



NIM 1000

Net Impedance Meter

USER GUIDE

Issue: 04 (06/2016) - EN
Article number: 82941

Consultation with Megger

The present system manual has been designed as an operating guide and for reference. It is meant to answer your questions and solve your problems in as fast and easy a way as possible. Please start with referring to this manual should any trouble occur.

In doing so, make use of the table of contents and read the relevant paragraph with great attention. Furthermore, check all terminals and connections of the instruments involved.

Should any question remain unanswered or should you need the help of an authorized service station, please contact:

Megger Limited

Archcliffe Road
Kent CT17 9EN
T: +44 1304 502100
F: +44 1304 207342
E: uksales@megger.com

Seba Dynatronic

Mess- und Ortungstechnik GmbH
Dr.-Herbert-Iann-Str. 6
D - 96148 Baunach
T: +49 9544 68 – 0
F: +49 9544 22 73
E: team.dach@megger.com

Hagenuk KMT
Kabelmesstechnik GmbH

Röderaue 41
D - 01471 Radeburg / Dresden
T: +49 35208 84 – 0
F: +49 35208 84 249
E: team.dach@megger.com

Megger USA

Valley Forge Corporate Centre
2621 Van Buren Avenue
Norristown, PA 19403 USA
T: +1 610 676 8500
F: +1 610 676 8610

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Since some states do not allow the exclusion or limitation of an implied warranty or of consequential damage, the limitations of liability described above perhaps may not apply to you.

Contents

Consultation with Megger3

Terms of Warranty4

Contents5

1 Basic Notes7

2 Technical Description9

2.1 System Description9

2.2 Technical Data11

2.3 Connections, Controls and Display12

3 Electrical connection13

4 Operation16

4.1 System Settings18

4.2 Performing Measurements19

4.2.1 Network Impedance Measurement20

4.2.1.1 Prepare Measurement.....20

4.2.1.2 Performing the Measurement.....22

4.2.1.3 Analysing Measurement Results.....23

4.2.2 Measuring in Fault Mode25

4.2.2.1 Preparing Measurement.....25

4.2.2.2 Performing the Measurement.....26

4.2.2.3 Identifying and Locating Faults27

4.3 Exporting the Measured Data28

5 Maintenance and care.....29

Annex 1: Measuring Accuracy30




Annex 2: Measuring Range.....32

1 Basic Notes

Safety precautions This handbook contains basic instructions for the initial use and operation of the NIM 1000. For this reason, it is important to ensure that the manual is always available to authorised and trained personnel. Operating personnel should read the manual thoroughly. The manufacturer will not be held liable for any injury or damage to personnel or property through failure to observe the safety precautions contained in this handbook.

The specific standards and regulations in each country must also be observed.

Labelling of safety instructions Important instructions concerning personnel, operational and technical safety are marked in the text as follows:

Symbol	Description
 WARNING	Indicates a potential danger of an electric shock that may result in fatal or serious injury.
 CAUTION	Indicates a potential danger that may lead to slight or moderate injury.
	The notes contain important information and useful tips for using the system. Failure to observe them can render the measurement results useless.

Working with products from Megger It is important to observe the general electrical regulations of the country in which the device will be installed and operated, as well as the current national accident prevention regulations and internal company directives (work, operating and safety regulations).

Use genuine accessories to ensure system safety and reliable operation. The use of other parts is not permitted and invalidates the warranty.

Operating staff This system and its peripheral equipment may only be operated by trained or instructed personnel. Anyone else must be kept away.

The system may only be installed by an authorised electrician. DIN VDE 0104 (EN 50191), DIN VDE 0105 (EN 50110) and the German accident prevention regulations (UVV) define an electrician as someone whose knowledge, experience and familiarity with the applicable regulations enables him to recognise potential hazards.

Declaration of Conformity (CE) The product meets the following security requirements of the European Council Directives:

- EMC Directive (2004/108/EC)
- Low Voltage Directive (2006/95/EC)
- RoHS Directive (2011/65/EU)

Radiated emission The device is intended for operation in the industrial segment in accordance with EN 55011. When used at home it could cause interference with other equipment (such as the radio or television).

The interference level from the line complies with the limit curve B (living area), the radiation level complies with the limit curve A (industrial area). Once the living area is sufficiently far away from the planned area of operation (industrial area), equipment there will not be impaired.

Use only as intended The operating safety is only guaranteed if the delivered system is used as intended. Incorrect use may result in danger to the operator, to the system and the connected equipment.

The thresholds listed in the technical data may not be exceeded under any circumstances. Condensation during the operation of Megger products may result in danger to persons and devices through voltage arc-over. Prevent condensation before and during the measuring mode by cooling the measuring systems sufficiently. The operation of Megger products in direct contact with water, aggressive substances and inflammatory gases and vapours is prohibited.

The NIM 1000 is built to be robust and can withstand the stresses it can expect to be subjected to in demanding everyday use. Nevertheless, it is a precision measuring device which needs to be treated with the appropriate care. This applies in particular to the connection cable and the clamps, which play an important role in ensuring the device remains safe while the results of measurements remain precise.

Procedure in the event that the device malfunctions The system may only be operated whilst it is in perfect working condition. In the event of damage, irregularities or malfunctions that cannot be resolved with the assistance of the operating instructions, the system must be shut down immediately and labelled accordingly. In such an event, the relevant management must be informed. Please contact Megger Service immediately to eliminate the malfunction. The system may only be started up again once the malfunction has been eliminated.

2 Technical Description

2.1 System Description

Intended use The NIM 1000 serves to measure network impedance in low voltage grids. In this process, the conductor connections are tested for their current carrying capacity while subjected to typical operating loads and potential flaws are indicated.

With the help of the following range of preventative applications, a consistently good supply quality can be guaranteed, outages prevented and adequate network rating ensured:

- Preventative inspection and uncovering of faults (e.g. neutral conductor fault)
- Determination of the maximum connected / feed-in power
- Monitoring for secure shut-down (rating of fuses)
- Approval of new / modified network sections

Fault detection in low voltage grids is another area of application of the device. For example, the NIM 1000 can be used to trigger a load-dependent fault which can then be located either with the help of a simultaneously connected measuring device or by means of multiple measurements at various connection points.

Function The device is linked to the low voltage grid to be tested by means of the available connection cables (four-conductor measurement with Kelvin clips) and also receives its supply voltage over these wires.

In preparation for a measurement, either a defined measurement period or a target number of measurements can be specified.

To determine the network impedance, the adjustable load current is generated for a short period by means of a semi-conductor circuit-breaker with the appropriate load-resistor. The current and voltage curves are recorded immediately before and while applying the load by means of A/D converters and then analysed by calculation. The result is shown on the display.

When taking measurements on more than one phase, there is automatic switching between the phases.

Features The NIM 1000 combines the following features in one device:

- Compact and sturdy design for portable use in the field
- Easy and convenient operation via rotary encoder
- Single and three phase measurement
- High test current of up to 1000 A
- Network impedance measurement (resistance and reactance) up to the 10th harmonic
- Automatic detection of rotary field
- Logging (export via USB interface)
- Wide range input for the voltage supply

Scope of delivery The scope of delivery of the system includes the following:

Quantity	Component	Description	Item number
1	Basic device		128312147
4	High performance Kelvin clamp	PKC-1	90009319
2	Connection lead	brown	90009320
2	Connection lead	black	90009321
2	Connection lead	grey	90009322
2	Connection lead	blue	90009323
1	NIM 1000-A socket adapter		128311627
1	USB flash drive		890020928
10	Spare fuses	T 25A H 440V (6.3 mm x 32 mm)	90004745
1	Manual		82941

Check contents Check the contents of the package for completeness and visible damage right after receipt. In the case of visible damage, the device must under no circumstances be taken into operation. If something is missing or damaged, please contact your local sales representative.

Optional accessories If the following optional accessories do not form part of the scope of delivery, these can be ordered from sales:

Accessory	Description	Item number
Kelvin clip with connection cable	Smaller clip ideally suited for use when space is restricted.	138315892

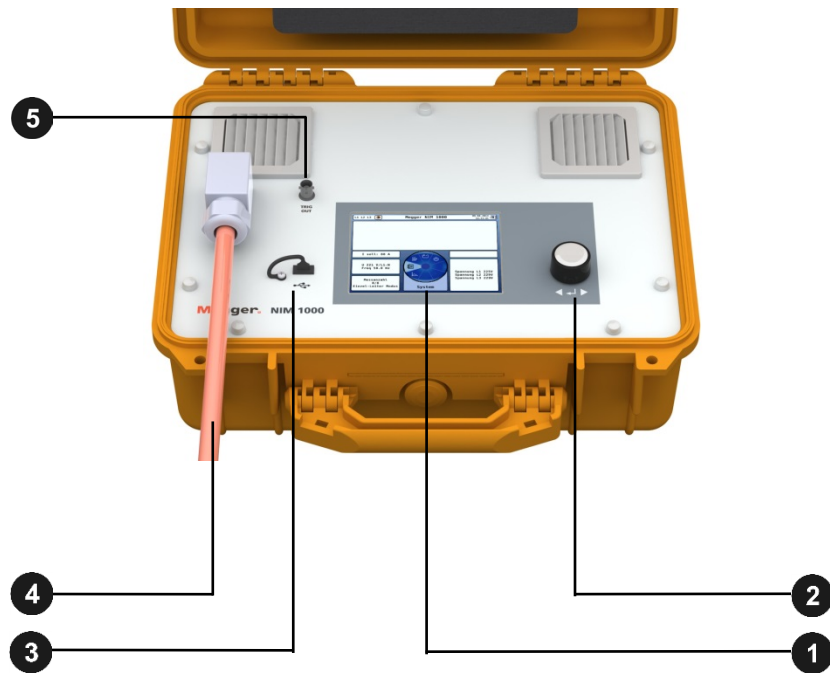
2.2 Technical Data

The NIM 1000 is defined by the following technical parameters:

Parameter	Value
Test current <ul style="list-style-type: none"> • Range • Maximum current as a peak value (I_{max} depends on the network impedance and the temperature and is, under certain circumstances, significantly lower than the indicated values) 	80 A ... 1000 A (adjustable) ≤ 1000 A at 400 V ≤ 600 A at 230 V ≤ 300 A at 115 V
Input voltage (supply voltage at the same time)	100 V ... 480 V, 50/60 Hz (at test terminals) 100 V ... 230 V, 50/60 Hz (at Schuko socket)
Operating uncertainty B (in accordance with IEC 61557-3)	Up to 3% ± 1 m Ω (see also Annex 1)
Measuring range	10 m Ω ... 5 Ω (230 V / 400 V) 10 m Ω ... 2,5 Ω (115 V) (See also Annex 2)
Resolution	1 m Ω
Measurement category	300V CAT IV or 600V CAT IV (when using the PKC-1 high performance connection clamps)
Safety functions	Temperature monitoring
Display	Transflective sunlight readable 5.7" colour display with a resolution of 640 x 480 pixels
Memory	At least 1000 records of test data
Interfaces	USB 2.0
Operating temperature	-20°C to 55°C
Operating humidity	Max. relative humidity 93% at 30°C
Storage temperature	-30°C to 70°C
Weight	10 kg
Dimensions	410 x 175 x 335 mm
Protection class (in accordance with IEC 61140 (DIN VDE 0140-1))	II
Ingress protection rating (in accordance with IEC 60529 (DIN VDE 0470-1))	IP 50 (open) IP 54 (closed)


2.3 Connections, Controls and Display


The NIM 1000 has the following connection, display and control elements:



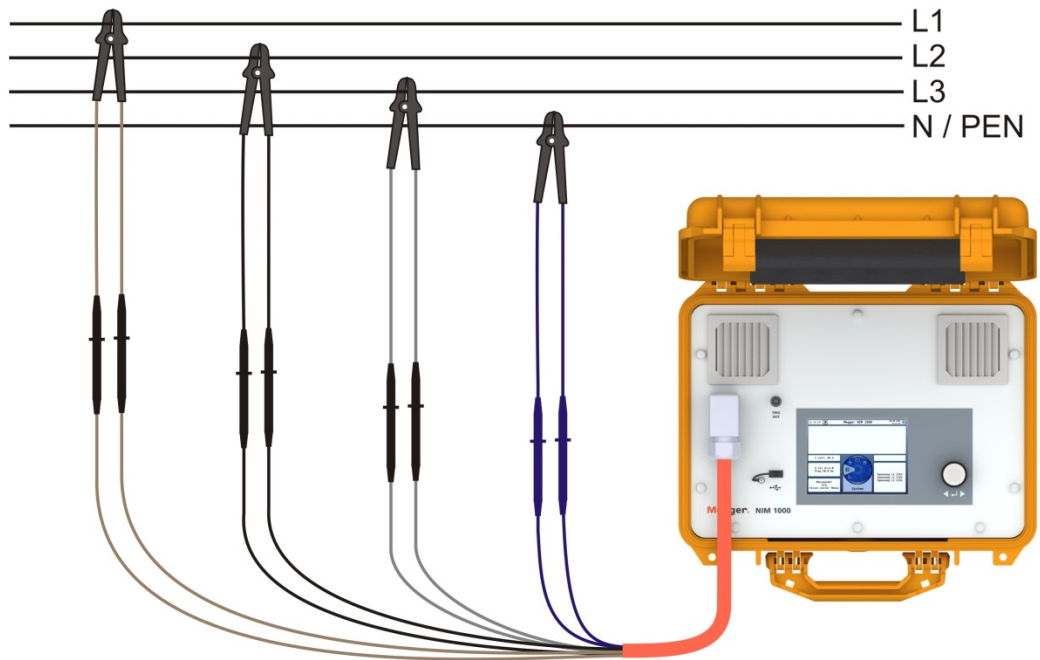
Element	Description
1	Display
2	Rotary encoder
3	USB port
4	Connection cables
5	Trigger output


3 Electrical connection

 WARNING	Work on live equipment The work can only be carried out safely while guaranteeing the protection of the health of all those involved in the work by employing suitable working procedures and using suitable protective equipment. For that reason, the electrical connection of the device must absolutely conform to the nationally applicable regulations for work on live equipment!
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 WARNING	Connection sequence When connecting the device, the two blue connection cables should be connected to the neutral conductor of the low voltage cable first. Not until after that can the live phase conductors be connected. The conductors are disconnected in reverse order: first disconnect the phase conductors, then the neutral conductor.
---	---

Connection diagram The following figure shows the simplified connection diagram for the NIM 1000:



 CAUTION	The fused measurement cables are colour-coded (brown = L1, black = L2, grey = L3, blue = N). Only a measurement cable with a matching colourcode may ever be connected to one and the same Kelvin clip!
---	--

Notes When making electrical connections, the following points should be observed:

- When connected with the supplied PKC-1 high performance connection clamps, the NIM 1000 is approved for measurements on low voltage installations in the measurement category 600V CAT IV in accordance with IEC 61010-1.
- The input voltage live on the measurement cables serves simultaneously as supply voltage and must remain within the range of 100 V and 480 V.
- The NIM 1000 must be connected to the neutral conductor and at least one phase. If the neutral conductor is not accessible, the blue connection cable must be connected to a free phase conductor.
- The connection should be made based on the principle of four-conductor measurement. So two measurement cables (current and voltage) must be connected to each conductor intended to be measured using a Kelvin clip.

Specific connection-configurations Using the NIM 1000, measurements can be carried out in both single-conductor mode (just L1–N) as well as in multi-conductor mode (all possible conductor combinations).

Measurements are only carried out on phases which are live with a suitable input voltage. Accordingly, phases which have not been connected will not be taken into account in multiple-conductor mode.

So, for special applications or for time-saving reasons, the conductor combinations to be measured can be purposefully limited in the multiple-conductor mode by using a specific connection configuration. The following table shows some examples of this:

Required measurements	Phases to be connected	Measured conductor pairs (instead of the 6 possible combinations)
L2–N	N (blue) L2 (black)	L2–N
L1–L2	N (blue) L1 (brown) L2 (black)	L1–N L2–N L1–L2
L2–L3 L2–N	N (blue) L2 (black) L3 (grey)	L2–N L3–N L2–L3

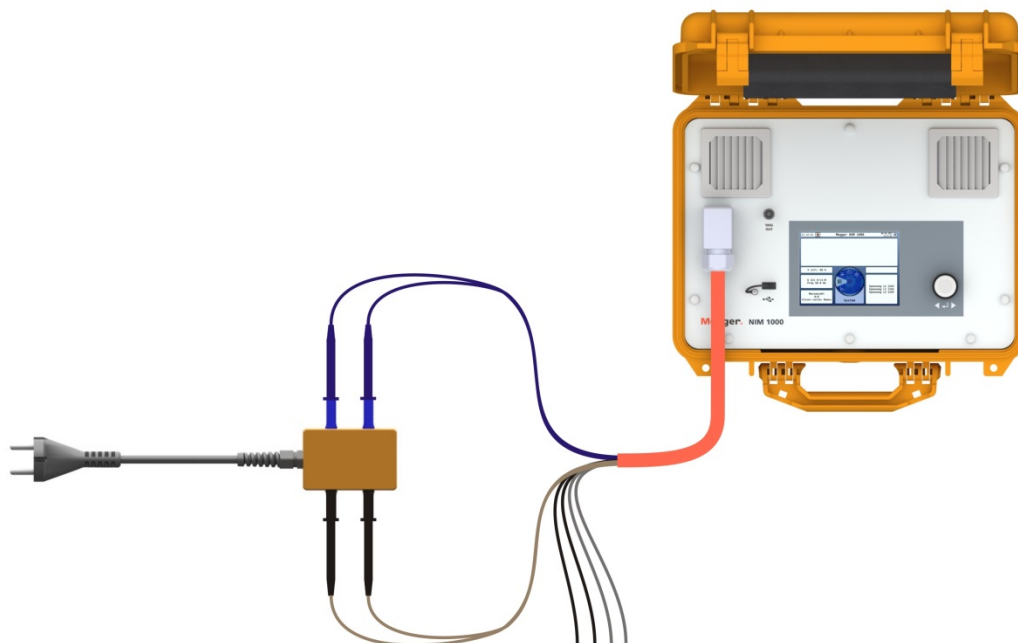
Connection to IT networks Measurements can also be carried out on IT networks using the NIM 1000.

Given the lack of a neutral conductor, in measurements on networks of this kind it is recommended that the blue test lead be connected to a free phase.

If, however, all phases are assigned test leads in multi-conductor mode, it is advisable that the blue test lead be connected to the station earth or, in the case of an emergency, even an earthing spike, in order to avoid faults in the voltage- and frequency detection (otherwise the measurement will not start).

Connection to mains socket Using the included NIM 1000-A adapter, the NIM 1000 can be quickly and safely connected to a mains socket for the purposes of measurement or the export of measurement data. The plug is designed as a Schuko plug (CEE 7/4) but it can also be connected to sockets of different designs without problem using the appropriate accessories.

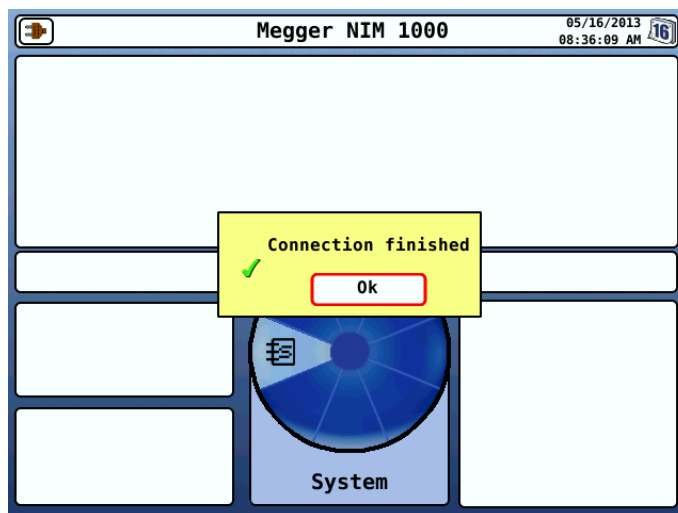
The connection between the NIM 1000 and the adapter should be established as follows with the help of the **blue** and the **brown** connection cables:



4 Operation

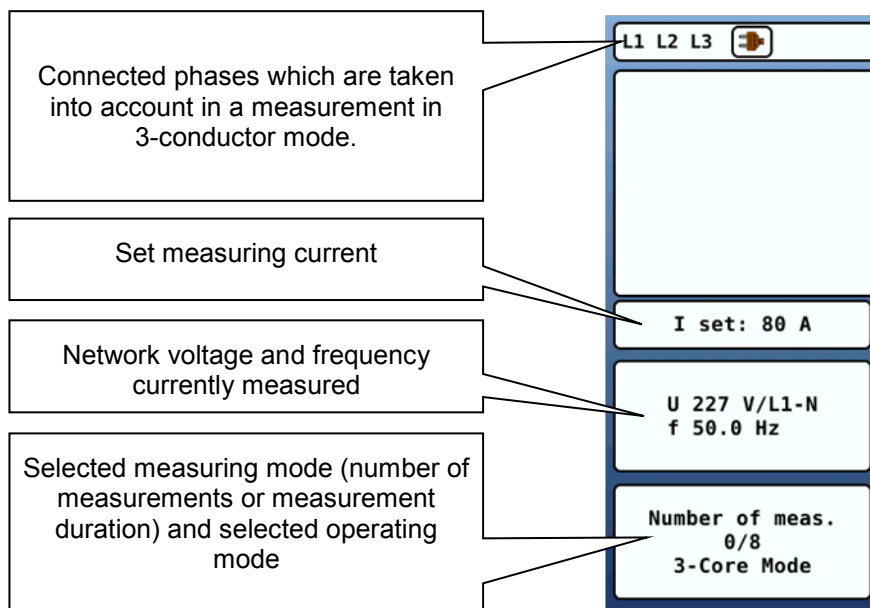
Power on As soon as one of the three connection cables has been connected to a low voltage phase with sufficient supply voltage (100 V ... 480 V), the NIM 1000 automatically turns on.

After the short switching on process, the system waits for confirmation from the user that the electrical connection has been finished.

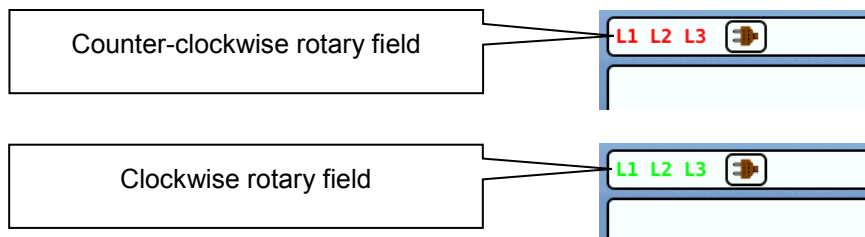


The corresponding dialogue window can be shut by a quick push of the rotary encoder 2, following which the three phase voltages are measured (audible phase relay switching).

System status After switching on, the following information on the current status of the system is shown on the left side of the display:

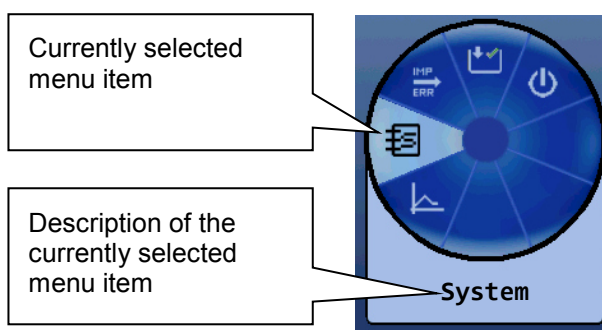


If it has been possible to detect the rotary field's direction of rotation, this will be indicated by the colour in which the phase designations are displayed:

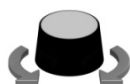


If, however, it is not possible to determine the direction of rotation say, for example, because less than three phases have been connected or because one phase has accidentally been connected multiple times, the phases are displayed in a black font.

Operating concept Navigation within the menus is effected almost entirely from the circular selection menu:



Operating the system with the rotary encoder **2** is as follows:




- Select the menu item
- Increase or decrease the value of a variable parameter
- Select an option from a selection list












- Call up the selected menu item
- Confirm the setting or the selection made

Each menu (with the exception of the main menu) has a menu item with which one can return to the next higher menu level.

4.1 System Settings

Selecting the menu item  takes you directly to the system menu, where the following functions and submenus are available:

Menu item	Description						
	<p>Submenu with detailed system information</p> <ul style="list-style-type: none"> <li data-bbox="523 517 1310 584">  Information on the current versions of the various software components <li data-bbox="523 595 1283 629">  Hardware information (e.g. serial number of the system) 						
	<p>System settings</p> <ul style="list-style-type: none"> <li data-bbox="523 707 1457 808">  Setting the interface language. Select the desired language by turning the rotary encoder and activate by pressing it. The language selection is immediately active. <li data-bbox="523 819 1374 887">  In this submenu, the brightness and layout of the display can be adjusted and the background lighting can be switched on or off. <li data-bbox="523 898 1457 1099">  Setting the date and time. The value of each segment that has been marked for selection can be adjusted by turning the rotary encoder. Pressing causes the mark to move the next segment. Once the input has been concluded, the changes can either be accepted with OK or rejected by selecting Cancel. 						
	<p>When this function is used, a search in respect of firmware and language files is conducted in the directory <i>nig/updates/</i> on the inserted USB flash drive. The files found are then listed and, using the rotary encoder, these can be selected and imported. A distinction is made between the following file types:</p> <table border="0" style="width: 100%;"> <tr> <td data-bbox="523 1267 759 1301"><i>application-x.xx.img</i></td> <td data-bbox="879 1267 1417 1301">Updating solely an application to version x.xx</td> </tr> <tr> <td data-bbox="523 1312 651 1346"><i>nig-xxx.tar</i></td> <td data-bbox="879 1312 1203 1346">Importing the language xxx</td> </tr> <tr> <td data-bbox="523 1357 743 1391"><i>nig-Languages.tar</i></td> <td data-bbox="879 1357 1398 1424">Importing all the languages contained in the language file</td> </tr> </table> <hr/> <div data-bbox="533 1496 1457 1626">  An also possible update of the real-time software of the measuring hardware needs not be initiated via this menu item. Instead of this, it suffices to insert the USB flash drive with the update files into the USB port and confirm the following query. </div> <hr/>	<i>application-x.xx.img</i>	Updating solely an application to version x.xx	<i>nig-xxx.tar</i>	Importing the language xxx	<i>nig-Languages.tar</i>	Importing all the languages contained in the language file
<i>application-x.xx.img</i>	Updating solely an application to version x.xx						
<i>nig-xxx.tar</i>	Importing the language xxx						
<i>nig-Languages.tar</i>	Importing all the languages contained in the language file						

4.2 Performing Measurements

Selecting the operating mode

By selecting the **IMP** **ERR** menu item in the main menu you will reach a sub menu in which you may select your desired operating mode. In principle, measurements may be carried out either in normal **network impedance measuring mode** or in **fault detection mode**.

Normal **network impedance measuring** takes place with a constant measuring current and over a freely-adjustable duration or number of measurements. Only in this mode can the software carry out a load calculation (see page 7) on the basis of the measured network impedance. However, the suitability of this mode to detect faults is limited, as some faults subside temporarily with higher current flows (e.g. due to fusing or drying out). Depending on the level of the measuring current selected, this could already happen during calibration and so the fault would remain undetected through the measurement.

That is why **fault mode** has been integrated. In this mode, the load current is gradually increased over the course of 8 measurements up to the preset value. All 8 recorded curves are displayed together in one diagram, whereby the relevant changes can be easily identified.


Further sub-division into single and multiple conductor mode gives the following operating modes:








Menu item	Description
L MODE	<p>Network impedance measurement on one conductor</p> <p>The impedance is only measured on the phase which is connected via the brown connection cables (L1).</p> <p>This time-saving single-conductor mode is particularly suitable if the results of one phase suffice for the intended purpose of the measurement or if only single-phase measuring is possible anyway (e.g. at sockets).</p>
L1-3 MODE	<p>Network impedance measurement on up to 6 conductor combinations</p> <p>In this mode, all possible conductor combinations (see page 14) are measured one after the other depending on the connection situation.</p>
ERR MODE	<p>Fault mode on one conductor</p> <p>This serves to trigger a known load-dependent fault on the phase connected to the brown connection cables (L1).</p> <p>This mode is recommended if the conspicuous phase has already been identified.</p>
ERR L1-3	<p>Fault mode on up to three conductors</p> <p>In this mode the 8 measurements are carried out on all connected phases (against the neutral conductor).</p> <p>So conclusions on the characteristic of the fault can be drawn from load-dependent impedance changes as well as from the comparison of the phases with one another.</p>

4.2.1 Network Impedance Measurement

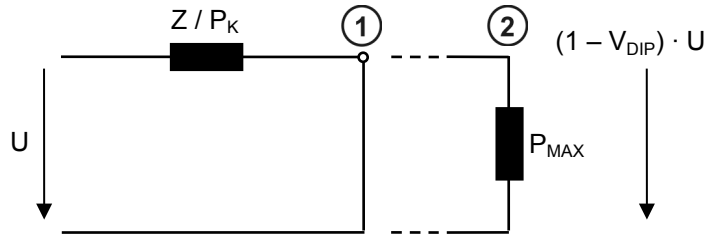
4.2.1.1 Prepare Measurement

Setting the measurement parameters

By selecting the  menu item in the main menu you will reach a sub menu in which you may select the following measurement parameters in preparation for a network impedance measurement.

Menu item	Description
 MAX	<p>Maximum measuring current (80 ... 1000 A)</p> <p>Because the accuracy of the measurement increases with increasing measuring current, as high as possible a measuring current but also one which is appropriate to the capacity of the network should be selected.</p> <hr/> <p> If the NIM 1000 is connected to a mains socket (with fusing of up to 16 A), the 80 A setting which has been particularly dimensioned for this type of application should be selected!</p> <hr/>
	<p>Total measurement duration (0 ... 20 days) and interval of the individual measurements.</p> <p>Over the whole measurement duration, one measurement per involved phase is taken at the set interval.</p> <p>After the menu item is selected, the two values are to be defined one after another. The options for setting the interval depend on the previously set total measurement time.</p> <p>The number of measurements can also be defined as an alternative to measurement duration (see below). The respective last adopted setting applies.</p>
	<p>Number of measurements (1 ... 255)</p> <p>The set number of measurements is carried out in quick succession and while constantly switching between the phases involved.</p> <p>The measurement duration can also be defined as an alternative to the number of measurements (see above). The respective last adopted setting applies.</p>
	<p>Delay time (0 ... 30 seconds)</p> <p>The start of the measurement can be delayed by the time set here.</p>
	<p>Resetting calibration values</p> <p>If the time of calibration was quite a while ago (e.g. after a measurement which lasted a while or in the case of temporary failure of a phase), it could be useful to reset the calibration values.</p>
	<p>Value to be calculated using a load calculation (see information on next page too)</p> <p>V_{DIP} Voltage dip at given connection power</p> <p>P_{MAX} Max. connection power at given voltage dip</p> <p>Off Load calculation deactivated</p>




Explanations concerning the load calculation When it comes to the load calculation, the NIM 1000 utilises the following physical correlation between the measurements for short-circuit power P_K , the maximum rated output P_{MAX} and the anticipated voltage dip V_{DIP} :




- ① Measurement
- ② Analysis (load calculation)

$$V_{DIP}^2 - V_{DIP} + \frac{P_{MAX}}{P_k} = 0$$

Now, depending on the application scenario, only one of the two unknown variables need be given in order to calculate the other:

Application scenario	Procedure
A large consumer with a known load (P_{MAX}) should be connected to the measurement point and the anticipated voltage dip (in %) calculated.	Call up the  menu item and select the option V_{DIP} . Then enter the load of the appliance.
The aim is to calculate the maximum load which can be connected to the measurement point without any voltage dip defined by existing guidelines being exceeded.	Call up the  menu item and select the option P_{MAX} . Then enter the maximum permissible voltage dip.
<div style="border: 1px solid black; padding: 5px;">  This function can also be used to calculate the maximum feed-in load (e.g. of a PV installation). Accordingly, in this case it is the maximum permissible mains voltage increase instead of the voltage dip which must be specified. </div>	

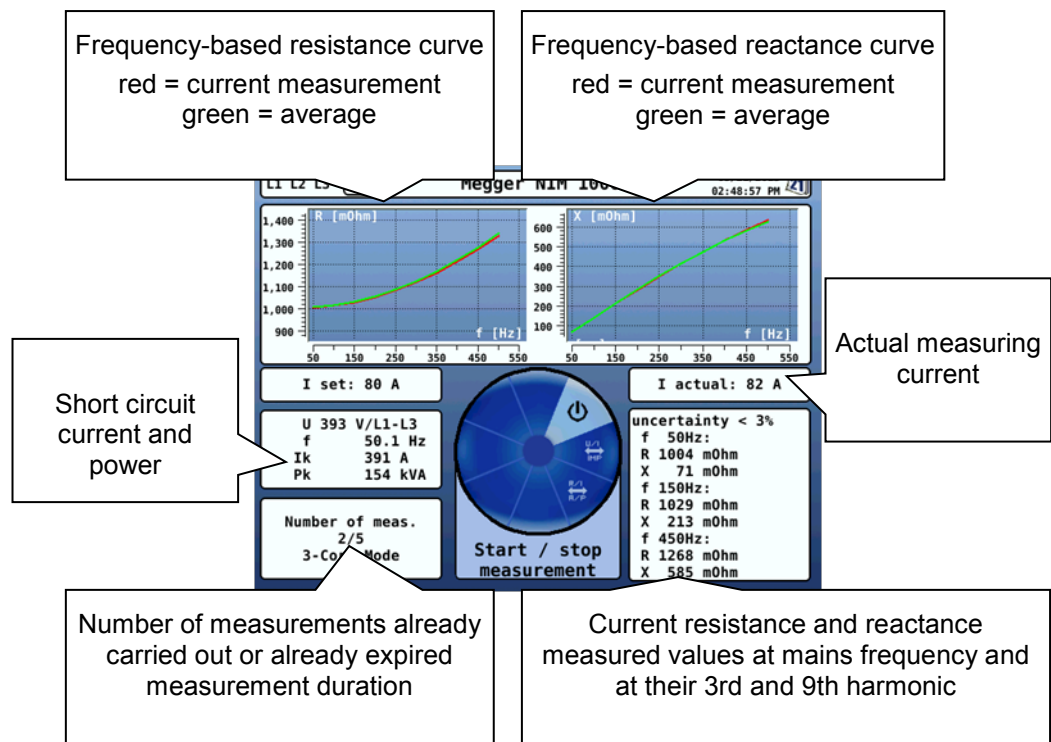
4.2.1.2 Performing the Measurement

Start measurement Once all the settings have been carried out and checked, the measurement can be started with the menu item .

If this is the first measurement after switching on the device or if the calibration values were reset before the measurement (see previous page), calibration will be carried out right after the start in order to set the preset maximum measuring current. A corresponding notice will appear on the display.


Performing the measurement Depending on the settings, the individual measurements will take place either in quick succession (depending on the measuring current 2 to 10 seconds) or at 15 minute intervals, switching between the involved phases.

The following measured values are shown on the display and continually updated during the running measuring process as standard.



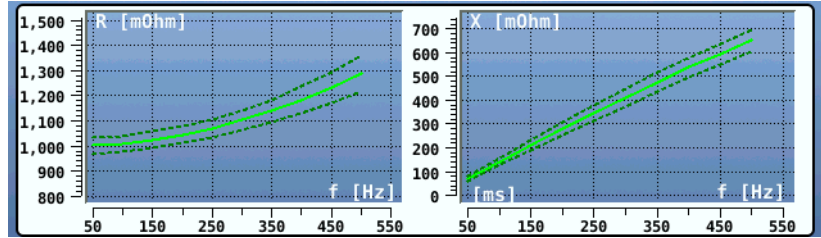
Using the $\frac{U/I}{IMP}$ menu item during and after the measurement, the diagram types may be switched between as follows:

- R/X** Impedance resistance and reactance
- |Z|/Phi** Impedance amount and phase shift angle
- U/I** Current and voltage curve of the period in which the measurement took place

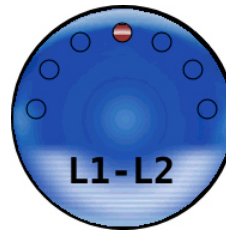
Ending the measurement The measurement will end automatically as soon as the preset number of measurements or the preset measurement time has been reached. The measurement can be manually deactivated at any time via the .

4.2.1.3 Analysing Measurement Results

Interpretation of the curves The red curve is hidden on completion of the measurement. Instead, dark-green envelope curves are marked above and underneath the light-green medium value curve, these envelope curves represent the upper and lower limit of 99.7% of the measured values.

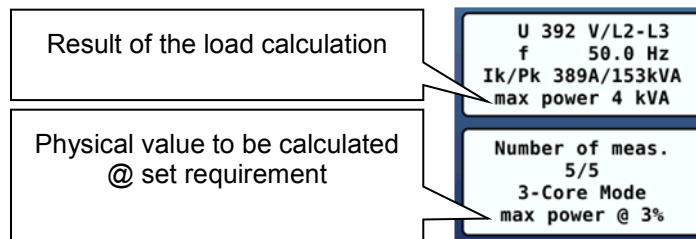


Toggling the phases To be able to carry out a comparison between the measured conductor combinations in the case of measuring more than one conductor, the following selection menu must be called up via the **→** menu item:

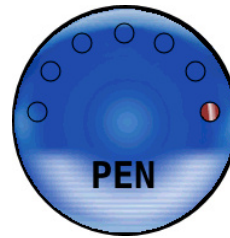


The conductor combination to be displayed is selected by turning the rotary encoder. By changing the selection, the corresponding curves and measured values are displayed.

Result of the load calculation In addition to the typical measured values (see previous page), the results of a load calculation (see page 20) which may have been carried out can be read on the left part of the display:



Impedance of the PEN conductor In the case of measuring more than one conductor, there is another option named **PEN** available for selection.



When this option is selected, the **calculated** impedance of the PEN conductor and the following values for a three-phase short-circuit (calculated in accordance with IEC 60909-0) are displayed:


Three-phase peak short-circuit current	Ip3	696 A
Three-phase sustained short-circuit current	Ik3	473 A
Three-phase sustained short-circuit power	Sk3	105 kVA

i Depending on the type of network and earthing conditions, these values do not necessarily match those of the neutral conductor!
 For instance, in the case of a three-phase measurement on IT networks, the three-phase short circuit current and the three-phase short circuit power are also measured. However, no impedance values (incl. graphs) will be shown for the non-existent PEN conductor.

4.2.2 Measuring in Fault Mode

4.2.2.1 Preparing Measurement

Setting maximum measuring current

By selecting the  menu item in the main menu you will reach a sub menu in which you may preset the maximum measuring current via the I_{MAX} menu item.

In fault mode, the current is increased as linearly as possible over 8 measurements up to the set maximum value in this case.



If the NIM 1000 is connected to a mains socket (with fusing of up to 16 A), the 80 A setting which has been particularly dimensioned for this type of application should be selected!

Connecting the trigger output to a reflectometer


In the case of intermittent faults in particular, it is recommended that you carry out a fault location at the same time as the fault trips. For this purpose, a suitable reflectometer must be connected to the same low voltage cable and hooked up to the NIM 1000 via the trigger output **5**.

The triggering of the reflectometer takes place at the time of each respective impedance measurement by means of a short 12 V voltage pulse at the trigger output.



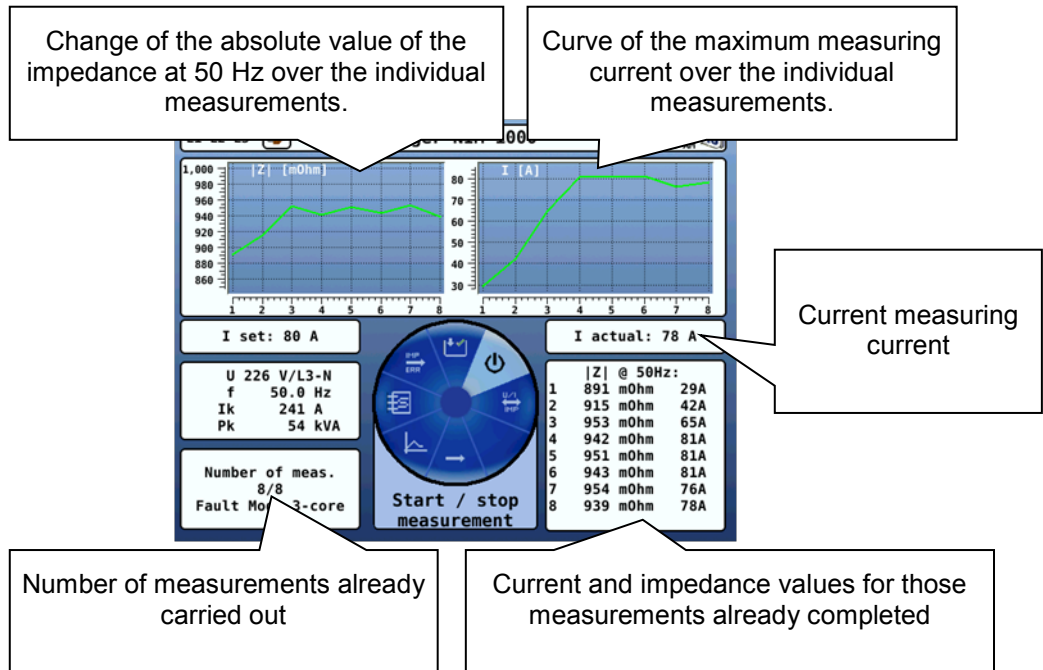
For more details about commissioning and configuring the reflectometer, please read the accompanying instructions.

4.2.2.2 Performing the Measurement

Starting the measurement Once all the settings have been carried out and checked, the measurement can be started with the menu item .


Performing the measurement In fault mode, the measurements take place in quick succession. Starting at a low value, the measuring current is increased as linearly as possible by a certain amount with each measurement and, after 8 measurements, reaches the set maximum value.

The following measured values are shown on the display and continually updated during the running measuring process as standard:



Using the $\frac{U/I}{IMP}$ menu item, the diagram types can be switched between as follows:

- |Z|/I** Impedance (absolute) and measuring current (maximum)
- U/I** Current and voltage curve of the period in which the measurement was carried out (for all measurements up until this point)

Ending the measurement Measuring ends automatically as soon as the 8 measurements have been carried out on all involved phases. The measurement can be manually deactivated at any time via the menu item .

4.2.2.3 Identifying and Locating Faults

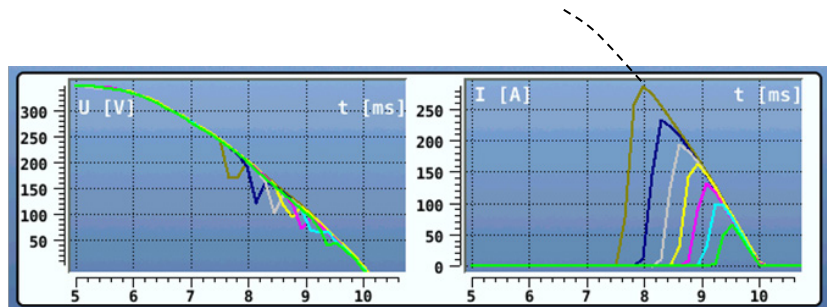
Comparing curves Following the measurement, the measured values and curves can be examined for any conspicuous jumps and thus the triggering or subsiding of the fault at a certain measuring current value can be detected.

As is the case even during the measurement, different diagram types can be switched between using the $\frac{U/I}{IMP}$ menu item (see also the previous page).

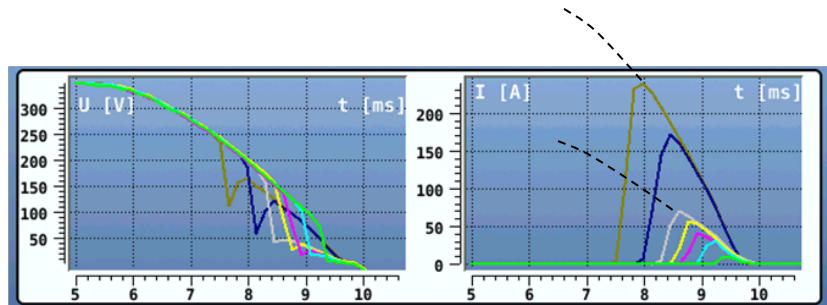
The curve of current and voltage in particular can be very useful when it comes to identifying a fault. The following applies in principle: As soon as a fault has been tripped in the course of the measurements, this is marked by diverging envelope curves.

This is very easy to see in the current curve in the example depicted below. While in the case of the inconspicuous measurement the envelope curve (broken black line) is identical for all curves, in the case of the faulty phase two different envelope curves are clearly recognisable.

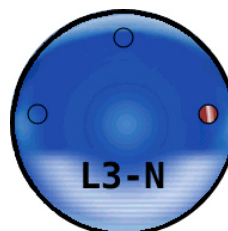
Inconspicuous measurement:



Conspicuous measurement:



In order to be able to undertake a comparison between the measured conductors when measuring multiple conductors, the following selection menu must be called up via the \rightarrow menu item:




The conductor to be displayed is selected by turning the rotary encoder.

Locating faults Information on the position of an identified fault can primarily be gained from the reflectograms recorded along with the measurement (see page 25).

If this option of fault prelocation is not available, the affected network section at the least can be identified by means of additional measurements at different connection points (using a process of elimination).

4.3 Exporting the Measured Data

Once a measurement has been completed, the measured data recorded is written to the internal memory of the NIM 1000. Measurement data records already contained in the memory will not be overwritten in this process and, thanks to the non-volatile memory, the data will be maintained permanently too.

As soon as at least one data measurement record is stored in the memory, an export of data can be initiated using the  menu item in the main menu. Here, all data measurement records stored in the memory are written into the `\nim1000\measurements\` folder of the plugged-in USB flash drive and deleted upon successful transfer from the internal memory. The files in CSV format (comma separated values) can be viewed later in the comfort of the workplace using any CSV-capable application (e.g. Excel).

5 Maintenance and care

Repair and maintenance Repair and maintenance work has to be carried out by Megger or authorised service partners using original spare parts only. Megger recommends having the system tested and maintained at a Megger service centre once a year.

Megger also offers its customers on-site service. Please contact your service centre if needed.

It is not necessary to open the housing of the device to commission and operate the system. Opening the housing causes the immediate termination of all warranty claims!

The connections and connection leads of the system must be regularly tested to ensure that they are free of defects and intact, in accordance with the applicable national and company-specific arrangements.

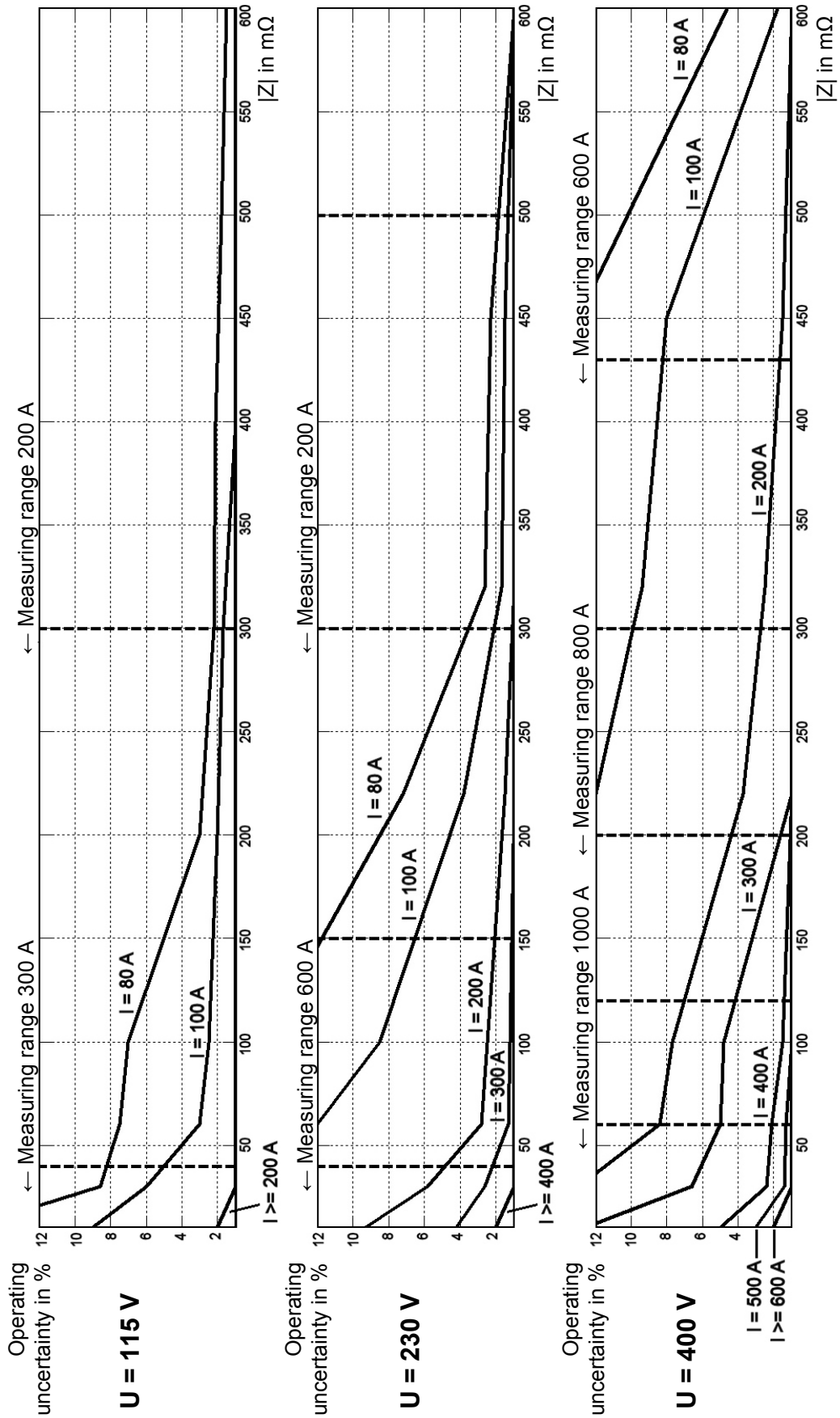
Storage If the device is not used for a lengthy period, it should be stored in a dust-free and dry environment.

Caring for the display Do not clean the display with aggressive products such as solvents or spirits.

Instead, use lukewarm water and a soft, lint-free cloth for wet wiping, or a microfibre cloth for dry wiping.

Replacing fuses Each connection cable is fused in the area of the plug connector with a T 25A H 440V micro-fuse (6.3 mm x 32 mm) which may be replaced independently if need be.

Annex 1: Measuring Accuracy



Voltage	Operating uncertainty	Current and measuring range
115 V	3% ± 1 mΩ	≥ 200 A for Z > 10 mΩ 100 A for Z > 200 mΩ 80 A for Z > 500 mΩ
	5% ± 1 mΩ	100 A for 40 mΩ < Z < 200 mΩ 80 A for 150 mΩ < Z < 500 mΩ
	10% ± 1 mΩ	100 A for 10 mΩ < Z < 40 mΩ 80 A for 30 mΩ < Z < 150 mΩ
230 V	3% ± 1 mΩ	≥ 400 A for Z > 10 mΩ 300 A for Z > 45 mΩ 200 A for Z > 150 mΩ 100 A for Z > 300 mΩ 80 A for Z > 500 mΩ
	5% ± 1 mΩ	300 A for 10 mΩ < Z < 45 mΩ 200 A for 45 mΩ < Z < 150 mΩ 100 A for 200 mΩ < Z < 300 mΩ 80 A for 275 mΩ < Z < 500 mΩ
	10% ± 1 mΩ	200 A for 20 mΩ < Z < 45 mΩ 100 A for 80 mΩ < Z < 200 mΩ 80 A for 180 mΩ < Z < 275 mΩ
400 V	3% ± 1 mΩ	≥ 600 A for Z > 10 mΩ 500 A for Z > 25 mΩ 400 A for Z > 70 mΩ 300 A for Z > 190 mΩ 200 A for Z > 400 mΩ 100 A for Z > 600 mΩ
	5% ± 1 mΩ	500 A for 10 mΩ < Z < 25 mΩ 400 A for 10 mΩ < Z < 70 mΩ 300 A for 90 mΩ < Z < 190 mΩ 200 A for 180 mΩ < Z < 400 mΩ 100 A for 525 mΩ < Z < 600 mΩ 80 A for 600 mΩ < Z
	10% ± 1 mΩ	300 A for 20 mΩ < Z < 90 mΩ 200 A for 50 mΩ < Z < 180 mΩ 100 A for 300 mΩ < Z < 525 mΩ 80 A for 500 mΩ < Z < 600 mΩ

Annex 2: Measuring Range

Voltage	Current range	Measuring range
115 V	300 A	$ Z < 40 \text{ m}\Omega$
	200 A	$ Z < 300 \text{ m}\Omega$
	100 A	$ Z < 1100 \text{ m}\Omega$
	80 A	$ Z < 2500 \text{ m}\Omega$
230 V	600 A	$ Z < 40 \text{ m}\Omega$
	500 A	$ Z < 150 \text{ m}\Omega$
	400 A	$ Z < 300 \text{ m}\Omega$
	300 A	$ Z < 500 \text{ m}\Omega$
	200 A	$ Z < 1000 \text{ m}\Omega$
	100 A	$ Z < 2500 \text{ m}\Omega$
	80 A	$ Z < 5000 \text{ m}\Omega$
	80 A / 100 A	$ Z < 5000 \text{ m}\Omega$
400 V	1000 A	$ Z < 60 \text{ m}\Omega$
	900 A	$ Z < 120 \text{ m}\Omega$
	800 A	$ Z < 200 \text{ m}\Omega$
	700 A	$ Z < 300 \text{ m}\Omega$
	600 A	$ Z < 430 \text{ m}\Omega$
	500 A	$ Z < 620 \text{ m}\Omega$
	400 A	$ Z < 900 \text{ m}\Omega$
	300 A	$ Z < 1400 \text{ m}\Omega$
	200 A	$ Z < 2300 \text{ m}\Omega$
	80 A / 100 A	$ Z < 5000 \text{ m}\Omega$



Tento symbol indikuje, že výrobek nesoucí takovéto označení nelze likvidovat společně s běžným domovním odpadem. Jelikož se jedná o produkt obchodovaný mezi podnikatelskými subjekty (B2B), nelze jej likvidovat ani ve veřejných sběrných dvorech. Pokud se potřebujete tohoto výrobku zbavit, obraťte se na organizaci specializující se na likvidaci starých elektrických spotřebičů v blízkosti svého působiště.



Dit symbool duidt aan dat het product met dit symbool niet verwijderd mag worden als gewoon huishoudelijk afval. Dit is een product voor industrieel gebruik, wat betekent dat het ook niet afgeleverd mag worden aan afvalcentra voor huishoudelijk afval. Als u dit product wilt verwijderen, gelieve dit op de juiste manier te doen en het naar een nabij gelegen organisatie te brengen gespecialiseerd in de verwijdering van oud elektrisch materiaal.



This symbol indicates that the product which is marked in this way should not be disposed of as normal household waste. As it is a B2B product, it may also not be disposed of at civic disposal centres. If you wish to dispose of this product, please do so properly by taking it to an organisation specialising in the disposal of old electrical equipment near you.



Този знак означава, че продуктът, обозначен по този начин, не трябва да се извърля като битов отпадък. Тъй като е B2B продукт, не бива да се извърля и в градски пунктове за отпадъци. Ако желаете да извърлите продукта, го занесете в пункт, специализиран в извърлянето на старо електрическо оборудване.



Dette symbol viser, at det produkt, der er markeret på denne måde, ikke må kasseres som almindeligt husholdningsaffald. Eftersom det er et B2B produkt, må det heller ikke bortskaffes på offentlige genbrugsstationer. Skal dette produkt kasseres, skal det gøres ordentligt ved at bringe det til en nærliggende organisation, der er specialiseret i at bortskaffe gammelt el-udstyr.



Sellise sümboliga tähistatud toodet ei tohi käidelda tavalise olmejäätmena. Kuna tegemist on B2B-klassi kuuluva tootega, siis ei tohi seda viia kohalikku jäätmekäitluspunkti. Kui soovite selle toote ära visata, siis viige see lähimasse vanade elektriseadmete käitlemisele spetsialiseerunud ettevõttesse.



Tällä merkinnällä ilmoitetaan, että kyseisellä merkinnällä varustettua tuotetta ei saa hävittää tavallisen kotitalousjätteen seassa. Koska kyseessä on yritysten välisen kaupan tuote, sitä ei saa myöskään viedä kuluttajien käyttöön tarkoitettuihin keräyspisteisiin. Jos haluatte hävittää tämän tuotteen, otakaa yhteys lähimpään vanhojen sähkölaitteiden hävittämiseen erikoistuneeseen organisaatioon.



Ce symbole indique que le produit sur lequel il figure ne peut pas être éliminé comme un déchet ménager ordinaire. Comme il s'agit d'un produit B2B, il ne peut pas non plus être déposé dans une déchetterie municipale. Pour éliminer ce produit, amenez-le à l'organisation spécialisée dans l'élimination d'anciens équipements électriques la plus proche de chez vous.



Cuireann an siombail seo in iúl nár cheart an táirgeadh atá marcáilte sa tsíl seo a dhiúscairt sa chóras fuíoll teaghlaigh. Os rud é gur táirgeadh ghnó le ghnó (B2B) é, ní féidir é a dhiúscairt ach oiread in ionaid dhiúscairthe phobail. Más mian leat an táirgeadh seo a dhiúscairt, déan é a thógáil ag eagralocht gar duit a sainfheidhmiú in ndiúscairt sean-fhearas leictrigh.



Dieses Symbol zeigt an, dass das damit gekennzeichnete Produkt nicht als normaler Haushaltsabfall entsorgt werden soll. Da es sich um ein B2B-Gerät handelt, darf es auch nicht bei kommunalen Wertstoffhöfen abgegeben werden. Wenn Sie dieses Gerät entsorgen möchten, bringen Sie es bitte sachgemäß zu einem Entsorger für Elektroaltgeräte in Ihrer Nähe.



Αυτό το σύμβολο υποδεικνύει ότι το προϊόν που φέρει τη σήμανση αυτή δεν πρέπει να απορρίπτεται μαζί με τα οικιακά απορρίματα. Καθώς πρόκειται για προϊόν B2B, δεν πρέπει να απορρίπτεται σε δημοτικά σημεία απόρριψης. Εάν θέλετε να απορρίψετε το προϊόν αυτό, παρακαλούμε όπως να το παραδώσετε σε μία υπηρεσία συλλογής ηλεκτρικού εξοπλισμού της περιοχής σας.



Ez a jelzés azt jelenti, hogy az ilyen jelzéssel ellátott terméket tilos a háztartási hulladékokkal együtt kidobni. Mivel ez vállalati felhasználású termék, tilos a lakosság számára fenntartott hulladékgyűjtőbe dobni. Ha a terméket ki szeretné dobni, akkor vigye azt el a lakóhelyéhez közel működő, elhasznált elektromos berendezések begyűjtésével foglalkozó hulladékkezelő központhoz.



Questo simbolo indica che il prodotto non deve essere smaltito come un normale rifiuto domestico. In quanto prodotto B2B, può anche non essere smaltito in centri di smaltimento cittadino. Se si desidera smaltire il prodotto, consegnarlo a un organismo specializzato in smaltimento di apparecchiature elettriche vecchie.



Št zíme noráda, ka izstrādājumu, uz kura tā atrodas, nedrīkst izmest kopā ar parastiem mājsaimniecības atkritumiem. Tā kā tas ir izstrādājums, ko cits citam pārdod un lieto tikai uzņēmumi, tad to nedrīkst arī izmest atkritumos tādās izgāztuvēs un atkritumu savāktuvēs, kas paredzētas vietējiem iedzīvotājiem. Ja būs vajadzīgs šo izstrādājumu izmest atkritumos, tad rīkojieties pēc noteikumiem un nogādājiet to tuvākajā vietā, kur īpaši nodarbojas ar vecu elektrisku ierīču savākšanu.



Šis simbolis rodo, kad juo paženklinto gaminio negalima išmesti kaip paprastų buitinių atliekų. Kadangi tai B2B (verslas verslui) produktas, jo negalima atiduoti ir buitinių atliekų tvarkymo įmonėms. Jei norite išmesti šį gaminį, atlikite tai tinkamai, atiduodami jį arti jūsų esančiai specializuotai senos elektrinės įrangos utilizavimo organizacijai.



Dan is-simbolu jindika li l-prodott li huwa mmarkat b'dan il-mod m'ghandux jintrema bħal skart normali tad-djar. Minhabba li huwa prodott B2B , ma jistax jintrema wkoll f'centri civici għar-rimi ta' l-iskart. Jekk tkun tixtieq tarmi dan il-prodott, jekk jogħġbok għamel dan kif suppost billi tiegħu għand organizzazzjoni fil-qrib li tispeċjalizza fir-rimi ta' tagħmir qadim ta' l-eletriku.



Dette symbolet indikerer at produktet som er merket på denne måten ikke skal kastes som vanlig husholdningsavfall. Siden dette er et bedriftsprodukt, kan det heller ikke kastes ved en vanlig miljøstasjon. Hvis du ønsker å kaste dette produktet, er den riktige måten å gi det til en organisasjon i nærheten som spesialiserer seg på kassering av gammelt elektrisk utstyr.



Ten symbol oznacza, że produktu nim opatrzonego nie należy usuwać z typowymi odpadami z gospodarstwa domowego. Jest to produkt typu B2B, nie należy go więc przekazywać na komunalne składowiska odpadów. Aby we właściwy sposób usunąć ten produkt, należy przekazać go do najbliższej placówki specjalizującej się w usuwaniu starych urządzeń elektrycznych.



Este símbolo indica que o produto com esta marcação não deve ser deixado fora juntamente com o lixo doméstico normal. Como se trata de um produto B2B, também não pode ser deixado fora em centros cívicos de recolha de lixo. Se quiser desfazer-se deste produto, faça-o correctamente entregando-o a uma organização especializada na eliminação de equipamento eléctrico antigo, próxima de si.



Acest simbol indică faptul că produsul marcat în acest fel nu trebuie aruncat ca și un gunoi menajer obișnuit. Deoarece acesta este un produs B2B, el nu trebuie aruncat nici la centrele de colectare urbane. Dacă vreți să aruncați acest produs, vă rugăm s-o faceți într-un mod adecvat, ducând-ul la cea mai apropiată firmă specializată în colectarea echipamentelor electrice uzate.



Tento symbol znamená, že takto označený výrobek sa nesmie likvidovať ako bežný komunálny odpad. Keďže sa jedná o výrobek triedy B2B, nesmie sa likvidovať ani na mestských skládkach odpadu. Ak chcete tento výrobek likvidovať, odneste ho do najbližšej organizácie, ktorá sa špecializuje na likvidáciu starých elektrických zariadení.



Ta simbol pomeni, da izdelka, ki je z njim označen, ne smete zavreči kot običajne gospodinske odpadke. Ker je to izdelek, namenjen za druge proizvajalce, ga ni dovoljeno odlagati v centrih za civilno odlaganje odpadkov. Če želite izdelek zavreči, prosimo, da to storite v skladi s predpisi, tako da ga odpeljete v bližnjo organizacijo, ki je specializirana za odlaganje stare električne opreme.



Este símbolo indica que el producto así señalado no debe desecharse como los residuos domésticos normales. Dado que es un producto de consumo profesional, tampoco debe llevarse a centros de recogida selectiva municipales. Si desea desechar este producto, hágalo debidamente acudiendo a una organización de su zona que esté especializada en el tratamiento de residuos de aparatos eléctricos usados.



Den här symbolen indikerar att produkten inte får blandas med normalt hushållsavfall då den är förbrukad. Eftersom produkten är en så kallad B2B-produkt är den inte avsedd för privata konsumenter, den får således inte avfallshanteras på allmänna miljö- eller återvinningsstationer då den är förbrukad. Om ni vill avfallshandla den här produkten på rätt sätt, ska ni lämna den till myndighet eller företag, specialiserad på avfallshandling av förbrukad elektrisk utrustning i ert närområde.