# USER'S MANUAL

# ZEROTEST pro

ILLKO

V 2.0-EN

# Table of Contents

# 1. INTRODUCTION

## 1.1. Safety

**Read this User's Manual carefully and completely and follow all instructions contained therein. Otherwise using of the instrument may be dangerous for operator, for installation under test under test or for the instrument**!

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 / fuse 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 by 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.
- RCD under test can trip-out even if it should not trip-out during particular measurement(s). This may be due, inter alia, too sensitive RCD to short current peaks (applies especially to IΔN = 10 mA and 30 mA types) or faulty RCD or because of a leakage current flow via RCD under test which adds up the differential current generated by the instrument. This may result in interruption of operation of various equipment(s) and cause damage (e.g. loss of data in computers) and / or threats, including threats to life or health (e.g. health facilities). Therefore, we strongly recommend that measurements are carried out in agreement with a person who is responsible for the operation of the object under test and who implement measures to prevent any damage. The simplest such measure (if it is possible) is to turn off such equipment(s).
- 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 slightly from the actual state.

## 1.2. General description of the instrument

The ZEROTESTpro is a compact instrument with a unique system for storing the test tips in the transport position – 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 ZEROTESTpro can measure:
- Fault Loop resistance and prospective fault current
- Fault Loop resistance and prospective fault current (no-trip of an RCD)
- Line resistance and prospective short-circuit current
- AC voltage
- Phase (live) conductor test

The ZEROTESTpro enables to evaluate automatically if measured fault Loop/Line resistance/ comply with selected fuse. Minimal prospective fault current depends on the type, rated current and disconnecting time of the fuse. There is the database (table) of fuses' types/disconnecting times/rated currents in the memory of the ZEROTESTpro. See APPENDIX A of this Manual for details.

## 1.3. Standards applied

| Measurements: | EMC: | Safety: |
|---|---|---|
| ČSN EN 61557-1 | ČSN EN 55022, class B | ČSN EN 61010-1 |
| ČSN EN 61557-3 | ČSN EN 61326-1 | ČSN EN 61010-2-031 |
| | ČSN 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

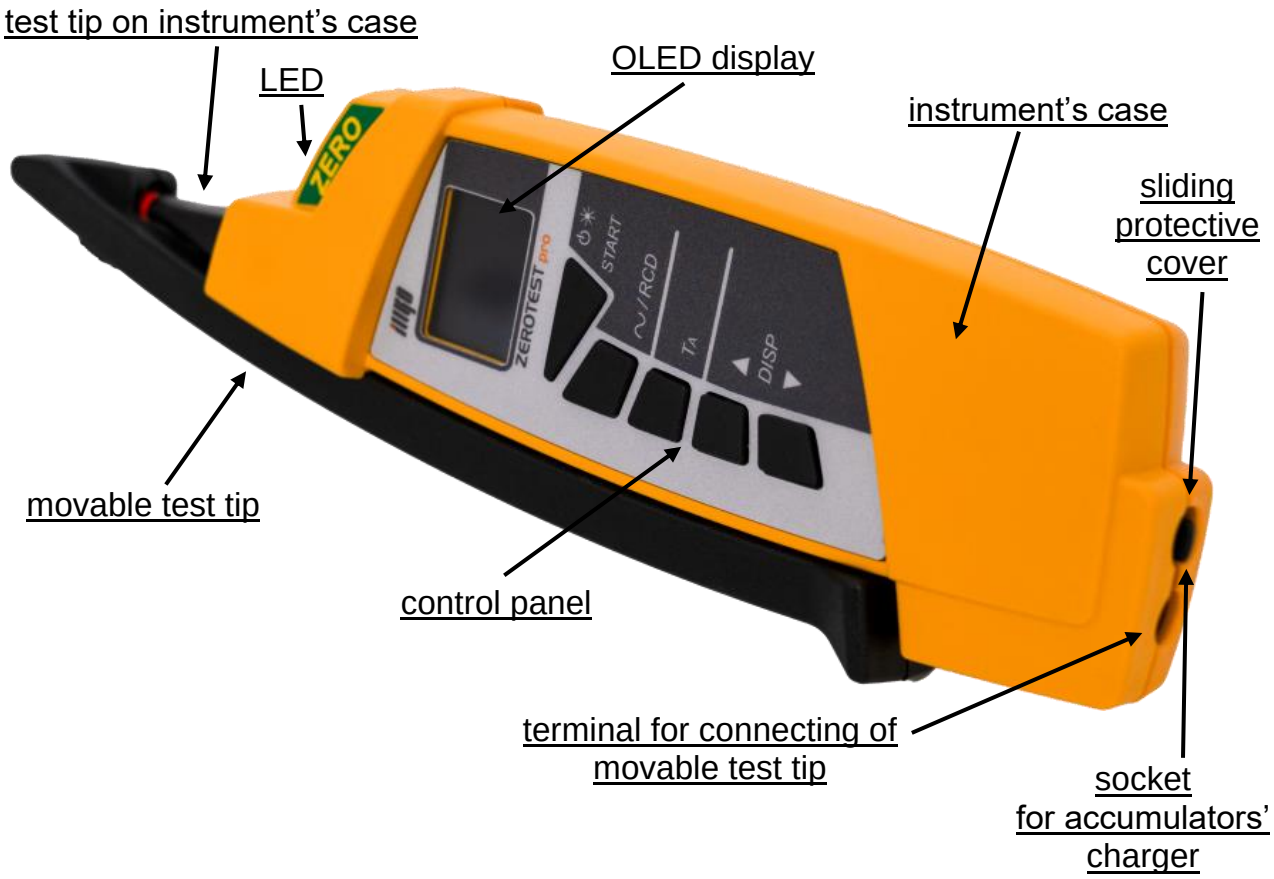


***Fig. 2.1.*** *Top side*

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

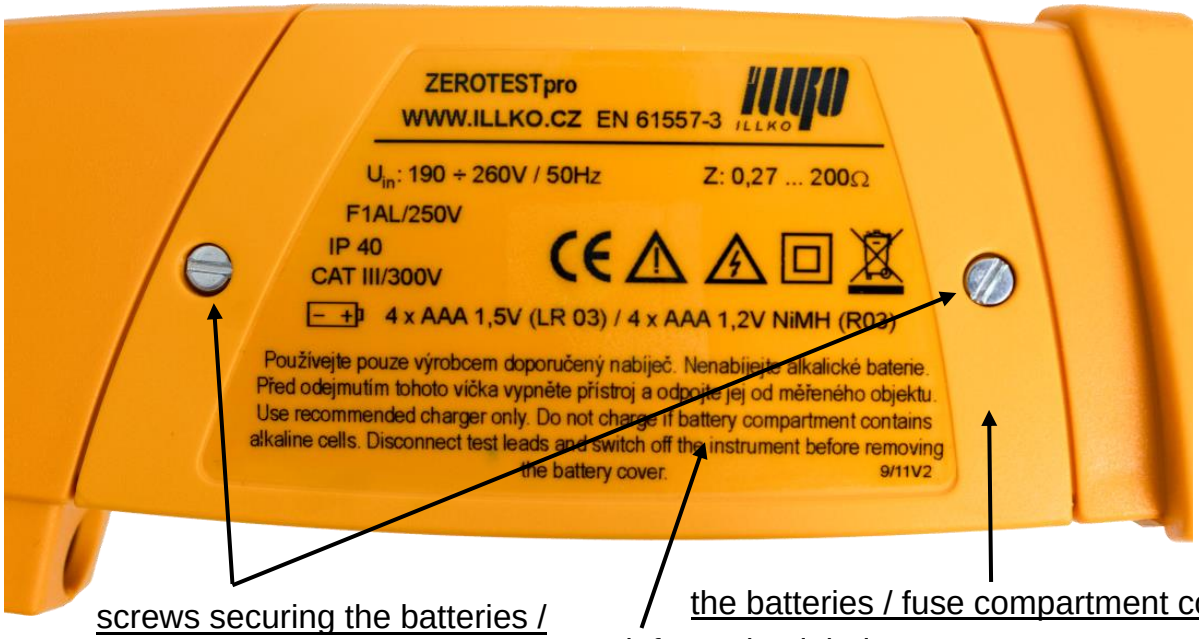


***Fig. 2.2.*** *Detail of bottom side*

## 2.2. Control panel and OLED display

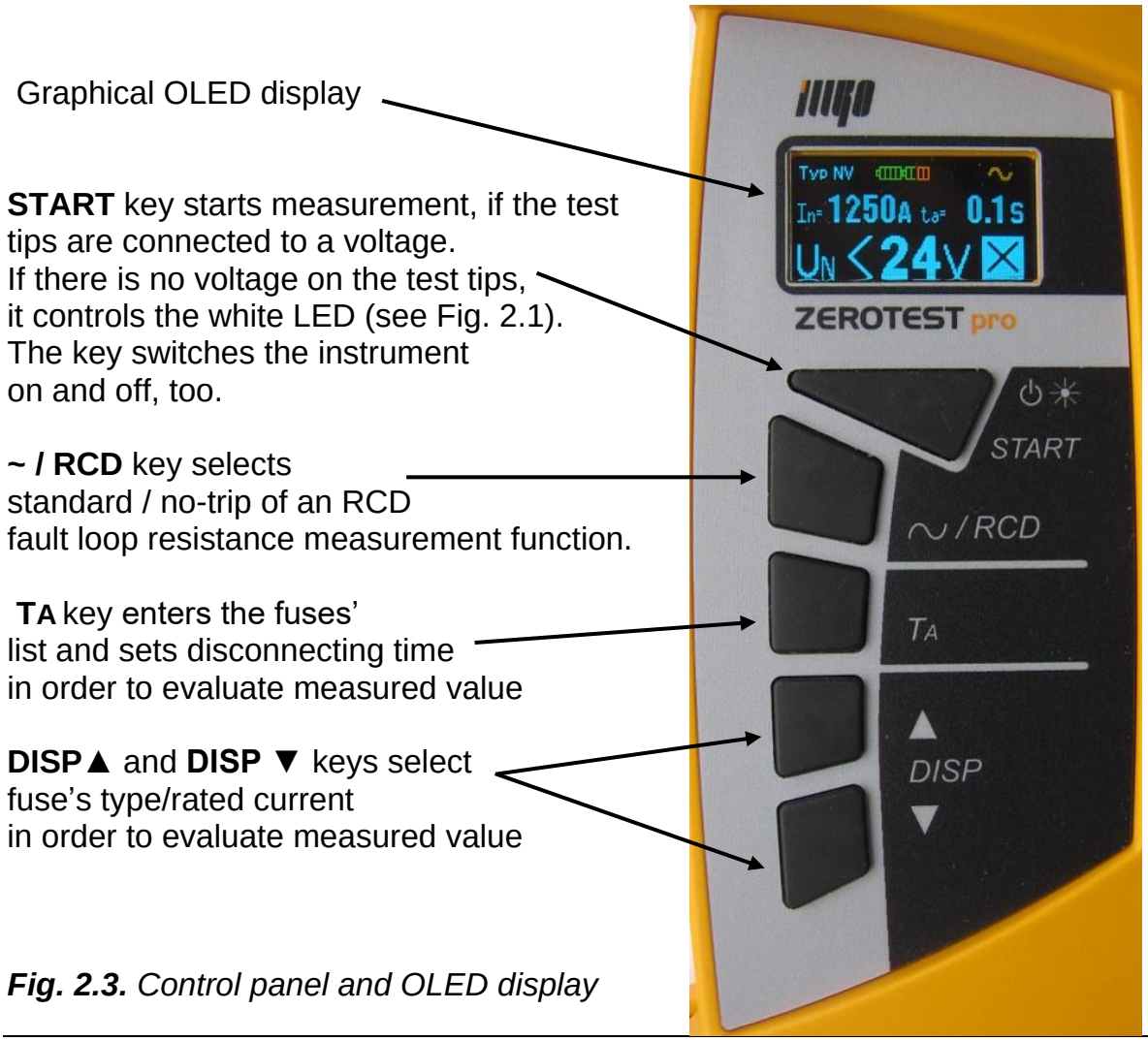


***Fig. 2.3.*** *Control panel and OLED display*

There are two modes how information is displayed in the OLED display:

- Basic mode: there are only measured results displayed with big digits. Evaluation of measured results is disabled.
- Detailed mode: there are both measured results and data from the database (table) of fuses displayed. Evaluation of measured results is enabled.

Some additional information can be displayed in both modes: live conductor symbol and battery indicator.
The description how to select Basic/Detailed mode is in the Chapter 3.5. of this Manual.


***Fig. 2.4a*** *Basic display mode (example)*


***Fig. 2.4b*** *Detailed display mode (example)*

The information displayed may vary according to the function, the voltage which is applied on the test tips, etc.

## 2.3. Included in the set

ZEROTESTpro
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** key, while no voltage can be applied on the test tips.
The instrument enters power saving mode (reduced display brightness) after short time 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 key 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 switched on again after about 1 s.

## 3.2. Notes and principles applicable to all measurements

- Select required parameter or function by the **~ / RCD**, **TA, DISP▲** and **DISP▼** keys. The **START** key starts measurement. All set parameters and functions remain valid until they are changed.

- If a voltage applied on the test tips is < 24 V or > 260 V, the relevant information is displayed and the **START** key does not start measurement. If a voltage applied on the test tips is in range 24 V ÷ 190 V, TRMS value is displayed, but after the **START** key is pressed the measurement does not start and „< 190 V“ is displayed:


***Fig. 3.1a*** *Voltage < 24 V*
*(Basic display mode, example)*


***Fig. 3.1b*** *Voltage < 24 V*
*(Detailed display mode, example)*

- If a voltage applied on the test tips is displayed, but after the **START** key is pressed the symbol of blown fuse is displayed, the measurement is not possible and fuse should be replaced as described in the Chapter 4.1.


***Fig. 3.2*** *The symbol of blown fuse (Detailed display mode, example)*

- If a voltage applied on the test tips is in range 190 V ÷ 260 V, TRMS value is displayed and the **START** key can start the measurement:


***Fig. 3.3a*** *Voltage measurement (Basic display mode, example)*


***Fig. 3.3b*** *Voltage measurement (Detailed display mode, example)*

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


***Fig. 3.4a*** *Indication of low battery (Detailed display mode, example)*


***Fig. 3.4b*** *Low battery after the **START** key was pressed*

- If more consecutive measurements of Loop/Line resistance are done, the red symbol „T“ showing the internal circuits of the instrument are hot can be displayed. With increasing internal temperature, the "T" symbol is coloured in and it starts to enlarge.


***Fig. 3.5a*** *Indication of high temp. (Basic display mode, example)*

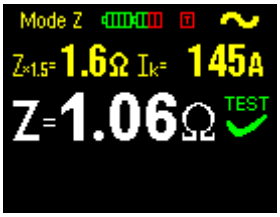


***Fig. 3.5b*** *Indication of high temp. (Detailed display mode, example)*

If the maximal allowable temperature has been exceeded, the STOP icon is displayed instead of “T” symbol and then you can’t start the measurement by the **START** key – after pressing it the overheating symbol is displayed for a while. Thereafter, the instrument goes into status before pressing the **START** key. Allow the instrument to cool down. Cooling can be seen in the gradually narrowing temperature indicator’s area.


***Fig. 3.6a*** *Max. temp. exceeded (the STOP icon)*


***Fig. 3.6b*** *Max. temp. exceeded icon (after the **START** key is pressed)*

- Before starting the measurement by the **START** key reliably connect the test tips to the measured object. Next, check whether the displayed value of the mains voltage is stabilized. During the measurement neither early disconnect the test leads nor interrupt the connection to the measured object. Doing so may cause displaying of incorrect values.

- The instrument evaluates the deviation of the measured values of individual samples obtained during the measurement. If during measurement greater interference in measured mains occurred and measured Loop/Line impedance would be measured/displayed incorrectly, the instrument does not display Loop/Line resistance measurement result, but returns to voltage measurement mode. In this case, start the measurement again.

- Results may be adversely affected and measurement error exceeded if mains voltage is unstable during measurement.

## 3.3. Fault Loop/Line resistance measurement

### 3.3.1. Function “~”

The „~“ function is suitable for Loop resistance measurement if there is no RCD in measured circuit, and for Line resistance measurement.

- Connect the turned-on instrument to L and PE (Loop measurement) or to L and N (Line measurement). Example of connection for measurement of Loop resistance:

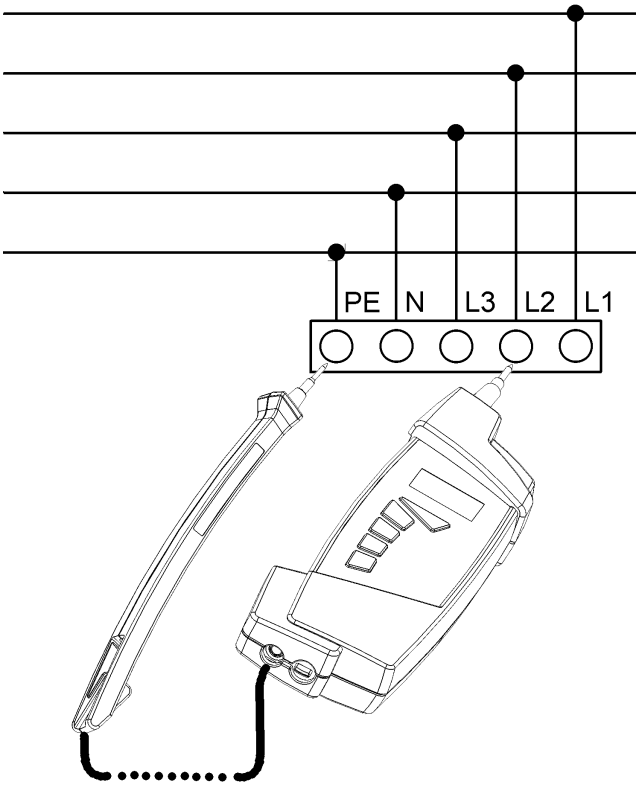


***Fig. 3.7*** *Example of connection - measurement of L2-PE Loop resistance*

- After displayed voltage is stabilized, press and release the **START** key. Ensure good contact between the test tips and the measured object. Measurement will be carried out.

- Result is displayed afterwards:


***Fig. 3.8a*** *Loop measurement result (Basic display mode, example)*

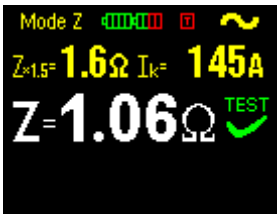


***Fig. 3.8b*** *Loop measurement result (Detailed display mode, example)*

where (Detailed display mode):
Z.....measured Loop/Line resistance [Ω]
Zx1.5... measured Loop/Line resistance multiplied by a factor 1.5 [Ω]
Ik.....calculated prospective fault/short-circuit current: Ik = 230 / (Zx1,5) [A]

- Disconnect the instrument from measured circuit.

**How to display additional measured / calculated results on the display**

Basic display mode - press and release the **DISP▲** or **DISP ▼** key. Following results are displayed successively: calculated prospective fault/short-circuit current, measured Loop/Line resistance multiplied by a factor 1.5, Loop/Line resistance result which takes into account the measurement error and finally measured Loop/Line resistance again.


***Fig. 3.9*** *Example of prospective fault/short-circuit current*


***Fig. 3.10*** *Example of Loop/Line resistance multiplied by a factor 1.5*


***Fig. 3.11*** *Example of Loop/Line resistance result which takes into account the measurement error*


***Fig. 3.12*** *Example of Loop/Line measurement result*

Detailed display mode - by the **DISP▲** key you can display Loop/Line resistance result which takes into account the measurement error. By the **DISP▼** key you can display measured Loop/Line resistance.


***Fig. 3.13*** *Example of Loop/Line resistance result which takes into account the measurement error*


***Fig. 3.14*** *Example of Loop/Line measurement result*

### 3.3.2. Function „RCD“

The „RCD“ function is suitable for Loop resistance measurement in circuits with RCD (no-trip of RCD).

- Connect the turned-on instrument to L and N of measured circuit.

- After displayed voltage is stabilized, press and release the **~ / RCD** key. The measurement of Line resistance is executed (it is necessary to measure it before Loop resistance measurement is executed). Ensure good contact between the test tips and the measured object. After the measurement is finished, the Line resistance measurement result is displayed and the symbol „~“ is replaced with symbol „RCD“.

- Disconnect the test tip from N and connect it to PE (example in Fig. 3.7).

- press and release the **START** key. Ensure good contact between the test tips and the measured object. Measurement will be carried out.

- Result is displayed afterwards:


***Fig. 3.15a*** *Loop measurement result, RCD (Basic display mode, example)*

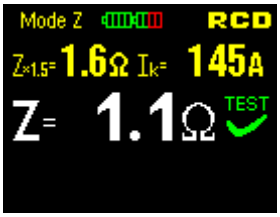


***Fig. 3.15b*** *Loop measurement result, RCD (Detailed display mode, example)*

where (Detailed display mode):
Z..... measured Loop resistance [Ω]
Zx1.5... measured Loop resistance multiplied by a factor 1.5 [Ω]
Ik..... calculated prospective fault current: Ik = 230 / (Zx1,5) [A]

- The instrument sets automatically the function „~“ few seconds after disconnecting the test tips from measured object. To execute another measurement with the „RCD“ function, repeat the whole procedure described in the Chapter 3.3.2.

- To display additional measured / calculated values proceed as described in the part „How to display additional measured / calculated results on the display” in the Chapter 3.3.1.

Notes:
1) If after measurement initialized by the **~ / RCD** key, when you disconnected one test tip from N and connected it to PE and then you pressed the **START** key only the white LED switches on, it means there is no voltage present on the test tips. Please check that you did not connect the test tips to N and PE by mistake and that PE in not broken.
2) RCD under test can trip-out even if “RCD” function is selected! This may be due, inter alia, too sensitive RCD to short current peaks (applies especially to IΔN = 10 mA and 30 mA types) or faulty RCD or because of a leakage current flow via RCD under test.

## 3.4. Automatic evaluation of the measured Loop/Line resistance

The automatic evaluation is enabled in Detailed display mode only!

- There is the database (table) of fuses' types/disconnecting times/rated currents in the memory of the ZEROTESTpro. There are displayed fuse type, rated current and disconnecting time (example in the Fig. 3.16). When the **TA** key is pressed first time, the minimal required fault current is displayed.


***Fig. 3.16.*** *Example of fuse parameters and minimal required fault current*

How to set fuse type and rated current: immediately after the **TA** key is pressed press and release (or hold) the **DISP▲** or **DISP ▼** key. When you set required fuse type and rated current, wait about 5 s. The instrument exits the setting mode and returns back to voltage measurement mode.

How to set disconnecting time: immediately after the **TA** key is pressed press and release it again. When you set required disconnecting time, wait about 5 s. The instrument exits the setting mode and returns back to voltage measurement mode.

When the measurement is executed and the measured Loop/Line resistance is displayed at the same time with the symbol TEST ✓, it means that the prospective fault/short-circuit current is higher than the minimal required value. If the prospective fault/short-circuit current is lower than the minimal required value, the symbol TEST ✗ is displayed instead.

## 3.5. Other functions of the instrument

**Phase (live) conductor test**
If the symbol ✕ is displayed in the right part of the display (Fig. 2.4a and 2.4b), then the connecting of the test tip on instrument's case to phase (live) voltage (movable test tip has to be unconnected) causes a change of symbol ✕ to symbol L.


***Fig. 3.17a*** *Phase voltage present on the test tip (Basic display mode)*


***Fig. 3.17b*** *Phase voltage present on the test tip (Detailed display mode)*

Note: *To avoid wrong results, following prerequisites must be met:*
You have to hold the instrument in hand (palm) in a standard way!
You have to stand on non-insulated floor!
The test tip has to be connected to a voltage at least 2 seconds.
Phase voltage between conductor under test and ground is ≥ 190 V / 45÷ 65 Hz.

**Illumination of measurement point with white LED**
LED can be switched on/off by briefly pressing and releasing the **START** key.
Note: The test tips have to be without applied voltage!

**Basic/Detailed display mode selection; information about firmware version**
The instrument has to be turned off and both test tips disconnected from any circuit!
Press the **~ / RCD** key and keep it pressed, then turn the instrument on. The icons of Basic/Detailed display mode appear. Firmware version (e.g. v 3.0.1) is displayed, too:

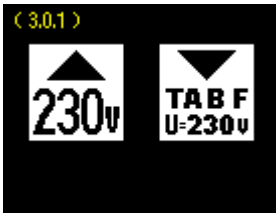


***Fig. 3.18 Basic/Detailed display mode selection; firmware version***

Basic display mode: press the **DISP▲** and release it**.**
Detailed display mode: press the **DISP▼** and release it**.**

**Displaying the serial number of the instrument**

The instrument has to be turned off and both test tips disconnected from any circuit!
When holding down the **$T_A$** 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 **$T_A$** key is pressed. Additional information (if available) may also be displayed. After releasing the keys, the instrument enters the normal operating mode.

## 3.6. 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 and fuse replacement

**Dangerous voltage in batteries / fuse compartment!**

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

**The instrument must not be put into operation without the batteries / fuse 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. There is fuse under batteries / fuse compartment cover. If the fuse is blown, it is indicated on the display, see Chapter 3.2.

### 4.1.1. Inserting and replacing the batteries / accumulators

Batteries/accumulators are inserted into the device by unscrewing two screws and removing the batteries / fuse 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 and the fuse location*

Always replace all four batteries/accumulators. Use only high-quality types.

### 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 processes 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 cannot 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.

### 4.1.3. Replacing the fuse

**Replace the fuse by the same type only:**
**F1A/500 V, breaking capacity 1500 A, dimensions 32x6,3 mm.**
**Using of another type of fuse can cause damage of the instrument and/or operator's safety can no longer be guaranteed!**

For replacing the fuse unscrew two screws and remove the batteries / fuse compartment cover, see Fig. 2.2. Then remove blown fuse from the fuse holder (see Fig. 4.1) with a suitable tool (e.g. a small screwdriver) and put in its place the new fuse. Then put the batteries / fuse compartment cover back and secure it with two screws. Verify the instrument's functionality.

## 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: 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 and the fuse, refer to the Chapter 4.1.

# 5. TECHNICAL SPECIFICATION

## 5.1. Functions

### Fault Loop Resistance / Line Resistance (Function „~“)

Operating range of use @ EN 61557-3: 0,27 Ω ÷ 200 Ω

| Measuring range (Ω) | Resolution (Ω) | Reference error | Operating error |
|---|---|---|---|
| 0,00 ÷ 4,99 | 0,01 | ±(3 % of R + 5 D) | ±(4 % of R + 7 D) |
| 5,0 ÷ 49,9 | 0,1 | ±(3 % of R + 3 D) | ±(4 % of R + 4 D) |
| 50 ÷ 200 | 1 | ±3 % of R | ±4 % of R |

Voltage range: 190 ÷ 260 V / 48 ÷ 52 Hz
Load: 50 Ω (variable no. of load pulses @10 ms)

### Fault Loop Resistance (Function „RCD“)

Operating range of use @ EN 61557-3: 0,8 Ω ÷ 200 Ω

| Measuring range (Ω) | Resolution (Ω) | Reference error | Operating error |
|---|---|---|---|
| 0,0 ÷ 4,9 | 0,1 | ±(5 % of R + 2 D) | ±(6 % of R + 2 D) |
| 5 ÷ 200 | 1 | ±7 % of R | ±8 % of R |

Voltage range: 190 ÷ 260 V / 48 ÷ 52 Hz
Load: 50 Ω (variable no. of load pulses, variable duration)
Note: RCD under test can trip-out even if “RCD” function is selected! This may be due, inter alia, too sensitive RCD to short current peaks (applies especially to IΔN = 10 mA and 30 mA types) or faulty RCD or because of a leakage current flow via RCD under test

### Prospective Fault Current / Short-Circuit Current

| Measuring range | Resolution | Reference error | Operating error |
|---|---|---|---|
| 0 ÷ 999 A | 1 A | Take into consideration error of Loop/Line measurement ± 1 D | Take into consideration error of Loop/Line measurement ± 1 D |
| 1,0 ÷ 9,9 kA | 0,1 kA | | |
| 10 ÷ 23 kA | 1 kA | | |

**AC voltage** (TRMS value)

| Measuring range (V) | Resolution (V) | Reference error | Operating error |
|---|---|---|---|
| 24 ÷ 260 | 1 (Basic disp. mode)<br>0,1 (Detailed disp. mode) | ±(2 % of R + 2 D) | ±(3 % of R + 3 D) |

Frequency range: 48 ÷ 52 Hz

Notes to the parameters stated in chapter 5.1:
a) Stated accuracy of Loop/Line Resistance and Prospective Fault Current / Short-Circuit Current is valid only if mains voltage is stable during measurement.
b) R... Reading, D... Digit.

## 5.2. General data

Power supply 4x AAA alkaline battery 1,5 V or NiMH accumulator 1,2 V

Over voltage class:

| | |
|---|---|
| - protective caps of the test tips inserted | CAT III 300 V |
| - protective cap(s) of the test tip(s) removed | CAT II 300V |
| Pollution degree | 2 |
| Protective class | II (double insulation) |
| Degree of protection | IP 40 |
| Dimensions | about 255x70x40 mm |
| Weight including batteries and movable test tip | about 0,36 kg |
| Altitude | ≤ 2000 m |

| | |
|---|---|
| Reference conditions | ambient temperature (23 ± 2) °C<br>relative humidity 40 ÷ 60 % (noncondensing)<br>mains voltage 230 V ± 2 % / 50 Hz ± 1 %<br>instrument's position arbitrary |
| Operating conditions | ambient temperature 0 ÷ 40 °C<br>relative humidity max. 85 % (noncondensing)<br>mains voltage 190 ÷ 255 V / 45 ÷ 65 Hz<br>instrument's position arbitrary |
| Storage conditions | ambient temperature -10 ÷ +70 °C<br>relative humidity (noncondensing) max. 90 % (-10 ÷ 40) °C<br>max. 80 % (40 ÷ 70) °C<br>instrument's position arbitrary |

# 6. APPENDIX A – Fuse table

**Fuse type NV**

| Rated current (A) | Disconnecting time [s] | | | | |
|---|---|---|---|---|---|
| | 35m | 0.1 | 0.2 | 0.4 | 5 |
| | **Min. prospective short-circuit current (A)** | | | | |
| 2 | 32.5 | 22.3 | 18.7 | 15.9 | 9.1 |
| 4 | 65.6 | 46.4 | 38.8 | 31.9 | 18.7 |
| 6 | 102.8 | 70 | 56.5 | 46.4 | 26.7 |
| 10 | 165.8 | 115.3 | 96.5 | 80.7 | 46.4 |
| 16 | 206.9 | 150.8 | 126.1 | 107.4 | 66.3 |
| 20 | 276.8 | 204.2 | 170.8 | 145.5 | 86.7 |
| 25 | 361.3 | 257.5 | 215.4 | 180.2 | 109.3 |
| 35 | 618.1 | 453.2 | 374 | 308.7 | 169.5 |
| 50 | 919.2 | 640 | 545 | 464.2 | 266.9 |
| 63 | 1217.2 | 821.7 | 663.3 | 545 | 319.1 |
| 80 | 1567.2 | 1133.1 | 964.9 | 836.5 | 447.9 |
| 100 | 2075.3 | 1429 | 1195.4 | 1018 | 585.4 |
| 125 | 2826.3 | 2006 | 1708.3 | 1454.8 | 765.1 |
| 160 | 3538.2 | 2485.1 | 2042.1 | 1678.1 | 947.9 |
| 200 | 4555.5 | 3488.5 | 2970.8 | 2529.9 | 1354.5 |
| 250 | 6032.4 | 4399.6 | 3615.3 | 2918.2 | 1590.6 |
| 315 | 7766.8 | 6066.6 | 4985.1 | 4096.4 | 2272.9 |
| 400 | 10577.7 | 7929.1 | 6632.9 | 5450.5 | 2766.1 |
| 500 | 13619 | 10933.5 | 8825.4 | 7515.7 | 3952.7 |
| 630 | 19619.3 | 14037.4 | 11534.9 | 9310.9 | 4985.1 |
| 710 | 19712.3 | 17766.9 | 14341.3 | 11996.9 | 6423.2 |
| 800 | 25260.3 | 20059.8 | 16192.1 | 13545.1 | 7252.1 |
| 1000 | 34402.1 | 23555.5 | 19356.3 | 16192.1 | 9146.2 |
| 1250 | 45555.1 | 36152.6 | 29182.1 | 24411.6 | 13070.1 |

**Fuse type gG**

| Rated current (A) | Disconnecting time [s] | | | | |
|---|---|---|---|---|---|
| | 35m | 0.1 | 0.2 | 0.4 | 5 |
| | **Min. prospective short-circuit current (A)** | | | | |
| 2 | 32.5 | 22.3 | 18.7 | 15.9 | 9.1 |
| 4 | 65.6 | 46.4 | 38.8 | 31.9 | 18.7 |
| 6 | 102.8 | 70 | 56.5 | 46.4 | 26.7 |
| 10 | 165.8 | 115.3 | 96.5 | 80.7 | 46.4 |
| 13 | 193.1 | 144.8 | 117.9 | 100 | 56.2 |
| 16 | 206.9 | 150.8 | 126.1 | 107.4 | 66.3 |
| 20 | 276.8 | 204.2 | 170.8 | 145.5 | 86.7 |
| 25 | 361.3 | 257.5 | 215.4 | 180.2 | 109.3 |
| 32 | 539.1 | 361.5 | 307.9 | 271.7 | 159.1 |
| 35 | 618.1 | 453.2 | 374 | 308.7 | 169.5 |
| 40 | 694.2 | 464.2 | 381.4 | 319.1 | 190.1 |

| | | | | | |
|---|---|---|---|---|---|
| 50 | 919.2 | 640 | 545 | 464.2 | 266.9 |
| 63 | 1217.2 | 821.7 | 663.3 | 545 | 319.1 |
| 80 | 1567.2 | 1133.1 | 964.9 | 836.5 | 447.9 |
| 100 | 2075.3 | 1429 | 1195.4 | 1018 | 585.4 |

**Fuse type B**

| Rated current (A) | Disconnecting time [s] | | | | |
|---|---|---|---|---|---|
| | 35m | 0.1 | 0.2 | 0.4 | 5 |
| | **Min. prospective short-circuit current (A)** | | | | |
| 6 | 30 | 30 | 30 | 30 | 30 |
| 10 | 50 | 50 | 50 | 50 | 50 |
| 13 | 65 | 65 | 65 | 65 | 65 |
| 16 | 80 | 80 | 80 | 80 | 80 |
| 20 | 100 | 100 | 100 | 100 | 100 |
| 25 | 125 | 125 | 125 | 125 | 125 |
| 32 | 160 | 160 | 160 | 160 | 160 |
| 40 | 200 | 200 | 200 | 200 | 200 |
| 50 | 250 | 250 | 250 | 250 | 250 |
| 63 | 315 | 315 | 315 | 315 | 315 |

**Fuse type C**

| Rated current (A) | Disconnecting time [s] | | | | |
|---|---|---|---|---|---|
| | 35m | 0.1 | 0.2 | 0.4 | 5 |
| | **Min. prospective short-circuit current (A)** | | | | |
| 0.5 | 5 | 5 | 5 | 5 | 2.7 |
| 1 | 10 | 10 | 10 | 10 | 5.4 |
| 1.6 | 16 | 16 | 16 | 16 | 8.6 |
| 2 | 20 | 20 | 20 | 20 | 10.8 |
| 4 | 40 | 40 | 40 | 40 | 21.6 |
| 6 | 60 | 60 | 60 | 60 | 32.4 |
| 10 | 100 | 100 | 100 | 100 | 54 |
| 13 | 130 | 130 | 130 | 130 | 70.2 |
| 16 | 160 | 160 | 160 | 160 | 86.4 |
| 20 | 200 | 200 | 200 | 200 | 108 |
| 25 | 250 | 250 | 250 | 250 | 135 |
| 32 | 320 | 320 | 320 | 320 | 172.8 |
| 40 | 400 | 400 | 400 | 400 | 216 |
| 50 | 500 | 500 | 500 | 500 | 270 |
| 63 | 630 | 630 | 630 | 630 | 340.2 |

**Fuse type K**

| Rated current (A) | Disconnecting time [s] | | | | |
|---|---|---|---|---|---|
| | 35m | 0.1 | 0.2 | 0.4 | |
| | **Min. prospective short-circuit current (A)** | | | | |
| 0.5 | 7.5 | 7.5 | 7.5 | 7.5 | |
| 1 | 15 | 15 | 15 | 15 | |
| 1.6 | 24 | 24 | 24 | 24 | |
| 2 | 30 | 30 | 30 | 30 | |
| 4 | 60 | 60 | 60 | 60 | |
| 6 | 90 | 90 | 90 | 90 | |
| 10 | 150 | 150 | 150 | 150 | |
| 13 | 195 | 195 | 195 | 195 | |
| 16 | 240 | 240 | 240 | 240 | |
| 20 | 300 | 300 | 300 | 300 | |
| 25 | 375 | 375 | 375 | 375 | |
| 32 | 480 | 480 | 480 | 480 | |

**Fuse type D**

| Rated current (A) | Disconnecting time [s] | | | | |
|---|---|---|---|---|---|
| | 35m | 0.1 | 0.2 | 0.4 | 5 |
| | **Min. prospective short-circuit current (A)** | | | | |
| 0.5 | 10 | 10 | 10 | 10 | 2.7 |
| 1 | 20 | 20 | 20 | 20 | 5.4 |
| 1.6 | 32 | 32 | 32 | 32 | 8.6 |
| 2 | 40 | 40 | 40 | 40 | 10.8 |
| 4 | 80 | 80 | 80 | 80 | 21.6 |
| 6 | 120 | 120 | 120 | 120 | 32.4 |
| 10 | 200 | 200 | 200 | 200 | 54 |
| 13 | 260 | 260 | 260 | 260 | 70.2 |
| 16 | 320 | 320 | 320 | 320 | 86.4 |
| 20 | 400 | 400 | 400 | 400 | 108 |
| 25 | 500 | 500 | 500 | 500 | 135 |
| 32 | 640 | 640 | 640 | 640 | 172.8 |