

ENERGY CONDUCTOR MEASUREMENT



AESA Cortailod

THE INCREASING COST OF
RAW MATERIALS MAKES IT
ESSENTIAL TO USE THEM AS
EFFICIENTLY AS POSSIBLE

THIS GOAL CAN ONLY
BE ACHIEVED WITH AN
EXTREMELY ACCURATE AND
RELIABLE MEASUREMENT
OF THE RESISTANCE OF THE
CONDUCTOR.

OUR SOLUTION

Performing fast measurements during manufacturing, ensuring optimal results accuracy, combining facilitated data analysis and simplicity of installation, the **ResTest** family is the perfect solution to overcome major challenges facing cables manufacturers.

ResTest family includes integrated equipment specifically designed for the cable industry.

These resistance bridges not only offer the operating comfort, but also allow mastering of all related uncertainties (temperature, length, current distribution...) to ensure full reliability of the measurement.

OUR OFFERING

AESA provides a full range of equipment, ISO 17025 certified, to fulfil the specificities of most types of conductors - solid, stranded, flexible, insulated,... - no matter where the measurement has to be performed:

- In the incoming inspection
- On the production line
- On the shop-floor
- In the laboratory
- On the drum

There are a multitude of areas requiring the transport of energy through a metallic conductor. The conductor's resistance is always one of the determining criteria. Our equipment allow the validation of this criterion, regardless of the type of cable.

- Building
- Automotive
- LV, MV, HV conductors
- Overhead lines
- Renewable energies
- and more

ROI < 6 MONTHS*

**Significant raw material savings
through ultra-smart inspection of
safety margin.**

* Considering a ResTest 813x on-the-line equipment and a reduced margin of 1% on a monthly copper consumption of 400 tons.

6 KEY POINTS TO BE VERIFIED FOR GETTING RELIABLE RESULTS.

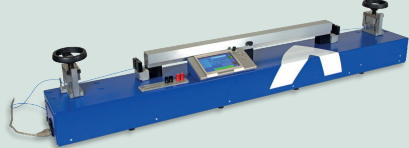
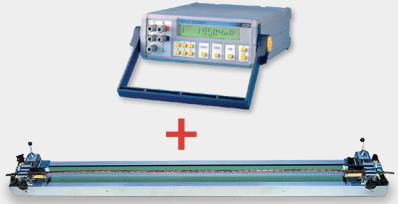
AESA SOLUTIONS

AESA delivers integrated, functional and accurate equipment/solutions.

The reliability of the measurement depends on the type of sample, uncertainties related to the connecting device and the operator skills. In our equipment, all components are integrated in a single housing to perfectly master the uncertainties. Unlike most other test equipment manufacturers, AESA specifications apply to a complete measuring system, which matches the needs of our customers.

COMPETITORS' SOLUTIONS

Usually, most of our competitors propose non-integrated equipment, with some parts according to their main activity (e.g. micro-ohmmeter). To address the wire industry, they propose accessories such as connection ruler, temperature probe, Kelvin test leads,... Specifications are limited to the dimensional capabilities. No clear commitment is given on the specifications for the complete system.

UNCERTAINTIES	STANDARD	AESA	COMPETITOR'S SOLUTION
	IEC 60468 Routine method		
1 Ohmmeter [Ω]	$\pm 0.15\%$	$\pm 0.03\%$	± 0.03 to $\geq 0.15\%$
2 Length [m]	$\pm 0.1\%$	Calibrated length (fix length) (deviation corrected by software)	Usually not specified (usually $> 0.05\%$ for adjustable systems)
3 Temperature [$^{\circ}\text{C}$]	$\pm 0.4^{\circ}\text{C}$	$\pm 0.05^{\circ}\text{C}$ (integrated sensor with stabilizer)	Usually not specified ~ (if ext. thermometer, accuracy $> 0.1^{\circ}\text{C}$) ($1^{\circ}\text{C} \rightarrow R=0.4\%$)
4 Method of measurement	4 points	Yes	Yes
5 Current distribution	Essential knowledge	Jaws (+ compacting system) (+ axial current injection)	Not specified
6 Risk of errors		Mastered by the equipment Compacting jaws Contact supervision with LEDs Fix integrated system Integrated sensor Final result displayed Print and export functions	Depend on the operators skills Current not correctly distributed Bad contact of voltage knives Wrong Kelvin points connections Temperature captured far from sample Wrong calculation of final result Wrong reporting
OVERALL ACCURACY R_{lin} [Ω/m at 20°C]	$\pm 0.15\%$	$\pm 0.10\%$	Never specified (instrument : electrical specifications) (rule : mechanical dimensions only)
CONCLUSIONS		Solution reliable for CABLES & WIRES 	Solution reliable for DISCRETE COMPONENTS 

RETEST FOR STRAND

The unique solution to measure directly on the stranding machine, without cutting samples. No other instrument available on the market today can offer such advantages!

On-the-line measurement avoids cutting samples for the laboratory. It allows rapid measurement, even at high temperature, of extremely compact and warm strands. Contrary to other solutions, ResTest 813x doesn't require the need of insulating a part of the production line (dangerous and unlawful).

OUR OFFERING

Temporary stop the production line, position and adjust the equipment towards the rope (height and slope). Tighten the jaws and close the cover. Set the basic data and start the measurement.

The equipment induces a regulated alternative current in the conductor and measures the difference of potential over a predetermined length. The resistance is calculated from the voltage to current ratio. The built-in probe measures the temperature of the conductor under test in order to display the corrected resistance value as function of the chosen nominal temperature.

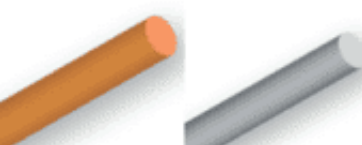
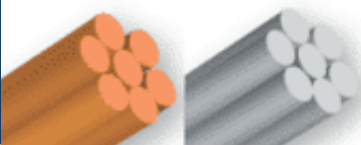
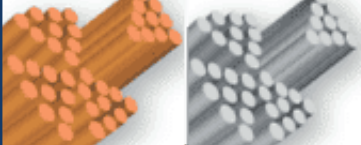
The equipment measures the rope temperature and the heating elements enable the whole area surrounding the measurement setup to quickly be brought up to the temperature of the conductor. All the heating elements are electronically regulated and controlled by microprocessor. After a few minutes only, the temperature is stabilized.

A signal notifies the operator when the displayed measuring value is valid. The value can be read or printed. At the end of the measurement, the operator may remove the equipment to continue the production.

Of course, ResTest 813x can also measure samples (use of a tensioner is recommended).



ResTest 8134

		CLASS 1 SOLID CONDUCTOR		CLASS 2 STRANDED CONDUCTOR		SECTOR CONDUCTOR	
							
		Cu	Al	Cu	Al	Cu	Al
12 AWG	2.5 mm ²	●		●		●	
9 AWG	6 mm ²	●		●		●	
2 AWG	35 mm ²	●		●		●	
3/0 AWG	95 mm ²	●		●		●	
450 MCM	240 mm ²	●		●		●	
1250 MCM	630 mm ²	●		●		●	
2000 MCM	1000 mm ²	●		●		●	
3600 MCM	1800 mm ²	●		●		●	
4000 MCM	2000 mm ²	●		●		●	

KEY FEATURES

- Substantial time saving as cables can be directly measured while still at high temperature, without cutting a sample
- Significant raw material savings through ultra-smart definition of the security margin of the production machinery
- Intermediate measurements during the production are possible.
- Material savings since the measurement is done directly on the rope in production (no sample to be scrapped)
- Facilitated data analysis as the display of the measured resistance values takes in consideration all parameters (nominal temperature, length, material...) related to the measurement
- Cost-effective solution provided by a robust trolley allowing to move and use the device on several lines
- The system is ISO 17025 certified



RESTEST 8134

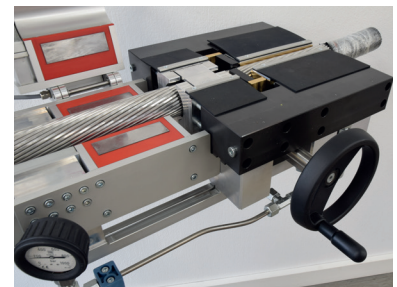
The standard version



ResTest 8134 is designed to measure copper and aluminium conductors of classes 1, 2 and sector-shaped conductors.

RESTEST 8135

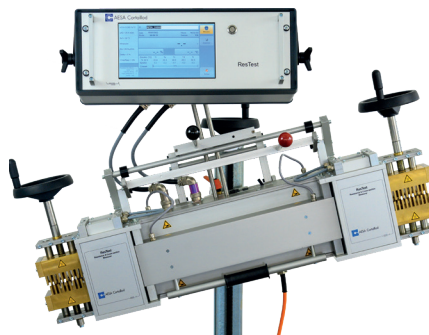
The aluminium version



ResTest 8135 can of course measure copper conductors, but is equipped with hydraulic jaws to extend the measuring range to aluminium conductors.

RESTEST 8136

The compact version



This model is specially designed to allow measurement when space is limited on the production line. It is shorter with a 50 cm ruler length.

IN TEST STATION/LABORATORY

RETEST FOR SAMPLES

The unique integrated solution to measure samples. In order to be reliable, measurement of the linear resistance of samples requires perfect mastery of important parameters such as temperature, length, input current, etc. This is the reason why this measurement is generally performed in the laboratory.

OUR OFFERING

ResTest offers a unique combination of ultra-high precision measurement with extreme simplicity of operation.

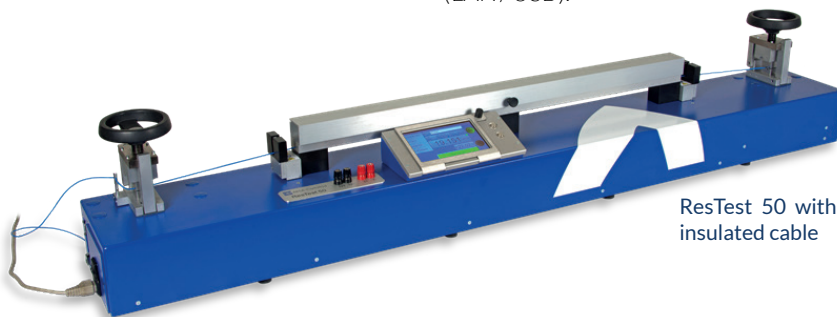
All critical components are integrated (temperature sensor, calibrated measuring ruler, micro-ohmmeter, specific jaws for all cable types etc.) which allows to manage and integrate measuring uncertainties.

Its two-button measuring system allows its use directly in production while its touch screen allows for advanced functionalities in the laboratory.

The displayed values can be used directly (all relevant corrections are already made), printed (label or report) or exported (LAN/USB).

KEY FEATURES

- Ease of use on the shop-floor, simple control with two buttons
- Extended test possibilities in the laboratory through a touchscreen
- Facilitated data analysis as the display of measured resistance values takes into consideration all parameters (nominal temperature, length, material...) related to the measurement
- High overall accuracy
- Several options available to enhance measurements of specialized samples
- Minimum risk of human errors
- Optimal traceability thanks to the saving of each measurement and related conditions
- ISO 17025 certified system

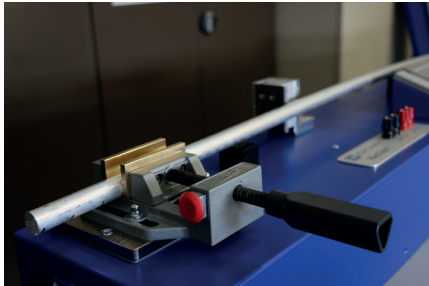


ResTest 50 with insulated cable

	CLASS 1 SOLID CONDUCTOR		CLASS 2 STRANDED CONDUCTOR		CLASS 5/6 FLEXIBLE CONDUCTOR		SECTOR CONDUCTOR		INSULATED CONDUCTOR	
	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al
20 AWG 0.5mm ²	ResTest 1									
12 AWG 2.5 mm ²	ResTest 1									
2 AWG 35 mm ²	ResTest 1									
1/0 AWG 50 mm ²	ResTest 1									
3/0 AWG 95 mm ²										
450 MCM 240 mm ²										
1250 MCM 630 mm ²										
2000 MCM 1000 mm ²										
3600 MCM 1800 mm ²										
5000 MCM 2500 mm ²										
7800 MCM 4000 mm ²										

RETEST 1

Solid conductors and rods

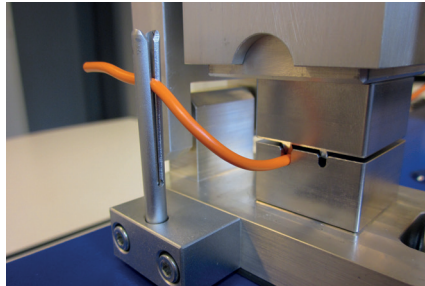


ResTest 1 perfectly masters the measurement of class 1 conductors. It is specially designed to suit the needs found after a casting or drawing process.

It can also measure round or specially shaped conductors like catenary wires. It accepts a very wide range of diameters. ResTest 1 can also perform conductivity measurements (option).

RETEST 50

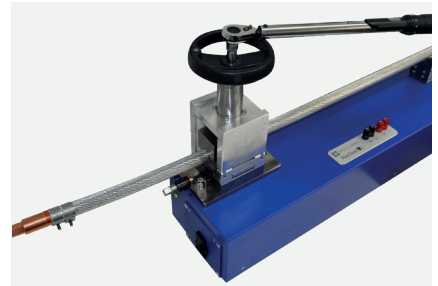
Small section wires and cables



ResTest 50 is a universal equipment ideally addressing the challenges experienced in the measurement of the small sections, including flexible and/or insulated wires and cables. It naturally finds its place in fields such as automotive or building for example.

RETEST 90

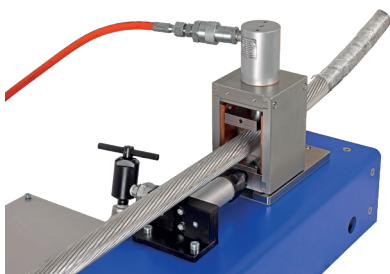
Medium section stranded conductors



ResTest 90 is an equipment designed to measure stranded conductors. It is equipped with quick-connect jaws for userfriendly and fast operation. In addition, it can be fitted with the "axial injection" option to improve the measurement of aluminium and/or waterproof cables.

RETEST 210

Medium and large section conductors



ResTest 210 is specially developed for the measurement of conductors with large cross-sections. Nevertheless, it is a universal equipment that can also be used to measure small and medium crosssections. It also accepts options such as "axial injection", water bath or other specific jaws to cover almost all measurement needs, including insulated, sectors and waterproof conductors.

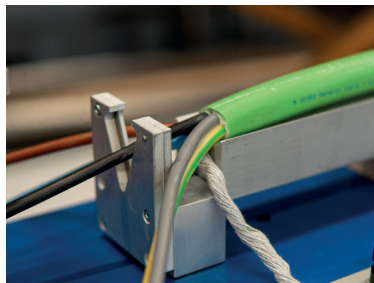
RETEST 410

Large section conductors

ResTest 410 designed for large-section conductors with diameters up to 85 mm, including those used in submarine cables. Its extended length ensures superior current distribution across the conductor section, resulting in even more accurate measurements.

RETEST 55

Small section wires and multicore cables



RETEST 95

Medium section stranded conductors - with water bath



ResTest 210

ACCESSORIES AND OPTIONS

AXIAL INJECTION

AESA has developed a new patent filed method for measuring the linear resistance of electrical conductors by axial current injection. Rather than injecting it transversely, current is injected axially. In this way, each wire in the conductor is in direct contact with the current source, thus minimizing the contact resistance effect between wires. Using this option on a ResTest significantly improves the repeatability and reproducibility of measurements.

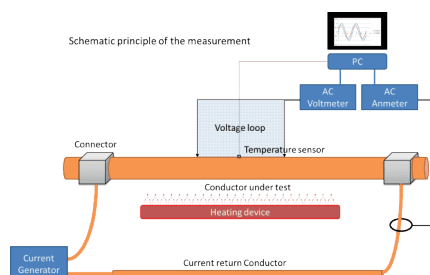
CONICAL AXIAL CONNECTOR



AC MEASUREMENT



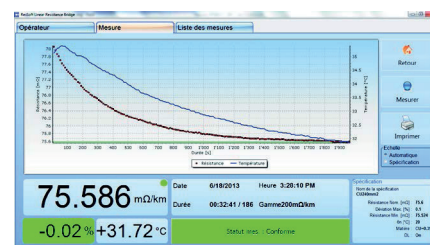
Measurement of the AC linear resistance of conductors is required to properly qualify large cross-section conductors, as DC linear resistance measurement can not take into account the skin effect at frequencies of 50 and 60 Hz for such cross-sections.



RESSOFT



ResTest devices are delivered with a user friendly and powerful embedded software, running under Windows via a touch screen. It allows to operate the device and to manage/export the measured values and test conditions.



ResSoft is a remote software to control the resistance bridge through an external PC. It completes the embedded software and allows, among other things, the following functions:

- Library of conductor specifications
- Measurement monitoring
- Reporting
- Maintenance

FLAT AXIAL CONNECTOR

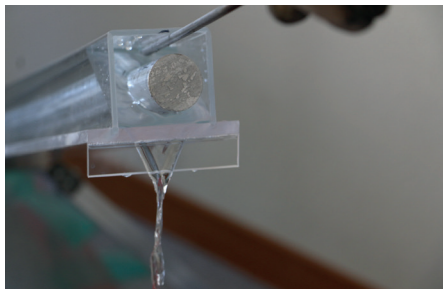


ACCESSORIES

Depending on the needs and the type of equipment, AESA offers different options to extend the measuring range and the functionalities or to allow the maintenance of the equipment. Some examples among others:

- Different compacting jaws
- Tensioning system
- Axial current injection
- Conductivity
- Water bath
- Label printer
- ISO 17025 Certified calibration box
- ISO 17025 Certified standard rod

CONDUCTIVITY (& RESISTIVITY)



Conductivity and Linear Resistance are intrinsically linked. Although the conductivity (inverse of resistivity) measurement is the first step of cable production monitoring, it may be the most critical. The measurement consists of three different phases : resistance, length, and volume measurements. All the measurements are then processed by software and the result is directly computed.

RETEST DRUM



ResTest Drum was designed together with a Swiss quality partner for high degree of accuracy to measure long conductor lengths. With its specifically designed clamp for the cable industry, it allows resistance measurement directly on the production or delivery drums.

It is a high precision, fully automatic, microprocessor based system. It applies a pre-set current level, selected by the user. The measurement results are automatically displayed within few seconds only on the easy-to-read liquid crystal display and can be stored or printed out.

The ResTest Drum is a lightweight system, it is battery operated, and comes complete with its own rugged waterproof field case.

KEY FEATURES

- Lightweight and portable
- Single push button operation
- Wide measuring range
 - resistances from 0.1mΩ to 400kΩ
 - cable diameter up to 50 mm / 2"
- Highest accuracy
 - automatic current reversal mode
- Automatic cable length and temperature corrections

SERVICES

SERVICES

Attest your credibility through certified standards and ensure equipment reliability for trustworthy data.

OUR OFFERING

- TECHNICAL SUPPORT
- CABLE ACADEMY & TRAINING
- ISO 17025 CALIBRATION
- REPAIR, MAINTENANCE & UPGRADE

Quality stems from processes, not from inspection. Nevertheless process improvements are only possible with reliable information that comes from dependable testing equipment used to conduct inspections.

Obviously, quality of inspection must remain at the highest level, whatever the age of your testing equipment and the evolution of technical standards.

AESA offers a wide range of services to help you face these challenges. Our technical team is committed to ensuring the long-lasting, accurate operation of your equipment, including through our ISO 17025 accredited laboratory. And the personalised courses offered by our engineers as part of our Cable Academy help to increase the efficiency and expertise of your employees.

Even the most reliable systems require regular, planned and preventive maintenance to perform at optimum levels and according to specification.

ISO 17025 & SERVICE CALIBRATION

AESA is proud of its ISO quality credentials. Our calibration laboratory is ISO 17025 accredited, confirming our competence to perform calibrations on our measurement instruments.

The AESA calibration laboratory is accredited by the Swiss Accreditation Service (SAS). The SAS is recognized by the major international accreditation bodies, such as the European Cooperation for Accreditation (EA), the International Accreditation Forum (IAF) and the International Laboratory Accreditation Cooperation (ILAC).

You can therefore rest assured that all your testing instruments are calibrated to the most stringent standards.

In addition, we offer a calibration service: not only can we re-calibrate your instruments; we can also provide certified standards for clients wishing to check instruments by themselves.

ISO 17025 ACCREDITED



MAINTENANCE AND SERVICE CONTRACTS

Even the most reliable systems require regular, planned and preventive maintenance to perform at optimum levels and according to specs. For this reason, AESA proposes preventive service packages.

Based on cycles of one, two or three years depending on your specific needs, the AESA service packages will help you extend the operating life of your equipment, control your maintenance costs, and ensure optimal performance. Moreover, our packages include advantages such as an extended warranty period, priority remote support, and discounted spare parts.

AESA MANUFACTURES AND SELLS HIGH-QUALITY PRODUCTS. BUT BESIDES THIS, AS A RELIABLE SUPPLIER, AESA CLOSELY WORKS WITH YOU BY OFFERING A FULL SET OF SERVICES TO ADDRESS YOUR MOST CHALLENGING NEEDS AND REQUESTS.

SERVICES, QUALITY AND CERTIFICATION

CABLE ACADEMY

At AESA, our aim is not only to provide our clients with effective solutions. We also help you enhance your understanding and mastery of the technology related to cable metrology, as well as optimize your ability to gain the full benefits of the possibilities offered by AESA equipment.

With our long track record and extensive experience in the cable industry, AESA is proud to offer a vast array of training courses.

Our specialists can share their expertise and know-how in an advisory capacity role on topics related to the wider aspects of cable metrology, such as for instance quality assurance or measurement of low and high frequency parameters.

Equally, we offer training courses for more specific topics such as installation and handling. Thus, persons ranging from senior engineering level to technicians and installers can broaden their knowledge and increase their skills from such training opportunities.

We can tailor courses to fit your specific needs, and deliver training in different languages, either on your premises, or at our headquarters in Switzerland.



**ATTEST YOUR CREDIBILITY
THROUGH CERTIFIED
TOOLS AND ENSURE
EQUIPMENT RELIABILITY
FOR TRUSTWORTHY DATA.**

WARRANTY EXTENSION

AESA is confident with its technology and the quality of its goods. This is why all new instruments are supplied with a 2-year warranty period by default.

In order to protect its customer's investment, AESA offers an exclusive contract with a smart package of services, extending the warranty period from 2 up to 3 years.



TESTING LABORATORY

**Increase your competitiveness,
outsource your specific cable tests,
and get an external certified report
from our cable Testing Laboratory**

OUR OFFERING

Cable testing with recognised report

- DC & AC linear resistance
- LF & HF communication cables
- EMC testing

We can take care, for instance, of your type-testing and/or production qualification testing following the latest applicable standards.

The testing is always performed on calibrated measurement instruments following the ISO17025 standard.

Results are made available in a recognised test report. Our testing laboratory is particularly relevant for tests for which you lack the capabilities and/or the adequate resources to perform, or that are seldom required.

Moreover, it allows you to properly balance your CapEx and OpEx, while having access to unmatched knowledge and expertise.



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