

## *M-133C Three phase Electric Power/Energy Calibrator*



- **DC/AC voltage “phase-neutral”**  
1V to 280V / 300mA,  
accuracy 260 ppm
- **AC voltage “phase – phase”**  
2V to 480V
- **DC/AC current 30mA to 30A /**  
5V, accuracy 310 ppm
- **DC/AC current 90A in one**  
**phase configuration**
- **Power factor setting -1 to +1**
- **Floating current outputs to**  
**450Vpk**
- **Harmonic, interharmonic**  
**distortion, modulation**
- **Frequency range 16Hz to 1kHz**
- **Simulated electric power to**  
**25.2 kVA (1.26 MVA with**  
**option M133C-01)**
- **Built-in process multimeter**
- **GPIB & RS232 interface**

Basic feature of the device is precise simulation of DC and AC electric power and energy in voltage range to 280V and in current range to 30 A. In AC electric power mode phase shift between voltage and current channel can be set in range 0° to 360°. Best accuracy of simulation is 0.05%. Calibrator offers high burden current of voltage output of several hundreds mA and compliance voltage of current output up to 5Vrms. Current range can be extended using Option 140-50 50 turns current coil up to 1500 A.

M-133C calibrator is equipped with special functions for power line voltage analyzers testing (qualimeters). It can generate calibrated harmonic and interharmonic distortion, fluctuation harmonics, flickers, ramp signals and others. User interface offers simple and user convenient programming of output signal parameters.

M-133Ci is delivered without the option of harmonic/interharmonic functions.

## Technical data

### DC/AC voltage sinus

Voltage range:	1 V to 280 V
Resolution:	5½ dig.
Frequency range:	DC, 16 Hz to 1000 Hz. Synchronization to mains frequency or external signal is available.
Frequency accuracy:	0.005%
Frequency resolution:	0.001 Hz bellow 40 Hz, 0.01 Hz above 40 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 * (mA)
	DC	DC	16 - 40 Hz 70 - 1000 Hz	16 - 40 Hz 400 - 1000 Hz	40 - 70 Hz	40 - 400 Hz
1.0000 - 10.0000 V	0.025 + 0.01	100	0.03 + 0.02	100	0.025 + 0.01	100
10.0001 - 30.0000 V	0.025 + 0.01	200	0.03 + 0.02	200	0.025 + 0.01	200
30.001 - 70.000 V	0.025 + 0.01	200	0.03 + 0.02	200	0.025 + 0.01	300
70.001 - 140.000 V	0.025 + 0.01	200	0.03 + 0.02	200	0.025 + 0.01	300
140.001 - 280.000 V	0.025 + 0.01	150	0.03 + 0.02	150	0.025 + 0.01	200

\* sum of all currents (three phases) is limited to 400mA

### DC/AC current sinus

Current range:	0.03 A to 30 A
Resolution:	5½ dig.
Frequency range:	DC, 16 Hz to 1000 Hz. Synchronization to mains frequency or external signal is available.
Frequency accuracy:	0.005%
Frequency resolution:	0.001 Hz bellow 40 Hz, 0.01 Hz above 40 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	16 - 40 Hz 70 - 1000 Hz	40 - 70 Hz	16 - 400 Hz	400 - 1000 Hz
0.030000 - 0.300000 A	0.03 + 0.01	8	0.04 + 0.02	0.03 + 0.01	5.5	3.5
0.30001 - 1.00000 A	0.03 + 0.01	8	0.04 + 0.02	0.03 + 0.01	5.5	3.5
1.00001 - 2.00000 A	0.03 + 0.01	8	0.04 + 0.02	0.03 + 0.01	5.5	3.5
2.00001 - 5.00000 A	0.03 + 0.01	5	0.04 + 0.02	0.03 + 0.01	3.5	3.5
5.0001 - 10.0000 A	0.035 + 0.015	5	0.05 + 0.02	0.035 + 0.015	3.5	3.5
10.0001 - 30.0000 A	0.04 + 0.02	5	0.06 + 0.02	0.04 + 0.02	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:	16 Hz to 1000 Hz
Phase shift resolution:	0.01°
Power factor range:	-1 to +1
Power factor resolution:	0.001
Power factor accuracy:	dPF = (1 - cos(φ+dφ))/cos φ (-)

Phase shift accuracy φ (internal synchronization)

Frequency (Hz)	Accuracy dφ (°)
16.000 - 70.000	0.05
70.001 - 400.000	0.1
400.001 - 1000.00	0.4

### DC electric power

Total range:	0.03 W to 8400 W (420 kW with current coil option 140-50)
Quantity:	W

DC electric power accuracy (%) *					
Current range	Voltage range				
	1 V - 10 V	10 V - 30 V	30 V - 70 V	70 V - 140 V	140 V - 280 V
30mA - 300mA	0.054	0.054	0.054	0.054	0.054
300 mA - 1 A	0.054	0.054	0.054	0.054	0.054
1 A - 2 A	0.054	0.054	0.054	0.054	0.054
2 A - 5 A	0.054	0.054	0.054	0.054	0.054
5 A - 10 A	0,062	0,062	0,062	0,062	0,062
10 A - 30 A	0,070	0,070	0,070	0,070	0,070

\* Best accuracy is shown.

### AC electric power \*

Total range: 3x (0.03VA to 8400 VA (420 kVA with current coil option 140-50))  
 Frequency range: 16Hz to 1000 Hz  
 Quantity: W, VA, VAr

AC electric power accuracy (%) for PF = 1.0 f = 40 – 70 Hz					
Current range	Voltage range				
	1 V - 10 V	10 V - 30 V	30 V - 70 V	70 V - 140 V	140 V - 280 V
30mA - 5 A	0,054	0,054	0,054	0,054	0,054
5 A - 10 A	0,062	0,062	0,062	0,062	0,062
10 A - 30 A	0,070	0,070	0,070	0,070	0,070

  

AC electric power accuracy (%) for PF = 0.8 f = 40 – 70 Hz					
Current range	Voltage range				
	1 V - 10 V	10 V - 30 V	30 V - 70 V	70 V - 140 V	140 V - 280 V
30mA - 5 A	0,082	0,082	0,082	0,082	0,082
5 A - 10 A	0,088	0,088	0,088	0,088	0,088
10 A - 30 A	0,094	0,094	0,094	0,094	0,094

  

AC electric power accuracy (%) for PF = 0.5 f = 40 – 70 Hz					
Current range	Voltage range				
	1 V - 10 V	10 V - 30 V	30 V - 70 V	70 V - 140 V	140 V - 280 V
30mA - 5 A	0,160	0,160	0,160	0,160	0,160
5 A - 10 A	0,163	0,163	0,163	0,163	0,163
10 A - 30 A	0,166	0,166	0,166	0,166	0,166

\* Best accuracy is shown.

Electric power accuracy is calculated according to formula:  $dP = dP = \sqrt{(dU^2 + dI^2 + dPF^2 + 0.01^2)} (\%)$

### DC/AC electric energy

Voltage range: 1 V to 280 V  
 Current range: 0.03 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

### Non-harmonic signals (model M-133C only)

#### Harmonic and interharmonic distortion, H/I products (model M-133C only)

Fundamental harmonic frequency range: 16 Hz to 1 kHz  
 Fundamental harmonic amplitude uncertainty: 0.2 % of range  
 Frequency range of harmonic products: 32 Hz to 5 kHz  
 Frequency range of interharmonic product: 16 Hz to 1 kHz  
 Max. number of harmonic products: 50  
 Number of interharmonic products: 1  
 Frequency uncertainty: 0.005 %  
 H/I products amplitude range: max. 30% of RMS output value  
 Amplitude resolution of H/I products: 0.001 %  
 Noise & distortion: - 60 dB

Accuracy of H/I products amplitude

Ranges	% of range	
	32 - 3000 Hz	3000 - 5000 Hz
1.0000 - 10.0000 V 10.0001 - 30.0000 V 30.001 - 70.000 V 70.001 - 140.000 V 140.001 - 280.000 V	0.1	0.2
0.030000 - 0.300000 A 0.30001 - 1.00000 A 1.00001 - 2.00000 A	0.1	0.2
2.00001 - 5.00000 A 5.0001 - 10.0000 A	0.2	0.4
10.0001 - 30.0000 A	0.2	0.8

**Modulation, Flicker (model M-133C only)**

Fundamental harmonic frequency range:	16 Hz to 1 kHz
Single harmonic (2-50) frequency range:	32 Hz to 5 kHz
Modulation frequency range:	0.001 Hz to 50 Hz
Modulation depth:	0 to 30%
Modulation depth resolution:	0.001%
RMS amplitude uncertainty:	0.2% of range
Waveform of modulation signal:	sinus, rectangular
Duty cycle ratio of rectangular signal:	1 % to 99 %
Modulation depth accuracy:	0.2 %

**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 $\pm$ 10 °C
Storage temperature:	-10 to 55 °C, humidity < 90 %
Reference temperature:	23 $\pm$ 2 °C
Dimensions:	500 x 520 x 430 mm
Netto weight:	54 kg
Power supply:	115/230V – 50/60 Hz
Power consumption:	max. 1500 VA
Safety class:	I according EN 61010

**Accessory (included)**

Power supply cable	1 pc	
Operation manual, CD	1 pc	
Option 10/11 Test lead 1000V - 30 A, black/red	12 pcs	Length 1m
Spare fuse	1 pc	
RS 232 cable	1 pc	Length 1.5m
M133C-01 High Current Adapter	1 pc	

**Options (extra ordered)**

Option 140-50	Current coil 25/50 turns	For clamp ammeters
Option 10	Test lead 1000V/32A (black)	Length 1m
Option 11	Test lead 1000V/32A (red)	Length 1m
GPIB cable	GPIB interface cable	Length 1 m
RS-232 cable	RS-232 interface cable	Length 1.5 m
POWER	Application SW. Transducers calibration.	

**Manufacturer:**

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