INSTRUCTION BOOKLET

AQtivate 200 IEC61850 configuration

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Revision	1.00
Date	6.2.2015
Changes	- The first revision for AQ200 IEC61850 instructions

Revision	1.01
Date	22.4.2015
Changes	- Updated the instructions for dataset settings.

1 INTRODUCTION

To make IEC61850 configuration for AQ2xx series relay AQtivate setting tool is needed. It is possible to setup the IEC61850 configuration without a physical unit if you have an aqs configuration package. Other useful tools are e.g. an IEC61850 client like Omicron's IEDScout and if really bit-by-bit information is needed an Ethernet traffic sniffer like Wireshark can be useful.
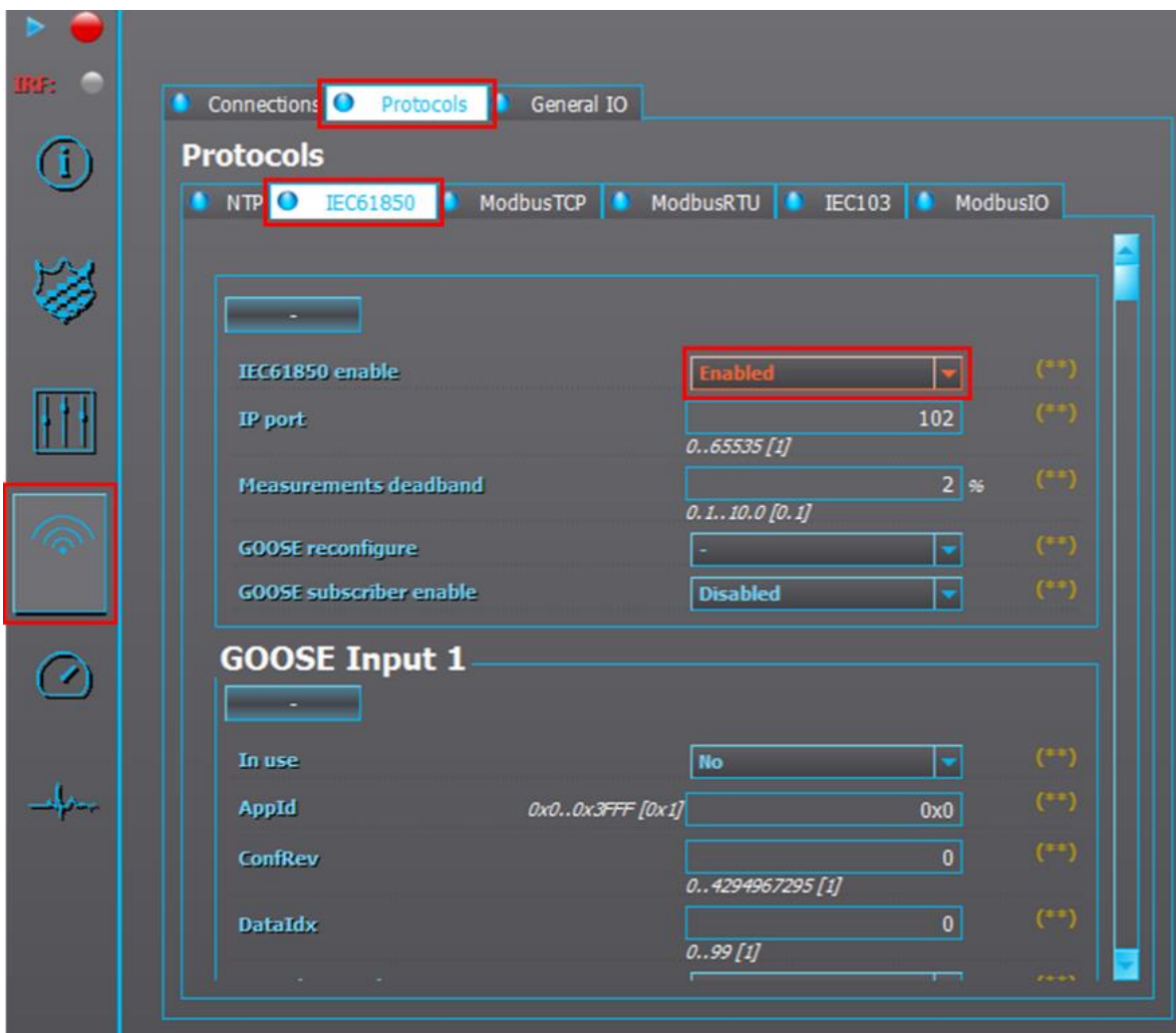
2 AQTIVATE

There are two ways to open an aqs package before you start setting up IEC 61850:

- Open a previously read .aqs file using AQtivate.
- Connect to a relay and use command 'Get Aqs-file' under Commands menu.

2.1 ENABLING IEC61850

To activate IEC61850 in the device go to Communication → Protocols → IEC61850 and set *IEC61850 enable* to *Enabled*. See picture below. Write this setting to the relay with *Commands → Write settings* command. Now the IEC61850 is activated and it is possible to connect to the device using an IEC61850 client. (As long as IP address information is setup). Upload this setting to the relay (Commands→Update settings or enable Live-edit).

3   IEC61850 EDITOR

The IEC61850 editor is the main tool for configuring IEC61850 for the AQ2xx series. The tool can be launched from Tools menu in AQtivate setting tool.

*Table 3-1 IEC61850 editor tool button description.*

|	Open cid file	Used to open a cid file from the hard drive.
	Save cid file	Save the current CID-settings to aqs (additional aqs **Save as** required after this).
	Save cid file as	Save CID file in chosen directory with custom name.
	Export DataSet info	Save dataset info into a .txt file in table form which can be opened with tools like Excel.
	Configurations	Opens main configurations dialog. See chapter 3.2.
	Edit datasets	Used to edit datasets. Opens new dialog. See chapter 4.
	Send to relay	Sends currently open CID configuration to relay. Connection to relay required.
	Get default cid from relay	AQtivate will retrieve the factory default CID file from the relay. Command requires a connection to a relay.

3.1 MAIN VIEW

The complete IEC61850 model for all AQ2xx series units is always available (opened aqs-file not required) and can be viewed using the editor. See picture below. All Logical Nodes with a short description can be seen in the left hand side tree-view.
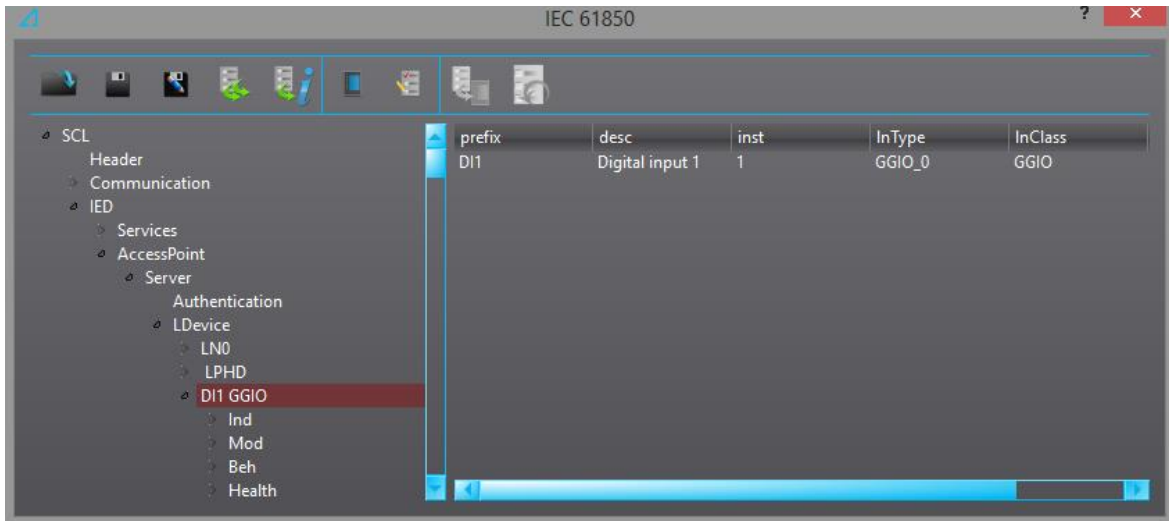
3.2 MAIN CONFIGURATIONS

The parameters visible in this dialog are actually part of the cid-file. This means that after editing any of these parameters the contents of the cid-file changes and should be written to the device.

3.2.1 COMMUNICATION PARAMETERS
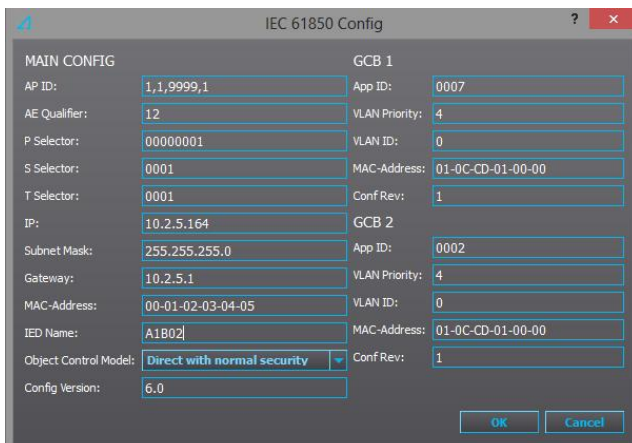
In the main configurations dialog on the left side are the MAIN parameters. First 5 parameters are upper layer addressing parameters. These are very seldom used. Check with client side implementation if these need to be changed.
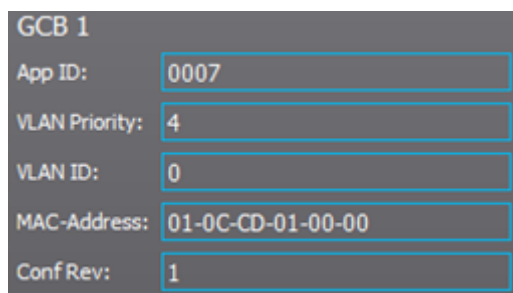
IP setting with mask and gateway needs to be set to suite the system. These settings are crucial. The IP settings in the cid file must match the communication settings of the device. The MAC address is automatically set by the device when the configuration is written to the device.

The IED Name is usually used to identify the device in the IEC61850 world. The name should be unique in the system.

Object control model can be changed for the controllable Logical nodes, OBJ1CSWI to OBJ5CSWI. Possible modes are; Direct with normal security, SBO with normal security, Direct with enhanced security and SBO with enhanced security.

3.2.2 GOOSE PUBLISHER

Figure 3-1 Parameters of the first goose dataset

On the right side in the configurations dialog are the 2 GOOSE control block parameters. These are used to configure GOOSE publisher.

App ID stands for Application Identification. This **hexadecimal** parameter defines the ID of published GOOSE data from this unit. There are 2 GOOSE control blocks available in the device. The App ID must be unique in the network. The App ID is used in the subscriber to identify the incoming GOOSE data frame.

VLAN Priority can together with VLAN ID parameter be used to build sub-networks in the system utilizing intelligent switches.

MAC-Address defines the multicast address to which the GOOSE publisher is sending its frames.

Conf Rev. stands for configuration revision. It can be considered to be the version number of the GOOSE dataset.

4   DATASETS AND CONTROL BLOCKS

All data traffic commonly used in IEC61850 is related to datasets and report control blocks. In IEC61850, report control blocks in the server are reserved by the client when the client wants to get reports from the server. After the client has enabled a report control block, the server is responsible of data reporting to the client. Dataset configuration can consist of URCB- or BRCB report control blocks.

- **BRCB**   Buffered report control block. Server collects, buffers, reports even if there is no subscription from the client.
- **URCB**   Buffered report control block. Reports only when there is a subscription from the client.

4.1   DATASET EDITOR
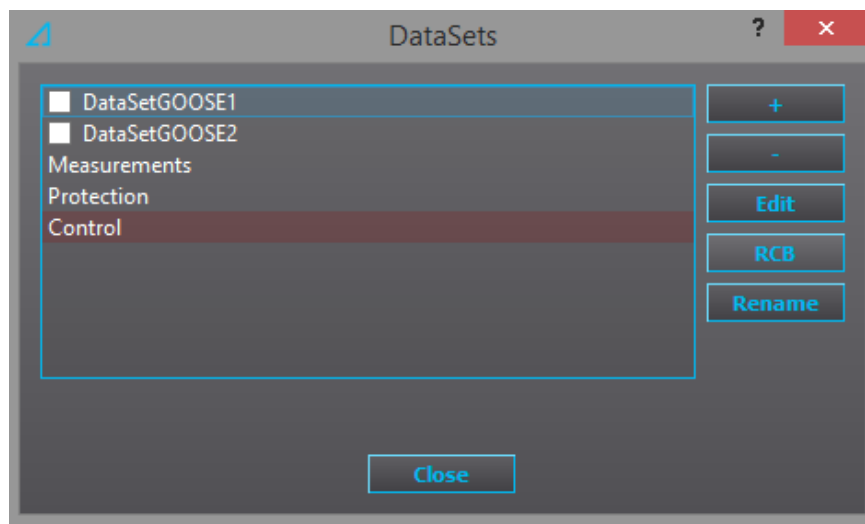
When opening the Dataset editor you will most likely see some datasets already in the configuration. By default there are three unbuffered, three buffered datasets and two GOOSE datasets. Datasets can be added or removed with + or - buttons. The two GOOSE datasets are hard coded in AQ2xx series relays. It is not possible to add or remove GOOSE datasets.
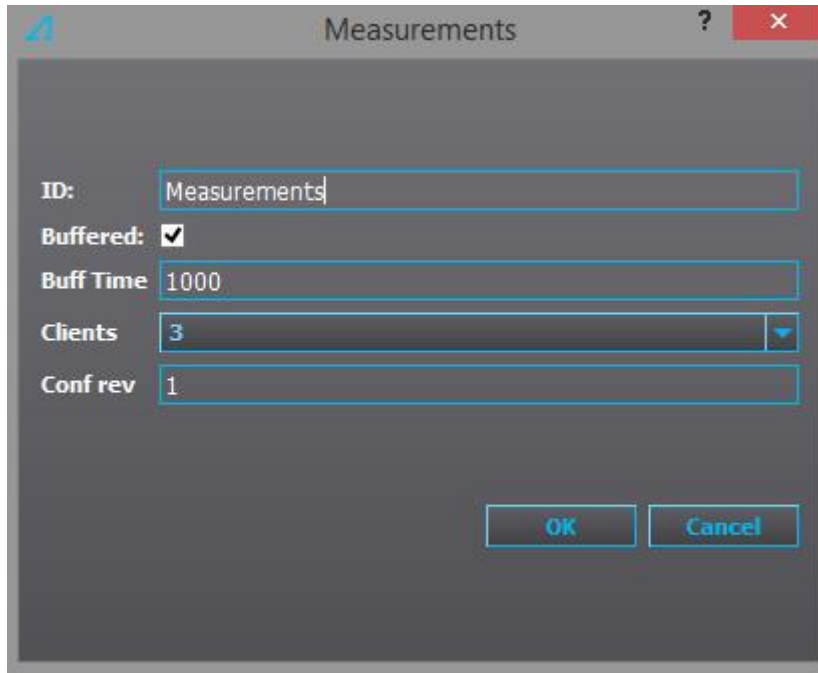
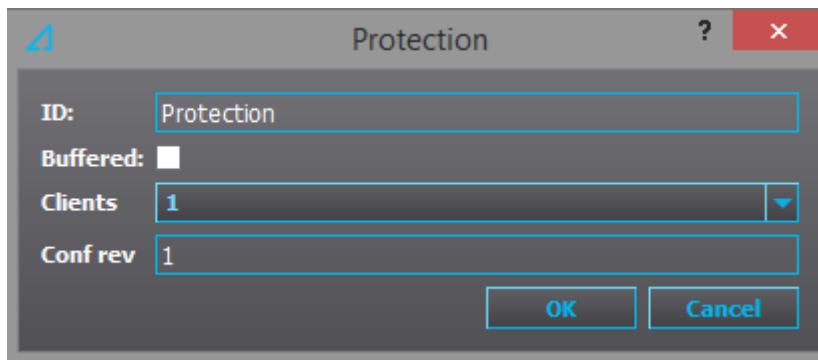*Figure 4-1 Buffered measurements dataset with 1000 ms buffering time.*


Figure 4-2 Protection signal unbuffered dataset

It is possible to have a total of six datasets. When a new dataset has been added you need to choose if the dataset is buffered (BRCB) or unbuffered (URCB). The more RCB:s (clients) have been selected for the dataset the more clients can subscribe to the dataset. Maximum amount of subscribers per dataset is five.

4.2 EDITING A DATASET

Contents of the dataset can be viewed and edited by selecting a dataset and clicking Edit-button.

In the datasets dialog each line represents a data entry in the dataset. Data items in datasets can be included on Data Object level or Data Attribute level. In this example all data is included as Data Objects which is also most common, the doName is Ind. A data object includes data attributes and in this example the Ind object contains attributes stVal, q and t. (value, quality and timestamp).
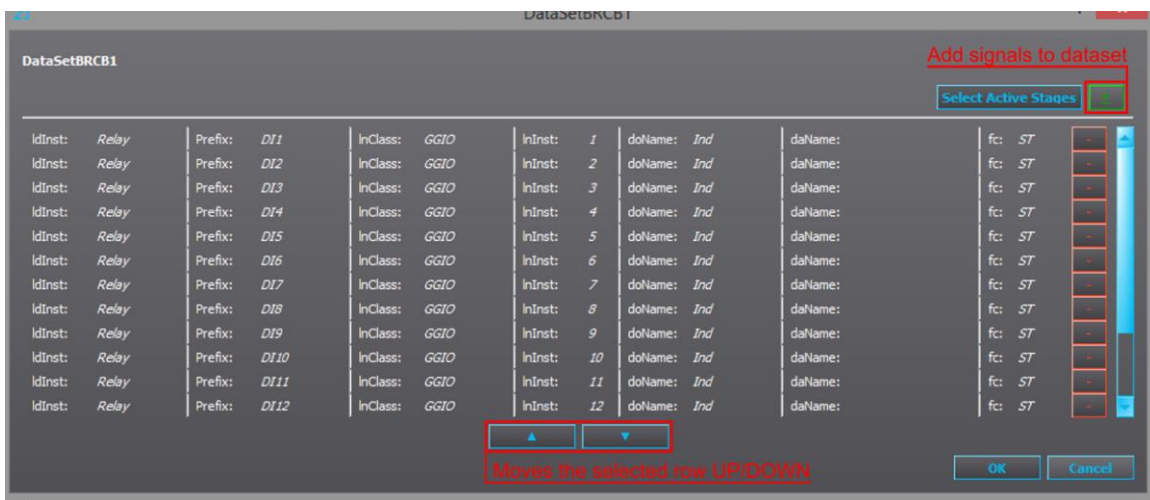
Pressing the '-' button at the end of the row deletes that entry from the dataset. Pressing the '+-' button opens a dialog where entries can be added and deleted. See picture below where DI1, 2, 3 and 4 have been selected in data object level which means that includes all data inside is included. Pressing the Select Active Stages button will include the start and trip information of all stages which are enabled in the relay configuration to this dataset.
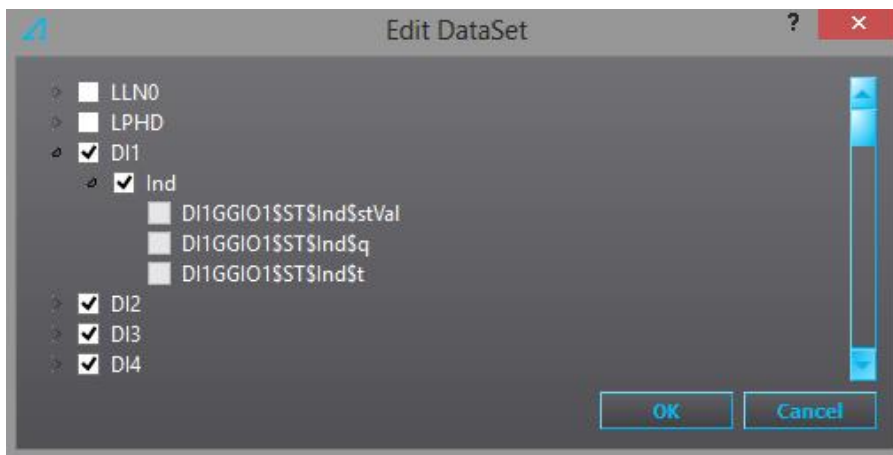
4.3   SAVING THE CHANGES TO .AQS PACKAGE

To save the changes to the aqs file when IEC61850 configurations are completed click on the .CID/.ICD file and then save the aqs file (File → Save or Ctrl+S). Now when the aqs package is uploaded to the relay (*Commands → Write all*) it will also update the IEC61850 configurations as well.

4.4   SENDING THE CID TO THE RELAY

If you are connected to a relay you have the option to upload the new configurations straight away by clicking on the Send to relay button.

CID file used in the aqs file will also be sent to the relay when giving "Write all" command (Commands → Write all).

4.5   DO VS DA

It is recommended that when adding entries to the URCB and BRCB datasets that this is done on Data object level. This way all attributes gets included, (value, quality and time).

The exception from this is when adding entries to the GOOSE datasets. The nature of GOOSE communication is such that same frame is repeatedly sent. The interval between frames is increasing until reaching 2 seconds, which is the keep-alive rate. If a data value in the GOOSE dataset changes the interval is reduced again. Timestamp information in this kind of communication is not relevant. In GOOSE datasets we recommend that only value and quality attributes are added.
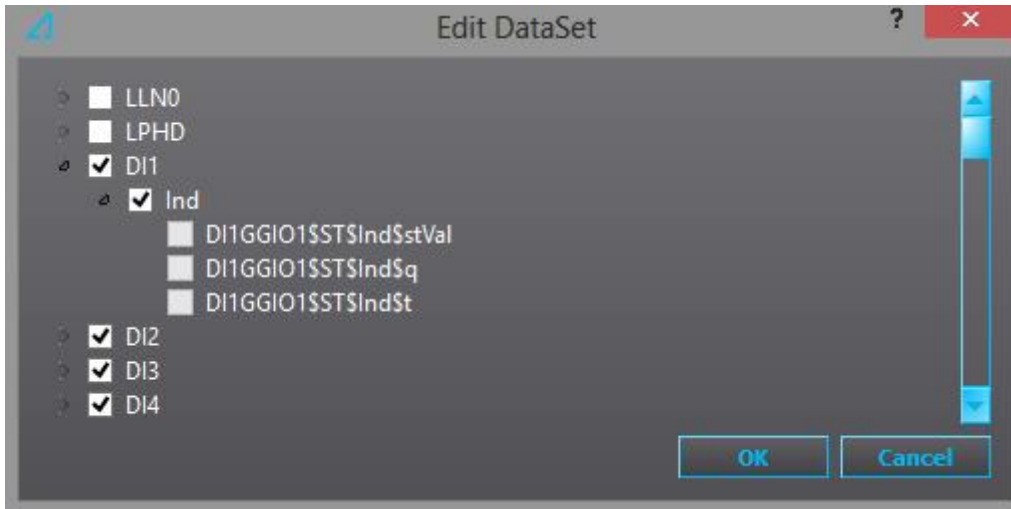
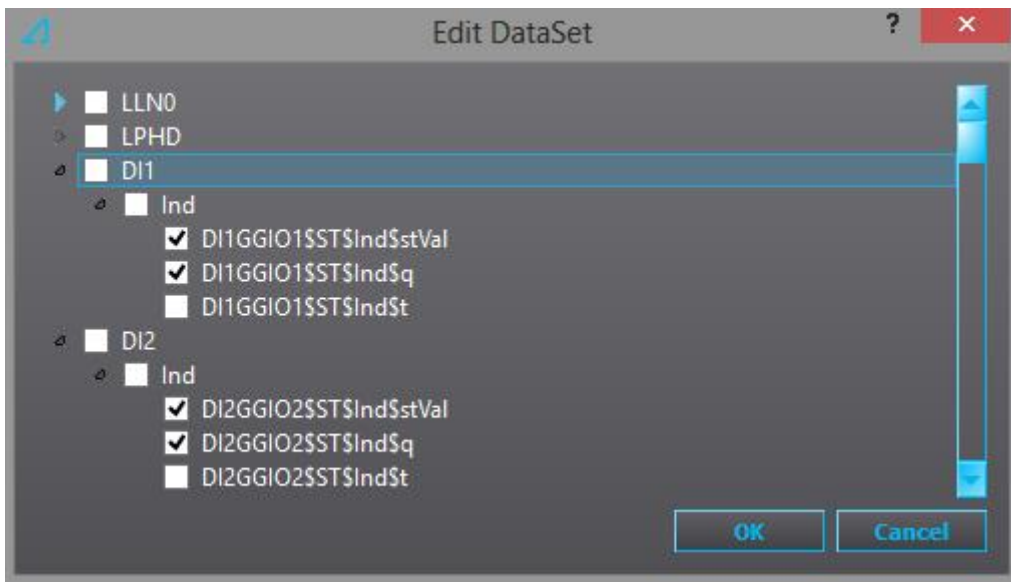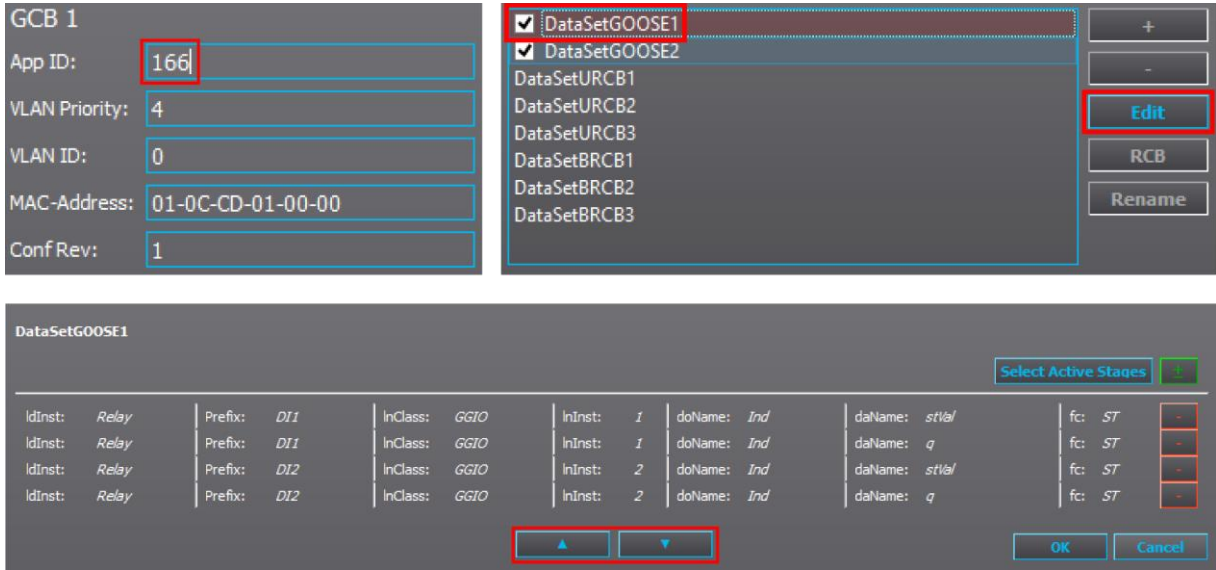*Figure 4-3 Digital input signal added in object level.*

Figure 4-4 Digital input signal added on attribute level.

4.6 GOOSE PUBLISHING

Editing GOOSE publishing datasets work in the same way as editing the other datasets. The difference is that you may want to change the order of the selected signals so that the DataIndex is to your liking. In the list above you can see DI1s value (stVal) and quality of the signal (q) and the same for DI2. The AppID of these signals is 166 which is a hexadecimal number given in IEC61850 settings.

5 GOOSE SUBSCRIBER

GOOSE subscriber is enabled setting a parameter under Communication → Protocols → IEC61850 view. There are 64 independent GOOSE inputs available in the device. For each of the inputs there are 5 settings: In use, AppId, ConfRev, DataIdx and NextIdx is quality. These settings are used to pair an input with single data in published frames in the system.

In the picture below GOOSE Input 1 has been configured to receive the DI1 input value that was configured in the previous chapter's configuration. *NextIdx is quality* has been enabled which means that relay will assume the next DataIdx (1) to be quality of the same Goose signal.
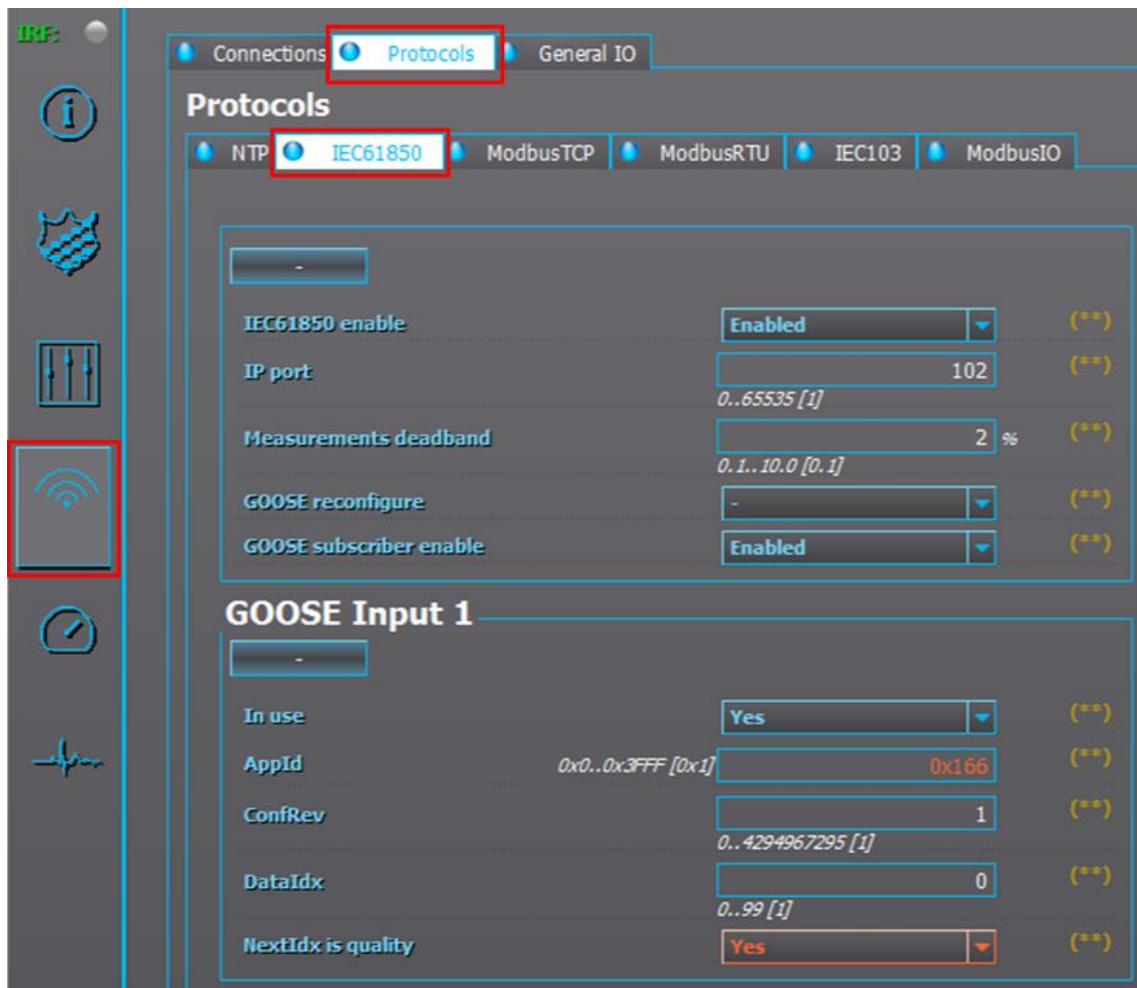
Now both the value and the quality have been configured and can be used in configuration. *Goose input 1* is the signals value and *Goose input 1 quality* is the quality of the same signal. Below is an example application of both signals.
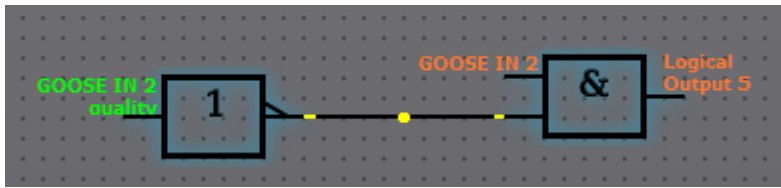
To change the name of the Goose input go to Control → DeviceIO → Logical Signals → GOOSE IN Description.

6   REFERENCE INFORMATION

Manufacturer information:

Arcteq Relays Ltd. Finland

Visiting and postal address:

Wolffintie 36 F 11

65200 Vaasa, Finland

Contacts:

Phone: +358 10 3221 370

Fax: +358 10 3221 389

url: www.arcteq.fi

email sales: sales@arcteq.fi

email technical support: support@arcteq.fi