



# Time Electronics

## 1021 Milliamp Source with Null Indicator



- 0 to 100mA output in 3 ranges
- Accuracy 0.02%
- 25ppm/hr stability
- Up to 40V output drive
- Short circuit and overload protected
- Safety terminals
- Removable protective cover
- Powered by 6 x AA batteries
- 10 hours typical use between charges
- Optional carry case

### DESCRIPTION

The 1021 is a precision DC current source suitable for calibration and test applications from micro-amp levels up to 100mA. Three output ranges are available; 0 to 99.99mA in 10 $\mu$ A steps, 0 to 9.999mA in 1 $\mu$ A steps, and 0 to 999.9 $\mu$ A in 0.1 $\mu$ A steps. Output voltage is adjustable between 14 and 40 volts, with a maximum output power of 2.4 watts.

The functionality of the 1021 is based on the popular Time Electronics 1007 millivolt source, incorporating many of the well-proven features that enable fast and simple operation. Useful attributes include an LED voltage limit indicator, that shows the user when the 1021 is unable to supply sufficient drive voltage to maintain the set output current. The instrument is also short circuit and overload protected.

The unique circuit design ensures that it stays well within specification for at least 12 months. Variation with temperature is better than 60ppm per  $^{\circ}$ C, and typically better than 20ppm per hour at constant temperature. To improve the switch reliability, additional back-up contacts have been used, so even if a contact fails the 1021 will still operate correctly.

The accuracy and stability are such that a wide range of applications are possible. In the process industries it may be used to test and calibrate current sensitive transducers, and their associated indicating and recording instruments. The semiconductor industry requires constant current sources for parameter measurements. It may also be used to measure DC current accurately by using the null facility to back off the unknown current. Resolution of 1 $\mu$ A is possible.

**Safety Terminals:** Fitted as standard and fully compatible with 4mm shrouded plugs, as well as standard plugs, bare wires, and spade terminals.

**Added Protection:** The 1021 comes fitted with an ergonomic rubber cover providing increased protection and durability. It has a textured grip for comfortable handling and openings at the top and bottom to allow access to the battery meter and a position to place labels if required. It is easy to remove if the user prefers a stand-alone unit or to house the 1021 in the optional 9027 carry case.

### PORTABLE OPERATION

Rechargeable batteries and mains charger are supplied with the unit as standard. Complete recharge time is 10 to 12 hours although sufficient charge for a few hours operation can be obtained with only 30 minutes charge. Full charge allows 10 hours typical use. The battery condition monitored by a meter on the top of the 1021.



# 1021 Applications and Specifications

## APPLICATIONS

### Transducers

The ability to source and measure current makes the 1021 ideal for testing and calibration of many types of current transducer and their associated measuring equipment.

### Semiconductor Parameters

The 1021 covers many applications in a wide variety of semiconductor measurements including; forward voltage drops, zener diode characteristics and temperature coefficients, transistor gains (hfe) and saturation voltages. Characteristic curves of devices can be easily plotted by selecting suitable output currents on the 1021. It can also be used to drive Hall effect devices.

### Resistance and Temperature Measurement

Low ohm and contact resistance of relays, switches, connectors, etc can be easily measured using the 1021 as the current source in a 4-terminal kelvin system where lead and probe resistance do not affect the accuracy of the reading. This method can also be used in thermometry for calibration and measurement of platinum-resistance thermometers and thermistors.

## TECHNICAL SPECIFICATION

Output .....	0 to 99.99mA in 3 ranges 0 to 99.99mA in 10 $\mu$ A steps 0 to 9.999mA in 1 $\mu$ A steps 0 to 999.9 $\mu$ A in 0.1 $\mu$ A steps
Accuracy .....	$\pm$ 0.02% of setting $\pm$ 0.02% of range, $\pm$ 0.2 $\mu$ A.
Voltage Capacity .....	Adjustable between 14 and 40 volts. Maximum output power 2.4 watts.
Voltage Limit Indicator .....	Provides indication of insufficient drive voltage.
Output Polarity .....	Positive or negative switch selected. A centre 'off' position provides an open circuit on the output terminals.
Output Stability .....	Better than 60ppm per $^{\circ}$ C (-10 $^{\circ}$ C to +50 $^{\circ}$ C). Better than 25ppm/hr (at constant temperature).
Output Noise .....	Less than 15ppm of full scale.
Load Regulation .....	Better than 20ppm per volt change in output.
Null Sensitivity .....	Adjustable from $\pm$ 20mA to $\pm$ 20 $\mu$ A FSD via front panel control. Maximum resolution is 1 $\mu$ A.
Power Supply .....	NiMH rechargeable batteries with external mains recharger. Standard mains voltage is 220–250V, 50/60Hz. 100–125V, 50/60Hz is available but must be specified on ordering.

## GENERAL SPECIFICATION

Dimensions .....	200 x 75 x 110mm (215 x 100 x 120mm including protective cover)
Weight .....	1kg (1.4kg including protective cover)
Optional Extras .....	Carry Case Calibration Certificates – traceable to NPL and UKAS
Country of Origin.....	UK

## ORDERING INFORMATION

1021 .....	DC Current Source with Null Meter (mains charger and protective cover included)
9027 .....	Leatherette Carry Case
C153 .....	Factory (NPL Traceable) Calibration Certificate
C105 .....	UKAS Calibration Certificate (ISO 17025)

Due to continuous development Time Electronics reserves the right to change specifications without prior notice.

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