Beamex MC2

HAND-HELD CALIBRATOR

Practicality in calibration


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F1
F2
F3

MC2 series: three different hand-held calibrators for field use

Practicality in calibration. The Beamex MC2 series includes three different hand-held calibrators for field use: the MC2 pressure/electrical calibrator, the MC2 temperature/electrical calibrator and the MC2 multifunction calibrator. The MC2 is a compact and easy-to-use hand-held calibrator. It has a large graphical display, a menu-based interface and a full numerical keyboard. The MC2 represents the high, uncompromised quality standards of Beamex calibration equipment.

The main features of MC2

Compact and user-friendly

The MC2 is a compact, lightweight portable calibrator with large graphical display, multilingual interface and full numerical keyboard. Calibration is quick and simple.

Accuracy guaranteed

The MC2 is delivered with a traceable, accredited calibration certificate.

Safe and robust field calibrator

The MC2 with impact protectors and membrane keyboard is robust and made for tough use.

Wide range of configuration possibilities

The MC2 provides a number of configuration possibilities, such as internal and external pressure modules.

The MC2 series specifications

FEATURES	MC2-PE PRESSURE / ELECTRICAL	MC2-TE TEMPERATURE / ELECTRICAL	MC2-MF MULTIFUNCTION
Internal pressure module	●	–	●
Connection for external pressure modules	●	●	●
Current measurement (with internal and external supply)	●	●	●
Voltage measurement	●	●	●
Frequency measurement	●	●	●
Pulse counting	●	●	●
Switch sensing	●	●	●
Internal HART compatible 24 VDC loop supply	●	●	●
Current generation (with internal and external supply)	–	●	●
Voltage generation	–	●	●
Frequency generation	–	●	●
Pulse generation	–	●	●
mV measurement / simulation	–	●	●
Resistance measurement / simulation	–	●	●
RTD measurement / simulation	–	●	●
TC measurement / simulation	–	●	●

The MC2 general specifications

GENERAL SPECIFICATIONS

GENERAL	MC2
Display	60 mm x 60 mm (2.36" x 2.36"), 160 x 160 pixels backlit LCD
Weight	720…830 g (1.59…1.83 lbs)
Dimensions	215 mm (8.5") x 102 mm (4") x 49 mm (1.9") (d/w/h)
Keyboard	Membrane keyboard
Battery type	Rechargeable NiMH, 4000 mAh, 3.6V DC
Charging time	5 hours
Charger supply	100…240 VAC, 50-60 Hz
Battery operation	13…24 hours in measurement mode, back light off. 8…12 hours when sourcing an average of 12 mA to loop, with back light on.
Operating temperature	–10…50 °C (14…122°F)
Operating temperature when charging batteries	0…35 °C (32…95°F)
Storage temperature	–20 to 60 °C (–4 to 140°F)
Humidity	0 to 80% R.H. non condensing
Warmup time	Specifications valid after a 5 minute warmup period.
Max. input voltage	30 V AC, 60 V DC
Safety	Directive 73/23/EEC, EN 61010-1
EMC	Directive 89/336/EEC, EN 61326
Warranty	Standard: 2 years for MC2; 1 year for battery pack. [1]

1) The warranty of the MC2 will be extended up to 6 years if the product is calibrated on a yearly basis at Beamex's calibration laboratory.

VOLTAGE MEASUREMENT –1…60 V DC

RANGE	RESOLUTION	1 YEAR UNCERTAINTY (±) [2]
±0.25 V	0.001mV	0.02% RDG + 5 µV
±(0.25…1 V)	0.01 mV	0.02% RDG + 5 µV
1…25 V	0.1 mV	0.02% RDG + 0.25 mV
25…60 V	1 mV	0.02% RDG + 0.25 mV

FEATURE	SPECIFICATION
Temperature coefficient	< ±0.0015% RDG / °C outside of 18…28 °C < ±0.0008% RDG / °F outside of 64.4…82.4°F
Input impedance	>1 MΩ
Supported units	V, mV, µV
Display update rate	3 / second

mA MEASUREMENT ±100 mA

RANGE	RESOLUTION	1 YEAR UNCERTAINTY (±) [2]
±25mA	0.0001 mA	0.02% RDG + 1.5 µA
±(25…100 mA)	0.001 mA	0.02% RDG + 1.5 µA

FEATURE	SPECIFICATION
Temperature coefficient	< ±0.0015% RDG / °C outside of 18…28 °C < ±0.0008% RDG / °F outside of 64.4…82.4°F
Input impedance	< 7.5 Ω
Supported units	mA, µA
Display update rate	3 / second

LOOP SUPPLY

FEATURE	SPECIFICATION
Maximum output current	> 25 mA, short circuit protected
Output voltage	24 V ± 10%
Output impedance in HART compatible mode	300 Ω ± 20%

2) Uncertainty includes reference standard uncertainty, hysteresis, non-linearity, repeatability and typical long-term stability for the mentioned period (k=2).

Electrical measurements

FREQUENCY MEASUREMENT 0.0027…50 000 Hz

RANGE	RESOLUTION	1 YEAR UNCERTAINTY (±) [1]
0.0027…0.5 Hz	0.000001 Hz	0.01% RDG
0.5…5 Hz	0.00001 Hz	0.01% RDG
5…50 Hz	0.0001 Hz	0.01% RDG
50…500 Hz	0.001 Hz	0.01% RDG
500…5000 Hz	0.01 Hz	0.01% RDG
5000…50000 Hz	0.1 Hz	0.01% RDG

FEATURE	SPECIFICATION
Temperature coefficient	Specification valid from –10 to 50 °C (14…122°F)
Input impedance	> 1 MΩ
Trigger level	–1…14 V in 1 V steps and open collector inputs
Minimum signal amplitude	2 Vpp (< 10 kHz), 3 Vpp (10…50 kHz)
Supported units	Hz, kHz, cph, cpm, 1/Hz (s), 1/kHz (ms), 1/MHz (µs)
Gate period	267 ms + 1 signal period

1) Uncertainty includes reference standard uncertainty, hysteresis, non-linearity, repeatability and typical long-term stability for the mentioned period (k=2).

PULSE COUNTING 0…9 999 999 PULSES

FEATURE	SPECIFICATION
Range	0 to 9 999 999 pulses
Input impedance	> 1 MΩ
Trigger level	–1…14 V in 1 V steps and open collector inputs
Minimum signal amplitude	2 Vpp (pulse length > 50 µs), 3 Vpp (pulse length 10…50 µs)

SWITCH TEST

FEATURE	SPECIFICATION	MC2
Potential free contacts	Test voltage (trigger level)	3 V, 0.13 mA (1 V) or 24 V, 35 mA (2 V)
Voltage level detection	Trigger level Input impedance	–1…14 V in 1 V steps > 1 MΩ

Pressure measurement

INTERNAL PRESSURE MODULES (IPM)

INTERNAL MODULE [3]	UNIT	RANGE [2]	RESOLUTION	1 YEAR UNCERTAINTY (±) [1]
IPM200mC	kPa mbar iwc	±20 ±200 ±80	0.001 0.01 0.01	0.05% RDG + 0.05% FS
IPM2C	kPa bar psi	–100 to 200 –1 to 2 –14.5 to 30	0.01 0.0001 0.001	0.05% FS
IPM20C	kPa bar psi	–100 to 2000 –1 to 20 –14.5 to 300	0.1 0.001 0.01	0.05% FS
IPM160	MPa bar psi	0…16 0…160 0…2400	0.001 0.01 0.1	0.05% FS
Barometric option	Also enables absolute pressure measurement for the above pressure inputs. When using the barometric option, add 0.1 kPa (0.0146 psi) uncertainty for absolute pressure measurement.			

FEATURE	SPECIFICATION
Temperature coefficient	< ±0.001% RDG / °C outside 15…35 °C. < ±0.0006% RDG /°F outside 59…95°F
Maximum overpressure	2 × Range
Pressure port	G 1/8” female with G 1/8" male (ISO 228/1) 60° internal cone adapter IPM160: G 1/8” female
Media compatibility	Wetted parts: AISI316 stainless steel, Nitrile rubber
Supported pressure units	Pa, hPa, kPa, MPa, mbar, bar, lbf/ft2, psi, ozf/in2, gf/cm2, kgf/cm2, kgf/m2, kp/cm2, at, mmH_2O, cmH_2O, mH_2O, iwc, ftH_2O, mmHg, cmHg, mHg, inHg, mmHg(0 °C), inHg(0 °C), mmH_2O(4 °C; 60°F; 68°F/20 °C), cmH_2O(4 °C; 60°F; 68°F/20 °C), inH_2O(4 °C; 60°F; 68°F/20 °C), ftH2O(4 °C; 60°F; 68°F/20 °C), torr, atm, + four (4) user-configurable units
Display update rate	2.5 / second

EXTERNAL PRESSURE MODULES (EXT) STANDARD ACCURACY

MODULE	RANGE [2]		RESOLUTION	1 YEAR UNCERTAINTY (±) [1]
EXT200mC-s	±200 mbar	±80 iwc	0.01 mbar 0.01 iwc	0.05% RDG + 0.05% FS
EXT2C-s	–1…2 bar	–14.5…30 psi	0.0001 bar 0.001 psi	0.05% FS
EXT20C-s	–1…20 bar	–14.5…300 psi	0.001 bar 0.01 psi	0.05% FS
EXT160-s	0…160 bar	0…2400 psi	0.01 bar 0.1 psi	0.05% FS

EXTERNAL PRESSURE MODULES (EXT) HIGH ACCURACY

MODULE	RANGE [2]		1 YEAR UNCERTAINTY (±) [1]
Barometric	800…1200 mbar abs	23.6…35.4 inHg a	0.5 mbar (0.015 inHg)
EXT10mD	±10 mbar differential	±4 iwc differential	0.1% RDG + 0.05% Span
EXT100m	0…100 mbar gauge	0…40 iwc	0.025% RDG + 0.025% FS
EXT400mC	±400 mbar	±160 iwc	0.025% RDG + 0.02% FS
EXT1C	±1 bar	–14.5…15 psi	0.025% RDG + 0.015% FS
EXT2C	–1…2 bar	–14.5…30 psi	0.025% RDG + 0.01% FS
EXT6C	–1…6 bar	–14.5…90 psi	0.025% RDG + 0.01% FS
EXT20C	–1…20 bar	–14.5…300 psi	0.025% RDG + 0.01% FS
EXT60	0…60 bar	0…900 psi	0.025% RDG + 0.01% FS
EXT100	0…100 bar	0…1500 psi	0.025% RDG + 0.01% FS
EXT160	0…160 bar	0…2400 psi	0.025% RDG + 0.01% FS
EXT250	0…250 bar	0…3700 psi	0.025% RDG + 0.015% FS
EXT600	0…600 bar	0…9000 psi	0.025% RDG + 0.015% FS
EXT1000	0…1000 bar	0…15000 psi	0.025% RDG + 0.015% FS

1) Uncertainty includes reference standard uncertainty, hysteresis, non-linearity, repeatability and typical long-term stability for the mentioned period (k=2).
2) The internal pressure module’s range may also be displayed in absolute pressure if a barometric module is used.
3) The MC2 calibrator can hold one internal pressure module and the barometric option.
All external pressure modules (EXT) are also compatible with Beamex MC4, MC5, MC5P and MC6 calibrators.

Electrical generation, measurement and simulation

mV MEASUREMENT (T/C-TERMINALS) –25…150 mV

RANGE	RESOLUTION	1 YEAR UNCERTAINTY (±) [1]
–25…150 mV	0.001 mV	0.02% RDG + 4 µV

FEATURE	SPECIFICATION
Temperature coefficient	< ±0.0015% RDG / °C outside of 18…28 °C < ±0.0008% RDG / °F outside of 64.4…82.4°F
Input impedance	> 10 MΩ
Supported units	V, mV, µV
Display update rate	3 / second

mV GENERATION (T/C-TERMINALS) –25…150 mV

RANGE	RESOLUTION	1 YEAR UNCERTAINTY (±) [1]
–25…150 mV	0.001 mV	0.02 % RDG + 4 µV

FEATURE	SPECIFICATION
Temperature coefficient	< ±0.0015% RDG / °C outside of 18…28 °C < ±0.0008% RDG / °F outside of 64.4…82.4°F
Maximum load current	5 mA
Load effect	< 5 µV/mA
Supported units	V, mV, µV

VOLTAGE GENERATION –3…12 V

RANGE	RESOLUTION	1 YEAR UNCERTAINTY (±) [1]
±0.25 V	0.01 mV	0.02% RDG + 0.1 mV
–3…–0.25 V	0.1 mV	0.02% RDG + 0.1 mV
0.25…12 V	0.1 mV	0.02% RDG + 0.1 mV

FEATURE	SPECIFICATION
Temperature coefficient	< ±0.0015% RDG / °C outside of 18…28 °C < ±0.0008% RDG / °F outside of 64.4…82.4°F
Maximum load current	5 mA
Load effect	< 50 µV/mA
Supported units	V, mV, µV

mA GENERATION (SOURCE/SINK) 0…25 mA

RANGE	RESOLUTION	1 YEAR UNCERTAINTY (±) [1]
0…25 mA	0.0001 mA	0.02% RDG + 1.5 µA

FEATURE	SPECIFICATION
Temperature coefficient	< ±0.0015% RDG / °C outside of 18…28 °C < ±0.0008% RDG / °F outside of 64.4…82.4°F
Max load impedance (source)	750 Ω (0…20 mA), 600 Ω (20…25 mA)
Max loop voltage (sink)	60 V
Supported units	mA, µA

1) Uncertainty includes reference standard uncertainty, hysteresis, non-linearity, repeatability and typical long-term stability for the mentioned period (k=2).

RESISTANCE MEASUREMENT 0…4000 Ω

RANGE	RESOLUTION	1 YEAR UNCERTAINTY (±) [1]
0…250 Ω	1 mΩ	4-wire connection: 0.02% RDG + 3.5 mΩ 3-wire connection: 0.02% RDG + 13.5 mΩ
250…2650 Ω	10 mΩ	
2650…4000 Ω	100 mΩ	

FEATURE	SPECIFICATION
Temperature coefficient	< ±0.0015% RDG / °C outside of 18…28 °C < ±0.0008% RDG / °F outside of 64.4…82.4°F
Measurement current	Pulsed, bi-directional 1 mA (0..500 Ω), 0.2 mA (>500 Ω)
Supported units	Ω, kΩ
Display update rate	3 / second

RESISTANCE SIMULATION 0…4000 Ω

RANGE	RESOLUTION	1 YEAR UNCERTAINTY (±) [1]
0…400 Ω	10 mΩ	0.04% RDG or 30 mΩ (Whichever is greater)
400…4000 Ω	100 mΩ	0.04% RDG or 30 mΩ (Whichever is greater)

FEATURE	SPECIFICATION
Temperature coefficient	< ±0.0015% RDG / °C outside of 18…28 °C < ±0.0008% RDG / °F outside of 64.4…82.4°F
Maximum resistance excitation current	5 mA (0…650 Ω) Iexc × Rsim < 3.25 V (650…4000 Ω)
Settling time (pulsed currents)	1 ms
Supported units	Ω, kΩ

FREQUENCY GENERATION 0.0005…10 000 Hz

RANGE	RESOLUTION	1 YEAR UNCERTAINTY (±) [1]
0.0005…0.5 Hz	0.000001 Hz	0.01% RDG
0.5…5 Hz	0.00001 Hz	0.01% RDG
5…50 Hz	0.0001 Hz	0.01% RDG
50…500 Hz	0.001 Hz	0.01% RDG
500…5000 Hz	0.01 Hz	0.01% RDG
5000…10000 Hz	0.1 Hz	0.01% RDG

FEATURE	SPECIFICATION
Temperature coefficient	Specification valid from –10 to 50 °C (14…122°F)
Maximum load current	5 mA
Output amplitude positive square wave	0…12 Vpp ±(0.2 V+5%)
Output amplitude symmetric square wave	0…6 Vpp ±(0.2 V+5%)
Duty cycle	1…99% (0.0009…500 Hz), high / low time: min 25µs, max 1165 s
Supported units	Hz, kHz, cph, cpm, 1/Hz (s), 1/kHz (ms), 1/MHz (µs)
Jitter	< 0.28 µs

PULSE GENERATION 0…9 999 999 PULSES

FEATURE	SPECIFICATION
Range	0 to 9 999 999 pulses
Resolution	1 pulse
Maximum load current	5 mA
Output amplitude positive pulse	0…12 Vpp ±(0.2 V+5%)
Output amplitude symmetric pulse	0…6 Vpp ±(0.2 V+5%)
Pulse frequency	0.0005…10 000 Hz
Duty cycle	1…99% (0.0009…500 Hz), high / low time: min 25µs, max 1165 s

1) Uncertainty includes reference standard uncertainty, hysteresis, non-linearity, repeatability and typical long-term stability for the mentioned period (k=2).

THERMOCOUPLE MEASUREMENT AND SIMULATION

Thermocouple types available as standard

TYPE	RANGE (°C)	RANGE (°C)	1 YEAR UNCERTAINTY (±) [1]
B [2]	0…1820	0…200 200…400 400…1820	[3] 2.0 °C 1.0 °C
R [2]	–50…1768	–50…0 0…100 100…1768	1.0 °C 0.8 °C 0.6 °C
S [2]	–50…1768	-50…0 0…1768	1.0 °C 0.7 °C
E [2]	–270…1000	–270…–200 -200…1000	[3] 0.25 °C
J [2]	–210…1200	–210…1200	0.3 °C
K [2]	–270…1372	–270…–200 –200…1000 1000…1372	[3] 0.3 °C 0.4 °C
N [2]	–270…1300	–270…-200 –200…1300	[3] 0.4 °C
T [2]	–270…400	–270…–200 –200…–100 –100…400	[3] 0.3 °C 0.2 °C
U [4]	–200…600	–200…–100 –100…600	0.3 °C 0.2 °C
L [4]	–200…900	–200…900	0.25 °C
C [5]	0…2315	0…1000 1000…2000 2000…2315	0.4 °C 0.8 °C 1.2 °C
G [6]	0…2315	0…100 100…2315	[3] 1.0 °C
D [5]	0…2315	0…1000 1000…2000 2000…2315	0.4 °C 0.8 °C 1.2 °C

FEATURE	MEASUREMENT	SIMULATION
Resolution	0.01 °C	0.01 °C
Temperature coefficient	< ±0.0015% of thermovoltage / °C outside of 18…28 °C < ±0.0008% of thermovoltage / °F outside of 64.4 …82.4°F	< ±0.0015% of thermovoltage / °C outside of 18…28 °C < ±0.0008% of thermovoltage / °F outside of 64.4 …82.4°F
Input impedance	>10 MΩ	–
Supported units	°C, °F, K	°C, °F, K
Display update rate	3 / second	–
Maximum load current	–	5 mA
Load effect	–	< 5 µV/mA

INTERNAL REFERENCE JUNCTION

RANGE (°C)	1 YEAR UNCERTAINTY
–10…50 °C	±0.25 °C

1) Uncertainty includes reference standard uncertainty, hysteresis, non-linearity, repeatability and typical long-term stability for the mentioned period (k=2). Uncertainty does not include reference junction uncertainty.
2) IEC 584, NIST MN 175, BS 4937, ANSI MC96.1
3) ±0.02% of thermovoltage + 4 µV
4) DIN 43710
5) ASTM E 988 - 96
6) ASTM E 1751 - 95e1

RTD MEASUREMENT AND SIMULATION

SENSOR TYPE	RANGE	RESOLUTION	MEASUREMENT 1 YEAR UNCERTAINTY (±) 1	SIMULATION 1 YEAR UNCERTAINTY (±) [1) 2)]
Pt 50 ... 1000	–200 ... 200°C 200 ... 600°C 600 … 850°C	0.01°C 0.01°C 0.01°C	0.1°C 0.2°C 0.3°C	0.15°C 0.25°C 0.35°C
Ni 100	–60 ... 180°C	0.01°C	0.1°C	0.15°C
Ni 120	–80 ... 260°C	0.01°C	0.1°C	0.15°C
Cu10	–200 ... 260°C	0.01°C	0.2°C	0.8°C

FEATURE	MEASUREMENT	SIMULATION
Temperature coefficient	< ±0.0015% of resistance / °C outside of 18…28 °C < ±0.0008% of resistance / °F outside of 64.4 …82.4 °F	< ±0.0015% of thermovoltage / °C outside of 18…28 °C < ±0.0008% of thermovoltage / °F outside of 64.4 …82.4 °F
Maximum Resistance excitation current	–	5 mA (0 ... 650 Ω) Iexc × Rsim < 3.25 V (650 ... 4000 Ω)
Supported units	°C, °F, K	°C, °F, K
Display update rate	3 / second	–

RTD TYPES AVAILABLE AS STANDARD				
Pt50 (385)	Pt400 (385)	Pt100 (3926)	Pt100 (3923)	Cu10 (427)
Pt100 (385)	Pt500 (385)	Pt100 (391)	Ni100 (618)	
Pt200 (385)	Pt1000 (385)	Pt100 (375)	Ni120 (672)	

1) Uncertainty includes reference standard uncertainty, hysteresis, non-linearity, repeatability and typical long-term stability for the mentioned period. (k=2).
2) Specification valid with an excitation current >0.2 mA (0 ... 400 Ω), >0.1 mA (400 ... 4000 Ω)

STANDARD ACCESSORIES

- User guide
- Calibration certificate
- Internal rechargeable NiMH battery pack + battery charger
- Test leads and clips
- USB cable
- Adapter pressure connector – from G1/8" female to G 1/8" male with 60° internal cone (included in MC2-PE and MC2-MF models)

OPTIONAL ACCESSORIES

- Pressure T-hose
- Soft carrying case
- Connection cable for external pressure modules
- Dry battery cartridge
- Calibration handpumps

SUMMARY

Beamex MC2

A SERIES OF PRACTICAL HAND-HELD CALIBRATORS

The Beamex MC2-series includes three different high-quality hand-held calibrators for field use: the MC2 pressure/electrical calibrator, the MC2 temperature/electrical calibrator and the MC2 multifunction calibrator. The MC2 is a compact and easy-to-use hand-held calibrator. It has a large graphical display, a menu-based interface and full numerical keyboard.

Compact and user-friendly

The MC2 is a compact, lightweight portable calibrator with large graphical display, multilingual interface and full numerical keyboard. Calibration is quick and simple.

Accuracy guaranteed

The calibrator is delivered with a traceable, accredited calibration certificate.

Safe and robust field calibrator

The MC2 with impact protectors and membrane keyboard is robust and made for tough use.

Wide range of configuration possibilities

The MC2 provides a number of configuration possibilities, such as internal and external pressure modules.

Main features

- Available in three versions:
  - MC2 pressure/electrical calibrator
  - MC2 temperature / electrical calibrator
  - MC2 multifunction calibrator
- Internal / external pressure modules
- Compact size and design
- User-friendly