

Beamex MC6-T

MULTIFUNCTION TEMPERATURE CALIBRATOR
AND COMMUNICATOR



79

The most versatile temperature calibrator

CMX



beamex



The most versatile temperature calibrator

The Beamex MC6-T combines a state-of-the-art temperature dry block with built-in multifunction process calibrator and communicator technology. It offers versatility that no other temperature calibrator can match.

With the ability to generate temperature as well as measure and simulate temperature and electrical signals, it offers a really unique combination of functionality. In addition to temperature calibration abilities, the MC6-T also offers electrical and pressure calibration capability, all in one device.

Thanks to the internal rechargeable battery, the process calibrator functionality in the MC6-T can be used also without mains voltage.

The MC6-T provides superior metrological performance and accuracy for temperature calibrations, while being robust, light and easy to carry field calibrator.

The calibrator is designed for industrial environments and it is designed to minimize the impact of varying environmental conditions and AC power fluctuations.

A large multilingual color touch screen, combined with numerical and graphical views, provides an easy to use system available in multiple languages.

The MC6-T has a built-in field communicator for HART, FOUNDATION Fieldbus H1 and Profibus PA instruments. This enables calibration, configuration and trimming of modern smart instruments with a single device, without the need to carry a separate field communicator.

The MC6-T is a documenting calibrator that communicates with Beamex CMX and LOGiCAL Calibration Management Software, enabling fully automated and digitalized calibration and documentation. Data can even be transferred wirelessly over Bluetooth, and without being connected to mains voltage.

MC6-T includes several unique safety features, such as a tilt sensor, warning light and stand-alone overheating protection.

81



Available models

MC6-T150

Generate temperatures between $-30 \dots 150^{\circ}\text{C}$ ($-22 \dots 302^{\circ}\text{F}$)



MC6-T660

Generate temperatures between $50 \dots 660^{\circ}\text{C}$ ($122 \dots 1220^{\circ}\text{F}$)





Automatic documenting calibrator – digitalize your calibration process

Superior metrological specifications and performance

MC6-T660 features an active triple zone temperature control technology for superior temperature gradient. MC6-T150 features a dual zone heating and cooling for optimum temperature control. The multizone temperature control technology ensures an excellent temperature gradient and compensates for the heat loss caused by the temperature sensors installed in the insert. MC6-T offers excellent accuracy and stability. The unique temperature control algorithm provides fast heating and cooling without overshoots, improving efficiency and saving time. The adjustable control speed let you optimize for the speed and accuracy. An accredited calibration certificate is included as standard as evidence of the accuracy.

Made for industrial use

MC6-T is designed for demanding industrial environments. It is designed to minimize the effects of varying environmental conditions, typical in process industry field conditions. It is also designed to minimize the effects of any mains voltage fluctuations, and it remains very stable in spite of changes in AC mains power voltage. As MC6-T is a portable, small, lightweight and robust device, ideal for industrial field usage. Being a multifunctional device, it replaces several traditional single-function devices. It is easier to carry just one device with you. With the transport case, you can take the MC6-T and required accessories conveniently with you out to the field.

Enhanced usability

MC6-T offers a large 5.7-inch backlit multilingual color touch screen user interface that can be easily used with bare fingers, gloved hands or any stylus. Direct numerical and QWERTY keyboards make it very easy and fast to enter data. There is no need to use clumsy arrow keys to enter a set point, just enter the temperature set point value. User interface can also be used with the membrane keys. The user interface is divided into different operation modes for enhanced usability. The user interface offers numerical and graphical information.

Extensive process calibrator functionality

MC6-T includes a built-in multifunctional process calibrator, based on the Beamex MC6 technology. The process calibrator can calibrate temperature, electrical and pressure signals. It offers three simultaneous RTD / resistance and two thermocouple measurement channels. It can also simulate RTD and thermocouples signals, for calibrating temperature transmitters and other temperature instruments. It can also measure and generate various DC electrical signals.

So, in addition to calibrating temperature sensors and temperature loops, you can calibrate different kinds of process instruments. MC6-T offers also a connection for Beamex external pressure modules (EXT) and can also be used for various pressure calibrations.

Digitalize your calibration process

MC6-T communicates with Beamex CMX and LOGiCAL calibration management software, enabling fully automated and digitalized calibration and documentation. Data can even be transferred wirelessly over Bluetooth, and without being connected to mains voltage. Use calibration management software to manage what, how, and when to calibrate, and execute the calibration with the MC6-T according to your pre-configured calibration procedure – even fully automatically. Maintain the full calibration history in LOGiCAL or CMX.

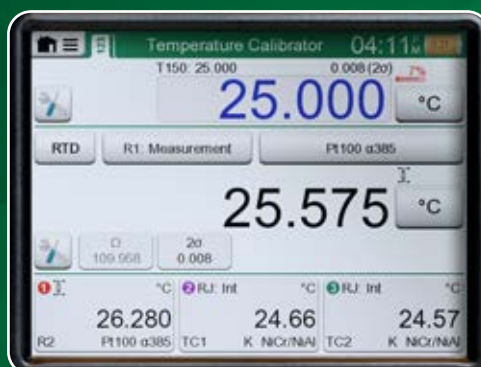
83



USER INTERFACE MODES

Temperature Calibrator

The Temperature Calibrator mode is optimized for easy and fast usage of the temperature generation and measurement. The desired temperature can be quickly entered using the virtual numerical keyboard. The internal or external reference probe can also be easily measured. The temperature values can be viewed in numerical or graphical view. Additional measurement or generation channels can also be measured simultaneously.



Calibrator

The Calibrator mode is designed for calibrating various process instruments. Often you need to check and calibrate process instruments, which typically have an input and an output. This means you either need two devices, or a single device capable of doing two things simultaneously. The Calibrator mode is optimized for this type of use.



Data Logger

The Data Logger is designed for logging up to nine measurements simultaneously. Often in industry, there is a need to measure signals for a certain period and to save the results for later analysis. This may be related to trouble-shooting, surveillance or calibration. The Data Logger mode is optimized for this type of use.





Documenting Calibrator

The Documenting Calibrator mode is designed for the documented and automated calibration of process instruments. With the Documenting Calibrator mode, the calibration process is guided, and the calibrator can automatically set the calibration points and document the results. The Documenting Calibrator mode also works together with calibration management software.



Communicator

The Communicator mode is designed to communicate with smart instruments. In today's process plants, smart instrumentation is being used to an increasing degree, so engineers need to use communicators or configuration software. Most of this instrumentation is HART, FOUNDATION Fieldbus or Profibus PA. The Communicator mode is optimized for communicator use to calibrate, configure, and trim your smart instruments.



Settings

The Settings mode allows you to edit the various settings of the calibrator. These settings include for example language selection, power management, regional settings, date & time and different maintenance settings.



Truly multifunctional — carry less

Built-in Field Communicator

MC6-T includes a field communicator for HART, FOUNDATION Fieldbus H1 and Profibus PA instruments. All protocols are modular, so you can choose the ones you need, and you can also add protocols later on as the requirements arise. With the help of the built-in communicator, you can configure and trim/adjust your smart instruments with a single MC6-T without the need to carry a separate field communicator with you. The communicator includes built-in loop supply and required impedances for the communications, so there is no need for separate power supply or impedances. New device description files are available on the Beamex website and can be easily downloaded into the calibrator's memory.

Stability control adds confidence in temperature calibration

In temperature calibration, stability is a very important feature. Temperature changes slowly and the user must be sure that the readings are stable. MC6-T follows the stability and 2 sigma standard deviation of the temperature measurements and makes sure that only readings that are within the stability requirements are being used. This takes the guessing out of the picture and adds confidence in calibration, ensuring the best calibration uncertainty even for a novice user. The stability control is used for the reference sensor as well as the sensors to be calibrated.

Advanced safety features

The MC6-T includes several advanced safety features. The unit has a red indicator light whenever the block is hot, as well as indication in the display. For safety reasons the MC6-T660 units has a tilt/orientation sensor. This will warn the user if the unit is tilted so much that calibration uncertainty is jeopardized. Also, it will switch off heating and turn on the fan if the unit is tilted too much, or if it falls on side. There is also processor independent stand-alone overheat protectors that will prevent overheating.

Short and sanitary sensor calibration

In some industries, such as food and beverage and pharmaceutical, short and sanitary temperature sensors are used. These kinds of sensors, sometimes provided with a flange, are difficult to calibrate with traditional temperature dry-blocks. The MC6-T150 is designed so that it enables the calibration of short and flanged sanitary sensors. A dedicated insert used together with a special very short reference sensor with flexible cable. The cover of the block includes grooves for the reference sensor cable, allowing a sensor with a flange being accurately calibrated.

External controllers

MC6-T supports communication with external temperature and pressure controllers. It can be used to automate temperature calibration with another (Beamex models or selected non-Beamex models) temperature block. For example, use it with your Beamex FB temperature dry block to extend the temperature range. Or use MC6-T to control your existing temperature block to automate the calibration process. Also, MC6-T can be used to automate pressure calibration by controlling an external pressure controller, such as Beamex ePG or POC8. This enables automatic calibration of various pressure instruments with MC6-T.

Internal rechargeable battery

MC6-T includes an internal rechargeable battery pack. This unique feature allows you to use all other capabilities, except the temperature generation, without mains voltage. For example, you can use the process calibrator functionality, field communicator, or communication with software, without the need to have mains power available.

Carry less

Being a truly multifunctional device, the MC6-T can replace a large amount of conventional single-function devices. MC6-T includes a temperature dry block, temperature calibrator, electrical calibrator, pressure calibrator, multibus field communicator, loop supply, note pad, and many more. Using MC6-T allows you to carry less.

87



Specifications ¹⁾

GENERAL SPECIFICATIONS

FEATURE	VALUE
Dimensions (D x W x H)	322 mm x 180 mm x 298 mm (12.68" x 7.09" x 11.73")
Weight	MC6-T150: 9.4 kg (20.7 lbs) MC6-T660: 8.6 kg (18.96 lbs)
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
Power requirements	230 V $\pm 10\%$, 50/60 Hz, 380 W (MC6-T150), 1560 W (MC6-T660) 115 V $\pm 10\%$, 50/60 Hz, 380 W (MC6-T150), 1560 W (MC6-T660)
Fuse size (MC6-T660)	230 V: T 8A 250V / 115 V: T 16A 250V
Fuse size (MC6-T150)	230 V: T 3.15A 250V / 115 V: T 3.15A 250V
Max. input voltage	30 V AC, 60 V DC
Operating temperature	0 ... 45 °C (32 ... 113 °F)
Operating humidity	0 ... 90% R.H. non condensing
Storage temperature	-20 ... 60 °C (-4 ... 140 °F)
Computer interface	USB / Bluetooth
Calibration certificate	Accredited calibration certificate
Warmup time	Specifications valid after a 5 minute warmup period
Battery type	Rechargeable lithium-ion, 4300 mAh, 11.1 V
Charging time	Approximately 4 hours
Battery operation time	10 ... 16 hours
Battery-operated capabilities	All functions except temperature generation and R3 measurement
Safety	Please see EU/UKCA declaration on Beamex website
EMC	Please see EU/UKCA declaration on Beamex website
RoHS compliance	Please see EU/UKCA declaration on Beamex website
Drop	EN 61010-1:2013
Warranty	Warranty 3 years, 1 year for battery pack.

¹⁾ All specifications are subject to change without further notice.

MEASUREMENT, GENERATION AND SIMULATION FUNCTIONS

- Temperature generation
MC6-T150: -30...150 °C
MC6-T660: 50...660 °C
 - Pressure measurement
(internal barometric and external pressure modules)
 - Voltage measurement (± 1 V and $-1 \dots 60$ VDC)
 - Current measurement (± 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 (± 1 V and $-3 \dots 24$ VDC)
 - Current generation (0...55 mA)
(active/passive, i.e. Internal or external supply)
 - Resistance measurement,
three simultaneous channels (0...4 k Ω)
 - Resistance simulation (0...4 k Ω)
 - RTD measurement, three 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)

TEMPERATURE SPECIFICATIONS

FEATURE	MC6-T150	MC6-T660
Temperature range at 23 °C (73 °F)	–30 ... 150 °C (–22 ... 302 °F)	50 ... 660 °C (122 ... 1220 °F)
Display uncertainty with internal reference ¹⁾	±0.15 °C	±0.2 °C at 50 °C ±0.3 °C at 420 °C ±0.5 °C at 660 °C
Stability ²⁾	±0.01 °C	±0.02 °C at 50 °C ±0.03 °C at 420 °C ±0.04 °C at 660 °C
Axial uniformity at 40 mm	±0.05 °C	±0.05 °C at 50 °C ±0.25 °C at 420 °C ±0.40 °C at 660 °C
Axial uniformity at 60 mm	±0.07 °C	±0.10 °C at 50 °C ±0.40 °C at 420 °C ±0.60 °C at 660 °C
Radial uniformity Difference between borings	±0.01 °C	±0.01 °C at 50 °C ±0.05 °C at 420 °C ±0.08 °C at 660 °C
Loading effect with internal reference sensor With 4 pcs 6 mm sensors	± 0.08 °C	±0.02 °C at 50 °C ±0.08 °C at 420 °C ±0.15 °C at 660 °C
Loading effect with external 6 mm reference sensor With 3 pcs 6 mm sensors	±0.005 °C	±0.01 °C at 50 °C ±0.02 °C at 420 °C ±0.03 °C at 660 °C
Hysteresis	±0.03 °C	±0.15 °C
Display resolution	0.001 °C / °F / K	0.001 °C / °F / K
Immersion depth	150 mm (5.9 in)	150 mm (5.9 in)
Outer dimension	30 mm (1.18 in)	24.5 mm (0.96 in)
Heating time	23 to 150 °C: 19 min –30 to 150 °C: 23 min	50 to 660 °C: 15 min
Cooling time	150 to 23 °C: 17 min 23 to –30 °C: 23 min 150 to –30 °C: 37 min	660 to 50 °C: 35 min 660 to 100 °C: 25 min
Stabilization time ³⁾	5 to 10 min	10 min

1) Includes 1-year uncertainty in typical use
2) 30 minutes stability (2 sigma) after the device has reached the setpoint and has stabilized
3) Typical time to stability

Specifications valid at temperature range 13...33 °C if not otherwise specified.



TC MEASUREMENT & SIMULATION

TC1 measurement & simulation / TC2 measurement

TYPE	RANGE (°C)	RANGE (°C)	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY (±) ⁽²⁾
B ⁽³⁾	0...1820	0...200	⁽⁸⁾	⁽⁴⁾
		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 ⁽³⁾	-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 ⁽³⁾	-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 ⁽³⁾	-270...1000	-270...-200	⁽⁸⁾	⁽⁴⁾
		-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 ⁽³⁾	-210...1200	-210...-200	⁽⁸⁾	⁽⁴⁾
		-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 ⁽³⁾	-270...1372	-270...-200	⁽⁸⁾	⁽⁴⁾
		-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 ⁽³⁾	-270...1300	-270...-200	⁽⁸⁾	⁽⁴⁾
		-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 ⁽³⁾	-270...400	-270...-200	⁽⁸⁾	⁽⁴⁾
		-200...0	0.07 °C + 0.07% RDG	0.1 °C + 0.1% RDG
		0...400	0.07 °C	0.1 °C
U ⁽⁵⁾	-200...600	-200...0	0.07 °C + 0.05% RDG	0.1 °C + 0.07% RDG
		0...600	0.07 °C	0.1 °C
L ⁽⁵⁾	-200...900	-200...0	0.06 °C + 0.025% RDG	0.08 °C + 0.04% RDG
		0...900	0.06 °C + 0.002% RDG	0.08 °C + 0.005% RDG
C ⁽⁶⁾	0...2315	0...1000	0.22 °C	0.3 °C
		1000...2315	0.018% RDG	0.03 °C + 0.027% RDG
G ⁽⁷⁾	0...2315	0...60	⁽⁸⁾	⁽⁴⁾
		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 ⁽⁶⁾	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.

¹⁾ Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

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

³⁾ IEC 584, NIST MN 175, BS 4937, ANSI MC96.1

⁴⁾ ±0.007% of thermovoltage + 4 µV

⁵⁾ DIN 43710

⁶⁾ ASTM E 988 – 96

⁷⁾ ASTM E 1751 – 95e1

⁸⁾ ±0.004% of thermovoltage + 3 µV

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

RTD MEASUREMENT & SIMULATION

R1 & R2 & R3 measurement

SENSOR TYPE	RANGE (°C)	RANGE (°C)	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY (±) ⁽²⁾
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

Measurement channel R3 is operational only when the mains power is connected.

R1 Simulation

SENSOR TYPE	RANGE (°C)	RANGE (°C)	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY (±) ⁽²⁾
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

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

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

Internal reference junction TC1 & TC2

RANGE ($^{\circ}\text{C}$)	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY ⁽²⁾
0...45 $^{\circ}\text{C}$	± 0.10 $^{\circ}\text{C}$	± 0.15 $^{\circ}\text{C}$

Specifications valid in temperature range: 15...35 $^{\circ}\text{C}$.

Temperature coefficient outside of 15...35 $^{\circ}\text{C}$: ± 0.005 $^{\circ}\text{C}/^{\circ}\text{C}$.

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 $^{\circ}\text{C}$.

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 reference junction uncertainty together as a root sum of the squares.

92

VOLTAGE MEASUREMENT

IN (−1 ... 60 V)

RANGE	RESOLUTION	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY ⁽²⁾
−1.01 ... 1 V	0.001 mV	3 μV + 0.003% RDG	5 μV + 0.006% RDG
1 ... 10 V	0.01 mV	0.125 mV + 0.003% RDG	0.25 mV + 0.006% RDG
10 ... 60.6 V	0.1 mV	0.125 mV + 0.003% RDG	0.25 mV + 0.006% RDG

Input impedance	> 2 M Ω
Supported units	V, mV, μV

TC1 & TC2 (−1 ... 1 V)

RANGE	RESOLUTION	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY ⁽²⁾
−1.01 ... 1.01 V	0.001 mV	3 μV + 0.004% RDG	4 μV + 0.007% RDG

Input impedance	> 10 M Ω
Supported units	V, mV, μV
Connector	TC1: Universal TC connector , TC2: TC Miniplug

¹⁾ Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

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

VOLTAGE GENERATION

OUT (–3...24 V)

RANGE	RESOLUTION	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY ⁽²⁾
–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
Maximum load current		10 mA	
Short circuit current		>100 mA	
Load effect		< 50 µV/mA	
Supported units		V, mV, µV	

TC1 (–1...1 V)

RANGE	RESOLUTION	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY ⁽²⁾
–1...1 V	0.001 mV	3 µV + 0.004% RDG	4 µV + 0.007% RDG
Maximum load current		5 mA	
Load effect		< 5 µV/mA	
Supported units		V, mV, µV	

93

CURRENT MEASUREMENT

IN (–100...100 mA)

RANGE	RESOLUTION	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY ⁽²⁾
–25...25 mA	0.0001 mA	0.75 µA + 0.0075% RDG	1 µA + 0.01% RDG
±(25...101 mA)	0.001 mA	0.75 µA + 0.0075% RDG	1 µA + 0.01% RDG
Input impedance		< 10 Ω	
Supported units		mA, µA	
Loop supply		Internal 24 V ±10% (max 55 mA), or external max 60 VDC	

CURRENT GENERATION

OUT (0...55 mA)

RANGE	RESOLUTION	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY ⁽²⁾
0...25 mA	0.0001 mA	0.75 µA + 0.0075% RDG	1 µA + 0.01% RDG
25...55 mA	0.001 mA	1.5 µA + 0.0075% RDG	2 µA + 0.01% RDG
Internal loop supply		24 V ±5%. Max 55 mA.	
Max load impedance w. internal supply		24 V / (generated current). 1140 Ω @ 20 mA, 450 Ω @ 50 mA	
Max external loop supply		60 VDC	
Supported units		mA, µA	

¹⁾ Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

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

FREQUENCY MEASUREMENT

IN (0.0027...50000 Hz)

RANGE	RESOLUTION	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY ⁽²⁾
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
Input impedance		>1 MΩ	
Supported units		Hz, kHz, cph, cpm, 1/Hz(s), 1/kHz(ms), 1/MHz(μs)	
Trigger level		Dry contact, wet contact –1...14 V	
Minimum signal amplitude		1.0 Vpp (<10kHz), 1.2 Vpp (10...50 kHz)	

FREQUENCY GENERATION

OUT (0.0005...50000 Hz)

RANGE	RESOLUTION	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY ⁽²⁾
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
Maximum load current		10 mA	
Wave forms		Positive square, symmetric square	
Output amplitude positive square wave		0...24 Vpp	
Output amplitude symmetric square wave		0...6 Vpp	
Duty Cycle		1...99%	
Amplitude accuracy		< 5% of amplitude	
Supported units		Hz, kHz, cph, cpm, 1/Hz(s), 1/kHz(ms), 1/MHz(μs)	

PULSE COUNTING

IN (0...9 999 999 pulses)

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

¹⁾ Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

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

PULSE GENERATION

OUT (0...9 999 999 pulses)

FEATURE	SPECIFICATION
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 & R3 (0...4000 Ω)

RANGE	RESOLUTION	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY ⁽²⁾
-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

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

Measurement channel R3 is operational only when the mains power is connected.

RESISTANCE SIMULATION

R1 (0...4000 Ω)

RANGE	RESOLUTION	ACCURACY ⁽¹⁾	1 YEAR UNCERTAINTY ⁽²⁾
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

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

¹⁾ Accuracy includes hysteresis, nonlinearity and repeatability (k=2).

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

Inserts

Replaceable inserts with different sized holes are to be used with MC6-T to allow calibration of temperature sensors with different diameters. For reliable and safe performance of the calibrator, use only original Beamex MC6-T inserts. All standard inserts are available in the Beamex webshop

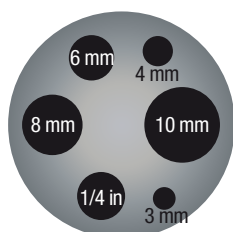
Inserts for MC6-T150

All inserts for MC6-T150 include two insulation rubber shields, either blank or with similar holes as the insert. Use the insulation shield to avoid condensation at temperatures below ambient.

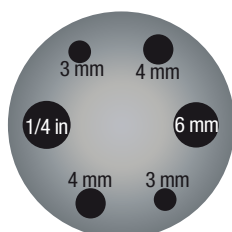
INSERT	DESCRIPTION
MC6-T150 MH1	Multi-hole (3 mm, 4 mm, 6 mm, 8 mm, 10 mm, 1/4 in)
MC6-T150 MH2	Multi-hole (2 × 3 mm, 2 × 4 mm, 6 mm, 1/4 in)
MC6-T150 MH3	Multi-hole (3 × 1/4 in, 3/16 in, 1/8 in, 3/8 in, 3 mm)
MC6-T150 MH4	Multi-hole (2 × 1/4 in, 2 × 3/16 in, 2 × 3/8 in, 3 mm)
MC6-T150 MH5	Multihole (6 mm flanged sanitary sensor, 3 mm)
MC6-T150 MH6	Multihole (1/4 in flanged sanitary sensor, 3 mm)
MC6-T150 blank	Blank, undrilled insert
MC6-T150 sanitary blank	Blank insert for short tri-clamp sanitary sensor

96

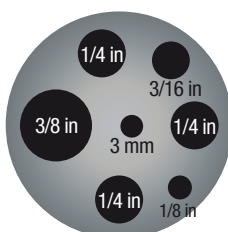
Please contact Beamex for custom inserts.



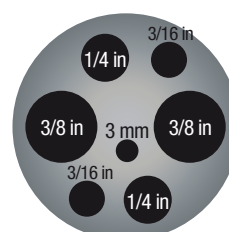
MC6-T150 MH1



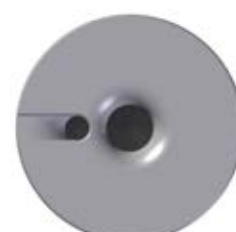
MC6-T150 MH2



MC6-T150 MH3



MC6-T150 MH4

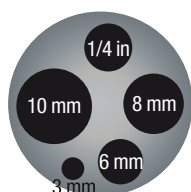


MH5/MH6

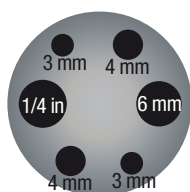
Inserts for MC6-T660

INSERT	DESCRIPTION
MC6-T660 MH1	Multi-hole (3 mm, 6 mm, 8 mm, 10 mm, 1/4 in)
MC6-T660 MH2	Multi-hole (2 × 3 mm, 2 × 4 mm, 6 mm, 1/4 in)
MC6-T660 MH3	Multi-hole (2 × 1/4 in, 3/16 in, 3/8 in, 3 mm)
MC6-T660 MH4	Multi-hole (2 × 1/4 in, 2 × 3/16 in, 3/8 in, 3 mm)
MC6-T660 blank	Blank, undrilled insert
MC6-T660 special	Special insert. Multiple special inserts available on request.

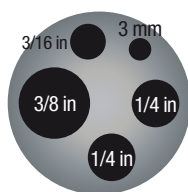
Please contact Beamex for custom inserts.



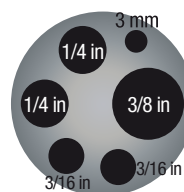
MC6-T660 MH1



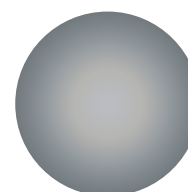
MC6-T660 MH2



MC6-T660 MH3



MC6-T660 MH4



MC6-T660 blank

Options, accessories and services

The MC6-T is a configurable product, and its capabilities can be expanded with options. The MC6-T can also be used together with various complementary products, such as Beamex RPRT, IPRT and SIRT temperature sensors. A wide range of accessories are quickly and easily available in the Beamex webshop. Beamex also provides calibration services, repairs, and convenient service plans to help you keep your calibration equipment operating at its full potential throughout its lifetime.

OPTIONS

- Optional internal barometric pressure module
- Software options:
 - Data Logger
 - HART communicator
 - FOUNDATION Fieldbus communicator
 - Profibus PA communicator
 - Mobile Security Plus
 - Additional RTD and thermocouple sensor types
 - Communication drivers for Beamex ePG, POC8 or FB/MB
 - Communication drivers for various 3rd party pressure controllers and temperature dry blocks
 - Wireless (Bluetooth) communication with Beamex Calibration Management Software



97

STANDARD ACCESSORIES

- Accredited calibration certificate
- User manual, various languages available
- Insert removal tool
- Internal Li-ion battery (installed)
- Power cord with country-specific plug
- A pair of spare fuses
- Test leads and clips
- USB communication cable



OPTIONAL ACCESSORIES

- Inserts
- Accessory holder for MC6-T150
- Accessory holder and heat shield for MC6-T660
- Transport case
- Spare fuses
- Various different test leads
- EXT cable for connecting external pressure modules

Please see full list of available accessories and spare parts in the Beamex webshop:

<https://shop.beamex.com/>

AVAILABLE SERVICES

- Care Plan or Calibration Plan
- Calibration and repair services
- Training services



SUMMARY

Beamex MC6-T

MULTIFUNCTION TEMPERATURE CALIBRATOR AND COMMUNICATOR

The Beamex MC6-T combines a state-of-the-art temperature dry block with built-in multifunction process calibrator and communicator technology. It offers versatility like no other temperature calibrator, providing calibration capabilities for temperature, pressure, and electrical signals as well as a multi-bus communicator for fieldbus instruments.

98

Ready for the field

The MC6-T is unique in terms of the functionality it provides in one device, meaning you have less to carry in the field. The calibrator is designed to remain accurate in varying environmental conditions or with fluctuating mains voltage and includes several unique safety features.

A better way to calibrate

The MC6-T will help you calibrate more efficiently. The extensive built-in process calibrator and advanced group calibration feature enable fully automatic documenting calibration. Even with automatic calibration, low calibration uncertainty is guaranteed.

Digital data flow

The MC6-T is a documenting calibrator that digitally captures data at source and ensures a secure data flow between the calibrator and Beamex LOGICAL or CMX Calibration Management Software. As a communicator, it enables digital communication with smart field instruments.

Sustainable by design

Sustainability is a core component of the Beamex design philosophy. We want you to keep using your calibrators for many years, so they have a long service life and are easy to repair, maintain, and upgrade. Our experts can help you with calibration/repair services, training, and consultancy.

Sanitary and short sensor calibration

The MC6-T150 is designed to accurately calibrate short and sanitary sensors, which is typically not possible with traditional temperature dry blocks. The immersion depth of flanged sensors can be optimized with a dedicated insert and Beamex SIRT.



Main features

- ▶ Superior metrological performance
- ▶ Stable and safe
- ▶ Advanced functionality
- ▶ Field communicator
- ▶ Digital data flow

CMX

LOGICAL

HART
COMMUNICATION PROTOCOL

PROFIBUS