



# MEMOCAL 2000

- Very low temperature drift (0.1 $\mu$ V/ $^{\circ}$ 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

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

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.

## Main features:

- Double linearisation standards for thermocouples and RTD
- Accuracy upto 0.015%
- Temperature drift 0.1 $\mu$ V/ $^{\circ}$ C
- Operates with standard AA type alkaline batteries or rechargeable batteries (Ni-Cd or Ni-MH)
- Advanced battery power management system
- 24 hour (average) battery life operation with Ni-MH batteries
- Built-in RS232 interface for remote programming and data recording
- Calibrator cradle, recharger and RS-232C/RS-485 converter in a companion desk-top module
- Autoranging during measurement and generation
- Simulates and measures T/C signals (15 T/C types) and RTD signals (PT100 and Ni 100)
- Generates and measures mA, mV, V and ohms signals
- Square root extraction and quadratic signal generation
- Programmable scaling for mA, mV and V measurement and generation
- Built-in 24 V DC power supply for 2-wires transmitter excitation and measurement
- Programmable external cold junction compensation value
- Peak and valley data hold
- Direct connection for all input types (no special connectors are required for TC inputs)
- Up to 50 program steps to create one or more programs
- Ramp, soak and step function capabilities
- Two dry contact logic inputs for program advance/wait
- Two rows by 16 character alphanumeric LCD display
- Ergonomic front panel with:
  - numeric multi function tactile keyboard
  - menu driven display with parameters-naming capability

## TECHNICAL SPECIFICATION

### GENERAL

Case	ABS, colour similar to RAL 6038
Self extinguishing degree	V-0 according to UL
Input protection	All measured and generated ranges are protected against fault connection to signals up to 30 V AC/DC
Terminals	3 external screw FEMALE plugs dia. 4mm
Weight	600g max. (1.4lb)
Power supply	4 batteries AA size. Alkaline 1.5V or Ni-Cd 1.2 V or NI-MH 1.2V. Switching type AC adapter (100 to 240 V AC)
Battery life	24 hours (average) with Ni-MH batteries
Recharging time	12 hours
Insulation resistance	> 100MΩ
Isolation voltage	1500 V r.m.s.
Common mode rejection ratio	120dB@50/60Hz
Normal mode rejection ratio	60dB@50/60Hz
Safety standard	Meets EN60950/A2
EMC standard	Meets generic emissions standard EN50081-2 and immunity standard EN50082-2 for industrial environments
A/D conversion	Dual slope integration
Sampling time	500ms
Display update time	500ms
Temperature drift	0.0028%/°C or 28ppm/°C
Operating temperature	0 to +40°C
Storage temperature	-10 to +60°C
Humidity	20% to 85% RH non condensing

### MEASURING INPUTS

#### mA and V inputs

Standard ranges table

Range	Resolution	Ref. Accur. (±)
-20mV to 20mV	1μV	0.015%
-200mV to 200mV	10μV	0.015%
-2V to 2V	100μV	0.015%
-20V to 20V	1mV	0.020%
-20mA to 20mA	1μA	0.015%
-130mA to 130mA	10μA	0.020%

Range selection	Automatic or manual
Input impedance	10Ω for mA input >500 kΩ for 20V input
Square root extraction	Programmable
Read-out	Keyboard programmable from -20000 to 20000
Decimal point	Programmable in any position

#### RTD input

RTD type	PT100 3-wire connection Ni 100 3-wire connection
Calibration	Programmable according to IPTS-68 or ITS-90
Line resistance	Up to 20Ω/wire with no measurable error
Engineering unit	°C or °F keyboard programmable
Measuring current	100μA
Burn out	Detection of the sensor open circuit and one or more wires open circuit

Standard range table for RTD PT100

Range PT100	Resolution	Ref. Accur. (±)
-200°C to 850°C	0.1°C	0.028%
-328°F to 512°F	0.1°F	0.012%
513°F to 1562°F	<0.2°F	0.029%

Standard range table for Ni 100

Range Ni100	Resolution	Ref. Accur. (±)
-60°C to 350°C	0.1°C	0.029%
-76°F to 662°F	0.1°F	0.029%

Available only when the IPTS-68 standard has been selected

#### Ohms input

Standard range table

Range	Resolution	Ref. Accur. (±)
0 to 800Ω	0.1Ω	0.025%

### TX MEASUREMENT

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

Power supply	24V DC (maximum current 24 mA)
Resolution	1 μA
Reference accuracy	0.015%
Input impedance	10Ω for mA input
Input range	0 to 20mA
Square root extraction	Programmable
Read-out	Keyboard programmable from -20000 to 20000
Decimal point	Programmable in any position
Burn out	The instrument shows the 'OPEN' message when a burn out condition is detected

### Thermocouples

Type	B,E,J,K,L,N,Ni/Ni-18%Mo, PLII, R, S, T, U, W, W3 and W5 keyboard programmable.
Engineering unit	°C or °F keyboard programmable
Burn out	Detection of the open input circuit (wires or sensor) with "OPEN" indication
Cold junction	Automatic compensation
Cold junction compensation error	±0.3 °C ±0.005 °C/°C
External cold junction compensation	Programmable value from -20 to 80°C
Input impedance	> 10MΩ
Calibration	Programmable according to IPTS-68 or ITS-90

#### Note:

New "International Temperature Scale" (ITS-90) In September 1989, the "International Committee of Weights and Measures" defined the new "International Temperature Scale" (ITS-90) that replaces the "International Practical Temperature Scale" (IPTS-68).

## STANDARD RANGES TABLE

TC Type	RANGE in °C	Resolution	Ref. Accuracy (±)
J	-200°C to 1200°C	0.1°C	0.021%
K	-200°C to 967°C	0.1°C	0.018%
	968°C to 1370°C	<0.2°C	0.032%
T	-200°C to 0°C	0.1°C	0.045%
	1°C to 400°C	0.1°C	0.023%
E	-200°C to 1000°C	0.1°C	0.019%
R	-50°C to 0°C	<0.3°C	0.08%
	1°C to 350°C	<0.2°C	0.048%
	351°C to 1684°C	0.1°C	0.024%
	1685°C to 1760°C	<0.2°C	0.037%
S	-50°C to 0°C	<0.3°C	0.06%
	1°C to 600°C	0.2°C	0.048%
	601°C to 1760°C	0.1°C	0.024%
B	50°C to 100°C	<3°C	0.7%
	101°C to 200°C	<1°C	0.23%
	201°C to 600°C	<0.5°C	0.11%
	601°C to 1150°C	0.2°C	0.039%
	1151°C to 1820°C	0.1°C	0.023%
U	-200°C to 600°C	0.1°C	0.027%
L	-200°C to 900°C	0.1°C	0.026%
N	0°C to 1410°C	<0.2°C	0.034%
Ni/Ni	0°C to 1300°C	0.1°C	0.024%
PLII	-100°C to 961°C	0.1°C	0.014%
	962°C to 1400°C	<0.2°C	0.039%
W (G)	0°C to 50°C	<1°C	0.126%
	51° to 100°C	<0.3°C	0.048%
	101°C to 250°C	<0.2°C	0.035%
	251°C to 1530°C	0.1°C	0.019%
W3 (D)	0°C to 100°C	0.1°C	0.019%
	101°C to 1090°C	0.1°C	0.014%
	1091°C to 2310°C	<0.3°C	0.042%
W5	0°C to 1096°C	0.1°C	0.014%
	1097°C to 2250°C	0.2°C	0.037%
	2251°C to 2315°C	<0.3°C	0.042%

TC Type (±)	RANGE in °F	Resolution	Ref. Accuracy
J	-328°F to 2192°F	0.1°F	0.021%
K	-328°F to 32°F	<0.2°F	0.018%
	33°F to 1772°F	0.1°F	0.014%
	1773°F to 2264°F	0.1°F	0.023%
	2265°F to 2498°F	<0.3°F	0.032%
T	-328°F to 32°F	<0.2°F	0.045%
	33°F to 752°F	0.1°F	0.023%
E	-328°F to 1832°F	0.1°F	0.019%
R	-58°F to 32°F	<0.5°F	0.08%
	33°F to 350°F	<0.4°F	0.048%
	351°F to 500°F	<0.3°F	0.036%
	501°F to 3062°F	<0.2°F	0.025%
	3063°F to 3214°F	<0.3°F	0.037%
S	-58°F to 32°F	<0.5°F	0.06%
	33°F to 140°F	<0.4°F	0.048%
	141°F to 470°F	<0.3°F	0.036%
	471°F To 3214°F	<0.2°F	0.024%
B	122°F To 212°F	<4°F	0.75%
	213°F to 320°F	<2°F	0.25%
	321°F to 600°F	<1°F	0.12%
	601°F to 1250°F	<0.5°F	0.063%
	1251°F to 1770°F	<0.3°F	0.041%
	1771°F to 3276°F	<0.2°F	0.025%
U	-328°F to 1112°F	0.1°F	0.027%
L	-328°F to 1299°F	0.1°F	0.016%
	1300°F to 1652°F	<0.2°F	0.026%
N	32°F to 1083°F	<0.2°F	0.014%
	1084°F to 2006°F	0.1°F	0.028%
	2007°F to 2570°F	<0.2°F	0.031%
Ni/Ni 18%Mo	32°F to 1529°F	0.1°F	0.016%
	1530°F to 2372°F	<0.2°F	0.024%
PLII	-148°F to 924°F	0.1°F	0.013%
	925°F to 1761°F	<0.2°F	0.015%
	1762°F to 2552°F	<0.3°F	0.039%
W(G)	32°F to 392°F	<1.2°F	0.16%
	393°F to 1292°F	<0.2°F	0.045%
	1293°F to 2309°F	0.1°F	0.023%
	2310°F to 2786°F	0.2°F	0.025%
	2787°F to 3276°F	<0.3°F	0.038%
W3(D)	32°F to 572°F	<0.2°F	0.024%
	573°F to 1832°F	0.1°F	0.017%
	1833°F to 1994°F	<0.2°F	0.019%
	1995°F to 3276°F	<0.3°F	0.053%
W5	32°F to 572°F	<0.2°F	0.018%
	573°F to 1958°F	<0.3°F	0.048%

Available only when the IPTS-68 standard has been selected

Note:  
In the tables above the accuracies are shown in % of the full specified span

## TECHNICAL SPECIFICATION (Continued)

### MEASURING OUTPUTS

#### mA and V outputs

Standard range table

Range	Resolution	Ref. Accur. (±)
-4mV to 20mV	1µV	0.015%
-40mV to 200mV	10µV	0.015%
-400mV to 2000mV	100µV	0.015%
-4V to 20V	1mV	0.020%
0mA to 21mA	1µA	0.015%

Output impedance outputs 50Ω for mV output  
0.5Ω for the other V

Maximum load for mA output 500Ω

Range selection Automatic or manual

Quadratic signal generation Programmable

Read-out Keyboard programmable from -4000 to 20000

Decimal point Programmable in any position

#### RTD simulation

RTD type PT100 3 wire connection  
Ni 100 3 wire connection

Calibration Programmable according to IPTS-68 or ITS-90

Engineering unit °C or °F keyboard programmable

Standard range table for RTD PT100

Range (PT100)	Resolution	Ref. Accur. (±)
-200°C to 850°C	0.1°C	0.029%
-328°F to 512°F	0.1°F	0.022%
513°F to 1562°F	<0.2°F	0.025%

Standard range table for Ni100

Range (Ni100)	Resolution	Ref. Accur. (±)
-60°C to 350°C	0.1°C	0.036%
-76°F to 680°F	0.1°F	0.036%

Available only when the IPTS-68 standard has been selected

#### Ohms simulation

Standard range table

Range	Resolution	Ref. Accur. (±)
15 to 500Ω	0.1Ω	0.031%

### Thermocouples

Type B, E, J, K, L, N, Ni/Ni-18%Mo, PLII, R, S, T, U, W, W3 and W5 keyboard programmable.

Engineering unit °C or °F keyboard programmable

Output impedance 50Ω

Calibration See table

Standard ranges For ranges, accuracies and resolutions see thermocouples standard ranges table

### SPECIAL FEATURES

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

Self diagnostic At instrument start up

Peak detection Minimum and maximum Peak Picker

### SEQUENTIAL FUNCTION ROUTINE

This instrument is provided with 50 steps which can be utilised to make up one or more programs  
Each program can consist of a number of soak and ramp simulations measurements and standby steps.

Low battery test

A test is provided at 3 different levels:

- 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 utilises the remaining power for memory back up only.

### SERIAL INTERFACE (optional)

Types Built-in: RS-232C  
External: RS-232 to RS485 optoisolated converter installed in the desk-top stand

Protocol type MODBUS, JBUS

Baud rate Keyboard programmable from 600 to 19200 BAUD

Byte format 8 bit

Parity Even, odd or none programmable

Stop bit One

Address From 1 to 255

Output voltage According to EIA standard levels

### LOGIC INPUTS

The MEMOCAL 2000 is equipped with 2 logic inputs.

They are mutually exclusive with serial interface. These 2 logic inputs have the following functions:

- Logic input 1: sequences to the next program step.
- Logic input 2: it allows to start or to suspend the program execution (RUN/WAIT)

## ORDERING CODE

### Standard equipment

Code	Description
<b>AMEM209000100</b>	MEMOCAL 2000 hand held calibrator including carry bag
<b>AMEM2090RS100</b>	MEMOCAL 2000 hand held calibrator + RS232 option

### Optional equipment

Code	Description
<b>A08M24000000</b>	Desk top stand including RS232 connection
<b>AMEM2000DT000</b>	Rechargeable battery kit
<b>AMEM2000CALCE</b>	Calibration Cert

## DIMENSIONAL DETAILS (mm)

