

Safe-STAT Teraohm Meter RM 4000 — surface, point-to-point and resistance-to-ground measurement in the EPA

Safety first

Never measure on live or energised equipment — switch off and de-energise the item under test first. The instrument applies a test voltage of up to 100 V: do not touch the electrodes or the measured surface while a measurement is running. Use the instrument only in dry indoor conditions.

1 · Before you measure

- Let the item under test acclimatise to the room. Resistance depends strongly on humidity — record temperature and relative humidity (the RM 4000 logs both automatically).
- Clean the measurement area and the electrode contact faces. Dust, release agents or fingerprints falsify the reading far more than most users expect.
- Connect the shielded test leads. For resistance to ground, connect one lead to the groundable point of the item, not to the mains earth of another circuit.
- Place the two 2.5 kg (5 lb) round electrodes on the surface. For point-to-point measurements keep the electrode spacing specified by the test method you are working to.

2 · Taking the measurement

1. Switch the instrument on and select the measurement category on the touchscreen (surface, point-to-point, resistance to ground, continuity).
2. Select the test voltage: **10 V** for resistances below $1 \times 10^6 \Omega$, **100 V** for $1 \times 10^6 \Omega$ and above. If you do not know the range, start at 10 V and repeat at 100 V when the reading exceeds 1 M Ω .
3. Press the electrodes down without additional force — their own weight is the defined contact force.
4. Start the measurement and let the reading settle. Read the value only after the electrification time required by your test method (typically 15 s).
5. Read the result. The display colour tells you immediately whether the value is inside or outside the limits you configured.
6. Scan the barcode or QR label of the test point so the reading is filed against the right location, then save. The value is written to the SD card together with category, test voltage, temperature, humidity, date and time.

3 · Reference values

Measurement	Requirement	Reference
Worksurface — resistance to groundable point (R_g)	$< 1 \times 10^9 \Omega$	ANSI/ESD S20.20 IEC 61340-5-1
Floor — resistance to groundable point (R_g)	$< 1 \times 10^9 \Omega$	ANSI/ESD S20.20 IEC 61340-5-1
Seating — resistance to groundable point	$< 1 \times 10^9 \Omega$	ANSI/ESD S20.20
Wrist strap system — person, strap and cord	$< 3.5 \times 10^7 \Omega$	ANSI/ESD S20.20 IEC 61340-5-1

Values are given for orientation at the point of use. Always work to the edition of the standard and the test method that apply to your ESD control program.

4 · Typical mistakes

- Measuring immediately after cleaning — a damp surface reads far too low. Let it dry.
- Using 100 V on a conductive material: the reading is valid, but the standard asks for 10 V below 1 M Ω . Auditors do check this.
- Taking the ground reference from a random metal part instead of the defined groundable point.
- Reading too early — high-resistance materials need the full electrification time to settle.
- Ignoring humidity. Below roughly 30 % r.h. the same floor can read a decade higher.

5 · Care and calibration

- Charge over the USB-C port (5 V, at least 1 A). A power supply is not included with the basic set.
- Keep the electrode contact faces clean; replace worn conductive rubber.
- Have the instrument calibrated once a year. ESDL performs calibration including a certificate.

Technical data · test voltages 10 V and 100 V · range 5×10^3 to $2 \times 10^{12} \Omega$ · accuracy $\pm 5 \%$ · memory for more than 30,000 readings on SD card · integrated temperature and humidity sensor · barcode / QR reader · lithium-ion battery or USB-C supply · approx. 210 × 105 × 40 mm, approx. 400 g. Manufacturer: BJZ, article C-212-4000-SDQR.

EFM 025 electrostatic field meter — measuring charge on surfaces, checking ionisers and finding sources of static in the EPA

Safety first

Do not use the meter in potentially explosive atmospheres or in power plants. Avoid discharge flashovers to the sensor head — they can destroy the modulator. Always ground the meter with the coiled ground cable before measuring, and never open the housing.

1 · Before you measure

- Connect the coiled ground cable to the meter and to a defined ground point of the EPA. An ungrounded field meter measures your own body, not the object.
- Remove the protective cap from the sensor opening.
- Fit the 2 cm spacer. Field strength falls off sharply with distance — the distance is part of the measurement, not a detail.
- Check the zero: hold the sensor head against the grounding socket and adjust until the display reads within ± 0 digits.

2 · Measuring a surface

1. Switch on with the ON / Enter button and wait for the main menu.
2. In Distance mode press A (Select) to set the measuring distance: 1 cm ► 2 cm ► 5 cm ► 10 cm ► 20 cm. The factory setting is 2 cm.
3. Hold the meter parallel to the surface at exactly the set distance, with the spacer touching the object.
4. Read the voltage. The instrument switches ranges automatically in Distance mode; in E-field mode you select the range yourself.
5. Use **Hold** to freeze a reading, and **M+** / **M-** to capture the highest positive and negative peak while you move along a bench or a reel of packaging.

3 · Checking an ioniser (charge plate mode)

1. Connect the charge plate and place it at the working distance of the ioniser.
2. Charge the plate to + 1000 V and start the measurement, then repeat with – 1000 V.
3. Read the discharge time for each polarity and the residual offset voltage.
4. Compare both against the values your ESD control program specifies for that ioniser.

4 · Reference values

Measurement	Requirement	Reference
Process-required insulator close to ESD-sensitive parts	Field < 2 kV measured at 2.5 cm, otherwise keep 30 cm away or ionise	ANSI/ESD S20.20
Ioniser — residual offset voltage	± 35 V	ANSI/ESD S20.20
Ioniser — discharge time	as defined by your program	ANSI/ESD S20.20

Values are given for orientation at the point of use. Always work to the edition of the standard that applies to your ESD control program.

5 · Typical mistakes

- Measuring without grounding the meter — the most common error of all.
- Guessing the distance instead of using the spacer. At 1 cm instead of 2 cm the same object reads roughly half the voltage.
- Holding the meter at an angle: it must be parallel to the surface.
- Measuring a small object from close up — the sensor averages over its field of view and reads too low.
- Forgetting to re-zero after a large temperature change.

6 · Care and calibration

- Charge over USB. Red LED means charging, green means full; operating time is over 10 hours.
- If the meter is not used, recharge it every six months.
- Have the readings checked once a year. ESDL performs calibration including a certificate.

Technical data · measuring ranges by distance: 1 cm = 0...5 kV, 2 cm = 0...10 kV, 5 cm = 0...25 kV, 10 cm = 0...50 kV, 20 cm = 0...100 kV · E-field ranges ± 5 / 25 / 100 / 250 / 500 kV/m · OLED display · Li-ion battery 1,100 mAh, USB mini · 122 × 70 × 26 mm, approx. 130 g · walk-test function with the MK 023 accessory · Manufacturer: Kleinwächter GmbH. The manufacturer publishes a full English manual (EFM025_MA_E).

Walking Test EVO — body voltage generated by a person walking on the floor, measured to IEC 61340-4-5

Safety first

The measurement is harmless to the test person: the instrument only measures, it does not apply any voltage. Do not perform the test on wet floors, and make sure the ground reference cable cannot become a trip hazard along the walking path.

1 · What this test tells you

Resistance measurements show whether floor and footwear *can* conduct charge away. The walking test shows what actually happens in use: how much voltage a person really builds up while walking. Floor, footwear, person and climate are assessed together as one system — which is why an ESD floor can pass a resistance test and still fail here.

2 · Preparing the test

- Insert six LR6 alkaline batteries.
- Record temperature and relative humidity, and note both with the result. Body voltage rises sharply in dry air, so a measurement without climate data cannot be reproduced.
- The test person wears the footwear to be assessed and normal working clothing.
- Connect the ground reference cable to a defined ground point of the EPA.
- The test person holds the probe electrode in one hand, with skin contact.
- Clear the walking path. During the test the person must not touch grounded objects, handrails or benches.

3 · Running the measurement

1. Switch the instrument on and start recording. The system samples at 200 Hz and stores up to 10 curves, 2.5 minutes in total.
2. The test person walks the sequence defined in IEC 61340-4-5 on the floor under test, at a steady pace, with full heel-to-toe contact.
3. Watch the display: positive and negative peak values are tracked continuously.
4. Stop the recording and read the highest positive and the highest negative body voltage.
5. Repeat the run — at least three times is good practice — and use the highest value of all runs for the assessment.
6. Transfer the curves with the WT Manager software to document them in the test report.

4 · Reference values

Measurement	Requirement	Reference
Body voltage of the walking person	$< 100 \text{ V}$	ANSI/ESD S20.20 IEC 61340-4-5
Person, footwear and floor as a system — resistance to ground	$< 1 \times 10^9 \Omega$	ANSI/ESD S20.20
Person and footwear where used instead of a wrist strap	$< 3.5 \times 10^7 \Omega$	ANSI/ESD S20.20

Values are given for orientation at the point of use. Always work to the edition of the standard that applies to your ESD control program.

5 · Typical mistakes

- Testing only once. A single run says little — the spread between runs is part of the result.
- Testing at comfortable humidity only. The critical measurement is the one taken in the driest period of the year.
- Loose skin contact with the probe electrode: the reading drops and looks better than reality.
- Shuffling instead of walking normally, or walking much faster than in real production.
- Recording the result without noting footwear, floor, temperature and humidity — it then cannot be reproduced at the next audit.

6 · Care and calibration

- Remove the batteries if the instrument is stored for a long period.
- Keep the probe electrode clean — skin grease increases contact resistance.
- Have the instrument calibrated once a year. ESDL performs calibration including a certificate.

Technical data · measuring range $\pm 1,050 \text{ V}$ · resolution 1 V · accuracy 5% or $\pm 5 \text{ V}$ · input resistance $10^{14} \Omega$ · LCD 128×64 pixels · six LR6 alkaline batteries · sampling 200 Hz, up to 10 curves, 2.5 min in total · instrument $243 \times 130 \times 60 \text{ mm}$, 650 g; probe $\varnothing 35 \times 130 \text{ mm}$, 250 g · supplied with electrode, cable, case and WT Manager software · Manufacturer: BJZ.