GOSSEN METRAWATT

KURTH ELECTRONIC

Operating

KE2100

Time Domain Reflectometer

Version 2.0

Gossen Metrawatt GmbH
Südwestpark 15 ■ 90449 Nürnberg ■ Germany Phone +49 911 8602-999 ■ Fax +49 911 8602-125
www.gmc-instruments.de , www.gmc-instruments.pl , www.gmc-instruments.ru , export@gossenmetrawatt.com

Usage
The KE2100 is a handy and compact Time Domain Reflectometer for fault location for all types of cables without service, such as twin wires, coax and power lines. It has a very short minimum resolution and a range of up to 14 km. The adjustable impedance and the editable shortening factor meet all requirements for a successful test setup. The tester offers simple and intuitive operation.

With the AUTO test, a single click ensures that the impedance and length specifications correspond to the cable section to be tested, thus ensuring fast diagnosis. With the clearly operable cursor a fast distance determination is possible, this is additionally supported by a second cursor.

The freeze function allows you to examine the curve accurately, a feature available on the very few TDRs in this price range. The high screen resolution with backlighting allows an accurate error evaluation of the trace. The bundled management software manages the cable database and the stored measurements can be examined in the intuitive interface.

At a glance
- Simple operation
- AUTO test for immediate use
- High measurement resolution / maximum cable length up to 14 km
- Menu language German or English
- Indicates the distance to the error in meters or feet
- Symmetrical search signal
- Freezing function for precise error evaluation
- Measurement curve as reference in the background

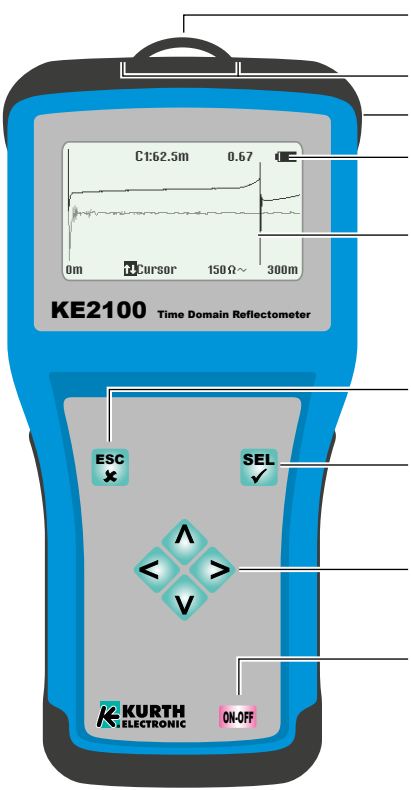
Preparation
Insert 4x AA alkaline batteries into the battery compartment on the back of the unit. Only replace the batteries with the test cables removed. See page 13 for details.

The KE2100 may only be used by sufficiently trained and competent persons.

- Safety warnings and cautions must be read and understood before using the KE2100. All safety instructions must be adhered to during use.
- Circuits must be de-energized and isolated before test connections are made.
- The operator must check the safety of the circuit before starting the test; appropriate precautions must be taken.
- During the tests, hands must be behind the protective devices of the probes/clamps.
- The instrument must not be used if any part is damaged. Test leads and crocodile clips must be proper, clean and without damaged or cracked insulation.
- The meter is protected from splash water and dust by the front foil, but it is not waterproof. It only needs to be opened to change the batteries – otherwise there are no parts inside the instrument that need to be maintained or adjusted.
- Remove the test cables before removing the battery cover. The battery cover must be closed during measurements.
- The optional BNC adapter may only be used for low voltage systems.
- All applicable safety regulations must be followed.

Documentation and software
Current operating instructions and software updates can be found at www.kurthelectronic.de in our download area. Under *Service and Support* > *Downloads* you will find the corresponding files such as current firmware and operating instructions for downloading.

Keyboard / Display / Connections



Loop for carrying strap

4mm banana sockets

Fall protection

Battery indicator

LCD display

ESC key
(AUTO test or main menu)

SEL button
(Display menu or TDR menu)

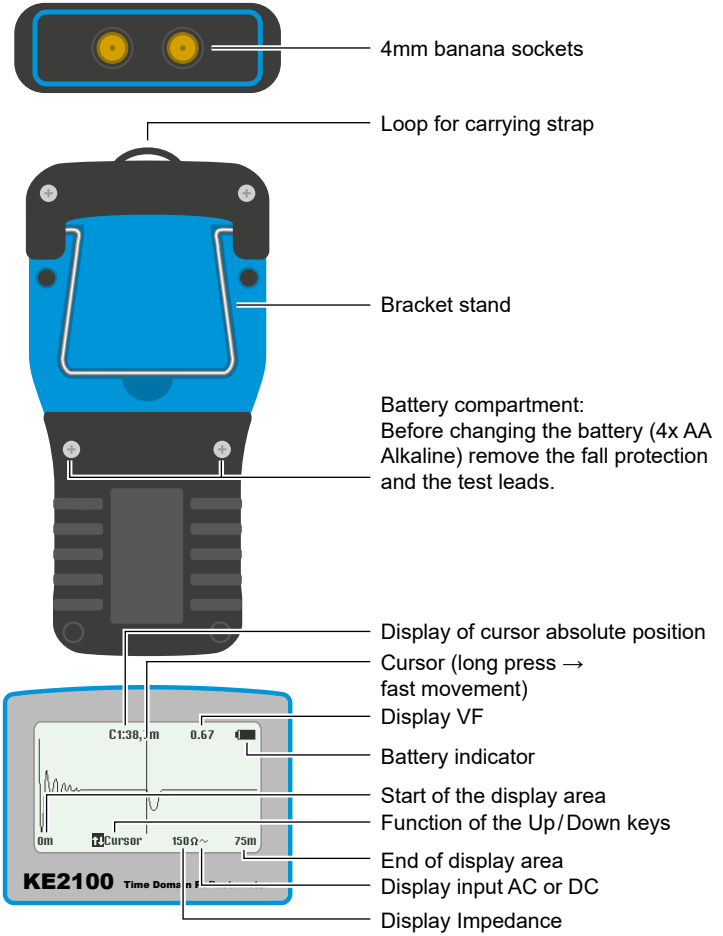
Control keys UP - DOWN /
LEFT - RIGHT

ON / OFF key

Battery compartment:
Before changing the battery
(4x AA Alkaline) remove the fall
protection and the test leads.

Caution: Despite overvoltage protection, the KE2100 may only be used on voltage-free cables!

Keyboard / Display / Connections



Usage

Press the **ON / OFF** key to turn the TDR on or off.
The TDR trace is displayed immediately after the **ON / OFF** key is pressed.

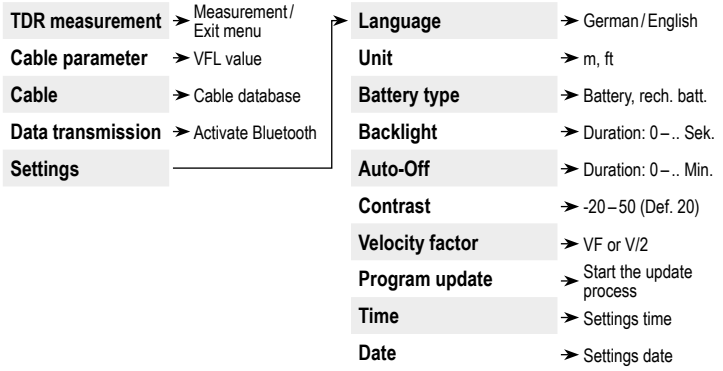
Briefly press **ESC** to activate the AUTO test:
The impedance of the cable to be tested, pulse width and gain are automatically selected for the selected range. (The cable must be longer than 10 meters or 30 feet).

Basic Operating Instructions

The menu structure in the KE2100 consists on the one hand of a menu bar structure, which is confirmed and exited with the **SEL** key. On the other hand there are selection fields <*XXX*>, which are operated with the **left / right** control keys. Once the selection has been made, the process must be completed with the ESC key.

Main menu

Long press of the **ESC** key:



TDR measurement: Measurement mode with display of the TDR trace and exit of the main menu

Cable parameters: Change the VFL value with the **Up / Down** keys. The Velocity Factor depends on the cable being tested and must be set correctly to display the measured distance correctly.

Cables: Choice of up to 32 cable types. Configuration is done via the KE2100 Manager software (see page 14).

Data transmission: Activation of data transmission via Bluetooth module

Menu *Settings*

Language: Choice between German and English

Unit: choice between meters (m) or feet (ft)

Battery type: choice between alkaline battery and rechargeable battery

Backlight: Adjustment of the lighting duration of the display after the last input, 0 is permanently on.

Auto-Off: Setting of the auto off after the last input, 0 is continuously on

Contrast: Setting from -20 (low contrast) to 50 (high contrast)

Velocity factor: Choice between VF and V/2

Program update: Starting the update process

Time: setting the time in 24-hour format

Date: Setting the date in the format *DD/MM/YY*

Exiting the *Settings* menu with **ESC**

TDR Menu

Press and hold the **SEL** key to open the TDR menu with the setting options specific to the measurement:

Reference: If <*On*> is selected, the current measurement is placed in the background as a reference curve (lighter color). This makes it possible to compare two measurements. Note that the reference curve is not changed at Y-zoom.

Save: Saves the current measurement with time stamp. The data can be transferred via Bluetooth to the *KE2100 Manager* software and evaluated there.

Freeze: Selecting <*On*> freezes the image of the current trace on the display.

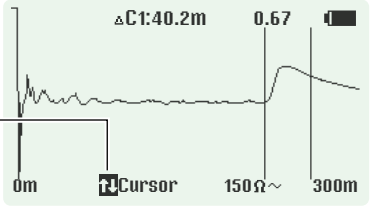
Input: Select between <*AC*> and <*DC*>. Use <*DC*> setting for long lines. The KE2100 is voltage protected up to DC 100 V; AC 230 V / 50 Hz. The safety regulations must be observed when connecting to live parts.

Pulse length: Select the desired pulse length with the **left / right** arrow keys. If the TDR range is adjusted, the transmission time of the pulse changes. The pulse length must be increased so that the device can overcome signal attenuation and continue to record the length of the cable. The larger the range selected on the TDR, the wider the transmitted pulse.

Z: The impedance is a characteristic of the cable to be tested. The desired impedance is selected with the **left / right** arrow keys (the cable impedance is determined automatically in the AUTO test).

TDR Menu

Short pressing of the **SEL** key allows scrolling through the different functions of the **up / down** control keys.



1. Length: Selection of length ranges from 0 to approx. 14,000 metres

2. Y Zoom: Enlarges the view of the measuring range in 6 dB increments

3. X Zoom: Enlarges the view of the measurement window

4. Cursor: Fade in the cursor. To move quickly, hold down the **left / right** control keys. The **up** key is used to display the second cursor; the inactive cursor changes its colour to black.

Further cursor modes:

1x : C1 Absolute position of cursor 1, cursor 1 is active

2x : C2 Absolute position of cursor 2, cursor 2 is active

3x : ΔC1 Difference between cursor 1 and 2, cursor 1 is active

4x : ΔC2 Difference between cursor 1 und 2, cursor 2 is active

This function can be used to measure two reflection points, e.g. the distance between two distributors, joints or distributor + defect.

If no reflections are visible, increase the gain in the TDR menu until all reflections are easily detected.

The range can be adjusted by moving the *Length/Y-Zoom/X-Zoom* up and down with the **up/down** arrow keys and the cursor left or right with the **left/right** arrow keys. If you move the cursor to the beginning of the reflection, the distance to the error can be read on the display.

The distance is calculated with the velocity factor set in the TDR. If the shortening factor for the cable to be tested was not correctly specified, the displayed distance is incorrect.

Examples

With the TDR method, the device sends a pulse to the cable, which is reflected by cable faults and sent back to the device. Characteristic reflection curves can be used to identify the type of fault and the measuring device also indicates the location of the fault to an accuracy of approx. 0.3 m. The cable fault is then reflected back to the device. Some typical reflection curves and the associated cable faults are, for example:

Open cable end

Short cirquit

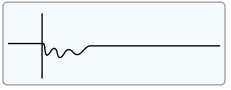
Splice

Branch-off

Split/Resplit

Water within the cable

Bad contact



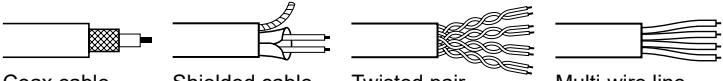
Intruding water

Branch-off, short

Splinters

Supported cable types

The TDR method can be used to check a large number of different cables and determine the possible fault location. The KE2100 can even examine cables up to 14 kilometers in length, for example:



Coax cable | Shielded cable | Twisted pair | Multi-wire line

Techniques

Depending on the local situation, countless techniques can be applied to improve measurement accuracy. Not every situation can be addressed, but the following measures have proven effective and are the most common and easiest to implement methods.

Cable testing from both cable ends

When troubleshooting a cable, it is a good practice to measure from both ends, especially in open circuit faults where the actual end of the cable is not visible. For a measurement from both ends, the combined result should correspond to the expected cable length. Even if the actual cable end is shown on the display, the reflections behind the error may be too unclear for unambiguous analysis; in this case, measurements from both ends give a clearer picture with higher accuracy.

KE2100 Manager

With the *KE2100 Manager* PC software, you can view and evaluate measurement results stored by the KE2100, manage the internal cable database and perform firmware updates.

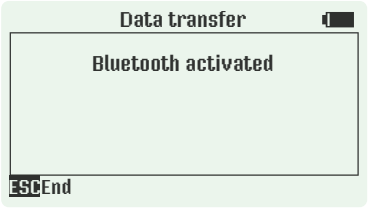
Installation of the Manager

You can download the current version of the *KE2100 Manager* at any time at www.kurthelectronic.de in our download area. Unzip the downloaded .zip file and start the installation by double-clicking on the file *KE2100_Manager_Setup_x_x_x.exe*. A Windows installation wizard will guide you through the necessary steps.

Connecting the KE2100 to the KE2100 Manager

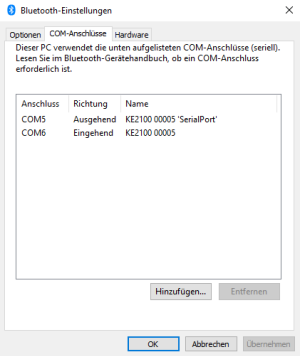
The KE2100 is connected to your PC via Bluetooth. To activate the Bluetooth module of the KE2100, select *Data transfer* in the main menu of the device. The message *Bluetooth activated* signals that the module is ready for operation.

Note: If you leave this menu item, the Bluetooth module is deactivated again.

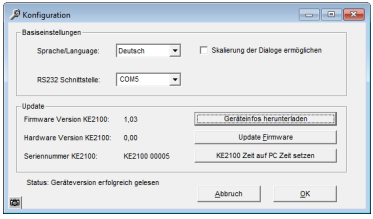


When you connect the KE2100 to your PC for the first time, it must first be paired. To do this, select *Add Bluetooth or other device* under *Devices* in the Control Panel. You may need to enable ports for the device via *Other Bluetooth Options*.

Note: Depending on the Windows version, the menu names may differ from those listed here. A connection is only possible if your Windows PC has an active Bluetooth interface.



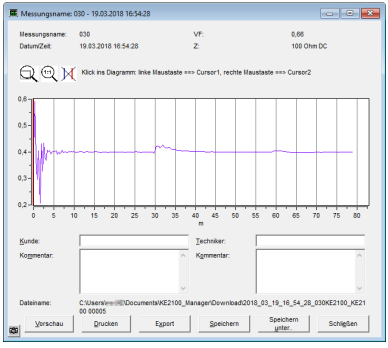
Run the KE2100 Manager now. Under *Configuration*, select the Bluetooth port via which the device is connected to your PC. With *Download device info* you can check the correct connection to the device.

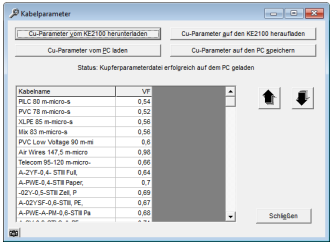


Working with the KE2100 Manager

Under the menu item *Line measurement* you can retrieve and evaluate measurement results stored by the instrument. Downloaded measurements stored on the PC can also be evaluated at a later time without requiring a connection to the instrument.

To view and manage the cable databases stored in the device, select the *Cable parameters* menu item.





Update KE2100 firmware

The Configuration menu allows you, among other things, to check the current software and hardware version of your device and to transfer firmware updates to the KE2100, where they can be installed under *Settings* > *Program Update*. Firmware updates are available for download at www.kurthelectronic.de.

Maintenance

With the exception of the replaceable batteries, there are no user-serviceable parts in the TDR.

Return a faulty device to your dealer or directly to Kurth Electronic. Only wipe the KE2100 with a slightly moistened cloth with soapy water.

Battery / rechargeable battery change

Switch off the KE2100 and disconnect it from all electrical circuits. Loosen the two screws on the edge protector (see page fig. page 5) and pull it downwards from the housing. Now the battery compartment is in front of you:

a) Remove the old batteries.
b) Insert the new batteries and pay attention to the polarity.
c) Replace the edge protector on the housing.
d) Tighten the screws.
e) Do not mix old and new batteries.

Alkaline and NiMH batteries are portable batteries and must be disposed of in accordance with applicable regulations. Contact your dealer for more information.

Repair and warranty

The device contains components that are sensitive to electrostatic charging, so the circuit board must be handled with care. If the protection of a device has been impaired, it must not be used and must be returned for repair. For example, protection is most likely impaired if: the instrument has visible damage; it does not perform the intended measurement; it has been stored for a long time under unfavorable conditions; or it has been subjected to severe stress during transportation.

Any unauthorized prior repair or adjustment will automatically void the warranty.

Specifications

Range	≤ 14 km
Accuracy	+1 % ± Pixel at 0.66 VF
Resolution	3.125 ns or 0.3 m depending on the cable
Overvoltage protection	DC 100 V; AC 230 V / 50 Hz
Output impusle	max. 20 V pp
Pulse lengths	12, 25, 50 100 200, 500, 1,000, 2,500 ns
Velocity factor	variable from 0.2 to 0.99 in 0.01steps
Impedance	75, 100, 120, 150 Ω
Signal type	symmetrical
Zoom factor	in 6 dB steps
Cable database	up to 32 entries
Auto-Off interval	Auto-Off configurable
Backlight	Duration and contrast configurable
Suited for	In-house, laboratory, construction site and industrial environment, IP52

General device information

Display	240 x 128 px graphical LCD
Languages	German, English
Ports	2x 4 mm safety sockets
Test leads	2x 2 m test leads, paired, 4 mm banana plug with crocodile clip
Power supply	4x LR6 (AA) batteries, NiMH
Operating time	depending on type and quality of battery (up to approx. 30 hours)

Scope of delivery

Size:

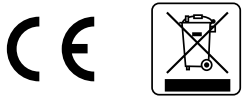
Dimensions	195 x 100 / 87 x 45 mm
Weight	390 g without batteries
Casing	High impact ABS, with fall protection
Display protection	2 mm Plexiglas with hardened protective glass

Environmental conditions:

Working temperature:	-10 – +50°C
Storing temperature:	-25 – +75°C

The device was manufactured according to the following guidelines:

Electromagnetic Compatibility Directive 2014/53/EC
LVD Directive 2014/53/EC
IEC/CISPR: 11:2009 + A1:2010, 16-1-2:2006 Edition 1.2, 16-2-1:2008 + A1:2010, 16-2-3:2008 + A1:2010
IEC: 61000-4-1:2016, 61000-4-2:2008 Edition 2, 61000-4-3:2006 + A1:2007 + A2:2010, 61000-4-8:2009, 61326-1:2012, 61326-2-1:2012



Safety instructions

The KE2100 may only be operated with the accessories originally provided. Using the device with accessories that are not original or for applications for which it was not intended can lead to incorrect measurements and may damage the device. The relevant safety regulations in VDE 0100, 0800 and 0805 must be adhered to.

- The usage of connections other than those provided can damage the device. The device should not be used with high-voltage current. Kurth Electronic assumes no liability for damage resulting from improper use.
- Never apply external voltage to the device.
- Open the device only to change the batteries. There are no other parts in the device that need to be serviced or calibrated.
- The measuring device is protected from splashing water and dust by the front film covering. However, it is not water proof.
- Never pull unnecessarily on the cables connected to the device.

Last revision: 06/2020