

TM

Photolonizer

ADVANCED ELECTROSTATIC REMOVER

"Particle Free" "Ozone Free" "No Air Flow"

Compact & Power supply compatible in world-wide & CE marking compliance



HAMAMATSU

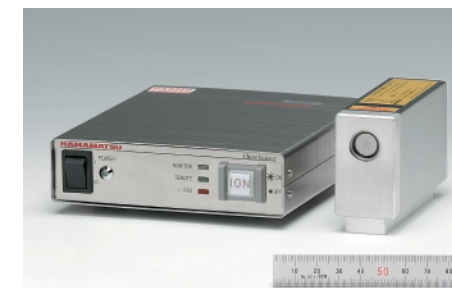
PHOTON IS OUR BUSINESS

Introducing a electrostatic charge removal using "PHOTOIONIZATION"!!



Photolonizer

ADVANCED ELECTROSTATIC REMOVER



L12645

No air flow

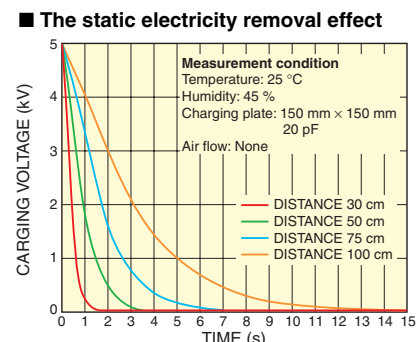
Why! The soft X-ray exposure volume is equal to the ion generation volume.

Ion generation constantly occurs over the entire volume exposed to soft X-rays. Ions generated near the charged object serve to effectively remove the electrostatic charge, so there is no need for sending generated ions toward the object by an air flow. The Photoionizer also removes electrostatic charges from lightweight parts and powder.

High ion density

Why! Ions are generated over the entire exposed area.

In the corona discharge method, ions are mainly generated only near the electrodes. In the soft X-ray method, however, ions are generated over the entire volume exposed to these soft X-rays, yielding a drastic improvement in the removal of electrostatic charges.



No overshoot

Why! Good ion balance eliminates overshoot.

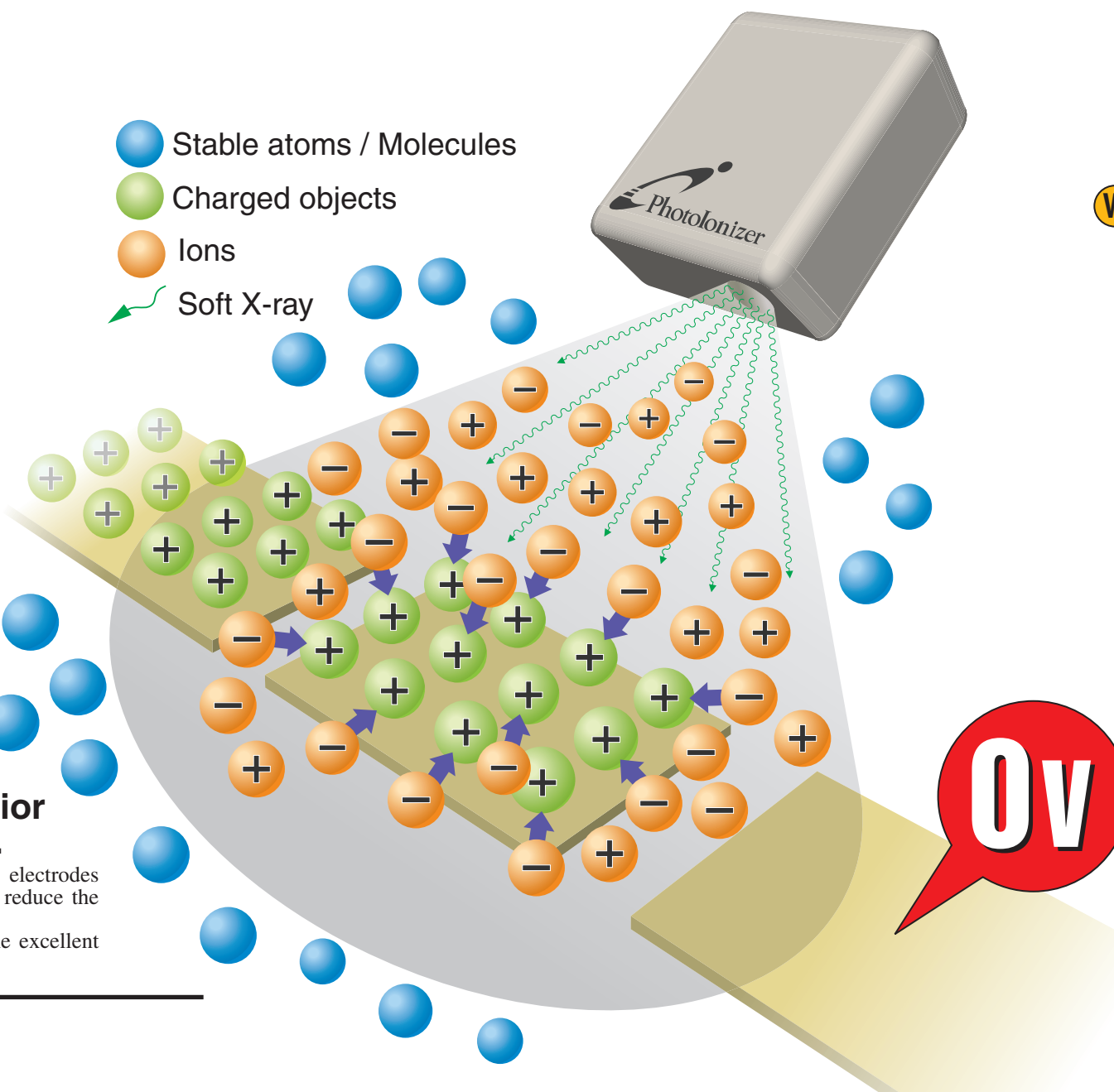
If ion generation balance is poor, the positive or the negative ions will continuously increase in large quantities, resulting in "overshoot" (generation of static charges of opposite polarity). The Photoionizer, however, simultaneously generates the same amount of "positive" and "negative" ions in an ideal balance that prevents overshoot.

No cleaning of electrodes required

Why! The soft X-ray method is greatly superior to the conventional discharge method.

Corona discharge ionizers require frequent cleaning of the discharge electrodes since they become contaminated due to dust adhering to them and so reduce the effect of neutralizing static electricity. Photoionizers, in contrast, require no maintenance at all and ensure the excellent effect of removing static electricity over a long period of time.

The Photoionizer is a completely new type of electrostatic remover using "photoionization" for clean, easy, yet effective generation of ions. The Photoionizer provides big advantages over the corona discharge method which is generally used. The Photoionizer thoroughly ionizes molecules near the charged object so these ions in turn work effectively to remove electrostatic charges accumulated on the object. The Photoionizer is certain to be the next generation of electrostatic charge removers, since it now eliminates all the problems conventional electrostatic removers have in terms of object, speed, environment and reliability.



No ozone generation

Why! The soft X-ray method does not emit UV radiation.

Ozone is generated when the air is exposed to specific types of UV rays (approx. 10 eV). The blue light of a corona discharge contains this type of UV ray. The Photoionizer, in contrast, emits soft X-rays into the air to make an ionization. This ion generation method does not generate any ozone.

No dust particles and electromagnetic noise generation

Why! The soft X-ray method is greatly superior to the conventional discharge method.

<Dust Particles> In the corona discharge method, microparticles in the air are attracted to the electrodes and then diffuse back as dust particles.

<Electromagnetic Noise> Corona discharge accompanies the generation of electromagnetic noise.

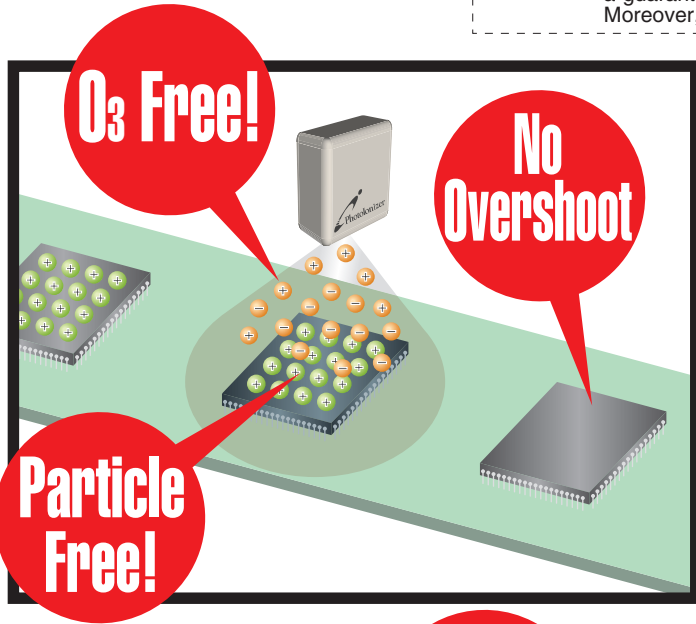
As long as the discharge method is used, the above problems are inevitable. In contrast, the soft X-ray method used by the Photoionizer eliminates these problems.

OTHER FEATURES (L12645)

- **Compact:** 30 mm x 50 mm x 96 mm (W x H x D) [head]
Installs even in narrow spaces.
- **Worldwide compatible power supply**
Accepts 100 V to 240 V AC.
- **External control**
15-pin D-sub connector.
Operates in two remote modes and provides 4 types of external outputs.
- **CE marking compliance**
The Photoionizer complies with CE marking requirements therefore can be used in Europe.

A new era of safe and clean electrostatic removal has now begun. The Photoionizer has solved problems such as "generation of ozone and dust particles" and "overshoot due to poor ion balance" that often occur in the conventional method. The Photoionizer can also remove accumulated static charges even on high-speed moving objects and powders, which have been impossible up until now, by using the corona discharge method. Here are some problem solutions delivered by the Photoionizer - the advanced electrostatic remover.

CAUTION The typical applications listed in this catalog are merely examples and do not constitute a guarantee that the device is suitable for commercial use or for a particular objective. Moreover, this catalog is not guarantee or a concession of intellectual assets.

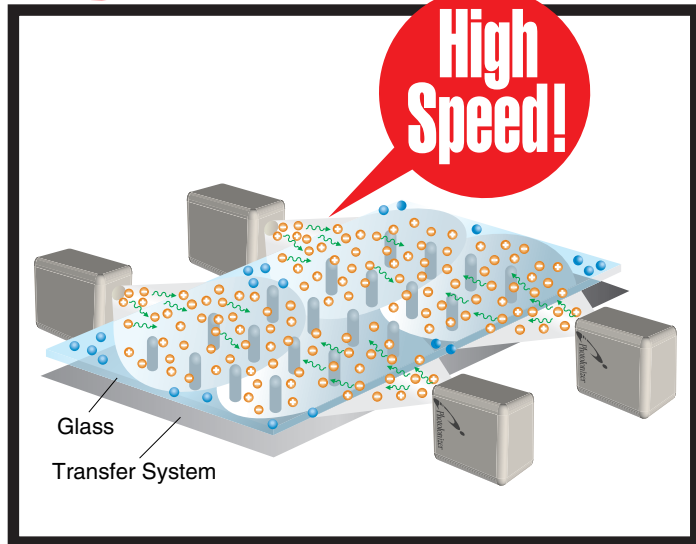


IC/LCD/PDP process lines

Problem On the IC, LCD and PDP process lines in a clean room, electrostatic charge may cause serious problem such as dust adhesion, dielectric breakdown and corrosion from ozone on peripheral equipment.

Solution The soft X-ray method does not cause diffusion of dust particles and provides a good ion balance that allows efficient removal of electrostatic charges without overshoot. Since this method generates no ozone, the electrostatic removal process is kept clean and safe.

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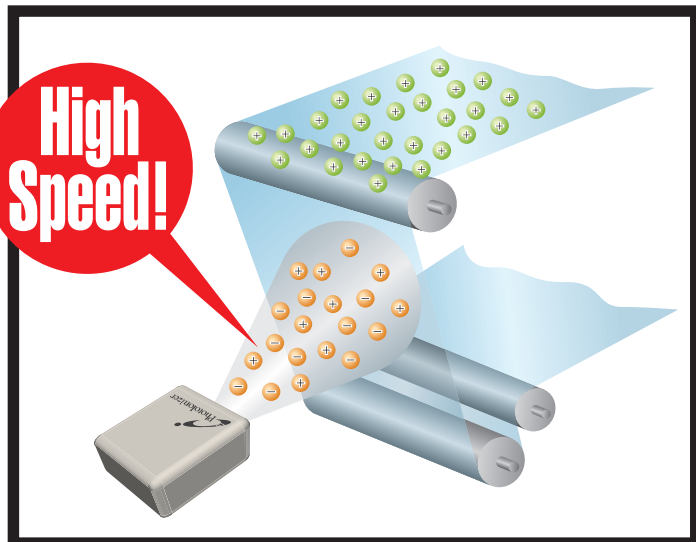


Large size glasses

Problem Electrostatic charges cause problems such as dust adhesion during the manufacturing process in clean room environments. If large size glasses are electrostatically charged, removing the electrostatic charges from them takes a great deal of time.

Solution In the soft X-ray method, ions are generated over the entire area exposed to X-rays so electrostatic charges can be quickly removed even from large glass surfaces.

TAPPC0123EA



High-speed moving objects (films, printed matters, etc.)

Problem In film manufacturing and offset printing processes which usually move at high speed, electrostatic charges accumulated on the transfer cylinders may result in non-uniform printing or cause electric shocks to the human body.

Solution In the soft X-ray method, ions generated near the film surface serve to efficiently remove the electrostatic charges. Even though the film moves at high speed, the electrostatic charges can be reliably neutralized. In addition, ions generated by soft X-rays penetrating through the film, also neutralize the electrostatic charges on the reverse side of the film, so that the electrostatic removal effect is greatly improved.

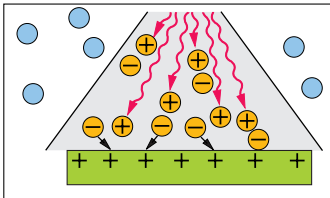
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Principle of Photoionization

Ionization occurs near the charged object.

Object

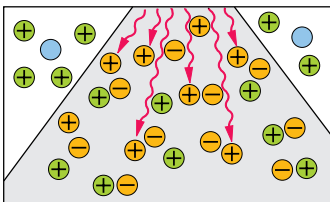
plate or film



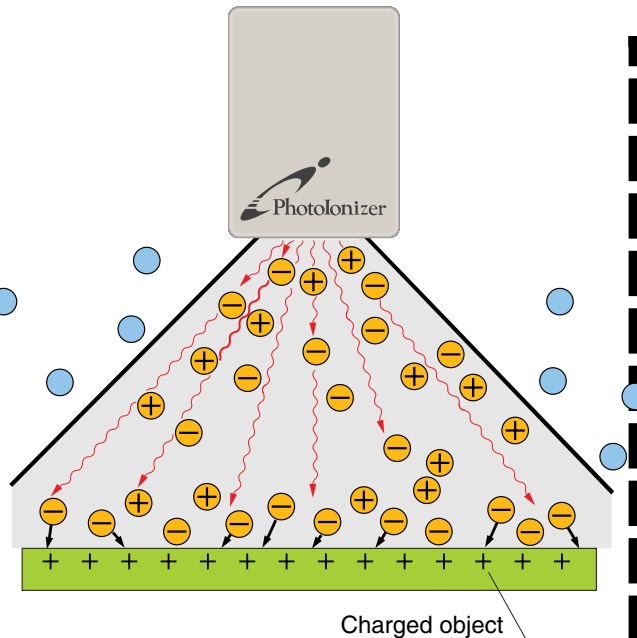
Ions generated near the charged object are easily attracted to it. Other generated ions return to their original stable state.

Object

Powder or dense solid



Ions are generated near each powder particle because ion generation occurs over the entire area exposed to the soft X-rays. So there is no need for a forced air flow.



- ... Stable atoms or molecules
- ... Ions
- + ... Charge
- ~ ... Soft X-rays

"Photoionization" mechanism

Stable atom or molecule



Soft X-ray



Ejected electron e^-

Atom or molecule of positive polarity as one electron is ejected.



e^- → Stable atom or molecule

Ion



Both positive and negative ions are generated.

Ion

Photoionization ensures a good ion balance.

If ion balance is poor, too many positive or too many negative ions are continually present. This is what causes "overshoot".

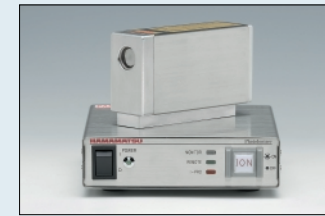
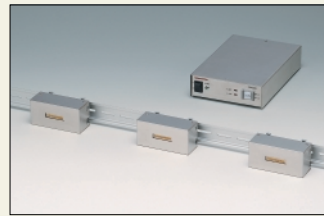
LINE UP COMPARISON

■ PhotoIonBar L12536

■ PhotoIonizer L12645

■ High Power PhotoIonizer L11754

Exterior view



Initial cost

Low

High

Installation footprint

Small

Large

Tube voltage

Low

4.9 kV

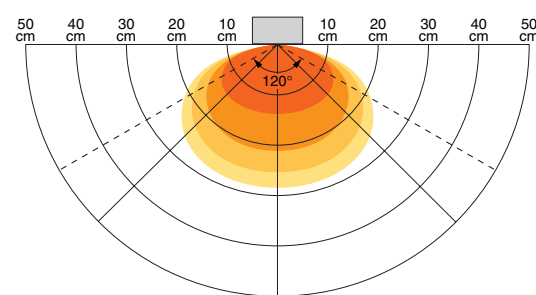
9.5 kV

15 kV

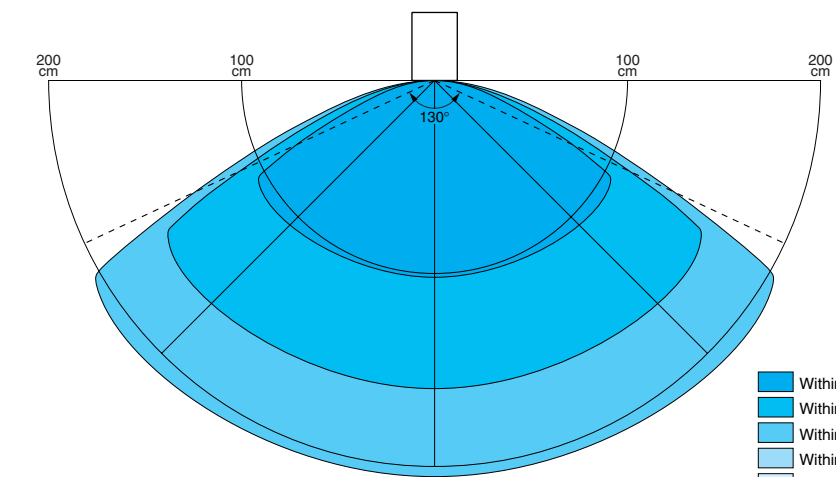
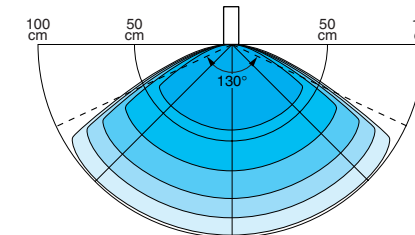
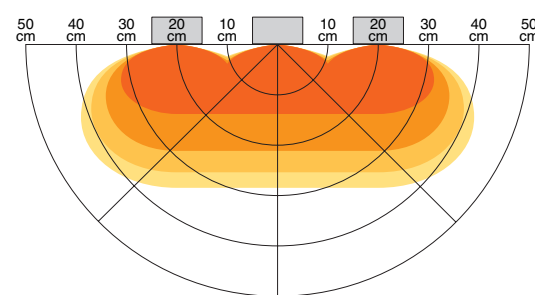
High

Neutralization range

● When using a single head unit



● When using three connected head units



Measurement conditions
Charged plate: □150 mm, 20 pF
Charged voltage: 1 kV → 100 V
Temperature: 25 °C
Humidity: 50 %

■ Within 1 second
■ Within 2 seconds
■ Within 3 seconds
■ Within 4 seconds
□ 4 seconds or more

Measurement conditions
Charged plate: □150 mm, 20 pF
Charged voltage: 1 kV → 100 V
Temperature: 25 °C
Humidity: 50 %

■ Within 1 second
■ Within 2 seconds
■ Within 3 seconds
■ Within 4 seconds
□ Within 5 seconds

Shielding material

Thin

Thick

Shielding material	Thickness (mm)
SUS304	0.11
Aluminum plate	0.23
PVC	0.65
Acrylic plate	3.3

Shielding material	Thickness (mm)
SUS 304	0.22
Aluminum plate	1.3
Glass plate	1.74
PVC	2.2
Acrylic plate	21.7

Shielding material	Thickness (mm)
SUS 304	0.4
Aluminum plate	7
PVC	10

* Using a PhotoIonbar or Photoionizer requires "soft X-ray shielding" during operation. The thickness of the shielding material differs depending on the tube voltage.

LINE UP

PhotoIonizer L12645



The Photoionizer is a completely new type of electrostatic remover using "photoionization" for clean, easy, yet effective generation of ions. The Photoionizer provides big advantages over the corona discharge method which is generally used.

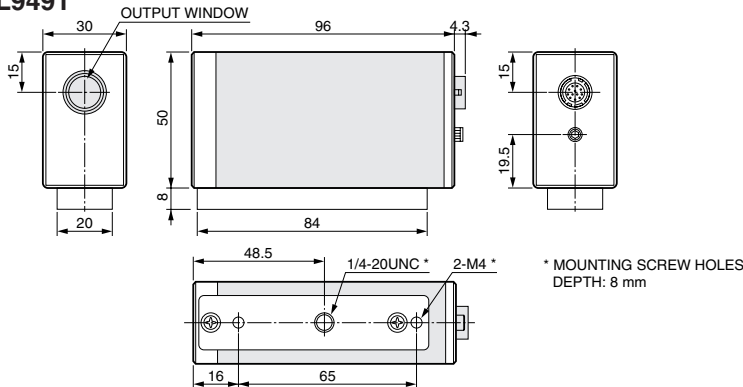
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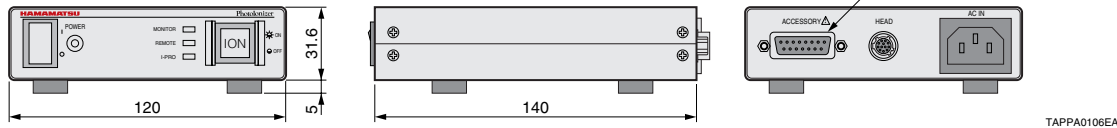


Dimensional Outline (Unit: mm)

● HEAD: L9491



● CONTROLLER: C12646

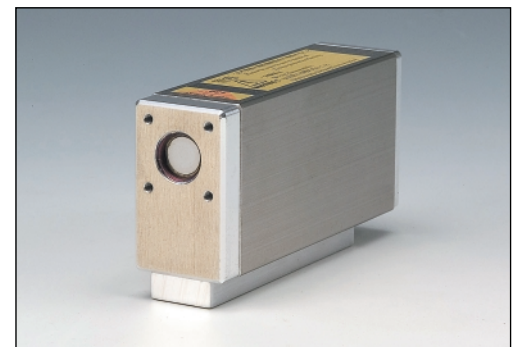
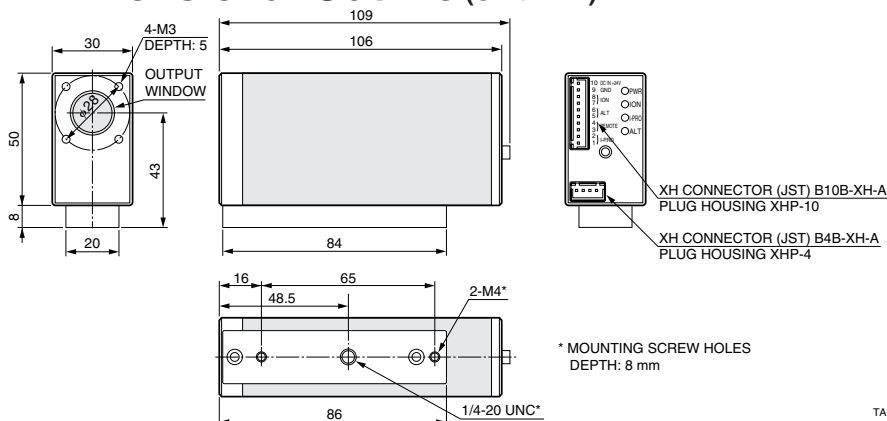


PhotoIonizer Operate by DC 24 V L9873



The L9873 Photoionizer operates on 24 V dc which is supplied from a power source in manufacturing equipment. Because the control system for manufacturing equipment can be used to directly control the L9873, there is no need for an additional controller that is usually required for other types of ionizers.

Dimensional Outline (Unit: mm)



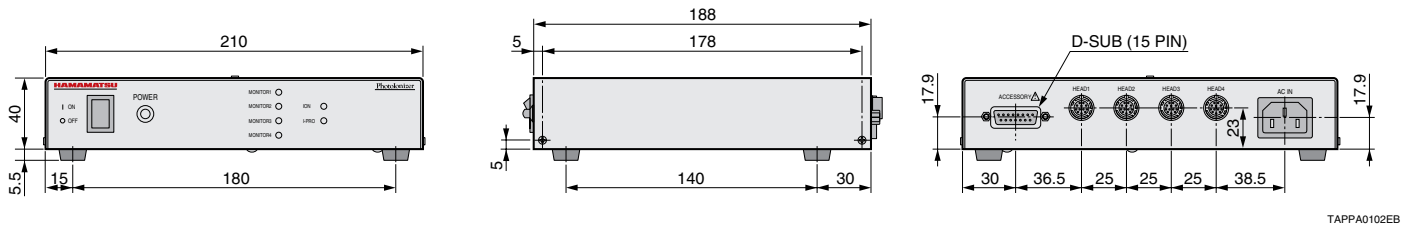
Multiple Four Head Type PhotoIonizer Controller C11952

The controller C11952 can operate 4-Photoionizer head in parallel. It should be convenient for the customer who likes to make synchronization.



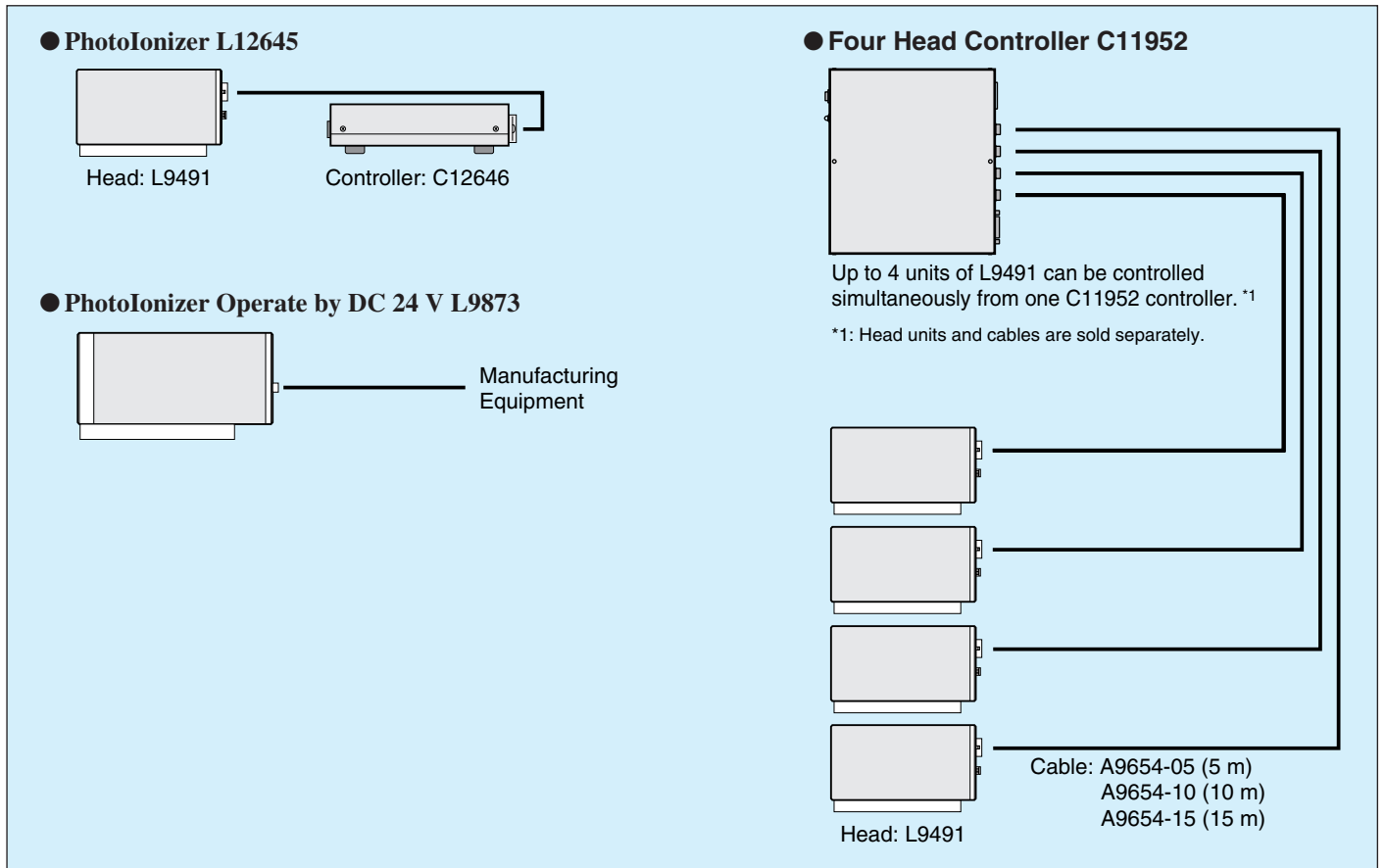
▲ Right: C11952

Dimensional Outline (Unit: mm)



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CONNECTING EXAMPLE

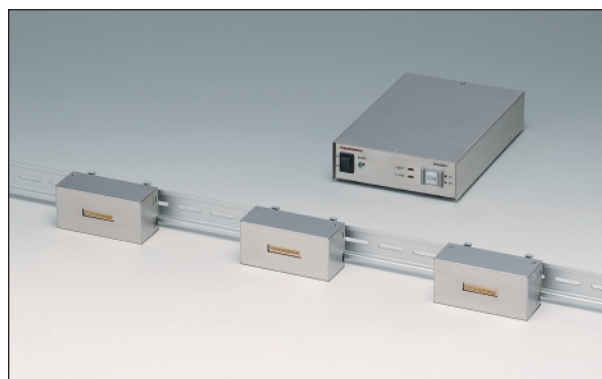


LINE UP

PhotoIonBar L12535



The Photoionbar is an electrostatic charge remover using photoionization that neutralizes static electricity by irradiating the charged object with weak soft X-rays. To neutralize static charges, ordinary ionizers generate ions by corona discharge and send them toward the charged object by air flow. Unlike these old methods, the Photoionbar emits weak soft X-rays that directly ionize the air around the charged object to neutralize static charges. The Photoionbar needs "NO AIR FLOW" and generates "NO DUST" and "NO ELECTROMAGNETIC NOISE".



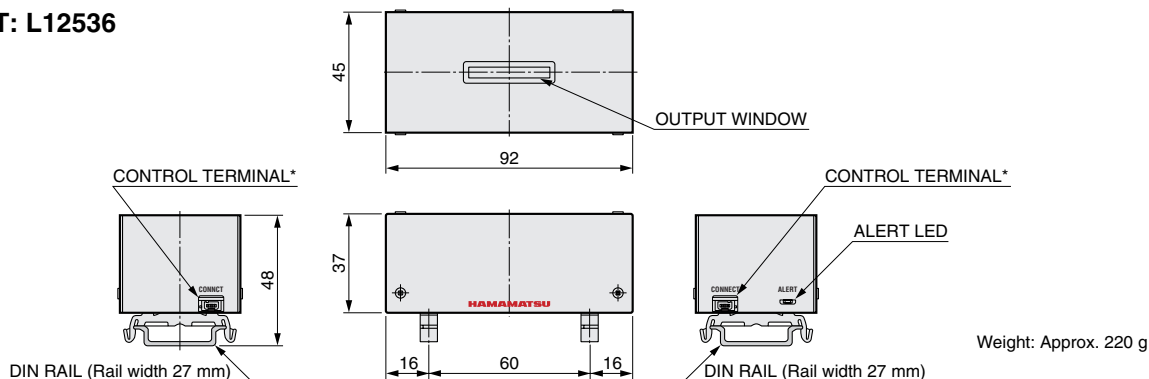
Features

- **Compact size for flexible installation layout**
Comes with DIN rail attachment for easy installation and removal
- **Static charge neutralization area can be changed to match production line layout**
Maximum of 10 ionizer heads can be daisy-chained to cover areas up to 2 m wide (recommended).
- **Eco-friendly (contains no hazardous beryllium)**

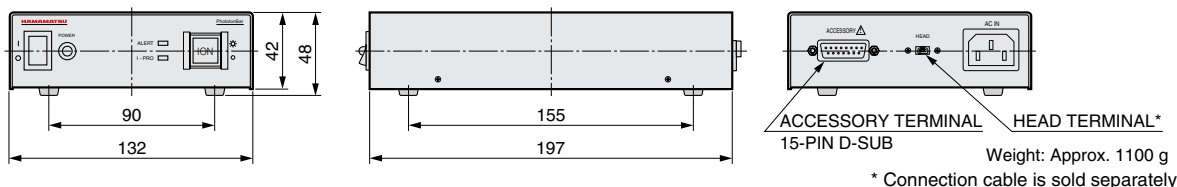
- **Low cost**
- **Low power consumption**
- **Long service life**
- **Easy to shield**
Soft X-rays can be completely shielded with acrylic plate only 3.3 mm thick

Dimensional Outline (Unit: mm)

● HEAD UNIT: L12536

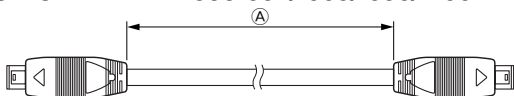


● CONTROLLER: C12537

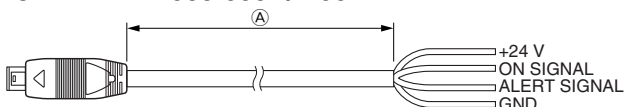


Connection Cable (Unit: mm) Sold Separately

● CONTROL CABLE: A12538-001/-005/-050/-100



● 4 PIN I/O CABLE: A12538-050N/-100N



Type No.	Connection Between	(A)
A12538-001	Head unit and head unit	100 mm
A12538-005		500 mm
A12538-050		5000 mm
A12538-100	Head unit and controller	10000 mm
A12538-050N		5000 mm
A12538-100N		10000 mm

*Programmable logic controller

High Power PhotoIonizer L11754



The L11754 Photoionizer eliminates electrostatic charges by utilizing a higher output than our previous Photoionizers. Features still include maintenance-free operation, zero dust generation, no overshooting (generating static charges of opposite polarity), and no need for air flow, yet the L11754 also boosts static electricity removal performance to drastically shorten the charge removal time. Wide-ranging removal of electrostatic charges in a short time gives a vastly improved tact time on production lines.

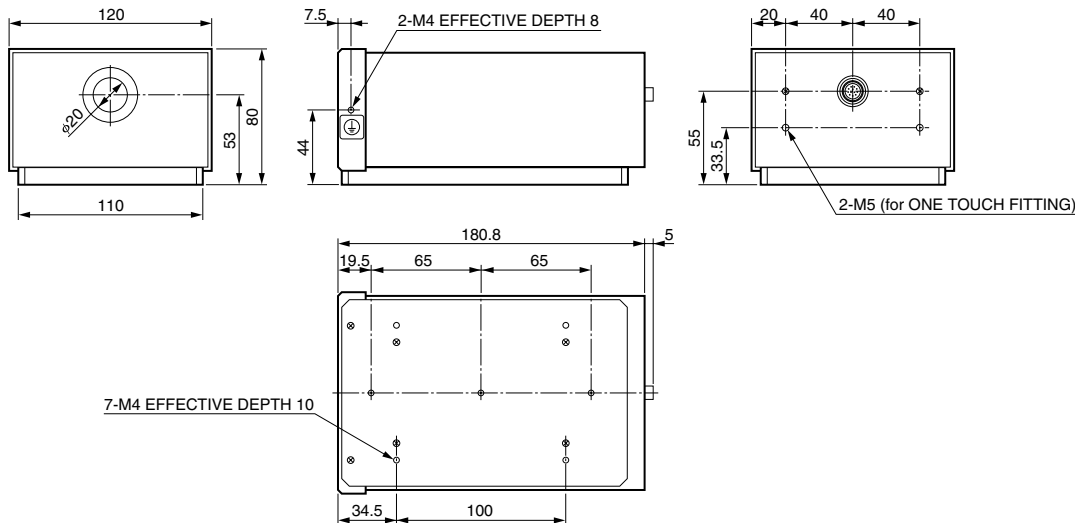


■ Features

- Quick removal of electrostatic charges for moving on high-speed production lines.
- Effectively removes static charges over a wide range with a small number of heads.

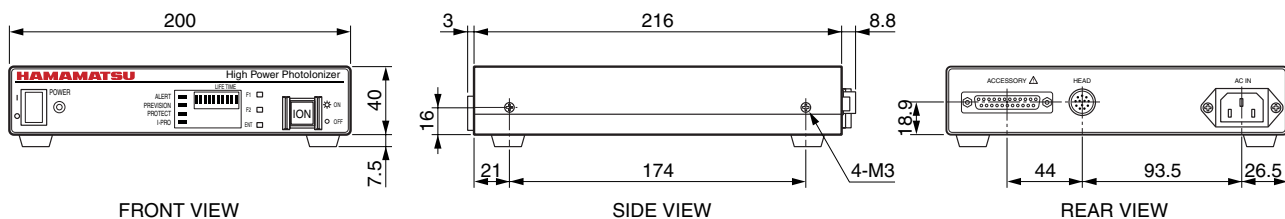
■ Dimensional Outline (Unit: mm)

● HEAD UNIT: L11755



TAPPA0098EA

● CONTROLLER: C11756



Control Cable: A10885 (20 m)

TAPPA0099EA

HOW TO USE!

SAFETY



Do X-rays remain in the space irradiated with a PHOTOIONIZER?



X-rays immediately disappear when the PHOTOIONIZER irradiation is stopped.

The generated X-rays fade away when they pass through a substance and collide with the electrons in the atoms making up the substance. For example, if X-rays are absorbed by a wall 3 meters away, they disappear in one 100-millionth of a second. (Speed of X-rays = Speed of light = 3×10^8 m/s)



What is the wavelength of the soft X-ray emitted by the PHOTOIONIZER?



Peak wavelength is 0.2 nm and the energy is 3 keV to 9.5 keV.¹⁾

The PHOTOIONIZER emits soft X-rays at peak wavelength of 0.2 nm²⁾. These soft X-rays have little ability to penetrate objects and are mostly absorbed by air or moisture.

(Note 1, 2: See "Terminology")



How strong are the soft X-ray emissions?



The X-ray dose at a distance of one meter from the output window of the PHOTOIONIZER is 15 mSv/h^{1) 3)}.

This value varies with the distance. The longer the distance, the lower the intensity. The shorter the distance, the higher the intensity.

(Note 1, 3: See "Terminology")



What happens if one is directly exposed to soft X-rays?



Direct exposure to soft X-rays can cause skin or eye burns similar to burns received from intense ultraviolet rays.

Always install the PHOTOIONIZER head in an X-ray shielded cabinet or other shielded location where the body is not directly exposed to X-rays.



How should soft X-ray leakage from the shield be checked?



We recommend survey meters. Please contact us for more information.

Soft X-ray leakage can be checked with a survey meter. In Japan, the PHOTOIONIZER is in compliance with health and safety regulations legally enforced to prevent physical problems due to ionizing radiation. X-ray leakage from the shield must be measured to ensure health and safety. To use the PHOTOIONIZERS more safely, we recommend using a calibrated survey meter (e.g. Hitachi Aloka Medical, Ltd.) when measuring X-ray leakage.

Terminology

Note 1: Average output of the L12645 and L9873.

Note 2: nm (nanometer) are a unit of length.

1 nm = 10^{-9} m (one billionth of a meter).

Note 3: Sv or Sieverts are units of absorbed dose of radiation in a body.

Sv/h indicates the absorbed dose per hour.

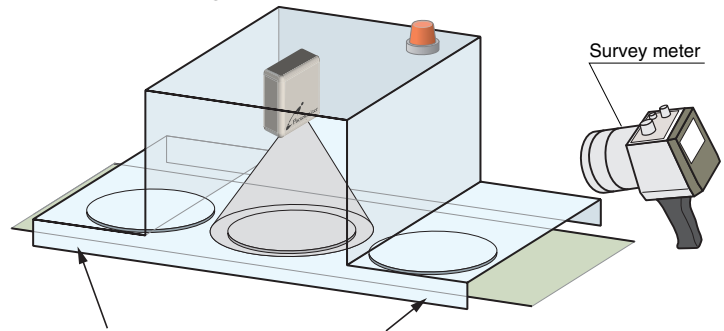


How should the shielding equipment be installed?



Soft X-rays can be securely shielded by filling the gaps or creating a structure (Labyrinth structure) that does not allow X-rays to leak out linearly.

Example of shielding equipment



Although X-rays are slightly scattered by air and reflected by an object, providing a sleeve-like opening at the workpiece entrance and exit prevents X-rays from leaking out from the opening.



Does reflection or scattering occur in the soft X-ray beam?

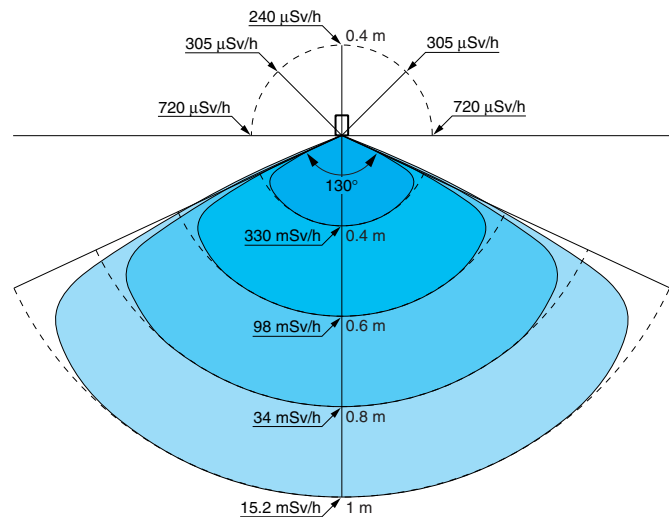


As with light, soft X-rays have the “reflection” and “scattering” properties.

Soft X-rays are slightly scattered by air and reflected by an object as shown below. Place shielding material not only on the X-ray emitting side but also on other sides (for example, backward).

X-ray dose distribution

■PhotoIonizer L12645



HOW TO USE!

SAFETY



Are there any equipment registration required before using the PHOTOIONIZER?



Yes, there are possibilities. Please comply with local safety and health regulations.

The PHOTOIONIZER might have to be registered before use and safety testing is usually required by local regulations in your area that deal with radiation or X-ray hazards. Consult our local sales office to find out more about these registration requirements.



Do the soft X-rays cause changes to or have adverse effect on the charged objects?



No, there are no changes nor adverse effects.

Under normal operation, no problems will occur. If an object is continuously exposed to soft x-rays emitted from the PHOTOIONIZER for several days, some deterioration may occur. The PHOTOIONIZER does not utilize or produce radioactive materials. The PHOTOIONIZER has been used in semiconductor and liquid crystal process lines. No problems with reliability or deterioration have occurred.



Is ozone generated by the soft X-ray exposure?



There is no generation of ozone with the PHOTOIONIZER.

The principle of the PHOTOIONIZER is quite different from the corona discharge ionizer which generates ozone and causes adverse effects on the surroundings (such as producing corrosion on objects and peripheral equipment). The PHOTOIONIZER, however, has no such problems.



When necessary, how should disposal of the PHOTOIONIZER be performed?



Please follow the applicable regulations regarding disposal of hazardous materials and industrial wastes in your country, state, region or province.

Beryllium is used as the output window material for the PHOTOIONIZER heads except for the PHOTOIONBAR (L12536).

■ PERFORMANCE



How long does the electrostatic removal effect last?



Once removing electrostatic charges, its effect last as long as the object is stationary.

Since the PHOTOIONIZER ensures a good ion balance, the neutralized state at zero volts can be maintained as long as the object is stationary. However, if additional electrostatic charging phenomena such as friction, contact or movement are applied to the object, the neutral condition may not be maintained.



Does the PHOTOIONIZER have remote ON/OFF control capability?



Yes, it has.

It is possible to control the soft X-ray irradiation (ON/OFF) using a remote control terminal.



How fast are soft X-rays emitted in response to ON/OFF switching?



Approximately 0.1 seconds.

The PHOTOIONIZER emits soft X-rays generating ions 0.1 seconds after turning on the controller "ION" switch. This X-ray irradiation also stops 0.1 seconds after turning off the "ION" switch. There are no residual X-rays.



How frequently should maintenance be performed on the PHOTOIONIZER?



There is no need for daily maintenance.

The PHOTOIONIZER has a high-performance stabilized circuit that ensures the device performance for a long time.



What is the approximate life time of the PHOTOIONIZER?



Mean time to failure 14800 hours.

Mean time to failure 14800 hours. The accumulated operating hours are displayed on the indicator of the control unit.

* PHOTOIONIZER is warranted for one year from date of delivery.



Can the PHOTOIONIZER be used for charged objects under reduced pressure such as, inside a vacuum chamber?



We recommend to use an ultra-violet light-type electrostatic remover.

Efficiency of the electrostatic charge removal effect of soft X-ray, drops sharply when the surrounding air pressure is reduced. In such environments, we recommended the ultra-violet light-type electrostatic remover.

■ Specifications

Parameter		L12645	L9873	L12535	L11754
Replace Head		L9491	—	L12536	L11755
Ionization Method		Soft X-ray exposure			
Ionization Source		Soft X-ray tube			
Type					
Tube Voltage (DC)		9.5 kV		4.9 kV	15 kV
Tube Current		150 μA		150 μA	1000 μA
Beam Angle		130°	130°	120°	130°
Input Voltage		AC100 V to AC240 V (50 Hz / 60 Hz)	DC24 V	AC100 V to AC240 V (50 Hz / 60 Hz)	AC100 V to AC240 V (50 Hz / 60 Hz)
Power Consumption		11 W Max.	7 W Max.	45 W Max. ^(A)	50 W Max.
Weight	Head	0.35 kg	0.4 kg	0.22 kg	1.73 kg
	Controller	0.5 kg	—	1.1 kg	1.41 kg
Operating Ambient Temperature		0 °C to +40 °C			
Storage Temperature		-10 °C to +60 °C			
Operating Ambient Humidity		Below 60 %			
Storage Humidity		Below 80 %			
CE (LVD EN61010-1:2010)		yes	yes	yes	yes
Use of four head controller C11952		yes	no	no	no

^(A)When 10 head units are connected for use.

⚠ SAFETY PRECAUTIONS

- Soft X-rays emitted from this product are harmful to human health. Take adequate precautions to avoid X-ray exposure.
- When using this product, always install the head inside an X-ray shielded cabinet or other shielded location with utilizing interlock mechanism.

⚠ PRECAUTIONS TO USE

- These products are high precision device. Handle it carefully so as not to apply shocks and vibrations.
- The internal ion generator (soft X-ray tube) is a vacuum tube consisting of a glass envelope that may crack or rupture if subjected to shock. Do not apply strong shocks or vibrations to these products.
- These products were designed for natural air cooling. Do not install it inside a small, air-tight container or locations where the generated heat cannot dissipate.
- To install the head, always use the mounting screw holes in the metal base on the bottom of the head.
- If these products does not operate correctly, turn the power off and check the cable connections. Then turn the power on again and recheck operation. If still inoperative then this product might be defective. Contact us for proper handling or repair.

LEGAL REGULATIONS INVOLVING THIS PRODUCT

These products must be used in compliance with health and safety regulations enforced to prevent the bodily harm caused by ionizing radiation. Users of these products must be familiar with the applicable laws that regulate use of X-ray emission devices. For more details, refer to international or domestic laws and regulations on ionizing radiation and comply with the required procedures listed there.

WARRANTY PERIOD

These device are guaranteed for one year from date of delivery, whichever comes first.
The warranty extends only to replacement of the products. The warranty does not cover damage due to misuse or natural calamity.

* 23 patents (Japan, Taiwan, China, Korea, U.S.A. etc.)

Subject to local technical requirements and regulations, availability of products included in this promotional material may vary. Please consult with our sales office.
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