VBO3

User Manual

Manual version: ENU 1210 05 03

The product information, specifications, and technical data embodied in this manual represent the technical status at the time of writing and are subject to change without prior notice.

We have done our best to ensure that the information given in this manual is useful, accurate, up-to-date, and reliable. However, OMICRON does not assume responsibility for any inaccuracies which may be present.

The user is responsible for every application that makes use of an OMICRON product.

OMICRON translates this manual from the source language English into a number of other languages. Any translation of this manual is done for local requirements, and in the event of a dispute between the English and a non-English version, the English version of this manual shall govern.

Table of contents

1 Introduction

1.1 About this document

This document provides information on how to use this product safely, properly and efficiently.

It contains important safety rules for working with this product and gets you familiar with operating this product. Following the instructions in this document will help you to prevent danger, repair costs, and avoid possible down time due to incorrect operation.

This document is to be supplemented by existing national safety standards for accident prevention and environmental protection.

1.2 Symbols and conventions

The following symbols indicate safety instructions for avoiding hazards:

⚠ DANGER

Death or severe injury will follow if the appropriate safety instructions are not observed.

⚠ WARNING

Death or severe injury may occur if the appropriate safety instructions are not observed.

⚠ CAUTION

Minor or moderate injury may occur if the appropriate safety instructions are not observed.

NOTICE

Equipment damage or loss of data possible

The following symbols and formatting styles are used:

Symbol/format	Description
✔	Conditions to be met before starting a task
▶	Instructions that can be carried out in any order
1. 2.	Instructions that have to be carried out in the given order 1. Step 2. Step 2.1 Substep 2.2 Substep
➔ / ➔	Expected outcome of a step/task
Text in bold	Text shown on a device, its display or in a software
Text in italics	OMICRON product name
ⓘ / **Note:**	Additional information, explanations or tips

1.3 Fulfilled directives

In the following statement, the device is designated as "product", "equipment", or "apparatus".

The OMICRON contact address can be found on the last page (back page) of this document.

European Union

The equipment adheres to the guidelines of the council of the European Community for meeting the requirements of the member states regarding the following directives:

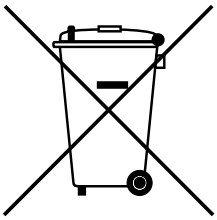
- Low voltage directive (LVD)
- RoHS directive

United Kingdom

The equipment adheres to the regulations of the UK government for meeting the requirements regarding the following regulations:

- Electrical Equipment Regulation (Safety)
- Regulation for Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

1.4 Recycling



This device (including all accessories) is not intended for household use. At the end of its service life, do not dispose of the device with household waste.

EU countries (incl. European Economic Area)

OMICRON devices are subject to the EU Waste Electrical and Electronic Equipment Directive (WEEE directive). As part of our legal obligations under this legislation, OMICRON offers to take back the device and to ensure that it is disposed of by authorized recycling agents.

Outside the European Economic Area

For information on the environmental regulations relevant to your country, contact the responsible authorities. Dispose of the OMICRON device only in accordance with your local legal requirements.

2 Safety

2.1 Basic safety information

- ▶ Before operating the device, make sure that you have read this document and fully understood all instructions.
- ▶ Only install and operate the device and any accessories according to the instructions in the corresponding user documentation.
- ▶ Make sure that this document is available on the site where the device is operated, either digitally or in print.
- ▶ Contact OMICRON Support (→ Support (page 25)) if you do not understand any of the instructions in this document.

Using the device must comply with all applicable local and national safety standards, regulations and safety-relevant documents.

Improper use may result in damage to persons or property and could invalidate warranty claims.

2.2 Designated use

The *VBO3* is a an accessory intended for use with OMICRON CMC test sets. The *VBO3* transforms a the CMC's output voltage of 0 ... 300 V to 0 ... 600 V.

The *VBO3* is intended for use in the following settings:

- V>> stage of LOM protection at wind power stations
- Renewable energy systems
- Combined heat plants
- Power plants

Disclaimer

The advisory procedures and information contained within this user manual have been compiled as a guide to the safe and effective operation of the *VBO3*. It has been prepared in conjunction with application engineers and the collective experience of the manufacturer.

The in-service conditions for the use of the *VBO3* may vary between customers and end-users. Consequently, this user manual is offered as a guide only. It shall be used in conjunction with the customer’s own safety procedures, maintenance program, engineering judgment, and training qualifications.

If the *VBO3* is used in a different manner than described in this user manual, the protection provided by the *VBO3* may be impaired, and this may result in damage to property or persons.

2.3 Operator qualifications

Only authorized and qualified personnel who are regularly trained in electrical engineering and their specific tasks are permitted to operate the device and any accessories.

Operators must be familiar with the equipment and observe all applicable standards, local regulations, and safety-relevant documents, for example, the following standards or their equivalents:

- EN 50191 (VDE 0104) "Erection and Operation of Electrical Test Equipment"
- EN 50110-1 (VDE 0105 Part 100) "Operation of Electrical Installations"
- IEEE 510 "IEEE Recommended Practices for Safety in High-Voltage and High-Power Testing"

Personnel receiving training, instructions, directions, or education on the device must be under constant supervision of an experienced operator while working with the equipment.

▶ Before starting to work, clearly establish the responsibilities:
  - Designated person in control of the electrical installation
  - Designated person in control of the work activities

▶ Make sure that the designated person in control of the work activities coordinates the communication with all persons involved in work activities.

2.4 Safety rules

Always observe the five safety rules:

1. Disconnect completely.
2. Secure against re-connection.
3. Verify that the installation is dead.
4. Carry out grounding and short-circuiting.
5. Provide protection against adjacent live parts.

2.5 Safety instructions

▶ Stay focused on your tasks to ensure safety.

▶ Visually check the device for damage. If the device or any accessory is damaged, not in technically sound condition, or does not seem to function properly, do not use it. If in doubt, contact OMICRON Support (→ Support (page 25)).

▶ Only use original cables provided by OMICRON.

▶ Only use original accessories provided by OMICRON.

The use of different cables and accessories is at the operator's own risk, considering the necessary high safety standards, the technical requirements, as well as relevant norms and certification standards. If in doubt, contact OMICRON Support (→ Support (page 25)).

2.5.1 Work environment

- ▶ Do not operate the device in a condensing environment.
- ▶ Do not operate the device in the presence of explosive gas or vapors.
- ▶ Do not operate the device under environmental conditions that exceed the temperature and humidity limits listed in the "Technical data" section.
- ▶ Before using any additional equipment, make sure that the environmental conditions are suitable for that equipment.

2.5.2 Personal safety

- ▶ Protect others from accessing the danger zone and accidentally touching live parts by setting up a suitable safety barrier and, if applicable, signal lamps.
- ▶ Warn other people prior to any operation to make them aware of any possible disturbances.

2.5.3 Product-specific safety

All 4 mm safety plug terminals on the *VBO3* front panel can carry signals at dangerous levels and can conduct dangerous voltages.

The *VBO3* does not contain any serviceable parts.

- ▶ Do not open the *VBO3*.
- ▶ Do not carry out any modifications, extensions, or adaptations.

3 Device overview

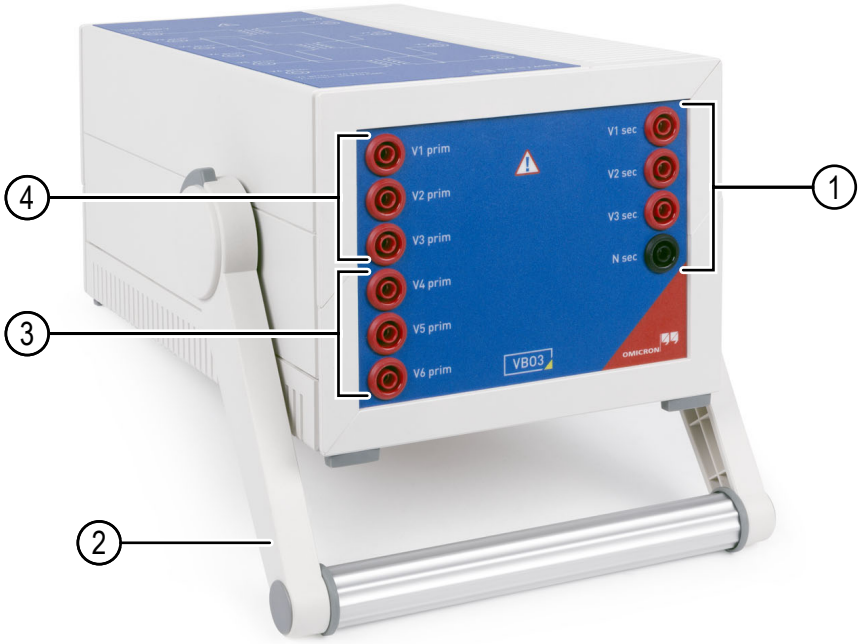


Figure 3-1: *VBO3* front view

1	Voltage output triple; 0 ... 600 V	3	Voltage input triple 2; 0 ... 300 V
2	Handle	4	Voltage input triple 1; 0 ... 300 V

4 Wiring

You can connect the *VBO3* to CMC test sets. The wiring and the configuration in the *Test Universe* software will change according to the respective use case.

→ Operation (page 15)

⚠ WARNING

Death or severe injury due to electrical shock

The isolation of the *VBO3* is designed for 600 V. The voltage ratio of about 1 : 2.16 could lead to voltages exceeding this value.

- ▶ Only operate the *VBO3* with primary voltages of up to 300 V

⚠ WARNING

Death or severe injury due to electrical shock

The output conductors may carry dangerous voltages.

- ▶ Always use connection cables with 4 mm safety plugs.
- ▶ If the application requires adapters, refer to the safety instructions and user documentation of the CMC test set in use before proceeding.

4.1 Connecting the VBO3 to a CMC 430

4.1.1 Max. 300 V output voltage

1. Connect the *CMC 430* voltage outputs **4**, **5** and **6** to the *VBO3* connectors **V1 prim**, **V2 prim** and **V3 prim**. Use a connection cable with 4 mm safety plugs.
2. To create a starpoint, use flexible jumpers to interconnect **V4 prim**, **V5 prim** and **V6 prim** on the *VBO3*.
3. Connect the star point to the **N** socket on the *CMC 430*.
4. Connect the *VBO3* outputs **V1 sec**, **V2 sec**, **V3 sec** and **N sec** to the test object.

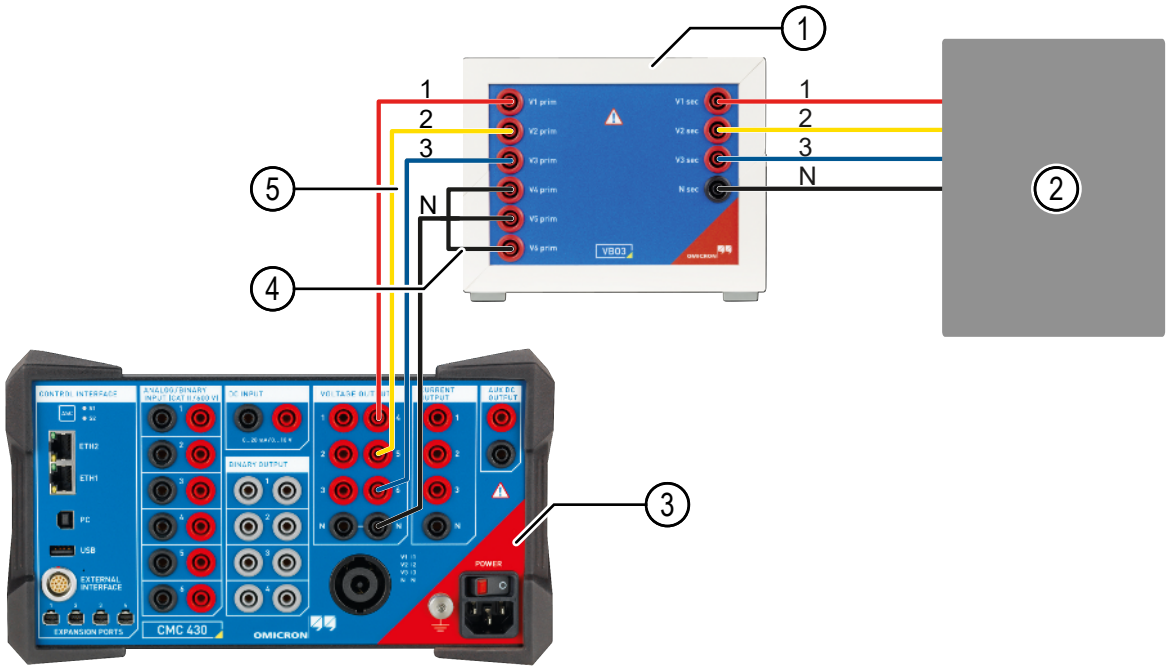


Figure 4-1: *CMC 430* connected to *VBO3*, with star point

1	VBO3	4	Flexible jumpers
2	Test object	5	Connection cables
3	CMC 430		

▶ For information on connecting other CMC test sets, refer to Connecting the VBO3 to other CMCs (page 14).

4.1.2 Max. 600 V output voltage

⚠ WARNING

Death or severe injury due to electrical shock

The *VBO3* is designed for 600 V. Using it with the wrong device could damage its isolation.

▶ Only perform this configuration with the *CMC 430*.

1. Connect all *CMC 430* voltage outputs (1 ... 6) to the corresponding *VBO3* connectors (**V1 prim** ... **V6 prim**). Use a connection cable with 4 mm safety plugs.
2. Connect the *VBO3* outputs **V1 sec**, **V2 sec**, **V3 sec** and **N sec** to the test object.

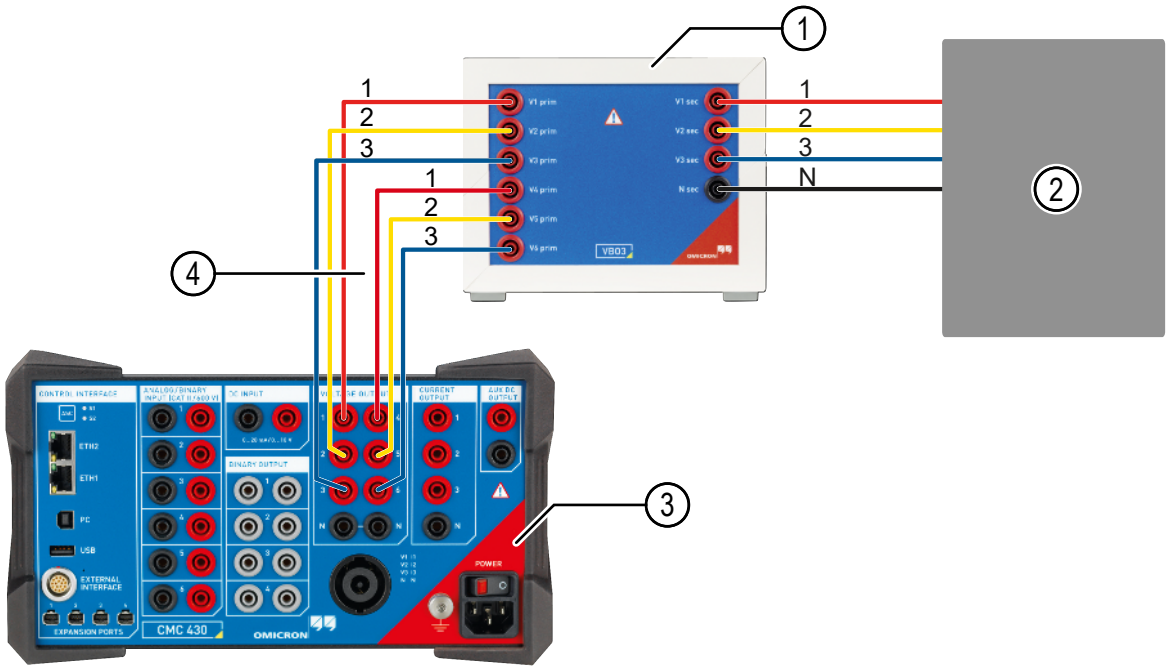


Figure 4-2: *CMC 430* connected to *VBO3*

1	VBO3	3	CMC 430
2	Test object	4	Connection cables

▶ For information on connecting other CMC test sets, refer to Connecting the VBO3 to other CMCs (page 14).

4.2 Connecting the VBO3 to other CMCs

Connect CMC test sets, except for the *CMC 430*, as follows.

1. Connect the CMC voltage outputs to the *VBO3* inputs **V1 prim**, **V2 prim** and **V3 prim**. Use a connection cable with 4 mm safety plugs.
2. To create a starpoint, use flexible jumpers to interconnect **V4 prim**, **V5 prim** and **V6 prim** on the *VBO3*.
3. Connect the star point to the **N** socket on the CMC.

   The image below illustrates how to connect a *CMC 256plus* to the *VBO3*, applicable to all CMC test sets except the *CMC 430*.

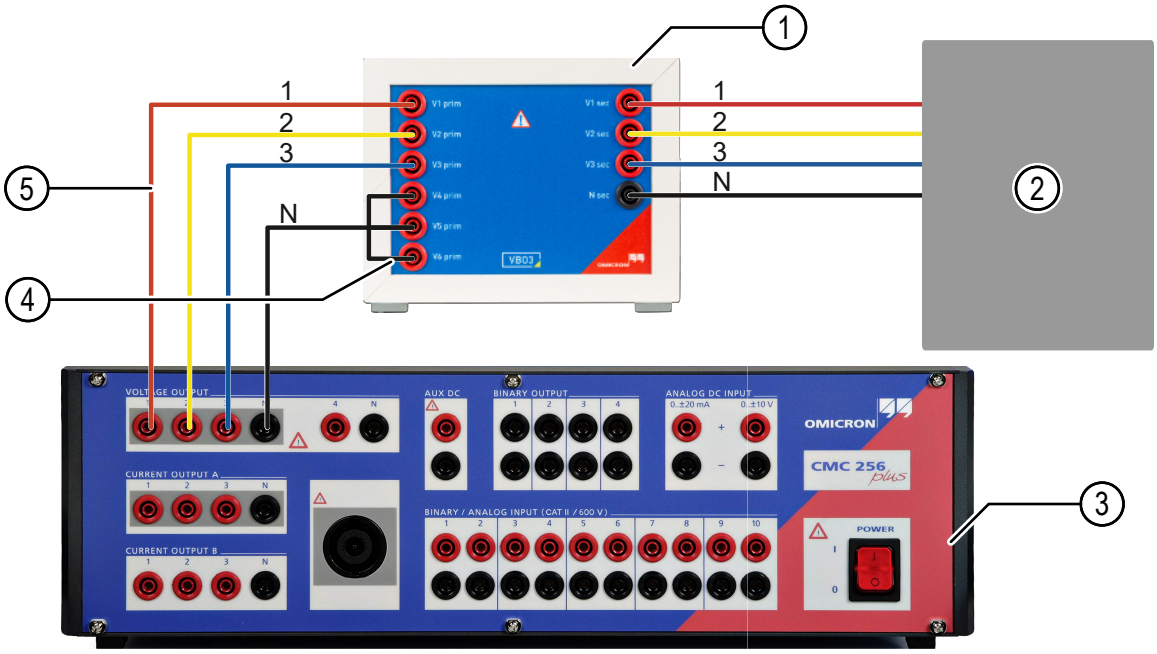


Figure 4-3: *CMC 256plus* connected to *VBO3*, with star point

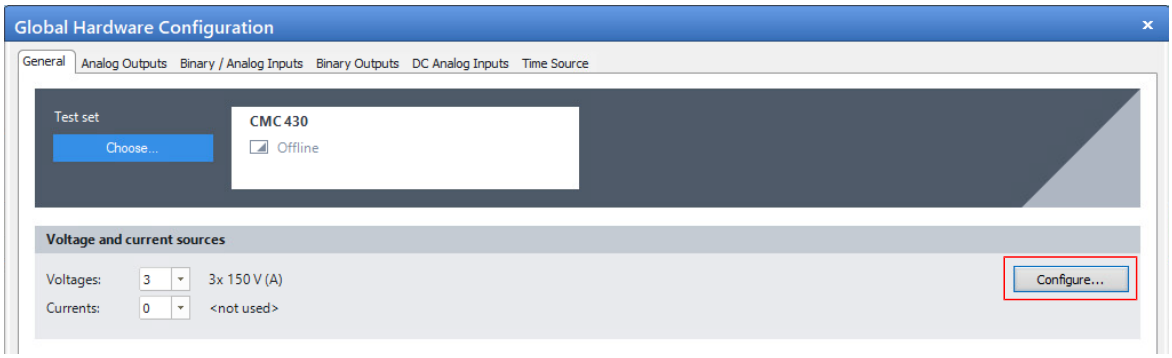
1	VBO3	4	Flexible jumpers
2	Test object	5	Connection cables
3	CMC 256plus		

▶ For information on connecting the *CMC 430*, refer to Connecting the VBO3 to a CMC 430 (page 12).

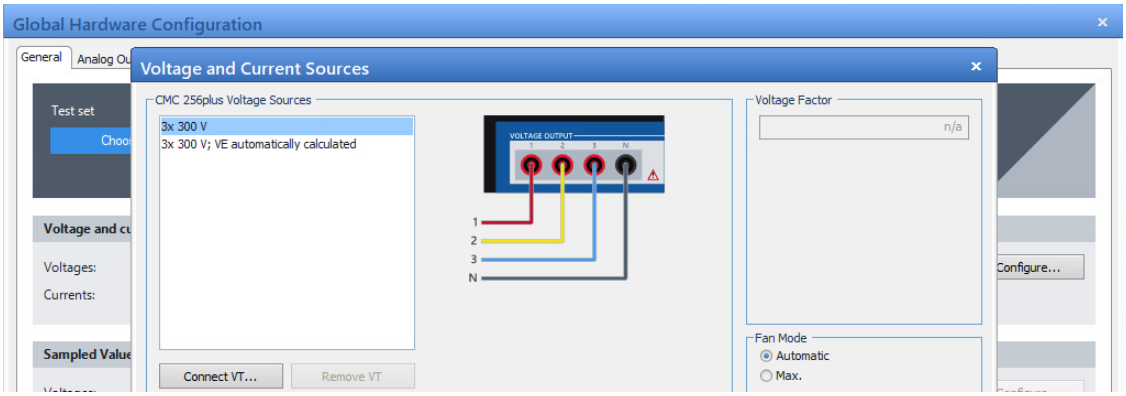
5 Operation

5.1 Configuring the voltage outputs in Test Universe

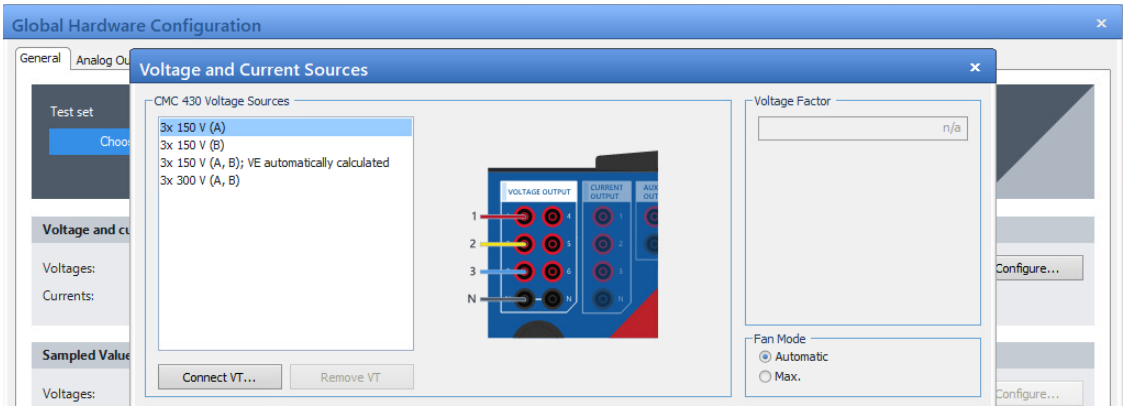
1. Launch a *Test Universe* module, and go to the **Hardware Configuration**.
2. On the **General** tab, select your CMC from the **Test Set** list
3. Click **Configure...**.



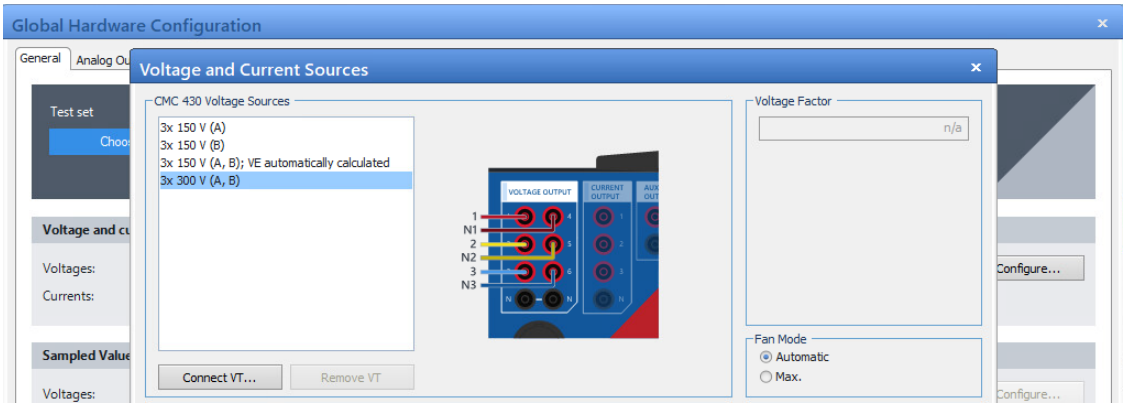
4. In the **Voltage and Current Sources** dialog, select one of the listed configurations for the voltage outputs:
   - CMC test sets with max. 300 V output voltage: Select a 3 × 300 V configuration.
     Example:



- *CMC 430*: To achieve up to 3 × 300 V output voltage, select a 3 × 150 V configuration. Example:



- *CMC 430*: To achieve up to 3 × 600 V output voltage, select a 3 × 300 V configuration. Example:



5. Click **Connect VT...**.
6. To complete the VT configuration details, calculate the true voltage ratio.
7. Proceed with section Calculation of voltage ratio (page 17).

5.2 Calculating the voltage ratio

Without load, the voltage ratio between the primary and secondary side of the *VBO3* is roughly 1 : 2.16. With load, the voltage ratio may be lower.

- ▶ To ensure accurate testing conditions, determine the voltage ratio under load conditions and enter the corresponding value in *Test Universe*.
- ▶ You can determine the voltage ratio using a multimeter that fulfills the requirements for measurement categories CAT III/1000 V and CAT IV/600 V.
- ▶ Connect the load before measuring the output voltages (see workflow below).

⚠ WARNING

Death or severe injury due to electrical shock

CMC test sets are designed for input voltages of max. 600 V. Due to the *VBO3*'s voltage ratio of about 1 : 2.16, voltages higher than 600 V might occur at the *VBO3* outputs.

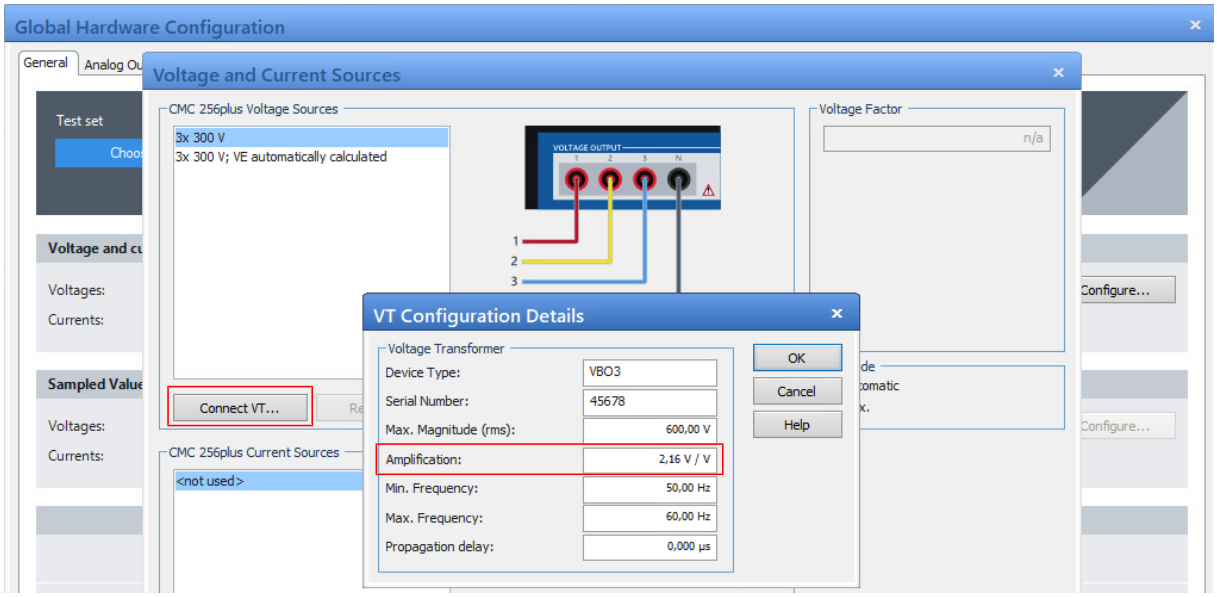
- ▶ Always measure the output voltages with a multimeter suitable for up to 1000 V working voltage.
- ▶ Do not use a CMC test set for measuring the output voltages.

Determining the voltage ratio

1. Connect the CMC test set to the *VBO3* (→Wiring (page 11)).
2. Connect the load by connecting the *VBO3* secondary outputs to the test object.
3. Connect the multimeter as shown in the → diagram below (page 19).
4. With the multimeter, measure the output voltages of the *VBO3* for each phase.
5. Calculate the voltage ratio for each phase, and then calculate the average value of the voltage ratios:

$$Amplification = \frac{\frac{V1sec}{V1prim} + \frac{V2sec}{V2prim} + \frac{V3sec}{V3prim}}{3}$$

6. In *Test Universe*, go to the **Voltage and Current Sources** dialog (→ Configuration in Test Universe (page 15)), click **Connect VT...**, and enter the average ratio in the **Amplification** field.



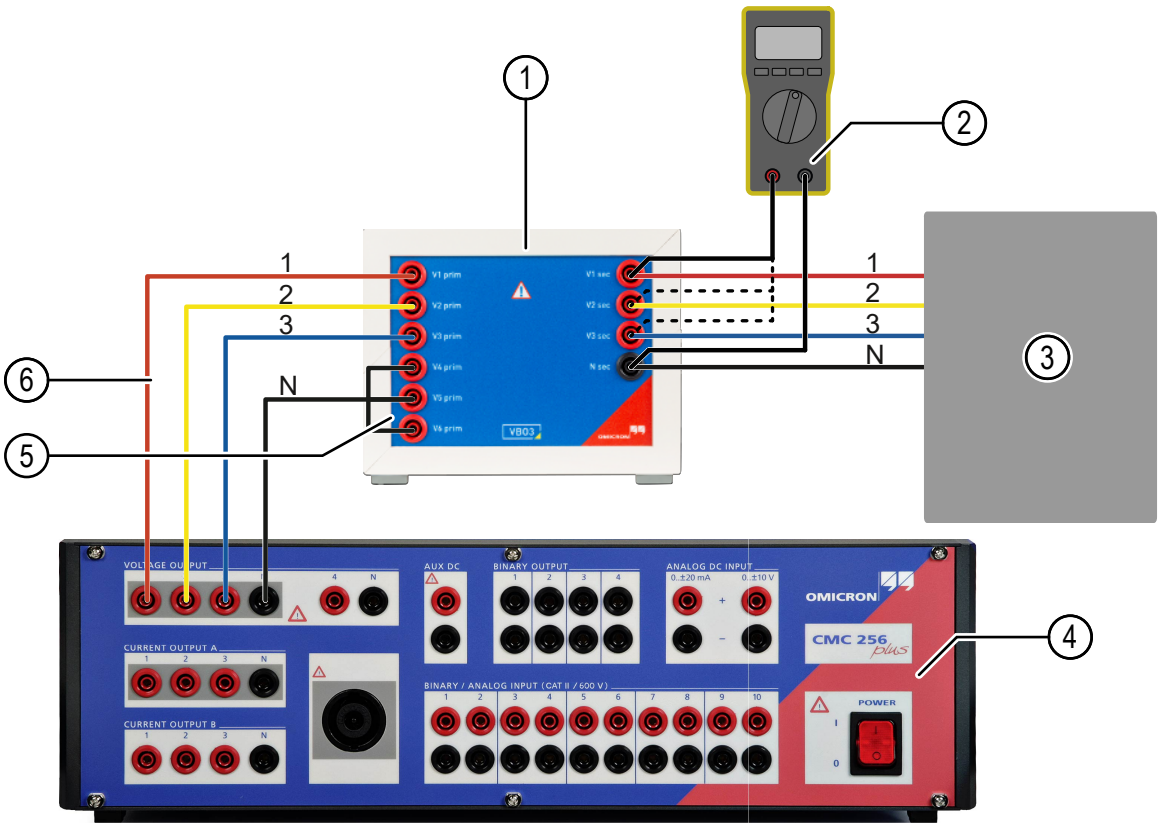


Figure 5-1: Connection diagram for voltage ratio measurement

1	VBO3	4	CMC test set
2	Multimeter	5	Flexible jumpers
3	Test object	6	Connection cables

6 Maintenance

6.1 Cleaning

✓ The device is switched off/de-energized.
✓ All connection cables are disconnected from the device.

▶ Clean the device with a cloth dampened with isopropanol alcohol.

7 Technical data

General

Characteristic	Specification
Voltage range primary	0 … 300 V, 3-phase
Voltage range secondary	0 … 600 V, 3-phase
Nominal frequency	50/60 Hz
Nominal power	33 VA per phase
Protection class of *VBO3* voltage transformer	II (for CAT III / 300 V , CAT II / 600 V)
Measurement category for *VBO3* cables	CAT III / 300V , CAT II / 600 V

Environmental conditions

Characteristic	Specification
Temperature	
Operating	−25 °C … + 50 °C (−13 °F … + 122 °F)
Storage and transportation	−40 °C … + 70 °C (−40 °F … + 158 °F)
Maximum altitude	
Operating	4 000 m (13 000 ft)
Storage	15 000 m (49 000 ft)
Humidity	5 % ... 95 % relative humidity; no condensation

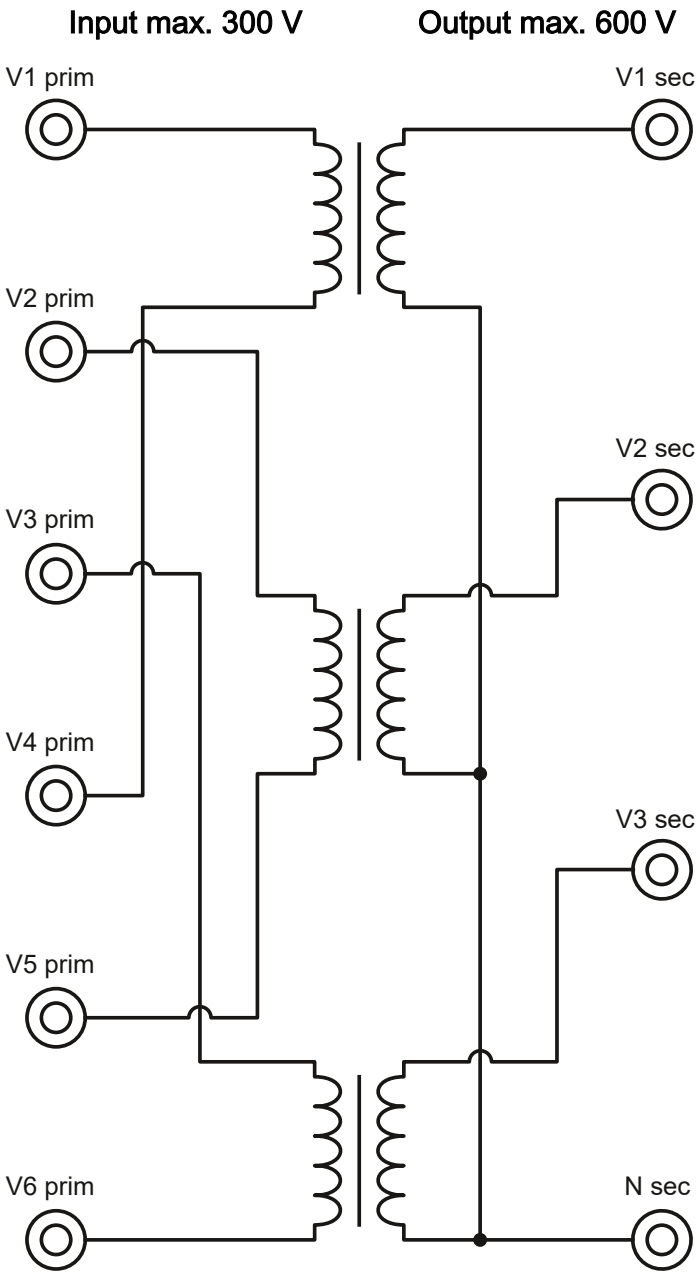
Mechanical data

Characteristic	Specification
Weight (mass)	6.3 kg (13.9 lb)
Dimensions without handle (w × h × d)	160 × 125 × 260 mm (6.30 × 4.92 × 10.24 in)

Standards

Safety	
International/Europe	IEC/EN 61010-1, IEC/EN 61010-2-030
USA	UL 61010-1, UL 61010-2-030
Canada	CAN/CSA-C22.2 No. 61010-1, CAN/CSA-C22.2 No. 61010-2-030

7.1 Circuit diagram



8 Transport

8.1 Setup with CMC 430 transport case

If you are using the *VBO3* in combination with a *CMC 430*, you can create a joint test setup with both devices in an OMICRON transport case. Simply detach the handle of the *VBO3* to conveniently use the voltage transformer without needing to take it out of the transport case.

Example:

Detaching the handle

1. Remove the two grey cover caps on both sides of the aluminium handle.
2. Remove the aluminium handle by loosening the screws.
3. Bring the two levers into a 45° position and remove them.
4. Remove the two fasteners on the left and on the right.

NOTICE

Equipment damage

The *CMC 430* transport case does not offer sufficient protection against transport damage for *VBO3* voltage transformers.

▶ Do not use the OMICRON transport case for transporting the *VBO3* voltage transformer.

8.2 Transportation with trolley/backpack

The *VBO3* is delivered with a soft bag that can be placed in a trolley/backpack together with a *CMC 430* test set. This enables you to conveniently transport your test set, voltage transformer, and additionally required accessories with one single trolley.

Example:

NOTICE

Equipment damage

The trolley/backpack and carry bags do not offer protection against drop damage.

- ▶ Do not use the trolley/backpack and soft bags for shipping CMC test sets or *VBO3* voltage transformers.
- ▶ Do not drop the trolley/backpack and soft bags when CMC test sets or *VBO3* voltage transformers are stored inside.

Support

When you are working with our products, we want to provide you with the greatest possible benefits. If you need any support, we are here to assist you.

OMICRON Support – get in touch

omicronenergy.com/support

At our support hotline, you can reach well-educated technicians for all of your questions.

Make use of our 24/7 hotlines:

Americas: +1 713 830-4660 or +1 800-OMICRON

Asia-Pacific: +852 3767 5500

Europe / Middle East / Africa: +43 59495 4444

Additionally, you can find the service center or sales partner closest to you at omicronenergy.com.

OMICRON Customer Portal – stay informed

my.omicronenergy.com

Browse through the knowledge library and find manuals, application notes, conference papers, and much more.

Download the latest software updates and learn about upcoming events.

OMICRON Academy – learn more

omicronenergy.com/academy

Learn more about your product in one of the training courses offered by the OMICRON Academy.

UK importer:
OMICRON electronics UK Limited
Staples Close
Redhill Business Park
Stafford
ST16 1WQ
United Kingdom

Manufacturer:
OMICRON electronics GmbH
Oberes Ried 1
6833 Klaus
Austria

ENU 1210 05 03