

Heavy Duty Stopper Cylinder

# Series *RSH*

ø20, ø32



Stopper cylinder with built-in shock absorber

# Heavy Duty Stopper Cylinder

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Ø20, Ø32

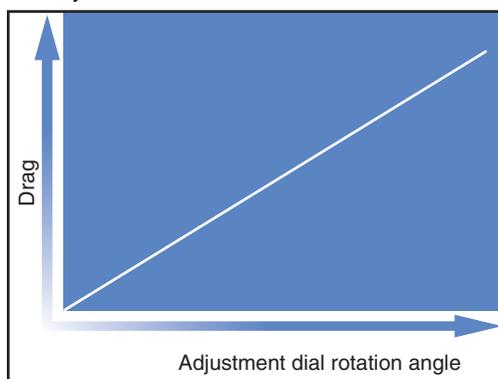
### To stop pallets gently

Stopper cylinder with built-in shock absorber

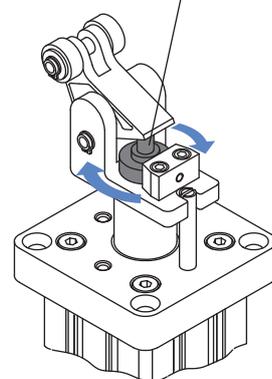
#### 1 Amount of energy absorption can be adjusted to suit the load.

Stops the work piece gently with adjustable built-in shock absorber.

The retardation value can be changed by rotating the adjustment dial.

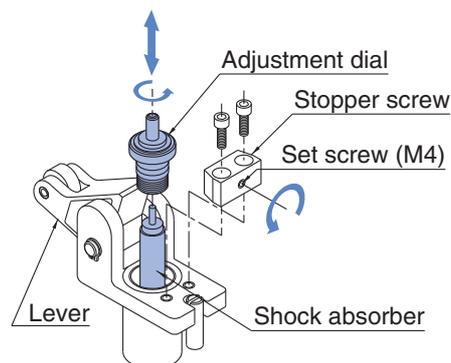


Adjustment dial



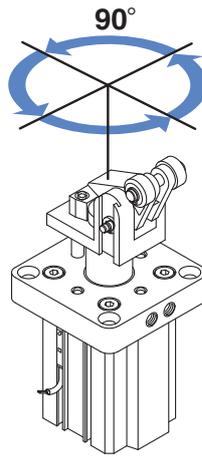
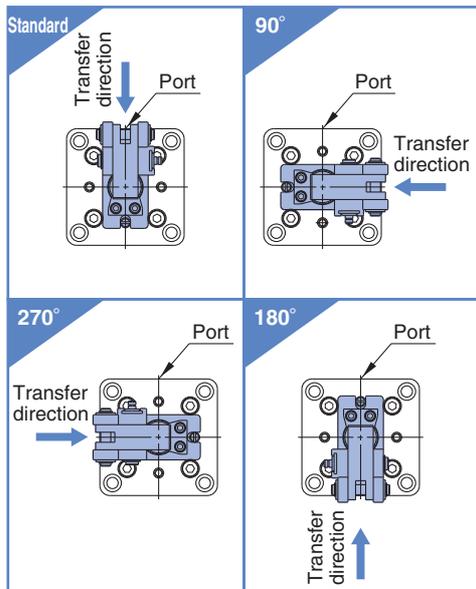
#### 2 Easy replacement of shock absorbers

Easy maintenance is possible with a shock absorber that can be removed simply by loosening the bolts and shock absorber fixing screw from the stopper.

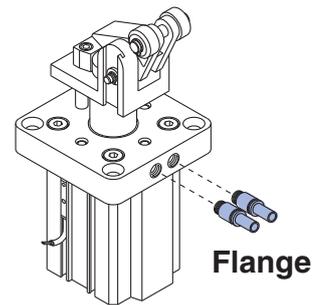


### 3 The roller lever direction can be changed in 90° steps.

To adapt the roller lever of the stopper to the work piece direction the roller lever can be positioned in 4 different directions (or 2 in case ø20) in 90° steps around the piston rod.

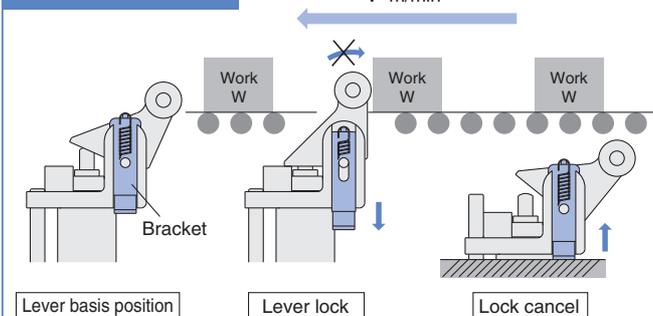


### 4 Slide piping (flange) is possible.



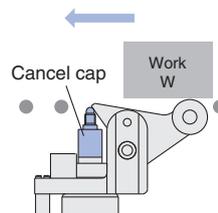
#### Option

##### With lock mechanism



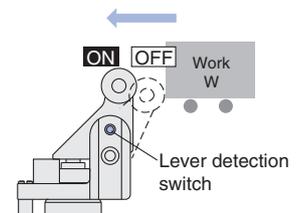
Even in the case of a light pallet, the locking mechanism prevents the pallet from rebounding due to spring.

##### With cancel cap



The cancel cap holds the lever horizontally allowing a pallet to pass.

##### With lever detection switch



When the lever stands erect (when the energy is absorbed), the switch turns on a signal that determines the pallet has reached the stop position. (For more information, please refer to page 8.)

#### ● High power rod

Bore size (mm)	20	32
Rod size (mm)	14	20

#### ● 3 types of operation

1. Single acting
2. Double acting
3. With double acting spring

#### ● Auto switch mounting available

Auto switches can be mounted without protruding from the body surface.

#### ● 2 types of roller materials are available depending on the application.

(Resin, Carbon steel)

### Series Variations

Series	Bore size (mm)	Standard stroke (mm)				Mounting type	Actuation system	Rod end shape	Standard variations		Option	
		15	20	30	40				Built-in magnet	With lock mechanism	With cancel	With proximity sensor
RSH	20	●				Flange	Double acting	Lever Adjustable	●	●	●	●
	32		●						Double acting spring type	●	●	●
						Single acting retraction type						

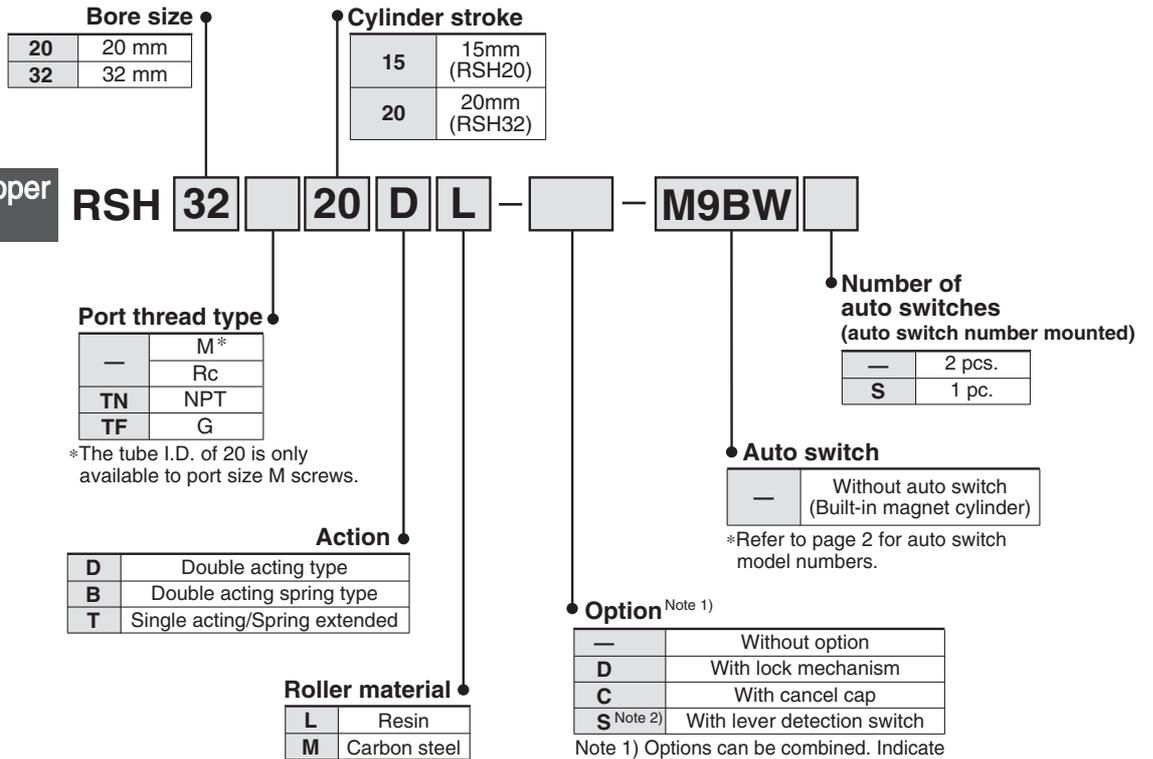
# Heavy Duty Stopper Cylinder

## Series *RSH*

ø20, ø32

### How to Order

Heavy Duty Stopper  
Cylinder ø20, ø32



**Applicable auto switches**/Refer to the Auto Switch Guide for detailed auto switch specifications.

Type	Special function	Electrical entry	Indicator/light	Wiring (output)	Load voltage		Auto switch models		Lead wire length (m)				Pre-wired connector	Applicable load		
					DC	AC	Perpendicular	In-line	0.5 (Nil)	1 (M)	3 (L)	5 (Z)				
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9NV	M9N	●	●	●	○	○	IC circuit	Relay, PLC
				3-wire (PNP)				M9PV	M9P	●	●	●	○	○		
				2-wire				M9BV	M9B	●	●	●	○	○		
				3-wire (NPN)				M9NWV	M9NW	●	●	●	○	○		
	Diagnostic indication (2-colour display)			3-wire (PNP)	M9PWV	M9PW	●	●	●	○	○	○	○	IC circuit		
				2-wire	M9BWV	M9BW	●	●	●	○	○	○	—			
	Water resistance (2-colour display)			3-wire (NPN)	M9NAV**	M9NA**	○	○	○	○	○	○	○	IC circuit		
				3-wire (PNP)	M9PAV**	M9PA**	○	○	○	○	○	○	○	IC circuit		
2-wire	M9BAV**	M9BA**	○	○	○	○	○	○	○	—						
Reed auto switch	—	Grommet	Yes	3-wire (NPN equiv)	—	5 V	—	—	Z76	●	—	●	—	—	IC circuit	—
				No	2-wire	24 V	12 V	100 V	—	Z73	●	—	●	—	—	
						100 V or less	—	Z80	●	—	●	—	—	IC circuit	Relay, PLC	

\*\* Water resistant type auto switches can be mounted on the above models, but in such case SMC cannot guarantee water resistance.

\*\* Consult with SMC regarding water resistant types with the above model numbers.

\* Lead wire length symbols: 0.5 m ..... Nil (Example) M9NV  
 1 m ..... M (Example) M9NW  
 3 m ..... L (Example) M9WL  
 5 m ..... Z (Example) M9WZ

\* Solid state auto switches marked with a "○" symbol are produced upon receipt of order.  
 \* D-A9□/A9□V types cannot be mounted.

\* Since there are other applicable auto switches than listed above, refer to the Auto Switch Guide for details.

\* For details about auto switches with pre-wired connector, refer to the Auto Switch Guide.

\* Auto switches are shipped together (not assembled).



RSH

**Specifications**

Model		RSH	
Bore size [mm]		20	32
Action		Double acting, Double acting spring, Single acting (Spring extended)	
Style of rod end		Lever with built-in shock absorber type	
Fluid		Air	
Proof pressure		1.5MPa	
Max. operating pressure		1.0MPa	
Ambient and fluid temperature		- 10 to 60°C (with no condensation)	
Lubrication		Not required (non-lube)	
Cushion		Rubber bumper	
Stroke length tolerance		+1.4 0	
Mounting		Flange	
Port size	For use in Japan	M5	Rc 1/8
	For use in U.S.A.	M5	NPT 1/8
	For use in Europe	M5	G 1/8

**Bore size, Standard strokes**

[mm]

Model	Bore size [mm]	Standard stroke
RSH	20	15
	32	20

**Weights**

(kg)

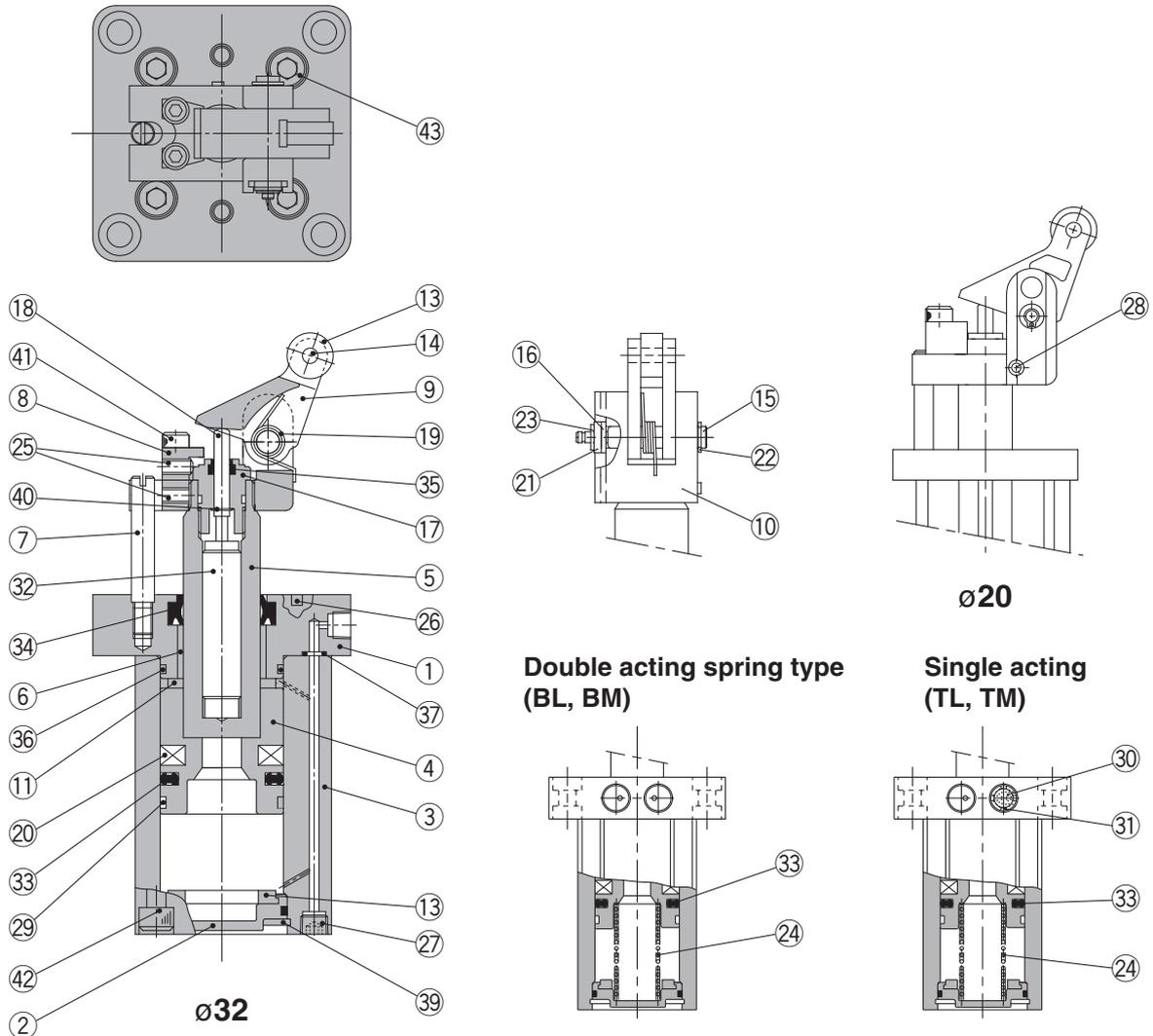
Action	Rod end configuration	Bore size [mm]	Weight
Double acting type Double acting spring type Single acting spring extended	Lever with built-in shock absorber type	20	0.41
		32	0.75

# Series RSH

## Construction

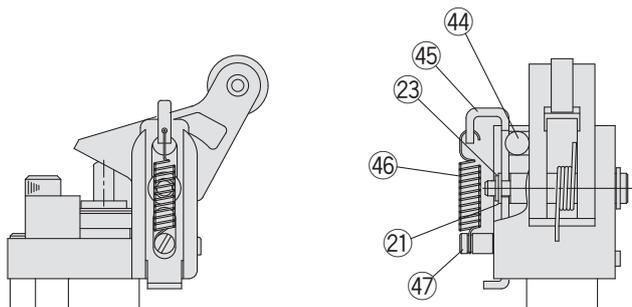
ø20, ø32

Double acting (DL, DM)

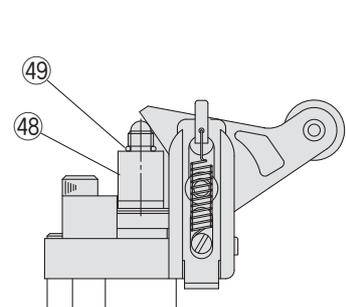


## Options (With lock mechanism, with cancel cap)

With lock mechanism (-D)



With cancel cap (-C)



## Construction

### Parts List

No.	Description	Material	Note
1	Rod cover	Aluminum alloy	Metallic painted
2	Bottom plate	Aluminum alloy	Chromate
3	Cylinder tube	Aluminum alloy	Hard anodized
4	Piston	Aluminum alloy	Chromate
5	Piston rod	ø20: Stainless steel ø32: Carbon steel	Hard chrome plated
6	Bushing	Bearing alloy	
7	Guide rod	Carbon steel	Hard chrome plated
8	Stopper screw	Stainless steel	
9	Lever	Carbon steel	Nickel plated
10	Lever holder	Carbon steel	Nickel plated
11	Bumper A	Urethane	
12	Bumper B	Urethane	
13	Roller	Resin	-□□L
		Carbon steel	-□□M
14	Spring pin	Carbon tool steel	
15	Lever pin	Carbon steel	
16	Ring A	Rolled steel	
17	Adjustment dial	Aluminum alloy	
18	End rod	Special steel	
19	Lever spring	Steel wire	
20	Magnet	—	
21	Flat washer	Steel wire	Nickel plated
22	Type C retaining ring for shaft	Carbon tool steel	
23	Type E retaining ring for shaft	Carbon tool steel	
24	Return spring	Steel wire	-T□/-B□
25	Hexagon socket head set screw	Chrome molybdenum steel	
26	Parallel pin	Carbon steel	ø20 only
27	Hexagon socket head plug	Chrome molybdenum steel	Nickel plated
28	Spring pin	Carbon tool steel	ø20 only
29	Wear ring	Resin	
30	Element	Bronze	-T□ only (ø20 is socket set screw)
31	Retaining ring	Carbon tool steel	ø32 -T□ only
32	Shock absorber	—	
33	Piston seal	NBR	
34	Rod seal	NBR	
35	Scraper	NBR	
36	Tube gasket	NBR	
37	O-ring	NBR	
38	Bottom plate gasket	NBR	
39	Type C retaining ring for hole	Carbon tool steel	Phosphate coated
40	Type CE retaining ring for shaft	Carbon tool steel	Phosphate coated
41	Hexagon socket head cap screw	Chrome molybdenum steel	Zinc chromated
42	Hexagon socket head cap screw	Stainless steel	ø20 only
43	Hexagon socket head cap screw	Stainless steel	ø32 only
44	Steel balls	Carbon steel	
45	Bracket	Carbon steel	Chromate
46	Bracket spring	Stainless steel wire	
47	Pin E	Stainless steel	
48	Cancel cap	Aluminum alloy	Clear anodized
49	O-ring	NBR	

### Replacement Parts/ Seal Kit

Bore size (mm)	Kit no.			Contents
	Double acting	Double acting spring type	Single acting	
20	RSH20D-PS		RSH20T-PS	Set of items ③③ to ③⑦ in above table (excluding ③④)
32	RSH32D-PS		RSH32T-PS	

\*Seal kit includes ③③ to ③⑦ (excluding ③④). Order the seal kit based on each bore size.

\*Since the seal kit does not include a grease pack, order it separately.

Grease pack part no.: GR-S-010 (10 g)

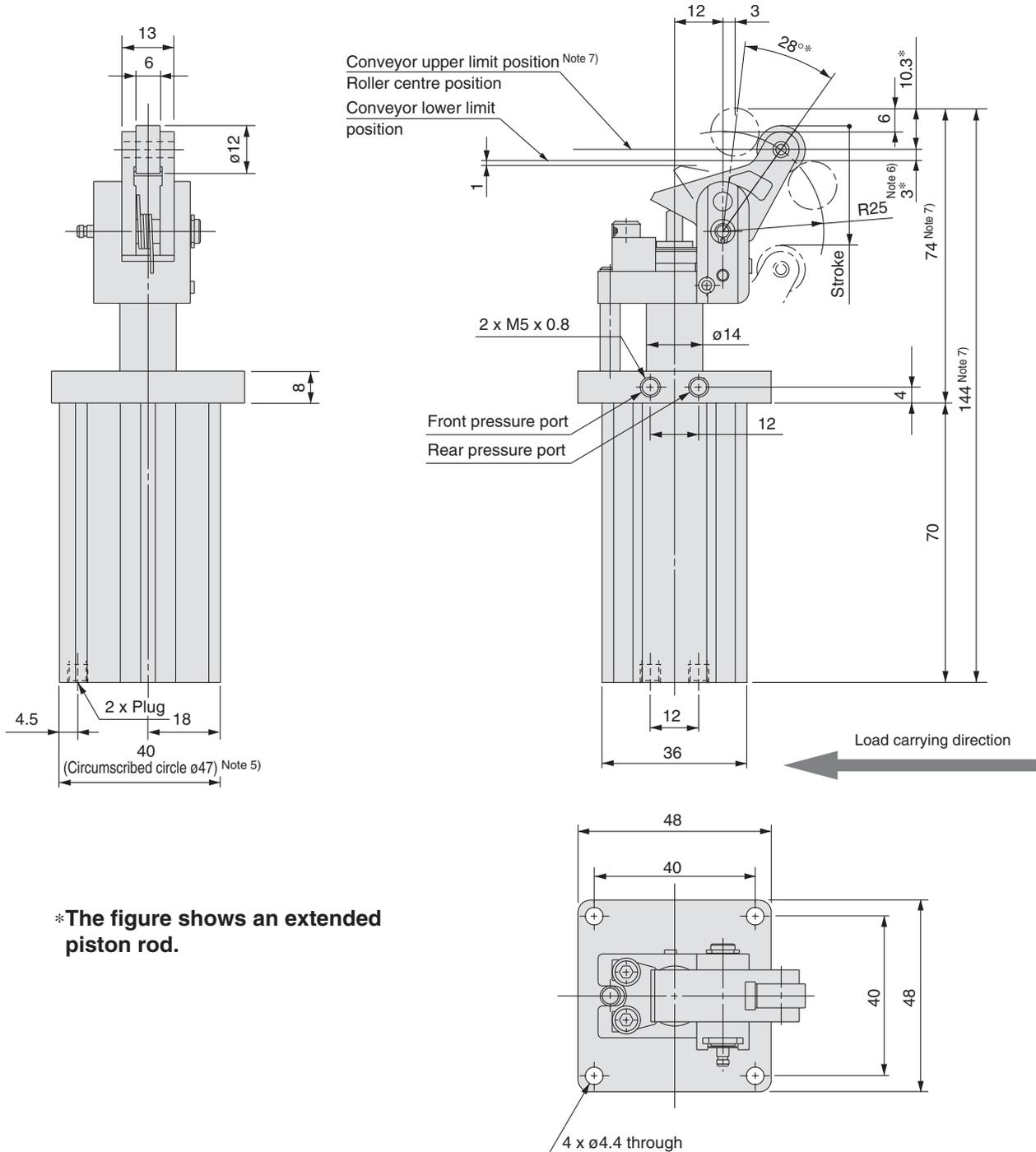
### Replacement Parts/ Shock Absorber

Bore size (mm)	Order no.
20	RSH-R20
32	RSH-R32

# Series RSH

## Dimensions/Bore size: $\phi 20$

### RSH20-15□□



**\*The figure shows an extended piston rod.**

Note 1) The figure shows dimensions at the maximum energy absorption capacity.

Note 2) Dimensions with auto switch are identical to the above.

Note 3) The figure shows an extended piston rod.

Note 4) The dimensions marked with "\*" vary according to adjustment of the shock absorber dial.

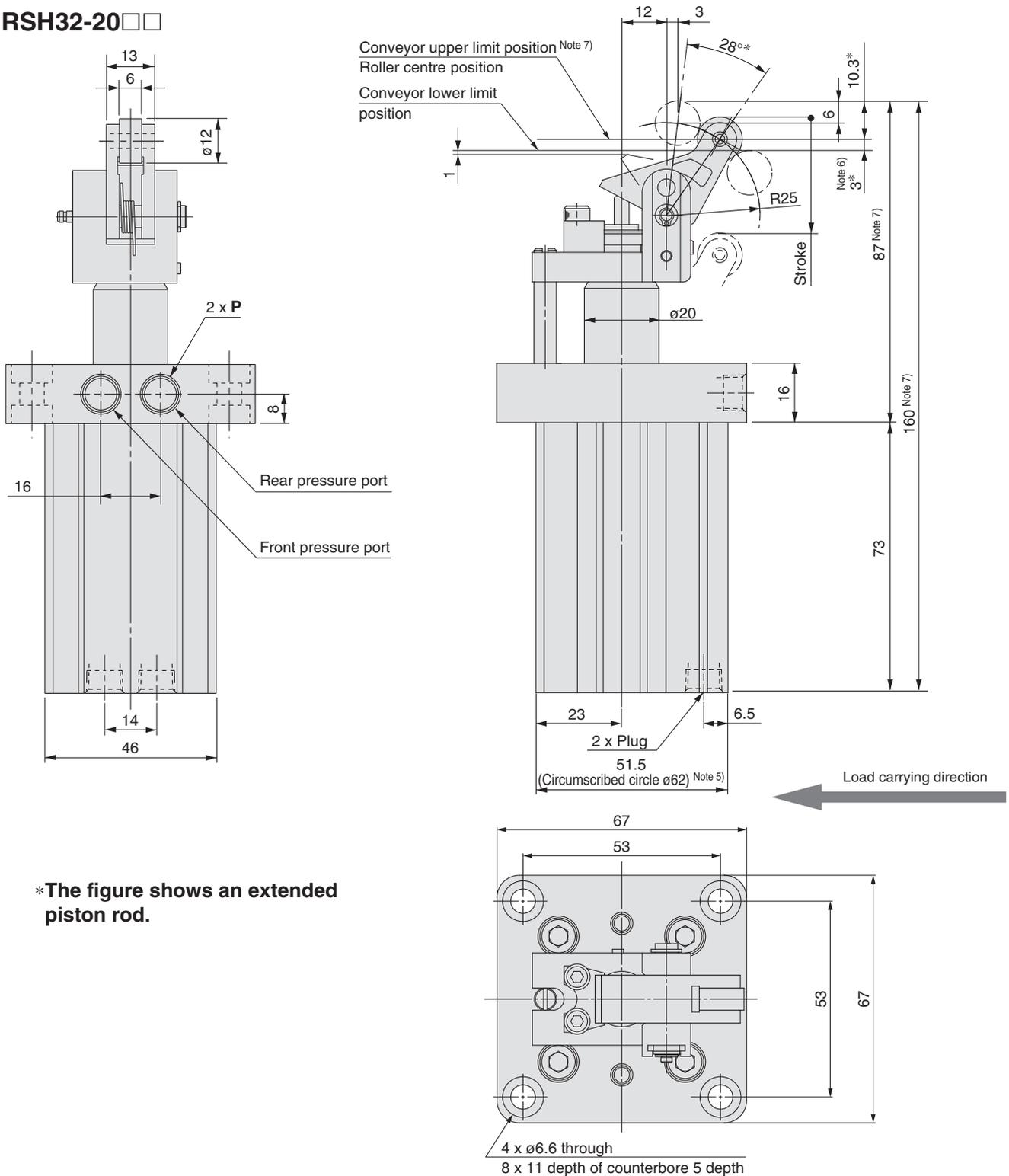
Note 5) Circumscribed circle  $\phi 47$  means that diameter of the circle circumscribed to the cylinder angles. Mounting hole diameter must be  $\phi 48$ . Be careful of the interference between the lever and the mounting base when mounted from the lever side. Thus, the thickness of the mounting base must be 8 mm or less.

Note 6) It is recommended to set the conveyor height in a range from the lower limit position to the upper limit position of the conveyor (dimension \*3 shown in the figure).

Note 7) The dimensions in the figure do not include the stroke length tolerance (0 to +1.4 mm). When fixing the cylinder (setting the conveyor position), take this into consideration, and be sure to set the cylinder within the range of Note 6) using the upper limit position of the conveyor (roller center position) as a reference.

**Dimensions/Bore size:  $\varnothing 32$**

**RSH32-20** □ □



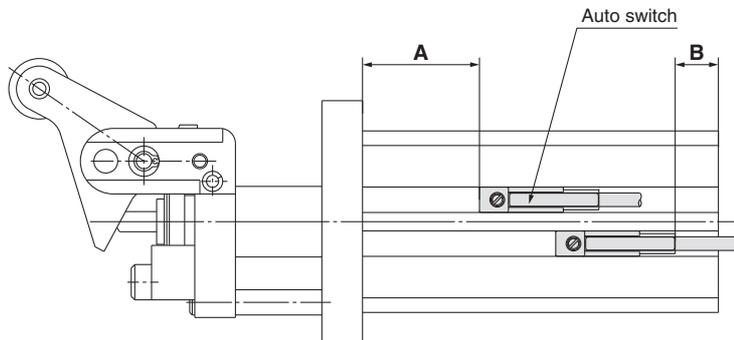
**\*The figure shows an extended piston rod.**

- Note 1) The figure shows dimensions at the maximum energy absorption capacity.
- Note 2) Dimensions with auto switch are identical to the above.
- Note 3) The figure shows an extended piston rod.
- Note 4) The dimensions marked with "\*" vary according to adjustment of the shock absorber dial.
- Note 5) Circumscriber circle  $\varnothing 62$  means that diameter of the circle circumscribed to the cylinder angles. Mounting hole diameter must be  $\varnothing 63$ . Be careful of the interference between the lever and the mounting base when mounted from the lever side. Thus, the thickness of the mounting base must be 9 mm or less.
- Note 6) It is recommended to set the conveyor height in a range from the lower limit position to the upper limit position of the conveyor (dimension \*3 shown in the figure).
- Note 7) The dimensions in the figure do not include the stroke length tolerance (0 to +1.4 mm). When fixing the cylinder (setting the conveyor position), take this into consideration, and be sure to set the cylinder within the range of Note 6) using the upper limit position of the conveyor (roller center position) as a reference.

P (Piping port)		
—	TN	TF
Rc 1/8	NPT 1/8	G 1/8

# Series RSH Auto Switch Mounting

## Auto Switch Proper Mounting Position (Detection at Stroke End)



### Auto switch proper mounting position

(mm)

Auto switch models	D-M9□ D-M9□W D-M9□AV		D-M9□V D-M9□WV		D-M9□A		D-Z7□/Z80 D-Y59□/Y7P/Y7□W		D-Y69□/Y7PV D-Y7□WV		D-Y7BA	
	A	B	A	B	A	B	A	B	A	B	A	B
<b>20</b>	23	8.5	23	10.5	23	6.5	18	8(6.5)	18	9.5	18	2
<b>32</b>	18.5	11	18.5	13	18.5	9	13.5	10.5(9)	13.5	12	13.5	4.5

The values inside ( ) are for D-Z73.

Note) Adjust the auto switch after confirming the operating conditions in the actual setting.

## Operating Range

(mm)

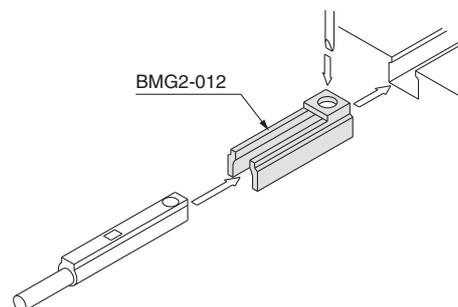
Auto switch models	Bore size	
	20	32
D-M9□/M9□V D-M9□W/M9□WV D-M9□A/M9□AV	5.5	6.0
D-Z7□/Z80	8	10
D-Y59□/Y69□ D-Y7P/Y7PV D-Y7□W/Y7□WV D-Y7BA	5	3.5

\*Since the operating range is provided as a guideline including hysteresis, it cannot be guaranteed (assuming approximately  $\pm 30\%$  dispersion). It may vary substantially depending on an ambient environment.

## Auto Switch Mounting Bracket/Part No.

Auto switch models	Bore size (mm)
	$\phi 20, \phi 32$
D-M9□/M9□V D-M9□W/M9□WV D-M9□A/M9□AV	BMG2-012

D-M9□(V)/M9□W(V)/M9□A(V)



Besides the models listed in How to Order, the following auto switches are applicable. Refer to the Auto Switch Guide for detailed specifications.

Auto switch type	Model	Electrical entry	Features
Solid state	D-Y69A, Y69B, Y7PV	Grommet (Perpendicular)	—
	D-Y7NWV, Y7PWV, Y7BWV		Diagnostic indication (2-colour display)
	D-Y59A, Y59B, Y7P	Grommet (In-line)	—
	D-Y7NW, Y7PW, Y7BW		Diagnostic indication (2-colour display)
	D-Y7BA		Water resistance (2-colour display)

\*For solid state auto switches, auto switches with a pre-wired connector are also available. Refer to the Auto Switch Guide for details.

\*Normally closed (NC = b contact) solid state auto switches (D-F9G/F9H/Y7G/Y7H types) are also available. Refer to the Auto Switch Guide for details.

# Series RSH

# Lever Detection Switch (Proximity Switch)

## Proximity switch specifications/Maker: OMRON Co. Ltd.

Model	E2E-S05S12-WC-C1
Wiring type	3-wire
Output type	Normally open
Power supply voltage (Operating voltage range)	12 to 24 VDC (10 to 30 VDC), Ripple 10% or less (P-P)
Current consumption (Leakage current)	10 mA or less
Response frequency	4 kHz
Control output (chest)	Open collector maximum 100 mA
Indicator light	Detection indication (Yellow European Standard EN60947-5-2 compliant)
Ambient temperature	-25 to 70°C (No freezing)
Operating ambient humidity	35 to 95% RH
Residual voltage	2 V or less
Withstand voltage	500 VAC
Vibration	Endurance 10 to 55 Hz, Duplex amplitude 1.5 mm X,Y,Z direction each 2h
Impact	Endurance 500 m/s <sup>2</sup> (approx. 50 G), X, Y, Z direction each 10 times
Enclosure	IEC standards IP67 (Immersion proof shape and oil proof shape by JEM standards IP67G)

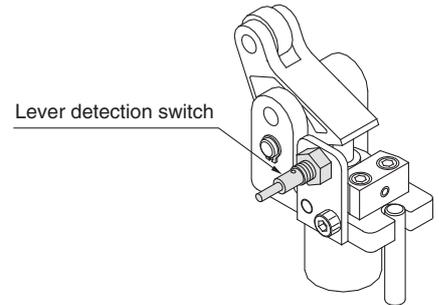
Note 1) At load current 100 mA and cord length of 2 m

Note 2) Between case and whole charging part

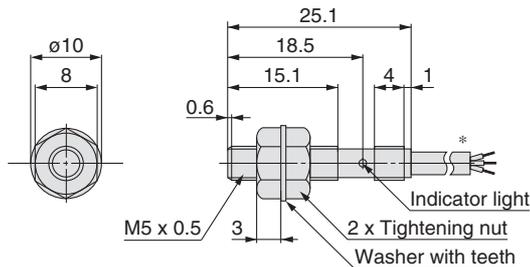
## Mounting Position

### ●E2E-S05S12-WC-C1

While holding the lever in the detection range of the switch, screw in the switch gradually until the indicator light (red) turns on. Then, screw the switch in further, halfway between the turn-on point and the lever.

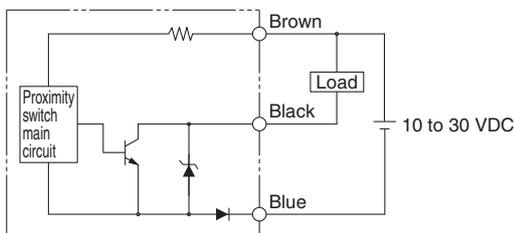


## Dimensions



\* Vinyl insulation round cord  $\phi 2.9$ , 3 cores,  
(Conductor area: 0.14mm<sup>2</sup>, Insulator O.D.:  $\phi 0.8$ ) Standard 2 m  
Robotic (Flexible) cable type:  
Vinyl insulation round cord  $\phi 2.9$ , 3 cores,  
(Conductor area: 0.15mm<sup>2</sup>, Insulator O.D.:  $\phi 1.05$ ) Standard 2 m

## Output Circuit

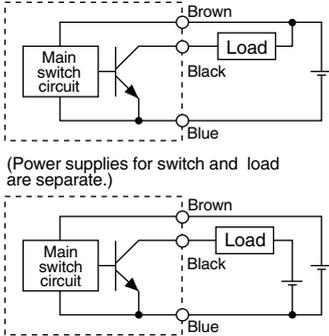


# Series RSH

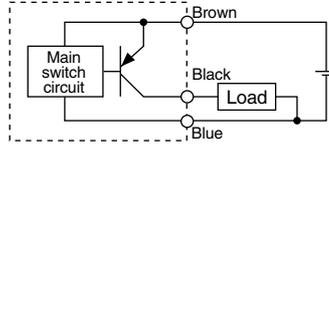
# Auto Switch Connections and Examples

## Basic Wiring

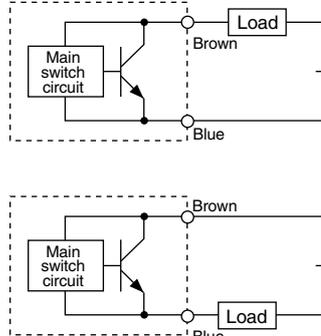
### Solid state 3-wire, NPN



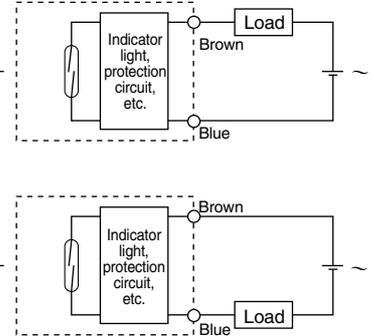
### Solid state 3-wire, PNP



### 2-wire <Solid state>

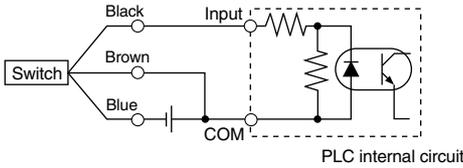


### 2-wire <Reed switch>

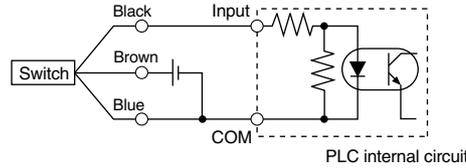


## Examples of Connection to PLC

### Sink input specifications 3-wire, NPN

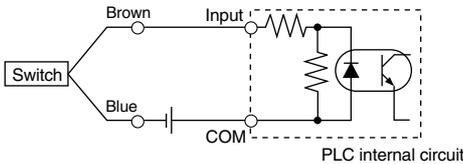


### Source input specifications 3-wire, PNP

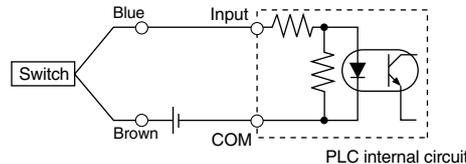


Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

### 2-wire



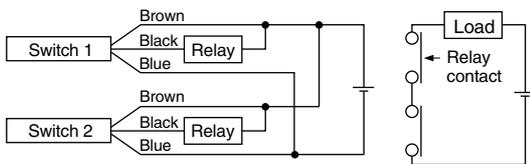
### 2-wire



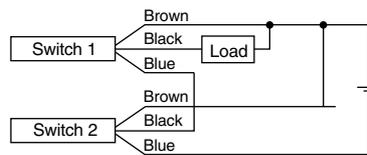
## Connection Examples for AND (Series) and OR (Parallel)

### 3-wire

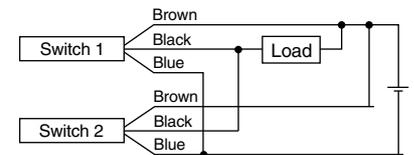
#### AND connection for NPN output (using relays)



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

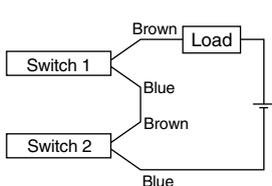


#### OR connection for NPN output



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

### 2-wire with 2 switch AND connection

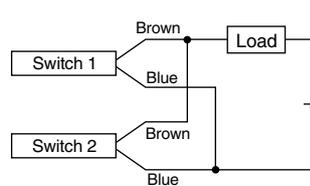


When two switches are connected in series, a load may malfunction because the load voltage will decline when in the ON state. The indicator lights will light up if both of the switches are in the ON state.

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

Example: Power supply is 24VDC  
Internal voltage drop in switch is 4V

### 2-wire with 2 switch OR connection



#### <Solid state>

When two switches are connected in parallel, malfunction may occur because the load voltage will increase when in the OFF state.

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

Example: Load impedance is 3kΩ  
Leakage current from switch is 1mA

#### <Reed switch>

Because there is no current leakage, the load voltage will not increase when turned OFF. However, depending on the number of switches in the ON state, the indicator lights may sometimes dim or not light up, because of dispersion and reduction of the current flowing to the switches.

# Series RSH Model Selection

## Operating Range

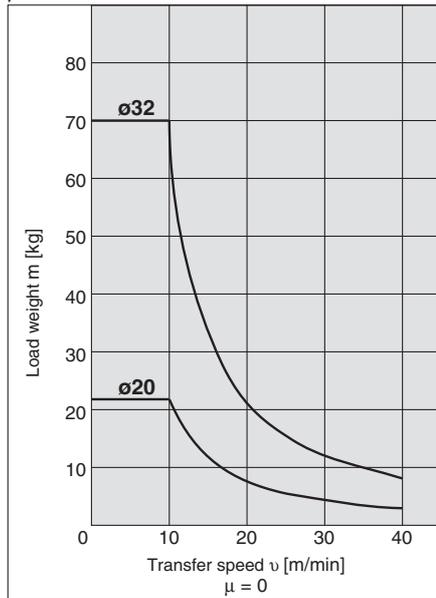
(Example) Load weight 10kg, Transfer speed 10m/min, Friction coefficient  $\mu = 0.1$

(How to read graph)

In graph [2], find the intersection of the vertical axis representing the weight of 10kg and the horizontal axis representing the speed of 10m/min. And select the bore size  $\phi 20$  positioned within the operating range of the cylinder.

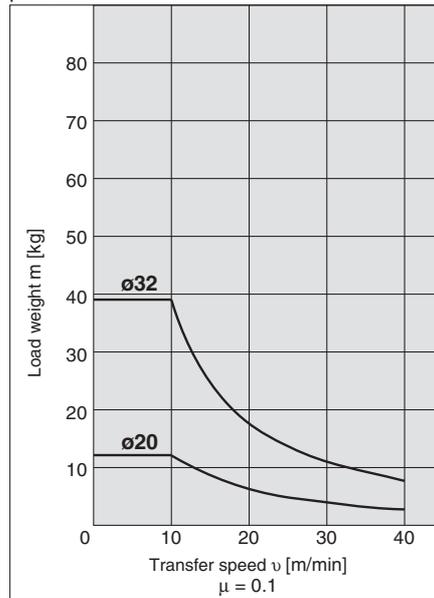
Graph ①

$\mu = 0$



Graph ②

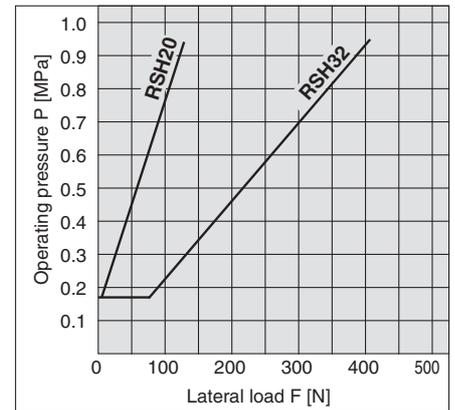
$\mu = 0.1$



\* The graphs for the load mass and transfer speed show the values measured at room temperature (20 to 25°C).

## Lateral Load and Operating Pressure

The greater lateral load needs higher cylinder operating pressure. Set the operating pressure by using the graph as a guideline.





# Series RSH Actuator Precautions 1

Be sure to read before handling.

## Design

### Warning

#### 1. There is a danger of sudden action by air cylinders if sliding parts of machinery are twisted, etc., and changes in forces occur.

In such cases, human injury may occur; e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be designed to avoid such dangers.

#### 2. Install a protective cover when there is a risk of human injury.

If a driven object and moving parts of a cylinder pose a danger of human injury, design the structure to avoid contact with the human body.

#### 3. Securely tighten all mounting parts and connecting parts so that they will not become loose.

Especially when a cylinder operates with high frequency or is installed where there is a lot of vibration, ensure that all parts remain secure.

#### 4. A deceleration circuit or shock absorber, etc., may be required.

When a driven object is operated at high speed or the load is heavy, a cylinder's cushion will not be sufficient to absorb the impact. Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the impact. In this case, the rigidity of the machinery should also be examined.

#### 5. Consider a possible drop in circuit pressure due to a power outage, etc.

When a cylinder is used in a clamping mechanism, there is a danger of work pieces dropping if there is a decrease in clamping force due to a drop in circuit pressure caused by a power outage, etc. Therefore, safety equipment should be installed to prevent damage to machinery and/or human injury. Suspension mechanisms and lifting devices also require consideration for drop prevention.

#### 6. Consider a possible loss of power source.

Measures should be taken to protect against human injury and equipment damage in the event that there is a loss of power to equipment controlled by air pressure, electricity or hydraulics, etc.

#### 7. Design circuitry to prevent sudden lurching of driven objects.

When a cylinder is driven by an exhaust centre type directional control valve or when starting up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will lurch at high speed if pressure is applied to one side of the cylinder because of the absence of air pressure inside the cylinder. Therefore, equipment should be selected and circuits designed to prevent sudden lurching, because there is a danger of human injury and/or damage to equipment when this occurs.

#### 8. Consider emergency stops.

Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions, a power outage or a manual emergency stop.

#### 9. Consider the action when operation is restarted after an emergency stop or abnormal stop.

Design the machinery so that human injury or equipment damage will not occur upon restart of operation. When the cylinder has to be reset at the starting position, install safe manual control equipment.

## Selection

### Warning

#### 1. Confirm the specifications.

The products advertised in this catalogue are designed according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use in these conditions. (Refer to specifications.)

Consult SMC if you use a fluid other than compressed air.

#### 2. Intermediate stops

When intermediate stopping of a cylinder piston is performed with a 3-position closed center type directional control valve, it is difficult to achieve stopping positions as accurately and precisely as with hydraulic pressure due to the compressibility of air.

Furthermore, since valves and cylinders are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time. Contact SMC in case it is necessary to hold a stopped position for an extended period.

### Caution

#### 1. Operate within the limits of the maximum usable stroke.

The piston rod will be damaged if operated beyond the maximum stroke.

Refer to the air cylinder model selection procedure for the maximum useable stroke.

#### 2. Operate the piston in such a way that collision damage will not occur at the stroke end.

The operation range should prevent damage from occur ring when a piston, having inertial force, stops by striking the cover at the stroke end. Refer to the cylinder model selection procedure for the maximum usable stroke.

#### 3. Use a speed controller to adjust the cylinder drive speed, gradually increasing from a low speed to the desired speed setting.

#### 4. Provide intermediate supports for long stroke cylinders.

Provide intermediate supports for cylinders with long strokes to prevent rod damage due to sagging of the rod, deflection of the tube, vibration and external loads.



# Series RSH Actuator Precautions 2

Be sure to read before handling.

## Mounting

### ⚠ Caution

1. **Do not scratch or gouge the cylinder tube or the sliding parts of the piston rod by striking or grasping them with other objects.**

Cylinder bores are manufactured to precise tolerances, so that even a slight deformation may cause malfunction.

Scratches and gouges on the sliding part of the piston rod can damage packing and cause air leakage.

2. **Prevent sticking of rotating parts.**

Prevent sticking of rotating parts (pin, etc.) by applying sufficient lubrication.

3. **Do not use until you can verify that equipment can operate properly.**

Verify correct mounting by suitable function and leakage tests after compressed air and power are connected following mounting, maintenance or conversions.

4. **Instruction manual**

The product should be mounted and operated after thoroughly reading the manual and understanding its contents.  
Keep the instruction manual where it can be referred to as needed.

## Piping

### ⚠ Caution

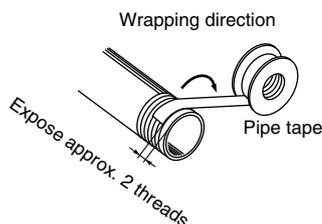
1. **Preparation before piping**

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

2. **Wrapping of pipe tape**

When screwing together pipes and fittings, etc., be certain that chips from the pipe threads and sealing material do not get inside the piping.

Also, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



## Lubrication

### ⚠ Caution

1. **Lubrication of non-lube type cylinder**

The cylinder is lubricated for life at the factory and can be used without any further lubrication.

However, in the event that additional cylinder lubrication is required, be sure to use ISO VG32 Class 1 turbine oil (with no additives).

Stopping lubrication later may lead to malfunctions because the new lubricant will cancel out the original lubricant. Therefore, additional lubrication must be continued once it has been started.

## Air Supply

### ⚠ Warning

1. **Use clean air.**

Do not use compressed air containing chemicals, synthetic oils containing organic solvents, salt, or corrosive gases, as this can cause damage or malfunction.

### ⚠ Caution

1. **Install air filters.**

Install air filters immediately upstream of valves. The filtration degree should be 5µm or finer.

2. **Install an after-cooler, air dryer, or water separator (Drain Catch).**

Air that includes excessive drainage or condensate may cause malfunction of valves and other pneumatic equipment. To prevent this, install an after-cooler, air dryer or water separator (Drain Catch).

3. **Use the product within the specified range of fluid and ambient temperature.**

Take measures to prevent freezing when below 5°C or less, since moisture in circuits can freeze and cause damage to seals and lead to malfunction.

Refer to SMC's "Best Pneumatics vol. 4" catalog for further details on compressed air quality.

## Operating Environment

### ⚠ Warning

1. **Do not use in environments where there is a danger of corrosion.**

Refer to the construction drawings regarding cylinder materials.

2. **In dusty locations or where water or oil splashing is a regular occurrence, protect the rod by installing a rod cover.**

3. **When using auto switches, do not operate in an environment where there are strong magnetic fields.**

## Maintenance

### ⚠ Warning

1. **Perform maintenance inspection and service according to the procedure indicated in the instruction manual.**

Improper handling and maintenance may cause malfunctioning and damage of machinery or equipment to occur.

2. **Removal of components, and supply/exhaust of compressed air.**

Before any machinery or equipment is removed, first ensure that the appropriate measures are in place to prevent the fall or erratic movement of driven objects and equipment, then cut off the electric power and reduce the pressure in the system to zero only then should you proceed with the removal of any machinery and equipment.

When machinery is restarted, proceed with caution after confirming that appropriate measures are in place to prevent cylinder from lurching.

### ⚠ Caution

1. **Filter drainage**

Drain out condensate from air filters regularly.



# Series RSH Auto Switch Precautions 1

Be sure to read before handling.

## Design and Selection

### Warning

#### 1. Confirm the specifications.

Read the specifications carefully and use the product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications for load current, voltage, temperature, or impact.

#### 2. Take precautions when multiple cylinders are used close together.

When two or more auto switch cylinders are lined up in close proximity to each other, magnetic field interference may cause the switches to malfunction. Maintain a minimum cylinder separation of 40mm. (When the allowable interval is specified for each cylinder series, use the indicated value.)

#### 3. Monitor the length of time that a switch is ON at an intermediate stroke position.

When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate, but if the speed is too great the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:

$$V(\text{mm/s}) = \frac{\text{Auto switch operating range (mm)}}{\text{Load operating time}} \times 1000$$

#### 4. Keep wiring as short as possible.

##### <Reed switches>

As the length of the wiring to a load gets longer, the rush current at switching ON becomes greater, and this may shorten the product's life. (The switch will stay ON all the time.)

- 1) For an auto switch without a contact protection circuit, use a contact protection box when the wire length is 5m or longer.

##### <Solid state switches>

- 2) Although wire length should not affect switch function, use a wire that is 100m or shorter.

#### 5. Monitor the internal voltage drop of the switch.

##### <Reed switches>

- 1) Switches with an indicator light (Except D-Z76)

- If auto switches are connected in series as shown below, take note that there will be a large voltage drop because of internal resistance in the light emitting diodes. (Refer to internal voltage drop in the auto switch specifications.)

[The voltage drop will be "n" times larger when "n" auto switches are connected.]

Even though an auto switch operates normally, the load may not operate.



- Similarly, when operating below a specified voltage, it is possible that the load may be ineffective even though the auto switch function is normal. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

$$\text{Supply voltage} - \text{Internal voltage drop of switch} > \text{Minimum operating voltage of load}$$

- 2) If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (Model D-Z80).

##### <Solid state switches>

- 3) Generally, the internal voltage drop will be greater with a 2-wire solid state auto switch than with a reed switch. Take the same precautions as in 1).

Also, note that a 12VDC relay is not applicable.

#### 6. Monitor leakage current.

##### <Solid state switch>

With a 2-wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.  
Operating current of load (OFF condition) > Leakage current

If the condition given in the above formula are not met, the switch will not reset correctly (it stays ON). Use a 3-wire switch if this condition cannot be satisfied.

Moreover, leakage current flow to the load will be "n" times larger when "n" auto switches are connected in parallel.

#### 7. Do not use a load that generates surge voltage.

##### <Reed switches>

If driving a load that generates surge voltage, use as a relay, use a switch with a built-in contact protection circuit or a contact protection box.

##### <Solid state switches>

Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if a surge is applied repeatedly. When directly driving a load that generates surge, such as a relay or solenoid valve, use a switch with a built-in surge absorbing element.

#### 8. Cautions for use in an interlock circuit

When an auto switch is used for an interlock signal requiring high reliability, devise a double interlock system to safeguard against malfunctions by providing a mechanical protection function, or by also using another switch (sensor) together with the auto switch. Also perform periodic maintenance inspections and confirm proper operation.

#### 9. Ensure sufficient clearance for maintenance activities.

When designing an application, be sure to allow sufficient clearance for maintenance and inspections.



# Series RSH Auto Switch Precautions 2

Be sure to read before handling.

## Mounting and Adjustment

### Warning

#### 1. Do not drop or bump.

Do not drop, bump or apply excessive impacts (300m/s<sup>2</sup> or more for reed switches and 1000m/s<sup>2</sup> or more for solid state switches) while handling.

Although the body of the switch may not be damaged, the inside of the switch could be damaged and cause a malfunction.

#### 2. Do not carry a cylinder by the auto switch lead wires.

Never carry a cylinder by its lead wires. This may not only cause broken lead wires, but it may cause internal elements of the switch to be damaged by the stress.

#### 3. Mount switches using the proper tightening torque.

When a switch is tightened beyond the range of tightening torque, the mounting screws or switch may be damaged. On the other hand, tightening below the range of tightening torque may allow the switch to slip out of position. (Refer to page 8 for how to install or move the switch and for specifications of the tightening torque, etc.)

#### 4. Mount a switch at the center of the operating range.

Adjust the mounting position of an auto switch so that the piston stops at the center of the operating range (the range in which a switch is ON). (The mounting positions shown in the catalog indicate the optimum position at the stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), the operation may be unstable.

## Wiring

### Warning

#### 1. Avoid repeatedly bending or stretching lead wires.

Broken lead wires will result from repeatedly applying bending stress or stretching force to the lead wires.

#### 2. Be sure to connect the load before power is applied.

##### <2 wire type>

If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged because of excess current.

#### 3. Confirm proper insulation of wiring.

Be certain that there is no faulty wiring insulation (such as contact with other circuits, ground fault, improper insulation between terminals). Damage may occur due to excess current flow into a switch.

#### 4. Do not wire in conjunction with power lines or high voltage lines.

Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits containing auto switches may malfunction due to noise from these other lines.

## Wiring

### 5. Do not allow short circuit of loads.

#### <Reed switches>

If the power is turned ON with a load in a short circuited condition, the switch will be instantly damaged because of excess current flow into the switch.

#### <Solid state switches>

D-J51 and all models of PNP output type switches do not have built-in short circuit protection circuits. If loads are short circuited, the switches will be instantly damaged, as in the case of reed switches.

Take special care to avoid reverse wiring with the brown [red] power supply line and the black [white] output line on 3 wire type switches.

### 6. Avoid incorrect wiring.

#### <Reed switches>

A 24VDC switch with indicator light has polarity. The brown [red] lead wire is (+), and the blue [black] lead wire is (-).

- 1) If connections are reversed, the switch will still operate, but the light emitting diode will not light up.

Also note that a current greater than the maximum specified one will damage a light emitting diode and make it inoperate.

Applicable models: D-Z73

#### <Solid state switches>

- 1) If connections are reversed on a 2-wire type switch, the switch will not be damaged because it is protected by a protection circuit, but it will remain in a normally ON state. However, it is still necessary to avoid reversed connections since the switch will be damaged if a load short circuits in this condition.
- 2) Even if (+) and (-) power supply line connections are reversed on a 3-wire type switch, the switch will still be protected by a protection circuit. However, if the (+) power supply line is connected to the blue [black] wire and the (-) power supply line is connected to the black [white] wire, the switch will be damaged.

### \* Lead wire colour changes

Lead wire colours of SMC switches have been changed in order to meet NECA Standard 0402 for production beginning September, 1996 and thereafter. Please refer to the tables provided. Special care should be taken regarding wire polarity during the time that the old colours still coexist with the new colours.

#### 2-wire

	Old	New
Output (+)	Red	Brown
Output (-)	Black	Blue

#### 3-wire

	Old	New
Power supply (+)	Red	Brown
Power supply GND	Black	Blue
Output	White	Black

#### Solid state with diagnostic output

	Old	New
Power supply (+)	Red	Brown
Power supply GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

#### Solid state with latch type diagnostic output

	Old	New
Power supply (+)	Red	Brown
Power supply GND	Black	Blue
Output	White	Black
Latch type diagnostic output	Yellow	Orange



# Series RSH Auto Switch Precautions 3

Be sure to read before handling.

## Operating Environment

### Warning

#### 1. Never use in the presence of explosive gases.

The construction of our auto switches does not make them explosion-proof. Never use them in the presence of an explosive gas, as this may cause a serious explosion.

#### 2. Do not use in an area where a magnetic field is generated.

Auto switches will malfunction or magnets inside cylinders will become demagnetized if used in such an environment.

#### 3. Do not use in an environment where the auto switch will be continually exposed to water.

Auto switches satisfy IEC standard IP67 construction (JIS C 0920: watertight construction). Nevertheless, they should not be used in applications where they are continually exposed to water splash or spray. They may cause deterioration of the insulation or swelling of the potting resin inside switches and may lead to a malfunction.

#### 4. Do not use in an environment laden with oil or chemicals.

Consult with SMC if auto switches will be used in an environment laden with coolants, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by a deterioration of the insulation, a malfunction due to swelling of the potting resin, or hardening of the lead wires.

#### 5. Do not use in an environment with temperature cycles.

Consult with SMC if switches are to be used where there are temperature cycles other than normal temperature changes, as they may be adversely affected internally.

#### 6. Do not use in an environment where there is excessive impact shock.

##### <Reed switches>

When excessive impact ( $300\text{m/s}^2$  or more) is applied to a reed switch during operation, the contact point may malfunction and generate or cut off a signal momentarily (1ms or less). Consult with SMC regarding the need to use a solid state switch depending on the environment.

#### 7. Do not use in an area where surges are generated.

##### <Solid state switches>

When there are units (such as solenoid type lifter, high frequency induction furnace, motor) that generate a large amount of surge in the area around cylinders with solid state auto switches, their proximity may cause deterioration or damage to internal circuit elements of the switch. Avoid and protect against sources of surge generation and crossed lines.

#### 8. Avoid close contact with accumulated iron waste or magnetic substances.

When a large accumulated amount of ferrous waste such as machining chips or welding spatter, or a magnetic substance (something attracted by a magnet) is brought into close proximity to a cylinder with auto switches, this may cause the auto switches to malfunction due to a loss of the magnetic force inside the cylinder.

## Maintenance

### Warning

#### 1. Perform the following maintenance inspection and services periodically in order to prevent possible danger due to unexpected auto switch malfunction.

##### 1) Securely tighten switch mounting screws.

If screws become loose or the mounting position is dislocated, retighten screws securely after readjusting the mounting position.

##### 2) Confirm that there is no damage to lead wires.

To prevent faulty insulation, replace switches or repair lead wires if damage is discovered.

##### 3) Confirm that the green light on a 2-colour indicator type switch lights up.

Confirm that the Green LED is ON when stopped at the set position. If the Red LED is ON when stopped at the set position, the mounting position is not appropriate. Readjust the mounting position until the Green LED lights up.

## Other

### Warning

#### 1. Consult with SMC concerning water resistance, elasticity of lead wires, and usage at welding sites.



# Series RSH Specific Product Precautions

Be sure to read before handling.

Refer to front matter 11 for Safety Instructions and pages 11 to 15 for Actuator and Auto Switch Precautions.

## Instructions

### ⚠ Caution

#### 1. Shock absorber capacity variable adjustment method

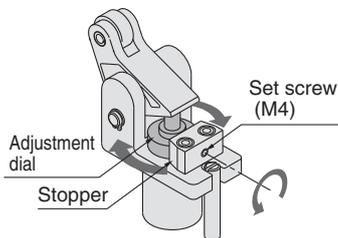
To stop the workpiece gently, loosen the set screw (M4) on the stopper and turn the adjustment dial in response to the energy value of the workpiece so as to select an optimal absorbing position (resistive force value). Turning the adjustment dial clockwise will decrease the resistive force value while turning the adjustment dial counterclockwise will increase the resistive force value. After the dial has been adjusted correctly, tighten the set screw firmly to secure the adjustment dial.

- **Set screw (M4) tightening torque: 1.5 N·m**

Note 1) Cautions for adjustment When adjusting the shock absorber resistive force value, first try the maximum value and then proceed to smaller values. If the energy value of the transferred workpiece is larger than the resistive force value of the shock absorber, an excessive load will be applied to the lever and may cause damage.

Note 2) As the adjustment dial is turned, the stroke of the shock absorber is variably changed (4 st to 6 st) and the resistive force value of the shock absorber can be changed. As the stroke is changed, the lever angle is also changed.

Note 3) Please consult SMC if shock absorption is not soft, even after adjusting the shock absorber with the above method.



#### 2. How to change the positional relationship between the transfer and piping directions

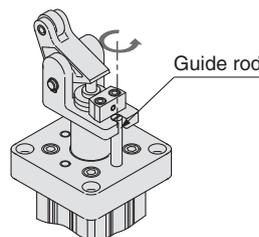
The positional relationship between the transfer and piping directions can be changed in 90° increments (or 180° increments in case of  $\phi 20$ ).

Insert a flat blade screwdriver into the notch at the guide rod end to loosen the guide rod. The lever is then turned freely. For  $\phi 32$  type, the lever can be changed in 90° steps. For  $\phi 20$  type, the lever can be reversed 180°.

- **Guide rod tightening torque**

$\phi 20$ : 1.5N·m

$\phi 32$ : 3.0N·m



#### 3. How to replace shock absorber during maintenance

Loosen the hexagon socket head cap screw on the stopper and the set screw (M4) that secures the shock absorber, and then remove the stopper from the lever holder. Incline the lever 90° and pull out the shock absorber after the adjustment dial has been removed.

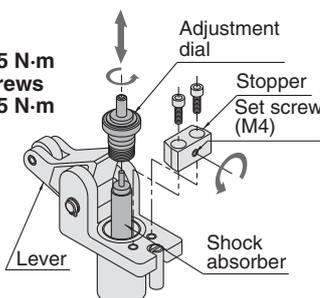
\*Cautions for assembly

After replacing the shock absorber, tighten the bolts and fixing screw firmly and apply grease to the shock absorber rod end surface.

- **Tightening torque**

**Set screws (M4): Common to all sizes 1.5 N·m**

**Hexagon socket head cap screws (M4): Common to all sizes 1.5 N·m**



## Selection

### ⚠ Danger

#### 1. Use the equipment only within the specified operating range.

If the condition exceeds the specified operating range, it will cause excessive impact or vibration to the stopper cylinder, leading to possible damages.

### ⚠ Caution

#### 1. Do not collide the pallet while the lever is standing erect.

In case of a lever with built-in shock absorber type, do not collide the next pallet while the lever is standing erect. Otherwise, all energy will be applied to the cylinder body.

#### 2. When a load directly connected to the cylinder is stopped at an intermediate position:

Apply the operating range in the catalogue only in these cases where the stopper cylinder is used to stop pallets on a conveyor belt. When using the stopper cylinder to stop loads directly connected to a cylinder or some other equipment, a lateral load is applied as the cylinder thrust. Consult SMC in such cases.

## Mounting

### ⚠ Caution

#### 1. Do not apply rotational torque to the cylinder rod.

Align the cylinder parallel to the working face of the pallet working when installing in order to prevent rotational torque working on the cylinder rod.

#### 2. Do not scratch or gouge the sliding part of the piston rod or guide rod.

Scratches and gouges may damage the packing, causing air leakage or malfunction.

#### 3. If the conveyor setting position is incorrect, the pallets or other items being conveyed may touch the lever (protrusion on the side of the shock absorber). When installing the cylinder, be very careful of the contents of Note 7) indicated in the dimensions.

## Operation

### ⚠ Caution

#### 1. In case of cylinders with locking mechanism, do not apply an external force from the opposite side when the lever is locked.

Lower the cylinder before adjusting the conveyor or moving the pallet.

#### 2. In case of cylinders with locking mechanism, do not collide the pallet and roller when the lever is locked.

If the pallet collides with the roller in the locked state, it may cause lever malfunction. (The lever is released when the cylinder is fully retracted.)

#### 3. Do not let your hand become caught when operating the cylinder.

The lever holder goes up and down while the cylinder is in operation. Pay sufficient attention not to let your hand or fingers become caught between the rod cover and lever holder.

#### 4. Do not let water, cutting oil or dust splash on the equipment.

It can cause oil leakage and malfunction of the shock absorber.

#### 5. The stop state of the workpiece may vary depending on changes in ambient temperature or secular changes in shock absorber resistive force.

Check the stop state periodically and adjust the shock absorber resistive force at appropriate intervals.

## ⚠ Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)\*1, and other safety regulations.

- ⚠ Caution:** Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
- ⚠ Warning:** Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
- ⚠ Danger:** Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

\*1) ISO 4414: Pneumatic fluid power – General rules relating to systems.  
ISO 4413: Hydraulic fluid power – General rules relating to systems.  
IEC 60204-1: Safety of machinery – Electrical equipment of machines.  
(Part 1: General requirements)  
ISO 10218-1: Manipulating industrial robots - Safety.  
etc.

### ⚠ Warning

#### 1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

#### 2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

#### 3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

#### 4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalogue.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

## Limited warranty and Disclaimer/ Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.  
Read and accept them before using the product.

### Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.\*2)  
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.  
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.

#### \*2) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

### Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

### ⚠ Caution

#### 1. The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries.

If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.

If anything is unclear, contact your nearest sales branch.

### ⚠ Caution

#### SMC products are not intended for use as instruments for legal metrology.

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.

Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

## ⚠ Safety Instructions

Be sure to read “Handling Precautions for SMC Products” (M-E03-3) before using.

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