Van Welleman Villas

WhitePaper

Inbound Closed-Loop Source Measurements ver. 1.0

"end-to-end electrical-contact insurance, from source to outlet"

Ensuring the highest possible electrical safety requires much more than the traditional acceptance-test of the electrical installation. Therefore Van Welleman Villas® performs three additional laboratory-grade measurements. The first (and simplest) out of three measurement is an end-to-end inbound 4-wire MilliOhm source measurement. The goal of this measurement is to ensure an error-free electrical system with low-impedance contacts.

Failsafe residual-current detection and an effective protection against lightning strikes require an impeccable electrical system. Even the smallest imbalance in line-resistance can generate life-threatening voltages upon a lightning impact. Also, the impedance imbalance can influence the correct operation of the residual current protection. That is why Van Welleman Villas® performs a thorough in-depth analysis of the electrical system.

The very first step is to prevent imperfections and technical flaws in the system (e.g. bad contacts, loose connections, etc.). This is done by implementing an electrical system based upon "Critical Path" and "Safe Path" building blocks combined with industry-grade components instead of residential components (e.g. fuse, circuit-breaker, etc.).

The second step is to check for anomalies and errors due to a faulty installation. This can be achieved through the measurement of the loop resistance starting from one outlet-contact to the next, including all electrical components in the loop.

In order to detect any possible anomaly it is mandatory to eliminate all external influences due to the measurement set-up. This can be done through the combination of 4-wire test-lead compensation and threefold resistance measurements (i.e. Phase-Neutral, Phase-Ground, Neutral-Ground).

Finally, all measurements are represented in a two-dimensional plot (distance vs. impedance) enabling to easily detect anomalies (outside green of the zone in figure 2 on next page).

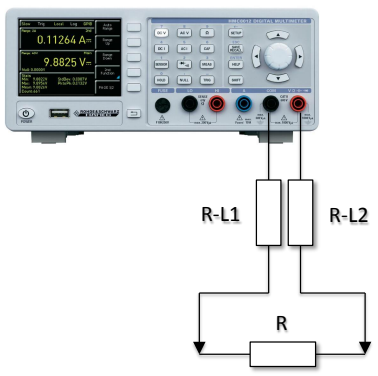
The following are some advantages of this acceptance test :

- Overall view on the connection-quality of all outlets.
- A truly and exhaustive end-to-end quality check.
- Provides insight on the contact quality.
- Includes phase-to-phase as well as phase-to-earth check.
- Provides useful data for statistical analysis (anomalies).
- Includes outlets, cabling, circuit beakers and fuses as well.
- 4-wire measurements exclude test-lead errors.
- The use of a Rohde & Schwarz laboratory multimeter with milli-ohm precision ensures exact measurement data.

All of the above is done with one purpose only … ensuring the very best and safe electrical systems for our customers.

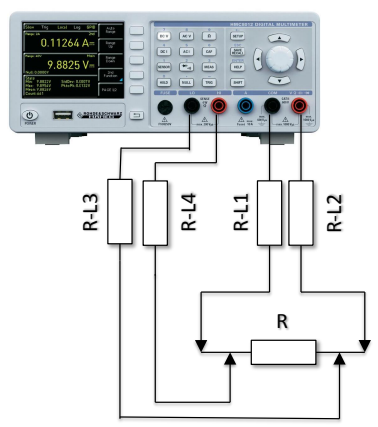
Traditional resistance measurement

Resistance measurements use a current-source enabling to calculate the resistance by measuring the voltage over the resistor (using Ohm's law R = U/I).



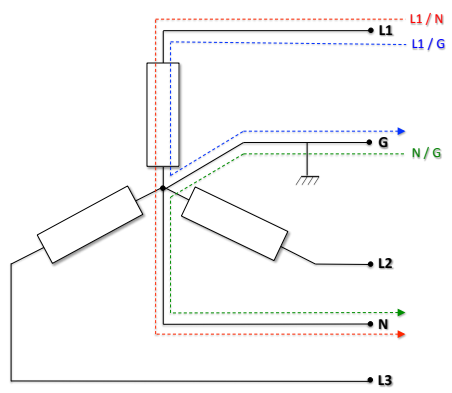
4-Wire test-lead compensation

4-Wire resistance measurements use the same principle as above, albeit with a separate high impedance input. As such the low resistance of the test leads (e.g. 1 Ohm) is negligible compared to the input impedance (100M Ohm).



4-Wire Resistance Measurement

Three resistance measurements are done per outlet, regardless of the phase (L1, L2, L3) it is connected to (L-N, L-G, N-G).



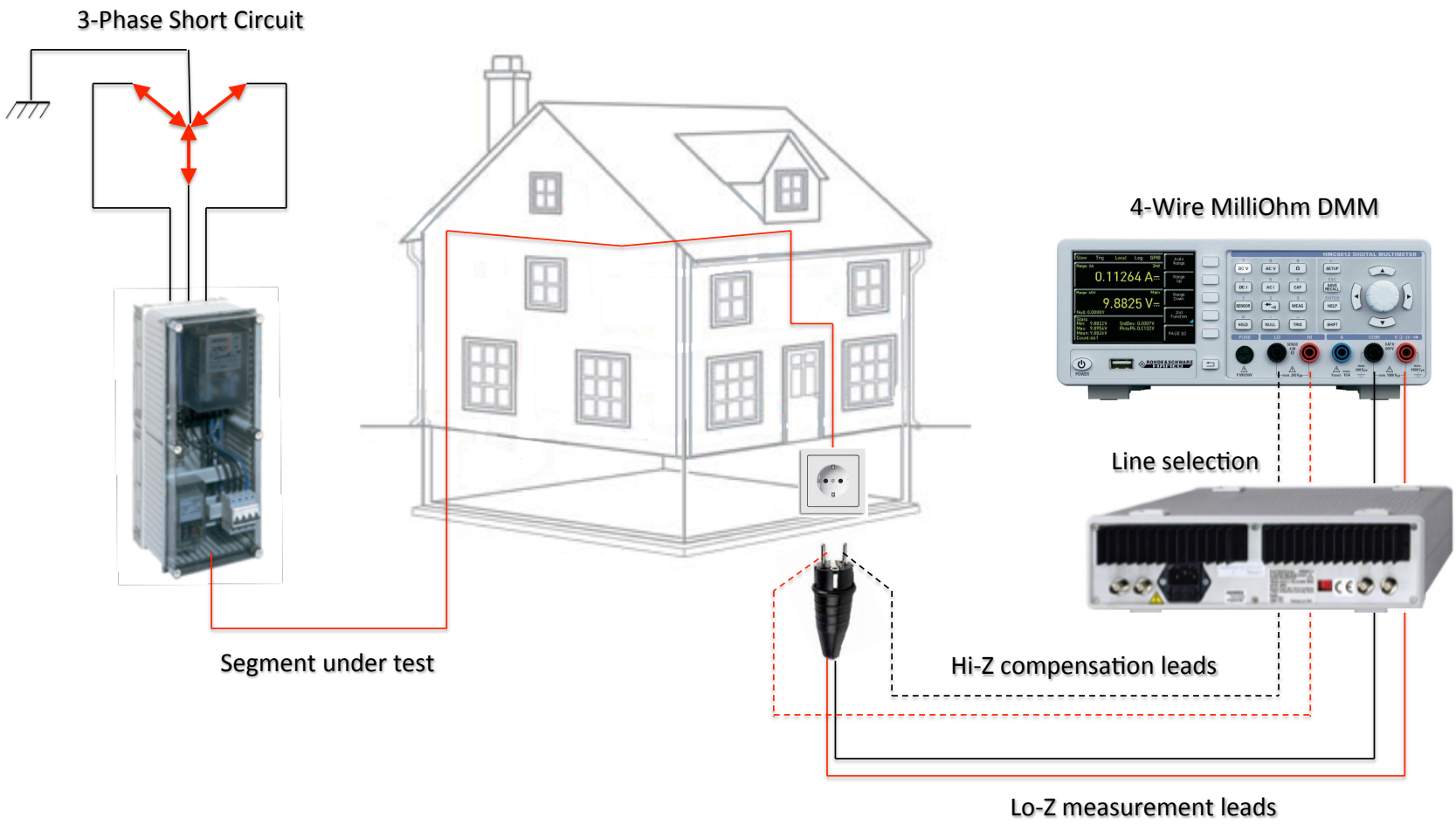


fig 1. Closed-loop source measurement with test-lead compensation (simplified test).
(A total of three measurements for each and every 230 VAC outlet)

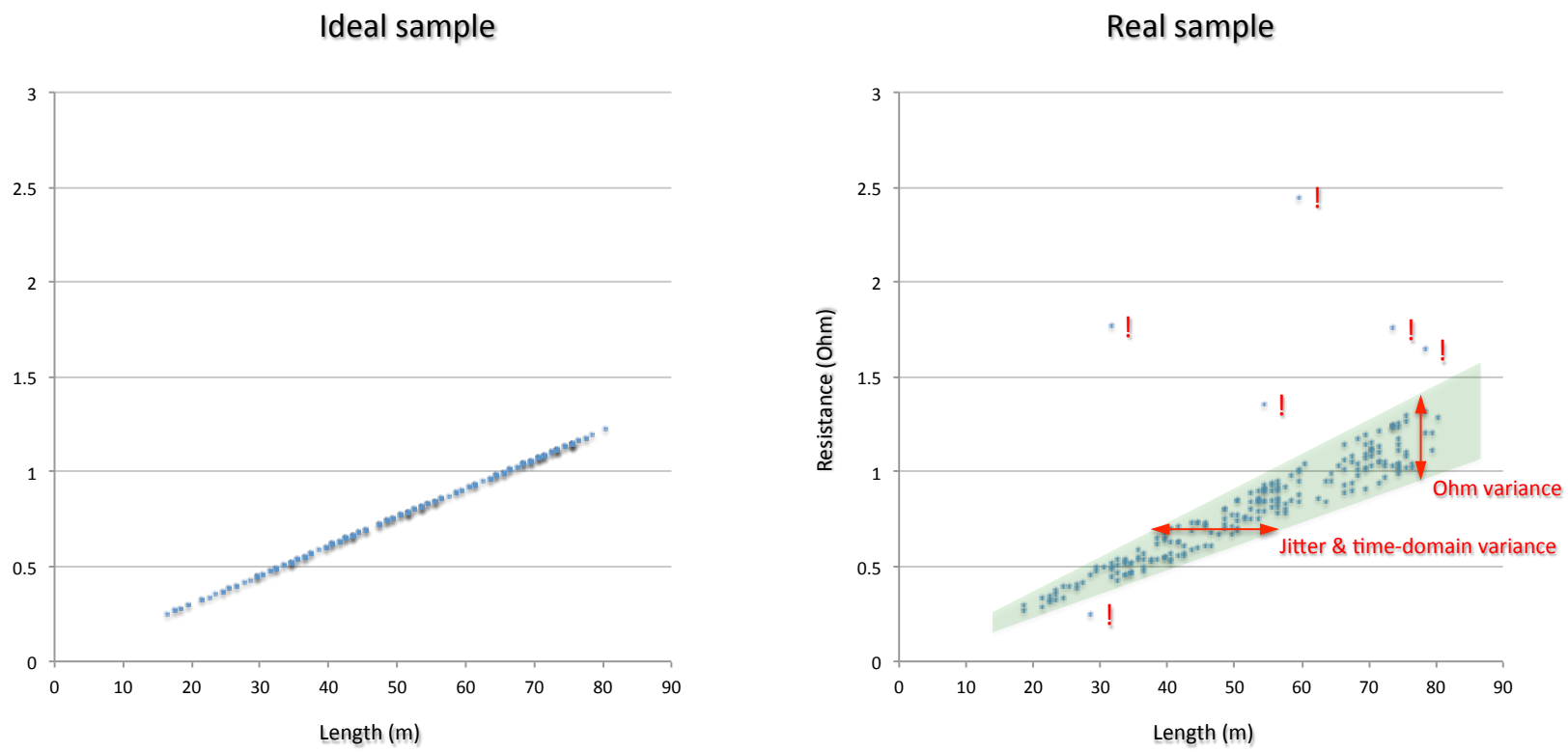


fig 2. Combining 4-Wire resistance data with time-domain length data enables to immediately detect anomalies (e.g. shorts, bad contacts, bad cable, hidden repairs, …).
(The green zone represents normal Ohm/meter values)

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