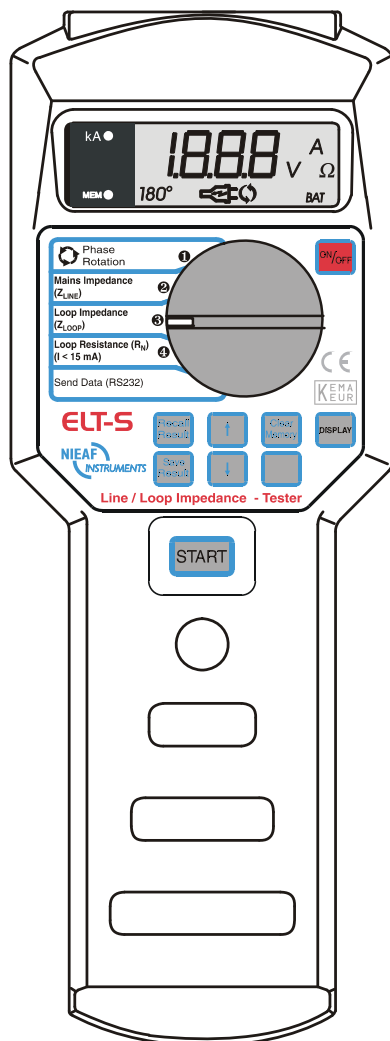


User manual

Earth Line / Loop Impedance tester



Supplier:	Nieaf-Smitt bv Vrieslantlaan 6 3526 AA Utrecht Holland P.O. box 7023 3502 KA Utrecht
Specifications of the equipment:	ELT-S
Specifications of the user manual:	Date: 17-11-2004 Number: 561144038 Ref. :004

Preface

This manual describes the earth line / loop impedance 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 earth line / loop impedance 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 or actions.



TIP:
gives you suggestions and advice to perform certain tasks easier or handier.



ATTENTION:
a remark with additional information; draws your attention to possible problems.



CAUTION:
the machine may be damaged, if you do not carefully execute the procedures.



WARNING FOR DANGER:
you can (seriously) hurt yourself or seriously damage the product, if you do not carefully execute the procedures.

- 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 rectangular 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: General sign for danger. Read the instructions carefully before use.	At the back side of the tester on the instruction label.
	Warning: Danger for direct contact with live parts.	At the back side of the tester on the instruction label and under the battery cover.
	Marking: Insulation class II (double insulation).	At the back side of the tester on the instruction label.
	Marking: Marks the KEMA certification of the tester.	The KEMA keur is placed on the front side of the tester.
	CE-mark: 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.

CONTENTS

1. GENERAL SAFETY REGULATIONS	7
2. INTRODUCTION	8
2.1 GENERAL	8
2.1.1 <i>The intended use</i>	8
2.1.2 <i>Target group</i>	8
2.1.3 <i>Working principle</i>	9
2.2 SPECIFICATIONS	10
2.3 CERTIFICATION	12
3. TESTER COMPOSITION	13
3.1 GENERAL	13
3.2 PRINCIPLE OF MEASUREMENT	13
3.2.1 <i>Visual inspection</i>	13
3.2.2 <i>Three phase rotation test</i>	13
3.2.3 <i>Line or fault loop impedance and prospective short-circuit current measurement</i>	14
3.2.4 <i>Loop resistance measurement without causing trip out RCCB</i>	14
4. INSTALLATION; START-UP AND ADJUSTING	15
5. HOW TO USE THE TESTER?	16
5.1 OPERATING	16
5.1.1 <i>Starting</i>	17
5.2 TESTING	18
5.2.1 <i>Test 1: Three phase rotation test</i>	18
5.2.2 <i>Test 2: Line or fault loop impedance and prospect. short-circuit current measurement</i>	19
5.2.3 <i>Test 3: Loop resistance measurement</i>	20
5.3 MEMORISING OF RESULTS	20
5.4 RECALLING OF MEMORISED RESULTS	22
5.5 RS232 COMMUNICATION	23
5.6 ERASING OF RESULTS	25
5.7 RESET OF THE INSTRUMENT	27
5.8 TROUBLESHOOTING	28
5.9 CALIBRATION AND REPAIR	29
6. MAINTENANCE	30
6.1 BATTERIES REPLACEMENT	30
6.2 CLEANING	31
7. ACCESSORY AND REPLACEABLE PARTS	32

Tables:

Table 1: Pictograms on the tester

Table 2: Switches

Table 3: Sub results and parameters

Table 4: General faults and display messages

Figures:

Figure 1: Practical installation

Figure 2: Operating

Figure 3: Identification number of each function

Figure 4: RS232 connector

Figure 5: RS232 cable

Figure 6: An example of print out

Figure 7: Batteries inserted

Figure 8: Test leads (separate connectors)

Attachments:

Attachment 1: EU-Declaration of Conformity

Attachment 2: Circuit diagrams

- *Three phase rotation test*
- *Line or fault loop impedance and prospective short-circuit current measurement*
- *Loop impedance and prospective short-circuit current measurement*
- *Loop impedance measurement without causing trip out RCCB*
- *Loop resistance measurement without causing trip out RCCB (using separate test leads)*

1. GENERAL SAFETY REGULATIONS



*Read, before you perform any action in connection with the tester, this user manual carefully.
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.*



*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.*



It's forbidden to place and/or to use the instrument in a room where is a risk of explosion.



If the tester is used by a third party, you being the owner are responsible, unless otherwise specified.



Repair can only be done by Nieaf-Smitt bv.



Provide a clean and save workplace which has sufficient lightning.

2. INTRODUCTION

2.1 GENERAL

2.1.1 The intended use

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

The tester is intended for execution of line (L-N or L-L) as well as loop (L-PE) impedance measurements on one or three phase systems. Using this instrument one can test also loop resistance between neutral and protective conductors without causing trip out RCCB. The tester can also be used to determine phase rotation. 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.



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By operating we mean:

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

2.1.3 Working principle

Structure

The ELT-S is a professional instrument intended for execution of line (L-N or L-L) as well as loop (L-PE) impedance measurements on one or three phase systems. Using this instrument one can test also loop resistance between neutral and protective conductors without causing trip out RCCB. Select the test by means of the rotary switch. Now the user is able to prescribe the desired measuring method. The test results are clearly displayed on the LCD.

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 it's specific circuit diagram which is given in the attachments.
Next measurements are executable by the instrument:

1. The measuring of the three phase rotation.
2. The measuring of the line impedance between line and neutral conductors.
3. The measuring of the line impedance between two line conductors and three phase system.
4. The measuring of the line impedance between line and protective conductors.
5. The measuring of the prospective short-circuit current.
6. The measuring of the prospective short circuit current.
7. The measuring of the loop resistance between neutral and protective conductors without causing trip out RCCB.
8. The measuring of the mains voltage.
9. The measuring of the mains frequency.

2.2 SPECIFICATIONS

General

Nominal voltage Z LINE	:	100 - 440 V _{ac} (eff)
Nominal voltage Z LOOP	:	100 - 250 V _{ac} (eff)
Nominal frequency	:	45 - 65 Hz
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 19mm with additional warnings
Quality standard	:	design, development and production according to ISO 9001
Automatic L/N exchange function	:	incorporated
Mass	:	approx. 0,75 kg including batteries and accessories
Dimensions (wxhxd)	:	110 x 65 x 290 mm

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) 90% RH (-10°C - 40°C)
Degree of protection	:	IP50
Pollution degree	:	Class II
Overvoltage protection	:	Category II 600V Category III 300V

Tests

Measurement of effective (r.m.s.) value of a.c. voltage

Range	:	0 - 440 V
Resolution	:	1 V
Accuracy	:	± (2% reading + 2 digits)

Measurement of frequency

Range	:	25,0 - 199,9 Hz / 200 - 400 Hz
Resolution	:	0,1 Hz / 1 Hz
Accuracy	:	± (0,1% reading + 1 digit)

Line impedance between phase and neutral conductors or between two phase conductors

Range (automatic selection)	:	0 - 19,99 Ω / 20,0 - 199,9 Ω / 200 - 1999 Ω
Resolution	:	0,01 Ω / 0,1 Ω / 1 Ω
Accuracy	:	± (2% reading + 2 digits)
Nominal voltage	:	100 - 440 V _{ac} (eff)
Nominal frequency	:	45 - 65 Hz

Loop impedance measurement between the phase and protective conductors

Range (automatic selection)	:	0 - 19,99 Ω / 20,0 - 199,9 Ω / 200 - 1999 Ω
Resolution	:	0,01 Ω / 0,1 Ω / 1 Ω
Accuracy	:	± (2% reading + 2 digits)
Nominal voltage	:	100 - 250 V _{ac} (Fe)
Nominal frequency	:	45 - 65 Hz

Loop resistance measurement between the neutral and protective conductors

Range (automatic selection)	:	0 - 19,99 Ω / 20,0 - 199,9 Ω / 200 - 1999 Ω
Resolution	:	0,01 Ω / 0,1 Ω / 1 Ω
Accuracy	:	± (2% reading + 2 digits) / ± (2% reading + 2 digits) / 5%
Open circuit test voltage	:	approx. U _{bat}
Test current	:	< 15 mA _{dc} , both polarities

Prospective short-circuit current(I_K) standard value (impedance)Short-circuit current I_K calculation:

$$I_K = \frac{U_{nom}}{Z} \cdot \left(1 + \frac{\delta}{100\%}\right)$$

$$U_{nom} = U_{L-N} \text{ ----- } 100V \langle U_{imp} \left(\frac{U_{L-N} + U_{L-L}}{2} \right)$$

$$U_{nom} = U_{L-L} \text{ ----- } \frac{U_{L-N} + U_{L-L}}{2} \langle U_{imp} \langle 440V$$

U_{L-N} (230V factory set-up)U_{L-L} (400V factory set-up)

δ (6% factory set-up)

*Accuracy of I_K : take into account the accuracy of Z LINE*I_K display range (400 V): 0,20 A - 40 kAI_K display range (230 V): 0,11 A - 23 kAResolution I_K :

0.01 A	.....	0,06 - 19,99 A
0.1 A	.....	20,0 - 199,9 A
1A	.....	200 - 1999 A
10A	.....	2,00 - 19,99 kA
100A	.....	20,0 - 40,0 kA

Nominal voltage: 100 - 440 V

Nominal frequency: 45 - 65 Hz

Prospective short-circuit current (I_K) standard value (resistance)

Short-circuit current I_K calculation:

$$I_K = \frac{U_{nom}}{Z_{LOOP}} \cdot \left(1 + \frac{\delta}{100\%}\right)$$

$$U_{nom} = U_{L-N}$$

U_{L-N} (230V factory set-up)

δ (6% factory set-up)



Accuracy of I_K : take into account the accuracy of Z LOOP

I_K display range (230 V): 0,11 A - 23 kA

Resolution I_K :

0.01 A	.....	0,06 - 19,99 A
0.1 A	.....	20,0 - 199,9 A
1A	.....	200 - 1999 A
10A	.....	2,00 - 19,99 kA
100A	.....	20,0 - 23,0 kA

Nominal voltage: 100 - 250 V

Nominal frequency: 45 - 65 Hz

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 ELT-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.

3.2.2 Three phase rotation test

This measurement has to be used in order to determine whether there is a left or right hand side phase rotation.

3.2.3 Line or fault loop impedance and prospective short-circuit current measurement

Why to test line or fault loop impedance and prospective short-circuit current?

- to verify correspondence fused fuses (nominal current and breaking current capacity);
- to dimension the protection system;
- to verify the capability of the power source;
- to remove bad contacts (measurement is performed using high current impulse).

Why test impedance instead of resistance?

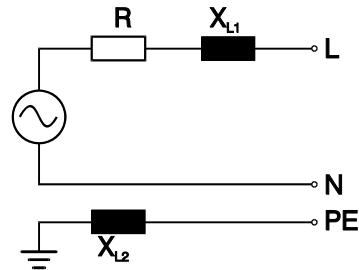


Figure 1: Practical installation

If the measurement is carried out close to the power transformer or some inductivity is connected in series with the power transformer, then the inductive part of the impedance already has a significant influence to the prospective short-circuit current. That is why impedance is the correct parameter for the calculation of the short-circuit current.

Short-circuit current is calculated with respect to the nominal value of the mains voltage.

3.2.4 Loop resistance measurement without causing trip out RCCB

In case of it isn't allowed tripping out the RCCB during the measurement of the loop resistance, the function Loop Resistance (R_N) must be selected. The test current in this function is lower than 15 mA which is low enough to cause no trip out of the RCCB, even in case of 30 mA types.

4. INSTALLATION; STARTING UP AND ADJUSTMENT



The tester can only be used if no damages 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.

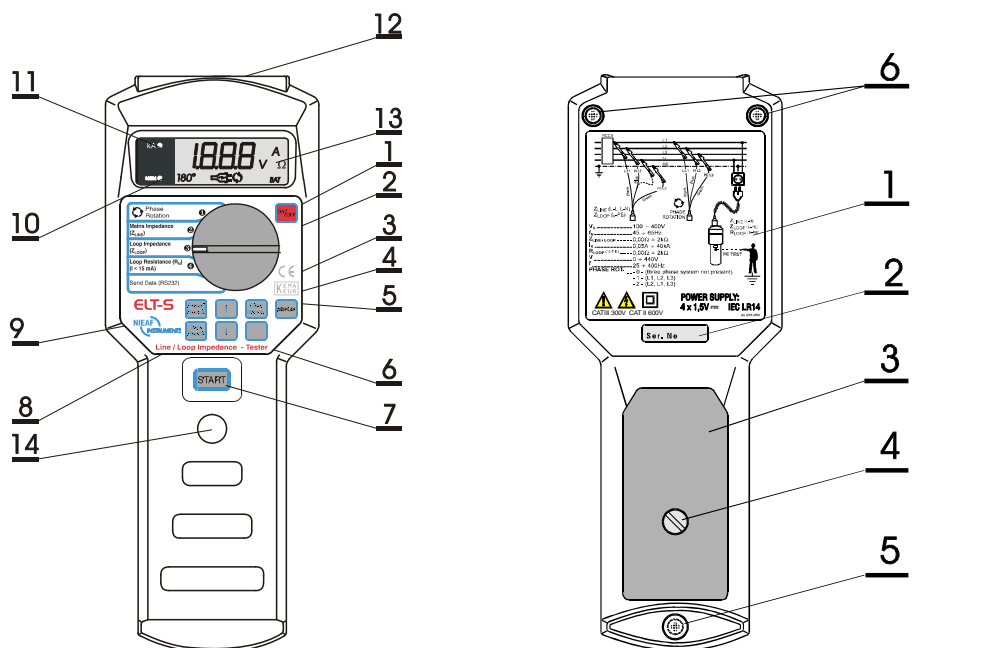
1. Unpack the instrument.
Remove the packing materials without causing damages to the environment. Check the tester on possible damages. If damages are noticed, contact Nieaf-Smitt bv..
2. Put the instrument in a horizontal position, at the workplace or on a table in the test room.
Keep enough clearance around the instrument to facilitate an easy operation, adjustment and reading of test results, without any problems or extra danger.
3. Insert the batteries in the instrument.
4. Connect the test object according to the circuit diagrams with the ELT-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. DISPLAY key
6. Decrease key of memory location
7. START key
8. Store key to save measuring results
9. Recall key to recall saved results
10. Memory indication LED
11. kA LED to indicate the short-circuit current function
12. Connection (functional and RS232)
13. LCD-display
14. Earth potential key

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 2: Operation


Keys

Function key description.

Table 2: Switches

Selector position	Description
ON/OFF Recall result Save result ↑ ↓ Clear memory Display Phase rotation Line impedance (Z _{line}) Loop impedance (Z _{Loop}) Loop resistance (RN) Data transfer (RS232)	<ul style="list-style-type: none"> - to switch on/off the tester; the tester will switch off automatically after it hasn't been used for ten minutes or more; - to recall the saved results; - to save the displayed measuring results; - to increase/decrease the object or measuring place identification number when saving or recalling the results; - 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; - to clear all saved results; - to clear all saved results under a certain object identification number (without dots YYY); - to clear the saved results under a certain measuring place identification number only (with dots XXX); - to clear, in the [Recall Result]-function, the displayed result only; - to execute a RESET of the instrument. - to select, in the [Save Result] or in the [Recall Result]-function, the object identification number or measuring place identification number; - to determine the phase rotation; - the measurement of the line impedance and the prospective short-circuit current; - the measurement of the loop impedance and the prospective short-circuit current; - the measurement of the loop resistance without causing a trip out of the RCCB; - to transfer stored data to the printer or to the PC.

5.1.1 Starting

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

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 a visual inspection on the test object or the installation. Connect the tester conform the circuit diagrams of attachment 2.

We have three different tests:

Test 1: Three phase rotation test.

Test 2: Line or fault loop impedance and prospective short-circuit current measurement.

Test 3: Loop resistance measurement without causing a trip out of the RCCB.

5.2 TESTING



- Avoid testing objects or installations under the influence of high electromagnetic and/or electrostatic fields.

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 Test 1: Three phase rotation test



*- Don't touch the test object nor the installation during measuring;
- Each result can be saved once only.*

How to carry out test 1:

1. Connect the test cords with the instrument conform the circuit diagram the of attachment 2.
2. To select the phase rotation test set the rotary switch to [Phase rotation].
3. The result is displayed (pushing the [START] key isn't necessary).
4. Read out the result, save it if required, and enter the memory codes when necessary.
5. Disconnect the test object or carry out another test.

Presentation of result:

- | - phases according to measuring cable marks
- 2 - phases not according to measuring cable marks
- □ - phases do not correspond to 3 phase system or one or two phases fail

5.2.2 Test 2: Line or fault loop impedance and prospect. short-circuit current measurement



- After finishing the measurement use the [DISPLAY] key to check the prospective short circuit current and the connection (connection L-L or L-N in Z LINE function only)
- Two polarities of the test current are possible when starting the Z LOOP function in order to avoid a trip out of the RCCB:
 - positive use it if the RCCB is sensitive to negative polarity only,
 - negative use it if the RCCB is sensitive to positive polarity only.
- Select the positive polarity by pressing the [START] key once, when starting the measurement, or select the negative polarity by pressing the [START] key twice (in that case 180° is displayed).
- If the rotary switch is set to [Mains Impedance (Z_{Line})] it is possible to check the safety state of the earth connection, at the concerning terminals in the instrument, by means of touching the metal earth potential key.

How to carry out test 2:

1. Connect the test cords with the instrument conform the circuit diagram of attachment 2. (2/5 three phase or 3/5 single phase).
2. Set the rotary switch to [Mains impedance (Z_{Line})] or [Loop impedance (Z_{Loop})]
3. The mains voltage is displayed.
 - For the Z_{Line} function press the metal button.
 - If the mains voltage is displayed, a Loop Resistance measurement can be performed.
 - If the message UPE is displayed there is a voltage >50V on the earth terminal. Disconnect the ELT-S and check the socket.
 - In the Z_{loop} function the tester checks continuous the difference between the phase / neutral voltage and the phase / earth voltage.
 - If the mains voltage is displayed the difference is <25V. The measurement can be performed.
 - If the message PEd is displayed the difference is >25V. Disconnect the ELT-S and check the socket.
5. The present mains voltage is displayed.
6. Press the [DISPLAY] key to check the mains frequency.
7. Press the [START] key and read out the result. Save it if required, and note the memory codes when necessary. Both results (impedance and prospective short circuit) will be saved.
8. Disconnect the test object or carry out another test.

5.2.3 Test 3: Loop resistance measurement



- The DC test current is pushed into PE - N loop using instrument's battery. In order to reach better results both polarities (positive and negative) are used during the test.

- There must be no voltage between the N and the PE terminals otherwise the instrument will not carry out the measurement but present voltage will be displayed flashing way.

How to carry out test 3:

1. Connect the test cords according to the circuit diagrams of attachment 2.
2. Set the rotary switch to [Loop resistance (RN)]
3. Press the [START] key and release it.
4. Read out the result. Save it if required, and note the memory codes (when necessary).
5. Disconnect the test object or carry out another test.

5.3 MEMORISING 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:

Pressed key


Comments

1.  The last **changed** 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.
2. ,  Insert new codes using the [↑, ↓] keys if necessary.
3. , ,  Check the other part of the code pressing the [DISPLAY] key and change it using the [↑, ↓] keys if necessary.
4.  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 3: Sub results and parameters.

Main result	Sub results and parameters
○ PHASE ROTATION	
LINE impedance	- Short-circuit current - Connection (L-L or L-N)
LOOP impedance	- Short-circuit current - Polarity of measuring current
LOOP resistance	

	<p><i>- If one wishes to abandon the current procedure (memorising), the rotary switch must be turned.</i></p> <p><i>- For all measuring results, numbers from 001 up to including 999 are available (for the object and for the measuring place).</i></p> <p><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></p> <p><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></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.

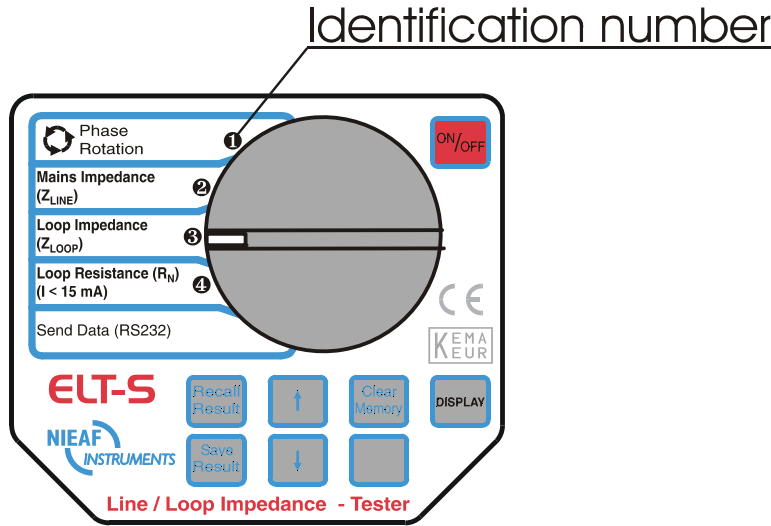


Figure 3: Identification number of each function

Procedure how to recall memorised results:

<u>Pressed key</u>	<u>Comments</u>
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.

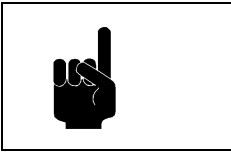


Check the other results saved under the same object and measuring place code by using the [↑, ↓] keys.

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

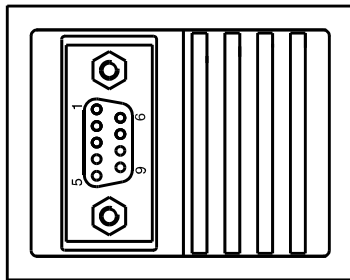
Result 1 + sub result;
Result 2 + sub result;
...
...
Result n + sub result

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



2.....Rx
3.....Tx
5.....GND

Figure 4: RS232 connector

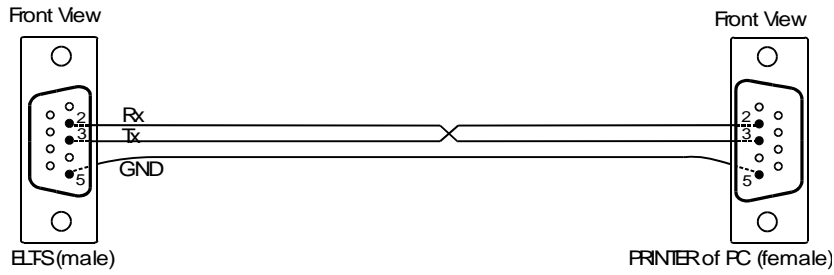


Figure 5: RS232 cable

- connect the printer or the PC to the ELT-S using a RS232 cable, which is supplied with the PATS-W or E-Test;
- 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, “**PrE**” 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_{ON}/X_{OFF}.


```

ELT-S
Serial number: 962002
-----
Date: -----
Operator: -----
Place: -----
Note: -----

Object: 001   Place: 001
-----
Test 1
Testresult

```

Figure 6: An example of a print out

	<p><i>- If one wishes to stop transmission, the rotary switch position must be changed.</i></p>
---	---

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



Cl 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

Comments



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 [↑, ↓] keys if necessary.



“ **Cl 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.

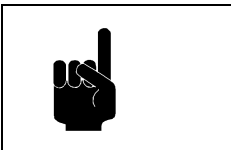
Only recalled result displayed is to be erased

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.



- Performing the reset function means that all memory locations will be erased.

Parameters of all functions will be set to it's default values as follows:

- the measuring place identification number is set to 0.0.1;
- the object identification number is set to 001.

5.8 TROUBLESHOOTING

Table 5 describes the different displayed fault messages of the tester. For each fault an explanation and cause is given. Faults, which demand technical qualified persons, are marked with a star (*).

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

Table 4. General faults and warnings

Display	Explanation	Cause
	Out of reach	The test result is out of reach, see paragraph "Specifications"
	Value of the present voltage is flashing on the display	Input voltage is out of nominal range.
		Mains frequency is out of nominal range
	Flashing	The instrument is overheated → wait.
		Mains voltage present, phase terminal at the same side as red dot at shuko plug.
		Mains voltage present; phase terminal on the opposite side as red dot at shuko plug.
		Battery voltage is lower than 4.3V → replace the batteries.
		All memory locations are empty.
		Full memory
		Send Data function is selected
		Clear function is active
		The tester is reset or the batteries are exchanged
		Measuring place identification number
		Object identification number
	In ZLOOP function only	Negative polarity of test current.
		Voltage between phase and zero is 25 V higher than the voltage between phase and earth
		Voltage on earth is higher than 50 V
	In ZLINE function only	The measurement was done between L and N terminals.
	In ZLINE function only	The measurement was done between two phase terminals.
		Fault fuse (in RN function only)


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 external 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.

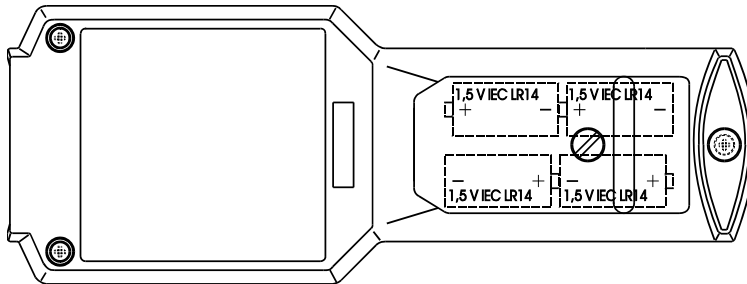



Figure 7: Batteries inserted



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 lose 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 moistened 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;
- E-test V.2
- Test cable - separate connectors, 2,2m with safety crocodiles;
- Carrier bag;
- Carrier suitcase;
- Protective holster.

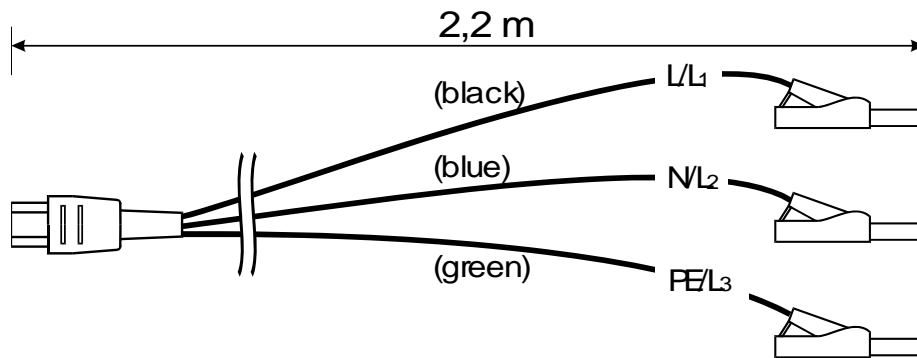


Figure 8: Test lead (separate connectors)

EU-DECLARATION OF CONFORMITY

Product: Earth Line / Loop Impedance Tester

Identification of the instrument:

Trademark: Nieaf-Smitt bv.
Model/Type: ELT-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

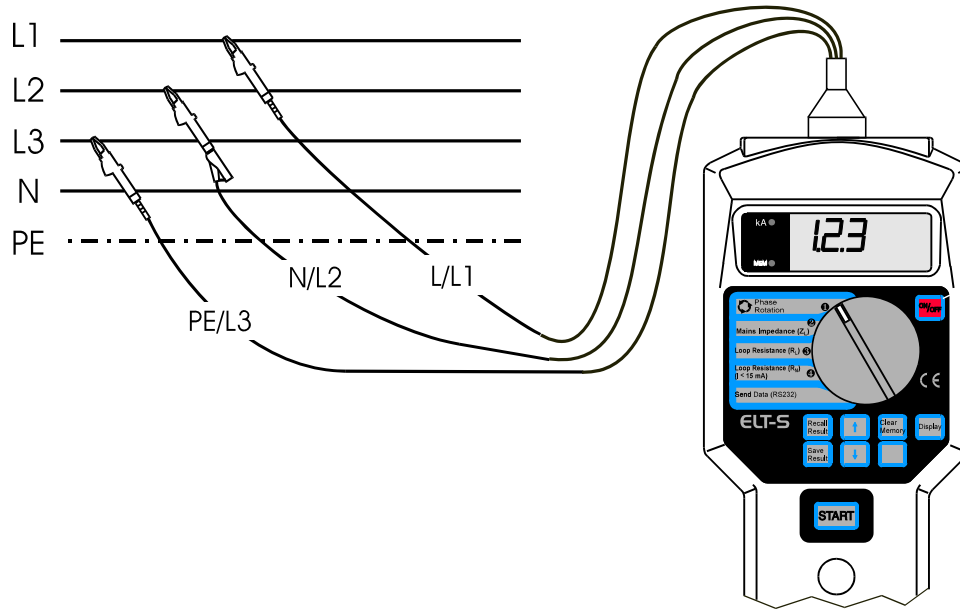
Place and date of issue

Name and signature or equivalent stamp of authorised person.

Circuit diagrams

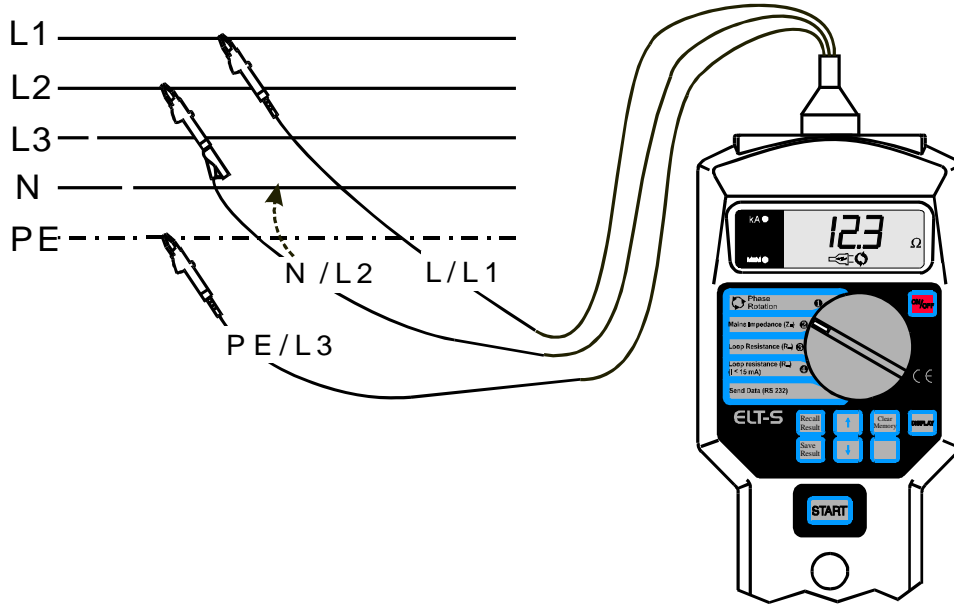
- Three phase rotation test

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



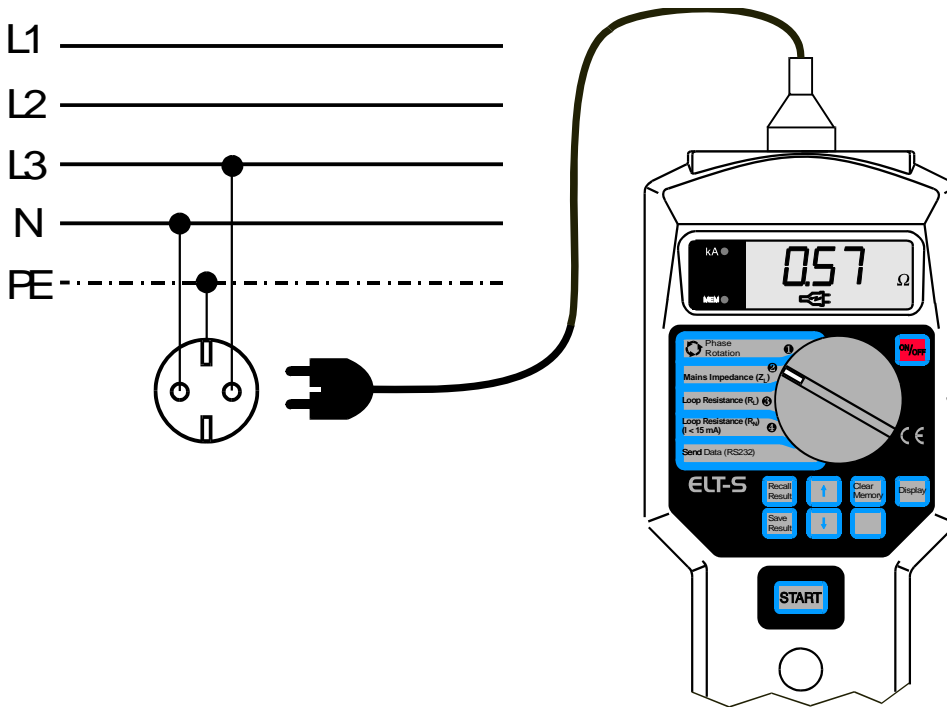
- Line impedance and prospective short-circuit current measurement

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



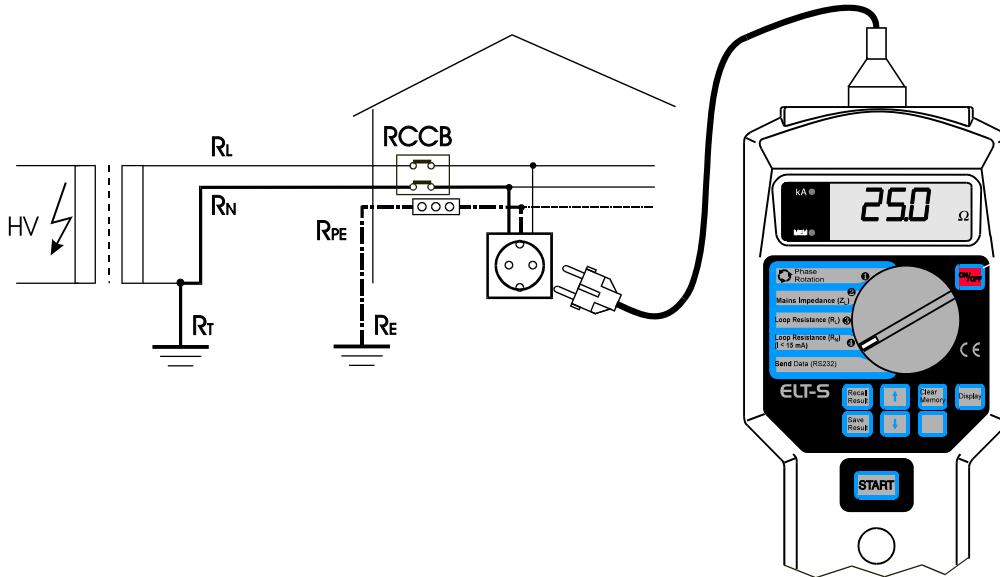
- Fault loop impedance and prospective short-circuit current measurement

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



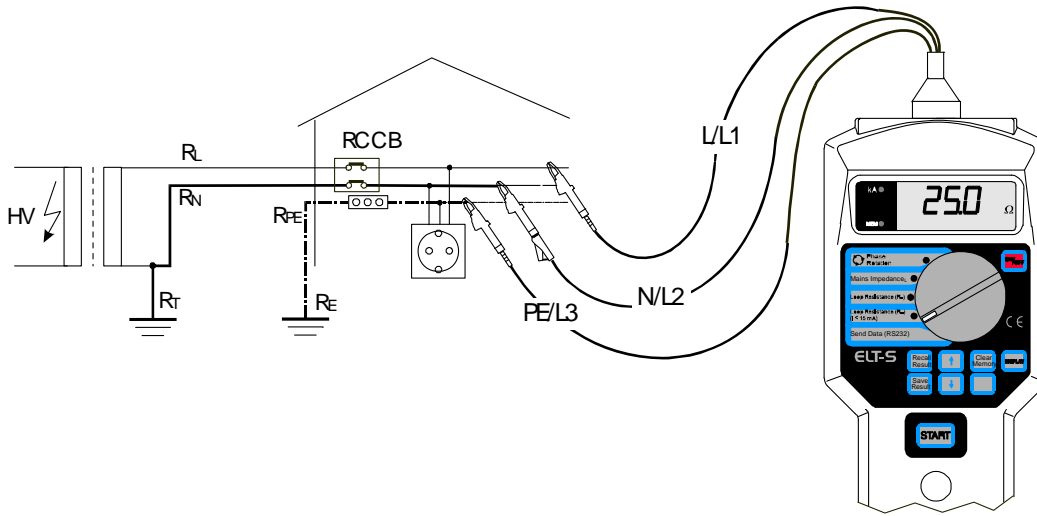
- Loop resistance measurement without causing trip out RCCB

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



**- Loop resistance measurement without causing trip out RCCB
(using separate test cords)**

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



Opmerking [WvR1]: Coreldra
w tekening "elt bijlage 5/5 engels"