



An ITW Company

# **FMX-004**

# **Digital Electrostatic**

# **Fieldmeter**

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**INSTALLATION AND OPERATING INSTRUCTIONS**

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# 1. SAFETY WARNINGS

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Simco-Ion recommends that these instructions be read completely before installation or operation is attempted. Failure to do so could result in personal injury and/or damage to the equipment.

**NOTE!** – Statements identified with a **NOTE** indicate precautions necessary to avoid potential equipment failure.

**CAUTION!** – Statements identified with a **CAUTION** indicate minor or moderate injury is possible.

**WARNING!** – Statements identified with a **WARNING** indicate serious injury is possible.



## **NOTE!**

1. This equipment must be correctly installed and properly maintained. Adhere to the following cautions for safe installation and operation.
2. Read instruction manual before operating or installing device.
3. Qualified service personnel must do installation and repairs.



## **CAUTION!**

1. This equipment is intended for use in electrostatic processes that are free from water, oil, solvent and other conductive contaminants. Exposure to such contaminants will cause failure of the electrical insulation system in the product.
2. Special care should be taken to ensure that there is no dew formation.
3. This equipment should be stored or used in a place having less than 60 %RH.
4. Do not insert any object in the opening for the sensor located at the measuring side of the instrument; no foreign substance should ever enter into the sensor opening.
5. This equipment should not be operated in an ambient with corrosive fumes of acid/alkali or corrosive gases such as chlorine.
6. This equipment is battery operated, do not connect with any other utility line. The normal operating conditions are indicated on its nameplate. When not in use, please switch off the instrument.
7. This equipment must have proper grounding for accurate measurement.
8. 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.

This is an electronic instrument and contains sensor that is sensitive to mechanical vibrations and shock. As it also contains a microcomputer chip and electronic circuitry, it should not be used in an environment where there is a lot of electromagnetic noise.

9. Suspend measurement when the voltage reading is outside the measuring range. If the range is exceeded, there is a possibility of damaging the sensor.
10. It is possible to use this product in ionized air. However, normally specified accuracy of 10 % cannot be guaranteed in this case.
11. Do not exert any pressure on the LCD display from the top.
12. The instrument has been calibrated for a measuring distance of  $25 \pm 0.5$  mm. This calibration is not valid outside this distance. Do not tamper with the sensor location and the guiding LEDs for that could alter the measuring distance.
13. The equipment was assembled and inspected at Simco-Ion. Do not attempt to disassemble or modify its construction. If you are not clear about its operation and maintenance, call your local Simco-Ion rep.

## 2. INTRODUCTION

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The FMX-004 Electrostatic Fieldmeter is a compact instrument used for measuring electrostatic potentials. It is compact (pocket size), portable, handy and easy to use.

The FMX-004 has a micro-computer inside. The fieldmeter can be turned on/off by a push button POWER switch (red). A grey push button switch marked ZERO is used for zero adjustment. A green push button switch marked HOLD holds the display and is especially useful where the display is difficult to see during a measurement.

Model FMX-004 can correctly measure static voltages within 30 kV (30,000V) range at a distance of 1" (25 mm). Two LED guide ring lights are provided on the sensor side of the unit to help position the instrument at the right distance from a charged object. The conductive case and ground lead facilitate grounding for proper measurement. Whenever the MODE button is pushed, the measurement mode is revocable.

Model FMX-004 can be used for static voltage as well as Ion Balance voltage measurements. By attaching the Ion Balance charge plate to the top of the unit then pushing the blue button marked IB, the unit will switch to Ion Balance mode. Here, ion balance voltage measurement can reach up to  $\pm 300V$ .

The compact design of this unit makes measurements easy and usable in relatively inaccessible work areas. It can be used in various applications such as deciding the location of static eliminators, investigating static charge levels, deciding the need for charge neutralization, as a support for the maintenance of static eliminators, etc.

### Features

- Compact and light body
- Multifunction micro-computer chip
- Large digital LCD display
- Positive (red) & Negative (blue) Bar graph
- Digital zero function
- Power supply automatic off function
- Hold function
- "Err" display for sensor fault
- LED assisted distance indication
- Battery condition display (4 stages)
- Output voltage the measuring data in the analogue voltage
- Four measurement modes (AUTO, Hi, Low, Ion balance)
- Easy plate attachment for ion balance measurement

## **Checking the Package Contents**

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 made to your local Simco-Ion representative. The address and other relevant information are written on the back cover page. Contents of package includes:

- FMX-004 Electrostatic Fieldmeter, 1 pc
- Ion balance plate, 1 pc
- Grounding cord, 1m long, 1 pc
- Soft case, 1 pc
- Battery (type 6F22, 9V), 1 pc
- Instructions Manual/Warranty, 1 pc
- Optional grounding and analog out cord, 1.8m long/bracket, 1 set

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.

### 3. SPECIFICATIONS

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Measuring Range:	AUTO: 0 - $\pm 1.49$ kV (low range); $\pm 1.0$ kV - $\pm 30.0$ kV (hi range) HI Range: 0 - $\pm 30.0$ kV LOW Range: 0 - $\pm 3.00$ kV Ion Balance: 0 - $\pm 300$ V
Distance:	25 mm $\pm 0.5$ mm (between charged object/fieldmeter)
Response Time:	<1 sec
LCD Display Renewal Rate:	5 times/sec
Ambient Conditions:	10 - 40°C; 0 - 60 % RH
LCD Display:	Large digital display or bar graph (red for POSITIVE POLARITY, blue NEGATIVE POLARITY)
Accuracy:	$\pm 10\%$
Digital Reading:	AUTO: $\square\square\square \rightarrow 0$ - $\pm 1.49$ kV (low range); $\square\square.\square \pm 1.0$ kV to $\pm 30.0$ kV (hi range) HI Range: $\square\square.\square \rightarrow 0$ - $\pm 30.0$ kV LOW Range: $\square\square\square \rightarrow 0$ - $\pm 3.00$ kV Ion Balance: $\square\square\square \rightarrow 0$ - $\pm 300$ V
[HOLD]:	Retains display after a measurement
[A.OFF]:	Auto power-off function deactivated
[Err]:	Error sign if sensor is damaged  Battery condition display (4 stages)
Analog out:	Response speed 40 ms
Output Voltage:	AUTO: $\pm 3.00$ V (2.0 kV = 0.20V) HI range: $\pm 3.00$ V (1.0 kV = 0.10V) LOW range: $\pm 3.00$ V (2.0 kV = 2.00V) Ion Balance: $\pm 3.00$ V (200 V = 2.00V)
Beep Sounds:	– Power on: Press POWER button <3 sec (1 beep) – Power on for cancellation of auto power off function: Press POWER button >3 sec (3 beeps) – Auto power off indication: 1 sec interval for 5 sec before powers off



- Over range: Continuous warning sound
- Auto power off: Powers off automatically if left on for  $\pm 5$  min
- Continuous operation: Press red POWER button for  $>3$  sec when power is turned on

Power:	9V, 6F22Y manganese battery; life approx. 30 hrs
Dimensions:	115 mm (L) x 73 mm (W) x 25 mm (H) (without ion balance plate) 123 mm (L) x 73 mm (W) x 25 mm (H); (with ion balance plate)
Weight:	140g with battery for static charge measurement 170g with battery and ion balance plate
Case material:	Conductive resin (ABS)

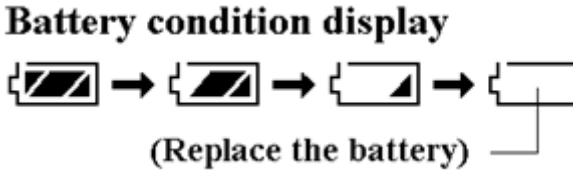
## 4. INSTALLATION

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This equipment is battery operated, do not connect with any other utility line. The battery is not installed at the time of shipment. Install the battery provided according to the procedure described below.

## Battery Replacement

FMX-004 uses 9V, 6F22 Manganese battery. The life of the battery is about 30 hours. When FMX-004 is turned on, the battery condition is displayed as shown in the figure below. Replace the battery when display shows the battery to be empty.



**CAUTION!** The dark area of battery indicator on the display is not proportional to the remaining energy.

### *Replacement Procedure*

1. There is a battery compartment at the back side of FMX-004. Press down on the dented area marked “OPEN” and slide the lid open.
2. Remove the old battery carefully (if present).
3. Connect the new battery and insert it into the battery compartment.

Make certain of the polarity. The battery is not installed at the time of shipment. A battery is enclosed in the same package.

4. Reattach the lid to the battery compartment.



**CAUTION!**

- Do not exert excessive pressure; it might damage the lid.
- Be careful while connecting or disconnecting a battery. Do not pull the plug by the connecting leads.
- The plug will be damaged when it is connected forcibly in the wrong polarity terminals.
- Before closing the cover, make sure that no part of the leads are outside the battery compartment.

## 5. OPERATION

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### MEASUREMENT

FMX-004 has four button switches to perform many functions.

Button	Color	Name	Functions
POWER	Red	Power switch	Turns on and off the power, a white LED for brighter display and Auto Power Off function Setting of ON-OFF of analog out mode
MODE	Blue	Mode switch	Changes the mode to measurement
HOLD	Green	Hold switch	Holds the measured value and the bar graph
ZERO	Gray	Digital zero switch	Adjusts the displayed value to zero

## Grounding Connection

The accuracy might be affected by the static charge on the person making the measurement if FMX-004 is ungrounded. For proper measurement, the operator should be grounded using a wrist strap and/or FMX-004 shall be grounded on the right side grounding socket by the grounding lead provided with the equipment.



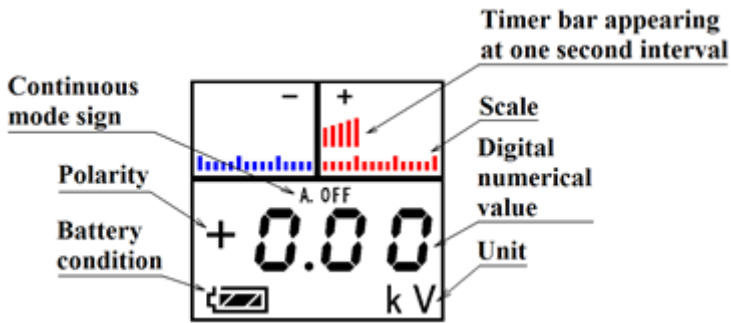
**CAUTION!** The plastic case of FMX-004 is made of conductive resin. The grounding terminal provides the reference potential for the electrical circuit. This terminal should be grounded properly for proper measurement. If it is not properly grounded, the accuracy is not guaranteed.

## Selection of the Measurement Mode

There are 4 modes of operation based on whether Auto-off function is operative or not.

### *Standard Mode for Static Charge (Voltage) Measurement*

1. Press the center of red circle button switch marked “POWER” once after turning the sensor of FMX-004 toward an uncharged area. A single beep (0.25 second) sounds once to inform that FMX-004 is into standard mode.
2. As the power is turned on, LCD display shows digital numerical value, polarity sign, unit of measurement “kV”, bar graph scale and battery condition. At this time, please confirm the state of the battery from “Battery condition display” as described in Section 5. The two red LEDs beside the sensor, also, turn on and FMX-004 is ready for static charge measurement.
3. Five minutes after the power is turned on, FMX-004 will turn itself off automatically. This is called “Auto power off function”. In this case, a combination of two beeps (0.15 second on and 0.1 second off) sounds five times at one second interval to inform that FMX-004 will be turned off soon.



- When the power is on, if POWER button is pressed, FMX-004 turns off and all indications disappear.



### CAUTION!

- FMX-004 can be activated by pressing POWER button just once lightly. There is no need to press it repeatedly. Frequent unnecessary on/off operation or pressing by a nail may affect the life of switches and the cover sheet.
- In standard mode, the measurement cannot be done for more than five minutes when "Auto power off function" is operative. For more than five minutes measurement, select continuous measurement mode when power is turned on as described in the next section.

### ***Standard Mode for Ion Balance Measurement***

FMX-004 can be used easily to measure ion balance voltage (offset voltage) for many kind of ionizers using a ion balance plate provided.

### ***Ion Balance Plate Installation***

- During static charge measurement, the ion balance plate is attached to the bottom end (opposite to that with the sensor) normally. For ion balance measurement it should be removed and attached to the top end having the sensor.
- Press rear side release buttons from both side and draw out the ion balance plate.
- Insert the plate into the sensor side slots until it clicks into place and stops as shown in the photograph below.
- The plate should enter smoothly. It should not move when secured in place properly. Forcible insertion could result in damage to the unit.
- In order to remove the plate after ion balance measurement, press sensor side release buttons from both sides and draw it out. The plate can be kept attached to either end of FMX-004 when not in use.



## CAUTION!

- Make certain that the surface of a white plastic plate under the ion balance plate is clean before attaching it to FMX-004 for ion balance measurement.
- The ion balance plate should be stored or used in a place having less than 60 %RH.

### ***Grounding Connection***

FMX-004 can be used to measure low voltages up to  $\pm 300$  V in the ion balance mode. It is important to connect it to ground using the grounding lead supplied, especially for ion balance measurement.



## CAUTION!

The plastic case of FMX-004 is made of conductive resin. The grounding terminal provides the reference potential for the electrical circuit. This terminal should be grounded for proper measurement. The accuracy is not guaranteed for measurement with an ungrounded FMX-004.

### ***Ion Balance Measurement***

1. Initially, ground the plate to remove any static charge. Press the center of red circle button switch marked [POWER] once. A single beep (0.25 second) sounds to inform that FMX-004 is into standard mode.
2. Press the center of blue circle button switch marked [MODE] once. LCD display shows “IB” along with digital numerical value, polarity sign, unit of measurement “V”, bar graph scale and battery condition. FMX-004 is, now, ready for ion balance measurement. The two red LEDs, located beside the sensor, do not light up. Please confirm state of the battery from “Battery condition display” as described in Section 4.
3. Five minutes after the power is turned on, FMX-004 will turn itself off automatically. This is called “Auto power off function”. In this case, a combination of two beeps (0.15 second on and 0.1 second off) sounds five times at one second interval to inform that FMX-004 will be turned off soon.
4. Press [POWER] button again to turn off FMX-004. All indications disappear.



## CAUTION!

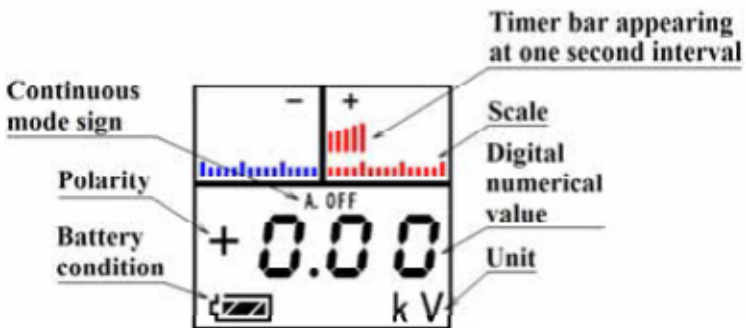
- FMX-004 can be activated by pressing [POWER] button just once lightly. There is no need to press it repeatedly. Frequent unnecessary on/off operation or pressing by a nail may affect the life of switches and the cover sheet.

- In standard mode, the measurement cannot be done for more than five minutes when “Auto power off function” is operative. For more than five minutes measurement, select continuous measurement mode when power is turned on as described in the next section.

## FUNCTION

### Continuous Mode

1. Keep [POWER] button pressed for three seconds after turning the sensor side toward an uncharged area. The number of red bars in the upper right side bar graph on the display increases by one at one second interval. When three red bars appear, release [POWER] button. Three beeps (0.15 second on and 0.1 second off) inform that FMX-004 is into continuous measurement mode. This is called “Cancellation of the Auto power off function”.
2. In continuous measurement mode, LCD display shows digital numerical value, polarity sign, unit of measurement “kV”, bar graph scale, battery condition and “A. OFF”. Please confirm the state of the battery. The two red LEDs for assisting in working distance adjustment should be turned on. FMX-004 is now ready for continuous static charge measurement.
3. One minute after power is turned on, the red LED will be turned off automatically in order to reduce the consumption of the battery. To turn the LEDs on again either press HOLD button twice or ZERO button once. Once turned on, LEDs remain on for one minute.
4. Press POWER button once again to turn off the unit after measurement. All indications disappear.





## CAUTION!

- FMX-004 cannot be turned off without pressing POWER button in continuous measurement mode. Confirm that power is turned off by observing the disappearance of all indicators. If power is not turned off, the battery will be drained completely.
- FMX-004 cannot return to this mode automatically, even if it is turned on again after turning off in continuous mode. For going into continuous mode, the operation described in **Continuous Mode** should be carried out when power is turned on.

## Zero Adjustment by “Digital Zero Function”

A gray button switch marked [ZERO] on the front panel can be used to adjust the reading to zero if the fieldmeter reading is not zero. To make FMX-004 read zero in this condition, press the button once turning the sensor toward an uncharged area.



## CAUTION!

- The digital zero function cannot be used for zero adjustment, if the reading of FMX-004 exceeds  $[\pm 0.30(\text{Au,Lo}), \pm 0.3(\text{Hi}), \pm 50(\text{IB})]$  approximately. Also, when in hold mode, the function is inoperative.
- If the reading is more than  $[\pm 0.30(\text{Au,Lo}), \pm 0.3(\text{Hi}), \pm 50(\text{IB})]$  in a measurement, the digital zero function is inoperative. However, if the reading is less than  $[\pm 0.30(\text{Au,Lo}), \pm 0.3(\text{Hi}), \pm 50(\text{IB})]$ , the real zero point would be shifted by this function when [ZERO] button is pressed.

## Focusing LED Guide Lights

FMX-004 has two red LEDs on the sensor side of the unit to help position the unit at the right distance from a charged object. The measuring distance is 25 mm. With the sensor and LEDs pointing towards the charged object, slowly bring FMX-004 close from far till two light beams converge into a concentric circle.



← **Measuring distance: Far**



← **Measuring distance: OK**



← **Measuring distance: Near**

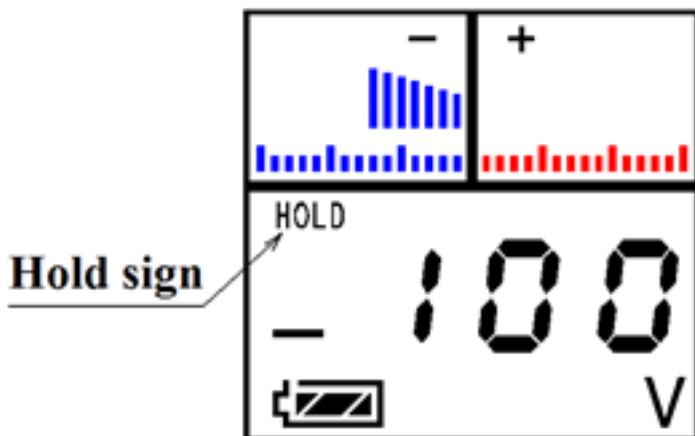


## CAUTION!

- The focussing distance of the two red light beams is adjusted to 25 mm in factory. It can be checked easily by directing the beams toward a white sheet of paper and moving the fieldmeter toward and away from the paper.
- If the reading blinks at over range with a continuous warning sound during the static charge measurement, maximum voltage reading limit has been exceeded. If this condition persists, the sensor of FMX-004 might be damaged. Please suspend the measurement in this case.

## Hold Mode

When the center of green circle button switch marked [HOLD] is pressed once during the measurement, the digital numerical value and the bar graph will be held on the display. This is called “Hold function”.



This function allows the operator to move FMX-004 after measurement where it can be more easily read. [HOLD] is shown on the left side of the display; the red LEDs are turned off. Once FMX-004 is in hold mode, no more measurement is possible. One more pressing of the button will cancel the hold function to resume measurement again with the red LEDs turned on.



## CAUTION!

- The numerical value and the bar graph displayed on the LCD will change if FMX-004 moves during measurement. Hold function enables measurements in inaccessible areas.



- Please note that the display of measured voltage as the numerical value and the bar graph are not saved in FMX-004, even if it is turned off in hold mode. Data and mode informations will be lost by switching off the unit.

## Analog Out Mode

1. With the optional analog out cable, you can use an analog out. The optional analog out cable is a mini plug with a specification of  $\phi 3.5\text{mm}$  (monaural type).
2. When “Aof” is displayed on the FMX-004, the analog out mode is turned off. Keep turning off the power supply once when an analog out is turned on and pushing the POWER button again. One bar graph in the upper right of the display will increase at intervals of one second. When the POWER button is separated when becoming five or more, “Aon” or “Aof” is displayed.
3. The analog output of the FMX-004 is the voltage output. Input DC voltage to the instrument settings you are using. In addition, the range of the analog out voltage is  $\pm 3\text{V}$ .

## Analog Out Bracket

The optional Bracket provided with the Analog Out cable is able to fix the body of the FMX-004. The bracket will secure the unit using the charge plate housing for freight. M3 or M4 screws can be used in the three holes.



**CAUTION!** Screws are not supplied with the bracket.

## INSTALLING THE BRACKET

The bracket should be mounted in a fixed location with M3 or M4 screws. The screw holes are 4.2 mm and 15 mm pitch.

Insert the main body of the FMX-004 in the fixed bracket.

## Function Switches

Situation	Function Switch	Color	Operations	Mode	Unit	Additional Display	
ON/OFF	POWER	RED	Pressing <3 sec	Standard	kV		
			Pressing 3 sec or more	Continuous		A.OFF	
			Pressing 5 sec or more	Analog out		Aon/AoF	
After Power ON			Press once more to turn off				
	MODE	BLUE	AUTO HI LOW ION BALANCE measurement ON/OFF	Standard or continuous	kV/V	Au, Hi, Lo, IB	
	HOLD	GREEN	Hold function ON/OFF. Holds the digital value and the bar graph information by pressing once				HOLD
	ZERO	GRAY	Zero adjustment of the displayed values by pressing once. The display should read less than $[\pm 0.30]$ kV for static charge measurement and less than $[\pm 50]$ V for ion balance measurement for zero function to operate				

## Beep Sounds

Once	Three times	Twice for 5 times each at 1 sec interval	Continuous
0.25 sec	ON 0.15, OFF 0.1 sec	ON 0.15, OFF 0.1 sec	
When power is turned on. POWER button is pressed for <3 sec	When power is turned on. POWER button is pressed for 3 seconds or more	5 sec before stopping by auto power off function	Measuring range exceeded

## **WARRANTY**

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This product has been carefully tested at the factory and is warranted to be free from any defects in materials or workmanship. Simco-Ion will, under this warranty, repair or replace any equipment that proves, upon our examination, to have become defective within one year from the date of purchase.

The equipment being returned under warranty should be shipped by the purchaser to Simco-Ion, 2257 North Penn Road, Hatfield PA 19440, transportation prepaid and insured for its replacement cost. Prior to returning any goods for any reason, contact Simco-Ion Customer Service at (215) 822-6401 for a Return Authorization Number. This number must accompany all returned items.

This 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 anyone other than an authorized factory representative.

The warranty does not apply when Simco-Ion parts and equipment have been energized by other than the appropriate Simco-Ion power supply or generator, or when a Simco-Ion power supply or generator has been used to energize other than Simco-Ion parts and equipment. Simco-Ion 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 stated herein.

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