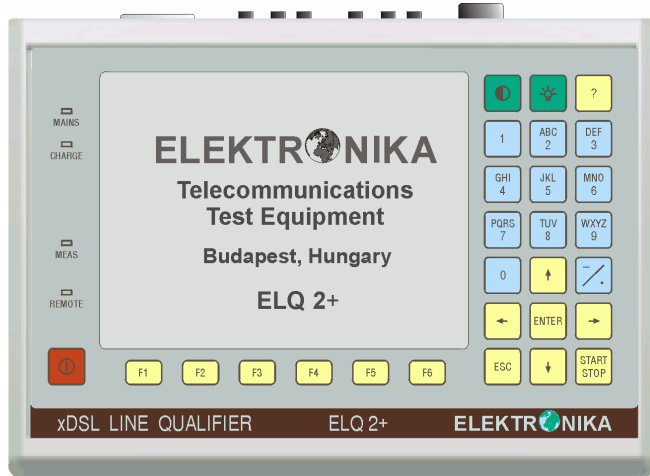


IS THIS PAIR SUITABLE FOR YOUR SYSTEM? IF NOT WHERE IS THE FAULT? ELQ 2+ GIVES THE ANSWER !



Four instruments in one

- **2,2 MHz test set** for the qualification of ADSL2 +, ADSL, READSL2, ADSL G LITE, ADSL G.LITE2, SHDSL, HDSL, ISDN and VF lines with pre-programmed templates and data transfer speed calculation
- **Active AC-DC bridge** for accurate and comfortable fault location
- **DCMM** functions
- **TDR** to locate cable faults like:
 - Loose contacts causing interruptions
 - Splits causing XTALK between the pairs

APPLICATIONS

The **COPPER 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.

- **Pre-qualification in Master Slave mode**

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.

ELQ 2+ can be programmed as MASTER and SLAVE as well. ELQ 2S the simplified slave version of ELQ 2+ is also available.

- **Pre-programmed Tolerance Masks**

Tolerance masks of cable parameters as Loss, LCL, Return Loss, Impedance, and the principal system parameters are pre-programmed for several xDSL systems.

- **Automatic Data Rate Calculation**
- **Immediate PASS/FAIL indication**

- 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. The test results can be stored in memory and transferred to PC.

- **Single Sided Measurements**

ELQ 2+ provides numerous single sided measuring modes like: Transmitter, Receiver, Spectrum Analyzer, Wide Band Noise, Impulsive Noise, Return Loss, Impedance, NEXT(Loss) Balance measurements, Load coil detection

- **Service Telephone Function**

With built in microphone and loud speaker.

ELQ 2+ provides numerous useful options like:

- **Micro Interruption Measurement Option**

ELQ 2+ detects the micro interruptions according to ITU O.62. and provides detailed information about:

- Number of interruptions divided into categories.
- Relative duration of interruptions.
- Errored seconds.
- Time distribution of interruptions in 240 time slots.

- **ESEL Measurement up to 120 dB Option**

The Exchange Side Electrical Length (ESEL) measurement is a useful tool for the programming of local DSLAM-s when Downstream Power Back Off (DPBO) is applied

- **ESEL dependent Templates Option**

ELQ 2+ provides proper templates and achievable rate calculation for the local subscriber lines when the local DSLAM is working with reduced transmit power (DPBO is applied)

- **Active AC-DC Bridge Option**

Basic Cable Parameter Measurements

- Loop resistance measurement
- Resistance difference measurement
- Insulation resistance measurement
- Mutual capacitance measurement
- Capacitive balance measurement

DC Fault Location Methods

- Murray method
- Küpfmüller method

AC-DC Voltage measurements

- **Parameter Set Editor PC Software Option**

For the creation of user defined test parameter sets.

Measurements

Automatic Measurements with two instruments

- Loss
- Noise Spectrum
- Signal-to-noise ratio
- Achievable bit rate calculation
- Longitudinal balance
- Return loss
- Impedance
- Near-end cross talk
- Far-end cross talk
- Quick cross talk (Optional)
- ESEL measurement (Optional)
- ADSL 2+ measurement with DPBO (Optional)

Manual Modes

- Transmitting
- Receiving
- Insertion loss
- Near-end cross talk
- Longitudinal balance
- Impedance
- Return loss
- Weighted noise
- Spectrum analyzer
- Spectrum as reference (Optional)
- 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
- 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)

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 +5 to -19 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 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) $\pm 0.4\% \pm 0.1\text{Ohm}$

Resistance difference Measurement

Measuring range
 RL 1 Ohm to 5 kOhm
 ΔR up to 1 kOhm
 Accuracy of ΔR
 1 Ohm to 10 Ohm $\pm 1\% \pm 0.1\text{ Ohm}$
 10 Ohm to 100 Ohm $\pm 1\%$ to $0.2\% \pm 0.1\text{ Ohm}$
 100 Ohm to 1000 Ohm $\pm 0.2\% \pm 0.1\text{ Ohm}$

Insulation Resistance Measurement

Measuring range 10 kOhm to 10 GOhm
 Accuracy
 0.1 to 100 MOhm $\pm 2\%$
 100 MOhm to 1 GOhm $\pm 10\%$

Capacitance Measurement

Measuring range 1 nF to 10 μF
 $\tan \delta$ 0.0001 to 10
 Accuracy (10nF to 10 μF) $\pm 5\% \pm 1\text{ digit}$
 Measuring frequency 11 Hz

Voltage Measurement

Measuring range AC, DC up to 100 V
 Frequency range 15 to 300 Hz
 Accuracy $\pm 1\% \pm 1\text{ V}$

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 $\pm 0.1\% \pm 1\text{ digit}$
 F=1 to 5 MOhm $\pm 0.2\% \pm 1\text{ digit}$
 F=5 to 25 MOhm $\pm 1\% \pm 1\text{ digit}$
 F=25 to 100 MOhm $\pm 5\% \pm 1\text{ digit}$

Break Location

Measuring range up to 10km (depending on cable)
 Accuracy (C=20nF to 10 μF) $\pm 0.2\%$ to $\pm 1\% \pm 1\text{ digit}$
 Measuring frequency 11 Hz

DMM (optional built in panel)

DC Voltage Measurement up to 200 V
 Accuracy $\pm 1\% \pm 1\text{ V}$
 DC Current Measurement up to 150 mA
 Accuracy $\pm 1\% \pm 1\text{ mA}$
 Loop Resistance Measurement 1 Ohm to 2 kOhm
 Accuracy $\pm 0.5\% \pm 1\text{ Ohm}$
 Insulation Measurement 1 MOhm to 500 MOhm
 Accuracy $\pm 5\%$

Micro Interruption (sw. option)

Test Signal 2kHz, 82 kHz $\pm 100\text{ Hz}$
 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
 Measuring Time 4 min to 72 hours
 Five Interruption Categories 0.3 ms to >1 min
 Evaluation Relative duration, Errored sec
 Time distribution of unavailability
 Count & time distribution/category

Group delay distortion (sw. option)

Test signal 37MTT, 200 to 3700 Hz
 Resolution 100 Hz
 Z output / input 600 Ohm
 Output level -30 dB/ tone (-7 dB 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
 Mains adapter
 2 balanced measuring cables
 Serial cable for PC connection
 PC sw. for result transfer
 CD Disk with PC programs
 Carrying case

Options**PC software**

For parameter set edition SW 403-520-000

Measuring Software for ELQ 2+

Micro interruption SW 370-530-000
 Group delay distortion SW 370-570-000
 10 Hz resolution SW 403-550-000
 Spectrum as Reference SW 403-630-000
 Quick XTALK SW 403-640-000
 ESEL measurement SW 403-600-000
 ESEL dependent templates SW 403-610-000

Others

ELQ 2S (Only in set with ELQ 2+) 353-000-000
 ER20 Direction Coupler 4-2200 kHz 430-000-000
 High Impedance Measuring Probe Y 107-395
 Built in AC/DC bridge panel 355-300-000
 or
 Built in DMM panel 370-300-000
 Calibration Report CR 355-000-000E