Technology Arts Sciences TH Köln

Practical Project

Commissioning of a synchronous unit Siprotec 7VE61

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1. Motivation

This practical project involves the synchronization of an existing synchronous machine with the integrated grid. This should be done with a synchronous unit 7VE61 from Siemens.

2. Siprotec 7VE61

2.1 General Information

The Siprotec 7VE61 is a device for synchronizing twosome grids. It compares these grids' phase voltage, phase and frequency. The tolerance can be set in the Digsi V4.92 program. Furthermore, the rotating field of the respective grid can be detected and messages about the respective process of synchronization externally detected via the seven front LEDs or via one of the binary outputs on the device.

2.2 Explaination of the Siprotec 7VE61 Display

Figure 1 : Siproetc 7VE61 Display

Figure 1 shows the main display of the Siprotec 7VE61, which consists of two columns with four rows each. The following Table 1 explains the respective abbreviations.

U1	The applied voltage at the measuring coils U_a and U_b.	f1	The frequency of the network at the measuring coils U_a and U_b
U2	The applied voltage at the measuring coils U_d and U_e.	f2	The frequency of the network at the measuring coils U_d and U_e
dU	The voltage difference of U1 and U2 (dU = U2 - U1).	df	The frequency difference of network 1 and network 2 (df = f2 - f1).
dα	The phase-shifting between U1 and U2 (dα = α2 – α1).	FG	Notification of the selected function group (Function group 1).

Table 1 : Abbreviations of the main display of the Siproetc 7VE61 [1]

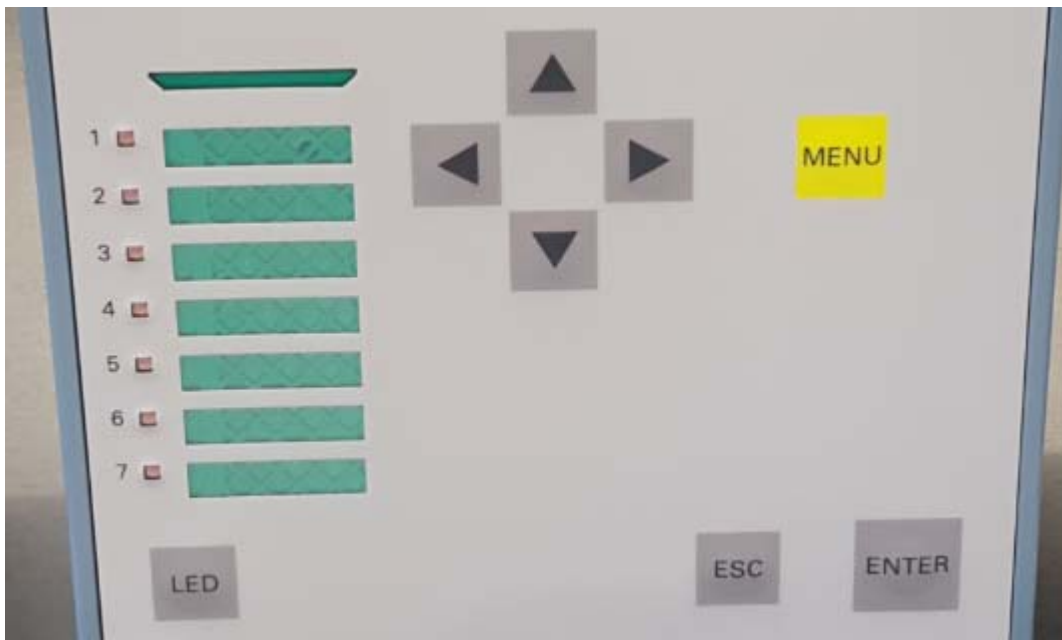## 1.3 Description of the LEDs and selection buttons

Figure 2 : LED and selection buttons [1]

Figure 2 shows the seven LEDs and the LED button on the left. This button resets the LED signal. In the middle of the console are the four arrow keys. In the upper right corner is the MENU key (highlighted in yellow). At the bottom right is the ESC key next to the ENTER key. The following table shows the LED functions.

1	No function
2	No function
3	Measurement procedure of function group 1 is working
4	Measurement procedure of function group 1 has a fault.
5	Frequency difference is ok.
6	Voltage difference is ok.
7	Phase angle is ok

Table 2 : LED function

1.3 Description of the interface, function keys and number pad

Figure 3 : Interface, function keys and number pad [1]

The interface establish a direct communication between the sync unit and the computer. In the middle are the function keys with preprogrammed function (Table 3).

F1	Display procedural message.
F2	Display secondary measurement.
F3	Display last fault message.
F4	Menu reset

Table 3 : function keys
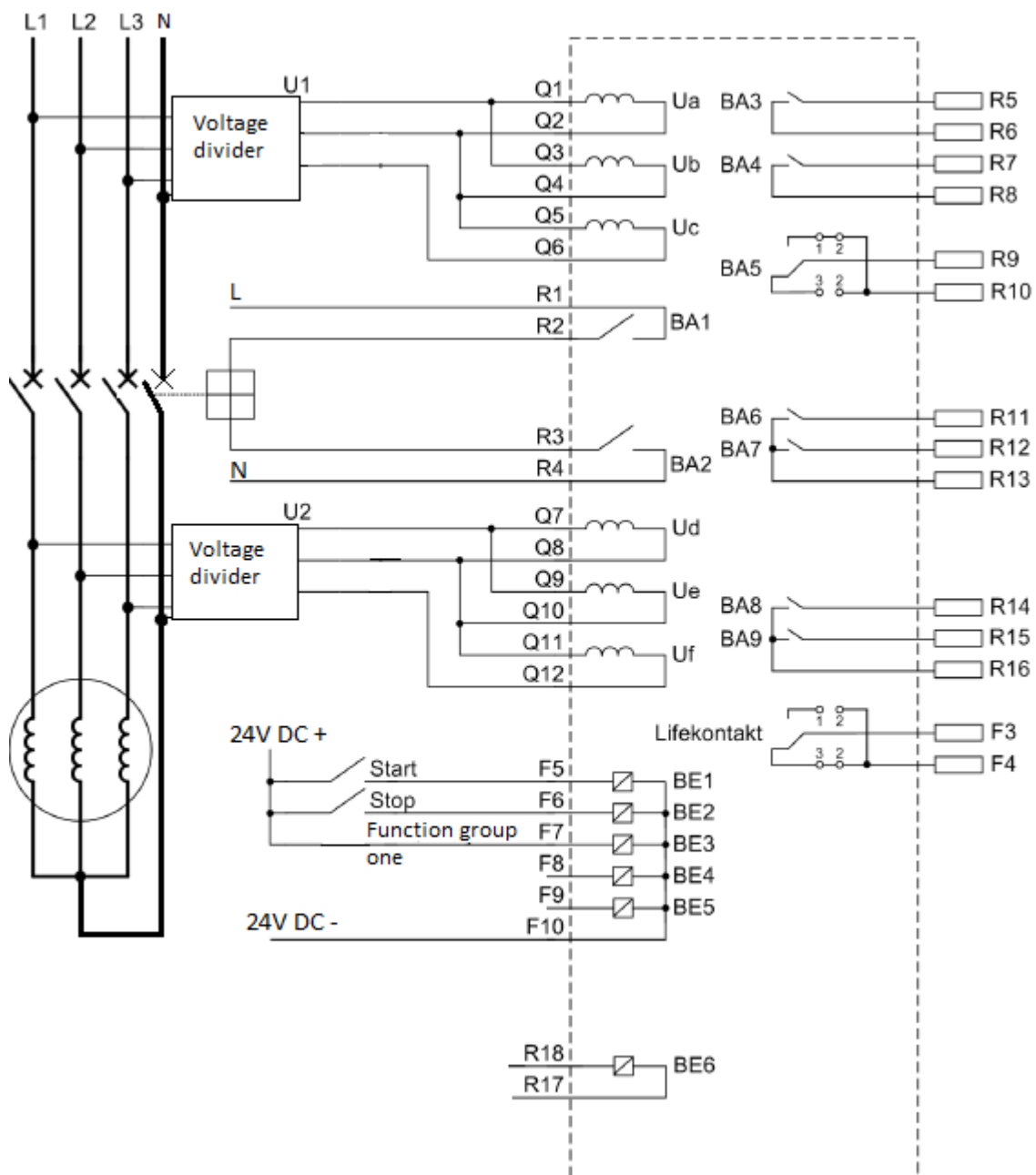
1.4 Wiring diagram

Figure 4 : Wiring diagram of a Siprotec 7VE61 [2]

The plan of terminal connections for the Siprotec 7VE61 is shown in Figure 4. At the measuring coils clamps the voltage divider. The measuring coils operate witch a chained voltage between L1, L2 and L3. The voltage divider needs the neutral conductor of the networks. The contactor is connect between the two binary outputs BA1 and BA2. It is necessary to install a self-holding for the contactor , which is not shown here. The start signal for the measurement is controlled via the binary input BE 1. The measurement stops via the binary input BE 2. A permanent 24 V direct current (DC) is connected to the binary input BE 3 to select the first function group. The remaining binary outputs are not connected but can be used for external messages or external control.
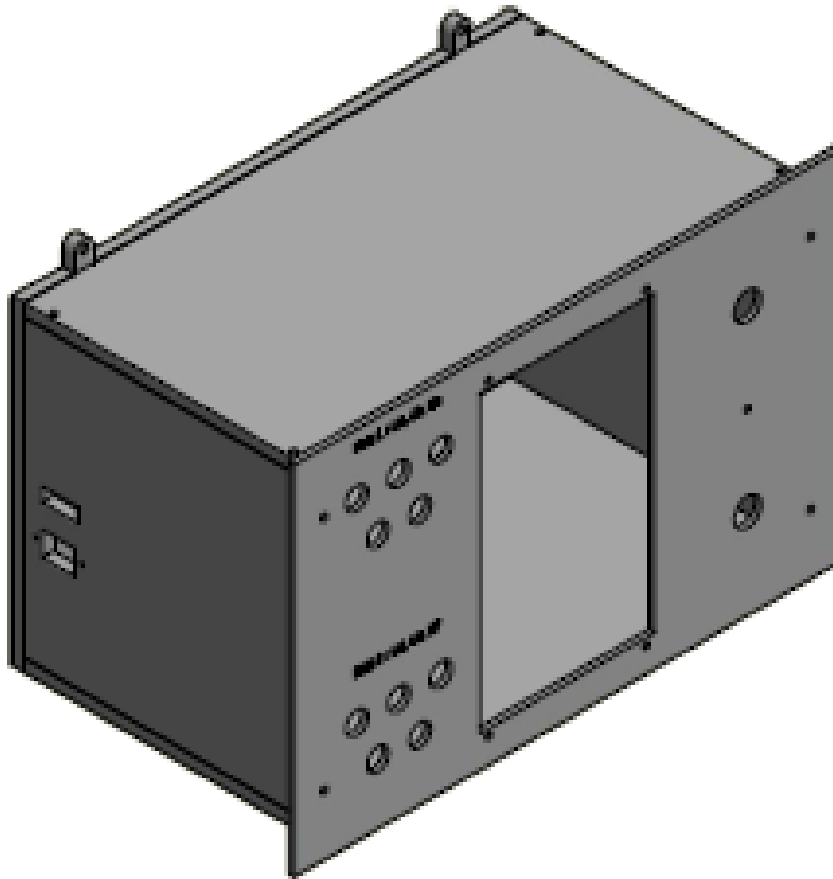
2 Enclosure

Figure 5 : Enclosure for Siprotec 7VE61 [1]

The construction of the enclosure (Figure 5) was chosen to ensure that all components are installed inside. The enclosure can be used for two different systems. The first system is a sliding system in which the front panel can be installed. For the second system the rear is mounted on wooden plates with screw holes. The front panel consists of a 5 mm wide piece of aluminum in which holes for the components are provided. The remaining components consist of 10 mm PVC pieces.

3. Completion and future prospects of the project

The requirements of this project were a compact housing with space for all components and two mounting options for a rail system at the front and a wooden plate at the rear. However, the heat development in the housing has to be considered , since no ventilation slots are included. This heat development can be investigated by a long-term test. The Siprotec 7VE61 is programmed only for the synchronization. This does not include external signaling, which can be programmed and connected at any time.

4. Source

[1] : Own representation

[2] : Based on a circuit diagram from the manual 7VE6xxx_Manual_A3_V041003_.de Page 251