



INFORMATION & SPECIFICATIONS DATA SHEET

TEMPERATURE & PROCESS INSTRUMENTS - INC

MicroCal 200/200+ Two Channel, Multifunction Temperature and Process Calibrator

The MicroCal 200/200+ are multifunctional calibrators with two isolated channels. The instruments are portable and developed to meet the needs of Instrumentation Engineers and Quality Managers, both in laboratory and in field work. These units are accurate, rugged, compact and easy to use. The MicroCal 200 Series are the ideal solution to simulate and measure simultaneously; voltage, current, resistance, thermocouple, resistance thermometers (RTD's), frequency and pulse. Advanced flexibility and high performance has been achieved using a 32 bit microprocessor and a fast A/D conversion technology. The calibrator's internal memory stores all data for normalized IEC, DIN and JIS thermocouple sensors for both IPTS68 and ITS90 International Temperature Scale. The microprocessor performs automatic linearization and cold junction compensation to assure high accuracy. It is possible to set the calibrator to execute menu-driven calibration procedures for your instruments in field work.

Microcal 200/200+ Common Features

- ▶ Simultaneously Simulate and Read Thermocouples, RTD's, mV, V, mA, Ohms, Frequency and pulse counter
- ▶ Two independent channels for source and read functionality - Ideal for calibrating transmitters
- ▶ Large high contrast backlit LCD display allows simultaneous indication of the measured and the simulated value
- ▶ Change parameters from the front keypad
- ▶ Large binding post for easy wiring input and output connections
- ▶ Datalogging and real time Graphing Capability
- ▶ TTL/RS-232 Communication interface Option

Common mode rejection: >140 dB at ac operation
 Normal mode rejection: >60 dB at 50 or 60 Hz
 Maximum input voltage: 50 Vdc (4 Vdc for mA mode)

Temperature stability:
 for temperature exceeding the band +18 C to +28 C (from +64 F to +84 F); full scale: - 8 ppm/ C; zero: - 0.2µV/ C
 Operating ambient temperature range: -10 to 55 C (+14 to 131 F)

Storage temperature range:
 -30 to 60 C (-22 to 140 F)

Input-output isolation: 150 Vdc

Measurement sampling time: 250 ms

Digital interface: Full bi-directional TTL (RS-232 normal or isolated available as option)

Display: Graphic LCD 128 x 64 dots display with LED backlight device

Case: Injection molded ABS with internal metal RFI coating

Dimensions: 264 x 96 x 172mm (10.39 x 3.78 x 6.77in) (DIN size)

Weight: Net 4 kg (8.82 lbs), with charger 6.0 kg (13.23 lbs)

Power Source: External ac power supply module/charger or internal rechargeable Ni-Cd batteries.

Battery life: 6 hr. on T/C and mV input/output (backlight Off) 3.5 hr. with 20 mA simulation (backlight Off)

Recharging time: 5 hr. at 90% and 6 hrs. at 99%.

Note: Battery recharge is active only when unit is off
 Battery charge indication: Bar graph on the LCD display

Power module line operation: 100 to 120 Vac, 220 to 240 Vac -10% 50/60 Hz

Power module line transformer isolation: 2500Vac



MicroCal 200+ Shown with Optional Simulated Leather Carrying Case

MicroCal 200 Features

- ▶ High accuracy $\pm 0.02\%$ of reading
- ▶ 32 Bit microprocessor

MicroCal 200+ Features

- ▶ Higher accuracy $\pm 0.01\%$ of reading
- ▶ PC Card Expansion Slot for
- ▶ Datalogging Capability up to 5,000 Points with Optional PC Card
- ▶ Full Function Paperless Recorder

Need Higher Accuracy the MicroCal 2000+ has the same features of the MicroCal 200+ but with an accuracy specification of - 0.0035%/- 0.01% of reading. Prices start at \$5544.00.



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Innovative design

The MicroCal 200/200+ calibrators use innovative electronics based on a powerful 32 bit microcontroller and sophisticated high stability, low level signal, thermal emf free analog circuit. A Flash memory allows firmware updating through serial interface and modem.

MicroCal 200+ incorporates a real time clock, PCMCIA Memory Card slot and improved performances.



Keyboard & Display

A thermoformed metal-click polycarbonate membrane keyboard, with a working life of one million operations per key, seals the internal electronics from the surrounding environment. Contact closure of the membrane keys is acknowledged as a coded signal directly by the microprocessor. The setting of the simulation signal value uses an in-line single digit setting mode or a direct numerical entry mode.

Flexibility

The operative set-up mode is simplified by a sequence of menu pages that only require **<Select>** and **<Enter>** instructions. A full set of operators notes are memory stored allowing a direct operator's assistance and instructions.

Any relevant instruction may be recalled through the **<Help>** key. Separate terminals for Channel 1 and Channel 2 are installed on the front panel.

The high contrast LCD graphic display, equipped with a backlight device, allows easy reading even in poor light conditions. The graphic display allows a simultaneous indication of the measured and simulated value (large digit), together with a comprehensive number of messages related to engineering units, type of sensor or signal, temperature scale, cold junction selection and battery level of charge. A backlight auto power OFF mode is installed to save battery life. A swap feature is also installed to change the position on the display of the IN and OUT parameters.

Digital serial interface

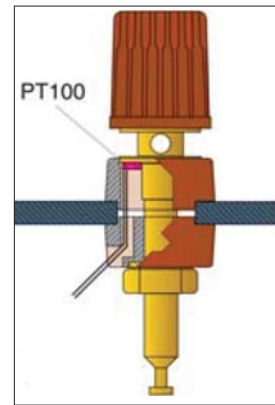
It is a full bidirectional TTL level digital interface for communication with computerized systems. A RS232 adapter with galvanic insulation is available as an option.

Scale factor & Square root

All non temperature ranges are fully programmable to read both measured and output values in term of engineering unit. Four characters, adjustable in an alphanumeric way, are available on the display to show the symbol of the parameter (i.e. mbar, % RH, % CO, etc.) mA reading and output can be eg.

Cold Junction compensation

Accurate and fast response automatic internal Rj compensation through a special low thermal



capacity design of binding posts incorporating a thin film high accuracy Pt100. The cold junction temperature is measured, acknowledged by the microprocessor, directly displayed for automatic Rj compensation. In addition to the automatic internal Rj compensation two alternative compensation modes can be selected:

"external" with a programmable temperature value or "remote" automatic with an external resistance thermometer.

Transmitter simulation and calibration

The instrument can be connected to system inputs to simulate a 4 to 20mA transmitter. It has an adequate power to drive 20mA into a load of 1000 Ω in the source mode. The operator can set and change temperature values while obtaining the equivalent mA output. The mA mode may be connected directly either on passive or on active loops.

Frequency - Counts

The "Out" mode is designed to generate zero based pulses, with an adjustable amplitude, at a frequency up to 20 KHz. A preset number of pulses may be programmed and transmitted to test or calibrate totalizers and counters. The instrument can be configured to measure frequency and count pulse (totalizer mode). Technical units in Hz, pulse/h and pulse/min. The input threshold is adjustable from 0 to 20 V with 0.01 V resolution.



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Programmable signal converter

The instrument can be used as a temporary signal convert replacement. Any input signal (including the remote auxiliary inputs) can be converted into any of the available output signals while maintaining full galvanic isolation.

2,3,4 wire RTD resistance thermometer

Although resistance and temperature with resistance thermometer may be measured on a 2, 3 wire connection, the instrument is also designed for 4-wire measurements with a resolution as low as 0.01°C.

Remote temperature probe

A high accuracy probe is available on request for general purpose temperature measurement and/or remote cold junction compensation.

Graphic mode

To obtain a real time graph of the measured



parameter. The input data are memory stored and the actual values, relevant to the required time, can be digital displayed using the cursor key.

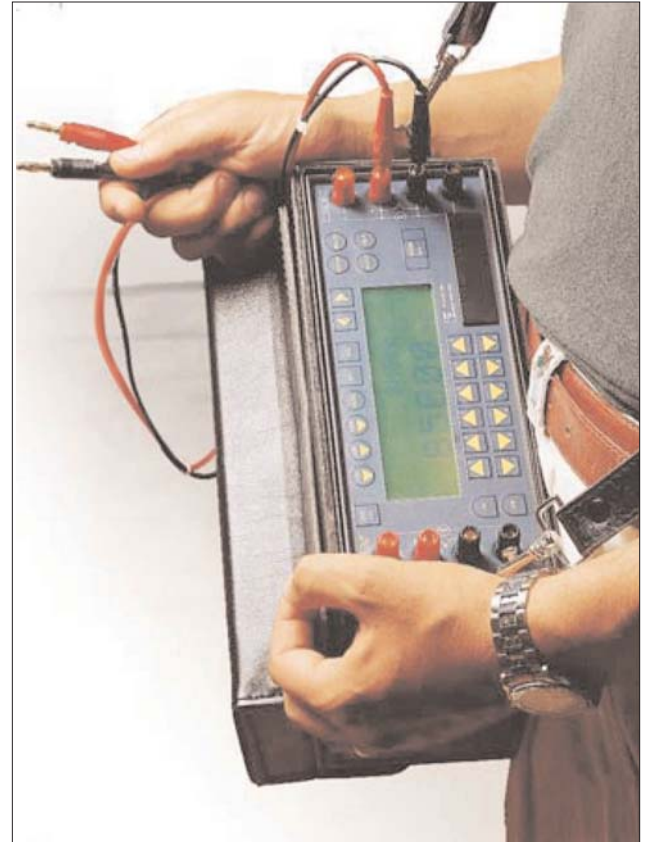
Simulation programs

Menu-driven set up to generate: a continuous or step ramp output where the total time, the starting point, the final point and the size of the steps are requested by the set-up procedure to run the program, a repetitive programmable cycle rises, soaks, falls; a manual requested increment through keyboard, an automatic sequence of up to 20 stored values (2 groups of 10 memories).

Power supply

External charger circuit and internal rechargeable battery. The instrument can operate from mains line continuously without removing the battery. When in normal operation from mains supply the battery is not recharged. To recharge the battery the instrument must be switched off.

Report of Calibration



Easy one hand operation. MicroCal 200 Shown with optional leather case.

Each instrument is factory calibrated against E Instruments standards, that are periodically certified by an International recognized Laboratory to ensure traceability, and shipped with a Report of Calibration stating the nominal and actual values and the deviation errors.

CalpMan software

Documents calibration data Standard Agencies and Quality Auditors require the collections, organization and analysis of traceability documents. A supporting software for DOS/Windows (Calpman Calibration Procedure Manager) is available to transfer a selection of calibration routine's from a PC to the internal memory of the instrument in order to simplify field calibrations selecting the appropriate tag number Test and calibration data can be memory stored and downloaded to a PC to document the calibration activity. ("before" and "after" data).

LogMan Software for data acquisition

Supporting software for DOS/Windows to download logged data from an internal memory to a PC. Data can be saved on disks, loaded from disks, viewed in a numeric or graphic mode and also printed in a numeric or graphic mode.



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MicroCal 200/200+ Multifunction Calibrator Specifications

| | |
|---|---|
| IN/OUT parameters: | Signal type: mV, V, mA, Ω , K, Frequency, Pulses Thermocouples type: J, K, T, R, S, B, N, C, E, U, L, F, G, D Resistance (RTD) thermometers: Pt100 IEC, OIML, USLAB, US, SAMA, JIS, Pt200, 500, 1000, 1000 OIML, Ni100, Ni120, Cu10, Cu100 |
| Reference junction compensation: | Internal automatic: from -10 °C to +55 °C (14°F to 130°F); external adjustable: from -50 °C to +100 °C (-58°F to 210°F); remote with external Pt100: from -10°C to +100 °C (14°F to 210°F) |
| Rj compensation drift: | $\pm 0.015^{\circ}\text{C}/^{\circ}\text{C}$ (from -10 °C to +55 °C) |
| Rj compensation error: | Internal: $\pm 0.15^{\circ}\text{C}$ ($\pm 0.3^{\circ}\text{F}$) Remote: $\pm 0.3^{\circ}\text{C}$ ($\pm 0.6^{\circ}\text{F}$) |
| Common mode rejection: | >140 dB at ac operation |
| Normal mode rejection: | >70 dB at 50 or 60 Hz |
| Temperature stability MicroCal 200/200+: | For temperature exceeding the band +18°C to +28°C (from +64 °C to +84 °F) full scale: $\pm 8\text{ppm}/^{\circ}\text{C}$ zero: $\pm 0.2 \text{ V}/^{\circ}\text{C}$ |
| Output impedance (emf output): | < 0.5 with 0.5mA maximum current |
| Input impedance (mV, V and Tc ranges): | >10 M Ω |
| Input impedance (mA ranges): | <140 @ 1mA |
| Source resistance effects: | $\pm 1\mu\text{V}$ error for 1000 source resistance |
| RTD and simulation excitation current: | From 0.01 to 5mA |
| RTD and measurement excitation current: | ~ 0.4mA @ 400 |
| RTD connection: | 2, 3, and 4 wires |
| RTD cable compensation: | Up to 100 (each wire) |
| RTD cable compensation error (Pt100): | $\pm 0.005^{\circ}\text{C}/$ of total wire |
| Maximum load resistance: | 1000 @ 20mA |
| Display: | Graphic LCD 240 x 64 dots display with LED backlight device |
| Measurement sampling time: | 250 ms |
| Output noise (at 300 Hz): | <2 μVpp for ranges up to 200mV fs., <10 μVpp for ranges up to 2V fs. <80 μVpp for ranges up to 20V f.s. |
| Digital interface: | Full bidirectional TTL (a RS232 adapter normal or insulated, is available as an option) |
| Channel 1_Channel 2 insulation: | 50Vdc |
| Calculation functions: | Hold, max, min, offset, average |
| Selection °C/°F/K: | Through the configuration procedure |
| In/Out data memory: | 20 data with manual or automatic recall |
| Logging mode: | 1500 input data items (optional memory card for memory extension) |
| Convert function: | Displays the electrical equivalent of the engineering unit |
| Scale factor: | 5 different settings with zero and span programmable within -399999 and +999999 |
| Square root: | In combination with scale factor |
| Calibration: | Self learning technique with automatic procedure |
| Power supply: | External charger and rechargeable Ni-Cd battery |
| Self contained operation: | 6h on Thermocouple and mV input/output (backlight Off) |
| Recharging time: | 3.5h with 20 mA simulation (backlight Off) 5h at 90% and 6h at 99% with instrument switched off. The battery charging is active only with the instrument switched off. |
| Line operation: | 100 - 120 - 230 Vac through the external battery charger |
| Line transformer insulation: | 2500Vac |
| Firmware release identification: | Release code on the display |
| Operating environment temperature range: | From -10 °C to +55 °C (from 14 °C to 130 °F) |
| Storage temperature range: | From -30 °C to +60 °C (from -22 °C to 140 °F) |
| Case: | Injection molded ABS with internal metal coating |
| Dimensions: | 264 x 96 x 172 mm (10.4"x3.8"x6.8") DIN size |
| Weights: | net: 8.8 lb. gross: 12.1 lb. |



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MicroCal 200/200+ Range and Accuracy Tables



- ▶ Displayed with engineering unit, type or sensor or signal, temperature scale, cold junction selection, etc.
- ▶ Generate a continuous or step ramp output with programmable: total time, start point, stop point, size of temperature step
- ▶ Programmable continuous cycle-rise, soak, and fall
- ▶ 60 temperature values (in 20 groups of 3) can be entered into memory and stored

Thermocouple Range and Accuracy Table

| Thermocouple Type | Temperature Range | Resol. | Microcal 200 Accuracy* | Microcal 200+ Accuracy* |
|--------------------|----------------------------------|-----------------|-------------------------------------|-------------------------------------|
| J | -210 to 1200°C -346 to 2192°F | 0.1°C 0.1°F | ±(0.01% +0.1°C) ±(0.01% +0.18°F) | ±(0.02% +0.1°C) ±(0.02% +0.18°F) |
| K | -270 to 1370°C -454 to 2498°F | 0.1°C 0.1°F | ±(0.01% +0.1°C) ±(0.01% +0.18°F) | ±(0.02% +0.1°C) ±(0.02% +0.18°F) |
| T | -270 to 400°C -454 to 752°F | 0.01°C 0.1°F | ±(0.01% +0.1°C) ±(0.01% +0.18°F) | ±(0.02% +0.1°C) ±(0.02% +0.18°F) |
| E | -270 to 1000°C -454 to 1832°F | 0.1°C 0.1°F | ±(0.01% +0.1°C) ±(0.01% +0.18°F) | ±(0.02% +0.1°C) ±(0.02% +0.18°F) |
| R/S | -50 to 1760°C -58 to 3200°F | 0.1°C 0.1°F | ±(0.01% +0.2°C) ±(0.01% +0.36°F) | ±(0.02% +0.2°C) ±(0.02% +0.36°F) |
| B | 50 to 1820°C 122 to 3308°F | 0.1°C 0.1°F | ±(0.01% +0.3°C) ±(0.01% +0.54°F) | ±(0.02% +0.3°C) ±(0.02% +0.54°F) |
| C | 0 to 2300°C 32 to 4172°F | 0.1°C 0.1°F | ±(0.01% +0.2°C) ±(0.01% +0.36°F) | ±(0.02% +0.2°C) ±(0.02% +0.36°F) |
| G/D | 0 to 2300°C 32 to 4172°F | 0.1°C 0.1°F | ±(0.01% +0.3°C) ±(0.01% +0.54°F) | ±(0.02% +0.3°C) ±(0.02% +0.54°F) |
| U (J DIN) | -200 to 400°C -328 to 752°F | 0.1°C 0.1°F | ±(0.01% +0.1°C) ±(0.01% +0.18°F) | ±(0.02% +0.1°C) ±(0.02% +0.18°F) |
| L (T DIN) | -200 to 760°C -328 to 1400°F | 0.1°C 0.1°F | ±(0.01% +0.1°C) ±(0.01% +0.18°F) | ±(0.02% +0.1°C) ±(0.02% +0.18°F) |
| N | -270 to 1300°C -454 to 2372°F | 0.1°C 0.1°F | ±(0.01% +0.1°C) ±(0.01% +0.18°F) | ±(0.02% +0.1°C) ±(0.02% +0.18°F) |
| F (Platinel II) | 0 to 1400°C 32 to 2552°F | 0.1°C 0.1°F | ±(0.01% +0.1°C) ±(0.01% +0.18°F) | ±(0.02% +0.1°C) ±(0.02% +0.18°F) |

RTD and Ohm Range and Accuracy Table

| Sensor/Parameter | Range | Resol. | Microcal 200 Accuracy | Microcal 200+ Accuracy |
|---------------------------|---------------------------------|-----------------|--------------------------------------|--------------------------------------|
| Pt100 α 385, 391, 3926 | -200 to 850°C -328 to 1562°F | 0.01°C 0.1°F | ±(0.01% +0.05°C) ±(0.01% +0.09°F) | ±(0.02% +0.05°C) ±(0.02% +0.09°F) |
| Pt100 α 3902 | -200 to 650°C -328 to 1202°F | 0.01°C 0.1°F | ±(0.01% +0.05°C) ±(0.01% +0.09°F) | ±(0.02% +0.05°C) ±(0.02% +0.09°F) |
| Pt100 α 3916, 3923 | -200 to 600°C -328 to 1112°F | 0.01°C 0.1°F | ±(0.01% +0.05°C) ±(0.01% +0.09°F) | ±(0.02% +0.05°C) ±(0.02% +0.09°F) |
| Pt200 | -200 to 850°C -328 to 1562°F | 0.1°C 0.1°F | ±(0.01% +0.15°C) ±(0.01% +0.27°F) | ±(0.02% +0.15°C) ±(0.02% +0.27°F) |
| Pt500 | -200 to 850°C -328 to 1562°F | 0.1°C 0.1°F | ±(0.01% +0.1°C) ±(0.01% +0.18°F) | ±(0.02% +0.1°C) ±(0.02% +0.18°F) |
| Pt1000 α 385, 391 | -200 to 850°C -328 to 1562°F | 0.01°C 0.1°F | ±(0.01% +0.1°C) ±(0.01% +0.18°F) | ±(0.02% +0.1°C) ±(0.02% +0.18°F) |
| Cu10 | -70 to 150°C -94 to 302°F | 0.1°C 0.1°F | ±(0.01% +0.4°C) ±(0.01% +0.72°F) | ±(0.02% +0.4°C) ±(0.02% +0.72°F) |
| Cu100 | -180 to 150°C -292 to 302°F | 0.1°C 0.1°F | ±(0.01% +0.05°C) ±(0.01% +0.09°F) | ±(0.02% +0.05°C) ±(0.02% +0.09°F) |
| Ni100 | -60 to 180°C -76 to 356°F | 0.1°C 0.1°F | ±(0.01% +0.05°C) ±(0.01% +0.09°F) | ±(0.02% +0.05°C) ±(0.02% +0.09°F) |
| Ni120 | 0 to 150 C 32 to 302 F | 0.1 C 0.1 F | -(0.01% +0.05 C) -(0.01% +0.09 F) | -(0.02% +0.05 C) -(0.02% +0.09 F) |
| Ω IN | 0 to 500Ω 0 to 5000Ω | 1mΩ 0.01Ω | ±(0.01% +12mΩ) ±(0.01% +120mΩ) | -(0.02% +12mΩ) -(0.02% +120mΩ) |
| Ω OUT | 0 to 500Ω 0 to 5000Ω | 1mΩ 0.01Ω | -(0.01% +20mΩ) -(0.01% +200mΩ) | -(0.02% +20mΩ) -(0.02% +200mΩ) |



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MicroCal 200/200+ Specifications and Ordering Information

| Sensor/ Parameter | Range | Resol. | IC91100 Accuracy | IC90100 Accuracy |
|----------------------|----------------------|-------------|---------------------|---------------------|
| m V | -20 to +200 mV | 1 V | -(0.01% +2 V) | -(0.02% +2 V) |
| m V | -0.2 to +2 V | 10 V | -(0.01% +10 V) | -(0.02% +10 V) |
| V | -2 to +20 V | 0.1 mV | -(0.01% +0.08 mV) | -(0.02% +0.08 mV) |
| Frequency | 1 to 200 Hz | 0.001 Hz | -(0.005% +0.001 Hz) | |
| | 1 to 2,000 Hz | 0.01 | -(0.005% +0.001 Hz) | |
| | 1 to 20,000 Hz | 0.1 Hz | -(0.005% +0.001 Hz) | |
| Pulse counter | 0 to 106 counts | 1 count | infinite | |
| Pulse (Out) | 0 to 6,000 pulse/min | 1 pulse/min | 1 c/m | |
| | 0 to 36,000 pulse/h | 1 pulse/hr | 1 c/m | |
| m A (In) | -5 to +50 mA | 0.1 A | -(0.01% +0.4 A) | -(0.02% +0.4 A) |
| m A (Out) | 0 to +50 mA | 0.1 A | -(0.01% +0.4 A) | -(0.02% +0.4 A) |

Note: The MicroCal 200/200+ relative accuracies shown above are stated for 360 days and the operative conditions are from +64°F to +82°F. Typical 90 days relative accuracy can be estimated by dividing the "% of reading" specifications by 1.6. Typical 2 years relative accuracy can be estimated by multiplying the "% of reading" specifications by 1.4. All input ranges: additional error ±1 digit.

| Order Information | | |
|-------------------|--|-----------|
| Part Number | Description | Price |
| 3916-124-1-23-1 | Microcal 200 multifunction temperature and process calibrator, with 115V USA plug with USA plug and Serial Interface RS232, Real time clock + internal memory, PC software: Logman, LinMan, Calpman, Soft Vinyl protection case Spare fuses Certificate of Calibration and Instruction Manual | \$3270.00 |
| 3918-1-1-23-1 | Microcal 200+ multifunction temperature and process calibrator, with USA 115V plug and RS232 Serial adapter + Slot PCMCIA (without card) Real time clock and internal memory PC software: Logman, LinMan, Calpman Soft Vinyl protection case Spare Fuses Certificate of Calibration Instruction Manual | \$3838.00 |
| Accessories | Description | |
| BB530011 | TTL/RS232 Isolated Plus MicroCal | \$92.00 |
| EE300122 | Compensated Tc J, K, T and R/S premium grade cables | \$43.00 |
| EE300040 | Electrical signal test lead kit | \$43.00 |

Need Higher Accuracy the MicroCal 2000+ has the same features of the MicroCal 200+ but with an accuracy specification of ± 0.0035%/± 0.01% of reading. Prices start at \$5544.00.

MicroCal Series Handheld Multifunction Calibrators

MicroCal 10+ Single Channel

- High accuracy (±0.02% of reading)
- Menu-driven procedures
- Single Channel

MicroCal 2+ Dual Channel

- Single-line LCD display (green, 7mm)
- Ideal tool for measuring and simulating mV, mA, V and Ohms
- Compatible with 14 Thermocouple Types
- RTD Resistance thermometers (Pt 100, Ni 100, Ni 120)
- Built-in RS-232 Serial Interface

MicroCal 1+ TRX Dual Channel

- Ideal tool for measuring and simulating mV, mA and Ohms
- Compatible with 11 Thermocouple Types
- RTD Resistance Thermometers (Pt100, Ni100)



Ordering is easy, fast and secure just go to our web site at:

<http://www.tnp-instruments.com>

and Click on the Online Store Link, for your convenience we accept the following credit cards



Temperature & Process Instruments Inc.

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