



ORIGINAL INSTRUCTIONS

Instruction Manual
Digital Flow Monitor
PFG301 series



The intended use of the digital flow monitor is to monitor and display flow information from a remote sensor and provide an output signal.

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.
- This product is class A equipment intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted or radiated disturbances.
- Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for more safety instructions.
- Special products (-X) might have specifications which are different to those shown in the specifications section. Contact SMC for specific drawings.

2 Specifications

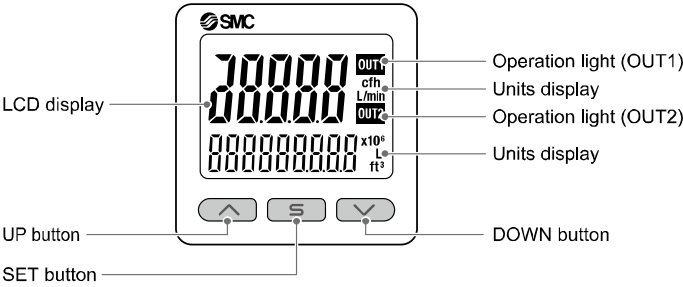
2.1 PFG301 specifications

Model		PFG301 series						
Applicable flow switch model		PFMV 505 -X502	PFMV 505	PFMV 510	PFMV 530	PFMV 505F	PFMV 510F	PFMV 530F
Voltage	Rated voltage range	1.00 to 5.00 V						
	Set voltage range	0.80 to 5.20 V						
	Min. setting unit	0.01 V						
Flow	Rated flow range (L/min)	0 to 0.1	0 to 0.5	0 to 0.1	0 to 3	-0.5 to 0.5	-1 to 1	-3 to 3
	Set flow rate range (L/min)	-0.005 to 0.105	-0.025 to 0.525	-0.05 to 1.05	-0.15 to 3.15	-0.525 to 0.525	-1.05 to 1.05	-3.15 to 3.15
	Min. setting unit	0.001 L/min		0.01 L/min		0.001 L/min	0.01 L/min	
Electrical	Power supply voltage	12 to 24 VDC ±10% or less						
	Current consumption	25 mA or less						
Accuracy	Protection	Polarity protection						
	Display accuracy	±0.5%F.S. Min. display unit (at ambient temperature 25 °C constant temperature)						
	Analogue output accuracy	±0.5%F.S. (at ambient temperature 25 °C constant temperature)						
	Repeatability	±0.1%F.S. Min. display unit, Analogue output is 0.3%F.S. or less						
	Temperature characteristics	±0.5%F.S. (at ambient temperature 0 to 50 °C, 25 °C standard)						
Switch output	Output type	Select from NPN or PNP open collector output						
	Output mode	Select from hysteresis mode, window comparator mode, error output mode or switch output OFF mode.						
	Switch operation	Select from normal output or reversed output						
	Max. load current	80 mA						
	Max. applied voltage (NPN only)	30 VDC						
	Internal voltage drop	NPN output: 1.0 V or less (at load current of 80 mA) PNP output: 1.5 V or less (at load current of 80 mA)						
	Response time	3 ms or less						
	Delay time	Select from 0, 0.05 to 0.10 sec. (increment of 0.01 sec.), 0.1 to 1.0 sec. (increment of 0.1 sec.), 1 to 10 sec. (increment of 1 sec.), 20 sec., 30 sec., 40 sec., 50 sec. or 60 sec.						
	Hysteresis	Variable from 0						
	Protection	Short circuit protection						
Analogue output	Output type	Voltage input: 1 to 5 V (0 to 10 V selectable, only when the power supply voltage is 24 VDC) Current input: 4 to 20 mA						
	Impedance - Voltage output type	Output impedance approx.: 1 kΩ						
	Impedance - Current output type	Max. load impedance: 300 Ω (at 12 VDC), 600 Ω (at 24 VDC)						
	Response time	50 ms or less						
External input	Peak / bottom reset	Input type	Input voltage: 0.4 V or less (reed or solid state sensor), Input time: 30 msec. or longer					
		Input mode	Peak / bottom reset					
	Auto-shift reset	Input type	Input voltage: 0.4 V or less (reed or solid state sensor), Input time: 30 msec. or longer					
		Input mode	Select from auto-shift or auto-shift zero					
Sensor input	Input type	Voltage input: 1 to 5 VDC (Input impedance: 1 MΩ)						
	Connection method	Connector (e-con)						
	Protection	Over voltage protection (up to 26.4 V)						

2 Specifications (continued)

Model		PFG301 series							
Display	Display mode		Instantaneous flow						
	Units		L/min, cfh (ft³/h)						
	Display range	Voltage	0.80 to 5.10 V						
		Flow rate (L/min)	-0.005 to 0.105	-0.025 to 0.525	-0.05 to 1.05	-0.15 to 3.15	-0.525 to 0.525	-1.05 to 1.05	-3.15 to 3.15
	Min. setting unit	Voltage	0.01 V						
	Flow rate	0.001 L/min		0.01 L/min		0.001 L/min	0.01 L/min		
	Display type		LCD						
	Number of displays		3-screen display (Main display, sub display)						
	Display colour		Main display: Red / Green Sub display: Orange						
Number of display digits		Main display: 5 digit (7 segments) Sub display: 9 digit (7 segments)							
Indicator LED		LED is ON when switch output is ON (OUT1 / OUT2: Orange)							
Digital filter			Select from 0, 0.05 to 0.10 s. (increment of 0.01 s.), 0.1 to 1.0 s. (increment of 0.1 s.), 1 to 10 s. (increment of 1 s.), 20 s. or 30 s.						
Environmental	Enclosure rating		IP40						
	Withstand voltage		1000 VAC, for 1 minute between live parts and case						
	Insulation resistance		50 MΩ or more between live parts and case (with 500 VDC megger)						
	Operating temperature		Operation: 0 to 50 °C, Storage: -10 to 60 °C (no condensation or freezing)						
	Operating humidity		Operation, Storage: 35 to 85%RH (no condensation or freezing)						
Weight	Body		25 g						
	Lead wire and connector		+39 g						

3 Names of Individual parts



Part	Description
Operation light	Displays the switch operating condition.
LCD Display	Displays the current status of flow, setting mode, selected display units and error code. 4 types of display can be selected for the main display: Single colour of constant red or green; or switching from red to green or green to red corresponding to the output. The indication for the sub display is orange
Unit display	Displays the unit currently selected.
UP button	Increases mode and ON/OFF set values.
SET button	Press this button to change mode and to confirm the settings.
DOWN button	Decreases mode and ON/OFF set values.

4 Installation

4.1 Installation

Warning

- Do not install the product unless the safety instructions have been read and understood.
- Use the product within the specified rated flow and temperature range.

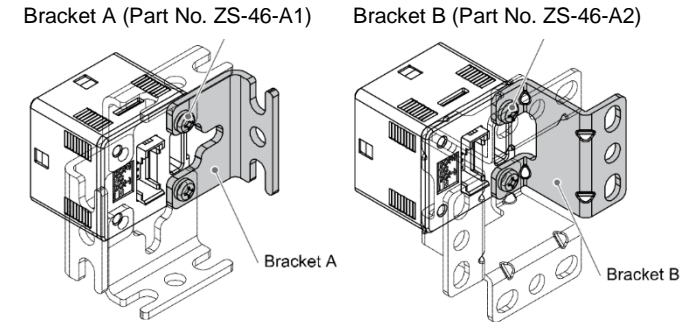
4.2 Environment

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.

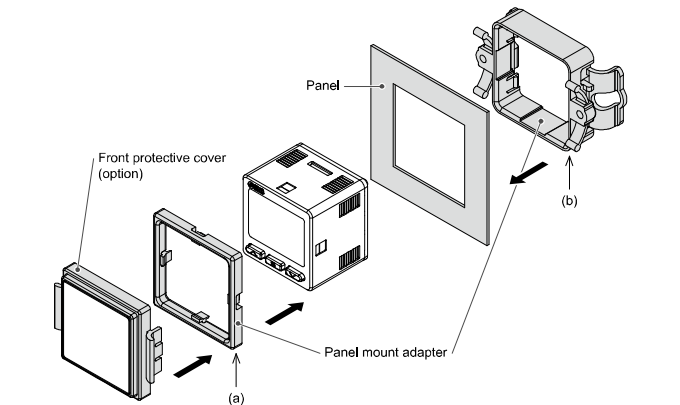
4.3 Mounting with Bracket

- Mount the bracket to the sensor monitor using mounting screws (self-tapping screws: Nominal size 3 x 8L (2 pcs.)), then set the product to the specified position.
* Tighten the bracket mounting screws to a torque of 0.5 ±0.05 N•m. Self-tapping screws should not be re-used several times.



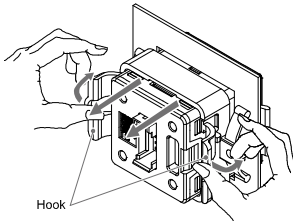
4.4 Mounting with panel mount adapter

- Mount part (a) to the front of the product and fix it. Then insert the product with (a) into the panel until (a) is in contact with the panel front surface.
- Next, mount part (b) to the product from the rear and insert it until (b) is in contact with the panel for fixing.
- Panel mount adapter (Part No.: ZS-46-B)
- Panel mount adapter + Front protective cover (Part No.: ZS-46-D)



4.5 Removal of panel mount adapter

- When removing the flow monitor with panel mount adapter from the installation, pull it forward while expanding the hooks on each side as shown below.
If the panel mount adapter is pulled forward with the hook caught, the product and the adapter may be damaged.



5 Wiring

5.1 Wiring

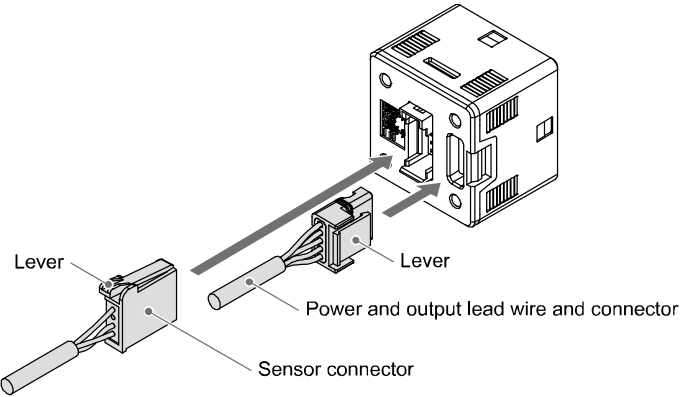


- **Do not perform wiring while the power is on.**
- **Confirm proper insulation of wiring.**
- **Use a separate route for the product wiring and any power or high voltage wiring.**
Otherwise, malfunction may result due to noise.
- If a commercially available switching power supply is used, be sure to ground the frame ground (FG) terminal. If the switching power supply is connected for use, switching noise will be superimposed and it will not be able to meet the product specifications. In that case, insert a noise filter such as a line noise filter/ferrite between the switching power supplies or change the switching power supply to a series power supply.

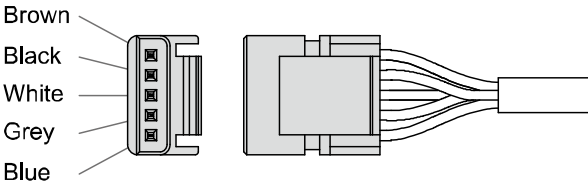
Connection of Sensor and Power and Output connectors

When connecting the connector, insert it straight onto the pins, holding the lever and connector body, and lock the connector by pushing the lever hook into the concave groove on the housing.

- To detach the connector, remove the hook from the groove by pressing the lever downward, and pull the connector straight out.

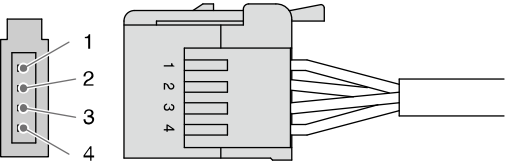


5.2 Power and Output Connector



Description	Wire colour
DC (+)	Brown
OUT1	Black
OUT2	White
Analogue output / External input / Copy function	Grey
DC (-)	Blue

5.3 Sensor Connector



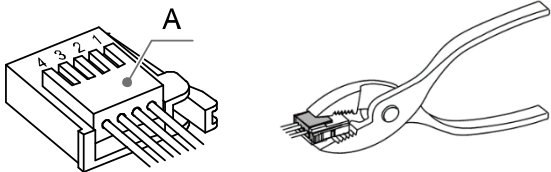
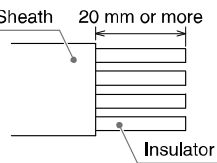
Pin No.	Description	Wire colour
1	DC (+)	Brown
2	N.C.	-
3	DC (-)	Blue
4	IN	White

*: The wire colours shown are for the PFMB, PFMC and PF3A7 series cables

5 Wiring (continued)

Wiring of the Sensor connector

- Strip the sensor lead wire as shown in the figure.
- Do not cut the insulator.
- The core of the corresponding colour shown in the table is put into the pin of the number marked on the connector for sensor connection.
- Ensure that the above-mentioned preparation work has been performed correctly, and press part "A" by hand to make temporary connection.

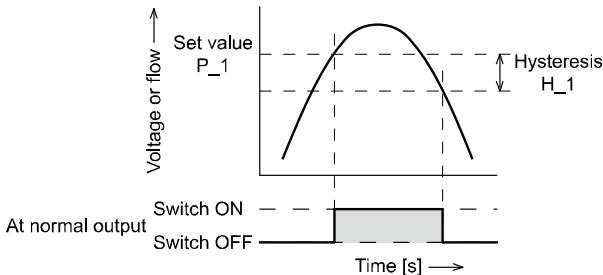


- Press part "A" centre straight in using a suitable tool, such as pliers.
- The sensor connector cannot be re-used once crimped.
For a connection failure such as incorrect order of wire or incomplete insertion, use a new connector.
- If the sensor is not connected correctly, "LLL" or "HHH" will be displayed.

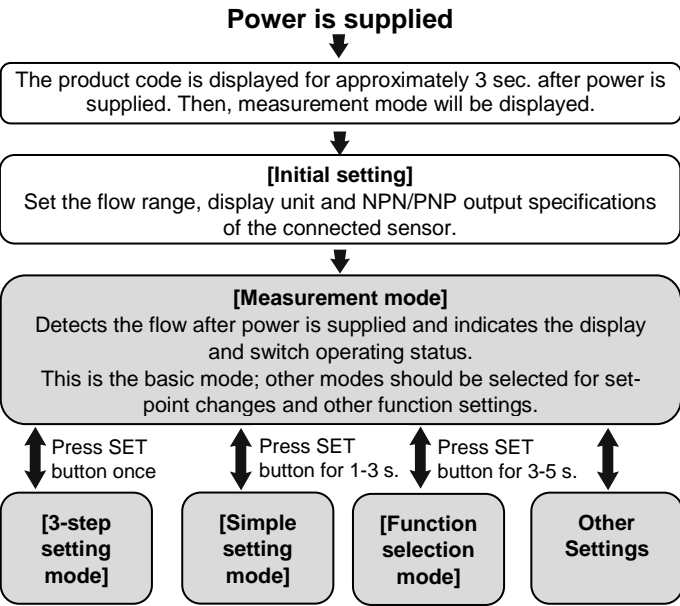
6 Flow Setting

6.1 Switch operation

When the flow exceeds the set value, the switch will be turned ON. When the flow falls below the set value by the amount of hysteresis or more, the switch will be turned off. The default setting is that the output is turned ON at 3.00 [V] for the connected sensor range voltage.



7 Outline of Settings



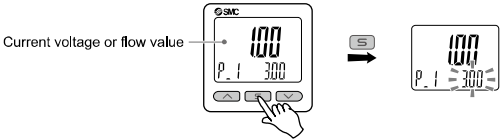
- The outputs will continue to operate during setting.
- 3 step setting mode, simple setting mode and function selection mode settings are reflected in each other.

8 3-step Setting mode

In this mode, the set values can be input in just 3 steps. Use this mode if the product is to be used straight away, after changing only the set values. (The current voltage or flow value is displayed on the main display).

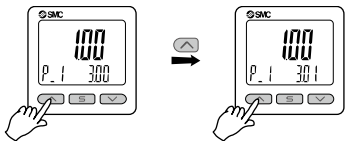
The set value (P_1 or n_1, P_2 or n_2) and hysteresis (H_1, H_2) can be changed. Set the items on the sub display (set value or hysteresis) with UP or DOWN buttons. When changing the set value, follow the operation below. The hysteresis setting can be changed in the same way.

1. Press the SET button once when the item to be changed is displayed on the sub display. The set value on the sub display (right) will start flashing.

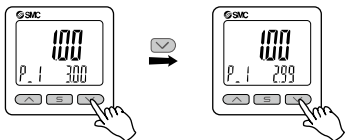


2. Press the UP or DOWN button to change the set value. The UP button is to increase and the DOWN button is to decrease.

- Press the UP button once to increase by one digit, or press and hold to continuously increase.



- Press the DOWN button once to decrease by one digit, or press and hold to continuously decrease.



3. Press the SET button to finish the setting.

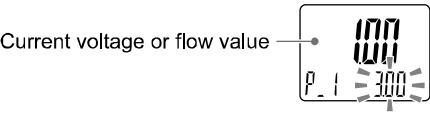
9 Simple Setting mode

In the simple setting mode, the set value and hysteresis can be changed while checking the current voltage or flow value (main display).

- (1) Press and hold the SET button between 1 and 3 seconds in measurement mode. [SET] is displayed on the main display. When the button is released while in the [SET] display, the current voltage or flow value is displayed on the main display, [P_1] or [n_1] is displayed on the sub display (left), and the set value is displayed on the sub display (right) (Flashing).



- (2) Change the set value with the UP or DOWN button, and press the SET button to set the value. Then, the setting moves to hysteresis setting (The snap shot function can be used).



- (3) Change the set value with UP or DOWN button, and press the SET button to set the value. Then, the setting moves to setting of OUT2.

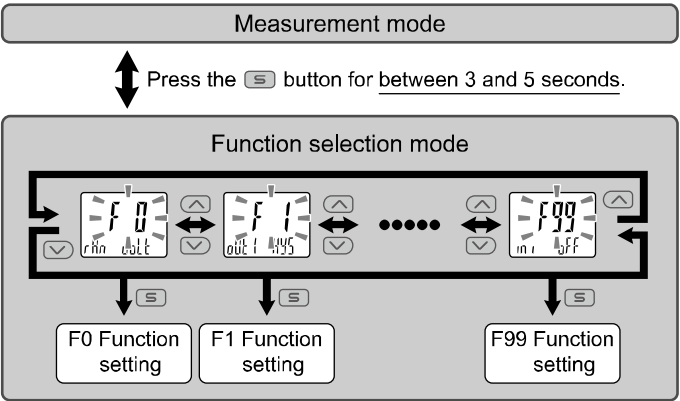


- (4) Press the SET button for less than 2 seconds to complete the OUT1 setting. [P_2] or [n_2] is displayed on the sub screen (left). Continue with setting the OUT2.

Press and hold the SET button for 2 seconds or longer to complete the setting. The product will return to measurement mode.

10 Function Selection mode

In measurement mode, press the SET button between 3 and 5 seconds, to display [F 0]. Select to display the function to be changed [F□□]. Press and hold the SET button for 2 seconds or longer in function selection mode to return to measurement mode.



*: Some products do not have all of the functions. If no function is available or selected due to configuration of other functions, [- - -] is displayed on the sub display (right).

10.1 Default function settings

The default settings are as follows. If no problem is caused by this setting, keep these settings. To change a setting, enter function selection mode.

- [F 0] Voltage or flow range, display unit and switch output switching

Item	Default setting
Flow range	Voltage [V] *1
Display units *2	L
Switch output specifications	NPN

*1: Displays the sensor input voltage.

*2: This setting is only available for models with the units selection function.

- Setting of [F 1] OUT1 and [F 2] OUT2

Item	Explanation	Default
Output mode	Either hysteresis mode, window comparator mode, error output or switch output OFF can be selected.	Hysteresis mode
Reversed output	Select normal or reversed output.	Normal
Threshold setting	Set the ON and OFF point of the switch output.	3.00 V
Hysteresis	Set the hysteresis will prevent the switch output from chattering.	0.20 V
Delay time	Set delay time of the switch output.	0.00 s
Display colour	Select the display colour.	Output ON: Green Output OFF: Red (Linked to OUT1)

- Other parameter settings

Item	Default
[F 3] Digital filter	0.00 s
[F 4] Auto preset function	OFF
[F 5] FUNC terminal function	Analogue output: 1 to 5 V / 4 to 20 mA External input: Auto-shift
[F10] Sub display	dEF
[F14] Display with zero cut-off	- - -
[F80] Power saving mode	OFF
[F81] Security code	OFF
[F90] Setting of all functions	OFF
[F96] Sensor input / External input signal status display	No configurable items
[F97] Copy function	OFF
[F98] Output check	Normal output
[F99] Reset to default settings	OFF

11 Other Settings

- Snap shot function
- Peak / Bottom hold function
- Reset function
- Key-lock function

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for setting these functions.

12 How to Order

Refer to the operation manual or catalogue on the SMC website (URL: <https://www.smcworld.com>) for How to order information.

13 Outline Dimensions (mm)

Refer to the operation manual or catalogue on the SMC website (URL: <https://www.smcworld.com>) for Outline Dimensions.

14 Troubleshooting

14.1 Error indication

Error	Error display	Description	Measures
Over current error		The switch output load current is 80 mA or more.	Turn the power off and remove the cause of the over current. Then supply the power again.
Flow error		Flow exceeding the upper limit of the set flow range is applied.	Reset applied flow to a level within the set flow range.
		Flow exceeding the lower limit of the set flow range is applied.	
COPY receiving error		Communication is not complete.	After checking the wiring, retry copying.
System error		Displayed if an internal data error has occurred.	Turn the power off and on again. If the failure cannot be solved, contact SMC.

If the error cannot be reset after the above measures are taken, or errors other than the above are displayed, please contact SMC.

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for more detailed information about troubleshooting.

15 Maintenance

15.1 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.

How to reset the product after a power cut or forced de-energizing

The setting of the product will be retained as it was before a power cut or de-energizing.

The output condition is also basically recovered to that before a power cut or de-energizing, but may change depending on the operating environment.

Therefore, check the safety of the whole installation before operating the product. If the installation is using accurate control, wait until the product has warmed up (approximately 10 to 15 minutes).

16 Limitations of Use

Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

17 Product disposal

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

18 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.smceu.com> (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan
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