

## Cobalt 4504

*Automatic balunless measuring system for LAN cables*



### DESCRIPTION

LAN cables are more and more specified for large and wider frequency ranges. Balun based systems cannot measure more than 3 frequency decades with reasonable accuracy. The Cobalt system based on a modal decomposition mathematical algorithm supports the development of new cables (complete tests at the lab) and simplifies operator's difficult job within systematic testing operations during production which are essential to achieve reliable results.

Cobalt can measure very easily patch cords or coaxial cables. Using a simple interface and introducing a de-embedding software correction, it doesn't need frequent and time-consuming calibration routines. It can provide not only the standard parameters as Next and RL, but also many other cable and individual wire parameters required for development of new cable designs as well as for detailed troubleshooting and quality analysis.

### KEY FEATURES

- **Multiple uses**
  - Quality inspection, with very high accuracy
  - Development, with individual values per wire
  - Data cables
  - Patch cords with RJ45 connectors (standard) or others
- **High-Tech**
  - Balunless technology (modal decomposition mathematical algorithm)
  - Executive HF switches using MIL standardized relays (min 2'000'000 cycles)
- **Performant**
  - More than 170 parameters (including TCL measurement with integrated common mode)
  - Performs all electric tests on cables responding to major standards
- **Go over the limits**
  - Very broad frequency range (<4GHz) for cat 8 and higher
  - Full dynamic range available
  - Short cable length (10m)
- **Add-on**
  - EMC parameters (TI, AS, AC)
  - Alien Crosstalk



AESA Cortailod

## TECHNICAL SPECIFICATIONS

Parameters	More than 170 parameters available (Transmission, Reflection, NEXT, FEXT, TCL...) <i>Note: Cobalt offers complete S-parameter capabilities (Differential-, Common- and Mixed Mode Parameters)</i>
Standards	Performs all electrical tests on cables responding to: <ul style="list-style-type: none"> <li>• ANSI/TIA-568-C.2 for Category 3, 5e, 6 and 6A</li> <li>• ANSI/TIA-568-C.2-1 for Category 8</li> <li>• IEC 61156-5/-6 for Category 5e, 6, 6A, 7 and 7A</li> <li>• IEC 61156-7/-8 for cables up to 1200MHz</li> <li>• IEC 61156-9/-10 for Category 8.1 and 8.2</li> </ul>
Measuring length	Cable samples from 10m up to 100m
Components	<ul style="list-style-type: none"> <li>• 4 pairs connecting frame for HF measurements exceeding 4 GHz</li> <li>• 1 state-of-the-art computer with a 17" colour monitor</li> <li>• Operating Windows system</li> <li>• 1 license OptiTest, AESA measurement and result management software</li> <li>• Power supplies, interfaces, connecting cables and measurement accessories</li> </ul>
Supply Voltage	100 - 240 VAC / 50 - 60 Hz, Consumption: 600 W without printer, 1000 W with printer
Article No:	<b>03.3504.0001.0</b>

## ACCURACY

	100 kHz - 10 MHz	10 MHz - 100 MHz	100 MHz - 200 MHz	200 MHz - 400 MHz	400 MHz - 750 MHz	750 MHz - 1.5 GHz	1.5 GHz - 3 GHz	3 GHz - 4.5 GHz (typical)
<b>Attenuation (corrected at 20°C)</b>								
-80 to -50 dB	± 1.3 dB	± 1.5 dB	± 1.7 dB	± 1.9 dB	± 3 dB	± 4 dB	± 6 dB	± 6 dB
-50 to -25 dB	± 0.5 dB	± 0.6 dB	± 0.6 dB	± 0.7 dB	± 0.9 dB	± 1.5 dB	± 2 dB	± 3 dB
-25 to -10 dB	± 0.2 dB	± 0.2 dB	± 0.3 dB	± 0.4 dB	± 0.8 dB	± 1.3 dB	± 1.7 dB	± 2 dB
-10 to 0 dB	± 0.2 dB	± 0.2 dB	± 0.2 dB	± 0.4 dB	± 0.8 dB	± 1.3 dB	± 1.5 dB	± 1.5 dB
<b>Near-End Crosstalk NEXT &amp; Far-End Crosstalk FEXT</b>								
-90 to -60 dB	± 2 dB	± 2 dB	± 2 dB	± 2.5 dB	± 4 dB	± 6 dB	± 8 dB	± 8 dB
-60 to -30 dB	± 1.6 dB	± 1.4 dB	± 1.4 dB	± 1.6 dB	± 1.8 dB	± 4 dB	± 6 dB	± 6 dB
-30 to -10 dB	± 0.5 dB	± 0.8 dB	± 0.8 dB	± 1 dB	± 1.5 dB	± 2 dB	± 3 dB	± 3 dB
<b>Impedance</b>								
70 Ω - 90 Ω	± 1 Ω	± 1.5 Ω	± 2 Ω	± 2 Ω	± 3 Ω	± 4.5 Ω	± 6 Ω	± 6 Ω
90 Ω - 110 Ω	± 0.75 Ω	± 1 Ω	± 1.5 Ω	± 1.5 Ω	± 2 Ω	± 4 Ω	± 5 Ω	± 5 Ω
110 Ω - 130 Ω	± 1 Ω	± 1.5 Ω	± 2 Ω	± 2 Ω	± 3 Ω	± 4.5 Ω	± 6 Ω	± 6 Ω

## REQUIRED COMPONENTS

The system must be completed with:

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

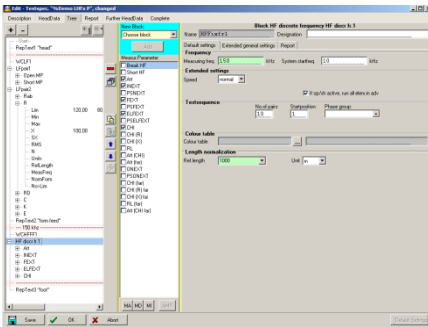
## AVAILABLE OPTIONS

The equipment can be completed with:

- Low frequency parameters measuring unit
- Coaxial cable measurement (50Ω or 50+75Ω)
- Switch for options
- EMC parameters  
(Transfer Impedance, Screening/Coupling Attenuation)
- Connecting frame for connectors (e.g. RJ45)
- 9000 Low Frequency standards
- 9800 High Frequency standards
- Spare parts

*AESA proposes other specific equipment for high frequency measurement*

## KEY BENEFITS



### USER-FRIENDLY

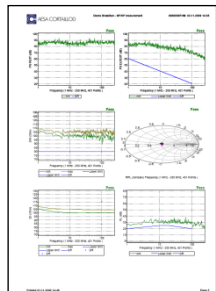
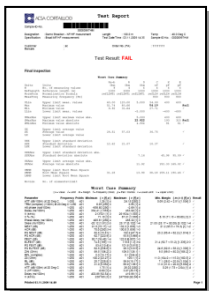
- Fast measurements
- No special HF or LF knowledge required
- OptiTest software is multilingual
- Direct results without post calculation
- Test order library

## ISO 17025 ACCREDITED



### ACCURATE AND REPEATABLE

- The equipment is checked against traceable calibration standards according to ISO/IEC 17025
- Perfect reproducibility
- 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

No balun so individual values per wire available and not only pair.  
 Accept wire diameters between 0.3 and 1.0mm (28AWG to 18AWG).  
 Full two ports calibration (Thru-Open-Short-Load) for high accuracy measurement.  
 No movable parts for maximum measurement speed and reliability.  
 Robust mechanical design studied to facilitate maintenance and servicing operations.

## LOW FREQUENCY PARAMETERS (Optional)

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

	<u>Pairs</u>	<u>Quads</u>
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 (from 100Hz to 10kHz)

Attenuation  
 Characteristic Impedance

### 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.

### Available HF parameters:

<p><b>Transmission/Reflection</b></p>	<ul style="list-style-type: none"> <li>• Reflection Differential Mode (each parameter is available at near and/or far end): Return Loss dd, characteristic impedance, S11, Fitted impedance, SRL</li> <li>• Transmission Differential Mode (each parameter is available for forward and reverse measurement): Attenuation (Insertion Loss), S21, S21 phase, Phase delay, phase delay velocity, Group delay, Delay skew...</li> <li>• Reflection Common Mode (each parameter is available at near and/or far end): Return Loss cc, characteristic impedance, S11, Fitted impedance, SRL</li> <li>• Transmission Common Mode (each parameter is available for forward and reverse measurement): Insertion Loss, S21, S21 phase, Phase delay, phase delay velocity, Group delay, Delay skew...</li> <li>• Conversion Loss (each parameter is available for forward and reverse measurement): LCLdc, LCTLdc, TCLcd, TCTLcd, ELTCTLcd</li> <li>• Single Ended Reflection (each parameter is available at near and/or far end and for wire a and/or b): Characteristic impedance, S11, Fitted impedance, SRL</li> <li>• Single Ended Transmission (each parameter is available for forward and reverse measurement and for wire a and/or b): Attenuation (Insertion Loss), S21, Phase, Phase delay, In Pair Skew...</li> <li>• Single Ended NEXT: S31, S13, S42, S24</li> <li>• Single Ended FEXT: S41, S14, S32, S23</li> </ul>
<p><b>Near-NEXT</b></p>	<ul style="list-style-type: none"> <li>• NEXT Differential Mode: Nextdd, PSNextdd, ACR-Ndd, PSACR-Ndd</li> <li>• NEXT Common/Differential Mode: Nextcd</li> <li>• NEXT Differential/Common Mode: Nextdc</li> <li>• NEXT</li> <li>• Common Mode: Nextcc</li> </ul>
<p><b>Far-NEXT</b></p>	<ul style="list-style-type: none"> <li>• Same as Near-NEXT but measured at the far end</li> </ul>
<p><b>FEXT</b></p>	<ul style="list-style-type: none"> <li>• FEXT Differential Mode: Fextdd, PSFextdd, Elfextdd, PSEIFextdd, ACR-Fdd, PSACR-Fdd</li> <li>• FEXT Common/Differential Mode: Fextcd</li> <li>• FEXT Differential/Common Mode: Fextdc</li> <li>• FEXT Common Mode: Fextcc</li> </ul>

### Statistical parameters

Maximum and minimum measured values  
 Pair of worst case  
 and more ...

Worst case  
 Frequency of worst case

**STANDARDS**

**Cobalt capabilities**

**Standard requirements**

	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8
Port 1	RLdd11	Sdd12	NEXTdd13	Sdd14	ILdd15	FEXTdd16	Sdd17	FEXTdd18
Port 2	NEXTdd21	Sdd22	NEXTdd23	Sdd24	FEXTdd25	ILdd26	Sdd27	FEXTdd28
Port 3	NEXTdd31	Sdd32	RLdd33	Sdd34	FEXTdd35	FEXTdd36	Sdd37	FEXTdd38
Port 4	NEXTdd41	Sdd42	NEXTdd43	Sdd44	FEXTdd45	FEXTdd46	Sdd47	ILdd48
Port 5	ILdd51	Sdd52	FEXTdd53	Sdd54	RLdd55	NEXTdd56	Sdd57	NEXTdd58
Port 6	FEXTdd61	Sdd62	FEXTdd63	Sdd64	NEXTdd65	RLdd66	Sdd67	NEXTdd68
Port 7	FEXTdd71	Sdd72	ILdd73	Sdd74	NEXTdd75	NEXTdd76	Sdd77	NEXTdd78
Port 8	FEXTdd81	Sdd82	FEXTdd83	Sdd84	NEXTdd85	NEXTdd86	Sdd87	RLdd88
Port 1	LCLdc11	Sdc12	NEXTdc13	Sdc14	LCLdc15	FEXTdc16	Sdc17	FEXTdc18
Port 2	NEXTdc21	Sdc22	NEXTdc23	Sdc24	FEXTdc25	LCLdc26	Sdc27	FEXTdc28
Port 3	NEXTdc31	Sdc32	LCLdc33	Sdc34	FEXTdc35	FEXTdc36	Sdc37	FEXTdc38
Port 4	NEXTdc41	Sdc42	NEXTdc43	Sdc44	FEXTdc45	FEXTdc46	Sdc47	LCLdc48
Port 5	LCLdc51	Sdc52	FEXTdc53	Sdc54	LCLdc55	NEXTdc56	Sdc57	NEXTdc58
Port 6	FEXTdc61	Sdc62	FEXTdc63	Sdc64	NEXTdc65	LCLdc66	Sdc67	NEXTdc68
Port 7	FEXTdc71	Sdc72	LCLdc73	Sdc74	NEXTdc75	NEXTdc76	Sdc77	NEXTdc78
Port 8	FEXTdc81	Sdc82	FEXTdc83	Sdc84	NEXTdc85	NEXTdc86	Sdc87	LCLdc88
Port 1	TCLcd11	Scd12	NEXTcd13	Scd14	TCLcd15	FEXTcd16	Scd17	FEXTcd18
Port 2	NEXTcd21	Scd22	NEXTcd23	Scd24	FEXTcd25	TCLcd26	Scd27	FEXTcd28
Port 3	NEXTcd31	Scd32	TCLcd33	Scd34	FEXTcd35	FEXTcd36	Scd37	FEXTcd38
Port 4	NEXTcd41	Scd42	NEXTcd43	Scd44	FEXTcd45	FEXTcd46	Scd47	TCLcd48
Port 5	TCLcd51	Scd52	FEXTcd53	Scd54	TCLcd55	NEXTcd56	Scd57	NEXTcd58
Port 6	FEXTcd61	Scd62	FEXTcd63	Scd64	NEXTcd65	TCLcd66	Scd67	NEXTcd68
Port 7	FEXTcd71	Scd72	TCLcd73	Scd74	NEXTcd75	NEXTcd76	Scd77	NEXTcd78
Port 8	FEXTcd81	Scd82	FEXTcd83	Scd84	NEXTcd85	NEXTcd86	Scd87	TCLcd88
Port 1	RLcc11	Scc12	NEXTcc13	Scc14	ILcc15	FEXTcc16	Scc17	FEXTcc18
Port 2	NEXTcc21	Scc22	NEXTcc23	Scc24	FEXTcc25	ILcc26	Scc27	FEXTcc28
Port 3	NEXTcc31	Scc32	RLcc33	Scc34	FEXTcc35	FEXTcc36	Scc37	FEXTcc38
Port 4	NEXTcc41	Scc42	NEXTcc43	Scc44	FEXTcc45	FEXTcc46	Scc47	ILcc48
Port 5	ILcc51	Scc52	FEXTcc53	Scc54	RLcc55	NEXTcc56	Scc57	NEXTcc58
Port 6	FEXTcc61	Scc62	FEXTcc63	Scc64	NEXTcc65	RLcc66	Scc67	NEXTcc68
Port 7	FEXTcc71	Scc72	ILcc73	Scc74	NEXTcc75	NEXTcc76	Scc77	NEXTcc78
Port 8	FEXTcc81	Scc82	FEXTcc83	Scc84	NEXTcc85	NEXTcc86	Scc87	RLcc88



## **OPTITEST (Software)**

The measuring system is equipped with OptiTest (a module of our CIQ quality data management 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.

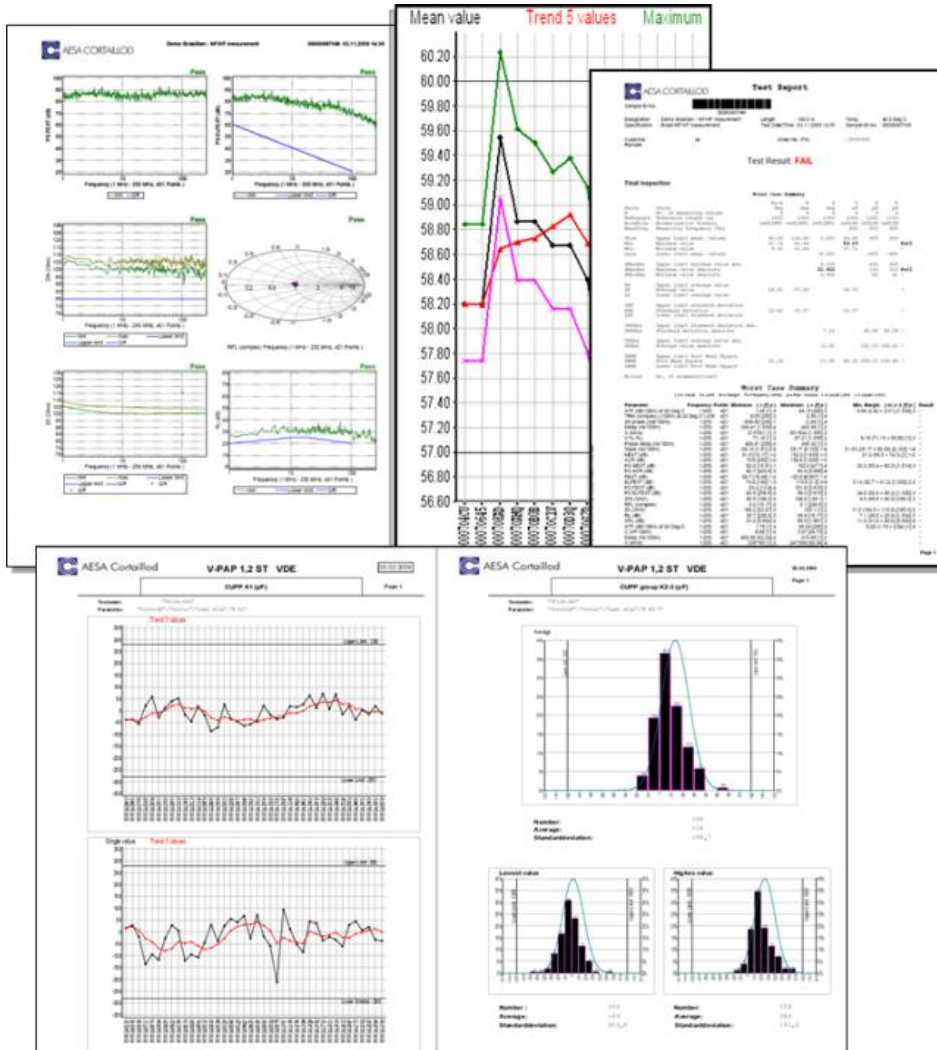
Filters and search criteria normally generate sample lists which facilitate multiple further actions such as:

- 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. Network Analyzer

- Agilent type E5080B 4 ports (9 kHz – 4.5 GHz)
- Rohde & Schwarz ZNB4 (9 kHz – 4.5 GHz)

Article No: 51.0001.0097.0

Article No: 51.0001.0060.0

Other types can be proposed upon request. VNA from customer can also be integrated.

## 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 Vega.

- 50 or 75 ohms coaxial option
- 50 + 75 ohms coaxial option

Article No: 50.0001.0031.0

Article No: 50.0001.0029.0

Coaxial accuracy (frequency range will depend on the VNA)	From	To		100 kHz 100 MHz	100 MHz 500 MHz	500 MHz 1 GHz	1 GHz 3 GHz	3 GHz 6 GHz
S21 transmission (Attenuation, NEXT) corrected at 20°C	-80	-50	dB	± 1.5 dB	± 1.7 dB	± 1.9 dB	± 2.4 dB	± 3.0 dB
	-50	-25	dB	± 0.5 dB	± 0.6 dB	± 0.7 dB	± 0.9 dB	± 1.5 dB
	-25	-10	dB	± 0.2 dB	± 0.3 dB	± 0.4 dB	± 0.8 dB	± 1.3 dB
	-10	0	dB	± 0.2 dB	± 0.2 dB	± 0.4 dB	± 0.8 dB	± 1.3 dB
Impedance	50	50	Ω	± 0.5 Ω	± 0.7 Ω	± 1.0 Ω	± 1.5 Ω	± 4.0 Ω
	75	75	Ω	± 0.75 Ω	± 1.2 Ω	± 1.5 Ω	± 2.0 Ω	± 6.0 Ω

## 3. LF option for Cobalt 4504

Article No: 50.0001.0061.0

The low frequency parameters measuring technology provides a self-calibration. It is designed to test up to 4 pairs or 2 quads. Different measuring frequencies are integrated in the capacitance bridge. They can be used depending on the length of the cable

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 at 800 Hz ± 0,25% ± 10pF at 125 Hz ± 0,25% ± 50pF at 12,5Hz	0 – 2'000nF
Capacitance unbalance	K	K1 – K12	± 1% ± 6pF at 800 Hz	
Capacitance unbalance to ground	Ei, Ea, E	Ei1-Ei3 Ea1-Ea3 E1-E3	± 1% ± 3pF at 125 Hz ± 1% ± 30pF at 12,5 Hz	

**Calculated parameters (from 100Hz to 10kHz)**

Attenuation

Characteristic Impedance

**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

**4. Switch for options**

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

- **Switch + 50 ohms N-connector for options**

[Article No: 50.0001.0032.0](#)**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,  $\varnothing$  2.3 - 9.8 mm**

[Article No: 51.0001.0072.0](#)

- **Transfer Impedance Kit,  $\varnothing$  6 - 22 mm**

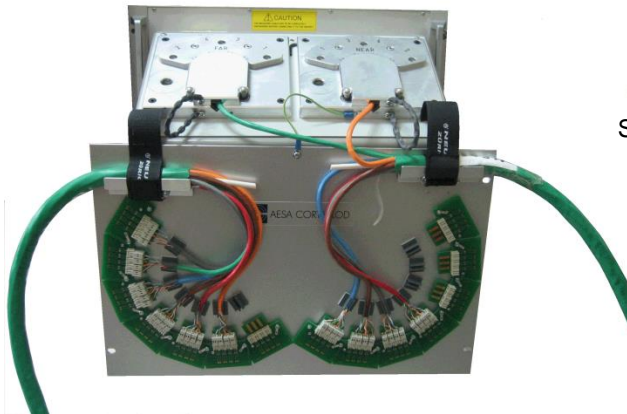
[Article No: 51.0001.0073.0](#)

**6. Option Alien Crosstalk AXT for ATE up to Cat. 6A (semi-automatic, incl. software)**

Article No: 52.0001.0007.0

AESA has developed a software package along with a test procedure that allows the swapping of the different cables on a 4-pair connecting frame. It allows making all necessary measurements in a well-defined order. The software will then compute the measured crosstalk and show the results as specified in the standards.

This option is optimized for 4-pair unshielded cables (U/UTP) up to 500MHz.



Semi-automatic AXT option connecting frame

**7. Option Alien Crosstalk AXT for ATE up to Cat. 8 (semi-automatic, incl. software)**

Article No: 52.0001.0011.0

AESA has developed a software package along with a test procedure that allows the swapping of the different cables on a 4-pair connecting frame. It allows making all necessary measurements in a well-defined order. The software will then compute the measured crosstalk and show the results as specified in the standards.

This option is optimized for screened cables (X/FTP, F/UTP) up to 2000MHz and unshielded cables (U/UTP) up to 500MHz.



Semi-automatic AXT option Cat 8 connecting frame

**8. Option for connector RJ45**

Article No: 50.0001.0070.0

Patch cord for RJ45 connectors: easy and direct adaptation to the Cobalt frame.  
 Using a simple interface and introducing a de-embedding software correction, it doesn't need frequent and time-consuming calibration routines. It can provide not only the standard parameters as Next and RL, but also other cable parameters for development and further analysis



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

Article No: 45.9000.0001.0

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



ISO 17025 ACCREDITED



**10. Set of ISO 17025 certifies HF calibration standards type AESA 9800**

Article No: 45.9800.0001.0

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



ISO 17025 ACCREDITED



**11. Movable Trolley**

Article No: 51.0190.0001.0



For convenience or operational reasons, it is possible to add a professional movable trolley to the system. In such a case, all tester components are integrated in the trolley, including the computer system and the printer.

**12. Spare parts**

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

Cobalt Type	HF measurement only (Mini kit)	Including optional LF measurement (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