

xDSL Line Qualifier

KE-LQ20



**KURTH
ELECTRONIC**



APPLICATIONS

The **xDSL LINE QUALIFIER KE-LQ20** is a handheld battery operated, multifunctional measuring device intended for pre-qualification, installation, fault location and maintenance of balanced copper pairs.

Several fault location tools in one unit: AC/DC bridge, TDR and basic cable parameter measurement.

To qualify a pair, end-to-end measurements with two instruments are required. This can be done by using two KE-LQ20 or one in conjunction with the Slave unit. A single person can perform such measurements thanks to the communication between the two units. Operation is made extremely simple by the means of pre-defined automatic test sequences.

Tolerance masks for cable parameters such as Loss, LCL, NEXT, FEXT, Impedance, Return Loss and the principal system parameters are pre-programmed for 38 different xDSL systems.

The operator can create new template sets using the KE-LQ20's PARAMETER EDITOR capability on the spot of the measurement. Template sets can be downloaded from a PC as well.

When the automatic test sequence is completed, the KE-LQ20 provides an immediate PASS/FAIL indication by comparing the test results to the tolerance masks and the required data rate to the calculated theoretically achievable rate.

Detailed test results are available in graphic and numeric form. In case of a FAIL indication, the cause of that failure is marked with asterisks.

At a glance

FEATURES

- Physical parameter measurements to pre-qualify copper wire pairs for POTS and high bit rate services as ADSL, HDSL, SHDSL, ISDN, PCM before the installation of modems
- Single end measurements
- End-to-end measurements by using two KE-LQ20 or one KE-LQ20 and one Slave
- Test of two pairs in one pass
- Fix-frequency and spectrum measurements
- Automatic test sequences with pre-programmed or user defined test parameter sets belonging to different xDSL systems
- Automatic immediate PASS/FAIL indication
- Automatic achievable bit rate calculation for each xDSL system
- Parameter set editor
- The test results can be stored and transferred to PC
- PC program is provided to produce detailed test protocols in .xml format
- 320 x 240 LCD display with back light
- Internal rechargeable battery with an operating time of approx. 8 hours
- Processor controlled battery manager with three hour fast charging facility
- English, German and Russian language selectable
- Load coil detection
- Acoustic pair detection
- Service telephone
- Fault location with TDR

BRIDGE option

- AC/DC voltage measurement
- Loop resistance measurement
- Resistance difference measurement
- Insulation resistance measurement
- Mutual capacitance measurement
- Cable temperature measurement
- Fault location with bridge

DMM option

- DC voltage measurement
- DC current measurement
- Loop resistance measurement
- Insulation resistance measurement



TECHNICAL DATA

Measurements

Automatic Measurements with two instruments

- Loss
- Frequency response
- Weighted noise
- Spectrum
- Signal-to-noise-ratio
- Achievable bit rate calculation
- Longitudinal balance
- Return loss
- Impedance
- Near-end cross talk
- Far-end cross talk

Manual modes

- Transmitting
- Receiving
- Insertion loss
- Frequency response
- Near-end cross talk
- Longitudinal balance
- Impedance
- Return loss
- Weighted noise
- Spectrum
- Impulse noise
- Load coil detection
- Micro interruption (optional)

Fault location with TDR

- Single pair test
- Pair comparison
- XTALK comparison
- Before and after comparison with memory

Measurement with BRIDGE option

Basic cable tests

- AC/DC voltage
- Loop resistance
- Resistance difference
- Insulation resistance
- Load coil detection
- Cable temperature

Leakage location with DC bridge

- Murray loop method
- Three point method
- Improved K upfm uller method

Break location with AC bridge

- Break
- Break and leakage

Basic cable tests with DMM option

- DC voltage
- DC current
- Loop resistance
- Insulation resistance

Preprogrammed parameter sets

ADSL2+ (ITU-T G.992.5 Annex A, B, I, J, M) optional

EC: 8 Mbps, 16 Mbps, 24 Mbps
FDD: 8 Mbps, 16 Mbps, 24 Mbps

ADSL2 (ITU-T G.992.3 Annex A, B, I, J, M)

EC: 4 Mbps, 6 Mbps, 8 Mbps
FDD: 4 Mbps, 6 Mbps, 8 Mbps

ADSL (ITU-T G.992.1 Annex A, B)

EC: 2 Mbps, 4 Mbps, 6 Mbps
FDD: 2 Mbps, 4 Mbps, 6 Mbps

ADSL (ETSI TS 101 388 v 1.3.1)

EC: 2 Mbps, 4 Mbps, 6 Mbps
FDD: 2 Mbps, 4 Mbps, 6 Mbps

READSL2 (ITU-T G.992.3 Annex L)

EC: 768 kbps, 1 Mbps, 1.5 Mbps
FDD: 768 kbps, 1 Mbps, 1.5 Mbps

ADSL G.LITE (ITU-T G.992.4 Annex A)

EC: 768 kbps, 1 Mbps, 1.5 Mbps
FDD: 768 kbps, 1 Mbps, 1.5 Mbps

ADSL G.LITE2 (ITU-T G.992.4 Annex I)

EC: 768 kbps, 1 Mbps, 1.5 Mbps
FDD: 768 kbps, 1 Mbps, 1.5 Mbps

HDSL (ITU-T G.991.1)

1 PAAR 2B1Q/CAP, 2 PAAR 2B1Q/CAP

SHDSL (ITU-T G.991.2 Annex B)

1 PAIR 16 TC PAM 256, 512, 768, 1024, 1280,
1536, 2048, 2304 kbps
2 PAIR 16 TC PAM 512, 1024, 1536, 2048, 2560,
3072, 4096, 4608 kbps

SHDSL (ETSI TS 101 524 v 1.3.1 Annex E)

1 PAIR 16 UC PAM 512, 1024, 2048, 3848 kbps
2 PAIR 16 UC PAM 1024, 2048, 4096, 7696 kbps
1 PAIR 32 UC PAM 768, 1536, 3840, 5696 kbps
2 PAIR 32 UC PAM 1536, 3072, 7680, 11392 kbps

ITU-T VOICE FREQUENCY MODEMS

2.4 kbps (V26), 56 kbps (V92), Fax14.4 kbps (V17)

ISDN

ITU-T G.962 Basic Rate, ETSI ETR 080 Primary Rate

General specifications

Power supply

Internal rechargeable NIMH battery pack

Operation time.....approx. 8 hours (w/o backlights)

Charging

From 230 V mainswith mains adapter

From 12 V car battery.....with car adapter

Fast charging time.....less than 3 hours

Screen.....320 x 240 LCD with backlight

Serial interface..... RS232C

Line connectors.....2 pieces of 3 pol CF sockets

Environmental conditions

Operating range..... - 10 to +50°C

Storage and transport..... - 20 to +70°C

Dimensions..... 224 x 160 x 44 mm

Weight..... approx. 1.5 kg



SPECIFICATIONS

Transmitter

Impedances	
10 kHz to 2.2 MHz	100, 120, 135, 150 Ohm
200 Hz to 10 kHz	600 Ohm
Output level range	+5 to -19 dBm
Resolution	0.1 dB
Accuracy at 0 dBm	-0.3 dB

Receiver

Impedance	
10 kHz to 2.2 MHz	100, 120, 135, 150 Ohm
200 Hz to 10 kHz	600 Ohm
200 Hz to 2 MHz	>20 kOhm 50 pF
Input level range:	
Z line=100, 120, 135, 150 Ohm	- 90 to +5 dBm
Z line=600 Ohm	- 90 to 0 dBm
Resolution	0.1 dB
Accuracy at 0 dBm	± 0.2 dB

Loss, NEXT and FEXT measurements

Impedance	
10 kHz to 2.2 MHz	100, 120, 135, 150 Ohm
200 Hz to 10 kHz	600 Ohm
Measuring range	
Loss, NEXT measurements	0 to 80 dB
Accuracy:	
Within frequency range of 200 Hz to 1 MHz	
Loss, FEXT, NEXT <50 dB	±0.5 dB
Loss, FEXT, NEXT <70 dB	±1dB
Loss, FEXT, NEXT >70 dB	±1.5 dB
Within frequency range of 1 MHz to 2.2 MHz	
Loss, FEXT, NEXT	-2 dB

LCL balance measurement

Impedance	
10 kHz to 2.2 MHz	100, 120, 135, 150 Ohm
200 Hz to 10 kHz	600 Ohm
Measuring range	0 to 40 dB
Accuracy:	
10 kHz to 2.2 MHz	±2 dB

Impedance measurement

Frequency range	
10 kHz to 2.2 MHz	up to 400 Ohm
200 Hz to 10 kHz	from 300 up to 1600 Ohm
Accuracy:	
10 kHz to 1 MHz	±5% ± 5 Ohm
200 Hz to 2.2 MHz	± 10% ± 5 Ohm

Return loss measurement

Impedance	
10 kHz to 2.2 MHz	100, 120, 135, 150 Ohm
200 Hz to 10 kHz	600 Ohm
Measuring range	
Return loss measurement	up to 40 dB
Impedance range	Z/2 to 2Z
Accuracy at 20 dB	
10 kHz to 1 MHz	±1 dB
200 Hz to 2.2 MHz	±2.5 dB

Spectrum analyzer

Frequency ranges	Bandwidth
10 to 2200 kHz	5/10 kHz
2.5 to 500 kHz	1.25/2.5 kHz
1 to 200 kHz	0.5/1 kHz
0.2 to 20 kHz	50/100 Hz
0.2 to 4 kHz (10 Hz resolution optional)	10/20 Hz
Measurement types	Normal, Peak, Average

Wideband noise measurement

Weighting filters	
for POTS	P Filter
mit 10 Hz Auflösung Option	1010 Hz Notch Filter
for ISDN BRA	E Filter
for ISDN PRA HDB3	G2-E Filter
for HDSL, 2 PAIR, 2B1Q	F-E Filter
for HDSL, 1 PAIR, 2B1Q	F1-E Filter
for ADSL, DMT	G Filter
for auto mode.	3 dB at fmin and fmax
Measuring range:	
With P and E filters	0 to -80 dBm
With F and G filters	0 to -70 dBm
Without filter	0 to -65 dBm
Measurement times	1, 5, 10, 15, 30 s 1, 5, 10, 15, 30 min

Impulse noise measurement

Pulse width	> 500 ns
Interval size	10 ms
Threshold range	0 to -60 dBm
Maximum count	65000
Measurement times	1, 5, 10, 15, 30 s 1, 5, 10, 15, 30 min

Fault location with TDR

Measuring modes	
Single pair	
Single pair long time	
Pair comparison	
Comparison to memory	
XTALK point location	
Measuring ranges	
Depending on cable quality	up to 20 km
Resolution	0.1% of range
Accuracy	0.4% of range
Propagation velocity	
PVF	0.3 to 0.999
V	90 to 299 m/ms
V/2	45 to 150 m/ms
Gain range	0 to 72 dB
Measuring pulse	
Width	10 to 5000 ns
Amplitude at 120 Ohm	
25 to 5000 ns pulse	»5 V
10 ns pulse	»4 V

KE-LQ20 xDSL line qualifier

BRIDGE (optional built-in panel)

Loop resistance measurement

Measuring range..... 0 to 10 kOhm
Accuracy (Rs >100 Ohm).....0.4% – 0.1 Ohm

Resistance difference measurement

Measuring range of RL..... 1 Ohm to 5 kOhm
Measuring range of DR..... up to 1 kOhm
Accuracy of DR

1 Ohm to 10 Ohm.....1% – 0.1 Ohm
10 Ohm to 100 Ohm.....1% to 0.2% – 0.1 Ohm
100 Ohm to 1000 Ohm.....0.2% – 0.1 Ohm

Insulation resistance measurement

Measuring range..... 10 kOhm to 10 GOhm
Accuracy

0.1 to 100 MOhm.....-2%
100 MOhm to 1 GOhm.....-10%

Capacitance measurement

Measuring range..... 1nF to 10 nF
tan d.....0.0001 to 10
Accuracy (10nF to 10 nF)5% – 1 digit
Measuring frequency..... 11 Hz

Voltage measurement

Voltage..... AC, DC up to 100 V
Frequency range..... 15 to 300 Hz
Accuracy.....1% – 1V

Leakage location

Loop resistance range..... 1 Ohm to 10 kOhm
Leakage resistance range..... 0,1 to 100 MOhm
Accuracy Lx/L (RL=2 kOhm, Lx/L=0.1 bis 1)
F<1 MOhm.....0.1% – 1digit
F=1 to 5 MOhm.....0.2% – 1digit
F=5 to 25 MOhm.....1% – 1digit
F=25 to 100 MOhm.....5% – 1digit

Break location

Measuring range..... up to 10 km (depending on cable)
Accuracy
(C=20 nF to 10 µF).....0.2% to 1% – 1digit
Measuring frequency..... 11 Hz

GROUP DELAY DISTORTION (SW. Option)

Measuring signal..... 37 MTT, 200 to 3700 Hz
Resolution..... 100 Hz
Z Output / Input..... 600 Ohm
Output level..... –30 dB/ton (-7 dB pointed)
Input level range..... -60 up to –20 dB/ton
Measuring range..... 0 to 10 ms
Resolution..... 1µs
Accuracy..... since ITU.O81 (4.1.1)

Micro interruption measurement (software option)

Test signal frequency..... 2 kHz, 82 kHz – 100 kHz
Input level range..... 0 to -30 dBm
Z for 2 kHz test signal..... 600 Ohm
Z for 82 kHz test signal..... 100 Ohm
selectable treshhold below the normal input level
for 2 kHz test signal..... 3, 6, 10, 20 dB
for 82 kHz test signal..... 3, 6, 10 dB
Accuracy of treshhold
for 3, 6, 10 dB.....1 dB
for 20 dB.....2 dB
Measuring time..... 4 mins to 72 hours
5 Interruption categories..... from 0.3 ms to >1 min
Evaluation..... relative duration, errored seconds,
count & time distribution / category

Ordering information

xDSL Line Qualifier KE-LQ20

Including:

- User manual
- Short operating manual
- Calibration certificate for KE-LQ20
- CD with PC software
- Software for ADSL2+
- 2 test leads
- Power supply
- Serial cable
- Carrying case

Options

PC software

Software for creating
parameter sets

Measuring software

Micro interruption measurement
Group delay distortion measurement
10 Hz Resolution

Other

High Impedance adapter
EFF 51 filter
Calibration protocol for KE-LQ20
Built-in measurement charts
AC/DC bridge

Article no.	Type	Description
KE-LQ20	KE-LQ20	Line qualifier for ADSL, SHDSL and ISDN services. TDR measurements up to 6 km. Includes user manual, 2 test leads, power supply, internal rechargeable battery, carrying case, serial cable and PC software. Optional: AC/DC bridge and software options

