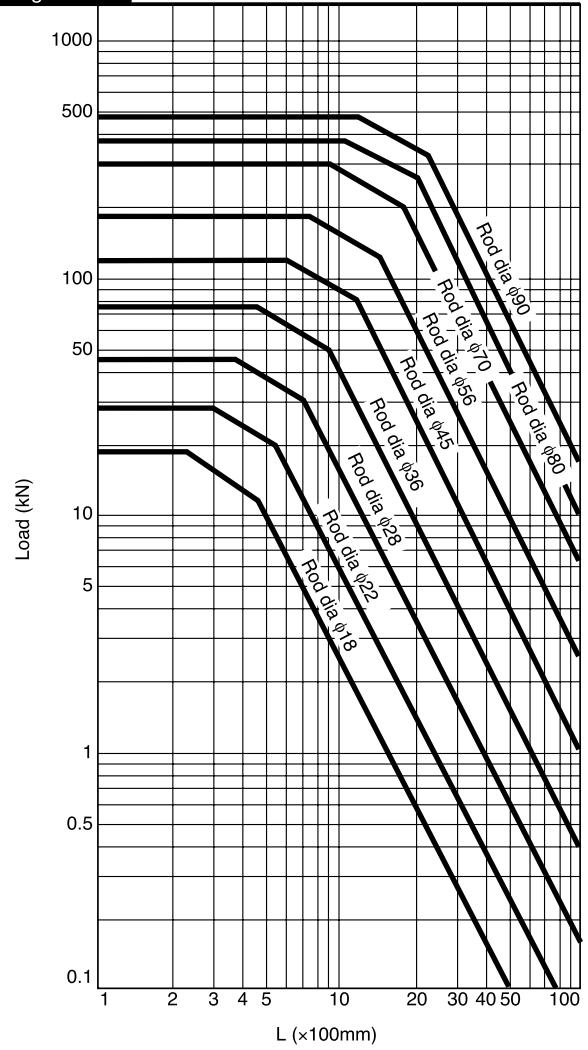
Both ends pin joints



Buckling chart



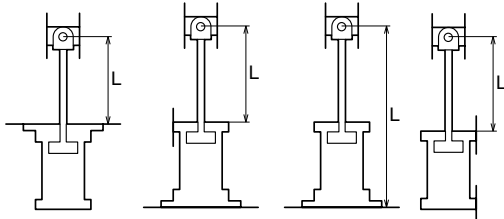
Buckling chart





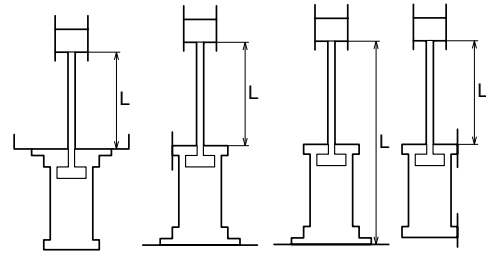
**Buckling chart by cylinder mounting style**

**Fixed cylinder, rod end pin joint**

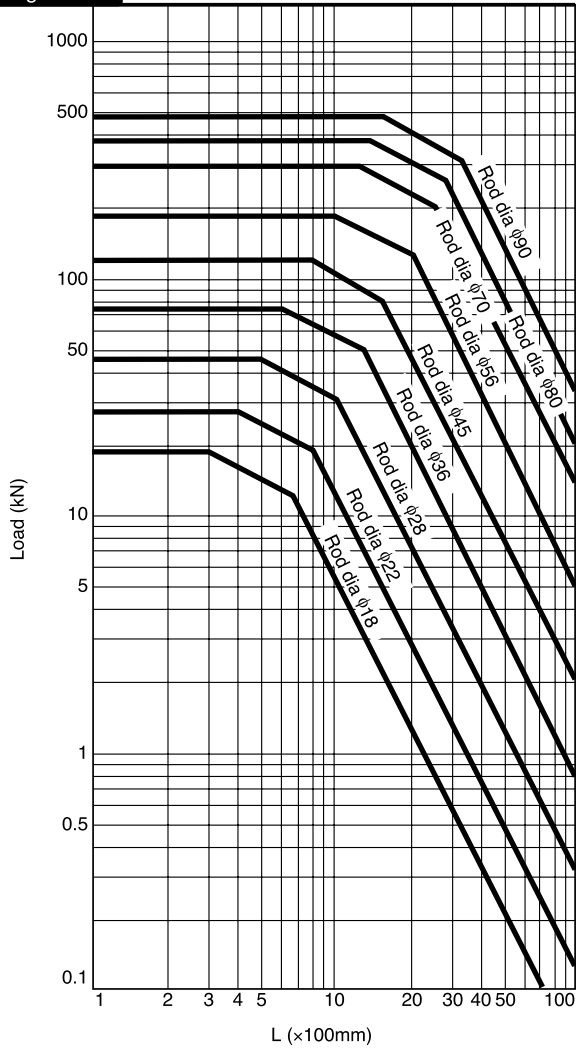


**Buckling chart by cylinder mounting style**

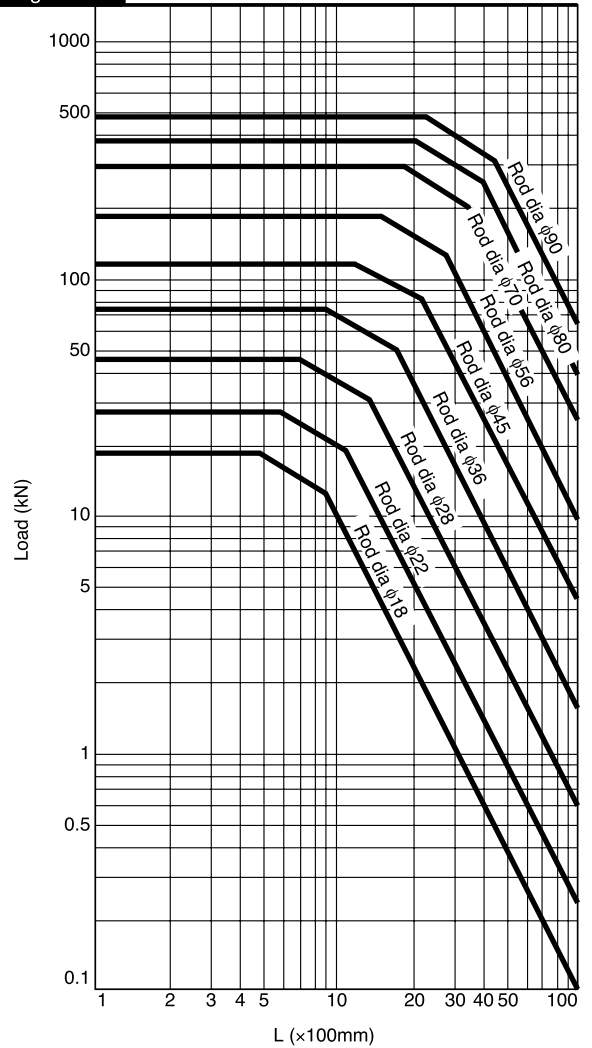
**Fixed cylinder, rod end guide**



**Buckling chart**



**Buckling chart**



### Selection of packing material

Prior to the selection of packing material, check the conditions below.

1. Oil temperature in a cylinder and ambient temperature
2. Type of working oil
3. Use frequency

- Notes)
- Select the packing material suitable for the working oil used. The wrong material selection may lead to the inferiority of packing material, causing the damaged packings.
  - The recommended cleanliness level of the working oil used is the NAS grade 12 or higher.
  - DO NOT mix fluids of different types. Otherwise, the mixed fluids may be changed in quality, posing inferiority of the packings.
  - In the case that working oil including water (water-glycol fluid, water in oil fluid, oil in water fluid, etc.) is used, and the cylinder tube is made of carbon steel for machine-structural use, it is recommended to plate the cylinder tube inside. When you request the plated cylinder tube, instruct us.

### Adaptability of packing material to working oil and working temperature range of packing material

Packing material	Applicable working oil					Oil temperature and ambient temperature (°C)							
	Petroleum-based fluid	Water-glycol fluid	Phosphate ester fluid	W/O fluid	W/O fluid	-50	-10	0	50	80	100	120	150
Nitrile rubber	○	○	×	○	○								
Urethane rubber	◎	×	×	△	△								
Hydrogenated nitrile rubber	○	◎	×	◎	◎								Notes)

- Notes)
- The ◎ and ○-marked items are applicable, while the ×-marked items are inapplicable. For the △-marked items, contact us.
  - In case that the priority is given to the abrasion resistance, adopt the packing material of the ◎-marked combinations.
  - In case that hydrogenated nitrile rubber is adopted for the use of water-glycol fluid, water in oil fluid, oil in water fluid, the oil temperature must be ranged from -10 to +100°C.
  - The temperature range in the table above indicates the working temperature range of packing material, and it is not the working temperature range of the cylinder. For the use of a cylinder at high temperature, contact us.
  - When using combined seals (code 8), refer to the notes on nitrile rubber.

### Criteria for selection of urethane rubber and nitrile rubber

The material of the packing for standard cylinders includes urethane rubber and nitrile rubber. When selecting the material, refer to the criteria for selection in the table below.

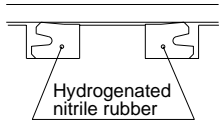
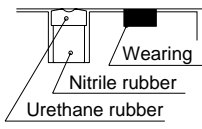
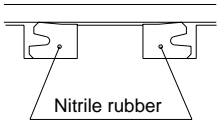
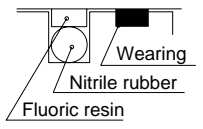
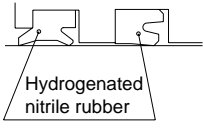
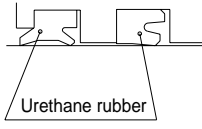
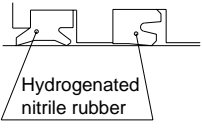
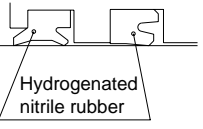
- Characteristics of urethane rubber  
Urethane rubber, having 2.5 times pull strength of nitrile rubber as shown in the table below, features the superior resistance against pressure and abrasion.  
However, urethane rubber may be changed in quality due to heat and inferiority in working oil in a long run (and the multiplier effect of oil temperature), and therefore, disassembly and inspection are required every year.
- Characteristics of nitrile rubber  
The influences of heat and inferiority in working oil on nitrile rubber is less than those on urethane rubber. Since the pull strength of nitrile rubber is less than that of urethane rubber, nitrile rubber is rather inferior to urethane rubber in the resistance against pressure and abrasion. Therefore, in case that the use frequency is low under low pressures and disassembly and inspection are not performed for two or three years, it is recommended to adopt nitrile rubber.
- Characteristics of hydrogenated nitrile rubber  
Hydrogenated nitrile rubber is most suitable for hot places or places where more reliable abrasion resistance than that of nitrile rubber is required at normal temperature.

### Table of packing selection criteria

Packing material	Nitrile rubber	Urethane rubber	Hydrogenated nitrile rubber
Abrasion resistance	○	◎	◎
Life against inferiority of working oil	○	△	○
Life with high oil temperature	○	△	◎
Oil leak from rod	○ (JIS B type)	◎ (JIS A type)	○ (JIS B type)
High use frequency under high pressure	○	◎	◎
Low use frequency under low pressure	◎	○	◎
Pull strength (reference value) (MPa)	17	47	30

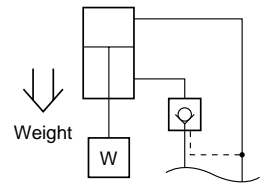
Note) ◎, ○, and △- marks indicate the priority of selection in this order.

Structures and selection guidance of packings for 160H-1

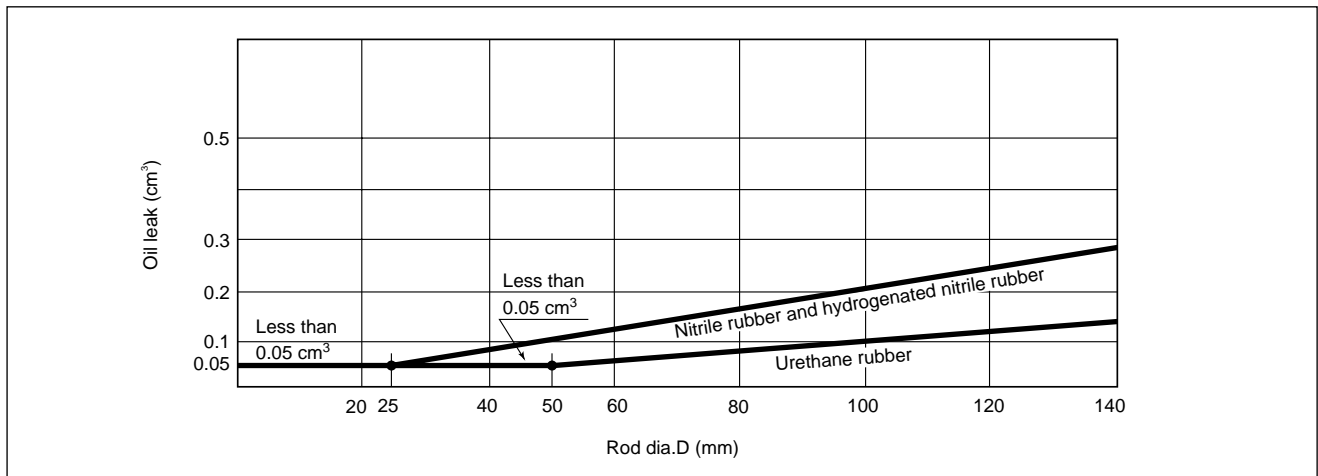
Packing code	1	2	6	8
Name of type	Nitrile rubber type	Urethane rubber type	Hydrogenated nitrile rubber type	Combined seal type
Packing structure	Piston packing 			
	Rod packing and wiper ring 			
Fixed section (including O-ring)	Nitrile rubber	Nitrile rubber	Hydrogenated nitrile rubber	Nitrile rubber

Notes on packings

- If any external force is applied to the cylinder as shown in the figure on the right, and the piston must be held at the fixed position, use of the nitrile rubber type or hydrogenated nitrile rubber type (code 1 or 6) U-packing as the piston packing is recommended.
- When the cylinder is operated at approximately 20 mm/s, stick-slip (crack) may occur to the nitrile rubber type, urethane rubber type, or hydrogenated nitrile rubber type packing depending on conditions (viscosity of fluid and hardness of machine).  
Combined seals are suitable for general use. For details, contact us.



Relation between external oil leak amount and rod dia.



External oil leak is the total of oil leak from the wiper ring with the piston moving distance of 100 m. (Refer to JIS B8367).

Selection of boots

If hydraulic cylinders are used in the places under unfavorable conditions, where are subjected to wind, wind and rain, and dusts, the piston rod especially needs to be protected. When selecting the boots, consider the environment conditions and temperature.

Boots type and resistible temperature

Symbols	Name	Material	Resistible temperature
J	Nylon tarpaulin	Vinyl-coated nylon cloth	80°C
JN	Chloroprene	Nylon cloth coated with chloroprene	130°C
JK	Conex	Silicon-coated Conex cloth	200°C

- Note) 1. If the boots are provided, the length of extended cylinder rod is changed.
- Note) 2. Remember that the resistible temperatures in the table above are for the boots, not for the cylinder.
- Note) 3. Conex is the registered trademark of Teijin Ltd.

### Check of port dia. depending on cylinder speed

Cylinder speed depends on the quantity of oil fed into a cylinder.

The cylinder speed  $V$  can be obtained from the following formula:

$$V = 1.67 \times 10^4 \times Q_c / A$$

- $V$  : cylinder speed (mm/s)
- $Q_c$  : oil quantity supplied into cylinder (L/mm)
- $A$  : pressurized area of piston (mm<sup>2</sup>)

The chart below shows the relation between the speed and the required flow rate for each size of standard hydraulic cylinders (cylinder inside) and that between the required flow rate and flow velocity in pipe for each port dia.

< Example >

In the case of the 160H-1 series with an 80 mm cylinder bore and 300 mm/s cylinder speed, is the standard port dia. applicable? Also, find the flow velocity in pipe.

< Answer >

In the chart below, find the cross point of the straight line from the point of 300 mm/s cylinder speed and the slant line of 80 mm cylinder bore, and draw a straight line parallel with the lateral axis until it reaches the slant line of the port dia. 3/4 (the standard port dia. for the 70/140H-8 series with a cylinder bore of 80 mm).

From the cross point on the slant port dia. line, draw a straight line parallel with the longitudinal axis until it reaches the lateral axis. From the cross point, the corresponding flow velocity in pipe is 5.2 m/s.

Since the cross point found based on the port diameter, cylinder speed, and bore is within the appropriate range, the standard port diameter is applicable.

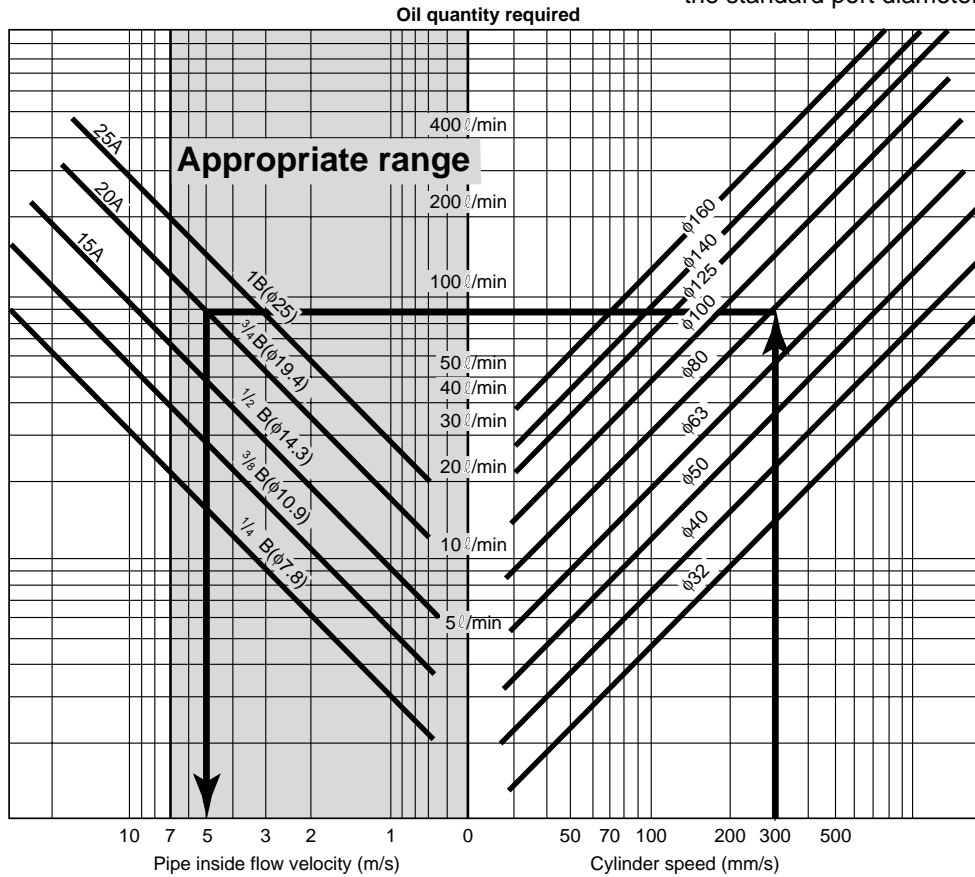


Chart of relation between cylinder speed, required flow rate, and flow velocity in pipe

Note)

The appropriate flow velocity in pipe for the appropriate range is 7 m/s or under. In general, if the flow velocity in pipe exceeds 7 m/s, the piping resistance and pressure loss are increased, causing less output during cylinder work and lower speed. To reduce pressure loss, adopt piping with larger dia. of one grade to the cylinder port. The flow velocity is calculated with steel tube for piping S ch80.

### 160H-1 Series standard port diameter

Bore (mm)	φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
Port dia. Rc, G	1/4	3/8	1/2	1/2	3/4	3/4	1	1	1

Note) The G thread type port for the cylinder with 32 mm bore cannot be manufactured in standard size. For details, contact us.

### Maximum energy absorbed of cylinder cushion

The conditions of absorbed energy allowable for the cylinder cushion can be obtained from the formula below. If a load is moved horizontally and straight, see the simplified charts on page 18 for selection.

Inertia energy of load at the inrush into cushion

 $E_1$ 

+

Energy generated by the external force applied to the cylinder at the inrush into cushion

 $E_2$ 

≤

Maximum energy absorbed of the cylinder cushion

 $E_t$ 

The procedures to find each item above are shown below.

Find the inertia energy of load at the inrush into cushion,  $E_1$ .

In the case of linear movement:

$$E_1 = MV^2/2 \text{ (J)} \quad M: \text{load weight (kg)} \\ V: \text{load speed at the inrush into cushion (m/s)}$$

In the case of rotation movement:

$$E_1 = I\omega^2/2 \text{ (J)} \quad I: \text{inertia moment of load (kg} \cdot \text{m}^2\text{)} \\ \omega: \text{angular velocity of load at the inrush into cushion (rads)}$$

Notes: If the cylinder speed is less than 0.08 m/s (80 mm/s), the cushioning effect is weakened.

Even if the cylinder speed is less than 0.08 m/s (80 mm/s), suppose it is 0.08 m/s to find the  $E_1$ .

In the case of rotation movement, even when the cylinder speed is 0.08 m/s or lower, similarly suppose it is 0.08 m/s, and calculate the angular velocity  $\omega$  to find the  $E_1$ .

Find the energy generated by the external force applied to the cylinder at the inrush into cushion,  $E_2$ .

The forces acting in the direction of the cylinder axis at the inrush into cushion are shown below.

- The force applied to the cylinder by the gravity of load
- The force applied by other cylinders
- The force applied to the cylinder by springs

Find the external force  $F$ , which is applied to the cylinder at the inrush into cushion, and the energy  $E_2$  by using the "Chart of conversion of external force into energy at the inrush into cushion."

In case that such an external force is not applied, the following condition is satisfied:  $E_2 = 0$ .

For the selection of cushion, suppose that the frictional resistance of load is 0.

Find the maximum energy absorbed of the cylinder cushion,  $E_t$ . Find it with the corresponding chart of the "Maximum energy absorbed".

Ensure that  $E_1 + E_2$  is same as the maximum energy absorbed  $E_t$ , or smaller.

If the following condition is satisfied, the cylinder is applicable:  $E_1 + E_2 \leq E_t$ .

If the following condition is satisfied, the cylinder is inapplicable:  $E_1 + E_2 \geq E_t$ . In such a case, perform the steps below, and then, select again.

- Decrease the inertia force of load.
- Decrease the external force applied to the cylinder.
- Lower the set pressure.
- Widen the cylinder bore.
- Install a shock absorber.

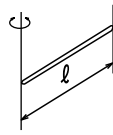
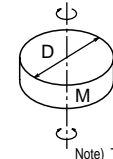
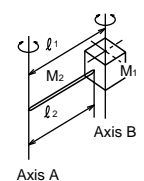
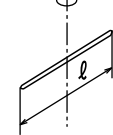
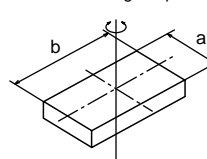
When installing a shock absorber, refer to the "TAIYO Shock absorber general catalogue".

DO NOT use the cylinder cushion together with a shock absorber. Otherwise, the inertia force of load may be applied to either of them due to the difference of cushioning characteristics.

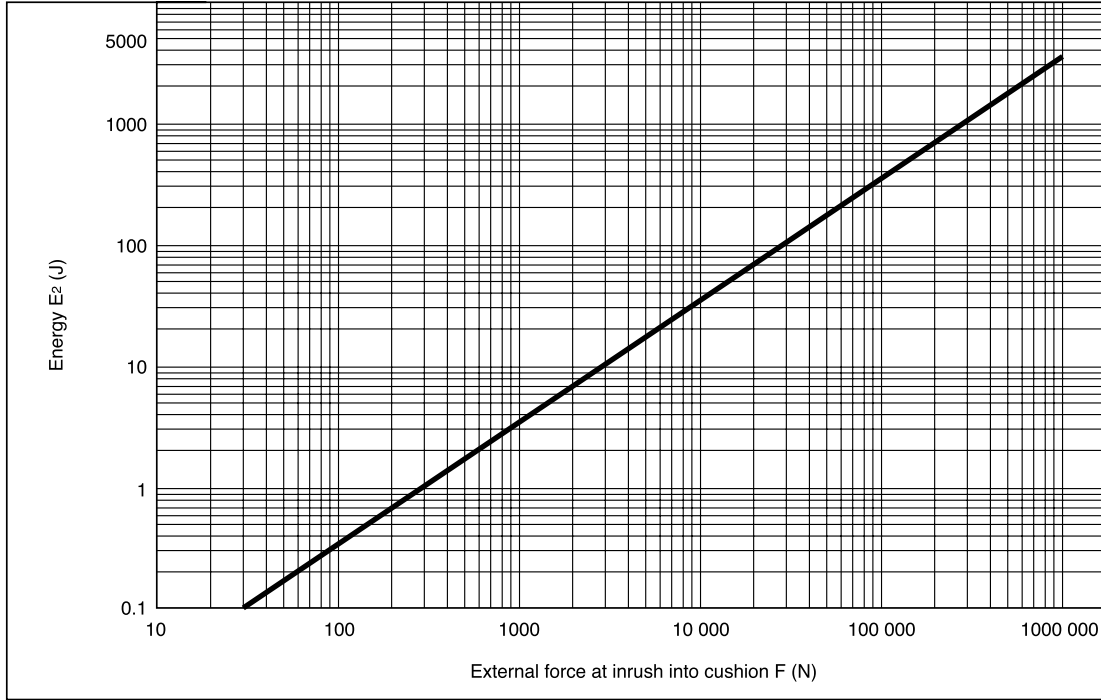
### ⚠ CAUTION

Be sure to use cylinders within the range of the maximum energy absorbed of the cylinder cushion. Otherwise, the cylinder or the peripheral devices may be damaged, leading to serious accidents.

### Inertia moment calculation table

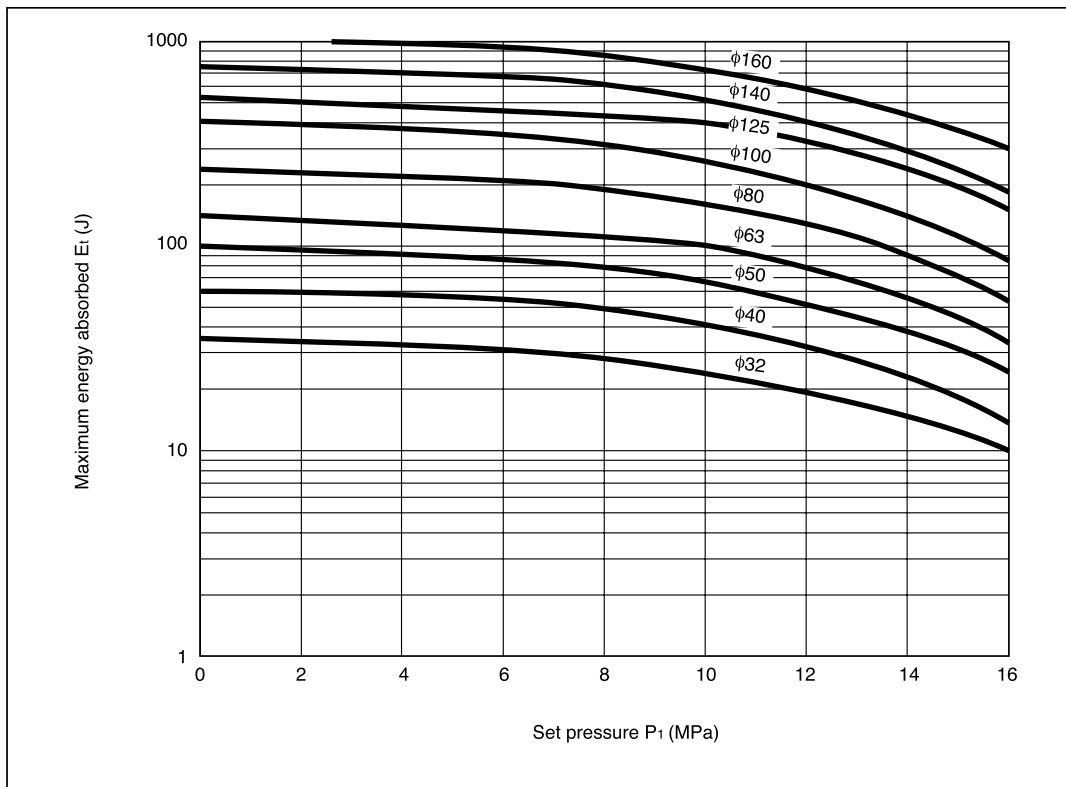
Outline	I: Inertia moment
<p>● In the case of the axis at rod end</p> 	$I = \frac{M l^2}{3}$
<p>● In the case of a cylinder (including a disk)</p>  <p style="text-align: center;">(Note) The axis passes through the center of gravity.</p>	$I = \frac{MD^2}{8}$
<p>● In the case of an arm (rotated around the axis A)</p>  <p>M1: Weight of a weight M2: Weight of an arm l1: Distance from the axis A to the center of a weight l2: Arm length</p>	$I = M_1 l_1^2 + I_1 + \frac{M_2 l_2^2}{3}$ <p style="text-align: center;">I<sub>1</sub>: The inertia moment of a weight when the axis passing through the center of the gravity of the weight (axis B) is the center.</p>
<p>● In the case of the axis in the middle of rod</p>  <p style="text-align: center;">(Note) The axis passes through the center of gravity.</p>	$I = \frac{M l^2}{12}$
<p>● In the case of a rectangular parallelepiped</p>  <p style="text-align: center;">(Note) The axis passes through the center of gravity.</p>	$I = \frac{M}{12} (a^2 + b^2)$
<p>I (I<sub>1</sub>): Inertia moment <math>\text{kg} \cdot \text{m}^2</math>            M (M<sub>1</sub>, M<sub>2</sub>): Weight <math>\text{kg}</math>            l, a, b: Length <math>\text{m}</math>            D: Diameter <math>\text{m}</math></p>	

**Chart of conversion of external force into energy at inrush into cushion of 160H-1**

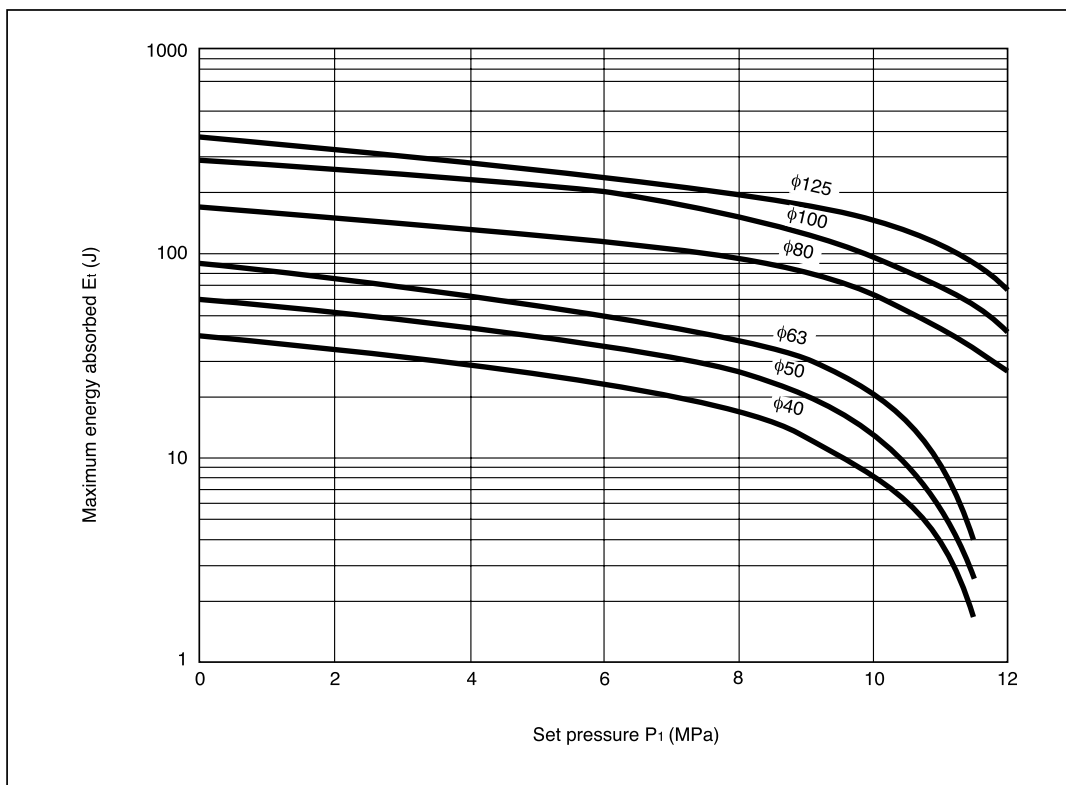




**160H-1 Rod B Maximum energy absorbed**



**160H-1 Maximum energy absorbed when rod A is forwarded**

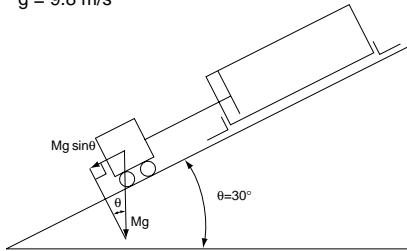


Note) For the maximum energy absorbed when the rod A is reversed, refer to that of the rod B.

### Example of calculation for selection

#### < Example 1 >

Cylinder	160H-1 rod B φ63
Set pressure	$P_1 = 10 \text{ MPa}$
Load weight	$M = 500 \text{ kg}$
Load speed	$V = 0.3 \text{ m/s}$ (the speed at the inrush into cushion is 300 mm/s)
Load moving direction	Downward
	$\theta = 30^\circ$ (there is no external force applied to the cylinder other than gravity)
Working direction	Forward (the direction of the piston rod ejected from the cylinder)
Gravitational acceleration	$g = 9.8 \text{ m/s}^2$

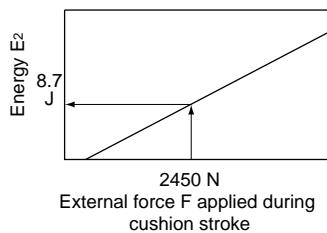


#### < Answer >

- Find the inertia energy of load at the inrush into cushion,  $E_1$ .  
Inertia energy in the case of linear movement,  $E_1$   
 $E_1 = MV^2/2 = 500 \times 0.3^2/2 = 22.5 \text{ J}$
- Find the  $E_2$ , energy generated by the external force  $F$ , applied to the cylinder at the inrush into cushion.  
2.1 Find the external force  $F$ , applied in the direction of the cylinder axis at the inrush into cushion.  
 $F = Mgsin \theta = 500 \times 9.8 \times \sin 30^\circ = 2450 \text{ N}$

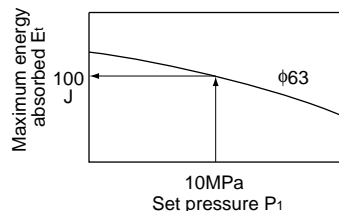
2.2 Convert the external force  $F$ , found in the step 2.1, into the energy  $E_2$ .

In the "Chart of conversion of external force into energy at the inrush into cushion of 160H-1", find the cross point of the straight line from the point of 2450 N on the lateral axis  $F$  and the slant line shown in the chart. Then, draw a straight line from the cross point on the slant line parallel with the lateral axis until it reaches the longitudinal axis of the chart. The cross point 8.7 J, indicates the energy applied by the external force.



$$E_2 = 8.7 \text{ J}$$

- Find the maximum energy absorbed of the cylinder,  $E_1$ .  
In the right chart, find the cross point of the straight line from the point of 10 MPa on the lateral axis, the set pressure of the "Maximum energy absorbed of cushion" of the 160H-1 and the curve of φ63. Then, draw a straight line from the cross point on the curve parallel with the lateral axis until it reaches the longitudinal axis of the chart. The cross point, 100 J, indicates the maximum energy absorbed.  
 $E_1 = 100 \text{ J}$



- Ensure that  $E_1 + E_2$  is same as the maximum energy absorbed  $E_1$ , or smaller.

$$E_1 + E_2 = 22.5 + 8.7 = 31.2 \text{ J}$$

where,  $E_1 = 100 \text{ J}$   
Therefore, the following condition is satisfied:  $E_1 + E_2 \leq E_1$ .  
As a result, the cylinder is applicable.

#### < Reference >

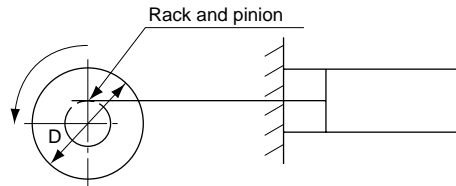
In case that the load moving direction is horizontal and there is no external force applied ( $E_2 = 0$ ), from the set pressure, first find the maximum energy absorbed,  $E_1$ . Then, the allowable load weight and allowable load speed can be found.

$$\begin{aligned} \text{To find the allowable load weight, } M &: M = 2E_1/V^2 \\ \text{To find the allowable load speed, } V &: V = \sqrt{2E_1/M} \end{aligned}$$

#### < Example 2 >

Cylinder	160H-1 rod B φ63
Set pressure	$P_1 = 8 \text{ MPa}$
Load weight	$M = 900 \text{ kg}$
Load dia.	$D = 0.7 \text{ m}$ (Uniform disk)
Angular velocity of load	$\omega = 1.5 \text{ rad/s}$ (angular speed at the inrush into cushion)
Load moving direction	Horizontal (without external force applied to the cylinder)
Working direction	Forward (the direction of the piston rod ejected from the cylinder)

The weight of the rack and pinion is so light that it can be ignored.



#### < Answer >

- Find the inertia energy of a load at the inrush into cushion,  $E_1$ .  
1.1 Find the inertia moment of a load,  $I$ .

From the inertia moment calculation table, the  $I$  can be calculated as below.  
 $I = MD^2/8 = 900 \times 0.7^2/8 = 55.1 \text{ (kg} \cdot \text{m}^2)$

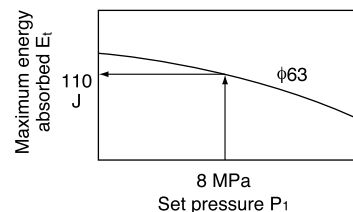
- Find the inertia energy of a load,  $E_1$ .  
 $E_1 = I\omega^2/2 = 55.1 \times 1.5^2/2 = 62.0 \text{ J}$

- Find the energy generated by the external force applied to the cylinder at the inrush into cushion,  $E_2$ .

$E_2 = 0$ , since there is no external force generated from the gravity of a load.

- Find the maximum energy absorbed of the cylinder,  $E_1$ .  
In the right chart, find the cross point of the straight line from the point of 8 MPa on the lateral axis, the supply pressure of the "maximum energy absorbed of cushion" of the 160H-1 and the curve of φ63 bore. Then, draw a straight line from the cross point on the curve parallel with the lateral axis until it reaches the longitudinal axis of the chart. The cross point 69 J, indicates the maximum energy absorbed.

$$E_1 = 110 \text{ J}$$



- Ensure that  $E_1 + E_2$  is same as the maximum energy absorbed,  $E_1$ , or smaller.

$$E_1 + E_2 = 62.0 + 0 = 62.0 \text{ J}$$

where,  $E_1 = 110 \text{ J}$   
Therefore, the following condition is satisfied:  $E_1 + E_2 \leq E_1$ .  
As a result, the cylinder is applicable.

Note: Even if the cylinder speed is less than 0.08 m/s (80 mm/s), suppose it is 0.08 m/s, and find the angular velocity for calculation.

#### < Reference >

In case of the rotation movement, of which load moving direction is horizontal, without an external force ( $E_2 = 0$ ), from the set pressure, first find the maximum energy absorbed,  $E_1$ . Then, the allowable inertia moment and allowable load angular velocity can be found.

$$\text{To find the allowable load inertia moment, } I = 2E_1/\omega^2$$

$$\text{To find the allowable load angular velocity, } \omega = \sqrt{2E_1/I}$$

### Maximum energy absorbed of cylinder cushion (simplified charts of load condition when a load moves horizontally and straight)

Charts shown below allow easier finding of the maximum energy absorbed (load condition) of the cylinder cushion.

1. They are applicable only when the cylinder moves horizontally and the load moves straight. When you operate cylinders under conditions other than the above, use selection materials shown on other pages.
2. Reduce the surge pressure generated during interim stopping of the cylinder to the maximum allowable pressure or less.

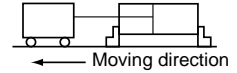
(Example)

Cylinder: 160H-1, rod B, 63 mm bore

Set pressure: 10 MPa

Load weight: 2000 kg

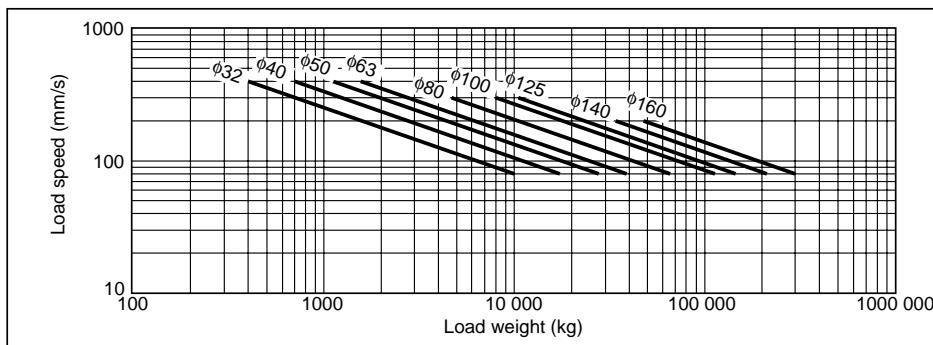
Find the allowable load speed.



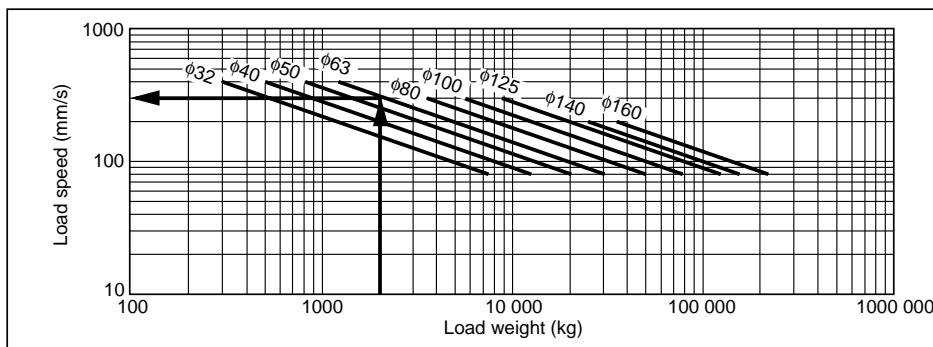
(Answer)

In the chart of "160H-1 rod B set pressure 10 MPa", find the cross point of the straight line from the point of 2000 kg on the lateral axis and the slant line of bore 63 mm shown in the chart. Then, draw a straight line from the cross point on the slant line parallel with the lateral axis until it reaches the longitudinal axis of the chart. The cross point, 310 mm/s, indicates the allowable load speed.

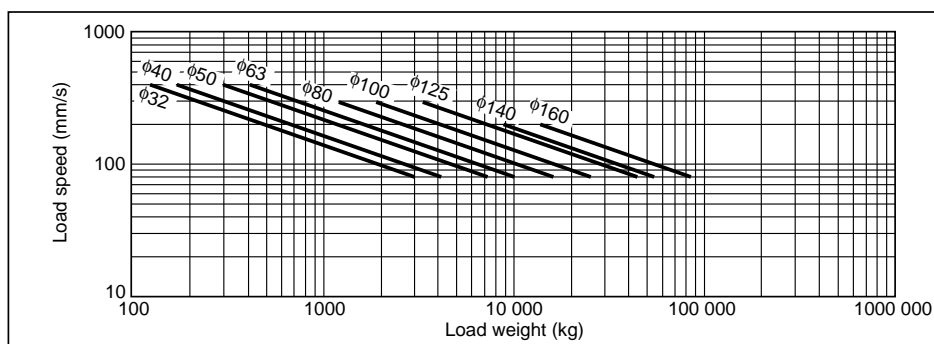
### 160H-1 Rod B Set pressure 5 MPa

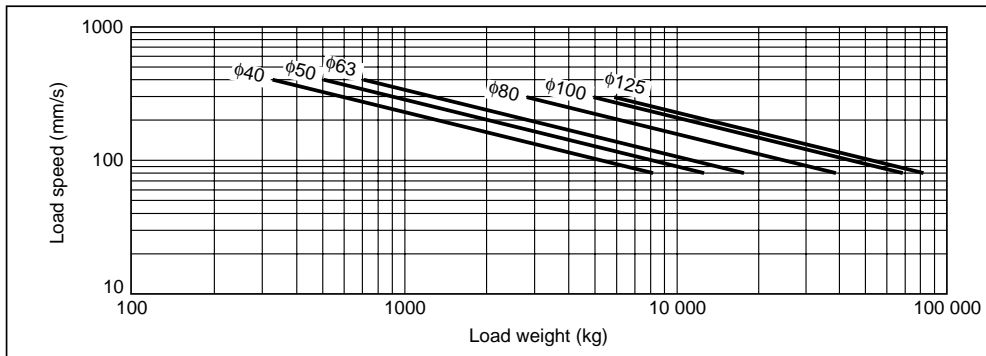
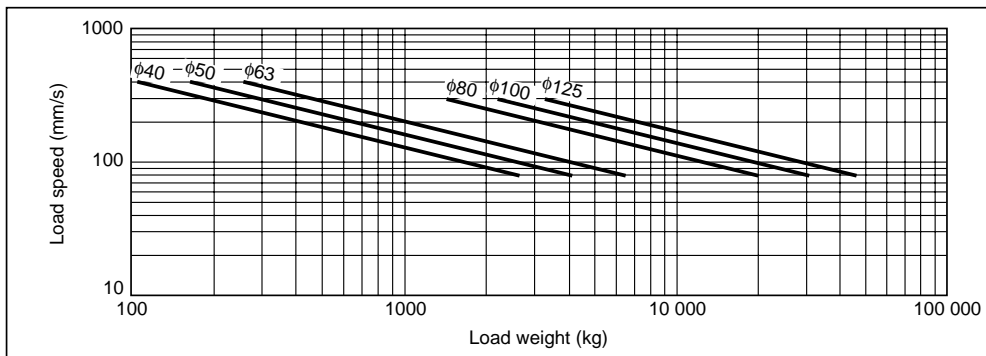


### 160H-1 Rod B Set pressure 10 MPa



### 160H-1 Rod B Set pressure 16 MPa

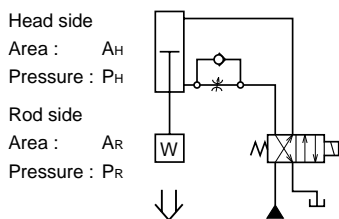


**160H-1** When rod A is forwarded, Set pressure 5 MPa**160H-1** When rod A is forwarded, Set pressure 10 MPa

Note) When the rod A is reversed, refer to the charts for the rod B.

**Maximum allowable pressure**

Since the pressurized area of the cylinder is small (especially, rod A) on the rod side, the pressure applied is liable to increase. Thus, pay attention to prevent it from exceeding the maximum allowable pressure.



Head side  
Area :  $A_H$   
Pressure :  $P_H$

Rod side  
Area :  $A_R$   
Pressure :  $P_R$

(Example)

Find the rod side pressure when the cylinder is forwarded (lowered) under the conditions shown below.

Cylinder: 160H-1, 80 mm bore, rod A  
Load:  $W=10000 \text{ kg}$  ( $\approx 100000 \text{ N}$ )  
Set pressure:  $P_H=10 \text{ MPa}$   
Installing direction: Rod faces downward  
Speed control: Meter-out system  
Operating speed is low, and load rate is 100%.

(Answer)

Pressure generated on the rod side,  $P_R$ , is the total of the pressure generated to balance with the load  $W$ ,  $P_1$ , and the pressure boosted up by the pressure supplied from the head end,  $P_2$ .

- $P_1$ , pressure generated to balance with load:

$$P_1 = \frac{W}{A_R} = \frac{100000 \text{ (N)}}{2564 \text{ (mm}^2\text{)}} = 3.9 \text{ (MPa)}$$

- $P_2$ , pressure boosted up by the pressure supplied from the head side:

$$\text{where, } P_2 A_R = P_H A_H$$

$$P_2 = \frac{P_H A_H}{A_R} = \frac{10 \text{ (MPa)} \times 5027 \text{ (mm}^2\text{)}}{2564 \text{ (mm}^2\text{)}} = 19.6 \text{ (MPa)}$$

- $P_R$ , pressure generated on the rod side:

$$P_R = P_1 + P_2 = 3.9 + 19.6 = 23.5 \text{ (MPa)}$$

$\therefore$  Since it exceeds the maximum allowable pressure on the rod side of the 160H-1 rod A type shown in the standard specification, 20 MPa, it is unavailable. Thus, change the conditions, and retry.

Use cylinders only under the operating conditions within the allowable range specified for each series. Otherwise, the performance may become unreliable as described below, or accidents may occur.

## 1. Pressure

The pressure supplied to cylinders, including surge pressure, must be lower than the maximum allowable level.

The use with the pressure exceeding the maximum allowable level may lead to galling in the slipping part or the damaged cylinder.

## 2. Speed

Use cylinders within the allowable working speed range. Otherwise, troubles below may occur.

When cylinders are used with the speed slower than the lower limit of the working speed range:

- Stick-slip (cracks)
- Unsmooth speed control

When cylinders are used with the speed faster than the upper limit of the working speed range:

- Damaged cylinder due to increased kinetic energy
- Damaged packings due to slipping heat
- Increased internal or external oil leak due to thickened oil film
- Higher flow velocity in the piping part, causing the lowered energy efficiency due to increased pressure loss

## 3. Environmental conditions

### 3-1) Temperature

Use cylinders only within the allowable working temperature range. Otherwise, troubles below may occur.

When cylinders are used at the temperature lower than the lower limit of the working temperature range:

- Brittle fracture due to lowered stretch of cylinder material
- Oil leak due to lowered elasticity of packings

When cylinders are used at the temperature higher than the upper limit of the working temperature range:

- Damage due to lowered strength of cylinder material
- Damaged packings
- Galling due to thermal expansion in the slipping part

### 3-2) Rust-proof measures

The use and storage of cylinders in the places where are highly humid, or are splashed with water or sea water require the consideration of rust-proof and anti-corrosion measures. In such a case, contact us.

### 3-3) Installing location

- (1) Use cylinders only indoors.
- (2) DO NOT use them in locations where dusts and vibration are excessive. Use of them under the environmental conditions shown below requires protection of the rod, rustproof measures, review of parts material, magnetic shield, and vibration-proof measures. If any countermeasure required for the cylinder side, contact us.

Working environmental conditions
Sands, dusts, soil, chips, welder spatter, etc.
Rain, water, sea water, oil, chemicals, etc.
Direct sunlight (ozone), humidity, etc.
High temperature, low temperature, freezing, etc.
Highly magnetic field
Vibrations

## 4. Mounting

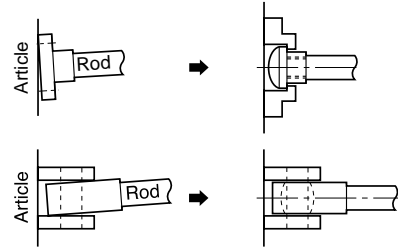


- When mounting a cylinder, use bolts of the specified size, and fix it with the bolts of the specified strength class (strength class 10.9). In the case of rotary type, use pins of the specified size. Use of bolts or pins other than designated ones may cause looseness of or damage to screws due to cylinder driving force or its reaction force.
- When a cylinder is mounted with fixed, the performance of the cylinder largely depends on the hardness of the mounting material. Therefore, insufficient hardness of mounting material may lead to a warp in mounting material due to the driving force of the cylinder and the disordered piston rod and bush, causing premature wear and the damaged thread of the piston rod. Use the mounting material with sufficient hardness.

### 4-1) Mounting of rod end in the case of fixed type

(SD, EA, EB types)

The movement direction of articles moved by a cylinder must be always aligned with the axis center of the piston rod movement. If the axis center is runout, premature wear of the bush, baking or galling of the cylinder tube may occur. To check the runout of the axis center, be sure to measure the core deviation of mounting part of the article at the position where the piston rod is fully ejected, and align the core. Then, connect the cylinder with the article.



### 4-2) Mounting of cylinder

When mounting cylinders, consider the following points.

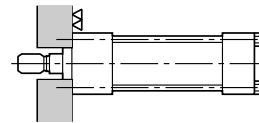
We cannot take responsibility for malfunctions due to wrong cylinder mounting.

(1) In the case of fixed type

- ① SD type
  - Thread accuracy of tie rod : JIS 6g
  - Clamping torque : tie rod clamping specified torque value

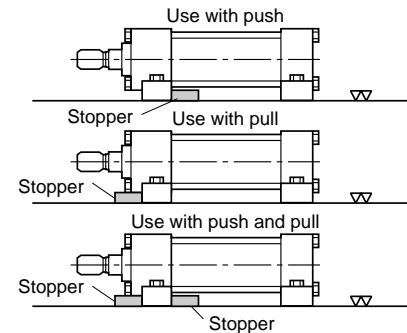
#### Specified tie rod tightening torque table

Bore	φ32	φ40	φ50·63	φ80·100	φ125	φ140	φ160
Tie rod thread	M6 × 1	M8 × 1	M12 × 1.25	M16 × 1.5	M22 × 1.5	M24 × 1.5	M27 × 2
Tightening torque N·m	8	22	70	170	460	610	854



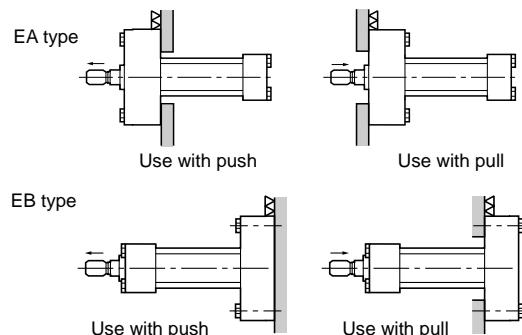
② LA type

To mount LA type, fix the attachments with clamping bolts. However, remember that this procedure is not perfect for the move in the axial direction when a load is applied. Therefore, install the stopper to the mounting base, as shown in the figures below.



③ EA, EB, FA, FE and FB types

Fix cylinders as shown in the figures below.



Note) When mounting the EA or EB type switch set cylinder, prevent the switch from interfering with the mounting plate.

## (2) Rotary type

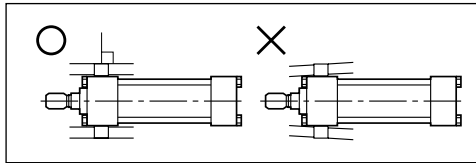
- For the cylinder of which mounting part moves inside a plane, be sure to connect the connection fittings of the rod end with pins, so that the mounting part can move inside the plane. For the plane and rectangular direction, perform centering similarly to the fixed type.
- Be sure to apply lubricant to the bearing part of the connection fittings.
- DO NOT use floating joints for rod end attachments.

## ① CA, CB, TA type attachments

- Use pins of the size specified in this catalogue.
- In the case of a long stroke (1000 mm or longer), avoid horizontal mounting. Otherwise, a lateral load is applied to the bush part due to the weight of the cylinder, causing uneven abrasion, substantially shorter service life, or galling.

## ② TA type attachments

Mount counterpart attachments so that they are vertical with the trunion boss. If they are mounted slantingly, uneven abrasion may occur in the boss bearing area, causing a substantially shorter service life.



## 5. Piping

- Take sufficient care to avoid dusts and chips of pipes in the piping. Avoid any air accumulation in pipes.
- When piping, avoid any air accumulation in pipes.
- When connecting with a rubber hose, do not bend it with the bending radius smaller than the specified level.
- Be sure to perform piping flushing. After flushing is complete, connect to the cylinder. Otherwise, the cylinder may be malfunctioned or oil leak may occur due to dusts in the piping.

## 6. Other notes

- When welding near a cylinder, it may be subjected with spatters. Protect the cylinder rod to avoid spatters.
- When welding during mounting, take sufficient care to avoid an electric current in the cylinder. Any electric current in the cylinder may lead to arcs between the rod and bush or between the piston and tube, causing the damaged cylinder parts.
- After mounting is complete, be sure to perform air vent and cushion adjustment. For the adjustment methods, follow the descriptions in "7. Operation".

## 7. Operation

## ⚠ CAUTION

- If the piston speed is fast from the beginning, abnormal surge pressure may occur, causing the damaged cylinder or machine.

- Trial run (before operation)

## 7-1) Air vent

## ⚠ CAUTION

- Excessive loosening of the air vent valve during air vent may lead to coming-off of the air vent valve from the cylinder, causing spurted oil and serious accidents.

- (1) Feed oil of low pressure (the pressure that the cylinder moves at a low speed, approx. 10 mm/s) to the cylinder, and vent air in oil from the air vent valve.

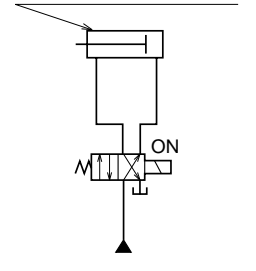
- At this time, if the check valve is excessively loosened, it may be come off from the cylinder, causing spouted oil and serious accidents.
- Repeat the step above until no air remains in the pipe.
- Exhaust air in the piping, as well as that in the cylinder. Any air remained may cause malfunctions below.

## [Symptoms]

- Stick-slip
- Unsmooth speed control
- Damaged packings due to increased temperature caused by adiabatic compression
- Shock or vibration occurs to outside
- Impossibility of set output

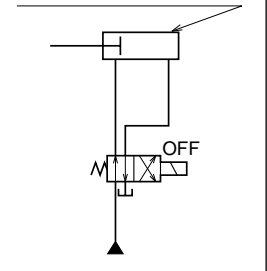
- When a cylinder moves forward

Loosen the check valve on the rod side



- When a cylinder moves backward

Loosen the check valve on the head side





7-2) Adjustment of cushion valve

**CAUTION**

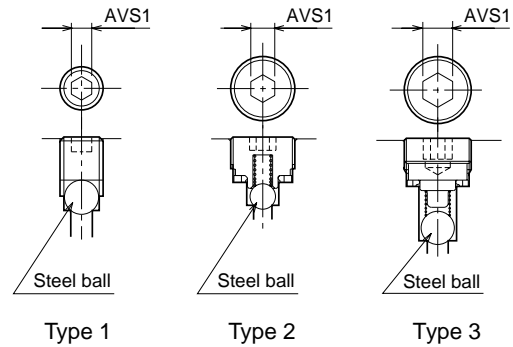
Excessive loosening of the cushion valve plug during cushion adjustment may lead to spurted oil, causing serious accidents.

(Cylinder with cushion)

Increase the piston speed gradually from a low speed, 50 mm/s or lower, and adjust the cushion.

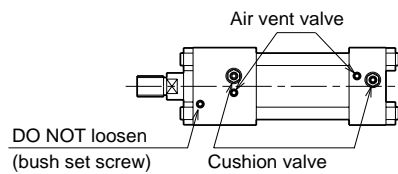
- The cushion must be adjusted, since it has not been adjusted at our factory.
- If the piston speed is fast from the beginning, abnormal surge pressure may occur, causing the damaged cylinder or machine.
- Excessive loosening of the cushion valve may lead to spurted oil, causing serious accidents.

**Air vent valve structure**

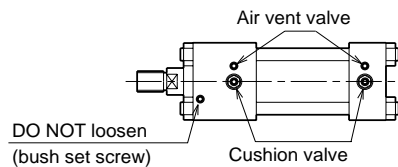


**Structure of cushion valve and air vent valve**

- Bore  $\phi 32$

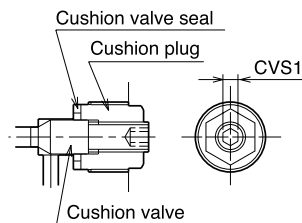


- Bore  $\phi 40 - \phi 160$



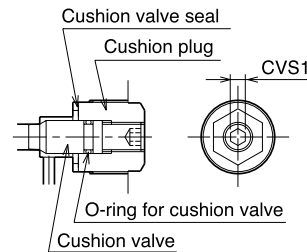
**Cushion valve structure**

- Bore from  $\phi 32$  to  $\phi 100$



Type 1

- Bore from  $\phi 125$  to  $\phi 160$



Type 2

**Width across flats of Allen key wrench used**

Bore	Rod B		Rod A	
	Type	CVS1 size	Type	CVS1 size
$\phi 32$	1	2.5	—	—
$\phi 40$	1	3	1	Rod side : 2.5 Head side : 3
$\phi 50$	1	3	1	3
$\phi 63$	1	3	1	3
$\phi 80$	1	3	1	3
$\phi 100$	1	3	1	3
$\phi 125$	2	4	2	4
$\phi 140$	2	4	—	—
$\phi 160$	2	4	—	—

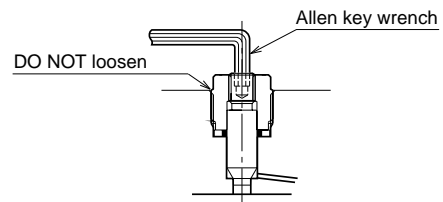
**Width across flats of Allen key wrench used**

Bore	Rod B		Rod A			
	Identical rod side and head side (Note 2)		Rod side (Note 1)		Head side (Note 2)	
	Type	AVS1 size	Type	AVS1 size	Type	AVS1 size
$\phi 32$	1	3	—	—	—	—
$\phi 40$	1	3	2	5	1	3
$\phi 50$	1	3	2	6	1	3
$\phi 63$	1	3	2	6	1	3
$\phi 80$	1	3	3	6	1	4
$\phi 100$	1	4	3	6	1	4
$\phi 125$	1	4	3	8	1	4
$\phi 140$	1	4	—	—	—	—
$\phi 160$	1	4	—	—	—	—

Note 1) Check valve type cushion, not the floating cushion, is provided for the rod side of the rod A. If the cylinder is equipped with cushions, check valves used as air vent valves are located on the two sides other than the sides that the ports and cushion valves are provided.

Note 2) Floating cushions are located on the head side of the rod A and the rod side and head side of the rod B. Cushion valves and air vent valves are located on the same side. If you need to change the locations of air vent valves, contact us.

- When adjusting cushion valves, use an Allen key wrench.
  - Turn clockwise: Cushion stroke speed decreases.
  - Turn counterclockwise: Cushion stroke speed increases.



## 8. Maintenance (maintenance and inspection)

To use cylinders without an accident for a long time, daily and regular inspections are required.

### 1) Daily inspection

For the daily inspection, check the points described below.

- (1) Check that the cylinder set bolts and nuts are not loosened.
- (2) Check that the working conditions are normal.
- (3) Check that there is no external leakage.
- (4) Check that there is no abnormality in other parts of the cylinder (tie rod, flange, etc.)

### 2) Regular inspection (disassembly inspection)

Decide the interval of the regular inspection depending on the working conditions and requirement, and perform according to the decided schedule. It is recommended to perform it once a year.

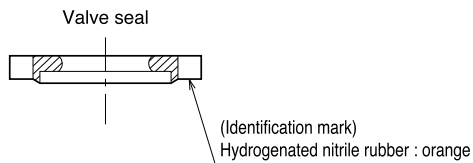
- Replace packings and gaskets with fresh ones at regular inspections.
- Do not use packings which have been stored for two years or more.
- Notes on fitting of valve seals

Valve seals must be fit in the specified direction and sequence. Wrong fitting direction and sequence will lead to the damaged packings, causing oil leak.

#### Fitting sequences

- Check the direction of a valve seal.  
The marked side must be faced inside (refer to Fig.1).
- Fit the valve seal to the shaft of the cushion valve in the correct fitting direction (refer to Fig.2).
- Take care to prevent the valve seal from being dropped, and screw it in (refer to Fig.3).

Fig.1



Fit with the marked side facing inside of the cylinder.

Fig.2

Cushion valve

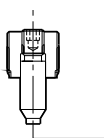
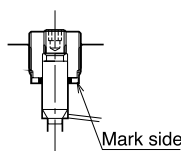


Fig.3



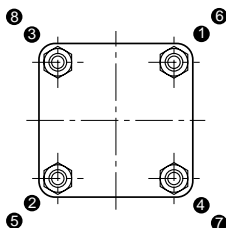
(Valve seal fitting sequence)

**Note** If the seal is first fit in the cover hole, and then, it is screwed in, it may be damaged.

### ● Notes on tie rod tightening torque at assembly

- 1) Assembly instruction manual for disassembly inspection of the TC type is available. Contact us.
- 2) For other types, refer to the "Specified tie rod tightening torque table" of "4-2) Installation of cylinder".

When tightening the tie rods, DO NOT tighten only a tie rod at a time, but tighten them gradually in order as shown in the figure below. Uneven tightening of the tie rods may lead to malfunction or cracks.



## 9. Storage

### 1) Notes on storage

When storing cylinders, take countermeasures against the following:

- (1) Rusted
- (2) Permanent warp and inferiority of packings

### 2) Storage location

- (1) Store cylinders in cool and dark place (max. temperature: 37°C), and protect them from direct sunlight and humidity. Place them higher than 30 cm from the floor.
- (2) DO NOT apply vibrations or shocks to the stored cylinders. The cylinder parts may be damaged.

### 3) Control and inspection during storage

- (1) Pack working oil (including rust preventive oil) in cylinders, and plug the port part.
  - If the port part is unplugged during storage, change working oil with fresh one, and plug again. Failure to perform this step may cause rusts on tube inside.
- (2) It is recommended to turn the stored cylinder 90° every three months to let packed oil flow and reduce permanent warp of packings.
  - If there is any abnormality in the working condition of the cylinder that has been stored for a long time, replace packings.
  - If the storage period is a year or longer, it is recommended to perform the internal inspection of the stored cylinder.
- (3) Repeat of rust preventive treatment

After the purchase of cylinders, repeat rust preventive treatment every year.

- Internal rust-proof measures (rust-proof measures for cylinder inside)  
Change working oil (including rust preventive oil) in the cylinder.
- External rust-proof measures (for machined face, exposed part)  
Apply rust preventive oil to mounting faces to machines and machined faces, such as a rod end screw part. Also, apply grease to the rod slipping part and the dust seal part, and protect with oil paper.

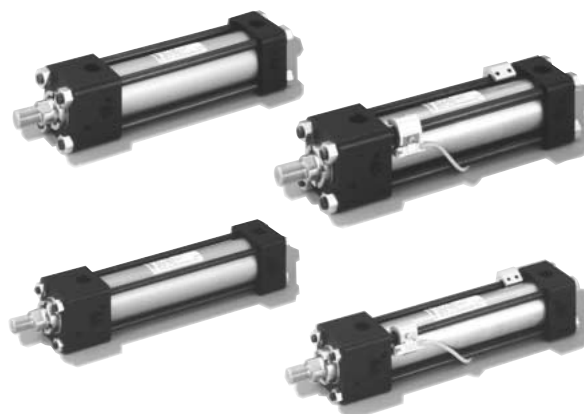
## 10. Disposal

- 1) Disassemble cylinders, sort the disassembled components by material (iron, copper, aluminum, resin, rubber, waste oil, etc.), and then, dispose them.
- 2) Piston rods are hard chrome plated. When disposing of them, consult with a disposal company.
- 3) Dispose of resin base and rubber base components as nonflammable wastes.
- 4) When disposing of waste oil, conform to related laws and rules.



## 16 MPa double-acting hydraulic cylinder with size conforming to JIS standards

- Designed to ISO 6020-2/JIS B8367-2 cylinder.
- Compact design and lightweight (Compared to previous JIS standard.)
- New floating cushion provides effective cushioning and quick start of each stroke.
- Switches can be used to all bore sizes in standard, 32 mm to 160 mm.
- Seals in sliding sections were designed to ISO standard.
- Light weight and compact. (Comparison to 140H-8 series)



### Standard specifications

Types	Specifications of general purpose and cutting fluid proof types
Nominal pressure	16 MPa
Maximum allowable pressure	20 MPa
Proof test pressure	24 MPa
Minimum working pressure	Rod side: Rod A 0.6 MPa or less Head side: 0.3 MPa or less Rod B 0.45 MPa or less
Operating speed range (Note 3)	$\phi 32 - \phi 63$ : 8 - 400 mm/s $\phi 80 - \phi 125$ : 8 - 300 mm/s $\phi 140 \cdot \phi 160$ : 8 - 200 mm/s
Temperature range (Ambient temperature and oil temperature)	Standard type : -10 - + 80°C Note 4) Switch set : -10 - + 70°C
Structure of cushioning	Metal fitting system
Adaptable working oil	Petroleum-based fluid (When using other fluids, refer to the table showing applicability of fluids.)
Tolerance of thread	JIS6g/6H
Port thread	Rc (JIS B 0203) • G (ISO 1179-1) Note 5)
Tolerance of stroke	100 mm or less <sup>+0.8</sup> <sub>0</sub> 101-250 mm <sup>+1.0</sup> <sub>0</sub> 251-630 mm <sup>+1.25</sup> <sub>0</sub> 631-1000 mm <sup>+1.4</sup> <sub>0</sub> 1001-1600 mm <sup>+1.6</sup> <sub>0</sub> 1601-2000 mm <sup>+1.8</sup> <sub>0</sub>
Mounting type	SD • LA • EA • EB • FA • FE • FB • CA • CB • TA • TC
Accessories	<ul style="list-style-type: none"> <li>● Rod end eye (T-end)</li> <li>● Rod end clevis (Y-end) with pin</li> <li>● Lock nut</li> <li>● Boots : Nylon tarpaulin (Standard) : Chloroprene (Semi-standard) : Conex (Semi-standard) Note 6)</li> </ul>

- Mounting styles SD, FA, FE, and FB are not specified in JIS nor ISO standards.

### Terminologies

#### Nominal pressure

Pressure given for a cylinder for convenience of naming. It is not always the same as the operating 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 unreliability performance at the return to nominal pressure.

#### Minimum working pressure

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

- The hydraulic pressure generated in a cylinder due to the inertia of load must be lower than the maximum allowable pressure.
- In case that the lock nut is attached to the piston rod end thread part, lengthen the thread length (dimension A).

Note 1) Cylinder with a bore of 140 mm and double rod type cylinder are not specified in JIS nor ISO standards. Rod series B and port Rc are included in JIS B8367-2 (not included in ISO6020-2).

Note 2) Floating cushion is not provided for the rod side of the rod A.

Note 3) The minimum working speed range of the combined seal type cylinder (packing code: 8) is 1 mm/s.

Note 4) The standard type cylinder can be used up to the operating temperature range shown in the selection materials by using packing material (6), hydrogenated nitrile rubber.

Note 5) The piping spacer and gasket are attached to the G thread of 32mm bore.

Note 6) Conex, material of the boots, is the trademark of Teijin, Ltd.

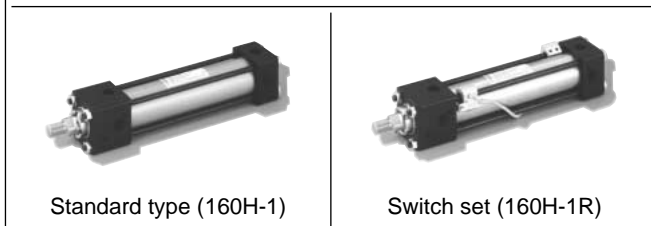
Lines

Unit : mm

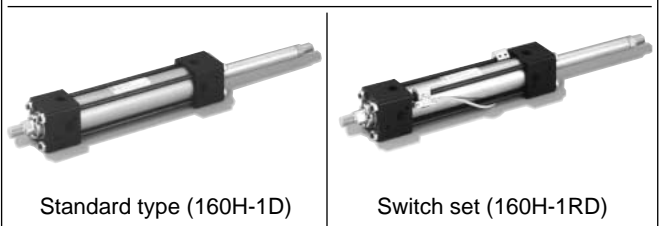
Structure	Type	Rod dia.	φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
General purpose type	Double Acting Single Rod	Standard type 160H-1	Rod B	●	●	●	●	●	●	●	●
		Rod A		●	●	●	●	●	●		
	Switch set 160H-1R	Rod B	●	●	●	●	●	●	●	●	●
		Rod A		●	●	●	●	●	●		
Double Acting Double Rod	Standard type 160H-1D	Rod B	●	●	●	●	●	●	●	●	
	Switch set 160H-1RD	Rod B	●	●	●	●	●	●	●	●	

- Notes) • When using a switch, use a switch set cylinder.  
 • No switch can be mounted onto the standard type cylinder.

Double Acting Single Rod



Double Acting Double Rod

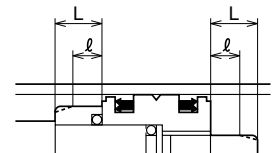


Standard stroke fabrication range Unit : mm

Bore	Stroke
φ32	- 1200
φ40 · φ50	- 1600
φ63	- 1800
φ80 - φ160	- 2000

Cushion stroke length Unit : mm

Bore	Cushion ring length L	Cushion ring parallel part length ℓ
φ32	21	6
φ40 - φ80	25	
φ100 · φ125	30	8
φ140 · φ160		



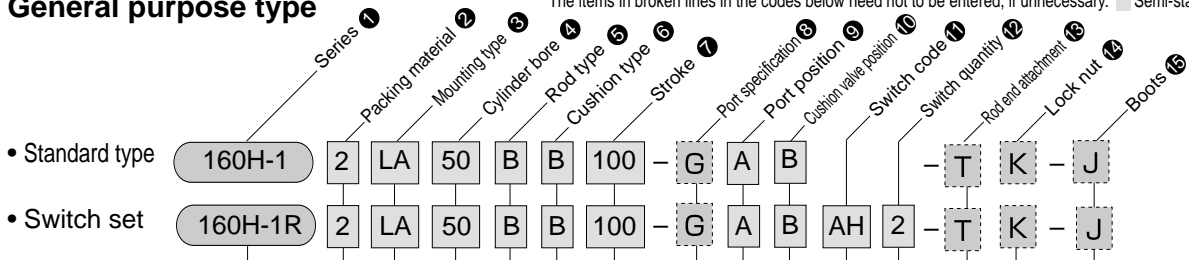
- The strokes above indicate the maximum available strokes for the standard type. If you request larger strokes than those in the table above, contact us.
- For the rod buckling, check with the buckling chart in the selection materials.
- Figures shown in the table above indicate the cushion stroke lengths in the case of cylinders used up to the stroke end.
- In the case that a cylinder is not used up to the stroke end, and if it is stopped 5 mm or more before the stroke end, the cushioning effect will be weakened. In such a case, contact us.

Packing structure table

Packing code	1	2	6	8
Name of type	Nitrile rubber type	Urethane rubber type	Hydrogenated nitrile rubber type	Combined seal type
Packing structure	Piston packing	<p>Wearing Nitrile rubber Urethane rubber</p>	<p>Nitrile rubber</p>	<p>Wearing Nitrile rubber Fluoric resin</p>
	Rod packing and wiper ring	<p>Urethane rubber</p>	<p>Hydrogenated nitrile rubber</p>	<p>Hydrogenated nitrile rubber</p>
Fixed section (including O-ring)	Nitrile rubber	Nitrile rubber	Hydrogenated nitrile rubber	Nitrile rubber

### General purpose type

The items in broken lines in the codes below need not to be entered, if unnecessary.   Semi-standard specification



#### Double-Acting Single Rod

160H-1 : Standard type  
160H-1R : Switch set

#### Double-Acting Double Rod

160H-1D : Standard type  
160H-1D : Switch set

- 1 Nitrile rubber
- 2 Urethane rubber
- 6 Hydrogenated nitrile rubber
- 8 Combined seal

● For packing configuration, refer to the selection materials at the beginning of this catalogue.

Mounting type

#### Cylinder bore (mm)

#### Rod B

φ32 • φ40 • φ50 • φ63 • φ80 • φ100 • φ125 • φ140 • φ160

#### Rod A

φ40 • φ50 • φ63 • φ80 • φ100 • φ125

- A Rod A
- B Rod B

- B with cushions on both ends
- R with cushion on the rod side
- H with cushion on the head side
- N without cushion

Cylinder stroke (mm)

- None Rc thread
- G G thread

Port position (A, B, C, D)

Cushion valve position (A, B, C, D, 0)

Switch symbol

Note) Select applicable switches out of the Switch List

#### Notes on order for switch sets

● If a switch is unnecessary, enter the switch code **1** and the switch quantity **12** of 0.

Switch quantity (1, 2, to n)

T T-end (rod end eye)

Y Y-end (rod end clevis)

K Long thread with lock nut

● For thread length, refer to the "Rod end attachment/Thread length with lock nut".

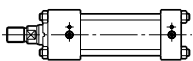
J Nylon tarpaulin

JN Chloroprene

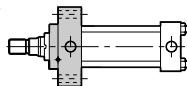
JK Conex

### Mounting type Codes in the < > marks below are names called in ISO 6020-2.

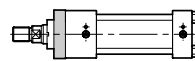
SD SD type (Basic type)



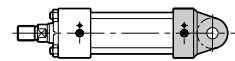
EA EA type (Rectangular rod cover attached)  
<ME5>



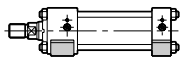
FA FA type (head rectangular flange mounting)  
(for Rod B)



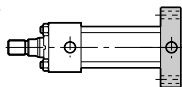
CA CA type (Eye mounting)  
<MP3>



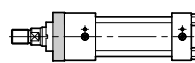
LA LA type (Side lugs mounting)  
<MS2>



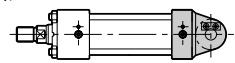
EB EB type (Rectangular head cover attached)  
<ME6>



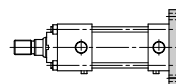
FE FE type (head rectangular flange mounting)  
(for Rod A)



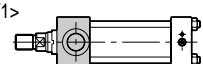
CB CB type (Clevis mounting)  
<MP1>



FB FB type (cap rectangular flange mounting)

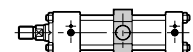


TA TA type (head trunnion mounting)  
<MT1>



Note) SD, FA, FE, and FB types are not included in ISO standards.

TC TC type (intermediate trunnion mounting)  
<MT4>





Switch List

Kind	Switch code	Load voltage range	Load current range	Maximum open/close capacity	Protective circuit	Indicating lamp	Wiring method	Cord length	Applicable load device	
Contact	AF AX101	DC:5 - 30V AC:5 - 120V	DC:5 - 40mA AC:5 - 20mA	DC:1.5W AC:2VA	None	LED (Lights up in red during ON)	0.3mm <sup>2</sup> , 2-core, outer dia. 4mm, rear wiring	1.5m	Small relay programmable controller	
	AG AX105							5m		
	AH AX111				1.5m					
	AJ AX115				5m					
	AE AX125	DC: 30 V or less AC: 120 V or less	DC:40mA or less AC:20mA or less	2VA	None	No	4-pin connector type, rear wiring	5m		
	AK AX11A	AC:5 - 120V	5 - 20mA					0.5m		
	AL AX11B	DC:5 - 30V	5 - 40mA	1.5W	Present	LED (Lights up in red during ON)	4-pin connector type, rear wiring	0.5m		
	AP AZ101	DC:5 - 30V AC:5 - 120V	DC:5 - 40mA AC:5 - 20mA	DC:1.5W AC:2VA				None		LED (Lights up in red during ON)
	AR AZ105				1.5m					
	AS AZ111				5m					
	AT AZ115				5m					
	AN AZ125	DC:30Vor less AC:120Vor less	DC:40mAor less AC:20mAor less	2VA	None	No	4-pin connector type, upper wiring	0.5m		
	AU AZ11A	AC:5 - 120V	5 - 20mA					0.5m		
	AW AZ11B	DC:5 - 30V	5 - 40mA	1.5W	Present	LED (Lights up in red during ON)	4-pin connector type, upper wiring	0.5m		
No contact	BE AX201	DC:5 - 30V	5- 40mA	-				Present	LED (Lights up in red during ON)	0.3mm <sup>2</sup> , 2-core, outer dia. 4mm, rear wiring
	BF AX205				5m					
	CE AX211				(2-lamp type, red/green)	4-pin connector type, rear wiring	1.5m			
	CF AX215						5m			
	CH AX21C				LED (Lights up in red during ON)	0.3mm <sup>2</sup> , 2-core, outer dia. 4mm, upper wiring	0.5m			
	CJ AX21D						1m			
	BM AZ201				(2-lamp type, red/green)	4mm, upper wiring	1.5m			
	BN AZ205						5m			
	CM AZ211				LED (Lights up in red during ON)	0.3mm <sup>2</sup> , 2-core, outer dia. 4mm, rear wiring	1.5m			
	CN AZ215						5m			
No contact (CE coformed)	CT AX211CE	DC:5 - 30V	5 - 40mA	-	Present	LED (2-lamp type, red/green)	0.3mm <sup>2</sup> , 2-core, outer dia. 4mm, rear wiring	1.5m	Small relay programmable controller	
	CU AX215CE							5m		
	CV AX21BCE							4-pin connector type, rear wiring		0.5m
	CW AZ211CE							0.3mm <sup>2</sup> , 2-core, outer dia. 4mm, upper wiring		1.5m
	CX AZ215CE							4-pin connector type, upper wiring		5m
	CY AZ21BCE							4-pin connector type, upper wiring		0.5m

- Notes) ● For the switches without a protective circuit, be sure to provide the protective circuit (SK-100) with load devices when using induction load devices (relay, etc.).  
 ● For the handling of switches, be sure to refer to the switch specifications in the end of this catalogue.  
 ● For the 200 V AC type, contact us.  
 ● We recommend AND UNIT (AU series) for multiple switches connected in series.

AX type (Rear wiring)

Cord type



Connector type



AZ type (Upper wiring)

Cord type



Connector type



Standard stroke fabrication range

Unit : mm

Bore	Stroke
φ32	- 1200
φ40 · φ50	- 1600
φ63	- 1800
φ80 - φ160	- 2000

- The strokes above indicate the maximum available strokes for the standard type. If you request larger strokes than those in the table above, contact us.  
 ● For the rod buckling, check with the buckling chart in the selection materials.

Adaptability of working oil to packing material

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

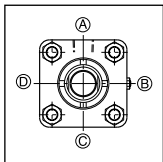
- Notes) 1. The ◎ and ○-marked items are applicable, while the X-marked items are inapplicable. For the use of the △-marked items, contact us.  
 2. The ◎-marked items are the recommended packing materials in case of giving the first priority to abrasion resistance.  
 3. When using [8] combined seals, refer to the notes on nitrile rubber seals.

## Switch mounting allowable min. stroke

Unit: mm

Bore mm	Mounting style	Types other than TC type		TC type	
	Switch quantity	with a switch	with two switches	with a switch	with two switches
	Switch type	AX type	AX type	AX type	AX type
φ32		30	30 (40)	60	115
φ40		25	25	60	115
φ50		25	25	65	125
φ63		25	25	65	125
φ80		20	25	75	135
φ100		20	25	90	150
φ125		20	25	90	160
φ140		20	25	95	170
φ160		20	25	110	185

## ★ Standard specifications



- With both ends cushions
- Port position (A), cushion valve position (B)

## ★ Port position and cushion valve position

- Standard type: With both end cushions  
Standard port position, cushion valve position

Mounting style	Order symbol		Rod cover		Head cover	
	Port position	Valve position	Port position	Valve position	Port position	Valve position
SD · LA · CA · CB · FA · FB · TC	A (B · C · D)	B (C · D · A)	A (B · C · D)	B (C · D · A)	A (B · C · D)	B (C · D · A)
EB	A	B	A	B	A	C
EA · TA	A	C	A	C	A	B

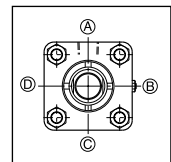
- The symbols (A) shown in the table above indicate the standard port positions of types other than EA, EB, and TA, and symbols (B) indicate the standard cushion valve positions. When changing any position, write down symbols shown in dimensional drawings.
- Specification of change in positions of rod side port and cushion valve (Example)
- Specification of change in positions of head side port and cushion valve (Example)

160H-1R 2CA50BB100- **B** **A** AH2  
 Port position  
 Cushion valve position

160H-1 2CA50BB100-**AB-X** **PPC**  
 Rod side port and cushion valve position  
 Head side port and cushion position change specification symbol

Position specification: **PC-BA**  
 Head side port and cushion valve position

- Order symbols and port and cushion valve positions shown above are applicable to the EA, EB, and TA types.  
When changing any position, specify the position on the rod side or the head side.  
As for the TA type rod cover, neither port nor cushion valve can be provided on the (B) or (D) side.  
As for the EA type rod cover, cushion valves cannot be provided on the (B) or (D) side.  
As for the EB type rod cover, cushion valves cannot be provided on the (B) or (D) side.
- If the cylinder has no cushion, cushion valve position is indicated as "0".
- If the ports are located on the (B) or (D) side of the LA type cylinder and general piping joints are used, they may interfere with the cylinder mounting bolts.
- Air vents are located on the same side as that the cushion valves are installed.  
If the cylinder has no cushion, they are located on the (B) side ((C) side, in the case of the EA or TA type rod cover).
- For details of positions of the ports, cushion valves, and air vents, refer to 31 page.

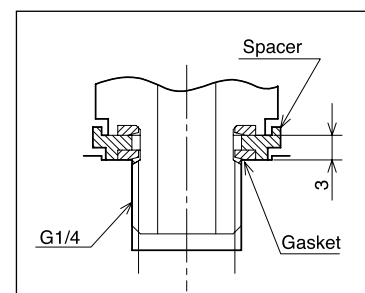


## ★ Port G thread type

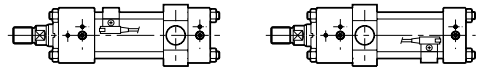
- As for the port G thread type, add "G" ahead of the port position symbol.  
(Example)

160H-1R 2CA50BB100 - **G** **A** **B**  
 Port G thread type  
 Port position  
 Cushion valve position

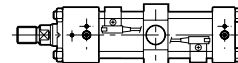
- Use the attached spacers and gaskets for the port G thread type cylinder with 32 mm bore.  
(If no spacer is attached to it, the joint may interfere with the parts in the cylinder.)



- Notes ● For the TC type (with a switch), cylinder strokes in case that the TC type attachment shown in the figures below is positioned closest to the cover are shown in the table on the left.



- Notes ● For the minimum PH at switch mounting, refer to the dimensional drawings of the TC type.
- For the TC type (with two switches), cylinder strokes in case that the TC type attachment shown in the figure below is positioned in the center are shown in the table on the left.

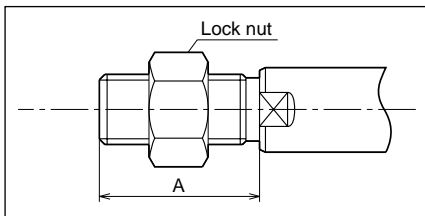


- Notes ● Figure in the parentheses in the line of bore 32 mm shown in the table on the left indicates the minimum stroke when the rod side detection switch and the head side detection switch are mounted on the same side.

★ Notes on order of cylinder with lock nut

The rod end thread length (A) must be longer when a lock nut is attached to the rod end.

(Example) **160H-1 2LA50BB100-AB -K**  
 Long thread with lock nut



A without lock nut  
 A=28  
 ↓  
 A of long thread with lock nut  
 A=40

Note) When a lock nut is attached to the rod end, length "A" shown in the figure above must be the same as that of the long thread with lock nut type or longer. For details, refer to "Rod end attachment/Thread length with lock nut".

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

Delivery specifications of the cylinder with lock nut and rod end attachment differ from those of the cylinder with rod end attachment only (without lock nut). For details, refer to the dimensional drawing of rod end attachment.

★ Semi-standard fabrication range

- With boots
- Change in position of TC attachment (Size symbol: PH)
- Change in piston rod end (Size symbol: WF (W), A, KK)
- Plated cylinder tube (Hard chrome plated 2/100 mm)

For details, contact us.

Weight table

Unit: kg

Rod type	Bore mm	Basic weight (SD type)		Additional weight per 1 mm stroke		Mounting accessories weight										Rod end attachment weight		
		Single rod type	Double rod type	Single rod type	Double rod type	LA	EA	EB	FA	FE	FB	CA	CB	TA	TC	Rod end eye (T-end)	Rod end clevis (Y-end)	Lock nut
B	φ32	1.31	1.73	0.0062	0.0082	0.26	0.34	0.23	0.32	—	0.28	0.15	0.19	0.04	0.16	0.31	0.38	0.03
	φ40	2.94	3.59	0.0098	0.0127	0.32	1.02	0.81	0.93	—	0.88	0.26	0.32	0.08	0.45	0.38	0.54	0.03
	φ50	4.55	5.69	0.0146	0.0194	0.65	1.42	1.16	1.60	—	1.48	0.80	0.99	0.15	0.84	1.17	1.68	0.05
	φ63	6.63	8.18	0.0193	0.0272	1.18	1.66	1.43	2.47	—	2.29	0.96	1.15	0.31	1.54	1.25	1.86	0.09
	φ80	12.55	15.40	0.0316	0.0440	1.37	2.93	2.58	4.40	—	4.07	1.97	2.45	0.63	3.05	1.95	3.64	0.13
	φ100	17.93	21.88	0.0458	0.0650	1.98	3.76	3.41	6.05	—	5.56	3.99	4.99	1.23	4.31	5.30	7.97	0.23
	φ125	33.67	39.03	0.0738	0.1038	2.49	6.67	6.67	10.24	—	9.44	6.60	8.46	2.43	9.01	7.31	11.79	0.31
	φ140	43.36	50.39	0.0988	0.1380	2.87	8.23	8.23	14.15	—	13.07	8.44	10.89	3.48	12.25	9.98	15.64	0.38
A	φ40	3.03	—	0.0116	—	0.32	1.02	0.81	—	1.43	0.88	0.26	0.32	0.08	0.45	0.50	0.62	0.05
	φ50	4.72	—	0.0177	—	0.65	1.42	1.16	—	2.28	1.48	0.80	0.99	0.15	0.84	1.25	1.86	0.09
	φ63	6.94	—	0.0238	—	1.18	1.66	1.43	—	3.50	2.29	0.96	1.15	0.31	1.54	1.66	2.08	0.13
	φ80	13.08	—	0.0384	—	1.37	2.93	2.58	—	5.43	4.07	1.97	2.45	0.63	3.05	2.98	3.98	0.23
	φ100	18.88	—	0.0566	—	1.98	3.76	3.41	—	7.90	5.56	3.99	4.99	1.23	4.31	6.78	9.25	0.31
	φ125	35.78	—	0.0934	—	2.49	6.67	6.67	—	14.95	9.44	6.60	8.46	2.43	9.01	10.28	13.77	0.46

Switch additional weight

Unit: kg

Bore (mm)	Switch	AX • AZ type		
		Cord length 1.5 m	Cord length 5 m	Connector type
φ32 - φ63		0.05	0.13	0.04
φ80 - φ140		0.07	0.15	0.06
φ160		0.09	0.17	0.08

Calculation formula cylinder weight (kg) = basic weight + (cylinder stroke mm × additional weight per 1 mm stroke) + (switch additional weight × switch quantity) + mounting accessories weight + rod end attachment weight

Calculation example 160H-1R, bore φ80, rod B, cylinder stroke 200 mm, LA type, 2 pcs. of AX215  
 12.55 + (0.0316 × 200) + 1.37 + (0.15 × 2) = 20.54 kg

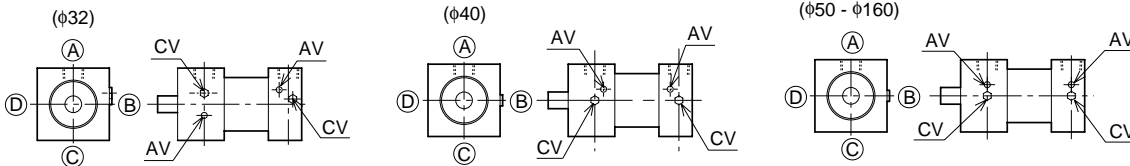
### Positions of ports, cushion valves, and air vents (Rod B)

Symbols AV : Air vent  
CV : Cushion valve

- In all the mounting styles, cushion valves and air vents are located on the same side. When any change in the position of air vent is required, contact us.
- If you need detailed dimensions of air vent positions, contact us.
- Cylinders without cushion have no cushion valve. Positions of air vents depend on mounting style.

### Double-acting type single rod/SD, FA, FB, CA, CB, TC types

- Basic type (Port and cushion position: (A) • (B) Order symbol [A] [B] )



- Other positions of port and cushion valve (bore from 50 mm to 160 mm)

		Cushion valve position				
		B	C	D	A	0 (without cushion)
Port position	A					
	B					
	C					
	D					

(With cushion)

- When changing the positions of cushion valves, turn them in the standard type clockwise by 90° viewed from the front of the rod.

(Without cushion)

- Air vents are at the positions turned clockwise from the port positions by 90° viewed from the front of the rod.

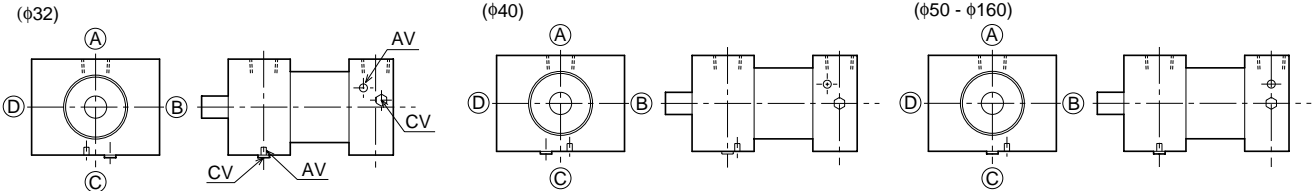
- When changing positions of the ports and cushion valves on the rod side and head side, specify the positions on the rod side and head side, respectively.

- Other positions of port and cushion valve (with 32 mm or 40 mm bore)

In the basic type cylinders with 32 mm or 40 mm bore, positions of the cushion valves and air vents differ from those of the cylinder with a bore from 50 mm to 160 mm. When changing the positions of the cushion valves, turn them clockwise by 90° viewed from the front of the rod, in a similar manner to the cylinder with a bore from 50 mm to 160 mm. Positions of air vents are the same as the above, even when the cylinder has no cushion.

### Double-acting type single rod/EA type

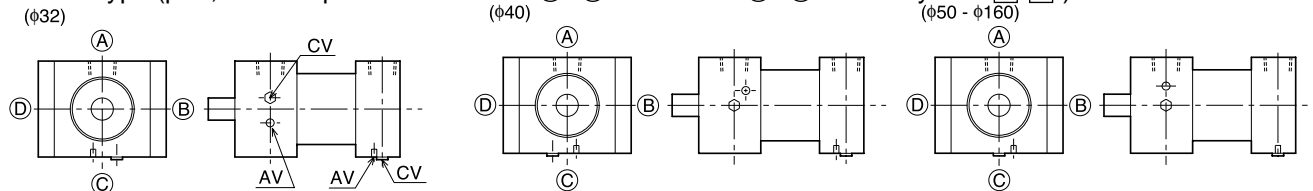
- Basic type (port, cushion position: Rod side: (A) • (C) Head side (A) • (B) Order symbol [A] [C] )



EA type cylinders with ports and cushion valves at positions other than basic ones are manufactured on demand. When ordering them, give us directions separately. Positions of air vents are the same as the above, even when the cylinders have no cushion.

### Double-acting type single rod/EB type

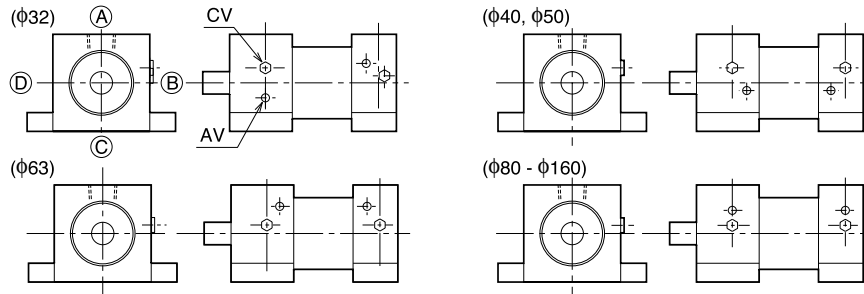
- Basic type (port, cushion position: Rod side (A) • (B) Head side (A) • (B) Order symbol [A] [B] )



EA type cylinders with ports and cushion valves at positions other than basic ones are manufactured on demand. When ordering them, give us directions separately. Positions of air vents are the same as the above, even when the cylinders have no cushion.

Double-acting type single rod/LA type

- Basic type (Standard port and cushion position: (A) • (B) Order symbol [A] [B] )



- Other positions of port and cushion valve (with 80 mm or 160 mm bore)

		Cushion valve position				
		B	C	D	A	0 (without cushion)
Port position	A					
	B					
	C					
	D					

(With cushion)

- Port position A, C: The port is positioned on the axis line (without offset)
- Port position B, D: The port is offset from the axis center upward by the distances shown below.

φ32, φ40	5.5mm
φ50	6.5mm
φ63, φ80	12mm
φ100	15mm
φ125 - φ160	0

- Change in cushion valve position (shown in drawings on the left side)

- Position A: Same as the cushion valve position A of the SD type
- Position B: Basic position
- Position C: Turn the position B clockwise by 90° viewed from the front of the position B.
- Position D: Line symmetric with respect to the position B

- Cushion valves on the B or D side are offset upward to prevent interference with the mounting bolts.

(Without cushion)

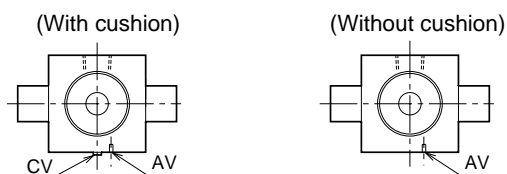
- When ports are located on the A side: The air vent is on the B side.
- When a port is located on the B, C, or D side: The air vent is on the A side. (If you need to change the location, contact us.)

- Other positions of port and cushion valve (with 32 mm or 63 mm bore)

In the basic type cylinders with 32 mm or 63 mm bore, positions of the cushion valves and air vents differ from those of the cylinder with a bore from 80 mm to 160 mm. When changing the positions of the cushion valves, turn them clockwise by 90° viewed from the front of the rod, in a similar manner to the cylinder with a bore from 80 mm to 160 mm. Positions of air vents are the same as the above, even when the cylinder has no cushion.

Double-acting type single rod/TA type

- Standard port and cushion position: (A) • (C) Order symbol [A] [C]

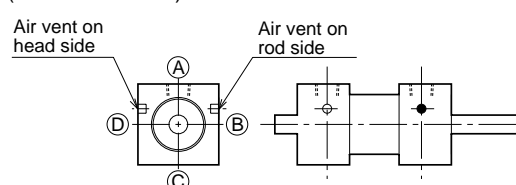


- The ports can be located on the A side only.
- The cushion valve and air vent are located on the side opposite to the ports.
- On the head side, the port cushions can be located on the (A) or (B) side.

Double-acting double rod type

(With cushion)  
Locations of the ports and valves are the same as those of the double-acting single rod type.

(Without cushion)



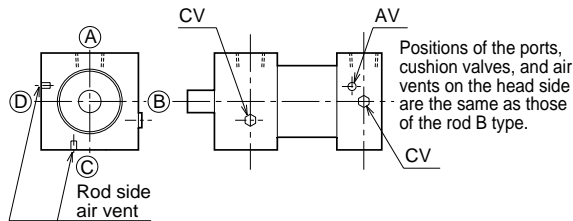
The air vent on the rod side is located on the side symmetric with the head side.

## Locations of ports, cushion valves, and air vents (Rod A)

Symbols AV : Air vent  
CV : Cushion valve

## Double-acting single rod type/SD, FE, FB, CA, CB, TC types

- Basic type (Standard port and cushion valve positions: Ⓐ • Ⓑ Order symbol  $\square \square$  )



- Other positions of port and cushion valve (on the rod side)

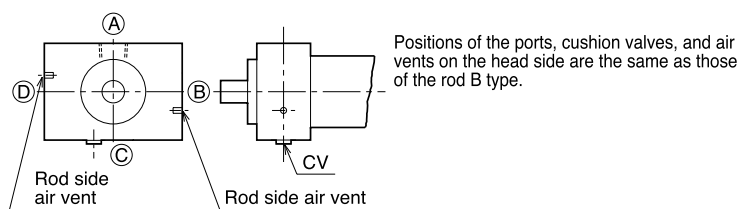
Turn the positions of the port and cushion valve of the basic type clockwise by 90° viewed from the front of the rod.

On the head side, the air vent is at the same position as that of the rod B type.

If the cylinder has no cushion, the air vents are installed to the cushion valve positions of the type with cushions. (Three positions)

## Double-acting single rod type/EA types

- Basic type (Standard port and cushion valve positions: Ⓐ • Ⓒ Order symbol  $\square \square$  )



- Other positions of port and cushion valve (on the rod side)

Turn the positions of the port and cushion valve of the basic type clockwise by 90° viewed from the front of the rod.

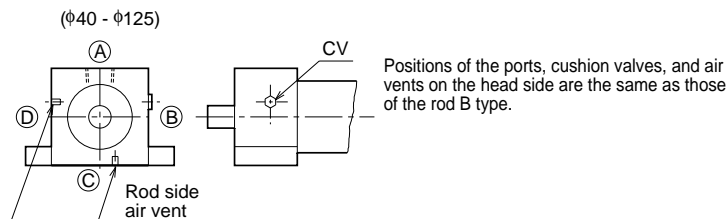
On the head side, the air vent is at the same position as that of the rod B type.

If the cylinder has no cushion, the air vents are installed to the cushion valve positions of the type with cushions. (Three positions)

- Locations of the ports, cushion valves, and air vents of the EB type cylinder are the same as those of the rod B type.

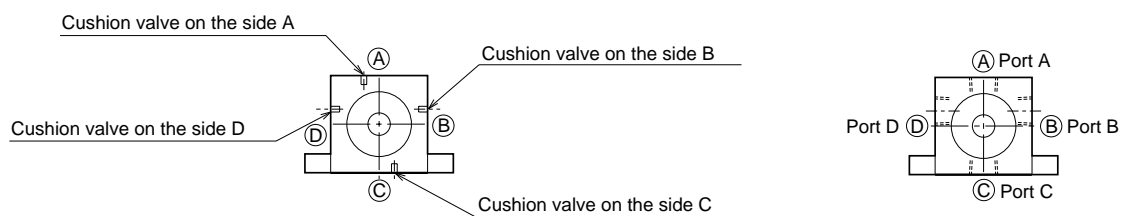
**Double-acting single rod/LA type**

- Basic type (Standard port and cushion valve positions: (A) · (B) Order symbol: [A] [B] )

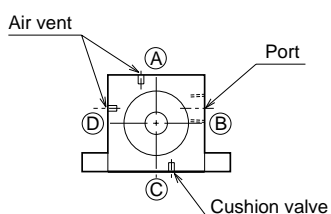


- Other positions of ports and cushion valve (on the rod side)

The combinations of cushion valve position and port position shown in the figures below are applicable. The air vents can be located on the two sides neither the port nor the cushion valve is located. Note that the ports and the cushion valve cannot be located on the same side.



Example (Positions of ports and cushion valve: (B), (C) )



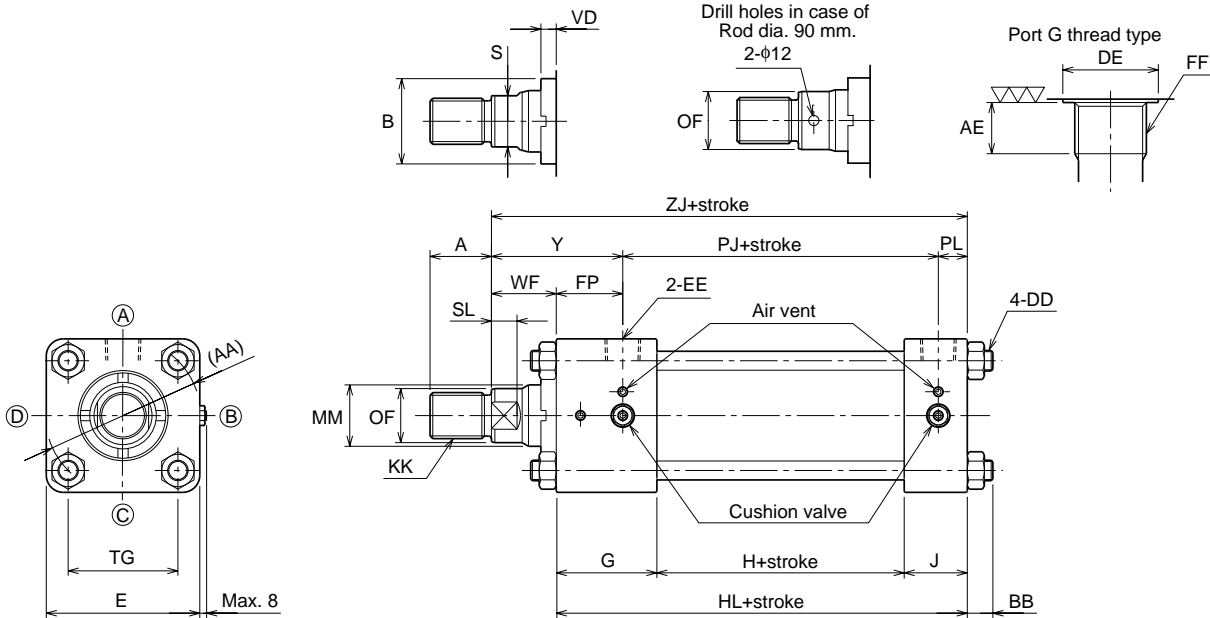
**Double-acting single rod/ TA type**

Standard port and cushion valve positions: (A) · (C) Order symbol: [A] [C] )

The cushion valve and air vents are located on the side opposite to that the ports are located.

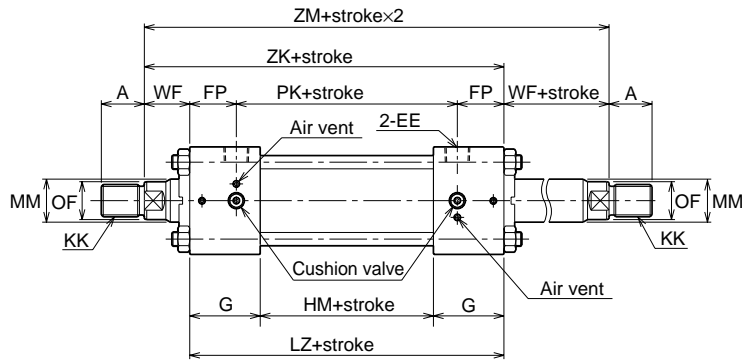
### SD

160H-1 [ 2 ] SD Bore [ B ] [ B ] Stroke - [ A ] [ B ]



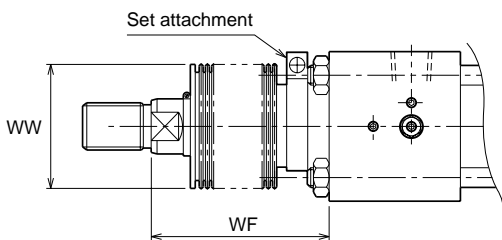
- Positions of the cushion valves and air vents depend on the cylinder bore.
- Rod end thread length (A) must be longer when a lock nut is attached to the rod end. Refer to "Rod end attachment/Rod end thread length with lock nut".
- For the use of the SD type, be sure to refer to the "Precautions for use, 4. Mounting" in the beginning of this catalogue.
- On the rod side of the rod A type cylinder, the air vents are located on the two sides neither the port nor the cushion valve is located.
- When you want to change the length of the projected rod, specify the "WF".
- For the mounting of switches, refer to the dimensional drawings of "Switch set". All the contents other than "switch mounting dimensions" are identical.

### Double-acting double rod (Rod B)



- Distance between the covers of the double rod type cylinder is longer than that of the single rod type cylinder by 10 mm.

### With boots



### WF

#### Rod B

Nylon tarpaulin	φ32-φ40	1/3	Stroke+X
	φ50	1/3.5	Stroke+X
Chloroprene	φ63 - φ100	1/4	Stroke+X
	φ125 - φ160	1/5	Stroke+X
Conex	φ32	1/2	Stroke+X
	φ40-φ50	1/2.5	Stroke+X
	φ63 - φ100	1/3	Stroke+X
	φ125 - φ160	1/3.5	Stroke+X

#### Rod A

Nylon tarpaulin	φ40	1/3.5	Stroke+X
	φ50 - φ80	1/4	Stroke+X
	φ100-φ125	1/5	Stroke+X
Chloroprene	φ40	1/2.5	Stroke+X
	φ50 - φ80	1/3	Stroke+X
	φ100-φ125	1/3.5	Stroke+X

- When the calculated WF has decimals, raise them to the next whole number.

	Standard	Semi-standard	
Material	Nylon tarpaulin	Chloroprene	Conex
Resistible temperature	80°C	130°C	200°C

- (Notes)
- Remember that the resistible temperatures shown in the table above are for the boots, not for the cylinder.
  - Conex is the registered trademark of Teijin Ltd.
  - The boots have been mounted at our factory prior to delivery.



Dimensional table

Symbol Bore	Rod B								Rod A							
	A	B	KK	MM	OF	S	SL	VD	A	B	KK	MM	OF	S	SL	VD
φ32	18	φ30 f9	M14×1.5	φ18	φ17	14	10	10	-	-	-	-	-	-	-	-
φ40	22	φ34 f9	M16×1.5	φ22	φ21	17	9	10	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9
φ50	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9	36	φ50 f9	M27×2	φ36	φ34	30	14	9
φ63	36	φ50 f9	M27×2	φ36	φ34	30	14	9	45	φ60 f9	M33×2	φ45	φ43	38	17	8
φ80	45	φ60 f9	M33×2	φ45	φ43	38	17	8	56	φ72 f9	M42×2	φ56	φ54	50	21	8
φ100	56	φ72 f9	M42×2	φ56	φ54	50	21	8	63	φ88 f9	M48×2	φ70	φ68	60	24	6
φ125	63	φ88 f9	M48×2	φ70	φ68	60	24	6	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5
φ140	75	φ98 f9	M56×2	φ80	φ78	70	27	5	-	-	-	-	-	-	-	-
φ160	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5	-	-	-	-	-	-	-	-

Symbol Bore	AA	AE	BB	DD	DE	E	EE	FF	FP	G	H
	φ32	47	12	7	M6×1	φ21.5	□45	Rc1/4	G1/4	35	49
φ40	59	12	9	M8×1	φ25.5	□62	Rc3/8	G3/8	37	54	39
φ50	74	14	13	M12×1.25	φ30	□75	Rc1/2	G1/2	42	60	38
φ63	91	14	13	M12×1.25	φ30	□90	Rc1/2	G1/2	39	59	40
φ80	117	16	16	M16×1.5	φ36.9	□114	Rc3/4	G3/4	46	70	45
φ100	137	16	16	M16×1.5	φ36.9	□130	Rc3/4	G3/4	47	74	47
φ125	178	18	21	M22×1.5	φ46.1	□165	Rc1	G1	51	82	55
φ140	200	18	22	M24×1.5	φ46.1	□185	Rc1	G1	51	82	62
φ160	219	18	25	M27×2	φ46.1	□205	Rc1	G1	54	87	64

Symbol Bore	HL	HM	J	LZ	PJ	PK	PL	TG	WF	Y	ZJ	ZK	ZM
	φ32	103	38	26	136	56	66	12	33.2	25	60	128	161
φ40	128	49	35	157	73	83	18	41.7	25	62	153	182	207
φ50	134	48	36	168	74	84	18	52.3	25	67	159	193	218
φ63	136	50	37	168	80	90	17	64.3	32	71	168	200	232
φ80	159	55	44	195	93	103	20	82.7	31	77	190	226	257
φ100	168	57	47	205	101	111	20	96.9	35	82	203	240	275
φ125	197	65	60	229	117	127	29	125.9	35	86	232	264	299
φ140	203	72	59	236	124	134	28	141.4	35	86	238	271	306
φ160	213	74	62	248	130	140	29	154.9	32	86	245	280	312

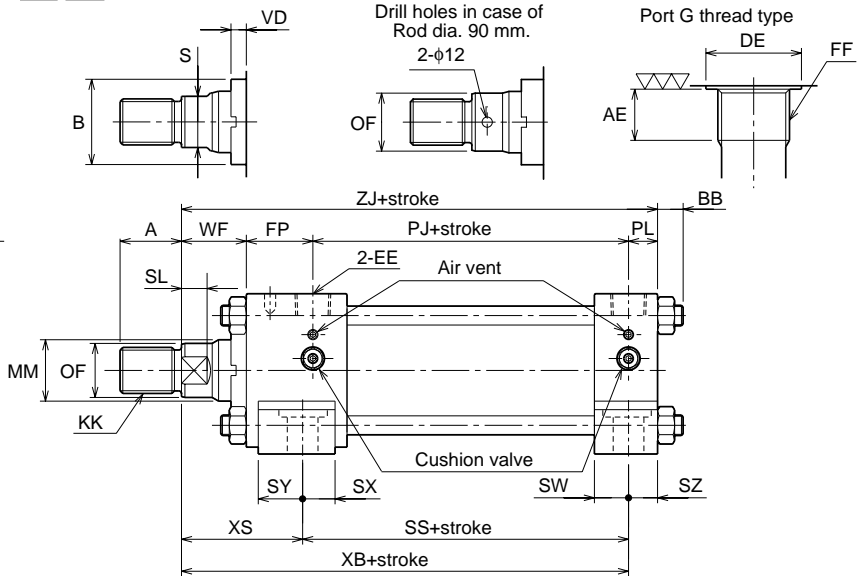
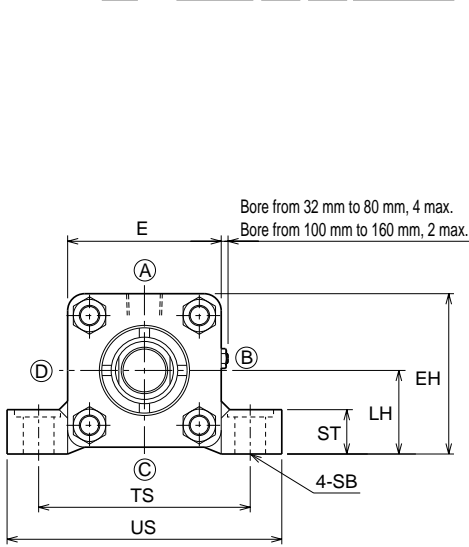
● Allowance of MM is f8.

## With boots

Symbol		Bore	φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
		WW	Rod B	φ40	φ50	φ50	φ71	φ80	φ100	φ100	φ125
Rod A	-		φ50	φ71	φ80	φ100	φ100	φ140	-	-	
X	Rod B	56	61	64	77	80	82	94	97	102	
	Rod A	-	64	77	80	82	94	102	-	-	

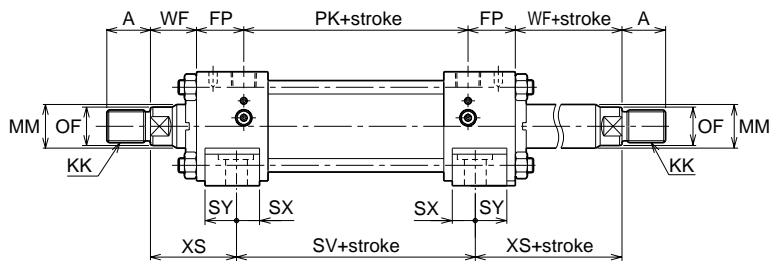
### LA

160H-1 [2] LA [Bore] [B] [B] Stroke - [A] [B]



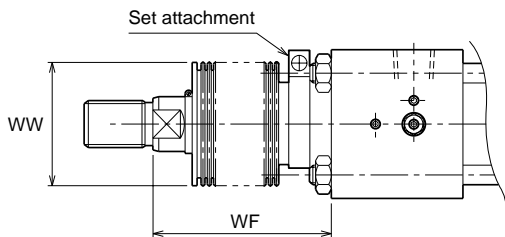
- Positions of the cushion valves and air vents depend on the cylinder bore.
- Rod end thread length (A) must be longer when a lock nut is attached to the rod end. Refer to "Rod end attachment".
- Notes on mounting bolts of cylinder with a bore of 100 mm or longer  
Use bolts with hexagonal hole as the mounting bolts.  
If hexagonal bolts are used, bolt heads may interfere with the cover or spot facing, causing failure in mounting.  
When using a washer, use of a disc spring for bolt with hexagonal hole is recommended.  
If a flat washer or spring washer is used, it may interfere with the cover or spot facing, causing failure in mounting.
- When the cylinder bore ranges 32 mm to 80 mm, hexagonal bolts, bolts with hexagonal hole, and flat washers can be used.
- On the rod side of the rod A type cylinder, the air vents are located on the two sides neither the port nor the cushion valve is located.
- When you want to change the length of the projected rod, specify the "WF".
- As for the dimensions other than those shown in the drawings, refer to the pages related to the SD type (basic type).
- For the mounting of switches, refer to the dimensional drawings of "Switch set". All the contents other than "switch mounting dimensions" are identical.

### Double-acting double rod (Rod B)



- Distance between the covers of the double rod type cylinder is longer than that of the single rod type cylinder by 10 mm.

### With boots



#### WF Rod B

Nylon tarpaulin Chloroprene	φ32-φ40	1/3	Stroke+X
	φ50	1/3.5	Stroke+X
	φ63 - φ100	1/4	Stroke+X
	φ125 - φ160	1/5	Stroke+X
Conex	φ32	1/2	Stroke+X
	φ40-φ50	1/2.5	Stroke+X
	φ63 - φ100	1/3	Stroke+X
	φ125 - φ160	1/3.5	Stroke+X

	Standard	Semi-standard	
Material	Nylon tarpaulin	Chloroprene	Conex
Resistible temperature	80°C	130°C	200°C

- Notes) • Remember that the resistible temperatures shown in the table above are for the boots, not for the cylinder.  
• Conex is the registered trademark of Teijin Ltd.  
• The boots have been mounted at our factory prior to delivery.

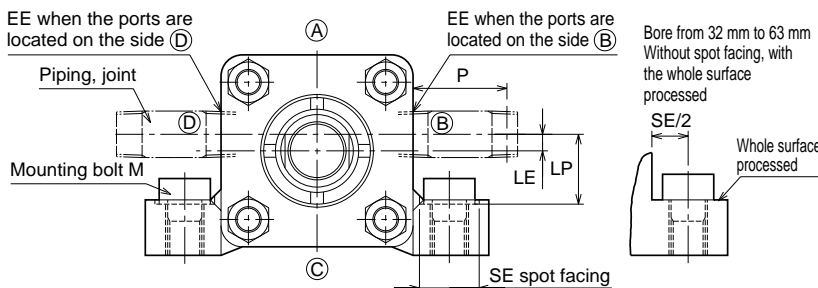
#### Rod A

Nylon tarpaulin Chloroprene	φ40	1/3.5	Stroke+X
	φ50 - φ80	1/4	Stroke+X
	φ100-φ125	1/5	Stroke+X
Conex	φ40	1/2.5	Stroke+X
	φ50 - φ80	1/3	Stroke+X
	φ100-φ125	1/3.5	Stroke+X

- When the calculated WF has decimals, raise them to the next whole number.

### ● Notes on LA type with ports on lateral side (B or D side)

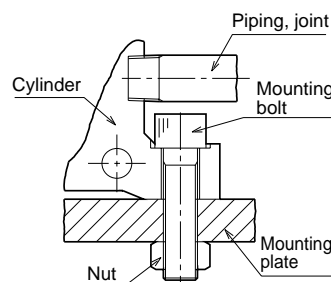
- The port G thread type is not the standard type. (When the bore is not less than 40 mm, position on the (A) or (C) side is the same as that of the standard type.)
- Positions of the ports are deviated from the cylinder center by the distance LE.
- Take into consideration the interference of the piping and joint with the mounting bolts (including handling of tightening tools), referring to the table on the right.



Symbol Bore	Port EE	LE	LP	Mounting bolt M	Spot facing dia. SE	P Note1
φ32	Rc 1/4	5.5	15	M8	18	20
φ40	Rc 3/8	5.5	24	M10	21	21
φ50	Rc 1/2	6.5	24.5	M12	27	26
φ63	Rc 1/2	12	30	M16	34	36
φ80	Rc 3/4	12	44	M16	31	36
φ100	Rc 3/4	15	47	M24	39	43
φ125	Rc 1	0	51	M24	39	45
φ140	Rc 1	0	55	M30	50	51
φ160	Rc 1	0	64	M30	50	57

Note1. When determining the length P, interference of joints with mounting bolts must be taken into consideration.

- When the cylinder bore is between 32 mm and 80 mm, mounting with hexagonal bolts is recommended. If bolts with hexagonal hole are used, bolt heads or tightening tool (Allen key wrench) may interfere with the piping or joint, causing failure in mounting or tightening.
- When the cylinder bore is 100 mm or longer, hexagonal bolts cannot be used (because the head of a hexagonal bolt may interfere with the cover or spot facing). Thus, in such a case, use bolts with hexagonal hole, and mount the cylinder by tightening nuts on the back of the mounting plate (refer to the drawing on the right side).



### Dimensional table

Symbol Bore	Rod B								Rod A							
	A	B	KK	MM	OF	S	SL	VD	A	B	KK	MM	OF	S	SL	VD
φ32	18	φ30 f9	M14×1.5	φ18	φ17	14	10	10	—	—	—	—	—	—	—	—
φ40	22	φ34 f9	M16×1.5	φ22	φ21	17	9	10	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9
φ50	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9	36	φ50 f9	M27×2	φ36	φ34	30	14	9
φ63	36	φ50 f9	M27×2	φ36	φ34	30	14	9	45	φ60 f9	M33×2	φ45	φ43	38	17	8
φ80	45	φ60 f9	M33×2	φ45	φ43	38	17	8	56	φ72 f9	M42×2	φ56	φ54	50	21	8
φ100	56	φ72 f9	M42×2	φ56	φ54	50	21	8	63	φ88 f9	M48×2	φ70	φ68	60	24	6
φ125	63	φ88 f9	M48×2	φ70	φ68	60	24	6	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5
φ140	75	φ98 f9	M56×2	φ80	φ78	70	27	5	—	—	—	—	—	—	—	—
φ160	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5	—	—	—	—	—	—	—	—

Symbol Bore	AE	BB	DE	E	EE	EH	FF	FP	LH	PJ	PK	PL	SB	SS	ST	SV	SW	SX	SY	SZ	TS	US	WF	XB	XS	ZJ
φ32	12	7	φ21.5	□45	Rc1/4	44.5	G1/4	35	22 <sup>0</sup> <sub>-0.084</sub>	56	66	12	φ9	73	12.5	96	16	29	20	10	63	84	25	118	45	128
φ40	12	9	φ25.5	□62	Rc3/8	62	G3/8	37	31 <sup>0</sup> <sub>-0.100</sub>	73	83	18	φ11	98	12.5	117	25	34	20	10	83	103	25	143	45	153
φ50	14	13	φ30	□75	Rc1/2	74.5	G1/2	42	37 <sup>0</sup> <sub>-0.100</sub>	74	84	18	φ14	92	19	110	23	31	29	13	102	127	25	146	54	159
φ63	14	13	φ30	□90	Rc1/2	89	G1/2	39	44 <sup>0</sup> <sub>-0.100</sub>	80	90	17	φ18	86	26	102	20	26	33	17	124	161	32	151	65	168
φ80	16	16	φ36.9	□114	Rc3/4	114	G3/4	46	57 <sup>0</sup> <sub>-0.120</sub>	93	103	20	φ18	105	26	121	27	30	34	17	149	186	31	173	68	190
φ100	16	16	φ36.9	□130	Rc3/4	128	G3/4	47	63 <sup>0</sup> <sub>-0.120</sub>	101	111	20	φ26	102	32	117	25	28	41	22	172	216	35	181	79	203
φ125	18	21	φ46.1	□165	Rc1	164.5	G1	51	82 <sup>0</sup> <sub>-0.140</sub>	117	127	29	φ26	131	32	141	38	35	40	22	210	254	35	210	79	232
φ140	18	22	φ46.1	□185	Rc1	184.5	G1	51	92 <sup>0</sup> <sub>-0.140</sub>	124	134	28	φ33	130	38	146	31	35	42	28	240	298	35	210	80	238
φ160	18	25	φ46.1	□205	Rc1	203.5	G1	54	101 <sup>0</sup> <sub>-0.140</sub>	130	140	29	φ33	130	38	140	33	28	49	29	260	318	32	216	86	245

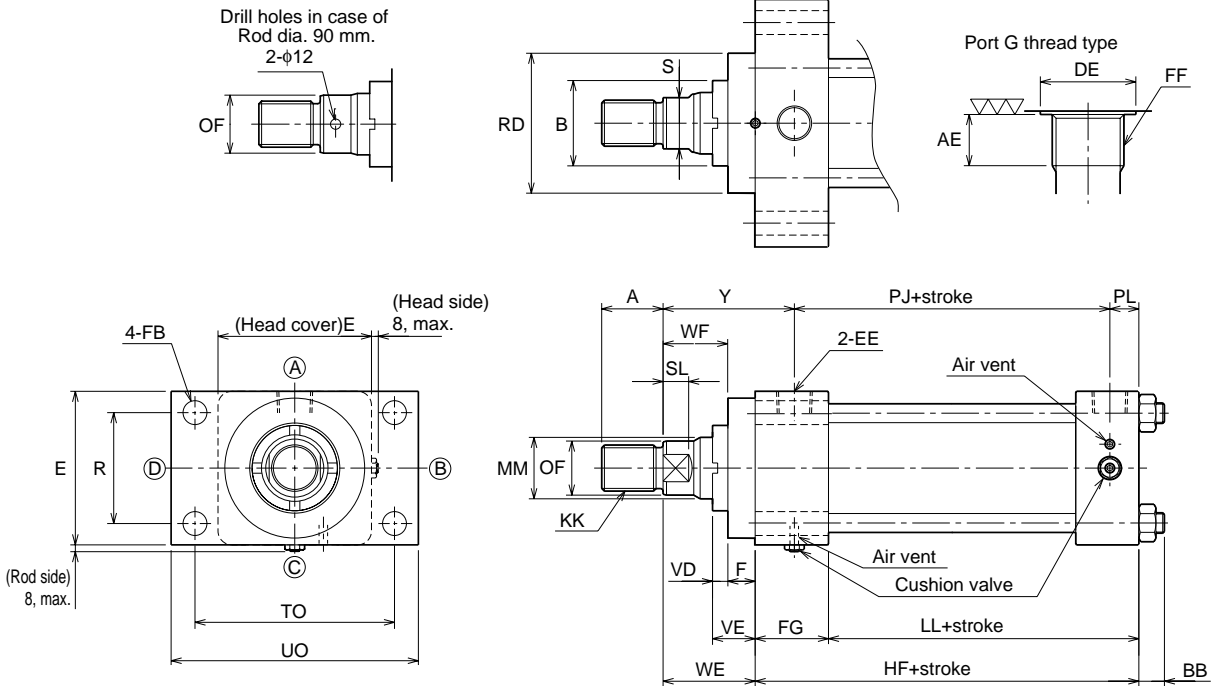
● Allowance of MM is f8.

### With boots

Symbol		Bore	φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
WW	Rod B		φ40	φ50	φ50	φ71	φ80	φ100	φ100	φ125	φ140
	Rod A		—	φ50	φ71	φ80	φ100	φ100	φ140	—	—
X	Rod B		56	61	64	77	80	82	94	97	102
	Rod A		—	64	77	80	82	94	102	—	—

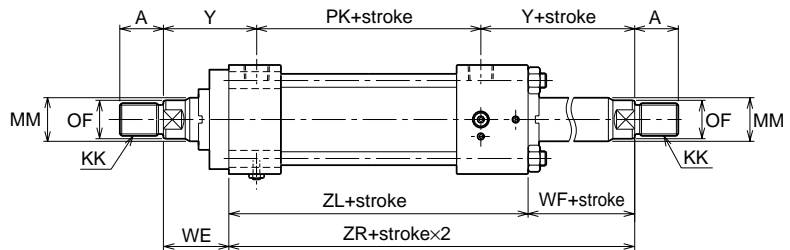
### EA

160H-1 [2] EA [Bore] [B] [B] Stroke - [A] [B]



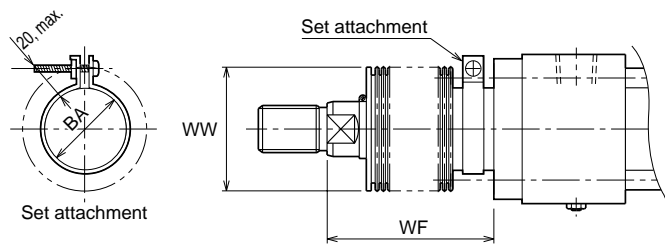
- Positions of the cushion valves and air vents depend on the cylinder bore.
- Rod end thread length (A) must be longer when a lock nut is attached to the rod end. Refer to "Rod end attachment/Rod end thread length with lock nut".
- If the mounting plate is located on the cylinder tube side of the switch set cylinder, take into consideration the interference of the switch with the mounting plate.
- On the rod side of the rod A type cylinder, the air vents are located on the two sides neither the port nor the cushion valve is located.
- When you want to change the length of the projected rod, specify the "WF".
- As for the dimensions not shown in these drawings, refer to the SD type (basic type).
- For the mounting of switches, refer to the dimensional drawings of "Switch set". All the contents other than "switch mounting dimensions" are identical.

### Double-acting double rod (Rod B)



- Distance between the covers of the double rod type cylinder is longer than that of the single rod type cylinder by 10 mm.

### With boots



Note) Take into consideration the interference of the set attachment with the mounting plate.

#### WF

#### Rod B

Nylon tarpaulin Chloroprene	$\phi 32 - \phi 40$	1/3	Stroke+X
	$\phi 50$	1/3.5	Stroke+X
	$\phi 63 - \phi 100$	1/4	Stroke+X
	$\phi 125 - \phi 160$	1/5	Stroke+X
Conex	$\phi 32$	1/2	Stroke+X
	$\phi 40 - \phi 50$	1/2.5	Stroke+X
	$\phi 63 - \phi 100$	1/3	Stroke+X
	$\phi 125 - \phi 160$	1/3.5	Stroke+X

#### Rod A

Nylon tarpaulin Chloroprene	$\phi 40$	1/3.5	Stroke+X
	$\phi 50 - \phi 80$	1/4	Stroke+X
	$\phi 100 - \phi 125$	1/5	Stroke+X
Conex	$\phi 40$	1/2.5	Stroke+X
	$\phi 50 - \phi 80$	1/3	Stroke+X
	$\phi 100 - \phi 125$	1/3.5	Stroke+X

- When the calculated WF has decimals, raise them to the next whole number.

	Standard	Semi-standard	
Material	Nylon tarpaulin	Chloroprene	Conex
Resistible temperature	80°C	130°C	200°C

- Notes)
- Remember that the resistible temperatures shown in the table above are for the boots, not for the cylinder.
  - Conex is the registered trademark of Teijin Ltd.
  - The boots have been mounted at our factory prior to delivery.

Dimensional table

Symbol Bore	Rod B										Rod A									
	A	B	KK	MM	OF	RD	S	SL	VD	VE	A	B	KK	MM	OF	RD	S	SL	VD	VE
φ32	18	φ30 f9	M14×1.5	φ18	φ17	φ42 f8	14	10	10	20	-	-	-	-	-	-	-	-	-	-
φ40	22	φ34 f9	M16×1.5	φ22	φ21	φ62 f8	17	9	10	20	28	φ42 f9	M20×1.5	φ28	φ26	φ62 f8	22	11	9	19
φ50	28	φ42 f9	M20×1.5	φ28	φ26	φ74 f8	22	11	9	25	36	φ50 f9	M27×2	φ36	φ34	φ74 f8	30	14	9	25
φ63	36	φ50 f9	M27×2	φ36	φ34	φ82 f8	30	14	9	25	45	φ60 f9	M33×2	φ45	φ43	φ88 f8	38	17	8	24
φ80	45	φ60 f9	M33×2	φ45	φ43	φ92 f8	38	17	8	28	56	φ72 f9	M42×2	φ56	φ54	φ105 f8	50	21	8	28
φ100	56	φ72 f9	M42×2	φ56	φ54	φ105 f8	50	21	8	30	63	φ88 f9	M48×2	φ70	φ68	φ125 f8	60	24	6	28
φ125	63	φ88 f9	M48×2	φ70	φ68	φ125 f8	60	24	6	28	85	φ108 f9	M64×3	φ90	φ88	φ150 f8	80	Drill hole	5	27
φ140	75	φ98 f9	M56×2	φ80	φ78	φ140 f8	70	27	5	28	-	-	-	-	-	-	-	-	-	-
φ160	85	φ108 f9	M64×3	φ90	φ88	φ150 f8	80	Drill hole	5	30	-	-	-	-	-	-	-	-	-	-

Symbol Bore	AE	BB	DE	E	EE	F	FB	FF	FG	HF	LL
φ32	12	7	φ21.5	45	Rc1/4	10	φ6.6	G1/4	39	93	54
φ40	12	9	φ25.5	62	Rc3/8	10	φ11	G3/8	44	118	74
φ50	14	13	φ30	75	Rc1/2	16	φ14	G1/2	44	118	74
φ63	14	13	φ30	90	Rc1/2	16	φ14	G1/2	43	120	77
φ80	16	16	φ36.9	114	Rc3/4	20	φ18	G3/4	50	139	89
φ100	16	16	φ36.9	130	Rc3/4	22	φ18	G3/4	52	146	94
φ125	18	21	φ46.1	165	Rc1	22	φ22	G1	60	175	115
φ140	18	22	φ46.1	185	Rc1	23	φ26	G1	59	180	121
φ160	18	25	φ46.1	205	Rc1	25	φ26	G1	62	188	126

Symbol Bore	PJ	PK	PL	R	TO	UO	WE	WF	Y	ZL	ZR
φ32	56	66	12	33	58	70	35	25	60	126	151
φ40	73	83	18	41	87	110	35	25	62	147	172
φ50	74	84	18	52	105	130	41	25	67	152	177
φ63	80	90	17	65	117	145	48	32	71	152	184
φ80	93	103	20	83	149	180	51	31	77	175	206
φ100	101	111	20	97	162	200	57	35	82	183	218
φ125	117	127	29	126	208	250	57	35	86	207	242
φ140	124	134	28	142	230	280	58	35	86	213	248
φ160	130	140	29	155	253	300	57	32	86	223	255

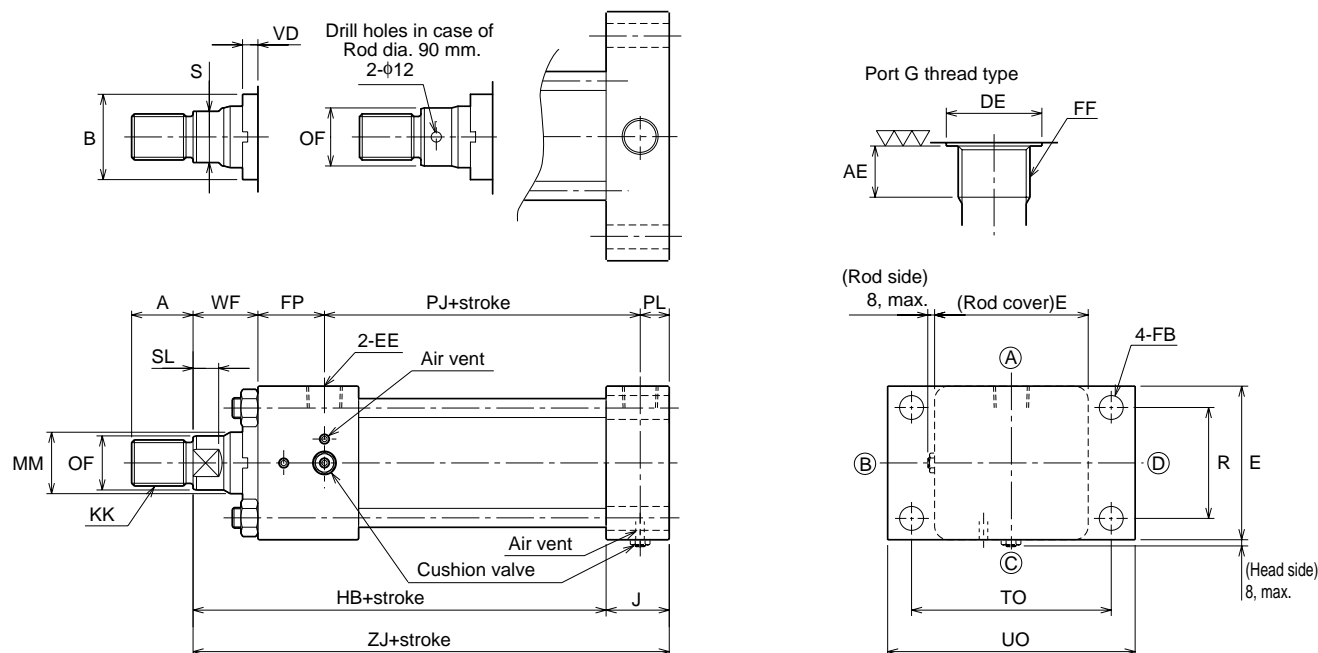
• Allowance of MM is f8.

## With boots

Symbol		Bore								
		φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
WW	Rod B	φ40	φ50	φ50	φ71	φ80	φ100	φ100	φ125	φ140
	Rod A	-	φ50	φ71	φ80	φ100	φ100	φ140	-	-
X	Rod B	56	61	64	77	80	82	94	97	102
	Rod A	-	64	77	80	82	94	102	-	-
BA	Rod B	φ34	φ40	φ46	φ55	φ65	φ77	φ92	φ103	φ112
	Rod A	-	φ46	φ55	φ65	φ77	φ92	φ112	-	-

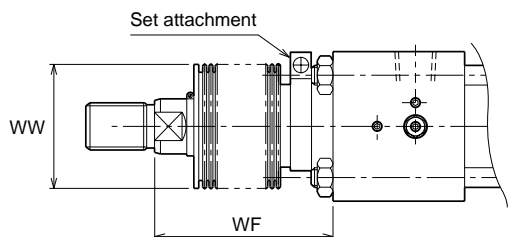
## EB

160H-1 [2] EB Bore [B] [B] Stroke - [A] [B]



- Positions of the cushion valves and air vents depend on the cylinder bore.
- Rod end thread length (A) must be longer when a lock nut is attached to the rod end. Refer to "Rod end attachment/Rod end thread length with lock nut".
- If the mounting plate is located on the cylinder tube side of the switch set cylinder, take into consideration the interference of the switch with the mounting plate.
- On the rod side of the rod A type cylinder, the air vents are located on the two sides neither the port nor the cushion valve is located.
- When you want to change the length of the projected rod, specify the "WF".
- As for the dimensions not shown in these drawings, refer to the SD type (basic type).
- For the mounting of switches, refer to the dimensional drawings of "Switch set". All the contents other than "switch mounting dimensions" are identical.

## With boots



## WF

## Rod B

Nylon tarpaulin Chloroprene	$\phi 32-\phi 40$	1/3	Stroke+X
	$\phi 50$	1/3.5	Stroke+X
	$\phi 63 - \phi 100$	1/4	Stroke+X
	$\phi 125 - \phi 160$	1/5	Stroke+X
Conex	$\phi 32$	1/2	Stroke+X
	$\phi 40-\phi 50$	1/2.5	Stroke+X
	$\phi 63 - \phi 100$	1/3	Stroke+X
	$\phi 125 - \phi 160$	1/3.5	Stroke+X

	Standard	Semi-standard	
Material	Nylon tarpaulin	Chloroprene	Conex
Resistible temperature	80°C	130°C	200°C

- (Notes)
- Remember that the resistible temperatures shown in the table above are for the boots, not for the cylinder.
  - Conex is the registered trademark of Teijin Ltd.
  - The boots have been mounted at our factory prior to delivery.

## Rod A

Nylon tarpaulin Chloroprene	$\phi 40$	1/3.5	Stroke+X
	$\phi 50 - \phi 80$	1/4	Stroke+X
	$\phi 100-\phi 125$	1/5	Stroke+X
Conex	$\phi 40$	1/2.5	Stroke+X
	$\phi 50 - \phi 80$	1/3	Stroke+X
	$\phi 100-\phi 125$	1/3.5	Stroke+X

- When the calculated WF has decimals, raise them to the next whole number.

Dimensional table

Symbol Bore	Rod B								Rod A							
	A	B	KK	MM	OF	S	SL	VD	A	B	KK	MM	OF	S	SL	VD
φ32	18	φ30 f9	M14×1.5	φ18	φ17	14	10	10	-	-	-	-	-	-	-	-
φ40	22	φ34 f9	M16×1.5	φ22	φ21	17	9	10	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9
φ50	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9	36	φ50 f9	M27×2	φ36	φ34	30	14	9
φ63	36	φ50 f9	M27×2	φ36	φ34	30	14	9	45	φ60 f9	M33×2	φ45	φ43	38	17	8
φ80	45	φ60 f9	M33×2	φ45	φ43	38	17	8	56	φ72 f9	M42×2	φ56	φ54	50	21	8
φ100	56	φ72 f9	M42×2	φ56	φ54	50	21	8	63	φ88 f9	M48×2	φ70	φ68	60	24	6
φ125	63	φ88 f9	M48×2	φ70	φ68	60	24	6	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5
φ140	75	φ98 f9	M56×2	φ80	φ78	70	27	5	-	-	-	-	-	-	-	-
φ160	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5	-	-	-	-	-	-	-	-

Symbol Bore	AE	DE	E	EE	FB	FF	FP	HB
	φ32	12	φ21.5	45	Rc1/4	φ6.6	G1/4	35
φ40	12	φ25.5	62	Rc3/8	φ11	G3/8	37	118
φ50	14	φ30	75	Rc1/2	φ14	G1/2	42	123
φ63	14	φ30	90	Rc1/2	φ14	G1/2	39	131
φ80	16	φ36.9	114	Rc3/4	φ18	G3/4	46	146
φ100	16	φ36.9	130	Rc3/4	φ18	G3/4	47	156
φ125	18	φ46.1	165	Rc1	φ22	G1	51	172
φ140	18	φ46.1	185	Rc1	φ26	G1	51	179
φ160	18	φ46.1	205	Rc1	φ26	G1	54	183

Symbol Bore	J	PJ	PL	R	TO	UO	WF	ZJ
	φ32	26	56	12	33	58	70	25
φ40	35	73	18	41	87	110	25	153
φ50	36	74	18	52	105	130	25	159
φ63	37	80	17	65	117	145	32	168
φ80	44	93	20	83	149	180	31	190
φ100	47	101	20	97	162	200	35	203
φ125	60	117	29	126	208	250	35	232
φ140	59	124	28	142	230	280	35	238
φ160	62	130	29	155	253	300	32	245

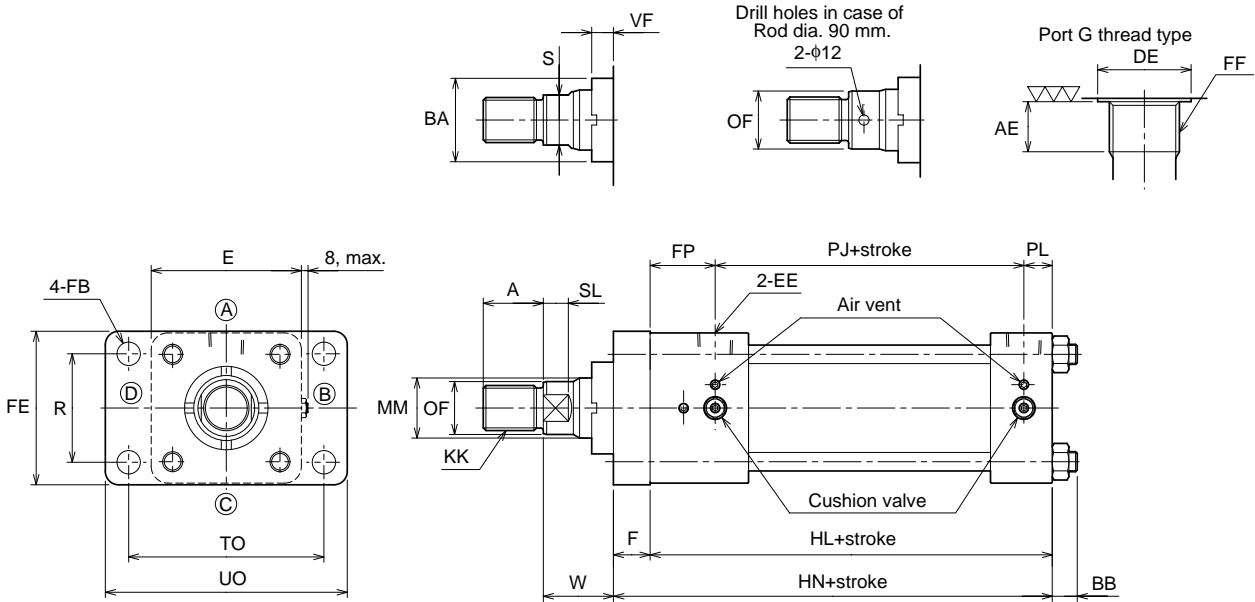
• Allowance of MM is f8.

### With boots

Symbol		Bore	φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
		WW	Rod B	φ40	φ50	φ50	φ71	φ80	φ100	φ100	φ125
Rod A	-		φ50	φ71	φ80	φ100	φ100	φ140	-	-	
X	Rod B	56	61	64	77	80	82	94	97	102	
	Rod A	-	64	77	80	82	94	102	-	-	

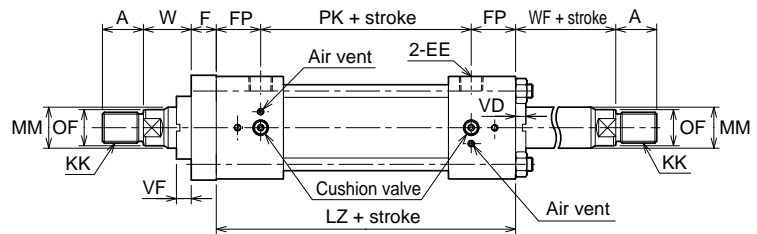
### FA

160H-1 [2] FA [Bore] B [B] Stroke - B [B]



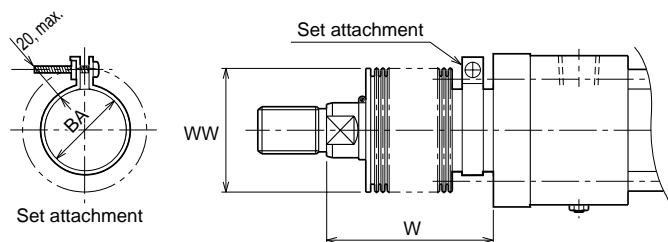
- Positions of the cushion valves and air vents depend on the cylinder bore.
- Rod end thread length (A) must be longer when a lock nut is attached to the rod end. Refer to "Rod end attachment/Rod end thread length with lock nut".
- When you want to change the length of the projected rod, specify the "W".
- As for the dimensions not shown in these drawings, refer to the SD type (basic type).
- For the mounting of switches, refer to the dimensional drawings of "Switch set". All the contents other than "switch mounting dimensions" are identical.

### Double-acting double rod (Rod B)



- Distance between the covers of the double rod type cylinder is longer than that of the single rod type cylinder by 10 mm.

### With boots



Note) Take into consideration the interference of the set attachment with the mounting plate.

### W Rod B

Nylon tarpaulin Chloroprene	$\phi 32 - \phi 40$	1/3	Stroke+X
	$\phi 50$	1/3.5	Stroke+X
	$\phi 63 - \phi 100$	1/4	Stroke+X
	$\phi 125 - \phi 160$	1/5	Stroke+X
Conex	$\phi 32$	1/2	Stroke+X
	$\phi 40 - \phi 50$	1/2.5	Stroke+X
	$\phi 63 - \phi 100$	1/3	Stroke+X
	$\phi 125 - \phi 160$	1/3.5	Stroke+X

- When the calculated W has decimals, raise them to the next whole number.

	Standard	Semi-standard	
Material	Nylon tarpaulin	Chloroprene	Conex
Resistible temperature	80°C	130°C	200°C

- Notes)
- Remember that the resistible temperatures shown in the table above are for the boots, not for the cylinder.
  - Conex is the registered trademark of Teijin Ltd.
  - The boots have been mounted at our factory prior to delivery.



Dimensional table

Symbol Bore	Rod B								
	A	BA	KK	MM	OF	S	SL	VD	VF
φ32	18	φ34 f9	M14×1.5	φ18	φ17	14	10	10	13
φ40	22	φ40 f9	M16×1.5	φ22	φ21	17	9	10	13
φ50	28	φ46 f9	M20×1.5	φ28	φ26	22	11	9	13
φ63	36	φ55 f9	M27×2	φ36	φ34	30	14	9	13
φ80	45	φ65 f9	M33×2	φ45	φ43	38	17	8	13
φ100	56	φ77 f9	M42×2	φ56	φ54	50	21	8	13
φ125	63	φ92 f9	M48×2	φ70	φ68	60	24	6	13
φ140	75	φ103 f9	M56×2	φ80	φ78	70	27	5	13
φ160	85	φ112 f9	M64×3	φ90	φ88	80	Drill hole	5	13

Symbol Bore	AE	BB	DE	E	EE	F	FB	FE	FF	FP
	φ32	12	7	φ21.5	□45	Rc1/4	11	φ6.6	47	G1/4
φ40	12	9	φ25.5	□62	Rc3/8	16	φ11	64	G3/8	37
φ50	14	13	φ30	□75	Rc1/2	19	φ14	77	G1/2	42
φ63	14	13	φ30	□90	Rc1/2	22	φ14	92	G1/2	39
φ80	16	16	φ36.9	□114	Rc3/4	25	φ18	116	G3/4	46
φ100	16	16	φ36.9	□130	Rc3/4	27	φ18	132	G3/4	47
φ125	18	21	φ46.1	□165	Rc1	29	φ22	167	G1	51
φ140	18	22	φ46.1	□185	Rc1	32	φ26	187	G1	51
φ160	18	25	φ46.1	□205	Rc1	37	φ26	207	G1	54

Symbol Bore	HL	HN	LZ	PJ	PK	PL	R	TO	UO	W	WF
	φ32	103	114	136	56	66	12	33	58	70	35
φ40	128	144	157	73	83	18	41	87	110	35	25
φ50	134	153	168	74	84	18	52	105	130	41	25
φ63	136	158	168	80	90	17	65	117	145	48	32
φ80	159	184	195	93	103	20	83	149	180	51	31
φ100	168	195	205	101	111	20	97	162	200	57	35
φ125	197	226	209	117	127	29	126	208	250	57	35
φ140	203	235	236	124	134	28	142	230	280	58	35
φ160	213	250	248	130	140	29	155	253	300	57	32

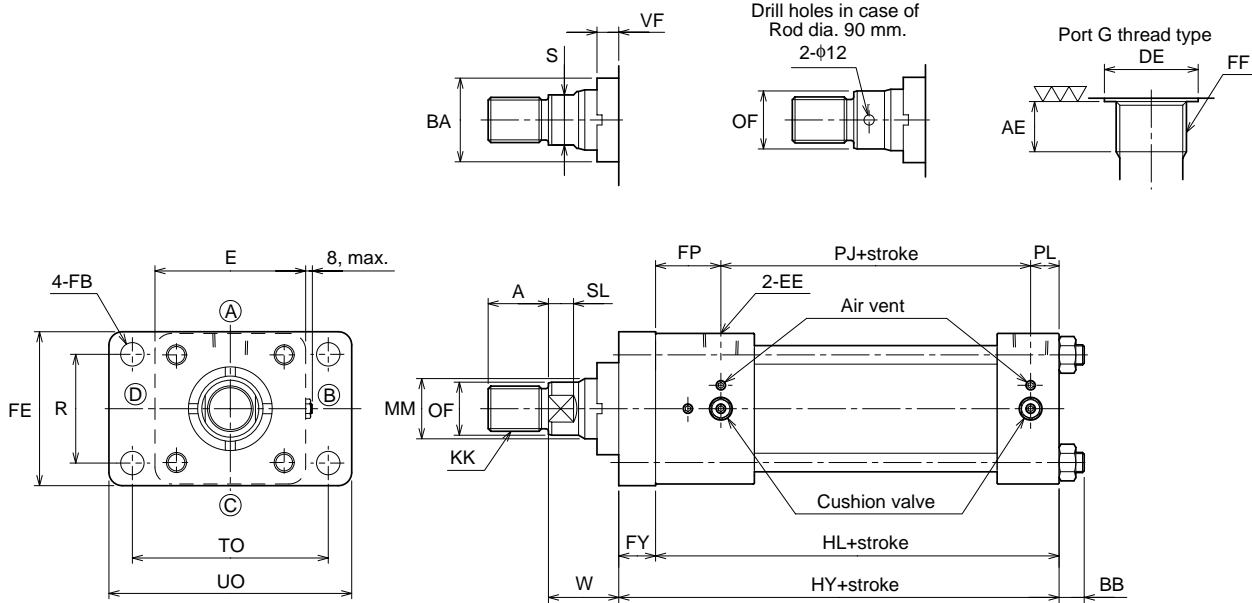
• Allowance of MM is f8.

## With boots

Symbol	Bore	φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
		WW	Rod B	φ40	φ50	φ50	φ71	φ80	φ100	φ100
X	Rod B	45	45	45	55	55	55	65	65	65
BA	Rod B	φ34	φ40	φ46	φ55	φ65	φ77	φ92	φ103	φ112

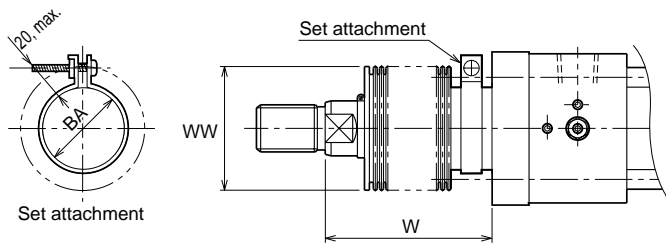
### FE

160H-1 [ 2 FE Bore A B Stroke - A B ]



- Positions of the cushion valves and air vents depend on the cylinder bore.
- Rod end thread length (A) must be longer when a lock nut is attached to the rod end. Refer to "Rod end attachment/Rod end thread length with lock nut".
- On the rod side of the rod A type cylinder, the air vents are located on the two sides neither the port nor the cushion valve is located.
- When you want to change the length of the projected rod, specify the "W".
- As for the dimensions not shown in these drawings, refer to the SD type (basic type).
- For the mounting of switches, refer to the dimensional drawings of "Switch set". All the contents other than "switch mounting dimensions" are identical.

### With boots



Note) Take into consideration the interference of the set attachment with the mounting plate.

	Standard	Semi-standard	
Material	Nylon tarpaulin	Chloroprene	Conex
Resistible temperature	80°C	130°C	200°C

- Notes) ● Remember that the resistible temperatures shown in the table above are for the boots, not for the cylinder.  
 ● Conex is the registered trademark of Teijin Ltd.  
 ● The boots have been mounted at our factory prior to delivery.

### W

#### Rod A

Nylon tarpaulin Chloroprene	φ40	1/3.5	Stroke+X
	φ50 - φ80	1/4	Stroke+X
	φ100-φ125	1/5	Stroke+X
Conex	φ40	1/2.5	Stroke+X
	φ50 - φ80	1/3	Stroke+X
	φ100-f125	1/3.5	Stroke+X

- When the calculated WF has decimals, raise them to the next whole number.

## Dimensional table

Symbol Bore	Rod A							
	A	BA	KK	MM	OF	S	SL	VF
φ40	28	φ46 f9	M20×1.5	φ28	φ26	22	11	13
φ50	36	φ55 f9	M27×2	φ36	φ34	30	14	13
φ63	45	φ65 f9	M33×2	φ45	φ43	38	17	13
φ80	56	φ77 f9	M42×2	φ56	φ54	50	21	13
φ100	63	φ92 f9	M48×2	φ70	φ68	60	24	13
φ125	85	φ112 f9	M64×3	φ90	φ88	80	Drill hole	13

Symbol Bore	AE	BB	DE	E	EE	FY	FB	FE	FF
	φ40	12	9	φ25.5	□ 62	Rc3/8	19	φ11	64
φ50	14	13	φ30	□ 75	Rc1/2	22	φ14	77	G1/2
φ63	14	13	φ30	□ 90	Rc1/2	25	φ14	92	G1/2
φ80	16	16	φ36.9	□ 114	Rc3/4	27	φ18	116	G3/4
φ100	16	16	φ36.9	□ 130	Rc3/4	29	φ18	132	G3/4
φ125	18	21	φ46.1	□ 165	Rc1	37	φ22	167	G1

Symbol Bore	FP	HL	HY	PJ	PL	R	TO	UO	W
	φ40	37	128	147	73	18	41	87	110
φ50	42	134	156	74	18	52	105	130	41
φ63	39	136	161	80	17	65	117	145	48
φ80	46	159	186	93	20	83	149	180	51
φ100	47	168	197	101	20	97	162	200	57
φ125	51	197	234	117	29	126	208	250	57

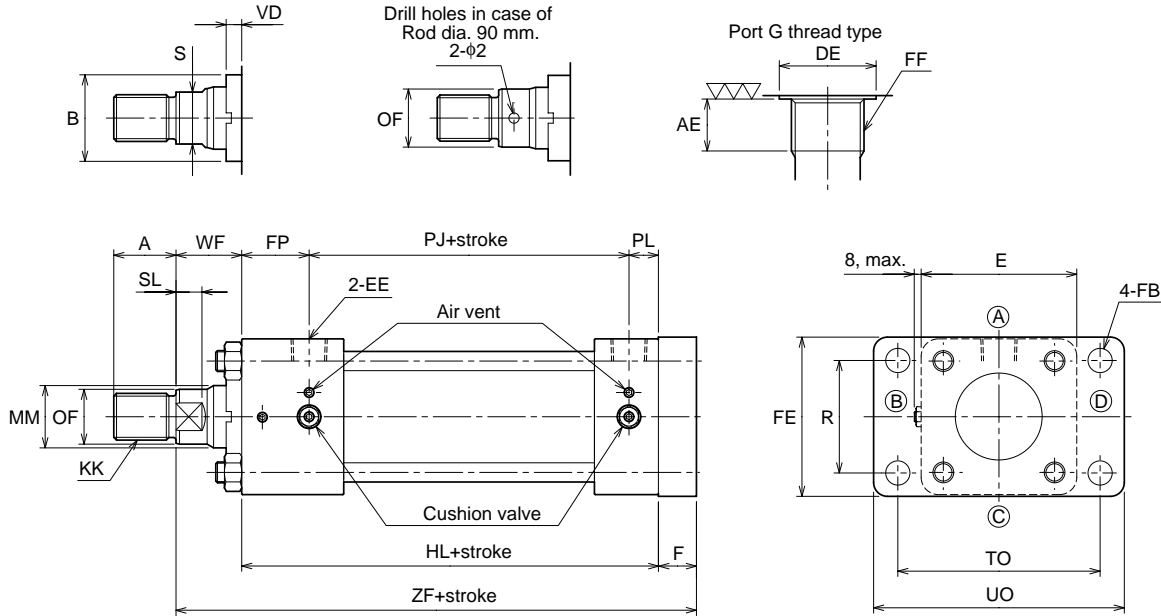
● Allowance of MM is f8.

## With boots

Symbol		Bore					
		φ40	φ50	φ63	φ80	φ100	φ125
WW	Rod A	φ50	φ71	φ80	φ100	φ100	φ140
X	Rod A	45	55	55	55	65	65
BA	Rod A	φ46	φ55	φ65	φ77	φ92	φ112

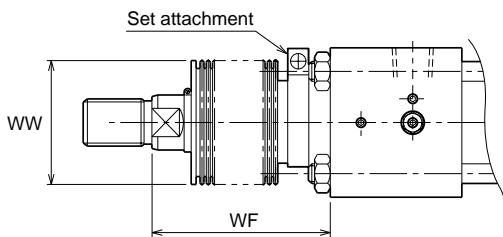
### FB

160H-1 [2] FB Bore [B] [B] Stroke - [A] [B]



- Positions of the cushion valves and air vents depend on the cylinder bore.
- Rod end thread length (A) must be longer when a lock nut is attached to the rod end. Refer to "Rod end attachment/Rod end thread length with lock nut".
- On the rod side of the rod A type cylinder, the air vents are located on the two sides neither the port nor the cushion valve is located.
- When you want to change the length of the projected rod, specify the "WF".
- As for the dimensions not shown in these drawings, refer to the SD type (basic type).
- For the mounting of switches, refer to the dimensional drawings of "Switch set". All the contents other than "switch mounting dimensions" are identical.

### With boots



### WF

#### Rod B

Nylon tarpaulin Chloroprene	$\phi 32-\phi 40$	1/3	Stroke+X
	$\phi 50$	1/3.5	Stroke+X
	$\phi 63 - \phi 100$	1/4	Stroke+X
	$\phi 125 - \phi 160$	1/5	Stroke+X
Conex	$\phi 32$	1/2	Stroke+X
	$\phi 40-\phi 50$	1/2.5	Stroke+X
	$\phi 63 - \phi 100$	1/3	Stroke+X
	$\phi 125 - \phi 160$	1/3.5	Stroke+X

#### Rod A

Nylon tarpaulin Chloroprene	$\phi 40$	1/3.5	Stroke+X
	$\phi 50 - \phi 80$	1/4	Stroke+X
	$\phi 100-\phi 125$	1/5	Stroke+X
Conex	$\phi 40$	1/2.5	Stroke+X
	$\phi 50 - \phi 80$	1/3	Stroke+X
	$\phi 100-\phi 125$	1/3.5	Stroke+X

- Notes) • Remember that the resistible temperatures shown in the table above are for the boots, not for the cylinder.  
 • Conex is the registered trademark of Teijin Ltd.  
 • The boots have been mounted at our factory prior to delivery.

• When the calculated WF has decimals, raise them to the next whole number.

**Dimensional table**

Symbol Bore	Rod B								Rod A							
	A	B	KK	MM	OF	S	SL	VD	A	B	KK	MM	OF	S	SL	VD
φ32	18	φ30 f9	M14×1.5	φ18	φ17	14	10	10	-	-	-	-	-	-	-	-
φ40	22	φ34 f9	M16×1.5	φ22	φ21	17	9	10	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9
φ50	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9	36	φ50 f9	M27×2	φ36	φ34	30	14	9
φ63	36	φ50 f9	M27×2	φ36	φ34	30	14	9	45	φ60 f9	M33×2	φ45	φ43	38	17	8
φ80	45	φ60 f9	M33×2	φ45	φ43	38	17	8	56	φ72 f9	M42×2	φ56	φ54	50	21	8
φ100	56	φ72 f9	M42×2	φ56	φ54	50	21	8	63	φ88 f9	M48×2	φ70	φ68	60	24	6
φ125	63	φ88 f9	M48×2	φ70	φ68	60	24	6	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5
φ140	75	φ98 f9	M56×2	φ80	φ78	70	27	5	-	-	-	-	-	-	-	-
φ160	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5	-	-	-	-	-	-	-	-

Symbol Bore	AE	DE	E	EE	F	FB	FE	FF
φ32	12	φ21.5	□45	Rc1/4	11	φ6.6	47	G1/4
φ40	12	φ25.5	□62	Rc3/8	16	φ11	64	G3/8
φ50	14	φ30	□75	Rc1/2	19	φ14	77	G1/2
φ63	14	φ30	□90	Rc1/2	22	φ14	92	G1/2
φ80	16	φ36.9	□114	Rc3/4	25	φ18	116	G3/4
φ100	16	φ36.9	□130	Rc3/4	27	φ18	132	G3/4
φ125	18	φ46.1	□165	Rc1	29	φ22	167	G1
φ140	18	φ46.1	□185	Rc1	32	φ26	187	G1
φ160	18	φ46.1	□205	Rc1	37	φ26	207	G1

Symbol Bore	FP	HL	PJ	PL	R	TO	UO	WF	ZF
φ32	35	103	56	12	33	58	70	25	139
φ40	37	128	73	18	41	87	110	25	169
φ50	42	134	74	18	52	105	130	25	178
φ63	39	136	80	17	65	117	145	32	190
φ80	46	159	93	20	83	149	180	31	215
φ100	47	168	101	20	97	162	200	35	230
φ125	51	197	117	29	126	208	250	35	261
φ140	51	203	124	28	142	230	280	35	270
φ160	54	213	130	29	155	253	300	32	282

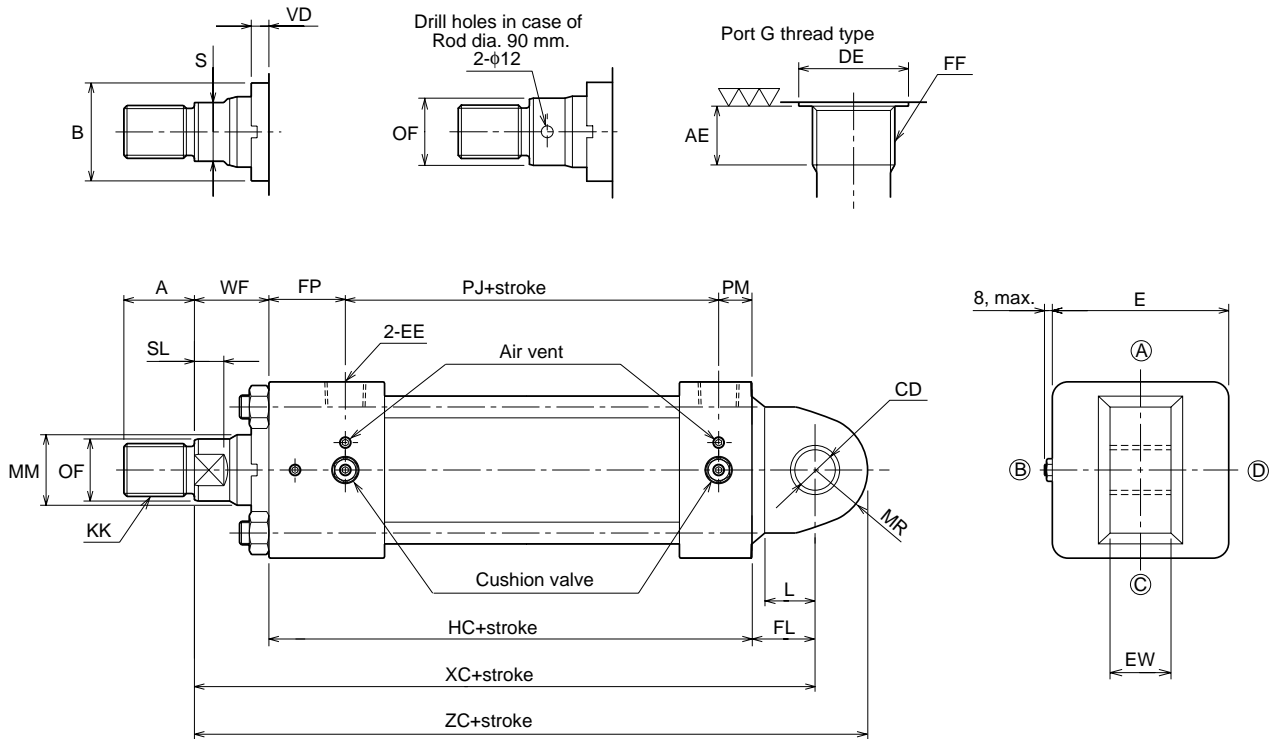
• Allowance of MM is f8.

**With boots**

Symbol		Bore	φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
WW	Rod B		φ40	φ50	φ50	φ71	φ80	φ100	φ100	φ125	φ140
	Rod A		-	φ50	φ71	φ80	φ100	φ100	φ140	-	-
X	Rod B		56	61	64	77	80	82	94	97	102
	Rod A		-	64	77	80	82	94	102	-	-

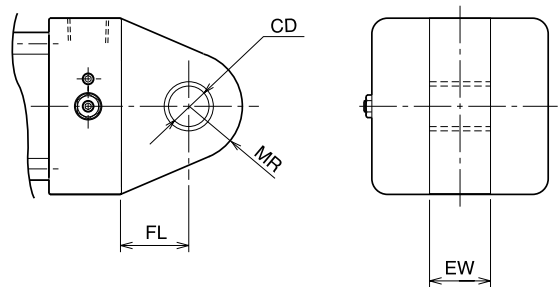
### CA

160H-1 [ 2 CA Bore B B Stroke - A B ]

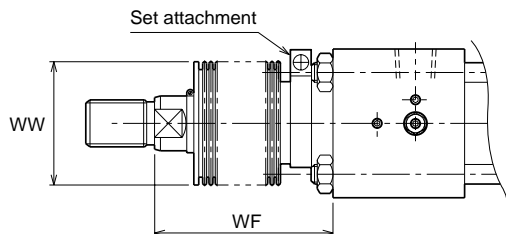


- Positions of the cushion valves and air vents depend on the cylinder bore.
- Rod end thread length (A) must be longer when a lock nut is attached to the rod end. Refer to "Rod end attachment/Rod end thread length with lock nut".
- Bush (made of gray iron cast) is press-fit to the mounting hole (dimensional symbol: CD).
- On the rod side of the rod A type cylinder, the air vents are located on the two sides neither the port nor the cushion valve is located.
- When you want to change the length of the projected rod, specify the "WF".
- As for the dimensions not shown in these drawings, refer to the SD type (basic type).
- For the mounting of switches, refer to the dimensional drawings of "Switch set". All the contents other than "switch mounting dimensions" are identical.

#### ● Bore 32 mm, 40 mm



#### With boots



#### WF

#### Rod B

Nylon tarpaulin Chloroprene	$\phi 32-\phi 40$	1/3	Stroke+X
	$\phi 50$	1/3.5	Stroke+X
	$\phi 63 - \phi 100$	1/4	Stroke+X
	$\phi 125 - \phi 160$	1/5	Stroke+X
Conex	$\phi 32$	1/2	Stroke+X
	$\phi 40-\phi 50$	1/2.5	Stroke+X
	$\phi 63 - \phi 100$	1/3	Stroke+X
	$\phi 125 - \phi 160$	1/3.5	Stroke+X

#### Rod A

Nylon tarpaulin Chloroprene	$\phi 40$	1/3.5	Stroke+X
	$\phi 50 - \phi 80$	1/4	Stroke+X
	$\phi 100-\phi 125$	1/5	Stroke+X
Conex	$\phi 40$	1/2.5	Stroke+X
	$\phi 50 - \phi 80$	1/3	Stroke+X
	$\phi 100-\phi 125$	1/3.5	Stroke+X

- When the calculated WF has decimals, raise them to the next whole number.

	Standard	Semi-standard	
Material	Nylon tarpaulin	Chloroprene	Conex
Resistible temperature	80°C	130°C	200°C

- (Notes)
- Remember that the resistible temperatures shown in the table above are for the boots, not for the cylinder.
  - Conex is the registered trademark of Teijin Ltd.
  - The boots have been mounted at our factory prior to delivery.

**Dimensional table**

Symbol Bore	Rod B								Rod A							
	A	B	KK	MM	OF	S	SL	VD	A	B	KK	MM	OF	S	SL	VD
φ32	18	φ30 f9	M14×1.5	φ18	φ17	14	10	10	—	—	—	—	—	—	—	—
φ40	22	φ34 f9	M16×1.5	φ22	φ21	17	9	10	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9
φ50	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9	36	φ50 f9	M27×2	φ36	φ34	30	14	9
φ63	36	φ50 f9	M27×2	φ36	φ34	30	14	9	45	φ60 f9	M33×2	φ45	φ43	38	17	8
φ80	45	φ60 f9	M33×2	φ45	φ43	38	17	8	56	φ72 f9	M42×2	φ56	φ54	50	21	8
φ100	56	φ72 f9	M42×2	φ56	φ54	50	21	8	63	φ88 f9	M48×2	φ70	φ68	60	24	6
φ125	63	φ88 f9	M48×2	φ70	φ68	60	24	6	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5
φ140	75	φ98 f9	M56×2	φ80	φ78	70	27	5	—	—	—	—	—	—	—	—
φ160	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5	—	—	—	—	—	—	—	—

Symbol Bore	AE	CD	DE	E	EE	EW	FF	FL
φ32	12	φ12 H9	φ21.5	□45	Rc1/4	16 <sup>0</sup> <sub>-0.43</sub>	G1/4	19
φ40	12	φ14 H9	φ25.5	□62	Rc3/8	20 <sup>0</sup> <sub>-0.52</sub>	G3/8	19
φ50	14	φ20 H9	φ30	□75	Rc1/2	30 <sup>0</sup> <sub>-0.52</sub>	G1/2	33
φ63	14	φ20 H9	φ30	□90	Rc1/2	30 <sup>0</sup> <sub>-0.52</sub>	G1/2	33
φ80	16	φ28 H9	φ36.9	□114	Rc3/4	40 <sup>0</sup> <sub>-0.62</sub>	G3/4	41
φ100	16	φ36 H9	φ36.9	□130	Rc3/4	50 <sup>0</sup> <sub>-0.62</sub>	G3/4	56
φ125	18	φ45 H9	φ46.1	□165	Rc1	60 <sup>0</sup> <sub>-0.74</sub>	G1	62
φ140	18	φ50 H9	φ46.1	□185	Rc1	65 <sup>0</sup> <sub>-0.74</sub>	G1	65
φ160	18	φ56 H9	φ46.1	□205	Rc1	70 <sup>0</sup> <sub>-0.74</sub>	G1	68

Symbol Bore	FP	HC	L	MR	PJ	PM	WF	XC	ZC
φ32	35	103	—	R17	56	12	25	147	164
φ40	37	128	—	R17	73	18	25	172	189
φ50	42	133	30	R28	74	17	25	191	219
φ63	39	135	30	R28	80	16	32	200	228
φ80	46	157	35	R33	93	18	31	229	262
φ100	47	166	51	R49	101	18	35	257	306
φ125	51	192	54	R52	117	24	35	289	341
φ140	51	200	57	R55	124	25	35	300	355
φ160	54	208	60	R58	130	24	32	308	366

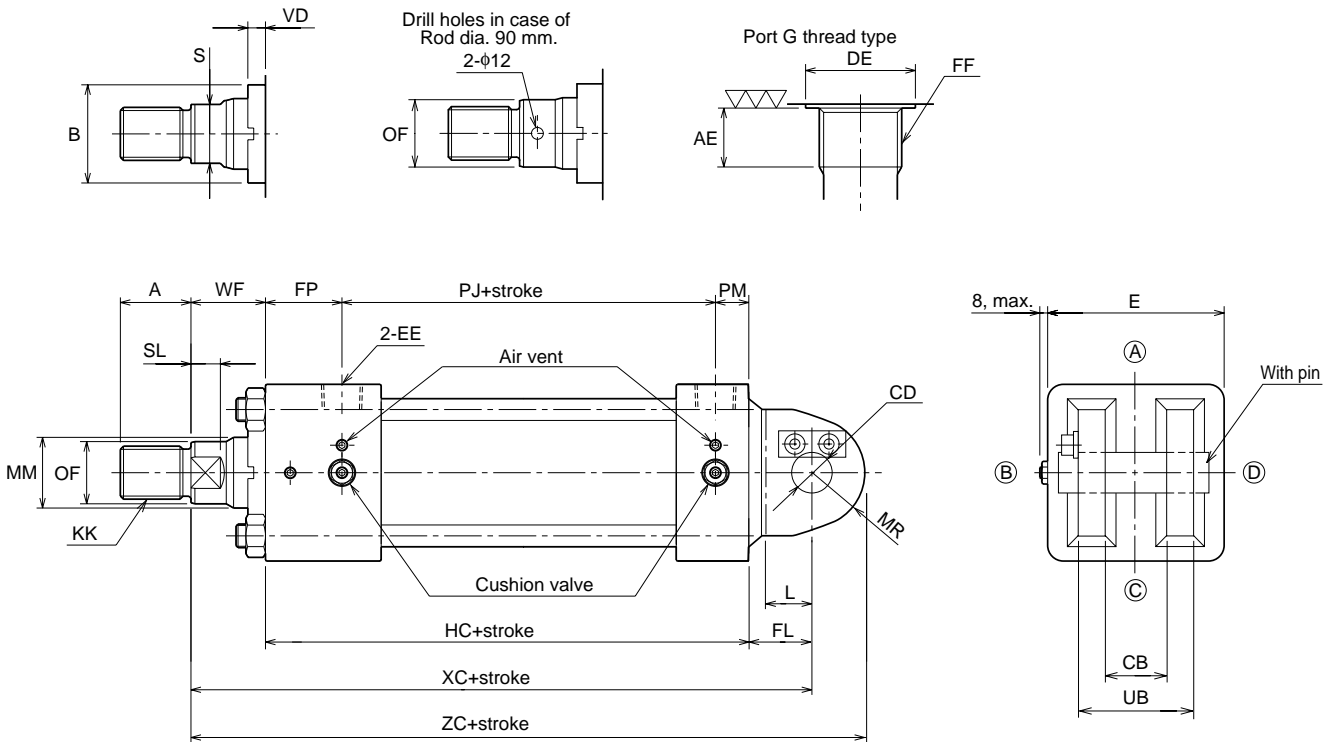
● Allowance of MM is f8.

**With boots**

Symbol		Bore	φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
		WW	Rod B	φ40	φ50	φ50	φ71	φ80	φ100	φ100	φ125
Rod A	—		φ50	φ71	φ80	φ100	φ100	φ140	—	—	
X	Rod B	56	61	64	77	80	82	94	97	102	
	Rod A	—	64	77	80	82	94	102	—	—	

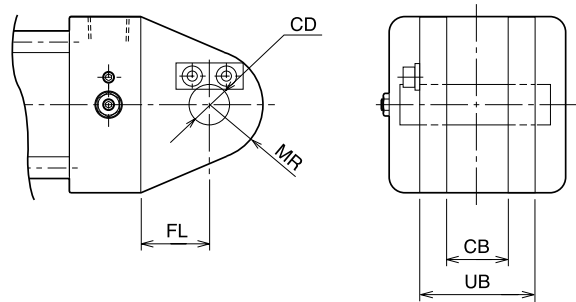
### CB

160H-1 [ 2 CB Bore B B Stroke - A B ]

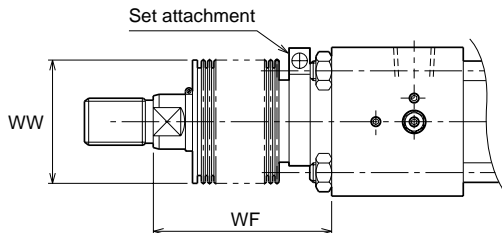


- Positions of the cushion valves and air vents depend on the cylinder bore.
- Rod end thread length (A) must be longer when a lock nut is attached to the rod end. Refer to "Rod end attachment/Rod end thread length with lock nut".
- On the rod side of the rod A type cylinder, the air vents are located on the two sides neither the port nor the cushion valve is located.
- When you want to change the length of the projected rod, specify the "WF".
- As for the dimensions not shown in these drawings, refer to the SD type (basic type).
- For the mounting of switches, refer to the dimensional drawings of "Switch set". All the contents other than "switch mounting dimensions" are identical.

### ● Bore 32 mm, 40 mm



### With boots



### WF Rod B

Nylon tarpaulin Chloroprene	$\phi 32 \sim \phi 40$	1/3	Stroke+X
	$\phi 50$	1/3.5	Stroke+X
	$\phi 63 - \phi 100$	1/4	Stroke+X
	$\phi 125 - \phi 160$	1/5	Stroke+X
Conex	$\phi 32$	1/2	Stroke+X
	$\phi 40 - \phi 50$	1/2.5	Stroke+X
	$\phi 63 - \phi 100$	1/3	Stroke+X
	$\phi 125 - \phi 160$	1/3.5	Stroke+X

	Standard	Semi-standard	
Material	Nylon tarpaulin	Chloroprene	Conex
Resistible temperature	80°C	130°C	200°C

- Notes) ● Remember that the resistible temperatures shown in the table above are for the boots, not for the cylinder.  
 ● Conex is the registered trademark of Teijin Ltd.  
 ● The boots have been mounted at our factory prior to delivery.

### Rod A

Nylon tarpaulin Chloroprene	$\phi 40$	1/3.5	Stroke+X
	$\phi 50 - \phi 80$	1/4	Stroke+X
	$\phi 100 - \phi 125$	1/5	Stroke+X
Conex	$\phi 40$	1/2.5	Stroke+X
	$\phi 50 - \phi 80$	1/3	Stroke+X
	$\phi 100 - \phi 125$	1/3.5	Stroke+X

- When the calculated WF has decimals, raise them to the next whole number.



**Dimensional table**

Symbol Bore	Rod B								Rod A							
	A	B	KK	MM	OF	S	SL	VD	A	B	KK	MM	OF	S	SL	VD
φ32	18	φ30 f9	M14×1.5	φ18	φ17	14	10	10	—	—	—	—	—	—	—	—
φ40	22	φ34 f9	M16×1.5	φ22	φ21	17	9	10	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9
φ50	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9	36	φ50 f9	M27×2	φ36	φ34	30	14	9
φ63	36	φ50 f9	M27×2	φ36	φ34	30	14	9	45	φ60 f9	M33×2	φ45	φ43	38	17	8
φ80	45	φ60 f9	M33×2	φ45	φ43	38	17	8	56	φ72 f9	M42×2	φ56	φ54	50	21	8
φ100	56	φ72 f9	M42×2	φ56	φ54	50	21	8	63	φ88 f9	M48×2	φ70	φ68	60	24	6
φ125	63	φ88 f9	M48×2	φ70	φ68	60	24	6	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5
φ140	75	φ98 f9	M56×2	φ80	φ78	70	27	5	—	—	—	—	—	—	—	—
φ160	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5	—	—	—	—	—	—	—	—

Symbol Bore	AE	CB	CD	DE	E	EE	FF	FL
φ32	12	16 <sup>+0.69</sup> <sub>+0.29</sub>	φ12 H9/f8	φ21.5	□ 45	Rc1/4	G1/4	19
φ40	12	20 <sup>+0.70</sup> <sub>+0.30</sub>	φ14 H9/f8	φ25.5	□ 62	Rc3/8	G3/8	19
φ50	14	30 <sup>+0.70</sup> <sub>+0.30</sub>	φ20 H9/f8	φ30	□ 75	Rc1/2	G1/2	33
φ63	14	30 <sup>+0.70</sup> <sub>+0.30</sub>	φ20 H9/f8	φ30	□ 90	Rc1/2	G1/2	33
φ80	16	40 <sup>+0.91</sup> <sub>+0.31</sub>	φ28 H9/f8	φ36.9	□ 114	Rc3/4	G3/4	41
φ100	16	50 <sup>+0.92</sup> <sub>+0.32</sub>	φ36 H9/f8	φ36.9	□ 130	Rc3/4	G3/4	56
φ125	18	60 <sup>+0.94</sup> <sub>+0.34</sub>	φ45 H9/f8	φ46.1	□ 165	Rc1	G1	62
φ140	18	65 <sup>+0.94</sup> <sub>+0.34</sub>	φ50 H9/f8	φ46.1	□ 185	Rc1	G1	65
φ160	18	70 <sup>+0.96</sup> <sub>+0.36</sub>	φ56 H9/f8	φ46.1	□ 205	Rc1	G1	68

Symbol Bore	FP	HC	L	MR	PJ	PM	UB	WF	XC	ZC
φ32	35	103	—	R17	56	12	32	25	147	164
φ40	37	128	—	R17	73	18	40	25	172	189
φ50	42	133	30	R28	74	17	60	25	191	219
φ63	39	135	30	R28	80	16	60	32	200	228
φ80	46	157	35	R33	93	18	80	31	229	262
φ100	47	166	50	R49	101	18	100	35	257	306
φ125	51	192	53	R52	117	24	120	35	289	341
φ140	51	200	56	R55	124	25	130	35	300	355
φ160	54	208	59	R58	130	24	140	32	308	366

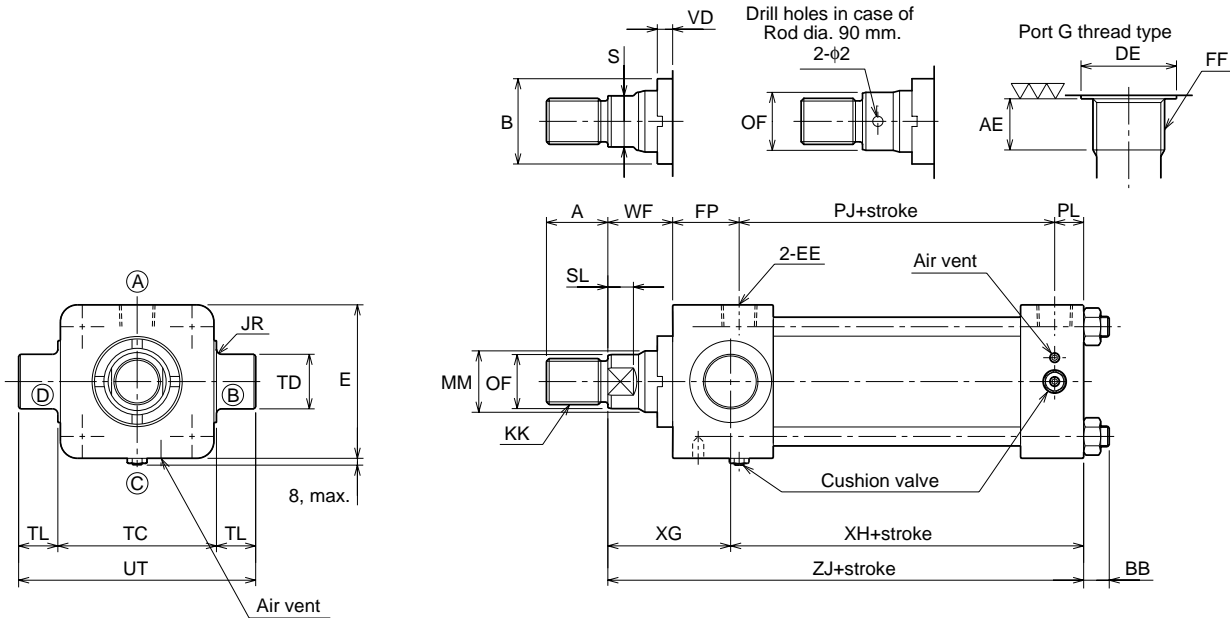
• Allowance of MM is f8.

**With boots**

Symbol		Bore	φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
WW	Rod B		φ40	φ50	φ50	φ71	φ80	φ100	φ100	φ125	φ140
	Rod A		—	φ50	φ71	φ80	φ100	φ100	φ140	—	—
X	Rod B		56	61	64	77	80	82	94	97	102
	Rod A		—	64	77	80	82	94	102	—	—

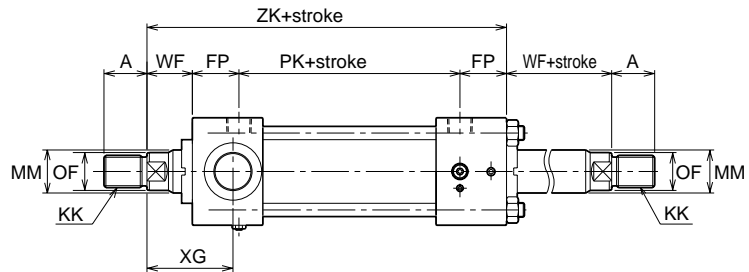
### TA

160H-1 [2] TA [Bore] [B] [B] [Stroke] - [A] [B]



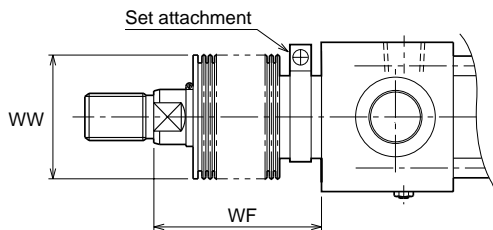
- Positions of the cushion valves and air vents depend on the cylinder bore.
- Rod end thread length (A) must be longer when a lock nut is attached to the rod end. Refer to "Rod end attachment/Rod end thread length with lock nut".
- If the stroke is short, pay attention to prevent the cushion valve from interfering with the mounting bracket.
- When you want to change the length of the projected rod, specify the "WF".
- As for the dimensions not shown in these drawings, refer to the SD type (basic type).
- For the mounting of switches, refer to the dimensional drawings of "Switch set". All the contents other than "switch mounting dimensions" are identical.

### Double-acting double rod (Rod B)



- Distance between the covers of the double rod type cylinder is longer than that of the single rod type cylinder by 10 mm.

### With boots



#### WF

#### Rod B

Nylon tarpaulin Chloroprene	$\phi 32 - \phi 40$	1/3	Stroke+X
	$\phi 50$	1/3.5	Stroke+X
	$\phi 63 - \phi 100$	1/4	Stroke+X
	$\phi 125 - \phi 160$	1/5	Stroke+X
Conex	$\phi 32$	1/2	Stroke+X
	$\phi 40 - \phi 50$	1/2.5	Stroke+X
	$\phi 63 - \phi 100$	1/3	Stroke+X
	$\phi 125 - \phi 160$	1/3.5	Stroke+X

#### Rod A

Nylon tarpaulin Chloroprene	$\phi 40$	1/3.5	Stroke+X
	$\phi 50 - \phi 80$	1/4	Stroke+X
	$\phi 100 - \phi 125$	1/5	Stroke+X
Conex	$\phi 40$	1/2.5	Stroke+X
	$\phi 50 - \phi 80$	1/3	Stroke+X
	$\phi 100 - \phi 125$	1/3.5	Stroke+X

- When the calculated WF has decimals, raise them to the next whole number.

	Standard	Semi-standard	
Material	Nylon tarpaulin	Chloroprene	Conex
Resistible temperature	80°C	130°C	200°C

- (Notes)
- Remember that the resistible temperatures shown in the table above are for the boots, not for the cylinder.
  - Conex is the registered trademark of Teijin Ltd.
  - The boots have been mounted at our factory prior to delivery.

**Dimensional table**

Symbol Bore	Rod B								Rod A							
	A	B	KK	MM	OF	S	SL	VD	A	B	KK	MM	OF	S	SL	VD
φ32	18	φ30 f9	M14×1.5	φ18	φ17	14	10	10	—	—	—	—	—	—	—	—
φ40	22	φ34 f9	M16×1.5	φ22	φ21	17	9	10	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9
φ50	28	φ42 f9	M20×1.5	φ28	φ26	22	11	9	36	φ50 f9	M27×2	φ36	φ34	30	14	9
φ63	36	φ50 f9	M27×2	φ36	φ34	30	14	9	45	φ60 f9	M33×2	φ45	φ43	38	17	8
φ80	45	φ60 f9	M33×2	φ45	φ43	38	17	8	56	φ72 f9	M42×2	φ56	φ54	50	21	8
φ100	56	φ72 f9	M42×2	φ56	φ54	50	21	8	63	φ88 f9	M48×2	φ70	φ68	60	24	6
φ125	63	φ88 f9	M48×2	φ70	φ68	60	24	6	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5
φ140	75	φ98 f9	M56×2	φ80	φ78	70	27	5	—	—	—	—	—	—	—	—
φ160	85	φ108 f9	M64×3	φ90	φ88	80	Drill hole	5	—	—	—	—	—	—	—	—

Symbol Bore	AE	BB	DE	E	EE	FF	FP	JR	PJ	PK
φ32	12	7	φ21.5	□45	Rc1/4	G1/4	35	R2	56	66
φ40	12	9	φ25.5	□62	Rc3/8	G3/8	37	R2	73	83
φ50	14	13	φ30	□75	Rc1/2	G1/2	42	R2.5	74	84
φ63	14	13	φ30	□90	Rc1/2	G1/2	39	R2.5	80	90
φ80	16	16	φ36.9	□114	Rc3/4	G3/4	46	R3	93	103
φ100	16	16	φ36.9	□130	Rc3/4	G3/4	47	R3	101	111
φ125	18	21	φ46.1	□165	Rc1	G1	51	R4	117	127
φ140	18	22	φ46.1	□185	Rc1	G1	51	R4	124	134
φ160	18	25	φ46.1	□205	Rc1	G1	54	R4	130	140

Symbol Bore	PL	TC	TD	TL	UT	WF	XG	XH	ZJ	ZK
φ32	12	44 <sup>0</sup> <sub>-0.62</sub>	φ16 f8	12	68	25	54	74	128	161
φ40	18	63 <sup>0</sup> <sub>-0.74</sub>	φ20 f8	16	95	25	57	96	153	182
φ50	18	76 <sup>0</sup> <sub>-0.74</sub>	φ25 f8	20	116	25	64	95	159	193
φ63	17	89 <sup>0</sup> <sub>-0.87</sub>	φ32 f8	25	139	32	70	98	168	200
φ80	20	114 <sup>0</sup> <sub>-0.87</sub>	φ40 f8	32	178	31	76	114	190	226
φ100	20	127 <sup>0</sup> <sub>-1.00</sub>	φ50 f8	40	207	35	71	132	203	240
φ125	29	165 <sup>0</sup> <sub>-1.00</sub>	φ63 f8	50	265	35	75	157	232	264
φ140	28	184 <sup>0</sup> <sub>-1.15</sub>	φ70 f8	58	300	35	75	163	238	271
φ160	29	203 <sup>0</sup> <sub>-1.15</sub>	φ80 f8	63	329	32	75	170	245	280

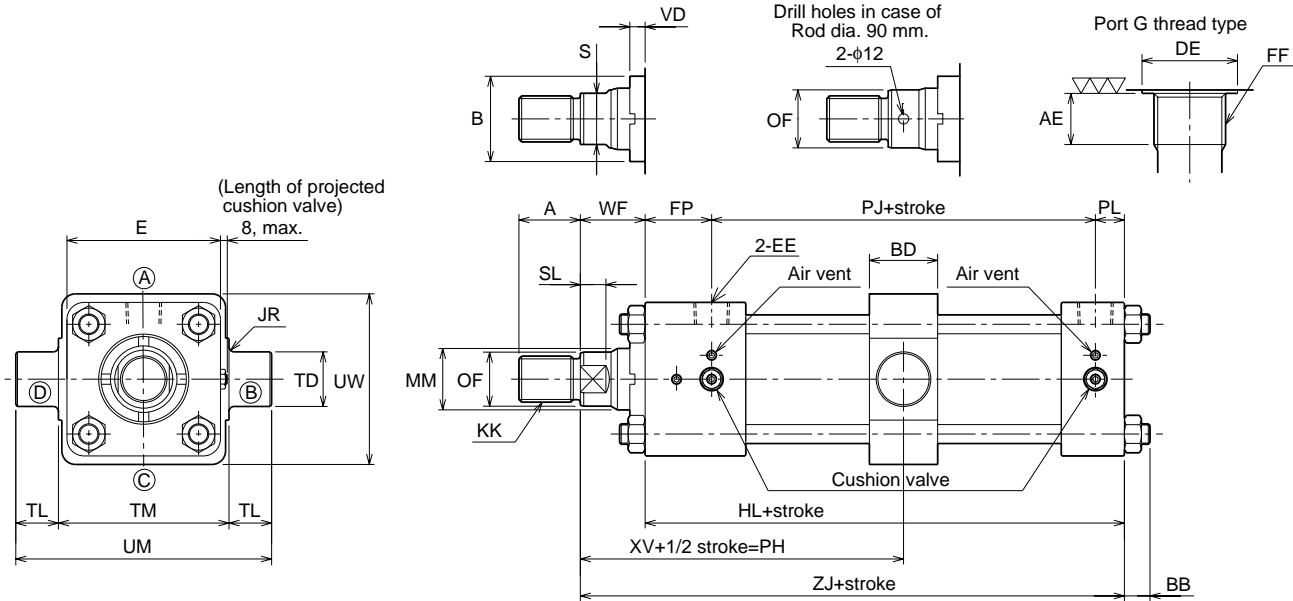
• Allowance of MM is f8.

**With boots**

Symbol		Bore	φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
WW	Rod B		φ40	φ50	φ50	φ71	φ80	φ100	φ100	φ125	φ140
	Rod A		—	φ50	φ71	φ80	φ100	φ100	φ140	—	—
X	Rod B		56	61	64	77	80	82	94	97	102
	Rod A		—	64	77	80	82	94	102	—	—

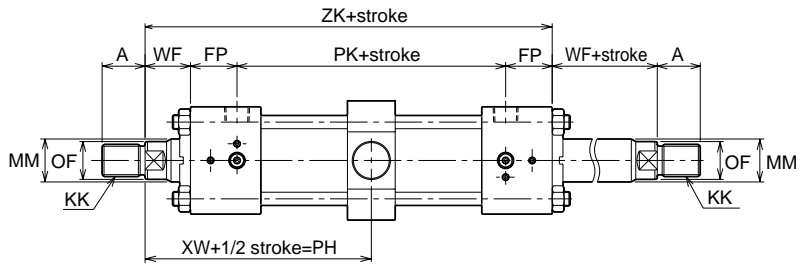
### TC

160H-1 [ 2 TC Bore B B Stroke - A B ]



- Positions of the cushion valves and air vents depend on the cylinder bore.
- Rod end thread length (A) must be longer when a lock nut is attached to the rod end. Refer to "Rod end attachment/Rod end thread length with lock nut".
- If the stroke is short, pay attention to prevent the cushion valve from interfering with the mounting bracket.
- The air vents on the rod side of the rod A type cylinder are located on the two sides neither the port nor the cushion valve is located.
- When you want to change the length of the projected rod, specify the "WF".
- As for the dimensions not shown in these drawings, refer to the SD type (basic type).
- For the mounting of switches, refer to the dimensional drawings of "Switch set". All the contents other than "switch mounting dimensions" are identical.

### Double-acting double rod (Rod B)



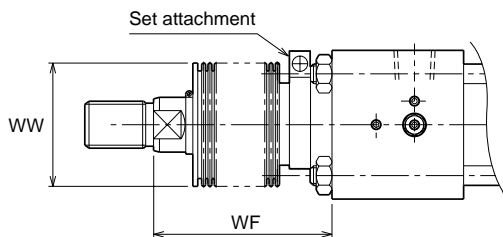
- Distance between the covers of the double rod type cylinder is longer than that of the single rod type cylinder by 10 mm.

### Minimum stroke of TC type

Bore	Stroke	Bore	Stroke	Bore	Stroke
φ32	10	φ63	10	φ125	25
φ40	10	φ80	10	φ140	25
φ50	10	φ100	25	φ160	35

- As for the minimum stroke of the switch set cylinder, refer to the model code.

### With boots



### WF

#### Rod B

Nylon tarpaulin Chloroprene	φ32-φ40	1/3	Stroke+X
	φ50	1/3.5	Stroke+X
	φ63 - φ100	1/4	Stroke+X
	φ125 - φ160	1/5	Stroke+X
Conex	φ32	1/2	Stroke+X
	φ40-φ50	1/2.5	Stroke+X
	φ63 - φ100	1/3	Stroke+X
	φ125 - φ160	1/3.5	Stroke+X

#### Rod A

Nylon tarpaulin Chloroprene	φ40	1/3.5	Stroke+X
	φ50 - φ80	1/4	Stroke+X
	φ100A-φ125	1/5	Stroke+X
Conex	φ40	1/2.5	Stroke+X
	φ50 - φ80	1/3	Stroke+X
	φ100-φ125	1/3.5	Stroke+X

- When the calculated WF has decimals, raise them to the next whole number.

	Standard	Semi-standard	
Material	Nylon tarpaulin	Chloroprene	Conex
Resistible temperature	80°C	130°C	200°C

- (Notes)
- Remember that the resistible temperatures shown in the table above are for the boots, not for the cylinder.
  - Conex is the registered trademark of Teijin Ltd.
  - The boots have been mounted at our factory prior to delivery.

**Dimensional table**

Symbol Bore	Rod B								Rod A							
	A	B	KK	MM	OF	S	SL	VD	A	B	KK	MM	OF	S	SL	VD
φ32	18	φ30 f8	M14×1.5	φ18	φ17	14	10	10	—	—	—	—	—	—	—	—
φ40	22	φ34 f8	M16×1.5	φ22	φ21	17	9	10	28	φ42 f8	M20×1.5	φ28	φ26	22	11	9
φ50	28	φ42 f8	M20×1.5	φ28	φ26	22	11	9	36	φ50 f8	M27×2	φ36	φ34	30	14	9
φ63	36	φ50 f8	M27×2	φ36	φ34	30	14	9	45	φ60 f8	M33×2	φ45	φ43	38	17	8
φ80	45	φ60 f8	M33×2	φ45	φ43	38	17	8	56	φ72 f8	M42×2	φ56	φ54	50	21	8
φ100	56	φ72 f8	M42×2	φ56	φ54	50	21	8	63	φ88 f8	M48×2	φ70	φ68	60	24	6
φ125	63	φ88 f8	M48×2	φ70	φ68	60	24	6	85	φ108 f8	M64×3	φ90	φ88	80	Drill hole	5
φ140	75	φ98 f8	M56×2	φ80	φ78	70	27	5	—	—	—	—	—	—	—	—
φ160	85	φ108 f8	M64×3	φ90	φ88	80	Drill hole	5	—	—	—	—	—	—	—	—

Symbol Bore	AE	BB	BD	DE	E	EE	FF	FP	HL	JR	Minimum PH	PJ
φ32	12	7	30	φ21.5	□45	Rc1/4	G1/4	35	103	R2	89	56
φ40	12	9	30	φ25.5	□62	Rc3/8	G3/8	37	128	R2	94	73
φ50	14	13	40	φ30	□75	Rc1/2	G1/2	42	134	R2.5	105	74
φ63	14	13	43	φ30	□90	Rc1/2	G1/2	39	136	R2.5	112.5	80
φ80	16	16	53	φ36.9	□114	Rc3/4	G3/4	46	159	R3	127.5	93
φ100	16	16	68	φ36.9	□130	Rc3/4	G3/4	47	168	R3	144	101
φ125	18	21	73	φ46.1	□165	Rc1	G1	51	197	R4	154.5	117
φ140	18	22	83	φ46.1	□185	Rc1	G1	51	203	R4	159.5	124
φ160	18	25	98	φ46.1	□205	Rc1	G1	54	213	R4	168	130

Symbol Bore	PK	PL	TD	TL	TM	UM	UW	WF	XV	XW	ZJ	ZK
φ32	66	12	φ16 f8	12	55 <sup>0</sup> <sub>-0.62</sub>	79	55	25	88	93	128	161
φ40	83	18	φ20 f8	16	76 <sup>0</sup> <sub>-0.74</sub>	108	76	25	98.5	103.5	153	182
φ50	84	18	φ25 f8	20	89 <sup>0</sup> <sub>-0.87</sub>	129	89	25	104	109	159	193
φ63	90	17	φ32 f8	25	100 <sup>0</sup> <sub>-0.87</sub>	150	100	32	111	116	168	200
φ80	103	20	φ40 f8	32	127 <sup>0</sup> <sub>-1.00</sub>	191	127	31	123.5	128.5	190	226
φ100	111	20	φ50 f8	40	140 <sup>0</sup> <sub>-1.00</sub>	220	140	35	132.5	137.5	203	240
φ125	127	29	φ63 f8	50	178 <sup>0</sup> <sub>-1.00</sub>	278	178	35	144.5	149.5	232	264
φ140	134	28	φ70 f8	58	200 <sup>0</sup> <sub>-1.00</sub>	316	200	35	148	153	238	271
φ160	140	29	φ80 f8	63	215 <sup>0</sup> <sub>-1.15</sub>	341	215	32	151	156	245	280

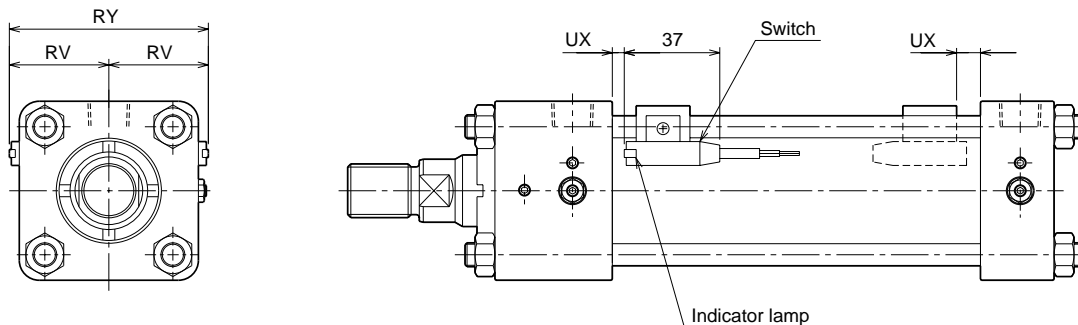
• Allowance of MM is f8.

**With boots**

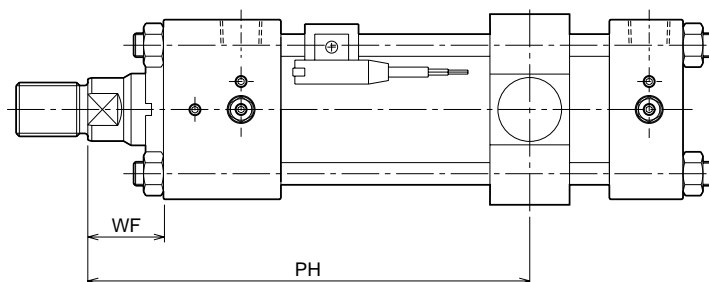
Symbol		Bore	φ32	φ40	φ50	φ63	φ80	φ100	φ125	φ140	φ160
WW	Rod B		φ40	φ50	φ50	φ71	φ80	φ100	φ100	φ125	φ140
	Rod A		—	φ50	φ71	φ80	φ100	φ100	φ140	—	—
X	Rod B		56	61	64	77	80	82	94	97	102
	Rod A		—	64	77	80	82	94	102	—	—

## Switch set

160H-1R	2	SD	Bore	B	B	Stroke	–	A	B	Switch code	Switch quantity
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## Minimum dimension PH of switch set cylinder 160H-1R



- The minimum dimension PH of the switch set cylinder is the dimension when the trunnion is moved toward the rod side in case that the switch is mounted to the rod side.

If the boots are equipped, the dimension WF is modified. In such a case, specify the dimension PH.

**Dimensional table**

Symbol Bore	RV	RY	UX	The minimum dimension PH
φ32	33	66	4 (9)	150 (155)
φ40	38	76	11 (16)	160 (165)
φ50	45	90	10 (15)	170 (175)
φ63	50	100	11 (16)	178.5 (183.5)
φ80	60	120	13 (18)	195.5 (200.5)
φ100	68	136	14 (19)	212 (217)
φ125	83	166	19 (24)	227.5 (232.5)
φ140	92	182	21 (26)	234.5 (239.5)
φ160	99	200	22 (27)	245 (250)

Note) ● Figures on the previous page show the AX type switch (rear wiring). As for the AZ type switch (upper wiring), take into consideration the bending radius of cord.

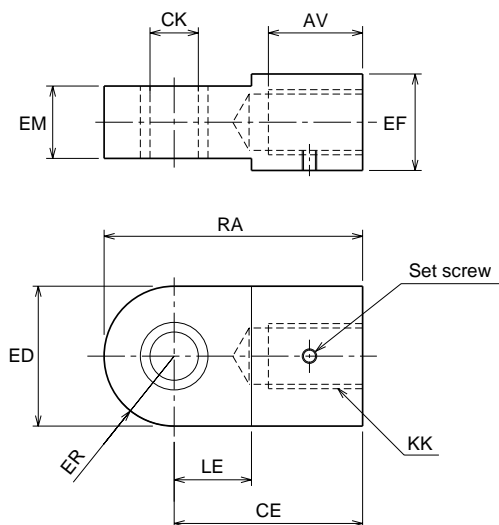
- The dimension UX indicates the optimum switch mounting position at the detection of the stroke end.
- Figures in the parentheses shown in the table above are applicable to the double rod type cylinder.

**Working range and difference**

Bore mm	Contact		No contact	
	AX1**		AX2**	
	Working range	Difference	Working range	Difference
φ32	4 - 14	2 or smaller	3 - 8	1 or smaller
φ40				
φ50				
φ63				
φ80				
φ100	11 - 18	4 - 10	6 - 13	
φ125	5 - 15			
φ140	11 - 20			
φ160				

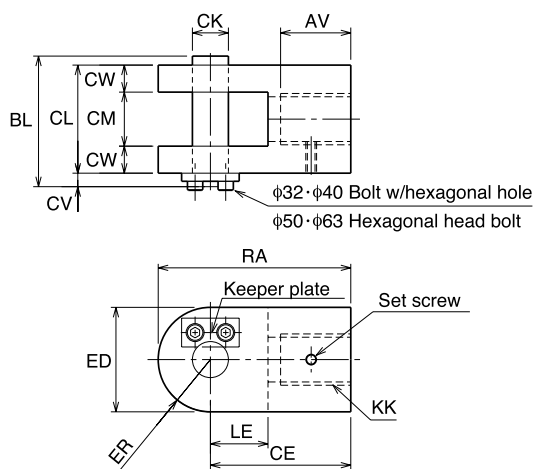
## Rod end attachment

### ● Rod end eye (T-end)

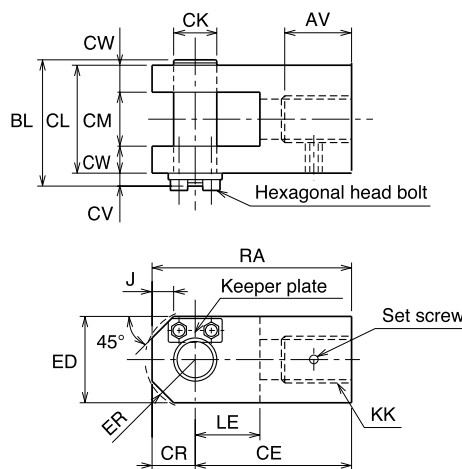


### ● Rod end clevis (Y-end)

Bore from 32 mm to 63 mm



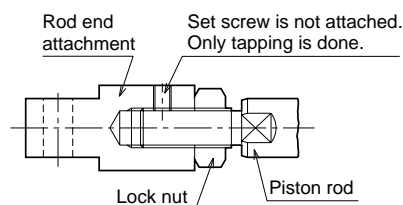
Bore from 80 mm to 160 mm



### ● Delivery of rod end attachment (T-end, Y-end)

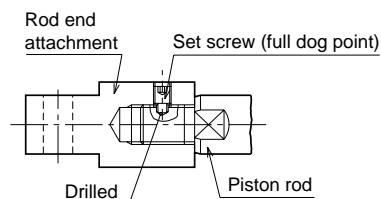
(1) In the case that the lock nut and rod end attachment are additionally ordered

The rod end attachment and lock nut are temporarily assembled to the piston rod for delivery. Since the lock nut is not tightened, tighten it after the position of the rod end attachment is adjusted. No set screw is included.



(2) In the case that only the rod end attachment is additionally ordered (without lock nut)

The rod end attachment is tightened to the piston rod, and a drill hole is made on the piston rod for delivery.



If a drill hole is unnecessary, advise us.



**Dimensional table/rod end eye (T-end)**

Symbol Bore	Rod B							Rod A						
	Part code	AV	CE	EF	KK	RA	Set screw	Part code	AV	CE	EF	KK	RA	Set screw
φ32	RTH-14-H	21	50	25	M14×1.5	67	M6	—	—	—	—	—	—	—
φ40	RTH-16-3-H	25	55	30	M16×1.5	72	M6	RTH-20-4-H	31	67	35	M20×1.5	84	M6
φ50	RTH-20-3-H	31	67	40	M20×1.5	96	M6	RTH-27-H	39	78	40	M27×2	107	M6
φ63	RTH-27-H	39	78	40	M27×2	107	M6	RTH-33-1-H	48	94	50	M33×2	123	M6
φ80	RTH-33-H	48	94	50	M33×2	128	M6	RTH-42-1-H	59	112	65	M42×2	146	M8
φ100	RTH-42-H	59	112	65	M42×2	162	M8	RTH-48-4-H	66	135	75	M48×2	185	M10
φ125	RTH-48-3-H	66	125	75	M48×2	178	M10	RTH-64-5-H	88	158	100	M64×3	211	M12
φ140	RTH-56-1-H	78	148	85	M56×2	204	M12	—	—	—	—	—	—	
φ160	RTH-64-4-H	88	158	100	M64×3	217	M12	—	—	—	—	—	—	

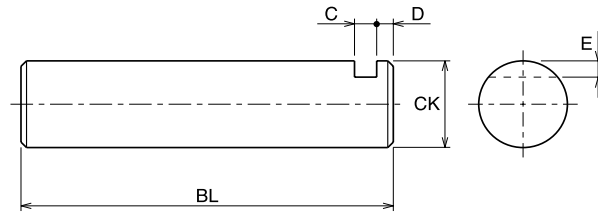
Symbol Bore	CK	ED	EM	ER	LE
φ32	φ12 H9	34	16 <sub>0</sub> <sup>0.27</sup>	R17	19
φ40	φ14 H9	34	20 <sub>0</sub> <sup>0.33</sup>	R17	19
φ50	φ20 H9	58	30 <sub>0</sub> <sup>0.33</sup>	R29	32
φ63	φ20 H9	58	30 <sub>0</sub> <sup>0.33</sup>	R29	32
φ80	φ28 H9	68	40 <sub>0</sub> <sup>0.39</sup>	R34	39
φ100	φ36 H9	100	50 <sub>0</sub> <sup>0.39</sup>	R50	54
φ125	φ45 H9	106	60 <sub>0</sub> <sup>0.46</sup>	R53	57
φ140	φ50 H9	112	65 <sub>0</sub> <sup>0.46</sup>	R56	63
φ160	φ56 H9	118	70 <sub>0</sub> <sup>0.46</sup>	R59	63

**Dimensional table/rod end clevis (Y-end)**

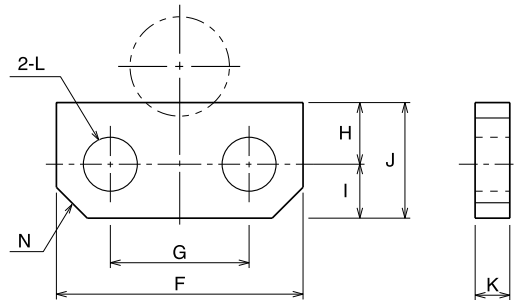
Symbol Bore	Rod B						Rod A					
	Part code	AV	CE	KK	RA	Set screw	Part code	AV	CE	KK	RA	Set screw
φ32	RYH-14-H	21	50	M14×1.5	67	M6	—	—	—	—	—	—
φ40	RYH-16-3-H	25	55	M16×1.5	72	M6	RYH-20-4-H	31	67	M20×1.5	84	M6
φ50	RYH-20-3-H	31	67	M20×1.5	96	M6	RYH-27-H	39	78	M27×2	107	M6
φ63	RYH-27-H	39	78	M27×2	107	M6	RYH-33-1-H	48	94	M33×2	123	M6
φ80	RYH-33-H	48	94	M33×2	125	M6	RYH-42-1-H	59	112	M42×2	143	M8
φ100	RYH-42-H	58	112	M42×2	155	M8	RYH-48-4-H	66	135	M48×2	178	M10
φ125	RYH-48-3-H	68	125	M48×2	170	M10	RYH-64-5-H	90	158	M64×3	203	M12
φ140	RYH-56-1-H	85	148	M56×2	198	M12	—	—	—	—	—	—
φ160	RYH-64-4-H	95	158	M64×3	212	M12	—	—	—	—	—	—

Symbol Bore	BL	CK	CL	CM	CR	CV	CW	ED	ER	J	LE
φ32	42	φ12 H9/f8	32	16 <sub>+0.29</sub> <sup>+0.69</sup>	—	8	8	34	R17	—	19
φ40	50	φ14 H9/f8	40	20 <sub>+0.30</sub> <sup>+0.70</sup>	—	8	10	34	R17	—	19
φ50	72	φ20 H9/f8	60	30 <sub>+0.30</sub> <sup>+0.70</sup>	—	10	15	58	R29	—	32
φ63	72	φ20 H9/f8	60	30 <sub>+0.30</sub> <sup>+0.70</sup>	—	10	15	58	R29	—	32
φ80	92	φ28 H9/f8	80	40 <sub>+0.31</sub> <sup>+0.91</sup>	31	10	20	65	R33	22	39
φ100	115	φ36 H9/f8	100	50 <sub>+0.32</sub> <sup>+0.92</sup>	43	13	25	90	R48	24	54
φ125	138	φ45 H9/f8	120	60 <sub>+0.34</sub> <sup>+0.94</sup>	45	14	30	100	R51	28	57
φ140	152	φ50 H9/f8	130	65 <sub>+0.34</sub> <sup>+0.94</sup>	50	18	32.5	100	R55	28	63
φ160	162	φ56 H9/f8	140	70 <sub>+0.36</sub> <sup>+0.96</sup>	54	18	35	110	R59	33	63

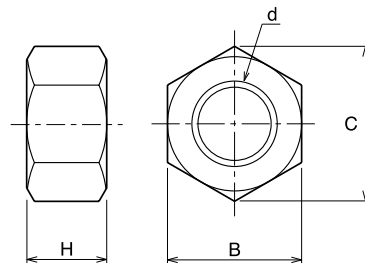
● Parallel pin



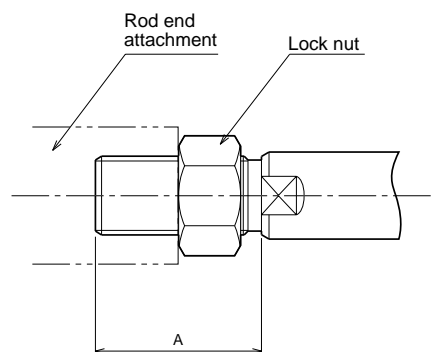
● Keeper plate



● Lock nut



● Thread length with lock nut



The standard fitting length of the rod end attachment and piston rod is approximately 80% of the thread diameter. When using a lock nut, it is required to lengthen the thread length (A) as shown in the figure above. If you order a cylinder with lock nut attached (symbol: K), the thread length (A) is as shown in the table on the next page.

**Dimensional table/Parallel pin**

Symbol Bore	Rod A, B				
	BL	C	CK	D	E
φ32	42	4	φ12f8	4	2
φ40	50	4	φ14f8	4	2
φ50	72	5.5	φ20f8	4.5	3
φ63	72	5.5	φ20f8	4.5	3
φ80	92	5.5	φ28f8	4.5	4
φ100	115	7	φ36f8	6	5
φ125	138	7	φ45f8	7	5.5
φ140	152	10	φ50f8	8	7
φ160	162	10	φ56f8	8	7

Note) ● For the rod A type, the bore is within the range from 40 mm to 125 mm.

**Dimensional table/Keeper plate**

Symbol Bore	Rod A, B								Mounting bolt
	F	G	H	I	J	K	L	N	
φ32	19	10	5.5	4.5	10	3	φ5.5	C2.5	M5
φ40	19	10	5.5	4.5	10	3	φ5.5	C2.5	M5
φ50	32	17	8	8	16	4.5	φ6.6	C4	M6
φ63	32	17	8	8	16	4.5	φ6.6	C4	M6
φ80	38	23	7	8	15	4.5	φ6.6	C4	M6
φ100	44	24	11	11	22	6	φ9	C3	M8
φ125	60	32	15	13	28	6	φ11	C10	M10
φ140	65	41	15	15	30	9	φ13	C10	M12
φ160	65	41	15	15	30	9	φ13	C10	M12

Note) ● For the rod A type, the bore is within the range from 40 mm to 125 mm.

**Dimensional table/Lock nut**

Symbol Bore	Rod B					Rod A				
	Parts model	B	C	d	H	Parts model	B	C	d	H
φ32	LNH-14F-H	22	25.4	M14×1.5	11	—	—	—	—	—
φ40	LNH-16F-1-H	24	27.7	M16×1.5	13	LNH-20F-2-H	30	34.6	M20×1.5	16
φ50	LNH-20F-2-H	30	34.6	M20×1.5	16	LNH-27F-H	41	47.3	M27×2	22
φ63	LNH-27F-H	41	47.3	M27×2	22	LNH-33F-H	50	57.7	M33×2	26
φ80	LNH-33F-H	50	57.7	M33×2	26	LNH-42F-1-H	65	75	M42×2	34
φ100	LNH-42F-1-H	65	75	M42×2	34	LNH-48F-2-H	75	86.5	M48×2	38
φ125	LNH-48F-2-H	75	86.5	M48×2	38	LNH-64F-2-H	95	110	M64×3	51
φ140	LNH-56F-1-H	85	98.1	M56×2	45	—	—	—	—	—
φ160	LNH-64F-2-H	95	110	M64×3	51	—	—	—	—	—

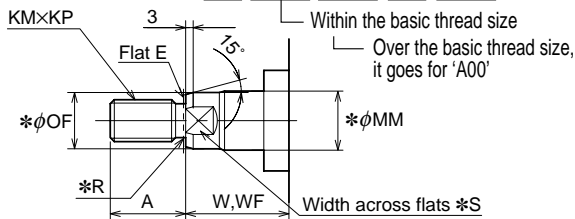
**Dimensional table/A when lock nut is used (long thread)**

Symbol Bore	Rod B		Rod A	
	A	KK	A	KK
φ32	28	M14×1.5	—	—
φ40	32	M16×1.5	40	M20×1.5
φ50	40	M20×1.5	54	M27×2
φ63	54	M27×2	66	M33×2
φ80	66	M33×2	84	M42×2
φ100	84	M42×2	96	M48×2
φ125	96	M48×2	128	M64×3
φ140	112	M56×2	—	—
φ160	128	M64×3	—	—

**Special specification at the rod end For rod size B**

(Please consult us in case of 'A rod' or the case that doesn't go for 'A01' or 'A00' below.)

- You can easily order following categorized items using the Semi-standard symbols and dimensional parameters.  
(No need to specify dimensional parameters if you would apply the basic dimensions.)

**How to order** [Series] [Model number] – X [Semi-standard symbols] [Dimensional parameters]Semi-standard symbols: **A01** Parameter KM and KP need to be specified as a pair.Optional parameters: **A KM KP W WF****The basic dimension table (=160H-1 Standard dimension)**

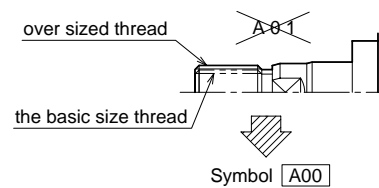
Bore	A	KM	KP	*MM	*OF	*R	*S	W (FA type)	WF (Others)
φ32	18	14	1.5	φ18	φ17	1	14	35	25
φ40	22	16	1.5	φ22	φ21	1.6	17	35	25
φ50	28	20	1.5	φ28	φ26	1.6	22	41	25
φ63	36	27	2	φ36	φ34	2	30	48	32
φ80	45	33	2	φ45	φ43	2	38	51	31
φ100	56	42	2	φ56	φ54	2	50	57	35
φ125	63	48	2	φ70	φ68	2	60	57	35
φ140	75	56	2	φ80	φ78	2	70	58	35
φ160	85	64	3	φ90	φ88	3	Drill hole	57	32

Occasion ■ Slight dimension change on the basis of 160H-1 series standard thread size.

Note

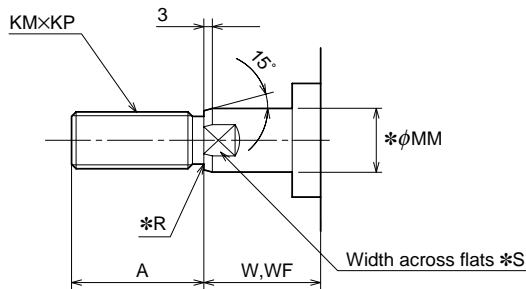
- A01's basic dimension shows the original 160H-1's standard itself. Don't use semi-standard symbols to avoid confusion in such a case.

- In case of over sized thread, the symbol should be 'A00', not 'A01'.



ex.

- bore:40mm, rod:B, thread size:M16×2, WF:80mm  
(order)160H-1 1CA40BB250-AB-X A01  
KM-16, KP-2, WF-80  
(manufacturing) rod end style A=22, KM=16, KP=2, WF=80, φMM=φ22, φOF=φ21, R=1.6, S=17
- bore:100mm, rod:B, thread size:M45×1.5  
'A01' can't be used. Refer to the symbol 'A00'.

Semi-standard symbols: **A00** Parameter KM and KP need to be specified as a pair.Optional parameters: **A KM KP W WF****The basic dimension table**

Bore	A	KM	KP	*MM	*R	*S	W (FA type)	WF (Others)
φ32	25	16	1.5	φ18	1	14	35	25
φ40	30	20	1.5	φ22	1	19	35	25
φ50	35	24	1.5	φ28	1	24	41	25
φ63	45	30	1.5	φ36	1.6	30	48	32
φ80	60	39	1.5	φ45	1.6	41	51	31
φ100	75	48	1.5	φ56	1.6	50	57	35
φ125	95	64	2	φ70	2	65	57	35
φ140	110	72	2	φ80	2	75	58	35
φ160	120	80	2	φ90	2	85	57	32

Occasion ■ In case of ordering over sized thread  
■ In case of applying the standard thread size of 70/140H-8 series

Note

- On this symbol 'A00' the basic dimension is completely different from that of 'A01'. 'A00's basic is originally based on the standard of 70/140H-8.

ex.

- bore:63mm, rod:B, 'A00' basic dimensions  
(order)160H-1R 2FA63BB300-BC-X A00  
(manufacturing) rod end style A=45, KM=30, KP=1.5, W=48, φMM=φ36, R=1.6, S=30
- bore:100mm, rod=B, thread size M45×1.5 other dimensions from 'A01' basic  
(order)160H-1 2CB100BR500-AB-X A00  
KM-45, KP-1.5, A-56  
(manufacturing) rod end style A=56, KM=45, KP=1.5, WF=35, φMM=φ56, R=1.6, S=50
- bore:50mm, rod:B, thread size:M22×1.5, WF:100mm, other dimensions from the basic  
(order)160H-1 2CA50BB500-AB-X A00  
KM-22, KP-1.5, WF-100  
(manufacturing) rod end style A=35, KM=22, KP=1.5, WF=100, φMM=φ28, R=1, S=24

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

**Installation of cylinder**

Take into consideration the points shown below.  
We cannot be responsible for faults due to inappropriate installation of the cylinder.

(1) Fixed type

SD type

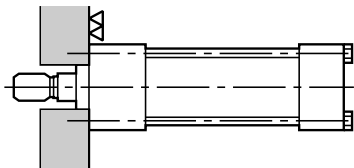
- Thread precision of tie rod: JIS 6g
- Tightening torque: Specified tie rod tightening torque

**Specified tie rod tightening torque table.  
(Note:Molybdenous Grease should be used.)**

Bore (mm)	φ32	φ40	φ50·63	φ80·100
Tie rod thread	M6×1	M8×1	M12×1.25	M16×1.5
Tightening torque N·m	8	22	70	170

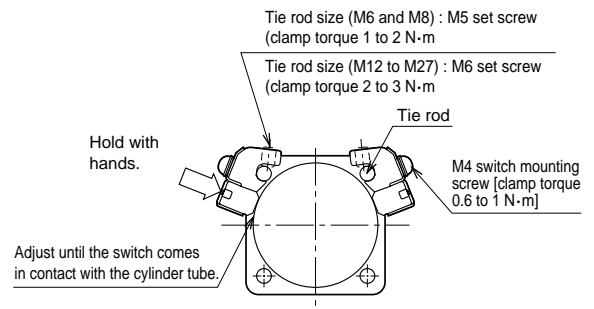
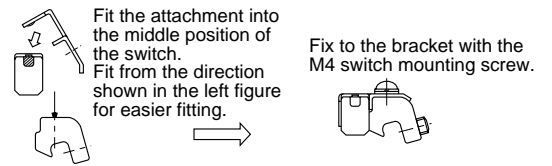
  

Bore (mm)	φ125	φ140	φ160
Tie rod thread	M22×1.5	M24×1.5	M27×2
Tightening torque N·m	460	610	850



**Setting method of switch detecting position**

**AX Type**



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





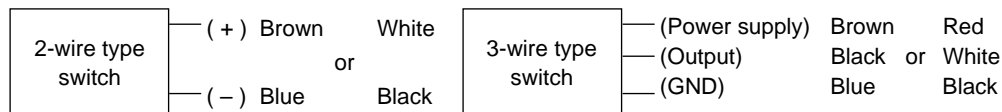
# Switch specifications

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## Important precautions

## ⚠ Caution

- **Supply voltage, current, load capacity**  
Avoid the voltage and current out of the specifications of the switches, and the load exceeding the contact open/close capacity. DO NOT apply AC voltage to the switches applicable to DC voltage. Application of wrong voltage or current may lead to malfunctions, breakage, or inflammable damages of the switches.
- **Shutdown of power supply**  
Prior to wiring and connection, be sure to shut down the power supply. Otherwise, the operator may get an electric shock.
- **Wrong wiring**  
Perform wiring correctly according to the colors of lead wires.  
If wiring is performed incorrectly, the inflammable damage or breakage of the switch will occur, even if the wrong wiring is momentary.



- **No load connection**  
DO NOT connect the switches direct to the power supply.  
Be sure to connect them through load devices, such as relays and programmable controllers.  
If the switches are connected direct to the power supply, the switches or load devices will be damaged or inflammable damages will occur, even if the connection is momentary.

## Correct use (common to all switches)

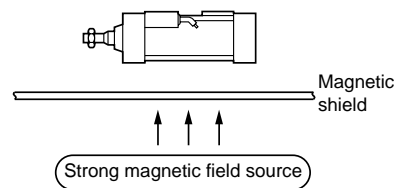
## 1. Selection

When selecting switches, be sure to follow the sequences in the "Switch selection materials".

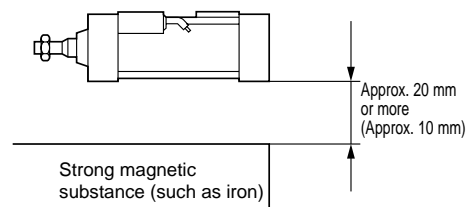
## 2. Working environmental conditions

- 1) These products do not have explosion-protected structure. DO NOT use them in the places where dangerous materials, including firing and ignitable objects, are present.
- 2) Use the switches indoors only.
- 3) Use the switches within the temperature range shown in the specifications of the switches. In the case of a hydraulic cylinder, the temperature of oil in it may be increased depending on the working conditions. Provide countermeasures in a hydraulic circuit, or install an oil cooler.
- 4) Use the switches within the allowable range of vibrations and shocks shown in the specifications.
- 5) DO NOT use the switches in the atmosphere of chemicals.
- 6) DO NOT use the switches in the places where the cylinders or switches are subjected to chips, cutting oil, and water. Otherwise, cords may be damaged or the switches may be malfunctioned.
- 7) Pay close attention to approach of cylinders.
  - When two or more switch set cylinders placed parallel and closely are used, the switch may be malfunctioned due to mutual magnet interference. Thus, keep one cylinder tube from the other by 50 mm or more. If allowable distances are specified for respective cylinder series, observe them.

- Be sure to check the operation of the switches before actual use.
- 8) **Strong magnetic field**
    - Prior to the use of the switches near a strong magnetic field, install the magnetic shield with steel plates (install it 20 mm or more distant from the cylinders and switches).
    - Otherwise, the switches may work incorrectly due to the influence of the magnetic field.



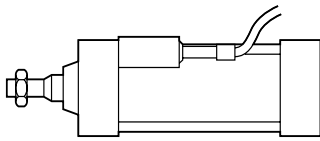
- 9) **Strong magnetic substance**
  - Keep away strong magnetic substances (such as iron) from cylinders outside and switches. Separate them by approx. 20 mm or more (as a guide). For compact cylinders, separate them by approx. 10 mm or more (KR and ZR type switches, etc.).
  - Otherwise, the switches may work incorrectly due to the influence of the magnetic field.





### 3. Wiring

- 1) Prior to wiring, be sure to shut down the power supply.
  - Otherwise, the operator may get an electric shock during working, or the switches or load devices may be damaged.
- 2) Pay attention to avoid bending, pulling, twist of the switch cord. Especially, provide appropriate measures to avoid any load applied to the end of the switch cord, including the fixing of the switch cord to the tie rod.



- Otherwise, the cord may be damaged, causing broken wires. Especially, any load applied to the end of the cord may lead to the damaged electric circuit boards in the switches.
  - When fixing the cord to the tie rod, do not clamp the cord excessively. Otherwise, the cord may be damaged, causing broken wires.
- 3) The larger bending radius (twice of the cord dia. or larger) is better for the cord.
    - Otherwise, the cord may be damaged, causing broken wires.
  - 4) If the connection distance is long, fix the cord every 20 cm to avoid a sag in the cord.
  - 5) When laying the cord on the floor, protect it by covering with metallic tubes.
    - Otherwise, the coating of the cord may be damaged, leading to the broken wires or short-circuit.
  - 6) The distance between the switches and load devices or power supply must be 10 m or shorter.
    - Otherwise, inrush current may occur to the switches during operation, causing the damaged switches. For the countermeasures against inrush current, refer to the "Precautions for contact protection".
  - 7) DO NOT bind the cord with high-voltage cables for other electric appliances, the power supply, nor with the power supply cord. NEVER perform wiring near these cables.
    - Otherwise, noises may enter the switch cord from the high-voltage cables and power source, or power supply cable, causing the malfunctions of the switches or load devices. It is recommended that the cord is protected with a shield tube.

### 4. Mounting

- 1) Tighten the switch mounting screws with the specified clamp torque.
 

If the clamp torque exceeds the specified torque, the switch may be damaged.

If the clamp torque is smaller than the specified torque, the switch may be loosened.
- 2) Adjust the switch position until the switch detecting position is centered on the switch working range.

### 5. Maintenance and inspection

For stable working of the switches for a long period, perform maintenance and inspection of the items shown below similarly to general electric appliances.

DO NOT disassemble the switches.

- 1) Off-center of switch mounting position and looseness of mounting screws
- 2) Working statuses of indicator lamps and load devices
- 3) Abnormalities in environmental conditions (vibrations, shocks, temperature, etc.)
- 4) Attachment of metallic dusts and chips
- 5) Presence of cutting oil and water
- 6) Abnormalities in wiring, wired parts, and cords.

### 6. Storage

- 1) Prior to storage, consider the storage temperature, and provide countermeasures against rusts, inferiority in cords, vibrations, and shocks.
- 2) Store the switches in cool and dark ( $-10 \sim 25^{\circ}\text{C}$ ) places.

### 7. Disposal

- 1) DO NOT put them into fire. Otherwise, poisonous gas may be generated.
- 2) Dispose them as nonflammable wastes.

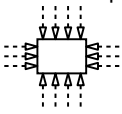
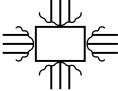

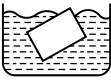
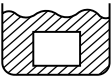
### Protective structure

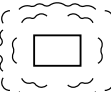
■ IEC (International Electrotechnical Commission) standards (IEC529)

IP-6 □

Grade of protection from ingress of water

Grade of protection of human body and from solid foreign matters

Grades	Contents of protection		Test methods
4	Protection from splashes 	No detrimental influence occurs even if water is splashed from any direction.	Splash water from all the directions for 10 minutes.
5	Protection from water injection 	No detrimental influence occurs even if water is injected direct from any direction.	Inject water from all the directions for 15 minutes in total.
6	Protection from strong water injection 	No ingress of water occurs even if water is strongly injected direct from any direction.	Inject water from all the directions for 15 minutes in total.
7	Protection from a soak 	No ingress of water occurs even if the object is soaked in water under the specified pressure and for the specified period.	Soak in 1 m from the water surface for 30 minutes.
8	Protection from submergence 	The object can be used with submerged.	Individually specified.

Grades	Contents of protection	
6	Dusts proof type 	No ingress of dusts occur.

(International Protection)

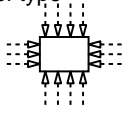
■ JEM (The Japan Electrical Manufacturers' Association) standards

IP-6 □ G

Grade of protection from ingress of oil

Grade of protection from ingress of water

Grade of protection of human body and from solid foreign matters

Grades	Contents of protection	
G	Oil proof type 	No ingress of oil drops or splashes from any direction occurs.

Same as IEC529

Same as IEC529

### General comparison of contact type with no contact type

Items \ Contact type	Contact	No contact
Reliability	Low, due to the mechanical contacts	High, due to the non-presence of the mechanical contacts
Number of working time (durability)	Several millions to ten millions times	Semi-eternal
Chattering	Yes	No
Responsibility	Slow	Fast
Vibration and shock resistance	Low	High
Difference	Large	Small
Number of lead wires	2	2 or 3
Price	Low	High

### Switch terminologies

#### Power supply voltage

The voltage to actuate the switch main circuit.  
(3-wire no contact type)

#### Load voltage (working voltage)

The voltage applicable to switches.  
(For the 3-wire no contact type, the voltage applicable to the output part.)

#### Load current (working current)

The current applicable to switches.  
(For the 3-wire no contact type, the current flowing in the output part.)

#### Consumption current

The current flowing in the switch main circuit.  
(3-wire no contact type)

#### Inner drop voltage

The voltage generated between the poles of a switch, + and -, (for the 3-wire no contact type, between the output and the GND) when a switch is set to the ON position. Thus, the voltage applied to load devices when the switch is set to the ON position decreases according to the inner drop voltage.

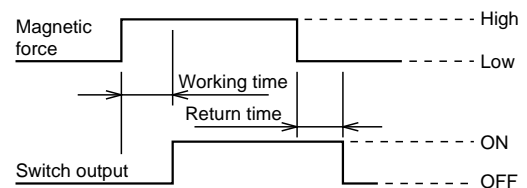
#### Leakage current

The current flowing between the poles of a switch, + and -, (for the 3-wire no contact type, between the output and the GND) when a switch is set to the OFF position.

#### Working time, return time

**Working time:** the time required for a switch to enter the ON status from the OFF status after a magnetic force reaches the level required for the switch to enter the ON status.

**Return time:** the time required for a switch to enter the OFF status from the ON status after a magnetic force reaches the level required for the switch to enter the OFF status.



#### Response time

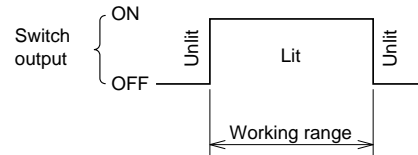
This term means both of the working time and return time. Since they are almost same in the case of the no contact type, this term is used for indicating both of them.

## Types of switch indicator lamp

## 1) 1-lamp type

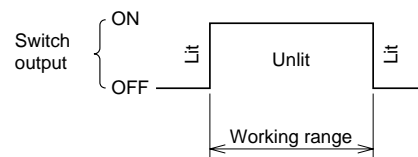
## a) Lights with switch ON

The indicator lamp lights up when the switch detects the piston position to indicate that the switch enters the ON status. While the piston position is not detected, the indicator lamp remains unlit to indicate that the switch is in the OFF status.



## b) Lights with switch OFF

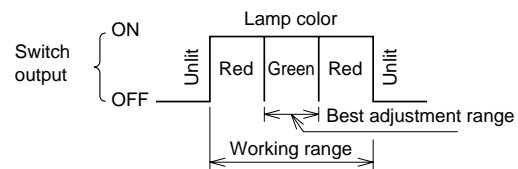
The indicator lamp becomes unlit when the switch detects the piston position to indicate that the switch enters the ON status. While the piston position is not detected, the indicator lamp remains lit to indicate that the switch is in the OFF status.



## 2) 2-lamp type

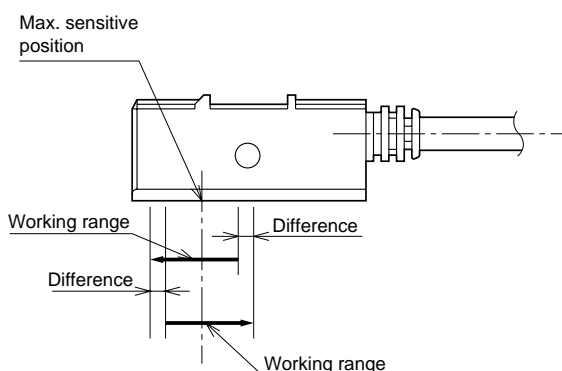
The indicator lamp lights up when the switch detects the piston position to indicate that the switch enters the ON status. At that time, either of the red or green indicator lamps lights up according to the detected piston position. The range within which the green indicator lamp remains lit is called the best adjustment range.

When mounting a switch, adjust the mounting position so that the detecting position of the switch is centered on the best adjustment range.

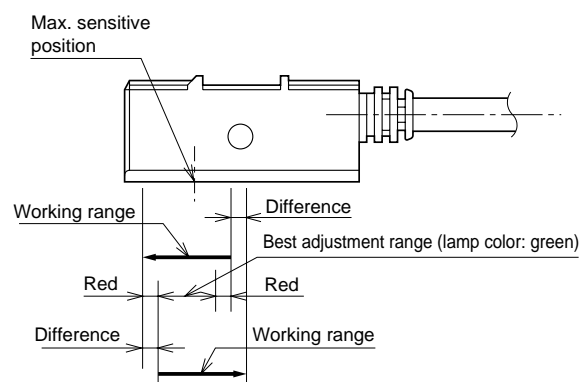


## The max. sensitive position and working range/difference of switch

## [ 1-lamp type ]



## [ 2-lamp type ]



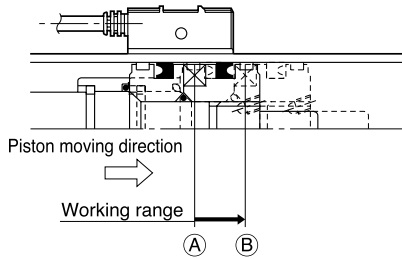
- When mounting a switch, adjust the mounting position so that the detecting position of the switch is centered on the working range (for the 2-lamp type, the center of the range within which the green indicator lamp remains lit).
- In case of the position detection at both ends of the cylinder stroke, mount the switch at the "Most suitable setting position of switch" (refer to the catalogue of each cylinder) to center the detecting position of the switch on the working range.

- Notes)
- For the max. sensitive position of each switch, refer to the dimensional drawings of each switch.
  - For the working range and difference of each switch, refer to the catalogue of the applicable cylinder.

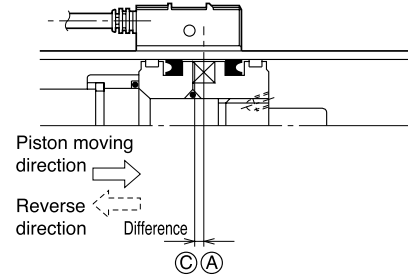
## Descriptions of switch working

### 1) Magnetic proximity type working

The piston position is detected when the piston with a magnet equipped passes under the magnetic proximity switch mounted on the periphery of the tube. The cylinder stroke position can be externally detected without contact.



If the piston moves toward the → direction, the switch enters the ON status when the magnet reaches the position (A).  
The ON status continues from when the magnet reaches the position (A) until it reaches the (B). The period is called the working range.



If the piston is moved toward the → direction, the switch enters the ON status when it reaches the position (A). When the piston is moved in the reverse ← direction, the ON status continues until it reaches the position (C).  
The period required for moving between the (A) and (C) is called a difference.  
It occurs at the both ends of the working range.

Note) The figures above show the AX type switch.

## Check of conditions when selecting switches

Items	Contents
1. Series of cylinder	The applicable shape of a switch differs depending on the cylinder series.
2. Type of load device	Small relay, programmable controller, small solenoid, etc.
3. Working voltage and working current of load device	Stationary voltage value, surge voltage value, stationary current value, inrush current value
4. Actuating voltage and actuating current, and return voltage and return current of load device	Check the adaptability of electrical specifications of a switch.
5. Working time of load device (ms)	The time when a load device is actuated after receiving the input from a switch
6. Cylinder working speed (mm/S)	Required for detection at the intermediate stroke.
7. Working frequency of switch (number of times/period)	The number of working times indicating durability of the contact type differs from that of the no contact type.
8. Control system	The sequence circuit of a switch against the motion of a cylinder. Especially, check for the connection in series and the connection in parallel.
9. Environmental conditions	Temperature, vibrations, shocks, splashing condition of cutting fluid and water, strength of neighboring magnetic field, presence of strong magnetic substance (iron and chips), presence of power source of other electric appliances (motor, etc.)

## Switch selection procedures

When selecting a switch, the items below need to be decided.

Check	Selection item	Selection method
<input type="checkbox"/> 1	Selection of cylinder	Select a cylinder, referring to the cylinder selection materials. Select appropriate switches among the switches applicable to the selected cylinder (referring to the switch specifications of each series).
<input type="checkbox"/> 2	Selection of load device type	Select the type of load devices required for control, referring to the specifications of loads applicable to each switch (IC circuit, small relay, programmable controller, small solenoid, etc.).
<input type="checkbox"/> 3	Selection of power supply to control circuit	DC (voltage value, voltage fluctuations, current capacity) AC (voltage value, voltage fluctuations, current capacity, etc.)
<input type="checkbox"/> 4	Selection of working voltage and working current of switch	Select the working voltage and working current of a switch so that the voltage value (for AC and DC) and current value during the stationary state are within the working voltage (current) range of the switch. For the contact type, select so that they do not exceed the max. open/close capacity (voltage X current). Check the adaptability to load devices, referring to the inner drop voltage value, leakage current value, consumption current value, etc.
<input type="checkbox"/> 5	Selection of contact (output) protective circuit	When using induction load devices (small relay, small solenoid) or capacity load devices (cable extension of 10 m or more, condenser, programmable controller of AC input type, etc.), surge voltages and inrush current will occur when the switch is set to the ON or OFF position. Prior to the use of them, provide the contact (output) protection (refer to the specifications of switches and the handling instructions of each switch). When using induction load devices, it is recommended to use the induction load devices incorporating the protective circuit for surge voltages on the load side.
<input type="checkbox"/> 6	Selection of contact type or no contact type	If high durability is required due to high use frequency, select the no contact type. When selecting, refer to the table of the comparison of the contact and no contact types.
<input type="checkbox"/> 7	Selection depending on environmental conditions	Select referring to the table in the next page.
<input type="checkbox"/> 8	Check of response speed	Check the working status of the load devices with the working time, return time, and response speed of the switch, and the working time of the load devices, referring to the descriptions in the next page.
<input type="checkbox"/> 9	Cord length	The types of 1.5 m and 5 m have been standardized (excepting cords for some switches). For details, refer to the catalogue of each cylinder.

## Environmental conditions

1) Working temperature

Use switches within the ambient temperature range described in the specifications of each switch. For hydraulic cylinders, oil temperature may be increased depending on the working conditions. Provide some countermeasures in the hydraulic circuit or install an air conditioner.

2) Criteria for selection in case that switches are splashed with cutting fluid or water

Conditions	Criteria for selection
When switches are splashed with cutting fluid or water always or frequently	Use the cutting fluid proof type switches (WR, WS types) even if cutting fluid or water is mist, or they are splashed only several times a day. However, in the case of the use of switches in the places where are splashed with nonaqueous cutting fluid of the type 2, contact us.
In cutting fluid or water	DO NOT use even if momentarily.

3) Other environmental conditions

The places where dangerous materials, including firing and ignitable objects, are present

The places where the atmosphere of chemicals, etc. is present

} ⇒ DO NOT use under these conditions.

The places where are subjected to chips

The places where strong magnetic fields are generated

When strong magnetic substances (iron, etc.) approach switches or cylinder

} ⇒ Provide countermeasures referring to the recommended mounting locations specified in the handling instructions of the switches.

The places where are subjected to vibrations and shocks

⇒ Refer to the vibration and shock resistance specifications of each switch.

The places where are subjected to direct sunlight (outdoor)

⇒ Use only indoors. In the places where are subjected to direct sunlight, provide covers.

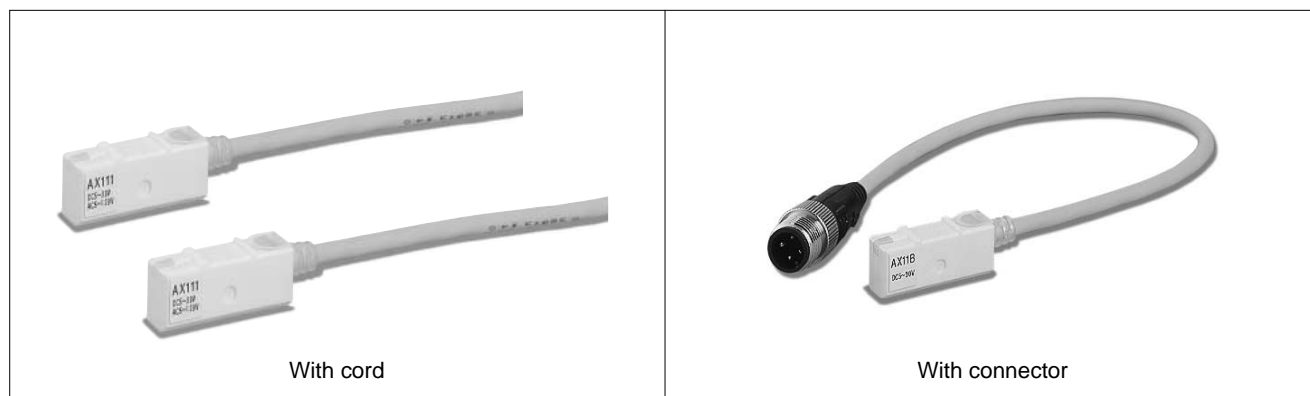
## Detectable cylinder piston speed

- When mounting the switch on the intermediate position, be sure to adjust the maximum cylinder speed to 300 mm/s or slower on account of the response speed of the load relays, etc.
- If the piston speed is excessively high, the switch working time becomes shorter, although the switch works, and load devices including relays may not work.

Determine the detectable cylinder piston speed, referring to the formula below.

$$\text{Detectable piston speed (mm/s)} = \frac{\text{working range of switch (mm)}}{\text{working time of load device (ms)}} \times 1000$$

- Notes)
- Refer to the materials related to the working time of load devices including relays of each manufacturer.
  - Apply the minimum value to the working range of a switch, and apply the maximum value to the working time of a load device.



## Specifications

Code	With cord (1.5m)	AX101	AX111	—	—	—	
	With cord (5m)	AX105	AX115	—	—	AX125	
	With connector (AC type)	—	—	AX11A	—	—	
	With connector (DC type)	—	—	—	AX11B	—	
Load voltage range	AC : 5 - 120V DC : 5 - 30V		AC : 5 - 120V		DC : 5 - 30V AC: 120 V or less DC: 30 V or less		
Load current range	AC : 5 - 20mA DC : 5 - 40mA		5 - 20mA		5 - 40mA AC: 20 mA or less DC: 40 mA or less		
Maximum open/close capacity	AC : 2VA DC : 1.5W						
Inner drop voltage	2V (at 10mA) 3V or less (at 40mA)					0V	
Current leak	0μA	10μA or less				0μA	
Working time	1ms or less						
Return time	1ms or less						
Insulation resistance	100 M.Ω or more at 500 MV DC (between case and cord)						
Voltage-proof	AC1500V 1 min (between case and cord)						
Shock resistance	294m/s <sup>2</sup> (Non-repetition)						
Vibration-proof	Total amplitude 1.5mm, 10 - 55Hz (1 sweep, 1 min) 2 hours in X, Y, and Z directions						
Ambient temperature	-10 - +70°C (at non-freezing condition)					-10 - +100°C (at non-freezing condition)	
Wiring method	0.3mm <sup>2</sup> 2-core Outer diameter 4mm Oil-proof cabtyre cord						
Protective structure	IP67 (IEC standards), JIS C0920 (dusts-proof, immersion-proof type)						
Contact protective circuit	Note) None	Equipped				Note) None	
Indicating lamp	LED (red lamp lights up during ON)					None	
Electric circuit							
Applied load	Small relay • Programmable Controller					IC circuit, small relay, programmable controller	

- Notes
- When using induction load devices (small relay, etc.), be sure to provide the protective circuit (SK-100).
  - For the cord length and connector pin position of the connector type, refer to the dimensional drawings.
  - When using the AC voltage input programmable controller as a load, select the switch with contact protective circuit.

## Applicable hydraulic cylinder

Series	Bore
35S-1R	φ20, φ25, φ32, φ40, φ50, φ63
HQS2R	φ32, φ40, φ50, φ63, φ80, φ100
100S-1R	φ32, φ40, φ50, φ63, φ80, φ100
160S-1R	φ32, φ40, φ50, φ63, φ80
210S-1R	φ32, φ40, φ50, φ63, φ80
35Z-1R	φ20, φ25, φ32
35H-3R	φ32, φ40, φ50, φ63, φ80, φ100

Series	Bore
100Z-1R	φ20, φ25, φ32
100H-2R	φ32, φ40, φ50, φ63, φ80, φ100, φ125
70/140H-8R	φ32, φ40, φ50, φ63, φ80, φ100, φ125, φ140
160H-1R	φ32, φ40, φ50, φ63, φ80, φ100, φ125, φ140, φ160

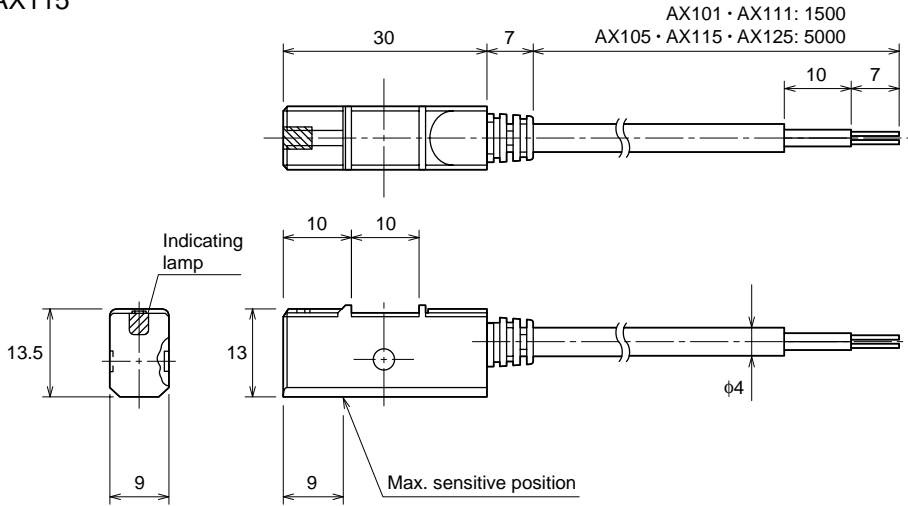
Series	Bore
210C-1R	φ40, φ50, φ63, φ80
70/140Y-2R	φ32, φ40, φ50, φ63, φ80, φ100, φ125
35P-3R	φ32, φ40, φ50, φ63, φ80, φ100
70/140P-8R	φ32, φ40, φ50, φ63, φ80, φ100



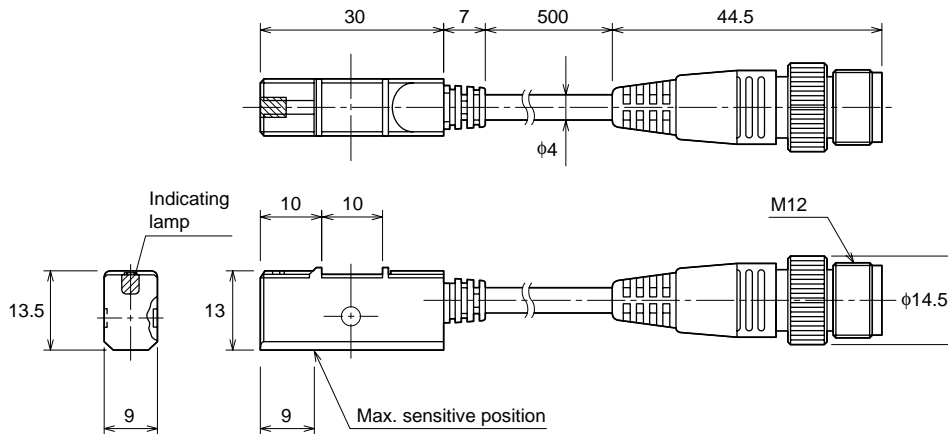
Unit: mm

## Dimensional Drawing

- Cord type  
AX101 • AX105  
AX111 • AX115  
AX125

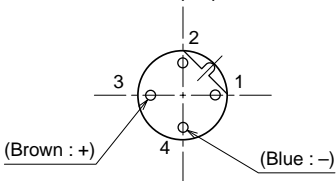


- Connector type  
AX11A • AX11B



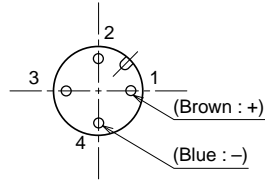
### AX11A (AC type)

Connector pin position



### AX11B (DC type)

Connector pin position

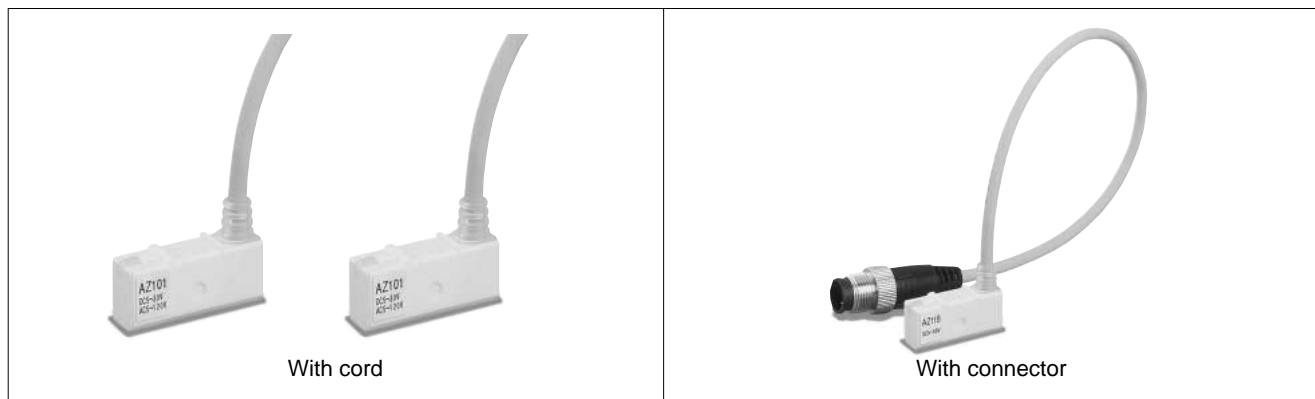


### Applicable counter connectors

Manufacturers	Connector series name	
Correns Co., Ltd.	VA connector	VA-4DS, VA-4DL
Omron Corporation	XS2 sensor I/O connector	XS2
Hirose Electric Co., Ltd.	Connector for FA sensor	HR24

• For details, refer to the catalogues of the manufacturers' products.

- No. of connector standards  
Models M12X1 screw locking
- IEC 947-5-2
- DIN/VDE 0660 part 208 A2
- NECA (The Japan Electric Control Equipment Industry Association) 4202  
Connector for FA sensor



## Specifications

Code	With cord (1.5m)	AZ101	AZ111	—	—	—	
	With cord (5m)	AZ105	AZ115	—	—	AZ125	
	With connector (AC type)	—	—	AZ11A	—	—	
	With connector (DC type)	—	—	—	AZ11B	—	
Load voltage range	AC : 5 - 120V DC : 5 - 30V		AC : 5 - 120V	DC : 5 - 50V	AC: 120 V or less DC: 30 V or less		
Load current range	AC : 5 - 20mA DC : 5 - 40mA		5 - 20mA	5 - 40mA	AC: 20 mA or less DC: 40 mA or less		
Maximum open/close capacity	AC : 2VA DC : 1.5W						
Inner drop voltage	2V (at 10mA) 3V or less (at 40mA)					0V	
Current leak	0 $\mu$ A	10 $\mu$ A or less				0 $\mu$ A	
Working time	1ms or less						
Return time	1ms or less						
Insulation resistance	100 M $\Omega$ or more at 500 MV DC (between case and cord)						
Voltage-proof	AC1500V 1 min (between case and cord)						
Shock resistance	294m/s <sup>2</sup> (30G) (Non-repetition)						
Vibration-proof	Total amplitude 1.5mm, 10 - 55Hz (1 sweep, 1 min) 2 hours in X, Y, and Z directions						
Ambient temperature	-10 - +70°C (at non-freezing condition)						
Wiring method	0.3mm <sup>2</sup> 2-core Outer diameter 4mm Oil-proof cabtyre cord					-10 - +100°C (at non-freezing condition)	
Protective structure	IP67 (IEC standards), JIS C0920 (dusts-proof, immersion-proof type)						
Contact protective circuit	Note) None	Equipped				Note) None	
Indicating lamp	LED (red lamp lights up during ON)					None	
Electric circuit							
Applied load	Small relay • Programmable Controller					IC circuit, small relay, programmable controller	

- Notes) • When using induction load (including a small relay) for the switch without contact protective circuit, be sure to provide the protective circuit (SK-100) for the load.  
 • For the cord length and connector pin position of the connector type, refer to the dimensional drawings.  
 • When using the AC voltage input programmable controller as a load, select the switch with contact protective circuit.

## Applicable hydraulic cylinder

Series	Bore
35S-1R	$\phi$ 20, $\phi$ 25, $\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63
HQS2R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100
100S-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100
160S-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80
210S-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80
35Z-1R	$\phi$ 20, $\phi$ 25, $\phi$ 32
35H-3R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100

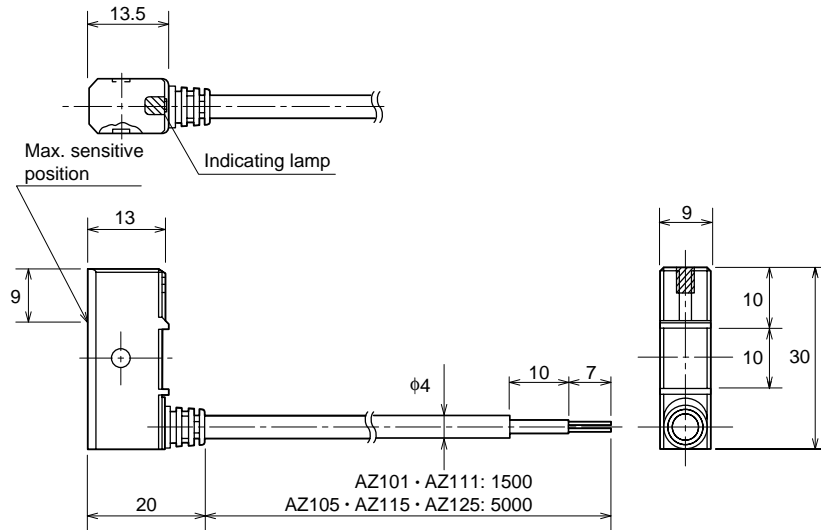
Series	Bore
100Z-1R	$\phi$ 20, $\phi$ 25, $\phi$ 32
100H-2R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125
70/140H-8R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125, $\phi$ 140
160H-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125, $\phi$ 140, $\phi$ 160

Series	Bore
210C-1R	$\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80
70/140Y-2R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125
35P-3R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100
70/140P-8R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100

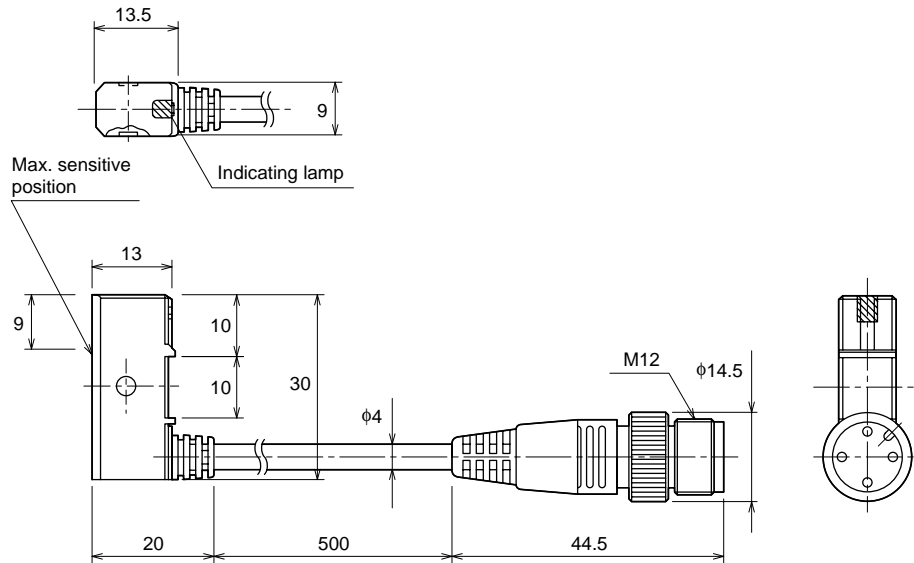
Unit: mm

## Dimensional Drawing

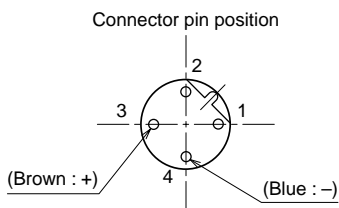
- Cord type  
AZ101 • AZ105  
AZ111 • AZ115  
AZ125



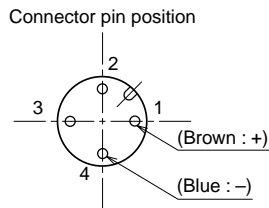
- Connector type  
AZ11A • AZ11B



AZ11A (AC type)



AZ11B (DC type)

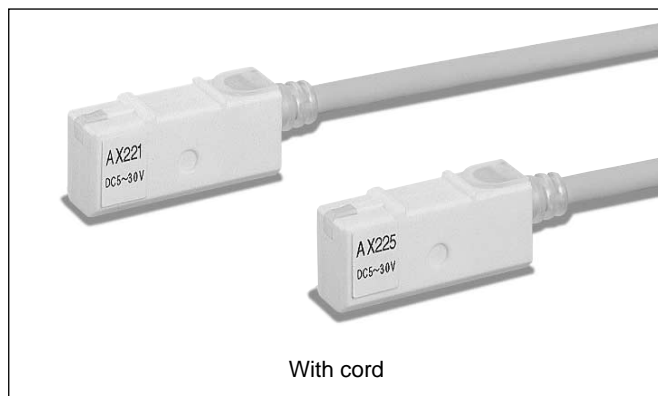


### Applicable counter connectors

Manufacturers	Connector series name	
Correns Co., Ltd.	VA connector	VA-4DS, VA-4DL
Omron Corporation	XS2 sensor I/O connector	XS2
Hirose Electric Co., Ltd.	Connector for FA sensor	HR24

• For details, refer to the catalogues of the manufacturers' products.

- No. of connector standards  
Models M12X1 screw locking
- IEC 947-5-2
- DIN/VDE 0660 part 208 A2
- NECA (The Japan Electric Control Equipment Industry Association) 4202  
Connector for FA sensor



### Specifications

Cord	With cord (1.5m)	AX221
	With cord (5m)	AX225
Wiring direction		Rear wiring
Power supply voltage range		DC : 5 - 30V
Load voltage range		DC : 30 V or less
Load current		Max. 200mA (NPN open collector output)
Consumption current		Max. 15mA
Inner drop voltage		At 200 mA, 0.6 V max.
Leak current		At 30 V DC, 10 $\mu$ A max.
Working time		1 ms or shorter
Return time		1 ms or shorter
Insulation resistance		100 M $\Omega$ or more at 500 MV DC (between case and cord)
Voltage-proof		AC 1500 V, 1 min (between case and cord)
Shock resistance		490m/s <sup>2</sup> (Non-repetition)
Vibration-proof		Total amplitude 0.6 mm, 10 Hz to 200 Hz (log sweep 1 hour) in X, Y, and Z directions
Ambient temperature		-10°C to +70°C (at non-freezing condition)
Wiring method		0.3 mm <sup>2</sup> 3-core Outer diameter 4 mm Oil-proof cabtyre cord
Protective structure		IP67 (IEC standards), JIS C0920 (dust-proof, immersion-proof type)
Protective circuit		Equipped
Indicating lamp		LED (red lamp lights up during ON)
Electric circuit	<p>○ Power supply (+, brown) ○ Output (OUT, black) ○ GND (-, blue)</p>	
Applied load	IC circuit, small relay, programmable controller	

### Applicable hydraulic cylinder

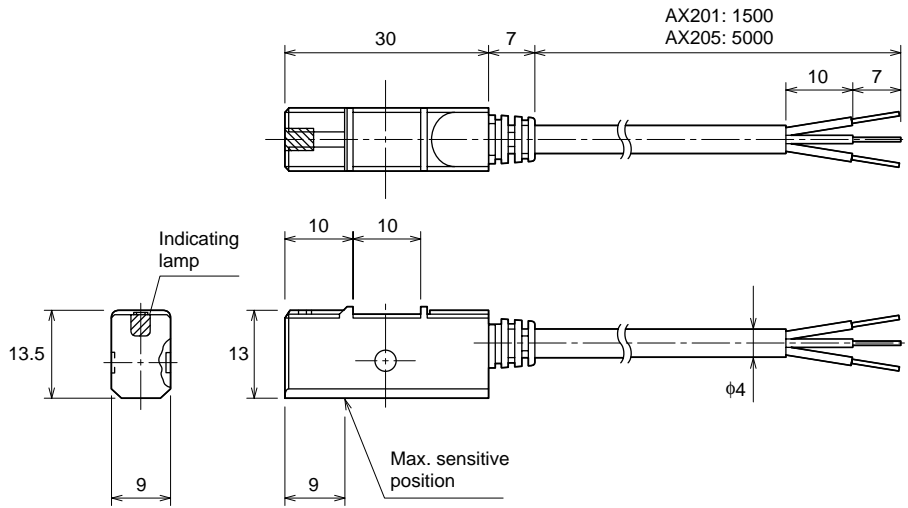
Series	Bore
35S-1R	$\phi$ 20, $\phi$ 25, $\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63
HQS2R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100
100S-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100
160S-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80
210S-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80
35Z-1R	$\phi$ 20, $\phi$ 25, $\phi$ 32
35H-3R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100

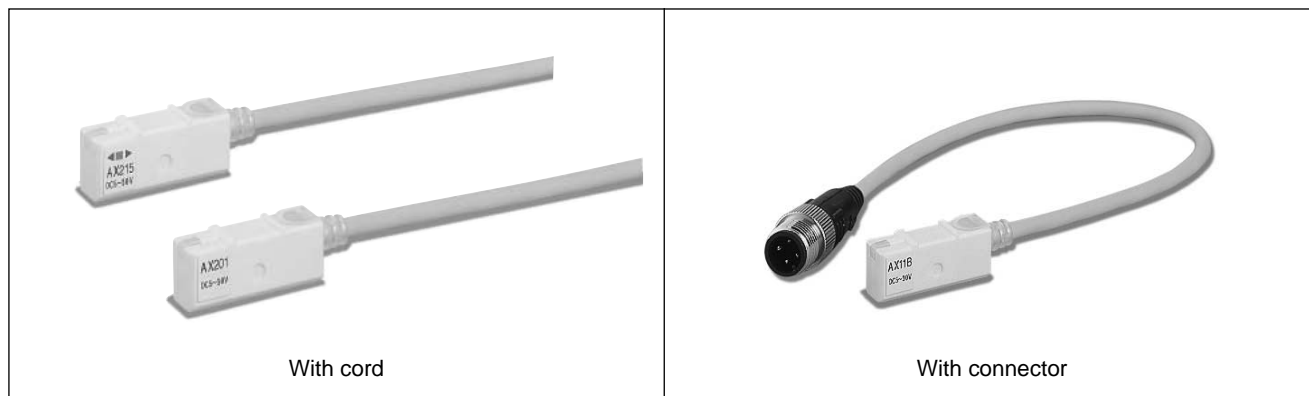
Series	Bore
100Z-1R	$\phi$ 20, $\phi$ 25, $\phi$ 32
100H-2R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125
70/140H-8R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125, $\phi$ 140
160H-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125, $\phi$ 140, $\phi$ 160

Series	Bore
210C-1R	$\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80
70/140Y-2R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125
35P-3R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100
70/140P-8R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125

## Dimensional Drawing

- Cord type  
AX221 • AX225





### Specifications

Code	With cord (1.5m)	AX201
	With cord (5m)	AX205
	With connector	AX20B
Wiring direction	Rear wiring	
Load voltage range	DC : 5 - 30V	
Load current range	DC : 5 - 40 mA	
Inner drop voltage	3 V or less (at 40 mA)	
Leak current	0.7 mA or less	
Working time	1 ms or shorter	
Return time	1 ms or shorter	
Insulation resistance	100 M $\Omega$ or more at 500 MV DC (between case and cord)	
Voltage-proof	AC 1500 V, 1 min. (between case and cord)	
Shock resistance	490m/s <sup>2</sup> (Non-repetition)	
Vibration-proof	Total amplitude 0.6 mm, 10 Hz to 200 Hz (log sweep 1 hour) in X, Y, and Z directions	
Ambient temperature	-10°C to +70°C (at non-freezing condition)	
Wiring method	0.3 mm <sup>2</sup> 2-core Outer diameter 4 mm Oil-proof cabtyre cord	
Protective structure	IP67 (IEC standards), JIS C0920 (dust-proof, immersion-proof type)	
Contact protective circuit	Equipped	
Indicating lamp	LED (red lamp lights up during ON)	
Electric circuit		
Applied load	Small relay, programmable controller	

### Applicable hydraulic cylinder

Series	Bore
35S-1R	$\phi$ 20, $\phi$ 25, $\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63
HQS2R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100
100S-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100
160S-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80
210S-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80
35Z-1R	$\phi$ 20, $\phi$ 25, $\phi$ 32
35H-3R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100

Series	Bore
100Z-1R	$\phi$ 20, $\phi$ 25, $\phi$ 32
100H-2R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125
70/140H-8R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125, $\phi$ 140
160H-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125, $\phi$ 140, $\phi$ 160

Series	Bore
210C-1R	$\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80
70/140Y-2R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125
35P-3R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100
70/140P-8R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100

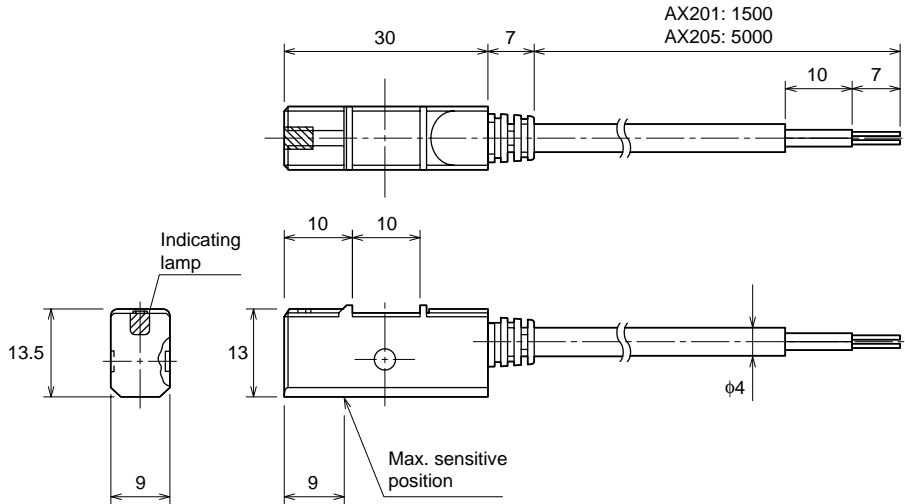
# Magnetic proximity type (No contact/Two-wire one-lamp type)

# AX Type Switch

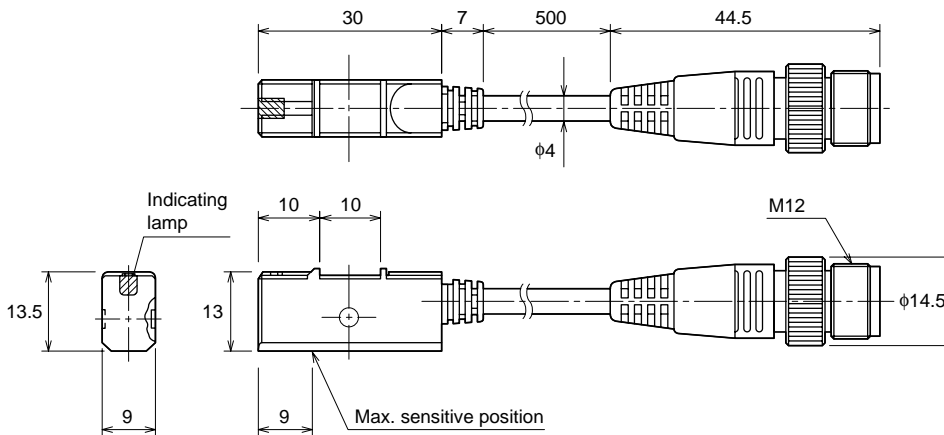
Unit: mm

### Dimensional Drawing

- Cord type  
AX201 • AX205

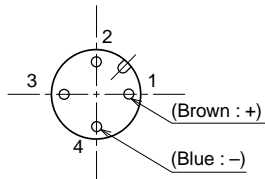


- Connector type  
AX20B



### AX20B (DC type)

Connector pin position

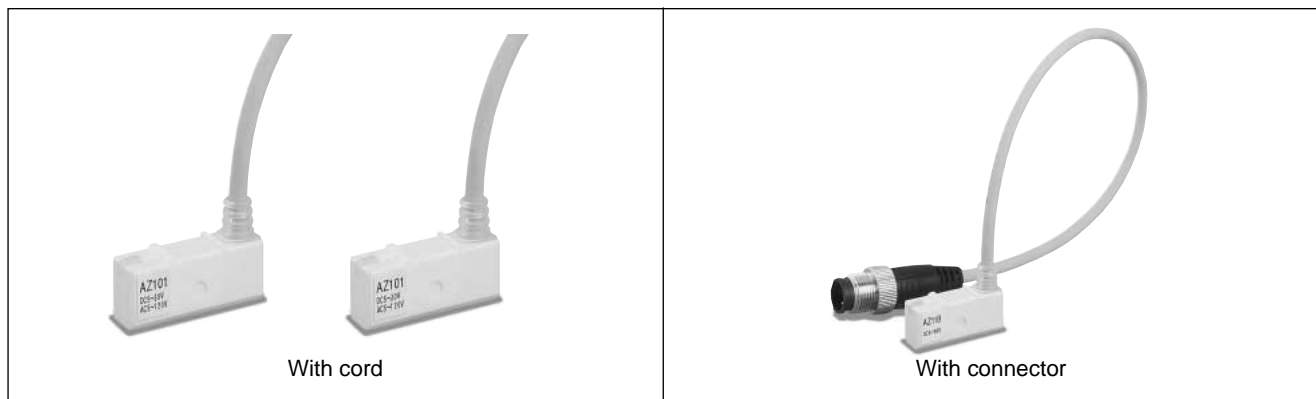


### Applicable counter connectors

Manufacturers	Connector series name	
Correns Co., Ltd.	VA connector	VA-4DS, VA-4DL
Omron Corporation	XS2 sensor I/O connector	XS2
Hirose Electric Co., Ltd.	Connector for FA sensor	HR24

- For details, refer to the catalogues of the manufacturers' products.

- No. of connector standards  
Models M12X1 screw locking
- IEC 947-5-2
- DIN/VDE 0660 part 208 A2
- NECA (The Japan Electric Control Equipment Industry Association) 4202  
Connector for FA sensor



### Specifications

Code	With cord (1.5m)	AZ201
	With cord (5m)	AZ205
	With connector	AZ20B
Wiring direction	Upper wiring	
Load voltage range	DC : 5 - 30V	
Load current range	DC : 5 - 40 mA	
Inner drop voltage	3 V or less (at 40 mA)	
Leak current	0.7 mA or less	
Working time	1 ms or shorter	
Return time	1 ms or shorter	
Insulation resistance	100 M $\Omega$ or more at 500 MV DC (between case and cord)	
Voltage-proof	AC 1500 V, 1 min. (between case and cord)	
Shock resistance	490m/s <sup>2</sup> (Non-repetition)	
Vibration-proof	Total amplitude 0.6 mm, 10 Hz to 200 Hz (log sweep 1 hour) in X, Y, and Z directions	
Ambient temperature	-10°C to +70°C (at non-freezing condition)	
Wiring method	0.3 mm <sup>2</sup> 2-core Outer diameter 4 mm Oil-proof cable cord	
Protective structure	IP67 (IEC standards), JIS C0920 (dust-proof, immersion-proof type)	
Contact protective circuit	Equipped	
Indicating lamp	LED (red lamp lights up during ON)	
Electric circuit		
Applied load	Small relay, programmable controller	

### Applicable hydraulic cylinder

Series	Bore
35S-1R	$\phi$ 20, $\phi$ 25, $\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63
HQS2R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100
100S-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100
160S-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80
210S-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80
35Z-1R	$\phi$ 20, $\phi$ 25, $\phi$ 32
35H-3R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100

Series	Bore
100Z-1R	$\phi$ 20, $\phi$ 25, $\phi$ 32
100H-2R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125
70/140H-8R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125, $\phi$ 140
160H-1R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125, $\phi$ 140, $\phi$ 160

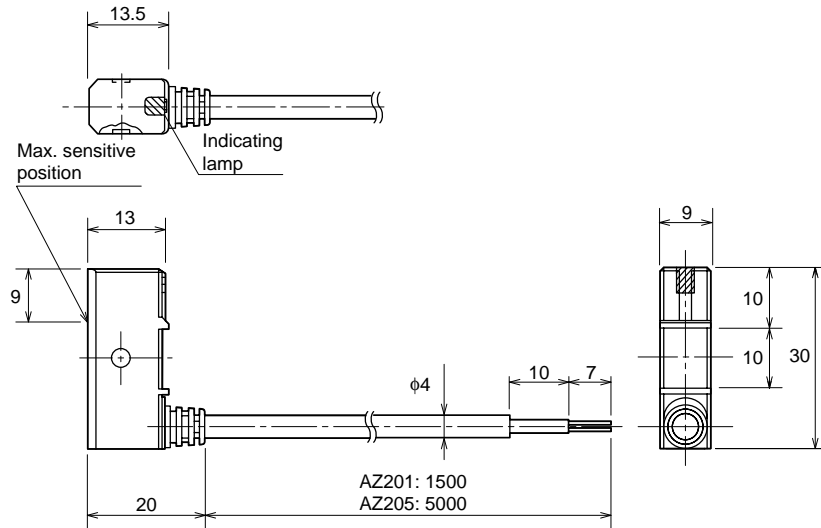
Series	Bore
210C-1R	$\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80
70/140Y-2R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100, $\phi$ 125
35P-3R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100
70/140P-8R	$\phi$ 32, $\phi$ 40, $\phi$ 50, $\phi$ 63, $\phi$ 80, $\phi$ 100



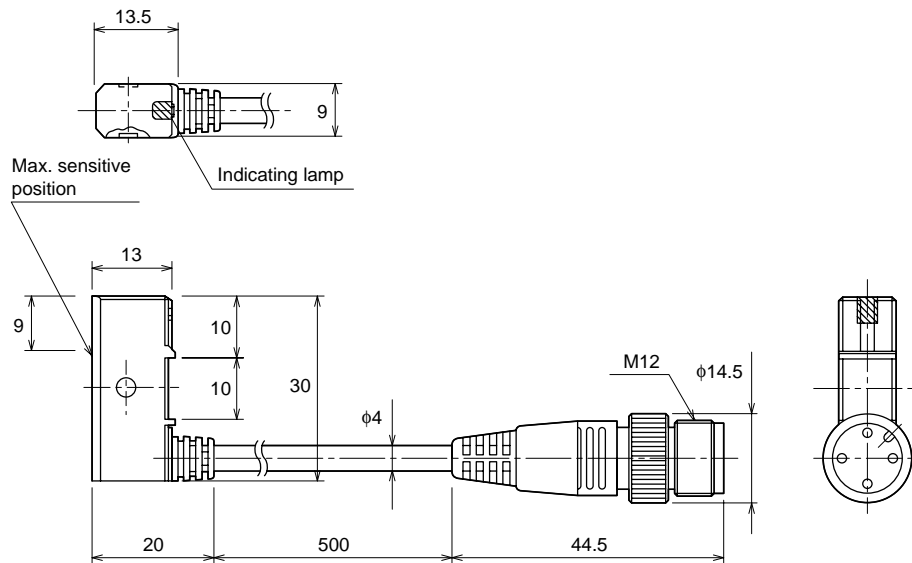
Unit: mm

Dimensional Drawing

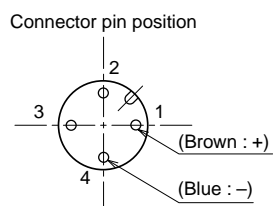
- Cord type  
AZ201 • AZ205



- Connector type  
AZ20B



AZ20B (DC type)

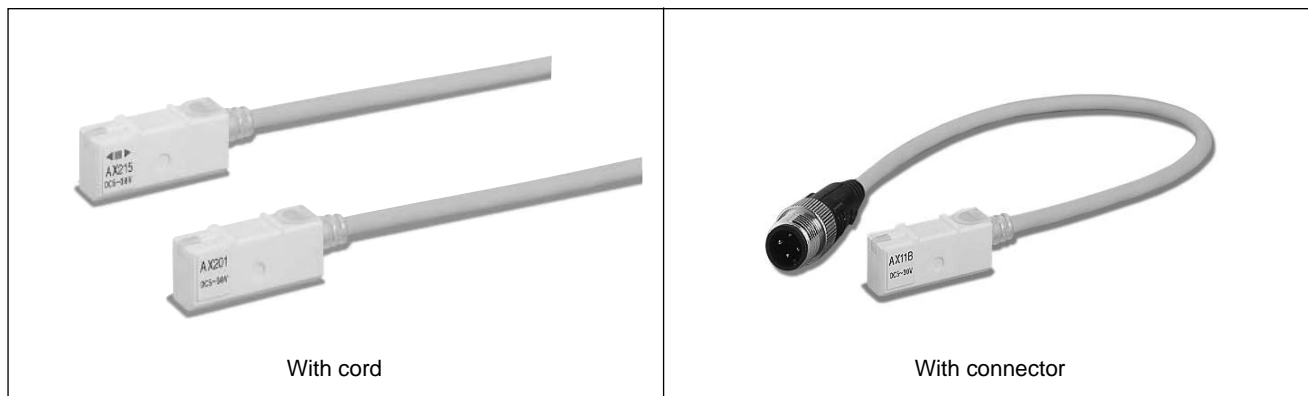


Applicable counter connectors

Manufacturers	Connector series name	
Correns Co., Ltd.	VA connector	VA-4DS, VA-4DL
Omron Corporation	XS2 sensor I/O connector	XS2
Hirose Electric Co., Ltd.	Connector for FA sensor	HR24

• For details, refer to the catalogues of the manufacturers' products.

- No. of connector standards  
Models M12X1 screw locking
- IEC 947-5-2
- DIN/VDE 0660 part 208 A2
- NECA (The Japan Electric Control Equipment Industry Association) 4202  
Connector for FA sensor

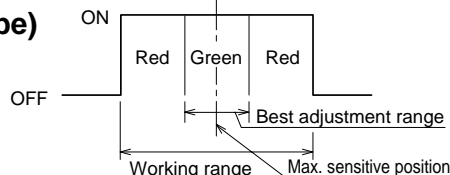


### Specifications

Code	With cord (1.5m)	AX211
	With cord (5m)	AX215
	With connector	AX21C
		AX21D
Wiring direction	Rear wiring	
Load voltage range	DC : 5 - 30V	
Load current range	DC : 5 - 40 mA	
Inner drop voltage	3 V or less (at 40 mA)	
Leak current	0.7 mA or less	
Working time	1 ms or shorter	
Return time	1 ms or shorter	
Insulation resistance	100 MΩ or more at 500 MV DC (between case and cord)	
Voltage-proof	AC 1500 V, 1 min. (between case and cord)	
Shock resistance	490m/s <sup>2</sup> (Non-repetition)	
Vibration-proof	Total amplitude 0.6 mm, 10 Hz to 200 Hz (log sweep 1 hour) in X, Y, and Z directions	
Ambient temperature	-10°C to +70°C (at non-freezing condition)	
Wiring method	0.3 mm <sup>2</sup> 2-core Outer diameter 4 mm Oil-proof cabtyre cord	
Protective structure	IP67 (IEC standards), JIS C0920 (dust-proof, immersion-proof type)	
Contact protective circuit	Equipped	
Indicating lamp	Working position: Red/green LED lights up Most suitable position: Green LED lights up	
Electric circuit		
Applied load	Small relay, programmable controller	

Note) AX211CE, AX215CE, and AX21BCE conforming to CE standards are also available.

### LED indicating style (Two-wire, two-lamp type)



### Applicable hydraulic cylinder

Series	Bore
35S-1R	φ20, φ25, φ32, φ40, φ50, φ63
HQS2R	φ32, φ40, φ50, φ63, φ80, φ100
100S-1R	φ32, φ40, φ50, φ63, φ80, φ100
160S-1R	φ32, φ40, φ50, φ63, φ80
210S-1R	φ32, φ40, φ50, φ63, φ80
35Z-1R	φ20, φ25, φ32
35H-3R	φ32, φ40, φ50, φ63, φ80, φ100

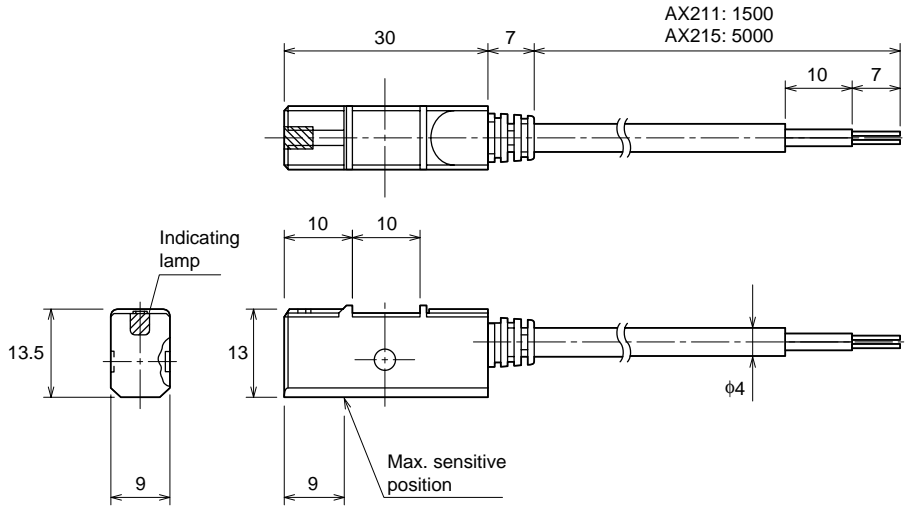
Series	Bore
100Z-1R	φ20, φ25, φ32
100H-2R	φ32, φ40, φ50, φ63, φ80, φ100, φ125
70/140H-8R	φ32, φ40, φ50, φ63, φ80, φ100, φ125, φ140
160H-1R	φ32, φ40, φ50, φ63, φ80, φ100, φ125, φ140, φ160

Series	Bore
210C-1R	φ40, φ50, φ63, φ80
70/140Y-2R	φ32, φ40, φ50, φ63, φ80, φ100, φ125
35P-3R	φ32, φ40, φ50, φ63, φ80, φ100
70/140P-8R	φ32, φ40, φ50, φ63, φ80, φ100

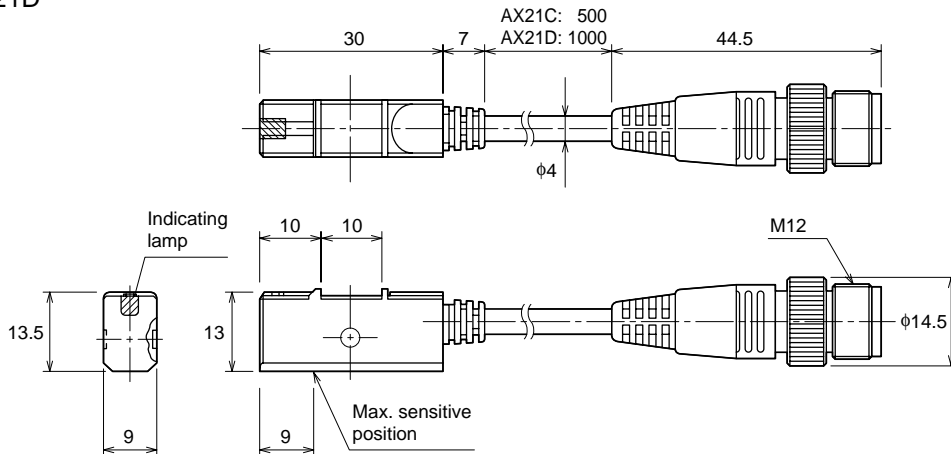
Unit: mm

Dimensional Drawing

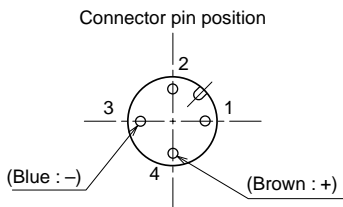
- Cord type  
AX211 • AX215



- Connector type  
AX21C • AX21D



AX21C · AX21D (DC type)



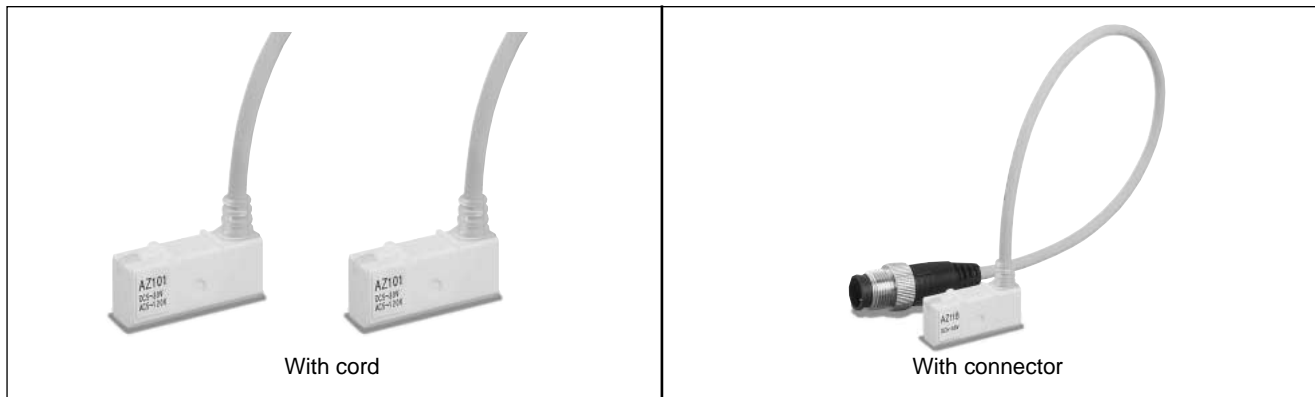
Applicable counter connectors

Manufacturers	Connector series name	
Correns Co., Ltd.	VA connector	VA-4DS, VA-4DL
Omron Corporation	XS2 sensor I/O connector	XS2
Hirose Electric Co., Ltd.	Connector for FA sensor	HR24

- For details, refer to the catalogues of the manufacturers' products.

- TMS standards conforming type

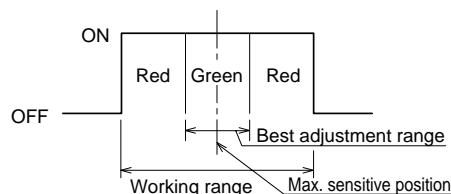
- As for the connector pin layout conforming to the IEC standards (1:+4:-), contact us.
- AX21B conforming to TMS standards is also available.



### Specifications

Code	With cord (1.5m)	AZ211
	With cord (5m)	AZ215
	With connector	AZ21C
		AZ21D
Wiring direction	Upper wiring	
Load voltage range	DC : 5 - 30V	
Load current range	DC : 5 - 40 mA	
Inner drop voltage	3 V or less (at 40 mA)	
Leak current	0.7 mA or less	
Working time	1 ms or shorter	
Return time	1 ms or shorter	
Insulation resistance	100 MΩ or more at 500 MV DC (between case and cord)	
Voltage-proof	AC 1500 V, 1 min. (between case and cord)	
Shock resistance	490m/s <sup>2</sup> (Non-repetition)	
Vibration-proof	Total amplitude 0.6 mm, 10 Hz to 200 Hz (log sweep 1 hour) in X, Y, and Z directions	
Ambient temperature	-10°C to +70°C (at non-freezing condition)	
Wiring method	0.3 mm <sup>2</sup> 2-core Outer diameter 4 mm Outer diameter Oil-proof cabtyre cord	
Protective structure	IP67 (IEC standards), JIS C0920 (dust-proof, immersion-proof type)	
Contact protective circuit	Equipped	
Indicating lamp	Working position: Red/green LED lights up Most suitable position: Green LED lights up	
Electric circuit		
Applied load	Small relay, programmable controller	

### LED indicating style (Two-wire, two-lamp type)



### Applicable hydraulic cylinder

Series	Bore
35S-1R	φ20, φ25, φ32, φ40, φ50, φ63
HQS2R	φ32, φ40, φ50, φ63, φ80, φ100
100S-1R	φ32, φ40, φ50, φ63, φ80, φ100
160S-1R	φ32, φ40, φ50, φ63, φ80
210S-1R	φ32, φ40, φ50, φ63, φ80
35Z-1R	φ20, φ25, φ32
35H-3R	φ32, φ40, φ50, φ63, φ80, φ100

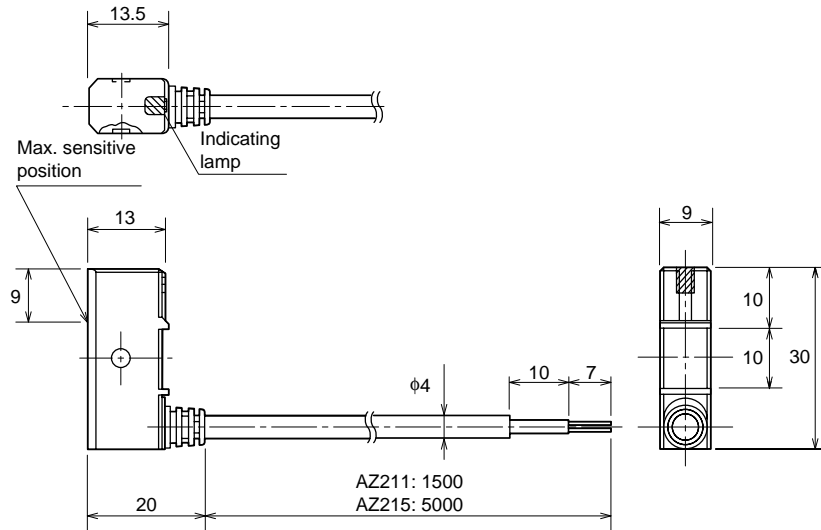
Series	Bore
100Z-1R	φ20, φ25, φ32
100H-2R	φ32, φ40, φ50, φ63, φ80, φ100, φ125
70/140H-8R	φ32, φ40, φ50, φ63, φ80, φ100, φ125, φ140
160H-1R	φ32, φ40, φ50, φ63, φ80, φ100, φ125, φ140, φ160

Series	Bore
210C-1R	φ40, φ50, φ63, φ80
70/140Y-2R	φ32, φ40, φ50, φ63, φ80, φ100, φ125
35P-3R	φ32, φ40, φ50, φ63, φ80, φ100
70/140P-8R	φ32, φ40, φ50, φ63, φ80, φ100

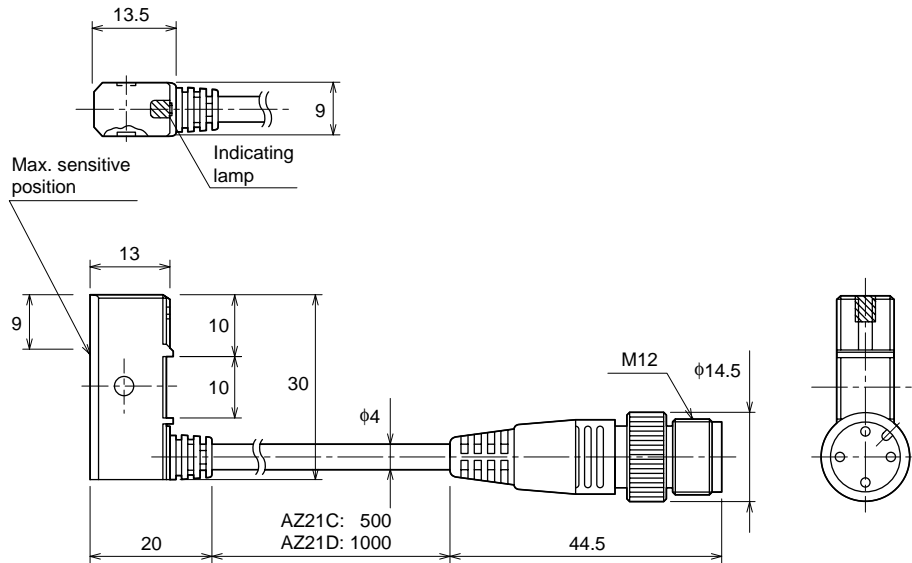
Unit: mm

Dimensional Drawing

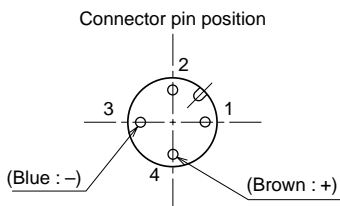
- Cord type  
AZ211 • AZ215



- Connector type  
AZ21C • AZ21D



AZ21C · AX21D (DC type)



Applicable counter connectors

Manufacturers	Connector series name	
Correns Co., Ltd.	VA connector	VA-4DS, VA-4DL
Omron Corporation	XS2 sensor I/O connector	XS2
Hirose Electric Co., Ltd.	Connector for FA sensor	HR24

• For details, refer to the catalogues of the manufacturers' products.

- TMS standards conforming type

### Switch bracket assembly model code

- Code for order of switches and bracket assemblies

- Code for order of switches

- Code for order of bracket bands

R32	AX111	AX111	R32
Bracket band symbol	Switch type	Switch type	Bracket band symbol

### Switch list

Switch type	Bore	Assy type		Switch single unit type		Bracket type
		Contact	No contact	Contact	No contact	
AX type (Cord rear wiring)	φ32	R32AX1**	R32AX2**	AX1**	AX2**	R32
	φ40	R33AX1**	R33AX2**			R33
	φ50・φ63	R35AX1**	R35AX2**			R35
	φ80・φ100	R36AX1**	R36AX2**			R36
	φ125	R37AX1**	R37AX2**			R37
	φ140	R38AZ1**	R38AZ2**			R38
	φ160	R39AZ1**	R39AZ2**			R39
AZ type (Cord upper wiring)	φ32	R32AZ1**	R32AZ2**	AZ1**	AZ2**	R32
	φ40	R33AZ1**	R33AZ2**			R33
	φ50・φ63	R35AZ1**	R35AZ2**			R35
	φ80・φ100	R36AZ1**	R36AZ2**			R36
	φ125	R37AZ1**	R37AZ2**			R37
	φ140	R38AZ1**	R38AZ2**			R38
	φ160	R39AZ1**	R39AZ2**			R39

#### Symbol/code for order of switches

##### ■ Contact

Cord rear wiring

AF : AX101 (with 1.5 m cord)

AG : AX105 (with 5 m cord)

AH : AX111 (with 1.5 m cord)

AJ : AX115 (with 5 m cord)

AE : AX125 (with 5 m cord/no lamp)

AK : AX11A (connector type/AC)

AL : AX11B (connector type/DC)

Cord upper wiring

AP : AZ101 (with 1.5 m cord)

AR : AZ105 (with 5 m cord)

AS : AZ111 (with 1.5 m cord)

AT : AZ115 (with 5 m cord)

AN : AZ125 (with 5 m cord/no lamp)

AU : AZ11A (connector type/AC)

AW : AZ11B (connector type/DC)

##### ■ No contact

- 2-wire, 1-lamp type

Cord rear wiring

BE : AX201 (with 1.5 m cord)

BF : AX205 (with 5 m cord)

Cord upper wiring

BM : AZ201 (with 1.5 m cord)

BN : AZ205 (with 5 m cord)

- 2-wire, 2-lamp type

Cord rear wiring

CE : AX211 (with 1.5 m cord)

CF : AX215 (with 5 m cord)

CH : AX21C (connector type/with 0.5 m cord)

CJ : AX21D (connector type/with 1.5 m cord)

Cord upper wiring

CM : AZ211 (with 1.5 m cord)

CN : AZ215 (with 5 m cord)

##### ■ CE standard

##### ■ No contact

General purpose type

- 2-wire, 2-lamp type

Cord rear wiring

CT: AX211CE (with 1.5 m cord)

CU: AX215CE (with 5 m cord)

CV: AX21B (connector type/DC)

Cord upper wiring

CW: AZ211CE (with 1.5 m cord)

CX: AZ215CE (with 5 m cord)

CY: AZ21B (connector type/DC)



# List of seals

## List of seals

## 1 Nitrile rubber type (Rod B)/160H-1

Parts name		Material	Q'ty	φ32	φ40	φ50	φ63	φ80
Piston packing		Hydrogenated nitrile rubber	2	OUHR32×25×5	OUHR40×32×5.4	OUHR50×42×5.4	OUHR63×55×5.4	OUHR80×70×6.5
Rod packing		Hydrogenated nitrile rubber	1	IUH18×25×5	IUH22×29×5	IUH28×36×5.4	IUH36×44×5.4	IUH45×53×5.4
Wiper ring		Hydrogenated nitrile rubber	1	LBH18×24V3.5×4.5	LBH22×28×3.5×4.5	LBH28×36×4.5×6	LBH36×44×4.5×6	LBH45×53×4.5×6
Cover seal		Nitrile rubber	2	TT-32	TT-40	TT-50	TT-63	TT-80
O-ring for piston rod		Nitrile rubber	1	S-12.5	S-16	S-20	G-25	G-30
O-ring for cushion ring		Nitrile rubber	1	S-15	P-18	P-22	G-30	S-38
O-ring for bush		Nitrile rubber	1	P-21	G-25	G-30	G-40	G-50
Valve seal		Canned hydrogenated nitrile rubber	2	CX-8H	CX-12H	CX-12H	CX-12H	CX-14H
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS1-032B	RH1/PKS1-040B	RH1/PKS1-050B	RH1/PKS1-063B	RH1/PKS1-080B

Parts name		Material	Q'ty	φ100	φ125	φ140	φ160
Piston packing		Hydrogenated nitrile rubber	2	OUHR100×90×6.5	OUHR125×110×9.6	OUHR140×125×9.6	OUHR160×145×9.6
Rod packing		Hydrogenated nitrile rubber	1	IUH56×66×6.5	IUH70×80×6.5	IUH80×90×6.5	IUH90×100×6.5
Wiper ring		Hydrogenated nitrile rubber	1	LBH56×66×5×6.5	LBH70×80×5×6.5	LBH80×90×5×6.5	LBH90×100×5×6.5
Cover seal		Nitrile rubber	2	TT-100	TT-125	TT-140	TT-160
O-ring for piston rod		Nitrile rubber	1	G-40	G-50	G-60	G-70
O-ring for cushion ring		Nitrile rubber	1	S-56	G-65	G-75	G-85
O-ring for bush		Nitrile rubber	1	G-65	G-80	G-90	G-100
Valve seal		Canned hydrogenated nitrile rubber	2	CX-14H	CR-18H	CR-18H	CR-18H
O-ring for cushion valve		Hydrogenated nitrile rubber	2	—	S-7	S-7	S-7
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS1-100B	RH1/PKS1-125B	RH1/PKS1-140B	RH1/PKS1-160B

- S-7 and S-12.5 are made of hydrogenated nitrile rubber with hardness of 70. S-16 and S-20 are made of the same with hardness of 90.

Other O-rings conform to JIS B 2401-1A.

- Nominal packing models are subject to change.



## List of seals

## 1 Nitrile rubber type (Rod B)/160H-1R

Parts name		Material	Q'ty	φ32	φ40	φ50	φ63	φ80
Piston packing		Hydrogenated nitrile rubber	2	OUHR32×25×5	OUHR40×32×5.4	OUHR50×42×5.4	OUHR63×55×5.4	OUHR80×70×6.5
Rod packing		Hydrogenated nitrile rubber	1	IUH18×25×5	IUH22×29×5	IUH28×36×5.4	IUH36×44×5.4	IUH45×53×5.4
Wiper ring		Hydrogenated nitrile rubber	1	LBH18×24×3.5×4.5	LBH22×28×3.5×4.5	LBH28×36×4.5×6	LBH36×44×4.5×6	LBH45×53×4.5×6
Cover seal		Nitrile rubber	2	TT-32	TT-40	TT-50	TT-63	TT-80
O-ring for piston rod		Nitrile rubber	1 Note 1)	P-15	S-16	P-22	G-30	G-30
O-ring for cushion ring		Nitrile rubber	1	S-15	P-18	P-22	G-30	S-38
O-ring for bush		Nitrile rubber	1	P-21	G-25	G-30	G-40	G-50
O-ring for piston		Nitrile rubber	1	—	—	—	—	G-45
Valve seal		Canned hydrogenated nitrile rubber	2	CX-8H	CX-12H	CX-12H	CX-12H	CX-14H
Packing set	Double acting single rod cylinder	—	1 set	RH1R/PKS1-032B	RH1R/PKS1-040B	RH1R/PKS1-050B	RH1R/PKS1-063B	RH1R/PKS1-080B

Parts name		Material	Q'ty	φ100	φ125	φ140	φ160
Piston packing		Hydrogenated nitrile rubber	2	OUHR100×90×6.5	OUHR125×110×9.6	OUHR140×125×9.6	OUHR160×145×9.6
Rod packing		Hydrogenated nitrile rubber	1	IUH56×66×6.5	IUH70×80×6.5	IUH80×90×6.5	IUH90×100×6.5
Wiper ring		Hydrogenated nitrile rubber	1	LBH56×66×5×6.5	LBH70×80×5×6.5	LBH80×90×5×6.5	LBH90×100×5×6.5
Cover seal		Nitrile rubber	2	TT-100	TT-125	TT-140	TT-160
O-ring for piston rod		Nitrile rubber	1	G-40	G-50	G-60	G-70
O-ring for cushion ring		Nitrile rubber	1	S-56	G-65	G-75	G-85
O-ring for bush		Nitrile rubber	1	G-65	G-80	G-90	G-100
O-ring for piston		Nitrile rubber	1	G-65	G-85	G-95	G-110
Valve seal		Canned hydrogenated nitrile rubber	2	CX-14H	CR-18H	CR-18H	CR-18H
O-ring for cushion valve		Hydrogenated nitrile rubber	2	—	S-7	S-7	S-7
Packing set	Double acting single rod cylinder	—	1 set	RH1R/PKS1-100B	RH1R/PKS1-125B	RH1R/PKS1-140B	RH1R/PKS1-160B

Note 1) Quantity of the O-rings for piston rod with a bore 40 mm is two.

- S-7 is made of hydrogenated nitrile rubber with hardness of 70. S-16 is made of the same with hardness of 90. Other O-rings conform to JIS B 2401-1A.
- Nominal packing models are subject to change.

## 2 Urethane rubber type (Rod B)/160H-1, 160H-1R

Parts name		Material	Q'ty	φ32	φ40	φ50	φ63	φ80
Piston packing		Urethane rubber + Nitrile rubber	1	KR003200701	KR304000701	KR005000701	KR006300701	KR408000701
Rod packing		Urethane rubber	1	B31826P5008	B32229P5008	B32836P5008	B33644P5008	B34050P5008
Wiper ring		Urethane rubber	1	AY1080P5008	AY2020P5008	AY2080P5008	AY3060P5008	AY4045P5008
Cover seal		Nitrile rubber	2	TT-32	TT-40	TT-50	TT-63	TT-80
O-ring for piston rod		Nitrile rubber	1	S-12.5	S-16	S-20	G-25	G-30
O-ring for cushion ring		Nitrile rubber	1	S-15	P-18	P-22	G-30	S-38
O-ring for bush		Nitrile rubber	1	P-21	G-25	G-30	G-40	G-50
Valve seal		Canned hydrogenated nitrile rubber	2	CX-8H	CX-12H	CX-12H	CX-12H	CX-14H
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS2-032B	RH1/PKS2-040B	RH1/PKS2-050B	RH1/PKS2-063B	RH1/PKS2-080B

Parts name		Material	Q'ty	φ100	φ125	φ140	φ160
Piston packing		Urethane rubber + Nitrile rubber	1	KR010000701	KR012500701	KR214000701	KR016000701
Rod packing		Urethane rubber	1	B35666P5008	B37079P5008	B38075P5008	B39001P5008
Wiper ring		Urethane rubber	1	AY5060P5008	AY7000P5008	AY8030P5008	AY9000P5008
Cover seal		Nitrile rubber	2	TT-100	TT-125	TT-140	TT-160
O-ring for piston rod		Nitrile rubber	1	G-40	G-50	G-60	G-70
O-ring for cushion ring		Nitrile rubber	1	S-56	G-65	G-75	G-85
O-ring for bush		Nitrile rubber	1	G-65	G-80	G-90	G-100
Valve seal		Canned hydrogenated nitrile rubber	2	CX-14H	CR-18H	CR-18H	CR-18H
O-ring for cushion valve		Hydrogenated nitrile rubber	2	—	S-7	S-7	S-7
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS2-100B	RH1/PKS2-125B	RH1/PKS2-140B	RH1/PKS2-160B

- S-7 and S-12.5 are made of hydrogenated nitrile rubber with hardness of 70. S-16 and S-20 are made of the same with hardness of 90.  
Other O-rings conform to JIS B 2401-1A.
- Nominal packing models are subject to change.

## List of seals

## 6 Hydrogenated nitrile rubber type (Rod B)/160H-1

Parts name		Material	Q'ty	φ32	φ40	φ50	φ63	φ80
Piston packing		Hydrogenated nitrile rubber	2	OUHR32×25×5	OUHR40×32×5.4	OUHR50×42×5.4	OUHR63×55×5.4	OUHR80×70×6.5
Rod packing		Hydrogenated nitrile rubber	1	IUH18×25×5	IUH22×29×5	IUH28×36×5.4	IUH36×44×5.4	IUH45×53×5.4
Wiper ring		Hydrogenated nitrile rubber	1	LBH18×24×3.5×4.5	LBH22×28×3.5×4.5	LBH28×36×4.5×6	LBH36×44×4.5×6	LBH45×53×4.5×6
Cover seal		Hydrogenated nitrile rubber	2	TT-32	TT-40	TT-50	TT-63	TT-80
O-ring for piston rod		Hydrogenated nitrile rubber	1	S-12.5	S-16	S-20	G-25	G-30
O-ring for cushion ring		Hydrogenated nitrile rubber	1	S-15	P-18	P-22	G-30	S-38
O-ring for bush		Hydrogenated nitrile rubber	1	P-21	G-25	G-30	G-40	G-50
Valve seal		Canned hydrogenated nitrile rubber	2	CX-8H	CX-12H	CX-12H	CX-12H	CX-14H
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS6-032B	RH1/PKS6-040B	RH1/PKS6-050B	RH1/PKS6-063B	RH1/PKS6-080B

Parts name		Material	Q'ty	φ100	φ125	φ140	φ160
Piston packing		Hydrogenated nitrile rubber	2	OUHR100×90×6.5	OUHR125×110×9.6	OUHR140×125×9.6	OUHR160×145×9.6
Rod packing		Hydrogenated nitrile rubber	1	IUH56×66×6.5	IUH70×80×6.5	IUH80×90×6.5	IUH90×100×6.5
Wiper ring		Hydrogenated nitrile rubber	1	LBH56×66×5×6.5	LBH70×80×5×6.5	LBH80×90×5×6.5	LBH90×100×5×6.5
Cover seal		Hydrogenated nitrile rubber	2	TT-100	TT-125	TT-140	TT-160
O-ring for piston rod		Hydrogenated nitrile rubber	1	G-40	G-50	G-60	G-70
O-ring for cushion ring		Hydrogenated nitrile rubber	1	S-56	G-65	G-75	G-85
O-ring for bush		Hydrogenated nitrile rubber	1	G-65	G-80	G-90	G-100
Valve seal		Canned hydrogenated nitrile rubber	2	CX-14H	CR-18H	CR-18H	CR-18H
O-ring for cushion valve		Hydrogenated nitrile rubber	2	—	S-7	S-7	S-7
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS6-100B	RH1/PKS6-125B	RH1/PKS6-140B	RH1/PKS6-160B

- Hardness of S-7 and S-12.5 is 70. The same of other O-rings is 90.
- Nominal packing models are subject to change.

## 6 Hydrogenated nitrile rubber type (Rod B)/160H-1R

Parts name		Material	Q'ty	φ32	φ40	φ50	φ63	φ80
Piston packing		Hydrogenated nitrile rubber	2	OUHR32×25×5	OUHR40×32×5.4	OUHR50×42×5.4	OUHR63×55×5.4	OUHR80×70×6.5
Rod packing		Hydrogenated nitrile rubber	1	IUH18×25×5	IUH22×29×5	IUH28×36×5.4	IUH36×44×5.4	IUH45×53×5.4
Wiper ring		Hydrogenated nitrile rubber	1	LBH18×24×3.5×4.5	LBH22×28×3.5×4.5	LBH28×36×4.5×6	LBH36×44×4.5×6	LBH45×53×4.5×6
Cover seal		Hydrogenated nitrile rubber	2	TT-32	TT-40	TT-50	TT-63	TT-80
O-ring for piston rod		Hydrogenated nitrile rubber	1 Note 1	P-15	S-16	P-22	G-30	G-30
O-ring for cushion ring		Hydrogenated nitrile rubber	1	S-15	P-18	P-22	G-30	S-38
O-ring for cushion valve		Hydrogenated nitrile rubber	1	P-21	G-25	G-30	G-40	G-50
O-ring for piston		Hydrogenated nitrile rubber	1	—	—	—	—	G-45
Valve seal		Canned hydrogenated nitrile rubber	2	CX-8H	CX-12H	CX-12H	CX-12H	CX-14H
Packing set	Double acting single rod cylinder	—	1 set	RH1R/PKS6-032B	RH1R/PKS6-040B	RH1R/PKS6-050B	RH1R/PKS6-063B	RH1R/PKS6-080B

Parts name		Material	Q'ty	φ100	φ125	φ140	φ160
Piston packing		Hydrogenated nitrile rubber	2	OUHR100×90×6.5	OUHR125×110×9.6	OUHR140×125×9.6	OUHR160×145×9.6
Rod packing		Hydrogenated nitrile rubber	1	IUH56×66×6.5	IUH70×80×6.5	IUH80×90×6.5	IUH90×100×6.5
Wiper ring		Hydrogenated nitrile rubber	1	LBH56×66×5×6.5	LBH70×80×5×6.5	LBH80×90×5×6.5	LBH90×100×5×6.5
Cover seal		Hydrogenated nitrile rubber	2	TT-100	TT-125	TT-140	TT-160
O-ring for piston rod		Hydrogenated nitrile rubber	1	G-40	G-50	G-60	G-70
O-ring for cushion ring		Hydrogenated nitrile rubber	1	S-56	G-65	G-75	G-85
O-ring for bush		Hydrogenated nitrile rubber	1	G-65	G-80	G-90	G-100
O-ring for piston		Hydrogenated nitrile rubber	1	G-65	G-85	G-95	G-110
Valve seal		Canned hydrogenated nitrile rubber	2	CX-14H	CR-18H	CR-18H	CR-18H
O-ring for cushion valve		Hydrogenated nitrile rubber	2	—	S-7	S-7	S-7
Packing set	Double acting single rod cylinder	—	1 set	RH1R/PKS6-100B	RH1R/PKS6-125B	RH1R/PKS6-140B	RH1R/PKS6-160B

Note 1) Quantity of the O-rings for piston rod with a bore 40 mm is two.

- Hardness of S-7 is 70. The same of other O-rings is 90.
- Nominal packing models are subject to change.

## List of seals

## 8 Combined seal type (Rod B)/160H-1, 160H-1R

Parts name		Material	Q'ty	φ32	φ40	φ50	φ63	φ80
Piston packing		Fluoric resin + Nitrile rubber	1	OE032005200211B	OE040005200211B	OE050005200211C	OE063005200211C	OE080005200211C
Rod packing		Hydrogenated nitrile rubber	1	IUH18×25×5	IUH22×29×5	IUH28×36×5.4	IUH36×44×5.4	IUH45×53×5.4
Wiper ring		Hydrogenated nitrile rubber	1	LBH18×24×3.5×4.5	LBH22×28×3.5×4.5	LBH28×36×4.5×6	LBH36×44×4.5×6	LBH45×53×4.5×6
Cover seal		Nitrile rubber	2	TT-32	TT-40	TT-50	TT-63	TT-80
O-ring for piston rod		Nitrile rubber	1	S-12.5	S-16	S-20	G-25	G-30
O-ring for cushion ring		Nitrile rubber	1	S-15	P-18	P-22	G-30	S-38
O-ring for bush		Nitrile rubber	1	P-21	G-25	G-30	G-40	G-50
Valve seal		Canned hydrogenated nitrile rubber	2	CX-8H	CX-12H	CX-12H	CX-12H	CX-14H
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS8 -032B	RH1/PKS8 -040B	RH1/PKS8 -050B	RH1/PKS8 -063B	RH1/PKS8 -080B

Parts name		Material	Q'ty	φ100	φ125	φ140	φ160
Piston packing		Fluoric resin + Nitrile rubber	1	OE100005200211D	OE125005200211D	OE140005200211E	OE160005200211E
Rod packing		Hydrogenated nitrile rubber	1	IUH56×66×6.5	IUH70×80×6.5	IUH80×90×6.5	IUH90×100×6.5
Wiper ring		Hydrogenated nitrile rubber	1	LBH56×66×5×6.5	LBH70×80×5×6.5	LBH80×90×5×6.5	LBH90×100×5×6.5
Cover seal		Nitrile rubber	2	TT-100	TT-125	TT-140	TT-160
O-ring for piston rod		Nitrile rubber	1	G-40	G-50	G-60	G-70
O-ring for cushion ring		Nitrile rubber	1	S-56	G-65	G-75	G-85
O-ring for bush		Nitrile rubber	1	G-65	G-80	G-90	G-100
Valve seal		Canned hydrogenated nitrile rubber	2	CX-14H	CR-18H	CR-18H	CR-18H
O-ring for cushion valve		Hydrogenated nitrile rubber	2	—	S-7	S-7	S-7
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS8 -100B	RH1/PKS8 -125B	RH1/PKS8 -140B	RH1/PKS8 -160B

- S-7 and S-12.5 are made of hydrogenated nitrile rubber with hardness of 70. S-16 and S-20 are made of the same with hardness of 90.  
Other O-rings conform to JIS B 2401-1A.
- Nominal packing models are subject to change.

## 1 Nitrile rubber type (Rod A)/160H-1

Parts name		Material	Q'ty	φ40	φ50	φ63	φ80
Piston packing		Hydrogenated nitrile rubber	2	OUHR40×32×5.4	OUHR50×42×5.4	OUHR63×55×5.4	OUHR80×70×6.5
Rod packing		Hydrogenated nitrile rubber	1	IUH28×36×5.4	IUH36×44×5.4	IUH45×53×5.4	IUH56×66×6.5
Wiper ring		Hydrogenated nitrile rubber	1	LBH28×36×4.5×6	LBH36×44×4.5×6	LBH45×53×4.5×6	LBH56×66×5×6.5
Cover seal		Nitrile rubber	2	TT-40	TT-50	TT-63	TT-80
O-ring for piston rod		Nitrile rubber	1	S-16	S-20	G-25	G-30
O-ring for cushion ring		Nitrile rubber	1	S-22.4	S-28	S-35.5	S-45
O-ring for bush		Nitrile rubber	1	G-30	G-40	G-50	G-65
Valve seal (for rod side)		Canned hydrogenated nitrile rubber	3	CX-8H	CX-12H	CX-12H	CX-14H
Valve seal (for head side)		Canned hydrogenated nitrile rubber	1	CX-12H	CX-12H	CX-12H	CX-14H
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS1-040A	RH1/PKS1-050A	RH1/PKS1-063A	RH1/PKS1-080A

Parts name		Material	Q'ty	φ100	φ125
Piston packing		Hydrogenated nitrile rubber	2	OUHR100×90×6.5	OUHR125×110×9.6
Rod packing		Hydrogenated nitrile rubber	1	IUH70×80×6.5	IUH90×100×6.5
Wiper ring		Hydrogenated nitrile rubber	1	LBH70×80×5×6.5	LBH90×100×5×6.5
Cover seal		Nitrile rubber	2	TT-100	TT-125
O-ring for piston rod		Nitrile rubber	1	G-40	G-50
O-ring for cushion ring		Nitrile rubber	1	S-56	G-65
O-ring for bush		Nitrile rubber	1	G-80	G-100
Valve seal (for rod side)		Canned hydrogenated nitrile rubber	3	CX-14H	CR-18H
Valve seal (for head side)		Canned hydrogenated nitrile rubber	1	CX-14H	CR-18H
O-ring for cushion valve		Hydrogenated nitrile rubber	2	—	S-7
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS1-100A	RH1/PKS1-125A

- S-7 is made of hydrogenated nitrile rubber with hardness of 70. S-16 and S-20 are made of the same with hardness of 90. Other O-rings conform to JIS B 2401-1A.
- Nominal packing models are subject to change.

## List of seals

## 1 Nitrile rubber type (Rod A)/160H-1R

Parts name		Material	Q'ty	φ40	φ50	φ63	φ80
Piston packing		Hydrogenated nitrile rubber	2	OUHR40×32×5.4	OUHR50×42×5.4	OUHR63×55×5.4	OUHR80×70×6.5
Rod packing		Hydrogenated nitrile rubber	1	IUH28×36×5.4	IUH36×44×5.4	IUH45×53×5.4	IUH56×66×6.5
Wiper ring		Hydrogenated nitrile rubber	1	LBH28×36×4.5×6	LBH36×44×4.5×6	LBH45×53×4.5×6	LBH56×66×5×6.5
Cover seal		Nitrile rubber	2	TT-40	TT-50	TT-63	TT-80
O-ring for piston rod		Nitrile rubber	1 Note 1	S-16	P-22	G-30	G-30
O-ring for cushion ring		Nitrile rubber	1	S-22.4	S-28	S-35.5	S-45
O-ring for bush		Nitrile rubber	1	G-30	G-40	G-50	G-65
O-ring for piston		Nitrile rubber	1	—	—	—	G-45
Valve seal (for rod side)		Canned hydrogenated nitrile rubber	3	CX-8H	CX-12H	CX-12H	CX-14H
Valve seal (for head side)		Canned hydrogenated nitrile rubber	1	CX-12H	CX-12H	CX-12H	CX-14H
Packing set	Double acting single rod cylinder	—	1 set	RH1R/PKS1-040A	RH1R/PKS1-050A	RH1R/PKS1-063A	RH1R/PKS1-080A

Parts name		Material	Q'ty	φ100	φ125
Piston packing		Hydrogenated nitrile rubber	2	OUHR100×90×6.5	OUHR125×110×9.6
Rod packing		Hydrogenated nitrile rubber	1	IUH70×80×6.5	IUH90×100×6.5
Wiper ring		Hydrogenated nitrile rubber	1	LBH70×80×5×6.5	LBH90×100×5×6.5
Cover seal		Nitrile rubber	2	TT-100	TT-125
O-ring for piston rod		Nitrile rubber	1	G-40	G-50
O-ring for cushion ring		Nitrile rubber	1	S-56	G-65
O-ring for bush		Nitrile rubber	1	G-80	G-100
O-ring for piston		Nitrile rubber	1	G-65	G-85
Valve seal (for rod side)		Canned hydrogenated nitrile rubber	3	CX-14H	CR-18H
Valve seal (for head side)		Canned hydrogenated nitrile rubber	1	CX-14H	CR-18H
O-ring for cushion valve		Hydrogenated nitrile rubber	2	—	S-7
Packing set	Double acting single rod cylinder	—	1 set	RH1R/PKS1-100A	RH1R/PKS1-125A

Note 1) Quantity of the O-rings for piston rod with a bore 40 mm is two.

- S-7 is made of hydrogenated nitrile rubber with hardness of 70. S-16 is made of the same with hardness of 90. Other O-rings conform to JIS B 2401-1A.
- Nominal packing models are subject to change.

## 2 Urethane rubber type (Rod A)/160H-1, 160H-1R

Parts name		Material	Q'ty	φ40	φ50	φ63	φ80
Piston packing		Urethane rubber + Nitrile rubber	1	KR304000701	KR005000701	KR006300701	KR408000701
Rod packing		Urethane rubber	1	B32836P5008	B33644P5008	B34050P5008	B35666P5008
Wiper ring		Urethane rubber	1	AY2080P5008	AY3060P5008	AY4045P5008	AY5060P5008
Cover seal		Nitrile rubber	2	TT-40	TT-50	TT-63	TT-80
O-ring for piston rod		Nitrile rubber	1	S-16	S-20	G-25	G-30
O-ring for cushion ring		Nitrile rubber	1	S-22.4	S-28	S-35.5	S-45
O-ring for bush		Nitrile rubber	1	G-30	G-40	G-50	G-65
Valve seal (for rod side)		Canned hydrogenated nitrile rubber	3	CX-8H	CX-12H	CX-12H	CX-14H
Valve seal (for head side)		Canned hydrogenated nitrile rubber	1	CX-12H	CX-12H	CX-12H	CX-14H
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS2 -040A	RH1/PKS2 -050A	RH1/PKS2 -063A	RH1/PKS2 -080A

Parts name		Material	Q'ty	φ100	φ125
Piston packing		Urethane rubber + Nitrile rubber	1	KR010000701	KR012500701
Rod packing		Urethane rubber	1	B37079P5008	B39001P5008
Wiper ring		Urethane rubber	1	AY7000P5008	AY9000P5008
Cover seal		Nitrile rubber	2	TT-100	TT-125
O-ring for piston rod		Nitrile rubber	1	G-40	G-50
O-ring for cushion ring		Nitrile rubber	1	S-56	G-65
O-ring for bush		Nitrile rubber	1	G-80	G-100
Valve seal (for rod side)		Canned hydrogenated nitrile rubber	3	CX-14H	CR-18H
Valve seal (for head side)		Canned hydrogenated nitrile rubber	1	CX-14H	CR-18H
O-ring for cushion valve		Hydrogenated nitrile rubber	2	—	S-7
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS2 -100A	RH1/PKS2 -125A

- S-7 is made of hydrogenated nitrile rubber with hardness of 70. S-16 and S-20 are made of the same with hardness of 90. Other O-rings conform to JIS B 2401-1A.
- Nominal packing models are subject to change.



## List of seals

## 6 Hydrogenated nitrile rubber type (Rod A)/160H-1

Parts name		Material	Q'ty	φ40	φ50	φ63	φ80
Piston packing		Nitrile rubber	2	OUHR40×32×5.4	OUHR50×42×5.4	OUHR63×55×5.4	OUHR80×70×6.5
Rod packing		Nitrile rubber	1	IUH28×36×5.4	IUH36×44×5.4	IUH45×53×5.4	IUH56×66×6.5
Wiper ring		Nitrile rubber	1	LBH28×36×4.5×6	LBH36×44×4.5×6	LBH45×53×4.5×6	LBH56×66×5×6.5
Cover seal		Nitrile rubber	2	TT-40	TT-50	TT-63	TT-80
O-ring for piston rod		Nitrile rubber	1	S-16	S-20	G-25	G-30
O-ring for cushion ring		Nitrile rubber	1	S-22.4	S-28	S-35.5	S-45
O-ring for bush		Nitrile rubber	1	G-30	G-40	G-50	G-65
Valve seal (for rod side)		Canned hydrogenated nitrile rubber	3	CX-8H	CX-12H	CX-12H	CX-14H
Valve seal (for head side)		Canned hydrogenated nitrile rubber	1	CX-12H	CX-12H	CX-12H	CX-14H
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS6 -040A	RH1/PKS6 -050A	RH1/PKS6 -063A	RH1/PKS6 -080A

Parts name		Material	Q'ty	φ100	φ125
Piston packing		Nitrile rubber	2	OUHR100×90×6.5	OUHR125×110×9.6
Rod packing		Nitrile rubber	1	IUH70×80×6.5	IUH90×100×6.5
Wiper ring		Nitrile rubber	1	LBH70×80×5×6.5	LBH90×100×5×6.5
Cover seal		Nitrile rubber	2	TT-100	TT-125
O-ring for piston rod		Nitrile rubber	1	G-40	G-50
O-ring for cushion ring		Nitrile rubber	1	S-56	G-65
O-ring for bush		Nitrile rubber	1	G-80	G-100
Valve seal (for rod side)		Canned hydrogenated nitrile rubber	3	CX-14H	CR-18H
Valve seal (for head side)		Canned hydrogenated nitrile rubber	1	CX-14H	CR-18H
O-ring for cushion valve		Hydrogenated nitrile rubber	2	—	S-7
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS6 -100A	RH1/PKS6 -125A

- Hardness of S-7 is 70. The same of other O-rings is 90.
- Nominal packing models are subject to change.

## 6 Hydrogenated nitrile rubber type (Rod A)/160H-1R

Parts name		Material	Q'ty	φ40	φ50	φ63	φ80
Piston packing		Nitrile rubber	2	OUHR40×32×5.4	OUHR50×42×5.4	OUHR63×55×5.4	OUHR80×70×6.5
Rod packing		Nitrile rubber	1	IUH28×36×5.4	IUH36×44×5.4	IUH45×53×5.4	IUH56×66×6.5
Wiper ring		Nitrile rubber	1	LBH28×36×4.5×6	LBH36×44×4.5×6	LBH45×53×4.5×6	LBH56×66×5×6.5
Cover seal		Nitrile rubber	2	TT-40	TT-50	TT-63	TT-80
O-ring for piston rod		Nitrile rubber	1 Note 1	S-16	P-22	G-30	G-30
O-ring for cushion ring		Nitrile rubber	1	S-22.4	S-28	S-35.5	S-45
O-ring for bush		Nitrile rubber	1	G-30	G-40	G-50	G-65
O-ring for piston		Nitrile rubber	1	—	—	—	G-45
Valve seal (for rod side)		Canned hydrogenated nitrile rubber	3	CX-8H	CX-12H	CX-12H	CX-14H
Valve seal (for head side)		Canned hydrogenated nitrile rubber	1	CX-12H	CX-12H	CX-12H	CX-14H
Packing set	Double acting single rod cylinder	—	1 set	RH1R/PKS6-040A	RH1R/PKS6-050A	RH1R/PKS6-063A	RH1R/PKS6-080A

Parts name		Material	Q'ty	φ100	φ125
Piston packing		Hydrogenated nitrile rubber	2	OUHR100×90×6.5	OUHR125×110×9.6
Rod packing		Hydrogenated nitrile rubber	1	IUH70×80×6.5	IUH90×100×6.5
Wiper ring		Hydrogenated nitrile rubber	1	LBH70×80×5×6.5	LBH90×100×5×6.5
Cover seal		Hydrogenated nitrile rubber	2	TT-100	TT-125
O-ring for piston rod		Hydrogenated nitrile rubber	1	G-40	G-50
O-ring for cushion ring		Hydrogenated nitrile rubber	1	S-56	G-65
O-ring for bush		Hydrogenated nitrile rubber	1	G-80	G-100
O-ring for piston		Hydrogenated nitrile rubber	1	G-65	G-85
Valve seal (for rod side)		Canned hydrogenated nitrile rubber	3	CX-14H	CR-18H
Valve seal (for head side)		Canned hydrogenated nitrile rubber	1	CX-14H	CR-18H
O-ring for cushion valve		Hydrogenated nitrile rubber	2	—	S-7
Packing set	Double acting single rod cylinder	—	1 set	RH1R/PKS6-100A	RH1R/PKS6-125A

Note 1) Quantity of the O-rings for piston rod with a bore 40 mm is two.

- Hardness of S-7 is 70. The same of other O-rings is 90.
- Nominal packing models are subject to change.

## List of seals

## 8 Combined seal type (Rod A)/160H-1, 160H-1R

Parts name		Material	Q'ty	φ40	φ50	φ63	φ80
Piston packing		Fluoric resin + Nitrile rubber	1	OE040005200211B	OE050005200211C	OE063005200211C	OE080005200211C
Rod packing		Hydrogenated nitrile rubber	1	IUH28×36×5.4	IUH36×44×5.4	IUH45×53×5.4	IUH56×66×6.5
Wiper ring		Hydrogenated nitrile rubber	1	LBH28×36×4.5×6	LBH36×44×4.5×6	LBH45×53×4.5×6	LBH56×66×5×6.5
Cover seal		Nitrile rubber	2	TT-40	TT-50	TT-63	TT-80
O-ring for piston rod		Nitrile rubber	1	S-16	S-20	G-25	G-30
O-ring for cushion ring		Nitrile rubber	1	S-22.4	S-28	S-35.5	S-45
O-ring for bush		Nitrile rubber	1	G-30	G-40	G-50	G-65
Valve seal (for rod side)		Canned hydrogenated nitrile rubber	3	CX-8H	CX-12H	CX-12H	CX-14H
Valve seal (for head side)		Canned hydrogenated nitrile rubber	1	CX-12H	CX-12H	CX-12H	CX-14H
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS8 -040A	RH1/PKS8 -050A	RH1/PKS8 -063A	RH1/PKS8 -080A

Parts name		Material	Q'ty	φ100	φ125
Piston packing		Fluoric resin + Nitrile rubber	1	OE100005200211D	OE125005200211D
Rod packing		Hydrogenated nitrile rubber	1	IUH70×80×6.5	IUH90×100×6.5
Wiper ring		Hydrogenated nitrile rubber	1	LBH70×80×5×6.5	LBH90×100×5×6.5
Cover seal		Nitrile rubber	2	TT-100	TT-160
O-ring for piston rod		Nitrile rubber	1	G-40	G-50
O-ring for cushion ring		Nitrile rubber	1	S-56	G-65
O-ring for bush		Nitrile rubber	1	G-80	G-100
Valve seal (for rod side)		Canned hydrogenated nitrile rubber	3	CX-14H	CR-18H
Valve seal (for head side)		Canned hydrogenated nitrile rubber	1	CX-14H	CR-18H
O-ring for cushion valve		Hydrogenated nitrile rubber	2	—	S-7
Packing set	Double acting single rod cylinder	—	1 set	RH1/PKS8 -100A	RH1/PKS8 -125A

- S-7 is made of hydrogenated nitrile rubber with hardness of 70. S-16 and S-20 are made of the same with hardness of 90. Other O-rings conform to JIS B 2401-1A.
- Nominal packing models are subject to change.

New Brand

**TAIYO**

**Parker**

New brand satisfying global standards

## Hydraulic Cylinder 100H-2 Series

Conforming to ISO10762 (JIS B8367-5)

### Features

- Seals in sliding sections conform to ISO standards groove size.
- Normally equipped switches for cylinders with bores from 32 mm to 125 mm.  
(CE mark switches are also available.)
- Adoption of the floating cushion unique to TAIYO (patent pending).
  - Improved start performance.
  - Cushion performance is hard to be affected by fluctuations in oil temperature.  
(Change in cushioning time is less to fluctuations in oil temperature.)
- Main specifications
  - Rod series: B
  - Nine types of bores from 32 mm to 125 mm are available.
  - Ports are applicable to Rc (tapered thread) and G (straight thread).
- More compact and lightweight than our 70H-8.
- Normally equipped high-performance cushion
- Cushion valve easy to adjust.

### Specifications

Bore (mm) :  $\phi 32 \cdot \phi 40 \cdot \phi 50 \cdot \phi 63 \cdot \phi 80 \cdot \phi 100 \cdot \phi 125$   
Nominal pressure : 10MPa  
Mounting style : SD · FA · FB · EA · EB · FE · LA · CA · CB · TA · TC



## Hydraulic Cylinder 210C-1/1R Series

The first 21 MPa new series with magnetic proximity switch (bore from 40 mm to 80 mm)

### Features

- More lightweight, compact, and low-cost than 210H-3 Series.
- Double rod type and larger bore type (from 180 mm to 250 mm) are added.
- Meets request for space-saving design.
- Normally equipped high-performance cushion
- Rod A is also available in addition to standard rod.
- G thread type is also available.



### Specifications

Bore (mm) : Standard type  $\phi 40 \cdot \phi 50 \cdot \phi 63 \cdot \phi 80 \cdot \phi 100 \cdot \phi 125 \cdot \phi 140 \cdot \phi 160 \cdot \phi 180 \cdot \phi 200 \cdot \phi 224 \cdot \phi 250$   
Switch set  $\phi 40 \cdot \phi 50 \cdot \phi 63 \cdot \phi 80$   
Nominal pressure : 21 MPa



## Tiny-Bore Hydraulic Cylinder 100Z-1 Series

10 MPa round type tiny-bore hydraulic cylinder with high-performance cushion

### Features

- 10 MPa tiny-bore hydraulic cylinders with bores 20, 25, and 32 mm.
- Cushion adjustable to all the bores and floating cushion.
- Nitrile rubber and hydrogenated nitrile rubber are used as the materials of seals for sliding section, widen the applicable range of hydraulic fluid.
- Completely identical mounting dimensions to those of 70Z-1 Series.
- New small type switches AX and AZ.

### Specifications

Bore (mm) :  $\phi 20 \cdot \phi 25 \cdot \phi 32$   
Nominal pressure : 10 MPa



## Compact Design Hydraulic Cylinder HQS2 Series

Depending on usage frequency, pressures up to 16 MPa can be used

### Features

- Economical selection can be made based on usage frequency and operating pressure.
- Comforms to JIS B8367-6. Fatigue test class A1.
- Type of mounting, SD, LD, FA, FB.
- Interchangeable with the 100S-1 and 160S-1 series, our preceding model.
- The switch of CE standard is also prepared.

### Specifications

Bore (mm) :  $\phi 20 \cdot \phi 25 \cdot \phi 32 \cdot \phi 40 \cdot \phi 50 \cdot \phi 63 \cdot \phi 80 \cdot \phi 100$   
Rated pressure : 16 MPa  
Type: General purpose, abrasive-fluid-resistant, double-acting single rod, double rod, standard, switch set



## Compact Design Hydraulic Cylinder 100S-1 Series

Space saving/10 MPa compact design hydraulic cylinder

### Features

- Allows economical selection depending on use frequency and operating pressure.
- Comforms to JIS B8367. Fatigue test class A1.
- Great variety of mounting styles, SD, LD, FA, and FB.

### Specifications

Bore (mm) :  $\phi 20 \cdot \phi 25 \cdot \phi 32 \cdot \phi 40 \cdot \phi 50 \cdot \phi 63 \cdot \phi 80 \cdot \phi 100$   
Nominal pressure : 10 MPa  
Type: General purpose type/Cutting oil proof type  
Double-acting single rod/Double rod type  
Standard type/Switch set



## Compact Design Hydraulic Cylinder 160S-1 Series

16 MPa compact design hydraulic cylinder requires less mounting space

### Features

- Standardized cutting oil proof type.
- Can be disassembled for easier maintenance.
- Allows highly precise mounting.
- Standardized switch outfit type. (Magnetic proximity type and cutting oil proof type)
- Great variety of mounting styles, SD, LA, LD, FA, and FB.
- Dog limit switch outfit type is also available. (Semi-standard type)

### Specifications

Bore (mm) :  $\phi 20 \cdot \phi 25 \cdot \phi 32 \cdot \phi 40 \cdot \phi 50 \cdot \phi 63 \cdot \phi 80 \cdot \phi 100 \cdot \phi 125$   
Nominal pressure : 16 MPa  
Type: General purpose type/Cutting oil proof type  
Double-acting single rod/Double rod/Foot type  
Standard type/Switch set



For further information please contact:

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Specifications are subject to change without notice.

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