Phoenix 100104

Low & High frequencies Automatic Testing Equipment for cables Cat 3, 4, 5 and 5e

Indicative picture

DESCRIPTION

Phoenix 100104 is designed to automatically measure the low and high frequency parameters of large composition of symmetrical pair cables. Customer requirements can vary considerably in terms of size and design of connecting frames depending on how many pairs need to be hooked up to the frame simultaneously. Phoenix 100104 allows you to hook up a maximum of 104 pairs.

Thanks to the "OptiTest" software (an element of the CIQ SW family) supplied with the system, operators can work easily, quickly and efficiently. OptiTest allows analysis of parameter measurements for process control, traceability or any other functions requiring statistical information.

KEY FEATURES

- **Fast and compliant**
  - The fastest measurement system on the market
  - Compliant to all major international standards for telephone and xDSL cables

- **Easy to use**
  - No wire preparation needed due to self-cutting knives
  - Intuitive software

- **Accurate and certified**
  - Quality inspection, with very high accuracy
  - Check against certified ISO 17025 standards

- **Add-on**
  - Mode conversion parameters (TCL, ELTCTL, etc...)
  - EMC parameters (TI, AS, AC)
  - Coaxial cable measurement

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TECHNICAL SPECIFICATIONS

Parameters	All standard low frequency and high frequency parameters available (Resistance, Capacitance, Insertion Loss, Impedance, NEXT, FEXT, …)
Standards	Performs all electrical tests on cables responding to: • ANSI/TIA-568-C.2 for Category 3 and 5e • IEC 61156-5/-6 for Category 5e
Components	• 2 connecting frames with 104 pairs each for LF & HF measurements up to 100MHz • 1 Microsoft Windows PC with a 17" colour monitor • 1 OptiTest license, AESA measurement and result management software • Power supplies, connecting interfaces and cables, measurement accessories • Practical movable trolley
Supply Voltage	100 - 240 VAC / 50 - 60 Hz, Consumption: 600 W without printer, 1000 W with printer
Article No:	10.1104.0001.0

HIGH FREQUENCY ACCURACY

	100 kHz - 30 MHz	30 MHz - 60 MHz	60 MHz - 100 MHz
Attenuation (corrected to 20°C)			
-80 to -50 dB*	± 2 dB	± 2 dB	± 3 dB
-50 to -25 dB	± 0.8 dB	± 1 dB	± 1.5 dB
-25 to -10 dB	± 0.3 dB	± 0.5 dB	± 1 dB
-10 to 0 dB	± 0.2 dB	± 0.4 dB	± 0.8 dB
Near-End & Far-End Crosstalk (NEXT & FEXT)			
-90 to -50 dB *	± 2 dB	± 2 dB	± 2 dB
-50 to -30 dB	± 1 dB	± 1 dB	± 1 dB
-30 to -20 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB
*Impedance ** *			
70 Ω - 90 Ω	± 2 Ω	± 2 Ω	± 2 Ω
90 Ω - 110 Ω	± 1.5 Ω	± 1.5 Ω	± 1.5 Ω
110 Ω - 130 Ω	± 2 Ω	± 2 Ω	± 2 Ω

*: Measured with lower bandwidth to reduce VNA noise
**: Data for a 100 Ohm system

LOW FREQUENCY ACCURACY

Resistance R (corrected to 20°C)	
Ra, Rb	± 0,1% + 10 mΩ
R	
DR	Computed
Capacitance C	
C	± 0,25% ± 10pF at 800 Hz ± 0,25% ± 10pF at 125 Hz ± 0,25% ± 50pF at 12,5Hz
K	± 1% ± 6pF at 800 Hz ± 1% ± 3pF at 125 Hz
E	± 1% ± 30pF at 12,5 Hz

Resistance : 0-19.999 kΩ
Capacitance : 0 – 2'000 nF

REQUIRED COMPONENTS

The system must be completed with:

• Vector Network Analyzer (VNA).
 This can be provided by AESA or by the customer.

AVAILABLE OPTIONS

The equipment can be completed with:

• Coaxial cable measurement
  (50Ω or 50+75Ω)
• Switch for options
• Mode conversion parameters
  (TCL, ELTCTL, …)
• EMC parameters
  (Transfer Impedance, Screening/Coupling Attenuation)
• Printer
• 9000 Low Frequency standards
• 9800 High Frequency standards
• Warranty extension
• Maintenance contract
• Spare parts

AESA proposes other specific equipment for low and high frequency measurement.

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KEY BENEFITS
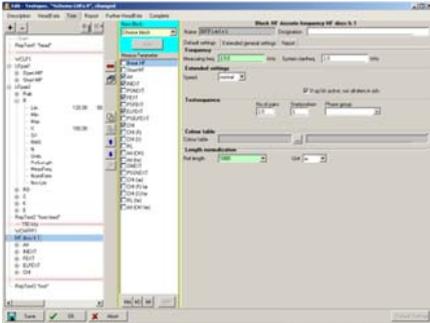
USER-FRIENDLY

- Self-cutting knives for a fast cable connection
- No special HF or LF knowledge required
- OptiTest software is multilingual
- Direct results without post calculation
- Test order library

ACCURATE

- The equipment is checked against traceable calibration standards according to ISO/IEC 17025
- The risk of human error is reduced to its strict minimum
- Calibration managed/saved by computer
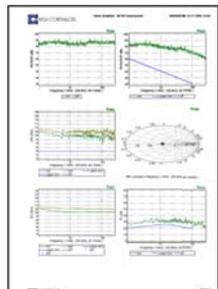
SMART

- All data (results & conditions) are saved in the PC
- Reports and evaluations can be printed
- Data can be exported (PDF, TXT or XLS files)

Overview

SYSTEM

Self cutting knives designed for wire diameters from 0.3mm to 0.9mm (1.5 mm on request).
Test heads with "open/short/load" capability allowing a fully automatic calibration procedure.
No other calibration is required, which reduces the service time.
No movable parts for maximum measurement speed, accuracy and reliability.
Robust mechanical design studied to facilitate maintenance and servicing operations.

LOW FREQUENCY PARAMETERS

The low frequency parameters feature is designed to measure pairs or quads.
The resistance is measured at 4 points (Kelvin bridge)
The capacitance can be measured at different frequencies in order to accommodate different cable lengths
(Please refer to our application note 'Length Restrictions in Cable Testing').
The feature provides self-calibration.

Measured parameters	Pairs	Quads
Conductor Resistance	Ra, Rb	Ra, Rb, Rc, Rd
Loop Resistance	R	R1, R2
Resistance unbalanced	DR	DR1, DR2, DR3
Capacitance	C	C1, C2, C3
Capacitance unbalanced	K	K1-K12
Capacitance unbalanced to ground	Ei, Ea, E	Ei1-Ei3, Ea1-Ea3, E1-E3

Calculated parameters at 800Hz (1'000Hz)

Attenuation
Characteristic Impedance
Crosstalk
Phase
Velocity of propagation (VOP)

Statistical parameters

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

HIGH FREQUENCY PARAMETERS

The high frequency parameters are measured as pairs only (1 quad = 2 pairs).
The measurement can be done according to a configurable curve or predefined fixed points.
2 connecting frames allow to connect both ends of the cable for an automatic measurement of all parameters.
A complete calibration is saved in the system allowing to change specifications without having to perform a new calibration.

Measured parameters

Transmission:	Attenuation or Insertion Loss
	Near end crosstalk
	Far end crosstalk
Reflection:	Impedance

Calculated parameters

Fitted Impedance
Return Loss (RL) (Open/Short and Terminated 100Ω) (fully complex method)
NEXT Power Sum
FEXT Power Sum
Individual ACR, ACR Worst Case, Power Sum ACR
ELFEXT Pair to Pair
Phase Delay
Velocity of Propagation (VOP)
and more …

Statistical parameters

Maximum and minimum measured values	Worst case
Pair of worst case	Frequency of worst case
and more …	

OPTITEST (Software)

The measuring system is equipped with OptiTest (a module of our CIQ quality data managemen software) which allows to prepare a measurement, to control the ATE to automatically acquire all the values of the defined parameters, to evaluate the results, to provide the measurement reports in the desired format and finally to save or export the measured values.

The software has been developed in the Microsoft® Windows™ environment and complies with the Windows features.

Creation and administration of test specification

The early creation of "Test Plan" file allows to define:
- the successive measuring sequences (Line test, LF, HF, EMC, …)
- the appropriated limits and conditions (including complex limit curves)
- the scales (logarithmic or linear)
- the HF measuring method (sweep or frequency table; start/stop frequencies; number of points,…)
- the configuration of reports

The test plan is created only once per cable type and can be saved and re-used accordingly.
Possibility to create an unlimited number of cable specifications and test sequences.
These "test specifications" will be stored with an individual customised name and are easily retrievable.
Most of the limits and formulas recommended by the international standards are already integrated.
Their variables are programmable to enable the preparation of special specifications

Measurement

The operator only needs to connect the cable on the frame, set the right test plan, fulfil the specific data (order number, operator name,…) and start the full automatic measurement.
- Fully automatic calibration management including automated calibration procedure
- Preliminary line test to verify the cable connection (short cut, crossover,…)
- Switching sequences indicated by LEDs
- In case of problem, the operator can repeat the measurement or continue in accepting the wrong value.

Reporting

Report generation is set in the test plan and is automatically generated.
The results may be displayed, printed, stored as PDF files, exported (e.g. Excel) or sent by email.
Different highly comprehensive reports can be generated containing a limit case compilation with graphics and for each measuring block a separate summary with related graphics.
Filters and search criteria normally generate sample lists which facilitate multiple further actions such as:
- Display and process measured values
- Print reports and labels

Evaluation

All data is available for evaluation at any time. Thus, all test data of a cable can be collectively evaluated and printed. Some examples of how to perform evaluations are:

- Sample list sorted by test order
- Search with pre-defined or customized filters through the data pool
- Generate quality charts (statistics)
- Statistical distribution (Gauss type curve)
- Evolution and parameter survey as function of time
- Measurements repartition in a defined time period to determine the testing load
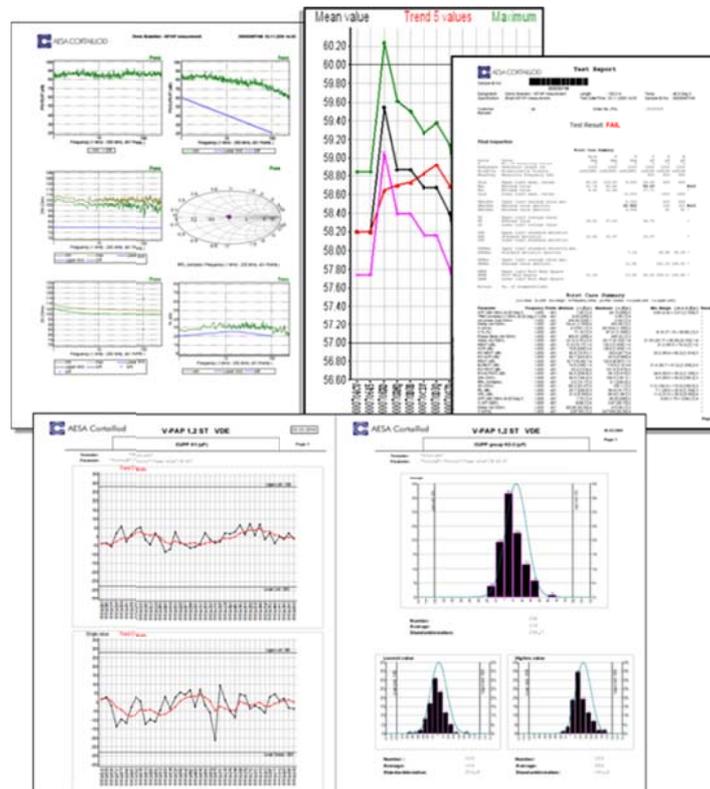
Data management

Connected to CIQ (AESA quality data management system), all data gathered with OptiTest can be used for further statistical evaluations and combined with other measurements gathered during the complete manufacturing process, from incoming good inspection to the dispatch of the finished product.

Options

1. Vector Network Analyzer (VNA)

A VNA must be integrated into the equipment. This can be provided as an option by AESA. If the customer already has a VNA, he can send it to us (if compatible). In this case, AESA will only charge the integration cost.

- Keysight E5061B 2 ports (100 kHz – 1.5 GHz) — Article No: 51.0001.0045.0

Other VNAs can be proposed upon request.

2. Coaxial cables measuring option

The option includes the modification of the equipment (N-connectors, switch,…) and the related software module to allow the measurement of coaxial cables with Phoenix.

- **50 or 75 ohms   coaxial option** — Article No: 50.0001.0031.0
- **50 + 75 ohms   coaxial option** — Article No: 50.0001.0029.0

3. Switch for options

The option includes the necessary hardware to connect specific options to the system (e.g. TCL, EMC,...).

- **Switch + 50 ohms N-connector for options** — Article No: 50.0001.0032.0

4. Mode conversion parameters TCL & ELTCTL*

To perform Mode conversion parameters measurements, following accessories are required
- One hardware connecting frame with special balun
- One software package (specific measurement module)

These accessories allow measuring all Mode conversion parameters like TCL, TCTL, LCL, LCTL, EL LCTL and EL TCTL.

this option requires a system with a 50 ohms switch. If the system is not equipped with it, it must be ordered separately.

- **TCL & ELTCTL option 4 pairs** — Article No: 51.0001.0024.0
- **TCL & ELTCTL option 25 pairs** — Article No: 51.0001.0032.0

5. EMC Parameters (TI, AS, AC)*

To perform EMC measurements (Transfer Impedance, Coupling Attenuation, Screening Attenuation) with the tri-axial method, following accessories are required
- One hardware package to prepare the sample and take care for the impedance adaptation
- One software package (specific measurement module)

These accessories allow measuring the transfer impedance, the screening attenuation and coupling attenuation according to IEC 62153-4-9 when knowing the impedance of the internal coaxial cable created with the sample under test.

this option requires a system with a 50 ohms switch. If the system is not equipped with it, it must be ordered separately.

Pictures next page.

- **Transfer Impedance Kit, ∅ 2.3 - 9.8 mm** — Article No: 51.0001.0035.0
- **Transfer Impedance Kit,   ∅ 6 - 22 mm** — Article No: 51.0001.0056.0

6. *Printer*

LaserJet printer

7. *Set of ISO 17025 certified LF standards type AESA 9000*

This set of "Low Frequency" standards, certified ISO 17025, allows the periodic calibration, thus proving the accuracy of the complete measurement system. The kit is composed of:

- Standard type 9001   C1,2   19,20 nF $\pm$ 0,1 % $\pm$ 30 ppM/°C
- Standard type 9002   C1,2   192,0 nF $\pm$ 0,1 % $\pm$ 30 ppM/°C
- Standard type 9003   C3   16,0 nF $\pm$ 0,1 % $\pm$ 30 ppM/°C
                        K1, K2, K3   16000 pF $\pm$ 0,1 % $\pm$ 30 ppM/°C
- Standard type 9004   E1, E2, E3   12000 pF $\pm$ 0,1 % $\pm$ 30 ppM/°C
- Standard type 9005   RA, RD   192 Ω $\pm$ 0,01 % $\pm$ 2 ppM/°C
                        RB, RC   1920 Ω $\pm$ 0,01 % $\pm$ 2 ppM/°C

8. *Set of ISO 17025 certified HF standards type AESA 9800*

This set of "coaxial" primary standards, certified ISO 17025, allows the periodic calibration, thus proving the accuracy of the complete measurement system (Vector Network Analyzer + RF multiplexer + connecting frame).

This set of "coaxial" primary standards should not be mixed up with the "symmetrical" zero correction kit, delivered with the ATE, which is used to carry out the periodical zero correction files of the equipment, required to measure LAN cables.

The set of certified HF standards is composed of:

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

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9. Warranty Extension

AESA is confident with its technology and the quality of its goods. This is why the system is supplied with a 2-years warranty period. In order to protect its customer's investment, AESA offers the possibility to extend the warranty period to 3 years.

10. Maintenance contract

Even the most reliable systems require regular, planned and preventive maintenance as well as periodical calibrations. AESA proposes service packages to extend the operating life of your equipment, control of your maintenance costs and ensure optimal performances.

11. Spare Parts

AESA recommends following set of spare parts for a safety operation of two years:

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