

2003S—2003N

2003S Precision Voltage Calibrator

- 0.02% Accuracy
- Battery/Mains Operation
- 20 mA Output
- 10 PPM Per Hr Stability
- Portable 22 × 16 × 19 cm

The 2003S is a solid state battery powered instrument suitable for applications requiring a precision voltage source of low internal resistance. Its small size, robust construction and independence of mains power make it easily portable and convenient for laboratory, field and industrial use. Five ranges to 10 V are provided with extension to 1000 V using an external optional unit.

Applications include calibration, linearity and gains stability measurements, etc. on DC amplifiers, digital and electronic voltmeters, data loggers and chart recorders. The 10 ppm per hr stability and low noise levels are of particular interest when an extremely stable backing off voltage is required.



2003N Precision Voltage Calibrator and Potentiometer

- 2003S Plus
- Micro-Volt Null Balance for Potentiometric Measurement

The 2003N includes all the features of the 2003S with the addition of a microvolt null balance display. This enables it to be used for potentiometric voltage measurement in addition to its basic function as a calibrator. The null zero and sensitivity are adjustable via front panel controls—maximum sensitivity enables null balance to within 1 microvolt.

Applications are essentially those of conventional potentiometers with the following significant advantages:

1. No standardisation is required.
2. 20 mA output current.
3. Electronic null with microvolt sensitivity.



DESCRIPTION

The Calibrator employs a precision zener diode as a basic reference source. This provides the input to an F.E.T. chopper amplifier system which operates in a feedback stabilised mode. The gain value is determined by a set of precision metal film resistors which are selected by the 5-decade thumbwheel switch. The output voltage is variable from 0 to 9.9999 V in 5 ranges. This can be extended to 1000 V by means of an external mains-powered unit which is available as an extra. The Calibrator's output resistance is typically 50 milliohms on the top 3 ranges and the maximum output current that can be drawn on these ranges is automatically limited to 35 mA—this is to prevent damage to the circuitry in the event of accidental short circuit, etc. The lower ranges have an output resistance of 1 ohm and will supply current up to the short circuit value. To ensure complete reliability the Calibrator range switch employs two contacts in parallel for each position—even if a contact fails the calibrator still functions correctly.

The 2003N version incorporates a high performance null amplifier system which allows potentiometric measurements to a resolution of 1 microvolt. Null is obtained by adjusting the thumbwheel digits until the display meter indicates zero. The meter is scaled 20-0-20 and by suitable adjustment of the sensitivity control can display directly in mV or μ V.

The 100 V and 1kV Output Units are mains-powered units which extend the output capability of the 2003. They are connected to the Calibrator output terminals and accurately multiply the Calibrator output voltage.



SPECIFICATION

Output

0-9.9999 V in 5 ranges.
 0-9.9999 V in 100 μ V steps.
 0-999.99 mV in 10 μ V steps.
 0-99.999 mV in 1 μ V steps.
 0-9.9999 mV in 0.1 μ V steps.
 0-999.99 μ V om 0.01 μ V steps.

Accuracy

10 V & 1 V ranges: $\pm 0.02\%$ of setting.
 0.005% of range.
 100 mV, 10 mV & 1 mV ranges:
 $\pm 0.05\%$ of setting.
 $\pm 0.005\%$ of range.
 $\pm 1 \mu$ V.

Output Resistance

10 V, 1 V & 100 mV ranges: Less than 0.1 ohm
 (typically 0.05 ohms).
 10 mV & 1 mV ranges: 1 ohm.

Maximum Output Current

10 V, 1 V & 100 mV ranges: 30 mA.
 10 mV & 1 mV ranges: Up to short circuit value although
 it should be noted that loads of greater than 1 Kohm
 will give greater than 0.1% error.

Maximum Overload

The instrument can withstand continuous short circuit
 on the output for all ranges. The 10 V, 1 V and 100 mV
 ranges have an automatic output current limit set at
 35 mA.

Output Voltage Stability

Less than 30 ppm/ $^{\circ}$ C (0° C to $+ 50^{\circ}$ C).
 Less than 5 ppm/V variation in supply voltage.
 Less than 75 ppm/year.
 Less than 10 ppm/hr at constant temperature.

Output Polarity

Positive or negative switch selected. A centre 'off'
 position is provided.

Output Noise Level

10 V, 1 V, 100 mV ranges: Less than 10 ppm of setting
 $\pm 2 \mu$ V (0-10 Hz).
 10 mV & 1 mV ranges: Less than $\pm 0.05 \mu$ V (0-10 Hz).

Reference Source

Precision zener diode selected after a special ageing
 process for a temperature co-efficient better than
 5 ppm/ $^{\circ}$ C and stability better than 10 ppm per month,
 non cumulative.

Power Supply

Time Electronics power unit type PU2 which is housed
 in the rear of the 2003. The PU2 will power the 2003
 direct from the mains or an internal rechargeable
 battery. The battery is automatically charged when
 mains power is connected. Alternatively an optional
 battery unit taking ten 1.5 V U2-size cells (60 x 33 mm
 dia.) may be fitted in place of the PU2. Access to the
 battery compartment is from the instrument rear.

Battery Level Indicator

A front panel display provides a continuous indication
 of the battery state, a minimum level indicating the
 batteries should be changed or recharged.

Null Balance (2003N only)

The Null display is on a front panel meter, zero and
 sensitivity controls are provided.
 Max. Sensitivity: $\pm 20 \mu$ V f.s.d. (2μ V/div.).
 Min. Sensitivity: ± 200 mV f.s.d.
 Meter Scale: 20-0-20 (20 divisions).
 Input Resistance: 10 Mohms increasing to greater than
 100 Mohms at null balance.
 Dimensions: 220 x 160 x 190 mm.
 Weight: 3.3 kg.

OPTIONAL EXTRAS

1 kV Output Unit

A separate mains-powered unit which enables the
 output capability to be increased. It is connected to
 the 2003's output, extending the range to 1000 V.
 Transfer Accuracy: 0.05%.
 Maximum Output Current: 3 mA.
 Dimensions: 160 x 216 x 195 mm.
 Weight: 3 kg.

See 1013 data sheet for full specification.

100 V Output Unit

A separate mains-powered unit which enables the
 output capability to be extended to 100 V. It is
 connected to the 2003 output and multiplies the 10 V
 range by a factor of 10. Transfer accuracy 0.005%.

Rack Mount Panels

Pre-punched matt black panels 4 u high (172 mm) are
 available for mounting either one or two 2003-size
 units in 19 in. systems.

Carry Case

Houses the 2003 for field use, etc. A leather shoulder
 strap and leads compartment are provided. Operation
 in the case is possible.

Calibration Certificates

Traceable
 to National
 Standards
 can be
 supplied.

CERTIFICATE OF CALIBRATION				K. 2003N/ 1046	
INSTRUMENT		DATE	BY	FOR	USER
10 V RANGE					
SETTING	NULL	LINEARITY	SETTING	NULL	LINEARITY
1.0	0.0	0.02	1.0	0.0	0.02
2.0	0.0	0.02	2.0	0.0	0.02
5.0	0.0	0.02	5.0	0.0	0.02
10.0	0.0	0.02	10.0	0.0	0.02
1 V RANGE					
SETTING	NULL	LINEARITY	SETTING	NULL	LINEARITY
0.1	0.0	0.02	0.1	0.0	0.02
0.2	0.0	0.02	0.2	0.0	0.02
0.5	0.0	0.02	0.5	0.0	0.02
1.0	0.0	0.02	1.0	0.0	0.02

ORDERING INFORMATION

Description	Order Code
D.C. Voltage Calibrator 2003S	1010
D.C. Voltage Potentiometer-Calibrator 2003N.....	1011
Battery Unit (alternative power unit allowing operation from ten U2-size cells)	9534
100 V Output Unit	1014
1 kV output unit	1013

Description	Order Code
Carrying Case for 2003S or N	9021
Calibration Certificate (traceable to N.P.L.)	1091
Rack Mount Adaptor Panel (single unit)	8790
Rack Mount Adaptor Panel (double unit)	8791

Note: Standard mains input is 200-250 V, 50/60 Hz.
 Please specify if 100-120 V, 50/60 Hz is required.

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