Clean Air Module
Series LLB

Made to Order

Port size

1	ø10 one-touch fitting
2	Rc1/4
2N	NPT1/4

Note) Use a resin fitting (no metal) for Rc and NPT thread.

Filter

F	With filter
F1	With filter with differential pressure indicator

Standard (100 ℓ/min (ANR)) **LLB3 – 1 – □ □ □ □ F**

High flow type (500 ℓ/min (ANR)) **LLB4 – 1 – □ □ □ □ F**

Port size

1	ø12 one-touch fitting
3	Rc3/8
3N	NPT3/8

Note) Use a resin fitting (no metal) for Rc and NPT thread.

Filter

F	With filter

Restrictor

Nil	Without restrictor
S	With restrictor

Digital flow switch

Nil	Without digital flow switch
P1	NPN open collector 1 output + Analog output (1 to 5 V)
P2	PNP open collector 1 output + Analog output (1 to 5 V)
P3	NPN open collector 2 outputs
P4	PNP open collector 2 outputs
P5	NPN open collector 1 output + Analog output (4 to 20 mA)
P6	PNP open collector 1 output + Analog output (4 to 20 mA)

ON/OFF valve

Nil	Without ON/OFF valve
V	With air operated
V1	With air operated flow adjuster
V2	Manual operation valve (with lever lock)

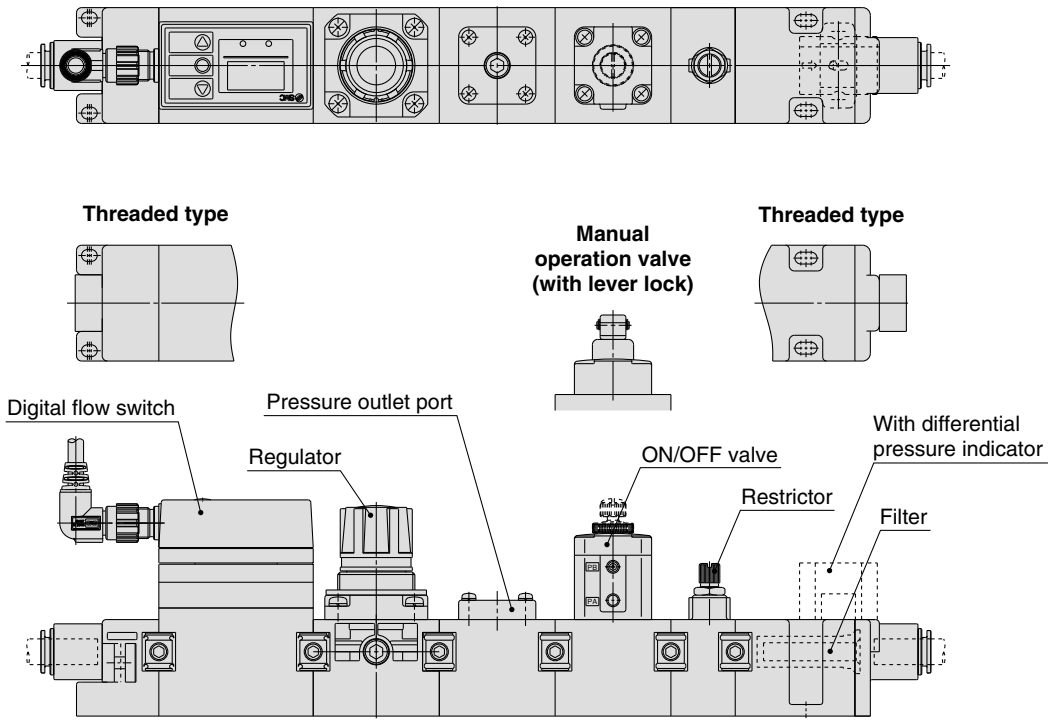
Regulator

Nil	Without regulator
R	With regulator
R1	With regulator + Pressure outlet port assembly

LLB3

LLB4

Variations



Variations

Flow switch **P□**	Regulator **R**	Regulator + Pressure outlet port **R1**	ON/OFF valve **V (V1/V2)**	Restrictor **S**	Filter **F (F1)**	Mass (kg)	
						LLB3	**LLB4**
●	—	—	—	—	●	0.36	0.84
●	●	—	—	—	●	0.52	1.18
●	—	—	●	—	●	0.47	1.10
●	—	—	—	●	●	0.41	1.09
●	—	—	●	●	●	0.52	1.35
●	●	—	●	—	●	0.63	1.44
●	●	—	—	●	●	0.57	1.44
●	—	●	—	—	●	0.59	1.36
●	●	—	●	●	●	0.61	1.70
●	—	●	—	●	●	0.57	1.61
●	—	●	●	—	●	0.63	1.62
●	—	●	●	●	●	0.76	1.87
—	●	—	—	—	●	0.33	0.90
—	●	—	—	●	●	0.39	1.15
—	●	—	●	—	●	0.44	1.16
—	●	—	●	●	●	0.50	1.41
—	—	●	—	—	●	0.41	1.07
—	—	●	—	●	●	0.46	1.32
—	—	●	●	—	●	0.52	1.33
—	—	●	●	●	●	0.51	1.71
—	—	—	●	—	●	0.28	0.82
—	—	—	●	●	●	0.34	1.07
—	—	—	—	●	●	0.23	0.81
—	—	—	—	—	●	0.19	0.49

Specifications

Model	LLB3	LLB4

Clean Air Module Common Specifications

Fluid			Clean air, N_2 gas (Inlet air conditions: equivalent to ISO 8573-1 and Quality Class 1.4.1-1.6.1) Note 3)	
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) ∗ The guaranteed display of digital flow switch ranges between 15 to 35°C.	
Ambient temperature				
Flow range Note 1)			5 to 100 ℓ/min (ANR)	50 to 500 ℓ/min (ANR)
Nominal filtration rating Note 2)			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) The maximum flow rate varies depending on set pressure. Refer to "Flow Characteristics" for detail.
Note 2) According to SMC measurement conditions.
Note 3) Refer to the back of page 2 "Operating Environment."

Digital Flow Switch Unit Specifications

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	**Switch output**		NPN or PNP open collector 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 (12 VDC), 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 S or less	
Power supply voltage			12 to 24 VDC (Ripple ±10% or less)	
Current consumption			160 mA or less	170 mA or less
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 contact space material		**Mesh**	Stainless steel	
		Sensor housing	PBT	
		Sensor	Lead glass (exempted from the RoHS application)	
			PtIr	
			FeNI	

Regulator Unit Specifications

Relief mechanism		Non-relief
Fluid contact space material	**Diaphragm**	FKM

ON/OFF Valve Unit Specifications

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 cm^3/min (ANR) or less	

Specifications

Model		LLB3	LLB4

Restrictor Unit Specifications

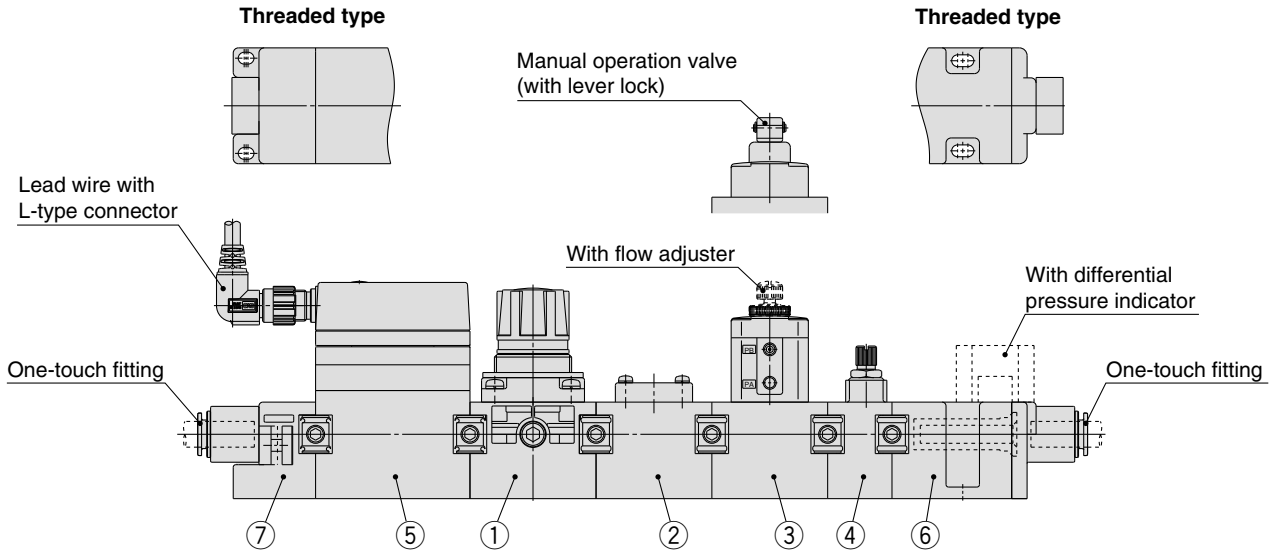
Cv factor		0.28	1.4
Number of needle rotations		8 rotations	10 rotations
Fluid contact space material	**Needle**	Stainless steel	

Filter Unit Specifications

Normal filtration rating Note 1)		0.01 μm (Filtration efficiency 99.99%)	
Element withstand differential pressure Note 2)		0.5 MPa	
Flow capacity		to 100 ℓ/min (ANR)	to 500 ℓ/min (ANR)
Fluid contact space material	**Filter case**	PC	
	Hollow fiber	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 "Installation" of Specific Product Precautions prior to use.

Component Parts

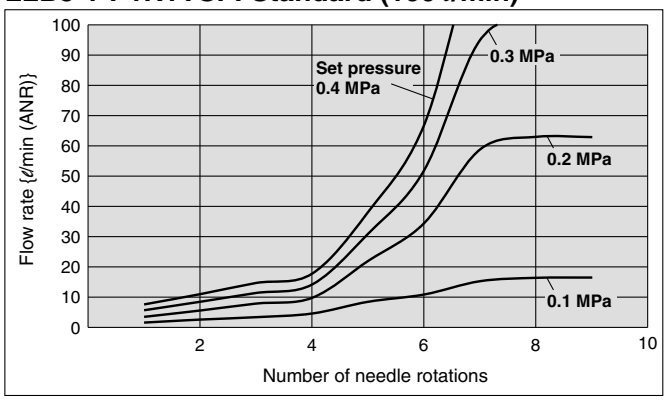


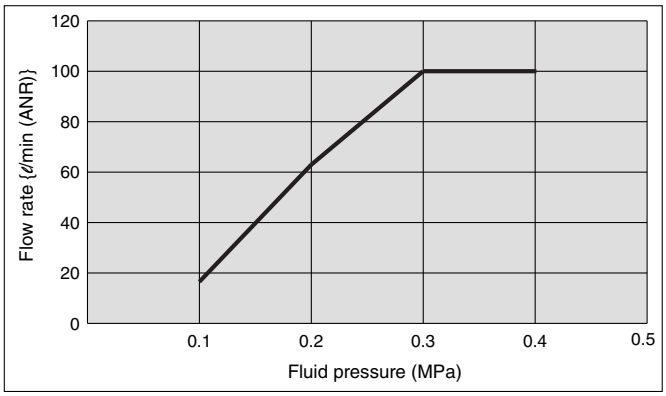
No.	Description		Individual part no.		Note
			LLB3	**LLB4**	
1	**Clean regulator assembly**	—	LVB3-1	LVB4-1	—
2	**Pressure outlet port assembly**	—	LVB3-2	LVB4-2	—
3	**ON/OFF valve assembly/ Air operated valve**	Without flow adjuster	LVB2-3	LVB4-3	—
		With flow adjuster	LVB2-3-1	LVB4-3-1	—
	ON/OFF valve assembly/Manual operation valve	—	LVB2-3-2	LVB4-3-2	—
4	**Restrictor assembly**	—	LVB2-4	LVB4-4	—
5	**Digital flow switch assembly**	5 to 100 ℓ/min	LVB3-6-□	—	With L-type connector With lead wire (3 m)
		50 to 500 ℓ/min	—	LVB4-6-□	
6	**Clean air filter assembly**	With ø10 one-touch fitting	LVB3-7-2	LVB4-7 (Filter body only)	With one-touch fitting
		Rc1/4	LVB3-7-3		Threaded type
		NPT1/4	LVB3-7-4		
		With ø10 one-touch fitting, with differential pressure indicator	LVB3-7-2-1		With one-touch fitting
		Rc1/4, with differential pressure indicator	LVB3-7-3-1		Threaded type
		NPT1/4, with differential pressure indicator	LVB3-7-4-1		
		Replacement element	SFD-EL101	SFD-EL050	—
7	**End plate assembly**	With ø10 one-touch fitting	LVB3-8-2	—	With one-touch fitting
		Rc1/4	LVB3-8-3	—	Threaded type
		NPT1/4	LVB3-8-4	—	
		With ø12 one-touch fitting	—	LVB4-8-1	With one-touch fitting
		Rc3/8	—	LVB4-8-2	Threaded type
		NPT3/8	—	LVB4-8-3	

∗ Each module has 2 connecting brackets.

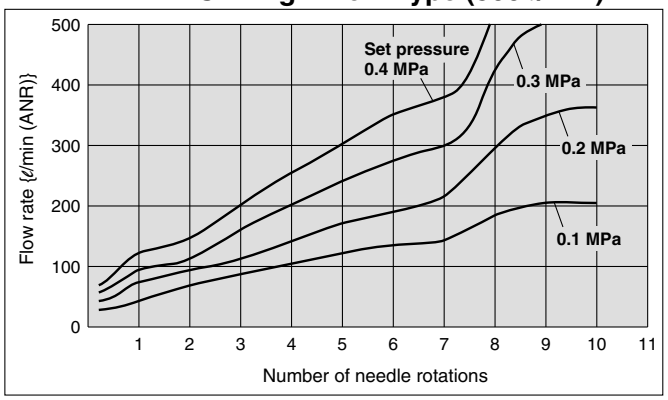
Flow Characteristics

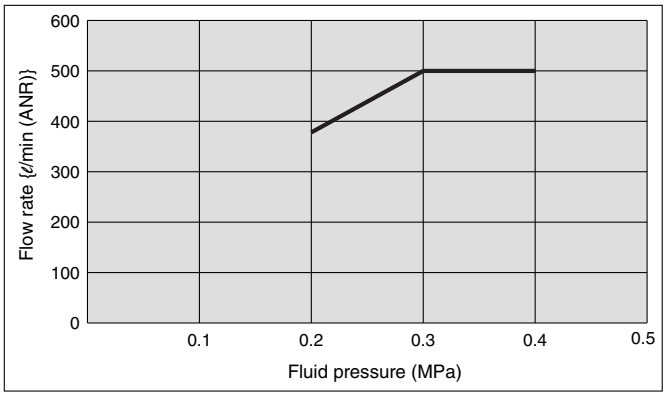
LLB3-1-P1R1VSF: Standard (100 ℓ/min)





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



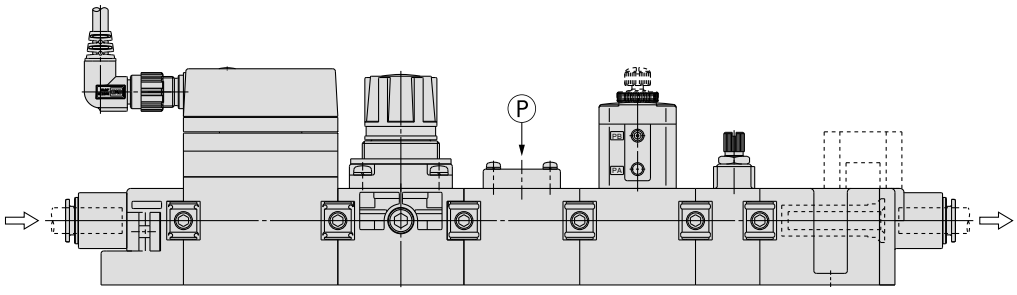


<Test Conditions>

Model: LLB3-1-P1R1VSF and LLB4-1-P1R1VSF

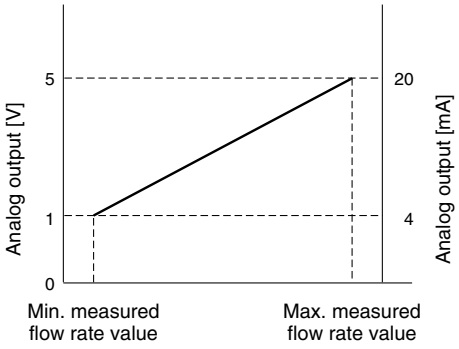
Supplied pressure: 0.5 MPa

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.



Digital Flow Switch Output Specifications

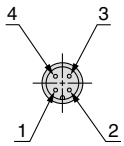
• Analog output



Flow Rate Range by Type

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

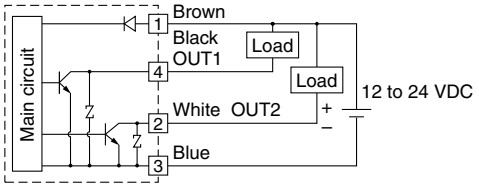
• Connector pin numbers



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

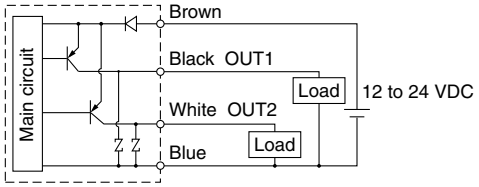
• Internal circuits and wiring examples

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



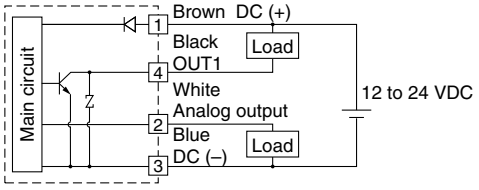
Max. 30 V, 80 mA
Internal voltage drop 1 V or less

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



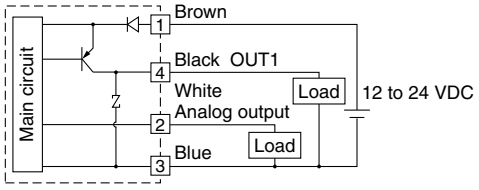
Max. 80 mA
Internal voltage drop 1.5 V or less

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)

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



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

Functions

Refer to the operation manual for how to set and to operate.

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 accumulatd flow rate is reset when power is turned off.

Flow rate conversion

Normal condition {0°C, 101.3 kPa, Dry air} or standard condition (ANR) {20°C, 101.3 kPa, 65% RH} can be selected.

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.

Key lock

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

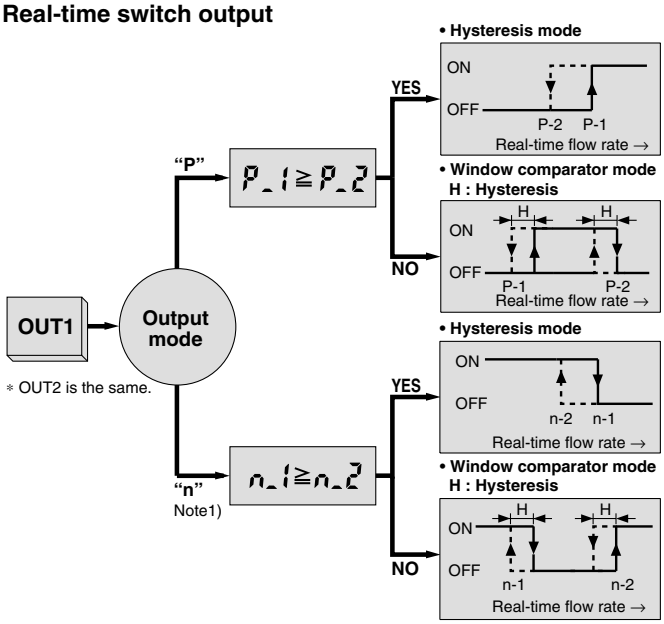
Error correction

LED display	Contents	Solution
Er 1	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.

Output types

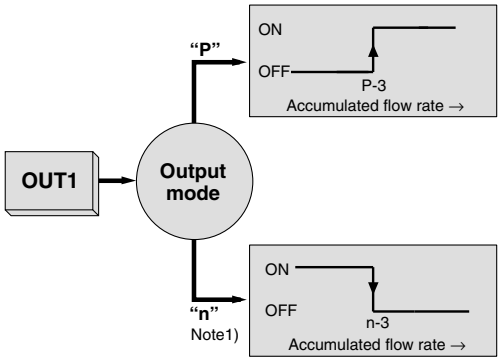
Real-time switch output, accumulated switch output, or accumulated pulse output can be selected as an output type.

Real-time switch output



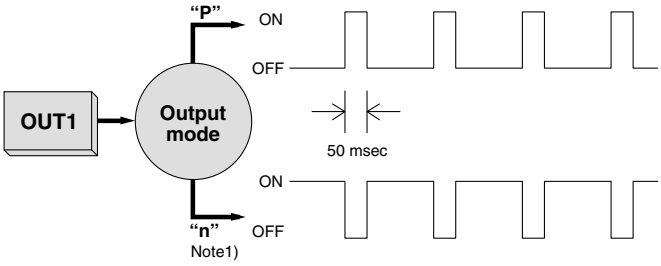
Note 1) Output mode is set to inverted output when shipped from factory.

Accumulated switch output



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

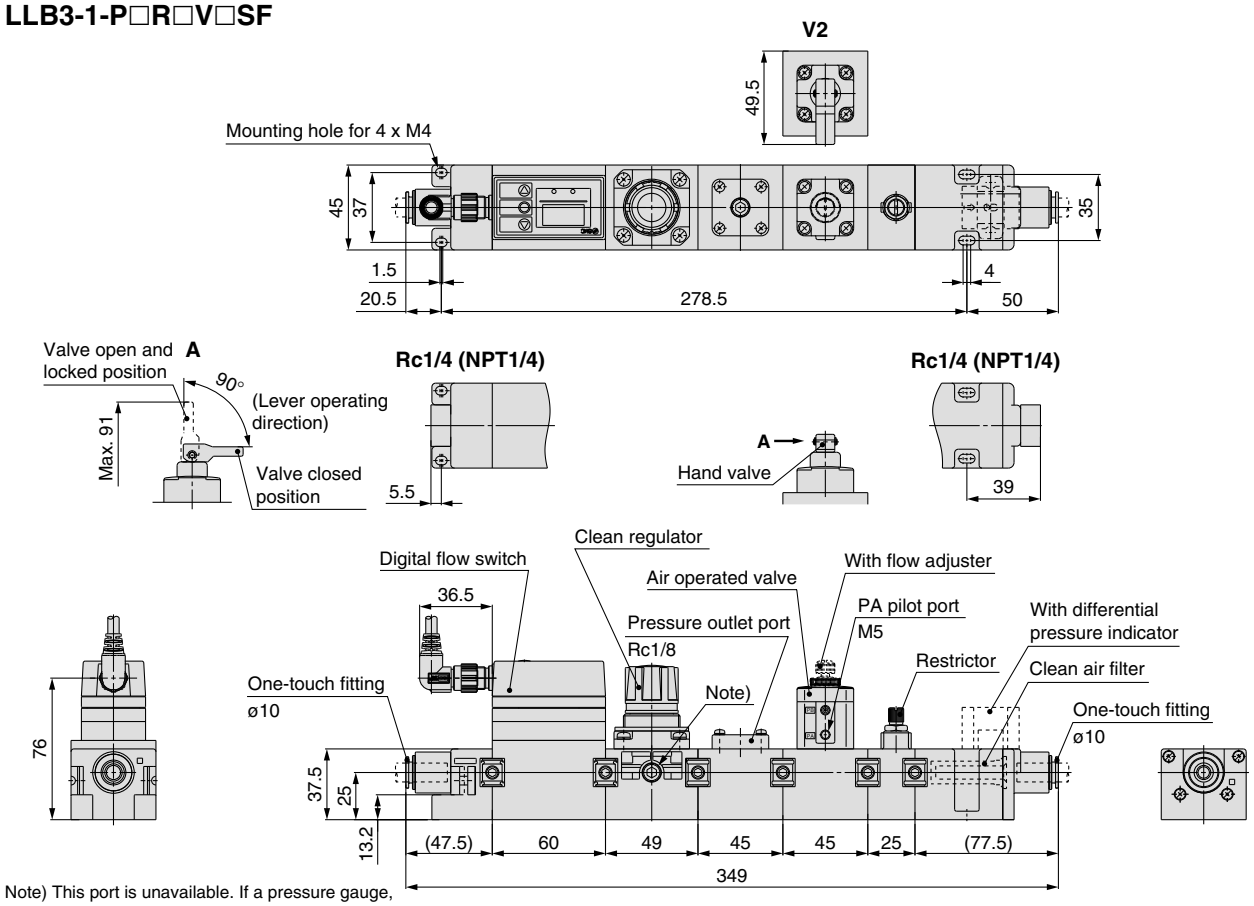
Accumulated pulse output



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

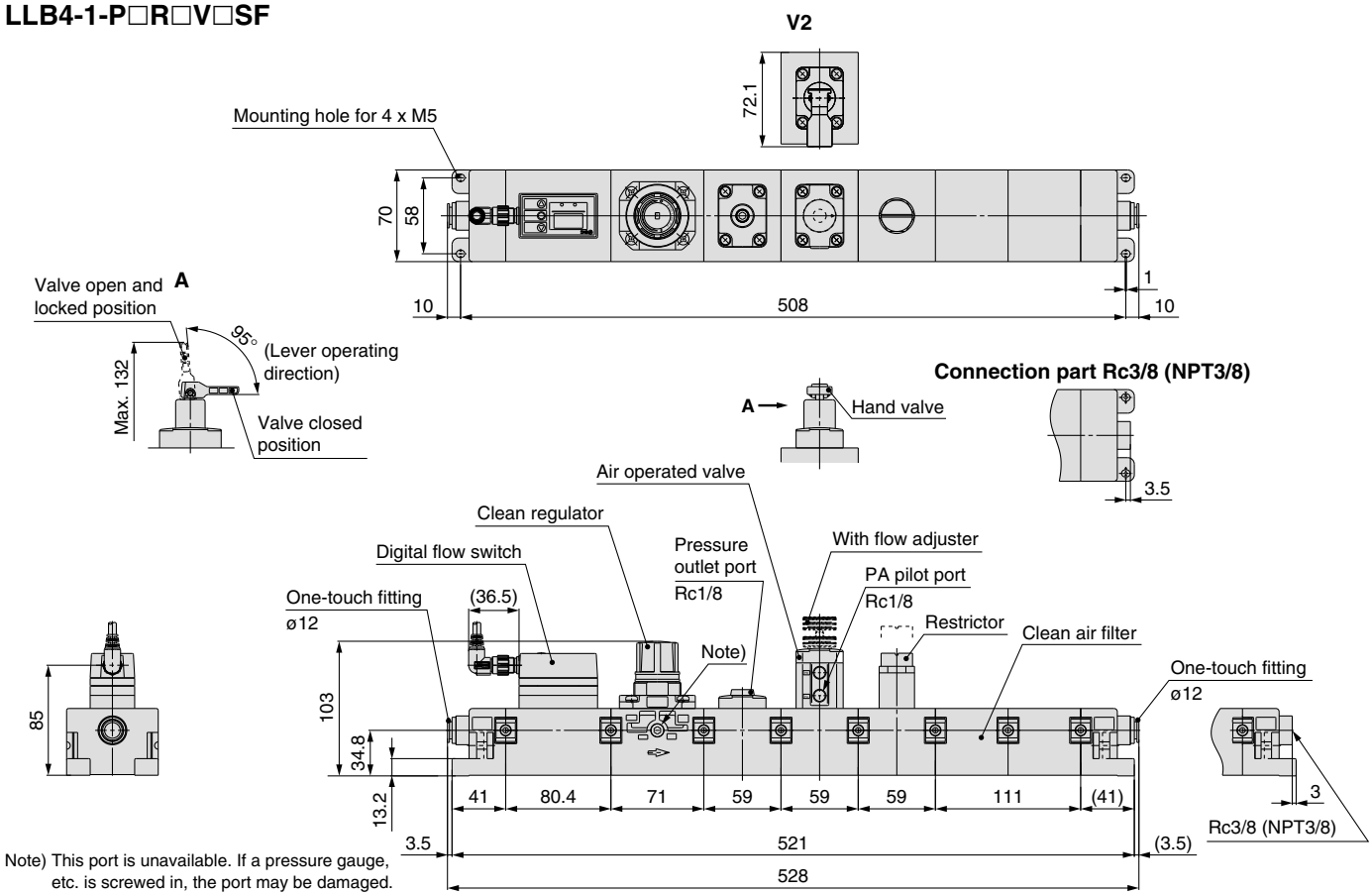
Dimensions

LLB3-1-P□R□V□SF



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

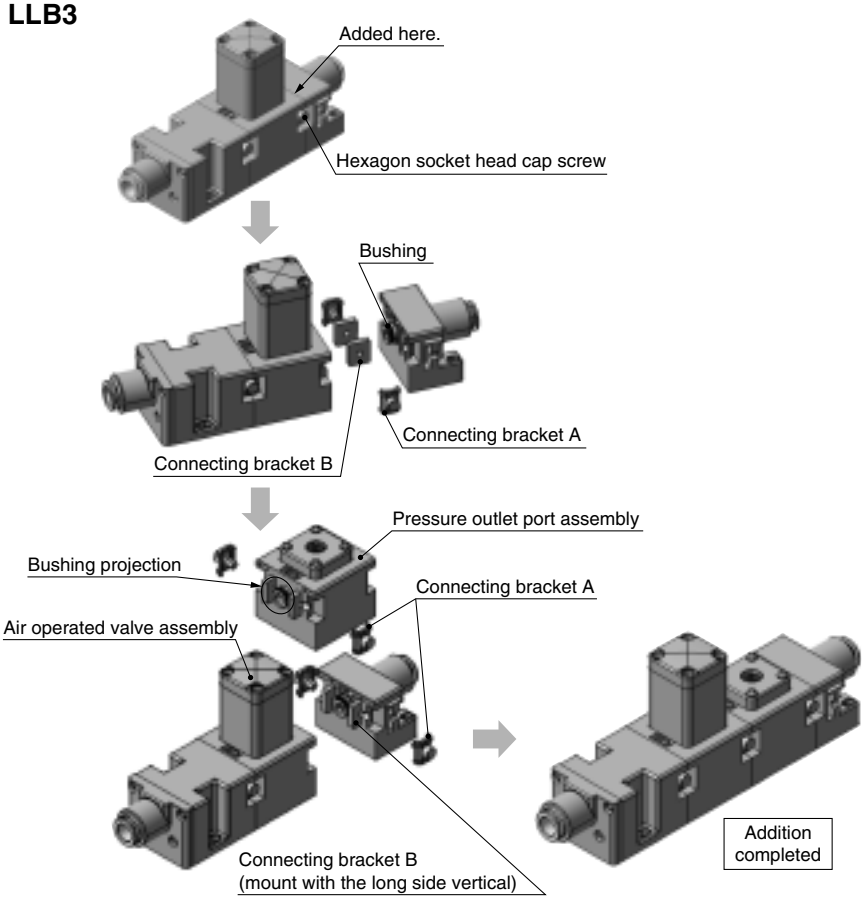
LLB4-1-P□R□V□SF



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

Additional Module Procedure

LLB3



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

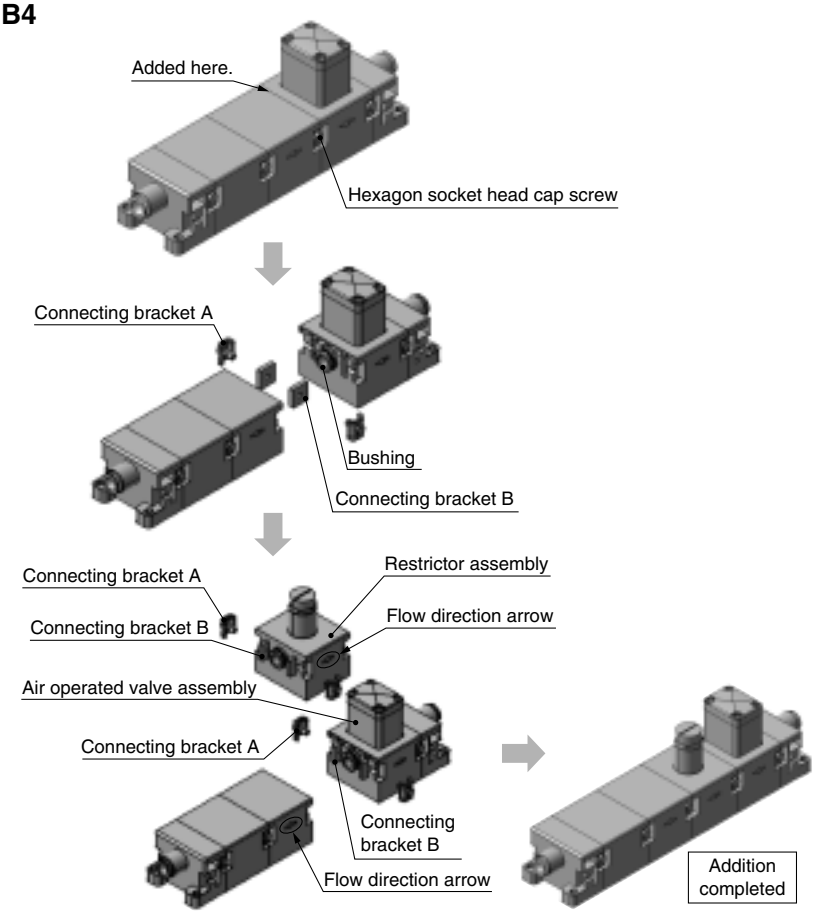
① Loosen two hexagon socket head cap screws at the position where the clean air module is added, and remove the connecting bracket A.

② After removing the connecting bracket A, separate the forward and backward blocks from each other.
Note) Do not lose the connecting bracket A.

③ Check that the connecting brackets B (at two positions) are attached, and insert the bushing projection of the pressure outlet port assembly into the indent of the air operated valve assembly. Similarly, insert the end plate assembly into the pressure outlet port assembly.

④ Mount the connecting bracket A, and tighten the hexagon socket head cap screw with the following torque.
Tightening torque: 1.0 to 1.4 N·m

LLB4



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

① Loosen two hexagon socket head cap screws at the position where the clean air module is added, and remove the connecting bracket A.

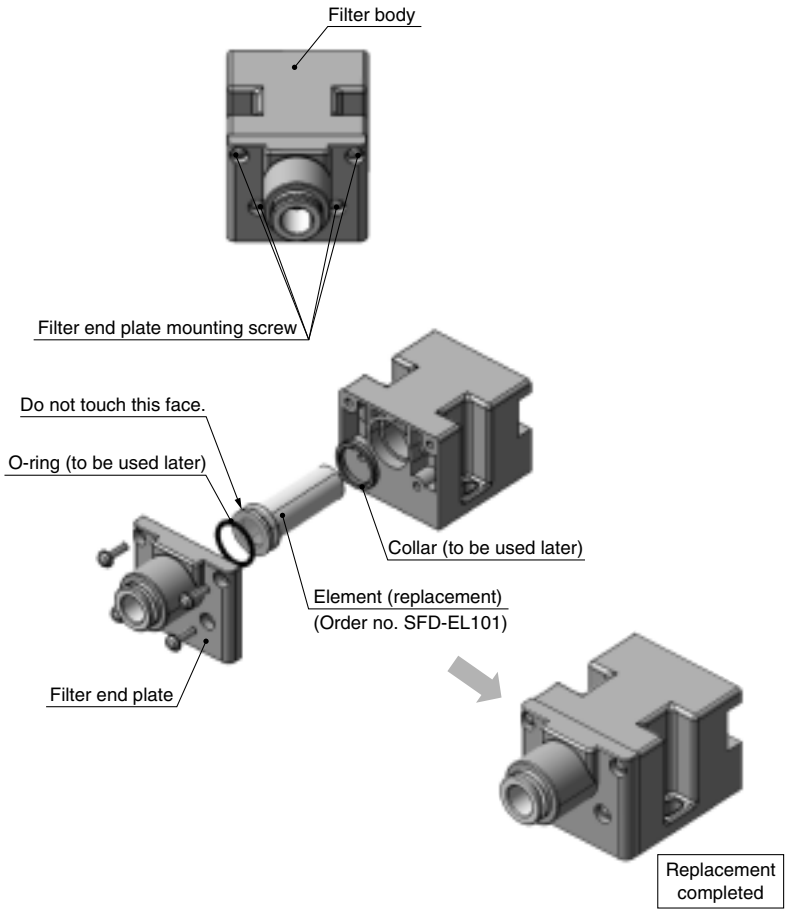
② After removing the connecting bracket A, separate the forward and backward blocks from each other.
Note) Do not lose the connecting bracket A.

③ 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.

④ Mount the connecting bracket A, and tighten the hexagon socket head cap screw with the following torque.
Tightening torque: 1.6 to 2.0 N·m

Element Replacing Procedure

LLB3



① Loosen the four filter end plate mounting screws on the clean air module.

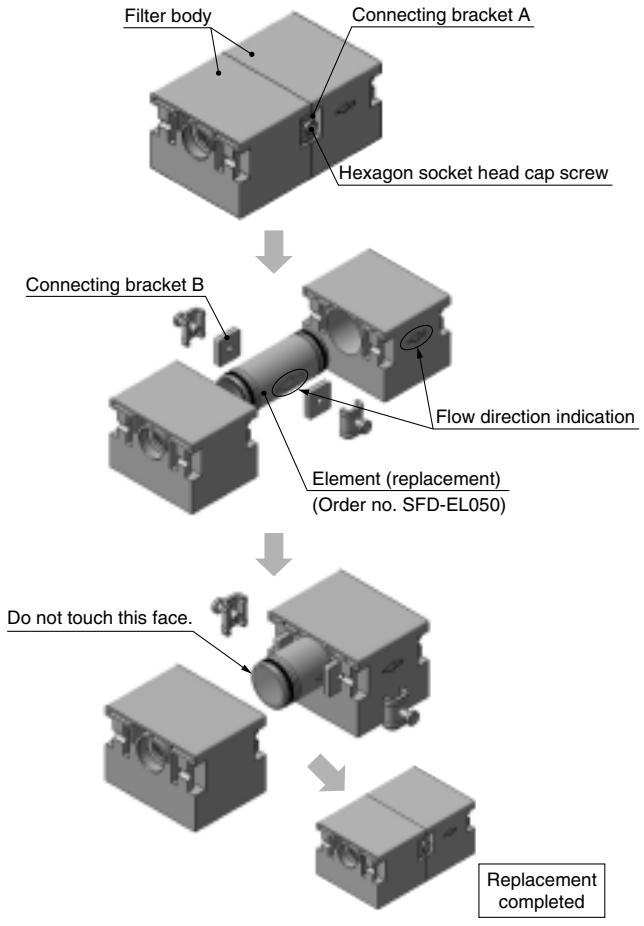
② After removing the filter end plate, take out the element.
Note) Do not lose the collar and O-ring.

③ Assemble a new element on the filter body.

④ Mount the filter end plate, and tighten the screws with the following torque.
Tighten the screws diagonally so that torque can be given to the screws evenly.
Tightening torque: 0.45 to 0.55 N·m

⑤ After replacing the elements, flush air before operation.

LLB4



① Remove the clean air filter from the clean air module.
* Refer to the additional module procedure on page 9 for removal.

② Loosen two hexagon socket head cap screws and remove the connecting bracket A.

③ After removing the connecting bracket A, open the filter body, and take out the element.
Note) Do not lose the connecting bracket.

④ Assemble a new element on the filter body.
Note) The arrow on the element and the arrow in the filter body must point in the same direction.

⑤ Check that two connecting brackets B are attached to the filter body, and assemble the filter body to the groove of the block.

⑥ Mount the connecting bracket A on the assembled filter body, and tighten the hexagon socket head cap screw with the following torque.
Tightening torque: 1.6 to 2.0 N·m

⑦ After replacing the elements, flush air before operation.