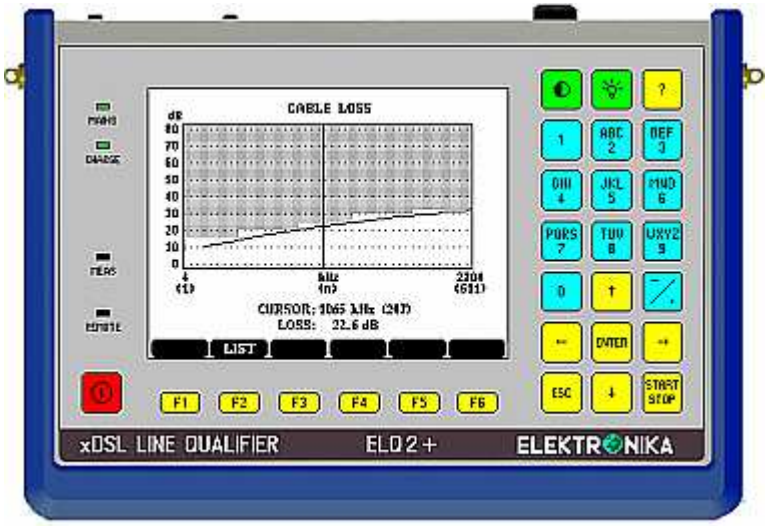
IS THIS PAIR SUITABLE FOR YOUR SYSTEM? IF NOT WHERE IS THE FAULT? ELQ 2+ GIVES THE ANSWER !



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
- **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 predefined automatic test sequences.
ELQ 2+ can be programmed as MASTER and SLAVE as well.

- **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 laud 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.

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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
- Küpfmüller method

Break Location with AC Bridge

- Break
- Break and leakage

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 100V to 240V mains.....with mains adapter
From 12V car battery..... with car adapter
Fast charging time..... less than 3 hours
Display.....320 x 240 LCD - TFT
Serial interface RS232C
USB connector for PC USB-MC5P
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

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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

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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

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 (-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)

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
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

Ordering information

xDSL Line Qualifier ELQ 2+..... 403-000-000
Including:
Operating manual
Short form operation instruction
Calibration Certificate
USB stick
ADSL2+ measurement
PC sw. for result transfer
2 balanced measuring cables
Mini USB cable for PC connection
Mains adapter
Battery (built-in)
Carrying case

Options

HW Option

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
Calibration Report.....CR 355-000-000E
Car lighter power adapter EAA 10..... 367-000-000

SW Option

Micro interruption..... SW 370-530-000
Group delay distortion ..... SW 370-570-000
10 Hz resolution..... SW 403-550-000
For parameter set edition ..... SW 403-520-000
Quick XTALK..... SW-403-640-000
Spectrum as Reference ..... SW 403-630-000
ESEL measurement SW-403-600-000
ESEL dependent templates..... SW-403-610-000
DPBO MUS SW-403-650-000
DPBO Annex J SW-403-660-000

DATA SUBJECT TO BE CHANGED WITHOUT PRIOR NOTICE ! 02.01.2017

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