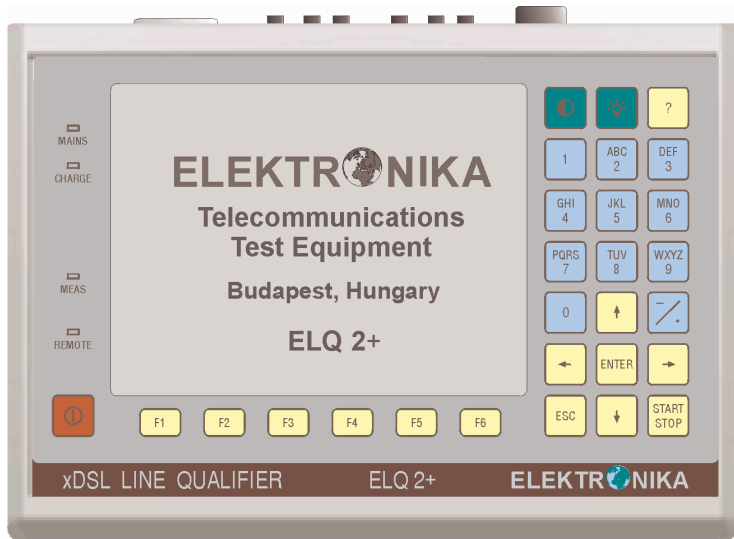


SUITABLE for your xDSL system or NOT??



xDSL LINE QUALIFIER ELQ 2+ ANSWERS !!



APPLICATIONS

The **xDSL LINE QUALIFIER ELQ 2+** is a hand held battery operated, multifunction measuring instrument, intended for pre-qualification, installation, fault location and maintenance of balanced copper pairs.

To qualify a pair, end-to-end measurements with two instruments have to be used in MASTER-SLAVE arrangement. Just one person, thanks to the communication between the two instruments, can perform such measurements. Operation is made extremely simple by means of pre-defined automatic test sequences.

Tolerance masks of cable parameters as Loss, LCL, NEXT, FEXT, Impedance, Return Loss and the principal system parameters are pre-programmed for more than 50 different xDSL systems.

The operator can create new template sets with the PARAMETER EDITOR facility of ELQ 2+ on the spot. Template sets can be downloaded from PC as well.

When the automatic test sequence is ready ELQ 2+ provides an immediate PASS/FAIL indication by comparing the test results with the tolerance masks and the required data rate with the calculated theoretically achievable rate.

Detailed test results are available in graphic and numeric forms. In case of FAIL indication the reason of failure is marked with asterisks.

For fault location DC-AC bridge, TDR and basic cable parameter measurements are provided.

FEATURES

- Physical parameter measurements to pre-qualify copper wire pairs for high bit rate services as **ADSL2+**, **ADSL2**, **READSL**, **ADSL**, **SHDSL**, **ISDN** etc. before the installation of modems
- Automatic test sequences with pre-programmed or user defined test parameter sets belonging to different xDSL systems
- **Bit rate calculation** for each xDSL system
- **PASS/FAIL** indication
- Parameter set edition
- **TDR** for fault location
- Load coil detection facility
- **DC-AC** bridge option
- **2.2 MHz frequency range** for fix-frequency and spectrum measurements
- **Longitudinal voltage protection**
- The test results can be stored in memory and transferred to PC
- PC program is provided to produce detailed test protocols in Excel 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
- Selectable English, German or Russian languages
- Acoustic pair detection facility
- Service telephone facility

BRIDGE option

- AC/DC voltage measurement
- Short-circuit indication
- 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

Measurements

Automatic Measurements with two instruments

- Loss
- 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
- Near-end cross talk
- Longitudinal balance
- Impedance
- Return loss
- Weighted noise
- Spectrum
- Impulse noise
- Load Coil Detection
- Micro interruption (Optional)
- Group delay distortion (Optional)

Fault Location with TDR

- Single pair test
- Pair comparison
- XTALK point location
- Before and after comparison by memory
- Intermittent fault location

Measurements with BRIDGE option

Basic cable tests

- AC/DC voltage
- Loop resistance
- Resistance difference
- Insulation resistance
- Mutual capacitance
- Cable temperature

Leakage Location with DC Bridge

- Murray loop method
- Küpfmüller 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) Option

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 PAIR 2B1Q/CAP, 2 PAIR 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 ETR080 Primary Rate

General Specifications

Power supply

Internal rechargeable NIMH battery pack

Operation time approx. 8 hours (without backlight)

Charging

(Without taking the battery pack out)

From 110V to 230V mains..... with mains adapter

From 12V car battery with car adapter

Fast charging time less than 3 hours

Display 320 x 240 LCD with backlight

Serial interface RS232C

Line connectors 2 pcs of 3 pol CF sockets

Ambient temperature range

Operating -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 | 0 to -24 dBm |
| Resolution | 0.1 dB |
| Accuracy at 0 dBm | 0.3 dB |

Receiver

| | |
|-------------------------------|------------------------|
| Impedances | |
| 10 kHz to 2.2 MHz | 100, 120, 135, 150 Ohm |
| 200 Hz to 10 kHz | 600 Ohm |
| 200 Hz to 2.2 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 0dBm | ±0.2 dB |

LOSS, NEXT and FEXT Measurement

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

Impedance Measurement

| | |
|-------------------|-----------------|
| Measuring range | |
| 10 kHz to 2.2 MHz | up to 400 Ohm |
| 200 Hz to 10 kHz | 300 to 1600 Ohm |
| Accuracy | |
| 10 kHz to 1 MHz | ±5% ± 5 Ohm |
| 200 Hz to 2.2 MHz | ± 10% ± 5 Ohm |

Return Loss Measurement

| | |
|-------------------------|------------------------|
| Line 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 (with 10 Hz resolution option) | 10/20Hz |
| Evaluation | Normal, Peak, Average |

Wideband Noise Measurement

| | |
|------------------------------|--|
| Weighting filters | |
| For POTS | P Filter |
| With 10 Hz resolution 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 modes | 3 dB at f_{min} and f_{max} Filter |
| Measuring Range | |
| With P and E filter | 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 | |
| Depends 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/μs |
| V/2 | 45 to 150 m/μs |
| Gain range | 0 to 72 dB |
| Measuring pulse | |
| Width | 10 to 5000ns |
| Amplitude into 120 Ohm | |
| For 25 to 5000 ns pulse | ≈5V |
| For 10 ns pulse | ≈4V |

BRIDGE (optional built in panel)**Loop Resistance Measurement**

Measuring range up to 10 kOhm
 Accuracy (RL>100 Ohm).....±0.4% ±0.1Ohm

Resistance difference Measurement

Measuring range
 RL..... 1 Ohm to 5 kOhm
 ΔR..... up to 1 kOhm
 Accuracy of ΔR
 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 1 nF to 10 μF
 tan δ..... 0.0001 to 10
 Accuracy (10nF to 10 μF)..... ± 5% ± 1 digit
 Measuring frequency..... 11 Hz

Voltage Measurement

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

Fault location**Leakage Location**

Loop resistance range..... 1 Ohm to 10 kOhm
 Leakage resistance range..... 0,1 to 100 MOhm
 Accuracy of Lx/L (RL=2 kOhm, Lx/L=0.1 to 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 10km (depending on cable)
 Accuracy (C=20nF to 10μF)±0.2% to ±1% ±1digit
 Measuring frequency..... 11 Hz

DMM (optional built in panel)

DC Voltage Measurement.....up to 200 V
 Accuracy..... ± 1%±1 V
 DC Current Measurement up to 150 mA
 Accuracy..... ± 1%±1 mA
 Loop Resistance Measurement 1Ohm to 2 kOhm
 Accuracy.....±0.5% ±1 Ohm
 Insulation Measurement..... 1 MOhm to 500 MOhm
 Accuracy.....±5%

Micro Interruption (sw. option)

Test Signal.....2kHz, 82 kHz ± 100 Hz
 Input level range 0 to -30 dBm
 Z for 2 kHz test signal.....600 Ohm
 Z for 82 kHz test signal.....100 Ohm
 Selectable Threshold 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 Threshold
 For 3, 6, 10 dB..... ± 1 dB
 For 20 dB..... ± 2 dB
 Measuring Time.....4 min to 72 hours
 Five Interruption Categories0.3 ms to >1 min
 Evaluation Relative duration, Errored sec
 Time distribution of unavailability
 Count & time distribution/category

Group delay distortion (sw. option)

Test signal37MTT, 200 to 3700 Hz
 Resolution..... 100 Hz
 Z output / input.....600 Ohm
 Output level..... -30 dB/tone (-7dB peak)
 Input level range -60 to -20 dB/tone
 Group delay distortion range.....0 to 10 ms
 Resolution..... 1 μs
 Accuracy..... According to ITU.O.81 (4.1.1)

Ordering information

xDSL Line Qualifier ELQ 2+ 403-000-000
 Including:
 Operating manual
 Short form operation instruction
 Calibration Certificate
 CD Disk with PC programs
 2 balanced measuring cables
 Mains adapter
 Serial cable for PC connection
 Carrying case

Options**PC software**

For result transferSW 403-510-000E
 For parameter set edition.....SW 403-520-000E

Measuring Software for ELQ 2+

ADSL2+ system measurement..... SW 403-560-000
 Micro interruption measurement..... SW 370-530-000
 Group delay distortion..... SW 370-570-000
 10 Hz resolution..... SW 403-550-000

Others

High Impedance Measuring Probe Y 107-395
 EFF 51 Filter 408-000-000
 Calibration Report..... CR 355-000-000E
 Built in BRIDGE panel..... 370-300-000
 or
 Built in DMM panel..... EL 570/300