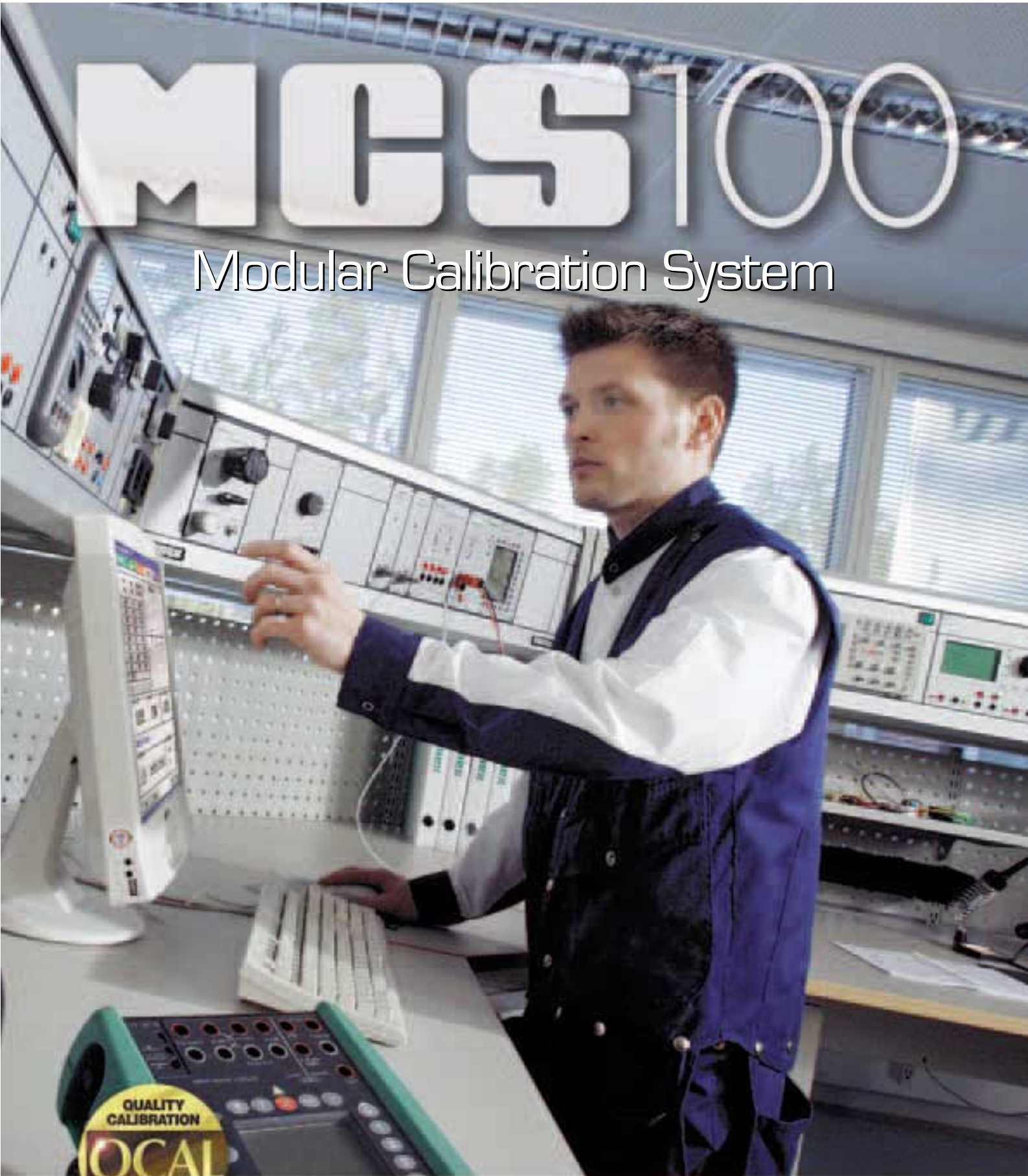


MCS100

Modular Calibration System



beamex



MCS100 Modular

MCS100 is a modular test and calibration system for workshops and laboratories. Available as a testbench, desktop cabinet or trolley, MCS100 offers efficient and ergonomic facilities for the maintenance of process instruments.

Many applications

MCS100 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 3-phase motors; soldering of surface mounted and traditional components; safety & high voltage testing; educational use, etc.



Calibration System

Safe and ergonomic

MCS100 bench system offers a safe environment with maximum working space as all equipment is mounted in the panel, and loose instruments and components can be placed on their own shelves and compartments.

The tabletop and module rack can be mounted to a user-defined height. Lighting is a standard feature, and AC socket outlets are within easy reach.

Versatile

The module panel hosts a great variety of modules including calibration modules, AC & DC power supplies, multimeters, function generators, oscilloscopes, etc. This makes the MCS100 Bench System ideal for both instrument and electrical workshops, as well as for use in laboratories.

ESD protected

Electrostatic discharges cause problems to electrical components, e.g. in repair and production facilities. MCS100 is a safe choice for places where sensitive components are handled. The MCS100 Bench System and its accessories are supplied with an electrically semiconducting coat of paint. For further protection, a semiconducting tabletop, ESD wrist straps, mats and grounding sets are available.

Technical specification for MC5P host module

Electrical Measurement

Function	Range	Resolution	1 Year Uncertainty (\pm) ¹⁾
mV measurement ²⁾	± 1000 mV	0.001–0.01 mV	0.02 % RDG + 5 μ V
V measurement ³⁾	± 50 V	0.00001–0.001 V	0.02 % RDG + 0.25 mV
mA measurement ⁴⁾	± 100 mA	0.0001–0.001 mA	0.02 % RDG + 1.5 μ A
Hz measurement ⁵⁾	0.0028 to 50 000 Hz	0.000001–0.1 Hz	0.01 % RDG
Pulse counting ⁵⁾	0 to 9 999 999 pulses	1 pulse	N/A
mA generation ⁶⁾	0 to 25 mA	0.0001 mA	0.02 % RDG + 1.5 μ A

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

²⁾ Bias current <10 nA

³⁾ Impedance >1 Mohm

⁴⁾ Impedance <7.5 ohm

⁵⁾ Impedance >1 Mohm. Frequency measurement minimum amplitude 0.5 Vpp (< 5 kHz), 1Vpp (5...50 kHz). Pulse counting minimum amplitude 0.5 Vpp (pulse length > 100 μ s), 1 Vpp (pulse length 100 μ s...10 μ s). Trigger level range –1...+15 V.

⁶⁾ Maximum load impedance 800 ohm

Multichannel datalogging: The MC5P host module can scan up to 7 datalogging channels for electrical-, temperature- and pressure signals, storing up to 70 000 results. The accompanying software allows storing the results onto the computer hard disk and viewing in graphical form. It also allows data export to spreadsheet programs.

HART®: The HART® option includes the 250 ohm resistor needed when the 24 VDC loop supply is used. The functions include both reading the HART® signal, editing parameters as well as sensor trimming for a great number of HART® instruments.

Technical specification for ET module

Electrical Generation and Measurement

Function	Range	Resolution	1 Year Uncertainty (\pm) ¹⁾
mV generation ²⁾	± 500 mV	0.001–0.01 mV	0.02 % RDG + 4 μ V
V generation ³⁾	± 12 V	0.00001–0.0001 V	0.02 % RDG + 0.1 mV
mA generation ⁴⁾	± 25 mA	0.0001 mA	0.02 % RDG + 1 μ A
Hz generation ⁵⁾	0.00028 to 50 000 Hz	0.000001–0.1 Hz	0.01 % RDG
Pulse generation ⁶⁾	0 to 9 999 999 pulses	1 pulse	N/A
Ohm simulation ⁷⁾	1 to 4000 ohm	0.01–0.1 ohm	0.04 % RDG or 30 mohm ⁸⁾
Ohm measurement ⁹⁾	0 to 4000 ohm	0.001–0.1 ohm	0.02 % RDG + 3.5 mohm
mV measurement ¹⁰⁾	± 500 mV	0.001–0.01 mV	0.02 % RDG + 4 μ V

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

²⁾ Load effect < 5 μ V/mA. Maximum output current 5 mA.

³⁾ Load effect < 100 μ V/mA. Maximum output current 10 mA (0 .. 10 V), 3 mA (10 .. 12 V).

⁴⁾ Maximum load impedance 400 ohm.

⁵⁾ Amplitude range 0 .. 12 Vpp. Amplitude setting accuracy up to 5 kHz \pm (200 mV + 5% of set value). Waveforms: Square wave (positive / symmetric) and sinewave (above 40 Hz).

⁶⁾ Pulse generation frequency range 0.1 ... 1000 Hz. Amplitude setting 0 ... 12 Vpp.

⁷⁾ Valid with measurement current 0.2 ... 5 mA (1 ... 1000 ohm), 0.1 ... 1mA (1 ... 4 kohm). Ohm/RTD simulation speed 1 ms.

⁸⁾ Which ever is greater.

⁹⁾ Specification valid with 4 wire connection. In 3 wire connection add 10 mohm.

¹⁰⁾ Bias current < 10 nA.

RTD Measurement and Simulation

Type	Range (°C)	Range (°C)	Measurement 1 Year Uncertainty (\pm) ¹⁾	Simulation 1 Year Uncertainty (\pm) ¹⁾
Pt-sensors	–200 to 850°C	–200 to 0°C 0 to 850°C	0.06°C 0.025 % RDG + 0.06°C	0.1°C 0.025 % RDG + 0.1°C
Resolution 0.01°C.				

Other RTD types available as standard

- Pt50 (385)
- Pt500 (385)
- Pt100 (391)
- Ni100 (618)
- Pt100 (385)
- Pt1000 (385)
- Pt100 (375)
- Ni120 (672)
- Pt200 (385)
- Pt100 (3923)
- Pt100 (3926)
- Cu10 (427)
- Pt400 (385)
- Pt100 (389)

RTD/ohm simulation excitation current 0.2 ... 5 mA (1...1000 ohm), 0.1...1 mA (1 ... 4 kohm).

Also other RTD types available as option

Thermocouple Measurement and Simulation

Type	Range (°C)	Range (°C)	1 Year Uncertainty (\pm) ¹⁾
B ²⁾	0 to 1820	0 to 200	³⁾
		200 to 500	2.0°C
		500 to 800	0.8°C,
		800 to 1820	0.6°C
R ²⁾	-50 to 1768	-50 to 0	1.0°C
		0 to 150	0.7°C
		150 to 1400	0.5°C
		1400 to 1768	0.6°C
S ²⁾	-50 to 1768	-50 to 0	1.0°C
		0 to 50	0.7°C
		50 to 1500	0.6°C
		1500 to 1768	0.7°C
E ²⁾	-270 to 1000	-270 to -200	³⁾
		-200 to 0	0.08 % RDG + 0.07°C
		0 to 600	0.015 % RDG + 0.07°C
		600 to 1000	0.026 % RDG
J ²⁾	-210 to 1200	-210 to -200	³⁾
		-200 to 0	0.07 % RDG + 0.08°C
		0 to 1200	0.02 % RDG + 0.08°C
K ²⁾	-270 to 1372	-270 to -200	³⁾
		-200 to 0	0.1 % RDG + 0.1°C
		0 to 1000	0.02 % RDG + 0.1°C
		1000 to 1372	0.03 % RDG
N ²⁾	-270 to 1300	-270 to -200	³⁾
		-200 to -100	0.2 % RDG
		-100 to 0	0.05 % RDG + 0.15°C
		0 to 750	0.01 % RDG + 0.15°C
		750 to 1300	0.03 % RDG
T ²⁾	-270 to 400	-270 to -250	³⁾
		-250 to -200	0.7°C
		-200 to 0	0.1 % RDG + 0.1°C
		0 to 400	0.01 % RDG + 0.1°C
U ⁴⁾	-200 to 600	-200 to 0	0.1 % RDG + 0.15°C
		0 to 600	0.01 % RDG + 0.15°C
L ⁴⁾	-200 to 900	-200 to 0	0.07 % RDG + 0.13°C
		0 to 900	0.02 % RDG + 0.13°C

Resolution 0.01°C.

With internal reference junction (module RJ) add 0.1°C uncertainty.

Thermocouple types C³⁾ (ASTM E 988-96), G³⁾ (ASTM E 1751-95e1) and D³⁾ (ASTM E 988-96) also available as standard.

Also other thermocouple types available as option.

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

²⁾ IEC 584, NIST MN 175, BS 4937, ANSI MC96.1

³⁾ $\pm(0.02\%$ of thermovoltage + 4 μ V)

⁴⁾ DIN 43710

Reference Junction Module (RJ)

Ambient temperature range	1 Year uncertainty (\pm) ¹⁾
-10 .. 50°C	0.1°C

1) RJ module uncertainty is to be added to the uncertainty of the thermocouple used.

Technical specification for PM modules

Pressure Measurement

Internal Modules	External Modules	Unit	Range ²⁾	Resolution	90 Days Uncertainty (\pm) ¹⁾	1 Year Uncertainty (\pm) ¹⁾
PM B	EXT B	kPa a	80 to 120	0.01	–	0.05 kPa
		mbar a	800 to 1200	0.1	–	0.5 mbar
		psi a	11.6 to 17.4	0.001	–	0.0073 psi
PM100m	EXT100m	kPa	0 to 10	0.0001	0.025 % RDG + 0.025 % FS	0.04 % RDG + 0.025 % FS
		mbar	0 to 100	0.001		
		iwc	0 to 40	0.001		
PM400mC	EXT400mC	kPa	–40 to 40	0.001	0.025 % RDG + 0.02 % FS	0.04 % RDG + 0.02 % FS
		mbar	–400 to 400	0.01		
		iwc	–160 to 160	0.001		
PM1C	EXT1C	kPa	–100 to 100	0.001	0.025 % RDG + 0.01 % FS	0.04 % RDG + 0.01 % FS
		bar	–1 to 1	0.00001		
		psi	–14.5 to 15	0.0001		
PM2C	EXT2C	kPa	–100 to 200	0.001	0.025 % RDG + 0.01 % FS	0.04 % RDG + 0.01 % FS
		bar	–1 to 2	0.00001		
		psi	–14.5 to 30	0.0001		
PM6C	EXT6C	kPa	–100 to 600	0.01	0.025 % RDG + 0.01 % FS	0.04 % RDG + 0.01 % FS
		bar	–1 to 6	0.0001		
		psi	–14.5 to 90	0.001		
PM20C	EXT20C	kPa	–100 to 2000	0.01	0.025 % RDG + 0.01 % FS	0.04 % RDG + 0.01 % FS
		bar	–1 to 20	0.0001		
		psi	–14.5 to 300	0.001		
PM60	EXT60	kPa	0 to 6000	0.1	–	0.04 % RDG + 0.01 % FS
		bar	0 to 60	0.001		
		psi	0 to 900	0.01		
PM100	EXT100	MPa	0 to 10	0.0001	–	0.04 % RDG + 0.01 % FS
		bar	0 to 100	0.001		
		psi	0 to 1500	0.01		
PM160	EXT160	MPa	0 to 16	0.0001	–	0.04 % RDG + 0.013 % FS
		bar	0 to 160	0.001		
		psi	0 to 2400	0.01		
PM250	EXT250	MPa	0 to 25	0.001	–	0.04 % RDG + 0.015 % FS
		bar	0 to 250	0.01		
		psi	0 to 3700	0.1		
PM600	EXT600	MPa	0 to 60	0.001	–	0.04 % RDG + 0.015 % FS
		bar	0 to 600	0.01		
		psi	0 to 9000	0.1		
–	EXT1000	MPa	0 to 100	0.001	–	0.04 % RDG + 0.015 % FS
		bar	0 to 1000	0.01		
		psi	0 to 15 000	0.1		

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

²⁾ Every internal/external pressure module's range may be displayed also in absolute pressure if the Barometric Module (PM B) is installed.

Supports the following pressure units as standard:

Pa, hPa, kPa, MPa, mbar, bar, lbf/ft², psi, gf/cm², kgf/cm², kgf/m², kp/cm², at, mmH₂O, cmH₂O, mH₂O, iwc, ftH₂O, mmHg, cmHg, mHg, inHg, mmHg(0°C), inHg(0°C), mmH₂O(4°C), inH₂O(4°C), ftH₂O(4°C), inH₂O(60°F), mmH₂O(68°F), inH₂O(68°F), ftH₂O(68°F), torr, atm.

Pressure modules 20 bar and below, pressure connection G 1/8 (ISO 228/1) 60° internal cone.

PM60, PM100, PM160, PM250, PM600 module pressure connection G 1/8 (ISO 228/1) BSP female adapter.

EXT60, EXT100, EXT160, EXT250, EXT600, EXT1000 pressure module pressure connection G 1/4 (ISO 228/1) male.

Wetted parts AISI316 stainless steel, Hastelloy, Nitrile rubber.

In the PM20C, EXT20C, PM60, EXT60, PM100, EXT100, PM160, EXT160 and PM250, EXT250 the maximum overpressure is twice the range.

The maximum overpressure for PM600, EXT600 is 900 bar and for EXT1000 1100 bar.

Calibration Modules

MC5P Host Module



The MC5P includes an electrical section (E) which hosts the optional HART® modem which allows digital communications with instruments that support the HART® protocol. MC5P automatically includes an internal 250 ohm resistor required for HART® communication when the +24V DC loop supply is used.

MC5P host module features:

- Voltage and current measurement
- Pulse counting and frequency measurement
- Current generation
- Switch testing
- 24 V DC loop supply
- Connection for external pressure modules

Optional features:

- HART® communication
- Datalogging
- Communication with pressure controller
- Communication with dry blocks
- Communication with software
- Environmental temperature sensor

The MC5P calibration host module is, with its large graphical display and membrane keyboard, the master module for temperature, electrical and pressure calibration modules. Apart from communicating with the calibration modules, it also features communication with dry blocks and automatic pressure controllers.

The MC5P can also work as a multichannel datalogger (option), using the other calibration modules.



ET Electrical and Temperature Module

The ET electrical and temperature module simulates and measures a wide variety of RTD's and thermocouples. Additionally it generates electrical signals including frequency and pulses as well as measures and generates/simulates V, mV and ohm.

The ET module includes the reference junction (RJ) module, using advanced temperature measurement technology providing very accurate internal cold junction compensation when measuring or simulating thermocouples. The unique design of the RJ module makes it possible to use practically any connector type or bare TC wires.



ET module features:

- RTD measurement / simulation
- Resistance measurement / simulation
- Thermocouple measurement / simulation
- Low voltage measurement / generation
- Reference junction (RJ)
- Frequency generation
- Pulse generation
- Voltage generation
- Current generation

PM Pressure Measurement Modules

The PM pressure measurement modules incorporate advanced pressure measurement technology resulting in only a few PM modules being required to cover a wide pressure range with excellent uncertainty.

The barometric module PM B 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 PM modules is displayed in the MC5P module.



Pressure Output Modules, manual

The PO pressure output modules are designed to regulate vacuum and pressure signals with high precision. For pressures up to 20 bar (290 psi), a regulator in combination with an adjustable volume is used to help achieving the exact pressure. High-pressure modules come with high-pressure regulators combined with needle valves.

The pressure supply module PS7 provides a basic pressure supply for devices such as I/P, E/P, etc.



Module	Range
PO6C	-0.95 to 6 barg / -13.7 to 87 psi
PO20	0 to 20 barg / 0 to 290 psi
PO60	0 to 60 barg / 0 to 870 psi
PO160	0 to 160 barg / 0 to 2320 psi
PO250	0 to 250 barg / 0 to 3625 psi

Pressure Output Modules, automatic

The POC4 pressure output controller is an automatic pressure output module designed for applications requiring automatic pressure testing and calibration. The POC4 is available in different pressure ranges from -0.95 bar to 60 bar (-13.7 to 870 psi). The POC4 automatically regulates the pressure output signal according to commands from MC5P.



Module	Unit	Range	Resolution	Uncertainty (for the test point)	
POC4	kPa	-100 to 600	0.01	±0.05% FS	FS = 600 kPa
	bar	-1 to 6	0.0001	±0.05% FS	FS = 6 bar
	psi	-14.5 to 87	0.01	±0.05% FS	FS = 87 psi
POC4	kPa	-100 to 6000	0.1	±0.05% FS	FS = 6000 kPa
	bar	-1 to 60	0.001	±0.05% FS	FS = 60 bar
	psi	-14.5 to 870	0.1	±0.05% FS	FS = 870 bar

Other ranges available on request.

Other modules and equipment

Main Supply Units

The main supply unit powers the modules installed in the MCS100 Bench System. Each type of main supply unit includes a mains switch, earthed socket outlets both in the front and inside the panel, thermal overload and fault current protections, and earth terminal screw. More features are available depending on the model.



Power Supply Modules

Many types of power supplies can be integrated into the MCS100 Bench System, such as variable and constant AC & DC supplies, dual power supplies, programmable DC supplies, isolated supply outlets, variable 3-phase AC supplies and 3-phase connections.



Measuring equipment

Various types of measuring equipment can be included in the module panel, such as digital multimeters, oscilloscopes, function generators / frequency counters, power analysers etc., providing an ergonomic and efficient measuring facility.



Soldering Equipment

The MCS100 Bench System can be fitted with soldering/desoldering stations, along with fume extraction equipment, vision systems, hot air pencils, preheaters etc., enabling soldering of surface mounted and traditional electronic components.



ESD Equipment

The ESD equipment available for the MCS100 Bench System removes the problems caused by electrostatic discharges into sensitive components. The range of ESD equipment includes semiconducting laminated tabletops, semiconducting mats under the bench and on the module panel, wrist straps, grounding sets, etc. All steel parts of the bench are ESD painted as standard.



Fittings

A large number of fittings and accessories are available for the MCS100 Bench System, such as drawer units, steel shelves, pick-up boxes, swivel stands, CPU and keyboard shelves, tool holders, chairs, etc.



MCS100 – a versatile System

Desk Top System

All Beamex calibration modules can be installed into a Desk Top System. The 19" Desk Top chassis, which includes internal power supply to all Beamex modules, form complete calibration stations. The Desk Top System is ideal to be placed on existing work benches or used in small calibration laboratories where the available space is always an issue.



Mobile Lab System

Mobile Lab is a portable equipment trolley allowing measuring and calibration modules to be mobile outside a confined work area. It is compact and easily transferable from one location to another. It is compatible with all MCS100 equipment modules.

Mobile Lab consists of an equipment frame with wheels and a power supply unit. In this configuration the calibration workshop can be taken to the worksite, eliminating the need to remove instrumentation from the process.



Calibration software

Beamex provides calibration software ranging from documenting software designed for efficient and easy documentation of calibration results, to versatile calibration management software with security system featuring electronic signature, multiuser / networking, history trend, and powerful report and certificate functionality.

All software products have communication with the host calibration module MC5P.

The validated QM6 software helps in complying with the requirements of regulations like (CFR21 part 11, cGMP, ISO 9000, etc.).



Beamex brochures

You will also find information in pdf-format on web: www.beamex.com



General Product Brochure



QM6 Calibration Software



QD3 Calibration Software



MC5 Multifunction Calibrator



MC5-IS Intrinsically Safe Calibrator



MC3 Portable Calibrators



PG Calibration Pumps



MIC Instrument Calibrators



MCS100 Modular Calibration System

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