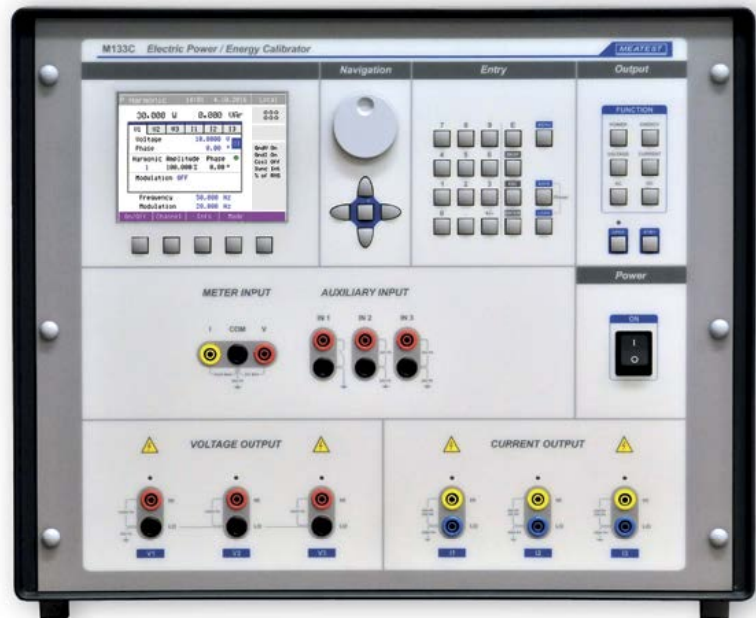


# M133C

# Electric Power / Energy Calibrator



## HIGHLIGHTS

- Power quality and energy functions three and single phase version
- AC power up to 3x 18 kVA, DC up to 25.2 kW
- Phase accuracy 0.02°, frequency range 15–1000 Hz
- Calibration of clamp meters up to 2250 A
- Floating current outputs, up to 5 Vrms
- Built-in process multimeter
- GPIB, RS-232 and ethernet as standart

## DESCRIPTION

M133C is electric AC/DC power and energy calibrator for calibration of power meters, power transducers, power quality analysers and generally all kinds of power measuring devices

Full version of M133C calibrator can generate four types of power distortion: harmonic up to 50 products, interharmonic up to 5 kHz, amplitude modulation using symmetrical sine or square wave envelope and finally dip/swell amplitude modulation using custom square wave envelope. All the parameters including distortion can be set independently for each phase.

M133C is more than just a sophisticated power source. Using built-in process multimeter, both transducer inputs and outputs can be handled by the M133C at the same time so you can calibrate it more easily, using no other calibration equipment. Floating current outputs can be connected directly with voltage outputs o allow for 3-wire power meter calibration. One calibrator, many applications – saving your time, space and costs.

## SPECIFICATION

### DC/AC voltage sinus

Voltage range:	1 Vdc to 280 Vdc, 1 Vac to 600 Vac
Resolution:	5½ dig.
Frequency range:	DC, 15 Hz to 1000 Hz. Synchronization to mains frequency or external signal is available.
Frequency accuracy:	0.005 %
Frequency resolution:	0.001 Hz, 0.01 Hz above 500 Hz
Distortion of output signal:	< 0.05 %

Range	% of value + % of range	Max. burden (mA)	% of value + % of range	Max. burden (mA)	% of value + % of range	Max. burden *
	DC	DC	15 - 40 Hz 70 - 1000 Hz	15 - 40 Hz 70 - 1000 Hz	40 - 70 Hz	40 - 70 Hz
1.0000 - 10.0000 V	0.015 + 0.01	100	0.02 + 0.01	100	0.015 + 0.01	100
10.0001 - 30.0000 V	0.015 + 0.01	200	0.02 + 0.01	200	0.015 + 0.01	200
30.001 - 70.000 V	0.015 + 0.01	200	0.02 + 0.01	200	0.015 + 0.01	300
70.001 - 140.000 V	0.015 + 0.01	200	0.02 + 0.01	200	0.015 + 0.01	300
140.001 - 280.000 V	0.015 + 0.01	150	0.02 + 0.01	150	0.015 + 0.01	200
280.001 - 600.000 V**	—	—	0.03 + 0.01	50	0.02 + 0.01	60

\*Sum of all currents (three phases) for M133C (M133Ci) is limited to 400 mA \*\*Only fundamental harmonic in range over 280 Vac, frequency range 20 - 1000 Hz

### DC/AC current sinus

Current range:	0.005 A to 30 A
Resolution:	5½ dig.
Frequency range:	DC, 15 Hz to 1000 Hz.
Frequency accuracy:	0.005 %
Frequency resolution:	0.001 Hz, 0.01 Hz above 500 Hz
Distortion of output signal:	< 0.1 %

Range	% of value + % of range	Max. voltage (V)	% of value + % of range	% of value + % of range	Max. voltage (V)	Max. voltage (V)
	DC	DC	15 - 40 Hz 70 - 1000 Hz	40 - 70 Hz	15 - 400 Hz	400 - 1000 Hz
0.005000 - 0.300000 A	0.025 + 0.01	8	0.03 + 0.02	0.025 + 0.01	5.5	3.5
0.30001 - 1.00000 A	0.025 + 0.01	8	0.03 + 0.02	0.025 + 0.01	5.5	3.5
1.00001 - 2.00000 A	0.025 + 0.01	8	0.03 + 0.02	0.025 + 0.01	5.5	3.5
2.00001 - 5.00000 A	0.025 + 0.01	5	0.03 + 0.02	0.025 + 0.01	3.5	3.5
5.0001 - 10.0000 A	0.03 + 0.015	5	0.04 + 0.02	0.03 + 0.015	3.5	3.5
10.0001 - 30.0000 A	0.035 + 0.015	5	0.05 + 0.02	0.035 + 0.015	3.5	3.5

Additional uncertainty with applied current coil Opt.140-50 is 0.3 %. Output current is multiplied by factor 50.

### Phase shift voltage/current - Power factor

Phase shift range:	0.00° to +359.99°
Frequency range:	15 Hz to 1000 Hz
Phase shift resolution:	0.01°
Power factor range:	-1 to +1
Power factor resolution:	0.001
Power factor accuracy:	dPF = 100*(1 - cos(φ+dφ)/cos φ) (%)

### Phase shift accuracy φ (internal synchronization)

Frequency (Hz)	15-70	15-70	15-70	70-400	400-1000
Current (A)	0.008-0.1	0.1-10	10-30	0.008-30	0.008-30
Accuracy φ (°)	0.05	0.02	0.05	0.1	0.4

## DC electric power

Total range: 0.005 W to 8400 W (420 kW with current coil option 140-50)  
Quantity: W

Current range	Voltage range				
	1 V - 10 V	10 V - 30 V	30 V - 70 V	70 V - 140 V	140 V - 280 V
5 mA - 5 A	0.044 %	0.044 %	0.044 %	0.044 %	0.044 %
5 A - 10 A	0.05 %	0.05 %	0.05 %	0.05 %	0.05 %
10 A - 30 A	0.06 %	0.06 %	0.06 %	0.06 %	0.06 %

\*Best accuracy is shown.

## AC electric power \*

Total range: 3x (0.005 VA to 18 kVA (900 kVA with current coil option 140-50))  
Frequency range: 15 Hz to 1000 Hz  
Quantity: W, VA, VAR

PF = 1.0 f = 40 - 70 Hz		Voltage range				
Current range	1 V - 10 V	10 V - 30 V	30 V - 70 V	70 V - 140 V	140 V - 280 V	280 V - 600 V
5 mA - 100mA	0.06 %	0.06 %	0.06 %	0.06 %	0.06 %	0.06 %
100 mA - 5 A	0.04 %	0.04 %	0.04 %	0.04 %	0.04 %	0.05 %
5 A - 10 A	0.05 %	0.05 %	0.05 %	0.05 %	0.05 %	0.06 %
10 A - 30 A	0.06 %	0.06 %	0.06 %	0.06 %	0.06 %	0.06 %
PF = 0.8 f = 40 - 70 Hz		Voltage range				
Current range	1 V - 10 V	10 V - 30 V	30 V - 70 V	70 V - 140 V	140 V - 280 V	280 V - 600 V
5 mA - 100 mA	0.09 %	0.09 %	0.09 %	0.09 %	0.09 %	0.09 %
100 mA - 5 A	0.05 %	0.05 %	0.05 %	0.05 %	0.05 %	0.05 %
5 A - 10 A	0.06 %	0.06 %	0.06 %	0.06 %	0.06 %	0.06 %
10 A - 30 A	0.09 %	0.09 %	0.09 %	0.09 %	0.09 %	0.09 %
PF = 0.5 f = 40 - 70 Hz		Voltage range				
Current range	1 V - 10 V	10 V - 30 V	30 V - 70 V	70 V - 140 V	140 V - 280 V	280 V - 600 V
5 mA - 100 mA	0.16 %	0.16 %	0.16 %	0.16 %	0.16 %	0.16 %
100 mA - 5 A	0.08 %	0.08 %	0.08 %	0.08 %	0.08 %	0.08 %
5 A - 10 A	0.08 %	0.08 %	0.08 %	0.08 %	0.08 %	0.08 %
10 A - 30 A	0.16 %	0.16 %	0.16 %	0.16 %	0.16 %	0.16 %

\*Best accuracy for active power.

Electric power accuracy is calculated according to formula:  $dP = \sqrt{(dU^2 + dI^2 + dPF^2 + 0.012)} (\%)$

## DC/AC electric energy

Voltage range: 1 V to 280 Vdc (600 Vac)  
Current range: 0.005 A to 30 A  
Power factor range: -1 to +1  
Time interval setting: 1 s to 10 000 s  
Time interval resolution: 0.1 s  
Time interval accuracy: 0.01% + 0.1s

## Built in process multimeter

Function	Range	Accuracy	Resolution
DC voltage	0 to $\pm 12$ V	0.01 % + 0.01 %	100 $\mu$ V
DC current	0 to $\pm 25$ mA	0.01 % + 0.01 %	100 nA
Frequency	1 Hz to 15 kHz	0.005 %	10 $\mu$ Hz - 0.1 Hz

## GENERAL DATA

Warm up time:	60 min
Operating temperature:	23 ± 10 °C
Storage temperature:	-10 to 55 °C, humidity < 90 %
Reference temperature:	23 ± 2 °C
Power supply:	115/230V – 50/60 Hz
Safety class:	I, according EN 1010
Dimensions:	500 x 520 x 430 mm
Weight:	59 kg
Power consumption:	max. 1875 VA

Specification includes 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.

## APPLICATION

### Calibration of different transducers

INPUT	OUTPUT
power	0...10 V
voltage	0...20mA
current	0...10 kHz
phase	
frequency	



### Calibration of power quality meters (M133C only)

power  
voltage  
current  
phase  
frequency  
harmonic 1...50  
interharmonic  
modulation  
flicker  
dip/swell



### High current adapter Option M133C-01

AC/DC current up to 90 A and up to 2250 A using 151-25 Current Coil. Comes as standards with three phase systems



### M133 control panel (freeware)

Program can be used with all M133C models to display and change output over remote control interface. Settings can be saved into a PC in file format. Program displays vector diagram and shapes of individual signals.

