
OPERATION MANUAL

PRODUCT NAME: Ionizer

MODEL: IZS31 Series

- Read this operation manual carefully to understand before installation and operation.
- Pay extra attention on the clause concerning the safety.
- Keep this operation manual available whenever necessary.

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1. Safety instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard by labeling "Caution", "Warning", and "Danger". To ensure safety, be sure to observe ISO4414, JIS B8370 and other safety precautions.

 CAUTION Operator error could result in injury or equipment damage.

 WARNING Operator error could result in serious injury or loss of life.

 DANGER In extreme conditions, there is a possibility of serious injury or loss of life.

※1) ISO 4414 : Pneumatic fluid power –Recommendation for application of equipment to transmission and control systems

※2) JIS B 8370 : Rule for Pneumatic System

WARNING

1. The compatibility of equipment is the responsibility of the person who designs the system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility with the specific system must be based on specifications or after analysis and/or tests to meet your specific requirements. Those who decide the compatibility of equipment shall take the responsibility to guarantee the initial system performance and safety. Construct system as reviewing all specifications in the latest catalog or documents as well as considering the possibility of equipment in every occasion.

2. Only trained personnel should operate machinery and equipment.

This product generates high voltage, so it can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to eliminate components until safety is confirmed.

- 1) Inspection and maintenance of the machinery and equipment should be performed after confirmation of the safety such as earthing, prevention of electric shock and each type of injury.
- 2) When equipment is to be eliminated, confirm the safety process as mentioned above. Cut air pressure supply and electric power supply that are the energy source for the equipment, and exhaust all residual compressed air in the system.
- 3) Before machinery/equipment is re-started, take measures to prevent short circuit etc. with enough care.

4. Do not use product under the following conditions or environments. If it is not avoidable, take appropriate measures and contact SMC.

- 1) Conditions and environments beyond specifications or if product is used outdoors.
- 2) Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, pressing clutch, break circuit and safety equipment.
- 3) An application which has the possibility of having negative effects on people, property, or animals requiring special safety analysis.

WARNING

1. This product is intended to be used for the general FA devices.
If other applications (especially the ones indicated in 4 on page 2) are used, please contact SMC before the use.
2. Use under specified voltage and temperature.
Voltage out of specification may cause malfunction, breakage, electric shock and fire.
3. Use clean compressed air for fluid.
Do not use inflammable or explosive gas for fluid. It may cause fire or explosion. When other fluid except compressed air is used, please contact SMC service representative.
4. This product doesn't incorporate explosion-proof construction.
Do not use this product in the place where dust explosion might be triggered or inflammable or explosive gas is present. It may cause fire.

CAUTION

1. This product has not been washed.
When bringing into clean room. Use after confirming its purification level after flushing.

Installation


WARNING

1. Get required space for maintenance, wiring and piping at installation.
Install connector and One-touch fitting for air supply to be able to eliminate and mount cable and tube.
Do not bend cable and tube with steep angle but fix them straight considering minimum bending radius to prevent forcible stress applied to installation base of connector and One-touch fitting.
Forcible installation and elimination may cause malfunction, broken wire, fire and air leakage.
Minimum bending radius: Power supply cable·····35mm
Sensor cable·····25 mm

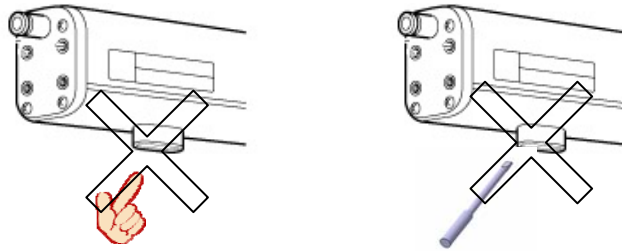
(Note: Here is allowable bending radius when fixing wiring at 20°C. If bending cable at lower temperature, it may apply forcible force to connector even with minimum bending radius or more.)
See instruction or catalog for minimum bending radius fo tube.
2. Install on the plane face.
Forcible force may apply to frame or case due to concave and convex or deformed mounting face and large level gap, and it may cause breakage or operation failure. Also, dropping or strong impact may cause operation failure or accident.
3. Do not use in the place where subject to noise (electromagnetic wave, surge etc.)
It may cause a malfunction, or deteriorate or damage internal elements. Take measures to prevent noise source and avoid lines from touching and mixing each other.
4. Tighten within the specified torque.
See the following table for the tightening torque. When exceeding the tightening torque, mounting screw and mounting bracket etc. might be broken. The screw might loosen for less than range of the tightening torque.

Screw size	Recommended tightening torque
M3	0.61 to 0.63 Nm
M4	0.73 to 0.75 Nm
M5	1.3 to 1.5 Nm

- Do not touch electrode needle with finger or metal tool directly. It may cause injury.
If electrode needle or cartridge is it may stick to the fingers, damaged by tools, it will not only interfere the specification function and performance but also may cause operation failure or accident.

 **Caution**
for High Voltage

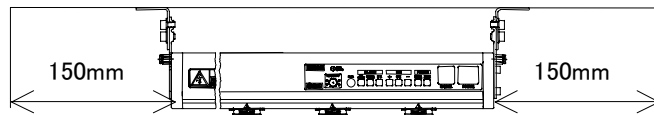
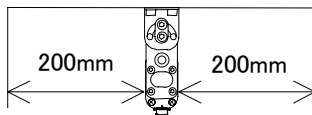
Do not touch the electrode needle.
High voltage is supplied.
If foreign substances are inserted
or persons come in contact with it,
they might get injured when trying
to avoid the electric shock or
instantaneous lightning stroke.



- Do not attach tape or seal on the product body.
If conductive adhesive and reflective paint is contained in the tape or seal, dielectric phenomenon will occur due to the produced ion and it may lead to the electrostatic charge and electric leakage.
- Be sure to install and adjust after power supply is stopped.

CAUTION

- Install IZS31 series with keeping distance from the wall etc. as shown in the figure below.
The generated ion might not reach the target effectively and efficiency decrease, where there is wall etc. inside the area shown in the figure below.



- Be sure to check the effect of static charge elimination after installation.
The effect of static charge elimination largely varies depending on the ambient installation conditions and operation conditions. After installation, be sure to check the effect of static charge elimination.

Wiring and piping

WARNING

- Check that power supply capacity is enough and voltage is in specification before piping.
- When selecting power supply, always use a UL-Listed power supply that either provides Class2 output as defined in the National Electrical Code, or that has been evaluated as a Limited Power Source as defined in UL60950.
- To maintain the product performance, Apply Ground at a resistance not exceeding 100 Ω to prevent electrical shock in accordance with instructions on this operation manual.
- Be sure to cut off power supply at wiring (including connector plug-in/out) .
- Use a dedicated cable with a sensor to connect the ionizer and a feed back sensor or an auto balance sensor, and do not disassemble and/or modify the cable for the sensor.
- Turn on the power after examining wiring and a surrounding situation enough, and confirming safety.
- Do not connect and disconnect connectors while supplying the power. Ionizer might be broken and cause malfunction.
- Installation with high-voltage line and power line in the same wiring route may cause malfunction by noise. Install separately with them.

9. Be sure there is no incorrect wiring before operation. Incorrect wiring may cause product breakage or malfunction.
10. Flush pneumatic piping before its installation. Make sure that all dust, water droplet, oil etc. are eliminated before piping.

Environment

WARNING

1. Use within operating fluid and ambient temperature range.
Operating fluid and ambient temperature range for Ionizer, feed back sensor and auto balance sensor are 0 to 50°C. Though ambient temperature is within specification, dew condensation might be generated where temperature is suddenly changed. Therefore do not use under such environment.
2. Do not use this product in an enclosed space.
This product utilizes the corona discharge phenomenon. Since a small amount of ozone and NOx is generated, do not use it in an enclosed space.
3. Environment to avoid
Do not use or store under the following environments, as these may cause operation failure. If it is unavoidable, take the appropriate measures.
 - a. The place where ambient temperature exceeds 0 to 50°C.
 - b. The place where ambient humidity exceeds 35 to 85% RH.
 - c. The place where dew condensation is generated due to sudden temperature change.
 - d. The place where there is corrosive gas, inflammable gas, and volatile inflammable substance is stored.
 - e. The atmosphere where the product is exposed to conductive powder such as iron powder and dust, oil mist, salt and organic solvent or machining chips, particles and cutting oil (water, liquid).
 - f. The place where product is directly exposed to the blow from air-conditioners.
 - g. The place where sealed and ventilation is not installed.
 - h. The place where the product is exposed to the direct sunlight and radiant heat.
 - i. The place where strong electromagnetic noise is generated. (Strong electric field/ strong magnetic field/ surge.)
 - j. The place where electricity is discharged. The situation which causes electric discharge on the product.
 - k. The place where strong high frequency is generated.
 - l. The place where lightning disaster is expected.
 - m. The place where the product is directly exposed to the vibration and impact.
 - n. The situation where the force and weight that causes deformation of the product is applied.
4. Do not use air containing mist or dust.
Air containing mist or dust may lower function and shorten maintenance cycle. Dryer (IDF series), air filter (AF/AFF series), mist separator (AFM/AM series) to produce clean compressed air.
5. Ionizer, feed back sensor and auto balance sensor are not tolerable against surge of lightning.
Protection against lightning surge should be incorporated in the equipment..

Maintenance

CAUTION

1. Keep electrode needle clean by regular maintenance.
Make sure that the equipment is operating without any failure by regular maintenance. Those who have enough knowledge and experience should perform the maintenance of the equipment.
Dust attached on the electrode needle due to longer operating lowers the function to eliminate static electricity. If electrode does not recover its function to eliminate static electricity due to worn out after cleaning, replace it with the new one. In order to maintain the stable performance, regular maintenance and cleaning of electrode are recommended.
2. Stop supplying power to the body without fail when cleaning the electrode needle or exchanging the electrode cartridge. Do not touch the electrode needle while energizing, or it may cause electric shock or



Caution
for High Voltage

A high voltage generating circuit is installed. Be sure to stop the supply voltage at the maintenance. Do not disassemble / renovate the product as it may deteriorate the functions and cause risks due to electric shock and electric leakage.

accident.

3. Do not open the case to disassemble and reconstruct the product.
It may cause electric shock, operation failure and 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.
4. Do not operate the product with the wet hands.
It may cause electric shock or accident.

WARNING

1. Do not drop, hit to the object and give excessive impact (10G or more) at handling.
Though Ionizer itself doesn't break, inside construction might be broken and cause malfunction.
2. When cable is mounted or eliminated, pinch modular plug claw with finger and insert or take out the plug itself vertically. If mounted or eliminated to inappropriate direction, mounting part of modular jack might be damaged and finally it leads to operation failure.

2. Installation

2-1. Installation of Ionizer body

Investigate the places where static problem occurs, or process and parts which generate ESD (Electro static discharge), and carefully consider the required conditions to ensure appropriate static charge elimination before installation.

1. Installation height

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

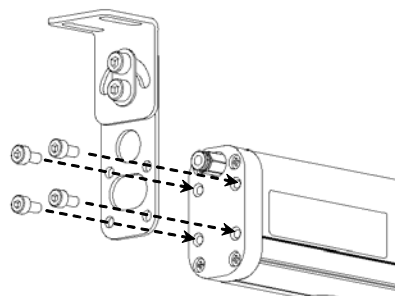
Ion-production frequency [Hz]	Distance between the charged objects and ionizer (mm)	
	With air purge (note)	W/o air purge
1	400 to 2000	400 to 500
3	300 to 2000	300 to 400
5	300 to 2000	300 to 400
10	200 to 2000	200 to 300
15	200 to 2000	200 to 300
20	150 to 2000	150 to 250
30	50 to 2000	50 to 200
60	50 to 2000	50 to 150

(Note) • As the installation height stated above is a standard, check the effect of the static charge elimination before installation.

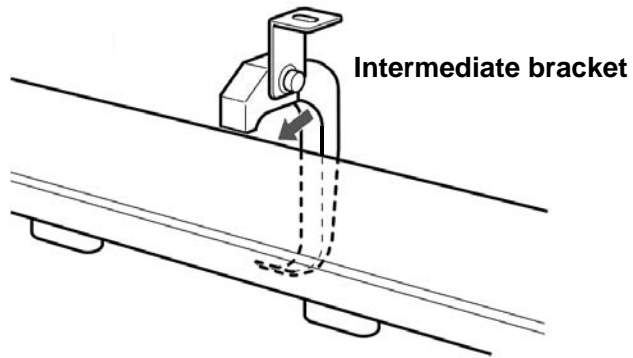
• The minimum installation height should be 200mm or more when the feed back sensor is use, and that for the auto balance sensor should be 100mm or more. When the ionizer is used outside of these conditions, be sure to check if these sensors will operate properly.

2. Mount end brackets on both sides of the ionizer body with the attached M4 threads.

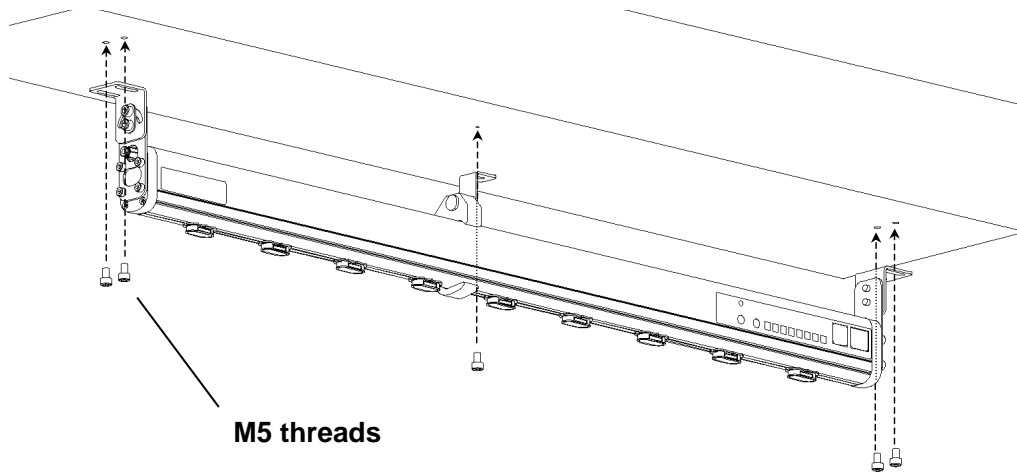
Attached M4 threads



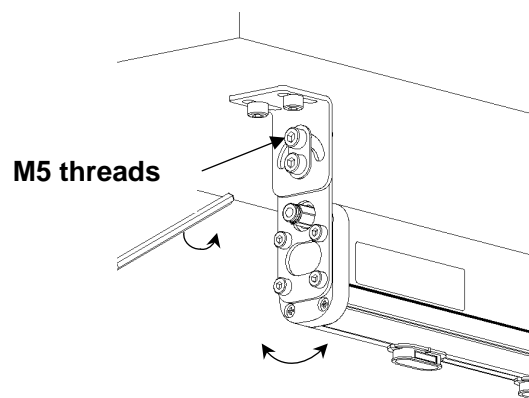
3. Mount intermediate brackets on the ionizer body at regular interval.



4. Tap M5 thread on the brackets mounting positions at the installation side, and fix the ionizer body and brackets with M5 threads.

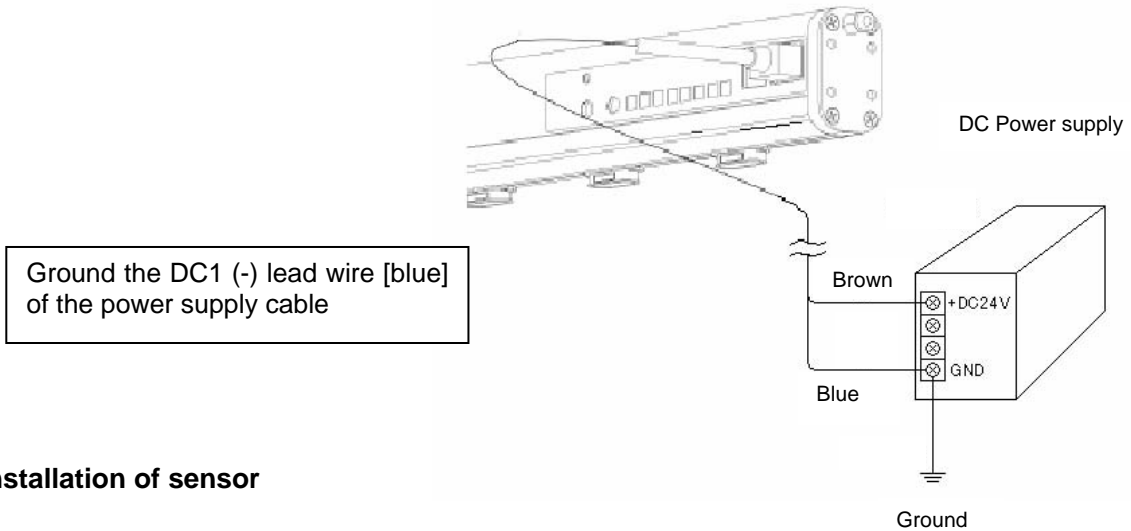


5. Adjust angle of the ionizer body to ensure proper static charge elimination, and fix it with detent threads (M5) of brackets.



6. Be sure to ground the DC1 (-) lead wire [blue] of the power supply cable (Resistance between the lead wire and the earth ground should be 100Ω or less.)

If the lead wire is not grounded, the ion balance will be unstable, and an electric shock may occur. At the same time, the ionizer and power supply might be damaged.



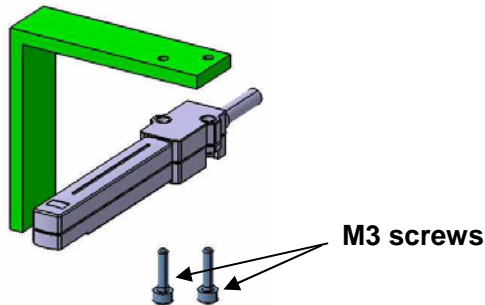
2-2. Installation of sensor

1. Installation of sensor head

■ Feed back sensor

Keep the detecting hole of the sensor head towards the charged object to precisely detect the target's static charge. Keep the distance between the detecting hole and surface of the charged object within 10 to 50mm to prevent the sensor from coming in contact with the charged object. The detecting range and sensor output will be changed depending on the installation distance.

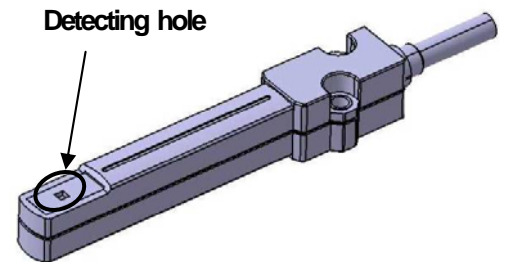
Mount the sensor head with two pieces of M3 screws (sold separately).



As the sensor head case is connected to the GND, pay great attention to the installation or power supply to prevent short-circuit between the GND and 24V power supply.

The detecting hole is open to detect static electricity. When foreign substances are intruded into the hole or tools come in contact with the inside of the detecting hole, it leads to a malfunction or damage of the sensor, resulting in an improper detection of the static electricity. Therefore, do not put any foreign substances in the detecting hole or touch it with a tool.

Do not pull a cable out of the sensor head. If the cable is pulled with a strong force, the sensor head might be damaged or its wires might be broken.

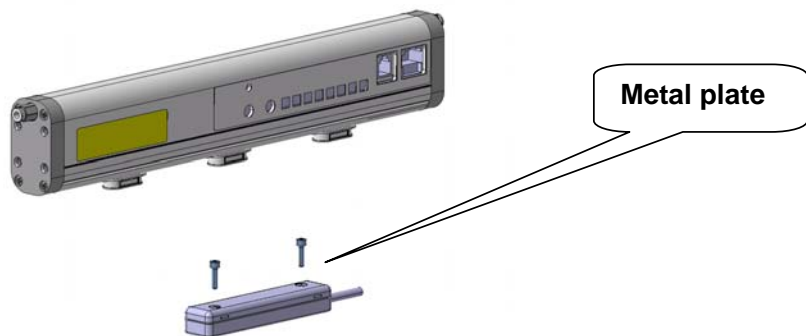


■ Auto balance sensor

Horizontally place the auto balance sensor under the ionizer and face its metal plate upward. Because the ion balance will be changed depending on the installation height, install the sensor on the same level with a workpiece as much as possible. 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 stated in 2-1.

Mount the head sensor with 2 pieces of M3 screws (sold separately).

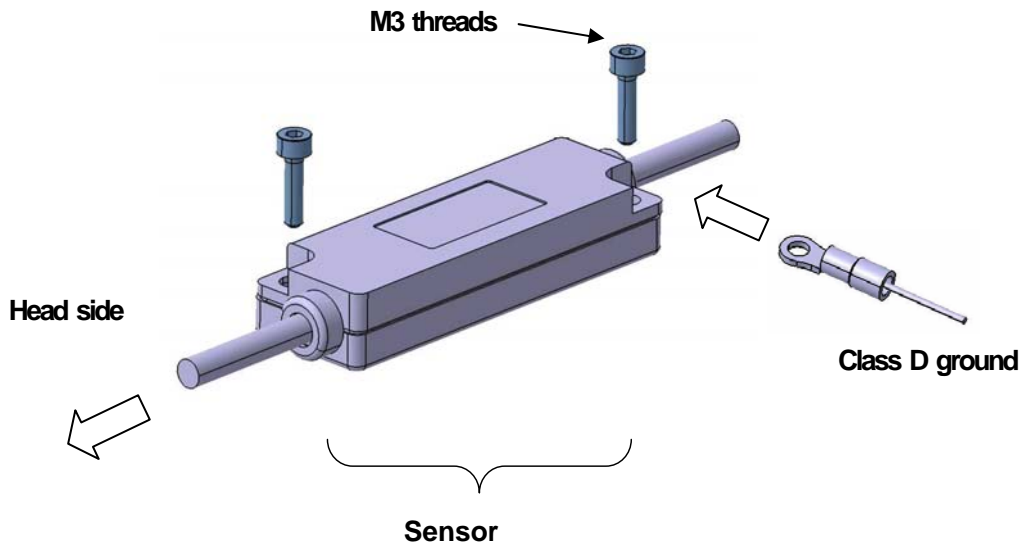


2. Installation of sensor amp

A sensor amp should be mounted with 2 pieces of M3 screws (sold separately).

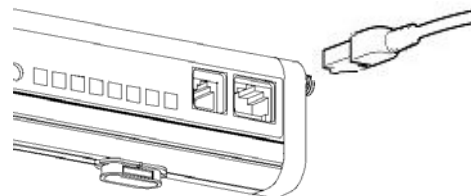
Do not pull a cable out of the sensor amp. If the cable is pulled with a strong force, the sensor amp might be damaged or its wires might be broken.

Be sure to ground the sensor amp case. (Resistance between the sensor amp case and the earth ground should be 100Ω or less.) Because the sensor amp case surface is treated with conductive plating, FG wiring is not necessary when the sensor amp case is connected to the mounting surface of the grounded unit. If the mounting surface is insulated with painting or being anodized, be sure to connect the FG wiring for grounding.

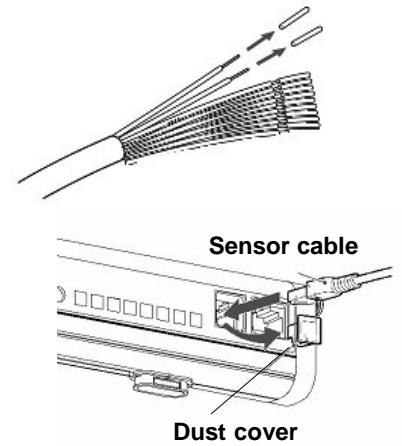


2-3. Connection of cable

1. Insert the modular plug of power supply cable IZS31-CP into the modular jack for indicating [power] on the ionizer body. A lever will snap when the modular plug is correctly locked. Fix cables with a tie wrap or other measures in the vicinity of connection not to apply compulsive force to the modular jack and plug.



2. Connect the lead wires in accordance with the lead wire list. (See Chapter 4) Arrange lead wires in accordance with the wiring table. The unused wires should be cut short or covered with vinyl tape without peeling the coat to prevent them from coming contact with other wires.



3. When the feed back sensor or auto balance sensor is used, remove the dust cover from the modular jack with [signal] indication, and insert the modular plug of the sensor cable (IZS31-CS). A lever will snap when the modular plug is correctly locked. Fix cables with a tie wrap or other measures in the vicinity of their connection not to apply compulsive force to the modular jack and plug.

3. Function description

3-1. Operation mode

3 types of operation modes are available with IZS31 (sensing DC mode, pulse DC mode and DC mode.) These modes are selectable depending on the applications and operating conditions.

1. Sensing DC mode

This mode detects the charged condition of the workpiece with the feed back sensor, and feed back the condition to the ionizer. With this mode, ions with optimal polarity are discharged to shorten the static charge elimination time. When the static charged of the workpiece becomes +/-30V or less ^{note)}, the completion signal of the static charge elimination will turn off.

This mode is suitable for the object that is largely charged.

Once the static charge elimination is completed, [energy-saving operation] or [continuous static charge elimination mode] can be selected.

Energy-saving operation	The ion-discharge output will automatically stop once the static charge elimination is completed. If the charged potential of the work becomes +/- 30 V or more, the ion will be discharged again. The [energy-saving operation] is recommended for conductive workpieces.
Continuous static charge eliminating operation	The static charge will be continuously eliminated with pulse DC as maintaining the ion balance to make the charged potential +/-30V or less ^{note)} even after the static charge is completed. The [continuous static charge eliminating operation] is recommended for nonconductive workpieces.

Note) when the installation height of the feed back sensor is 25mm.

2. Pulse DC mode

The ionizer discharges plus ions and minus ions by turns.

When the auto balance sensor is used, the ion balance is automatically adjusted within +/-30V. If the ion balance exceeds +/-30V due to the dirt on the electrode needle, the maintenance output signal will be output.

This mode is suitable for eliminating the static charge in the air and/or on the workpieces.

■ When the auto balance sensor is used.

[Manual operation] or [auto operation] can be selected for the ion balance adjustment.

Manual operation	When maintenance start-up signal is input, or the power supply of the ionizer is applied, the ion balance adjustment will begin. When workpieces are moving, [manual operation] is recommended. Start the equipment after ion balance is adjusted.
Auto operation	The ion balance is continuously adjusted. When the static charge of the still workpieces or in the atmosphere is eliminated, the [auto operation] is recommended.

■ When the auto balance sensor is not used.

The ion balance is adjusted with a balance adjusting trimmer. An instrument is separately needed to check the ion balance.

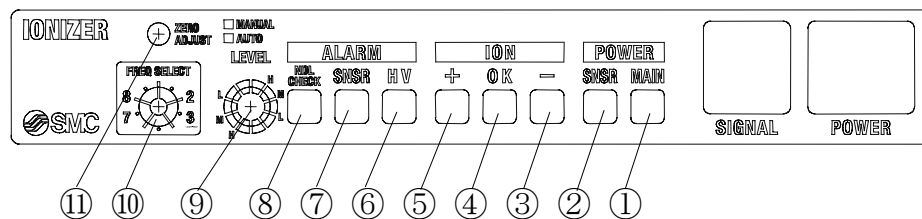
3. DC mode

Plasma ions or minus ions are continuously discharged. The parts other than the charged object need to be grounded to prevent them from being charged. The plasma and minus ions cannot be discharged simultaneously.

3-2. Detection of the dirt on the electrode needle

When the maintenance start-up signal is input, the ionizer detects if the static charge elimination capability is degraded due to the dirt on the electrode needle. If the electrode needle needs to be cleaned because of the degraded capability of the static charge, the maintenance LED lights up, and then the maintenance output signal is output. Because just installing the feed back sensor or auto balance sensor is not enough to detect if the static charge eliminating capability is degraded, regularly input the maintenance start-up signal to check the static charge elimination capability.

3-3. Indication/ Setting part description

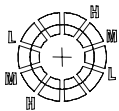


No.	Name	Type	Description
①	Power supply indication	LED (Green)	Lights up green when the power supply is turned ON. Flashes when the power supply voltage is not proper.
②	Sensor connecting indication	LED (Green)	Lights up when the feed back sensor and/or auto balance sensor is connected.
③	Minus indication	LED (Blue)	LED will change depending on the operating modes. 4. See the selection of models and setting.
④	Completion indication	LED (Green)	
⑤	Plus indication	LED (Orange)	
⑥	Indication for abnormal high voltage	LED (Red)	Lights on red when overcurrent is applied to the electrode needle.
⑦	Sensor failure indication	LED (Red)	Lights on red when the feed back sensor and/or auto balance sensor is not operating properly.
⑧	Maintenance indication	LED (Red)	Flashes red when dirt on the electrode needle is detected.
⑨	Maintenance level selecting switch	Rotary switch	LED will change depending on the operating modes. 4. See the selection of models and setting.
⑩	Frequency selecting switch	Rotary switch	
⑪	Balance adjusting trimmer	Trimmer	This trimmer is used to adjust the ion balance when the auto balance sensor is not used.

4. Selection and setting of equipment

4-1. Sensing DC mode

1. Selection of bar length
 - Select the length applicable to work size base on static charge elimination area and static charge elimination characteristics.
2. Installation of body
 - Keep the distance between the ionizer and charged objects within 200 to 2000mm. Although the ionizer can be mounted outside of this range, it may not operate properly depending on the operating conditions. Therefore, be sure to check if the ionizer will operate properly.
3. Installation of the sensor
 - Install the feed back sensor. Keep the detecting hole towards the charged face.
 - It should be mounted within a 10 to 50mm of installation height. Although the ionizer can be mounted outside of this range, it may not operate properly depending on the operating conditions. Therefore, be sure to check if the sensor will operate properly.
 - When the ionizer and feed back sensor are connected, the mode is automatically shifted to the sensing DC mode.
4. Setting of the maintenance level selecting switch
 - Set the level for detecting the dirt on the electrode needle.
 - Select the level from H(High), M(Middle) or L(Low). The dirt on the electrode needle cannot be detected with other levels.



- H(High) ... The level that doesn't affect the static charge eliminating time (Even a small amount of dirt can be detected).
- M(Middle) ... The level that can notify the maintenance just before the static charge elimination time becomes slow.
- L(Low) ... The level that the static charge elimination time becomes slower than the one in the initial state.

• The dirt detection is done when the maintenance start-up signal is input.

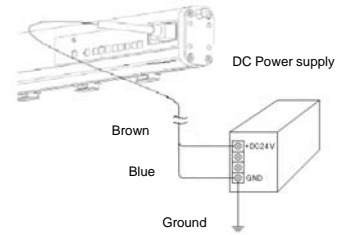
5. Setting of frequency selection switch
 - This switch is used to switch the [energy-saving operation] and [continuous static charge eliminating operation].
 - With [continuous static charge eliminating operation], the ion-production frequency needs to be selected after the static charge elimination is completed.



	Operation details		Switch setting
Energy-saving operation	When the static charge elimination is completed, the ion-discharge-output will automatically stop.	<p>+ ion</p> <p>— ion</p> <p>stops</p>	8
Continuous static charge eliminating operation	The static charge elimination continues as controlling the ion balance with pulse DC even after the static charge elimination is completed so that the charged potential of works maintains +/-30V or less. Ions are discharged with the set frequency.	<p>+ ion</p> <p>— ion</p> <p>(e.g.) Charged work: negative charge</p> <p>Static charge Elimination completed</p>	0 ... 1Hz 1 ... 3Hz 2 ... 5Hz 3 ... 10Hz 4 ... 15Hz 5 ... 20Hz 6 ... 30Hz 7 ... 60Hz

6. Wiring of the power supply cable

- Connect dedicated power supply cables.



■ Connection with the power supply for ionizer operation

Symbol	Cable color	Cable name	Connection	Description
DC1(+)	Brown	Power supply DC24V	○	Power supply cable for ionizer operation
DC1(-)	Blue	Power supply GND[FG]	○	
OUT4	Dark Green	Sensor monitor output	△	Charged potential of the work is output with analog signal (1 to 5V)

※ Be sure to ground DC1(-)[Blue]. (Resistance between the lead wire and the earth ground should be 100Ω or less.) If not, it may break the ionizer.

■ Connection with the power supply for I/O signal

Symbol	Cable color	Cable name	Connection	Description
DC2(+)	Red	Power supply DC24V	○	Power supply cable for I/O signal
DC2(-)	Black	Power supply GND	○	
IN1	Light Green	Discharge-stop signal	○	Signal for starting/ stopping the discharge (NPN spec) Operation will begin when it is connected with DC2(-) [Black]. (PNP spec) Operation will begin when it is connected with DC2(+) [Red].
IN2	Gray	Maintenance start-up signal	△	A signal that is input when the maintenance of the electrode needle is necessary.
—	White	—	—	—
—	Orange	—	—	—
OUT1	Pink	Completion signal for static charge elimination	△	Outputs when the charged potential of the work is +/-30V or more, and when the dirt on the electrode needle is detected.
OUT2	Yellow	Maintenance output signal	△	Outputs when the maintenance of the electrode needle is necessary.
OUT3	Purple	Signal for failure	△	Outputs in case of abnormal high voltage and sensor and/or CPU failure. (B contact output)

○ : Wires that are minimum required to operate the ionizer.

△ : Wires that are required to use the functions.

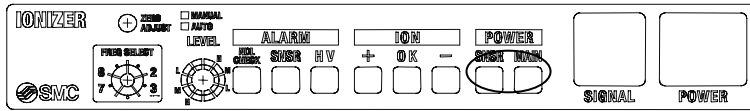
— : Wires that are not necessary with the sensing DC mode. These wires should not be short-circuited with other cables.

7. Air piping

- When the piping is only connected to one port, the other unused port should be plugged with the M-5P that is packaged together with the ionizer.

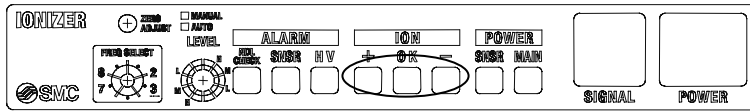
8. LED display

- POWER LED ... The power supply input and the connection of the sensors are displayed.



LED name		Functions
POWER	MAIN	Lights up when the power supply is applied. (Green) (Flashes when wrong power supply is applied.)
	SNSR	Lights up when the feed back sensor is connected.(Green)

- ION LED ... The charged condition of the work is displayed.

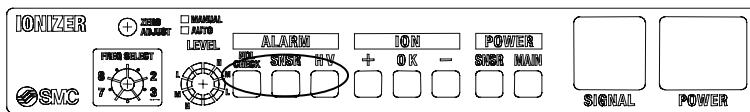


LED name		Functions
ION	+	The charged potential of the work is positive. (Orange)
	OK	The charged potential of the work is low. (Green)
	-	The charge potential of the work is negative. (Blue)

· The charged condition of the work can be identified with the LED display.

Charged polarity of work	LED		Charged potential of the work	
	+	OK -		
↑ Plus ↑ static charge elimination ↓ Minus ↓	■ □ □	□ □ □	More than +400V	■ light on ■ flash with 4 Hz □ light out
	■ □ □	□ □ □	+100V to +400V	
	■ □ □	■ □ □	+30V to +100V	
	□ □ □	■ □ □	+30V to -30V	
	□ □ □	■ □ ■	-30 to -100V	
	□ □ □	□ □ ■	-100 to -400V	
	□ □ □	□ □ ■	More than -400V	

- ALARM LED ... Failure of the ionizer is displayed.



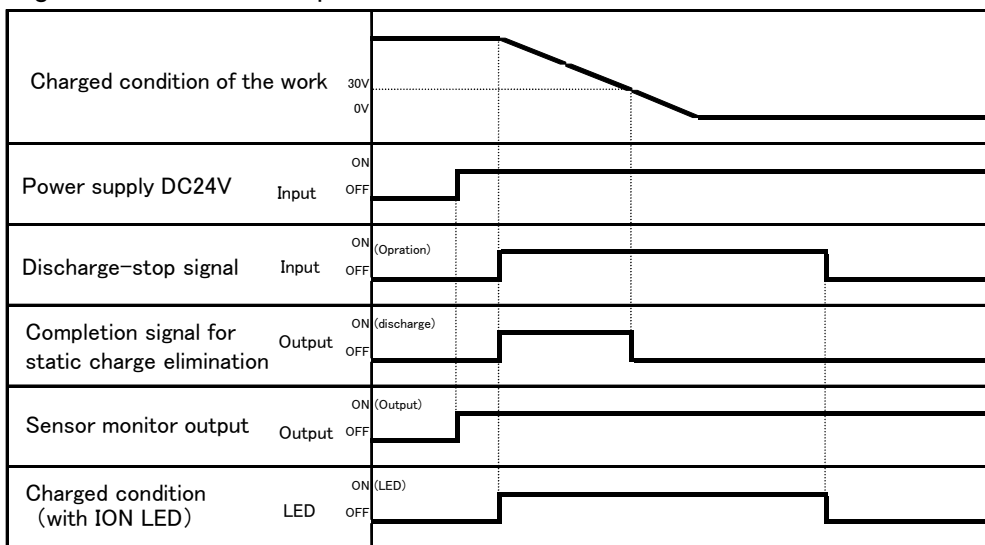
LED name		Functions
ALARM	HV	Lights up when overcurrent is applied to the electrode needle. (Red)
	SNSR	Lights up when the feed back sensor doesn't work properly. (Red)
	NDL CHECK	Lights up when dirt on the electrode needle is detected. (Red) (Flashes when the dirt is being detected.)

9. Alarm

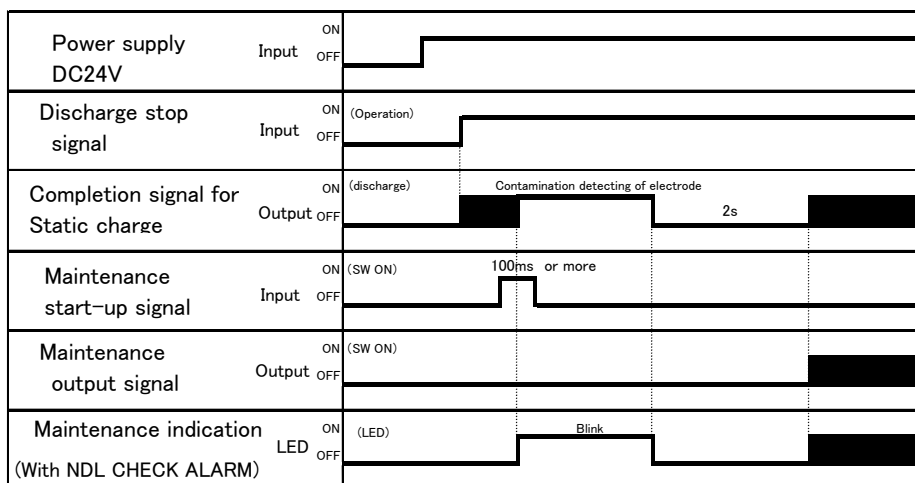
Type of alarm	Description	How to reset
Abnormal high voltage	Notifies when overcurrent such as high voltage leakage occurs. The ion-discharge-output is stopped, HV ALRM sets off and output the signal for failure.	Turn off the power supply to solve the problem. Once it's solved, apply the power supply again. Or turn on and off the discharge-stop signal.
Sensor failure	Notifies that the feed back sensor doesn't work properly. SNSR ALARM lights up, and the signal for sensor failure is output.	Turn off the power supply to solve the problem. Once it's solved, apply the power supply again. Or turn on and off the discharge-stop signal.
CPU failure	Notifies that CPU fails due to noise. All LEDs Flashes, and the signal for CPU failure is output.	Turn off the power supply to solve the problem. Once it's solved, apply the power supply again. Or turn on and off the discharge-stop signal.
Electrode needle maintenance	Notifies when the maintenance of the electrode needle is necessary. NDL CHECK ALARM lights up, and the maintenance output signal is output.	Turn off the power supply and clean the electrode needle. Then apply the power supply.

10. Timing chart

■ Timing chart with a normal operation



■ Timing chart when the dirt on the electrode needle is detected



■ ON and OFF status will be changed depending on the situation

- The completion signal for static charge elimination is output while the dirt on the electrode needle is being detected
- Because ions are discharged from the ionizer when the electrode needle is being detected, the workpiece might be charged. Therefore, the workpieces should not be mounted when the detection is executed.

4-2. Pulse DC mode

1. Selection of the bar length

- Select an appropriate length that is suitable for the work size, static charge elimination characteristics and static charge elimination range.

2. Installation of the ionizer

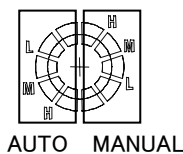
- Keep the distance between the ionizer and charged object within 50 to 2000mm. When the auto balance sensor is used, the distance should be ranged from 100 to 2000mm. When the ionizer is used outside of the operating conditions, it might not operate properly. In that case, be sure to check if the ionizer will operate properly.

3. Installation of the sensor

- Install the auto balance sensor to adjust the ion balance.
- Horizontally place the auto balance sensor under the ionizer, and install the sensor on the same level with a workpiece as much as possible.
- When the auto balance sensor is connected, the balance adjustment trimmer will be invalid.

4. Setting of the maintenance level selecting switch

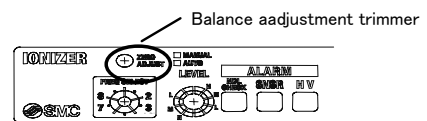
- [manual operation] or [auto operation] can be selected when the ion balance needs to be adjusted with the auto balance sensor.



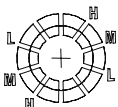
	Description	Switch setting
Manual operation	Ion balance is adjusted when the maintenance start-up signal is input or when the power supply of the Ionizer is applied. The ion-balance adjustment values are retained per ion-production frequency. When the ion-production frequency is changed, adjust the ion balance. Once the ion-balance adjustment is completed, the ion balance adjustment will not be executed unless the next maintenance start-up signal is input. Therefore, the auto balance sensor can be removed.	MANUAL
Auto operation	Ion-balance is continuously adjusted. Once the auto balance sensor is removed, manually adjust the ion-balance with a balance adjustment trimmer.	AUTO

* Set the switch in line with the detection level of the dirt on the electrode needle.

- When the auto balance sensor is not used, change the switch setting to AUTO, and manually adjust the ion-balance with a balance adjustment trimmer.



- Set the level for detecting the dirt on the electrode needle.
- Select the level from H(High), M(Middle) or L(Low). The dirt on the electrode needle cannot be detected with other levels.



- H(High) ... The level that doesn't affect the static charge eliminating time (Even a small amount of dirt can be detected).
- M(Middle) .. The level that can notify the maintenance just before the static charge elimination time becomes slow.
- L(Low) ... The level that the static charge elimination time becomes slower than the one in the initial state.

- The dirt detection will begin once the maintenance start-up signal is input.
- If H, M and L levels are set, ion balance adjustment is executed after the dirt on the electrode needle is detected.

5. Setting of the frequency selecting switch

- Select the ion-production frequency.



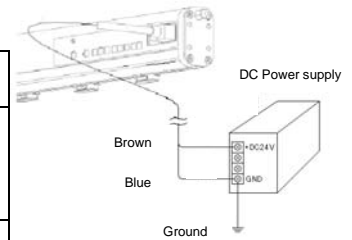
Ion-production frequency	Switch setting
1Hz	0
3Hz	1
5Hz	2
10Hz	3
15Hz	4
20Hz	5
30Hz	6
60Hz	7

6. Wiring of the power supply cables

- Connect a dedicated power supply cable.

■ Connection power supply for ionizer drive

No	Lead wire color	Description	Direction of signal	Function
DC1(+)	Brown	Power supply DC24V	○	power supply cable for ionizer drive
DC1(-)	Blue	Power supply GND[FG]	○	
OUT4	Dark Green	Sensor monitor output	—	—



※ Be sure to ground DC1(-)[Blue]. (Resistance between the lead wire and the earth ground should be 100Ω or less.) If not, it may break the ionizer.

■ Connection power supply for I/O signal

No	Lead wire color	Description	Direction of signal	Function
DC2(+)	Red	Power supply DC24V	○	Power supply cable for I/O signal
DC2(-)	Black	Power supply GND	○	
IN1	Light Green	Discharge-stop signal	○	Signal for starting/ stopping the discharge (NPN spec) Operation will begin when it is connected with DC2(-) [Black]. (PNP spec) Operation will begin when it is connected with DC2(+) [Red].
IN2	Gray	Maintenance start-up signal	△	A signal that is input when the maintenance of the electrode needle is necessary.
—	White	—	—	—
—	Orange	—	—	—
OUT1	Pink	Completion signal for static charge elimination	△	Outputs when the dirt on the electrode needle is detected.
OUT2	Yellow	Maintenance output signal	△	Outputs when the maintenance of the electrode needle is necessary.
OUT3	Purple	Signal for failure	△	Outputs in case of abnormal high voltage and sensor and/or CPU failure. (B contact output)

○ : Wires that are minimum required to operate the ionizer.

△ : Wires that are required to use the functions.

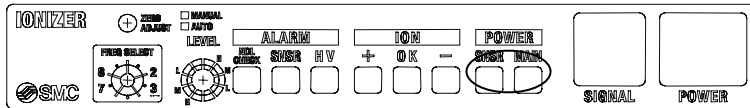
— : Wires that are not necessary with the pulse DC mode. These wires should not be short-circuited with other cables.

7. Air piping

- When the piping is only connected to one port, the other unused port should be plugged with the M-5P that is packaged together with the ionizer.

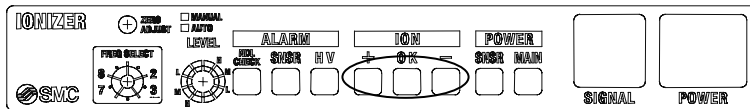
8. LED display

- **POWER LED** ... The power supply input and the connection of the sensors are displayed.



LED name		Functions
POWER	MAIN	Lights up when the power supply is applied. (Green) (Flashes when wrong power supply is applied.)
	SNSR	Lights up when the auto balance sensor is connected.(Green)

- **ION LED** ... The discharged ion polarity and ion balance are displayed.



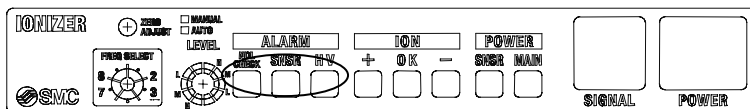
LED name		Function
ION	+	Lights on when plus ions are generated.(Orange)
	OK	[With auto balance sensor] Condition of the ion balance (Green) [W/o auto balance sensor] Goes out
	-	Lights on when minus ions are generated.(Blue)

• The ion balance state can be identified with the LED display.

Ion balance	OK LED
Below +/-30V	Lighet up.(or flashes)
+/-30V or more	Goes out

※ LED [OK] flashes when the ion balance nears the limit of the adjustment of the ion balance and indicates that it is time for maintenance of the electrode needle.

- **ALARM LED** ... Failure of the ionizer will be indicated.



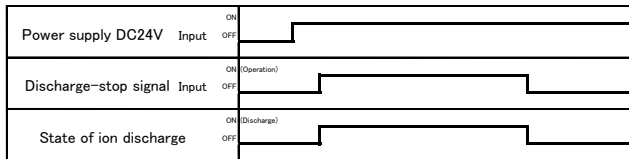
LED name		Functions
ALARM	HV	Lights up when overcurrent is applied to the electrode needle. (Red)
	SNSR	Lights up when the auto balance sensor doesn't work properly. (Red)
	NDL CHECK	Lights up when dirt on the electrode needle is detected. (Red) (Flashes when the dirt is being detected.)

9. Alarm

Type of alarm	Description	How to reset
Abnormal high voltage	Notifies when overcurrent such as high voltage leakage occurs. The ion-discharge-output is stopped, HV ALRM sets off and output the signal for failure.	Turn off the power supply to solve the problem. Once it's solved, apply the power supply again. Or turn on and off the discharge-stop signal.
Sensor failure	Notifies that the auto balance sensor doesn't work properly. SNSR ALARM lights up, and the signal for sensor failure is output.	Turn off the power supply to solve the problem. Once it's solved, apply the power supply again. Or turn on and off the discharge-stop signal.
CPU failure	Notifies that CPU fails due to noise. All LEDs Flashes, and the signal for CPU failure is output.	Turn off the power supply to solve the problem. Once it's solved, apply the power supply again. Or turn on and off the discharge-stop signal.
Electrode needle maintenance	Notifies when the maintenance of the electrode needle is necessary. NDL CHECK ALARM lights up, and the maintenance output signal is output.	Turn off the power supply and clean the electrode needle. Then apply the power supply.

10. Timing chart

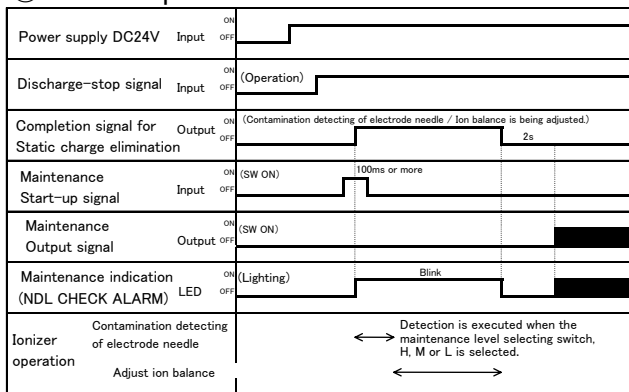
■ Timing chart with a normal operation



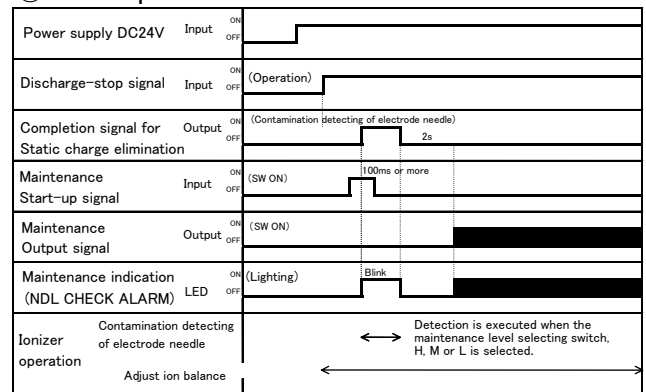
■ Timing chart when the dirt on the electrode needle is detected / adjust ion balance

(a) With auto balance sensor

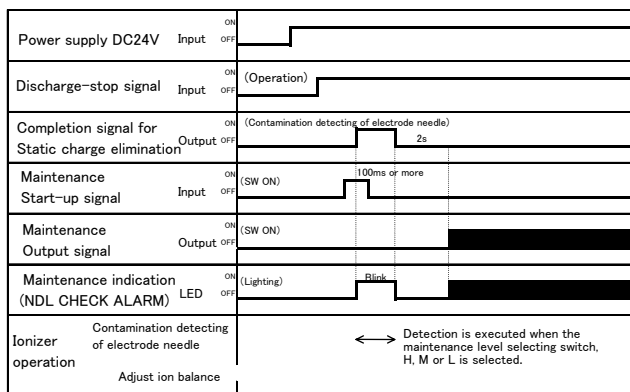
① Manual operation



② Auto operation



(b) W/o auto balance sensor



■ ON and OFF status will be changed depending on the situation.

- The completion signal for static charge elimination is output while the dirt on the electrode needle is being detected
- Because ions are discharged from the ionizer when the electrode needle is being detected, the workpiece might be charged. Therefore, the workpieces should not be mounted when the detection is executed.

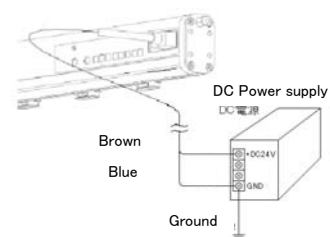
4-3. DC mode

1. Selection of bar length
 - Select the length applicable to work size base on static charge elimination area and static charge elimination characteristics.
2. Installation of body
 - Keep the distance between the ionizer and charged objects within 50 to 2000mm. Although the ionizer can be mounted outside of this range, it may not operate properly depending on the operating conditions. Therefore, be sure to check if the ionizer will operate properly.
3. Installation of the sensor
 - [Plus ion discharge] or [minus ion discharge] can be selected.



Ion polarity	Switch setting
Plus ion discharge	8
Minus ion discharge	9

4. Wiring of the power supply cable
 - Connect dedicated power supply cables.



■ Connection with the power supply for ionizer operation

Symbol	Cable color	Cable name	Connection	Description
DC1(+)	Brown	Power supply DC24V	○	Power supply cable for ionizer operation
DC1(-)	Blue	Power supply GND[FG]	○	
OUT4	Dark Green	Sensor monitor output	—	—

※ Be sure to ground DC1(-)[Blue].(Resistance between the lead wire and the earth ground should be 100Ω or less.)
If not, it may break the ionizer.

■ Connection with the power supply for I/O signal

Symbol	Cable color	Cable name	Connection	Description
DC2(+)	Red	Power supply DC24V	○	Power supply cable for I/O signal
DC2(-)	Black	Power supply GND		
IN1	Light Green	Discharge-stop signal	○	Signal for starting/ stopping the discharge (NPN spec)Operation will begin when it is connected with DC2(-) [Black]. (PNP spec)Operation will begin when it is connected with DC2(+) [Red].
IN2	Gray	Maintenance start-up signal	—	—
—	White	—	—	—
—	Orange	—	—	—
OUT1	Pink	Completion signal for static charge elimination	—	—
OUT2	Yellow	Maintenance output signal	—	—
OUT3	Purple	Signal for failure	△	Outputs in case of abnormal high voltage and sensor and/or CPU failure. (B contact output)

○ : Wires that are minimum required to operate the ionizer.

△ : Wires that are required to use the functions.

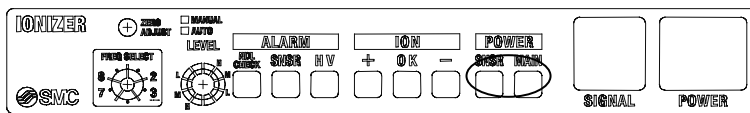
— : Wires that are not necessary with the sensing DC mode. These wires should not be short-circuited with other cables.

5. Air piping

- When the piping is only connected to one port, the other unused port should be plugged with the M-5P that is packaged together with the ionizer.

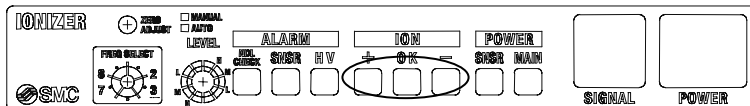
6. LED display

- POWER LED ... The power supply input and the connection of the sensors are displayed.



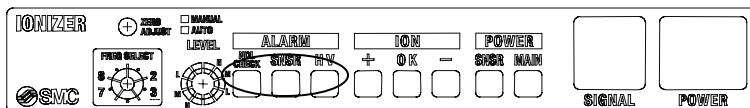
LED name		Functions
POWER	MAIN	Lights up when the power supply is applied. (Green) (Flashes when wrong power supply is applied.)
	SNSR	Goes out.

- ION LED ... The discharged ion polarity is displayed.



LED name		Functions
ION	+	Lights on when plus ions are generated.(Orange)
	OK	Goes out.
	-	Lights on when minus ions are generated.(Blue)

- ALARM LED ... Failure of the ionizer is displayed.



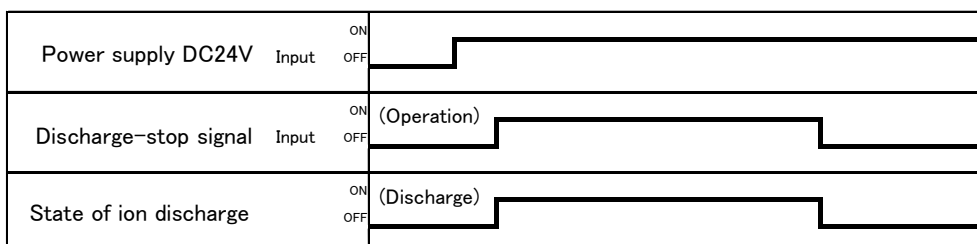
LED name		Functions
ALARM	HV	Lights up when overcurrent is applied to the electrode needle. (Red)
	SNSR	Goes out.
	NDL	Goes out.
	CHECK	Goes out.

7. Alarm

Type of alarm	Description	How to reset
Abnormal high voltage	Notifies when overcurrent such as high voltage leakage occurs. The ion-discharge-output is stopped, HV ALRM sets off and output the signal for failure.	Turn off the power supply to solve the problem. Once it's solved, apply the power supply again. Or turn on and off the discharge-stop signal.
CPU failure	Notifies that CPU fails due to noise. All LEDs Flashes, and the signal for CPU failure is output.	Turn off the power supply to solve the problem. Once it's solved, apply the power supply again. Or turn on and off the discharge-stop signal.

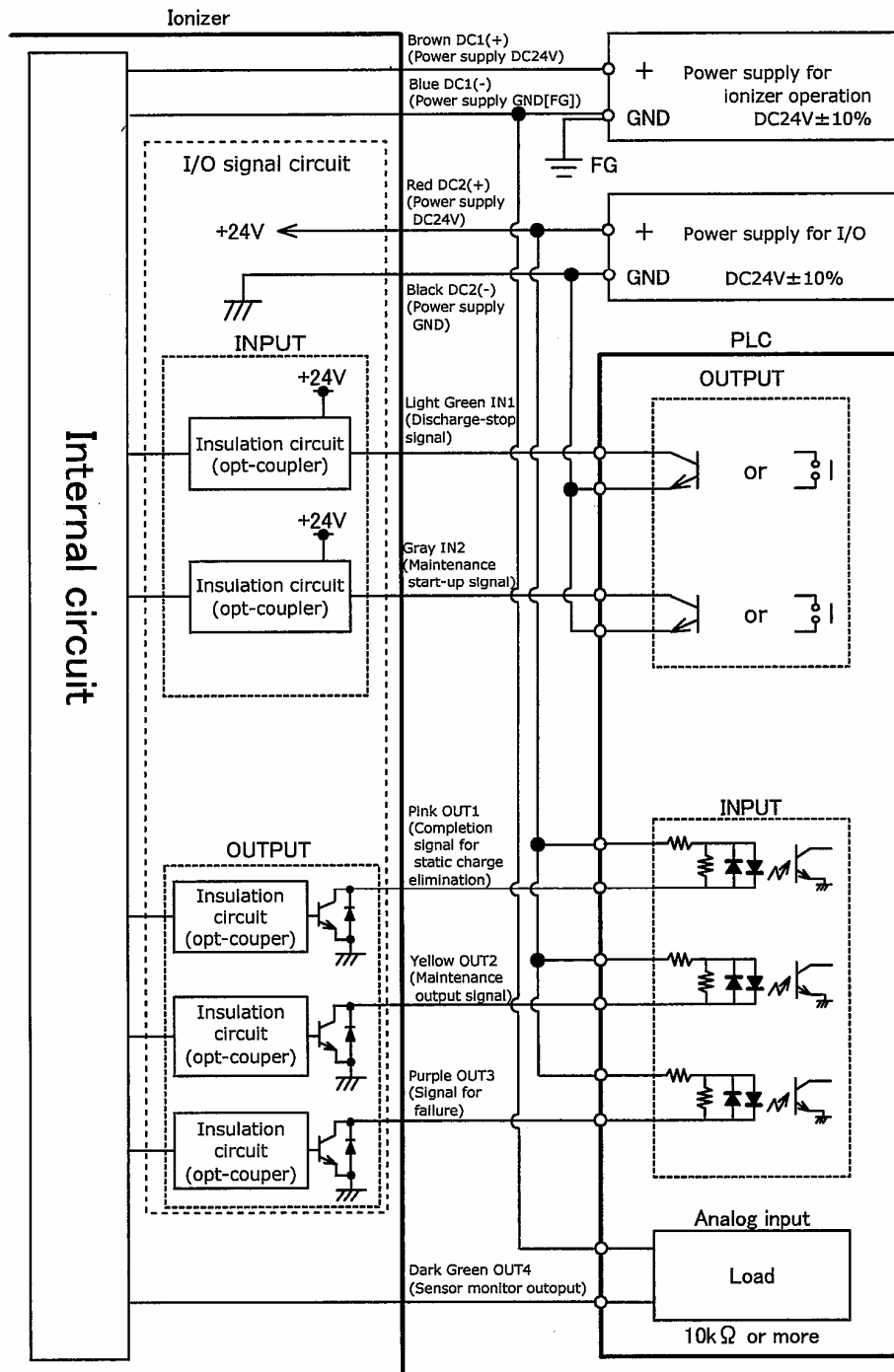
8. Timing chart

- Timing chart with a normal operation

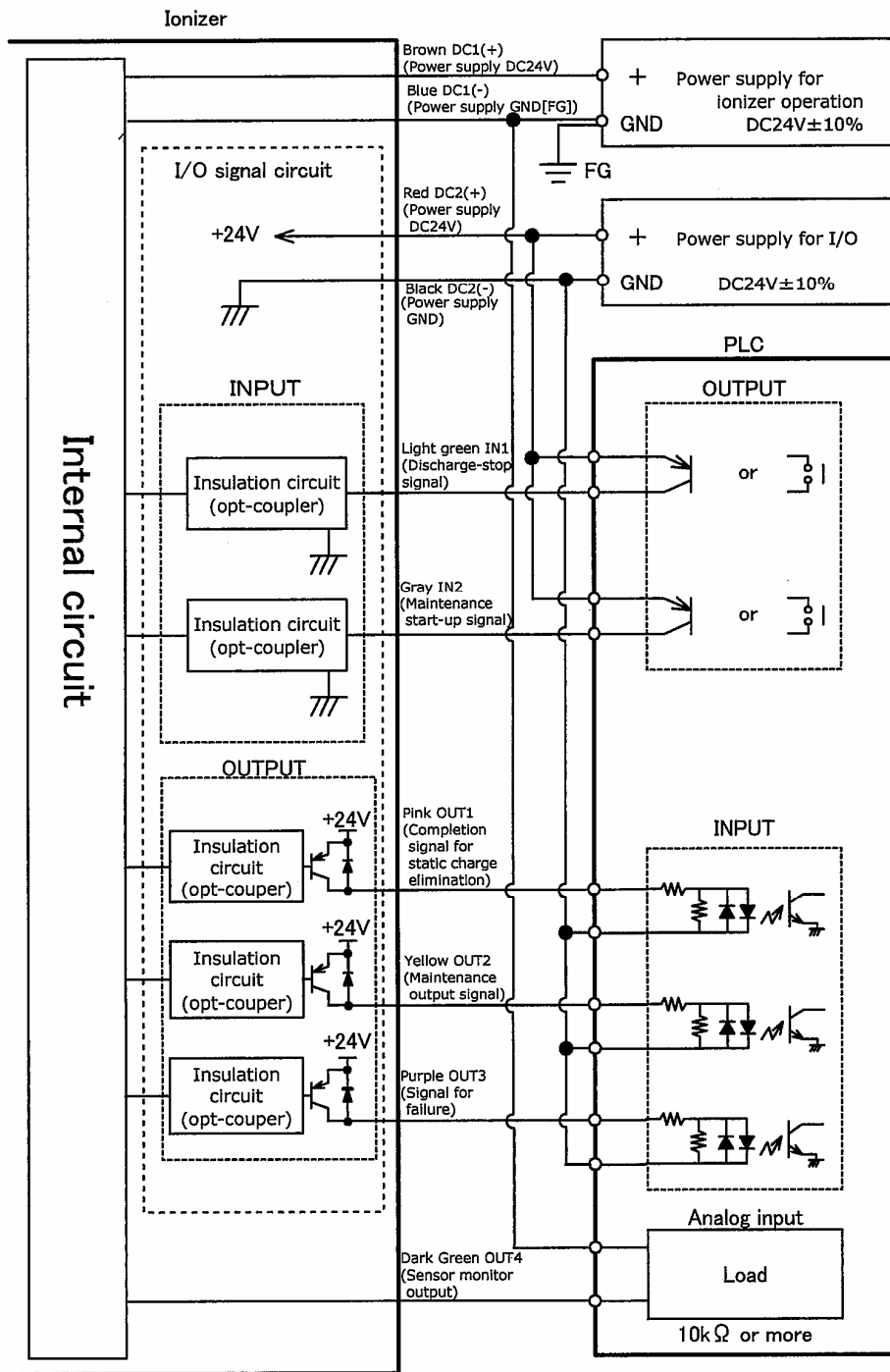


4-4. Power supply cable connection circuit

■ NPN



Note) Because the sensor monitor output (OUT4: Dark Green) is not insulated from the internal circuit of the ionizer, it is grounded. (It is connected to FG).



Note) Because the sensor monitor output (OUT4: Dark Green) is not insulated from the internal circuit of the ionizer, it is grounded. (It is connected to FG).

5. Specifications

5-1. Ionizer

Ionizer model		IZS31 (NPN)	IZS31P (PNP)
Type		Corona discharge	
Voltage supply method		Sensing DC, pulse DC, Plus DC, Minus DC	
Discharge output		+/- 7000 V	
Ion balance *1		+/-30V (For Stainless electrode needle, from -100 to +100V)	
Purge air	Fluid	Air (Clean dry air)	
	Op. pressure (MPa)	0.7 MPa or less	
	Connection tube size	Φ4	
Power supply voltage		DC24 V +/- 10 %	
Current consumption	Sensing DC mode operated	200 mA or less (When sensor is standby : 120 mA or less)	
	Sensing DC mode stand-by	200 mA or less (When sensor is not used : 170 mA or less)	
	Pulse DC mode	170mA or less	
Input signal	Discharge stop signal	No-voltage contact signal	
	Maintenance start-up signal		
Output signal	Completion signal for static charge elimination	Maximum load current : 100mA Residual voltage : 1V or less (when the load current is 100mA) Max. applied voltage:DC28V	Maximum load current : 100 mA Residual voltage : 1V or less (With load current of 100 mA)
	Maintenance output signal		
	Signal for failure		
	Sensor monitor output *2	Output voltage: 1 to 5 V (Please connect the load of 10kΩ or more.)	
Effective 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 dew condensation)	
Material		Ionizer cover : ABS Electrode needle : Tungsten, single crystal silicon, stainless	
Vibration resistance		Endurance 50Hz Amplitude 1mm 2 hours to X,Y,Z each direction of vibration	
Impact resistance		10G	
Applicable standard/ directive		CE (EMC directive : 89/336/EEC,92/31/EEC,93/68/EEC,2004/108/EC, Low Voltage Directive : 73/23/EEC,93/68/EEC)	

※1 : The distance between the charged object and ionizer is 300mm or more. With air purge.

※2 : When the potential of the charged object is measured with the feed back sensor, the relation between the charged potential and the sensor-monitor-output-voltage and the sensor detecting range will vary depending on the installation distance between the ionizer and sensor.

[Electrode cartridge quantity and weight]

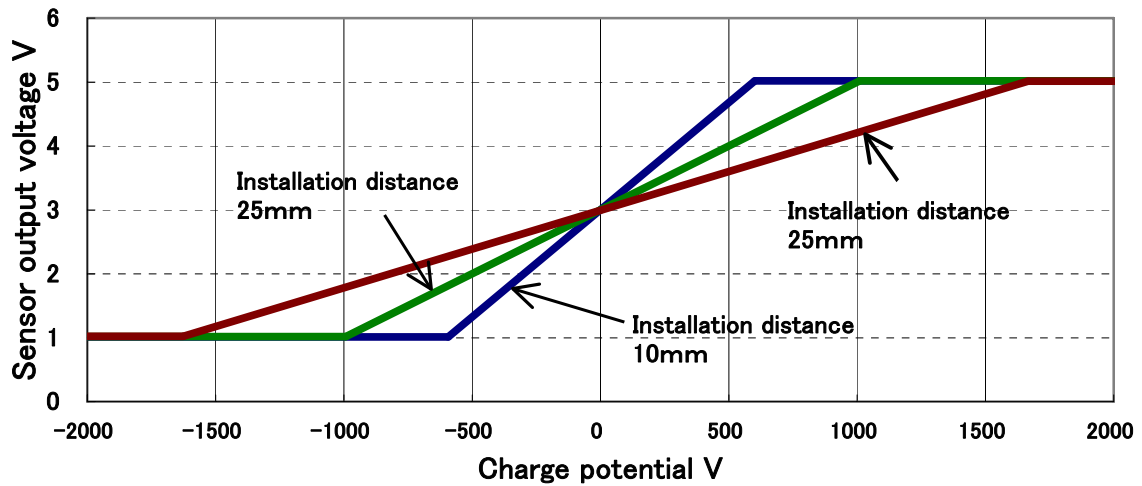
Bar length mm	300	380	620	780	1100	1260	1500	1900	2300
Q'ty of electrode cartridge	3	4	7	9	13	15	18	23	28
Weight g	330	400	600	720	1000	1100	1500	2000	2500

5-2. Sensor

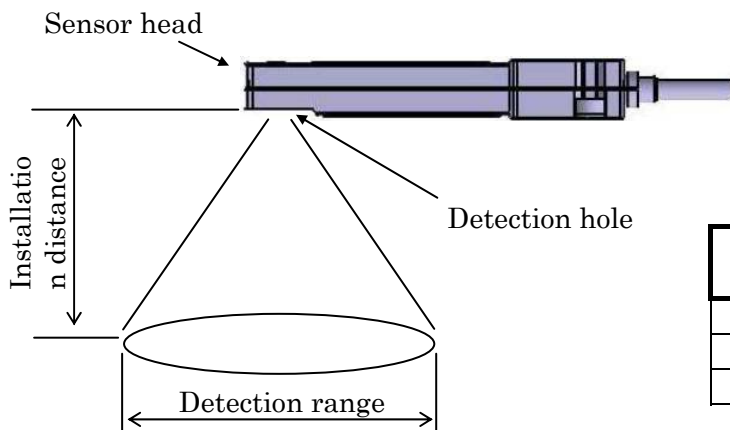
Sensor model	IZS31-DF (Feed back sensor)	IZS31-DG (Auto-balance sensor)
Operating ambient temp	0 to 50 °C	
Operating ambient humidity	35 to 80%Rh (No dew condensation)	
Case material	ABS	ABS, Stainless
Vibration resistance	Endurance 50Hz, Amplitude 1mm, 2hours each for XYZ	
Impact resistance	10G	
Weight	200g (including cable weight)	220g (including cable weight)
Installation distance	10 to 50mm (Recommended)	-
Applicable standard/ directive	CE (EMC directive: 89/336/EEC, 92/31/EEC, 93/68/EEC, 2004/108/EC, Low voltage directive: 73/23/EEC, 93/68/EEC)	

- Sensor monitor output (When feed back sensor is used)

Relation of sensor output and charge potential based pm installation distance



- Detection range of Feedback sensor



Installation distance mm	Detection range mm
10	45
25	100
50	180