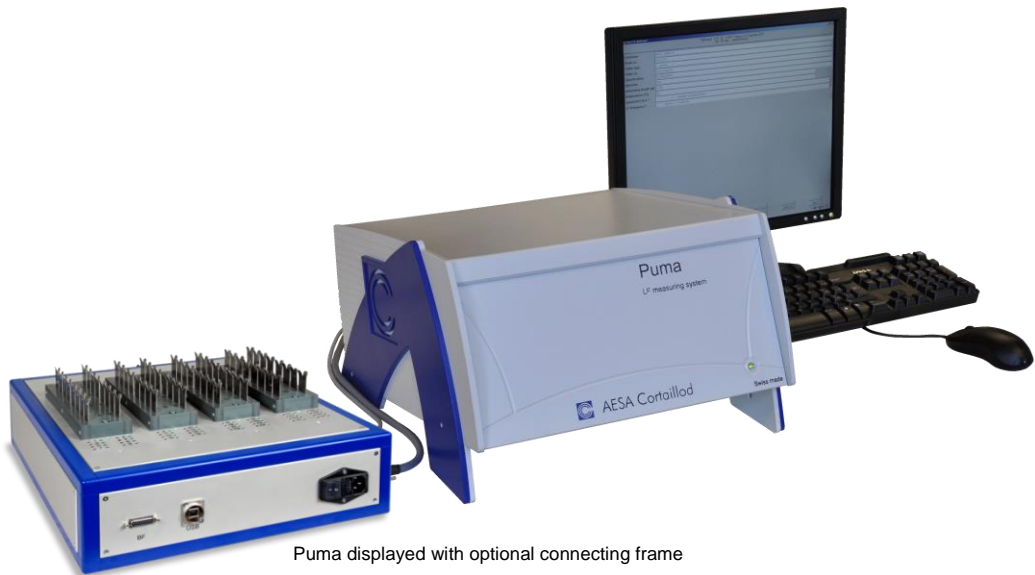


Puma

Automatic “Resistance / Capacitance & Capacitance unbalances” (RCKE) test instrument



Puma displayed with optional connecting frame

DESCRIPTION

This RCKE testing system is especially developed for the intermediate testing of long distance pairs and quads intended to be assembled in more complex cables.

During the production process, the performance of the twisting-machines can be controlled at regular intervals allowing monitoring the manufacturing quality of the cable by analysing the measured Low Frequency (LF) parameters. The analysis of the results can provide needed data useful for process control, product traceability or any other statistical information.

The LF parameters measuring technology provides a self-calibration. It is designed to test pairs and quads. Four measuring frequencies are integrated in the capacitance bridge allowing measurements at 12.5Hz, 125Hz, 800Hz and 1000Hz, respectively.

Puma can accept one or two monopliers (for 2 pairs or 1 quad) for single or double end measurements (long cables) as well as the use of connecting frames allowing the connection of cables reaching up to 128 pairs.

KEY FEATURES

- **A high precision automatic solution**
 - Quality inspection, with very high accuracy
- **User friendly and easy to operate**
 - Automatized testing sequences
 - Controlled through an integrated PC equipped with an external screen and keyboard with an intuitive and user-friendly software
- **Flexible and modular**
 - State of the Art software package
 - Integrated data storage and management system
 - Highly modular to fit any requirements
 - Capability of networking and allowing for remote maintenance
- **Option to measure “long distance” cables**



AESA Cortailod

TECHNICAL SPECIFICATIONS

Parameters	Description	Designation for pairs	Designation for quads	Accuracy	Scale
	Conductor resistance	Ra, Rb	Ra, Rb, Rc, Rd	$\pm 0,1\% \pm 10 \text{ m}\Omega$	0 - 20000 Ω
	Loop resistance	R	R1, R2		
	Resistance unbalance	DR	DR1, DR2, DR3	Computed	%, Ω
	Capacitance	C	C1, C2, C3	$\pm 0,25\% \pm 10\text{pF}$ at 1000 Hz $\pm 0,25\% \pm 10\text{pF}$ at 800 Hz $\pm 0,25\% \pm 10\text{pF}$ at 125 Hz $\pm 0,25\% \pm 50\text{pF}$ at 12,5Hz	0 – 600nF 0 – 600nF 0 – 5000nF 0 – 5000nF
	Capacitance unbalance to ground	Ei, Ea, E	Ei1-Ei3, Ea1-Ea3, E1-E3	$\pm 1\% \pm 6\text{pF}$ at 1000 Hz $\pm 1\% \pm 6\text{pF}$ at 800 Hz $\pm 1\% \pm 6\text{pF}$ at 125 Hz	0 – 20nF 0 – 20nF 0 – 200nF
	Capacitance unbalance	K	K1 – K12	$\pm 1\% \pm 30\text{pF}$ at 12,5 Hz	0 – 200nF
<p><i>Note: The given accuracies are worst cases. Typical accuracy is twice better as specified.</i></p> <p>Additional calculated parameters</p> <ul style="list-style-type: none"> - Mutual Inductance L (μH) and L/R ratio ($\mu\text{H}/\Omega$) - Secondary parameters Attenuation (Insertion Loss) and Characteristic Impedance (100Hz – 10kHz) <p>Statistical parameters</p> <ul style="list-style-type: none"> - Maximum measured value - Absolute maximum measured value - Minimum measured value - Absolute minimum measured value - Average value - Variance - RMS - Upper quality factor - Lower quality factor - Quality factor - Absolute average value - Standard deviation 					
Components	<ul style="list-style-type: none"> • One main unit type AESA Puma • One 22" external monitor with keyboard & mouse • Two inputs for the connection of monopliers or connecting frames • 2x USB outputs & 1x RJ45 • One power cord • One operating manual 				
Supply Voltage	100 - 240 VAC / 50 - 60 Hz / Consumption: 25 W				
Dimensions (Width x Depth x Height)	390 x 390 x 250 cm, weight 12 Kg (screen & keyboard excluded)				
Article No	18.9100.0001.0				

COMPONENTS

We deliver:

- Measurement device
- Optitest LF measurement software
- One monitor, keyboard and mouse
- ISO 17025 Certificate

REQUIRED COMPONENTS

- Monopliers and/or connecting frames

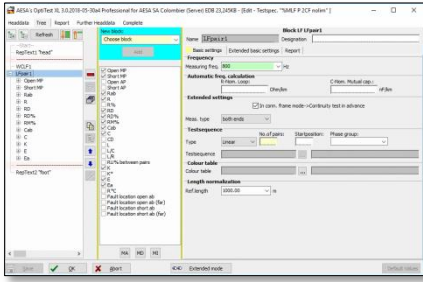
AVAILABLE OPTIONS

The equipment can be completed with:

- 9000 RCKE ISO 17025 certified standards
- Maintenance contract
- Spare parts

AESA proposes other specific equipment for high frequency and high voltage measurements

KEY BENEFITS



USER-FRIENDLY

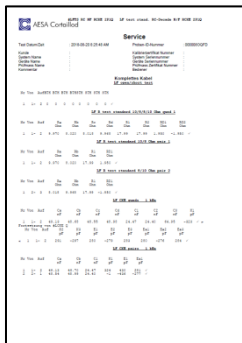
- Self-cutting knives for a fast cable connection
- Automatized testing sequences
- Multilingual Optitest software
- Direct results without post calculation

ISO 17025 ACCREDITED



ACCURATE

- The equipment is ISO/IEC 17025 certified and checked against traceable calibration standards
- The risk of human error is reduced to its strict minimum
- No movable parts for maximum measurement speed, accuracy and reliability



SMART

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

OVERVIEW

SYSTEM

The system consists of a central measuring unit. The optional connection tables are mobile, thus facilitating the handling and connection of the cable.

Robust mechanical design to facilitate maintenance and servicing operations.

LOW FREQUENCY PARAMETERS (RCKE - L)

The low frequency parameters unit is designed to measure wires, pairs, triads or quads.

The resistances R and DR are measured according to the 4 points method (Kelvin).

The capacitances CKE can be measured at different frequencies to accommodate different cable lengths.

(Please refer to our application note 'Length Restrictions in Cable Testing').

The inductances L and L/R ratio are computed from other LF parameters

The unit provides self-calibration.

<u>Measured parameters</u>	<u>Pairs</u>	<u>Triads</u>	<u>Quads</u>
Conductor Resistance	Ra, Rb	Ra, Rb, Rc	Ra, Rb, Rc, Rd
Loop Resistance	R	R1	R1, R2
Resistance unbalanced <i>(computed)</i>	DR	DR1	DR1, DR2, DR3
Capacitance	C	C1	C1, C2, C3
Capacitance unbalanced	K	K1	K1-K12
Capacitance unbalanced to ground	Ei, Ea, E	Ei1, Ea1, E1	Ei1-Ei3, Ea1-Ea3, E1-E3
Inductance <i>(computed)</i>	L	L1	C1, C2, C3
Inductance / Resistance ratio <i>(computed)</i>	L/R	L1/R1	L1/R1, L2/R2

OPTITEST (Software)

The measuring system is equipped with OptiTest LF (a module of our CIQ quality data management software) which allows to prepare a measurement, to control the Puma to automatically acquire all the values of the defined parameters, to evaluate the results, to provide the measurement reports in the desired format, and to 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...)
- the appropriated limits and conditions
- 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.

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.

- Preliminary line test to verify the cable connection (short cut, crossover,...)
- In case of problem, the operator can repeat the measurement or continue by 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.

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

The screenshot shows the 'Measuringparameter cap.unb.to shield EA [Ea, LFpair1], pF' window. A list of parameters is shown with checkboxes for selection:

Active	Limittype	Description	Upper limit	Lower limit
<input checked="" type="checkbox"/>	Lim	Limit Meas. Values		
<input checked="" type="checkbox"/>	Min abs	Minimum value absolute		
<input checked="" type="checkbox"/>	Max abs	Maximum value absolute		
<input checked="" type="checkbox"/>	X abs	Average value absolute		
<input checked="" type="checkbox"/>	SX abs	Standarddeviation absolute		
<input checked="" type="checkbox"/>	RMS	Root mean square		
<input checked="" type="checkbox"/>	N	No. of measur. Values		
<input checked="" type="checkbox"/>	Units	Unit		
<input checked="" type="checkbox"/>	RefLength	Referencelength		
<input checked="" type="checkbox"/>	MeasFreq	Measur. frequency		
<input checked="" type="checkbox"/>	NozmFoorm	Norm. formula		
<input checked="" type="checkbox"/>	No>Lim	No. of elements >Limit		

Below the parameter list, a 'Service' window is open, displaying test details and results for 'LF test standard 10/8/10 Ohm quad 1' and 'LF test standard 10/8 Ohm pair 1'.

Example of selection of parameters to be measured and printed

The screenshot shows the 'Block LFpair1' configuration window. Key settings include:

- Frequency:** Measuring freq: 800 Hz
- Automatic freq. calculation:** R-Nom. Loop: Ohm/km, C-Nom. Mutual cap.: nF/km
- Extended settings:** In conn. frame mode->Continuity test in advance
- Testsequence:** Type: Linear, No. of pairs: 2, Start position: 1, Phase group: 1
- Length normalization:** Ref.length: 1000.00 m

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. Connecting frames

AESA has developed a wide range of connecting frames, giving the customer the possibility to connect up to 128 pairs simultaneously.

The connecting frames are equipped with self-cutting knives, able to handle copper diameters between 0.4mm and up to 2.5mm.

Remarks: Two connecting frames are required to make 100% automatic measurements. Other fixture sizes or designs are available on request.

Name	Number of pairs	Reference
LFT8	8 pairs	15.9208.0001.0
LFT16	16 pairs	15.9216.0001.0
LFT32	32 pairs	15.9232.0001.0
LFT56 (squared shape)	56 pairs	15.9256.0002.0
LFT56 (round shape)	56 pairs	15.9256.0001.0
LFT104	104 pairs	15.9214.0001.0
LFT128	128 pairs	15.9218.0001.0



LFT32



LFT56
(round shape)

2. RC knives Monoplier 2 m with start (Sub-D)

Article No: 50.0001.0071.0

The simplest way to connect a cable is to use a mechanical monopliers.

2 or 4 monopliers can be connected to the PUMA system, depending on which parameters have to be measured. Two are sufficient if "K" parameters between pairs or quads are not necessary.

Otherwise, 4 monopliers are required. In any case, these monopliers are mainly used with low pair/quad count cables. As soon as the cable structure is exceeding 8 pairs, connecting frames are highly recommended.



3. Option allowing the measurement of Capacitance Unbalances between pairs and Quads (K4-K8 and K9-K12 parameters)

This option is needed when using monopliers instead of connecting frames for measuring K4-K8 and K9-K12.

4. 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



5. Set of Spare parts

Article No: 50.0900.0004.0

AESA is recommending following set of spare parts for securing operations during two years:

- 1 KM measuring bridge 9100.02
- 1 RM measuring bridge 9100.03
- 1 AZU relay matrix board 9100.05
- 1 CPU board 9100.00
- 1 set of different hardware
- 1x4 pairs boards
- 10 blades
- 1 set of relays
- 1 set of fuses

6. Sticker printer type QL-700

Article No: 51.0500.0012.0

aesa									
Numéro Id		U72							
Opérateur		AESA							
Température		24,00							
Longueur du câble		167							
Fréquence		800							
Date		10.06.2010 16:46							
Remarque		test							
Ra	Rb	Rc	Rd	R1	R2	DR1	DR2		
Ohm	Ohm	Ohm	Ohm	Ohm	Ohm	%	%		
14.672	14.685	14.687	14.636	29.359	29.324	0.047	-0.171		
C1	C2	K1	K2	K3	E1	E2	E3		
nF	nF	pF	pF	pF	pF	pF	pF		
10.414	10.399	-62	72	-104	88	-88	-90		



This printer is directly connected to the USB port of the Puma. It allows printing stickers.

7. Laser Printer

Article No: 51.0500.0021.0