

# ELQ 2+

## xDSL Line Qualifier

### Key Features

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.

ELQ 2+ can be programmed as MASTER and SLAVE as well. 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.

- 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 preprogrammed 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-TG.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-TG.992.3 Annex A, B, I, J, M)

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

#### ADSL (ITU-TG.992.1 Annex A, B)

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

#### ADSL (ETSITS 101 388v 1.3.1)

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

#### READSL2 (ITU-TG.992.3 Annex L)

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

#### ADSL G.LITE (ITU-TG.992.4 Annex A)

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

#### ADSL G.LITE2 (ITU-TG.992.4 Annex I)

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

#### HDSL (ITU-TG.991.1)

1 PAIR 2B1Q/CAP, 2 PAIR 2B1Q/CAP

#### SHDSL (ITU-TG.991.2 Annex B)

1 PAIR 16 TC PAM 256,512,1024,2048,2304 kbps  
2 PAIR 16 TC PAM 512,1024,2048,4096,4608 kbps

#### SHDSL (ETSITS 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 (V.26), 56 kbps (V.92), Fax 14.4 kbps (V.17)

### 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 230V mains	with mains adapter
From 12V car	with car adapter battery
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 $\Omega$
200 Hz to 10 kHz	600 $\Omega$
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 $\Omega$
200 Hz to 10 kHz	600 $\Omega$
200 Hz to 2.2 MHz	>20 k $\Omega$ // 50 pF

**Input level range**

$Z_{line} = 100, 120, 135, 150 \Omega$	-90 to +5 dBm
$Z_{line} = 600 \Omega$	-90 to +0 dBm
Resolution	0.1 dB
Accuracy at 0 dBm	$\pm 0.2$ dB

**Loss, NEXT and FEXT measurement****Impedance**

10 kHz to 2.2 MHz	100, 120, 135, 150 $\Omega$
200 Hz to 10 kHz	600 $\Omega$

**Measuring range**

Loss, NEXT measurement	0 to 80 dB
------------------------	------------

**Accuracy****In frequency range 200 Hz to 1 MHz**

Loss, FEXT, NEXT <50 dB	$\pm 0.5$ dB
Loss, FEXT, NEXT <70 dB	$\pm 1$ dB
Loss, FEXT >70 dB	$\pm 1.5$ dB

**In frequency range 1 to 2.2 MHz**

Loss, FEXT, NEXT	$\pm 2$ dB
------------------	------------

**LCL balance measurement****Impedance**

10 kHz to 2.2 MHz	100, 120, 135, 150 $\Omega$
200 Hz to 10 kHz	600 $\Omega$
Measuring range	0 to 40 dB

**Accuracy**

10 kHz to 1 MHz	$\pm 1$ dB
200 Hz to 2.2 MHz	$\pm 2$ dB

**Impedance measurement****Measuring range**

10 kHz to 2.2 MHz	up to 400 $\Omega$
200 Hz to 10 kHz	300 to 1600 $\Omega$

**Accuracy**

10 kHz to 1 MHz	$\pm 5\% \pm 5 \Omega$
200 Hz to 2.2 MHz	$\pm 10\% \pm 5 \Omega$

**Return loss measurement****Line impedance**

10 kHz to 2.2 MHz	100, 120, 135, 150 $\Omega$
200 Hz to 10 kHz	600 $\Omega$

**Measuring range**

Return loss measurement	up to 40 dB
Impedance range	Z/2 to 2Z

**Accuracy at 20 dB**

10 kHz to 1 MHz	$\pm 1$ dB
200 Hz to 2.2 MHz	$\pm 2.5$ 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)	10/20 Hz
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 fmin and fmax 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 measurements**

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 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	$\pm 0.1\%$ of range
Accuracy	$\pm 0.4\%$ of range

**Propagation velocity**

PVF	0.3 to 0.999
V	90 to 299 m/ $\mu$ s
V/2	45 to 150 m/ $\mu$ s

Gain range	0 to 72 dB
------------	------------

**Measuring pulse**

Width	10 to 5000 ns
Amplitude into 120 $\Omega$	
For 25 to 5000 ns pulse	$\sim 5$ V
For 10 ns pulse	$\sim 4$ V

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

Measuring range	up to 10 k $\Omega$
Accuracy (RL>100 $\Omega$ )	$\pm 0.4\% \pm 0.1\Omega$

**Resistance difference Measurement**

Measuring range	
RL	1 $\Omega$ to 5 k $\Omega$
$\Delta R$	up to 1 k $\Omega$
Accuracy of $\Delta R$	
1 $\Omega$ to 10 $\Omega$	$\pm 1\% \pm 0.1 \Omega$
10 $\Omega$ to 100 $\Omega$	$\pm 1\% \pm 0.2\% \pm 0.1 \Omega$
100 $\Omega$ to 1000 $\Omega$	$\pm 0.2\% \pm 0.1 \Omega$

**Insulation Resistance Measurement**

Measuring range	10 k $\Omega$ to 10 G $\Omega$
Accuracy	
0.1 to 100 M $\Omega$	$\pm 2\%$
100 M $\Omega$ to 1 G $\Omega$	$\pm 10\%$

**Capacitance Measurement**

Measuring range	1 nF to 10 $\mu$ F
tan $\delta$	0.0001 to 10
Accuracy (10 nF to 10 $\mu$ F)	$\pm 5\% \pm 1$ 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 Ω to 10 kΩ
Leakage resistance range	0.1 to 100 MΩ

**Accuracy of Lx/L (RL=2 kΩ, Lx/L=0.1 to 1)**

F<1 MΩ	± 0.1% ± 1 digit
F=1 to 5 MΩ	± 0.2% ± 1 digit
F=5 to 25 MΩ	± 1% ± 1 digit
F=25 to 100 MΩ	± 5% ± 1 digit

**Break Location**

Measuring range	up to 10 km (depending on cable)
Accuracy (C = 20 nF to 10 μF)	± 0.2% to ± 1% ± 1 digit
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	1 Ω to 2 kΩ
Accuracy	± 0.5% ± 1 Ω
Insulation Measurement	1 MΩ to 500 MΩ
Accuracy	± 5%

**Micro interruption (software option)**
**Test signal**

Test signal	2 kHz, 82 kHz ± 100 Hz
Input level range	0 to -30 dBm
Z for 2 kHz test signal	600 Ω
Z for 82 kHz test signal	100 Ω
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 categories	0.3 ms to >1 min
Evaluation	Relative duration, errored sec, Time distribution of unavailability, Count & time distribution/category

**Group delay distortion (software option)**

Test signal	37 MTT, 200 to 3700 Hz
Resolution	100 Hz
Z output/input	600 Ω
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-T O.81 (4.1.1)

**Ordering information**

EL403/000	xDSL Line Qualifier ELQ 2+
-----------	----------------------------

**Including**

Operating manual
Short form operation instruction
Calibration certificate
CD with PC programs
2 balanced measuring cables
Mains adapter
Serial cable for PC connection
Carrying case

EL403/510	Result transfer software
EL403/560	ADSL2+ (pre-programmed parameter set)

**Options**
**PC software (needs to be ordered for each instrument separately)**

EL403/520	Support of parameter set editor software
-----------	--

**Measuring software for ELQ 2+**

EL370/003A	Micro-interruption measurement
EL370/007	Group delay distortion
EL403/005	10 Hz resolution

**Others**

EL307/395	High impedance measuring probe
EL403/CRD	Calibration protocol
EL355/300	Built-in BRIDGE panel including EFF51 longitudinal voltage filter
or	
EL370/300	Built-in DMM panel
EL391/000	ER10 directional coupler with adaptation software

All statements, technical information and recommendations related to the products herein are based upon information believed to be reliable or accurate. However, the accuracy or completeness thereof is not guaranteed, and no responsibility is assumed for any inaccuracies. The user assumes all risks and liability whatsoever in connection with the use of a product or its applications. JDSU reserves the right to change at any time without notice the design, specifications, function, fit or form of its products described herein, including withdrawal at any time of a product offered for sale herein. JDSU makes no representations that the products herein are free from any intellectual property claims of others. Please contact JDSU for more information. JDSU and the JDSU logo are trademarks of JDS Uniphase Corporation. Other trademarks are the property of their respective holders. © 2007 JDS Uniphase Corporation. All rights reserved. xxx 001 1108 ELQ2+-DS.CPO.TM.AE

**Test & Measurement Regional Sales**

<b>NORTH AMERICA</b> TEL: 1 866 228 3762 FAX: +1 301 353 9216	<b>LATIN AMERICA</b> TEL:+1 954 688 5660 FAX:+1 954 345 4668	<b>ASIA PACIFIC</b> TEL:+852 2892 0990 FAX:+852 2892 0770	<b>EMEA</b> TEL:+49 7121 86 2222 FAX:+49 7121 86 1222	<b>WEBSITE: www.jdsu.com</b>
---	--	---	---	------------------------------