Generator Wizard

Instruction booklet

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Version: 1.00 EN

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Changes	- The first revision of the booklet

DISCLAIMER

Please read these instructions carefully before using the equipment or taking any other action with respect to the equipment. Only trained and qualified persons are allowed to perform installation, operation, service, or maintenance of the equipment. Such qualified persons have the responsibility to take all appropriate measures (such as the use of authentication, encryption, and anti-virus programs, safe switching programs, etc.) necessary to ensure a safe and secure environment and the usability of the equipment. The warranty granted to the equipment remains in force only provided that the instructions contained in this document have been strictly complied with.

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1 INTRODUCTION

The Generator Wizard is an advanced setting tool integrated into the AQtivate 200 setting and configuration tool. The Wizard can be used to generate settings to Arcteq's generator protection relays (for example, AQ-G215 and AQ-G257A). A variety of generator-related information, such as application and CT data, is the basis that the Wizard uses to build suitable setting parameters to your relay.

Using the Generator Wizard offers various benefits:

- It is easy to install and easy to use.
- It makes it easy for you to write application and CT settings to your relay.
- It presents direct feedback from the installation.

The basic function of the Generator Wizard is to calculate certain output results based on given input values. It combines data from your application and from all the CTs connected to the application, and calculates the rated armature current and the underexcitation functionality values.

2   GETTING STARTED

2.1   Requirements

In order to download and upload configurations into and from your device, you first need to establish communication with it. This requires that you have a standard RJ-45 cable as well as at least one (1) free Ethernet port in your PC. Please make sure that your firewall and anti-virus protection programs allow AQtivate 200 to connect to the PC and freely use its Ethernet ports.
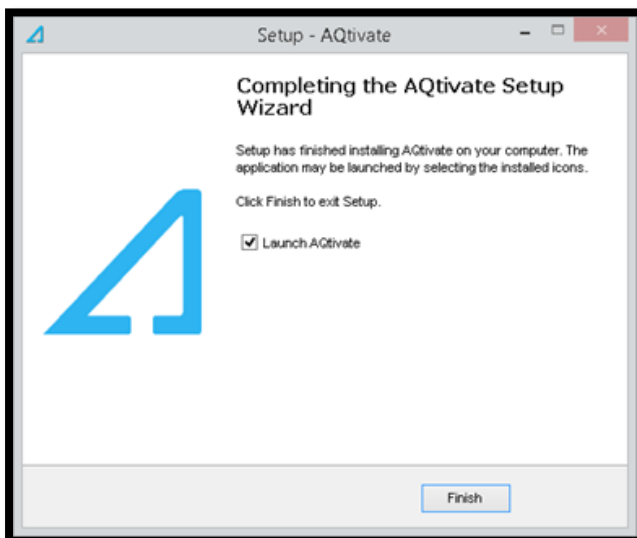
2.2   Installing the AQtivate 200 software suite

First, download the latest software installation file for AQtivate 200 from our website at arcteq.fi/documents-and-software, from the "Software" section. The software suite is free of charge. Please note that downloading requires that you log in to the Arcteq website. If you do not have a username to log in, you can create one at the top-right corner of our website. This is also free of charge.

When you have downloaded the installation files, launch the AQtivate Offline Installer .exe file (please note that this requires you to have administrator rights to the PC). First, the installer asks you to select the language that you would like to use during the installation process. Next, follow the step-by-step instructions provided by the AQtivate Setup Wizard to finish installing the software (*Figure 2–2*): select a destination for the software, select a place for the program's shortcuts, choose whether you want a desktop icon, and finally start the installation process by clicking **Install**.

When AQtivate 200 has been successfully installed, a pop-up window (*Figure 2-1*) will appear to prompt you to finish the installation process by clicking the **Finish** button in the window.

*Figure 2-1. Finishing the AQtivate 200 installation process.*

> ⚠ Please note that the installation process may be halted by your cybersecurity protections! If they detect the software suite, select to allow the connection to the PC. You may also manually whitelist AQtivate 200 on a list of programs allowed to have a connection to the PC.

3   CONNECTING TO A DEVICE

You can establish a connection between AQtivate 200 and your device by typing the relay's IP address to the Connect field at the top of the AQtivate 200 window (*Figure 3-1*) and then clicking **Connect**.

Figure 3-1. Connecting AQtivate 200 to a relay.
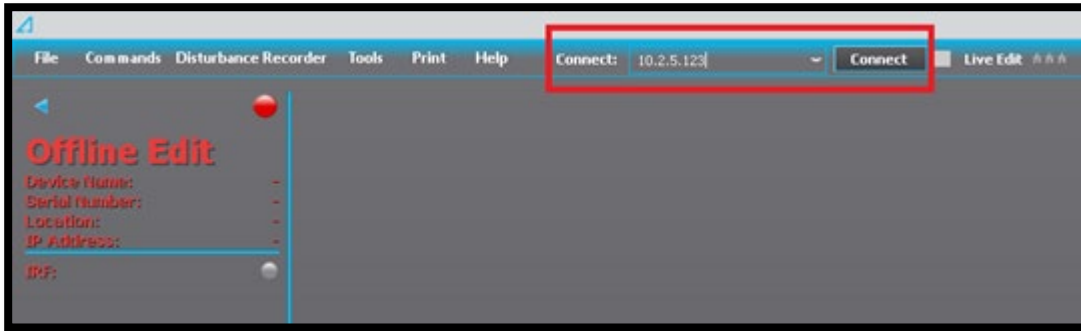
You do not have to be connected to a device in order to use the Generator Wizard as it can also be used offline. You can store and open any project at any time. However, when you want to write your settings to the relay, you must have a connection between AQtivate 200 and your device.

> ⚠ Please note that establishing a connection to your protection device with the AQtivate 200 setting tool requires that the following ports must be open: 20, 21, and 1551. If the software cannot connect to your device, please check the settings in your firewall and anti-virus software suites.

> ⚠ Each Arcteq protection relay is equipped with two (2) RJ-45 ports: one is at the front of the device, the other at the back. Both can be used to connect the relay to AQtivate 200. Please note that only the back port can be used for upgrading the device's firmware and for communication protocols. For more information on the ports, please refer to Chapter 3.3 in the AQtivate 200 instruction manual!

4 BASIC OPERATIONS

4.1 Opening the Generator Wizard

You can open the Generator Wizard tool from the AQtivate 200 software. Open the *Tools* menu on the software's main toolbar and select "Wizard" (*Figure 4-1*).

*Figure 4-1. Opening the Wizard selection window.*
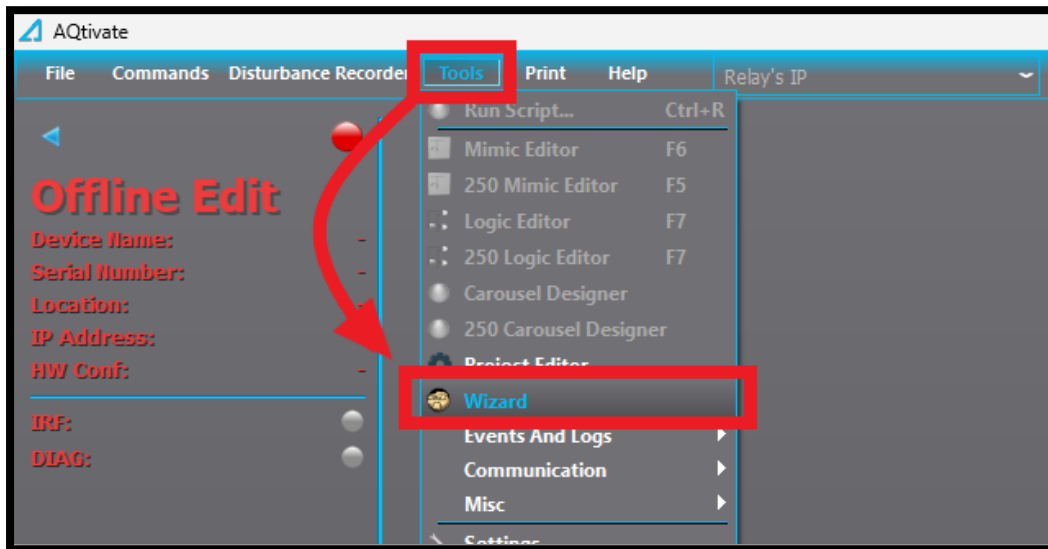
This opens the wizard selection window, allowing you to choose which integrated wizard tool you want to use. For the Generator Wizard, select "Generator" (*Figure 4-2*).

Figure 4-2. Selecting the Generator Wizard.
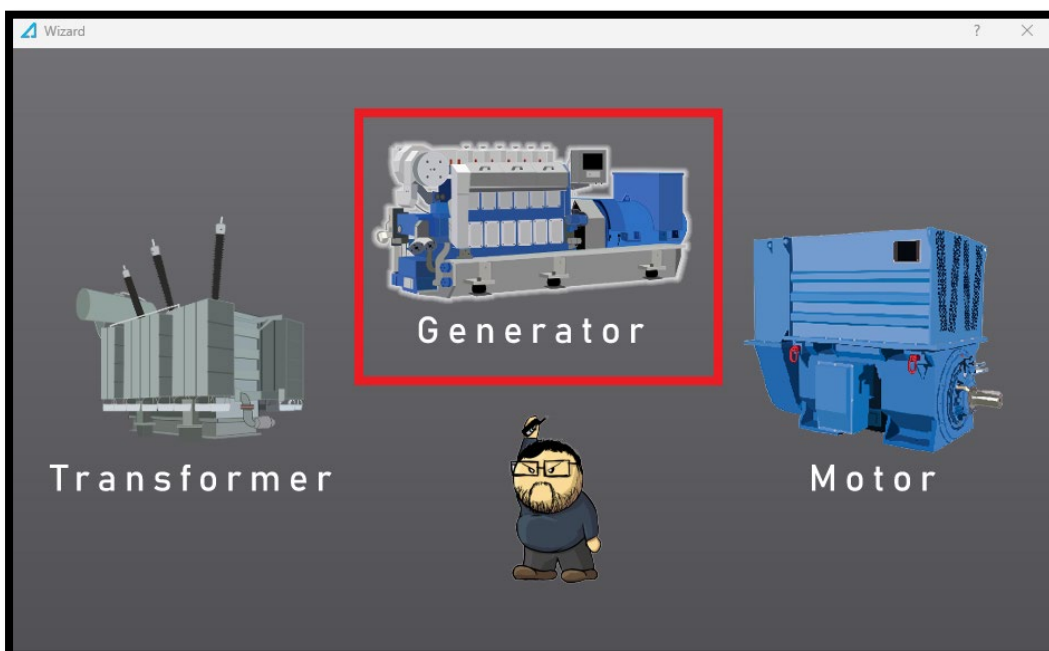
Before you can access the Wizard itself, you need to acknowledge the disclaimer pop-up window (*Figure 4-3*) by clicking the **Close** button. You can also choose whether the disclaimer message will be shown in the future when you open the Wizard by tapping or untapping the checkbox titled "Show this message again".
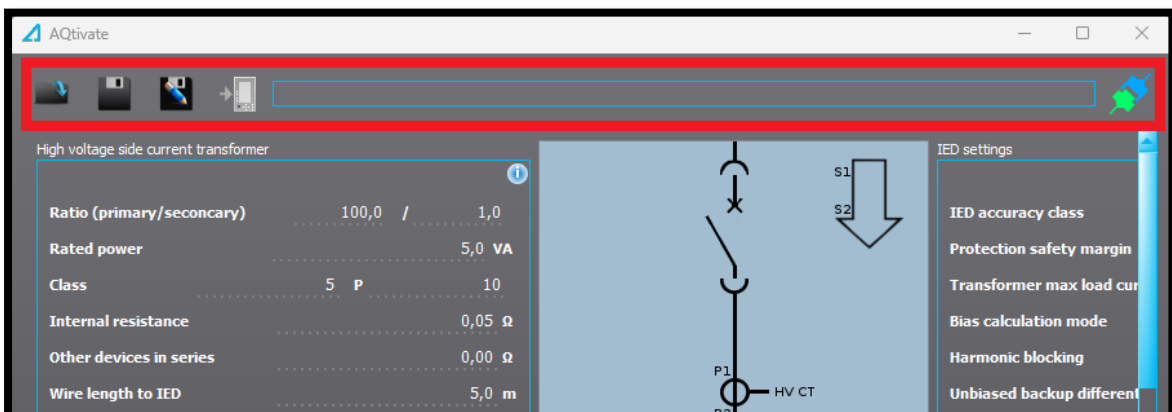
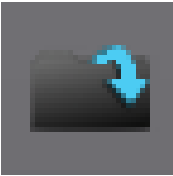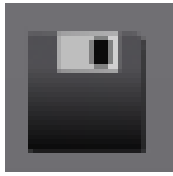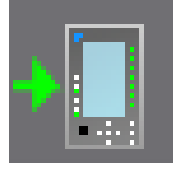*Figure 4-3. The Disclaimer pop-up window.*
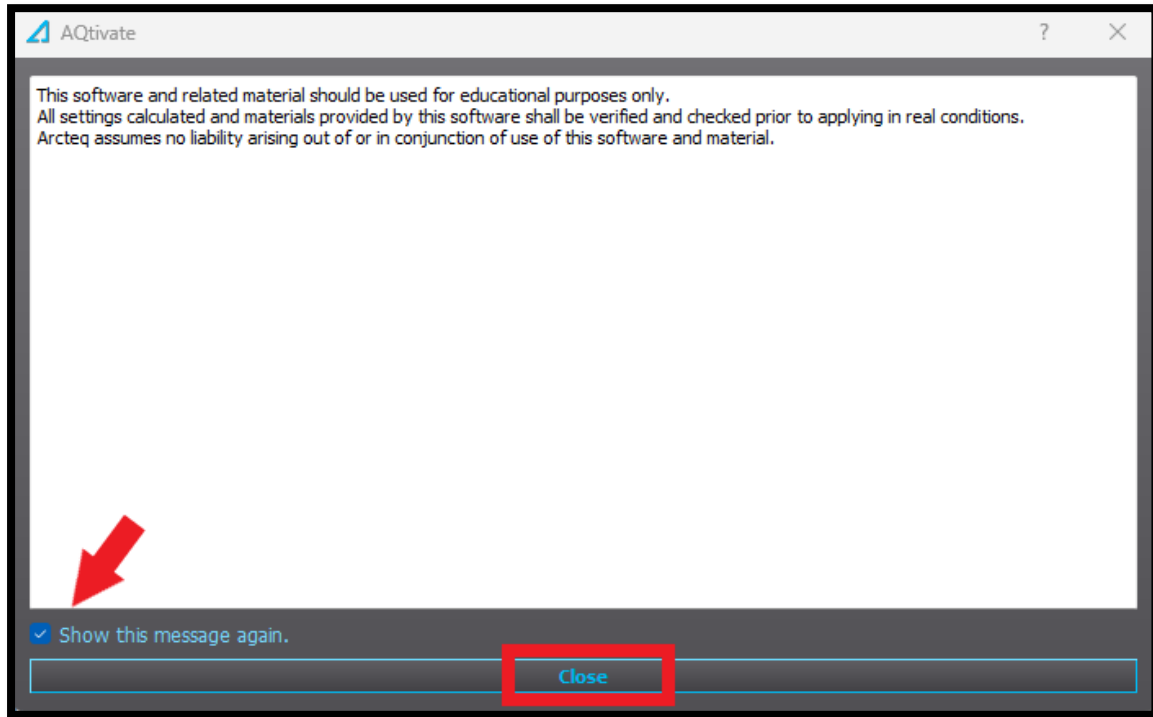
4.2 Toolbar buttons
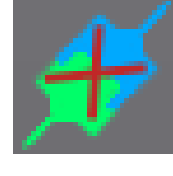
The Generator Wizard window's default view includes a toolbar at the top of the window (*Figure 4-4*).

Figure 4-4. The main toolbar.

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The buttons in the toolbar are explained in *Table 1* below.

Table 1. The toolbar buttons and their descriptions.

Toolbar icon	Name	Description
	Open	Open an existing wizard file (*.aqwz).
	Save	Save changes.
	Save as…	Save a wizard file (*.aqwz) to the selected location under the selected name.
	Write into relay	Write the calculated values of the Wizard into the connected relay. **If you are <u>not</u> connected to a relay, this icon is colored in grayscale!**
	Connect	Connect to a relay.
	Disconnect	Disconnect from the connected relay.

4.3 Visualizations for application settings and generator protection

The Generator Wizard has a separate application view (*Figure 4-5*) at the center of the Wizard window. It follows the application settings, and makes it easier for you to get a fuller picture of your generator protection.

Figure 4-5. Application view.
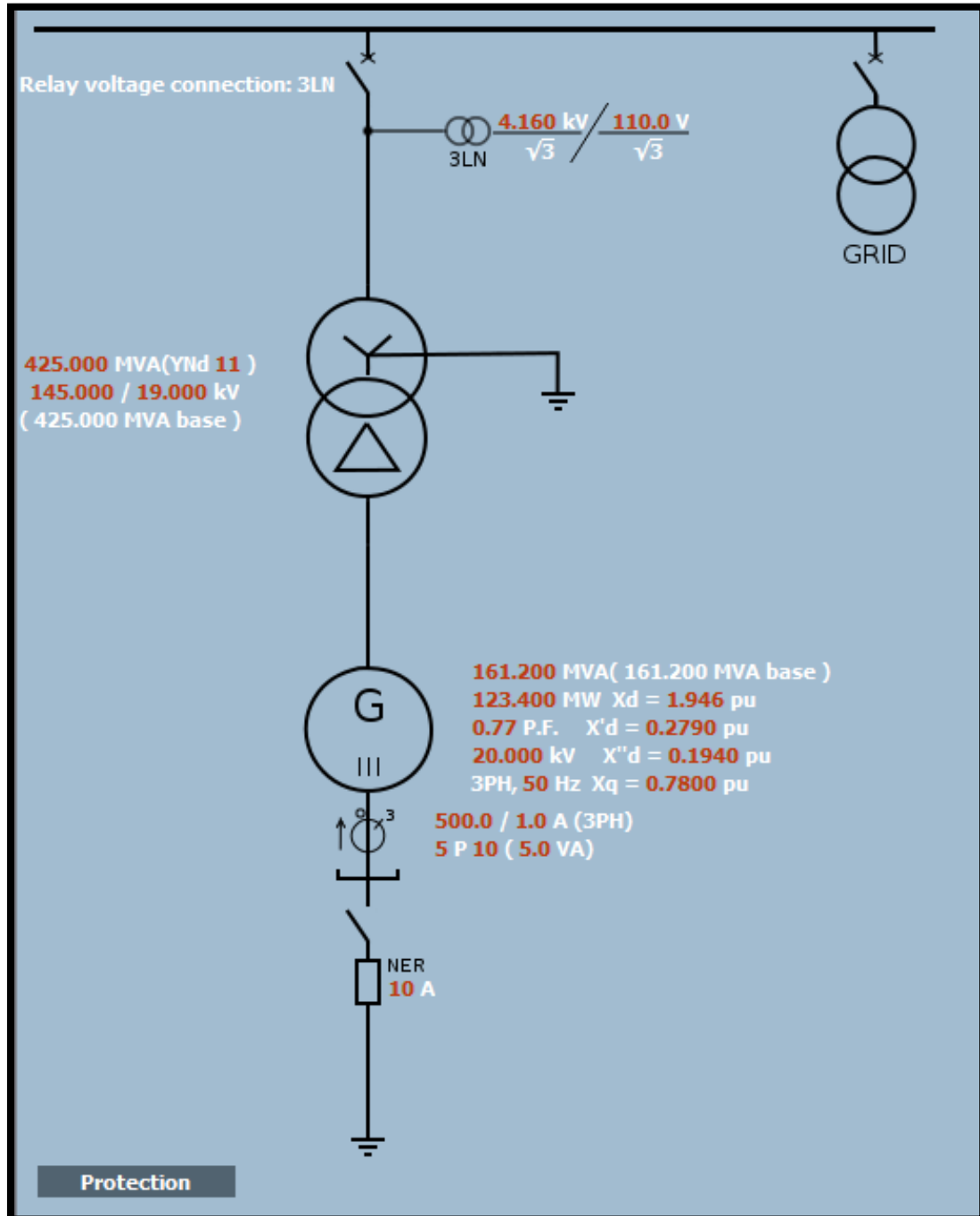
The Wizard includes two additional visualizations: one for the rated armature current (*Figure 4-6*) and another for the underexcitation function (*Figure 4-7*).

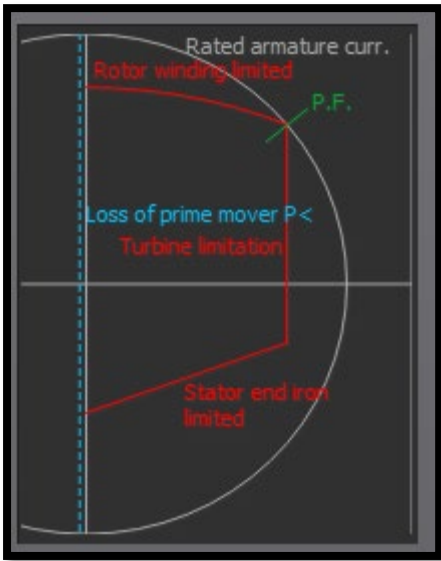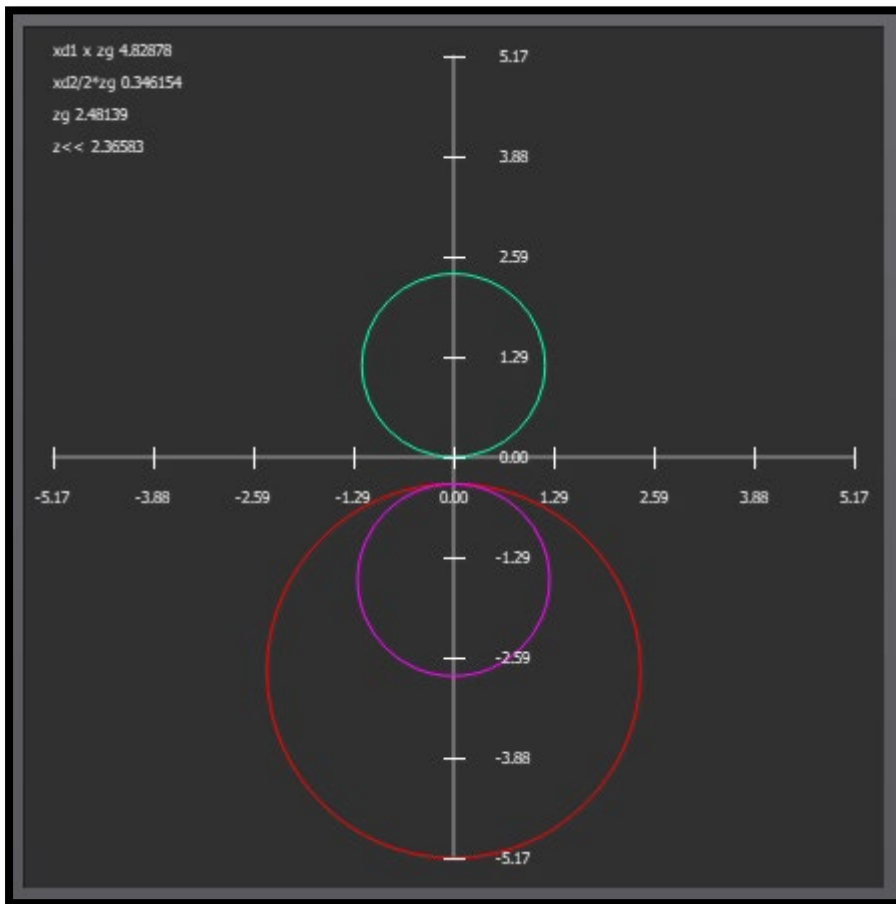*Figure 4-7. Rated armature current diagram.*

Figure 4-6. The underexcitation function diagram.

5 SETTING PARAMETERS

5.1 Parameters for the generator application

Table 2. Setting parameters for the generator application.

Name	Range	Default
User mode	1: Regular 2: Advanced user	1: Regular
Generator type	1: Salient pole 2: Turbo	1: Salient pole
Cooling	1: Indirectly cooled 2: Directly cooled	1: Indirectly cooled
Generator excitation	1: Brushless 2: Static	1: Brushless
Generator max. motoring power	$0.5…60.0$ %P_n	5.0 %P_n
Generator I2 capacity	$1.0…20.0$ %I_g	9.0 %I_g
Prime mover	1: Diesel 2: Gas turbine 3: Hydro 4: Steam	1: Diesel
Generator grounding	1: Ungrounded 2: Resistance grounded (NER) 3: Solidly grounded	2: Resistance grounded (NER)
Generator ground measurement	1: None 2: I0 current transformer 3: Calculated I0 4: U0 measurement 5: U0+I0 measurement	1: None
Step-up transformer	1: Individual 2: Common 3: No	1: Individual
Step-up transformer reactance influence	1: Disabled 2: Enabled	1: Disabled
Voltage measurement	1: Grid side 2: Generator side	1: Grid side
Generator differential	1: No 2: Yes	1: No

Name	Range	Default
CT2 side	1: HV side 2: LV side	2: LV side
Auxiliary load inside protected zone	1: No 2: Yes	1: No
Integrated synchronizer	1: No 2: Yes	1: No
Integrated rotor earth-fault	1: No 2: Yes	1: No
Permanent island mode	1: No 2: Yes	1: No
System reactance influence	1: Disabled 2: Enabled	1: Disabled

5.2 Parameters for the current transformers

Table 3. Setting parameters for the current transformers.

Name	Range	Default
Phase CT		
Phase CT; Internal resistance	0.01…1.00 Ω	0.05 Ω
(mystery value)	0.001…1.000	0.05
Phase CT; Wiring length	1.0…500.0 m	5.0 m
Phase CT; % of wiring is 6w	0…100 %	0 %
Phase CT; Wire type	1: Manually set 2: Copper 75 °C	2: Copper 75 °C
Phase CT; Wire resistance	0.00001…1.00000 Ω/m	0.01350 Ω/m
Phase CT; Wire cross section	1: 1.5 mm^2 2: 2.5 mm^2 3: 4.0 mm^2 4: 6.0 mm^2	3: 4.0 mm^2
Phase CT; Direction	1: Towards load 2: Towards generator star point	1: Towards load

Name	Range	Default
Phase CT2		
Phase CT2; Internal resistance	0.01…1.00 Ω	0.05 Ω
Phase CT2; Wiring length	1.0…500.0 m	5.0 m
Phase CT2; % of wiring is 6w	0…100 %	0 %
Phase CT2; Wire type	1: Manually set 2: Copper 75 °C	2: Copper 75 °C
Phase CT2; Wire resistance	0.00001…1.00000 Ω/m	0.01350 Ω/m
Phase CT2; Wire cross section	1: 1.5 mm^2 2: 2.5 mm^2 3: 4.0 mm^2 4: 6.0 mm^2	3: 4.0 mm^2
Phase CT2; Direction	1: Towards load 2: Towards generator star point	1: Towards load
I02 CT		
I02 CT; Internal resistance	0.01…1.00 Ω	0.05 Ω
I02 CT; Wiring length	1.0…500.0 m	5.0 m
I02 CT; % of wiring is 6w	0…100 %	0 %
I02 CT; Wire type	1: Manually set 2: Copper 75 °C	2: Copper 75 °C
I02 CT; Wire resistance	0.00001…1.00000 Ω/m	0.01350 Ω/m
I02 CT; Wire resistance	0.00001…1.00000 Ω/m	0.01350 Ω/m
I02 CT; Direction	1: Towards ground 2: Towards generator	1: Towards ground

5.3 Parameter interdependencies

Some of the setting parameters are only available when a specific other parameter has a specific option selected. *Tables 4* and *5* on the following pages gather these interdependencies for both parameter groups to make the Wizard easier to use.

Table 4. Interdependencies for the application setting parameters.

Parameter name	Requirement(s)
Cooling	The *Generator type* parameter must be set to "2: Turbo".
Generator max. motoring power	The *User mode* parameter must be set to "2: Advanced user".
Step-up transformer reactance influence	The *Step-up transformer* parameter must be set to "1: Individual" or "2: Common".
Voltage measurement	The *Step-up transformer* parameter must be set to "1: Individual".
CT2 side	The *Generator differential* parameter must be set to "2: Yes".
Auxiliary load inside protected zone	The *Step-up transformer* parameter must be set to "1: Individual".
Permanent island mode	The *Step-up transformer* parameter must be set to "1: Individual" or "2: Common".
System reactance influence	The *Permanent island mode* parameter must be set to "1: No".

Table 5. Interdependencies for the current transformer setting parameters.

Parameter name	Requirement(s)
Phase CT2	
(All setting parameters)	The *Generator differential* parameter (the Application parameter group) must be set to "2: Yes ".
I02 CT	
(All setting parameters)	The *Generator grounding* parameter (the Application parameter group) must be set to "2: I0 current transformer".

6 USING THE TRANSFORMER WIZARD

The format of a settings file (or a "wizard file") from the Generator Wizard is *.aqwz. A single wizard file includes all the essential settings related to generator protection, including all relevant application settings and the necessary current transformer settings.

> ⚠ Please note that the breaker connections and I/O connections ("matrix") must be set separately using the AQtivate 200 software.

6.1 Saving and opening a wizard file

You can save a wizard file with the **Save** button or the **Save as…** button. You can also open an existing project with the **Open** button. Please refer to *Table 1* on page 10 for the respective icons of these buttons.

> ⚠ Please note that AQtivate 200 setting files (*.aqs) and wizard files (*.aqwz) are fully independent, and they must be saved and opened separately!

6.2 Writing settings into a device

You can write a selected .aqwz file into a relay by clicking the **Write to relay** button (see *Table 1* on page 10 for the icon of this button). You must be connected to the relay for this button to work. If you have not established a connection, the button is gray and will not function.

When the software has finished writing the setting values from the wizard file into the connected device, a separate window pops up to inform you of this (*Figure 6-1*). Click **OK** to proceed.

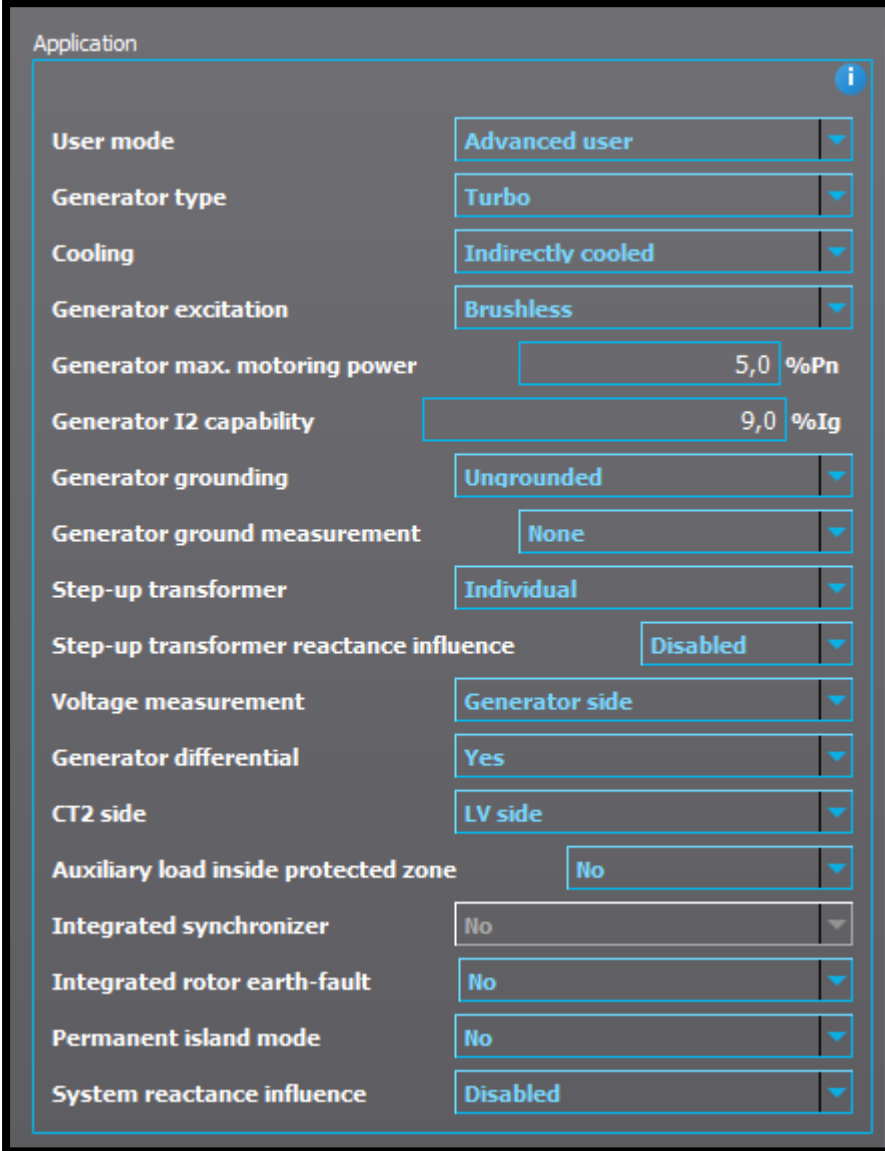*Figure 6-6-1. Writing process complete.*
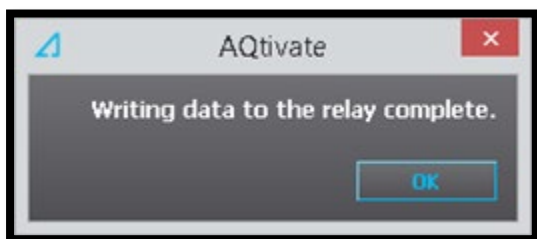
6.3 Changing setting parameters

All setting parameters which appear in blue text fields or drop-down menus in the wizard's main window can be modified. When one of these parameters appears in gray, it cannot be modified while the one or more parameters are defined the way they are at that moment. Its value is fixed and is only visible for informative purposes.

When you want to change the value of a setting parameter, place the cursor on top of the parameter box (either a text field or a drop-down menu). When you left-click the box, you can either type in a new value and press **Enter** (text fields) or select one of pre-set options (drop-down menus).

In *Figure 6-2* below, you can see an example of both types of changeable parameters. The parameters "Generator max. motoring power" and "Generator I2 capability" are examples of text fields, denoted by their white text and a unit to the right of the box. "User mode" and "Generator type" are examples of parameters with a drop-down menu, denoted by the triangle to the right of the box. You can also see an example of a parameter in gray ("Integrated synchronizer"), meaning that they cannot be changed.

Figure 6-2. Parameter type examples.

> ⚠ Please note that you cannot change setting parameter values while in the information mode. You have to return to the default view mode to modify the parameters!

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