Operating Instruction

Fully Automatic
Insulating Oil Tester DPA 75

Designed for the fully automatic measuring of the electric breakdown strength of insulators
Guide to this Operating Instruction

Observe info signs!

For fast finding of important information the corresponding text passages are marked with symbols (symbols not stated here are self-explaining):

More and special information concerning the respective subject are available from BAUR.

Important unit information!
In any case, read carefully!

Important information text.

Copyright

© Copyright by BAUR

© BAUR Prüf- und Messtechnik GmbH,
A-6832 Sulz / Austria
All rights reserved.
No part of this publication may be produced, transmitted, stored in a data processing system or translated into another language without the written permission of Baur/Sulz, Austria.

Subject to modification!

In the interest of our customers we reserve the rights for modifications due to technical progress. Illustrations, descriptions and delivery content are therefore not binding.
Preface

This manual contains all information necessary for the correct handling and use of the Fully Automatic Insulating Oil Tester DPA 75. Before using the DPA 75 unit please read carefully this Operating Instruction.

If you have any question please contact directly:

Tel  +43 / 55 22 / 49 41-0
Fax  +43 / 55 22 / 49 41 3

BAUR Prüf- und Messtechnik GmbH,
Raiffeisenstrasse 8
A-6832-Sulz / Austria

or refer to your nearest BAUR representative.
Safety Precautions

Please read now and avoid damage and injury later!

- The Insulating Oil Tester DPA 75 is built in accordance with today’s state of engineering and is safe to operate. Individual components and the finished unit are inspected continually by our qualified staff within the framework of our Quality Assurance Provisions. Each unit is subjected to thorough testing prior to shipment.

In any case read Operating Instruction before using the unit!

- It is imperative to every person who is involved with the installation, start-up, operation and maintenance to have read and understood the complete Operating Instruction.

Only authorized personnel!

- The user is responsible for ensuring that no unauthorized personnel works with the unit. He has an obligation to report immediately any changes to the unit which affect its safety.

Use the DPA 75 unit as directed!

- Use as directed: The DPA 75 unit may be used exclusively for insulating liquids with a flash point of ≥110°C (230°F).

The local safety and accident prevention regulations are always applicable to the operation of the DPA 75 unit.
Warranty Terms

At the customer’s written request we undertake to repair or replace at our discretion and as quickly as possible all parts that become faulty or useless as the demonstrable result of poor material, faulty design or defective execution.

We shall bear the costs of any faulty parts requiring replacement, but not the costs of transport to us and back to the customer, nor the costs of packing and insurance!

The 12 month warranty time starts with delivery.

We shall not be liable for any damage resulting from normal wear and tear, improper handling, non-observance of Operating Instruction and safety regulations.

We shall also refuse to accept any liability if the customer carries out repairs or changes to the unit himself or has others carry out them!

The warranty does not cover damage in transit, batteries, fuses and any readjustments in accordance with the Operating Instruction!

We draw attention in addition to the ‘General Terms of Sales and Delivery’ of:

BAUR Prüf-und Messtechnik GmbH,
A-6832 Sulz / Austria
Contents

1. Product Information ................................................................. 1-1
   1.1 Test cycle ................................................................. 1-2
   1.2 Construction / Principle .............................................. 1-3
   1.3 Function and control elements .................................... 1-5
   1.4 Control panel ............................................................ 1-7
   1.5 Menu overview ......................................................... 1-7
   1.6 Technical data .......................................................... 1-9
   1.7 RBM switching off .................................................... 1-11

2. Packing and Delivery .............................................................. 2-1
   2.1 Unpacking .............................................................. 2-1
   2.2 Damage during transport ......................................... 2-1
   2.3 Check extent of delivery ......................................... 2-2
   2.4 Installation ............................................................. 2-4

3. Putting into Operation ........................................................... 3-1
   3.1 Selecting language .................................................. 3-2
   3.2 Adjust contrast of display ....................................... 3-3
   3.3 Set actual date ....................................................... 3-4
   3.4 Set actual time ....................................................... 3-5
   3.5 Cleaning of electrodes ............................................. 3-6

4. Testing Preparations ................................................................. 4-1
   4.1 Checking battery state of charge ............................. 4-1
   4.2 Switching printer on/off ......................................... 4-2
   4.3 Enter report no. ...................................................... 4-3
   4.4 Adjust electrode spacing ......................................... 4-4
   4.5 Sampling of insulating liquids ................................. 4-5
   4.6 Filling test vessel .................................................... 4-7
   4.7 Carry out DPA test .................................................. 4-9
5. Standard Test ................................................................. 5-1
   5.1 Start standard test ......................................................... 5-1
   5.2 Indication of test results - standard test ......................... 5-3
   5.3 Printer report (option) - standard test ......................... 5-4

6. Customer-specific Test Cycle ............................................. 6-1
   6.1 Define and store customer-specific test cycle .................. 6-1
   6.2 Start customer-specific test cycle .................................. 6-9
   6.3 Indication of test results - customer-specific test cycle .......... 6-10
   6.4 Printer report (option) - customer-specific test cycle ......... 6-11

7. Single Test ................................................................. 7-1
   7.1 Start single test ......................................................... 7-1
   7.2 Indication of test results - single test ............................. 7-2
   7.3 Printer report (option) - single test ............................... 7-2

8. Maintenance and Care .................................................... 8-1
   8.1 Replacing mains fuse .................................................. 8-1
   8.2 Replacing printer ribbon (option) ................................. 8-3
   8.3 Replacing printer paper roll (option) ............................. 8-4

9. Spare and Wearing Parts ................................................. 9-1

10. Test Standards ............................................................. 10-1

11. Index ............................................................................ 11-1
1. Product Information

The Insulating Oil Tester DPA 75 is used to measure the electric breakdown strength of insulating liquids (e.g., insulating oil of transformers, etc.).

The dissipation factor $\tan \delta$ and the relative permittivity $\varepsilon_r$, together with the breakdown voltage, are the most important parameters for which insulating liquids are tested.

The breakdown voltage shows the degree of contamination by cellulose fibres and water. For the operating safety of oil-insulated high voltage units, the electrical breakdown strength of insulants is the deciding factor.

For further information, also see the technical report 'Testing of dielectric properties of insulating liquids' by M. Krüger. Obtainable from BAUR under no. 8602e.
1.1 Test cycle

1. Open protective hood and remove test vessel. Test vessel must comply with selected test standard.

2. Insert electrodes corresponding to selected test standard into the test vessel and adjust electrode spacing.

3. Fill insulating liquid into test vessel considering standards
   - IEC 475 / VDE0370 part 3/2.80
   - IEC 156 / VDE0370 part 5
   and insert test vessel into DPA unit again.


5. Fold out front panel.
   The DPA unit is switched on automatically.

6. Select desired test standard via function keys.
   Before starting test pay attention to indicated and actual electrode form and spacing:
   - 13 pre-programmed test standard cycles are available with the DPA 75 unit.
   - Additionally, all parameters can be freely programmed acc. to a customer-specific test cycle.

7. After starting the test cycle the measured data are automatically reported via integrated printer (option).

8. After conclusion of the test cycle close front panel.
   The DPA unit is switched off automatically.

For more and detailed information in operating the DPA 75 unit refer to section 4. Testing Preparations.
1.2 Construction / Principle

Power Supply

Test Vessel and Electrodes

Control Unit

High-voltage Transformer

Plain Paper Printer (option)

Control Panel

RS232 Interface bidirectional
1 **Power supply**

- Mains operation (100 ... 240 V / 50/60 Hz) possible via mains cable, even if battery is discharged. With mains operation this symbol appears in the upper right corner of any menu: 🌡️

- Battery operation via internal and rechargable battery (2 x 6V / 6.5Ah). With connected mains cable battery charging happens even with switched off unit.

2 **Control unit**

Coordinates all unit functions according to the selected and actual menu.

3 **Control panel**

For selecting the desired menus.

4 **High-voltage transformer**

For generating the test voltage (max. 75 kV).

5 **Test vessel and electrodes**

Individually configurable depending on test standard. Temperature acquisition of the insulating liquid via sensor.

6 **Plain-paper printer (option)**

Reports test data automatically.

7 **Interface RS232**

Bidirectional interface on the rear of the unit for data communication with a PC.
1.3 Function and control elements
1 Gripping strip for opening/closing the protective hood.

2 Protective hood with self-acting mechanical locking mechanism (double interlock switch - forced contact). For highest operational safety!

3 Test vessel with electrodes - available for all current standards. Quickly removable test vessel for easy cleaning, with a built-in vernier for exact setting of electrode spacing.

4 Easy-to-clean oil pan.
   Suitable for cleaning with petroleum ether.

5 Carrying handle (option) and shoulder strap - for easy and simple mobile use.

6 Built-in rechargeable battery - for mains independent operation.
   Integrated power supply unit for controlled battery charging, even during a test.

7 Bidirectional RS232 interface - for data communication with a PC.

8 Folding front panel - switches the DPA unit on/off automatically.

9 Built-in plain paper printer - for automatic reporting of test data and test conditions (option).

10 Control panel with self-explanatory menu-guiding.
1.4 Control panel

- backlit dot matrix graphic display
- self-explanatory menu-guiding
- keys which can be activated and active menu functions are highlighted with a black bar

1.5 Menu overview

- CONTRAST: setting of display contrast
- LANGUAGES: selection of desired language: GERMAN, ENGLISH, FRENCH, SPANISH
- PRINTER: Disabling of the integrated printer is possible
- RS232 INFO: Information to the interface configuration RS232 for:
  - service-mode
  - calibration-mode
  - remote control
    (with BAUR PC software)
- DATE: setting of actual date
- TIME: setting of actual time
STANDARD
- 13 pre-programmed test standards are available:
  - ASTM D 1816/84
  - ASTM D 877/87
  - BS 5874/80
  - CEI 10-1/73
  - CSSR RVHP/85
  - IEC 156/95
  - IRAM 2341/72
  - JIS C2101/78
  - PN 77/ED4408
  - SEV 3141/69
  - UNE 21 309/89
  - UTE *60
  - VDE 0370/78
- Additionally in the submenu DEFINE TEST CYCLE
  5 customer-specific test sequences are freely programmable.
  TEST CYCLE 1
  TEST CYCLE 2
  TEST CYCLE 3
  TEST CYCLE 4
  TEST CYCLE 5

SINGLE TEST
- Start of a single test
- Voltage rate of rise adjustable
  (0.5 - 1 - 2 - 3 - 5 kV/s)

EXTRA
- BATTERY: Load status of rechargeable battery and no. of further possible breakdowns until recharge
- REPORT NO.: Input of a max. 12-digit report number
- ELECTRODES CLEAN.: 24 cleaning breakdowns are carried out (when using new electrodes the first time)
- DPA TEST: Menu item for high voltage testing with calibrator KA 75.
- INFO: No. of software version. Indication of date of the last calibration (calibration of DPA unit should be carried out once a year)
1.6 Technical data

DPA main dimensions
Dimensions in mm

DPA interfaces

T 4 A / fuse
90 . . . 264 V AC / mains supply
RS232 bidirectional / 9 pin Sub D
### Power supply
- 100 ... 240 V (50 / 60 Hz)

### Power consumption
- approx. 120 VA

### Internal, rechargeable battery (option)
- 2 x 6 V / 6.5 Ahrs

### Output voltage, dielectric strength test
- 0 ... 75 kVrms symmetric

### For insulating liquids with tan δ values < 4.5 or specific resistance $\rho > 30 \text{ M}\Omega\text{m}$

### Voltage rate of rise
- 0.5 / 1 / 2 / 3 / 5 kV/s

### Switch off current
- 4 mA

### Switch-off time on breakdown
- $\leq 1 \text{ ms}$

### Error message
- Real Breakdown Monitoring (RBM) detects actual flash over

### Internal temperature acquisition of oil sample
- 0 - 99°C/+32°F...+120°F

### Temperature resolution
- 1°C/1.8°F

### Display
- Back lit, 160 x 80 dot matrix LCD

### Voltage indication digital
- 0 - 75 kV ± 1 kV

### Resolution (displayed)
- 0.1 kV

### Languages
- German, English, French, Spanish, ask for other languages

### Interface
- Bidirectional RS 232; 9600 Baud; 8 Bit 1 stopbit; no parity 9 pin sub D

### Printer (option)
- Matrix printer, 24 char. 57 mm / 2 1/4" plain paper

### Operating temperature
- 0°C ... +45°C/+32°F...+113°F

### Storage temperature
- -20°C ... +55°C/-4°F...+131°F

### Relative humidity
- $\leq 90\%$

### Dimensions
- 405 x 345 x 275 mm / 16" x 13 1/2" x 10 3/4"

### Weight
- Without battery 18.7 kg / 43.6 lbs
- With battery (option) 21 kg / 49 lbs

### Designed and built acc. to the following standards:
- IEC 1010,
- EN 61010-1,
- VDE 0411 Part 100
1.7 RBM switching off

**RBM**  
**Real Breakdown Monitoring**

RBM is an electronic monitoring of the kV indication which controls the measuring process at breakdown. RBM monitors the linearity of voltage rate of rise within a specified tolerance range.

**Indication at RBM switching off**

With RBM switching off the test cycle is canceled automatically. On the display appears:

<table>
<thead>
<tr>
<th>WARNING 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBM SWITCHING OFF \nIS ACTIVATED!</td>
</tr>
<tr>
<td>CONT.</td>
</tr>
</tbody>
</table>

With key CONT. jump back to the actual menu.

**Causes of RBM switching off**

- air breakdowns
- insulating liquid too low-resistive (eg with water)
- insulating liquid to be tested does not correspond with the following specifications:  
  insulating liquid with tan δ values < 4.5 resp. specific resistance \( \rho > 30 \text{ M}\Omega \)

**Condition for RBM**

Calibrated DPA 75 unit.  
Calibration of the DPA 75 unit should be carried out once per year.
2. Packing and Delivery

The units are shipped in a robust cardboard packaging.

If units are not used immediately always store them in the sealed carton and in dry rooms!

2.1 Unpacking

Unpack unit and lift from its packaging by the carrying handle.

Keep packaging in case you need to move the unit at a later date.

2.2 Damage during transport

Complaints concerning damage should be made to us by the purchaser without delay after receipt of the shipment using a standard damage certificate.

Confirmation in writing of externally visible damage should be obtained from the carrier immediately. When this is done, the extent and probable cause of the damage should be stated.

For damage which is discovered during unpacking the responsible transportation company should immediately be requested verbally and in writing (recorded delivery) for loss assessment and should be made responsible at the same time!

We also refer to the ‘General Sales and Delivery Conditions’ of:

BAUR Prüf- und Messtechnik GmbH,
A-6832 Sulz / Austria
2.3 Check extent of delivery

DPA 75 standard equipment:

a Automatic Oil Tester DPA 75 with test report
b Test vessel and electrodes
c Carrying strap
d Mains cable
e Operating Instruction
  - Setting gauge (electrode spacing)
  - Lifting stick for magnetic stirrer

Option package I, be made of:
  - Built-in battery pack
  - Integrated carrying handle
  - Integrated plain paper printer
  - Paper roll, 2 1/4" (57mm) width, Ø 30 mm
  - Ink ribbon for plain paper printer

Option package II (testing in field), be made of:
  - Built-in battery pack
  - Integrated carrying handle

Option package III (printer), be made of:
  - Integrated plain paper printer
  - Paper roll, 2 1/4" (57mm) width, Ø 30 mm
  - Ink ribbon for plain paper printer

Option package IV (printer, carrying handle), be made of:
  - Integrated plain paper printer
  - Paper roll, 2 1/4" (57 mm) width, Ø 30 mm
  - Ink ribbon for plain paper printer
  - Integrated carrying handle

Accessories:
  - Ring nut wrench for dismounting of test vessel
  - Cover bag with partition for accessories and Operating Instruction
  - setting gauge 0.039" (1mm)
  - Setting gauge 0.079" (2 mm)
  - Setting gauge 0.158" (4 mm)
  - Setting gauge 0.197" (5 mm)
  - Kalibrator KA75
  - Tester KT 75
# Test vessels and electrodes

<table>
<thead>
<tr>
<th>Description</th>
<th>Image</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test vessel 0.4 lt. with lid</td>
<td><img src="image" alt="IEC 156 Fig I" /></td>
<td>415-567</td>
</tr>
<tr>
<td>Test vessel 0.4 lt. with lid</td>
<td><img src="image" alt="IEC 156 Fig II" /></td>
<td>415-566</td>
</tr>
<tr>
<td>Test vessel 0.4 lt. with lid</td>
<td><img src="image" alt="ASTM D 877" /></td>
<td>415-568</td>
</tr>
<tr>
<td>Test vessel 0.4 lt. with lid, oil stirrer and setting gauge</td>
<td><img src="image" alt="ASTM D 1816" /></td>
<td>415-585</td>
</tr>
</tbody>
</table>
2.4 Installation

Lift DPA unit by its carrying handle and put down on desired location.

**Locate in a suitable place:**

- Install DPA unit in a dust-free environment.
- Do not install DPA unit near laser printer or copier (ozone!).
- Observe environmental requirements specified by the manufacturer when using special insulating liquids.
- Environmental conditions:
  - Ambient temperature: 0 to 45 C (+32 F to 113 F) preferably 18 to 28C (64.5 F to 82 F)
  - Relative humidity: ≤ 90% not condensing!
- Avoid direct sunlight.
3. Putting into Operation

1 Mains or battery operation optionally
Voltage supply at:
- mains operation 100 ... 240 V / 50/60 Hz
  via mains cable on rear of DPA unit
- battery operation 2 x 6 V / 6.5 Ah
  via internal, rechargeable battery
  battery time of charge: approx.  8 h

2 Switch on DPA unit
Fold out front panel.
DPA unit is switched on.

3 DPA self test
After switching on the DPA the unit carries out a self test automatically.
Proceeding at error message:
- switch on and off again DPA unit
- note error message no. and contact
  BAUR Service Department.

4 Actual menu
After carried out self test the last selected menu STANDARD or SINGLE TEST appears on the display.
The DPA unit is ready for operation.

The key nos. 1, 2, 3 etc. used in this Operating Instruction are key commands:
- for step by step proceeding
- as reference to the corresponding information text
- do not exist on the unit.
3.1 Selecting language

1. Select menu.

2. Select menu INSTRUMENT SETTING.

3. Confirm black highlighted menu item INSTRUMENT SETTING.

On the display the menu INSTRUMENT SETTING appears.

4. Select menu item LANGUAGES.

5. Confirm black highlighted menu item LANGUAGES.
3.2 Adjust contrast of display

1 Within the menu INSTRUMENT SETTING select menu item CONTRAST.

2 Confirm black labeled menu item CONTRAST.

3 Adjust contrast.

↑ = darker
↓ = brighter

4 Back to menu INSTRUMENT SETTING.

On the display the menu LANGUAGES appears.

6 Select desired language in the menu LANGUAGES.

7 Confirm selected language.

All texts appear in the language defined within this menu.

The language is:
- factory-set.
- only to reset when unit is putting into operation the first time and when needed.
3.3 Set actual date

1. Select menu item DATE within menu INSTRUMENT SETTING.

2. Confirm black highlighted menu item DATE.

Select year, month, day one after the other and confirm with key ENTER.

3. Select actual data for YY (year).

4. Confirm input for YY (year).

5. Select actual data for MM (month).

6. Confirm input for MM (month).

7. Select actual data for DD (day).

8. Confirm input for DD (day).

9. Finally select OK.

10. Confirm input of date.
    The menu INSTRUMENT SETTING appears on the display.
    The actual date is set.

The actual date appears on each test report (print).
3.4 Set actual time

1. Select menu item TIME within menu INSTRUMENT SETTING.

2. Confirm black highlighted menu item TIME.

Select hours, minutes one after the other and confirm with key ENTER.

3. Select actual data for HH (hours).

4. Confirm input for HH (hours).

5. Select actual data for MM (minutes).

6. Confirm input for MM (minutes).

7. Finally select OK.

8. Confirm input of time.
   The menu INSTRUMENT SETTING appears on the display.
   The actual time is set.

The actual time appears on each test report (print).
3.5 Cleaning of electrodes

1. Select menu item ELECTRODES CLEANING within menu EXTRA.

2. Confirm black highlighted menu item ELECTRODES CLEANING.

3. Start cleaning of electrodes.

24 cleaning breakdowns are carried out automatically, without indication of breakdown voltage.

Jumping back into menu EXTRA happens automatically after conclusion of the cleaning breakdowns.

Cleaning of electrodes only when putting unit into operation the first time.
Test vessel must be empty!
4. Testing Preparations

4.1 Checking battery state of charge

1. Select menu item EXTRA.
2. Confirm black highlighted menu item EXTRA.

Menu EXTRA appears on the display.

3. Select menu item BATTERY.
4. Confirm black highlighted menu item BATTERY.

Option:
Menu BATTERY appears on the display.
Within menu BATTERY an optical state of charge indication appears as well as the number of single tests which still can be carried out. With indication of - 20 single tests please connect unit to mains using mains cable and charge battery for approx. 8 hours.

**DPA unit is ready for operation even during charging process!**

5. Back into menu EXTRA.

- If the battery symbol appears in the upper right corner of any menu: charge battery, i.e. connect to mains. The mains symbol appears in the upper right corner of the menu:

- Do not store battery in discharged state.
4.2 Switching printer on/off

1. Select menu item PRINTER within menu INSTRUMENT SETTING.

2. Confirm black highlighted menu PRINTER.

3. Switch printer on/off.

4. Confirm installation and back into menu INSTRUMENT SETTING.

With activated printer the report test data are automatically printed during the test cycle.
4.3 Enter report no.

1. Select menu item REPORT NO. within menu EXTRA.
2. Confirm black highlighted menu item REPORT NO.

Select desired numbers for the REPORT NO. one after the other and confirm with key ENTER:

3. Select first number desired.
4. Confirm input for first number.
5. Select second number desired.
6. Confirm input for second number.
7. Finally select OK.
8. Confirm input for REPORT NO.

The menu EXTRA appears on the display.
The report no. is set.

- It is possible to enter a max. 12-digit report no. (repeat step 3 and 4 as long as necessary).
- On each test report the entered report no. appears.
- Before starting a test: Check report no. and reenter if necessary.
4.4 Adjust electrode spacing

1. Open protective hood.
2. Set scale of vernier to zero.
3. Turn adjusting ring clockwise until the unit sounds a ‘peep’ (electrodes touch each other).
4. Only turn adjusting ring clockwise and slowly step by step to the point the ‘peep’ is switched off. Electrode spacing is now set to zero.
5. Set scale of vernier to the desired electrode spacing.
   1 turn (360) = 1mm
6. Remove cover from test vessel and check adjusted electrode spacing using corresponding setting gauge.
7. Place cover onto test vessel again.

Attention:
Electrode form and spacing must be adjusted acc. to the selected test standard and are indicated for checking purpose before starting a test cycle.
4.5 Sampling of insulating liquids

Meet correct requirements

For testing electrical breakdown strength of insulants and as a result their assessment a careful sampling without assimilation of moisture is the deciding factor. Also minor impurities can strongly affect breakdown voltage of the sample.

Before sampling

- Be sure that sampling is performed only by skilled personnel.
- Strictly observe instructions and safety precautions supplied by manufacturers for used sample containers or electrical devices.
- Eliminate impurities at the sampling port (eg at transformers).
- Preferably carry out sampling during standard operation of the (electrical) equipment (eg transformers).
- Preferably carry out sampling during dry weather. Avoid contamination from the environment.
- If possible the insulating liquid should have the same temperature as the surrounding air.
- Avoid condensation by warming up the sampling device over the ambient temperature.

Use suitable sample containers

- For sampling use separate sample containers for each type of insulating liquid.
- Sampling devices must be completely clean and dry (no traces of impurities as dust, fibres etc.).

continued on next page
Testing Preparations

Carry out sampling carefully!
- Do not touch with bare hands surfaces of sampling device getting in contact with insulating liquids.
- Let sampled insulating liquid flow into the sample container along its inside wall. Avoid penetration of air.
- Flush sample container with the liquid to be sampled.
- Fill sample container up to 95 to 98% of its volume.
- Protect insulating liquid against contamination and humidity.
- Close sampling port after sampling.

Make sampling report!
Make sampling report with all necessary specifications for designating the samples (eg type of sample: mixed, single or average, temperature, sample no. etc.).
Enclose a copy of the report to each sample.

Shipping and storing sample!
During shipping and storing protect insulating liquid against any influence of light.
Store sample at a dark location.

Pay attention to standards!
Find more information about sampling of insulating liquids in the standards
- IEC 475 / VDE0370 part 3/2.80 and
- IEC 156 / VDE0370 part 5.
4.6 Filling test vessel

Before filling
- The installation site must be dry and free of dust. *Also ref. to section 2.4 Installation, page 22!*
- Carry out test with insulating liquids in state of delivery without drying or degassing.
- Before using test vessel clean it by flushing the vessel with the liquid to be tested (2-3 times).
- Do not touch with bare fingers empty and cleaned test vessel and electrodes as well as surfaces getting in contact with insulating liquids!

 Procedure:

1. Open protective hood.

2. Remove test cell.
   Test cell must comply with selected test standard.

3. Remove lid of test vessel.

Fill test vessel slowly and bubble-free

4. Fill test medium (insulating liquid) into test vessel.
   - Fill insulating liquid to be tested into test vessel slowly and bubble-free.
   - Eventually shake test vessel so that evenly distribution of impurities of the insulating liquid is achieved.
   - Avoid formation of air bubbles.
   - Volume of test vessel = 0.4l

5. Install lid of test vessel again.
**Testing Preparations**

**After filling**

6 Insert test vessel into DPA unit.

**After testing**

When not in use:
Store test vessel in a clean and dry place filled with insulating liquid and protect it against dust (this avoids formation of moisture in the empty test vessel).

**Work carefully!**
Avoid contamination of insulating liquid!
4.7 Carry out DPA test

1. Install and connect calibrator KA75 for high-tension check to the DPA75 unit.

   Find further information in the separate Operating Instruction KA75.

2. Select menu item DPA TEST within menu EXTRA.

3. Confirm black highlighted menu item DPA TEST.

4. Start DPA TEST.

   At a withstand voltage of 40 kV the DPA kV-indication is compared with the indication of the KA75 (max. deviation ±1 kV).
5. Standard Test

5.1 Start standard test

1. Select menu STANDARD.

2. Confirm black highlighted menu item STANDARD.

3. Select desired standard.

4. Confirm black highlighted menu item STANDARD (e.g., IEC 156/95).

Check indicated electrode form and adjusted electrode spacing.

5. Start test cycle.
The test cycle runs fully automatically acc. to selected standard. Duration of the test process depends on the selected test standard.

6 During activated high voltage the red high voltage warning lamp lights up.

7 If needed the test cycle can be canceled at any time using key function STOP.

The test results can be read from display or from printer report if printer is activated.

**Note:**
With standards ASTM D877 and ASTM D1816 an additional test cycle with 5 breakdowns must be carried out, depending on result of 1st test cycle:

Ratio standard deviation to average value $S/M > 10\%$

Note that test vessel must be refilled when applying ASTM D877 standard. Operator is reminded of sample change.
5.2 Indication of test results - standard test

After finished test cycle read test data from display.

1. Indication of further test results.
   (eg single results with multiple tests)

2. Indication of further test results.

3. Indication of further test results.

4. Start a new test cycle acc. to selected standard.

5. Back into the main menu.
5.3 Printer report (option) - standard test

Reading test results from printer report:

test data and evaluation results

REPORT DPA 75 V1.0
26.04.94 09:30

REPORT NR.: 4309

STANDARD: IEC 156/95

ELECTRODES: ...

SPACING: ...

TEMP. 20.5 °C
36.8 °F

S/M 10.6 %

STD. DEV. 7.1

MEAN VALUE 67.2 kV

TEST 6 65.7 kV
TEST 5 > 75.0 kV
TEST 4 66.3 kV
TEST 3 > 75.0 kV
TEST 2 65.0 kV
TEST 1 56.0 kV

> No breakdown happened.
Breakdown voltage higher than 75 kV.

Condition:
If printer is switched off activate it within menu INSTRUMENT SETTING.
6. Customer-specific Test Cycle

6.1 Define and store customer-specific test cycle

1. Select menu STANDARD.

2. Confirm black highlighted menu STANDARD.

3. Select menu item DEFINE TEST CYCLE.

4. Confirm black highlighted menu DEFINE TEST CYCLE.

5. Select respectively define desired test cycle 1, 2, 3, 4 or 5.

   eg TEST CYCLE 1
   All subsequent inputs (steps 7 to 52) are stored under TEST CYCLE 1.

6. Confirm black highlighted menu TEST CYCLE 1.
Only carry out LOAD STANDARD (steps 7, 8, 9 and 10) if the customer-specific test cycle should be derived from an existing standard.

If a standard is loaded single menu items can be changed as desired.

7 Select menu LOAD STANDARD.

8 Confirm black highlighted menu item LOAD STANDARD.

9 Select needed standard used for the desired test cycle.

eg IEC 156/95

10 Confirm black highlighted menu item STANDARD.

1.PAUSE is the setting time after start of test until first switch on of high voltage.

11 Select menu item 1.PAUSE.

12 Confirm black highlighted menu item 1.PAUSE.
13 Select desired time period for 1.PAUSE.

14 Confirm input.

STIRRER 1.PAUSE is the setting time after start of test until first switch on of high voltage.

15 Select menu item STIRRER 1.PAUSE.

16 Confirm black highlighted menu item STIRRER 1.PAUSE.

17 Select desired time period for STIRRER 1.PAUSE.

18 Confirm input.

19 Select menu item kV/s (=voltage rate of rise).

20 Confirm black highlighted menu item kV/s.
21 Select desired value for kV/s.
22 Confirm input.

PAUSE is the break time between the tests, eg break between test 1 and 2.
23 Select menu item PAUSE.
24 Confirm black highlighted menu item PAUSE.
25 Select desired time period for PAUSE.
26 Confirm input.

STIRRER is the break time between the tests, eg break between test 1 and 2.
27 Select menu item STIRRER.
28 Confirm black highlighted menu item STIRRER.
29 Select desired time period for STIRRER.

30 Confirm input.

31 Select menu item NUMBER OF TESTS.

32 Confirm black highlighted menu item NUMBER OF TESTS.

33 Select desired numbers of tests.

34 Confirm input.

Menu MAX. OUTPUT VOLT. is used for limiting the output voltage respectively the load to the sample.

35 Select menu item MAX. OUTPUT VOLT.

36 Confirm black highlighted menu item MAX. OUTPUT VOLT.
37 Select desired value for MAX. OUTPUT VOLT.

38 Subsequently select OK and confirm input.

WITHSTD. VOLT. is the voltage applied between the electrodes during a preset time period (withstand voltage time).

39 Select menu item WITHSTD. VOLT.

40 Confirm black highlighted menu item WITHSTD. VOLT.

41 Select desired value for WITHSTD. VOLT.

Input 00 kV:

No withstd. voltage activated.

42 Subsequently select OK and confirm input.

43 Select desired value for WITHSTAND TIME.

44 Confirm input.
The breakdown voltage can be determined after expiration of the withstanding voltage:

45 Determine breakdown voltage YES/NO:

YES The voltage is increased up to breakdown or until switch-off.

NO The voltage is switched off.

46 Confirm input.

47 Select menu item CALC. MEAN VALUE (with single tests).

48 Confirm black highlighted menu item CALC. MEAN VALUE.

Exclude first or/and last test for calculation of mean value:

For calculation of mean values these values are not considered.

49 Select desired field (FIRST or/and LAST).

50 Confirm selected field (eg LAST).

51 Select OK.

52 Confirm input.
6.2 Start customer-specific test cycle

1. Select menu STANDARD.

2. Confirm black highlighted menu item STANDARD.

3. Select defined test cycle, eg TEST CYCLE 1.

4. Confirm black highlighted menu item TEST CYCLE 1.

Check electrode form and adjusted electrode spacing (indicated acc. to selected standard).

5. Start test cycle.
   The test cycle runs fully automatically acc. to selected standard.

6. During activated high voltage the red high voltage warning lamp lights up.

7. If needed the test cycle can be canceled at any time using key function STOP.
   The test results can be read from display or from printer report if printer is activated.
6.3 Indication of test results - customer-specific test cycle

After finished test cycle read test data from display.

1. Indication of further test results. (eg single results with multiple tests)

<table>
<thead>
<tr>
<th>TEST CYCLE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MEAN VALUE</strong></td>
</tr>
<tr>
<td><strong>STD. DEV.</strong></td>
</tr>
<tr>
<td><strong>S/M</strong></td>
</tr>
<tr>
<td><strong>TEMP.</strong></td>
</tr>
</tbody>
</table>

2. Indication of further test results.

<table>
<thead>
<tr>
<th>TEST CYCLE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEST 1</strong></td>
</tr>
<tr>
<td><strong>TEST 2</strong></td>
</tr>
<tr>
<td><strong>TEST 3</strong></td>
</tr>
<tr>
<td><strong>TEST 4</strong></td>
</tr>
</tbody>
</table>

3. Indication of further test results.

<table>
<thead>
<tr>
<th>TEST CYCLE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEST 5</strong></td>
</tr>
<tr>
<td><strong>TEST 6</strong></td>
</tr>
</tbody>
</table>

4. Start a new test cycle acc. to selected standard.

5. Back into the main menu.
6.4 Printer report (option) - customer-specific test cycle

Reading test results from printer report:

test data and evaluation results

No breakdown happened.
Breakdown voltage higher than 75 kV.

Condition:
If printer is switched off activate it within menu INSTRUMENT SETTING.
7. Single Test

7.1 Start single test

1. Select menu SINGLE TEST.

2. Confirm black highlighted menu item SINGLE TEST.

3. Select desired voltage rate of rise (kV/s).
   (possible input: 0.5 - 1 - 2 - 3 - 5 kV/s)
   Check indicated electrode form and adjusted electrode spacing.

4. Start test cycle.
   The test cycle runs fully automatically.

5. During activated high voltage the red high voltage warning lamp lights up.

6. If needed the test cycle can be canceled at any time using key function STOP.

The test results can be read from display or from printer report if printer is activated.
7.2 Indication of test results - single test

After finished test the test data can be read from the display.

7.3 Printer report (option) - single test

Reading test results from printer report:

test data and evaluation results

**Condition:**

If printer is switched off activate it within menu
INSTRUMENT SETTING.
8. Maintenance and Care

Oil pan
Hold oil pan clean and dry!
For cleaning it is recommended to use a cloth soaked in petroleum ether!

8.1 Replacing mains fuse

1. Pull out mains cable.

2. Open and swing out fuse holder using a screwdriver.

3. Insert new fuses (T4A/250V).

4. Swing in fuse holder until it clicks into place and plug in mains cable.
Changing fuses (US ´ EURO)

1 By pressing the clamp pull out the fuse holder plate.

2 Turn fuse holder plate 180 degrees and insert it again.

3 Insert new fuses:
   US type       Ø 6.3 x 32 mm
   Euro type     Ø 5 x 20 mm

4 Swing in fuse holder until it clicks into place and plug in mains cable.
8.2 Replacing printer ribbon (option)

1 Remove cover.

2 Press down ribbon on left-hand side and insert the new one.

3 Place on cover and snap it into place.
8.3 Replacing printer paper roll (option)

1. Remove cover and ribbon.

2. Press snap fasteners on both side simultaneously and pull out printer.

3. Insert new paper roll:
   Introduce the leading end of the roll into the lower slot - turn transport roll by hand or press right hand key "LF/SEL" (line feed) - until paper roll projects by approx. 5 cm.

4. Insert ribbon and install printer with cover again.
### 9. Spare and Wearing Parts

<table>
<thead>
<tr>
<th>Ident no.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>554-004</td>
<td>Mains cable, SEV 1011-S24507-IEC320/C13</td>
</tr>
<tr>
<td>554-005</td>
<td>Mains cable, safety plug</td>
</tr>
<tr>
<td>554-009</td>
<td>Mains cable, UL 498/C22.2-42 - CEE(22) V</td>
</tr>
<tr>
<td>554-011</td>
<td>Mains cable, BS 1363 - CEE(22) V</td>
</tr>
<tr>
<td>563-023</td>
<td>Glass tube fuse $\phi$ 6.3 x 32 / 4 AT</td>
</tr>
<tr>
<td>565-513</td>
<td>Ink ribbon for printer (purple) - option</td>
</tr>
<tr>
<td>565-514</td>
<td>Paper roll, 2 1/4&quot; (57mm) width, D30, 5m, (option)</td>
</tr>
</tbody>
</table>

When ordering spare parts always specify unit type DPA 75 and serial no. acc. to type plate!
## Test vessels and electrodes

<table>
<thead>
<tr>
<th>Description</th>
<th>Image</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test vessel 0.4l with lid</td>
<td><img src="image" alt="IEC 156 Fig I" /></td>
<td>415-567</td>
</tr>
<tr>
<td>Test vessel 0.4l with lid</td>
<td><img src="image" alt="IEC 156 Fig II" /></td>
<td>415-566</td>
</tr>
<tr>
<td>Test vessel 0.4l with lid</td>
<td><img src="image" alt="ASTM D 877" /></td>
<td>415-568</td>
</tr>
<tr>
<td>Test vessel 0.4l with lid, oil stirrer and setting gauges</td>
<td><img src="image" alt="ASTM D 1816" /></td>
<td>415-585</td>
</tr>
</tbody>
</table>
## Test Standards

### Table I

<table>
<thead>
<tr>
<th>Standard</th>
<th>Shape and dimensions</th>
<th>Spacing (mm)</th>
<th>Tolerance (mm)</th>
<th>Rate of rise kV/s</th>
<th>Interval between filling and first test</th>
<th>Tests on one filling</th>
<th>Tests not evaluated</th>
<th>Interval between tests</th>
<th>Oil circulation</th>
<th>Req. test temp.</th>
<th>Test cell volume</th>
<th>Circuit interrupting within ms</th>
<th>Short circuit current of transformer mA</th>
<th>Peakfactor</th>
</tr>
</thead>
<tbody>
<tr>
<td>International IEC 156/95</td>
<td>12.5 to 13.0 sphere</td>
<td>36 mm diam.</td>
<td>2.5 (0.098)</td>
<td>± 0.05 (0.002)</td>
<td>2 ± 0.2</td>
<td>5 min</td>
<td>6</td>
<td>—</td>
<td>20 °C ± 5°C</td>
<td>350 ml to 600 ml</td>
<td>≤ 5</td>
<td>10 to 25mA at u ≥ 15kV</td>
<td>1.41 ± 0.07</td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>NBN C 27 - 002</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>NEN 10 156</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>SEV 3141/69</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Great Britain BS 5874/1980</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDE 370 part 5/93</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>UNE 21 309/70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>AS 1767/75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southern Africa SABS 555/76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>UTE C27-221/74</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>CEI 10-1/73</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>VDE 0370 part 1/78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td>IRAM 2341/72</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSSR</td>
<td>RVHP 1985</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>PN-77/ED4408</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>JIS C2101/78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>ÖVE-WT Teil2/86</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>ASTM D1816/64a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>ASTM D877/87</td>
<td>disc type 1' diam</td>
<td>2.5 (0.1)</td>
<td>± 0.01 (0.0005)</td>
<td>3 ± 20%</td>
<td>2-3 min</td>
<td>5</td>
<td>1 min</td>
<td>no stirring</td>
<td>Room temp. not less than 20 °C (68°F)</td>
<td>0.91 (0.51)</td>
<td>≤ 83 if Imax &gt; 0.2A 1-10mA/kV interrupting at 2xI+20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>MSZ 20880/74</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>UNE 21309-89</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard</th>
<th>Spacing (mm)</th>
<th>Tolerance (mm)</th>
<th>Rate of rise kV/s</th>
<th>Interval between filling and first test</th>
<th>Tests on one filling</th>
<th>Tests not evaluated</th>
<th>Interval between tests</th>
<th>Oil circulation</th>
<th>Req. test temp.</th>
<th>Test cell volume</th>
<th>Circuit interrupting within ms</th>
<th>Short circuit current of transformer mA</th>
<th>Peakfactor</th>
</tr>
</thead>
<tbody>
<tr>
<td>International IEC 156/95</td>
<td>36 mm diam.</td>
<td>2.5 (0.098)</td>
<td>± 0.05 (0.002)</td>
<td>2 ± 0.2</td>
<td>5 min</td>
<td>6</td>
<td>—</td>
<td>20 °C ± 5°C</td>
<td>350 ml to 600 ml</td>
<td>≤ 5</td>
<td>10 to 25mA at u ≥ 15kV</td>
<td>1.41 ± 0.07</td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Great Britain BS 5874/1980</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDE 370 part 5/93</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southern Africa SABS 555/76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSSR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

● the same as IEC 156/63
11. Index

A
Accessories ............................................................................... 2-2
Adjust contrast of display ........................................................... 3-3
Attention .................................................................................... 4-4

C
Carry out DPA test ..................................................................... 4-9
Changing fuses (US ´ EURO) .................................................... 8-2
Check extent of delivery ......................................................... 2-2
Checking battery state of charge ............................................... 4-1
Cleaning of electrodes ............................................................... 3-6
Construction / Principle .............................................................. 1-3
Contents .................................................................................... 0-7
Control panel ........................................................................... 1-4, 1-7
Control unit ................................................................................ 1-4
Copyright ................................................................................... 0-3
Customer-specific Test Cycle .................................................... 6-1

D
Damage during transport ........................................................... 2-1
Date ........................................................................................... 3-4
Define and store customer-specific test cycle ............................ 6-1

E
Electrode spacing ...................................................................... 4-4
Enter report no. ......................................................................... 4-3
EXTRA ...................................................................................... 1-8

F
Filling test vessel ....................................................................... 4-7
Function and control elements ................................................... 1-5

G
Guide to this Operating Instruction ............................................ 0-3

H
High-voltage transformer .......................................................... 1-4
I
Indication of test results - customer-spec. test ........................... 6-9
Indication of test results - single test ........................................ 7-2
Indication of test results - standard test ..................................... 4-3
Installation ................................................................................. 2-4
INSTRUMENT SETTING .......................................................... 1-7
Interface RS232 ........................................................................ 1-4
Interfaces ................................................................................... 1-9

K
kV/s (=voltage rate of rise) ......................................................... 6-3

L
LOAD STANDARD. ................................................................. 6-2

M
Mains or battery operation optionally ......................................... 3-1
Maintenance and Care ............................................................. 8-1
MAX. OUTPUT VOLT. ............................................................ 6-5
Menu overview .......................................................................... 1-7

N
NUMBER OF TESTS ................................................................ 6-5

O
Oil pan ....................................................................................... 8-1
Option package ......................................................................... 2-2

P
Packing and Delivery ............................................................... 2-1
PAUSE ...................................................................................... 6-4
Plain-paper printer (option) ...................................................... 1-4
Power supply ............................................................................. 1-4
Preface ...................................................................................... 0-4
Printer report (option) - customer-spec. test cycl ..................... 6-10
Printer report (option) - single test ........................................... 7-2
Printer report (option) - standard test ....................................... 5-4
Product Information .................................................................. 1-1
Putting into Operation ............................................................ 3-1

R
RBM switching off ................................................................. 1-11
Replacing mains fuse ................................................................ 8-1
Replacing printer paper roll (option) ........................................... 8-4
Replacing printer ribbon (option) .............................................. 8-3
### S
- Safety Precautions .......................................................... 0-5
- Sampling of insulating liquids ........................................ 4-5
- Selecting language ......................................................... 3-2
- SINGLE TEST ................................................................. 1-8
- Single Test ..................................................................... 7-1
- Spare and Wearing Parts ................................................. 9-1
- STANDARD ....................................................................... 1-8
- Standard Test ................................................................. 5-1
- Start customer-specific test cycle .................................... 6-8
- Start single test ............................................................... 7-1
- Start standard test .......................................................... 5-1
- STIRRER ........................................................................... 6-4
- STIRRER 1.PAUSE .......................................................... 6-3
- Switch on DPA unit ......................................................... 3-1
- Switching printer on/off ................................................. 4-2

### T
- Technical data .................................................................... 1-9
- Test cycle ........................................................................ 1-2
- Test Standards .................................................................. 10-1
- Test vessel and electrodes ............................................... 1-4
- Test vessels and electrodes .............................................. 2-3, 9-2
- Testing Preparations .......................................................... 4-1
- Time ................................................................................ 3-5

### U
- Unpacking ......................................................................... 2-1

### W
- Warranty Terms ............................................................... 0-6
- WITHSTAND TIME. ....................................................... 6-6
- WITHSTD. VOLT. ............................................................. 6-6
Notes