Automatic measuring system for xDSL & LAN cables (100 MHz)

Indicative picture

ISO 17025 ACCREDITED

- **Designed to measure all types of telecom and special cables**
- **Compliant to all major national standards for telephone, xDSL, Cat 5E cables**
- **High accuracy, high repeatability**
- **Fast measurements: 4 pairs Cat 5E in 1 minute**
- **Automatic calibration LF & HF**
- **Optional ISO 17025 certified LF & HF calibration standards**
- **No specific cable preparation, thanks to the self-cutting knives**

Delivery package	a) One central unit including: - Desktop 4 pairs connecting frame (Near + Far-End) for LF & HF measurements from 64 kHz up to 100 (120) MHz - Embedded VNA - Low Frequency measurement technology type LF 9100 - Secondary calculated parameters Embedded state-of-art computer (internal hard disk minimum 500 Go) with an external 17" color monitor - Windows Operating System - AESA Optitest measurement and result management software (1 license) - Power supplies, interfaces, connecting cables and measurement accessories
Article No:	10.1004.0003.0

1. Technical hardware features

- Unique zero correction procedure for all tests configurations (monitored calibration)
- Automatic Open-Short and Thru connecting frame equipped with self-cutting knives designed for copper diameters ranging from 0.35 to 0.9 mm (1.2 mm without insulation)
- High reliable internal switches for a better stability and reproducibility
- Mechanical design studied to facilitate maintenance and service operations

Important comments:

a) The OptiTest software is delivered with AESA ATE system. It allows preparing, performing, evaluating and managing the measurements. Optitest works in stand-alone and is protected with one hardware license dedicated to the concerned system.

OptiTest can be easily upgraded to CIQ 3.0, the AESA quality data management system, in keeping the same human-machine interface. CIQ 3.0 enables connecting the system to the company's LAN. AESA highly recommends migrating to CIQ 3.0 if several equipment are utilised.
In this way, all the specifications can be prepared at the office station (e.g. Quality Manager) and further used at any testing station. All the results are saved on the same server enabling consolidated reports, data evaluations and group analysis. Data can be easily interfaced with an ERP or accessible from other office stations through intranet as example (Industry 4.0).

CIQ not only handles the AESA testing equipment but can interface any other quality data equipment (electrical, mechanical, and dimensional) as well as process data (production monitoring).

b) **The remote maintenance** feature is using TeamViewer and allows AESA to get access to the customer's system using an internet connection. This allows updating or correcting the software, as well as diagnosing the reason of a breakdown in the system. The cost for an intervention using the remote maintenance is based on the addition of following points:
During the warranty period: Free of charge
Outside the warranty period: Working time of the AESA engineer

2. HF System specifications

2.1. HF Measured parameters

➢ ***Attenuation (corrected at 20°C)***

Accuracy	64 kHz - 30 MHz	30 MHz - 60 MHz	60 MHz - 100 MHz
-50 dB to -80 dB	± 2 dB	± 2 dB	± 3 dB
-25 dB to -50 dB	± 0.8 dB	± 1 dB	± 1.5 dB
-10 dB to -25 dB	± 0.3 dB	± 0.5 dB	± 1 dB
0 dB to -10 dB	± 0.2 dB	± 0.4 dB	± 0.8 dB

➢ ***Near-End Crosstalk NEXT & Far-End Crosstalk FEXT***

Accuracy	64 kHz - 30 MHz	30 MHz - 60 MHz	60 MHz - 100 MHz
-50 dB to -90 dB	± 3 dB	± 3 dB	± 3 dB
-30 dB to -50 dB	± 1.5 dB	± 1.5 dB	± 2 dB
-20 dB to -30 dB	± 1 dB	± 1 dB	± 1 dB

- ***Impedance (open/short and terminated 100Ω)***

Accuracy	64 kHz - 100 MHz
70 Ω - 90 Ω	± 3 Ω
90 Ω - 110 Ω	± 2 Ω
110 Ω - 135 Ω	± 3 Ω

2.2. HF Parameters

- Fitted Impedance
- Open / Short / Load impedance
- NEXT, Power Sum, Power Sum Worst Case
- FEXT, Power Sum
- Individual ACR, ACR, Power Sum ACR
- ELFEXT Pair to Pair, Power Sum
- Velocity of Propagation (VOP)
- Phase Delay, Group Delay, Delay Skew
- Etc…

2.3. Statistical HF Parameters

Statistical HF means (pair)

Maximum value, absolute maximum value
Minimum value, absolute minimum value
Average value, absolute average value
Standard deviation, standard deviation (n-1)
Average standard deviation
Quadratic average
Minimum margin, average margin
Etc…

Statistical HF means (cable)

Minimum and maximum value
Frequency for minimum or maximum values
Pair for minimum or maximum values
Minimum margin
Frequency of minimum cable margin
Value for minimum cable margin
Average of the minimum margin for each pair
Etc…

3. Low Frequency parameters specifications

The low frequency parameters measuring technology provides a self calibration. It is designed to test wires, pairs, triples and quads. OptiTest is a stand-alone application software, specially designed for the cable and wire data capture with AESA automatic testing equipment. This specific SW module is part of the AESA's Quality Management System CIQ 3.0 designed for the cable manufacturers.*

Description	Designation for pairs	Designation for quads	Accuracy	Scale
Conductor resistance	Ra, Rb	Ra, Rb Rc, Rd	± 0,1% + 10 mΩ	0 - 19,999 kΩ
Loop resistance	R	R1, R2		
Resistance unbalance	DR	DR1, DR2, DR3	Computed	%, Ω
Capacitance	C	C1, C2, C3	± 0,25% ± 10pF @800/1000 Hz ± 0,25% ± 10pF at 125 Hz ± 0,25% ± 50pF at 12,5Hz	0 – 2'000nF
Capacitance unbalance	K	K1 – K12	± 1% ± 6pF @800/1000 Hz ± 1% ± 3pF at 125 Hz ± 1% ± 30pF at 12,5 Hz	
Capacitance unbalance to ground	Ei, Ea, E	Ei1-Ei3 Ea1-Ea3 E1-E3		

Calculated parameters for 100 Hz to 10 kHz

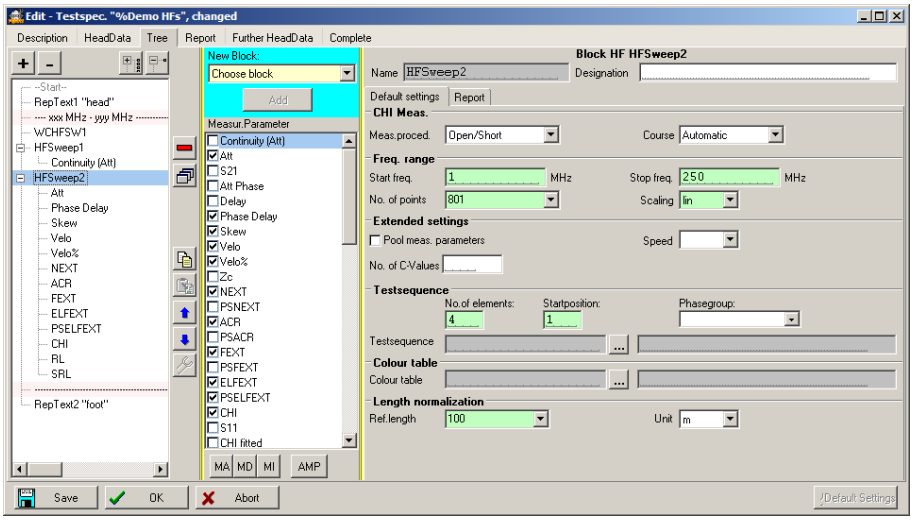
Attenuation	Phase	Crosstalk
Characteristic Impedance	Velocity of propagation (VOP)	

Statistical parameters

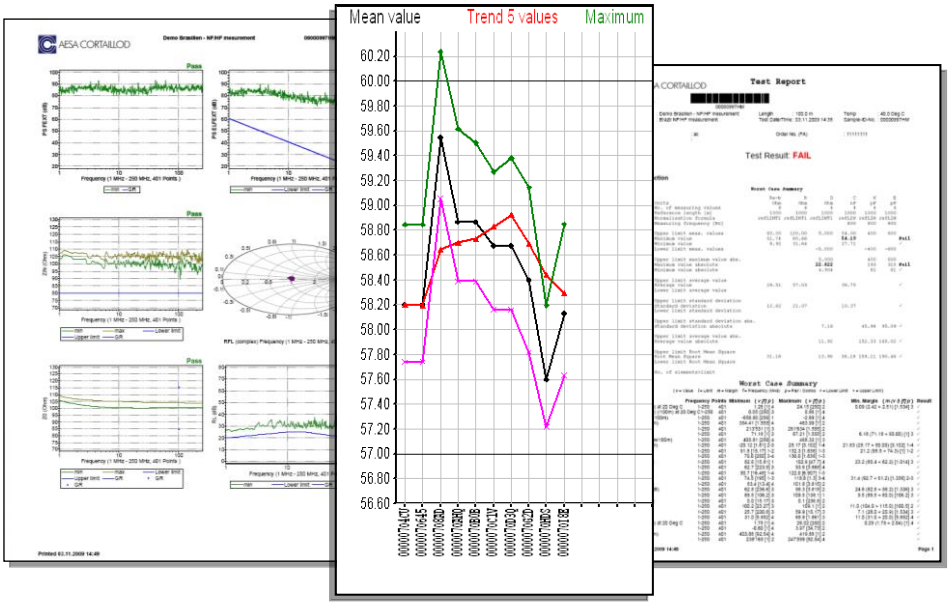
Maximum and minimum measured values	Upper quality factor	Standard deviation
Absolute minimum measured value	Lower quality factor	Variance
Average value	Standard deviation RC	RC product
Quadratic average		

4. Main software features of Optitest XL (Part of CIQ 3.0)

- The software has been developed in the Microsoft® Windows™ environment.
- User-friendly Optitest XL software package, easily operated with a mouse and a keyboard.
- Optitest is part of AESA CIQ 3.0 Quality management system. All data captured during the test can be used for further statistical evaluations
- No specific skills required, ideal for shop floor integration.
- Driver for the implemented Network Analyzer.
- Fully automatic measurement.
- The measurements can be performed in the sweep mode and/or by using frequency tables.
- Open choice for start and stop frequencies.
- Choice of logarithmic or linear scales.
- Fully customizable reports.
- Fully automatic calibration management including calibration procedure, calibration validity supervision, and calibration availability management depending on parameters to be measured.
- Possibility to create an unlimited number of cable specifications and test sequences. This “test specifications” will be stored under a customized name, easily retrieved by the operator for the call up of the specific cable type to be tested.
- Possibility to generate complex limit curves. All the limits and formulas given by the international standards are integrated. Their variables are programmable to enable the preparation of specific specifications



Example of set of selected parameters to be measured (and printed)



Examples of test and statistical reports with AESA Optitest

Options

➢ ***Set of 5 standards (resist. & capacit.) type AESA 9000***

Article No: 45.9000.0001.0

Complete ISO 17025 certified LF calibration standards.

The kit of certified LF calibration standards is composed of:

- **Standard type 9001**
  C1,2 with 19.20 nF ± 0.1 % ± 30 ppM/°C
- **Standard type 9002**
  C1,2 with 192.0 nF ± 0.1 % ± 30 ppM/°C
- **Standard type 9003**
  C3 with 16,00 nF ± 0,1 % ± 30 ppM/°C
  K1, K2, K3 with 16000 pF ± 0,1 % ± 30 ppM/°C
- **Standard type 9004**
  E1, E2, E3 with 12000 pF ± 0.1 % ± 30 ppM/°C
- **Standard type 9005**
  RA, RD with 192 Ω ± 0.01 % ± 2 ppM/°C
  RB, RC with 1920 Ω ± 0.01 % ± 2 ppM/°C

ISO 17025 ACCREDITED

➢ ***Set of HF calibration standards (attenuators and loads) type AESA 9800***

Article No: 45.9800.0001.0

ISO 17025 ACCREDITED

During a quality control, the symmetric artifacts have to be replaced by 50Ω certified coaxial standards. Using an appropriate set of terminations and attenuators, it is possible to prove within a given tolerance that the system (network analyzer + HF multiplexer + connecting frame) is measuring correctly. It is also possible to prove that the calibration used for the measurement of LAN cables has been done properly.

The kit of certified HF calibration standards is composed of:

- 2 attenuation references –3dB type 9801
- 2 attenuation references –6dB type 9802
- 2 attenuation references –10dB type 9803
- 2 attenuation references –20dB type 9804
- 2 attenuation references –30dB type 9805
- 2 x 50Ω terminations
- 3 special adapters for the terminations
- 4 HF connecting cables for the attenuation
- 1 set of miscellaneous HF material

➢ *Coaxial options*

Specific output (N-connectors) for coax measurement. The solution includes the equipment modification and related software module.

- **50 ohms coaxial option** Article No: 50.0001.0031.0
- **50 and 75 ohms coaxial option** Article No: 50.0001.0029.0
- **Mini calibration kit type N, 50 ohms** Article No: 45.8503.0001.0
- **Mini calibration kit type N, 75 ohms** Article No: 45.8503.0002.0
- **Pair of connectors for coaxial cable type AESA FASTCON3** Article No: 50.0100.0013.0

➢ *Spare parts*

AESA recommends the following set of spare parts for a safe operation :

Phoenix Type	Mini kit	Full kit
1 CKE measuring bridge type KM		✓
1 R measuring bridge type RM		✓
1 LF relay matrix board type AZU		✓
1 CPU board		✓
2 test heads (4 if two different connecting frames)	✓	✓
2 HF relays (3 if two different connecting frames)	✓	✓
1 control boards set	✓	✓
1 set of HF cable	✓	✓
1 set of different mechanical and electronic hardware	✓	✓
Article No	50.0900.0003.0	50.0900.0002.0

- ***Transfer Impedance Kit, inc. Coupling and Screening Attenuation 2.3-9.8 mm***

To perform EMC measurements with the triaxial method IEC 62153-4-9, following accessories are required:

- One hardware package to prepare the sample and take care for the impedance adaptation
- One software package (specific module)

Article No: 51.0001.0035.0

Please note that the connection of tubes is made through the coaxial 50 Ω switch and the corresponding option Article No: 50.0001.0031.0 has to be purchased separately.

- ***Printer*** Article No: 55.0500.0012.0