SKH

Shock absorbing valve

Overview

The SKH shockless valve suppresses impact at the cylinder stroke end, enabling soft stopping. This valve can be used to drive cylinders up to ø125.

Features

Shock-free stopping

The cushion effect is adjusted by pressure so bouncing does not occur. Deceleration G at stopping is adjusted from slow stopping to sudden stopping by setting the cushion stroke.

Multifunctional and compact

Large dynamic energy can be absorbed with just the valve using the air cylinder's thrust. Heat generation by energy absorption is suppressed, so the usable frequency is not limited.

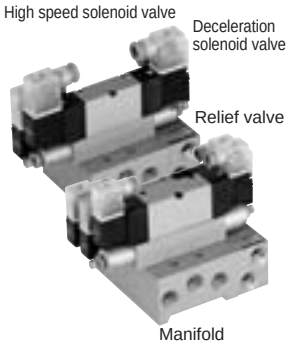
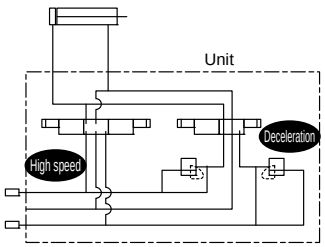
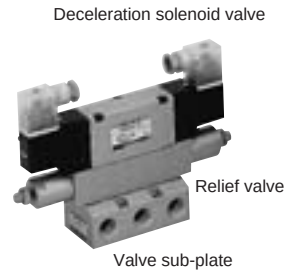
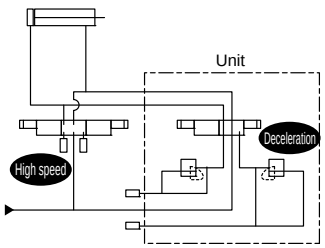
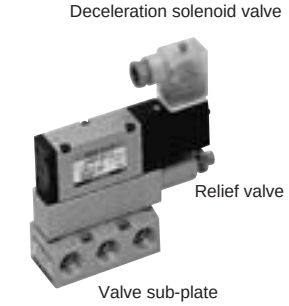
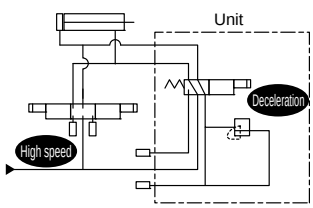
Easy installation

Additional piping is not needed when adding the cushion unit. (Piping can be completed with P, R, A, and B 5 ports.)
The cushion unit can be added easily, because the sequence program is modified only by changing the air-operated cylinder drive's solenoid valve with external signal inputs.

Easy maintenance

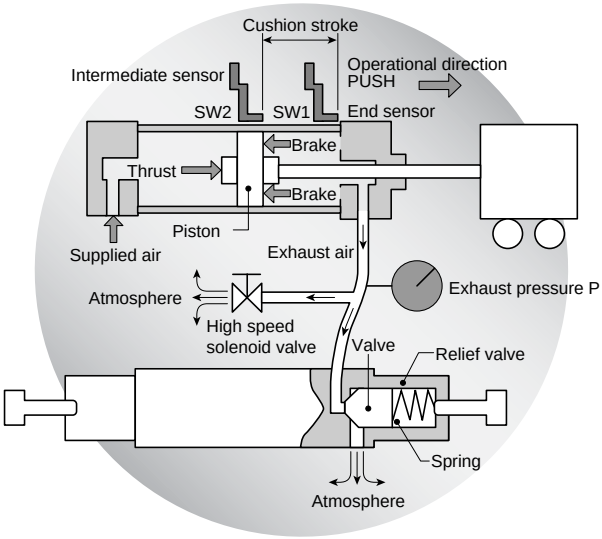
The solenoid valve and spacer relief valve can each be replaced with three bolts. DIN terminal electric wiring can also be replaced easily.

CONTENTS

	Model no.		Cylinder bore size	Appearance	Circuit figure	PLC I/O	Piping	Page
Variable speed unit	SKH-320		ø25 to ø50			IN 4 points (Sensor) OUT 4 points (Valve)	1) The circuit for deceleration and solenoid valve for control are integrated. Cylinder can be operated by a single unit. 2) Piping man-hours is as same as the normal cylinder drive circuit.	1202
	SKH-420		ø40 to ø80					
	SKH-520		ø63 to ø125					
Deceleration unit	Both ends decelerating	SKH-328	ø25 to ø50			IN 2 points (Sensor) OUT 2 points (Valve)	The circuit for deceleration is completed just by additional piping to solenoid valve circuit.	1202
		SKH-428	ø40 to ø80					
	Single decelerating	SKH-318	ø25 to ø50			IN1 point (Sensor) OUT1 point (Valve)	1) The circuit for deceleration is completed just by additional piping to solenoid valve circuit. 2) Due to single decelerating unit, install the unit close to cylinder port.	1202
		SKH-418	ø40 to ø80					

●Basic operational principle

When the air cylinder starts moving, the high-speed solenoid valve is opened. The cylinder moves at a high-speed while discharging exhaust air into the atmosphere.
When the intermediate sensor (SW2) for the cushion operation is activated, the high-speed solenoid valve closes. The flow of exhaust air is controlled by the relief valve and operation decelerates.
As the piston moves, exhaust pressure P gradually increases to the pressure set by the relief valve spring. Air brakes are applied in reverse of thrust and the air cylinder stops while softly decelerating.



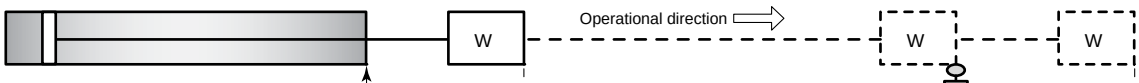


Fig.1

●Principle of cushion

(Pressure control method)
When the cylinder moves in the direction shown at right is considered here. The cylinder starts moving when the solenoid valve switches and the supply side pressure and exhaust side pressure change as shown in Fig. 2. Thrust is applied on the same direction as the operation direction due to the difference in supply and exhaust pressure while the cylinder is moving.
At "L1" just before stroke end, the flow of exhaust air is changed by the external signal (proximity switch, etc.), and exhaust pressure is controlled. With this unit, exhaust pressure is controlled by using a relief valve.
As cylinder displacement nears the end as shown in Fig. 2, exhaust pressure rises and the difference in pressure with the supply side changes, causing the cylinder thrust to change, and cylinder movement gradually decelerates to a stop.
When making adjustments, if cushion stroke range "L1" is set to a longer range, the cylinder deceleration distance will increase and the cylinder will stop smoothly. In this case, cushion time "T" increase.

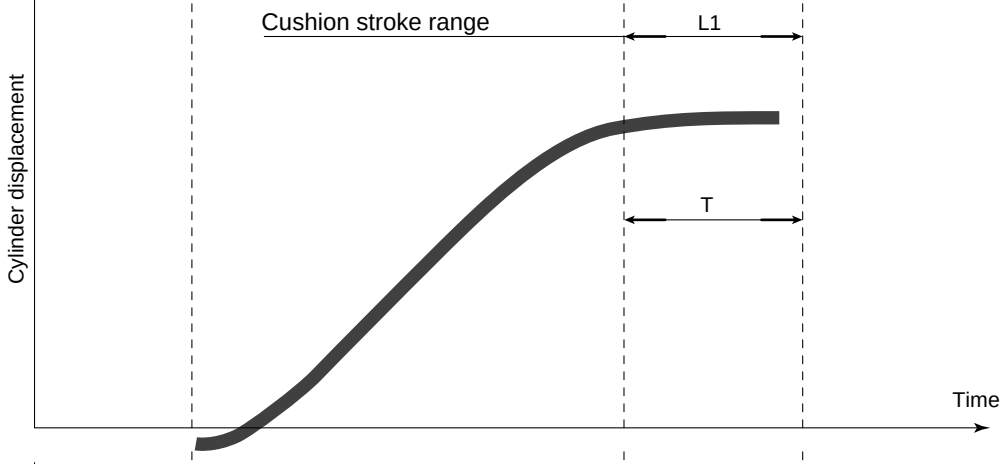
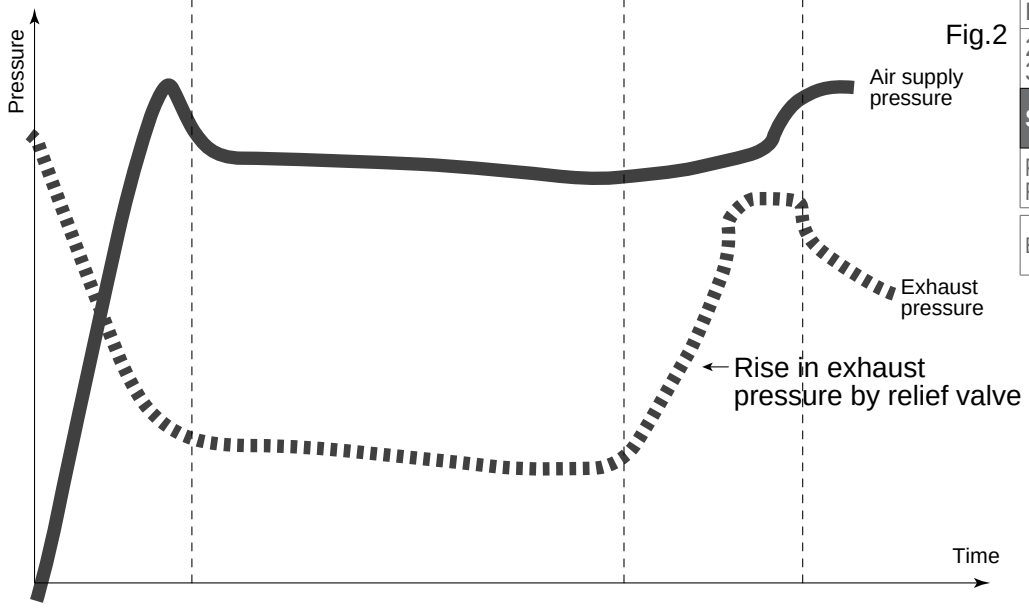


Fig.2



Safety precautions

Always read this section before starting use.
Refer to Intro 63 for valve general precautions.

Shock absorbing valve SKH Series

Installation & Adjustment

⚠ CAUTION

■ Installation positions and types of deceleration command switches

Install this switch at least 350 mm away from the cylinder end. If installed closer, cylinder exhaust pressure may not rise, and the cylinder could contact the end with great impact, damaging the cylinder or component.
When this command switch is used for the cylinder switch, there may be cases when input cannot be detected with the programmable controller. In this case, use the off delay type cylinder switch, etc., and check that the switch signal is output long enough to be detected by the programmable controller.

■ Setting the relief valve

Do not lower the relief valve setting pressure before adjusting. Exhaust pressure may not rise, and the cylinder could contact the end with a great impact, damaging the cylinder or component.

■ Installing a regulator

Pressure is controlled with exhaust pressure to achieve a cushion effect. Install a regulator so supply pressure does not fluctuation, and create an air circuit with stable pressure.

■ Fixing the relief valve dial

After adjusting the relief valve, lock the dial on the relief valve. If the dial is not locked, the dial could loosen, and the set pressure value could change, damaging the cylinder or component.

During Use & Maintenance

⚠ CAUTION

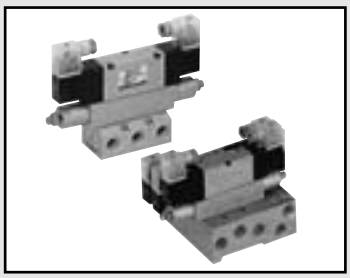
■ Braking

Do not brake with the SKH330, 430, 530, 338, or 438 for a long time or popping out phenomenon could occur when operation is restarted, causing a hazardous situation.

■ Handling in energized state

Do not disconnect the DIN terminal while the solenoid valve is energized. Failure to observe this could lead to a short-circuit or electrical shock.

MEMO



Shock absorbing valve

SKH Series

● Applicable cylinder bore size: ø25 to ø125

RoHS CAD

Common specifications

	Speed variable unit	Deceleration unit	Single decelerating unit
	Solenoid valves to drive an air cylinder and to decelerate, and relief valve are integrated. This enables simple and smooth deceleration and stop.	Adding this unit to the existing air cylinder drive circuit enables smooth deceleration and stop at the end of stroke during high speed operation.	Decelerating solenoid valve and relief valve are integrated into a unit to control speed at the single end of stroke in the existing air cylinder drive circuits. This enables smooth deceleration and stop.

Descriptions		2 SKH3305	2 SKH4305	2 SKH5305	2 SKH3385	2 SKH4385	SKH318	SKH418
Working fluid		Compressed air						
Operating method		Pilot (soft spool)						
Basic solenoid valve		4KB3	4KB4		4KB3	4KB4	4KB3	4KB4
Working pressure MPa		0.3 to 0.7						
Withstanding pressure MPa		1.0						
Flow characteristics	C (dm^3/ (s·bar))	4.3	8.9	16.3	4.1	7.9	4.4	8.5
	b	0.18	0.19	0.27	0.14	0.17	0.13	0.17
Ambient temperature (Note 1) °C		-5 to 50 (no freezing)						
Fluid temperature °C		5 to 50						
Lubrication		Not required						
Weight g		1950	3250	4230	660	1030	500	810

Note 1: Ambient temperature refers to the temperature for storage and installation, and differs from fluid temperature, which applies during operation.
Note 2: Effective sectional area S and sonic conductance C are converted as S≒5.0×C.
Note 3: SKH**0 flow characteristics are the value in the A/B ⇒R direction when only the high-speed valve is operated.
Note 4: SKH**8 flow characteristics are the value in the P ⇒A/B direction.

Electric specifications

Descriptions			2 SKH3305	2 SKH4305	2 SKH5305	2 SKH3385	2 SKH4385	SKH318	SKH418
Rated voltage V	AC		100, 200 (50/60Hz)						
	DC		24						
Rated voltage fluctuation range			±10%						
Starting current A	AC	100 V	0.092/0.084		0.138/0.126	0.046/0.042			
		200 V	0.046/0.042		0.069/0.063	0.023/0.021			
	DC	24 V	-		-	-			
Holding current A	AC	100 V	High speed: 0.046/0.042 Low speed: 0.023/0.021		High speed: 0.069/0.063 Low speed: 0.023/0.021	0.023/0.021			
		200 V	High speed: 0.028/0.022 Low speed: 0.014/0.011		High speed: 0.042/0.033 Low speed: 0.014/0.011	0.014/0.011			
	DC	24 V	High speed: 0.15 Low speed: 0.075		High speed: 0.225 Low speed: 0.075	0.075			
Power consumption W	AC	100 V	High speed: 3.6/3.0 Low speed: 1.8/1.5		High speed: 5.4/4.5 Low speed: 1.8/1.5	1.8/1.5			
		200 V	High speed: 3.6/3.0 Low speed: 1.8/1.5		High speed: 5.4/4.5 Low speed: 1.8/1.5	1.8/1.5			
	DC	24 V	High speed: 4.0 Low speed: 2.0		High speed: 6.0 Low speed: 2.0	2.0			
Temperature rise °C			30						
Insulation class			B (molded coil)						
Surge suppressor			Provided as standard						
Indicator			Provided as standard						

Copper and PTFE free

● Free of copper-based and PTFE based materials in flow path

** - Voltage - P6

How to order shock absorbing valve

● Speed variable unit

SKH - 3 20 —— 10 - 1

● Deceleration unit

SKH - 3 28 —— 10 - 1

● Single decelerating unit

SKH - 3 18 - A - 10 - 1

Ⓐ Nominal size
Note 1

Ⓑ Solenoid position

Ⓒ Ports of relief valve
Note 2

Ⓓ Port size
Note 1

Ⓔ Voltage

Symbol	Descriptions	Model: Speed variable unit	Model: Decelerating unit	Model: Single decelerating unit
Ⓐ Nominal size				
3	4KB3 used	●	●	●
4	4KB4 used	●	●	●
5	4KB4 used	●		
Ⓑ Solenoid position				
18	2-position single solenoid			●
20	2-position double solenoid	●		
28	2-position double solenoid		●	
30	3-position all ports closed	●		
38	3-position all ports closed		●	
50	3-position P/A/B	●		
58	3-position P/A/B		●	
Ⓒ Ports of relief valve				
Blank	Connect to B port			●
A	Connect to A port			●
Ⓓ Port size				
08	Rc1/4		●	●
10	Rc3/8	●	●	●
15	Rc1/2	●	●	●
Ⓔ Voltage				
1	100 VAC	●	●	●
2	200 VAC	●	●	●
3	24 VDC	●	●	●

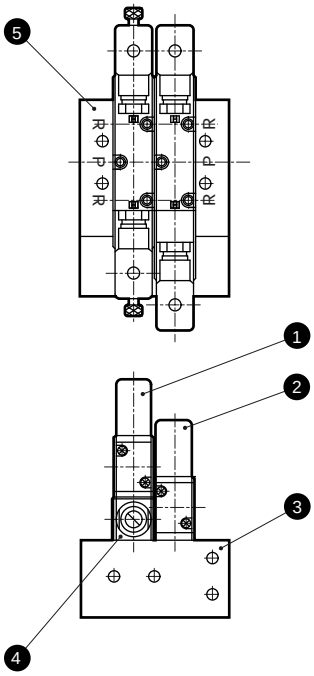
Note 2: Refer to "Example of connecting port and time chart" (page 1214) for air circuit.

Note 1: Nominal size and port size

Symbol / Model	Ⓐ Nominal size	Ⓑ Port size	
Speed variable unit SKH-430 (32, 55)	**3**	**10**	Rc3/8
	4	**15**	Rc1/2
	5	**15**	Rc1/2
Deceleration unit SKH-3(2,4,5)38	**3**	**08**	Rc1/4
		10	Rc3/8
	4	**10**	Rc3/8
		15	Rc1/2
Single decelerating unit SKH-(3,4)18	**3**	**08**	Rc1/4
		10	Rc3/8
	4	**10**	Rc3/8
		15	Rc1/2

Internal structure and parts list

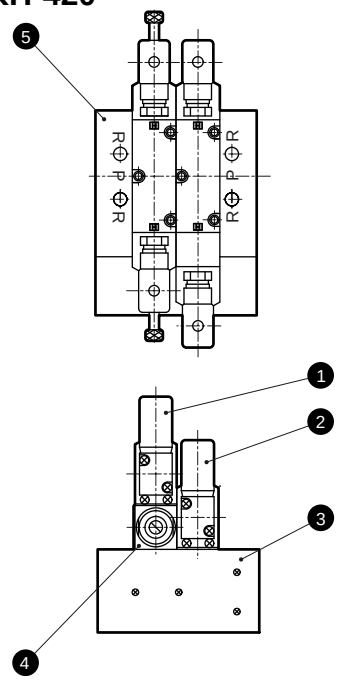
SKH-320



Main parts list

No.	Parts name	Model no.	Qty	Remarks
1	Solenoid valve	4KB329-00	1	Deceleration
2	Solenoid valve	4KB339-00	1	High speed
3	Side plate	-	1	Aluminum alloy
4	Spacer relief valve	SKH-3-SR	1	Relief valve assembly
5	Sub-plate	-	1	Aluminum alloy

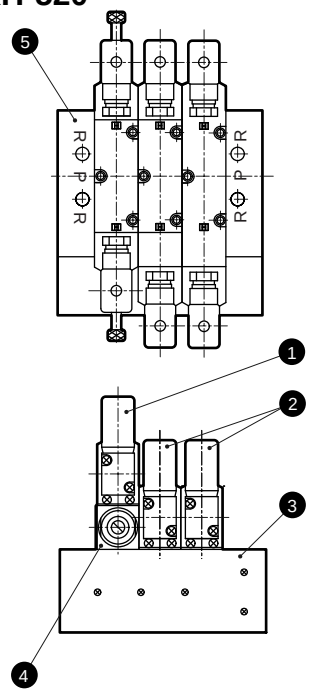
SKH-420



Main parts list

No.	Parts name	Model no.	Qty	Remarks
1	Solenoid valve	4KB429-00	1	Deceleration
2	Solenoid valve	4KB439-00	1	High speed
3	Side plate	-	1	Aluminum alloy
4	Spacer relief valve	SKH-4-SR	1	Relief valve assembly
5	Sub-plate	-	1	Aluminum alloy

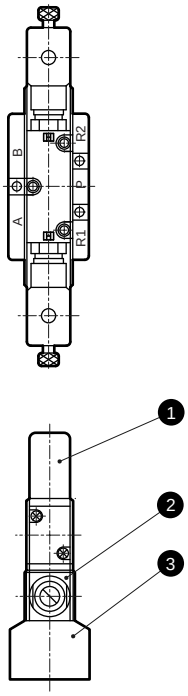
SKH-520



Main parts list

No.	Parts name	Model no.	Qty	Remarks
1	Solenoid valve	4KB429-00	1	Deceleration
2	Solenoid valve	4KB439-00	2	High speed
3	Side plate	-	1	Aluminum alloy
4	Spacer relief valve	SKH-4-SR	1	Relief valve assembly
5	Sub-plate	-	1	Aluminum alloy

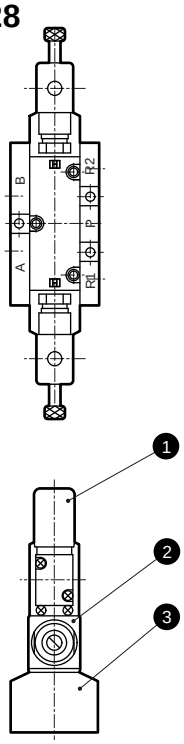
SKH-328



Main parts list

No.	Parts name	Model no.	Qty	Remarks
1	Solenoid valve	4KB329-00	1	Deceleration
2	Spacer relief valve	SKH-3-SR	1	Relief valve assembly
3	Sub-plate	-	1	Aluminum alloy die-casting

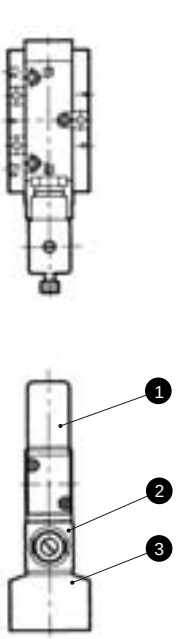
SKH-428



Main parts list

No.	Parts name	Model no.	Qty	Remarks
1	Solenoid valve	4KB429-00	1	Deceleration
2	Spacer relief valve	SKH-4-SR	1	Relief valve assembly
3	Sub-plate	-	1	Aluminum alloy die-casting

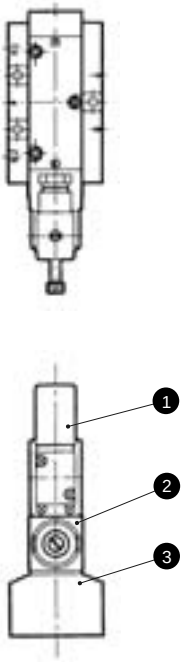
SKH-318



Main parts list

No.	Parts name	Model no.	Qty	Remarks
1	Solenoid valve	4KB319-00	1	Deceleration
2	Spacer relief valve Note 2	SKH-3S-SR SKH-3S-SR-A	1	Relief valve assembly
3	Sub-plate	-	1	Aluminum alloy die-casting

SKH-418

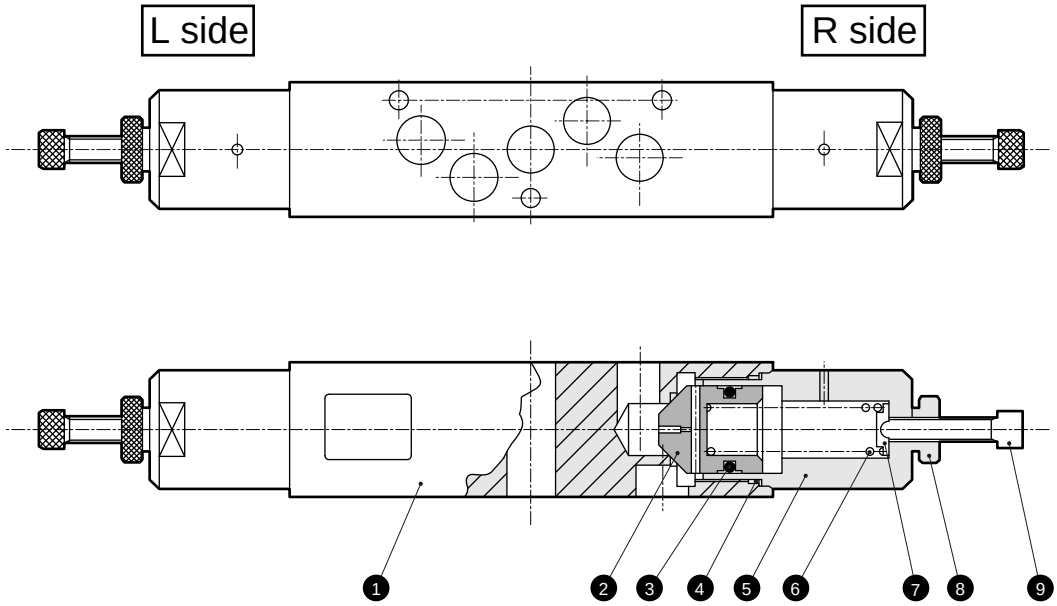


Main parts list

No.	Parts name	Model no.	Qty	Remarks
1	Solenoid valve	4KB419-00	1	Deceleration
2	Spacer relief valve Note 2	SKH-4S-SR SKH-4S-SR-A	1	Relief valve assembly
3	Sub-plate	-	1	Aluminum alloy die-casting

Note 1: The appearance shows the SKH-318 and SKH-418 type (types with a relief valve connected to the B port).
Note 2: Spacer relief valves on the upper line are for SKH-318 and SKH-418 (types with relief valve connected to B port), and those on the lower line are for SKH-318-A and SKH-418-A (types with relief valve connected to A port).

Internal structure and parts list



* The above part indicates both sides deceleration (SKH-$\frac{3}{4}$-SR).
* For single decelerating, SKH-$\frac{3}{4}$S-SR means relief valve on the L side (2 to 9), while SKH-$\frac{3}{4}$S-SR-A means relief valve on the R side (2 to 9).

Main parts list

No.	Parts name	Material	Qty
1	Spacer	Aluminum alloy	1
2	Valve retainer	Polyacetal resin	2
3	O ring	Nitrile rubber	2
4	O ring	Nitrile rubber	2
5	Cover	Aluminum alloy	2
6	Coil spring	Piano wire	2
7	Spring disk	Steel	2
8	Stop nut	Stainless steel	2
9	Adjusting screw	Brass	2
Accessories	Gasket	Nitrile rubber	1
	Hexagon socket head cap bolt	Alloy steel	3

* Accessories are used to fix 4KB$\frac{3}{4}$ valves, spacer, and subplate.

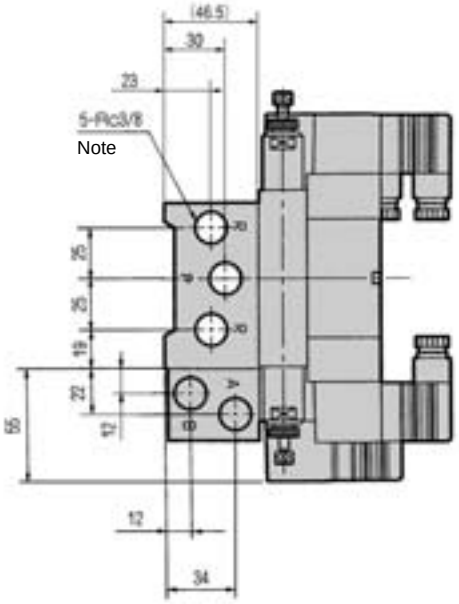
Repair parts list

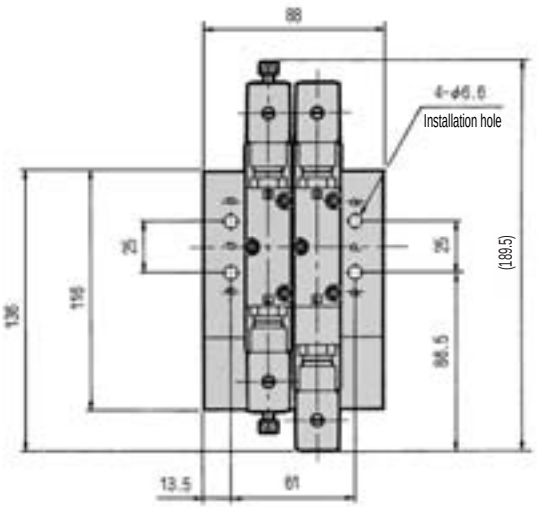
Repair parts / Series	Solenoid valve: High speed solenoid valve	Solenoid valve: Decelerating solenoid valve	Relief valve	Relief valve: Spacer relief valve Note 2	Relief valve: Maintenance kit Note 1
SKH-3	**4KB339-00-LS-** 200 VAC / 100 VAC / 24 VDC	**4KB3*9-00-LS-** 200 VAC / 100 VAC / 24 VDC	Note 3 Single deceleration	**SKH-3S-SR** / **SKH-3S-SR-A**	**SKH-3S-SRK**
			Both sides deceleration	**SKH-3-SR**	**SKH-3-SRK**
SKH-4 / **SKH-5**	**4KB439-00-LS-** 200 VAC / 100 VAC / 24 VDC	**4KB4*9-00-LS-** 200 VAC / 100 VAC / 24 VDC	Note 3 Single deceleration	**SKH-4S-SR** / **SKH-4S-SR-A**	**SKH-4S-SRK**
			Both sides deceleration	**SKH-4-SR**	**SKH-4-SRK**

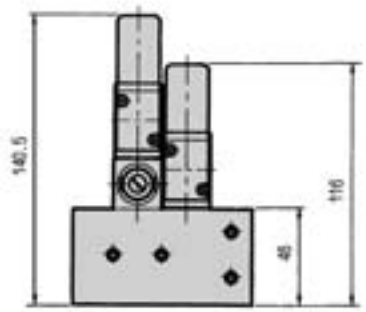
Note 1: Maintenance kit is ❷+❸+❹+❺+❻+❼.
Note 2: Spacer relief valve is ❶+❷+❸+❹+❺+❻+❼+❽+❾+ accessories.
Note 3: Spacer relief valve for single deceleration on the upper row is used for SKH-$\frac{3}{4}$ 18 (connected to B port), while one on the lower low is used for SHK-$\frac{3}{4}$ 18-A (connected to A port).

Dimensions CAD

SKH-320

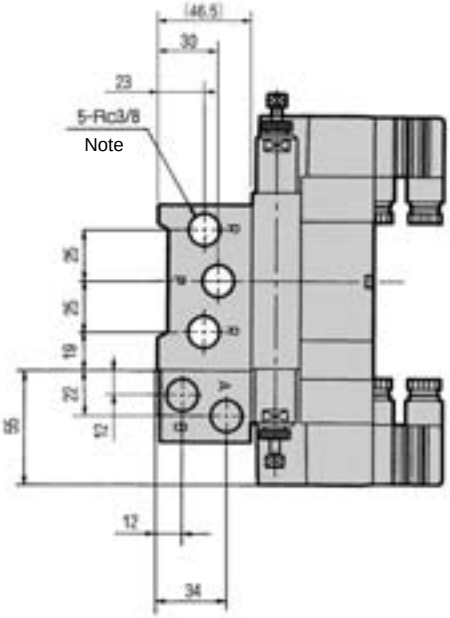


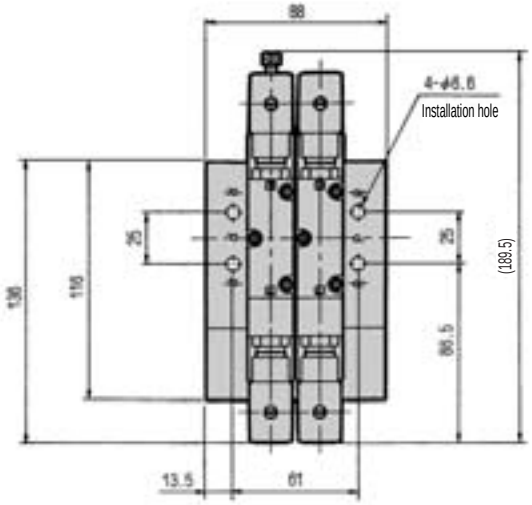


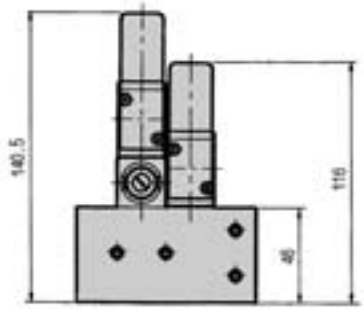


Note) For Port P/R, ports are provided at the opposite side, while for Port A/B, ports are only provided on this side.

SKH-3$^{3}_{5}$0



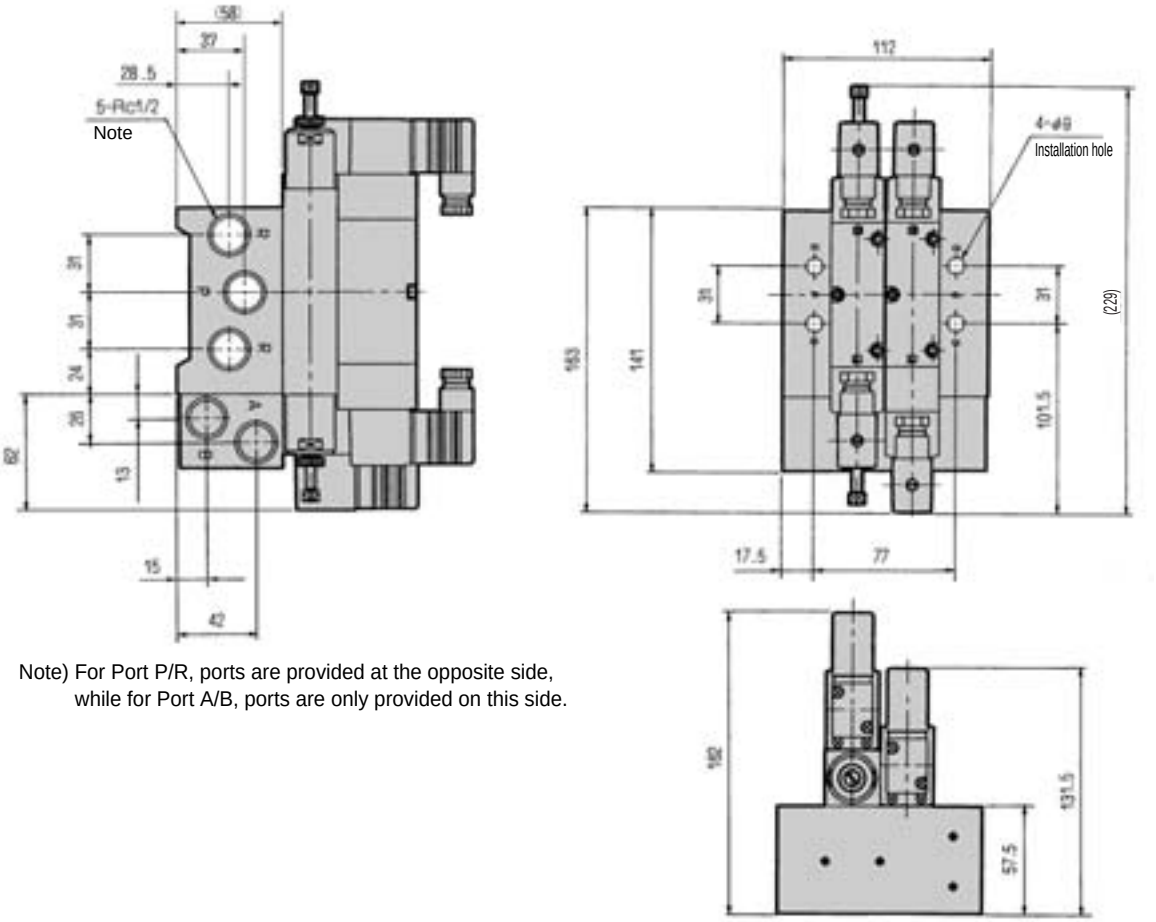




Note) For Port P/R, ports are provided at the opposite side, while for Port A/B, ports are only provided on this side.

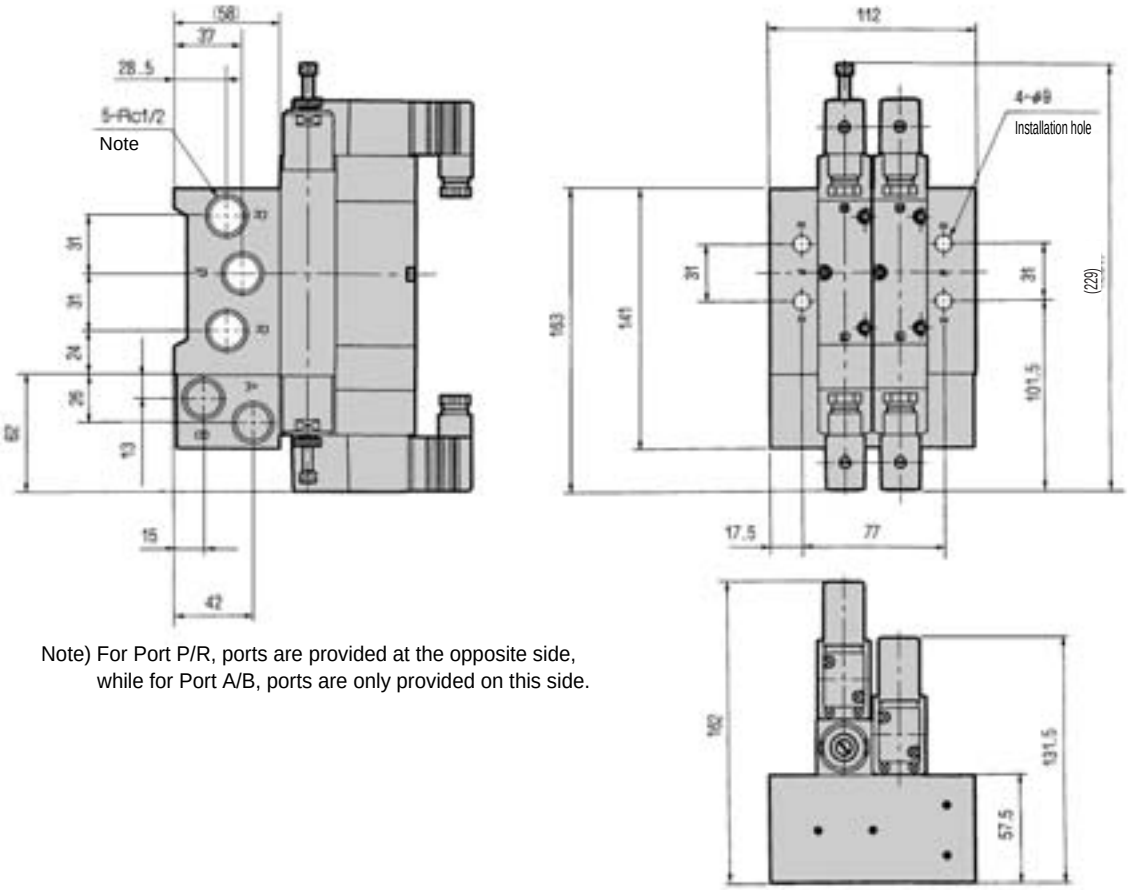
Dimensions CAD

SKH-420



Note) For Port P/R, ports are provided at the opposite side, while for Port A/B, ports are only provided on this side.

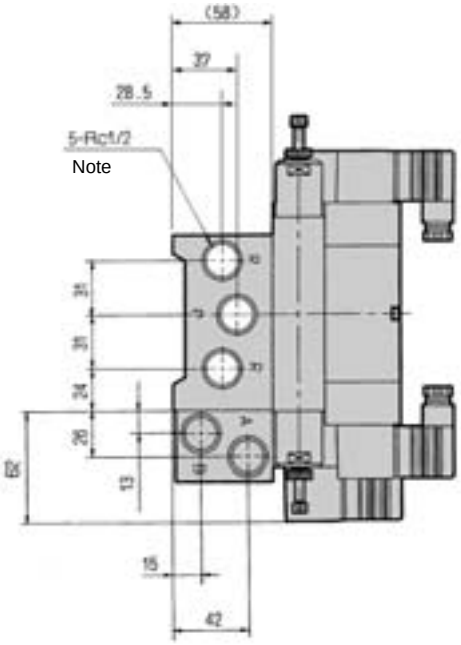
SKH-4$^{3}_{5}$0

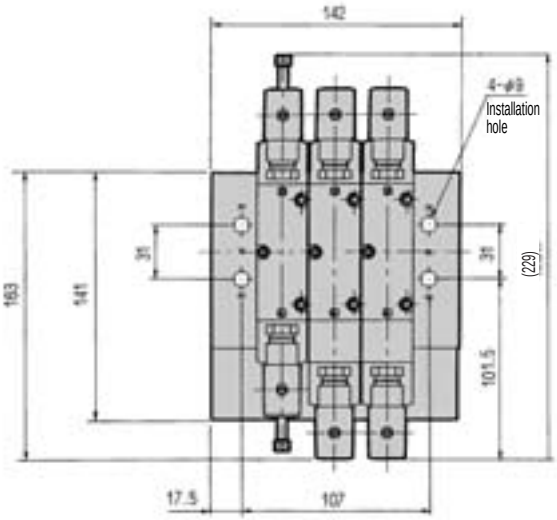


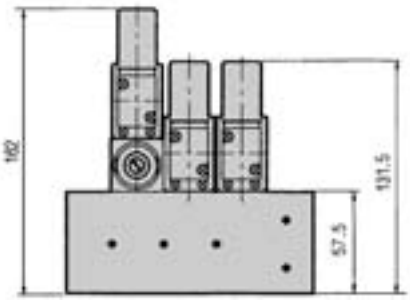
Note) For Port P/R, ports are provided at the opposite side, while for Port A/B, ports are only provided on this side.

Dimensions CAD

SKH-520

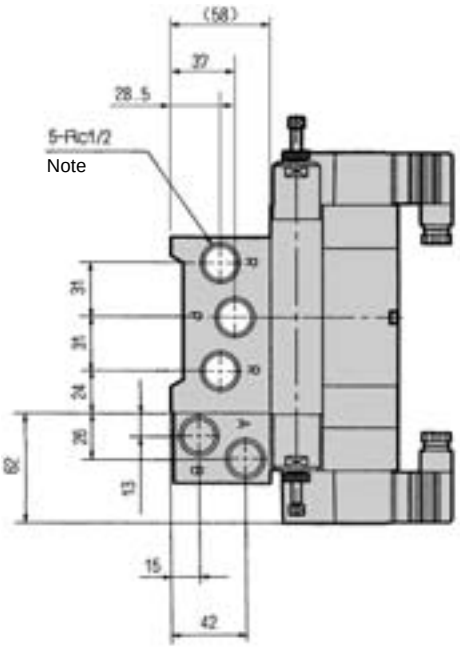


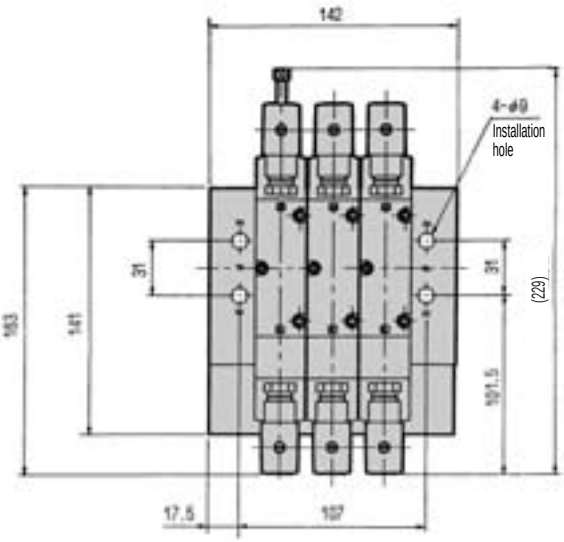


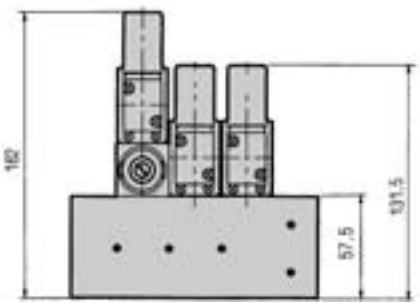


Note) For Port P/R, ports are provided at the opposite side, while for Port A/B, ports are only provided on this side.

SKH-5$\frac{3}{5}$0



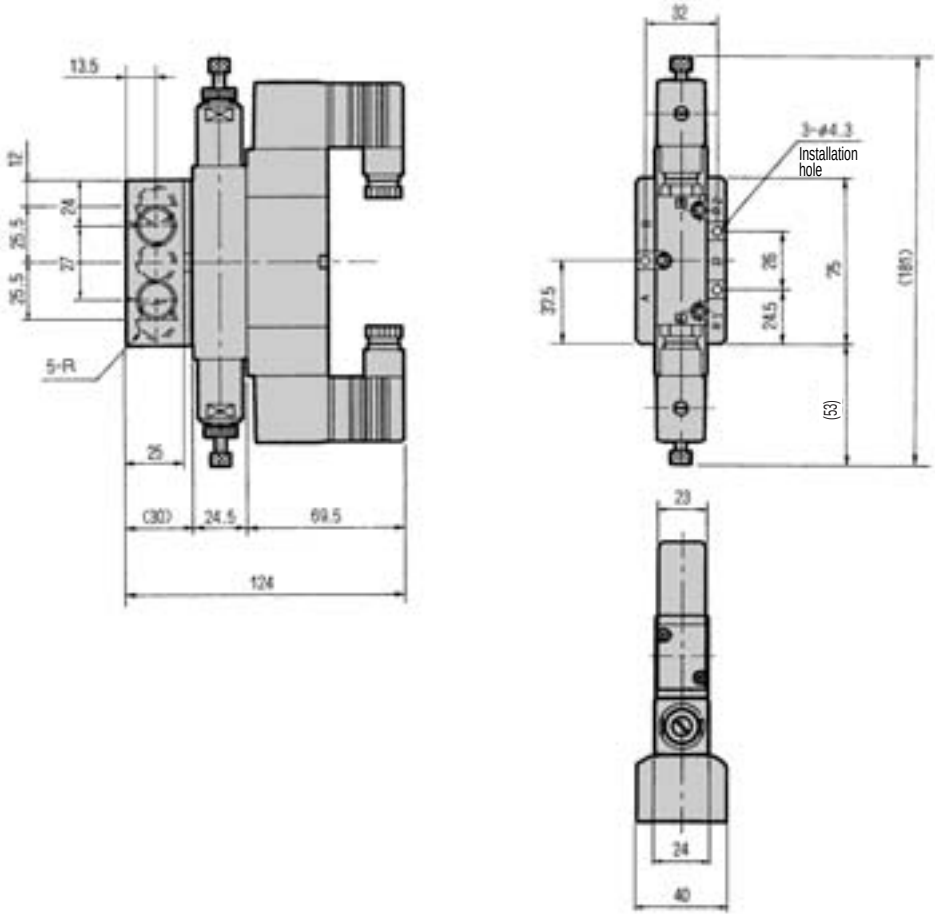




Note) For Port P/R, ports are provided at the opposite side, while for Port A/B, ports are only provided on this side.

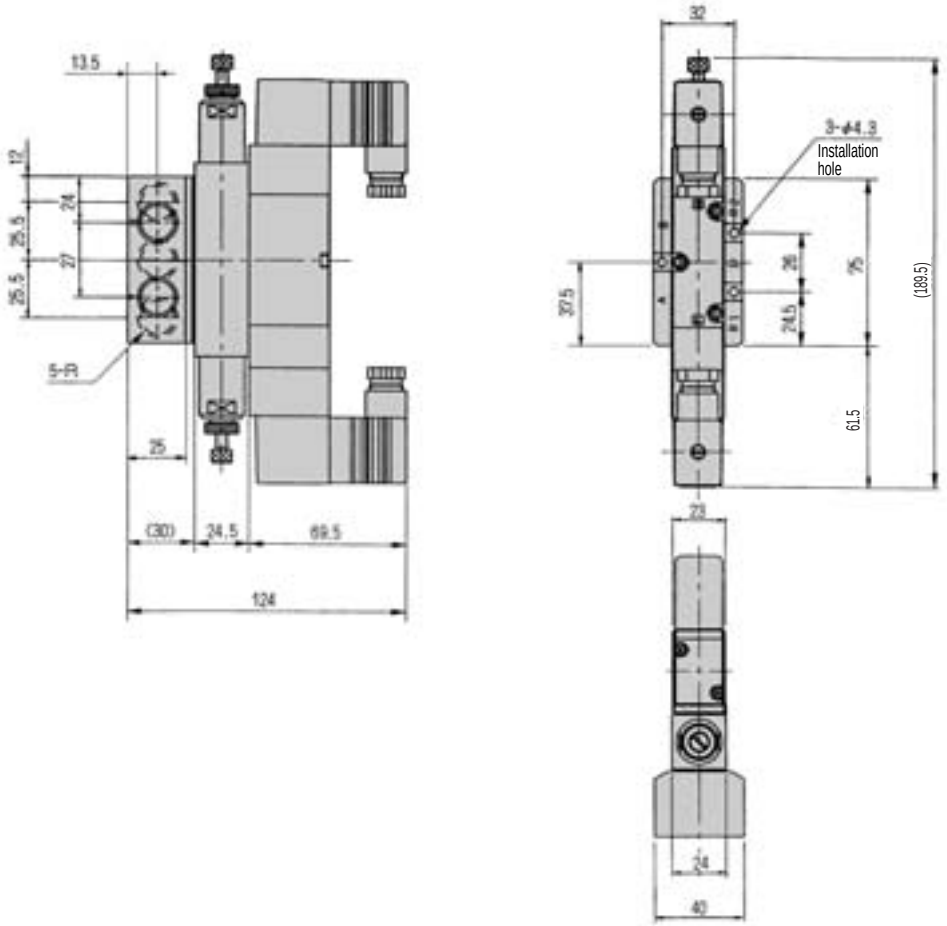
Dimensions CAD

SKH-328



Model no.	R
SKH-328-08	Rc1/4
SKH-328-10	Rc3/8

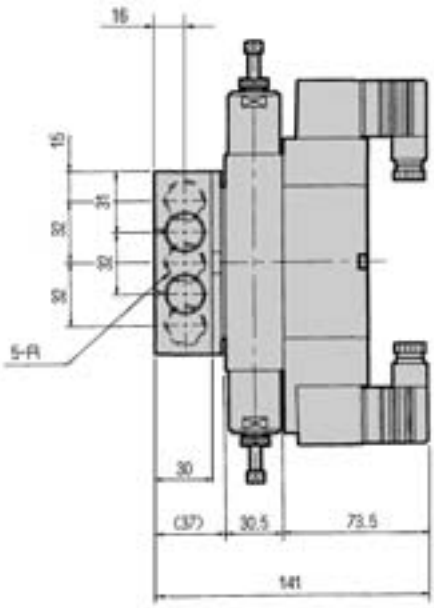
SKH-3$\frac{3}{5}$8

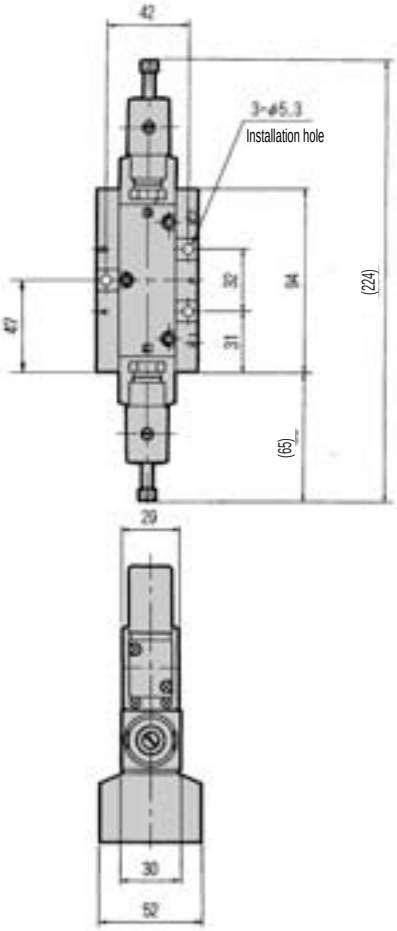


Model no.	R
SKH-3$\frac{3}{5}$8-08	Rc1/4
SKH-3$\frac{3}{5}$8-10	Rc3/8

Dimensions CAD

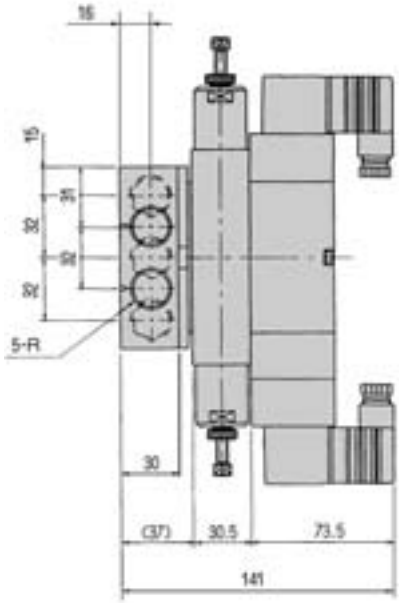
SKH-428

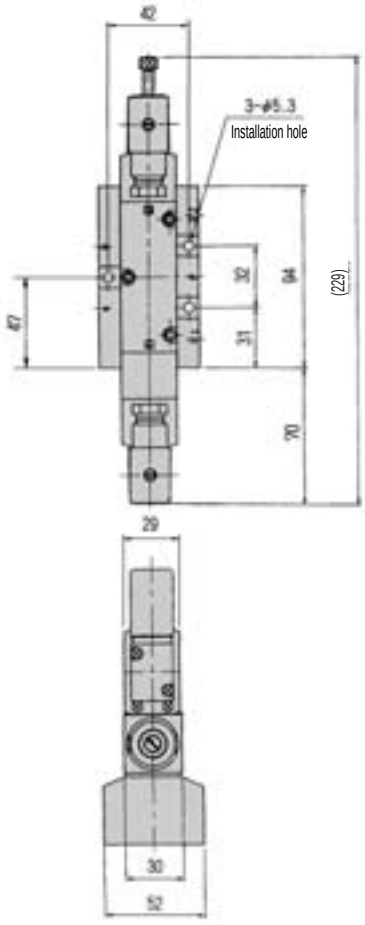




Model no.	R
SKH-428-10	Rc3/8
SKH-428-15	Rc1/2

SKH-4$\frac{3}{5}$8



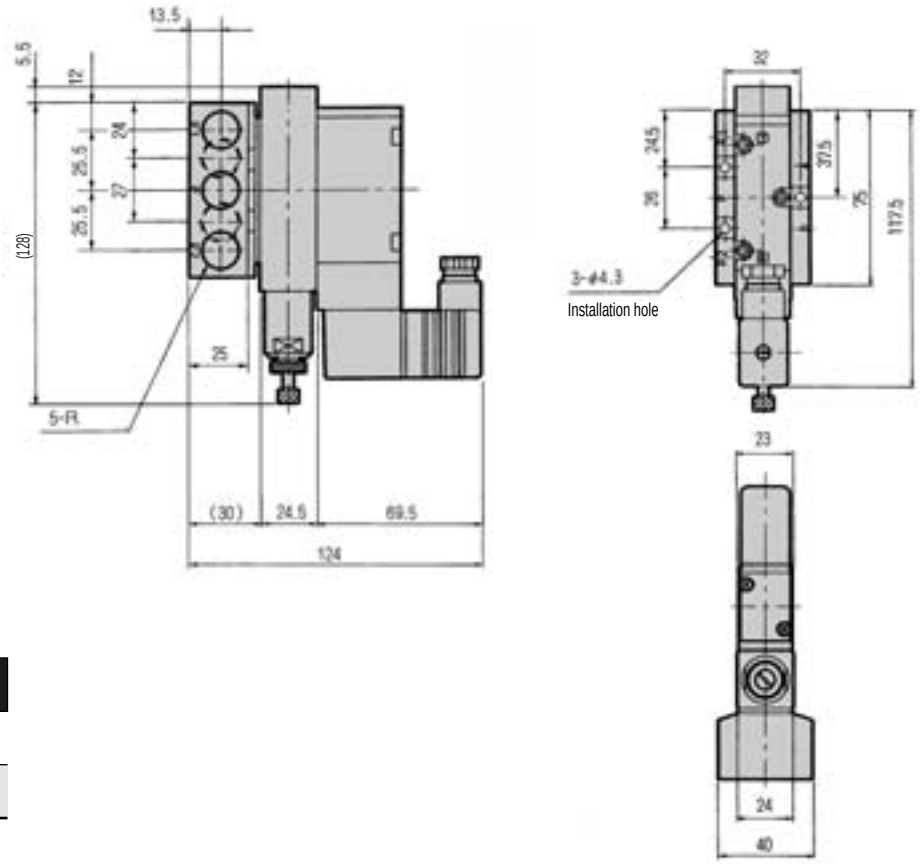


Model no.	R
SKH-4$\frac{3}{5}$8-10	Rc3/8
SKH-4$\frac{3}{5}$8-15	Rc1/2

Dimensions

SKH-318

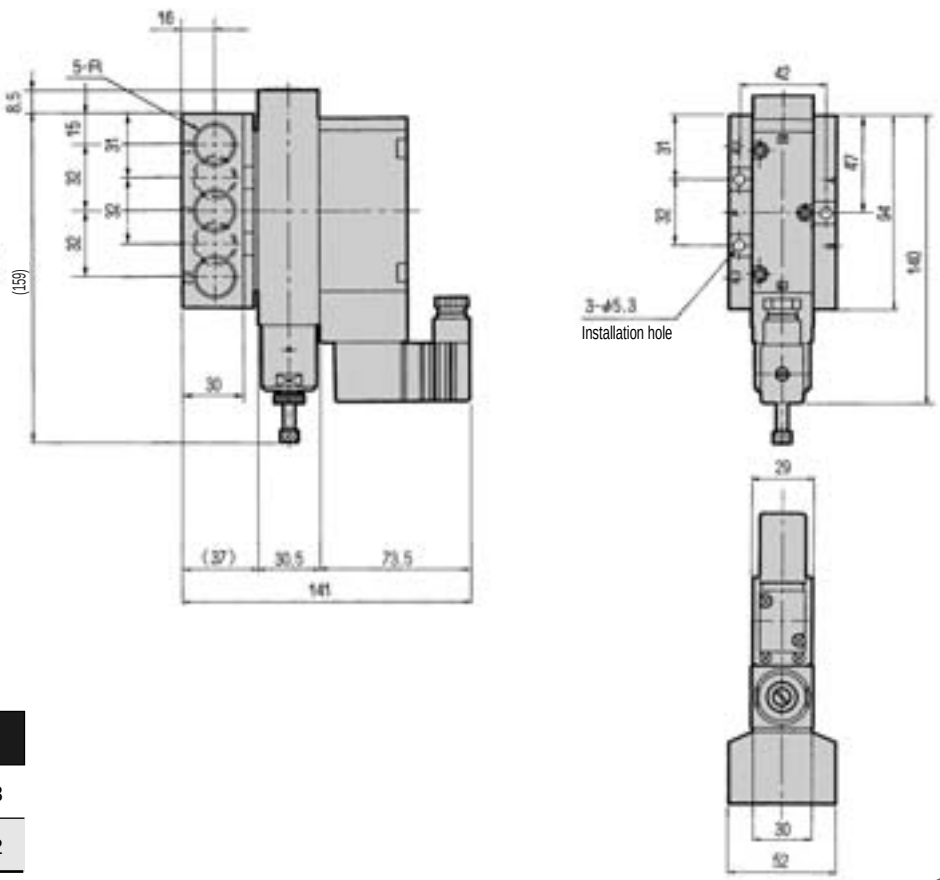
(Relief valve connected to B port)



Model no.	R
SKH-318-08	Rc1/4
SKH-318-10	Rc3/8

SKH-418

(Relief valve connected to B port)

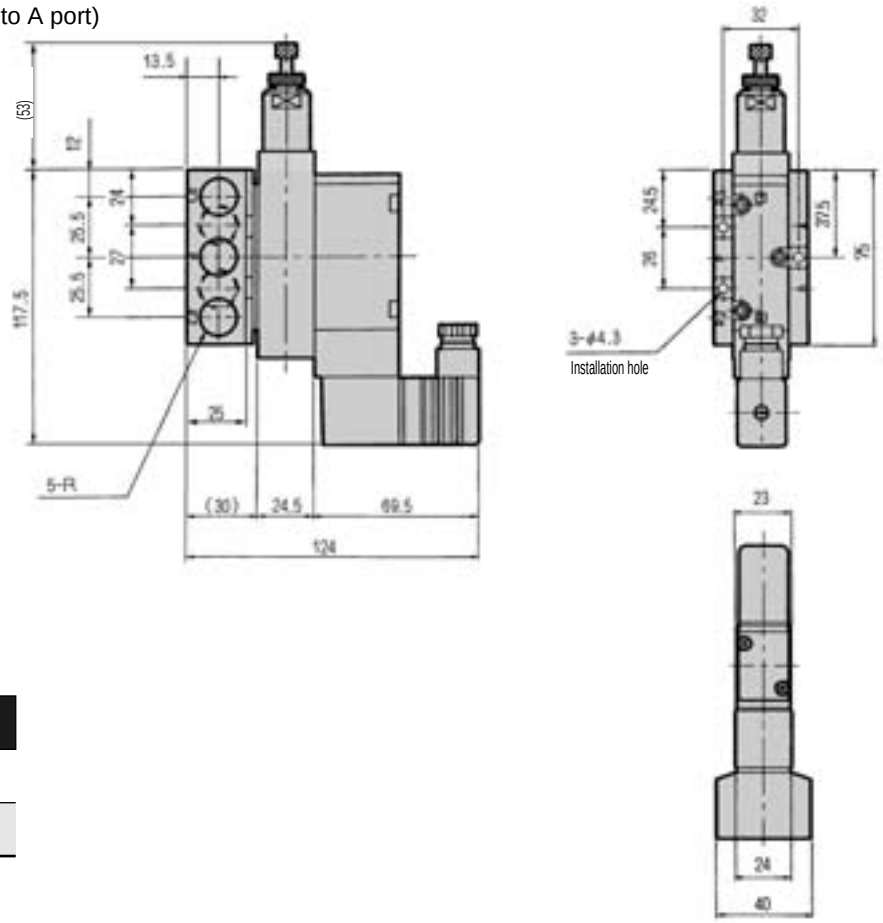


Model no.	R
SKH-418-10	Rc3/8
SKH-418-15	Rc1/2

Dimensions CAD

SKH-318-A

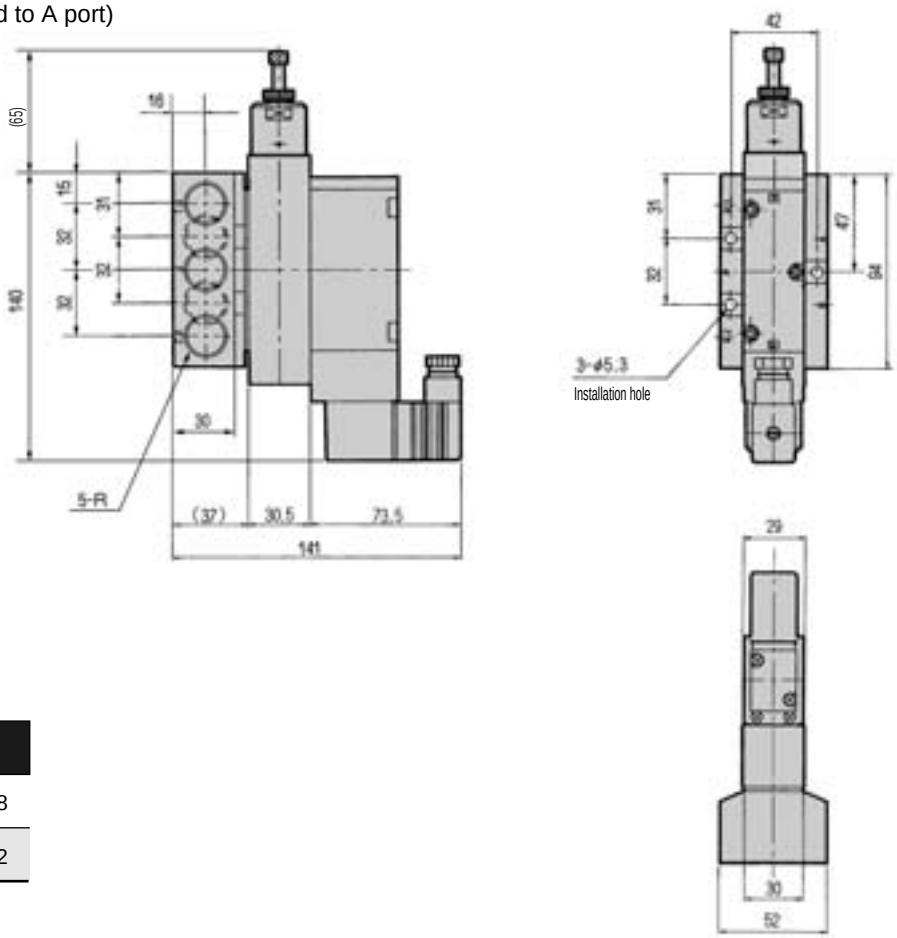
(Relief valve connected to A port)



Model no.	R
SKH-318-08	Rc1/4
SKH-318-10	Rc3/8

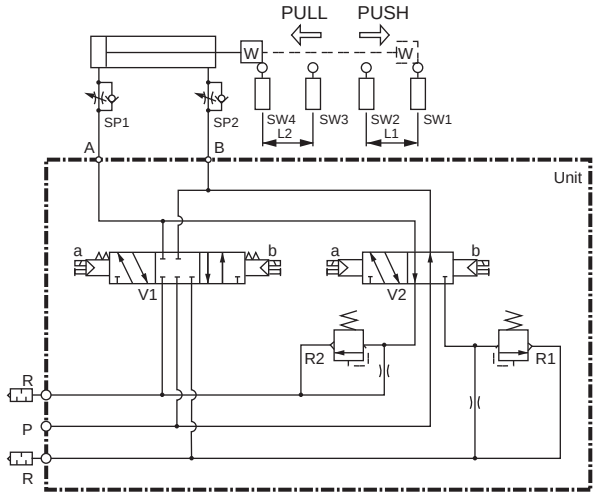
SKH-418-A

(Relief valve connected to A port)

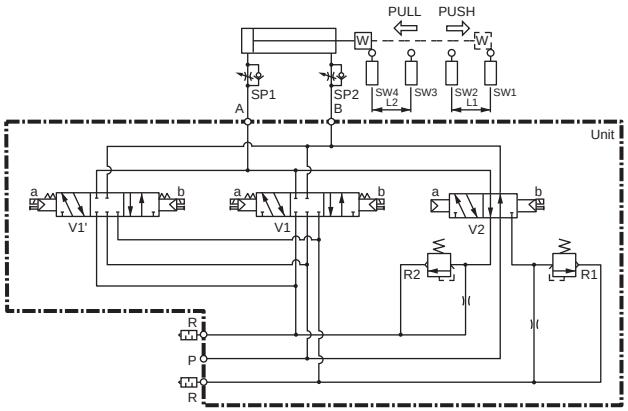


Model no.	R
SKH-418-10	Rc3/8
SKH-418-15	Rc1/2

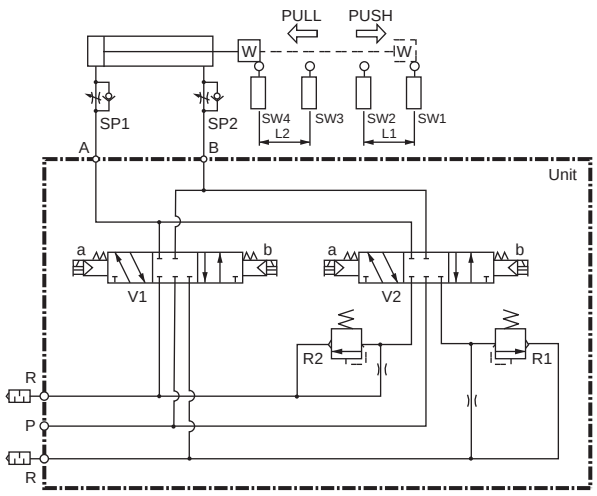
(SKH-320/420)



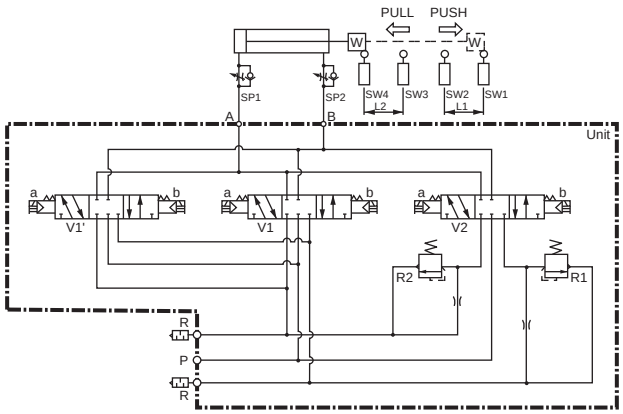
(SKH-520)



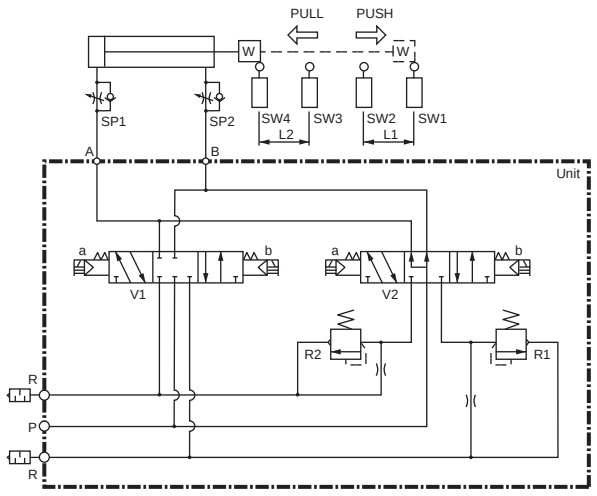
(SKH-330/430)



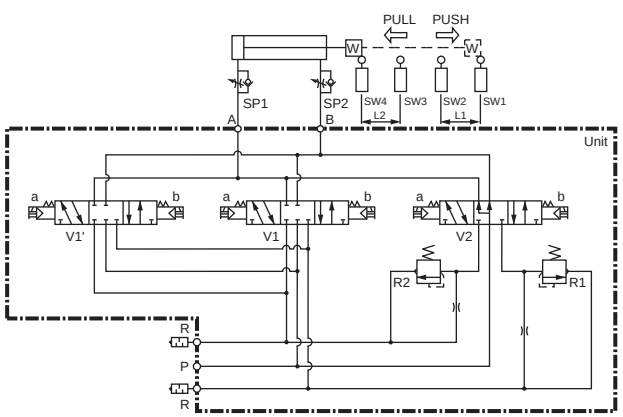
(SKH-530)



(SKH-350/450)

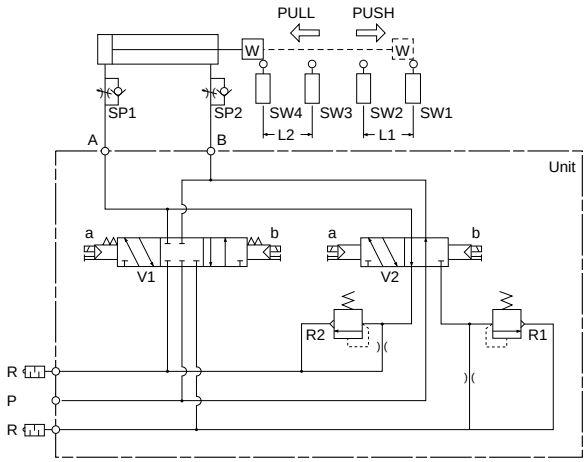
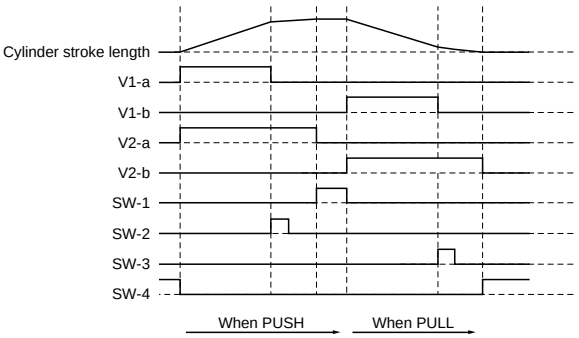
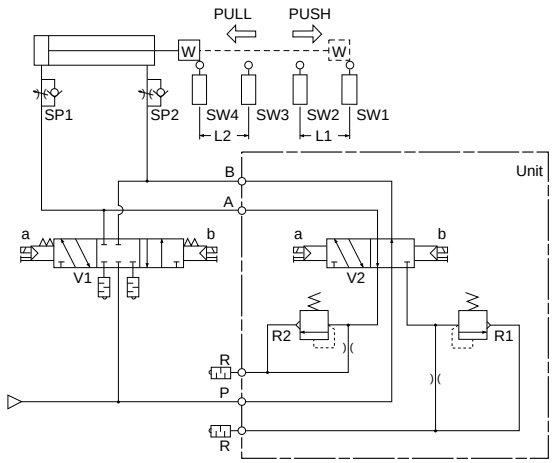
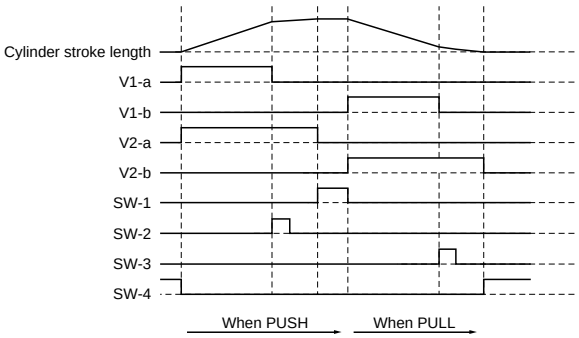


(SKH-550)



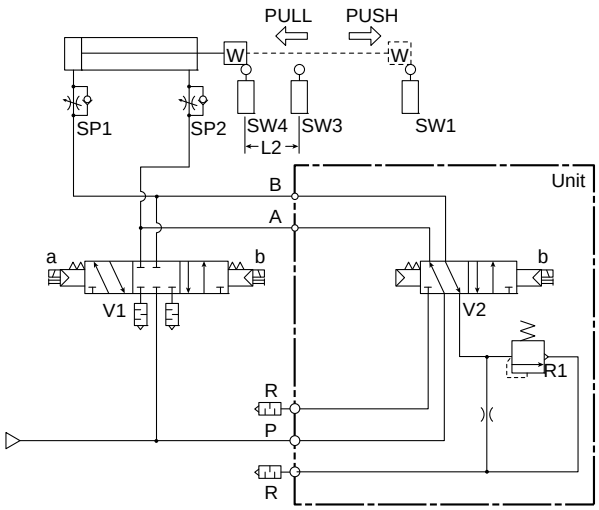
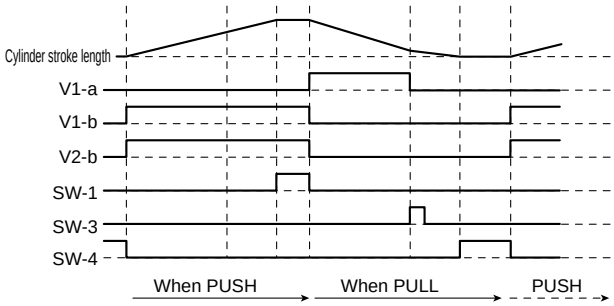
Example of porting and time chart

· Control sequence circuit should be provided according to the following time chart.

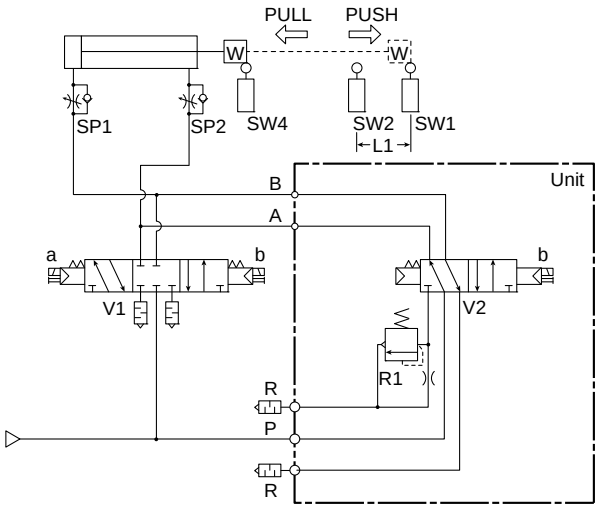
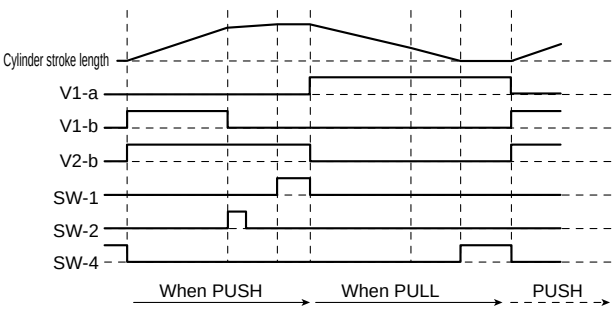
	Example of porting	Time chart
SKH-$^{3}_{4}$20		
SKH-$^{3}_{4}$28		

Example of porting and time chart

· Control sequence circuit should be provided according to the following time chart.

	Example of porting	Time chart
SKH-$^{3}_{4}$18		

Note: · This relief valve is connected to B port.
· In this circuit, relief valve can be used at Pull status.

	Example of porting	Time chart
SKH-$^{3}_{4}$18		

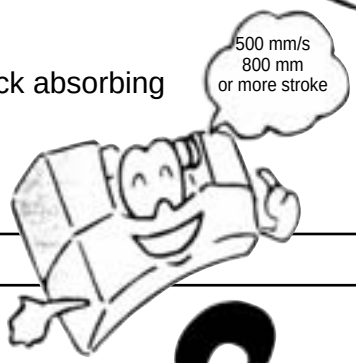
Note: · This relief valve is connected to A port.
· In this circuit, relief valve can be used at Push status.

Q&A

SKH shock absorbing valve Q&A

Q1

When is the SKH shock absorbing valve effective?

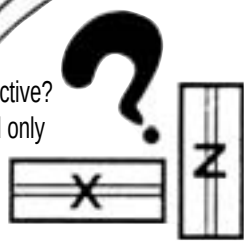


A1

This valve is effective when cylinder movement is 500 mm/s over and the stroke is 800 mm over. This valve is used to decelerate to remove shock at the end.

Q2

When is the SKH shock absorbing valve effective? Can the SKH shock absorbing valve be used only for a cylinder installed on the X axis (horizontally)?



A2

No. This valve is also used with cylinders installed on the Z axis (vertically). (Install a reverse regulator to balance top and bottom.)

Q3

Can the SKH shock absorbing valve be used together with a cylinder with a brake?

A3

Yes. Dispersion in brake stopping accuracy is reduced by installing the SKH shock absorbing valve.

Q4

Are there any cases when the SKH shock absorbing valve cannot be used?

A4

Yes. Pressure is controlled using the relief valve. The exhaust pressure will not rise under the following conditions, so the valve cannot be used:

(1) When cylinder movement speed is less than 500 mm/s.
(2) When the cylinder stroke is less than 800 mm, and the deceleration distance is less than 350 mm.
(3) When the cylinder bore size is less than ø25.
(4) When air pressure is not within 0.3 MPa to 0.7 MPa.

Q5
Must a valve switchover timing sensor be installed on the cylinder when using the SKH shock absorbing valve?

A5
Valve switchover must be timed, and timing changes with a soft timer, etc., in the control sequence circuit instead of the external sensor.
(Use a memory type cylinder switch when using a cylinder sensor.)

Q6
Where should the SKH shock absorbing valve be installed?

A6
The shock absorbing effect is most effective when the distance between the cylinder port and shock absorbing valve is as short as possible.

Q7
Can the SKH shock absorbing valve be used in an adverse environment where it could be subject to water drops, cutting chips, or powder dust, etc.?

A7
Basically, the valve should be covered with a protective cover.
A master type is available in addition to the solenoid valve type.
Contact CKD for details.

Q8
Is the end absorber required even when using the SKH shock absorbing valve?

A8
If a cylinder stroke distance sufficient for deceleration is secured, the absorber is not required.
Installation of the absorber poses no problem.

Q9
Is it difficult to adjust the SKH shock absorbing valve?

A9
Follow adjustment procedures in the Instruction Manual.

Q10
Is it easy to maintenance and inspect the SKH shock absorbing valve?

A10
Refer to the relief valve structural drawing. The simple structure enables easy disassembly and inspections.
A relief valve kit for maintenance is also available.