

# MCS200

MODULAR CALIBRATION SYSTEM



MCS200 is a modular test and calibration system for workshops and laboratories

# MCS200 modular test a

MCS200 OFFERS EFFICIENT AND ERGONOMIC FACILITIES FOR PROCESS INSTRUMENT MAINTENANCE.

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## MULTIPLE APPLICATIONS

MCS200 modular test and calibration system offers a solution for a large variety of applications, such as calibration of pressure, temperature and electrical signals; electrical tests and measurements; maintenance & testing of single and three-phase motors and other electronic devices; soldering and desoldering, educational use, etc.

## FLEXIBLE AND ERGONOMIC

The advanced design of the MCS200 table frame and module rack offers many advantages such as easier installation, height adjustable tabletop and module rack, dual panel possibility, 2 benches – 3 legs solution, LED lighting and movable accessories under the tabletop.

# nd calibration system

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## VERSATILE

The module rack hosts a great variety of modules including calibration modules, AC & DC power supplies, multimeters, function generators, oscilloscopes, etc. This makes the MCS200 test and calibration system ideal for both instrument and electrical workshops, as well as for laboratory use.

## ESD PROTECTED

Electrostatic discharges cause problems to electrical components, e.g. in repair and production facilities. MCS200 is a safe choice for places where sensitive components are handled. MCS200 test and calibration system and its accessories are supplied with an electrically semiconducting coat of paint. For full ESD protection, a semiconducting tabletop, ESD wrist straps, mats and grounding sets are available.

# Built to meet your specific requirements

BEAMEX HAS VARIOUS SAMPLE LAYOUTS FOR INDUSTRY-SPECIFIC AND APPLICATION-SPECIFIC MCS200 MODULAR TEST AND CALIBRATION SYSTEM

## 16 EXAMPLE WORKSTATIONS

1.



### PRESSURE CALIBRATION BENCH

**Highly accurate pressure calibration facility for ranges from vacuum to 1000 bar.**

#### APPLICATIONS

- Periodic calibration of process instruments, such as:
  - Pressure transmitters, sensors, gauges, switches, recorders
  - Differential pressure transmitters
  - I/P converters
  - HART, Profibus PA, FOUNDATION Fieldbus instruments

2.



### TEMPERATURE CALIBRATION BENCH

**Efficient calibration of temperature and electrical instruments.**

#### APPLICATIONS

- Periodic calibration of process instruments, such as:
  - Temperature transmitters, sensors, indicators, switches, recorders
  - Thermocouples and RTD's
  - Electrical limit switches
  - Frequency meters, tachometers, pulse meters
  - HART, Profibus PA, FOUNDATION Fieldbus instruments

3.



### ELECTRICAL AND ELECTRONIC REPAIR BENCH

**ESD-protected facility for safe handling of PCBs and components.**

#### APPLICATIONS

- Testing and maintenance of electrical and electronic devices
- Soldering and de-soldering of surface-mounted and traditional electronic components



4.



### HEAVY-DUTY 3- PHASE BENCH

**Heavy-duty workbench  
for testing and maintenance.**

#### APPLICATIONS

- Testing electrical equipment up to 16A, such as electrical motors, tools, extension cables, heaters and coolers
- Soldering and de-soldering

5.



### CALIBRATION TROLLEY

**Movable trolley with  
accurate and versatile  
calibration modules.**

#### APPLICATIONS

- Periodic calibration of process instruments, such as:
  - Pressure transmitters, sensors, gauges, switches, recorders, I/P converters
  - Temperature transmitters, sensors, indicators, switches, recorders
  - Thermocouples and RTD's
  - Electrical limit switches
  - Frequency meters, tachometers, pulse meters
  - HART, Profibus PA, FOUNDATION Fieldbus instruments

6.



### MOTOR TESTING TROLLEY

**Functional tests of 3-phase  
electrical motors up to 100 kW  
(without load).**

#### APPLICATIONS

- Functional tests are necessary after repair, maintenance or longer storage of electrical motors
- Measurements during motor test run:
  - Temperature
  - Rotation speed
  - Overall vibration
  - Bearing condition
- Voltage, current, frequency, etc.

# Calibration modules

## Beamex POC6 automatic pressure output modules

Beamex POC6 is an accurate and user-friendly automatic pressure controller, providing regulated output from vacuum to 100 bar (1450 psi). POC6 is designed for applications requiring automatic pressure testing and calibration.



## Pressure measurement modules

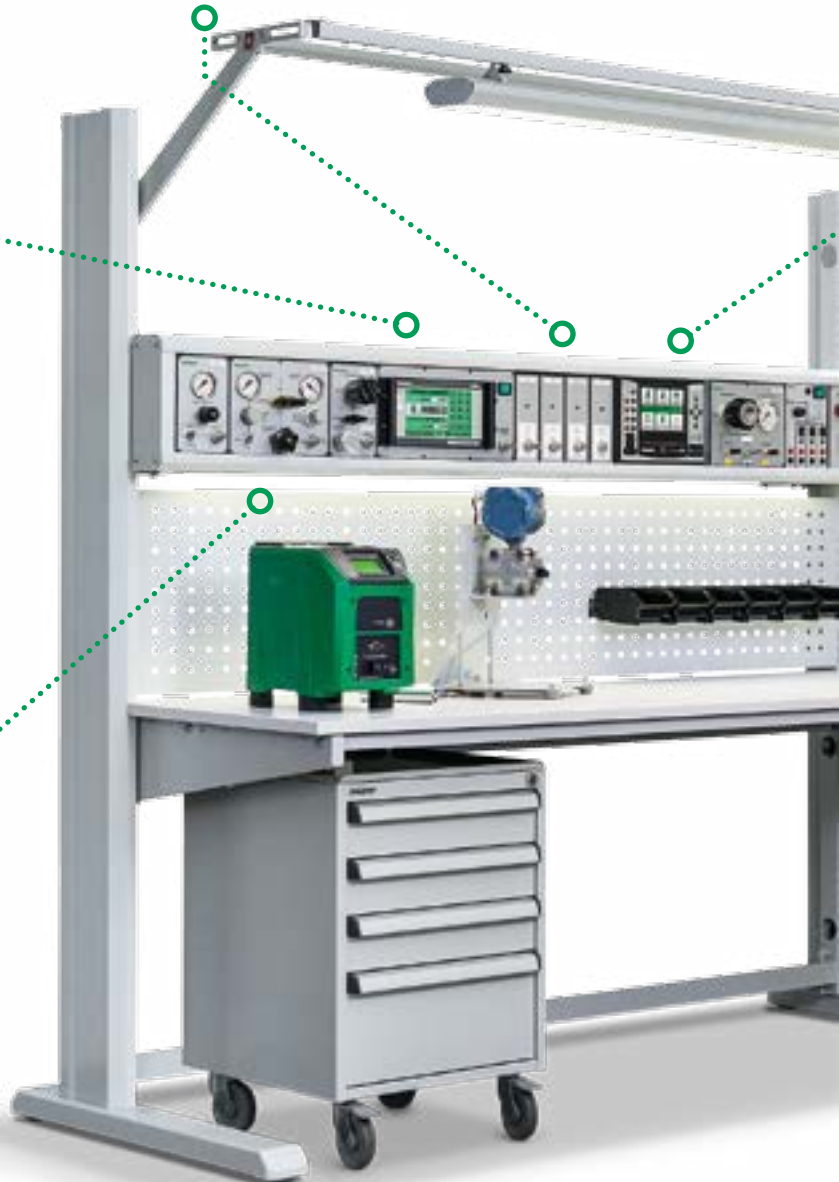
The P (pressure measurement) modules ranging from -1 to 600 bar (external modules up to 1000 bar) incorporate advanced pressure measurement technology resulting in only a few P modules being required to cover a wide pressure range with excellent levels of uncertainty. The low pressure measurement modules are provided with built-in relief valves for over pressure protection.



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## Pressure output modules

The PO (pressure output) modules are designed to regulate vacuum and pressure sources with high precision.



### Beamex MC6 Workstation host module

With its large color touchscreen the MC6 Workstation is the host module for temperature, electrical and pressure calibration. The MC6 communicates with the pressure measurement modules, automatic pressure controllers, temperature blocks and calibration management software.



# Module specifications

## BEAMEX MC6 WORKSTATION ADVANCED WORKSTATION CALIBRATOR AND COMMUNICATOR

Beamex MC6 workstation is an advanced, high-accuracy calibrator and communicator. It offers calibration capabilities for pressure, temperature and various electrical signals. The MC6 also contains a full fieldbus communicator for HART, FOUNDATION Fieldbus and Profibus PA instruments.

The usability and ease-of-use are among the main features of the MC6. It has a large 5.7" color touch-screen with a multilingual user interface.

The MC6 is one device with several different operation modes, which means that it is fast and easy to use. The operation modes are: meter, calibrator, documenting calibrator, data logger and fieldbus communicator.

MC6 communicates with automatic pressure controllers and temperature dry blocks enabling fully automatic calibration.

In addition, the MC6 communicates with Beamex CMX calibration software, enabling paperless calibration.

### Summary of measurement, generation and simulation functions

- Pressure measurement
- Voltage measurement and generation
- Current measurement and generation
- Frequency measurement and generation
- Pulse counting and generation
- Switch state sensing
- Built-in 24 VDC loop supply
- Resistance measurement (two simultaneous channels) and simulation
- RTD measurement (two simultaneous channels) and simulation
- TC measurement (two simultaneous channels) and simulation
- HART communicator
- FOUNDATION Fieldbus communicator
- Profibus PA communicator

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## PRESSURE MEASUREMENT MODULES

The pressure modules ranging from -1 to 600 bar incorporate advanced pressure measurement technology resulting in only a few modules being required to cover a wide pressure range with excellent uncertainty.

The barometric module measures the ambient barometric pressure. When the barometric module is incorporated in the system, the ranges of all other pressure measurement modules can be displayed both in gauge and absolute pressure.

The read out from pressure modules is displayed in the MC6.



## PRESSURE OUTPUT MODULES

The PO modules are designed to regulate vacuum and pressure sources with high precision. For pressures up to 20 bar (290 psi), a regulator in combination with an adjustable volume is used to help achieve the exact pressure. The high-pressure modules are provided with high-pressure regulators combined with ball valves for coarse adjustment and needle valves for fine adjustment. The pressure supply module PS7 provides a basic pressure supply for devices such as I/P, E/P, etc.

MODULE	RANGE
P08C	-1 to 8 bar g / -14.5 to 116 psi
P020	0 to 20 bar g / 0 to 290 psi
P060	0 to 60 bar g / 0 to 870 psi
P0160	0 to 160 bar g / 0 to 2320 psi
P0250	0 to 250 bar g / 0 to 3625 psi
PS7	0 to 7 bar g / 0 to 100 psi



## AUTOMATIC PRESSURE OUTPUT MODULES

Beamex POC6 is an accurate and user-friendly automatic pressure controller, providing regulated output from vacuum to 100 bar (1450 psi). POC6 is designed for applications requiring automatic pressure testing and calibration. POC6 communicates with Beamex MC6 calibration host module (optional). POC6 automatically regulates the pressure output signal according to commands from MC6, enabling fully automated calibration of pressure transmitters and other pressure instruments.



FEATURE	SPECIFICATION
Output range	$\pm 1$ bar ( $\pm 14.5$ psi) -1 to 6 bar (-14.5 to 87 psi) -1 to 20 bar (-14.5 to 290 psi) -1 to 70 bar (-14.5 to 1015 psi) -1 to 100 bar (-14.5 to 1450 psi) Special range within -1 to 100 bar (-14.5 to 1450 psi)
Precision	< 0.015% FS
1 year uncertainty	< 0.025% FS

# Specifications

## MC6 WORKSTATION GENERAL SPECIFICATIONS

FEATURE	VALUE
Display	5.7" Diagonal 640 x 480 TFT LCD module
Touch panel	5-wire resistive touch screen
Keyboard	Membrane keyboard
Backlight	LED backlight, adjustable brightness
Weight	5.5. kg (12 lb)
Dimensions	250 mm x 200 mm x 305 mm (W x H x D) (9.84 in x 7.87 in x 12.01 in)
Battery type	(9.84 in x 7.87 in x 12.01 in)
Charging time	Approximately 4 hours
Charger supply	100...240 VAC, 50–60 Hz
Battery operation	10...16 hours
Operating temperature	–10...45 °C (14...113 °F)
Operating temperature while charging batteries	0...30 °C (32...86 °F)
Storage temperature	–20...60 °C (–4...113 °F)
Specifications valid	–10...45 °C, unless other mentioned
Humidity	0...80% R.H. non condensing
Warmup time	Specifications valid after a 5 minute warmup period.
Max. input voltage	30 V AC, 60 V DC
Display update rate	3 readings/second
Safety	Directive 2006/95/EC, EN 61010-1:2001
EMC	Directive 2004/108/EC, EN 61326-1:2006
Vibration	IEC 60068-2-64. Random, 2 g, 5...500 Hz
Max altitude	3,000 m (9,842 ft)
Warranty	Warranty 3 Years. 1 year for battery pack. Warranty extension programs are also available.

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## MEASUREMENT, GENERATION AND SIMULATION FUNCTIONS

- Pressure measurement (internal/external pressure modules)
  - Voltage measurement ( $\pm 1$  V and  $-1 \dots 60$  VDC)
  - Current measurement ( $\pm 100$  mA) (internal or external supply)
  - Frequency measurement (0...50 kHz)
  - Pulse counting (0...10 Mpulse)
  - Switch state sensing (dry/wet switch)
  - Built-in 24 VDC loop supply (low impedance, HART impedance or FF/PA impedance)
  - Voltage generation ( $\pm 1$  V and  $-3 \dots 24$  VDC)
  - Current generation (0...55 mA) (active/passive, i.e. Internal or external supply)
  - Resistance measurement, two simultaneous channels (0...4 k $\Omega$ )
  - Resistance simulation (0...4 k $\Omega$ )
  - RTD measurement, two simultaneous channels
  - RTD simulation
  - TC measurement, two simultaneous channels (universal connector/mini-plug)
  - TC simulation
  - Frequency generation (0...50 kHz)
  - Pulse queue generation (0...10 Mpulse)
  - HART communicator
  - FOUNDATION Fieldbus communicator
  - Profibus PA communicator
- (Some of the above functions are optional)

# PRESSURE MEASUREMENT

PRESSURE MODULE	UNIT	RANGE <sup>(3)</sup>	RESOLUTION	ACCURACY <sup>(1)</sup> (±)	1 YEAR UNCERTAINTY (±) <sup>(2)</sup>
PB	kPa a	70 to 120	0.01	0.3 mbar	0.05 kPa 0.5 mbar 0.0073 psi
	mbar a	700 to 1200	0.1		
	psi a	10.15 to 17.4	0.001		
P10mD	kPa diff	±1	0.0001	0.05% Span	0.05% Span + 0.1% RDG
	mbar diff	±10	0.001		
	iwc diff	±4	0.001		
P100m	kPa	0 to 10	0.0001	0.015% FS + 0.0125% RDG	0.025% FS + 0.025% RDG
	mbar	0 to 100	0.001		
	iwc	0 to 40	0.001		
P400mC	kPa	±40	0.001	0.01% FS + 0.0125% RDG	0.02% FS + 0.025% RDG
	mbar	±400	0.01		
	iwc	±160	0.001		
P1C	kPa	±100	0.001	0.007% FS + 0.0125% RDG	0.015% FS + 0.025% RDG
	bar	±1	0.00001		
	psi	-14.5 to 15	0.0001		
P2C	kPa	-100 to 200	0.001	0.005% FS + 0.01% RDG	0.01% FS + 0.025% RDG
	bar	-1 to 2	0.00001		
	psi	-14.5 to 30	0.0001		
P6C	kPa	-100 to 600	0.01	0.005% FS + 0.01% RDG	0.01% FS + 0.025% RDG
	bar	-1 to 6	0.0001		
	psi	-14.5 to 90	0.001		
P20C	kPa	-100 to 2000	0.01	0.005% FS + 0.01% RDG	0.01% FS + 0.025% RDG
	bar	-1 to 20	0.0001		
	psi	-14.5 to 300	0.001		
P60	kPa	0 to 6000	0.1	0.005% FS + 0.0125% RDG	0.01% FS + 0.025% RDG
	bar	0 to 60	0.001		
	psi	0 to 900	0.01		
P100	MPa	0 to 10	0.0001	0.005% FS + 0.0125% RDG	0.01% FS + 0.025% RDG
	bar	0 to 100	0.001		
	psi	0 to 1500	0.01		
P160	MPa	0 to 16	0.0001	0.005% FS + 0.0125% RDG	0.01% FS + 0.025% RDG
	bar	0 to 160	0.001		
	psi	0 to 2400	0.01		
P250	MPa	0 to 25	0.001	0.007% FS + 0.0125% RDG	0.015% FS + 0.025% RDG
	bar	0 to 250	0.01		
	psi	0 to 3700	0.1		
P600	MPa	0 to 60	0.001	0.007% FS + 0.01% RDG	0.015% FS + 0.025% RDG
	bar	0 to 600	0.01		
	psi	0 to 9000	0.1		
EXT1000	MPa	0 to 100	0.001	0.007% FS + 0.01% RDG	0.015% FS + 0.025% RDG
	bar	0 to 1000	0.01		
	psi	0 to 15000	0.1		

<sup>1)</sup> Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

<sup>2)</sup> Uncertainty includes hysteresis, nonlinearity, repeatability and typical long term stability for mentioned period (k=2).

<sup>3)</sup> Every internal/external gauge pressure module's range may be displayed also in absolute pressure if the barometric module (PB or EXT B) is installed/connected.

Maximum number of installed pressure modules is 10 pcs.

Beamex EXT external pressure modules can also be used with MC6 Workstation.

## OVER-PRESSURE PROTECTION

The pressure measurement modules from P100m to P6C are provided with internal safety valves for over-pressure protection.

## SUPPORTED PRESSURE UNITS

Pa, kPa, hPa, MPa, mbar, bar, gf/cm<sup>2</sup>, kgf/cm<sup>2</sup>, kgf/m<sup>2</sup>, kp/cm<sup>2</sup>, lbf/ft<sup>2</sup>, psi, at, torr, atm, ozf/in<sup>2</sup>, iwc, inH<sub>2</sub>O, ftH<sub>2</sub>O, mmH<sub>2</sub>O, cmH<sub>2</sub>O, mH<sub>2</sub>O, mmHg, cmHg, mHg, inHg, mmHg(0 °C), inHg(0 °C), mmH<sub>2</sub>O(60°F), mmH<sub>2</sub>O(68°F), mmH<sub>2</sub>O(4 °C), cmH<sub>2</sub>O(60°F), cmH<sub>2</sub>O(68°F), cmH<sub>2</sub>O(4 °C), inH<sub>2</sub>O(60°F), inH<sub>2</sub>O(68°F), inH<sub>2</sub>O(4 °C), ftH<sub>2</sub>O(60°F), ftH<sub>2</sub>O(68°F), ftH<sub>2</sub>O(4 °C).

Large number of user pressure units can be created.

## TEMPERATURE COEFFICIENT

<±0.001% RDG/ °C outside 15–35 °C (59–95 °F).

P10mD / EXT10mD: < ±0.002% Span/ °C outside 15–35 °C (59–95 °F)

## MAX OVERPRESSURE

2 times the nominal pressure. Except following modules;

PB/EXTB: 1200 mbar abs (35.4 inHg abs). P10mD/EXT10mD: 200 mbar (80 iwc).

EXT600: 900 bar (13000 psi). EXT1000: 1000 bar (15000 Psi).

## PRESSURE MEDIA

Modules up to P6C/EXT6C: dry clean air or other clean, inert, non-toxic, non-corrosive gases. Modules P20C/EXT20C and higher: clean, inert, non-toxic, non-corrosive gases or liquids.

## WETTED PARTS

AlSi316 stainless steel, Hastelloy, Nitrile rubber

## PRESSURE CONNECTION

PB/EXTB: M5 (10/32") female.

P10mD/EXT10mD: Two M5 (10/32") female threads with hose nipples included.

P100m/EXT100m to P20C/EXT20C: G1/8" (ISO228/1) female. A conical 1/8"

BSP male with 60° internal cone adapter included for Beamex hose set.

P60, P100, P160: G1/8" (ISO228/1) female.

EXT60 to EXT1000: G 1/4" (ISO228/1) male.

# TC MEASUREMENT & SIMULATION

## TC1 measurement & simulation / TC2 measurement

TYPE	RANGE (°C)	RANGE (°C)	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY (±) <sup>(2)</sup>
B <sup>(3)</sup>	0...1820	0...200	<sup>(8)</sup>	<sup>(4)</sup>
		200...500	1.5 °C	2.0 °C
		500...800	0.6 °C	0.8 °C
		800...1820	0.4 °C	0.5 °C
R <sup>(3)</sup>	-50...1768	-50...0	0.8 °C	1.0 °C
		0...150	0.6 °C	0.7 °C
		150...400	0.35 °C	0.45 °C
		400...1768	0.3 °C	0.4 °C
S <sup>(3)</sup>	-50...1768	-50...0	0.7 °C	0.9 °C
		0...100	0.6 °C	0.7 °C
		100...300	0.4 °C	0.55 °C
		300...1768	0.35 °C	0.45 °C
E <sup>(3)</sup>	-270...1000	-270...-200	<sup>(8)</sup>	<sup>(4)</sup>
		-200...0	0.05 °C + 0.04% RDG	0.07 °C + 0.06% RDG
		0...1000	0.05 °C + 0.003% RDG	0.07 °C + 0.005% RDG
J <sup>(3)</sup>	-210...1200	-210...-200	<sup>(8)</sup>	<sup>(4)</sup>
		-200...0	0.06 °C + 0.05% RDG	0.08 °C + 0.06% RDG
		0...1200	0.06 °C + 0.003% RDG	0.08 °C + 0.006% RDG
K <sup>(3)</sup>	-270...1372	-270...-200	<sup>(8)</sup>	<sup>(4)</sup>
		-200...0	0.08 °C + 0.07% RDG	0.1 °C + 0.1% RDG
		0...1000	0.08 °C + 0.004% RDG	0.1 °C + 0.007% RDG
		1000...1372	0.012% RDG	0.017% RDG
N <sup>(3)</sup>	-270...1300	-270...-200	<sup>(8)</sup>	<sup>(4)</sup>
		-200...-100	0.15% RDG	0.2% RDG
		-100...0	0.11 °C + 0.04% RDG	0.15 °C + 0.05% RDG
		0...800	0.11 °C	0.15 °C
		800...1300	0.06 °C + 0.006% RDG	0.07 °C + 0.01% RDG
T <sup>(3)</sup>	-270...400	-270...-200	<sup>(8)</sup>	<sup>(4)</sup>
		-200...0	0.07 °C + 0.07% RDG	0.1 °C + 0.1% RDG
U <sup>(5)</sup>	-200...600	0...600	0.07 °C	0.1 °C
		-200...0	0.07 °C + 0.05% RDG	0.1 °C + 0.07% RDG
L <sup>(5)</sup>	-200...900	0...900	0.06 °C + 0.025% RDG	0.08 °C + 0.04% RDG
		-200...0	0.06 °C + 0.002% RDG	0.08 °C + 0.005% RDG
C <sup>(6)</sup>	0...2315	0...1000	0.22 °C	0.3 °C
		1000...2315	0.018% RDG	0.027% RDG
G <sup>(7)</sup>	0...2315	0...60	<sup>(8)</sup>	<sup>(4)</sup>
		60...200	0.9 °C	1.0 °C
		200...400	0.4 °C	0.5 °C
		400...1500	0.2 °C	0.3 °C
		1500...2315	0.014% RDG	0.02% RDG
D <sup>(6)</sup>	0...2315	0...140	0.3 °C	0.4 °C
		140...1200	0.2 °C	0.3 °C
		1200...2100	0.016% RDG	0.024% RDG
		2100...2315	0.45 °C	0.65 °C

Resolution 0.01 °C.

With internal reference junction please see separate specification.

Also other thermocouple types available as option, please contact Beamex.

<sup>1)</sup> Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

<sup>2)</sup> Uncertainty includes hysteresis, nonlinearity, repeatability and typical long term stability for mentioned period (k=2).

<sup>3)</sup> IEC 584, NIST MN 175, BS 4937, ANSI MC96.1

<sup>4)</sup> ±0.007% of thermovoltage + 4 µV

<sup>5)</sup> DIN 43710

<sup>6)</sup> ASTM E 988 - 96

<sup>7)</sup> ASTM E 1751 - 95e1

<sup>8)</sup> ±0.004% of thermovoltage + 3 µV

<b>Measurement input impedance</b>	> 10 MΩ
<b>Simulation maximum load current</b>	5 mA
<b>Simulation load effect</b>	< 5 µV/mA
<b>Supported units</b>	°C, °F, Kelvin, °Ré, °Ra
<b>Connector</b>	TC1: Universal TC connector , TC2: TC Miniplug

# RTD MEASUREMENT & SIMULATION

## R1 & R2 measurement

SENSOR TYPE	RANGE (°C)	RANGE (°C)	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY (±) <sup>(2)</sup>
Pt50(385)	-200...850	-200...270 270...850	0.025 °C 0.009% RDG	0.03 °C 0.012% RDG
Pt100(375) Pt100(385) Pt100(389) Pt100(391) Pt100(3926)	-200...850	-200...0 0...850	0.011 °C 0.011 °C + 0.009% RDG	0.015 °C 0.015 °C + 0.012% RDG
Pt100(3923)	-200...600	-200...0 0...600	0.011 °C 0.011 °C + 0.009% RDG	0.015 °C 0.015 °C + 0.012% RDG
Pt200(385)	-200...850	-200...-80 -80...0 0...260 260...850	0.007 °C 0.016 °C 0.016 °C + 0.009% RDG 0.03 °C + 0.011% RDG	0.01 °C 0.02 °C 0.02 °C + 0.012% RDG 0.045 °C + 0.02% RDG
Pt400(385)	-200...850	-200...-100 -100...0 0...850	0.007 °C 0.015 °C 0.026 °C + 0.01% RDG	0.01 °C 0.02 °C 0.045 °C + 0.019% RDG
Pt500(385)	-200...850	-200...-120 -120...-50 -50...0 0...850	0.008 °C 0.013 °C 0.025 °C 0.025 °C + 0.01% RDG	0.01 °C 0.02 °C 0.045 °C 0.045 °C + 0.019% RDG
Pt1000(385)	-200...850	-200...-150 -150...-50 -50...0 0...850	0.007 °C 0.018 °C 0.022 °C 0.022 °C + 0.01% RDG	0.008 °C 0.03 °C 0.04 °C 0.04 °C + 0.019% RDG
Ni100(618)	-60...180	-60...0 0...180	0.009 °C 0.009 °C + 0.005% RDG	0.012 °C 0.012 °C + 0.006% RDG
Ni120(672)	-80...260	-80...0 0...260	0.009 °C 0.009 °C + 0.005% RDG	0.012 °C 0.012 °C + 0.006% RDG
Cu10(427)	-200...260	-200...260	0.012 °C	0.16 °C

## R1 Simulation

SENSOR TYPE	RANGE (°C)	RANGE (°C)	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY (±) <sup>(2)</sup>
Pt50(385)	-200...850	-200...270 270...850	0.055 °C 0.035 °C + 0.008% RDG	0.11 °C 0.11 °C + 0.015% RDG
Pt100(375) Pt100(385) Pt100(389) Pt100(391) Pt100(3926)	-200...850	-200...0 0...850	0.025 °C 0.025 °C + 0.007% RDG	0.05 °C 0.05 °C + 0.014% RDG
Pt100(3923)	-200...600	-200...0 0...600	0.025 °C 0.025 °C + 0.007% RDG	0.05 °C 0.05 °C + 0.014% RDG
Pt200(385)	-200...850	-200...-80 -80...0 0...260 260...850	0.012 °C 0.02 °C 0.02 °C + 0.006% RDG 0.03 °C + 0.011% RDG	0.025 °C 0.035 °C 0.04 °C + 0.011% RDG 0.06 °C + 0.02% RDG
Pt400(385)	-200...850	-200...-100 -100...0 0...850	0.01 °C 0.015 °C 0.027 °C + 0.01% RDG	0.015 °C 0.03 °C 0.05 °C + 0.019% RDG
Pt500(385)	-200...850	-200...-120 -120...-50 -50...0 0...850	0.008 °C 0.012 °C 0.026 °C 0.026 °C + 0.01% RDG	0.015 °C 0.025 °C 0.05 °C 0.05 °C + 0.019% RDG
Pt1000(385)	-200...850	-200...-150 -150...-50 -50...0 0...850	0.006 °C 0.017 °C 0.023 °C 0.023 °C + 0.01% RDG	0.011 °C 0.03 °C 0.043 °C 0.043 °C + 0.019% RDG
Ni100(618)	-60...180	-60...0 0...180	0.021 °C 0.019 °C	0.042 °C 0.037 °C + 0.001% RDG
Ni120(672)	-80...260	-80...0 0...260	0.021 °C 0.019 °C	0.042 °C 0.037 °C + 0.001% RDG
Cu10(427)	-200...260	-200...260	0.26 °C	0.52 °C

Resolution 0.001 °C.

For platinum sensors ITS-90 and Callendar van Dusen coefficients can be programmed. Also other RTD types available as option, please contact Beamex.

<b>RTD Measurement current</b>	Pulsed, bi-directional 1 mA (0..500 Ω), 0.2 mA (>500 Ω)
<b>4-wire connection</b>	Measurement specifications valid
<b>3-wire measurement</b>	Add 10 mΩ
<b>Max resistance excitation current</b>	5 mA (0...650 Ω). $I_{exc} * R_{sim} < 3.25 \text{ V}$ (650...4000 Ω)
<b>Min resistance excitation current</b>	> 0.2 mA (0...400 Ω). >0.1 mA (400...4000 Ω)
<b>Simulation settling time with pulsed excitation current</b>	< 1 ms
<b>Supported units</b>	°C, °F, Kelvin, °Ré, °Ra

## Internal reference junction TC1 & TC2

RANGE (°C)	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY <sup>(2)</sup>
-10...45 °C	±0.10 °C	±0.15 °C

Specifications valid in temperature range: 15...35 °C.

Temperature coefficient outside of 15...35 °C: ±0.005 °C/ °C.

Specifications assumes that calibrator has stabilized in environmental condition, being switched on, for minimum of 90 minutes. For a measurement or simulation done sooner than that, please add uncertainty of 0.15 °C.

In order to calculate the total uncertainty of thermocouple measurement or simulation with internal reference junction used, please add the relevant thermocouple uncertainty and the uncertainty together as a root sum of the squares.

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## VOLTAGE MEASUREMENT

### IN (-1...60 V)

RANGE	RESOLUTION	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY <sup>(2)</sup>
-1.01...1 V	0.001 mV	3 μV + 0.003% RDG	5 μV + 0.006% RDG
1...60.6 V	0.01 mV	0.125 mV + 0.003% RDG	0.25 mV + 0.006% RDG

<b>Input impedance</b>	> 2 MΩ
<b>Supported units</b>	V, mV, μV

### TC1 & TC2 (-1...1 V)

RANGE	RESOLUTION	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY <sup>(2)</sup>
-1.01...1.01 V	0.001 mV	3 μV + 0.004% RDG	4 μV + 0.007% RDG

<b>Input impedance</b>	> 10 MΩ
<b>Supported units</b>	V, mV, μV
<b>Connector</b>	TC1: Universal TC connector , TC2: TC Miniplug

<sup>1)</sup> Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

<sup>2)</sup> Uncertainty hysteresis, nonlinearity, repeatability and typical long term stability for mentioned period (k=2).

## VOLTAGE GENERATION

### OUT (-3...24 V)

RANGE	RESOLUTION	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY <sup>(2)</sup>
-3...10 V	0.00001 V	0.05 mV + 0.004% RDG	0.1 mV + 0.007% RDG
10...24 V	0.0001 V	0.05 mV + 0.004% RDG	0.1 mV + 0.007% RDG
<b>Maximum load current</b>		10 mA	
<b>Short circuit current</b>		>100 mA	
<b>Load effect</b>		< 50 $\mu$ V/mA	
<b>Supported units</b>		V, mV, $\mu$ V	

### TC1 (-1...1 V)

RANGE	RESOLUTION	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY <sup>(2)</sup>
-1...1 V	0.001 mV	3 $\mu$ V + 0.004% RDG	4 $\mu$ V + 0.007% RDG
<b>Maximum load current</b>		5 mA	
<b>Load effect</b>		< 5 $\mu$ V/mA	
<b>Supported units</b>		V, mV, $\mu$ V	

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## CURRENT MEASUREMENT

### IN (-100...100 mA)

RANGE	RESOLUTION	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY <sup>(2)</sup>
-25...25 mA	0.0001 mA	0.75 $\mu$ A + 0.0075% RDG	1 $\mu$ A + 0.01% RDG
$\pm$ (25...101 mA)	0.001 mA	0.75 $\mu$ A + 0.0075% RDG	1 $\mu$ A + 0.01% RDG
<b>Input impedance</b>		< 10 $\Omega$	
<b>Supported units</b>		mA, $\mu$ A	
<b>Loop supply</b>		Internal 24 V $\pm$ 10% (max 55 mA), or external max 60 VDC	

## CURRENT GENERATION

### OUT (0...55 mA)

RANGE	RESOLUTION	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY <sup>(2)</sup>
0...25 mA	0.0001 mA	0.75 $\mu$ A + 0.0075% RDG	1 $\mu$ A + 0.01% RDG
25...55 mA	0.001 mA	1.5 $\mu$ A + 0.0075% RDG	2 $\mu$ A + 0.01% RDG
<b>Internal loop supply</b>		24 V $\pm$ 5%. Max 55 mA.	
<b>Max load impedance w. internal supply</b>		24 V / (generated current). 1140 $\Omega$ @ 20 mA, 450 $\Omega$ @ 50 mA	
<b>Max external loop supply</b>		60 VDC	
<b>Supported units</b>		mA, $\mu$ A	

<sup>1)</sup> Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

<sup>2)</sup> Uncertainty hysteresis, nonlinearity, repeatability and typical long term stability for mentioned period (k=2).

# FREQUENCY MEASUREMENT

## IN (0.0027...51000 Hz)

RANGE	RESOLUTION	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY <sup>(2)</sup>
0.0027...0.5 Hz	0.000001 Hz	0.000002 Hz + 0.001% RDG	0.000002 Hz + 0.002% RDG
0.5...5 Hz	0.00001 Hz	0.00002 Hz + 0.001% RDG	0.00002 Hz + 0.002% RDG
5...50 Hz	0.0001 Hz	0.0002 Hz + 0.001% RDG	0.0002 Hz + 0.002% RDG
50...500 Hz	0.001 Hz	0.002 Hz + 0.001% RDG	0.002 Hz + 0.002% RDG
500...5000 Hz	0.01 Hz	0.02 Hz + 0.001% RDG	0.02 Hz + 0.002% RDG
5000...51000 Hz	0.1 Hz	0.2 Hz + 0.001% RDG	0.2 Hz + 0.002% RDG

<b>Input impedance</b>	>1 MΩ
<b>Supported units</b>	Hz, kHz, cph, cpm, 1/Hz(s), 1/kHz(ms), 1/MHz(μs)
<b>Trigger level</b>	Dry contact, wet contact -1...14 V
<b>Minimum signal amplitude</b>	1.0 Vpp (<10kHz), 1.2 Vpp (10...50 kHz)

# FREQUENCY GENERATION

## OUT (0.0005...50000 Hz)

RANGE	RESOLUTION	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY <sup>(2)</sup>
0.0005...0.5 Hz	0.000001 Hz	0.000002 Hz + 0.001% RDG	0.000002 Hz + 0.002% RDG
0.5...5 Hz	0.00001 Hz	0.00002 Hz + 0.001% RDG	0.00002 Hz + 0.002% RDG
5...50 Hz	0.0001 Hz	0.0002 Hz + 0.001% RDG	0.0002 Hz + 0.002% RDG
50...500 Hz	0.001 Hz	0.002 Hz + 0.001% RDG	0.002 Hz + 0.002% RDG
500...5000 Hz	0.01 Hz	0.02 Hz + 0.001% RDG	0.02 Hz + 0.002% RDG
5000...50000 Hz	0.1 Hz	0.2 Hz + 0.001% RDG	0.2 Hz + 0.002% RDG

<b>Maximum load current</b>	10 mA
<b>Wave forms</b>	Positive square, symmetric square
<b>Output amplitude positive square wave</b>	0...24 Vpp
<b>Output amplitude symmetric square wave</b>	0...6 Vpp
<b>Duty Cycle</b>	1...99%
<b>Amplitude accuracy</b>	< 5% of amplitude
<b>Supported units</b>	Hz, kHz, cph, cpm, 1/Hz(s), 1/kHz(ms), 1/MHz(μs)

# PULSE COUNTING

## IN (0...9 999 999 pulses)

<b>Input impedance</b>	>1 MΩ
<b>Trigger level</b>	Dry contact, wet contact -1...14 V
<b>Minimum signal amplitude</b>	1 Vpp (< 10 kHz), 1.2 Vpp (10...50 kHz)
<b>Max frequency</b>	50 kHz
<b>Trigger edge</b>	Rising, falling

<sup>1)</sup> Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

<sup>2)</sup> Uncertainty hysteresis, nonlinearity, repeatability and typical long term stability for mentioned period (k=2).



## PULSE GENERATION

### OUT (0...9 999 999 pulses)

Resolution	1 pulse
Maximum load current	10 mA
Output amplitude positive pulse	0...24 Vpp
Output amplitude symmetric pulse	0...6 Vpp
Pulse frequency range	0.0005...10000 Hz
Duty cycle	1...99%

## RESISTANCE MEASUREMENT

### R1 & R2 (0...4000 Ω)

RANGE	RESOLUTION	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY <sup>(2)</sup>
-1...100 Ω	0.001 Ω	4.5 mΩ	6 mΩ
100...110 Ω	0.001 Ω	0.0045% RDG	0.006% RDG
110...150 Ω	0.001 Ω	0.005% RDG	0.007% RDG
150...300 Ω	0.001 Ω	0.006% RDG	0.008% RDG
300...400 Ω	0.001 Ω	0.007% RDG	0.009% RDG
400...4040 Ω	0.01 Ω	9 mΩ + 0.008% RDG	12 mΩ + 0.015% RDG

<b>Measurement current</b>	Pulsed, bi-directional 1 mA (0..500 Ω), 0.2 mA (>500 Ω)
<b>Supported units</b>	Ω, kΩ
<b>4-wire connection</b>	Measurement specifications valid
<b>3-wire measurement</b>	Add 10 mΩ

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## RESISTANCE SIMULATION

### R1 (0...4000 Ω)

RANGE	RESOLUTION	ACCURACY <sup>(1)</sup>	1 YEAR UNCERTAINTY <sup>(2)</sup>
0...100 Ω	0.001 Ω	10 mΩ	20 mΩ
100...400 Ω	0.001 Ω	5 mΩ + 0.005% RDG	10 mΩ + 0.01% RDG
400...4000 Ω	0.01 Ω	10 mΩ + 0.008% RDG	20 mΩ + 0.015% RDG

<b>Max resistance excitation current</b>	5 mA (0...650 Ω). $I_{exc} * R_{sim} < 3.25 V$ (650...4000 Ω)
<b>Min resistance excitation current</b>	> 0.2 mA (0...400 Ω). >0.1 mA (400...4000 Ω)
<b>Settling time with pulsed excitation current</b>	< 1ms
<b>Supported units</b>	Ω, kΩ

<sup>1)</sup> Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

<sup>2)</sup> Uncertainty hysteresis, nonlinearity, repeatability and typical long term stability for mentioned period (k=2).

