



ORIGINAL INSTRUCTIONS

## Instruction Manual

### Ionizer - Bar type

### Series IZS31



The intended use of this product is to neutralize charged objects.

## 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)<sup>(1)</sup>, and other safety regulations.

<sup>(1)</sup> 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.

	<b>Caution</b>	Indicates a hazard with a low level of risk, which if not avoided, could result in minor or moderate injury.
	<b>Warning</b>	Indicates a hazard with a medium level of risk, which if not avoided, could result in death or serious injury.
	<b>Danger</b>	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.

#### 1.1 Specific Recommendations

### Warning

- This product is intended for use in general factory automation.** Consult SMC beforehand when using this product for other intentions.
- Use within the specified voltage and temperature range.** Operation with a voltage other than that specified can cause malfunction, damage to the product, electric shock or fire.
- Use clean compressed air as fluid.** Never use flammable or explosive gas as fluid. This may lead to fire or explosion. If fluid other than compressed air is used, consult SMC.
- The product is not designed to be explosion proof.** Never use in an atmosphere of potential dust explosion, flammable gas or explosive gas. It may cause fire.

### Caution

- This product has not been flushed.** If using this product in a clean room environment, flush and confirm the products purification level before use.

Refer to the operation manual and catalogue on the SMC website (URL: <https://www.smcworld.com>) for further Safety Instructions.

## 2 Specifications

Ionizer type		IZS31 (NPN)	IZS31P (PNP)
Ion generation method		Corona discharge	
Method of applying voltage		Sensing DC, Pulse DC, DC	
Discharge output		±7,000 V	
Offset voltage (Ion balance) <sup>*1</sup>		Within ±30 V (for stainless steel emitter: ±100 V)	
Air purge	Fluid	Air (Clean, dry air)	
	Operating pressure	0.7 MPa max.	
	Connecting tube size (mm)	φ 4	
Power supply voltage		24 VDC ±10%	
Current consumption (max)	Sensing DC mode	200 mA (with sensor in standby: 120 mA)	
	Pulse DC mode	200 mA (when sensor is not used: 170 mA)	
	DC mode	170 mA	
Input Signal	Discharge stop signal	Connected to 0 V (Voltage: 5 VDC or less, Current consumption: 5 mA or less)	Connected to +24 VDC (Voltage: Between 19 VDC and power supply voltage, Current consumption: 5 mA or less)
	Maintenance start-up signal		
Output Signal	Completion signal for static charge elimination	Max. load current: 100 mA Residual voltage: 1 V or less (load current: 100 mA)	Max. load current: 100 mA Residual voltage: 1 V or less (load current: 100 mA)
	Maintenance output signal		
	Signal for failure	Max. applied voltage: 28 VDC	
Sensor monitor output <sup>*2</sup>		Output voltage: 1 to 5 V (min. load 10 kΩ)	
Effective static elimination distance		50 to 2000 mm (with sensing DC mode: 200 to 2000 mm)	
Ambient temperature		0 to 50°C	
Ambient humidity		35 to 80% RH (no condensation)	
Material		Ionizer cover: ABS Electrodes: Tungsten, Single crystal silicon, Stainless steel	
Vibration resistance		Endurance: 50 Hz, amplitude: 1 mm, 2 hours each direction X,Y and Z	
Impact resistance		10 G	

\*1: Distance between the charged object and ionizer is 300 mm or more.

\*2: When the potential of the charged object is measured using the feedback sensor, the relationship between the charged potential, the sensor monitor output voltage and the sensor detecting range will vary depending on the installation distance between the ionizer and the sensor.

## 3 Installation

### 3.1 Installation

### Warning

- Do not install the product unless the safety instructions have been read and understood.**
- Install only where there is adequate space for maintenance, wiring and piping.**

When installing the electrical connector and one touch pneumatic fitting, ensure sufficient room is left for easy insertion and removal of electrical cable and pneumatic tube.

Do not install with sharp bends in the cable or tube. With consideration of the minimum bend radii given below, ensure that cable and tube entries are straight, and do not apply stress to the electrical connectors or pneumatic fittings. If the connectors or fittings are subject to mechanical stress, malfunctions such as broken wires, air leaks or fire may occur.

[Minimum bending radius] Power supply cable: 35 mm  
Sensor cable: 25 mm

Note: This is the minimum bend radius at 20°C. If the installation is at a lower temperature, the radius will be higher.

## 3 Installation (continued)

- Install only on a flat surface.**

A curved or uneven mounting surface may cause excessive force to be applied to the frame or case. This force, as well as a heavy impact (e.g. from dropping the ionizer) may result in damage and failure.

- Do not use in areas subject to electrical noise.**

It may cause malfunction, deterioration or damage to internal components. Take measures to prevent noise at source and avoid power and signal lines from coming into close contact.

- Tighten using the correct tightening torque.**

Refer to the following table for the correct tightening torque. If the tightening torque is exceeded the mounting screws and brackets may be broken. If the tightening torque is not reached, the mounting screws and brackets may become loose.

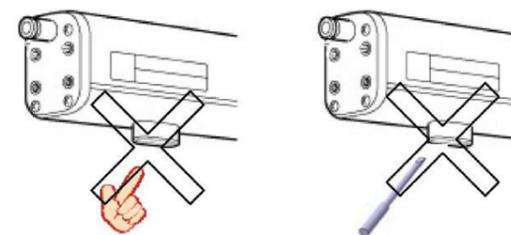
Screw size	Recommended tightening torque
M3	0.61 to 0.63 N•m
M4	0.73 to 0.75 N•m
M5	1.3 to 1.5 N•m

- Do not directly touch the electrodes with a finger or metal tool.**

If the electrodes are touched with a finger, injury or damage may result or if the electrodes are touched with metal tools damage may result. This may interfere with the specified function and performance, but may also cause operational failure or accident.

### Caution: High Voltage

High voltage is applied to the emitters. Never touch the emitters. Inserting foreign matter into the cartridge or touching emitter may cause electric shock and instantaneous rapid body motion to escape from the shock. Your body may then impact the equipment around you, causing injury.



- Do not adhere tape or labels on the product body.**

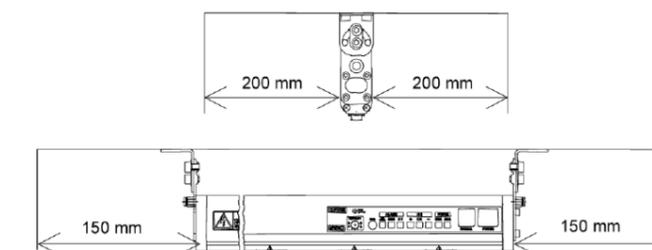
If conductive adhesive or reflective paint is contained in the tape or seal, dielectric phenomenon will occur due to the ions emitted by the ionizer and it may lead to electrostatic charge or electric leakage.

- Be sure to disconnect the power supply and air supply to the product before starting the installation.**

### Caution

- Maintain the minimum free space (as shown in the diagrams) around the ionizer for correct operation, installation and maintenance.**

Walls or other objects that are present within the minimum free space area can interfere with the operation of the ionizer, reducing the efficiency of static charge removal.



- Be sure to check the effect of static charge removal after installation.** The effectiveness of static charge removal varies depending on the installation and operating conditions.

## 3 Installation (continued)

### 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. Check the product specifications.
- Do not mount in a location exposed to radiant heat.
- Operate the product within the specified fluid and ambient temperature range.
- The operating fluid and ambient temperature range for the ionizer, feedback sensor and auto-balance sensor is 0 to 50°C. In areas where sudden temperature changes occur, even when these changes are within the specified temperature range, condensation may form. The ionizer should not be used in such conditions.
- Do not use this product in an enclosed space.
- This product utilizes the corona discharge phenomenon. Since this process generates a small amount of ozone and NOx, only use the ionizer in open, well-ventilated areas.
- Environments to avoid  
Never use or store the product under the following conditions:
  - Areas where ambient temperature exceeds the operating temperature range.
  - Areas where ambient humidity exceeds the operating humidity range.
  - Areas where abrupt temperature changes may cause condensation.
  - Areas where corrosive gas, flammable gas or other volatile flammable substances are stored.
  - Areas where the product may be exposed to conductive powder such as iron powder or dust, oil mist, salt, organic solvent, machining chips, particles or cutting oil (including water and any liquids), etc.
  - Paths of direct air flow, such as air conditioners.
  - Enclosed or poorly ventilated areas.
  - Locations that are exposed to direct sunlight or heat radiation.
  - Areas where strong electromagnetic noise is generated, such as strong electrical and magnetic fields or supply voltage spikes.
  - Areas where the product is exposed to static electricity discharge.
  - Locations where strong high frequency is generated.
  - Locations that are subject to potential lightning strikes.
  - Areas where the product may be exposed to direct impact or vibration.
  - Areas where the product may be subjected to forces or weight that could cause physical deformation.
- If any of these conditions are unavoidable, take appropriate protection measures.**
- Ionizer, feedback sensor and auto-balance sensor are not proof against lightning strikes.** Protection against electrical surges due to lightning should be incorporated into the equipment.

### 3.3 Installation of ionizer bar

Investigate the places where static problems occur, or places where processes and parts generate ESD (electro-static discharge), and carefully consider the required conditions to ensure appropriate static charge removal before installation.

#### 3.3.1 Installation height

When the ionizer is installed, keep the distance between charged objects and the ionizer within the range below.

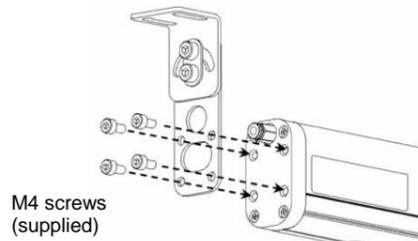
Ion-production frequency (Hz)	Distance between object and ionizer (mm)	
	With air purge	Without air purge
1	400 to 2000	400 to 500
3	300 to 2000	300 to 400
5	300 to 2000	300 to 400
10	200 to 2000	200 to 300
15	200 to 2000	200 to 300
20	150 to 2000	150 to 250
30	50 to 2000	50 to 200
60	50 to 2000	50 to 150

### 3 Installation (continued)

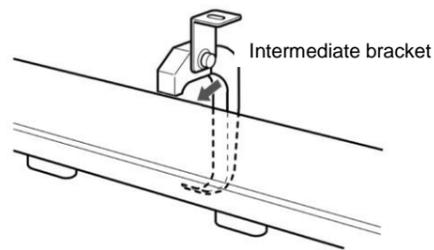
Note: The installation heights stated above are nominal values; check the efficiency of operation before installation.  
 The minimum installation height should be greater than 200 mm when the feedback sensor is used.  
 When the auto-balance sensor is used, the installation height should be greater than 100 mm.  
 When the ionizer is used outside of these conditions, ensure the correct operation of the sensors.

#### 3.3.2 Mounting and installation of bracket

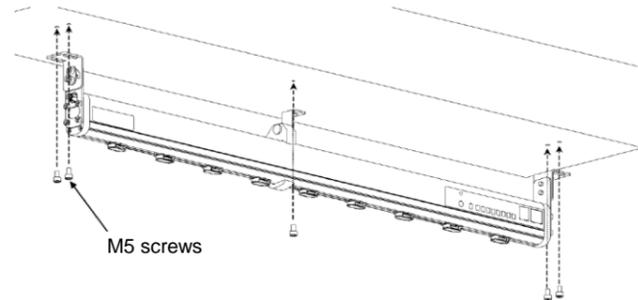
Mount an end bracket on both ends of the ionizer body using the M4 screws supplied.



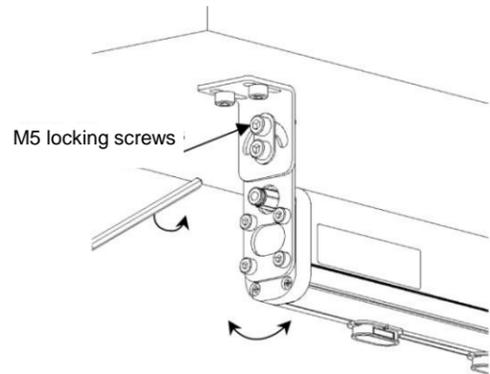
#### 3.3.3 Mount Intermediate brackets at regular intervals



#### 3.3.4 Installation of the ionizer (using brackets) with M5 screws.



#### 3.3.5 Adjust the angle of the ionizer body to ensure proper static charge removal, and fix it in position with the bracket locking screws (M5).

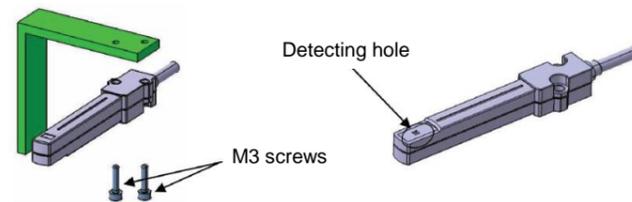


### 3 Installation (continued)

#### 3.4 Installation of Sensors

##### 3.4.1 Feedback Sensor installation

Point the detecting hole of the sensor head towards the charged object to accurately measure the object's static charge. Ensure the distance between the detecting hole and surface of the charged object is between 10 and 50 mm. Do not allow the feedback sensor to come into contact with the charged object.  
 The detecting area and sensor output will vary depending on the distance between the surface of the charged object and sensor.  
 Mount the sensor head with 2 x M3 screws (supplied by the user).



The sensor head case is connected to GND, therefore when installing the power supply, it is very important to take great care that there is not a short circuit between GND and 24V.

Do not insert foreign objects into the detecting hole. The detecting hole is open to enable the measurement of static electricity. If foreign objects, such as tools are inserted into it, the sensor will be damaged. The ionizer will not function correctly with a damaged sensor.

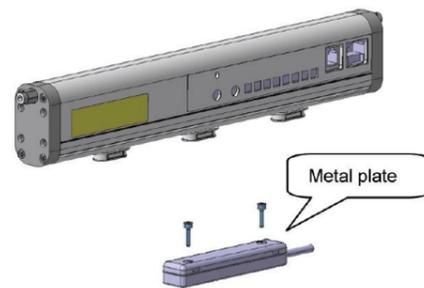
Do not pull the cable out of the sensor head. If the cable is pulled with excessive force, the sensor head may be damaged.

##### 3.4.2 Auto Balance Sensor installation

Position the auto-balance sensor directly under the Ionizer, with its metal plate facing upwards. The ion balance will change depending on the installation height, so the sensor should be installed on a level as close as possible to that of the work-piece. The auto-balance sensor can be removed once the ion balance adjustment is completed.

Keep the height between the auto-balance sensor and Ionizer within the installation height specified.

Mount the sensor head with 2 x M3 screws (supplied by the user).

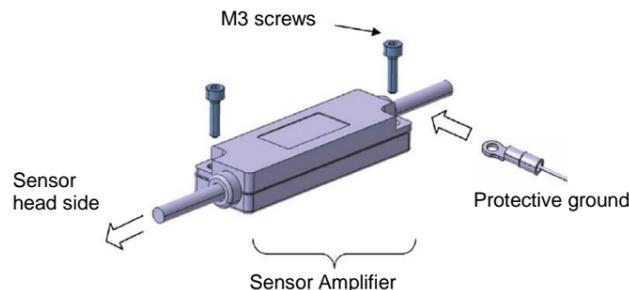


#### 3.5 Installation of Sensor Amplifier

The sensor amplifier should be fixed with 2 x M3 screws (supplied by the user).

Do not pull the cable out of the sensor amplifier. If the cable is pulled with excessive force, the amplifier may be damaged.

Ensure the case of the sensor amplifier is grounded (resistance between the lead wire and ground must be less than 100 Ω). The amplifier case surface is treated with conductive plating, therefore, when the mounting surface itself is grounded, it is not necessary to provide a separate connection to ground. If, however, the mounting surface is insulated (by paint or anodising for example), the case must be wired to ground.



### 3 Installation (continued)

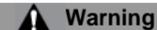
#### 3.6 Piping



- Before piping make sure to clean up chips, cutting oil, dust etc.
- Flush the piping before connecting. Verify that all dust, moisture, oil, etc. are eliminated from the piping before connecting.
- Do not use air containing mist and / or dust.**  
 Air containing mist or dust may reduce function and shorten the maintenance cycle. Use a dryer (IDF series), air filter (AF/AFF series), and mist separator (AFM/AM series) to produce clean, compressed air.

### 4 Wiring

#### 4.1 Wiring



- Only connect to SELV type external circuits.
- Ensure that the power supply capacity is sufficient, and that the voltage is within specification before wiring.
- Always use a UL listed / recognized power supply which is of a class 2 power supply with 24 VDC and under 2.1 A.
- To maintain the product performance, ground the product with an earth ground cable with a resistance of 100 ohm or less.
- Be sure to disconnect the power supply before wiring (including the connector plug in/out).
- Use a dedicated cable to connect the ionizer with the feedback or auto-balance sensor, and do not disassemble and/or modify the cable.
- Check wiring is correct and confirm safety, before powering up the product.
- Malfunctions induced by noise may occur if the wire is installed in the same route as that of power or high-voltage cable. Wire the ionizer independently.
- Confirm that there is no error in wiring before operation. Incorrect wiring will lead to a malfunction or damage to the product.

#### 4.2 Connection details for Ionizer operation

Connection details for ionizer operation using power supply cable.

Symbol	Colour	Signal	Connection	Description
DC1(+)	Brown	24 VDC	O	Power supply for ionizer operation
DC1(-)	Blue	0 V (FG)	O	
OUT4	Dark Green	Sensor monitor output	Δ	Analogue O/P (1 to 5 V) proportional to static charge present on work-piece

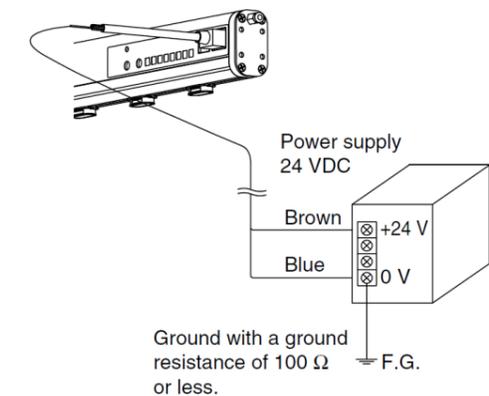
#### 4.3 Connection details for I/O signals

Symbol	Colour	Signal	Connection	Description
DC2(+)	Red	24 VDC	O	Power supply for I/O signal
DC2(-)	Black	0 V	O	
IN1	Light Green	Discharge stop signal	O	Signal to start/stop ion generation (NPN type). Operation will begin when IN1 connected to DC2(-). (PNP type) Operation will begin when IN1 is connected to DC2(+).
IN2	Grey	Maintenance detection signal	Δ	Input to begin contamination level check of electrodes, to determine if cleaning is required.
-	White	-	-	-
-	Orange	-	-	-
OUT1	Pink	Static neutralization completion signal	Δ	Output is ON when the electrode contamination is being checked and when the static charge of the work-piece is outside of specification (±30 V).
OUT2	Yellow	Maintenance detection signal	Δ	Output is ON when cleaning of electrodes is required.
OUT3	Purple	Irregular signal	Δ	Output is ON if abnormally high voltage, and/or sensor, and/or CPU failure (B contact output).

- O: Minimum number of wires required to operate the ionizer.
- Δ: Wires required to operate the functions.
- : Wires not required for sensing DC mode. These wires should not be short circuited with other wires.

### 4 Wiring (continued)

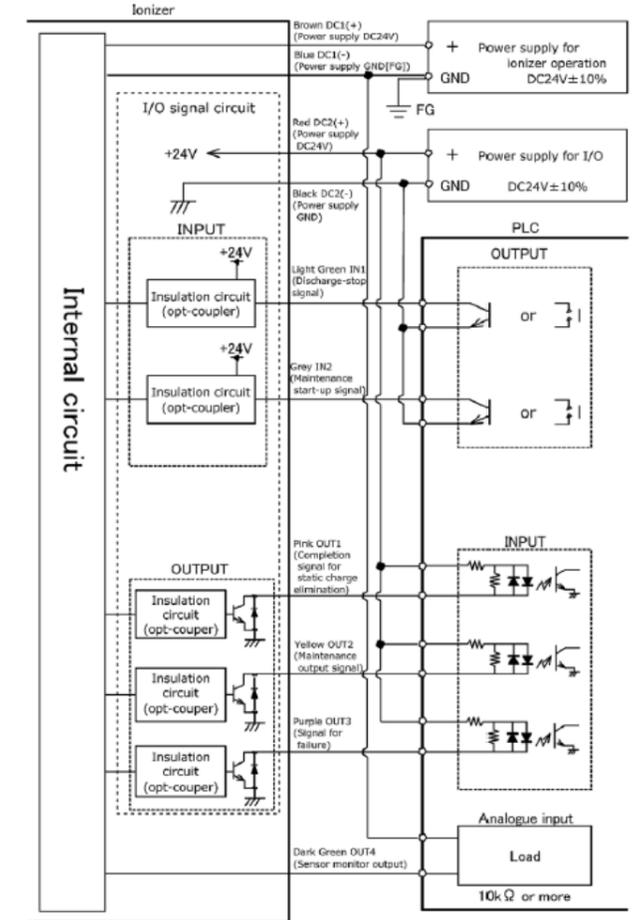
#### 4.4 Ground connection



Be sure to ground the DC1(-) [Blue] connection to FG. To prevent possible damage to the ionizer, ensure that the resistance between the lead wire and ground is less than 100 Ω.

#### 4.5 Circuit Diagram

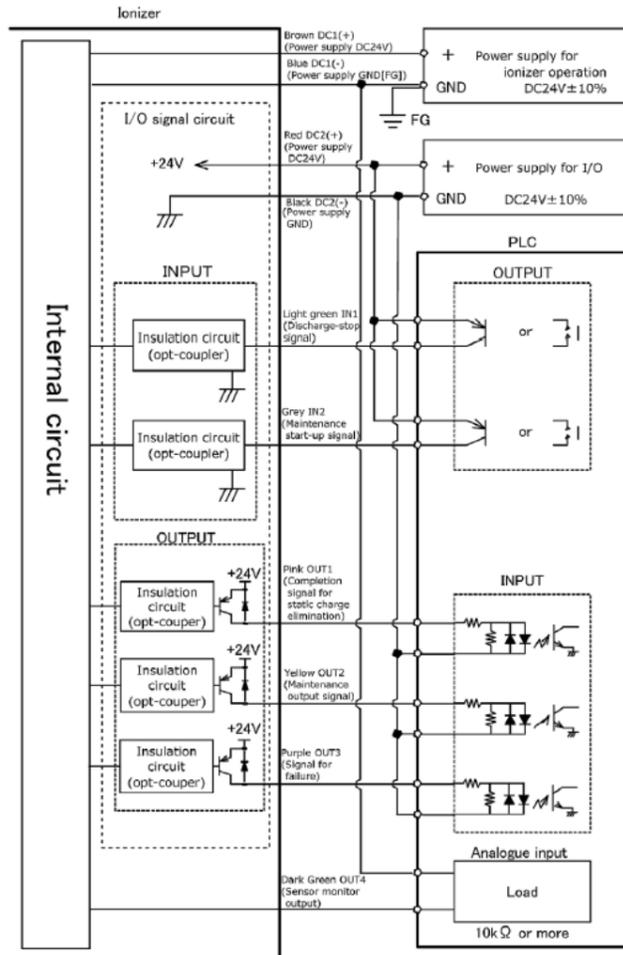
##### NPN circuit



Note: The sensor monitor output (OUT4: Dark Green) is not isolated from the internal circuit of the ionizer; therefore, the return path is to ground (FG).

## 4 Wiring (continued)

### PNP circuit



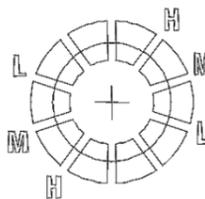
Note: The sensor monitor output (OUT4: Dark Green) is not isolated from the internal circuit of the ionizer; therefore, the return path is to ground (FG).

## 5 Settings

### 5.1 Sensing DC mode

#### LEVEL selector dial (maintenance level)

Use the maintenance level selector dial to choose from three different contamination detection levels:



- H (High)**  
Notification will be before static charge elimination time is affected (very slight contamination will be detected).
- M (Middle)**  
Notification will be before there is a large change in static charge elimination time.
- L (Low)**  
Notification will be when the static charge elimination time is significantly longer than normal.

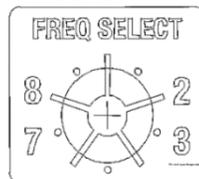
The contamination detection function is performed when the maintenance start-up signal is input.

#### FREQ SELECT dial (energy saving or continuous elimination)

In sensing DC operation, there are 2 modes of use: Energy saving and continuous elimination.

In energy saving mode, when static charge removal is complete, the ionizer stops generating ions.

In continuous elimination mode, when static charge elimination is complete, the ionizer continues to operate in pulse DC mode. The frequency of operation of pulse DC mode must be selected. The FREQ SELECT dial is used to select which mode (and frequency), the ionizer will operate in.

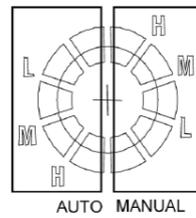


## 5 Settings (continued)

### 5.2 Pulse DC mode

#### LEVEL selector dial (maintenance level and auto-ion balance)

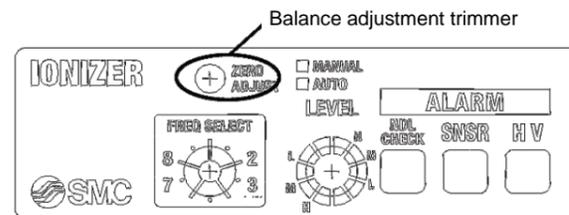
When ion balance is adjusted using the auto balance sensor, either manual or auto mode can be selected.



Mode	Description	Switch setting
Manual	Ion balance is adjusted when the maintenance start-up signal is input or when the ionizer power supply is applied. The ion-balance adjustment values are retained for each ion-generation frequency. When the ion-generation frequency is changed, adjust the ion balance. Once the ion-balance adjustment is completed, the ion balance adjustment will not be repeated until the maintenance start-up signal is input again. Therefore the auto balance sensor can be removed.	MANUAL
Auto	Ion-balance is continuously adjusted. If the auto-balance sensor is removed, manually adjust the ion-balance with the balance adjustment trimmer.	AUTO

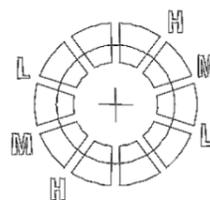
\* Position the dial in line with the desired detection level of electrode contamination.

When the ionizer is used without the auto-balance sensor, change the dial setting to AUTO, and manually adjust the ion-balance with the balance adjustment trimmer.



#### LEVEL selector dial (maintenance level)

The electrode contamination detection level must also be set. Choose from three different levels: L (Low), M (Medium) or H (High).



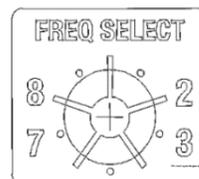
- H (High)**  
Notification will be before static charge elimination time is affected (very slight contamination will be detected).
- M (Middle)**  
Notification will be before there is a large change in static charge elimination time.
- L (Low)**  
Notification will be when the static charge elimination time is significantly longer than normal.

The contamination detection function is performed when the maintenance start-up signal is input.

If H, M and L levels are set, ion balance adjustment will be performed after the contamination detection.

#### FREQ SELECT dial (ion generation frequency)

The ionizer can operate over a range of several frequencies, to suit different applications. The desired ion generation frequency should be selected using the FREQ SELECT dial.



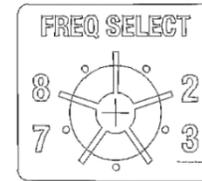
## 5 Settings (continued)

Ion-generation frequency (Hz)	Dial position
1	0
3	1
5	2
10	3
15	4
20	5
30	6
60	7

### 5.3 DC mode

#### FREQ SELECT dial (polarity of emitted ions)

The ionizer can emit a constant stream of either positive or negative ions. Use the FREQ SELECT dial to select the desired polarity:



Ion discharge polarity	Dial position
Positive	8
Negative	9

## 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 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.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.
- Do not drop, hit an object or cause excessive impact (10G or more) when handling. Although externally the ionizer may not appear to be broken, there may be internal damage causing malfunction.
- When the cable is inserted or removed, pinch modular plug spring clip with finger and insert or remove the plug in a straight line. If inserted or removed in an inappropriate direction, the mounting part of the modular jack might be damaged leading to operational failure.

### 6.2 Maintenance and Inspection

#### Caution

#### Keep electrodes clean with regular maintenance

Make sure that the equipment is operating without any errors by regular maintenance. Only people with sufficient knowledge and experience should perform maintenance of the equipment. Contamination adhering to the electrodes, due to long operating periods, reduces the ability of the ionizer to eliminate static electricity. If, after cleaning the electrodes, the ionizer does not regain its correct performance, the electrodes should be replaced. In order to maintain stable performance, regular maintenance and cleaning of electrodes is recommended.

#### Caution: High Voltage

This product contains a high voltage generation circuit. When performing maintenance inspection, be sure to confirm that the power supply to the ionizer is turned off. Never disassemble or modify the product, as this can cause loss of product functionality, and there is also a risk of electric shock and earth leakage.

## 6 Maintenance (continued)

- The power supply must be removed when cleaning the electrodes or changing the electrode cartridge. To avoid the risk of electric shock, do not touch the electrodes whilst the ionizer has power connected.
- Do not open the case to disassemble and reconstruct the product. It may cause electric shock, operational failure and/or disaster, such as, fire. In addition, note the product, which is disassembled or reconstructed, may not satisfy the functions and performance in the specifications and is out of guarantee.
- Do not operate the product with wet hands. There is a danger of electric shock.

## 7 Limitations of Use

### 7.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.

## 8 Product Disposal

This product shall 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.

## 9 Contacts

Refer to [www.smcworld.com](http://www.smcworld.com) or [www.smc.eu](http://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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