Gaia DC

Programmable High Voltage test system combining several additional measurements (IR, LF, HF)

Indicative pictures: Gaia S (16 wires) & Gaia M (40 wires)

DESCRIPTION

Gaia is dedicated to high voltage testing of multi-conductor cables (pairs, quads, building wires,...). Its programmable generator allows to determine the sequences to be performed, either wire(s) to wire(s) or wire(s) to ground. Gaia is equipped with active and passive safety circuits that guarantee an optimal and safe usage.

Gaia can take advantage of the connected cable to perform additional measurements such as insulation resistance, low frequency (and computed high frequency) parameters. Thus, it allows for quick, easy, efficient and reliable testing without the need for time-consuming reconnections. It then provides a consolidated measurement report.

Gaia DC is available in three versions to cover the needs up to 208 wires.

KEY FEATURES

- Automatic testing equipment combining:
  - Continuity / short circuit test
  - High Voltage test (6kV DC)
  - Insulation Resistance (IR) test
  - Low frequency (LF) parameters measurement
  - High frequency (HF) parameters calculation
- For telecommunication, industrial and building cables:
  - Capacity configurable from 8 to 208 wires per step of 8 wires
- Connecting frame with self-cutting knives
- Easy operation and dedicated reports

AESA Cortaillod

TECHNICAL SPECIFICATIONS

Model	Gaia DC		
Version	S (24 wires)	M (104 wires)	L (208 wires)
Article	25.0024.0001.0	25.0104.0001.0	25.02081.0
Connecting frame capacity (by step of 8 wires)	8 - 24	32 - 104	112 - 208
Wire diameter	Ø 0.6 - 2.5 mm Ø 1.3 - 2.5 mm stripped		
Extremities	Single		
Dimensions HV connecting frame	60 x 80 x 95 [cm]	110 x 65 x 200 [cm]	2x (110 x 65 x 200)
Dimensions control unit	60 x 60 x 200 [cm]		
Weight: control unit / frame	100 / 100 [kg]	100 / 150 [kg]	100 / 2x 150 [kg]
Operating / storage temperature	5...40° / -10...60°C		

HIGH VOLTAGE

Voltage setting	0.1 to 6 kV DC ± (2% +5 V)
Voltage stability	< ± 3% from output voltage
Measurement accuracy	± (1.5% +5V)
Test current	0 - 4 mA
Testing time	1 to 9999 seconds, steps of 1 s
Test sequences	wires to wires / wires to ground
Max cable capacitance	1 µF

INSULATION RESISTANCE

Voltage	20 to 1000 VDC, ± (1% +1 V)
Range min	Utest / 1000 * 1 MOhm
Range max	Utest / 1000 * 200 GOhm
Measurement accuracy	± (1.5% + 1 digit)
Max cable capacitance	100 µF

LOW FREQUENCY (RCKE)

Parameters	Accuracy	Scale
Conductor resistance Ra, Rb (Rc, Rd)	± 0,1% ± 10 mΩ	0 - 20000 Ω
Loop resistance R (R1, R2)		
Resistance unbalance DR (DR1, DR2, DR3)	%, Ω (Computed)	
Capacitance C (C1, C2, C3)	± 0,25% ± 10pF at 1000 Hz ± 0,25% ± 10pF at 800 Hz ± 0,25% ± 10pF at 125 Hz ± 0,25% ± 50pF at 12,5Hz	0 – 600nF 0 – 600nF 0 – 5000nF 0 – 5000nF
Capacitance unbalance to ground Ei, Ea, E (Ei1-Ei3, Ea1-Ea3,E1-E3)	± 1% ± 6pF at 1000 Hz ± 1% ± 6pF at 800 Hz ± 1% ± 6pF at 125 Hz ± 1% ± 30pF at 12,5 Hz	0 – 20nF 0 – 20nF 0 – 200nF 0 – 200nF
Capacitance unbalance K (K1 – K12)		

- The given accuracies are worst cases. Typical accuracy is twice better as specified
- In automatic frequency mode an extra 1% accuracy has to be added on parameters C, K and E

COMPUTED PARAMETERS

Parameters	(*) frequencies between 100Hz – 10kHz
Mutual Inductance L	mH
Inductance / Resistance L/R	mH/Ω
Attenuation (Insertion Loss) * IL	dB/100m at 20°C
Near-End CrossTalk * NEXT	dB
Far-End CrossTalk * FEXT	dB
Characteristic Impedance * Zc	ohm
Velocity Of Propagation * VOP	%c

COMPONENTS

The equipment is delivered with:

- Control unit on a separate trolley
- Connecting frames with self-cutting knives
- Testing equipment (µohm meter, dielectric meter,…)
- Integrated safety elements (lamp, emergency stop, safety circuit)
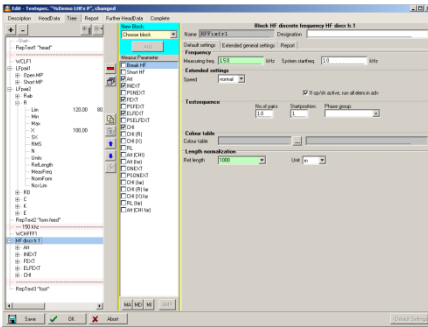- Computer, monitor, OS Windows, OptiTest,…

AVAILABLE OPTIONS

The equipment can be completed with:

- ISO 17025 certified calibration box
- Low Frequency calibration standards
- Various spare part kits
- Warranty extension
- Maintenance agreement

Product design and specifications are subject to change without notice

KEY BENEFITS

VERSATILE

- Several tests performed at once
- No special HV or LF knowledge required
- OptiTest software is multilingual
- Direct results without post calculation
- Test order library

ACCURATE

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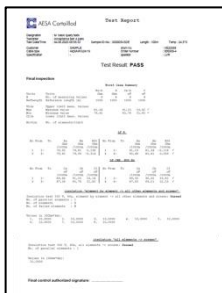
SMART

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

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Overview

SYSTEM

Gaia is an equipment designed to automatically perform high voltage testing of multi-core cables (pairs, quads, building cables,...). Its programmable generator allows to determine the sequences to be performed, either wire(s) to wire(s) or wire(s) to ground. Examples

- wire to wire a_1 to b_1 a_2 to b_2 a_3 to b_3 …
- wires to wires a_{1-n} to b_{1-n} a_{1-n} to c_{1-n} a_{1-n} to d_{1-n} …
- wire to ground a_1 to GND a_2 to GND a_3 to GND   …
- wires to ground a_{1-n} to GND b_{1-n} to GND c_{1-n} to GND   …

But Gaia also takes advantage of the connected cable to perform other measurements such as insulation resistance (IR), low frequency (LF) parameters, and computed high frequency (HF) parameters.

Its heavy-duty design and its ergonomics features enable it to be used on the shop-floor as well as in the laboratory. The Gaia is mounted on trolleys allowing it to be easily moved to the cable location. Gaia is operated from an embedded computer with AESA OptiTest software.

MEASURING SEQUENCES

The measurement sequences can be defined in the specification according to the cable specifications. Below is an example of measurement sequences.

- Continuity test
- Resistance measurement (R, DR)
- Short circuit test
- Capacitance measurement (C, K, E)
- High frequency parameter computing
- High Voltage test (HV)
- Cable discharge
- Insulation resistance test (IR)
- Cable discharge
- Reporting

SAFETY / HIGH VOLTAGE TEST / INSULATION RESISTANCE

The test voltages generated by the Gaia system can be life-threatening. For safety reasons it is therefore necessary to use a protection fence connected to an in-build safety circuitry. During the test, a red warning light is indicating that high voltage is applied on the cable under test. If a problem occurs, the measured current detector immediately switches off the output voltage and activates optical, acoustic and/or electric alarms.

LOW FREQUENCY PARAMETERS (and high frequency secondary parameters)

The low frequency parameters measurement includes a self-calibration. It is designed for testing pairs and quads. Different measuring frequencies are integrated in the capacitance bridge, in order to be chosen in accordance with the cable length (by default 12.5 Hz, 125 Hz and 800 or 1000 Hz). The high frequency parameters are calculated using the secondary parameters method, up to 10 kHz. The resistance is measured at 4 points (Kelvin bridge).

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

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HF Calculated parameters at 800Hz (1'000Hz)

Attenuation
Crosstalk
Velocity of propagation (VOP)

Statistical parameters

Maximum and minimum measured values	Absolute maximum and minimum measured value
Average value	Absolute average value
Quality factor	Upper and lower quality factor
RC product	Standard deviation RC
Quadratic average	RMS
Standard deviation	Variance

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 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.

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
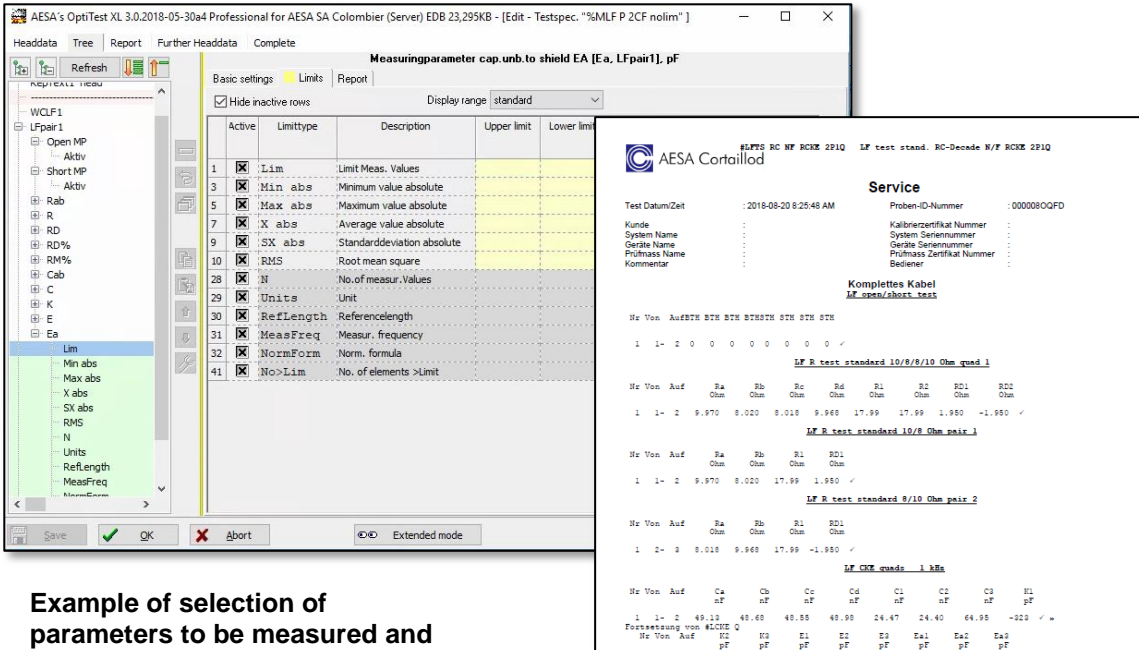
Example of selection of parameters to be measured and printed
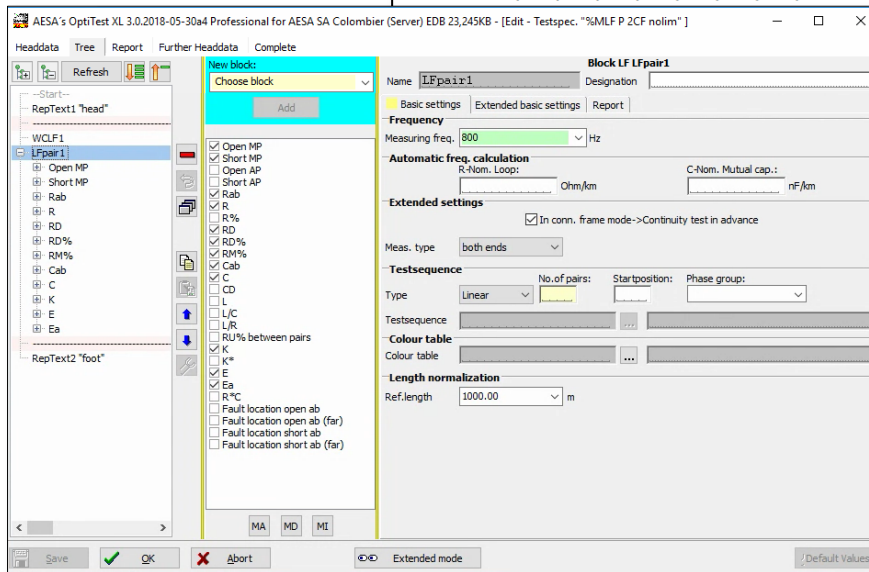
Data management

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.

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Options

1. ISO 17025 certified calibration box ResCal 3

Article No: 45.0001.0003.0

This standard is needed to verify the accuracy of each range of the mega-ohmmeter / insulation resistance testing part.
This standard is delivered with an ISO 17025 certificate.

Including 3 resistance reference values:

- #1: 100 MOhm, ±0,25% // 25ppm
- #2: 1 GOhm, ±1% // 25ppm
- #3: 10 GOhm, ± 5% // 100ppm

Delivered with ISO 17025 certificate

2. Low Frequency calibration standards AESA 9000

Article No: 45.9000.0001.0

Set of 5 calibration standards ISO/IEC 17025 certified

The set 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

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3. *Spare parts*

AESA recommends the following set of spare parts:

	LF measurement (Standard kit)	HV and LF measurement (Full kit)
1 KM measuring bridge 9100.02	✓	✓
1 RM measuring bridge 9100.03	✓	✓
1 AZU relay matrix board 9100.05	✓	✓
1 CPU board 9100.00	✓	✓
1x4 pairs boards	✓	✓
10 blades	✓	✓
1 set of relays	✓	✓
1 set of fuses	✓	✓
1 control board		✓
1 HV board		✓
Article No:	50.0900.0005.0	50.0900.0006.0

4. *LaserPrinter*

Article No: 51.0500.0021.0

5. *Warranty extension*

Article No: 60.0900.0004.0

Details available on request

6. *Maintenance contract*

Article No: 55.0500.0012.0

Details available on request

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