SIMCO ION™
An ITW Company

Simco-Ion Electrostatic Neutralizer
Static Neutralizing Bar MF-4N

INSTRUCTIONS
Installation/Operation/Maintenance

⚠ CAUTION

It is important that these instructions be read and understood before installation or operation. Failure to follow these instruction so could result in serious personal injury and/or damage to the equipment. At the end of this manual, a written warranty is provided. This should be stared in a safe place.

Notes to Users

WARNING

This equipment is not constructed for classified (hazardous) environment. It cannot be used where it will be exposed to ignitable or corrosive materials and gases.

CAUTION

This equipment employs high voltage. Please follow the operating instructions carefully in order to minimize electrical shock hazard.

This equipment is intended for use in electrostatic processes that are free from water, oil and other conductive contaminants. Exposure to such contaminants will cause failure of the electrical insulation system in the product.

This equipment should not be operated in an ambient with corrosive fumes of acid/alkali or corrosive gases such as chlorine.

The equipment is designed to be used with specific Simco-Ion Power unit. Its performance and durability cannot be guaranteed if any other power supply used. The Power unit, in turn, shall be connected to proper utility line. The utility line conditions are indicated on the nameplate of the Power unit.

The Static Neutralizing Bars and Power units should be mounted in position and all high voltage connections completed with high voltage cables properly secured before the system is connected to the utility lines. Flexing the high voltage cables with power on can cause failure of the insulation system.

The equipment must have proper grounding. Without proper grounding there may be electrical shock/fire hazard.

During normal use of this product, there should be no visible spark. If any spark is observed, please turn off power and clean the unit following proper maintenance procedure. In case sparking continues, switch off the Power unit and contact us or our sales representatives in your area. Inspection, exchange and repair service will be provided in accordance with the warranty conditions.

The neutralizing electrodes in this product consist of sharp needles. Please take precautions against injury. Periodic maintenance, such as cleaning of needle electrodes, is necessary for satisfactory performance of the equipment.

This equipment is likely to be damaged if dropped. In such an event, it should be carefully examined and any necessary repairs be made by an authorized technician. The equipment will produce considerable electrical noise and insulation might burn if the unit is damaged.

Thank you for buying Simco-Ion products. This equipment will meet your expectations and provide safe operation when it is properly installed and maintained.

Checking the contents of package

Please carefully remove the equipment from the carton and inspect. Note any damage that might have occurred during shipment. Empty the carton to ensure that small parts are not discarded.

If any damage has occurred during shipment, the local carrier should be notified at once. A report should be forwarded to SIMCO JAPAN, INC. The address and other relevant informations are written on the back cover page.

Package Contents

1) Static bar 1 pcs.

2) High voltage cable (typically 2.5m, HVC−25 ※1) 1 pcs.

3) Instructions Manual / Warranty 1 pc.

4) Option
Mounting brackets (MF bracket:SUS)

※1 The type product number title and the specification are changed to the high voltage cable depending on the content of the order (cable length).

Please check if any part is missing or does not have satisfactory finish. Contact us or our agents immediately in the event of such occurrence.

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ELECTRIC SHOCK HAZARD

SECTION 1. General Description

Simco-Ion Static Bars are used to neutralize static charge. These are used with Simco-Ion Power unit. Each type is designed to be used with a particular type of Power unit. MF-4N needs a single phase AC 4 kV ± 7 % Power unit.

As for Static Bar MF-4N, the reduction of a high discharge performance and maintenance has been achieved with the structure of electrodes of original Simco-Ion.（Japan Patent No.2997835）Moreover, the material of the emitter adopts titanium with a little deterioration and wear-out by use.

The cleaning work in the emitter point is regularly necessary for the neutralization apparatus. Static Bar MF-4N can supply a clean air. The frequency of the cleaning work can be greatly reduced by this air. Moreover, Can greatly extend the installation distance from the electrification thing of Static Bar MF-4N by supplying the air.

Static Bar MF-4N needs single phase exchange 4kV±7%. The high voltage power supply (power unit) must use made of Simco-Ion Power unit 47 or Power unit 150. This power unit is a safe design with built-in abnormal detection circuit of a high voltage. A high voltage output of the power unit is stopped automatically, and the relay output for warning operates if the high abnormal voltage (short-circuit and Leake, etc.) do occurrence. Can remotely observe it by using this alarm output for the external display circuit etc.

The ion balance adjustment circuit is built into the recommended power unit besides the abnormal detection circuit of a high voltage. Therefore, the ion balance can be adjusted by various use conditions. Adjust the ion balance by using the charge plate monitor etc. according to the position of work（electrification thing） after Static Bar MF-4N is set up. Read the instruction of the power unit well about the adjusting method.

Inquire details of the number etc. of electrodes that can be connected with the power unit of our Sales Department.

Main characteristic of Static Bar MF-4N is as follows.

Low maintenance type to spout air from inside of emitter
The effective range an excellent discharge performance of 300mm or more.
Compact size in section 18mm × 32mm
Epoxy resin filling type that insulation is strengthened
It is solid and a stainless casing for a clean room.
The pitch of the emitter:20mm in the standard. Can manufacture 30mm or 40mm pitches.
The material of the emitter has adopted made of titanium.
The high voltage cable of the detaching type and high resisting pressure silicon shield cable.
Two stud made of SUS M5 applying（welding）/standard issue. Prepare the mounting made of SUS metal fittings.
Can input a clean air from either right and left about Static Bar MF-4N.
Recommended high voltage power supply is high voltage abnormality detection circuit of Power unit 47 or Power unit 150 and addition ion balance adjustment circuit

SECTION 2. Specifications

Model:	MF-4N
Product type:	AC high voltage
Construction:	- Emitters in direct contact with high voltage (non-shockless) - Compressed air is passed through the emitters
Rated voltage:	4 kVac, 50/60 Hz or 150 Hz is used.
Ambient conditions:	0 − 40 ℃, 10 − 80 %RH (non-condensing)
Life expectancy:	Over 10,000 hours (based on 8 h/d, 250 d/y, 5 years)
Warranty:	One year after shipment
Overall size:	18 (W) × 32 (H) (cross section) [mm] Refer to the drawings for other details.
Weight:	Bar unit; approx. 680 g for 500 mm long bar (without brackets) Cable unit; approx. 200 g for 2.5 m long standard cable
Materials:	Emitters; Titanium (TB35H) Ground electrode; Stainless steel (SUS304) Insulation; ABS and epoxy resin
High voltage cable:	Detachable shielded silicone cable with clear silicone tube cover Standard length is 2.5 m.(HVC−25)
Cable end:	Standard high voltage connector model A3030R
Installation:	Two welded studs, M5 stainless steel, and two pcs. of mounting brackets type MF, stainless steel for 500 mm long bar.
Air supply:	Clean quick joint connection at both end of the bar for 6 mm outside dia. tube.
Input air pressure:	0.4 MPa max. (0.1 MPa recommended), Clean dry air or N_2
Ozone production:	Less than 0.01 ppm (measured at 0.1 MPa, 100 mm distance from the bar)

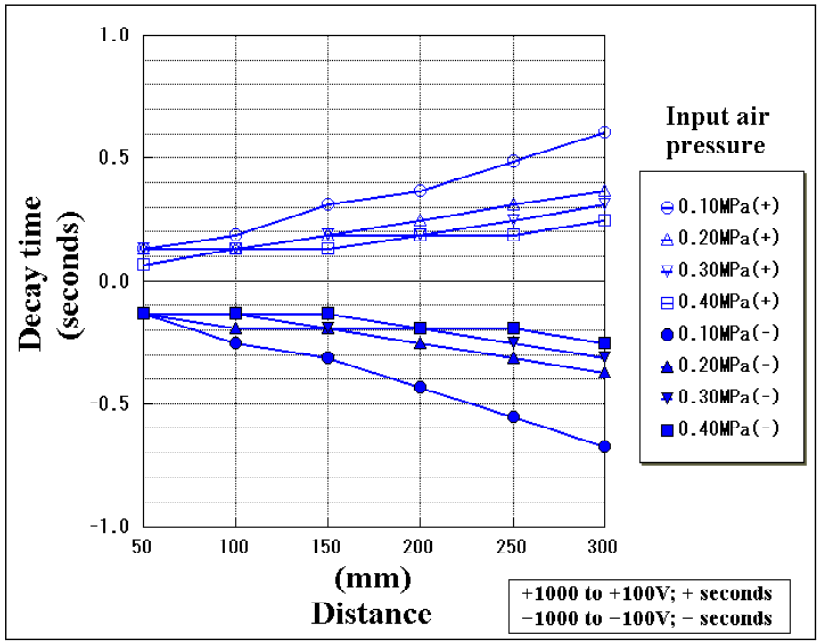
Air consumption: Refer to the following table（for 500 mm long bar）.

Audible noise:

Input air pressure（MPa）	0.1	0.2	0.3	0.4
Air volume（NL/min.）	70	100	140	170
Noise level（dB-A）	55	62	66	70

Audible noise: Measured at 600 mm from the bar

Performance: Refer to following graph（for 500 mm long bar）.
（decay time） Decay times are in seconds from 1000 volts to 100 volts at location shown.



Ion balance: Less than 30 V（measuring distance; 50 mm）
（offset voltage） （After ion balance adjustment.）

NOTE:

- Offset voltage and decay time were determined using a 6" × 6", 20 pF metal plate（Charged Plate Monitor）.
- Ion balance adjustment can be done with Power unit 47 or 150.
- Ion balance depends on the distance and input air pressure. Readjust the ion balance after installing, if needed.
- For the details of the power unit, please refer to the its instruction manual.

SECTION 3. Principle of Operation

A Simco−Ion static eliminator consists of ionizing electrodes, high voltage cable and a power unit. Power unit supplies high voltage to energize ionizing electrodes. Model MF-4N requires 4 kVac. The ionizing electrodes（emitters） are sharpened needle tips at high voltage, positioned near ground electrode.

MF-4N is non-shockless or hot type eliminators. In the non-shockless type eliminators, needle electrodes have direct contact with high voltage conductor. When in operation, never touch to the electrode, because there is a risk of electrical shock.

High voltage cable is special, cannot be replaced by other general electrical cables. There will be electrical noise produced by High voltage discharge. Static bar model MF-4N uses a shielded cable in order to reduce radiated noise from the high voltage cable.

Simco−Ion static eliminator operates as follows:

1） When the power switch is turned on, it produces high voltage.

2） Because of the intense electric field at the emitter needle tips, corona discharge is initiated. Air around the needles is ionized and positive and negative ions are produced.

3） The air supplied to MF-4 carries both ions to the charged object.

4） As the unlike charges attract, the charged object that needs to be neutralized attracts ions of opposite polarity until it is neutralized.

Fig.1 shows how an object, charged statically to 1～10 kV can be neutralized, typically, down to ≦ 0.03 kV.

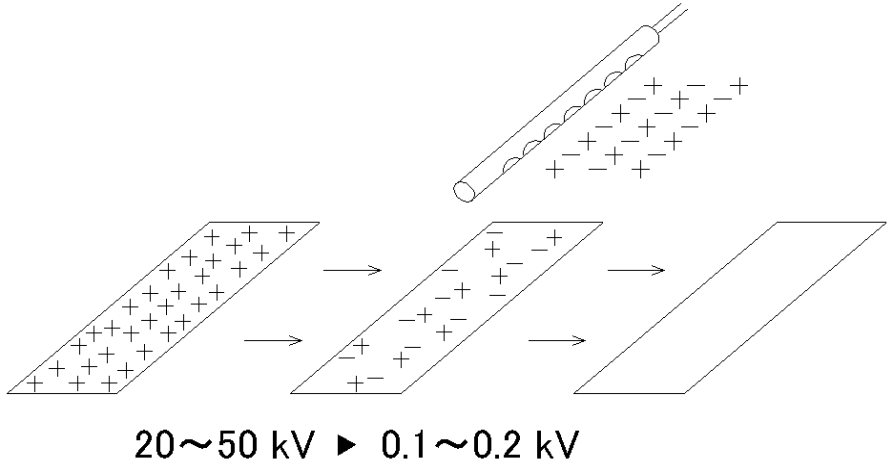


Fig.1 Neutralization of charged object using a static bar

SECTION 4. Installation

⚠ CAUTION

- **The installation of the power unit, high voltage cable and static bars must be carried out by a trained electrician.**
- **Complete all installing, wirings and connections before switching on the power.**

4.1 Installation of a power unit

The power unit should be located such that the length of the cable supplied is sufficient to connect the static bar. For more information regarding location, installation etc., see manual of instructions on power unit.

4.2 Location of static bars model MF-4

- Use in a clean environment is recommended. (ex. clean room, clean booth, etc.)
- Best locations are usually just ahead of place where static charge gives trouble.
- The bar should be pointing directly towards the object to be neutralized. Between static bars and charged material to be neutralized, there should be no other object.
- The material to be neutralized should not be in contact with another surface as it passes the static bar, since static charges cannot be easily neutralized if the object is not free.
- The bar cannot be cut or bent; also, decide on a wiring route for the high voltage cable.
- The bar should be placed 50 mm ～ 300 mm from the object. Please install static bars close to a charged object and input enough air pressure for efficient neutralizing performance.

⚠ CAUTION

- **A neutralized object is not static-proof. It can get charged again by friction.**
- **For a thick object (＞0.1 mm), neutralization is necessary on both the surfaces. Two Static Bars will be required, one for each surface.**

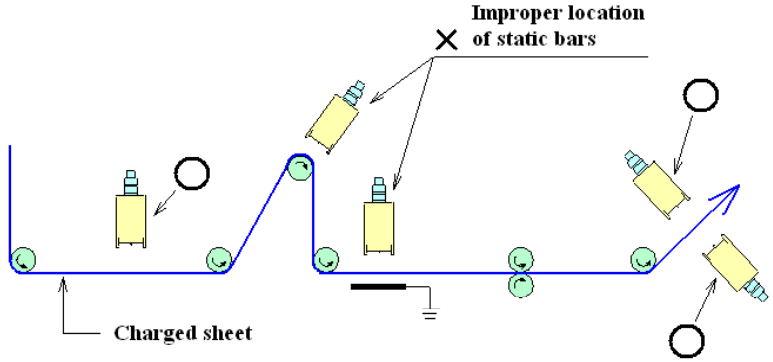


Fig.2 Static bar location

4.3 Mounting of static bars

- MF-4N is provided with mounting brackets (SUS) that can be bent and twisted to support them from the frame of the machine or convenient stationary shafts that span the machine. Welded studs are provided for direct mounting.
- Emitters of MF-4N should be pointing downwards to avoid accumulation of dust on the surface of the bar.

⚠ CAUTION

- **The enclosure of MF-4N must be grounded. Machine frame on which the bar is mounted should be grounded. Please check the resistance between the enclosure and the ground. It should be ≦100Ω. Improper grounding affects neutralization performance and could lead to electrical shock hazard.**
- **Ionizing needle electrodes, emitters, are very sharp and can cause considerable physical injury. Please handle static bars with care.**
- **Do not cover the emitters. If there is any object within 15 mm from an emitter, there is a risk of spark over.**
- **Do not twist or bend the bar. Do not put any pressure on it.**

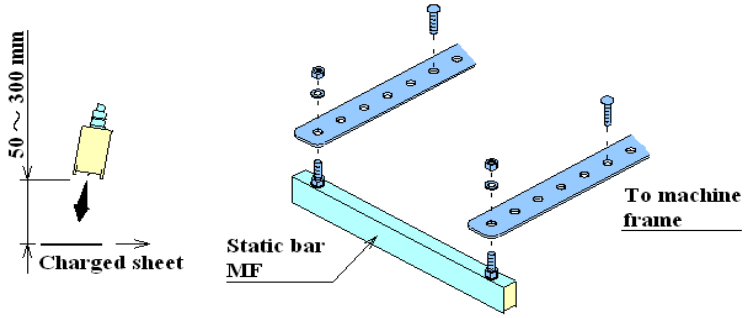


Fig. 3 Mounting of a static bar

4.4 High Voltage Cable Installation

- Decide on a wiring route from MF-4N to the power unit.
- Please use nylon clamps attached on the route. In order to avoid any damage, fix the high voltage cable near the bar and the power unit. For other part of the cable, use a nylon clamp for each one meter.

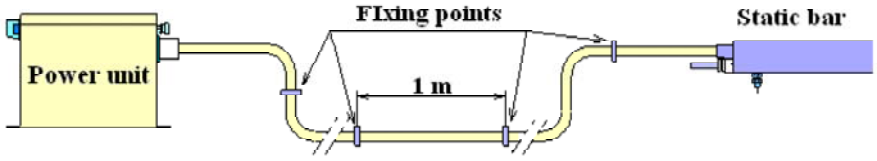


Fig.4 High voltage cable installation

CAUTION

- **Life expectancy of a high voltage cable is about 10,000 hours. Please consider future maintenance and replacement while installing the high voltage cable.**
- **The high voltage cable is specially constructed for this product. Do not replace it with any other cable. Pulling, sharp bending could damage it. Also, metal powder and water should be avoided on the cable.**
- **High voltage cable should not be moved after installation.**
- **Please avoid any sagging of high voltage cable.**
- **High voltage cable should be fixed on a machine frame and so on using plastic ties or nylon clamps attached. Metal wires cannot be used.**
- **The minimum bending radius permitted is about 60 mm. While installing the cable, avoid contact with the pointed corners of metal frame. Pointed corners could damage the insulation and eventually lead to failure.**

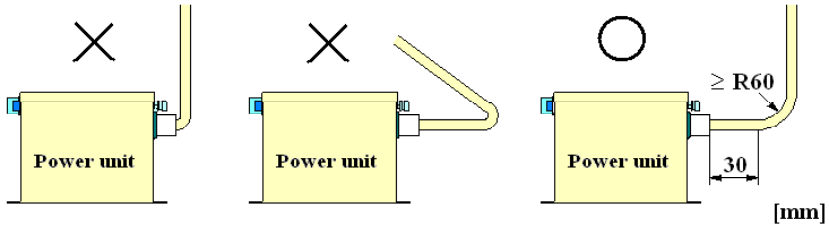


Fig.5 Bending of high voltage cable

- **The following figure shows how not to apply pressure on the high voltage cable.**

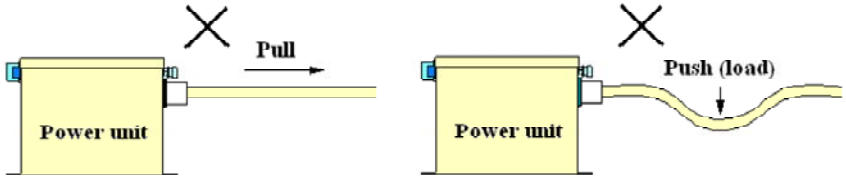


Fig.6 Pressure on high voltage cable

CAUTION

- **Grounding lead of the shielded cable must be connected to the ground terminal of a power unit and then connected to ground as shown in Fig.7. The resistance to the ground must be less than 100 ohms. If grounding is not properly done, there is a risk of electrical shock/fire hazard.**
- **The shielded cable cannot be shortened easily. If it is necessary, please contact us or our agents.**

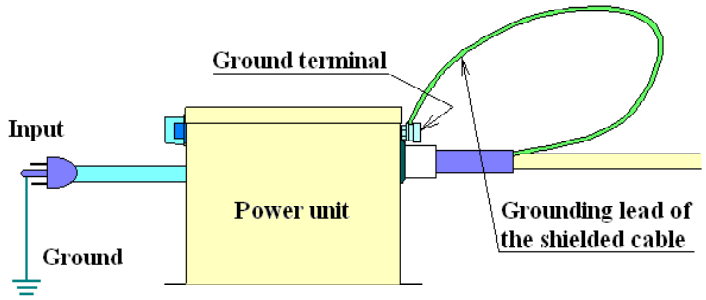


Fig.7 Shielded cable connection at the power unit

4.5 High voltage cable connection at the power unit

- In standard type a high voltage connector model A3030R is attached at one end of the cable. The connector has a spring at the tip, and it should be inserted into the output terminal of the power unit. Rotate the plastic cover to fix by hand. Please refer to the instruction manual of the power unit; if necessary, please contact our sales department for a copy.

4.6 High voltage cable connection at the bar

- The other end of the cable with a white Teflon tube should be connected to a bar.
- Insert the Teflon tube into the end of the bar until it stops. Holding the stainless cover "Lock Nut" by finger tips, rotate by hand until it stops to secure the high voltage contact.
- Please do not use any tool. Correct any twisting of the cable.

Fig.8 Cable end for connection to the bar

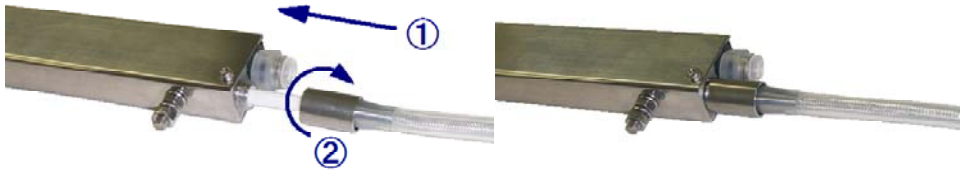


Fig.9 Cable connection at the bar

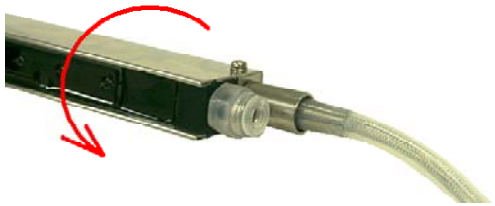


Fig.11 Twisted cable correction

4.7 High voltage caution labels

- The three attached stickers should be used on the high voltage cable. Please use these stickers on suitable positions of the high voltage cable.

4.8 Air tube connection

- Clean dry air or N_2 should be supplied to MF-4N. It should enter from one side or both side for the bar. If the bar length is shorter than 500 mm, it has an End plug on its quick joint for air connection. If the bar does not have the plug, Clean dry air or N_2 must enter from both sides for uniform outflow of air from the emitters.
- A flexible tube of 6 mm outside diameter should be used to connect the air supply to the bar.
- Usually the input air pressure is 0.1 MPa (≒1 kgf/cm²). The maximum allowable pressure is 0.4 MPa. Use pressure regulator, air-filter, separator etc. as needed.

Section 5. OPERATION & ADJUSTMENT

An ON/OFF switch on the power unit is used to turn a static bar on and off. Please read the manual of instructions for your power unit before turning it on.

5.1 Start Operation

1) Supply clean dry air.
2) Turn the switch of the power unit on for ionization to start.

5.2 Stop Operation

1) Turn the switch of the power unit off for ionization to stop.
2) Stop air supply.

CAUTION

- **Possibility of electrical shock exist because of the direct connection of high voltage to the emitters.**
- **Turn the switch off when the power unit is not in use. If left unused for a long period of time, the power unit should be unplugged from line socket.**

5.3 Ion balance adjustment

Ion balance adjustment of a static bar MF-4N is done at the Power unit 47 or 150 using a small screwdriver. Please refer to the instruction manual of Power unit 47 or 150.

1) Prepare a CPM (charge plate monitor).
2) Place CPM plate in front of MF-4. The distance "d", called working distance, is the distance between the neutralizer bar and charged object. The monitor zero should be adjusted before any measurement.
3) Activate the monitor in ion balance mode and operate MF-4 at its usual operating condition.
4) Adjust ion balance with a small screwdriver until the display of the monitor shows nearly zero.
5) After ion balance adjustment, the measurement of decay time should be performed.

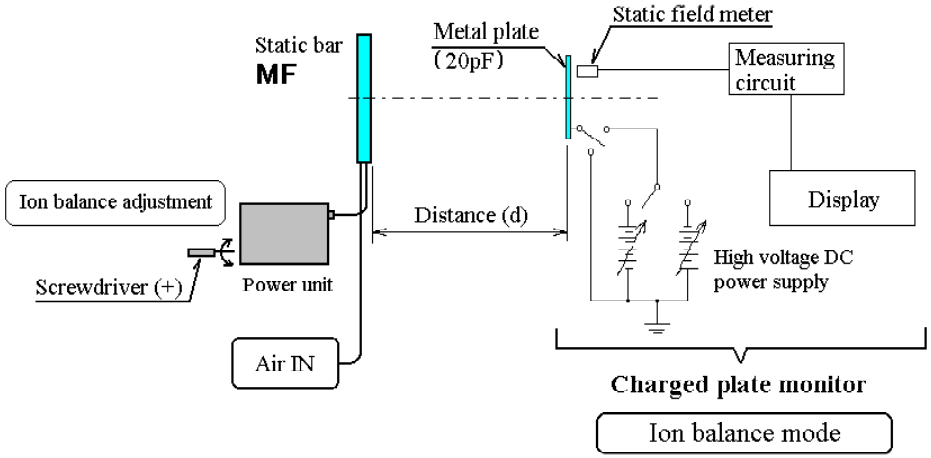


Fig.13 Ion balance adjustment

Section 6. MAINTENANCE

The static bar employs high voltage and is a special product. If regular maintenance is neglected, there may be deterioration of neutralizing performance. There is also a possibility of insulation burn-out.

6.1 Cleaning of the static bar

CAUTION

- **Turn off the power supply at the power unit at the time of cleaning.**
- **There is a possibility of injury because of sharp needles.**
- **Never use metal brush (wire).**
- **Do not use any organic solvent (other than methanol and IPA), water, paint thinner etc.**
- **In case alcohol is used, do not pour it on the bar; use a few drops on a piece of cloth and use it to clean the bar. Let it dry completely before power supply is turned on.**

6.1.1 Cleaning of the ionizing needle

If there is dust on the tip of an emitter, ionizing efficiency suffers. Even if static bars are used in clean rooms, there may be the accumulation of white powder due to the interaction electric field with humidity and ambient air. Please clean the emitters with a soft nylon brush or clean cloth regularly. This should be done with air flowing at 0.05 MPa through the needles so that the needles do not get clogged.

6.1.2 Removal of hard contaminants

In order to remove dirt that cannot be removed by brushing alone, for insulating material such as ABS or epoxy resin, a few drops of pure methanol or pure IPA on a clean cloth may be used. Do not pour any alcohol on the bar.

6.2 Maintenance of the high voltage cable

- Periodically check the high voltage cable for color change or damage on the external silicone tube that protects the cable. Also, please check if the inside cable is damaged. When the inside cable is damaged, ionization cannot be achieved.
- In case of minor problem that does not involve the high voltage cable inside, it can be easily taken care of by putting some insulation tape around this region.
- In case a high voltage cable becomes dirty with oil, water etc., please wipe it off with a piece of cloth.
- In case the high voltage cable inside is damaged, contact our sales division as repair or replacement of the high voltage cable may be necessary.

6.3 Emitter shape

Check if any of the emitters are bent or if there is any other sign of abnormality. In this case, the bar might have to be replaced.

6.4 Periodic check

CAUTION

The following checks should be carried out by a trained electrician.

6.4.1 Spark test

WARNING

- **Do not perform this test in a hazardous area, and especially near flammable materials or solvents.**
- **If electrical noise can influence devices in the area, turn off that equipment during the test.**

1) Turn the power switch ON.
2) Take a screwdriver with an insulating handle and connect its metal shaft to the common ground with a connecting lead (or maintain contact with casing of MF-4N which is grounded).
3) Approach the emitter with a sharp corner of the screwdriver within 3-5 mm, until a spark occurs. **An arc, approximately 3-5 mm long, should be observed.**

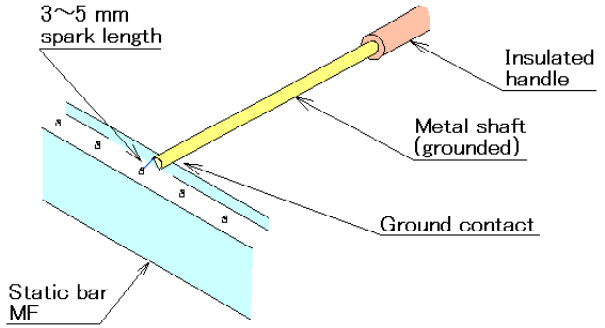


Fig. 14 Spark test

NOTE:

- **If any intense spark occurs, this would turn off high voltage and the pilot lamp in the case of Power unit 47 or 150. In this case, remove the screwdriver; turn the power switch OFF. After waiting for more than 3 seconds, turn the power switch ON again. The pilot lamp should light up and high voltage output should be restored.**
- **The test of the failure detection circuit (with Power unit 47 or 150) should not be repeated frequently as it causes undue stress on the power unit and the protective circuit.**

6.4.2 Grounding resistance check

Measure the resistance between the stainless steel casing of MF-4N, machine frame and the power unit. The measured value should be less than 100 ohms.

6.4.3 Neutralizing performance check

This test should be done periodically. The neutralization performance should be measured with an electrostatic fieldmeter.

- Measure the initial voltage of the charged object using the fieldmeter.
- Turn the static bar on and use it to neutralize a charged object. (distance: 50 mm)
- Measure the final voltage again.

If the charged object was neutralized quickly, the bar and the power unit are operation normally. Please note that the voltage of the object does not decrease without the static bar turned on.

6.4.4 Insulation resistance check

If spark test and neutralization performance are found unsatisfactory, the insulation resistance of the bar should be checked. The following table provides the course of action to be taken depending on the insulation resistance.

Measuring points	Equipment used	Comments
HV cable end - casing of MF-4N	DC 1,000 V meggar	≧1 GΩ: OK
		1 GΩ~ 100 MΩ: bar needs to be cleaned.
HV cable end or emitters - machine ground		<100 MΩ: bar needs to be replaced.

ATTENTION

- **Disconnect the cable at the power unit end while carrying out the resistance measurements.**
- **In the insulation resistance measurement above, high voltage cable-end refers to the spring belonging to the connector of Model A3030R.**
- **If, even after cleaning, the insulation resistance of the bar does not become normal, replacement of the bar is needed. Please do not use the bar anymore.**
- **Even if the insulation-resistance check is OK, when the neutralizing performance check is not OK, the power unit might have some problem. Please refer to the instruction manual of the power unit and check it.**
- **Even if the insulation resistance values are normal, regular cleaning of the emitters is necessary.**

Section 7. ABNORMAL CONDITIONS

7.1 Spark from an ionizing needle electrode

During normal operation, there should be no visible spark. If spark is observed repeatedly, turn off the power unit and clean the bar properly. If the sparking continues even after cleaning, please switch off the power unit and contact us directly or an authorized agent in your area.

7.2 Other abnormalities

In case the following abnormalities are observed, please switch off the power unit and contact us directly or an authorized agent in your area.

a) Sparking from any part of a static bar or high voltage cable

b) Change in the shape of a static bar

c) Melting or burning of high voltage cable

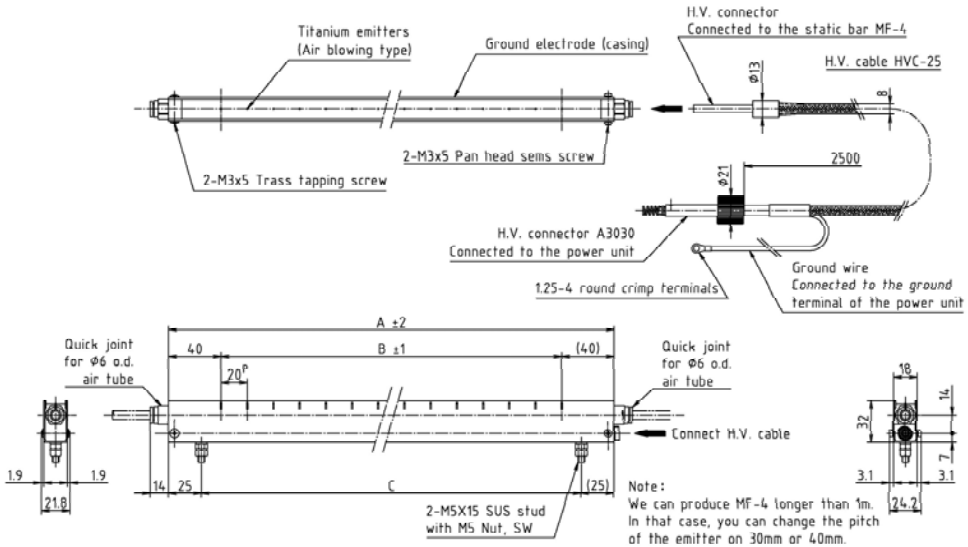
7.3 Replaceable parts

There is no replaceable part in MF-4 except the high voltage cable. If the protective silicone tube changes color or is damaged, reinforce with insulation tape or contact us for replacement.

Replace A3030R connector if any crack is observed.

In case a repair is needed, please contact Simco Japan's sales division or an authorized agent in your area with the details of the defects, test results, observations etc. and ask for an estimate. Any inspection and repair will be treated in accordance with the warranty provided at the end of this manual.

Overview dimensional drawing



Simco-Ion EQUIPMENT REPAIR WARRANTY

Simco-Ion equipment has been carefully tested and inspected at the factory and is warranted to be free from any defects in materials or workmanship.

Simco Japan, Inc. will, under this warranty, repair or replace any equipment, which proves upon their examination, to have become defective within the Warranty period from the date of purchase. A one year Warranty applies to all Simco-Ion equipment. The equipment is to be returned by the purchaser to Simco Japan, Inc. or authorized agent of Simco-Ion, transportation prepaid and insured for its full purchase price. Prior to returning any goods for any reason, contact Simco Japan, Inc. or authorized agent for an Authorized Return Number. This number must accompany all returns.

The Warranty does not apply when the equipment has been tampered with, misused, improperly installed, altered, has received damage through abuse, carelessness, accident, connected to improper line voltage, or has been serviced by anyone other than an authorized factory representative. The warranty does not apply when Simco-Ion parts and equipment have been energized by other than appropriate Simco-Ion Power unit or generator, or when Simco-Ion Power unit or generator has been used to energize other than Simco-Ion parts and equipment.

Simco Japan, Inc. makes no Warranty, expressed or implied, nor accepts any obligation, liabilities or responsibility in connection with the use of this product other than the repair or replacement of parts as stated herein.

Product Name	*Simco-Ion Electrostatic Neutralizer* ***Static Neutralizing Bar MF-4N***		
Delivery Date	Product's serial number contains information on the shipping date.	Warranty Period	***A one year Warranty***

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