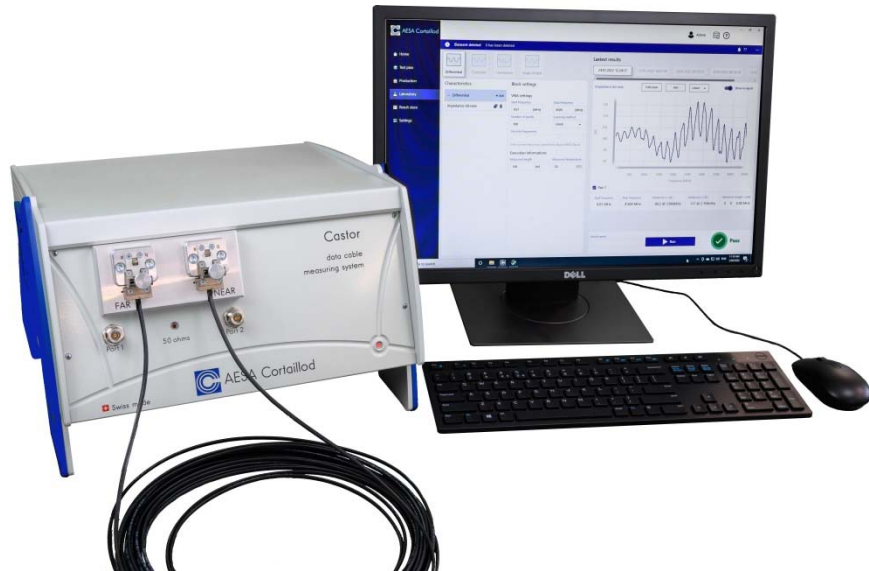


## Castor DT

*Desktop fully integrated automatic test system for single pair data cables*



### DESCRIPTION

Single Pair Ethernet is the new standard for intelligent network communication. It represents the extremely high-performance parallel transmission of data and power, via Ethernet, over a single pair of wires, using Power over Data Line (PoDL). This new network technology enables continuous IP communication and power, even in complex industrial applications or IoT solutions. The Castor test equipment offers you an efficient and easy way to characterize it.

By conducting measurements on individual wires based on balunless technology and not just on pairs, Castor 1 DT allows measurement of a particularly wide range of parameters that cannot generally be tested by conventional methods. This fully integrated equipment is a valuable tool also to assist you in cable development. Equally important, final cable testing is rendered simpler and more reliable as it is fully automated, thus eliminating the need for the operator to conduct very cumbersome tasks with the associated risks of handling errors.

### KEY FEATURES

- **Integrated solution**
  - 1 pair connection
  - Embedded VNA (Vector Network Analyser)
  - Integrated computer and software
- **High-Tech**
  - Balunless technology (modal decomposition mathematical algorithm)
- **Performant**
  - Performs all electric tests on cables responding to major standards
  - checked against traceable calibration standards according to ISO/IEC 17025
- **Go over the limits**
  - Very broad frequency range for cat 8 and higher
  - Full dynamic range available
  - Short cable length (10m)



AESA Cortailod

## TECHNICAL SPECIFICATIONS

Measuring range	100 kHz – 2 GHz (Frequency extension upon request)		
Integrated equipment	<ul style="list-style-type: none"> <li>• 1 pair connecting frame for HF measurements</li> <li>• Embedded Network Analyser</li> <li>• Embedded windows based PC with operating system Windows 10</li> <li>• 1 license Metis, AESA measurement and result management software</li> <li>• Power supplies, interfaces, connecting cables and measurement accessories</li> </ul>		
Standards	Performs all electrical tests on cables responding to: <ul style="list-style-type: none"> <li>• ANSI/TIA-568.5 SP1/2/3 for single pair balanced twisted pair</li> <li>• IEC 61156-13/-14 for cables up to 20MHz, -11/-12 for cables up to 600MHz</li> <li>• IEEE 802-3ch/bp (600MHz)/bw (166MHz)/cg (20MHz)</li> </ul>		
Supply voltage	100 - 240 VAC / 50-60Hz		
Interfaces	4 x USB (e.g. for printer) 1 x VGA Display Port connector for external monitor (delivered with the system) 1 x DVI Display Port 1 x HDMI 1 x RJ45 for LAN connection		
Dimensions	400 x 410 x 250 mm (15.8" x 16.1" x 9.9")		
Weight	≈ 11 kg (24 lbs)		
Versions (High Frequency only)	Castor DT 21 HF (20MHz max)	Castor DT 601 HF (600MHz max)	Castor DT 2001 HF (2GHz max)
Article No	04.0021.0001.0	04.0601.0001.0	04.2001.0001.0
Versions (Low & High Frequency)	Castor DT 21 LF/HF (20MHz max)	Castor DT 601 LF/HF (600MHz max)	Castor DT 2001 LF/HF (2GHz max)
Article No	04.0021.0002.0	04.0601.0002.0	04.2001.0002.0

## ACCURACY

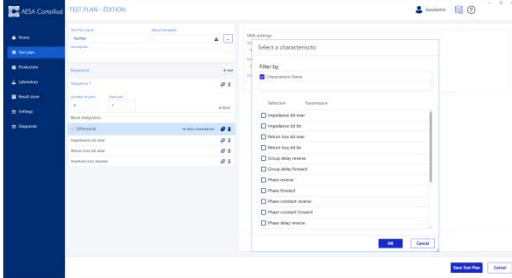
	100 kHz - 10 MHz	10 MHz - 20 MHz	20 MHz - 200 MHz	200 MHz - 400 MHz	400 MHz - 600 MHz	600 MHz - 1.3 GHz	1.3 GHz - 2 GHz
<b>Attenuation (corrected at 20°C)</b>							
-90 to -80 dB	± 2.5 dB	± 2.5 dB	± 2.5 dB	± 2.5 dB	± 5.0 dB	± 5.0 dB	NA
-80 to -70 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 2.5 dB	± 2.5 dB	± 5.0 dB
-70 to -60 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 2.0 dB	± 2.0 dB
-60 to 0 dB	± 0.2 dB	± 0.2 dB	± 0.2 dB	± 0.2 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB
<b>Near-End Crosstalk NEXT &amp; Far-End Crosstalk FEXT</b>							
-90 to -80 dB	± 2.5 dB	± 2.5 dB	± 2.5 dB	± 2.5 dB	± 5.0 dB	± 5.0 dB	NA
-80 to -60 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 2.5 dB	± 2.5 dB	± 5.0 dB
-60 to -10 dB	± 0.2 dB	± 0.2 dB	± 0.2 dB	± 0.2 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB
<b>Impedance</b>							
70 Ω - 90 Ω	± 1 Ω	± 1.5 Ω	± 2 Ω	± 2 Ω	± 3 Ω	± 4.5 Ω	± 6 Ω
90 Ω - 110 Ω	± 0.75 Ω	± 1 Ω	± 1.5 Ω	± 1.5 Ω	± 2 Ω	± 4 Ω	± 5 Ω
110 Ω - 130 Ω	± 1 Ω	± 1.5 Ω	± 2 Ω	± 2 Ω	± 3 Ω	± 4.5 Ω	± 6 Ω

## AVAILABLE OPTIONS

- Low frequency parameters measuring unit
- Coaxial cable measurement (50Ω or 50+75Ω on request)
- Switch for options
- EMC parameters (Transfer Impedance TI, Screening Attenuation AS, Coupling Attenuation AC)
- Alien Crosstalk
- 9800 High Frequency standards
- 9000 Low Frequency standards
- Maintenance contract

*AESA proposes other specific equipment for high frequency measurement.*

## KEY BENEFITS



### USER-FRIENDLY

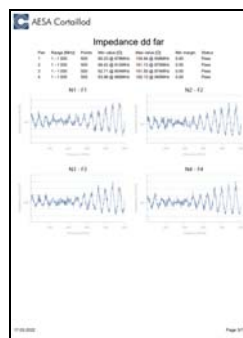
- Metis software is multilingual
- Direct results without post calculation
- Calibration managed/saved by computer
- Test orders library

### ISO 17025 ACCREDITED



### ACCURATE

- The equipment is checked against traceable calibration standards according ISO/IEC 17025
- The risk of human error is reduced to its minimum



### SMART

- All data (results and conditions) are saved on the internal PC
- Reports can be printed
- Data can be exported through the LAN in an ASCII or XLS file

# Overview

## SYSTEM

Fully integrated test system, no external component required.  
 No balun so that 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 to facilitate maintenance and servicing operations.

## HIGH FREQUENCY PARAMETERS

The measurement can be done according to a configurable curve or predefined fixed points.  
 2 connecting fixtures allow to connect both ends of the pair 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:

<b>Transmission/Reflection</b>	<ul style="list-style-type: none"> <li>• Reflection Differential Mode (each parameter is available at near and/or far end): Return Loss, 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 (: LCL, LCTL, TCL, TCTL, ELTCTL)</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</li> <li>• Single Ended FEXT</li> </ul>
--------------------------------	--

## Statistical parameters

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

## LOW FREQUENCY PARAMETERS (Optional)

The low frequency parameters feature is designed to measure pairs.

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

Conductor Resistance	Ra, Rb
Loop Resistance	R
Resistance unbalanced	DR
Capacitance	C
Capacitance unbalanced	K
Capacitance unbalanced to ground	Ei, Ea, E

### 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 ...	

## Metis (Software)

The measuring system is equipped with Metis which allows to: prepare a measurement, control the ATE to automatically acquire all the values of the defined parameters, evaluate the results, provide the measurement reports in the desired format and finally 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,...)
- 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.

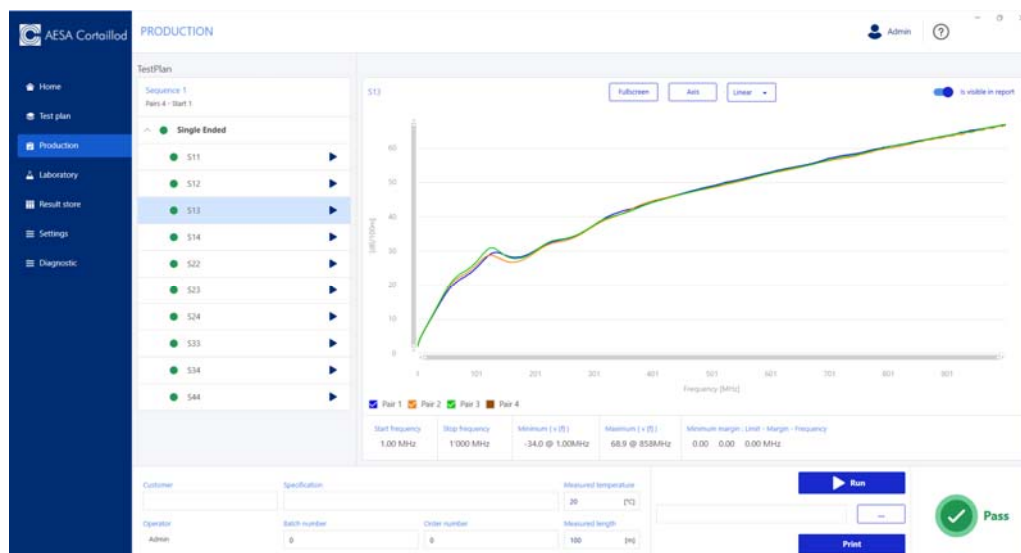
Filters and search criteria normally generate sample lists which facilitate multiple further actions such as:

- 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



# Options

## 1. 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 Castor.

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

Article No: 50.0001.0031.0

Article No: on request

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

## 2. LF option for Castor DT

Article No: 50.0001.0061.0

The low frequency parameters measuring technology provides a self-calibration. It is designed to test 1 pair. Different measuring frequencies are integrated in the capacitance bridge. They can be used depending on the length of the cable

Description	Designation for pairs	Accuracy	Scale
Conductor resistance	Ra, Rb	± 0,1% + 10 mΩ	0 - 19,999 kΩ
Loop resistance	R		
Resistance unbalance	DR	Computed	%, Ω
Capacitance	C	± 0,25% ± 10pF at 800 Hz ± 0,25% ± 10pF at 125 Hz ± 0,25% ± 50pF at 12,5Hz	0 – 2'000nF
Capacitance unbalance	K	± 1% ± 6pF at 800 Hz	
Capacitance unbalance to ground	Ei, Ea, E	± 1% ± 3pF at 125 Hz ± 1% ± 30pF at 12,5 Hz	

**Calculated parameters (from 100 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

**3. 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](#)

**4. 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, Ø 2.3 - 9.8 mm**

[Article No: 51.0001.0035.0](#)

- **Transfer Impedance Kit, Ø 6 - 22 mm**

[Article No: 51.0001.0056.0](#)

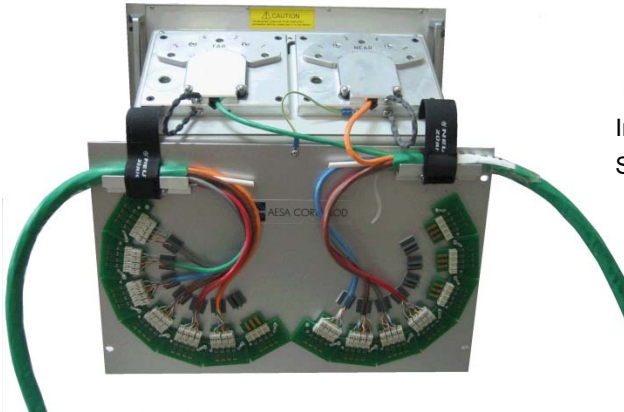




**5. Option Alien Crosstalk AXT for ATE up to Cat. 6A (semi-automatic, incl. software)**

AESA has developed a software package along with a test procedure that allows the swapping of the different 1 pairs cables on a 1 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 1-pair unshielded cables (U/UTP) up to 500MHz.



Indicative picture  
Semi-automatic AXT option connecting frame

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

AESA has developed a software package along with a test procedure that allows the swapping of the different 1 pairs cables on a 1 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 pairs (X/FTP, F/UTP) up to 2000MHz and unshielded pairs (U/UTP) up to 500MHz.



Indicative picture  
Semi-automatic AXT option Cat 8 connecting frame

**7. 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
	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
	RB, RC	1920 Ω	± 0,01 %	± 2 ppM/°C



ISO 17025 ACCREDITED



**8. 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



## 9. Spare parts

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

Castor 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)	✓	✓
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

## 10. Maintenance contract

Article No: 60.0100.0002.0

Details on request.