

# CMC 256plus

## CMC 256plus: 6 Phase Current + 4 Phase Voltage Test Set and Universal Calibrator



The CMC 256plus is the first choice for applications requiring very high accuracy. This unit is not only an excellent test set for protection devices of all kinds but also a universal calibration tool. Its high precision allows the calibration of a wide range of measuring devices, including: electricity meters of class 0.2, measuring transducers, power quality measurement devices and phasor measurement units (PMU). Its unique accuracy and flexibility make the CMC 256plus ideal for protection and measurement equipment manufacturers for research and development, production and type testing. The CMC 256plus can either be operated by the Test Universe software running on a PC or by the front panel control device CMControl.

### Technical Data<sup>1</sup>

Current generators		
Setting range	6-phase AC (L-N)	6 x 0 ... 12.5 A
	3-phase AC (L-N)	3 x 0 ... 25 A (Group A II B)
Power	1-phase AC (3L-N)	1 x 0 ... 75 A (Group A II B), 2 x 0 ... 37.5 A
	DC (3L-N)	1 x 0 ... ±35 A (Group A II B), 2 x 0 ... ±17.5 A
	6-phase AC (L-N)	6 x 80 VA typ. at 8.5 A, 6 x 70 VA guar. at 7.5 A
	3-phase AC (L-N)	3 x 160 VA typ. at 17 A (Group A II B) 3 x 140 VA guar. at 15 A (Group A II B)
1-phase AC (3L-N)	1 x 480 VA typ. at 51 A (Group A II B), 2 x 240 VA at 25.5 A	
	1 x 420 VA guar. at 45 A (Group A II B), 2 x 210 VA at 22.5 A	
	1-phase AC (L-L)	1 x 320 VA typ. at 8.5 A (Group A II B), 2 x 160 VA at 8.5 A
	1 x 280 VA guar. at 15 A (Group A II B), 2 x 140 VA at 7.5 A	
1-phase AC (L-L-L-L)	1 x 320 VA typ. at 8.5 A (40 VRMS, Group A and B in series)	
	1 x 280 VA guar. at 7.5 A (40 VRMS, Group A and B in series)	
DC (3L-N)	1 x 480 W typ. at ±35 A (Group A II B), 2 x 240 W at ±17.5 A	
	1 x 470 W guar. at ±35 A (Group A II B), 2 x 235 W at ±17.5 A	

Accuracy <sup>2</sup>	error < 0.015 % rd. <sup>3</sup> + 0.005 % rg. <sup>3</sup> typ. at 0 ... 12.5 A error < 0.04 % rd. + 0.01 % rg. guar. at 0 ... 12.5 A
Distortion (THD+N) <sup>4</sup>	< 0.025 % typ., < 0.07 % guar.
Ranges	1.25 A / 12.5 A (Group A, B) or 2.5 A / 25 A (Group A II B)
Resolution (for respective range)	50 μA / 100 μA / 500 μA / 1 mA
Max. compliance voltage (L-N)/(L-L)	15 Vpk / 60 Vpk
Connection	4 mm (0.16 in) banana sockets / combination socket (Group A only)

<sup>1</sup> All data specified are guaranteed, except where indicated otherwise. OMICRON guarantees the specified data for one year after factory calibration, within 23 °C ± 5 °C (73 °F ± 10 °F) in the frequency range from 10 to 100 Hz and after a warm-up phase > 25 minutes

<sup>2</sup> Rload: 0 ... 0.5 Ω

<sup>3</sup> rd. = reading, rg. = range

<sup>4</sup> THD+N: Values at 50/60 Hz, > 1 A / 20 V with 20 kHz bandwidth

<sup>5</sup> Rload: > 250 Ω

<sup>6</sup> Amplitude derating at > 1000 Hz

<sup>7</sup> Data are valid from 0.1 to 12.5 A (current amplifier A or B) and 50 to 300 V (voltage amplifier) at 50/60 Hz

Permissible load for current outputs:

Range 1.25 A: 0 to 1 Ω and 1 VA max., cos φ = 0.5 to 1

Range 12.5 A: 0 to 0.5 Ω and 6 VA max., cos φ = 0.5 to 1

Permissible load for voltage outputs:

10 VA max. at 50 to 300 V, cos φ = 0.5 to 1

Voltage generators			
Setting range	4-phase AC (L-N)	4 x 0 ... 300 V (VL4(t) automatically calculated: VL4 = (VL1+VL2+VL3)*c or freely programmable)	
	3-phase AC (L-N)	3 x 0 ... 300 V	
	1-phase AC (L-L)	1 x 0 ... 600 V	
	DC (L-N)	4 x 0 ... ±300 V	
Power	3-phase AC (L-N)	3 x 100 VA typ. at 100 ... 300 V 3 x 85 VA guar. at 85 ... 300 V	
	4-phase AC (L-N)	4 x 75 VA typ. at 100 ... 300 V 4 x 50 VA guar. at 85 ... 300 V	
	1-phase AC (L-N)	1 x 200 VA typ. at 100 ... 300 V 1 x 150 VA guar. at 75 ... 300 V	
	1-phase AC (L-L)	1 x 275 VA typ. at 200 ... 600 V 1 x 250 VA guar. at 200 ... 600 V	
	DC (L-N)	1 x 420 W typ. at ±300 V	
		1 x 360 W guar. at ±300 V	

Accuracy <sup>5</sup>	error < 0.015 % rd. <sup>3</sup> + 0.005 % rg. <sup>3</sup> typ. at 0 ... 300 V error < 0.04 % rd. + 0.01 % rg. guar. at 0 ... 300 V
Distortion (THD+N) <sup>4</sup>	0.015 % typ., < 0.05 % guar.
Ranges	150 V / 300 V
Resolution	5 mV / 10 mV in range 150 V / 300 V
Connection	4 mm (0.16 in) banana sockets / combination socket (1,2,3,N)

Generators, general		
Frequency	range sine signals	10 ... 1000 Hz
	range harmonics / interharmonics <sup>6</sup>	10 ... 3000 Hz
	range transient signals <sup>6</sup>	DC ... 3.1 kHz
	accuracy / drift	±0.5 ppm / ±1 ppm
Phase	resolution	< 5 μHz
	angle range	-360° ... +360°
	resolution	0.001°
Bandwidth (-3 dB)	error at 50 / 60 Hz	< 0.005° typ., < 0.02° guar.
		3.1 kHz
Simulated power S, P (calibration of energy meters)	accuracy <sup>7</sup>	error < 0.05 % rd. typ., < 0.1 % rd. guar.
	temperature drift	< 0.001 %/°C typ., < 0.05 %/°C guar.

<b>Low level outputs<sup>1</sup></b>	
Number of outputs	6 (12 with Option LLO-2)
Setting range	0 ... ±10 Vpk
Max. output current	1 mA
Accuracy	error < 0.025 % typ., < 0.07 % guar. at 1 ... 10 Vpk
Resolution	250 µV
Distortion (THD+N) <sup>2</sup>	< 0.015 % typ., < 0.05 % guar.
Unconventional CT/VT simulation	linear, Rogowski (transient and sinewave)
Overload indication	yes
Isolation	SELV
Usability	completely independent from internal amplifier outputs
Connection	16 pin combination socket (rear side)
<b>Auxiliary DC supply</b>	
Voltage ranges	0 ... 264 VDC, 0.2 A / 0 ... 132 VDC, 0.4 A / 0 ... 66 VDC, 0.8 A
Power	max. 50 W
Accuracy	error < 2 % typ., < 5 % guar.
Connection	4 mm (0.16 in) banana sockets
<b>Binary inputs</b>	
Number	10
Trigger criteria	Toggling of potential-free contacts or DC voltage compared to threshold voltage
Input characteristics	0 ... ±600 VDC threshold or potential-free
Ranges	100 mV / 1 V / 10 V / 100 V / 600 V
Resolution of threshold	±2 mV, ±20 mV, ±200 mV, ±2 V, ±20 V in ranges
Sample rate	10 kHz (resolution 100 µs)
Time stamping accuracy	±0.00015 % of rd. <sup>3</sup> ±70 µs
Max. measuring time	infinite
Debounce / Deglitch time	0 ... 25 ms / 0 ... 25 ms
Counting function	< 3 kHz at pulse width > 150 µs
Galvanic isolation	5 galvanically isolated groups (2+2+2+2+2)
Max. input voltage	CAT IV / 150 V, CAT III / 300V, CAT II / 600 V (850 Vpk)
Connection	4 mm (0.16 in) banana sockets
<b>Counter inputs 100 kHz</b>	
Number	2
Max. counting frequency	100 kHz
Pulse width	> 3 µs
Threshold voltage	6 V
Voltage hysteresis	2 V
Max. input voltage	±30 V
Isolation	SELV
Connection	16 pin combination socket (rear side)
<b>Trigger on overload</b>	
Supported generators	Current generators
Timer accuracy	error < 1 ms
<b>Binary outputs, relays</b>	
Type	potential-free relay contacts, software controlled
Number	4
Break capacity AC	Vmax: 300 VAC / Imax: 8 A / Pmax: 2000 VA
Break capacity DC	Vmax: 300 VDC / Imax: 8 A / Pmax: 50 W
Connection	4 mm (0.16 in) banana sockets

<sup>1</sup> For directly testing relays with low level inputs by simulating signals from non conventional CTs and VTs with low level interfaces and for controlling external amplifier units

<sup>2</sup> THD+N: Values at 50/60 Hz, 20 kHz measurement bandwidth, nominal value, and nominal load

<sup>3</sup> rd. = reading, rg. = range

<sup>4</sup> Up to three inputs can be used for measuring RMS values, frequency, and phase angle without the Enerlyzer software license. Full functionality requires Enerlyzer software license

<b>Binary outputs, transistor</b>	
Type	open collector transistor outputs
Number	4
Update rate	10 kHz
Imax	5 mA
Connection	16 pin combination socket (rear side)
<b>DC voltage measuring input</b>	
Measuring range	0 ... ±10 V
Accuracy	error < 0.003 % rg. <sup>3</sup> typ., < 0.02 % rg. guar.
Input impedance	1 MΩ
Connection	4 mm (0.16 in) banana sockets
<b>DC current measuring input</b>	
Measuring range	0 ... ±1 mA, 0 ... ±20 mA
Accuracy	error < 0.003 % rg. <sup>3</sup> typ., < 0.02 % rg. guar.
Input impedance	15 Ω
Connection	4 mm (0.16 in) banana socket
<b>Analog AC+DC measuring inputs<sup>4</sup></b>	
Type	AC + DC analog voltage inputs (current measurement with external current clamps or shunt resistors)
Number	10
Nominal input ranges (RMS values)	100 mV, 1 V, 10 V, 100 V, 600 V
Amplitude accuracy	error < 0.06 % typ., < 0.15 % guar.
Bandwidth	DC ... 10 kHz
Sampling frequency	28.44 kHz, 9.48 kHz, 3.16 kHz
Input impedance	500 kΩ // 50 pF
Transient input buffer at 28 kHz	3.5 s for 10 input channels / 35 s for 1 input channel
Transient input buffer at 3 kHz	31 s for 10 input channels / 5 min. for 1 input channel
Transient trigger	threshold voltage, power quality trigger: sag, swell, harmonic, frequency, frequency change, notch
Measurement functions	I (AC + DC), V (AC + DC), phase, frequency, power, harmonics, transient recording, event recording, trend recording
Input overload indication	yes
Input protection	yes
Max. input voltage	CAT IV / 150 V, CAT III / 300V, CAT II / 600 V (850 Vpk)
Galvanic isolation	5 groups (2+2+2+2+2)
Connection	4 mm (0.16 in) banana sockets (combined with binary inputs)
<b>Time Synchronization</b>	
Timing accuracy	IRIG-B synchronization with CMIRIG-B GPS synchronization with CMGPS
To external voltage	error < 1 µs typ., < 5 µs guar. error < 1 µs typ., < 5 µs guar.
	Reference signal on binary input 10: 10 ... 300 V / 40 ... 70 Hz
With the unique PermaSync functionality (supported by TU 2.30 or higher), analog and Sampled Values outputs stay permanently in sync with the internal CMC time reference. In combination with the optional CMIRIG-B interface box, PermaSync additionally allows the continuous synchronization of the output quantities with an external IRIG-B time protocol or an external PPS signal. With CMIRIG-B it is also possible to transmit the internal PPS signal of the CMC to the device under test (e.g. PMUs or IEDs stimulated with a synchronized Sampled Values data stream).	

## Technical Data CMC 256plus (continued)

IEC 61850 GOOSE <sup>1</sup>	
Simulation	Mapping of binary outputs to data attributes in published GOOSE messages. Number of virtual binary outputs: 360 Number of GOOSEs to be published: 128
Subscription	Mapping of data attributes from subscribed GOOSE messages to binary inputs. Number of virtual binary inputs: 360 Number of GOOSEs to be subscribed: 128
Performance	Type 1A; Class P2/3 (IEC 61850-5). Processing time (application to network or vice versa): < 1 ms
VLAN support	Selectable priority and VLAN-ID
IEC 61850 Sampled Values (Publishing) <sup>1</sup>	
Specification	According to the "Implementation Guideline for Digital Interface to Instrument Transformers Using IEC 61850-9-2" of the ICA International Users Group
Sampling Rate	80 samples per cycle for nominal frequencies of 50 Hz and 60 Hz; synchronized with CMIRIG-B.
Synchronization	Synchronization attribute (smpSynch) is set when the CMC is in synchronized operation mode utilizing CMIRIG-B. Sample count (smpCnt) zero is aligned with top of the second (IRIG-B and PPS) Accuracy data see above
VLAN support	Selectable priority and VLAN-ID
Max. number of SV streams	2 (with option LLO-2: 3 SV streams)
Power supply	
Nominal input voltage <sup>2</sup>	100 – 240 VAC, 1-phase
Permissible input voltage	85 ... 264 VAC
Nominal frequency	50/60 Hz
Permissible frequency range	45 ... 65 Hz
Power consumption	1.4 kVA at 115 V / 2.3 kVA at 230 V
Rated current	12 A at 115 V / 10 A at 230 V
Connection	Standard AC socket (IEC 60320)
Environmental conditions	
Operation temperature <sup>3</sup>	0 ... +50 °C (+32 ... +122 °F)
Storage temperature	-25 ... +70 °C (-13 ... +158 °F)
Humidity range	Relative humidity 5 ... 95 %, non-condensing
Vibration	IEC 60068-2-6 (20 m/s <sup>2</sup> at 10 ... 150 Hz)
Shock	IEC 60068-2-27 (15 g/11 ms half-sine)
Safety Standards, Electromagnetic Compatibility	
EMC	The product adheres to the electromagnetic compatibility (EMC) Directive 2004/108/EC (CE conform).
Emission	Europe EN 61326-1; EN 61000-6-4; EN 61000-3-2/3 International IEC 61326-1; IEC 61000-6-4; IEC 61000-3-2/3 USA FCC Subpart B of Part 15 Class A
Immunity	Europe EN 61326-1; EN 61000-6-2; EN 61000-4-2/3/4/5/6/11 International IEC 61326-1; IEC 61000-6-2; IEC 61000-4-2/3/4/5/6/11
Safety	The product adheres to the low voltage Directive 2006/95/EC (CE conform).
Europe	EN 61010-1 Insulation of PC and SELV interfaces complies with EN 60950-1
International	IEC 61010-1
USA	UL 61010-1
Canada	CAN/CSA-C22.2 No 61010-1-04


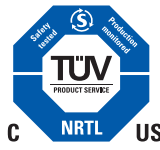
<sup>1</sup> Testing with GOOSE and Sampled Values functionality requires software licences for the corresponding configuration modules

<sup>2</sup> For line inputs below 115 VAC, it is not possible to drive all outputs (voltage output, current output, Aux DC) simultaneously at full load. All other technical specifications (e.g. the maximum output power of a single amplifier) are not affected

<sup>3</sup> For an operational temperature above +30 °C (+86 °F) a duty cycle of down to 50 % may apply

<sup>4</sup> PoE = Power over Ethernet

<sup>5</sup> CMC 256plus with PAR-1 option is connected to the USB port of the PC by means of the parallelport cable and the CMUSB-P (USB to Parallel Port Converter). CMC 256plus equipped with the PAR-1 option can not be extended with the LLO-2 option and does not support the CMIRIG-B accessory

Miscellaneous	
Weight	15.9 kg (35 lbs)
Dimensions (W x H x D, without handle)	450 x 145 x 390 mm (17.7 x 5.7 x 15.4 in)
PC connection	Two 10/100 Mbit/s PoE <sup>4</sup> Ethernet ports: <ul style="list-style-type: none"> <li>10/100 Mbit/s (10/100 Base-TX, auto-sensing, auto-crossover, RJ45 connector for twisted pair cables)</li> <li>IEEE 802.3af compliant</li> <li>Port capability limited to one Class 1 (3.84 W) and one Class 2 (6.49 W) powered device</li> </ul> If equipped with PAR-1 option: Parallel port (IEEE 1284-C connector). Replaces the standard Ethernet interfaces by a parallel port if required by the used PC or if the binary extension device CMB IO-7 should be used <sup>5</sup>
Signal indication (LED)	> 42 V for voltage outputs and AUX DC
Connection to ground (earth)	4 mm (0.16 in) banana socket (rear side)
Hardware diagnostics	Self diagnostics upon each start-up
Galvanically separated groups	The following groups are galvanically separated from each other: mains, voltage amplifier output, current amplifier group A/B, auxiliary DC supply, binary/analog input
Protection	All current and voltage outputs are fully overload and short circuit proof and protected against external high-voltage transient signals and over temperature
Certifications	
 	
Developed and manufactured under an ISO 9001 registered system	

## Ordering Information

CMC 256plus with Test Universe Software	
VE002701	CMC 256plus Basic
VE002702	CMC 256plus Protection
VE002703	CMC 256plus Advanced Protection
VE002704	CMC 256plus Universal
VE002705	CMC 256plus Meter
VE002706	CMC 256plus Measurement

## CMC 256plus with CMControl (without Test Universe Software)

VE002715	CMC 256plus with CMControl-6
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The CMControl can also be ordered as add-on together with a CMC 256plus with Test Universe software or as a later upgrade.

## CMC 256plus Hardware Options

VEHO2703	Option LLO-2 if ordered with a new unit
VEHO2704	Option LLO-2 if ordered as an upgrade
VEHO2701	Option PAR-1 if ordered with a new unit <sup>5</sup>
VEHO2702	Option PAR-1 if ordered as an upgrade <sup>5</sup>