



ORIGINAL INSTRUCTIONS

**Instruction Manual
Clean Air Modules
Series LLB3, LLB4**



The intended use of this product is to control and measure the supply of clean air or Nitrogen into clean room applications. This product is modular and can consist of a digital flow switch, regulator, on/off valve, restrictor and filter.

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: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.

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 Clean Air Module Common Specifications

Model	LLB3	LLB4
Fluid ^{Note 3)}	Clean Air, N ₂	
Set pressure	0.05-0.4 MPa	
Withstand Pressure	1.0 MPa	
Fluid Temperature ^{Note 1)}	5°C to 45°	
Ambient Temperature ^{Note 1)}	5°C to 45°	
Flow Range (L/min (ANR))	5 to 100	50 to 500
Nominal Filtration Rating ^{Note 2)}	0.01µm (99.99% Efficiency)	
Fluid Contact Space	Grease-free, Silicone-free	
Material	Body	PBT
	Module Connection Seal	FKM
	One-touch fitting seal	EPDM

Table 1.

Note 1) No Freezing. The guaranteed display of the digital flow switch ranges between 15°C to 35°C.

2 Specifications - Continued

Note 2) According to SMC measurement conditions.
Note 3) Inlet air conditions: equivalent to ISO 8573-1:1991 [1:4:1] - [1:6:1].

2.2 Digital Flow Switch Unit Specifications

Model	LLB3	LLB4	
Detection Type	Thermal Type		
Measured Flow Range (L/min (ANR))	5 to 100	50 to 500	
Minimum Unit Setting (L/min)	1	5	
Accumulated pulse flow rate exchange value (Pulse Width: 50 [ms])	1 L/Pulse	5 L/pulse	
Accumulated Flow Range	0 to 999999L		
Linearity	±5% F.S. or less ^{Note 1)}		
Repeatability	±2% F.S. or less		
Temperature Characteristics	±5% F.S. or less ^{Note 1)}		
Specifications	Switch Output	NPN or PNP open collector output	
		Max. Load Current	80 mA
		Max. Applied Voltage	30 VDC (at NPN output)
	Analog Output	Internal Voltage Drop	NPN output: ≤1V (at 80 mA) PNP output: ≤1.5V (at 80 mA)
		Voltage Output	Output voltage 1 to 5V Allowable load resistance: ≥100kΩ
		Current Output	Output current 4 to 20 mA Allowable load resistance: ≤300Ω (12 VDC) ≤600Ω (24 VDC)
Status LED's	Lights up when output is ON, OUT1: Green; OUT2: Red (OUT1 only for analog output)		
Response Time	1s or less		
Power Supply Voltage	12-24 VDC (Ripple ±10% or less)		
Current Consumption	≤160 mA	≤170 mA	
Withstand Voltage	1000 VAC for 1 min. between external terminal and case		

Insulation Resistance	50 MΩ or more (500 VDC measured via megohmmeter) 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	Mesh	Stainless Steel
	Sensor Housing	PBT
	Sensor	Lead Glass (RoHS Exempt) Ptr FeNi

Table 2.

Note 1) 15°C to 35°C: Based on 25°C

2.3 Regulator Unit Specifications

Model	LLB3	LLB4
Relief Mechanism	Non-Relief	
Fluid Contact Space Material	Diaphragm FKM	

Table 3.

2.4 ON/OFF Valve Unit Specification

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	4mm	8mm
Cv Factor	0.35	1.7
Fluid Contact Space Material	Diaphragm PTFE	
Valve Leakage	1 cm ³ /min (ANR) or less	

Table 4.

2 Specifications - Continued

2.5 Restrictor Unit Specifications

Model	LLB3	LLB4
Cv Factor	0.28	1.4
Number of Needle Rotations	8	10
Fluid Contact Space Material	Needle Stainless Steel	

Table 5.

2.6 Filter Unit Specifications

Model	LLB3	LLB4
Nominal Filtration Rating ^{Note 1)}	0.01µm (99.99% Efficiency)	
Element Withstand Differential Pressure ^{Note 2)}	0.5 MPa	
Flow Capacity (L/min (ANR))	Up to 100	Up to 500
Fluid Contact Space Material	Filter Case	PC
	Hollow Fibre	PP
	Potting	PU

Table 6.

Note 1) According to SMC measurement conditions.
Note 2) This means that the element will not break at 0.5 MPa.

Warning

Special products (-X) might have specifications different from those shown in this section. Contact SMC for specific drawings.

3 Installation

3.1 Installation

Warning

- Do not install the product unless the safety instructions have been read and understood.
- Verify the color and terminal number when wiring.
- Avoid repeatedly bending or stretching the lead wire.
- Confirm proper insulation of wiring.
- Do not wire in conjunction with power lines or high voltage lines.
- Do not allow loads to short circuit.
- The maximum operating pressure and back pressure must be within the specified range.
- Set operating flow rate within the specified range.
- Restrictor cannot be used as a stop valve, which requires zero leakage.

3.2 Environment

Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- 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 specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.
- When the product is used for blowing, use caution to prevent the work from being damaged by entrained air from the surrounding area.
- Mount switches in locations where there is no vibration greater than 98 m/s², or impact greater than 490 m/s².
- Do not use in an area where surges are generated.
- Switches are not equipped with surge protection against lightning.

3.3 Piping

Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. 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 connection of fittings to the IN and OUT ports.
- Tighten fittings to the specified tightening torque.

Thread Size	Rc, NPT 1/4	Rc, NPT 3/8
Tightening Torque	0.5 to 1 Nm	2 to 3 Nm

Table 7.

- Connect tubing to the IN and OUT one-touch fittings in accordance with the precautions for one-touch fittings.
- When tubing of brands other than SMC's are used, verify that the tubing O.D. satisfies the following accuracy;
 - Polyolefin tubing: Within ±0.1 mm
 - Polyurethane tubing: Within +0.15 mm, -0.2 mm
 - Nylon tubing: Within ±0.1 mm
 - Soft nylon tubing: Within ±0.1 mm

3 Installation - Continued

- Do not use tubing which does not meet these outside diameter tolerances. It may not be possible to connect them, or they may cause other trouble, such as air leakage or the tube pulling out after connection.
- The recommended tube for the clean fitting is polyolefin tube. Other tubes can satisfy the performance in terms of leakage, tensile strength, etc., but impair the cleanliness. Note this point for use.

3.4 Lubrication

Caution

- Wetted parts of LLB are Grease-Free, Silicone Free
- Do not use lubricant in the system.

4 Settings

4.1 Pressure Adjustment

- Rotating the regulator knob clockwise increases the outlet pressure.
- Rotating the regulator knob counterclockwise decreased the outlet pressure.
- Do not use any tool to operate the pressure regulator knob.
- If pressure setting is too 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.

4.2 Restrictor Adjustment

- For flow adjustment, adjust the flow rate by opening the knob gradually from the fully closed state.
- Turning the adjusting knob counterclockwise opens the valve.
- Turning the adjustment knob clockwise closes the valve.

5 How to Order

Refer to drawings or catalogue for 'How to Order'.

6 Outline Dimensions

Refer to drawings or 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.
- 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 has elapsed.
 - When the set flow rate is not achieved even if it has been less than 1 year since operation started.

8 Limitations of Use

8.1 Limited warranty and disclaimer/compliance requirements
Refer to Handling Precautions for SMC Products.

9 Product Disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose this product correctly, in order to reduce the impact on human health and the environment.

10 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor/importer.

SMC Corporation

URL : <https://www.smcworld.com> (Global) <https://www.smc.eu> (Europe)
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