

AQtivate 300

Instruction manual

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1 Document information

Table. 1 - 1. Version 2 revision notes.

Revision	2.00
Date	June 2026
Changes	<ul style="list-style-type: none">• Updated visual look.• Complete rewrite of the instruction manual.

Table. 1 - 2. Version 1 revision notes.

Revision	1.00
Date	April 2011
Changes	<ul style="list-style-type: none">• The first revision of the manual.
Revision	1.01
Date	February 2015
Changes	<ul style="list-style-type: none">• Added the descriptions for IEC-101/104, IEC-103 and SPA.

Disclaimer

Please read these instructions carefully before using the equipment or taking any other actions 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, including e.g. use of authentication, encryption, anti-virus programs, safe switching programs etc. necessary to ensure a safe and secure environment and 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.

Nothing contained in this document shall increase the liability or extend the warranty obligations of the manufacturer Arcteq Relays Ltd. The manufacturer expressly disclaims any and all liability for any damages and/or losses caused due to a failure to comply with the instructions contained herein or caused by persons who do not fulfil the aforementioned requirements. Furthermore, the manufacturer shall not be liable for possible errors in this document.

Please note that you must always comply with applicable local legislation and regulations. The manufacturer gives no warranties that the content of this document is in all respects in line with local laws and regulations and assumes no liability for such possible deviations.

You are advised to notify the manufacturer in case you become aware of any errors in this document or of defects in the equipment.

The manufacturer reserves the right to update or amend this document at any time.

2 Safety information

This document contains important instructions that should be saved for future use. Read the document carefully before installing, operating, servicing, or maintaining this equipment. Please read and follow all the instructions carefully to prevent accidents, injury and damage to property.

Additionally, this document may contain four (4) types of special messages to call the reader's attention to useful information as follows:



NOTICE!

"Notice" messages indicate relevant factors and conditions to the concept discussed in the text, as well as to other relevant advice.



CAUTION!

"Caution" messages indicate a potentially hazardous situation which, if not avoided, could result in minor or moderate personal injury, in equipment/property damage, or software corruption.



WARNING!

"Warning" messages indicate a potentially hazardous situation which, if not avoided, could result in death or serious personal injury as well as serious damage to equipment/property.



DANGER!

"Danger" messages indicate an imminently hazardous situation which, if not avoided, will result in death or serious personal injury.

These symbols are added throughout the document to ensure all users' personal safety and to avoid unintentional damage to the equipment or connected devices.

Please note that although these warnings relate to direct damage to personnel and/or equipment, it should be understood that operating damaged equipment may also lead to further, indirect damage to personnel and/or equipment. Therefore, we expect any user to fully comply with these special messages.

3 Abbreviations

General

CB – Circuit Breaker

CDSP – Communication Digital Signals Processor

CT – Current Transformer

DSP function – Functionality realized in the Digital Signal Processor

IED – Intelligent Electronic Device

RBAC – Role-based Access Control

RDSP – Relay Digital Signal Processor

VT – Voltage Transformer

Related to IEC61850

CDC – Common Data Class

CID – Configured IED Description file

DA – Data Attribute

DOI – Digital Output Input

FCDA – Functional Constraint Data Attribute

GCB – GOOSE Control Block

GOOSE – Generic Object Oriented Substation Event

ICD – IED Capability Description file

RCB – Report Control Block

SCD – Substation Configuration Description file

SCL – Substation Configuration Description Language

SPS – Single Point Status

Related to other communication protocols

ASDU – Application Service Data Unit

CAD – Common Address

COT – Cause of Transmission

IOA – Information Object Address

SBO – Select Before Operate

4 Introduction

The AQtivate 300 software tool is the general program used for making configurations for Arcteq's AQ 300 series protection devices. This software is used to manage both the hardware and the software included in the devices. All factory configurations for the default protective tasks are also done with this software. This document describes the application of the AQtivate 300 software tool.

The AQ 300 series has been designed to perform various tasks in electric power systems: protection, supervision, monitoring, communication, and automatic control. To better meet the complex nature that this level of protection requires, both the hardware and the software in the devices are modular. The exact protection requirements then determine how these modules are assembled and configured, whereas the software and the preset parameter values determine what functions the protection device needs to include. You activate the loaded software modules, and then set the parameters and any additional services that the protection requires.

The AQ 300 series devices communicate using standard Ethernet networks. All setting of parameters can be done with the web interface integrated in all devices. You can use any standard web browser (such as Mozilla Firefox, Google Chrome, etc.) to access the interface.

You can download the AQtivate 300 software free of charge from the Arcteq website ([Documents & Software](#) → AQ 300 series → AQtivate 300).



NOTICE!

Downloading the software installer requires registration to the Arcteq website because you must be logged in to view the installation files.

5 Starting the software

The configuration tool is started by clicking the icon. The usual Windows operating techniques can be used in the application. This description assumes that the user is familiar with the Windows operating system.

The AQtivate 300 configuration tool has two “views”. These views are the user levels configured with different access rights depending on the utility. These are the Master (general user level) and Administrator (factory user level) views.

For the AQ 300 devices, customers need the “Master View”. Consequently, this document describes the details of this mode only.

NOTICE!



The previously available “Normal” and “Designer” views are now done away with. Since the “Normal” view was a subset of the “Master” view, users can now use only the “Master view”. Factory users can now use “Factory” or “Administrator” view which also includes the capabilities previously available with the “Designer” view. The previously available change view icon is also now inactive and greyed out.

6 Active configuration

Opening or downloading a configuration file

After starting the program, two main icons are active:

- **Open** for opening a stored file. The alternative method of opening is to select “File / Open Ctrl+O” from the menu. In this case, a AQ 300 configuration file (.epc / .epcs) can be opened for further processing using the usual Windows selection method. It is also possible to open a recently used file in “File / Open Recent” menu and select a file. Last 10 opened configuration files are stored here.
- **Download from device** for uploading the configuration to a device connected to the Ethernet network. After clicking on the icon, one of the devices connected to the Ethernet network can be selected for processing. It takes a short time to find these devices, and then the “Select device” window is opened. This window lists the responding devices together with their IP address, substation and device name and firmware identifiers. The selection is performed using the usual Windows methods. The alternative method of opening is to select “Project / Upload configuration” from the menu. In this case the user can choose between the current or previous version of the configuration stored in the device.

Additional active icons are:

- **Language** for changing language of AQtivate 300 software.
- **Default window size** for setting the default window size of the AQtivate 300 software. The alternative method of setting is to select “View / Default Window Size” from the menu.
- **About...** for opening the “About” information Window. The alternative method of opening is to select “Help / About” menu from the menu.
- **Print Archive File** Print From Archive: you can print the Feedback Documentation directly from the report.zip file. Please note that the configuration file is not opened by the program, it is printed directly from the .zip archive file. This function is available for use with report.zip files generated from devices with CDSP version 2.8.13.1520 and higher.



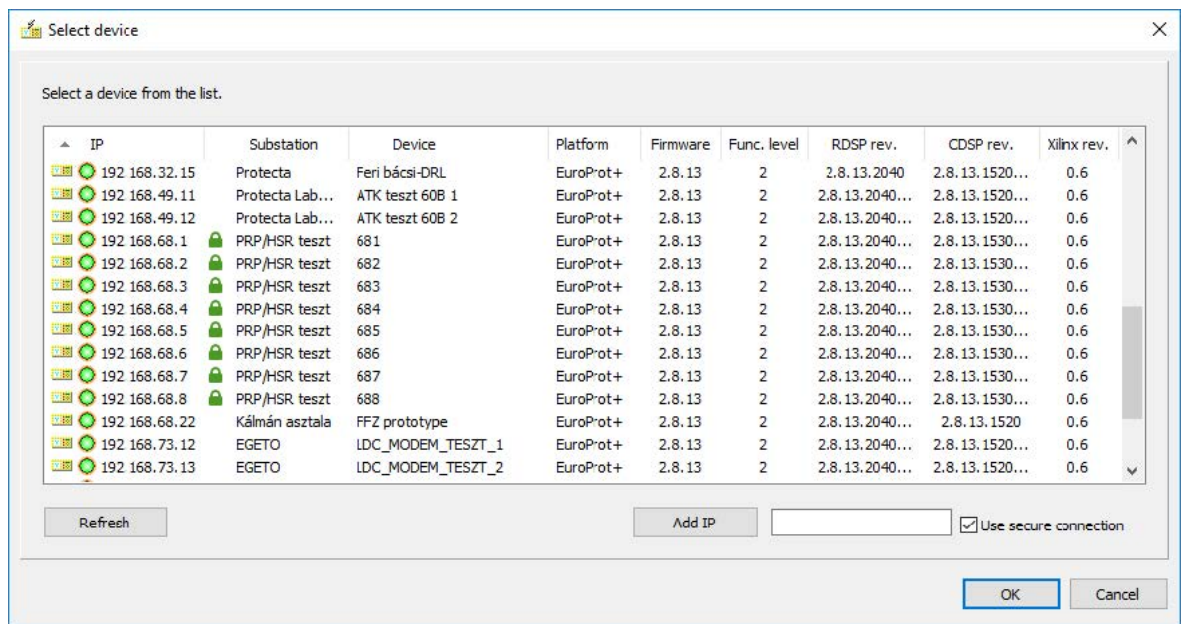
NOTICE!

Archived files can only be extracted from a device that runs on system version 2.8. Consequently, this feature is only available for devices running on system version 2.8 and not 2.10.

Additional information available through the Help menu:

- Version info, for opening a list of the changes applied in previous versions;
- “Arcteq on the WEB” for opening the Arcteq homepage;
- “SoftReal on the WEB” for opening the SoftReal homepage.

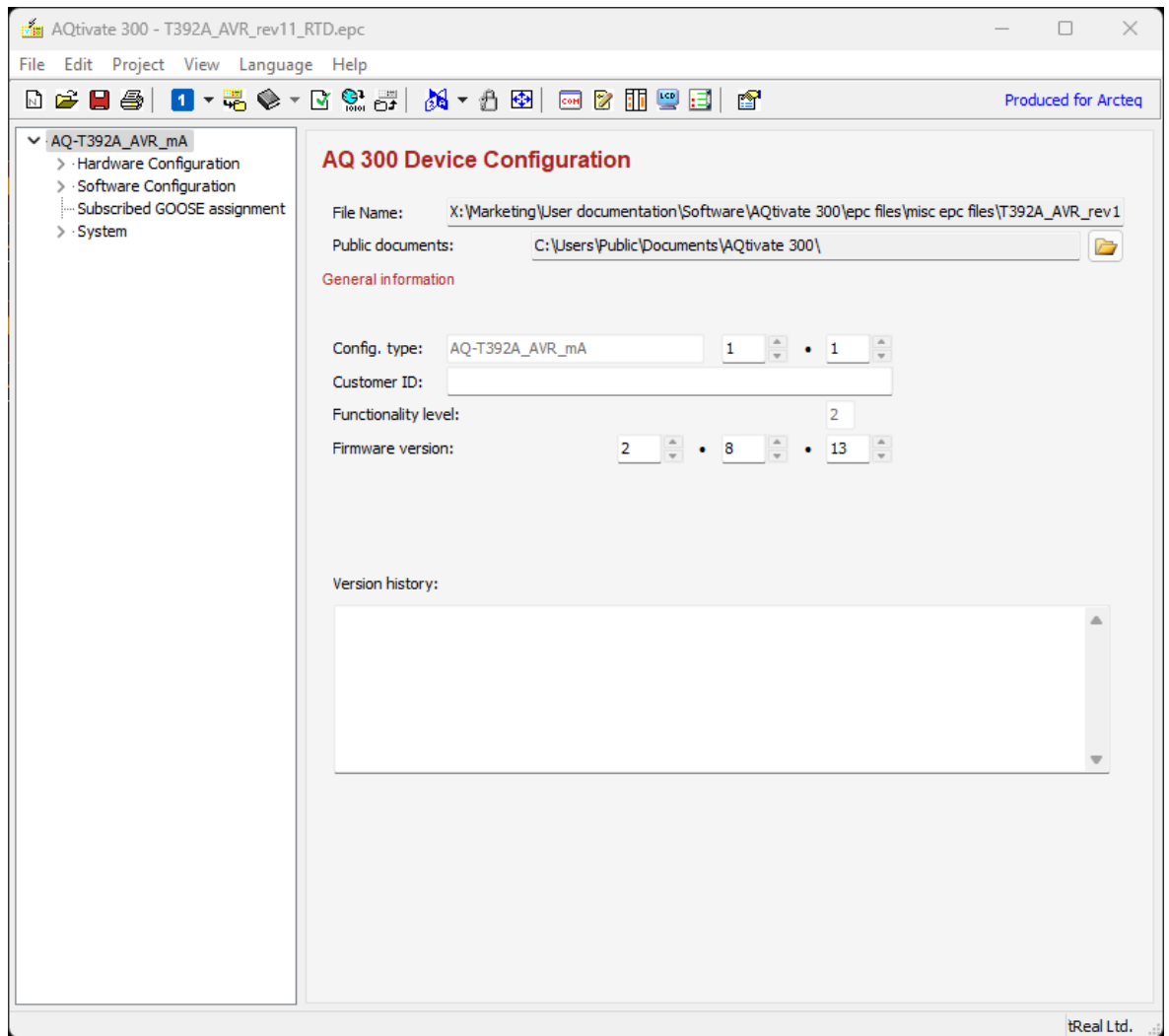
Figure. 6 - 1. Dialog window for selecting a device.



After selection and successful downloading (or after opening a stored configuration file), the window shown in figure above opens automatically.

In case of secure file transfer (SFTP), the download window displays animated dots during connecting. An additional message line is also displayed: "It can take more than one minute in some cases.". Connect time-out is 120 seconds.

Figure. 6 - 2. AQtivate 300 configuration main window.



The main changes of the window, as compared to its starting state are:

- the activation of new icons on the toolbar (See below)
- a menu in the window on the left side: the Configuration menu
- some basic information about the configuration (right side of the window, see figure above.)

Active icons when a configuration is active

If a configuration is active (a configuration file is opened or the configuration is downloaded from a device), then in addition to the basic icons (see Paragraph 2.4.1), the following main icons are also activated:

- **Save** for saving the file on the computer. The alternative method saving is to select "File / Save Ctrl+S" from the menu. If the file name is to be modified or another path is to be selected, then click on the menu item "File / Save as". In this case, an .epc/.epcs AQ 300 configuration file can be saved using the usual Windows selection method.
- **IEC61850 Compatibility** icon has been introduced to select between the Edition 1 or Edition 2 version of the IEC 61850 implementation. The data model that is implemented in the device depends on the selection during configuration upload. If Edition 1 is selected, then Edition 1 data model will be implemented, likewise, if Edition 2 is selected, Edition 2 data model will be implemented.

- **Translations** for translation of the displayed text. By default, the text displayed on the LCD of the device and the web page of IED is generated in English. If the display needs to be in a different language, please contact Arcteq Relays.
- **Check configuration** for checking the active configuration. The alternative method of checking is to select “Project / Check configuration” from the menu. Before saving the .epc/.epcs AQ 300 configuration file or building a downloadable version, it is advisable to check the file for syntactic errors using this icon or menu item.
- **Generate communication files** for generating communication files. Use this button to generate the necessary communication file e.g. .cid and .icd files for IEC 61850 communication, etc.
- **Upload to device** for uploading the opened configuration. The alternative method of uploading is to select “Project / Upload to Device” from the menu. Before uploading the files, the “Building” procedure must be run. If it has not been done yet, the software offers to do the processing. It is described in detail in Paragraph 2.4.5. uploading an .epc/.epcs file to device is also allowed in normal view.
- **Communication Configuration** for invoking the communication configuration menu, including IEC 61850 configuration. The communication configuration program is embedded software in the AQtivate 300 system. The alternative method of opening the communication configurator is to select “Project / Communication Configurator” from the menu.
- **Logic Editor** for invoking the Logic editor for composing and modifying logic with the graphical method to extend the “PLC-like” functionality of the AQ 300 devices. The Logic editor program is embedded software in the AQtivate 300 system; it is described in detail in Chapter 6. The alternative method of opening the Logic editor is to select “Project / Logic Editor” from the menu.
- **Rack Designer** for launching the “Rack designer” embedded software. This software is needed for assembling the hardware modules of a AQ 300 device.
- **LCD parameters** for modifying the screens of the LCD on the front panel of the device. The alternative method of modifying is to select “Project / LCD parameters” from the menu. The LCD editor program is embedded software in the AQtivate 300 system.
- **Offline Parameter Set Editor** for setting the operating parameters of the AQ 300 devices. The alternative method of parameter setting is to select “Project / Offline Parameter Set Editor” from the menu. The aim of this option is to provide various kinds of access to the device within single software. The usual method of parameter setting for users is the internet browser. The Offline parameter set editor program is embedded software in the AQtivate 300 system.

Recovery

The following functions are available in “File / Recovery” menu. This function is available to use with report.zip files generated from devices with CDSP version 2.8.13.1520 or later.

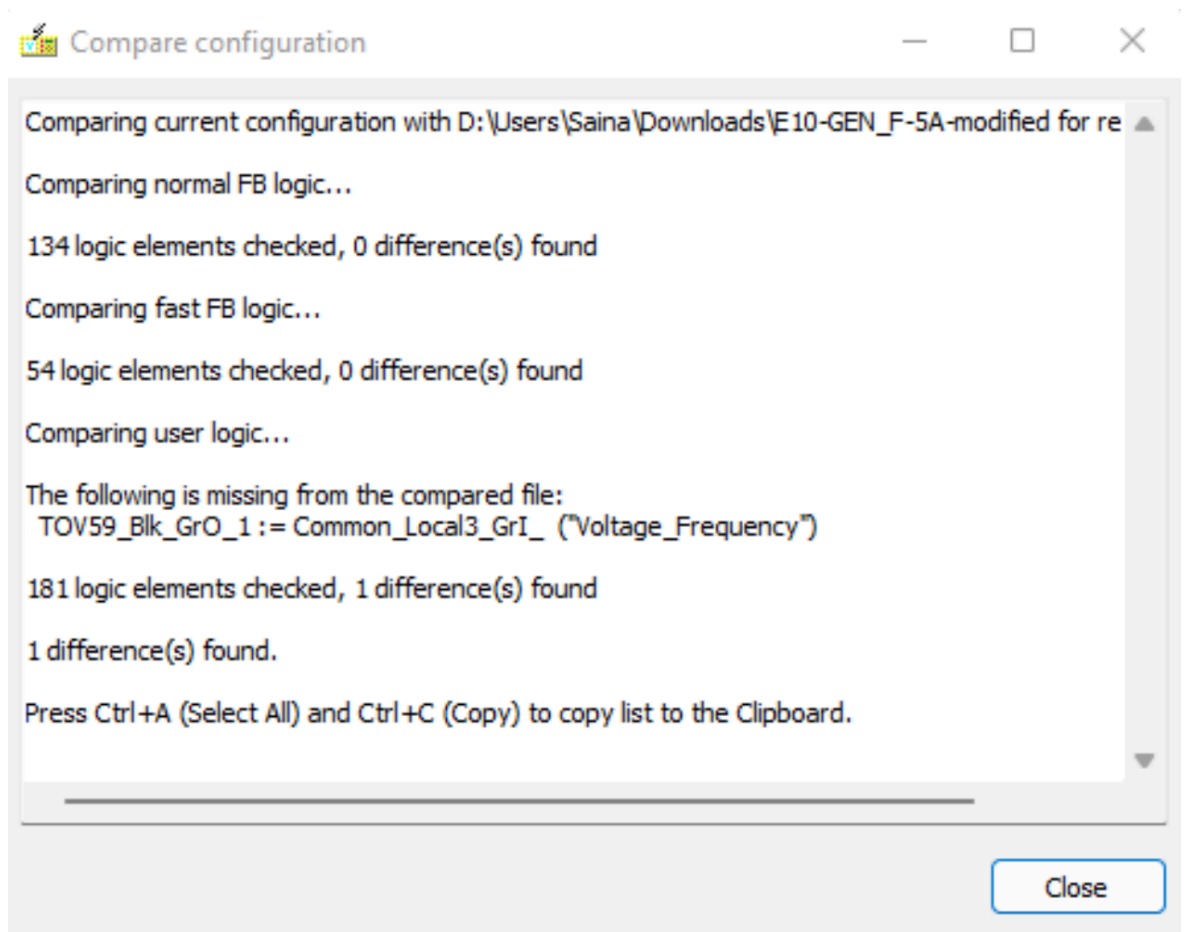
- **Open From Archive:** user can also open the configuration file from within a report.zip file with this menu command. When the file is opened, you are offered to save it with its original name (much like when you download a file from the device).
- **Print Archive File:** Documentation of the IED can be printed from the xxxx_report.zip file.
- **Extract Parameter Files:** the parameter setting file can be extracted from the existing report.zip. The user can select a folder and save the .par file there. You can open it in the Offline Parameter Set Editor.
- **Extract Log Files:** there are .log files in the report.zip which helps the Arcteq staff to troubleshoot and advise the customer when a problem appears. Users also can see these log files, however they may not understand the exact meaning of it. These .log files can be extracted and saved to a selected location in the menu.

Compare

Available in the “File / Compare” menu, this function is used to compare the logic equations (graphical, normal or fast) of two configurations. It compares the equations of the currently opened configuration to the equations of another configuration which can be selected from the pop-up window that appears when the “compare” button is clicked.

If there are differences, they will be displayed in a “Compare configuration” pop-up window.

Figure. 6 - 3. Result of compared configurations, difference found in graphical user equations.



Print

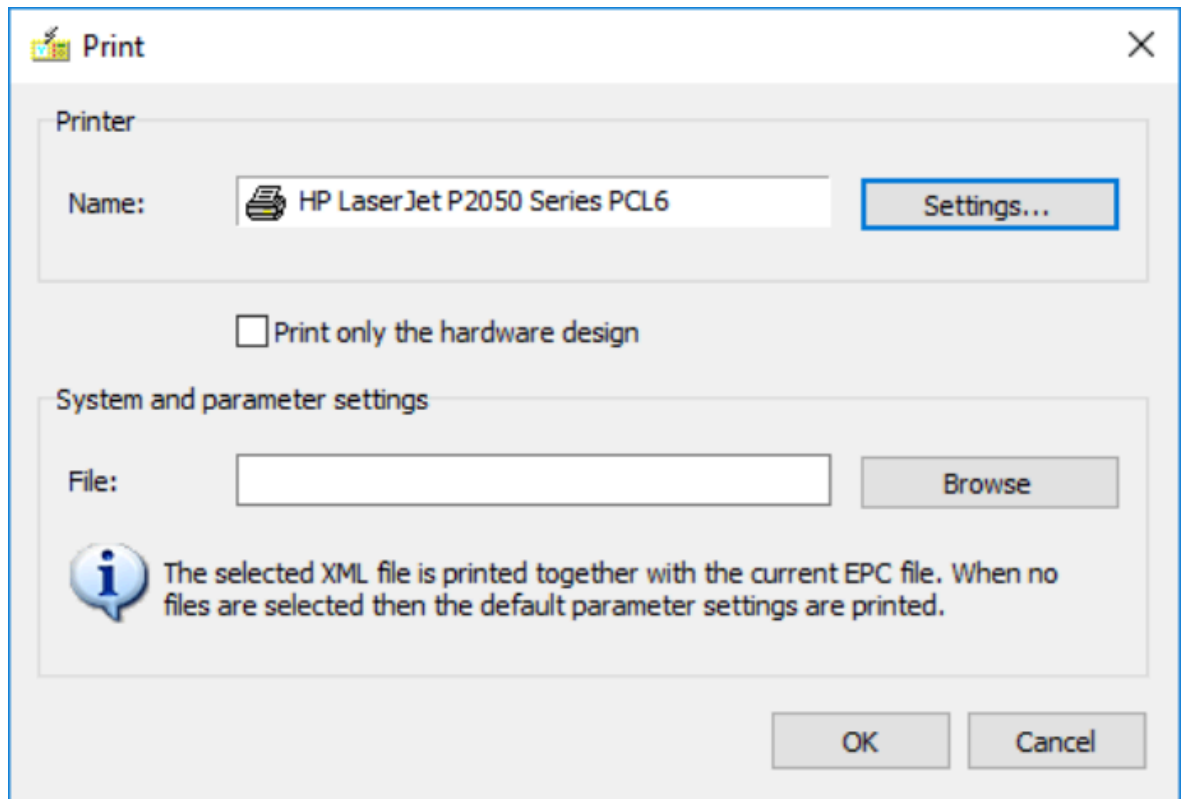
This function is available in "File / Print" Ctrl+P menu to print the Feedback Documentation of the current configuration file optionally together with the system and parameter settings file.



NOTICE!

The last saved configuration file can be printed. Please save the current configuration file before printing.

Figure. 6 - 4. The "Print" menu



The optional "System and parameter settings" can be taken from an XML file extracted from the web page of the device. It contains the actual system settings and protection parameters. This XML file is not mandatory for printing. If it is not selected, the factory default parameters will be included in the Feedback Documentation.

Users can print a hardware design only which contains the Rack design and Connection assignment list, if the "Print only the hardware design" is selected.

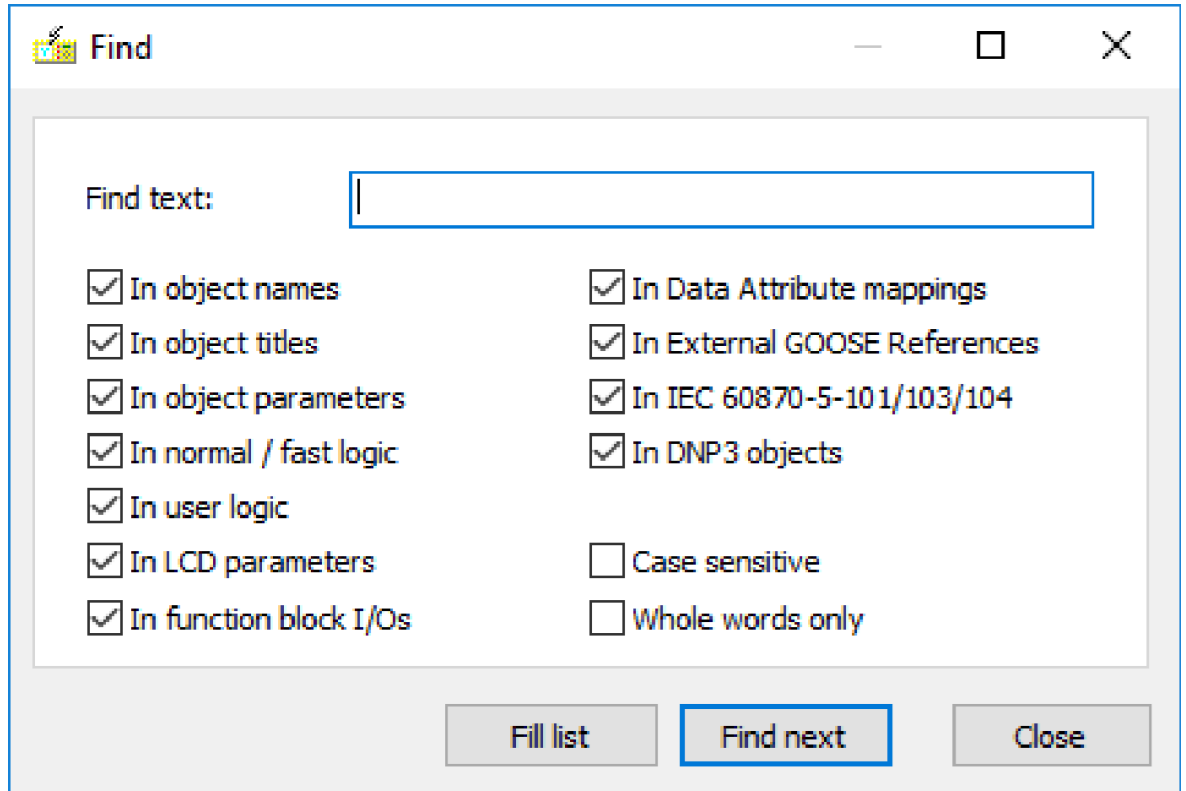
The Feedback Documentation contains the following information:

- System settings
- Firmware
- Configuration files
- Rack design
- Connection assignment
- Function blocks of the configuration
- On-line measurands
- Event channels
- Disturbance record channels
- Trip assignment
- LED assignment
- Counter functions
- IEC 60870-5-101/104 configuration settings
- IEC 60870-5-103 configuration settings
- IEC 61850 communication settings
- DNP3 configuration settings
- Logic editor configuration
- Parameter settings

Find

This function is available in “Edit / Find” Ctrl+F menu.

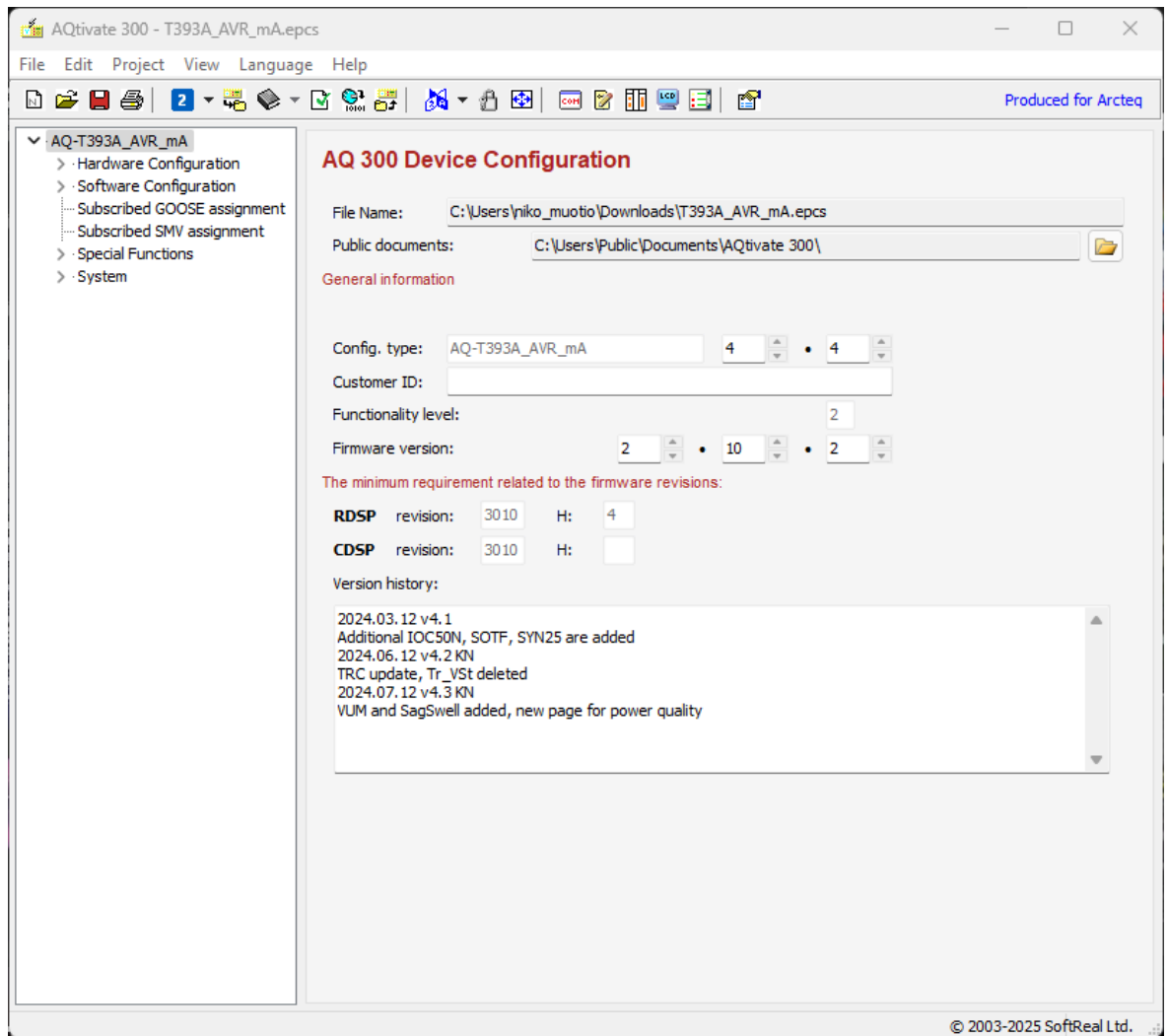
Figure. 6 - 5. The “Find” window



Information about the active configuration

On the right side of the window, information about the active configuration is displayed.

Figure. 6 - 6. Information about the active configuration.



Here, the “File Name” shows the path and file name of the saved configuration document (assigned at saving).

The “Public documents” show where the generated documents, e.g.: “cid” and “icd” files belonging to the IEC 61850 communication are (or will be) stored.

The “Config type” is the identifier displayed also on the local LCD of the device. The major and minor version numbers after it shows the factory version of the configuration file. These fields and the “Platform”, the “Functionality” and the “Firmware version” cannot be changed in Master view, they belong to the factory configuration.

The “Firmware version” and “Functionality level” specify the requirements to upload the configuration into a CPU.

The “Customer ID” is the identifier for special user version of the configuration.

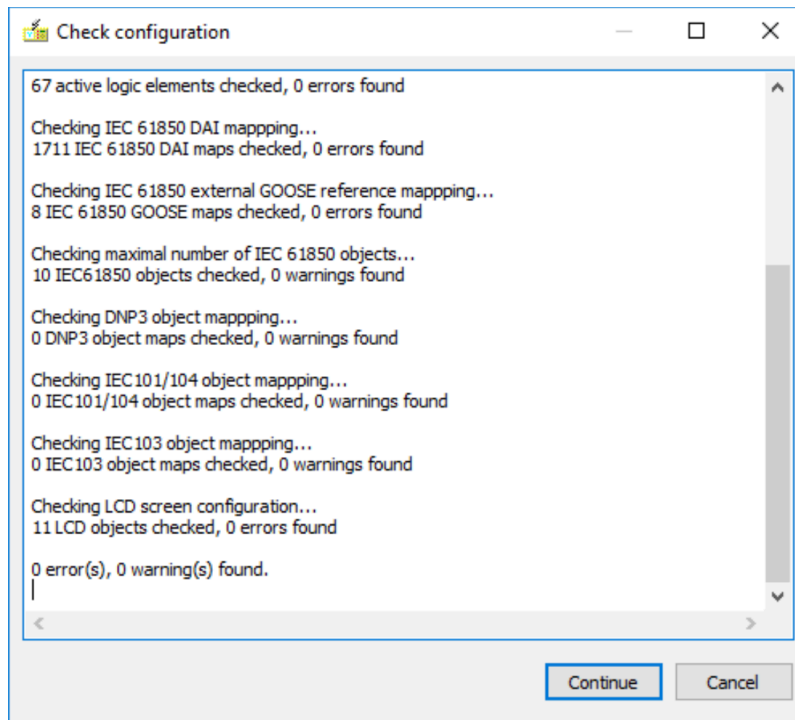
The minimum requirement of RDSP and CDSP defines the minimum or the fixed version of firmwares. Below these versions the configuration cannot run properly. The AQtivate 300 does not allow the uploading a configuration, which requires higher firmware version than the CPU actually has.

The Master user can make notes of configuration changes in “Version history” field.

Checking the configuration

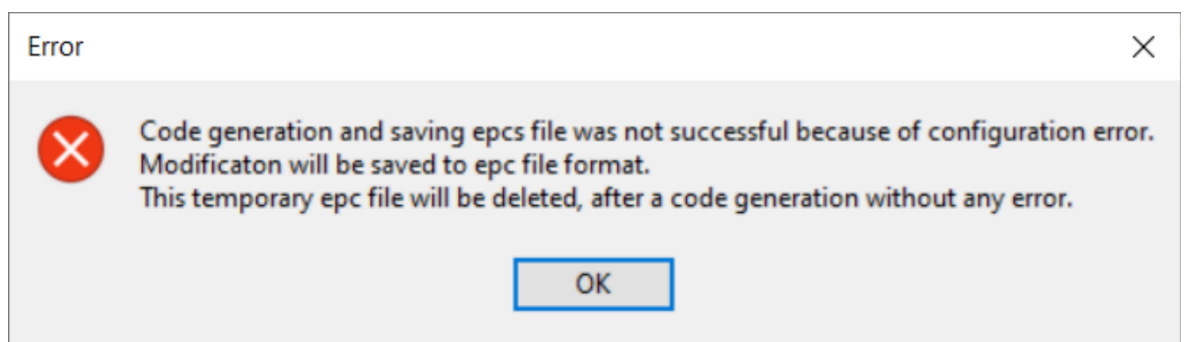
Before the configuration can be uploaded to the device, it has to be checked for any errors and saved as a .epcs file. The check configuration button is used for this function.

Figure. 6 - 7. Check configuration window



If an error is found, when the configuration is saved, it is saved without a digital signature, as an .epc file. If there are no errors, the configuration will be saved as a .epcs file. Figure below shows the pop-up dialogue box when the user tries to save a configuration file with errors.

Figure. 6 - 8. The pop-up message generated when the configuration cannot be saved with a digital signature.



Files saved with a .epc extension can no longer be uploaded to the device. They can be saved but not uploaded. In order to be able to upload the file, all errors in the configuration flagged by the “check configuration” function have to be fixed.

The “Check configuration” function checks the maximal number of IEC 61850 objects (datasets, FCDAs, RCBs and GCBs), the user logic, trip assignment, the numbers of different variables, IEC 101/103/104 and DNP3 mapping, LCD configuration.

Object parameters in trip assignment are mandatory and they are also checked.

In case the number of IEC 61850 objects exceed the limit, the “check configuration” function will generate warnings but the configuration will still be saved as an .epcs file.

The number of defined objects and the active ones can differ for some types (e.g. Reportable objects of Event recorder). This depends on the active and inactive function blocks. All defined objects are objects belonging to all the installed function blocks. The active objects belong to only the active function blocks. In versions of AQtivate 300 earlier than 2.1.3.10, only the number of the defined objects and the limit was displayed for every object type. Now the number of the defined objects is in brackets and also the number of the active objects is displayed. If the active one exceeds the limit, the ‘Check configuration’ function indicates it as an error and the configuration can only be saved as a .epc file. Decrease the number of objects below the limit for the configuration to be saved as an .epcs file. This error is also indicated by a red (x) as shown in figure below.

Figure. 6 - 9. Count / limit in AQtivate 300 object lists

The screenshot shows the 'Event recorder / Reportable objects' configuration window. On the left is a tree view with 'Reportable objects' selected. The main area contains a table of objects with columns for 'Ix', 'Name', and 'Title'. Below the table, the text 'Count/Limit: 156(156)/128' is displayed. A red circle highlights this text, and arrows point to the three numbers: '156' (active), '156' (all defined), and '128' (limit). A red 'X' is placed over the '156' in parentheses, indicating that the active count exceeds the limit.

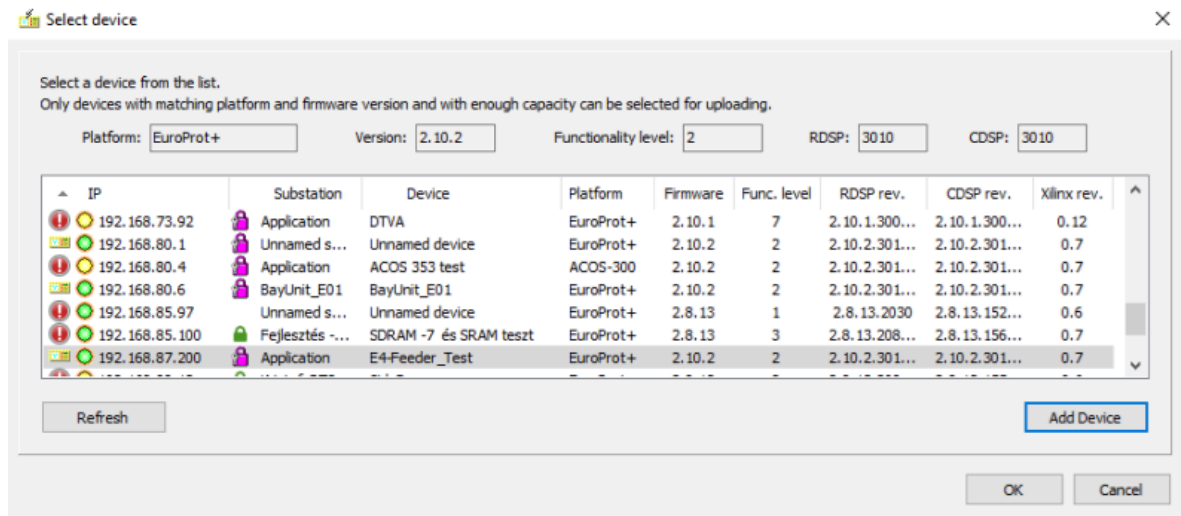
Ix	Name	Title
0	Ev_Common_LLNOMod_	Mode of device
1	Ev_Common_LPHDHealth_	Health of device
2	Ev_TOV59_StL1_	Start L1
3	Ev_TOV59_StL2_	Start L2
4	Ev_TOV59_StL3_	Start L3
5	Ev_TOV59_GenSt_	General Start
6	Ev_TOV59_GenTr_	General Trip
7	Ev_TUV27_StL1_	Start L1
8	Ev_TUV27_StL2_	Start L2
9	Ev_TUV27_StL3_	Start L3
10	Ev_TUV27_GenSt_	General Start
11	Ev_TUV27_GenTr_	General Trip
12	Ev_TOV59N_GenSt_	General Start
13	Ev_TOV59N_GenTr_	General Trip
14	Ev_CTSuperV_CTFail_	CT failure

Uploading the configuration

Click on "Upload to device" for uploading the configuration. The alternative method of uploading is to select “Project / Upload to Device” from the menu.

Upon clicking this button, the user is prompted to select the device into which the configuration will be uploaded. The target device can be selected from within a list of devices which are in the same LAN network. See figure below.

Figure. 6 - 10. Select device window with detected devices.



The exclamation sign before the IP address means that the device has lower functionality level than the requirement of configuration (2).

Device icon means that the user can upload the configuration to the selected device.

The LED which is green/yellow in this example, shows the status of IED.

The green lock marks the devices which are using the Secure FTP connection. The minimum required firmware version of this feature is CDSP 1530. The purple lock marks the devices using HTTP/HTTPS connection. Minimum firmware requirement for this is version 2.10.1.3000. Devices without a padlock are those using FTP connection. These are devices operating on firmware versions below CDSP 1530.

If the user has to add a device manually with "Add device" button, user has to know whether the device uses the FTP, SFTP, or HTTP/HTTPS connection.

In case of manually entered device IP address, the following warning message appears:

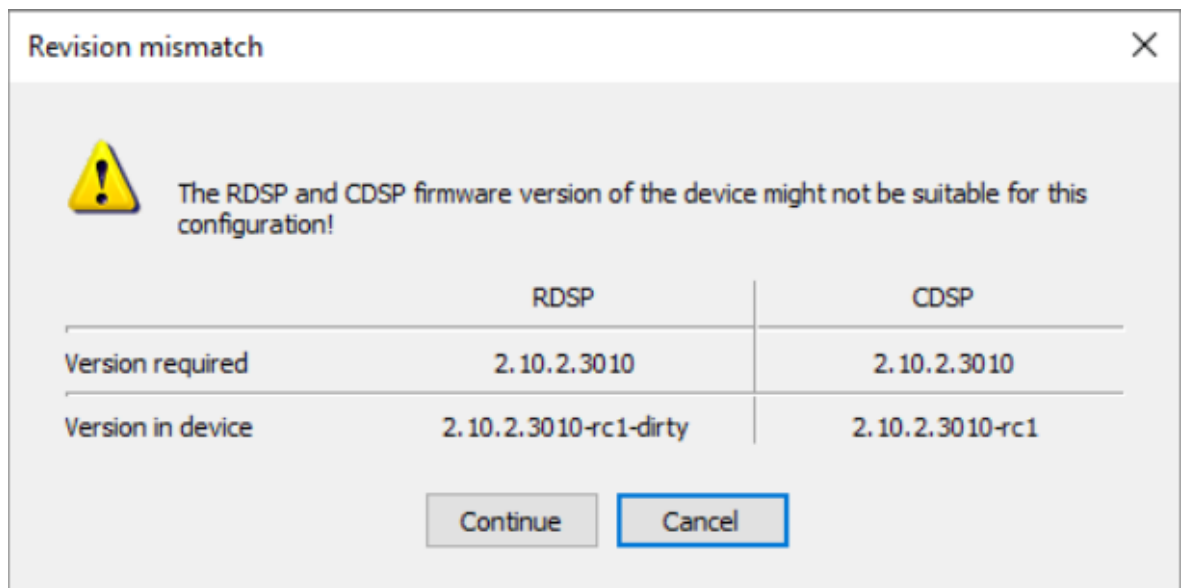
"By uploading via entering the device IP address, the checking of the RDSP/CDSP firmware versions should be done manually."

Uploading is not allowed to a device which has a lower RDSP and/or CDSP firmware version number than the one required by the configuration file. The following error message appears in this case:

- The RDSP firmware version of the device is not suitable for this configuration!
- The CDSP firmware version of the device is not suitable for this configuration!

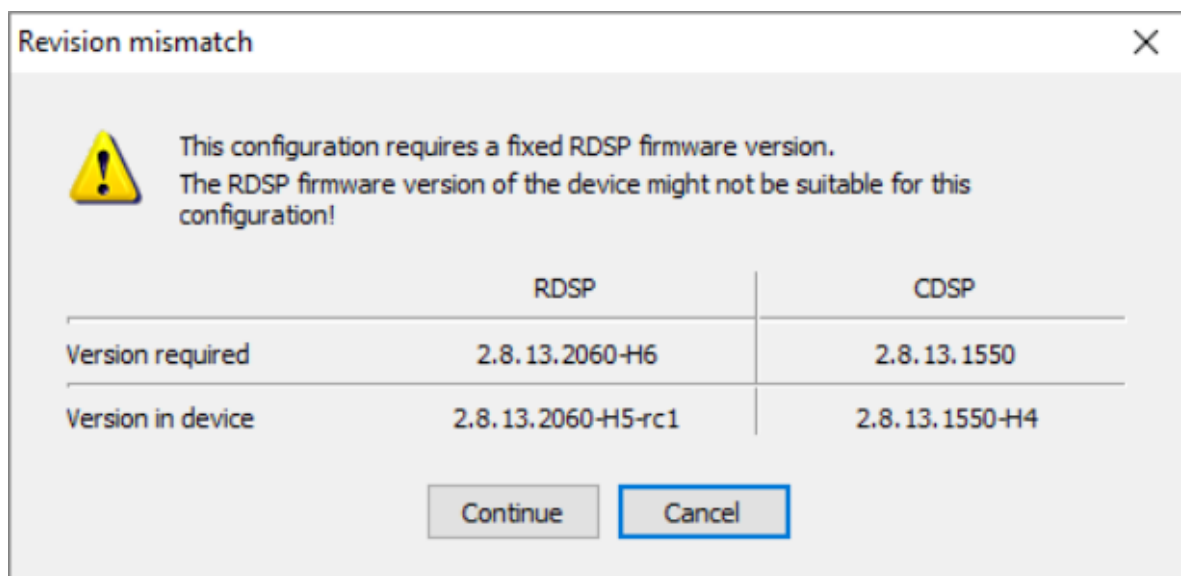
In other cases, the Revision mismatch window may appear where you can continue or cancel uploading. There is also shown which firmware does not match:

Figure. 6 - 11. Revision mismatch window (minimum firmware requirement set for the config in AQivate 300 is higher than the firmware version in the device)



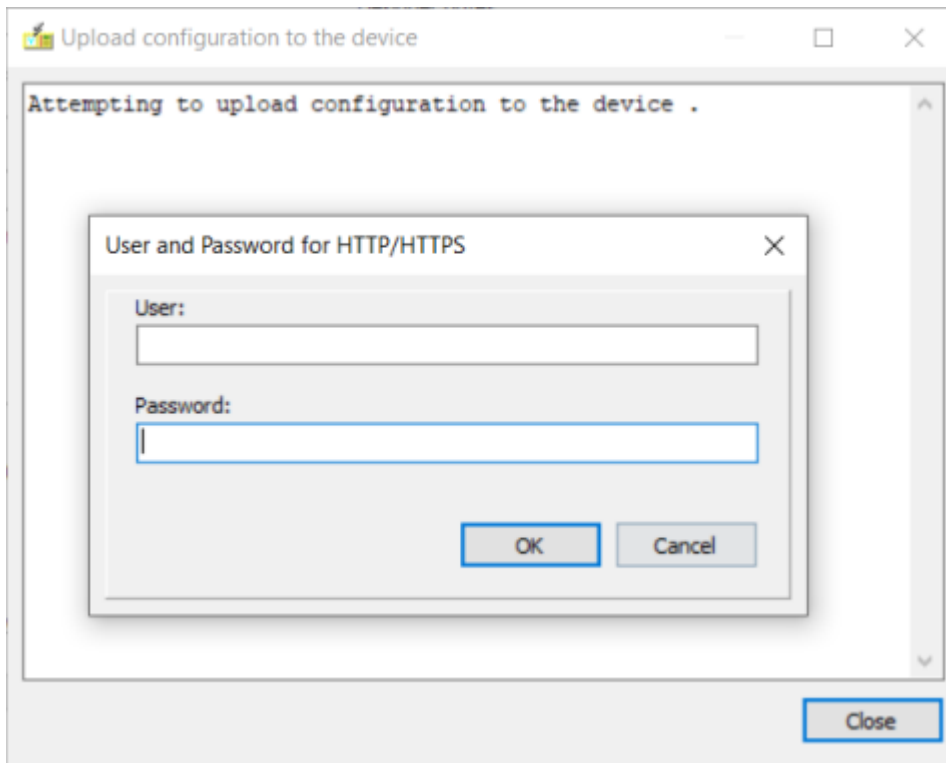
Furthermore, when a fixed device firmware is required by the configuration file then a new line appears in the Revision mismatch window: This configuration requires a fixed XXXX firmware version.

Figure. 6 - 12. Revision mismatch window in case when fixed firmware version is required



Uploading a configuration file to a device in which role-based access control is activated prompts the user to input log-in credentials. The window shown in figure below pops up.

Figure. 6 - 13. Pop-up window during configuration upload for devices with RBAC



7 Understanding the configuration

The simplified HW and SW structure of the AQ 300 devices are shown on figure below. The functions of the device operate in the hardware environment, which provides inputs and outputs for the functions. To receive the required number of analogue and binary inputs and to send the output signals to the primary equipment of the electric power system, the device is assembled of hardware modules (see hardware configuration below).

The functionality of the device is determined by the software configuration. This configuration means the assembly of functions blocks and assignment of the physical inputs to software inputs (see software configuration below).

The software consists of function blocks (e.g., overcurrent protection function, distance protection function, etc.). The “heart” of the function block consists of several “DSP functions” (e.g., Fourier component calculation, RMS value evaluation, function logic, etc.) These function blocks are described in function block description documents.

A DSP function (performed by the dedicated Digital Signal Processor DSP) needs

- status signals
- parameters
- constants
- measured values.

They are stored in the “data bank” of the function block.

A DSP function generates

- binary status signals
- events and
- measured values.

All these values are stored in the “data bank” of the function block, too.

The “data bank” of the function block is also used by the following function block elements:

- factory equations
- internal timers
- event channels and
- “IEC 61850 data”.

The binary “results” of a function block stored as status variables can be processed by special function blocks available in all AQ 300 configurations:

- disturbance recorder
- matrix
- graphic equation editor
- counters

The events are

- processed by the Event recorder function block.

The measured values, events, recorded disturbances and counter values can be

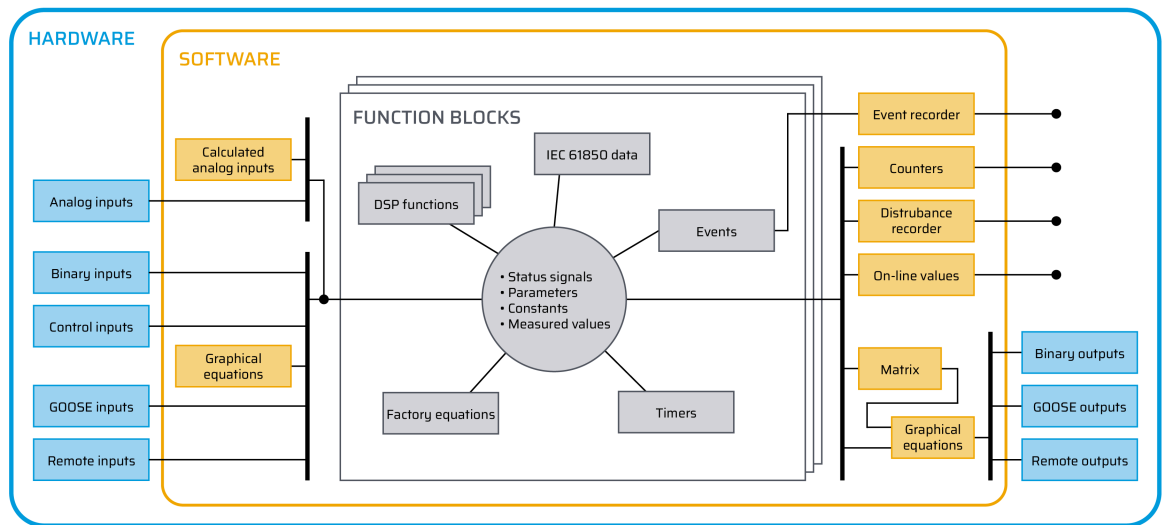
- sent to the supervising computer via Ethernet

- communicated by serial channels
- involved in IEC 61850 communication
- displayed on the LCD of the device (except disturbance records).

The physical outputs of the device are

- binary outputs
- Goose messages
- remote output channels
 - Ethernet messages
 - serial channels
 - the channels of IEC 61850 communication.

Figure. 7 - 14. Simplified hardware and software structure of AQ 300 series devices.



8 The configuration menu

The configuration menu is on the left side of the window. The displayed and active menu items depend on the mode of operation of the software.

Figure below shows the structure of the configuration menu as it is displayed in Master view. The > symbols indicate that the menu item can be expanded, opening sub-menus, by clicking on the > symbol.

The four main menu items are:

- "Hardware configuration",
- "Software configuration",
- "Subscribed GOOSE assignment", and
- "System".

When translation is available the language can be changed in the Language menu or with the Language speed button on the toolbar. The object's titles will be translated to the chosen language on the following property sheets (currently only German, English and Hungarian languages are available):

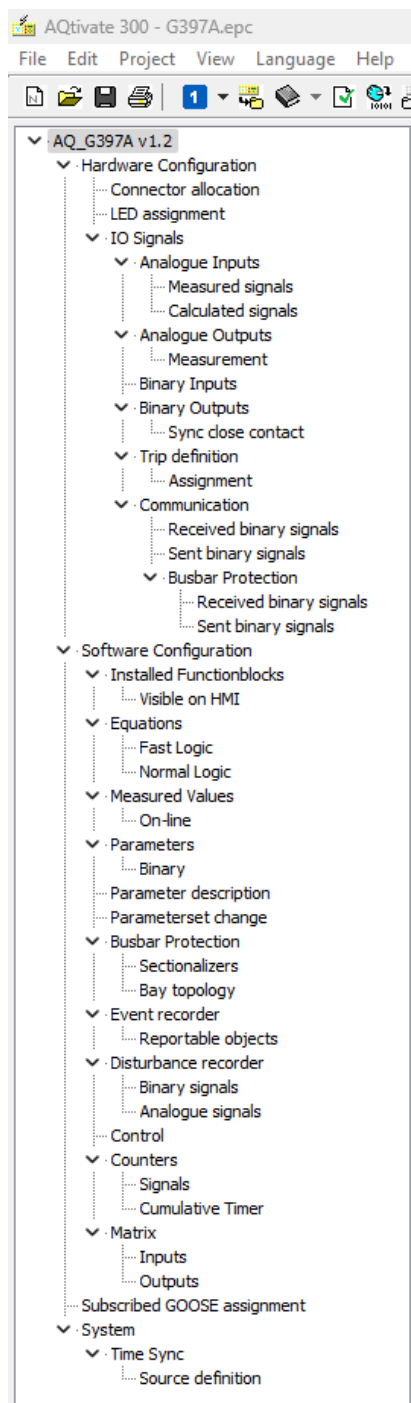
- All object lists, like status variables or IO signals (in the Title column)
- Installed and Visible Function Blocks (after the colon)
- Connector Allocation (in the Name column and also in copied or printed output)
- Hardware Configuration

When the display language is not English (the default) then translated object properties (title and parameters, units, etc.) are also shown in the Object properties dialog window and in this window both the original (English) and the translated value can be edited. The translation can also be changed by the translation button.

The configuration menu in "Master view"

Figure shows the configuration menu tree as viewed on the "Master" level. In this figure, the menu items are fully expanded. The menu items can be collapsed by clicking on the "down arrow" symbol.

Figure. 8 - 15. Fully expanded configuration menu.



The items of the configuration menu serve the purpose of checking and modification of the active configuration. The available menu items depend on the selected “User level”.

9 Hardware configuration

The functions of the device operate in the hardware environment, which provides inputs and outputs for the functions. To receive the required number of analogue and binary inputs and to send the output signals to the primary equipment of the electric power system, the device is assembled of hardware modules.

In Master View, the hardware configuration can be displayed and extended by clicking on the "Hardware configuration" menu. The user also has the possibility to assign a Design No. which will be inserted in the configuration documentation.

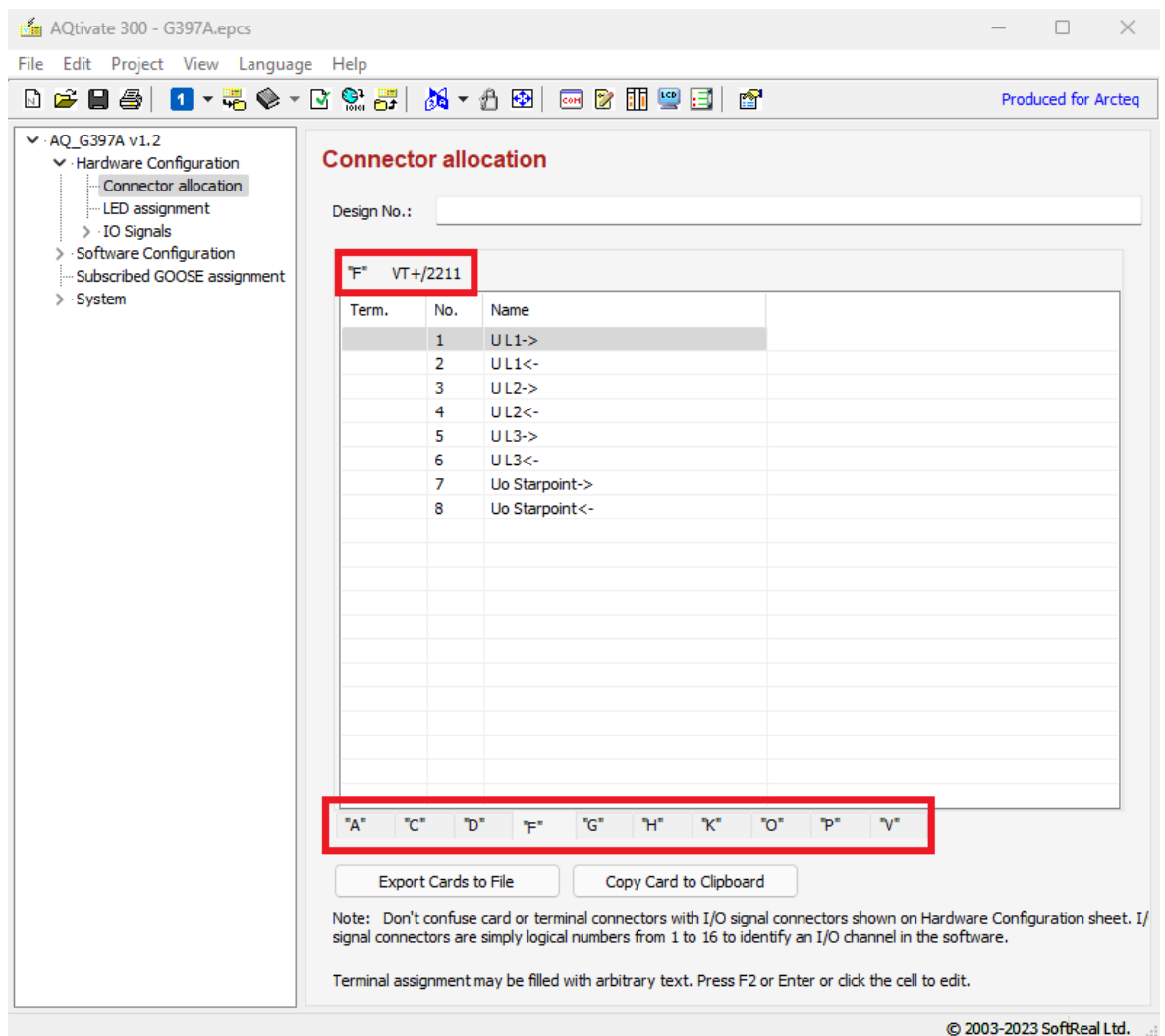
The "Hardware configuration" section in the configuration menu consists of the following three submenus:

- "Connector allocation",
- "LED assignment", and
- "I/O signals".

9.1 Connector allocation

The details of the I/O signals can be checked from the configuration menu: open "Hardware configuration" on the left-side panel of the software's main window and then select "Connector allocation". This opens a list of all available connectors in each individual slots. Each slot can be selected from the tabs (identified with capital letters) located at the bottom of the window. Above the connector listing the software displays the slot letter as well as the exact card in that slot. In the figure below, you can see an example of the "Connector allocation" window where the listing for Slot "F" (with the card VT+/2211) has been selected.

Figure. 9.1 - 16. Example of a "Connector allocation" window.



You can generate a tabular text file by clicking the **Export Cards to File** button at the bottom of the window. This file lists all the slots in your configuration, the cards in those slots as well as their terminals, connectors, and signal names.

You can also download all the data for a selected module by clicking the **Copy Card to Clipboard** button and by inserting the data into an Excel file. This lists the name, the card, and the connectors of the slot, as well as the connectors' signal names. Additionally, it also includes the terminal connections.

NOTICE!

Do not confuse card or terminal connectors with I/O signal connectors! The I/O signal connectors are shown in the hardware configuration simply because software uses logical numbers (1...16) to identify the I/O signal connectors with their respective channels!

Terminal assignments (the "Term." column) are text fields that you can edit yourself. Click the selected row and then press **F2** or **Enter** to edit the cell. Press **Enter** again to stop editing.

9.2 LED assignment

The figure below shows the procedure of LED definition. In the demonstrated version LED No. 1 is on if the input variable TRC94_GenTr_Grl_(General Trip) is active and it is blinking if only the input Bin_G11 is active.

Figure. 9.2 - 17. LED definition

The screenshot shows a window titled "Object properties" with the following fields and values:

Type:	0005 LED
Defined by:	RootFunctionBlock
Name:	LED3101
Title:	General Trip
Connector [1,16]:	1
GeoGrafic address [0,31]:	31
On Item name [uoz]:	0213 Graphed input Status
	TRC94_GenTr_GrI_ (General Trip)
Blink Item name [uoz]:	0001 Filtered Binary Input
	BIn_G11 (Remote Trip)
Color [0/r,1/g,2/y] [0,2]:	0
Latch [0/h,1/y,2/e] [0,2]:	1

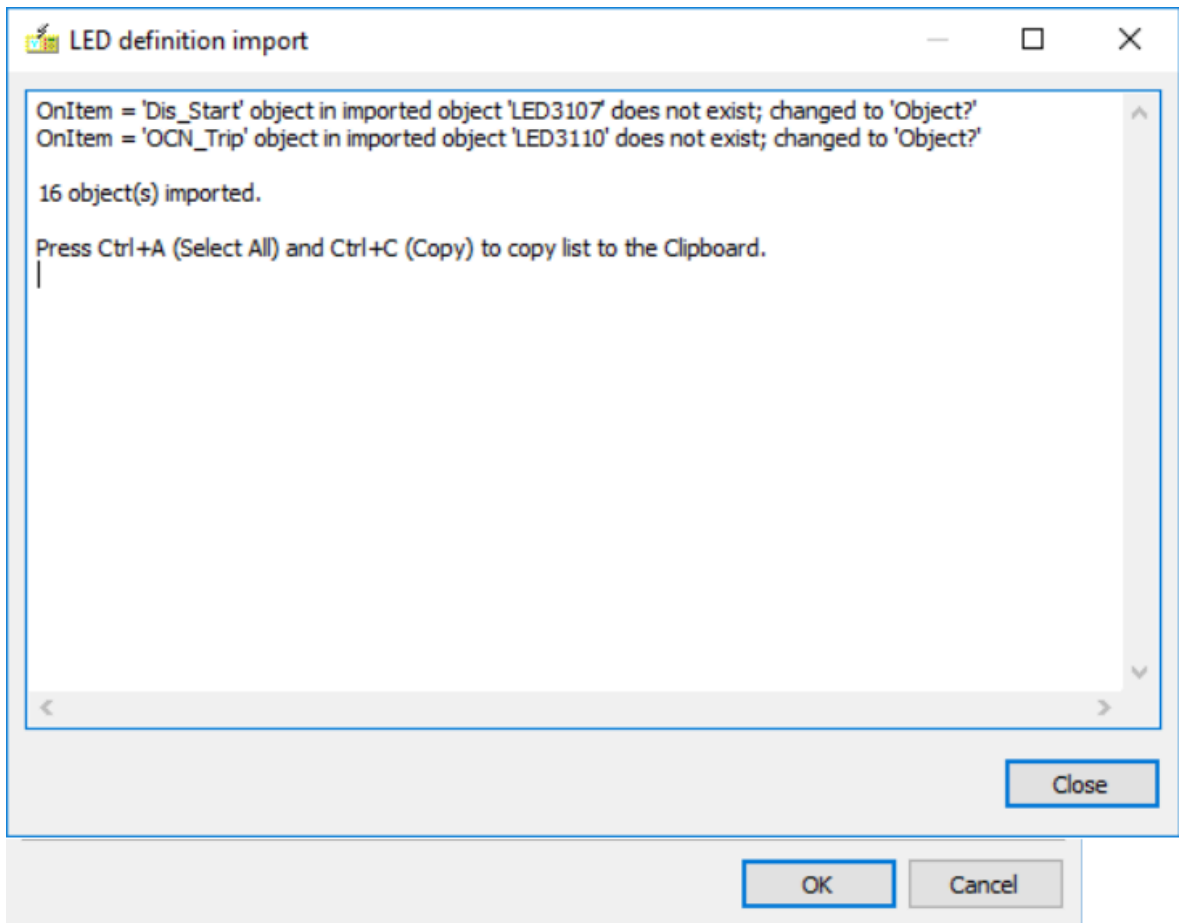
At the bottom of the dialog are "OK" and "Cancel" buttons.

LED assignment objects can be exported to and imported from an XML file.

Using the "Export" button in "LED assignment", the user can export the LED assignment settings into XML file. It is also possible to Import these settings from XML file using "Import" button.

A report window will pop-up after the import process. This report will contain warning messages if some of the LED "On Item name"-s or the "Blink Item name"-s refer to non-existent objects. In this case these parameters are changed to "Object?".

Figure. 9.2 - 18. LED definition import warning message.



NOTICE!

LED signal assignment (i.e. "On Item" & "Blink Item") is done from the graphical logic editor for higher configuration versions supported by firmware version 2.10.1.3000 and above.

Figure. 9.2 - 19. LED signal assignment in the logic editor (for higher configuration versions).

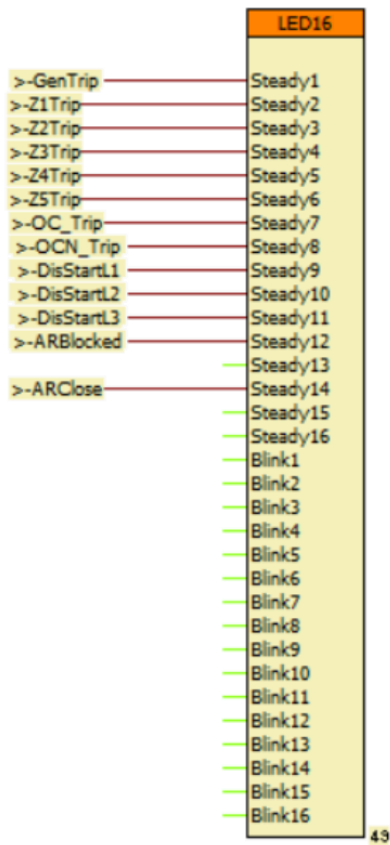


Figure. 9.2 - 20. LED definition (higher configuration versions)

Object properties

Type: 0005 HMILED

Defined by: RootFunctionBlock

Name: LED3101

Title: General Trip

Connector [1,16]: 1

Slot ID [0,31]: 31

Color [0/r,1/g,2/y] [0,2]: 0

Latch [0/n,1/y,2/e] [0,2]: 1

OK Cancel

When secondary language is available in the configuration file, the user can translate or change the existing translation of title with the translations button.

For the “LED assignment” when clicking the available “Modify” button, the data input window on the figure below is opened. Here, the following modifications are allowed:

- **Title** This is a free-text field; the text will be the identifier of the LED in the documentation and when printing the LED titles. (e.g., “General Trip”)
- **On Item name** Means the selection of a signal, the 1 state of which results in continuous ON state of the LED. See the selection method on figure below.
- **Blink Item name** Means the selection of an output signal, the 1 state of which results in the blinking state of the LED. See the selection method on figure below.
- **Color** Means that the color of the LED can be selected as red (r), green (g) or yellow (y) by writing 0, 1 or 2 in this input field. The On and Blink item has the same color.
- **Latch** Means that the on or blinking state of the LED can be latched until reset. The method of resetting is simply pressing the front panel button X below the front panel LEDs. When setting this variable to 2/e then a new event (fault) modifying the LED state will erase the previous latched state and show only the latest state.

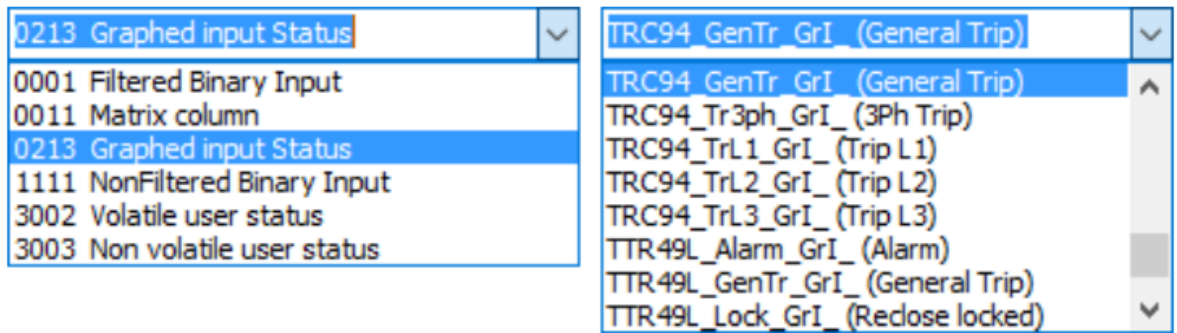
Figure. 9.2 - 21. The “Object property” window for LED assignment

The screenshot shows a window titled "Object properties" with the following fields and values:

Type:	0005 LED
Defined by:	RootFunctionBlock
Name:	LED3101
Title:	General Trip
Connector [1,16]:	1
GeoGrafic address [0,31]:	31
On Item name [uoz]:	0213 Graphed input Status
	TRC94_GenTr_GrI_ (General Trip)
Blink Item name [uoz]:	
	(nothing)
Color [0/r,1/g,2/y] [0,2]:	0
Latch [0/h,1/y,2/e] [0,2]:	1

At the bottom right, there are "OK" and "Cancel" buttons.

Figure. 9.2 - 22. Details of the “Object property” window for fast relay contacts under On Item name.



The left side of above lists the available signal types:

- **Filtered Binary Inputs** These are the signals from the binary inputs of the device. Filtering means that the transient changes within a limited time span are not considered as status changes.
- **Matrix column** These signals are the derived signals of the software matrix.
- **Graphed input Status** These are the binary output status signals of the function blocks. These status signals are explained in detail in the documents of the individual function blocks.
- **NonFiltered Binary Inputs** These are the signals from the binary inputs of the device. These signals are the non-filtered versions; they can reflect also the transient changes of the inputs.
- **Volatile user status** When editing the user logic in the Graphic logic editor the user may define new binary output status signals, and compose logic relationship resulting these signals.
- **Non volatile user status** When editing the user logic in the Graphic logic editor the user may define new binary output status signals, and compose logic relationship resulting these signals. These signals are defined to be stored in non-volatile memory. If the supply voltage of the device is switched off then it is switched on again, these signals preserve their logic status assigned during the previous energized state of the device.



NOTICE!

Using the Matrix, any logic combination of the available binary signals can be assigned to the LED-s.

9.3 I/O signals

When you insert a module into the rack with [the Rack Designer tool](#), all its information is automatically stored in the device's data bank. Although the individual cards have default names for the connectors, you can rename these physical inputs and outputs in their respective submenus.

The "I/O signals" menu contains the following submenus:

- Analog inputs
 - Measured signals
 - Calculated signals
- Analog outputs
 - Measurement
- Binary inputs
- Binary outputs
 - Sync close contact
- Trip definition
 - Assignment

- Communication
 - Received binary signals
 - Sent binary signals
 - Busbar protection
 - Received binary signals
 - Sent binary signals



NOTICE!

Please note that while some submenus are visible you can edit only their "Title" parameter! You can do this by clicking the **Modify** button. For example, you cannot access the analog inputs as they are arranged during in the factory during the configuration procedure.



NOTICE!

You can sort the rows within a selected column in the windows for each menu/submenu. Click the header of the column with the right mouse button to sort its values in ascending or descending order. Please note that you can only sort the columns that have a gray triangle in front of the column title!

9.3.1 Binary inputs

The "Binary inputs" menu contains the filtered signals. (Filtering means that the transient changes within a limited time span are not considered as status changes.) When clicking the available "Modify" button, the following modifications are allowed:

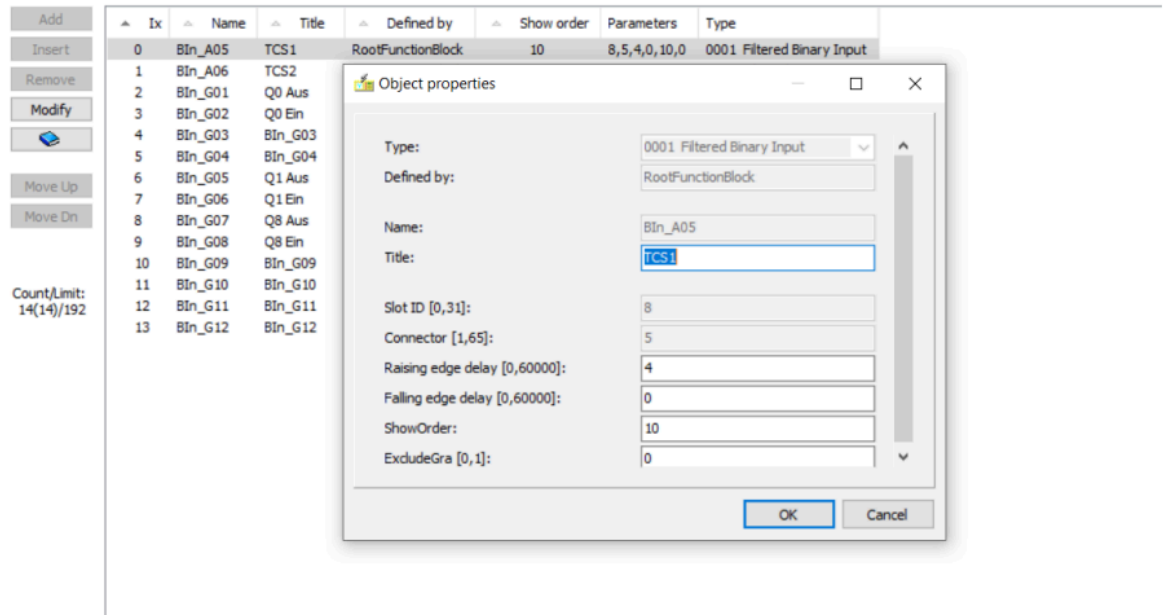
- **Title** This is a free-text field; the text will be the identifier of the input in the documentation and the "On-line" web page also show this title. (e.g., "CB phase L3 status")
- **Rising edge delay** This value is given in ms. The status change from 0 to 1 is accepted only if the initial state is 0 and during the delay time, all checking indicate status 1. (Filtering effect)
- **Falling edge delay** This value is given in ms. The status change from 1 to 0 is accepted only if the initial state is 1 and during the delay time all checking indicate status 0. (Filtering effect)
- **Show order** This value organizes the "On-line" web page sequence of displaying the binary status values. If 0 is given, the status is not displayed. All figures above 0 mean that the signals with identical figures are grouped (e.g., all signals of Show order = 2 are grouped in group No.2). The group number is not shown.

The figure shows that the hardware module in position G provides 12 input connectors. The "Title" field is filled out according to the application. The name, the slot ID and the connector No. may not be modified. The edge delays mean the number of repeated checking before a status change is accepted. "Show order" determines the location of this status signal on the On-line screen.

Every object list is sortable by "Ix", "name", "title", "defined by" and "show order" if the user clicks on header of the proper column.

Figure. 9.3.1 - 23. Binary input signals

IO Signals / Binary Inputs

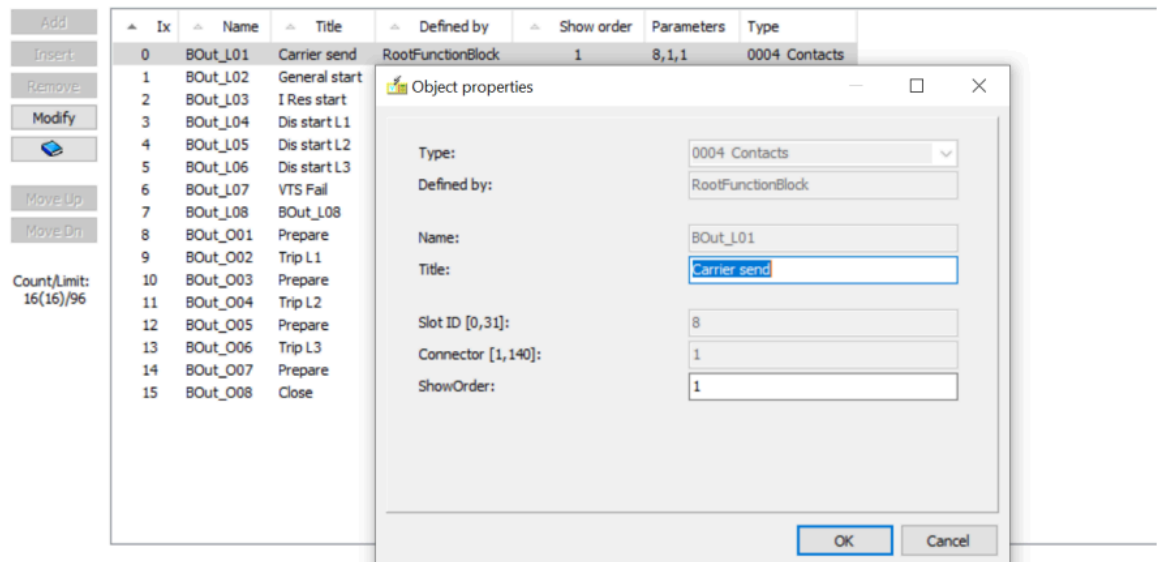


Note: You may not add or remove I/O signals manually. In Master View you may use Check I/O Allocations button on Hardware Configuration property sheet to match signals with hardware.

9.3.2 Binary outputs

Figure. 9.3.2 - 24. Binary output signals

IO Signals / Binary Outputs



Note: You may not add or remove I/O signals manually. In Master View you may use Check I/O Allocations button on Hardware Configuration property sheet to match signals with hardware.

It can be seen that the hardware module in position “L” provides 8 output connectors for signalling and in position “O” 4 output connectors for tripping. Tripping module “O” is characterized by the Prepare Titles. The rest of the Titles are filled out according to the intended application.

For “Binary Outputs” clicking the available "Modify" button, the following modifications are allowed:

- **Title** This is a free-text field; the text will be the identifier of the output in the documentation and the “On-line” web page also show this title. (e.g., “Carrier send”)
- **Show order** This value organizes the “On-line” web page sequence of displaying the binary status values. If 0 is given, the status is not displayed. All figures above 0 mean that the signals with identical figures are grouped (e.g., all signals of Show order = 2 are grouped in group No.2).

The “Sync close contact” submenu provides fast relay operation for the user. In this case, the driving signal does not need to wait for the relatively slow processing of the logic equations available for the users; the selected relays get the status of the assigned signal in every millisecond.

If fast closing (without delay, within 1 ms) is needed, then this kind of contact operation is to be prescribed by clicking the “Add”, “Insert” “Modify” active buttons.

Here the

- “Title” can be renamed. This is a free-text field.
- “Contact” a selection from the dropdown menu. E.g.:
- “0004 Contacts” the only choice here
- “BOut_O08 (Close)” is a contact selected from the second dropdown menu
- “On Item name” identifies the binary signal to operate the relay. Any internal signal can be selected from the dropdown menu. The user must select these signals first by the signal type according to then the selected signal itself.

Figure. 9.3.2 - 25. Assignment of the Sync Close contacts

Sync close contact

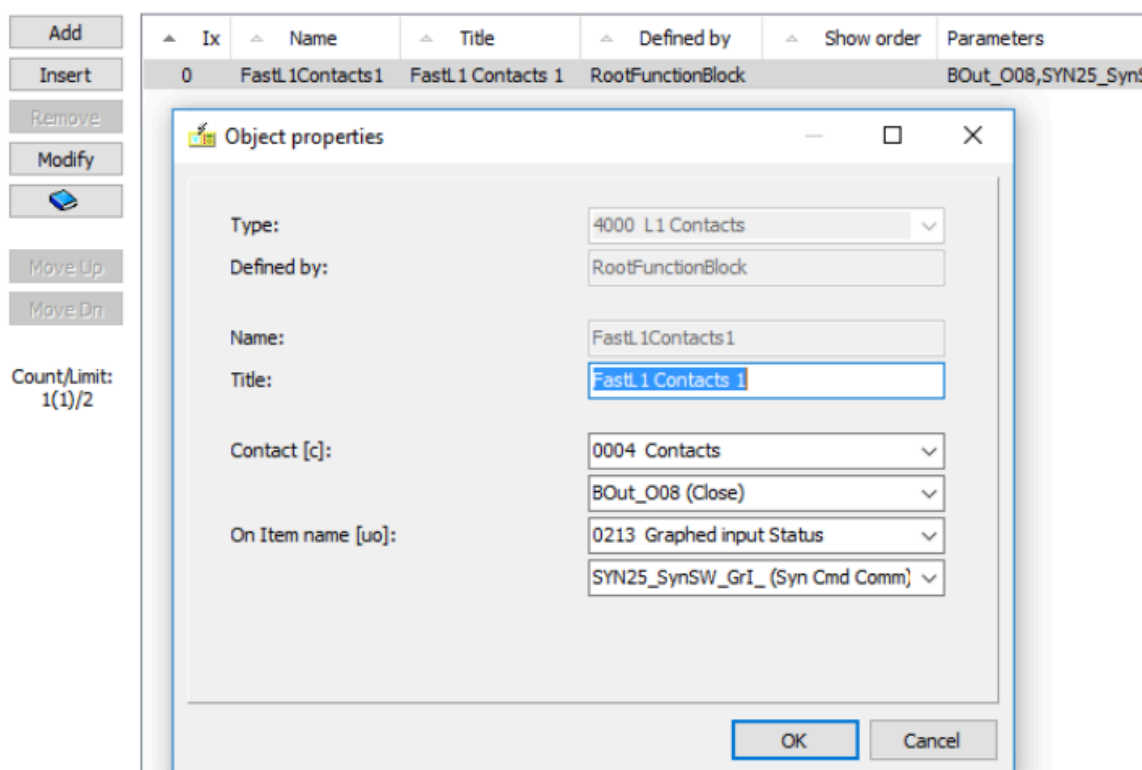


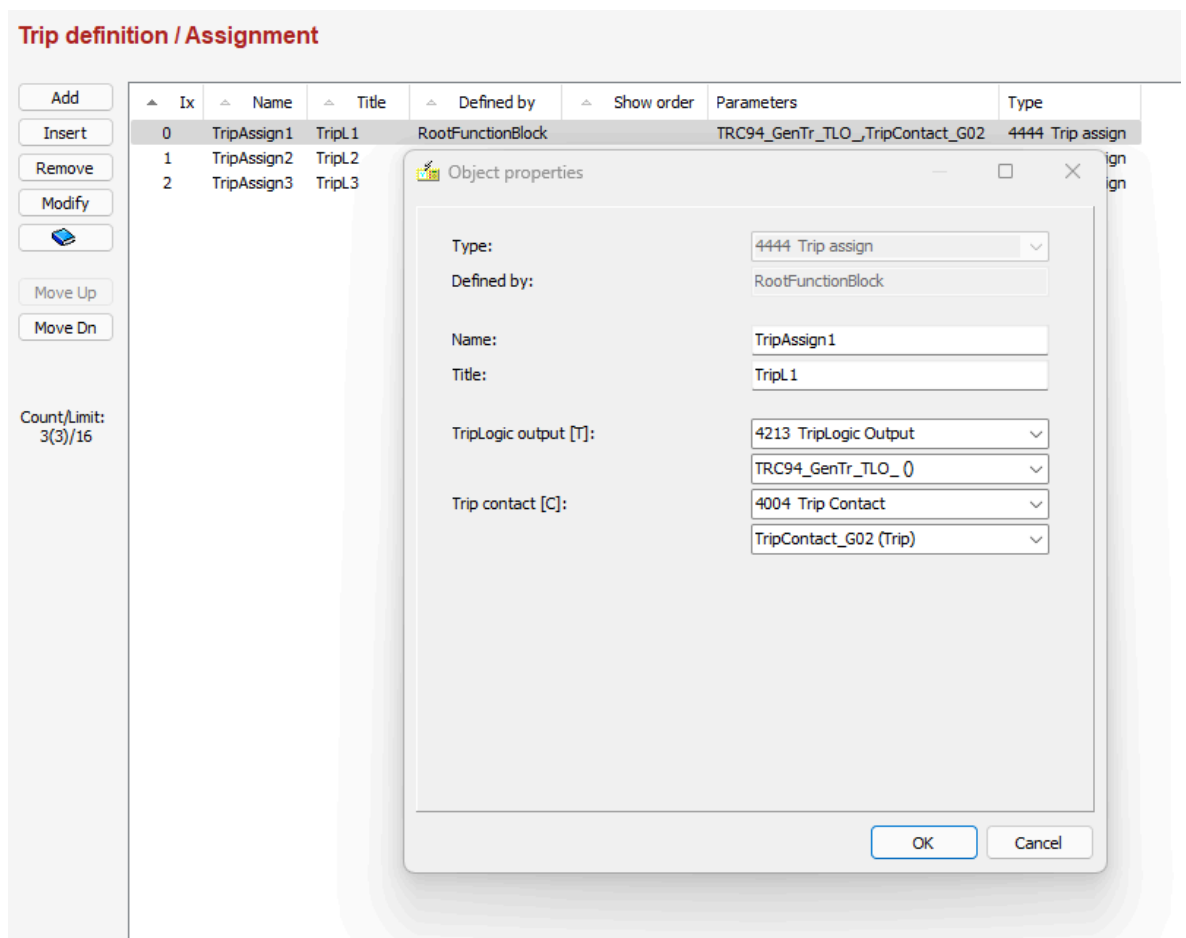
Figure above shows that the Bout_O08 (Close) contact gets the status of the SYN25_SynSW_GrI_ (SyncroSwitch Close) in every millisecond. The selection of both the output contact and the driving signal is supported by dropdown menus.

9.3.3 Trip definition

The contacts of TRIP module are special. These are selected to operate very fast. If fast tripping (without delay, within 1 ms) is needed using e.g. Distance / Differential protection function, then this kind of contact operation is to be prescribed by clicking the

- “Add”,
- “Insert”
- “Remove” or
- “Modify” active buttons. In this case, the data input window shown in figure below is opened.

Figure. 9.3.3 - 26. The “Object property” window for Trip definition / Assignment.



Here the

- “Title” is a free-text field; the text will be the identifier of the output in the documentation.
- “TripLogic output” is a selection from the dropdown menu pre-defined by Arcteq, E.g.:
 - “4213 TripLogic Output” type the only choice here
 - “TRC94_GenTr_TLO_()” is the Trip logic output selected from the second dropdown menu
 - Protection functions can be assigned to a Trip logic block (e.g. TRC94) by means of a graphical logic or with fast equations. Assignment information can be found in the graphical logic editor.
- “Trip contact” identifies the trip relay to operate.

9.3.4 Communication

The master user can modify only the title of the following items:

- The “Received binary signals” and “Sent binary signals” submenus show the received / sent signals from one end to the other end via e.g. a fiber optic cable using the line differential function.
- Signals of busbar protection communication between the “central-unit” and the “bay-unit” are shown in the Busbar protection / “Received binary signals” and “Sent binary signals” submenus.

10 Software configuration

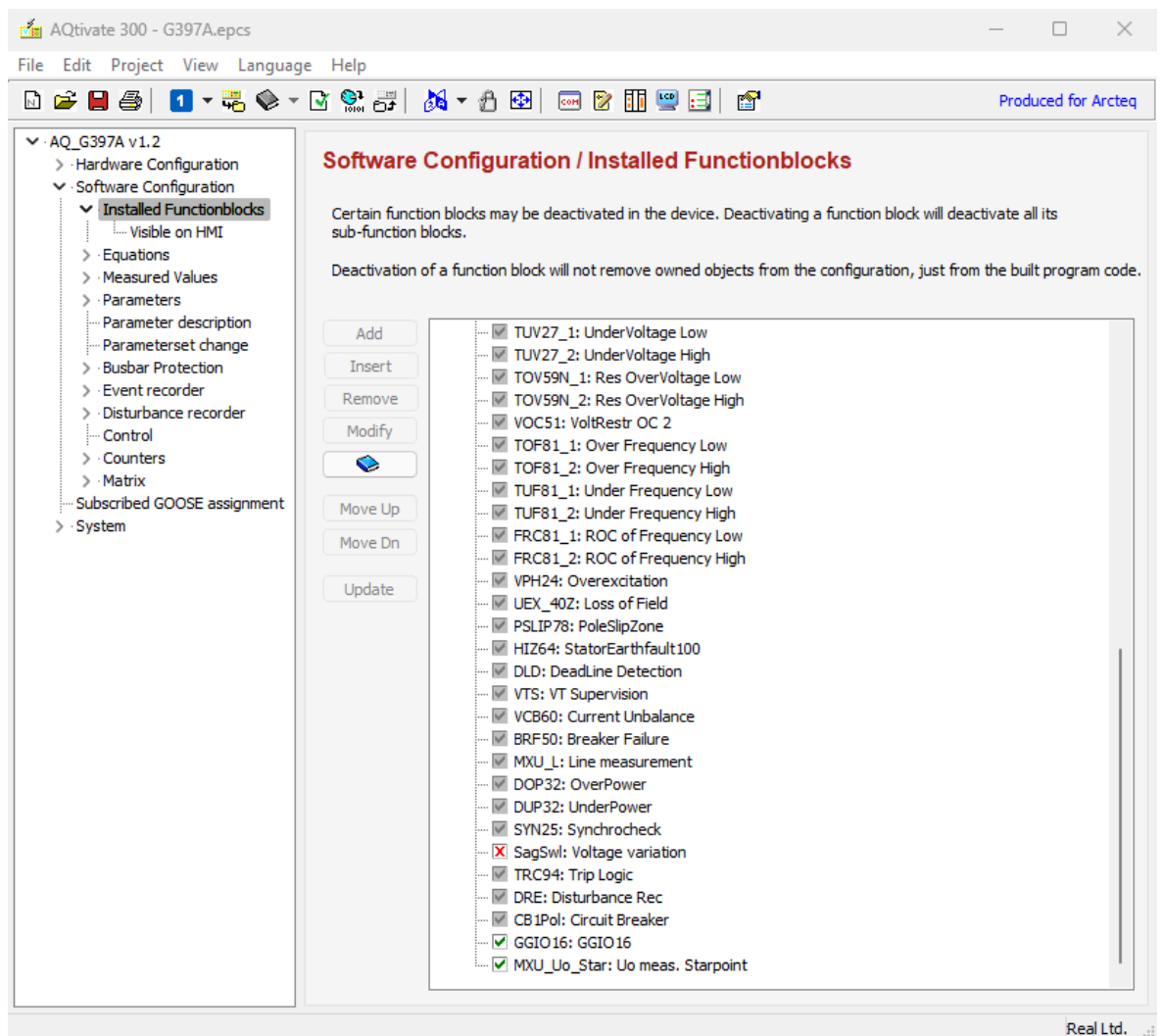
The functionality of the device is determined by the software configuration. This configuration means the assembly of functions blocks for the device and assignment of physical inputs to software inputs (see software configuration below).

The software consists of function blocks (e.g., overcurrent protection function, distance protection function, etc.). Arcteq installs the function blocks during the factory configuration process. In “Master view” the user has the possibility to deactivate/activate the various function blocks. For a deactivated block, no parameter setting is needed and no output signals are generated.

10.1 Functions

Figure below shows a possible configuration when opening the “Software configuration/ /Installed Functionblocks” menu. The green checkmarks indicate active blocks, the red X means that the function block is not needed and it is deactivated. The grayed checkmark means that the operation of the function block cannot be deactivated because it is not allowed or it is used in a logic editor sheet.

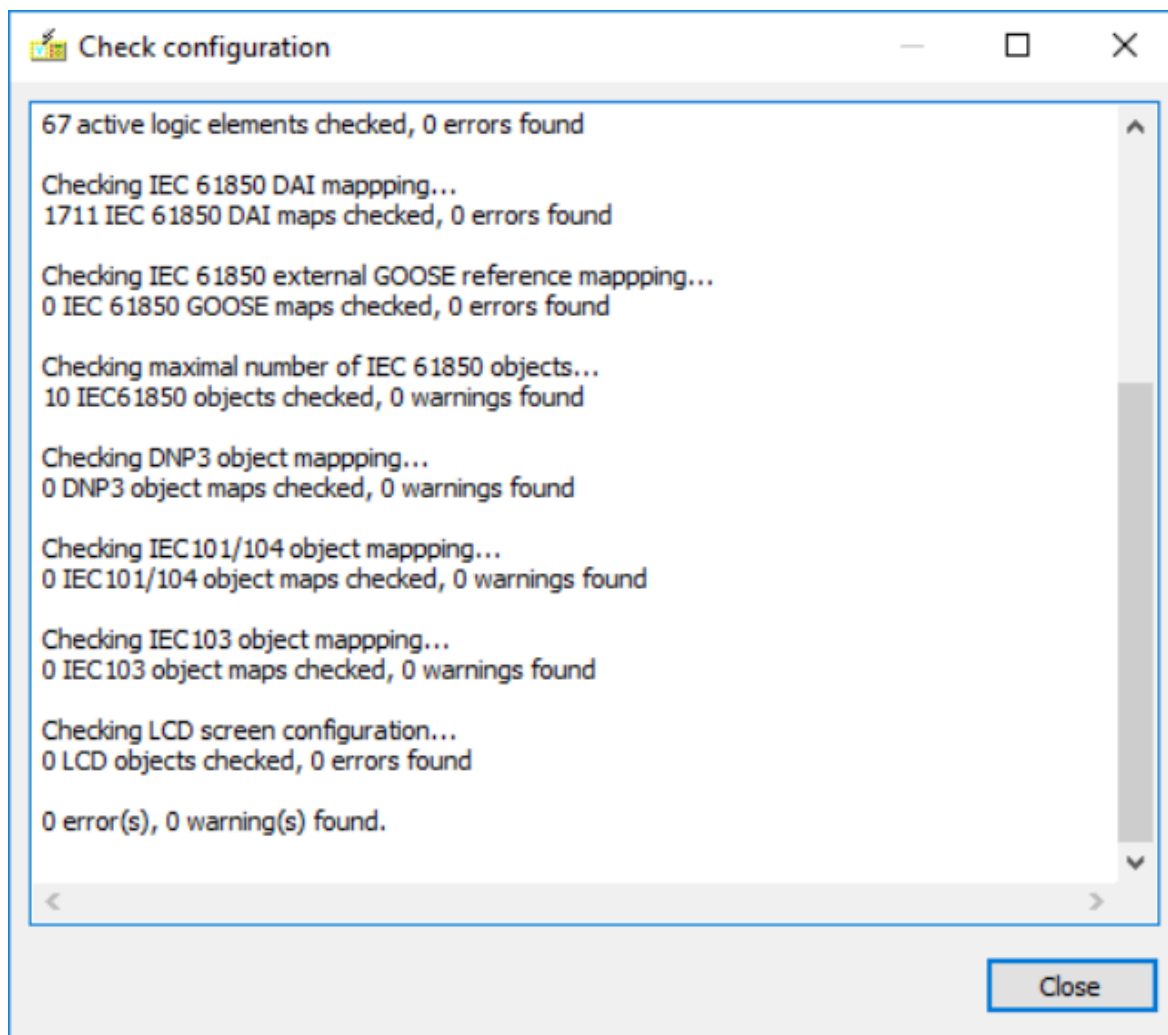
Figure. 10.1 - 27. Example of installed function blocks in an AQ-G397A configuration.



If the checkbox is not grey, the user can activate or deactivate the functions blocks simply by clicking on the checkmark field.

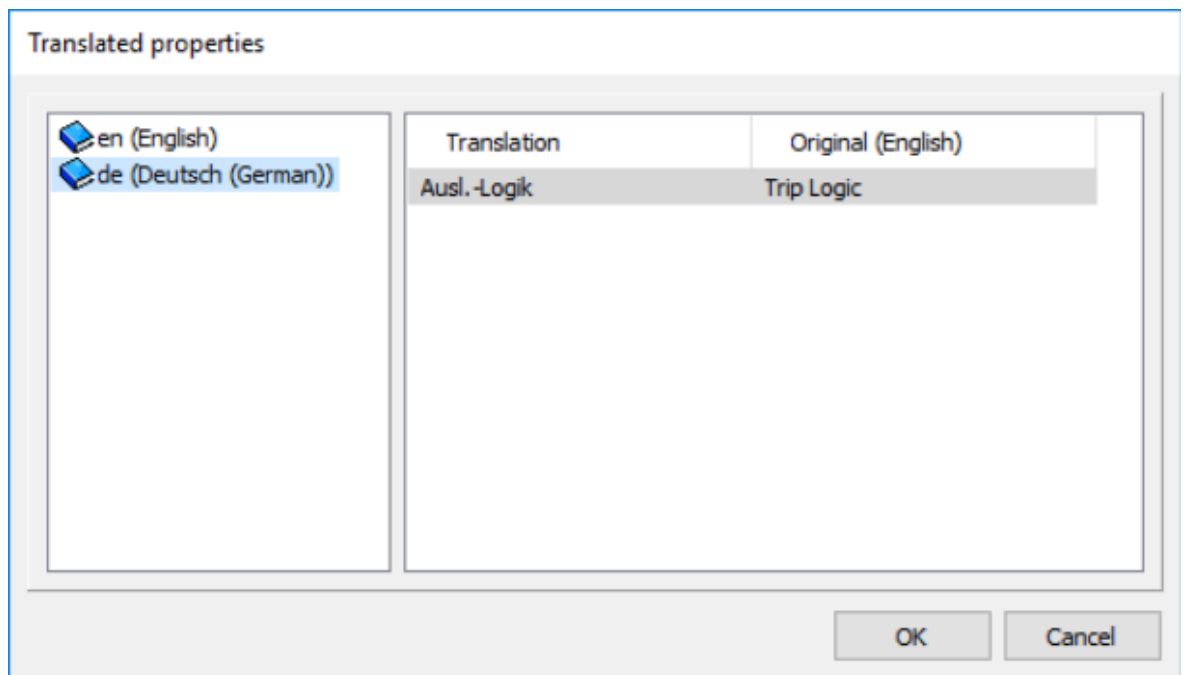
Be careful when deactivating functions! To check for errors, apply the "Check configuration" icon, which will start the "Check Configuration" procedure. The alternative method of checking is to select "Project / Check configuration" from the menu. The result is acceptable, if the summary of the check is similar to figure below: No errors found.

Figure. 10.1 - 28. The result of "Check Configuration"



In Master level the Title of the function block may be modified. In addition, by clicking on the Translation button, the translation of the title can be modified.

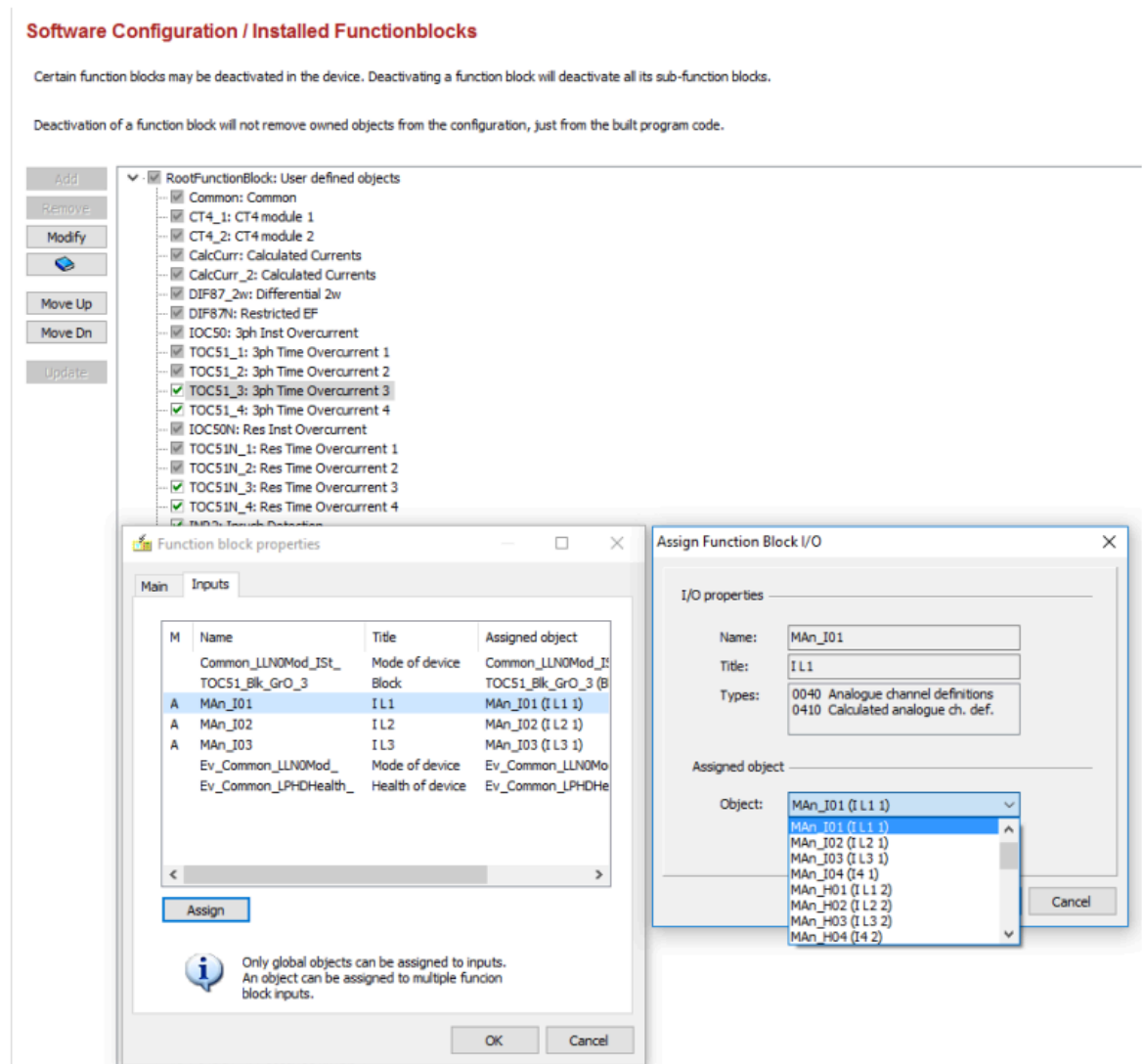
Figure. 10.1 - 29. Translation



Selected Function Block can be moved up and down in the Installed FBs list in Master View. The display order of the function blocks on the web page of the IED can be modified by this feature.

In some exceptional cases, the user can perform some modifications in the function blocks in "Master view". When the "Modify" active button is clicked, the function block properties are shown in a pop-up window shown in figure below.

Figure. 10.1 - 30. The “Function block properties” window.



As an example, this window shows the procedure of assigning inputs to a definite time overcurrent protection function (TOC51D).

The “A” in the column “M” shows that the input can be reassigned by the general user and not just the factory user (the designation with letter “A” may vary in different languages, like “Z” in German language).

When the active “Assign” button is clicked, the “Assign Function Block I/O” window is opened. In our example an assignment was selected (the name “Man_I01(IL1 1)” in this factory configuration).

Function blocks also have a version number. The version is displayed in the Function Block Properties “Main” window. Only an Administrator can modify the version number. The general user can however modify the title and set up groups for mutually exclusive function blocks (figure below). If multiple FB’s are assigned to the same group, only one of them can be activated at a time. Time critical functions (e.g. differential, inst. OC) are part of the fast equations and therefore cannot be assigned to a group of mutually exclusive function blocks.

Figure. 10.1 - 31. The “Main” window of FB properties.

Function block properties

Main Inputs Outputs Owned objects

Function block identifiers

Give a unique object identifier as name and a short description as title for the function block.

Name: IOC50

Title: 3ph Instaneous Overcurrent

Version: 10

Deactivation

This function block may be deactivated

This function block is used in User Logic

This function block is active

Group of mutually exclusive FBs: 0

OK Cancel

In most cases, however, the user has no access to the function block and the modification is permitted on higher access level (e.g.: administrator view) only.

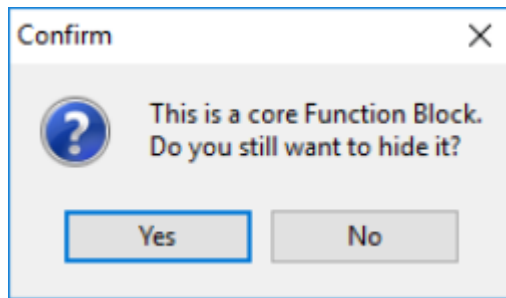
Visible on HMI

The function block list in “Visible on HMI” submenu contains only the active function blocks which are not deactivated in the Installed function blocks list. Core Function Blocks -which cannot be deactivated, because they are used in the Logic editor or the deactivation is forbidden- are shown with grey checkbox in the Visible function blocks list.

If some of the function blocks are not needed, they can be set to “invisible” status here. The invisible function blocks do not show the parameters and do not change status signals and the measured variables. Hiding a core function block requires confirmation.

To set a function block invisible, enter the “Software configuration / Functions / Visible function block” menu and toggle the “Visible” status from green check mark to red X.

Figure. 10.1 - 32. Confirmation question.



10.1.1 Activating and deactivating function blocks

If the checkbox in front of the function block is not gray, you can activate and deactivate the block whenever you need by simply clicking its checkmark field.

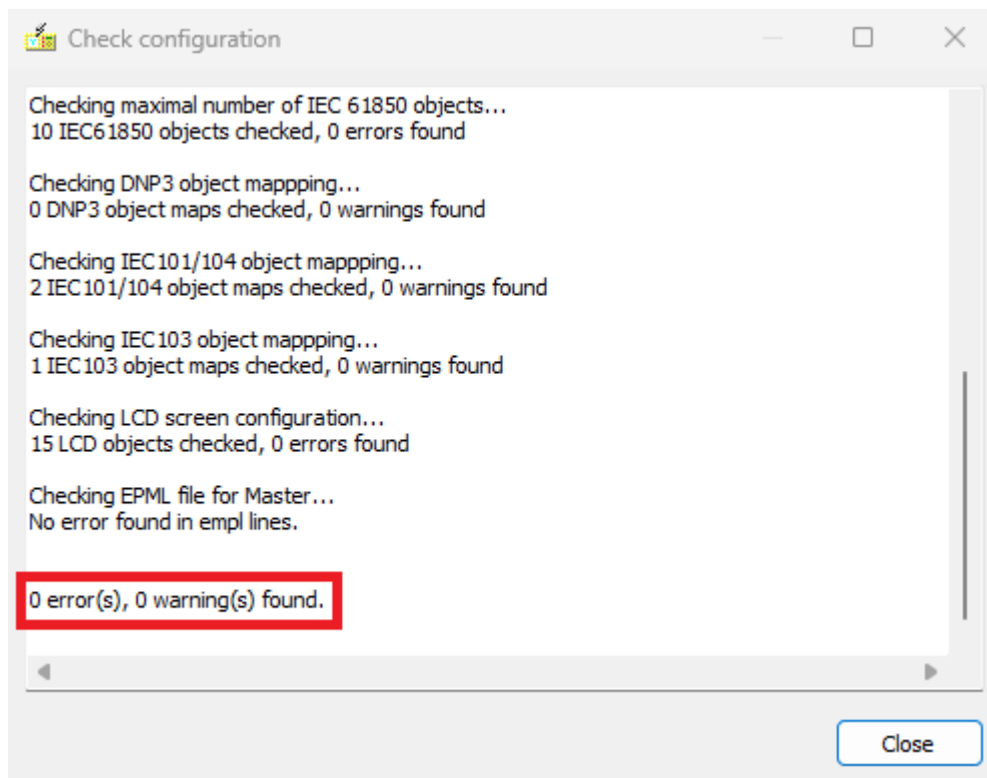


CAUTION!

Be careful when you deactivate functions! For example, deactivating a function whose output is used in a graphic equation or another part of the software system may disrupt the signal flow.

After you have deactivated a function block, check the configuration for errors (*Project* → "Check configuration"). The result is acceptable if the summary shows no errors as in the figure below ("0 error(s), 0 warning(s) found").

Figure. 10.1.1 - 33. Example of a configuration check summary without errors.



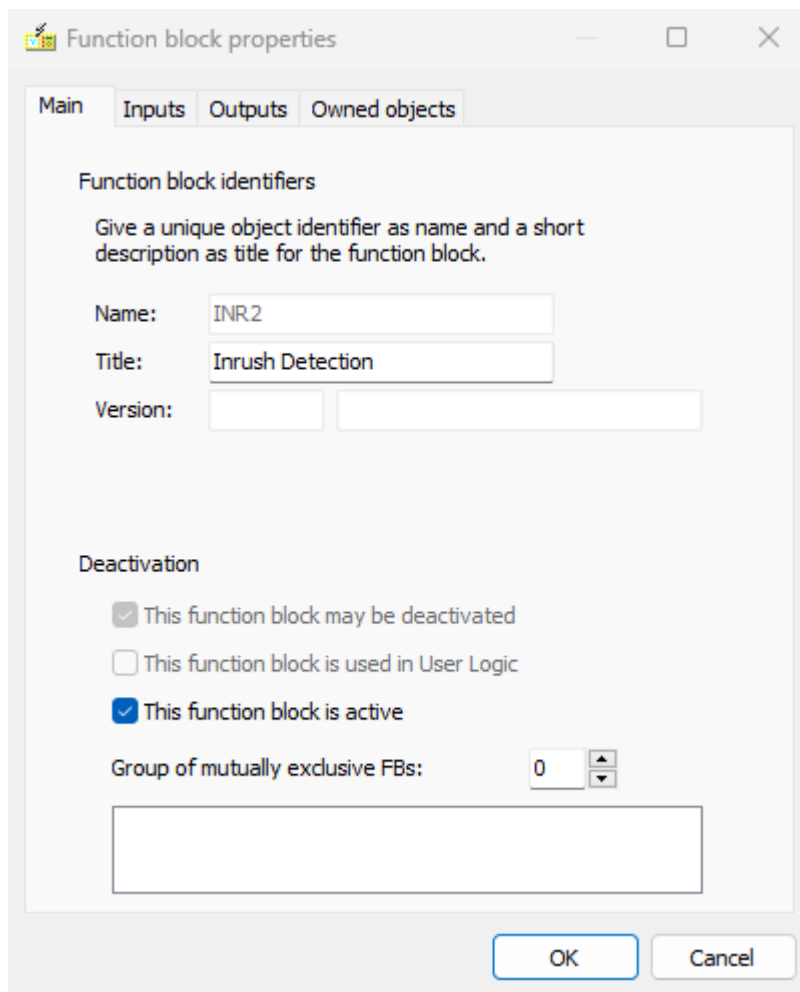
NOTICE!

Deactivating a function block will also deactivate all its sub-function blocks!
Deactivating a function block does **not** remove its owned objects from the configuration, only from the built program code!

10.1.2 Modifying function blocks

You can modify various aspects of a function block by selecting the function block and pressing the **Modify** button. This opens the "Function block properties" dialog window (see the figure below).

Figure. 10.1.2 - 34. "Function block properties" dialog window.



Each function block has four (4) tabs in this dialog window: "Main", "Inputs", "Outputs", and "Owned objects". The sections below describe each of these in more detail.

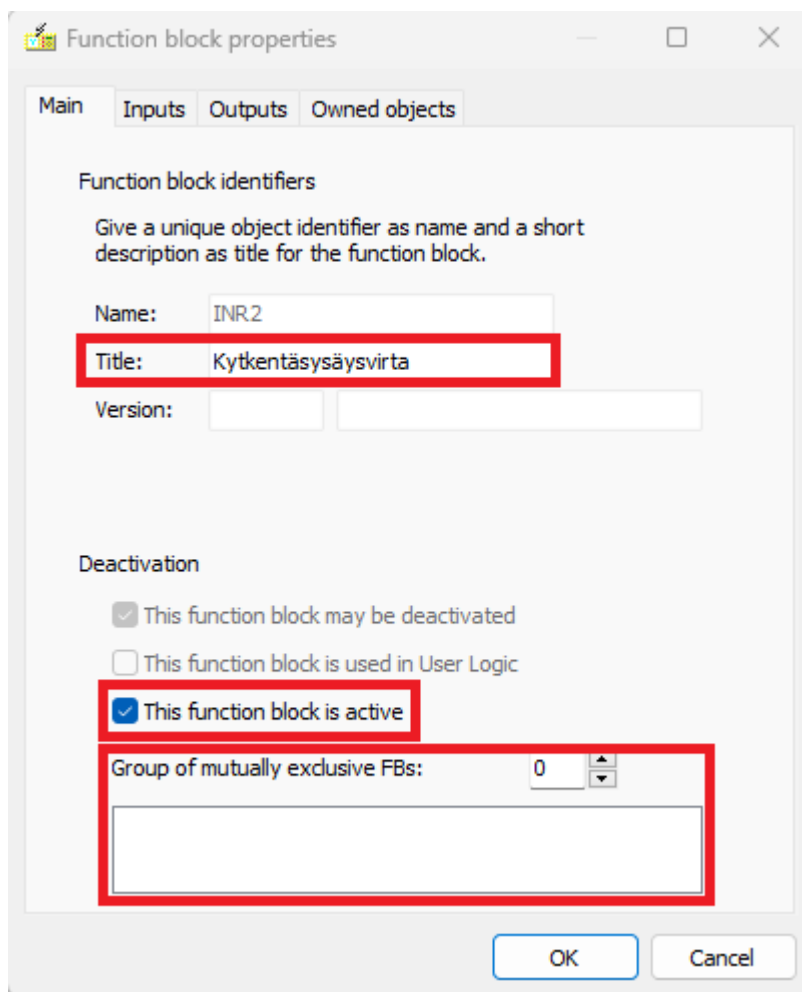
NOTICE!

When the language of AQtivate 300 is not English, you can also modify the translation of the function block's title by selecting a function block in the list and pressing the **Translation** button (the blue book icon below the **Modify** button)!

Main

In the "Main" tab you can find information on the function block's identifiers and deactivation settings (see the figure below).

Figure. 10.1.2 - 35. "Main" tab.



Name

A unique object identifier given to the function block. These are usually abbreviations derived from the function block name and/or ANSI codes. You cannot modify the name field.

Title

The title is usually a short description of the function block. You can edit the title as you like.

Version

The function block's version number can only be changed by Arcteq.

Deactivation checkboxes

The boxes show whether the function can be activated or deactivated. It also shows whether any of the function block's I/O is being used in user logic. You can activate and deactivate functions from this window as well as with the function block list checkboxes.

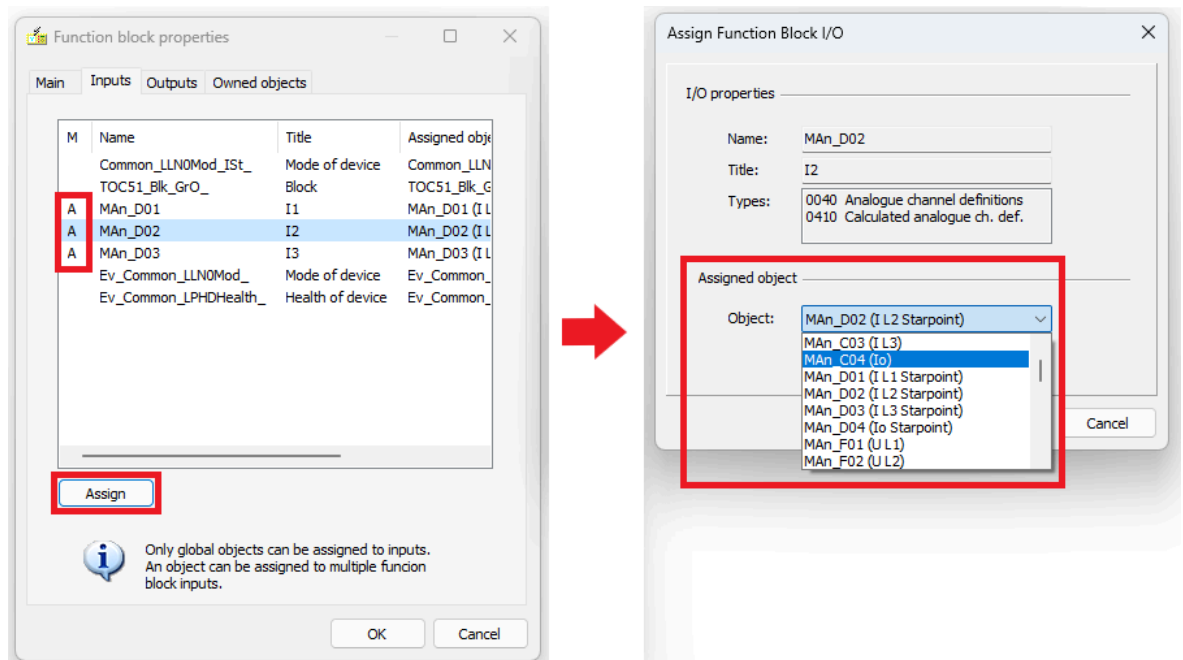
Mutually exclusive FB groups

You can set up function block groups to make sure specific function blocks can only be activated one at a time. When two or more function blocks are assigned to the same group, only one of them can be activated. Please note that time critical functions (such as the overcurrent protection function) are part of fast equations and cannot therefore be assigned to these FB groups.

Inputs

In the "Inputs" tab you can determine which objects are assigned to which inputs of the function block. The inputs on the list with an "A" in the "M" column indicates that they can have inputs assigned. Select one of these inputs and press the **Assign** button. This opens a new dialog window "Assign Function Block I/O". Here you can see the inputs's type(s), and choose the assigned object from the dropdown menu (see the figure below).

Figure. 10.1.2 - 36. Assigning objects to function block inputs.



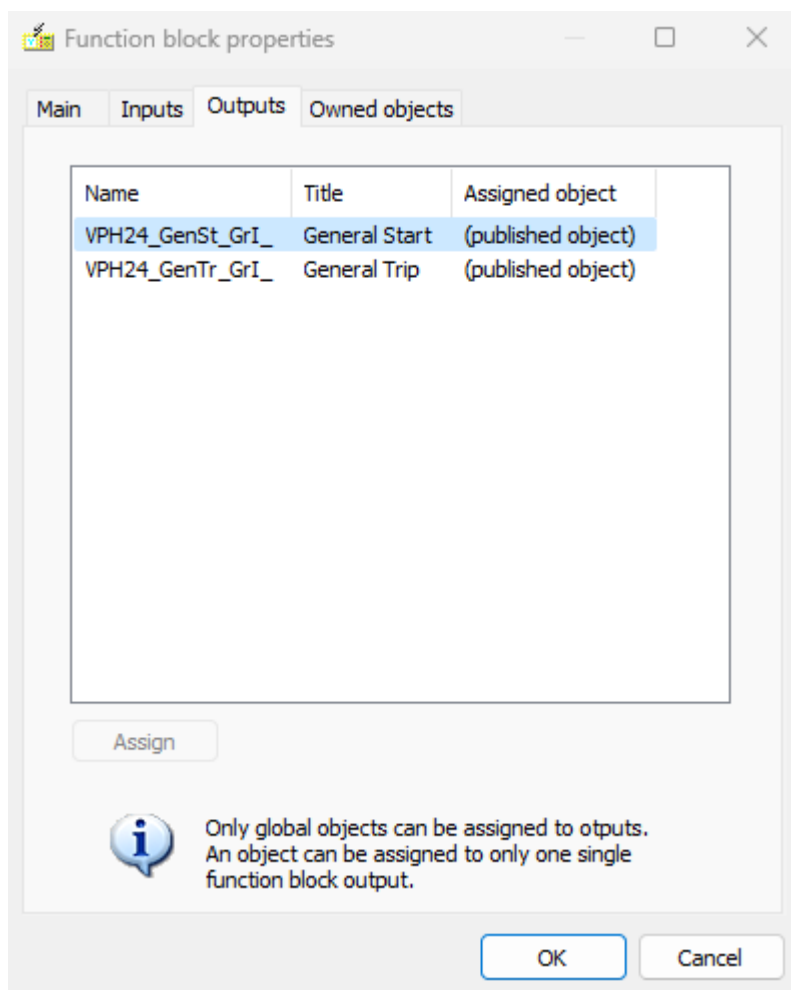
NOTICE!

You can only assign global objects to a function block input! However, this object can be assigned to multiple inputs at the same time.

Outputs

The "Outputs" tab lists all the outputs of the function block. The process of assigning outputs works the same as with inputs.

Figure. 10.1.2 - 37. "Outputs" tab.



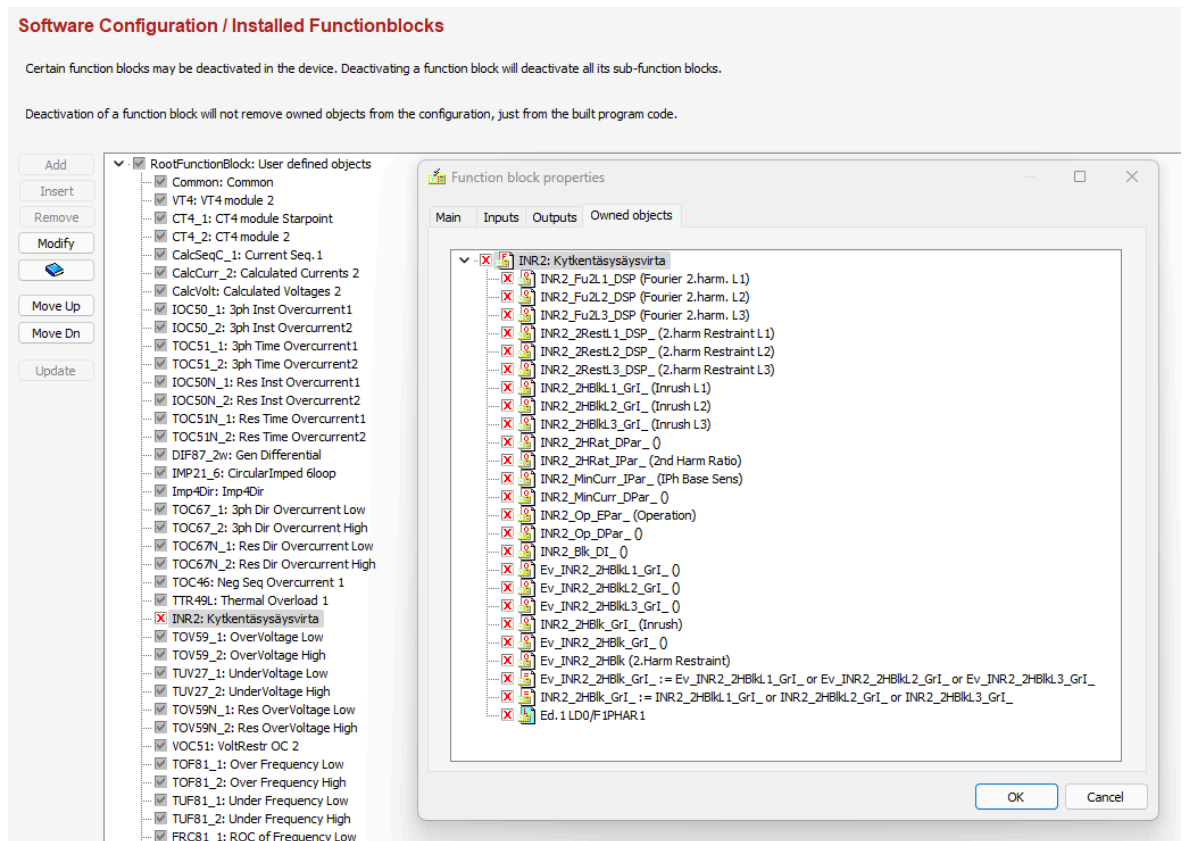
NOTICE!

You can only assign global objects to a function block output!
One object can only be assigned to one FB output!

Owned objects

The "Owned objects" tab lists all the objects that have been assigned to the inputs and outputs of the function block in question. As was mentioned previously, deactivating a function block does **not** remove its owned objects from the configuration, it only removes them from the built program code. You can see an example of this in the figure below, where the inrush detection FB (INR2) has been deactivated: its owned objects are also deactivated but they are still attached to the INR2 function block.

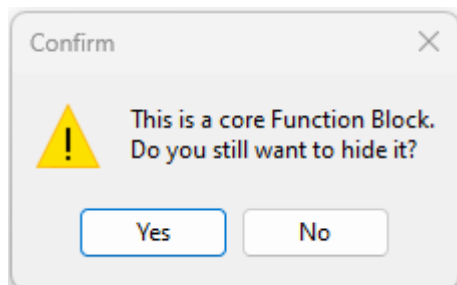
Figure. 10.1.2 - 38. "Owned objects" tab.



10.1.3 The "Visible on HMI" submenu

The function block list in the "Visible on HMI" submenu only contains the active function blocks which are not deactivated in the Installed function blocks list. There are a number of core function blocks which cannot be deactivated because they are used in the Logic Editor tool or their deactivation is forbidden due to other reasons. These core FBs are shown with gray checkboxes in the "Visible on HMI" FB list. However, if you do not need a core function to be visible, you can hide it by clicking the checkbox in front of the function block name. A pop-up window will then notify you that it is a core function block and asks you to confirm that you want to make it invisible regardless (see the figure below). If you click **Yes**, the checkbox's green checkmark toggles to a red "X".

Figure. 10.1.3 - 39. Pop-up window confirming that you want to hide a core function block.



NOTICE!

You cannot see the parameters of invisible function blocks in the device's web interface, and you cannot change their status signals or their measured variables!

10.2 Equations

Master users can see the equations applied for the different protection functions for information. Changes are not allowed on this access level.



NOTICE!

The content of these equations are not visible in the Logic Editor tool!

Fast logic

Fast Logic equations are used to create a fast channel for time sensitive functions (e.g.: 87 trip, 21 trip, 50 trip or 25 synch switch command) to activate the relay high-speed outputs. The equations assign the time sensitive signals to functions (TRC94, SYN25_SynSW), which can directly operate the high-speed output contacts. Contact assignment to these functions shall be done under HW Configuration / IO Signals / Binary Outputs & Trip definition.

Normal logic

Normal Logic equations are used to supplement FB functionalities and implement special functions requested by the customer. They shall be used for non-time sensitive signals only.

10.3 Measured values

The “Software configuration /Measured Values” menu has a submenu “On-line”. All measured values are listed here, which are visible under “On-line data” on the web browser. The “Title” field can be modified only.

Figure. 10.3 - 40. Measured values in AQtivate 300.

▲ Ix	▲ Name	▲ Title	▲ Defined by	▲ Show order	Parameters	Type
0	VT4_U1_OLM_	Voltage Ch - U1	VT4	1	-2,V,1	0305 Online measurands
1	VT4_U1Ang_OLM_	Angle Ch - U1	VT4	1	0,deg,1	0305 Online measurands
2	VT4_U2_OLM_	Voltage Ch - U2	VT4	1	-2,V,1	0305 Online measurands
3	VT4_U2Ang_OLM_	Angle Ch - U2	VT4	1	0,deg,1	0305 Online measurands
4	VT4_U3_OLM_	Voltage Ch - U3	VT4	1	-2,V,1	0305 Online measurands
5	VT4_U3Ang_OLM_	Angle Ch - U3	VT4	1	0,deg,1	0305 Online measurands
6	VT4_U4_OLM_	Voltage Ch - U4	VT4	1	-2,V,1	0305 Online measurands
7	VT4_U4Ang_OLM_	Angle Ch - U4	VT4	1	0,deg,1	0305 Online measurands
8	CT4_I1_OLM_1	Current Ch - I1	CT4_1	1	-2,A,1	0305 Online measurands
9	CT4_I1Ang_OLM_1	Angle Ch - I1	CT4_1	1	0,deg,1	0305 Online measurands
10	CT4_I2_OLM_1	Current Ch - I2	CT4_1	1	-2,A,1	0305 Online measurands
11	CT4_I2Ang_OLM_1	Angle Ch - I2	CT4_1	1	0,deg,1	0305 Online measurands
12	CT4_I3_OLM_1	Current Ch - I3	CT4_1	1	-2,A,1	0305 Online measurands
13	CT4_I3Ang_OLM_1	Angle Ch - I3	CT4_1	1	0,deg,1	0305 Online measurands
14	CT4_I4_OLM_1	Current Ch - I4	CT4_1	1	-2,A,1	0305 Online measurands
15	CT4_I4Ang_OLM_1	Angle Ch - I4	CT4_1	1	0,deg,1	0305 Online measurands
16	CT4_I1_OLM_2	Current Ch - I1	CT4_2	1	-2,A,1	0305 Online measurands
17	CT4_I1Ang_OLM_2	Angle Ch - I1	CT4_2	1	0,deg,1	0305 Online measurands
18	CT4_I2_OLM_2	Current Ch - I2	CT4_2	1	-2,A,1	0305 Online measurands
19	CT4_I2Ang_OLM_2	Angle Ch - I2	CT4_2	1	0,deg,1	0305 Online measurands
20	CT4_I3_OLM_2	Current Ch - I3	CT4_2	1	-2,A,1	0305 Online measurands
21	CT4_I3Ang_OLM_2	Angle Ch - I3	CT4_2	1	0,deg,1	0305 Online measurands
22	CT4_I4_OLM_2	Current Ch - I4	CT4_2	1	-2,A,1	0305 Online measurands
23	CT4_I4Ang_OLM_2	Angle Ch - I4	CT4_2	1	0,deg,1	0305 Online measurands
24	DIF87_L1D_OLM_	I Diff L1	DIF87_2w	1	-2,*In,1	0305 Online measurands
25	DIF87_L2D_OLM_	I Diff L2	DIF87_2w	1	-2,*In,1	0305 Online measurands
26	DIF87_L3D_OLM_	I Diff L3	DIF87_2w	1	-2,*In,1	0305 Online measurands
27	DIF87_L1Bia_OLM_	I Bias L1	DIF87_2w	1	-2,*In,1	0305 Online measurands
28	DIF87_L2Bia_OLM_	I Bias L2	DIF87_2w	1	-2,*In,1	0305 Online measurands
29	DIF87_L3Bia_OLM_	I Bias L3	DIF87_2w	1	-2,*In,1	0305 Online measurands
30	TTR49L_Temp_OLM_	Calc Temperature	TTR49L	1	0,o,1	0305 Online measurands

10.4 Parameters



NOTICE!

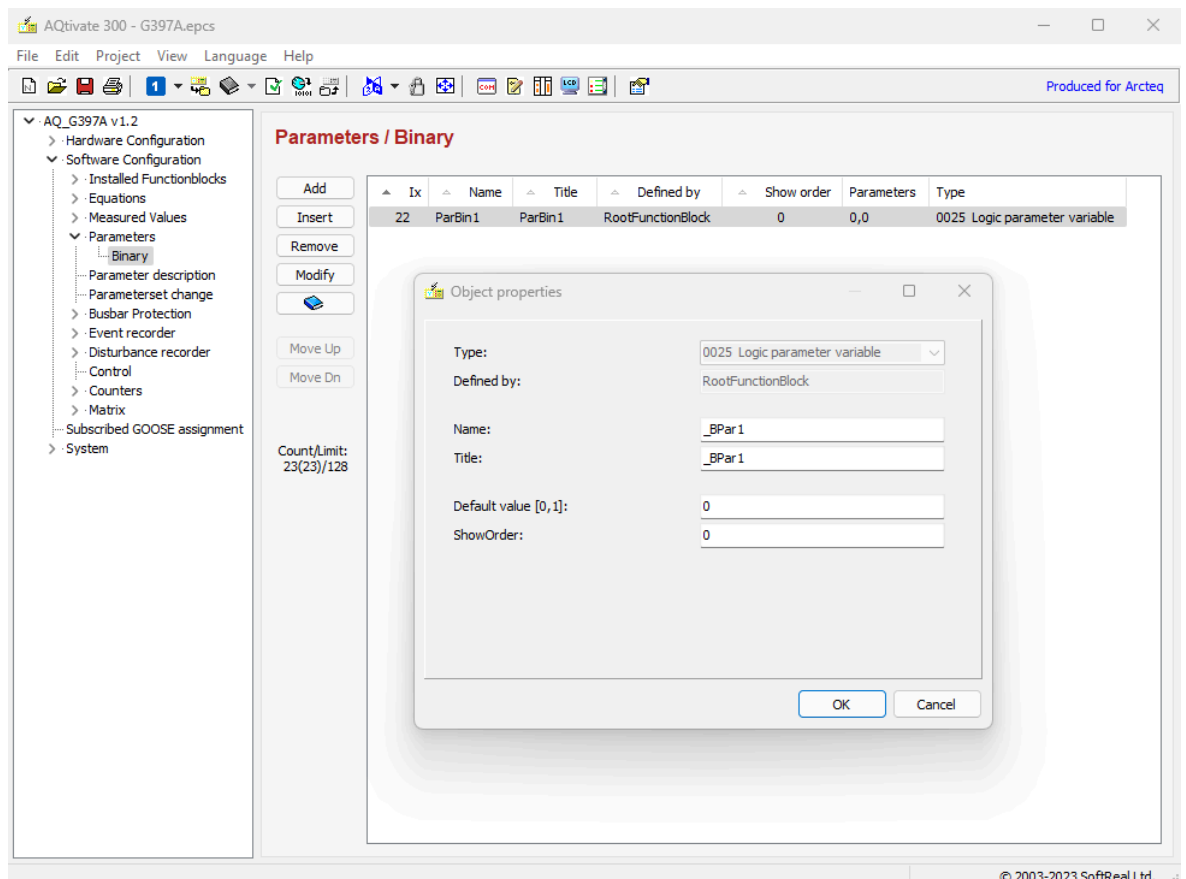
The parameter setting is basically not a task for this AQtivate 300 configuration software. Only the Binary parameter type can be managed under “Software configuration /Parameters” menu.

All other necessary parameters are part of the factory configuration; the user has no access to them. (Timer parameters are exceptions: when a user defines a new timer in the Logic editor then also a new timer can be defined. This new timer may be modified in the Logic editor.)

When opening the “Binary parameters” menu, figure below is displayed. Only the user defined parameters are shown here. These new parameter values must be set in the device, and the parameters can be applied when editing the graphical equations.

If no parameter has been defined yet, then the active “Add” button can be clicked and the “Object properties” window is also opened. The same window is displayed when several user defined parameters exist and the button “Insert” or “Modify” is clicked. The “Remove” button is also active for the user defined binary parameters.

Figure. 10.4 - 41. Dialog window for binary parameters.



When adding a new binary parameter, the following must be defined:

- **Name** the freely editable name of the new parameter displayed in the graphical editor
- **Title** the freely editable title of the new parameter displayed in the graphical editor (in brackets)
- **Default** value the value without parameter modification

- **ShowOrder** this value organizes the “Parameter” sequence of displaying the parameter values. If 0 is given, the status is not displayed. All figures above 0 mean that the signals with identical figures are grouped (e.g., all signals of Show order = 2 are grouped in group No.2).

10.5 Parameter description



NOTICE!

Parameter descriptions require that your CDSP version is 1530 or higher!

If you think that your title does not offer enough information of the binary parameter, you can always create a parameter description with more character space to describe its purpose better. This description is displayed in the device's web interface, in the "Parameters" page.

You can add a parameter description in the submenu of the same name in under the "Software configuration" menu.

When you add a new parameter description, you must define the following:

- **Name**
This value is a freely editable text field, where you give the parameter description an identifying name. We recommend using a derivative of the binary parameter to which this description belongs to. For example, if this description were to belong to the binary parameter "ParBin1", you could name the description as "ParBin1_Desc". This name is displayed in the Logic Editor tool.
- **Title**
This value is freely editable text field, where you give the parameter description an identifying title. We recommend using a derivative of the binary parameter to which this description belongs to, for example, "Description for ParBin1". This title is displayed in the Logic Editor tool, and it comes in brackets after the description name.
- **Referred object**
This value determines the object type described. You select the type from a dropdown list where the options are "Integer", "Timer", "Logic", "Constant", "Float", "Enumerated", and "User timer parameters".
- **Text**
This freely editable text field provides you space to fill in detailed information about the parameter or to make a note, such as adding suggested setting values.



CAUTION!

If you receive an error message when you create or modify a parameter description, your configuration file needs to be updated. Please contact Arcteq's technical support (details at the end of this manual).

10.6 Parameterset change

When opening the “Parameterset change” menu, figure below is displayed. In this example, a new parameter set is to be added. The ParSet1 is active if the “Bin_G02” binary input receives an active signal. In the example, a new set is “Add”-ed, and the “Bin_G02” binary input is prepared for selection to activate that set.

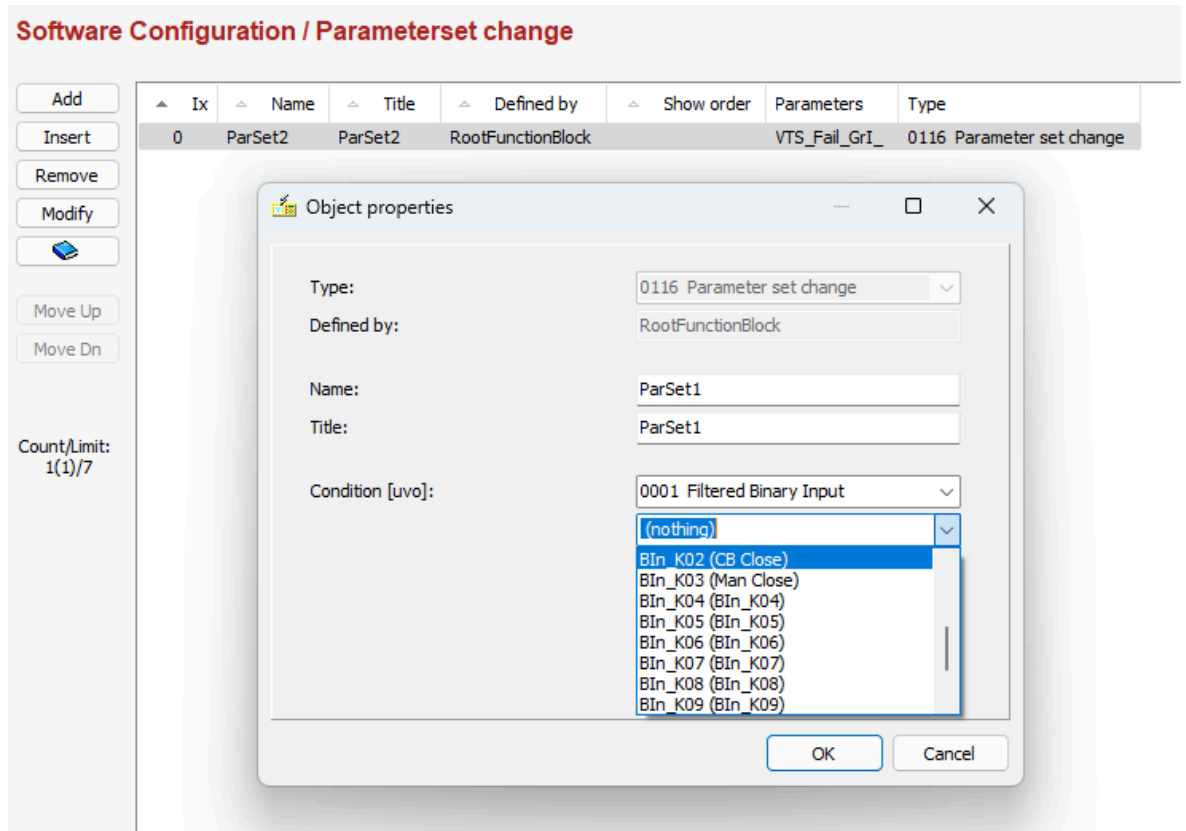


NOTICE!

The number of parameter sets is defined by the number of the parameter sets added plus the original one. If any condition for parameter set changes is set in the “Parameter set change” window, then this operation cannot be performed in any other way. If the “Condition” input field is empty, the command via IEC 61850 communication channel or via web browser can change between the available parameter sets.

If no new parameter set has been defined yet, then the active “Add” button can be clicked and the “Object properties” window is also opened (see figure below). The same window is displayed when several defined parameters exist and the button “Insert” or “Modify” is clicked. The “Remove” button is also active.

Figure. 10.6 - 42. Example of adding a new parameter set.



10.7 Busbar protection

A factory default primary topology is set in all central unit of a distributed or a centralized busbar protection device. The user can modify this pre-configured topology, using the following types.

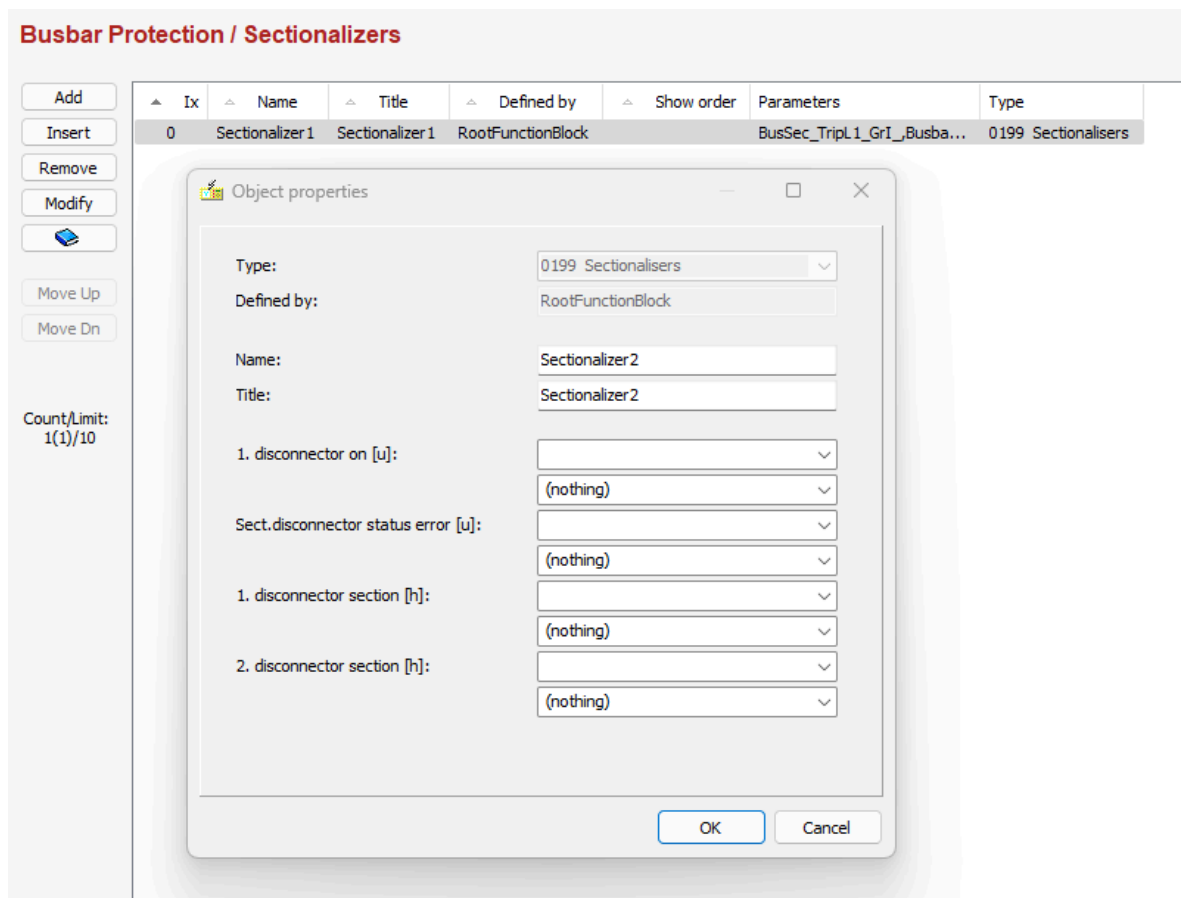
The object lists are sortable by “Ix”, “name”, “title”, “defined by” and “show order” if the user clicks on header of the proper column. Note: “Ix” of an object is the creation order by default, but it can be modified for some type of objects by the “Move up” and “Move down” buttons (like for disturbance recorder signals, matrix inputs and outputs), because this number means also the displaying order for those object types.

Sectionalizers

The sectionalizer can combine zones when you have disconnectors in the sectionalizer bay without current transformer. If no sectionalizer has been defined yet, then the active “Add” button can be clicked and the “Object properties” window is also opened.

User can choose a Disconnector closed status which combines the selected Bus Sections (Zones). A Master View user can not add new Bus Section function blocks into the configuration. Busbar protection algorithm can handle maximum 10 pieces of Sectionalizers.

Figure. 10.7 - 43. The “Sectionalizers” window and the “Object properties” data block.



NOTICE!

The maximum number of sectionalizers is 10!

Bay topology

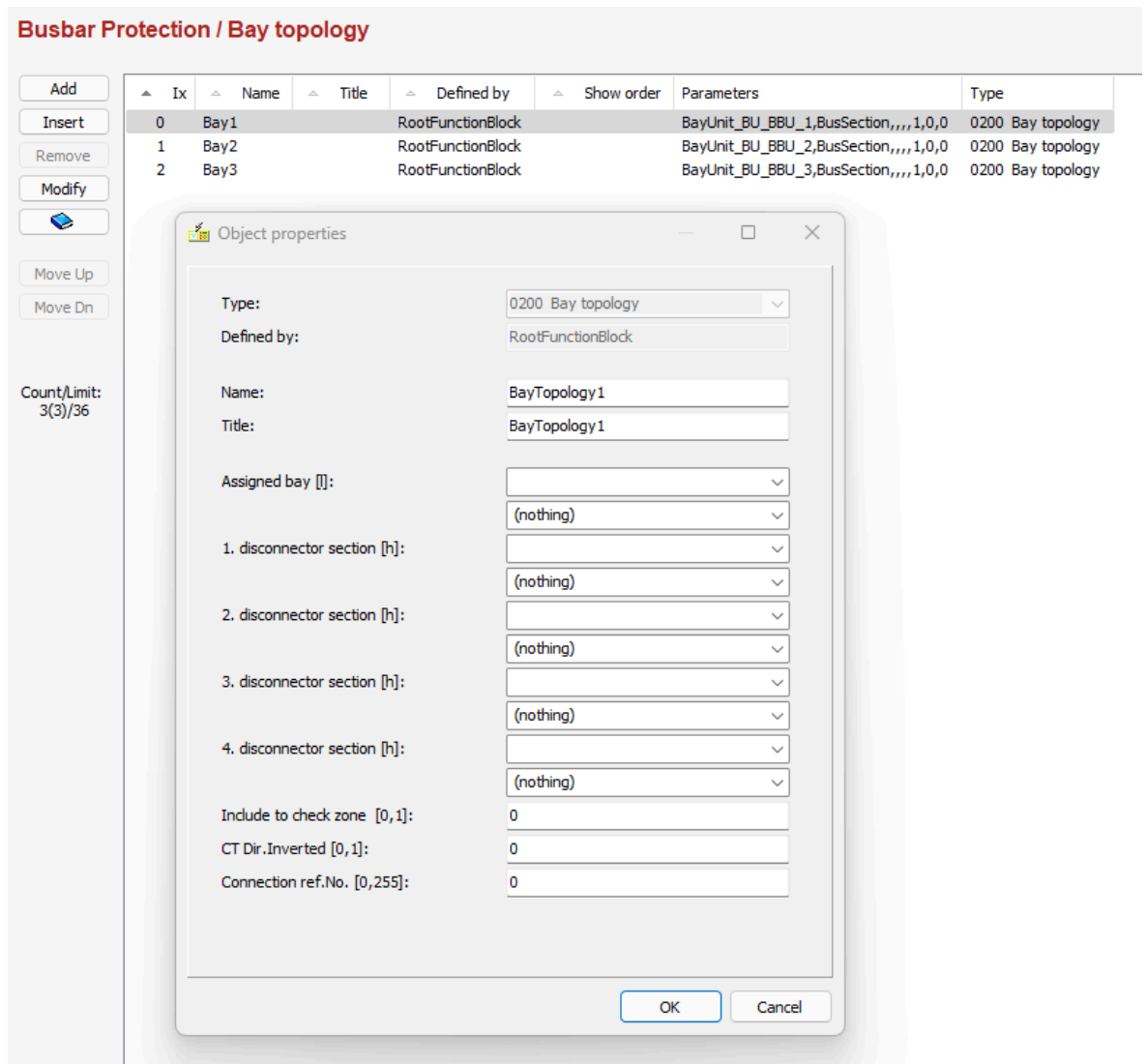
The bay topology handles all bays where current transformer(s) is available. Incomer or feeder bays, bus coupler bays with one or two current transformer(s) and some special bays.

If no bay unit has been defined yet, then the active “Add” button can be clicked and the “Object properties” window is also opened.

All fields can be modified by the user. The maximum bay element number is 36.

For some examples and detailed information please visit our webpage and find the detailed description of “Centralized busbar differential and breaker failure protection function” or “Distributed busbar differential and breaker failure protection function”.

Figure. 10.7 - 44. Dialog window for adding a new bay topology.



10.8 Events

The AQ 300 protection devices log the events with a time stamp of 1 ms time resolution. The list of the possible events is populated in the factory configuration procedure; the user has possibility to modify the "Title", the text identifier of the event. This Title is shown in the event list.



NOTICE!

User-defined events shall be set up by applying the GGIO16 function blocks in the Logic Editor, then editing its events' titles here. Up to 16 events can be generated per function block.

The object lists are sortable by "Ix", "name", "title", "defined by" and "show order" if the user clicks on header of the proper column. Note: "Ix" of an object is the creation order by default, but it can be modified for some type of objects by the "Move up" and "Move down" buttons (like for disturbance recorder signals, matrix inputs and outputs), because this number means also the displaying order for those object types.

The IEC 61850 DOI description column shows the first non-empty description of the mapped Data Objects (the owners of the mapped Data Attributes).

Figure. 10.8 - 45. Event channels with IEC 61850 DOI descriptions.

Event recorder / Reportable objects

	▲ Ix	▲ Name	▲ Title	▲ Defined by	▲ Event list	Parameters	Type	IEC101/104	IEC61850 DOI description
Add	100	GGIO16_stVal01_	Input01	GGIO16	1	GGIO16_stVal01_GrO_,1	0009 ...	0	Man. Close
Insert	101	GGIO16_stVal02_	Input02	GGIO16	1	GGIO16_stVal02_GrO_,1	0009 ...	0	VT Fail
Remove	102	GGIO16_stVal03_	Input03	GGIO16	1	GGIO16_stVal03_GrO_,1	0009 ...	0	TLP error
Modify	103	GGIO16_stVal04_	Input04	GGIO16	1	GGIO16_stVal04_GrO_,1	0009 ...	0	SynChk block
-> Title	104	GGIO16_stVal05_	Input05	GGIO16	1	GGIO16_stVal05_GrO_,1	0009 ...	0	AR start
	105	GGIO16_stVal06_	Input06	GGIO16	1	GGIO16_stVal06_GrO_,1	0009 ...	0	Remote Trip
	106	GGIO16_stVal07_	Input07	GGIO16	1	GGIO16_stVal07_GrO_,1	0009 ...	0	PSD Block
	107	GGIO16_stVal08_	Input08	GGIO16	1	GGIO16_stVal08_GrO_,1	0009 ...	0	
Move Up	108	GGIO16_stVal09_	Input09	GGIO16	1	GGIO16_stVal09_GrO_,1	0009 ...	0	
Move Dn	109	GGIO16_stVal10_	Input10	GGIO16	1	GGIO16_stVal10_GrO_,1	0009 ...	0	
	110	GGIO16_stVal11_	Input11	GGIO16	1	GGIO16_stVal11_GrO_,1	0009 ...	0	
	111	GGIO16_stVal12_	Input12	GGIO16	1	GGIO16_stVal12_GrO_,1	0009 ...	0	
Count/Limit: 176(176)/512	112	GGIO16_stVal13_	Input13	GGIO16	1	GGIO16_stVal13_GrO_,1	0009 ...	0	

The "Title" button copies the content of the IEC 61850 DOI description column to the Title column for all selected lines. When the current language is English then the original value, otherwise the translated value of the object's title will be modified. Please select lines carefully because the titles will be overwritten without confirmation. This feature is useful because the IEC 61850 DOI description field can be filled already in the Logic editor where the connections of e.g. a GGIO16 defined.

The list on the IEC 61850 Logical Nodes property sheet is sorted by the owner Function Blocks (the Defined by column). The contents of the ICD / CID files are not affected.

When a language other than English is selected, you can still modify the original (English) title and translatable parameters together with their translations in the Object properties window. The translation button appears next to a translation.

10.9 Disturbance recorder

The disturbance recorder function records binary and analogue signals; these signals can be selected (and modified) by the user.

Binary signals in disturbance recording

Figure. 10.9 - 46. Adding a binary signal to disturbance recording.

Disturbance recorder / Binary signals

	▲ Ix	▲ Name	▲ Title	▲ Defined by	▲ Show order	Parameters	Type
Add	0	DRBin1	Bus Sec Trip L1	RootFunctionBlock		BusSec_TripL1_GrI_	0097 Dist.rec. digit signals (max64)
Insert	1	DRBin11	Bus Sec Trip L2				x64)
Remove	2	DRBin12	Bus Sec Trip L3				x64)
Modify	3	DRBin3	Bus Sec U block				x64)
	4	DRBin4	Bus Sec CT fail				x64)
	5	DRBin2	Bay1 Trip				x64)
Move Up	6	DRBin21	Bay2 Trip				x64)
Move Dn	7	DRBin22	Bay3 Trip				x64)
	8	DRBin5	Blocked				x64)
	9	DRBin6	Test mode				x64)
	10	DRBin7	Bay1 DC Error				x64)
	11	DRBin71	Bay2 DC Error				x64)
	12	DRBin72	Bay3 DC Error				x64)
Count/Limit: 14(14)/64	13	DRBin8	Bus Sec BFP Trip				x64)

Object properties

Type:

Defined by:

Name:

Title:

Item name [uoc]:

The figure above shows the dialog window for adding a binary signal to disturbance recording. You must define the following:

- **Name**
This is the freely editable name of the signal.
- **Title**
This is the freely editable title of the signal.
- **Item name**
This defines the item that is to be recorded.

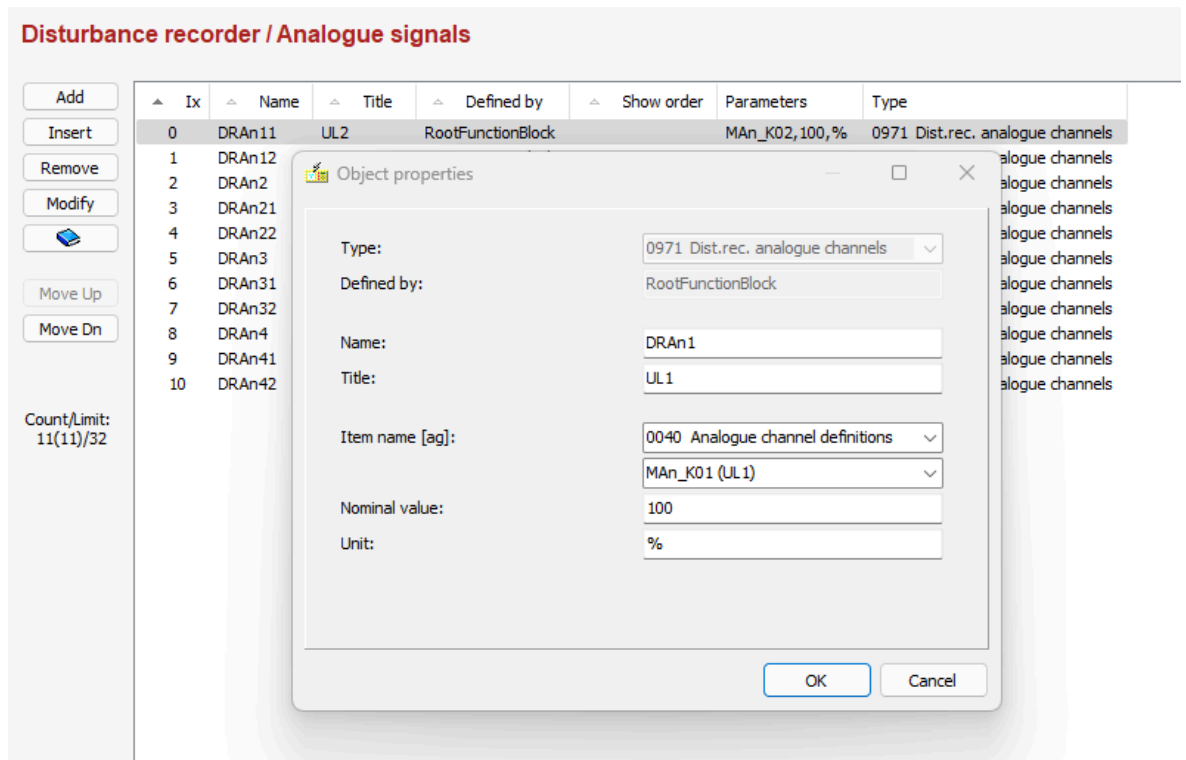
The method for item selection is similar to the method encountered elsewhere in the AQtivate 300 software, such as in defining the I/O signals in the "Hardware configuration" menu. First, you must select the signal type from the drop-down list (in the example the selected type is "Graphed input status"). The second step is to select a specific signal from another drop-down list that displays all the available signals of the selected type. In the example, the backup trip for the busbar protection's CBFP has been selected. You can define the signal in [the Logic Editor tool](#).

There are six (6) different signal types available to choose from:

- ***Filtered binary input***
Signals of this type come from the device's binary inputs. As the signal is filtered, any transient changes within a limited time span are not considered as the status changes.
- ***Contacts***
Signals of this type are the binary status of the output contacts.
- ***Graphed input status***
Signals of this type are the binary output signals of the function blocks. These status signals are explained in the descriptions of the individual function blocks, which you can find in your device manual.
- ***Non-filtered binary input***
Signals of this type come from the device's binary inputs. Unlike the first item on this list, these are not filtered, which means that they can reflect any transient changes in the inputs.
- ***Volatile user status***
Signals of this type are the result of logic relationships that are composed when editing user logic with the Logic Editor program and defining new binary output status signals. Please refer to the "Logic Editor" chapter (linked above).
- ***Non-volatile user status***
Signals of this type are the result of logic relationships that are composed when editing user logic with the Logic Editor program and defining new binary output status signals. These signals are defined to be stored in the device's non-volatile memory. If the supply voltage for some reason gets switched off and then switched on again, these signals preserve their logic status assigned to them during the previous energized state of the device. For more information on how to use Logic Editor, please refer to its chapter further in this manual (linked above).

Analog signals in disturbance recording

Figure. 10.9 - 47. Adding an analog signal to disturbance recording.



The figure above shows the dialog window for adding an analog signal to disturbance recording. You must define the following:

- **Name**
This is the freely editable name of the signal.
- **Title**
This is the freely editable title of the signal.
- **Item name**
This defines the item that is to be recorded.
- **Nominal value**
This determines the nominal value of the signal.
- **Unit**
This determines the unit of measurement.

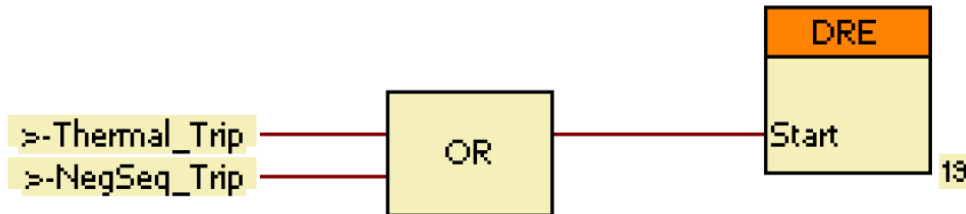
The method for item selection is similar to the method encountered elsewhere in the AQtivate 300 software, such as in defining the I/O signals in the "Hardware configuration" menu. First, you must select the signal type from the drop-down list (in the example the selected type is "Analog channel definitions"). The second step is to select a specific signal from another drop-down list that displays all the available signals of the selected type. In the example, the first voltage input signal has (that is, the L1 phase voltage connected to the K01 (UL1) input) has been selected. You can define the signal in [the Logic Editor tool](#).

The nominal value and the measurement unit can be as they are in the factory default configurations. Furthermore, you can set primary and secondary values: for example, the values "1 A", "5 A sec.", and "1 000 A prim." are possible. The COMTRADE file displays these values as well. When you want to express a VT secondary that is not 100 V, you must express it as a percentage of 100 V. For example, when a VT has a 110 V AC secondary nominal, the nominal value of the analog channel has to be 91 % to compensate the 110 V nominal.

Starting the disturbance recorder function

You can use the Logic Editor tool to program the starting of the disturbance recorder. Add the required starting condition to the "Start" pin of the disturbance recorder's function block ("DRE"). The figure below shows a simple example of a DR starting logic, with recording beginning when either the thermal overload protection function ("Thermal") or the negative sequence protection function ("NegSeq") trips.

Figure. 10.9 - 48. Example of starting the disturbance recorder function.



NOTICE!

The pre-fault time, the post-fault time, and the total duration (= the maximum fault time) of the disturbance recorder are all dependent on the parameter settings! You can set these in the device's web interface.

10.10 Control

The "Control" submenu contains the controllable objects of the configuration. In the figure below you can see an example of the submenu from an AQ-G397A configuration.

Figure. 10.10 - 49. "Control" submenu.

Software Configuration / Control										
	ix	Name	Title	Defined by	Event list	Parameters	Type	IEC 101/104	IEC 61850 DOI description	IEC 61850 Data Attributes
	0	Common_Mod_Con_	Mode of device	Common		"N/A,On,Blocked,Test,Test(Blocked,Off",1,5,1	0043 Control channels	0		LD0,LLN0\$CS\$Mod\$Oper\$ctrlVal
	1	Common_LEDReset_Con_	LEDReset	Common		"Off,On",0,1,1	0043 Control channels	0		LD0,LLN0\$CS\$LEDRes\$Oper\$ctrlVal
	2	CB IPol_Ober_Con_	Operation	CB IPol		"Off,On",0,1,1	0043 Control channels	0		LD0,SBwCSW11\$CO\$Pos\$SB0w\$ctrlVal, LD0,SBwCSW11\$CO\$Pos\$Oper\$ctrlVal

You can modify the title of the controllable objects. This title is used to identify the object on the device's local display or on the web interface (under the "Operation" section).

When you press the **-> Title** button with one or more rows highlighted, it copies the contents of the row's "IEC 61850 DOI description" column to its "Title" column. If the current language in the software is English, the original value is replaced; otherwise, the translated value of the title is modified. This feature is useful because the IEC 61850 DOI description field can be filled in the Logic Editor tool where you define the connections of a GGIO function block. This way you can fill in this information during connection creation and just move it to the title without having to write it again.

The "IEC 61850 Data Attributes" column shows the logical node and the DOI structure of the controllable object.



CAUTION!

The **-> Title** button overwrites the title immediately without separate confirmations! Please be careful not to accidentally overwrite important information!

10.11 Counters

In the "Counters" submenu you can find the pre-defined signal counters (such as CB switching operations) and cumulative timers; these are located in their own submenus below "Counters". You can modify the counters' title; it is used to identify the counter in question on the device display and on the web interface (under "Operation counters"). In the figure below you can see the pre-defined counters available in an AQ-G397A configuration.

Figure. 10.11 - 50. Example of pre-defined counters.

The screenshot shows the 'Counters / Signals' configuration window. On the left, there are buttons for 'Add', 'Insert', 'Remove', 'Modify', 'Move Up', and 'Move Dn'. Below these buttons, it says 'Count/Limit: 3(3)/256'. The main area contains a table with the following data:

▲ Ix	▲ Name	▲ Title	▲ Defined by	▲ Show order	Parameters	Type
0	Count_CB1Pol_Oper_	Operation counter	CB1Pol	1	CB1Pol_Oper_GrI_1	0008 Counter
1	Count_SegSwl_Swl_	Swell Counter	SagSwl	1	SagSwl_SwlTrg_GrI_1	0008 Counter
2	Count_SegSwl_Sag_	Sag Counter	SagSwl	1	SagSwl_SagTrg_GrI_1	0008 Counter

An 'Object properties' dialog box is overlaid on the table, showing the following fields:

- Type: 0008 Counter
- Defined by: CB1Pol
- Name: Count_CB1Pol_Oper_
- Title: Operation counter
- Item name [uvo]: 0213 Graphed input Status
- CB1Pol_Oper_GrI_ (CB Operated)
- ShowOrder: 1

Buttons for 'OK' and 'Cancel' are at the bottom of the dialog.



NOTICE!

If you need a counter with a reference to IEC 61850, please [contact Arcteq](#) for advice!

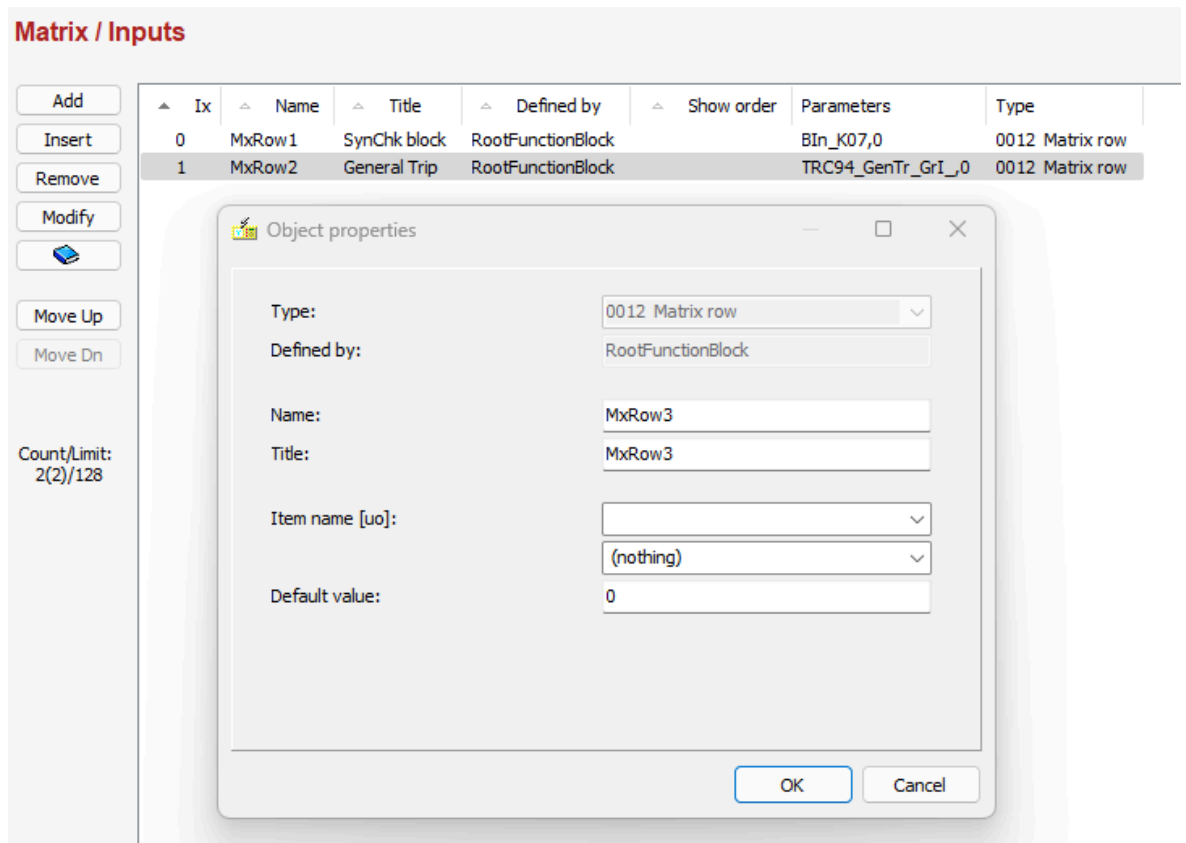
10.12 Matrix

The "Matrix" submenu consists of inputs (the rows) and outputs (the columns). You select both the inputs and outputs, and you define the assignments between rows and columns during the parameter setting process.

Inputs (rows)

The inputs (rows) of the software matrix are the binary status signals you have selected. In the submenu "Inputs" (under "Matrix") you can define the inputs as you like. In the figure below is an example, where two rows have already been defined. The first input "MxRow1" has the user-defined title "SynChk block" and its selected signal is "BIn_K07". In the second row the input signal is received from the "TRC94_GenTr_GrI_" general trip input.

Figure. 10.12 - 51. Adding a new matrix input.



You can define the following characteristics for matrix inputs:

- **Name**
This is the freely editable name of the row.
- **Title**
This is the freely editable title of the row.
- **Item name**
This value includes two (2) drop-down menu selections. The first one determines the signal type, whereas the second one selects a specific signal among all the available signals of the selected type.
- **Default value**
This determines the value given to the matrix input when the device first starts.

There are five (5) signal types available to choose from:

- **Filtered binary input**
Signals of this type come from the device's binary inputs. As the signal is filtered, any transient changes within a limited time span are not considered as the status changes.
- **Graphed input status**
Signals of this type are the binary output signals of the function blocks. These status signals are explained in the descriptions of the individual function blocks, which you can find in your device manual.
- **Non-filtered binary input**
Signals of this type come from the device's binary inputs. Unlike the first item on this list, these are not filtered, which means that they can reflect any transient changes in the inputs.
- **Volatile user status**
Signals of this type are the result of logic relationships that are composed when editing user logic with the Logic Editor program and defining new binary output status signals. Please refer to [the "Logic Editor" chapter](#).

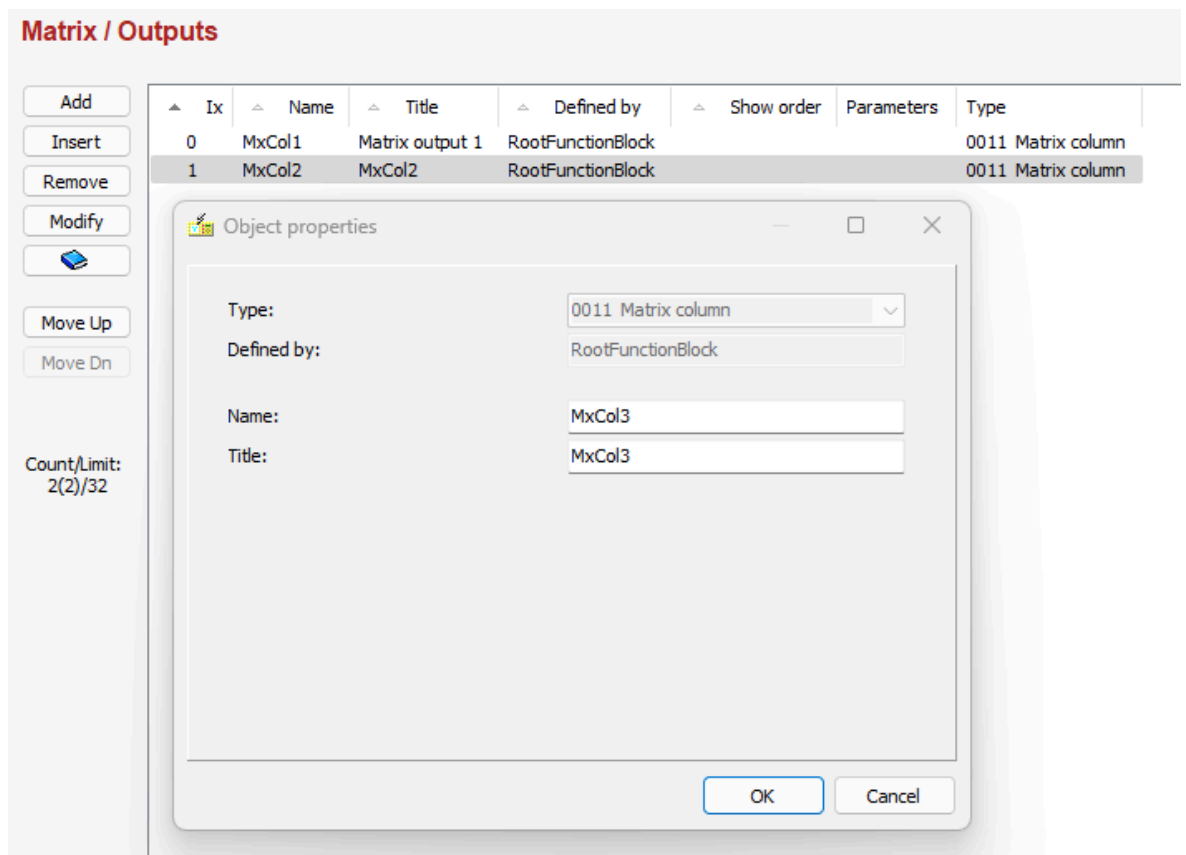
- **Non-volatile user status**

Signals of this type are the result of logic relationships that are composed when editing user logic with the Logic Editor program and defining new binary output status signals. These signals are defines to be stored in the device's non-volatile memory. If the supply voltage for some reason gets switched off and then switched on again, these signals preserve their logic status assigned to them during the previous energized state of the device. For more information on how to use Logic Editor, please refer to its chapter further in this manual (linked above).

Outputs (columns)

The columns in the matrix are outputs which you can apply as inputs signals and then use as they are required. The application happens with the Logic Editor tool (linked above). In the figure below is an example, where two columns have already been defined. The first output "MxCol1" has the user-defined title "Matrix output 1", whereas the second has been named and titled "MxCol2".

Figure. 10.12 - 52. Adding a new matrix output.



As you can see in the figure, you can only edit two parts of the outputs: their name and title. Both are freely editable text fields, and the title identifies the matrix output in the device's web interface.

11 LCD editor

The “LCD editor” is embedded software used for picture generation for the LCD, integrated in the front panel of the AQ 300 devices.

The factory configuration usually contains the basic pictures that may be needed:

Figure. 11 - 53. “Main”, this screen displays the date and time, the names of the substations and that of the device and the IP address. With the information button “i” on the touchscreen the MAC address of the device, the version ID of RDSP/CDSP and the configuration name can also be displayed.

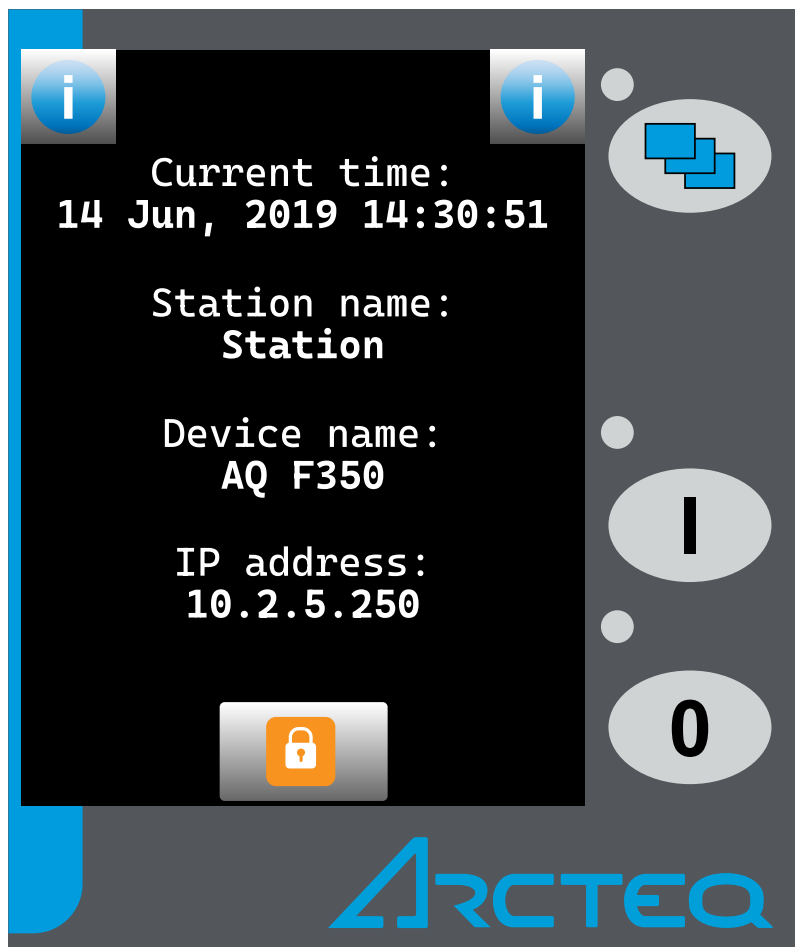


Figure. 11 - 54. "Param", this screen supports the selection of the applicable parameter sets.

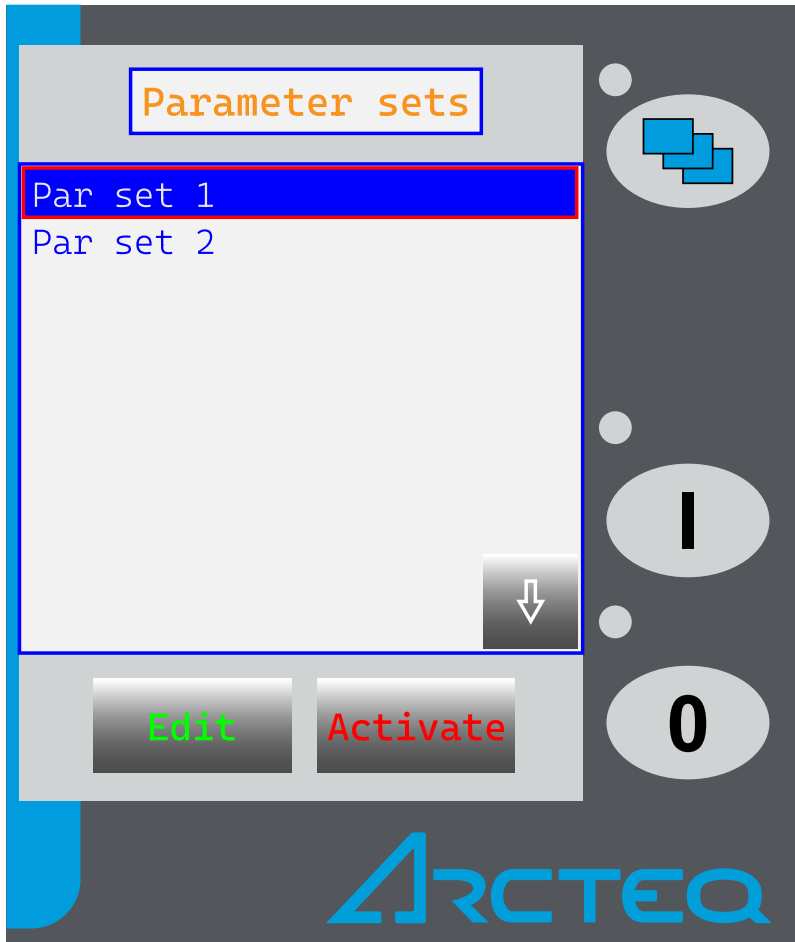


Figure. 11 - 55. "On-line", this screen displays the measured values and the information collected.

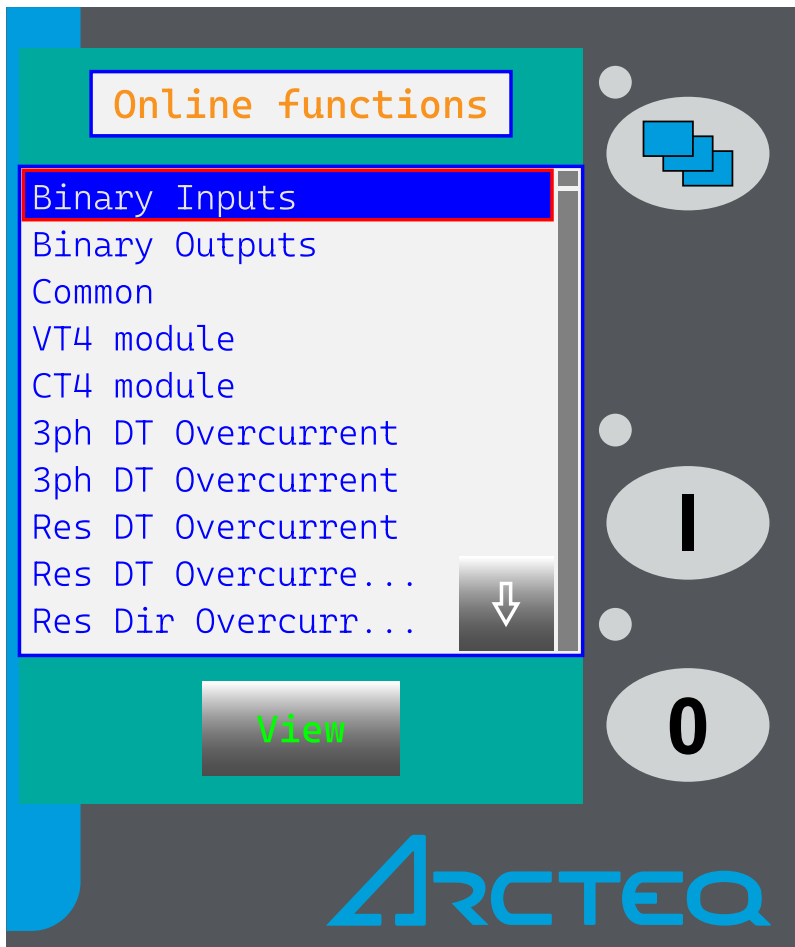


Figure. 11 - 56. "Events", the events logged in the device can be displayed on this screen

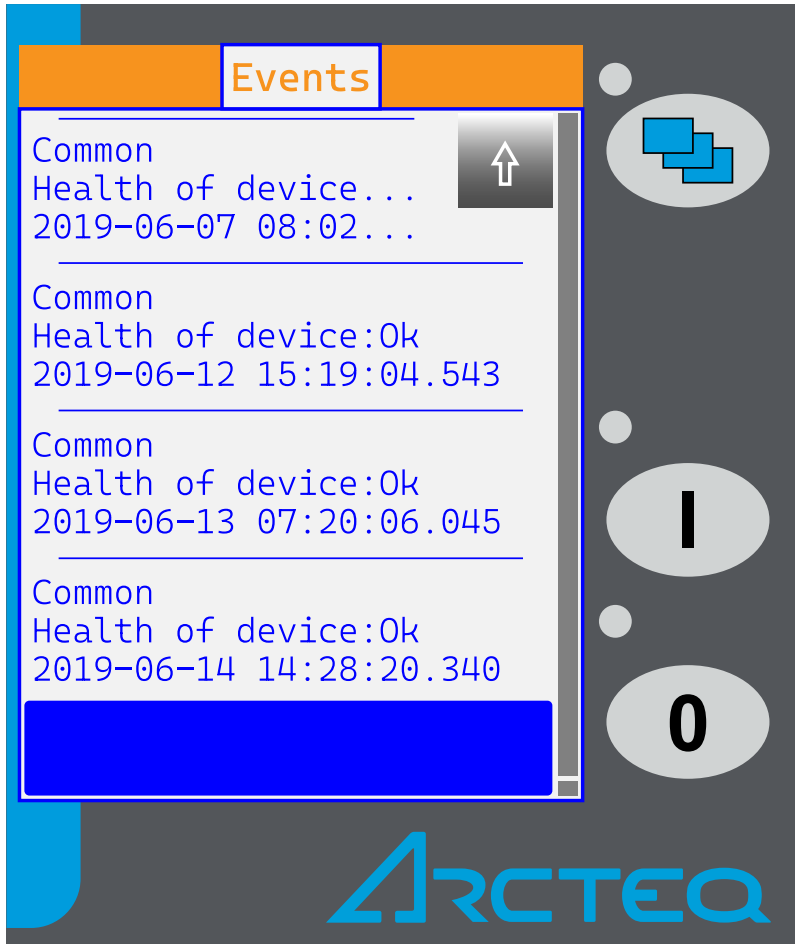


Figure. 11 - 57. "System Settings", This screen serves the purpose of displaying and editing the parameters for the hardware and communication functions.

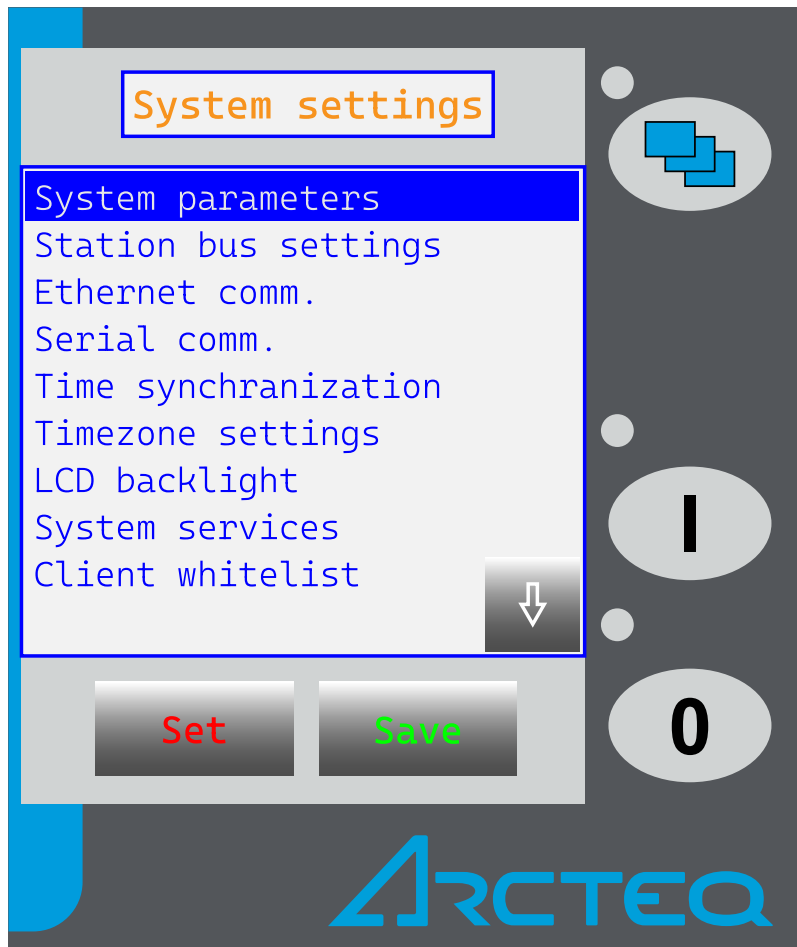
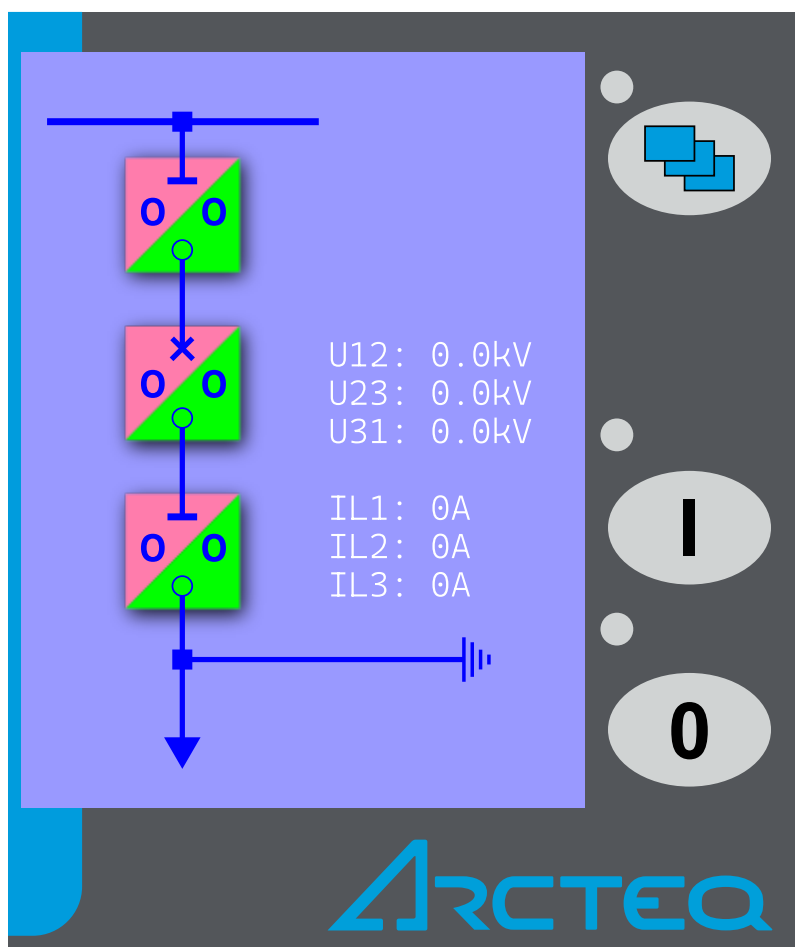


Figure. 11 - 58. Example of a user-generated screen.



11.1 User's Manual for the LCD editor

The "LCD editor" is embedded software in the AQtivate 300 configuration tool for creating, editing or deleting user screens of the AQ 300 protection devices. These user screens can be uploaded to the device via communication connections.

Factory integrated screens are not editable by the user. Displaying them can be disabled; however, their application is advised to make the local operation of the device easier.

The LCD editor works in windows. These windows can be moved with the mouse, holding down the left mouse button on the headline. Resizing is also possible if the left mouse button is held down on the edge of the window and the "<->" symbol is dragged.

The basic screens (main, param, online, events, settings) cannot be modified or deleted by the user.

Starting the LCD editor

The LCD editor is opened by clicking the "LCD" icon on the toolbar of the AQtivate 300 configuration tool or in the sub-menu Project/LCD Parameters.

If the LCD button is inactive, then no AQ 300 configuration file is open, or the access level does not allow any modification. To open a configuration file, click the "Open" button.

Password protection

The view modes of the software are password protected. The users can be entitled to perform various operations within the software, controlled by four pre-defined user profiles. When the AQtivate 300 software is started and the password for the selected view mode is entered, the required AQ 300 configuration file can be opened and the LCD Parameters icon also becomes available.


Figure. 11.1 - 59. The access levels

Change View Mode

Choose the desired view mode:

- Normal View: basic functionality
- Master View: extended functionality
- Designer View: full functionality
- Administrator View: system management

Password (lowercase letters are converted to capitals):

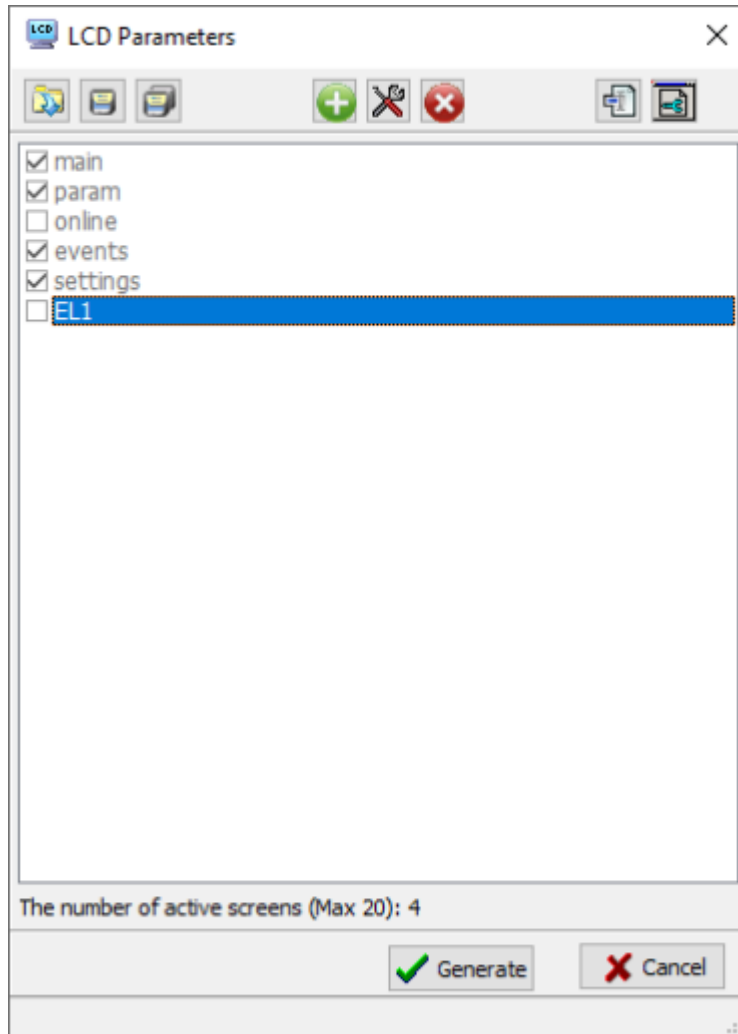
 Note that your password is valid also in lower view modes. Using lower visibility reduces the risk of making unwanted changes on the configuration.

Manage Passwords OK Cancel

The LCD editor is not available in „Normal View” mode.

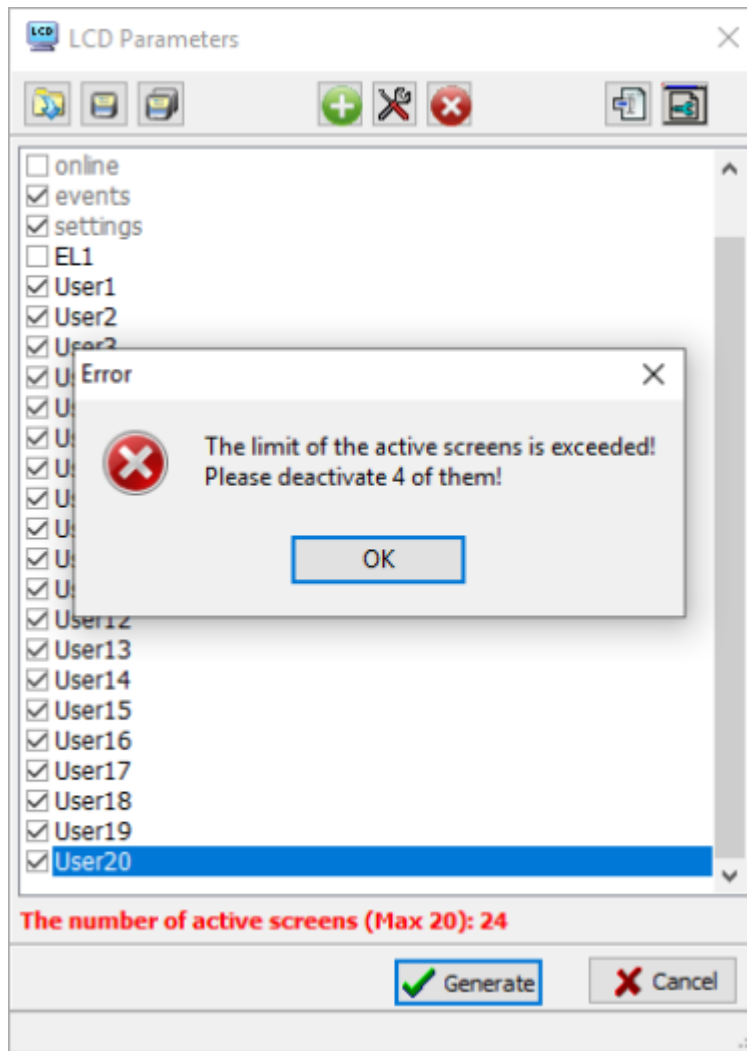
The “LCD Parameters” window

Figure. 11.1 - 60. The starting screen of the LCD editor



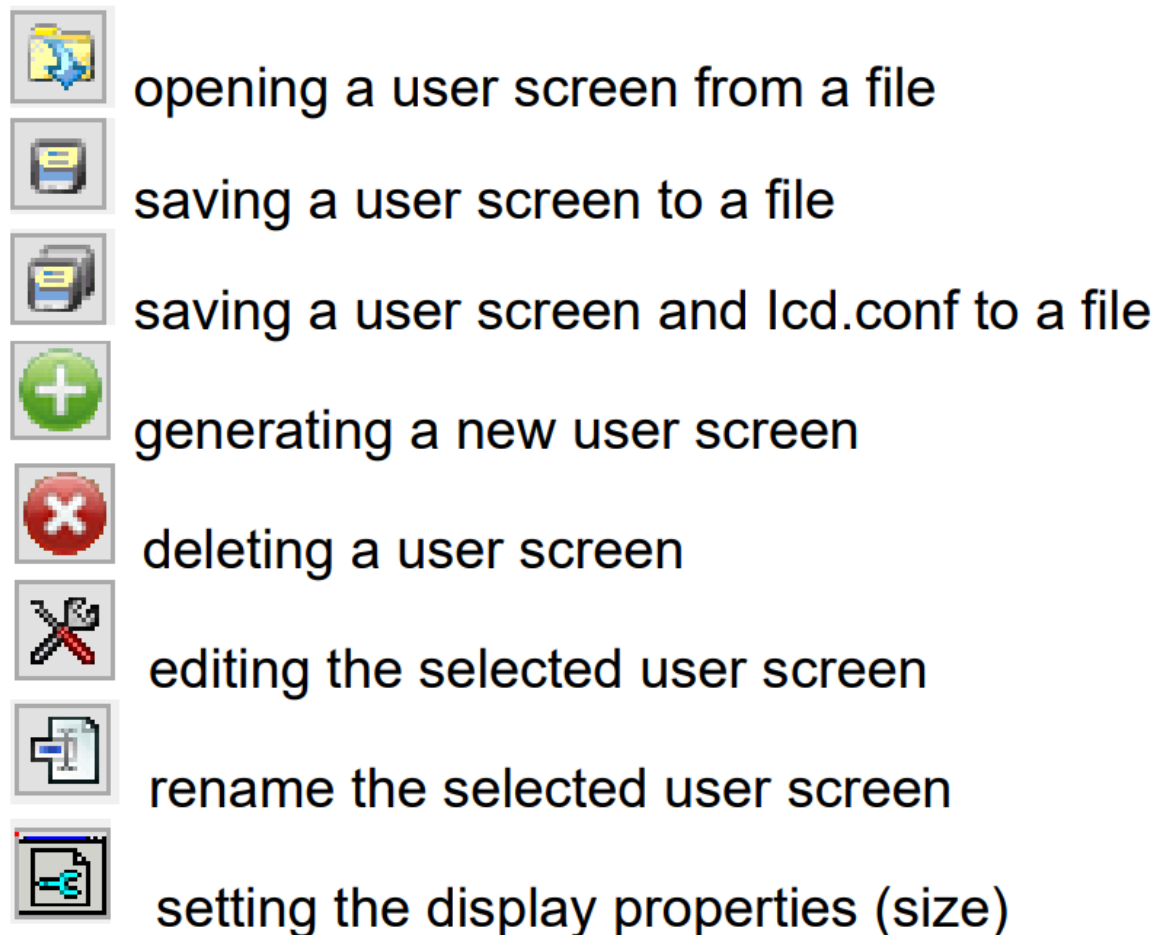
The list contains the available screens. The checkmarks indicate the screens that can be activated on the LCD (in figure above some of them are not active). The number of the checked screens is limited to 20. If there are checked more, the user gets error message after clicking the Generate button.

Figure. 11.1 - 61. Exceeding the maximum number of active screens.



Creating new user screens

Figure. 11.1 - 62. Icons of the toolbar.



Icons of the toolbar

A new user screen can be created by pressing green plus icon. This adds a new "User" screen to the list with a new serial number.

The sequence of the displayed screens can be modified by left-clicking on the row of the selected screen, and dragging the row up or down on the list to the required position.

For saving the screens into a file the "Export all" button of the menu bar can be clicked. Here a dialog window serves the purpose of selecting the path and name to save the information to. All selected and not factory-made User Screens will be saved in addition to the "lcd.conf" file into the selected directory. After successful saving, a message is displayed. This message can be acknowledged by clicking the "OK" button.

Saving only the screen file (*.lcd) without configuration information can be done by pressing the "Export" button in the menu bar.

To read the screens from a file, the "Import" button of the menu bar can be clicked. Here a dialog window serves the purpose of selecting the path and name of the file to be read. Only one User Screen may be loaded. If the name of the screen already exists on the list of screens, the program asks for permission to overwrite the information.

Before uploading press "Generate". The downloadable version will be generated and the editor window is closed.

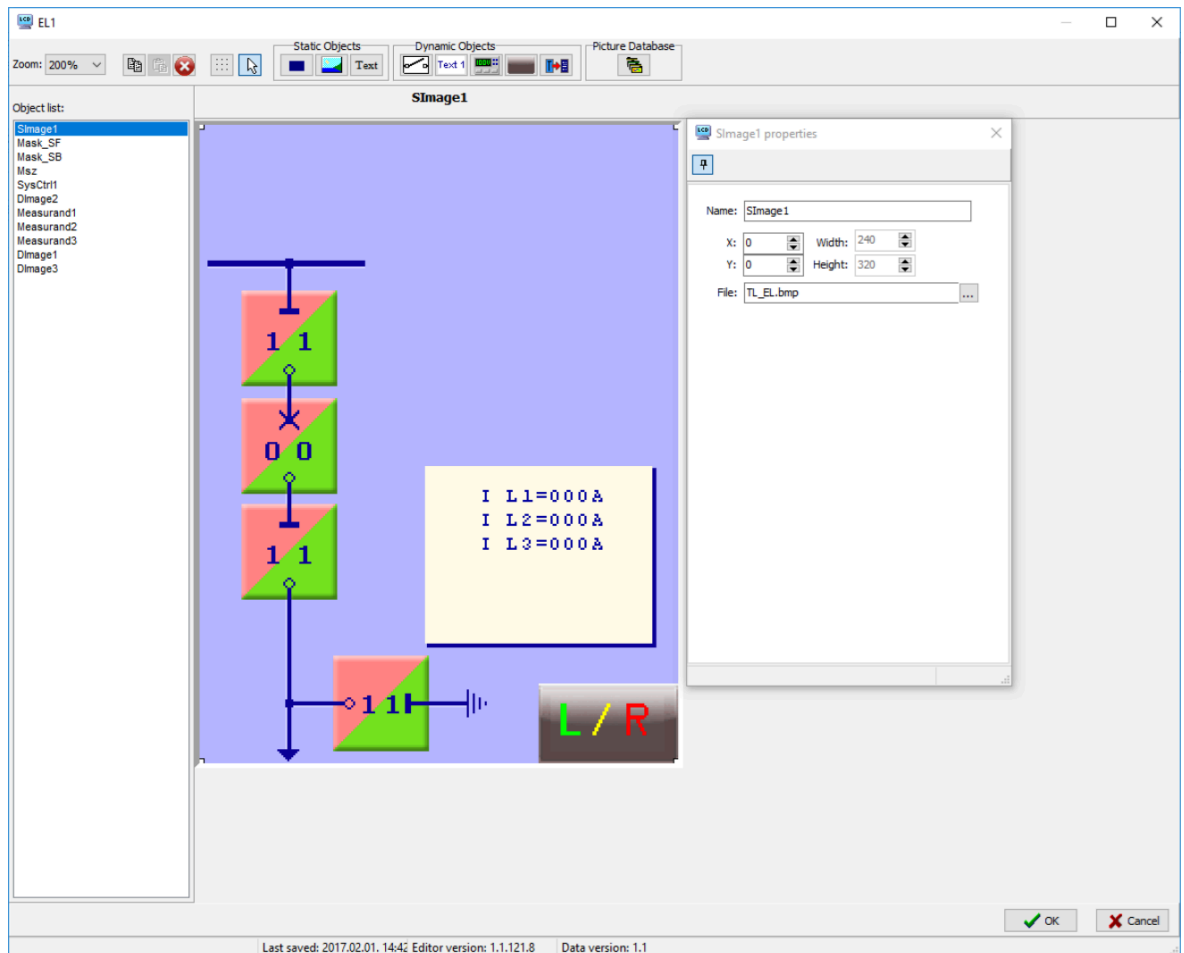
If no generation is needed, then press "Cancel". The editor window is closed without generation or saving.

The window where the properties of the LCD can be set is opened using the "Screen size" button. Two pre-configured resolutions can be selected (240*320, 320*240).

Editing user screens

The LCD screen editor is composed of windows. The window in the middle is the graphic area showing the screen picture to be edited. The left side window is the Object List, showing the objects located on the graphic area. The window on the right side displays the properties of the selected objects. This window is also used for modification. The toolbar is located in the upper part of the window. The icons on the toolbar are for copying and pasting existing objects. Additionally, new static and dynamic objects can be placed on the graphic area, too.

Figure. 11.1 - 63. The screen editor



The Zoom dropdown menu supports selecting the zoom mode. The enlargement is expressed in percent.

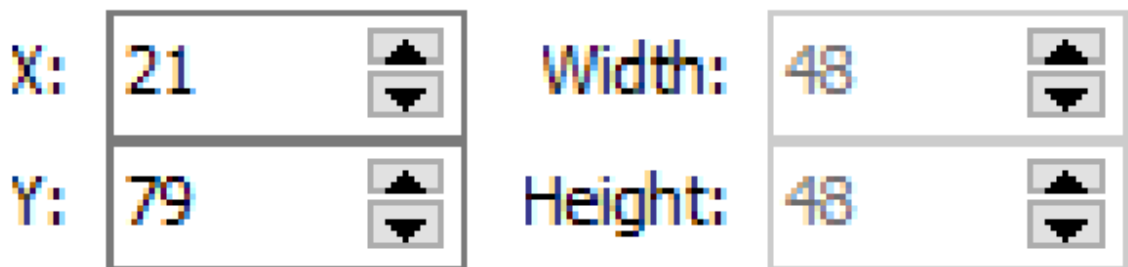
The selected object can be copied by clicking on the "Copy current object" button or by using the Ctrl + C key combination, or by right-clicking on the object, then selecting the Copy command. The selected object remains on the original location.

The objects placed previously on the clipboard can be inserted by clicking on the "paste and object" button or by using the Ctrl + V key combination, or by right-clicking on the working area, then selecting the Paste command. The location of the inserted object will be 10 pixels down and 10 pixels to the right of the original object, but it can be dragged freely. The object remains on the clipboard, too, and it can be inserted again.

A selected object can be deleted using the red cross button.

The selected objects can be dragged keeping the left mouse button pressed. The new location can be defined directly in the object properties window, too.

Figure. 11.1 - 64. Moving objects.



Using the grid (or raster), the objects can be placed more accurately on the User Screen. For toggling the grid, use the button with 9 dots. The distance between grid points is 4 pixels. They are invisible but if the grid is switched on, then the objects will match the grid positions.

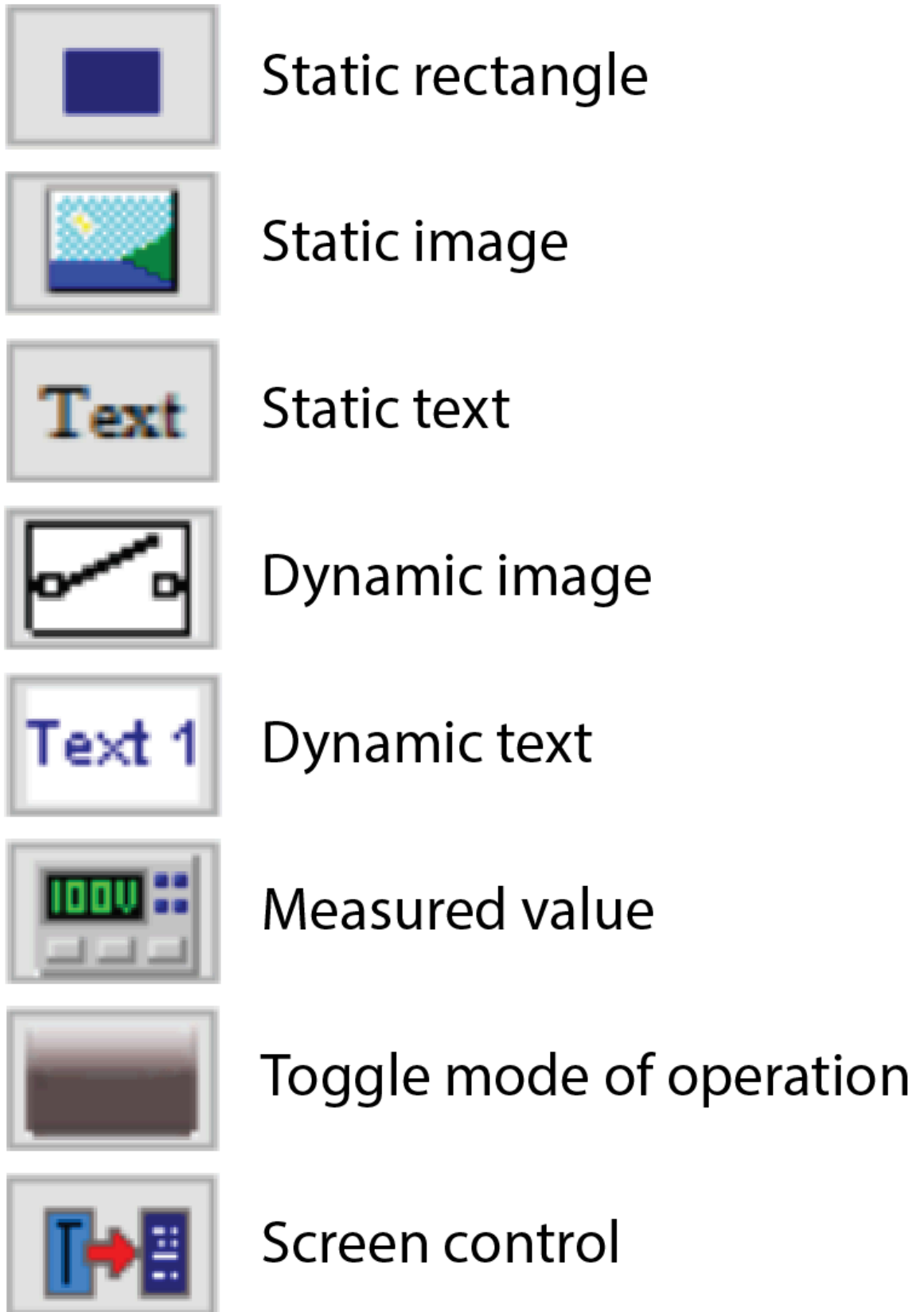
New objects: (see below for details)

- Static objects:
 - Static rectangle (Rectangle)
 - Static picture (Image)
 - Static text (Label)
- Dynamic objects:
 - Dynamic picture (Dynamic Image)
 - Dynamic text (Dynamic Label)
 - Measured values (Analogue)
 - Switch for mode selection (SysCtrl)
 - Switch for screen selection (Screen Ctrl)

To place a new object, click on the symbol (icon) of the selected object type on the toolbar, then click on the graphic area. The contour of the object will appear in the editor area. The new object can be moved as required.

The left side window is the Object List, showing the objects located on the graphic area. The sequence of the objects is of great importance. If an object is located at the top of the list, then the subsequent objects will overlap and cover the preceding ones. The position of the objects on the list can be modified by clicking and dragging the object while keeping the left mouse button depressed. The object names can be also overwritten by clicking on the name, then using the object properties window or by double-clicking the name.

Figure. 11.1 - 65. The Objects toolbox



Static rectangle: (Rectangle)

Using this icon, a rectangle can be placed on the screen, the size and color of which can be modified as required. The „Name” field contains the identifier, which is shown on the Object List, too. In addition to the size and the color, the position can be defined as well. When the “Fill” option is ticked, the area of the rectangle will be filled with the selected color.

Figure. 11.1 - 66. The properties of the Rectangle

Name:

X:

Y:

Width:

Height:

Color:

Fill

Static image: (Image)

The first step is to place a symbolic square on the screen, the properties of which can be defined additionally. A name and the starting position can be given, then if the „Assign picture” button is pressed, the required picture can be selected from the available database.

Figure. 11.1 - 67. The properties of the Image

Name:

X:

Y:

Width:

Height:

File:

Static text: (Label)

The name of the label, its size and position can be defined here. The „Text:” field contains the text to be displayed, then the „Font:” dropdown menu can be used to define the character size. The color of the text is selected using „Font Color”, the background can be colored using the „Back Color” button. To show the background color, „Fill” must be ticked.

Figure. 11.1 - 68. The properties of the static text

Name:

X:

Y:

Width:

Height:

Text:

Font:

Fill

Dynamic picture: (Dynamic Image)

The difference between dynamic and static pictures is that several states can be assigned to a dynamic picture based on external information. This external information can be selected in the „Source“ dialog box. The pictures assigned to different states can be selected from the „Files“ list. The serial number of the selected file (usually bit-map) means the value of the variable the file is assigned too. A control command can be assigned to these dynamic images in the „Command“ dialog box. Select the required control object from the available object type „Control Channels (43)“, then assign the On and Off commands. If confirmation is required, then check the “Confirm Before Execute” box, too.

Figure. 11.1 - 69. The properties of the Dynamic image

Name:

X:

Width:

Y:

Height:

Files:

- 0-Intermediate: CB_00.bmp
- 1-Off: CB_Off.bmp
- 2-On: CB_On.bmp
- 3-Bad: CB_11.bmp

Source

Command

Confirm Before Execute

Dynamic: (Dynamic text)

The treatment of dynamic text is similar to that of dynamic pictures: several states can be assigned and displayed based on external information. Text can be typed in by clicking on the "T" letter, then its size and color can be selected. The command assignment is also similar: in the „Command" dialog box, a „Control Channel (43)" can be assigned.

Figure. 11.1 - 70. The properties of the Dynamic text

Name:

X: **Width:**

Y: **Height:**

Texts:
 T

Font:

Fill

Source

Command

Confirm Before Execute

Measured value: (Measurand)

To display measured values, the following information must be assigned: name, location and size. „Prefix” means the short text to be displayed as static text before the displayed value, “Suffix” means the short text added to the displayed value. The number of the displayed digits can also be defined under „Spacing”. The source of the measured value is selected using the “Source” dropdown list.

Figure. 11.1 - 71. The properties of displaying a measured value

The screenshot shows the configuration interface for a measured value display. It includes the following elements:

- Name:** A text input field containing "Measurand1".
- X:** A numeric input field with a spinner, set to 140.
- Y:** A numeric input field with a spinner, set to 180.
- Width:** A numeric input field with a spinner, set to 63.
- Height:** A numeric input field with a spinner, set to 13.
- Prefix:** A text input field containing "I L1=".
- Suffix:** A text input field containing "A".
- Spacing:** A numeric input field with a spinner, set to 3.
- Font:** A dropdown menu showing "small (7x13)".
- Font color:** A blue button.
- Back color:** A black button.
- Fill:** An unchecked checkbox.
- Source:** A dropdown menu showing "MXU_I1_OLM_ (Current L1)" with a small icon to its right.

Toggle mode of operation: (SysCtrl)

This button on the user screen is used to set the local/remote operational mode for one channel in the common function block. There are four channels available in the common FB and after selecting the desired one the user has to set the operating mode.

The list of available operating modes (values):

Disable all: This option disables all operations.

Local only: This option enables local operation only.

Remote only: This option enables remote operation only.

Both enable: This option enables both local and remote operation.

Invert Remote: This option is for toggling remote operation.

→ Local → Remote → : This option is for switching between operating modes.

→ None → Remote → Local → Both → : This option sets disabled, remote, local and full enabled operating modes in turn.

The above values describe the selected control channel output value in the common FB after touching the SysCtrl button. Additionally, it is also possible to set confirmation for command generation.

Apart from the “usual” information (name, position, file of the image), some additional information can also be defined: there are three options available for “Button Width”: 40, 70 or 85 pixels. The button width determines the required size of the image as well: for a width of 40 pixels, it is 40*40, for 70 it is 40*70, and for 85 it is 40*85. No other sizes can be applied.

Figure. 11.1 - 72. The properties of a dialog for confirmation

Name: SysCtrl1

X: 170 Width: 70

Y: 280 Height: 40

File: LR.bmp

Button Width: 70

Confirm: SysCtrl1

Channel: Local/Remote Switch 1

Value: -> Local -> Remote ->

Screen control: (ScreenCtrl)



NOTICE!

This function is supported from CDSP firmware version 1530 and higher only. Loading the configuration to a device with an older CDSP version will result in LCD malfunction!

This button on the user screen is used to jump to another user screen.

There are two options for the symbol to be used on the screen:

- Select a picture from a file
- Use text (by selecting this option a standard symbol will be shown in the background of the text)

Apart from the “usual” information (name, position, file of the image), some additional information can also be defined: there are three options available for “Button Width”: 40, 70 or 85 pixels. The button width determines the required size of the image as well: for a width of 40 pixels, it is 40*40, for 70 it is 40*70, and for 85 it is 40*85. No other sizes can be applied, and if the size is wrong, the database cannot be closed. The button with setting will be applied for image selected from a file but also for text option.

Figure. 11.1 - 73. The properties of a dialog for confirmation

Name:

X: Width:

Y: Height:

File: ...

Button Width:

Text:

Font:

Font color:

JumpTo:

Status bar:

The Status bar contains three important bits of information: date and time of the last saving, the version identifier of the software and the version identifier of the database.

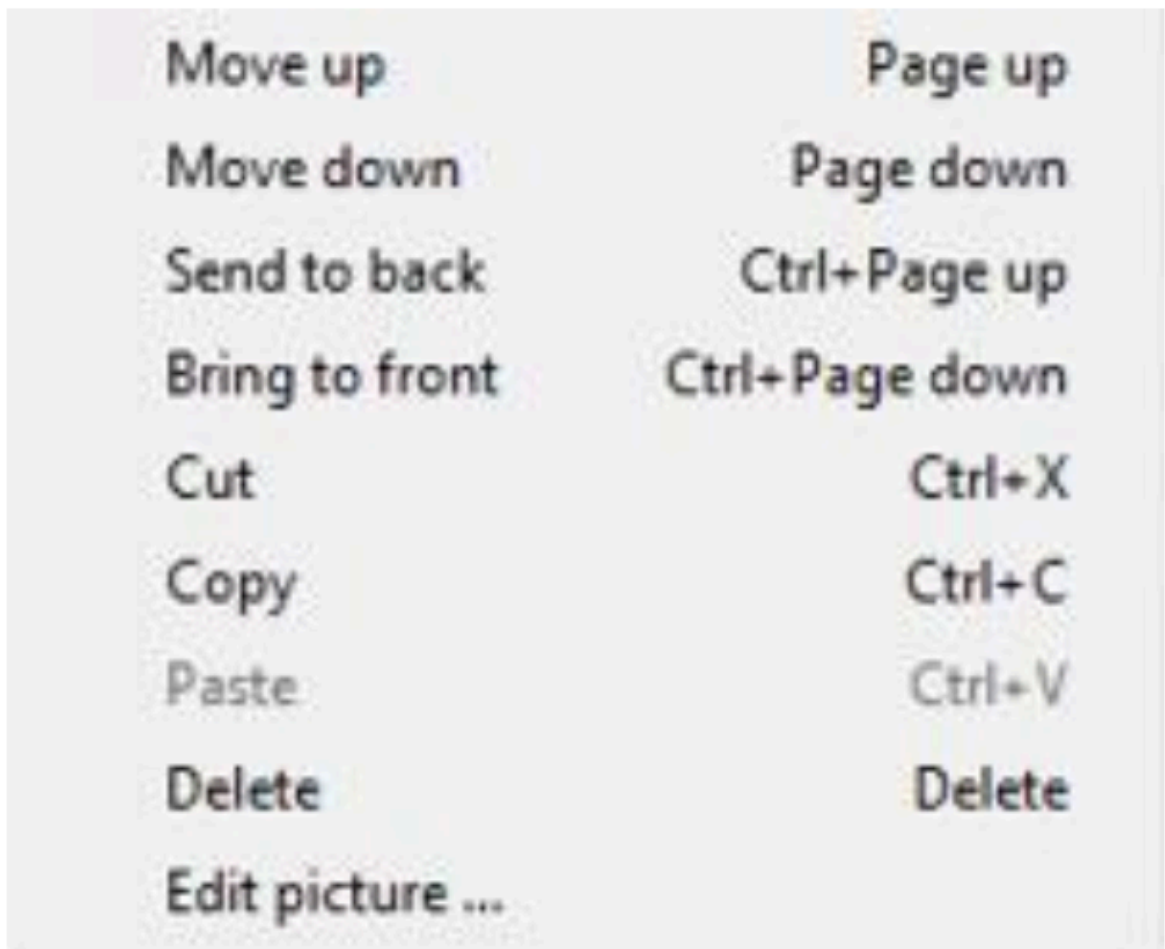
The object properties window:

This is a separate window located on the right side of the computer's screen, displaying the properties of the selected object. If this window is not needed, it can be closed using the “X” button. To re-open this window, simply double-click on the object needed.

Right-clicking on an object:

When right-clicking on an object, the following menu is displayed:

Figure. 11.1 - 74. The menu of an object

**Move up:**

This menu item moves the selected object one position up on the object list. This means that all objects located lower on the object list will be on top of the selected object.

Move down:

This menu item moves the selected object one position down on the object list. This means that the selected object will be on top of all objects located higher on the object list.

Send to back:

The selected object will be sent to the background and covered by all other objects.

Bring to front:

The selected object will be sent to the foreground covering all other objects on the list.

Cut:

This menu item cuts the selected object and places it on the clipboard.

Copy:

This menu item copies the selected object to the clipboard.

Paste:

This menu item inserts the object previously placed on the clipboard to a new location, which is 10 pixels down and 10 pixels to the right from its original position. This inserted new object can be moved freely to any other position.

Delete:

This menu item deletes the selected object.

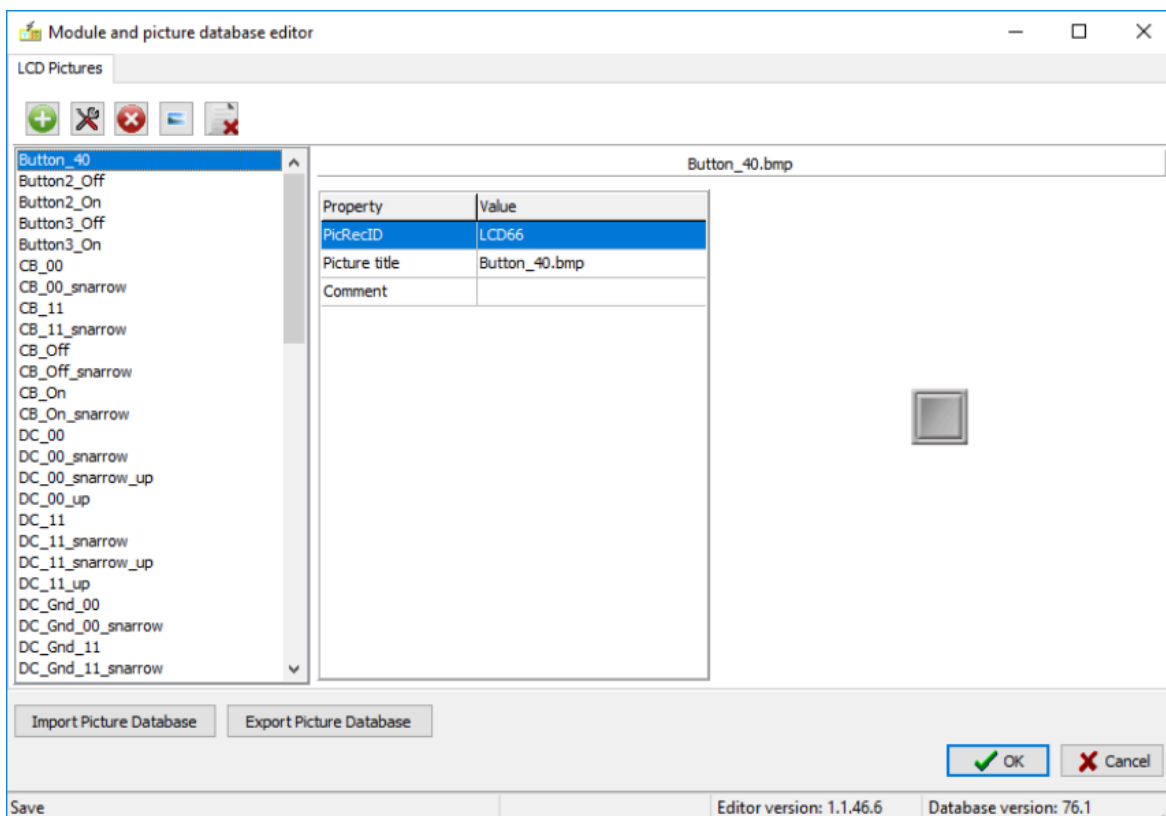
Edit picture:

This menu item serves to edit the active picture element. Editing will be performed by the Windows-default graphic editor. All required changes can be made here.

The LCD Picture Database:

The LCD Picture Database contains all pictures applicable on User Screens. The unused pictures may be deleted, new pictures can be added for future application. The content of the database is displayed if a static or dynamic picture or a SysCtrl switch needs picture assignment.

Figure. 11.1 - 75. The database editor



The green plus button is for importing a picture to the database. After pressing this button, a file selection dialog serves the purpose of locating the required picture.

A picture can be changed by pressing the Modify Picture button and replacing it with another one.

To edit a picture, simply right-click on the selected picture and activate the „Edit Image” menu item or press the "Edit picture" icon. The windows-default picture editor will be opened to perform the required modifications.

A picture can be deleted from the database by selecting the picture and pressing the red cross button.

For deleting all LCD pictures from the list press . Only pictures not applied on the user screen may be deleted.

A selected picture can be inserted by pressing the "OK" button.

If there is no need to save the performed changes, simply press the "Cancel" button. The LCD Picture Database will be closed and the changes will be lost.

Importing and export the picture database is also possible with the "Import Picture Database" and "Export Picture Database" buttons. When importing a new database, the existing database will be overwritten.

12 The Offline Parameter Set Editor

The AQtivate 300 configuration software provides a special tool for processing the parameter sets of the AQ 300 devices. The following operations are possible:

- Reading the parameter values from a .par file *
- Modifying the parameter values off-line
- Saving the parameters to a .par file *
- Exporting and importing the parameter files to and from Excel files
- Preparing “RIO” files for testing some of the protection functions implemented in the AQ 300 configurations
- Printing the parameter settings

The AQtivate 300 configuration tool cannot perform the following operations:

- Uploading directly the operating parameters from a AQ 300 device
- Uploading directly the operating parameters to a AQ 300 device

These tasks are supported by the webpage of the devices accessible via the recommended internet browsers.

In general, there are two scenarios, when the user has to work on parameter settings off-line and then load them into the device. The recommended procedures are the following:

- Creating parameter settings for a new application (open the off-line parameter set editor, the standard parameter set will be loaded, type in the desired parameter values, save them as a .par file*, the created .par file* can be loaded into the device with the web browser)
- Modifying parameters of an existing device (save parameters from the device with the web browser as a .par file*, open the off-line parameter set editor, the standard parameter set will be loaded, load the .par file* saved from the device, modify parameters as required and save the changes, the modified .par file* can be loaded into the device with the web browser)

After creating or modifying parameters in the off-line editor it is also possible to save the changes. As previously mentioned, by opening the Off-line Parameter Set Editor always the standard parameter set will be loaded. With the button “Set as Default Parameters” any change on the parameters can be saved as a new default for the actual configuration.

12.1 Starting the off-line parameter set editor

The off-line parameter set editor is started by clicking the "Offline parameter set editor" icon on the toolbar of the AQtivate 300 configuration tool. The alternative method of opening is to select Project / Off-line parameter set editor from the menu.

When the off-line parameter set editor is started, the long window shown in figure below is displayed. This window can be scrolled and contains all parameters of all implemented functions. The parameters are grouped in boxes (e.g. “Common”, in this case, the Ext LR source, the CT4 module, etc., see figure below.) The parameters at startup are the factory default parameters.

Figure. 12.1 - 76. The Offline Parameter Set Editor window

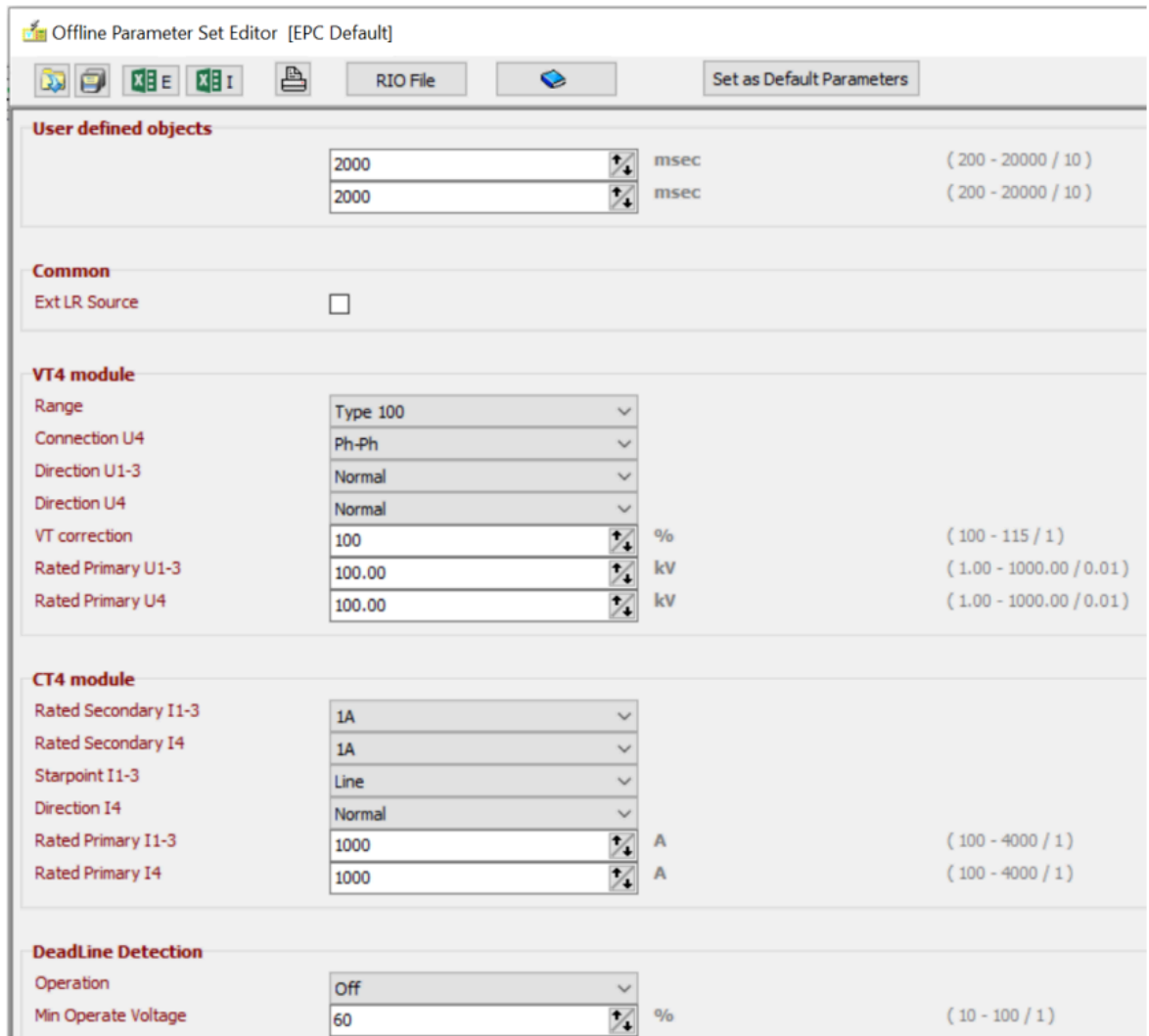





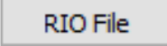



Figure. 12.1 - 77. The available icons.

-  for reading the parameter values from a file (.par file).
-  for saving the parameter values to a file (.par file)
-  for exporting the parameter file to an Excel file
-  for importing the parameter file to an Excel file
-  for printing the parameter values
-  for generating input parameters for a relay test set
-  for translation; when pressing this button, a new window shows the available languages:

"Set as Default Parameters" set actual parameter set as a new default. By re-opening the parameter set editor, the saved parameters will be loaded as default.

12.2 Editing the parameter values

After reading the parameters from a file (or having the default values), the parameter settings can be modified and the modified values can be saved to .par file.

Setting options

Figure below shows the usual setting methods:

- Checkbox
- Dropdown menu
- Numerical value

Figure. 12.2 - 78. Setting methods in the Offline Parameter Set Editor

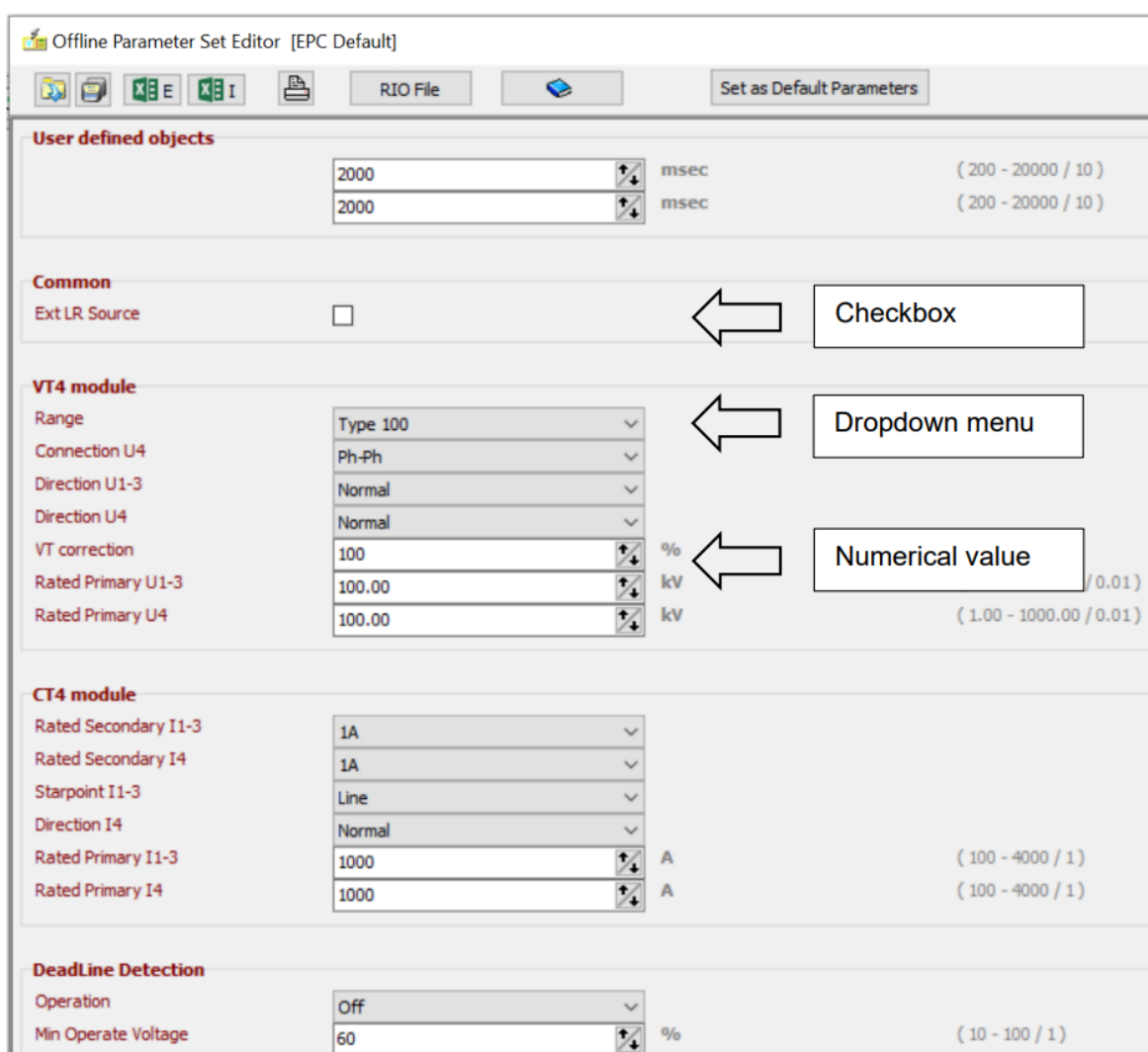
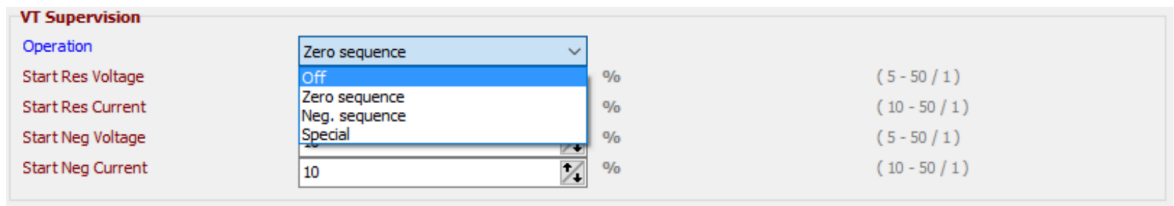


Figure below shows an example of selecting an alternative from a drop-down menu (in this case, Voltage Transformer Supervision). The title of the changed parameter value is indicated by blue colour to warn the user of unsaved modification (The changes against the default settings are indicated).

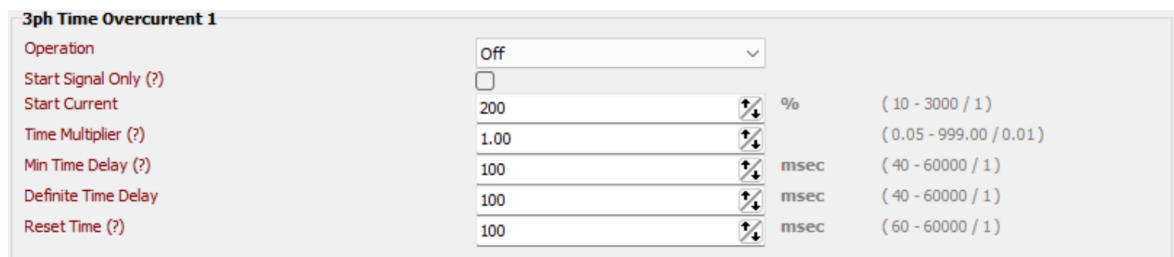
Figure. 12.2 - 79. Example: dropdown menu



Helptexts

Helptexts are descriptions for parameters intended to assist the user to clearly understand what a given parameter is about. Where a parameter has a helptext, a question mark is displayed beside the parameter name. See figure below. To display the helptext, hover over the question mark with the mouse cursor.

Figure. 12.2 - 80. Parameters of a function showing helptexts in question marks "(?)"



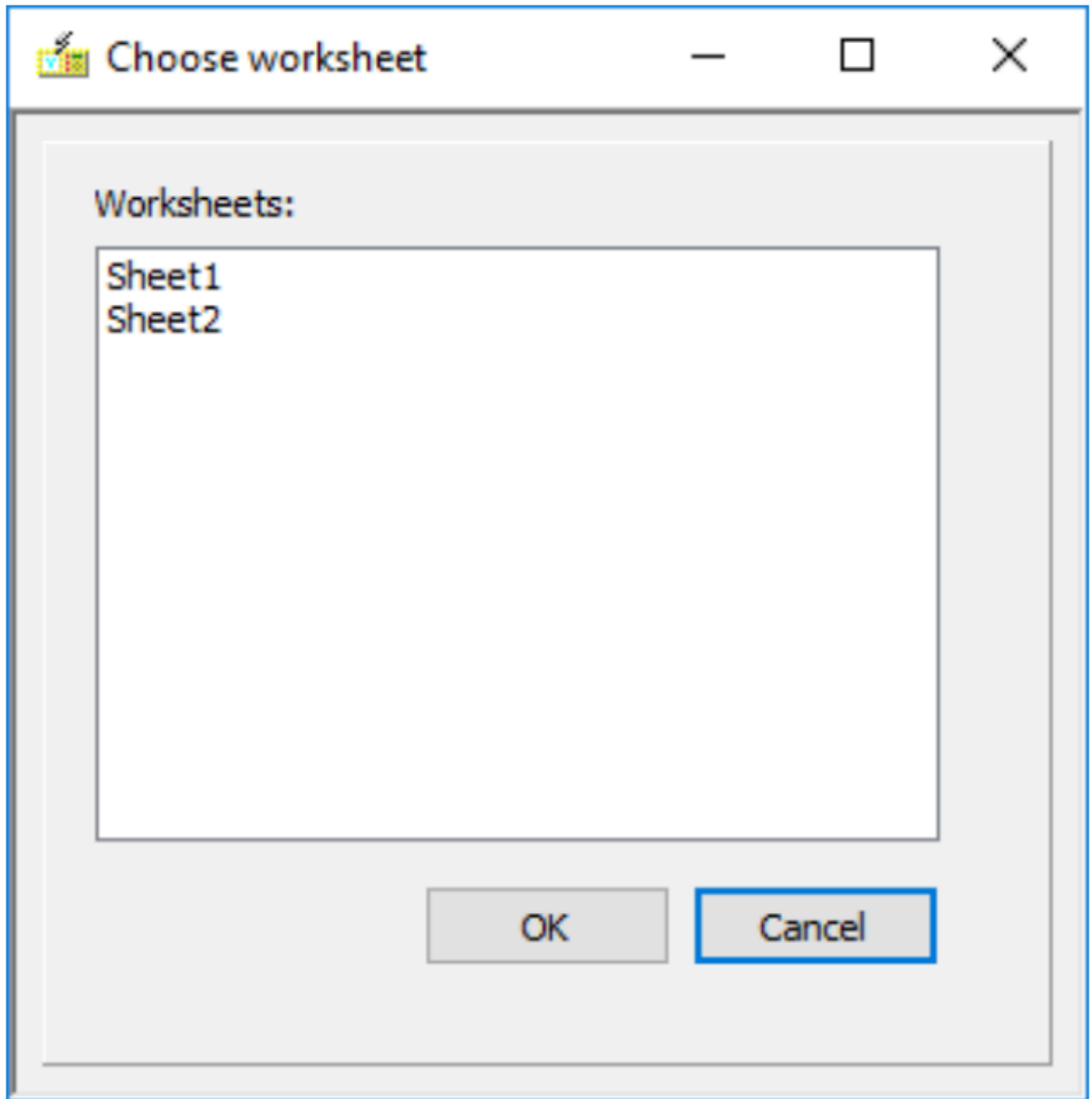
12.3 Exporting and importing the parameter files to and from Excel files

It is possible in the Offline Parameter Set Editor to export the parameter file to an Excel file, edit it in the MS Excel software and import the spreadsheet back to the editor. The only criterion for the use of these functions is an installed Microsoft Excel software on the computer. No other type of spreadsheet software is acceptable.

To start the export procedure, simply press the "Export to Excel" button. The file name and location must be selected in the usual file selection dialog window, then the file is saved.

If the user starts an import procedure by the "Import to Excel" button, he has to choose from the existing sheets in the Excel file:

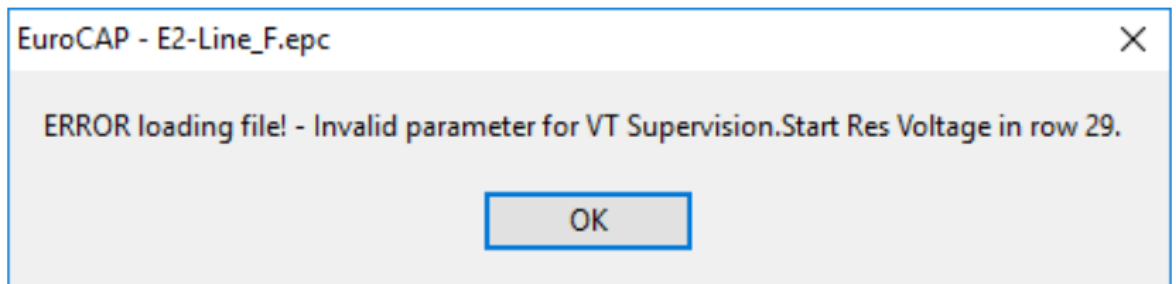
Figure. 12.3 - 81. Selecting worksheet from an MS Excel file



If the Excel file is correct, its settings will be copied into the Offline Parameter Set Editor.

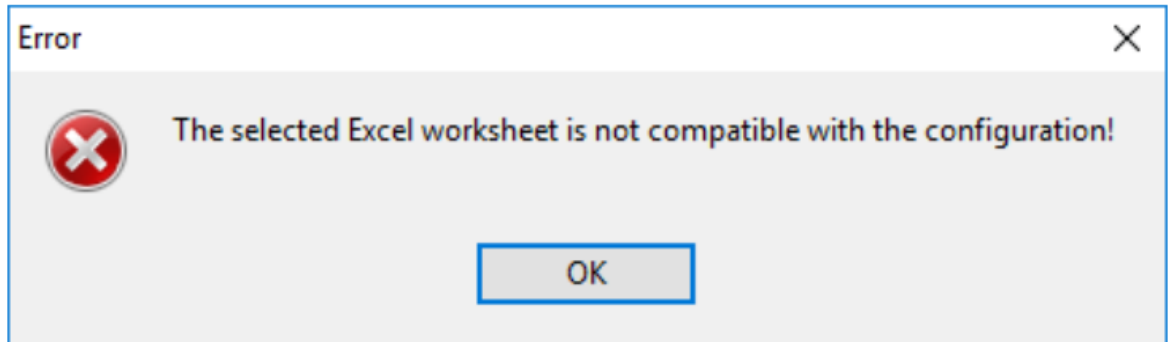
If however there are one or more settings which are out of the setting range, the import process will not be executed. The displayed error message will be like this:

Figure. 12.3 - 82. Error message because of one or more settings are out of range



If the Excel file was exported from a different type of configuration (which has different functionblocks), the import procedure will be also stopped with this error message:

Figure. 12.3 - 83. Error message because of missing function blocks in the Excel file



If the Excel file includes extra function blocks over that are in the configuration, the import process will be executed. The settings of the extra function blocks will be ignored.

12.4 Application of RIO files for testing

When a function is to be tested, the parameters of the function and the parameters of the testing device must be set to the same parameter values. The purpose of testing is the verification of correct operation.

To make the test procedure error-free and easy, RIO files are applied. At present, the Offline Parameter Set Editor supports the generation of RIO files only for 3 different types of the “5 zone Distance” protection function (normal, with independent characteristics for ph-n and ph-ph faults and with independent arc resistance parameter for ph-n and ph-ph faults). Furthermore, two types of parametrization of the test set regarding the network modelling is available (positive sequence impedance or loop impedance calculation). To start the procedure of RIO file generation, simply press the "RIO file" button.

Figure below shows the RIO file generation window. Here the RIO Template for the distance protection function is selected.

- phs: positive sequence impedance calculation,
- loop: loop impedance calculation,
- phsEnh: positive sequence impedance calculation with independent characteristics for ph-n and ph-ph faults,
- phsR: positive sequence impedance calculation with independent arc resistance parameter for ph-n and ph-ph faults

Figure. 12.4 - 84. Example: RIO Template selection

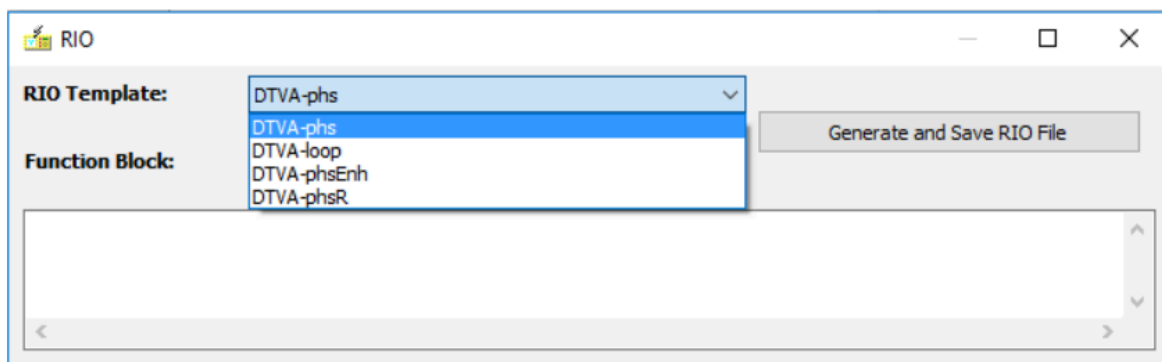
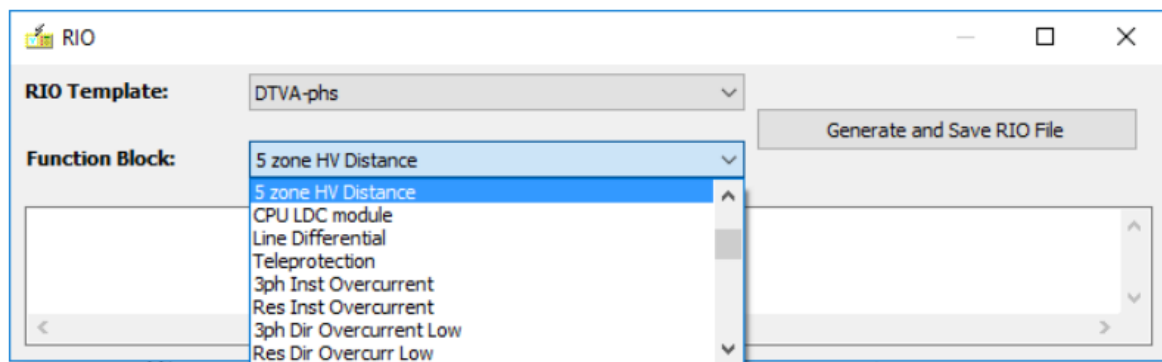


Figure below shows, on an example, how the “5 zone Distance” protection function is selected for testing. (At present there are no RIO templates for other functions, only for the different types of distance protection function.)

Figure. 12.4 - 85. Example: RIO Template selection



When the “Generate and Save RIO file” is pressed, first the file name and location must be selected in the usual file selection dialog window, then the file is saved and the RIO window also shows the generated file. The file can be checked with a text editor but the machine coded content may be difficult for the user to understand. The test set will set the test parameters according to this information.

Please note that the generated RIO files can be used by test sets capable of UTF-16 character encoding only.

In order to further support protection device testing, Arcteq offers an option with the use of XRIO files as well. These files are available for multiple function blocks and can be downloaded from the website under Downloads/Arcteq/Software.

13 Rack Designer

The “Rack designer” is embedded software needed for assembling the hardware modules of a AQ300 device (or of a “traditional” AQ-300 device, the design of which is not covered by this document).

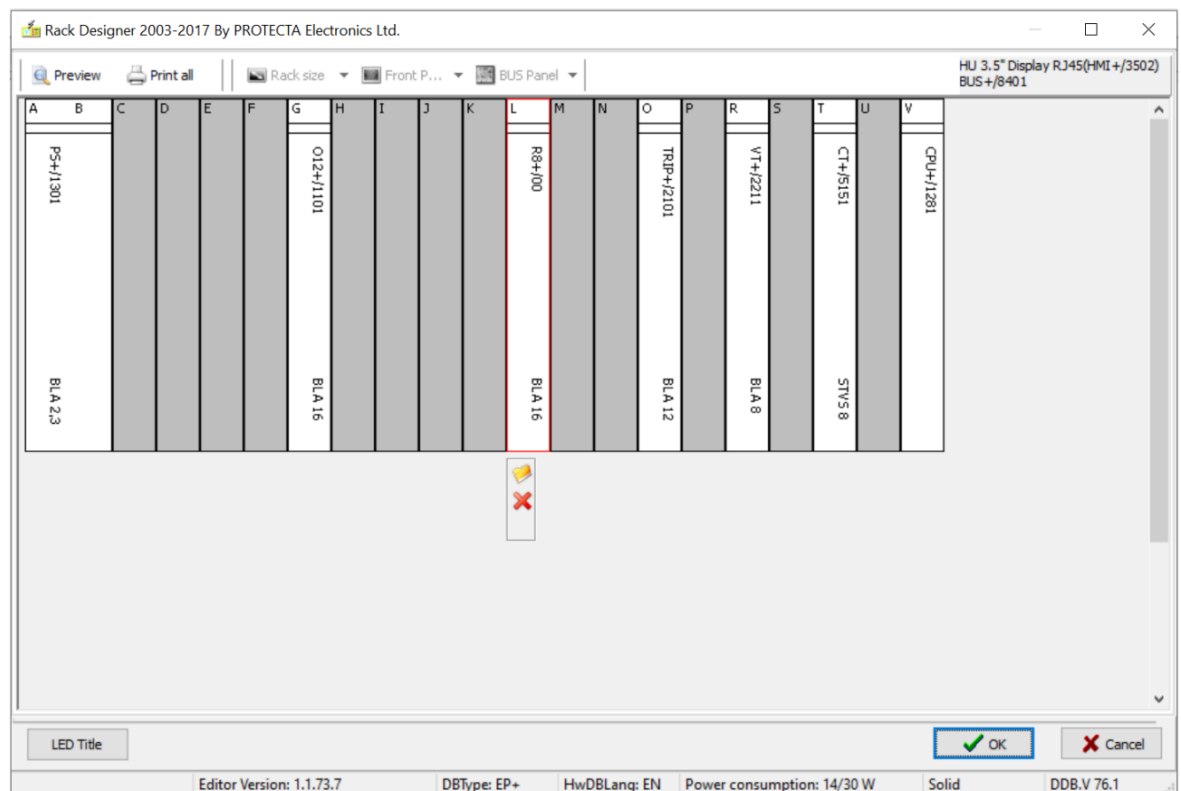
A device consists of:

- a rack, the size of which can be selected (84TE = full size, 42TE = half size)
- a front panel, the size of which is to be matched to the rack
- a bus panel, the size of which is to be matched to the rack
- several hardware modules.

13.1 Designing the rack

Arcteq provides factory configurations, the module arrangement of which can be changed or extended by the user.

Figure. 13.1 - 86. A factory configuration in the rack designer



The rack size, the type of front and BUS panel are factory selected, so these options cannot be modified by the user in Master View.

Figure above shows a “full-size” version, containing (from right to left in rear view):

- CPU module in position V
- CT input module in position T
- VT input module in position R
- Trip relay module in position O
- Signalling relay module in positions L

- Binary (optocoupler) input module in position G
- Power supply module in positions A-B
- The other slots are empty

The CPU module is always in the rightmost position in rear view (I in a half-size rack, V in a fullsize rack and F in S24 devices); the power supply unit is located on the left side (positions A (and B)).

When clicking on a module or on an empty position (e.g., position C in the example), a small symbolic menu shows the possible actions:

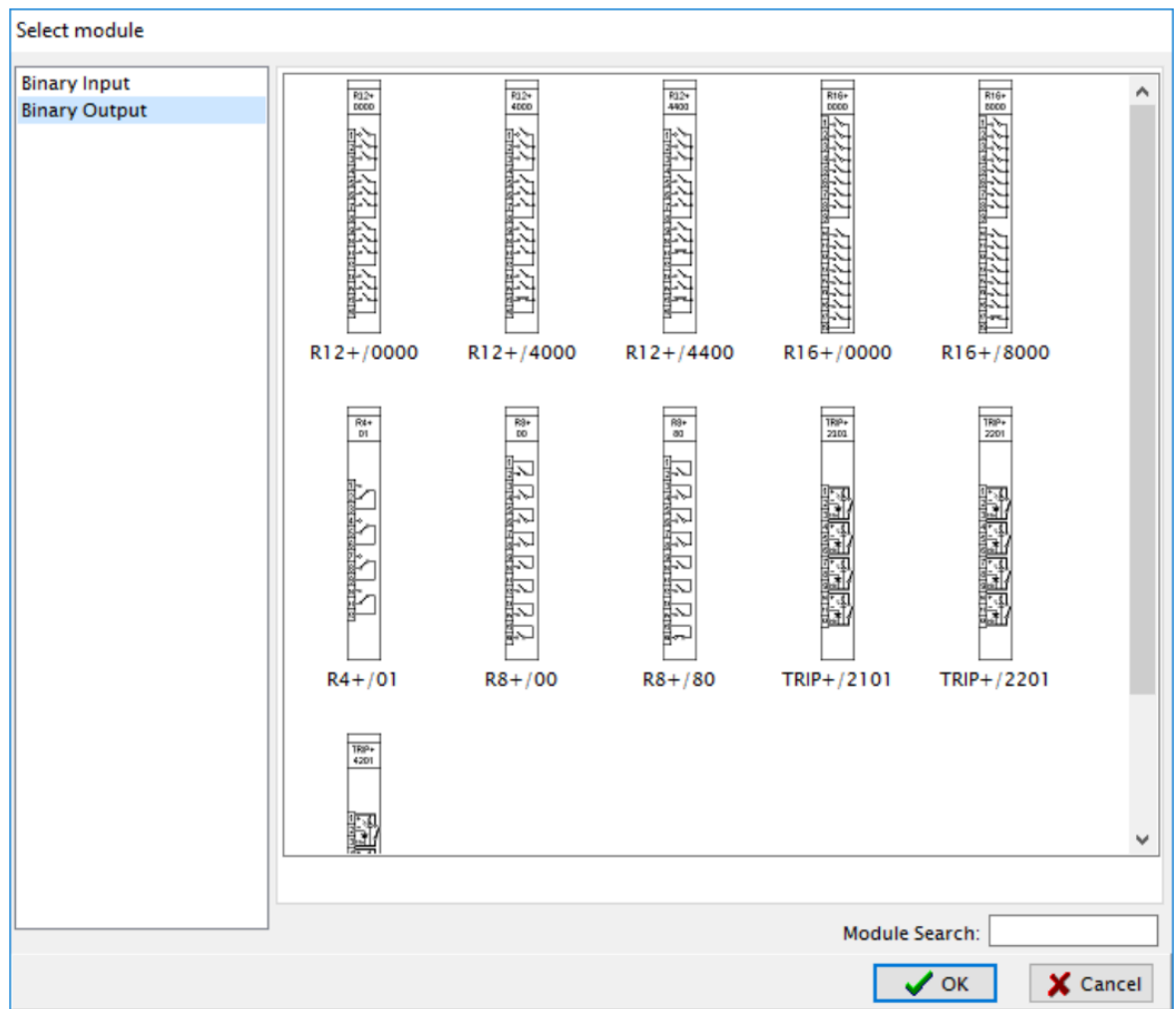
Figure. 13.1 - 87. Possible actions when clicking on a module or an empty position.



Here the top icon opens the module selection window, offering the main selection menu of the module type depending on the type of the module on which the user has clicked. By clicking on empty slots, binary input and binary output (signalling) modules can be selected for addition. By clicking on existing modules, only from the same type can be selected for modification. Power supply, current transformer, voltage transformer and trip modules can be modified in Master View. Note, that if the type of the CT or the VT is changed, some parameter ranges might have to be changed, as well! In these cases, please contact Arcteq support!

Figure below shows, as an example, the selection of the binary output modules. Although the trip module types also appear in this window if an empty slot or a binary input/output module is chosen, trip modules cannot be added in Master View, only the type of an existing trip module can be changed.

Figure. 13.1 - 88. Module selection window showing the choice of the binary output modules

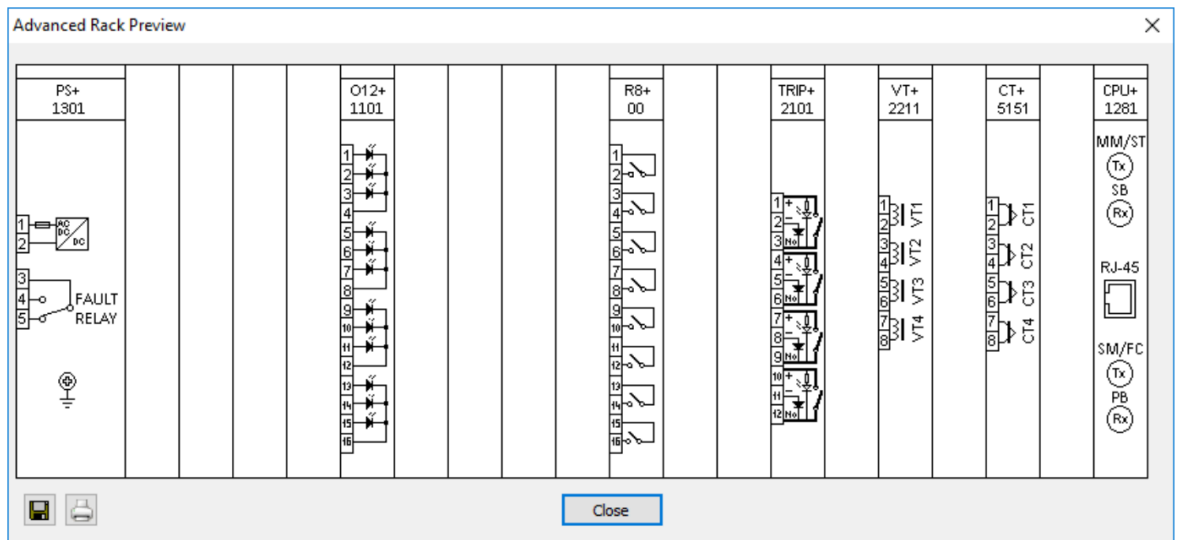


The user in Master View can remove binary input and output modules by the red cross icon. If other module type is selected, a warning message will inform the user, that deleting that module is not allowed for master users. If an empty slot is chosen, this icon is greyed out showing that this function is not active.

If you would like to add, change or remove a module which is not allowed in Master View, please contact Arcteq support!

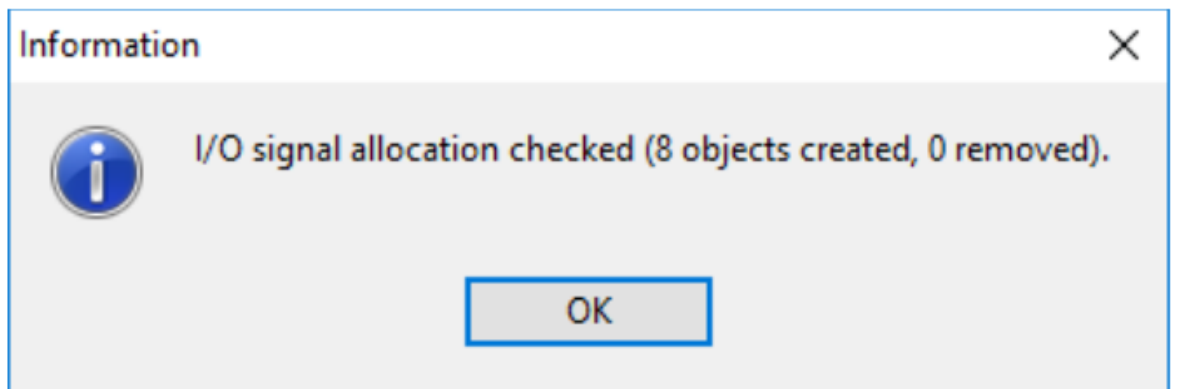
Selecting "Preview" on the toolbar shows the arrangement familiar to the user, according to figure below. The connectors and the symbolic functions of the modules are also shown.

Figure. 13.1 - 89. The rack preview



When the number of binary inputs or outputs of the device has been changed (because of changing, addition or removing one or more input or output module), attempting to leave the Rack designer by pressing the "OK" button, an information message is displayed.

Figure. 13.1 - 90. Message after adding an R8 module



The Rack designer allows modification of the LED titles for the printed front panel of the device. For this procedure press "LED Title". The "LED title" window supports editing:

Figure. 13.1 - 91. The LED text editor (Example)

The screenshot shows a software window titled "LED Title" with a close button (X) in the top right corner. The window contains a text input field at the top with the text "E2-Line_F". Below this, there are two columns of text input fields for configuring LED titles. The left column contains: "General Trip", "Z1 Trip", "Z2 Trip", "Z3 Trip", "Z4 Trip", "Z5 Trip", "Dis Start", and "AR Blocked". The right column contains: "OC Trip", "Res OC Trip", "Voltage Trip", "Frequ Trip", "AutoReclose", "LDiff Trip", and "LD CommFail". At the bottom of the window, there is a "Count" label followed by a spinner box set to the value "8", and a language dropdown menu currently showing "English". At the very bottom, there are three buttons: "Print", "Save Image", and "Close".

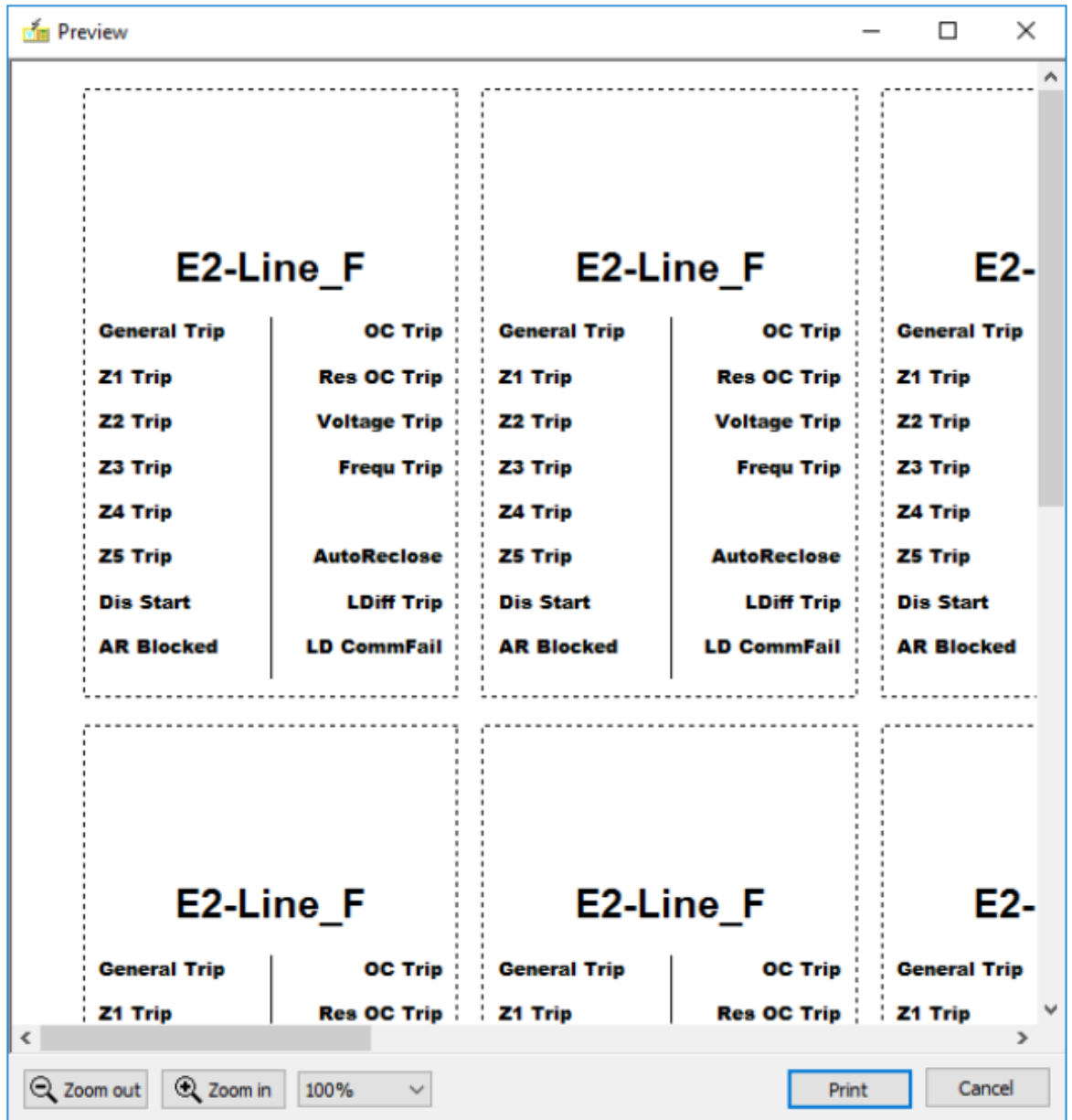
You can modify the LED titles to be printed. However, these modified titles will appear only on the printed sheet and not on the mirror of the front panel on the webpage of the device! There the titles will be displayed, which are defined in the menu Hardware Configuration / LED assignment.

It is possible to set in this window the count of the LED-title pages on the A4-size sheet. The count can be between 1 and 8. The size of one LED-title page does not depend on this count, it is always the same, which fits to the pocket on the front panel.

Also, the language of the titles to be printed can be selected by the dropdown menu, if there are more translations in the configuration file.

Before printing the print preview is shown, like below:

Figure. 13.1 - 92. The LED-title pages print preview (Example)



The LED-title page can be also saved as image by the "Save Image" button in the LED title window. The format of the image can be .png or .bmp.

13.2 Displaying the details of the I/O signals

The details of the I/O signals can be checked in the left-side configuration menu by selecting *Connector allocation*.

14 Logic Editor

You can use the graphical Logic Editor tool to compose logic equations based on the binary signals of a factory configuration.

Logic equations can have the following inputs:

- filtered binary inputs,
- graphed input statuses,
- logic parameter variables, and
- matrix columns.

The outputs of the logic equations are the following:

- contacts, and
- graphed output statuses.

You can use the following logic operators in your equations:

- AND,
- OR, and
- NOT.

Finally, Logic Editor includes the following functional objects:

- function blocks,
- timers, and
- macros.

Starting the graphical logic editor

There are two methods for starting the graphical logic editor:

- Clicking the "Graphical Logic Editor" icon on the toolbar,
- selecting the "Project" menu item on the header, then clicking "Logic Editor"

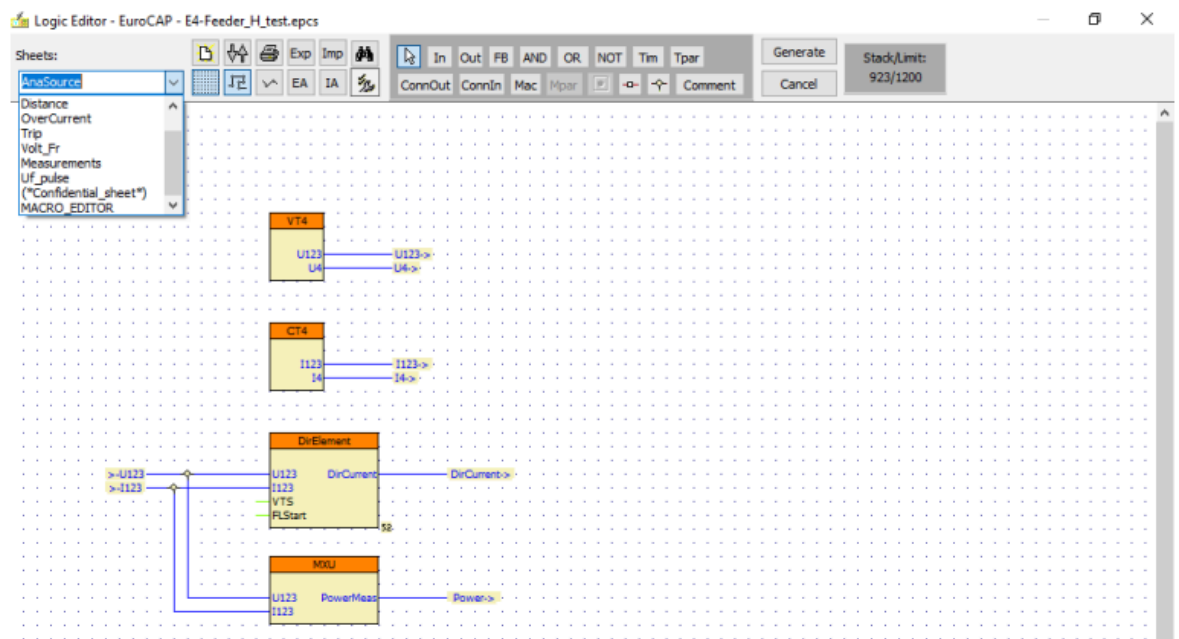
Active icons at starting the graphical logic editor


After starting the graphical logic editor, the window opens showing a drop-down menu and the icons on the toolbar.

The editor is divided into "sheets", each of them contains one or more graphic equations. The names of the sheets are free to define. At the first opening, "Sheet 1" and "MACRO EDITOR" are available.

The drop-down menu provides a tool for selection among the sheets; figure below shows an opened drop-down menu, using names given in the factory configuration.

Figure. 14 - 93. The toolbar of the graphical logic editor



 **NOTICE!**
All the sheets can be opened in "Master" view except sheets that are locked in the factory. These are displayed enclosed in asterisks on the drop-down menu. See Confidential_sheet in figure above.

The icons on the toolbar are as follows (the details of their use are described in this chapter below):

Figure. 14 - 94. The icons related to the sheet













-  "New sheet" icon for adding an empty sheet to the list. A name is given automatically but it can be modified easily in the "Sheet properties" dialog.
-  This icon can change the sequence of the sheets
-  This icon is for printing the graphic equation. It opens a dialog that controls printing the way similar to any Windows-based software.
-  This icon can export and save the sheet
-  This icon can export and save all sheet
-  This icon can import a saved sheet
-  This icon can import a set of sheets
-  The properties of the sheet (colors, size, parameters for printing, etc) can be set using this icon.
-  The sheet can be viewed with or without grids; this icon serves for toggling.
-  When connecting the elements and this mode is active, only horizontal and vertical lines can be drawn.
-  When connecting the elements and this mode is active, any straight line can be drawn.
-  Icon starting the search function. The name of the last selected item is offered when launching the search window

Figure. 14 - 95. The icons symbolizing the sheet elements

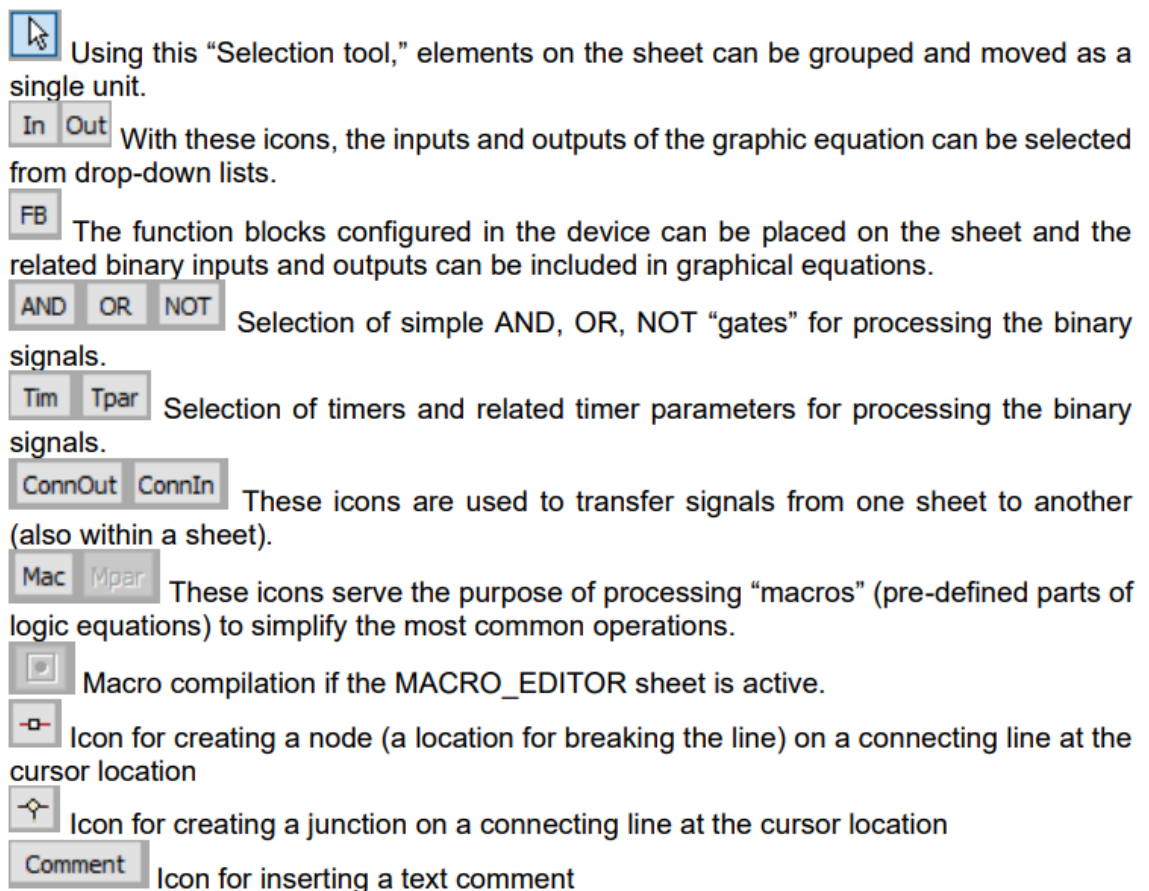


Figure. 14 - 96. The active buttons of the toolbar.

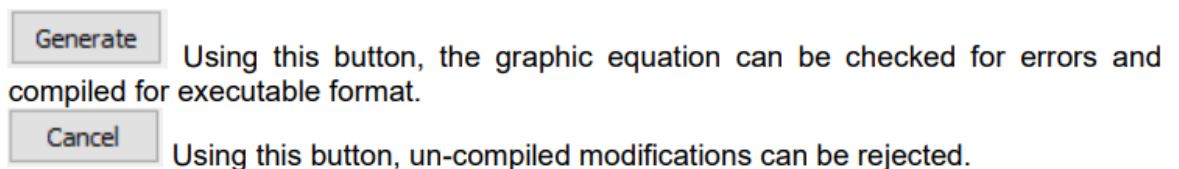
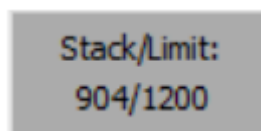


Figure. 14 - 97. Stack/Limit monitoring



"Stack/Limit" icon shows the limit and the current number of the stack operation. Displaying current number of stack operation does not change during editing, only at the next opening of the Logic editor. If the stack is close within 10% of the limit or exceeds the limit, a warning message appears. This way the user logic can be generated and saved, but the upload process is disabled. The same operation applies, if a generated equation is too long. A warning message appears for every long equation to help correcting.

14.1 Analogue signal assignment in logic editor

Starting from version 3.1.1 there is a possibility to assign analogue inputs to function blocks from the logic editor. There are now graphical representations of the voltage and current input modules which can be used to generate transferrable ConnOut signal outputs. Transferred ConnIn signals can then be assigned to protection function blocks.



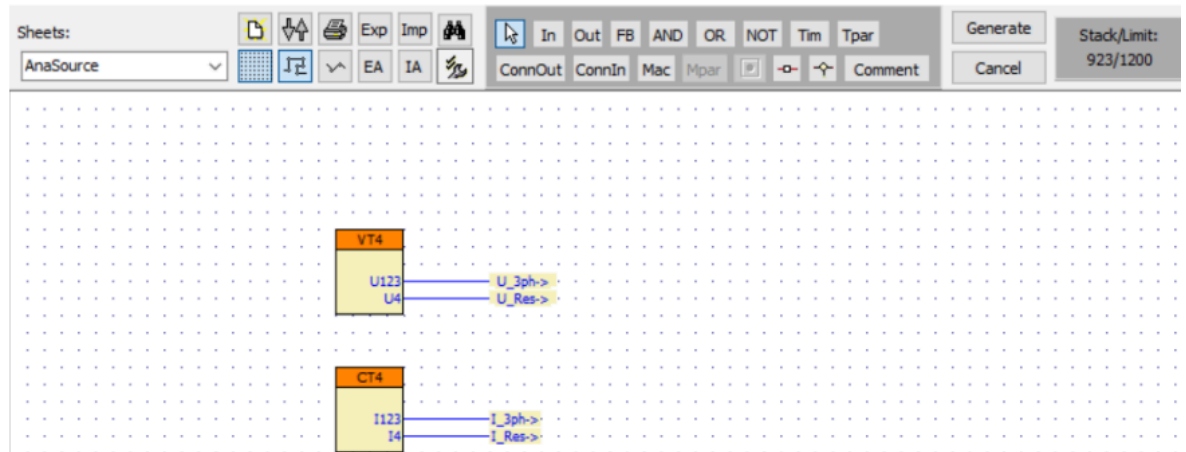
NOTICE!

Analogue signal assignment in the logic editor requires an upgrade in device firmware to version 2.10.2.3010 and above, which supports configuration versions with this feature.

New VT & CT function blocks

Figure below shows the voltage and current input function blocks. In newer configuration versions, these function blocks have outputs that can be used to process different analogue signals. The outputs of the function blocks are the so-called analogue sources. These analogue sources can be further split into different types depending on the application of the output. The most common as seen in the figure below is to group the first three channels and designate them three-phase voltage/current and the fourth channel as a different group, designated residual voltage/current.

Figure. 14.1 - 98. Voltage and current input modules in the logic editor

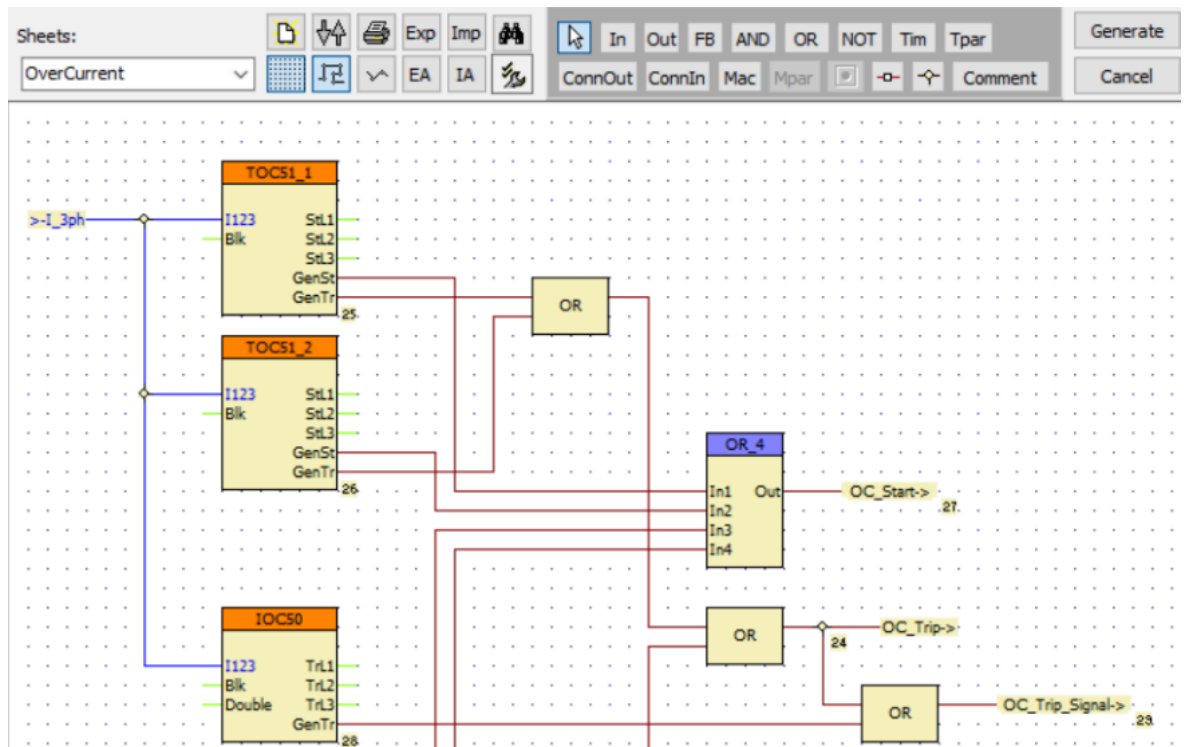


The signals from the analogue sources can be transferred to the relevant function block inputs through ConnOut objects. In figure above, the analogue signal sources are connected to ConnOut objects U_3ph & U_Res for voltage and I_3ph & I_Res for current.

Analogue input assignment for function blocks

The analogue source signals from the current and voltage input function blocks can be transferred to other function blocks through ConnIn objects. In newer configuration versions, protection and control function blocks have a provision for a new type of input, a graphical analogue input. In figure below, three-phase current analogue signal (in blue lines) is connected to overcurrent function blocks through ConnIn object I_3ph. The displayed overcurrent function blocks, the two instances of TOC51, and IOC50, have an I123 analogue input, where the I_3ph signal is connected. Other function blocks may have different types of analogue inputs depending on their application. All analogue inputs are displayed in blue while the binary inputs in black.

Figure. 14.1 - 99. Analogue input assignment for protection function blocks



14.2 Drawing new graphical logic

The operation of the graphical logic editor is best explained through an example.

Let's compose a logic for the following task:

EXAMPLE: The under-frequency protection function must be blocked by dead-line detection or by any of two dedicated binary inputs.

The start signal of the under-frequency protection function must be delayed by a timer parameter, and then a pulse of a given duration must be directed to a free binary output of the device.

1. The proposed steps are as follows:

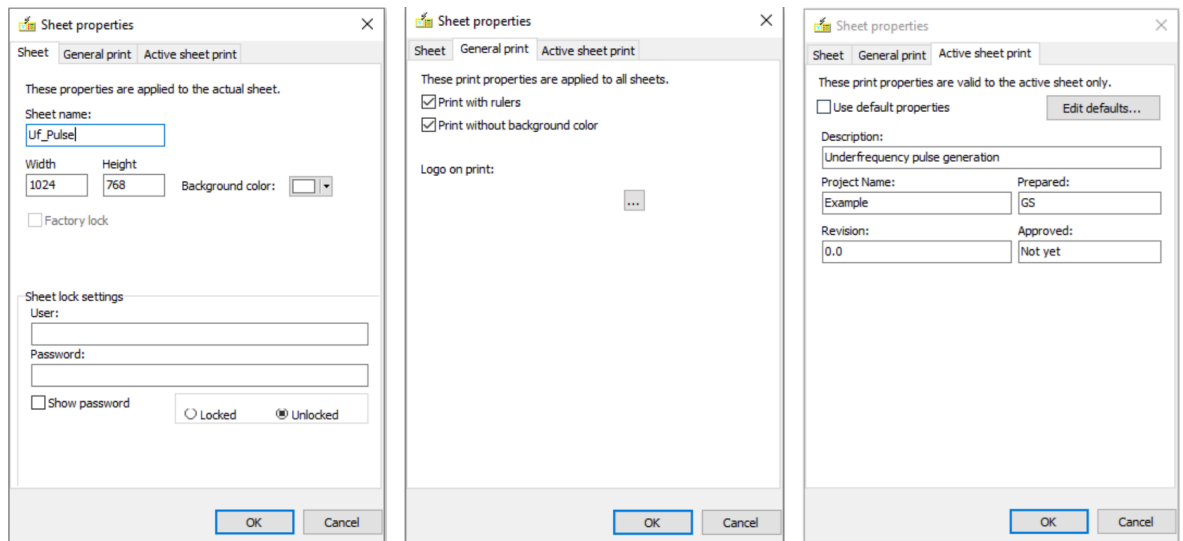
Open a new sheet and name it "Uf_pulse"

Using the "New sheet" icon and the "Properties" icon, fill in the dialog boxes as shown in figure below. The contents of the boxes are defined by the user at his discretion.

- The left-side box of figure below shows the definition of the sheet name, size and color on the "Sheet" tab;
- The box in the middle shows the definition of printing details;
- The right-side box shows the definition of the identifiers of the printed page.

(These definitions are not compulsory but advised.)

Figure. 14.2 - 100. Example for defining the graphic sheet



2. Place the graphic elements on the sheet:

The required function blocks are DLD (dead-line detection) and TUF81_3. Click the icon "FB" (Function blocks), then click on the empty sheet. A selection window is opened (showing the selection of the function block TUF81_3 according to below). Clicking "OK" and the block is placed on the sheet. Repeat the procedure with the function block DLD as well.

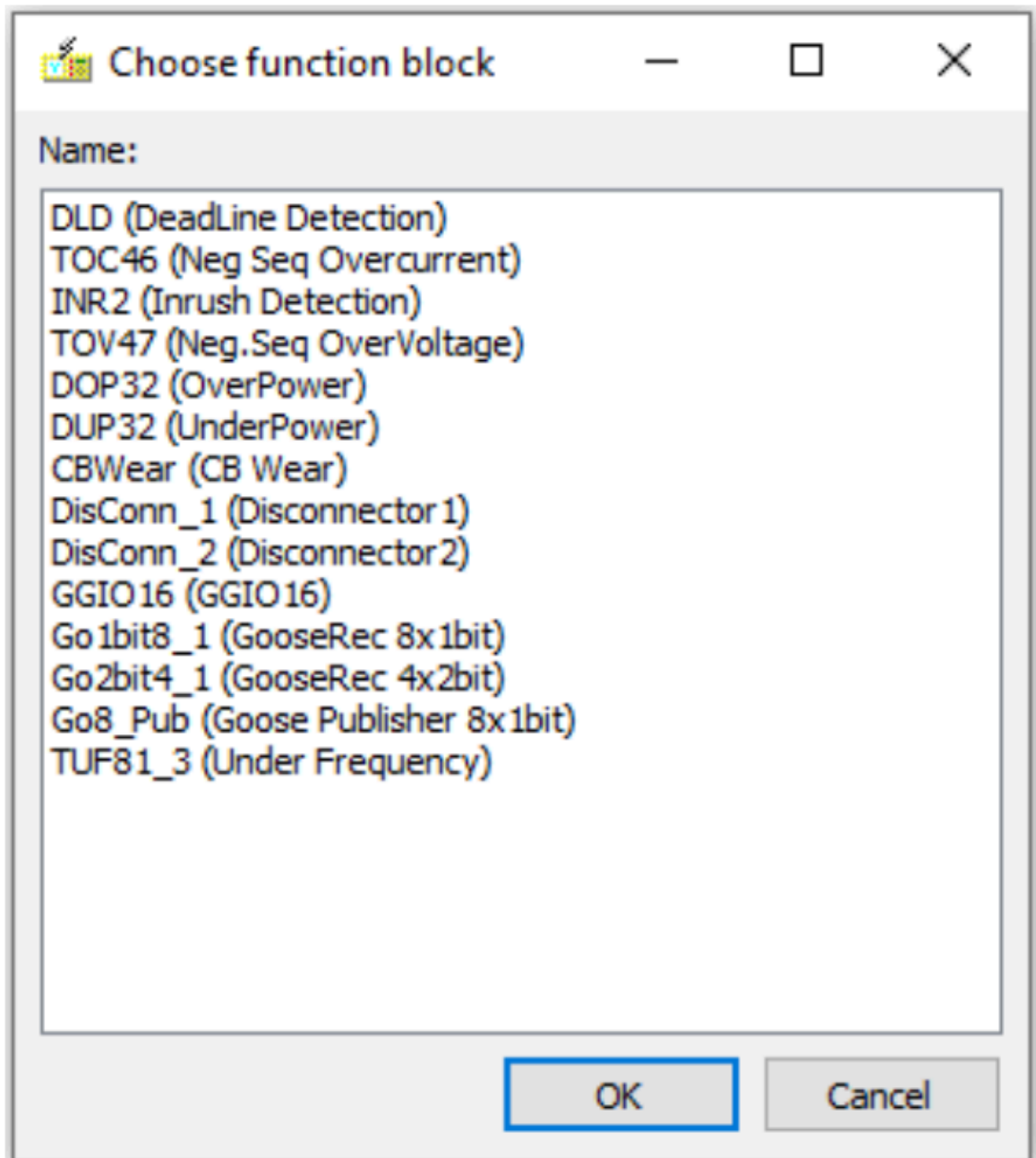


NOTICE!

if the desired function block cannot be found on the list, then either the configuration excludes this block (it cannot be applied) or the block is already used on some other sheets.

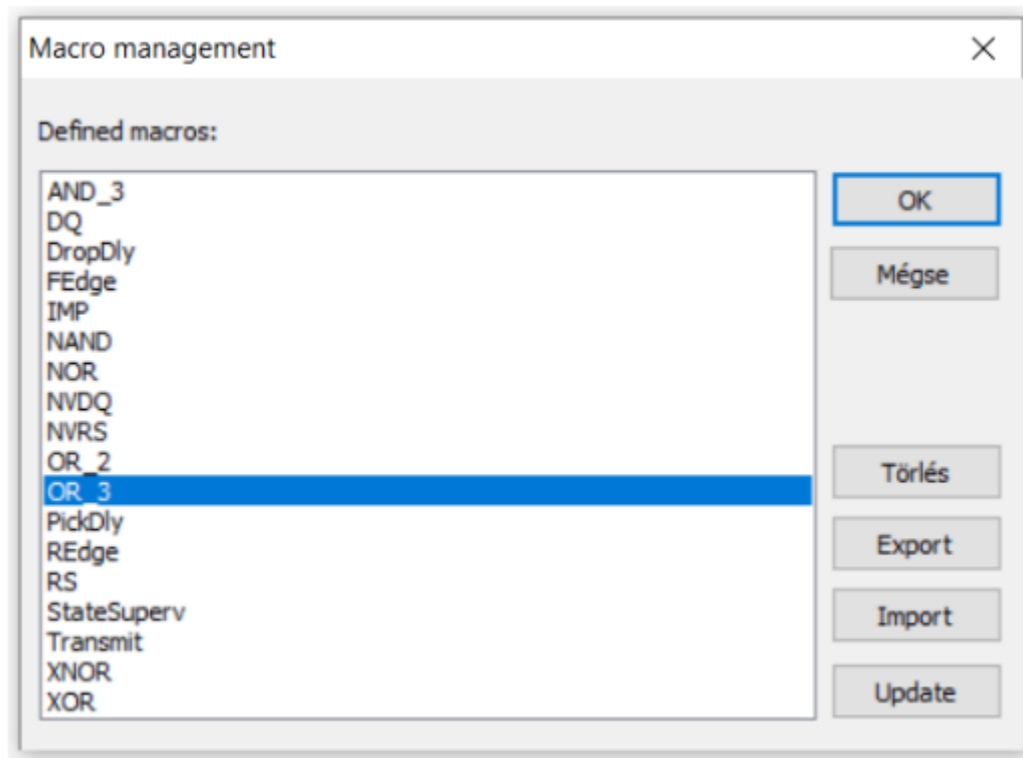
In the second case, use the "ConnOut" and "ConnIn" icons to transfer the required signal for further processing.

Figure. 14.2 - 101. Example for FB selection



The example needs OR connection of three signals (two binary inputs and the DLD function output). This can be achieved using two OR gates, or simply using a predefined macro clicking the icon , then selecting from the list of factory-defined macros according to figure below.

Figure. 14.2 - 102. Example for macro selection.



The example needs two timers: one for the delay and one for pulse duration. This can be realized with two general purpose timers; however, it is more convenient to select the predefined macros “PickDly” for pick-up delay and “IMP” for pulse duration. (The selection method is similar to “OR_3” selection, see above.)

The two timers need timer parameters. These are defined using the icon (timer parameter). The window of figure below must be filled in. This figure shows the selection of the “Variable” timer parameter. In this case, the delay is defined in a normal parameter setting session. (The “ShowOrder” information indicates the location of this parameter on the parameter list; all other information is selfexplanatory.) The parameters to be defined are: “TUF_PickDelay_TPar” and “TUF_Imp_TPar”.

Using multiple function blocks or logical gates of the same type can be simplified with copy+paste commands. The recommended procedure is to use the FB or logical gate local menu (copy) by right clicking on the element. Then point the cursor on the desired location and use the right click again (paste). Keyboard command Ctrl+V is not supported.

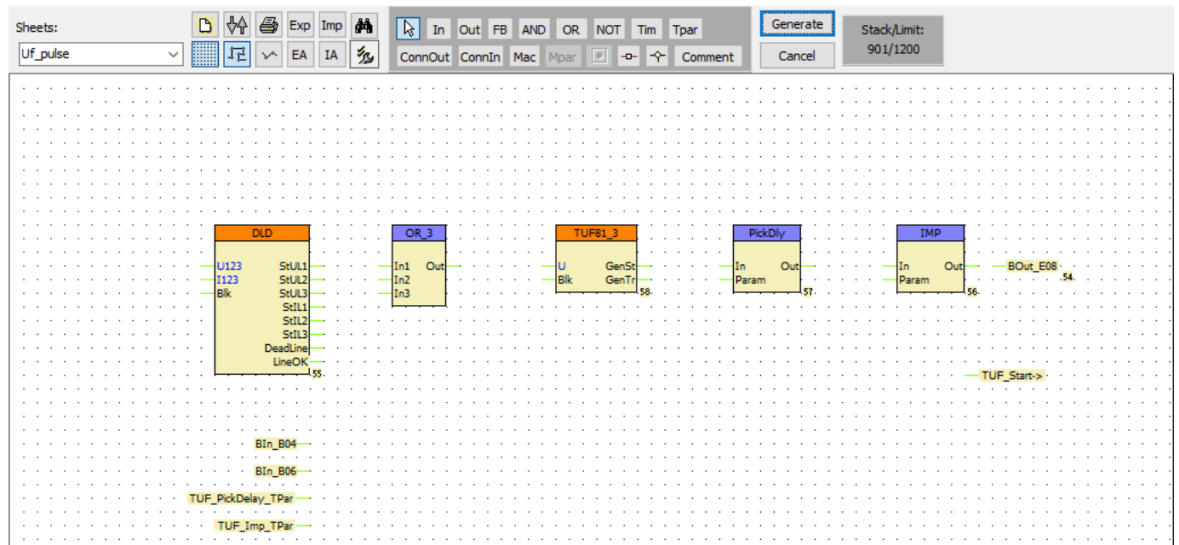
Figure. 14.2 - 103. Example for timer parameter selection

The equation needs two binary inputs and one binary output. Select them using the "In" and "Out" icons. The selected inputs are "BIn_B04" and "Bin_B06" found on the dropdown list, the selected output is "Bout_E08" (figure below). It is also possible to put down more inputs or connector inputs at the same time with the use of Shift or Ctrl keys in the input selection and in the connector input selection windows.

The output of this sheet can be transferred to other sheets by creating a dedicated output "TUF_Start" with the "ConnOut" icon. 'Create user status' and 'Non-volatile' attributes can also be selected for the connector outputs during the creation process in the dialog box. The output signal can be used on other sheets by clicking on the "ConnIn" button and clicking on the desired place on the sheet. A list with all available ConnOut signals will pop up and the user can select "TUF_Start". Once the ConnIn is created, its source can be easily tracked down with a right mouse click and selecting "Find source".

The result of these steps is shown in figure below. Here the icon "Show Grid" is depressed: the grid is visible on the sheet. The location of the elements can be altered using the drag-and-drop technique.

Figure. 14.2 - 104. Example for placing the elements on an empty sheet



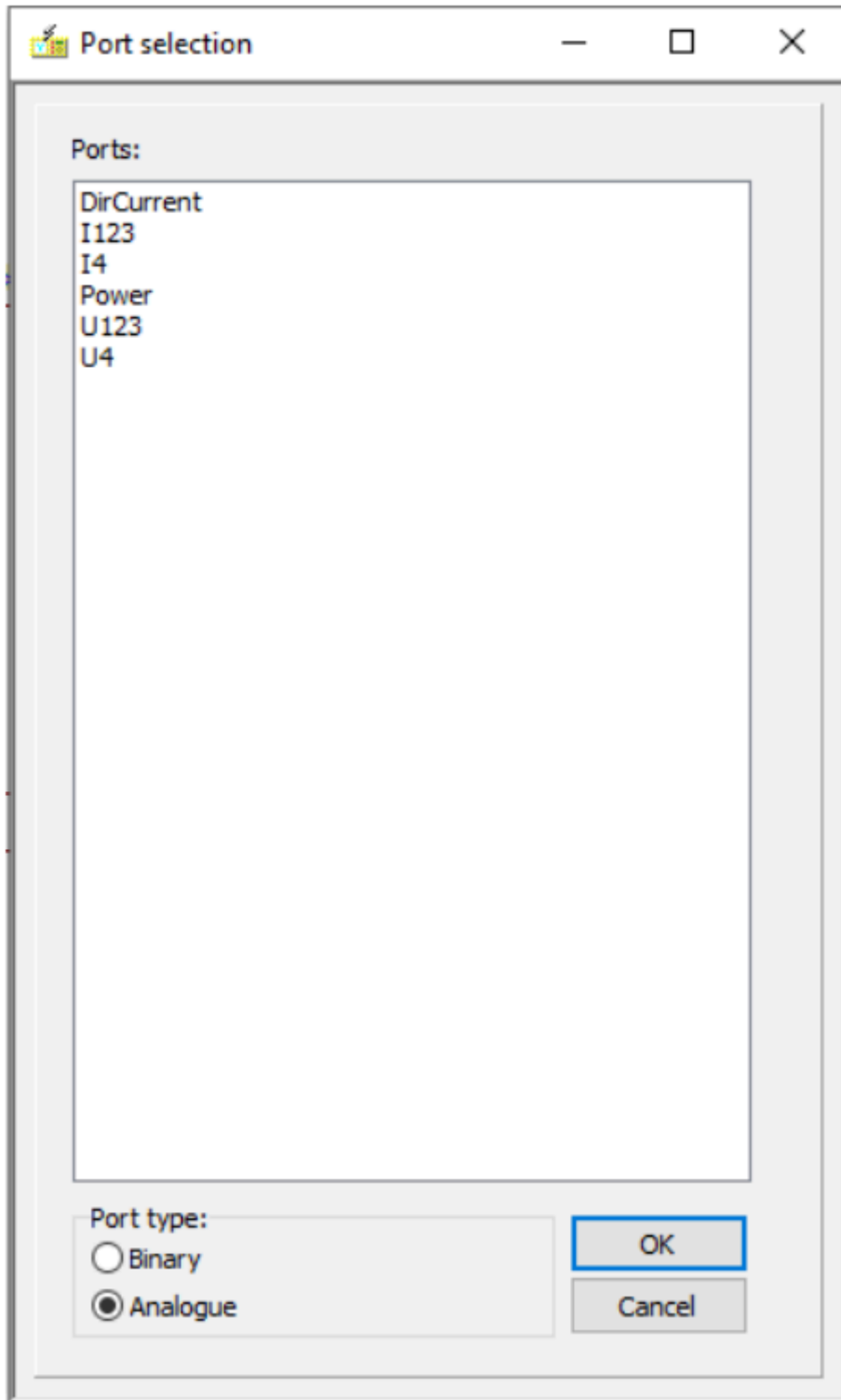
3. Draw the interconnections:

As figure above shows, the elements placed have green connection points. Draw a line by clicking on a green start point, clicking on the required corners and clicking on the green end point. A finished line and corners can be rearranged using the drag-and-drop technique. (The line can also be deleted.)

4. Connect the analogue input signals

The analogue input signals are relevant for the two function blocks: DLD and TUF_81. Connect the necessary analogue inputs by clicking on the "ConnIn" button. On the pop-out window, select "Analogue" port type from the bottom side of the window, click on the relevant analogue signals from the top side of the window to lay the signals down on the logic editor. Repeat this process until you have all the necessary analogue signals, i.e., 2x U123 and 1x I123. Connect each signal to its respective function block input.

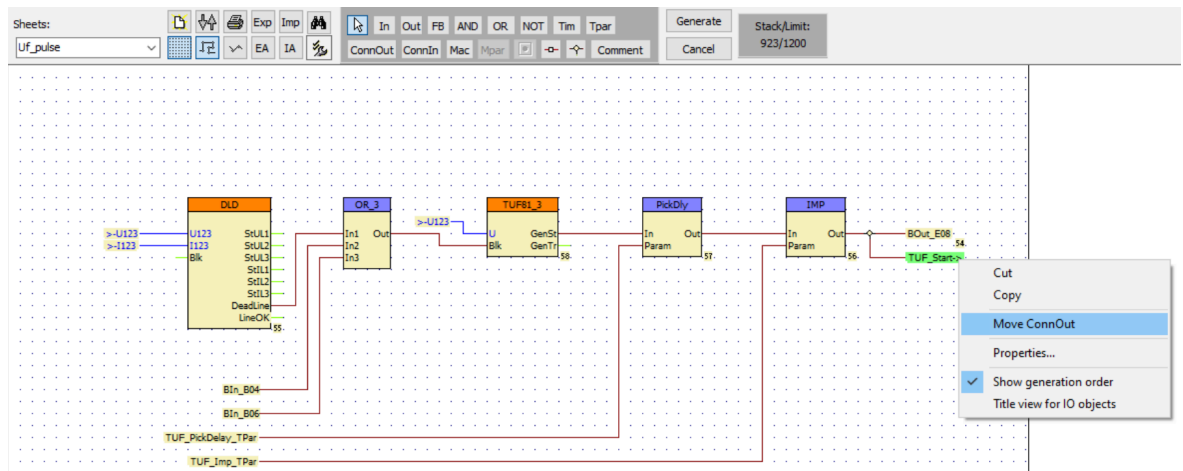
Figure. 14.2 - 105. Pop out window showing analogue inputs



5. The finished equation needs the “generation” of the executable format.

This is done automatically when pressing the “Generate” button on the toolbar. The result is shown in figure below.

Figure. 14.2 - 106. Example for a defined logic



When double-clicking on a line, a potential node point can be inserted.

When double-clicking on a node point, a junction can be inserted.

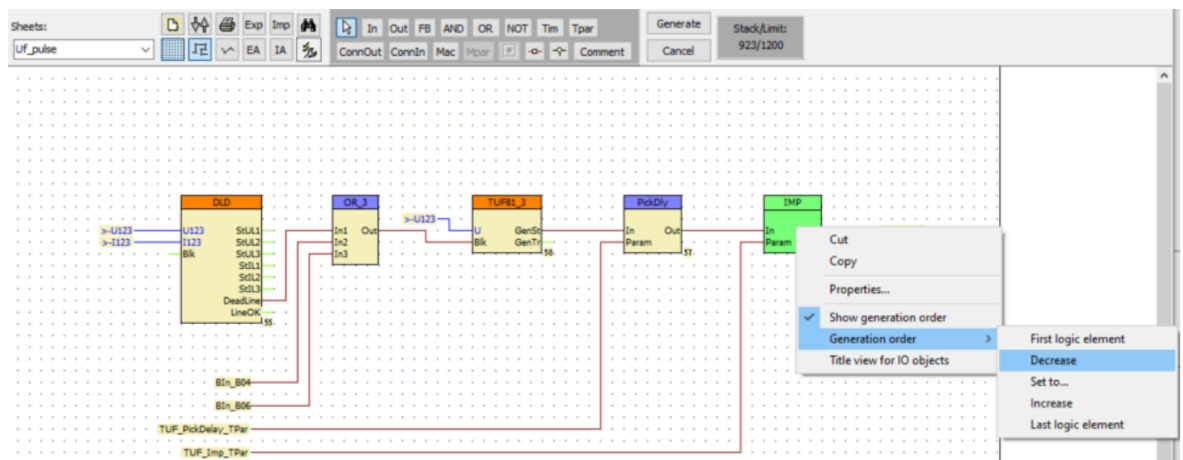
When right-clicking on a junction, the properties of the automatic new binary variable can be modified.

Connector outputs can be moved from one sheet to another. It can be done by selecting from the right click pop-up menu the "Move ConnOut" item on the source sheet (figure above) and the "Paste ConnOut" item on the destination sheet".

NOTICE!

the small numbers at the bottom right corner of the blocks shows the processing sequence. This sequence can be modified by selecting the logical block, holding "Alt" and pressing the "Up" or "Down" arrows. The same can be done with right mouse click on the object -> "decrease" and "increase" commands. Additionally, exact sequence number definition can be done with "Set to..." User shall make sure about proper sequence numbering before clicking the "Generate" button.

Figure. 14.2 - 107. Right-click menu of an object



14.3 Printing graphic logic

The graphic equations can be printed using the "Print" icon. The required settings for printing were made using the "Properties" icon. These settings will apply when printing the sheets.

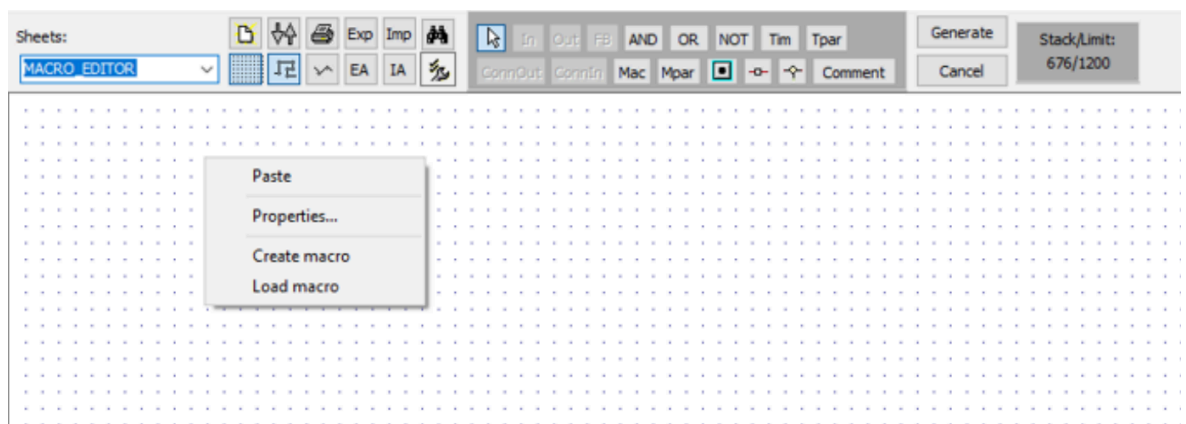
14.4 Using macros

For the most common protection tasks Arcteq prepares “macros”, which can be applied by the user in the graphic equations. The details are hidden from the user, which promotes the readability of the defined equations. Additionally, basic logical blocks like AND/OR gates are available with up to 8 inputs in the basic factory configuration. The details of macros are described below.

Macro definition and modification

Figure above shows, as an example, the macro for impulse generation. These details can be seen if the “MACRO_EDITOR” sheet is selected in the dropdown menu of the graphic editor’s toolbar. The primary purpose of this sheet is to create new or to edit existing macros. When the new macro is completed, it shall be saved and not stored on the “MACRO_EDITOR” sheet. If there is a graphic equation here, it is advisable to delete it. When right-clicking on the empty “MACRO_EDITOR” sheet, a dialog appears, see

Figure. 14.4 - 108. The MACRO_EDITOR sheet



- Paste (any details marked elsewhere with the selection tool can be pasted here).
- Properties are similar to those described in the previous chapter.
- Create macro a new macro can be defined.
- Load macro the details of an existing macro can be viewed and edited.

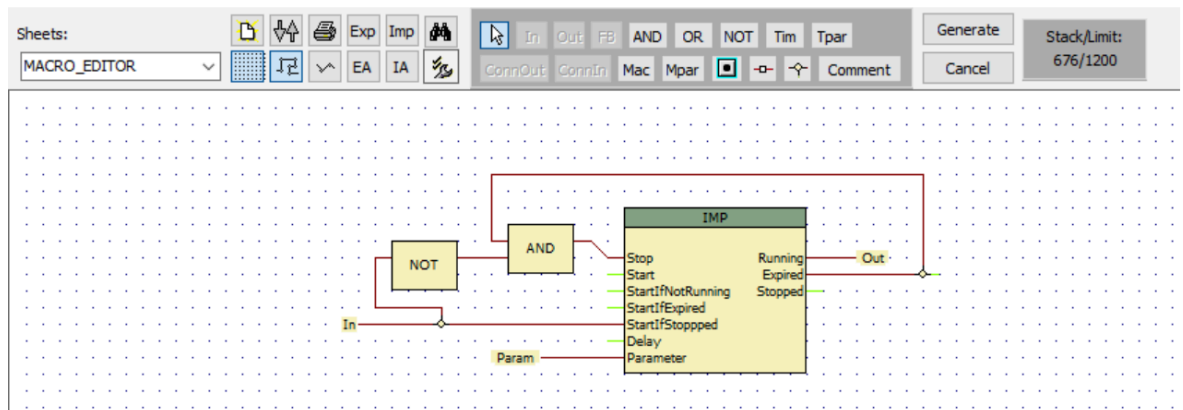
When “Load macro” is selected, a list of the existing macros can be seen and any of them can be selected. In our example the “IMP” macro is shown.

The short explanation of the IMP macro:

The Macro has two inputs (“In” and “Param”) and one output (“Out”). These connection points can be created with the “Mpar” icon.

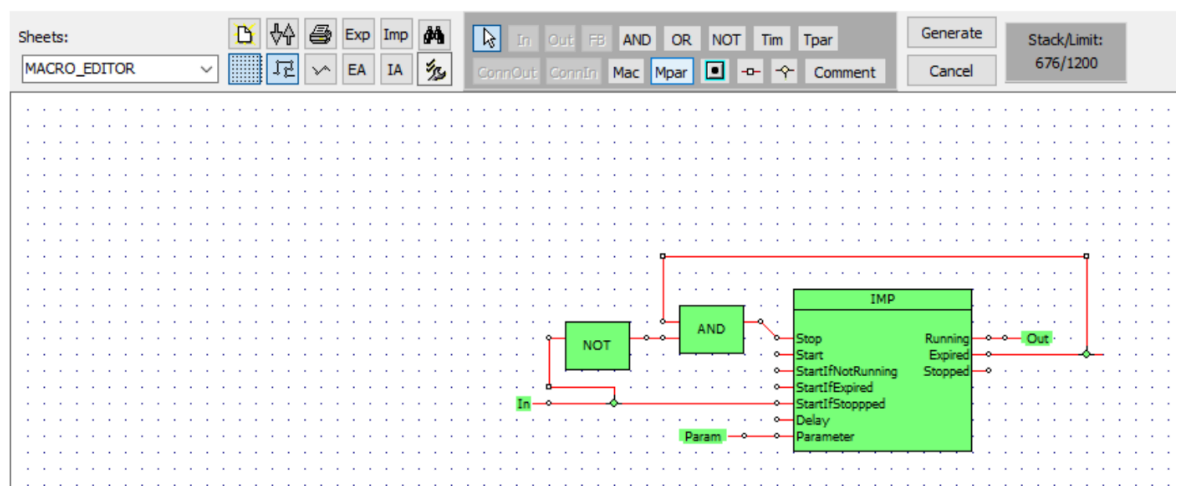
The timer is a “general” timer, selected by the “Tim” icon. In this case it is called IMP. (This timer can be started by several inputs, the “Running”, “Expired” or “Stopped” state can be used for further processing, timer parameter can be assigned, it can be named, etc.) For pulse generation, the “Start if Stopped” input is used for starting, and the “Stop” input is used for stopping. The stop condition is that the input starting signal is FALSE, AND the timer is “Expired”. The output is the running state, the duration of which is defined by the parameter. During the running state it cannot be restarted, and the expired state is not sufficient to reset in “Stopped” state if the input signal is still active.

Figure. 14.4 - 109. Example of a factory-defined macro for impulse generation.



The edited macro must be tested for syntactic error and “compiled” using the "Create macro" icon. (The same procedure can be started by right-clicking on the sheet and selecting the “Create macro” menu item.) For compilation, the graph to be compiled needs to be marked using the selection tool. See figure below.

Figure. 14.4 - 110. Selection a macro for “compilation”



During compilation, a special window is opened, as seen in figure below.

Figure. 14.4 - 111. Macro “compilation”

Create macro ✕

Macro name: OK Cancel Visible only in designer view or above

Input parameters:	Output parameters:	Equation generation order:
<div style="border: 1px solid gray; padding: 2px;">In Param</div> <div style="text-align: center;"> ▲ ▲ ▼ ▼ </div>	<div style="border: 1px solid gray; padding: 2px;">Out</div> <div style="text-align: center;"> ▲ ▲ ▼ ▼ </div>	<div style="border: 1px solid gray; padding: 2px;"> IMP (Impulse Timer) LocalStatus6 LocalStatus7 </div> <div style="text-align: center;"> ▲ ▲ ▼ ▼ </div>

The macro must be named in the "Macro name" dialog box, then the "OK" button is to be pressed for compilation. As a result, the macro can be found on the list of the available macros when the icon "Mac" is selected on a sheet.

Managing Macros

In the Macro management window the user can execute multiple operations with compiled macros. "Export" means saving the selected macro in a file for application in other configurations, while "Import" means that a ready-made macro stored in a file can be imported to the active configuration's list of available macros. It is also possible to update the available macro list based on a selected folder which contains macros. Unused macros will be updated, while new macros will be loaded after clicking the "Update" button and selecting the intended folder. The edited and imported macros must be generated by clicking on the "Generate" button on the toolbar, and then saved in the configuration file. The location of this file is shown on the figure below.



NOTICE!

The indicated location needs to contain a folder named "Macros" to export the generated macros. If it is missing, please generate it manually.

14.5 Logical sheet export and import

The paragraphs of this chapter describe the logical sheet export/import process in the Logic Editor tool of the AQtivate 300 configuration software.

Sheet export

Every sheet can be exported individually by the "Exp" button as an .sht file.

The "EA" button can be used for the all sheets export. The exported file format is Multi sheet files (.sheets file extension). This feature can be launched from the AQtivate 300 software version 1.5.1.10 and higher.

Sheet import

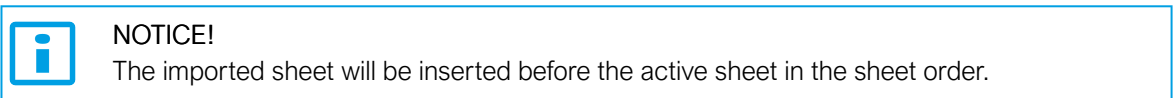
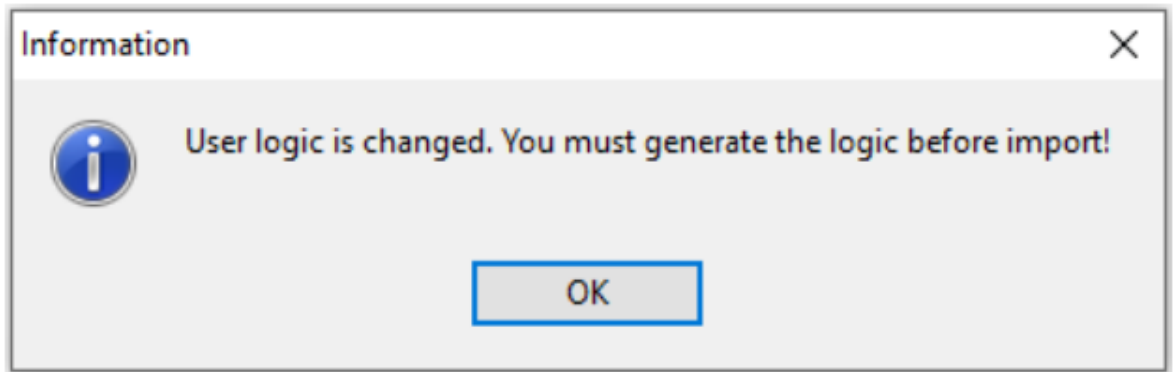
The import button "Imp" can be used for importing the previously saved logical sheets (.sht file extension).



NOTICE!

If an active sheet is being modified and a new sheet needs to be imported, the modified graphical logic on the active sheet has to be generated first. Then the import process can start. By not following this procedure, the AQtivate 300 will notify the user. This message (figure below) can be acknowledged by clicking the "OK" button.

Figure. 14.5 - 112. Information window related to the sheet import



The following warning/information messages can possibly pop-up during the sheet import process:

If you see the message which is written in the figures below and press the „OK” button, the import process is interrupted.

Figure. 14.5 - 113. Information window related to the sheet import

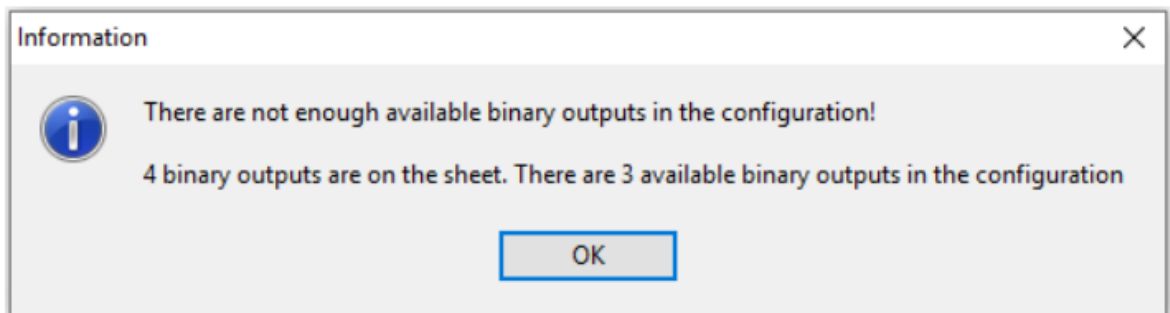
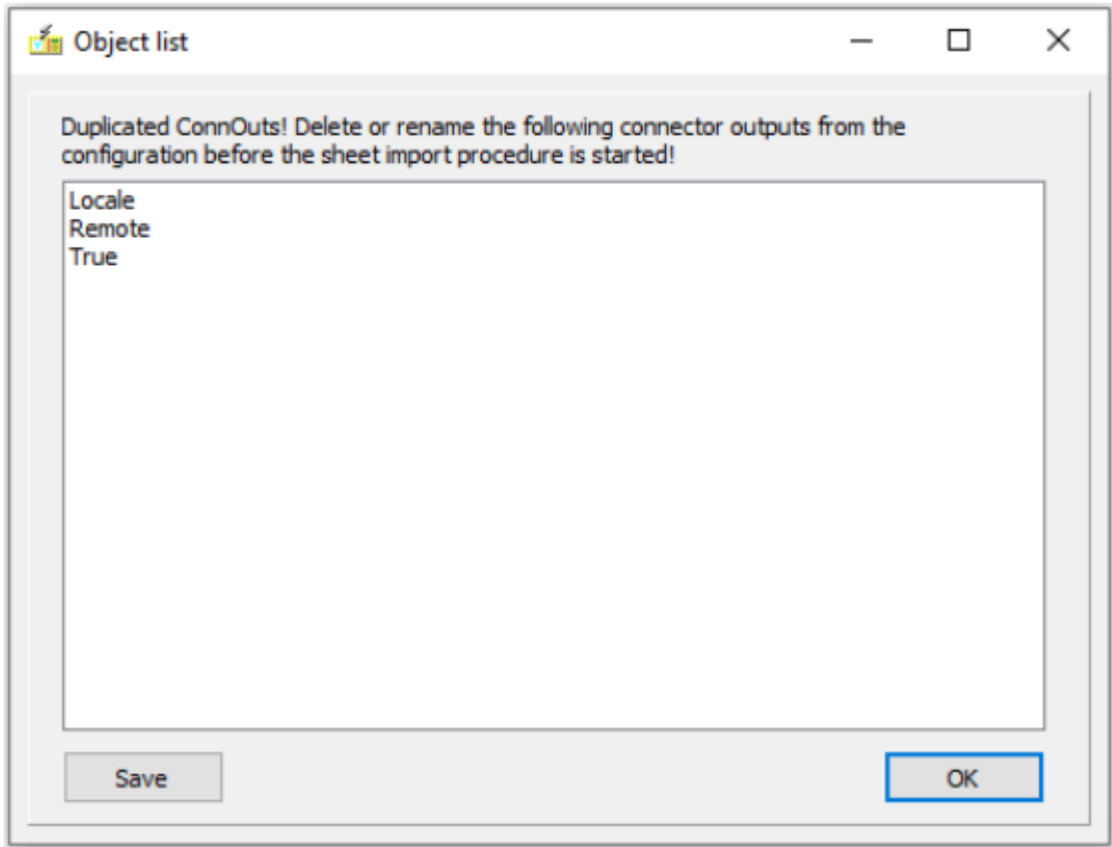


Figure. 14.5 - 114. "Duplication ConnOuts!" pop-up window



The following window (figure below) is displayed if the name of the required imported sheet and the name of one sheet in the configuration are the same. In this case the imported sheet must be renamed before clicking the "OK" button.

Figure. 14.5 - 115. Pop-up window during the sheet import.

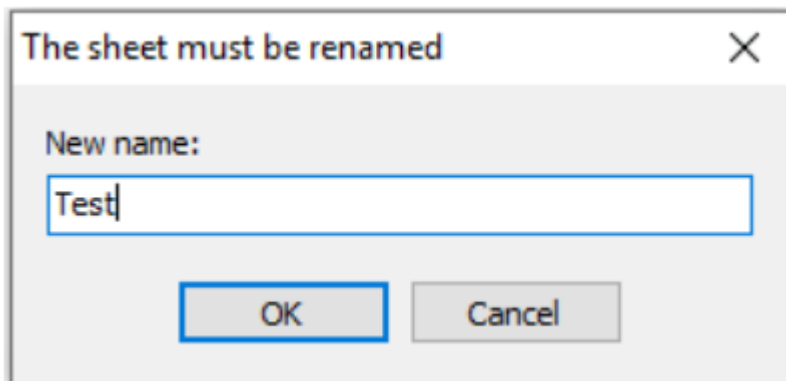


Figure. 14.5 - 116. Message window while the sheet import

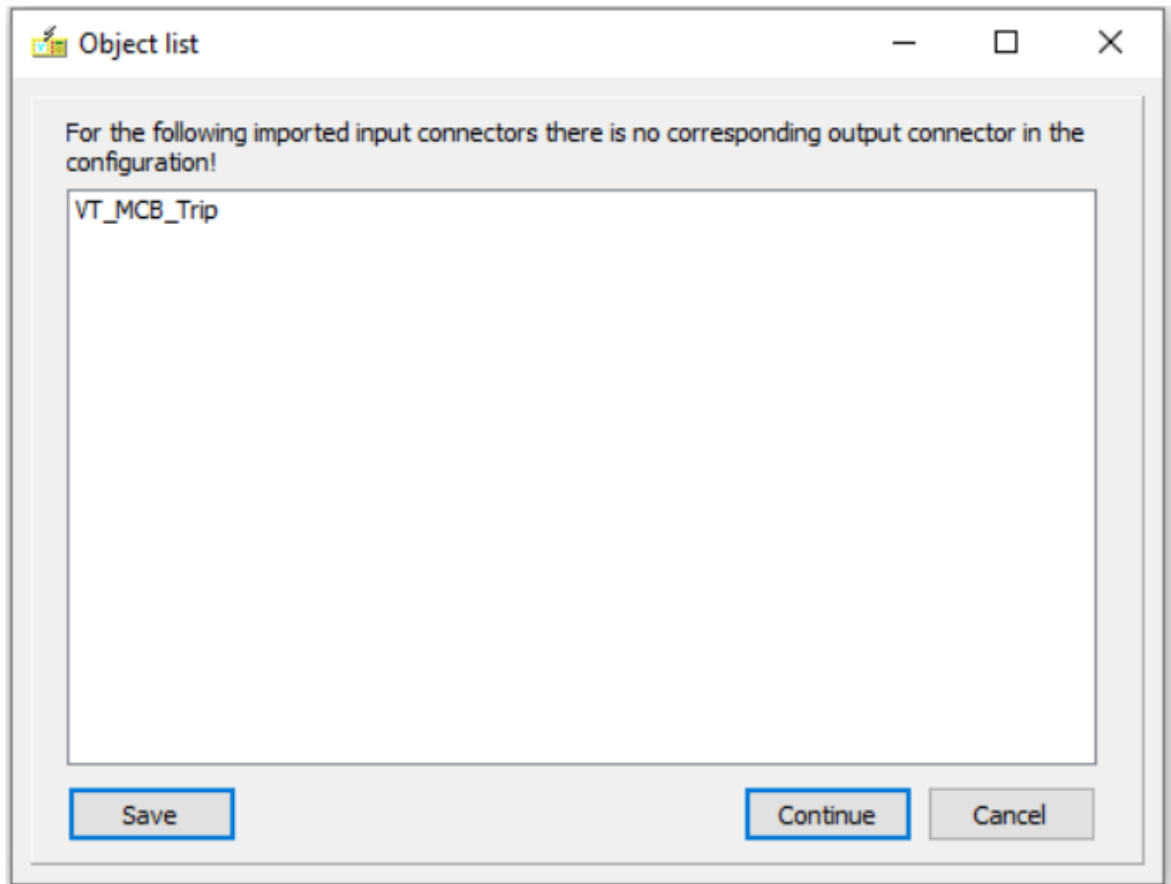
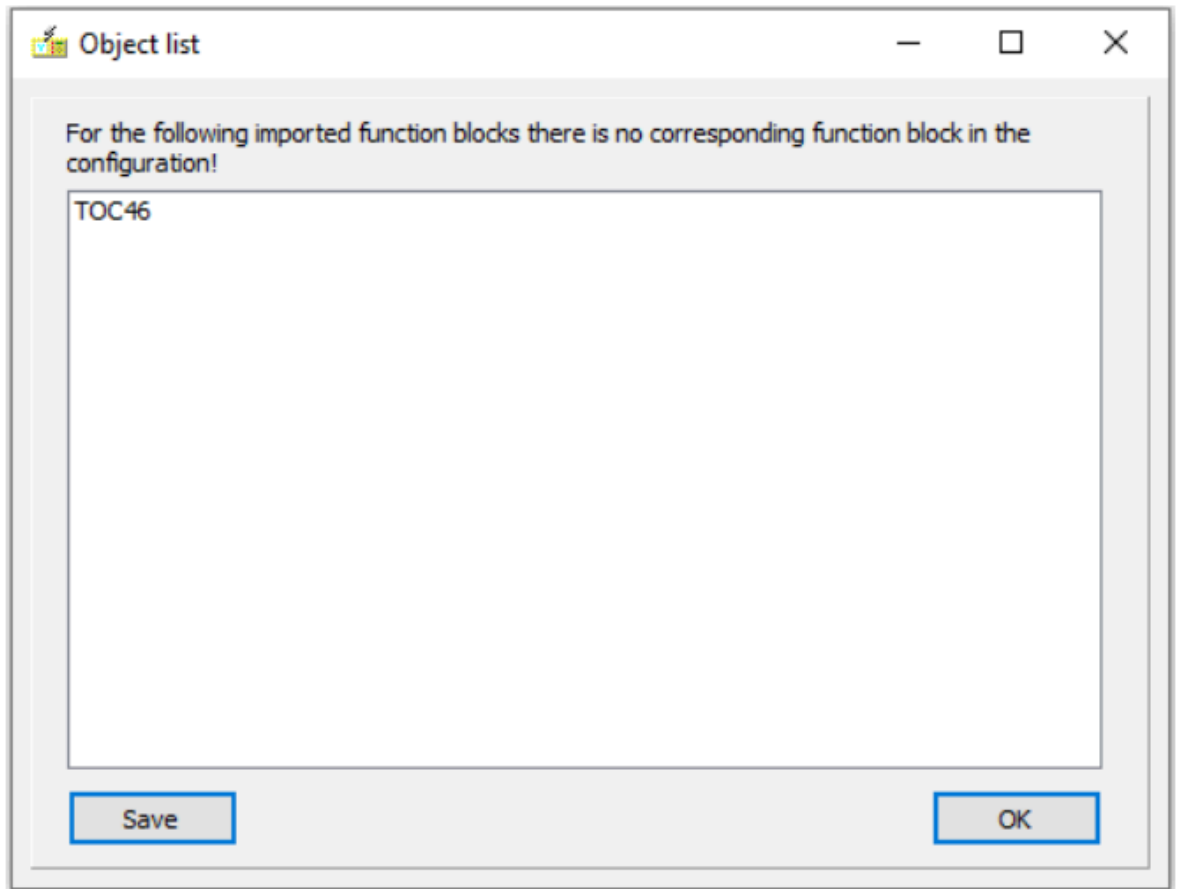


Figure above shows the list of the connector inputs which have no corresponding output connectors in the current configuration. It can be exported to file by clicking the "Save" button.

The following situation can be met if the required imported function block is deactivated or not defined in the configuration, as shown in figure below. The list of the function blocks can be exported to file by the „Save" button. If "OK" button is selected the import process is interrupted.

Figure. 14.5 - 117. Message window concerning to the sheet import process

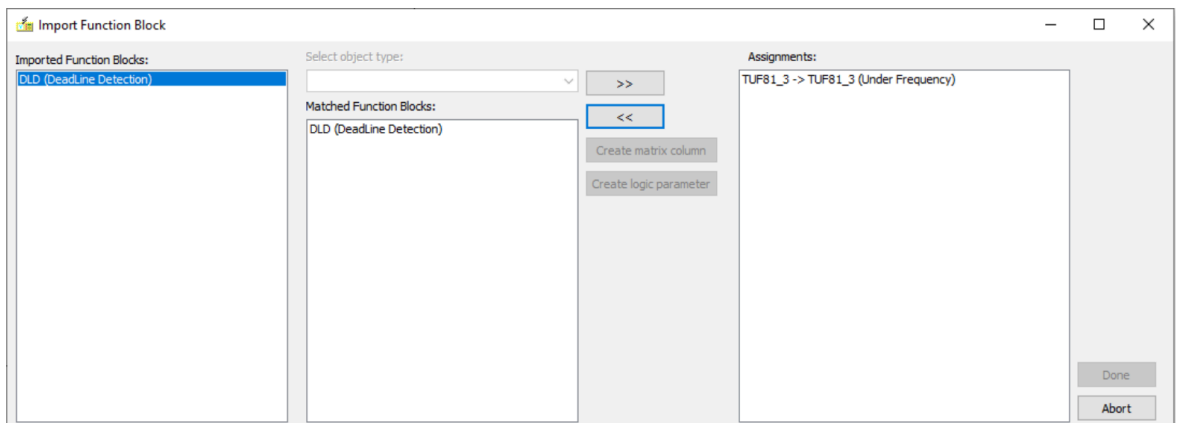


Matching during the sheet import process

If there are function blocks, binary inputs, connector inputs or matrix columns on the required imported sheet the following pop-up windows can be seen during the import process.

The AQtivate 300 software pre-matches the function block pairs automatically but the user can reassign them, see figure below.

Figure. 14.5 - 118. Import Function Block



There is a possibility to create matrix column or logic parameter for the imported Binary inputs or the matrix columns, see figures below.

Figure. 14.5 - 119. Import Binary input

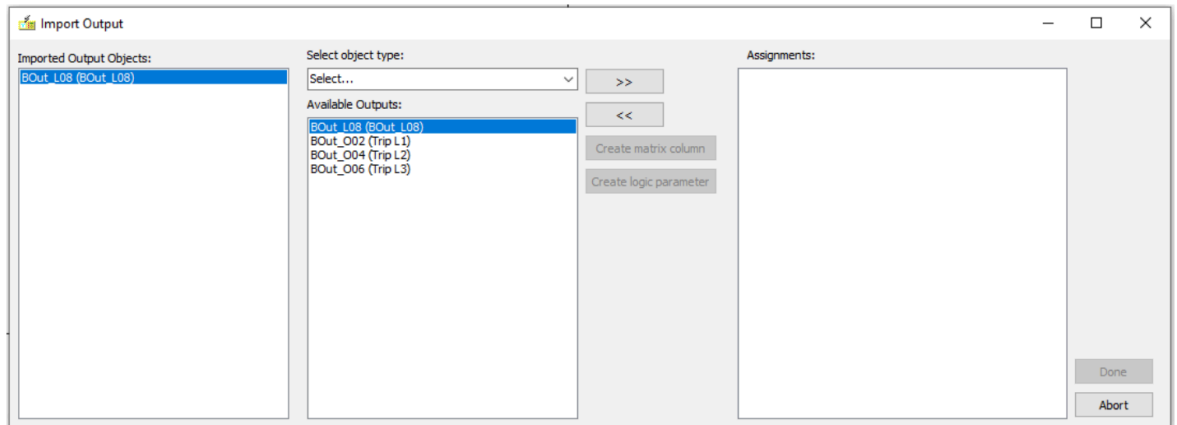
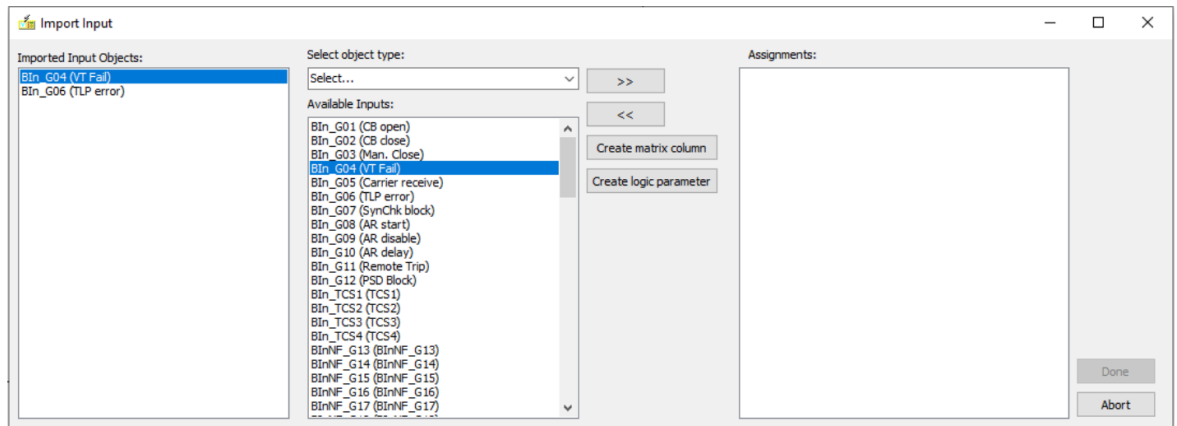


Figure. 14.5 - 120. Import Matrix column



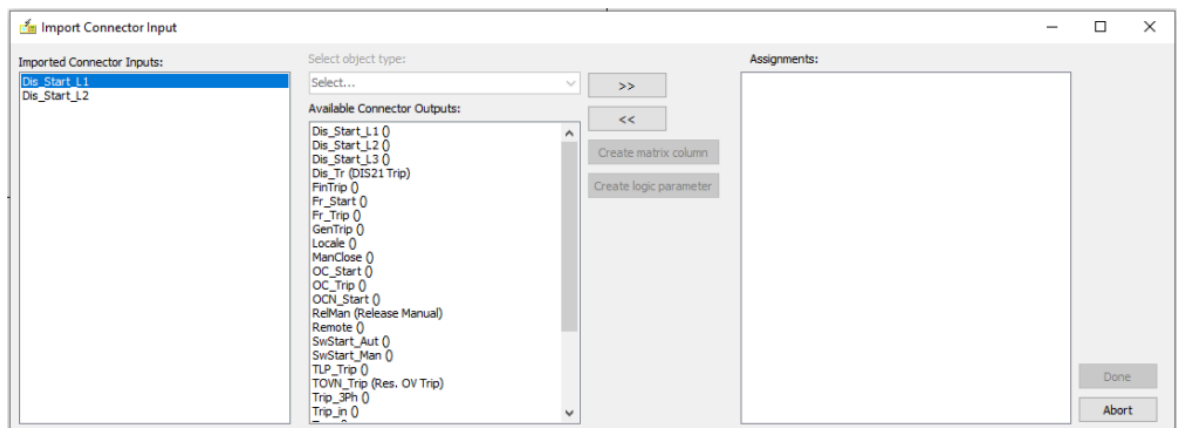
If new matrix column or logic parameter shall be created and there is matrix column with the same name in the configuration then the following message will be generated.

Figure. 14.5 - 121. Error message during the matrix column assignment



The figure below is related to the matching of the connector input. Here there are listed all connector inputs, which are on the imported sheet.

Figure. 14.5 - 122. Import Connector input



NOTICE!

Anytime if clicking the “Abort” button during the assignment then the sheet import process will be interrupted.

Import all sheets

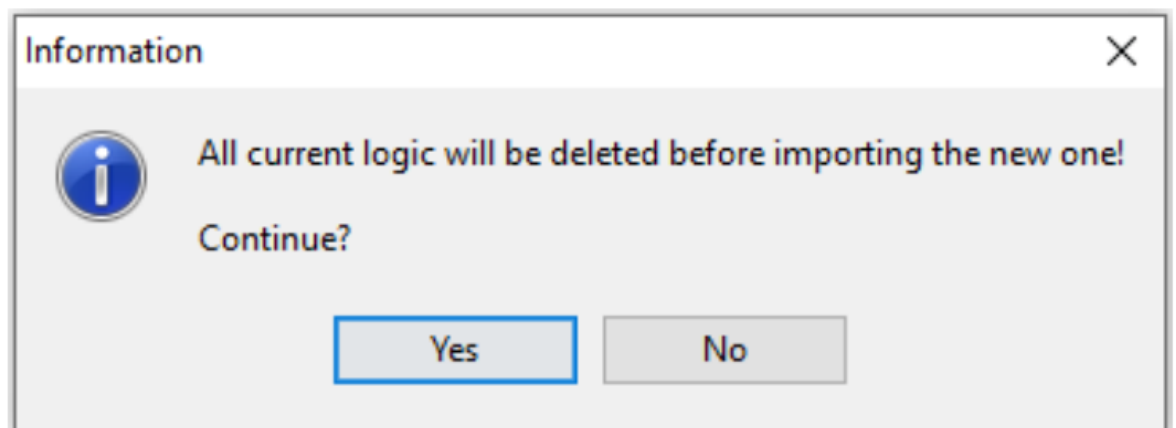
The "IA" button is for the all sheets import from another configuration. The applied file format is the Multi sheet files (.sheets). This feature can be launched from the AQtivate 300 software version 1.5.1.10 and higher.



NOTICE!

If the “all sheets import” option is selected the current logical sheets will be changed to the imported sheets. The following warning message informs the user about it before the all sheet import.

Figure. 14.5 - 123. Information window related to the all sheet import

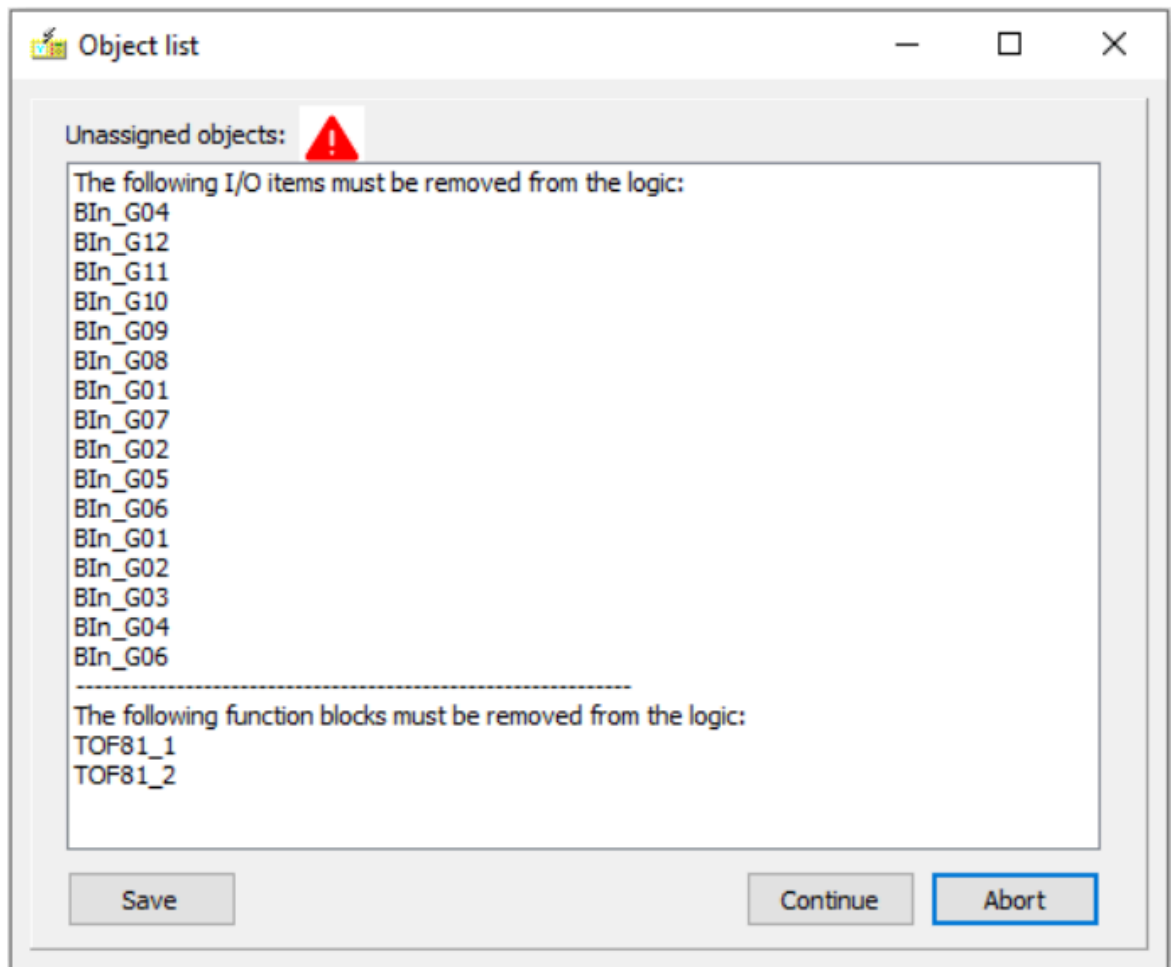


NOTICE!

During the all sheet import process the deactivated FBs are activated in the configuration automatically which are used on the imported sheets.

If the required imported function blocks, matrix or binary inputs are missing in the current configuration you will get the following information window figure below.

Figure. 14.5 - 124. Information message during the all sheet import process.



14.6 Setting DOI descriptions for IEC 61850 Logical Nodes

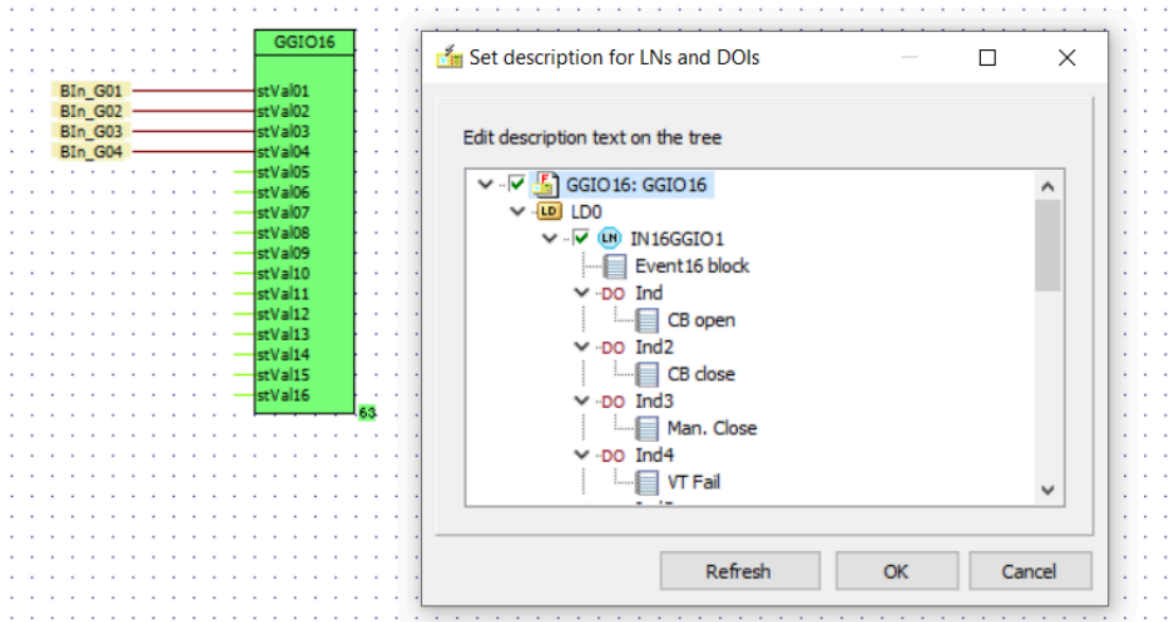
When a Function Block owns one or more IEC 61850 Logical Nodes then you can set the description of the contained Data Objects by right clicking on the symbol of the function block.

The DOI descriptions can be automatically filled for *GGIO16, and **GO8_Pub function blocks, if the connected signals' title fields are filled. The text in the title will be copied to the DOI description. If the titles change, simply click Refresh to update the DOI descriptions.

*GGIO16 (16Ch Event) – function block for creating user-defined events

**Go8_Pub (GOOSE Publisher 8x 1bit) – function block for GOOSE signal publishing

Figure. 14.6 - 125. Set description for LNs and DOIs in Logic Editor



15 Communication Configurator

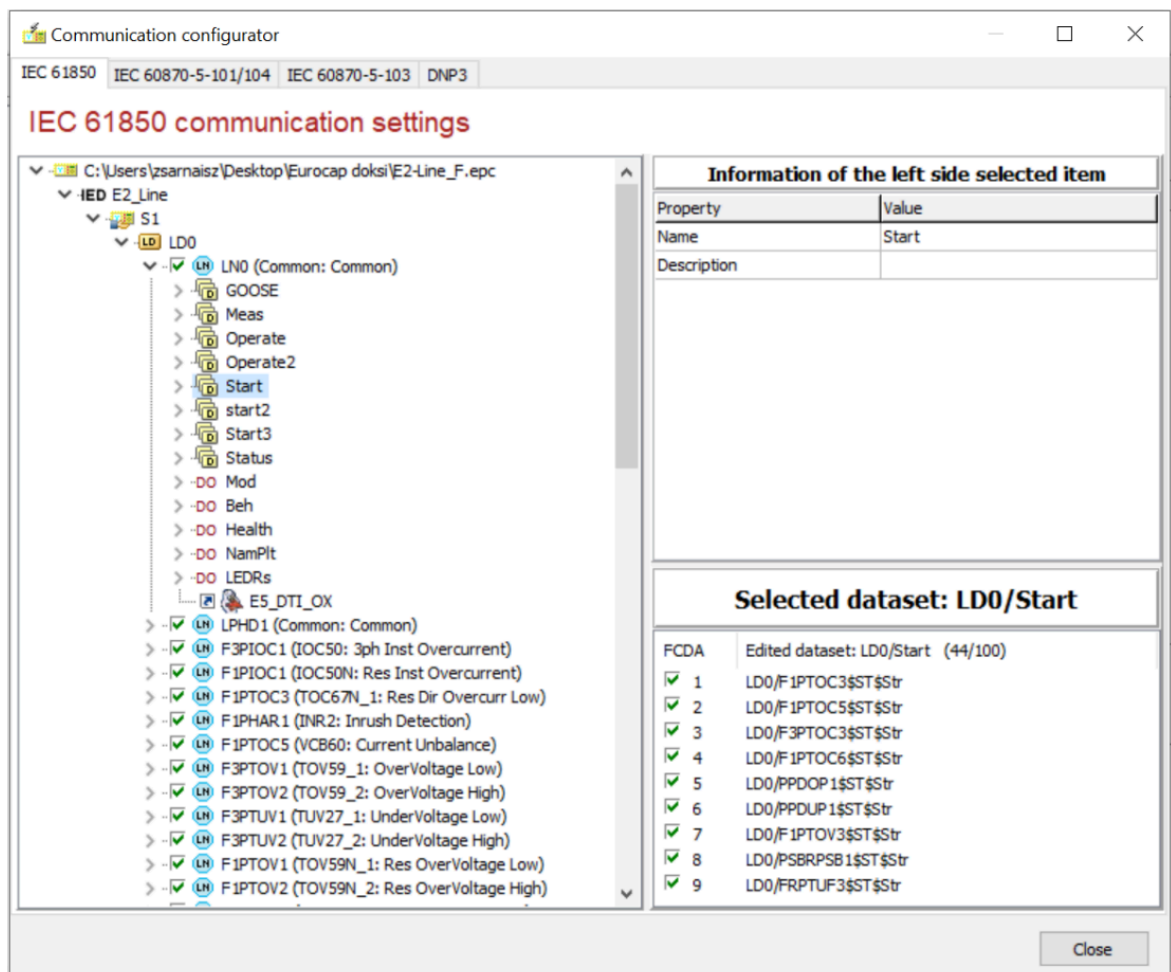
The AQ 300 device supports several communication protocols. Modbus and SPA protocols are “self-configuring” that means the data points are fixed to the event channels of the device. The list of available objects can be found on the web interface (Advanced – Status/Log – Communication files). Other protocols need application engineering, they have specific configuration sheet in the communication configuration tool. This chapter contains information about this software. For more information about the communication protocols please read the corresponding standard's documentation.

The communication configuration software is integrated into the AQtivate 300 and can be started by clicking the "COM" button on the header of the main display. The alternative method of opening the configuration communicator is to select “Project / Communication Configurator” from the menu.

There are four different sheets that can be selected: IEC 61850, IEC 60870-5-101/104, IEC 60870-5-103 and DNP3. Every sheet is divided into two main panels:

- the left panel displays the objects' overview, the tree of the available data of the current configuration,
- the panel on the right side usually contains the properties of the selected object, optionally lists the selected dataset (only IEC 61850)

Figure. 15 - 126. Main view of communication configuration



The behaviour of the tree depends on the characteristic of the specific protocol. Detailed description can be found in the following chapters.

15.1 IEC 61850

The AQ 300 family is a native IEC 61850 platform, which means that this new communication standard was a fundamental consideration during the development. There is no protocol converter implemented but all the function blocks contain the logical nodes necessary for correct data modelling. This data model is factory-defined and cannot be changed by the master user. Datasets and control blocks are available for customization.

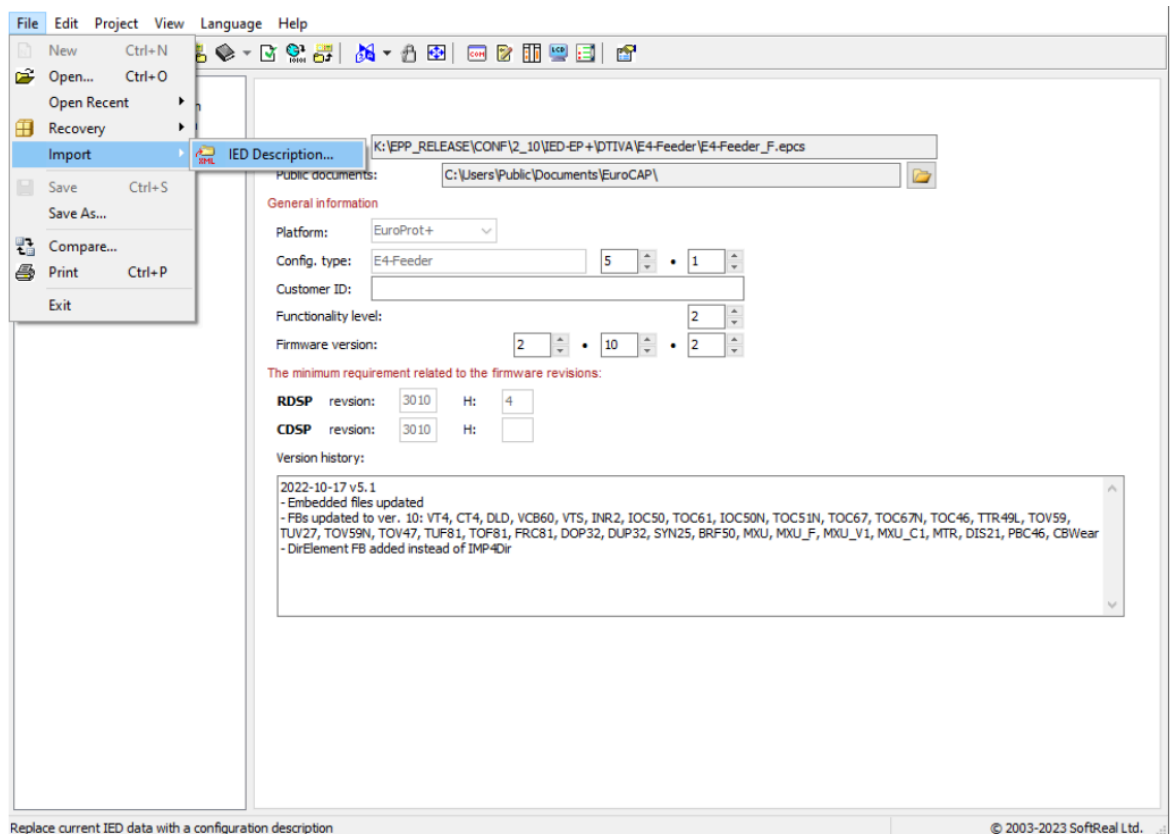
15.1.1 Exporting to and importing from the system integrator

The factory default configuration contains the logical nodes describing the data model as well as the default datasets and report control blocks. A maximum of four datasets with the report control blocks are created by default, depending on the data model of the configuration. Those datasets contain the most important data object (protection start and operate signals, statuses and measurands). If this default arrangement is acceptable for the user, then no further communication engineering is needed. Otherwise, if customization is needed, the IEC 61850 configurator serves as an advanced engineering tool.

An ICD file for a system integrator is automatically generated together with the other run-time files by clicking “Generate communication files”. The generated ICD and CID files contain also those DOIs which have a description. CID file does not contain the IP address of the IED.

An SCD file from the system integrator can also be imported by using the Import/IED Description menu.

Figure. 15.1.1 - 127. Importing IED description



Data model

The root of the tree is the name of the configuration file. It always contains a single node, the IED device itself. By clicking on it the right panel opens its property editor. The values displayed are general information about the device and important limits regarding the reporting configuration.

The IED Name must start with an alphabetic character, numbers are not allowed.

Next object is the access point (S1) which is shown only for keeping compatibility with the standard, its name cannot be changed.

Logical Devices LD0

Next level is for the logical devices. Theoretically unlimited number of logical devices are possible. For practical reasons it depends on the number of logical nodes. The name of a logical device should contain only characters 'a'-'z', 'A'-'Z', '0'-'9', '_'. Its length concatenated with the IED's name cannot exceed 64 characters.

It is possible to create new logical device by dragging a logical node onto the IED name node. Another option to create new LD is right-clicking on the logical node – selecting copy – right clicking on the IED name – selecting Create new logical device. Moving logical devices is not allowed.

The default logical nodes of a logical device are LN0, LPHD1 and the copied logical node. The property editor of a selected logical device contains the name and a description field. Please note that the text placed in the description field will be transferred to the SCL file's (ICD or CID) corresponding field. It is also true for logical node and dataset objects.

Deleting logical device is only possible for logical devices which contain only LN0 and LPHD1 logical nodes.

There is a check-box in front of the logical node name. The red cross means the function connected to the logical node is inactive in the configuration.

Logical Node LN0

The communication configuration objects have to be placed in the LN0 logical node inside the logical devices. These objects are datasets, report control blocks and GOOSE control blocks. They must be placed to this logical node. The maximum number of the objects is determined by the device type and can be found in the communication configurator. By clicking on the IED name, the properties window will appear on the right side showing the object limits.

Using the tree

The left panel displays the data model. Object names can be changed (if it is enabled for the object type) by clicking on it in the tree or using the property editor on the right side. Since some parameters are not allowed to change, the editor denies the selection of them. Editable parameters are checked against their constraints as the user leaves the field.

IEC 61850 Logical Node prefix can be 6 characters long; prefix + instance cannot exceed 7 characters.

In this dialog, the factory default prefix and the instance number can be modified. It is also possible to edit the description attribute of the logical node. In the same time, the free text entered here is mapped to the attribute of the "NamPit" data object of the edited LN.



NOTICE!

These elements must not be modified after system integration (importing an SCD file) because such an action would change the Logical Node references.

Figure. 15.1.3 - 129. Logical Node property

Property	Value
Name	F3PIOC1 (IOC50: 3ph Inst Overcurrent)
Description	Inst. OC
Type	Eupp_F3_PIOC
Prefix	F3
LnClass	PIOC
Instance	1
Defined by	IOC50
Title	3ph Inst Overcurrent

Creating, moving and deleting objects can be done in two ways: using context menu or using drag and drop operation.

Figure. 15.1.3 - 130. IEC 61850 data model in the tree view

Creating new objects using context menu of the tree:

- click with the right button of the mouse on the object you want to be contained by the new object and select Copy. Pressing Ctrl-C buttons while the object is selected has the same effect.
- right click on the target and select Create new ... (Ctrl-A)

Figure. 15.1.3 - 131. Creating object by context menu, copy first...

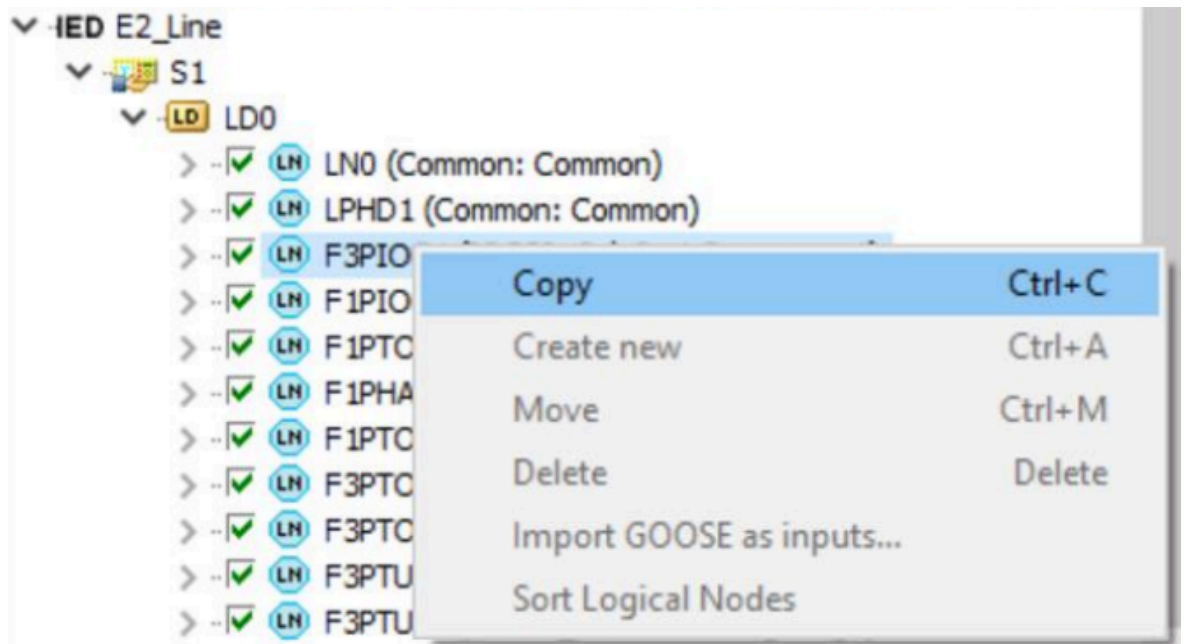
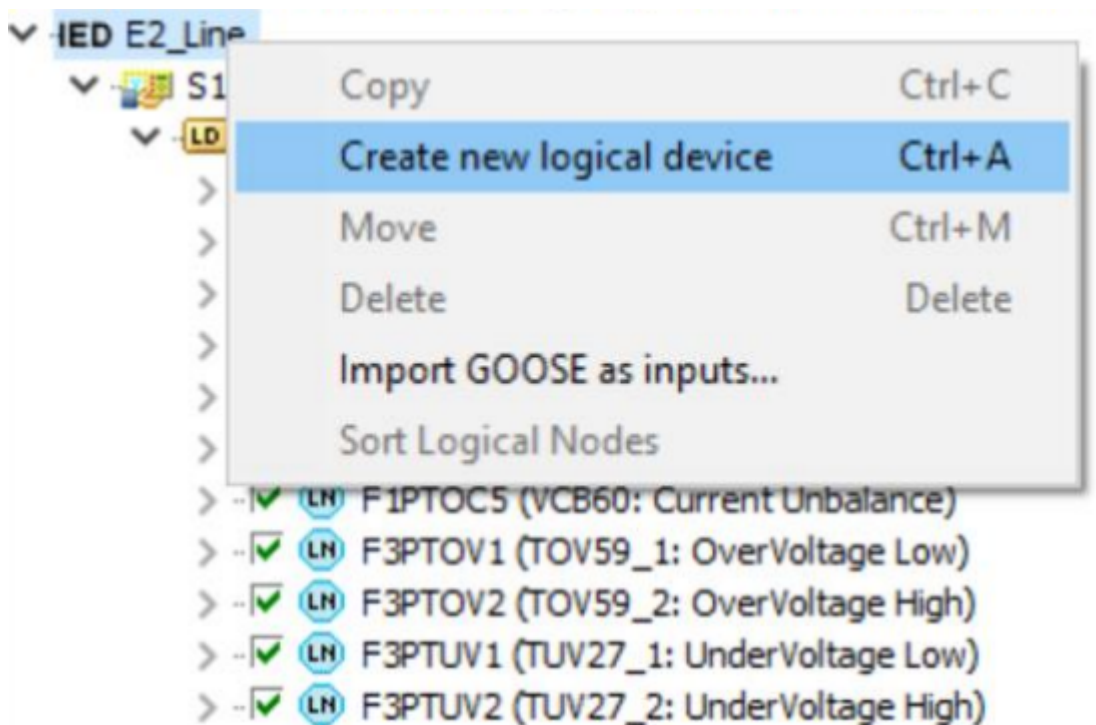


Figure. 15.1.3 - 132. ... then paste it to the target object



Creating new objects using the drag and drop method (use only with objects displayed within one page – there is no scrolling function): click and hold left mouse button on the object you want to be contained by the new object, drag it onto the target object and release mouse button. The new object will be created with a default name. The focus will jump onto this new name allowing the user to give the desired name immediately.

Create operation is allowed for logical devices under the IED, datasets, report control blocks and GOOSE control blocks under the LN0 logical node.

Moving objects is similar to creating. The only difference is that the target object is an existing object which can serve as a container for source object. While dragging an object, the symbol of the dragged object shows that the selected target can be a container of the target or can't be. Movable objects e.g. logical nodes, report and GOOSE control blocks.

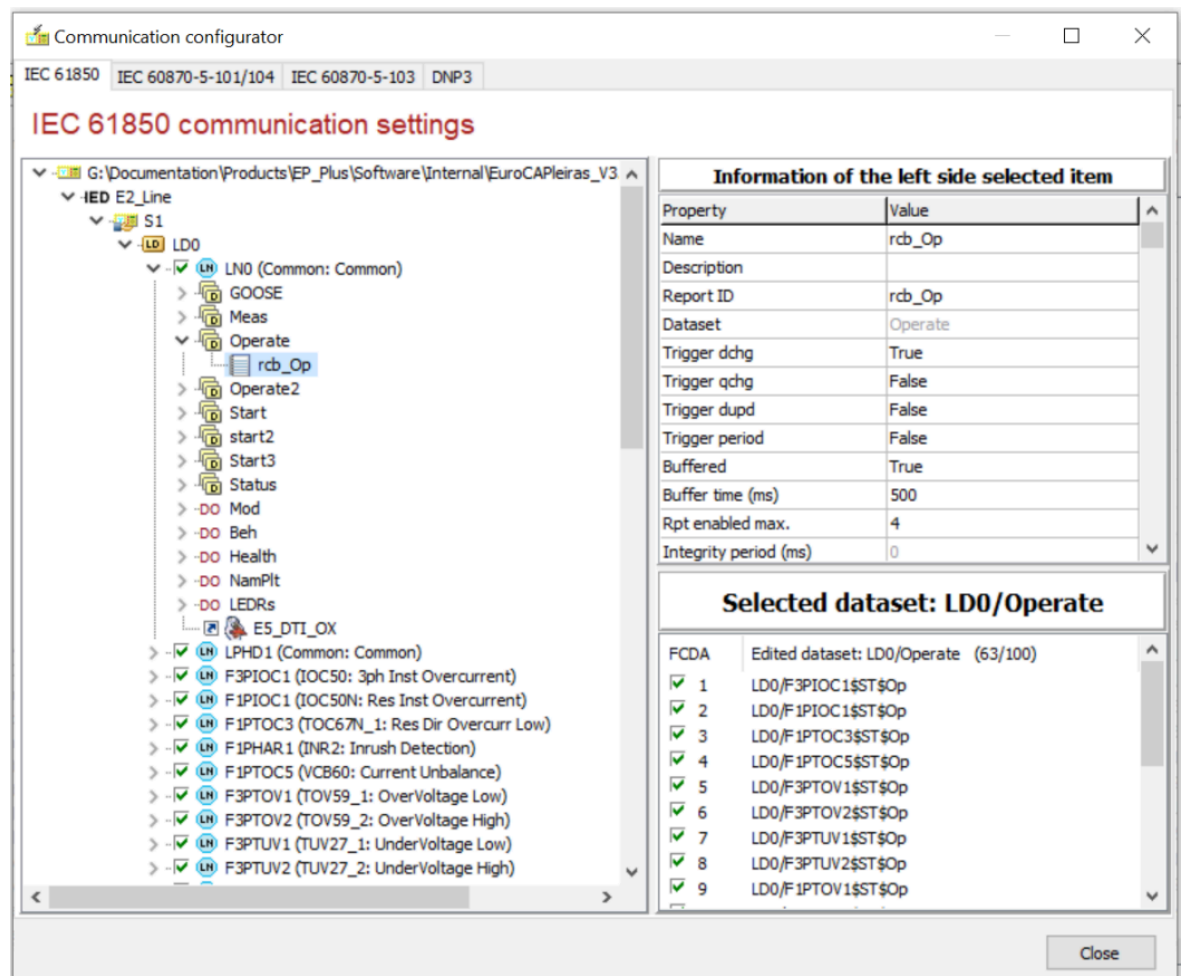
Datasets

Datasets are the basic objects for the reporting and GOOSE services. New dataset can be created in the usual way: with context menu or with drag and drop operation. Source object can be a single data object or data object attribute selected from any logical node.

Target object must be a LNO type logical node. Please don't forget to give new name to the new dataset, immediately after creating it.

The new dataset will have only one item, the source data object. To add new data objects to the dataset use the context menu or the drag and drop method. On the right panel there is a dataset editor (items list) which always shows the last selected dataset items. The list area can also be used as the target for the drag and drop operation. Multiple data objects can be selected for dragging into a Dataset.

Figure. 15.1.3 - 133. Dataset items list box



The configuration revision number of the affected Control Block is automatically increased when a function block is added, removed, activated or deactivated and when a Logical Node's ownership is changed. The increase is executed when the Code and parameter files have been generated (build process of the configuration file).



NOTICE!

NOTE: there are two types of datasets, the data object level makes the difference. A data object can be referenced by its data object name. In this case, protocol algorithms assume all the referenced data object's attribute exist in the dataset. E.g. a dataset which contains an item given by the "IEDName/LD1.INTCILO1.EnaOpn" reference contains stVal, q, t, dU data object attributes also. This data structure comes from the EnaOpn object's well known common data class (CDC) SPS(Single Point Status). This type of dataset can be used for buffered or unbuffered reporting service.

The other type dataset may contain a list of the data object attributes, there should be three items for the same example:

- IEDName/LD1.INTCILO1.EnaOpn.stVal,
- IEDName/LD1.INTCILO1.EnaOpn.q,
- IEDName/LD1.INTCILO1.EnaOpn.t.

This type of dataset can be used for buffered or unbuffered reporting and also for GOOSE service. For GOOSE service, timestamp is not used.

A data object can be member for more dataset. However, it is not recommended to create a dataset which contains the same object more than once.

Deleting selected dataset items is possible by pressing Del button on the keyboard. Multi selection is also possible. Before it is deleted, the user has to answer the following question in a new window: "Do you really want to delete the selected FCDA(s)?"

Deleting the dataset is possible only when it is not attached to any report control block. There is a check-box in front of the logical node name. The red cross means the function connected to the logical node of data object is inactive in the configuration.

Now you can create a Dataset in the following ways:

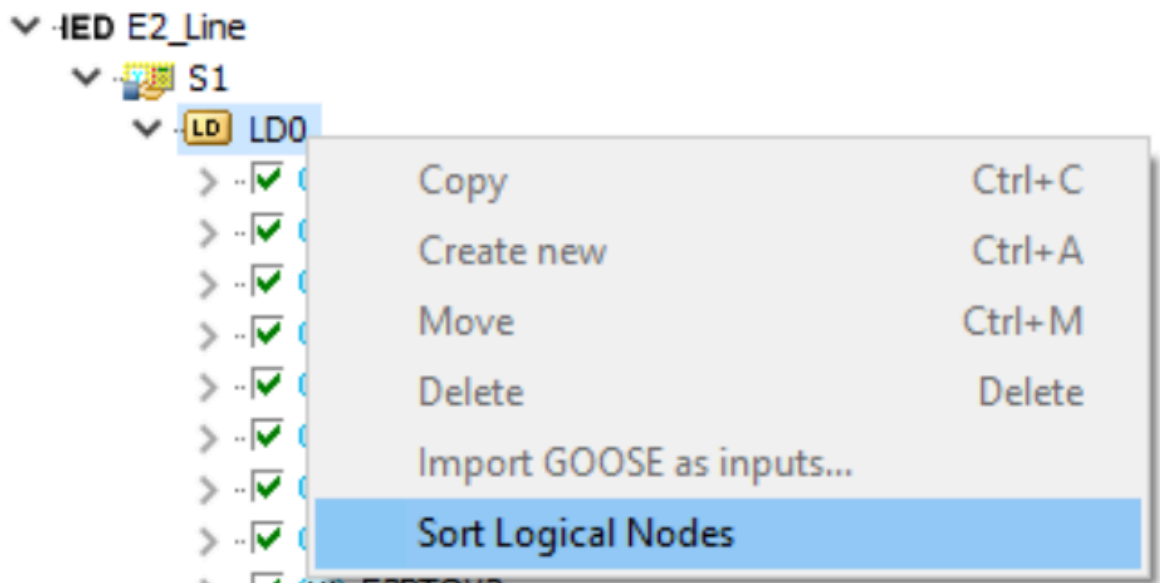
- from the local menu of LN0 (right click on LN0)
- by dragging a DO from a logical node to LN0

You can move a DO from one dataset to another (to avoid exceeding limits).

Order of Logical nodes in the communication configurator window shows the order of the function blocks were added into the configuration.

Logical nodes can be sorted by name (except for LN0 and LPHD1) in the local menu of LD0.

Figure. 15.1.3 - 134. Context menu of LD0



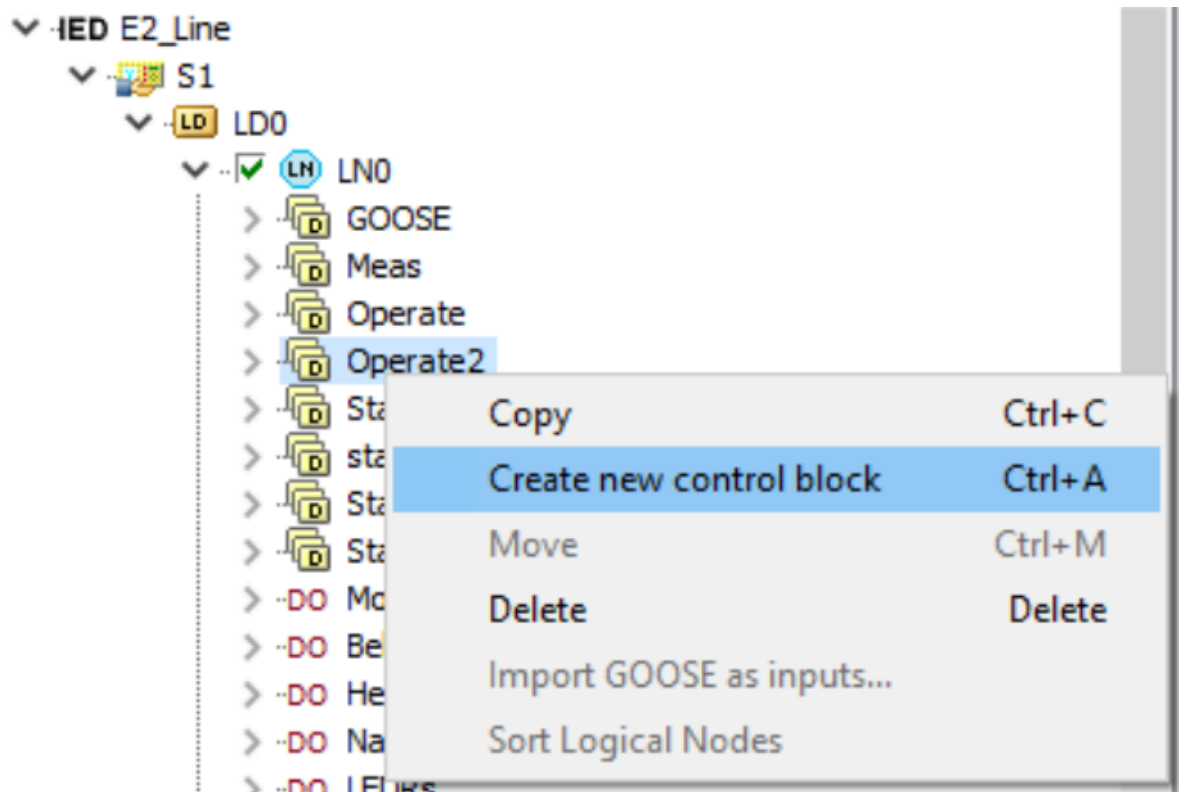
Communication configurator has to close and reopen to get the original order of Logical nodes.

Reporting

Information collected by bay-level devices should be transferred to the control center. The IEC 61850 standard defines reporting service for this purpose. Doing it in proper way there must be report control blocks defined.

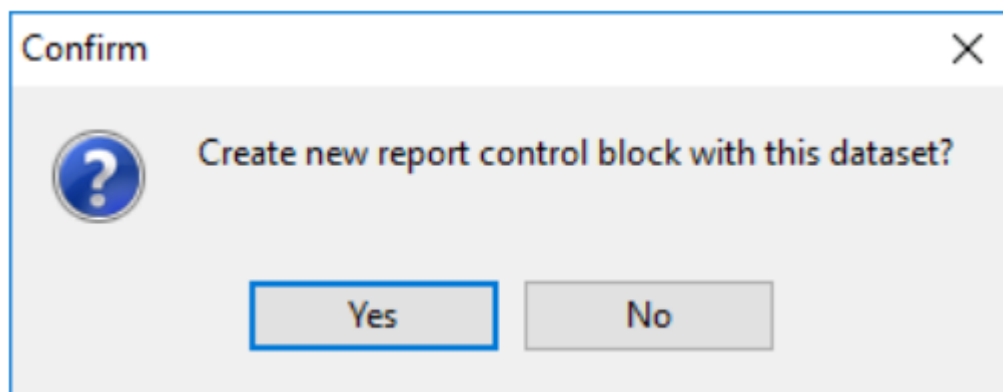
Report control block can be created for the LN0 logical node inside any logical device. To create a new report control block, drag the desired dataset onto the LN0 logical node or use the context menu of Dataset.

Figure. 15.1.3 - 135. Context menu of Dataset



A dialog will pop up asking confirmation to the create operation.

Figure. 15.1.3 - 136. Confirmation dialog box of creating report control

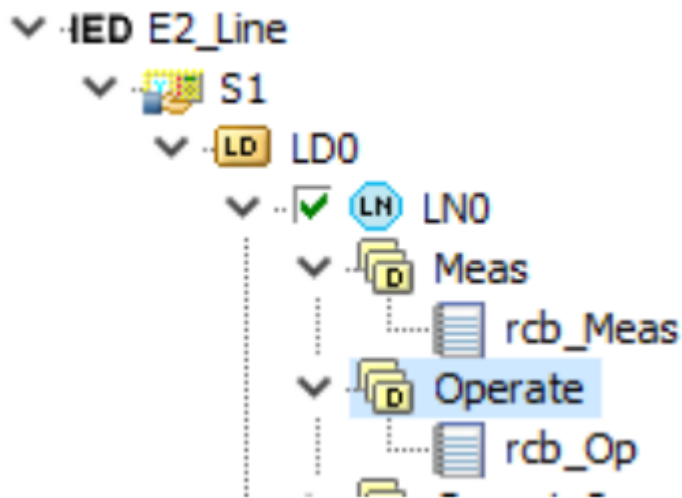


Source dataset can be defined at FCD or FCDA level. (in the last case, the program offers creating a GOOSE control block). It is recommended to give a user-defined name just after the creation.

The property editor allows the user to change the parameters of the selected control block.

In the object tree, the report control blocks are below their linked datasets.

Figure. 15.1.3 - 137. Object tree - the RCBs are below their linked datasets



GOOSE communication

GOOSE communication means data exchange among any IEC 61850-conform devices. GOOSE messages are controlled by GOOSE control blocks. Creating new GOOSE control block is very similar to the report control's case. The only significant difference is that the dataset has to be defined at FCDA-level for all their items.

The owner of the IN8GGIO1 LN is Go8 GOOSE publisher function block. This is used to create GOOSE signals from the connected inputs to "stVal" in the logic editor.

Figure. 15.1.3 - 138. GOOSE publisher function

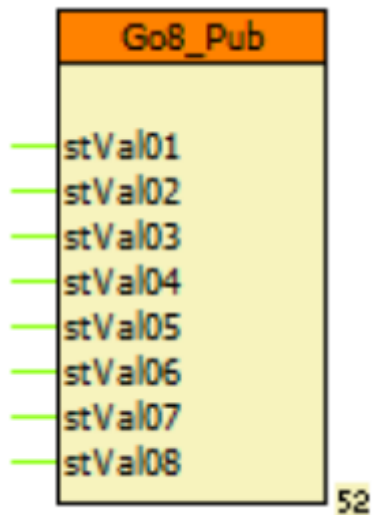


Figure. 15.1.3 - 139. Creating Dataset from the local menu

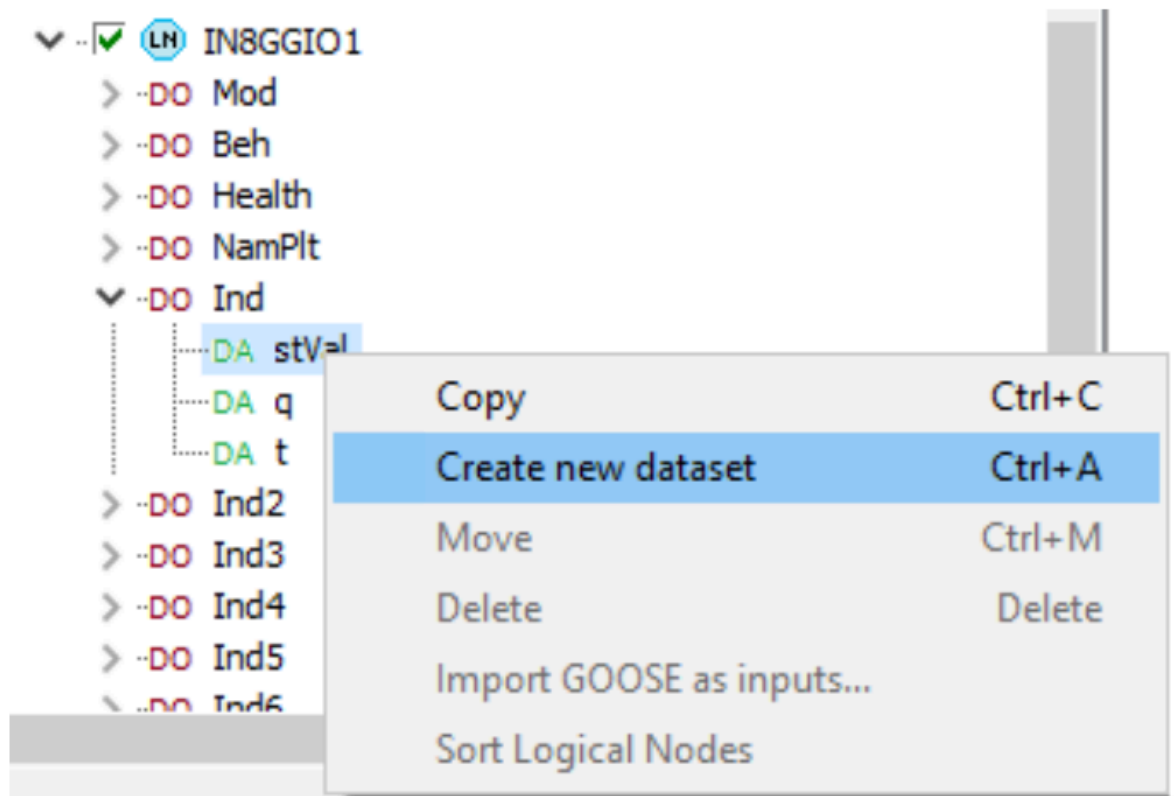
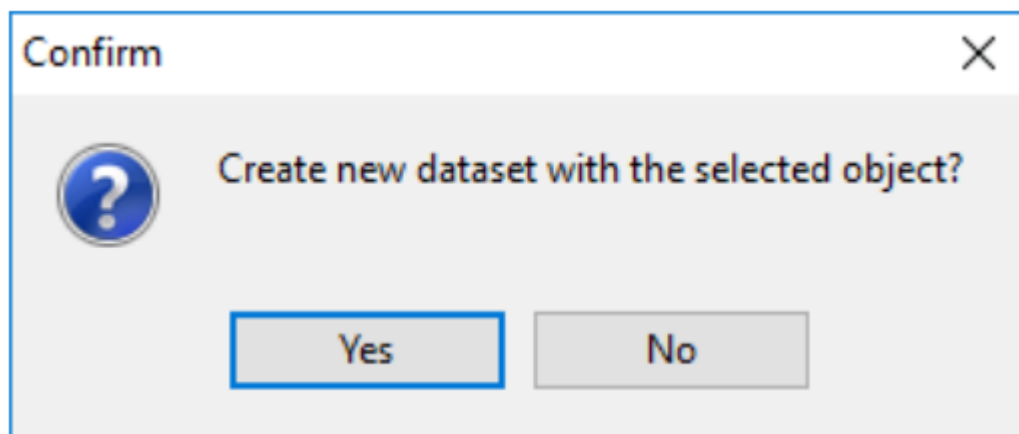


Figure. 15.1.3 - 140. Confirmation question of creating Dataset



The program offers creating a Report control block at first, don't accept it, then you can create a GOOSE control block with the selected Dataset. The parameters of the selected GOOSE control block can be modified in its property editor panel. It is recommended to give a user-defined name just after the creation.

Figure. 15.1.3 - 141. Confirmation questions of creating GOOSE control block

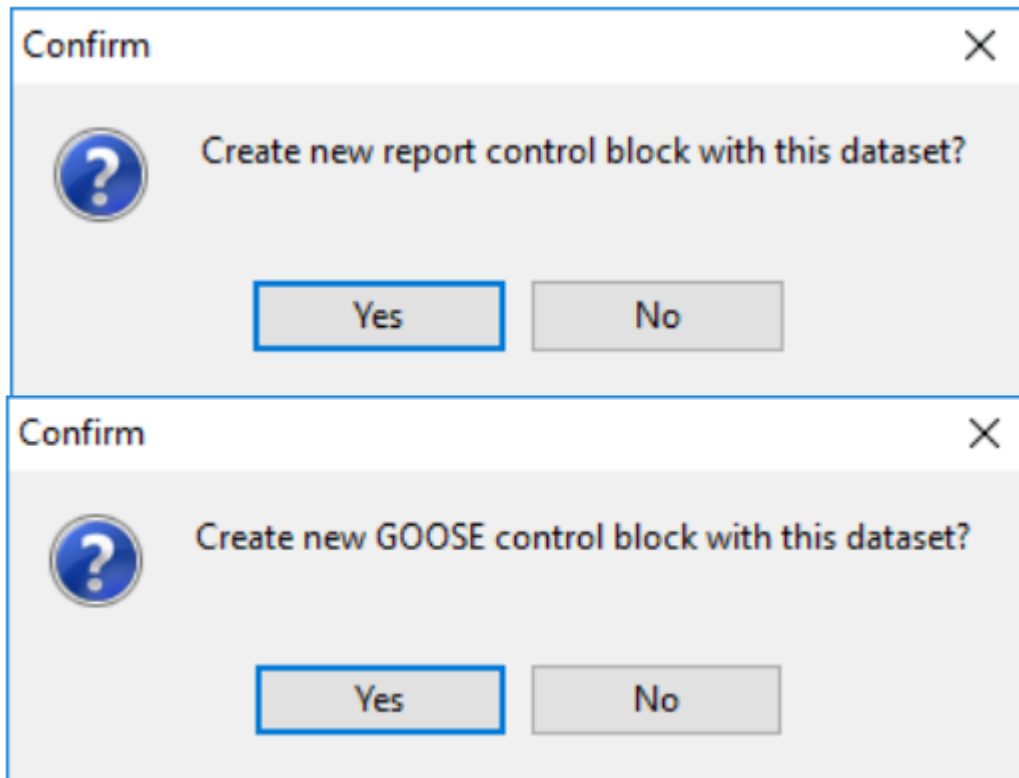
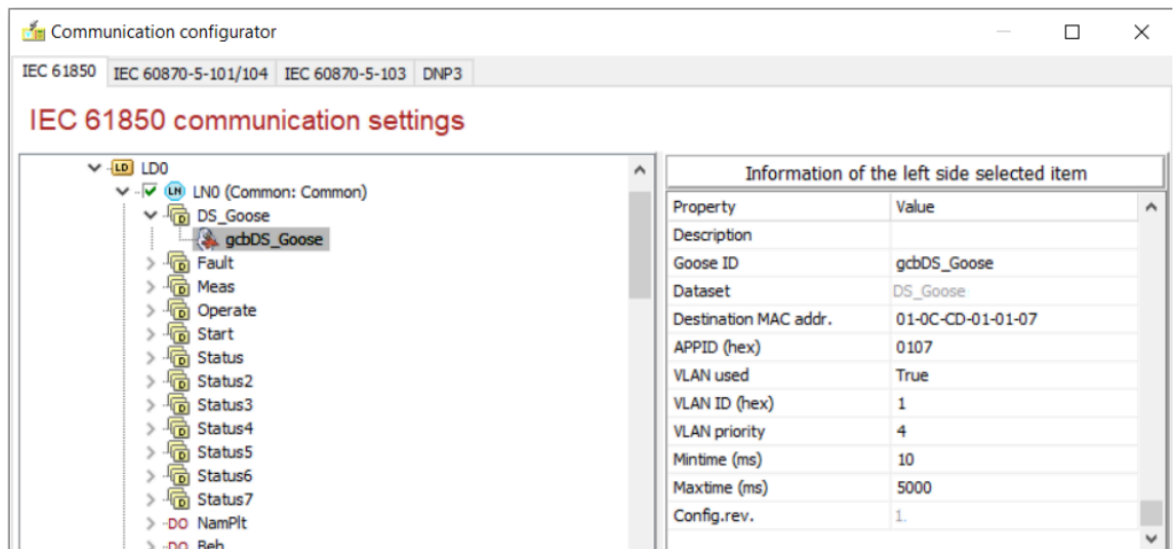


Figure. 15.1.3 - 142. Property of GOOSE control block



15.1.4 GOOSE input mapping

Receiving GOOSE messages is possible using external references given in the input section of the SCD file. This file is the result of system integration task and may be imported by AQivate 300 software. To import it, go to the main screen, then select File / Import / IED Description. User will be asked to select the own IED name by a list dialog window. It is important that the selected device must be identical with the currently opened IED. The available input data will be shown below the LN0 logical node of the logical device.

There is an alternative way to import any GOOSE data without using system integration software. The AQtivate 300 will take all the available published GOOSE data from any CID file. Open the context menu of the IED name, then select „Import GOOSE as inputs...”. User should select the desired publisher IED from the list.

Figure. 15.1.4 - 143. Import GOOSE from any CID file

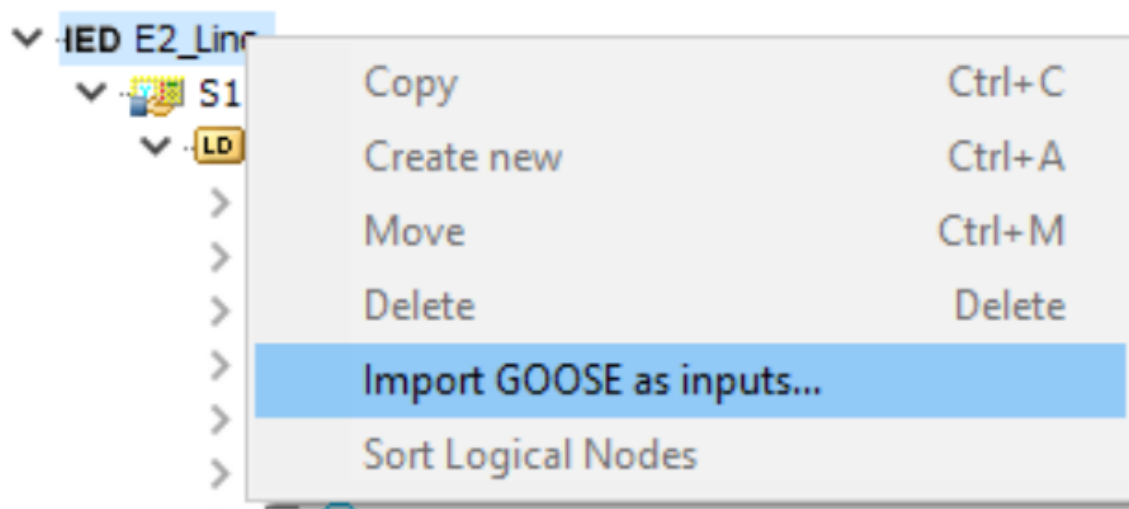


Figure. 15.1.4 - 144. Imported GOOSE signals from a .CID file

Information of the left side selected item	
Property	Value
Name	E5_DTI_OX
Description	

Inputs from E5_DTI_OX	
FCDA	Inputs from E5_DTI_OX
<input checked="" type="checkbox"/> 1	LD0/IN16GGIO2\$Ind\$stVal
<input checked="" type="checkbox"/> 2	LD0/IN16GGIO2\$Ind\$stVal
<input checked="" type="checkbox"/> 3	LD0/IN16GGIO2\$Ind10\$stVal
<input checked="" type="checkbox"/> 4	LD0/IN16GGIO2\$Ind10\$stVal
<input checked="" type="checkbox"/> 5	LD0/IN16GGIO2\$Ind13\$stVal
<input checked="" type="checkbox"/> 6	LD0/IN16GGIO2\$Ind13\$stVal
<input checked="" type="checkbox"/> 7	LD0/IN16GGIO2\$Ind16\$stVal
<input checked="" type="checkbox"/> 8	LD0/IN16GGIO2\$Ind16\$stVal

The “Subscribed GOOSE assignment” menu lists the input references subscribed by the IED. GOOSE subscription can be configured by means of the SCD file, i.e., the list of external references appears only after a valid SCD file is imported.

Figure. 15.1.4 - 145. External GOOSE references

IED	LD	LN	DA	intAddr	bType	Mapping	GSE	Rev	APPID	VLAN	MAC	GoID	Dataset	Index
ZUGL_D04_L01_DVEZ	LD0	SBwCSW11	PosSetVal		Dboos		LD0,LLN0\$GO\$GOOSE	5	0008		01-0C-CD-01-00-0A	gcbGoose	LD0,LLN0\$Goose	0
		SBwCSW12	PosSetVal		Dboos		LD0,LLN0\$GO\$GOOSE	5	0008		01-0C-CD-01-00-0A	gcbGoose	LD0,LLN0\$Goose	1
		SBwCSW13	PosSetVal		Dboos		LD0,LLN0\$GO\$GOOSE	5	0008		01-0C-CD-01-00-0A	gcbGoose	LD0,LLN0\$Goose	2
		SBwCSW14	PosSetVal		Dboos		LD0,LLN0\$GO\$GOOSE	5	0008		01-0C-CD-01-00-0A	gcbGoose	LD0,LLN0\$Goose	3
		SBwCSW15	PosSetVal		Dboos		LD0,LLN0\$GO\$GOOSE	5	0008		01-0C-CD-01-00-0A	gcbGoose	LD0,LLN0\$Goose	4
		INBGGID1	Ind2setVal		BOOLEAN	GoIbt8_Govar01_GoR_1	LD0,LLN0\$GO\$GOOSE	5	0008		01-0C-CD-01-00-0A	gcbGoose	LD0,LLN0\$Goose	5
		INBGGID1	Ind2setVal		BOOLEAN	GoIbt8_Govar02_GoR_1	LD0,LLN0\$GO\$GOOSE	5	0008		01-0C-CD-01-00-0A	gcbGoose	LD0,LLN0\$Goose	6
		INBGGID1	Ind2setVal		BOOLEAN	GoIbt8_Govar03_GoR_1	LD0,LLN0\$GO\$GOOSE	5	0008		01-0C-CD-01-00-0A	gcbGoose	LD0,LLN0\$Goose	7
		INBGGID1	Ind4setVal		BOOLEAN		LD0,LLN0\$GO\$GOOSE	5	0008		01-0C-CD-01-00-0A	gcbGoose	LD0,LLN0\$Goose	8
ZUGL_D05_L02_DVEZ	LD0	SBwCSW14	PosSetVal		Dboos	GoZbt4_Govar01_GoR_1	LD0,LLN0\$GO\$GOOSE	5	0002		01-0C-CD-01-00-01	GOOSE	LD0,LLN0\$GOOSE	0
		SBwCSW15	PosSetVal		Dboos	GoZbt4_Govar02_GoR_1	LD0,LLN0\$GO\$GOOSE	5	0002		01-0C-CD-01-00-01	GOOSE	LD0,LLN0\$GOOSE	1
		SBwCSW13	PosSetVal		Dboos	GoZbt4_Govar03_GoR_1	LD0,LLN0\$GO\$GOOSE	5	0002		01-0C-CD-01-00-01	GOOSE	LD0,LLN0\$GOOSE	2
		SBwCSW11	PosSetVal		Dboos		LD0,LLN0\$GO\$GOOSE	5	0002		01-0C-CD-01-00-01	GOOSE	LD0,LLN0\$GOOSE	3
ZUGL_D05_L03_DVEZ	LD0	SBwCSW12	PosSetVal		Dboos	GoZbt4_Govar04_GoR_1	LD0,LLN0\$GO\$GOOSE	3	0003		01-0C-CD-01-00-02	GOOSE	LD0,LLN0\$GOOSE	0
		SBwCSW13	PosSetVal		Dboos		LD0,LLN0\$GO\$GOOSE	3	0003		01-0C-CD-01-00-02	GOOSE	LD0,LLN0\$GOOSE	1

When double clicked on the selected row (DA of the GOOSE publisher IED), the property dialog of the selected external reference appears, and the user can map the subscribed input to one of the predefined Goose receiver channels. Alternatively, this can be done by clicking on the “Modify” button on the bottom of the window.

Figure. 15.1.4 - 146. External GOOSE reference properties

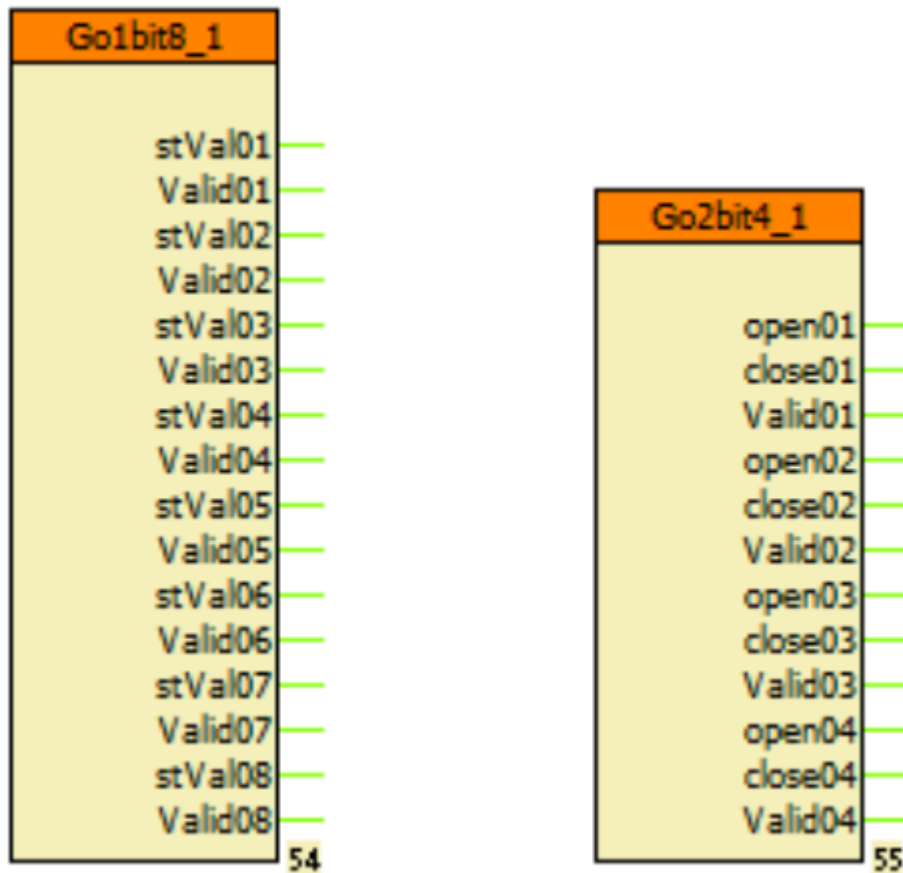
The screenshot shows a dialog box titled "ExtRef properties" with the following fields and values:

iedName	E5_DTI_OX
ldInst	LD0
prefix	IN16
lnClass	GGIO
lnInst	2
doName	Ind13
daName	stVal
intAddr	
bType	BOOLEAN
GOOSE receiver	Go1bit8 GoVar02 GoR_1 ()
GSE Control Reference	LD0/LLN0\$GO\$gcbGSE
Config Rev.	1
APPID	1
MAC Address	01-0C-CD-01-00-00
GoID	gcbGSE
Dataset Reference	LD0/LLN0\$GSE
Dataset Index	4

At the bottom of the dialog box, there are "OK" and "Cancel" buttons.

There are two types of predefined receiver channels: a 2-bit type typically for switchgear statuses and a 1-bit type typically for protection signals. Please note that AQ 300 devices accept only data attributes as external reference. Data objects cannot be subscribed by the tool. External references containing a "q" attribute are automatically mapped to the same receiver channel as the status value of the corresponding data object. Receiver channels are grouped into function blocks. Currently two function block types are available: one with eight 1-bit channels and one with four 2-bit channels.

Figure. 15.1.4 - 147. Receiver channel function blocks



All channels have a Validity output, which is logical TRUE if the IED receives the mapped GOOSE messages within the maximum time period; otherwise, it goes to FALSE. The validity output of one channel also goes to FALSE if the q data attribute is mapped to this channel as well and its validity bits are not 00. The output variables of these function blocks are available both in the graphical Logic editor and in the Sync close Contacts menu.

15.2 IEC 60870-5-101/104

Legacy communication protocols IEC61870-5-101 and 104 (in short form IEC101 and IEC104) have common configuration sheet since their application level is the same. The tree of the configuration software has sub-nodes of the differentiated base data types. The tree menu is fixed, user specific data can be added below the sub-nodes.

By selecting the root of the tree, the basic IEC101/IEC104 parameters appear. By default, structured addressing is used, it means bit masking to differentiate data types.

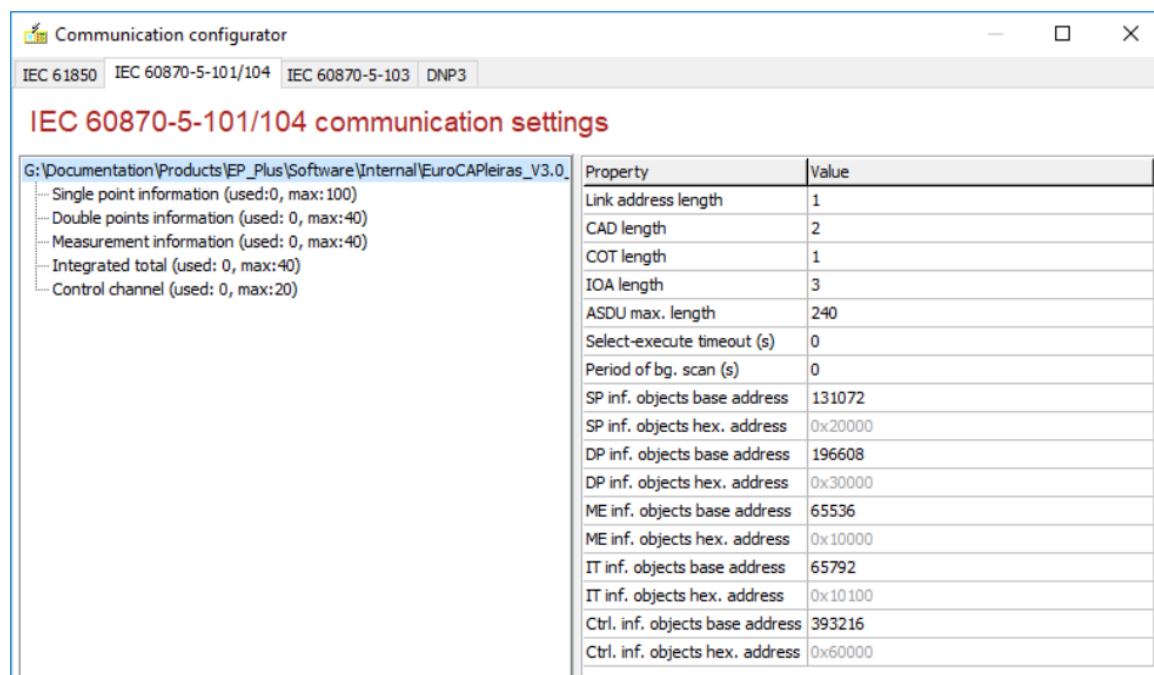
Length of link address, CAD and COT can be 1 or 2 byte(s). IOA can be 1, 2 or 3 byte(s). Default setting is shown on figure below.

Select-execute timeout has to be 0 for direct execution and between 5 to 255 for SBO command.

Period of bg. scan 0 means that background scan is not used. Minimum value is 5s and the maximum is 255 when it is used.

Base addresses of the different object types can be modified in decimal numbers which are black numbers. Hexadecimal addresses change automatically (grey numbers).

Figure. 15.2 - 148. Basic parameters of IEC101/IEC104

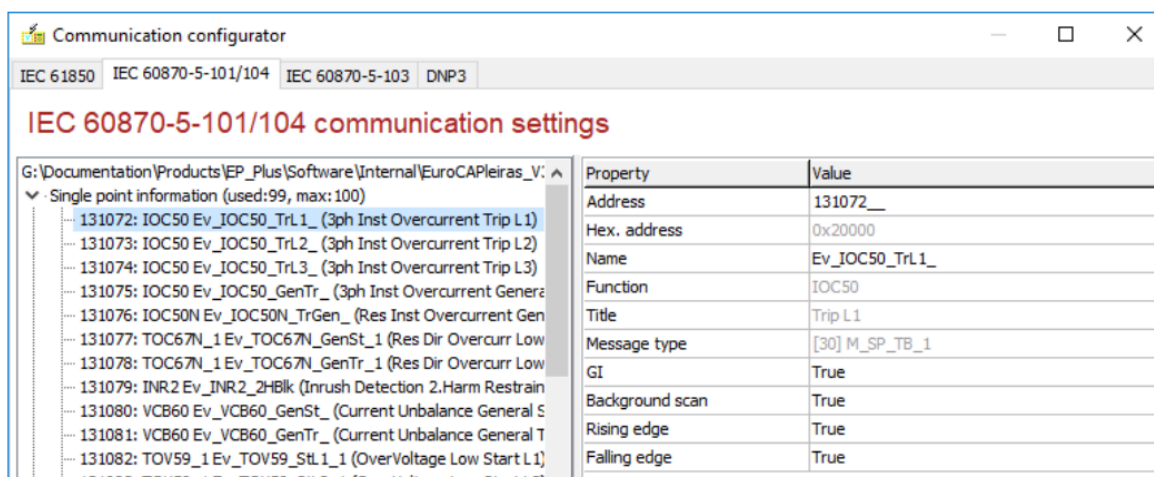


The context menu of different data types provides the following operations:

- New Object [Insert] – the user can select the object to be inserted from a list which contains all objects from the proper type. So far, the first object from this list is automatically inserted. An object is disappearing from the list of source events when it is added to the list of reported objects.
- Add All – adds all available items for the selected data type with a single click
- Sort by Address – objects below the selected node will be sorted by their address
- Readdressing Objects – removes existing addresses and creates new ones for all object (sorted)

Property editor of a selected object displays the parameters. Some of them are allowed to be changed, others are read-only. It is configurable for every signal to take part in the General Interrogation or Background scan cyclically sending. Rising or falling edge trigger event types can be defined for spontaneous data sending. The owner Function Block of the referred object is displayed as a prefix before the name of the object.

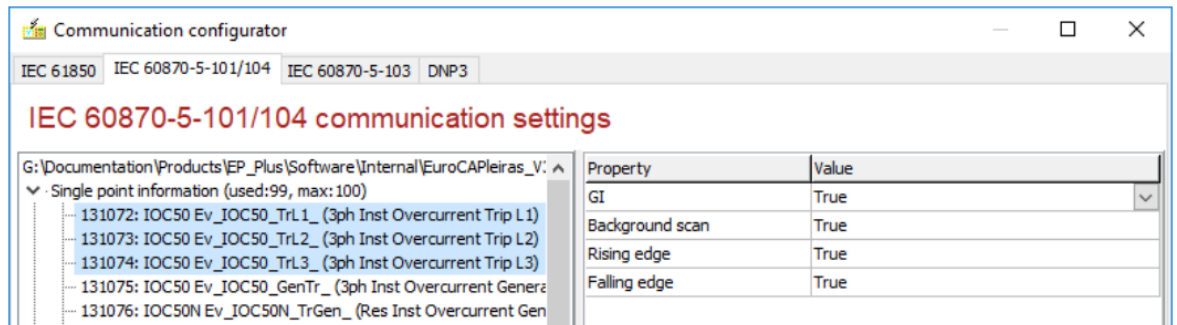
Figure. 15.2 - 149. Properties of a signal



It is possible to delete selected objects by pressing Del button. Multi selection is also possible.

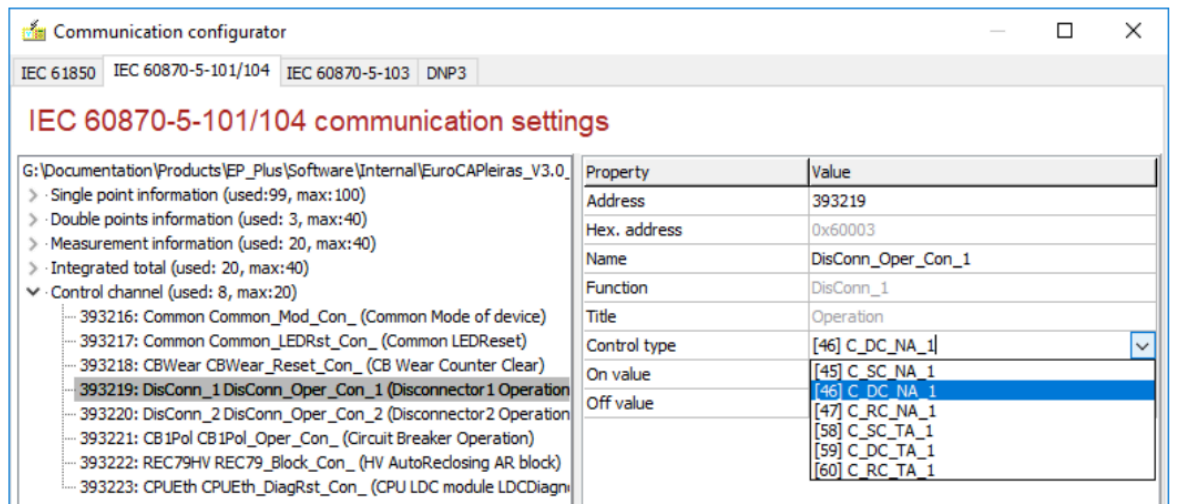
Using multi selection with CTRL button hold down is possible and allows changing the same type of parameters of the selected items.

Figure. 15.2 - 150. Multi selection allows to change the same type of objects



Control type of the command is selectable. Supported types are 45,46,47,58,59,60.

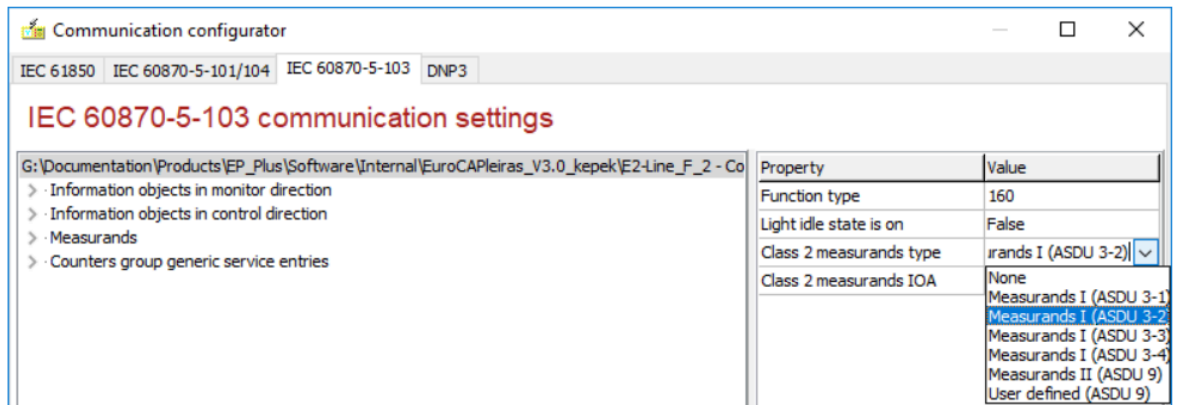
Figure. 15.2 - 151. Properties of a command



15.3 IEC 60870-5-103

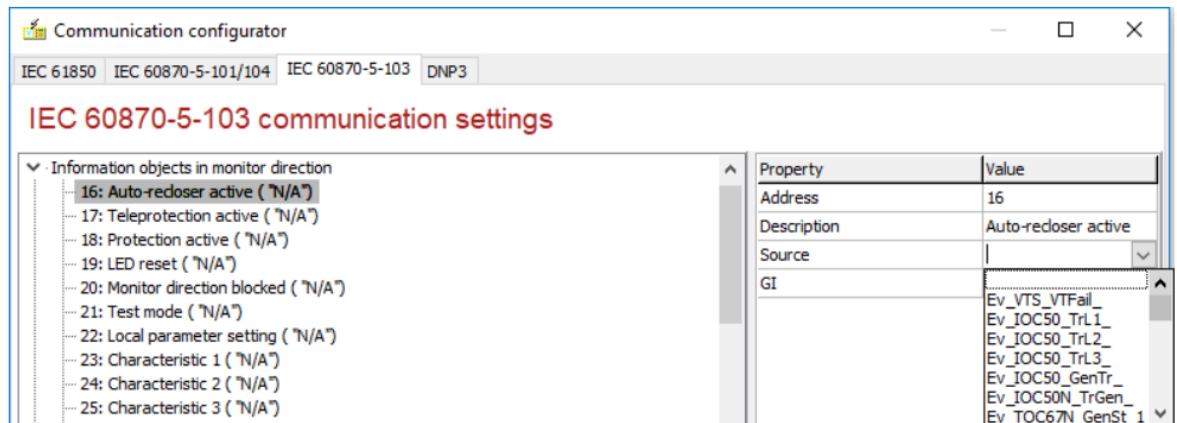
The IEC 60870-5-103 communication protocol has been designed for single-function protection devices. It is implemented in the AQ 300 device and needs application engineering. The sheet labelled with the protocol name contains a fixed tree object.

Figure. 15.3 - 152. Fixed tree of IEC103



Since the protocol specifies fixed address for the commonly used functions, sub-nodes list these addresses prepared. User should assign the data objects to the corresponding address. By clicking on any address, the property editor opened on the right side allows the user to select the desired data object. The Source field is a combo-box with the available data objects. Addresses from 164 to 239 is a free range, it can be used for any binary data object of any function selected from the device's database. To delete a data object from the Source field, double-click on it or select the empty row at the beginning of the list. The GI parameter true means that data should be included in the general interrogation. It is allowed to change in case of the free addresses. In the standard range it is fixed.

Figure. 15.3 - 153. Selection of standard data item of IEC103 protocol



According to the standard, measurements are specified as class 2 messages. The assignment of the standard frame items should be defined by the user. The protocol's root node contains a parameter called **Measurands** which is used for selecting the class 2 message type. User can choose either the standard message format or can define user-specific message. Standard formats are the different variations of the **Measurands I** (ASDU type 3) and can be the **Measurands II** format (ASDU type 9). The items of sub-node **Measurands** depend on the selected frame type. It is the user's responsibility to select the right data object for the right data item of the class 2 message to keep the system conformity to the standard. For not assigned items the communication software of the device will transmit zero with invalid flag (ER=true).

By selecting the **User-defined** value of the **Measurands** parameter, user is allowed to build nonstandard message. It will be transmitted with ASDU 9 type frame without gaps (no empty item enabled). Protocol software transmits only one type of class 2 message selected as described. Any measurands has its own source data object parameter in the property editor. In addition, it is possible to define the scaling factor here. Standard values are the nominal value of the specific data multiplied by 1.2 or 2.4. User can define non-standard value also. Please note that the measurement objects in the device are represented as floating point analogue values in base SI units (e.g. volts, amperes, etc.)

The AQ 300 device is a native IEC 61850 device. As a consequence, all process calculating measurements as floating point objects and there is no prefixes used. It ensures more accuracy in the data communication and eliminates the using of scales. These values are available via generic services of the IEC103 standard. Data object description can be found below the Measurands group generic service entries and Counters group generic service entries. For more information please read the standard.

**NOTICE!**

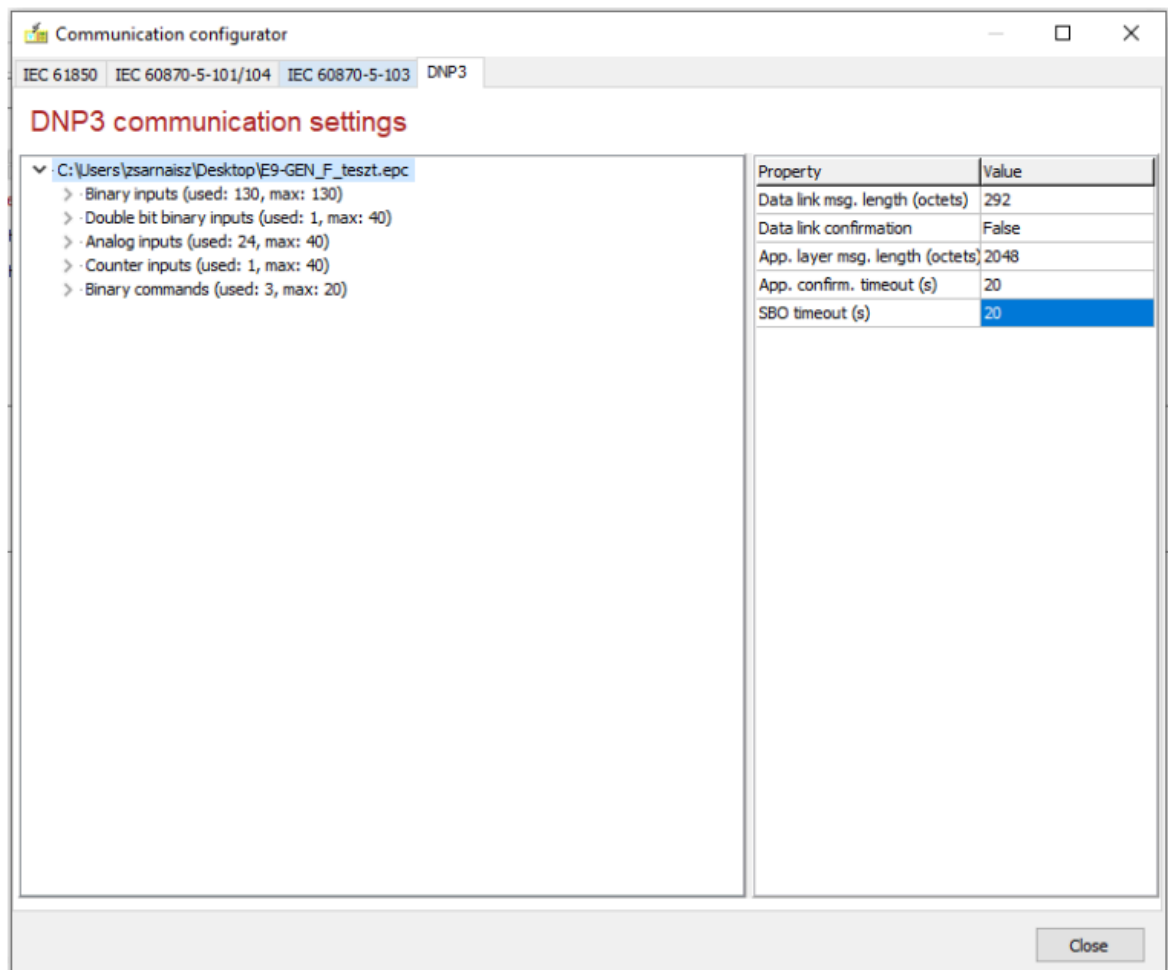
A source object cannot be assigned to multiple IEC 103 measurands II and/or control items.

15.4 DNP3

The standard DNP3 communication has its own definition sheet. Sub-nodes include the supported DNP3 object types. Detailed list of supported frames and object types can be found in the “AQ 300 DNP3 Device Profile” document on Arcteq web page.

By selecting the root of the tree, the basic DNP3 parameters appear, see figure below. Data link message length can be set between 50 and 292 octets. Data link confirmation can be activated (true) or deactivated (false). Application layer message length varies between 100 and 2048 octets. Application confirmation timeout and SBO timeout have a setting range from 3 to 60 seconds.

Figure. 15.4 - 154. Basic parameters of DNP3



Context menu of a sub-node contains two commands:

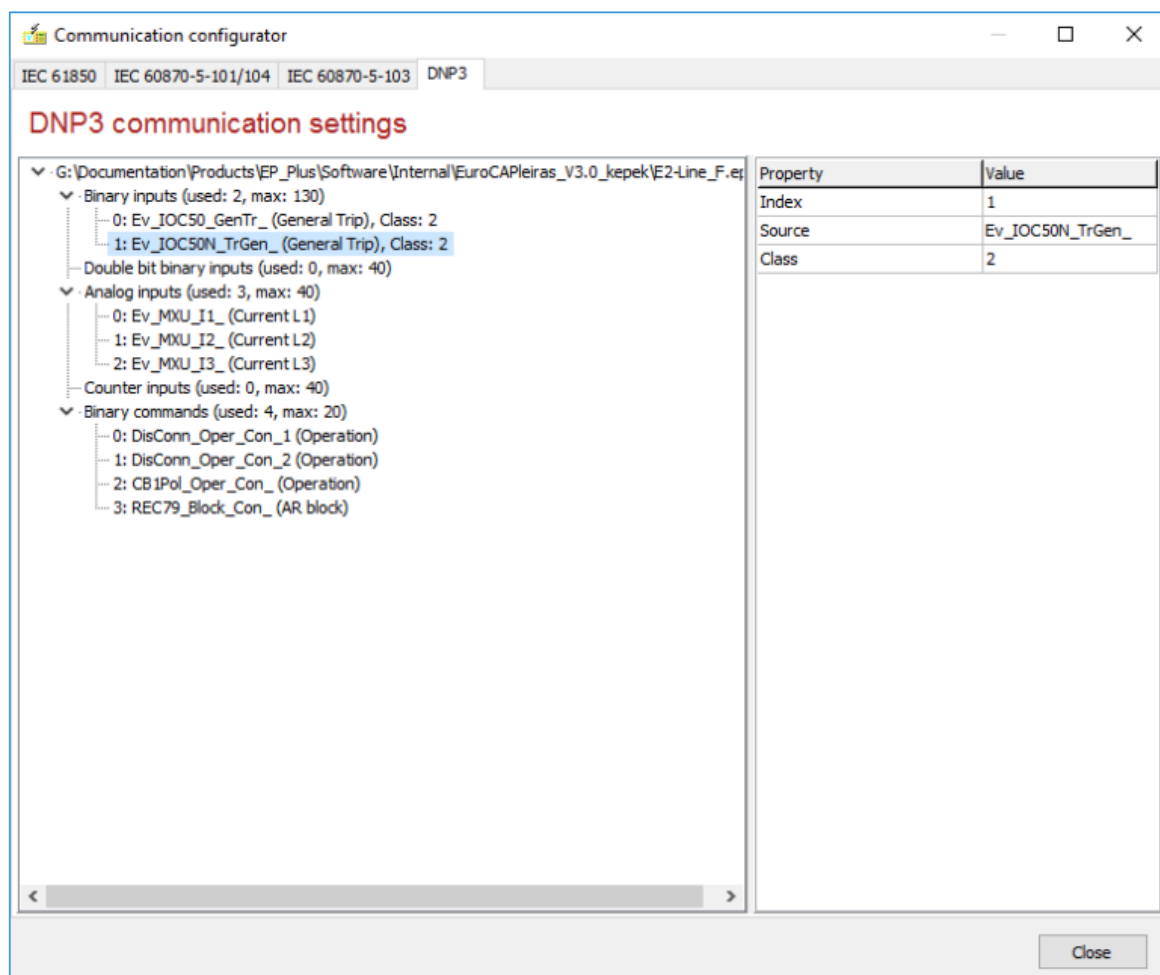
- **New object** adds a single data to the node. The data source property will be automatically assigned to the next available object. Index will be the last used index value plus one.
- **Add all** command adds all available objects to the selected tree node.

The DNP3 protocol uses indices instead of addresses. The AQ 300 device doesn't allow gaps. By clicking with right mouse button on a single data item the context menu allows the following operations:

- **Delete** will delete the selected object and make a trigger for an automatic indexrearrangement to ensure gap-free indices.
- **Move Object...** is an index manipulation command with sub-commands. Selected item can be moved in the indexed list.

Property editor allows the user to change the source of the selected data object. The listed data points are in a filtered list. This way user can select compatible data object only. Index cannot be changed directly in the property editor; it can be changed by moving the data item. DNP3 protocol defines a kind of classification parameter. This parameter is also available in the property editor. The allowed range is 0..3, and empty value also enabled. Multi selection for class changing is also possible.

Figure. 15.4 - 155. DNP3 setting sheet



16 Contact and reference information

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