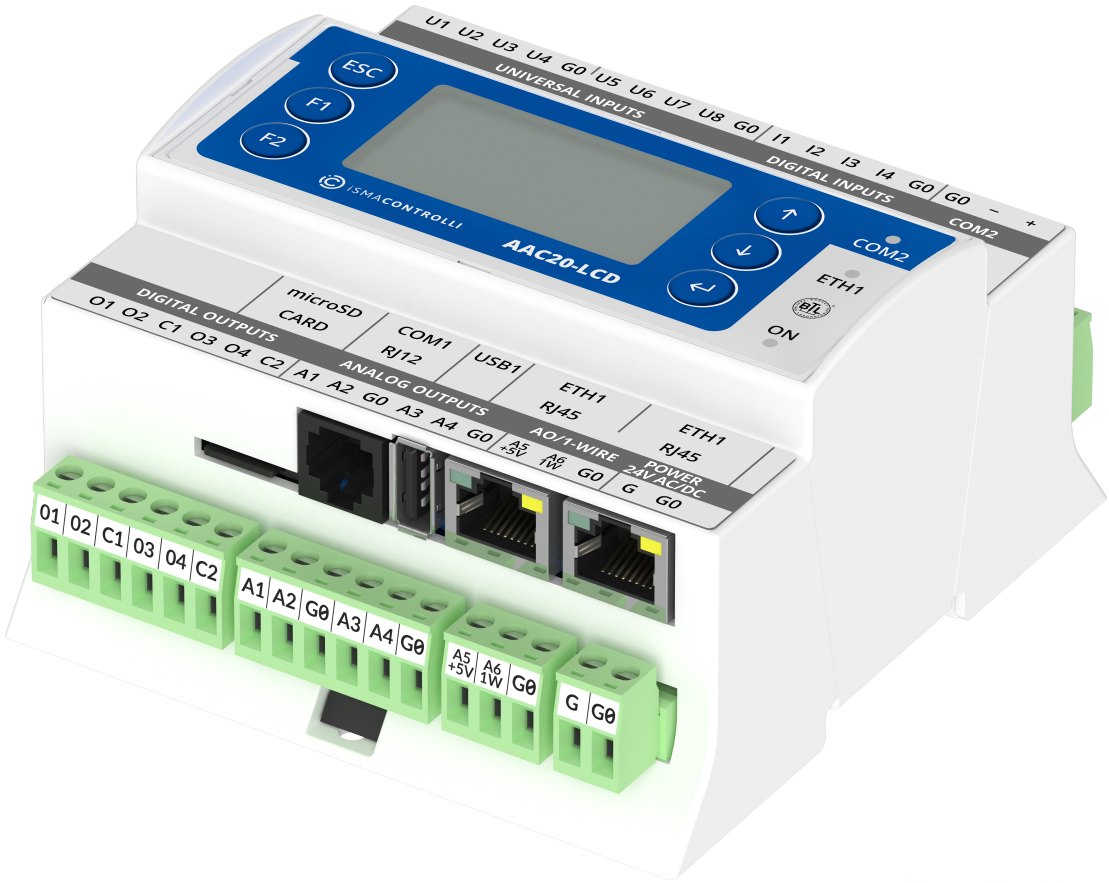
iSMACONTROLLI

iSMA-B-AAC20

User Manual

Visualization Web Server



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1 Introduction

This user manual contains information about the visualization web server for the iSMA-B-AAC20 controllers.

The visualization web server allows to present basic information about an application controlled by the iSMA-B-AAC20 controllers. The web server is based on .html files and works together with an existing built-in web server administrator platform. Visualizations can be customized and must be loaded separately.
The visualization web server is composed of a main page and up to four subpages intended for time schedules control.

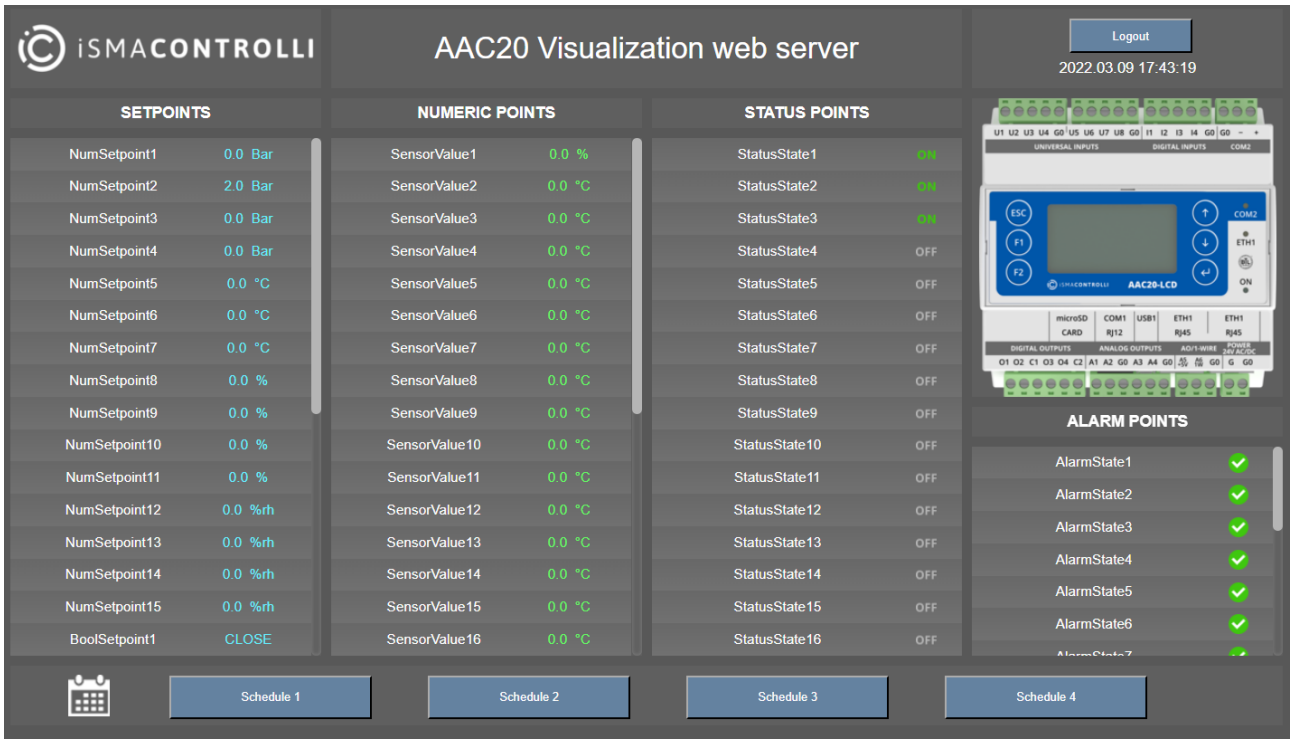


Figure 1. Main page of the visualization web server

1.1 Revision History

Rev.	Date	Description
1.2	19 Jun 2024	Improvements: • possibility to add up to 10 web users; • enum variables for numeric points, setpoints, and schedules; • light theme configured in the visualization configurator.
1.1	17 Apr 2023	Improvements: • added description of the ModbusNumericSchedule and ModbusBooleanSchedule components; • enhanced description of using the Visualization demo application; • enhanced description of the Visualization web server view; • editorial corrections.

Rev.	Date	Description
1.0	28 Feb 2022	First edition

Table 1. Revision history

2 Overview

Worth to notice:

The configuration file of the visualization web server file is an .xlsm file. Please note that it works only on the Microsoft Excel 2010 and higher versions.

On the default main page there are 4 containers, which can be fully adjusted with the Visualization_configurator.xlsm file:

- setpoints;
- numeric points;
- status points;
- alarm points.

There are also 4 buttons opening additional subpages, responsible for schedules, which types (numeric or Boolean) can also be configured using the iSMA Tool software.

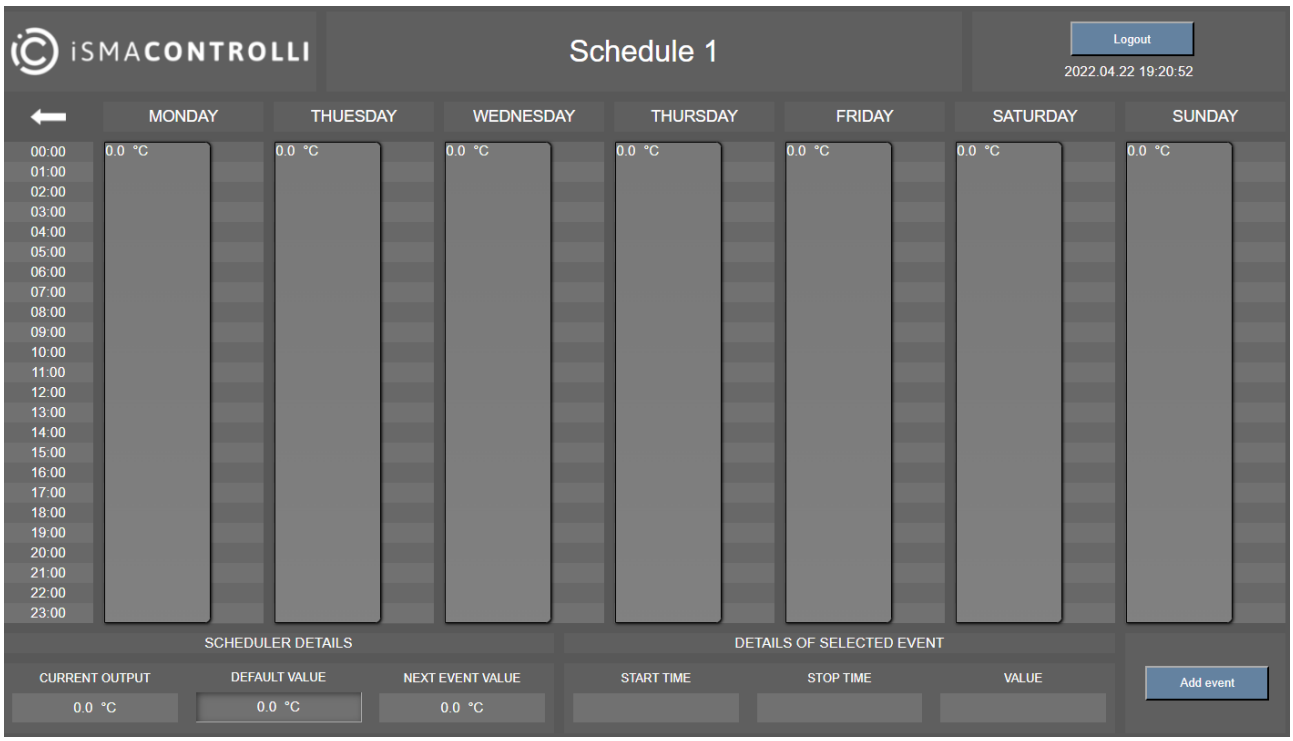


Figure 2. Schedule view of visualization

3 Quick Start-up

Step 1: Download the newest software bundle for AAC20 from the iSMA CONTROLLI Download Center page.

Step 2: Update your AAC20 with the newest firmware using the AAC20 Updater.

Step 3: Open the iC Tool, and follow one of the below paths depending on whether the visualization web server is to be run on a demo application or preexisting user application:

- (a) using the demo application:
  - go to the Application Manager;
  - use the Put App function to install an available demo application;
- (b) using the preexisting user application:
  - run the AAC20 Simulator;
  - open the Application Manager for the simulator;
  - use the Put App function to install an available demo application to the AAC20 Simulator;
  - copy the ModbusTcpSlaveNetwork folder to the Drivers folder on the destination device;
  - link points in the existing application to the points in the ModbusTcpSlaveNetwork folder;

    or add the required components manually from kits and, for schedule components, create relevant links (see Visualization Demo Application section).

Step 4: If necessary, customize the .xlsm configuration file.

Step 5: When all changes are introduced in the configuration file, generate the output file using the Generate XML file on the first sheet.

Step 6: Copy the Generation Output Files folder contents to the SD card.

Step 7: Send the index.html file to the flash memory using the AAC20 Updater.

Step 8: Log in to the visualization web server using a web browser.

4 Communication Protocol

The visualization web server uses the Modbus TCP communication with the iSMA-B-AAC20 controller and html5 to be displayed on PC, Android panel, or with Niagara Framework.

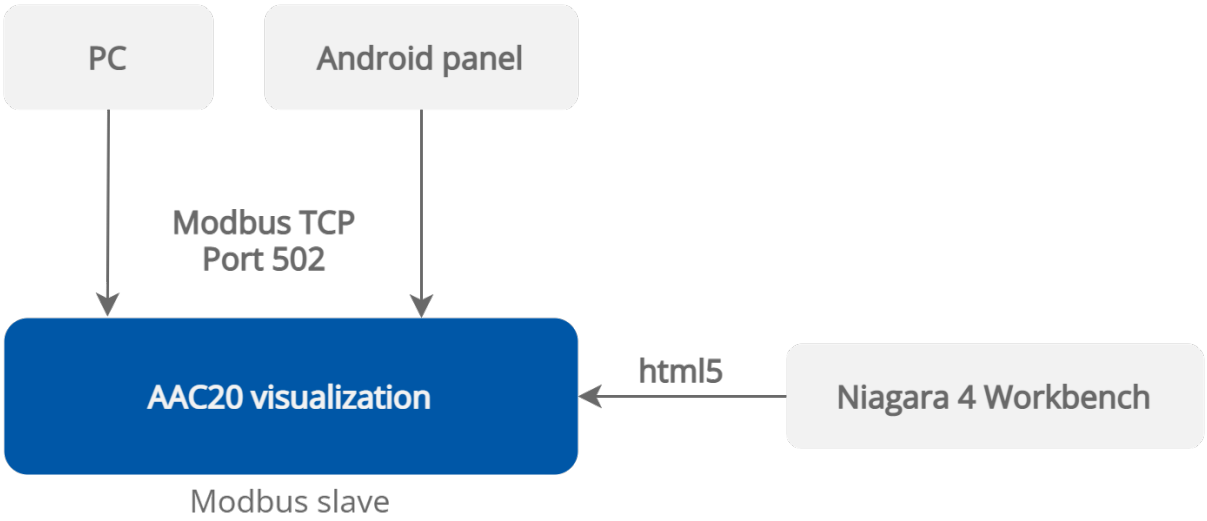


Figure 3. Visualization web server display methods

Warning!

The web server uses a TCP/IP socket to communicate with the controller.
The iSMA-B-AAC20 controller has 16 sockets for Modbus network. 3 out of 16 sockets are permanently occupied for:

- Modbus server;
- SOX;
- web server.

Consequently, there are 13 sockets left to use in the device, for example, the Modbus TCP network can communicate with 13 devices with different IP addresses and connect them to application (adding more devices automatically forces them into the fault status). Also, adding any of the iSMA_weather or iSMA_MailService kits occupies 1 socket per each kit (which becomes apparent after adding the kit and its components, saving the application, and rebooting the controller). The iSMA_MailService kit can occupy more sockets if the mail service is configured for one account on one host– each next host occupies next sockets.

5 Software Bundle

To use the visualization web server, it is necessary to download the Software Bundle 6.1. for the iSMA-B-AAC20 controller from the iSMA CONTROLLI website.

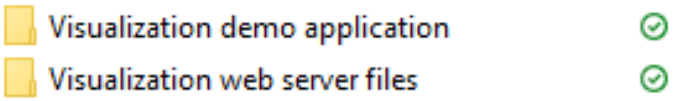


Figure 4. Visualization.zip package folders

The Visualization.zip package contains the following folders:

- Visualization demo application;
- Visualization web server files.

The visualization web server requires also specific kits from the iC_kits.zip package.

Warning!

Please remember to save the web server configuration files locally, not in a network location (e.g., OneDrive, Sharepoint, Google Drive, etc.); the web server will not operate if saved in a network location.

5.1 Kits

To run the visualization web server, the following kits need to be installed on the controller using the Kit Manager:

- iSMA_ModbusTcpSlaveNetwork;
- iSMA_VisualizationWebServer.

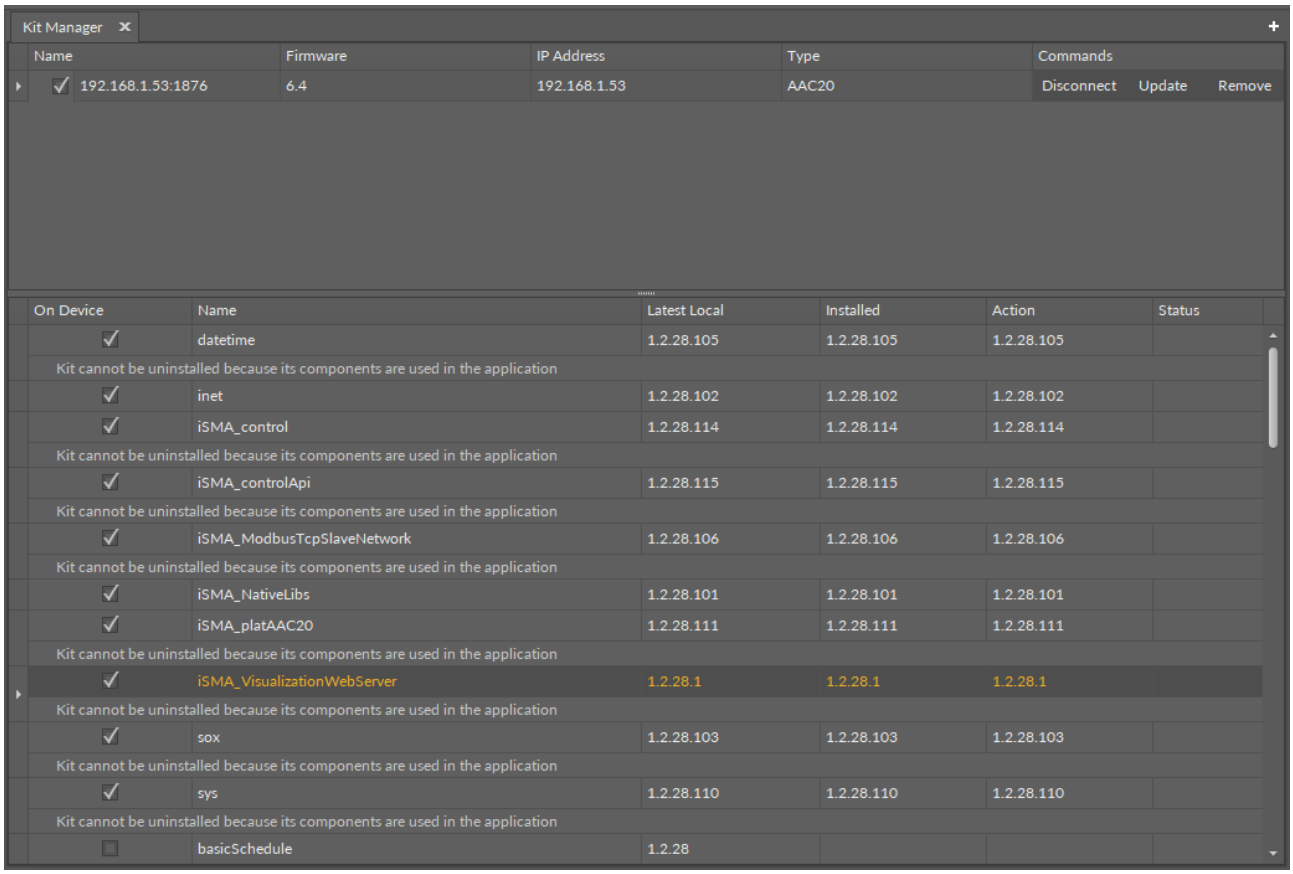


Figure 5. The Kit Manager view of installed kits

5.1.1 Web Server Structure of Components in iC Tool

A proper structure of components for the visualization web server to operate adequately is the following:

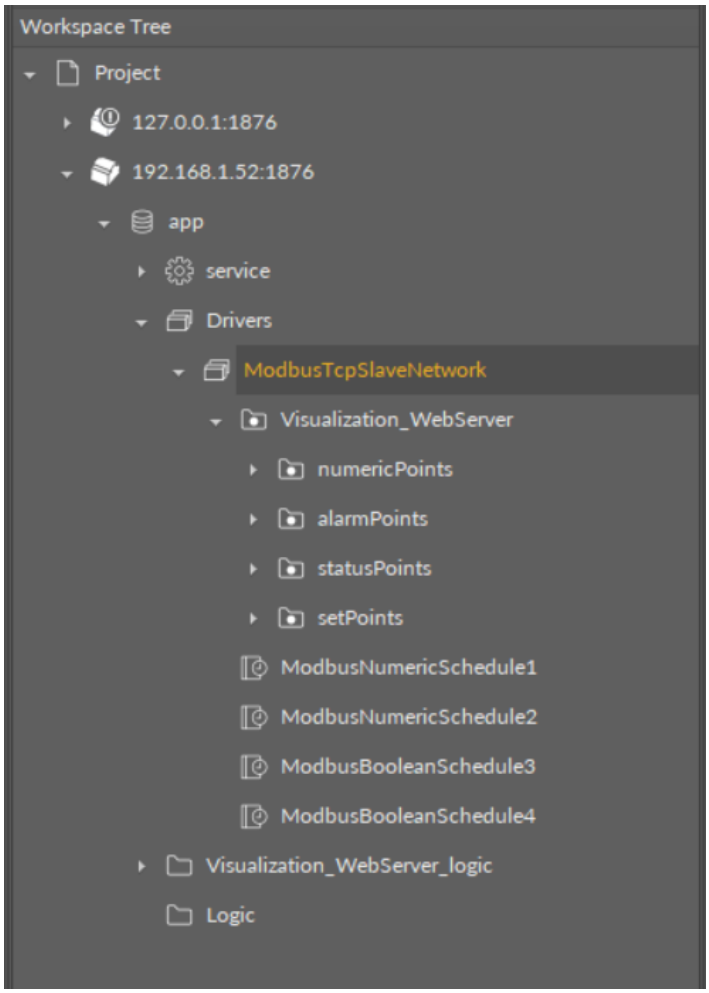


Figure 6. Components structure for the visualization web server

Demo application vs preexisting user application

The above structure is by default implemented in a demo application, however, the visualization web server can work with a preexisting user application. For this purpose, the components structure must sustained–points (NumericValue or BooleanValue) and schedules components must be located under the ModbusTcpSlaveNetwork component.
In the demo application, the schedules components are automatically linked with the schedules in the Visualization_WebServer_Logic folder. In case of preexisting user application, the links have to be made manually.
Either in the demo or user application, the points have to be linked to source components or have values entered manually. In the demo application, points are grouped into folders, but this is not necessary for the visualization web server to operate properly.
The easiest way to start working with the preexisting user application is to upload a demo application (app.sax) in the AAC20 Simulator, copy the components structure to the destination device, and then create necessary links to the user application.

- ModbusTcpSlaveNetwork: located in the Drivers folder, contains predefined, already addressed, components for the Modbus TCP slave network communication;
  - Points (NumericValue or BooleanValue from the iSMA_ModbusTcpSlaveNetwork kit): components representing variables visible on visualization web server page and are responsible for a correct communication;

- Schedules: (ModbusNumericSchedule or ModbusBooleanSchedule from the isma_VisualizationWebServer kit): components for schedules control.

Note: In the demo application, components are sorted and grouped into folders responsible for each editable container on the web page, similar as organized in the Visualization_configurator.xlsm sheets. They also have preconfigured Modbus addresses. If added manually, the points have to be located under the ModbusTcpSlaveNetwork component, and it is crucial to have their Modbus addresses kept compliant with those defined in the Visualization configurator (the Excel file).

The ModbusNumericSchedule and ModbusBooleanSchedule components have the following slots:

- **Status:** the current status of the component;
- **Fault Cause:** indicates the fault cause of the component;
- **Description:** an additional detailed information about a component that may be freely described by the user;
- **Enable:** enables or disables the component;
- **Starting Address:** a number of a first Modbus address used by the schedule;
- **Number of Events:** allows to set a number of daily events in the schedule (the default and maximum value is 8);

Note: Please note that if the number of events in a day is changed and set to less than 8, this change will be automatically read by the visualization web server, and it will not be possible to add more events in the web server view.

- **Last Address:** shows a number of the last Modbus address used by the schedule; the number of used registers depends on the Number of Events slots and the type of the schedule, and is calculated according to the formula:
  - ModbusNumericSchedule: 4 + (2 * 7 * Number Of Events);
  - ModbusBooleanSchedule: 1 + (7 * Number Of Events);

Note: The configuration file allows to modify addresses set by default.

Registers in the visualization web server

The visualization web server is designed to accept Modbus addresses from a range of 1000-2999. This range is applicable both to points and schedules.

- **Decimal Places (only ModbusNumericSchedule):** allows to set a number of decimal places for values displayed on the schedule;
- **In Schedule:** the slot is used to create a link from the schedule's Out slot, and then displays a current value of the linked schedule.

Note: In the demo application, there are two ModbusNumericSchedule and two ModbusBooleanSchedule components directly in the ModbusTcpSlaveNetwork component. They are linked with the schedule components in the logic folder.

Logic

In the demo application, the Visualization_WebServer_logic folder contains four schedule components from the isma_ControlApi kit, which are responsible for schedules in the application and are already linked with components in the Driver folder.

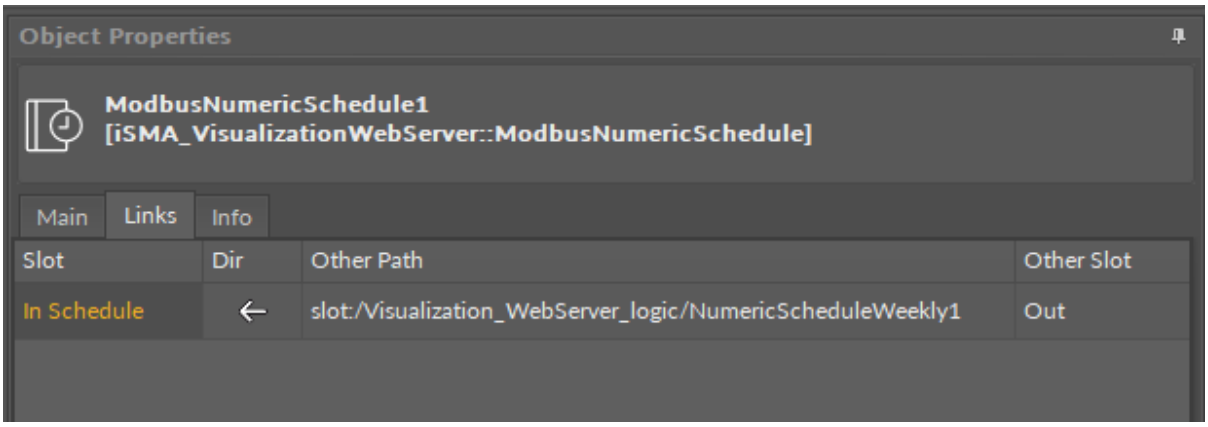


Figure 7. Links between Schedule controller (Logic-Driver)

In case of the user application, it is possible to link the components in the application to respective components in the ModbusTcpSlaveNetwork component.

5.2 Visualization Web Server Files

The Visualization web server package contains files for configuration of the web server functionalities and looks.

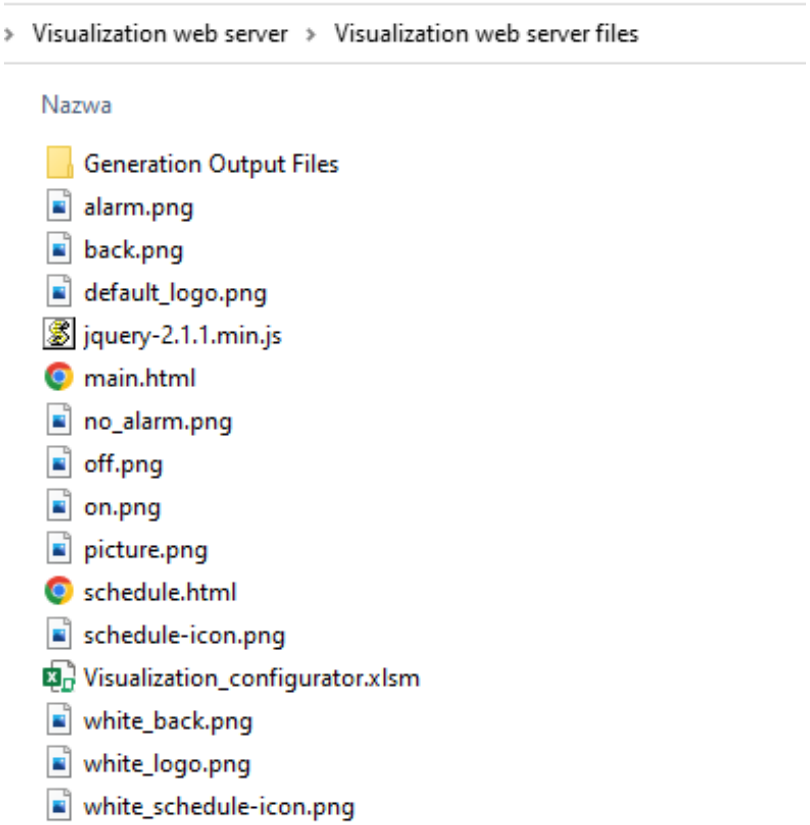


Figure 8. Visualization web server files

- Generation Output Files folder: created upon using the Generate XML File button in the Visualization_configurator.xlsm file; contains all files necessary for the configured web server to operate properly;
- .png files: image files including icons and picture for specific functions; among them:
  - logo: a file defining a default logo displayed in the web server;
  - picture: a file defining a default image displayed on the web server's main page; by default, the iSMA-B-AAC20 image is displayed;

Note: Dimensions of a picture window are 300 px x 300 px, and it is recommended to use pictures of this resolution. Pictures with higher resolution will be scaled automatically, however, it may extend page loading time. Maximum recommended image size is 500 kB.

Note: Names of graphic files have to be kept the same as the source files. The only option of renaming a graphic file is to add a prefix of a 'ThemeName_' (as in: Blue_no_alarm.png), which allows to differentiate graphic files between color themes.

Changing image files

It is possible to substitute all default image files included in the Visualization web server files folder. The only condition is to preserve their names with the exception of differentiating files between themes by adding a theme name prefix.

- alarm.png/no_alarm.png: icons used to notify states of alarm points (could be changed to, for example, blue_alarm.png/blue_no_alarm.png):

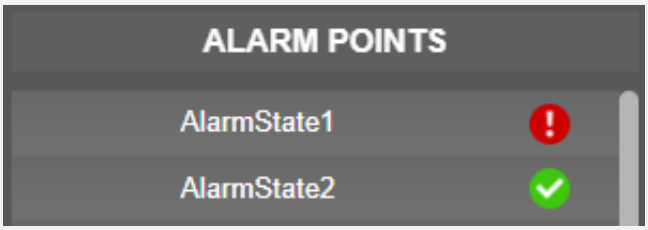


Figure 9. States of alarm points

- back.png: an icon used to navigate back from a schedule view to a main view (could be changed to, for example, orange_back.png);
- logo.png: an image displayed in a left top corner of a main view (could be changed to, for example, blue_logo.png);
- on.png/off.png: icons used to notify states of status points (could be changed to, for example, orange_on.png/orange_off.png):

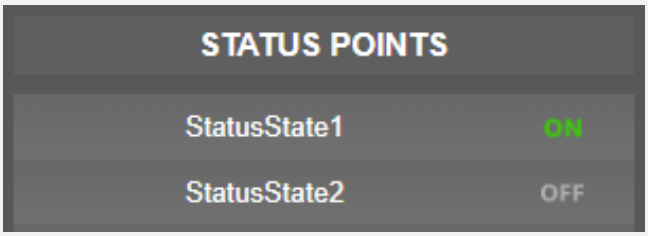


Figure 10. States of status points

- picture.png: an image displayed in a right column of a main view over alarm points column (could be changed to, for example, blue_picture.png);
- schedule_icon.png: an icon displayed to the left of schedules buttons in a main view (could be changed to, for example, orange_schedule_icon.png).

- main.html: a file responsible for a main view of the visualization template in the web server;
- schedule.html: a file responsible for the visualization of schedules;
- Visualization_configurator.xlsm: a main configuration file for the web server.

The Visualization web server files folder contains files necessary to install on the SD card and flash memory of the iSMA-B-AAC20 controller:

- files to be installed on the flash memory of AAC20;
- files to be installed on the SD card.

5.2.1 Installation on the Flash Memory

There is one file, which needs to be installed directly in the iSMA-B-AAC20's flash memory. To upload the file, run the AAC20 Updater software and configure the connection appropriately. Then, upload the following file with the AAC20 Updater:

- Index.html: activates .html files on the SD card.

Note: Cleaning of the flash memory from the uploaded files is carried out by erasing all components in the controller, which means that also the kits and applications are erased during this process (it is done with the Erase Flash Memory option in the context menu after right-clicking the Send File button).

5.2.2 Installation on the SD Card

Files to be copied on to the SD card are located in the Generation Output Files folder. These files are generated upon using the Generate XML File button in the Visualization_configurator.xlsm file.

To install files on the SD card, first, place the SD card in the card reader of a computer. Then, copy all files located in the SD card folder to the actual SD card:

Warning!

While copying files to the SD card, please remember to copy files from inside the Generation Output Files folder, and paste them to the SD card directly, instead of copying the folder with its contents itself. Copying the folder and pasting it to the SD card will cause the visualization web server error. It is also not allowed to group files in folders.

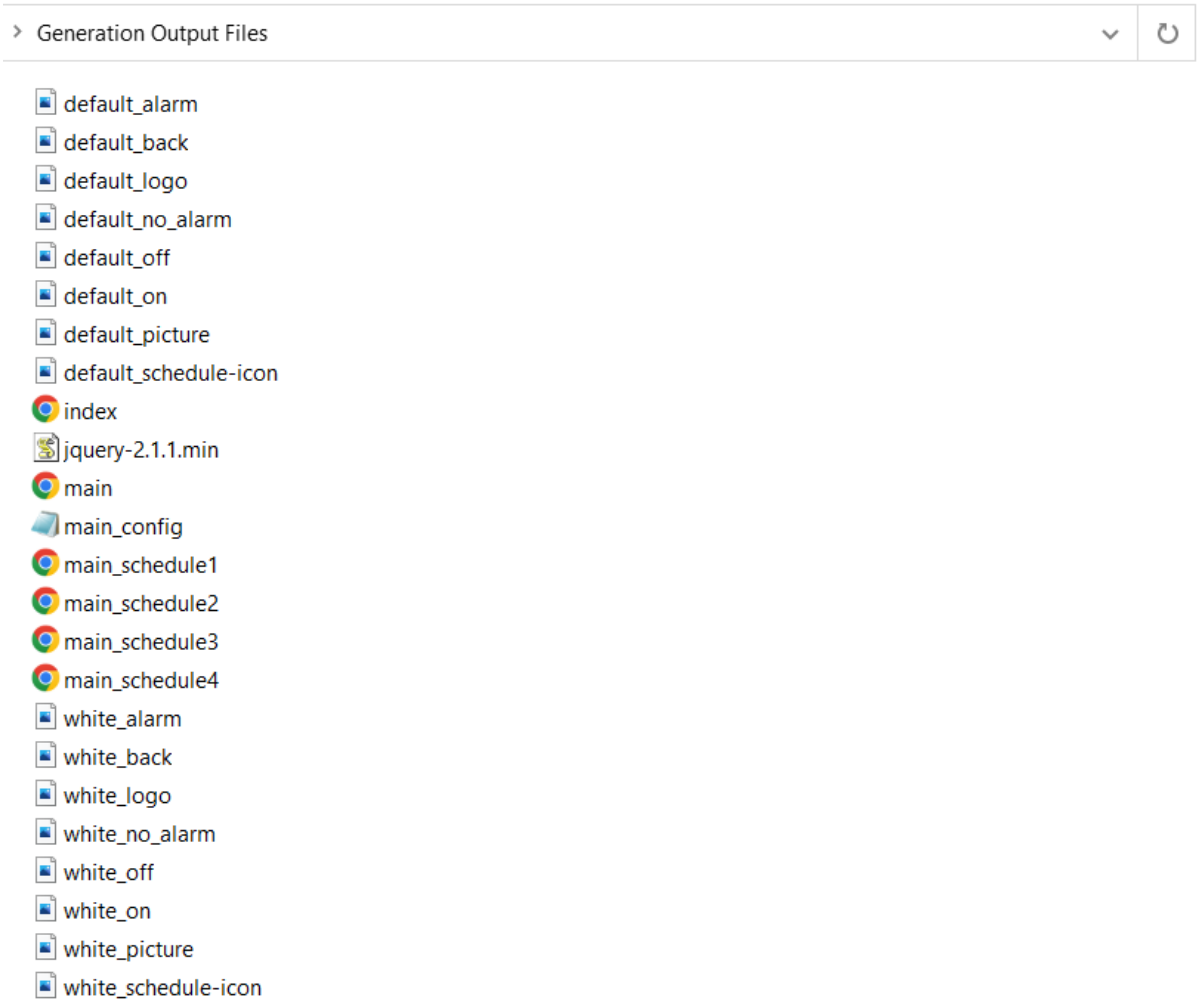


Figure 11. Generation Output Files folder

All files must be copied to the main folder on SD card. It is not allowed to group files in folders. Files for the installation on the SD card are the following:

- .png files: default image files generated based on the files in the Visualization web server main folder;
- index.html;
- jquery: engine file;
- main.html: a file responsible for a main view of the visualization template in the web server;
- main_config.xml: a file containing the web server configuration;
- main_schedule1-4.html: files responsible for the schedules views in the web server.

Next, disconnect the card from the computer using the secure disconnect device function. Place the SD card in the iSMA-B-AAC20 while the controller is powered off.

Note: It is important to remember that disconnecting the iSMA-B-AAC20 from the power supply does not mean that the unit is already completely powered off. It is necessary to wait about 5 to 15 seconds after all the signal diodes of the controller turn off. Only then the SD card can be safely placed in the controller. The same rule applies when taking the SD card out of the controller.

5.3 Visualization Demo Application

The Visualization demo application folder contains files required for a demo configuration of the web server:

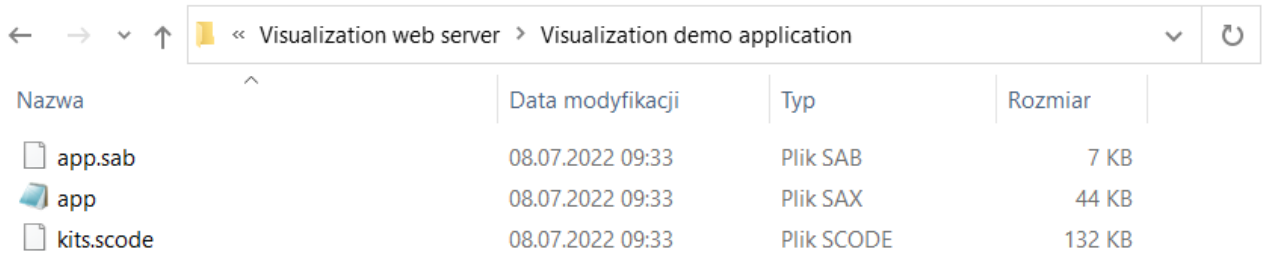


Figure 12. Visualization demo application folder

In order to use the visualization web server, it is required to install a default application, app.sax, which includes predefined folders and components responsible for displaying values on the main page:

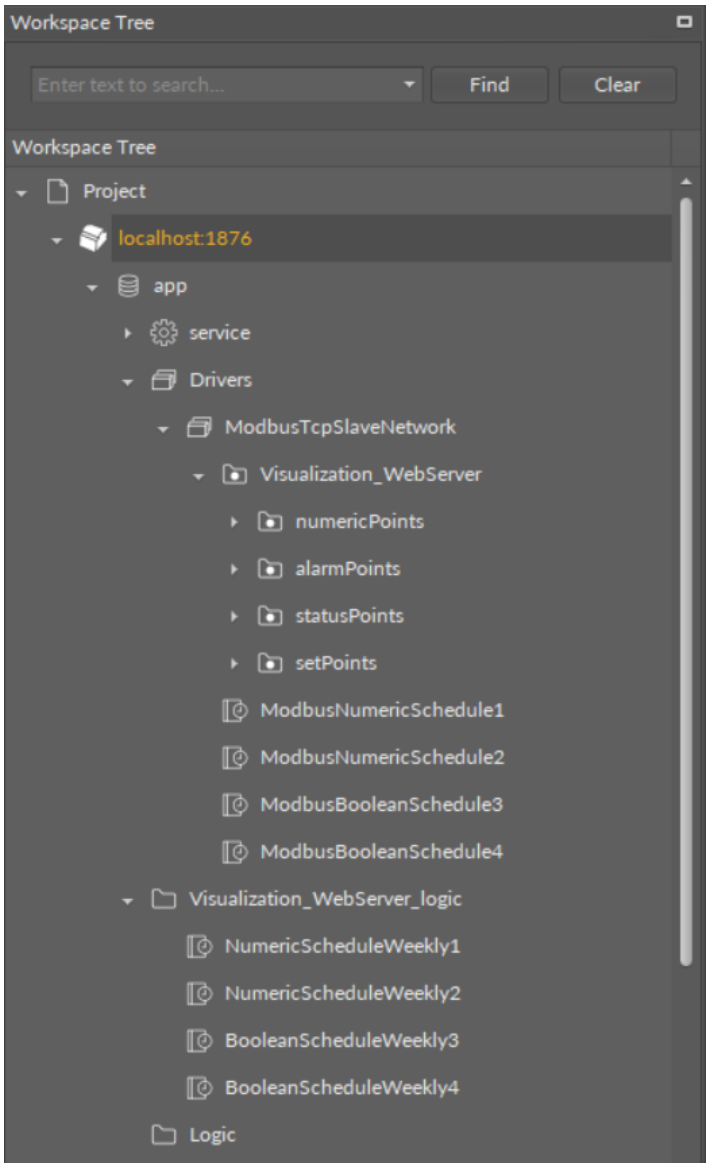


Figure 13. Demo application structure

The visualization demo application contains the following components and folders:

- ModbusTcpSlaveNetwork in the Drivers folder:
  - Visualization_WebServer Modbus folder:
    - numericPoints folder containing 30 NumericValue components for sensor values;
    - alarmPoints folder containing 16 BooleanValue components for alarm states;
    - statusPoints folder containing 16 BooleanValue components for status states;
    - setPoints folder containing 15 NumericValue and 15 BooleanValue components for setpoints;
  - 2 ModbusNumericSchedule components linked with numeric schedules from the Visualization_WebServer_logic folder;
  - 2 ModbusBooleanSchedule components linked with Boolean schedules from the Visualization_WebServer_logic folder;
- Visualization_WebServer_logic folder in the app component containing:
  - 2 NumericScheduleWeekly components linked with Modbus numeric schedules in the ModbusTcpSlaveNetwork;
  - 2 BooleanScheduleWeekly components linked with Modbus Boolean schedules in the ModbusTcpSlaveNetwork.

The visualization web server uses the demo application to display points values (sensors, alarms, status, and setpoints values) on the main view, and schedules on the schedules view.

5.3.1 Uploading the Visualization Demo Application

Warning!

Installing the visualization demo application on the device with a running user application erases the preexisting application!
If there is a user application installed on the controller, please go to the Using the Visualization Web Server with the User Application section.

Warning!

Before uploading the demo application, please make sure that the iSMA_ModbusTcpSlaveNetwork and iSMA_VisualizationWebServer kits are installed.

In order to install the visualization demo application, it is required to:

- go to the AAC20 Software Bundle, then the Visualization web server folder and the Visualization demo application folder;
- copy the app.sax file from this folder;
- go to the latest iSMA Tool folder, then the home folder and Applications folder;
- paste the copied app.sax file there;
- go back to the iSMA Tool program and open the Application Manager for the running device;
- use the Get App function to refresh a list of available applications;
- use the Put App function to upload the app.sax file with the visualization demo application.

Please make sure that the iSMA_ModbusTcpSlaveNetwork and iSMA_VisualizationWebServer kits are installed.

5.3.2 Using the Visualization Web Server with the User Application

There are two methods to start using the visualization web server with the user application preinstalled on the device. The first method is to manually add necessary components, and the second involves using the AAC20 simulator to install a demo application and copy necessary files.

Adding Components Manually

In order to use the visualization web server on the device that has the user application running, it is required to add and link the following folders and components (from kits in the Device Kits window):

- in the Drivers folder:
  - add and configure the ModbusTcpSlaveNetwork component (if already added, use the existing network);
    To display sensors, alarms, status, and setpoints values:
  - add the Modbus folder (the Visualization_WebServer folder in the demo application), and name it as appropriate;
  - add and configure NumericValue or BooleanValues components that will represent sensors, alarms, status, and setpoints values (possibly, group the components in Modbus folders as in the demo application);
    To use schedules:
  - add and configure the ModbusNumericSchedule and/or ModbusBooleanSchedule components;
- in the logic:
  - add and configure NumericScheduleWeekly and/or BooleanScheduleWeekly components (possibly, group the components into folders as appropriate).

Linking

In order for the visualization web server to display schedules properly, it is required to link the NumericScheduleWeekly and/or BooleanScheduleWeekly components with the relevant ModbusNumericSchedule and/or ModbusBooleanSchedule components.

Please note that the visualization web server has priority over the iSMA Tool, so if components are linked, the web server will overwrite any change to the schedule made in the iSMA Tool. In order to make changes to schedule from the iSMA Tool, it is required to unlink schedules components, and reinstate links when the change is completed.

Using the Visualization Demo Application on the AAC20 Simulator

The other method to use the visualization web server on an existing application is to install the demo application (app.sax file) on the simulator (127.0.0.1:1876) and copy the necessary files from the simulator to the controller.

Worth to notice:

Please note that in order to install the demo application to the AAC20 simulator, it is required to copy the app.sax file from the Visualization demo application folder in the Software Bundle to the iSMA Tool's home/Applications folder. Then, use the Get app and Put app functions in the Applications Manager for the AAC20 simulator. The detailed procedure is described in the Uploading the Visualization Demo Application section.

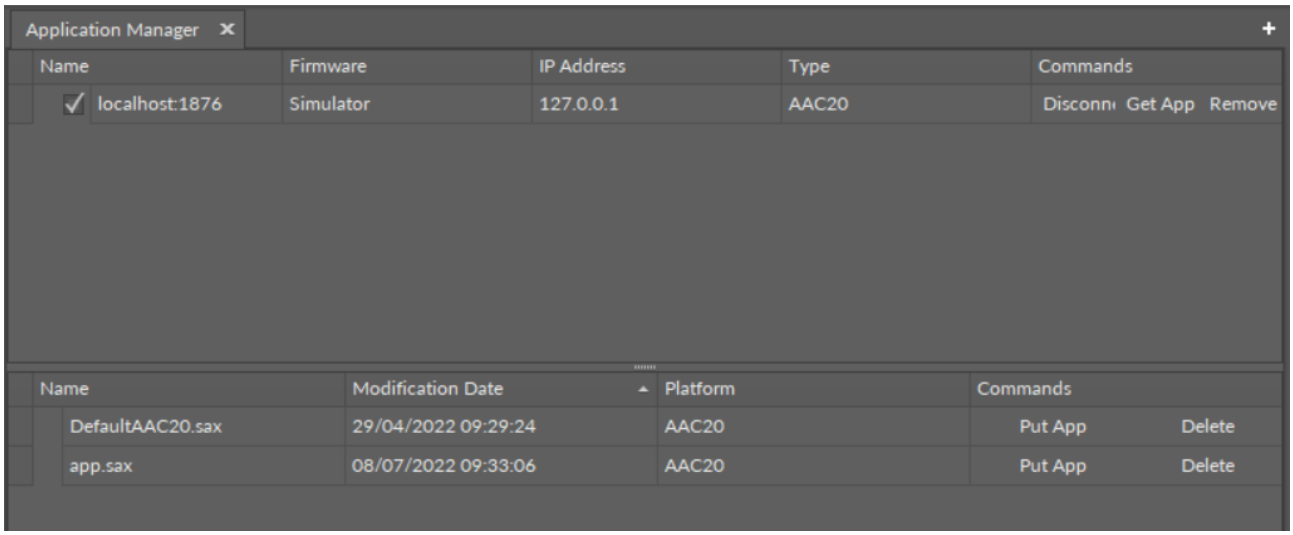


Figure 14. Installing Default the default application on simulator

Components to copy from the demo application are grouped in two folders:

- the ModbusTcpSlaveNetwork folder contents (Visualization_WebServer folder and ModbusNumericSchedule/ModbusBooleanSchedule components) from Drivers, and
- the Visualization_WebServer_logic folder to the used device.

After copying the required components, paste them into relevant folders on the destination AAC20 controller.

Warning!

Copying components between 2 different devices is allowed from the iSMA Tool 1.2.6. Please note that the same versions of kits are required on both devices.

If more components are still necessary, it is required to add them manually.

Please notice that, for the schedules to be displayed correctly, it is required to always add a corresponding pair of components for weekly schedule in the logic and Modbus schedule in the ModbusTcpSlaveNetwork (for example, the NumericScheduleWeekly and ModbusNumericSchedule pair).

Linking

In order for the visualization web server to display schedules properly, it is required to link the NumericScheduleWeekly and/or BooleanScheduleWeekly components with the relevant ModbusNumericSchedule and/or ModbusBooleanSchedule components.

Worth to notice:

Please note that the visualization web server has priority over the iSMA Tool, so if components are linked, the web server will overwrite any change to the schedule made in the iSMA Tool. In order to make changes to schedule from the iSMA Tool, it is required to unlink schedules components, and reinstate links when the change is completed.

6 Configuration File

The Visualization web server files folder contains the Visualization_configurator.xlsm file, which is dedicated to configure the main view of the visualization. This file allows to customize prepared .html file and generate new .xml file to be sent to the SD card.

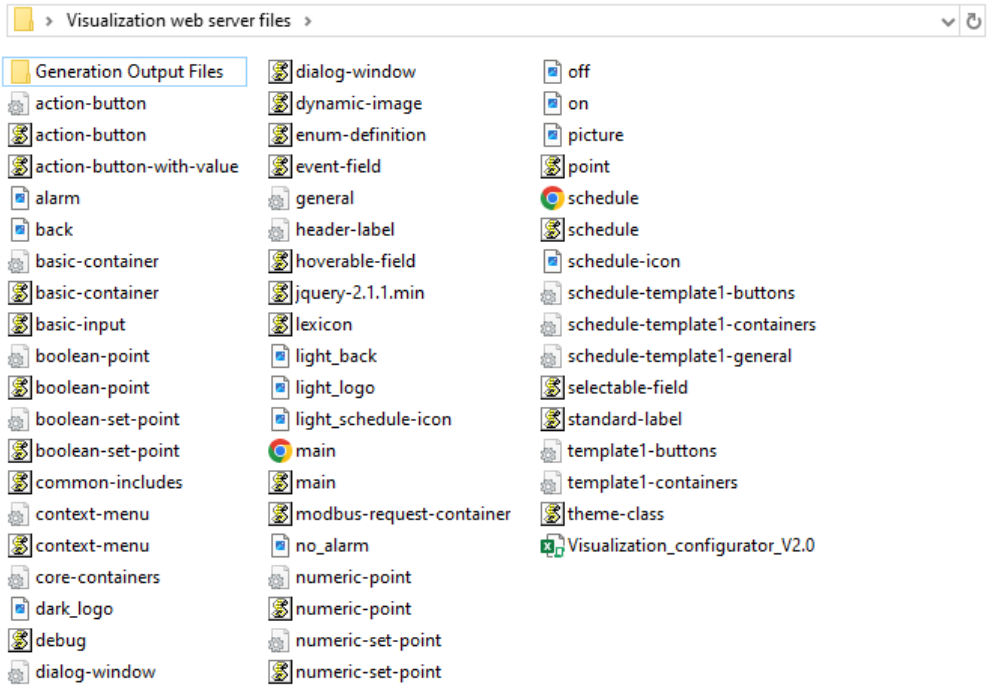
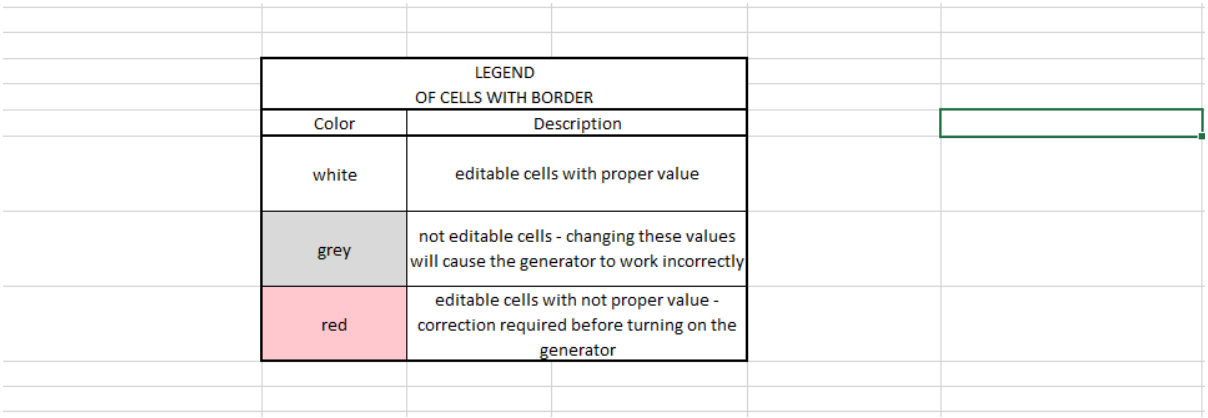


Figure 15. Visualization web server files

The Visualization_configurator.xlsm file is a main file for configuration of the visualization web server. It is constructed with separate sheets, which contain tables prepared to configure different functionalities of the visualization web server. Each sheet includes a legend table, which explains functions of colored cells in tables:



LEGEND OF CELLS WITH BORDER	
Color	Description
white	editable cells with proper value
grey	not editable cells - changing these values will cause the generator to work incorrectly
red	editable cells with not proper value - correction required before turning on the generator

Figure 16. Cells legend in the Visualization_configurator file

Also, each cell in tables has a Tip or Attention note assigned. These notes contain indications on a purpose of each field or restrictions of the fields edition.

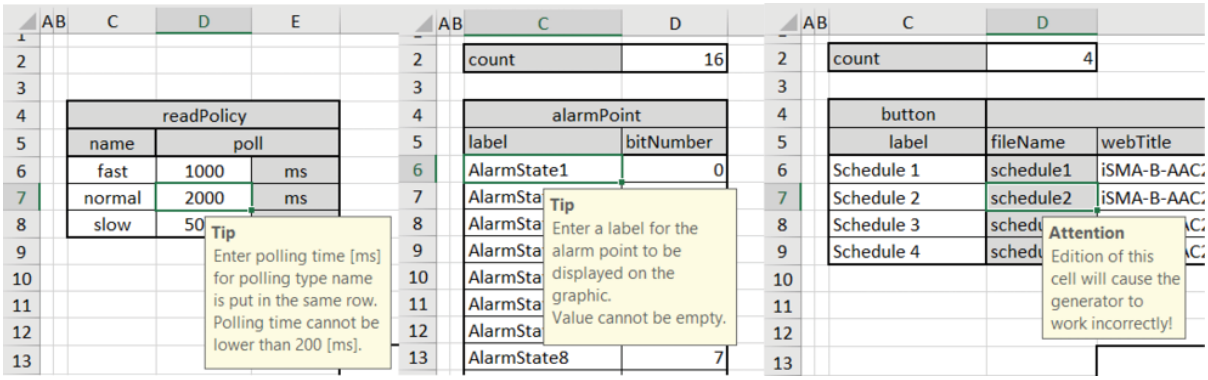


Figure 17. Tips and Attention notes

6.1 Excel Sheets Description

Each of the configuration excel sheets is responsible for each editable container on the web page.

- general
- network
- numericPoints
- alarmPoints
- setPoints
- statusPoints
- schedulers
- enums
- lexicons
- themes

6.1.1 general

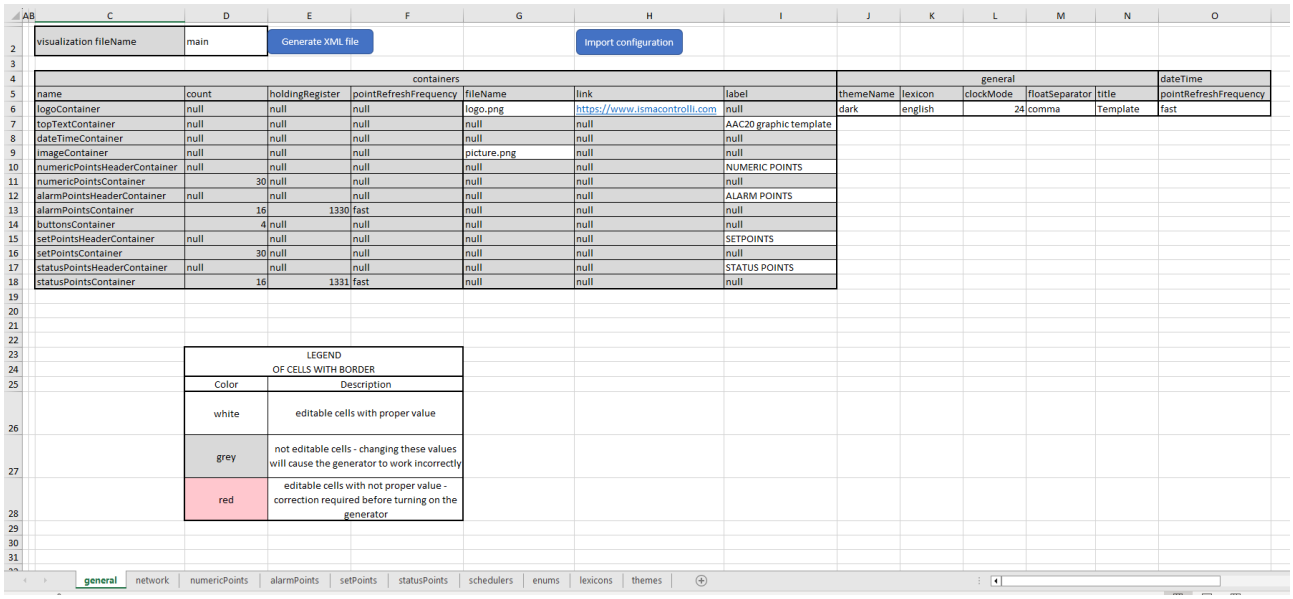


Figure 18. General sheet

A general sheet defines all main information about the visualization page. Most importantly, it contains two functional buttons:

- **Generate XML file** button, which generates an .xml configuration file to be uploaded on the SD card. Using this option creates a Generation Output Files folder, which includes all files that have to be copied onto the SD card;

Warning!

In order to use the Generate XML File option, please remember to enable macros in the Excel application.
With some Microsoft updates, it may be required not just to use an Enable Content button, but follow one of the two ways:

- enter the Visualization_configurator properties from the file explorer level and check the Unblock option;
- go to the location in Excel menu: File/Options/Trust Center/Trust Center Settings/ Macro settings, and check one of the options:
  - disable all macros with notification, or
  - enable all macros.

at the same time checking the Trust access to the VBA project object model.

Warning!

While copying files to the SD card, please remember to copy files from inside the Generation Output Files folder, and paste them to the SD card directly, instead of copying the folder with contents itself. Copying the folder and pasting it to the SD card will cause the visualization web server error. It is also not allowed to group files in folders.

- **Import configuration** button, which allows to implement a preexisting configuration of the visualization web server from an Excel file of the first version of the visualization web server:

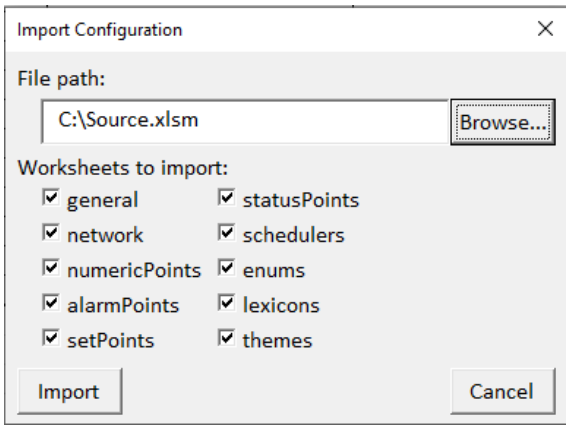


Figure 19. Importing configuration pop-up

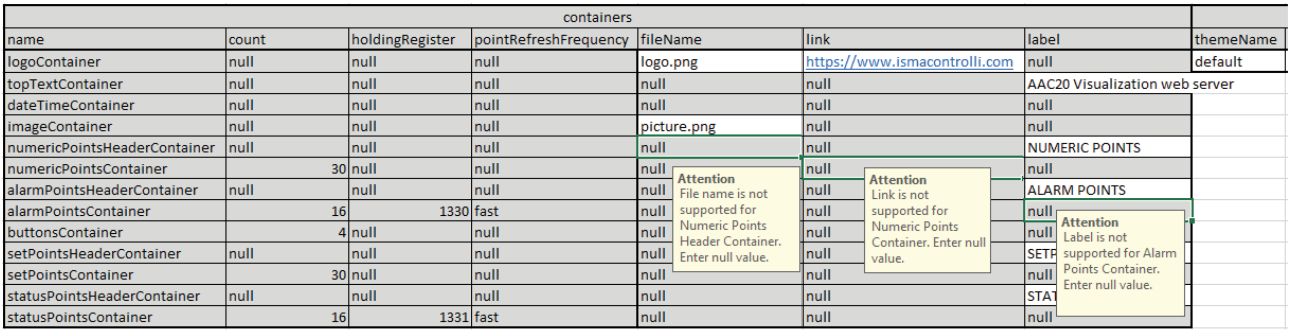
The importing configuration pop-up allows to select a source file from a PC location and select its configuration sheets to import data specifically from.

The general sheet contains the following parameters to edit:

- **fileName:** identifies image files for logo and image containers (these files have to be located in the Generate Output Files folder);
- **link:** allows to link a logo container image to a specific web location;

- **label:** specifies header of container column's (top text container, numeric points header container, alarm points header container, setpoints header container, and status points header container)

Note: Please note that the above functionalities cannot be defined for fields where the null value is inserted. If such field is to be edited, the attention note is displayed:



containers							
name	count	holdingRegister	pointRefreshFrequency	fileName	link	label	themeName
logoContainer	null	null	null	logo.png	https://www.ismacontrolli.com	null	default
topTextContainer	null	null	null	null	null	AAC20 Visualization web server	
dateTimeContainer	null	null	null	null	null	null	
imageContainer	null	null	null	picture.png	null	null	
numericPointsHeaderContainer	null	null	null	null	null	NUMERIC POINTS	
numericPointsContainer	30	null	null	null	null	null	
alarmPointsHeaderContainer	null	null	null	null	null	ALARM POINTS	
alarmPointsContainer	16	1330	fast	null	null	null	
buttonsContainer	4	null	null	null	null	null	
setPointsHeaderContainer	null	null	null	null	null	SETP	
setPointsContainer	30	null	null	null	null	null	
statusPointsHeaderContainer	null	null	null	null	null	STAT	
statusPointsContainer	16	1331	fast	null	null	null	

Attention
File name is not supported for Numeric Points Header Container. Enter null value.

Attention
Link is not supported for Numeric Points Container. Enter null value.

Attention
Label is not supported for Alarm Points Container. Enter null value.

Figure 20. Attention note

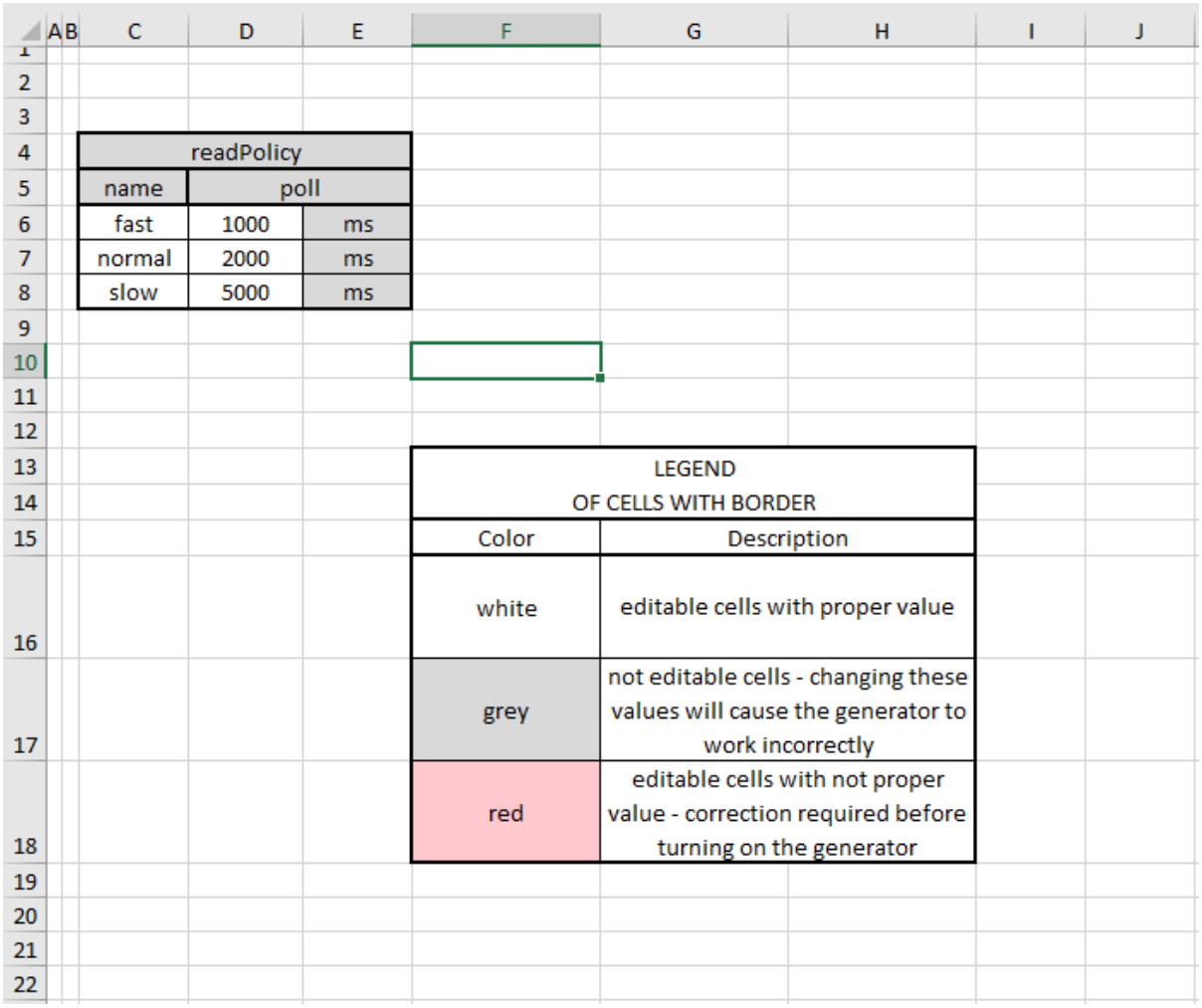
Please also note that if a null value is entered in a predefined field (for example, in the imageContainer row, fileName column, where the picture.png is a default content), then, despite the attention note, the image container will be removed from the visualization.

In further columns, the following parameters can be configured:

- **themeName:** defines a theme used for the web server (themes are configured in the themes sheet);
- **lexicon:** defines a language version used for the web server (translations are configured in the lexicons sheet);
- **clockMode:** defines a clock mode used for the web server;
- **floatSeparator:** defines a separator type used for float values;
- **title:** defines a title displayed as a web page name on a browser's tab;
- **pointRefreshFrequency:** sets a frequency of refreshing points values (frequencies are configured in the network sheet).

6.1.2 network

A network sheet defines values for read polling frequencies for each component visible on the visualization page.



readPolicy		
name	poll	
fast	1000	ms
normal	2000	ms
slow	5000	ms

LEGEND OF CELLS WITH BORDER	
Color	Description
white	editable cells with proper value
grey	not editable cells - changing these values will cause the generator to work incorrectly
red	editable cells with not proper value - correction required before turning on the generator

Figure 21. Network sheet

The default polling values are the following:

- **fast:** 1000 ms;
- **normal:** 2000 ms;
- **slow:** 5000 ms.

The frequency, which is used to read values for points displayed in the visualization page, is determined in the general sheet.

Note: It is not recommended to set the polling frequency faster than 1000 ms (the minimum value possible to set is 200 ms).

6.1.3 numericPoints

A numericPoints sheet lists all numeric points displayed on the visualization page.

	C	D	E	F	G	H	I
2	count	30					
3							
4	numericPoint			label	value		
5	holdingRegister	pointRefreshFrequency	permissionLevel	text	unit	scale	enum
6	1300	normal	100	SensorValue1	%	1	null
7	1301	normal	100	SensorValue2	°C	0,1	null
8	1302	normal	100	SensorValue3	°C	0,1	null
9	1303	normal	100	SensorValue4	°C	0,1	null
10	1304	normal	100	SensorValue5	°C	0,1	null
11	1305	normal	100	SensorValue6	°C	0,1	null
12	1306	normal	100	SensorValue7	°C	0,1	null
13	1307	normal	100	SensorValue8	°C	0,1	null
14	1308	normal	100	SensorValue9	°C	0,1	null
15	1309	normal	100	SensorValue10	°C	0,1	null
16	1310	normal	100	SensorValue11	°C	0,1	null
17	1311	normal	100	SensorValue12	°C	0,1	null
18	1312	normal	100	SensorValue13	°C	0,1	null
19	1313	normal	100	SensorValue14	°C	0,1	null
20	1314	normal	100	SensorValue15	°C	0,1	null
21	1315	normal	100	SensorValue16	°C	0,1	null
22	1316	normal	100	SensorValue17	%	1	null
23	1317	normal	100	SensorValue18	%	1	null
24	1318	normal	100	SensorValue19	%	1	null
25	1319	normal	100	SensorValue20	%	1	null
26	1320	normal	100	SensorValue21	%	1	null
27	1321	normal	100	SensorValue22	%	1	null
28	1322	normal	100	SensorValue23	%	1	null
29	1323	normal	100	SensorValue24	%	1	null
30	1324	normal	100	SensorValue25	%	1	null
31	1325	normal	100	SensorValue26	%	1	null
32	1326	normal	100	SensorValue27	%	1	null
33	1327	normal	100	SensorValue28	%	1	null
34	1328	normal	100	SensorValue29	%	1	null
35	1329	normal	100	SensorValue30	%	1	null
36							

Figure 22. numericPoints sheet

The maximum number of numeric points is set to 30. To set the number of visible numeric points, it is required to fill in the "count" cell. For each point, it is possible to set the following parameters:

- **Modbus holding register:** defines the address of the Modbus holding register for the numeric point;

Note: Please note that, although possible, it is not recommended to change the default addresses of these holding registers. Holding registers are linked to components in the app.sax file. Each change of addresses in the .xlsm file must be synchronized with the application in the iSMA Tool.

- **pointRefreshFrequency:** choosing polling frequency selected from predefined values (fast, normal, slow);
- **label:** text visible displayed on the main visualization page;
- **unit:** unit visible displayed on the main visualization page;
- **scale:** scale of the Modbus holding register for correct reading via Modbus protocol;
- **enum:** enum value displayed in the main visualization page (value defined in the enums sheet).

Example

Modbus holding register cannot read values with decimal places. In order to display values with decimal places on the visualization web server (for example, 21.5°C), it is required to set the scale for reading a Modbus register to 0,1 (the configuration file accepts only a decimal comma separator).

6.1.4 alarmPoints

An alarmPoints sheet lists the alarm points displayed on the visualization page.

	A	B	C	D	E	F	G	H	I	J	K
2			count	16		holdingRegister	1330		pointRefreshFrequency	fast	
3											
4			alarmPoint								
5			label	bitNumber	permissionLevel						
6			AlarmState1	0	100						
7			AlarmState2	1	100						
8			AlarmState3	2	100						
9			AlarmState4	3	100						
10			AlarmState5	4	100						
11			AlarmState6	5	100						
12			AlarmState7	6	100						
13			AlarmState8	7	100						
14			AlarmState9	8	100						
15			AlarmState10	9	100						
16			AlarmState11	10	100						
17			AlarmState12	11	100						
18			AlarmState13	12	100						
19			AlarmState14	13	100						
20			AlarmState15	14	100						
21			AlarmState16	15	100						
22											

Figure 23. alarmPoints sheet

The maximum number of alarm points is set to 16. To set the number of visible displayed number alarm points, fill the "count" cell. All alarm points use 1 holding register. Polling frequency can be set for reading points (fast, normal, slow).
For each point, it is possible to set the following parameters:

- label: text visible displayed on the main visualization page;
- bitNumber: defines a bit of a holding register responsible for each variable in a component.

6.1.5 setPoints

A setPoints sheet lists all setpoints displayed on the visualization page.

2	count	30										
3												
4	setPoint					label	value					
5	setPointType	holdingRegister	pointRefreshFrequency	bitNumber	permissionLevel	text	unit	scale	enum	falseText	trueText	
6	numericSetPoint	1332	normal	null	100	NumSetpoint1	Bar	1	null	null	null	
7	numericSetPoint	1333	normal	null	100	EnumSetpoint1	°C	0,1	null	null	null	
8	numericSetPoint	1334	normal	null	100	EnumSetpoint2	°C	0,1	null	null	null	
9	numericSetPoint	1335	normal	null	100	EnumSetpoint3	°C	0,1	null	null	null	
10	numericSetPoint	1336	normal	null	100	EnumSetpoint4	°C	0,1	null	null	null	
11	numericSetPoint	1337	normal	null	100	NumSetpoint2	°C	0,1	null	null	null	
12	numericSetPoint	1338	normal	null	100	NumSetpoint3	°C	0,1	null	null	null	
13	numericSetPoint	1339	normal	null	100	NumSetpoint4	%	1	null	null	null	
14	numericSetPoint	1340	normal	null	100	NumSetpoint5	%	1	null	null	null	
15	numericSetPoint	1341	normal	null	100	NumSetpoint6	%	1	null	null	null	
16	numericSetPoint	1342	normal	null	100	NumSetpoint7	%	1	null	null	null	
17	numericSetPoint	1343	normal	null	100	NumSetpoint8	%rh	1	null	null	null	
18	numericSetPoint	1344	normal	null	100	NumSetpoint9	%rh	1	null	null	null	
19	numericSetPoint	1345	normal	null	100	NumSetpoint10	%rh	1	null	null	null	
20	numericSetPoint	1346	normal	null	100	NumSetpoint11	%rh	1	null	null	null	
21	booleanSetPoint	1347	fast	0	100	BoolSetpoint1	null	null	null	CLOSE	OPEN	
22	booleanSetPoint	1347	fast	1	100	BoolSetpoint2	null	null	null	STOP	START	
23	booleanSetPoint	1347	fast	2	100	BoolSetpoint3	null	null	null	STOP	START	
24	booleanSetPoint	1347	fast	3	100	BoolSetpoint4	null	null	null	STOP	START	
25	booleanSetPoint	1347	fast	4	100	BoolSetpoint5	null	null	null	STOP	START	
26	booleanSetPoint	1347	fast	5	100	BoolSetpoint6	null	null	null	STOP	START	
27	booleanSetPoint	1347	fast	6	100	BoolSetpoint7	null	null	null	STOP	START	
28	booleanSetPoint	1347	fast	7	100	BoolSetpoint8	null	null	null	STOP	START	
29	booleanSetPoint	1348	fast	0	100	BoolSetpoint9	null	null	null	Off	On	
30	booleanSetPoint	1348	fast	1	100	BoolSetpoint10	null	null	null	Off	On	
31	booleanSetPoint	1348	fast	2	100	BoolSetpoint11	null	null	null	Off	On	
32	booleanSetPoint	1348	fast	3	100	BoolSetpoint12	null	null	null	Off	On	
33	booleanSetPoint	1348	fast	4	100	BoolSetpoint13	null	null	null	Off	On	
34	booleanSetPoint	1348	fast	5	100	BoolSetpoint14	null	null	null	Off	On	
35	booleanSetPoint	1348	fast	6	100	BoolSetpoint15	null	null	null	Off	On	
36												

Figure 24. setPoints sheet

The maximum number of all setpoints is 30, no matter what type of variables is used (numeric, Boolean, or enum setpoint). To set the number of displayed setpoints, fill in the "count" cell.
For numeric and Boolean setpoints, it is possible to set the following parameters:

- **setpointType:** defines a type of component used for setpoints (numeric or Boolean);
- **Modbus holdingRegister:** defines the address of the Modbus holding register used in the iSMA Tool application;.
- **pointRefreshFrequency:** polling frequency selected from pre-defined values (fast, normal, slow);
- **label:** text displayed on the main visualization page.

In order to use numeric setpoints, set the additional parameters:

- **unit:** unit displayed on the main visualization page;
- **scale:** scale of the Modbus holding register for correct reading via Modbus protocol;

or

- **enum:** enum value defined in the enums sheet, disyplayed on the main visualization page.

For numeric setpoints, the bitNumber, falseText, and trueText cells have to be left with a null value. Also, if the numeric setpoint is to show enum values, the unit and scale fields have to be left with a null value too.
In order to use Boolean setpoints, set the additional parameters:

- **bitNumber:** defines a bit of the holding register responsible for each variable in a component;
- **falseText:** text displayed for a false (0) value;
- **trueText:** text displayed for a true (1) value.

For Boolean setpoints, the unit, scale, and enum cells have to be left with a null value.

Warning!

The maximum number of setpoints types is set to 30. Please make sure that the combined numbers of Boolean and numeric setpoints do not exceed 30.

6.1.6 statusPoints

A statusPoints sheet lists the status points displayed on the visualization page.

	C	D	E	F	G	H	I	J
2	count	16		holdingRegister	1331		pointRefreshFrequency	fast
3								
4	statusPoint							
5	label	bitNumber	permissionLevel					
6	StatusState1	0	100					
7	StatusState2	1	100					
8	StatusState3	2	100					
9	StatusState4	3	100					
10	StatusState5	4	100					
11	StatusState6	5	100					
12	StatusState7	6	100					
13	StatusState8	7	100					
14	StatusState9	8	100					
15	StatusState10	9	100					
16	StatusState11	10	100					
17	StatusState12	11	100					
18	StatusState13	12	100					
19	StatusState14	13	100					
20	StatusState15	14	100					
21	StatusState16	15	100					
22								
23								

Figure 25. statusPoints sheet

The maximum number of status points is set to 16. To set the number of visible displayed number status points, fill the "count" cell. All status points use 1 holding register. Polling frequency can be set for reading points (fast, normal, slow).
For each point, it is possible to set the following parameters:

- **label:** text visible displayed on the main visualization page;
- **bitNumber:** defines a bit of a holding register responsible for each variable in a component.

6.1.7 schedulers

A schedulers sheet allows to configure schedules displayed in the visualization web server.

	C	D	E	F	G	H	I	J	K	L	M	N
2	count	4		pointRefreshFrequency	fast							
3												
4	button	scheduler					value					
5	label	fileName	webTitle	topTextContainerLabel	startingHoldingRegister	permissionLevel	unit	scale	enum	falseText	trueText	
6	Schedule 1	schedule1	iSMA-B-AAC20 Schedule 1	Schedule 1	2000	100	°C	0,1	null	null	null	
7	Schedule 2	schedule2	iSMA-B-AAC20 Schedule 2	Schedule 2	2200	100	null	null	occupancyMo	null	null	
8	Schedule 3	schedule3	iSMA-B-AAC20 Schedule 3	Schedule 3	2400	100	null	null	null	Stop	Start	
9	Schedule 4	schedule4	iSMA-B-AAC20 Schedule 4	Schedule 4	2500	100	null	null	null	Stop	Start	
10												

Figure 26. schedulers sheet

It is possible to configure up to 4 schedules; in order to set the number of displayed schedules, fill in the "count" cell. Polling frequency can be set in the pointRefreshFrequecy field.

For each schedule, it is possible to set the following parameters:

- **label:** sets a text displayed on a schedule's button on the main page;
- **webTitle:** sets a text displayed on a sheet in a browser;
- **topTextContainerLabel:** sets a text displays on top of a page of each schedule in the web server;
- **startingHoldingRegister:** sets an address of a starting holding register for each schedule (accepts only decimal addresses in a range of 1000-2999);

For numeric schedules, set the additional parameters:

- **unit:** unit displayed on the main visualization page;
- **scale:** scale of the Modbus holding register for correct reading via Modbus protocol

or

- **enum:** enum value defined in the enums sheet, disyplayed on the main visualization page.

For numeric schedules, the falseText and trueText cells have to be left with a null value. Also, if the numeric schedule is to show enum values, the unit and scale fields have to be left with a null value too.
For Boolean schedules, set the additional parameters:

- **falseText:** text displayed for a false (0) value;
- **trueText:** text displayed for a true (1) value.

For Boolean schedules, the unit, scale, and enum cells have to be left with a null value.

6.1.8 enums

An enums sheet allows to define enum variables that can be used for specifying numeric points, setpoints, and schedules.

	enum		item		item		item		item		item		item		item		item	
	id	name	value	label	value	label	value	label	value	label	value	label	value	label	value	label	value	label
6	1	fanMode	0	off	1	speed1	2	speed2	3	speed3	4	auto						
7	2	fanStatus	0	off	1	speed1Manual	2	speed2Manual	3	speed3Manual	4	speed1Auto	5	speed2Auto	6	speed3Auto		
8	3	occupancyMode	0	unoccupied	1	occupied	2	standby										
9	4	fcuMode	0	off	1	auto	2	heatingOnly	3	coolingOnly	4	fanOnly						
10	5	controlMode	1	auto	2	manual	3	scheduler										
11																		
12	null	null	null	null	null	null	null	null	null	null	null	null	null	null	null	null	null	null

Figure 27. enums sheet

First two columns are designed to define the number and name of enum variables:

- **id:** identification number of the enum variable;
- **name:** label of the enum variable.

Next columns, titled 'item', are designed to store values, which are listed for each enum variable in a form of a drop-down list in the visualization web server view.

Each 'item' pair of columns consist of the following columns:

- **value:** numeric value to be represented with a label in the visualization web server view;
- **label:** text value representing a defined numeric value.

By default, 5 enum variables, typical for FCU applications, are predefined in the visualization configurator files.

6.1.9 lexicons

A lexicons sheet allows to enter translations to display the web server in various language versions.

language	translations										
name	day1	day2	day3	day4	day5	day6	day7	contextMenuAdd	contextMenuEdit	contextMenuCopyDay	contextMenuPasteDay
english	MONDAY	THUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY	Add event	Edit event	Copy day	Paste day
polish	PONIEDZIAŁEK	WTOREK	ŚRODA	CZWARTEK	PIĄTEK	SOBOTA	NIEDZIELA	Dodaj zdarzenie	Edytuj zdarzenie	Kopiuj dzień	Wklej dzień
italiano	LUNEDI	MARTEDI	MERCOLEDI	GIOVEDI	VENERDI	SABATO	DOMENICA	Aggiungi evento	Modifica evento	Copia giorno	Incolla giorno

Figure 28. lexicons sheet

The lexicons table allows to define a language of a translation in a first column. Following columns identify web server fields which names can be translated to different language. Each row contains translation to one language. It is possible to introduce an unlimited number of languages and translations.

Note: All translated terms have to be put in one row, which refers to a language defined in the first column.

The language used in the web server is defined in the general sheet.

6.1.10 themes

A themes sheet allows to configure variants of the web server's appearance.

theme	body												
name	general	logoContainer	topTextContainer	dateTimeContainer	setPointsHeaderContainer	setPointsContainer	numericPointsHeaderContainer	numericPointsContainer	statusPointsHeaderContainer	statusPointsContainer	imageContainer	alarmPointsHead
dark	example	example	example	example	example	example	example	example	example	example	example	example
light	example	example	example	example	example	example	example	example	example	example	example	example

LEGEND	
attribute	Description
name (column C)	Name will be identifier of a theme. Enter here text only. Don't use special chars and spaces. Don't start with a number.
transparent color	Put "no color" into cell.
example text	Put any text (e.g. any your own text instead "example" to verify look of your theme.
size of cells	You can freely resize columns and rows it doesn't affect into theme configuration.
headers (rows 4 and 5)	Do not edit rows 4 and 5, it could cause the generator to work incorrectly!

Figure 29. themes sheet

The themes table allows to define the following parameters of the appearance of each component identified in the table's header:

- background color;
- font color;
- font size;
- font name;
- font weight;
- font style.

Note: To define the above formats, please use the Excel font options on a ribbon, except for cell borders.

First column defines names of themes. Following columns define formatting for web server containers identified in a second top row. Each row contains formatting defined for a separate theme (here: default, light). It is possible to introduce an unlimited number of themes.

Note: All formatting for one theme has to be put in one row, which refers to the theme defined in the first column.

A theme of the web server is selected in the general sheet.

7 Web Users

Logging into the visualization web server requires setting up dedicated web users in the User Manager view. By default, one user is pre-installed in the users service:

- username: user
- password: 1357

7.1 Adding and Managing Web Users

The User Manager view (users service in the Workspace Tree) allows adding new web users, setting their permission levels, changing passwords, and removing. The bottom window of the User Manager view is the Web Users view. Web users are designed to log in to the AAC20 visualization web server.

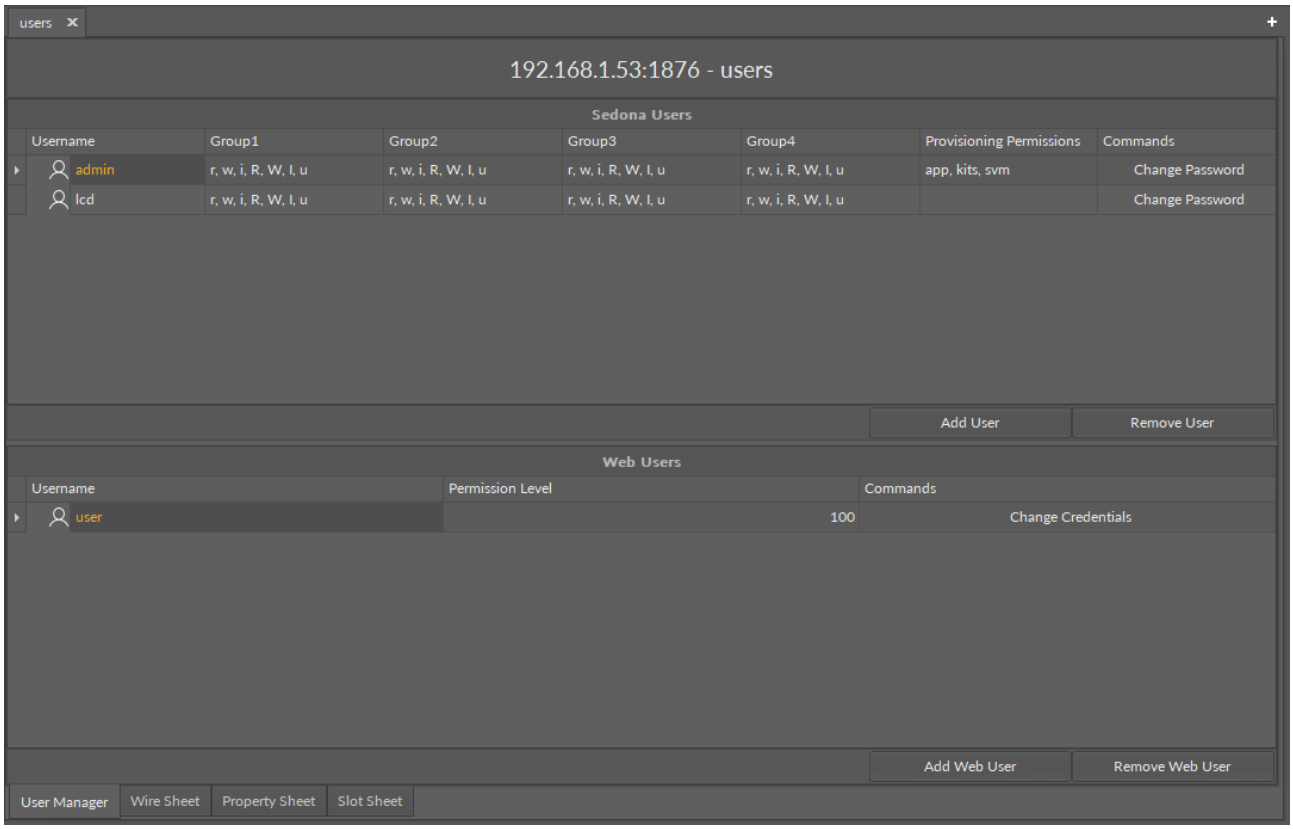


Figure 30. User Manager

The view has 3 columns:

- Username: displays a username of the web user;
- Permission Level: allows to set a permission level for the user;

Note: The permission level of the user is correlated with the permission level of schedules determined in the Visualization_configurator.xlsm file. If the user's permission level is lower than the schedule's required level of permissions, the schedule will not be displayed for this user after logging in to the visualization web server.

- Commends: allows to set new credentials for a user.

Note: In order to change a username, it is required to change password at the same time too.

7.1.1 Adding

To add new web user, press the Add web user button in the right bottom corner of the view. It is possible to add up to 10 web users with different permission levels.

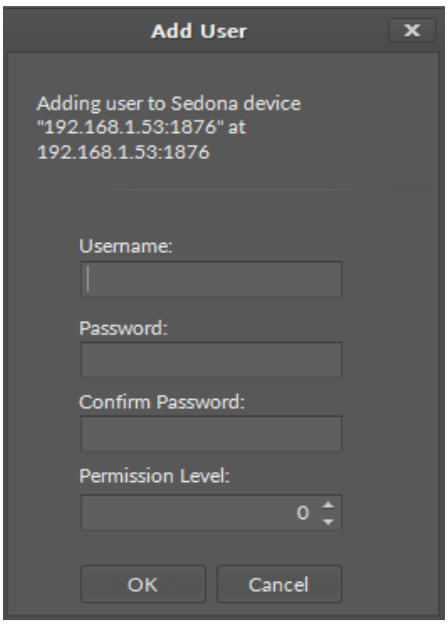


Figure 31. Dialog window for adding web user

Set the user's username, password, and permission level. Confirm with OK.

7.1.2 Changing Credentials

To change the web user's credentials, press the Change Credentials button in the Web Users view:

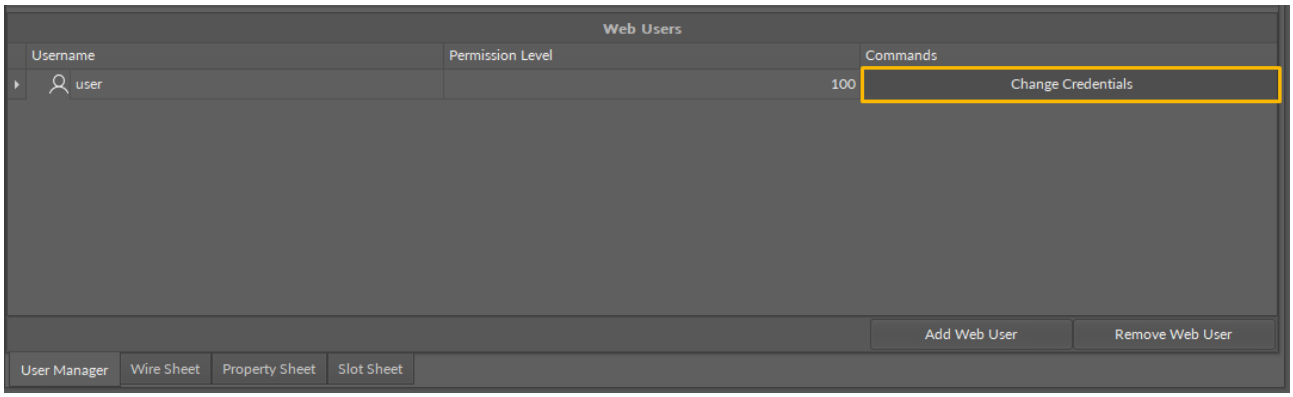


Figure 32. Changing credentials option

Note: In order to change a username, it is required to change password at the same time too.

7.1.3 Removing

To remove the web user, press the Remove Web User button in the Web Users view and confirm with OK:

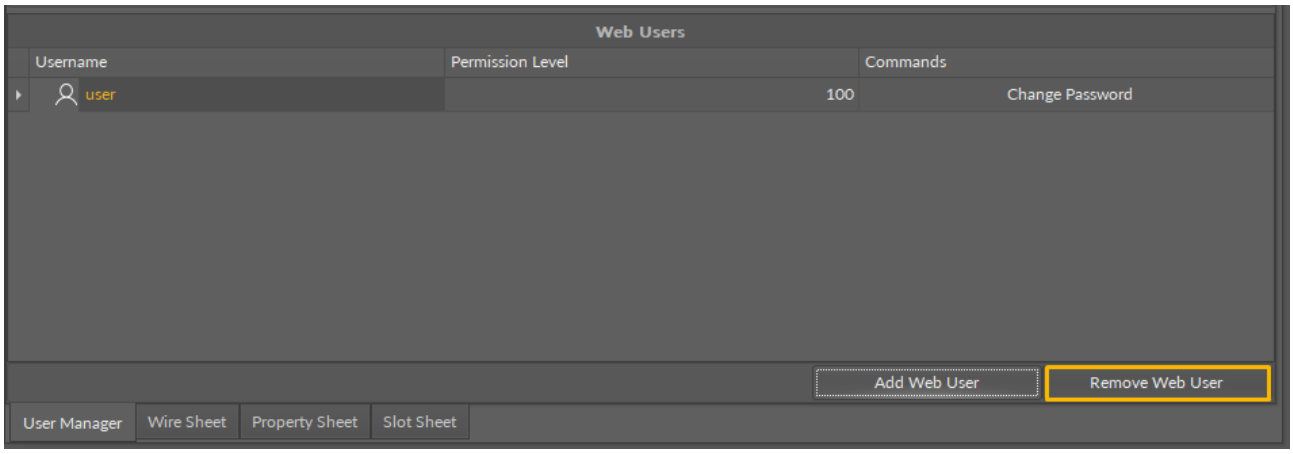


Figure 33. Removing web user

8 Logging in

There are two ways to log in to the visualization web server: manual and autologin.

8.1 Manual Login

In order to log in to the graphic visualization in the iSMA-B-AAC20, insert the controller's IP address in the URL field of an Internet browser (preferably, Google Chrome), click 'Enter', and wait until the login site loads.

When the login site is up, introduce the credentials, and click Login. Default credentials are:

- login: user
- password: 1357

Having properly logged in, the Internet browser redirects to the index.html file.

Warning!

If the index.html file has not been loaded to the flash memory of the controller, the web server will not load.

Warning!

If, after logging in to graphics the visualization web server, the web page in the Internet browser takes longer than few seconds to load (the web page is still, and the spinning wheel is active), then duplicate the tab, which makes the web page to fully load.

8.2 Setting Autologin to Graphics

To set automatic logging in to own graphics, in the application, go to the iC Tool, then to 'app/service/plat', and change the 'Web autologin' slot to true.

Warning!

Please remember that if the 'Web autologin' slot is set to true, then each attempt to log out of the graphics causes the web page to immediately log back in.

Warning!

The option available from the 5.7 firmware.

9 View

9.1 Main View

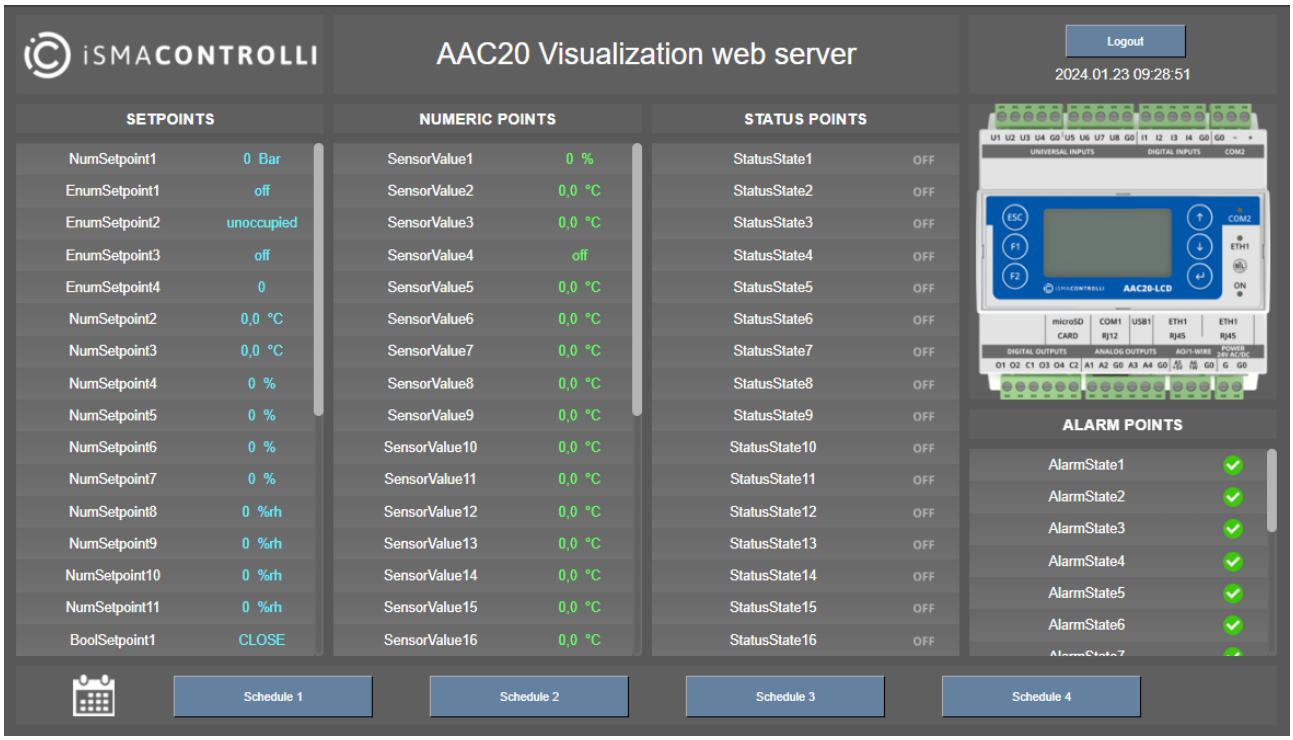


Figure 34. The visualization web server main view

The main view of the visualization web server displays the following items:

- logo;
- heading (top text);
- logout button;
- device image;
- points current values;
- schedules buttons.

All of these items can be configured in the Visualization_configurator.xlsm file.

In the main view of the visualization web server, it is possible to edit setpoints values by clicking a value itself.

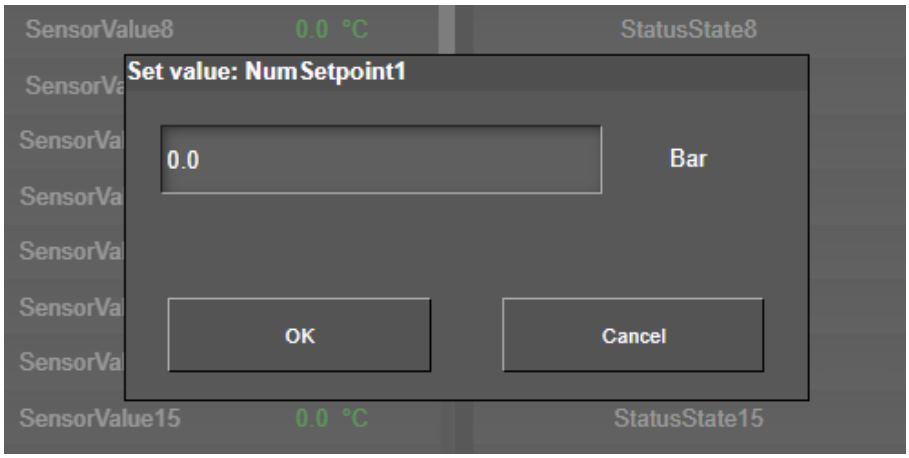


Figure 35. Setpoint edition dialog window

A pop-up window allows to enter a new setpoint value in units set in the configuration file for the selected setpoint. To confirm the new value, confirm with OK. The edited valued is automatically updated in the iSMA Tool.

9.2 Schedules View

Pressing a schedule button in the main view changes it to the schedule view. In order to exit the schedule view, click the arrow button left to days of week.

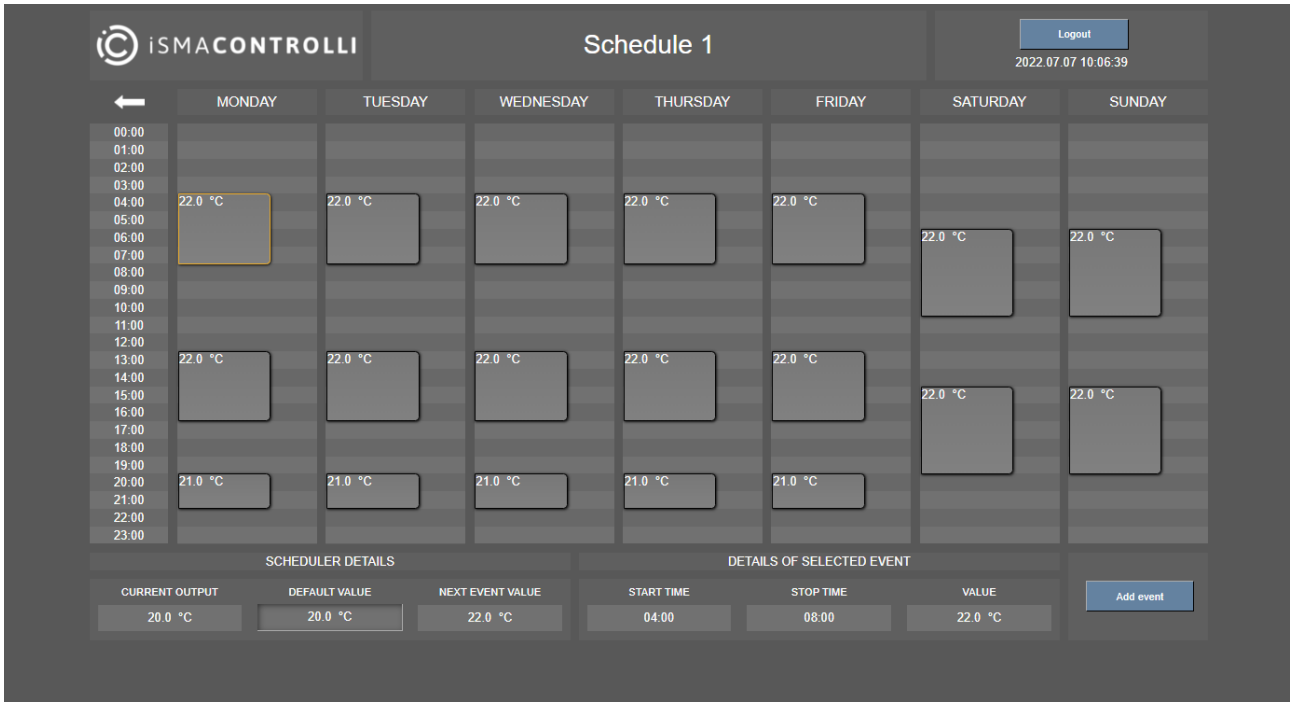


Figure 36. The Schedule 1 view

The schedule view displays a weekly view of events per 24 hours. The view is fully editable in terms of adding, editing, copying/pasting, and removing events.

9.2.1 Context Menu

All options available for events in a schedule are listed in a context menu (adding an events is also available using a button in bottom right corner of the view).

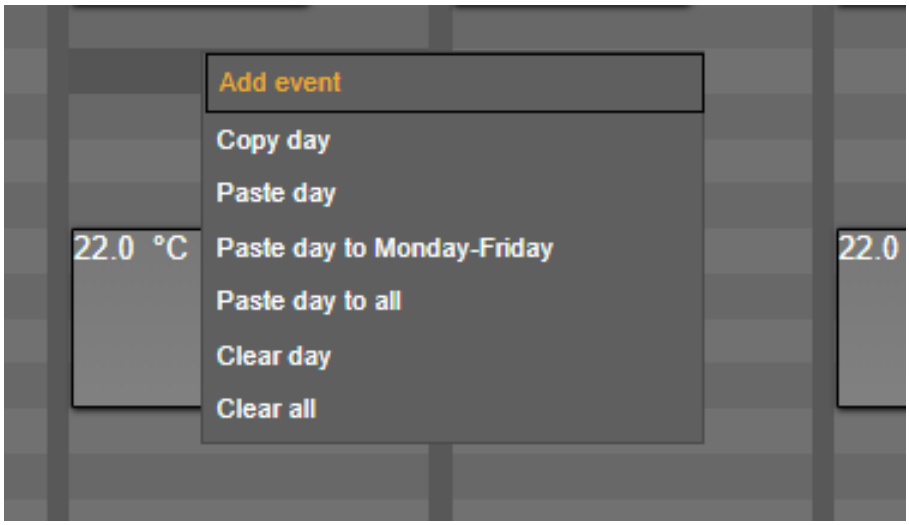


Figure 37. Schedules context menu

- Add event

Selecting an Add event option, a dialog window pops up:

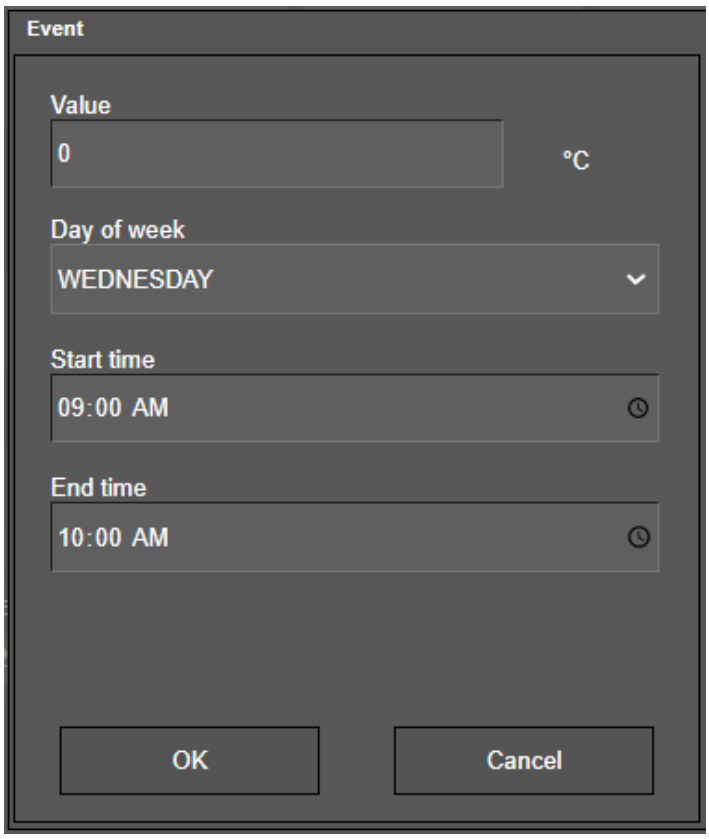


Figure 38. Event dialog window

The dialog window allows to set the event's current value, day of week, and time. Confirm with OK to add the event.

- Copy/paste

The context menu includes options for copying and pasting events for selected days:

Context Menu Option	Function
Copy day	Copies all events from a selected day
Paste day	Pastes all copied events to a selected day (clears any other events set for the day)
Paste day to Monday-Friday	Pastes all events from a day, which the context menu is invoked for, to Monday, Tuesday, Wednesday, Thursday, Friday (clears any other events set for the days)
Paste day to all	Pastes all events from a day, which the context menu is invoked for, to a whole week (clears any other events set for the days)

Table 2. Copy/paste options

- Clear day

Removes all events set for the day.

- Clear all

Removes all events set in the schedule.

Context Menu for a Selected Event

The context menu for a specific event differs only in two options: the Add event option is replaced by the Edit event option and the Remove event option is added. All other options have the same functions.

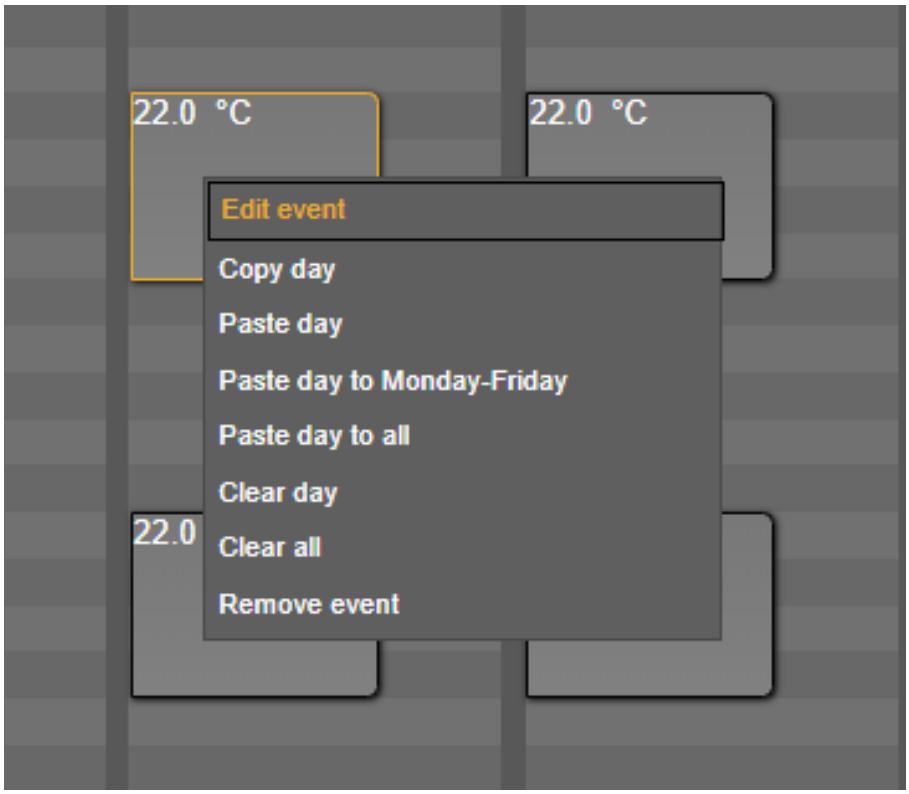


Figure 39. Context menu for a specific event

- Edit event

Editing of an event is carries out in a pop-up window, which shows the same fields as for the Add event option but with the event's values. It is possible to edit a current value of the event, day of week, and time.

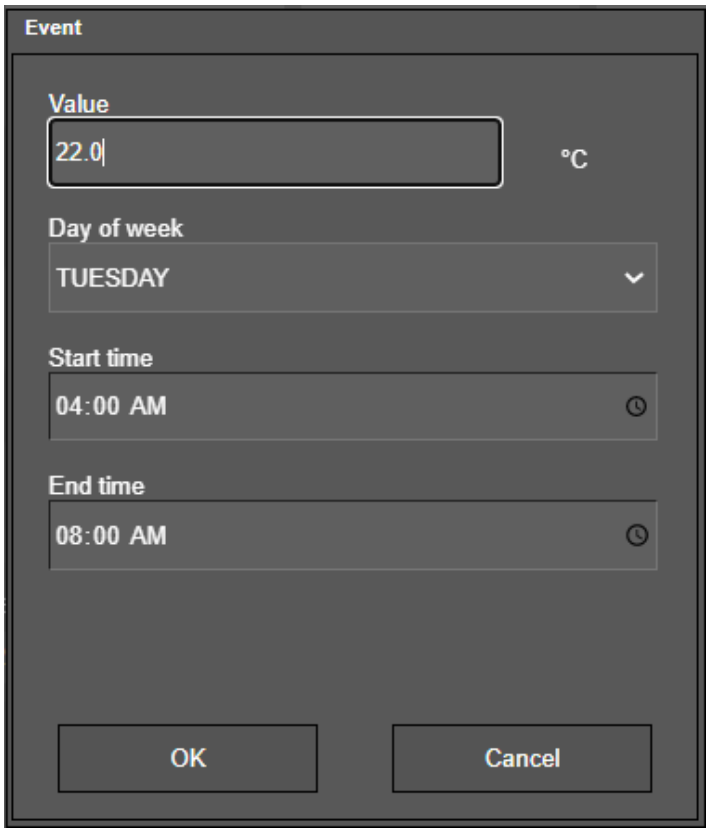


Figure 40. Editing of event dialog window

- Remove event

Deletes a selected event.

9.3 Displaying the Visualization Web Server on Various Devices

The visualization web server is automatically fitted to PC's resolution (fixed resolution 1280x720). However, to correctly display the web server on other devices (e.g., panels), it may be required to change the resolution of display.

9.3.1 Industrial PC Panel 7" (iSMA-D-PA7C-B1)

To fit the visualization web server size to the Industrial PC panel 7", it is required to change the dpi settings to lower than the default value:

- go to the panel's settings;
- select OtherSettings;
- select settingDpi;
- set value lower than the default value, for example, 120 dpi.

10 List of Modbus Registers

Warning!

The following registers are applicable to a demo application.
Please note that the visualization web server accepts Modbus addresses from a range of 1000-2999.

10.1 Numeric Points Registers

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
41301	1300	514	SensorValue1	Read/write	Value read from the sensor no. 1
41302	1301	515	SensorValue2	Read/write	Value read from the sensor no. 2
41303	1302	516	SensorValue3	Read/write	Value read from the sensor no. 3
41304	1303	517	SensorValue4	Read/write	Value read from the sensor no. 4
41305	1304	518	SensorValue5	Read/write	Value read from the sensor no. 5
41306	1305	519	SensorValue6	Read/write	Value read from the sensor no. 6
41307	1306	51A	SensorValue7	Read/write	Value read from the sensor no. 7
41308	1307	51B	SensorValue8	Read/write	Value read from the sensor no. 8
41309	1308	51C	SensorValue9	Read/write	Value read from the sensor no. 9
41310	1309	51D	SensorValue10	Read/write	Value read from the sensor no. 10
41311	1310	51E	SensorValue11	Read/write	Value read from the sensor no. 11
41312	1311	51F	SensorValue12	Read/write	Value read from the sensor no. 12
41313	1312	520	SensorValue13	Read/write	Value read from the sensor no. 13
41314	1313	521	SensorValue14	Read/write	Value read from the sensor no. 14

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
41315	1314	522	SensorValue15	Read/write	Value read from the sensor no. 15
41316	1315	523	SensorValue16	Read/write	Value read from the sensor no. 16
41317	1316	524	SensorValue17	Read/write	Value read from the sensor no. 17
41318	1317	525	SensorValue18	Read/write	Value read from the sensor no. 18
41319	1318	526	SensorValue19	Read/write	Value read from the sensor no. 19
41320	1319	527	SensorValue20	Read/write	Value read from the sensor no. 20
41321	1320	528	SensorValue21	Read/write	Value read from the sensor no. 21
41322	1321	529	SensorValue22	Read/write	Value read from the sensor no. 22
41323	1322	52A	SensorValue23	Read/write	Value read from the sensor no. 23
41324	1323	52B	SensorValue24	Read/write	Value read from the sensor no. 24
41325	1324	52C	SensorValue25	Read/write	Value read from the sensor no. 25
41326	1325	52D	SensorValue26	Read/write	Value read from the sensor no. 26
41327	1326	52E	SensorValue27	Read/write	Value read from the sensor no. 27
41328	1327	52F	SensorValue28	Read/write	Value read from the sensor no. 28
41329	1328	530	SensorValue29	Read/write	Value read from the sensor no. 29
41330	1329	531	SensorValue30	Read/write	Value read from the sensor no. 30

Table 3. List of numeric points Modbus registers

10.2 Alarm Points Register

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
41331	1330, bit 0	532	AlarmState1	Read/write	State of the alarm point no. 1
41331	1330, bit 1	532	AlarmState2	Read/write	State of the alarm point no. 2
41331	1330, bit 2	532	AlarmState3	Read/write	State of the alarm point no. 3
41331	1330, bit 3	532	AlarmState4	Read/write	State of the alarm point no. 4
41331	1330, bit 4	532	AlarmState5	Read/write	State of the alarm point no. 5
41331	1330, bit 5	532	AlarmState6	Read/write	State of the alarm point no. 6
41331	1330, bit 6	532	AlarmState7	Read/write	State of the alarm point no. 7
41331	1330, bit 7	532	AlarmState8	Read/write	State of the alarm point no. 8
41331	1330, bit 8	532	AlarmState9	Read/write	State of the alarm point no. 9
41331	1330, bit 9	532	AlarmState10	Read/write	State of the alarm point no. 10
41331	1330, bit 10	532	AlarmState11	Read/write	State of the alarm point no. 11
41331	1330, bit 11	532	AlarmState12	Read/write	State of the alarm point no. 12
41331	1330, bit 12	532	AlarmState13	Read/write	State of the alarm point no. 13
41331	1330, bit 13	532	AlarmState14	Read/write	State of the alarm point no. 14
41331	1330, bit 14	532	AlarmState15	Read/write	State of the alarm point no. 15
41331	1330, bit 15	532	AlarmState16	Read/write	State of the alarm point no. 16

Table 4. List of alarm points Modbus registers

10.3 Status Points Register

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
41332	1331, bit 0	533	StatusState1	Read/write	State of the status point no. 1
41332	1331, bit 1	533	StatusState2	Read/write	State of the status point no. 2
41332	1331, bit 2	533	StatusState3	Read/write	State of the status point no. 3
41332	1331, bit 3	533	StatusState4	Read/write	State of the status point no. 4
41332	1331, bit 4	533	StatusState5	Read/write	State of the status point no. 5
41332	1331, bit 5	533	StatusState6	Read/write	State of the status point no. 6
41332	1331, bit 6	533	StatusState7	Read/write	State of the status point no. 7
41332	1331, bit 7	533	StatusState8	Read/write	State of the status point no. 8
41332	1331, bit 8	533	StatusState9	Read/write	State of the status point no. 9
41332	1331, bit 9	533	StatusState10	Read/write	State of the status point no. 10
41332	1331, bit 10	533	StatusState11	Read/write	State of the status point no. 11
41332	1331, bit 11	533	StatusState12	Read/write	State of the status point no. 12
41332	1331, bit 12	533	StatusState13	Read/write	State of the status point no. 13
41332	1331, bit 13	533	StatusState14	Read/write	State of the status point no. 14
41332	1331, bit 14	533	StatusState15	Read/write	State of the status point no. 15
41332	1331, bit 15	533	StatusState16	Read/write	State of the status point no. 16

Table 5. List of status points Modbus registers

10.4 Numeric Setpoint Registers

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
41333	1332	534	NumSetpoint1	Read/write	Value of the numeric setpoint no. 1
41334	1333	535	NumSetpoint2	Read/write	Value of the numeric setpoint no. 2
41335	1334	536	NumSetpoint3	Read/write	Value of the numeric setpoint no. 3
41336	1335	537	NumSetpoint4	Read/write	Value of the numeric setpoint no. 4
41337	1336	538	NumSetpoint5	Read/write	Value of the numeric setpoint no. 5
41338	1337	539	NumSetpoint6	Read/write	Value of the numeric setpoint no. 6
41339	1338	53A	NumSetpoint7	Read/write	Value of the numeric setpoint no. 7
41340	1339	53B	NumSetpoint8	Read/write	Value of the numeric setpoint no. 8
41341	1340	53C	NumSetpoint9	Read/write	Value of the numeric setpoint no. 9
41342	1341	53D	NumSetpoint10	Read/write	Value of the numeric setpoint no. 10
41343	1342	53E	NumSetpoint11	Read/write	Value of the numeric setpoint no. 11
41344	1343	53F	NumSetpoint12	Read/write	Value of the numeric setpoint no. 12
41345	1344	540	NumSetpoint13	Read/write	Value of the numeric setpoint no. 13
41346	1345	541	NumSetpoint14	Read/write	Value of the numeric setpoint no. 14
41347	1346	542	NumSetpoint15	Read/write	Value of the numeric setpoint no. 15

Table 6. List of numeric setpoints Modbus registers

10.5 Boolean Setpoint Register

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
41348	1347, bit 0	543	BoolSetpoint1	Read/write	Value of the Boolean setpoint no. 1
41348	1347, bit 1	543	BoolSetpoint2	Read/write	Value of the Boolean setpoint no. 2
41348	1347, bit 2	543	BoolSetpoint3	Read/write	Value of the Boolean setpoint no. 3
41348	1347, bit 3	543	BoolSetpoint4	Read/write	Value of the Boolean setpoint no. 4
41348	1347, bit 4	543	BoolSetpoint5	Read/write	Value of the Boolean setpoint no. 5
41348	1347, bit 5	543	BoolSetpoint6	Read/write	Value of the Boolean setpoint no. 6
41348	1347, bit 6	543	BoolSetpoint7	Read/write	Value of the Boolean setpoint no. 7
41348	1347, bit 7	543	BoolSetpoint8	Read/write	Value of the Boolean setpoint no. 8
41349	1348, bit 0	544	BoolSetpoint9	Read/write	Value of the Boolean setpoint no. 9
41349	1348, bit 1	544	BoolSetpoint10	Read/write	Value of the Boolean setpoint no. 10
41349	1348, bit 2	544	BoolSetpoint11	Read/write	Value of the Boolean setpoint no. 11
41349	1348, bit 3	544	BoolSetpoint12	Read/write	Value of the Boolean setpoint no. 12
41349	1348, bit 4	544	BoolSetpoint13	Read/write	Value of the Boolean setpoint no. 13
41349	1348, bit 5	544	BoolSetpoint14	Read/write	Value of the Boolean setpoint no. 14
41349	1348, bit 6	544	BoolSetpoint15	Read/write	Value of the Boolean setpoint no. 15

Table 7. List of Boolean setpoints Modbus registers

10.6 Schedules Registers

Modbus Address	Decimal Address	Hex Address	Register Name	Access	Description
42001-42116	2000-2115	7D0-843	ModbusNumericSchedule1	Read/write	Value of the numeric schedule no. 1
42201	2200-2315	898-90B	ModbusNumericSchedule2	Read/write	Value of the numeric schedule no. 2
42401-42457	2400-2456	960-998	ModbusBooleanSchedule3	Read/write	Value of the Boolean schedule no. 3
42501-42557	2500-2556	9C4-9FC	ModbusBooleanSchedule4	Read/write	Value of the Boolean schedule no. 4

Table 8. List of schedules Modbus registers