



# Operation Manual

PRODUCT NAME

*LOCK UP VALVE 3-PORTS*

MODEL/ Series

IL220-02 \* -L

**SMC Corporation**

## Table of Contents

Instructions for your Safety	1~2
1. Summary	3
2. Specification	3
3. Operation Principle	3~4
4. Transportation and Storage	5
5. Mounting and Piping	5
6. Precautions in Using	6
7. Maintenance	7
8. Example Application	8
9. Troubleshooting	9
10. Spare Parts List	9
11. Drawing	10~11



# 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.

\*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 10218-1992: Manipulating industrial robots -Safety.

etc.



## 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.

## 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 catalog 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 catalog.

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.



# Safety Instructions

## Caution

**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.

## 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 catalog 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 regulation 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.

## 1. Summary

Lock up valve is used for switching pneumatic circuit of air source and operation part when an accident of air source and piping in pneumatic process control causes abnormal supplied air, and air pressure lowers below setting pressure.

## 2. Specification

Signal pressure	Max. 1MPa (Note 1)
Setting pressure range	0.14~0.7MPa (Note 1)
Line pressure	Max. 0.7MPa
Effective orifice (Cv factor)	20mm <sup>2</sup> (1.1)
Ambient and fluid temperature	-30~60°C
Port size	Rc 1/4
Differential	0.01 MPa
Mass	700g



### Caution

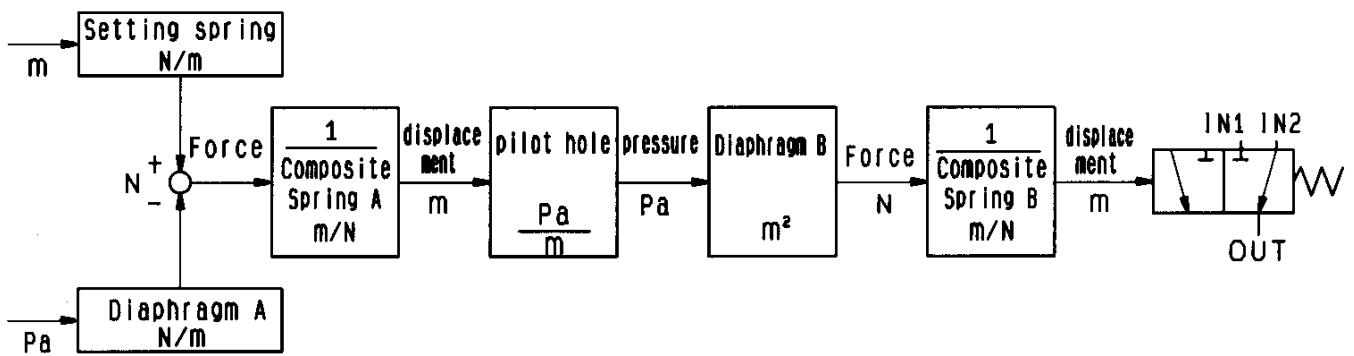
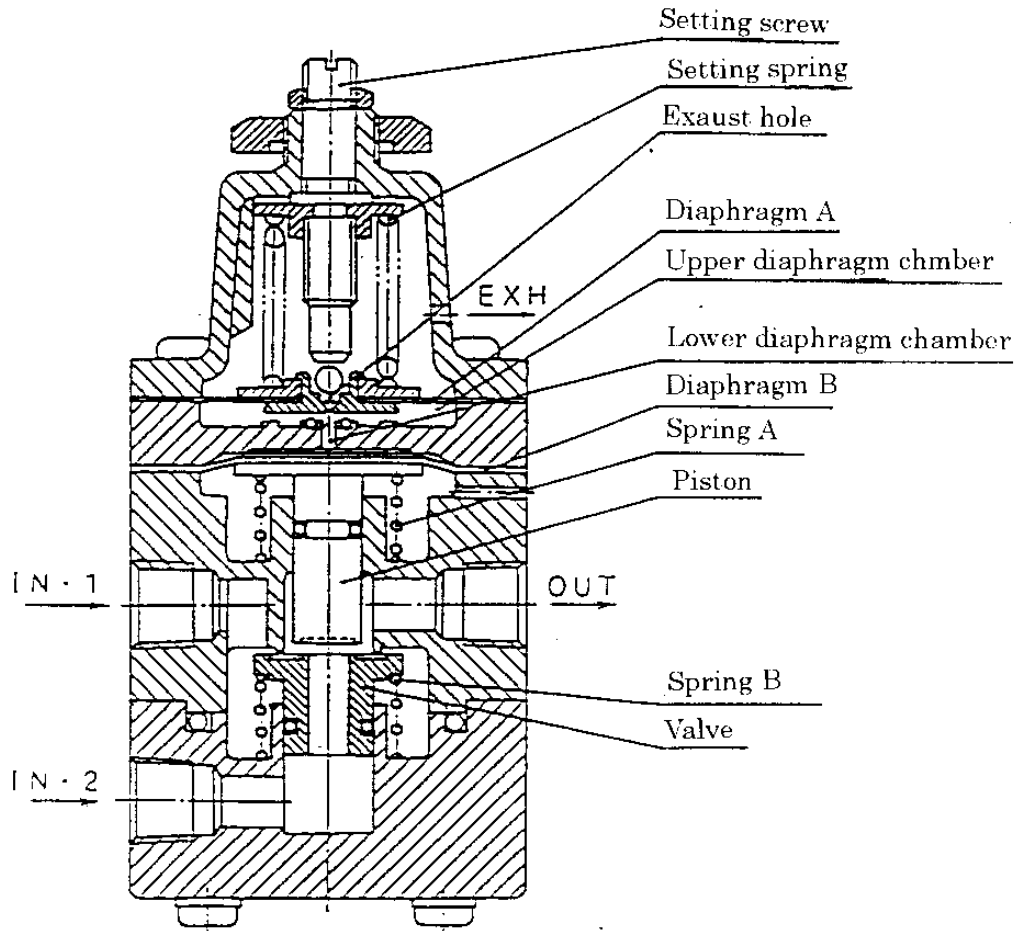
(Note 1) Signal pressure and the set pressure must be different for more than 0.1 MPa. Inadequate differential pressure may increase the bleed amount from the bleed hole because of the wearing of internal part. This may effect on the performance.

## 3. Operating principles

When signal pressure entering the upper diaphragm chamber is larger than the force by pressing adjusting spring, the diaphragm A moves upward, the exhaust valve is closed, signal pressure enters the lower diaphragm camber, the diaphragm B is affected, the valve is opened against the spring, and the flow can go from IN1 to OUT.

When signal pressure is lower than the setting pressure, the diaphragm is pushed down and the pressure of lower pressure diaphragm is exhausted from the exhaust valve. Therefore spring A pushes up the piston, and the valve shuts the air circuit being open by the force of spring B. This realizes the air passage from IN2 to OUT.

Pressure is adjusted by the screw.



Block diaphragm

## 4. Transportation and Storage



### Warning

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- (1) Handle the product with care.
- (2) Do not expose to rain.
- (3) The product is packed in a vinyl bag for shipment to prevent from dust. Avoid taking out of the bag just before piping even after unpacking.
- (4) If the product is kept unpacking for a certain period, select a place where there is no moisture nor corrosive gas.  
While the product shipped has been applied specified paint and surface treatment, take care that inappropriate storing environment may cause generating rust.

## 5. Mounting and Piping



### Warning

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#### Precaution for mounting

- (1) Ensure to use a filter for IN line (IN) and signal pressure line (SIG).
- (2) Connect the lock-up valve after flushing piping used.
- (3) The setting pressure increases when the setting screw is turned clockwise and it decreases when the screw is turned counterclockwise.
- (4) Fix by the lock nut when the setting pressure is settled.
- (5) Connect piping not to leak air from piping joints.

#### Precaution for piping

Thoroughly flush piping to prevent entering foreign matter such as chips, cutting oil and dust before connecting piping.

## 6. Precautions in using



### Warning

### Operation

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- (1) Do not operate the lock-up valve out of the specifications, because it causes malfunction.
- (2) If lock-up valve failure affecting the system is expected, provide a safety circuit for the system to avoid danger.
- (3) When supplying air pressure fails and it decreases lower than the setting pressure, air source and operating part are shut down, but since the pressure decrease gradually, check line pressure (movement of actuator) constantly.



### Warning

### Handling

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- (1) Excess vibration and impact on the lock-up valve cause failure, that take care handling during transportation and operation.
- (2) If the product is left the site for long time, take measures such as closing a cover and plugging piping ports to avoid direct instruction of rain.  
If the case of high temperature and high humidity atmosphere, take measures not to form dews in the internal machines. Especially for packing for export, thoroughly take countermeasures for dew formation.



### Warning

### Air supply

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- (1) Supply clean compressed air whose moisture and dust are removed since there is capillary tubing in the lock-up valve inside. Avoid using a lubricator.
- (2) Avoid using compressed air compressed air containing chemicals, synthetic fluid including organic solvent, salinity, and corrosive gas as it may cause malfunction.



### Warning

### Environment

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- (1) Do not use in environment where the product is exposed to corrosive gas, chemicals, salt water, water or steam.
- (2) Do not operate the product in a location where it is subject to strong vibration and/or shock. For vibration, it should be within 1G 60Hz.



## 7. Maintenance



### Warning

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- (1) If handled improperly, compressed air can be dangerous. Maintenance and replacement of unit parts should be performed only by trained and experienced personnel for instrumentation equipment as well as following the product specifications.
- (2) For maintenance, removing lock-up valve or replacing unit parts without dismounting, stop supply pressure and exhaust residual pressure beforehand.
- (3) After installation, repair and disassembling, connect compressed air and perform a proper function test and a leak test. If bleed noise is louder than the initial state or operation is abnormal, stop operation and check if installation is proper or not.

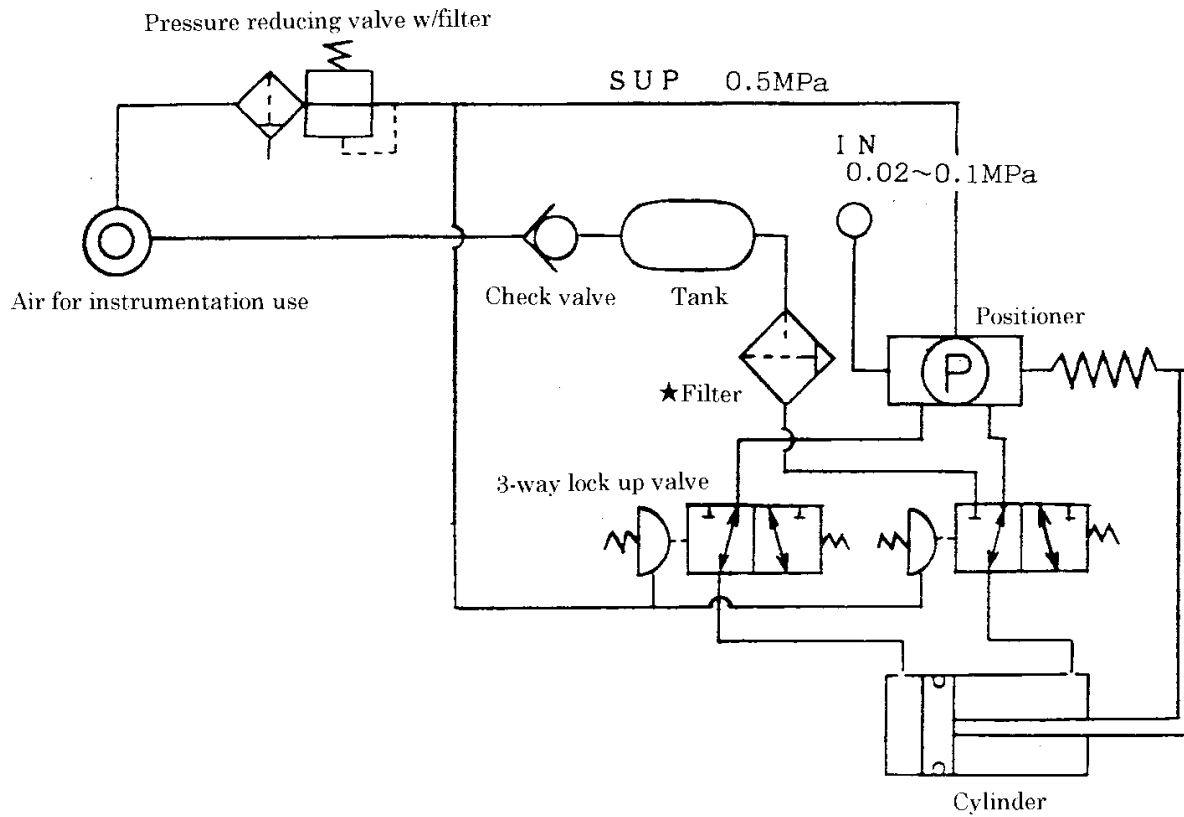


### Caution

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- (1) Check air leak from piping which compressed air flows. Air leak from air piping could deteriorate characteristics.  
Air is exhausted from the bleed port constantly, and this air consumption is essential due to valve structure, so that it is not a problem if the range is within the specification.  
Small amount of air leaks from diaphragm (cloth between rubber sheets of diaphragm) and its seating part, but it is within the tolerance.
- (2) Check if supply air is clean or not. If dust, particle, oil, and moisture contained in supply air are entered in the device, it may cause malfunction or failure of lock-up valve, so that regularly examine air preparation equipment.
- (3) When a lock-up valve is disassembled, apply small amount of grease to sliding sections ("O" ring).  
Use grease of Toray Silicon SH45 Silicon Grease.
- (4) Examine lock-up valve once a year. Replace deteriorated packing parts such as diaphragms and "O" rings, and units during maintenance.  
Especially, when the product is operated in severe environment and operating conditions such as the coast, take measures early.
- (5) The interval of 3 years is recommended to change diaphragm, "O" ring and spring.
- (6) Refer to the spare parts list as for parts for replacement.
- (7) Assembling / disassembling of the product should be performed indoors in accordance with the assembling / disassembling drawing.
- (8) 1~2 times of operation test is necessary if the product is not operated for a long period

## 8. Example Application



A filter is used to remove dust in air.

Note : Above diaphragm shows the situation when the supply pressure is higher than the setting pressure.

## 9. Troubleshooting



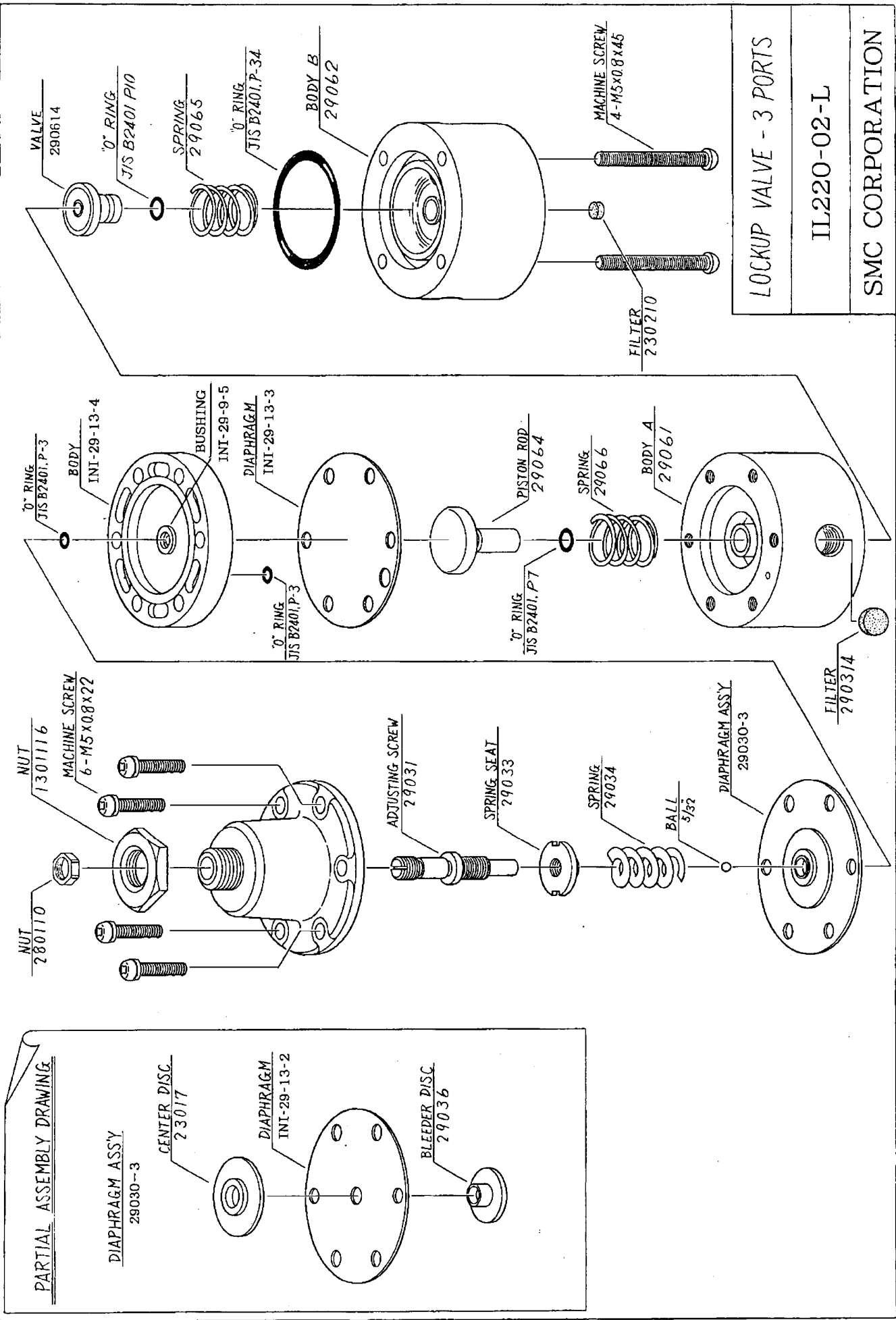
### Warning

Stop using the product if failures are not improved.

Failures	Causes	Countermeasures
Excess flow from exhaust port	Dust and carbon adhere to seating part of exhaust port of diaphragm Ass'y.	Disassembling cleaning (Change diaphragm Ass'y if there is a flaw on seating part of exhaust port.)
	Breakage of diaphragm Ass'y.	Replace diaphragm Ass'y.
Air is not exhausted from exhaust port	Exhaust port of diaphragm Ass'y is closed.	Disassembling cleaning (Change diaphragm Ass'y if there is a flaw.)
Reducing the set pressure less than the signal pressure, doesn't switch the air circuit.	Exhaust port of diaphragm Ass'y is closed.	Disassembling cleaning (Change diaphragm Ass'y if there is a flaw.)
Raising the set pressure higher than the signal pressure doesn't switch the air circuit.	Filter for signal pressure is clogged up.	Replace filter.
	Diaphragm Ass'y is broken.	Change diaphragm Ass'y.
IN1 and IN2 allow air simultaneously.	Dust or carbon is adhered to rubber sheet of valve.	Disassembling cleaning (Change rubber sheet of valve if there is a flaw.)

## 10. Spare Parts List

Part number	Part name	Material	Quantity
29030-3	Diaphragm Ass'y	Si	1
INI-29-13-3	Diaphragm	Si	1
290614#1	Valve	Si	1
JIS B 2401, P3	"O" ring	11-7070	2
JIS B 2401, P7	"O" ring	11-7070	1
JIS B 2401, P10	"O" ring	11-7070	1
JIS B 2401, P34	"O" ring	11-7070	1



LOCKUP VALVE - 3 PORTS

IL220-02-L

SMC CORPORATION

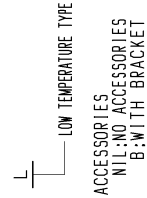
A T-IL220-23



1-20-02271 (A) DN 50

MODEL IDENTIFICATION NUMBERING

1 L 2 2 0 - 0 2



SPECIFICATIONS

SETTING PRESSURE RANGE : 0.14~0.7MPa

LINE PRESSURE : 0.7MPa

DIFFERENTIAL : WITHIN 0.01MPa

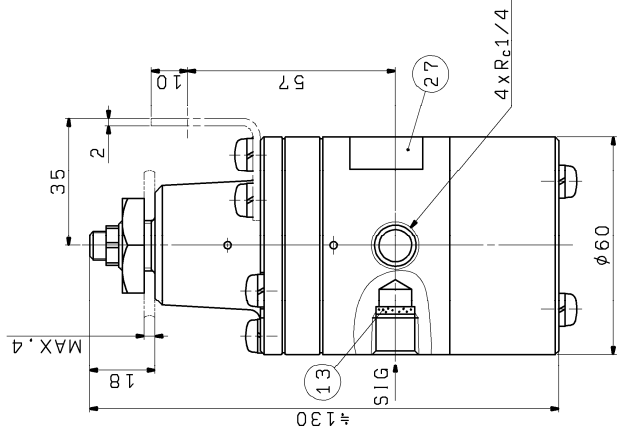
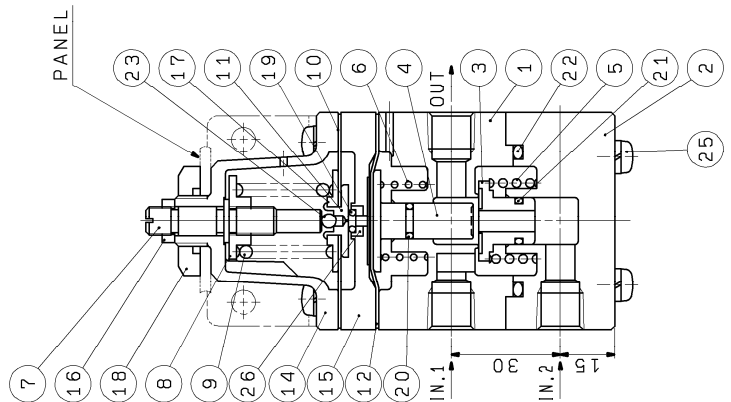
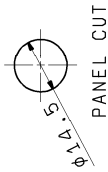
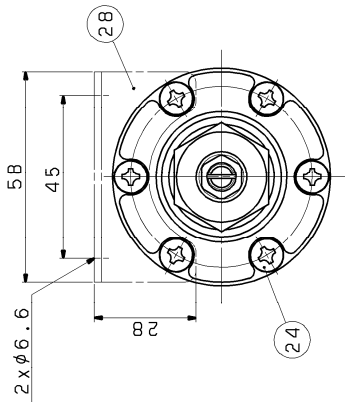
OPERATING TEMPERATURE : -30~60°C (DO NOT FREEZE)

ORIFICE : 2.0mm<sup>2</sup>

MASS : ?009 (745g; WITH BRACKET)

NOTE)

SIGNAL PRESSURE AND THE SET PRESSURE MUST BE DIFFERENT FOR MORE THAN 0.1MPa.



NOTE) THE PARTS MARKED "φ" ARE NOT USED FOR MODEL IL220-02\*.  
 NOTE2) ② THREE CROSS RECESSED HEAD SCREW WITH CAPTIVE WASHER CHANGE INTO M5x25 (AA00040) WITH THE BRACKET.

ITEM	PART NO	PART NAME	MATERIAL	QTY	REMARKS
28	230466	BRACKET	ROLLED STEEL PLATE	1	Zn-CHROMATED
27	290624	NAME PLATE	RESIN	1	
26	INI-29-9-5#1	BUSHING	ALUMINIUM ALLOY	1	CHROMATED
25	AA00181	WASHER WITH CAPTIVE WASHER	STAINLESS STEEL	4	M5x40
24	AA00039	WASHER WITH CAPTIVE WASHER	STAINLESS STEEL	6	M5x22
23	JA00049	STEEL BALL	STAINLESS STEEL	1	5/32" HARD
22	KA01400	ORING	NR(L)W NITRILE	1	P34
21	KA01190	ORING	NR(L)W NITRILE	1	P10
20	KA01192	ORING	NR(L)W NITRILE	1	P7
19	KA01396	ORING	ZINC ALLOY	2	P3
18	1301116	NUT	ALUMINIUM ALLOY	1	NI PLATED CHROMATED
17	23017	CENTER DISK	ALUMINIUM ALLOY	1	CHROMATED
16	280110	NUT	BRASS	1	NI PLATED
15	INI-29-13-4	BODY	ALUMINIUM ALLOY	1	SILVER FINISH
14	290322	BONNET	ALUMINIUM ALLOY	1	SILVER FINISH
13	290314	FILTER	BRONZE	1	70μm
12	INI-29-13-3	DIAPHRAGM	SILICONE RUBBER	1	
11	29036	BLEEER DISK	BRASS	1	
10	INI-29-13-2	DIAPHRAGM	SILICONE RUBBER	1	
9	29034	SPRING	PIANO WIRE	1	Zn-CHROMATED
8	29033	SPRING SEAT	BRASS	1	
7	29031	ADJUSTING SCREW	STAINLESS STEEL	1	
6	29066	PISTON SPRING	STAINLESS STEEL	1	
5	29065	VALVE SPRING	STAINLESS STEEL	1	
4	29064	PISTON ROD	BRASS	1	
3	290614#1	VALVE	BRASS	1	RUBBER LINING CP
2	29062	BODY B	ALUMINIUM ALLOY	1	SILVER FINISH
1	29061	BODY A	ALUMINIUM ALLOY	1	SILVER FINISH

REVISION	DATE	DESCRIPTION	DRWN	DATE	DESIGNED	CHECKED	APPROVED
0	8/20/09	1st DRW	0	8/20/09	0	0	0
1	8/20/09	REVISED	1	8/20/09	1	1	1
2	8/20/09	REVISED	2	8/20/09	2	2	2
3	8/20/09	REVISED	3	8/20/09	3	3	3

SCALE: FREE  
 DWG NAME: LOCKUP VALVE-3PORTS  
 DWG NO: IL220-02\*-L  
 REVISION: (A)  
 SMC Corporation  
 A2-V06

Revision history	
A	Format change and content review

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.

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