



SCHNIER



HMG 11/03

COULOMBMETER

Part N°: 810461

OPERATING MANUAL

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1. Product and manufacturer

1.1. Product description

The coulombmeter type HMG 11/03 is used for contactless measurement of the charge transferred in a spark. It is a hand-held measuring device with color OLED display and integrated lithium-ion battery.

1.2. Type designation

HMG 11/03

1.3. Specifications

| | |
|--------------------|---|
| Power supply | Lithium-ion battery (permanently installed) |
| Battery capacity | 3,7 V / 3.000 mAh |
| Charging port | USB-C (5 V, max. 1A) |
| Charging time | Approx. 4h |
| Measuring range | 5-200 nC (calibrated from 15 nC) |
| Resolution | 0,1 nC |
| Measuring memory | 255 measured values |
| Dimensions (LxHxW) | 320 mm x 50 mm x 70 mm |
| Weight | 640 g |
| Display | OLED color display 128 x 128 px |

1.4. Marking



1.5. Warranty

The warranty period is 24 months after delivery. Any kind of warranty expires if the device is opened, modified, parts are replaced with non-original parts or these operating instructions are not observed.

1.6. Manufacturer

SCHNIER Elektrostatik GmbH
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 72768 Reutlingen
 Germany

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Managing Director: Olav Schnier
 Commercial register Stuttgart
 HRB 354 513
 ISO 9001:2008 certified

2. Guide to these operating instructions

These operating instructions must be read, understood and observed in all points by all persons who are responsible for this device. Only with knowledge of these operating instructions can errors be avoided and safe and trouble-free operation be guaranteed. SCHNIER Elektrostatik GmbH accepts no liability for damage resulting from non-observance of these operating instructions!

These operating instructions apply to:

Installation and maintenance personnel (e.g. machine setters, IT specialists, electrically qualified persons) who have been trained by the manufacturer or operator regarding to the manual and corresponding safety regulations.





Operating personnel (e.g. machine setters, IT specialists, electrically qualified persons) who have been trained by the manufacturer or operator regarding to the manual and corresponding safety regulations.

2.1. Accessibility of the operating manual / storage

The operating manual must be permanently available and ready to hand at the measuring instrument for the responsible technical personnel (operating, maintenance, repair personnel, etc.). The operating manual must be kept by the operator for the entire lifetime of the measuring instrument. In case of resale of the measuring device, the operating manual must be handed over to the new owner, as it is part of the measuring device.

2.2. Work safety symbols and expressions

Note: The expressions "live parts" or "active parts" in this operating manual stand for parts that have a high voltage potential during normal operation.

| Symbol | Impact |
|---|---|
|  | This symbol warns of potentially hazardous situations which, if not avoided, could result in death or injury. |
|  | This symbol warns of potentially dangerous electric shocks that can result in death or injury if not avoided. |
|  | Warning of damage to the equipment or malfunctions |
|  | Note for simple, rational procedure |

3. Intended use and measuring principle

The Coulombmeter Type HMG 11/03 is used for contactless measurement of the charge transferred in a spark. It is not suitable for measuring surface charges, which only give a measured value on contact. For a proper measurement, a spark must occur when the measuring ball approaches the test specimen. If there is no spark discharge until contact is made, this measured value cannot be used. Due to the charge transferred in the spark, the ignition hazard of this spark can be assessed.

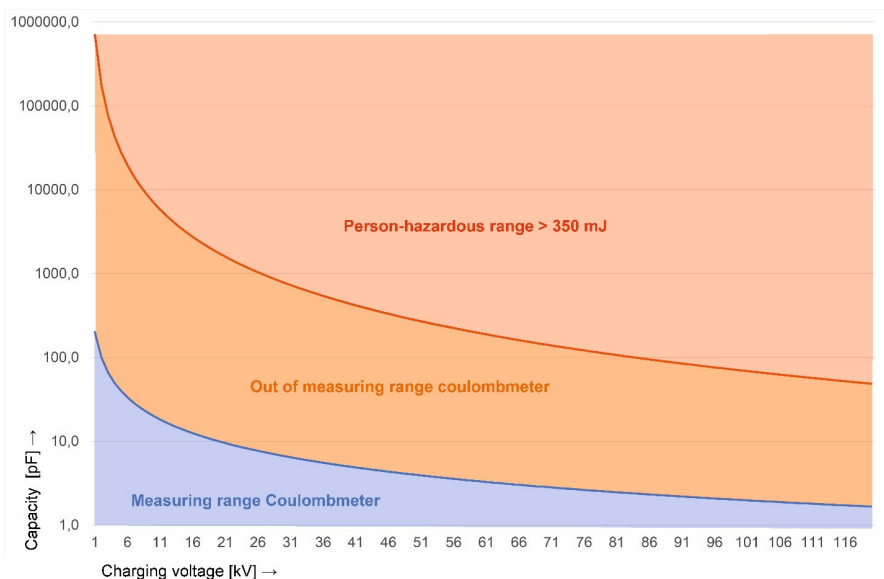
The intended use is for measuring electrostatically charged, insulating or conductive surfaces. The charge can be caused by friction or by a high voltage source (DC - max. 100 kV). The high voltage source must be switched off and away from the test specimen at the time of measurement.

The coulombmeter can also be used to assess the ignitability of residual charges on coating equipment.

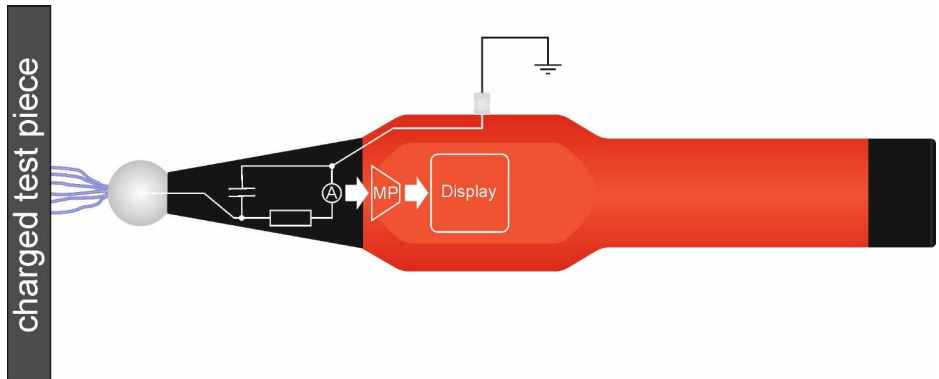


Dangerous discharges for persons can occur at conductive surfaces/test objects depending on the capacity and the charged voltage!

3.1. Measuring range for conductive test specimens



3.2. Coulombmeter circuit principle



The charge transferred from the charged test piece via spark/brush discharge to the ball electrode is stored in capacitor C and then discharged to ground. The current, flowing across the measuring resistor, is measured. By an integral calculation, the charge is calculated from current over time.

$$Q = I \cdot t$$

The microcontroller "MP" used in the Coulombmeter analyzes the rising and falling current. The measurement is triggered at a given slope and runs until a turning point in the current curve occurs. This avoids erroneous measurements, e.g. due to influence or ionization.

The polarity of the measured charge is shown in the display.

4. Functionality and operation

4.1. Displays and control elements



4.2. Displays and Turning the coulombmeter on and off

The manual coulombmeter is turned on by pushing the I-switch upwards for at least one second.

The coulomb meter is switched off by confirming the menu item "switch off" by pressing the I key upwards.

Irrespective of this, the coulombmeter switches off after 15 minutes without pressing a key or 15 minutes after the last value has been recorded.

4.3. Display

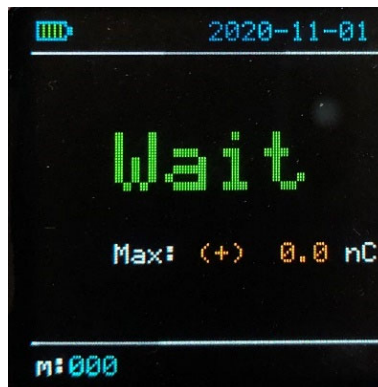
Measured value OK / NOK



Largest measured
value (display nC
/s)

Stopwatch display

4.4. Ready for measurement



"Wait" signals ready for measurement.

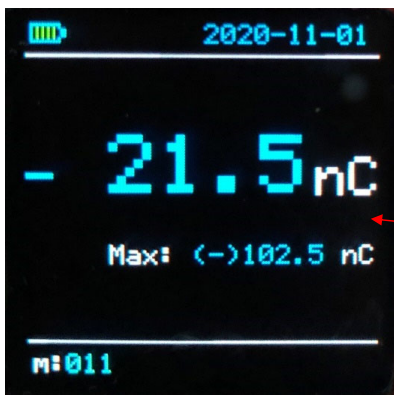
The results appear at this location after a measurement, adding the prefix.

4.5. Measured value display after correct measurement



Display with measured
value of positive polarity

(Measured value:
+22,5 nC)



Display with measured
value of negative polarity

(Measured value:
-21,5 nC)

4.6. Measured value OK / NOK

Depending on the success of the measurement, the following appears in the display:



The measurement was successful, no measurement error was detected.

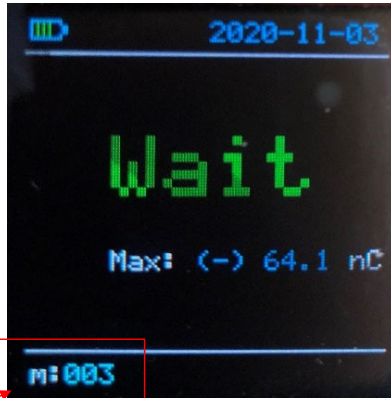


The zero point could be or cannot be maintained, e.g. error due to corona charge. The measurement result is not very useful.

4.7. Number of saved measured values

Number of saved measured values.

m:003 = 3 measured values present in memory.



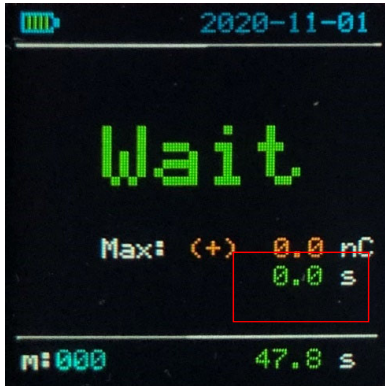
There are currently 3 measured values stored here.

4.8. Largest saved measured value



Display of the largest saved measured value.

4.9. Stopwatch display

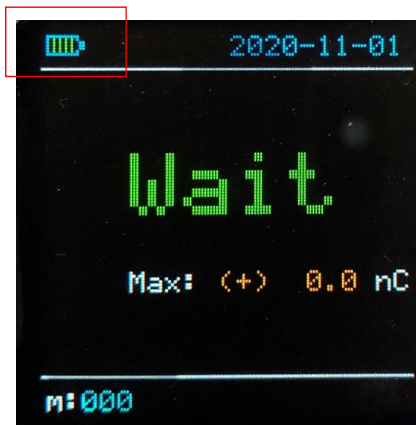


The second counter runs since releasing the “Reset switch” and stops when a measured value is recorded (this indicator can be switched off in the settings).

4.10. Charge status

The charge level for the built-in lithium-ion battery is displayed as a bar graph in the upper left corner.

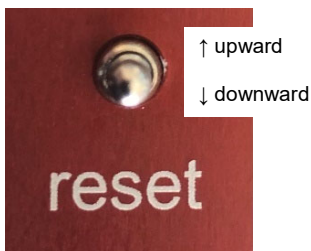
Depending on the ambient conditions, operation up to 35 hours is possible with a fully charged battery.



If the battery level display shows only one bar, the device should be charged with the supplied charger. If the battery level is too low, measurements are no longer possible.

4.11. Function of the buttons (switches)

R-switch (r)



Only active in measurement operation!

The measurements are reset and the second counter restarted in both switch directions.

Upward: saves the measured value

Downward: deletes the measured value.

Exception:

When the timer function is active, the timer can be restarted by pushing up until a valid measured value is recorded without previously having to save something.

I-switch (I)

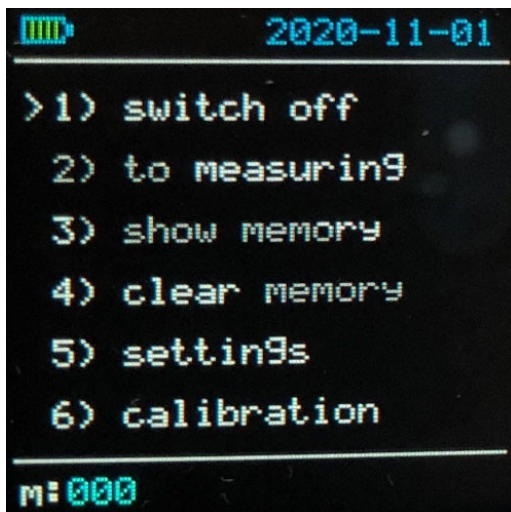


Upward: Turns on the device. Guides through the menu when turned on.

Downward: Selects the menu item.

5. Menu

To get to the menu with the I-switch "pushing up"



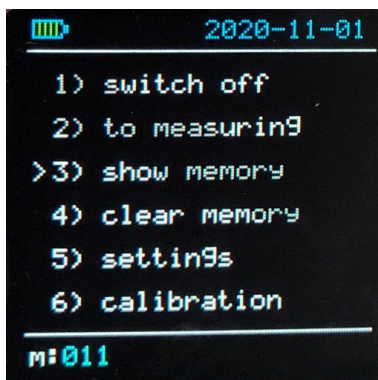
The arrow points to the selected menu item.
Further "pushing up" switches to the next menu entry.
"Pushing down" executes the selected menu item.

5.1. Explanation of the menu items

- 1 Switches the manual coulombmeter off
- 2 Returns to measurement mode
- 3 Indicates the saved measured values
- 4 Access to menu deleting the memory values
- 5 Access to the following settings:
 - "Activate" time (stop watch yes/no)
 - Vibration (Vibration during a measurement data recording: yes/no)
 - Date (Set date and time)
 When leaving the item, push upward to accept the settings
- 6 Enables calibration of the device, requires consultation with SCHNIER
(Item can be left by repeated "pushing down the I-switch").

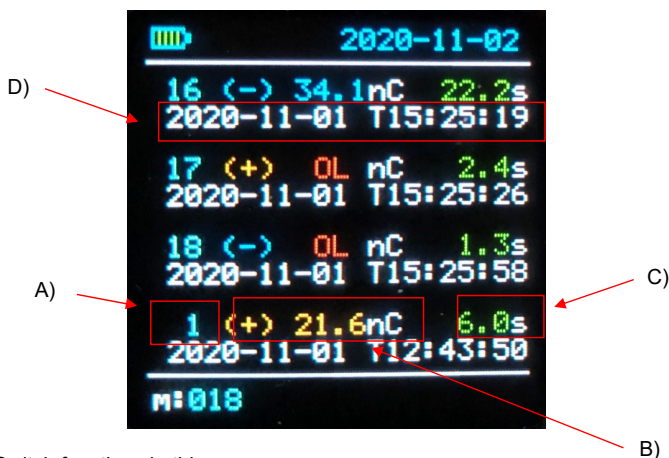
5.2. Show memory (call up menu item 3)

When turned on push the I-switch upward to get into the menu.
 Push I-switch upward until line 3 "show memory" is selected.
 Push I-switch down to deselect line 3 "show memory",
 afterwards, the list appears with the saved measured values.



5.3. Display of the saved measured values (in menu 3)

- A) Sequential number of the measurement
- B) Measured value in nanocoulomb or possibly with measurement error symbol.
- C) Time from time-counter reset up to measurement data recording in seconds
- D) Date and time of the measurement

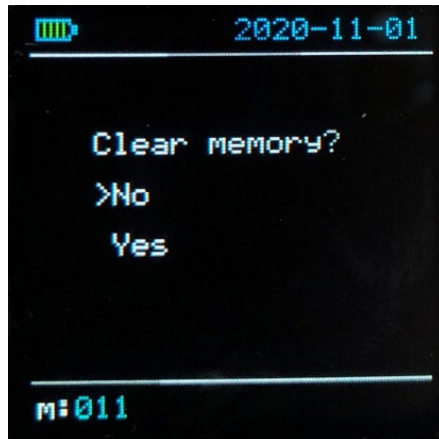


Switch functions in this menu:

| | |
|---------------------------------|---|
| "I-switch <i>pushed up</i> ": | select next value or scroll display. |
| "I-switch <i>pushed down</i> ": | return to measurement mode. |
| "R-switch <i>pushed up</i> ": | direction change for measured value selection. |
| "R-switch <i>pushed down</i> ": | deletes the upper displayed measured value, maximum and minimum are recalculated. |

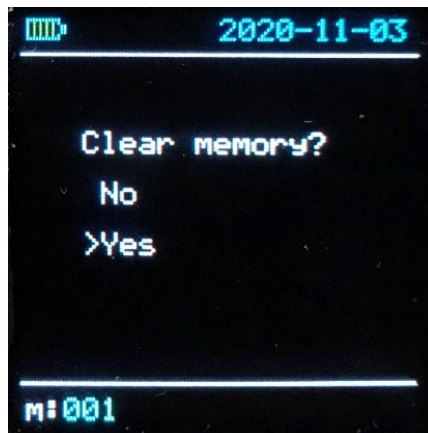
5.4. Clear memory (in menu item 4)

When turned on push the I-switch upward to get to the menu.



Push I-switch upward until line 4 "Clear memory" is selected.

Push I-switch downward to select line 4 "Clear memory".

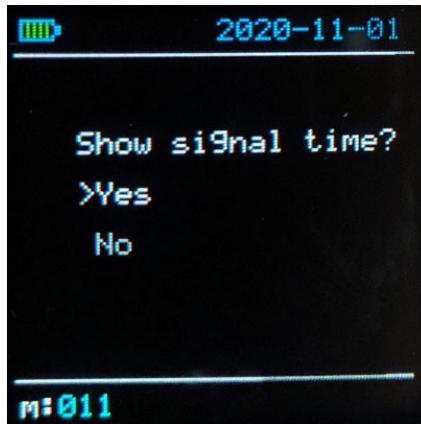


To delete the memory the query must be confirmed by pushing the R-switch down.

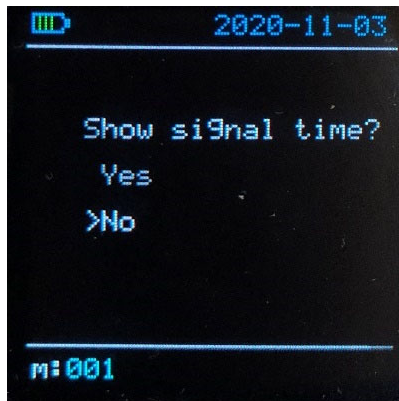
(R-switch "pushed down": delete; R-switch "pushed up": do not delete).

5.5. Show time (in menu item 5)

When turned on push the I-switch upward to get to the menu.



Push I-switch up until line 5 "Show signal time" is selected. Push I-switch down to select line 3 "Show signal time"



Using the I-switch upward with "Show signal time", change between "Yes" (stop function active) and "No" (stop function deactivated).

Switch downward activates the selected function.

6. Measurements with the manual coulombmeter



The manual coulombmeter must only be operated when grounded!

The included ground connection wire must be plugged onto the POAG socket and connected with ground.

The wire should hang with no loops (prevent self-induction).

6.1. Measurement

- Turn on the device by pushing up the “I-switch” for at least one second.
- Come near the test object with the ball electrode of the device until the indicator displays a measured value instead of “Wait”.
- Remove the device from the test location and read or save the measured value.
- If this appears



then the measurement was successful.

A display of



moved the zero point and the measurement is questionable.

6.2. Exceeding the measurement range

If the following appears in the display, then



the measurement range for negative charges is exceeded (blue minus sign as prefix)

or



the measurement range for positive charges is exceeded (brown plus sign as prefix)

Measured value or measurement range exceeded.

The actual value exceeds the displayed value, thus the measurement must be discarded.

A stopwatch is activated when the time measurement is turned on. The stop process is started when releasing the R-switch and stops as soon as a measured value is recorded. The stopped time is displayed in seconds.

After successful measurement, the measured value can be deleted by "pushing down" the R-switch or added to the measured value memory by "pushing up" the R-switch.

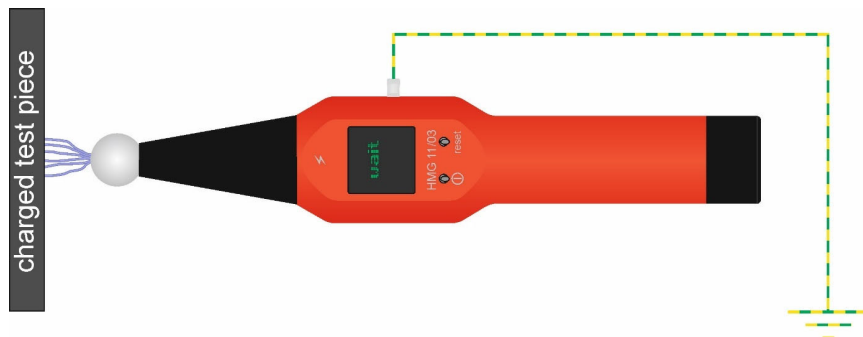
Only after pushing the R-switch up or down can a measurement be done again and "Wait" again appears in the display.

If no measurement is executed, the coulombmeter automatically turns off after approx. 15 min. to increase the service life.

6.3. Achieving optimum measurement results

Electrostatic charges are generally subject to climatic influences. Therefore, measurements on charge transfer should no longer be carried out at a rel. humidity > 50 %. Because the measured values are also influenced (albeit to a lesser extent) by the abs. humidity, a higher rel. humidity can be tolerated at 10 °C, for example, than at 30 °C, for example.

The ball electrode should approach the test object at a speed of about 1 m/s if possible. If a tuft discharge has not yet occurred up to a distance of about 2 mm, the electrode should not be moved further until contact is made, as this could then lead to a contact discharge of an e.g. antistatically equipped part. In this case, the MZQ limits are not applicable.



The ball electrode should be moved as perpendicularly as possible to the surface of the project; a grazing approach can lead to several, rapidly successive tuft discharges, whose individual charge pulses - if their interval is less than 10 μ s - would be added together. The result would then be an excessively high measured value.

Care must be taken to ensure that the ball electrode is only used free of scratches and deposited dust particles. In both cases, corona discharges may occur which will falsify the measurement result.

If the instrument is moved from a cold storage area to a warmer area, condensation of humidity may occur, resulting in deterioration of electrical insulation, which may cause erroneous measurements. Therefore, sufficient adjustment time should always be allowed for measurements after abrupt temperature changes.

Since electrostatic charges are often subject to strong fluctuations, a larger number of measurements should always be carried out to evaluate a hazardous situation, taking into account as far as possible all influences relevant to charging (e.g. climate, speed, contact pressure, etc.).

6.4. Charging the battery

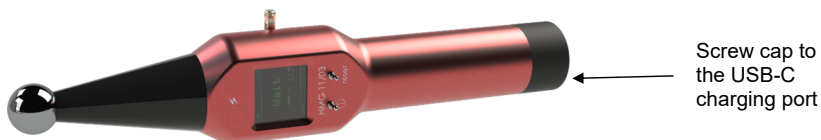
If the battery indicator in the display of the coulombmeter shows only one bar, the built-in lithium-ion battery should be charged using the USB charger supplied. If the charge level is low, the Coulombmeter switches off to protect the battery and no more measurements are possible.

The charging time is approx. 4 hours when the lithium-ion battery is fully discharged and the supplied charger is used, depending on the ambient conditions.

The built-in lithium-ion battery has the longest service life when stored at constant moderate temperatures in a partially charged state.

If the lithium-ion battery is charged at least every 6 months, it is ensured that the integrated real-time clock remains buffered for approx. 12 months without using the device.

The USB-C charging port is protected behind the black cover at the end of the Coulombmeter.



6.5. Functional test (replacement for battery test)

Due to the optimized measurement procedure, the function test with a 1.5 V battery is no longer possible. A comparable test can be performed with a laboratory power supply (as shown). For this purpose, the (-) pole of the laboratory power supply is firmly connected to the ground connection of the coulombmeter. The (+) pole of the laboratory power supply is briefly contacted with the ball electrode of the coulomb meter by means of a test lead. In this constellation, the measured value is displayed with a positive sign. If the polarity is reversed, the measured value is displayed with a negative sign.



0.10 V at the laboratory power supply unit corresponds to 20 nC
 0.25 V at the laboratory power supply unit corresponds to 50 nC
 0.50 V at the laboratory power supply unit corresponds to 100 nC
 0.75 V at the laboratory power supply unit corresponds to 150 nC

7. Maintenance of the handheld coulombmeter

- Avoid storage and keeping at temperatures $< +5\text{ }^{\circ}\text{C}$.
- Avoid soiling the surface. Clean with a dry textile cloth. Remove stubborn dirt from the ball electrode and the insulating cone with isopropanol and a textile cloth. (Caution: highly flammable!)
- Protect the ball electrode from scratching. Damage to the ball will lead to incorrect measurements; replace the ball if necessary.
- Check the installed battery.
- The battery status is displayed, recharge the battery if necessary. To do this, unscrew the cap and charge the coulombmeter using the USB cable supplied.
- Calibration:
- Depending on the frequency of use, the device should be sent to the manufacturer for checking and recalibration occasionally - but after 2 years at the latest.
- At the end of its service life, the Coulombmeter must either be returned to the manufacturer for disposal or disposed of in accordance with the applicable guidelines.

8. Accessories

HV generator, type HER 26/01

Suitable for charging insulating surfaces.

Output voltage:
max. 70 kV

Output current:
max. 65 μ A

Output power:
max. 0,6 W



Fakir electrode type HMG 13/01

96 pins on 100 cm².
For defined charging of surfaces in combination
with the HV generator
Type HER 26/01



EC Declaration of conformity

SCHNIER Elektrostatik GmbH
72768 Reutlingen
Germany

declares that the

Coulombmeter, type HMG 11/03

conforms to the following standards:

DIN EN 61000-6-4 (EMC Emission standard for industrial environments)
DIN EN 61000-6-2 (EMC Immunity for industrial environments)

The CE labelling has been carried out according to the following directive:

2014/30/EU

Note:

The device is suitable for measurements according to the following standards:

EN 60079-0 (VDE 0170-1)

Reutlingen, February 03 2023 SCHNIER Elektrostatik GmbH

Olav Schnier



Geschäftsführer
General Manager