

16 MPa COMPACT DESIGN HYDRAULIC CYLINDER

OPERATES UP TO 10 MILLION TIMES AT MAXIMUM 16 MPa

- CYLINDER BODY IS STEEL MATERIAL STANDARD TYPE : CARBON STEEL FOR MACHINE STRUCTURE SWITCH SET : STAINLESS STEEL
- MOUNTING DIMENSIONS COMPLETELY INTERCHANGEABLE WITH 140S-1 SERIES.
- FOR SWITCH SET, ADOPT A NEW TYPE, EASY TO MAINTAIN SWITCH THAT CAN ALSO BE USED FOR TIE ROD TYPE UNITS.







Standard type: Carbon steel for machine structure Switch set: Stainless steel External and mounting dimensions completely interchangeable

with 140S-1 series.

Abrasion resistant hydrogenated nitrile rubber seal is standardized.
 Standard type cylinders are fully operable at ambient temperatures of up to 120°C.

- Introducing special copper alloy for vital hydraulic cylinder rod gland.
 - Sliding type switches allow flexible switch placement.
- Adopt a new type, easy to maintain switch that can also be used for tie rod type

units.

140S-1 Series - Newly Updated

New 16 MPa Spec!

(Operates up to 10 million times at a maximum of 16 MPa)

Piston rod Carbon steel for machine structure/ with hard chrome plating



160S-1 Series Compact Design Hydraulic Cylinder

1. Standard Type



2. Switch Set



3. Cutting Fluid Proof Type



4. Both Male and Female Thread Rod Ends Are Available

Female thread



Magnetic proximity switch AX/AZ type

A special cutting fluid proof dust wiper can be used.

Cutting fluid proof specifications WR/WS type switches

Male thread type

TAIYO CAD/DATA reflects customers' requests.

TAIYO is currently supplying the third CAD/DATA that has been improved to reflect customers' various requests.

The improvement in the second CAD/DATA, comparing with the first CAD/DATA was centered on the operation performance, while the retrieving performance was stressed in the development of the third CAD/DATA, comparing with the second CAD/DATA.

Features of TAIYO CAD/DATA

1. Less number of the factors (data capacity) constructing the diagrams of products

The diagrams of products comprise the minimum factors necessary for machine design. Therefore, the influences on the all diagrams (influences on the data capacity) have been reduced even if the products' CAD/DATA are used on the diagram of the machine.

The non-use of ellipses and spline curves limits the increase of the factors even when data conversion is performed.

Application for CAD/DATA

2. Less number of diagrams (files)

The diagrams of products are classified into the models to reduce the number of files for easier file management and less labor in data conversion.

Date of entry:

The CAD/DATA is available with no charge. If you request for the CAD/DATA, fill the application form below, and contact your nearest TAIYO sales office.

Application Form of TAIYO Series CAD/DATA

Company name					Our remarks
				Charge sales office	
Department, section				Sales office code	
Official position				Person in charge	
Name					
Address					
	ZIP CODE	TEL	F	AX	
E-mail					
Your CAD	CAD system (software)	Name	Ver.	Manufacture	
system	Computer model (hardware)	Name		Manufacture	
	Required data	DXF			
supplying		Others			
	Supplying modium	CD-ROM			
	Supplying mealum	Others			
Supplier of our products	Company name				

• "MICRO CADAM" is the registered trademark of which exclusive right for use is owned by CADAMSYSTEMS CO. "AUTO CAD" is the registered trademark of Autodesk, Inc. in the U.S.A.

• "DXF File" is the public data format of Autodesk, Inc. in the U.S.A.



For Safe Use

For Safe Use5

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 safe 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

- ISO 4413 : Hydraulic fluid power-General rules for the application of equipment to transmission and control systems
- JIS B 8361 : General rules for hydraulic system
- JIS B 8354: Double acting hydraulic cylinder
- JIS B 8367: Hydraulic cylinder, mounting dimensions
- High-pressure gas preservation law
- · Labor safety and hygiene law
- Fire laws
- 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.



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 excessively loosen the air vent plug when venting air.

The excessive loosening of the air vent plug may lead to coming-off or jumping of the plug from the cylinder, causing spouted oil, injury of operator, or misoperation 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 or steel working machinery 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.

ACaution

(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 unsmooth movement of the rod may also occur.
- 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 10 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 Cushion and Air Vent)

- The excessive loosening of the check plug when venting air may lead to coming-off or jumping of the check plug from the cylinder, causing spouted oil.
 - Feed the oil with a low pressure (the pressure with which the cylinder can move at the low speed of approx. 10 mm/s), and loosen the check plug by one or two turns (counterclockwise) to vent air in the oil from the check valve.
 - When using a cylinder without a check valve, attach a metering valve, etc. to a pipe and perform air-bleeding.
- 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.

SI Unit Conversion Table

	SI Units	Conventional Units	Conversion Rate	* Conversion Values
Force, load	Ν	kgf	1 N = 0.102 kgf	× 9.80
Pressure	MPa	kgf/cm ²	1 MPa = 10.2 kgf/cm ²	× 0.098
Torque, moment	N∙m	kgf∙m	1 N⋅m = 0.102 kgf⋅m	× 9.80
Work, energy	J	kgf∙m	1 J = 0.102 kgf⋅m	× 9.80
Moment of inertia	kg⋅m²	kgf.cm.sec ²	1 kg·m ² = 10.2 kgf·cm·sec ²	× 0.098
Power	12)0/	kgf∙m/sec	1 kW = 102 kgf⋅m/sec	× 0.0098
Power	KVV	PS	1 kW =1.36 PS	× 0.735
Stress	N/mm ²	kgf/mm ²	$1 \text{ N/mm}^2 = 0.102 \text{ kgf/mm}^2$	× 9.80
Vacuum pressure	– kPa	–mmHg	−1 kPa = −7.52 mmHg	× 0.133
Angle	rad	° (Degree)	1 rad = 57.3° (Degree)	× 0.0175
Angular speed	rad/s	rad/sec	1 rad/s = 1 rad/sec	1
Acceleration	m/s ²	cm/sec ²	1 m/s ² = 100 cm/sec ²	× 0.01

The conversion values with *-marks are the coefficients to convert the conventional units into the SI units.

Ex.) 5 kgf/cm² \times 0.098 = 0.49 MPa



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Check of Conditions When Using Hydraulic Cylinders

Items	Contents
1. Set pressure (MPa)	Set pressure in hydraulic circuit
2. Load weight (kg)	Weight of objects to be moved, angle with gravity
3. Load driving conditions	Load installation, moving condition, presence of offset load
4. Required cylinder stroke (mm)	Cylinder stroke required for machines, cylinder excess stroke
5. Working speed (mm/s)	The maximum and working speed of cylinder inrush into cushion
6. Working frequency (number of time/time)	Working frequency
7. Working oil	Type of working oil used
8. Environmental conditions Note)	Temperature, dusts, vibration, cutting fluid splashing conditions, etc.

Note) Be sure to contact us before using or storing cylinders in places where are splashed with water and sea water, or are highly humid, since countermeasures against rusts and corrosion are required.

Selection of Cylinder Bore

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



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

- A1 : push side piston pressurized area (mm²) A1 = $\frac{\pi}{4}$ D²
- A₂: pull side piston pressurized area (mm²) A₂ = $\frac{\pi}{4}$ (D²⁻ d²)
- D : cylinder bore (mm) d: piston rod dia. (mm)
- P : set pressure (MPa)
- $\beta~:~\text{load rate}$

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%

Pushed Hydraulic Cylinder Theoretical Output Table (Load rate 100%)

Set Pressure MPa Bore Pressurized Area mm² mm 1.0 3.5 5.0 7.0 10.0 14.0 16.0 314 0.31 1.10 1.57 2.20 3.14 4.40 φ20 5.02 ¢25 491 0.49 1.72 2.45 3.44 4.91 6.87 7.85 804 ¢32 0.80 2.81 4.02 5.63 8.04 11.26 12.86 1257 1.26 4.40 17.59 φ40 6.28 8.80 12.57 20.11 1963 1.96 6.87 9.82 13.74 19.63 31.40 φ50 27.49 ¢63 3117 3.12 10.91 15.59 21.82 31.17 43.64 49.87 φ80 5027 5.03 17.59 25.13 35.19 50.27 70.37 80.43 **φ100** 7854 7.85 27.49 109.96 39.27 54.98 78.54 125.66 12272 ¢125 12.27 42.95 61.36 85.90 122.72 171.81 196.35

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.

Pulled Hydraulic Cylinder Theoretical Output Table (Load rate 100%)

Unit : kN (1 kN≒102 kgf)

Unit : kN (1 kN ≒ 102 kgf)

Bore	Rod Dia.	Pressurized		Set Pressure MPa							
mm	mm	Area mm ²	1.0	3.5	5.0	7.0	10.0	14.0	16.0		
φ20	φ 1 2	201	0.20	0.70	1.01	1.41	2.01	2.81	3.21		
φ25	φ 1 4	337	0.34	1.18	1.68	2.36	3.37	4.72	5.39		
φ32	φ18	550	0.55	1.92	2.75	3.85	5.50	7.70	8.80		
φ40	φ 2 2	877	0.88	3.07	4.38	6.14	8.77	12.27	14.02		
φ50	φ 2 8	1348	1.35	4.72	6.74	9.43	13.48	18.87	21.56		
φ63	¢36	2099	2.10	7.35	10.50	14.70	20.99	29.39	33.59		
φ80	φ 4 5	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		
φ 1 25	φ70	8423	8.42	29.48	42.12	58.96	84.23	117.93	134.77		

• 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.

Selection of Sealing Materials

Checking the following conditions, select a correct sealing material.

- 1. Cylinder internal oil and ambient temperatures
- 2. Hydraulic fluid type
- 3. Cutting oil (coolant) type to be splashed, if any
- 4. Frequency of use

Notes)

- Select a sealing material matching the hydraulic fluid type to be used. If an inappropriate sealing material is selected, this material may be deteriorated, causing the seal to be damaged.
- It is recommended that hydraulic fluid with NAS class 10 or higher cleanliness be used.
- DO NOT mix the different types of hydraulic fluid. Otherwise, the mixed hydraulic fluid may be transformed, causing the seal to be deteriorated.
- When using hydraulic fluid containing water (water-glycol based hydraulic fluid, W/O and O/W hydraulic fluid, etc.) and also using carbon steel for machine structural use as a cylinder tube material, it is recommended metalplating be performed on the cylinder tube's inner surface. If wishing to obtain the cylinder tube with its inner surface metal-plated, please contact us.

Sealing Material-hydraulic Fluid Suitability and Sealing Material Usage Temperature Range

			Suitabl	e Hydrauli	c Fluid										
No.	Sealing Material	General mineral hydraulic fluid	Water-glycol based hydraulic fluid	Phosphate based hydraulic fluid	W/O hydraulic fluid	O/W hydraulic fluid	Oil and Ambient Temperature (°C) -50 -10 0 50 80 100 120				150				
1	Nitrile rubber	0	0	X	0	0									
2	Urethane rubber	0	×	×	\bigtriangleup	\triangle									-
3	Fluorine- containing rubber	0	×	0	0	0		I					1		
6	Hydrogenated nitrile rubber	0	0	×	O	0								_	_
												NC	ites)		

Notes) • \bigcirc & \bigcirc : Can be used, \times : Cannot be used, \triangle : Please contact us

- Sealing materials with \bigcirc are recommended to be used when abrasion resistance is most required.
- When using fluorine-containing rubber with water-glycol based, W/O, or O/W hydraulic fluid, use it within the oil temperature range of -10 to +100°C.
- These temperatures are within the seal's usage temperature range. This range differs from the cylinder unit's usage temperature range. When using the cylinder at high temperatures, please contact us.

Urethane and Nitrile Rubber Selection Method

Urethane and nitrile rubbers are standard cylinder sealing materials. When selecting the appropriate one, refer to the following reference table.

• Urethane rubber characteristics

As shown in the table below, urethane rubber's tensile strength is approximately 2.5 times more than that of nitrile rubber, which makes urethane rubber's pressure and abrasion resistance superior. Urethane rubber, however, may be transformed due to heat and hydraulic fluid deterioration after the use for a long period of time (also from synergistic effects with oil temperature). Therefore, yearly overhaul is required.

Nitrile rubber characteristics

Compared to urethane rubber, nitrile rubber is not affected very much by heat and hydraulic fluid deterioration. Since nitrile rubber's tensile strength is smaller than that of urethane rubber, nitrile rubber's pressure and abrasion resistance is comparatively smaller. Therefore, when using a seal at low pressures for two to three years without overhauling, and also when the frequency of its use is not high, nitrile rubber is considered more suitable as a sealing material.

Hydrogenated nitrile rubber characteristics

Hydrogenated nitrile rubber is most appropriate when abrasion resistance is more required than that of fluorine-containing rubber at high temperatures, and also when abrasion resistance is more required than that of nitrile rubber at regular temperatures.

Sealing Material Items	Nitrile Rubber	Urethane Rubber	Fluoric-containing Rubber	Hydrogenated Nitrile Rubber
Abrasion resistance	\bigcirc	O	0	0
Life against inferiority of working oil	0	\bigtriangleup	0	0
Life with high oil temperature	0	\bigtriangleup	0	0
Oil leak from rod	◯ (JIS type B)	© (JIS type A)	◯ (JIS type B)	◯ (JIS type B)
High use frequency under high pressure	0	O	\bigtriangleup	0
Low use frequency under low pressure	O	0	0	0
Pull strength (reference value) (MPa)	17	47	15	30

Sealing Material Selection Reference Table

Note) \bigcirc , \bigcirc , and \triangle indicate the suitability order of those sealing materials. \bigcirc indicates its suitability is most superior.

Criteria for selection in case that cutting fluid is splashed

Cutting fluid is in mist form or it is splashed several times a day. Cutting fluid is splashed always or frequently.	According to the suitability between the cutting oil and sealing material, select a correct sealing material and it can be used for a regular cylinder.
Cutting oil can be splashed always or frequently.	If a regular cylinder is used, cutting oil may enter the inside of the cylinder from the gland section. Therefore, select cutting oil proof specification cylinder (70/140HW-8). However, if water-immiscible cutting fluid type 2 can be splashed onto the cylinder, please contact us.

Suitability between Cutting Oil (Coolant) and Sealing Material

	Cutting Oil Type	Water-immiscible	Cutting Fluid Type	Water-miscible Cutting Fluid Type			
No.	Chlorine Sealing Material	Not included (type 1)	Included (type 2)	Not contained (W1, Type 2, Nos1 and 3)	Contained (W1, Type 2, No.2)		
1	Nitrile rubber	×	×	\bigtriangleup	×		
2	Urethane rubber	×	×	×	×		
3	Fluoric rubber	0	0	×	×		
6	Hydrogenated nitrile rubber	0	×	0	0		

Note) \bigcirc : Can be used, X : Cannot be used, \triangle : Can be used at 50°C or less

Sealing Material Suitable for Each Series

No.	Packing Material	35Z-1	35H-3 35P-3	100Z-1	100H-2	70/140H-8 70/140P-8 (¢32~¢160)	70/140H-8R 70/140P-8R (¢32~¢140)	70/140H-8 (φ180~φ250)	70/140HW-8	160H-1	210C-1 210H-3	35S-1	HQS2 100S-1 160S-1 210S-1	HQSW2 100SW-1 160SW-1	70/140M-3
1	Nitrile rubber	0	\bigcirc	0	\bigcirc	\bigcirc	0	0	×	\bigcirc	\bigcirc (with BUR)	\times	×	×	
2	Urethane rubber	×	×	×	0	\bigcirc	0	×	×	\bigcirc	0	\times	×	×	0
3	Fluoric-containing rubber	×	0	×	×	\bigcirc	0	0	×	×	\bigcirc (with BUR)	×	0	×	\triangle
6	Hydrogenated nitrile rubber	\times	0	0	\bigcirc	\bigcirc	0	0	0	\bigcirc	\bigcirc (with BUR)	\bigcirc	0	0	×
Q	Slipper seal	\times	0	×	×	\bigcirc	×	×	×	×	×	\times	×	×	×
0	Combined seal	×	\times	×	\bigcirc	×	×	×	×	\bigcirc	×	\times	×	×	×

 \bigcirc : Standard

riangle : Semi-standard

 \times : Cannot be manufactured

"BUR" for 210H-3 series is an abbreviation of "backup ring."



Precautions for Use

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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 For the use of the items below, use them at the temperature lower than the upper limits shown below.

Items	Upper Limit Oil Temperature	
Quitable act outlinder	WR • WS types	60°C or lower
Switch set cylinder	Other switches	70°C or lower
Cylinder with position	35P-3 70/140P-8	50°C or lower
detector	70•140MT-3	65°C or lower
Cylinder with primary components for which aluminum alloy is used (35S-1•HQS(W)2•100S(W)-1•35SY-1)		70°C or lower

If several items with different upper limits of oil temperature are used, adopt the lowest temperature limit, and use the items at the temperature lower than the adopted upper limit.

Ex.) When using 100SW-1R • HQSW2R with the WR type switch, use it at 60°C or lower.

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 anticorrosion measures. In such a case, contact us.

3-3) Installing Location

- (1) Use cylinders only indoors.
- (2) Avoid the use in the places where are subjected to dusts and vibrations.

DO NOT use them under the environmental conditions shown below. The use under these conditions requires the protection of the rod part, rust-proof measures, review of part material, magnetic shield, and vibrationproof 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

• For the mounting of cylinders, use bolts of the specified size, and fix with the bolts of the strength class (refer to JIS B8367).

In the case of the rotary type, use pins of the specified size. Otherwise, screws may be loosened or damaged 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.

- When using the cylinder with the rod push output, tighten the screw(s) to the rod end completely so that no load is applied to the piston rod screw section.
- Since lateral load (eccentric load) cannot be applied to the piston rod, carefully adjust it after rod end attachment.
- When tightening the double-acting double rod type's piston rod end thread(s), be sure to use the width across flats of the rod to be tightened. Since the double rod type's piston rod is tightened by screws, be careful not to apply rotational force to the piston rod's both ends.

4-2) Mounting of Cylinder

- Use four hexagon socket bolts (JIS B1176, strength classification of 10.9 or more) to install the cylinder.
- When using mounting bolts, screw the bolt's threads 80% or more into the installation members. The material for the installation members must have strength equal to SS400.
- When using nuts to tighten the mounting bolts, use steel nuts with a strength classification of 6 or more. (However, DO NOT use type 3 nuts.)
- When using the mounting bolts to secure the cylinder unit, be sure to use the following standard tightening torque.

5 5	
Mounting Bolt	Tightening Torque N ∙ m
$\text{M5}\times 0.8$	4.8
$\text{M5}\times 0.8$	4.8
M6 imes 1	8.1
M8 imes 1.25	20.0
M10 imes 1.5	40.0
M12 imes 1.75	67.0
$M14 \times 2$	110.0
$M18 \times 2.5$	240.0
$M22 \times 2.5$	460.0
	Mounting Bolt $M5 \times 0.8$ $M5 \times 0.8$ $M6 \times 1$ $M8 \times 1.25$ $M10 \times 1.5$ $M12 \times 1.75$ $M14 \times 2$ $M18 \times 2.5$ $M22 \times 2.5$

Cylinder Mounting Bolt Tightening Torque

Values in the parenthesis are for the foot type.

• When installing the foot type, use the accompanying key. If this key cannot be used, attach a stopper in front and rear of the cylinder unit. Otherwise, the mounting bolts may be damaged.

5. Piping

- Take sufficient care to avoid dusts and chips of pipes in the piping.
- 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

- Prior to first operating the cylinder, be sure to perform air-bleeding via the piping section. After air-bleeding is completed, operate the cylinder with the pressure kept lower, and then increase the pressure gradually to the specified value.
 - Note) Since the 160S-1 series is not equipped with the air bleeder, perform air-bleeding via the piping section.

Any air remained may cause malfunctions below. [Symptoms]

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

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.

3) Overhaul and Reassembly Requirements

 After removing the set screw, use the rod gland's turning hole to remove the rod gland from the cylinder body. Since, when removing the rod end thread's jig, burrs may

width across flats, use



occur on the rod's Note) The body contains a copper piece under the set screw.

a file or other appropriate tools to remove the burrs and then remove the rod gland.

- The piston rod and piston cannot be disassembled.
- When reassembling the cylinder, be careful that foreign matters such as dust, filings, and debris do not enter the inside of the cylinder.
- Under the set screw, a rod gland thread protective copper piece is equipped. First, remove this ball and then tighten the rod gland.
- After tightening the rod gland, return the seal set's copper piece in place and tighten the set screw.

4) Seal Replacement

- When overhauling the cylinder, replace all the sealing materials (seals and gaskets) with new ones.
- General purpose type (160S-1, 160S-1D, 160S-1R, 160S-1RD)'s piston seal, rod seal, dust wiper, and rod gland O-ring can be replaced.
- Cutting fluid proof type (160SW-1, 160SW-1D, 160SW-1R, 160SW-1RD)'s piston seal, rod seal, rod gland Oring can be replaced.

Wiper-seal of Cutting Fluid Proof Type is pressed into the rod grand, so rod grand including the Wiper-seal is available as a spare part. Please be careful for not being included wiper-seal in the seal kit.

• Since the piston and rod have been locked, the piston rod O-ring cannot be replaced.

Dimension of turning hole



*General purpose type:bore ϕ 20~ ϕ 125 *Cutting fluid proof type:bore ϕ 32 Cutting fluid proof type:bore $\phi 40 \sim \phi 100$

Bore	а	d	PCD
<i>φ</i> 20	4	4	23
<i>φ</i> 25	4	4	25
<i>φ</i> 32	5	4	32
<i>φ</i> 40	7	4	38
<i>φ</i> 50	8	5	46
<i>ф</i> 63	8	5	58
<i>\phi</i> 80	10	8	70
<i>φ</i> 100	12	10	85
<i>ф</i> 125	10	8	106

9. Storage

1) Notes on Storage

When storing cylinders, take countermeasures against the followings:

- (1) Rusts
- (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°C 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 them, consult with a disposal company.
- 3) Dispose resin base and rubber base components as nonflammable wastes.
- 4) When disposing waste oil, conform to related laws and rules.



Compact Design Hydraulic Cylinder 160S-1

16MPa Compact Design Hydraulic Cylinder with Steel Body

- Operates up to 10 million times at maximum 16 MPa.
- Abrasion resistant seal is standard.
 Standard type cylinders are fully operable at ambient temperatures of up to 120°C.
- Introducing special copper alloy for vital hydraulic cylinder.
- Sliding type switches allow flexible switch placement.



Standard Specifications

60.

Types	Specifications of General Purpose	Cutting Fluid Proof Types
Nominal pressure	16 N	ИРа
Maximum operating pressure	16 N	ИРа
Proof test pressure	24N	ſРа
Minimum working pressure	0.3 1	MPa
Operationg speed range	8 - 100) mm/s
Temperature range (Ambient temperature and oil temperature)	Standard type Switch set AX · AZ type WR · WS type . (free of freeze)	
Structure of cushioning	No	ne
Adaptable working oil	Petroleum- (For other working oil, refer to the	based fluid e table of working oil adaptability)
Tolerance of thread	JIS 6 g/6H (JIS grad	de 2 or equivalence)
Tolerance of stroke	0 to 0	.8mm
Mounting type	SD, ST, LA, LD, FA, FB	SD, LD, FA, FB
Rod end threads	Female and	male threads
Suitable switches for switch set	AX ⋅ AZ types 160S-1R: WR ⋅ WS types	160SW-1R: WR · WS types

Note) The switch 'AX125' and 'AZ125' are newly developed for high temperature circumstance up to 100°C.

Cutting fluid proof models

- These models can be used in environments where the machine tool cutting oil (coolant) can be splashed.
- Sealing materials suitable for each cutting oil are as shown in the right side table:

Terminologies (Referred to the revised JIS B8367)

Nominal pressure

Pressure to be used to express a cylinder model's typical performance. This pressure value does not always match the actual operating pressure (rated pressure) at which the cylinder's performance is ensured under the specified conditions.

Maximum operating pressure

The cylinder's maximum internal pressure available. This pressure differs from the relief valve's set pressure. Pressures that are higher than the relief valve's set pressure, such as surge pressure during valve changing, are applied to the inside of the cylinder.

Proof test pressure

Proof test pressure is defined what could keep performance of cylinder through test pressure and nominal pressure.

Minimum working pressure

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

- - Since lateral load (eccentric load) cannot be applied to the piston rod, carefully adjust it after rod end attachment.
 - The working temperature range depends on the material of packings. For details, refer to the selection materials in the beginning of this catalogue.
 - If the piston touches the cylinder end at the stroke end, decelerate the cylinder to a speed lower than the minimum operating speed.

Allowable Seal Material (Hydrogenated Nitrile Rubber) and Cutting Oil

Non-water Solu	uble Cutting Oil	Water Soluble Cutting Oil
Type 1	Type 2	Water Soluble Cutting On
0	×	0

 \bigcirc : All wable X: Unallowable



Notes) • Switches can't be mounted on Standard type. You are requested to select "Switch set" type when you would like to use switches.
The ST mounting type is a made-to-order product.



• Cylinder dimensions are all the same for both general purpose and cutting fluid proof types.

60.

160S-1

16MPa Compact Design Hydraulic Cylinder



Switch List

Kind	Switch Symbol	Load Voltage Range	Load Current Range	Maximum Open/ Close Capacity	Protective Circuit	Indicating Lamp	Wiring Method	Cord Length	Applicable Load Device
	AF AX101				Nono			1.5m	
	AG AX105	DC:5 - 30 V	DC:5 - 40mA		None	LED (Ped light lights	Core of 0.3 mm ² outer	5m	
	AH AX111	AC:5 - 120 V	AC:5 - 20mA	AC:2VA	Dresent	up during ON)	diameter of ø4 mm, cord	1.5m	
	AJ AX115			/.0.27/	Fleselii	,	extended from the rear	5m	
	AE AX125	DC:30V or less AC:120V or less	DC:40V or less AC:20V or less		None	None		5m	
	AK AX11A	AC:5 - 120 V	5 - 20mA	2VA	Present	LED (Red light lights	4-pin connector, type	0.5m	
	AL AX11B	DC:5 - 30 V	5 - 40mA	1.5W	1100011	up during ON)	Rear wiring	0.5m	
Ŧ	5 WR525	DC:5 - 50 V	DC:3 - 40mA	DC:1.5W	None	LED (Red light lights	Core of 0.3 mm ² , outer diameter of ø4 mm cord	5m	Small relay
ntac	5F WR525F	AC:5 - 120 V	AC:3 - 20mA	AC:2VA		up during ON)	extended from the rear	5m	programmable
Cor	AP AZ101				None			1.5m	controller
	AR AZ105	DC:5 - 30 V	DC:5 - 40mA AC:5 - 20mA			(Red light lights	Core of 0.3 mm ² , outer	5m	
	AS AZ111	AC:5 - 120 V		AC:2VA	Present	up during ON)	diameter of ø4 mm, cor	1.5m	
	AT AZ115				1100011		extended from the top	5m	
	AN AZ125	DC:30V or less AC:120V or less	DC:40V or less AC:20V or less		None	None		5m	
	AU AZ11A	AC:5 - 120 V	5 - 20mA	2VA	Present	LED (Red light lights	4-pin connector, cord	0.5m	
	AW AZ11B	DC:5 - 30 V	5 - 40mA	1.5W		up during ON)	extended from the top	0.5m	
	8 WR535	DC:5 - 50 V	DC:3 - 40mA	DC:1.5W	None	LED (Red light lights	Core of 0.3 mm ² , outer diameter of ø4 mm. cord	5m	
	8F WR535F	AC:5 - 120 V	AC:3 - 20mA	AC:2VA		up during ON)	extended from the top	5m	
	BE AX201			-	Present	LED (Red light lights		1.5m	
	BF AX205	DC:5 - 30 V	5 - 40mA			up during ON)		5m	_
	CE AX211					LED (2-lamp type in	diameter of 0.3 mm ² , outer	1.5m	
	CF AX215					red/green)	extended from the rear	5m	
act	2 WS235	DC:10 - 30 V	6 - 70mA	_	Present	LED (2-lamp type in		5m	
onta	2F_WS235F					red/green)		5m	
Ŭ 0	BM AZ201					LED (Red light lights		1.5m	
z	BN AZ205	DC:5 - 30 V	5 - 40mA	_	Present	up during ON)	0	5m	Small relay
	CM AZ211					LED (2-lamp type in	diameter of Ø4 mm. cord	1.5m	programmable
	CN AZ215					red/green)	extended from the top	5m	controller
	1 WS245	DC [.] 10 - 30 V	6 - 70mA	_	Present	LED (2-lamp type in		5m	
	1F WS245F	20110 00 1	0 101111		1100011	red/green)		5m	
_	CT AX211CE						Core of 0.3 mm ² , outer diameter of ø4 mm, cord	1.5m	
No Contact (CE coformed)	CU AX215CE						extended from the rear	5m	
	CV AX21BCE	DC:5 - 30 V	5 - 40mA	_	Present	LED (2-lamp type in	4-pin connector, type Rear wiring	0.5m	
	CW AZ211CE	20.0 00 0	5 1011.01		1 1000111	red/green)	Core of 0.3 mm ² , outer	1.5m	
	CX AZ215CE					ieu/gieen)	/ diameter of ø4 mm, cord extended from the top	5m	
	CY AZ21BCE						4-pin connector, cord extended from the top	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.).

WR525

Switch body

5

For the handling of switches, be sure to refer to the switch specifications in the end of this catalogue.
The WR and WS type switches are cutting fluid proof type.
For the 200 V AC type, contact us.

We recommend AND UNIT (AU series) for multiple switches connected in series.

 General purpose type AX type (cord rear wiring)

 Cutting fluid proof type WR · WS type switch Cord rear wiring

AZ type (cord upper wiring)





WS245

The switch and straight box connector (F-SB) 8 WR535 are combined [the flex tube (F-05: 4.8 m) is 2 WS235 required]. 1 WS245 5F WR525F 8F WR535F The flex tube (F-05: 4.8 m) is attached to the 2F WS235F switch and straight box connector (F-SB). 1F WS245F

Straight box connector: F-SB

Flex tube: F-05

• For the switch symbol **③**, pay attention to the points below when ordering the cutting fluid proof type switches, WR and WS types.

Standard stroke fabrication range (Single-rod)

Charlesterne	Tuno	Mounting	Dava	Cylinder Stroke (mm)									Male						
Structure	туре	Туре	Bore	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	Type
			<i>φ</i> 20	0	0	0	0	0	0	\circ	0	0	0		—		—		0
			<i>ø</i> 25	0	0	0	0	0	0	0	0	0	0				—		0
			<i>ø</i> 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Desistant	<i>φ</i> 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Basic type	<i>φ</i> 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		(3D)	<i>_</i> 63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			<i>\phi</i> 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			<i>ϕ</i> 100																
	Oton dond		<i>ø</i> 125											—	—				
	Standard	Flange	<i>φ</i> 20	0	0	0	0	0	0	0	0	0	0		—				0
	160S-1	type	<i>\$</i> 25	0	0	0	0	0	0	0	0	0	0			—	_	_	0
	1003-1	(FA, FB)	<i>ø</i> 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		(,)	<i>φ</i> 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
General			<i>φ</i> 50	0	0	\bigcirc	\bigcirc	0	0	0	0	\circ	0	0	0	\bigcirc	\circ	0	0
purpose		Foot type	<i>_</i> 63	0	0	\bigcirc	\bigcirc	0	0	0	0	\circ	0	0	0	\bigcirc	\circ	0	0
type			<i>\phi</i> 80	0	\bigcirc	0	\bigcirc	0	\bigcirc	\circ	\bigcirc	\circ	0	0	0	\circ	\circ	\bigcirc	0
			<i>ø</i> 32	\bigcirc	\bigcirc	\circ	\bigcirc	0	\bigcirc	\circ	\bigcirc	\circ	0						0
		Foot type	<i>φ</i> 40	0	0	0	0	0	0	0	0	0	0						0
		(LA)	<i>φ</i> 50	0	0	0	0	0	0	0	0	0	0						0
			<i>_</i> 63	0	0	0	0	0	0	\circ	0	0	0						0
		Basic type	<i>ø</i> 32	0	0	0	0	0	0	\circ	0	\circ	0	0	0	\circ	0	0	
		(SD) Elange type	<i>φ</i> 40	0	0	0	0	0	0	\circ	0	0	0	0	0	\circ	0	0	
	Switch set	(FA, FB)	<i>φ</i> 50	0	0	\circ	\circ	0	0	$ \circ $	\circ	\circ	0	0	0	\circ	\circ	0	0
		Foot type	<i>_</i> 63	0	0	0	0	0	0	\circ	0	0	0	0	0	\circ	0	0	
	160S-1R	(LD)	<i>\phi</i> 80	0	\bigcirc	0	\bigcirc	0	0	\circ	\bigcirc	\circ	0	0	0	\circ	\circ	\bigcirc	0
			<i>ø</i> 32																
		Foot type	<i>φ</i> 40																
		(LA)	<i>\$</i> 50																
			<i>_</i> 63																
			<i>ø</i> 32	0	\bigcirc	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	\bigcirc	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	0	\bigcirc	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	\bigcirc	
		Desistant	<i>φ</i> 40	0	0	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	\bigcirc	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	0	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	0	
		Basic type	<i>φ</i> 50	0	\bigcirc	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	0	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	\bigcirc	
	Chara da rad	(5D)	<i>φ</i> 63	0	0	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	0	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	0	
	Standard		<i>φ</i> 80											0	\cup	$ $ \bigcirc	$\left \right\rangle$	\bigcirc	
	160SW-1		<i>φ</i> 100																
Cutting	100300-1	Flange	<i>φ</i> 32	0	\bigcirc								$\left \right\rangle$			$\left \begin{array}{c} 0 \\ 0 \end{array} \right $		\bigcirc	
fluid			<i>φ</i> 40	0	0			$\left \begin{array}{c} 0 \\ 0 \end{array} \right $					$\left \right\rangle$			$\left \begin{array}{c} 0 \\ 0 \end{array} \right $		0	
proof type			<i>φ</i> 50	0	0	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $		$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $		0		$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	0	
			<i>ψ</i> ο3	0	0	0		0	0				0	0	0	0		0	\square
		(LD) Basic type	<i>ψ</i> δ0 <i>φ</i> 22	0	0	0		0	0				0	0				0	
		(SD)	ψ32 <u> </u> <u> </u> <u> </u> φ32	0															\vdash
	Switch set	Flange type	φ40 <u> </u> <u> </u>	0															\vdash
	160SW-1R	(FA, FB)	φ50 	0						0									\vdash
		Foot type	<i>ψ</i> 03	0	0													0	
			ψδυ	\cup	\cup	\cup	\cup	\cup	\cup	\square	\square	\square	\cup	\cup	\cup	\Box	\mathbf{D}	\cup	

 \bigcirc : Standard manufacturing range, \square : Range available for manufacturing for order

Available bore range at ST mounting. (Single-rod only/Made-to-order)

Structure	Type	Mounting	Bore					Cylinde	r Stroke	(mm)				Male
Olluciale	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Туре	Dore	110	120	130	140	150	160	170	180	190	200	Туре
		Throad	<i>ø</i> 32											
	Standard	holos	<i>φ</i> 40											
	type 160S-1	mounting (ST)	<i>φ</i> 50											
General			<i>_</i> 63											
			<i>\phi</i> 80											
type		Thread	<i>ø</i> 32											
iypo	Switch set holoo	holes	<i>φ</i> 40											
	160S-1R	R mounting	<i>φ</i> 50											
		(ST)	<i>_</i> 63											
		(01)	<i>\phi</i> 80											

Compact Design Hydraulic Cylinder

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 $\hfill\square$: Range available for manufacturing for order

Standard stroke fabrication range (Double-rod)

Otaria	Turne	Mountina	Dam	Cylinder Stroke (mm)									Male						
Structure	туре	Туре	Bore	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	Thread Type
			<i>φ</i> 20	0	0	0	0	0	0						—	—	—	—	0
			<i>ø</i> 25	0	0	0	0	0	0							-	_	_	0
			<i>ø</i> 32	0	0	0	0	0	0	0	0	0	0						0
		Basic type	<i>φ</i> 40	0	0	0	0	0	0	0	0	0	0						0
		(SD)	<i>φ</i> 50	0	0	0	0	0	0	0	0	0	0						0
		(02)	<i>ф</i> 63	0	0	0	0	0	\bigcirc	0	0	0	0						0
			<i>ø</i> 80	0	0	0	0	0	0	0	0	0	0						0
			<i>ф</i> 100																
	Standard		<i>ф</i> 125												_			—	
	type	Flange	<i>ф</i> 20	0	0	0	0	0	0						-	-		—	0
	160S-1D	type	<i>¢</i> 25	0	0	0	0	0	0									—	0
General		(FA)	<i>ø</i> 32	0	0	0	0	0	0	0	0	0	0						0
purpose			<i>φ</i> 40	0	0	0	0	0	0	0	0	0	0						0
type		Foot type	<i>φ</i> 50	0	0	0	0	0	0	0	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	0	$\left \right\rangle$						0
		(LD)	<i>\$</i> 63	\bigcirc	0	\bigcirc	\bigcirc	\bigcirc	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	\bigcirc	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $	$\left \begin{array}{c} 0 \\ 0 \end{array} \right $						
		()	<i>\delta</i>				\bigcirc			\square	$\left \right\rangle$		\bigcirc						
			φ32																
		Foot type	<i>φ</i> 40																
		(LA)	<i>φ</i> 50																
		Pagia tuna	<i>φ</i> 63																
		(SD)	φ32 #40																
	Switch set	Flange type	φ40 φ50																
	160S-1RD	(FA)	φ50 																
		Foot type	φ03 																
		(LD)	φ00 φ32																
			φ02 φ40																
		Basic type	φ.10 φ50																
		(SD)	<i>ø</i> 63																
	Standard	()	<i>•</i> <i>•</i> 80																
	type		<i>ф</i> 100																
	160SW-1D	-	<i>ø</i> 32																
Cutting		Flange type	<i>φ</i> 40																
TIUIO proof type		(FA)	<i>ø</i> 50																
proor type		Foot type	<i>ø</i> 63																
		(LD)	<i>ø</i> 80																
		Basic type	<i>ø</i> 32																
	Qualitate and	(SD)	<i>φ</i> 40																
		Fiange type (FA)	<i>φ</i> 50																
	1003W-1RD	Foot type	<i>\phi</i> 63																
	100300-180	(LD)	<i>\phi</i> 80																

 \bigcirc : Standard manufacturing range, \Box : Range available for manufacturing for order

Adaptability of Working Oil to Packing Material

Packing		Adapt	able Work	ing Oil	
Material	Petroleum-	Water-glycol	Phosphoric	W/O Water in	O/W Oil in
	based fulid	fulid	ester fluid	oil fluid	water fluid
3 Fluoric rubber	0	×	0	0	\bigcirc
6 Hydrogenated nitrile rubber	0	0	X	0	0

Notes) 1. The \bigcirc and \bigcirc - marked items are applicable, while the ${\bf x}$ - marked items are inapplicable.

 The O - marked items are the recommended packing materials in case of giving the first priority to abrasion resistance.

How to order G screw piping port (only for SD type)

• Please specify the model as following.

ex. 160S-1 6SD63N30 - G

G screw piping port

Note) In some bores, the apparent dimensions are changed from their standard when you specify G screw.

Please refer to the detailed dimension table in following pages.

How to order only lock nut



Cutting Fluid Proof Type/Adaptability of Cutting Fluid to Packing Material

Packing	Non-water Solu	uble Cutting Oil	Water Soluble Cutting Oil
Material	Type 1	Type 2	Water Soluble Cutting Oil
6 Hydrogenated nitrile rubber	0	×	0

 \bigcirc : applicable x: inapplicable

Specification of Air Vent (Option)

• The air vents are laid on the port surface and located symmetrical position to the port.



Single-rod, Double-rod SD/LD/FA/FB type

Dimension Table

Bore	Part Model	d	В	С	h
ø20	LNA-10F-H	M10x1.25	17	19.6	6
ø25	LNH-12F-H	M12X1.25	19	21.9	7
ø32	LNH-16F-H	M16X1.5	22	25.4	10
ø40	LNH-20F-H	M20×1.5	27	31.2	12
ø50	LNH-24F-H	M24x1.5	32	37.0	14
ø63	LNH-30F-H	M30×1.5	41	47.3	17
ø80	LNH-39F-H	M39X1.5	55	68.5	20
ø100	LNH-48F-H	M48×1.5	70	80.8	26
ø125	LNH-64F-H	M64X2	90	104	35

Switch Mounting Minimum Possible Stroke

Dere		With A Switch		With Two Switches					
Bore	AX and AZ types	WR type	WS type	AX and AZ types	WR type	WS type			
ø32									
ø40									
ø50	5	5	10	10*	10	20			
ø63									
ø80									

Note) • When attaching two switches of the WR or WS type, they cannot be attached to the same surface. (WR and WS type switches are not available for LA mounting.)

*If you would like to mount two switches to 10mm stroke cylinder, please.

Operating Ranges and Differences

		Cor	ntact			No C	ontact	
Bore	AX and A	AZ types	WR	type	AX and A	AZ types	WS	type
	Operating range	Difference						
ø32								
ø40								
ø50	10 - 17	2 or less	10 - 17	2 or less	4 - 8	1 or less	15 - 24	1 or less
ø63	10 - 17							
ø80								

		Basic ty	pe (SD)			Foot ty	pe (LA)		Mounting a additiona	ccessories al weight	Rod end attachment additional weight	
Bore	Double A	Acting Single-rod	Double A	Acting Double-rod	Double A	Acting Single-rod	Double A	Acting Double-rod			Separate	Added male
(mm)	Basic weight	Added weight for each stroke of 1 mm	Basic weight	Added weight for each stroke of 1 mm	Basic weight	Added weight for each stroke of 1 mm	Basic weight	Added weight for each stroke of 1 mm	Flange type (FA, FB)	Foot type (LD)	joint (M type joint)	thread weight
ø20	0.6	0.013	0.7	0.014	-	-	-	-	0.25	0.46	0.2	0.015
ø25	0.8	0.016	1.0	0.017	-	_	-	_	0.30	0.58	0.3	0.026
ø32	1.4	0.025	1.6	0.024	1.4	0.027	1.9	0.028	0.62	1.09	0.3	0.057
ø40	1.8	0.030	2.1	0.032	1.8	0.034	2.4	0.036	1.16	1.42	0.4	0.114
ø50	2.5	0.037	2.7	0.036	2.6	0.044	3.3	0.048	1.60	2.43	0.6	0.201
ø63	3.8	0.047	4.1	0.041	4.1	0.062	5.0	0.068	2.02	3.30	0.8	0.435
ø80	6.6	0.067	7.6	0.083	_	-	_	-	3.77	5.86	1.4	0.798
ø100	12.5	0.102	14.9	0.121	-	-	-	-	-	-	3.0	-
ø125	21.5	0.152	29	0.222	_	_	_	_	_	_	5.3	_

Weight Table/General Purpose and Cutting Fluid Proof Types

Weight Table/Switch set

		Basic ty	pe (SD)		Fo	ot type (LA)	Mounting a additiona	iccessories al weight	Rod end attachment additional weight	
Bore	Double	Acting Single-rod	Double /	Acting Double-rod	Double	Acting Single-rod			Separate	Added male
(mm)	Basic weight	Added weight for each stroke of 1 mm	Basic weight	Added weight for each stroke of 1 mm	Basic weight	Added weight for each stroke of 1 mm	Flange type (FA, FB)	Foot type (LD)	flange joint (M type joint)	thread weight
ø32	1.2	0.022	1.3 0.024		1.2	0.022	0.62	1.09	0.3	0.057
ø40	1.6	0.028	1.7	0.031	1.6	0.028	1.16	1.42	0.4	0.114
ø50	2.2	0.036	2.4 0.041		2.3	0.036	1.60	2.43	0.6	0.201
ø63	3.3	0.049	3.7	0.057	3.6	0.049	2.02	3.30	0.8	0.435
ø80	6.2	0.071	7.2	0.084	_	-	3.77	5.86	1.4	0.798

Unit: kg

Switch Added Weight Table

	AX · AZ Type											
Cord length 1.5 m	Cord length 5 m	Connector type										
0.05	0.13	0.04	0.50									

 Formula
 Cylinder weight (kg) = Basic weight + (Cylinder stroke (mm) X Added weight for each stroke of 1 mm) + (Added switch weight X Number of switches)

 Calculation example
 160S-1R: Bore of ø40, cylinder stroke of 50 mm, AZ101 (cord length of 1.5 m), with two switches

 1.6 + (50 × 0.028) + (0.05 × 2) = 3.10 kg

Unit: mm²

Piston Pressurized Area Table

Bore	Rod	Double Actin	ig Single-rod	Double Actin	g Double-rod			
(mm)	(mm)	Push side	Pull side	Push side	Pull side			
ø20	ø12	314	201	2	01			
ø25	ø14	491	337	3	37			
ø32	ø18	804	550	5	50			
ø40	ø22	1257	876	8	76			
ø50	ø28	1963	1348	13	48			
ø63	ø36	3117	2100	21	00			
ø80	ø45	5027	3436	34	36			
ø100	ø56	7854	5391	5391				
ø125	ø70	12272	8424	8424				

Formula $F = A \cdot P \cdot \beta(N)$ F: Cylinder force (N) A: Piston pressurized area (mm²)

P: Applied pressure (MPa)

β: Load rate

Calculation exampleDouble acting single-rod, bore of \emptyset 40, appliedpressure of 16 MPa, load rate of 0.8Push side cylinder force (N)= 1257 × 16 × 0.8 = 16090 (N)Pull side cylinder force (N)= 876 × 16 × 0.8 = 11213 (N)

Unit: kg

Unit: kg

5-1 16MPa Compact Design Hydraulic Cylinder Double Acting Single-rod/Standard TypeUnit: mm



ΜN

Width across flats D

TV

Е

<u>C</u> WF i –

LL+Stroke

LF+Stroke

Dimension Table

Symbol			DT	0	_		F			FF	50	К	К	
Bore	A	AE	ВІ	C		DE	E	EE	гв	FF	FG	Female thread	Male thread	KL
ø20	15(25)	_	5.4	6	10	-	□ 44	Rc1/8	ø5.5	-	ø9.5	M8×1.25	M10×1.25	10
ø25	18(30)	_	5.4	6	12	-	□ 50	Rc1/8	ø5.5	-	ø9.5	M10×1.5	M12×1.25	12
ø32	25(40)	8	6.5	7	14	ø17.5	□ 62	Rc1/4	ø6.6	G1/8	ø11	M12×1.75	M16×1.5	15
ø40	30(45)	8	8.6	7	19	ø17.5	□ 70	Rc1/4	ø9	G1/8	ø14	M16×2	M20×1.5	20
ø50	35(50)	12	10.8	8	24	ø21.5	□ 80	Rc1/4	ø11	G1/4	ø17.5	M20×2.5	M24×1.5	24
ø63	45(60)	12	13	9	30	ø21.5	□ 94	Rc1/4	ø14	G1/4	ø20	M27×3	M30×1.5	33
ø80	60(80)	12	15.2	14	41	ø21.5	□ 114	Rc3/8	ø16	G1/4	ø23	M30×3.5	M39×1.5	36
ø100	75(95)	12	19.5	22	50	ø25.5	□ 140	Rc3/8	ø20	G3/8	ø29	M39×4	M48×1.5	45
ø125	95(125)	14	23.5	25	65	ø30	□ 172	Rc1/2	ø24	G1/2	ø35	M48×5	M64×2	58

Symbol	15		N 4 N 4	1	١	P	J	P	L	τ\/		١	(
Bore	LF		IVIIVI	Rc thread	G thread	Rc thread	G thread	Rc thread	G thread	IV	VVF	Rc thread	G thread
ø20	51	43	ø12	-	-	10.5	-	12	-	□ 30	8	20.5	-
ø25	53	45	ø14	-	-	12.5	-	12	-	□36	8	20.5	-
ø32	64	54	ø18	10	10	14	14	12	12	□ 47	10	28	28
ø40	65	55	ø22	10	10	16	16	12	12	□52	10	27	27
ø50	71	60	ø28	10	14	19	13.5	13	18.5	□ 58	11	28	28
ø63	80	67	ø36	10	16	24	20	13	17	□ 69	13	30	30
ø80	95	78	ø45	15	19	25	24	18	18	□86	17	35	36
ø100	122	96	ø56	15	18	26	26	28	28	□ 106	26	42	42
ø125	135	105	ø70	25	25	29	29	30	30	□ 132	30	46	46

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• 20mm and 25mm bore size of Cutting Fluid Proof Type are not available.

• Allowance of MM is f8.

16MPa Compact Design Hydraulic Cylinder Double Acting Single-rod/Standard Type



• Bore ø32 - ø80







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Dimension Table

				- FF	К	K	N 4 N 4	N		-		v
Bore				EE	Female thread	Male thread	IVIIVI	IN	11		VVF	ř
ø32 25(40) 1	15 7	14	□62	Rc1/4	M12×1.75	M16×1.5	ø18	10	M6×1	□47	10	28
ø40 30(45) 2	20 7	19	□70	Rc1/4	M16×2	M20×1.5	ø22	10	M8×1.25	□52	10	27
ø50 35(50) 2	25 8	24	□80	Rc1/4	M20×2.5	M24×1.5	ø28	10	M10×1.5	□58	11	28
ø63 45(60) 3	30 9	30	□94	Rc1/4	M27×3	M30×1.5	ø36	10	M12×1.75	□69	13	30
ø80 60(80) 3	35 14	41	□114	Rc3/8	M30×3.5	M39×1.5	ø45	15	M16×2	□86	17	35

					L	L									Р	J				
Stroke Bore	110	120	130	140	150	160	170	180	190	200	110	120	130	140	150	160	170	180	190	200
ø32	192	202	212	222	232	242	252	262	272	282	136	146	156	166	176	186	196	206	216	226
ø40	192	202	212	222	232	242	252	262	272	282	138	148	158	168	178	188	198	208	218	228
ø50	195	205	215	225	235	245	255	265	275	285	139	149	159	169	179	189	199	209	219	229
ø63	202	212	222	232	242	252	262	272	282	292	142	152	162	172	182	192	202	212	222	232
ø80	215	225	235	245	255	265	275	285	295	305	145	155	165	175	185	195	205	215	225	235

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• Allowance of MM is f8.



16MPa Compact Design Hydraulic Cylinder Double Acting Single-rod/Standard Type

Unit: mm



• Bore ø32 - ø63



Dimension Table

_																			
Symbol	Δ	вт	С	D	F	4 F	FB	FF	FG		GB		k	ĸĸ		кі	١F		ін
Bore				_		. -					02	Fem	ale thread	Male	thread				
ø32	25(40)	8.6	7	14	7	0 !	56	Rc1/4	ø14		ø9	M1	2×1.75	M16	×1.5	15	64	25	±0.06
ø40	30(45)	10.8	7	19	8	0 0	64	Rc1/4	ø17.	.5	ø11	M1	6×2	M20	×1.5	20	65	29	±0.06
ø50	35(50)	13	8	24	9	4	74	Rc1/4	ø20		ø14	M2	20×2.5	M24	×1.5	24	71	34	±0.06
ø63	45(60)	15.2	9	30	11	4 8	89	Rc1/4	ø23		ø16	M2	27××3	M30	×1.5	33	80	42	±0.06
																	_		
Symbol																			
Bore	LL	MM	N	F	งใ	PL	-	SG	SW	S	SY	Т	TS	ΤW	ТХ	TZ	W	F	Y
ø32	54	ø18	10	1	4	12	2	24	10	2	20	63	56	12	28	14	1	0	28
ø40	55	ø22	10	1	6	12	2	23	12	2	20	70	62	12	28	15	1	0	27
ø50	60	ø28	10	1	9	13	;	27	13	2	20	80	74	14	29	17	1	1	28
ø63	67	ø36	10	2	24	13		32	15	2	20	100	90	16	31	20	1	3	30

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• Allowance of MM is f8.

Recommended Key Way Dimensions



When using a parallel key:



Parallel key attached to the cylinder

When not using a parallel key:



Use the same dimensions for the stopper as the attached parallel key.

- When using the foot type, use the attached parallel key to install the cylinder, referring to the "Recommended Key Way Dimensions."
- When not using the parallel key, attach the stoppers to the cylinder's front and rear sides toward its stroke direction.
 If the cylinder is used without using the key or stoppers, a large force is applied to the cylinder's mounting bolts, possibly resulting in the fracturing of the bolts.

Dimension Table

Poro	Key's Nominal	Key	Way Dimens	ions
Bore	b X h X 1	b1	t1	ľ 1
ø32	12×8×63 (Both rounded)	$12_{-0.043}^{0}$	5 ^{+0.2}	
ø40	12×8×70 (Both rounded)	12 _{-0.043}	5 ^{+0.2}	0.25 - 0.40
ø50	14×9×80 (Both rounded)	14 _{-0.043}	5.5 ^{+0.2}	0.23 - 0.40
ø63	16×10×100 (Both rounded)	16 _0_043	6 ^{+0.2}	

16MPa Compact Design Hydraulic Cylinder Double Acting Single-rod/Standard Type

Unit: mm



*Please be sure to use the Socket Head Screw when install the cylinder to the contact patch.

Dimension Table

Unit: mm

Symbol	•					-		_			KK			4			
Bore	A					EH		Р	Fei	male thre	ad N	lale thread	_ r	Ĺ			.⊓
ø20	15(25)	6	10	□44	Rc1/8	46	3	5.5	N	18×1.25		/10×1.25	1	0	73	24±0).15
ø25	18(30)	6	12	□50	Rc1/8	52	3	5.5	N	110×1.5		/12×1.25	1	2	75	27±0).15
ø32	25(40)	7	14	□62	Rc1/4	66	4	8	N	112×1.7	5 1	/16×1.5	1	5	94	35±0).15
ø40	30(45)	7	19	□70	Rc1/4	72.5	5 4	7	N	116×2	1	//20×1.5	2	20	95	37.5	±0.15
ø50	35(50)	8	24	□80	Rc1/4	85	5	3	N	120×2.5	1	//24×1.5	2	24	110	45±0).15
ø63	45(60)	9	30	□94	Rc1/4	97	5	5	N	127×3		//30×1.5	3	3	117	50±0).15
ø80	60(80)	14	41	□114	Rc3/8	117	6	5	N	130×3.5		//39×1.5	3	6	138	60±0).25
Symbol																	
Bore	LL	MM	Ν	PJ	PK	SB	SS	s	Т	SU	SY	TS	US		W	XS	ZB
ø20	43	ø12	-	10.5	27	6.6	58	1	2	15	7.5	58	70)	8	15.5	81
ø25	45	ø14	-	12.5	27	6.6	60	1	2	15	7.5	64	76	;	8	15.5	83
ø32	54	ø18	10	14	32	9	74	1	6	20	10	79	94	+	10	20	104
ø40	55	ø22	10	16	32	11	75	2	0	20	10	90	108	3	10	20	105
ø50	60	ø28	10	19	38	14	85	2	4	25	12.5	104	126	;	11	23.5	121
ø63	67	ø36	10	24	38	16	92	3	0	25	12.5	121	146	;	13	25.5	130
ø80	78	ø45	15	25	48	18	108	3	5	30	15	144	172	2	17	32	155

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• 20mm and 25mm bore size of Cutting Fluid Proof Type are not available.

• Allowance of MM is f8.
160S-1 16MPa Compact Design Hydraulic Cylinder Double Acting Single-rod/Standard Type Unit: mm











Unit: mm

							_															
Symbol	•		6	P				EE	E			,	FE			K	K			KI		F
Bore	A			U		-		CC			ГС		ΓC		Fema	le thread	Μ	ale threa	d	κL	"	-
ø20	15(25)		6	10		14	F	Rc1/8	10		ø5.	5	46	6	M8)	× 1.25	Μ	10X1.25	5	10		61
ø25	18(30)		6	12		50	F	Rc1/8	10		ø5.	5	52	2	M10	X1.5	Μ	12X1.25	5	12		63
ø32	25(40)		7	14		62	F	Rc1/4	15		ø6.	6	62	2	M12	2 X 1.75	Μ	16 X 1.5		15		79
ø40	30(45)		7	19		70	F	Rc1/4	20		ø11		70)	M16	6X2	Μ	20 X 1.5		20		85
ø50	35(50)		8	24		30	F	Rc1/4	20		ø14	1	85	5	M20	X2.5	Μ	24 X 1.5		24		91
ø63	45(60)		9	30		94	F	Rc1/4	20		ø14	1	98	3	M27	7X3	Μ	30×1.5		33	1	00
ø80	60(80)		14	41		114	F	Rc3/8	25		ø18	3	118	3	M30	X3.5	Μ	39 X 1.5		36	1	20
Cumbal																						
Bore	LL		М		MM	N	I	PJ		ΡL	-	F	R		TF	ΤV		UF		w	Y	,
ø20	43	Ν	/15 ×0.8		ø12	_	-	10.5		12	2	3	80		60	□30		75		8	20	.5
ø25	45	N	∕I5 ×0.8		ø14	_	-	12.5		12	2	3	6		66	□36		80		8	20	.5
ø32	54	N	/16 ×1		ø18	10	0	14		12	2	4	0		80	□47		95		10	28	
ø40	55	N	/18 ×1.2	5	ø22	10	0	16		12	2	4	6		96	□52		118		10	27	
ø50	60	N	/10 X 1.	5	ø28	10	0	19		13	3	5	68		108	□58		135		11	28	
ø63	67	N	/12 X 1.	75	ø36	10	0	24		13	3	6	5		124	□69		150		13	30	
ø80	78	Ν	/14 X2		ø45	1:	5	25		18	3	8	37		154	□86		185		17	35	

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

20mm and 25mm bore size of Cutting Fluid Proof Type are not available.

• Allowance of MM is f8.

60S-1 16MPa Compact Design Hydraulic Cylinder Double Acting Single-rod/Standard Type Unit: mm











Unit: mm

Symbol	۸		C	р		-		==	F		FF	2	FE			K	<			KI		
Bore	A		C	D		-			Г		FE	2	ΓE		Fema	e thread	Ма	ale threa	ad	RL.		LF
ø20	15(25)		6	10	4	14	F	lc1/8	10		<i>φ</i> 5.	5	46	6	M8>	< 1.25	Μ	10 X 1.2	25	10		61
ø25	18(30)		6	12		50	F	lc1/8	10		<i>φ</i> 5.	5	52	2	M10	X1.5	Μ	12 X 1.2	25	12		63
ø32	25(40)		7	14		62	F	lc1/4	15		<i>ø</i> 6.	6	62	2	M12	2X1.75	М	16 X 1.5	5	15		79
ø40	30(45)		7	19		70	F	lc1/4	20		<i>ф</i> 11		70)	M16	SX2	M	20 × 1.5	5	20		85
ø50	35(50)		8	24	□8	30	F	lc1/4	20		<i>ф</i> 14	ŀ	85	5	M20	X2.5	M	24 × 1.5	5	24		91
ø63	45(60)		9	30		94	F	lc1/4	20		<i>ф</i> 14	۱ I	98	3	M27	7X3	M	30 × 1.5	5	33	1	100
ø80	60(80)		14	41	□1	14	F	lc3/8	25		<i>ф</i> 18	3	118	3	M30	X3.5	Μ	39 × 1.5	5	36	1	120
Oursels all																	_		-			
Bore	LL		М		MM	N	I	PJ		ΡL	-	R	2	-	TF	ΤV		UF		WF	٢	Y
ø20	43	N	15 X0.8		<i>ф</i> 12	_	-	10.5		12	2	3	0		60	□30		75		8	20).5
ø25	45	N	15 X0.8		<i>ф</i> 14	_	-	12.5		12	2	3	6		66	□36		80		8	20).5
ø32	54	N	16 X1		<i>ф</i> 18	1()	14		12	2	4	0		80	□47		95		10	28	3
ø40	55	N	18 ×1.2	5	<i>ф</i> 22	10)	16		12	2	4	6		96	□52		118		10	27	7
ø50	60	N	110 ×1.	5	<i>ф</i> 28	1()	19		13	3	5	8	1	80	□58		135		11	28	3
ø63	67	N	112 X 1.	75	<i>ø</i> 36	1()	24		13	3	6	5	1	24	□69		150		13	30)
ø80	78	N	114 X 2		<i>φ</i> 45	1:	5	25		18	3	8	7	1	54	□86		185		17	35	5

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

20mm and 25mm bore size of Cutting Fluid Proof Type are not available.

Allowance of MM is f8.





• Bore ø20, ø25

SD



• Bore ø32 - ø125



• Face with no V cut machined circle is for mounting.

Unit: mm

Dimension Table

Symbol		<u>۸</u> ۲	DT	0	5		_				50	К	К	
Bore	A	AE	ВІ	C	D	DE	E	EE	FB	FF	FG	Female thread	Male thread	KL
ø20	15(25)	-	5.4	6	10	-	□44	Rc1/8	ø5.5	-	ø9.5	M8×1.25	M10X1.25	10
ø25	18(30)	-	5.4	6	12	-	□50	Rc1/8	ø5.5	-	ø9.5	M10×1.5	M12X1.25	12
ø32	25(40)	8	6.5	7	14	ø17.2	□62	Rc1/4	ø6.6	G1/8	ø11	M12X1.75	M16X1.5	15
ø40	30(45)	8	8.6	7	19	ø17.2	□70	Rc1/4	ø9	G1/8	ø14	M16X2	M20×1.5	20
ø50	35(50)	12	10.8	8	24	ø21.5	□80	Rc1/4	ø11	G1/4	ø17.5	M20×2.5	M24×1.5	24
ø63	45(60)	12	13	9	30	ø21.5	□94	Rc1/4	ø14	G1/4	ø20	M27×3	M30×1.5	33
ø80	60(80)	12	15.2	14	41	ø21.5	□114	Rc3/8	ø16	G1/4	ø23	M30×3.5	M39×1.5	36
ø100	75(95)	12	19.5	22	50	ø25.5	□140	Rc3/8	ø20	G3/8	ø29	M39×4	M48×1.5	45
ø125	95(125)	14	23.5	25	65	ø30	□172	Rc1/2	ø24	G1/2	ø35	M48×5	M64×2	58

Symbol		N 4 N 4	١	1	Р	J	τV		١	1
Bore	LL	IVIIVI	Rc thread	G thread	Rc thread	G thread	IV	VVF	Rc thread	G thread
ø20	54	ø12	-	-	13	-	□30	8	20.5	-
ø25	56	ø14	-	-	15	-	□36	8	20.5	-
ø32	72	ø18	10	10	16	14	□47	10	28	28
ø40	72	ø22	10	10	18	16	□52	10	27	27
ø50	75	ø28	10	14	19	13.5	□58	11	28	28
ø63	82	ø36	10	16	22	20	□69	13	30	30
ø80	95	ø45	15	19	25	24	□86	17	35	36
ø100	108	ø56	15	18	24	24	□106	26	42	42
ø125	120	ø70	25	25	28	28	□132	30	46	46

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• 20mm and 25mm bore size of Cutting Fluid Proof Type are not available.

• Allowance of MM is f8.



16MPa Compact Design Hydraulic Cylinder Double Acting Double-rod/Standard Type

Unit: mm



• Bore ø32 - ø63



Unit: mm

Symbol	A	BT	С	D	EA	EB	EE	FG	GE	B Ferr	k Jale thread	KK Malet	thread	KL
Dure										T Ch		wate	uncau	
ø32	25(40)	8.6	7	14	70	56	Rc1/4	ø14	ø9	M	12 X 1.75	M16	X 1.5	15
ø40	30(45)	10.8	7	19	80	64	Rc1/4	ø17.5	5 ø1 [.]	1 M ⁻	16 X 2	M20	X1.5	20
ø50	35(50)	13	8	24	94	74	Rc1/4	ø20	ø14	4 M2	20 X 2.5	M24	X 1.5	24
ø63	45(60)	15.2	9	30	114	89	Rc1/4	ø23	ø16	5 M2	27X3	M30	X 1.5	33
		_												
Symbol Bore	LH	LJ	MM	N	PJ	sv	SY	т	TS	TW	ТХ	ΤZ	WF	Y
ø32	25±0.06	72	ø18	10	16	32	20	63	56	12	28	32	10	28
ø40	29±0.06	72	ø22	10	18	32	20	70	62	12	28	32	10	27
ø50	34±0.06	75	ø28	10	19	35	20	80	74	14	29	32	11	28
ø63	42±0.06	82	ø36	10	22	42	20	100	90	16	31	35	13	30

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• Allowance of MM is f8.

Recommended Key Way Dimensions



When using a parallel key:



Parallel key attached to the cylinder

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When not using a parallel key:



Use the same dimensions for the stopper as the attached parallel key.

- When using the foot type, use the attached parallel key to install the cylinder, referring to the "Recommended Key Way Dimensions."
- When not using the parallel key, attach the stoppers to the cylinder's front and rear sides toward its stroke direction.
 If the cylinder is used without using the key or stoppers, a large force is applied to the cylinder's mounting bolts, possibly resulting in the fracturing of the bolts.

Dimension Table

Poro	Key's Nominal	Key	Way Dimens	ions
Bore	b X h X 1	b1	t1	ľ 1
ø32	12×8×63 (Both rounded)	$12_{-0.043}^{0}$	5 ^{+0.2}	
ø40	12×8×70 (Both rounded)	12 _{-0.043}	5 ^{+0.2}	0.25 - 0.40
ø50	14×9×80 (Both rounded)	14 _{-0.043}	5.5 ^{+0.2}	0.23 - 0.40
ø63	16×10×100 (Both rounded)	16 _0_043	6 ^{+0.2}	





(+

TS

US

LH

4-SB

ST



EE

*Please be sure to use the Socket Head Screw when install the cylinder to the contact patch.

Unit: mm

Symbol			-	_									KK				
Bore	A	1	С	D		-	EE	E	н	FΡ	Fema	le threa	d Ma	ale thread	KL	LG	LH
ø20	15(2	25)	6	10		14	Rc1/8	46	6	33.5	M8>	< 1.25	М	10 X 1.25	10	84	24±0.15
ø25	18(3	30)	6	12		50	Rc1/8	52	2	35.5	M10	X1.5	M	12X1.25	12	86	27±0.15
ø32	25(4	40)	7	14		62	Rc1/4	66	6	48	M12	2 X 1.75	м	16X1.5	15	112	35±0.15
ø40	30(4	45)	7	19		70	Rc1/4	72	2.5	47	M16	6 X 2	M	20 X 1.5	20	112	37.5±0.15
ø50	35(50)	8	24	1	30	Rc1/4	8	5	53	M20	X2.5	м	24 X 1.5	24	125	45±0.15
ø63	45(6	60)	9	30		94	Rc1/4	97	7	55	M27	7X3	M	30×1.5	33	132	50±0.15
ø80	60(8	80)	14	41		114	Rc3/8	117	7	65	M30	X3.5	M	39×1.5	36	155	60±0.25
Symbol																	
Bore	LZ	MM	N	PJ	SB	ST	SU	SV	TS	US	W	XS	ZZ				
ø20	54	ø12	-	13	6.6	12	15	69	58	70	8	15.5	100				
ø25	56	ø14	-	15	6.6	12	15	71	64	76	8	15.5	102				
ø32	72	ø18	10	16	9	16	20	92	79	94	10	20	132				
ø40	72	ø22	10	18	11	20	20	92	90	108	10	20	132				
ø50	75	ø28	10	19	14	24	25	100	104	126	11	23.5	147				
ø63	82	ø36	10	22	16	30	25	107	121	146	13	25.5	158				
ø80	95	ø45	15	25	18	35	30	125	144	172	17	32	189				

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• 20mm and 25mm bore size of Cutting Fluid Proof Type are not available.

Allowance of MM is f8.

160S-1 16MPa Compact Design Hydraulic Cylinder Double Acting Double-rod/Standard Type Unit: mm 160S-1/THS16 Bore CAD/DATA is available.



• Bore ø32 - ø80



Unit: mm

Symbol	٨	C	П	F	FE	F	FB	FF		KK		- KI
Bore	A		U	L					Female thr	ead N	Male thread	
ø20	15(25)	6	10	□44	Rc1/8	3 10	ø5.5	46	M8×1.2	5	M10×1.25	10
ø25	18(30)	6	12	□50	Rc1/8	3 10	ø5.5	52	M10×1.	5	M12×1.25	12
ø32	25(40)	7	14	□62	Rc1/4	15	ø6.6	62	M12X1.7	75	M16×1.5	15
ø40	30(45)	7	19	□70	Rc1/4	1 20	ø11	70	M16X2		M20×1.5	20
ø50	35(50)	8	24	□80	Rc1/4	1 20	ø14	85	M20X2.	5	M24×1.5	24
ø63	45(60)	9	30	□94	Rc1/4	1 20	ø14	98	M27X3		M30×1.5	33
ø80	60(80)	14	41	□114	Rc3/8	3 25	ø18	118	M30×3.	5	M39×1.5	36
Oursels all												
Symbol	LL	М	MM	1 1	N PJ	R	TF	TV	UF	W	WF	Y
Bore												
ø20	54	M5×0.8	ø12	2 -	- 13	30	60	□30	75	8	8	20.5
ø25	56	M5×0.8	ø14	1 -	- 15	36	66	□36	80	8	8	20.5
ø32	72	M6×1	ø18	3 1	0 16	40	80	□47	95	10	10	28
ø40	72	M8×1.25	ø22	2 1	0 18	46	96	□52	118	10	10	27
ø50	75	M10×1.25	ø28	3 1	0 19	58	108	□58	135	11	11	28
ø63	82	M12X1.75	ø36	6 1	0 22	65	124	□69	150	13	13	30
ø80	95	M14 X 2	ø45	5 1	5 25	87	154	□86	185	17	17	35

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• 20mm and 25mm bore size of Cutting Fluid Proof Type are not available.

Allowance of MM is f8.

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16MPa Compact Design Hydraulic Cylinder **Double Acting Single-rod/Switch set**

Unit: mm



General purpose type

Dimension Table

Symbol	٥	۸ ۲	DT	0	D		F	FF	ED	FF	50	к	К	
Bore	А	AE	ВІ		D	DE	E	EE	гв		FG	Female thread	Male thread	κL
ø32	25(40)	8	6.5	7	14	ø17.2	□62	Rc1/4	ø6.6	G1/8	ø11	M12 X1.75	M16 X1.5	15
ø40	30(45)	8	8.6	7	19	ø17.2	□70	Rc1/4	ø9	G1/8	ø14	M16 X2	M20 ×1.5	20
ø50	35(50)	12	10.8	8	24	ø21.5	□80	Rc1/4	ø11	G1/4	ø17.5	M20 ×2.5	M24 X1.5	24
ø63	45(60)	12	13	9	30	ø21.5	□94	Rc1/4	ø14	G1/4	ø20	M27 X3	M30 X1.5	33
ø80	60(80)	12	15.2	14	41	ø21.5	□114	Rc3/8	ø16	G1/4	ø23	M30 ×3.5	M39 X1.5	36

Symbol		N 4 N 4	1	٧	P	IJ	P	Ľ	R	V	T V	1174	1122		\ \	ſ
Bore	LL	IVIIVI	Rc thread	G thread	Rc thread	G thread	Rc thread	G thread	AX type	AZ type	IV	0.71	072	VVF	Rc thread	G thread
ø32	54	ø18	10	10	14	14	12	12	37	44	□47	19	17	10	28	28
ø40	55	ø22	10	10	16	16	12	12	41	48	□52	20	17	10	27	27
ø50	60	ø28	10	14	19	13.5	13	18.5	46	53	□58	22	20	11	28	28
ø63	67	ø36	10	16	24	20	13	17	53	60	□69	24	25	13	30	30
ø80	78	ø45	15	19	25	24	18	18	63	70	□86	30	30	17	35	36

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• 20mm and 25mm bore size of Cutting Fluid Proof Type are not available.

• Allowance of MM is f8.

Cutting fluid proof type

WR • WS type switch attachment

dimensions

 Cord rear wiring WR525 (contact) WS235 (no contact)



• Cord upper wiring WR535 (contact) WS245 (no contact)





Poro	R	V	R	Y	U	X1	U)	X2
DOIE	Cord rear wiring	Cord upper wiring	Cord rear wiring	Cord upper wiring	WR	WS	WR	WS
ø32	53	53	106	106	11	15	12	16
ø40	57	57	114	114	17	20	14	16
ø50	62	62	124	124	19	21	16	20
ø63	69	62 62 69 69		138	20	24	21	23
ø80	79	79	158	158	25	29	25	29

Note) Set the flex tube so that its bend radius becomes R25 or more. If the bend radius becomes smaller than this value, the cord may be disconnected.



160S-1

16MPa Compact Design Hydraulic Cylinder Double Acting Single-rod/Switch set



Symbol	•	DT	<u> </u>	D		FF	К	К	N 4N 4	N	R	V	T T	T \/	1174			V
Bore	A	ві	C	D	E	EE	Female thread	Male thread	IVIIVI	IN	AX type	AZ type	11	IV	UXI	072	VVF	ř
ø32	25(40)	15	7	14	□62	Rc1/4	M12 X1.75	M16 X1.5	ø18	10	37	44	M6×1	□47	29	35	10	28
ø40	30(45)	20	7	19	□70	Rc1/4	M16 X2	M20 ×1.5	ø22	10	41	48	M8×1.25	□52	30	34	10	27
ø50	35(50)	25	8	24	□80	Rc1/4	M20 ×2.5	M24 X1.5	ø28	10	46	53	M10X1.5	□58	32	35	11	28
ø63	45(60)	30	9	30	□94	Rc1/4	M27 X3	M30 ×1.5	ø36	10	53	60	M12X1.75	□69	34	40	13	30
ø80	60(80)	35	14	41	□114	Rc3/8	M30 ×3.5	M39 ×1.5	ø45	15	63	70	M16X2	□86	40	47	17	35

Symbol					L	L									Р	J				
Stroke Bore	110	120	130	140	150	160	170	180	190	200	110	120	130	140	150	160	170	180	190	200
ø32	192	202	212	222	232	242	252	262	272	282	136	146	156	166	176	186	196	206	216	226
ø40	192	202	212	222	232	242	252	262	272	282	138	148	158	168	178	188	198	208	218	228
ø50	195	205	215	225	235	245	255	265	275	285	139	149	159	169	179	189	199	209	219	229
ø63	202	212	222	232	242	252	262	272	282	292	142	152	162	172	182	192	202	212	222	232
ø80	215	225	235	245	255	265	275	285	295	305	145	155	165	175	185	195	205	215	225	235

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• Allowance of MM is f8.



• Bore ø32 - ø63



Symbol	٨	рт	6		ΕΛ	EB	EE	FG	GB		K	К		KI				NANA
Bore	A	Ы				LD		10	GD	Female th	read	Male t	hread		LU		LJ	
ø32	25(40)	8.6	7	14	70	56	Rc1/4	ø14	ø9	M12 x 1	.75	M16	x 1.5	15	25±0.	06	72	ø18
ø40	30(45)	10.8	7	19	80	64	Rc1/4	ø17.5	ø11	M16 X 2		M20	x 1.5	20	29±0.	06	72	ø22
ø50	35(50)	13	8	24	94	74	Rc1/4	ø20	ø14	M20x2	.5	M24)	x 1.5	24	34±0.	06	75	ø28
ø63	45(60)	15.2	9	30	114	89	Rc1/4	ø23	ø16	M27 x 3		M30	x 1.5	33	42±0.	06	82	ø36
								-		-								
Symbol	N	ы	ы		0		6	-	то	T \A/		- -		1174			_	V
Bore	IN	РJ	PL	RV	SE	55	36		15	IVV		^		UXI	072			Ŷ
ø32	8	16	28	62	13	13	46	63	56	12	2	в ;	32	19	35	10)	28
ø40	10	18	27	70	13	13	46	70	62	12	2	в :	32	20	34	10)	27
ø50	10	15	30	80	13	13	49	80	74	14	2	э :	32	22	35	11		30
ø63	10	18	32	95	15	15	52	100	90	16	3	1 :	35	24	40	13	3	32

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• Allowance of MM is f8.

Recommended Key Way Dimensions



Dimension Table

Poro	Key's Nominal	Key	Way Dimens	ions
DOIE	Dimensions b X h X 1	b1	t1	ľ 1
ø32	12×8×63 (Both rounded)	$12_{-0.043}^{0}$	5 ^{+0.2}	
ø40	12×8×70 (Both rounded)	$12_{-0.043}^{0}$	5 ^{+0.2}	0.25 0.40
ø50	14×9×80 (Both rounded)	14 ⁰ _{-0.043}	5.5 ^{+0.2}	0.25 - 0.40
ø63	16×10×100 (Both rounded)	16 _{_0.043}	6 ^{+0.2}	

When using a parallel key:



When not using a parallel key:



Use the same dimensions for the stopper as the attached parallel key.

- When using the foot type, use the attached parallel key to install the cylinder, referring to the "Recommended Key Way Dimensions."
- When not using the parallel key, attach the stoppers to the cylinder's front and rear sides toward its stroke direction. If the cylinder is used without using the key or stoppers, a large force is applied to the cylinder's mounting bolts, possibly resulting in the fracturing of the bolts.

16MPa Compact Design Hydraulic Cylinder 160 **Double Acting Single-rod/Switch set** Unit: mm CAD/DATA 160S-1/THS16 Bore is available.



• Bore ø32 - ø80



General purpose type

Dimension Table

Symbol	•		~			-	FF	-					KK				. –			
Bore	А		C				CC			ГР	Fe	male thr	ead	Male th	read	RL		LF	1	LL
ø32	25(40	0)	7	7 14	1 🗆	62	Rc1/4	66	;	48	N	112 X 1.7	75	M16X	1.5	15	94	35±0	.15	54
ø40	30(4	5)	7	19) □	70	Rc1/4	72	2.5	47	N	116 X 2		M20X	1.5	20	95	37.5±	0.15	55
ø50	35(50	0)	8	3 24	↓ □	80	Rc1/4	85	;	53	N	120×2.5	5	M24X	1.5	24	110	45±0	.15	60
ø63	45(60	0)	9	30) 🗆	94	Rc1/4	97		55	N	127×3		M30×	1.5	33	117	50±0	.15	67
ø80	60(80	0)	14	4 4'		114	Rc3/8	117	•	65	N	130×3.5	5	M39X	1.5	36	138	60±0	.25	78
			_																	
Symbol	N 4 N 4	N 1		ы	אס		RV	00			·-	011	OV.					14/	VO	
Bore	IVIIVI	IN		ΡJ	PK	AX typ	e AZ type	30	33		51	30	51	13	03	UA		vv	^3	ZD
<i>ø</i> 32	<i>ф</i> 18	10)	14	32	37	44	9	74	1	6	20	10	79	94	19	17	10	20	104
<i>φ</i> 40	<i>ф</i> 22	10)	16	32	41	48	11	75	2	20	20	10	90	108	20	17	10	20	105
<i>φ</i> 50	<i>ф</i> 28	10)	19	38	46	53	14	85	2	24	25	12.5	5 104	126	22	20	11	23.5	121
<i>\</i> \$63	<i>\$</i> 36	10)	24	38	53	60	16	92	3	80	25	12.5	5 121	146	24	25	13	25.5	130
<i>\</i> \$80	<i>φ</i> 45	15	5	25	48	63	70	18	108	3	35	30	15	144	172	30	30	17	32	155

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• Allowance of MM is f8.

Cutting fluid proof type WR • WS type switch attachment

dimensions

 Cord rear wiring WR525 (contact) WS235 (no contact)



• Cord upper wiring WR535 (contact) WS245 (no contact)



Dimension Table

Poro	R	V	R	Y	U	X1	U)	X2
DOIE	Cord rear wiring	Cord upper wiring	Cord rear wiring	Cord upper wiring	WR	WS	WR	WS
ø32	53	53	106	106	11	15	12	16
ø40	57	57	114	114	17	20	14	16
ø50	62	62	124	124	19	21	16	20
ø63	69	69	138	138	20	24	21	23
ø80	79	79	158	158	25	29	25	29

Note) Set the flex tube so that its bend radius becomes R25 or more. If the bend radius becomes smaller than this value, the cord may be disconnected.



When the switch cannot be attached as shown above, use the other type (cord upper wiring).

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16MPa Compact Design Hydraulic Cylinder Double Acting Single-rod/Switch set

Unit: mm



General purpose type

Dimension Table

Symbol	Δ	6	D					_	ED	EE			KK	<			1 5			N.A.
Bore	A		U					-	ГD	FC	Fe	male threa	ad	Male	thread	κL	LF			IVI
ø32	25(40)	7	14	□6	2	Rc1/	1	5	ø6.6	62	N	112 X 1.7	5	M16	6 X 1.5	15	79	54	M6 >	< 1
ø40	30(45)	7	19		0	Rc1/	2	0	ø11	70	N	116 X2		M20) X 1.5	20	85	55	M8 >	< 1.25
ø50	35(50)	8	24	8	0	Rc1/	2	0	ø14	85	N	120 X2.5		M24	1 X 1.5	24	91	60	M10	X1.5
ø63	45(60)	9	30	□94	4	Rc1/	1 2	0	ø14	98	N	127 X3		M30) X 1.5	33	100	67	M12	X 1.75
ø80	60(80)	14	41		14	Rc3/	3 2	5	ø18	118	N	130 X3.5		M39	9 X 1.5	36	120	78	M14	X 2
Symbol									F	۲V										
Bore	MM	Ν		ວ]	P	°L	R	ł	AX type	AZ ty	/pe	TF	Т	ΓV	UF	UX1		X2	W	Y
ø32	ø18	10		14	1	2	40		37	44		80]47	95	19		17	10	28
ø40	ø22	10	· ·	16	1	2	46		41	48		96		52	118	20		17	10	27
ø50	ø28	10		19	1	3	58		46	53		108		58	135	22	2	20	11	28
ø63	ø36	10		24	1	3	65		53	60		124		69	150	24	1	25	13	30
ø80	ø45	15		25	1	8	87		63	70		154		86	185	30	:	30	17	35

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• 20mm and 25mm bore size of Cutting Fluid Proof Type are not available.

• Allowance of MM is f8.

Cutting fluid proof type

 $\mathsf{WR}\boldsymbol{\cdot}\mathsf{WS}$ type switch attachment

dimensions

 Cord rear wiring WR525 (contact) WS235 (no contact)



• Cord upper wiring WR535 (contact) WS245 (no contact)





Poro	R	V	R	Y	U	X1	U)	X2
DOIE	Cord rear wiring	Cord upper wiring	Cord rear wiring	Cord upper wiring	WR	WS	WR	WS
ø32	53	53	106	106	11	15	12	16
ø40	57	57	114	114	17	20	14	16
ø50	62	62	124	124	19	21	16	20
ø63	69	69	138	138	20	24	21	23
ø80	79	79	158	158	25	29	25	29

Note) Set the flex tube so that its bend radius becomes R25 or more. If the bend radius becomes smaller than this value, the cord may be disconnected.



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60S-1 16MPa Compact Design Hydraulic Cylinder Double Acting Single-rod/Switch set

Unit: mm



General purpose type

Dimension Table

Symbol	٥	6			EE	F	ED	EE	к	К	KI	15		M
Bore	A					Г	ГБ	FE	Female thread	Male thread	κL	LF		IVI
ø32	25(40)	7	14	□62	Rc1/4	15	ø6.6	62	M12X1.75	M16X1.5	15	79	54	M6 X1
ø40	30(45)	7	19	□70	Rc1/4	20	ø11	70	M16X2	M20×1.5	20	85	55	M8 X1.25
ø50	35(50)	8	24	□80	Rc1/4	20	ø14	85	M20×2.5	M24×1.5	24	91	60	M10 X1.5
ø63	45(60)	9	30	□94	Rc1/4	20	ø14	98	M27X3	M30×1.5	33	100	67	M12 X1.75
ø80	60(80)	14	41	□114	Rc3/8	25	ø18	118	M30×3.5	M39×1.5	36	120	78	M14 X2

Symbol				DI	D	R	V							
Bore	IVIIVI	IN	PJ	PL	R	AX type	AZ type	IF	IV	UF	UX1	UX2	VVF	Y
ø32	ø18	10	14	12	40	37	44	80	□47	95	19	17	10	28
ø40	ø22	10	16	12	46	41	48	96	□52	118	20	17	10	27
ø50	ø28	10	19	13	58	46	53	108	□58	135	22	20	11	28
ø63	ø36	10	24	13	65	53	60	124	□69	150	24	25	13	30
ø80	ø45	15	25	18	87	63	70	154	□86	185	30	30	17	35

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• 20mm and 25mm bore size of Cutting Fluid Proof Type are not available.

• Allowance of MM is f8.

Cutting fluid proof type

WR • WS type switch attachment

dimensions

 Cord rear wiring WR525 (contact) WS235 (no contact)



• Cord upper wiring WR535 (contact) WS245 (no contact)





Poro	R	V	R	Y	U	X1	U	<2
DOIG	Cord rear wiring	Cord upper wiring	Cord rear wiring	Cord upper wiring	WR	WS	WR	WS
ø32	53	53	106	106	11	15	12	16
ø40	57	57	114	114	17	20	14	16
ø50	62	62	124	124	19	21	16	20
ø63	69	69	138	138	20	24	21	23
ø80	79	79	158	158	25	29	25	29

Note) Set the flex tube so that its bend radius becomes R25 or more. If the bend radius becomes smaller than this value, the cord may be disconnected.



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S-1 16MPa Compact Design Hydraulic Cylinder Double Acting Double-rod/Switch set Unit: mm



• Bore ø32 - ø80



General purpose type

Dimension Table

Symbol	•	A.E.	DT		5		-				50	К	К	
Bore	А	AE	ы		D	DE	E	EE	гв		FG	Female thread	Male thread	NL
ø32	25(40)	8	6.5	7	14	ø17.2	□62	Rc1/4	ø6.6	G1/8	ø11	M12X1.75	M16X1.5	15
ø40	30(45)	8	8.6	7	19	ø17.2	□70	Rc1/4	ø9	G1/8	ø14	M16X2	M20×1.5	20
ø50	35(50)	12	10.8	8	24	ø21.5	□80	Rc1/4	ø11	G1/4	ø17.5	M20×2.5	M24×1.5	24
ø63	45(60)	12	13	9	30	ø21.5	□94	Rc1/4	ø14	G1/4	ø20	M27×3	M30×1.5	33
ø80	60(80)	12	15.2	14	41	ø21.5	□114	Rc3/8	ø16	G1/4	ø23	M30×3.5	M39×1.5	36

Symbol		N / N /	1	٧	P	ู่ป	R	V	T \/	1174	1122		١	(
Bore		IVIIVI	Rc thread	G thread	Rc thread	G thread	AX type	AZ type	IV	0.71	072	VVF	Rc thread	G thread
ø32	72	ø18	10	10	16	14	37	44	□47	19	35	10	28	28
ø40	72	ø22	10	10	18	16	41	48	□52	20	34	10	27	27
ø50	75	ø28	10	14	19	13.5	46	53	□58	22	35	11	28	28
ø63	82	ø36	10	16	22	20	53	60	□69	24	40	13	30	30
ø80	95	ø45	15	19	25	24	63	70	□86	30	47	17	35	36

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one. • The lock nut needs to be ordered separately.

• Allowance of MM is f8.

Cutting fluid proof type WR • WS type switch attachment

dimensions

 Cord rear wiring WR525 (contact) WS235 (no contact)



• Cord upper wiring WR535 (contact) WS245 (no contact)



Dimension Table

D	R	V	R	Y	U	X1	UX2	
Bore	Cord rear wiring	Cord upper Cord rear wiring		Cord upper wiring	WR	WS	WR	WS
ø32	53	53	106	106	11	15	28	32
ø40	57	57	114	114	17	20	33	36
ø50	62	62	124	124	19	21	35	37
ø63	69	69	138	138	20	24	36	40
ø80	79	79	158	158	25	29	43	47

Note) Set the flex tube so that its bend radius becomes R25 or more. If the bend radius becomes smaller than this value, the cord may be disconnected.



When the switch cannot be attached as shown above, use the other type (cord upper wiring).

160S-1

16MPa Compact Design Hydraulic Cylinder Double Acting Double-rod/Switch set

Unit: mm



63

General purpose type

Dimension Table

Symbol	Δ	6		E		Ē	ЕЦ	ED		K	K		h	(1	IG		1 LL	17
Bore	~					. 🗠	L11	IF	Female th	Female thread Male thre		ale thre	ad	`L	10		L 11	
ø32	25(40)	7	14	□62	Rc	:1/4	66	48	M12X1	.75	М	116 X 1.	5 1	15	112	35	±0.15	72
ø40	30(45)	7	19	□70	Ro	:1/4	72.5	47	M16×2		М	120×1.	5 2	20	112	37	′.5±0.15	72
ø50	35(50)	8	24	□80	Rc	:1/4	85	53	M20×2	.5	М	124 X 1.	5 2	24	125	45	±0.15	75
ø63	45(60)	9	30	□94	Ro	:1/4	97	55	M27X3		М	130×1.	5 3	33	132	50	±0.15	82
ø80	60(80)	14	41	□11	4 Ro	3/8	117	65	M30×3	.5	Μ	139 × 1.	5 3	36	155	60	±0.25	95
Symbol	N/N/	N	Ы	R	V	C B	I ST	S11	SV	те		119	11¥1		~	۱۸/	VS	77
Bore	IVIIVI	IN	15	AX type	AZ type	50		00	00			00	UNI		12	vv		
ø32	ø18	10	16	37	44	9	16	20	92	79)	94	19	3	5	10	20	132
ø40	ø22	10	18	41	48	11	20	20	92	90)	108	20	3	4	10	20	132
ø50	ø28	10	19	46	53	14	24	25	100	104	t	126	22	3	5	11	23.5	147
ø63	ø36	10	22	53	60	16	30	25	107	121		146	24	4	0	13	25.5	158
ø80	ø45	15	25	63	70	18	35	30	125	144	t	172	30	4	7	17	32	189

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• Allowance of MM is f8.

Cutting fluid proof type WR • WS type switch attachment

dimensions

 Cord rear wiring WR525 (contact) WS235 (no contact)



• Cord upper wiring WR535 (contact) WS245 (no contact)



Dimension Table

Poro	R	V	R	Y	U	X1	UX2	
DOIE	Cord rear wiring	Cord upper wiring	Cord rear wiring	Cord upper wiring	WR	WS	WR	WS
ø32	53	53	106	106	11	15	28	32
ø40	57	57	114	114	17	20	33	36
ø50	62	62	124	124	19	21	35	37
ø63	69	69	138	138	20	24	36	40
ø80	79	79	158	158	25	29	43	47

Note) Set the flex tube so that its bend radius becomes R25 or more. If the bend radius becomes smaller than this value, the cord may be disconnected.



When the switch cannot be attached as shown above, use the other type (cord upper wiring).

160S-1

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65

16MPa Compact Design Hydraulic Cylinder Double Acting Single-rod/Switch set

Unit: mm



• Bore ø32 - ø80



General purpose type

Dimension Table

Symbol	٨			F		_			K	к		
Bore	A			E	EE	F	ГВ	FE	Female thread	Male thread	RL	LL
ø32	25(40)	7	14	□62	Rc1/4	15	ø6.6	62	M12X1.75	M16X1.5	15	72
ø40	30(45)	7	19	□70	Rc1/4	20	ø11	70	M16X2	M20X1.5	20	72
ø50	35(50)	8	24	□80	Rc1/4	20	ø14	85	M20×2.5	M24X1.5	24	75
ø63	45(60)	9	30	□94	Rc1/4	20	ø14	98	M27×3	M30X1.5	33	82
ø80	60(80)	14	41	□114	Rc3/8	25	ø18	118	M30×3.5	M39X1.5	36	95
Symbol						RV						

	M	МЛМ	N	P.I	R		. •	TF	TV	UF	LIX1	11X2	W	WF	Y
Bore				10		AX type	AZ type			01	U/I	0/12			
<i>ø</i> 32	M6 X1	ø18	10	16	40	37	44	80	□47	95	19	35	10	10	28
<i>φ</i> 40	M8 X1.25	ø22	10	18	46	41	48	96	□52	118	20	34	10	10	27
<i>φ</i> 50	M10 X1.5	ø28	10	19	58	46	53	108	□58	135	22	35	11	11	28
<i>ø</i> 63	M12 X1.75	ø36	10	22	65	53	60	124	□69	150	24	40	13	13	30
<i>ø</i> 80	M14 X2	ø45	15	25	87	63	70	154	□86	185	30	47	17	17	35

Notes) • When you use the cylinder with lock nut, we recommend you change A dimension for parenthetic one.

• The lock nut needs to be ordered separately.

• Allowance of MM is f8.

Cutting fluid proof type WR • WS type switch attachment

dimensions

 Cord rear wiring WR525 (contact) WS235 (no contact)



• Cord upper wiring WR535 (contact) WS245 (no contact)



Dimension Table

Poro	R	V	R	Y	U	X1	UX2	
DOIE	Cord rear wiring	Cord upper wiring	Cord rear wiring	Cord upper wiring	WR	WS	WR	WS
ø32	53	53	106	106	11	15	28	32
ø40	57	57	114	114	17	20	33	36
ø50	62	62	124	124	19	21	35	37
ø63	69	69	138	138	20	24	36	40
ø80	79	79	158	158	25	29	43	47

Note) Set the flex tube so that its bend radius becomes R25 or more. If the bend radius becomes smaller than this value, the cord may be disconnected.



When the switch cannot be attached as shown above, use the other type (cord upper wiring).

160S-1

Special specification at the rod end

60S-'

• You can easily order following categolized 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



Note) Only WF dimension can be changed at A82 and A83 special rod end shape. If you would like to change other.

Special rod end shape

A00(T)



Basic Dimension Table (Standard Dimensions)

Bore	A	KM	KP	*MM	*S	WF
ø20	15	10	1.25	ø12	10	8
ø25	18	12	1.25	ø14	12	8
ø32	25	16	1.5	ø18	14	10
ø40	30	20	1.5	ø22	19	10
ø50	35	24	1.5	ø28	24	11
ø63	45	30	1.5	ø36	30	13
ø80	60	39	1.5	ø45	41	17



Basic Dimension Table

Bore	*MM	WF
ø20	ø12	8
ø25	ø14	8
ø32	ø18	10
ø40	ø22	10
ø50	ø28	11
ø63	ø36	13
ø80	ø45	17

Dimensions indicated by *Mark are fixed as our semi-standard.

• You are requested to consult us if you would like to change fixed dimensions.

A54



A81

A83



Basic Dimension Table

Bore	A	* A1	DN	KM	KP	L	*MM	*S	WF
ø20	15	4	2	10	1.25	0	ø12	10	8
ø25	18	4	2	12	1.25	0	ø14	12	8
ø32	25	4	2	16	1.5	0	ø18	14	10
ø40	30	4	2	20	1.5	0	ø22	19	10
ø50	35	4	2	24	1.5	0	ø28	24	11
ø63	45	4	2	30	1.5	0	ø36	30	13
ø80	60	4	2	39	1.5	0	ø45	41	17

Basic Dimension Table

Bore	A	DN	KM	KP	L	*MM	*S	WF
ø20	10	2	8	1.25	0	ø12	10	8
ø25	12	2	10	1.5	0	ø14	12	8
ø32	15	2	12	1.75	0	ø18	14	10
ø40	20	2	16	2	0	ø22	19	10
ø50	24	2	20	2.5	0	ø28	24	11
ø63	33	2	27	3	0	ø36	30	13
ø80	36	2	30	3.5	0	ø45	41	17



Basic Dimension Table (Standard dimension)

Bore *A	N 6	× A 1+0.5	NA 2-0.2	*DM	×∩⊓ ^{−0.2}	*DD	SCAAA	W	WF
DOIE	ጥ ለ	*A1 _{+0.3}	≁A∠_0.3	νDIN	*DP_0.3	ΦUR	ጥIVIIVI	FA type	SD.FB type
ø20	25	12.5	12.5	ø12	ø8	0.5	ø12	20	20
ø25	25	12.5	12.5	ø14	ø10	0.5	ø14	20	20
ø32	25	12.5	12.5	ø18	ø13	1.0	ø18	30	30
ø40	25	12.5	12.5	ø22	ø16	1.5	ø22	35	35
ø50	25	12.5	12.5	ø28	ø21	1.5	ø28	35	35
ø63	30	15	15	ø36	ø26	2.0	ø36	40	40
ø80	30	15	15	ø45	ø31	2.0	ø45	45	45



Basic Dimension Table (Standard dimension)

Bore *A		No. A 4 +0.5	Na A ⊃ -0.2	-0.1	-0.2	**		W	WF
Dore	ጥ ለ	≁A ι _{+0.3}	≁AZ _0.3	*DIVI_0.4	≁DP _0.3	۳DΚ	ጥIVIIVI	FA type	SD·FB type
ø40	25	12.5	12.5	Ø18	ø13	1.0	ø22	35	35
ø50	25	12.5	12.5	ø22	ø16	1.5	ø28	35	35
ø63	25	12.5	12.5	ø28	ø21	1.5	ø36	40	40
ø80	30	15	15	ø36	ø26	2.0	ø45	45	45

• Dimensions indicated by *Mark are fixed as our semi-standard.

• You are requested to consult us if you would like to change fixed dimensions.

Separate flange joint : Only for A82 rod end style



• Need additional order for this item. Part No.: RMH-(bore(mm))

Symbol	Parts code	A	В	с	D1	D2	D3	D4	E	F	G	Н	J
Боге													
ø20	RMH-12	ø44	20.5	0.5	ø13	ø8.5	ø5.5	ø9.5	19.6	25	12.5	5.4	ø29
ø25	RMH-14	ø46	21.5	0.5	ø15	ø10.5	ø5.5	ø9.5	19.6	25	12.5	5.4	ø31
ø32	RMH-18	ø49	23	1	ø19	ø13.5	ø6.6	ø11	18.5	25	12.5	6.5	ø34
ø40	RMH-22	ø57	27	1.5	ø23	ø16.5	ø9	ø14	16.4	25	12.5	8.6	ø40
ø50	RMH-28	ø71	34	1.5	ø29	ø21.5	ø11	ø17.5	14.2	25	12.5	10.8	ø50
ø63	RMH-36	ø77	37	2	ø38	ø27	ø11	ø17.5	19.2	30	15	10.8	ø55
ø80	RMH-45	ø100	48.5	2	ø48	ø33	ø14	ø20	17	30	15	13	ø76

Switch Detection Position Adjustment Method

AX \cdot AZ type bracket set screw's tightening torque: Approximately 0.4 N·m



Approximately 0.6 N-m

WR · WS type bracket set screw's tightening torque:

- 1. Loosen the bracket set screw and attach the bracket to the switch center part.
- 2. Attach the switch and bracket assembly to the cylinder body's switch attachment section.
- 3. Slide the switch to the desired position. When the switch is attached to the center of the operating range, switch detection is performed most stably.
- 4. To detect the cylinder stroke end, attach the switch to the UX dimension (optimal setting position).
- 5. After sliding the switch to the detection position, tighten the bracket set screw.
- Note) If the tightening torque to tighten the bracket set screw is inappropriate, switch dislocation or damage to the switch body may be caused.

Individual switch ordering method





Switch specifications Magnetic Proximity Type/ With Contact



AZ Type Switch




Specifications

-			A \/ A A A						
	With cord (1.5m)	AX101	AX111	_		_			
ode	With cord (5m)	AX105	AX115	—	—	AX125			
ŏ	With connector (AC type)	—	—	AX11A	—	_			
	With connector (DC type)	—	—	—	AX11B	—			
Lo	ad voltage range	AC : 5 - 120V	DC : 5 - 30V	AC : 5 - 120V	DC : 5 - 30V	AC: 120 V or less DC: 30 V or less			
Lo	ad 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							
Inr	er drop voltage		2V (at 10mA) 3V or less		0V			
Cu	rrent leak	0μΑ		$_{10\mu A}$ or less		ομΑ			
Wo	orking 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 ² (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 nor	n-freezing condition)		-10 - +100°C (at non-freezing condition)			
Wi	ring method	0.3mm ² 2-core Outer diameter 4mm Oil-proof cabtyre cord							
Pro	otective structure	IP67 (IEC standards), JIS C0920 (dusts-proof, immersion-proof type)							
Со	ntact protective circuit	Note) None		Note) None					
Inc	licating lamp		LED (red lamp lig	None					
Electric circuit		Reed switch (Blue)	Reed switch	Protective circuit	e (Brown)	No polarity \oplus, \bigcirc (Brown) Reed switch (Blue)			
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		Series	Bore
35S-1R	\$\$\phi20, \$\phi25, \$\pi32, \$\pi40, \$\pi50, \$\pi63\$\$\$		100Z-1R	<i>ϕ</i> 20, <i>ϕ</i> 25, <i>ϕ</i> 32
HQS2R	\$\$\phi_32, \phi_40, \phi_50, \phi_63, \phi_80, \phi_100\$		100H-2R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\$\$
100S-1R	\$\$\phi_32, \phi_40, \phi_50, \phi_63, \phi_80, \phi_100\$			φ100, φ125
160S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80\$\$\$\$		70/140H-8R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$
210S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80\$\$\$\$			φ100, φ125, φ140
35Z-1R	<i>φ</i> 20, <i>φ</i> 25, <i>φ</i> 32		160H-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\$\$\$\$\$\$\$\$\$\$
35H-3R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$\$\$\$\$\$\$\$			φ100, φ125, φ140, φ160

Series	Bore
210C-1R	φ40, φ50, φ63, φ80
70/140Y-2R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\$\$\$
	φ100, φ125
35P-3R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\$\$\$
	<i>ф</i> 100
70/140P-8R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\$\$\$\$\$
	<i>ф</i> 100

Dimensional Drawing



 Connector type AX11A • AX11B



AX11A (AC type)

(Blue : -)





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.

- Models M12X1 screw locking • IEC 947-5-2
 - DIN/VDE 0660 part 208 A2

No. of connector standards

• NECA (The Japan Electric Control Equipment Industry Association) 4202 Connector for FA sensor



Specifications

	With cord (1.5m)	AZ101	AZ111	—	—	—			
de	With cord (5m)	AZ105	AZ115	—	—	AZ125			
ပိ	With connector (AC type)	—	—	AZ11A	—	—			
	With connector (DC type)	—	—	—	AZ11B	—			
Lo	ad voltage range	AC : 5 - 120V	DC : 5 - 30V	AC : 5 - 120V	DC : 5 - 50V	AC: 120 V or less DC: 30 V or less			
Lo	ad 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					
Inr	ner drop voltage		2V (at 10mA) 3V or less		0V			
Cu	irrent leak	0 _µ A		$_{10\mu A}$ or less		0μΑ			
W	orking time			1ms or less					
Re	turn 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 ² (30G) (Non-repetition)							
Vit	oration-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 nor	n-freezing condition)		-10 - +100°C (at non-freezing condition)			
Wi	ring method	0.3mm ² 2-core Outer diameter 4mm Oil-proof cabtyre cord							
Pre	otective structure	IP67 (IEC standards), JIS C0920 (dusts-proof, immersion-proof type)							
Со	ntact protective circuit	Note) None		Equipped	Note) None				
Inc	licating lamp		LED (red lamp lig	hts up during ON)		None			
Electric circuit		Reed switch (Blue)	Reed switch	Protective circuit)(Blue)	No polarity \oplus, \bigcirc (Brown) Reed switch (Blue)			
Applied load			Small relay • Progra	mmable Controller		IC circuit, small relay, programmable			

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		Series	Bore
35S-1R	\$\$\phi20, \$\$\phi25, \$\$\phi32, \$\$\phi40, \$\$\phi50, \$\$\phi63\$\$		100Z-1R	<i>ϕ</i> 20, <i>ϕ</i> 25, <i>ϕ</i> 32
HQS2R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$		100H-2R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$
100S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$			φ100, φ125
160S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80\$\$\$\$		70/140H-8R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$\$
210S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80\$\$\$\$			φ100, φ125, φ140
35Z-1R	<i>\$</i> \$		160H-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$\$
35H-3R	\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$			φ100, φ125, φ140, φ160

Series	Bore
210C-1R	<i>φ</i> 40, <i>φ</i> 50, <i>φ</i> 63, <i>φ</i> 80
70/140Y-2R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$
	<i>ϕ</i> 100, <i>ϕ</i> 125
35P-3R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$
	<i>ϕ</i> 100
70/140P-8R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$\$
	<i>ϕ</i> 100

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Dimensional Drawing





AZ11A (AC type)

Connector pin position



AZ11B (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

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Handling instructions

Handling instructions

Precautions for wiring

- 1. 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.
- 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 (see
 - 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 is better for the cord.
 - If the bending radius is excessively small, the cord may be damaged. The recommended bending radius is twice of the cord dia. or larger.
- 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 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.
- 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".
- 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.

Precautions for connection

- 1. Be sure to shut down the power supply to the switches.
 - Otherwise, the operator may get an electric shock during working, or the switches and load devices may be damaged.
- Avoid the voltage and current out of the specifications of the switches, and the load exceeding the contact open/close capacity.
 - Application of wrong voltage or current may lead to malfunctions and damages to the switches.

- DO NOT connect the switches direct to the power supply. Be sure to connect them through load devices, such as small relays and programmable controllers.
 - Otherwise, short-circuit may occur to the circuit, causing the malfunctions of the switches.
 - Use only one relay among the choices shown below or an equivalence.

Omron Corporation	:	MY type
Idec Izumi Corporation	:	RY type
Fuji Electric Co., Ltd.	:	HH-5 type
Matsushita Electric Works, Ltd.	:	HC type

- 4. Perform wiring correctly according to the colors of lead wires.
 - If an electric current is supplied without the correction of the wrong wiring, the switches will be damaged, and the load devices may also be damaged. If wiring is performed incorrectly, it will lead to the inflammable damage of the electric circuit inside the switches, even if the wrong wiring is momentary.

<Connecting method>

1. Basic connection

Connection to PLC (programmable controller)

 a) In the case that the power supply is contained in the PLC



- The circuit diagram above shows the connection example in the case of the DC input type PLC.
- (For details, refer to the handling instructions of the PLC.)
 The connection of the AC input type PLC is similar to the above example. Refer to "Precautions for contact protection".
- b) In the case that the power supply is not contained in the PLC



- The circuit diagram above shows the connection example in the case of the DC input type PLC.
- (For details, refer to the handling instructions of the PLC.)
- The connection of the AC input type PLC is similar to the above example. Refer to "Precautions for contact protection".

2) Connection to small relay



• For the protective circuits, refer to "Precautions for contact protection".

2. Multiple connection

Avoid multiple connection of the switches (connection in series and connection in parallel), since it may be inapplicable depending on the combination of load devices.

1) Connection in parallel

The circuit diagram is shown below.

- · Indicator lamps may not light up, depending on the combination of load devices.
- Remember that if any leakage current is present in the switches, it will be increased according to the number of the switches.

The leakage current may lead to the unexpected working or impossibility of return of load devices.



- Set the connection so that the following condition is satisfied: sum of leakage currents < return current value of load devices.
- Set the connection in the case of AC power supply similarly to the above.
- 2) Connection in series

The circuit shown below is recommended.

Provide a small relay for a switch, and connect the contacts of the small relays in series.



- Remember that the connection of the switches in series will lead to the increased inner drop voltage of the switch output according to the number of the switches. If the inner drop voltage is increased, load devices may not work.
- When connecting the switches in series, set the connection so that the following condition is satisfied: sum of inner drop voltage < working voltage of load devices.
- Set the connection in the case of AC power supply similarly to the above.
- Be sure to connect the protective circuits to the both ends of the relay coil.

Precautions for contact protection

1. Connection to induct load devices (small relay, solenoid valves, etc.)

Remember that surge voltages will occur when the switch is set to the OFF position. Be sure to provide the protective circuit on the side of the load devices to protect the contacts.

 Unless the protective circuit shown below is provided, the internal electric circuit of the switch may be damaged due to the surge voltage.







Surge absorber

R: relay coil

Use at 24 V DC	Varistor voltage: approx. 30 V	
Use at 48 V DC	Varistor voltage: approx. 60 V	
Use at 100 V AC	Varistor voltage: approx. 180 V	





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Handling instructions

 In the case of the extension of the switch cord by 10 m or more, or the connection to the AC input type PLC (programmable controller) and capacity loads (condenser, etc.), inrush current will occur when the switch is set to the ON position. Be sure to provide the protective circuit as shown in the circuit diagram below.



 Unless the protective circuit shown below is provided, the internal electric circuit of the switch may be damaged due to inrush currents.

Precautions for installation

- 1. DO NOT use cylinders and switches in the places where are directly subjected to chips and cutting oil.
 - Otherwise, the cord may be damaged by chips, or cutting oil may enter the switch inside, and short-circuit may occur, causing the malfunctions of the switches.
- 2. 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 cylinder and switch).
 - Otherwise, the switches may work incorrectly due to the influence of the magnetic field.



- 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).
 - Otherwise, the switches may work incorrectly due to the influence of the strong magnetic substances.



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.

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 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.



Switch specifications Magnetic Proximity Type/ With No Contact



AZ Type Switch





Specifications

용 With cord (1.5m)	AX221					
S 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 or less					
Leak current	At 30 V DC, 10μA or less					
Working time	1 ms or less					
Return time	1 ms or less					
Insulation resistance	100 M Ω 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 ² (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 - +70°C (at non-freezing condition)					
Wiring method	0.3 mm ² 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	Power supply (+, brown) Output (OUT, black) Transistor ORD (-, blue)					
Applied load	IC circuit, small relay, programmable controller					

Applicable hydraulic cylinder

Series	Bore		Series	Bore	Series	Bore
35S-1R	\$\phi 20, \$\phi 25, \$\phi 32, \$\phi 40, \$\phi 50, \$\phi 63\$\$] [100Z-1R	<i>\$</i> \$\phi_20, <i>\$</i> \$	210C-1R	\$\$\phi40, \$\$\phi50, \$\$\phi63, \$\$\phi80\$
HQS2R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$		100H-2R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\$\$\$	70/140Y-2R	\$\$\phi\$32, \$\phi\$40, \$\phi\$50, \$\phi\$63, \$\phi\$80,
100S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$			φ100, φ125		φ100, φ125
160S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80\$\$\$\$	1 [70/140H-8R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\$\$\$	35P-3R	\$\$\phi\$32, \$\phi\$40, \$\phi\$50, \$\phi\$63, \$\phi\$80,
210S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80\$\$\$\$			φ100, φ125, φ140		<i>ф</i> 100
35Z-1R	<i>\$</i> \$		160H-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\$\$\$\$	70/140P-8R	\$\$\phi\$32, \$\phi\$40, \$\phi\$50, \$\phi\$63, \$\phi\$80,
35H-3R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$			<i>ϕ</i> 100, <i>ϕ</i> 125, <i>ϕ</i> 140, <i>ϕ</i> 160		<i>ϕ</i> 100, <i>ϕ</i> 125



Dimensional Drawing

• Cord type AX221 • AX225





Specifications

AX Type Switch

a	With cord (1.5m)	AX201				
pod	With cord (5m)	AX205				
0	With connector	AX20B				
Wi	ring direction	Rear wiring				
Lo	ad voltage range	DC : 5 - 30V				
Lo	ad current range	DC : 5 - 40 mA				
Inr	ner drop voltage	3 V or less				
Le	ak current	0.7 mA or less				
Wo	orking time	1 ms or less				
Re	turn time	1 ms or less				
Insulation resistance		100 M Ω 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 ² (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 - +70°C (at non-freezing condition)				
Wi	ring method	0.3 mm ² 2-core Outer diameter 4 mm Oil-proof cabtyre cord				
Pro	otective structure	IP67 (IEC standards), JIS C0920 (dust-proof, immersion-proof type)				
Cor	ntact protective circuit	Equipped				
Inc	licating lamp	LED (red lamp lights up during ON)				
Electric circuit		Switch main circuit LED Transistor				

Applied load

Small relay, programmable controller

Applicable hydraulic cylinder

Series	Bore	Series	Bore	Series	Bore
35S-1R	\$\$\phi20, \$\$\phi25, \$\$\phi32, \$\$\phi40, \$\$\phi50, \$\$\phi63\$\$	100Z-1R	<i>\$</i> \$\phi_20, <i>\$</i> \$	210C-1R	φ40, φ50, φ63, φ80
HQS2R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$	100H-2R	\$\$\phi\$32, \$\$\phi\$40, \$\$\phi\$50, \$\$\phi\$63, \$\$\phi\$80,	70/140Y-2R	\$\$\phi\$32, \$\$\phi\$40, \$\$\phi\$50, \$\$\phi\$63, \$\$\phi\$80,
100S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$		<i>φ</i> 100, <i>φ</i> 125		φ100, φ125
160S-1R	<i>\$</i> 932, <i>\$</i> 40, <i>\$</i> 50, <i>\$</i> 63, <i>\$</i> 80	70/140H-8R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\$\$\$	35P-3R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$
210S-1R	<i>\$</i> 932, <i>\$</i> 40, <i>\$</i> 50, <i>\$</i> 63, <i>\$</i> 80		φ100, φ125, φ140		<i>ф</i> 100
35Z-1R	<i>\$</i> \$	160H-1R	\$\$\phi\$32, \$\phi\$40, \$\phi\$50, \$\phi\$63, \$\phi\$80,	70/140P-8R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$
35H-3R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$		φ100, φ125, φ140, φ160		<i>ф</i> 100



Dimensional Drawing

Cord type
 AX201 • AX205



Connector type

AX20B



AX20B (DC type)

Connector pin position



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

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.



Specifications

a)	With cord (1.5m)	AZ201				
bo	With cord (5m)	AZ205				
0	With connector	AZ20B				
Wi	ring direction	Upper wiring				
Lo	ad voltage range	DC : 5 - 30V				
Lo	ad current range	DC : 5 - 40 mA				
Inr	ner drop voltage	3 V or less				
Le	ak current	0.7 mA or less				
Wo	orking time	1 ms or less				
Re	turn time	1 ms or less				
Ins	ulation resistance	100 M Ω or more at 500 MV DC (between case and cord)				
Vo	Itage-proof	AC 1500 V, 1 min. (between case and cord)				
Sh	ock resistance	490m/s ² (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 - +70°C (at non-freezing condition)				
Wiring method		0.3 mm ² 2-core Outer diameter 4 mm Oil-proof cabtyre cord				
Pro	otective structure	IP67 (IEC standards), JIS C0920 (dust-proof, immersion-proof type)				
Coi	ntact protective circuit	Equipped				
Inc	licating lamp	LED (red lamp lights up during ON)				
Ele	ectric circuit	Switch main circuit LED Transistor GND (Blue)				
Ap	plied load	Small relay, programmable controller				

Applicable hydraulic cylinder

Series	Bore	Series	Bore	Series	Bore
35S-1R	\$\phi20, \$\phi25, \$\pi32, \$\pi40, \$\pi50, \$\pi63\$	100Z-1R	<i>\$</i> \$\phi20, <i>\$</i> \$	210C-1R	\$\$\phi40, \$\$\phi50, \$\$\phi63, \$\$\phi80\$
HQS2R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$	100H-2R	\$\$\phi\$32, \$\phi\$40, \$\phi\$50, \$\phi\$63, \$\phi\$80,	70/140Y-2R	\$\$\phi\$32, \$\$\phi\$40, \$\$\phi\$50, \$\$\phi\$63, \$\$\phi\$80,
100S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$		<i>ϕ</i> 100, <i>ϕ</i> 125		<i>ϕ</i> 100, <i>ϕ</i> 125
160S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80\$\$\$\$	70/140H-8R	\$\$\phi\$32, \$\phi\$40, \$\phi\$50, \$\phi\$63, \$\phi\$80,	35P-3R	\$\$\phi\$32, \$\phi\$40, \$\phi\$50, \$\phi\$63, \$\phi\$80,
210S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80\$\$\$\$		φ100, φ125, φ140		<i>ф</i> 100
35Z-1R	<i>\$</i> \$	160H-1R	\$\$\phi\$32, \$\phi\$40, \$\phi\$50, \$\phi\$63, \$\phi\$80,	70/140P-8R	\$\$\phi\$32, \$\phi\$40, \$\phi\$50, \$\phi\$63, \$\phi\$80,
35H-3R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$		φ100, φ125, φ140, φ160		<i>ф</i> 100

Dimensional Drawing





AZ20B (DC type)

Connector pin position

• No. of connector standards Models M12X1 screw locking

• DIN/VDE 0660 part 208 A2

Connector for FA sensor

• IEC 947-5-2



• NECA (The Japan Electric Control Equipment Industry Association) 4202

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.



Specifications

AX Type Switch

	With cord (1.5m)	AX211				
e	With cord (5m)	AX215				
õ	MACH	AX21C				
	with connector	AX21D				
Wi	ring direction	Rear wiring				
Lo	ad voltage range	DC : 5 - 30V				
Lo	ad current range	DC: 5 - 40 mA				
Inr	ner drop voltage	3 V or less				
Le	ak current	0.7 mA or less				
W	orking time	1 ms or less				
Return time		1 ms or less				
Insulation resistance		100 M Ω 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 ² (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 - +70°C (at non-freezing condition)				
Wi	ring method	0.3 mm ² 2-core Outer diameter 4 mm Oil-proof cabtyre cord				
Pr	otective structure	IP67 (IEC standards), JIS C0920 (dust-proof, immersion-proof type)				
Co	ntact protective circuit	Equipped				
Inc	dicating lamp	Working position: Red/green LED lights up Most suitable position: Green LED lights up				
Ele	ectric circuit	Switch main circuit LED Switch main circuit GND (Blue)				

Applied load

Small relay, programmable controller

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

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



Applicable hydraulic cylinder

Series	Bore		
35S-1R	\$\$\phi20, \$\phi25, \$\phi32, \$\phi40, \$\phi50, \$\phi63\$\$\$\$		
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	<i>ϕ</i> 20, <i>ϕ</i> 25, <i>ϕ</i> 32		
35H-3R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$		

Series	Bore		
100Z-1R	<i>\phi</i> 20, <i>\phi</i> 25, <i>\phi</i> 32		
100H-2R	<i>\$</i> 32, <i>\$</i> 40, <i>\$</i> 50, <i>\$</i> 63, <i>\$</i> 80,		
	φ100, φ125		
70/140H-8R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$		
	φ100, φ125, φ140		
160H-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$\$		
	φ100, φ125, φ140, φ160		

Series	Bore		
210C-1R	\$\$\phi40, \$\$\phi50, \$\$\phi63, \$\$\phi80\$		
70/140Y-2R	\$\$\phi\$32, \$\$\phi\$40, \$\$\phi\$50, \$\$\phi\$63, \$\$\phi\$80,		
	φ100, φ125		
35P-3R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\$\$\$		
	<i>ф</i> 100		
70/140P-8R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\$\$\$\$		
	<i>ф</i> 100		

Dimensional Drawing

• Cord type AX211 • AX215



• Connector type AX21C • AX21D



AX21C · AX21D (DC type)



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.

Switch specifications

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- 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

	With cord (1.5m)	AZ211						
de	With cord (5m)	AZ215						
ပိ	With compositor	AZ21C						
	with connector	AZ21D						
Wi	ring direction	Upper wiring						
Lo	ad voltage range	DC : 5 - 30V						
Lo	ad current range	DC : 5 - 40 mA						
Inr	ner drop voltage	3 V or less						
Le	ak current	0.7 mA or less						
Wo	orking time	1 ms or less						
Return time		1 ms or less						
Ins	ulation resistance	100 M Ω or more at 500 MV DC (between case and cord)						
Vo	Itage-proof	AC 1500 V, 1 min. (between case and cord)						
Sh	ock resistance	490m/s ² (Non-repetition)						
Vit	oration-proof	Total amplitude 0.6 mm, 10 Hz to 200 Hz (log sweep 1 hour) in X, Y, and Z directions						
Am	bient temperature	-10 - +70°C (at non-freezing condition)						
Wi	ring method	0.3 mm ² 2-core Outer diameter 4 mm Outer diameter Oil-proof cabtyre cord						
Pro	otective structure	IP67 (IEC standards), JIS C0920 (dust-proof, immersion-proof type)						
Col	ntact protective circuit	Equipped						
Inc	licating lamp	Working position: Red/green LED lights up Most suitable position: Green LED lights up						
Ele	ectric circuit	Switch main circuit LED Transistor						

Applied load

Small relay, programmable controller

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

LED indicating style

(Two-wire, two-lamp type)



Applicable hydraulic cylinder

Series	Bore
35S-1R	\$\$\phi20, \$\$\phi25, \$\$\phi32, \$\$\phi40, \$\$\phi50, \$\$\phi63\$\$
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	<i>\$</i> 932, <i>\$</i> 40, <i>\$</i> 50, <i>\$</i> 63, <i>\$</i> 80
210S-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80\$\$\$\$
35Z-1R	<i>\$</i> \$
35H-3R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\phi_100\$

Series	Bore
100Z-1R	<i>\$</i> \$\phi20, <i>\$</i> \$
100H-2R	<i>\$</i> 32, <i>\$</i> 40, <i>\$</i> 50, <i>\$</i> 63, <i>\$</i> 80,
	φ100, φ125
70/140H-8R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$\$
	φ100, φ125, φ140
160H-1R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80,\$\$\$
	φ100, φ125, φ140, φ160

Series	Bore
210C-1R	<i>φ</i> 40, <i>φ</i> 50, <i>φ</i> 63, <i>φ</i> 80
70/140Y-2R	\$\$\phi\$32, \$\$\phi\$40, \$\$\phi\$50, \$\$\phi\$63, \$\$\phi\$80,
	φ100, φ125
35P-3R	\$\$\phi\$32, \$\$\phi\$40, \$\$\phi\$50, \$\$\phi\$63, \$\$\phi\$80,
	<i>ф</i> 100
70/140P-8R	\$\$\phi_32, \$\phi_40, \$\phi_50, \$\phi_63, \$\phi_80, \$\$\$\$
	<i>ф</i> 100

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Dimensional Drawing





AZ21C · AX21D (DC type)



• TMS standards conforming 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.

Handling instructions

Precautions for wiring

- 1. 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.
- 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 (see the figure below).
 - 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 is better for the cord.
 - If the bending radius is excessively small, the cord may be damaged. The recommended bending radius is twice of the cord dia. or larger.
- 4. 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.
- 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 output circuit protection".
- 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 highvoltage 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.

Precautions for connection

- DO NOT connect the switches direct to the power supply. Be sure to connect them through load devices, such as small relays and programmable controllers.
 - Otherwise, short-circuit may occur to the circuit, causing inflammable damage of the switches.
- 2. Carefully check the switches used, voltage of power supply and load devices, and current specifications.
 - Application of wrong voltage or current may lead to the malfunctioned or damaged switches.
- 3. 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.

 Wrong wiring and short-circuit of load devices 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.
 Operation with electric current supplied may lead to the damages in switches and electric circuit of the load devices.



< Connecting method> 1. Basic circuit



2. Contact to PLC (Programmable controller)

• In the case that the power supply is contained in the PLC



- Note) For details, refer to the handling instructions of the PLC used.
- In the case that the power supply is not contained in the PLC



Note) For details, refer to the handling instructions of the PLC used.

3. Multiple connection

Avoid multiple connection of the switches (connection in series and connection in parallel), since it may be inapplicable depending on the combination of load devices.

- 1) Connection in parallel
 - The working status of the switches can be checked with the indicator lamps of the switches.

Remember that leakage currents will be increased according to the number of the switches. The leakage currents may lead to the unexpected working or impossibility of return of load devices.



• Set the connection so that the following condition is satisfied: sum of leakage currents < return current value of load devices.

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- 2) Connection in series
 - The connection in series of the switches is impossible. Provide a small relay as shown in the circuit diagram below, and connect the contacts of the small relays in series, or program the connection so that the PLC internal contacts can be connected in series with the switches.



 Be sure to connect the protective circuits to the both ends of the relay coil. For the protective circuit and connecting method, refer to the items related to the output circuit protection.

Precautions for output circuit protection

 In the case of the connection to induct load devices (small relay, solenoid valves, etc.)

Remember that the surge voltage will occur when the switch is set to the OFF position. Be sure to provide the protective circuit on the side of load devices to protect the contacts.

 Unless the protective circuit shown below is provided, the internal electric circuit of the switch may be damaged due to the surge voltage.



- 2. In the case of the connection to the capacity loads (condenser, etc.) or the extension of the switch cord by 10 m or more Inrush currents will occur when the switch is set to the ON position. Be sure to provide the protective circuit near the switch (within 2 m from the switch) as shown in the circuit diagram below.
 - Unless the protective circuit shown below is provided, the internal electric circuit of the switch may be damaged due to the inrush currents.



R: inrush current limit resistor

R = apply the possible great resistance within the allowable range of the circuit on the load device.

Notes)

- If the applied resistance is excessively great, the load device may not work.
- Provide the wiring for the switches as near as possible (within 2 m).



L : choke coil

L = equivalence to approx. 2mH

- Note)
- Provide the wiring for the switches as near as possible (within 2 m).

Handling instructions

Precautions for installation

- 1. DO NOT use cylinders and switches in the places where are directly subjected to chips and cutting oil.
 - Otherwise, the cord may be damaged by chips, or cutting oil may enter the switch inside, and short-circuit may occur, causing the malfunctions of the switches.
- 2. 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 cylinder and switch).
 - Otherwise, the switches may work incorrectly due to the influence of the magnetic field.



- 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).
 - Otherwise, the switches may work incorrectly due to the influence of the strong magnetic substances.



- 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.

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 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.



Switch specifications Magnetic proximity type (cutting fluid proof type)

WR/WS type switch 95





Reliable sealing performance regardless of an environment where is splashed direct with cutting oil

- Protective structure IP67G
- Flexible tubes have been standardized for the protection of cabtyre cords.
- Long service life even if cutting fluid is splashed (approx. 10 times longer compared to our conventional products)
- Oil-proof soft PVC has been adopted to the coatings of flexible tubes.
- The cord of upper take-out type and cord type (without flexible tube) have been added to allow the selection in wide varieties depending on applications.
- No contact type with only 2-wires for less wiring

The adoption of the 2-LED system permits easier setting of the most suitable setting position.

Specifications

Cont	act types	Contact		No contact		
Code	With cord (5m)	WR505, WR515, WR525, WR545	WR535, WR555	WS215, WS225, WS235, WS255	WS245, WS265	
Wiring	direction	Rear	Upper	Rear	Upper	
Load vol	tage, current	DC5-50V•AC5-120V	DC3-40mA•AC3-20mA	DC10-30\	/ 6-70mA	
Inner d	rop voltage	2V o	rless	4V o	4V or less	
Max. o close c	pen/ apacity	DC1.5W	•AC2VA			
Curren	t leak	OĻ	ιA	1mA (or less	
Respor	nse time		1ms c	or less		
Insulatio	on resistance	100 $\text{M}\Omega$ or more at 500 MV DC (between case and cord)				
Voltage	e-proof	AC 1500V, 1 min (between case and cord)				
Shock	resistance	294m/s² (No	on-repetition)	490m/s ² (Non-repetition)		
Vibratio	on-proof	Lateral oscill 10 to 55 Hz (1 s 2 hours in X, Y,	ation 1.5 mm weep for 1 min) and Z directions	Lateral oscillation 0.6 mm 10 to 200 Hz log sweep for 1 hour in X, Y, and Z directions		
Ambier temper	nt ature	-10 - +60°C (at non-freezing condition)				
Wiring	method	0.3 mm ² 2-core Outer diameter 4 mm Oil-proof cabtyre cord				
Protecti	ve structure	IP67G (JEN standards)(oil-proof type)			oe)	
Indicating lamp		LED (red lamp lights up during ON)		Working position: red/green LED Most suitable position: green LED		
Electric circuit		LED Diode Brown Diode Reed switch Blue		Switch (Green) (Red)	er diode Output ⊕(Brown)	
Applied load		Sn	nall relay • Progra	ammable Contro	ller	

Note) When using the induction load (small relay, etc.), the protective circuit SK-100 shall be surely provided for load.

Unit : mm

Switch structure diagram



Applicable actuator and mounting bracket list

	Hydraulic actuator						
Actuator series	35H-3R	100H-2R 100H-2RD 100HW-2R	70/140H-8R * 70/140HW-8R 70/140Y-2R * 70/140YW-2R	35S-1R 35SY-1R	HQS2R HQSW2R 100S-1R 100SW-1R	160S-1R *160SW-1R	
	WR505 WS215 (Flexible tube type)			WR525 WS235 (Rear wiring)			
Switch type	WR5	15 WS225 (Cord t			R535 8245 (Upper wiring))	
Bore							
¢20	_	_	—		_	_	
¢25	_	_	—		_	_	
¢32							
ф 4 0	R21WR (WS) H		R22WR (WS) -H				
ф 5 0				T07WR (WS)		Н	
¢63			R23WR (WS) -H				
ф80		R23WR (WS) H	R24WR (WS) -H	—			
¢100	R23WR (WS) H	_	R25WR (WS) -H	_		_	
¢125			R26WR (WS)H			_	
ф 1 40	-		_	-	_	_	
¢160			_	_	_	_	

Notes) • The *-marked actuators are of the cutting oil proof type. The WR and WS type switches can be provided for them as the standard outfits.

As for the actuators other than the *-marked ones, the WR and WS type switches can be provided as the semi-standard outfits.
Before using the WR or WS type switch for the actuators other than the *-marked ones, check the operating environment, and select appropriate switch.

<Code example>



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Dimensional drawings



WR-WS Type Switch

Handling instructions

- Switch and flexible tube
- Connector parts configuration



• Mounting to switch



- Cut the flexible tube
 at the required length (avoid any burr and deformation on the cut surface. Otherwise, the terminal cap may not be able to be fit).
- Insert the jam nut (), ring washer (), seal packing (), and terminal cap () into the flexible tube () in this order (insert the terminal cap () into the bore of the flexible tube ().
- 4. Insert the unit above into the switch bush 𝔄, and tighten the jam nut 𝔅 onto the threads of the switch bush 𝔄.
- 5. Tighten the jam nut () until its end face comes in contact with the width across flats of the switch bush () (in the arrow direction). Then, the mounting is complete.
- When tightening the jam nut
 , wrench the width across flats of the switch bush
 with a spanner.



Straight box connector and flexible tube

Parts of straight box connector (F-SB)



Mounting to Straight box connector (F-SB)



- Insert the end of the flexible tube
 with the parts from
 to
 o inserted into the threads of the nipple body
 o, and tighten
 the jam nut
 onto the threads of the nipple body
 o.
- 3. Tighten the jam nut until its end face comes in contact with the width across flats of the nipple body (in the arrow direction). Then, the mounting is complete.
- Sectional drawing of completed mounting to straight box connector (F-SB)



Cord type

Connector parts configuration



- Width across flats
- Insert the parts passed through the cord into the switch bush ②, and tighten the bush cap ③ onto the threads of the switch bush ③.
- When tightening the bush cap G, hold the width across flats of the switch bush Q with a spanner, and tighten with hands.



Handling instructions

Precautions for working environmental conditions

- 1. It is possible to use in the places where are splashed with cutting fluid (coolant) for machine tools.
- 2. The splash of the applicable cutting fluids shown below will not affect switches.

Adaptability of cutting fluid to WR and WS switches

Nonaqueous	cutting fluid	Aqueous outting fluid					
Type 1 Type 2		Aqueous cutting fluid					
O x		0					

 \bigcirc : applicable \mathbf{x} : inapplicable

- To keep oil resistance for a long period and reduce the influences on cylinders, protect with protective covers to avoid direct splashes of cutting fluid.
- 3. In case that switches are used in the places where are splashed with cutting fluid, use the cutting fluid proof type cylinders.
 - When using the cylinders of types other than the cutting fluid proof type, carefully check the adaptability of the packing material to the cutting fluid used (refer to "Selection of packing material").
- 4. It is possible to use in the places where are splashed with water.
 - Rust-proof measurers are required for cylinders (refer to the cylinder selection materials).
 - Rusts may occur to the connector part (brass) of switches, since no surface treatment is provided.

Other precautions

• For details of wiring, connection, etc. of the WR type, refer to "Handling instructions of contact type". For those of the WS type, refer to "Handling instructions of no contact (2-wire, 2-LED) type".



Sectional drawings/Packing list

Code for arrangement of packing list

When placing orders, specify the codes as shown below.



Note) • For details, refer to the sectional drawings.

Working oil	Packing material	-10	0	Temperature (°C)	80	100 	120
	Nitrile rubber						
Detrolours based fluid	Urethane rubber					1	I
Petroleum-based liuid	Fluoric rubber	I.			-		I
	Hydrogenated nitrile rubber						
Motor shugel fluid	Nitrile rubber		1			I	
water-grycor nuid	Hydrogenated nitrile rubber						I
Phosphate ester fluid	Fluoric rubber						
	Nitrile rubber						
water in oil fiuld	Hydrogenated nitrile rubber		1				
	Nitrile rubber						
Oil in water fluid	Hydrogenated nitrile rubber						

Working temperature range of packing material depending on working oil type

Notes) • Use the packings applicable to working oil used within the working temperature range. Otherwise, substantial abrasion and inferiority may occur to the packings.

• The temperature range shown in the table above is applicable to each packing material. For the switch sets, use them within the working temperature range applicable to the switches.

Adaptability of working oil to packing material

	Adaptable working oil						
Packing material	Petroleum- based fluid	Water-glycol fluid	Phosphate ester fluid	Water in oil fluid	Oil in water fluid		
1 Nitrile rubber	0	0	×	0	0		
2 Urethane rubber	0	×	×	\bigtriangleup	\bigtriangleup		
3 Fluoric rubber	0	×	0	0	0		
6 Hydrogenated nitrile rubber	0	O	×	O	O		

Notes)* The \bigcirc and \bigcirc -marked items are applicable, while the \times -marked items are inapplicable. For the use of the \triangle -marked items, contact us.

* The \odot -marked items are the recommended packing materials in case of giving the first priority to abrasion resistance.

Cutting fluid proof type/adaptability of cutting fluid to packing material

Packing matorial	Nonaqueous cutting fluid		Aguagua outting fluid	
Facking material	Type 1	Type 2	Aqueous cutting fluid	
6 Hydrogenated nitrile rubber	0	x	0	

Note) The \bigcirc -marked items are applicable, while the x-marked items are inapplicable.

Double Acting Single-rod/Standard type/160S-1

Standard type / ϕ 20 · ϕ 25 · ϕ 32 · ϕ 40 · ϕ 50 · ϕ 63 · ϕ 80 · ϕ 100 · ϕ 125



*Piston designs in detail are different by each bore size.







*Piston designs in detail are different by each bore size.

Double Acting Single-rod/Switch set/160S-1R

Standard type / ϕ 32 · ϕ 40 · ϕ 50 · ϕ 63 · ϕ 80





*Piston designs in detail are different by each bore size.

Double Acting Single-rod/Cutting Fluid Proof type/160SW-1•160SW-1R

Standard type / ϕ 32 · ϕ 40 · ϕ 50 · ϕ 63 · ϕ 80 · ϕ 100



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Parts list

No.	Name	Material	Q'ty
0	Body	Carbon steel for machine structural use	1
2	Body	Stainless steel	1
8	Piston	Spheroidal graphite iron castings (ϕ 20, ϕ 25, ϕ 125) Special copper alloy (ϕ 32 - ϕ 100)	1
4	Piston rod	Carbon steel for machine structural use	1
0	Rod gland	Special copper alloy (ϕ 20 - ϕ 100) Spheroidal graphite cast iron (ϕ 125)	1
8	Magnet holder	Stainless steel (ϕ 32 - ϕ 80)	1
9	Magnet		
0	Set screw	Chrome molybdenum steel	1
0	Steel ball	Stainless steel	1
1 2	Copper piece	Copper	1
ß	Piston rod O-ring		1
14	Parallel double key		1
ß	Switch		_

• The piston rod O-ring (cannot be replaced because the piston and rod are tighting.

Packing list

6 Hydrogenated nitrile rubber/160S-1, 160S-1R

No.	Parts name	Material	Q'ty	Parts code						
				<i>ф</i> 20	<i>ф</i> 25	<i>ø</i> 32	<i>ϕ</i> 40	<i>φ</i> 50		
Ð	Piston packing	Hydrogenated nitrile rubber	1	NCHY-20	NCHY-25	NCHY-32	NCHY-40	NCHY-50		
Ð	Rod packing	Hydrogenated nitrile rubber	1	UHY-12	UHY-14	UHR-18	UHR-22	UHR-28A		
B	Dust wiper	Hydrogenated nitrile rubber	1	LPH-12	LPH-14	DHS-18	DHS-22	DHS-28		
₽	Rod gland O-ring	Hydrogenated nitrile rubber	1	S-18	S-22.4	G-25	G-35	G-45		
Packing set	Double acting single rod cylinder		1 set	RS1/PKS6 -020	RS1/PKS6 -025	QS1/PKS6 -032	QS1/PKS6 -040	QS1/PKS6 -050		

No.	Dorto nomo	Motorial	0.4	Parts code					
	Parts name	watena	Qiy	<i>ф</i> 63	<i>ø</i> 80	<i>ф</i> 100	<i>ф</i> 125		
6	Piston packing	Hydrogenated nitrile rubber	1	NCHY-63	NCHY-80	NCHY-100	P-115		
Ð	Rod packing	Hydrogenated nitrile rubber	1	UHR-36	UHR-45	UHR-56	UHR-70		
₿	Dust wiper	Hydrogenated nitrile rubber	1	DHS-36	DHS-45	DHS-56	DHS-70		
ً	Rod gland O-ring	Hydrogenated nitrile rubber	1	* G-58	G-75	G-95	G-120		
Packing set	Double acting single rod cylinder		1 set	QS1/PKS6 -063	QS1/PKS6 -080	QS1/PKS6 -100	QS1/PKS6 -125		

 $\bullet\,$ The hardness of the O-ring is Hs90. The models with *-marks conform to TAIYO standards.

• A copper piece **()** for protecting the threads of the rod gland is included in the packing set.

Be careful not to lose it.

- Note The nominal code packings may be changed.
 - 20mm, 25mm and 100mm bore are not available at Switch set type.

3 Fluoric rubber (semi-standard)/160S-1, 160S-1R

No.	Dorto nomo	Material	Q'ty	Parts code						
	Parts name			<i>ø</i> 32	<i>φ</i> 40	<i>φ</i> 50	<i>ф</i> 63	<i>ø</i> 80	<i>φ</i> 100	<i>ф</i> 125
6	Piston packing	Fluoric rubber	1	P-26	P-34	P-44	P-53	P-70	P-90	P-125
Ð	Rod packing	Fluoric rubber	1	UHR-18	UHR-22	UHR-28A	UHR-36	UHR-45	UHR-56	UHR-70
B	Dust wiper	Fluoric rubber	1	DHS-18	DHS-22	DHS-28	DHS-36	DHS-45	DHS-56	DHS-70
₽	Rod gland O-ring	Fluoric rubber	1	G-25	G-35	G-45	* G-58	G-75	G-95	G-120
Packing set	Double acting single rod cylinder		1 set	QS1/PKS3 -032	QS1/PKS3 -040	QS1/PKS3 -050	QS1/PKS3 -063	QS1/PKS3 -080	QS1/PKS3 -100	QS1/PKS3 -125

• The hardness of the O-ring (P·G) is Hs90. The models with *-marks conform to TAIYO standards.

 \bullet A copper piece ${\rm I}\!\!{\rm I}$ for protecting the threads of the rod gland is included in the packing set.

Be careful not to lose it.

Note • The nominal code packings may be changed.

• 20mm, 25mm and 100mm bore are not available at Switch set type.

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6 Cutting fluid proof type/160SW-1, 160SW-1R

No.	Parts name	Material	Q'ty	Parts code					
				<i>ø</i> 32	<i>φ</i> 40	<i>φ</i> 50	<i>ø</i> 63	<i>ø</i> 80	<i>ф</i> 100
6	Piston packing	Hydrogenated nitrile rubber	1	NCHY-32	NCHY-40	NCHY-50	NCHY-63	NCHY-80	NCHY-100
Ð	Rod packing	Hydrogenated nitrile rubber	1	UHR-18	UHR-22	UHR-28A	UHR-36	UHR-45	UHR-56
25	Dust wiper 1	Canned hydrogenated nitrile rubber	1	(DYL-18SK)	(DYL-22SK)	(DYL-28SK)	(DYL-36SK)	(DYL-45SK)	(DYL-56)
₽	Rod gland O-ring	Hydrogenated nitrile rubber	1	G-25	G-35	G-45	* G-58	G-75	G-95
Packing set	Double acting single rod cylinder		1 set	QSW1/PKS6 -032	QSW1/PKS6 -040	QSW1/PKS6 -050	QSW1/PKS6 -063	QSW1/PKS6 -080	QSW1/PKS6 -100

• The hardness of the O-ring is Hs90. The models with *-marks conform to TAIYO standards.

• You could replace it, but we recommend that you change the Rod grand ass'y including Dust-Wiper. Because the damage to the grand may lead to the leakage of oil. In this reason, Dust-Wiper isn't included in the seal kit. But you could buy only Dust-Wiper according to your separate order.

• The dust wipe (2) is pressed in the rod gland to be incorporated with it, and cannot be replaced singly. When replace together with the rod gland.

• A copper piece 10 for protecting the threads of the rod gland is included in the packing set. Be careful not to lose it.

Note • The nominal code packings may be changed.

• 20mm, 25mm and 100mm bore are not available at Switch set type.

Double Acting Double-rod/160S-1D

Standard type / ϕ 20 · ϕ 25 · ϕ 32 · ϕ 40 · ϕ 50 · ϕ 63 · ϕ 80 · ϕ 100 · ϕ 125





Note) Rod structure for ϕ 40 - ϕ 80 is with one piece.

Foot type / ϕ 32 · ϕ 40 · ϕ 50 · ϕ 63





Note) Rod structure for ϕ 40 - ϕ 63 is with one piece.

Double Acting Double-rod/Switch set/160S-1RD

Standard type / ϕ 32 · ϕ 40 · ϕ 50 · ϕ 63 · ϕ 80





Note) Rod structure for ϕ 40 - ϕ 80 is with one piece.

Double Acting Double-rod/Cutting Fluid Proof type/160SW-1D, 160SW-1RD

Standard type / ϕ 32 · ϕ 40 · ϕ 50 · ϕ 63 · ϕ 80 · ϕ 100



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Parts list

No.	Name	Material	Q'ty	
0	Body	Carbon steel for machine structural use	1	
2	Body	Stainless steel	1	
8	Piston	Spheroidal graphite iron castings (ϕ 20, ϕ 25, ϕ 125)	1	
•		Special copper alloy (ϕ 32 - ϕ 100)		
6	Piston rod A	Carbon steel for machine structural use	1	
6	Piston rod B	Carbon steel for machine structural use (ϕ 20 - ϕ 32)	1	
0		Special copper alloy (ϕ 20 - ϕ 100)	2	
	Rod gland	Spheroidal graphite cast iron (ϕ 125)		
8	Magnet holder	Stainless steel (ϕ 32 - ϕ 80)	1	
9	Magnet		_	
0	Set screw	Chrome molybdenum steel	2	
Ø	Copper piece	Copper	2	
ß	Piston rod O-ring		1	
Ø	Parallel double key		1	
ß	Switch		_	

• The piston rod O-ring () cannot be replaced because the piston and rod are tighting.
Packing list

6 Hydrogenated nitrile rubber/160S-1D, 160S-1RD

No.	Parts name	Material	Q'ty	Parts code						
				<i>φ</i> 20	<i>ф</i> 25	<i>ø</i> 32	<i>ϕ</i> 40	<i>φ</i> 50		
6	Piston packing	Hydrogenated nitrile rubber	1	NCHY-20	NCHY-25	NCHY-32	NCHY-40	NCHY-50		
Ð	Rod packing	Hydrogenated nitrile rubber	2	UHY-12	UHY-14	UHR-18	UHR-22	UHR-28A		
18	Dust wiper	Hydrogenated nitrile rubber	2	LPH-12	LPH-14	DHS-18	DHS-22	DHS-28		
₽	Rod gland O-ring	Hydrogenated nitrile rubber	2	S-18	S-22.4	G-25	G-35	G-45		
Packing set	Double acting double rod cylinder		1 set	RS1D/PKS6 -020	RS1D/PKS6 -025	QS1D/PKS6 -032	QS1D/PKS6 -040	QS1D/PKS6 -050		

No.	Dorto nomo	Motorial	0.4	Parts code					
	Parts name	wateria	Qiy	<i>ф</i> 63	<i>ø</i> 80	<i>ф</i> 100	<i>ф</i> 125		
6	Piston packing	Hydrogenated nitrile rubber	1	NCHY-63	NCHY-80	NCHY-100	P-115		
Ð	Rod packing	Hydrogenated nitrile rubber	2	UHR-36	UHR-45	UHR-56	UHR-70		
18	Dust wiper	Hydrogenated nitrile rubber	2	DHS-36	DHS-45	DHS-56	DHS-70		
₽	Rod gland O-ring	Hydrogenated nitrile rubber	2	*G-58	G-75	G-95	G-120		
Packing set	Double acting double rod cylinder		1 set	QS1D/PKS6 -063	QS1D/PKS6 -080	QS1D/PKS6 -100	QS1D/PKS6 -125		

• The hardness of the O-ring is Hs90. The models with *-marks conform to TAIYO standards.

 \bullet A copper piece ${\rm I\!\!O}$ for protecting the threads of the rod gland is included in the packing set.

Be careful not to lose it.

- Note The nominal code packings may be changed.
 - 20mm, 25mm and 100mm bore are not available at Switch set type.

3 Fluoric rubber (semi-standard)/160S-1D, 160S-1RD

No.	Parts name	Material	Q'ty	Parts code							
				<i>ø</i> 32	<i>φ</i> 40	<i>φ</i> 50	<i>φ</i> 63	<i>\phi</i> 80	<i>ф</i> 100	<i>ф</i> 125	
6	Piston packing	Fluoric rubber	1	P-26	P-34	P-44	P-53	P-70	P-90	P-115	
Ð	Rod packing	Fluoric rubber	2	UHR-18	UHR-22	UHR-28A	UHR-36	UHR-45	UHR-56	UHR-70	
₿	Dust wiper	Fluoric rubber	2	DHS-18	DHS-22	DHS-28	DHS-36	DHS-45	DHS-56	DHS-70	
₽	Rod gland O-ring	Fluoric rubber	2	G-25	G-35	G-45	*G-58	G-75	G-95	G-120	
Packing set	Double acting double rod cylinder		1 set	QS1D/PKS3 -032	QS1D/PKS3 -040	QS1D/PKS3 -050	QS1D/PKS3 -063	QS1D/PKS3 -080	QS1D/PKS3 -100	QS1D/PKS3 -125	

• The hardness of the O-ring (P-G) is Hs90. The models with *-marks conform to TAIYO standards.

• A copper piece **(2)** for protecting the threads of the rod gland is included in the packing set.

Be careful not to lose it.

Note • The nominal code packings may be changed.

• 20mm, 25mm and 100mm bore are not available at Switch set type.

6 Cutting fluid proof type/160SW-1D, 160SW-1RD

No.	Parts name	Material	Q'ty	Parts code						
				<i>ø</i> 32	<i>ϕ</i> 40	<i>φ</i> 50	<i>¢</i> 63	<i>\</i> \$0	<i>ф</i> 100	
6	Piston packing	Hydrogenated nitrile rubber	1	NCHY-32	NCHY-40	NCHY-50	NCHY-63	NCHY-80	NCHY-100	
Ð	Rod packing	Hydrogenated nitrile rubber	2	UHR-18	UHR-22	UHR-28A	UHR-36	UHR-45	UHR-56	
25	Dust wiper 1	Canned hydrogenated nitrile rubber	2	(DYL-18SK)	(DYL-22SK)	(DYL-28SK)	(DYL-36SK)	(DYL-45SK)	(DYL-56)	
₽	Rod gland O-ring	Hydrogenated nitrile rubber	2	G-25	G-35	G-45	* G-58	G-75	G-95	
Packing set	Double acting double rod cylinder		1 set	QSW1D/PKS6 -032	QSW1D/PKS6 -040	QSW1D/PKS6 -050	QSW1D/PKS6 -063	QSW1D/PKS6 -080	QSW1D/PKS6 -100	

• The hardness of the O-ring is Hs90. The models with *-marks conform to TAIYO standards.

• You could replace it, but we recommend that you change the Rod grand ass'y including Dust-Wiper. Because the damage to the grand may lead to the leakage of oil. In this reason, Dust-Wiper isn't included in the seal kit. But you could buy only Dust-Wiper according to your separate order.

• The dust wipe (a) is pressed in the rod gland to be incorporated with it, and cannot be replaced singly. When replace together with the rod gland.

• A copper piece () for protecting the threads of the rod gland is included in the packing set. Be careful not to lose it.

Note • The nominal code packings may be changed.

• 20mm, 25mm and 100mm bore are not available at Switch set type.

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