
**High Accuracy Resistance
Decade Boxes
Type 00 Series
5, 6 & 8 Decades**
Operating Instructions



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Limited Warranty & Limitation of Liability

CROPICO guarantees this product for a period of 1 year. The period of warranty will be effective at the day of delivery.

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Disposal of Old Product



This product has been designed and manufactured with high quality materials and components that can be recycled and reused.

When the crossed out wheellie bin symbol is attached to a product it means the product is covered by the European Directive 2002/96/EC.

Please familiarise yourself with the appropriate local separate collection system for electrical and electronic products.

Please dispose of this product according to local regulations. Do not dispose of this product along with normal waste material. The correct disposal of this product will help prevent potential negative consequences for the environment and human health.

User Note:

These Operating Instructions are intended for the use of Competent Personnel.

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HIGH ACCURACY RESISTANCE DECADE BOXES 5, 6 & 8 DECADES

The 00# series of resistance boxes are available in 5, 6 & 8 decades. High Accuracy and wide range 0.001 ohm to 11 Megohms are combined in a compact lightweight case. The switches have gold plated contacts to ensure a low contact resistance and negligible thermal emf. Some models are particularly suited to Pt100 simulation with resolution as low as 0.001 ohm ($\pm 0.0025^{\circ}\text{C}$).



The Switches

Contact material gold plated brass. Contact Resistance $< 5\text{m}\Omega$. Insulation Resistance (all paths $> 10\text{G}\Omega$)

Resistance Coils

Proof Voltage 1 kV. Temperature Co-efficient. $\pm 3\text{ppm}/+20^{\circ}\text{C}$ to $+85^{\circ}\text{C}$. $\pm 5\text{ppm}$ maximum over -55°C to $+125^{\circ}\text{C}$. 0.1, 0.01 and 0.001 dials $10\text{ppm}/^{\circ}\text{C}$

Full Load Stability

$\pm 35\text{ppm}/10,000$ hours. $\pm 50\text{ppm}/26,000$ Hours

No Load Stability

$\pm 25\text{ppm}/10,000$ hours. $\pm 35\text{ppm}/26,000$ hours over full temperature range; -55°C to 125°C

Power Rating

0.33 watt ($+85^{\circ}\text{C}$). 0.25 watt ($+110^{\circ}\text{C}$)

Maximum Continuous Working Voltage

Up to 250V DC

Noise

Essentially non-measurable

Thermal EMF

<0.4 μ V/°C typical <1.5 μ V/°C max

Encapsulation

Moulded Epoxy

Leads

22 SWG tinned copper

Windings

Exclusive 'air cushion' technique provides virtually stressless elements for improved performance. Non inductively wound. Direction of winding reversed at half turns point

7 Models to choose from

Model	Decades	Total R Ω	Smallest Steps Ω	Residual Resistance
005-B	5	1,112.10	0.01	1.0
006-A	6	1,112.11	0.001	1.0
006-B	6	11,112.10	0.01	1.0
006-C	6	111,111	0.1	0.07
008-A	8	111,112.11	0.001	1.0
008-B	8	1,111,112.1	0.01	1.0
008-C	8	11,111,111	0.1	0.08

Accuracy of Decades

Decade	Accuracy	Max Current
10 x 0.001	$\pm 2\%$	1.4 A
10 x 0.01	$\pm 1\%$	1.4 A
10 x 0.1	$\pm 0.5\%$	1.4 A
10 x 1	$\pm 0.2\%$	300mA
10 x 10	$\pm 0.01\%$	100mA
10 x 100	$\pm 0.01\%$	30mA
10 x 1k	$\pm 0.01\%$	18mA
10 x 10k	$\pm 0.01\%$	5mA
10 x 110k	$\pm 0.01\%$	1.8mA
10 x 1M	$\pm 0.01\%$	0.5mA

The 00# series of decade resistance boxes has been designed to be lightweight, small size, and require the minimum maintenance. The switches should not require any maintenance during their lifetime. The resistance elements are factory adjusted to be within specification and it is not possible to alter their value. In the event of a resistor becoming damaged it is necessary to replace the whole resistor. The 00# series of decade resistance boxes has been designed to be lightweight, small size, and require the minimum maintenance. The switches should not require any maintenance during their lifetime. The resistance elements are factory adjusted to be within specification and it is not possible to alter their value. In the event of a resistor becoming damaged it is necessary to replace the whole resistor.

Residual Resistance

With all the decade dials set at 0 there will be a resistance measured at the terminals, this resistance is made up from 2 components. The resistance of the wires connecting the decade switches to the terminals; this is a constant value. The contact resistance of the decade switches, this will vary each time the switch is turned or disturbed. This residual resistance must be added to the decade values set on the decades, it is therefore important that this residual should be as low and constant as possible.

The CROPICO decade boxes have a low and stable residual resistance per decade. This value is controlled by the use of special low resistance switches.

It is not practical to manufacture decade resistance boxes where the lowest decade is less than 0.1Ω , to switch in steps of 0.01Ω and lower, special techniques need to be employed.

Low Value Decades

When switching decade resistance of 0.01Ω and lower the switch contact resistance variations become significant, this variation can be typically $40\text{m}\Omega$ for an 8 decade unit and $30\text{m}\Omega$ for a 6 decade and would, therefore, add greatly to the errors of the selected values. In addition the total residual resistance which would also include the internal wiring of the decade box could be significantly higher than the lowest decade values. CROPICO overcome this problem by using the Wagner Wolf decade, this technique enables higher resistance values to be used for the decade which are then shunted to give the correct incremental steps. The residual value of the unit is deliberately increased to 1Ω , and the 1Ω decade will start at 1 and not zero. This is not normally a problem, because the applications that require values to be selected with high resolution would have a much greater full scale resistance, typical applications include the simulation of Pt100 temperatures. The Pt100 resistance thermometers have a resistance of 100Ω at 0°C and 0.01°C is approximately equal to 0.001Ω .

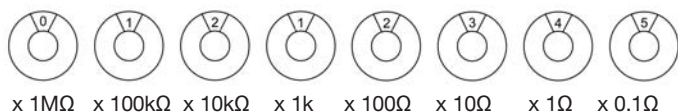
Decade	Incremental Step	Accuracy $\pm 0.01\%$
100 Ω	100 Ω	$\pm 0.01\Omega$
200 Ω	100 Ω	$\pm 0.02\Omega$
300 Ω	100 Ω	$\pm 0.03\Omega$
400 Ω	100 Ω	$\pm 0.04\Omega$
500 Ω	100 Ω	$\pm 0.05\Omega$
600 Ω	100 Ω	$\pm 0.06\Omega$
700 Ω	100 Ω	$\pm 0.07\Omega$
800 Ω	100 Ω	$\pm 0.08\Omega$
900 Ω	100 Ω	$\pm 0.09\Omega$
1000 Ω	100 Ω	$\pm 0.10\Omega$

Note: the residual value of the decade resistance box must always be added to the value selected and this will give additional errors to these values, this emphasises the importance of the CROPICO low and more importantly stable residual resistance value.

Operation

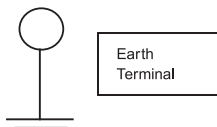
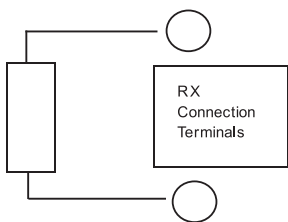
To select a resistance value turn the dial of the appropriate decade until the desired value is indicated in the viewing window. The multiplier for each decade is shown below the dial i.e. x 0.1 or x 10 etc.

Example to select 121,234.5 Ω



Connection

The connections to the resistance box are made via the two 4mm terminals marked with the resistance symbol either banana plugs or spade terminals may be used. The third terminal marked with an earth symbol is connected directly to the top panel and case.



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