

# PoroTest<sup>®</sup> 7

Technical Reference and Operating Manual

Advancing with Technology **ElektroPhysik**

© B13-A6 08/2014

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# Caution!

## Safety Note

Please refer to the safety notes in section 2 before starting operation of PoroTest® 7.

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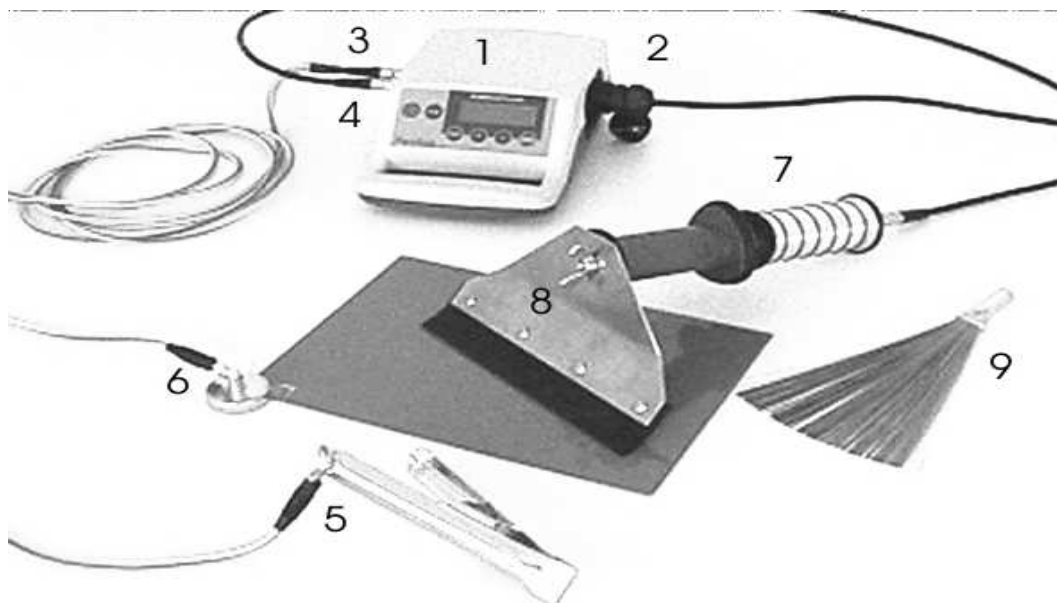


Fig. 1

- 1 PoroTest® control unit
- 2 Mains cable
- 3 Equipotential cable (Earting cable) (green/yellow)
- 4 Connecting cable (probe-control unit) (black)

- 5 Cable lug for protection earth with earth clamp
- 6 Cable lug for earth magnet or earth clamp
- 7 High voltage probe
- 8 Silicon-rubber electrode
- 9 Metall sweeper electrode

Mains cable socket



Fig. 2

Sockets for earthing cable and high voltage probe connecting cable

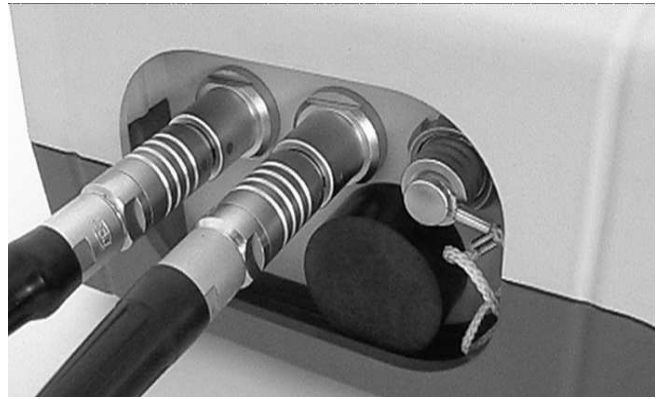


Fig. 3

## 1. General Information

Designed for high voltage porosity detection, PoroTest® 7 conforms to the following industrial standards:

DIN 55670

DIN 50191 (VDE 0104)

DIN EN 61010 /Teil 1 (VDE 0411/ Part 1)

### 1.1 Applications

PoroTest® 7 holiday detector detects pores and holes in insulating materials on conductive substrates such as steel, aluminum, etc. Typical applications: Testing linings and coatings applied on ducts, pipes, hulls, oil and storage tanks, enamel, paint, rubber and bitumen linings, vessels and tanks, GFK and other plastics materials. Tanks or vessels must be filled with water or other conductive material. To detect porosity, the appropriate test voltage specific to the material thickness is set on the control unit which applies, when activated, a spark discharge at the moment a material flaw is detected. In addition to the spark discharge, flaws are counted and indicated by a visible and audible signal. Depending on the test electrode, test voltage can be set from 0.5...7 kV (P7) for coatings from 30 microns to 1.7mm or from 6 to 35kV (P35) for coatings from 1.4mm to 11,3mm.

### 1.2 Description

The test instrument consists of a high voltage probe with an integrated high voltage generator and a test electrode connected to the probe. The control unit features a digital display and control pad. The control unit housing is fully portable and made of rugged ABS plastic with an integrated handle. The high voltage probe and control unit are connected via a rugged cable

### 1.3 Supply schedule

- rugged plastics carrying case
- control unit with integrated storage battery
- connecting cable (probe - control unit)
- high voltage probe (optional accessories)
- metal sweeper electrode
- earth magnet
- earth clamp
- equipotential cable, 5 m (16 ft.) length
- mains cable
- shoulder belt

## 1.4 Accessories

- Aluminium case
- Brush, rolling spring, ring and right-angle electrodes in various designs, silicon-rubber electrode, 200 mm (7.8 ft.) width
- 3-pin plug, cable-free, directly plugs into the integrated signal contact (make/break contact). The signal contact is automatically actuated if a pore is detected and may be used for an external signal devices.
- Earthing rod
- Earthing/equipotential cable, 10 m (32 ft.) length
- Connecting cable for control unit and high voltage probe in special lengths: 5m (16 ft.), 10m ( 32 ft.)
- Non-destructive coating thickness gauges, help you to adjust test voltage specific to coating thickness

## 2. Safety notes

- PoroTest® 7 is designed for safe use. When observing the safety notes, operation of the instrument is absolutely risk free to the operator. Current and capacitance limits conform to the German standards DIN EN 61010/ Part 1 (VDE 0411/Part 1).
- Persons with cardiac pacemakers should consult their physician about the possibility of interference with the instrument.
- **Caution!**  
**Never use unearthed equipment! Before use, make sure both, PoroTest® 7 and the test object are well earthed (see section 3.)**
- Only use **rechargeable** NiMH C-cells. Non rechargeable batteries pose an explosion hazard if on charge!
- After the control unit has been switched off, discharge the high-voltage generator to earth.
- Do not carry out high voltage discharge to the instrument or to the connecting cable between instrument and probe.

### 3. Preparing PoroTest® 7 for operation

1. Plug the yellow/green earth cable into the two-pin earth socket of the gauge. Connect one of the wire ends to the earth clamp or the earth magnet (for magnetic substrates). Fix the earth clamp or the earth magnet to an uncoated spot of



Fig. 4

Earth cable (yellow / green), left  
High voltage cable (black), right

2. Build-up an additional protection earth by securely connecting the second end of the yellow/green earth cable to a water pipe, heating installation, to the earthing contact of a socket-outlet or to another suitable earthed metal construction. For in the field testing, the earth rod (available as an option) should be used.

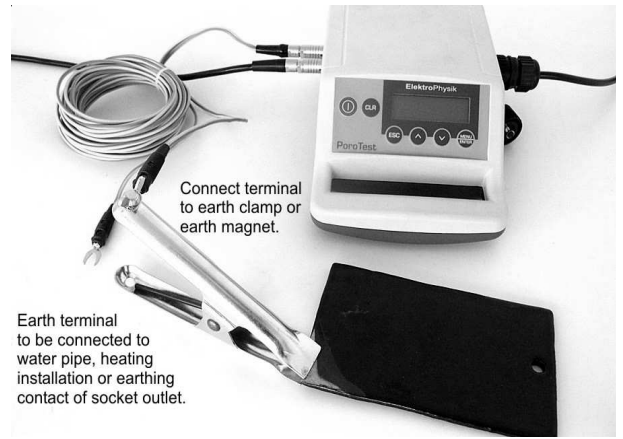


Fig. 5

3. Use the wing nut to connect the test electrode to the high voltage probe (Fig. 1). The metal sweeper electrode can directly be connected to the high voltage probe.
4. Use the black high-voltage cable to connect the high voltage probe to the control unit (4-pin socket).
5. Hold the high voltage probe by the metal handle to prevent static charge.



6. Switch on the control unit (red button). A short bleep indicates that the instrument is ready for operation. If no bleep sounds, the storage batteries should be recharged or replaced by new ones.



**Safety note:**

As soon as the earth cable is disconnected from the instrument, the feed of the high voltage probe will be interrupted.

**4. Preparing the test object**

Make sure the surface of the test object is dry and clean.

**5. Selection of the test electrode**

For surfaces susceptible to scratches we recommend to use the silicon rubber electrode. For uneven surfaces, the metal sweeper electrode is recommended. Special electrodes available upon request

**6. Instrument settings**

1. Switch the gauge on. Press Menu/Enter key.

The following message appears:

Current readings

XXX...

Press Menu/Enter to go to the *Main menu* (your selection is shaded on display).

2. Using Arrow-keys the following parameters can be selected and adjusted according to your requirements.

- Test parameters
- Sensitivity
- Limit for pores

- High voltage trigger
  - Signal LED
  - Contrast
  - Display backlight
  - Language
  - Setting mode
  - Display mode
3. Use Arrow-keys to make your selection and confirm by pressing Menu/Enter. Use Arrow-keys to set and select your custom settings. Confirm by pressing Menu/Enter. You will automatically go back to the main menu and to the last parameter selected.
  4. To reset a changed parameter to the factory setting, call requested parameter and press CLR. Confirm by pressing Menu/Enter. The parameter has been reset to default value.
  5. By pressing ESC, you can quit parameter setting and go back to the main menu without storing your changes.

## 6.1 Test parameters (test voltage)

Excessive test voltage may damage the surface through spark discharge whereas insufficient test voltage prevents reliable porosity detection. An appropriate test voltage must be set according to the thickness of the coating to be tested.

Use Arrow-keys to adjust to the requested coating thickness. Test voltage changes automatically according to the adjusted coating thickness.

### Test parameters

- Coat. thickn. XXX kV (default setting: 20.0 kV)
- Test voltage XXX mm (default setting: 5.97 mm)

## 6.2 Sensitivity

Sensitivity is adjustable from

- 1...15 (Default setting: 13)

Sensitivity can be adjusted from 1...15 (low...high). If the pores to be expected are very large, sensitivity should be adjusted to a low level so that the instrument will be insensitive to very small pores.

High air humidity, moist surfaces, build-up of dust or graphite may make the test object slightly conductive causing leakage current to the surface. In such case, sensitivity should also be controlled to a low level.

### 6.3 Limit for pores

Pore limit is the admissible number of pores. When exceeding such limit, an alarm tone will sound. You can choose from

- 0...255 (default setting: 0)

### 6.4 High voltage trigger

You can choose from

- Auto-off (default setting) = push-button
- No auto-off = (switch)

*Auto-off = Push-button function:*

The black rubber ring at the high voltage probe operates as a push-button. As long as you keep it pressed down, voltage remains switched on.

*Switch function :*

The black rubber ring at the high voltage probe operates as a switch. If you press once, voltage is switched on. If you press again, voltage is switched off.

In both modes, push-button and switch mode, the red ring at the high voltage probe lights up as long as high voltage is fed.

### 6.5 Signal LED

You can choose from:

- All 3 indicators (Equipm. ON, Pores, Resid. voltage; default setting)
- Pores & resid. voltage
- Equipm. ON & res. voltage
- Residual voltage
- Equipm. ON & pores
- Pores
- Equipm. ON
- Signal OFF

## 6.6 Display contrast

Contrast can be set from

- 0...100% (default setting: 50%)

The higher the value, the higher the contrast.

The display contrast is susceptible to changes in ambient temperature. Low temperatures result in poor contrast, high temperatures increase contrast. Make sure to adjust contrast not below a readable level, otherwise you will not be able to make further settings or operate the gauge.

## 6.7 Display backlight

You can choose from

- ON (Display and keys are backlit)
- OFF (default setting)

## 6.8 Language

You can choose from

- German
- French
- Spanish
- English (default setting)
- further languages upon request

## 6.9 Setting mode

For the dialogue „Test parameters“ you can choose from

- Thickness [mm] ⇒ [kV] (default setting)
- Thickness [mils] ⇒ [kV]

Test voltage changes automatically according to the adjusted coating thickness.

- Voltage [kV] ⇒ [mm]
- Voltage [kV] ⇒ [mils]

If you change the parameter „voltage“, the coating thickness will change accordingly.

## 6.10 Display mode

For the dialogue „Current readings“ you can choose from:

- No. of pores
- Test voltage
- Pores and voltage (default setting)

---

## 7. General remarks on Operation and Application

- The relationship between high voltage adjustment and coating thickness as defined in the setting menu conforms to the DIN 55670 regulations. As test conditions may vary according to configuration, this relationship should only be considered as a rough setting. We recommend to select sensitivity as follows:

1. For each test object, the minimum test voltage should be determined at which pores can be detected reliably.

2. After the minimum test voltage has been determined, the maximum test voltage at which spark discharge starts to damage the test object should be determined

A suitable test voltage results from the mean value evaluated from these two values (minimum and maximum voltage).

- For highly conducting surfaces or surfaces subject to capacitance loading, it is recommended to select a sensitivity value low enough to prevent damage but high enough to ensure a reliable pore detection.

- If the high voltage probe is slowly approaching ground - i.e. without any test sample being in between - a reliable pore detection will only take place if the distance between probe and ground equals to the adjusted „layer thickness“. However, low energy spark discharges may take place even before the adjusted layer thickness has been reached.

**Please note:** This is NOT a malfunction of the instrument!

### 7.1 Testing procedure

After you have carried out earthing according to chapter 3, after setting the instrument into operation and after setting the instrument according to your requirements press ESC to quit the main menu. Then choose „Current readings“

#### Current values

No. of pores (default setting: 0)

### Please note:

The number of pores can be reset to Zero by pressing CLR.

Please proceed as follows:

1. Hold the high voltage probe by the metal grip to prevent static charge.
2. Switch on high voltage.
3. Slowly sweep the test electrode in parallel rows across the surface to be tested. Make sure to scan over the complete surface to be tested. The scanning speed should not exceed 40 cm/s ( 15,8 inches/s). For counting pores and fissures, the test speed should be around 2-5 cm/s (0.8...2 inch).
4. A spark discharge only occurs at the presence of an interconnected pore or flaw. At the same time, an alarm tone will sound and the red ring at the high voltage probe will light up to indicate a pore or flaw.

### Please note:

- Even if voltage supply is turned off, residual voltage remains at the high voltage probe. The red ring flashing indicates residual voltage. The higher the flashing frequency, the higher the residual voltage. Residual voltage is available until the red light goes off.
- Insufficient coating thickness or air bubbles will not be detected.
- Coatings containing metal particles or carbon powder are electrically conductive. They are not suitable for being tested with PoroTest® 7 since such particles would result in spark discharges and thus simulate porosity.

## 8. Power supply

PoroTest® 7 is storage battery fed by four rechargeable NiMH C-cells. The battery state is tested continuously during operation. Erratic measurements due to low battery do not occur. The battery state is indicated by the number of bars appearing on the right display edge.

- Battery symbol and four bars (fully charged) to
- Battery symbol and zero bars (battery run down)

The lower the number of bars, the lower the battery charge. If batteries run down, the high voltage generator fails to build up test voltage. PoroTest® 7 is not serviceable until the batteries are recharged.

**Important Note:**

- Deep discharge of batteries must be avoided otherwise they might be destroyed.
- If not in use for a longer period of time, batteries must be fully recharged before storing them.
- It is recommended to recharge the batteries every two months.
- It is highly recommended to use solely batteries that have been tested and supplied by ElektroPhysik.

**Caution - Explosion hazard!**

Only use **rechargeable** NiMH C-cells. Non rechargeable batteries pose an explosion hazard if on charge!

## 9. Charging storage batteries

If you connect PoroTest® 7 to the mains, the message „Mains connected“ appears and there will be an automatic test whether recharge of batteries is necessary or not.. If recharge is necessary, the message „On charge...“ appears, if not, „Mains operation“ appears.

You can interrupt the recharge procedure at any time by pressing Menu/Enter (see chapter 12 „Battery charging messages“).

The recharging procedure is completely menu controlled. Please follow the instructions on display.

## 10. Changing storage batteries

1. Switch the instrument off.
2. Open the battery compartment (black, round covers at bottom side). Remove old batteries.
3. Replace with fresh ones. Note polarity. **Plus** must be connected to battery cover direction.
4. Place cover on battery compartment, push batteries down and make sure lid fits tightly.

## 11. Error Messages

Error Message	Cause	Remedy
Probe or GND error	Probe connecting or earthing error	Check probe cable for damages. Connect probe cable properly. Earth equipment properly.
Probe connection error	Data communication failure. Connection between probe and control unit has been interrupted during operation.	Check probe cable for damages. Connect probe cable properly.
Probe voltage drop	Voltage drop between control unit and probe	Recharge battery or switch to mains supply or attach a shorter connecting cable
Low battery. Please recharge!	Low battery	Recharge will be necessary soon.
Battery run down. Please recharge.	Insufficient battery charge	Immediate recharge necessary.
Long bleep - instrument switches off automatically	Deep discharge protection	Immediate battery discharge necessary.
!	Data have been changed or deleted from memory	Please send the instrument to your dealer for repair.

After troubleshooting, all error messages can be quit by pressing ESC. If you press Menu/Enter you will go back to the main menu.

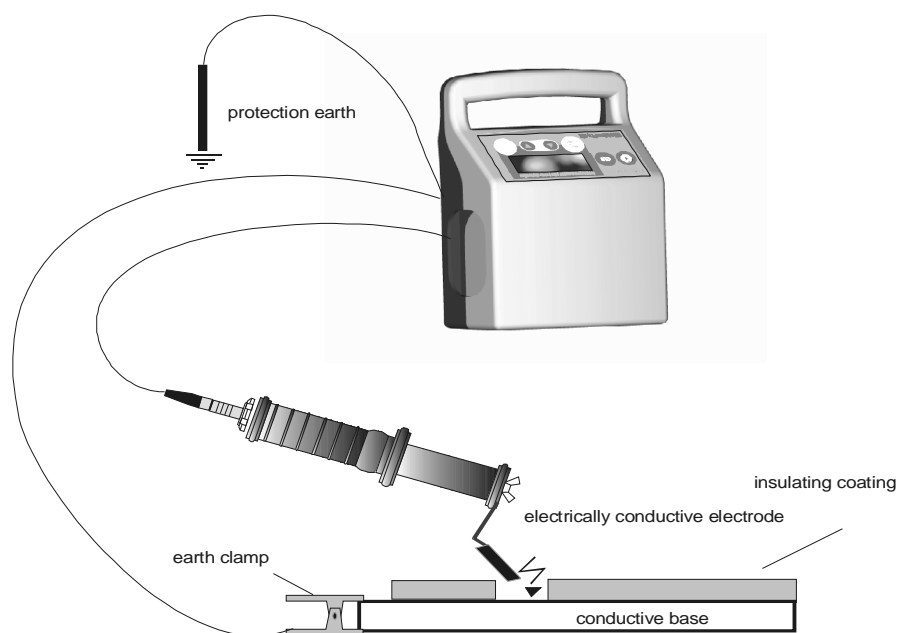


## 12. Battery charging messages

Message	Cause	Remedy
Mains connected	Mains connected successfully	--
Mains connection interrupted	Mains connection interrupted	Check connections. Check mains supply. Check safety fuse of control unit (next to the mains socket)
Mains operation	Battery charge completed or batteries not available	--
please wait...	Checking battery state	--
On charge...	Charging in progress	Charging procedure can be interrupted by the operator.
Charging completed	Battery charge completed	--
Charge interrupted	Battery charge has been interrupted by the operator	--
Storage batteries removed or faulty	Batteries have been removed during charge or faulty batteries	Insert batteries or replace by fresh ones.
Storage batteries faulty or temperature too high	Deep discharge or faulty batteries or or excessive temperature situation (unsuitable for battery charge)	Replace batteries. Keep PoroTest 7 cool when recharging batteries.
Confirm all messages by Menu/Enter-key.		

### 13. Test principle

When scanning the high voltage probe over the non-conductive material, a spark discharge is produced at the presence of a pore. The gauges identifies the sparks to register and count them accordingly.



14. Technical specification

High voltage probe	P 7	P 35
Test voltage ranges:	0.5...7 kV	6...35 kV
Coating thickness	0.03 mm...1.7 mm 1 mils ...67 mils	1.4 mm...11.3 mm 55 mils ...444 mils
Type of voltage:	Direct current (DC)	
Test voltage indication:	3-digit LC display	
Accuracy of voltage setting:	±(0.1 kV + 3% of reading)	
Dimensions / weight of high voltage probe:	274mm x 63 mm (l x dia.) / 550 g    10.8" x 2.48" / 1lbs. 3oz	
Dimensions / weight of control unit	225 mm x 150 mm x 85 mm (L x W x H) / 1400 g 8.87" x 5.9" x 3.35" (L x W x H) / 3 lbs. 1 oz	
Alarm signal:	90 dB, 0.1s / pore, continuous tone in case of short-circuit	
Signal output:	potential free, U <sub>max</sub> : 100V, I <sub>max</sub> : 0,1A	
Storage battery:	4 C cells. IEC LR 14, 3,5 Ah, NiMH, replaceable	
Storage battery life at maximum voltage:	PoroTest 7-P 7 approx. 20 h continuous operation	PoroTest 7-P 35: approx. 10 h continuous operation

Storage battery charging time:	approx. 4 hours
Mains voltage:	115 to 230 V, 50/60Hz, automatic switch
Operating temperature:	0°...+50°C / 32°...122°F
Type of protection:	IP 65 (dust and hoseproof)
Probe cable:	standard length approx. 1.5m / 59"; 10 m / 393.70" (max.)
Earth cable:	2 x 5m / 2 x 196.85" green/yellow, flexible
Mains cable:	2 m / 78.74" mains plug with earthing contact
Humidity:	avoid dew on the surface (refer to DIN 55 670)
Safety fuse:	2,5 A time-lag fuse
Industrial standards and regulations	DIN 55670 DIN 50 191 (VDE 0104) DIN EN 61010/Part 1 (VDE 0411/Part 1)

## 15. After-sales service

ElektroPhysik's manufacturing practices and quality management systems according to DIN EN ISO 9001 ensure highest quality of this product.

Any operating problems or trouble should be reported to the ElektroPhysik service department. Please include a short description of the problem.

For any further question regarding application, use or technical data please call your dealer or directly refer to ElektroPhysik.

Please refer to the next page for ElektroPhysik contact addresses.

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