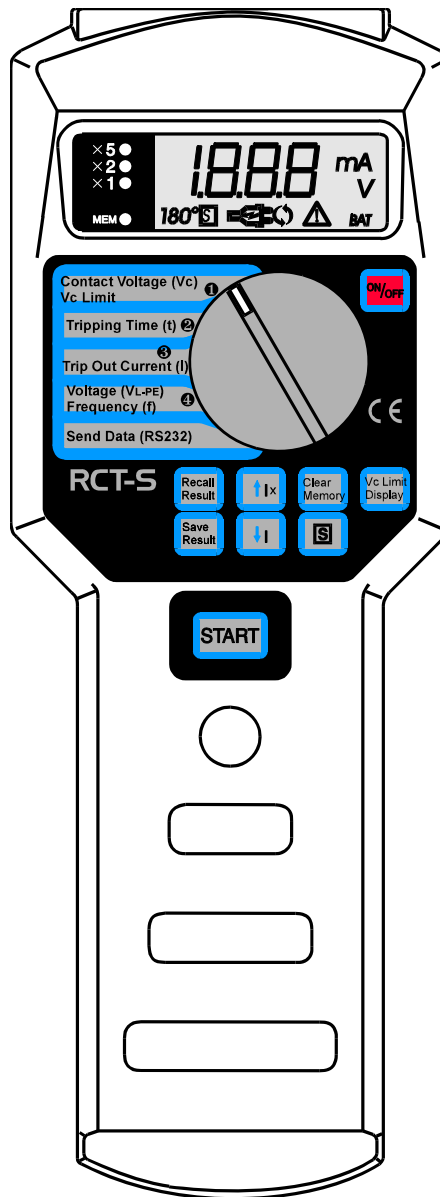


# User manual

## RCCB Tester





|   |   |
|---|---|
| <b>Supplier:</b>                          | Nieaf-Smitt bv<br>Vrieslantlaan 6<br>3526 AA Utrecht Holland<br>P.O. box 7023 3502 KA Utrecht |
| <b>Specifications of the equipment:</b>   | RCT-S   |
| <b>Specifications of the user manual:</b> | Date: 1-12-2005<br>Number: 561144040<br>Ref.: 003   |


## Preface


This manual describes the RCCB Tester. The information in this manual is important for proper and safe functioning of the machine. In case you are not familiar with the operation, the preventive maintenance, etc. of the RCCB Tester, then you read this user manual from the beginning to the end thoroughly. If you are familiar with these matters, you can use this manual for reference. You can find the required information rapidly using the table of contents.

In this user manual, the following four marking conventions are used to focus attention on certain subjects of actions.

|   |  |
|---|--|
|  | <p><b>TIP:</b><br/><i>gives you suggestions and advice to perform certain tasks easier or handier.</i></p> |
|---|--|

|   |  |
|---|--|
|  | <p><b>ATTENTION:</b><br/><i>a remark with additional information; draws your attention to possible problems.</i></p> |
|---|--|

|   |   |
|---|---|
|  | <p><b>CAUTION:</b><br/><i>the machine may be damaged, if you do not carefully execute the procedures.</i></p> |
|---|---|

|   |   |
|---|---|
|  | <p><b>WARNING FOR DANGER:</b><br/><i>you can (seriously) hurt yourself or seriously damage the product, if you do not carefully execute the procedures.</i></p> |
|---|---|

- this document is described with the words manual or user manual;
- the test equipment is described with the words tester, instrument or test device;
- values or displayed data is placed between inverted commas for example “230 V”;
- keys or switch positions are placed between angular brackets for example [Start] key.

## **Warranty**

Nieaf-Smitt bv guaranties the tester for a period of 6 months.

The period of warranty will be effective at the day of delivery. The warranty clauses and the stipulations regarding liability in terms of delivery (FME and HE).

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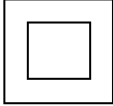


Nieaf-Smitt bv reserves the right to change parts at any given moment, without prior or direct notification to the client. The contents of this user manual may also be changed without prior warning.

This user manual is compiled with all possible care, but Nieaf-Smitt bv can not accept any responsibility for possible errors in this user manual or any consequences resulting from that.

## Warning pictograms on the tester

There are a number of pictograms on the tester, meant to warn the user of remaining risks that may be present in spite of the safe design.

Table 1: Pictograms on the tester

| Pictogram   | Description  | Location on the tester   |
|---|--|--|
|    | Warning:<br>General sign for danger. Read the instructions carefully before use. | At the back side of the tester on the instruction label.                             |
|    | Warning:<br>Danger for direct contact with live parts.                           | At the back side of the tester on the instruction label and under the battery cover. |
|   | Mark:<br>Insulation class II (double insulation).                                | At the back side of the tester on the instruction label.                             |
|  | Mark:<br>Marks the KEMA certification of the tester.                             | The KEMA KEUR is placed on the front side of the tester.                             |
|  | CE-mark:<br>Declares the conformity with the European Directives.                | The CE-mark is placed on the front side of the tester.                               |

All peripherals which are used by this tester, must be provided with a CE-mark. For example the use of a PC.

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## **Attachments:**

*Attachment 1: EU-Declaration of Conformity*

*Attachment 2: Circuit diagrams*

- Contact voltage ( $V_c$ ) at the current of  $I_{\Delta N}$  (ordinary type) or at the current of  $2I_{\Delta N}$  (selective type) without tripping
- Tripping time ( $t$ ) at the current of  $I_{\Delta N}$ ,  $2I_{\Delta N}$ ,  $5I_{\Delta N}$
- Trip out current ( $I_{\Delta}$ )
- Mains voltage between phase and protective earth terminals

## **1. GENERAL SAFETY REGULATIONS**

|   |   |
|---|---|
|    | <p><i>Read, before you perform any action in connection with the tester, this user manual carefully.</i></p> <p><i>Nieaf-Smitt bv is not liable for injuries, (financial) damage and/or excessive wear resulting from incorrectly performed maintenance, incorrect use of or modifications to the instrument.</i></p> |
|    | <p><i>It is not allowed to remove, to skirt or to tide over (by handy constructions) the enclosure or safeties of the tester during normal use. Method of measurement and range are indicated on the back side of the instrument.</i></p>   |
|    | <p><i>It's forbidden to place and/or to use the instrument in a room where is a risk of explosion.</i></p>  |
|  | <p><i>If the tester is used by a third party, you being the owner are responsible, unless otherwise specified.</i></p>  |
|  | <p><i>Repair can only be done by Nieaf-Smitt bv.</i></p>  |
|  | <p><i>Provide a clean and save workplace which has sufficient lightning.</i></p>  |

## **2. INTRODUCTION**

### **2.1 GENERAL**

#### **2.1.1 The intended use**

The RCCB tester is intended to be used for judgement of the safety of electrical installations.

The RCT-S is intended for execution of all tests concerning different protective switches with differential current protection. If the instrument is used in manner not specified in this user manual, the protection provided by the instrument may be impaired and the supplier is excluded from any responsibility.

#### **2.1.2 Target group**

The target group of people for whom the tester and this user manual are applicable are competent and technical qualified persons.

Competent persons are persons who:

- have got a certain level of technical knowledge gained by education/training and who;
- have got certain skills required to operate the tester.

Technical qualified persons are persons who:

- are competent and who;
- have got a certain level of technical knowledge gained by education/training and who;
- are familiar with the applied technology in the instrument and are aware of the possible dangers and risks.



*Repair can only be done by Nieaf-Smitt bv.*

By operating we mean:

- setting up the instrument and executing tests;
- processing the test results.



### 2.1.3 Working principle

#### Theoretical principles of RCD operation

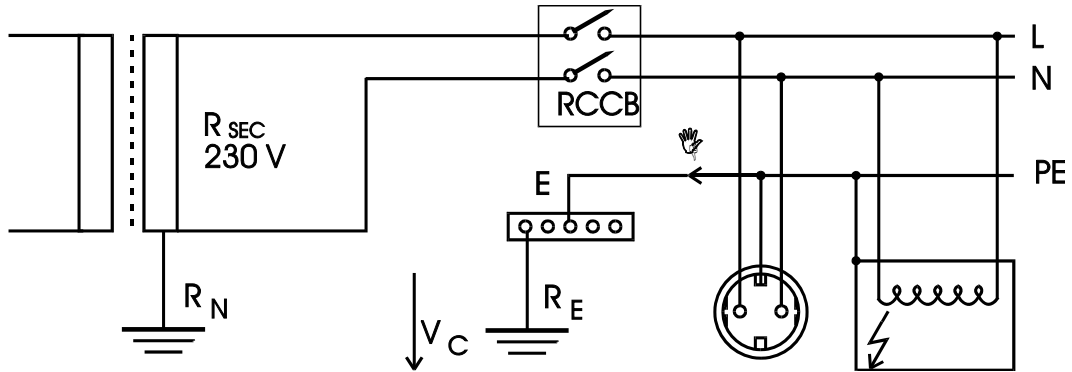
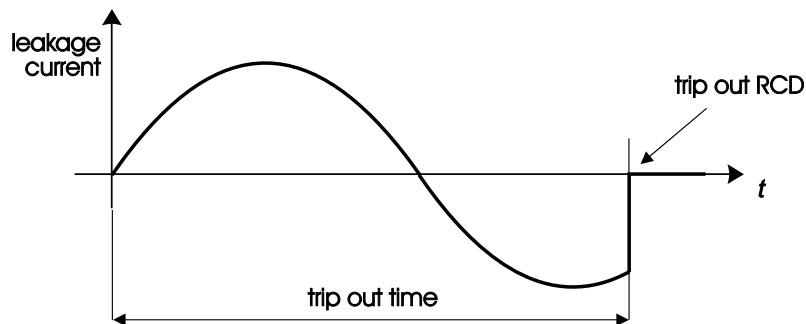


Figure 1: TT system connection

$R_N$  grounding resistance of transformer  
 $R_{SEC}$  resistance of transformer's secondary

If a portion of the phase current is leakage through a bad insulation to the enclosure a test device a hazardous contact voltage  $V_C$  can appear across the grounding resistance  $R_E$ . Some RCD's are sensitive only to positive or negative half periods. The RCT-S has the possibility to generate the fault current with a positive ( $0^\circ$ ) or a negative ( $180^\circ$ ) start phase, see figure 2 (a & b).

#### a) Alternating form (starting phase $0^\circ$ )



b) Alternating form (starting phase 180°)

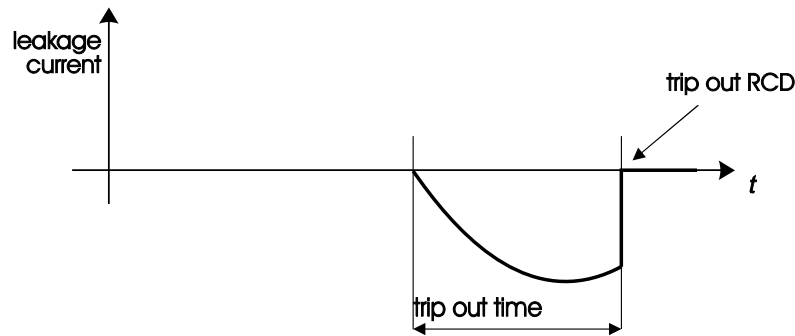


Figure 2: Alternating fault current.

## Structure

The RCT-S is an electronic microprocessor controlled instrument intended for the execution of all tests concerning different protective switches with differential current protection (with or without switch-off delay) Select the test by means of the rotary switch. The user is able to prescribe the desired measuring method now

RCD types which can be tested by RCT-S:

1. The sensitivity according to the form of the fault current
  - type AC.
2. The disconnection delay
  - without delay (standard type);
  - with delay (selective type).
3. The rated values of the fault currents
  - 10 mA; 30 mA; 100 mA; 300 mA; 500 mA.

## Connecting

The instrument is powered by four alkaline batteries (4 x 1,5 V IEC). The tester is provided with a on/off switch and can, after powering up the instrument, be used at once. The test cord or the RS232 cable (data transfer cable) are connected at the upper side of the tester.

## Measuring

Each test has its specific circuit diagram which is given in the attachments.

The following measurements can be executed by the instrument:

1. The contact voltage ( $V_c$ ) at the current of  $I_{\Delta N}$  (ordinary type) or at the current of  $2I_{\Delta N}$  (selective type) without tripping
2. The tripping time ( $t$ ) at the current of  $I_{\Delta N}$ ,  $2I_{\Delta N}$ ,  $5I_{\Delta N}$
3. The trip out current ( $I_{\Delta}$ ) and the tripping time ( $t$ ) at the trip out current ( $I_{\Delta}$ )
4. The mains voltage between the phase and the protective earth terminals

## 2.2 SPECIFICATIONS

### General

|                         |   |  |
|-------------------------|---|--|
| Power supply            | : | 4 x 1,5 V IEC LR14 alkaline batteries                    |
| Battery life time       | : | approx. 2000 measurements (1 measurement per 5 minutes)  |
| Display                 | : | 3 digit 7 segment LCD 19 mm with additional warnings     |
| Quality standard        | : | design, development and production according to ISO 9001 |
| Mass                    | : | approx. 0,75 kg including batteries and accessories      |
| Dimensions (wxhxd)      | : | 110 x 65 x 290 mm  |
| Automatic L/N exchanged | : | incorporated   |

### Environment and storage

|                           |   |   |
|---------------------------|---|---|
| Reference temp. range     | : | 5°C - 35°C                                    |
| Operating temp. range     | : | 0°C - 40°C                                    |
| Storage temp. range       | : | -10°C - 60°C                                  |
| Max. operating humidity   | : | 85% RH (0°C - 40°C)                           |
| Max. storage humidity     | : | 80% RH (40°C - 60°C)<br>90% RH (-10°C - 40°C) |
| Degree of protection      | : | IP50  |
| Protection classification | : | double insulation                             |
| Pollution category        | : | Class II                                      |
| Over voltage protection   | : | Category III 300V                             |

### Tests

|                             |   |                           |
|-----------------------------|---|---------------------------|
| Nominal voltage             | : | 100 - 250 V <sub>ac</sub> |
| Nominal frequency           | : | 45 - 65 Hz                |
| Max. voltage against ground | : | 250 V <sub>ac</sub>       |
| Max. voltage L/N            | : | 264 V <sub>ac</sub>       |

### Tripping time (t) of a standard of selective RCD

| Leakage current  | Range t (ms)   | Resolution (ms) | Accuracy               |
|------------------|----------------|-----------------|------------------------|
| $I_{\Delta N}$   | 0 ÷ 1000       | 1               | ±(2% of reading + 3ms) |
| 2 $I_{\Delta N}$ | 0 ÷ 200        |                 |                        |
| 5 $I_{\Delta N}$ | 0 ÷ 50 (150 m) |                 |                        |

### RMS values (10 ms) of fault currents

| $I_{\Delta N}$ (mA) | $2 I_{\Delta N}$ (mA) | $5 I_{\Delta N}$ (mA) |
|---------------------|-----------------------|-----------------------|
| 10                  | 20                    | 250 *                 |
| 30                  | 60                    | 250 *                 |
| 100                 | 200                   | 500                   |
| 300                 | 600                   | 1500                  |
| 500                 | 1000                  | 2500                  |

Accuracy of fault current: +10%, -0%

\* For rated values  $I_{\Delta N} \leq 30\text{mA}$  the five-fold test current is 0.25A.

### Contact voltage ( $V_C$ ) at the rated fault current (a standard RCD type) or at double rated fault current (selective RCD type)

| Range $V_C$ (V) * | Resolution (V) | Accuracy   |
|-------------------|----------------|--|
| 0 ÷ 99,9          | 0, 1           | +10%, -0% (of reading) $\pm 0,2$ V<br>( $V_C = 0 \div 9,9$ V)<br>+10%, -0% (of reading)<br>( $V_C = 10.0 \div 99.9$ V) |

Test current:  $0.5 I_{\Delta N}$

The specifications of the above table are valid under the following conditions:

- max. instability of line voltage during measurement is  $\pm 1\%$ ,
- the protective conductor is free of interfering voltages.

### Tripping out current ( $I_{\Delta}$ ) of a standard RCD

| Range $I_{\Delta}$            | Resolution         | Accuracy                                       |
|-------------------------------|--------------------|--|
| $(0,5 \div 1,4) I_{\Delta N}$ | $0,1 I_{\Delta N}$ | - $0,1 I_{\Delta N}$ .... + $0,2 I_{\Delta N}$ |

- Tripping time (t) of a standard RCD at trip out current:

| Range t (ms) | Resolution (ms) | Accuracy                     |
|--------------|-----------------|------------------------------|
| 0 ÷ 500      | 1               | $\pm$ (2% of reading + 2 ms) |

## Alternating voltage $U_{L-PE}$

| Range $U_{L-PE}$ (V) | Resolution (V) | Accuracy              |
|----------------------|----------------|-----------------------|
| 0 ÷ 250              | 1              | ± (2% of reading +2V) |

## Frequency

| Range f (Hz) | Resolution (Hz) | Accuracy                  |
|--------------|-----------------|---------------------------|
| 25 ÷ 99,9    | 0,1             | ± (0,1% of reading +1dig) |
| 100 ÷ 499    | 1               |                           |

## Transport

The tester is a portable test device which can be hand-held or lay down (solid foundation) during the tests. Take care of the instrument during transport to avoid any damage.

## 2.3 CERTIFICATION

The tester and this manual have been designed, constructed and tested according to the European directives. During all these phases the relevant (preliminary) European standards have been taken into account. The CE-mark has been mounted on the instrument. The directives and the standards mentioned are enumerated in the EC-Declaration of Conformity.

### **3. TESTER COMPOSITION**

#### **3.1 GENERAL**

The RCT-S is built in an enclosure of solid ABS plastic. The display is situated at the front side of the tester. The test results are displayed. The main parts (see figures in Chapter 5) are listed below:

**Front:**

1. On/off key
2. Rotary switch
3. LCD-display (NR. 13 in the figure)

**Back:**

1. Instruction label
2. Serial number
3. Battery cover
4. Battery cover fastening screw

#### **3.2 PRINCIPLE OF MEASUREMENT**

##### **3.2.1 Visual inspection**

Visually check the test object or installation before executing the safety tests. The function of the visual inspection is to ensure the electrical safety of the latter parts. Check wires, cables and components for possible damages. If any damage has been noticed, it isn't allowed to perform any tests before a technical qualified person has repaired the test object or installation . The visual inspection is executed by the operator.

#### **4. INSTALLATION; STARTING UP AND ADJUSTMENT**



*The tester can only be used if no damages and/or defects are noticed and all original components belonging to the tester are mounted*



*The transportation and the handling of the tester should be done carefully to prevent any damage.*

This paragraph describes the installation and the starting up procedure of the instrument. The installation, the starting up and the adjustment of the instrument may be done by competent persons.

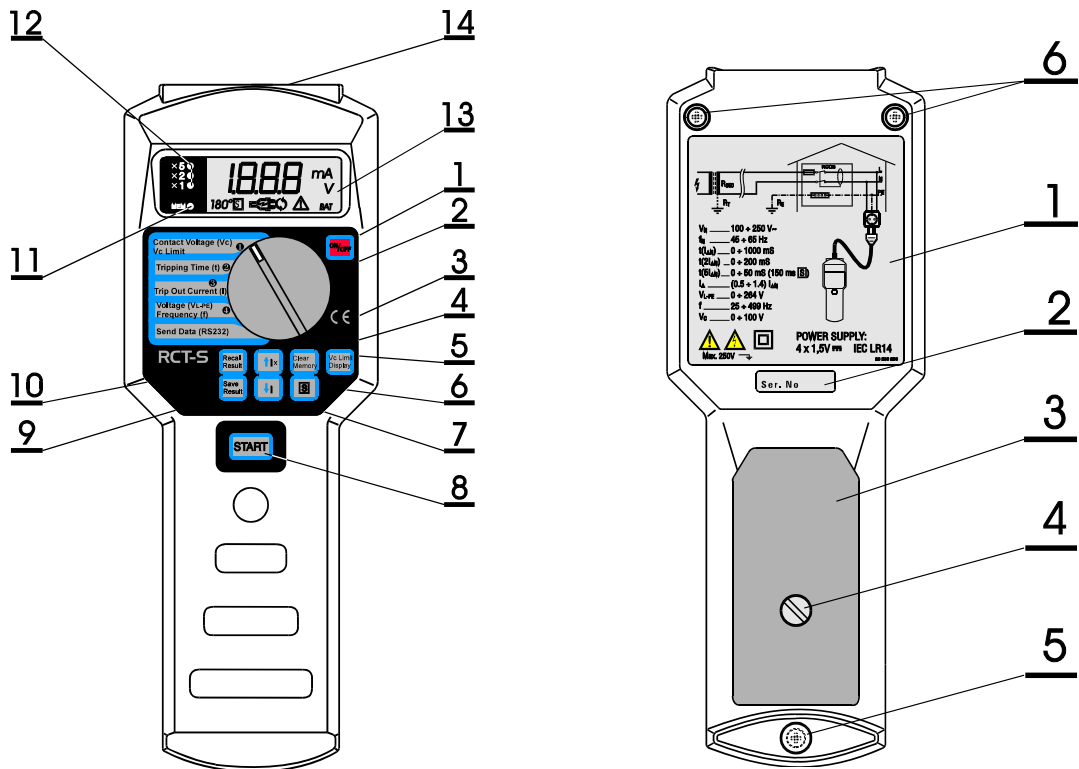
1. Unpack the instrument.  
Remove the packing materials without causing damages to the environment. Check the tester on damages. If damages are noticed, contact Nieaf-Smitt bv. at once;
2. Put the instrument in a horizontal position, at the work place or on a table in the test room.  
Keep enough clearance around the instrument to facilitate an easy operation, adjustment and reading of the test results, without problems or extra danger.
3. Insert the batteries in the instrument.
4. Connect the test object according to the circuit diagrams with the RCT-S.
5. Carry out the selected test.



*Find a place to put the manual such that it is within reach during the use of the instrument.*

## 5. HOW TO USE THE TESTER?

### 5.1 OPERATION



1. On/off key
2. Rotary switch
3. Increase key of memory location
4. Erase key of memory location
5. VC Limit/Display key
6. Selective RCD type
7. Decrease key of memory location
8. Start key
9. Store key to save measuring results
10. Recall key to recall saved results
11. Memory indication LED
12. LED's to indicate the selected multiplier of the nominal fault current in the  $tAN$  function
13. LCD Display
14. Connection (functional and RS232)

1. Instruction label
2. Serial number
3. Battery cover
4. Fixing screw for battery cover
5. Plastic cover of the locking screw
6. Locking screw covered by a rubber foot

Figure 3: Operating




## Keys

Function key description.

Table 2: Switches

| Selector position  | Description   |
|--|---|
| On/off<br>Recall result<br>Save result<br>↑ IΔN <sub>x</sub><br>↓ IΔN<br>Clear memory<br>[S]<br>Vc lim / Display<br>Contact voltage (VC)<br>Tripping time (t)<br>Trip out current (I)<br>Voltage (VL-PE)<br>Frequency (f)<br>Send Data (RS232) | <ul style="list-style-type: none"> <li>- to switch on/off the tester; the tester will switch off automatically after it hasn't been used for ten minutes or more;</li> <li>- to recall the saved results;</li> <li>- to save the displayed measuring results;</li> <li>- to increase/decrease object or measuring place identification number when saving or recalling results;</li> <li>- to check, in the [Recall Result] function, other results which have been saved later than the displayed one under the same object and measuring place identification number;</li> <li>- to select the appropriate multiplier of the nominal fault current in the tΔN function (IΔN<sub>x</sub>)</li> <li>- to select the appropriate nominal fault current in the VC, tΔN or IΔ functions (IΔN)</li> <li>- to clear all saved results;</li> <li>- to clear all saved results under a certain object identification number (without dots YYY);</li> <li>- to clear the saved results under a certain measuring place identification number only (with dots XXX);</li> <li>- to clear, in the [Recall Result]-function, the displayed result only;</li> <li>- to execute a RESET of the instrument.</li> <li>- key to select the ordinary or the selective (delayed trip out) type of the RCD in the VC or tΔN functions</li> <li>- to select [VC LIM] when the rotary switch is in the [VC] position</li> <li>- to display the results or the parameters of the displayed results</li> <li>- to select, in the [Save Result] or in the [Recall Result]-function, the object identification number or measuring place identification number;</li> <li>- the measurement of the contact voltage;</li> <li>- the measurement of the tripping time;</li> <li>- the measurement of the trip out current;</li> <li>- the measurement of the main voltage;</li> <li>- measurement of main frequency;</li> <li>- to transfer stored data to the printer or the PC.</li> </ul> |

### 5.1.1 Starting

|   |  |
|---|--|
|  | <p><i>Operating the instrument may only be done by competent persons.<br/>Never open the instrument during the testing.</i></p> <p><i>Check before every test:</i></p> <ul style="list-style-type: none"><li><i>* cables and test cords on possible damages;</i></li><li><i>* tester on possible damages and/or defects.</i></li></ul> |
|---|--|

1. Check the instrument on visible damages and/or defects, for example the power plug, the line cord etc.. Don't carry out any test with a damaged or broken instrument. Provide skilled reparation first.
2. Do not connect the test object as well as the test cords with the tester.
3. The instrument can be used at once.

### **Test selection**

First carry out the visual inspection on the test object or the installation. Connect the tester conform the circuit diagram.

We have four different tests:


Test 1: the measurement of the contact voltage (VC);

Test 2: the measurement of the tripping time (t);

Test 3: the measurement of the trip out current ( $I\Delta$ ) and the tripping out time( $t\Delta$ );

Test 4: the measurement of the main voltage and the main frequency.

### 5.2 TESTING

|   |   |
|---|---|
|  | <p><i>- Avoid testing objects or installations under the influence of high electromagnetic and/or electrostatic fields.</i></p> |
|---|---|

In the following paragraph the test methods will be explained. We consider that the starting-up is carried out as described in paragraph 5.1.1.

### 5.2.1 Setting of the contact voltage (VC)



*Don't remove the test cords during the measuring. Otherwise it's able that the test object will contain live parts;  
- Don't touch the test object nor the installation during the measuring;  
- Each result can be saved once only.*

In normal house installations the admissible value of the contact voltage is 50 V. When higher safety is required (e.g. hospitals), this value can be as low as 25 V. Therefore a admissible value can be preset on the instrument by proceeding as follows:

#### **Procedure setting contact voltage:**

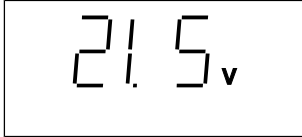
1. Connect the test cords with the instrument conform the circuit diagram of attachment 2
1. Set the rotary switch to [Contact voltage VC].
2. Set a correct ultimate value using the [VCLIM / Display] key.

The value is thus set is valid for all functions and remains stored even if the instrument is switched off. After batteries have been exchanged, the instrument is set to the default value of 50 V.

### 5.2.2 Test 1: Contact voltage (VC)

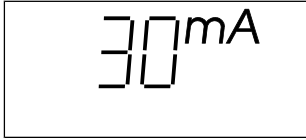
#### **How to carry out test 1:**

1. Connect the test cords with the instrument conform the circuit diagram of attachment 2.
2. Set the rotary switch to [contact voltage Vc].
3. Use the [ $\downarrow$  I $\Delta$ N] key to set the required rated fault current.
4. Take into account that the maximal admissible value of the contact voltage VCLIM has already been set (see paragraph 5.2.1).
5. Press the [Start] key and release it.
6. The result is displayed. Read out the result, save it if required, and note the memory codes when necessary.
7. Press the [Display] key to check the parameters of the measurement.
8. Save the displayed results, if required, and note the memory codes when necessary.
9. Disconnect the test object or carry out another test.

A rectangular box containing a digital display showing the number '21.5' followed by a small 'v' for volts.

Contact voltage. (If the result is higher than the preset limit contact voltage, then a general warning sign will appear).

↓  
DISPLAY  
↓

A rectangular box containing a digital display showing the number '30' followed by 'mA' for milliamperes.

The nominal leakage current (fault current) which holds the shown contact voltage.

*Figure 4: An example of a test result of the contact voltage*

### **5.2.3 Test 2: Tripping time (t)**

#### **How to carry out test 2:**

1. Connect the cords to the instrument conform the circuit diagram of attachment 2.
2. Set the rotary switch to [Tripping time (t)].
3. Use the [ $\uparrow$  I $\Delta$ N] key to set the required rated fault current (as displayed on the RCD to be tested).
4. Use the [ $\downarrow$  I $\Delta$ NX] key to select the correct multiplier for the rated fault current.
5. Use [S] key to select the standard or the selective RCD type (symbol S indicates selective type).
6. Take into account that the admissible value of the contact voltage  $V_{CLIM}$  has already been set (see paragraph 5.2.1).
7. Press the [Start] key and release it.
8. The result is displayed. Read out the result..  
One can change the starting current phase by pressing the [Start] key twice (180° is displayed). If the selective RCD type is selected, wait 30 seconds for the result (a countdown 30 to 0 is displayed).
9. Save the displayed results if required, and note memory codes when necessary.
10. Disconnect the test object or carry out another test.

15ms

Tripping time (t). (If the results are not according with the values in table 3, then the general warning sign will appear).

DISPLAY  
↓

30mA


The nominal leakage current of the displayed tripping time.

Figure 5: An example of a test result of the tripping time

Table 3: Admissible ranges of disconnection times according to IEC 1008-1 standard

| Type RCCB | I    | 2I   | 5I * | Remark                 |
|-----------|------|------|------|------------------------|
| standard  | 0,3  | 0,15 | 0,04 | max. tripping time (s) |
| selective | 0,5  | 0,2  | 0,15 | max. tripping time (s) |
|           | 0,13 | 0,06 | 0,05 | min. delay (s)         |

\* For rated values  $I_{\Delta N} \leq 30\text{mA}$  the five-fold test current is 0.25A.

|   |   |
|---|---|
|  | <p><b>- Because of safety reason, the measuring of the contact voltage will be executed, with half the nominal fault current, before any other parameter will be tested.</b></p> <p><b>- A selective RCD has an integrated leakage current function because of the required delayed trip out. That is why the operator must wait for 30 s before reaching final. The influence of the test current for contact voltage measurement will be compensated now.</b></p> |
|---|---|

### 5.2.4 Test 3: Trip out current (I) at tripping time (t)

#### How to carry out test 3:

1. Connect the test cords with the instrument conform the circuit diagram of attachment 2.
2. Set the rotary switch to [Trip out current (I)].
3. Use the [ $\downarrow$  I $\Delta$ NX] key to set the required rated fault current (as displayed on the RCD to be tested).
4. Take into account that the admissible value of the contact voltage VCLIM has already been set (see paragraph 5.2.1).
6. Press the [Start] key and wait for the result. One can change the starting current phase by pressing the [Start] key twice.
7. Check the tripping time at the tripping out current, by pressing the [Display] key.
8. Save, if required, the displayed result, and note the memory codes when necessary.
9. Disconnect the test object or carry out another test.

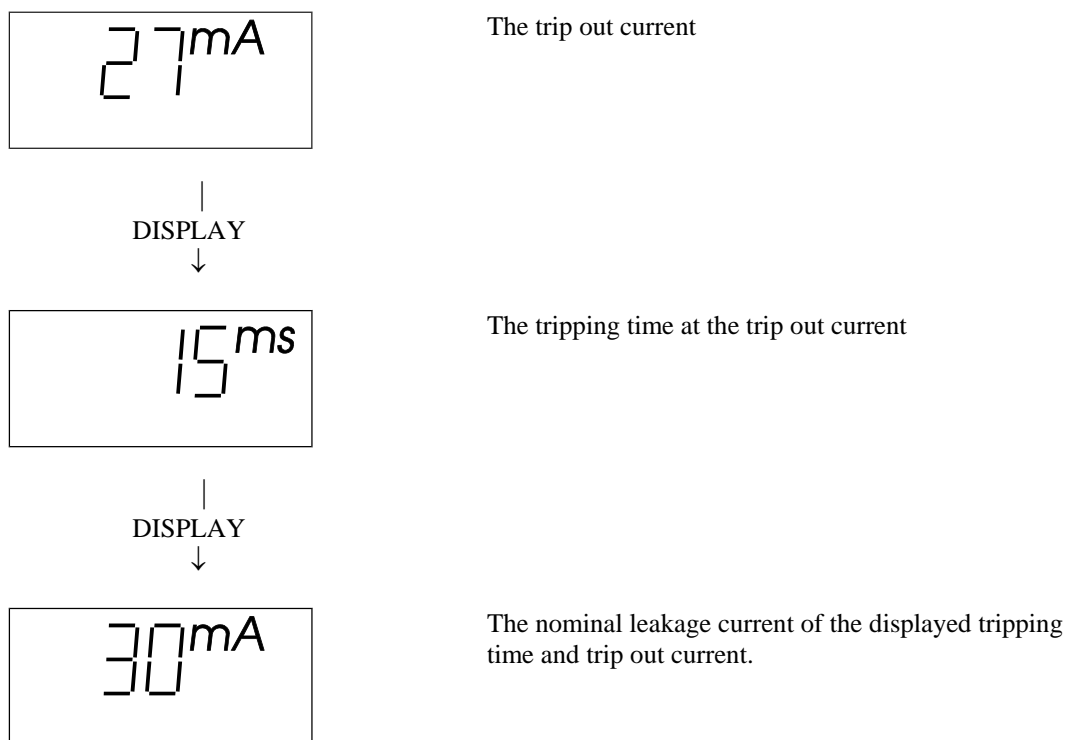



Figure 6: An example of a test result of the displayed trip out current, the tripping time at the trip out current

|   |   |
|---|---|
|  | <p><i>- Because of safety reason, the measuring of the contact voltage will be executed, with half the nominal fault current, before any other parameter will be tested.</i></p> <p><i>- A selective RCD has an integrated leakage current function because of the required delayed trip out. That is why the operator must wait for 30 s before reaching final. The influence of the test current for contact voltage measurement will be compensated now.</i></p> |
|---|---|

### 5.2.5 Test 4: Voltage (V<sub>L-PE</sub>) or frequency (f)

#### How to carry out test 4:

1. Connect the test with the instrument conform the circuit diagram of attachment 2.
2. Set the rotary switch to [Voltage (V<sub>L-PE</sub>) / frequency (f)].
3. Read out the displayed result.
4. Check the frequency of the present voltage by pressing the [Display] key.
5. Save, if required, the displayed result and note the memory codes when necessary.
6. Disconnect the test object or carry out another test.

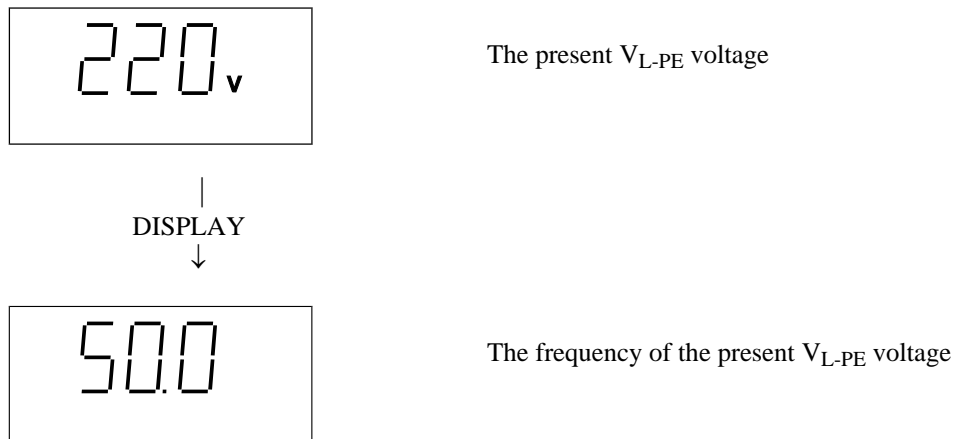


Figure 7: An example of a test result of the V<sub>L-PE</sub> voltage and the mains frequency








### 5.3 MEMORIZING OF RESULTS

Each saved result is equipped with an identification code defined by the customer. The code consists of 2 x 3 characters as follows:

X.X.X  $\xleftrightarrow{\text{DISPLAY}}$  YYY

Where X.X.X represents a code of a certain measuring place inside the tested object, and YYY represents a code of the tested object. Remark: X.X.X is at least one level higher than YYY. For detailed information we refer to the manual delivered with the PATS-W Administration-Software.

Each displayed result can be stored as follows:


| <u>Pressed key</u>  | <u>Comments</u>   |
|---|---|
|    | The last <b>changed</b> partial code (X.X.X. of YYY) which is used for the memorising of the results will, if necessary, be saved in the order of changing. |
|  ,    | Insert new codes using the [ $\uparrow$ , $\downarrow$ ] keys if necessary.   |
|  ,  ,  | Check the other part of the code pressing the [DISPLAY] key and change it using the [ $\uparrow$ , $\downarrow$ ] keys if necessary.                        |
|    | Confirm saving by using the [Save Result] key.  |

The displayed value is now saved to a memory location including the sub results and the parameters of the measurement that can be checked by using the [DISPLAY] key when it is set into the [Recall Result]-function. The list of the sub results and the parameters, which are saved to memory together with the main result, are shown in the following table:



Table 4: Saving the results into the memory

| Main result      | Sub results and parameters  |
|------------------|---|
| Contact voltage  | I- Nominal fault current<br>- Type of RCD (ordinary or selective)   |
| Tripping time    | I- Nominal fault current<br>- Type of RCD (ordinary or selective)<br>- Multiplier of the nominal fault current<br>- Start polarity of the fault current |
| Trip out current | t- Tripping time at trip out current<br>I- Nominal fault current<br>- Start polarity of the fault current   |
| Mains voltage    | f- Mains frequency  |

|   |  |
|---|--|
|  | <p><b><i>- If one wishes to abandon the current procedure (memorising), the rotary switch must be turned.</i></b></p> <p><b><i>- For all measuring results, numbers from 001 up to including 999 are available (for the object and for the measuring place).</i></b></p> <p><b><i>- If one does not care numeration of objects, then all the results can be saved under the same object code. Only the measuring place code has to be changed from test to test.</i></b></p> <p><b><i>- If one does not care numeration of objects as well as measuring places, then all the results can be saved under the same object and measuring place code, simply by omitting steps 2 and 3 of the upper demonstration.</i></b></p> |
|---|--|

## 5.4 RECALLING OF MEMORISED RESULTS.

Each memorised result is equipped with an eventual sub result and parameters of the measurement (see table 4). Each function has an identification number (1 t/m 3 see figure below). The user is able to identify the function where the sub result belongs to. The identification number is displayed for a while only, before the recalled results are displayed.

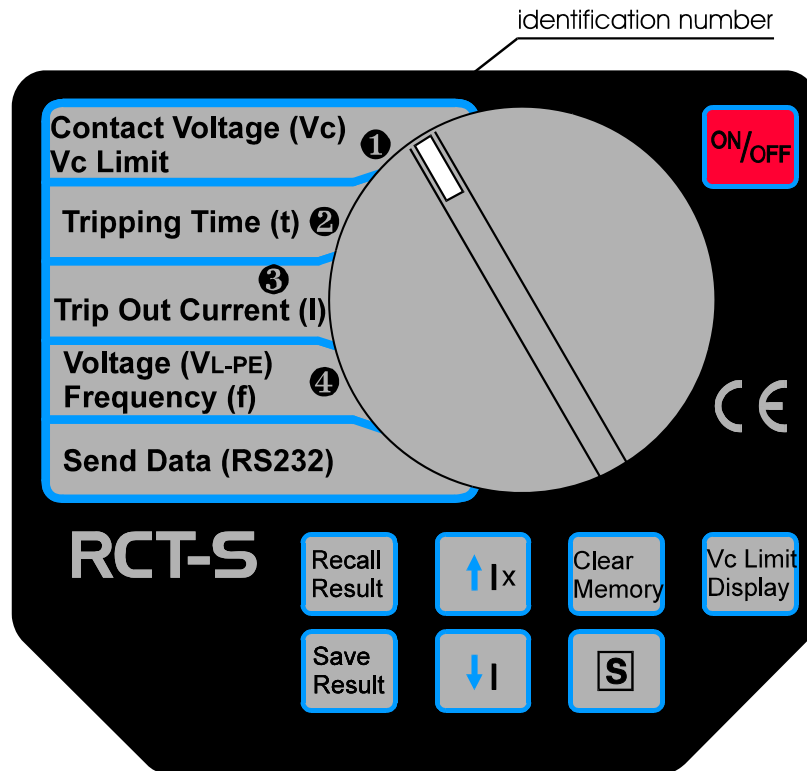


Figure 8: Identification number of each function

### Procedure how to recall memorised results:

#### Pressed key

#### Comments

Recall Result

The last **changed** partial code (X.X.X of YYY), used for the recalling of results, is displayed.

↑, ↓

Insert the desired code by using the [↑, ↓] keys if necessary.

DISPLAY, ↑, ↓

Insert the desired code by using the [↑, ↓] keys if necessary.

Recall Result

Confirm recalling pressing [Recall Result] key again.

First the identification number of a function is displayed for a while and then the main result will be displayed.



Check the other results saved under the same object and measuring place code by using the [↑, ↓] keys.

Form of the memory locations under a certain code X.X.X, YYY:

Result 1 + sub result;

Result 2 + sub result;

...

...

Result n + sub result

For detail information about codes we refer to the user manual delivered with the PATS-W Administration-Software.



***- If one wishes to abandon the current procedure (recalling),  
the rotary switch must be turned.***

***- Use the [DISPLAY] key to check the sub results too.***

## 5.5 RS232 COMMUNICATION

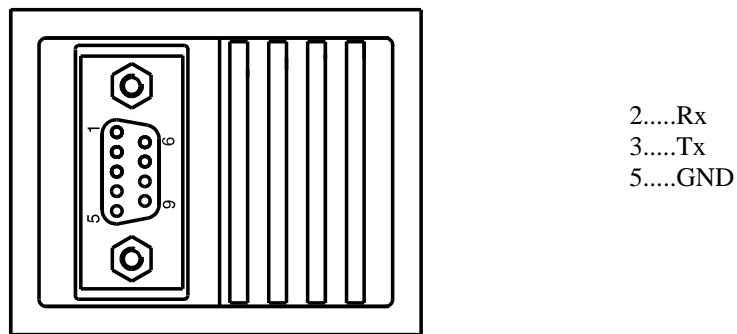


Figure 9: RS232 connector

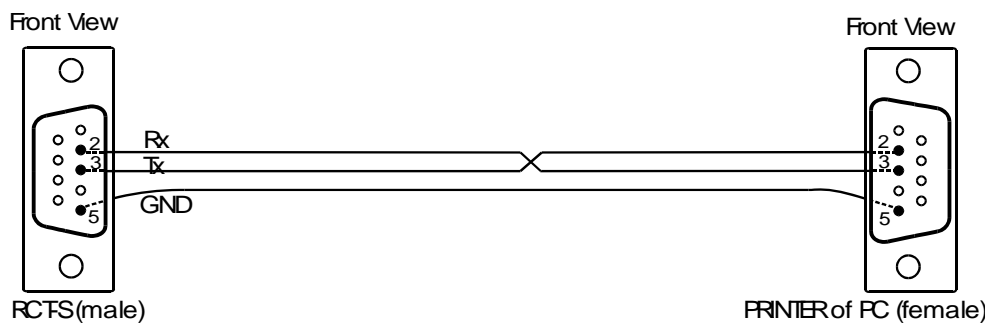


Figure 10: RS232 cable

- connect the printer or the PC to the ELT-S using a RS232 cable, which is supplied with the PATS-W;
- set all communication parameters at the PC by using the PATS-W Administration Software that can be supplied by NIEAF-SMITT upon separate order;
- set the rotary switch of the ELT-S to the RS232-position, “*Prt*” will be displayed;
- press the [START] key in order to transfer the stored data to the PC or to the printer;

## RS232 parameters

- baud rate 4800 Baud;
- format: 1 start bit, 8 data bits, 1 stop bit, no parity;
- protocol: X<sub>ON</sub>/X<sub>OFF</sub>.

```
Nieaf - Smitt B.V.  
Type Tester  
Serial. Nr.      9621002  
-----  
Date: -----  
Operator: -----  
Place: -----  
Note: -----  
  
Object: 001      Place: 001  
-----  
Test 1  
Testresult
```

*Figure 11: An example of print out*



***- If one wishes to stop transmission, the rotary switch position must be changed.***

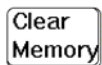
## 5.6 ERASING OF RESULTS

In order to avoid confusion, it is advisable to erase all stored results before starting new family of measurements. Sometimes only results stored under a certain object number or measuring place of the object are to be erased, or even only a recalled result has to be erased. To prevent confusion it is important to follow the erasing procedure correctly.

### All results are to be erased

Set the rotary switch in any position but the RS232 position.

#### Pressed key



#### Comments

**[ ] r** is flashing.



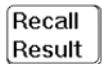
By pressing this key again, the clearing will be confirmed.

All results will be erased.

### Only results of a certain object (YYY) are to be erased.

Set the rotary switch in any position but the RS232 position.

#### Pressed key



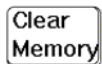
The last changed partial code (X.X.X of YYY), used for the recalling of the results, is displayed.



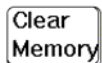
Use the [DISPLAY] key to select an object code (without dots) if necessary.



Insert the desired code by using the [ $\uparrow$ ,  $\downarrow$ ] keys if necessary.



“**[ ] r**” is flashing.



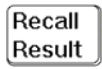
By pressing this key again, the clearing will be confirmed.

## Only results of a certain measuring place (X.X.X) of the object are to be erased.

The rotary switch in any position but the RS232 position.

### Pressed key

### Comments



The last changed partial code (X.X.X of YYY), used for the recalling of the results, is displayed.



Insert the desired object / measuring place code by using the [↑, ↓] keys.



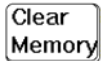
Use the [DISPLAY] key to select a measuring place / object code.




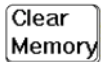
Insert desired object / measuring place code by using the [↑, ↓] keys if necessary.



Use the [DISPLAY] key to select the already inserted measuring place code (with dots) if it is not already selected.



“” is flashing.




By pressing this key again, the clearing will be confirmed.

Only results of a certain measuring place of the object will be erased.

## Only recalled result displayed is to be erased

Set the rotary switch in any position but the RS232 position.

Execute the following acts:

1. Recall the result under a certain measuring place and object code - follow the procedure under paragraph 5.6..
2. Use the [↑, ↓] keys to select the result which has to be erased.
3. Press the [Clear memory] key, “” is flashing.
4. Press the [Clear memory] key again to confirm the erasing.

Only the recalled result under a certain measuring place of the object is erased now. The next result saved under the same measuring place and object code is displayed.



*- If one wishes to abandon the current procedure (recalling / clearing), the rotary switch position must be changed.*


## 5.7 RESET OF THE INSTRUMENT

After inserting the batteries or if there is a malfunction noticed, it is advisable to reset the instrument.  
How to reset?

1. Switch off the instrument.
2. Press the [Clear memory] key and keep it pressed while you're switching on the instrument.
3. **rES** is displayed for a while meaning the reset function has been effected.

Table 5: Default values

| Parameter                               | Default values                      |
|---|-------------------------------------|
| VC lim                                  | 50 V                                |
| All memory locations                    | erased                              |
| Type of RCD                             | standard                            |
| Start location for storing              | 001 / 0.0.1 (object- / meas. place) |
| Start location for recalling            | 001 / 0.0.1 (object- / meas. place) |
| Nominal fault current                   | 10 mA                               |
| Multiplier of the nominal fault current | x 1                                 |

|   |  |
|---|--|
|  <p><i>Fout!</i><br/><i>Schakeloptie-<br/>instructie niet<br/>opgegeven.</i></p> | <p><i>If batteries are removed from the RCT-S, exchanged and the tester switched on, then the reset function will be executed automatically.</i></p> <p><i>All parameters of all functions will assume their default values.</i></p> |
|---|--|




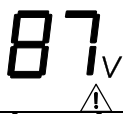

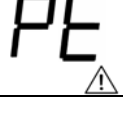












## 5.8 TROUBLESHOOTING

Table 6 describes the different displayed fault messages of the tester. For each fault an explanation and cause is given.

When executing various tests, various warnings could be displayed. They are having the following meanings:

Table 6. General faults and warnings

| Display   | Explanation   | Cause   |
|---|---|---|
|    | Measured voltage:<br>$V_{L-PE}$ blinking on display | Voltage $V_{L-PE}$ out of limits<br>$100V \div 264V$  |
|    | Out of reach  | The test result is out of reach, see paragraph "Specifications"   |
|    | Flashing  | RCD tripped during contact voltage test with the halved rated current ( $I_{\Delta N}/2$ )  |
|    | Contact voltage $V_C$ on display                    | Contact voltage $V_C$ at the rated $I_{\Delta N}$ or at the double rated current $2I_{\Delta N}$ (S type) is higher than the preset value $V_C$ lim |
|   | Flashing  | The instrument is overheated → wait   |
|  | Flashing  | No or bad PE connection   |
|  |   | Tripping time doesn't comply with the table 1 or contact voltage higher than present value $V_C$ lim  |
|  |   | Mains voltage present, phase terminal on the same side as the red dot of SHUKO plug.  |
|  |   | Phase and neutral terminals have been interchanged, phase terminal on the opposite side as the red dot of SHUKO plug.                               |
|  |   | Battery voltage is lower than 4.2V → replace the batteries.   |
|  |   | All memory locations are empty.   |
|  |   | Full memory   |
|  |   | Clear function is active.   |
|  |   | The tester is reset or the batteries are exchanged  |
|  |   | Measuring place identification number   |
|  |   | Object identification number  |


## **5.9 CALIBRATION AND REPAIR**

To warrant the technical specifications of the tester, we will advise you to calibrate the instrument at least once a year. It's to be shown that the tested products are governed by an established test procedure.


The calibration will be executed by Nieaf-Smitt b.v.. In the calibration report the results, judgements, town, date and name of the responsible person will be mentioned. There are no user replaceable parts in the instrument (batteries excepted)!


For calibration and/or service you can send your tester post-paid to your local dealer.

## 6. MAINTENANCE

|   |  |
|---|--|
|  | <p><i>Don't replace parts yourself but call technical qualified persons</i></p> <p><i>(see paragraph 2.1.2).</i></p> |
|---|--|

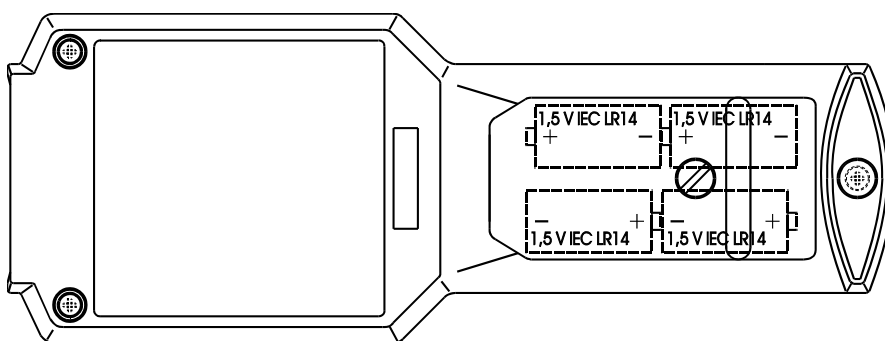
### 6.1 BATTERIES REPLACEMENT

|   |   |
|---|---|
|  | <p><i>Exchange all four batteries. If there are memorised results in the instrument and the "BAT" mark appears then transfer them to an extern printer or PC first. The batteries have to be changed within one minute!</i></p> |
|---|---|

|  |  |
|--|--|
|  | <p><i>Disconnect all cables (test cable or RS232 cable) before removing the battery cover.</i></p> <p><i>Caution, possible live parts under the battery cover</i></p> <p><i>Throw, after using, the empty batteries in special the battery basket.</i></p> |
|--|--|

If the "BAT" mark appears at the display, it means that the battery voltage is lower than 4,3 V. Remove the old batteries and insert new ones. Procedure batteries replacement:

1. Disconnect all cables and cords, and remove the battery cover.
2. Remove the old batteries.
3. Place the new batteries in the battery holder. Always exchange all four batteries simultaneously.



niet opgegeven.


Fout! Schakeloptie-instructie

Figure 12: Batteries inserted



*Use the batteries declared in technical specification only.*

If there is no chance to transfer the results (extern printer or PC not available), then follow the next procedure when changing batteries in order not to loose any stored data:

1. Switch off the instrument.
2. Remove the battery cover.
3. Exchange the batteries within one minute.
4. Place the battery cover back and switch on the instrument
5.  should not be displayed after switching it on. The memorised results have not been erased now.

## 6.2 CLEANING



*Do not use liquids based on petrol!  
Do not spill cleaning liquid over the instrument.*

Use soft patch moister by water or alcohol, and leave the instrument to dry totally after the cleaning.

## 7. ACCESSORY AND REPLACEABLE PARTS

### Supplied standard set:

- one test main cable shuko, curly type, 2 m;
- one English user manual.

Check all the supplied items (enclosure of the instrument as well as the accessories). If there are any damages please return the tester to the supplier for exchange or service.

### Supplied options:

- RS232 cable, for data transfer and software;
- PATS-W Administration-Software;
- Test cable - separate connectors, 2,2m with safety crocodiles;
- Carrier bag;
- Carrier suitcase.

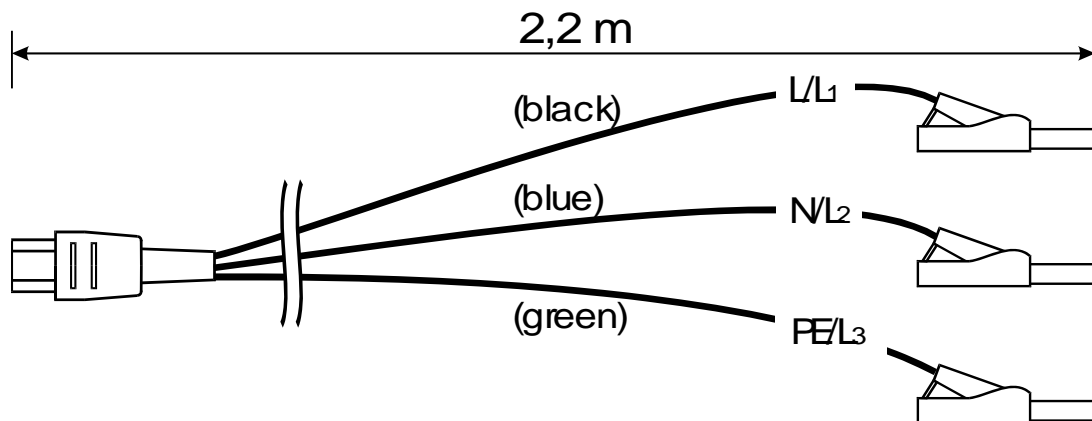


Figure 13: Test leads

## EU-DECLARATION OF CONFORMITY

Product: RCCB Tester

Identification of the instrument:

Trademark: Nieaf-Smitt bv.  
Model/Type: RCT-S

Nieaf-Smitt herewith declare that the instrument which this declaration refers to is in conformity with the following standards and according to the conditions of following Directives:

Low Voltage Directive (73/23/EEG) as last amended.  
EMC-Directive (89/336/EEG) as last amended.

VDE0701  
IEC1010-1  
EN 55022 class B  
NEN-EN 50081-1  
NEN-EN 50082-1  
IEC801-2 level 3  
IEC801-3 level 2  
IEC801-4 level 4

Place and date of issue

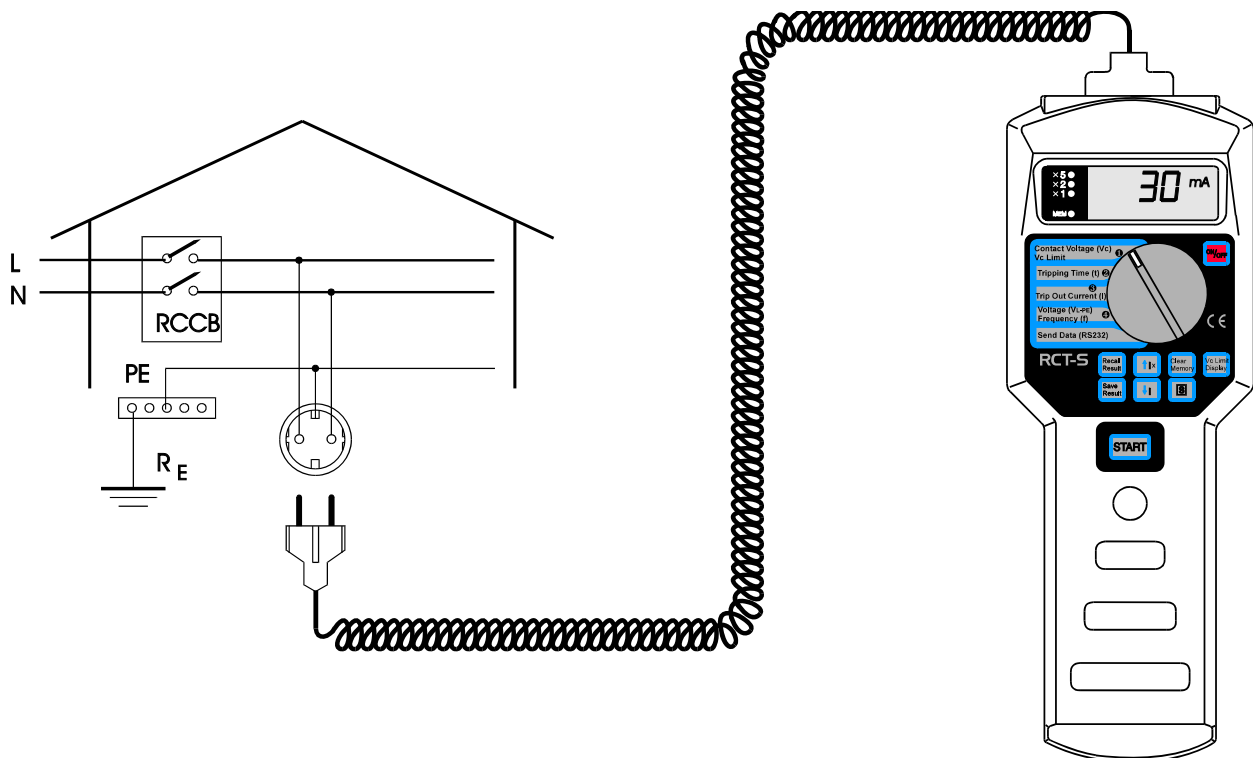
Name and signature or equivalent stamp of authorized person.

## Circuit diagrams

### - Contact voltage (VC) without tripping out RCD

Connect the instrument to the test object or installation according to the circuit diagram.

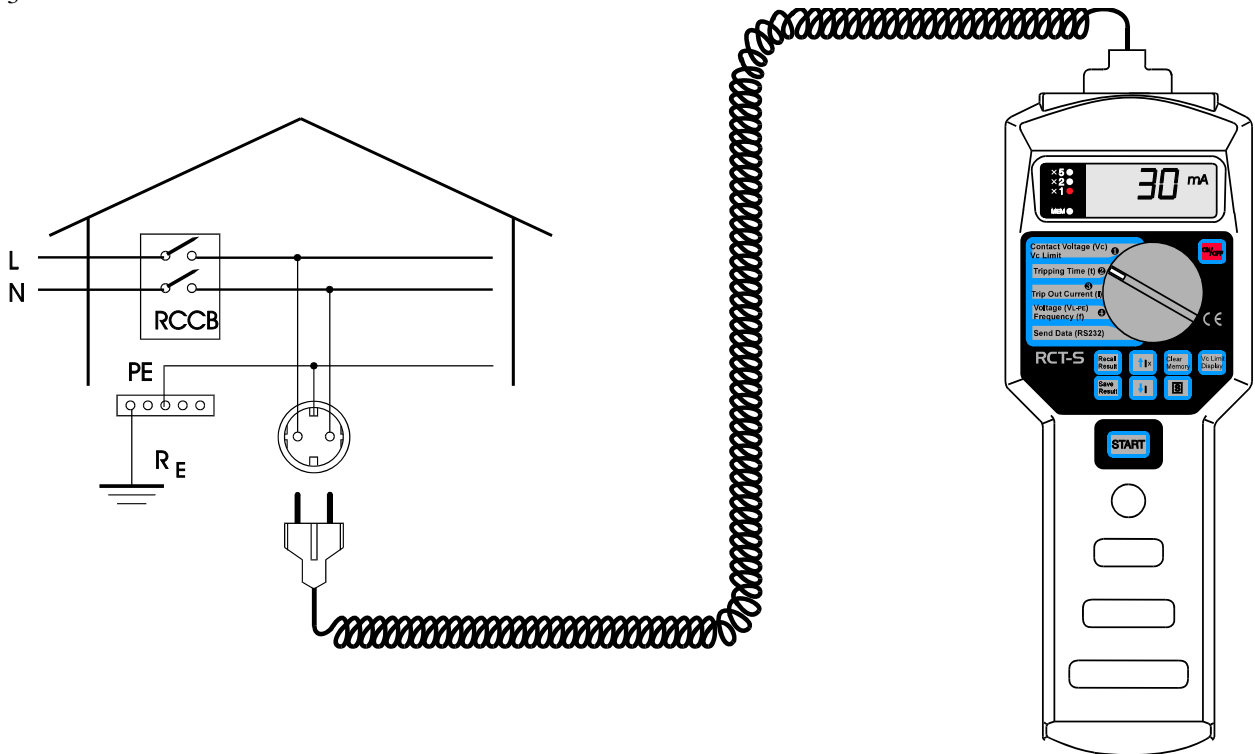
2



### - RCD tripping time ( $t$ )

Connect the instrument to the test object or installation according to the circuit diagram.

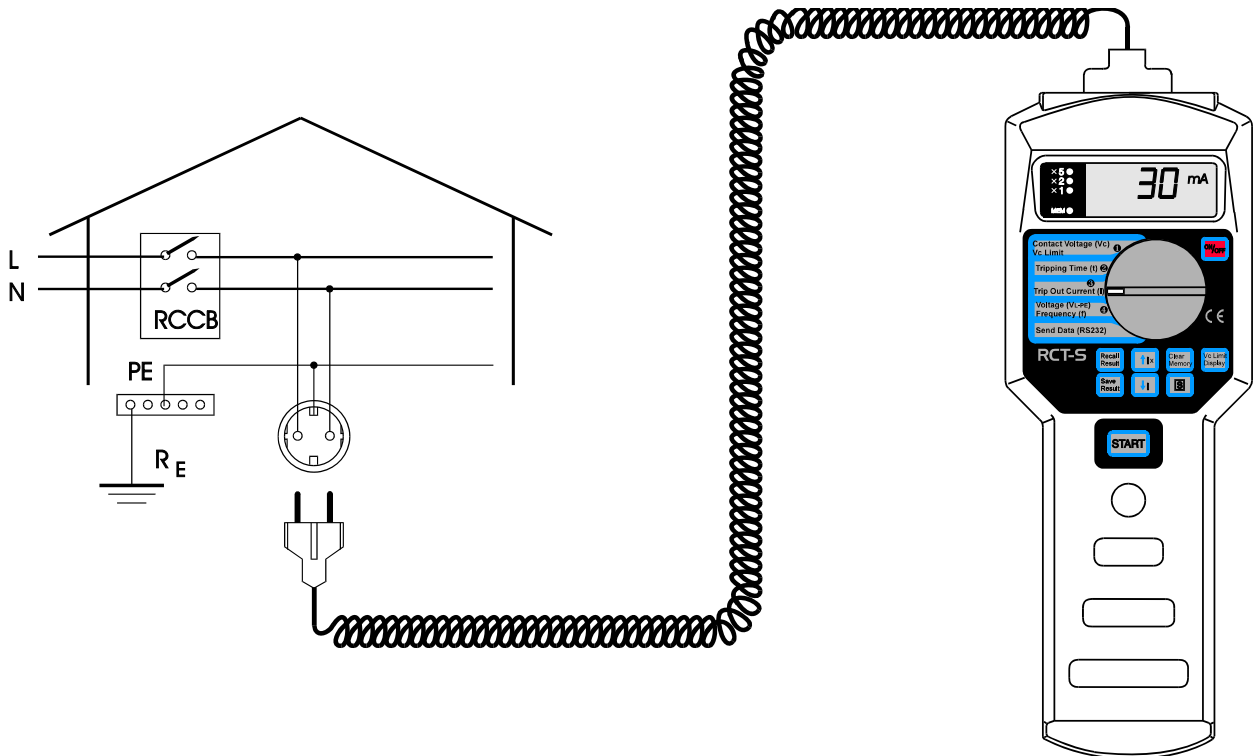
3





**- RCD trip out current ( $I$ ) at tripping time ( $t$ )**

Connect the instrument to the test object or installation according to the circuit diagram.



*- Voltage or frequency*

Connect the instrument to the test object or installation according to the circuit diagram.

