2 Specifications

2.1 General Specifications
Clean Air Module Common Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>LLB3</th>
<th>LLB4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid</td>
<td>Clean air, N₂ gas</td>
<td>Clean air, N₂ gas</td>
</tr>
<tr>
<td>Maximum operating pressure</td>
<td>0.7 MPa</td>
<td>0.7 MPa</td>
</tr>
<tr>
<td>Min. pressure</td>
<td>0.06 to 0.1 MPa</td>
<td>0.06 to 0.1 MPa</td>
</tr>
<tr>
<td>Withstand pressure</td>
<td>1.0 MPa</td>
<td>1.0 MPa</td>
</tr>
<tr>
<td>Fluid temperature</td>
<td>5°C to 45°C (No freezing)</td>
<td>5°C to 45°C (No freezing)</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Flow rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow rate range</td>
<td>0 to 100</td>
<td>0 to 500</td>
</tr>
<tr>
<td>Minimum flow rate</td>
<td>5 l/min (ANR)</td>
<td>5 l/min (ANR)</td>
</tr>
<tr>
<td>Nominal filtration rating</td>
<td>0.01 μm (Filtration efficiency 99.99%)</td>
<td>-</td>
</tr>
<tr>
<td>Fluid contact space</td>
<td>Stainless steel</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>Material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module connection seal</td>
<td>FKM</td>
<td>FKM</td>
</tr>
<tr>
<td>One-touch fitting seal</td>
<td>EPDM</td>
<td>EPDM</td>
</tr>
</tbody>
</table>

Digital Flow Switch Unit Specifications

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.

Table 1

Note 1) According to SMC measurement conditions.
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.

Table 2

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.

Table 3

Note 1) According to SMC measurement conditions.
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.

Table 4

Note 1) According to SMC measurement conditions.
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.

Table 5

Note 1) According to SMC measurement conditions.
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.

Table 6

Note 1) According to SMC measurement conditions.
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.

Table 7

Note 1) According to SMC measurement conditions.
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.

Table 8

Note 1) According to SMC measurement conditions.
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.

Table 9

Note 1) According to SMC measurement conditions.
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.
2 Specifications (Continued)

2.2 Component Parts

1. Clean regulator assembly  
   Individual part no.: LV83-1  
   LV84-1

2. Pressure outlet port assembly  
   Individual part no.: LV83-2  
   LV84-2

3. ON/OFF valve assembly / Air operated valve  
   Individual part no.: LV83-3  
   LV84-3

4. Resistor assembly  
   Individual part no.: LV83-4  
   LV84-4

3 Specifications (Continued)

2.3 Options

1. Supplier: LC, the pressure gauge, etc. is screwed in to the necessary, exposed. Use a protective cover.

4. Do not mount the product in a location where it is subject to strong vibrations and/or shock. Check the product specifications.

5. Do not mount the product in a location exposed to radiant heat.

3.2 Environment

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

2. Install the product ensuring there is sufficient space for maintenance.

3. Give careful consideration to the operating conditions such as the application, fluid and environment and use within the operating ranges specified in this document.

Table 9

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Individual part no.</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Digital flow switch assembly</td>
<td>LV83-6-4</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>With L-type connector</td>
<td>LV83-6-5</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>With load wire (3 m)</td>
<td>LV83-6-6</td>
<td>-</td>
</tr>
</tbody>
</table>

6. Clean air filter assembly  
   Individual part no.: LV83-7-3  
   LV83-7-4  
   LV83-7-1  
   LV83-7-4-1  
   LV83-7-2  
   LV83-7-1  
   LV84-7-1  
   LV84-7-2  
   LV84-7-3  
   LV84-7-4  
   LV84-7-5  
   LV84-7-6  
   LV84-7-7  
   LV84-7-8  
   LV84-7-9  
   LV84-7-10  

3.3 Piping

1. Before piping, make sure to clean up chips, cutting oil, dust etc.

2. When installing piping or fittings, ensure sealant material does not enter the fluid.

3. Use fittings with resin threads for the IN and OUT ports.

4. Use the switch within the specified fluid and ambient temperature range.

5. Do not mount the product in a location exposed to radiation.

Table 10

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Individual part no.</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Clean air filter assembly</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

7. End plate assembly  
   Individual part no.: SFD-EL010  
   SFD-EL050

Table 8

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Individual part no.</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>End plate assembly</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Connector pin numbers</th>
<th>Function descripted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC (+)</td>
</tr>
<tr>
<td>2</td>
<td>Analog output</td>
</tr>
<tr>
<td>3</td>
<td>OUT1</td>
</tr>
<tr>
<td>4</td>
<td>OUT2</td>
</tr>
</tbody>
</table>

**Figure 7**

- Hold the body of the switch when handling. The tensile strength of the lead wire with connector is 44N. 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**

### Table 14

<table>
<thead>
<tr>
<th>Flow rate confirmation display</th>
<th>Contents</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A current of more than 60 mA is flowing to OUT1</td>
<td>Check the load and wiring for OUT1</td>
</tr>
<tr>
<td>2</td>
<td>A current of more than 60 mA is flowing to OUT2</td>
<td>Check the load and wiring for OUT2</td>
</tr>
<tr>
<td>4</td>
<td>The setting data has changed for whatever reasons.</td>
<td>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.</td>
</tr>
</tbody>
</table>

**LLD display**

**Figure 9**

- 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.

4 Setting

**Digital Flow Switch**

**Functions:**

- 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**

<table>
<thead>
<tr>
<th>LED display</th>
<th>Contents</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Er1</td>
<td>A current of more than 60 mA is flowing to OUT1</td>
<td>Check the load and wiring for OUT1</td>
</tr>
<tr>
<td>Er2</td>
<td>A current of more than 60 mA is flowing to OUT2</td>
<td>Check the load and wiring for OUT2</td>
</tr>
<tr>
<td>Er3</td>
<td>The setting data has changed for whatever reasons.</td>
<td>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.</td>
</tr>
<tr>
<td>Er4</td>
<td>The flow rate is over the flow rate measurement range.</td>
<td>Reduce the flow rate until it is within the flow rate measurement range, using an adjustment valve.</td>
</tr>
</tbody>
</table>

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**

**Figure 10**

- Window comparator mode
- Hysteresis

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

**Accumulated switch output**

**Figure 11**

- Window comparator mode
- Hysteresis

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

**Accumulated pulse output**

**Figure 12**

- Window comparator mode
- Hysteresis

**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.

5 Internal Circuit & Wiring

- 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.

**Figure 13**

**NPN open collector 2 outputs**

**Figure 14**

<table>
<thead>
<tr>
<th>NPN open collector 1 output +Analog output</th>
</tr>
</thead>
<tbody>
<tr>
<td>P5: Analog output to 5 V</td>
</tr>
<tr>
<td>Allowable load resistance 100 kΩ or more</td>
</tr>
<tr>
<td>P5: Analog output to 20 mA</td>
</tr>
<tr>
<td>Allowable load resistance 300 kΩ or less</td>
</tr>
</tbody>
</table>

**LLB4, 4-TFM20GB**
6.1 General Maintenance

- 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 equipment 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 pressure loss and 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.
- 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 Nm.

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.

6.4 Maintenance (Continued)

- After replacing the elements, flush with air before operation.
- 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 generates 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 fluid sensor heats up to approximately 100°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.

7. Limitations of Use

- 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 to malfunction and lead to equipment damage.
- Data of the flow switch will be stored even after the power is turned off.

8. Maintenance (Continued)

- Loosen the four filter end plate mounting screws on the clean air module.
- Point the arrow on the module and the arrow on the block must point in the same direction.
- After the removing the connecting bracket A, separate the forward and aft blocks from each other.
- Do not lose the connecting bracket A.
- 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 Nm.
- After replacing the elements, flush with air before operation.

9. 7 Limitations of Use

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

10. 7.3 Regulator

- Adjust pressure by 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.
- After adjusting pressure, lock the knob by pressing down on it.
- Adjust pressure by increasing the pressure. Pressure is adjusted 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-refill 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 cm³/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.
- Flow adjustment with flow adjuster, adjust the flow rate by opening the knob gradually from the fully closed state. Turning the adjusting knob counterclockwise 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 l/min (ANR) or less
  - LLB4: 500 l/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

<table>
<thead>
<tr>
<th>Country</th>
<th>Phone</th>
<th>Country</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUSTRIA</td>
<td>(43) 2262 0286</td>
<td>NETHERLANDS</td>
<td>(31) 20 531 8888</td>
</tr>
<tr>
<td>BELGIUM</td>
<td>(32) 3 355 1464</td>
<td>NORWAY</td>
<td>(47) 67 12 90 20</td>
</tr>
<tr>
<td>CZECH REP.</td>
<td>(420) 541 424 611</td>
<td>POLAND</td>
<td>(48) 22 211 9500</td>
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<tr>
<td>DENMARK</td>
<td>(45) 7052 2003</td>
<td>PORTUGAL</td>
<td>(35) 21 471 1850</td>
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<tr>
<td>FINLAND</td>
<td>(308) 207 53513</td>
<td>SLOVAKIA</td>
<td>(421) 2 444 56725</td>
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<td>FRANCE</td>
<td>(33) 1 8478 1000</td>
<td>SLOVENIA</td>
<td>(386) 73 885 412</td>
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<td>GERMANY</td>
<td>(49) 6103 4020</td>
<td>SPAIN</td>
<td>(34) 945 184 160</td>
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<td>GREECE</td>
<td>(30) 210 271 7265</td>
<td>SWEDEN</td>
<td>(46) 8 850 1200</td>
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<tr>
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<td>(36) 3 351 390</td>
<td>SWITZERLAND</td>
<td>(41) 52 396 3131</td>
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<tr>
<td>IRELAND</td>
<td>(353) 1 403 9000</td>
<td>UNITED KINGDOM</td>
<td>(44) 1908 583 888</td>
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<tr>
<td>ITALY</td>
<td>(39) 02 8711</td>
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</tbody>
</table>

SMC Corporation

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