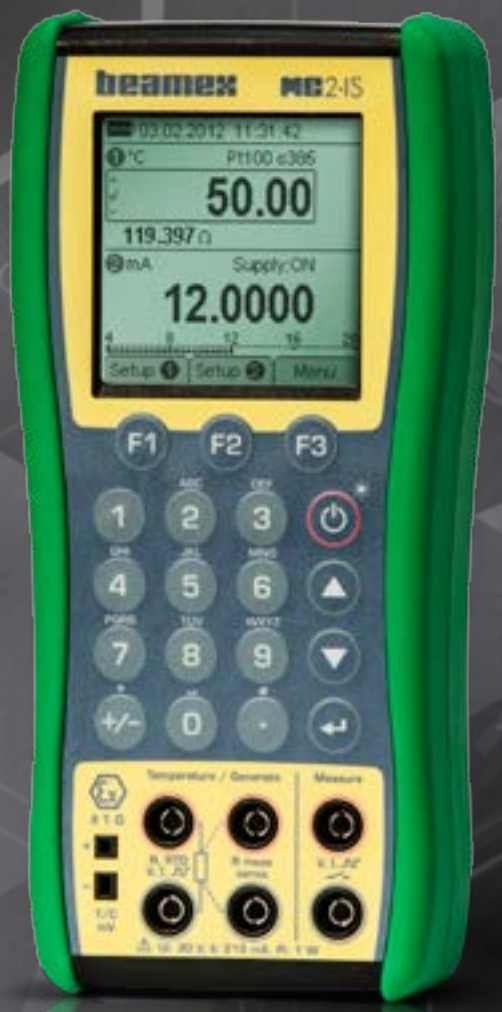
Beamex MC2-IS

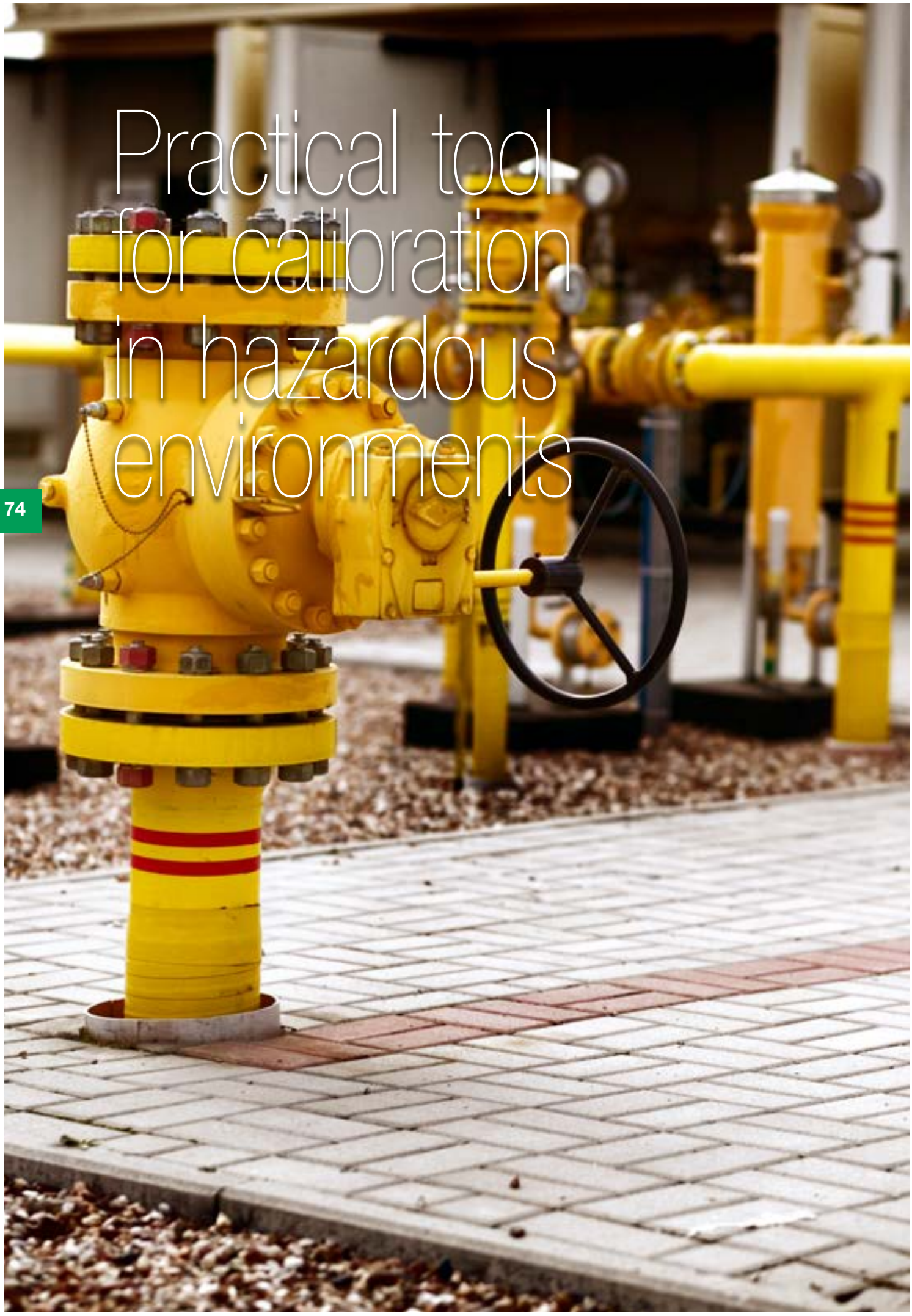
INTRINSICALLY SAFE MULTIFUNCTION CALIBRATOR



Practical tool for calibration in hazardous environments

IEC Ex VTT 003

Practical tool for calibration in hazardous environments



The ATEX- and IECEx- certified MC2-IS is a compact calibrator for hazardous environments

The MC2-IS intrinsically safe multifunction calibrator is an ATEX- and IECEx- certified calibrator designed for use in potentially explosive environments such as offshore platforms, oil refineries, chemical and petrochemical plants where inflammable gases may be present. It connects to almost 20 available Beamex intrinsically safe external pressure modules. The calibrator has a compact size and design.

Main features of MC2-IS

Compact and user-friendly

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

Accuracy guaranteed

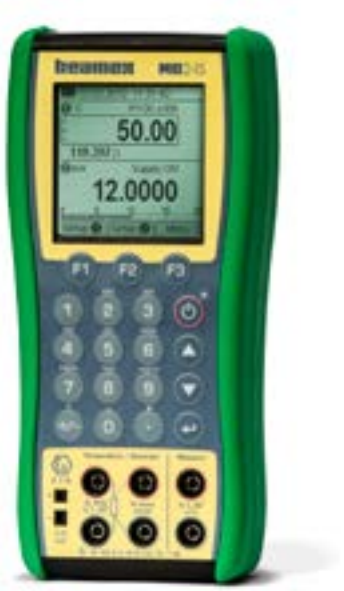
The MC2-IS is delivered with a traceable, accredited calibration certificate.

Safe and robust field calibrator

The ATEX- and IECEx- certified MC2-IS with impact protectors and membrane keyboard is robust and made for tough use.

Extensive configuration possibilities

The MC2-IS provides a number of configuration possibilities and connects to nearly 20 available Beamex external pressure modules (IS).



The MC2-IS general specifications

GENERAL SPECIFICATIONS

GENERAL	MC2-IS
Display	60 mm x 60 mm (2.36" x 2.36"), 160 x 160 pixels LCD, backlit
Weight	1070 g (2.3 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, 1700 mAh, 4.8V DC
Charging time	12 hours
Charger supply	100…240 VAC, 50–60 Hz
Battery operation	12 hours in measurement mode, backlight off. 4 hours when sourcing a loop, backlight continuously on.
Operating temperature	–10…50 °C (14…122°F)
Operating temperature when charging batteries	0…35 °C (32…95°F) (Must be charged at a non Ex area.)
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 DC
Safety	Directive 73/23/EEC, EN 61010-1
EMC	Directive 89/336/EEC, EN 61326
Ex	IECEx: Ex ia IIC T4 Ga, Ta= –10 …+50°C ATEX: Ex II 1 G, Ex ia IIC T4 Ga, Ta= –10 …+50°C
Warranty	Standard: 2 years for MC2-IS; 1 year for battery pack. [1]

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

VOLTAGE MEASUREMENT –1…30 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…30 V	0.1 mV	0.02% RDG + 0.25 mV
–	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	20 V ± 10% @ 0 mA, > 12 V @ 20 mA
Output impedance in HART compatible mode	250 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

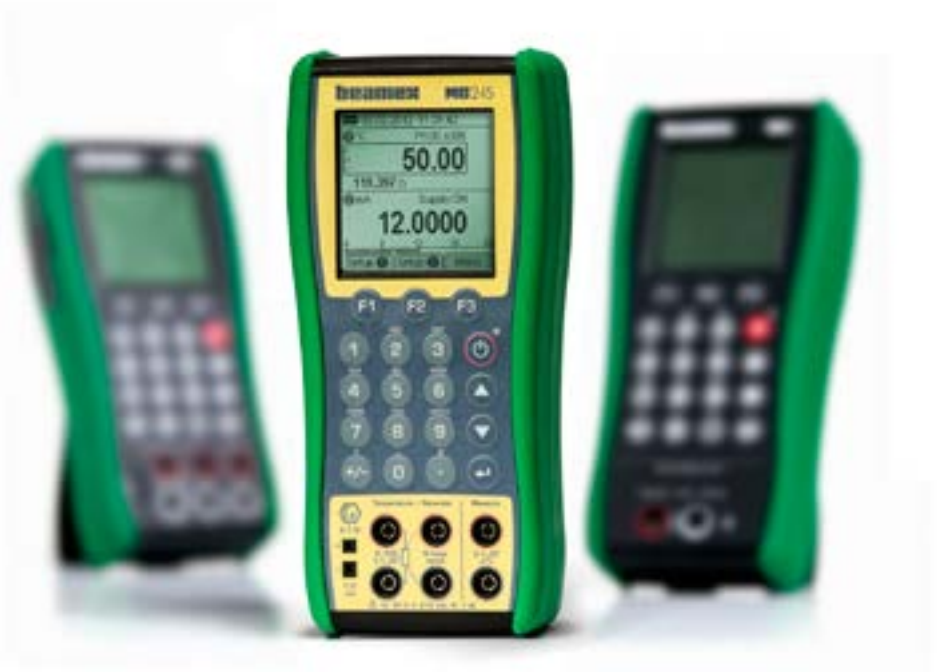
1) Uncertainty includes reference standard uncertainty, hysteresis, non-linearity, repeatability and typical long-term stability for the mentioned period (k=2).

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-IS
Potential free contacts	Test voltage (trigger level)	3 V, 0.08 mA (1 V) or 20 V, 25 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]
Barometric option -IS	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, ftH2O, 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), ftH_2O(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

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

EXTERNAL PRESSURE MODULES (EXT) HIGH ACCURACY

INTRINSICALLY SAFE	RANGE [2]		1 YEAR UNCERTAINTY (±) [1]
Barometric-IS	800…1200 mbar abs	23.6…35.4 inHg a	0.5 mbar (0.015 inHg)
EXT10mD-IS	±10 mbar differential	±4 iwc differential	0.1% RDG + 0.05% Span
EXT100m-IS	0…100 mbar gauge	0…40 iwc	0.025% RDG + 0.025% FS
EXT400mC-IS	±400 mbar	±160 iwc	0.025% RDG + 0.02% FS
EXT1C-IS	±1 bar	–14.5…15 psi	0.025% RDG + 0.015% FS
EXT2C-IS	–1…2 bar	–14.5…30 psi	0.025% RDG + 0.01% FS
EXT6C-IS	–1…6 bar	–14.5…90 psi	0.025% RDG + 0.01% FS
EXT20C-IS	–1…20 bar	–14.5…300 psi	0.025% RDG + 0.01% FS
EXT60-IS	0…60 bar	0…900 psi	0.025% RDG + 0.01% FS
EXT100-IS	0…100 bar	0…1500 psi	0.025% RDG + 0.01% FS
EXT160-IS	0…160 bar	0…2400 psi	0.025% RDG + 0.01% FS
EXT250-IS	0…250 bar	0…3700 psi	0.025% RDG + 0.015% FS
EXT600-IS	0…600 bar	0…9000 psi	0.025% RDG + 0.015% FS
EXT1000-IS	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 pressure module's range may also be displayed in absolute pressure if a barometric module is used.
3) The MC2-IS does not have any internal pressure modules, but it does have a barometric option.
All external pressure modules (EXT-IS) are also compatible with Beamex MC2, MC4, MC5, MC6, MC5-IS and MC5P calibrators.

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	1 mA
Load effect	< 5µV/mA
Supported units	V, mV, µV

VOLTAGE GENERATION –3…11 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…11 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	1 mA
Load effect	< 50 µV/mA
Supported units	V, mV, µV

mA GENERATION (SINK)

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

FEATURE	SPECIFICATION MC2-IS
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)	none
Max loop voltage (sink)	30 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 MC2-IS
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	4 mA (0…812 Ω) Iexc × Rsim < 3.25 V (812…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	1 mA
Output amplitude positive square wave	0…11 Vpp ±(0.2 V+5%)
Output amplitude symmetric square wave	0…5.5 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	1 mA
Output amplitude positive pulse	0…11 Vpp ±(0.2 V+5%)
Output amplitude symmetric pulse	0…5.5 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	–	1 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	0.80°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	–	4 mA (0 ... 812 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

OPTIONAL ACCESSORIES

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

SUMMARY

Beamex MC2-IS

INTRINSICALLY SAFE MULTIFUNCTION CALIBRATOR

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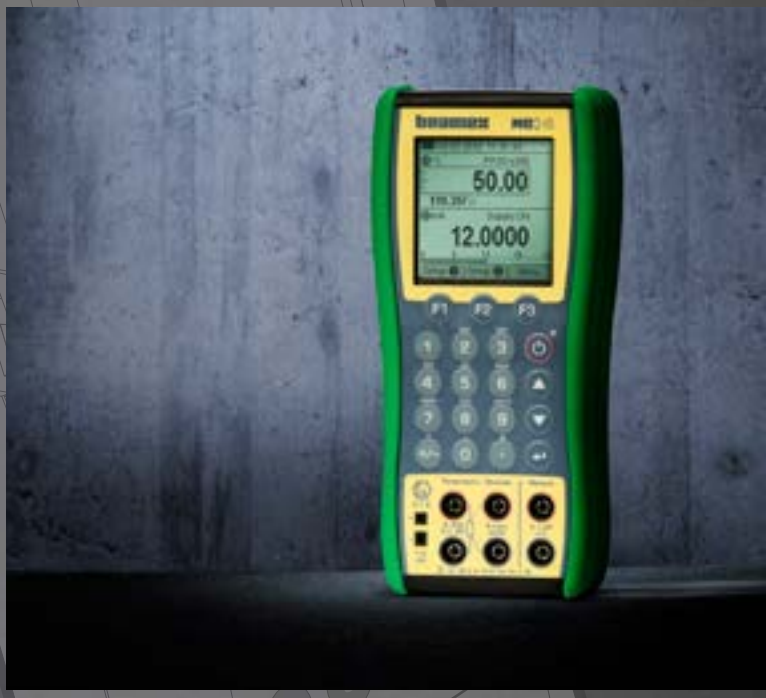

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Accuracy guaranteed

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Safe and robust field calibrator

The ATEX- and IECEx- certified MC2-IS with impact protectors and membrane keyboard is robust and made for tough use.

Extensive configuration possibilities

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Main features

- ATEX-certified intrinsically safe multifunction calibrator
- Connects to nearly 20 available Beamex intrinsically safe external pressure modules
- Compact size and design
- User-friendly