

MEMOCAL

PORTABLE PROCESS CALIBRATOR



MEMIOCAL

- SIMULATES AND MEASURES THERMOCOUPLE AND RTD SENSORS, (15 THERMOCOUPLE TYPES, Pt100, NI100 RTDS)
- GENERATES AND MEASURES mA, mV, V AND OHM SIGNALS
- DIRECT INPUT CONNECTION (AUTOMATIC CJC FOR THERMOCOUPLE INPUTS)
- HIGH ACCURACY- (0.015% OF MEASUREMENT RANGE SPAN)
- LOW TEMPERATURE DRIFT 0.1 μ V/ $^{\circ}$ C
- 24V TRANSMITTER POWER SUPPLY
- AUTO-RANGING DISPLAY WITH PEAK DATA HOLD
- SQUARE ROOT EXTRACTION AND QUADRATIC SIGNAL GENERATION
- 50 STEP PROGRAMMABLE TEST SEQUENCER
- 24 HOUR CONTINUOUS BATTERY OPERATION (USING NI-MH CELLS)
- BUILT IN BATTERY CHARGER
- RS-232 INTERFACE OPTION
- DESKTOP STAND AND LEATHER CARRY CASE AVAILABLE

ROELELECTRONIC

OVERVIEW

The Memocal 2000 is a lightweight, versatile, portable, hand-held calibrator developed for use in both field and laboratory calibration maintenance, quality control and process simulation.

- Very low temperature drift ($0.1V\mu^{\circ}C$)
- Accuracy: 0.015% of span
- Power supply: standard AA size battery (Alkaline, NiCd or Ni-MH)
- Measurement & generation of TC (15 types), RTD, linear and ohms signals

For **field calibration** the Memocal 2000 offers: compact size, long battery life, easy to use interface, low temperature drift, high noise immunity and simple programming capabilities.

For **laboratory calibration** the Memocal 2000 offers: digital interface to data loggers or supervision and control systems, large range of I/O capabilities, high accuracy and stability over time.

SPECIAL FEATURES

LED backlighting with manual ON and automatic (30 second) shut OFF

Self diagnostic at instrument start up.

Dynamic battery level indication

- Level 1:* the instrument is fully operative.
- Level 2:* the instrument shows the message "BATTERY LOW" on the upper display while the lower display shows the measured or generated value. The instrument is still fully operative.
- Level 3:* the instrument turns OFF automatically and utilizes the remaining power for memory back up only.

LOGIC INPUTS

The MEMOCAL 2000 is equipped with 2 logic inputs. They are mutually exclusive with the serial interface. These 2 logic inputs have the following functions:

Logic input 1: sequences to the next program step.

Logic input 2: allows you to start, or to suspend the program execution (RUN/WAIT).

SEQUENTIAL FUNCTION ROUTINE

This instrument is provided with 50 steps which can be utilized to make up one or more programs.

Each program can encompass a free number of soak and ramp simulations, measurements and stand by steps.

PRODUCT SPECIFICATIONS

Case:	ABS, grey RAL 6038.
Self extinguishing degree:	V-0 according to UL746C.
Input protection:	all measured and generated ranges are protected against fault connection to signals up to 30V AC/DC.
Terminals:	3 external screw FEMALE plugs Ø 4mm.
Weight:	600g max. (1,4 lb).
Power supply:	4 batteries AA size: - Alkaline 1,5V or - Ni-Cd 1,2V or - Ni-MH 1,2V. - Switching type AC adapter (100 to 240V AC).
A/D conversion:	dual slope integration.
Common mode rejection ratio:	120 dB @ 50/60Hz.
Normal mode rejection ratio:	60 dB @ 50/60Hz.
EMC/Safety:	this instrument is marked CE. It conforms to council directive 89/336/EEC (reference harmonized standard EN-50081-2 and EN-50082-2).
Sampling time:	500mSec.
Display update time:	500mSec.
Temperature drift:	0.0028%/°C or 28 ppm/°C.
Operating temperature:	from 0 to +40°C.
Storage temperature:	from -10 to +60°C.
Humidity:	from 20% to 85% RH non condensing.
Battery life:	24 hours (average) with Ni-MH batteries.
Recharging time:	12 hours.
Insulation resistance:	> 100 MΩ according to IEC 348.
Isolation voltage:	1500V r.m.s. according to IEC 348.

MEASURING INPUTS

mA and V inputs

<i>Range selection:</i>	automatic or manual.
<i>Input impedance:</i>	10Ω for mA input > 10MΩ for mV inputs > 500kΩ for 20V input.
<i>Square root extraction:</i>	programmable.
<i>Read-out:</i>	keyboard programmable from -20000 to 20000.
<i>Decimal point:</i>	programmable in any position.

Standard range table

Range	Resol.	Ref.Accur.	MAx.Error
-20 mV to 20 mV	1μV	± 0.015%	0.006 mV
-200 mV to mV	10μV	± 0.015%	0.060 mV
-2 V to 2 V	100μV	± 0.015%	0.001 V
-20 V to 20 V	1μV	± 0.020%	0.008 V
-20 mA to 20 mA	1μA	± 0.015%	0.006 mA
-130 mA to 130 mA	10μA	± 0.020%	0.052 mA

TX Measurement

a mA measurement with a 24V power supply generated by the instrument and is used to calibrate 2, 3 or 4-wire transmitters.

<i>Power supply:</i>	24V DC (maximum current 24mA).
<i>Resolution:</i>	1 μ A.
<i>Reference accuracy:</i>	0.015%.
<i>Input impedance:</i>	10 Ω for mA input.
<i>Input range:</i>	0 to 20mA.
<i>Square root extraction:</i>	programmable.
<i>Read-out:</i>	keyboard programmable from -20000 to 20000.
<i>Decimal point:</i>	programmable in any position.
<i>Sensor break:</i>	the instrument shows the "OPEN" message when a burn out condition is detected.

RTD Input

<i>RTD type:</i>	- Pt 100 3-wire connection. - Ni 100 3-wire connection.
<i>Calibration:</i>	programmable according to IPTS-68 or ITS-90.
<i>Line resistance:</i>	up to 20 Ω /wire with no measurable error.
<i>Engineering unit:</i>	$^{\circ}$ C or $^{\circ}$ F keyboard programmable.
<i>Measuring current:</i>	100 μ A.
<i>Sensor break:</i>	detection of the sensor open circuit and one or more wires in open circuit.

Standard range table for RTD Pt 100

Range (Pt 100)	Resol.	Max. Error
-200 $^{\circ}$ C to 850 $^{\circ}$ C	0,1 $^{\circ}$ C	0.294 $^{\circ}$ C
-328 $^{\circ}$ F to 512 $^{\circ}$ F	0,1 $^{\circ}$ F	0.227 $^{\circ}$ F
513 $^{\circ}$ F to 1562 $^{\circ}$ F	<0,2 $^{\circ}$ F	0.548 $^{\circ}$ F

Standard range table for RTD Ni 100

Range (Ni 100) (*)	Resol.	Max. Error
-60 $^{\circ}$ C to 350 $^{\circ}$ C	0,1 $^{\circ}$ C	0.119 $^{\circ}$ C
-76 $^{\circ}$ F to 662 $^{\circ}$ F	0,1 $^{\circ}$ F	0.217 $^{\circ}$ F

Available only when IPTS-68 standard has been selected.

Ohm input

Ohm input

Range	Resol.	Max. Error
0 Ω to 800 $^{\circ}$ C	0,1 Ω	\pm 0.025%

Thermocouples

<i>Engineering unit:</i>	$^{\circ}$ C or $^{\circ}$ F keyboard programmable.
<i>Sensor break:</i>	detection of the open input circuit (wires or sensor) with "OPEN" indication.
<i>Cold junction:</i>	automatic compensation.
<i>Cold junction compensation error:</i>	\pm 0.3 $^{\circ}$ C \pm 0,005 $^{\circ}$ C/ $^{\circ}$ C.
<i>External cold junction compensation:</i>	programmable: - from -20 $^{\circ}$ C to +80 $^{\circ}$ C or from -4.0 $^{\circ}$ F to 176.0 $^{\circ}$ F for TC type J, K, T, E, R, S, U, L, PLII; - from 0 $^{\circ}$ C to 80 $^{\circ}$ C or from 32 $^{\circ}$ F to 176 $^{\circ}$ F for TC type B, N, Ni/Ni 18% Mo, W, W3 and W5.
<i>Input impedance:</i>	> 10 M Ω .
<i>Calibration:</i>	programmable according to IPTS-68 or ITS-90.

Standard range table

Type TC	Range	Resol.	Max. Error (CJ ascl.)
J	-200°C to 1200°C	0,1 °C	0.2 °C
K	-200°C to 967°C	0,1 °C	0.3 °C
	968°C to 1370°C	< 0,2 °C	0.5 °C
T	-200°C to 0°C	0,1 °C	0.3 °C
	1°C to 400°C	0,1 °C	0.1 °C
E	-200 °C to 1000°C	0,1 °C	0.2 °C
	-50°C to 0°C	<0,3 °C	1.4 °C
R	1°C to 350°C	<0,2 °C	0.9 °C
	351°C to 1684°C	0,1 °C	0.4 °C
	1685°C to 1760°C	<0,2 °C	0.7 °C
	-50°C to 0°C	<0,3 °C	1.1 °C
S	1°C to 600°C	<0,2 °C	0.9 °C
	601°C to 1760°C	0,1 °C	0.4 °C
	50°C to 100°C	<3 °C	12.4 °C
	101°C to 200°C	<1 °C	4.1 °C
B	201°C to 600°C	<0,5 °C	1.9 °C
	601°C to 1150°C	0,2 °C	0.7 °C
	1151°C to 1820°C	0,1 °C	0.4 °C
U	-200°C to 600°C	0,1 °C	0.2 °C
L	-200°C to 900°C	0,1 °C	0.3 °C
N	0°C to 1410°C	<0,2 °C	0.5 °C
Ni/Ni	0°C to 1300°C	0,1 °C	0.3 °C
18% Mo			
PLII	-100°C to 961°C	0,1 °C	0.2 °C
	962°C to 1400°C	<0,2 °C	0.6 °C
	0°C to 50°C	<1 °C	2.9 °C
	51°C to 100°C	<0,3 °C	1.1 °C
W (G)	101°C to 250°C	<0,2 °C	0.8 °C
	251°C to 1530°C	0,1 °C	0.4 °C
	1351°C to 2300°C	<0,2 °C	1.4 °C
	0°C to 100°C	0,1 °C	0.4 °C
W3 (D)	101°C to 1090°C	0,1 °C	0.3 °C
	1091°C to 2310°C	<0,3 °C	1.0 °C
	0°C to 1096°C	0,1 °C	0.3 °C
W5	1097°C to 2250°C	0,2 °C	0.9 °C
	2251°C to 2315°C	<0,3 °C	1.0 °C

Standard range table

Type TC	Range	Resol.	Max. Error (CJ ascl.)
J	-328°F to 1382°F	0,1 °F	0.5 °F
	-328°F to 32°F	<0,2 °F	0.5 °F
K	33°F to 1772°F	0,1 °F	2.0 °F
	1773°F to 2264°F	0,1 °F	0.6 °F
	2265°F to 2498°F	<0,3 °F	0.9 °F
T	-328°F to 32°F	<0,2 °F	0.5 °F
	33°F to 752°F	0,1 °F	0.2 °F
E	-328°F to 1832°F	0,1 °F	0.4 °F
	-58°F to 32°F	<0,5 °F	2.6 °F
	33°F to 350°F	<0,4 °F	1.6 °F
R	351°F to 500°F	<0,3 °F	1.2 °F
	501°F to 3062°F	<0,2 °F	0.8 °F
	3063°F to 3214°F	<0,3 °F	1.2 °F
	-58°F to 32°F	<0,5 °F	2.0 °F
S	33°F to 140°F	<0,4 °F	1.6 °F
	141°F to 470°F	<0,3 °F	1.2 °F
	471°F to 3214°F	<0,2 °F	0.8 °F
	122°F to 212°F	<4 °F	14.9 °F
B	213°F to 320°F	<2 °F	5.0 °F
	321°F to 600°F	<1 °F	2.4 °F
	601°F to 1250°F	<0,5 °F	1.2 °F
	1251°F to 1770°F	<0,3 °F	0.8 °F
U	1771°F to 3276°F	<0,2 °F	0.5 °F
	-328°F to 1112°F	0,1 °F	0.4 °F
L	-328°F to 1299°F	0,2 °F	0.3 °F
	1300°F to 1652°F	<0,2 °F	0.5 °F
	32°F to 1083°F	<0,2 °F	0.4 °F
N	1084°F to 2006°F	0,1 °F	0.7 °F
	2007°F to 2570°F	<0,2 °F	0.8 °F
Ni/Ni	32°F to 1529°F	0,1 °F	0.5 °F
18% Mo			
PLII	1530°F to 2372°F	<0,2 °F	0.5 °F
	-148°F to 924°F	0,1 °F	0.4 °F
W (G)	925°F to 1761°F	<0,2 °F	0.4 °F
	1762°F to 2552°F	<0,3 °F	1.1 °F
	32°F to 392°F	<1,2 °F	5.2 °F
W3 (D)	393°F to 1292°F	<0,2 °F	0.9 °F
	1293°F to 2309°F	0,1 °F	0.7 °F
	2310°F to 2786°F	0,2 °F	0.7 °F
	2787°F to 3276°F	<0,3 °F	0.7 °F
W5	32°F to 572°F	<0,2 °F	0.8 °F
	573°F to 1832°F	0,1 °F	0.6 °F
	1833°F to 1994°F	<0,2 °F	0.6 °F
	1995°F to 3276°F	<0,3 °F	1.7 °F
W5	32°F to 572°F	<0,2 °F	0.6 °F
	573°F to 1958°F	<0,3 °F	1.6 °F
	1959°F to 3276°F	<0,4 °F	1.8 °F

Available only when IPTS-68 standard has been selected

GENERATIONS

mA and V generation

<i>Output impedance:</i>	50 Ω for mV output 0.5 Ω for the other V outputs.
<i>Maximum load for mA output:</i>	500 Ω .
<i>Range selection:</i>	automatic or manual.
<i>Quadratic signal generation:</i>	programmable.
<i>Read-out:</i>	keyboard programmable from -4000 to 20000.
<i>Decimal point:</i>	programmable in any position.

RTD simulation

	- Pt 100 3 wire connection.
	- Ni 100 3 wire connection
<i>Calibration:</i>	programmable according to IPTS-68 or ITS-90.
<i>Engineering unit:</i>	$^{\circ}$ C or $^{\circ}$ F keyboard programmable.

Thermocouples simulation

<i>Type:</i>	B, E, J, K, L, N, Ni/Ni-18%Mo, PLII, R, S, T, U, W, W3 and W5 keyboard programmable.
<i>Engineering unit:</i>	$^{\circ}$ C and $^{\circ}$ F keyboard programmable.
<i>Output impedance:</i>	50 Ω .
<i>Standard ranges:</i>	for ranges, accuracies and resolutions see thermocouples standard ranges table.

Ω Simulation

SERIAL INTERFACE (optional)

Type:	RS-232 C.
Protocol type:	MODBUS, JBUS.
Baud rate:	keyboard programmable from 600 to 19200 BAUD.
Byte format:	8 bit.
Parity:	even, odd or non-programmable.
Stop bit:	one.
Address:	from 1 to 255.
Output voltage levels:	according to EIA standard.

Standard range table

Range	Resoluz.	Ref.Accur.	Max. Error
-4 mV to 20 mV	1 μ V		\pm 0.015% 0.006 mV
-40 mV to 200 mV	10 μ V		\pm 0.015% 0.060 mV
400 mV to 200 mV	100 μ V		\pm 0.015% 0.001 V
-4 V to 20 V	1 μ V		\pm 0.020% 0.008 V
-20 mA to 20 mA	1 μ A		\pm 0.015% 0.006 mA

Standard range table for Pt 100

Range(Pt 100)	Resoluz.	Max. Error
-200 $^{\circ}$ C to 850 $^{\circ}$ C	0,1 $^{\circ}$ C	0,395 $^{\circ}$ C
-328 $^{\circ}$ F to 512 $^{\circ}$ F	0,1 $^{\circ}$ F	0,416 $^{\circ}$ F
513 $^{\circ}$ F to 1562 $^{\circ}$ F	< 0,2 $^{\circ}$ F	0,473 $^{\circ}$ F

Standard range table for Ni 100

Range(Ni 100)	Resoluz.	Max. Error
-60 $^{\circ}$ C to 350 $^{\circ}$ C	0,1 $^{\circ}$ C	0,148 $^{\circ}$ C
-76 $^{\circ}$ F to 680 $^{\circ}$ F	0,1 $^{\circ}$ F	0,194 $^{\circ}$ F

In the following tables, the accuracies are shown in % of the full specific span.

Standard range table Ω

Range	Resoluz.	Ref.Accur.
15 Ω to 500 Ω	0,1 Ω	\pm 0.031%

STANDARD EQUIPMENT

The MEMOCAL 2000 is shipped with AC adapter (100 to 240V AC) and 4 Ni-Ca rechargeable batteries.

OPTIONAL ACCESSORIES

Desk top adaptor stand with RS232/RS485 communication interface.



LEATHER CARRYING CASE

Designed to protect the instrument and enable its easy use in the field. The leather bag has a waistband support with a snap catch and a long shoulder strap with hands free operation capability.



MEMOCAL

HOW TO ORDER

MODEL	OPTION	CARRY CASE OPTION	CERTIFICATE OPTION
MEM2090 MEMOCAL calibrator to ITS 90 specification	00 not provided RS Internal RS232	0 not provided 1 supplied with instrument	0 ERO 1 SIT certificate
MEM2090			

HOW TO ORDER - ACCESSORIES

RECHARGEABLE NI/CD BATTERY PACK	AMEM2000BATT1
POWER SUPPLY ADAPTOR	AMEMPWSKIT000
LEATHER CARRYING CASE	A08M024000000
DESK TOP ADAPTOR WITH RS232/RS485	AMEM2000DT000
DESK TOP ADAPTOR WITH RS232 PLUG	AMEM2000DT232
ERO CALIBRATION CERTIFICATE	MEM2000CALCE