Installation and Maintenance Manual
*Series LLB3*4*
Clean Air Module

1 Safety Instructions

- This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.
- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- These instructions indicate the level of potential hazard by label of “CAUTION”, “WARNING” or “DANGER”, followed by important safety information which must be carefully followed.
- To ensure safety of personnel and equipment the safety instructions in this manual and the product catalogue must be observed, along with other relevant safety practices.
- This product is class A equipment that is intended for use in an industrial environment.

⚠ CAUTION	If instructions are not followed there is a possibility of injury or equipment damage.
⚠ WARNING	If instructions are not followed there is a possibility of serious injury or loss of life.
⚠ DANGER	In extreme conditions, there is a possibility of serious injury or loss of life.

⚠ WARNING

- **The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.**
  Since the products specified here can be 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 specific requirements.
- **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 personnel.
- **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. Switch off air and electrical supplies and exhaust all residual compressed air in the system.
  3) Before machinery/equipment is re-started, ensure all safety measures to prevent sudden movement of cylinders etc. (Supply air into the system gradually to create back pressure, i.e. incorporate a soft-start valve).
- **Do not use this product outside of the specifications. Contact SMC if it is to be used in any of the following conditions:**
  1) Conditions and environments beyond the given specifications, or if the product is to be used outdoors.
  2) Installations in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
  3) An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

⚠ CAUTION

- Ensure that the air supply system is filtered to 5 microns.

2 Specifications

2.1 General Specifications

Clean Air Module Common Specifications

Model			LLB3	LLB4
Fluid			Clean air, N_2 gas (Inlet air conditions) (1)	
Maximum operating pressure			0.7 MPa	
Set pressure			0.05 to 0.4 MPa	
Withstand pressure			1.0 MPa	
Fluid temperature			5°C to 45°C (No freezing) (2)	
Ambient temperature				
Flow range (3)			5 to 100 *l* /min (ANR)	50 to 500 *l* /min (ANR)
Nominal filtration rating (4)			0.01 µm (Filtration efficiency 99.99%)	
Fluid contact space			Grease free, Silicon free	
	Material	Body	PBT	
		Module connection seal	FKM	
		One-touch fitting seal	EPDM	

Note 1) Inlet air conditions: Equivalent to ISO 8573-1 and Quality Class 1.4.1-1.6.1.
Note 2) The guaranteed display of digital flow switch ranges between 15 to 35°C.
Note 3) The maximum flow rate varies depending on set pressure. Refer to 'Flow Characteristics' for detail.
Note 4) According to SMC measurement conditions.

Table 1

Digital Flow Switch Unit Specifications

Model			LLB3	LLB4
Detection type			Heat type	
Measured flow range			5 to 100 *l* /min	50 to 500 *l* /min
Minimum unit setting			1 *l* /min	5 *l* /min
Accumulated pulse flow rate exchange value (Pulse width : 50 ms)			1 *l* /pulse	5 *l* /pulse
Accumulated flow range			0 to 999999 *l*	
Linearity			±5% F.S. or less (15 to 35°C: based on 25°C)	
Repeatability			±2% F.S. or less	
Temperature characteristics			±5% F.S. or less (15 to 35°C: based on 25°C)	
Specifications			NPN or PNP open collector output	
	Switch output	Maximum load current	80 mA	
		Maximum applied voltage	30 VDC (at NPN output)	
		Internal voltage drop	NPN output : 1 V or less (at 80 mA) PNP output : 1.5 V or less (at 80 mA)	
	Analog output	Voltage output	Output voltage 1 to 5 V	
			Allowable load resistance: 100 kΩ or more	
		Current output	Output current 4 to 20 mA	
			Allowable load resistance: 300 Ω or less (12VDC), 600 Ω or less (24 VDC)	
Status LED's			Lights up when output is turned ON, OUT1: Green, OUT2: Red (OUT1 only for analog output)	
Response time			1 sec or less	
Power supply voltage			12 to 24 VDC (Ripple ±10% or less)	
Current consumption			160 mA or less	170 mA or less

2 Specifications (Continued)

Model		LLB3	LLB4
Withstand voltage		1000 VAC for 1 min. between external terminal and case	
Insulation resistance		50 MΩ or more (500 VDC Mega) between external terminal and case	
Noise resistance		1000 Vp-p, Pulse width 1 µs, Rise time 1 ns	
Lead wire		Lead wire with connector	
Enclosure		IP65	
Fluid control space material	Mesh	Stainless steel	
	Sensor housing	PBT	
	Sensor	Lead glass (exempted from RoHS application)	
		PtIr	
		FeNI	

Table 2

- **Analog output**

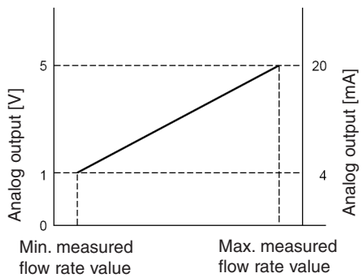


Figure 1

Model	Normal condition (*l* /min) [nor]		Standard condition (*l* /min) [ANR]	
	Minimum measured flow rate range	Maximum measured flow rate range	Minimum measured flow rate range	Maximum measured flow rate range
LLB3	5	100	5	107
LLB4	50	500	55	535

Table 3

Regulator Unit Specifications

Model		LLB3	LLB4
Relief mechanism		Non-relief	
Fluid contact space material	Diaphragm	FKM	

Table 4

ON/OFF Valve Unit Specifications

Model		LLB3	LLB4
Pilot pressure (ON/OFF valve operating pressure)		0.4 to 0.5 MPa	
Back pressure		0.4 MPa or less	
Valve type		N.C.	
Orifice size		4 mm	8 mm
Cv factor		0.35	1.7
Fluid contact space material	Diaphragm	PTFE	
Valve leakage		1 cm³/min (ANR) or less	

Table 5

Restrictor Unit Specifications

Model		LLB3	LLB4
Cv factor		0.28	1.4
Number of needle rotations		8 rotations	10 rotations
Fluid contact space material	Needle	Stainless steel	

Table 6

2 Specifications (Continued)

Filter Unit Specifications

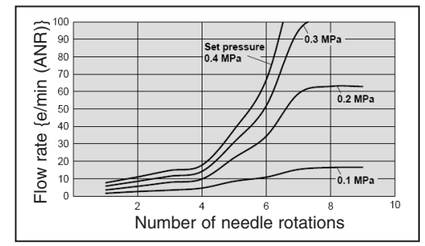
Model		LLB3	LLB4
Normal filtration rating (1)		0.01µm (Filtration efficiency 99.99%)	
Element withstand differential pressure (2)		0.5 MPa	
Flow capacity		to 100 *l* /min (ANR)	to 500 *l* /min (ANR)
Fluid contact space material	Filter case	PC	
	Hollow fibre	PP	
	Potting	PU	

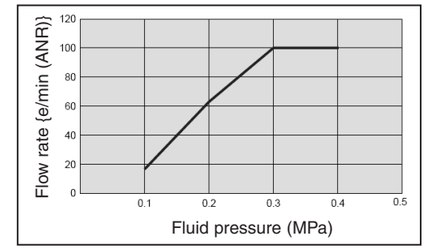
Note 1) According to SMC measurement conditions.
Note 2) This means that the element will not break at 0.5 MPa. Refer to Section 7.5, ‘Limitations of Use’.

Table 7

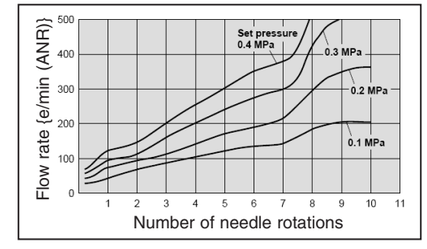
Flow Characteristics

LLB3-1-P1R1VSF: Standard (100 *l* /min)





LLB4-1-P1R1VSF: High Flow Type (500 *l* /min)



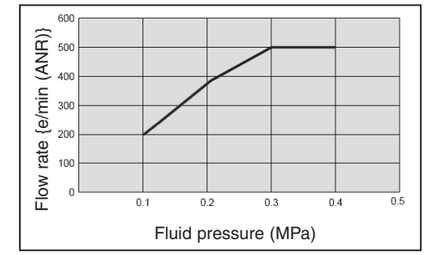


Figure 2

2 Specifications (Continued)

- Test conditions.

Model: LLB3-1-P1R1VSF and LLB4-1-P1R1VSF
Supply pressure: 0.5 MPa.
Pressure setting condition and measured position:
Pressure is set by turning the regulator knob with ON/OFF valve turned off.
Pressure is measured at the pressure outlet port.

2.2 Component Parts

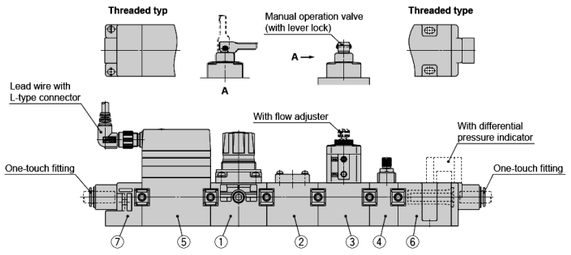


Figure 3

No.	Description		Individual part no. LLB3	Individual part no. LLB4	Note
1	Clean regulator assembly	-	LVB3-1	LVB4-1	-
2	Pressure outlet port assembly	-	LVB3-2	LVB4-2	-
3	ON/OFF valve assembly/ Air operated valve	Without flow adjuster	LVB2-3	LVB4-3	-
		With flow adjuster	LVB2-3-1	LVB4-3-1	-
	ON/OFF valve assembly/ Manual operation valve	-	LVB2-3-2	LVB4-3-2	-
4	Restrictor assembly	-	LVB2-4	LVB4-4	-

Table 8

2 Specifications (Continued)

2.3 Options

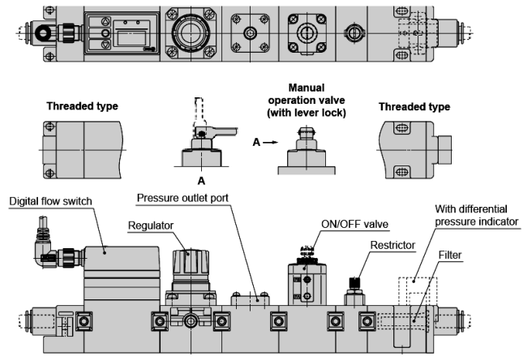


Figure 4

Flow Switch **P**	Regulator **R**	ON/OFF Valve **V(V1/V2)**	Restrictor **S**	Filter **F(F1)**	Mass (kg) LLB3	Mass (kg) LLB4
●	●	-	-	●	0.52	1.18
●	●	●	-	●	0.63	1.44
●	●	-	●	●	0.57	1.44
●	●	●	●	●	0.61	1.70
●	-	-	-	●	0.36	0.84
●	-	●	-	●	0.47	1.10
●	-	-	●	●	0.41	1.09
●	-	●	●	●	0.52	1.35
-	●	-	-	●	0.33	0.90
-	●	●	-	●	0.44	1.16
-	●	-	●	●	0.39	1.15
-	●	●	●	●	0.50	1.41

Flow Switch **P**	Regulator + Pressure outlet port **R1**	ON/OFF Valve **V(V1/V2)**	Restrictor **S**	Filter **F(F1)**	Mass (kg) LLB3	Mass (kg) LLB4
●	●	-	-	●	0.59	1.36
●	●	●	-	●	0.63	1.62
●	●	-	●	●	0.57	1.61
●	●	●	●	●	0.76	1.87
-	●	-	-	●	0.41	1.07
-	●	●	-	●	0.52	1.33
-	●	-	●	●	0.46	1.32
-	●	●	●	●	0.51	1.71
-	-	-	-	●	0.19	0.49
-	-	●	-	●	0.28	0.82
-	-	-	●	●	0.23	0.81
-	-	●	●	●	0.34	1.07

Table 9

3 Installation

3.1 Installation

⚠ WARNING

- Do not install the product unless the safety instructions have been read and understood.
- Install the product ensuring there is sufficient space for maintenance.
- Give careful consideration to the operating conditions such as the application, fluid and environment and use within the operating ranges specified in this document.

3 Installation (Continued)

3.2 Environment

⚠ WARNING

- Do not use in an environment where the product is directly exposed to corrosive gases, organic solvents, chemicals, salt water or steam.
- Do not use in an environment where the product is directly exposed to high humidity or large amounts of dust.
- Do not use in an explosive atmosphere.
- The product should not be exposed to prolonged sunlight. Use a protective cover.
- Do not mount the product in a location where it is subject to strong vibrations and/or shock. Check the product specifications.
- Do not mount the product in a location exposed to radiant heat.

Digital Flow Switch

⚠ WARNING

- Do not use in an environment where the likelihood of heavy splashing or spraying of liquid exists.
- Use the switch within the specified fluid and ambient temperature range. The fluid and temperature range is 5 to 45°C but the accuracy warranted range is 15 to 35°C.
- Take measures to prevent frozen fluid when using in low temperatures, since this may cause damage to the switch causing a malfunction.
- The installation of an air dryer is recommended to eliminate condensate and moisture.
- Never use the switch in an environment where there are drastic temperature changes, even when these temperatures are within the specified temperature range.

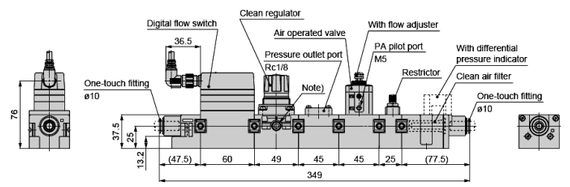
3.3 Piping

⚠ CAUTION

- Before piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the module. When using seal tape, leave 1.5 to 2 threads exposed on the end of the pipe/fitting.
- Use fittings with resin threads for the IN and OUT ports. Using fittings with metal threads could damage the ports.
- Install piping so that it does not apply pulling, pressing, bending or other forces on the module unit.
- Tighten fittings according to appropriate tightening torque shown in Table 10.

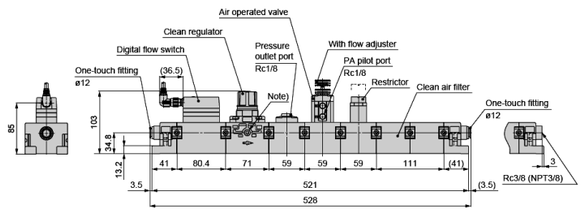
Thread	Release Torque (N•m)	Tightening Torque (N•m)	Tightening Guide (Thread rotation)
Rc 1/4 (LLB3)	2 to 3	0.5 to 1	2 to 3 rotations
Rc 3/8 (LLB4)	6 to 9	2 to 3	3 to 4 rotations

Table 10



Note) This port is unavailable. If a pressure gauge, etc. is screwed in, the port may be damaged.

Figure 5



Note) This Port is unavailable. If a pressure gauge, etc. is screwed in, the port may be damaged.

Figure 6

3 Installation (Continued)

Port Size	Port Size: Inlet	Port Size: Outlet	Port Size: Pressure outlet port	Port Size: Pilot Port Valve, PA
LLB3	Rc, NPT 1/4, One-touch fitting Ø10	Rc, NPT 1/4, One-touch fitting Ø10	Rc, 1/8	M5
LLB4	Rc, NPT 3/8 One-touch fitting Ø12	Rc, NPT 3/8 One-touch fitting Ø12	Rc, 1/8	Rc, 1/8

Table 11

Precautions for One-touch fittings

- Attaching of tube.
  Use a tube having no flaws on its periphery and cut it off at a right angle. When cutting the tube use cutters TK-1, 2, or 3. Do not use pinchers, nippers or scissors, etc. If cutting is done with tools other than tube cutters, the tube may be cut diagonally or become flattened etc., making a secure installation impossible, and causing problems such as the tube pulling out after installation or air leakage. Allow some extra length in the tube.
  Grasp the tube and push it in slowly, inserting it securely all the way into the fitting.
  After inserting the tube, pull on it lightly to confirm that it will not come out. If it is not installed securely all the way into the fitting, this can cause problems such as air leakage or the tube pulling out.
- Detaching the tube.
  Push in the release bushing sufficiently, and push the collar equally at the same time.
  Pull out the tube while holding down the release bushing so that it does not come out. If the release bushing is not pressed down sufficiently there will be an increased bite on the tube and it will become more difficult to pull out.
  When the removed tube is to be used again, cut off the portion what has been chewed before re-using it. If the chewed portion is used as is, this can cause trouble such as air leakage or difficulty in removing the tube.
- After connecting the tubing, care should be taken not to put excessive force (tensile force, compression, bending etc.) on the tubing.

Other Tube Brands

- When tubing brands other than SMC's are used, verify the tubing O.D. satisfies the following accuracy;
  Polyolefin tubing: Within ±0.1 mm
  Polyurethane tubing: Within +0.15 mm, within –0.2 mm
  Nylon tubing: Within ±0.1 mm
  Soft nylon tubing: Within ±0.1 mm
- Do not use tubing what does not meet these outside diameter tolerances. It may not be possible to connect them or they may cause other problems such as air leakage or the tube pulling out of the connection.
- The recommended tube for the clean fitting is polyolefin tube.
- Please note; Other tubes can satisfy the performance in terms of leakage, tensile strength, etc., but impair the cleanliness.

ON/OFF Valve

⚠ CAUTION

- For pilot port, tighten fittings to torque shown in Table 12.

Operating port	Torque (N•m)
M5	After tightening by hand, tighten additional 1/6 rotation with a tool
Rc, NPT 1/8	0.8 to 1.0

Table 12

- Use the pilot ports and sensors (respiration) port as in Table 13.

	PA port	PB port	Sensor (respiration) port
N.C.	Pressurisation	Respiration	Respiration
N.O.	Respiration	Pressurisation	Respiration
Double acting	Pressurisation	Pressurisation	Respiration

Table 13

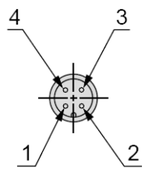
3 Installation (Continued)

- For N.C. and N.O. type, the port what is not pressurised should be open to atmosphere. If air intake and exhaust from the valve is not preferable due to ambient atmosphere or dust, install piping to the valve so that the valve can intake/exhaust air at the proper place.

3.4 Electrical connection

Digital flow switch

Connector pin numbers



Pin no.	Pin description
1	DC (+)
2	Analog output
3	DC (-)
4	OUT1

Figure 7

⚠ WARNING

- Hold the body of the switch when handling. The tensile strength of the lead wire with connector is 49N. Applying a greater pulling force can cause a malfunction. When handling, hold the body of the switch, do not dangle it from the wire.
- Verify the colour and terminal number when wiring. Incorrect wiring can cause the switch to be damaged and malfunction. Verify the colour and terminal number in the instruction manual before wiring.
- Avoid repeatedly bending or stretching the lead wire. Repeatedly applying bending stress or stretching force to the lead wire will cause it to break.
- Confirm proper insulation of wiring. Make sure there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals etc.). Damage may occur due to excess current flow into a switch.
- Do not wire in conjunction with power lines or high voltage lines. Wire separately from power lines and high voltage lines, avoid wiring in the same conduit with these lines. Control circuits including switches may malfunction due to noise from these other lines.
- Do not allow loads to short circuit. Although switches indicate excess current error if loads are short circuited, all incorrect wiring connections (power supply polarity etc.) cannot be protected. Take precautions to avoid incorrect wiring.

3.5 Mounting

⚠ WARNING

- If air leakage increases or equipment does not operate properly, stop operation. After mounting is completed, confirm that is has been done correctly by performing a suitable function test.
- Be sure to allow straight pipe length that is minimum 8 times the port size for the inlet side of the switch.

The clean air modules can be mounted using 4 x M4 screws for the LLB3 and 4 x M5 screws for the LLB4.

LLB3

Mounting hole for 4 x M4

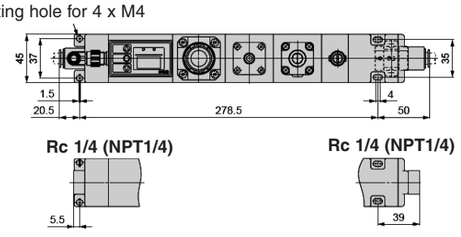


Figure 8

3 Installation (Continued)

LLB4

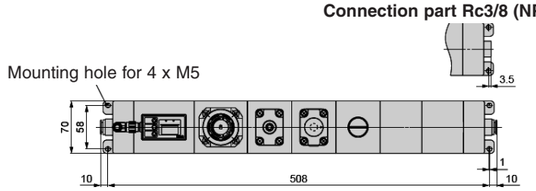


Figure 9

3.6 Lubrication

⚠ CAUTION

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, use turbine oil Class 1 (no additive), ISO VG32. Once lubricant is used in the system, lubrication must be continued because the original lubricant applied during manufacturing will be washed away.

4 Setting

Digital Flow Switch
Functions;

4.1 Flow rate selection display

- Real-time flow rate and accumulated flow rate can be selected. Up to 999999 of flow rate value can be accumulated.
- The accumulated flow rate is reset when power is turned off.

4.2 Flow rate conversion

- Normal condition (nor) {0°C, 101.3 kPa, Dry air} or standard condition (ANR) {20°C, 101.3 kPa, 65% RH} can be selected.

4.3 Flow rate confirmation display

- This function allows the accumulated flow rate confirmation when real time flow rate is selected, and the real-time flow rate confirmation when accumulated flow rate is selected.

4.4 Key lock

- This function prevents incorrect operation such as changing the set value accidentally.

4.5 Error correction

LED display	Contents	Solution
Er1	A current of more than 80 mA is flowing to OUT1	Check the load and wiring for OUT1
Er2	A current of more than 80 mA is flowing to OUT2	Check the load and wiring for OUT2
Er4	The setting data has changed for whatever reasons.	Perform the RESET operation and reset all data again. If the setting does not return to the factory setting, inspection needs to be performed by SMC.
---	The flow rate is over the flow rate measurement range.	Reduce the flow rate until it is within the flow rate measurement range, using an adjustment valve.

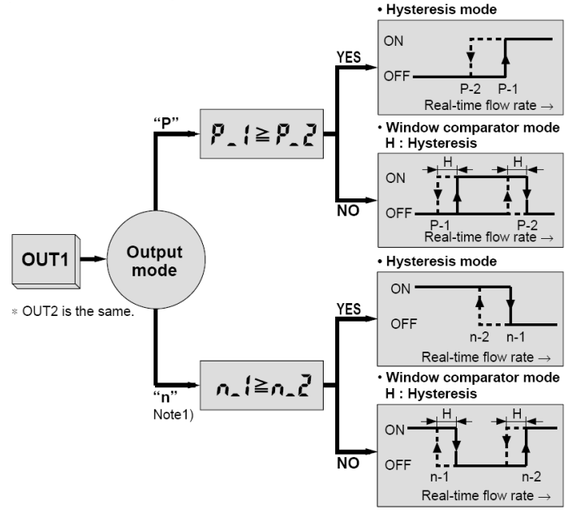
Table 14

4 Setting (Continued)

4.6 Output types

- Real-time switch output, accumulated switch output or accumulated pulse output can be selected as an output type.

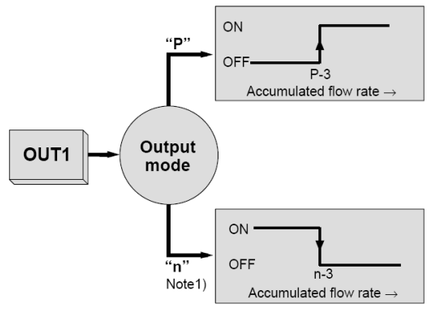
Real-time switch output



Note 1) Output mode is set to inverted output when shipped from factory.

Figure 10

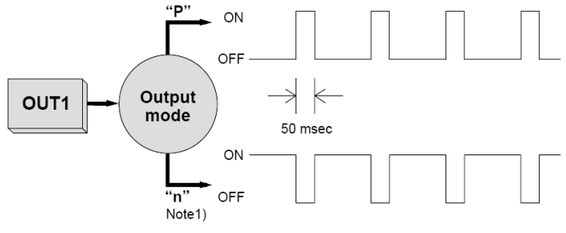
Accumulated switch output



Note 1) Output mode is set to inverted output when shipped from factory.

Figure 11

Accumulated pulse output



Note 1) Output mode is set to inverted output when shipped from factory.
Note 2) Refer to the specifications of display unit for flow rate value per pulse.

Figure 12

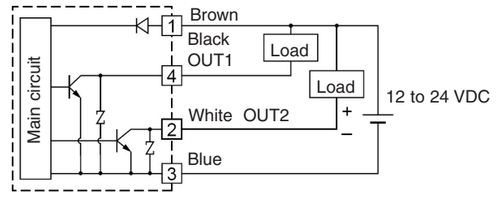
4 Setting (Continued)

⚠ WARNING

- Since switch output remains OFF while a message is displayed after power is turned on, start measurement after value is displayed.
- Perform settings after stopping control systems. When the switch's initial setting and flow rate setting are performed, output maintains the condition prior to the settings.
- Do not apply excessive rotational force to the display unit. The integrated type display unit can rotate 360°. Rotation is controlled by the stopper: however the stopper may be damaged if the display unit is turned with excessive force.
- Be certain to turn on the power when the flow rate is at zero. Allow an interval of 10 minutes after turning on the power, as there are some changes in the display.
- Flow rate unit: Switch measures mass flow rates without being influenced by temperature and pressure. The switches use ***l*** /min as the flow rate indicator unit, in which the volumetric flow is substituted for mass flow at 0°C and 101.3 kPa (nor). The volumetric flow rate at 20°C, 101.3 kPa, and 65%RH (ANR) can be displayed.

5 Internal Circuit & Wiring

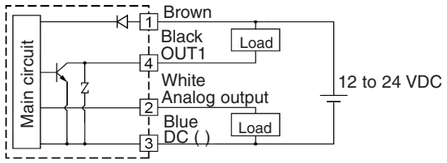
NPN open collector 2 outputs
LLB□-□-P3□□□F (F1)



Max. 30 V, 80 mA
Internal voltage drop 1 V or less

Figure 13

NPN open collector 1 output +Analog output
LLB□-□-P1 / P5 □□□F (F1)

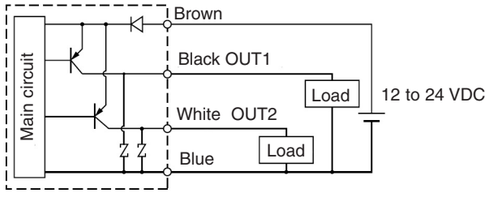


P1: Analog output 1 to 5 V
Allowable load resistance 100 kΩ or more
P5: Analog output 4 to 20 mA
Allowable load resistance 300 Ω or less (12 VDC), 600 Ω or less (24 VDC)

Figure 14

5 Internal Circuit & Wiring (Continued)

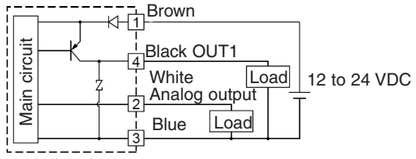
PNP open collector 2 outputs
LLB□-□-P4□□□F (F1)



Max. 80 mA
Internal voltage drop 1.5 V or less

Figure 15

PNP open collector 1 output + Analog output
LLB□-P2/P6 □□□F (F1)



P2: Analog output 1 to 5 V
Allowable load resistance 100 k Ω or more
P6: Analog output 4 to 20 mA
Allowable load resistance 300 Ω or less (12 VDC), 600 Ω or less (24 VDC)

Figure 16

6 Maintenance

6.1 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 by qualified personnel only.
- Before performing maintenance ensure the supply pressure is shut off and all residual air pressure is released from the system.
- After maintenance apply operating pressure and power to the equipment and check for proper operation and possible air leaks. If operation is abnormal, verify product set-up parameters.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

6.2 Adding a module procedure

LLB3

Example: Addition of the pressure outlet port assembly (LVB3-2).

- Loosen two hexagon socket head cap screws at the position where the clean air module is to be added and remove the connecting bracket A.
- After removing the connecting bracket A, separate the forward and aft blocks from each other.
  Note: Do not lose the connecting bracket A.
- Check that the connecting brackets B (at two positions) are attached and insert the bushing projection of the pressure outlet port assembly. Similarly, insert the end plate assembly into the pressure outlet port assembly.
- Mount the connecting bracket A and tighten the hexagon socket head cap screw to torque 1.0 to 1.4 N•m

6 Maintenance (Continued)

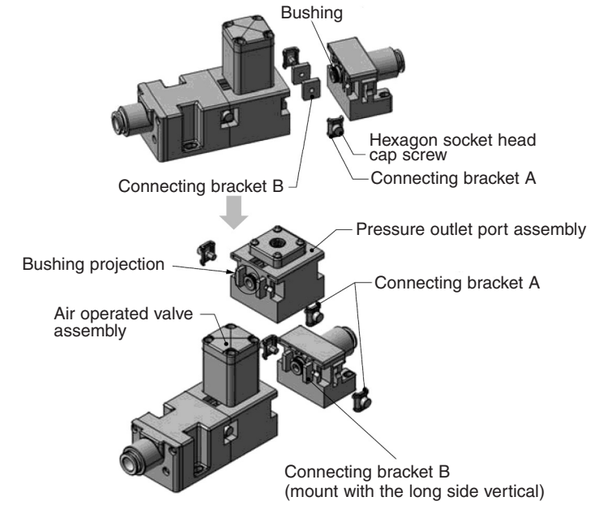


Figure 17

LLB4

Example: Addition of the restrictor assembly (LVB4-4).

- Loosen two hexagon socket head cap screws at the position where the clean air module is to be added and remove the connecting bracket A.
- After removing the connecting bracket A, separate the forward and aft blocks from each other.
  Note: Do not lose the connecting bracket A.
- Check that the connecting brackets B (at two positions) are attached and assemble the restrictor assembly on the groove of the block with care as to the direction of the restrictor assembly. Similarly, connect the air operated valve assembly to the restrictor assembly.
  Note: The arrow on the module and the arrow on the block must point in the same direction.
- Mount the connecting bracket A and tighten the hexagon socket head cap screw to torque 1.6 to 2.0 N•m

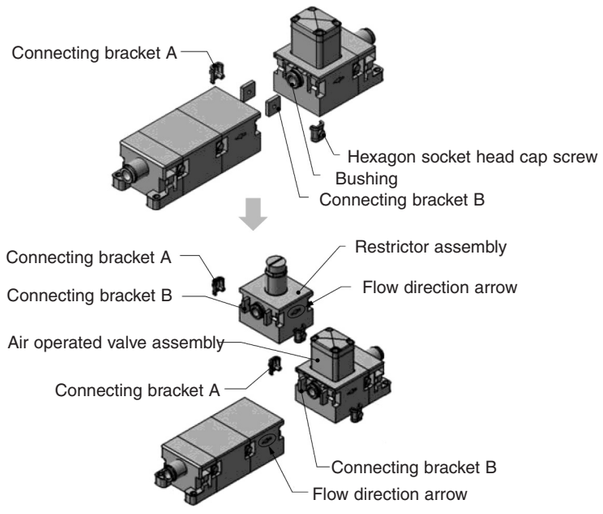


Figure 18

6.3 Filter element replacement

- When the filter element comes to the end of its life, immediately replace it with a new filter or replacement element.
- Service life of element;
  - After 1 year of usage.
  - When the set flow rate is not achieved, even if it is less than 1 year since operation began.

6 Maintenance (Continued)

LLB3

- Loosen the four filter end plate mounting screws on the clean air module.
- After removing the filter end plate, take out the element.
  Note: Do not lose the collar and O-ring.
- Assemble a new element on the filter body.
- Mount the filler end plate and tighten the screws diagonally to a torque of 0.45 to 0.55 N•m
- After replacing the elements, flush with air before operation.

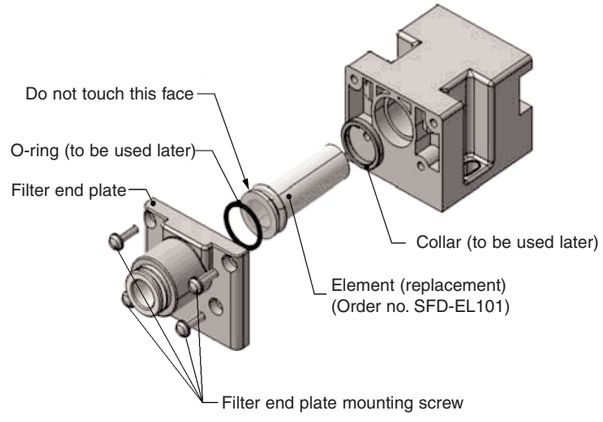


Figure 19

LLB4

- Remove the clean air filter from the clean air module.
  Note: Refer to the additional module procedure in section 6.2.
- Loosen two hexagon socket head cap screws and remove the connecting bracket A.
- After removing the connecting bracket A, open the filter body and take out the element.
  Note: Do not lose the connecting bracket.
- Assemble a new element on the filter body.
  Note: The arrow on the element and the arrow on the filter body must point in the same direction.
- Check the two connecting brackets B are attached to the filter body and assemble the filter body to the groove of the block.
- Mount the connecting bracket A on the assembled filter body and tighten the hexagon socket head cap screws to a torque of 1.6 to 2.0 N•m
- After replacing the elements, flush with air before operation.

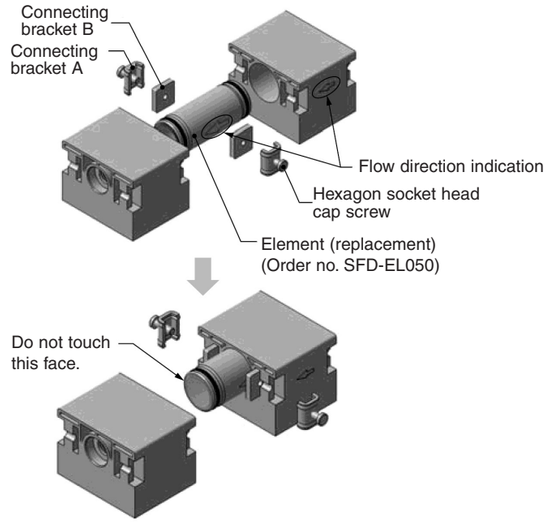


Figure 20

7 Limitations of Use

- When the compressed air is used for air blow, the exhausted air from the blow nozzle may have taken in airborne foreign matter (such as solid particle, fluid particle) from the surrounding air. The foreign matter will be sprayed on the work and may adhere to it. Therefore, use in a suitable environment.

7.1 Digital Flow Switch

⚠ WARNING

- Operate the switch only within the specified voltage. Use of the switch outside the range of the specified voltage can cause not only malfunction and damage of the switch, but also electrocution and fire.
- Do not exceed the maximum allowable load specification. A load exceeding the maximum load specification can cause damage to the switch.
- Do not use a load that generates surge voltage. Although surge protection is installed in the circuit at the output side of the switch, damage may still occur if a surge is applied repeatedly. When a surge generating a load, such as a relay or solenoid is directly driven, use a type of switch with a built-in surge absorbing element.
- The fluids the switch can measure accurately are nitrogen and air. The accuracy cannot be guaranteed if other fluids are used.
- The switch does not have explosion proof structure, so do not use flammable gas, otherwise fire may occur. The flow sensor heats up to approximately 150°C.
- Monitor the internal voltage drop of the switch. When operating below a specified voltage, it is possible that the load may be ineffective even though the pressure switch function is normal. The formula below should be satisfied after confirming the minimum operating voltage of the load.

Supply Voltage	-	Internal voltage drop of switch	>	Minimum operating voltage of load

- Use the switch within the specified flow rate measurement and operating pressure. Operating beyond the specified flow rate and operating pressure can damage the switch.
- Mount switches in locations where there is no vibration greater than 98 m/s², or impact greater than 490 m/s².
- When abruptly reducing the size of piping or when there is a restriction such as a valve on the inlet side, the pressure distribution in the piping changes and makes accurate measurement impossible.

⚠ CAUTION

- Data of the flow switch will be stored even after the power is turned off. Input data will be stored in EEPROM so that the data will not be lost after the flow switch is turned off. (Data can be rewritten for up to one million times and data will be stored for up to 20 years).
- The accumulated flow rate is reset when power is turned off.

7.2 Regulator

⚠ WARNING

- Do not use any tool to operate the pressure regulator knob. Using a tool may cause breakage. Operate the knob by hand.

⚠ CAUTION

- Adjust pressure after unlocking the pressure regulator knob. If the pressure regulator knob does not rotate, it is locked. Pull up the pressure regulator knob once to unlock it. Forcibly rotating the knob may break it.
  After adjusting pressure, lock the knob by pressing down on it.
- Adjust pressure by increasing the pressure. If pressure is adjusted by decreasing the pressure, pressure cannot be set correctly. Rotating the knob clockwise increases the outlet pressure and rotating the knob counter clockwise decreases the pressure.
- As this is a non-relief type regulator, rotating the knob counter clockwise does not decrease the pressure, unless the fluid at the outlet side is consumed.
  If the knob is forcibly rotated, the knob may break.
  If pressure setting is to high, consume fluid at the outlet side once to decrease the outlet pressure to the necessary set pressure or less, and set the pressure again.

7 Limitations of Use (Continued)

⚠ CAUTION

- Check the inlet pressure. The setting of the outlet pressure should be 85% or less of the inlet pressure. If the inlet pressure is low, pressure cannot be set correctly.
- Do not operate with fluid what contains solid matter, otherwise, this may cause malfunction.
- Oscillation (beat) may occur with some operating conditions, even if the operation is within specification. Contact SMC if that is the case.

7.3 ON/OFF Valve

⚠ WARNING

- The maximum operating pressure and back pressure must be within the specified range.

⚠ CAUTION

- Valve leakage is 1 cm^3/min or less (at pneumatic pressure), as shipped from factory.
- Product with flow adjuster can cause oscillation with some operating conditions if operating flow rate is small, so check the flow rate, pressure and piping conditions carefully before operating.
- For flow adjustment with flow adjuster, adjust the flow rate by opening the knob gradually from the fully closed state.
  Turning the adjusting knob counter clockwise opens the valve. Do not apply excessive force to the knob around the fully open or fully closed state, otherwise the orifice seat can be deformed or the adjusting screw knob can be broken. It is shipped from the factory fully closed.
- Have a trial run before operation if the valve has not been used for long periods of time.
- Pay attention to the lever operating direction and handling of the lever.

7.4 Restrictor

⚠ WARNING

- Restrictor cannot be used as a stop valve, which requires zero leakage. There will be some leakage.
- Check the number of rotations of the needle valve. It will not rotate further because of drop-out prevention. Rotating the needle too much may cause damage.

7.5 Filter

⚠ WARNING

- Air equipment what is mounted on the outlet side may generate dust. If this is the case, it will be a factor in cleanliness. Examine the position to install air equipment.
- Set operating flow rate within the specified range;
  LLB3: 100 / /min (ANR) or less
  LLB4: 500 / /min (ANR) or less
  If the operating flow rate is out of the specified range, it will cause functional deterioration and breakage.
- The filter should be installed in a place where pulsation does not occur.
- This product cannot operate compressed air what contains fluids such as water and oil.
  - For the air source for this product, install a dryer, mist separator, micro mist separator, super mist separator, odour removal filter, etc.
  - Generally, compressed air contains the following particle contaminants;
    - Moisture (condensate)
    - Dust in atmospheric air
    - Deteriorated oil exhausted from the compressor
    - Solid foreign matter such as rust from the piping
- Flush the piping with air, for cleaning, before installing product.
  To decrease the affect of dust from a connection, also flush the piping with air before using the product for the first time and when it is replaced.

8 Contacts

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