

Operating Manual



KE2500

Telco Multimeter

Version 1.1.27 / 04/2016 Copyright KURTH ELECTRONIC GmbH

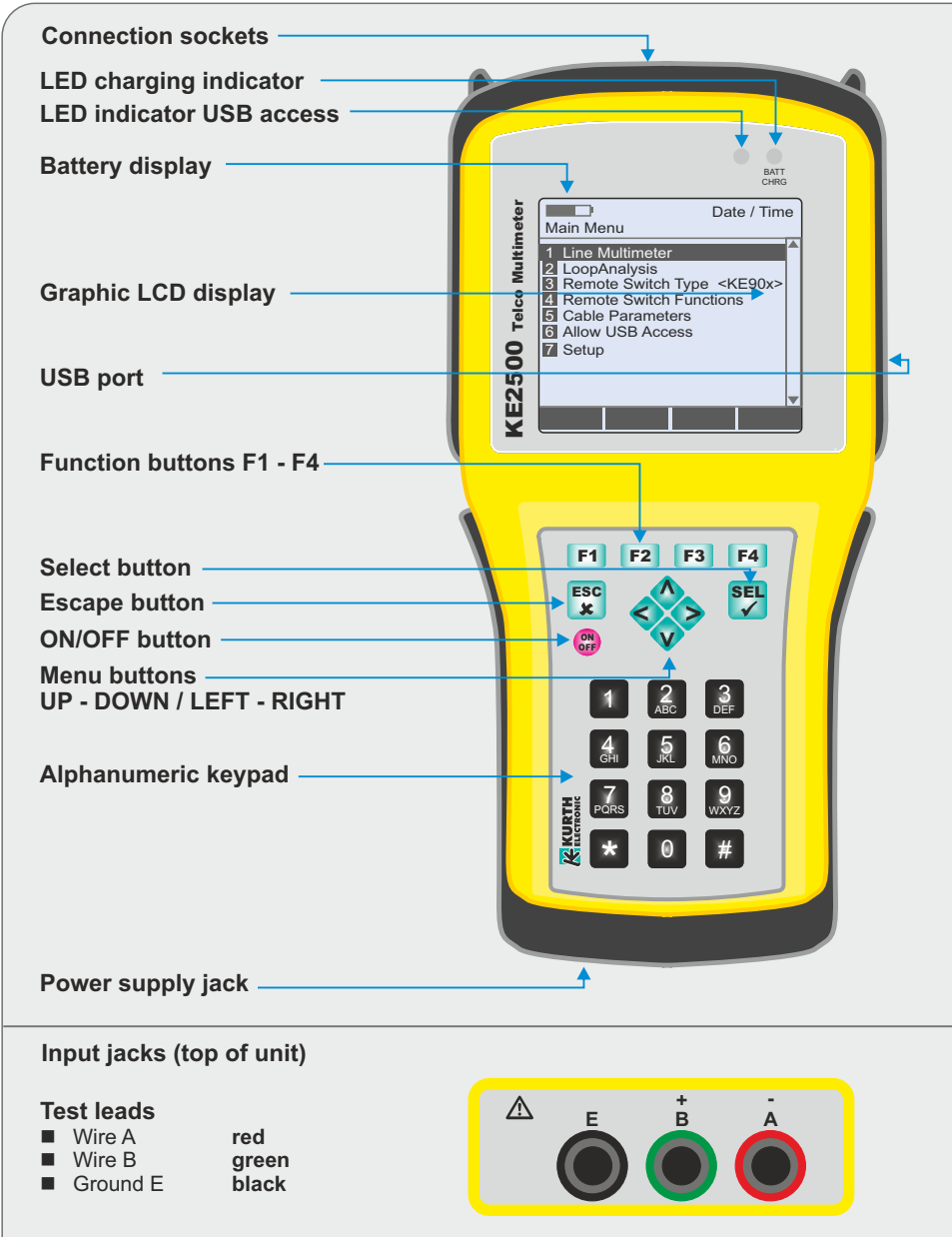
All rights reserved, including translations.

All reprints and electronic copies, including excerpts, require prior written approval of Kurth Electronic.

All of the brand names and trademarks cited herein are the property of their registered owners.



Keyboard / display / connections



Contents

Introduction	4
Symbols used	4
Safety instructions and warnings	4
Operation	6
KE2500 – Functions	6
Battery calibration	6
Connectors and test leads	7
General operating	8
1. Line Multimeter	9
1.1 Voltage	9
1.2 Resistance line	10
1.3 Resistance line balanced	10
1.4 Insulation	11
1.5 Capacitance	11
1.6 Capacitive balanced	12
1.7 Ground return resistance	12
1.8 LCL 1 MHz	12
1.9 PPA and Signature detection	13
1.10 Current	13
1.11 Insulation (quick)	13
2. Loop Analysis	14
2.1 Loop Analysis w/o CO	14
2.2 Loop Analysis with CO	15
2.3 Loop Analysis (auto)	16
2.4 Schleifenanalyse QA8 07/2014	16
3. Remote Switch Type	17
4. Remote Switch Functions	17
5. Cable Parameters	19
6. Allow USB Access	20
7. Setup	21
7.1 Automatic Off	21
7.2 LCD illumination	21
7.3 Language	21
7.4 Date & time	21
7.5 Signals & display	21
7.6 Show min/max	21
7.7 System information	21
8. Update	22
9. Repair and warrenty	23
10. Technical Data	24

Introduction

With the KE2500 Telco Multimeter you have purchased a simple and intuitive solution for troubleshooting and copper qualification. In order to use the KE2500 often and successfully, please read through this manual.

The device was manufactured according to the following guidelines:

Noise emission according to EN61326-1: 2006 Class B

Interference immunity according to EN61326-1: 2006 and EN61326-2-1: 2006

Should you have additional questions regarding the operation and use of this device, please contact:

Kurth Electronic GmbH

Test & Measurement

Mühleweg 11

72800 Eningen u.A.

Tel: +49-7121-9755-0

Fax: +49-7121-9755-56

E-Mail: sales@kurthelectronic.de

www.kurthelectronic.de

Symbols used



Device complies with the relevant EC directives



Do not dispose the device in household waste



General warning sign: For connections see page 9.

Warning and Safety instructions

Before using this test device, you must have read and understood the safety instructions and warnings carefully. These safety instructions and warnings must be observed when operating the device.

The circuit under test must be switched off, powered down safely from the mains isolated and shown to be de-energized before the test connections for the isolation and continuity tests are carried out.

Circuit connections and exposed conductive parts and other metal parts of a installation or device must not be touched during the tests.

Other safety devices are warnings and automatic discharge for voltage circuits. These safety devices can fail. Therefore, safe work practices are to be applied.

The voltage function works only for functional test device and switched on.

After insulation tests, capacitive circuits were made must have time to discharged before the test cables must be separated

If any part of the device is damaged, the appliance should not be used.

All test leads, probes and alligator clips must be in good condition, be clean and have a decent insulation without breaks or cracks.

Make sure that your hands during testing are behind the protective covers of the probe / stop terminals.

It could be that authorities responsible for electrical safety of the corresponding speaking countries in voltage measurement on high voltage systems recommend use of fused test cables.

NOTE

THE TEST EQUIPMENT MUST ONLY BE OPERATED IN ACCORDANCE WITH TRAINED AND COMPETENT PERSONNEL

Users of the test device and / or its employees are reminded that the work safety laws of the country require the application of a valid risk assessments of all electrical work to identify potential electrical hazards and to reduce the risk of injury from electric shock, such as in accidental short circuits.

Supply voltage

This tester is designed for use on isolated (de-energized) circuits. Provide before carrying out test measurements, and using a maximum method ensures that the circuit to be tested has been completely separated from the supply voltage and securely isolated.

Preventive maintenance

The KE2500 Telco multimeter requires very little maintenance:

- The test cable must be checked prior to use for damage.
- The test device can be cleaned with a damp cloth.
- The fall protection can be removed to simplify cleaning.
- Do not use any cleaning agents for cleaning on alcohol base, as these residues can leave.

EMC

In accordance with IEC 61326-1

Temperature effects

Temperature coefficient of <0.1% per ° C

Environmental conditions

Operating range: -20° to +55°C

Operating humidity : 95 % RH . to 0° C to +35° C, 70% RH +35° C to +55° C.

Storage temperature range: -30 to +80° C

Calibration temperature : +20° C.

Maximum operating altitude : 2000 m

Notes

KE2500 may only be operated with the supplied original accessories. The use of non-original accessories as well as application areas other than those specified may result in measurement errors and damage the product. Basically, the relevant safety regulations according to VDE 0100, to consider 0800 and 0805.

- The use of ports other than the designated may damage the unit .
It is not intended for use on the power network. Kurth Electronic takes over no liability for damage by inappropriate use .
- No external voltages applied to the device.
- The device must not be opened. There are no parts inside the can be maintained or adjusted or need.
- The instrument is protected by the front foil against splash and dust ingress .
However, it is not waterproof.
- Never burden the device on the cables connected to, for hanging the loop on the device use the supplied strap.

Operating

The main advantage of xDSL is the omission of the installation cost of new cable. The approved maximum line length and the maximum sustained data transfer rate depends on the characteristics of the cable. Before installing a xDSL modem the properties and quality of the selected pair of wires should correspond to the demands of the chosen system.

Here helps the new KE2500, specifically designed for applications in telecommunications systems.

Functions

- Troubleshooting with digital multimeter functions
- Automatic test programs provide detailed measurement results
- Parameter editor to change the system and cable parameters
- Remote switch with optional KE900/905 remote unit

Auto. tests

- Voltage
- Insulation
- Resistance
- Capacitance
- Capacitive Unbalance
- LCL 1 MHz
- Current

Measurement modes

- Voltage
- Insulation
- Resistance line
- Resistance line balanced
- Capacitance
- Capacitive balanced
- LCL 1 MHz
- Current

Battery calibration

The KE2500 is equipped with a high-performance lithium polymer (LiPo) battery. In spite of its low weight, this allows an operating time of several hours in the measuring mode, under full load. The capacity of the mains charger is sufficient to operate the KE2500 and charge the battery at the same time, but the power supply should not be connected during ongoing measurements. This can lead to a falsification of the measuring results in the case of critical lines. Thanks to a special charger, the battery is carefully charged with time, voltage and current to ensure the longest possible service life.

Caution: The device may be operated only with the supplied original KE power supply, UMEC UP0181A-09PE! Damage to the appliance resulting from non-observance will be repaired for a fee!

Basically the PSU is only put on the unit and then into the wall outlet.

Note: Please fully charge battery before first use!

Changes the charging LED from orange to green the charging is completed. To check the charge indicator after the initial charging turn off the device and then turn it on again with the AC adapter connected for about 2-3 minutes. During this time, the battery indicator will be calibrated and now displays the correct value.

Connections and test leads

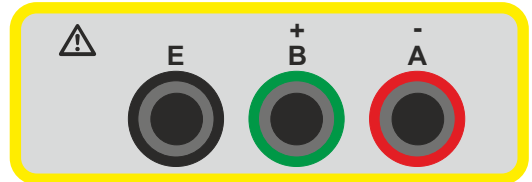


Test leads

To connect the measured wire pair shielded CAT III test leads are used with 4 mm diameter and with the following color code:

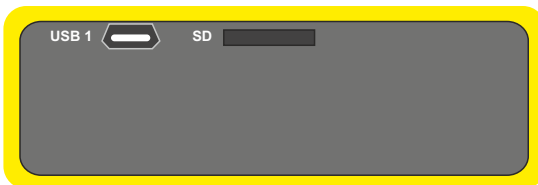
- Wire A **red**
- Wire B **green**
- Ground GND **black**

The connection of the test leads appended to the selected mode.



Side connections

- USB 1-Port for data transfer
- SD Card



Examination of the test leads

Functional test

1. Run before each use of the test device , a visual inspection of the test leads , probes and Alligator clips are in good condition and undamaged and not cracked Insulation through.
2. Check the consistency of the test cable through solid short-circuit the test leads and reading the resistor directly on the screen (the resistance should be less than 1.0) .

Terminals of the test cable

The test cables are connected as shown in Figure above. This figure shows the on top lying tester sockets for the test cable.

Standard test cable

The red, green and black test leads to be plugged into the appropriate sockets on the top of the test device , which the names + (B green) , - (A red) and earth (E black) bear (see illustration) The test probe and alligator clips for connection to the circuit under test are also included.

OPERATING

Starting & general rules

The KE3600 works with an operating system that has to be booted. The boot menu with various device parameters such as the hardware and software versions appears at the end of the booting process. You can bring up the *Main Menu* immediately by pressing any button.

The user can make basic device settings in the *Setup* before starting the measurements.

In most cases, the measurements and settings are selected using the menu-driven user interface. The vertical control buttons ▲+▼ are used for the selection.

Pressing the **SEL** key confirms the input or starts the measurement.

To go to the previous screen or cancel ongoing measurements, press **ESC**.

Various cable and test parameters can be selected by pressing the function buttons **F1 - F4**.

In order to facilitate and speed up the operation, some modes of measurement can also be selected directly with the help of the digit keys, e.g. with the key combination **1** + **2** in quick succession you can start directly the Resistance line measurement. The measurements start immediately after the parameters have been selected.

Save

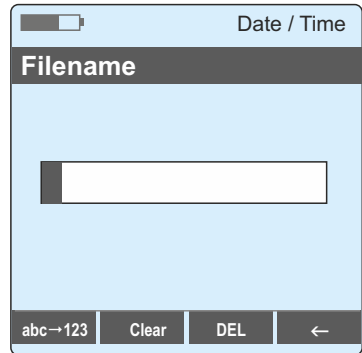
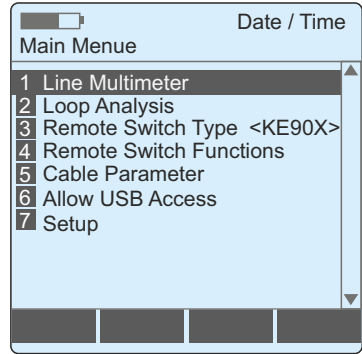
Some tests have the possibility to save the results. When available, the memory dialog is called with **F4**. The file name is entered using the alphanumeric keyboard. Under **F1** *abc* → *123* you can switch between text and number input, under **F2** *Clear* the entire input can be reset. Individual digits can be cleared with the control buttons and **F3** *DEL*. Pressing the backspace key ← under **F4** deletes the entry from right to left.

Special characters can be found under the buttons * and #.

*: . - / @ : _ + , [] ; = ?

#: # \$ % & ' () { } ~

With **SEL** measurement is then stored ultimately under the file name entered.



Basically, the user should make the on-screen instructions in each measurement mode row!

Line Multimeter

1.1 Voltage

The purpose of this study is to measure the direct and the alternating voltage: in the AC range only the alternating voltage is displayed, the direct voltage and the rms value (DC + AC) are displayed in the DC range.

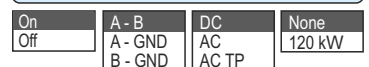
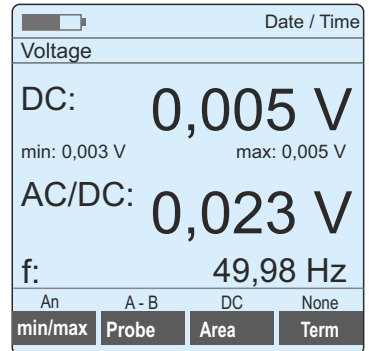
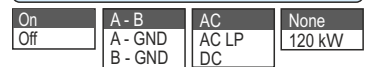
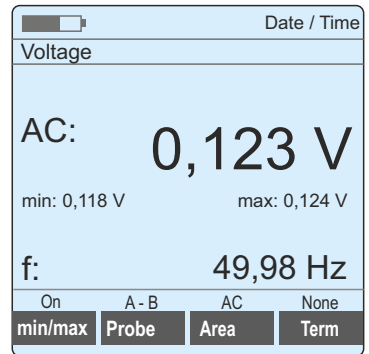
Measuring method

Connect the wires to be measured and the shield of the cable. Select the *Voltage* mode and press **SEL**. The measurement is then started automatically. The results of the alternating and direct voltage are displayed numerically in volts and the frequency in Hz.

With **F1**, the min / max values can be switched on or off for easier assessment. Under **F2** Probe the measurement points can be selected from the differential voltage measured between two cores of a pair of conductors (A-B) and the common-mode voltage measured between a pair of conductors and the ground (A-GND, B-GND). With **F3**, the measuring ranges can be switched between DC (DC voltage) and AC (AC voltage) and AC TP (AC voltage with low-pass filter > 200 Hz). Under **F4** Term, the input resistance is reduced from 10 MW to 120 kW to measure the actual voltage.

Safety note:

The measured voltage must not exceed the value of 600 V for phase to ground or phase to phase.



1.2 Resistance line

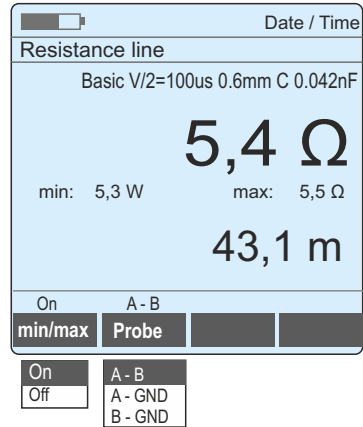
The purpose of this measurement is the determination of the loop resistance.

Measuring method

Connect the wires to be measured and the shield of the cable. The far end of the pair of wires to be measured must be short-circuited, work with a 2nd person or with the KE90X Remote Unit. Select the *Resistance line* mode and press **SEL**. The measurement is then started automatically. On top of the display the used cable is shown. The measuring result is shown in ohms and the cable length in meters.

Under **F1**, you can show or hide the min / max values. With **F2** Probe you can select the measuring point. The measurement points can be selected, e.g. between two wires of a wire pair (A-B) and between a wire and ground (A-GND, B-GND).

Please ensure that the cable is voltage-free before measurement!



1.3 Resistance line balanced

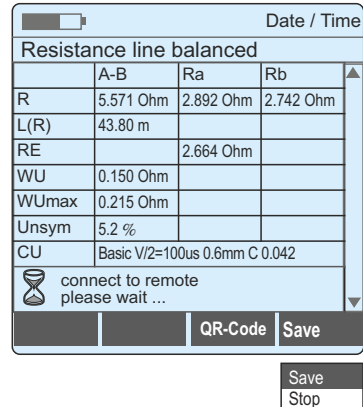
Determination of the loop resistors A-B and the resistors A-Gnd, B-Gnd. The cable length, the earth line resistance, the resistance difference (WU) and the maximum resistance difference (WUmax *) as well as the unbalance are displayed. The selected cable parameter is displayed at the bottom of the table.

Autom. Measuring procedures (only possible with remote KE90X and TX915) see Resistance line.

Please ensure that the cable is voltage-free before measurement! The measuring points are automatically tested in sequence with the aid of the remote measuring devices. The result can be displayed as a QR code (key **F3**, see page 14) or stored for later evaluation (key **F4**).

For more information, see **7. Allow USB Access** on page 20.

* The maximum permissible WU depends on the length and diameter of the cable.



1.4 Insulation

In this setting KE2500 measures the insulation resistance between the two wires running a pair of wires and the individual wires and ground.

Measurement method

Connect the wires to be measured and the shield of the cable. Select *Insulation* and press **SEL**. The measurement starts automatically thereafter. The results are displayed in Ohm.

With **F1**, the min / max values can be switched on or off for easy assessment.

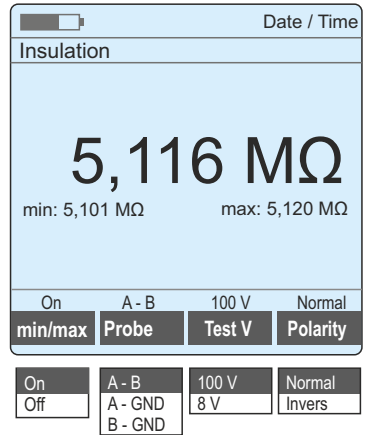
F2 can be selected from the individual operating resistors such as two cores of a wire pair (A-B) and between a wire pair and the ground (A-GND, B-GND).

Under **F3** Test V the test voltage at A-B can be changed from 100 V to 8 V. Reason: In order to be able to measure the insulation also on lines with terminated ISDN / NTBA. For A-GND, B-GND, a test voltage of 100 V is always present.

The polarity can be reversed with **F4**.

Safety note:

The tests of insulation resistance occur at high DC voltages. There is the risk of electric shock when touching conductive parts. When performing a test of the insulation resistance always follow the safety precautions and make sure that you follow the precautions for safety at work.



1.5 Capacitance

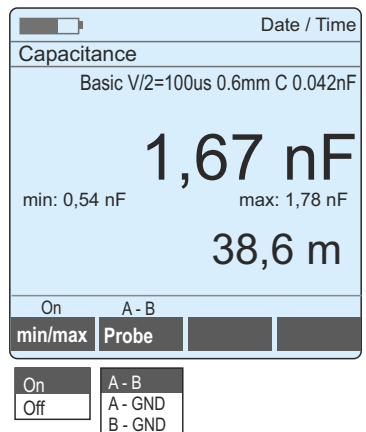
The purpose of the measurement is to determine the operating capacity of a wire pair. The measurement shows whether the line is open and shows the typical input capacitance of connected devices as well as asymmetries of the conductor pair.

Measuring method

Connect the wires to be measured and the shield of the cable. The far end of the pair of wires to be measured must be open! Select the *Capacitance* mode and press **SEL**. The measurement is then started automatically. The display shows on the top the cable parameters used for this measurement. The capacity and the resulting cable length are displayed.

With **F1**, the min / max values can be switched on or off for the assessment of fluctuations.

Under **F2** measuring points the measuring points can be selected.



1.6 Capacity balanced

Determination of capacities of the A and B wires, A wire to earth and B wire to earth, the resulting cable length and the symmetry values. Under CU, the set cable parameter is displayed.

Measuring method

See Capacity. The measuring points are automatically tested in series. The result can be displayed as a QR code (key **F3**, see page 14) or stored for later evaluation (key **F4**).

For more information, see 7. Allow USB Access on page 20

Capacity balanced			
C	A-B	A-GND	B-GND
	1.6 nF	1.9 nF	1.9 nF
L(C)	38.09 m		
Sym	0.0 %	0.000nF	
CU	Basic V/2=100us 0.6mm C 0.042		

Save
Stop

1.7 Ground return resistance

Here the resistance of the ground-return is measured, for the evaluation of defective or missing shields or corroded terminals.

Measuring method

Connect the wires to be measured and the shield of the cable. Select the earthing resistance mode and press SEL. The measurement is then started automatically. The display shows the cable parameter used. Measurement results are displayed in Ohms.

With **F1**, the min / max values can be switched on and off, the absolute value is not necessarily meaningful, but high fluctuations indicate errors.

Ground return resistance	
Basic V/2=100us 0.6mm C 0.042nF	
5,4 W	
min: 3,1 W	max: 5,6 W
On	
min/max	

On
Off

1.8 LCL 1 MHz* (Longitudinal Conversion Loss)

In the case of the asymmetry measurement (LCL), the balance between the A wire to ground is compared with that of the B wire to ground. For this purpose, a signal with 1 MHz is fed symmetrically to the wires in relation to the ground. The voltage measured at A + B is the indicator of the unbalance. The higher the dB value, the lower the unbalance.

With **F1**, the min / max values can be displayed and dimmed to view fluctuations.

Measuring method

Connect the wires to be measured and the shield of the cable. Select the operating mode **LCL 1 MHz** and press **SEL**. The measurement is then started automatically.

* LCL Measurement according to ITU G.117

LCL 1 MHz	
Longitudinal Conversion Loss	
51,78 dB	
min: 50,18 dB	max: 56,21 dB
f: 1,00 MHz	
On	
min/max	

On
Off

1.9 PPA and Signature detection

With the **PPA** detection (Passive test completion), it is possible to check whether a TAE of the Deutsche Telekom is properly installed on the subscriber side. The PPA is installed in the first TAE at the participant. With the help of the PPA the Telekom can measure the line into the house to the 1. TAE and thus detect possible errors.

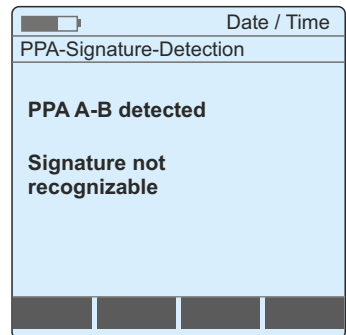
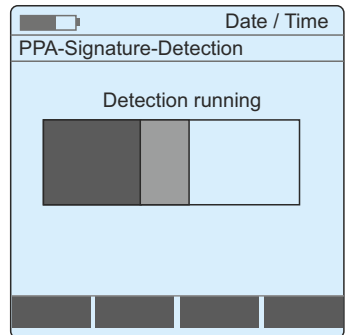
The **Signature** is a feature of the DSL connection cable supplied by Deutsche Telekom together with DSL routers for the All-IP connection.

With the **Signature** detection can be checked whether the subscriber has the DSL router from the Telekom properly connected with the cable provided to the TAE socket.

The detection can be canceled with ESC.

Possible results:

- PPA not recognized
- Signature not recognized
- PPA A-B detected
- PPA inverse detected
- Signature detected
- PPA detection is not unique
- Signature not recognizable
- Signature not recognized, PPA present
- 2 or more PPA A-B detected
- 2 or more PPA inverse detected
- 2 x PPA antiparallel suspected
- Resistance A-B and B-A too small



1.10 Current

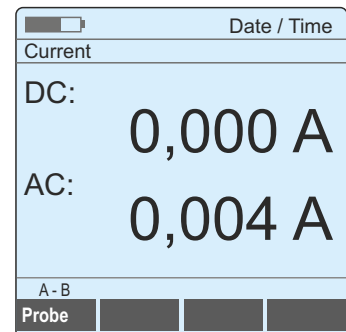
In this setting, the KE2500 measures the DC (DC) and AC (AC) currents. This makes it possible to assess whether the available power is sufficient for ISDN or analogue connections.

Measuring method

Connect the wires to be measured and the shield of the cable. Select the *Current* mode and press **SEL**. The measurement is then started automatically. The results of the measurement of alternating and direct current are shown in amperes. Under **F1** measuring points. The measurement points can be selected, e.g. (A-B) and between a pair of wires and the ground (A-GND, B-GND).

1.12 Insulation (quick)

As 1.5 Isolation, a filter accelerates the measurement, other settings see 1.4 Isolation (Page 11).



A - B
A - GND
B - GND

2. Loop Analysis

Loop analysis is a measurement method that summarizes and automates the most important measurements, in order to simplify and speed up the test sequences. In the main menu you have to set the measuring aid to be used.

You can choose between:

KE90X (with acknowledgment of switching commands)

TX915 (reduced functions)

or **Manual** (manual switch).

2.1 Loop Analysis w/o CO

The loop analysis without the exchange refers to a recently released line that is separate from the central office.

Measurement method

Connect the wires to be measured and the shield of the cable. Select *Loop analysis without C.O.* and press **SEL**. The measurement starts automatically thereafter. Follow the coming instructions shown in the display.

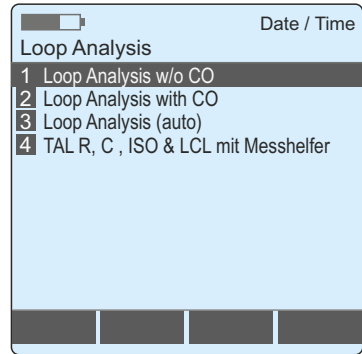
First every measuring point combinations (A-B, A-GND and B-GND) successively established the current levels of direct and alternating current, followed by the measurement of the DC and AC voltages, the resistance measurements and the length resulting from the resistance, capacity, the length resulting from the capacitance and finally the insulation resistance.

With **F4 Stop**, the measurement can be frozen and then left completely with **ESC**.

After the measurement has been completed, a QR code with the measured values can be generated and displayed with **F3 QR** code. This can then simply be read in with a QR application. **ESC** exits the view and test.

Alternatively, the measured values can also be stored as a CSV file under **F4** for later evaluation.

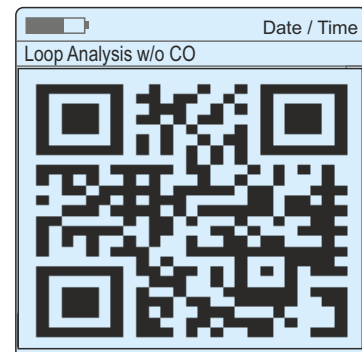
For more information, see 7. *Allow USB Access* on page 20.



Selection of different autom. line measurements

	A-B	A-GND	B-GND
I=	0.1 mA	0.1 mA	0.1 mA
I~	0.5 mA	0.4 mA	0.4 mA
U=	0.0 V	0.0 V	0.0 V
U~	0.0 V	0.0 V	0.0 V
R	>MAX	>MAX	>MAX
L(R)=	>MAX		
C	0.0 nF	0.0 nF	0.0 nF
L(C)=	0.000 m		
Riso	>20G	>20G	>20G

Display results



Embedded QR code with the measurement results

2.2 Loop Analysis with CO

The loop analysis is a measurement technique that summarizes and automates the most important measurements so the test procedures are simplified and accelerated. The loop analysis with CO refers to a recently released line that must be connected to the central office, however, separated from the central office for some measurements. This will be passed in clear-screen instructions to the user.

Measurement method

Connect the wires to be measured and the shield of the cable. Select *Loop analysis with CO* and press **SEL**. The measurement starts automatically thereafter. Follow the coming instructions shown in the display.

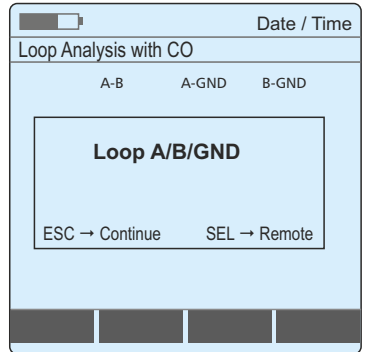
First, for every measuring point (A-B, A-GND, B-GND) successively the currents for DC and AC identified in connection to the central office, followed by the measurement of the DC and AC voltages, also in connection to the central office. Now, the line has to be separated from the central office, and the measurements of current and voltage is repeated. Then place a loop A-B, followed by the measurements of resistance and the cable length as a result of resistance. Resistance measurements, and the resultant of the resistive length, capacitance, the length resulting from the capacitance and the end of the insulation resistance. Then a loop A-B-GND has to be insert, measurements to the capacitance and the cable length as a result of capacitance, as well as the insulation resistance follows.

With **F4 Stop**, the measurement can be frozen and then left completely with **ESC**.

After the measurement has been completed, a QR code with the measured values can be generated and displayed with **F3 QR** code. This can then simply be read in with a QR application. **ESC** exits the view and test.

Alternatively, the measured values can also be stored as a CSV file under **F4** for later evaluation.

For more information, see 7. *Allow USB Access* on page 20.



Example of Screen dialog

	A-B	A-GND	B-GND
I= CO	0.1 mA	0.1 mA	0.1 mA
I~ CO	0.5 mA	0.4 mA	0.4 mA
U= CO	0.0 V	0.0 V	0.0 V
U~ CO	0.0 V	0.0 V	0.0 V
I=	0.1 mA	0.1 mA	0.1 mA
I~	0.5 mA	0.4 mA	0.4 mA
U=	0.0 V	0.0 V	0.0 V
U~	0.0 V	0.0 V	0.0 V
R	>MAX	>MAX	>MAX
L(R)=	>MAX		

	A-B	A-GND	B-GND
R	>MAX	>MAX	>MAX
L(R)=	>MAX		
C	0.0 nF	0.0 nF	0.0 nF
L(C)=	0.000 m		
Riso	>20G	>20G	>20G

2.3 Loop Analysis (auto)

The loop analysis is a measurement technique that summarizes and automates the most important measurements so the test procedures are simplified and accelerated. The loop analysis (auto remote) will perform the line switching using the KE900 remote unit.

Measurement method

Connect the wires to be measured and the shield of the cable. Select *Loop analysis (auto)* and press **SEL**. The measurement starts automatically thereafter.

First, for every measuring point combinations (A-B, A-GND and B-GND) successively the currents for DC and AC identified in connection to the office, followed by the measurement of the DC and AC voltages, also in connection to the office. The switching functions of the KE90X now allows direct measurements as shown in **2.2. Loop Analysis with CO**.

With **F4** Stop, the measurement can be frozen and then left completely with **ESC**. After the measurement has been completed, a QR code with the measured values can be generated and displayed with **F3** QR code. This can then simply be read in with a QR application. **ESC** exits the view and test. Alternatively, the measured values can also be stored as a CSV file under **F4** for later evaluation.

For more information, see 7. *Allow USB Access* on page 20.

2.4 Schleifenanalyse (Loop Analysis) QA8 07/2014

The loop analysis QA8 is a customized, automated analysis for telecom applications are carried out the required measurements for the skilled conclusion for AN according to Annex 8.

Measurement method

Connect the wires to be measured and the shield of the cable. Select *Schleifenanalyse QA8 07/2014* and press **SEL**. The measurement starts automatically thereafter.

These values can then be saved as a CSV file for later evaluation on a PC or laptop.

For further information see the *Loop Analysis* before.

Loop Analysis (auto)			
	A-B	A-GND	B-GND
I= CO	0.1 mA	0.1 mA	0.1 mA
I~ CO	0.5 mA	0.4 mA	0.4 mA
U= CO	0.0 V	0.0 V	0.0 V
U~ CO	0.0 V	0.0 V	0.0 V
I=	0.1 mA	0.1 mA	0.1 mA
I~	0.5 mA	0.4 mA	0.4 mA
U=	0.0 V	0.0 V	0.0 V
U~	0.0 V	0.0 V	0.0 V
R	>MAX	>MAX	>MAX
L(R)=	>MAX		

Buttons: QR-Code, Save

Measurements with measuring aids such as KE905

Schleifenanalyse QA8 07/2014			
	A-B	A-GND	B-GND
R	0.653 W	0.671 W	0.645 W
L(R)=	5.141 m		
U=	0.0 V	0.0 V	0.0 V
U~	0.0 V	0.5 V	0.0 V
Riso	<1M	> 3G	> 3G
C	0.3 nF	0.3 nF	0.3 nF
R	>MAX	>MAX	>MAX
L(C)=	5.141 m		

Buttons: QR-Code, Save

3. Remote Switch Type

Selection of the measuring helper type for (remote) switching of the copper duplex to be tested. There is the choice between Kurth Electronic Remote KE900 / KE905 (with acknowledgment of the switching commands) and the Teletech TX915 (restricted function). Alternatively, the switching operations can also be carried out manually

4. Remote Switch Functions

With the KE2500 you have the possibility to send control commands directly from the device to the optional measuring devices like the KE900 / KE905 and the TX915 remote units. The use of the remote unit for remote-controlled line measurement allows you to:

- One-man testing, no assistance required
- Used in areas such as underground distribution, cable shafts, etc. without communication access
- Subscribers' line stay in service until testing starts and will be restored after
- Remote controlled switching functions such as cut through, loop, grounding and open
- Measurement up to 30 MHz with the use of the device at the far end
- Ideal for testing dual pairs in preparation for channel bonding

Possible remote unit modes:

4.1 Trace Tone On/Select

So the trace tone loud speaker will be activated and the trace tone send from KE900 and the port can be changed.

4.2 Open Ports 1+4

Opens Port 1 and stops tracing tone. Used for measurements like open circuit noise, capacitance, leakage resistance. *Teletech TX915: Open port (OPEN)*

4.3 Port 1 Loop

Port 1 pair shorted. Used to measure the loop resistance. *Teletech TX915: A-B-GRD loop (SHORT)*

4.4 Port 1 Loop Pulse 3 sec

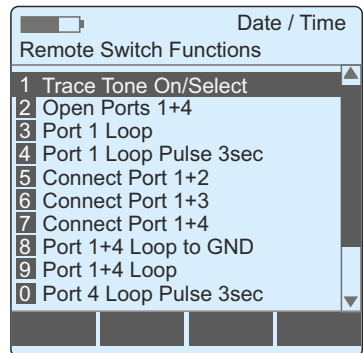
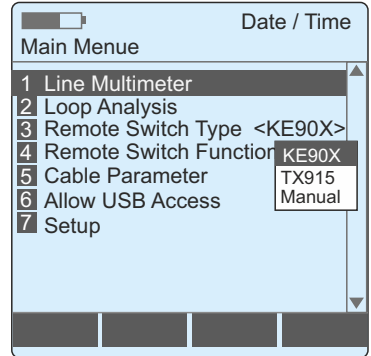
Port 1 loop pulse for 3 seconds. With it you can clearly detect the far end with a TDR even the loop is correct terminated on the CO side.

4.5 Connect Port 1+2

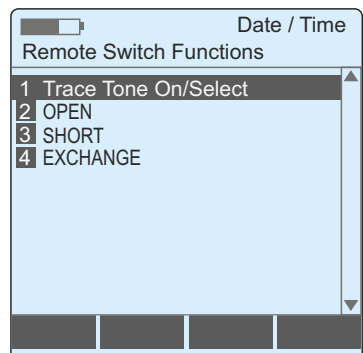
Port 1 connected to Port 2. Used to restore the subscriber's line before and after testing. *Teletech TX915: Switch through port (EXCHANGE)*

4.6 Connect Port 1+3

Port 1 connected to Port 3. A test set on Port 3 can then be used for end-to-end measurements like attenuation in conjunction with a additional signal transmitter on the far end.



Control functions with KE90X



Control functions with TX915

Operating Manual

KE2500 Telco Multimeter

4.7 Connect Port 1+4

Port 1 connected with Port 4.
Teletch TX915: Switch through port (EXCHANGE)

2.8 Port 1+4 Loop to Ground

Loop Port 1 and Port 4 and connected to ground e.g. for resistance symmetrical measurement

2.9 Port 1+4 Loop

Port 1 and Port 4 loop.

2.10 Port 4 Loop Pulse 3 sec

Port 1 and Port 4 loop pulse for 3 seconds. With it you can clearly detect the far end with a TDR even the loop is correct terminated on the CO side.

2.11 Connect Port 2+4

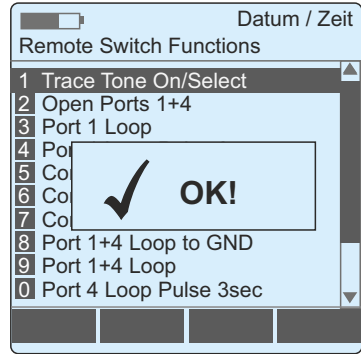
Port 4 connected to Port 2. With it you can switch e.g. the exchange line on another pair of wires.

2.12 Connect Port 3+4

Port 4 connected to Port 3, Port 1 open

2.13 Connect Port 1+2 and 3+4

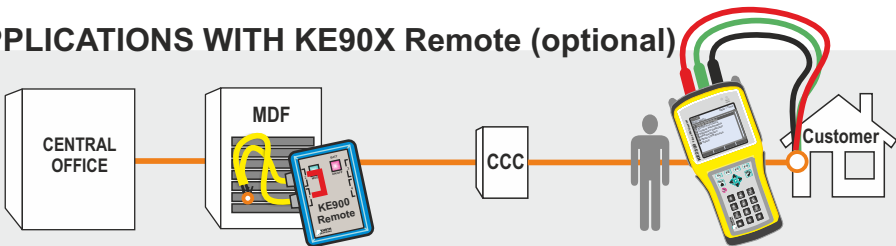
Port 1 connected to Port 2 and Port 3 connected to Port 4. This configuration allows to measure two independent loops for influence to each other.



Acknowledge switching commands

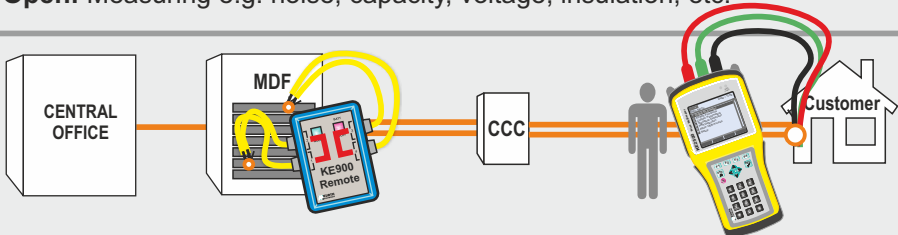
The switching commands are sent from the KE90X with a notification so that the user can be sure of the correct test setup.

APPLICATIONS WITH KE90X Remote (optional)



Cut through: Customers line remains in service up for the start of the measurement, the customer can continue working.

Open: Measuring e.g. noise, capacity, voltage, insulation, etc.



Bonding preparation: This configuration allows to measure two independent loops for influence to each other

5. Cable Parameters

The most common cable parameters are installed in the device.

1. **Basic V/2=100m/μs ø 0.6mm C0.042nF** (default)
2. Default V/2=100 Dia=0,4mm C/km
3. A-02Y/0,5/STIII Zell,PE
4. A-02Y/0,8/STIII Zell,PE
5. A-02YSF/0,5/STIII Foam Skin,PE
6. A-02YSF/0,6/STIII Zell,PE
7. A-2Y/0,35/STIII Zell,PE
8. A-2Y/0,8/STIII Papier,Lagen
9. A-2Y/0,9/STIII Zell,PE
10. A-2YF/0,35/STIII Voll,PE
11. A-2YF/0,4/STIII Voll,PE
12. A-PWE/0,4/STIII Papier,Buendel
13. A-PWE/0,6/STIII Papier,Buendel
14. A-PWE/A-PM/0,4/STIII Papier,Lagen
15. A-PWE/A-PM/0,6/STIII Papier,Lagen
16. A2Y/0,4/STIII Voll,PE
17. A2Y/0,6/STIII Voll,PE Tragseil

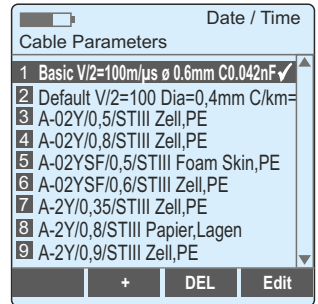
The cable parameters are transferred to the KE2500 via the file CUPARAMS.DAT. To do this, set up a USB connection (see page 20) and then copy the file to the directory KE2500: \ SYS \ KECT.

Create new copper cable parameters:

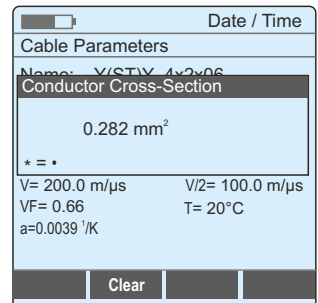
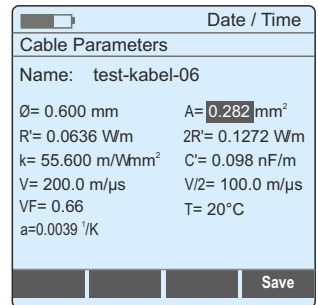
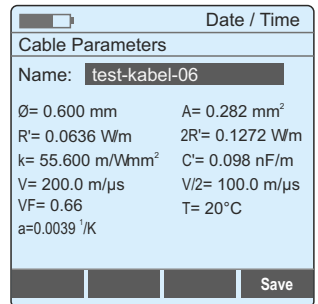
The **F2 +** key is used to copy a parameter for editing and can then be edited with **F4 Edit**. By entering only 2 values - such as the cable diameter \varnothing and the resistance per meter R' - the KE2500 independently calculate the remaining copper cable parameters. Use the left / right control buttons to scroll through the values. The selected value is then selected with **SEL** and changed in the context menu via the numeric keypad.

Make sure that the new settings are saved under a changed label as the default setting. To change the name go to **Name** and confirm with **SEL** to get to the context menu for the name change, after the name change confirm with **SEL** and you will get back to the cable parameter menu, press **F4 Save** for conclusion. The new name will now appear under *Cable Parameters* in the selection menu.

SEL selects the desired value. This is then marked with a hook at the right edge of the screen. The **F3 DEL** button can be used to remove the cables that are installed.

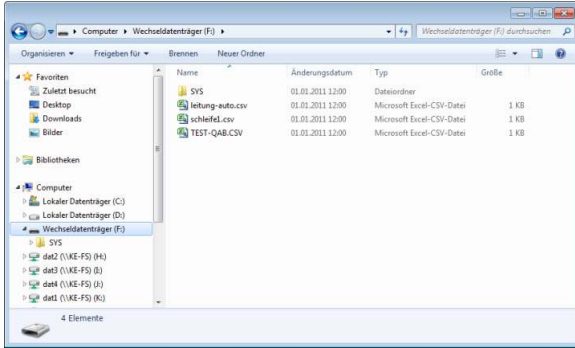


Predefined copper cable types

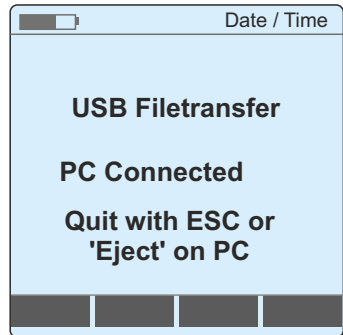
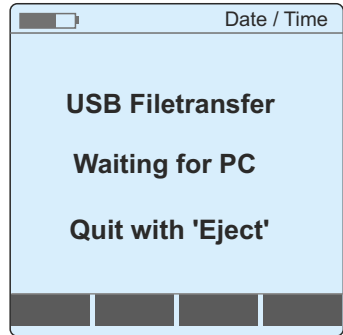


6. Allow USB Access

The stored results (table with measured values in CSV format) are transferred to a PC or laptop using the USB port. To do this, you must first enable the USB device on the main menu. Select *Allow USB Access*. Now the meter is displayed as a USB drive on the connected device and the stored files can be edited. Please do not delete the SYS folder.



Then disconnect the ESC key or Eject using Windows explorer.



	A	B	C	D	E
1		A-B	Ra	Rb	
2	R	5.571 Ohm	2.892 Ohm	2.742 Ohm	
3	L(R)	43.80 m			
4	RE		2.664 Ohm		
5	WU	0.150 Ohm			
6	WUmax	0.215 Ohm			
7	Unsym	5.2 %			
8	CU	Basic V/2=100us 0.6mm C 0.042nF			
9					
10					
11					
12					
13					
14					
15					

Example of a loop resistance asymmetry measurement in CSV format

7. Setup (Selection of functions and setting parameters)

7.1 Auto Power Off

Automatic shutoff after the last button is pushed. Setting options: *Always on, 3 minutes, 5 minutes, 15 minutes, 30 minutes, 60 minutes*. When a test is running and when the power supply is active, the KE2500 does not shut off even after the time has passed.

7.2 Backlight

Setting options: *Always on, always off, 3 minutes*.
When the power supply is plugged in, the light is always "ON."

7.3 Language

Here the menu language can be set. The languages German and English are available.

7.4 Date & Time

Date and time setting in 24 hour format. DD.MM.YY HH:MM such as 15:06:13 14:40

7.5 Signals & Display

Here you can find further settings:


- | | |
|----------------------------|--|
| 1. Keybord Beep | <i>On or Off</i> |
| 2. Low Battery Beep | <i>On or Off</i> |
| 3. Contrast | <i>Level 1 to 30</i> |
| 4. Brightness | <i>Level 1 to 7 (1 dark, 7 bright)</i> |
| 5. Messung Ende Ton | <i>On or Off</i> |

7.6 Show min/max Value

Fading in and out of the min / max values facilitates viewing, since the measured value does not have to be observed all the time.

7.7 Systeminformation

Here you will find information on the built-in modules such as HW and SW version.

	Date / Time
Systeminformation	
Modul	FW-Version
LPC	1.1-28 DT
KECT	1.28-0
HW-ID	
XXXXXXXXXXXXXXXXXX	

8. UPDATE VIA USB ACCESS

With the USB interface software updates can be transferred to the base board (LPC) and the KECT board for installation on the KE2500.

The two components can be installed independently, or in one step.

First access from a Windows PC via USB to the internal µSD Card KE2500. The KE2500 behaves like a USB memory stick.

The installation file (s) now is / are one or both components on the internal µSD Card KE2500 copied and then disconnected logical over the 'Eject' function of Windows.

Attention! The installation of software updates is only started when the KE2500 is powered by the power pack!

Update the base board (LPC)

The installation of software updates for the base board (LPC) of the KE2500 automatically start immediately when the installation file is available after the logical 'Eject' on the internal µSD card. Then the installation file from the internal µSD card is deleted and the KE2500 reboots.

Update the KECT board

After each (re) started KE2500 will determine whether a software update for the KECT board is present on the internal µSD card. If this is the case, the installation starts automatically and immediately.

Then the installation file from the internal µSD card is deleted and the KE2500 sets the startup sequence until the main menu appears.

Attention! The installation of software updates is only started when the KE2500 is powered by the power pack!

Step by Step:

Transfer of files for software updates on the internal µSD Card KE2500

1. **Provide first KE2500 on the power supply with voltage**
2. Establish USB connection with the PC
3. KE2500 on (if not already on),
4. In the main menu, select 'Allow USB Access'
5. Click in the Windows dialog screen that appears after a short time on 'Continue Unchecked'
6. Open if necessary. Appears Windows dialog 'Auto Play' to 'folder View files ... 'button
7. Now opens an Explorer window, the contents of the root directory of the internal µSD Card from the KE2500 is shown.
8. Copy the Installation file(s) of one or both components in the root directory ('SYS') of the internal µSD Card from the KE2500.
9. Close the Explorer window and the connection via the 'Eject function of Windows and separate logically.
10. The installation of software updates for the base board (LPC) starts automatically once the Installation of software updates for the KECT board starts after restarting the KE2500 automatically.

11. Repair and Warranty

The meter contains devices that are sensitive to static electricity, and the circuit board needs to be handled with caution. If the protection of a test device was impaired in any way, the device should not be used further, but be sent in for repair by suitably trained and qualified personnel. The protection of the tester is likely to be impaired if: there is visible damage, the intended measurement task is not running, has been stored for a long period of time under adverse conditions, or has been exposed to during transport heavy loads.

NEW TEST INSTRUMENTS ARE 1 YEAR WARRANTY FROM THE DATE OF YOUR PURCHASE BY THE USER.

NOTE:

Any unauthorized repair or adjustment of the test device will automatically void the warranty.

Repair and spare parts

If you want the tester to be repaired, contact us at:

**Kurth Electronic GmbH
Test & Measurement**

Muehleweg 11

72800 Eningen u.A.

Tel: +49-7121-9755-0

Fax: +49-7121-9755-56

E-Mail: sales@kurthelectronic.de

To return your product to Kurth Electronic in Germany

1. If a repair is required in a test device, you will be asked to provide the following information to enable the service department in advance the appropriate receipt of your test device. So that we can provide you with the best possible service:
 - Model, for example, KE2500
 - Serial number, for example, 00250
 - Reason for the return (eg required repair)
 - Details of the error

12. Technical Data

Voltage	Measuring range	≥ 1 mV to ≤ 600 V (AC, DC, TRMS)
	Maximum voltage	≤ 600 V
	Input impedance	> 9 MΩ DC, > 9 MΩ II <50 pF AC, Low Z ca. 116 kΩ
	Resolution at 6,000 V	1 mV ¹
	Resolution at 60 V	10 mV ¹
	Resolution at 600 V	100 mV ¹
	Accuracy	DC 0,5 % / AC 1,5 %
Overload protection	600 V AC/DC Sinus permanent	
Current	Measuring range	≥ 1 mA to ≤ 500 mA (AC, DC, TRMS)
	Maximum voltage	950 mA
	Input impedance	< 0,8 Ω
	Accuracy	DC 0,5 % / AC 1,5 % at > 20 mA ²
	Overload protection	0,95 A shutdown
Resistance	Measuring range	0 to 300 kΩ
	Resolution 0 .. 3 kΩ	0,1 Ω
	Resolution 3 .. 30 kΩ	1 Ω
	Resolution 30 .. 300 kΩ	100 Ω
	Measuring current 0 .. 3 kΩ	2 mA
	Measuring current 3 .. 30 kΩ	0,2 mA
	Measuring current 30 .. 300 kΩ	20 μA
	Accuracy	± 0,5 % to ± 1,5 %
	Overload protection	600 V AC/DC shutdown
Resistance line	Measuring range	0 to 2 kΩ
	Resolution 0 .. 2 kΩ	0,1 Ω
	Accuracy	± 0,5 % to ± 1,5 %
	Overload protection	600 V AC/DC shutdown
Insulation 100 V	Measuring range	70 kΩ to 2 GΩ
	Accuracy 0 .. 100 MΩ	2 %
	Accuracy 100 MΩ .. 1GΩ	4 %
	Accuracy 1 GΩ .. 2GΩ	8 %
	Maximum voltage	120 V
	Kurzschlussstrom	< 9 mA
Overload protection	600 V AC/DC shutdown	
Insulation 8 V	Measuring range	1 kΩ to 150 MΩ
	Accuracy 0 .. 10 MΩ	2 %
	Accuracy 10 MΩ .. 100 MΩ	4 %
	Accuracy 100 MΩ .. 150 MΩ	8 %
	Maximum voltage	70 V
	Short circuit current	< 9 mA
Overload protection	600 V AC/DC shutdown	
Capacitance	Measuring range	0 nF to 3 μF
	Input impedance	< 24 V ss
	Resolution max.	10 pF
	Accuracy 0 .. 100 nF	2 % ± 0,2 nF
	Accuracy 100 .. 200 nF	2 % ± 0,5 nF
	Accuracy 200 .. 400 nF	2 % ± 1 nF
	Accuracy 400 nF .. 1 μF	2 % ± 2 nF
	Accuracy 1 μF .. 2 μF	2 % ± 4 nF
	Accuracy 2 μF .. 3 μF	2 % ± 10 nF
	Overload protection	600 V AC/DC shutdown
	Device Data	Dimensions
Weight		700 g
Housing		high impact ABS
Display		LCD with backlight
Display cover		high impact acrylic
Power supply		built in batterie
Languages		DE, EN

Measurements with current clamps are not permitted

¹ Sinusoidal voltage > 5 % of final value 45 Hz .. 65 Hz, > 15 Hz .. 45 Hz or > 65 Hz .. 10 kHz additional error of ±3 % +5 digits.

² The TRMS converter generates a zero error in the AC measurements up to 30 digit