PROMET.
APPLICATION

PROMET High-Precision Ohm Meters

High-accuracy resistance measurement results with the Kelvin measurement method

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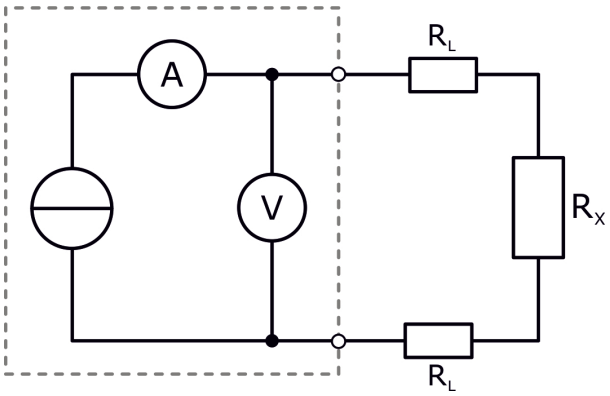
The measurement of very large or very small quantities places tough demands on measurement technology and resistance measurements are no exception. Using the two-wire method, it is not possible to carry out measurements with high accuracies on resistances in the micro-ohm and milli-ohm range. Using the four-wire or Kelvin measurement method, however, very low resistances can be measured extremely accurately.
The ohm meters for resistance measurement now available on the market use either two-wire or four-wire technology.



Two-wire method

The two-wire method is used for high resistances. However, with this measurement method, the resistance of the measuring leads influences the resistance result and this can lead to a large measuring error when measuring low resistances.

The four-wire or Kelvin measurement method is used for resistance measurements in the micro-ohm and milli-ohm range as it allows highly accurate and repeatable measurements of these low resistances. The measurement method is named after the physicist William Thomson „Lord Kelvin" [1] who developed this procedure in 1876.

This Kelvin measurement method is used by all the KoCoS resistance measuring systems in the PROMET range.

Four separate leads are used with the Kelvin measurement method. Two leads carry the current through the test object. The other two leads measure the voltage drop.

Four-wire connection to PROMET R300/R600

1) William Thomson, Lord Kelvin, b. 26th June 1824 in Belfast, Northern Ireland, d. 17th December 1907 in Netherhall near Largs, Scotland, was a British physicist born in Ireland.

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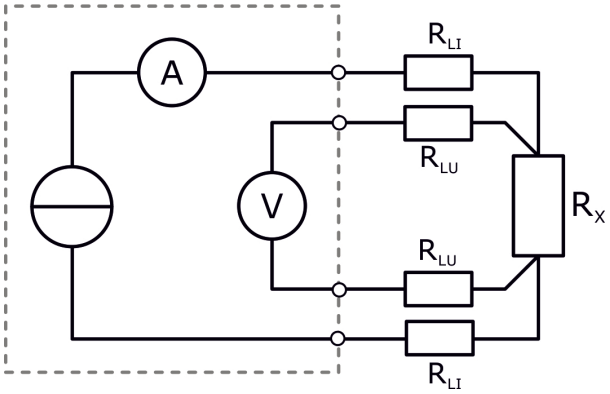
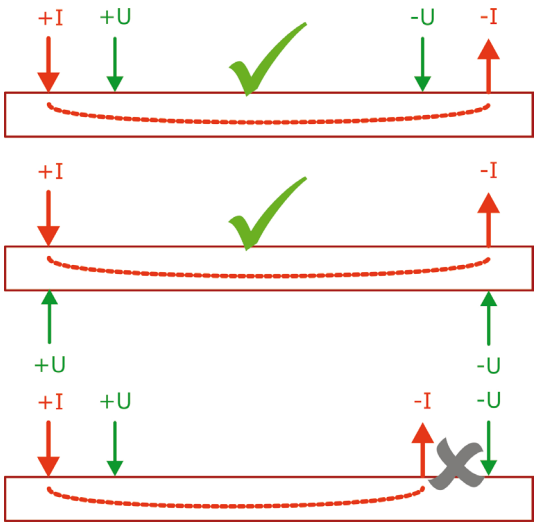


Four-wire or Kelvin measurement method

A constant current which is independent of the resistances of the supply cable flows through the measurement object. The resistance is measured directly on the measurement object via a high-resistance input amplifier. Because of the constant measurement current and the high internal resistance of the voltage input, the resistances of the measurement leads / supply cables and of the contact transitions do not affect the measurement result and no additional measuring error occurs.

In order to increase accuracy even more, test currents of up to 600 A can be generated which cause a higher voltage drop across the measurement object. This measurement method allows accurate and repeatable measurements of low resistances.



Connecting the four-wire method

Special attention must be paid to connection when measuring low resistances. A poor connection means a large measuring error.
The connection of the current to the measuring object is irrelevant; however, the connection must lie outside of the voltage drop measurement or be rotated by 180°.

The voltage drop measurement lies within the current connection (or rotated by 180°) and must be connected exactly to those points between which the resistance is to be determined. Correct polarity is also important when connecting.

Kelvin measurement clamps enable simple connection and offer a variety of measuring options for a wide range of applications. In order to fulfil the conditions of the four-wire method and to simplify the connection of four wires, two test contacts, insulated from one another, are attached

Kelvin measurement clamps

in one clamp. One set of contacts is used for power supply, the other as potential tap. Kelvin measurement clamps offer a practical solution for connecting four wires to cables, bus bars, electrodes, etc. and ensure a perfect and simple 4-pole connection to the measuring object.

With the Kelvin measurement method, as used in systems of the PROMET range, and with Kelvin measurement clamps, low-resistance measurements are made much easier. Fast and reproducible measurements allow an accurate assessment to be made of whether the test object meets the quality standards.

Measuring with PROMET SE and Kelvin measurement clamps

Kelvin test probe(s) KP 200 for two-handed working