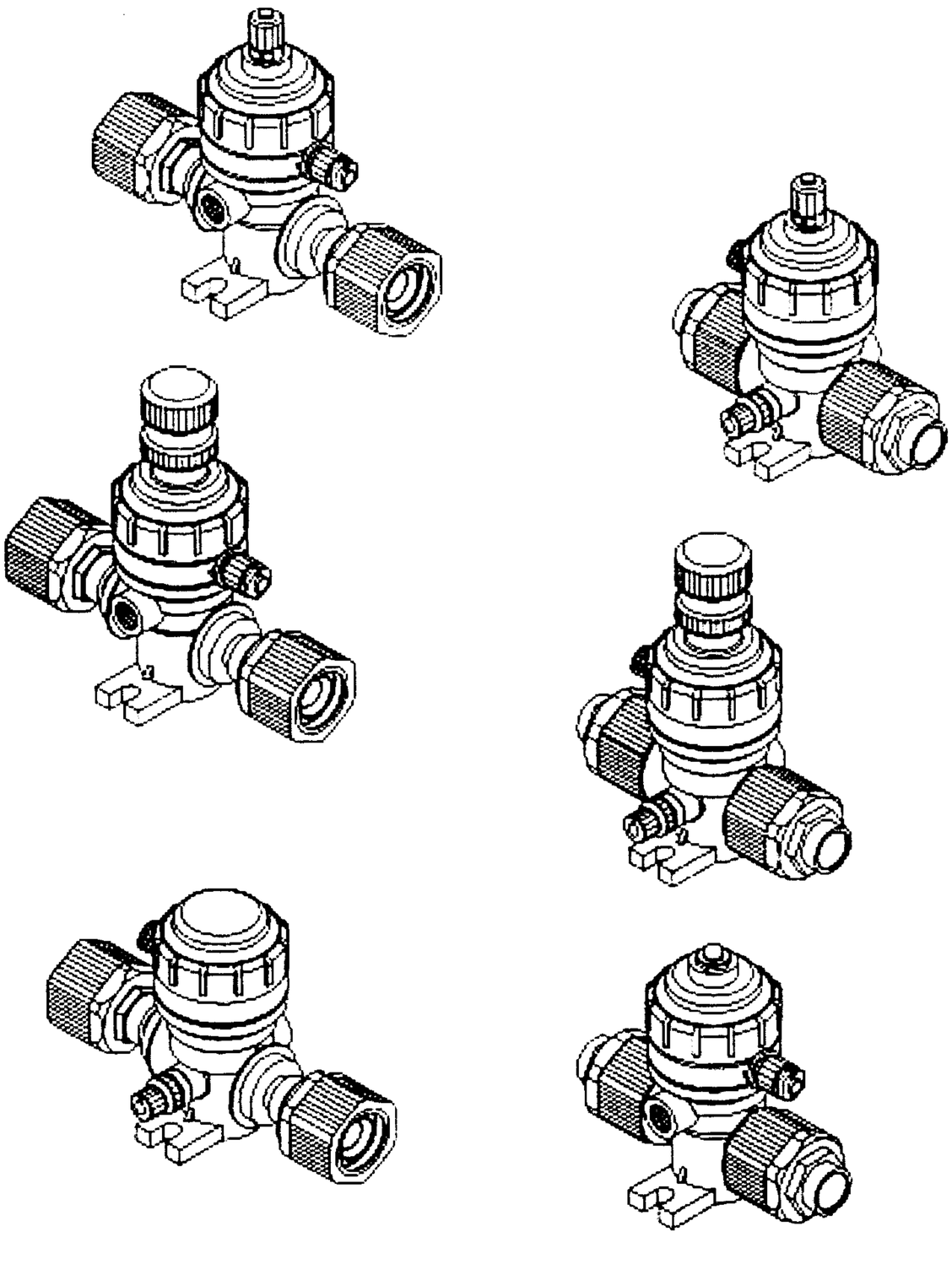
SMC

External non-metal type
Chemical air operate valve
LVQ Series
OPERATION MANUAL



REV	QTY	DESCRIPTION	PREPARED	REV No.

SMC Corporation

-INDEX-

LVQ Series
Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard by labeling "**Caution**", "**Warning**", and "**Danger**" . To ensure safety, be sure to observe ISO4414, JIS B8370 and other safety practices.

⚠ **Caution :** Operator error could result in injury or equipment damage.

⚠ **Warning :** Operator error could result in serious injury or loss of life.

⚠ **Danger :** In extreme conditions, there is a possibility of serious injury or loss of life.

※1)ISO 4414 :Pneumatic fluid power Recommendations for the application of equipment to transmission and control systems

※2)JIS B 8370:Pneumatic system axiom.

⚠Warning

1. **The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decide its specifications.**
   Since the product specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.
2. **Only trained personnel should operate pneumatically operated machinery and equipment.**
   Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.
3. **Do not service machinery/equipment or attempt to remove components until safety is confirmed.**
   1) Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked out control positions.
   2) When equipment is to be removed, confirm the safety process as mentioned above. Cut the pressure supply for the equipment and exhaust all residual compressed air in the system.
   3) Before machinery/equipment is re-started, take measures to prevent quick extensions of the cylinder piston rod etc.
4. **Be sure to comply with Standard and Law for safety use.**
   ISO4414/JIS B 8370(Pneumatic system axiom)/Labor Safety And Health Law and other safety regulations..

LVQ Series

Chemical air operate Valve／Precautions ①

Be sure to read before handling.

Precautions on Design and Selection

⚠Warning

① Check specification

Use within the range of the specifications stated in this catalog with adequate consideration of application, fluid and environment.

② Operating fluid

Before operation, check the compatibility of components material and operating fluid with check list(P6). Other fluid that are not indicated in check list are available on request.

Furthermore, use the fluid within the range of operating fluid temperature range.

③ Maintenance space

Secure the space necessary for maintenance.

④ Fluid pressure range

Supplied fluid pressure should be used in the range of operating pressure stated in catalog.

⑤ Ambient environment

Use within the range operating ambient temperature pressure. Check compatibility of components material and ambient atmosphere to prevent fluid from sticking to external surface of product.

⑥ Liquid ring

.In case of applying fluid, set relief valve in system to prevent liquid ring on circuit.

⑦ Countermeasure to static electricity

Apply countermeasure to possible static electricity caused by fluid.

Installation

⚠Warning

① If air leakage increases or equipment is not properly operating, cease use of the valve and inspect.

Check mounting conditions initial function and leakage tests are performed.

② Install only after reading and understanding the safety instructions.

Keep the catalog on life so that it can be referred to when necessary.

Piping

⚠Caution

① Before piping

Make sure to clean up chips, cutting oil, dust etc., before piping.

Pipe with paying attention not to apply the force of tension, compression and bending caused by piping to valve body.

① Tighten pilot port with following tightening torque.

Operating port tightening torque

Operating port	Torque(N·m)
M5	After tightening with hand, tighten for 1/6 rotation additionally with tightening tool.
Rc,NPT 1/8	0.8 to 1.0

② Metal fitting

In case of using taper screw with resin, do not pipe metal fitting to prevent the breakage of screw.

③ Use pilot port and sensor (breathing) port following the table stated below.

Operating port tightening torque

	PA port	PB port	Sensor (Breathing) port
N.C.	Pressurized	Breathing	Breathing
N.O.	Breathing	Pressurized	Breathing
Double	Pressurized	Pressurized	Breathing

In case of N.C. and N.O. type, port to which pilot pressure is not applied should be released to atmosphere. If it is preferable to supply and exhaust directly from valve due to the ambient atmosphere or dispersion of dust, set piping and supply / exhaust at the place where is not contaminated.

④ Refer to P.7 for tube connection.

Air Supply Source

⚠Warning

① Use clean air

If the compressed air supply includes chemicals, synthetic materials (including organic solvents), salinity, corrosive gas, etc., it can lead damage or malfunction..

LVQ Series

Chemical air operate Valve／Precautions ②

Be sure to read before handling.

Operating Environment

⚠Warning

① Do not use in atmospheres where the valve is in direct contact with corrosive cases, chemicals, salt water, water or steam.

② Do not use in an explosive atmosphere.

③ Do not use in a place subject to heavy vibrations and/or shocks.

Maintenance

⚠Warning

① **Maintenance procedures are shown in the operation manual**
If maintenance is not properly done, it may cause malfunction and damage of machine or equipment..

② Before equipment as well as supply and exhaust equipment of compressed air are removed, cut off the supply air and power supply with exhausting compressed air in system. In addition, at the remounting of equipments and when they are operated again after replacement, confirm if they will operate properly after checking the safety.

③ Operate after removing residual chemicals and replacing it with DI water and oil properly.

④ Do not assemble products. Dissembled products are not guaranteed. If disassembly of products is needed, please contact SMC or distributor.

⑤ Check and inspect the leakage from both valve and fitting in regular interval to use valve with optimal functions.

⚠Caution

① **Drain**
Remove condensate from air filter regularly.

Precautions on operation

⚠Warning

① Max. operating pressure and back pressure should be within the range of specifications.

⚠Caution

① **In case of using diaphragm with PTF**
When the fluid is gas such as N2 gas and air, pay attention not to generate valve leakage with 1cm^3/min or less (with air pressure) at the shipment.

② In case of using valve under fine flow rate, consider flow rate, pressure, piping conditions adequately, as LVQ series with flow rate adjustment may occur vibration etc. depending operating conditions.

③ Depending on conditions of fluid pressure, LVQ series may occur water hammer. Though it is possible to improve it by adjusting pilot pressure with speed controller in most case, please review flow rate, pressure and piping condition.

④ Adjust LVQ series with flow rate adjustment as opening it by degrees from totally closed state.
Adjustment handle opens with counterclockwise. For your information, they are totally closed at the shipment.

⑤ If they have been left for a long time, perform trial operation before starting operation

⑥ Since LVQ series is packaged in clean room, pay great attention to open it.

LVQ Series

Standard Specifications

● External non-metal type LVQ

Model		LVQ20	LVQ30	LVQ40	LVQ50	LVQ60
Tube I.D.	Millis	6	10	12	19	25
	Inch	1/4	3/8	1/2	3/4	1
Orifice		4DIA.	8DIA.	10DIA.	16DIA.	22DIA.
Flow characteristics	Avx$10^{-6}m^2$	8.4	31.2	45.6	120	192
	Cv	0.35	1.3	1.9	5	8
Proof pressure (MPa)		1				
Operating pressure(A → B)		-98Kpa to 0.5Mpa			-98Kpa to 0.4Mpa	
Back pressure (MPa)		0.3 or less			0.2 or less	
Valve leakage (cm^3/min)		0 (With water pressure)				
Pilot pressure (MPa)		0.3 to 0.5				
Pilot port size		1/8"(3mm), 4mm, Rc1/8, NPT1/8				
Operating fluid temperature (℃)		0 to 100				
Ambient temperature (℃)		0 to 60				
Weight (Kg)		0.08	0.17	0.22	0.70	0.81

● External non-metal Compact type LVQ

Model		LVQ20S	LVQ30S	LVQ40S	LVQ50S	LVQ60S
Connection fitting size		2(1/4)	3(3/8)	4(1/2)	5(3/4)	6(1)
Orifice		4DIA.	8DIA.	10DIA.	16DIA.	22DIA.
Flow characteristics	Avx$10^{-6}m^2$	8.4	31.2	45.6	120	192
	Cv	0.35	1.3	1.9	5	8
Proof pressure (MPa)		1				
Operating pressure(A → B)		-98Kpa to 0.5Mpa			-98Kpa to 0.4Mpa	
Back pressure (MPa)		0.3 or less			0.2 or less	
Valve leakage (cm^3/min)		0 (With water pressure)				
Pilot pressure (MPa)		0.3 to 0.5				
Pilot port size		1/8"(3mm), 4mm, Rc1/8, NPT1/8				
Operating fluid temperature (℃)		0 to 100				
Ambient temperature (℃)		0 to 60				
Weight (Kg)		0.08	0.17	0.22	0.70	0.81

Applicable fluid

Compatibility check list regarding operating material and fluid between chemical air operate valve and hand valve.

Chemicals name	Body material			Diaphragm material		
	SUS316	PFA	PPS	PTFE	NBR	EPR
Acetone	○	○ note1)	○ note1)	○ note2)	×	×
Ammonium hydroxide	○	○	○	○ note2)	×	×
Isobutyl alcohol	○	○ note1)	○ note1)	○ note2)	○	○
Isopropyl alcohol	○	○ note1)	○ note1)	○ note2)	○	○
Hydrochloric acid	×	○	○	○	×	×
Ozone	○	○	○	○	×	○
Hydrogen peroxide	×	○	○	○	×	×
Ethyl acetate	○	○ note1)	○ note1)	○ note2)	×	×
Butyl acetate	○	○ note1)	○ note1)	○ note2)	×	×
Nitric acid	×	○	○	○ note2)	×	×
Pure water	○	○	○	○	×	○
Sodium hydroxide	○	○	○	○	×	×
Nitrogen gas	○	○	○	○	○	○
Super pure water	×	○	○	○	×	×
Toluene	○	○ note1)	○ note1)	○ note2)	×	×
Hydrofluoric acid	×	○	×	○ note2)	×	×
Sulfuric acid	×	○	×	○ note2)	×	×
Phosphoric acid	×	○	×	○	×	×

※Compatibility check list regarding operating material and fluid is reference valve as standard.

Note 1)For your information,use SUS body to prevent static electricity from occurring.

Note 2)Pay attention to the possible transmission..

How to read table

○ : Available

○ : Available upon conditions

× : Not available

・Fluid temperature indicates compatibility at 100℃ or less.

・In case of using other fluid except for above mentioned,please contact us.

・Please contact regarding operating conditions.

LVQ Series
Fitting and special tool

FITTING

Replacement of tube size

Replacement of nut and insert tube allows to replace tube size within the same body class(body size).

Body class	Tube O.D.													
	mm size							inch size						
	4	6	8	10	12	19	25	1/8	3/16	1/4	3/8	1/2	3/4	1
2	●	○	–	–	–	–	–	●	●	○	–	–	–	–
3	–	●	●	○	–	–	–	–	–	●	○	–	–	–
4	–	–	–	●	○	–	–	–	–	–	●	○	–	–
5	–	–	–	–	●	○	–	–	–	–	–	●	○	–
6	–	–	–	–	–	●	○	–	–	–	–	–	●	○

Part construction

	Components		
	Nut	Insert	Color insert Ass'y
Standard size	Mounted	Mounted	Not mounted
Reducer type	Mounted	Mounted	Mounted

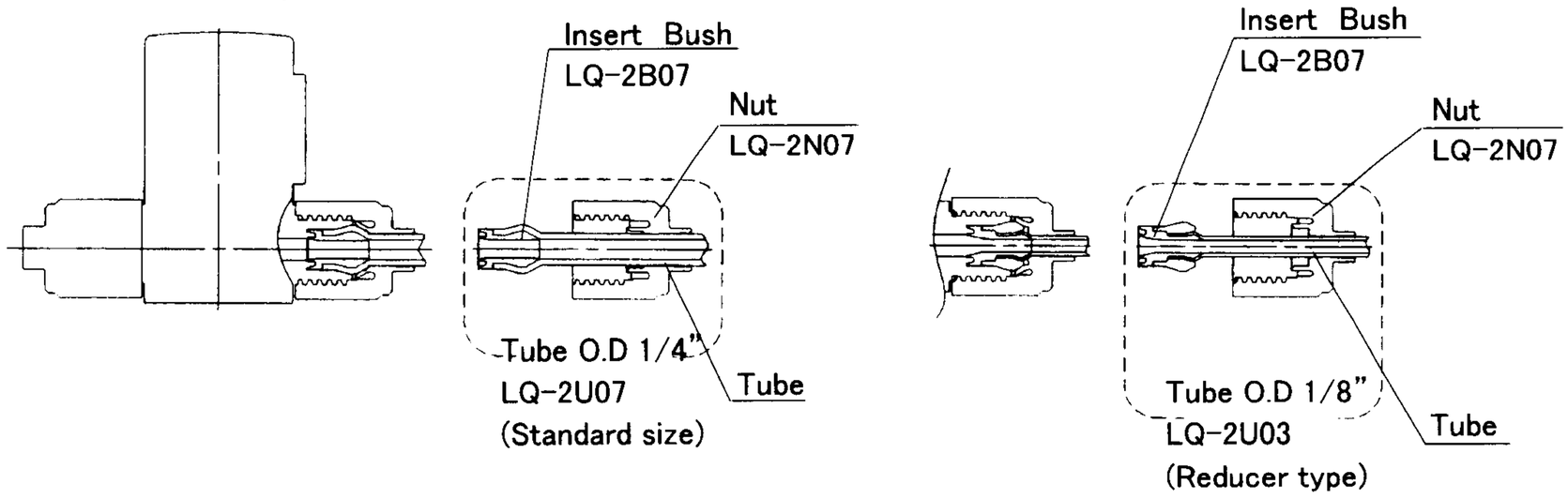
Replacement of tube size

i.e.)When tube O.D. is changed from 1/4" to 1/8"withinbody class 2.

Order insert bush with 1/8" of tube O.D. and nut (LQ-2U03) and replace tube size.

(Refer to how to order for fitting parts)

Note)Tube is sold separately.



How to order for fitting parts

LQ— **2** **U** **03**

Body Class ●

Symbol	Body class
2	2
3	3
4	4
5	5
6	6

Part kind ●

Symbol	Part kind
U	Insert bush + Nut
B	Insert bush
N	Nut

●Tube size

Symbol	Tube O.D.	Body class
03	1/8"	2
04	φ4	
05	3/16"	
06	φ6	
07	1/4"	
06	φ6	3
08	φ8	
10	φ10	
07	1/4"	
11	3/8"	
10	φ10	4
12	φ12	
11	3/8"	
13	1/2"	
12	φ12	5
13	1/2"	
19	3/4"・φ19	
19	3/4"・φ19	6
25	1"・φ25	

LVQ Series
Fitting and special tool

Special tool

How to order for fitting parts

LQ−G J □ − □ − □

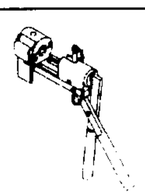
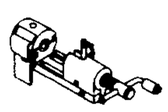
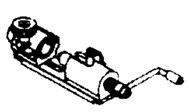
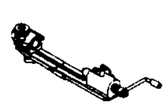
Material of insert pin

Nil	Resin
S	SUS (Only J·T type)

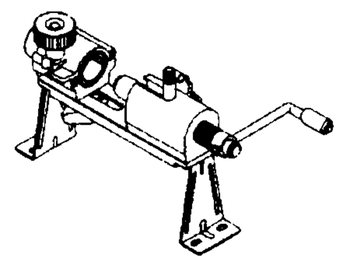
Kind of insert pin/holder

Nil	mm size
N	inch size

Type

Symbol	Body size		
J·K	1·2		
L·M	1·2·3·4·5·6		

Option(Only L·M type)

Symbol	Body size	
Nil	None	
B	With Bracket	

Option

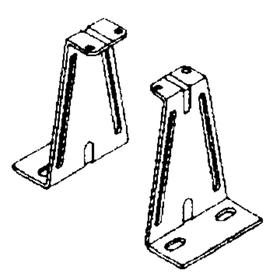
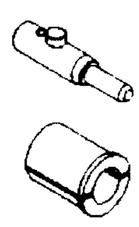
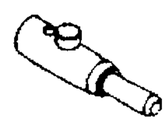
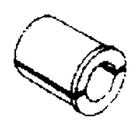
Part name		P/N
Bracket Ass'y		LQ-GBL

Table 1.Symbol of tube size

Type	Body size	Tube O.D.														
		mm size								inch size						
		φ3	φ4	φ6	φ8	φ10	φ12	φ19	φ25	1/8"	3/16"	1/4"	3/8"	1/2"	3/4"	1"
J	1	03	04	–	–	–	–	–	–	03	–	–	–	–	–	–
	2	–	04	06	–	–	–	–	–	03	05	07	–	–	–	–
L	1	03	04	–	–	–	–	–	–	03	–	–	–	–	–	–
	2	–	04	06	–	–	–	–	–	03	05	07	–	–	–	–
	3	–	–	06	08	10	–	–	–	–	–	07	11	–	–	–
	4	–	–	–	–	10	12	–	–	–	–	–	11	13	–	–
	5	–	–	–	–	–	12	19	–	–	–	–	–	13	19	–
	6	–	–	–	–	–	–	19	25	–	–	–	–	–	19	25

Replacement of components

Part name		Part number
Insert pin holder Ass'y (Parts case included)		LQ-GP J □ − □ Type Material of insert pin (Only J,K type): None = Resin; S = SUS Kind of insert pin/holder: None = mm size; N = inch size
Insert pin (single part)		LQ-GP 2 J □ − 07 Body size (see Table1.) Type Kind of insert pin/holder (Only J·K type): None = Resin; S = SUS Tube size symbol (see Table1.)
Holder (single part)		LQ-GH J − 07 Type Tube size symbol (see Table1.)

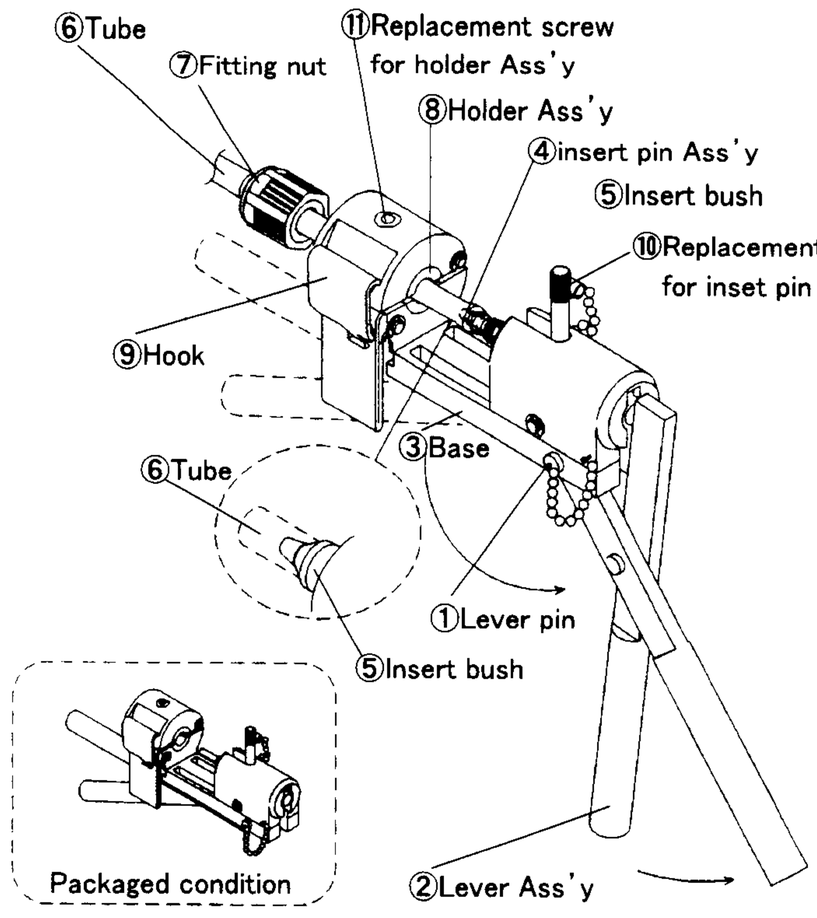
Note1)Replacement parts type J indicates the parts for LQ-GJ,LQ-GK.

Note2)Replacement parts type L indicates the parts for LQ-GL,LQ-GM.

Fitting assembly procedure

Assemble following the procedure stated below.

J Type



J type fitting assembly procedure

1 Pull out lever pin ①. Rotate lever Ass'y ② and correspond the holes of lever Ass'y ② and base ③ Insert lever pin ① to the hole and fix lever pin ②.

2 Set insert bush ⑤ to insert pin Ass'y ④.

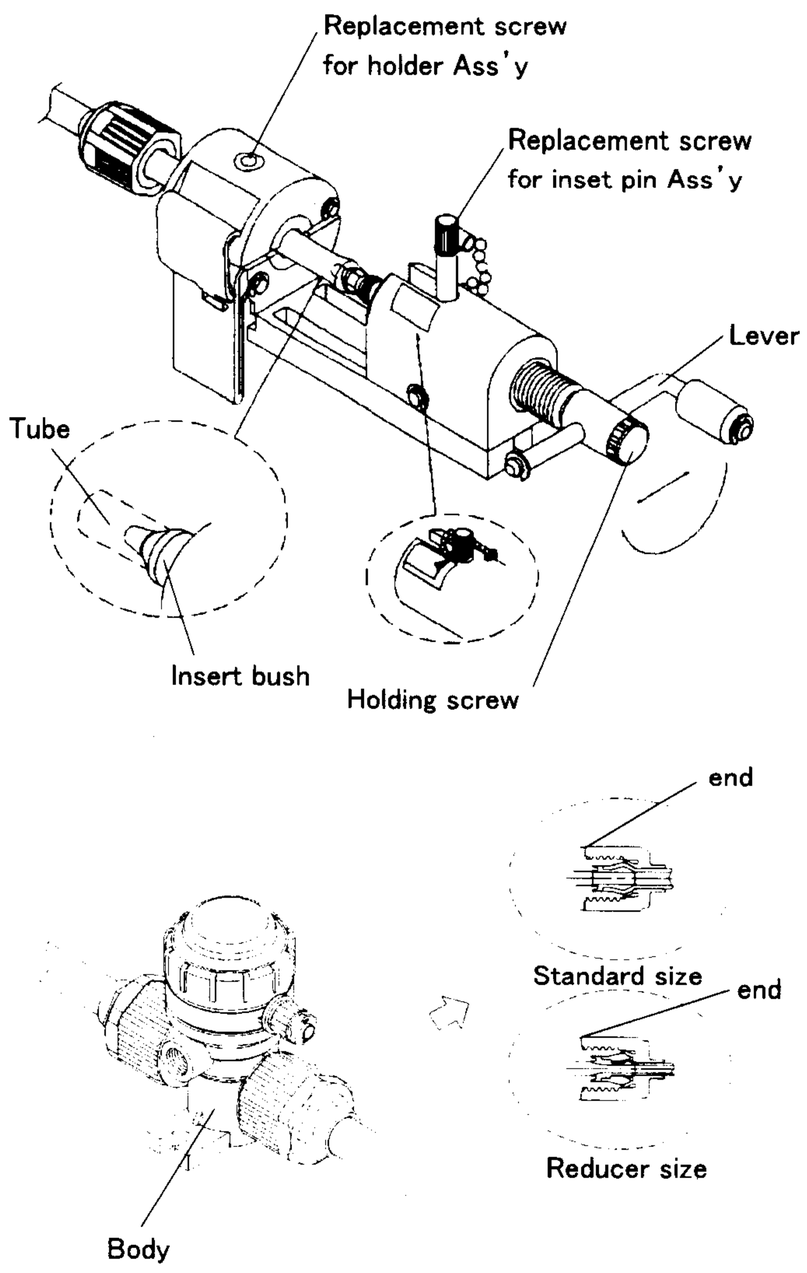
3 Cut the end of tube ⑥ at light angle,and set fitting nut ⑦.After setting tube ⑥ to holder Ass'y ⑧, insert it until it contacts with bush,and clamp with hook ⑨.

Precautions
- When tube is bent,correct it to straight and use.
- Oil and dust attached on holder Ass'y ⑧ might cause sliding of tube,please remove it with alcohol etc.

4 Operate lever Ass'y press-in insert bush ⑤ to tube ⑥.

5 Insert pin Ass'y ④ and holder Ass'y ⑧ should be replaced with replacement screw for insert pin Ass'y ⑩ and holder Ass'y ⑪.

K Type



K type fitting assembly procedure

- Refer to L and M type fitting assembly procedure for set and press-in of insert pin Ass'y.
- Refer to J type procedure for tube setting.

1 → 5 Refer to J type fitting assembly procedure.

6 Tighten fitting nut ⑦ to the given position of body(end).Refer to the following optimal tightening torque as standard.

Tightening torque of nbut at piping

Body size	Torque	
	LQ1	LQ2
2	0.3～0.4	1.5～2.0

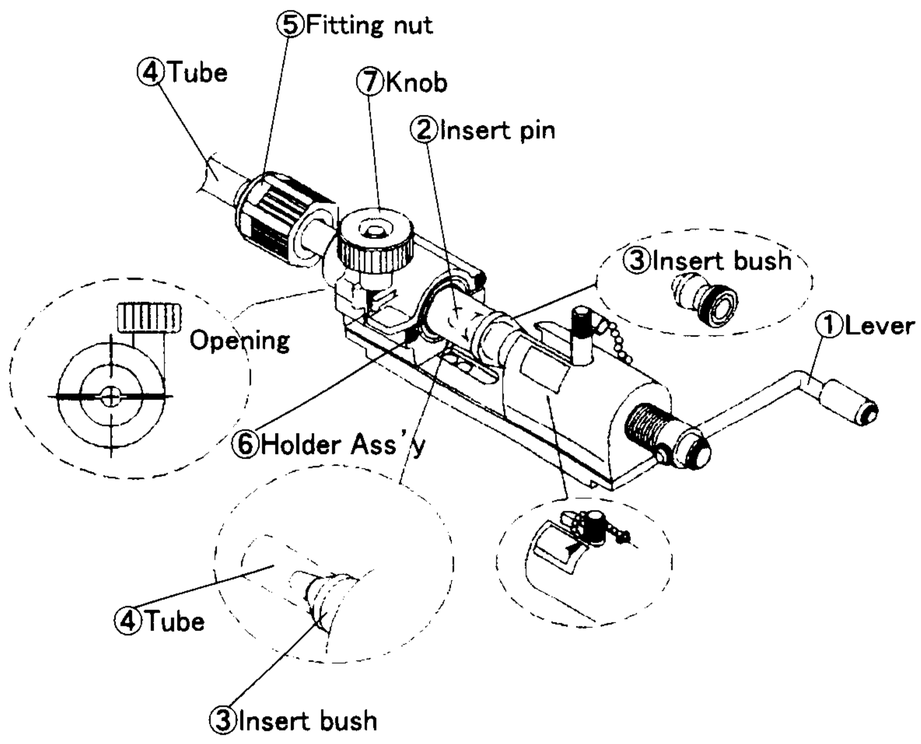
Note1)Body size 1 should be tightened with hand.

LVQ Series
Fitting and special tool

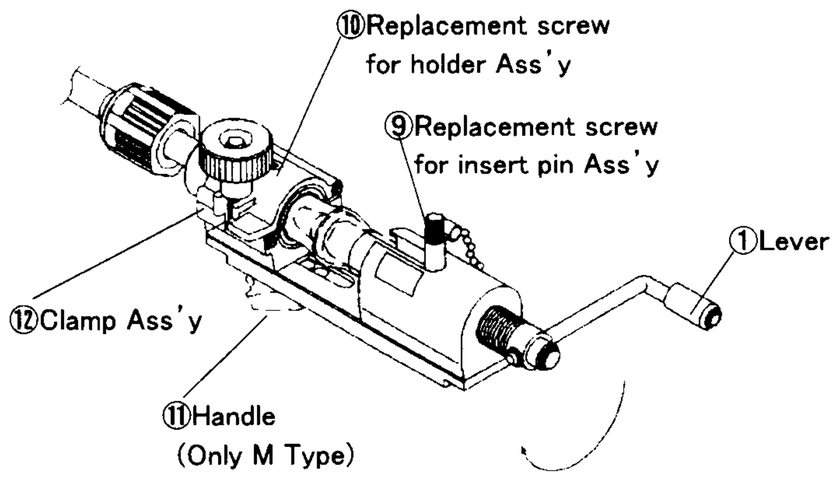
Fitting assembly procedure

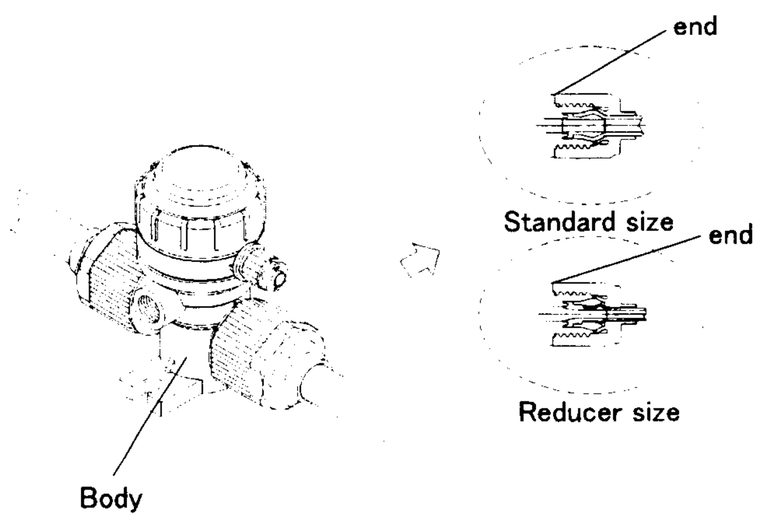
Assemble following the procedure stated below.

L Type



M Type





L, M type fitting assembly procedure

1. Rotate lever 1 and correspond it to SET POS.
2. Set insert bush ③ to insert pin Ass'y ②.
3. Cut the end of tube ④ at light angle,and set fitting nut ⑤.After setting tube ④ to holder Ass'y ⑥, insert it until it contacts with bush,and clamp with knob ⑦.

⚠ Precautions
- When tube is bent,correct it to straight and use.
- Oil and dust attached on holder Ass'y ⑥ might cause sliding of tube,please remove it with alcohol etc.

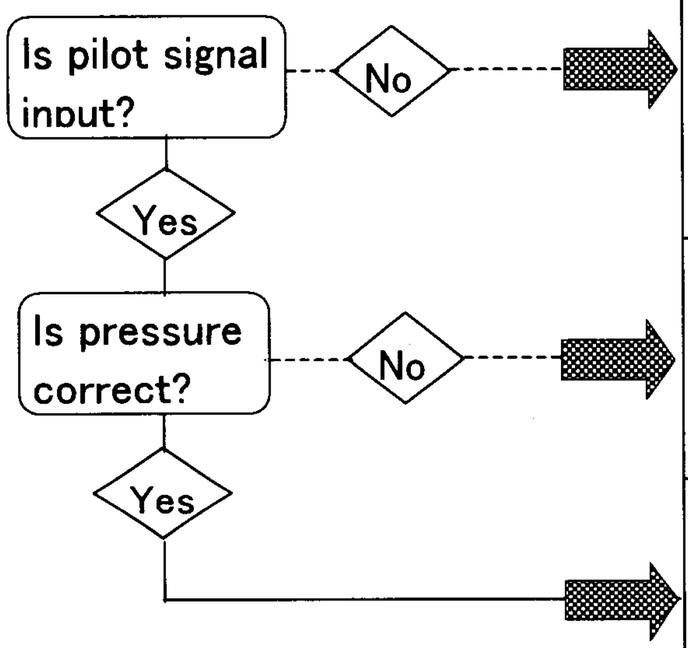
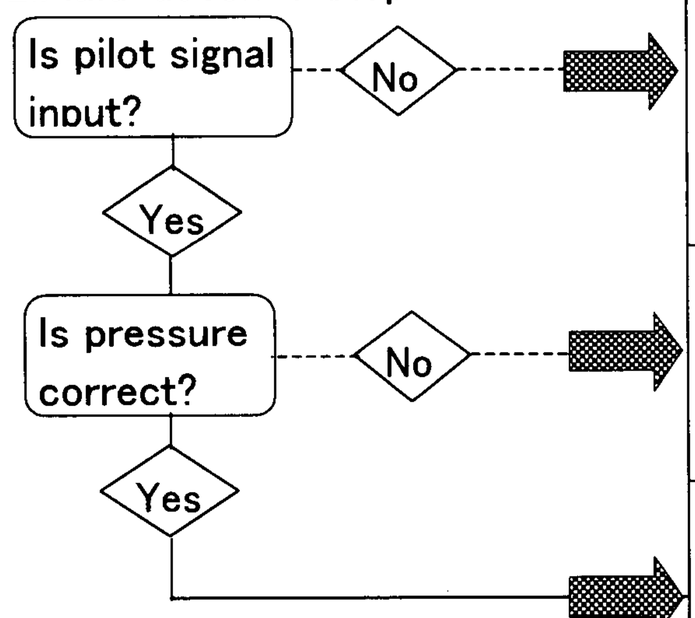
4. Operate lever and press-in insert bush ③ to tube ④. (Lever can be pressed-in for 2～3 rotations).
5. Insert pin Ass'y ② and holder Ass'y ⑥ should be replaced with replacement screw for insert pin Ass'y ⑨ and holder Ass'y ⑩.
6. For M type for short piping,remove handle ⑪,set clamp Ass'y ⑫ as sliding it to the specified length and tighten it with handle ⑪.
7. Tighten fitting nut ⑤ to the given position of body(end).Refer to the following optimal tightening torque as standard.

Tightening torque of nbut at piping

Body size	Torque	
	LQ1	LQ2
2	0.3～0.4	1.5～2.0
3	0.8～1.0	3.0～3.5
4	1.0～1.2	7.5～9
5	2.5～3.0	11～13
6	5.5～6.0	-

Note1)Body size 1 should be tightened with hand.

Failure and countermeasures

Failure	If valves don't operate properly, refer the following failure and perform countermeasures stated in check list.	Causes	Countermeasures
Malfunction	1.Fluid doesn't stop. 	1)Malfunction of pilot valve	·Replace valve ·Clean air supply source
		2)Failure of electrical system	·Check power supply
		1)Lacking pilot pressure (N.O.valve,double acting valve)	·Set proper pressure
		2)Main pressure is high.	·Set proper pressure
		1)Back pressure is high	·Set proper pressure
		2)Particle intrusion	·Eliminate particles and install filter.
		3)Mispiping of pilot port	·Check if the connection of pilot port is correct.
	2.Fluid doesn't stop 	1)Malfunction of pilot valve	·Replace valve ·Clean air supply source
		2)Failure of electrical system	·Check power supply
		1)Lacking pilot pressure (N.C.valve)	·Set proper pressure
		1)No main pressure	·Check to proper pressure
		2)Side failure of piston packing.	·Replace product.
Failure of air tight	1.Internal leakage	1)Intrusion of particles	·Eliminate particles and install filter.
		2)Flaws on valve seat	·Replace product
	2.External leakage	1)Tightening failure	·Tighten additionally
		2)Breakage of diaphragm	·Replace product