Application Note

# Testing Schneider Electric Easergy relays with sensor inputs for LPCTs and LPVTs

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# General information

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The product information, specifications, and technical data embodied in this Application Note 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 Application Note is useful, accurate and entirely reliable. However, OMICRON does not assume responsibility for any inaccuracies which may be present.

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# Table of content

# 1 Safety instructions

This Application Note may only be used in conjunction with the relevant product manuals which contain all safety instructions. The user is fully responsible for any application that makes use of OMICRON products.

Instructions are always characterized by a ▶ symbol, even if they are included in a safety instruction.

**NOTICE**

**Equipment damage or loss of data possible**

- Carefully read and understand the content of this Application Note as well as the manuals of the systems involved before taking them into operation.
- Please contact OMICRON support if you have any questions or doubts regarding the safety or operating instructions.
- Follow each instruction listed in the manuals, especially the safety instructions, since this is the only way to avoid the danger that can occur when working on high voltage or high current systems.
- Only use the equipment involved according to its intended purpose to guarantee safe operation.
- Existing national safety standards for accident prevention and environmental protection may supplement the equipment's manual.
- Before starting a test always check that the test signals are suitable for your system under test.

Only experienced and competent professionals that are trained for working in high voltage or high current environments may implement this Application Note. Additionally, the following qualifications are required:

- Authorized to work in environments of energy generation, transmission or distribution, and familiar with the approved operating practices in such environments.
- Familiar with the five safety rules.
- Good knowledge/proficient in working with CMC test sets, CMLIB A and LLX1.

# 2 Introduction

Protection relays of Schneider Electric's Easergy range are available in different versions concerning their analog inputs:

1. for conventional instrument transformers (VT, CT)
2. for LPCTs/LPVTs (low power CT, low power VT)

This application note explains the required equipment for testing the LPCT/LPVT version of these relays and how to configure such a test.

# 3 Connections at the relay

The sensor inputs of Schneider Electric Easergy relays use RJ45 connectors. As can be seen in the following picture on slot A there are five RJ45 connectors for connecting sensors.

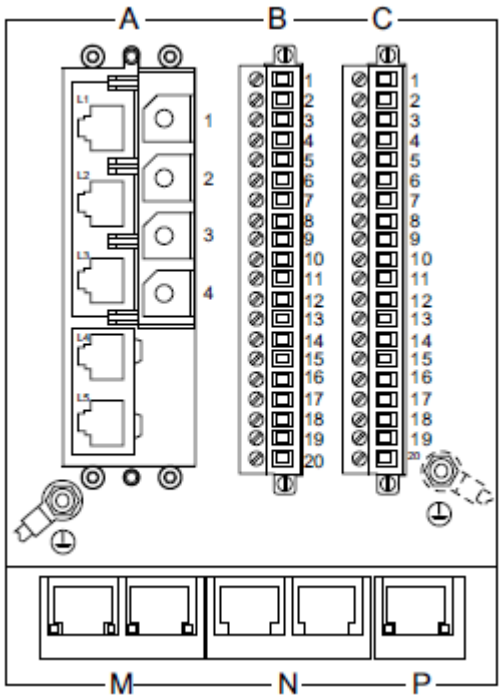



Figure 1: Easergy P5U20 rear panel (LPCT/LPVT version)

The LPCTs for IL1, IL2 and IL3 are connected directly to **RJ45-1**, **RJ45-2** and **RJ45-3**.

V1, V2 and V3 are combined to one single RJ45 connection (**RJ45-4**). To achieve this the three LPVTs are connected to a so-called LPVT hub, which then is connected to RJ45-4 using a single connection.

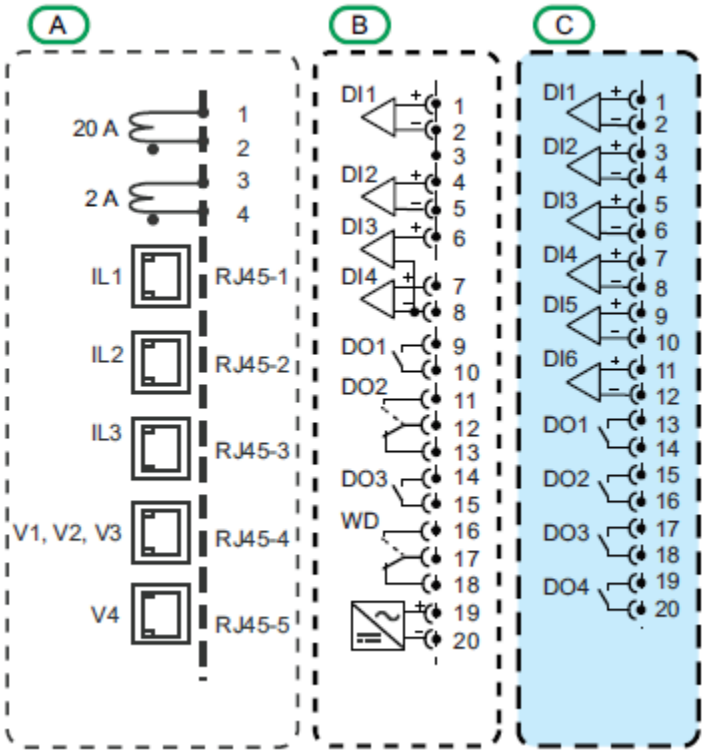



Figure 2: Easergy P5U20 (LPCT/LPVT version) rear terminal designations

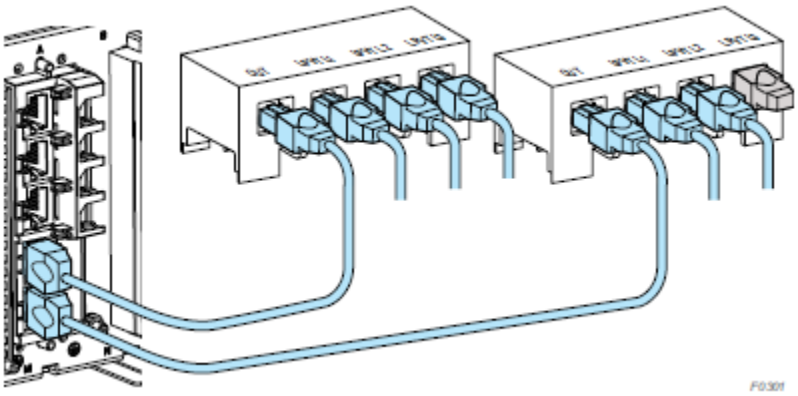


Figure 3: LPVT hub connector connected to Easergy P5 protection relay

# 4 Test equipment

## 4.1 With CMC 356, CMC 256plus and CMC 353 test sets

### 4.1.1 Required equipment

These test sets have six (12 with Option LLO-2) built-in low level outputs on the **LL out 1 – 6** interface connector that can be found on the back panel of the test set.


Figure 4: Back panel of a CMC test set with interfaces “LL out 1 – 6” and “LL out 7 – 12”

A CMLIB A and Easergy cable with corresponding pin assignment of the RJ45 connector are used to connect the low-level outputs of the CMC to the sensor inputs of a Schneider Electric Easergy relay.


Figure 5: CMLIB A

Figure 6: Easergy cable for CMLIB A

### 4.1.2 Test setup example

**Figure 102 - Connection diagram for testing the LPCT and LPVT measurement accuracy**

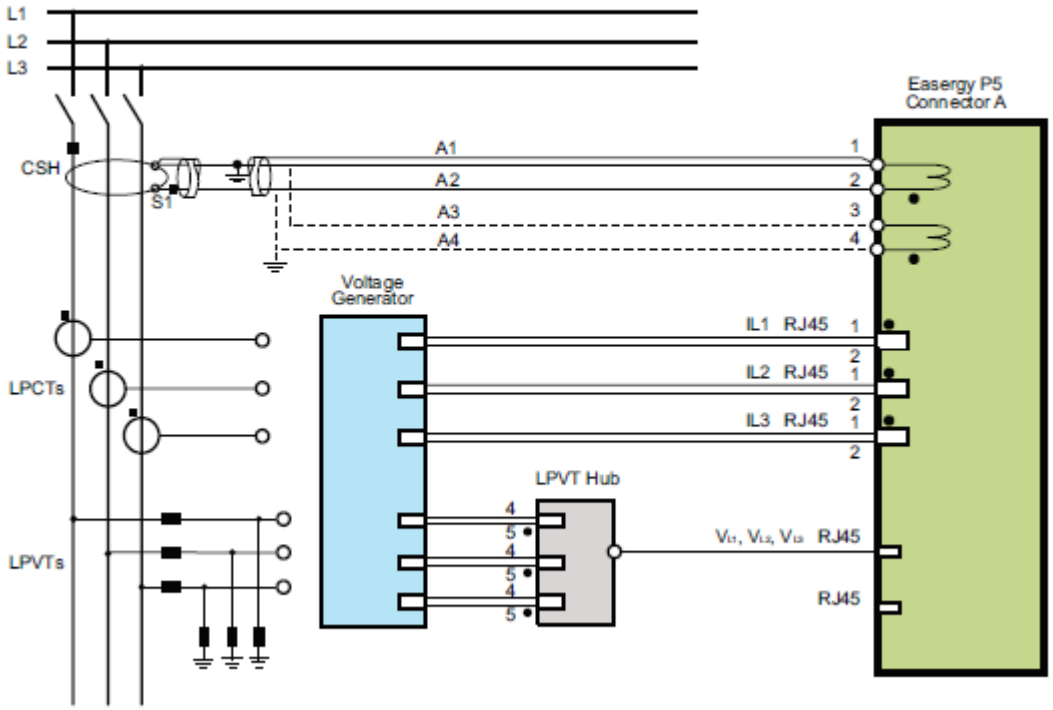



Figure 7: Connection diagram for testing from Easergy P5 User Manual

The generically shown voltage generator in the picture above is replaced by the CMC test set with CMLIB A and connections are made with the Easergy cables:

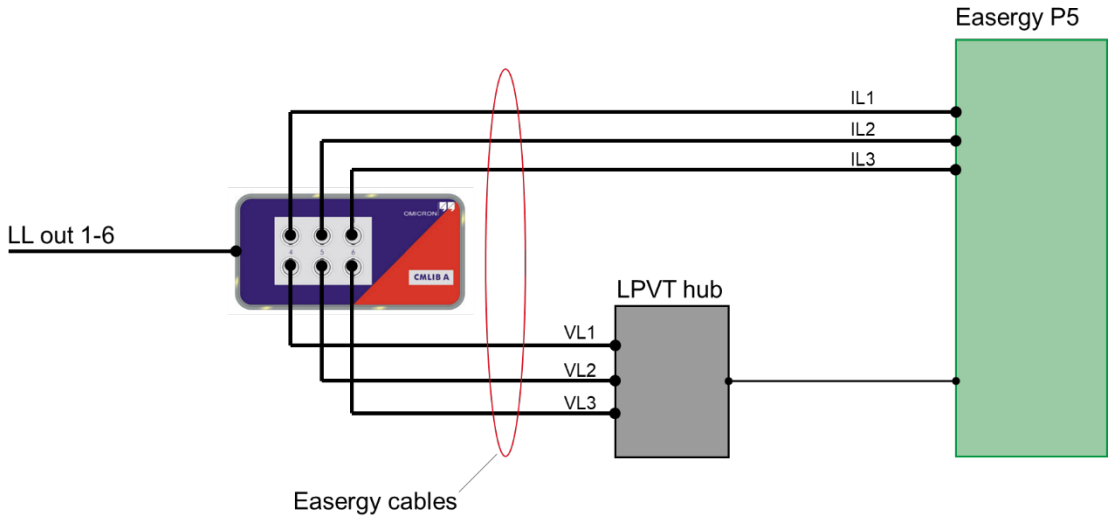



Figure 8: Test setup with CMLIB A and Easergy cables

## 4.2 With CMC 430 test sets

### 4.2.1 Required equipment

LLX accessory units are used to expand CMC 430 test sets with six low level outputs. They are connected to one of the CMC 430s expansion ports, which powers and controls them.

LLX1 is the right choice for testing devices with sensor inputs (such as Schneider Electric Easergy protection relays). A wide range of cables are available for easily connecting LLX1 to different devices that have specific connectors and pinouts.


Figure 9: LLX1 accessory unit

Cable type LSE2 is available for testing Schneider Electric Easery protection relays:

| Cable type | Suitable for | Connector type | Order no. |
|---|---|---|---|
| LAB1 | ABB Relion | RJ45 | VEHK0306 |
| LAB2 | ABB REF542plus | 2 x Twin-BNC | VEHK0307 |
| LSI1 | Siemens Siprotec Compact | RJ45 | VEHK0308 |
| LSE2 | Schneider Electric Easergy | 2 x RJ45 | VEHK0311 |

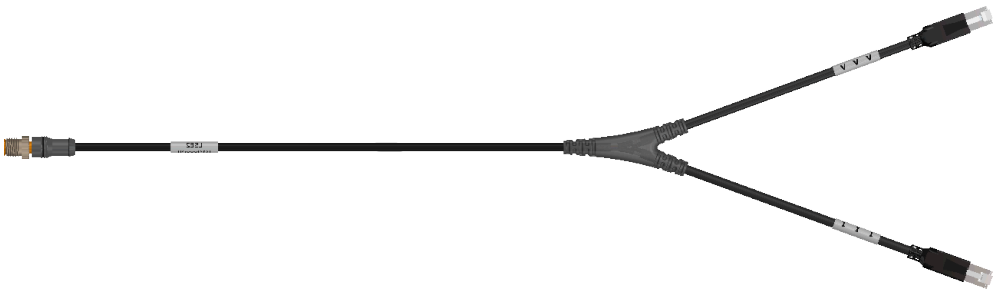


Figure 10: LSE2 test cable

### 4.2.2 Test setup example

LSE2 test cables have two ends with RJ45 connectors in order to connect to the separate LPVT and LPCT input connectors of the respective phases:

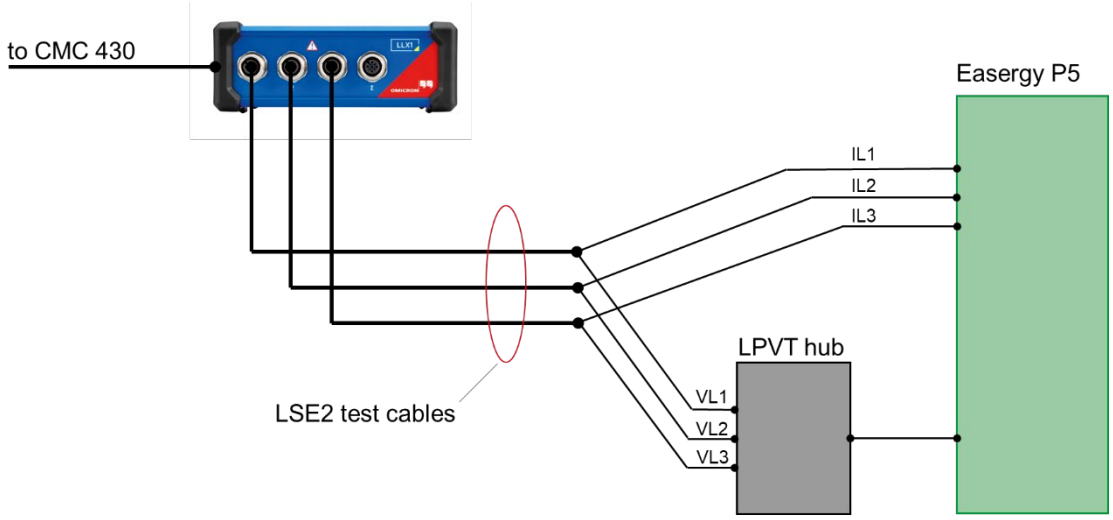



Figure 11: Test setup with LLX1 and LSE2 test cables

# 5 Test configuration

## 5.1 Test object

While with conventional VTs and CTs it is very common to work in secondary voltages and currents, this is not the case when working with sensors. Instead it is recommended to work completely with primary values. Therefore set “V nom (secondary)” and “I nom (secondary)” to the same value as the primary counterparts. Do not forget to adapt the limits to primary values as well!

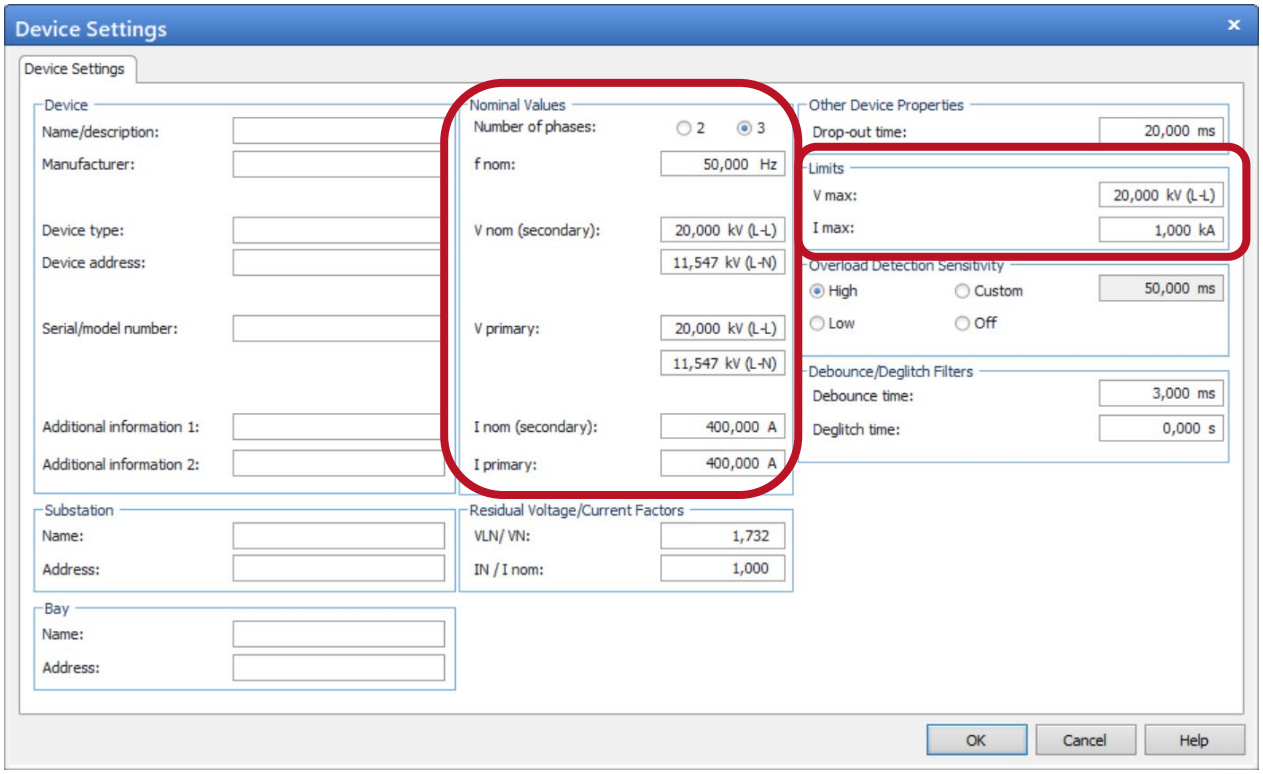
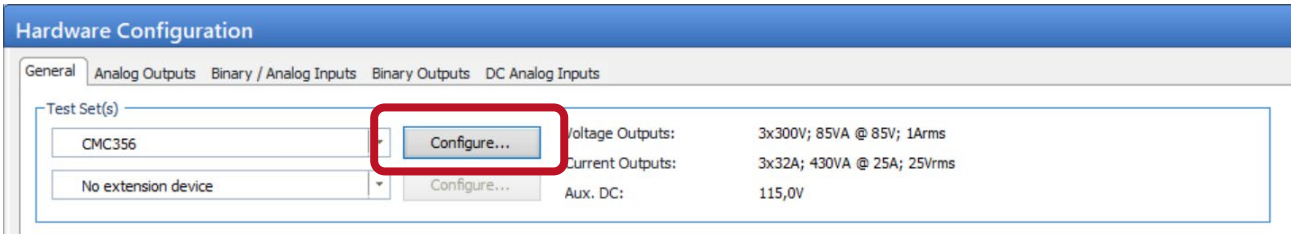


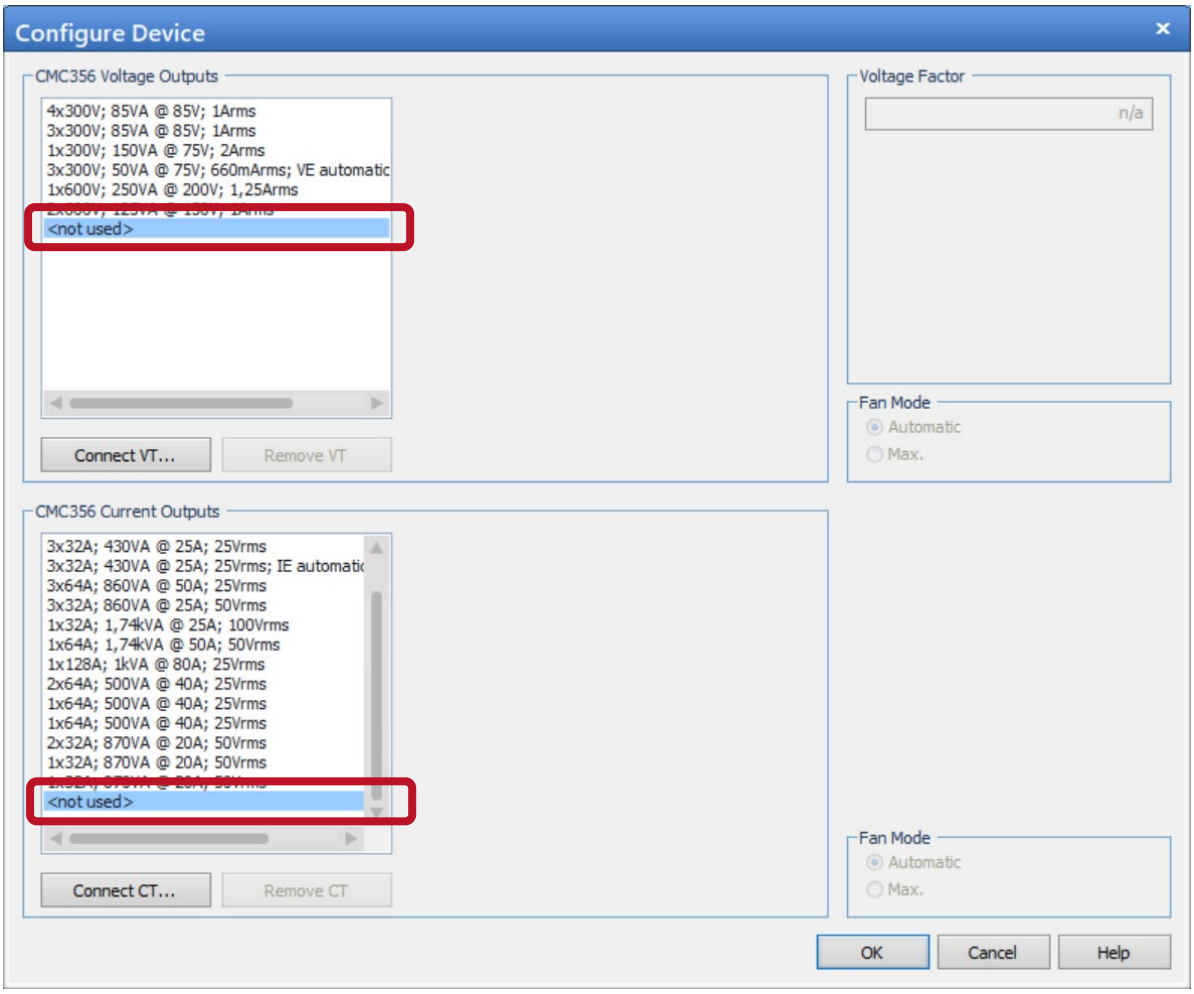

Figure 12: Device settings with configured Nominal Values and Limits

## 5.2 Hardware configuration

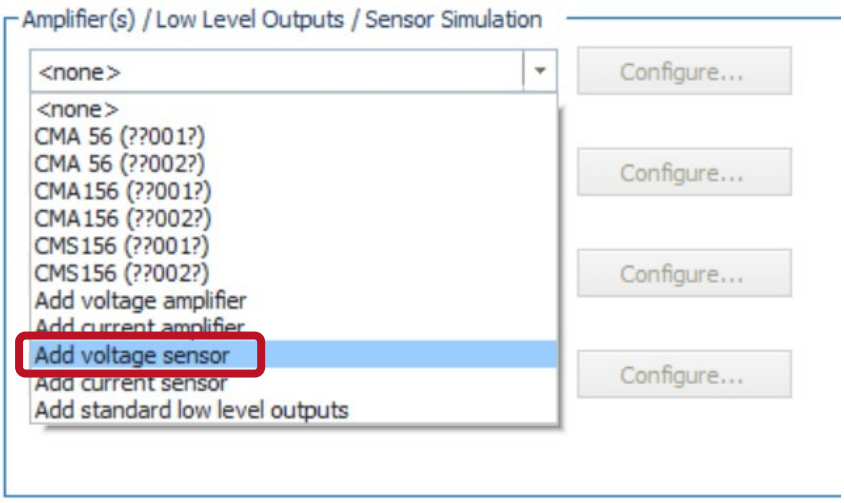
### 5.2.1 With CMC 356, CMC 256plus and CMC 353 test sets

- First, it is recommended to deactivate the voltage and current outputs of the test set. To do so hit the button “Configure…” next to the test set and then set the outputs to “<not used>”:

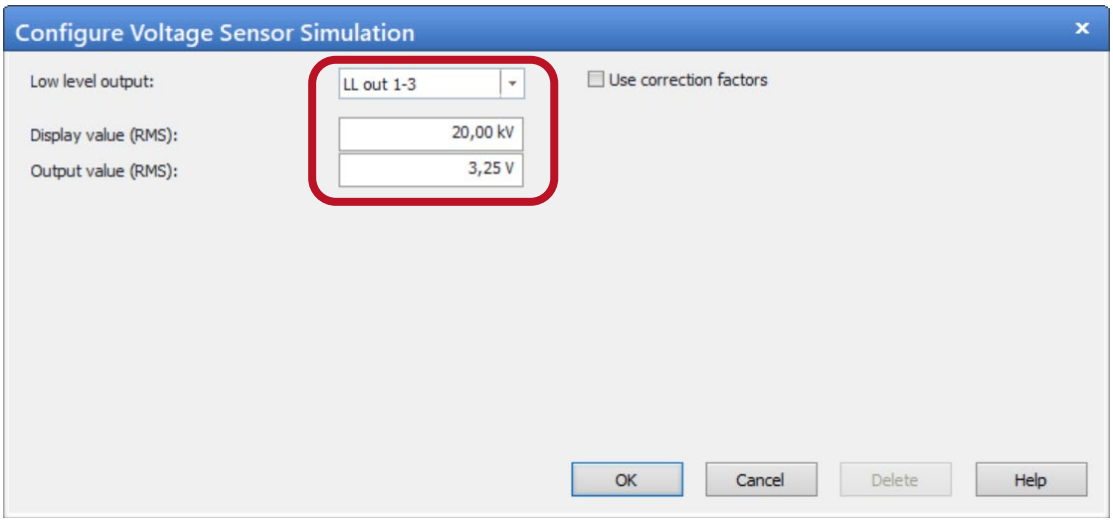




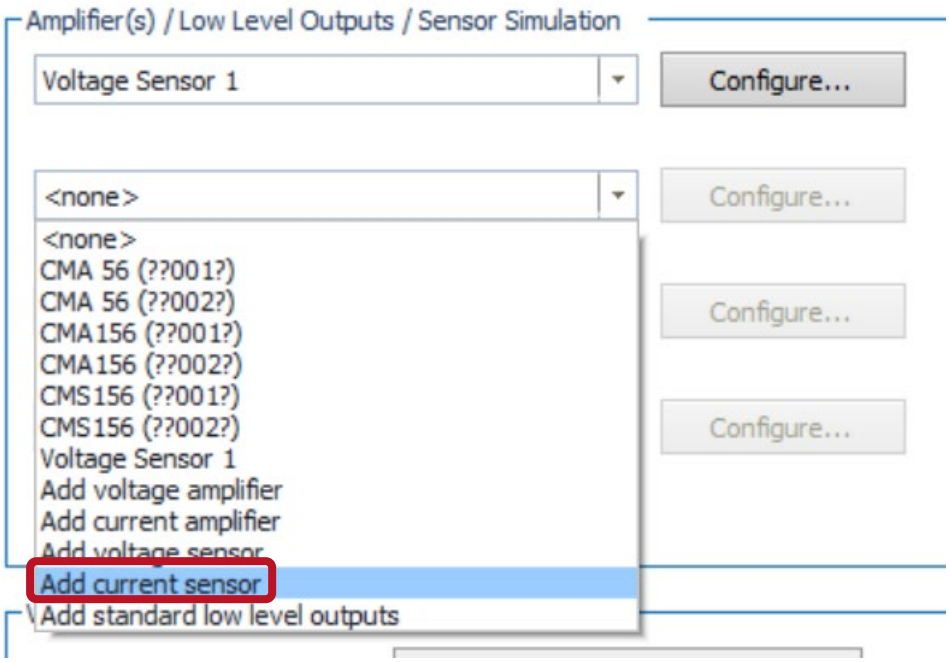

▶ Then you can configure the voltage and current sensors at „Amplifier(s) / Low Level Outputs / Sensor Simulation". Click the first drop-down and select "Add voltage sensor":



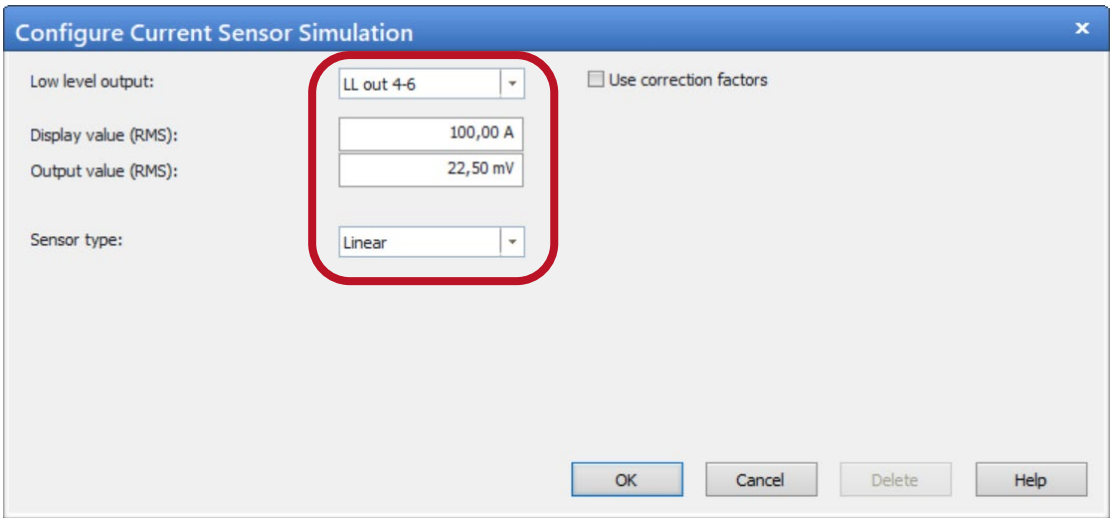
- The dialog for configuring the voltage sensor will open. At “Low level output” select “LL out 1-3” and enter the ratio of the LPVT:




- The configuration of the current sensor is done in a very similar way. Click the second drop-down and select “Add current sensor”:

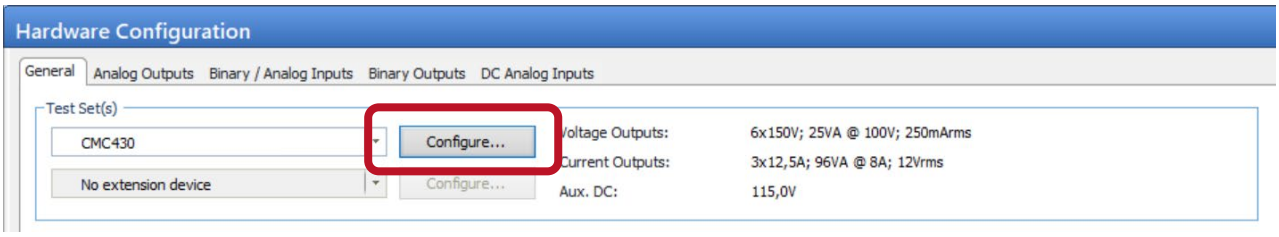


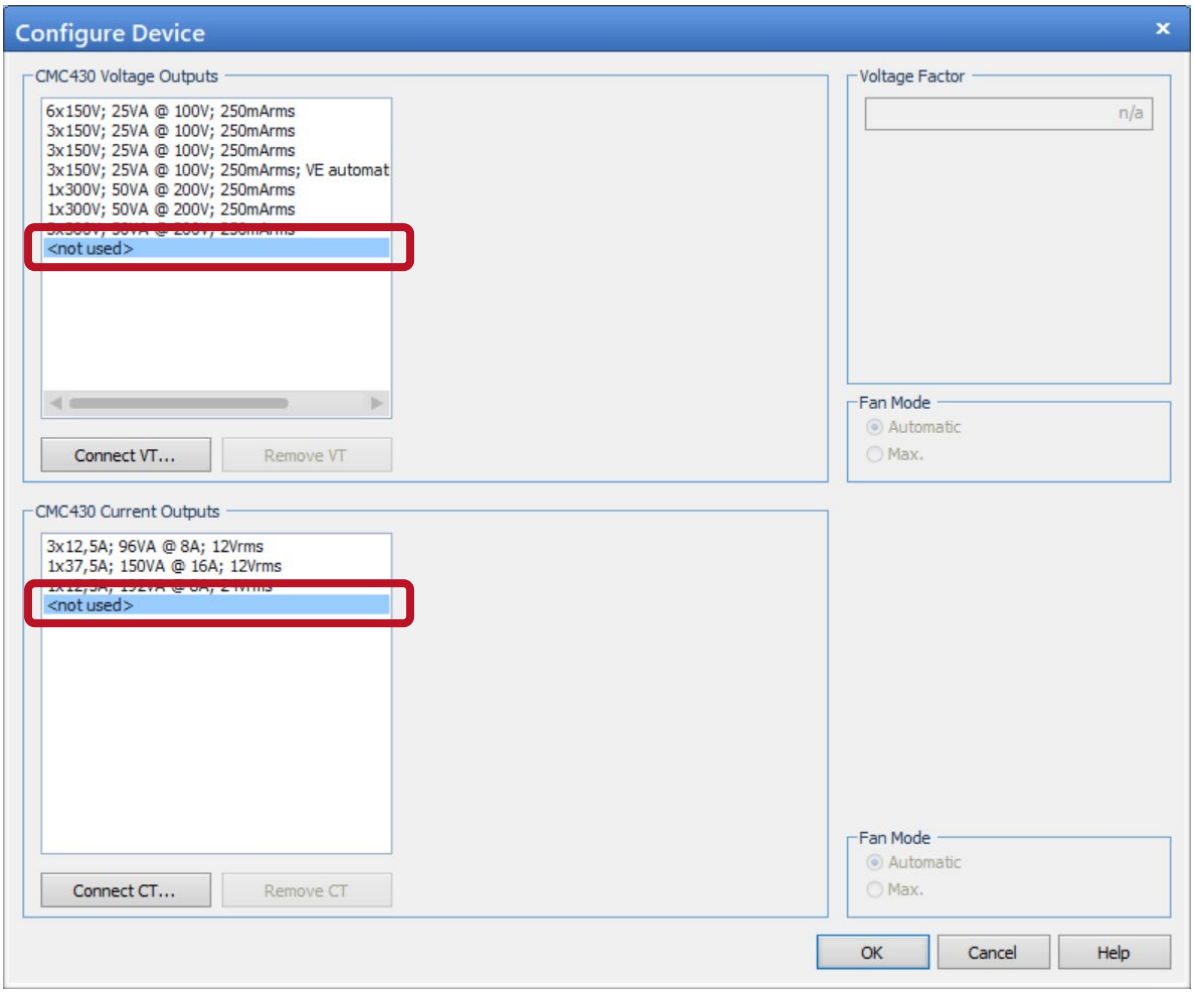

- The dialog for configuring the current sensor will open. At “Low level output” select “LL out 4-6” and enter the ratio of the LPCT. Additionally, select the sensor type “Linear”:



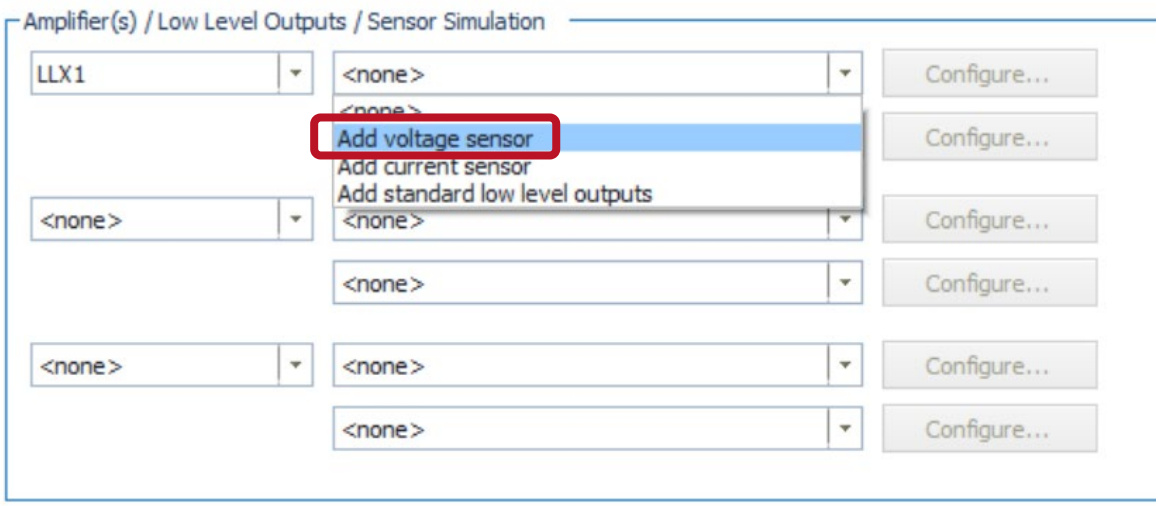

### 5.2.2 With CMC 430 test sets

- First, it is recommended to deactivate the voltage and current outputs of the test set. To do so hit the button “Configure…” next to the test set and then set the outputs to “<not used>”:

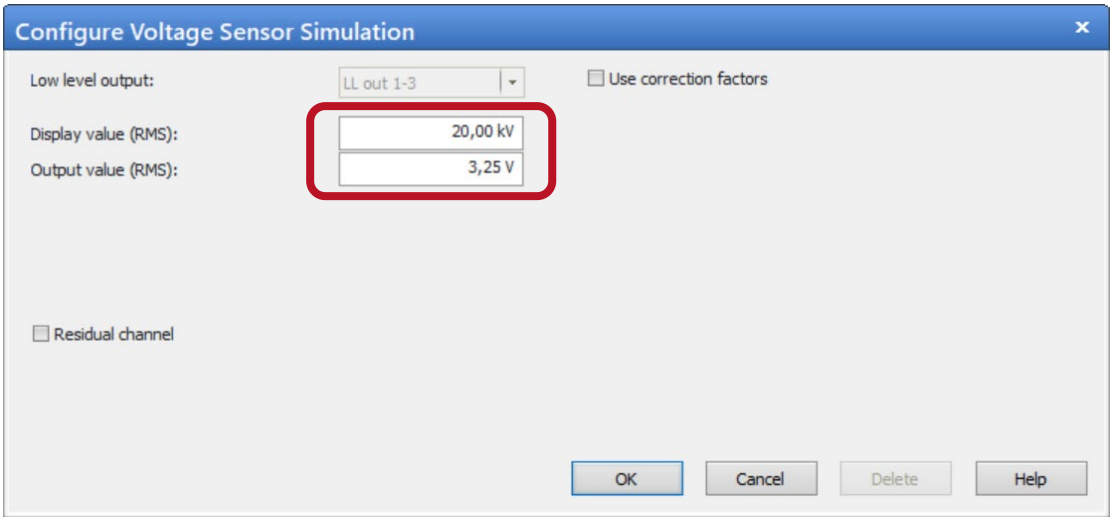




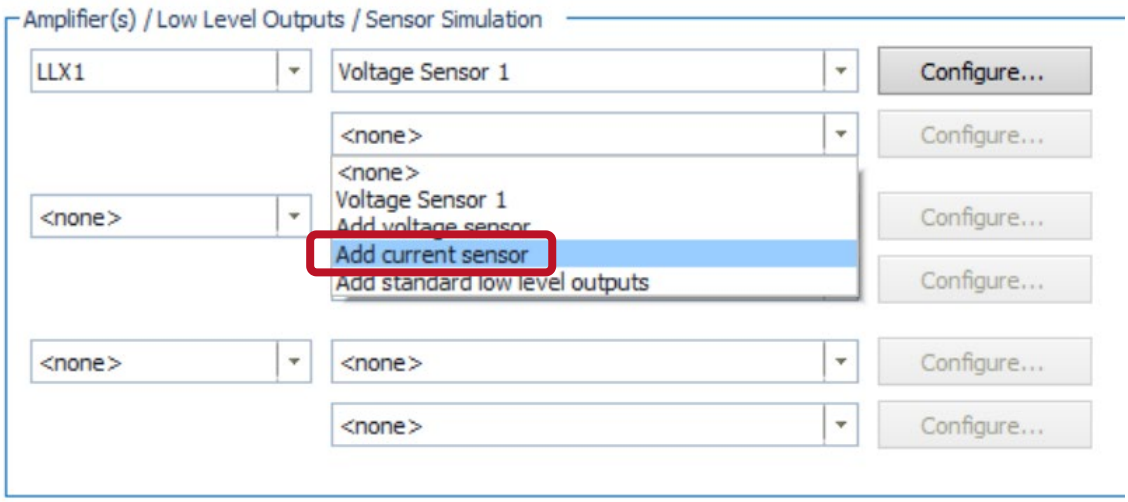

▶ Then you can find LLX1 at „Amplifier(s) / Low Level Outputs / Sensor Simulation". Click the first drop-down next to it and select "Add voltage sensor":



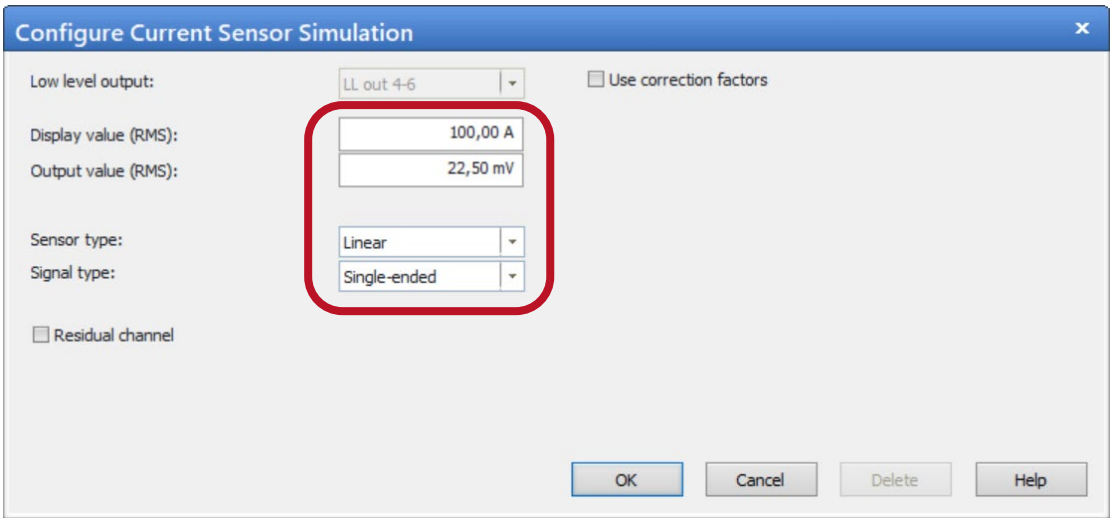
▶ The dialog for configuring the voltage sensor will open and you can enter the ratio of the LPVT:




▶ The configuration of the current sensor is done in a very similar way. Click the second drop-down and select “Add current sensor”:

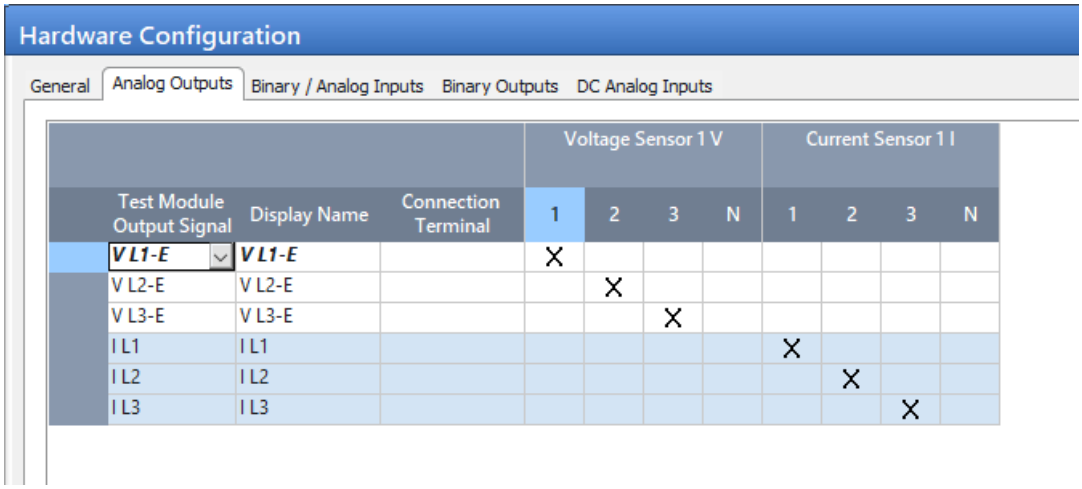



▶ The dialog for configuring the current sensor will open and you can enter the ratio of the LPCT. Additionally, select the sensor type “Linear”. For the signal type “Single-ended” is the correct choice for Schneider Electric Easergy devices:




### 5.2.3 Routing of analog outputs

Don’t forget to go to the Analog Outputs tab to check if all your defined sensor outputs are routed properly:



# 6 List of literature

[1] Schneider Electric, 2019, *Easergy P5 User Manual*, Version P5/EN M/22A

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