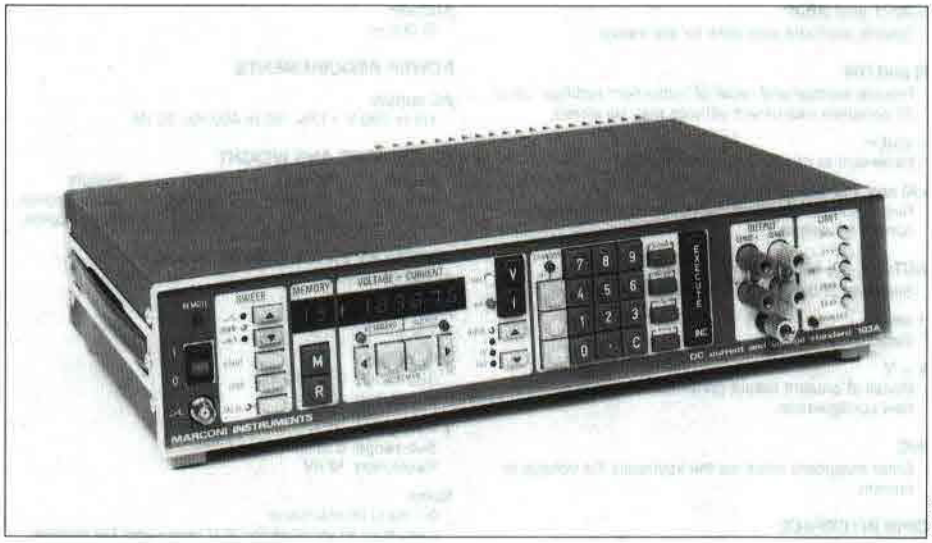
# DC Voltage and Current Reference Source

leasametric® High Technology Only

# 103A

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- **Three voltage ranges 1.1, 11 and 110 V**
- **Three current ranges 1.1, 11 and 110 mA**
- **Reverse polarity**
- **GPIB fitted as standard**
- **Storage facility for up to 20 configurations**
- **Short circuit protection with LED indicator**
- **Automatic sweep**

The 103A Voltage and Current Reference Source is based on a unique pulse width modulation digital/analog conversion principle ensuring high accuracy and stability. This makes the 103A ideally suited for use as a reference unit in many applications such as: voltage and current generator, system calibration, resistance measurements and sensor stimulation.

## EASY ENTRY OF DATA

Parameters keyed-in immediately appear on the 7 digit display but are not validated until the "EXECUTE" key is pressed. Pressing "EXECUTE", the keyboard lamp turns off and the OUTPUT lamp turns on, indicating the displayed value is now available at the output terminals. The polarity of the output voltage or current is reversed by pressing + or − followed by "EXECUTE".

## INCREMENTED OUTPUT

The output may be changed via the increment/decrement keys. Set the increment value by pressing in "INC" key. Multiply or divide increment in tens by pressing the "x 10" or "÷ 10" keys. By holding down the "+" or "−" key for more than two seconds the output is automatically incremented or decremented at a rate of approximately 5 steps per second.

## MEMORY

For repetitive measurements, the displayed value may be stored in memory and assigned an address between 01 and 20. The contents of any of the 20 memories can be recalled by pressing "RM" and the setting then output by pressing "EXECUTE". Swap memories to optimise use of memory space.

## SWEEP

Two scanning modes automatically sweep the output or scan the memory contents between two set limits. The output scanning step is that of the increment selected with each step lasting 250 ms. During scanning an auxiliary voltage is also available varying between 0 and 5 V at a rate of 5 mV per step, for up to 1000 steps.

## MICROPROCESSOR CONTROL

Internal microprocessor control provides the instrument with a monitoring facility enabling the user to be alerted of system faults by generating an error code on the display.

## PROGRAMMING

Voltage, current and polarity reversal can all be programmed externally via the GPIB enabling the 103A to be incorporated in automatic systems.

## SPECIFICATION

### GENERAL DESCRIPTION

103A is a voltage and current standard covering the ranges 1 µV to 110 V and 1 nA to 110 mA respectively. Microprocessor control enables flexibility of use. Remote control via the General Purpose Interface Bus is provided as standard.

### VOLTAGE MODE

**Range**
±1 µV to ±109.9999 V.

**Resolution**
1 µV from ±1 µV to ±1.099999 V. 10 µV from ±10 µV to ±10.99999 V. 100 µV from ±100 µV to ±109.9999 V.

**Range selection and indication**
2 front panel keys and 4 LED display of auto or selected ranges.

**Selection**
Front panel key.

**Indication**
7 digit display.

**Linearity**
0.001% of range.

**Accuracy**
After 1.5 hours of continuous operation with required output parameters and at 70% humidity, 23°C ±1°C (3 months after switch on):-
±0.005% of range ±0.003% of displayed value in 1 V range. ±0.001% of range ±0.003% of displayed value in 10 V range. ±0.001% of range ±0.005% of displayed value in 100 V range.

**Stability**
After 1.5 hours continuous operation at a constant temperature (±1°C) between 15°C and 35°C:-
±0.0005% of range after an additional 2 hours.
±0.002% of range after an additional 3 months.
±0.005% of range after an additional year.

**Common mode rejection**
−140 dB.

**Internal impedance**
Resistance: 0.1 mΩ
Impedance: From DC to 10 kHz for an AC load current up to 20% of the DC component; Less than 2 Ω in 1V range. Less than 2 Ω in 10 V range. Less than 8 Ω in 100 V range.

**Current limiting**
0 to 110 mA across the three ranges. Maximum limitations may be set to 25 or 50 mA at the front panel.

**4 wire output**
≤0.1 V drop across the load for the accuracy specified. Maximum permissible capacitive load: 0.22 µF. Dielectric rigidity: ±500 V between output posts and ground. Four quadrant operation, with maximum current direct or reverse.

### CURRENT MODE

**Range**
0 to 110 mA.

**Resolution**
1 nA from ±1 nA to ±1.099999 mA. 10 nA from ±10 nA to ±10.99999 mA. 100 nA from ±100 nA to ±109.9999 mA.

**Range selection and indication**
2 front panel keys and a 4 LED display of auto or selected range.

**Selection**
Front panel key.

**Indication**
7 digit display.

**Linearity**
0.001% on 1 mA range. 0.002% on 10 mA range. 0.005% on 100 mA range.

**Accuracy**
After 1.5 hours of continuous operation with required output parameters and at 70% humidity, 23°C ±1°C (3 months after switch on);
For 1 mA range: ±(0.008% of range + 0.005% of displayed value).

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For 10 mA range: ±(0.004% of range + 0.005% of displayed value).
For 100 mA range: ±(0.005% of range + 0.006% of displayed value).

**Stability**
After 1.5 hours continuous operation at a constant temperature (±1°C) between 15 and 35°C: 0.0007% after 2 hours, 0.002% after 3 months, 0.005% after 1 year.

**Voltage limiting**
0 to 110 V. Maximum limits of 25 and 50 V may be selected at the front panel.

**Output conductance**
0.1 siemens.

## VOLTAGE AND CURRENT MODES

**Settling time**
Within $10^{-4}$ of the displayed value 100 ms (approx.) after entry of new data. Within $10^{-3}$ of the displayed value 50 ms (approx.) after entry of new data.

**Temperature coefficient**
(5 µV + 0.0001% of the displayed value)/°C for temperatures between 15 and 35°C.

**Dielectric stiffness**
Measured between ground and the positive and negative floating outputs: ±500 V on output.

**Output protection**
Outputs are disabled on the application of a short circuit. On removal of the short circuit, operation is resumed.

## SWEEP

Single or continuous sweep of current, voltage and memories may be performed.

**Time/step**
1 second.

**Monitor sweep output**
0 to 5 V in steps of 5 mV for voltage or current. 0 to 5 V in steps of 250 mV for the memories. Impedance: 10 kΩ load (Front panel BNC).

## KEYBOARD AND DISPLAYS

**Main Functions**
All instrument settings are controlled by the front panel keyboard. Settings are entered by selecting the required function and keying in the value followed by the execute key. Other functions provided are:
Single or continuous sweep.

**START and STOP**
Specify start and stop data for the sweep.

**M and RM**
Provide storage and recall of instrument settings. Up to 20 complete instrument settings may be stored.

**+ and −**
Increment or decrement output values.

**x10 and ÷10 Volt, V and mA, I**
Resolution of increment. Selection of either voltage or current for output.

**AUTO, 1, 10, 100 and ↓ ↑**
Selection of the range for voltage or current.

**+ and −**
Selection of polarity.

**X ⇄ Y**
Recall of present output parameters while entering a new configuration.

**INC**
Enter increment value via the keyboard, for voltage or current.

## GPIB INTERFACE

A GPIB interface is fitted as standard. Voltage, current, polarity, signal inhibit and LOCAL/REMOTE modes are remotely programmable.

**Capabilities**
Complies with the following subsets as defined in IEEE 488-1975. SH1, AH1, T6, TE0, L3, LE0, SR1, RL1, PP0, DC1, DT1, C0, E1.

## SAFETY

Complies with IEC 348.

## RATED RANGE OF USE
**(Over which full specification is met)**

**Temperature**
+15 to 35°C.

**Humidity**
70% relative.

## CONDITIONS OF STORAGE AND TEMPERATURE

**Temperature**
−20 to + 70°C.

**Humidity**
97% non-condensing.

**Altitude**
15 000 m.

## POWER REQUIREMENTS

**AC supply**
115 or 230 V +13% . 50 to 400 Hz. 30 VA.

## DIMENSIONS AND WEIGHT

| Height | Width | Depth | Weight |
|---|---|---|---|
| 88 mm | 440 mm | 360 mm | 10 kg Approx. |
| 3.5 in | 17.3 in | 14.2 in | 22 lb Approx. |

## NANOVOLT EXTENSION ACCESSORY 1/100 DIVIDER

**Internal Resistance**
2 Ω ±5% .

**10 V range**
Sub-range: 0 to 100 mV.
Resolution: 100 nV.

**1 V range**
Sub-range: 0 to 10 mV.
Resolution: 10 nV.

**Noise**
0.1 Hz to 20 kHz band.
Less than 10 µV RMS for 10 V range and 1 V ranges.
Less than 60 µV RMS for 100 V range.

## VERSIONS AND ACCESSORIES

When ordering please quote eight digit code numbers.

| Ordering numbers | Versions |
|---|---|
| **103A** | Current and Voltage Standard |
| **Option 103A-15** | 19 inch Rack Mounting Adapter |
| | **Supplied with** |
| | AC supply lead |
| | Operating Manual |
| | **Accessories** |
| **133** | Nanovolt Extension, 1/100 Divider |
| **46881-365R** | GPIB Lead Assembly |
| **43126-012S** | GPIB Manual |