USER'S MANUAL

FITESTpro

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, 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 FITESTpro 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 FITESTpro can measure:
- RCD trip-out time
- RCD trip-out current
- RCD contact voltage
- Loop resistance (no-trip of RCD)
- AC voltage
- Phase (live) conductor test

1.3. Standards applied

Measurements:	EMC:	Safety:
EN 61557-1	EN 55022, class B	EN 61010-1
EN 61557-6	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

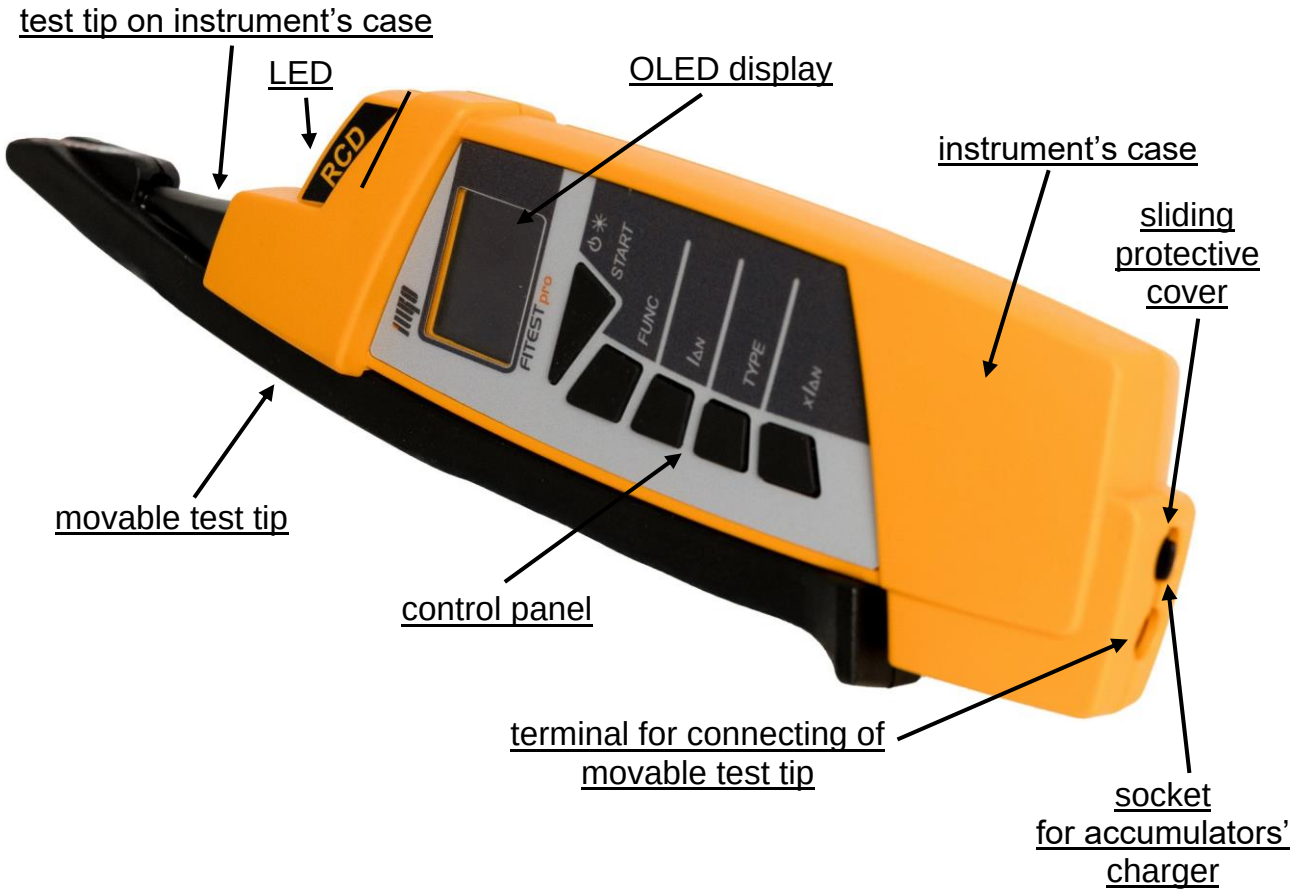


Fig. 2.1. *Top side*

- 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.

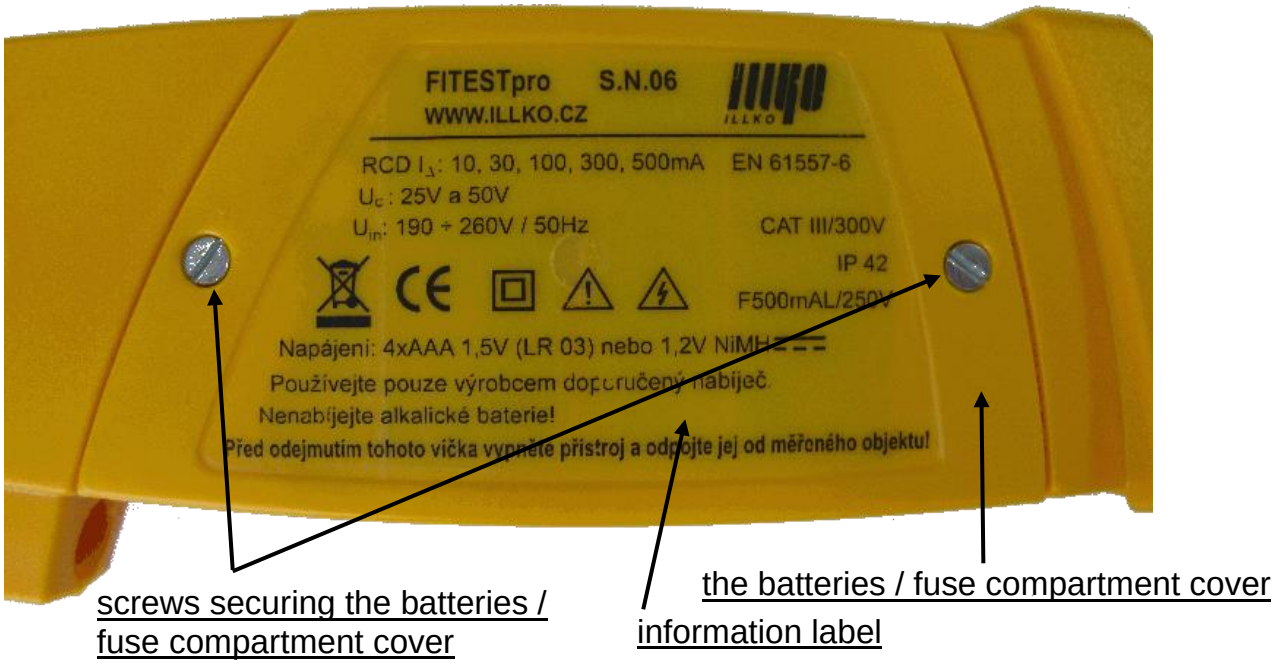


Fig. 2.2. *Detail of bottom side*

2.2. Control panel and OLED display

Graphical OLED display

START key starts measurement, if test tips are connected to voltage.
If there is no voltage on test tips, it controls white LED (see Fig. 2.1).
The key switches the instrument on and off, too.

FUNC key selects measured function.

$I_{\Delta N}$ key selects nominal differential current.

TYPE key selects RCD type and differential current shape.

x$I_{\Delta N}$ key selects multiplier of nominal differential current or limit contact voltage.

Fig. 2.3. *Control panel and OLED display*

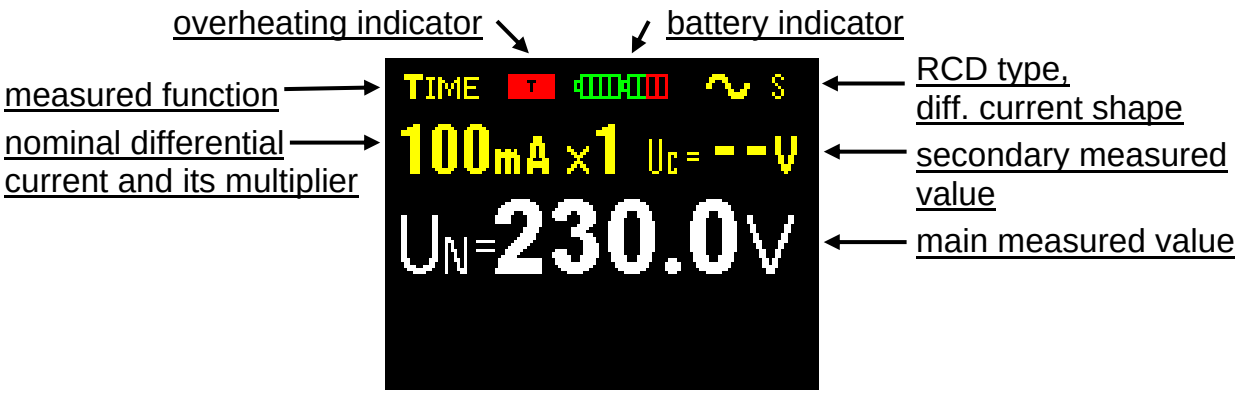


Fig. 2.4 *Example of displayed information*

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

FITESTpro
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 **FUNC**, **$I_{\Delta N}$**, **TYPE** and **x$I_{\Delta N}$** keys. The **START** key starts measurement. All set parameters and functions remain valid until they are changed.

- If voltage applied on the test tips is < 190 V (consider also the note in the next paragraph!) or > 255 V, the relevant information is displayed and the **START** button does not start measurement:

Fig. 3.1a *Voltage < 190 V*

Fig. 3.1b *Voltage > 255 V*

- If the fuse is blown, it is indicated on the display:

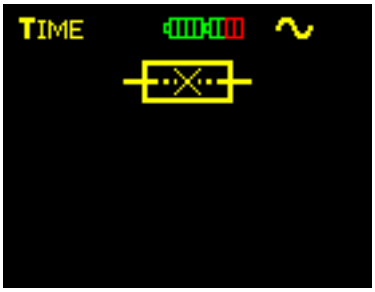


Fig. 3.2 *The symbol of blown fuse*

The fuse should be replaced as described in the Chapter 4.1.

Note: If voltage applied on the test tips of the instrument *with not blown fuse* is in range about 25 V ÷ 190V, the instrument also *displays the symbol of blown fuse*. Before replacing the fuse, therefore, make sure that voltage in measured circuit in range 190 V ÷ 255 V!

- If voltage applied on the test tips is in range 190 V ÷ 255 V, TRMS value is displayed and the **START** button can start the measurement:

Fig. 3.3 *Example of voltage measurement*

- For safety reasons the device each time after you press the **START** key before measuring the desired RCD parameter first tests whether the contact voltage Uc is higher than the set limit. If the contact voltage is higher, this dangerous status is indicated and the measurement is not allowed:

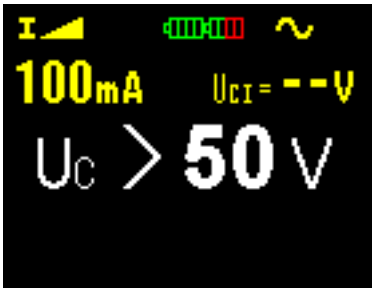


Fig. 3.4a *Contact voltage > 50 V*

Fig. 3.4b *Contact voltage > 25 V*

- If after starting the measurement by the **START** key the symbol of RCD trip-out is displayed (Fig. 3.5), RCD tripped-out during contact voltage measurement. This may be caused by bad $I_{\Delta N}$ set, by faulty RCD or because of a leakage current flow via RCD under test which adds up the differential current generated by the instrument. This status is indicated until a key for selecting function is pressed, or a new connection to mains voltage is done.

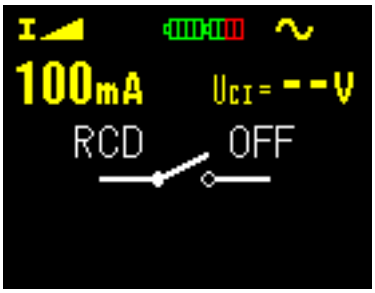


Fig. 3.5 *Example of RCD trip-out during contact voltage measurement displaying*

- 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. 3.6a *Indication of low battery*

Fig. 3.6b *Low battery after the* ***START*** *key was pressed*

- If more consecutive measurements at higher values of $I_{\Delta N}$ are done, the red indicator showing the internal circuits of the instrument are hot can be displayed. By the increasing temperature indicator's area starts to expand. If the maximal allowable temperature has been exceeded, the STOP icon is displayed 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. 3.7a *Indication of high temperature*

Fig. 3.7b *High temperature after the* ***START*** *key is pressed*

- Current flowing in PE, caused for example by connected appliances or capacities between L and PE, may adversely affect the results of measurements or measurement may be impossible. Before the measurements, therefore, remove such appliances / capacities.

- Before starting the measurement by the **START** key reliably connect the test tips by 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 by the measured object. Doing so may cause displaying of incorrect values.

- Results may be adversely affected and measurement error exceeded:
  If leakage current flows in PE (caused for example by connected appliances or capacities between L and PE), or if noise voltage/current is present in grounding system or grounding system is affected by the potential of another grounding system, or if mains voltage is unstable during measurement.
- If the symbol 

is displayed simultaneously by the measurement result, it means that the main measured value result is within the required limits.

3.3. Parameters that can be set

- **Limit contact voltage** Ucmax can be set to 50 V or 25 V. Setting can be done by the **x$I_{\Delta N}$** key. Measurement function contact voltage Uc must be selected.

- **Nominal differential current** can be set to 10 mA, 30 mA, 100 mA, 300 mA or 500 mA by the **x$I_{\Delta N}$** key. For more details see technical data in the Chapter 5.1.

- **Multiplier of the nominal differential current** can be set to ½, 1, 2 or 5 by the **x$I_{\Delta N}$** key. For more details see technical data in the Chapter 5.1.

- **RCD type and initial polarity of the differential current** can be set by the **TYPE** key.

Displayed symbol	RCD type (shape of the differential current)	Initial polarity of the differential current
	AC (sine wave)	Positive half-wave
		Negative half-wave
	A (pulsed)	Positive half-wave
		Negative half-wave

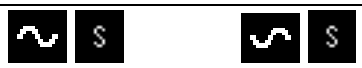
Displayed symbol	RCD type	RCD type
	AC or A	Standard
		Selective

For more details see technical data in the Chapter 5.1.

3.4. Measurement of RCD parameters

3.4.1. Contact voltage Uc

Displayed contact voltage is related to the nominal differential current.
For security reasons, it is multiplied by a coefficient:

RCD type	Contact voltage is proportional to:
	$1{,}05\times I_{\Delta N}$
	$1{,}05\times 2\times I_{\Delta N}$
	$1{,}05\times \sqrt{2}\times I_{\Delta N}$
	$1{,}05\times 2x\sqrt{2}\times I_{\Delta N}$

- Set Uc function by the **FUNC** key.
  You can set the nominal differential current by the **$I_{\Delta N}$** key.
  You can set the RCD type by the **TYPE** key.
  You can set the limit contact voltage Ucmax by the **x$I_{\Delta N}$** key.

Fig. 3.8 *Example of settings for contact voltage measurement*

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

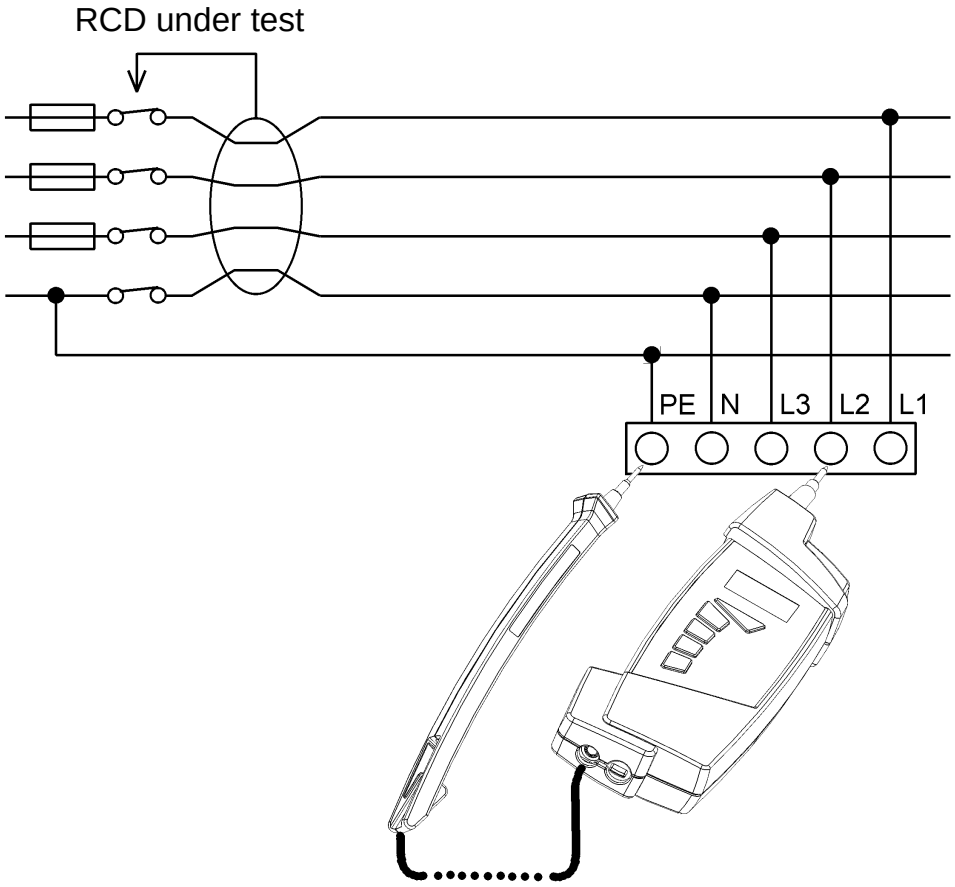


Fig. 3.9 *Example of connection*

- After displayed mains voltage UL-PE is stabilized, press and release the **START** key. Measurement will be carried out.

- Result is displayed afterwards:

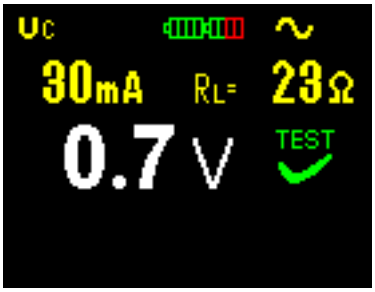


Fig. 3.10 *Example of contact voltage measurement result*

R_L.....Loop resistance; $R_L = Uc^* / I_{\Delta N}$,
where Uc* is actually measured value, i.e. no safety coefficient is used as listed in the table at the beginning of this chapter.

Note: loop resistance is displayed if the nominal differential current $I_{\Delta N}$ is set to value ≥ 30 mA.

- Disconnect the instrument from RCD under test.

3.4.2. Trip-out time TIME

Following table lists allowed trip-out times according to EN 61008 / EN 61009 and IEC 60364-4-41 standards:

	½ $I_{\Delta N}$ *	$I_{\Delta N}$	2 $I_{\Delta N}$	5 $I_{\Delta N}$	Note
Standard	–	300 ms	150 ms	40 ms	max. allowed trip-out current
Selective	–	500 ms	200 ms	150 ms	
	–	130 ms	60 ms	50 ms	min. allowed trip-out current

* RCD must not trip-out.

- Set TIME function by the **FUNC** key.
  You can set the nominal differential current by the **$I_{\Delta N}$** key.
  You can set the RCD type by the **TYPE** key.
  You can set the multiplier of nominal differential current by the **x$I_{\Delta N}$** key.

Fig. 3.11 *Example of settings for trip-out time measurement*

- Connect the instrument to RCD under test. Example of connection in Fig. 3.9.

- After displayed mains voltage UL-PE is stabilized, press and release the **START** key. Measurement will be carried out.

- Result is displayed afterwards:

Fig. 3.12a *Example of trip-out time measurement result*

Fig. 3.12b *Example of measurement result – RCD did not trip-out*

Uc.....Contact voltage.

- Disconnect the instrument from RCD under test.

Note: For safety reason, contact voltage is automatically measured before trip-out time is measured. As the selective type of RCDs include integrator, it is necessary to wait some time before the integrator sets to default. This is why the measuring process inserts a pause 30 s for selective RCDs. The remaining time is displayed as count down from 30 to 1:

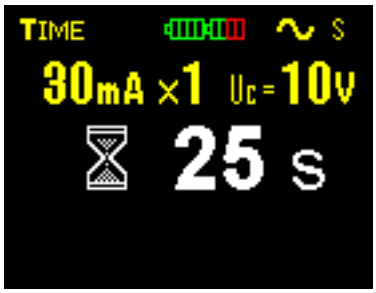


Fig. 3.13 *Example of count down for selective RCD*

3.4.3. Trip-out current I◢

- Set I◢ function by the **FUNC** key.
  You can set the nominal differential current by the **$I_{\Delta N}$** key.
  You can set the RCD type by the **TYPE** key.

Fig. 3.14 *Example of settings for trip-out current measurement*

- Connect the instrument to RCD under test. Example of connection in Fig. 3.9.

- After displayed mains voltage UL-PE is stabilized, press and release the **START** key. Measurement will be carried out.

- Result is displayed afterwards:

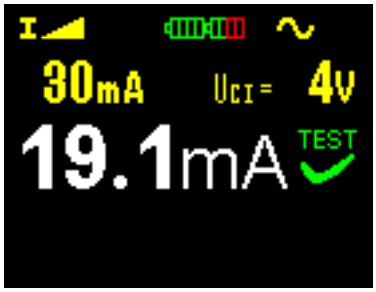


Fig. 3.15a *Example of trip-out current measurement result*

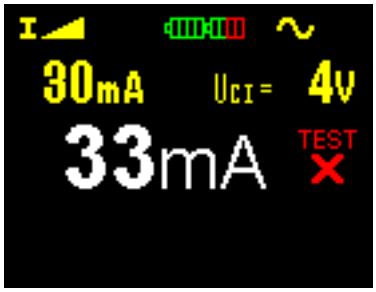


Fig. 3.15b *Example of measurement result – RCD did not trip-out*

U_{cI}.....Contact voltage at tripping current.

- Disconnect the instrument from RCD under test.

3.5. Other functions of the instrument

Phase (live) conductor test
If the symbol ☒ is displayed in the lower right corner of the display, 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. 3.16a *Phase voltage not present on the test tip*

Fig. 3.16b *Phase voltage present on the test tip*

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!
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!

How to display firmware version
The instrument has to be turned off and both test tips disconnected from any circuit!
Press the **FUNC** key and keep it pressed, then turn the instrument on. Firmware version (e.g. v1.0.0 and possibly additional service information) is displayed. After releasing the keys, the instrument enters the normal operating mode.

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 $\mathbf{I_{\Delta N}}$ 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 $\mathbf{I_{\Delta N}}$ 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.

Then put the batteries / fuse 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 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 can not 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:
F0,5 A / 250 V, breaking capacity 1500 A, dimensions 32x6,3mm.
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

RCD – general data

Nominal differential currents: 10, 30, 100, 300, 500 mA
Accuracy of differential current: (-0 / +0,1)·IΔ; IΔ = $I_{\Delta N}$, 2×$I_{\Delta N}$, 5×$I_{\Delta N}$
(-0,1 / +0)·IΔ; IΔ = ½×$I_{\Delta N}$
Test current shape: sine wave AC, pulsed A
RCD type: standard or selective
Initial polarity of the differential current: 0° or 180°
Nominal input voltage: 190 V ÷ 255 V / 45 ÷ 65 Hz

Differential currents generated by the instrument (TRMS @ 20 ms):

	½×$I_{\Delta N}$		$I_{\Delta N}$		2×$I_{\Delta N}$		5×$I_{\Delta N}$		I◢	
IΔN (mA)	AC	A	AC	A	AC	A	AC	A	AC	A
10	5	3,5	10	20	20	40	50	100	✓	✓
30	15	10,5	30	42	60	84	150	212	✓	✓
100	50	35	100	141	200	282	500	-	✓	✓
300	150	105	300	424	-	-	-	-	✓	✓
500	250	175	500	-	-	-	-	-	✓	-

Contact voltage Uc and Uci

Operating range of use @ EN 61557-6: (3,0 ÷ 49,0) V for limit contact voltage 25 V
Operating range of use @ EN 61557-6: (3,0 ÷ 99,0) V for limit contact voltage 50 V

Measuring range (V)	Resolution (V)	Reference error	Operating error
0,0 ÷ 9,9	0,1	(-0/+10 %) of R + 2 D	(-0/+10 %) of R + 3 D
10,0 ÷ 99,9		(-0/+10 %) of R	(-0/+10 %) of R + 1 D

Test current: ≤ ½$I_{\Delta N}$
Limit contact voltage: 50 V or 25 V

Loop resistance RL

Operating range of use @ 61557-3: 27 Ω ÷ 2000 Ω

Measuring range (Ω)	Resolution (Ω)	Reference error	Operating error
0 ÷ 2000	1	±(5 % of R + 3 D + 0,05 V / $I_{\Delta N}$)	±(5 % of R + 5 D + 0,05 V / $I_{\Delta N}$)

Test current: ≤ ½$I_{\Delta N}$
Note: loop resistance is displayed if the nominal differential current $I_{\Delta N}$ is set to value ≥ 30 mA.

Trip-out time TIME

Standard RCD (Measuring range meets the EN 61557-6 requirements)

Measuring range (ms)	Resolution (ms)	Reference error	Operating error
0 ÷ 300 (½$I_{\Delta N}$, $I_{\Delta N}$)	1	±3 ms	±4 ms
0 ÷ 150 (2x$I_{\Delta N}$)			
0 ÷ 40 (5x$I_{\Delta N}$)			

Selective RCD (Measuring range meets the EN 61557-6 requirements)

Measuring range (ms)	Resolution (ms)	Reference error	Operating error
0 ÷ 500 (½$I_{\Delta N}$, $I_{\Delta N}$)	1	±3 ms	±4 ms
0 ÷ 200 (2x$I_{\Delta N}$)			
0 ÷ 150 (5x$I_{\Delta N}$)			

Trip-out current I◢

Measuring range meets the EN 61557-6 requirements

Measuring range IΔ	Resolution (mA)	Reference error	Operating error
0,4 ÷ 1,1 $I_{\Delta N}$ (type AC)	0,1	±0,08 $I_{\Delta N}$	±0,1 $I_{\Delta N}$
0,4 ÷ 1,5 $I_{\Delta N}$ (type A)			

AC voltage (frequency range 45 ÷ 65 Hz)

Measuring range (V)	Resolution (V)	Reference error	Operating error
190 ÷ 255	0,1	±(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) Stated measuring errors are valid if leakage current does not flow in PE, if noise voltage/current is not present in grounding system, grounding system is not affected by the potential of another grounding system and if mains voltage is stable during measurement.
c) 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 relative humidity 40 ÷ 60 % (noncondensing) mains voltage 230 V ± 2 % / 50 Hz ± 1 % instrument's position arbitrary	
Operating conditions	ambient temperature 0 ÷ 40 °C relative humidity max. 85 % (noncondensing) mains voltage 190 ÷ 255 V / 45 ÷ 65 Hz instrument's position arbitrary	
Storage conditions	ambient temperature -10 ÷ +70 °C relative humidity	max. 90 % (-10 ÷ 40) °C
	(noncondensing)	max. 80 % (40 ÷ 70) °C
	instrument's position arbitrary	