

## **A simple resistance network for calibrating resistance bridges**

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### **ABSTRACT**

This paper describes a simple, passive, low-cost resistance network, closely related to Hamon build-up resistors, that enables the calibration of dc and low-frequency ac resistance and conductance bridges. The network is configured so that the four component resistors can be connected to realize 35 distinct four-terminal resistances, all interrelated by the usual formulas for the series and parallel connections of resistors. Theoretical analysis and experimental results show that with due care in the design, the network can be readily constructed to achieve an accuracy of better than  $1 \mu\Omega$ ; for resistances of the order of  $100 \Omega$ ; ( $1:10^8$ ) for angular frequencies from dc to  $10^4$  rad/s

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## **Resistance network for verifying the accuracy of resistance bridges**

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## ABSTRACT

A novel resistance network for verifying the accuracy of resistance bridges is described. The network of four resistors generates 35 four-terminal resistance values all interrelated by the formulae for series and parallel connections of resistors, and by appropriate choice of the resistors different resistance scales can be generated. Although many resistance bridges have internal calibration procedures, an independent check of the accuracy of such bridges when measuring actual resistances is often desirable. The network provides such a check and can be used to verify the accuracy of resistance bridges on a regular basis. It has been used to assess the accuracy of a cryogenic current comparator bridge and demonstrates an accuracy approaching  $1 \text{ n}\Omega/\Omega$  at  $100 \Omega$

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## A General Technique for Calibrating Indicating Instruments

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## ABSTRACT

A method for calibrating indicating instruments that exploits the combinatorial properties of a set of different-valued, and mostly uncalibrated, artefacts is described. The paper presents the underlying principles of the method, its limitations, and examples of the application of the method to mass balances, optical detectors, and resistance bridges. The method is applicable to indicating instruments that measure rational quantities and for which it is possible to combine artefacts with negligible error. For direct-reading instruments, at least one of the artefacts should be calibrated. For ratio-indicating instruments, none of the artefacts need be calibrated. It is shown that for artefacts that can be combined linearly, a binary sequence generally comes close to maximising the number of combinations available.

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