



M191

- Programmable high voltage high resistance decade box
- Resistance range from 10 kΩ to 1 TΩ
- Operating voltage range up to 10 kVDC
- Grounded or floating operation
- Built-in three fix value high voltage capacitors from 10 nF to 100 nF
- Built-in monitoring voltmeter
- SHORT function for short current testing of UUTs
- Timer function for testing of UUTs
- Easy recalibration using front panel keypad
- GPIB & RS232 interface

M191 calibrator is based on programmable high resistance decade with additional electronic circuits allowing calibration of not only resistance ranges, but also calibration of UUT test voltage, short current testing, verifying of functions of measuring dielectric parameters like polarization index (PI), dielectric absorption ratio (DAR) and polarization ratio (PR). The calibrator can be also used to verify timer function of the UUT.

Main feature of the calibrator is High resistance source mode. In this mode any resistance value in range from 10 kΩ to 1 TΩ adjustable with 4 digit resolution can be set and connected to the output terminals. Maximum allowed working DC voltage is from range 50 V to 10 000 V depending on set resistance. Switching the resistance value under test voltage is allowed in limited voltage range. In this range it the basic accuracy is 0.1 % to 5 % depending on set resistance value.

The calibration can be controlled manually using front panel keypad or in remote mode using one of two types of interfaces GPIB, RS-232. The calibrator can easily fit within calibration systems featuring CALIBER software support.

## Specification

### **Function HVR (High resistance programmable decade box)**

Total resistance range:	10.00 kΩ to 1000.0 GΩ
Test voltage range:	10 000 VDC + 5 % over range
Maximum applicable voltage during over-switching:	3 000 VDC (without output terminals disconnection)
Test voltage indication:	4 digit meter with range of 10 kVDC with suppressed indication below 50 VDC
Test voltage accuracy:	0.5 % + 10 V
Test current indication:	4 digit meter in range from 0.01 pA to 99.99 mADC
Maximum safe DC voltage between H and L terminal:	11 000 VDC
Maximum allowed DC voltage between L and GND terminal:	15 VDC

## Accuracy in grounded mode (G) and floating mode (F):

Resistance range	Accuracy in G mode*	Accuracy in F mode*	Maximum DC test voltage***	Typical voltage dependency	Test voltage accuracy	Test current range	Test current accuracy
10.00 kΩ – 99.99 kΩ	0.2 %	0.2 %	65 V	< 0.05 ppm/V	0.5 % + 10 V	10 mA	0.7 % + 100 μA
100.0 kΩ – 999.9 kΩ	0.1 %	0.1 %	315 V			2.5 mA	0.7 % + 10 μA
1.000 MΩ – 9.999 MΩ			1 250 V			1 mA	0.7 % + 1 μA
10.00 MΩ – 99.99 MΩ			5 000 V			500 μA	0.7 % + 100 nA
100.0 MΩ – 499.9 MΩ	0.2 %	0.2 %	10 000 V	< 0.07 ppm/V		100 μA	0.7 % + 20 nA
500.0 MΩ – 999.9 MΩ				< 0.15 ppm/V		20 μA	1 % + 10 nA
1.000 GΩ – 9.999 GΩ	0.5 %	0.5 %		< 0.20 ppm/V		10 μA	1.5 % + 1 nA
10.00 GΩ – 19.99 GΩ	1 %	1.0 %		N/A**		1 μA	1.5 % + 500 pA
20.00 GΩ – 99.99 GΩ		2 %				500 nA	2 % + 100 pA
100.0 GΩ – 299.9 GΩ		3 %				100 nA	5 % + 20 pA
299.9 GΩ – 1000.0 GΩ	5 %	6 %					

\* Accuracy is valid in reference temperature range 23+/-2 °C with RH < 50 %.

\*\* Test voltage voltmeter function is not available in resistance range from 299.9 GΩ to 1 000 GΩ.

\*\*\* Maximum measured DC test voltage is 5 % over the specified range

## SHORT function for Short test current verification

Current range: 0.000 – 5.000 mA DC  
 Input resistance: 2700 Ω nom.  
 Short test current accuracy: 0.2 % + 5 uA

## HVC function, high voltage capacitance

Range of capacitance: 10, 50, 100 nF fix values  
 Tolerance: ± 10 %  
 Calibration value uncertainty: 0.3 % + 200 pF  
 Max. test voltage: 5 000 VDC + 5 % over range  
 Test voltage indication: 0 to 5 000 kVDC with suppressed indication bellow 50 VDC  
 Test voltage accuracy: 0.5 % + 10 V

## General specification

Warm up time: 15 minutes  
 Operating temperature: 23 ± 10 °C, Relative humidity < 70 %  
 Reference temperature: 23 ± 2 °C,  
 Relative humidity < 50 % for resistance range from 10 kΩ to 1 000 GΩ  
 Relative humidity < 70 % for resistance range from 10 kΩ to 10 GΩ  
 Temperature coefficient: Additional resistance uncertainty due to temperature coefficient for temperature outside of Tcal ± 2 °C:  
 from + 13 °C to +33 °C add 0.1 x specified accuracy / °C at reference temperature  
 Humidity coefficient: Additional uncertainty due to humidity coefficient in range 50 to 70 % RH is:  
 - 0.15 x specified accuracy / % RH for range 10.00 GΩ to 1 000.0 GΩ  
 - 0.05 x specified accuracy / % RH for range 100.0 MΩ to 9.99 GΩ  
 - 0.02 x specified accuracy / % RH for range 10.00 kΩ to 99.99 MΩ  
 Storage temperatures: -10 °C ... +55 °C  
 Dimension: W 450 mm, H 150 mm, D 430 mm  
 Netto weight 12 kg  
 Power line: 115 / 230 VAC, 50 / 60 Hz  
 Power consumption: 40 VA

### Following information is displayed on the display:

- Set resistance value in Ω.
- Maximum safe test voltage that can be applied to the output terminals.
- Actual test voltage. This is value of DC test voltage sourced by UUT and connected to the calibrator output terminals.
- Test current.
- Accuracy. Selected resistance point accuracy shown in %.

100.0 GΩ		OFF
Umax: 10 kV		Local Gnd
Test voltage: 0.000 kV	Mode: HVR	ACCURACY 2.0%
Test current: n/a		