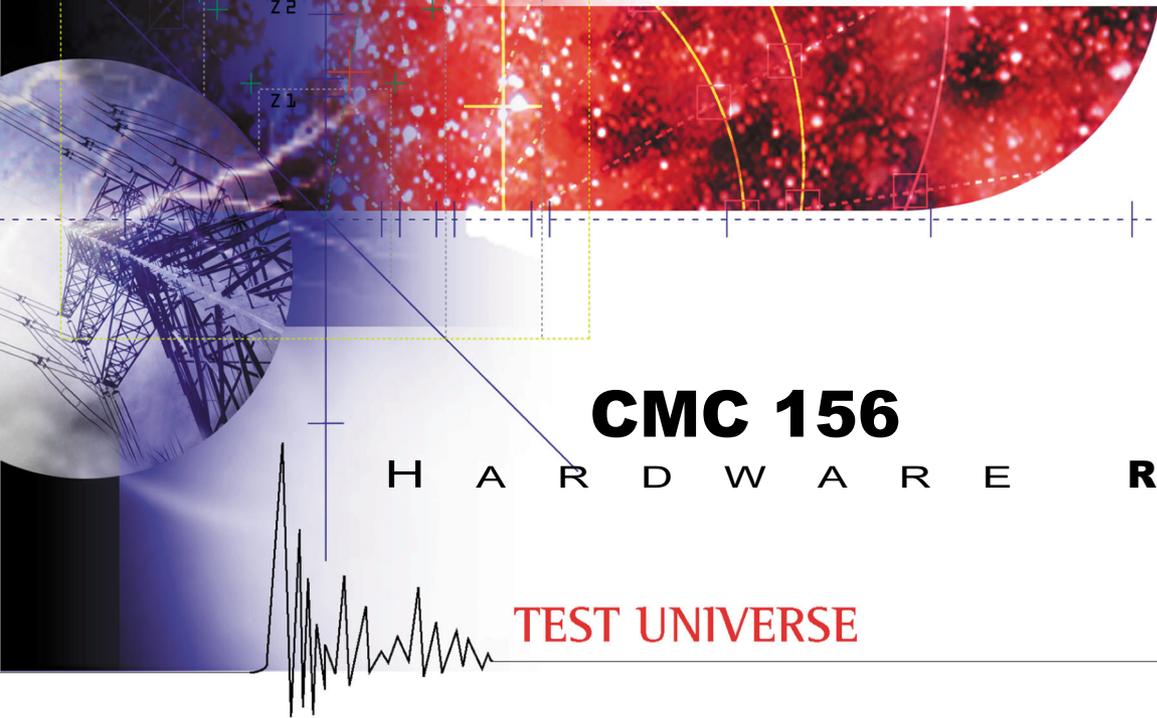




**OMICRON**



# CMC 156

H A R D W A R E

**Reference Manual**

TEST UNIVERSE



Article number VESD1002 - manual version: CMC156.AE.5

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# Safety Instructions

**ATTENTION:** Before starting up the CMC 156, carefully read the following safety instructions.

The system must not be put into operation without full knowledge of this information!

The CMC 156 may only be operated by trained personnel on the company premises!

For your safety

The generator outputs supply voltages up to  $125 V_{\text{rms}}$  relative to the N connector - therefore:

- Operate the CMC 156 only with mains supplies with a protective grounding!
- Connecting of one of the front-sided connectors to protective ground is not permissible as this may cause dangerous contact voltages at all front panel connectors. Grounding of a voltage output causes that also the sockets of the analog inputs as well as the current outputs and N-connectors have phase voltage.
- Use only measuring cables with 4 mm banana plugs and plastic jacketing for connection to banana sockets; always insert plugs up to the stops.  
Recommendation: use 4 mm safety banana plugs.
- Do not leave any test leads exposed; always disconnect leads at the CMC 156 first!
- When connecting and disconnecting the test object make sure that all generator outputs have been turned "OFF". Never disconnect the test object when in a manual program section a switch in the software is "ON" or a sweep is still under way (e.g.  $V$ ,  $I$ ,  $\varphi$ ).
- All front panel sockets are to be considered as dangerous voltage contacts with working voltages of up to  $250V_{\text{rms}}$ ; for this reason, only cables which are certified to UL and the corresponding national standards institute may be used.

- If the generator section lamp lights when there is a dangerous contact voltage ( $> 42 V_{pk}$ ) at least at one of the three voltage outputs!
- Never insert conductive parts (screwdriver, etc.) into the sockets!
- Do not operate in a wet or humid environment (condensation).
- Do not operate if an explosion hazard exists.
- External devices may only be connected to the SELV interfaces of the CMC 156 (host-interface, Gen. out 7-12, ext. Interface) if they comply to the SELV requirements according to EN60950.

**The device may only be opened at the manufacturer's factory - if irregularities occur, please send it to us. Voltages of up to 400 V will occur inside the unit! If the unit is opened, warranty claims will become void.**

If the mains fuse must be replaced (back panel of the device)

First disconnect the mains plug of the CMC test device!

Unscrew the little plastic tile and change the fuse.

Fuse: T6.3AH 250V.

# Instructions de sécurité

**REMARQUE IMPORTANTE.** Lire attentivement les instructions de sécurité données dans la suite avant de mettre en service le dispositif d'essai CMC156.

**Ce système ne doit pas être mis en service sans une connaissance précise de ces informations !**

**Le dispositif d'essai CMC 156 ne doit être utilisé dans l'enceinte de l'usine que par un personnel technique spécialement formé à cet effet !**

Points à observer pour votre sécurité



Les sorties du générateur délivrent des tensions pouvant atteindre  $125 V_{\text{eff}}$ . Pour cette raison:

- Le CMC 156 ne doit fonctionner que lorsqu'il est raccordé à une alimentation dotée d'une prise de terre appropriée.
- Le raccordement d'un des connecteurs sur la face avant avec prise de terre n'est pas admissible, car de ce fait des tensions considérées comme dangereuses au toucher apparaîtraient sur tous les connecteurs de la face avant. La mise à la terre d'une sortie de tension provoque la mise sous tension de phase des entrées analogiques ainsi que des sorties de courant et des connecteurs de neutre.
- Pour le raccordement à des prises femelles bananes, employer exclusivement un câble de mesure doté d'une fiche banane de 4 mm et d'une gaine en plastique; introduire le connecteur toujours à fond. Recommandation: utiliser des fiches bananes de sécurité de 4 mm.
- Ne laisser aucun câble de générateur (conduites d'alimentation) à découvert; toujours débrancher le câble d'abord au niveau du dispositif !
- Lors du branchement et du débranchement des équipements testés, s'assurer que toutes les sorties du générateur sont coupées. Ne jamais débrancher l'équipement testé lorsque le commutateur de la partie manuelle du logiciel se trouve en position "Marche" ou lorsqu'une injection automatique d'une grandeur d'essai dans les limites de plage (par exemple U, I) est encore en cours.

- Lorsque le voyant rouge s'allume sur la face avant, au moins une des trois sorties de tension est sous une tension considérée comme dangereuse au toucher (>42V)!
- Ne pas introduire d'éléments conducteurs (tournevis, etc.) dans les prises femelles.
- Toutes les prises femelles de la face avant doivent être considérées comme étant dangereuses au toucher. Le raccordement au dispositif d'essai ne peut être assuré que par un câble possédant une fiche de sécurité agréée par UL et par l'institut national de normalisation compétent.
- Ne pas utiliser le CMC 156 dans des environnements mouillés ou humides (condensation).
- Ne pas utiliser le CMC 156 dans des environnements présentant des risques d'explosion.
- Seul des équipements externes qui satisfont aux exigences SELV (Safety Extra Low Voltage) selon la norme EN 60950 peuvent être raccordés aux interfaces SELV du dispositif d'essai CMC 156 (interface avec l'ordinateur de commande, Gen. out 7-12, ext. Interface).

**L'ouverture du dispositif ne peut s'effectuer que dans l'usine du constructeur. En cas de défaut de fonctionnement, le renvoyer immédiatement à l'usine. Ce dispositif peut renfermer des tensions atteignant 400 V ! Le droit de garantie est suspendu en cas d'ouverture du dispositif.**

En cas de nécessité de remplacement d'un coupe-circuit réseau (face arrière de l'appareil):

Débrancher tout d'abord la fiche d'alimentation réseau du dispositif !

Sortir en les dévissant les plaquettes de plastique et changer le fusible

Fusible: T6.3AH 250V.

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# 1 Introduction

The CMC156 test system consists of the components CMC156 test device, a control PC and the CMC user software. External amplifiers and optional devices can also be controlled optionally.

Due to its wide range of optional settings, the CMC 156 test device completely eliminates the need for operating elements on the front panel - every function is controlled by the software on the PC. This means the module-structured application software as well as the configuration of the test system. The CMC software is described in the CMC software user's manual.

This description exclusively refers to the hardware of the CMC 156 base device.



## 2 Start-up

### 2.1 System components

Before start-up, please verify that all system components are present:

- CMC 156 (test unit)
- Mains cable
- Connection cable CMC 156 ↔ PC (25-pole)
- Connection cable CMC 156 ↔ test object:  
These are provided by the user.
- Standard PC with a parallel interface

## 2.2 System Start

The instructions below can be followed if the PC is set up completely and the software is installed properly.<sup>1</sup>



A description of the installation of the CMC software is found in your CMC software manual, chapter 1 "Installation".

The following procedure is recommended to connect the system components:

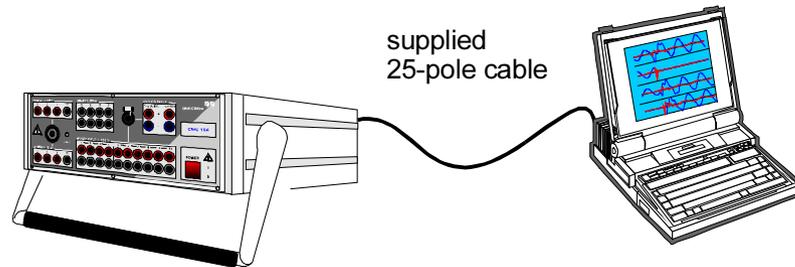


Figure 1 Connection CMC 156 and PC

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<sup>1</sup> These instructions refer to a system including a PC and basic device CMC 156, i.e. without additional amplifiers. If the system is to be operated with external amplifiers, please refer to the instructions in your CMC SW user's manual, section "Configuring an external amplifier".

**Generally: Make sure that the ventilation slots in the back panel of the CMC 156 are free and clear!**

1. Connect the CMC 156 and the PC by means of the supplied 25-pole cable.<sup>1</sup>
  - CMC 156: at the 25-pole back panel connector.
  - PC: at a parallel port.<sup>2</sup>  
(Marked "PRT", "Printer", "LPT1", etc.)
2. Connect the CMC 156 and the PC to the power supply. (Power supply cable is supplied.)
3. Power both units up. CMC 156: ON/OFF switch on the front panel.
4. For further actions, see the Installation in the appropriate software manual.
5. Start the software.

An extensive hardware test is carried out when the software is starting up (the device clicks several times). If there is a hardware fault, the software will put out an appropriate message after starting).

---

<sup>1</sup> Only original centronics cable may be used due to the electromagnetic compatibility (EMC) requirement for the connecting cable.

<sup>2</sup> Use of the standard printer interface offers a considerable price advantage over the IEEE-488 interface and does not require an additional PC slot. This is an important factor, particularly if a laptop is used. Compared to the serial interface (RS-232) the parallel interface has a considerably higher data transfer rate capability.



# 3 Design and Operation

Our PC-controlled design concept allows the following segregation of functions:

## PC

- Application software
- Control and display
- Measuring data processing
- Reporting and archiving

## CMC 156 test device

- Signal generation
- Voltage and current amplifier
- Input signal measurement
- Time-critical processes

### 3.1 Modules

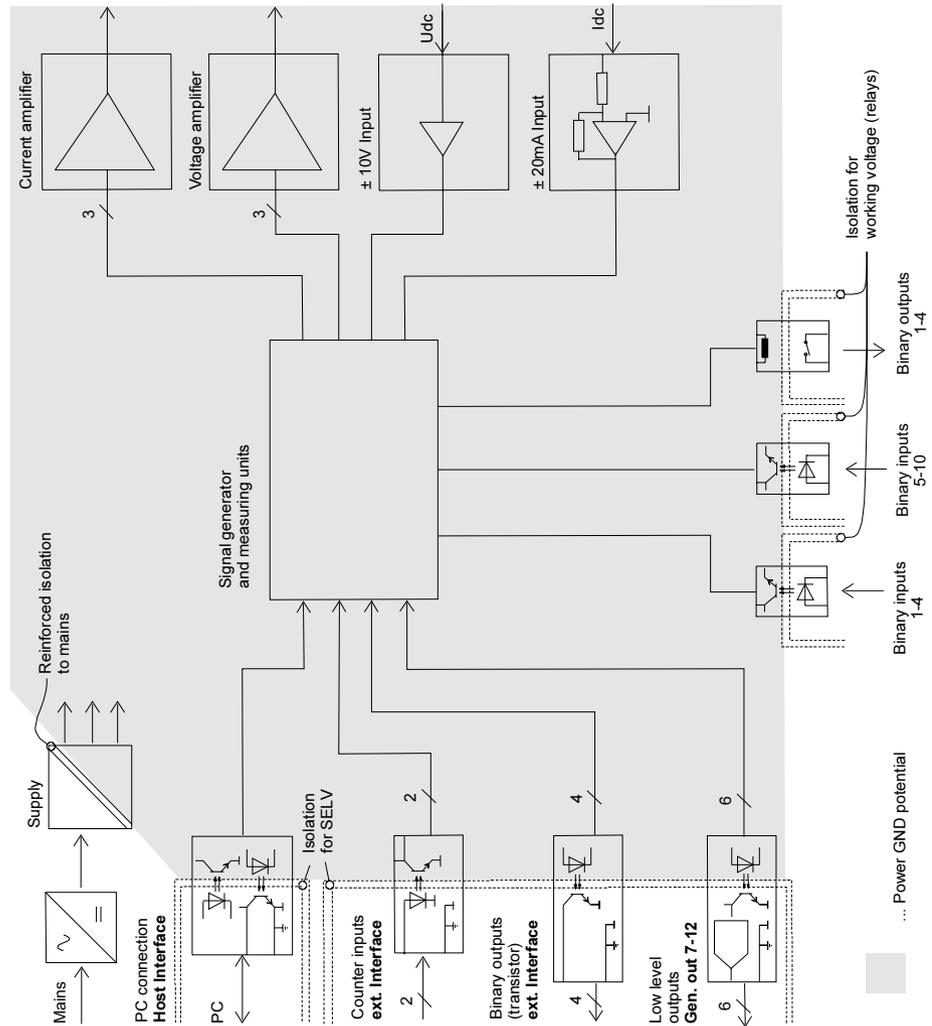


Figure 2 Basic block diagram of the CMC 156

### 3.1.1 Host Interface

Using the parallel printer interface as the connection between the PC and the CMC 156 on the one hand ensures sufficiently high data transfer rates, and on the other hand ensures that any standard notebook can be used as the control computer (for minimum requirements of the PC for operation with the CMC for DOS software please refer to chapter 1 of the CMC for DOS software manual).

During start-up, the CMC for DOS software checks if and to which interface (LPTx) of the PC the CMC 156 is connected.

### 3.1.2 Processor

A signal processor is the core of the test device hardware. It has the following tasks:

- Communications with the host computer
- Signal generation
- Control of the test device hardware
- Input signal measurement and filtering

Its Harvard architecture and the built-in arithmetic unit make the signal processor ideally suited for digital signal processing tasks.

For example, the signal processor needs for multiplication + adding + parallel data transfer only two machine cycles (30ns). The CMC 156 uses this advantage of the signal processor for signal generation and digital filtering.

### 3.1.3

## D/A Converter + Reconstruction Filter

For D/A converters 16-bit PCM converters are used. Their high resolution allows coverage of the entire amplitude range without range switching.

This is important in particular for fault simulation for protective devices, because range switching in the test device via relays may cause erroneous tripping when switching from a load to a fault condition.

The reconstruction low pass filter forms the desired output signal from the stair-step output signals of the D/A converters and suppresses the high frequency component, which is periodically repeated with the sampling frequency. The 3dB bandwidth is at 3.1kHz.

### 3.1.4 Measuring Module

The measuring module for analog signals primarily consists of a laser trimmed high-precision voltage reference, a 16-bit A/D converter with series-connected multiplexer and the appropriate input circuits (precision voltage divider, filter). The input signals  $V_{dc}$  and  $I_{dc}$ , the output voltages, amplifier temperatures, etc. are measured here. Behind the  $I_{dc}$  input a PTC thermistor is located as reversible fuse.

The binary inputs are read via opto-isolators having a time resolution of 100  $\mu$ s and are divided in two isolated groups (group 1: binary inputs 1..4; group 2: binary inputs 5..10). The binary inputs can be configured by means of the CMC software. You can specify if floating or potential-carrying contacts are to be connected. For potential-carrying contacts, the expected rated voltage may be specified (individually for each binary input) and the operating threshold of the binary inputs may be set.

The operating threshold is set in % of the nominal voltage.<sup>1</sup>

To isolate single binary inputs against each, other additional opto-Isolators may be connected in series to the binary inputs.



For ordering notes see section 7.2, „Ordering Notes“.

---

<sup>1</sup> Range: 10 to 71%; valid for binary inputs 1-10.



The configuration of the binary inputs in the CMC software is described in your CMC software user's manual, section "Configuring the binary inputs".

The binary inputs 1..10 can also be used as counter inputs for input frequencies of up to 3kHz.

Additionally, for meter testing with higher frequencies (e.g. with reference meters), two counter inputs for input frequencies of up to 100kHz are available at the 'ext. Interf.' interface.

### 3.1.5 Internal Current and Voltage Amplifiers

The output amplifiers are designed as linear amplifiers and direct voltage coupling with MOSFET output stages.

Using this technology, excellent harmonic distortion and frequency response specifications can be realized in a very compact design.

The direct voltage coupling allows accurate representation of any transient function.

#### Protection of the current and voltage outputs

If a current output is feed externally from one of the voltage outputs, it will not self-destruct. However, if power is supplied from an external source, the current output may be destroyed.

The voltage outputs are also protected against overload and sustained short circuit by means of a fast electronic current limiter and temperature sensors. Protection against transient overvoltage is effected by means of transient absorbers.

If two voltage outputs are shorted against each other, the output elements are brought close to their capacity limits, but they will not be destroyed.

For heat sink temperatures  $> 167^{\circ}\text{F}$  ( $75^{\circ}\text{C}$ ), all outputs are thermally disconnected (including the outputs on the rear of the device).

### Overload displays in the software

At the event of an overload at one of the current or voltage outputs a corresponding display will be shown in the CMC software.<sup>1</sup>

### What to do in case of a switching OFF due to overtemperature?

If a thermal switching OFF occurs due to a low ohmic burden in connection with a high ON period, one of the following messages is displayed on screen:

#### **Overtemperature at voltage output! All V and I outputs switched off!**

Overtemperature at current output! All V and I outputs switched off!



The most important status messages can be found in chapter 13 of the CMC software manual.



To avoid switching OFF, the power supply voltage of the current amplifier can be reduced. For more information, please refer to the CMC software manual, chapter 'System configuration'.

---

<sup>1</sup> This display depends on the software version; for how your software will display these states, please refer to chapter 3 of the CMC software manual.

### 3.1.6 Power Supply

The following power supplies are used in the CMC 156:

- a) The mains-sided power supply with power factor correction creates an intermediate circuit voltage for the supply of the connected isolated power supplies.
- b) Auxiliary supply for the supply of the processor and of all analog circuits of the power amplifiers.
- c) Supply for the voltage amplifiers
- d) Supply for the current amplifiers
- e) Supplies for the two isolated binary input groups
- f) Supply for the parallel SELV1 interface to the PC
- g) Supply for the analog SELV interfaces for controlling additional amplifiers

---

<sup>1</sup> Safety extra-low voltage.

## 3.2 Signal Generation

To achieve the specified quality of the output signals, the generation of sine signals of high quality is necessary. The requirement for 6 fixed-phase coupled signals suggests a digital implementation.

In the CMC 156 the quality of the signals is achieved due to the use of a modern and powerful signal processor.

The implemented algorithm linearly interpolates between the basic values of any signal table according to the following equation:

$$S[i+x]=S[i]+x*\{S[i+1]-S[i]\}$$

$S[i]$  ..... basic table value  $i$

$x$  ..... fractional component of the table pointer

The table may be processed with any real step width. The output of sine signals uses the internal sine table which has 256 basic entries. The frequency resolution is 2.33  $\mu$ Hz, and the phase resolution is < 50  $\mu$  degrees.

16k words are available per channel in the signal table for transient signals. By means of interpolation, the signals are always output at 10k-samples/s, even if the basic value table contains less samples/s, as is common in fault recordings.

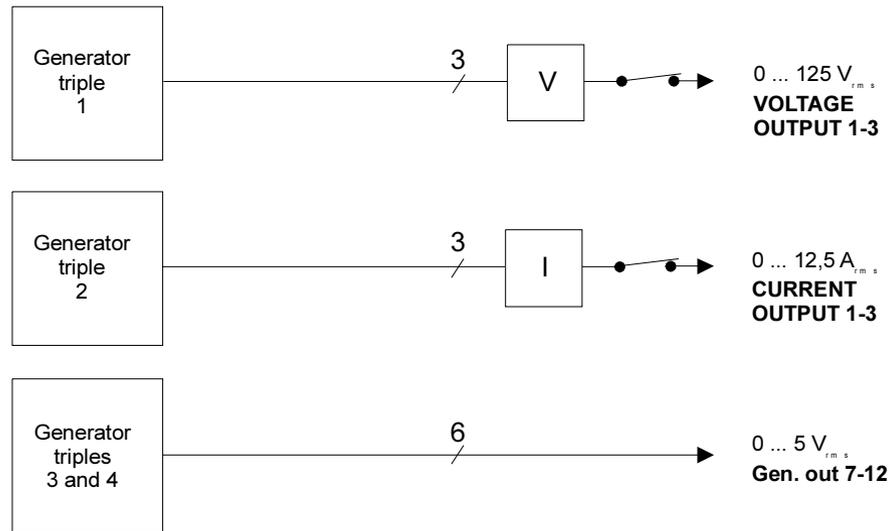


Figure 3 Block diagram of the generator outputs of the CMC 156

The CMC 156 test system supplies four generator triples of three signals each.

The generator triples 1 and 2 are output via the internal amplifiers to the outputs of the front panel.

The generator triple 1 is output via the internal voltage amplifier to the outputs **VOLTAGE OUTPUT 1-3** on the front panel.

The generator triple 2 is output via the internal current amplifier to the outputs **CURRENT OUTPUT 1-3** on the front panel.

The completely independent generator triples 3 and 4 are output on the interface **Gen. out 7-12** at the back panel, which is intended for controlling external amplifiers (0 to 5V<sub>rms</sub>).

The generator triples 3 (Gen. out 7-9) and 4 (Gen. out 10-12) can be

- put out via external amplifiers, which can be connected via the isolated interfaces at the back panel of the unit

or

- used directly.

The selection of the amplifiers takes place in the software.



The configuration of amplifiers in the CMC software is described in chapter 3 your CMC software user's manual.

### 3.3 Accuracy

The data sheet values for the CMC 156 are not typical values but guaranteed values over one year from the time of factory calibration at  $73^{\circ}\text{F} \pm 10^{\circ}\text{F}$  ( $23^{\circ}\text{C} \pm 5\%$ ).

Some factors had to be taken into account during development in order to achieve the desired accuracy. For example, let's look at the signal path from the signal generator to the output jack:



Figure 4 Output signal path

When the signal is generated in the DSP, an adequate bit width is ensured. Naturally, the drift and the temperature coefficients are unimportant. Therefore, the amplitude and offset correction is preferably carried out in the DSP. There are no conventional trim pots (with poor temperature coefficients) at all.

The amplification and offset errors of the D/A converters are corrected by the DSP. For component selection the linearity as well as temperature and long-term drift were taken into account above all.

In the case of the voltage amplifier it is important that there is a gain-fixing negative feedback across the entire amplifier, which is built via precision resistors with corresponding temperature coefficient.

To ensure precision production appropriate measuring devices are necessary. The measuring devices used by OMICRON are calibrated at regular intervals. This ensures traceability to national and international standards.

## **4 Connectors and Interfaces**

### **4.1 Connectors of the Front Panel**

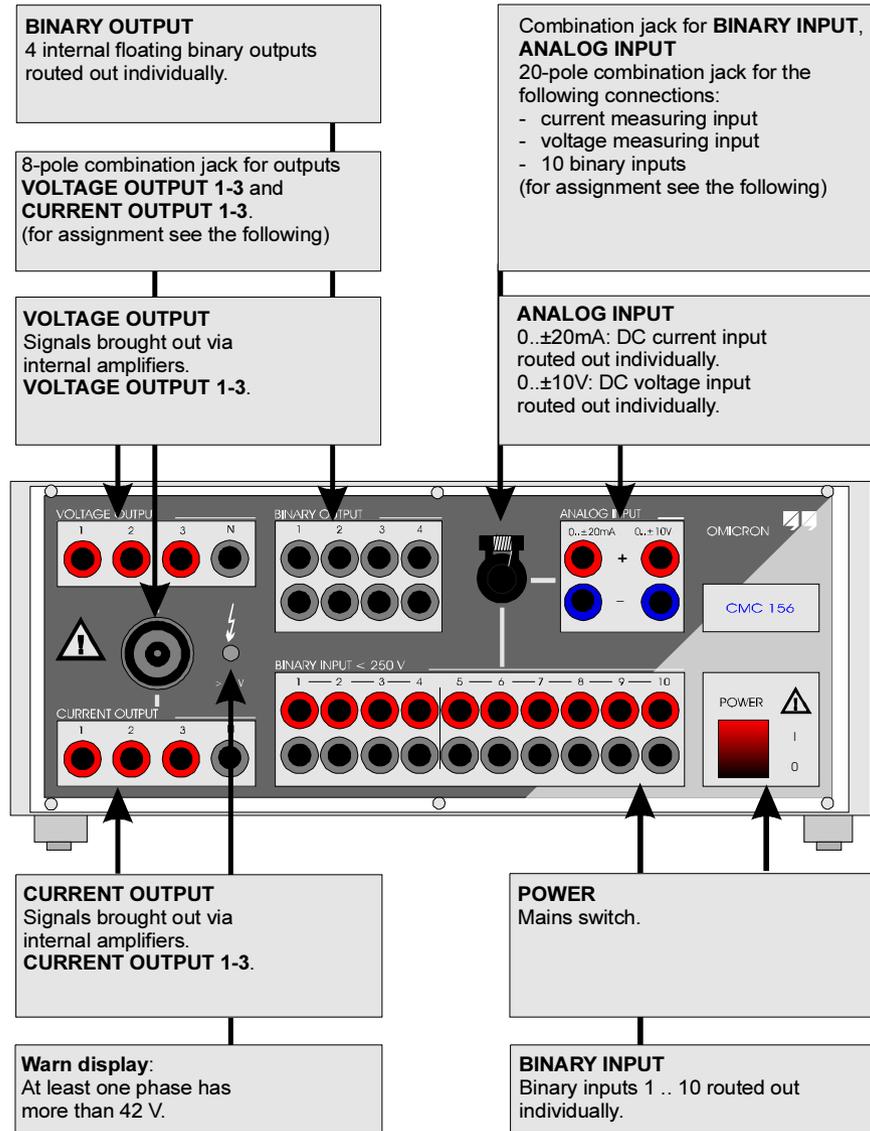


Figure 5 Front panel

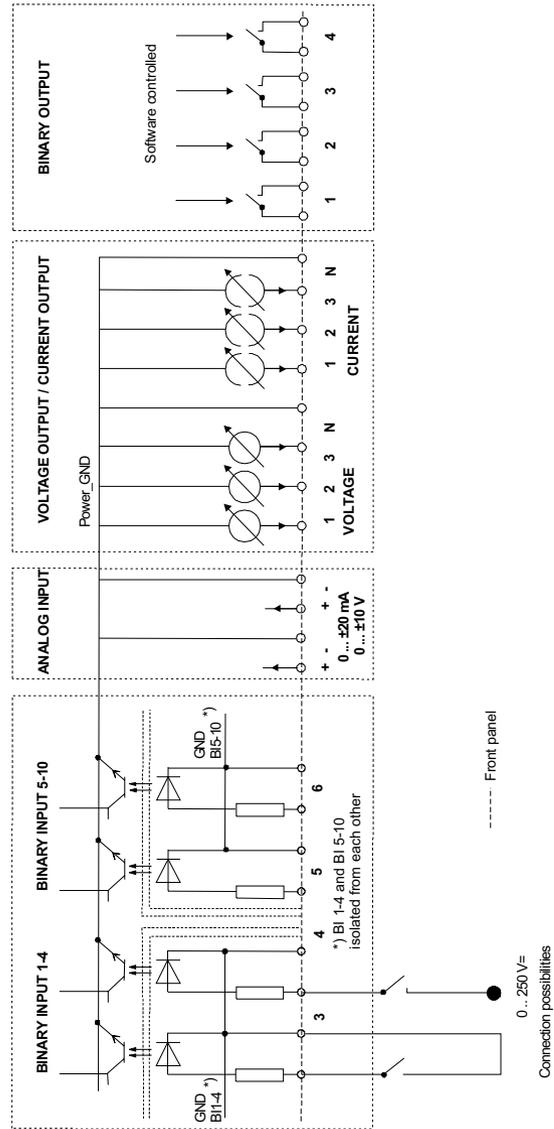


Figure 6 Outputs and inputs of the front panel

### 4.1.1

## Generator Combination Socket for VOLTAGE OUTPUT, CURRENT OUTPUT

The combination socket CURRENT OUTPUT / VOLTAGE OUTPUT serves for easy connection of the test object to the CMC 156. All signals of the connection sections CURRENT OUTPUT and VOLTAGE OUTPUT are brought out at this connector.

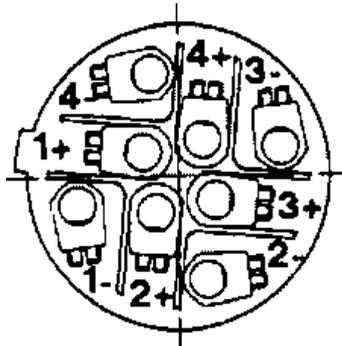


Figure 7 Plug for Generator Combination socket (cable connection view)

#### WARNING :



The connections on this socket are dangerous voltage contacts when the device is in its ON state; for this reason, this socket may not be used without full knowledge of the safety instructions found at the beginning of this manual.

Pin	Signal
1-	Voltage N
2-	Voltage 3
3-	Voltage 2
4-	Voltage 1
1+	Current 1
2+	Current N
3+	Current 3
4+	Current 2

Table 1 Assignment

Notice: For a left-hand rotating field Voltage\_2 / Voltage\_3 and Current\_2 / Current\_3 are to be exchanged.

Manufacturer designation of plug for Generator Combination socket	
Description	SPEAKON LINE 8-pole
Article number	NL8FC
Manufacturer	Neutrik

Table 2 Manufacturer designation

Suppliers for plug for Generator Combination socket	
USA	Neutrik USA Inc., 195-S3 Lehigh Avenue, Lakewood, NJ 08701-4527 Tel.: ++/908/901 94 88, Fax: ++/908/901 96 08
South Africa	Eltron (Pty.) Ltd. P.O. Box 44598, Linden, Johannesburg 2104, Tel.: ++/11/787 03 55, Fax: ++/11/787 96 27
D	H. Adam & Co, Felix -Wankel-Str. 1, 8060 Dachau, Tel.: (08131) 2808-0 or NCV, Erzbischof Buchberger Allee 14, 8400 Regensburg, Tel.: (0941)-98041, FAX: (0941)-999772

Table 3 Suppliers



If you want to order from OMICRON, refer to section 7.2 "Ordering Notes ".

## 4.1.2 Measurement Combination Socket for BINARY INPUT and ANALOG INPUT

The combination socket BINARY INPUT / ANALOG INPUT serves for easy connection of the test object to the CMC 156. All signals of the connection sections BINARY INPUT and ANALOG INPUT are brought out at this connector.

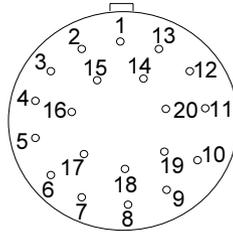


Figure 8 Plug for Measurement Combination socket (cable connection view)<sup>1</sup>

### WARNING:



The connections on this socket are dangerous voltage contacts when the device is in its ON state; for this reason, this socket may not be used without full knowledge of the safety instructions found at the beginning of this manual.

<sup>1</sup> Wires with max. 0.14mm<sup>2</sup> can be soldered on to this plug.

Pin	Signal	Cable color code	Description
1	I7	wh	Binary input 7
2	NC	bn	Not connected
3	NC	gn	Not connected
4	NC	ye	Not connected
5	I10	gy	Binary input 10
6	I9	pk	Binary input 9
7	I2	bu	Binary input 2
8	I3	rd	Binary input 3
9	GND_BI1	bk	Binary GND 1
10	GND_BI2	vt	Binary GND 2
11	I5	gy/pk	Binary input 5
12	I6	rd/bu	Binary input 6
13	I8	wh/gn	Binary input 8
14	IDC*_IN	bn/gn	DC current input
15	NC	wh/ye	Not connected
16	NC	ye/bn	Not connected
17	I1	wh/gy	Binary input 1
18	I4	gy/bn	Binary input 4
19	GND_A	wh/pk	Analog GND
20	UDC_IN	pk/bn	DC voltage input
The shield is not connected within the CMC 156 and has therefore to be connected within the signal source.			

Table 4 Assignment Measurement Combination Socket

Manufacturer designation of plug for Measurement Combination socket	
Plug with guide cam and pull relief	FGG.3B.320. PLAD9GY
Bend protection spout black	GMA.3B.080.DG
Appliance socket with guide slot, soldering contact	ENG.3B.320.PLLGY

Table 5 Manufacturer designation

Manufacturer / Supplier of plug for Measurement Combination socket	
USA	LEMO USA Inc. 335 Tesconi Circle, Santa Rosa, CA 95406, Tel.: 001/707/578 88 11, Fax: 001/707/578 08 69
D	LEMOSA GmbH , Stahlgruberring 7, 8000 München 82 Tel. (089) 42 30 85, Fax (089) 42 71 92

Table 6 Manufacturer / Supplier



If you want to order from OMICRON, refer to section 7.2, "Ordering Notes ".

## 4.2 Connections of the Back Panel

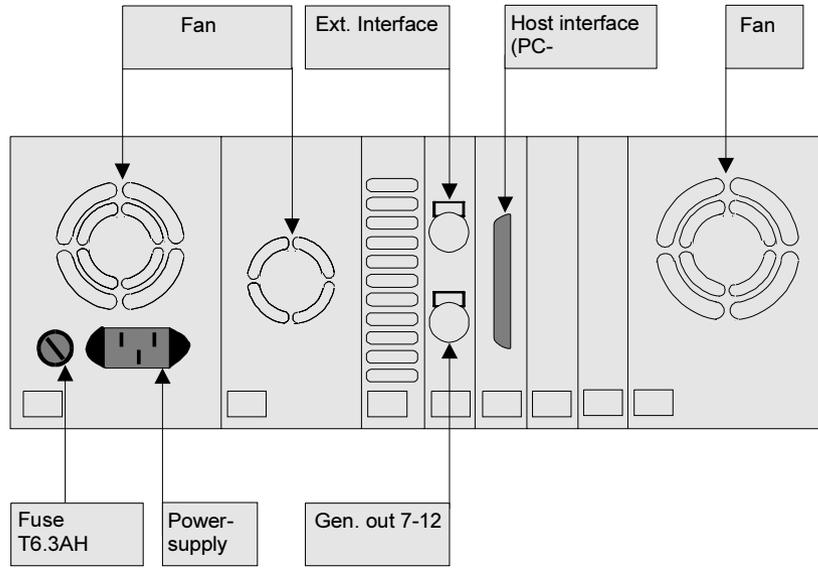


Figure 9 Rear view CMC 156

## 4.2.1 Gen. out 7-12

At the socket Gen. out 7-12 two completely independent generator triples are supplied. These signals can be used to control an external amplifier or to be used directly as low level signal outputs.

For connection to this socket use the cable which is included in the scope of delivery of the external amplifier (connection cable CMC 156 - amplifier).

The outputs are isolated from mains and the power outputs by reinforced isolation (SELV interface) and supply calibrated signals in the range 0 to  $5V_{\text{rms}}$  ( $7.07V_{\text{pk}}$ ).



The selection of the amplifiers as well as the adaptation of the scaling for the corresponding amplifier to be connected takes place in the software. Corresponding notes are found in chapter 3 of the CMC Software manual.

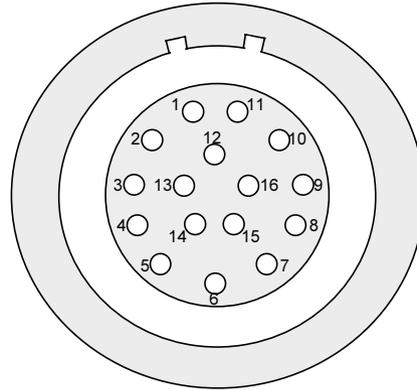


Figure 10 Plug for Interface "Gen. out 7-12" (lower 16-pole Lemo jack); (cable connection view)

Pin	Function <sup>1</sup>
Pin 1	Gen. Out 7
Pin 2	Gen. Out 8
Pin 3	Gen. Out 9
Pin 4	GND_A (electrically connected to ground)
Pin 5	Gen. Out 10
Pin 6	Gen. Out 11
Pin 7	Gen. Out 12
Pin 8-16	for internal use
Housing	shield connection

Table 7 Assignment

<sup>1</sup> Gen. out 7-9 and Gen. out 10-12 each form a selectable triple (voltage or current system).

## 4.2.2 ext. Interface

On the connection socket 'ext. Interf.' two counter inputs are supplied for meter testing with input frequencies of up to 100kHz. In addition, there are four additional transistor binary outputs 11-14. Compared to the relay binary outputs these have the advantage that they do not bounce and that only minimal response times occur.

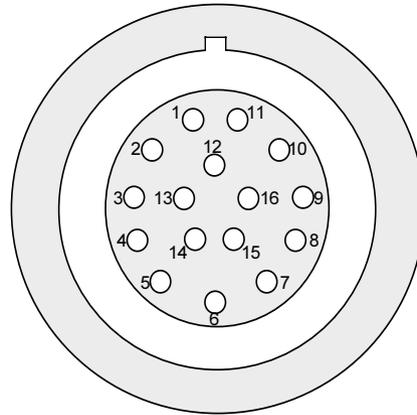


Figure 11 Plug for Interface "ext. Interface" (upper 16-pole Lemo jack); (cable connection view)

Socket	Function
Pin 1	Counter input 1
Pin 2	Counter input 2
Pin 3	Reserved
Pin 4	GND connected with GNDA (Gen. Out 7-12)
Pin 5	Binary output 11
Pin 6	Binary output 12
Pin 7	Binary output 13
Pin 8	Binary output 14
Pin 9-16	Reserved
Housing	Shield connection

Table 8 Assignment

Manufacturer designation of plug for "Gen. out 7-12" and "ext. Interface"	
For Gen. out 7-12: Plug with 2 guide cams and pull relief	FGB.2B.316.CLAD 72Z
For ext. Interface: Plug with 1 guide cam and pull relief	FGG.2B.316.CLAD 72Z
Bend protection spout black	GMA.2B.070 DN

Table 9 Manufacturer designation



If you want to order from OMICRON, refer to section 7.2 "Ordering Notes".

## 5 Technical data

The following data refer to a CMC 156 test device with standard design, without external amplifiers.



For devices with the EP1 option (Extended Precision), technical data regarding the power amplifiers are different from the corresponding data of standard devices: therefore, these data can be found separately in chapter 6, "Technical Data EP1 Option".

- Guaranteed values:
  - In general:  
Valid for 1 year from factory calibration, within  $73^{\circ}\text{F} \pm 10^{\circ}\text{F}$  ( $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ) at nominal value and a warm-up time of  $> 25\text{min}$ .
  - Guaranteed values of generator outputs:  
Valid in the frequency range 10 - 100Hz.
- Accuracy specifications:  
Valid in the frequency range DC - 100Hz.

## 5.1 Mains Supply

Mains supply	
Connector	Plug after IEC320
Voltage, 1-phase Nominal voltage Permissible range	110 to 240Vac 99V to 264Vac
Mains fuse	T6.3AH 250V
Power consumption	< 600VA
Frequency Nominal frequency Permissible range	50 / 60Hz 47 to 63Hz

Table 10 Supply data

## 5.2 Outputs

The data given in the following table are valid for all generator outputs, regardless of the amplifiers used (internal or external ones); the following tables are valid only for equipment with internal amplifiers.



For the block diagram of the generator outputs available please refer to Figure 3 on page 29.

Analog current and voltage outputs		
Frequency range		
Sinusoidal signals	10 to 1000Hz	
Transient signals	DC to 3.1kHz	
Frequency resolution	5μHz	
Frequency accuracy	0.5ppm	
Frequency drift	1ppm	
Phase range	- 360° to + 360°	
Phase resolution	0.001°	
Phase error <sup>1</sup>	typ. 0.02°	Guaranteed < 0.1°

Table 11          Analog current and voltage outputs

<sup>1</sup> valid for sinusoidal signals with 50 / 60 Hz.

## 5.2.1

## Current Outputs CURRENT OUTPUT 1-3

3 current outputs <sup>1</sup> for standard design		
Output currents		
3-phase AC (L-N)	3 × 0 to 12.5A	
1-phase AC (L-N)	1 × 0 to 12.5A	
in parallel	1 × 0 to 21A	
1-phase DC (L-N)	1 × 0 to ±12.5A	
Power <sup>2</sup>		
3-phase AC (L-N)	typ. 3 × 40VA	guar. 3 × 37.5VA
1-phase AC (L-L) <sup>3</sup>	typ. 1 × 80VA	guar. 1 × 75VA
1-phase AC (L-N) <sup>4</sup>	typ. 1 × 65VA	guar. 1 × 62VA
1-phase DC (L-N)	typ. 1 × 62W	guar. 1 × 59W
Resolution	< 500µA	
Accuracy <sup>5</sup>	typ. error < 0.02%	guar. error < 0.1%
Harmonic distortion <sup>6</sup>	typ. 0.03%	guar. < 0.07%
Short-circuit protection	Unlimited against N and from L to L.	
Open-circuit protection	Open outputs (idling) allowed.	
Connection	4 mm banana sockets or amplifier combination socket.	
Isolation	Reinforced isolation to mains and to all SELV interfaces.	

Table 12 Current outputs with standard design

<sup>1</sup> Data for 3-phase systems are valid under symm. conditions (0°, 120°, 240°).

<sup>2</sup> For higher current or output power demands connection of an external amplifier is possible (e.g. CMA current amplifier). The power data refers to an output current of 12.5A<sub>eff</sub> or 12.5A<sub>DC</sub>.

<sup>3</sup> Single-phase model (operation with two phases in phase opposition):  
two currents in series, additional adapter SPA156 recommended.

<sup>4</sup> 2 phases (2 × 10.5A) in parallel for in-phase operation.

<sup>5</sup> Percentage refers to nominal current (12.5A).

<sup>6</sup> Values at 50/60 Hz, 20 kHz measuring band width, nominal value and nominal load.

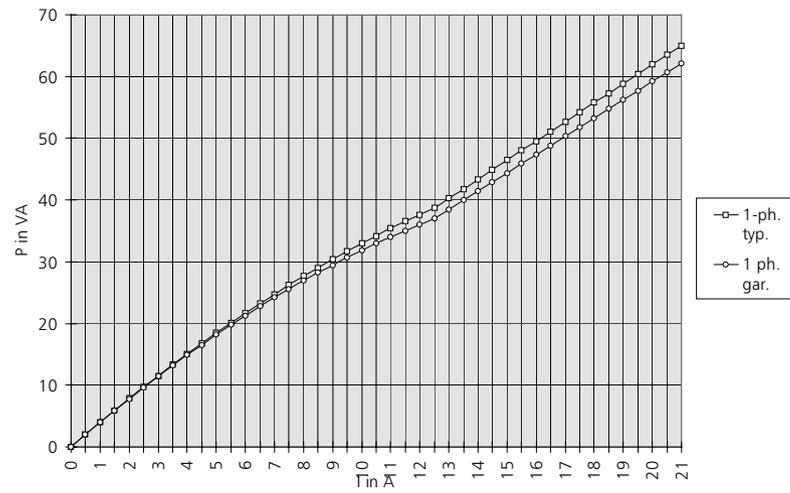


Figure 12 Typical ( $P_{typ.}$ ) and guaranteed ( $P_{guar.}$ ) output power of the internal current amplifiers with standard design

For a parallel connection of two current outputs a maximum output power of  $P_{out} > 65VA_{ac}$  is reached.

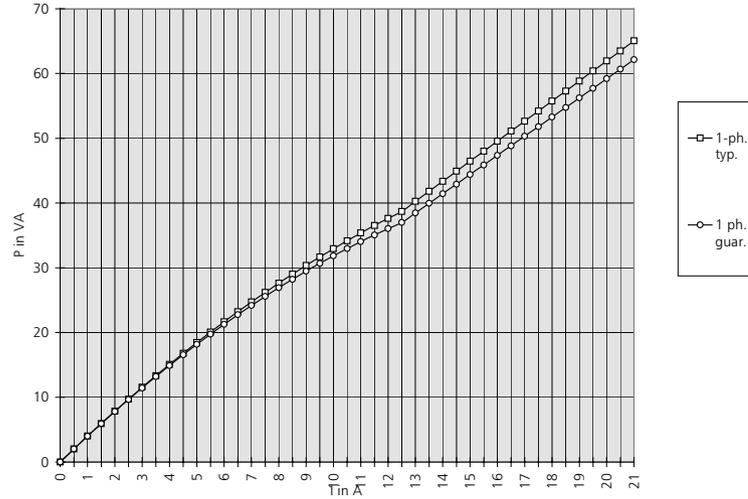


Figure 13 Typical (typ) and guaranteed (guar.) output power of the current outputs for single-phase operation (two outputs in parallel) with standard design

## 5.2.2

**Voltage Outputs VOLTAGE OUTPUT 1-3**

3 voltage outputs for standard design <sup>1</sup>		
Output voltages		
3-phase AC (L-N)	3 × 0 to 125V	
1-phase AC (L-L)	1 × 0 to 250V	
3-phase DC (L-N)	3 × 0 to ±125V	
Resolution	6 mV	
Power <sup>2</sup>		
3-phase AC <sup>3</sup> (L-N)	3 × 50VA for 125V	
1-phase AC (L <sub>1</sub> -N/L <sub>3</sub> -N)	1 × 50VA for 125V	
1-phase AC (L <sub>2</sub> -N)	1 × 100VA for 125V	
1-phase AC (L-L)	1 × 100VA for 250V	
1-phase DC (L <sub>1</sub> -N/L <sub>3</sub> -N)	1 × 42W for ±60 to ±125V	
1-phase DC (L <sub>2</sub> -N)	1 × 90W for ±125V	
Accuracy <sup>4</sup>	typ. error < 0.025%	guar. error < 0.1%
Harmonic distortion <sup>5</sup>	typ. 0.015%	guar. < 0.05%
Short-circuit protection	Unlimited against N and from L to L.	
Connection	4 mm banana sockets or amplifier comb. socket.	
Isolation	Reinforced isolation to mains and to all SELV interfaces.	

Table 13 Voltage outputs for standard designs

<sup>1</sup> If not indicated otherwise, the voltages quoted are L-N.

<sup>2</sup> Refer to output power curve in Figure 14

<sup>3</sup> Data for three-phase systems are valid under symmetrical conditions (0°, 120°, 240°).

<sup>4</sup> Percentage refers to nominal voltage (125V).

<sup>5</sup> Values at 50/60 Hz, 20 kHz measuring band width, nominal value and nominal load.

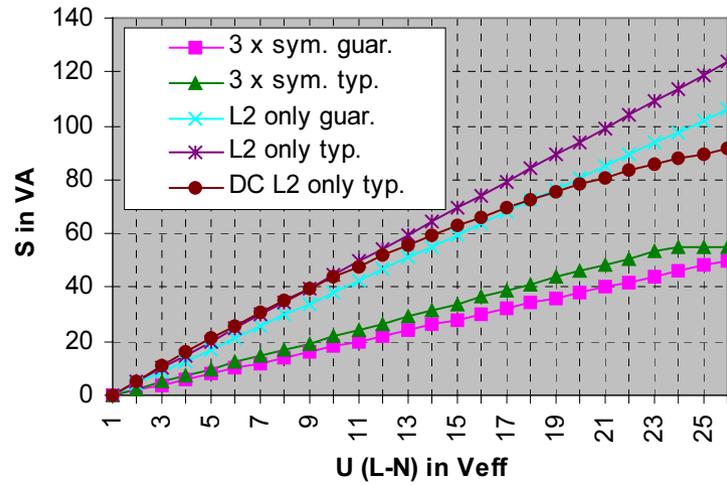


Figure 14 Typical (Ptyp) and guaranteed (Pmin) output power of the voltage amplifiers<sup>1</sup> with standard design

<sup>1</sup> To obtain the specified power, in the test object parameters file (.TYP) in the CMC software the corresponding voltage has to be set.

### 5.2.3 Interface for an External Amplifier ‘Gen. out 7-12’

6 outputs		
Setting range	0 to 5V <sub>rms</sub>	
Output current	max. 2mA	
Resolution	< 250μV	
Accuracy	typ. error < 0.025%	guar. error < 0.05%
Harmonic distortion <sup>1</sup>	typ. < 0.015%	guar. < 0.05%
Short-circuit protection	Unlimited against GND A.	
Isolation	SELV isolated to all other potential groups. Electrically connected to ground.	

Table 14 Interface Gen. out 7-12

<sup>1</sup> Values at nominal voltage (5V), 50/60 Hz and 20 kHz measuring band width.

## 5.2.4 Binary Outputs Relays

4 Binary outputs relays (Binary outputs 1-4)	
Type	potential free contacts, software controlled
AC break capacity	$V_{\max}$ 250V <sub>AC</sub> ; $I_{\max}$ 8A; $P_{\max}$ 2000VA
DC break capacity	$V_{\max}$ 300V <sub>DC</sub> ; $I_{\max}$ 8A; $P_{\max}$ 50W (see the following limit curve)
Inrush current	15A (max. 4 sec. At 10% ON period)
Electrical endurance	10 <sup>5</sup> switching cycles at 220V <sub>ac</sub> / 8A; ohmic
Time to stable closed condition	approx. 6ms
Time to stable open condition	approx. 10ms
Bounce time	approx. 0.5ms
Connection	4 mm banana sockets
Isolation	Functional isolation to power outputs. Reinforced isolation to all SELV interfaces and to mains.

Table 15 Binary outputs relays

The following diagram shows the limit curve for direct voltage (for alternative voltage a max. power of 2000VA is achieved).

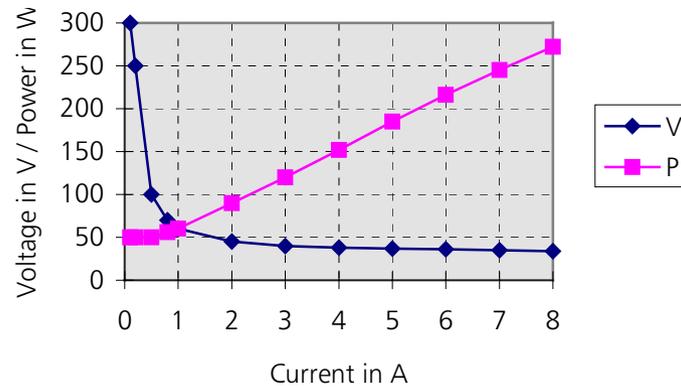


Figure 15 Limit curve of the relays of the binary outputs for direct voltage

## 5.2.5 Binary Outputs Transistor

4 Binary outputs transistor (Binary outputs 11-14)	
Type	Open collector transistor outputs; external pull-up resistor; see Figure 16.
Switching voltage	max. 15V
max. input voltage.	$\pm 16V$
Switching current	max. 5mA (current limited) min. 100 $\mu A$
update time	100 $\mu s$
rise, fall time	$< 3\mu s$ ( $V_{external} = 5V, R_{pullup} = 4k7$ )
Connector	Socket "ext. Interf." (Back panel CMC 156)
Isolation	SELV to all other potential groups of the device. Electrically connected to Gen. Out 7-12 and ground.

Table 16 Binary outputs transistor

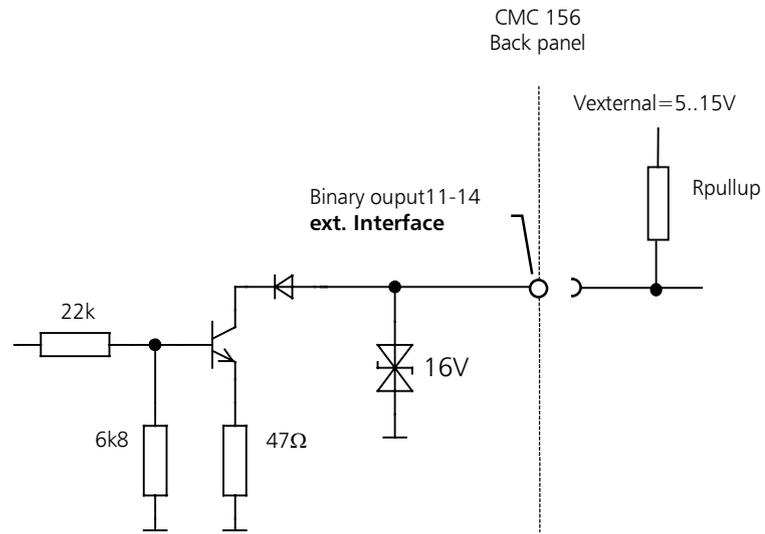


Figure 16: Binary outputs transistor 11-14 output module

## 5.3 Inputs

### 5.3.1 Binary Inputs

10 Binary inputs	
Response time	typ. 220µs (debounced)
Sampling rate	< 100 µs
Measurement accuracy	See table Table 19 and table Table 20
Counter function	
Counting frequency	3kHz (per input)
Pulse width	> 150 µs (for high and low signal)
Operating threshold for potential-free operation	- Guaranteed 0: input open or load against N > 100kΩ - Guaranteed 1: input short-circuited to N or load against N < 20kΩ
Operating threshold for potential-sensing operation	2 to 250 V <sub>dc</sub> to be set in the software
Hysteresis	0.36V ± 0.2V
Input resistance	70kΩ against reference potential (GND_BI)
Input capacity	10nF against reference potential (GND_BI)
Trigger criteria	Switching of a potential-free contact or application of direct voltage up to 250 V. Configurable operating threshold.
Integration period	27 min
Connection	4 mm banana sockets

Table 17 Binary inputs (continues on following page)

10 Binary inputs	
Isolation	Functional isolation to power outputs and between the two groups, with galvanic separation from each other. Reinforced isolation to all SELV interfaces and to mains.
Configuration	The binary inputs are configurable. Information about binary input configuration is found in the CMC software user's manual in Chapter 3 "Configuring the binary inputs"

Table 18 Binary inputs (cont. from previous page)

### Time measurement on binary inputs

Due to the sampling rate and to the features of the input filters, a signal present on binary inputs can only be sampled with a certain time tolerance.

All input binary signals are filtered on a period of 100  $\mu$ s to remove possible noise and therefore this time represents a delay in all measurements. As all inputs are filtered in the same way, this delay does not appear when:

- we measure the difference between the switching times on two inputs, or
- we achieve synchronization between two devices.

Measurement accuracy when sensing a signal		
	time in $\mu\text{s}$	
Operating mode	minimum	maximum
Zero potential contact opening	200	400
Zero potential contact closing	110	220
Active signals	110	220

Table 19 Maximum accuracy for time measurements on one input

Measurement accuracy when assessing the difference between switching times on two different inputs or when synchronizing two devices (GPS)		
	time in $\mu\text{s}$	
Operating mode	minimum	maximum
Zero potential contact opening	0	200
Zero potential contact closing	0	120
Active signals	0	120

Table 20 Maximum accuracy for time measurements between two inputs or during a synchronization

### 5.3.2 Counter Inputs 100 kHz

2 Counter inputs	
max. counting frequency	100 kHz
Pulse width	>3 $\mu$ s (high and low signal)
Operating threshold pos. edge neg. edge	max. 8V min. 4V
Hysteresis	typical: 2V
rise, fall time	< 1ms
max. input voltage	$\pm$ 30V
Connector	Socket "ext. Interf." (Back panel CMC 156)
Isolation	SELV to all other potential groups of the device. Electrically connected to Gen. Out 7-12 and ground.

Table 21 Counter inputs 100 kHz

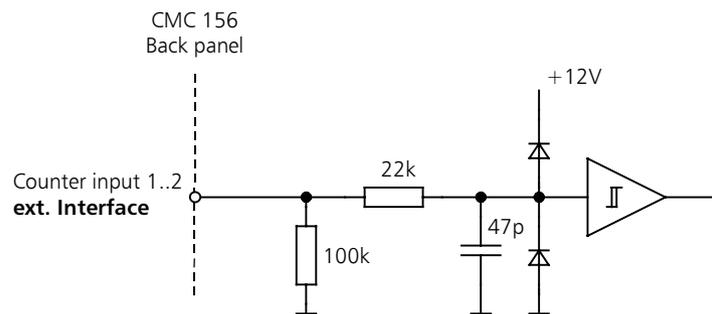


Figure 17 Input circuit of counter inputs 1, 2

### 5.3.3 Measuring Inputs

1 Direct current measuring input	
Measuring range	0 to $\pm 20\text{mA}$
max. input current <sup>1</sup>	600mA
Accuracy	typ. error 0.01%   guaranteed error < 0.05%
Connection	4 mm banana sockets or measuring comb. socket.
Isolation	Electrically connected to the current and voltage power outputs.

Table 22 Direct current measuring input

1 Direct voltage measuring input	
Measuring range	0 to $\pm 10\text{V}$
max. input voltage <sup>1</sup>	$\pm 11\text{V}$
max. input current <sup>1</sup>	$\pm 90\text{mA}$
Accuracy	typ. error < 0.01%   guaranteed error < 0.05%
Connection	4 mm banana sockets or measuring comb. socket.
Isolation	Electrically connected to the current and voltage power outputs.

Table 23 Direct voltage measuring input

<sup>1</sup> Exceeding this value may lead to destruction in the device.

## 5.4 PC Interface

25-pole SUB-D-plug	
Designation	Host Interface
Use	The Host Interface serves as connection from the CMC 156 to the PC. As connection cable to the PC only the supplied connection cable may be used.
Isolation	SELV isolated to all other potential groups electrically connected to ground

Table 24 PC interface

## 5.5 Ambient Conditions

### 5.5.1 Climate

Climate	
Operating temperature	0 ... 50°C
Storage and transport	-25 ... +70°C
Humidity range	5 ... 95% relative humidity; non condensing

Table 25 Climate

## 5.5.2 Shock and Vibration

Dynamics	
Vibration	Tested according to IEC68-2-6 (operating mode) frequency range 10 to 150 Hz; acceleration 2 g continuous (20 m/s <sup>2</sup> ); 10 sweeps, each axis.
Shock	Tested according to IEC68-2-27 (operating mode) 15 g/11 ms, half-sine, each axis.

Table 26 Shock and Vibration

## 5.5.3 Electromagnetic Compatibility (EMC)

EMC	
CE conformity	The product complies to the normative document about electromagnetic compatibility for standardization of the laws of the member states of the council of the European Union (EMC standard 89/336/EEC).
Emission International Europe	EN 50081-2 FCC Subpart B of Part 15 Class A
Susceptibility International Europe	EN 50082-2:1992 IEC 1000-4-2/3/4/6

Table 27 Electromagnetic Compatibility

## 5.6 Safety

Safety standards and certificates complied with	
European standards	EN 61010-1:1993 EN 60950 +A1:1993-05
International standards	IEC 1010-1 UL 3111-1 CAN/CSA-C22.2 No 1010.1-92
Certificates	    

Table 28 Safety standards and certificates complied with

## 5.7 Mechanical Data

Dimensions and weight	
Weight	22.46 lb. (9.8 kg)
Dimensions W x H x D (without handle)	13.5" × 5.7" × 10.6" (343 × 145 × 268 mm)

Table 29 Dimensions and weight

## 6 Technical Data EP1 Option

The following technical data refer to power amplifiers integrated into devices with the EP1 (Extended Precision) option.

Devices with EP1 option mainly differ from devices in standard design in the following key features:

- specified accuracy on output power
- suitability to test of 0.2 class meters according to IEC687
- higher accuracy on power outputs
- higher output power
- two current ranges (from 0 to 12.5 A and from 0 to 1.25 A)



Technical data valid for a CMC 156 test device with standard design can be found in chapter 5, "Technical data".

## 6.1 Outputs (EP1 option)

The power output specifications of devices with EP1 option (Extended Precision) may differ in substantial extent from the standard design. For the standard design specifications, please refer to Paragraph 5.2 “Outputs”.



A block diagram of the generator outputs is given in Figure 3 on page 29.

Analog current and voltage outputs		
Frequency range		
Sinusoidal signals	10 to 1000Hz	
Transient signals	DC to 3.1kHz	
Frequency resolution	5μHz	
Frequency accuracy	0.5ppm	
Frequency drift	1ppm	
Phase range	- 360° to + 360°	
Phase resolution	0.001°	
Phase error <sup>1</sup>	typ. 0.005°	Guaranteed < 0.02°

Table 30          Analog current and voltage outputs

<sup>1</sup> valid for sinusoidal signals with 50 / 60 Hz.

## 6.2 Current Outputs CURRENT OUTPUT 1-3

3 current outputs (-EP1 option) <sup>1</sup> range 12.5A		
Output currents		
3-phase AC (L-N)	3 × 0 to 12,5A	
1-phase AC (L-N)	1 × 0 to 12,5A	
in parallel	1 × 0 to 27A at >45Hz	
	1 × 0 to 21A at <45Hz	
1-phase DC (L-N)	1 × 0 to ±12,5A	
Power <sup>2</sup>		
3-phase AC (L-N)	typ. 3 × 43VA	guar. 3 × 40VA
1-phase AC (L-L) <sup>3</sup>	typ. 1 × 86VA	guar. 1 × 75VA
1-phase AC (L-N) <sup>4</sup>	typ. 1 × 65VA	guar. 1 × 74VA
1-phase DC (L-N)	typ. 1 × 62W	guar. 1 × 59W
Resolution	< 500µA	
Accuracy <sup>5</sup>	typ. error < 0.02%	guar. error < 0.05%
Harmonic distortion <sup>6</sup>	typ. 0.025%	guar. < 0.05%
Short-circuit protection	Unlimited against N and from L to L.	
Open-circuit protection	Open outputs (idling) allowed.	
Connection	4 mm banana sockets or amplifier combination socket.	
Isolation	Reinforced isolation to mains and to all SELV interfaces.	

Table 31: Current outputs, range 12.5A (EP1 option)

<sup>1</sup> Data for 3-phase systems are valid under symm. conditions (0°, 120°, 240°).

<sup>2</sup> For higher current or output power demands connection of an external amplifier is possible (e.g. CMA current amplifier). The power data refers to an output current of 12.5A<sub>eff</sub> or 12.5A<sub>DC</sub>.

<sup>3</sup> Single-phase model (operation with two phases in phase opposition):  
two currents in series, additional adapter SPA1 or SPA156 recommended.

<sup>4</sup> 3 phases (3 × 9A) in parallel for in-phase operation.

<sup>5</sup> Percentage refers to nominal current (12.5A).

<sup>6</sup> Values at 50/60 Hz, 20 kHz measuring band width, nominal value and nominal load.

3 current outputs <sup>1</sup> range 1.25A		
Output currents		
3-phase AC (L-N)	3 × 0 to 1.25A	
1-phase AC (L-N)	1 × 0 to 1.25A	
in parallel	1 × 0 to 3.75A	
1-phase DC (L-N)	1 × 0 to ±1.25A	
Power		
3-phase AC (L-N)	typ. 3 × 5VA	guar. 3 × 4.9VA
1-phase AC (L-L) <sup>2</sup>	typ. 1 × 10VA	guar. 1 × 9.8VA
1-phase AC (L-N) <sup>3</sup>	typ. 1 × 15VA	guar. 1 × 14.7VA
Resolution	< 50µA	
Accuracy <sup>4</sup>	typ. error < 0.02%	guar. error < 0.05%
Harmonic distortion <sup>5</sup>	typ. 0.025%	guar. < 0.05%
Short-circuit protection	Unlimited against N and from L to L.	
Open-circuit protection	Open outputs (idling) allowed.	
Connection	4 mm banana sockets or amplifier combination socket.	
Isolation	Reinforced isolation to mains and to all SELV interfaces.	

Table 32 Current outputs, range 1.25A

<sup>1</sup> Data for 3-phase systems are valid under sym. conditions (0°, 120°, 240°).

<sup>2</sup> Single-phase model (operation with two phases in phase opposition):  
two currents in series, additional adapter SPA1 or SPA 156 recommended.

<sup>3</sup> 3 phases (3 × 1.25A) in parallel for in-phase operation.

<sup>4</sup> Percentage refers to nominal current (1.25A).

<sup>5</sup> Values at 50/60 Hz, 20 kHz measuring band width, nominal value and nominal load.

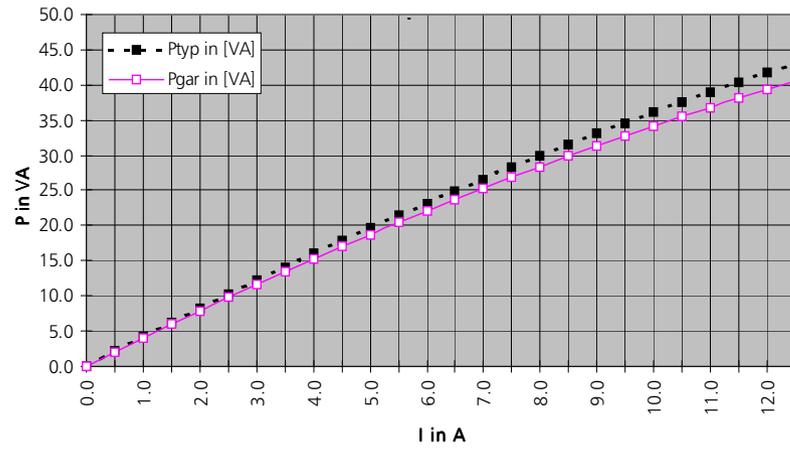


Figure 18 Typical (Ptyp.) and guaranteed (Pguar.) output power of the internal current amplifiers in the 12.5A range for EP1 option

For a parallel connection of three current outputs a maximum output power of  $P_{out} > 80VA_{ac}$  is reached.

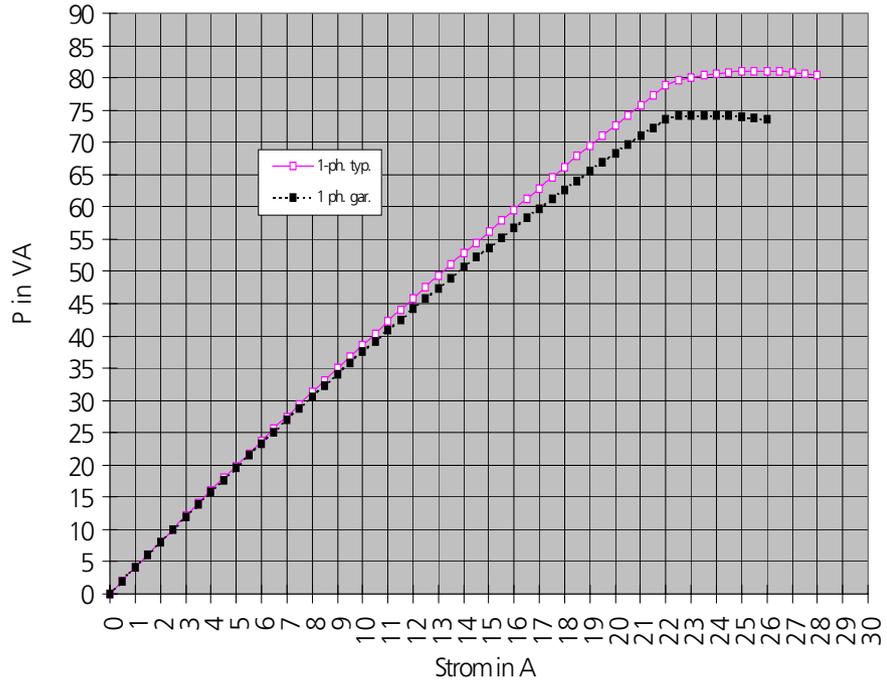


Figure 19 Typical (typ) and guaranteed (guar) output power of the current outputs for single-phase operation in the 12.5A range for EP1 option (three outputs in parallel)

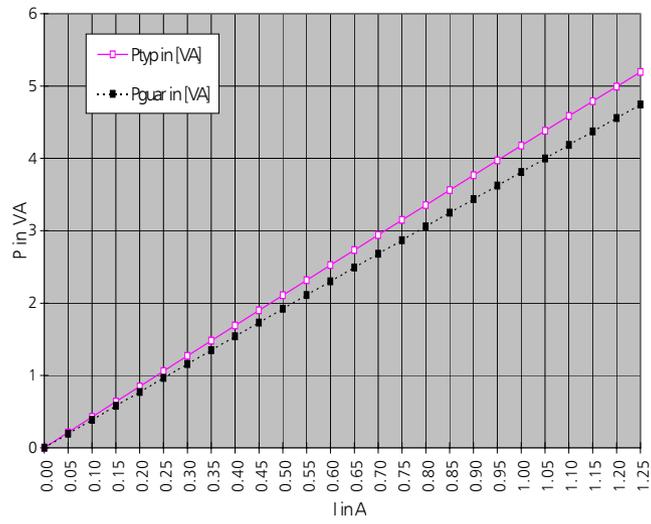


Figure 20 Typical (P<sub>typ.</sub>) and guaranteed (P<sub>guar.</sub>) output power of the internal current amplifiers in the 1.25A range for option EP1

## 6.2.1

## Voltage Outputs

### VOLTAGE OUTPUT 1-3

3 voltage outputs (option EP1)		
Output voltages		
3-phase AC (L-N)	3 × 0 to 127.5V	
1-phase AC (L-L)	1 × 0 to 255V (240 V <sub>ac</sub> + 6% or 230 V <sub>ac</sub> + 10%)	
3-phase DC (L-N)	3 × 0 to ±127.5V	
Resolution	6 mV	
Power <sup>1</sup>	guar.	typ.
3-phase AC (L-N) <sup>2</sup>	3 × 50VA for 125V	3 × 60VA
1-phase AC (L <sub>1</sub> -N/L <sub>3</sub> -N)	1 × 60VA for 125V	1 × 70VA
1-phase AC (L <sub>2</sub> -N)	1 × 100VA for 125V	1 × 140VA
1-phase AC (L-L)	1 × 140VA for 255V	1 × 170VA
1-phase DC (L <sub>2</sub> -N)	1 × 90W for ±125V	1 × 93W
Accuracy <sup>3</sup>	typ. error < 0.025%	guar. error < 0.1%
Harmonic distortion <sup>4</sup>	typ. 0.015%	guar. < 0.05%
Short-circuit protection	Unlimited against N and from L to L.	
Connection	4 mm banana sockets or amplifier comb. socket.	
Isolation	Reinforced isolation to mains and to all SELV interfaces.	

Table 33 Voltage outputs for option EP1

<sup>1</sup> Refer to output power curve in Figure 21.

<sup>2</sup> Data for 3-phase systems are valid under symm. conditions (0°, 120°, 240°).

<sup>3</sup> Percentage refers to nominal voltage (125V).

<sup>4</sup> Values at 50/60 Hz, 20 kHz measuring band width, nominal value and nominal load.

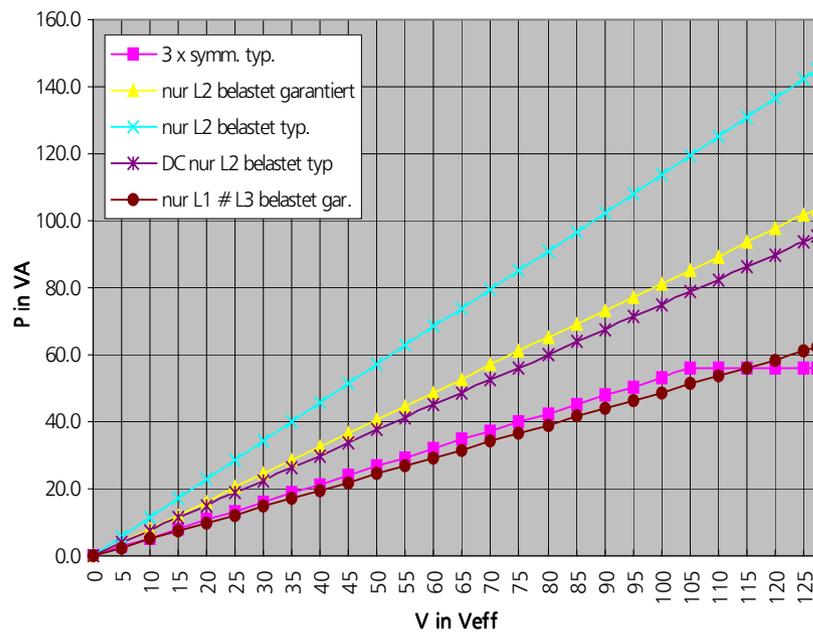


Figure 21 Typical and guaranteed output power of the voltage amplifiers (option EP1)<sup>1</sup>

<sup>1</sup> To obtain the specified power, in the test object parameters file (.TYP) in the CMC software the corresponding voltage has to be set.

## 6.2.2 Output Power with EP1 option

The output power accuracy is defined only for the system CMC156 with EP1 option.

Output power accuracy	
Accuracy <sup>1</sup> (VA)	0.1%
Temperature drift	0.005% / °C max.

Table 34 Output power accuracy

Limitations for obtaining an accuracy of 0.1% on output power	
Output current ranges	
Range 12.5A	1.25 to 12.5 A
Range 1.25A	0.1 to 1.25 A
Permissible load and current	
Range 12.5A	0 to 0.5 $\Omega$ and 6 VA max. at $\cos \varphi$ from 0.5 to 1
Range 1.25A	0 to 1 $\Omega$ and 1VA max. at $\cos \varphi$ from 0.5 to 1
Permissible load and voltage	max. 10VA
Output voltage range	50 to 125 VAC
Frequency range	50/60 Hz

Table 35 Limitations for obtaining an accuracy of 0.1% on output power

<sup>1</sup> Valid under the conditions stated in Table "Conditions for output power measurement".

# 7 Appendix

## 7.1 Optional Devices

In this section optional devices to the OMICRON test device are listed. This information is valid by the time of marketing the CMC 156 test device.

## 7.1.1

### Current Amplifier CMA 56

The CMA 56 is controlled via the CMC 156. The current amplifier is located in the same compact housing as the CMC 56 test device and supplies  $3 \times 50A_{\text{rms}}$  (max. 135VA per phase).

Control is effected via an input jack on the back of the CMA 56 via the interface Gen. out 7-12 on the back of the CMC 156.

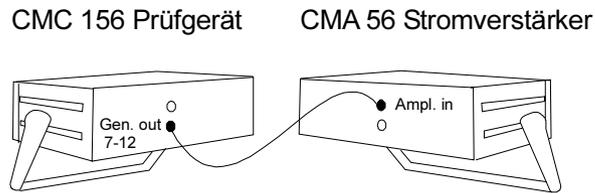


Figure 22      Connection of the CMA 56 current amplifier to the CMC 156 test device

Using the CMA 56 current amplifier, the OMICRON test system is able to test relays having high requirements for power and current, so that a wide range of possible test objects can be covered.



Please also observe the following data of the CMA 156. Information about the CMA 56 is found in the CMA 56 manual.

## 7.1.2 Current Amplifier CMA 156

The 6-phase current amplifier CMA 156 serves as an additional device to the CMC 156 test device, for tests that require:

- higher currents and/or higher power in the current path than is delivered by the CMC 156
- up to nine independent current phases.

The six current phases are arranged in two isolated groups and can be used independently from the phases of the CMC 156 (e.g. for differential protection testing). By connecting the current phases in series, a power of up to 280VA can be output, which allows the testing of a wide range of electromechanical relays.

**The CMA 156 is connected via the interface Gen. out 7-12 on the back of the CMC 156 test device:**

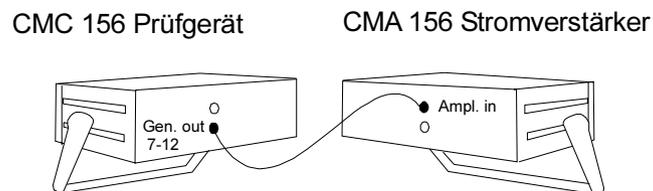


Figure 23 Connection of the CMA 156 current amplifier to the CMC 156 test device

Most important specifications of the CMA 156:

Output currents

6-phase AC	6 x 0 to 25 A
3-phase AC <sup>1</sup>	3 x 0 to 50 A
DC	1 x 0 to $\pm 25$ A

Power

6-phase AC	6 x 70 VA at 7.5 A
3-phase AC <sup>1</sup>	3 x 140 VA at 15 A
1-phase AC (L-L) <sup>2</sup>	1 x 140 VA at 7.5 A
1-phase AC (L-L) <sup>3</sup>	1 x 280 VA at 7.5 A
DC (L-N)	1 x 140 W at 10.5 A

Weight 34.4 lb. / 15.6 kg

Dimensions without handle

W x H x D 450 x 145 x 390 mm



More detailed information on the CMA 156 may be found in the CMA 156 manual.

<sup>1</sup> By connecting the two amplifier groups in parallel.

<sup>2</sup> Single-phase model: two current phases in series.

<sup>3</sup> By connecting four amplifier phases in series.

### 7.1.3 Voltage and Current Amplifier CMS 156

The voltage and current amplifier CMS 156 serves as an additional device to the CMC 156 test device, for tests that require:

- higher current or voltage than is delivered by the CMC 156,
- higher power in the voltage or the current path than is delivered by the CMC 156,
- up to six independent current or voltage phases.

The three voltage phases and the three current phases of the amplifier are isolated from each other and can be used independently from the phases of the CMC 156. This allows testing of differential relays with six independent current phases, or synchronizing devices with six independent voltage phases. The higher power in the current path as well as voltage path extends the range of electromechanical relays that can be tested.

**The CMS 156 is connected via the interface Gen. out 7-12 on the back of the CMC 156 test device:**

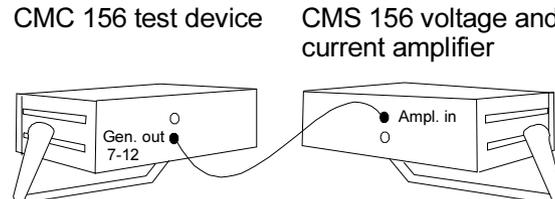


Figure 24 Connection of the CMS 156 voltage and current amplifier to the CMC 156 test device

**Most important specifications of the CMS 156:**

Output voltages

3-phase AC (L-N)	3 x 0 to 250 V
1-phase AC (L-L)	1 x 0 to 500 V
DC (L-N)	3 x 0 to $\pm 250$ V

Voltage outputs power

3-phase AC (L-N)	3 x 75 VA at 75 to 250 V
1-phase AC (L-N)	1 x 150 VA at 75 to 250 V
1-phase AC (L-L)	1 x 150 VA at 150 to 500 V
DC (L-N)	1 x 212 W at $\pm 150$ to $\pm 250$ V

Output currents

3-phase AC	3 x 0 to 25 A
DC	1 x 0 to $\pm 25$ A

Current outputs power

3-phase AC (L-N)	3 x 70 VA at 7.5 A
1-phase AC (L-L) <sup>1</sup>	1 x 140 VA at 7.5 A
DC (L-N)	1 x 140 W at $\pm 10.5$ A

Weight 32.8 lb. / 14.9 kg

Dimensions without handle  
W x H x D 450 x 145 x 390 mm



More detailed information about the CMS 156 may be found in the CMS 156 manual.

<sup>1</sup> Single-phase model: two current phases in series.

## 7.1.4 CMLIB B - Optional connection for meter testing

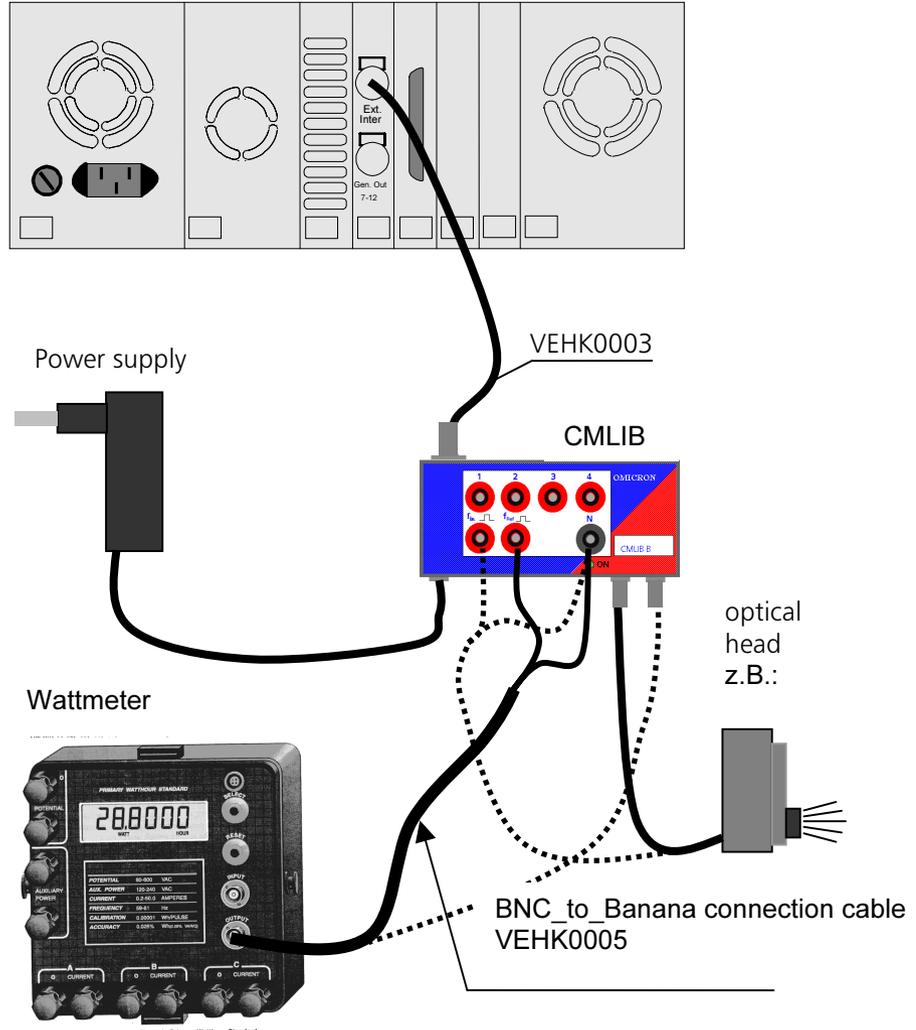
**With the option CMLIB B it is easily possible to connect auxiliary equipment needed for meter testing to a CMC test device.**

The devices involved are:

- Test meter
- Reference meter
- Optical scanning head

Further information in the CMLIB B manual.

### Principle diagram



## 7.2 Ordering Notes

In this section ordering notes for additional devices and accessories to the CMC 156 are found.

For easier identification of cables and plugs these items are represented graphically below.

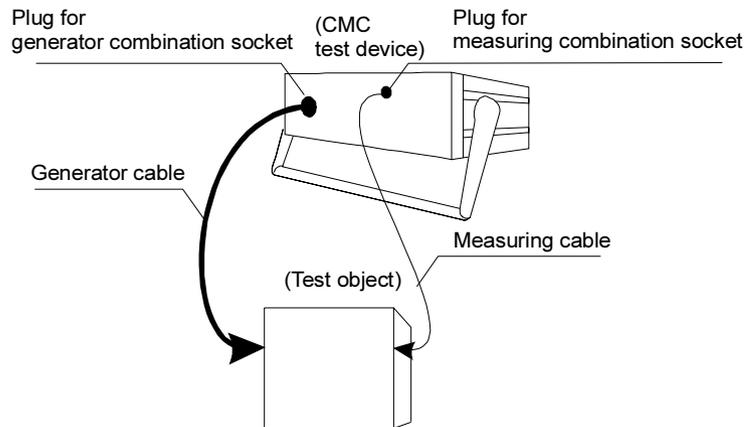


Figure 25 Connection cables, plugs

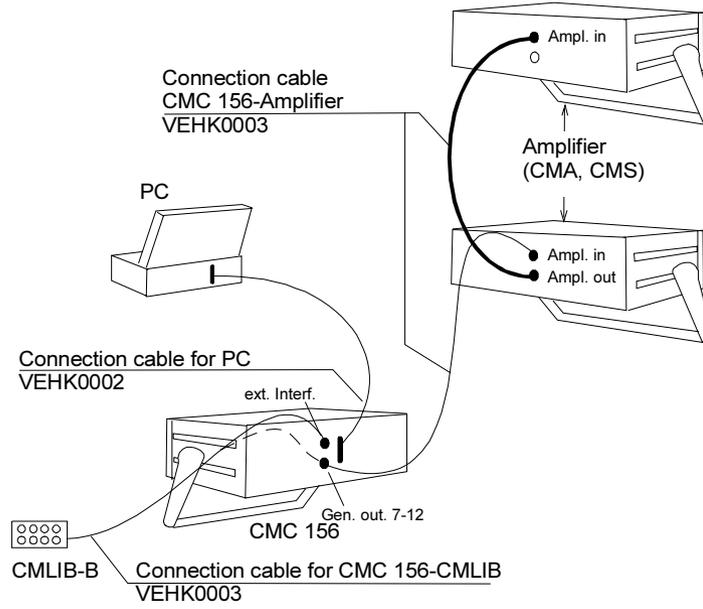


Figure 26 Connection cables, plugs (continued)

Ordering designation	Ordering number
<b>Amplifiers</b>	
CMA 156 current amplifier	VEHV1010
CMS 156 voltage and current amplifier	VEHV1030
<b>Plugs</b>	
Plug for Generator Combination socket	VEHS0103
Plug for Measuring Combination socket	VEHS0104
<b>Cables</b>	
Connection cable to PC	VEHK0002
Connection cable amplifier to CMC 156 identical to con. cable CMC 156 to CMLIB	VEHK0003
Generator cable	VEHK0103
- 1 <sup>st</sup> side Generator Combination plug, 8-pin	
- 2 <sup>nd</sup> side safety plugs 4mm black	
- 3 m length, 8 x 2.5 mm <sup>2</sup>	
Measuring cable	VEHK0104
- 1 <sup>st</sup> side Lemo-plug, 20-pin	
- 2 <sup>nd</sup> side open (ends with connector sleeves)	
- 3 m length, 20 x 0.14 mm <sup>2</sup>	

Table 36 Ordering notes

Ordering designation	Ordering number
CMLIB B (4mm sockets connector)	VEHZ1102
<b>Scanning devices for meters</b>	
SH2003 (reference from MTE company with mechanical driving roller; also suited for pulse outputs)	VEHZ2003
TVS6.15/1 (reference from MTE) for a meter with pulse outputs only	VEHZ2004
<b>Opto-Isolators (5 pieces)</b>	
CMC-OI-220	VEHZ0001
CMC-OI-110	VEHZ0002
CMC-OI-60	VEHZ0003
CMC-OI-24	VEHZ0004
CMC-OI-TTL	VEHZ0005
<b>Carrying bag</b>	
for CMC 156 (mini)	VEHP0100
for CMA/CMS	VEHP0010
<b>Transport case</b>	
CMCase for CMA/CMS	VEHP0011
CMCase for CMC156/151 (mini)	VEHP0101
<b>Additional user manuals (german)</b>	
for CMC 156	VESD1002
for CMC software	VESD0001

Table 37      Ordering notes (continued)

## 7.3 OMICRON Contact Addresses

### Offices with customer service centers

<b>Europe</b>	OMICRON electronics Gmbh Oberes Reid 1 6833 Klaus Austria	Phone: +43 5523 507-0 Fax: +43 5523 507-999 eMail: <a href="mailto:support@omicron.at">support@omicron.at</a> Web: <a href="http://www.omicron.at">www.omicron.at</a>
<b>USA</b>	OMICRON electronics Corp. USA 12 Greenway Plaza, Suite 1200 Houston TX 77046 USA	Phone: +1 713 830-4660 1-800-OMICRON Fax: +1 713 830-4661 eMail: <a href="mailto:info@omicronusa.com">info@omicronusa.com</a> Web: <a href="http://www.omicronusa.com">www.omicronusa.com</a>
<b>Asia</b>	OMICRON electronics Asia Ltd. Room 719, Tower II Grand Central Plaza 138 Shatin Rural Committee Road Shatin, Hong Kong	Phone: +852 2634-0377 Fax: +852 2634-0390 eMail: <a href="mailto:info@asia.omicron.at">info@asia.omicron.at</a>

### Regional sales offices

<b>Spain</b>	OMICRON Technologies España S.L. Avenida Somosierra 12 Escalera Derecha, Oficina 1H 28700 San Sebastián de los Reyes Madrid, Spain	Phone: +34 91 652-4280 Fax: +34 91 653-6165 eMail: <a href="mailto:info@spain.omicron.at">info@spain.omicron.at</a>
<b>UK</b>	OMICRON electronics UK Ltd. Unit 9, Marconi Gate Staffordshire Technology Park Beaconside, Stafford ST18 OAP England	Phone: +44 1785 251-000 Fax: +44 1785 252-000 eMail: <a href="mailto:info@uk.omicron.at">info@uk.omicron.at</a>

**Training, Consulting, Commissioning**

**Germany**

OMICRON electronics  
Deutschland GmbH

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91341 Röttenbach  
Germany

Phone: +49 9195 9475-1  
Fax: +49 9195 9475-39  
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