

MEMOCAL 2000/2000S

Hand-held calibrator



MEMOCAL 2000

- **Very low temperature drift (0.1 μ V/°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 μ V/°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 (2000 only)
- Calibrator cradle, recharger and RS-232C/RS-485 converter in a companion desk-top module (2000 only)
- Autoranging during measurement and generation
- Simulates and measures T/C signals (15 T/C types) and RTD signals (PT100 and Ni 100)(2000 only)
- 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

MEMOCAL 2000S

The **MEMOCAL 2000S** has been engineered specifically for the Hospital and Healthcare industry. It has the same high specification as the standard model except that it provides type T thermocouple and process inputs only.

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	>100M Ω
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%/ $^{\circ}$ C or 28ppm/ $^{\circ}$ C
Operating temperature	0 to +40 $^{\circ}$ C
Storage temperature	-10 to +60 $^{\circ}$ C
Humidity	20% to 85% RH non condensing

MEASURING INPUTS

mA and V inputs*

Standard ranges table

Range	Resolution	Ref. Accur. (\pm)
-20mV to 20mV	1 μ V	0.015%
-200mV to 200mV	10 μ V	0.015%
-2V to 2V	100 μ V	0.015%
-20V to 20V	1mV	0.020%
-20mA to 20mA	1 μ A	0.015%
-130mA to 130mA	10 μ A	0.020%

Range selection	Automatic or manual
Input impedance	10 Ω for mA input >500 k Ω 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 20 Ω /wire with no measurable error
Engineering unit	$^{\circ}$ C or $^{\circ}$ F keyboard programmable
Measuring current	100 μ A
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. (\pm)
-200 $^{\circ}$ C to 850 $^{\circ}$ C	0.1 $^{\circ}$ C	0.028%
-328 $^{\circ}$ F to 512 $^{\circ}$ F	0.1 $^{\circ}$ F	0.012%
513 $^{\circ}$ F to 1562 $^{\circ}$ F	<0.2 $^{\circ}$ F	0.029%

Standard range table for Ni 100

Range Ni100	Resolution	Ref. Accur. (\pm)
-60 $^{\circ}$ C to 350 $^{\circ}$ C	0.1 $^{\circ}$ C	0.029%
-76 $^{\circ}$ F to 662 $^{\circ}$ F	0.1 $^{\circ}$ F	0.029%

Available only when the IPTS-68 standard has been selected

Ohms input

Standard range table

Range	Resolution	Ref. Accur. (\pm)
0 to 800 Ω	0.1 Ω	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 μ A
Reference accuracy	0.015%
Input impedance	10 Ω 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	$^{\circ}$ C or $^{\circ}$ 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	\pm 0.3 $^{\circ}$ C \pm 0.005 $^{\circ}$ C/ $^{\circ}$ C
External cold junction compensation	Programmable value from -20 to 80 $^{\circ}$ C
Input impedance	>10M Ω
Calibration	Programmable according to IPTS-68 or ITS-90

* Only input ranges marked '*' are available with the Hospital and Healthcare version MEMOCAL 200S

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%
	1531°C to 2300°C	<0.2°C	0.03%
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%

* Only input ranges marked '*' are available with the Hospital and Healthcare version MEMOCAL 200S

Available only when the IPTS-68 standard has been selected

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%
T	2265°F to 2498°F	<0.3°F	0.032%
	-328°F to 32°F	<0.2°F	0.045%
E	33°F to 752°F	0.1°F	0.023%
	-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%
S	3063°F to 3214°F	<0.3°F	0.037%
	-58°F to 32°F	<0.5°F	0.06%
B	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%
	122°F To 212°F	<4°F	0.75%
U	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%
L	-328°F to 1112°F	0.1°F	0.027%
N	-328°F to 1299°F	0.1°F	0.016%
	1300°F to 1652°F	<0.2°F	0.026%
Ni/Ni	32°F to 1083°F	<0.2°F	0.014%
	1084°F to 2006°F	0.1°F	0.028%
18%Mo	2007°F to 2570°F	<0.2°F	0.031%
	32°F to 1529°F	0.1°F	0.016%
PLII	1530°F to 2372°F	<0.2°F	0.024%
	-148°F to 924°F	0.1°F	0.013%
W(G)	925°F to 1761°F	<0.2°F	0.015%
	1762°F to 2552°F	<0.3°F	0.039%
	32°F to 392°F	<1.2°F	0.16%
	393°F to 1292°F	<0.2°F	0.045%
W3(D)	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%
	32°F to 572°F	<0.2°F	0.024%
W5	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%
	1959°F to 3276°F	<0.4°F	0.054%

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

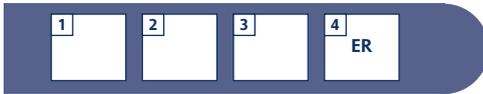
LOGIC INPUTS

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



1 Basic Product	
MEM2090	Standard unit
MEM2095	Healthcare version

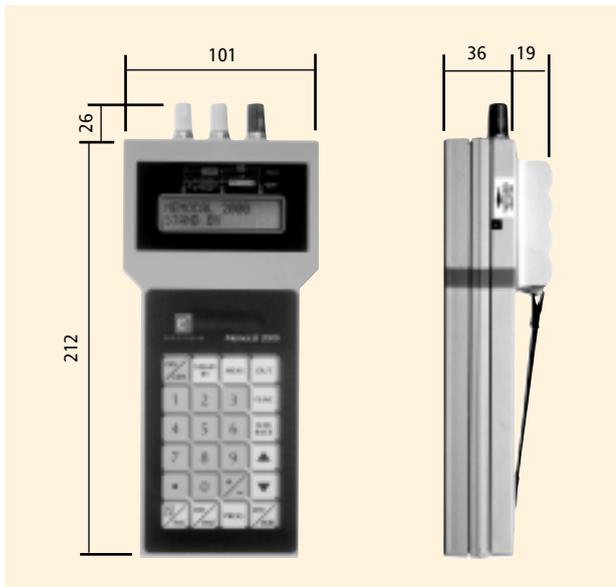
Accessories:
MEM2000BATTO Battery pack (rechargeable)
MEM2000CALER Factory calibration and certificate

2 Options	
00	None
RS	RS232 Comms ⁽¹⁾
DT	Desk Top Adaptor ⁽¹⁾

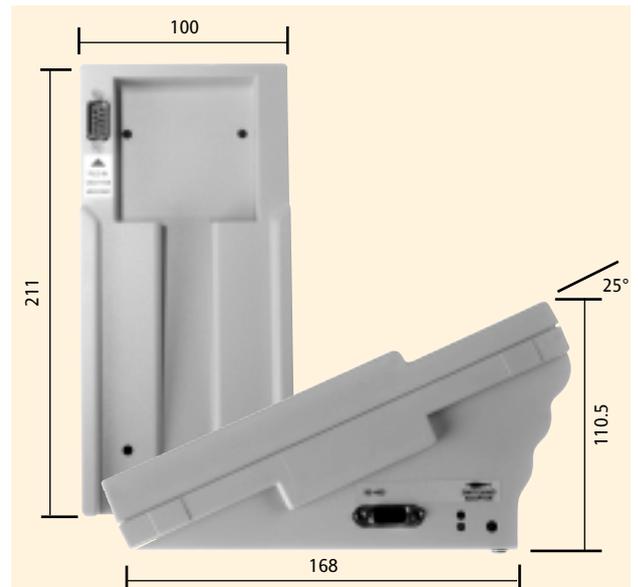
Note:
 (1) Not available with MEM2095

3 Case	
0	None
1	Case

DIMENSIONAL DETAILS (mm)



MEMOCAL 2000/2000S



MEMOCAL desk top stand

EUROTHERM LIMITED UK

Faraday Close Durrington Worthing BN13 3PL United Kingdom
 Tel. +44 (0)1903 205277 Fax +44 (0)1903 236465

Email info@eurotherm.co.uk

Web www.eurotherm.co.uk

EUROTHERM US

741-F Miller Drive Leesburg VA 20175-8993

Tel. 1-703-443-0000 Fax 1-703-669-1300

Email info@eurotherm.com

Web www.eurotherm.com

© Copyright Eurotherm Limited 2002

All rights are strictly reserved. No part of this document may be reproduced, modified, or transmitted in any form by any means, nor may it be stored in a retrieval system other than for the purpose to act as an aid in operating the equipment to which the document relates, without the prior written permission of Eurotherm limited.

Eurotherm Limited pursues a policy of continuous development and product improvement. The specifications in this document may therefore be changed without notice. The information in this document is given in good faith, but is intended for guidance only. Eurotherm Limited will accept no responsibility for any losses arising from errors in this document.

