

# Beamex MC6

ADVANCED FIELD CALIBRATOR AND COMMUNICATOR



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The impossible made possible:  
combining advanced functionality with ease-of-use



**beamex**  
A BETTER WAY TO CALIBRATE



# The impossible made possible: combining advanced functionality with ease-of-use

Beamex MC6 is an advanced, high-accuracy field calibrator and communicator. It offers calibration capabilities for pressure, temperature and various electrical signals. The MC6 also contains a 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 robust IP65-rated dust- and water-proof casing, ergonomic design and light weight make it an ideal measurement device for field use in various industries, such as the pharmaceutical, energy, oil and gas, food and beverage, service as well as the petrochemical and chemical industries.

The MC6 is one device with five different operational modes, which means that it is fast and easy to use, and you can carry less equipment in the field. The operation modes are: meter, calibrator, documenting calibrator, data logger and fieldbus communicator. In addition, the MC6 communicates with Beamex CMX calibration software, enabling fully automated and paperless calibration and documentation.

In conclusion, the MC6 is more than a calibrator.



## MC6 main features

### Accuracy

High-accuracy, advanced field calibrator and communicator.

### Usability

Combines advanced functionality with ease-of-use.

### Versatility

Versatile functionality beyond traditional calibration applications.

### Communicator

Multi-bus communicator for HART, FOUNDATION Fieldbus and Profibus PA instruments.

### Integration

Automates calibration procedures for paperless calibration management.







# High-accuracy, advanced field calibrator and communicator

## Accredited calibration certificate as standard

Each MC6 is delivered with a traceable, accredited calibration certificate as standard. The certificate includes calibration and uncertainty data from the calibration laboratory. The calibration laboratory's Scope of Accreditation can be found on Beamex's website ([www.beamex.com](http://www.beamex.com)).

## Summary of accuracy figures

The MC6 has specifications for short-term accuracy and for 1-year total uncertainty. Brief summary of the accuracy figures:

- Pressure accuracy starting from  $\pm(0.005\% \text{ FS} + 0.0125\% \text{ of reading})$ .
- Temperature – RTD temperature measurement accuracy starting from  $\pm 0.011 \text{ }^\circ\text{C}$ .
- Electric – current measurement accuracy starting from  $\pm(0.75 \text{ } \mu\text{A} + 0.0075\% \text{ of reading})$ .

# Designed for field use

## User-friendly interface

The MC6 has a large 5.7" color touch-screen with high resolution and an effective adjustable backlight. In addition, the MC6 has a membrane keypad. A soft number keypad and alphabetical QWERTY text keypad will appear whenever necessary for easy number/text entries.

## Robust, lightweight and ergonomic design

The MC6 has rechargeable lithium-ion polymer batteries, which are durable and charge up quickly. The user interface keeps you up to date on the remaining operation time in hours and minutes, making it easy to follow how long the battery will last. Once the unit is switched on, it is ready to use in just a few seconds. The case is ergonomic and water-/dust-proof (IP65). There are two types of cases available: a slim case when internal pressure modules are not needed and an extended version, which provides room for the internal pressure modules.





# USER-INTERFACE MODES

## 1. Meter

The meter mode is designed for simple and easy measurement of signals. Oftentimes, you may need to measure something quickly and easily. Often a simple multi-meter is used for this purpose, as it is easy to use. Some multifunctional calibrators may be too slow and difficult to use, so it is easier to just choose the simpler meter. The meter mode in MC6 is optimized for this type of simple and easy metering.



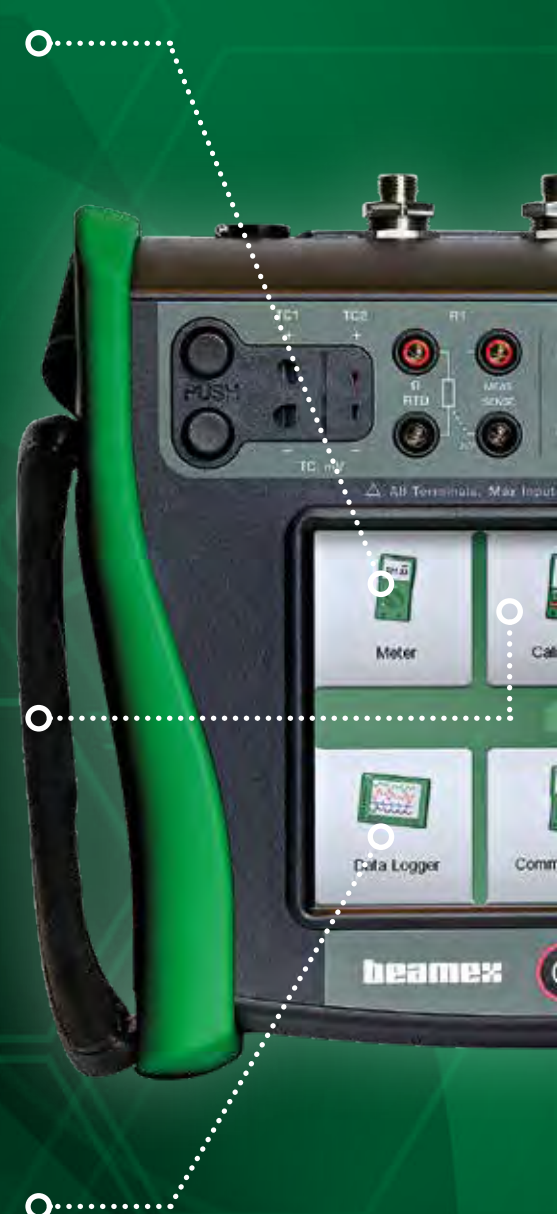
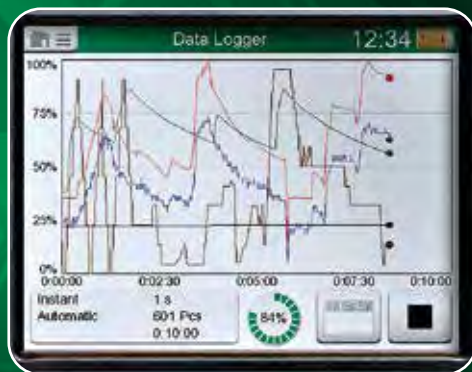
## 2. Calibrator

The calibrator mode is designed for calibrating various process instruments. Oftentimes, you need to check and calibrate a certain process instrument/transmitter. Transmitters typically have an input and an output. So you either need to have two devices, or a device capable of doing two things simultaneously. The calibrator mode in MC6 is optimized for this type of use.



## 3. Data logger

The data logger is designed for logging various measurement results. Often in industry, there is a need to measure signals for shorter or longer periods and to save the results in a memory for later analysis. This may be related to troubleshooting, surveillance or calibration. The data logger mode in MC6 is optimized for this type of use.





#### 4. Documenting calibrator

The documenting calibrator mode is designed for the process instrument calibration and documenting of the calibration results. In today's process plant, calibrations often have to be documented. Without a documenting calibrator, documentation must be done manually, which takes a lot of precious time and is prone to error. The documenting calibrator mode in MC6 is optimized for use as a documenting process calibrator.



#### 5. Communicator

The communicator mode is designed to communicate with Fieldbus instruments. In today's process plants, smart instrumentation is being used to an increasing degree. Therefore, engineers need to use communicators or configuration software. Most of this instrumentation is HART, FOUNDATION Fieldbus or Profibus PA. The communicator mode in MC6 is optimized for communicator use.



#### 6. Settings

The settings mode allows you to edit the calibrator's various settings.



78077340759834759843  
 87984654546546  
 798746546546513213213  
 62587965836458734657  
 665387875684653400







# Multi-bus field communicator for HART, FOUNDATION Fieldbus and Profibus PA instruments

## Communicator

The communicator mode is a multi-bus communicator for HART, FOUNDATION Fieldbus and Profibus PA instruments. All of the communicator electronics for all protocols are built into the MC6, including internal loop power supply with various required impedances for different buses, which means there is no need to use any external loop supply or resistors.

## Multi-bus communicator

The MC6 communicator can be used with all types of fieldbus instruments, not only pressure and temperature transmitters. All 3 protocols can be simultaneously installed into an MC6, and therefore the very same device can be used as a HART, FOUNDATION Fieldbus and Profibus PA communicator. With the MC6, you can access all parameters in all blocks of a fieldbus instrument. Its memory stores device descriptions for the fieldbus instruments. When new instruments are introduced on the market, new device description files will be made available and can be easily downloaded into the memory.



# Additional features

| FEATURE                  | SPECIFICATION   |
|--------------------------|---|
| Scaling                  | A versatile programmable scaling function allows user to scale any measurement or generation unit into any other unit. Supports also rooting transfer function for flow applications. Also, custom units and custom transfer functions are supported. |
| Alarm                    | An alarm that can be programmed with high or low limit, as well as slow rate or fast rate limit.  |
| Leak test                | A dedicated function that can be used to analyse a change in any measurement. Can be used for pressure leak testing as well as any stability testing.   |
| Damping                  | A programmable damping allows user to filter any measurement.   |
| Resolution               | Possibility to change the resolution of any measurement by reducing or adding decimals.   |
| Step                     | A programmable step function for any generation or simulation.  |
| Ramp                     | A programmable ramp function for any generation or simulation.  |
| Quick access             | Possibility to set five (5) quick access buttons in generation to easily generate the programmed values.  |
| Spinner                  | Possibility to easily step any digit in the generation value up or down.  |
| Additional info          | Allow user to see additional information in the screen such as: min, max, rate, average, internal temperature, RTD sensor's resistance, thermocouple's thermovoltage, range min/max, etc.   |
| Function info            | Displays more information on the selected function.   |
| Connection diagrams      | Displays a picture showing where to connect the test leads with the selected function.  |
| Calibration references   | Allows you to document the additional references that were used during the calibration and passes on the information to Beamex CMX calibration software.  |
| Users                    | Possibility to create a list of persons in the documenting calibrator in order to easily select who did the calibration.  |
| Custom pressure unit     | Large number of custom pressure units can be created.   |
| Custom RTD sensor        | Unlimited number of custom RTD sensors can be created using the Callendar van Dusen coefficients.   |
| Custom point sets        | Unlimited number of custom point sets can be created in calibration of an instrument, or step generation.   |
| Custom transfer function | Unlimited number of custom transfer functions can be created in calibration of an instrument or in scaling function.  |

Note: All functions are not available in all user interface modes.





# Specifications

## 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   | Extended case: 1.5...2.0 kg (3.3...4.4 lb)<br>Flat case: 1.5 kg (3.3 lb)   |
| Dimensions                                     | Extended case: 200 mm × 230 mm × 70 mm (D × W × H) (7.87 in × 9.06 in × 2.76 in)<br>Flat case: 200 mm × 230 mm × 57 mm (D × W × H) (7.87 in × 9.06 in × 2.24 in) |
| Battery type                                   | Rechargeable lithium-ion polymer, 4200 mAh, 11.1V  |
| 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...140 °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 2014/35/EU, EN 61010-1:2010  |
| EMC  | Directive 2014/30/EU, EN 61326-1:2013  |
| Ingress protection                             | IP65   |
| RoHS compliance                                | ROHS II Directive 2011/65/EU, EN 50581:2012  |
| Drop   | IEC 60068-2-32. 1 meter (3.28 ft)  |
| 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.   |

## MEASUREMENT, GENERATION AND SIMULATION FUNCTIONS

- Pressure measurement (internal/external pressure modules)
  - Voltage measurement ( $\pm 1$  V and  $-1...60$  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  $-3...24$  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

| INTERNAL MODULES | EXTERNAL MODULES | UNIT                              | RANGE <sup>(3)</sup>                      | RESOLUTION                 | ACCURACY <sup>(1)</sup> (±)        | 1 YEAR UNCERTAINTY (±) <sup>(2)</sup> |
|------------------|------------------|-----------------------------------|---|----------------------------|------------------------------------|---------------------------------------|
| PB               | EXT B            | kPa a<br>mbar a<br>psi a          | 70 to 120<br>700 to 1200<br>10.15 to 17.4 | 0.01<br>0.1<br>0.001       | 0.03 kPa<br>0.3 mbar<br>0.0044 psi | 0.05 kPa<br>0.5 mbar<br>0.0073 psi    |
| P10mD            | EXT10mD          | kPa diff<br>mbar diff<br>iwc diff | ±1<br>±10<br>±4                           | 0.0001<br>0.001<br>0.001   | 0.05% Span                         | 0.05% Span + 0.1% RDG                 |
| P100m            | EXT100m          | kPa<br>mbar<br>iwc                | 0 to 10<br>0 to 100<br>0 to 40            | 0.0001<br>0.001<br>0.001   | 0.015% FS + 0.0125% RDG            | 0.025% FS + 0.025% RDG                |
| P400mC           | EXT400mC         | kPa<br>mbar<br>iwc                | ±40<br>±400<br>±160                       | 0.001<br>0.01<br>0.001     | 0.01% FS + 0.0125% RDG             | 0.02% FS + 0.025% RDG                 |
| P1C              | EXT1C            | kPa<br>bar<br>psi                 | ±100<br>±1<br>-14.5 to 15                 | 0.001<br>0.00001<br>0.0001 | 0.007% FS + 0.0125% RDG            | 0.015% FS + 0.025% RDG                |
| P2C              | EXT2C            | kPa<br>bar<br>psi                 | -100 to 200<br>-1 to 2<br>-14.5 to 30     | 0.001<br>0.00001<br>0.0001 | 0.005% FS + 0.01% RDG              | 0.01% FS + 0.025% RDG                 |
| P6C              | EXT6C            | kPa<br>bar<br>psi                 | -100 to 600<br>-1 to 6<br>-14.5 to 90     | 0.01<br>0.0001<br>0.001    | 0.005% FS + 0.01% RDG              | 0.01% FS + 0.025% RDG                 |
| P20C             | EXT20C           | kPa<br>bar<br>psi                 | -100 to 2000<br>-1 to 20<br>-14.5 to 300  | 0.01<br>0.0001<br>0.001    | 0.005% FS + 0.01% RDG              | 0.01% FS + 0.025% RDG                 |
| P60              | EXT60            | kPa<br>bar<br>psi                 | 0 to 6000<br>0 to 60<br>0 to 900          | 0.1<br>0.001<br>0.01       | 0.005% FS + 0.0125% RDG            | 0.01% FS + 0.025% RDG                 |
| P100             | EXT100           | MPa<br>bar<br>psi                 | 0 to 10<br>0 to 100<br>0 to 1500          | 0.0001<br>0.001<br>0.01    | 0.005% FS + 0.0125% RDG            | 0.01% FS + 0.025% RDG                 |
| P160             | EXT160           | MPa<br>bar<br>psi                 | 0 to 16<br>0 to 160<br>0 to 2400          | 0.0001<br>0.001<br>0.01    | 0.005% FS + 0.0125% RDG            | 0.01% FS + 0.025% RDG                 |
| -                | EXT250           | MPa<br>bar<br>psi                 | 0 to 25<br>0 to 250<br>0 to 3700          | 0.001<br>0.01<br>0.1       | 0.007% FS + 0.0125% RDG            | 0.015% FS + 0.025% RDG                |
| -                | EXT600           | MPa<br>bar<br>psi                 | 0 to 60<br>0 to 600<br>0 to 9000          | 0.001<br>0.01<br>0.1       | 0.007% FS + 0.01% RDG              | 0.015% FS + 0.025% RDG                |
| -                | EXT1000          | MPa<br>bar<br>psi                 | 0 to 100<br>0 to 1000<br>0 to 15000       | 0.001<br>0.01<br>0.1       | 0.007% FS + 0.01% RDG              | 0.015% FS + 0.025% RDG                |

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

<sup>2)</sup> Uncertainty includes reference standard uncertainty, 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 internal pressure modules is 3 gauge/differential pressure modules and one barometric (PB) module in the extended case. The flat case has room for internal barometric module only. Both cases have connection for external pressure modules.

External pressure modules are also compatible with Beamex MC2, MC4 and MC5 family calibrators.

## 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

AISI316 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 |
| 0...400          |                      |                     | 0.07 °C                 | 0.1 °C                                |                   |
| U <sup>(5)</sup> | -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 <sup>(5)</sup> | -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 <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 reference standard uncertainty, 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<br>270...850                         | 0.025 °C<br>0.009% RDG  | 0.03 °C<br>0.012% RDG  |
| Pt100(375)<br>Pt100(385)<br>Pt100(389)<br>Pt100(391)<br>Pt100(3926) | -200...850 | -200...0<br>0...850                             | 0.011 °C<br>0.011 °C + 0.009% RDG                                     | 0.015 °C<br>0.015 °C + 0.012% RDG                                  |
| Pt100(3923)   | -200...600 | -200...0<br>0...600                             | 0.011 °C<br>0.011 °C + 0.009% RDG                                     | 0.015 °C<br>0.015 °C + 0.012% RDG                                  |
| Pt200(385)  | -200...850 | -200...-80<br>-80...0<br>0...260<br>260...850   | 0.007 °C<br>0.016 °C<br>0.016 °C + 0.009% RDG<br>0.03 °C + 0.011% RDG | 0.01 °C<br>0.02 °C<br>0.02 °C + 0.012% RDG<br>0.045 °C + 0.02% RDG |
| Pt400(385)  | -200...850 | -200...-100<br>-100...0<br>0...850              | 0.007 °C<br>0.015 °C<br>0.026 °C + 0.01% RDG                          | 0.01 °C<br>0.02 °C<br>0.045 °C + 0.019% RDG                        |
| Pt500(385)  | -200...850 | -200...-120<br>-120...-50<br>-50...0<br>0...850 | 0.008 °C<br>0.013 °C<br>0.025 °C<br>0.025 °C + 0.01% RDG              | 0.01 °C<br>0.02 °C<br>0.045 °C<br>0.045 °C + 0.019% RDG            |
| Pt1000(385)   | -200...850 | -200...-150<br>-150...-50<br>-50...0<br>0...850 | 0.007 °C<br>0.018 °C<br>0.022 °C<br>0.022 °C + 0.01% RDG              | 0.008 °C<br>0.03 °C<br>0.04 °C<br>0.04 °C + 0.019% RDG             |
| Ni100(618)  | -60...180  | -60...0<br>0...180                              | 0.009 °C<br>0.009 °C + 0.005% RDG                                     | 0.012 °C<br>0.012 °C + 0.006% RDG                                  |
| Ni120(672)  | -80...260  | -80...0<br>0...260                              | 0.009 °C<br>0.009 °C + 0.005% RDG                                     | 0.012 °C<br>0.012 °C + 0.006% RDG                                  |
| Cu10(427)   | -200...260 | -200...260                                      | 0.012 °C  | 0.16 °C  |

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## R1 Simulation

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



| 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 mΩ  |
| 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)                              |
| Simulation settling time with pulsed excitation current | < 1 ms   |
| Supported units   | °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 reference junction uncertainty together as a root sum of the squares.

## 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 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 <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 includes reference standard 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) |                          |                                   |

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## 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                         |

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

<sup>2)</sup> 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 (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   |

## 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). $I_{exc} \times R_{sim} < 3.25 \text{ V}$ (650...4000 Ω) |
| <b>Min resistance excitation current</b>            | > 0.2 mA (0...400 Ω). >0.1 mA (400...4000 Ω)                               |
| <b>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 includes reference standard uncertainty, hysteresis, nonlinearity, repeatability and typical long term stability for mentioned period (k=2).

# Modularity, options and accessories

## MODULARITY AND OPTIONS

- All electrical / temperature functions are included as standard
- Two case bottom choices:
  - flat (no room for internal pressure modules, only barometer)
  - extended (room for internal pressure modules)
- Optional internal pressure modules (up to four internal pressure modules; three standard and one barometric)
- Optional user-interface modes:
  - Documenting calibrator
  - Data logger
  - HART communicator
  - FOUNDATION Fieldbus communicator
  - Profibus PA communicator
- Pressure / temperature controller communications



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## STANDARD ACCESSORIES

- Accredited calibration certificate
- User guide
- Computer cable (USB)
- Battery charger / eliminator
- Internal LiPO battery pack
- Test leads and clips



## OPTIONAL ACCESSORIES

- Soft carrying case
- Soft accessory case
- Hard carrying case
- Spare battery pack
- Adapter cables for the second RTD channel
- Cable for pressure and temperature controllers
- Appropriate pressure T-hose with internal low pressure modules



# Beamex MC6

## ADVANCED FIELD CALIBRATOR AND COMMUNICATOR

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Beamex MC6 is an advanced, high-accuracy field 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 MC6 is one device with five different operational modes, which means that it is fast and easy to use, and you can carry less equipment in the field. The operation modes are: meter, calibrator, documenting calibrator, data logger and fieldbus communicator. In addition, the MC6 communicates with Beamex CMX calibration software, enabling fully automated and paperless calibration and documentation.

### Guided procedures

The MC6 provides automated, guided procedures. For instance, whenever a certain measurement or generation is selected, the user interface shows where to make the connections.

### Paperless calibration

The MC6 communicates with calibration software enabling fully automated and paperless calibration and documentation.

### One device, five operational modes

How is it possible to combine advanced functionality with ease-of-use? In the MC6 this has been achieved through integrating various operational modes into one device. This means that you only need to learn how to use one device.

### Communicator

Smart instrumentation is becoming more and more common in today's process plants. The most widely used smart instrument protocols are HART, FOUNDATION Fieldbus and Profibus PA. Therefore, in addition to a calibrator, an engineer often needs to use a field communicator. The MC6 combines these two; it's a calibrator and a communicator.



### Main features

- ▶ High-accuracy calibrator for pressure, temperature and electrical signals
- ▶ Full multi-bus communicator for HART, FOUNDATION Fieldbus and Profibus PA instruments
- ▶ Five operational modes: meter, calibrator, documenting calibrator, data logger and communicator
- ▶ Combines advanced functionality with ease-of-use
- ▶ Automates calibration procedures for paperless calibration management

