

Linear resistance measurement

WHAT DO YOU NEED ?

Check first your objectives and constraints.
Set your decision criteria.
Select the right price/performance solution.

Test bench:	integrated, on-line	integrated, off-line	not integrated
★ = the most adapted solution			
Decision criteria:			
Reliability	★	★	
Conformance with standards	★	★	
Uncertainties & risks mgmt	★	★	
User-friendly	★	★	
ON the line measurements	★		
Data handling	★	★	
Investment price			★
Operating costs	★	★	
Saving time & raw material	★	★	

■ AESA delivers integrated, functional and accurate equipment / solutions.

Usually the equipment proposed on the market are by manufacturers specialised in instruments (micro-ohmmeter). To approach the wire industry, they propose accessories such as connection rule, temperature probe, Kelvin test leads,...). Their electrical specifications are related to the performance of the sole instrument, their dimensional specifications are simply the rule's clamping capacity e rule and none with a clear commitment on the specifications for the complete system.

The reliability of the measurement depends on the type of sample, uncertainties related to the connecting device or the operator skill. In our equipment, all components are integrated in a single housing to perfectly master the uncertainties.

Unlike most other manufacturers, AESA specifications apply to a complete measuring system, which matches the needs of our customers.

■ Beware reading datasheets

- Verify the overall specifications, R_{lin} [Ω/m at $20^{\circ}C$]
- Verify all the uncertainties are under control
- Verify the scope of guaranteed specifications

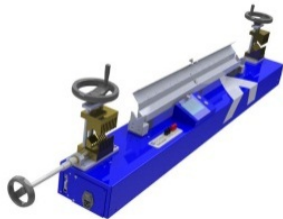
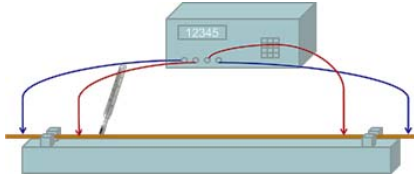

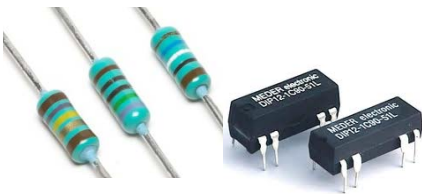
We are pleased to provide you some information that can help you taking the right decision.

■ Guaranteed vs mechanical specs

Equipment are able to measure over the guaranteed specifications with a relative accuracy. But it requires skill and a perfect master of the metrology (*comparison method as example*).

equipment	guaranteed specifications	max ability
8130 family	Cu 1800 mm^2 ($\cong 48\text{mm}$) Al 1200 mm^2 ($\cong 40\text{mm}$)	$\varnothing 58\text{ mm}$
ResTest 80	630 mm^2 ($\cong 28\text{mm}$)	$\varnothing 52\text{ mm}$
ResTest 50	50 mm^2 ($\cong 8\text{mm}$)	$\varnothing 10\text{ mm}$

6 points to be verified for getting reliable results

INDIVIDUAL uncertainties	IEC 60468	AESA	COMPETITION
❶ Ohmmeter [Ω]	$\pm 0.15 \%$	$\pm 0.03 \%$	± 0.03 to more than 0.15%
❷ Length [m]	$\pm 0.05 \%$	Calibrated length (fix length) (deviation corrected by software)	Usually not specified (usually $> 0.05 \%$ for adjustable systems) ($1 \text{ m } \delta < 500 \mu\text{m}$)
❸ Temperature [$^{\circ}\text{C}$]	$\pm 0.1 \text{ }^{\circ}\text{C}$	$\pm 0.05 \text{ }^{\circ}\text{C}$ (integrated sensor with stabilizer)	Usually not specified (if ext. thermometer, accuracy $> 0.1^{\circ}\text{C}$) ($1 \text{ }^{\circ}\text{C } \delta \cong 0.4\%$)
❹ Method of measurement	4 points	Yes	Yes
❺ Current distribution	Essential knowledge	jaws + compacting system	Unknown (clamps/jaws)
❻ Risk of errors		Risks are mastered by the equipment <ul style="list-style-type: none"> • Compacting jaws • Contact supervision with LEDs • Fix integrated system • Integrated sensor • Final result displayed • Print and export functions 	Risks depend on the operators skill <ul style="list-style-type: none"> • 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 • Current inversion / e.m.f. suppression
LINEAR RESISTANCE	OVERALL accuracy		
R_{lin} [Ω/m at 20°C]	$\pm 0.20 \%$	$\pm 0.10 \%$ (overall accuracy)	Not specified (Instrument = electrical specifications) (rule = mechanical dimensions only)
CONCLUSIONS		SOLUTION RELIABLE FOR CABLES & WIRES 	INSTRUMENT RELIABLE FOR DISCRETE COMPONENTS  System inadequate for cables & wires