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Product description

1. Proper Use

ELMED ISOTEST[®] test equipment has been exclusively designed for mobile testing of non-porosity of non-conducting or semiconducting materials, especially insulation, and may only be used for this purpose.

- The equipment is not designed to be used for the stationary continuous operation.
- Other use than described above is prohibited.

Please note that



operating the equipment in explosion-hazard environments is strictly forbidden.

Proper use extends on reading these operating instructions as well as meeting all relevant requirements, especially safety regulations. Furthermore, all inspection and maintenance should be performed within the specified time intervals.

During the operation of ISOTEST[®] test equipment, radio equipment or radio services may be affected by radio interference. In these cases, the equipment must not be used. The equipment should always be turned on only for a minimum period of time.

ISOTEST[®] test equipment may only be operated by trained personnel.

If ISOTEST[®] test equipment is not used as described above, safe operation cannot be guaranteed.

The manufacturer does not assume any liability for injuries of persons or damage to equipment if the test equipment is not properly used.

These operating instructions apply to the following test equipment:

ISOTEST inspect 4.0

ISOTEST inspect 8.0

ISOTEST inspect 35



All differences between the model versions are explained separately.

If no differences are explained, the contents of the relevant chapter applies to all versions.

2. Design

All ELMED ISOTEST[®] test equipment is designed for maximum safety. The units are designed and manufactured according to acknowledged safety rules and the current state of art.

The high safety standards guarantee that personnel is protected from electric shock hazards. Potential hazards resulting from pulse voltages in the ISOTEST[®] are clearly below the allowable limits of IEC 479-1 and IEC 479-2.

The basic construction of all ISOTEST[®] test equipment is very similar with respect to the components being used:

Enclosures	Rugged polystyrene enclosure with separate compartment for rechargeable batteries
Carrying Case	Carrying case made of heavy-duty nylon (Cordura) with shoulder belt, split cover for accessory and belly-band as well as bag for the operating instructions.
Power Supply	Easily replaceable lead-acid accumulator (maintenance-free) Lithium battery (safety button and clock)
Deep discharge protection of rechargeable battery	acoustic alarm by piezo buzzer when the operating voltage falls below its allowable minimum plus warning indication in the display and automatic standby after one minute
Operation	Membrane-switch keyboard
Voltage Generation (test voltage)	Processor-controlled switching power supply with high-voltage transformer
Adjustable Test Voltage (with limits)	Spherical spark gap with stepping-motor control and continuous zero calibration or electronic spark gap
Adjustable Test Voltage	Membrane-switch keys
Indication Of Test Voltage	Display
Test Voltage Regulation	Load-dependent, processor-controlled electronic adjustment (continuous)

Load Matching	Freely selectable filter adjustment for optimum matching to individual test conditions
Adjustable Load Matching	Membrane-switch keys/menu
Evaluation of voids	Integral evaluation process
Void indication	Acoustic by piezo buzzer, visual in display
Safety button	Two-stage safety button
	Selectable/menu emergency shutdown function
Pinhole counter	Resettable counter/menu
Language display	Selectable language/menu
Test duration (current)	Resettable counter for the current test duration/menu
Test duration (total)	Display of the overall test duration/menu
Maintenance	Display of next maintenance due date



Maintenance and repair of the test equipment may only be performed by qualified personnel authorized by ELMED. Special care should be taken when opening the unit because metal parts may become accessible that carry voltages considerably higher than the unit's supply voltage.

3. Functional description

By using a high-voltage tester, even the smallest voids can safely be detected. Voids can be pinholes, cracks or weak spots.

Depending on the grounding method employed, the following tests can be performed:

Recognition of voids in non-conducting or semiconducting coatings on electrically conductive carrier material.

Areas of application, e.g.,:	Coating material, e.g.:
Systems for protection of pipelines	Polyethylene (PE) Bitumen
Coatings applied by the manufacturer (internal and external)	Butyl rubber bands Petroleum jelly Gummings Rilsan
Coatings applied in the field	Halar Ceramic
Tanks and containers	Enamel Epoxy resin Powder coatings
	Carrier material, e.g.:
	Fe-based metals Ne-based metals Electrically conductive fillers Electrically conductive fleece Concrete with sufficient residual moisture

Before testing, the test object as well as the ISOTEST[®] test equipment must be grounded.

Subsequently, a suitable testing electrode is moved in close distance to the test object across the latter's entire surface. The test voltage applied to the testing electrode should be chosen according to the coating thickness as well as the relevant standards and manufacturer specifications.

A void is detected by sparking between the testing electrodes and the electrically conductive carrier material as well as an acoustic and visual alarm.

Voids and porosity with or without inclusions can be detected in non-conducting material such as welded or glued seams.

Material types, e.g.	All types of plastic Ceramic
Manufacturing types, e.g.	Foils Plates Enclosures Pipelines Hoses

The test object and the ISOTEST® test equipment are grounded by applying the suitable coating of electrically conductive material. Subsequently, a suitable testing electrode is moved in close distance to the test object across the latter's entire surface. The test voltage applied to the testing electrode is to be chosen according to the coating thickness as well as the relevant standards and manufacturer specifications. A void can be detected by sparking between the test electrode and the conductive ground electrode and is indicated by an acoustic signal and the pinhole indication in the display.

Among others, the following grounding methods can be applied:

- Applying electrically conductive foils and fleeces
- Applying electrically conductive rubber mats
- Filling with electrically conductive liquids or solid matters
- Insertion of a metal wire



Missing or marginal grounding of the ISOTEST® test equipment and/or test object may result in accidents and injury to persons. Chapter "Grounding" contains a detailed description of all possible grounding methods.

4. Technical data

Power Supply

Supply Voltage	Lead-acid accumulator, 6 V/4.5 Ah, with integrated fuse, connecting cable and two-prong safety plug * Lithium battery
Current consumption (load-dependent)	Approx. 0.8 A (2.0 A maximum)
Test duration (cycle operation)	Approx. 9 h
Test duration (continuous operation)	2.5 to 5.5 h

Test voltage

Magnitude of test voltage	0.5 to 4.0 kV, adjustable in steps of 0.5 kV each (inspect 4.0) 0.5 to 8.0 kV, adjustable in steps of 0,5 kV each (inspect 8.0) 5.0 to 35.0 kV, adjustable in steps of 0.1 kV each (inspect 35)
Signal shape	Unipolar high-voltage pulses
Cycle duration	Approx. 10 μ s
Pulse repetition frequency	25 Hz
Current (rms)	Approx. 40 mA

Dimensions and weights (incl. carrying case)

Length	280 mm
Height	270 mm
Width	120 mm
Length of high-voltage cable	1500 mm
Weight, including handle	4.5 kg
Weight of rechargeable battery	0.9 kg
Type of protection	IP 52
Ambient temperature limit:	0°C to +50°C (Heat timing constant: > 10 K/h)



* To avoid fire hazards and damage to the rechargeable battery, the pins of the safety plug must not be shorted under all circumstances.

Even shorting these pins over a short period of time may cause the fuse to blow and prevent from testing the charge state of the rechargeable battery. To ensure proper safety and functionality of the rechargeable battery, defective fuses may only be replaced with original fuses.

5. Performance characteristics

ISOTEST® test equipment excel with the following features:

- Maximum safety of personnel by fiber optic controlled safety button and ground connection monitoring
- Significantly reduced hazards for personnel by pulse-shaped test voltage and processor-controlled, load-dependent supply voltage regulation
- The processor-controlled, load-dependent supply voltage regulation guarantees a constant test voltage even under worst-case load conditions
- The test voltage is adjusted using a self-calibrating spherical spark gap according to DIN EN 60052 or an electronic spark gap
- The high pulse repetition frequency allows testing speeds of up to 300 mm/s
- By making use of extremely short, unipolar high-voltage pulses and a specially designed evaluation circuitry, even the smallest pinholes (channels) and voids can be detected and indicated with only a minimum of material stress
- Residual electrostatic charge on the test object is negligible if the tests are performed correctly
- Pinhole and leakage tests of non-conducting or semiconducting materials
- Testing of completely coated test objects by making use of capacitive grounding
- All ISOTEST® test equipment carries the CE label and meets the requirements of all relevant standards and specifications (DIN EN/ISO, DVGW, etc.)

EC Conformity Declaration

It is herewith confirmed that the products listed below

ISOTEST inspect 8.0
ISOTEST inspect 35

meet the safety requirements within the scope of the conformity evaluation procedure of the related competent authority, which are defined in the regulation 2004/108/EG of the European Council for the approximation of laws of the member states with respect to electromagnetic compatibility. The same applies to the provisions of the law on electromagnetic compatibility of electrical equipment (EMVG) as of 9 November 1992.

This declaration applies to all units that are manufactured in accordance with the appropriate manufacturing documentation which is part of this declaration.

For the evaluation of products regarding the electromagnetic compatibility, relevant harmonized standards have been used.

Immunity: **EN 61000-6-2:2005 including:**
EN 61000-4-2:2009; EN61000-4-3:2006 + A1:2008
IEC 61000-4-2:2008
IEC 61000-4-3:2006 + A1:2007

Emission: **EN 55011:2009** (IEC/CISPR 11:2009 modified)

The devices meet the requirements of class A in the standby mode and are designed for operation in industrial environments. In occurrence of radio interference while using the devices in residential or commercial areas, the use must be kept as short as possible or the device must be switched off.

Design-engineering modifications that have such significant effects on both the technical specifications and the proper use defined in this operation manual so as to change the instrument significantly shall nullify this declaration of conformity.

This declaration has been signed for manufacturer

ELMED Dr. Ing. Mense GmbH, Heiligenhaus

by



Claudia Mense

Managing director

Heiligenhaus, 14th February 2012

General safety information

1. User's responsibility

All ISOTEST® test equipment has been designed and manufactured, considering hazard analyses and compliance with the relevant harmonized standards as well as additional technical specifications. Therefore, ISOTEST® test equipment is state-of-the-art equipment and offers a maximum of safety.

However, this safety level can only be achieved if all required measures have been taken. The user of the test equipment is responsible for planning and performing these measures and for verifying their proper execution.

The user is especially responsible for ensuring that

- ISOTEST® test equipment is only used as intended by the manufacturer (please refer to Chapter "Product Description"),
- the test equipment is only operated if in perfect condition,
- required personal protective equipment is available and being used,
- the operating instructions are always legible and available at the workplaces where the test equipment is used,
- the test equipment is only operated by qualified and authorized personnel,
- this personnel is trained in all aspects of industrial safety and environmental protection, and knows the contents of the operating instructions and the relevant safety regulations,
- no safety labels are removed from the equipment and that all safety labels are clearly legible.

2. Explanation of safety symbols being used in this manual

The following symbols are used in these operating instructions:

- Safety symbols indicate the presence of adjacent safety notes.
- Special symbols indicate important information that should strictly be observed.

This symbol indicates that the relevant action imposes a hazard for life and limb.



Danger

The symbol indicates information provided for improving the understanding of processes.



NOTE

3. Basic safety measures

The basic safety guidelines and regulations of the relevant professional associations apply.

Before turning on the ISOTEST® test equipment, the workplace should be checked for potential obstacles and safety hazards, e.g., tripping hazards.

Intentional or inadvertent touching of a metal part possibly carrying high voltage and an uncontrolled action resulting from this electric shock must not lead to hazard for personnel. This also applies to working on ladders and scaffolds.

Before insertion or removal of testing electrodes, the ISOTEST® test equipment must be turned off using the main switch.

After turning on the unit with the main switch, the area behind the red insulator (electrode clamping device) as well as the testing electrode in the handle must not be touched.

During the tests, suitable work clothes and shoes meeting the requirements of industrial safety regulations should be worn.

If tests are performed in small rooms or containers, the relevant safety regulations and guidelines must be observed (e.g., safety guards).

High-voltage sparks lead to the formation of ozone. To avoid excessive ozone concentrations in rooms or containers, sufficient ventilation must be provided.

Special care should be taken when using high-voltage extension cords or extension bars as this will tamper safety shielding against accidental contact with hazardous live adjacent to the electrode clamping device.

When using circular electrodes for testing the inner side of cylindrical parts, the ISOTEST® test equipment must be turned off during insertion or removal of the electrode.

By using suitable testing electrodes, a test method should be available that avoids touching of the testing electrodes during the tests.

To maintain the high safety standards, only original ELMED accessories such as testing electrodes may be used.

4. Operator requirements

ISOTEST[®] test equipment must not be used by unqualified or unauthorized personnel. Persons who intend to operate the test equipment must have read the operating instructions, especially Chapter "Safety Information", and observe these instructions. These persons must have been trained in the basic regulations on industrial safety and accident prevention.

Operating personal still being in the training phase must not operate the ISOTEST[®] test equipment unless supervised by a sufficiently trained person.

5. Special hazards

Important notice for wearers of a **Heart pacemaker**

During operation of the ISOTEST[®] unit it is necessary to take into consideration a fault in the form of switching over of the heart pacemaker into error mode. It is possible to avoid this effect on heart pacemakers by ensuring that patients with implanted pacemakers do not get closer than 3 m to

- the test unit and the spark gap
- the test electrodes
- the item being tested and all parts connected to it electrically
- and the earthing cable.

Patients with pacemakers must not use this insulation testing equipment!!



A handwritten signature in black ink, appearing to read "M. Lampadius".

Dipl.-Ing. Univ.
Dott./Univ. Bologna
Michael S. Lampadius

Excerpt from the expert opinion of 20.02.1997

Important advice for epileptics

Contact with high voltage or parts which conduct high voltage could lead to epileptic attacks if you are accordingly susceptible to them.

Grounding

To enable safe porosity tests with high voltage, both the ISOTEST® test equipment and the test object shall be grounded.



Independently of the grounding method, all electrical connections should exhibit the lowest resistance possible. The contact surfaces for attaching the clamping tongs should be free from contamination and stain.



To prevent inadvertent pulling of the grounding plug from the ISOTEST® test equipment, the stress relief attached to all grounding cables should be hooked to the snap link at the bag.



When describing the grounding methods, basically both the grounding of the ISOTEST® test equipment and the test object are described.

Depending on the test assignment, the following grounding methods can be employed.

1. Direct grounding

Direct grounding is used when the grounding conductor can be connected to a contact surface free from contamination and stain.

Required accessories:

Standard grounding cable with plug and clamping tongs

Part number: 0174320000 (supplied)

Grounding cable, length of 15 m, with plug and clamping tongs

Part number: 0174200100

Application:

1. Connect the plug of the standard grounding cable to the grounding receptacle of the ISOTEST® test equipment.
Connect the clamping tongs at the other end of the grounding cable to the test object.
2. Connect a pair of clamping tongs of the second grounding cable (part number 0174200100) to the test object.
Connect the second pair of clamping tongs to a ground terminal.
3. Turn the ISOTEST® test equipment on and perform the high-voltage test.

alternatively

Required accessories:

Grounding cable Y - type (clamping tongs - clamping tongs/plug)

Part number: 0174250010

Application:

1. Connect the plug of the Y grounding cable to the grounding receptacle of the ISOTEST[®] test equipment.
2. Connect the clamping tongs at the other end of the grounding cable to the test object.
Connect the second pair of clamping tongs to a ground terminal.
3. Turn the ISOTEST[®] test equipment on and perform the high-voltage test.

alternatively

Required accessories:

Standard grounding cable (Plug/clamping tongs)

Part number 0174320000 (supplied)

Grounding stick with cable, 2 m

Part number 0174200000

Application:

1. Connect the plug of the standard grounding cable to the grounding receptacle of the ISOTEST[®] test equipment.
Connect the clamping tongs at the other end of the grounding cable to the test object.
2. Connect the clamping tongs at the cable from the grounding stick to an accessible area of the test object.
3. Deeply bury the grounding stick in the soil. If the soil is dry, thoroughly water the respective area to obtain a low-resistance connection.
4. Turn the ISOTEST[®] test equipment on and perform the high-voltage test.

2. Special grounding methods

Testing plastic material

In most cases, welding seams will be tested when testing plastic material. To allow using the high-voltage test method, coat the welding seam and/or area with a electrically conductive material (grounding electrode). Attach a grounding electrode to the entire rear of the area to be tested. Pinholes and voids will safely be detected by sparking between the testing electrode and the grounding electrode.

Required accessories:

Grounding foil

Part number 0174500010

Grounding cable Y - type (clamping tongs - clamping tongs/plug)

Part number 0174250010

Application:

1. Cut the grounding foil to the required size.
Tear off the protective foil by holding at the edges, and fold one corner. Glue the remainder of the grounding foil to the entire rear of the welding seam or area to be tested, press against the test object, and remove all air bubbles by wiping. Remove the protective foil step by step.
2. Connect the plug of the Y grounding cable to the grounding receptacle of the ISOTEST[®] test equipment.
3. Attach a pair of clamping tongs at the grounding cable to the folded corner of the grounding foil, and attach the second pair of clamping tongs to ground, ensuring a low-resistance path.
To obtain safe stress relief for the clamping tongs at the folded corner of the grounding foil, secure the grounding foil with adhesive tape, e.g., friction tape.
4. Turn the ISOTEST[®] test equipment on and perform the high-voltage test. Remove the grounding foil after the test.

As an alternative to the grounding foil described above, you can also use electrically conductive fleeces, grounding mats or grounding collars made of electrically conductive rubber for testing of plastic parts.

The leakage test of containers can be performed using electrically conductive liquids, e.g., saltwater, acids, etc.

Welding seams can also be tested by inserting a wire.

Grounding brushes are available for cylindrical test objects.

3. Indirect grounding through the soil

Indirect grounding is used where the distance between the test object and a suitable grounding terminal is greater than 15 m. Typical examples are completely muffled pipelines.

Required accessories:

Trailing ground wire	Part number 0174120000
Grounding stick with cable, 2 m	Part number 0174200000

Application:

1. Connect the plug of the trailing ground wire to the grounding jack of the ISOTEST[®] test equipment.
Spread the bronze spiral of the trailing ground wire (6.5 m) on the soil in full length.
2. Connect the clamping tongs at the cable from the grounding stick to a non-insulated area of the test object.
3. Deeply bury the grounding stick in the soil. If the soil is dry, thoroughly water the respective area to obtain a low-resistance connection.
4. Turn the ISOTEST[®] test equipment on and perform the high-voltage test.

Indirect grounding can only be used if the following conditions are met:

- the test object is grounded
- because of its characteristics, the soil exhibits the required conductivity
 - all types of moist soil are suitable
 - unsuitable are, e.g., dry sand, asphalt, and flags.

4. Capacitive grounding

Capacitive grounding is used where direct or indirect grounding is not possible.

This is the case when the test object has metal carrier material that is inaccessible or consists of completely coated material.

a) Grounding of coated test objects, using grounding collars

Commonly used test objects are pipelines that have been coated in the field after repair and are subject to high-voltage testing.

As there is normally no possibility of direct or indirect grounding, grounding collars offer the only possibility of proper and safe grounding.

Required accessories:

Grounding collar, type 1, for DN 100 - 200

Part number 0174401020

Grounding collar, type 2, for DN 200 - 400 (alternative)

Part number 0174402040

Grounding collar, type 3, for DN 300 - 600 (alternative)

Part number 0174403060

Grounding collar, type 4, for DN 500 - 1000 (alternative)

Part number 0174450100

Grounding stick with cable, 2 m

Part number 0174200000

Application:

1. Wrap the grounding collar tightly (without any air gaps) around the pipe and fix it with the lashing strap. The grounding collar must be aligned such that the two connecting bolts can be used for the connection of the grounding cables.
2. Bury the grounding stick deeply in the soil. If the soil is dry, water the respective area thoroughly to obtain a low-resistance connection.
3. Connect the clamping jaw on the cable of the grounding stick to one of the connecting bolts on the grounding collar.
4. Connect the plug of the standard grounding cable to the ground jack of the ISOTEST[®] test device. The clamping jaw on the other end of the ground cable must be connected to the remaining connection bolt of the grounding collar. The bolts must be metallic bright. The bolts should be free from contamination and stain.
5. Switch the ISOTEST[®] holiday detector on and perform the high-voltage test.

b) Grounding of completely coated test objects by using grounding foil

Required accessories:

Grounding cable Y - type (clamping tongs - clamping tongs/plug)

Part number 0174250010

Grounding foil

Part number 0174500010

Application:


1. The ratio of the areas of the testing electrode to the grounding foil is smaller than 1 : 10. This means that the contact area of the electrodes must not exceed 10% of the foil area.
Cut the grounding foil to the required size.
Tear off the protective foil by holding at the edges, and fold one corner. Glue the remainder of the grounding foil over the entire surface and remove all air bubbles by wiping. Remove the protective foil step by step.
2. Connect the plug of the Y grounding cable to the grounding receptacle of the ISOTEST[®] test equipment. To prevent inadvertent pulling of the plug, hook up the stress relief attached to the grounding cable to the snap link at the equipment bag.
3. Attach a pair of clamping tongs at the grounding cable to the folded corner of the grounding foil, and attach the second pair of clamping tongs to ground, ensuring a low-resistance path. To obtain safe stress relief for the clamping tongs at the grounding foil, secure the clamping tongs with adhesive tape, e.g., friction tape.
4. Turn the ISOTEST[®] test equipment on and perform the high-voltage test.
5. Remove the grounding foil after the test.

Safety button

The functionality and the design of the safety button ensure maximum safety when using the ISOTEST® test equipment. The integral optical waveguide isolates the safety button from all parts that may carry high voltage.

The safety button has two trigger points activated by applying different pressure.

1. Functional description of the safety button

The test voltage is enabled by pressing the safety button at the handle. This is indicated by the high-voltage symbol  .

One of two operating modes can be selected:

Standard mode

In this mode, the trigger points of the safety switch provide the following functions:

Trigger point "1" enables the test voltage

Trigger point "2" enables the test voltage

Safety mode

In this mode, the trigger points of the safety switch provide the following functions:

Trigger point "1" enables the test voltage

Trigger point "2" disables the test voltage (emergency stop function)


- The operating mode is to be selected before putting the system into operation, and depending on the working conditions.
To ensure maximum safety for the user, the safety mode should be selected whenever possible.
- The currently selected operating mode can be checked by using menu option "Safety Button".



Switching between the two operating modes is described in Chapter "Displaying Or Changing Of Menu Options".

2. Functions of the safety button

Trigger point "1" Enabling of test voltage

By pressing the safety button **after** turning on the test equipment with low pressure to exceed the first trigger point, the test voltage is enabled. Whenever the test voltage is present, an acoustic alarm is generated and a high-voltage symbol  in the display.



If the safety button is already pressed **during** power-up of the test equipment, an acoustical alarm is generated and the following message is displayed: "Safety button stuck".

The test voltage is not enabled-

Release the safety button to enable the test voltage. After the error message ("Safety button stuck") is reset, the test equipment is ready for use.

Trigger point "2" Emergency stop function (only if the respective operating mode is selected)

If the safety button is pressed to activate trigger point "2", the test voltage is immediately shut off as long as the safety button is pressed to exceed trigger point "2".

The safety shutdown function described above protects the user, e.g., from muscular induration caused by electric shock.

A shut-off is indicated by an alarm signal and the message "Safety shutdown" in the display.

To enable the test voltage, let go the safety button. After the error message ("Safety button stuck") is reset, the test equipment is ready for use.



The test equipment is factory set to the standard mode.
The emergency stop function is **not** enabled.

Startup

To avoid damage to the ISOTEST[®] test equipment or injuries of persons during power-up, the following precautions must be observed:

- The equipment may only be put into operation by qualified persons observing the safety instructions.

General Startup Procedure

Before putting the test equipment into operation, the following steps should be performed:

- Insert the fully charged battery into the battery compartment and connect the safety lock to the corresponding jacks of the unit
- Close and lock the battery compartment
- Remove any contamination and moisture from the testing electrode, the handle, the accessories and the as connectors
- Check all parts that may carry high voltage for mechanical damage



Damaged parts must not be used!

- Ground the ISOTEST[®] test equipment as described in Chapter "Grounding"
- Ground the test object as described in Chapter "Grounding"
- Select a suitable testing electrode
- Insert the testing electrode or the guiding fork into the electrode clamping device at the handle by following the steps below:
 - Loosen the white cap nut by turning CCW
 - Insert the testing electrode or the guiding fork
 - Fasten the white cap nut by turning CW (hand-screwed)

Insert the extension bars instead of the electrodes into the electrode clamping device at the handle.

Then insert the testing electrode or the guiding fork at the end of the extension into the electrode clamping device as described above.

- Turn the ISOTEST[®] test equipment on
 - Observe the safety instructions
- Check the settings according to the corresponding testing requirements and readjust, if necessary



Safe choice of accessories and testing electrodes

In order to provide for a safe and trouble-free testing it is compulsory to consider all testing conditions and procedures before choosing the necessary accessories and the right size and type of the testing electrodes. The user is responsible for the right choice of accessories and electrode size, for their proper use as well as their related maintenance.



Functional Test:

Before beginning with the tests, establish contact between the testing electrodes and the grounding terminal with the test voltage enabled. When approaching the grounding terminal, sparking should be observed. The distance at which sparking occurs depends on the adjusted magnitude of the test voltage. Alternatively, the functional verification can be performed on a test pore. At the moment of the flashover the acoustic alarm must be audible and the signal "Pore" must be indicated on the display.

Check the settings and modify, if required

All values can be set and changed through keys on the front panel.



Turn the ISOTEST® test equipment on

If the unit is turned on, this is indicated by a hooter.

Calibrating to the test voltage adjusted most recently is indicated in the display.

Calib .

The completion of the calibration procedure is indicated by a hooter alarm.

The current test voltage is indicated in the display.

The battery symbol shows the charge state of the rechargeable battery.

20.0kV

1. Readjusting the test voltage



The value is increased with each key depression.

If the key is pressed over a longer period of time, the value is increased with higher speed.

20.5kV



The value is decreased with each key depression.

If the key is pressed over a longer period of time, the value is decreased with higher speed.

19.5kV



Adjusted values can be confirmed by pressing the ON key or the Menu/Enter key. After subsequent calibration, the unit is ready for use.

Calib .



This is indicated by a hooter alarm.

20.0kV



Instead of confirming a new value by pressing the ON or the Menu/Enter key, of the adjusted voltage value is automatically accepted 10 seconds after the last key depression.

Menu

Because of the well organized menu structure, all settings can be performed easily and safely.
Both the current values as well as all changes are indicated in the display.

The following menu options are available:

- **"Filter settings"**
for optimum matching of the measurement sensitivity to the various load conditions. Six filter stages from "Filt-2" to "Filt+3" are available. The filter function is described in Chapter "Additional Information".
- **"Pinhole counter" - resettable**
All sparks at the electrode that occurred after all the last three sets are displayed. Up to 999 sparks can be counted. Display: PZ 000 to PZ 999
- **Operating mode "Safety button"**
for selecting the operating modes "Standard" or "Safety". Display: Safety button ON/safety button OFF.
- **"Language"**
for the display, the following languages are available: German (DE), English (EN), and French (FR).
- **"Display of the current test duration"**
Resettable counter with display of the test duration after the last reset. Up to 99 h and 59 min can be displayed. Display: ED99:59
- **Display of the "overall test duration"**
Cumulative counter (not resettable) with display of the overall test duration with a maximum value of 9999 h.
Display: ED Σ 9999h
- **"Maintenance schedule"**
Display of the next recommended maintenance deadline.

Displaying and modifying of menu options

By pressing the Menu/Enter key after starting out the unit, the menu options can be selected.



Instead of using the menu as described below, a new value can automatically be accepted 10 seconds after the last key depression. Subsequent date, the unit is again ready for use.

Settings can be checked or modified as described below:



Turn the ISOTEST[®] test equipment on

If the unit is turned on, this is indicated by a hooter.



Calibrating to the test voltage adjusted most recently is indicated in the display. The completion of the calibration procedure is indicated by a hooter alarm.



Calib.

The current test voltage is indicated in the display.



20.0kV

The battery symbol shows the charge state of the rechargeable battery.

Checking and modifying of settings



Press the Menu/Enter key

**First
menu option**

1. Filter

The current filter setting is indicated in the display



The value is increased with each key depression.
(maximum value = +3)

Filt +2



The value is decreased with each key depression.
(minimum value = -2)

Filt +3



The selected value is confirmed by pressing the ON key, and the menu is aborted.
The test equipment is now ready for use.
This is indicated by a hooter alarm.

Filt +1



20.0kV

alternatively:



2x

The selected value is confirmed and the next menu option selected by pressing the Menu/Enter key twice.
This is confirmed by the hooter.

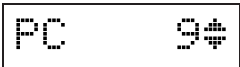


Filt +3

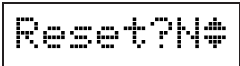
Next menu option

2. Pinhole counter

The display indicates the current status of the pinhole counter (PZ)



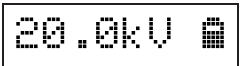
The functions "Delete (Delete?) YES/NO" are selected by pressing the respective key.



The actual status is changed by each key depression.



The selected function is confirmed by pressing the ON key, and the menu is aborted.
The test equipment is now ready for use.
This is indicated by a hooter alarm.

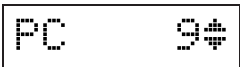


alternatively:



2x

The selected function is confirmed and the next menu option selected by pressing the Menu/Enter key twice.
This is confirmed by the hooter.

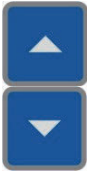


Next menu option

3. Safety shutdown

The display indicates the status of function safety shutdown with „safety button"

First, the display indicates the title (safety button) and subsequently the status of the unit (ON/OFF).



The current mode of the safety button changes with each key depression.



The selected function is confirmed by pressing the ON key, and the menu is aborted.

The test equipment is now ready for use.

This is indicated by a hooter alarm.



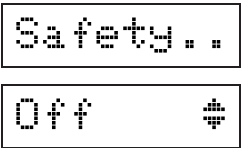
alternatively:



2x

The selected function is confirmed and the next menu option selected by pressing the Menu/Enter key twice.

This is confirmed by the hooter.



Next menu option

4. Language

The display indicates the selected language



Each key depression results in the selection of the next menu option.



The selected function is confirmed by pressing the ON key, and the menu is aborted.

The test equipment is now ready for use.

This is indicated by a hooter alarm.

Language

EN



20.0kV

alternatively:



2x

The selected language is confirmed and the next menu option selected by pressing the Menu/Enter key twice.

This is confirmed by the hooter.



EN

Next menu option

5. Resettable counter

The display indicates the state of the resettable counter with the current test duration

OT99:59+



The "Delete" and "(Delete?)" functions

Reset?N+



YES/NO are selected by pressing a key.
The actual status is changed by each key depression.

Reset?Y+



The selected value is confirmed by pressing the ON key, and the menu is aborted.
The test equipment is now ready for use.
This is indicated by a hooter alarm.



20.0kV

alternatively:



2x

The selected value is accepted and the next menu option selected by pressing the Menu/Enter key twice.
This is confirmed by the hooter.



OT99:59+

Next menu option

6. Overall test duration

The display indicates the counter state with the overall test duration (read-only)



The menu is aborted by pressing the ON key.
The test equipment is now ready for use.
This is indicated by a hooter alarm.



alternatively:

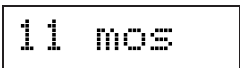
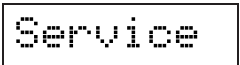


Each depression of the Menu/Enter key results in the selection of the next menu option.

Next menu option

7. Maintenance

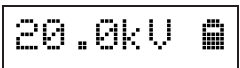
The display indicates the next recommended maintenance deadline (read-only)



First, the display indicates the title (Service in) and subsequently the residual term.



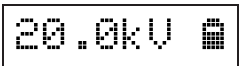
The menu is aborted by pressing the ON key.
The test equipment is now ready for use.



This is indicated by a hooter alarm.



The menu is aborted by pressing the Menu/Enter key.
The test equipment is now ready for use.
This is indicated by a hooter alarm.

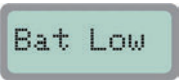
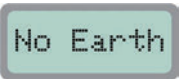
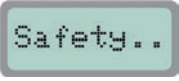



Error messages and troubleshooting (checklist)

Error message: No acoustic signal after pressing the ON key

Possible Causes	Remedy
No rechargeable battery inserted	Insert the rechargeable battery
Discharge the rechargeable battery to below the unit's shut-off threshold	Replace or charge the rechargeable battery
The rechargeable battery is defective	Replace the rechargeable battery or its fuse

Error message: Acoustic signal approx. 3 seconds after pressing the ON key

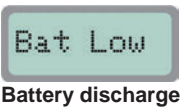

Error Message	Possible Causes	Remedy
 Battery discharged	Low battery charge	Replace or charge the rechargeable battery
 Missing ground	Missing or incorrectly connected grounding plug	The grounding plug should be inserted until it reaches a stop
 Safety button stuck	The safety button was pressed during power-up	Release the safety button during power-up. After the error message is reset, the test equipment is ready for use.

Error Message	Possible Causes	Remedy
 <p>Spark ... Spark gap error</p>	Automatic integration of the spark gap is not possible	Turn the unit off. If the error message is still displayed after the unit was turned on again, ship the unit to the manufacturer for inspection.



Error message: No acoustic signal after pressing the safety button

Possible Causes	Remedy
The unit is not turned on	Turn the unit on (press the ON key)
Automatic shut-off for energy savings was enabled	The unit must be turned on again (press the ON key)
Low voltage of the battery in the handle	Replace the battery (refer to Chapter "Replacing The Lithium Battery")

Error message: Acoustic signal approx. 3 seconds after pressing the safety button without contacting the test object with the electrode

Error Message	Possible Causes	Remedy
 <p>Bat Low Battery discharged</p>	Low battery charge	Replace or charge the rechargeable battery
 <p>Safety... Safety shutdown</p>	The safety mode is enabled	Press the safety button to exceed the first trigger point, or use the standard mode for the safety button.

Error message: Acoustic signal after pressing the safety button and contacting the test object with the electrode

Error Message	Possible Causes	Remedy
<div>Pore </div>	Incorrect filters sittings	<p>Check the filter settings and select a higher filter stage, if required</p> <p>Clean and dry the test object</p> <p>Use a testing electrode with a smaller contact area</p> <p>The coating is electrically conductive and cannot be tested</p>
<div>Safety..</div> <div>Safety shutdown</div>	<p>Continuous sparking over more than 5 seconds</p> <p>The safety mode is enabled</p>	<p>Turn of the unit by pressing the OFF key, and turn on again by pressing the ON key. Avoid continuous sparking</p> <p>Press the safety button to exceed the first trigger point, or use the standard mode for the safety button.</p>
<div>Pore </div>	Void in the test object	Desired result

Repair

1. Storage

If the test equipment is not used over more than 1 week, the following measures should be taken:

- Remove the rechargeable battery from the test equipment and connect to the battery charger. Complete discharge can be avoided by connecting the rechargeable battery to the battery charger.
- Clean the test equipment and the accessories.
- Protect the test equipment and the accessories from damage by storing in a dry room.
The optimum solution for avoiding damage to the test equipment and the accessories is to use an ELMED transportation box (part number 0177200002).
- To avoid condensation at temperatures below the dew point, ensure that the equipment is stored at normal ambient temperature.
Storage temp.: -20°C bis +50°C (Heat timing constant: > 10 K/h)

2. Maintenance

Because of its matured and rugged design, ISOTEST® test equipment from ELMED requires only a minimum of maintenance efforts. However, the following maintenance should always be performed:

- Clean all connectors from contamination.
Clean the test equipment and the accessories, using a soft, dampened or dry cloth. Use only mild detergents.
- Do not touch the high-voltage cable with hot parts and/or parts having sharp edges.
- Always close the carrying case to protect the unit from mechanical damage.
- Do not throw the ISOTEST® test equipment or expose to heavy impact or vibration.

3. Inspections / Calibration

To maintain the high reliability and the high quality standard of ISOTEST® test equipment as long as possible, the equipment should be inspected and calibrated by the manufacturer each year.

Observing recommended inspection intervals contributes to continuous functional safety of the equipment and avoids expensive repair.

During inspections, all equipment functions are checked and the unit is calibrated. The results of an inspection are stored in a database and documented in a manufacturer certificate traceable to the PTB (Physikalisch-Technische Bundesanstalt, the German Bureau of Standards).

A clearly visible label indicates the due date of the next inspection.



Four weeks before the respective deadline, the message "Next maintenance" is displayed for approx. five seconds after powering up the ISOTEST[®] test equipment to assist your company's quality assurance system.

If the schedule for routine maintenance was not observed, this information will also be displayed after turning on the ISOTEST[®] test equipment by an error message ("Maintenance required") as well as the original maintenance due date. This message can be reset by pressing the ON key.

4. Repairs

Damaged components or components that do not perform to their specifications must be replaced immediately. To ensure the unit's safety and functionality, only original spare parts may be used for repair.



ISOTEST[®] test equipment, accumulators and batteries must be disposed of according to legal requirements.

If your ISOTEST[®] test equipment requires inspection or repair, please send the unit with all transportation fees prepaid to:

ELMED Dr.-Ing. Mense GmbH
ISOTEST Service
Weilenburgstrasse 39
42579 Heiligenhaus, Germany



Proper maintenance work and repairs in accordance with the regulations can only be ensured if such work is carried out by the manufacturer or by qualified and authorized service centres.

Additional information



Below, please find a list of terms with explanations that allows better understanding of the operation of the ISOTEST[®] test equipment

1. Definitions of terms

Terms	Explanations
Test object	The object that is to be subject to testing.
Voids	Pinholes or connects in the material to be tested. During a test, voids are indicated by an acoustic and a visual alarm. The display will indicate "Pinhole".
Testing electrodes	Electrically conductive spiral or fan brushes applying the test voltage to the test object.
Capacitive load	The capacitive load depends on the type and thickness of the coating as well as on the contact area of the testing electrode. Thin coatings and large contact areas result in high capacitive load. If the maximum allowable capacitive load is exceeded, a high-voltage arrow will flash in the display.
Ground potential	The reference potential for testing. Ground potential is available through: <ul style="list-style-type: none">- all parts of a building electrically connected to foundation ground- all building parts electrically connected to the potential compensation bus- PE power line conductor- Separate grounding stick (part number 0174200000)
Low-resistance	Contact resistance of less than 10 Ω . Prerequisite: <ul style="list-style-type: none">- Contact surfaces should be free from contamination and stain- Short grounding cable (length of less than 15 m)- Cable a cross-section equal to or greater than 2.5 mm²

To earth	Applying ground potential to the ISOTEST [®] test equipment and the test object.
Grounding	is establishing a low-resistance connection between a point of ground potential to the ISOTEST [®] test equipment and the test object.
Capacitive grounding	Grounding of completely coated test objects by employing the capacitor method. In combination with suitable accessories, the pulse-shaped voltage in the ISOTEST [®] test equipment allows grounding of the test object without a galvanic connection.
Test voltage	<p>The magnitude of the high voltage in kV used to perform the tests. It depends on the type and the thickness of the material to be tested. The following documents contain information about the magnitude of the test voltage:</p> <ul style="list-style-type: none"> - DIN standards - EN standards - Worksheets - Documentation of coating manufacturers
Pulse voltage	is a gated DC voltage. Unipolar high-voltage pulses ensure maximum testing safety with minimum materials stress and without electrostatic charge of the test object.
Filter	<p>Electronic matching to different, capacitive loads.</p> <p>The load conditions depend on:</p> <ul style="list-style-type: none"> - Type and thickness of the material to be tested - Environmental effects such as humidity - Type and size of the testing electrode <p>The tests should be started with filter stage "0". If a continuous acoustic alarm is audible after touching a non-porous test object with the testing electrode, a higher filter stage should be selected until the continuous acoustic alarm is stopped.</p> <p>If the filter is set to its maximum and the continuous acoustic alarm is still audible, the load conditions should be changed by using a different testing electrode or by drying the test object.</p>

	For thin coatings with a thickness of less than 600 µm and test voltages of up to 5.0 kV, filter stage "-2" should be selected in the beginning. Selecting the filter stage does not affect the magnitude of the adjusted test voltage.
Ground connection monitoring	A missing grounding plug in the corresponding jack of the ISOTEST® test equipment is detected electronically and indicated by an acoustic alarm and the message "No ground" in the display. The test voltage cannot be enabled.
Turn-off reminder	Automatic shut-off if the unit was not turned off within 5 minutes after the last depression of the safety button. If the unit should be used again, it must be powered off and on again by pressing the ON key.
Load adjustment	To achieve a maximum operating time per battery charge, the ISOTEST® holiday detectors work with a load-dependent processor-controlled energy control. By a continuous monitoring of the applied load, the energy content of the test voltage is regulated to a value that guarantees a reliable signal when detecting a pore / void. The energy control is reflected in the fact that the audible flashover of the internal spark gap softens under a lower load. Depending on the load, the intensity of the spark varies in its degree in the event of a pore / void. The energy control has <u>no effect</u> on the level of the set test voltage.
Overload	If the flashing of the high-voltage icon in the Display indicates an unsafe load on the ISOTEST® holiday detector, it is no longer guaranteed that the chosen test voltage is applied on the test object. The user has to decide whether the level of the applied test voltage is sufficient for a reliable signal in the event of a pore / void. For the evaluation a sample pore could be helpful. Measures to reduce the load, see checklist „Error messages and troubleshooting“

2. Rechargeable battery


- Lead-acid accumulator (6 V/4.5 Ah)
with integrated fuse, connecting cable and two-prong safety plug

Lead-acid accumulators must never be discharged completely. ISOTEST® test equipment provides visual ("Battery empty") and acoustic alarm whenever there is a risk of complete discharge of the rechargeable battery. If this alarm is generated, the rechargeable battery should be replaced with a charged battery and recharged as soon as possible. To protect the lead-acid accumulator from short circuit, a fuse holder with suitable fuse is mounted on the rechargeable battery, adjacent to the terminal block. Shorting of the plug results causes the fuse to blow.





Blown fuses must not be shunted by wires, nails or similar as this may irreversibly damage the rechargeable battery, should a short circuit occur again. **Fire hazard!**
Damaged rechargeable batteries can only be repaired by the manufacturer.

Battery capacity display

The current capacity of the rechargeable battery inserted into the ISOTEST® is continuously indicated by a battery symbol  in the display.

After turning on the test equipment, a power-on self test is performed during which also the charge state is being checked.

During the self test, the following battery symbol appears in the display: .
After approx. 30 seconds, the current charge state of the rechargeable battery is displayed .

3. Battery chargers

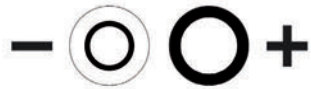
For charging of rechargeable batteries used in the test equipment, different battery chargers are available. The functions and technical data can be found in the manuals for the respective chargers.

Connecting the battery to the universal charger / charging adapter

Open the battery case and pull the plug out of the sockets using the provided grip. Remove the battery from the device using the holder. Do not pull on the cable! Connect the battery to the charger.

The single plug of the Pb battery have contacts of different sizes to prevent them being connected incorrectly.

In order to prevent damage to the fuse of the battery, ensure that the pins of the plug are never shorted or brought into contact with conductive parts of the battery itself.



The battery should be put back into the unit once it has been tested or charged. The cables are to be connected to the ISOTEST[®] unit in the same way as described above for connection to the charger unit.

4. Replacing the lithium battery in the handle

Under standard operating conditions the battery inside the testing handle of the ISOTEST® will last several years.

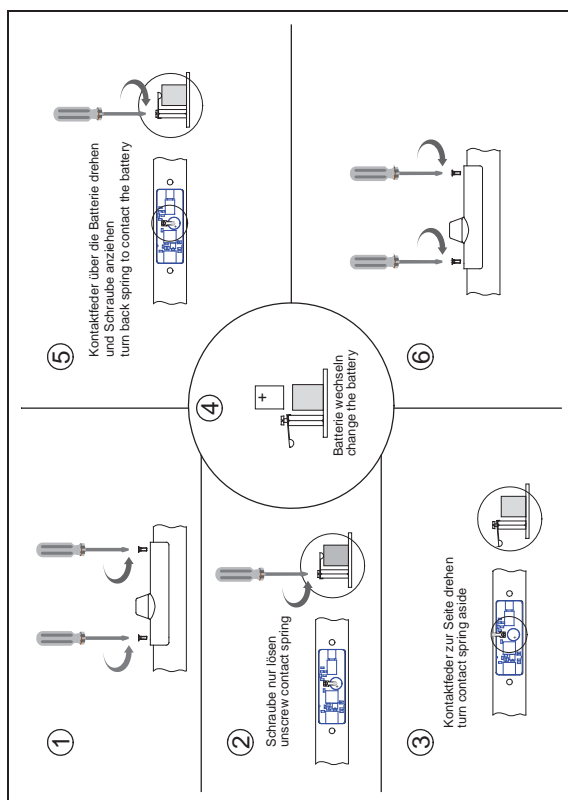
So **before** changing the battery please check if you can hear an acoustic signal after switching the ISOTEST® on.

If this signal is missing not the battery in the handle but the main supply accumulator

inside the device has to be loaded or changed.

In case you can hear an acoustic signal when you first switch on the main switch but you do not hear one if you second press the safety test button you have to change the battery in the handle.

To change the battery please proceed as described on the back page (step 1 to step 6).



5. Extension bars

Extension bars can be supplied in the following forms:

- With electrode clamping device (Fig. 4.3.b ③) and without electrode clamping device (Fig. 4.3.b ②).
- In lengths of 500 mm and 1000 mm.



There is **NO PROTECTION** against flash-overs, neither in the area of the screwed section on the handle of the ISOTEST® unit not in the area of the screwed section of the extension bar.

If for technical reasons it is not possible to exclude the possibility that the tester could come into contact with the extension bar, then only the hand protection ⑥ that is delimited by two plastic rings is to be used. (See Fig. 4.3.a)

Dampness and dirt on the extension bars and the handle can cause flash-overs.

The extension bars and the handle of the ISOTEST® unit must therefore be kept completely clean and dry. This applies in particular if contact by the tester cannot be excluded completely.

In addition, the extension bars must be checked for mechanical damage each time before they are used.

In the simplest case, an extension bar is connected with an electrode clamping device to the handle of the ISOTEST® unit (Fig. 4.3.a). When doing this, it is necessary to ensure that the plastic tube at the end of the extension bar is firmly attached to the plastic nut of the handle. A locator tube ④ must be screwed into the extension bar.

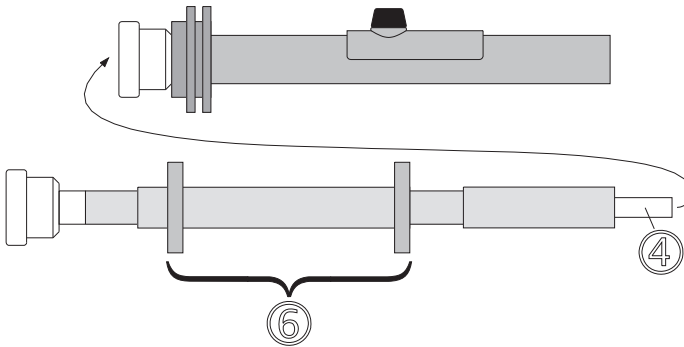


Fig. 4.3.a

Extension bars are connected **to each other** without a locator tube by screwing them inside each other (② and ③ in Fig. 4.3.b). The extension bar ② coupled to the handle ① only requires to be provided with a locator tube ④. The locator tube is only screwed into the extension bars and can be changed easily.

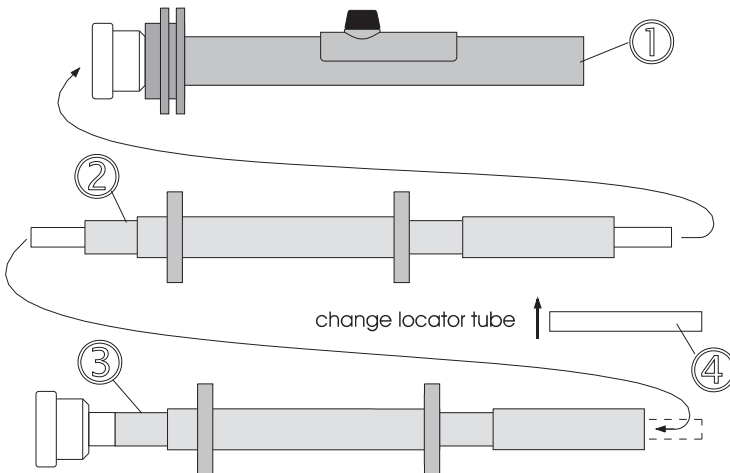


Fig. 4.3.b

Manufacturer certificate

Adjusting the test voltage

The manufacturer or an authorised service centre (see identification number) hereby confirms the proper inspection of the ISOTEST[®] test control unit according to the manufacturer's specifications.

The test voltage was checked using the measuring equipment listed in column "Measuring Equipment".

Observed values / kV:		Test date:
	10/15/20/25/30/35	valid until:
	0.5/1.0/1.5/2.0/2.5/3.0/3.5/4.0	Unit No.:
	1.0/2.0/3.0/4.0/5.0/6.0/7.0/8.0	Inventory No.:
The values that have been checked were within their specified limits.		
Identification number of the authorised service centre:		
Measuring equipment The voltage values are verified with a calibrated spherical spark gap. Calibration mark: The diameter of the balls of the calibrating discharger is 20 mm.		Tester / Company stamp / Date

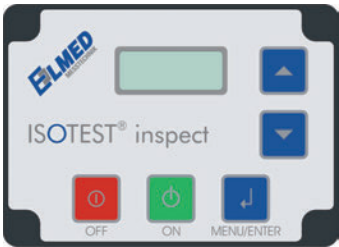
Observed values / kV:		Test date:
	10/15/20/25/30/35	valid until:
	0.5/1.0/1.5/2.0/2.5/3.0/3.5/4.0	Unit No.:
	1.0/2.0/3.0/4.0/5.0/6.0/7.0/8.0	Inventory No.:
The values that have been checked were within their specified limits.		
Identification number of the authorised service centre:		
Measuring equipment The voltage values are verified with a calibrated spherical spark gap. Calibration mark: The diameter of the balls of the calibrating discharger is 20 mm.		Tester / Company stamp / Date

Observed values / kV:		Test date:
	10/15/20/25/30/35	valid until:
	0.5/1.0/1.5/2.0/2.5/3.0/3.5/4.0	Unit No.:
	1.0/2.0/3.0/4.0/5.0/6.0/7.0/8.0	Inventory No.:
The values that have been checked were within their specified limits.		
Identification number of the authorised service centre:		
Measuring equipment The voltage values are verified with a calibrated spherical spark gap. Calibration mark: The diameter of the balls of the calibrating discharger is 20 mm.		Tester / Company stamp / Date

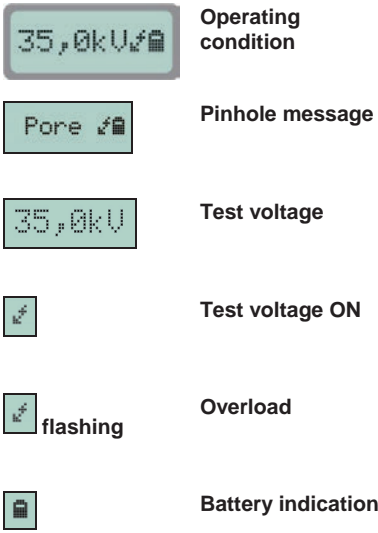
Observed values / kV:		Test date:
	10/15/20/25/30/35	valid until:
	0.5/1.0/1.5/2.0/2.5/3.0/3.5/4.0	Unit No.:
	1.0/2.0/3.0/4.0/5.0/6.0/7.0/8.0	Inventory No.:
The values that have been checked were within their specified limits.		
Identification number of the authorised service centre:		
Measuring equipment The voltage values are verified with a calibrated spherical spark gap. Calibration mark: The diameter of the balls of the calibrating discharger is 20 mm.		Tester / Company stamp / Date

Note:

Overview of controls



Overview of the LC display



Overview of the safety and warning messages

