Kelvin-Varley Voltage Divider

KVD-500

The KVD-500 is a cost-effective, three-terminal, Kelvin Varley Voltage Divider that uses thumbwheel switches.

KVD-500 Voltage Divider

Features:

- Suitable for use in voltage and current dividers for calibration and linearity testing
- Eliminates the need for dials & multi-turn potentiometers
- 1 through 6-decade units are available
- Resistor accuracies from 0.01% to 1%
- Available as a stand-alone instrument in a plastic case or without a case for panel mounting
- Fully customizable for customers' needs

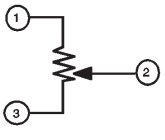
See Also:

- For higher accuracy and stability - **KVD-600/KVD-700**
- For a basic 2-terminal resistance substituter - **RS Series**
- For high-accuracy resistance substituter - **HARS Series**

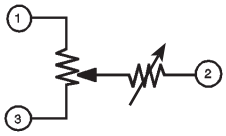
DESCRIPTION

Circuit Model

The Kelvin Varley Voltage Divider may be thought of as being equivalent to a digital potentiometer, except that it has an additional, variable resistance in series with the wiper arm. See circuit model figure below.



Digital Potentiometer



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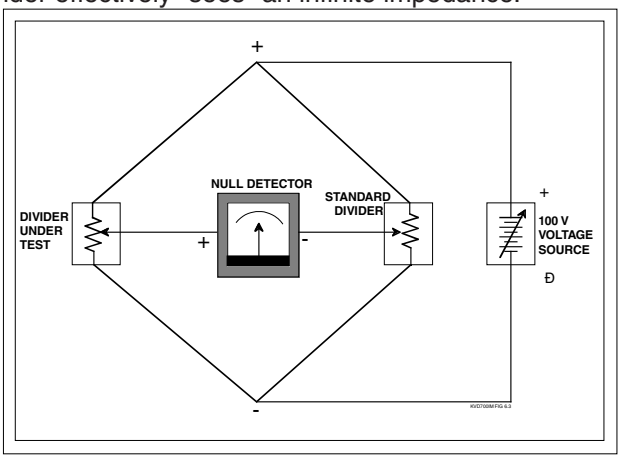
Effect of Series Resistance

The effect of series resistance may be safely ignored in general bridge applications, such as the one shown below. As the bridge comes into balance, the current that flows out of the divider is nominally zero; therefore, the divider effectively "sees" an infinite impedance.

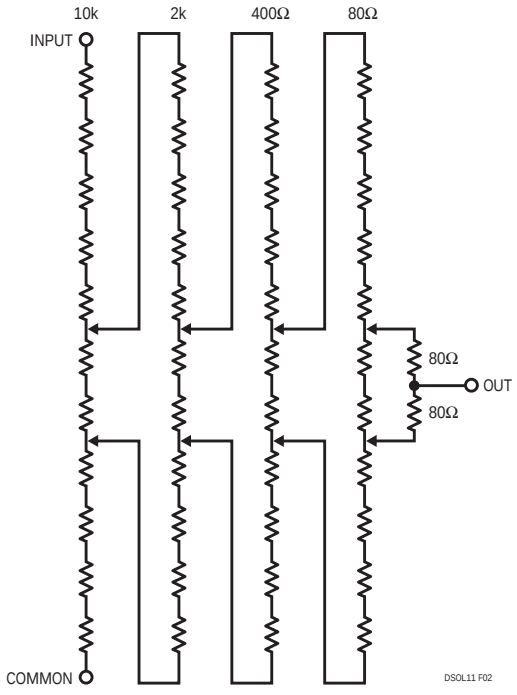


Typical application of a Kelvin-Varley Voltage Divider for measuring resistance of voltage

Resolution and Precision

The problem with a conventional voltage divider is that it uses a tapped resistor string, which has a fundamental design disadvantage: the resolution of 1 part in 1000 requires 1000 precision resistors.

The Kelvin-Varley Voltage Divider solves this problem by using a clever iterated scheme (see schematic below). In a typical design, each stage provides a decade of resolution and requires only 11 precision resistors. Cascading 3 stages permits any division ratio from 0 to 1 in increments of 0.001 (i.e. resolution of 1 part in 1000).



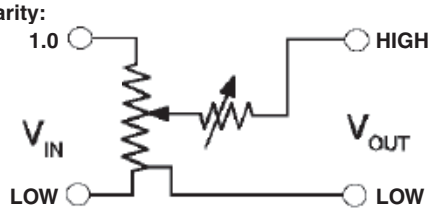
A 4-decade Kelvin-Varley Voltage Divider

IET LABS, INC. in the GenRad Tradition
534 Main Street, Westbury, NY 11590
www.ietlabs.com
TEL: (516) 334-5959 • (800) 899-8438 • FAX: (516) 334-5988

Kelvin-Varley Voltage Divider

SPECIFICATIONS

Absolute Linearity:



Linearity deviation, the error between the actual output voltage (V_{OUT}) and the output voltage for a particular setting (**S**) = [V_{OUT}/V_{IN}] - **S**
Linearity will be smaller than the resistor accuracy.

Power across input terminals:
2 W (others available)

Temperature coefficient:
50 ppm/°C (others available)

Resistor Accuracy:
Note: Linearity error will be smaller than the resistor error.
X: 0.01% ± 5 mΩ
Q: 0.02% ± 5 mΩ
A: 0.05% ± 50 mΩ
B: 0.1% ± 50 mΩ
C: 0.5% ± 50 mΩ
F: 1.0% ± 50 mΩ

Operating temperature:
10°C to 50°C

Dimensions:
Without case: 81 mm x 79 mm x 56 mm (3.2" x 3.1" x 2.2")
With case: 120 mm x 79 mm x 56 mm (4.7" x 3.1" x 2.2")

Applications:
See www.ietlabs.com/kelvin-varley-voltage-dividers

ORDERING INFORMATION

KVD-500 - B - 50k - 5 - PM

(Example: 50 kΩ, 0.1%, 5-decade unit for panel mounting)

Resistor Accuracy:
X: 0.01% ± 5 mΩ
Q: 0.02% ± 5 mΩ
A: 0.05% ± 50 mΩ
B: 0.1% ± 50 mΩ
C: 0.5% ± 50 mΩ
F: 1.0% ± 50 mΩ

Total Resistance (Ω)	No. of Decades				
	1	2	3	4	5
10, 20, 50	x	x			
100, 200, 500	x	x			
1 k, 2 k, 5 k	x	x	x	x	
10 k, 20 k,50 k	x	x	x	x	x
100 k, 200 k, 500 k	x	x	x	x	x
1 M, 2 M, 5 M	x	x	x	x	x

Packaging Options:
PM: Supplied without case for panel mounting or other use
WC: Packaged in a plastic case with binding posts

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