Ionizer

- 3 types of the sensors are available.
  - Autobalance sensor [High-precision type] Adjusts ion balance near the workpiece to reduce any interference!
  - Autobalance sensor [Body-mounting type] New
  - Rapid elimination of static electricity by a feedback sensor: 0.3 seconds

**Conditions**
- Static buildup decreased from 1000 V to 100 V
- Discharged object: Charged plate (150 mm x 150 mm, capacitance 20 pF)
- Installation distance: 200 mm (Tungsten electrode needle with air purge)

Continuous static electricity elimination time (sec)

<table>
<thead>
<tr>
<th>Installation distance (mm)</th>
<th>With sensor</th>
<th>Without sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>500</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>1000</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>2000</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

*Conditions* Static electricity elimination features are based on the data using the charged plate (size: 150 mm x 150 mm, capacitance: 20 pF) as defined in the U.S. ANSI standards (ANSI/ESD, STM3, 1-2000). Use this as a guideline purpose only for model selection because the value varies depending on the material and/or size of a subject.

Supply pressure: 0.1 MPa (7.48 in \( \text{Hg} \) per nozzle)

Controlled ion balance with sensors

Series IZS31 RoHS compliant

CAT.EUS100-68B-UK
Feedback sensor / Rapid elimination of static electricity

Rapid elimination of static electricity by a feedback sensor
- The speed of static electricity elimination has been increased by reading the workpiece’s electrostatic potential by the feedback sensor and continuously emitting ions with a reverse polarity.

**Operation mode after static electricity removal (ion balance: within ±30 V) can be selected.**

**Energy saving operation mode:** Stops generating ions after static electricity removal to reduce power consumption. Air consumption can also be reduced by controlling a pneumatic valve with a static electricity removal completion signal.

*Note:* The pneumatic valve must be separately procured.

**Continuous static electricity removal operation mode:** After static electricity elimination, the ionizer changes to pulse DC mode and continues to eliminate static electricity to make it approach 0 V even if the ion balance is below 30 V.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Ion emission waveform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensing DC</td>
<td></td>
</tr>
<tr>
<td>Energy saving mode</td>
<td>Stop</td>
</tr>
<tr>
<td>Sensing DC</td>
<td></td>
</tr>
<tr>
<td>Continuous static electricity elimination mode</td>
<td></td>
</tr>
<tr>
<td>Pulse DC</td>
<td></td>
</tr>
<tr>
<td>+ charged image</td>
<td>Static electricity elimination completion</td>
</tr>
</tbody>
</table>
Autobalance sensor / Reduction in adjustment and maintenance man-hours

- **Autobalance sensor [High-precision type]**
  - The ion balance near the workpiece is accurately adjusted.
  - The object is not affected by the height of installation or any interference.
  - “Ion balance adjustment to an external signal input” or “ion balance adjustment at any time” can be selectable.
  - The autobalance sensor may be connected only when adjusting the ion balance.

- **Autobalance sensor [Body-mounting type]**
  - Can be mounted on the body, and can be installed in any place
  - Monitoring the amount of ions emitted by an ionizer, the autobalance sensor maintains the initial ion balance by adjusting the +/- ion supply rate.

- **Ion balance**
  - Ion balance condition
  - Controlled ion balance

---

New

Features 2
Electrode cartridge variations

- **Electrode cartridge with rapid elimination of static electricity, focusing on discharge time and energy saving**
  - High-efficiency nozzle design improves discharge time with low air consumption.

- **Electrode cartridge with low maintenance, focusing on ion balance and reduced maintenance time**
  - Stain on electrode needle is reduced by compressed air.

3 types of electrode needle materials

- **Tungsten**: Ion balance ±30 V
- **Monocrystal silicon**: Ion balance ±30 V, suitable for eliminating static electricity onto silicon wafers
- **Stainless steel**: Ion balance ±100 V, low-cost type, suitable for environments sensitive to heavy metal contamination such as food processing

* Only for electrode cartridge with rapid elimination of static electricity
**Applicable to workpieces moving at high speeds**
- Switching over frequency: Max. 60 Hz
  - Ions are discharged at high density to workpieces moving at high speed.

**Effective static electricity elimination for short distances**
- Prevention of irregular static electricity elimination
  
  Electrode cartridge 40 mm-pitch: -X15
  
  (Standard: 80 mm-pitch)
  
  (Length: 1260 mm or less)
  
  Note) 80 mm-pitch in case of air purge

**Indicator functions**
- Visualization of the charging condition
  (During sensing DC mode)

  **Voltage**
  - Positive Static electricity elimination completion
    - +400 V or higher
      - Light ON
    - +100 V to +400 V
      - Flash at 4 Hz
    - +30 V to +100 V
      - Light OFF
  - Negative Static electricity elimination completion
    - –30 V to –100 V
      - Flash at 4 Hz
    - –100 V to –400 V
      - Light OFF
  - Light OFF:
    - –400 V or lower

- Visualization of ion balance
  (When pulse DC mode or the autobalance sensor are used.)

**Safety functions**
- Electrode cartridge drop prevention
  - Locking by double-action

**Continuous ion emission of a desired polarity during DC mode**
- Can be used to remove static electricity from fast-charged or high-potential workpieces or to electrostatically charge them.

**Detects the electric potential difference and outputs in an analogue voltage.**
- Outputs measured data at a 1 to 5 V level when a feedback sensor is used. By outputting the data to a PLC, it is possible to control static electricity.

**Applicable to purge pressure of 0.7 MPa**
- Air purge: Yes, With sensor: 1 Hz/60 Hz

**Features 4**
## Made to Order

**Ionizer / Series IZS31**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Contents</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>X10</td>
<td>Non-standard bar length Model with 80 mm-pitch electrode cartridges</td>
<td>460, 540, 700, 860, 940, 1020, 1180, 1340, 1420, 1580, 1660, 1740, 1820, 1980, 2060, 2140, 2220</td>
</tr>
<tr>
<td>X14</td>
<td>Model with electrode cartridge security cover</td>
<td>The main unit is shipped fitted with an electrode cartridge security cover available as an option.</td>
</tr>
<tr>
<td>X15</td>
<td>Model with 40 mm-pitch electrode cartridges</td>
<td>This model comes fitted with electrode cartridges arranged at a 40 mm-pitch. (Standard pitch: 80 mm) Note: Maximum bar length is 1260 mm. The air purge nozzles are arranged at an 80 mm-pitch.</td>
</tr>
<tr>
<td>X210</td>
<td>High-voltage/control unit detachable short type Model with 80 mm-pitch electrode cartridges</td>
<td>A short type ionizer (full length of 180 mm and 220 mm) can be installed in a small space. The high-voltage unit (ionizing unit) and control unit are detachable from each other. The distance between them is also optional according to the length of the selected connection cables.</td>
</tr>
<tr>
<td>X211</td>
<td>High-voltage/control unit detachable short type Model with 40 mm-pitch electrode cartridges</td>
<td></td>
</tr>
</tbody>
</table>

### Power cable

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Contents</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>X13</td>
<td>Non-standard power cable length</td>
<td>Available in 1 m increments from 1 m to 20 m</td>
</tr>
</tbody>
</table>

### AC adapter

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Contents</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>X196EU</td>
<td>Ionizer driving AC adapter</td>
<td>Input voltage: 100 V to 240 V, Output voltage: 24 VDC</td>
</tr>
</tbody>
</table>

## Variations

### Bracket

- **End bracket**
- **Center bracket**

### Bar length (mm)

- 300, 380, 620, 780, 1100, 1260, 1500, 1900, 2300

### Power cable

- 3 m, 10 m

### Sensor

- **Feedback sensor**
- **Autobalance sensor [High-precision type]**
- **Autobalance sensor [Body-mounting type]**

### Electrode cartridge

- **Electrode cartridge with rapid elimination of static electricity**
- **Electrode cartridge with low maintenance**

### Electrode needle material

- **Tungsten**
- **Silicon**
- **Stainless steel**

## Features 5
Application Examples

Eliminating static electricity on PET bottles
- Trip-resistance during conveying
- Prevents adhesion of dust.

Eliminating static electricity on molded goods
- Improves detachability of molded goods from a die.

Eliminating static electricity during wafer transfer
- Prevents breakage due to discharge between wafers and hands.

Eliminating static electricity on an electric substrate
- Prevents element disruption due to discharge.
- Prevents adhesion of dust.

Eliminating static electricity on a film
- Prevents adhesion of dust.
- Prevents winding failure due to wrinkles, etc.

Eliminating static electricity on film molded goods
- Prevents attaching to conveyor.
- Prevents dispersion of finished goods.

Eliminating static electricity from packing films
- Prevents the filled substance from adhering to the packing film.
- Reduces packing mistakes.

Eliminating static electricity on a glass substrate
- Prevents breakage due to adhesion and discharge.
- Prevents adhesion of dust.

Eliminating static electricity on a glass substrate
- Prevents breakage due to adhesion and discharge.
- Prevents adhesion of dust.

Features 6
Series IZS31
Technical Data 1

Static Electricity Elimination Characteristics

Note: Static electricity elimination features are based on the data using a charged plate (size: 150 mm x 150 mm, capacitance: 20 pF) as defined in the U.S. ANSI standards (ANSI/ESD, STM3, 1-2000). Use this as a guideline for model selection because the value varies depending on the material and/or size of a subject.

1) Installation distance and discharge time (Discharge time from 1000 V to 100 V)

Electrode cartridge with rapid elimination of static electricity

Air purge: No

Air purge: Yes

Supply pressure: 0.05 MPa (3.5 l/min (ANR) per nozzle)

Supply pressure: 0.02 MPa (1 l/min (ANR) per nozzle)

Supply pressure: 0.1 MPa (7 l/min (ANR) per nozzle)

Supply pressure: 0.5 MPa (20 l/min (ANR) per nozzle)

Supply pressure: 0.3 MPa (14 l/min (ANR) per nozzle)

Supply pressure: 0.7 MPa (30 l/min (ANR) per nozzle)

Installation height of the sensor: 10 mm

Be sure to perform air purge when using a low-maintenance electrode cartridge.

Without air purge, low-maintenance efficiency will decrease.
Electrode cartridge with low maintenance

⚠️ Caution
Be sure to perform air purge when using a low-maintenance electrode cartridge. Without air purge, low-maintenance efficiency will decrease.

Air purge: Yes  Supply pressure: 0.05 MPa (3.5 ℓ/min (ANR) per nozzle)

Air purge: Yes  Supply pressure: 0.02 MPa (1 ℓ/min (ANR) per nozzle)

Air purge: Yes  Supply pressure: 0.3 MPa (14 ℓ/min (ANR) per nozzle)

Air purge: Yes  Supply pressure: 0.5 MPa (20 ℓ/min (ANR) per nozzle)

Air purge: Yes  Supply pressure: 0.7 MPa (30 ℓ/min (ANR) per nozzle)

Air purge: Yes  Supply pressure: 0.1 MPa (7 ℓ/min (ANR) per nozzle)

Supply pressure: 0.5 MPa (20 ℓ/min (ANR) per nozzle)

Supply pressure: 0.7 MPa (30 ℓ/min (ANR) per nozzle)

Supply pressure: 0.3 MPa (14 ℓ/min (ANR) per nozzle)

Supply pressure: 0.1 MPa (7 ℓ/min (ANR) per nozzle)

Supply pressure: 0.05 MPa (3.5 ℓ/min (ANR) per nozzle)

Supply pressure: 0.02 MPa (1 ℓ/min (ANR) per nozzle)
Series IZS31
Technical Data 2

Static Electricity Elimination Characteristics

2) Static electricity elimination range

Electrode cartridge with rapid elimination of static electricity

Air purge: No

Electrode cartridge with rapid elimination of static electricity, electrode cartridge with low maintenance

Air purge: Yes (0.05 MPa to 0.7 MPa)

3) Installation height of the feedback sensor and discharge time / Ion balance

The height a feedback sensor is mounted at should be 50 mm or less. When using a feedback sensor at a height greater than 50 mm, refer to the below graphs.

Air purge: Yes (0.1 MPa)

Note) Static electricity elimination features are based on the data using a charged plate (size: 150 mm x 150 mm, capacitance: 20 pF) as defined in the U.S. ANSI standards (ANSI/ESD, STM3, 1-2000). Use this as a guideline for model selection because the value varies depending on the material and/or size of a subject.
### Series IZS31

#### Technical Data 3

**Static Electricity Elimination Characteristics**

Note: Static electricity elimination features are based on the data using a charged plate (size: 150 mm x 150 mm, capacitance: 20 pF) as defined in the U.S. ANSI standards (ANSI/ESD, STM3, 1-2000). Use this as a guideline for model selection because the value varies depending on the material and/or size of a subject.

### 4) Flow rate — Pressure characteristics

![Graph showing flow rate vs. pressure characteristics](image)

**How to measure**

- **Air supply measurement**
- **Pressure measurement**

![Diagram showing air supply and pressure measurement](image)

(a) Single side air supply (IZS31-300, 380, 620, 780)

(b) Both sides air supply (IZS31-1100, 1260, 1500, 1900, 2300)

**Sensor Monitor Output (When a feedback sensor is used)**

Note: The installation distance in the figure refers to the distance from the target to the electrostatic sensor.

![Relationship in installation distance between electrostatic potential and sensor output voltage](image)

**Feedback sensor detection range**

The relationship between the installation distance of the electrostatic sensor and the detection range is as follows:

<table>
<thead>
<tr>
<th>Installation Distance (mm)</th>
<th>Detection Range (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>45</td>
</tr>
<tr>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>50</td>
<td>180</td>
</tr>
</tbody>
</table>

![Diagram showing feedback sensor detection range](image)
Ionizer Series IZS31

How to Order

Ionizer

IZS31-780

Bar type

Electrode cartridge type / Electrode needle material

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Electrode cartridge type</th>
<th>Electrode needle material</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>Rapid elimination</td>
<td>Tungsten</td>
</tr>
<tr>
<td>C</td>
<td>of static electricity</td>
<td>Silicon</td>
</tr>
<tr>
<td>S</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>Low maintenance</td>
<td>Tungsten</td>
</tr>
<tr>
<td>K</td>
<td></td>
<td>Silicon</td>
</tr>
</tbody>
</table>

Bar length

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Bar length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>300 mm</td>
</tr>
<tr>
<td>380</td>
<td>380 mm</td>
</tr>
<tr>
<td>620</td>
<td>620 mm</td>
</tr>
<tr>
<td>780</td>
<td>780 mm</td>
</tr>
<tr>
<td>1100</td>
<td>1100 mm</td>
</tr>
<tr>
<td>1260</td>
<td>1260 mm</td>
</tr>
<tr>
<td>1500</td>
<td>1500 mm</td>
</tr>
<tr>
<td>1900</td>
<td>1900 mm</td>
</tr>
<tr>
<td>2300</td>
<td>2300 mm</td>
</tr>
</tbody>
</table>

Made to Order

Refer to the table below.

Sensor

<table>
<thead>
<tr>
<th>Without sensor</th>
<th>E</th>
<th>Autobalance sensor [Body-mounting type]</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td></td>
<td>With feedback sensor</td>
</tr>
<tr>
<td>G</td>
<td></td>
<td>Autobalance sensor [High-precision type]</td>
</tr>
</tbody>
</table>

Note) The number of center brackets differs depending on the bar length. (Refer to the table below.)

Bracket

<table>
<thead>
<tr>
<th>End bracket</th>
<th>Center bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without bracket</td>
<td>With bracket (M)</td>
</tr>
</tbody>
</table>

Number of brackets

<table>
<thead>
<tr>
<th>Bar length (mm)</th>
<th>End bracket</th>
<th>Center bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td>300, 380, 620</td>
<td>With 2 pcs.</td>
<td>None</td>
</tr>
<tr>
<td>780</td>
<td>With 1 pc.</td>
<td>With 2 pcs.</td>
</tr>
<tr>
<td>1100, 1260, 1500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900, 2300</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Non-standard power cable length

How to Order

IZS31-CP X13

Power cable full length

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Cable full length</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>1 m</td>
</tr>
<tr>
<td>02</td>
<td>2 m</td>
</tr>
<tr>
<td>19</td>
<td>19 m</td>
</tr>
<tr>
<td>20</td>
<td>20 m</td>
</tr>
</tbody>
</table>

Note 1) 11 m or longer power supply cables are not CE Marking-compliant.
Note 2) Use standard power supply cables for 3 m and 10 m lengths.

Ionizer driving AC adapter (100 to 240 VAC)

IZS31-F X196EU

Power cable full length

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Cable full length</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>NPN specification</td>
</tr>
<tr>
<td>P</td>
<td>PNP specification</td>
</tr>
</tbody>
</table>

Applicable output spec.

<table>
<thead>
<tr>
<th>Applicable output spec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
</tr>
<tr>
<td>P</td>
</tr>
</tbody>
</table>

Individual Special Order

(Please contact an SMC sales representative.)

- Change in the direction of access to power cable
  - The direction of the access to the power cable is changed to the right side of the body.

Note) The power cable is connected directly to the body. A connector is not used.
Ionizer Series IZS31

Accessories

Feedback sensor IZS31-DF
Autobalance sensor [High-precision type] IZS31-DG
Autobalance sensor [Body-mounting type] IZS31-DE

Power cable
- IZS31-CP (3 m)
- IZS31-CPZ (10 m)

Connection cable A/B for connecting the autobalance sensor to the body
- For driving: IZS31-CF (12P)
- For I/O signals: IZS31-CR (6P)

Electrode cartridge with rapid elimination of static electricity
- IZS31-NT (Material: Tungsten)
- IZS31-NC (Material: Silicon)
- IZS31-NS (Material: Stainless steel)

Electrode cartridge with low maintenance
- IZS31-NJ (Material: Tungsten)
- IZS31-NK (Material: Silicon)

End bracket / IZS31-BE

Center bracket / IZS31-BM

Sensor bracket / IZS31-BL
(For mounting IZS31-DE on the body)

Note) The number of center brackets required, as listed below, depends on the bar length. Two end brackets are always required regardless of the bar length.

<table>
<thead>
<tr>
<th>Bar length (mm)</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>300, 380, 620, 780</td>
<td>2 pcs.</td>
</tr>
<tr>
<td>1100, 1260, 1500</td>
<td>With 1 pc.</td>
</tr>
<tr>
<td>1900, 2300</td>
<td>With 2 pcs.</td>
</tr>
</tbody>
</table>

Note) The model number is for a single bracket.

Symbol

- K
- C
- S
- J

Contents

How to Order

Series IZS31
Bar type Electrode cartridge type Electrode needle material

Ionizer of static electricity Rapid elimination Low maintenance

Symbol

- F
- X
- CP
- X
- P
- L
- M

Note) Maximum bar length is 1260 mm. The air purge nozzles are arranged at a 80 mm-pitch.
**Options**

**Electrode cartridge security cover**

**IZS31—E3**

<table>
<thead>
<tr>
<th>Number of fixed electrode cartridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>IZS31-E3</td>
</tr>
<tr>
<td>IZS31-E4</td>
</tr>
<tr>
<td>IZS31-E5</td>
</tr>
</tbody>
</table>

**Number of required security covers**

<table>
<thead>
<tr>
<th>Bar length (mm)</th>
<th>Number of required security covers</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>IZS31-E3 1</td>
</tr>
<tr>
<td>380</td>
<td>IZS31-E4 1</td>
</tr>
<tr>
<td>620</td>
<td>IZS31-E5 1</td>
</tr>
<tr>
<td>780</td>
<td>IZS31-E3 1</td>
</tr>
<tr>
<td>1100</td>
<td>IZS31-E4 1</td>
</tr>
<tr>
<td>1260</td>
<td>IZS31-E5 1</td>
</tr>
<tr>
<td>1500</td>
<td>IZS31-E3 2</td>
</tr>
<tr>
<td>1900</td>
<td>IZS31-E4 5</td>
</tr>
<tr>
<td>2300</td>
<td>IZS31-E5 4</td>
</tr>
</tbody>
</table>

The model number requires the suffix "-X14" to indicate that the body is to be shipped fitted with an electrode cartridge security cover.

**IZS31** Standard part no. — X14

**Screwdriver for ion balance adjustment trimmer / IZS30-M1**

**Electrode needle cleaning kit / IZS30-M2**
Specifications

<table>
<thead>
<tr>
<th>Ionizer model</th>
<th>IZS31-□□□ (NPN specification)</th>
<th>IZS31-□□□P (PNP specification)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ion generation method</td>
<td>Corona discharge type</td>
<td>Corona discharge type</td>
</tr>
<tr>
<td>Method of applying voltage</td>
<td>Sensing DC, Pulse DC, DC</td>
<td>Sensing DC, Pulse DC, DC</td>
</tr>
<tr>
<td>Electricity discharge output</td>
<td>≥7000 V</td>
<td>≥7000 V</td>
</tr>
<tr>
<td>Ion balance (Note 1)</td>
<td>±30 V (Stainless steel electrode needle: ±100 V)</td>
<td>±30 V (Stainless steel electrode needle: ±100 V)</td>
</tr>
<tr>
<td>Air purge</td>
<td>Fluid Air (Clean and dry)</td>
<td>Fluid Air (Clean and dry)</td>
</tr>
<tr>
<td>Operating pressure</td>
<td>0.7 MPa or less (Note 2)</td>
<td>0.7 MPa or less (Note 2)</td>
</tr>
<tr>
<td>Connecting tubing O.D.</td>
<td>ø4</td>
<td>ø4</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>24 VDC ±10%</td>
<td>24 VDC ±10%</td>
</tr>
<tr>
<td>Current consumption</td>
<td>Sensing DC mode 200 mA or less (While standing by: 120 mA or less)</td>
<td>Sensing DC mode 200 mA or less (While standing by: 120 mA or less)</td>
</tr>
<tr>
<td></td>
<td>Pulse DC mode Autobalance sensor [Body-mounting type]: 300 mA or less Autobalance sensor [High-precision type]: 200 mA or less When sensor is not used: 170 mA or less</td>
<td>Pulse DC mode Autobalance sensor [Body-mounting type]: 300 mA or less Autobalance sensor [High-precision type]: 200 mA or less When sensor is not used: 170 mA or less</td>
</tr>
<tr>
<td>DC mode</td>
<td>170 mA or less</td>
<td>170 mA or less</td>
</tr>
<tr>
<td>Input signal</td>
<td>Electricity discharge stop signal Connected to GND (Voltage: 5 VDC or less, Current consumption: 5 mA or less)</td>
<td>Electricity discharge stop signal Connected to GND (Voltage: 5 VDC or less, Current consumption: 5 mA or less)</td>
</tr>
<tr>
<td></td>
<td>Maintenance signal</td>
<td>Maintenance signal</td>
</tr>
<tr>
<td></td>
<td>Output signal</td>
<td>Static electricity removal completion signal Max. load current: 100 mA Residual voltage: 1 V or less (Load current at 100 mA) Max. applied voltage: 28 VDC</td>
</tr>
<tr>
<td></td>
<td>Error signal</td>
<td>Error signal</td>
</tr>
<tr>
<td></td>
<td>Sensor monitor output (Note 3)</td>
<td>Voltage output 1 to 5 V (Connect a 1 kΩ or larger load.)</td>
</tr>
<tr>
<td>Effective discharge distance</td>
<td>50 to 2000 mm (Sensing DC mode: 200 to 2000 mm)</td>
<td>50 to 2000 mm (Sensing DC mode: 200 to 2000 mm)</td>
</tr>
<tr>
<td>Ambient temperature, Fluid temperature</td>
<td>0 to 50°C</td>
<td>0 to 50°C</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>35 to 80% Rh (With no condensation)</td>
<td>35 to 80% Rh (With no condensation)</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>Durability 50 Hz Amplitude 1 mm XYZ each 2 hours</td>
<td>Durability 50 Hz Amplitude 1 mm XYZ each 2 hours</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>10 G</td>
<td>10 G</td>
</tr>
</tbody>
</table>

Note 1) When the air purge is performed between a charged object and an ionizer at a distance of 300 mm
Note 2) When a low maintenance type electrode cartridge is used, the operating pressure must be 0.05 MPa or more.
Note 3) When the potential of a charged object is measured with a feedback sensor, the relationship between the potential being measured, the sensor monitor output voltage and the detection range of the sensor may vary depending on the sensor’s installation distance. Refer to page 4.

Number of Electrode Cartridges/Weight

<table>
<thead>
<tr>
<th>Bar length (mm)</th>
<th>300</th>
<th>380</th>
<th>620</th>
<th>780</th>
<th>1100</th>
<th>1260</th>
<th>1500</th>
<th>1900</th>
<th>2300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (g)</td>
<td>470</td>
<td>530</td>
<td>720</td>
<td>850</td>
<td>1100</td>
<td>1220</td>
<td>1410</td>
<td>1730</td>
<td>2040</td>
</tr>
</tbody>
</table>

Sensor

<table>
<thead>
<tr>
<th>Sensor model</th>
<th>IZS31-DF (Feedback sensor)</th>
<th>IZS31-DG (Autobalance sensor [High-precision type])</th>
<th>IZS31-DE (Autobalance sensor [Body-mounting type])</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>0 to 50°C</td>
<td>0 to 50°C</td>
<td>0 to 50°C</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>35 to 85% Rh (With no condensation)</td>
<td>35 to 85% Rh (With no condensation)</td>
<td>35 to 85% Rh (With no condensation)</td>
</tr>
<tr>
<td>Case material</td>
<td>ABS</td>
<td>ABS, Stainless steel</td>
<td>ABS</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>Durability 50 Hz - Amplitude 1 mm XYZ each 2 hours</td>
<td>Durability 50 Hz - Amplitude 1 mm XYZ each 2 hours</td>
<td>Durability 50 Hz - Amplitude 1 mm XYZ each 2 hours</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>10 G</td>
<td>10 G</td>
<td>10 G</td>
</tr>
<tr>
<td>Weight</td>
<td>200 g (including cable weight)</td>
<td>200 g (including cable weight)</td>
<td>110 g (including cable weight)</td>
</tr>
<tr>
<td>Installation distance</td>
<td>10 to 50 mm (Recommended)</td>
<td>10 to 50 mm (Recommended)</td>
<td>10 to 50 mm (Recommended)</td>
</tr>
</tbody>
</table>

Construction

![Diagram of IZS31 series ionizer components]
Functions

1. Operation mode
There are 3 different operation modes (Sensing DC mode/Pulse DC mode/DC mode) for Series IZS31, which can be selected based on the application and operating condition.

(1) Sensing DC mode
The discharge time is reduced by detecting the workpiece’s charge condition with a feedback sensor which feeds the data back to the ionizer and causes ions with the polarity best suited for static electricity elimination to be emitted. The static electricity elimination completion signal turns off when the workpiece’s electrostatic potential falls within ±30 V. Note)
This mode is suited for eliminating static electricity from heavily charged workpieces.
Either “Energy Saving Mode” or “Continuous Static Electricity Elimination Mode” can be selected depending on the ionizer’s operation after static electricity elimination is completed.

| Energy saving mode | The ionizer stops discharging automatically after the completion of static electricity elimination is completed. It resumes discharging when the workpiece’s electrostatic potential exceeds ±30 V. Note)
| Continuous static electricity elimination mode | Even after the completion of static electricity elimination, this method continues to eliminate static electricity using DC pulses while controlling the ion balance, so that the workpiece’s electrostatic potential falls within ±30 V. Note)

Note) When the feedback sensor is installed at a height of 25 mm.

(2) Pulse DC mode
Alternatively emits positive and negative ions.

● When an autobalance sensor (high-precision type) is used.
When an autobalance sensor is used, the ionizer automatically adjusts the ion balance to ±30 V.
If the ion balance exceeds ±30 V due to electrode needle contamination, the ionizer outputs a maintenance output signal.
The ion balance is adjusted and retained at the position of the workpiece. This mode is suited for eliminating spatial static electricity or preventing workpieces from becoming electrostatically charged.
Either “Manual Operation” or “Automatic Operation” can be selected depending on the method of ion balance adjustment.

| Manual operation | When a maintenance start signal is input or the ionizer is turned on, this method adjusts the ion balance. For static electricity elimination from moving workpieces, “Manual Run” is recommended. Start system operation after the completion of ion balance adjustment.
| Automatic operation | This method continuously adjusts the ion balance. For static electricity elimination from stationary workpieces or spatial static electricity elimination, “Automatic Run” is recommended.

● When an autobalance sensor (body-mounting type) is used.
Controls the initial ion balance. If the ion balance cannot be kept due to electrode needle contamination, the ionizer outputs a maintenance output signal. Use a balance adjustment trimmer to set the ion balance (requires a separate measuring instrument to verify the ion balance).

● When a sensor is not used.
Use a balance adjustment trimmer to adjust the ion balance. This requires the separate use of a measuring instrument to verify the ion balance.

(3) DC mode
Continuously emits positive and negative ions. Parts other than the workpiece need to be appropriately grounded to prevent them from being charged. This mode cannot emit both positive and negative ions at the same time.
Functions

2. Contamination-detection on an electrode needle
When a maintenance start signal is input, the ionizer detects any deterioration that may interfere with the electrode needles’ capability to eliminate static electricity. If the needles need to be cleaned due to such deterioration, the maintenance indicator LED comes on and the maintenance output signal turns ON. Ion emission continues even if the maintenance output signal is turned ON.

Note) Deterioration in the static electricity elimination capability cannot be detected by only connecting a feedback sensor, autobalance sensor [high-precision type], or autobalance sensor [body-mounting type]. Verify the capability by periodically inputting a maintenance start signal.

3. Display/Setting component description

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Type</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power supply display</td>
<td>LED (Dark green)</td>
<td>Illuminates when power is supplied. Blinks when the supply voltage is irregular.</td>
</tr>
<tr>
<td>2</td>
<td>Sensor display</td>
<td>LED (Dark green)</td>
<td>Illuminates when the feedback sensor, autobalance sensor [high-precision type] or autobalance sensor [body-mounting type] is connected.</td>
</tr>
<tr>
<td>3</td>
<td>Negative display</td>
<td>LED (Blue)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Static electricity elimination completion display</td>
<td>LED (Dark green)</td>
<td>Functionality differs depending on the operation mode. Refer to “Model Selection and Settings” on page 13, 17, 20.</td>
</tr>
<tr>
<td>5</td>
<td>Positive display</td>
<td>LED (Orange)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Irregular high-voltage display</td>
<td>LED (Red)</td>
<td>Illuminates when an abnormal current flows through an electrode needle.</td>
</tr>
<tr>
<td>7</td>
<td>Irregular sensor display</td>
<td>LED (Red)</td>
<td>Illuminates when the feedback sensor, autobalance sensor [high-precision type] or autobalance sensor [body-mounting type] is not operating normally.</td>
</tr>
<tr>
<td>8</td>
<td>Maintenance display</td>
<td>LED (Red)</td>
<td>Illuminates when the electrode needle contamination is detected. Blinks while the contamination is being detected.</td>
</tr>
<tr>
<td>9</td>
<td>Maintenance level selection switch</td>
<td>Rotary switch</td>
<td>Functionality differs depending on the operation mode. Refer to “Model Selection and Settings” on page 11, 15, 16, 19.</td>
</tr>
<tr>
<td>10</td>
<td>Frequency selection switch</td>
<td>Rotary switch</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Balance adjustment trimmer</td>
<td>Trimmer</td>
<td>Used to adjust the ion balance when the autobalance sensor [high-precision type] or autobalance sensor [body-mounting type] is not used.</td>
</tr>
</tbody>
</table>
Model Selection and Settings 1 / Sensing DC Mode

1. Sensing DC mode (Refer to page 15 when using the ionizer in the pulse DC mode, or refer to page 19 when using it in the DC mode.)

1) Bar length selection
   - Select the appropriate length suited for a workpiece size by referring to “Static Electricity Elimination Characteristics” and “Static Electricity Elimination Range”.

2) Ionizer installation
   - Install the ionizer within 200 to 2000 mm. Although the ionizer can also be used at other distances, it may fail to operate normally depending on the conditions of use. Before use, always verify that the ionizer is functioning normally.

3) Sensor installation
   - Install the feedback sensor with the detection hole facing the charged surface.
   - Installation at a height from 10 to 50 mm is recommended. Although the sensor can also be used at other heights, it may fail to operate normally depending on the conditions of use. Before use, always verify that the sensor operates normally. (Refer to “Installation height of feedback sensor and discharge time/Ion balance” on page 3 as a guide.)
   - When the ionizer and feedback sensor are connected, the sensing DC mode is automatically selected.

4) Contamination-detection level setting on an electrode needle
   - Maintenance level selection switch
   - Set the switch to either H (High), M (Middle), L (Low). At settings other than these, the ionizer does not perform the electrode needle contamination-detection.

   ![Diagram](https://via.placeholder.com/150)

   H (High)------Level that does not affect the discharge time.
   M (Middle)------Level at which the discharge time is a little bit longer than it was initially.
   L (Low)-------Level at which the discharge time is longer than it was initially.

   Note) Contamination-detection starts when a maintenance start signal is input.

5) Frequency selection switch setting
   - Select “Energy Saving Mode” or “Continuous Static Electricity Elimination Mode”.
   - In case of “Continuous Static Electricity Elimination Mode”, select the ion generation frequency after static electricity elimination is completed.

<table>
<thead>
<tr>
<th>Details of operation</th>
<th>Switch setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy saving mode</td>
<td></td>
</tr>
<tr>
<td>Automatically stops emitting electricity even after static electricity elimination is completed.</td>
<td>+ ion Stop</td>
</tr>
<tr>
<td></td>
<td>– ion</td>
</tr>
<tr>
<td>Continuous static electricity elimination mode</td>
<td>+ ion Pulse operation</td>
</tr>
<tr>
<td>Continously eliminates static electricity with pulse DC by controlling the ion balance so that the charged potential on a workpiece would be within ±30V even after static electricity elimination is completed. The ionizer generates ions at the preset frequency.</td>
<td>– ion</td>
</tr>
<tr>
<td>(Example) Charged object workpiece: negative electric charge</td>
<td></td>
</tr>
<tr>
<td>Static electricity elimination completion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0–1 Hz 1–3 Hz 2–5 Hz 3–10 Hz 4–15 Hz 5–20 Hz 6–30 Hz 7–60 Hz</td>
</tr>
</tbody>
</table>
Model Selection and Settings 1 / Sensing DC Mode

6) Wiring of the power supply cable
- Connect the dedicated power supply cable.

[Table]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Cable color</th>
<th>Description</th>
<th>Connection needs</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC1(+)</td>
<td>Brown</td>
<td>Power supply 24 VDC</td>
<td>○</td>
<td>Ionizer driving power supply cable</td>
</tr>
<tr>
<td>DC1(−)</td>
<td>Blue</td>
<td>Power supply GND [FG]</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>OUT4</td>
<td>Dark green</td>
<td>Sensor monitor output</td>
<td>△</td>
<td>Outputs the workpiece’s electrostatic potential as an analogue signal. (1 to 5 V)</td>
</tr>
</tbody>
</table>

* DC1 (−) [Blue] may be grounded according to Class-D. If the terminal is not grounded, the ionizer may malfunction.

7) Air piping
- For single-side piping, block the unused port with the M-5P plug supplied with the ionizer.

[Table]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Cable color</th>
<th>Description</th>
<th>Connection needs</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC2(+)</td>
<td>Red</td>
<td>Power supply 24 VDC</td>
<td>○</td>
<td>Input/Output signal power supply cable</td>
</tr>
<tr>
<td>DC2(−)</td>
<td>Black</td>
<td>Power supply GND</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>IN1</td>
<td>Light green</td>
<td>Discharge stop signal</td>
<td>○</td>
<td>Signal for enabling/disabling discharge (NPN spec.) Discharge is enabled when connected to DC2 (−) [Black] (PNP spec.) Discharge is enabled when connected to DC2 (+) [Red]</td>
</tr>
<tr>
<td>IN2</td>
<td>Grey</td>
<td>Maintenance start signal</td>
<td>△</td>
<td>Input signal when determining the necessity of electrode needle maintenance</td>
</tr>
<tr>
<td>–</td>
<td>White</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>–</td>
<td>Orange</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>OUT1</td>
<td>Pink</td>
<td>Static electricity elimination completion signal</td>
<td>△</td>
<td>Turned ON when the workpiece’s electrostatic potential is greater than ±30 V or when electrode needle contamination is detected.</td>
</tr>
<tr>
<td>OUT2</td>
<td>Yellow</td>
<td>Maintenance output signal</td>
<td>△</td>
<td>Turned ON when electrode needle maintenance is necessary.</td>
</tr>
<tr>
<td>OUT3</td>
<td>Purple</td>
<td>Abnormal signal</td>
<td>△</td>
<td>Turned ON in normal operation. Turned OFF in case of high-voltage error, sensor error, CPU error.</td>
</tr>
</tbody>
</table>

○: Minimum wiring requirement for ionizer operation
△: Wiring necessary to use various functions
−: Wiring not required in the sensing DC mode. Ensure that this wire does not short-circuit to other wires.
8) LED display

- **POWER LED**—Indicates the state of the power input and the sensor connection.

<table>
<thead>
<tr>
<th>LED</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAIN</td>
<td>Illuminates when power is supplied. (Dark green) (Blinks when the power supply is irregular.)</td>
</tr>
<tr>
<td>SNSR</td>
<td>Illuminates when the feedback sensor is connected. (Dark green)</td>
</tr>
</tbody>
</table>

- **ION LED**—Indicates the workpiece state of electrostatic charging.

<table>
<thead>
<tr>
<th>LED</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Illuminates when the workpiece is positively charged. (Orange)</td>
</tr>
<tr>
<td>OK</td>
<td>Illuminates when the workpiece electrostatic potential is low. (Dark green)</td>
</tr>
<tr>
<td>–</td>
<td>Illuminates when the workpiece is negatively charged. (Blue)</td>
</tr>
</tbody>
</table>

- **ALARM LED**—Indicates abnormal states of the ionizer.

<table>
<thead>
<tr>
<th>LED</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV</td>
<td>Illuminates when an abnormal current flows through an electrode needle. (Red)</td>
</tr>
<tr>
<td>SNSR</td>
<td>Illuminates when the feedback sensor is not operating normally. (Red)</td>
</tr>
<tr>
<td>NDL CHECK</td>
<td>Illuminates when electrode needle contamination is detected. (Red) (Blinks while contamination is being detected.)</td>
</tr>
</tbody>
</table>
Model Selection and Settings 1 / Sensing DC Mode

9) Alarm

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Description</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-voltage error</td>
<td>Occurrence of an abnormal current, such as high-voltage leakage. The ionizer stops ion emission,</td>
<td>Turn the power supply OFF, solve the problem, then turn the power supply on again. Alternatively, switch</td>
</tr>
<tr>
<td></td>
<td>turns on the HV ALARM indicator, and turns OFF the error signal (OUT3).</td>
<td>the discharge stop signal from OFF to ON.</td>
</tr>
<tr>
<td>Sensor error</td>
<td>The feedback sensor has become unable to operate normally. The ionizer stops ion emission, turns on</td>
<td>Turn the power supply OFF, solve the problem, then turn the power supply on again. Alternatively, switch</td>
</tr>
<tr>
<td></td>
<td>the SNSR ALARM indicator, and turns OFF the error signal (OUT3).</td>
<td>the discharge stop signal from OFF to ON.</td>
</tr>
<tr>
<td>CPU error</td>
<td>Failure in the CPU due to noise, etc. The ionizer stops ion emission, all of the LED indicators blink,</td>
<td>Turn the power supply OFF, solve the problem, then turn the power supply on again. Alternatively, switch</td>
</tr>
<tr>
<td></td>
<td>turns OFF the error signal (OUT3).</td>
<td>the discharge stop signal from OFF to ON.</td>
</tr>
<tr>
<td>Electrode needle maintenance</td>
<td>Electrode needle maintenance is necessary. The NDL CHECK ALARM indicator comes on and a maintenance</td>
<td>Turn the power supply OFF, clean or replace the electrode needles, and turn the power supply on again.</td>
</tr>
<tr>
<td></td>
<td>output signal (OUT2) turns ON.</td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>

10) Timing chart

- Timing chart in normal operation

- Timing chart when electrode needle contamination is detected.

- Static electricity elimination completion signal is turn on when the electrode needle contamination-detection is in progress.

⚠️ Caution

Ions are emitted from the ionizer to detect electrode needle contamination and the workpiece may therefore be electrostatically charged. Perform this detection procedure in the absence of workpieces.
2. Pulse DC mode

1) Bar length selection
   - Select the appropriate length suited for a workpiece size by referring to “Static Electricity Elimination Characteristics” and “Static Electricity Elimination Range”.

2) Ionizer installation
   - Install the ionizer within 50 to 2000 mm distance to the object requiring electricity elimination. However, install the ionizer at a distance from 100 to 2000 mm when using an autobalance sensor [high-precision type or body-mounting type]. Although the ionizer can also be used at other distances, it may fail to operate normally depending on the conditions of use. Before use, always verify that the ionizer is functioning normally.

3) Sensor installation
   **Autobalance sensor [High-precision type]**
   - When adjusting the ion balance using a high-precision type sensor, install the sensor immediately below the ionizer so that it is close to the workpiece.
   - When an autobalance sensor is connected, the settings of the balance adjustment trimmer on the body are nullified.

   **Autobalance sensor [Body-mounting type]**
   - When adjusting the ion balance using a body-mounting type sensor, fix it to the ionizer with a bracket and then use the connection cables A and B to connect the ionizer and the sensor.
   - When an autobalance sensor is connected, the settings of the balance adjustment trimmer on the body are nullified.

4) Maintenance level selection switch setting
   **Autobalance sensor [High-precision type]**
   - Select “Manual Operation” or “Automatic Operation” when an autobalance sensor [high-precision type] is connected to adjust the ion balance.

   ![Switch Setting Diagram](image)

   - **Manual operation**
     - When a maintenance start signal is input or the ionizer is turned on, the ionizer detects electrode needle contamination according to the ion balance adjustment and the detection level settings.
     - An ion balance adjustment value for each ion generation frequency is retained.
     - After adjustment, the autobalance sensor may be removed as the ion balance adjustment will not be performed again until a maintenance start signal is input.

   - **Automatic operation**
     - The ionizer continuously adjusts the ion balance. When the autobalance sensor is removed, adjust the ion balance manually using the balance adjustment trimmer.

   * Set the switch according to the contamination-detection level.

   **Autobalance sensor [Body-mounting type]**
   Configuration is not necessary.

5) Ion balance adjustment
   **Autobalance sensor [High-precision type]**
   When an autobalance sensor is used, the ionizer automatically adjusts the ion balance to within ±30 V. Either “Manual Operation” or “Automatic Operation” can be selected depending on the method of ion balance adjustment.

   ![Balance Adjustment Diagram](image)

   - **Manual operation**
     - When a maintenance start signal is input or the ionizer is turned on, this method adjusts the ion balance. For static electricity elimination from moving workpieces, “Manual Operation” is recommended. Start system operation after ion balance adjustment is completed.

   - **Automatic operation**
     - This method continuously adjusts the ion balance. For static electricity elimination from stationary workpieces or spatial static electricity elimination, “Automatic Operation” is recommended.

   **Autobalance sensor [Body-mounting type]**
   Controls the initial ion balance.
   When changing the ion balance settings, use a balance adjustment trimmer on the autobalance sensor (requires a separate measuring instrument to verify the ion balance).

   ![Balance Adjustment Diagram](image)

   A balance adjustment trimmer is turned two full turns.
Model Selection and Settings 2 / Pulse DC Mode

7) Wiring of the power supply cable
   · Connect the dedicated power supply cable.

[Connection with ionizer driving]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Cable colour</th>
<th>Description</th>
<th>Connection needs</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC1 (+) Brown</td>
<td>Power supply 24VDC</td>
<td>○</td>
<td>—</td>
<td>Ionizer driving power supply cable</td>
</tr>
<tr>
<td>DC1 (–) Blue</td>
<td>Power supply GND [FG]</td>
<td>○</td>
<td>○ [FG]</td>
<td>—</td>
</tr>
<tr>
<td>OUT4 Dark green</td>
<td>Sensor monitor output</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

- When a high-precision type sensor is used, connect DC1 (–) [Blue] to the power supply GND and be sure to ground according to Class-D. If the lead is not grounded, the ionizer may malfunction.
- When a body-mounting type sensor is used, do not connect DC1 (–) [Blue] to the power supply GND and be sure to ground according to Class-D. In case of connecting the lead to the power supply GND and grounding according to Class-D, all I/O signals are not insulated from the FG terminal.

[Connection with input/output signal power supply cable]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Cable colour</th>
<th>Description</th>
<th>Connection needs</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC2 (+) Red</td>
<td>Power supply 24 VDC</td>
<td>○</td>
<td>○</td>
<td>Input/Output signal power supply cable</td>
</tr>
<tr>
<td>DC2 (–) Black</td>
<td>Power supply GND</td>
<td>○</td>
<td>○</td>
<td>—</td>
</tr>
<tr>
<td>IN1 Light green</td>
<td>Discharge stop signal</td>
<td>△</td>
<td>△</td>
<td>Signal for enabling/disabling discharge (NPN spec.) Discharge is enabled when connected to DC2 (–) [Black]. (PNP spec.) Discharge is enabled when connected to DC2 (+) [Red].</td>
</tr>
<tr>
<td>IN2 Grey</td>
<td>Maintenance start signal</td>
<td>△</td>
<td>△</td>
<td>Input signal when determining the necessity of electrode needle maintenance</td>
</tr>
<tr>
<td>— White</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>— Orange</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>OUT1 Pink</td>
<td>Static electricity elimination completion signal</td>
<td>△</td>
<td>△</td>
<td>Turned ON when the electrode needle contamination-detection is in progress.</td>
</tr>
<tr>
<td>OUT2 Yellow</td>
<td>Maintenance output signal</td>
<td>△</td>
<td>△</td>
<td>Turned ON when electrode needle maintenance is necessary.</td>
</tr>
<tr>
<td>OUT3 Purple</td>
<td>Abnormal signal</td>
<td>△</td>
<td>△</td>
<td>Turned ON in case of high-voltage error, sensor error, CPU error. (B contact output)</td>
</tr>
</tbody>
</table>

○: Minimum wiring requirement for ionizer operation
△: Wiring necessary to use various functions
—: Wiring not required in the sensing DC mode. Ensure that this wire does not short-circuit to other wires.
8) Air piping
   · For single-side piping, block the unused port with the M-5P plug supplied with the ionizer.

9) LED displays
   ■ POWER LED—Indicates the state of the power input and the sensor connection.

<table>
<thead>
<tr>
<th>LED</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER</td>
<td>(MAIN) Illuminates when power is supplied. (Dark green) (Blinks when the power supply is irregular.)</td>
</tr>
<tr>
<td></td>
<td>(SNSR) Illuminates when an autobalance sensor [high-precision type or body-mounting type] is connected. (Dark green)</td>
</tr>
</tbody>
</table>

   ■ ION LED—Indicates the polarity of the ions being emitted and the ion balance.

<table>
<thead>
<tr>
<th>LED</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ION</td>
<td>+  Illuminates when positive ions are being emitted by the ionizer. (Orange)</td>
</tr>
<tr>
<td></td>
<td>OK When an autobalance sensor [high-precision type] is used, it indicates the state of ion balancing. (Dark green) The LED display turns OFF when a sensor is not used, or an autobalance sensor [body-mounting type] is used.</td>
</tr>
<tr>
<td></td>
<td>–  Illuminates when negative ions are being emitted by the ionizer. (Blue)</td>
</tr>
</tbody>
</table>

   · When an autobalance sensor [high-precision type] is used, the state of ion balancing can be checked by reading the LED display.

<table>
<thead>
<tr>
<th>Ion balance</th>
<th>OK LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under ±30 V</td>
<td>Turns ON (or blinks)</td>
</tr>
<tr>
<td>±30 V or more</td>
<td>Turns OFF</td>
</tr>
</tbody>
</table>

   * The OK LED display blinks when the ion balance is approaching the limits of the adjustable range, signaling that the time for electrode needle maintenance is approaching.

   ■ ALARM LED—Indicates abnormal states of the ionizer.

<table>
<thead>
<tr>
<th>LED</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALARM</td>
<td>HV Illuminates when an abnormal current flows through an electrode needle. (Red)</td>
</tr>
<tr>
<td></td>
<td>SNSR Illuminates when the autobalance sensor [high-precision type] is not operating normally. (Red)</td>
</tr>
<tr>
<td></td>
<td>NDL CHECK Illuminates when electrode needle contamination is detected. (Red) (Blinks while contamination is detected.)</td>
</tr>
</tbody>
</table>
10) Alarm

<table>
<thead>
<tr>
<th>High-voltage error</th>
<th>Description</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occurrence of an abnormal current, such as high-voltage leakage. The ionizer stops the ion emission, turns the HV ALARM display, ON and turns the error signal (OUT3) OFF.</td>
<td>Turn the power OFF, solve the problem, then turn the power on again. Alternatively, turn the discharge stop signal (IN1) OFF, then ON.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sensor error</th>
<th>Description</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The autobalance sensor (high-precision type or body-mounting type) has become unable to operate normally. The ionizer stops the ion emission, turns the SNSR ALARM display ON, and turns the error signal (OUT3) OFF.</td>
<td>Turn the power OFF, solve the problem, then turn the power on again. Alternatively, turn the discharge stop signal (IN1) OFF, then ON.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CPU error</th>
<th>Description</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occurrence of a failure in the CPU due to noise, etc. The ionizer stops the ion emission, all of the LED displays blink, and turns the error signal (OUT3) OFF.</td>
<td>Turn the power OFF, solve the problem, then turn the power on again. Alternatively, turn the discharge stop signal (IN1) OFF, then ON.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrode needle maintenance</th>
<th>Description</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrode needle maintenance is necessary. The NDL CHECK ALARM display comes on and a maintenance output signal (OUT2) turns ON.</td>
<td>Turn the power OFF, clean or replace the electrode needles, and turn the power on again.</td>
<td></td>
</tr>
</tbody>
</table>

11) Timing chart

- **Timing chart in normal operation**

- **Timing chart when electrode needle contamination or ion balance is detected.**
  
  **(a) When an autobalance sensor [high-precision type] is connected.**

  **(1) Manual operation**

<table>
<thead>
<tr>
<th>Power supply 24 VDC</th>
<th>Input ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge stop signal</td>
<td>Input ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Static electricity elimination completion signal (OUT1)</td>
<td>Output OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Maintenance start signal (IN2)</td>
<td>Input ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Maintenance output signal (OUT2)</td>
<td>Output OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Maintenance indicator (NDL CHECK ALARM)</td>
<td>LED OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Internal processing Contamination-detection</td>
<td>Ion balance adjustment</td>
<td>(Performed when the maintenance level selection switch is set to H, M, L)</td>
</tr>
</tbody>
</table>

  **(2) Automatic operation**

<table>
<thead>
<tr>
<th>Power supply 24 VDC</th>
<th>Input ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge stop signal (IN1)</td>
<td>Input ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Static electricity elimination completion signal (OUT1)</td>
<td>Output OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Maintenance start signal (IN2)</td>
<td>Input ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Maintenance output signal (OUT2)</td>
<td>Output OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Maintenance indicator (NDL CHECK ALARM)</td>
<td>LED OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Internal processing Contamination-detection</td>
<td>Ion balance adjustment</td>
<td>(Performed when the maintenance level selection switch is set to H, M, L)</td>
</tr>
</tbody>
</table>

  **(b) When an autobalance sensor [body-mounting type] is connected.**

<table>
<thead>
<tr>
<th>Power supply 24 VDC</th>
<th>Input ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge stop signal (IN1)</td>
<td>Input ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Static electricity elimination completion signal (OUT1)</td>
<td>Output OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Maintenance start signal (IN2)</td>
<td>Input ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Maintenance output signal (OUT2)</td>
<td>Output OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Maintenance indicator (NDL CHECK ALARM)</td>
<td>LED OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Internal processing Contamination-detection</td>
<td>Ion balance adjustment</td>
<td>(Performed when the maintenance level selection switch is set to H, M, L)</td>
</tr>
</tbody>
</table>

  **(c) When a sensor is not connected.**

<table>
<thead>
<tr>
<th>Power supply 24 VDC</th>
<th>Input ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge stop signal (IN1)</td>
<td>Input ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Static electricity elimination completion signal (OUT1)</td>
<td>Output OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Maintenance start signal (IN2)</td>
<td>Input ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Maintenance output signal (OUT2)</td>
<td>Output OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Maintenance indicator (NDL CHECK ALARM)</td>
<td>LED OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Internal processing Contamination-detection</td>
<td>Ion balance adjustment</td>
<td>(Performed when the maintenance level selection switch is set to H, M, L)</td>
</tr>
</tbody>
</table>

- *Static electricity elimination completion is turned on when the electrode needle contamination-detection is in progress.*

**Caution**

Ions are emitted from the ionizer to detect electrode needle contamination, so the workpiece may, therefore, be electrostatically charged. Perform this detection procedure in the absence of workpieces.
3. DC mode

1) Bar length selection
   · Select the appropriate length suited for a workpiece size by referring to "Static Electricity Elimination Characteristics" and "Static Electricity Elimination Range", etc.

2) Ionizer installation
   · Install the ionizer within 50 to 2000 mm distance to the object requiring electricity elimination. Although the ionizer can also be used at other distances, it may fail to operate normally depending on the conditions of use. Before use, always verify that the ionizer is functioning normally.

3) Frequency selection switch setting
   · Select “Positive Ion Emission” or “Negative Ion Emission”.

4) Wiring of the power supply cable
   · Connect the dedicated power supply cable.

5) Air piping
   · For single-side piping, block the unused port with the plug (M-5P-X112) supplied with the ionizer.
Model Selection and Settings 3 / DC Mode

6) LED displays

- **POWER LED**—Indicates the state of the power input and the sensor connection.

<table>
<thead>
<tr>
<th>LED</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER</td>
<td>MAIN</td>
</tr>
<tr>
<td>SNSR</td>
<td>Light OFF</td>
</tr>
</tbody>
</table>

- **ION LED**—Indicates the polarity of the ions being emitted.

<table>
<thead>
<tr>
<th>LED</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ION</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>OK</td>
</tr>
<tr>
<td></td>
<td>–</td>
</tr>
</tbody>
</table>

- **ALARM LED**—Indicates abnormal states of the ionizer.

<table>
<thead>
<tr>
<th>LED</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALARM</td>
<td>HV</td>
</tr>
<tr>
<td></td>
<td>SNSR</td>
</tr>
<tr>
<td></td>
<td>NDL CHECK</td>
</tr>
</tbody>
</table>

7) Alarm

<table>
<thead>
<tr>
<th>Alarm item</th>
<th>Description</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-voltage error</td>
<td>Occurrence of an abnormal current, such as high-voltage leakage. The ionizer stops ion emission, turns the HV ALARM display, ON and turns an error signal (OUT3) OFF.</td>
<td>Turn the power OFF, solve the problem, then turn the power ON again. Alternatively, turn the discharge stop signal (IN1) OFF, then ON.</td>
</tr>
<tr>
<td>CPU error</td>
<td>Occurrence of a failure in the CPU due to noise, etc. The ionizer stops ion emission, all of the LED displays blink, and turns an error signal (OUT3) OFF.</td>
<td>Turn the power OFF, solve the problem, then turn the power ON again. Alternatively, turn the discharge stop signal (IN1) OFF, then ON.</td>
</tr>
</tbody>
</table>

8) Timing chart

- **Timing chart in normal operation**
Circuit of Power Cable Connection

(1) When a sensor is not used. / When a feedback sensor or autobalance sensor [high-precision type] is used.

NPN output

Ionizer

Input/Output signal circuit

+24 V

FG

PLC

OUTPUT

Isolation circuit

(Photocoupler)

OUTPUT

Isolation circuit

(Photocoupler)

Isolation circuit

(Photocoupler)

Isolation circuit

(Photocoupler)

+24 V

+24 V

INPUT

INPUT

INPUT

INPUT

INPUT

INPUT

INPUT

Load

10 kΩ or more

Analogue input

Dark green: OUT4

Brown: DC1 (+)

Blue: DC1 (–)

Red: DC2 (+)

Black: DC2 (–)

Grey: IN2

Light green: IN1

Pink: OUT1

Yellow: OUT2

Purple: OUT3

Dark green: OUT4

Apply Class-D grounding to the GND terminal of the ionizer driving power supply by connecting the lead DC (–) [Blue] to the FG terminal. The leads for output signals (OUT1 to OUT3) are insulated from the insulation circuit (Photocoupler), while the sensor monitor output lead* (OUT4: Dark green) is not insulated from the FG terminal.

* Sensor monitor output lead (OUT4: Dark green) When the feedback sensor is used, the terminal outputs the potential measured by the feedback sensor as an analogue signal. When the autobalance sensor is used, the terminal does not output signals.

The lead of the ionizer driving power supply (DC1) and the lead of the power supply for I/O signals (DC2) can be connected with a common power supply. When a common power supply is used, the lead DC1 (–) with Class-D grounded and leads for I/O signals are not insulated.

(2) When an autobalance sensor [body-mounting type] is used.

PNP output

Ionizer

Input/Output signal circuit

+24 V

FG

PLC

OUTPUT

Isolation circuit

(Photocoupler)

OUTPUT

Isolation circuit

(Photocoupler)

Isolation circuit

(Photocoupler)

Isolation circuit

(Photocoupler)

+24 V

+24 V

INPUT

INPUT

INPUT

INPUT

INPUT

INPUT

INPUT

Load

10 kΩ or more

Analogue input

Dark green: OUT4

Brown: DC1 (+)

Blue: DC1 (–)

Red: DC2 (+)

Black: DC2 (–)

Light green: IN1

Grey: IN2

Pink: OUT1

Yellow: OUT2

Purple: OUT3

Apply Class-D grounding to the lead DC (–) [Blue], and do not connect to the GND terminal of the power supply. When the lead is connected to the GND terminal of the power supply and Class-D grounding is applied, leads for I/O signals are not insulated from the FG terminal.

Sensor monitor output lead (OUT4: Dark green) When the feedback sensor is used, the terminal outputs the potential measured by the feedback sensor as an analogue signal. When the autobalance sensor is used, the terminal does not output signals.

When using the autobalance sensor (body-mounting type) near the ionizer in DC mode, keep clearance of at least 2 m between them.

Caution

* If the clearance is not enough, the ions from the ionizer in DC mode affect the control of the autobalance sensor, thus resulting in imbalance of ions.
Circuit of Power Cable Connection

(2) When an autobalance sensor [body-mounting type] is used.

*NPN output*

Ionizer

Input/Output signal circuit

+24 V

Internal circuit

Isolation circuit (Photocoupler)

Isolation circuit (Photocoupler)

Isolation circuit (Photocoupler)

Isolation circuit (Photocoupler)

Autobalance sensor [Body-mounting type]

Red: DC2 (+)
Black: DC2 (–)
Blue: DC1 (–)

GND: 24 VDC ±10% FG

PLC

OUTPUT

Light green: IN1
Grey: IN2

or

or

INPUT

Pink: OUT1
Yellow: OUT2
Purple: OUT3

*NPN output*

Ionizer

Input/Output signal circuit

+24 V

Internal circuit

Isolation circuit (Photocoupler)

Isolation circuit (Photocoupler)

Isolation circuit (Photocoupler)

Isolation circuit (Photocoupler)

Autobalance sensor [Body-mounting type]

Red: DC2 (+)
Black: DC2 (–)
Blue: DC1 (–)

GND: 24 VDC ±10% FG

PLC

OUTPUT

Light green: IN1
Grey: IN2

or

or

INPUT

Pink: OUT1
Yellow: OUT2
Purple: OUT3

Apply Class-D grounding to the lead DC (–) [Blue], and do not connect to the GND terminal of the power supply. When the lead is connected to the GND terminal of the power supply and Class-D grounding is applied, leads for I/O signals are not insulated from the FG terminal.

⚠️ Caution

When using the autobalance sensor (body-mounting type) near the ionizer in DC mode, keep clearance of at least 2 m between them.

* If the clearance is not enough, the ions from the ionizer in DC mode affect the control of the autobalance sensor, thus resulting in imbalance of ions.
Electrode cartridge

4 x M4 x 0.7 depth 5
(For mounting, opposite side: Same)

Dimensions

Ionizer / IZS31-

<table>
<thead>
<tr>
<th>Bar length (mm)</th>
<th>Fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>300, 380, 620, 780</td>
<td>M-5P-X112</td>
</tr>
<tr>
<td>1100, 1260, 1500, 1900, 2300</td>
<td>KJH04-M5-X34</td>
</tr>
</tbody>
</table>

Note) Plug (M-5P-X112) 1 pc. is shipped together.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>n</th>
<th>L (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IZS31-300</td>
<td>3</td>
<td>300</td>
</tr>
<tr>
<td>IZS31-380</td>
<td>4</td>
<td>380</td>
</tr>
<tr>
<td>IZS31-620</td>
<td>7</td>
<td>620</td>
</tr>
<tr>
<td>IZS31-780</td>
<td>9</td>
<td>780</td>
</tr>
<tr>
<td>IZS31-1100</td>
<td>13</td>
<td>1100</td>
</tr>
<tr>
<td>IZS31-1260</td>
<td>15</td>
<td>1260</td>
</tr>
<tr>
<td>IZS31-1500</td>
<td>18</td>
<td>1500</td>
</tr>
<tr>
<td>IZS31-1900</td>
<td>23</td>
<td>1900</td>
</tr>
<tr>
<td>IZS31-2300</td>
<td>28</td>
<td>2300</td>
</tr>
</tbody>
</table>
Ionizer Series IZS31

Dimensions

End bracket / IZS31-BE

Center bracket / IZS31-BM

Note) Number of center brackets included in a model with brackets. (Refer to "How to Order" in page 5.)

<table>
<thead>
<tr>
<th>Bar length (mm)</th>
<th>Center bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td>300, 380, 620, 780</td>
<td>None</td>
</tr>
<tr>
<td>1100, 1260, 1500</td>
<td>With 1 pc.</td>
</tr>
<tr>
<td>1900, 2300</td>
<td>With 2 pcs.</td>
</tr>
</tbody>
</table>
Series IZS31

Dimensions

Feedback sensor / IZS31-DF

![Feedback sensor diagram]

Autobalance sensor [High-precision type] / IZS31-DG

![Autobalance sensor diagram]

Power supply cable / IZS31-CP

![Power supply cable diagram]

<table>
<thead>
<tr>
<th>Model</th>
<th>L(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IZS31-CP</td>
<td>3000</td>
</tr>
<tr>
<td>IZS31-CPZ</td>
<td>10000</td>
</tr>
</tbody>
</table>
Dimensions

Autobalance sensor [Body-mounting type] / IZS31-DE

When mounting on the ionizer

Connection cable A (12P) / IZS31-CF

230 (Tolerance ±1%)

Connection cable B (6P) / IZS31-CR

Sensor bracket / IZS31-BL
**Series IZS31**
Made to Order 1

For detailed dimensions, specifications and delivery time, please contact SMC.

---

1. **Non-standard bar length (80 mm-pitch)**

- **Bar length (mm)**
  - 460, 540, 700
  - 860, 940, 1020, 1180, 1340, 1420, 1580, 1660, 1740, 1820, 1980, 2060, 2140, 2220

- **Part no.**
  - KJH04-M5-X34

- **Note:** Plug (M-5P-X112) 1 pc. is shipped together.

- **Symbol:** X10

2. **Non-standard power supply cable length**

- Available in 1 m increments from 1 m to 20 m.

- **Number of Center Brackets**
  - **Bar length (mm)**
    - 460 to 700: None
    - 860 to 1580: With 1 pc.
    - 1660 to 2220: With 2 pcs.

- **Note:** Be sure to apply Class-D grounding to the GND terminal.

- **Note:** Uneven static electricity elimination can be prevented when the installation height is low.

- **Note:** For mounting, install the electrode cartridges at a 40 mm-pitch.

**How to Order**

IZS31-CP X13

- **Cable length**
  - **L (Tolerance ±1%)**
  - **Red (2)**
Series IZS31
Made to Order 2
For detailed dimensions, specifications and delivery time, please contact SMC.

3 Model with 40 mm-pitch electrode cartridges

Install the electrode cartridges at a 40 mm-pitch.
(Standard: 80 mm-pitch)
Note) The maximum bar length is 1260 mm.
The air purge nozzles are arranged at an 80 mm-pitch.
● Uneven static electricity elimination can be prevented when the installation height is low.

Bar length (mm) | Fitting
---|---
300, 380, 620, 780 | M-SP-X112
1100, 1260 | KJH04-M5-X34

Note) Plug (M-SP-X112) 1 pc. is shipped together.

Center bracket / IZS31-BM-X158

Angle adjustable

4 Ionizer driving AC adapter (100 to 240 VAC)

The ionizer operation is possible if the power plug is connected to the AC power supply (100 to 240 V)

Heat-shrinkable tube
(Output signal identification, Black for NPN, White for PNP)
1800 ±20 96 2000 ±20

GND connection terminal (Note)
(Inside diameter ø4.5 Lead wire length 125 ±5)

Note: Be sure to apply Class-D grounding to the GND terminal.

How to Order
IZS31 - F - X196EU

IZS31 - F X196EU
Applicable output spec
- NPN specification
P PNP specification

Specifications

<table>
<thead>
<tr>
<th>Input voltage</th>
<th>100 VAC to 240 VAC, 50/60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Output current</td>
<td>1A</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>0 to 40°C</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>35 to 65% Rh</td>
</tr>
<tr>
<td>Weight</td>
<td>220 g</td>
</tr>
</tbody>
</table>
**Series IZS31**
**Made to Order 3**
For detailed dimensions, specifications and delivery time, please contact SMC.

---

### High-voltage/control unit detachable short type

- A short type ionizer (full length of 180 mm and 220 mm) can be installed in a small space. The high-voltage unit (ionizing unit) and control unit are detachable from each other. The distance between them is also optional according to the length of the selected connection cables.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>IZS31-CF01-X210</td>
<td>1000 mm</td>
</tr>
<tr>
<td>IZS31-CF02-X210</td>
<td>2000 mm</td>
</tr>
<tr>
<td>IZS31-CF03-X210</td>
<td>3000 mm</td>
</tr>
<tr>
<td>IZS31-CF04-X210</td>
<td>4000 mm</td>
</tr>
<tr>
<td>IZS31-CF05-X210</td>
<td>5000 mm</td>
</tr>
<tr>
<td>IZS31-CF07-X210</td>
<td>7000 mm</td>
</tr>
<tr>
<td>IZS31-CF10-X210</td>
<td>10000 mm</td>
</tr>
</tbody>
</table>

Order connection cables separately.

---

**How to Order**

IZS31-180 R X210

- **Bar type**
- **Electrode needle material**
  - **—** Tungsten
  - C Silicon
  - S Stainless steel
  - J Low-maintenance type / Tungsten
  - K Low-maintenance type / Silicon

- **Output specification**
  - — NPN output
  - P PNP output

- **Bracket**
  - — Without bracket
  - B With bracket [E] [F]

Note: Four end brackets are bundled with the bracket model. Brackets can be attached on the high-voltage unit and control unit.

- **Sensor**
  - — Without sensor
  - E Autobalance sensor (Body-mounting type)
  - F Feedback sensor
  - G Autobalance sensor [High-precision type]

- **Power cable**
  - — With power cable (3 m)
  - Z With power cable (10 m)
  - N Without power cable

- **Control unit cable entry direction**
  - — Left-side entry
  - R Right-side entry

---

**Connection cable from the right side of the control unit**

**High-voltage unit full length: 180 mm**

**High-voltage unit full length: 220 mm**

---

**Symbol**

X210

---

For detailed dimensions, specifications and delivery time, please contact SMC.
Series IZS31
Made to Order 4
For detailed dimensions, specifications and delivery time, please contact SMC.

High-voltage/control unit detachable short type with 40 mm-pitch electrode cartridges X211

A short type ionizer (full length of 180 mm and 220 mm) can be installed in a small space. The high-voltage unit (ionizing unit) and control unit are detachable from each other. The distance between them is also optional according to the length of selected connection cables.

Order connection cables separately.

Part no. | L
---|---
IZS31-CF01-X210 | 1000 mm
IZS31-CF02-X210 | 2000 mm
IZS31-CF03-X210 | 3000 mm
IZS31-CF04-X210 | 4000 mm
IZS31-CF05-X210 | 5000 mm
IZS31-CF07-X210 | 7000 mm
IZS31-CF10-X210 | 10000 mm

IZS31-CF10-X210
IZS31-CF07-X210
IZS31-CF05-X210
IZS31-CF04-X210
IZS31-CF03-X210
IZS31-CF02-X210
IZS31-CF01-X210

4 x M4 x 0.7 depth 5
(For mounting, opposite side: Same)

4 x M4 x 0.7 depth 5
(For mounting, opposite side: Same)

How to Order
IZS31- 180 R X211

High-voltage unit full length

180 mm
220 mm

Electrode needle material

- Tungsten
C Silicon
S Stainless steel
J Low-maintenance type / Tungsten
K Low-maintenance type / Silicon

Output specification

- NPN output
P PNP output

Bracket

- Without bracket
B With bracket

Note) Four end brackets are bundled with the bracket model. Brackets can be attached on the high-voltage unit and control unit.

Sensor

- Without sensor
E Autobalance sensor [Body-mounting type]
F Feedback sensor
G Autobalance sensor [High-precision type]

Power cable

- With power cable (3 m)
Z With power cable (10 m)
N Without power cable

Control unit cable entry direction

- Left-side entry
R Right-side entry

For detailed dimensions, specifications and delivery time, please contact SMC.
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) Note 1), and other safety regulations.

Note 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.
eetc.

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications. Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.
The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.
   1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
   2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
   3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.
   1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
   2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalogue.
   3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
   4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.
Safety Instructions

⚠️ Caution

1. The product is provided for use in manufacturing industries.
   The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary. If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”. Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered. Note 2)
   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
   This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.
   Note 2) Vacuum pads are excluded from this 1 year warranty.
   A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
   Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.

2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.
Warning

1. This product is intended to be used with general factory automation (FA) equipment.
   If considering using the product for other applications (especially those stipulated in 4 on back page 1), please consult with SMC beforehand.

2. Use this product within the specified voltage and temperature range.
   Using within a voltage range other than specified can cause malfunction, damage, electrical shock, or fire.

3. Use clean compressed air for fluid.
   This product is not explosion proof. Never use a flammable gas or an explosive gas as a fluid and never use this product in the presence of such gases. Please contact us when fluids other than compressed air are used.

4. This product is not explosion-protected.
   Never use this product in locations where the explosion of dust is likely to occur or flammable or explosive gases are used. This can cause fire.

Caution

1. This product is not washed. When bringing into a clean room, flush for several minutes and confirm the required cleanliness before using.

Warning

1. Reserve enough space for maintenance, piping and wiring
   Please take into consideration that the one-touch fittings need enough space for air tubing to be easily attached/detached. To avoid excessive stress on the connector and one-touch fitting, please take into consideration the air tubing minimum bending radius and avoid bending at acute angles. Wiring with excessive twisting, bending, etc. can cause malfunction, wire breakage, fire or air leakage.

   Minimum bending radius:
   Power cable, connection cable A …………………..35 mm
   Sensor cable, connection cable B …………………25 mm

   (Note: Wiring with the fixed minimum allowable bending radius and at a temperature of 20 °C shown above. If used under this temperature, the connector can receive excessive stress even though the minimum bending radius is allowable.)
   Regarding the minimum bending radius of the air tubing, refer to the instruction manual or catalogue for tubing.

2. Mount this product on a plane surface.
   If there are irregularities, cracks or height differences, excessive stress will be applied to the frame or case, resulting in damage or other trouble. Also, do not drop or apply a strong shock. Otherwise, damage or an accident may occur.

Warning

3. Do not use this product in areas where noise (electric magnetic field or surge voltage, etc.) is generated.
   Using the ionizer under such conditions may cause malfunction or internal devices to deteriorate or break down. Take noise countermeasures against noise and prevent the lines from mixing or coming into contact with each other.

4. Consider the tightening torque requirements when mounting the ionizer. Refer to the table below for tightening torques for screws, etc.
   If overtightened with a high torque, the mounting screws or mounting brackets may break. Also, if undertightened with a low torque, the connection may loosen.

<table>
<thead>
<tr>
<th>Thread size</th>
<th>Recommended tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3</td>
<td>0.61 to 0.63 N·m</td>
</tr>
<tr>
<td>M4</td>
<td>0.73 to 0.75 N·m</td>
</tr>
<tr>
<td>M5</td>
<td>1.3 to 1.5 N·m</td>
</tr>
</tbody>
</table>

5. Do not touch the electrode needle directly with fingers or metallic tools.
   If a finger is used to touch the electrode, it may get stuck or an injury or electrical shock may occur from touching the surrounding equipment. In addition, if the electrode needle or cartridge is damaged with a tool, the specification will not be met and damage and/or an accident may occur.

Danger High Voltage!

Electrode needles are under high voltage. Never touch them as there is a danger of electric shock or injury due to an evasive action against a momentary electrical shock caused by inserting foreign matter in the electrode cartridge or touching the electrode needle.

6. Do not affix any tape or seals to the body.
   If the tape or seal contains any conductive adhesive or reflective paint, a dielectric phenomenon may occur due to ions arising from such substances, resulting in electrostatic charging or electric leakage.

7. Installation and adjustment should be conducted after turning the power supply off.
## Precautions 2

### Mounting

**Caution**

1. Install the ionizer away from walls as illustrated below.

   If a wall is located closer than that in the illustration below, the ions generated will not be able to reach the object which requires static electricity elimination and therefore result in a decrease in efficiency.

   ![](mounting-diagram.png)

   After installation, be sure to verify the effects of static electricity elimination.

   The effects vary depending on the ambient conditions, operating conditions, etc. After installation, verify the effects of static electricity elimination.

2. Install a feedback sensor away from walls as illustrated below.

   The ionizer may fail to measure electrostatic potentials correctly if a wall or other obstacle exists within the clearances shown in the following figure.

   ![](feedback-sensor-diagram.png)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>30</td>
<td>55</td>
</tr>
<tr>
<td>40</td>
<td>65</td>
</tr>
<tr>
<td>50</td>
<td>75</td>
</tr>
</tbody>
</table>

### Wiring / Piping

**Warning**

2. Be sure to provide Class-D grounding in order to maintain product performance.

   If such grounding is not provided, not only may the ion balance be disrupted but electric shocks may also result and the ionizer or power supply may break down.

   ![](grounding-diagram.png)

3. Be sure to turn the power supply off before wiring (including attachment/detachment of the connector).

4. To connect a feedback sensor or autobalance sensor to the ionizer, use the cable included with the sensor. Do not disassemble or modify the ionizer.

5. When applying the power supply, pay special attention to the wiring and/or surrounding environment until safety is confirmed.

6. Do not connect or remove any connectors including the power supply, while power is being supplied. Otherwise, the ionizer may malfunction.

7. If the power line and high-pressure line are routed together, this product may malfunction due to noise. Therefore, use a separate wiring route for this product.

8. Be sure to confirm there are no wiring errors before turning this product on.

   Incorrect wiring will lead to damage or malfunction of the product.


   Before piping this product, prevent particles, water drops, or oil contents from entering the piping.
### Operating Environment / Storage Environment

**Warning**
1. Consider the fluid temperature and ambient temperature range.
   Fluid and ambient temperature ranges are 0 to 50°C for the ionizer, feedback sensor and autobalance sensor. Do not use the ionizer in locations subjected to sudden temperature changes even if the ambient temperature range is within the specified limits, as condensation may result.

2. Do not use this product in an enclosed space.
   This product is based on the corona discharge phenomenon. Do not use the product in an enclosed space as ozone and nitrogen oxides exist in such places, even though in marginal quantities.

3. Environments to avoid
   Avoid using and storing this product in the following environments since they may cause damage to this product.
   a) Avoid using in places exceeding an ambient temperature range of 0 to 50°C.
   b) Avoid using in places exceeding an ambient humidity range of 35 to 80% Rh.
   c) Avoid using places where condensation occurs due to a dramatic temperature change.
   d) Avoid using in the presence of corrosive or explosive gas or where there is a volatile combustible.
   e) Avoid using in atmospheres where there are particles, conductive iron powders, oil mist, salt, solvent, blown dust, cutting oil (water, liquid), etc.
   f) Avoid using in places where ventilated air from an air conditioner is directly applied to the product.
   g) Avoid using in closed places without ventilation.
   h) Avoid using in direct sunlight or radiated heat.
   i) Avoid using in places under strong magnetic noise (strong electric field, strong magnetic field, or surge).
   j) Avoid using in places where static electricity is discharged to the body.
   k) Avoid using in places where a strong high frequency occurs.
   l) Avoid using in places where this product is likely to be damaged by lightning.
   m) Avoid using in places where direct vibration or shock is applied to the body.
   n) Avoid using in places where there is a force large enough to deform the body or weight is applied to the product.

4. Do not use air containing mist or dust.
   Air containing mist or dust will cause the performance to decrease and shorten the maintenance cycle.
   Supply clean compressed air by using an air dryer (IDF series), an air filter (AF/AFF series), and a mist separator (AFM/AM series)

5. The ionizer and sensors are not protected against surge caused by lightning.

### Maintenance

**Warning**
1. Periodically (every two weeks or so) inspect the ionizer and clean the electrode needles.
   Conduct regular maintenance to check if the product is running having a disorder.
   Maintenance should be conducted by a fully knowledgeable and experienced person.
   If particles attach to the electrode needle after long periods of time, usage the static electricity eliminating performance will be lowered.
   Replace the electrode cartridge if the pins are rough and the static electricity eliminating performance does not return even after cleaning.

**Danger 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 ionizer, as this may not only impair the product’s functionality but could cause an electric shock or electric leakage.

2. When cleaning the electrode needle or replacing the electrode cartridge, be sure to turn the power supply to the body off.
   Touching an electrode needle when it is electrified may result in electric shock or other accidents.

3. Do not disassemble or modify this product.
   Otherwise, an electrical shock, damage and/or a fire may occur. Also, disassembled or modified products may not achieve the performance guaranteed in the specifications; the product will not be guaranteed.

### Handling

**Warning**
1. Do not drop, bump or apply excessive impact (10 G or more) while handling.
   Even though it does not appear to be damaged, the internal parts may be damaged and cause malfunction.

2. When mounting/dismounting the cable, use your finger to pinch the claw of the modular plug, then attach/detach it correctly. If the modular plug is at a difficult angle to attach/detach, the modular jack’s mounting section may be damaged and cause disorder.

3. Do not operate this product with wet hands.
   Otherwise, an electrical shock or accident may occur.
1. Consider the fluid temperature and ambient temperature range. Fluid and ambient temperature ranges are 0 to 50 °C for the ionizer, feedback sensor and autobalance sensor. Do not use the ionizer in locations subjected to sudden temperature changes even if the ambient temperature range is within the specified limits, as condensation may result.

2. Do not use this product in an enclosed space. This product is based on the corona discharge phenomenon. Do not use the product in an enclosed space as ozone and nitrogen oxides exist in such places, even though in marginal quantities.

3. Environments to avoid
   a) Avoid using in places exceeding an ambient temperature range of 0 to 50 °C.
   b) Avoid using in places exceeding an ambient humidity range of 35 to 80% Rh.
   c) Avoid using places where condensation occurs due to a dramatic temperature change.
   d) Avoid using in the presence of corrosive or explosive gas or where there is a volatile combustible.
   e) Avoid using in atmospheres where there are particles, conductive iron powders, oil mist, salt, solvent, blown dust, cutting oil (water, liquid), etc.
   f) Avoid using in places where ventilated air from an air conditioner is directly applied to the product.
   g) Avoid using in closed places without ventilation.
   h) Avoid using in direct sunlight or radiated heat.
   i) Avoid using in places under strong magnetic noise (strong electric field, strong magnetic field, or surge).
   j) Avoid using in places where static electricity is discharged to the body.
   k) Avoid using in places where a strong high frequency occurs.
   l) Avoid using in places where this product is likely to be damaged by lightning.
   m) Avoid using in places where direct vibration or shock is applied to the body.
   n) Avoid using in places where there is a force large enough to deform the body or weight is applied to the product.

4. Do not use air containing mist or dust. Air containing mist or dust will cause the performance to decrease and shorten the maintenance cycle. Supply clean compressed air by using an air dryer (IDF series), an air filter (AF/AFF series), and a mist separator (AFM/AM series).

5. The ionizer and sensors are not protected against surge caused by lightning.

1. Periodically (every two weeks or so) inspect the ionizer and clean the electrode needles.
2. When cleaning the electrode needle or replacing the electrode cartridge, be sure to turn the power supply to the body off. Touching an electrode needle when it is electrified may result in electric shock or other accidents.
3. Do not disassemble or modify this product. Otherwise, an electrical shock, damage and/or a fire may occur. Also, disassembled or modified products may not achieve the performance guaranteed in the specifications; the product will not be guaranteed.

Warning

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 ionizer, as this may not only impair the product’s functionality but could cause an electric shock or electric leakage.

Danger High Voltage!

1. Do not drop, bump or apply excessive impact (10 G or more) while handling. Even though it does not appear to be damaged, the internal parts may be damaged and cause malfunction.
2. When mounting/dismounting the cable, use your finger to pinch the claw of the modular plug, then attach/detach it correctly. If the modular plug is at a difficult angle to attach/detach, the modular jack’s mounting section may be damaged and cause disorder.
3. Do not operate this product with wet hands. Otherwise, an electrical shock or accident may occur.

Conduct regular maintenance to check if the product is running having a disorder. Maintenance should be conducted by a fully knowledgeable and experienced person. If particles attach to the electrode needle after long periods of time, usage the static electricity eliminating performance will be lowered. Replace the electrode cartridge if the pins are rough and the static electricity eliminating performance does not return even after cleaning.
**Ionizer Nozzle type Series IZN10**

- Dust removal and static electricity elimination by air blow
- Eliminates dust clinging to lamp covers.

**Electrode needle contamination detector**
- Outputs the maintenance signal when detects contamination or wear of an electrode needle.
- Detects optimal maintenance time, reduced labor for maintenance.

**Built-in power supply substrate**
- High-voltage power supply cable/external high-voltage power supply are unnecessary.

---

**Electrostatic Sensor Series IZD10 / Electrostatic Sensor Monitor Series IZE11**

**Electrostatic Sensor Series IZD10**
- The importance of the static electric control is put on confirming the “current status”.
  - Potential measurement: ±20 kV (detected at a 50 mm distance)
  - ±0.4 kV (detected at a 25 mm distance)
  - Detects the electrostatic potential and outputs in an analogue voltage
    - Output voltage: 1 to 5 V (Output impedance: Approx. 100 Ω)
  - Possible to measure electrostatic potential

**Electrostatic Sensor Monitor Series IZE11**
- Output: Switch output x 2 + Analogue output (1 to 5 V, 4 to 20 mA)
- Minimum unit setting: 0.001 kV (at ±0.4 kV), 0.1 kV (at ±20 kV)
- Display accuracy: ±0.5% F.S., ±1 digit or less
- Detection distance correction function
  (adjustable in 1 mm increments)
- Range switching supports two sensors. (±0.4 kV, ±20 kV)

---

**Handheld Electrostatic Meter Series IZH10**

- The importance of the static electric control is put on confirming the “current status”.
- Easy-to-use handheld electrostatic meter
  - Measuring range: ±20.0 kV
  - Minimum unit display: 0.1 kV (±1.0 to ±20.0 kV)
    0.01 kV (0 to ±0.99 kV)
  - Compact & Lightweight: 85 g
    (excluding dry cell batteries)
  - Backlight for reading in the dark
  - LOW battery indicator
  - Peak/Bottom display function
  - Zero-out function
  - Auto power-off function
SMC can provide all the equipment required to supply air to the ionizer. Consider the equipment below not only for providing an “opportunity to decrease maintenance” and “preventing damage” but also for an “energy-saving countermeasure”.

**Related Products**

---

**Recommended pneumatic circuit diagram**

1. **Air Dryer / Series IDF**
   - Decreases the dew point of compressed air.
   - Limits moisture generation which can lead to damage.

2. **Air Filter / Series AF**
   - Eliminates solid foreign matter such as powder particles in the compressed air.

3. **Mist Separator / Series AFM**
   - Eliminates oil mist which is difficult to eliminate with an air filter.

4. **Digital Flow Switch / Series PF2A**
   - Decreases air consumption with flow control.

5. **2-Colour Display Digital Flow Switch / Series PFM**
   - Decreases air consumption by setting to an appropriate pressure.

6. **Digital Pressure Switch / Series ISE30**
   - Pressure control prevents the static electricity removal performance from being reduced in accordance with the reduction of air pressure.

7. **Regulator / Series AR**
   - Regulates to the appropriate air volume depending on the installation conditions.
   - Decreases air consumption.

8. **Restrictor / Series AS-X214**
   - Regulates to the appropriate air volume depending on the installation conditions.
   - Decreases air consumption.

9. **Clean Air Filter / Series SFD**
   - Built-in capillary element
   - Nominal filtration rating: 0.01 μm
   - Hollow fiber elements with over 99.99% filtering efficiency do not contaminate workpieces.