INDE
reliable & caring since 1976

Wolfgang Warmbier
Systeme gegen Elektrostatik

Pocket size surface resistance meter with LCD display.
Includes conductive carrying case, grounding cord, USB-Cable, calibration certificate and software for reading the saved test data.

- Test range: 10^3 - 10^{12} ohm
- Test voltage: open circuit voltage 100 V
  (switches automatically above > 1 MOhm)
- Operation: Battery operated
- Display: LCD-Display
- Probes: Built-in electrodes with conductive rubber

- with memory and USB connection to PC
- 2 external probes connection possible

Built-in bar electrodes

Part Nr.

7100.SRM200.K	Surface Resistance Meter SRM® 200

SRM®200/EFM®51 STARTERKIT

Starterkit for testing conductive an dissipative surfaces and electrostatic fields/surface potentials

Includes
- SRM®200 as described above
- EFM®51 (see page 79)
- conductive carrying case

Part Nr.

7100.SRM200.SK51	SRM®200/EFM®51 Startertkit

TEST AND MEASUREMENT

Warmbier Germany, Electrostatic Field Meter EFM51 — Warmbier P/N: 7100.EFM51

- Handheld, portable, digital electrostatic field meter with rotating chopper
- Detects and accurately measures electrostatic fields
- Measures: fields, potentials and discharge time
- Automatic field to voltage conversion according to selected distance
- Very stable zero adjust

Technical data:

- Power supply: 9V battery IEC6F22 or rechargeable battery
- Range: 0 - 160 kV / 0 - 800 kV/m
- Display: 2 row LCD-display
- Dimension: 70 x 122 x 26 mm (W x L x H)
- Weight: 130 g (without battery)

Distance:	Range:	Max. resolution
1 cm	0 - 8 kV	1 volt
2 cm	0 - 16 kV	2 volts
5 cm	0 - 40 kV	10 volts
10 cm	0 - 80 kV	10 volts
20 cm	0 - 160 kV	20 volts
E-Field mode	0 - 800 kV/m	100V/m
CPS mode	1.000 to 100 volts	0,1 sec.

Wolfgang Warmbier
Systeme gegen Elektrostatik

CE

Supplied with:

9V battery
Grounding cable
Carrying bag
User Manual
Calibration certificate

Wrist Strap Tester — Inde P/N: ISM-498

- Use anywhere to check personnel ESD grounding quickly
- Checks contact resistance between Wrist Strap and skin
- Power Supply: 9V Battery • Grounding Wire: 2.5 meter

Operation

Wrist Strap

Grounding Wire
of Wrist Strap Tester

Grounding Wire
of Wrist Strap
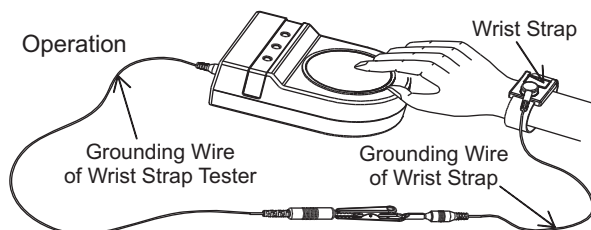
Simply touch circular surface on Tester with your hand and connect ground wire. In case of a safe ground, LED will be 'Green'. Opposite Table summarizes test indications.

LED Indication	Resistance	Buzzer
Power Low (Red)	< 750 KΩ	OFF
Good (Green)	750KΩ ~ 10MΩ	ON
High (Red)	> 10 MΩ	OFF

Replacing the Battery

Replace the 9V battery when "Low Battery" appears on the display. Please switch off the unit before opening the battery compartment. Remove the battery and carefully disconnect the contact-clip. Plug the contact-clip onto the new battery and put it back into the compartment; then close the compartment.

Warning

The unit is not approved for usage in explosive areas!

The usage in power plants is not allowed!

This unit cannot measure alternating fields > 1 Hz!

The Instrument must be grounded when high electrostatic charges are present.

Sparking on the modular system can cause damage to the unit and need to be avoided.

The EFM51 includes:

- Electro Field Meter EFM 51 including the 9V battery and 2 cm distance guides
- Storage Bag including grounding cable and clip
- User's manual in German and English
- Calibration Certificate

Legend
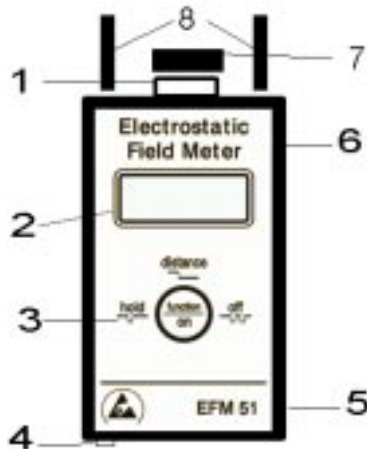
1. Rotating chopper
2. LCD – Display (2 x 12) alphanumeric
3. Function/on key
4. Grounding Socket (4mm)
5. Battery compartment (back-side)
6. Zero adjustment trimmer
7. Protection cap
8. Distance guides (removable for E-Field mode)

Electrostatic Field Meter - EFM 51   V0805

Small hand-held Electrostatic Field Meter with digital display designed to measure electrostatic charges and fields according to the field mill induction principle.

- The instrument measures the electrostatic voltage potential. A microcontroller calculates the field strength (V/m) with the pre-selected distance (1cm, 5cm, 10cm and 20cm).
- In "E-Field meter" mode, the instrument displays the field strength in "kV/m"

Measurement Principle

The induced charge caused by the electrical field, generates a current proportional to the electrical field strength. The selective, parametric operating-amplifier measures the current without affecting the averaged time. There are no radioactive components inside the unit.

Technical Data

Dimensions:	70 x 122 x 26 mm (B x L x H)
Weight:	130 g (without battery)
Power Supply:	9V – Alkaline battery IEC 6F22 or rechargeable NiMH battery

Measurement Range:				
	distance 1 cm	➜	0..... 8 kV	max. resolution 1 V
	Distance 2 cm	➜	0..... 16 kV	max. resolution 2 V
	Distance 5 cm	➜	0..... 40 kV	max. resolution 10 V
	Distance 10 cm	➜	0... 80 kV	max. resolution 10 V
	Distance 20 cm	➜	0... 160 kV	max. resolution 20 V
	E-Field meter	➜	0… 800 kV/m	max. resolution 0,1 kV/m

Display:	2 lines, 12 digits alphanumeric LCD display
Operating Time:	app. 10 hours at continuous operation with an Alkaline battery
Adjustment:	Within a plate capacitor's homogeneous field, plate size 200 mm x 200 mm, distance between both plates is 20 mm, the rotating chopper system is centered in the grounded plate.

Warranty

We provide12 months limited warranty.

The warranty does not include the battery, mechanical damage or unauthorized opening of the instrument.

Operating instructions

Operation

- Press the „function/on" key "shortly" to switch on the instrument
- Press the key twice while in measuring mode to switch off the instrument
- Remove the protection cap before a measurement
- The unit will switch off automatically when the „function/on" key was not pressed for app. 4 minutes (in CPS-Mode app. 18 min.)

Hold Function

The hold-function freezes the display with the actual measured value.

- Press the „function/on" key "shortly" while in measuring mode for "hold".
- Press the key while in "hold" to return to measuring mode.

Measuring Ranges

1. Measurement of electrostatic voltages:
   The instrument is preset to 2cm distance after switching on. To measure, it must be positioned at 2 cm distance in front of the object. For high voltages or uneven surfaces the measuring distance should be increased.
2. E-Field meter mode
   The instrument indicates the field strength in V/m for the current position.

Measuring Distance / Measuring mode

Press and hold the „function/on"-key (approximately 2 seconds) until „change cm" will appear. The pre-selected distance in cm is displayed in the first line. Pressing the „function/on"-key changes the measuring distance.

2cm => 5cm => 10cm => 20cm => E-Field meter => CPS-Mode => 1cm

After selecting the desired distance or mode, the instrument switches back to measuring mode if no key is pressed for a certain time.

Important!

The measuring range is preset to 2cm distance each time the instrument is switched on!

The instrument measures the field strength in V/m and calculates the voltage using the selected range:

Display value (V) = Field strength (V/m) x Distance (m)

i.e.. Display value= 1000V   Distance= 10cm ➔ 1000V = 10000 V/m x 0,1m

In "E-Field meter" mode the instrument displays the field strength in "kV/m".

Distance guides

The instrument is supplied with two 2cm distance guides which are fitted on the front plate.

The alphanumeric Liquid Crystal Display (LCD) consists of 2 lines of 12 digits each. The measured distance in cm or the measuring mode is displayed in the first line, while the test result is displayed in the second line. An „overflow !" indication requires to increase the distance.

Battery control

The EFM 51 has a permanent battery-voltage-control. If the battery voltage falls below 7,5 V a „Low Battery" warning appears and the 9V Battery must be replaced!

In case the battery falls below 7,0 V the instrument switches off with „auto off" message to avoid total discharge and acid leakage.

Note: Please use Alkaline or Lithium 9V Batteries only!

If rechargeable batteries are preferred, please use a suitable battery charger for charging the battery separately and follow the manufacturer's instructions.

Grounding

The unit must be connected to ground to allow accurate voltage levels and polarity measurements. Use the grounding socket (4) for ground connection. The unit housing is conductive, and the instrument may be grounded through the operator if he is at ground potential.

Zero Adjust

in general , zero adjustment is not necessary. However the trimmer (6) can be used for zero adjust if the instrument does not indicate U=000 or U=00X when the rotating chopper is shielded by the protection cap. The last digit can be ignored, as it is much lower than the specified tolerance.

Maintenance

It is very important not to touch any parts of the rotating chopper. The sensor head must be free of dust and humidity.

If needed, the rotating chopper be cleaned with alcohol and a lint-free tissue, when switched off.

Deforming the rotating chopper will damage the instrument!

Warmbier Model SRM200, **Part No.** 7100.SRM200.K+2x850

Digital test kit makes testing all surfaces accurate and simple. Supplied with two 5 lb. weights & foam filled case.

Features:

- Pocket size, lightweight, auto ranging surface resistance meter
- LCD Display and data memory
- USB interface to PC
- Integrated temperature and humidity sensor
- Built-in electrodes with conductive rubber
- External probes can be connected
- Rechargeable battery operated

CE

Wolfgang Warmbier
Systeme gegen Elektrostatik

Specifications

- Resistance range: 1×10^3 - 1×10^{12}
- Accuracy range: 10^3 - 10^9 = 10 %
  10^{10} - 10^{12} = 25 %
- Test Voltage: 10/100V
- Electrodes: Two (2) 5lb weights
- Weight: 290 g
- Size: 145 x 80 x 35 mm

$>1 \times 10^{12}$ Ohm
23°C   50%
01 02/10/09 12:15
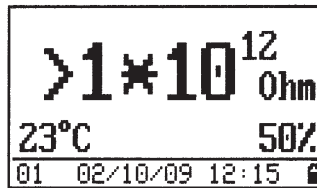
Supplied with:
Instrument SRM®200
Conductive carrying case
Battery charger
USB-cable
2 x 5 lb. probes (model 850)
Grounding cord
Software for Windows on CD
User's manual and calibration certificate

Probe model 850

Back side view

Software

User's Manual

Surface Resistance Meter
SRM®200

Wolfgang Warmbier e.K.
Untere Gießwiesen 21
D-78247 Hilzingen
www.warmbier.com

Table of Contents

Wolfgang Warmbier ®
Systeme gegen Elektrostatik

Introduction

The SRM110 is a pocket size, lightweight, auto ranging surface resistance tester.
Measured values are displayed on an LCD dot matrix module and can be stored in the internal memory.
Each measurement includes the current temperature and relative humidity.
Built-in electrodes with conductive rubber make good contact with the object under test.
IEC compatible electrodes can be externally connected for tests according to **IEC 61340-4-1**, **IEC 61340-2-3** and **IEC 61340-4-5.** The measuring voltage is auto-ranging from 10V to 100V.

Operating Instructions

■ Operation Description

1. Socket for external probes
2. LCD-Display
3. Range LED's

LED	Measuring range	Definition
Green	$< 1x10^3 \, \Omega$ - $9x10^4 \, \Omega$	Electrostatic conductive
Yellow	$1x10^5 \, \Omega$ - $9x10^{10} \, \Omega$	Electrostatic dissipative
Red	$\geq 1x \, 10^{11} \, \Omega$	Electrostatic insulating

4. Buttons Up / Down / MENU / OK

Button	Function
MENU	- Open menu - Return from sub-menu
OK	- Confirm or change value
▼	- Increase value - Scroll down in menu
▲	- Decrease value - Scroll up in menu

Simultaneously pressing ▲▼ turns the instrument off.

5. "Push to test" button to switch ON and start measurement
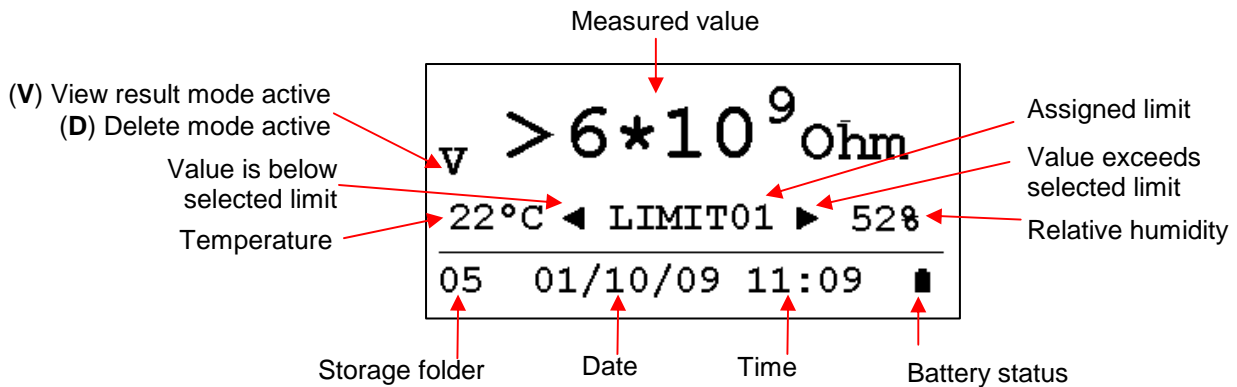6. USB connector for battery charger and PC connection
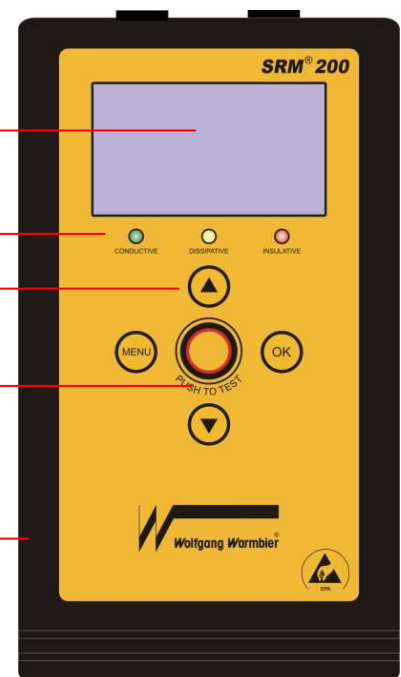
Menu structure overview

View results	Display measurement results
Delete results	Delete measurement data
Delete all data	Delete all measurement data
Limit	Display or change limit values (max. 19)
Folder name	Display or change folder names (max. 99) *Folder names can be entered more convenient by using the PC software*
Timeout	Turn-off delay time
Temperature	Change temperature between ℃ and ℉
Date	Adjust date and time
Calibration	Display calibration date and software version
Language	Language selection German / English

LCD display overview

Measured value

(**V**) View result mode active
(**D**) Delete mode active

Value is below
selected limit

Temperature

Assigned limit

Value exceeds
selected limit

Relative humidity

$$> 6 * 10^9 \, \text{Ohm}$$

V

22°C ◄ LIMIT01 ► 52%

05   01/10/09 11:09

Storage folder   Date   Time   Battery status


■ Measuring Surface Resistance

- To measure the surface resistance of an object, hold the instrument onto the surface and press the "PUSH TO TEST" button.
- The value is indicated on the display. The coloured LED's additionally indicate the measuring range if no limit is assigned. If the limit is assigned, the limit arrows on the display will indicate the measured value being below or above the limit range.
- ▼▲ selects the storage folder; **OK** stores the current measurement value to the selected folder.

PUSH TO TEST
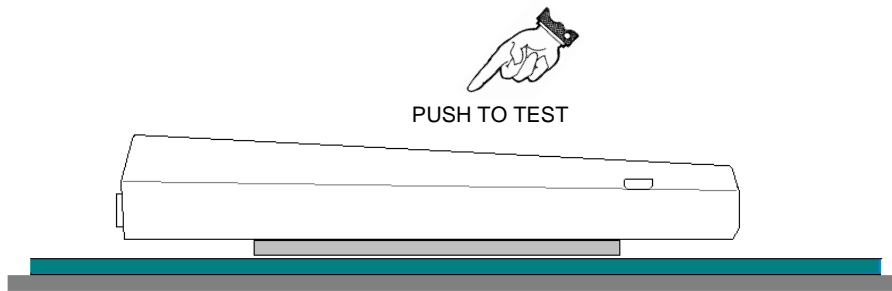
■ Measuring Resistance to Ground

- Plug in the supplied grounding cord at one socket of the instrument. The associated internal electrode will be disconnected.
- Connect the opposite end of the grounding cord to "ground" or a "groundable point".
- Hold the instrument onto the surface like described above and press the button.

PUSH TO TEST

Wolfgang Warmbier ®
Systeme gegen Elektrostatik
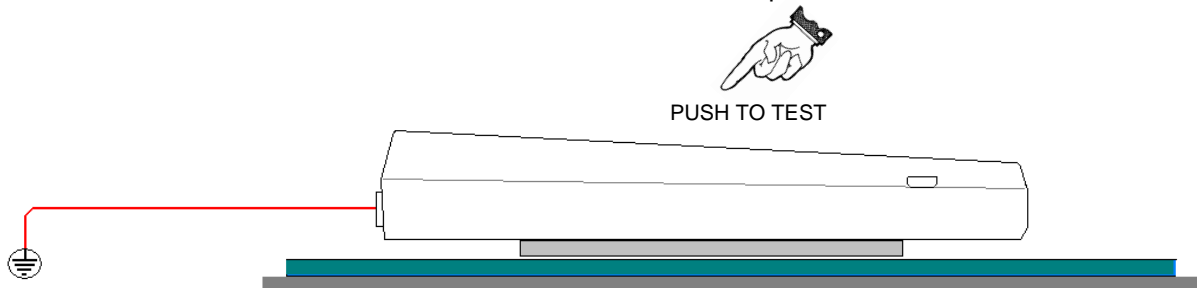
■ Other Measurements

By connecting external electrodes to the instrument's sockets it is possible to measure "point to point resistance", or "volume resistance" for example.

Volume resistance R_V

Metal counter electrode

Probe model 850

Probe model 850

Surface resistance R_{PP}
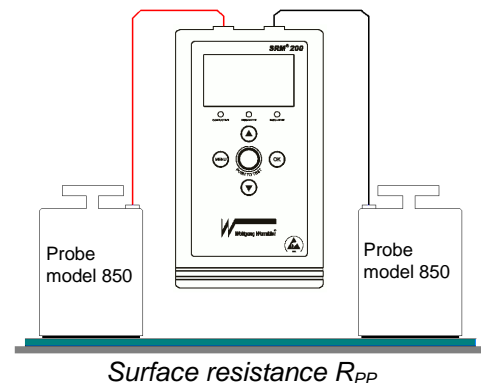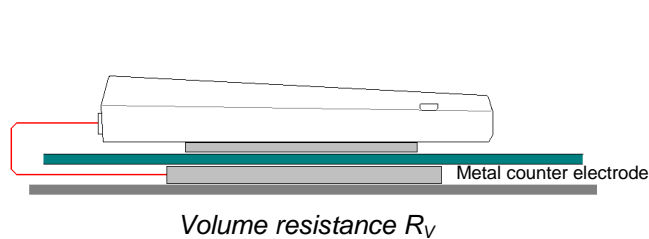
Test values Storage

The included software can be used to transfer and process test values to the computer.
The functionality includes:

- ➢ Measurement data transfer
- ➢ Store and export measurement data
- ➢ Print measurement report

- ➢ Limit value definition
- ➢ Labelling of measurement folders
- ➢ Adjust Date and time

Functions

The following functions are available. Most of them can be accessed more conveniently by the PC software.

■ View results

MENU - press button
View results - select
OK - confirm
▼▲ - select folder (1-99)
OK - confirm folder
▼▲ - select record (1-99)
OK - display value

$$_U\!\!>\!\!1\!*\!10^{12}_{Ohm}$$
23°C ▮LIMIT01▮ 49%
▮▮ 00 02/10/09 12:15

Folder
Record
Date
Time
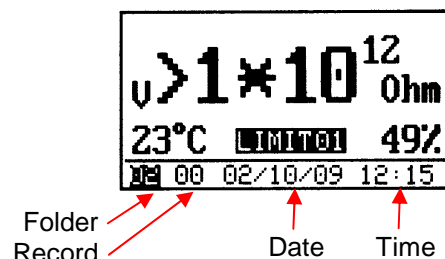
■ Delete results

MENU - press button
Delete results - select
OK - confirm
▼▲ - select folder (1-99)
OK - confirm folder
▼▲ - select record (1-99)
OK - confirm to delete
▼▲ - select yes
OK - delete value
MENU - back to menu

Delete data
Series all
Delete all
Yes / No
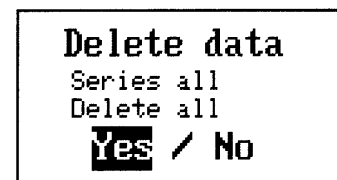
■ Change Limits

MENU - press button
Limit - select limit
    OK - select limit (1-19)
▼ - down to name
    OK - enter name for limit

Limit
▮Limit▮ 1
Name:FLOOR
$1*10^5$ $1*10^9$
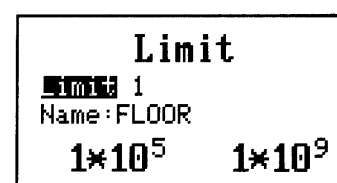
▼ - down to values
    OK - change values
        ▼▲ - increase/decrease
        OK - next value
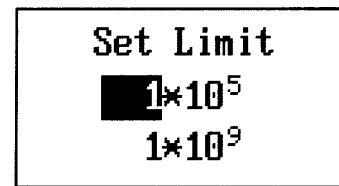   **MENU** - back to limit
MENU - back to menu

```
Set Limit
1*10^5
1*10^9
```

■ Folder names

MENU - press button
Folder Name - select
▼▲ - select folder to change
OK - enter text
    ▼▲ - select character
    OK - insert character
   **MENU** - back to folder names
MENU - back to menu

```
Folder name
1 2 3 4 5 6 7 8 9 0 A
Ä B C D E F G H I J K
L M N O ö P Q R S T U
Ü V W X Y Z   c A End
01  FOLDER 1
```

■ Timeout

MENU - press button
Timeout - select timeout
    OK - change value
MENU - back to menu

```
Limit
Folder Name
Time out  30s
Temperature °C
Date
```
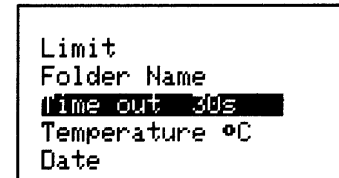
■ Temperature

MENU - press button
Temperature - select temperature
OK - change between ℃ or ℉
MENU Z- back to menu

```
Folder Name
Time out  30s
Temperature °C
Date
Calibration
```
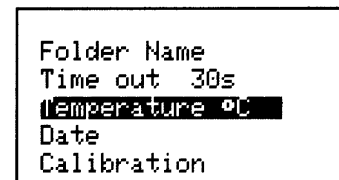
■ Date

MENU - press button
Date - select date
OK - change date
    ▼▲ - increase/decrease value
    OK - accept value
MENU - back to menu

```
Date
02/10/09
12:15:06
```
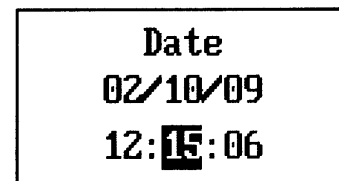
■ Calibration

Calibration date and software version display
MENU - press button
Calibration - select calibration
OK - display
MENU - back to menu

```
Calibration
10/06/09
Software v1.10
```
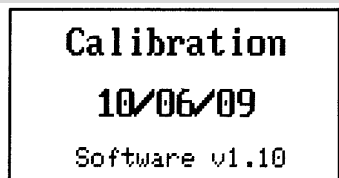
■ Language

MENU - press button
Language - select language
OK - change language
MENU Z- back to menu

```
Time out  30s
Temperature °C
Date
Calibration
Language English
```

Wolfgang Warmbier ®
Systeme gegen Elektrostatik

| Additional user instructions for the Software are available on the CD-ROM.

Packing List

The SRM200 includes:
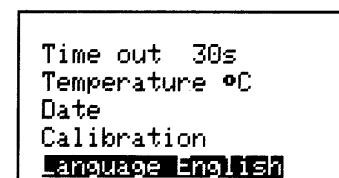
1. Surface Resistance Meter SRM®200
2. Carrying bag
3. Battery charger
4. USB data cable
5. Software on CD-ROM
6. Grounding cord
7. User's manual (German / English)
8. Calibration certificate

Warranty

The warranty does not include the rechargeable battery, battery damage due to drainage, and mechanical damage of the instrument.
The warranty is void if the unit is opened.

Notice

This instrument is **not** approved for measurements in explosion hazard areas!

High electrostatic charges or measuring insulating highly charged materials might damage the instrument!

Using the instrument in power plants is **not** permitted.

Maintenance

Battery condition is permanently monitored in the LCD display.
Connect the instrument to a computer or use the power supply to charge the battery in time.
The unit won't switch on if the battery is damaged. Unscrew the battery lid at the backside of the unit to replace the battery. Replace only a rechargeable battery of the **same type** and take care of the polarity.

Calibration

The recommended calibration interval is 2 years.

Problem Solving

Problem	Cause	Remedy
No Operation	Battery discharged	Connect power supply to charge the battery
No operation even after charging	Battery defect	Replace battery
No operation after battery replacement, red LED inside the battery case lit	Wrong polarity	Insert battery in correct polarity
Conductive rubber defect	Wear	Replace contact rubber

Wolfgang Warmbier ®
Systeme gegen Elektrostatik

Repair

Repairs shall be carried out by qualified personnel only.

In case you send the instrument for repair, please pack it safely and state clearly the problem

Waste Disposal

Follow the local environmental rules when disposing of the equipment.

Technical Data

Power supply:	Rechargeable Lithium Battery 3,6V 900mAh R6 (AA)
	Charged via external power supply or USB interface
Operating conditions:	-5 ... +40℃, up to 75% rel. humidity, non condensing
Storing conditions:	-10 ... +50℃, up to 85% rel. h umidity, non condensing
Connectors:	2 banana sockets - short version (15mm)
Resistance measuring range:	$1x10^3$ - $1x10^{12}$ Ω
Temperature measuring range:	0 - 50 ℃ +/- 1℃
Humidity measuring range:	10 - 90% r.F. +/- 5%
Memory:	9801 measuring values
Test voltage:	10V / 100V (automatic)
Dimensions:	145 x 80 x 35mm (L x B x H)
PC interface:	USB 2.0
Case:	ABS
Weight:	290 g
	Complies with CE

Measuring range	Display range	Resolution	Accuracy	Test Voltage
10^3 Ω	$1x10^3$ - $9x10^3$	1 kΩ	10% reading	10V
10^4 Ω	$1x10^4$ - $9x10^4$	10 kΩ	10% reading	10V
10^5 Ω	$1x10^5$ - $9x10^5$	100 kΩ	10% reading	10V
10^6 Ω	$1x10^6$ - $9x10^6$	1 MΩ	10% reading	100V
10^7 Ω	$1x10^7$ - $9x10^7$	10 MΩ	10% reading	100V
10^8 Ω	$1x10^8$ - $9x10^8$	100 MΩ	10% reading	100V
10^9 Ω	$1x10^9$ - $9x10^9$	1 GΩ	10% reading	100V
10^{10} Ω	$1x10^{10}$ - $9x10^{10}$	10 GΩ	25% reading	100V
10^{11} Ω	$1x10^{11}$ - $9x10^{11}$	100 GΩ	25% reading	100V
10^{12} Ω	$1x10^{12}$	1 TΩ	25% reading	100V

Spare Parts

Part number	Description
7100.SRM200.CR	Conductive rubber (Set of 2 pieces)
7100.SRM200.BAT	Lithium rechargeable battery
7100.SRM200.NT	Power supply