

M191 Insulation Tester Calibrator



- Programmable high voltage high resistance decade
- Resistance range from 10 kΩ to 1 TΩ
- Working voltage range up to 10 kV DC
- Grounded or floating operation
- Built-in three fix value high voltage capacitors from 10 nF to 100 nF
- Built-in monitoring high voltage voltmeter
- SHORT function for short current testing of UUTs
- Special function for Timer function testing in UUTs.
- Verification of dielectric absorption ratio and polarization indexes measurement
- Easy recalibration using front panel keypad
- GPIB & RS232 interface

M191 Insulation tester calibrator is a device designed for application field of calibration of insulation testers. It can be used for calibration of any DC high resistance meter with working voltage up to 10 kV.

M191 calibrator is based on programmable high resistance decade which is completed with additional electronic circuits allowing calibration not only resistance ranges, but also calibration of test voltage generated by UUT, testing of short current, verifying of functions of measuring dielectric parameters like polarization index (PI), dielectric absorption ratio (DAR) and polarization ratio (PR). The calibrator enables also verification of timer function of UUTs.

Basic feature of the calibrator is adjustable high resistance decade in summary range from 10 kΩ to 1 TΩ. The decade is designed for operation voltages up to 10 kV. In this range it offers basic accuracy 0.1% to 5 % depending on set resistance value.

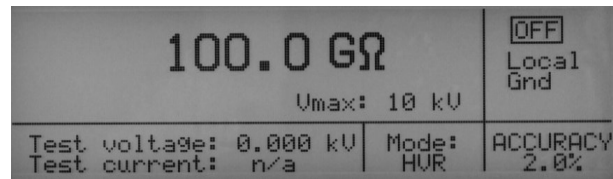
The calibration can be controlled manually using front panel keypad or in remote mode using one of two types of interfaces GPIB, RS-232. The calibrator can easily fit within calibration systems featuring CALIBER software support.

HVR High resistance source mode

The calibrator basic function is High resistance source mode. In the 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.

Following information are displayed on the display:

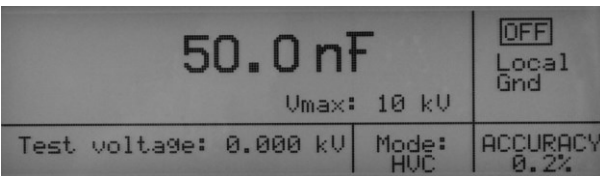
- Set resistance value in Ω.
- Maximum safe test voltage which is allowed to apply to the output terminals.
- Applied test voltage. This is value of DC test voltage sourced by UUT and connected to the calibrator output terminals.
- Test current. Calibrator calculates and displays test current.
- Accuracy. Calibrator displays accuracy of selected resistance point in %.



HVC High voltage capacitance

In High voltage capacitance function the calibrator enables to connect to the output terminals one of three high voltage capacitors which are built-in the calibrator. Sense of the capacitance function is to offer tool for calibration of those megaohmmeters and insulation testers which can measure also capacitance. The calibrator is equipped with 3 capacitors with nominal values 10, 50, 100 nF. Maximum test voltage is 5 000 VDC.

When in HVC mode the display shows information as follows:



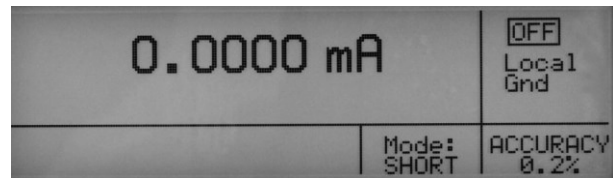
- Calibration value of the selected capacitor
- Vmax. Maximum allowed DC test voltage.
- Test voltage. To the output terminals currently connected test voltage
- Accuracy of the set capacitance in %.

SHORT Short current mode

Short current mode is designed to enable verification of short current capability of UUTs - megaohmmeters. M191 measures DC test current which is sourced by UUT under short circuit condition. M191 milliamperimeter has one range 5 mA with five-digit resolution in this mode. Nominal input resistance is 2.5 kΩ.

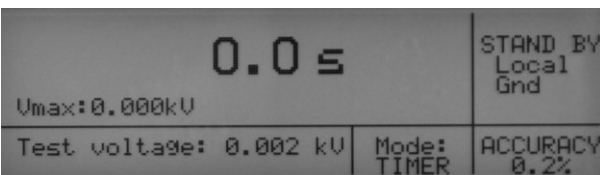
Display shows information as follows:

- Measured short current in mA
- Accuracy of the measured value in %.



TIMER Timer function

Timer function allows verifying Timer features of safety testers and megaohmmeters. Calibrator can measure time interval for what the UUT test voltage is presented on the calibrator output terminals. During the measurement the calibrator goes automatically through sequence of statuses: OFF, STANDBY, RUNNING, OFF. In Timer function calibrator automatically connects to the output terminals resistance value 100 MΩ. The value cannot be modified.

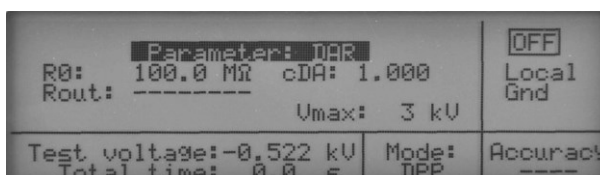


Display shows information as follows (Standby mode):

- Measured time in seconds.
- Maximum DC test voltage which has been caught by the calibrator during time interval of the Timer calibration.
- Test voltage. Current test voltage presented on the calibrator output terminals during calibration process.
- Accuracy of the measured time interval in s.

DPP & PSP Dielectric and polarization parameters

DPP & PSP functions enable direct calibration if isolation meters which are equipped with function of DAR (dielectric absorption ratio), PI (polarization index) or PR (polarization ratio). Operation of the functions is based on switching different values of resistance to the output terminals in predefined time sequence.



Following parameters can be entered in DPP mode:

- DAR/PR/PI PARAMETER can be selected.
- Basic resistance level given by R0 parameter. The parameter range is from 10 MΩ to 100 GΩ.
- DAR/PR/PI coefficient in range from 0.5 to 99.9.

DPP is preprogrammed mode with time sequences of DAR/PR/PI parameters. PSP mode is programmable mode. The resistances connected to the output terminals can be preset in range 10 MΩ to 100 GΩ and can be switched over in programmable time interval up to 9 999 s.

In the PSP mode any resistance values can be set and switched to the output terminals in predefined intervals.

t0: 0 s	R0: 100.5 MΩ	RUNNING
t1: 5 s	R1: 120.3 MΩ	Local
t2: 10 s	R2: 150.6 MΩ	Gnd
t3: 15 s	R3: 260.2 MΩ	
Test voltage: 0.149 kV	Mode: ACCURACY	
Total time: 10.8 s	PSP	0.2%

Specification

Accuracies include long-term stability, temperature coefficient, linearity, load and line regulation and the traceability of factory and National calibration standards. Specified accuracy is valid after one hour warm up in temperature range 23 ± 2 °C. Specified accuracy is one year accuracy.

1. Function HVR (High resistance programmable decade box)

Total resistance range: 10.00 kΩ to 1000.0 GΩ

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

Resistance range Ω	Accuracy in G mode* %	Accuracy in F mode* %	Maximum DC test voltage*** V	Typical voltage dependency ppm/V	Test voltage accuracy	Test current range A	Test current accuracy
10.00k - 99.99k	0.2	0.2	65	< 0.05	0.5 % + 10 V	10 m	0.7 % + 100 uA
100.0k - 999.9k	0.1	0.1	315	< 0.05	0.5 % + 10 V	2.5 m	0.7 % + 10 uA
1.000M - 9.999M	0.1	0.1	1 250	< 0.05	0.5 % + 10 V	1 m	0.7 % + 1 uA
10.00M - 99.99M	0.1	0.1	5 000	< 0.05	0.5 % + 10 V	500 u	0.7 % + 100 nA
100.0M - 499.9M	0.2	0.2	10 000	< 0.05	0.5 % + 10 V	100 u	0.7 % + 20 nA
500.0M - 999.9M	0.2	0.2	10 000	< 0.07	0.5 % + 10 V	20 u	1 % + 10 nA
1.000G - 9.999G	0.5	0.5	10 000	< 0.15	0.5 % + 10 V	10 u	1.5 % + 1 nA
10.00G - 19.99G	1.0	1.0	10 000	< 0.15	0.5 % + 10 V	1 u	1.5 % + 500 pA
20.00G - 99.99G	1.0	2.0	10 000	< 0.20	0.5 % + 10 V	500 n	2 % + 100 pA
100.0G - 299.9G	2.0	3.0	10 000	< 0.20	0.5 % + 10 V	100 n	5 % + 20 pA
299.9G - 1000.0G	5.0	6.0	10 000	< 0.20	N/A**	N/A**	N/A**

* 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

Test voltage range:	10 000 VDC + 5% over range
Maximum applied voltage during over-switching:	3 000 VDC (without output terminals disconnection)
Test voltage indication:	4 digit meter with range to 10 kVDC with suppressed indication bellow 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

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

TIMER function, verification of Timer feature

Range of the timer:	5 s to 9 999 s
Timer accuracy:	$(0.3 + 0.0001 * t)$ s where t is elapsed time
Threshold voltage:	< 100 VDC,
Maximum test voltage:	10 000 VDC + 5% over range
Output resistance:	100 MΩ
Test voltage indication:	0 to 10 000 kV DC with suppressed indication bellow 50 VDC
Test voltage accuracy:	0.5 % + 10 V
Max. test voltage hold function:	to 11 kV DC

PSP function, programmable simulation of polarization parameters

Number of switching positions: 4
Applicable resistance range: 10.00 MΩ to 100.00 GΩ
Maximum allowed test voltage: 3 000 VDC
Max. period setting: 9 999 s

DPP function DPP, Dielectric and polarization parameters

Applicable resistance range: 10.00 MΩ to 100.00 GΩ
Maximum allowed test voltage: 3 000 VDC
Max. period setting: 9 999 s
Preset parameters: Polarization index (PI)
Dielectric absorption ratio (DAR)
Polarization ratio (PR)

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 kV DC with suppressed indication bellow 50 VDC
Test voltage accuracy: 0.5 % + 10 V

General data

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 GΩ
Storage temperatures: -10 °C to +55 °C
Dimension: 450 (W) x 430 (D) x 150 (H) mm
Netto weight: 12 kg
Power line: 110/115/120/125 - 220/230 V – 50/60 Hz
Power consumption: 40 VA
Safety class: I according to EN 1010-1
Used external fuses: T500mL250V for 230 VAC power supply voltage, 1 pc
T1L250V for 115 VAC power supply voltage, 1 pc

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