USER'S MANUAL

GIGATEST pro

ILLKO

V 3.2-EN

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1. INTRODUCTION

1.1. Safety

Read this User's Manual carefully and completely and follow all instructions contained therein. Failure to comply with all warnings and instructions may result in serious damage or destruction of the measuring instrument, damage to the object being measured, or even electric shock!

Explanation of the symbols on the instruments:

Protection class (double insulation)

Danger of electric shock

Warning concerning a point of danger!
Read User's Manual and observe all precautions!

The instrument meets the requirements of relevant European standards

If there is reason to believe that safe operation has become impossible, put the instrument out of operation and secure it against any unintended operation. Safe operation must be presumed to be no longer possible, if:

- The instrument does not operate properly any longer. In this case, we recommend RESET as described in the Chapter 3.6.
- The instrument, cables, connectors, plugs or accessories exhibits visible damages.
- The instrument was stored under unfavourable conditions for a long period.
- The instrument was exposed to extraordinary stress caused by transport.
- The batteries compartment cover is not properly fastened by both screws.

Observe the following safety precautions:

- Make sure that the instrument, measuring cables and all other accessories are in flawless condition, e.g. no damaged insulation, no broken cables or plugs etc.
- Do not touch conductive parts of test tips, crocodiles, test cables etc., even if only one test tip, crocodile, test cable etc. is connected to installation. DANGER OF ELECTRIC SHOCK!
- Only a trained, skilled person, who is familiar with hazardous voltage operations, can handle the instrument.
- It is necessary to respect all safety regulations applicable to particular measurement.
- Use only standard or optional accessories supplied with the instrument by your distributor.
- Do not press any key (unless otherwise stated in this manual) when connecting the instrument to the measured installation.

- The instrument can be used only under conditions that are specified in Technical Specification, see Chapter 5.
- Do not expose the instrument to aggressive gases, vapours, liquids and dust.
- If you have transferred the unit from cold to hot environment, it can cause the condensation. We recommend a short acclimatization.
- If the device will be out of operation for a longer time, it is recommended to remove the batteries. This prevents the possibility of leakage into the device. Leakage can cause serious damage or to destroy the instrument.
- The instrument contains two fairly strong magnets. Do not leave them near the equipment and items that could be damaged by the magnetic field - such as watches, credit cards with magnetic strips, etc.
- Images in this manual are illustrative and may vary from the actual state.

1.2. General description of the instrument

The GIGATESTpro is a compact instrument with a unique system for storing the test tips in the transport position – the sharp tips are safely hidden.
High contrast bright multicolour graphic OLED display ensures excellent legibility. When measured under low light conditions it is possible to illuminate the measured object by a bright white LED light positioned on the front side of the housing.

The GIGATESTpro can measure:

- insulation resistance with voltage 40 V ÷ 1000 V,
- overvoltage protection devices (OPDs): varistor surge protection devices (varistor SPDs) or gas discharger tubes (GDTs) with voltage 40 V ÷ 1000 V,
- DC and AC voltage.

1.3. Standards applied

Measurements:	EMC:	Safety:
EN 61557-1	EN 55022, class B	EN 61010-1
EN 61557-2	EN 61326-1	EN 61010-2-031
	EN 61000-4-2,3,4,5,6	

1.4. Ecology

Shipping case
It is made of cardboard and is recyclable. Please hand it to a collection point of secondary raw materials in accordance with local regulations.
Batteries
Please dispose of used batteries in the designated locations in accordance with local regulations.
The instrument

This symbol on the product, packaging or the accompanying documentation indicates that the product should not be dispose of in municipal waste.
Please dispose of it in accordance with local regulations.

2. DESCRIPTION OF THE INSTRUMENT

2.1. Instrument's case

Fig. 2.1. *Top side*

- Use original accessories only!
- Max allowed voltage between test tip and ground is 300V AC!
- Max allowed voltage between test tips is 440V AC!

When not in use, the instrument's body and the movable test tip can slide one into another in such a way that they form a compact unit, while the sharp end of the measuring tips is safely hidden. Against accidental ejection are both parts secured by non-contact magnetic latch.

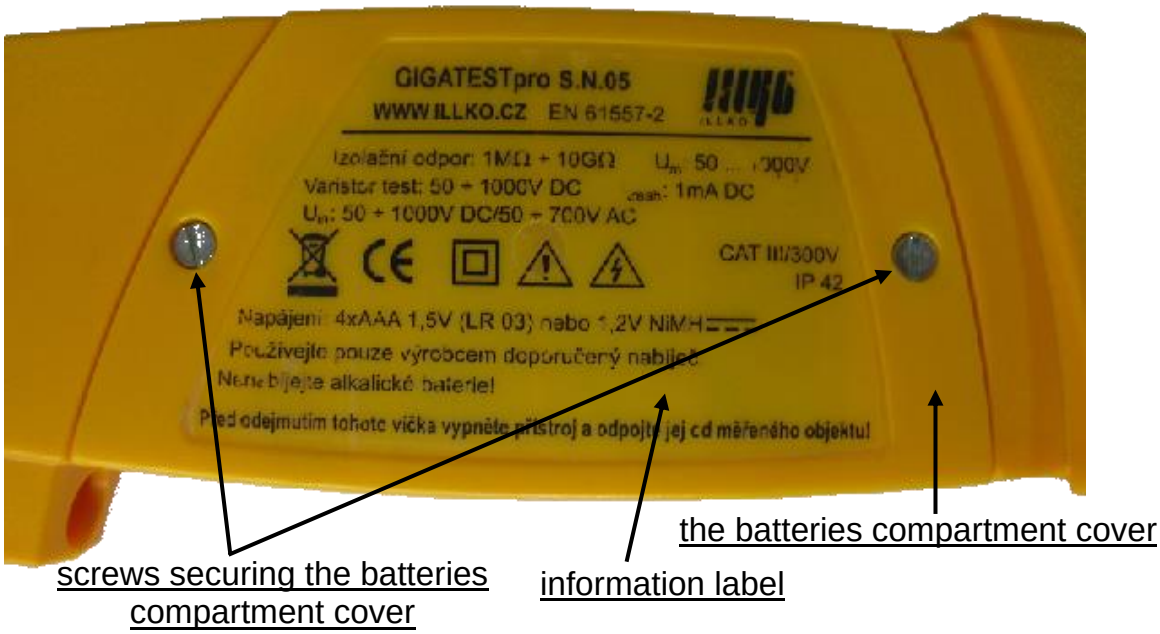

Fig. 2.2. *Detail of bottom side*

2.2. Control panel and OLED display

Graphical OLED display

Turning on and off: a long press of the **START** key turns the instrument on, the instrument can be turned off with two short presses. Measurement and LED: Press and hold the **START** key to start measurement, a short press controls the LED on the front of the instrument.

RISO/USPD key is used to switch between insulation resistance measurement and overvoltage protection device measurement.

FUNC key has no function for RISO measurement, for overvoltage protection device measurement it allows the selection of other functions.

▲ **UTEST** key is used to set measuring voltage or selects the type of overvoltage protection device.

▼ **UTEST** key is used to set the measuring voltage or selects the type of overvoltage protection device.

Fig. 2.3. *Control panel and OLED display*

2.3. Included in the set

GIGATESTpro
Twisted test lead with measuring tip
Pouch
User's Manual
Calibration Certificate
Cardboard shipping case

2.4. Optional accessories

P 5050 – adapter for charging accumulators
P 5060 – set of 4 NiMH AAA accumulators
P 2011 – test lead, black, 2 m
P 3011 – test tip, black
P 4011 – crocodile clip, black

Note: optional accessories P 2011 + P 3011, respectively P 2011 + P 4011 can be connected instead of twisted test lead with measuring tip.

2.5. Putting the instrument into operation

Putting the instrument into operation consists of inserting the batteries or accumulators - the procedure is described in the Chapter 4.1. of this manual.

3. MEASUREMENTS

3.1. Turning the instrument on and off, power saving mode, auto power off

Hold the **START** key pressed until the device turns on.
The instrument is turned off after two short pressing/releasing the **START** button, while no voltage must be applied on the test tips.
The instrument enters power saving mode (reduced display brightness) after about 30 s of inactivity (no key pressed, no voltage applied on the test tips).
From power saving mode (to full display brightness), the instrument enters after pressing any button or by applying the voltage on the test tips.
Auto power off occurs when the instrument is idle (no key pressed, no voltage applied on the test tips) for about a minute.
After turning off the device can be turned on again after about 1s.

3.2. Notes and principles applicable to all measurements

- Select required parameter or function by the **RISO/USPD**, **FUNC**, ▲ **UTEST** and ▼ **UTEST** keys. The **START** key starts measurement. All set parameters and functions remain valid even after the instrument is turned off, until they are changed.

- If voltage applied on the test tips is > about 10 V, its value is displayed in the UIN area and simultaneously warning symbol "**!**" is displayed. In that case, the **START** key cannot be used to start the measurement until the voltage applied on the test tips drops under about 10 V:

Fig. 3.1 *Example of voltage measurement*

- If battery is low (only red part of battery indicator is displayed, see Fig 3.2a), then you can't start the measurement by the **START** key; after pressing it the low battery symbol (see Fig. 3.2b) is displayed for about 1 s. Thereafter, the instrument goes into status before pressing the **START** key. Battery must be replaced / accumulators charged as described in the Chapter 4.1.

- When measuring very high values of insulation resistance, put the test leads in free space, or put them to a pad made of high-quality insulating material.

- Before starting the measurement by the **START** key reliably connect the test tips with the measured object. During the measurement neither early disconnect the test leads nor interrupt the connection with the measured object. Doing so may cause displaying of incorrect values.

Fig. 3.2a *Indication of low battery*

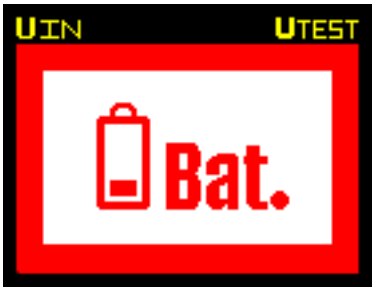

Fig. 3.2b *Low battery after the* ***START*** *key was pressed*

3.3. Measurements of the particular functions

WARNING

- Make sure tested object is deenergized before measurement!
- Do not touch tested object or conductive parts of the test tips during measurement or after measurement, until tested object is discharged – RISK OF ELECTRIC SHOCK!
- Tested object can be charged to voltage up to 1050 V. Do not disconnect the test tips from tested object during or immediately after the measurement. After the measurement is finished, tested object is automatically discharged by the instrument. Voltage drop is indicated on the display simultaneously with warning symbol “!”. Disconnect the test tips when the voltage drops to a safe value, i.e. when warning symbol “!” disappears.
- When measuring the insulation resistance between conductors, all appliances must be disconnected.

3.3.1. Voltage

- Connect the instrument to object under test. Example of connection:

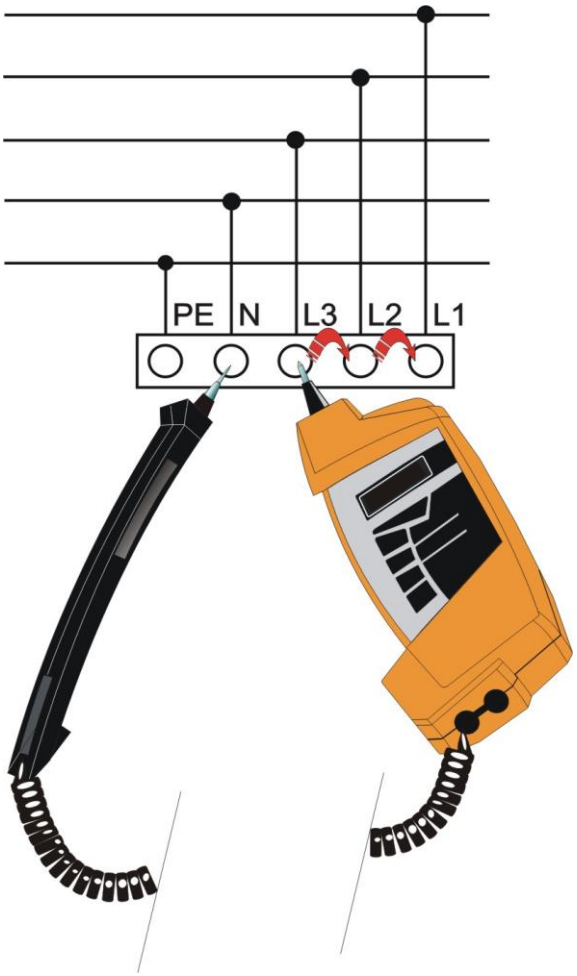

Fig. 3.3 *Example of connection*

- If voltage applied on the test tips is > about 10 V, its value is displayed in the UIN area. For AC voltage, symbol ”~” is displayed. For DC voltage, symbol “+” is displayed if the test tip on instrument’s case is connected to +, or “-” is displayed in case of the opposite polarity. Warning symbol “!” is displayed as well. The **START** key will not start any measurement.

Fig. 3.4a *Example of voltage measurement (RISO function)*

Fig. 3.4b *Example of voltage measurement (USPD function)*

3.3.2. Insulation resistance

- Set RISO function by the **RISO/USPD** key:

Fig. 3.5 *Example of setting for insulation resistance measurement*

- By the ▲ **UTEST** and ▼ **UTEST** keys select the desired nominal test voltage. By short-clicks of the ▲ **UTEST** or ▼ **UTEST** key you can increase or decrease the nominal test voltage in values of 50, 100, 250, 500 and 1000 V. Value of the nominal test voltage is displayed in the UTEST area. To set a different nominal test voltage hold down the key ▲ **UTEST** or ▼ **UTEST** until the voltage starts to rapidly increase or decrease in 1 V step. The exact value then set with short-clicks of appropriate button. After a few seconds after you last pressed the key ▲ **UTEST** or ▼ **UTEST** the instrument goes back to a status where short-clicks can set the nominal test voltage in the values of 50, 100, 250, 500 and 1000 V.

- Connect the instrument to the object under test. An example of connection is shown in Fig. 3.6.

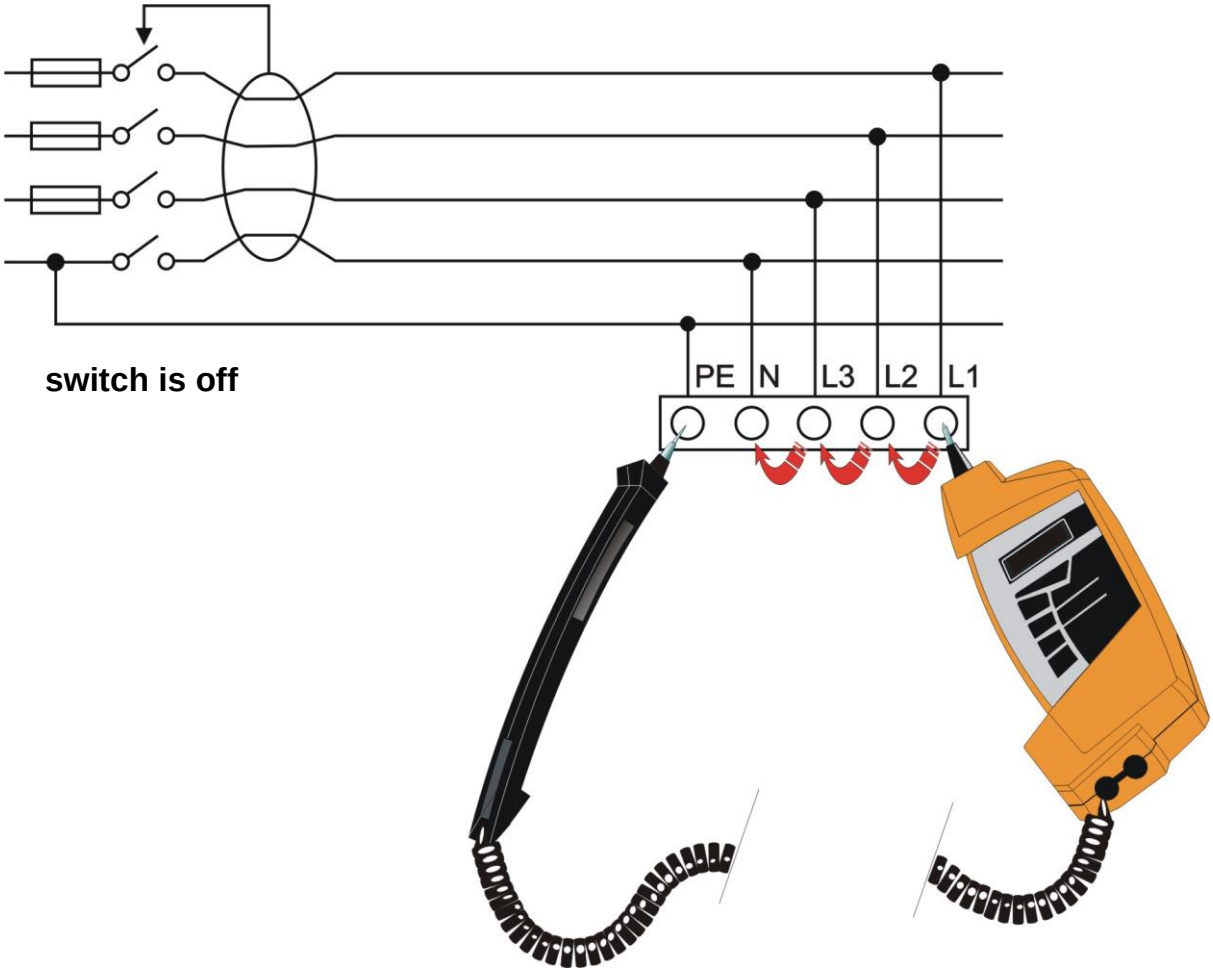

Fig. 3.6 *Example of connection*

Note: If voltage applied on the test tips is > about 10 V, its value is displayed and the **START** key does not start the measurement. See the Chapter 3.3.1. for details. Disconnect applied voltage; only then you can continue in measurement!

- Hold the **START** key pressed until the measurement starts. Then release the key. The increase of the test voltage (at large capacity it can last up to tens of seconds) is displayed in bar graph. The value of the test voltage is displayed in the UIN area. The measuring cycle is completed automatically. Note: If you want the measurement was made longer, it is necessary to hold the **START** key pressed during the whole measurement.
  On the contrary, the automatic measuring cycle may be terminated earlier by short-clicking the START key. The measurement result in this case will not be displayed.

- Read the measured insulation resistance.
  Note: Do not disconnect the instrument from tested object until warning symbol “!” disappears. Tested object is automatically discharged by the instrument and it may take at large capacity up to tens of seconds.

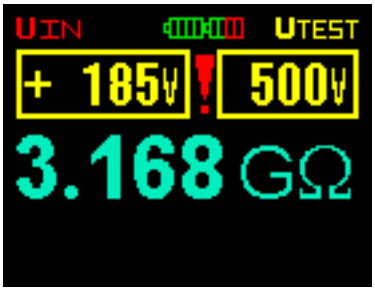

Fig. 3.7a *Example of RISO measurement result (discharging in progress)*

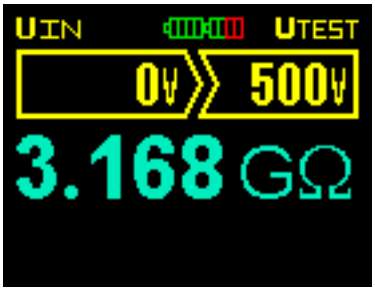

Fig. 3.7b *Example of RISO measurement result (discharged)*

Note: Instrument may make a hissing or whistling sound during measurement.

- If there is a varistor SPD or a GDT in the circuit where the insulation resistance is measured, then the instrument will display the symbol of the varistor SPD and the so-called “voltage at the milliampere point” or the symbol of the GDT and its breakdown voltage on the display.

  Note: The presence of a varistor SPD or a GDT in the measured circuit may cause inadequate result of insulation resistance measurement. An indication of the presence of such an SPD or GDT in the measured circuit can facilitate the decision whether the cause of the inadequate insulation resistance is a fault in the wiring or an SPD or GDT that was not disconnected before the measurement.

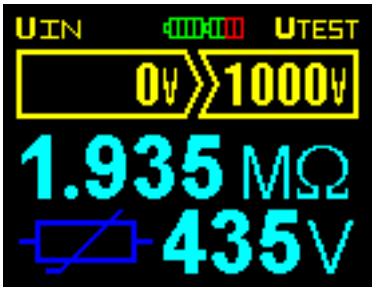

Fig. 3.8a *Example of a measurement result (a varistor SPD is connected in the measured circuit)*

Fig. 3.8b *Example of a measurement result (a GDT is connected in the measured circuit)*

3.3.3. Overvoltage protection devices (OPDs)

When measuring varistor surge protection device (varistor SPD), the instrument generates a gradually rising DC voltage in the range of about 40 V ÷ 1050 V and simultaneously measures the current flowing through the measured varistor SPD. When the current reaches a value of 1 mA, the voltage rise is finished and the varistor voltage (also so-called “voltage at the milliampere point”) of the varistor SPD is displayed.
If gas discharger tube (GDT) is measured, the instrument generates a gradually increasing DC voltage until its sudden drop (due to GDT breakdown). The

magnitude of the voltage just before its sudden drop is breakdown voltage of the GDT.
Based on the characteristics of the measured voltage over the course of the measurement, the instrument *automatically determines* whether a GDT or a varistor SPD was measured.

The **FUNC** key can be used to select the measurement mode of the OPD:

DC – the instrument measures so-called "voltage at the milliampere point" of the varistor SPD or the breakdown voltage of the GDT - without evaluating the functionality of the OPD.

USER – one value of the minimum and maximum voltage of so-called "voltage at the milliampere point" of the varistor SPD or the breakdown voltage of the GDT can be set by the user. After measuring the OPD, the instrument performs an evaluation of the OPD according to these set limits.

SPD LIST – the instrument evaluates the measurements for a specific selected OPD according to the data stored in the OPD database in the instrument memory.
Note: Although the name is "SPD LIST", this list contains both varistor SPDs and GDTs!

According to the function selected by the **FUNC** key the automatic evaluation of measurement result of OPD is carried out, as indicated in the table below.
Table 1: Measurement evaluation depending on the selected function

	The symbol on the display and its meaning	
Selected function		
DC	varistor voltage has been measured	varistor voltage is out of the instrument's measuring range
USER DCMAX USER DCMIN	varistor voltage is inside the user-selected range	varistor voltage is outside the user-selected range
SPD LIST	varistor SPD voltage or GDT breakdown voltage is within the range given by the selected type of OPD	varistor SPD voltage or GDT breakdown voltage is outside the range given by the selected type of OPD

A) OPD measurement according to the list of products and manufacturers:

After selecting the **SPD LIST** function, a specific type of OPD can be selected from the list of products. The display shows the manufacturer and type of the specific OPD, as well as the breakdown voltage range of the GDT (if the OPD block contains it), the voltage range of the varistor voltage (milliampere point of the varistor) and any other information important for the measurement.

If the symbol  is displayed in the description of the OPD, it means that it is a type for which the instructions given by the manufacturer of the OPD must be

observed. It may, for example, be necessary to measure such OPD twice with different connections, etc. If you have any questions regarding the measurement of specific type of OPD, please contact the manufacturer of the respective OPD or its documentation!
Data on specific types of OPDs are stored in the instrument's memory, were obtained from individual manufacturers of OPDs and cannot be edited.

Note: An up-to-date list of OPD types stored in the instruments' memory can be published at www.illko.cz and/or www.illko.com.

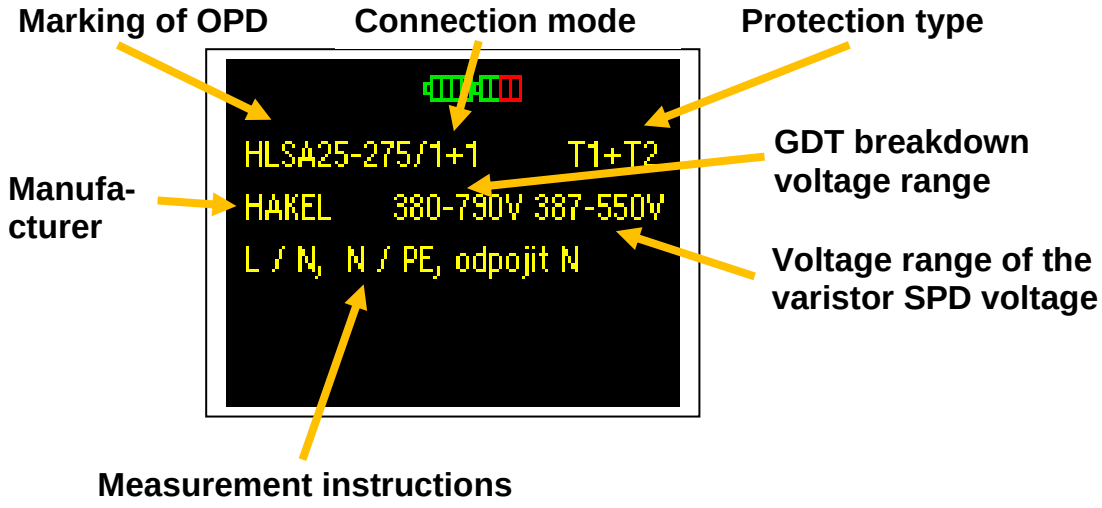

Fig. 3.9 *Example of displaying the selected OPD on the instrument display*

A) Table of the ten last measured types of OPD

The instrument stores in its memory a table of the *last ten measured types of OPD*. This table enables quick selection from the most recently measured types of OPD.

After entering the complete table of OPDs, described above, press the ▼ **UTEST** key. The display shows the first item from the table of the ten most recently measured types of OPDs. It is indicated by the inscription "**Last 10**" in the upper left corner of the display and the yellow bar graph position indicator in the table in the upper right corner of the display. You can scroll through the table of the ten most recently measured types with the ▲ **UTEST** and ▼ **UTEST** keys.
After scrolling with the ▲ **UTEST** a ▼ **UTEST** keys, before the first or after the last item in the table of the ten last measured types, scrolling goes to the complete table of OPDs stored in the instrument's memory, and continues with the next item after the item that was last displayed when entering the menu of the OPDs table.

Re-entry into the table of ten last measured types is possible after a new entry into the menu of the OPDs table. That is, after performing the measurement, after changing the menu with the **FUNC** or **RISO/USPD** keys, or after turning the instrument off and on again and after entering the complete table of OPDs with the ▼ **UTEST** key.

During measurement, the last measured type of OPD is stored in the first place in the table of ten last measured protection types, and the type from the last place in

the table is deleted. When repeatedly measuring the same type of OPD, the item is not saved repeatedly. If an item is measured that is already in the table of the last ten measured types, it is only moved to the first place of the table.

If any item from the last ten measured types of OPDs is shown on the display, it is possible to block further saving in this table by pressing the **RISO/USPD** key. The inscription "**Favourite**" is displayed and the table remains unchanged during further measurements. Using the same procedure, the table can be unblocked again, the inscription "**Last 10**" is displayed and the last measured types are written into the table again.

OPD measurement procedure:

- Use the **RISO/USPD** key to select OPD measurement, use the **FUNC** key to select the **SPD LIST** or **Last 10** function and select the particular OPD.
- Disconnect the measured OPD from the voltage.
- Connect the test tips to the measured OPD. The specific connection method depends on the type and construction of the measured OPD. It can be described in the bottom line of the display or measure according to the OPD circuit diagram from the technical documentation of the OPD manufacturer.

  Note: If a voltage greater than about 10 V is present on the measured OPD, it is indicated on the display and the START key cannot be used to start the measurement. For more details, see chapter 3.3.1. Disconnect the source of this voltage. Only then can the measurement be continued!
- Start the measurement by holding down the **START** key. As soon as the measurement starts, release the button. The increase in current flowing through the OPD is displayed by a bar graph. The value of the measuring voltage is also displayed in the UIN field. The measurement is finished automatically.
- The symbol of the measured element (varistor SPD or GDT) will appear in the lower left corner of the display. The display shows the measured voltage and the evaluation of the measurement (see table 1).

  Note: Do not disconnect the device from the measured OPD while the warning symbol is displayed "!". The possible OPD charge is being discharged.

The character of the measured element (varistor SPD or GDT) is automatically determined by the instrument and its symbol is displayed in the lower left corner of the display (see fig. 3.10).

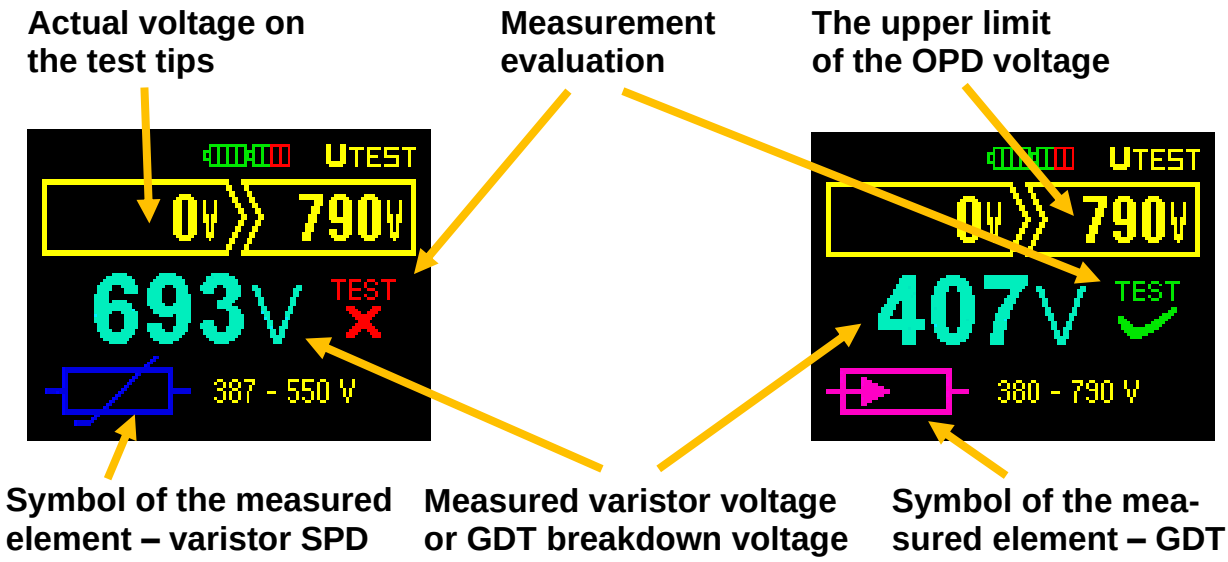

Fig. 3.10 *An example of displaying the measurement result of the selected OPD on the device display*

Notes on the practical execution of OPD measurements:

- *Before measuring, the OPD must be disconnected from the voltage (by switching off the appropriate circuit breaker, main switch, disconnecting the phase conductor, pulling the OPD block from the socket, etc.).*
- *Connect the instrument to the terminals of the OPD block according to the information in the bottom line of the display (if this information is displayed on the display for the selected type of OPD) or according to the product's technical documentation. Incorrect connection to the OPD terminals can cause an incorrect measurement result (e.g. measurement via two varistor SPDs or a varistor SPD and GDT in series).*
- *Measure all protective elements in the OPD block (see example in Fig. 3.11).*
- *If an unsatisfactory result is measured for the OPD protective element in the switchboard, remove the defective part from the switchboard and perform a control measurement of the element itself. When measuring in the switchboard, in some cases the measurement result may be distorted by the flow of the measuring current through other circuits of the electrical installation.*
- *If the optical signalling of a varistor SPD failure is performed using an LED, the polarity of the measuring voltage must be maintained so that the signalling LED remains in the reverse direction. Therefore, if the signalling LED lights up during the measurement, change the measuring tips of the device and perform the measurement with such a polarity of the measuring voltage that the LED does not light up during the measurement.*
- *If the OPD in the switchboard is connected between N and PE, it is necessary to disconnect the N wire before measuring it (by switching off the appropriate circuit breaker or by disconnecting the wire from the terminal of the measured element).*
- *When measuring GDT, the instrument can evaluate the first measurement as a faulty GDT (the measuring current affects the state of the GDT). In*

that case, perform a second (control) measurement immediately afterwards.

We measure: $L_1 \rightarrow$ PEN $L_2 \rightarrow$ PEN $L_3 \rightarrow$ PEN

***Fig. 3.11** Example of varistor SPD 3+0 block measurement*

B) OPD measurement - manual setting of limits

OPD measurement procedure:

- Use the **RISO/USPD** key to select OPD measurement.
- Use the **FUNC** key to select USER DCMIN and use the ▲ **UTEST** and ▼ **UTEST** keys to set the lower voltage limit of the measured OPD.
- Use the **FUNC** key to select USER DCMAX and use the ▲ **UTEST** and ▼ **UTEST** keys to set the higher voltage limit of the measured OPD.
- Disconnect the measured OPD from the voltage
- Connect the test tips to the measured OPD. The specific connection method depends on the type and construction of the measured OPD.

  Note: If a voltage greater than about 10 V is present on the measured OPD, it is indicated on the display and the START key cannot be used to start the measurement. For more details, see chapter 3.3.1. Disconnect the source of this voltage. Only then can the measurement be continued!
- Start the measurement by holding down the **START** key. As soon as the measurement starts, release the button. The increase in current flowing through the OPD is displayed by a bar graph. The value of the measuring voltage is also displayed in the UIN field. The measurement is finished automatically.

- The symbol of the measured element (varistor SPD or GDT) will appear in the lower left corner of the display. The display shows the measured voltage and the evaluation of the measurement (see table 1).

  Note: Do not disconnect the device from the measured OPD while the warning symbol is displayed "!". The possible OPD charge is being discharged.

3.4. Other functions of the instrument

To select the following functions, the instrument must be switched off (unless otherwise specified) and both measuring tips must be disconnected from the measured object. After selecting/setting the relevant function, the instrument switches to the normal operating mode.

Setting the language, displaying the firmware version
When holding down the **RISO/USPD** key, turn on the instrument. The display shows the firmware version (e.g. v 4.0.1) and the currently selected language. Press the ▲ **UTEST** key to select Czech, press the ▼ **UTEST** to select English:

Fig. 3.12 Example of language selection menu

Displaying the serial number of the instrument
When holding down the **FUNC** key, turn on the instrument. The display shows the date the firmware was loaded to the instrument (in MM. YYYY format) and the serial number of the instrument as long as the **FUNC** key is pressed. Additional information (if available) may also be displayed.

Changing the colour of the display of the measured value and the bar graph
When holding down the ▲ **UTEST** or ▼ **UTEST** key, turn on the instrument. As long as the ▲ **UTEST** or ▼ **UTEST** key is pressed, the display lights up with the colour that will be used to display the measured value and the bar graph: ▲ **UTEST** – white colour, ▼ **UTEST** – turquoise colour.

Illumination of the measurement spot with white LED
The instrument must be switched on. LED can be switched on/off by briefly pressing and releasing the **START** key.

3.5. RESET of the instrument

If the instrument does not work correctly as described in this manual, we recommend RESET:
The instrument has to be turned off and both test tips disconnected from any circuit! If you turn the instrument on and it will not restore its proper function, then remove batteries – the procedure is described in the Chapter 4.1., wait at least 10 s and insert set of new batteries. If proper function will not be restored, then remove batteries again – the procedure is described in the Chapter 4.1., put the instrument out of operation and secure it against any unintended operation. Contact service.

4. MAINTENANCE

4.1. Batteries

Dangerous voltage in batteries compartment!

Disconnect both test tips from tested object and turn off the instrument before removing the batteries compartment cover or before connecting jack to the socket for accumulator charger!

The instrument must not be put into operation without the batteries compartment cover properly fastened by both screws!

The instrument uses four AAA either alkaline cells or NiMH accumulators. The batteries/accumulators are continuously monitored, see description in the Chapter 3.2. If batteries/accumulators are low, it must be replaced/charged.

4.1.1. Inserting and replacing the batteries / accumulators

Batteries/accumulators are inserted into the device by unscrewing two screws and removing the batteries compartment cover, see Fig. 2.2. Then remove old batteries/accumulators and insert new ones. Observe correct polarity:

Fig. 4.1 *Correct batteries/accumulators polarity*

Always replace all four batteries/accumulators. Use only high-quality types. Then put the batteries compartment cover back and secure it with two screws.

4.1.2. Charging of accumulators

For charging of accumulators use only adapter supplied as optional accessories!

Accumulators are charged as soon as the adapter is connected to mains and to socket for accumulators charger (see Fig. 2.1). If accumulators are fully discharged, the charging takes about 6 hours (applies to batteries with a capacity of 800 mAh). Prolonged charging is not a problem, however, do not charge accumulators for more than 12 hours.
The charging of the accumulators is indicated by the red light of the LED, which is located on the front of the instrument (see Fig. 2.1).

Notes:

- Do not charge alkaline cells – it may lead to explosion, leakage, etc. This can cause serious damage or destruction of instrument.
- During charging of new accumulators or ones that were unused for a longer period (few months) unpredictable chemical process may arise. As a result, the instrument operation time can be significantly reduced. In this case, we recommend several charge (with optional charger) / discharge (normal use of the instruments) cycles.
  Another way is to use a stand-alone intelligent charger which discharge / charge each cell individually. The discharge / charge cycle is automatically executed, see instruction manual for the charger used.
  After the procedure, the capacity of the accumulators should return to normal. The above-described cycle in stand-alone intelligent charger is recommended every few months to make.
- If after several cycles of the above-described discharge / charge capacity of the accumulators does not return to normal, this may be due to the fact that the one or more accumulators are degraded - whereas, the built-in accumulator charger charges all cells connected in series at the same time, and even one bad (or just different) cell negatively affects the entire accumulator pack.
  It may result in uneven charging of cells, excessive heating of the cell(s) during charging etc.
  In this case, we recommend that a faulty cell is identified with an intelligent stand-alone charger, or at least comparing the voltage of each cell and then a faulty cell replace with a new one.
- The above-described effects can’t be confused with a normal reduction in accumulators’ capacity over time. All accumulators with a growing number of charge / discharge cycles gradually loose capacity. This is normal, depending on accumulator type, the number and parameters of the discharge / charge cycles.

4.2. Cleaning

Disconnect both test tips from tested object and turn off the instrument before cleaning!
Wait until the instrument becomes totally dry before using it!

Use soft cloth, slightly moistened with lukewarm soap water for plastic case cleaning. Do not spill cleaning liquid over the instrument!
Do not use cleaning liquids based on petrol, hydrocarbons etc.!

4.3. Calibration

Measuring instruments should be regularly calibrated. We recommend interval of calibration 1 year. Furthermore, we recommend carrying out calibration after each repair. Contact your local distributor for further information.

4.4. Service

Manufacturer, service:

ILLKO, s.r.o.
Masarykova 2226
678 01 Blansko
Czech Republic

tel./fax: +420 516 417 355
e-mail: illko@illko.cz
http://www.illko.cz

Unauthorized persons are not allowed to open the instrument.
There are no replaceable components inside the instrument, except batteries, refer to the Chapter 4.1.

5. TECHNICAL SPECIFICATION

5.1. Functions

Insulation resistance RISO

Operating range of use @ EN 61557-2: 0,100 MΩ ÷ Rmax*

Measuring range	Resolution	Reference error	Operating error
0,100 MΩ ÷ 9,999 MΩ	0,001 MΩ	±(2 % of R + 10 D)	±(3 % of R + 20 D)
10,00 MΩ ÷ 99,99 MΩ	0,01 MΩ	±(2 % of R + 10 D)	±(3 % of R + 20 D)
100,0 MΩ ÷ 999,9 MΩ	0,1 MΩ	±(2 % of R + 10 D)	±(3 % of R + 20 D)
1,000 GΩ ÷ Rmax*	0,001 GΩ	±(4 % of R + 15 D)	±(5 % of R + 25 D)

* Value of Rmax depends on the nominal test voltage:
Nominal test voltage 40 V ÷ 99 V Rmax = 1,999 GΩ
Nominal test voltage 100 V ÷ 249V Rmax = 3,999 GΩ
Nominal test voltage 250 ÷ 1000 V Rmax = 9,999 GΩ

Nominal test voltage Un: 40 V ÷ 1000 V adjustable in 1 V steps
Open-circuit voltage: (-0% / + 10%) of the Un
Nominal test current: ≥ 1 mA (Utest > Un)
Short-circuit current: < 3 mA
Automatic discharge of tested object: yes
Number of measurements about 250 (with new alkaline cells)

Varistor surge protection devices, gas discharger tubes USPD

Measuring range (V)	Resolution (V)	Reference error	Operating error
40 ÷ 1050	1	±(2 % of R + 2 D)	±(3 % of R + 3 D)

Measuring principle: varistor SPD - increasing DC voltage and simultaneously measures the current through the varistor SPD.
GDT - increasing DC voltage until its sudden drop.

DC and AC voltage (frequency range 45 ÷ 65 Hz)

Measuring range (V)	Resolution (V)	Reference error	Operating error
0 ÷ 600	1	±(2 % of R + 2 D)	±(3 % of R + 3 D)

Notes to the parameters stated in chapter 5.1:
a) Measured AC values are TRMS.
b) R... Reading, D... Digit.

5.2. General data

Power supply	4x AAA alkaline battery 1,5 V or NiMH accumulator 1,2 V	
Measuring category:		
- protective caps of the test tips inserted		CAT III 300 V
- protective cap(s) of the test tip(s) removed		CAT II 600V
Pollution degree		2
Protective class		II (double insulation)
Protection degree		IP 40
Dimensions		about 260x70x40 mm
Weight including batteries and movable test tip		about 0,36 kg
Altitude		≤ 2000 m
Reference conditions	ambient temperature (23 ± 2) °C relative humidity 40 ÷ 60 % (noncondensing) instrument's position arbitrary	
Operating conditions	ambient temperature 0 ÷ 40 °C relative humidity max. 85 % (noncondensing) instrument's position arbitrary	
Storage conditions	ambient temperature -10 ÷ +70 °C relative humidity (noncondensing)	max. 90 % (-10 ÷ 40) °C max. 80 % (40 ÷ 70) °C
	instrument's position arbitrary	