ORIGINAL INSTRUCTIONS

Instruction Manual

High Purity Chemical Liquid Valve
Series LVA/LVC
Air Operated 2 Port/3 Port Valve

The intended use of this valve is to control the flow of chemical liquid fluid within a circuit.

1 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 10218-1: Manipulating industrial robots -Safety. etc.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

⚠ **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

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

2 Specifications

2.1 General specifications LVA/LVC

Model	LVA10-60 LVC20-60	LVA200 LVC200
	2 port	3 port
Valve construction	Air-operated valve Diaphragm type	
Flow rate characteristics	Refer to catalogue	
Maximum operating frequency (Hz)	Contact SMC	
Duty cycle	Contact SMC	
Withstand pressure (MPa)	1	
Valve leakage (cm^3 /min)	0 (with water pressure)	
Fluid temperature (°C)	0 to 100 *1	
Ambient temperature (°C)	0 to 60	
Weight (kg)	Refer to catalogue	
Vibration resistance	30 m/s^2	
Impact resistance	150 m/s^2	

Table 1

**1: 0 to 60°C when the diaphragm is NBR or EPR.*

2 Specifications - continued

2.2 Other Specifications 2 port LVA

Model LVA		10	20	30	40	50	60
Orifice diameter (mm)		Ø2	Ø4	Ø8	Ø12	Ø20	Ø22
Port size		1/8, 1/4	1/8, 1/4	1/4, 3/8	3/8, 1/2	1/2, 3/4	1
Operating pressure (MPa)	A → B	0 to 0.5	(-94 kPa) 0 to 0.5 *3			(-94 kPa) 0 to 0.4 *3	
	B → A	0 to 0.05	(-94 kPa) 0 to 0.2 *3			(-94 kPa) 0 to 0.1 *3	
Back pressure (MPa)	N.C./N.O. *2	0.15 or less	0.3 or less			0.2 or less	
	Double acting	0.3 or less	0.4 or less			0.3 or less	
Pilot air pressure (MPa)		0.3 to 0.5					
Pilot port size	Standard	M5	M5*4	Rc1/8, G1/8, NPT1/8			
	-Z type *5	-	Rc1/8, G1/8, NPT1/8	-			

Table 2

**2: The N.O. type is not available for LVA10.*
**3: When using for vacuum, select the product number ending in "-V". This product cannot be used for vacuum retention. Also, connecting the vacuum to the B port may reduce the life of the product.*
**4: Applicable for the LVA21 (N.O.) and LVA22 (double acting) types*
**5: Applicable for the LVA20 (N.C.)-Z type*

2.3 Other specifications 3 port LVA

Model LVA	200
Orifice diameter (mm)	Ø4
Port size	1/4
Operating pressure (MPa)	0 to 0.5
Pilot air pressure (MPa)	0.4 to 0.5
Pilot port size	M5 x 0.8

Table 3

2.4 Other specifications 2 port LVA organic solvents compatible

Model LVA			20	30	40	50	60
Tubing O.D*1		Metric size	6	10	12	19	-
		Inch size	¼	3/8	1/2	3/4	1
Orifice diameter			4	8	12	20	22
Operating pressure	Standard	A → B	0 to 0.5			0 to 0.4	
		B → A	0 to 0.2			0 to 0.1	
	High back pressure	A → B	0 to 0.5				
		B → A	0 to 0.4				
Back pressure (MPa)	Standard	N.C./N.O.	0.3 or less			0.2 or less	
		Double acting	0.4 or less			0.3 or less	
	High back pressure *2	N.C/N.O/ Double acting	0.5 or less				
Pilot air pressure (MPa)			0.3 to 0.5 (High back pressure: 0.5 to 0.8)*2				
Pilot port size			M5	Rc1/8, NPT1/8			
Fitting type			With double ferrule fittings, With metal gasket seal fitting, Integrated tubing				

Table 4

**1: Metric size is only available for fitting type D and T*
**2: High back pressure is optional.*

2 Specifications - continued

2.5 Other specifications 2 port LVC

Model LVC		20	30	40	50	60
Tubing O.D*1	Metric size	6	10	12	19	25
	Inch size	¼	3/8	1/2	3/4	1
Orifice diameter		4	8	10	16	22
Operating pressure	A → B	(-94 kPa)*2 0 to 0.5			(-94kPa)*2 0 to 0.4	
	B → A	(-94 kPa)*2 0 to 0.2			(-94kPa)*2 0 to 0.1	
Back pressure (MPa)	N.C./N.O.	0.3 or less			0.2 or less	
	Double acting	0.4 or less			0.3 or less	
Pilot air pressure (MPa)		0.3 to 0.5				
Pilot port size	Standard	M5*3	Rc1/8, NPT1/8, G1/8			
	-Z type*4	Rc1/8, NPT1/8, G1/8	-			

Table 5

**1: Refer to catalogue for details of the applicable tubing sizes.*
**2: When using for vacuum, select the product number ending in "-V". This product cannot be used for vacuum retention. Also, connecting the vacuum to the B port may reduce the life of the product.*
**3: Applicable for the LVC21 (N.O) and LVC22 (double acting) types*
**4: Applicable for the LVC20 (N.C.) -Z type*
**: Contact SMC if the manifold will be used with vacuum and A → P flow.*

2.6 Other specifications suck back type LVC

Model LVC		23	23U
Tubing O.D*1,*2	Metric size	(3), (4), 6	
	Inch size	(1/8), (3/16), 1/4	
Orifice diameter		-	3
Operating pressure (MPa)		0 to 0.2	
Maximum suck back volume (cm^3)		0.1	
Pilot air pressure (MPa)		0.3 to 0.5	
Pilot port size		M5	

Table 6

**1: Different diameter tubing shown in ( ) can be selected when used with a reducer. Refer to catalogue for details.*
**2: Refer to catalogue for details of the applicable tubing sizes.*

2.7 Other specifications 3 port LVC

Model LVC	200
Orifice diameter (mm)	Ø4
Operating pressure (MPa)	0 to 0.5
Pilot air pressure (MPa)	0.4 to 0.5
Pilot port size	M5 x 0.8

Table 7

2.8 Indicators

- Valves with indicator have a mechanical indicator to indicate when the valve is open.
- The indicator shows blue when the valve is open.

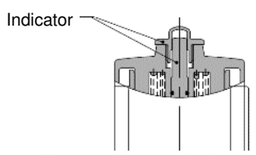

Figure 1 – Example of LVA with indicator

2.9 Pneumatic symbols

Refer to catalogue.

2.10 Response time

Response time will depend on the pilot valve used and pressure or piping conditions.

3 Installation

3.1 Installation

⚠ Warning

- Do not install the product unless the safety instructions have been read and understood.

3.2 Environment

⚠ Warning

- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product's specification.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.
- Do not use in a high humidity environment where condensation may occur.

3.3 Piping

⚠ Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- Install piping so that it does not apply pulling, pressing, bending or other forces on the valve body.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave *1 thread* exposed on the end of the pipe/fitting.
- Use the tightening torques shown below for the pilot port and sensor port.

Operating port	Torque (N.m)
M3	1/4 turn with a tightening tool after first tightening by hand
M5	1/6 turn with a tightening tool after first tightening by hand
Rc1/8, NPT1/8	0.8 to 1

Table 8

- Do not use metal fittings for piping on taper threads made of resin, as this may cause damage to the threads.
- Use pilot ports and sensor (breathing) ports as indicated in the table below.

Function	PA Port	PB Port	Sensor port (Breathing port)
N.C.	Pressure	Breathing	Breathing
N.O.	Breathing	Pressure	Breathing
Double acting	Pressure	Pressure	Breathing

Table 9

For N.C. and N.O. types, the port which does not receive operating pressure is released to atmosphere. When intake and exhaust directly from the valve is not desired due to problems with the ambient environment or scattering of dust, etc., install piping and ensure intake and exhaust are at a location which does not present a problem.

3.3.1 LVA stainless steel and PFA body tightening torque for fittings

Thread	Tightening Torque (N.m)	
	Stainless steel Note)	PFA
1/8	3 to 5	0.6 to 0.9
1/4	8 to 12	0.8 to 1.2
3/8	15 to 20	1.0 to 1.6
1/2	20 to 25	1.5 to 2.0
3/4	28 to 30	2.0 to 2.7
1	36 to 38	2.5 to 3.6

Table 10

Note) When metal fitting is installed.

3.3.2 LVA PPS body ported tightening torque for fittings

Size	Thread	Breaking torque (N.m)	Tightening torque (N.m)	Guideline for tightening torque (number of turns) *
LVA10	1/8, 1/4	2 to 3	0.5 to 1	2 to 3 turns
LVA20	1/4	2 to 3	0.5 to 1	2 to 3 turns
LVA30	3/8	6 to 8	2 to 3	3 to 4 turns
LVA40	1/2	11 to 14	5 to 7	3 to 4 turns
LVA50	3/4	18 to 20	8 to 10	3 to 4 turns

Table 11

3 Installation - continued

*: Guideline for tightening torque
Number of turns when the fitting is screwed into the body with 2 to 3 windings of sealant tape applied to threaded portion of the piping. The value may differ for types other than sealant type.

3.3.3 LVC tightening torque for piping

- Tighten the nut until it touches the end surface of the body, and then tighten it an additional 1/8 turn. If the nut won't turn any further, then it means enough tightening has occurred. Refer to the proper tightening torques shown below.

Body class	Torque (N.m)
2	1.5 to 2
3	3 to 3.5
4	7.5 to 9
5	11 o 13
6	5.5 to 6

Table 12

3.4 Tubing

- Connect tubing with special tools

Refer to the catalogue "High-Purity Fluoropolymer Fittings Hyper Fittings/LQ1, 2 Series Work Procedure Instructions" (M-E05-1) for connecting tubing and special tools. (Downloadable from the SMC website.)

⚠ Caution

Refer to the applicable tubing sizes shown below for tubing to be used.

	Connecting tubing size	O.D. [mm]		Internal thickness [mm]	
		Standard size	Tolerance	Standard size	Tolerance
Metric size	Ø3 x Ø2	3.0	+0.2 -0.1	0.5	±0.06
	Ø4 x Ø3	4.0			
	Ø6 x Ø4	6.0		1.0	±0.1
	Ø8 x Ø6	8.0			
	Ø10 x Ø8	10.0			
	Ø12 x Ø10	12.0			
	Ø19 x Ø16	19.0	+0.3 -0.1	1.5	±0.15
	Ø25 x Ø22	25.0			
Inch size	1/8" x 0.086"	3.18	+0.2 -0.1	0.5	±0.1
	3/16" x 1/8"	4.75		0.8	
	1/4" x 5/32"	6.35		1.2	±0.12
	3/8" x 1/4"	9.53		1.6	±0.15
	1/2" x 3/8"	12.7			
	3/4" x 5/8"	19.0	+0.3 -0.1		
	1" x 7/8"	25.4			

Table 13

3.5 Lubrication

⚠ Caution

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.

3.6 Mounting

Tighten mounting screws to appropriate tightening torque shown in the table below.

3.6.1 Stainless steel body

Model	Mounting	Tightening torque (N.m) Note)
LVA10/20	M5x0.8	3 ±0.7
LVA30	M6x1.0	5 ±0.7
LVA40/50/60	M8x1.25	12 +3/-1

Table 14

3.6.2 PFA body with SUS plate

Model	Mounting	Tightening torque (N.m) Note)
LVA200	M5x0.8	3 ±0.7

Table 15

Note) The value shown is applicable to metal plate panel. Please adjust the torque to meet the requirements of the panel material.

3 Installation - continued

3.7 Handling

- When the diaphragm is made of PTFE; please note that when the product is shipped from the factory, gases such as N2 and air may leak from the valve at a rate of 1 cm3/min (when pressurised).
- In the LV□ series, water hammering may occur depending on the fluid pressure conditions. In most cases, improvement is possible by adjusting the pilot pressure with a speed controller, etc., but the flow rate, pressure and piping conditions should be reviewed.
- After a long period of non-use, perform a test run before beginning regular operation.

3.8 Operating air supply

⚠ Warning

- **Use clean air**

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

⚠ Caution

- **Install an air filter for supply air**

Install an air filter at the upstream side of the valve. Select an air filter with a filtration size of 5 μm or smaller.

3.9 Effect of back pressure

Use the valve within the allowable operating pressure range as the valve may not close correctly when closing if an excessive back pressure is applied and the valve may open if an excessive reverse pressure is applied.

4 Settings

4.1 Suck back type

A change of volume inside the suck back valve pulls in liquid at the end of the nozzle to prevent dripping.

Figure 2 - Example LVC

4.2 Flow rate adjuster

The flow rate is adjusted by controlling the diaphragm stroke.

- To adjust the flow rate for valves with flow rate adjustment, open gradually starting from the fully closed condition. Ensure lock nut is loosened.
- Opening is accomplished by turning the adjustment knob counter-clockwise.
- Do not apply excessive force to the adjustment knob when approaching the fully open or closed state. This may result in deformation of the orifice sealing surface or damage to the threaded part of the adjustment mechanism.
- Once the required flow rate is achieved, the adjuster can be locked in position by tightening the lock nut in a clockwise direction.
- The product is supplied in the fully closed position.
- The valve may vibrate if operated at very low flow rates, depending on the operating conditions. Therefore, review the flow rate, operating pressure and piping conditions.

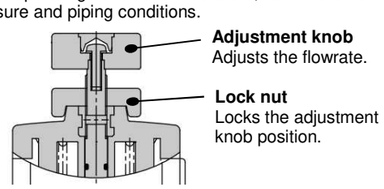

Figure 3 - Example LVA

4 Settings - continued

4.3 By-pass

- The by-pass feature allows a small amount of fluid from the inlet side to flow continuously to the outlet side.
- To adjust the fluid flow for valves with the by-pass feature, open gradually starting from the fully closed condition. Ensure lock nut is loosened.
- Opening is accomplished by turning the adjustment knob counter-clockwise.
- Do not apply excessive force to the adjustment knob when approaching the fully open or closed state. This may result in deformation of the orifice sheet surface or damage to the threaded part of the adjustment mechanism.
- Once the required by-pass flow is achieved, the adjuster can be locked in position by tightening the lock nut in a clockwise direction.
- The product is supplied in the fully closed position.

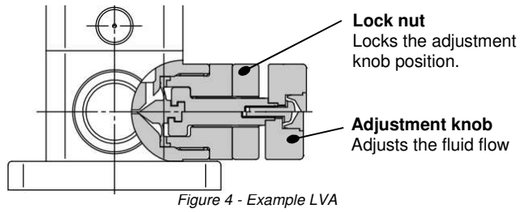

Figure 4 - Example LVA

5 How to Order

Refer to catalogue for 'How to Order'.

6 Outline Dimensions (mm)

Refer to catalogue for outline dimensions.

7 Maintenance

7.1 General Maintenance

⚠ Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

- Perform work after removing residual chemicals and carefully replacing them with DI water (Deionised water) or air, etc.
- In order to obtain optimum performance from valves, perform periodic inspections to confirm that there are no leaks from valves or fittings, etc.
- Removal of drainage
  Flush drainage from filters regularly.

7.2 Return of the product

⚠ Warning

If the product to be returned is contaminated or is possibly contaminated with substances that are harmful to humans, for safety reasons, please contact SMC beforehand and then employ a specialist cleaning company to decontaminate the product. After the decontamination prescribed above has been carried out, submit a Product Return Request Sheet or the Detoxification/Decontamination Certificate to SMC and await SMC's approval and further instructions before attempting to return the item. Please refer to the International Chemical Safety Cards (ICSC) for a list of harmful substances. If you have any further questions, please don't hesitate to contact your SMC sales representative.

8 Limitations of Use

8.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

⚠ Caution

8.2 Fluids

- Operate after confirming the compatibility of the product's component materials with fluids, using the check list "Applicable Fluids: High Purity Air and Manually Operated Chemical Liquid Valves Material and Fluid Compatibility Check List" in the catalogue. Please contact SMC regarding fluids other than those in the check list.
- Operate within the indicated fluid temperature range.

8.4 Liquid closed circuit

When fluid is circulating, install a by-pass valve or relief valve in the system, so that it does not form a closed circuit of liquid, as valve will malfunction.

8.5 Countermeasures against static electricity

Since static electricity may be generated depending on the fluid being used, implement suitable countermeasures.

8.6 Return of the valve to the original position (N.C./N.O. type only)

The valve moves to the original position by spring return.

9 Contacts

Refer to Declaration of Conformity and www.smcworld.com for contacts.

SMC Corporation

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