®

TeslaSCADA2 IDE User manual

Version of TeslaScada IDE: 2.62

1 About TeslaSCADA IDE

TeslaSCADA IDE is an integrated development environment used for con?guring, developing and managing HMI/SCADA applications. In this manual you will ?nd everything you need to create a full-featured SCADA (Supervisory Control and Data Acquisition) project visualization. With this tool you can create and manage TeslaSCADA projects, con?gure connections with devices, enter tags, alarms, and trends.

A simple to use interface allows for easy manipulation of the project's con?guration and data processing. The project data are stored in a single ?le (based on xml) for easy backup and restoration.

TeslaSCADA IDE has an integrated GUI (Graphical User Interface) visualization editor for easy creation of professionally looking graphics.

Main features of TeslaSCADA projects

- Use on MacOS, Windows, Linux, Android and iOS.
- Supports many industrial protocols - Modbus RTU and TCP(UDP), Siemens ISO/TCP, Ethernet/IP, Omron FINS/TCP(UDP) devices, OPC UA and MQTT servers.
- Lots of graphical objects for developing screens.
- Supports user-defined images in *.png, *.jpg and *.gif format.
- Supports creating group objects.
- Supports scripts based on FBD and ST language.
- Supports events. Use SQL Lite or MySQL databases to store tag's event information.
- Supports event notifications by E-mail, Telegram messenger and third part HTTP services.
- Supports history. Use SQL Lite or MySQL databases to store tag's history information.
- Configure user permissions.
- Web-server.
- Report system in Excel.
- Direct printing reports.
- Supports Import/Export screens, tags (including excel format), scripts.
- Supports touch panel.
- Supports sound notification on alerts.

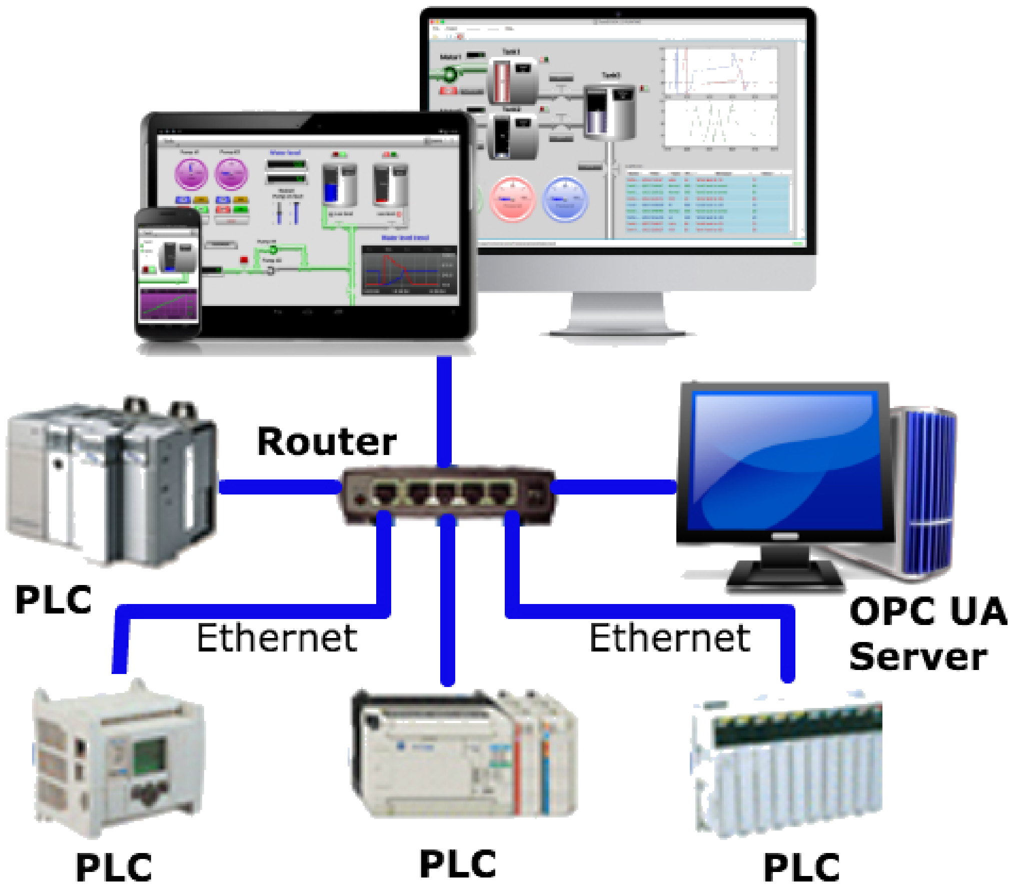
Also information about TeslaSCADA2 you can find on our site: https://teslascada.com/products/teslascada2

There are 2 possible ways to use TeslaSCADA:

- Direct architecture 12.
- Client-server architecture 12.

1.1 Direct architecture

In the simplest process control system based on TeslaSCADA, every device (computer or mobile) is, in fact, a server, since it reads and writes tag values from/to devices, works with a database, etc.

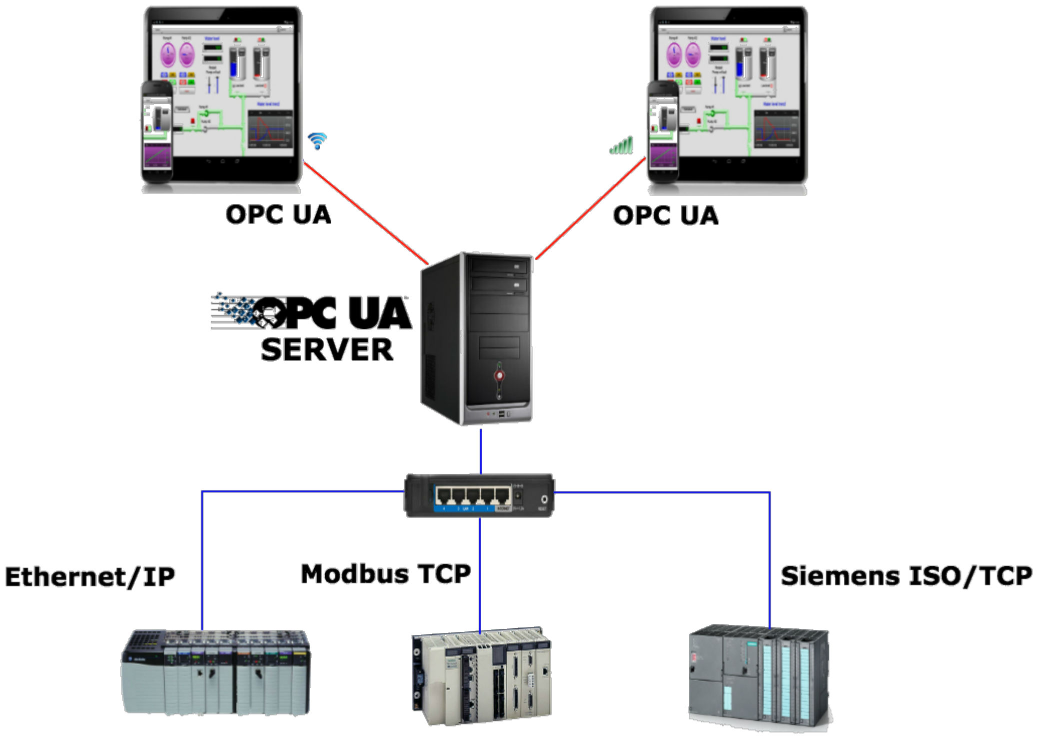


The advantage of this architecture is that there is no need to use some intermediate device for the server. All connections are made directly to industrial devices and servers. A PC or mobile device can be used as an HMI.

The disadvantages of such a system are that with a large number of devices (PCs and mobiles) with TeslaSCADA, there is a load on the controller, the exchange of data when communicating with the controllers is via an unencrypted channel, and all the necessary calculations in scripts are carried out on each device.

1.2 Client-Server architecture

If your process control system is large and you want to use many devices (PC or mobile) with TeslaSCADA for display and control You can use Client-Server architecture:



A built-in (or third-party) OPC UA server or built-in HTTP-server or a third-party MQTT broker can be used as a server.

The advantage of this architecture is to reduce the load on the controller when using a large number of devices with TeslaSCADA, encryption when exchanging data with the server (especially important for mobile devices used remotely) and the ability to perform all calculations on the server.

The disadvantage of this architecture is the need to use an intermediate device with an installed OPC UA server, HTTP-server or MQTT broker.

2 System requirements

TeslaSCADA IDE requires Windows, Mac OS or Linux operating systems.

2.1 Windows

Processors: Intel Pentium 4, Intel Centrino, Intel Xeon, or Intel Core Duo (or compatible) 1.8 GHz minimum.
Operating systems: Windows 10, Windows 8 (Modern UI (i.e. Metro Mode) is not supported), Windows 7, Windows Vista, Windows XP (not recommended but supported).
Memory: 1 GB (2 GB recommended).
Disk Space: 2 GB of free disk space (4 GB of free disk space).

2.2 MacOS

Processors: Dual-Core Intel, PowerPC G5
Operating systems: 10.7.3 or greater
Memory: 1 GB (2 GB recommended).
Disk Space: 2 GB of free disk space (4 GB of free disk space).

2.3 Linux

Processors: Intel Pentium 4, Intel Centrino, Intel Xeon, or Intel Core Duo (or compatible) 1.8 GHz minimum.
Operating systems: Ubuntu 10.4 + gtk2 2.18+ Memory: 1 GB (2 GB recommended).
Disk Space: 2 GB of free disk space (4 GB of free disk space).
Media: You must install the following in order to support AAC audio, MP3 audio, H.264 video, and HTTP Live Streaming:
libavcodec52 and libavformat52 on Ubuntu Linux 10.04, 10.10, 11.04 or equivalent.
libavcodec53 and libavformat53 on Ubuntu Linux 11.10, 12.04 or equivalent.

Important! We've tested Linux version only on Ubuntu 14, Ubuntu 20, РЕД ОС and Astra Linux (Orel) OS. Unfortunately we didn't test it on other Linux OS.

2.4 Raspberry PI

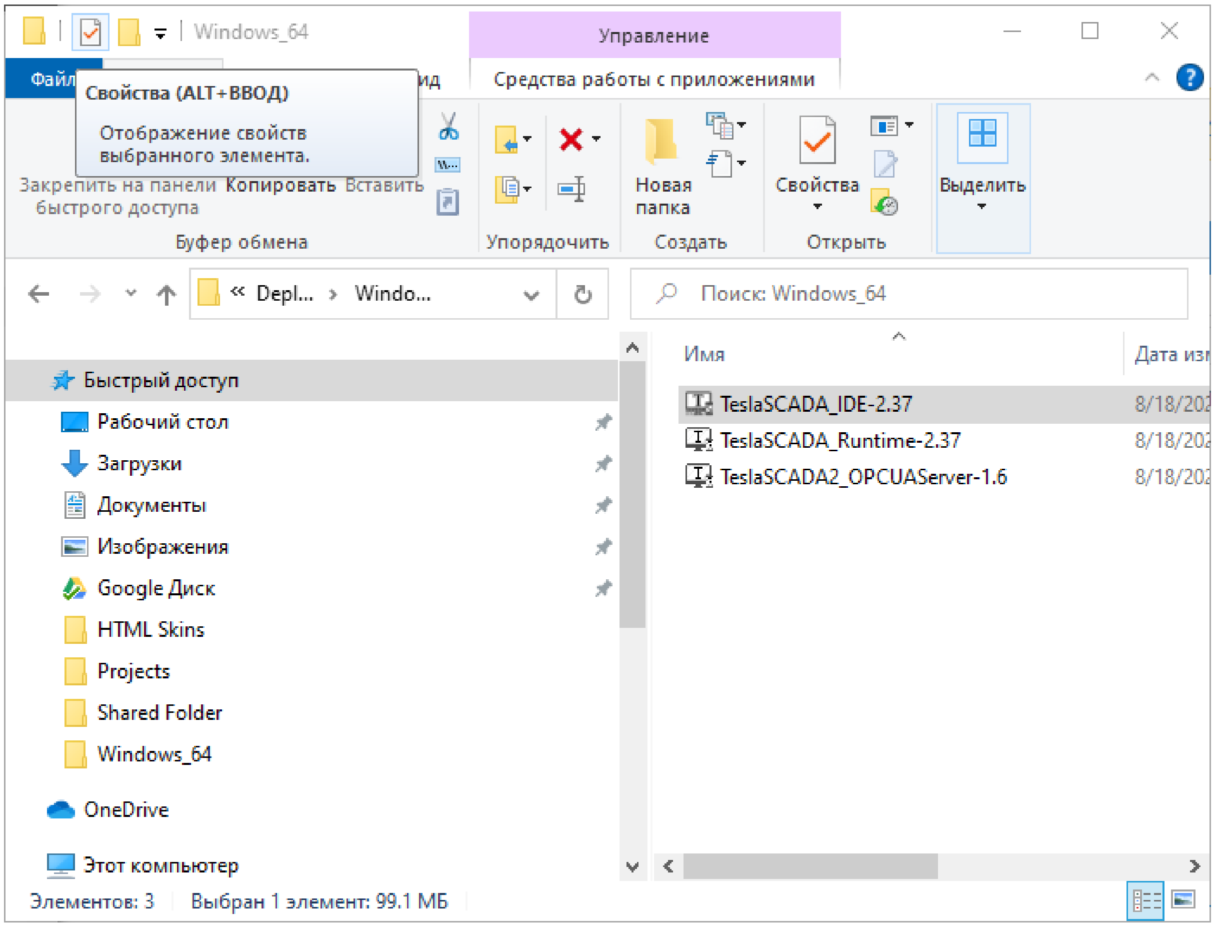
Processors: processors on Raspberry PI 3,4
Operating systems: Raspbian
Memory: 1 GB (2 GB recommended).
Disc Space: 2 GB of free disc space (4 GB of free disc space).

3 Installation

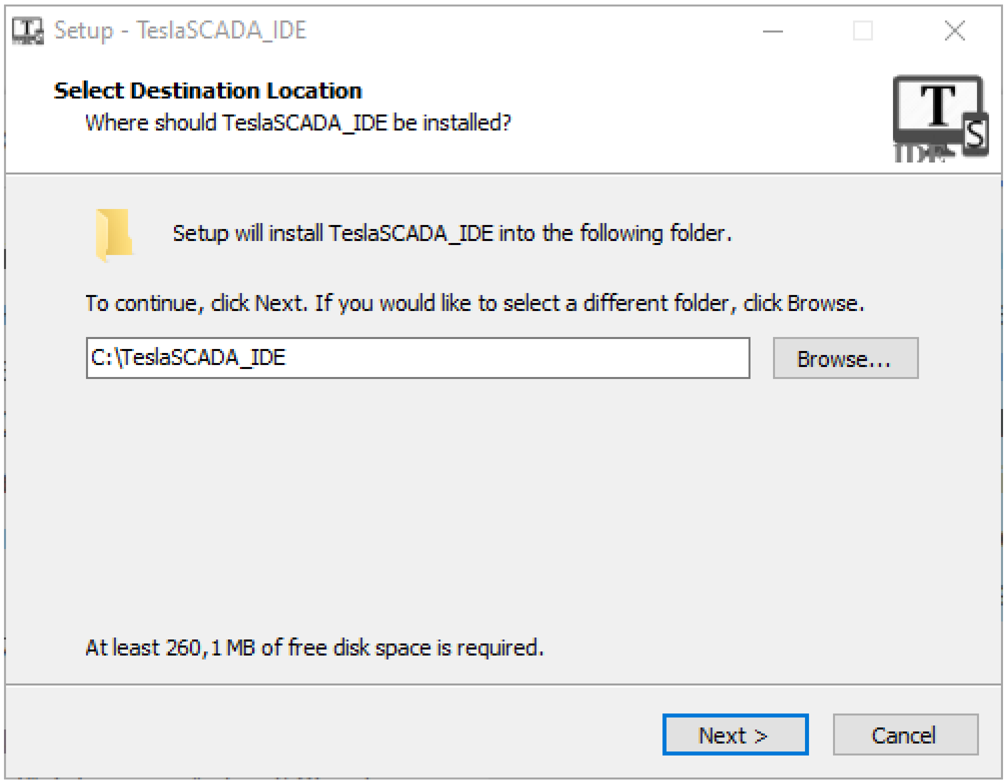
Installation depends on operating system.

3.1 Windows

To install TeslaSCADA IDE download EXE package for your operating system, then you need to run the installation file:



Then the window for selecting directories for the main program files and user data will be displayed. It is recommended to install the "system" part of TeslaSCADA IDE to the system drive in the "C:\TeslaSCADA_IDE\" folder, and the folder with user files can be selected at the user's discretion. The main thing is that the OS allows the creation, modification and deletion of files in this folder without requiring administrator rights. Also if you want to use Web Server the path shouldn't contain white spaces. After selecting the directories, click "Next":



Setup - TeslaSCADA_IDE

Select Destination Location

Where should TeslaSCADA_IDE be installed?

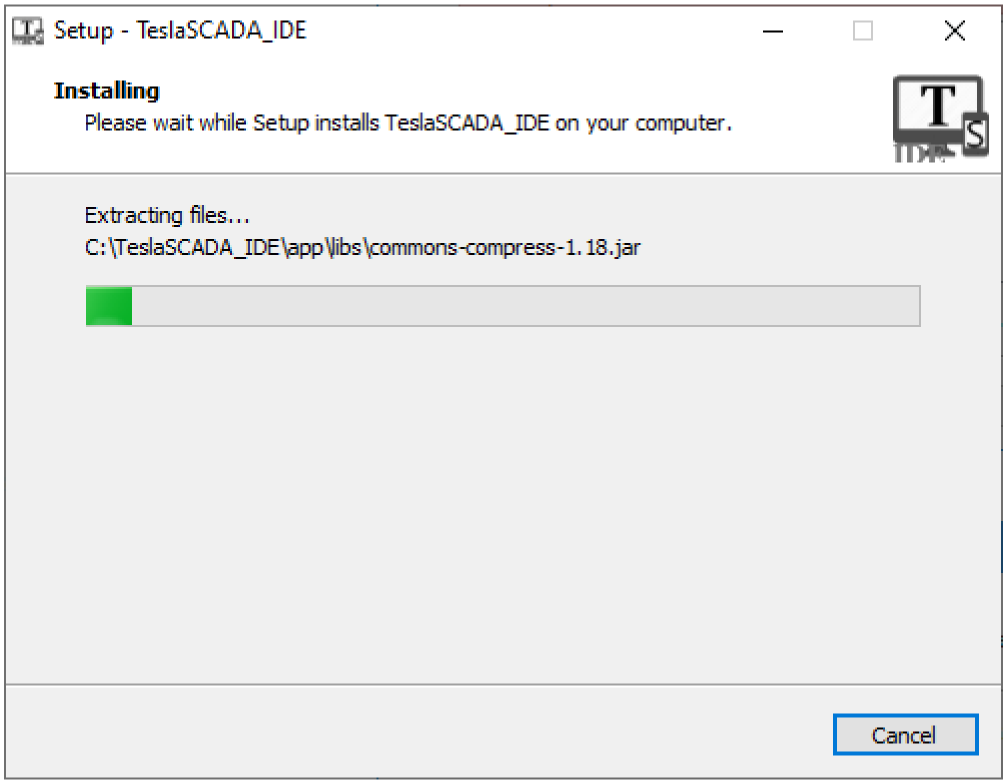
Setup will install TeslaSCADA_IDE into the following folder.

To continue, click Next. If you would like to select a different folder, click Browse.

C:\TeslaSCADA_IDE

At least 260,1 MB of free disk space is required.

After clicking "Next" application will be installed:



Setup - TeslaSCADA_IDE

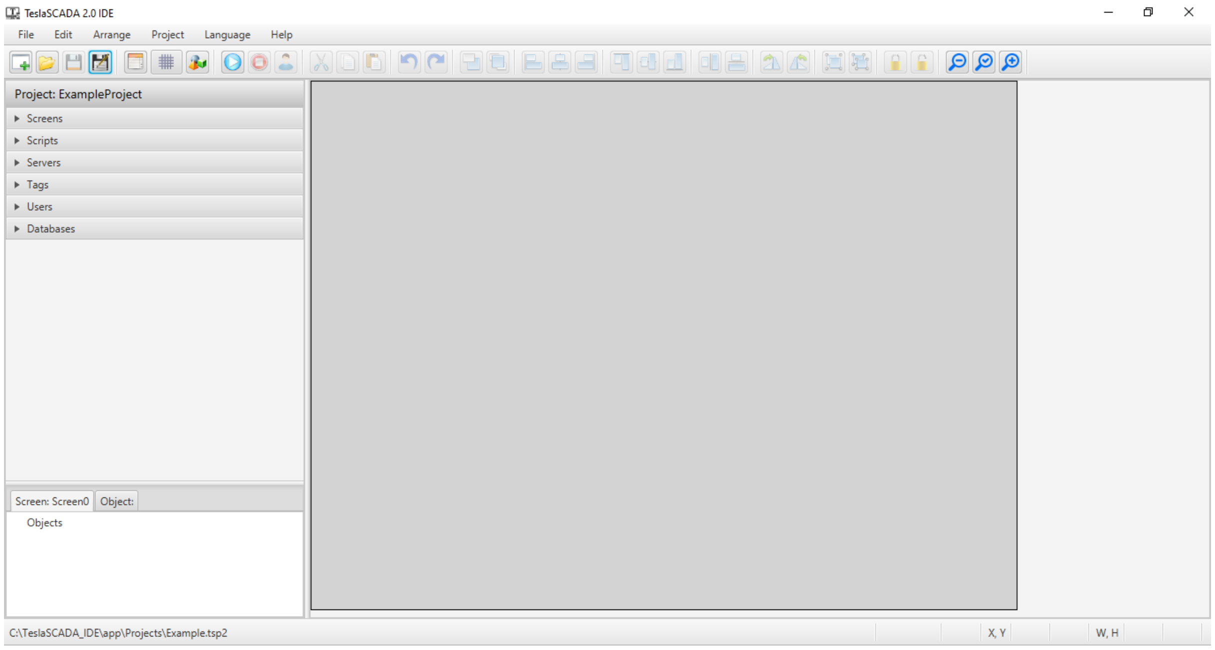
Installing

Please wait while Setup installs TeslaSCADA_IDE on your computer.

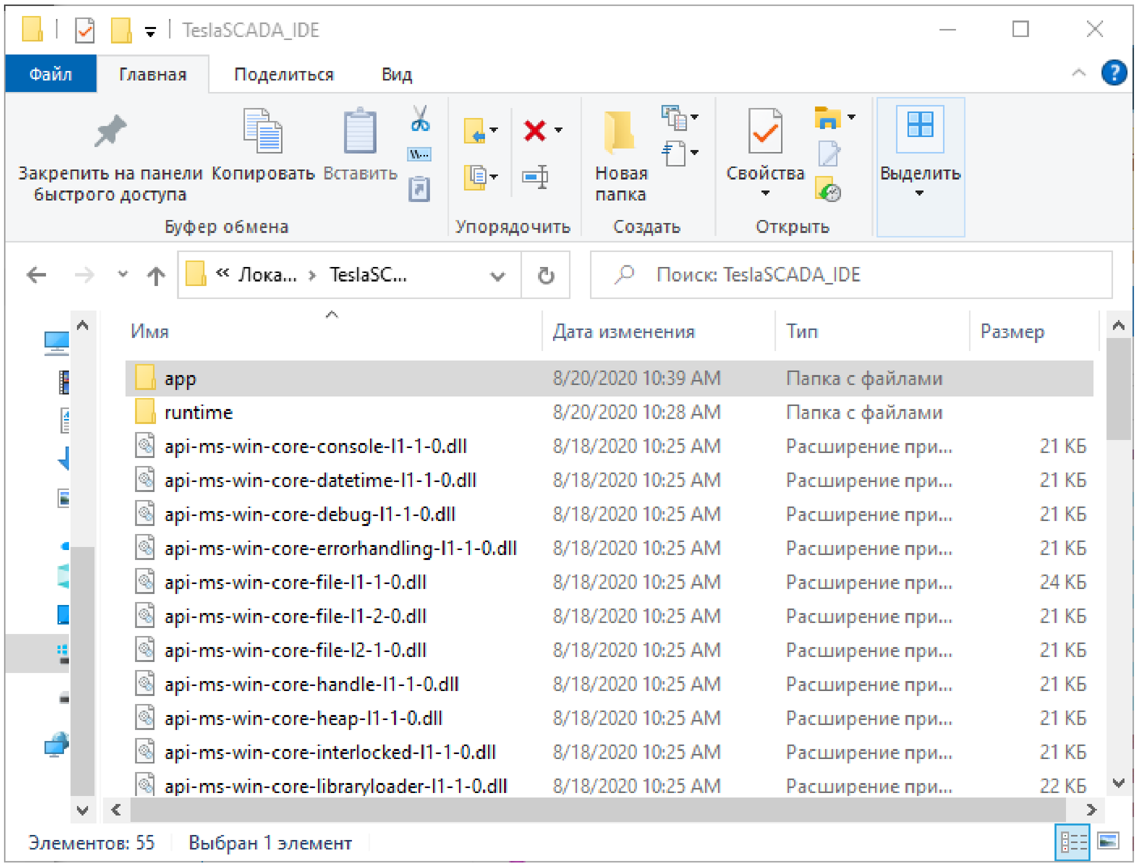
Extracting files...

C:\TeslaSCADA_IDE\app\libs\commons-compress-1.18.jar

After the installation is complete, TeslaSCADA IDE will be started automatically:



To study folder where you install TeslaSCADA IDE open it:



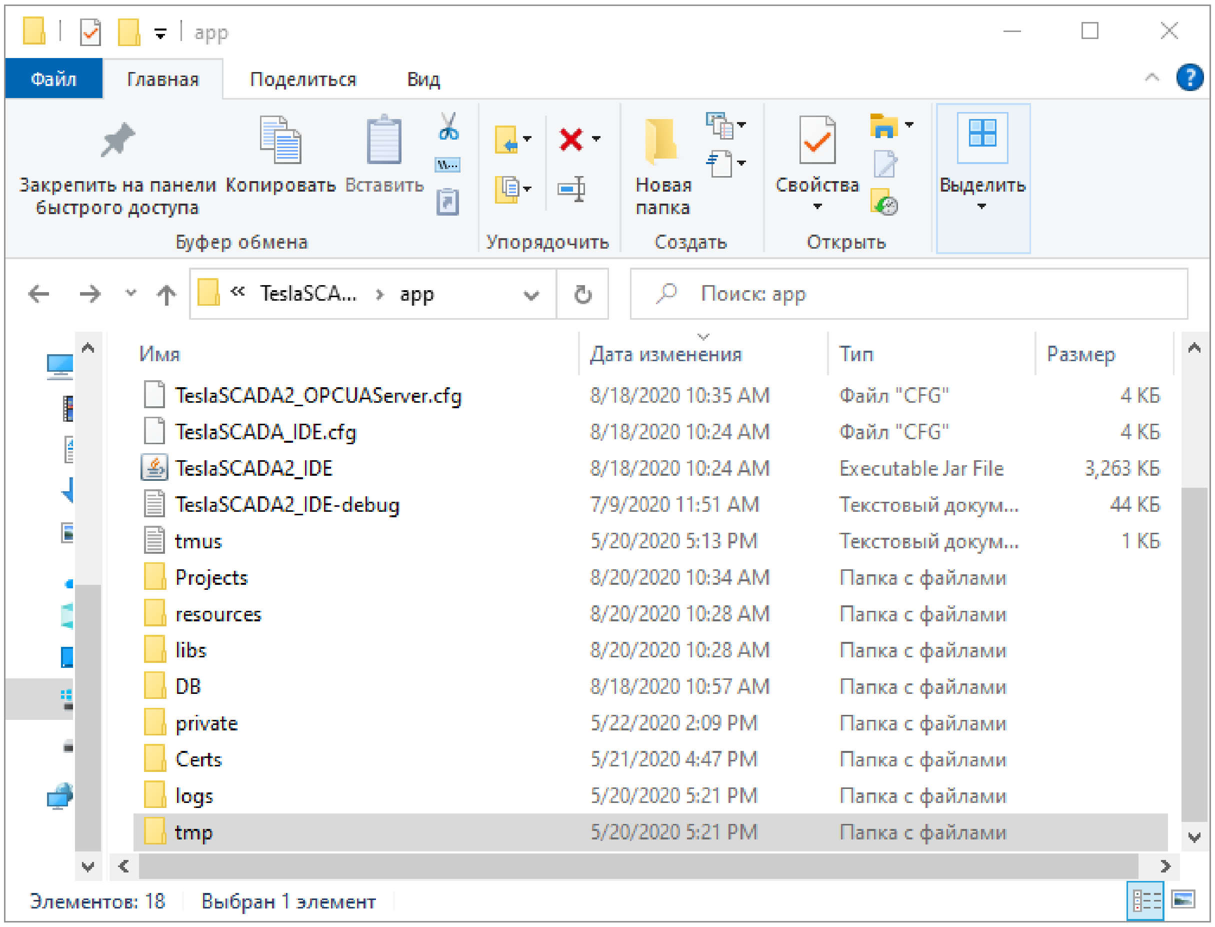
Имя	Дата изменения	Тип	Размер
app	8/20/2020 10:39 AM	Папка с файлами	
runtime	8/20/2020 10:28 AM	Папка с файлами	
api-ms-win-core-console-l1-1-0.dll	8/18/2020 10:25 AM	Расширение при...	21 КБ
api-ms-win-core-datetime-l1-1-0.dll	8/18/2020 10:25 AM	Расширение при...	21 КБ
api-ms-win-core-debug-l1-1-0.dll	8/18/2020 10:25 AM	Расширение при...	21 КБ
api-ms-win-core-errorhandling-l1-1-0.dll	8/18/2020 10:25 AM	Расширение при...	21 КБ
api-ms-win-core-file-l1-1-0.dll	8/18/2020 10:25 AM	Расширение при...	24 КБ
api-ms-win-core-file-l1-2-0.dll	8/18/2020 10:25 AM	Расширение при...	21 КБ
api-ms-win-core-file-l2-1-0.dll	8/18/2020 10:25 AM	Расширение при...	21 КБ
api-ms-win-core-handle-l1-1-0.dll	8/18/2020 10:25 AM	Расширение при...	21 КБ
api-ms-win-core-heap-l1-1-0.dll	8/18/2020 10:25 AM	Расширение при...	21 КБ
api-ms-win-core-interlocked-l1-1-0.dll	8/18/2020 10:25 AM	Расширение при...	21 КБ
api-ms-win-core-libraryloader-l1-1-0.dll	8/18/2020 10:25 AM	Расширение при...	22 КБ

Элементов: 55 Выбран 1 элемент

Consider its contents:

- **app** - contains application information.
- **runtime** - contains JRE. TeslaSCADA based on Java language. The folder runtime contains JRE for Windows environment. If you don't use Web server in your project you don't need to install Java separately. TeslaSCADA IDE will work any way. If you want to use Web server in your project you have to install Java on your PC.

Let's study app folder:



Имя	Дата изменения	Тип	Размер
TeslaSCADA2_OPCUAServer.cfg	8/18/2020 10:35 AM	Файл "CFG"	4 КБ
TeslaSCADA_IDE.cfg	8/18/2020 10:24 AM	Файл "CFG"	4 КБ
TeslaSCADA2_IDE	8/18/2020 10:24 AM	Executable Jar File	3,263 КБ
TeslaSCADA2_IDE-debug	7/9/2020 11:51 AM	Текстовый докум...	44 КБ
tmus	5/20/2020 5:13 PM	Текстовый докум...	1 КБ
Projects	8/20/2020 10:34 AM	Папка с файлами	
resources	8/20/2020 10:28 AM	Папка с файлами	
libs	8/20/2020 10:28 AM	Папка с файлами	
DB	8/18/2020 10:57 AM	Папка с файлами	
private	5/22/2020 2:09 PM	Папка с файлами	
Certs	5/21/2020 4:47 PM	Папка с файлами	
logs	5/20/2020 5:21 PM	Папка с файлами	
tmp	5/20/2020 5:21 PM	Папка с файлами	

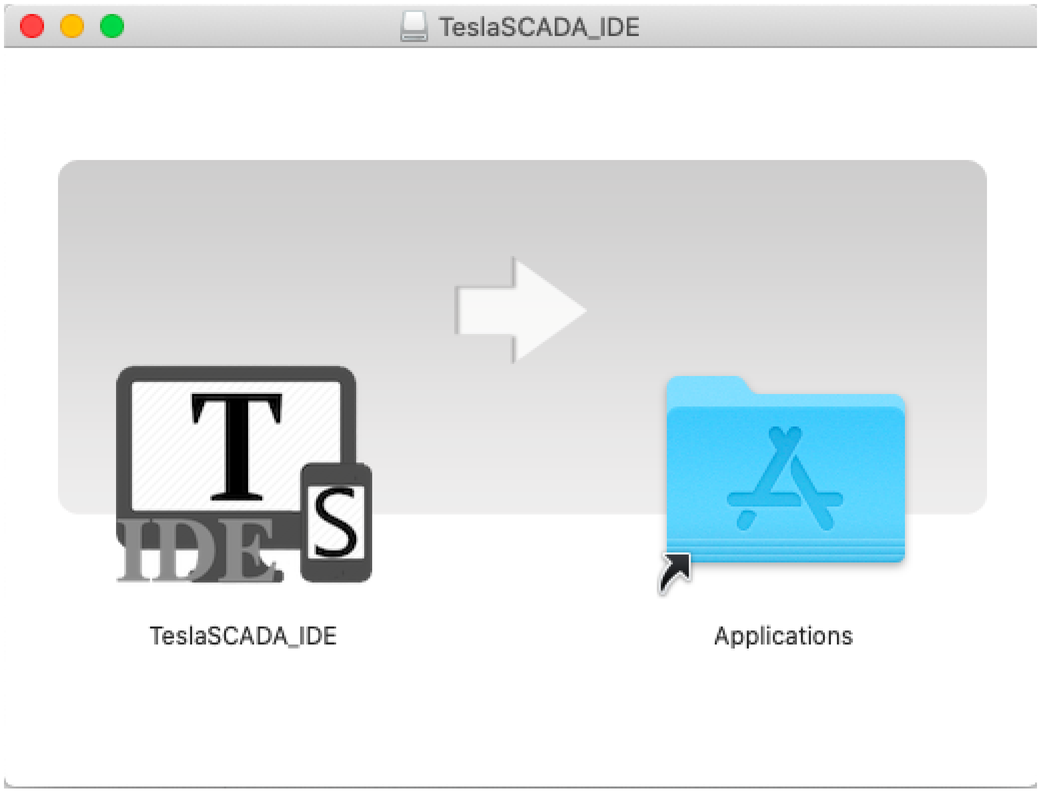
Consider its contents:

- **Projects** - default project folder of TeslaSCADA IDE. You can save projects in other folders.
- **DB** - project contains SQL Lite databases. If you use SQL Lite databases for history, events and recipes they will be stored in this folder.
- **private** - contains certificates and keys for OPC UA and MQTT protocols if you use OPC UA or MQTT clients in your project.
- **Certs** - contains certificates and keys for OPC UA server if you use it.
- **TeslaSCADA_IDE-debug** - contains Log information about application working.
- **Other folders and files** - related to working of application and Web server.

Install TeslaSCADA2 on Windows

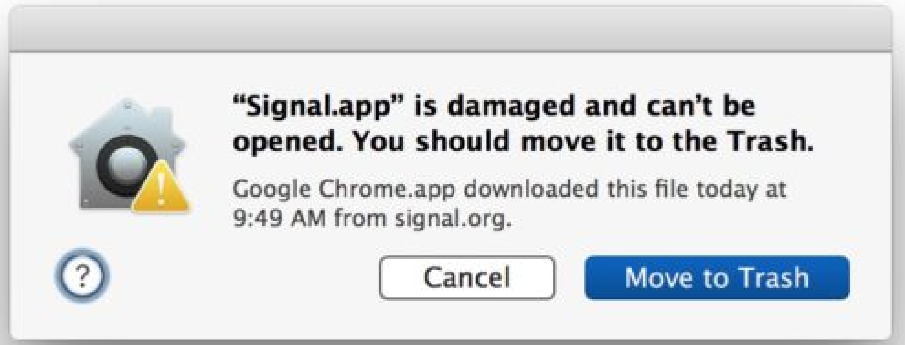
3.2 MacOS

To install TeslaSCADA IDE download DMG package for your operating system. DMG package provides a simple possibility to install application by double clicking on it:



By using left mouse button of the mouse drag and drop TeslaSCADA IDE in Applications. No you can open it in Applications.

Important! Sometimes you've got error message: "TeslaSCADA_IDE.app is damaged and can't be opened. You should move it to the Trash." Like in the picture below:

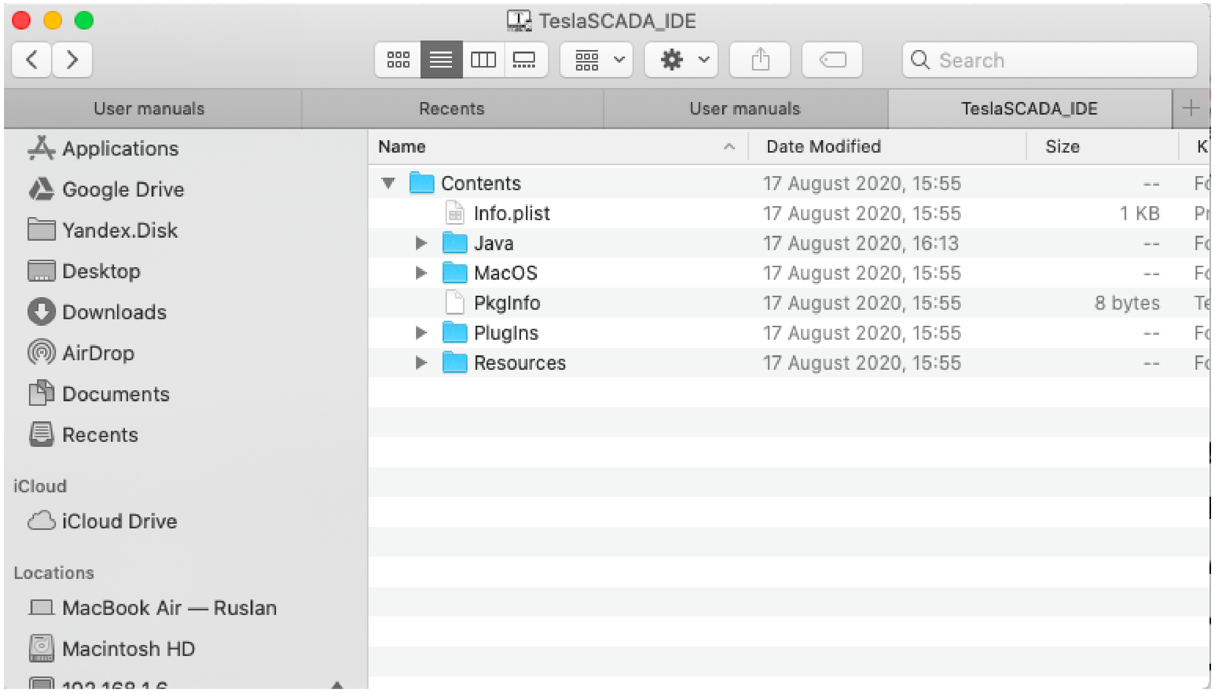


"Signal.app" is damaged and can't be opened. You should move it to the Trash.

Google Chrome.app downloaded this file today at 9:49 AM from signal.org.

To solve this problem you should open Terminal and execute the command below: **sudo xattr -rd com.apple.quarantine /Applications/TeslaSCADA_IDE.app**

To study folder in Applications click by right mouse button on TeslaSCADA_IDE and choose Show Package Contents. You'll see:

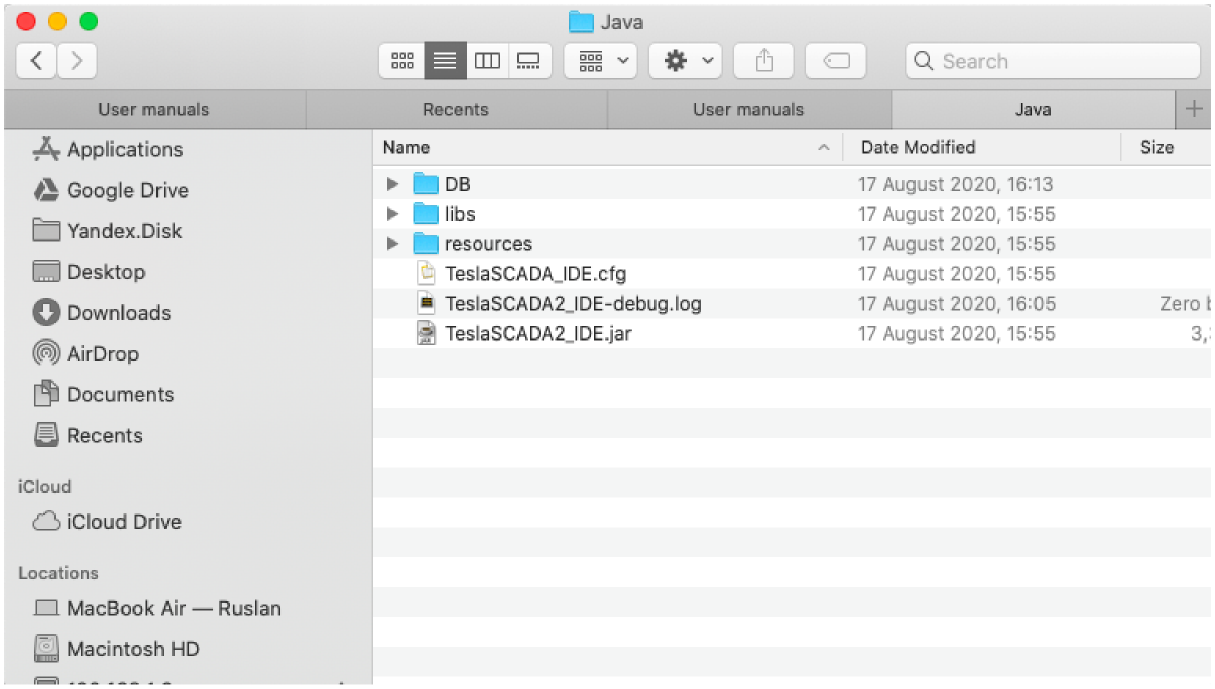


Name	Date Modified	Size	K
Contents	17 August 2020, 15:55	--	Fo
Info.plist	17 August 2020, 15:55	1 KB	Pr
Java	17 August 2020, 16:13	--	Fo
MacOS	17 August 2020, 15:55	--	Fo
PkgInfo	17 August 2020, 15:55	8 bytes	Te
PlugIns	17 August 2020, 15:55	--	Fo
Resources	17 August 2020, 15:55	--	Fo

Consider its contents:

- **Java** - contains application information.
- **Plugins** - contains JRE. TeslaSCADA based on Java language. The folder runtime contains JRE for MacOS environment. If you don't use Web server in your project you no need to install Java separately. TeslaSCADA IDE will work any way. If you want to use Web server in your project you have to install Java on your PC.
- **MacOS and Resources** - related to working application.

Let's study Java folder:



Name	Date Modified	Size
DB	17 August 2020, 16:13	
libs	17 August 2020, 15:55	
resources	17 August 2020, 15:55	
TeslaSCADA_IDE.cfg	17 August 2020, 15:55	
TeslaSCADA2_IDE-debug.log	17 August 2020, 16:05	Zero b
TeslaSCADA2_IDE.jar	17 August 2020, 15:55	3,

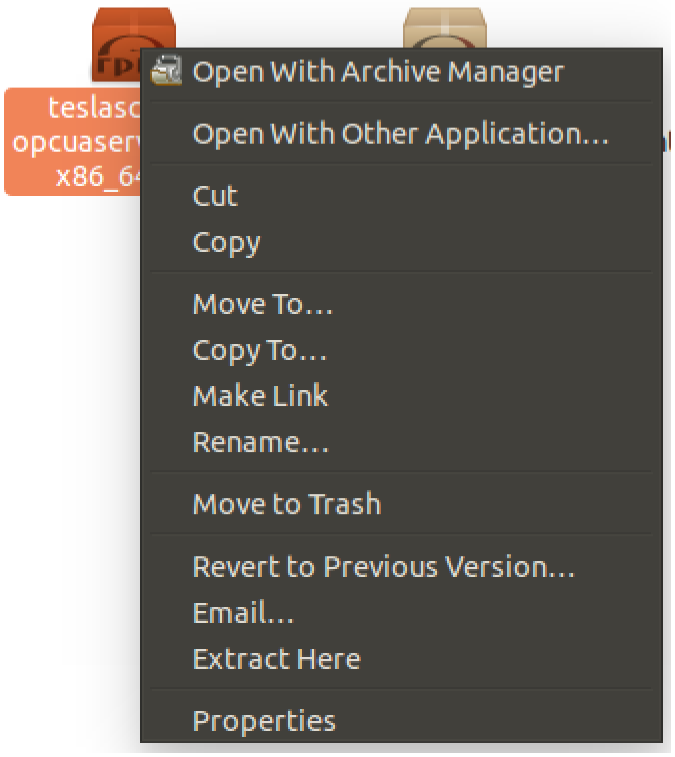
Consider its contents:

- **Projects** - default project folder of TeslaSCADA IDE. You can save projects in other folders (it's not shown in this picture).
- **DB** - project contains SQL Lite databases. If you use SQL Lite databases for history, events and recipes they will be stored in this folder.
- private - contains certificates and keys for OPC UA and MQTT protocols if you use OPC UA or MQTT clients in your project (it's not shown in this picture).
- **Certs** - contains certificates and keys for OPC UA server if you use it (it's not shown in this picture).
- **TeslaSCADA_IDE-debug** - contains Log information about application working.
- **Other folders and files** - related to working of application and Web server.

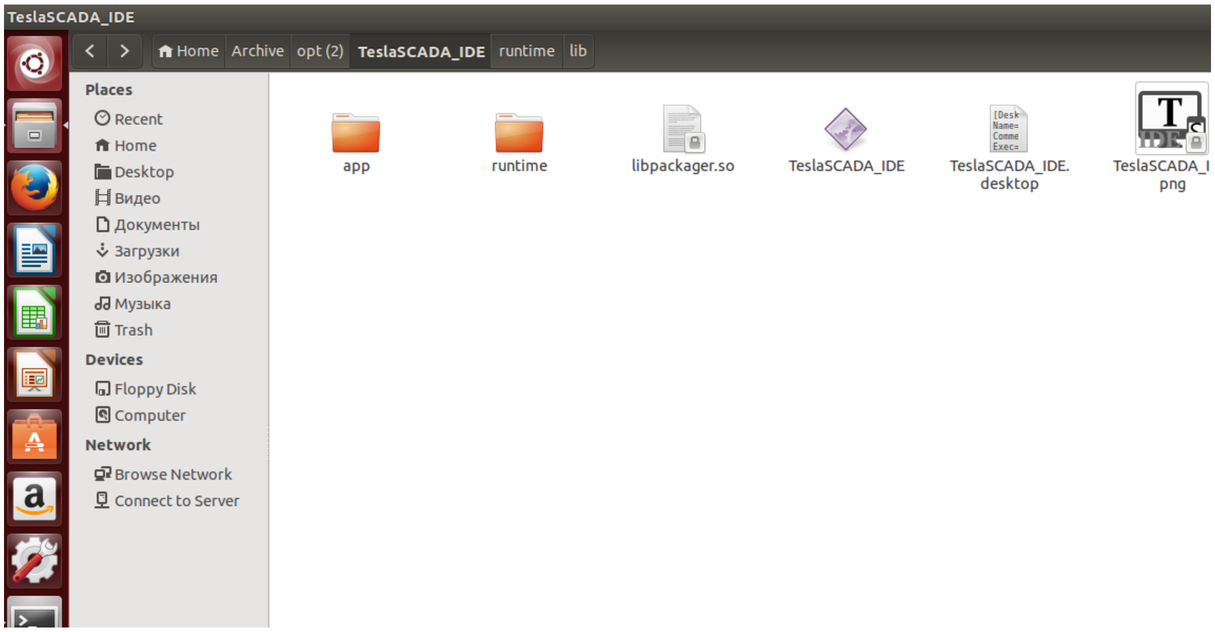
Installation TeslaSCADA2 on MacOS

3.3 Linux

To install TeslaSCADA IDE download RPM package for your operating system. Right click mouse button on RPM package and choose Extract Here:



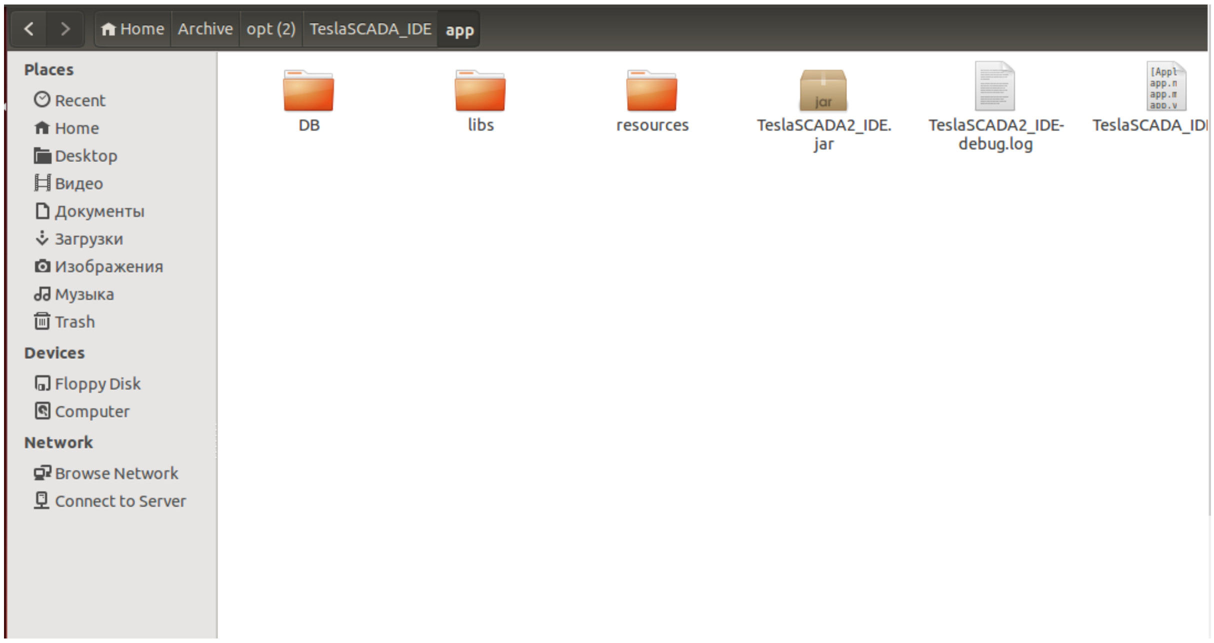
By default RPM package will install the application to /opt, add a shortcut to the application menu. RPM package does not have any UI for installation (normal behavior for Linux). Let's study opt folder. In this folder you can find TeslaSCADA_IDE folder. When you open it:



Consider its contents:

- **app** - contains application information.
- **runtime** - contains JRE. TeslaSCADA based on Java language. The folder runtime contains JRE for Linux environment. If you don't use Web server in your project you don't need to install Java separately. TeslaSCADA IDE will work any way. If you want to use Web server in your project you have to install Java on your PC.

Let's study app folder:



Consider its contents:

- **Projects** - default project folder of TeslaSCADA IDE. You can save projects in other folders (it's not shown in this picture).
- **DB** - project contains SQL Lite databases. If you use SQL Lite databases for history, events and recipes there will be stored in this folder.
- **private** - contains certificates and keys for OPC UA and MQTT protocols if you use OPC UA or MQTT clients in your project (it's not shown in this picture).
- **Certs** - contains certificates and keys for OPC UA server if you use it (it's not shown in this picture).
- **TeslaSCADA_IDE-debug** - contains Log information about application working.
- **Other folders and files** - related to working of application and Web server.

Important: We've tested Linux version only on Ubuntu 14, Ubuntu 20, РЕД ОС and Astra Linux (Orel) OS. Unfortunately we didn't test it on other Linux OS.

Lesson 1.3. SCADA for beginners. Download...
TeslaSCADA
MULTI-PLATFORM SOLUTION
Смотреть
Поделиться
Downloading and Installing
TeslaSCADA software on Linux
Посмотреть на YouTube
https://teslascada.com

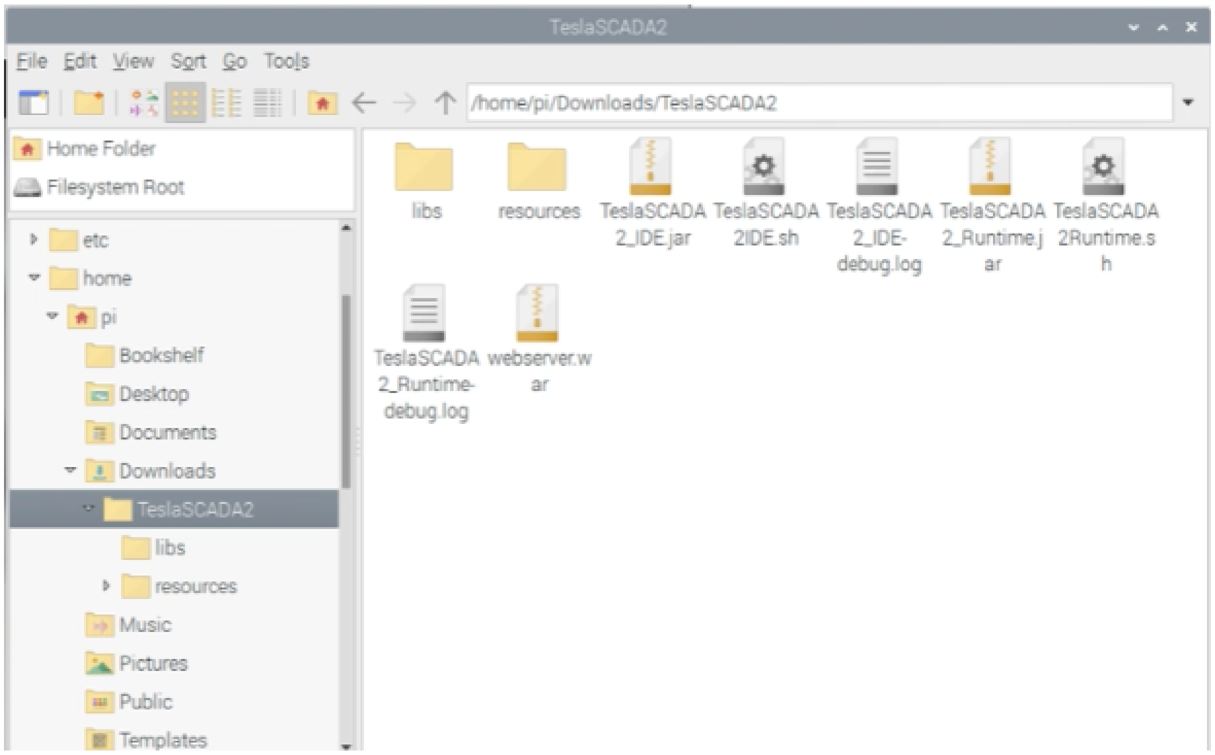
Install TeslaSCADA2 on Linux

3.4 Raspberry PI

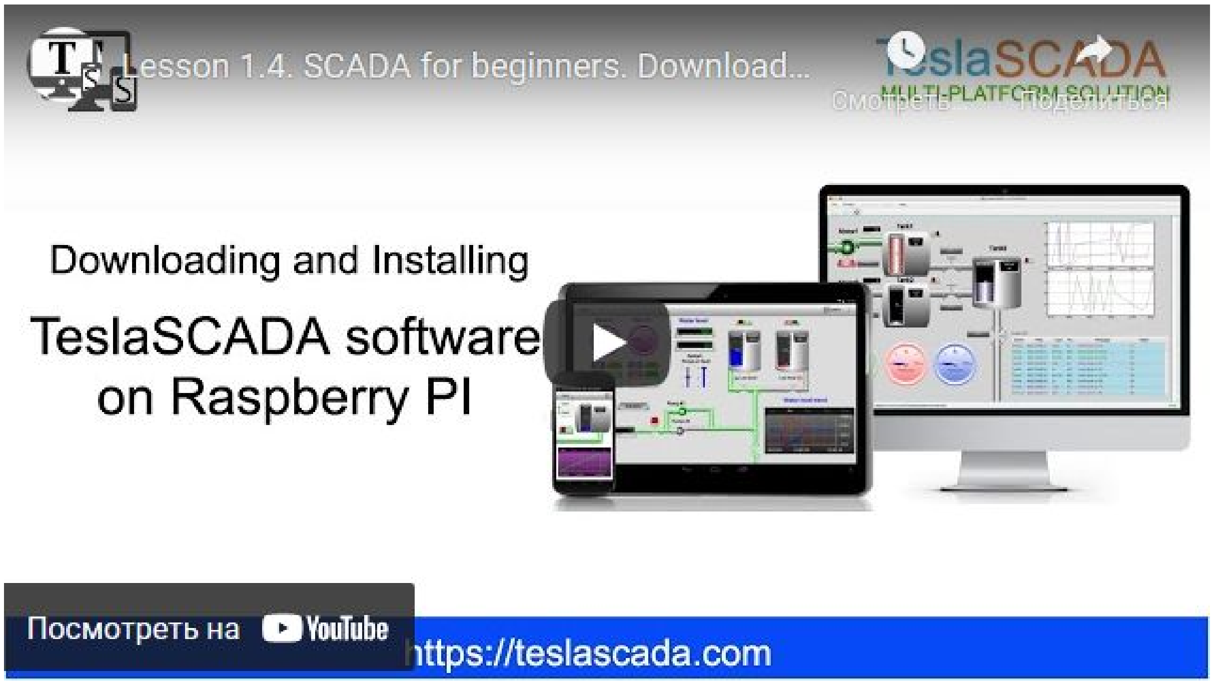
Package for Raspberry PI doesn't contain JVM. First you have to install Java 11 with Java FX. We recommend to install Java 11 from Bell Soft for ARM 32 bit. You can do it by downloading installation from the link. Then you can install Java 11 with Java FX libraries by using command:

```
sudo apt-get install ./bellsoft-jdk11.0.11+9-linux-arm32-vfp-hflt-full.deb
```

After that you can download archive from our site and unpack it:



You can start TeslaSCADA2 IDE by double clicking on the script TeslaSCADA2IDE.sh.
You can start TeslaSCADA2 Runtime by double clicking on the script TeslaSCADA2Runtime.sh.


Lesson 1.4. SCADA for beginners. Download...
TeslaSCADA
MULTI-PLATFORM SOLUTION
Смотреть
Поделиться
Downloading and Installing
TeslaSCADA software on Raspberry PI
Посмотреть на YouTube
https://teslascada.com

Install TeslaSCADA2 on Raspberry PI

4 Databases

The databases in TeslaSCADA2 are necessary for archiving alarms, operator actions, trends and recipes. When archiving into a database, the subsequent retrieval of data (viewing trends, messages) is much faster, especially over long time intervals. TeslaSCADA2 supports 2 types of databases:

- SQLite 29
- MySQL 31
- MSSQL 55
- PostgreSQL 58

Event database

The database for collecting events you can setup in **Project properties->Events/History tab** 110 in Events DB name field. There are several types of events saved in database:

- Tag's events. You can setup them in **Tag properties->Alarms tab** 482.
- Server events. This information about connection, disconnection and lost connection servers 381 in the project.
- User 489 login/logout information.
- If you setup in User settings 491 it's possible to save user operation.

You can show all events by Events log 243 graphical object from Events library.

General history database

The database for collecting history information you can setup in **Project properties->Events/History tab** 110 in History DB name field. If you want that tag's history information is saved in this database you have to Enable history in **Tag properties->History tab** 483, setup Storage period and check Store in DB.

The history values will be saved every storage period during execution if the value of the tag is changed (if Use deadband is enabled the delta between current value and value last saved should be greater Deadband).

You can show history information collected in General history database by using Trend DB 233 graphical object from Trends and charts 233 library.

History database

It's another way for collecting history information. The differences between General history database and History database 494, is in History database you save only selected tag's values and values are saved in two ways:

- Time interval. Tags values are saved every time interval independently values are changed or not.
- Tag. Tags values are saved when set tag's value become TRUE independently saved values are changed or not.

You can create history database in **Project Window** 73 **->** **Databases** 86 or in the menu item **Project** 67 **->** **New Database** 69 of the **Main menu** 61.

Tag's value will be saved in the History database if you check Enable history in Tag properties (you no need to check Store in DB in this case) and include this tag in History database properties collection of tags.

Like for General history database you can use as SQLite 29 as MySQL 31 databases.

You can show history information collected in History database by using History DB table 257 and History DB trend 260 from History DB 257 library. History Excel Report 268 and History Max and Min Report also work with this database.

Recipe database

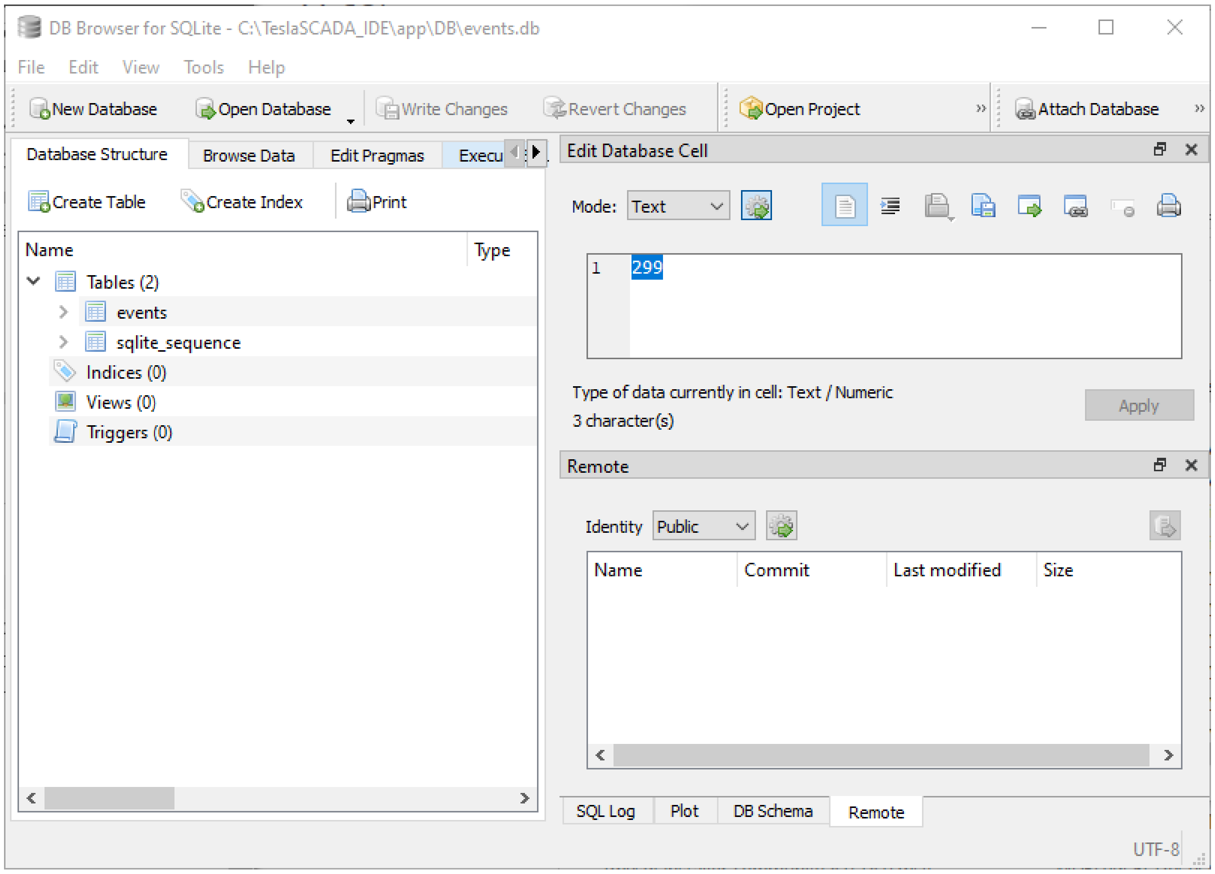
The database for working with recipes and parameters. You can create recipe database in **Project Window** 73 **->** **Databases** 86 or in the menu item **Project** 67 **->** **New Database** 69 of the Main menu 61.

Like for events and history databases you can use as SQLite 29 as MySQL 31 recipe databases.

You can show recipe information collected in Recipe database by using graphical objects from Recipes library.

4.1 SQLite

If you want to use SQLite database in your project you no need to install any additional software on your PC. All databases are created automatically during application running. Databases are stored in the folder DB 18 in the place where TeslaSCADA2 was installed. If you want to open database use some SQLite DB browsers. For example, for Windows you can use this one: https://sqlitebrowser.org/dl/. How looks SQLite database in this browser you can see here:



DB Browser for SQLite - C:\TeslaSCADA_IDE\app\DB\events.db

Name	Type
Tables (2)	
events	
sqlite_sequence	
Indices (0)	
Views (0)	
Triggers (0)	

Mode: Text

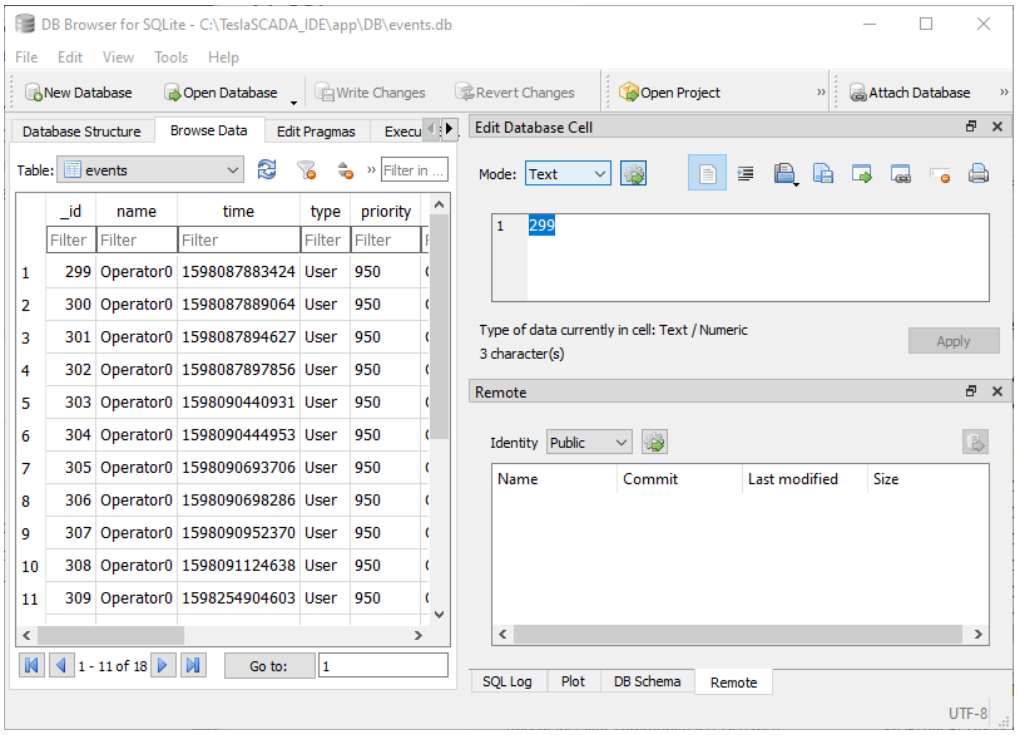
1 299

Type of data currently in cell: Text / Numeric
3 character(s)

Identity Public

Name	Commit	Last modified	Size

DB data looks like here:



DB Browser for SQLite - C:\TeslaSCADA_IDE\app\DB\events.db

Table: events

	_id	name	time	type	priority
	Filter	Filter	Filter	Filter	Filter
1	299	Operator0	1598087883424	User	950
2	300	Operator0	1598087889064	User	950
3	301	Operator0	1598087894627	User	950
4	302	Operator0	1598087897856	User	950
5	303	Operator0	1598090440931	User	950
6	304	Operator0	1598090444953	User	950
7	305	Operator0	1598090693706	User	950
8	306	Operator0	1598090698286	User	950
9	307	Operator0	1598090952370	User	950
10	308	Operator0	1598091124638	User	950
11	309	Operator0	1598254904603	User	950

1 - 11 of 18 Go to: 1

Mode: Text

1 299

Type of data currently in cell: Text / Numeric
3 character(s)

Identity Public

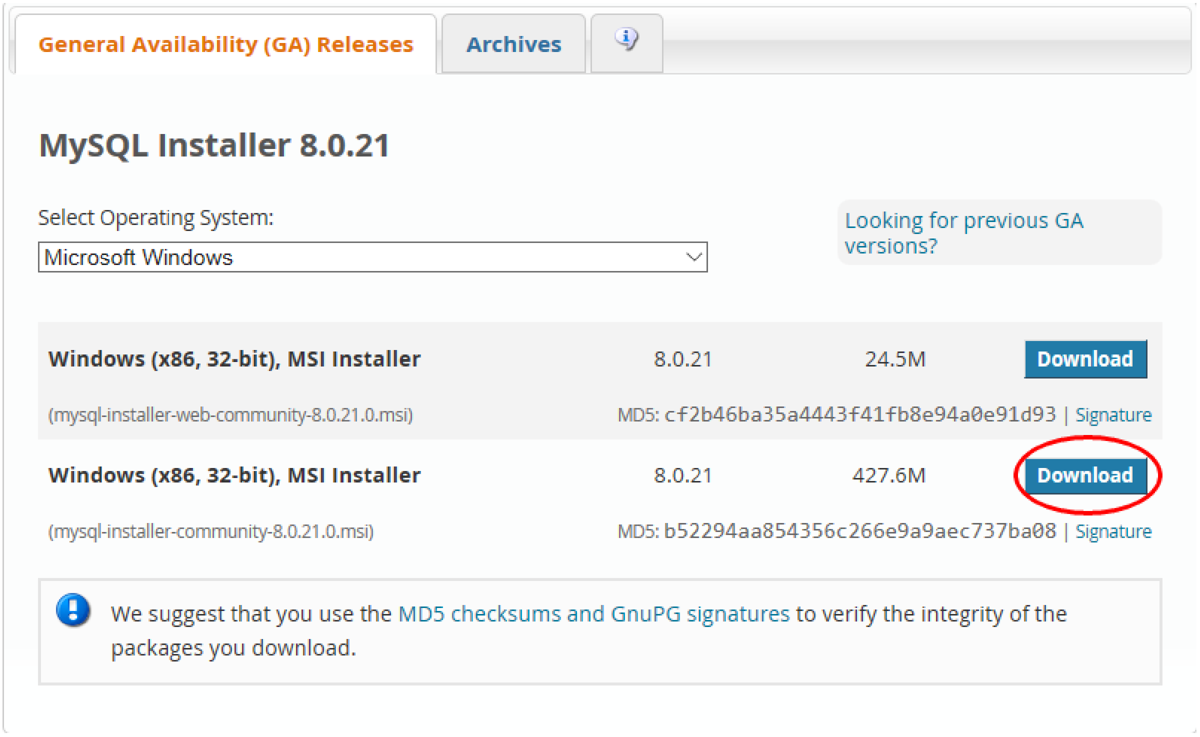
Name	Commit	Last modified	Size

4.2 MySQL

To work with MySQL databases you have to install it on your PC. This chapter provides a step-by-step overview of the MySQL database installation process on Windows PC - this does not require special skills and knowledge, everything is quite simple. TeslaSCADA2 works with MySQL versions 5.6.2 and higher. The current MySQL version can be found on the official download page: https://dev.mysql.com/downloads/windows/installer/

Important! On Windows 7 x32 only MySQL 5.7.25 can be installed.

After going to the download page at the bottom you can see the "MySQL Installer" block - click "Download":



MySQL Installer 8.0.21

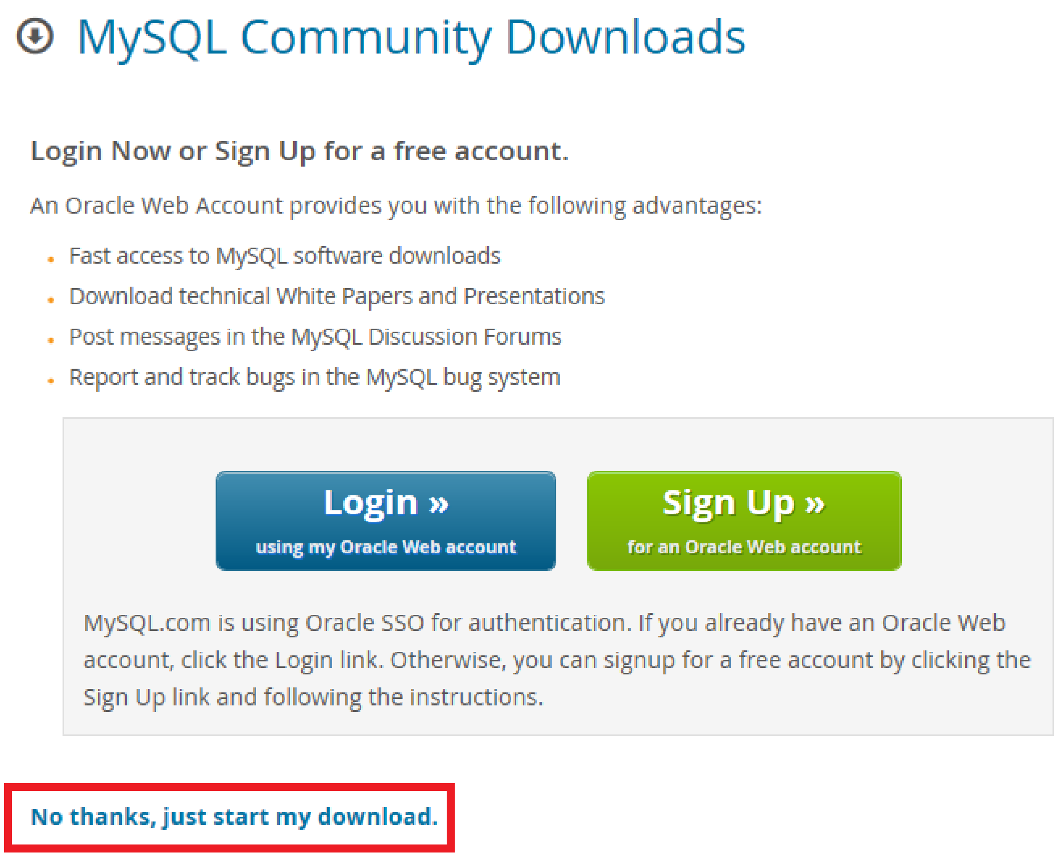
Select Operating System: Microsoft Windows

Looking for previous GA versions?

Windows (x86, 32-bit), MSI Installer	8.0.21	24.5M	Download
(mysql-installer-web-community-8.0.21.0.msi)	MD5: cf2b46ba35a4443f41fb8e94a0e91d93 | Signature		
Windows (x86, 32-bit), MSI Installer	8.0.21	427.6M	Download
(mysql-installer-community-8.0.21.0.msi)	MD5: b52294aa854356c266e9a9aec737ba08 | Signature		

We suggest that you use the MD5 checksums and GnuPG signatures to verify the integrity of the packages you download.

To download MySQL without registration, click on the link "No thanks, just start my download":


MySQL Community Downloads

Login Now or Sign Up for a free account.

An Oracle Web Account provides you with the following advantages:

- Fast access to MySQL software downloads
- Download technical White Papers and Presentations
- Post messages in the MySQL Discussion Forums
- Report and track bugs in the MySQL bug system

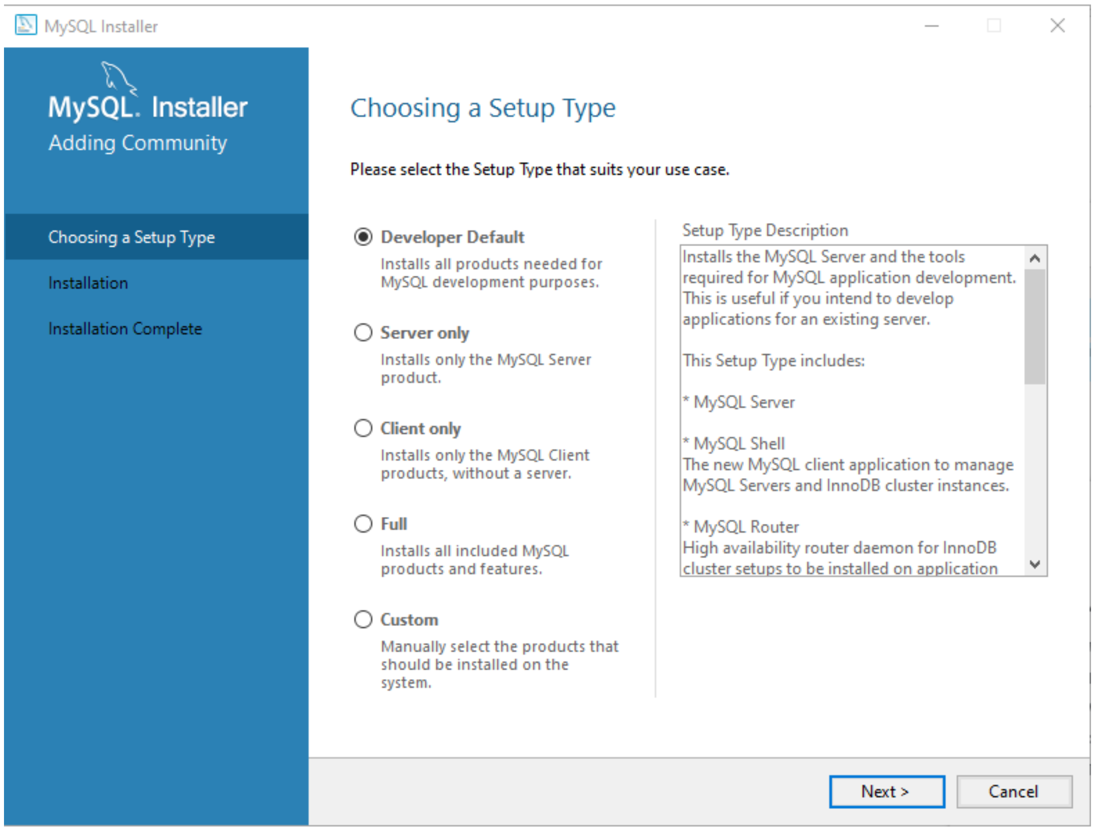
MySQL.com is using Oracle SSO for authentication. If you already have an Oracle Web account, click the Login link. Otherwise, you can signup for a free account by clicking the Sign Up link and following the instructions.

After the download is complete, you should make sure that the components necessary for installing MySQL are installed on the system:

• Microsoft .NET Framework 4.5.2

• Microsoft Visual C ++ Redistributable for Visual Studio 2015

We select the default installation type "Developer Default" and click "Next":



Choosing a Setup Type

Please select the Setup Type that suits your use case.

(●) Developer Default
Installs all products needed for MySQL development purposes.

( ) Server only
Installs only the MySQL Server product.

( ) Client only
Installs only the MySQL Client products, without a server.

( ) Full
Installs all included MySQL products and features.

( ) Custom
Manually select the products that should be installed on the system.

Setup Type Description

Installs the MySQL Server and the tools required for MySQL application development. This is useful if you intend to develop applications for an existing server.

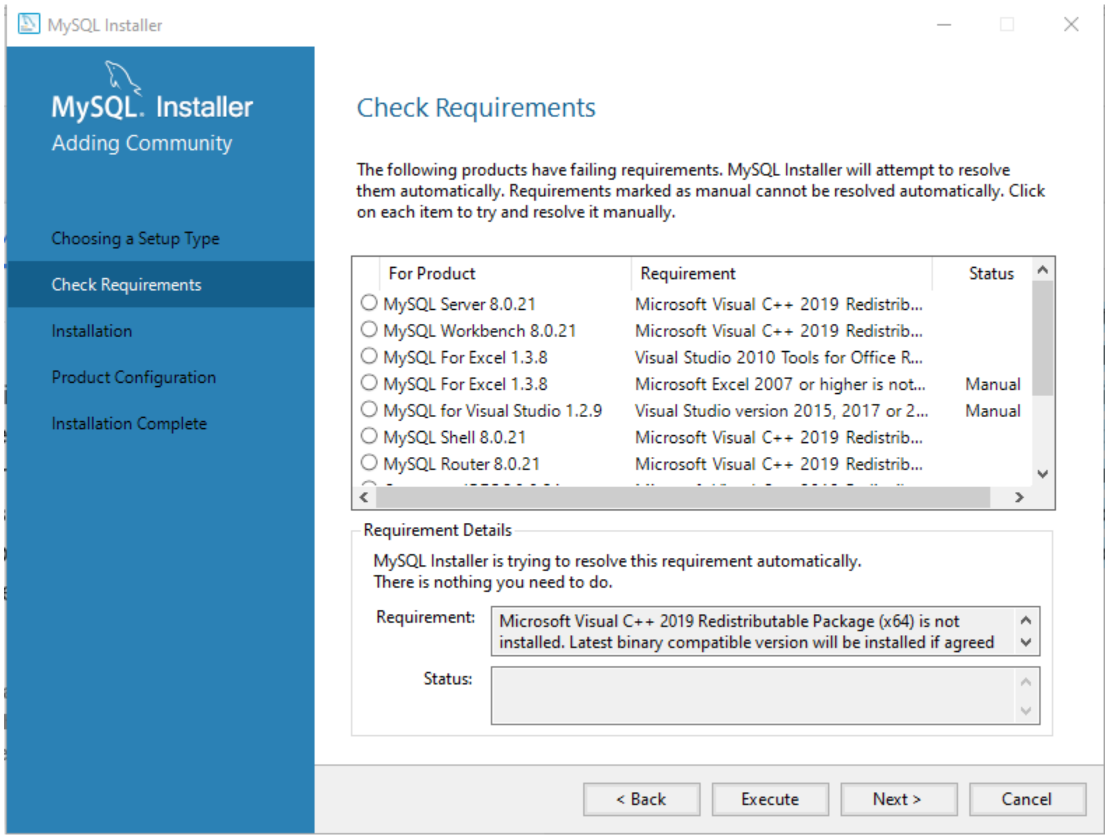
This Setup Type includes:

* MySQL Server

* MySQL Shell
The new MySQL client application to manage MySQL Servers and InnoDB cluster instances.

* MySQL Router
High availability router daemon for InnoDB cluster setups to be installed on application

Next, the installer will show a list of components in the "For Product" column and a list of software required to install them in the "Requirement" column. For example, this list might include MySQL Workbench if Microsoft Visual C ++ Redistributable for Visual Studio 2015 is not installed on the system. If you ignore the warning and continue with the installation, MySQL Workbench will not be installed. To install Microsoft Visual C++ Redistributable for Visual Studio 2015 click "Execute". Installation of other components is not required - you can continue the installation by clicking "Next":



Check Requirements

The following products have failing requirements. MySQL Installer will attempt to resolve them automatically. Requirements marked as manual cannot be resolved automatically. Click on each item to try and resolve it manually.

For Product	Requirement	Status
MySQL Server 8.0.21	Microsoft Visual C++ 2019 Redistrib...	
MySQL Workbench 8.0.21	Microsoft Visual C++ 2019 Redistrib...	
MySQL For Excel 1.3.8	Visual Studio 2010 Tools for Office R...	
MySQL For Excel 1.3.8	Microsoft Excel 2007 or higher is not...	Manual
MySQL for Visual Studio 1.2.9	Visual Studio version 2015, 2017 or 2...	Manual
MySQL Shell 8.0.21	Microsoft Visual C++ 2019 Redistrib...	
MySQL Router 8.0.21	Microsoft Visual C++ 2019 Redistrib...	

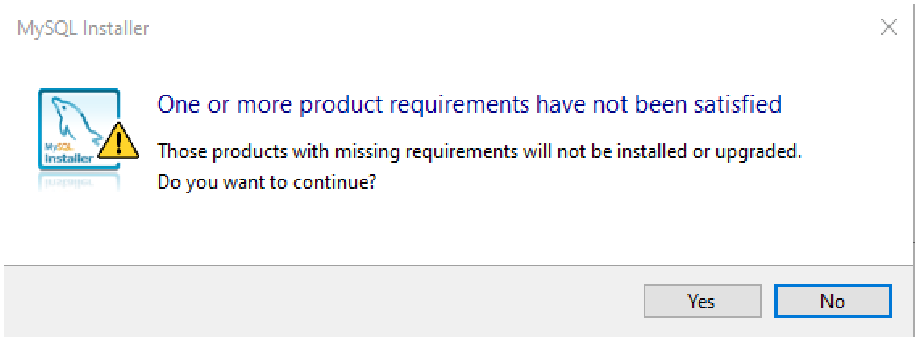
Requirement Details

MySQL Installer is trying to resolve this requirement automatically.
There is nothing you need to do.

Requirement: Microsoft Visual C++ 2019 Redistributable Package (x64) is not installed. Latest binary compatible version will be installed if agreed

Status:

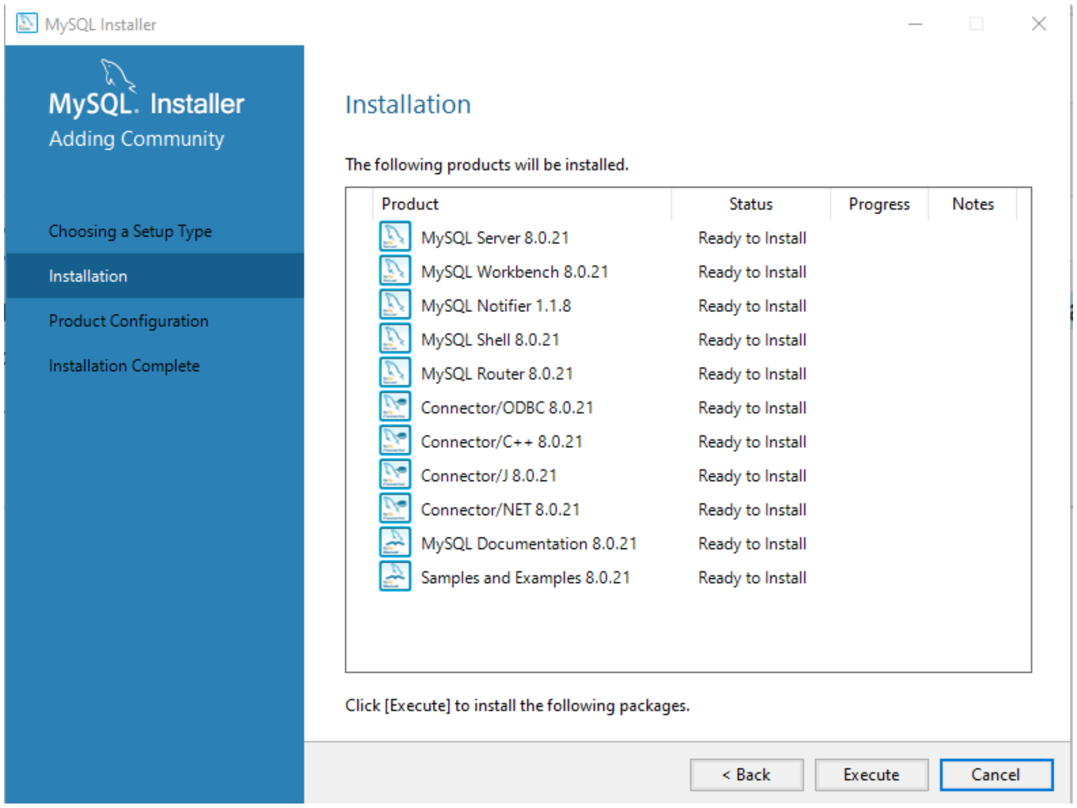
A warning will appear - press "YES":



One or more product requirements have not been satisfied

Those products with missing requirements will not be installed or upgraded.
Do you want to continue?

Then the installer will show you what exactly it will install, click "Execute":



Installation

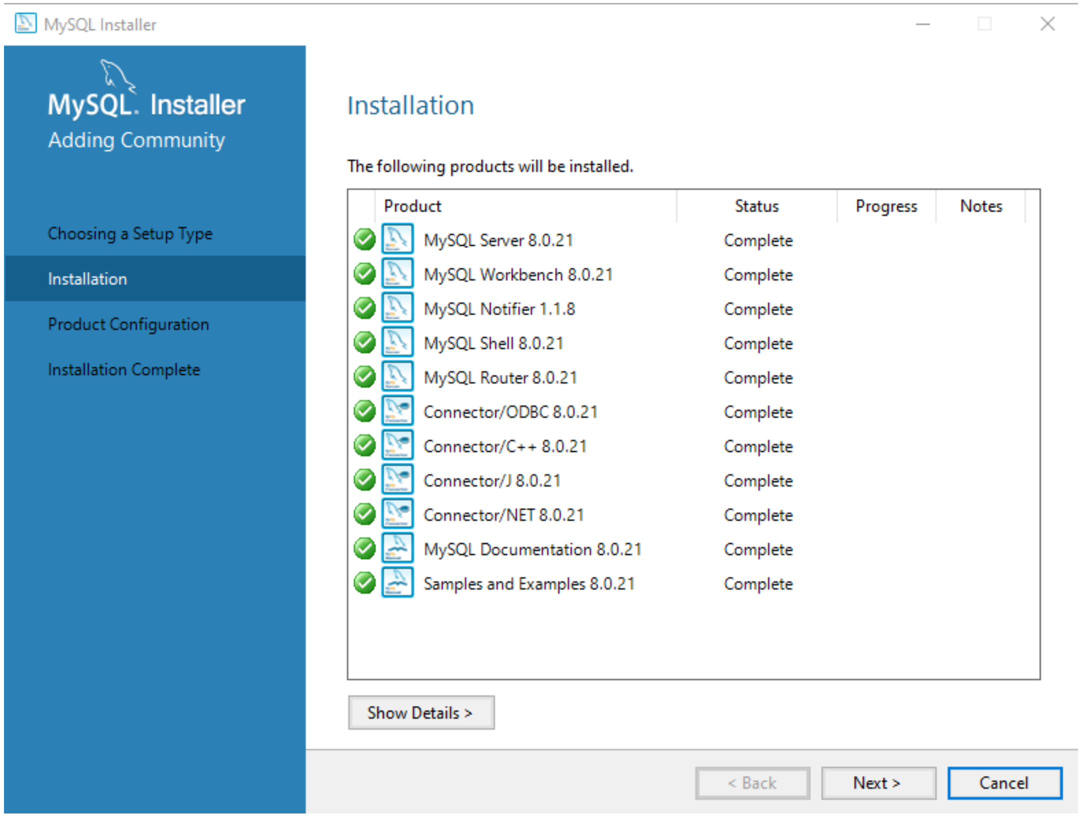
The following products will be installed.

Product	Status	Progress	Notes
MySQL Server 8.0.21	Ready to Install		
MySQL Workbench 8.0.21	Ready to Install		
MySQL Notifier 1.1.8	Ready to Install		
MySQL Shell 8.0.21	Ready to Install		
MySQL Router 8.0.21	Ready to Install		
Connector/ODBC 8.0.21	Ready to Install		
Connector/C++ 8.0.21	Ready to Install		
Connector/J 8.0.21	Ready to Install		
Connector/NET 8.0.21	Ready to Install		
MySQL Documentation 8.0.21	Ready to Install		
Samples and Examples 8.0.21	Ready to Install		

Click [Execute] to install the following packages.

Important! If during the installation MySQL Server does not install with the error "This application requires Visual Studio 2015 Redistributable. Please install the Redistributable then run this installer again", then you need to install the 32-bit package Microsoft Visual C ++ Redistributable for Visual Studio 2015 (vcredist_x86) even if you are using a 64-bit operating system.

The installation process begins. After installing all the components, the "Next" button will appear, click it:

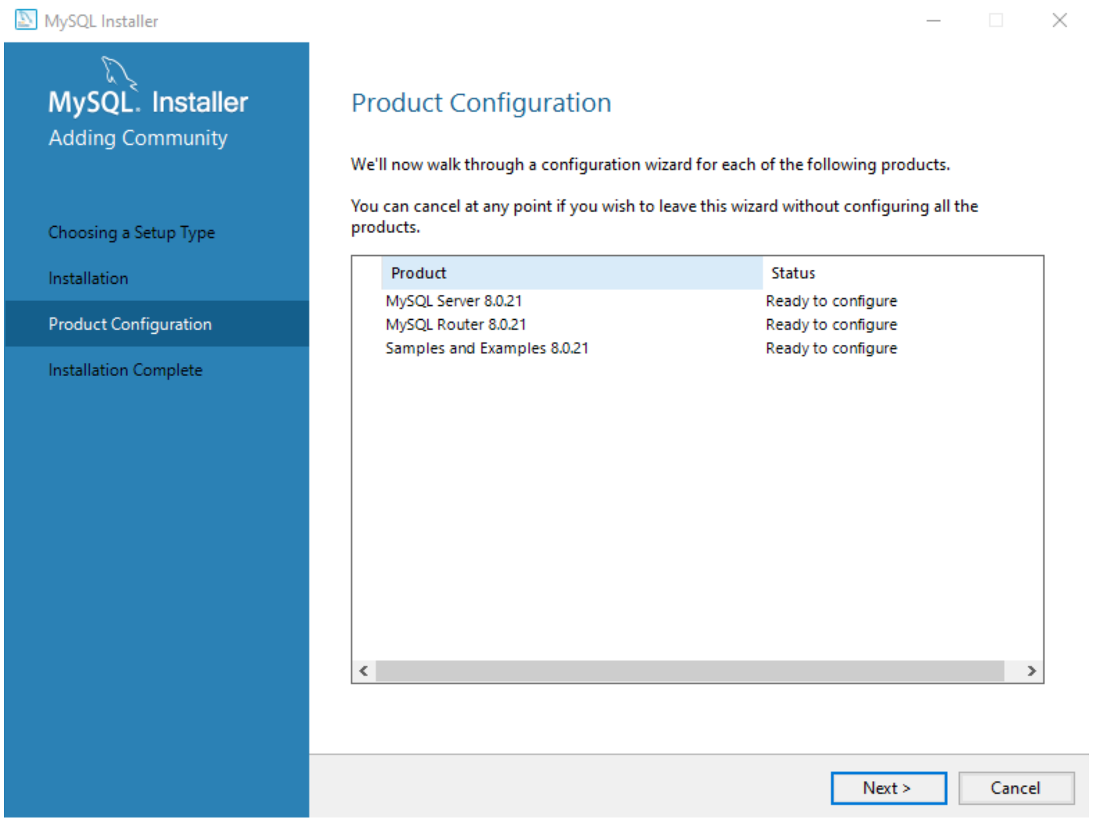


Installation

The following products will be installed.

Product	Status	Progress	Notes
MySQL Server 8.0.21	Complete		
MySQL Workbench 8.0.21	Complete		
MySQL Notifier 1.1.8	Complete		
MySQL Shell 8.0.21	Complete		
MySQL Router 8.0.21	Complete		
Connector/ODBC 8.0.21	Complete		
Connector/C++ 8.0.21	Complete		
Connector/J 8.0.21	Complete		
Connector/NET 8.0.21	Complete		
MySQL Documentation 8.0.21	Complete		
Samples and Examples 8.0.21	Complete		

Next, you need to configure the MySQL server, click "Next":



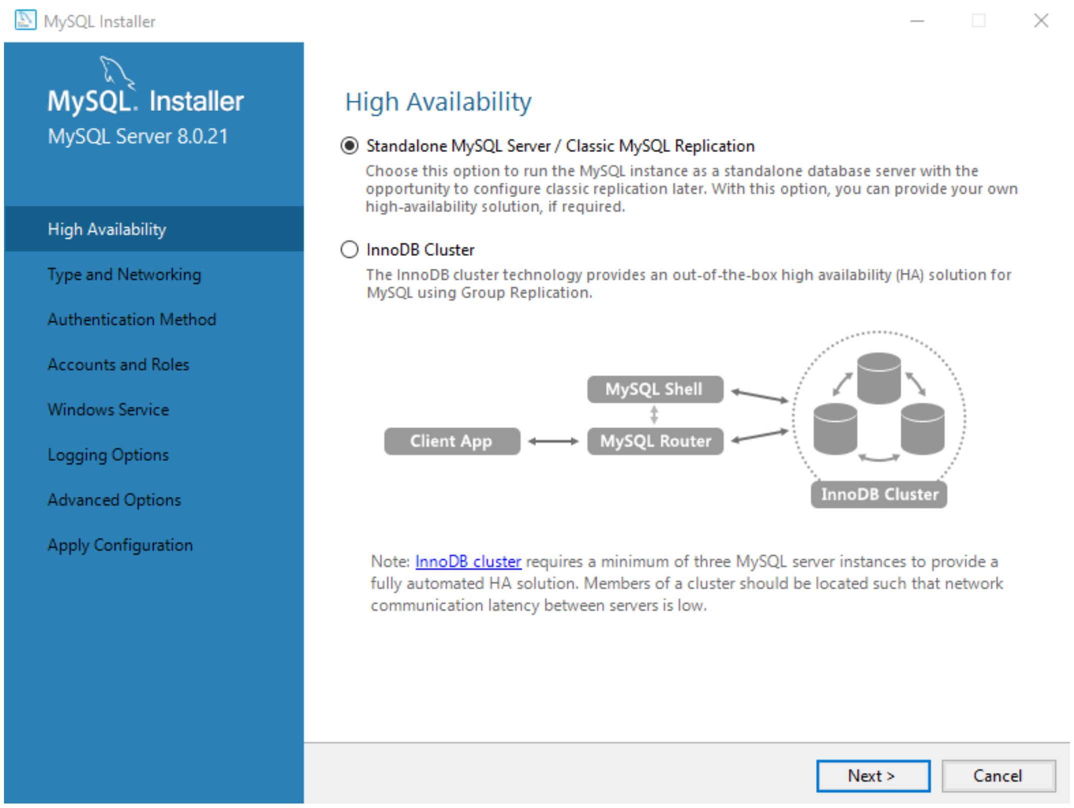
Product Configuration

We'll now walk through a configuration wizard for each of the following products.

You can cancel at any point if you wish to leave this wizard without configuring all the products.

Product	Status
MySQL Server 8.0.21	Ready to configure
MySQL Router 8.0.21	Ready to configure
Samples and Examples 8.0.21	Ready to configure

Select the "Standalone MySQL Server / Classic MySQL Replication" item and click "Next":



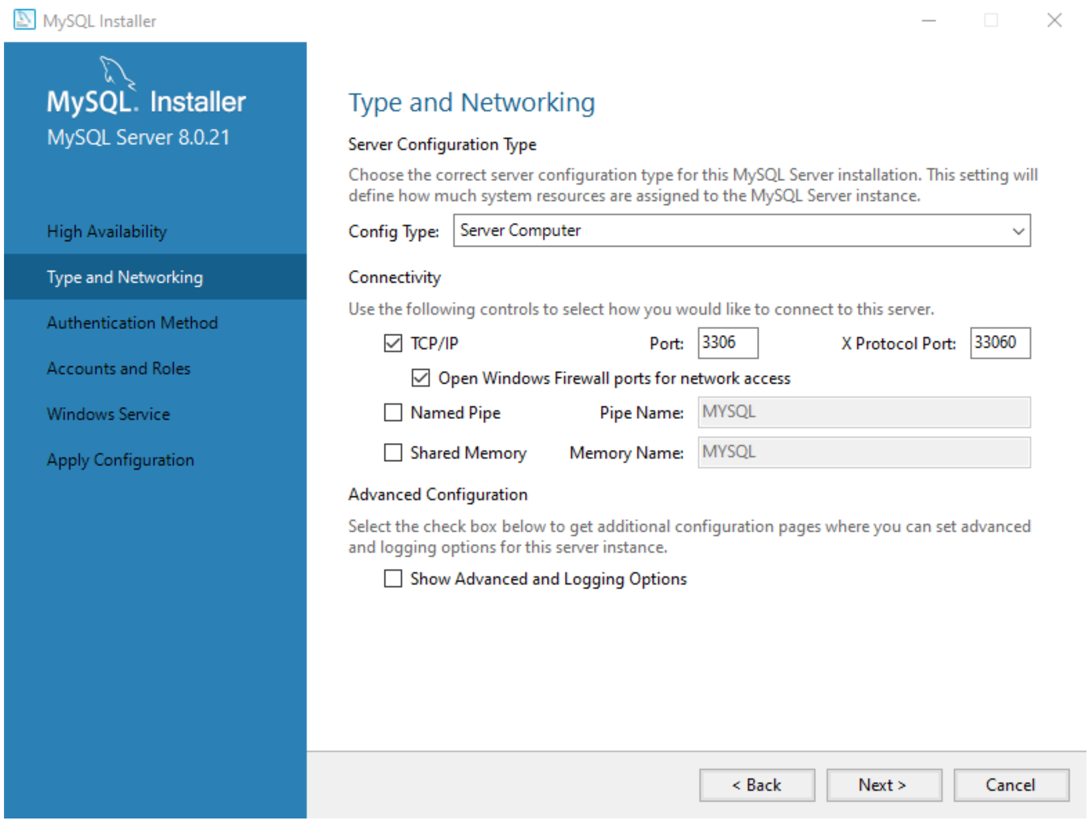
High Availability

[✓ Standalone MySQL Server / Classic MySQL Replication]
Choose this option to run the MySQL instance as a standalone database server with the opportunity to configure classic replication later. With this option, you can provide your own high-availability solution, if required.

InnoDB Cluster
The InnoDB cluster technology provides an out-of-the-box high availability (HA) solution for MySQL using Group Replication.

Note: InnoDB cluster requires a minimum of three MySQL server instances to provide a fully automated HA solution. Members of a cluster should be located such that network communication latency between servers is low.

Next, in the "Config Type" parameter, select "Server Computer" and click "Next":



MySQL Installer

MySQL Server 8.0.21

- High Availability
- Type and Networking
- Authentication Method
- Accounts and Roles
- Windows Service
- Apply Configuration

Type and Networking

Server Configuration Type

Choose the correct server configuration type for this MySQL Server installation. This setting will define how much system resources are assigned to the MySQL Server instance.

Config Type: Server Computer

Connectivity

Use the following controls to select how you would like to connect to this server.

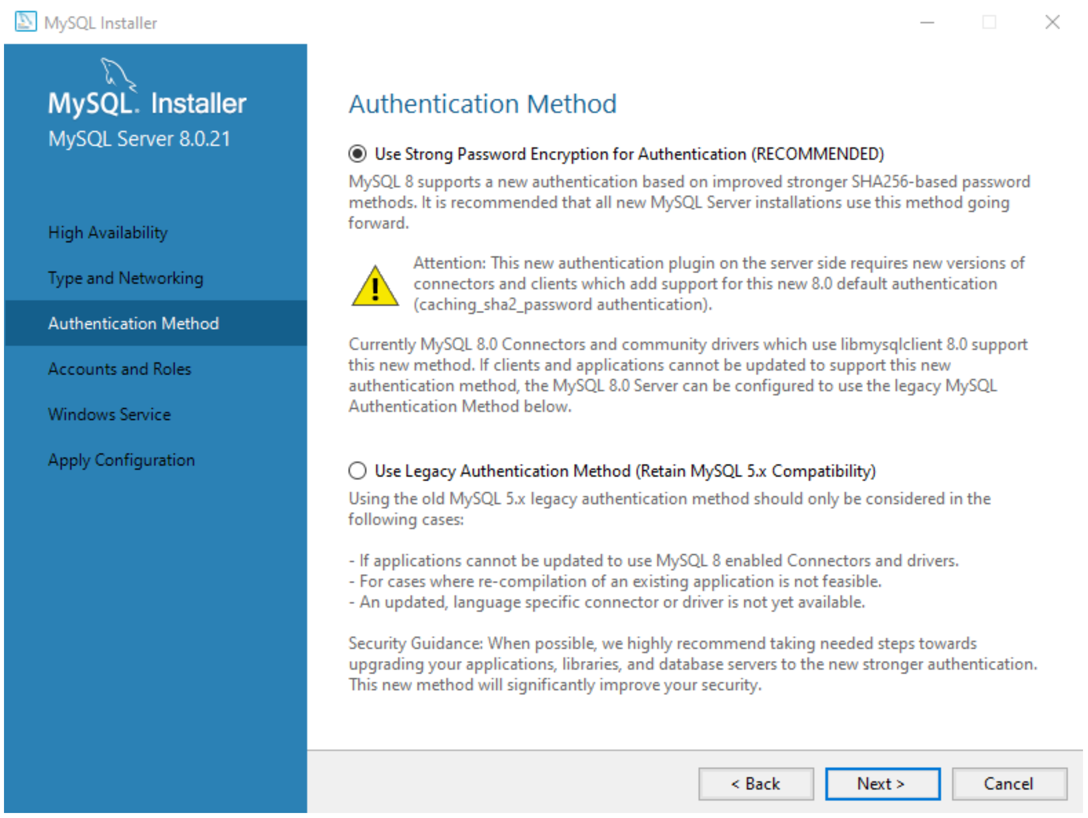
- [✓] TCP/IP Port: 3306 X Protocol Port: 33060
- [✓] Open Windows Firewall ports for network access
- [ ] Named Pipe Pipe Name: MYSQL
- [ ] Shared Memory Memory Name: MYSQL

Advanced Configuration

Select the check box below to get additional configuration pages where you can set advanced and logging options for this server instance.

- [ ] Show Advanced and Logging Options

Select "Use Strong Password Encryption for Authentication" and click "Next":



Authentication Method

● Use Strong Password Encryption for Authentication (RECOMMENDED)

MySQL 8 supports a new authentication based on improved stronger SHA256-based password methods. It is recommended that all new MySQL Server installations use this method going forward.

Attention: This new authentication plugin on the server side requires new versions of connectors and clients which add support for this new 8.0 default authentication (caching_sha2_password authentication).

Currently MySQL 8.0 Connectors and community drivers which use libmysqlclient 8.0 support this new method. If clients and applications cannot be updated to support this new authentication method, the MySQL 8.0 Server can be configured to use the legacy MySQL Authentication Method below.

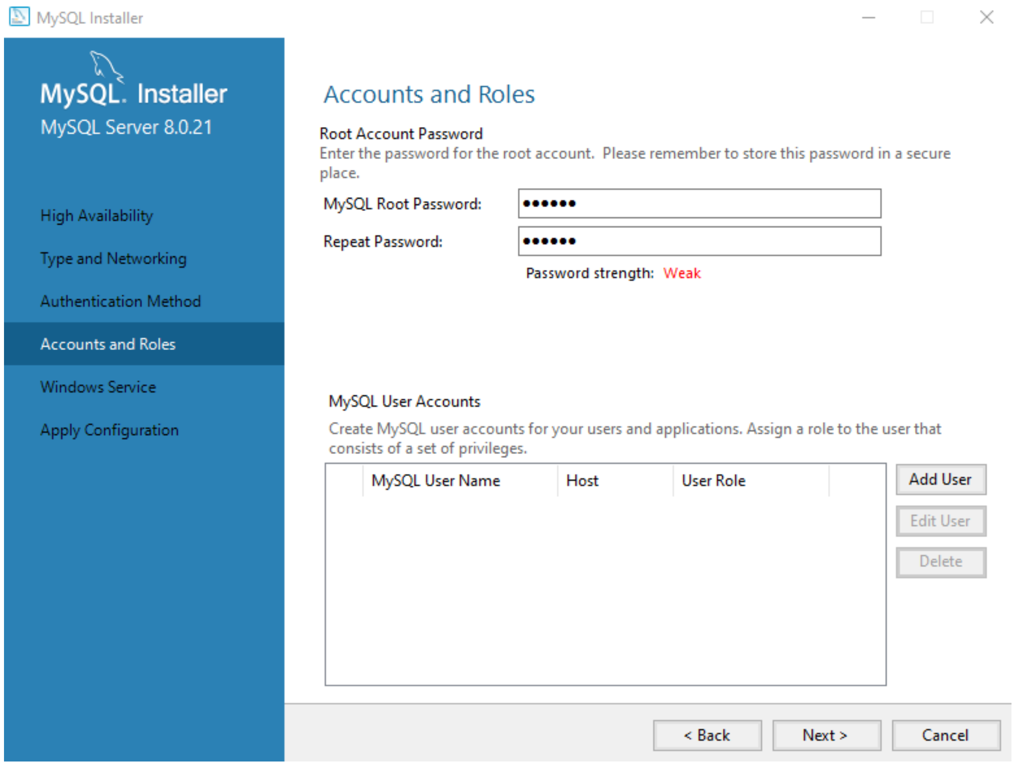
○ Use Legacy Authentication Method (Retain MySQL 5.x Compatibility)

Using the old MySQL 5.x legacy authentication method should only be considered in the following cases:

- If applications cannot be updated to use MySQL 8 enabled Connectors and drivers.
- For cases where re-compilation of an existing application is not feasible.
- An updated, language specific connector or driver is not yet available.

Security Guidance: When possible, we highly recommend taking needed steps towards upgrading your applications, libraries, and database servers to the new stronger authentication. This new method will significantly improve your security.

In the next window, you need to set a password for the root user (administrator). Also, here you can add other users (by clicking the "Add User" button), if necessary. After entering the password, click "Next":



MySQL Installer

MySQL. Installer
MySQL Server 8.0.21

Accounts and Roles

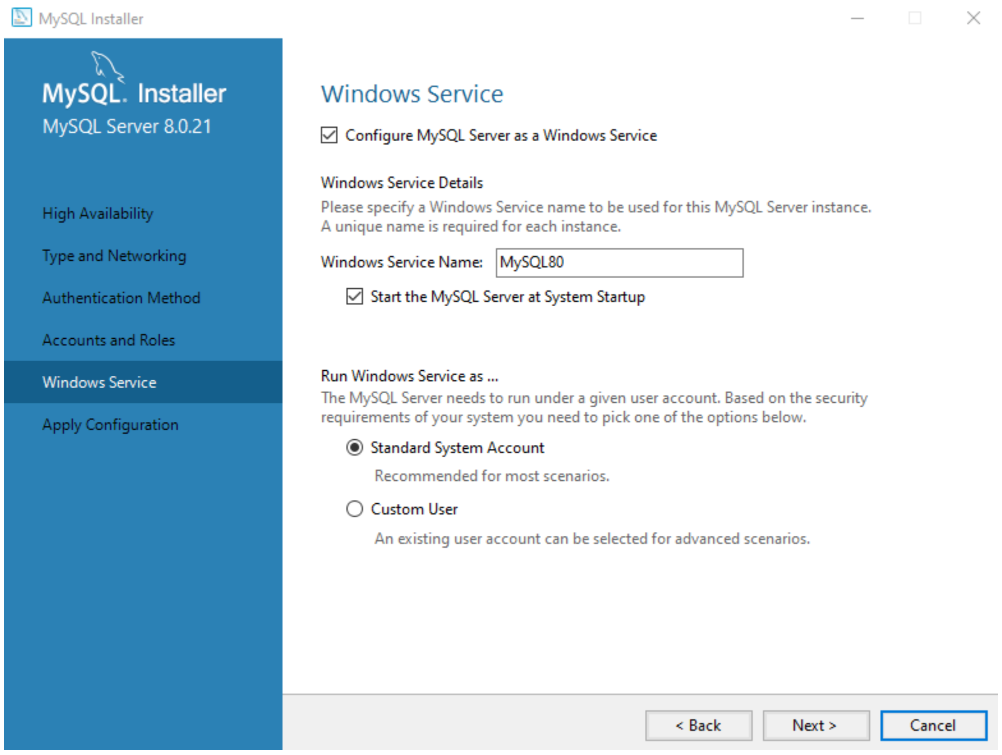
Root Account Password
Enter the password for the root account. Please remember to store this password in a secure place.

MySQL Root Password: ••••••
Repeat Password: ••••••
Password strength: Weak

MySQL User Accounts
Create MySQL user accounts for your users and applications. Assign a role to the user that consists of a set of privileges.

MySQL User Name	Host	User Role

At the next step, we leave all the default settings, click "Next":



MySQL Installer

MySQL. Installer
MySQL Server 8.0.21

Windows Service

☑ Configure MySQL Server as a Windows Service

Windows Service Details
Please specify a Windows Service name to be used for this MySQL Server instance.
A unique name is required for each instance.

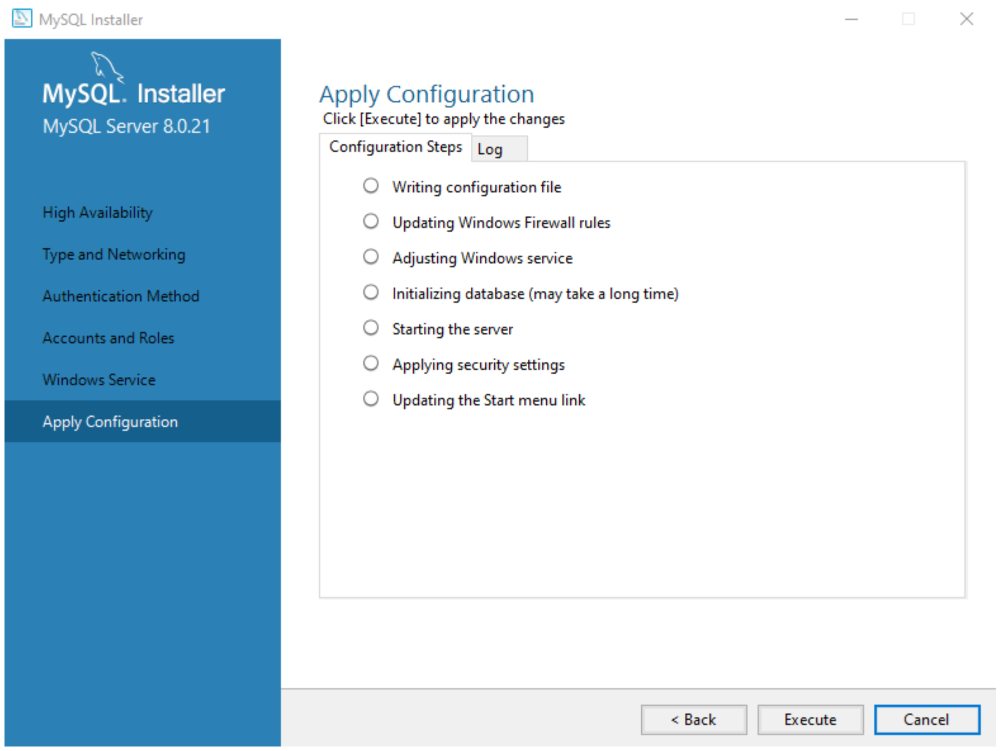
Windows Service Name: MySQL80
☑ Start the MySQL Server at System Startup

Run Windows Service as ...
The MySQL Server needs to run under a given user account. Based on the security requirements of your system you need to pick one of the options below.

● Standard System Account
Recommended for most scenarios.

○ Custom User
An existing user account can be selected for advanced scenarios.

Next, you need to apply the MySQL server settings by clicking "Execute":

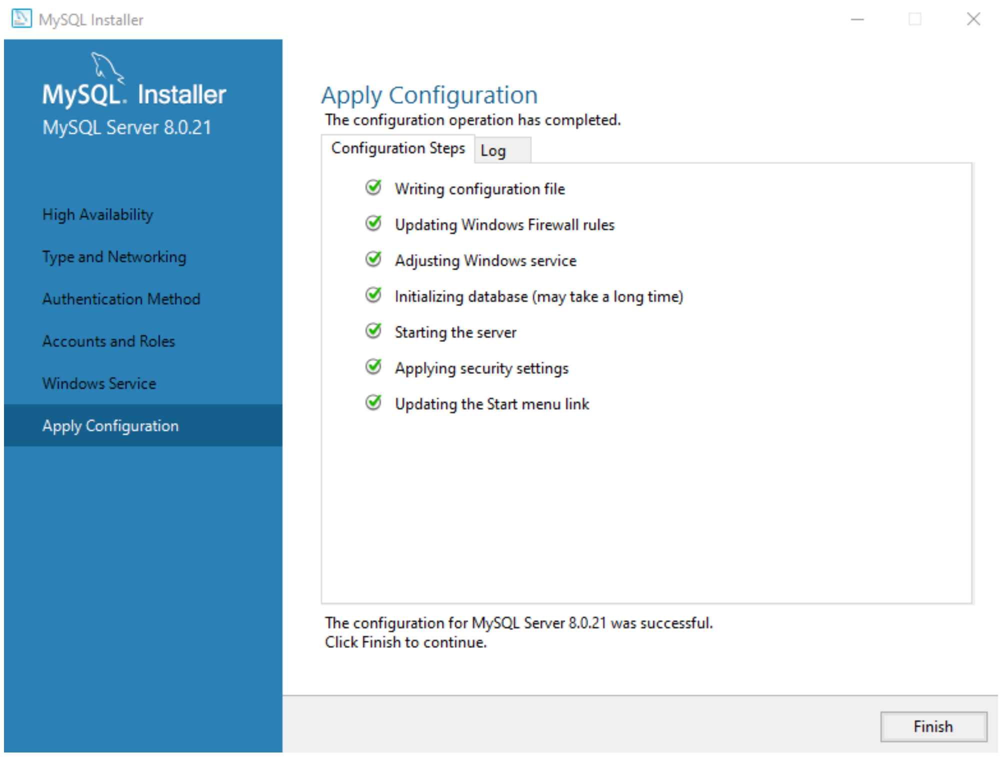


Apply Configuration

Click [Execute] to apply the changes

- ○ Writing configuration file
- ○ Updating Windows Firewall rules
- ○ Adjusting Windows service
- ○ Initializing database (may take a long time)
- ○ Starting the server
- ○ Applying security settings
- ○ Updating the Start menu link

MySQL server is configured, click "Finish":



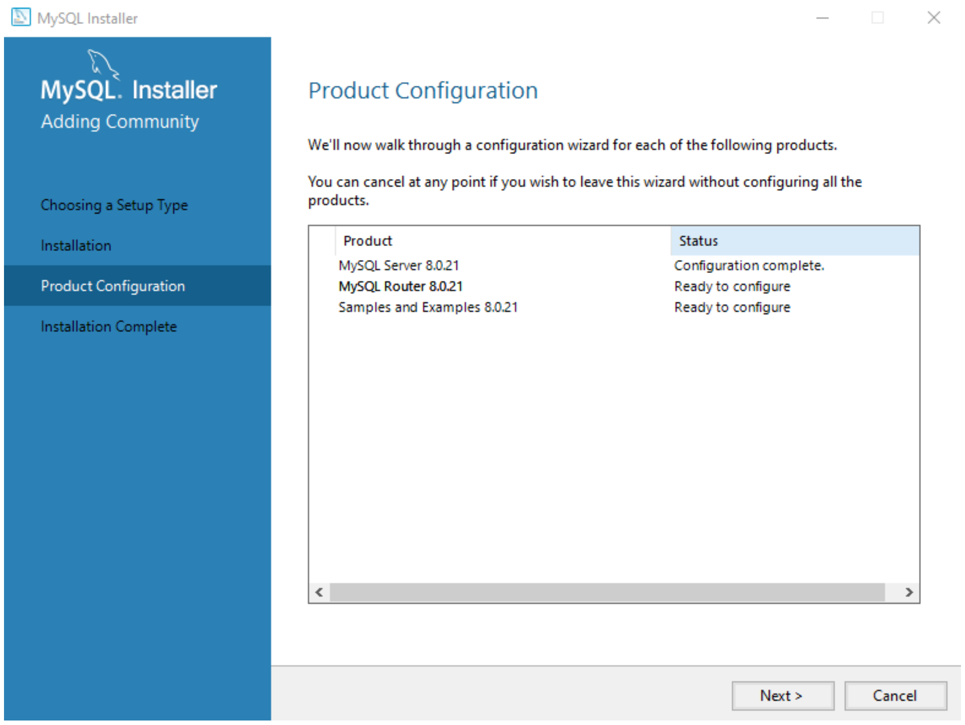
Apply Configuration

The configuration operation has completed.

- ✓ Writing configuration file
- ✓ Updating Windows Firewall rules
- ✓ Adjusting Windows service
- ✓ Initializing database (may take a long time)
- ✓ Starting the server
- ✓ Applying security settings
- ✓ Updating the Start menu link

The configuration for MySQL Server 8.0.21 was successful.
Click Finish to continue.

Next, let's move on to configuring MySQL Router. Click "Next":



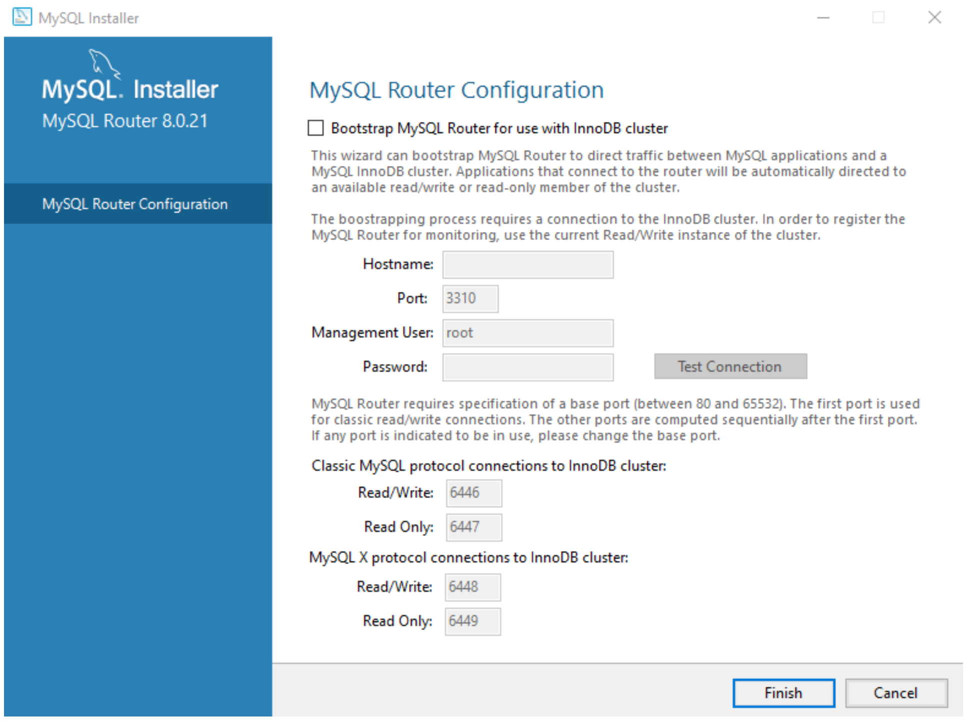
Product Configuration

We'll now walk through a configuration wizard for each of the following products.

You can cancel at any point if you wish to leave this wizard without configuring all the products.

Product	Status
MySQL Server 8.0.21	Configuration complete.
MySQL Router 8.0.21	Ready to configure
Samples and Examples 8.0.21	Ready to configure

Leave all the default settings and click "Finish":



MySQL Router Configuration

☐ Bootstrap MySQL Router for use with InnoDB cluster

This wizard can bootstrap MySQL Router to direct traffic between MySQL applications and a MySQL InnoDB cluster. Applications that connect to the router will be automatically directed to an available read/write or read-only member of the cluster.

The boostrapping process requires a connection to the InnoDB cluster. In order to register the MySQL Router for monitoring, use the current Read/Write instance of the cluster.

Hostname:	
Port:	3310
Management User:	root
Password:	

MySQL Router requires specification of a base port (between 80 and 65532). The first port is used for classic read/write connections. The other ports are computed sequentially after the first port. If any port is indicated to be in use, please change the base port.

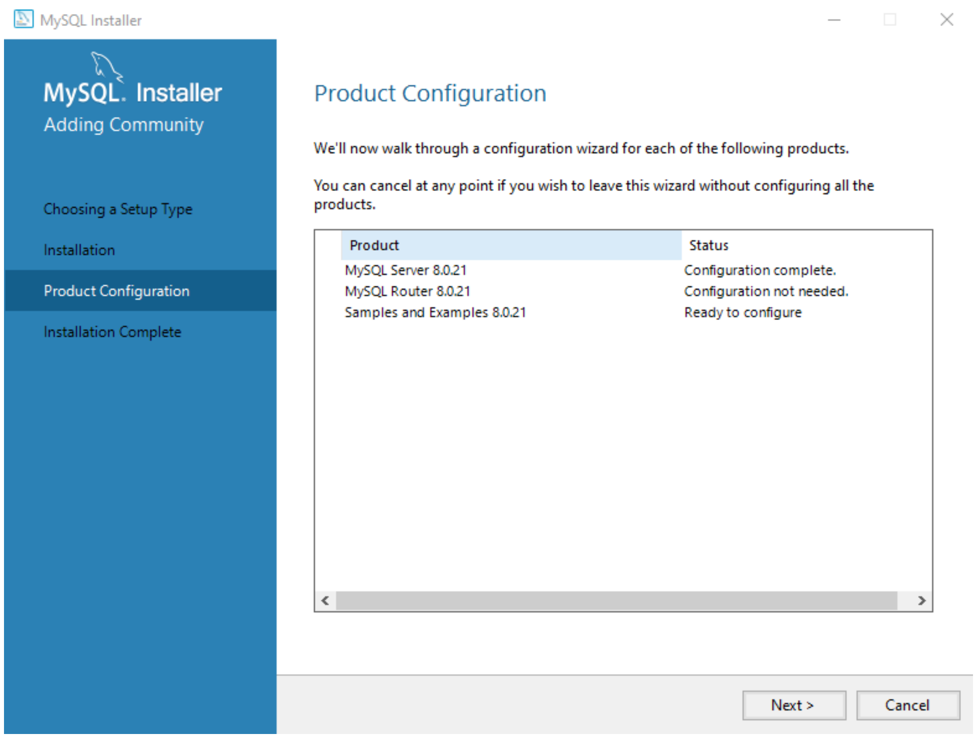
Classic MySQL protocol connections to InnoDB cluster:

Read/Write:	6446
Read Only:	6447

MySQL X protocol connections to InnoDB cluster:

Read/Write:	6448
Read Only:	6449

Now you need to check the created database, click "Next":



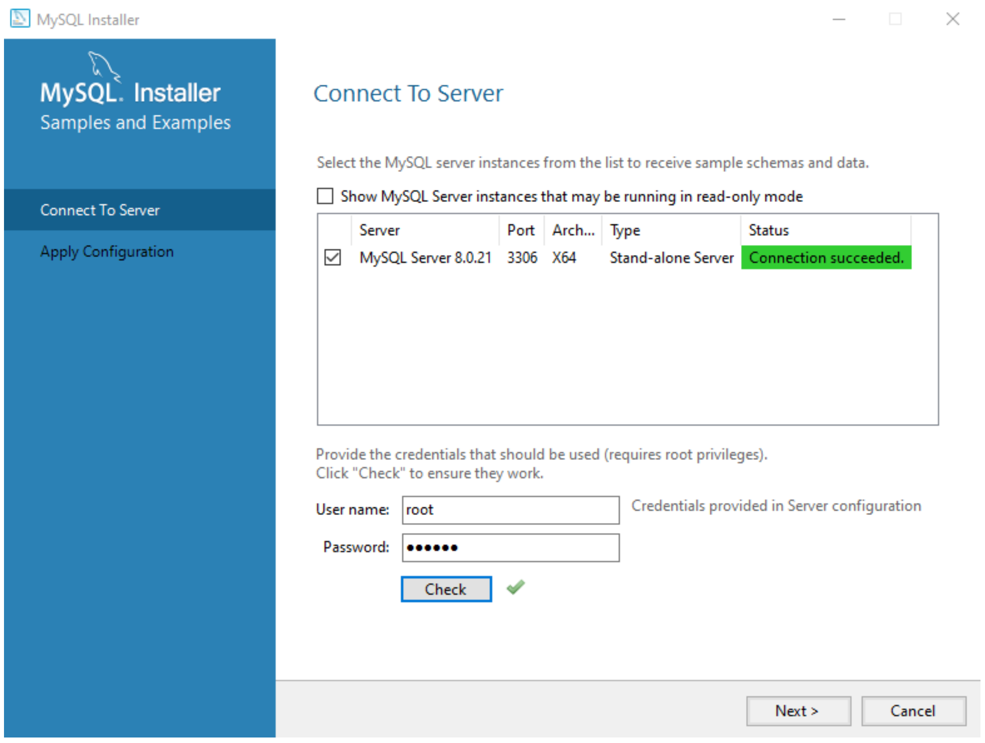
Product Configuration

We'll now walk through a configuration wizard for each of the following products.

You can cancel at any point if you wish to leave this wizard without configuring all the products.

Product	Status
MySQL Server 8.0.21	Configuration complete.
MySQL Router 8.0.21	Configuration not needed.
Samples and Examples 8.0.21	Ready to configure

Check the connection. Enter the password, click "Check", then click "Next":



Connect To Server

Select the MySQL server instances from the list to receive sample schemas and data.

☐ Show MySQL Server instances that may be running in read-only mode

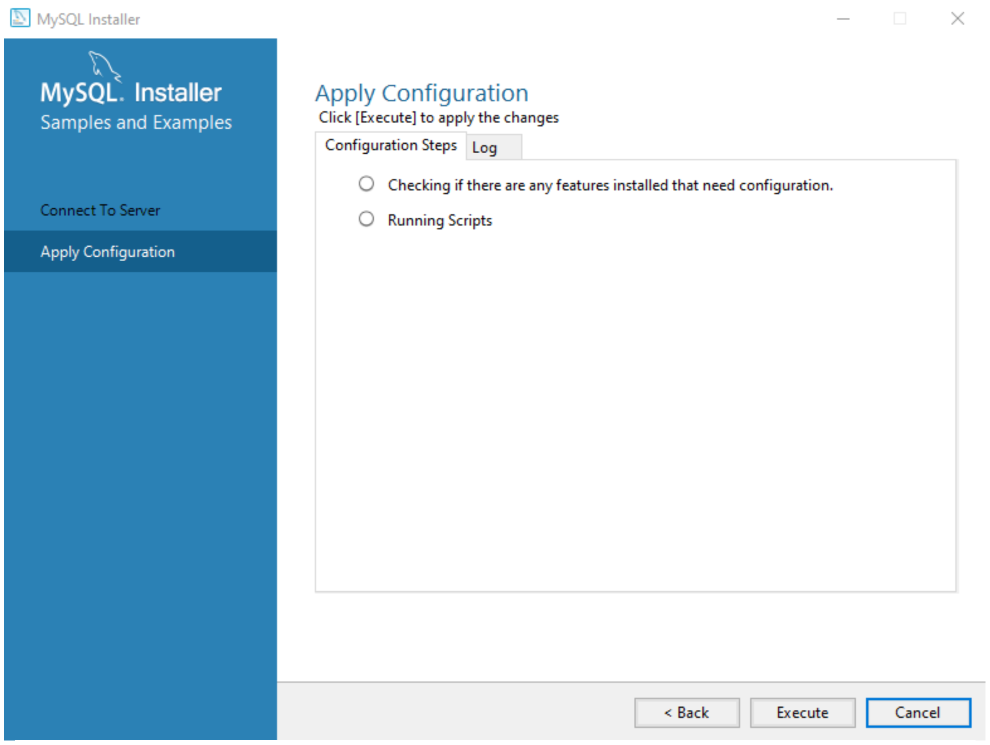
	Server	Port	Arch...	Type	Status
☑	MySQL Server 8.0.21	3306	X64	Stand-alone Server	Connection succeeded.

Provide the credentials that should be used (requires root privileges).
Click "Check" to ensure they work.

User name: root — Credentials provided in Server configuration

Password: ●●●●●●

Next, click "Execute" and then "Finish":

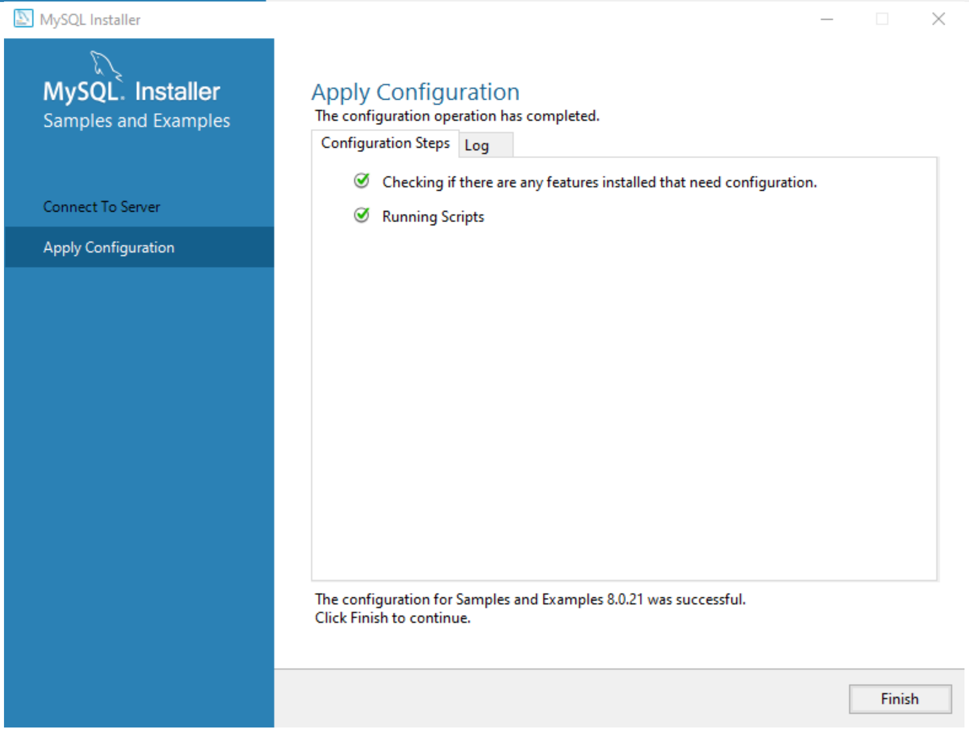


Apply Configuration

Click [Execute] to apply the changes

Checking if there are any features installed that need configuration.

Running Scripts



Apply Configuration

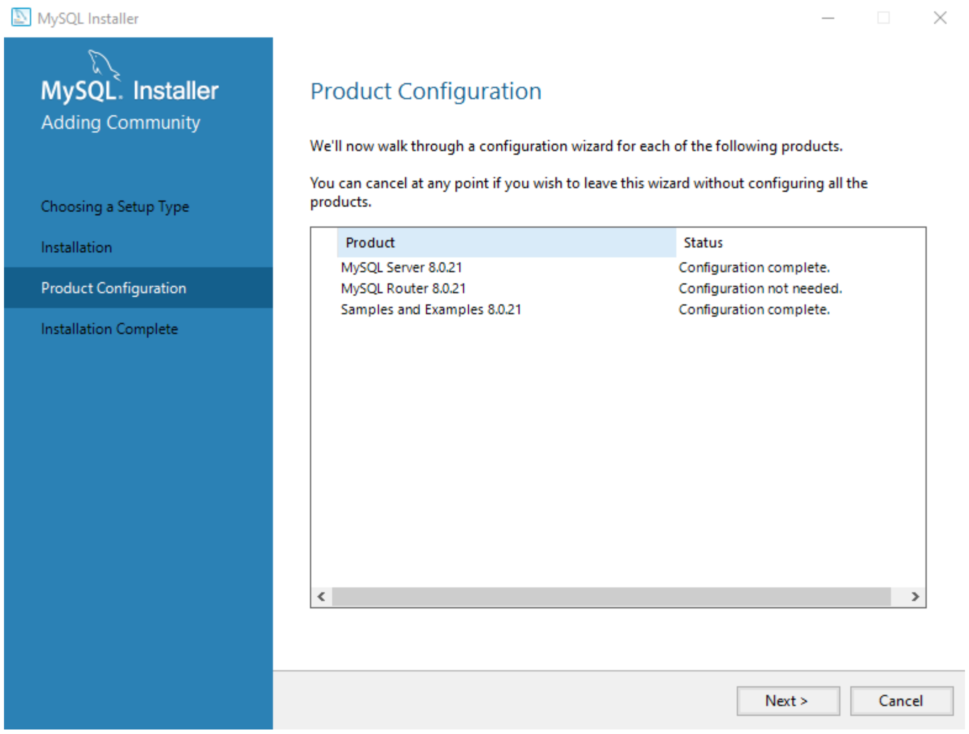
The configuration operation has completed.

✓ Checking if there are any features installed that need configuration.

✓ Running Scripts

The configuration for Samples and Examples 8.0.21 was successful.
Click Finish to continue.

Installation is almost complete, click "Next":



Product Configuration

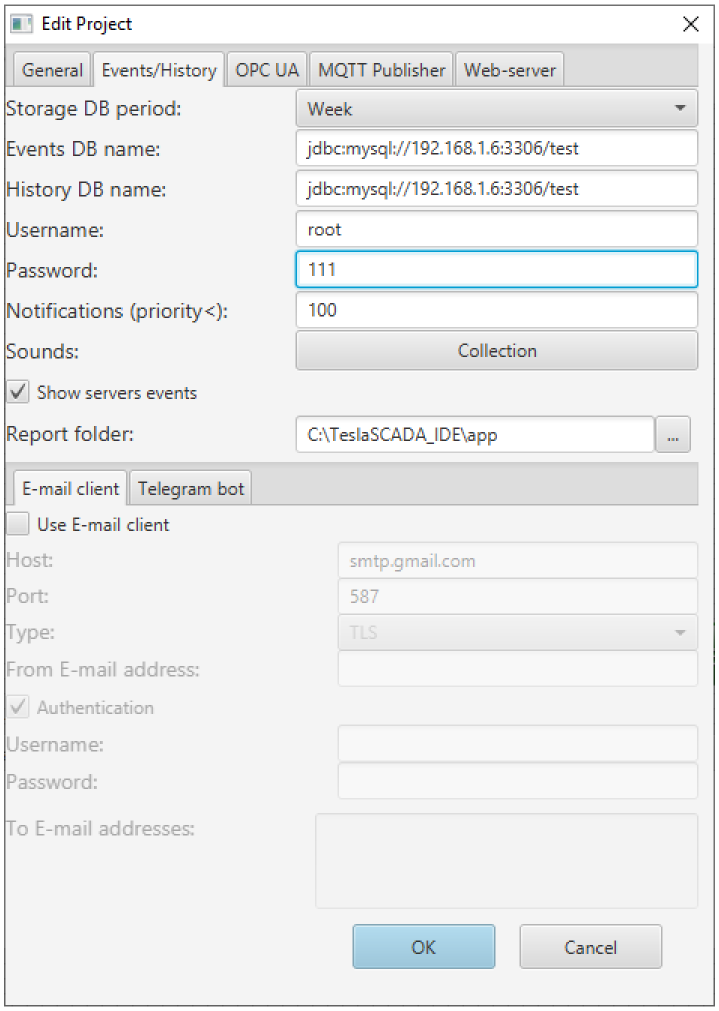
We'll now walk through a configuration wizard for each of the following products.

You can cancel at any point if you wish to leave this wizard without configuring all the products.

Product	Status
MySQL Server 8.0.21	Configuration complete.
MySQL Router 8.0.21	Configuration not needed.
Samples and Examples 8.0.21	Configuration complete.

Installation is complete - click "Finish". If you check the "Start MySQL Workbench after Setup" box, the MySQL Workbench 47 program will start, in which you can make additional database settings.

You have to create a database 49 in MySQL server by using MySQL Workbench manually. After creating database you can use it for collecting event and history information. To do this open Project properties and in Event/History tab 110 setup My SQL database by using jdbc:mysql: at the beginning of the Events DB name and History DB name:



Edit Project

General | Events/History | OPC UA | MQTT Publisher | Web-server

Storage DB period:	Week
Events DB name:	jdbc:mysql://192.168.1.6:3306/test
History DB name:	jdbc:mysql://192.168.1.6:3306/test
Username:	root
Password:	111
Notifications (priority<):	100
Sounds:	Collection

✓ Show servers events

Report folder:	C:\TeslaSCADA_IDE\app

E-mail client | Telegram bot

☐ Use E-mail client

Host:	smtp.gmail.com
Port:	587
Type:	TLS
From E-mail address:	

✓ Authentication

Username:	
Password:	
To E-mail addresses:	

In our case it's: jdbc:mysql://192.168.1.6:3306/test

where:

- **jdbc:mysql:** - beginning for MySQL.
- **192.168.1.6:3306** - IP address and port.
- **test** - name of the database (created in MySQL Workbench 49).

Also you can use My SQL database in Databases - Recipes and History DB. To do this in Db name of the database use jdbc:mysql: at the beginning also.

Important! If you get during the first running TeslaSCADA2 IDE or TeslaSCADA2 Runtime the Error message like this: "java.sql.SQLException: The server time zone..." , you have to setup time zone for your My SQL server, to do this open MySQL Workbench 51.

4.2.1 MySQL Workbench

MySQL Workbench is a visual database design tool that integrates database design, modeling, creation and operation. Its capabilities will be useful to us for:

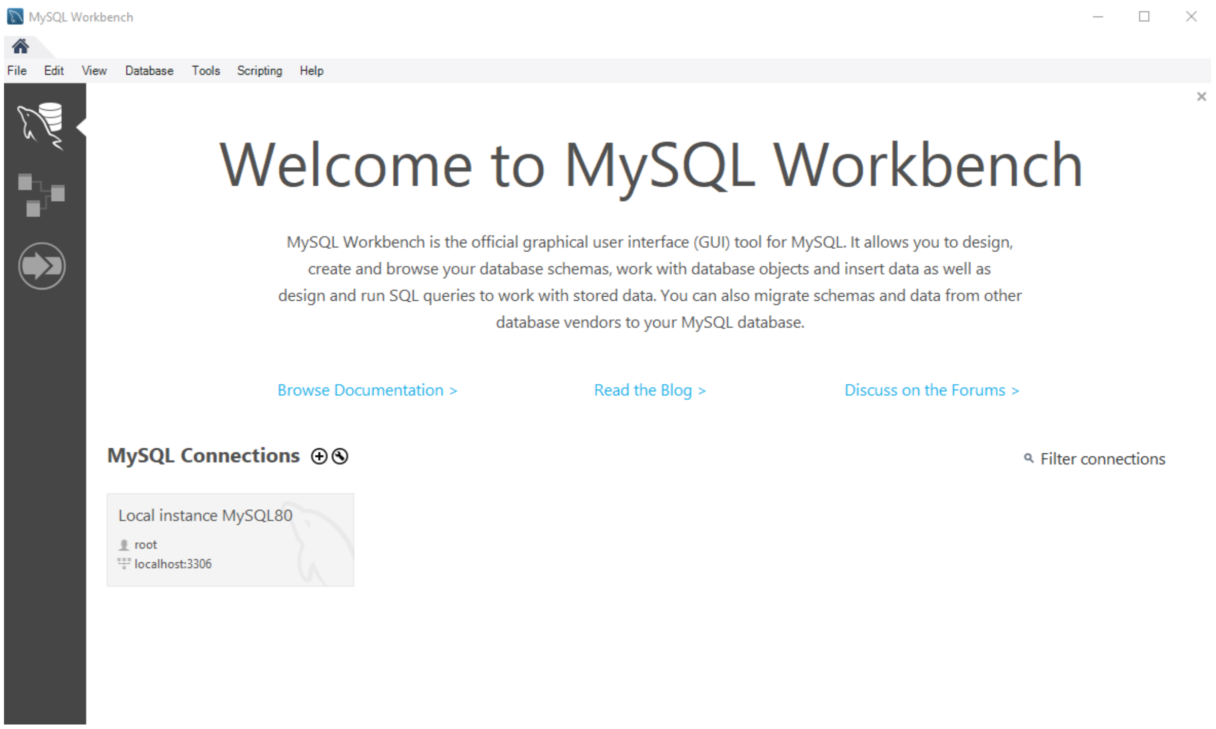
• backing up and restoring the database (also useful for transferring the database to another PC).

• settings for connecting to a remote database.

• changing the path of saving the database - "by default" is saved to disk "C".
• viewing database statistics.

If the database was installed according to the instructions in the previous section, then MySQL Workbench was installed along with MySQL, otherwise it can be downloaded from this link: http://dev.mysql.com/downloads/workbench/

After starting MySQL Workbench, you need to select an instance of the MySQL server in order to connect to it. In our case, it is only one (local) - click on it:

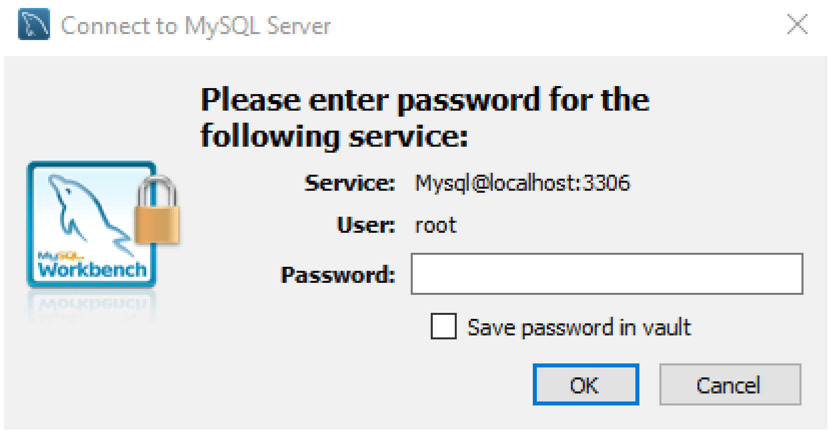


Welcome to MySQL Workbench

MySQL Workbench is the official graphical user interface (GUI) tool for MySQL. It allows you to design, create and browse your database schemas, work with database objects and insert data as well as design and run SQL queries to work with stored data. You can also migrate schemas and data from other database vendors to your MySQL database.

Local instance MySQL80
root
localhost:3306

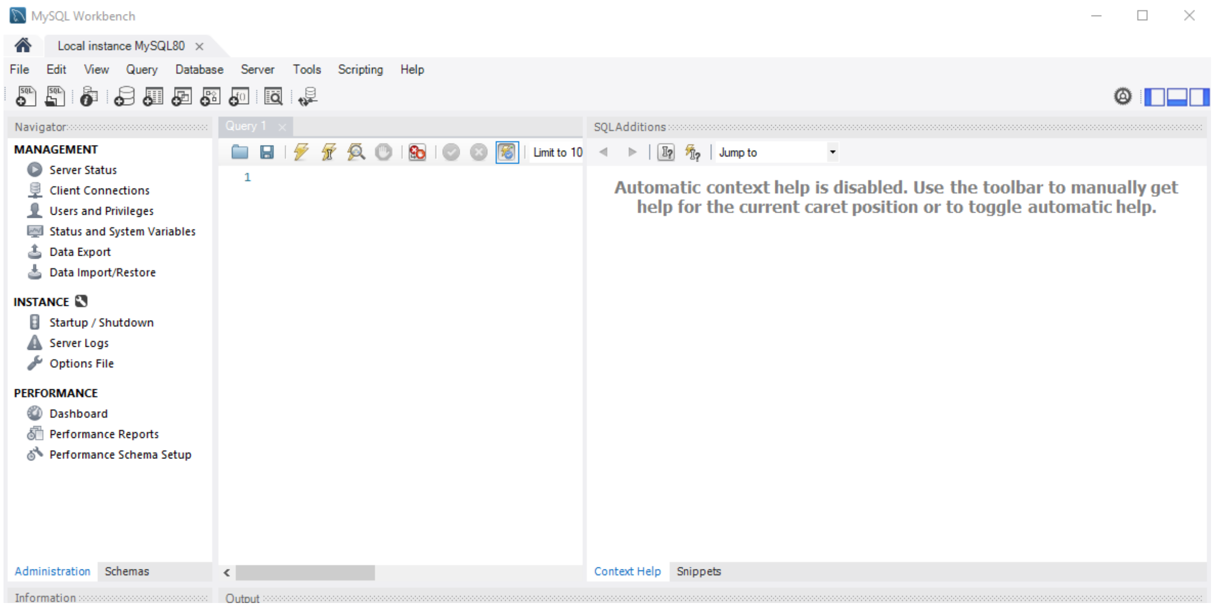
Enter the root user password (which was invented when setting up MySQL):



Please enter password for the following service:

Service: Mysql@localhost:3306
User: root
Password:

After connecting to the MySQL server, we will see the start page:

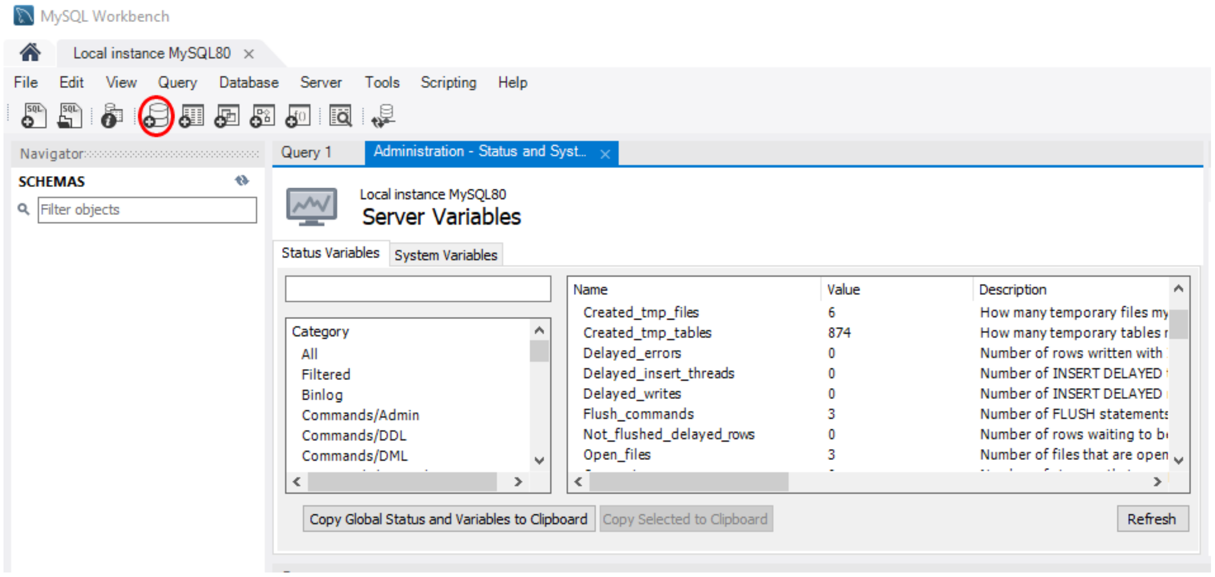


Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

1. Administration - Settings of the MySQL server.
2. Schemas (Database area) - the list of created databases is displayed here. Also, when you first turn it on, test databases can be displayed here - they can be deleted by clicking on the name of the database with RMB - a pop-up menu will appear in which you need to select "Drop Schema".

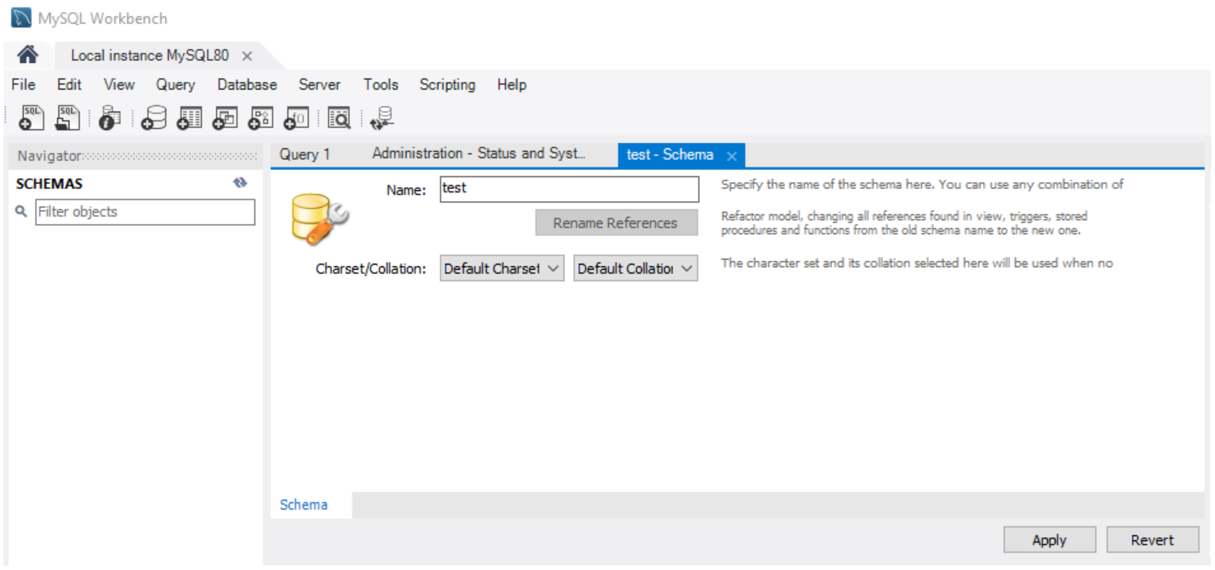
Create database

You have to create database manually:
Open "Schemas" tab. Click "Create a new schema in the connected server" icon:



Name	Value	Description
Created_tmp_files	6	How many temporary files my
Created_tmp_tables	874	How many temporary tables r
Delayed_errors	0	Number of rows written with
Delayed_insert_threads	0	Number of INSERT DELAYED
Delayed_writes	0	Number of INSERT DELAYED
Flush_commands	3	Number of FLUSH statements
Not_flushed_delayed_rows	0	Number of rows waiting to be
Open_files	3	Number of files that are open

Enter "Name" of the schema and click Apply:



Name: test

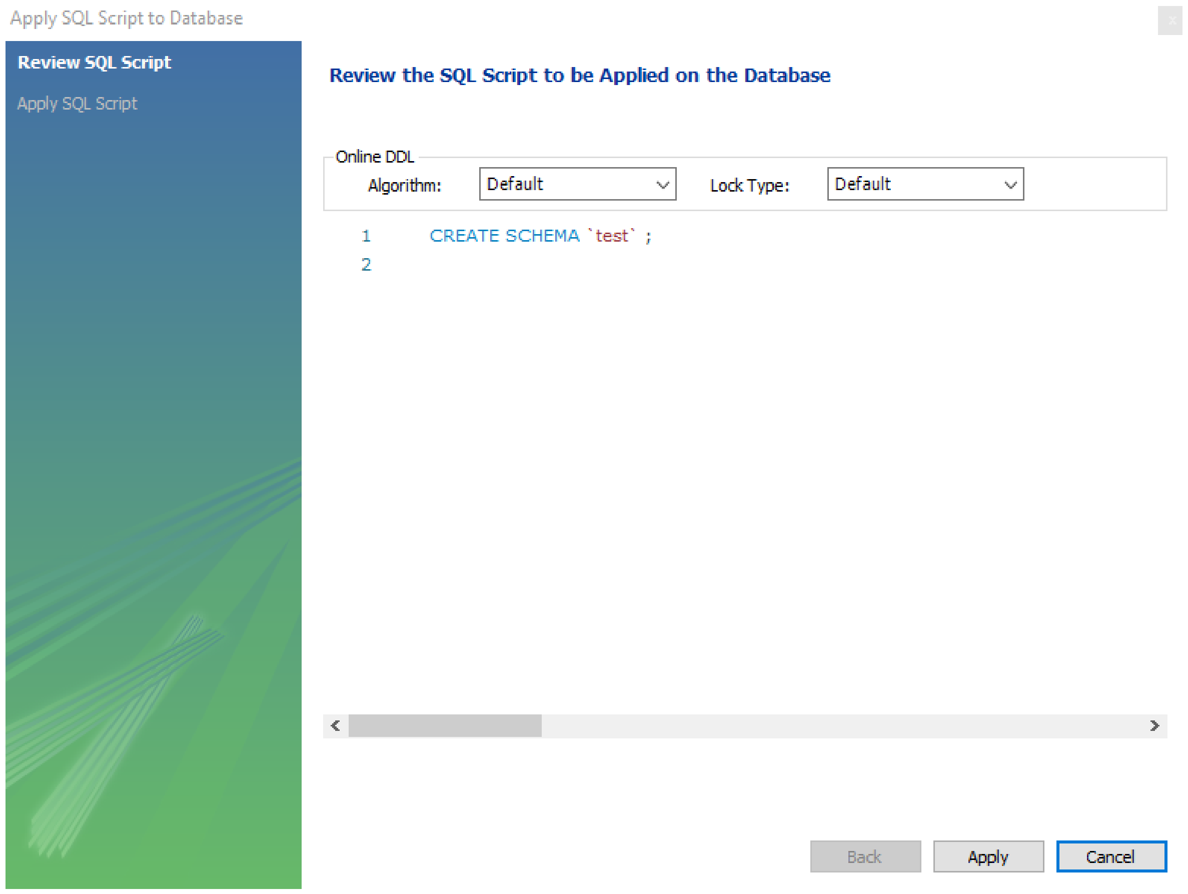
Charset/Collation: Default Charset Default Collation

Specify the name of the schema here. You can use any combination of

Refactor model, changing all references found in view, triggers, stored procedures and functions from the old schema name to the new one.

The character set and its collation selected here will be used when no

"Apply SQL script to Database" window will be appeared. Click Apply:

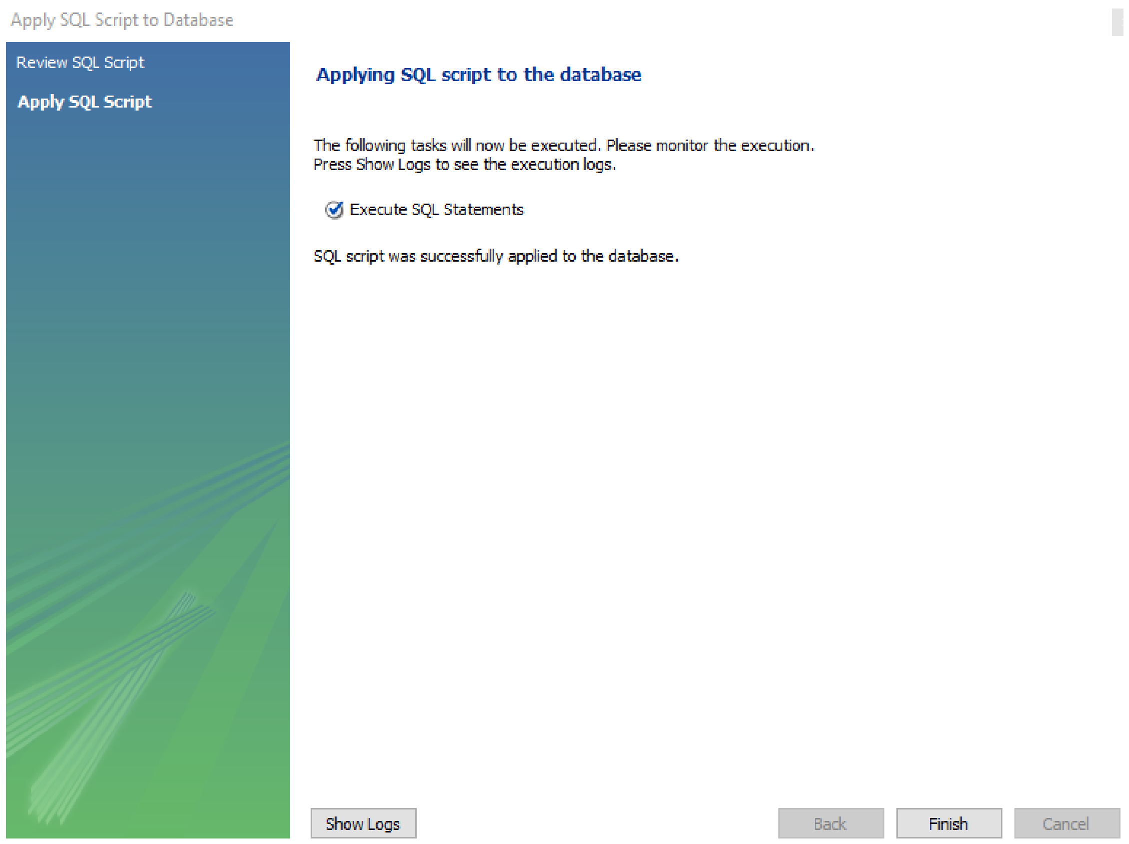

Apply SQL Script to Database
Review SQL Script
Apply SQL Script
Review the SQL Script to be Applied on the Database
Back
Apply
Cancel

Online DDL

Algorithm: Default Lock Type: Default

```
CREATE SCHEMA `test` ;
```

Then click "Finish":



Applying SQL script to the database

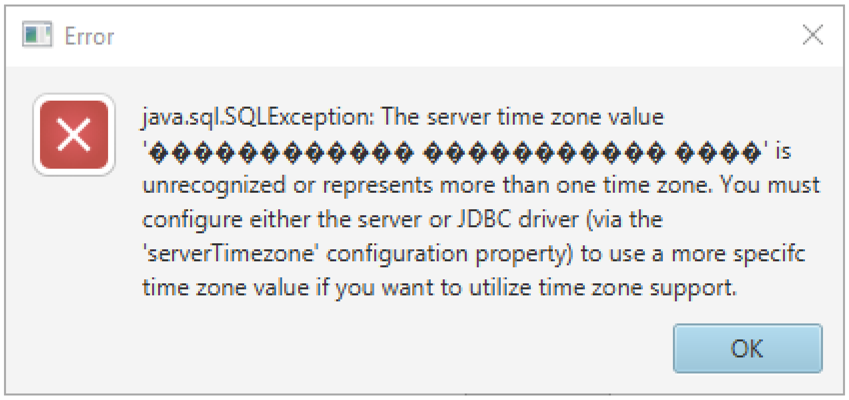
The following tasks will now be executed. Please monitor the execution.
Press Show Logs to see the execution logs.

✓ Execute SQL Statements

SQL script was successfully applied to the database.

Change server time zone

If you get during the first running TeslaSCADA2 IDE or TeslaSCADA2 Runtime the Error message like this:

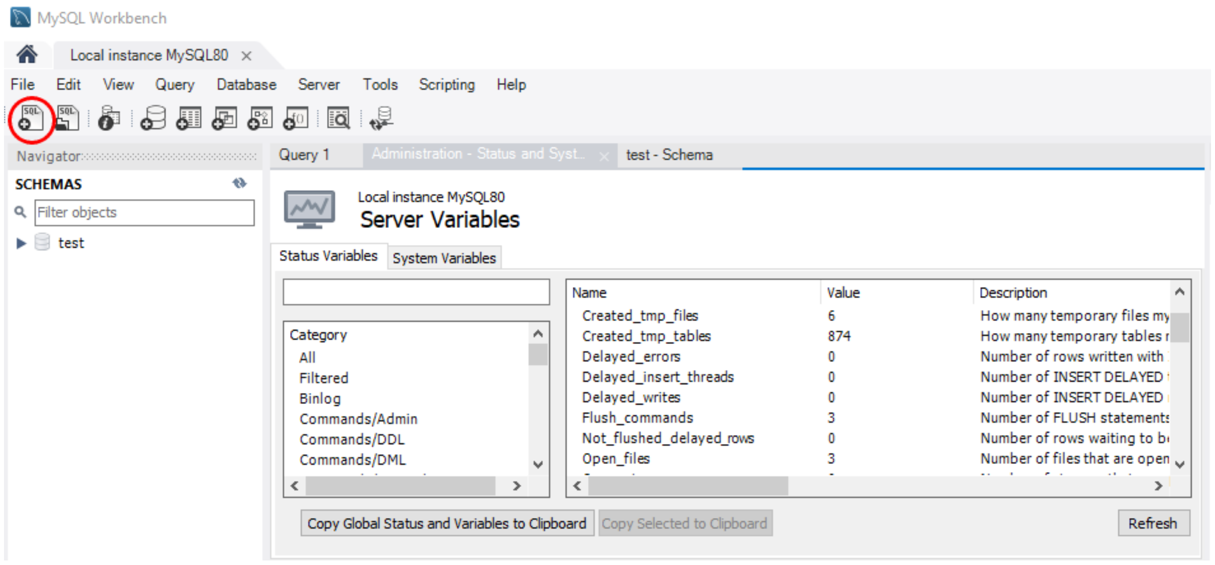


```
java.sql.SQLException: The server time zone value
'������������ ����������� ����' is
unrecognized or represents more than one time zone. You must
configure either the server or JDBC driver (via the
'serverTimezone' configuration property) to use a more specifc
time zone value if you want to utilize time zone support.
```

You can fix it in 2 ways:

1. Set global by SQL query (it's a temporary solution, after restart your MySQL server the problem will return).

To do this you have to setup time zone for your My SQL server to do this open MySQL Workbench and click icon "Create a new SQL tab for executing queries":

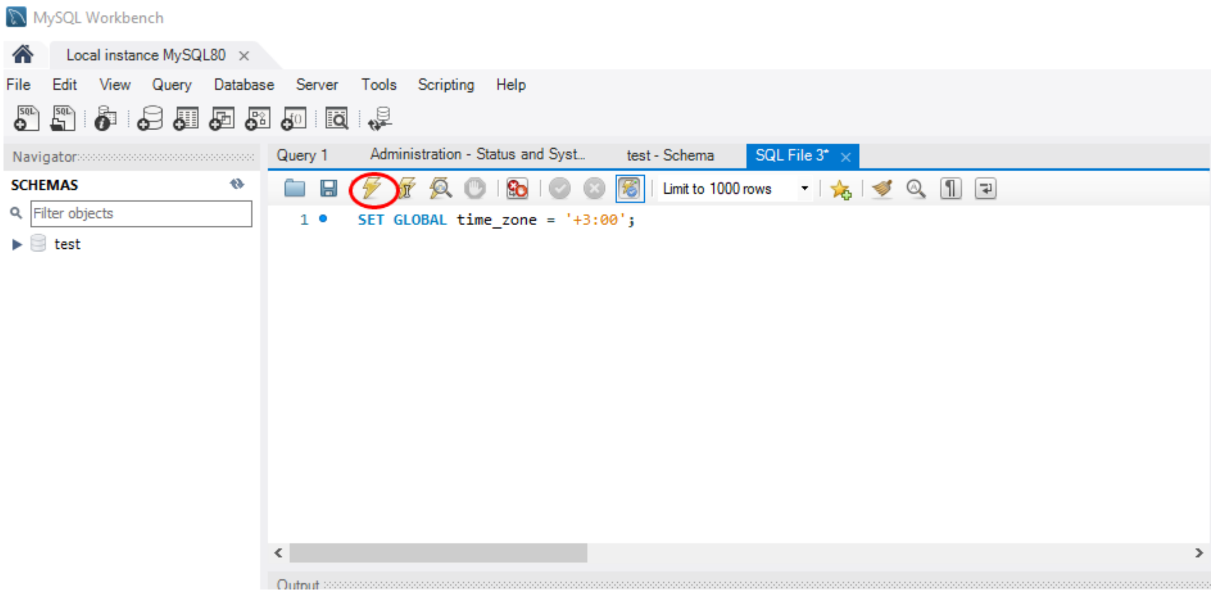


Category
All
Filtered
Binlog
Commands/Admin
Commands/DDL
Commands/DML

Name	Value	Description
Created_tmp_files	6	How many temporary files my
Created_tmp_tables	874	How many temporary tables r
Delayed_errors	0	Number of rows written with
Delayed_insert_threads	0	Number of INSERT DELAYED
Delayed_writes	0	Number of INSERT DELAYED
Flush_commands	3	Number of FLUSH statements
Not_flushed_delayed_rows	0	Number of rows waiting to b
Open_files	3	Number of files that are open

Enter: SET GLOBAL time_zone = '+3:00';

Where instead of '+3:00' you have to enter your time zone. And then click "Execute..." icon:

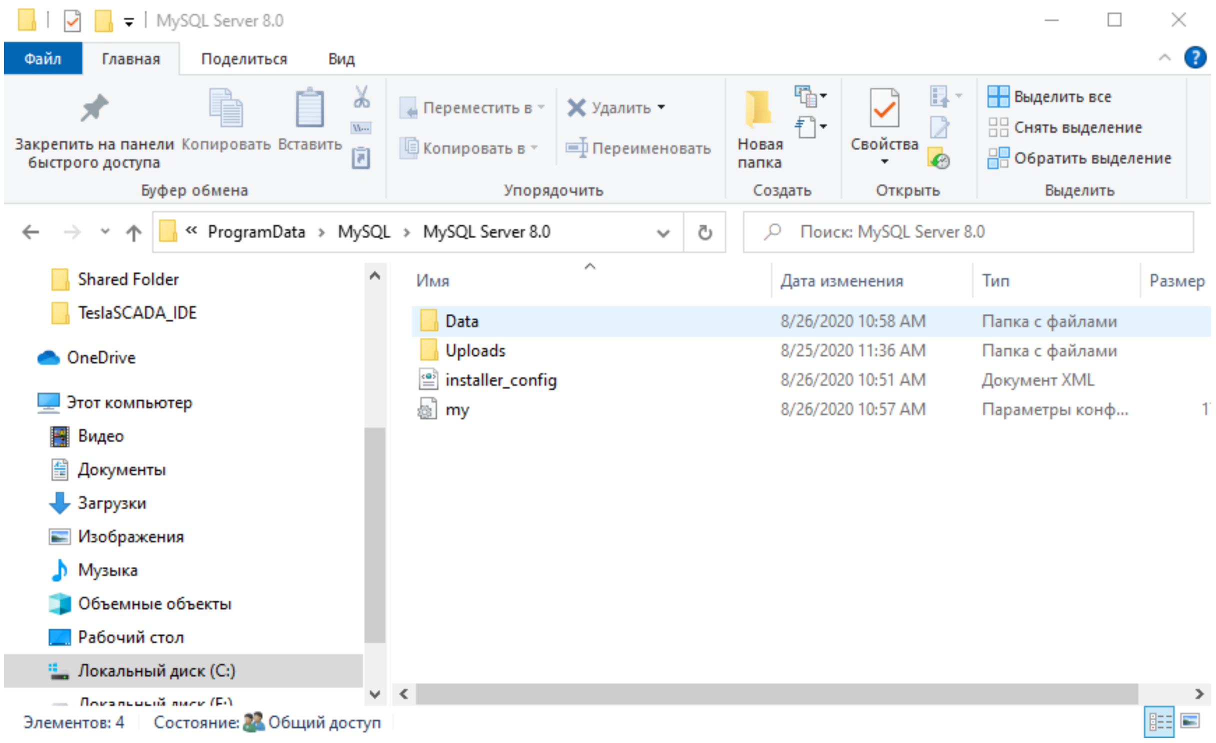


```
SET GLOBAL time_zone = '+3:00';
```

Now you can try Run TeslaSCADA2 project again in TeslaSCADA2 IDE or in TeslaSCADA2 Runtime.

2. Change my.ini (Windows) or my.inf (Linux) file.

2.1 Find my.ini or my.inf file. It's an initialization file for MySQL server. Usually it's placed in C:/ProgramData/MySQL/MySQL Server 8.0/:



Имя	Дата изменения	Тип	Размер
Data	8/26/2020 10:58 AM	Папка с файлами	
Uploads	8/25/2020 11:36 AM	Папка с файлами	
installer_config	8/26/2020 10:51 AM	Документ XML	
my	8/26/2020 10:57 AM	Параметры конф...	1

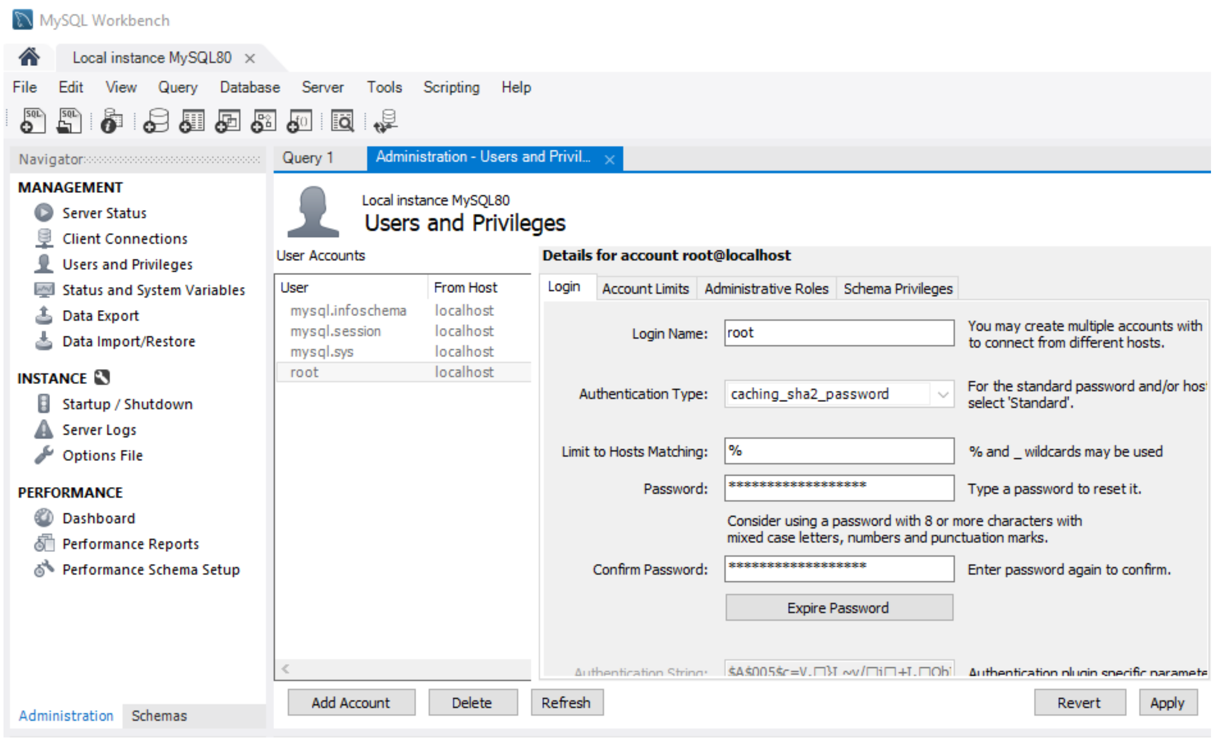
2.2. Open file my.ini and add this line: default-time-zone='+03:00' Where instead of '+3:00' you have to enter your time zone.

2.3. Save file (your current user should have access to this folder).

2.4. Restart your MySQL server.

Now you can try Run TeslaSCADA2 project again in TeslaSCADA2 IDE or in TeslaSCADA2 Runtime.

Settings required for connecting to a remote database



Local instance MySQL80
Users and Privileges

User Accounts

User	From Host
mysql.infoschema	localhost
mysql.session	localhost
mysql.sys	localhost
root	localhost

Details for account root@localhost

Login Name: root — You may create multiple accounts with to connect from different hosts.

Authentication Type: caching_sha2_password — For the standard password and/or host select 'Standard'.

Limit to Hosts Matching: % — % and _ wildcards may be used

Password: ****************** — Type a password to reset it.

Consider using a password with 8 or more characters with mixed case letters, numbers and punctuation marks.

Confirm Password: ****************** — Enter password again to confirm.

Authentication String: $A$005$c=V... — Authentication plugin specific paramete

1.Select the item "Users and Privileges".
2. Select the user "root".
3.In the "Limit to Hosts Matching" field, enter "%".
4. Save the changes by clicking the "Apply" button.
Now you can connect to the database from a remote PC.

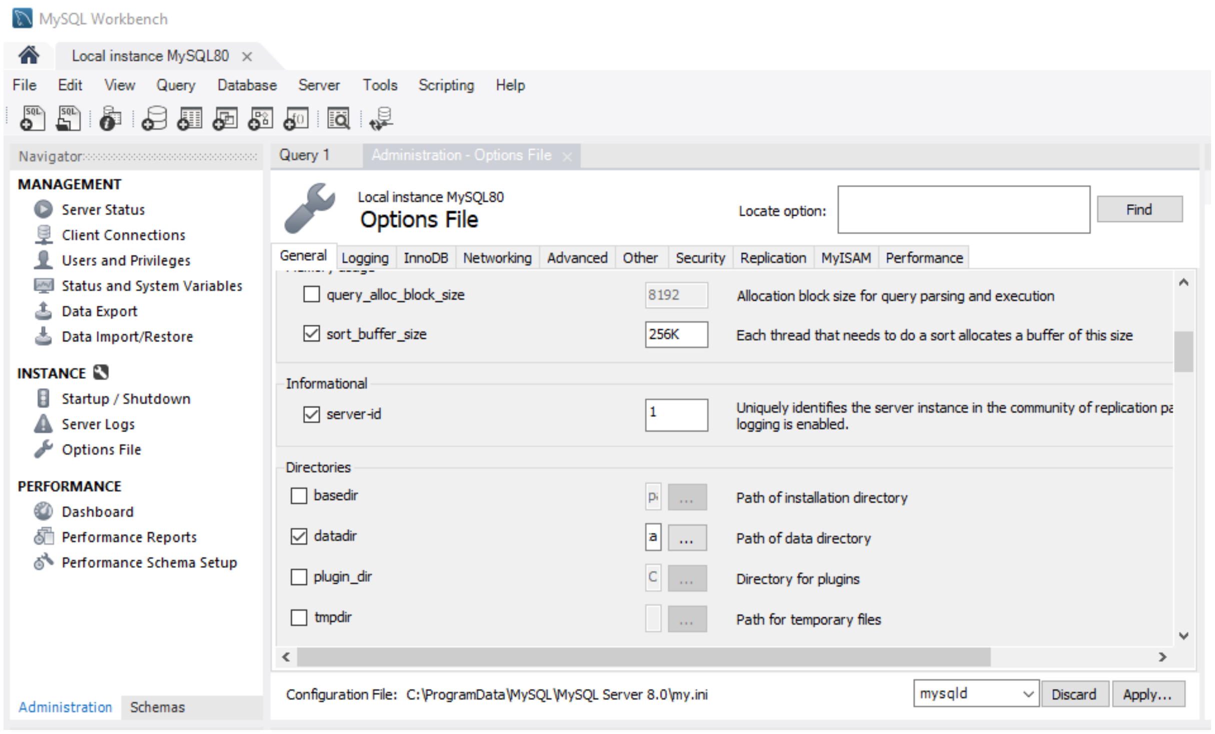
Changing the database save path

To change the path for saving the database, you should do the following:

• stop the MySQL service via Windows services.

• move the entire "data" directory from the current location (by default "C: \ ProgramData \ MySQL \ MySQL Server 5.x \ data") to a new one (cut - paste).

Next, you need to run MySQL Workbench "as administrator" and change the "datadir" parameter to a new location for the data directory:



query_alloc_block_size 8192 Allocation block size for query parsing and execution

[✓] sort_buffer_size 256K Each thread that needs to do a sort allocates a buffer of this size

Informational

[✓] server-id 1 Uniquely identifies the server instance in the community of replication pa logging is enabled.

Directories

basedir Path of installation directory

[✓] datadir a Path of data directory

plugin_dir C Directory for plugins

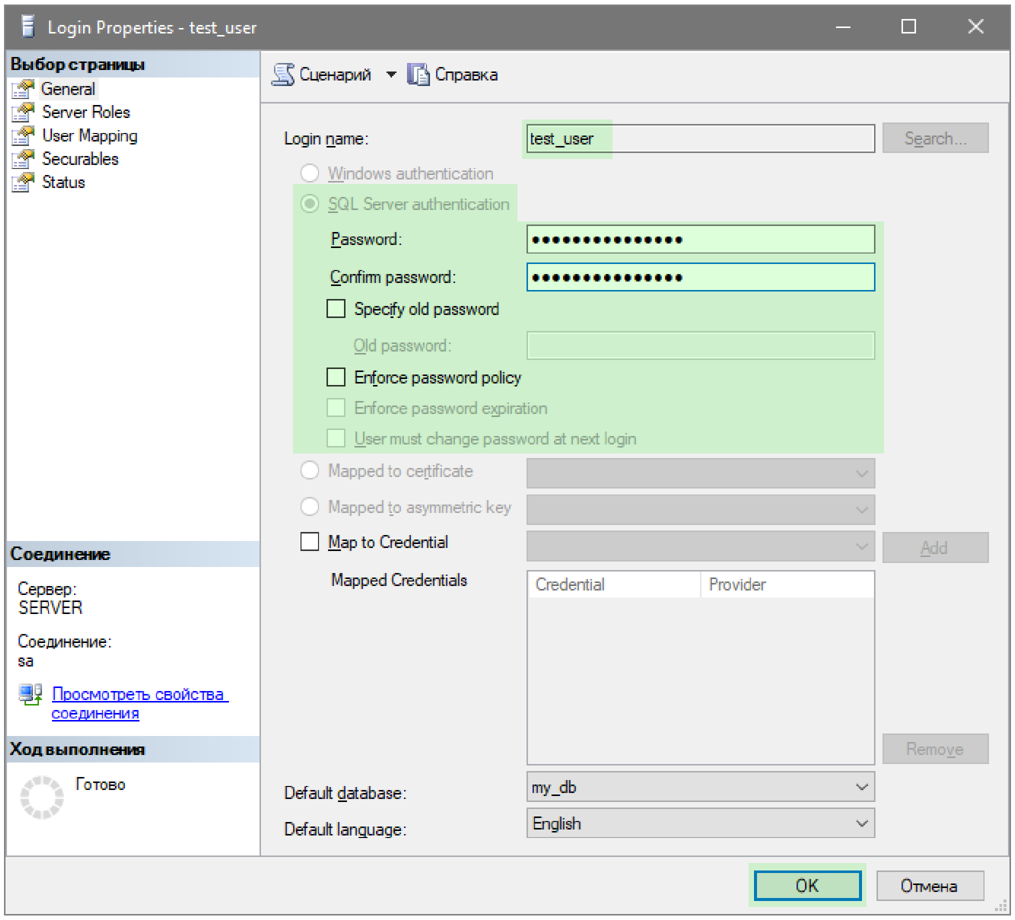
tmpdir Path for temporary files

Configuration File: C:\ProgramData\MySQL\MySQL Server 8.0\my.ini mysqld

4.3 MSSQL

To work with MSSQL databases you have to install MSSQL server on your PC. How to install MSSQL server you can find in the Internet. For example, how to install Express version you can find here.

Important! For TCP / IP connection the user should be created in SQL Server with the ability to authorize through the SQL server (not through Windows!):


Login Properties - test_user

Выбор страницы
- General
- Server Roles
- User Mapping
- Securables
- Status

Соединение

Сервер:
SERVER

Соединение:
sa

Просмотреть свойства соединения

Ход выполнения

Готово

Сценарий ▾ Справка

Login name: test_user Search...

( ) Windows authentication
(●) SQL Server authentication

Password: ●●●●●●●●●●●●●●●

Confirm password: ●●●●●●●●●●●●●●●

☐ Specify old password

Old password:

☐ Enforce password policy
☐ Enforce password expiration
☐ User must change password at next login

( ) Mapped to certificate
( ) Mapped to asymmetric key
☐ Map to Credential Add

Mapped Credentials

Credential	Provider

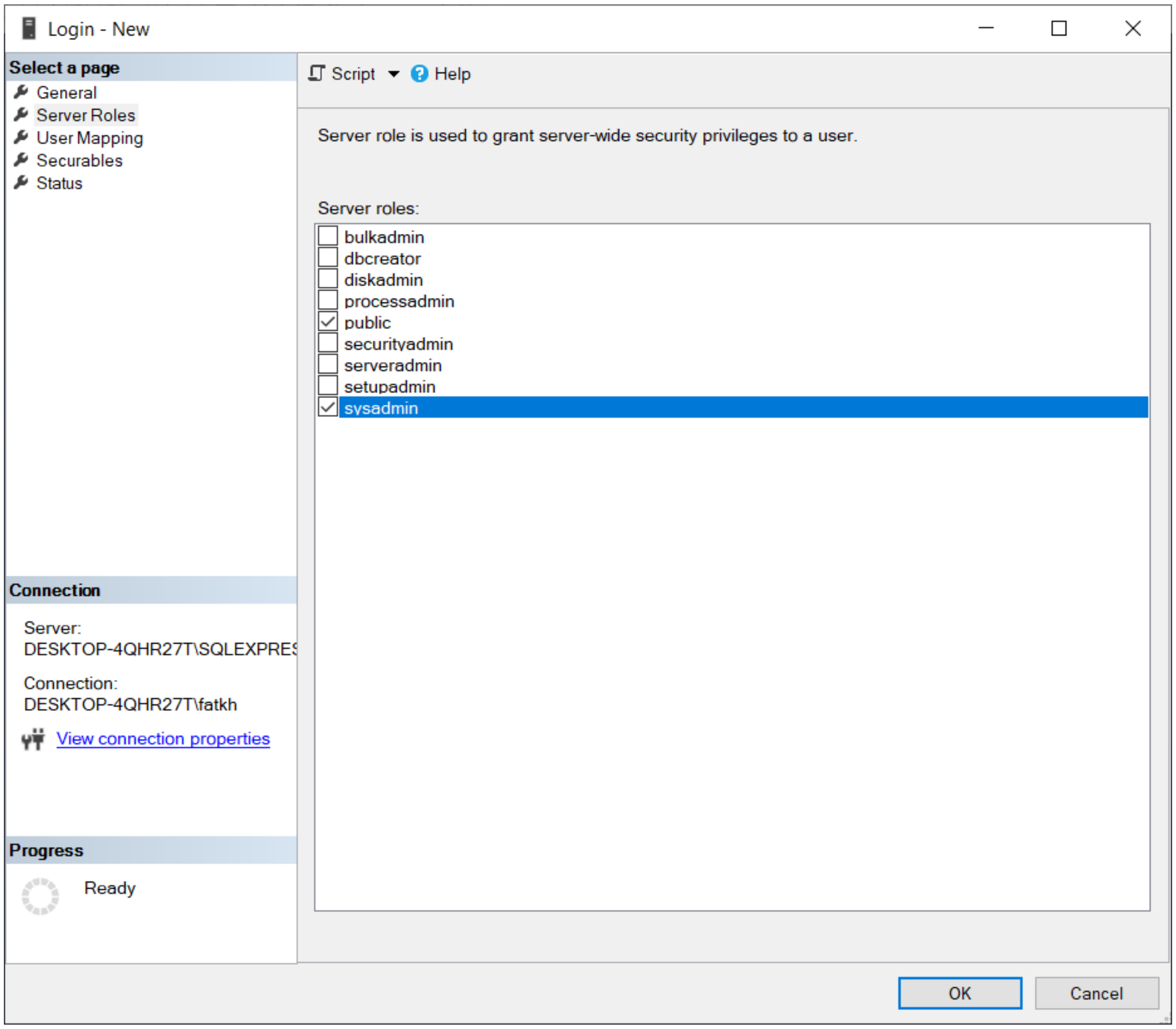
Remove

Default database: my_db

Default language: English

OK Отмена

And you have to provide user possibility to create tables, read, write into database and other function. The most easy way to is to provide sysadmin server role:



Server role is used to grant server-wide security privileges to a user.

Server roles:

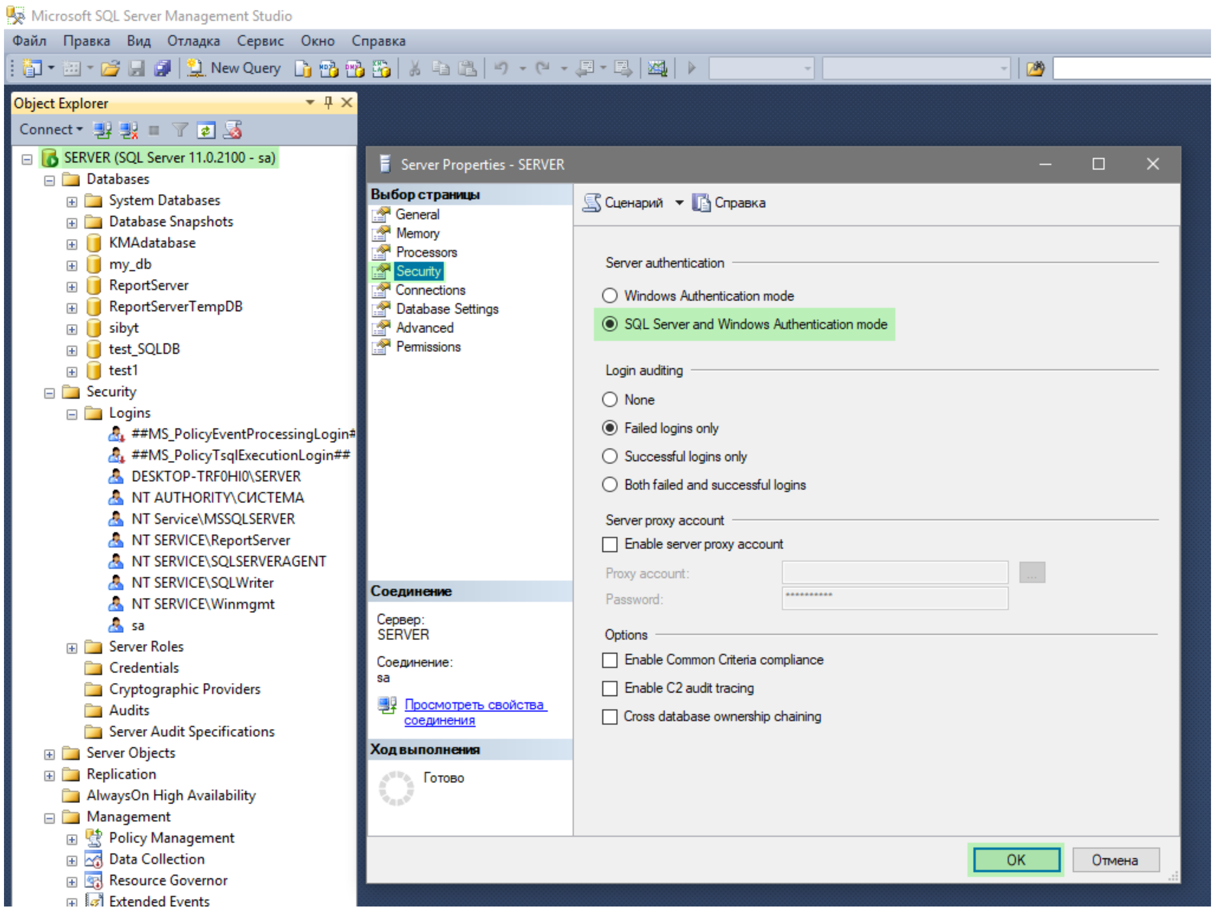
- [ ] bulkadmin
- [ ] dbcreator
- [ ] diskadmin
- [ ] processadmin
- [✓] public
- [ ] securityadmin
- [ ] serveradmin
- [ ] setupadmin
- [✓] sysadmin

Server:
DESKTOP-4QHR27T\SQLEXPRES

Connection:
DESKTOP-4QHR27T\fatkh

Ready

And SQL Server itself should allow more than just Windows authentication:



Server authentication
- Windows Authentication mode
- [✓ SQL Server and Windows Authentication mode]

Login auditing
- None
- [✓ Failed logins only]
- Successful logins only
- Both failed and successful logins

Server proxy account
- Enable server proxy account

Proxy account:
Password: **********

Options
- Enable Common Criteria compliance
- Enable C2 audit tracing
- Cross database ownership chaining

Сервер: SERVER
Соединение: sa

Also don't forget to check your firewall. Port used by MSSQL server (default 1433) should be opened.

4.4 PostgreSQL

To work with PostgreSQL databases you have to install PostgreSQL server on your PC. How to install server you can find in the Internet. For example here. To setup firewall use this command in command line (should be started under Administrator rights):

netsh advfirewall firewall add rule name="Postgre Port" dir=in action=allow protocol=TCP localport=5432

Settings required for getting exception in English

If you are getting exceptions with not readable symbols (actual for users who doesn't use english language) you have to find file postgresql.conf in the directory where install PosgreSQL server. Find property lc_messages and change it into 'en-En.utf-8'. Save the file and restart postgresql service (you can find it task manager ->Services tab).

Settings required for connecting to a remote database

In order to remotely access a PostgreSQL database, you should set the two main PostgreSQL configuration files:

postgresql.conf

pg_hba.conf

Here is a brief description how you can set them (note that the following description is purely indicative: To configure a machine safely, you should be familiar with all the parameters and their meanings). First of all, configure PostgreSQL service to listen on port 5432 on all network interfaces in Windows machine:

open the file postgresql.conf (usually located in C:\Program Files\PostgreSQL\{your version}\data) and sets the parameter

listen_addresses = '*' (if it didn't setup)

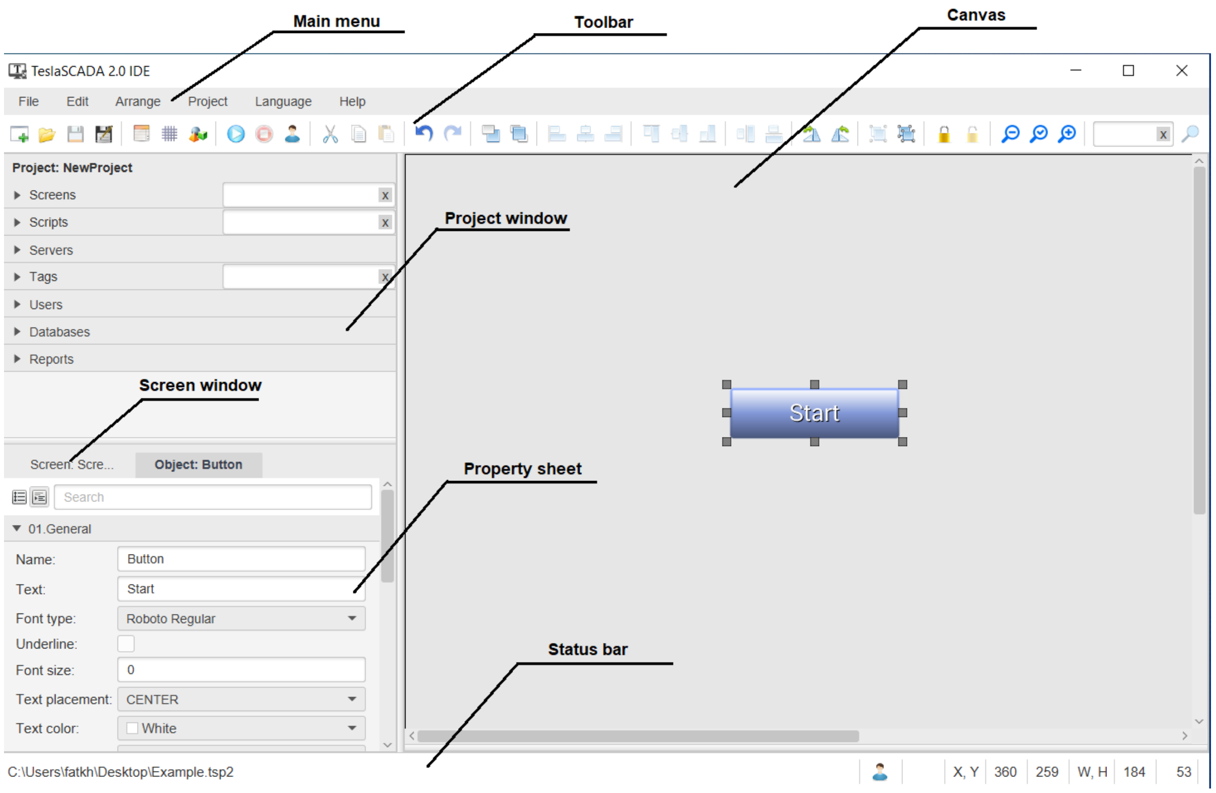
Open and add in the pg_hba.conf file:

```
host    all         all         0.0.0.0/0               md5
```

Save the files and restart postgresql service (you can find it in task manager ->Services tab).

5 Start TeslaSCADA IDE

After opening the application you will see the start screen. Look at the picture below to brie?y get to know the TeslaSCADA IDE interface:



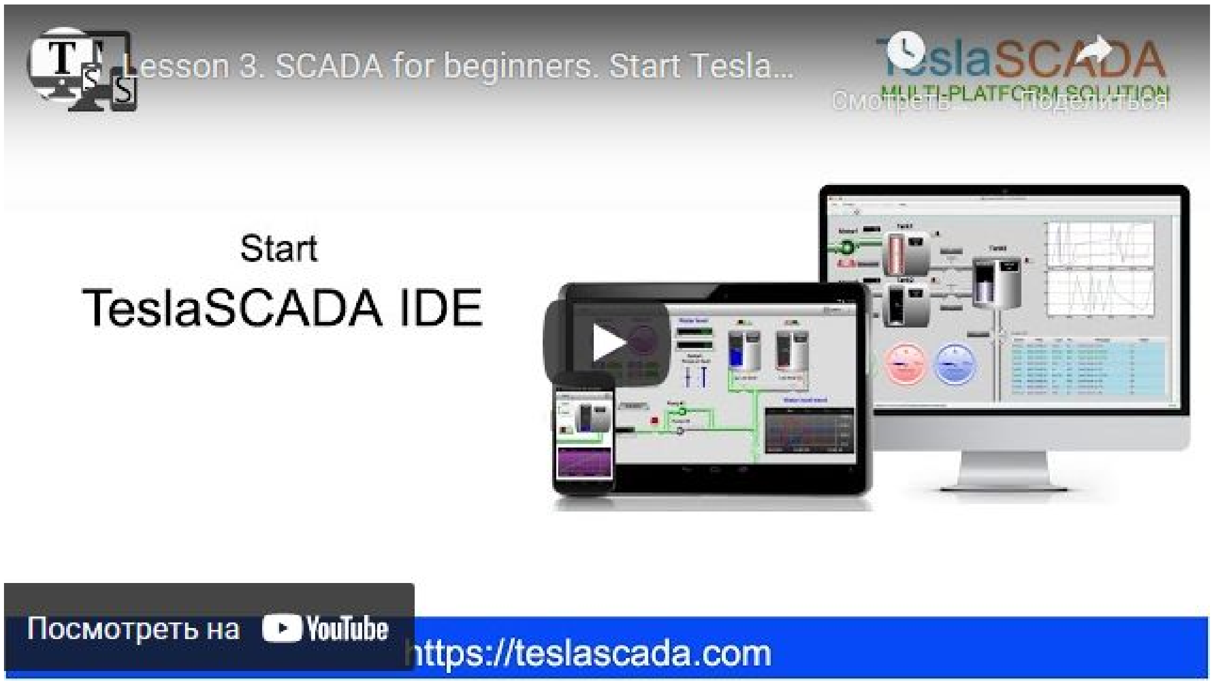
01.General

Name: Button
Text: Start
Font type: Roboto Regular
Underline:
Font size: 0
Text placement: CENTER
Text color: White

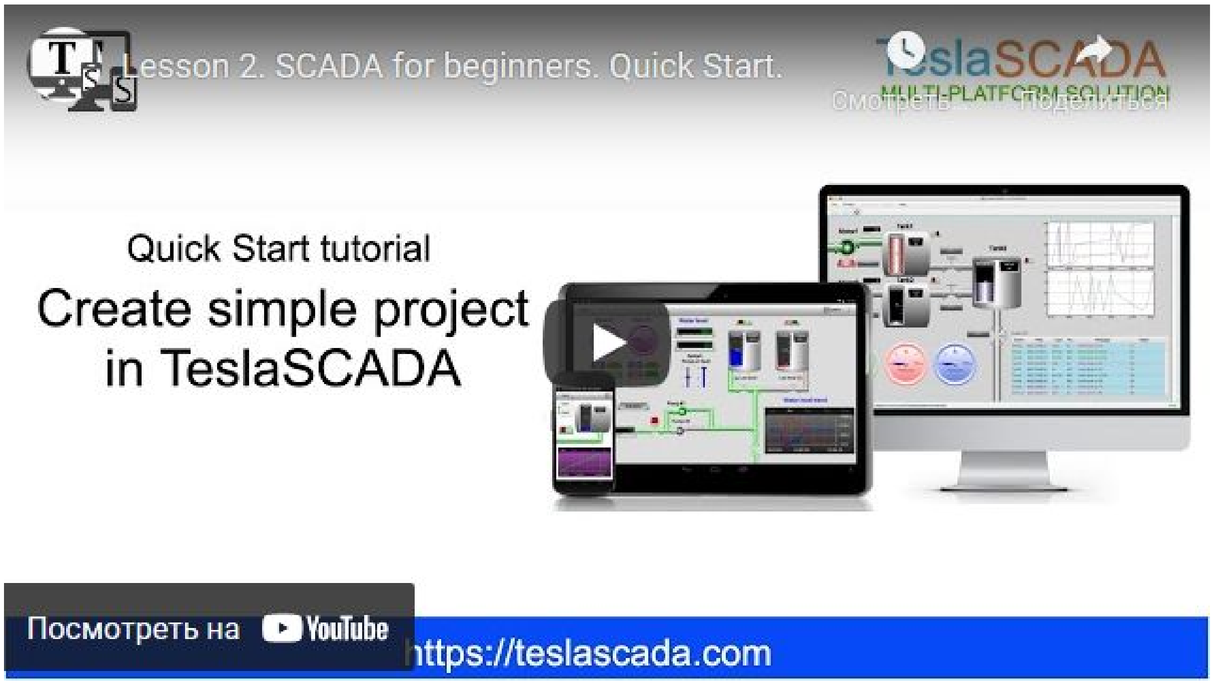
C:\Users\fatkh\Desktop\Example.tsp2 X, Y 360 259 W, H 184 53

There are several zones:

- **Main menu** 61
- **Toolbar** 70
- **Project window** 73
- **Canvas** 92
- **Property sheet** 93
- **Screen window** 94
- **Status bar** 96
- **Debug window** - you can slide up debug window between **Status bar** and **Canvas** to monitor ST scripts messages by print function.

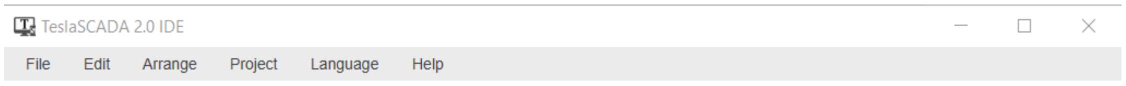


Start TeslaSCADA2 IDE



Quick Start TeslaSCADA2

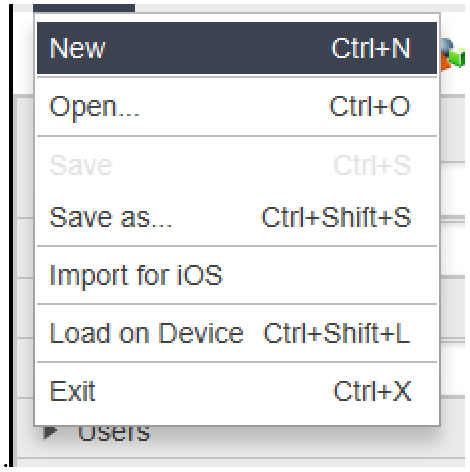
5.1 Main menu



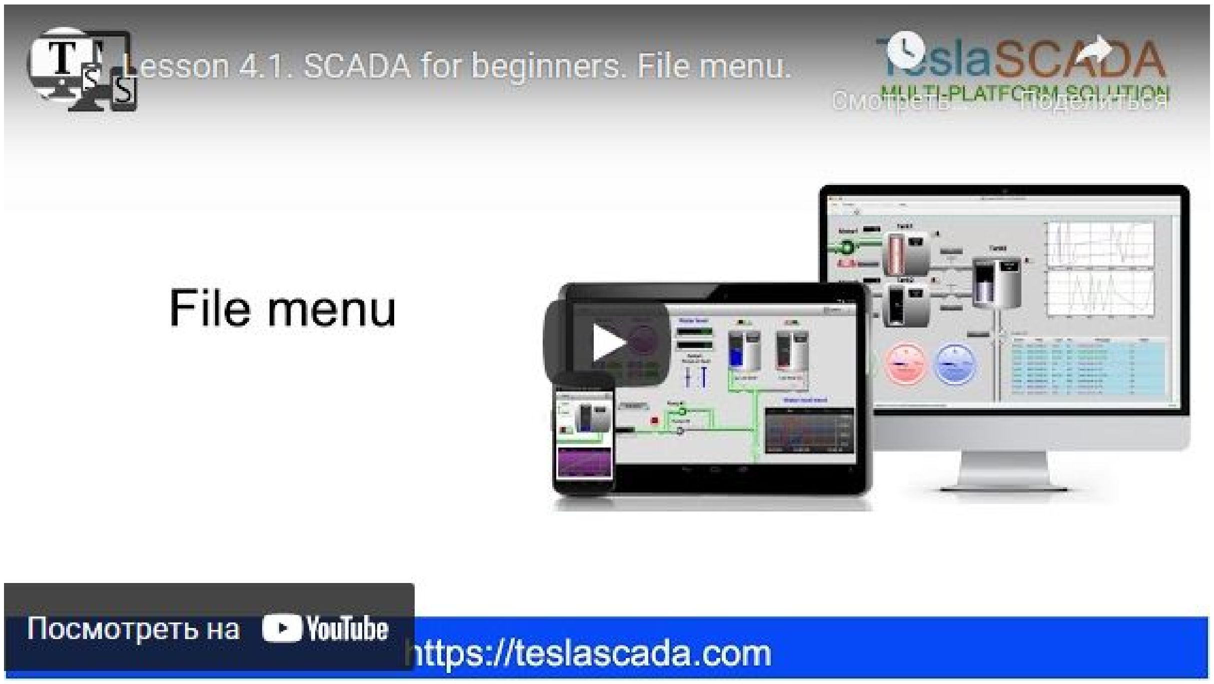
File 62 - manipulation with project ?les.
Edit 63 - manipulation with objects (cut, copy, paste and etc.).
Arrange 64 - arrange manipulation with objects (align, rotate and etc.).
Project 67 - possibility to create new objects of the project, change its properties and run/stop simulation. Also in this menu you can login (change operator) and make screenshots.
Language - possibility to change language of the interface.
Help - opens the help menu.

Main menu

5.1.1 File

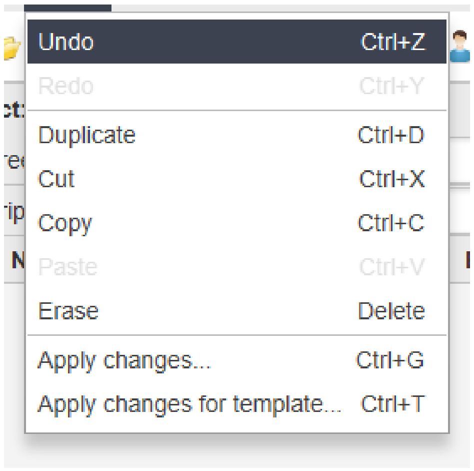


New - create a new project 100.
Open - open existing project.
Save - save project under the current name.
Save as... - save project under a new name.
Export for iOS 536 - export project in iOS format. For iOS devices, a different format is used than the format used for desktop and Android devices.
Load on Device 534 - call dialog box for uploading current project on remote desktop or Android device.
Exit - exit application.



File menu

5.1.2 Edit



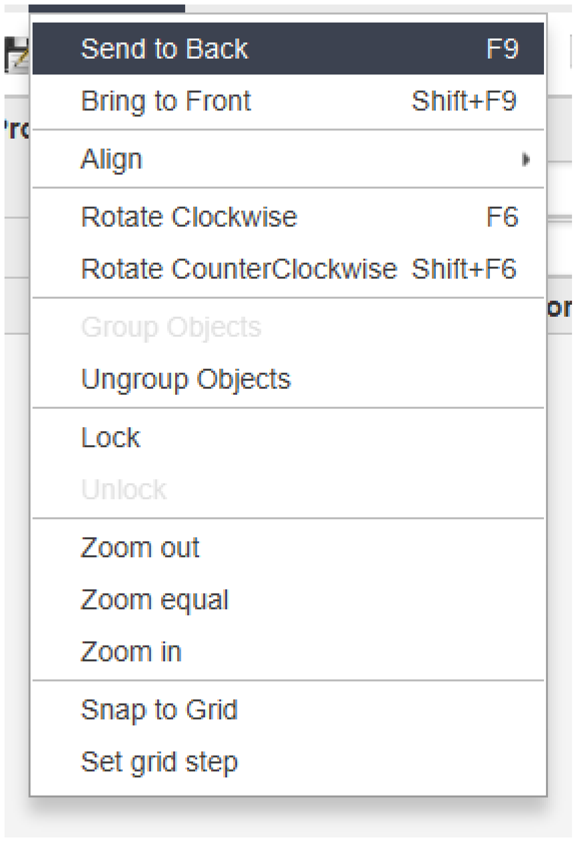
Undo - undo the last action.
Redo - redo the last action.
Duplicate - duplicate selected graphical object(s).
Cut - cut selected graphical object(s).
Copy - copy selected graphical object(s).
Paste - paste selected graphical object(s).
Erase - erase selected graphical object(s).

Apply changes... - apply changes of the selected object for all objects with the same name. In the window that appears, you must choose to replace tags or not.

Apply changes for template... - apply changes of the selected group object for all objects with the same template name. In the window that appears, you must choose to replace tags or not.

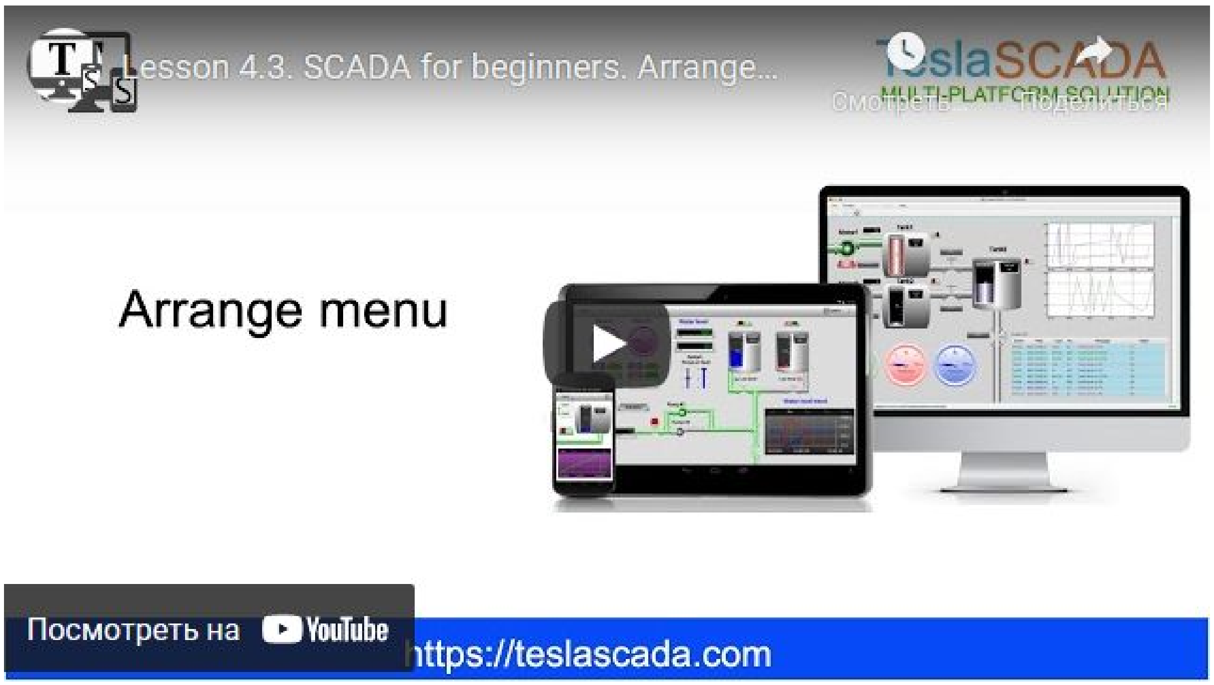
Edit menu

5.1.3 Arrange



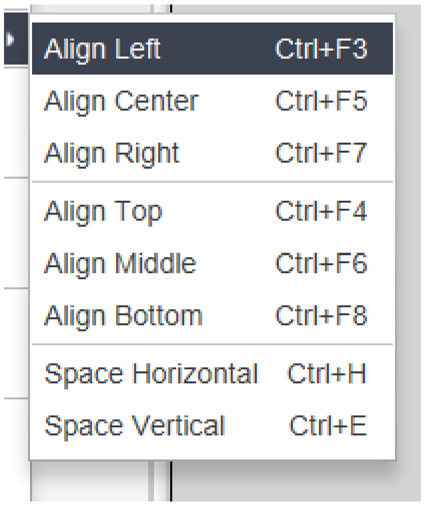
Send to Back - send to back of the screen selected object.

Bring to Front - bring to front of the screen selected object.
Align 66 - align selected objects.
Rotate Clockwise - rotate clockwise selected object(s). To current rotation angle 90 degrees will be added.
Rotate CounterClockwise - rotate counter clockwise selected object(s). From current rotation angle 90 degrees will be subtracted.
Group Objects - group selected graphical objects.
Ungroup Objects - ungroup selected group of graphical objects.
Lock - lock selected object. You'll not be able to move this object after lock it.
Unlock - unlock selected object. You'll be able to move this object after unlock it.
Zoom out - zoom out screen.
Zoom equal - return to initial screen scale.
Zoom in - zoom in screen.
Snap to Grid - enable/disable the display of the grid on the drawing area.
Set grid step - setup the size of grid cells.



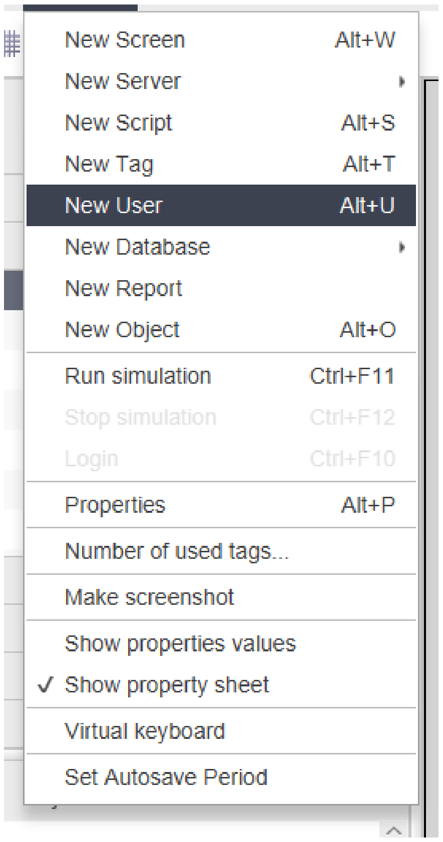
Arrange menu

5.1.3.1 Align



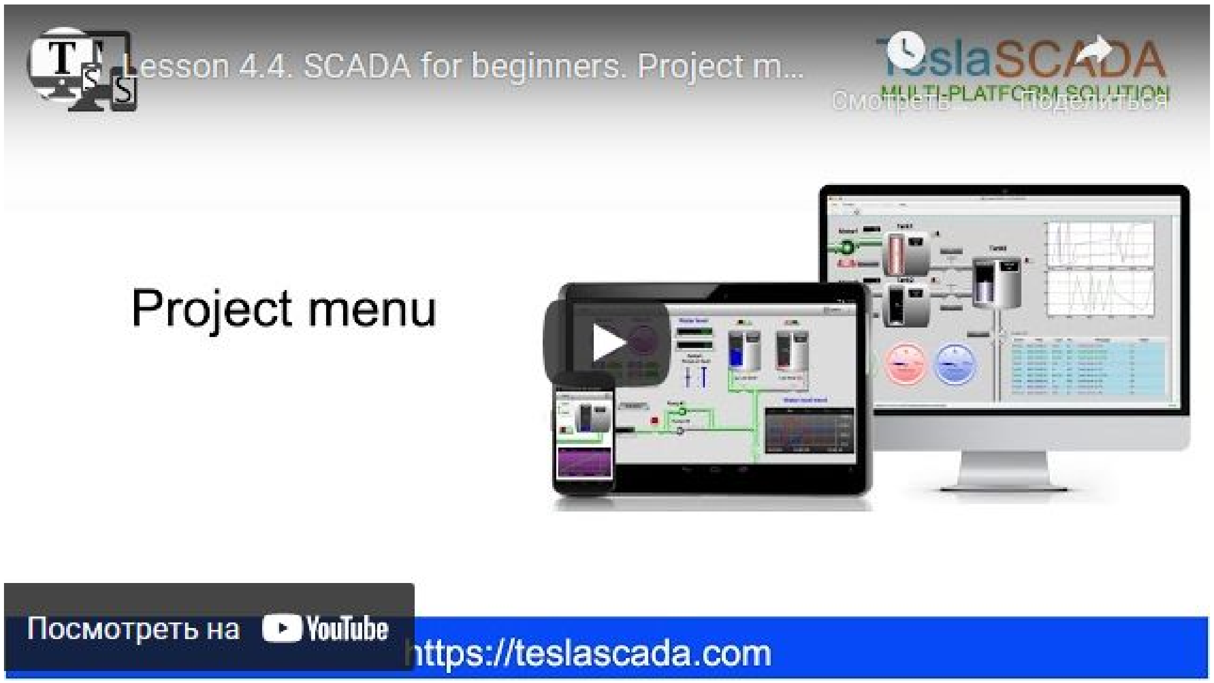
Align Left - align the selected graphical objects to the left.
Align Center - center selected graphical objects horizontally.
Align Right - align the selected graphical objects to the right.
Align Top - align the selected graphical objects to the top.
Align Middle - center selected graphical objects vertically.
Align Bottom - align the selected graphical objects to the bottom.
Space Horizontal - distribute the selected objects evenly horizontally.
Space Vertical - distribute the selected graphical objects evenly vertically.

5.1.4 Project



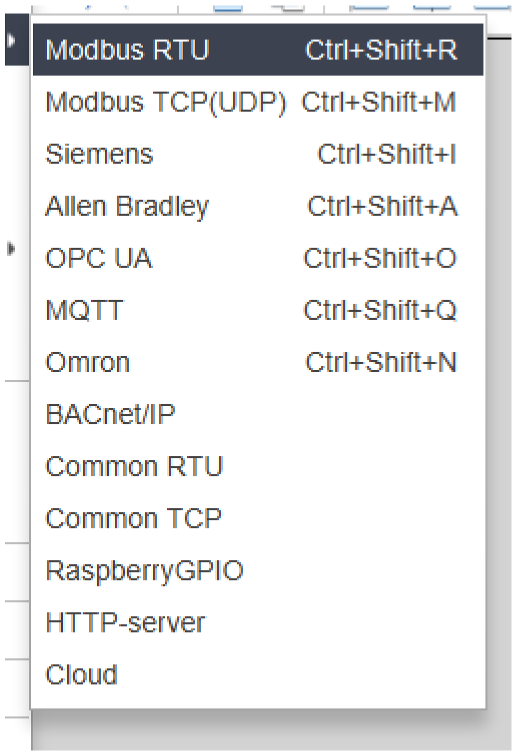
New Screen 137 - create new screen in the project.
New Server 69 - create new server in the project.
New Script 402 - create new script in the project.
New Tag 470 - create new tag in the project.
New User 489 - create new user in the project.
New Database 69 - create new database in the project.
New Report - create new report in the project.
New Object 141 - add new graphical object in the project.
Run simulation - run simulation of the project.
Stop simulation - stop simulation of the project.
Login - logout and login new user.
Properties 100 - open project properties window.
Number of used tags... - call dialog box with information about number of tags used in the project. It's useful if you want to check license you need if you want to buy tags dependent license.
Make screenshot - make screen shot of the project.
Show properties values - check this menu item if you want to monitor properties values by placing the mouse cursor over the graphical object during run simulation.
Show property sheet - check if you to edit properties of the graphical object in property sheet or uncheck if you want edit properties only in graphical object dialog boxes.

Virtual keyboard 100 - check if you want to use virtual keyboard. It's useful if you want to use your project on sensor panel.
Set Autosave Period - set autosave period of your project in minutes. The project is autosaved with adding "_autosave" at the end of the name of the project's file name.



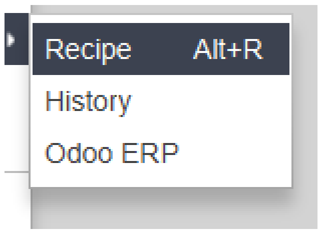
Project menu

5.1.4.1 New server



Modbus RTU 382 **- create new Modbus RTU server and open window to edit its properties.**
Modbus TCP(UDP) 384 - create new Modbus TCP(UDP) server and open window to edit its properties.
Siemens 386 - create new Siemens server and open window to edit its properties.
Allen Bradley 387 - create new Allen Bradley server and open window to edit its properties.
OPC UA 388 - create new OPC UA server and open window to edit its properties.
MQTT 390 - create new MQTT server and open window to edit its properties.
Omron 395 - create new Omron server and open window to edit its properties.
BACnet/IP 397 - create new BACnet/IP server and open window to edit its properties.
Raspberry GPIO 400 - create new Raspberry GPIO server and open window to edit its properties.
HTTP-server 400 - create new HTTP server and open window to edit its properties.
Cloud 401 - create new Cloud client and open window to edit its properties.

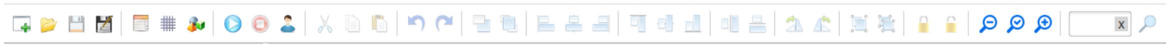
5.1.4.2 New Database



Recipe 492 - create database for recipe and open window to edit its properties.

History 494 - create database for history and open window to edit its properties.
Odoo ERP 497 - create object to work Odoo ERP and open window to edit its properties.

5.2 Toolbar

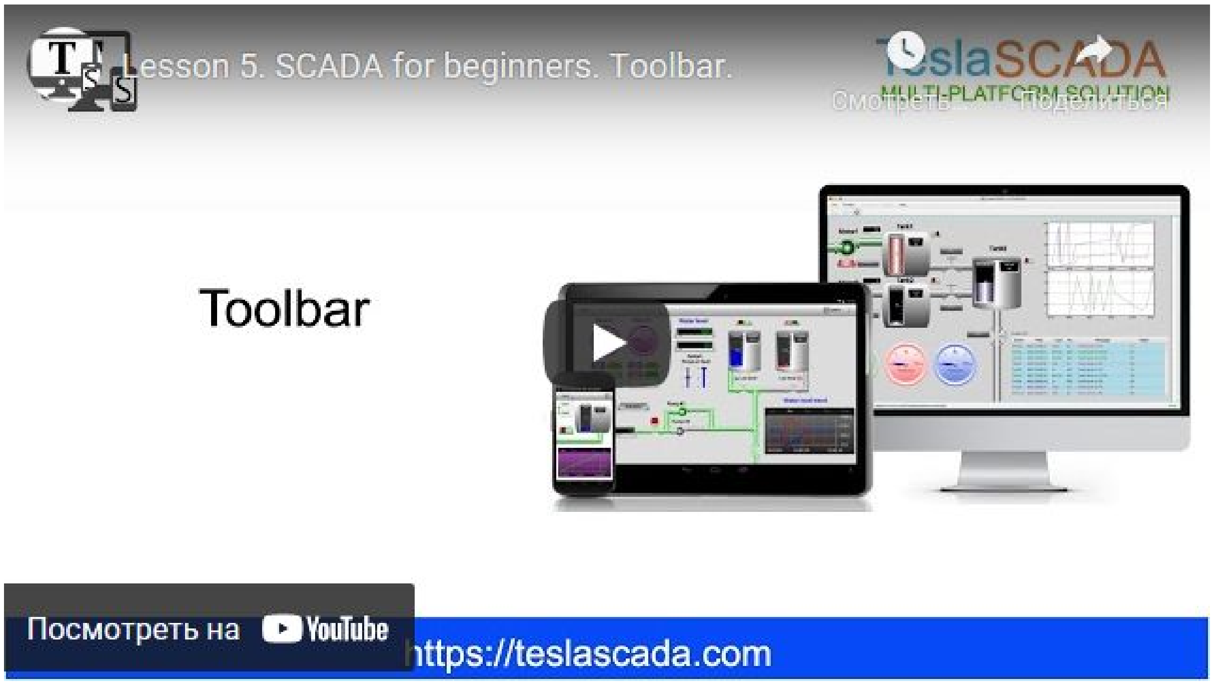


The toolbar consists of the following functions:

➕	**New project**	Creates a new project.
📂	**Open project**	Opens an existing project.
💾	**Save**	Saves your project.
💾	**Save as**	Saves your project with a new name.
📋	**Properties**	Properties of your project.
▦	**Snap to Grid**	ON/OFF snap to grid.
◆	**New object**	Creates a new graphical object.
▶	**Run simulation**	Start simulation of your project.
⏹	**Stop simulation**	Stop simulation of your project.
👤	**Login**	Change (logout/login) user.
✂	**Cut**	Cut selected object(s).
📄	**Copy**	Copy selected object(s).
📋	**Paste**	Paste selected object(s).

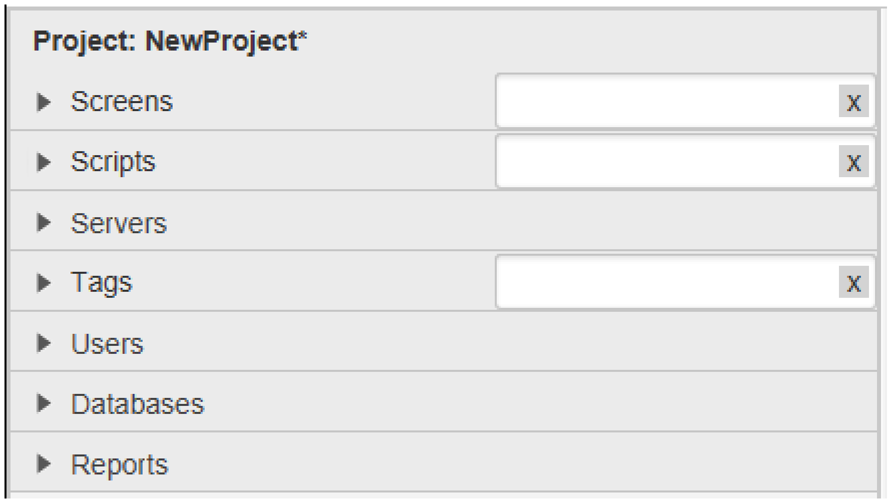
	Undo	Undo the last operation.
	Redo	Redo the last operation.
	Send to Back	Send to back selected object.
	Bring to Front	Bring to front selected object.
	Align Left	Align to the left side the selected objects.
	Align Center	Align the vertical center of the selected objects.
	Align Right	Align to the right side the selected objects.
	Align Top	Align on top of the selected objects.
	Align Middle	Align the horizontal center of the selected objects.
	Align Bottom	Align to the bottom of the selected objects.
	Space Horizontal	Align the horizontal spacing between the selected objects.
	Space Vertical	Align the vertical spacing between the selected objects.
	Rotate Clockwise	Rotate clockwise selected object(s).
	Rotate Counter Clockwise	Rotate counterclockwise selected object(s).
	Group Objects	Group selected objects.
	Ungroup Objects	Ungroup selected objects.
	Lock Object	Lock object to the position

🔓	**Unlock Object**	Unlock object from the position.
🔍	**Zoom Out**	Zoom out screen with all objects.
🔍	**Zoom Equal**	Zoom screen with all objects to original sizes.
🔍	**Zoom In**	Zoom in screen with all objects.
🔍	**Find**	Find graphical object. Name you enter in the field.



Toolbar

5.3 Project window



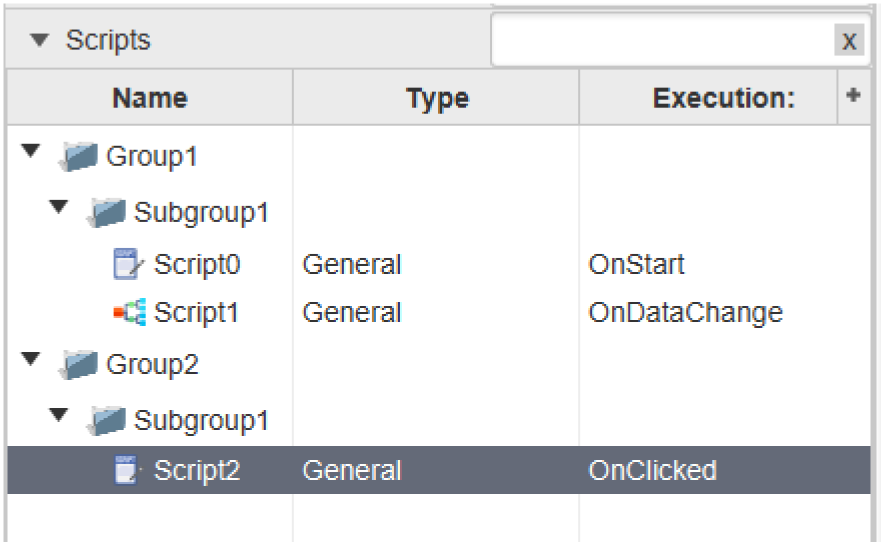
Project window contains:

- **Project name**. You can change project name in the Project properties. If a "*" is displayed next to the project name, then changes have been made to the project since the last save.
- Tab **Screens** 108. This tab contains all screens used in the project.
- Tab **Scripts** 74. This tab contains all scripts used in the project.
- Tab **Servers** 77. This tab contains all servers used in the project. Server refers to all devices and servers to which you are connecting.
- Tab **Tags** 79. This tab contains all tags used in the project.
- Tab **Users** 84. This tab contains all users used in the project.
- Tab **Databases** 86. This tab contains all databases used in the project.

Project window

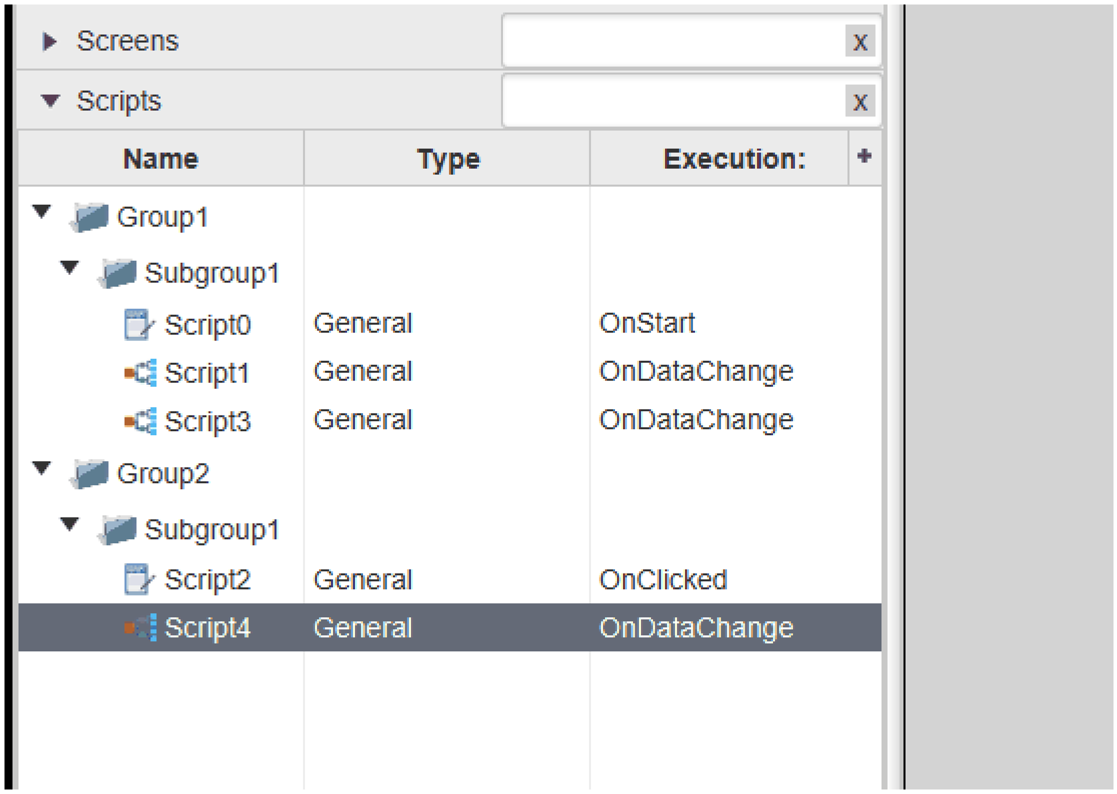
5.3.1 Scripts

The scripts are shown in the table. The first column contains the script name, the second column contains the script type - General, Screen, Tag or Object, the third column contains the execution type - OnDataChange, OnStart, OnClick and others:



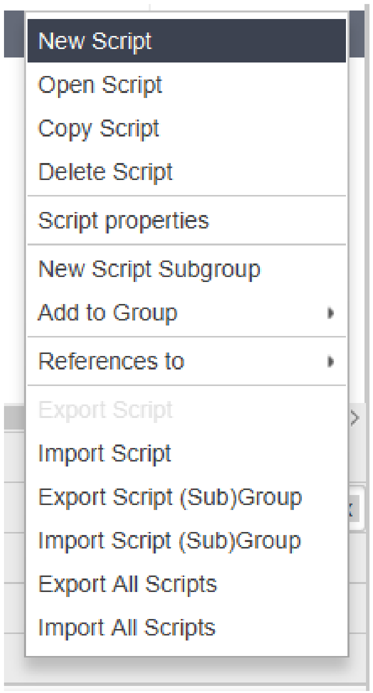
Name	Type	Execution:
Group1		
Subgroup1		
Script0	General	OnStart
Script1	General	OnDataChange
Group2		
Subgroup1		
Script2	General	OnClicked

You can hide or show columns by clicking "+" button:



Name	Type	Execution:
Group1		
Subgroup1		
Script0	General	OnStart
Script1	General	OnDataChange
Script3	General	OnDataChange
Group2		
Subgroup1		
Script2	General	OnClicked
Script4	General	OnDataChange

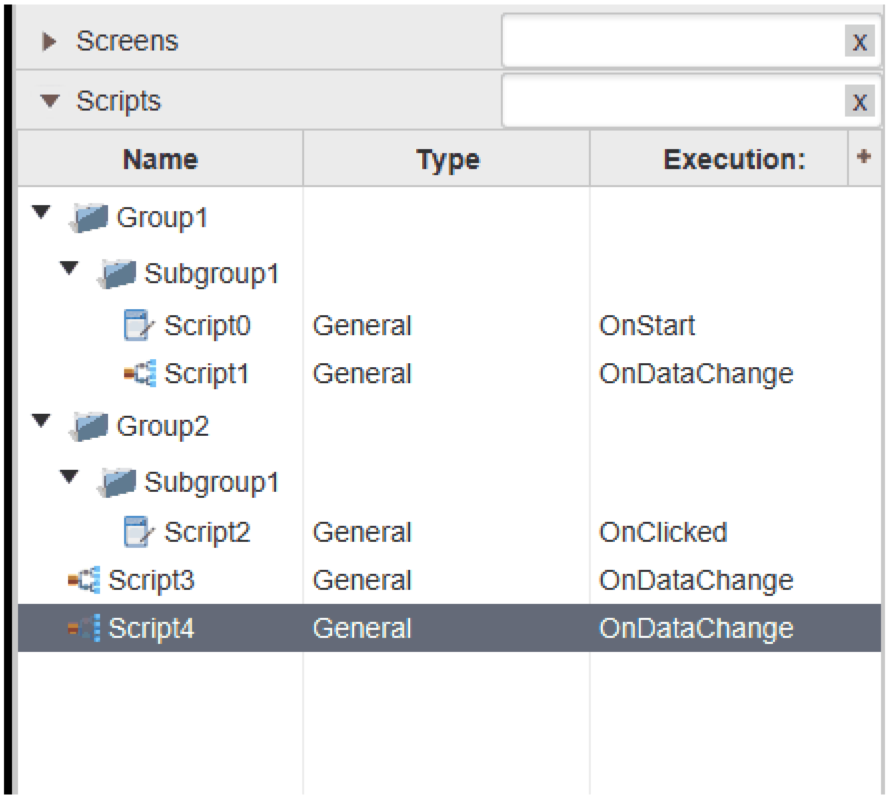
By clicking right button on the script you can call context menu:



List of menu items with their functions:

- **New Script** 402 - create a new script. You can also create a new script in the main menu Project 67 ->New script. Then dialog window will be opened for editing script properties.
- **Open Script** - open the script. It is opened for develop script command purposes. If script use FBD language design screen for FBD objects will be opened. If script use ST language code area will be opened. You can also open the script by double clicking on it.
- **Copy Script** - copy the script. It is copied with all FBD objects if you use FBD language or with all code if you use ST language.
- **Delete Script** - delete the script. It is deleted from the project.
- **Script properties** - open dialog window for editing script properties.
- **New Script Group** - create a new script group. It's useful to simplify the structure of the project.
- **New Script Subgroup** - this menu item is shown when your right click on the script group. It creates new script's sub group. It's also useful to simplify of the project structure.
- **Add to Group** - add this script to the script group or subgroup from the list.
- **Reference to** - help to find the script in the project. General and Screen types of the script will be searched in the screen, Tag type in tags and Object type in objects.
- **Export Script** - export this script for another project. File is saved with .tsp2scipt extension.
- **Import Script** - import the script from the file with .tsp2script extension.
- **Export Script (Sub)Group** - export scripts from the group or(and) subgroup. File is saved with .tsp2groupscripts extension.
- **Import Script (Sub)Group** - import scripts with the group or(and) subgroup from the file with .tsp2groupscripts extension.
- **Export All Scripts** - export all scripts for another project. File is saved with .tsp2allscripts extension.
- **Import All Scripts** - import all scripts from the file with .tsp2allscripts extension.

You can also manage scripts in script groups and subgroups by using drag and drop technology:

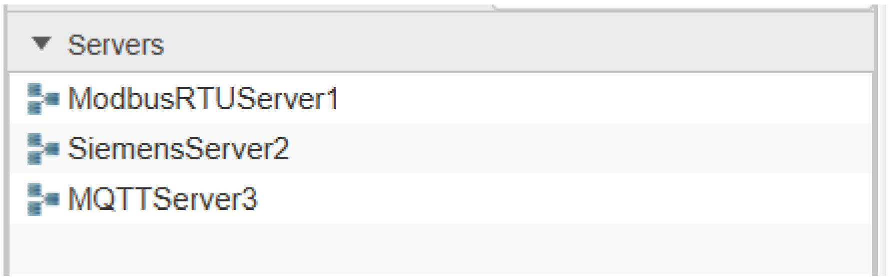


Name	Type	Execution:
Group1		
Subgroup1		
Script0	General	OnStart
Script1	General	OnDataChange
Group2		
Subgroup1		
Script2	General	OnClicked
Script3	General	OnDataChange
Script4	General	OnDataChange

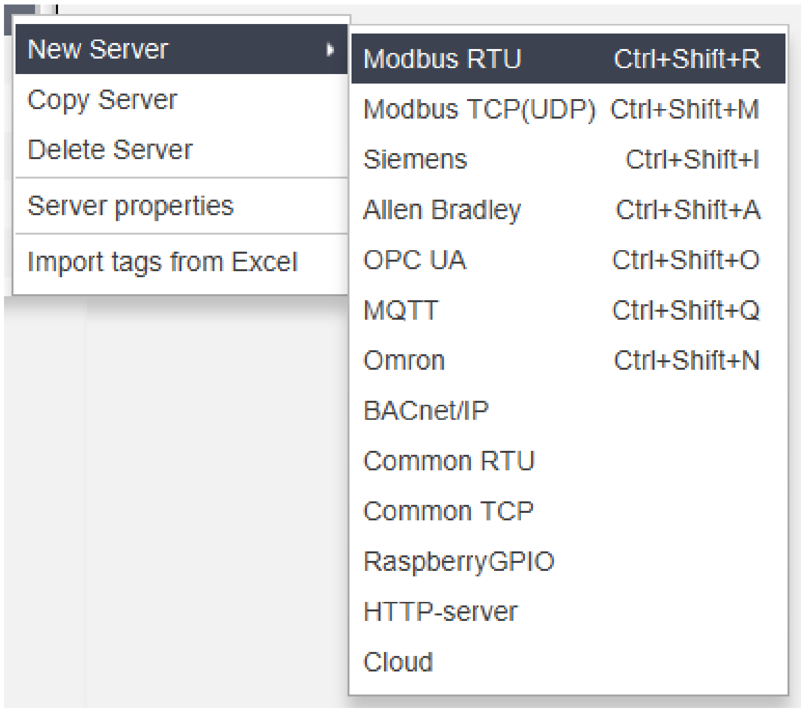
Scripts window

5.3.2 Servers

The servers are shown in the list. The list contains names of the servers used in the project:



By clicking right button on the server you can call context menu:



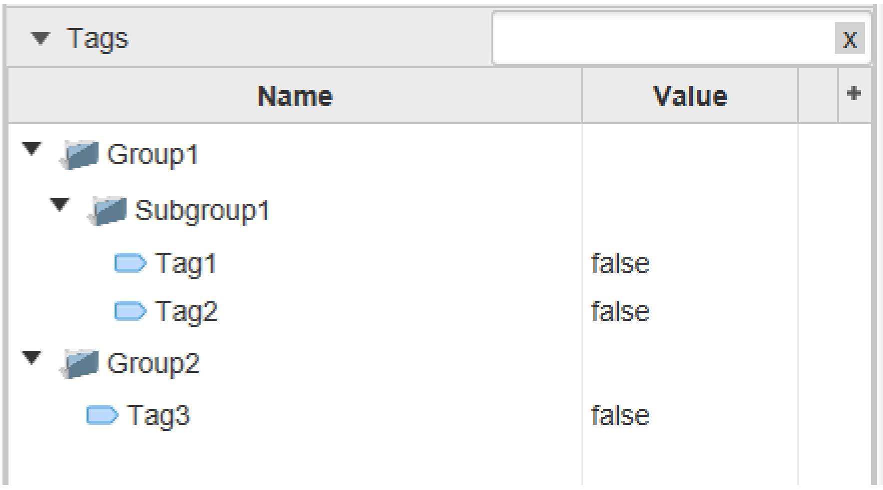
List of menu items with their functions:

- **New Server** - create a new server. You can also create a new server in the main menu Project 67->New Server. Choose server 69 you want to add. Then dialog window will be opened for editing server properties.
- **Copy Server** - copy the server.
- **Delete Server** - delete the server. It is deleted from the project.
- **Server properties** - open window for editing server properties. You can also do it by double clicking on the server you want to edit.
- **Import tags from Excel** - possibility to import tags from PLC through Excel files.

Servers window

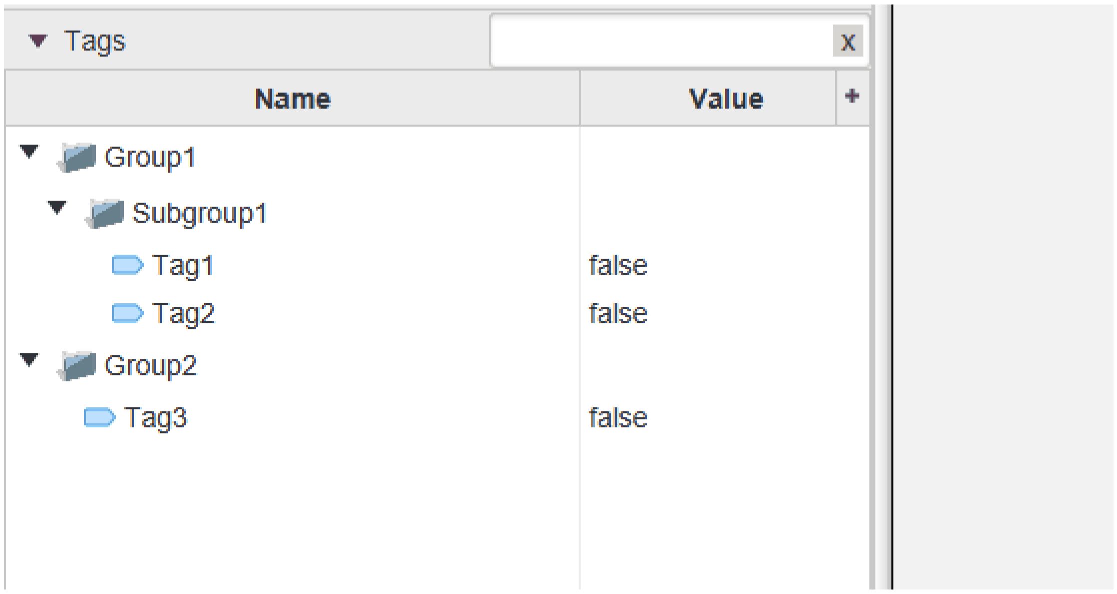
5.3.3 Tags

The tags are shown in the table. The first column contains the tag name, the second column contains the tag's value, the third column contains the tag's input source (pointer in string format and it depends on server). You can use filter field to find tag you want by entering its name:

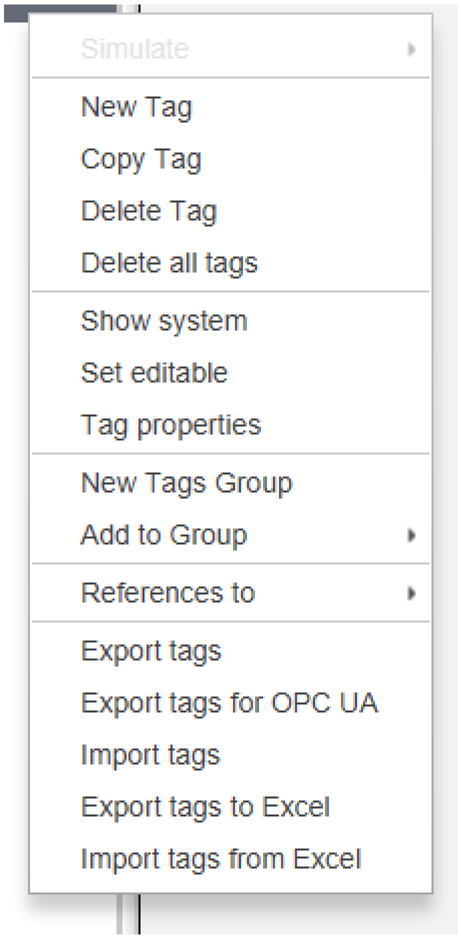


Name	Value
Group1	
Subgroup1	
Tag1	false
Tag2	false
Group2	
Tag3	false

You can hide or show columns by clicking "+" button:

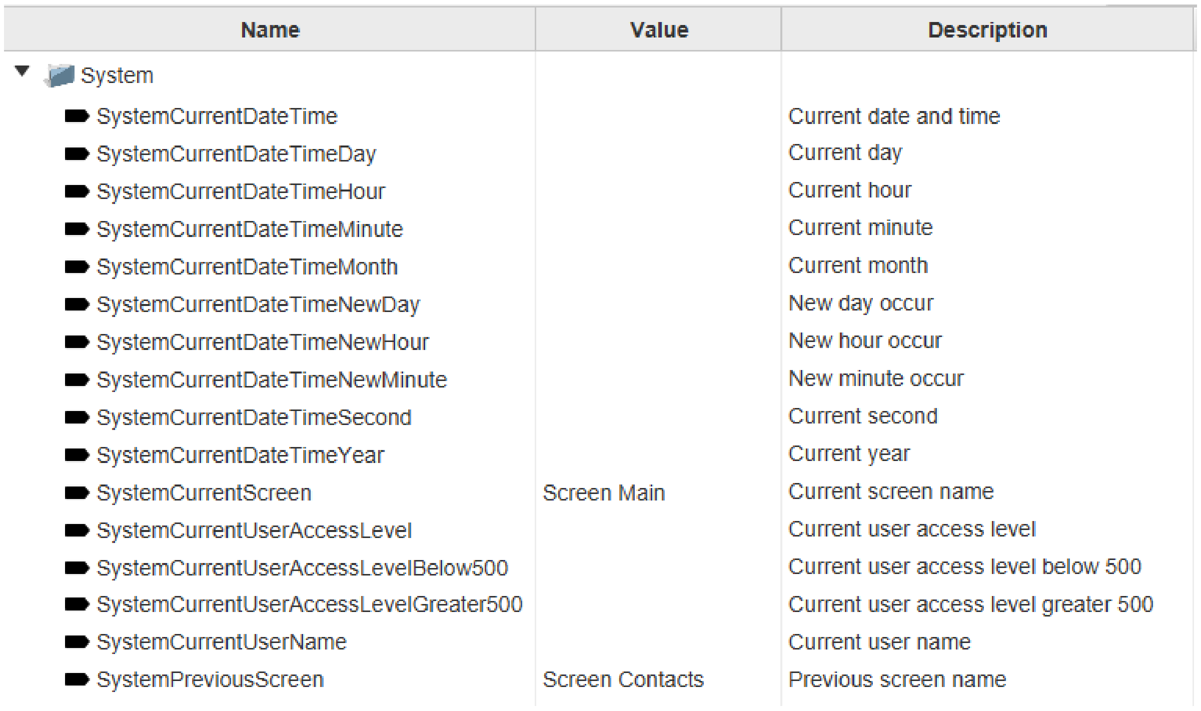


By clicking right button on the tag you can call context menu:



List of menu items with their functions:

- **Simulate** - this menu is enable only when you run simulation. By using sub menu items you can **Set value** of the tag, for some tag's types you can use *Random value* for simulation tag's random value, *Ramp value* for simulation value from 0 to 100. By using sub menu *Cancel* you can reset Random value and Ramp value simulation.
- **New Tag** 470 - create a new tag. You can also create a new tag in the main menu Project 67->New Tag. Then dialog window will be opened for editing tag properties.
- **Copy Tag** - copy the tag.
- **Delete Tag** - delete the tag. It is deleted from the project.
- **Delete all tags** - delete all tags from the project.
- **Show system** - check this menu item if you want to show system tags in this window. You can't edit values of this tags, but you can use its in the project.



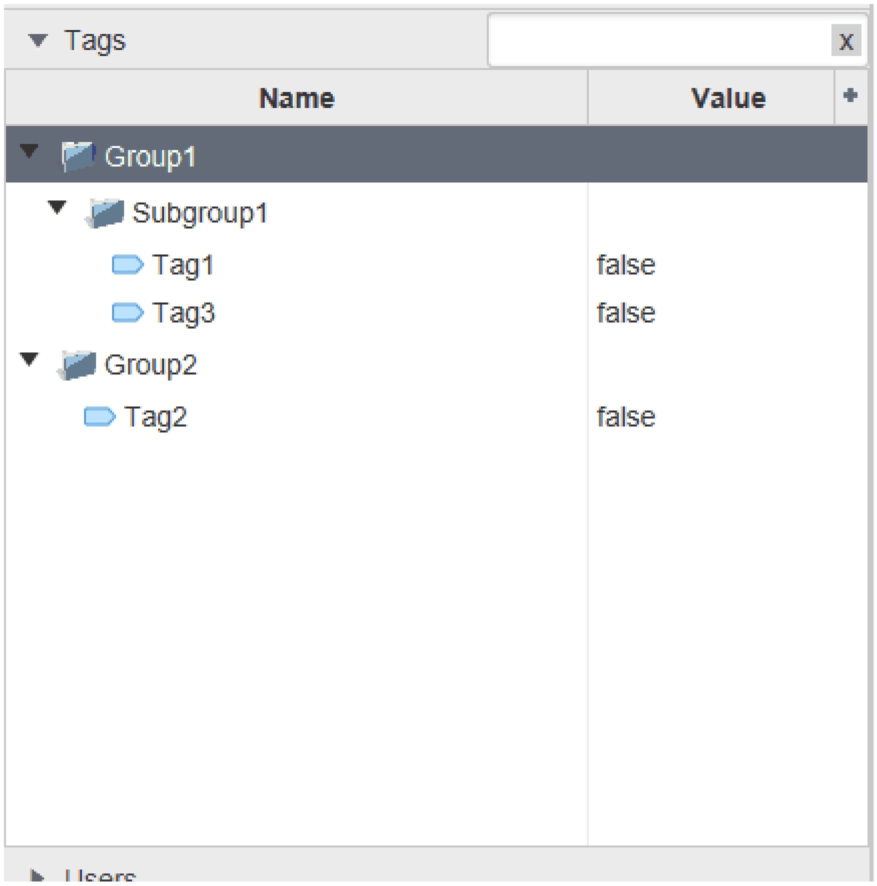
Name	Value	Description
System		
SystemCurrentDateTime		Current date and time
SystemCurrentDateTimeDay		Current day
SystemCurrentDateTimeHour		Current hour
SystemCurrentDateTimeMinute		Current minute
SystemCurrentDateTimeMonth		Current month
SystemCurrentDateTimeNewDay		New day occur
SystemCurrentDateTimeNewHour		New hour occur
SystemCurrentDateTimeNewMinute		New minute occur
SystemCurrentDateTimeSecond		Current second
SystemCurrentDateTimeYear		Current year
SystemCurrentScreen	Screen Main	Current screen name
SystemCurrentUserAccessLevel		Current user access level
SystemCurrentUserAccessLevelBelow500		Current user access level below 500
SystemCurrentUserAccessLevelGreater500		Current user access level greater 500
SystemCurrentUserName		Current user name
SystemPreviousScreen	Screen Contacts	Previous screen name

Table of system tags:

Name	Data type	Description
SystemCurrentDateTime	String	Current date and time in string format (YYYY.MM.DD HH:mm:ss).
SystemCurrentDateTimeDay	Integer	Current day of the month.
SystemCurrentDateTimeNewDay	Boolean	Becomes TRUE from FALSE every day.

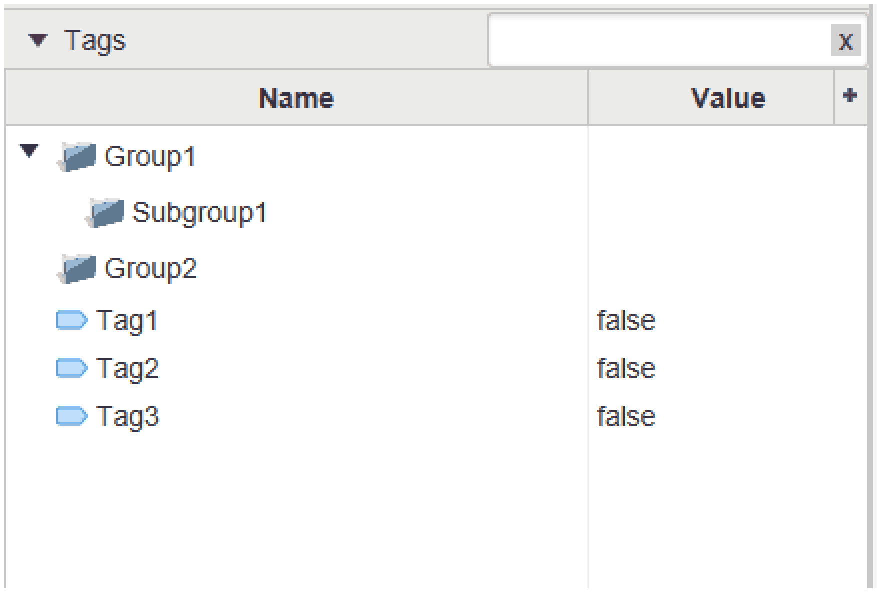
Name	Data type	Description
SystemCurrentDateTimeHour	Integer	Current hour in 24 format.
SystemCurrentDateTimeNewHour	Boolean	Becomes TRUE from FALSE every hour.
SystemCurrentDateTimeMinute	Integer	Current minute.
SystemCurrentDateTimeNewMinute	Boolean	Becomes TRUE from FALSE every minute.
SystemCurrentDateTimeMonth	Integer	Current month (01-January, 02-February...).
SystemCurrentDateTimeSecond	Integer	Current second.
SystemCurrentDateTimeYear	Integer	Current year.
SystemCurrentScreen	String	Name of the current opened screen.
SystemCurrentUserAccessLevel	Integer	Current user access level.
SystemCurrentUserAccessLevelBelow500	Boolean	TRUE if current user's access level below 500.
SystemCurrentUserAccessLevelGreater500	Boolean	TRUE if current user's access level greater or equal 500.
SystemCurrentUserName	String	Current user's name.
SystemPreviousScreen	String	Previous opened screen.

- **Set editable** - check this menu item if you want to change name of the tag or its input directly in the table.



- **Tag properties** - open dialog window for editing tag properties. You can also do it by double clicking on the tag you want to edit.
- **New Tags Group** - create a new tag group. It's useful to simplify the structure of the project.
- **New Tags Subgroup** - this menu item is shown when your right click on the tag group. It creates new tag's sub group. It's also useful to simplify of the project structure.
- **Add to Group** - add this tag to the tag group or subgroup from the list.
- **Reference to** - help to *find the tag in* the project. You can find in which scripts this tag is used and to which objects this tag is bound.
- **Export tags** - export all tags of the project. File is saved with .tsp2tags extension.
- **Export tags for OPC UA** - export all tags of the project for OPC UA client if you want to use current project in the Client-Server architecture.
- **Import tags** - import all tags from the file with .tsp2tags extension.
- **Export tags to Excel** - export all tags to Excel file. File is saved with .xls extension.
- **Import tags from Excel** - import all tags from the Excel file with .xls extension.

You can also manage tags in tag groups and subgroups by using drag and drop technology:

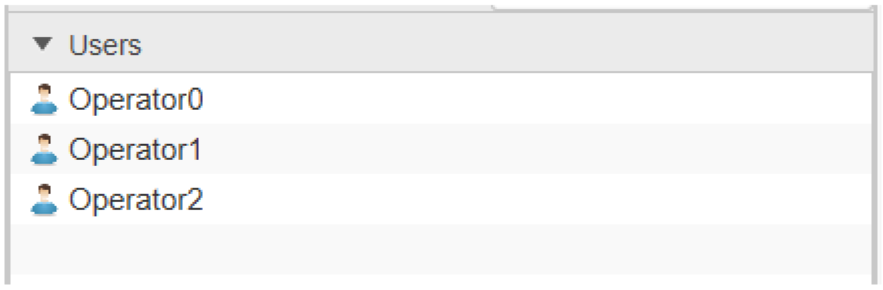


Name	Value
Group1	
Subgroup1	
Group2	
Tag1	false
Tag2	false
Tag3	false

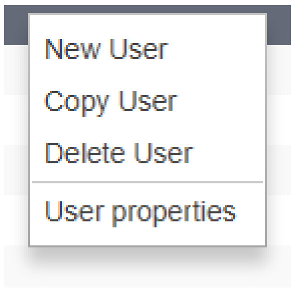
Tags window

5.3.4 Users

The users are shown in the list. The list contains names of the users used in the project:



By clicking right button on the user you can call context menu:



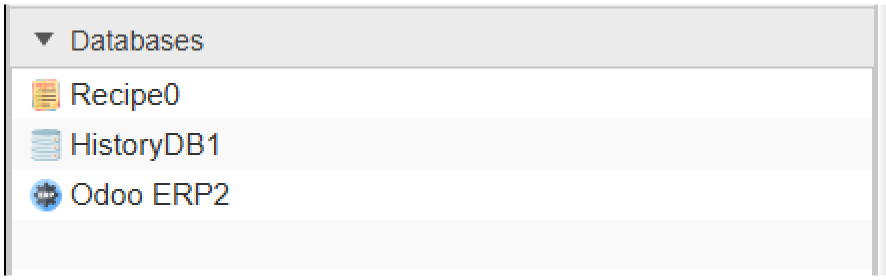
List of menu items with their functions:

- **New User** 489 - create a new user. You can also create a new user in the **main menu Project** 67 **->New User**. Then dialog window will be opened for editing user properties.
- **Copy User** - copy the user.
- **Delete User** - delete the user. It is deleted from the project.
- **User properties** - open window for editing user properties. You can also do it by double clicking on the user you want to edit.

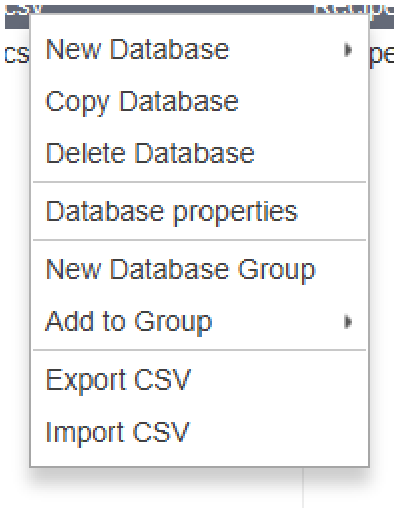
Users window

5.3.5 Databases

The databases are shown in the list. The list contains names of the databases used in the project:



By clicking right button on the database you can call context menu:



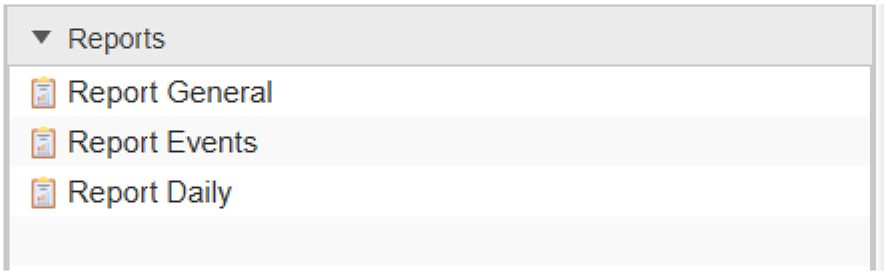
List of menu items with their functions:

- **New Database** 492 - create a new database. You can also create a new database in the main **menu Project** 67**->New Database**. Choose database 69 you want to add. Then dialog window will be opened for editing database properties.
- **Copy Database** - copy the database.
- **Delete Database** - delete the database. It is deleted from the project.
- **Database properties** - open window for editing database properties. You can also do it by double clicking on the database you want to edit.
- **New Database Group** - create a new database group. It's useful to simplify the structure of the project.
- **New Database Subgroup** - this menu item is shown when your right click on the database group. It creates new databases's sub group. It's also useful to simplify of the project structure.
- **Add to Group** - add this database to the database group or subgroup from the list.
- **Export CSV** - export the content of Recipe database to CSV file. (for other databases it doesn't work).
- **Import CSV** - import the CSV content to Recipe database. Works only for Recipes.

Databases window

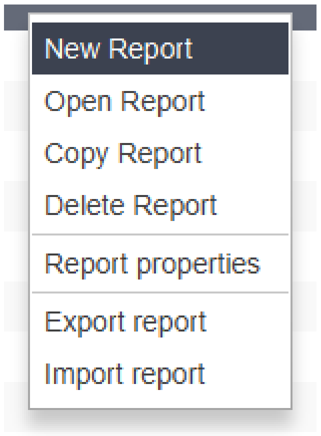
5.3.6 Reports

The reports are shown in the list. The list contains names of the reports used in the project:



Reports
- Report General
- Report Events
- Report Daily

By clicking right button on the report you can call context menu:



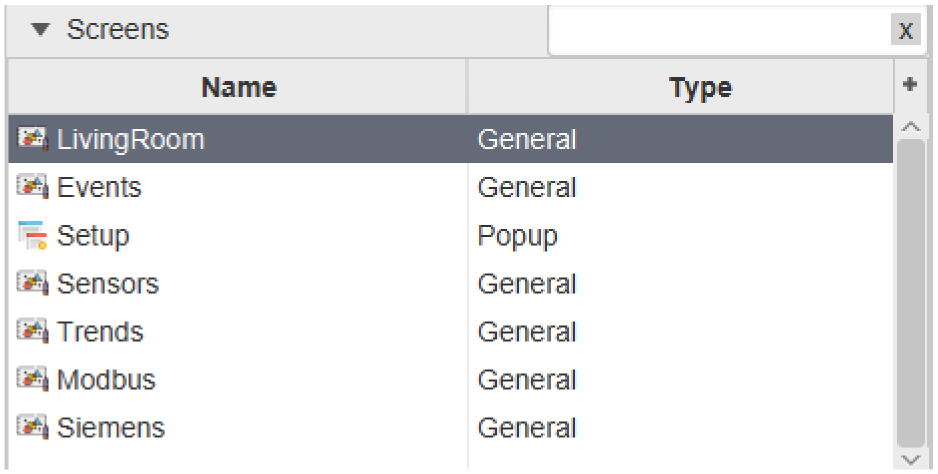
List of menu items with their functions:

- **New report** - create a new report. You can also create a new report in the **main menu** **Project** 67**->New Report**. Then dialog window will be opened for editing report properties.
- **Open Report** - open the report for design properties. You can open the report by double clicking on it also.
- **Copy Report** - copy the report.
- **Delete Report** - delete the report. It is deleted from the project.
- **Report properties** - open window for editing report properties.
- **Export report** - export report.
- **Import report** - import report.

Reports window

5.4 Screens

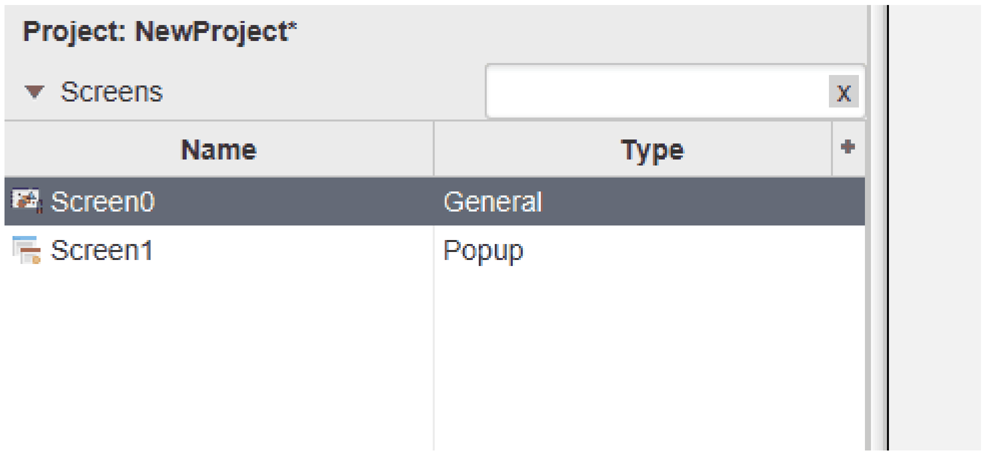
The screens are shown in the table. The first column contains the screen name, the second column contains the screen type - General or Popup:



Screens

Name	Type
LivingRoom	General
Events	General
Setup	Popup
Sensors	General
Trends	General
Modbus	General
Siemens	General

You can hide or show columns by clicking "+" button:

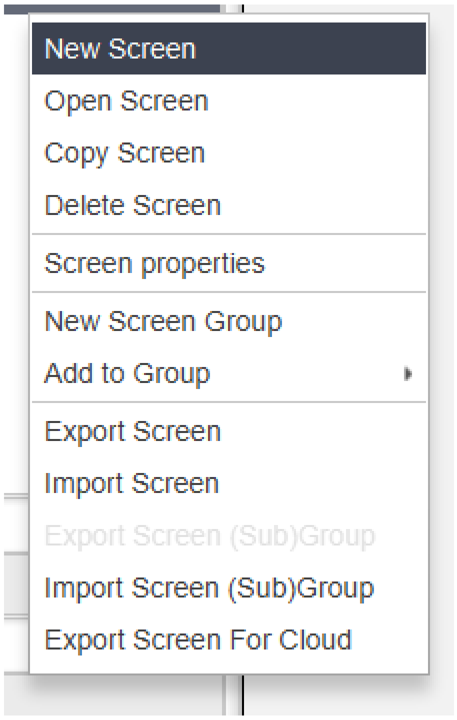


Project: NewProject*

Screens

Name	Type
Screen0	General
Screen1	Popup

By clicking right button on the screen you can call context menu:

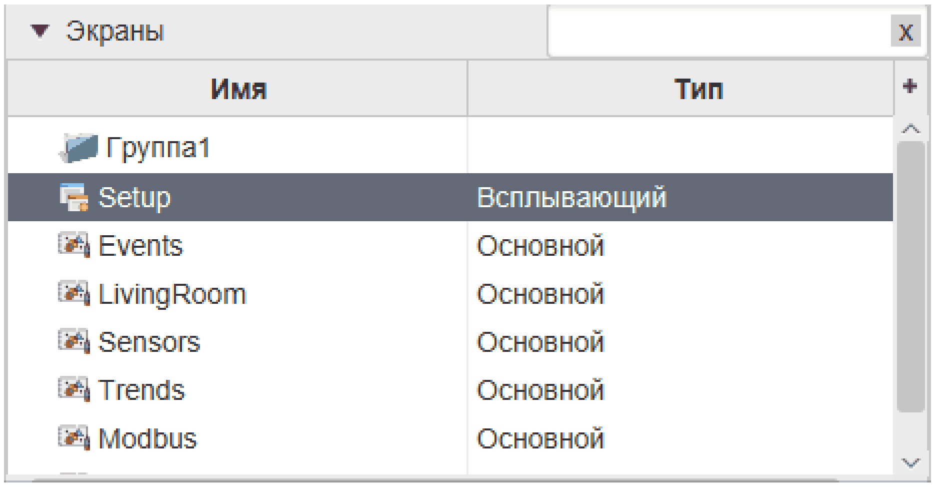


List of menu items with their functions:

- **New Screen** - create a new screen. You can also create a new screen in the main menu Project->New Screen. Then dialog window will be opened for editing screen properties.
- **Open Screen** - open the screen. It is opened for design purposes. You can also open the screen by double clicking on it.
- **Copy Screen** - copy the screen. It is copied with all graphical objects on it.
- **Delete Screen** - delete the screen. It is deleted from the project.
- **Screen properties** - open window for editing screen properties.
- **New Screen Group** - create a new screen group. It's useful to simplify the structure of the project.
- **New Screen Subgroup** - this menu item is shown when your right click on the screen group. It creates new screen's sub group. It's also useful to simplify of the project structure.
- **Add to Group** - add this screen to the screen group or subgroup from the list.
- **Export Screen** - export this screen for another project. File is saved with .tsp2screen extension.
- **Import Screen** - import the screen from the file with .tsp2screen extension.
- **Export Screen (Sub)Group** - export all screens of the group or(and) subgroups including global images of these screens. File is saved with .tsp2groupscreen extension.
- **Import Screen (Sub)Group** - import screens of the group or(and) subgroups, including global images of these screens, from the file with .tsp2groupscreen extension.

- **Export Screen for Cloud** - export screen for cloud. File is saved with .tsp2json extension. You can upload this file on ESP device and use it for WEB interface if you want.

You can also manage screens in screen groups and subgroups by using drag and drop technology:


Экраны

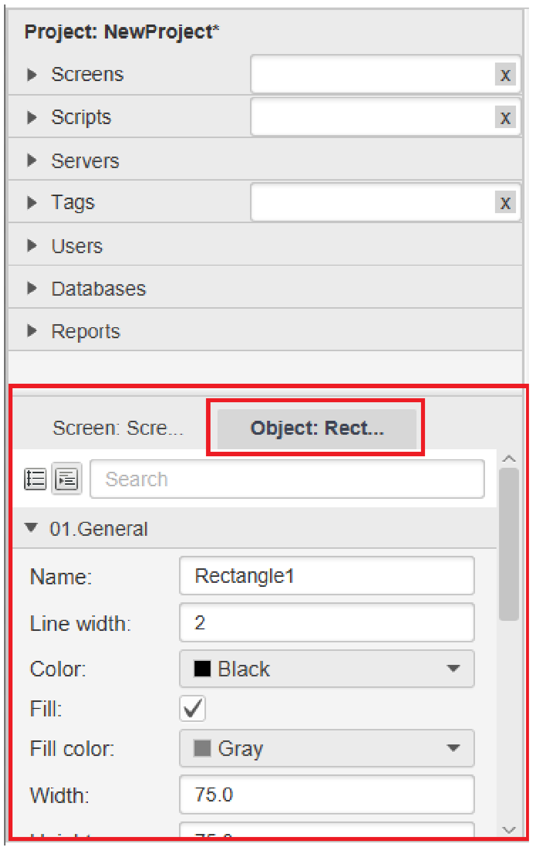
Имя	Тип
Группа1	
Setup	Всплывающий
Events	Основной
LivingRoom	Основной
Sensors	Основной
Trends	Основной
Modbus	Основной

5.5 Canvas

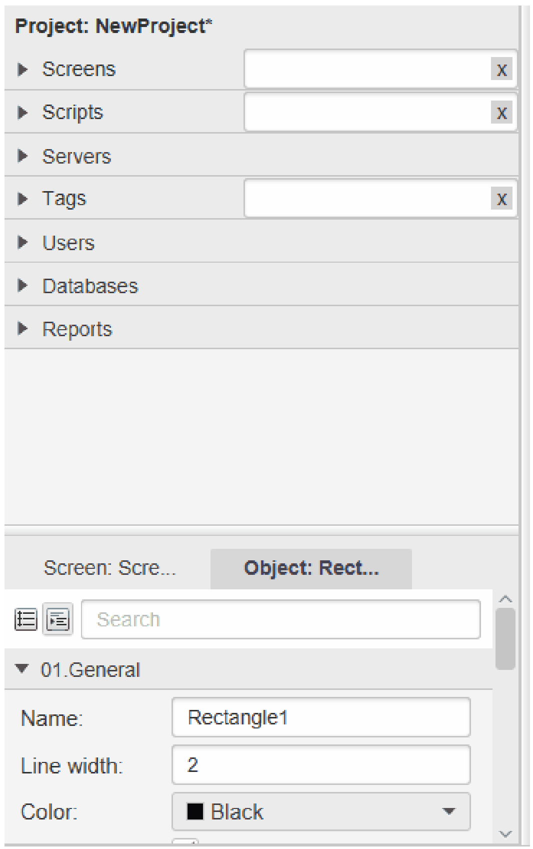
In the canvas the project is created using the graphical objects. For convenient control and navigation in the drawing area, you can use the information in the "Hot keys and Tips 96" section.

5.6 Property Sheet

When you select any object, the property sheet display the properties available for this object. **"Show property sheet"** menu item should be checked in Project 67 main menu. You can expand property sheet if you want:

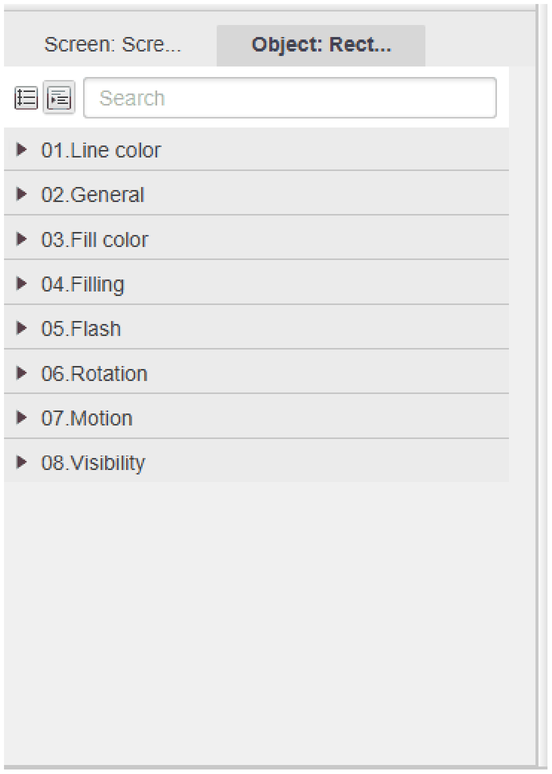


Name: Rectangle1
Line width: 2
Color: Black
Fill: ✓
Fill color: Gray
Width: 75.0



Name: Rectangle1
Line width: 2
Color: Black

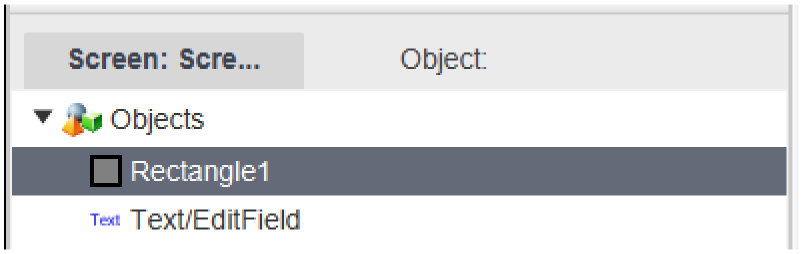
By default only General properties are enabled for new created object. To enable other property groups you have to check enable for them:



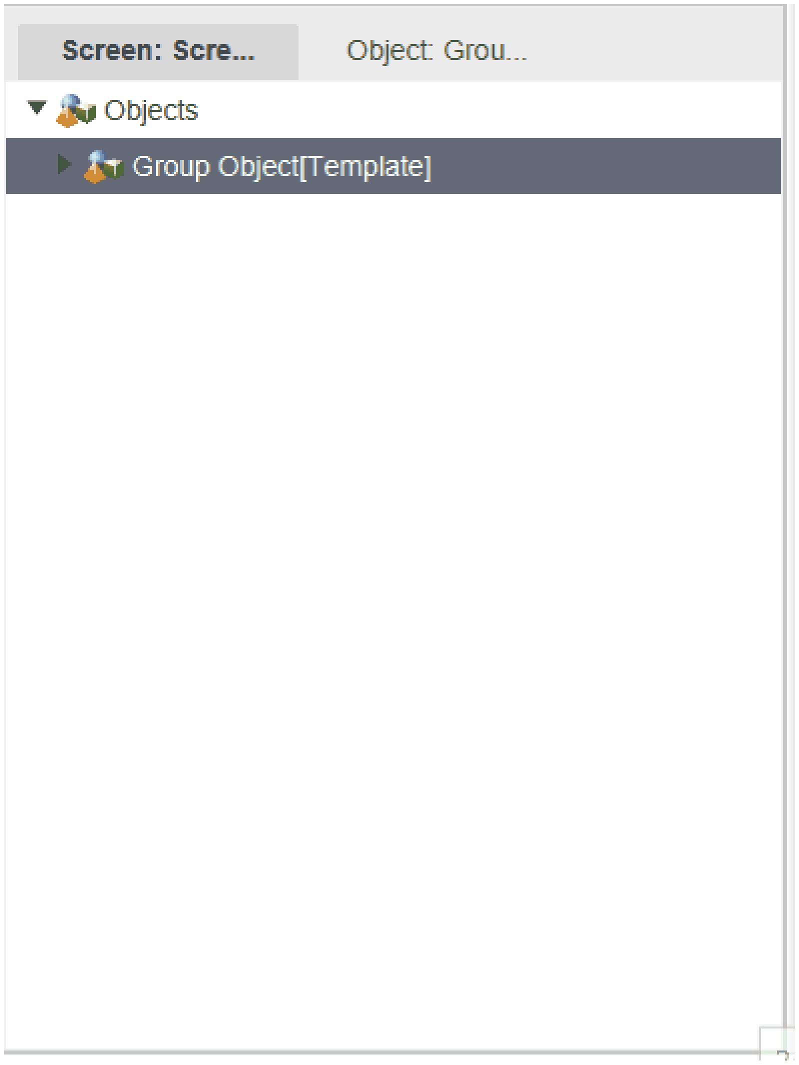
It's possible to edit Object's properties not only in Property sheet, but also in Object properties window. To call this window you have to double click by left mouse button on the object you want to edit or click by right button on the Object and choose Object properties menu item.

5.7 Screen window

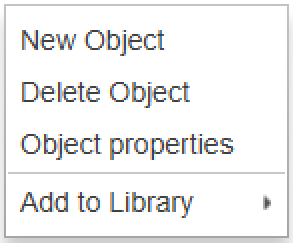
In the same place where the property sheet is located you can find the screen window:



The screen window is useful to find graphical objects that placed on the screen behind other graphical objects and to find and edit properties of the object inside the group object:



By clicking right button on the screen object you can call context menu:



List of menu items with their functions:

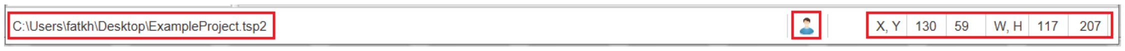
- New object 141 - create a new graphical object and add it in the project and on canvas 92 and screen window.
- **Delete object** - delete selected graphical object from the project.
- **Object properties** - call object properties window for selected object.

- **Add to Library** - add selected object to the library (preliminary you have to create user-defined library in **Add graphical object** 141 window).

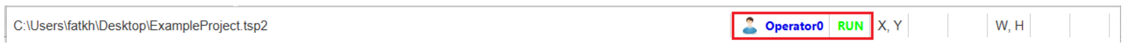
5.8 Status bar

Status bar in all modes contains information about location of the project file in the left.

In design mode contains information about coordinate and dimension of the selected object in the right.


C:\Users\fatkh\Desktop\ExampleProject.tsp2 | X, Y 130 59 W, H 117 207

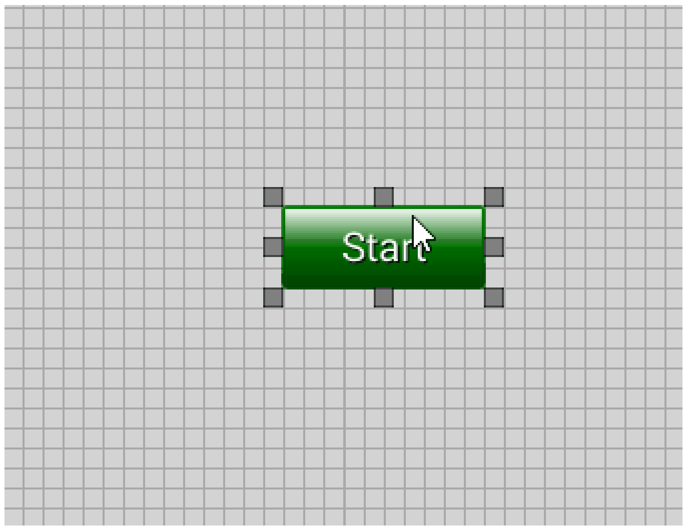
In simulation mode it contains Run label information about simulation mode and information about current user.


C:\Users\fatkh\Desktop\ExampleProject.tsp2 | Operator0 RUN X, Y W, H

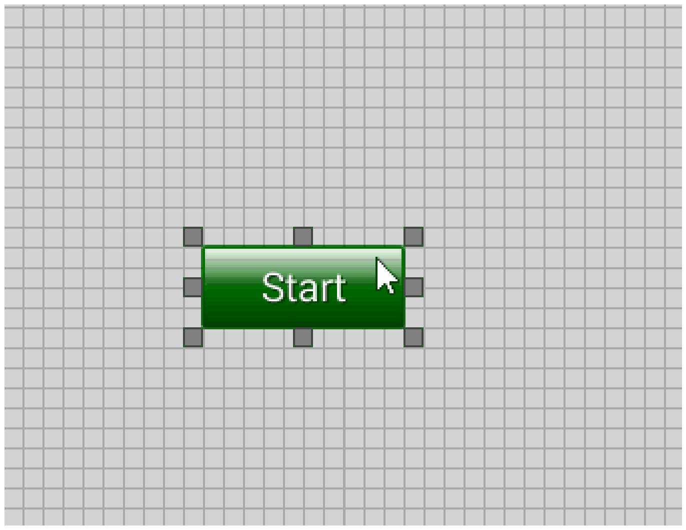
5.9 Hot keys and tips

Editor

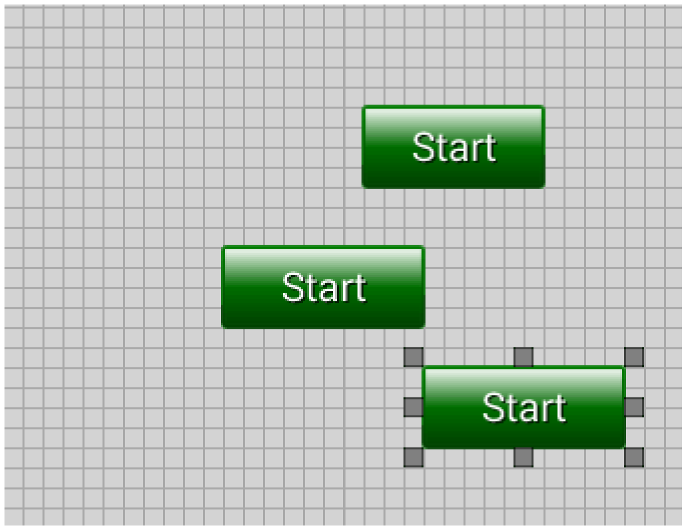
You can move objects by using arrow buttons of the keyboard (UP, DOWN, LEFT and RIGHT):



If CAPS LOCK is ON you can change dimension of the object by using arrow buttons of the keyboard:



You can select multiple graphical objects by holding CTRL keyboard button and clicking left mouse button on the objects:



Keyboard shortcut Windows and Linux	MacOS	Function
CTRL+N	^N	Create a new project.
CTRL+O	^O	Open project.
CTRL+S	^S	Save project.
CTRL+SHIFT+S	^+SHIFT+S	Save project as...
CTRL+SHIFT+L	^+SHIFT+L	Load project on remote desktop or Android device. TeslaSCADA2 Runtime should be started.

Keyboard shortcut Windows and Linux	MacOS	Function
CTRL+Z	^Z	Undo last action.
CTRL+Y	^Y	Redo last action.
CTRL+D	^D	Duplicate selected graphical object(s).
CTRL+X	^X	Cut selected graphical object(s).
CTRL+C	^C	Copy selected graphical object(s).
CTRL+P	^V	Paste selected graphical objects(s).
DEL	Fn+Delete(Backspase)	Delete selected graphical object(s).
CTRL+G	^G	Apply changes of the selected object for all objects with the same name.
F9	Fn+F9	Send to back selected graphical object(s).
SHIFT+F9	Fn+SHIFT+F9	Bring to front selected graphical object(s).
CTRL+F3	Fn+^F3	Align the selected objects to the left.
CTRL+F5	Fn+^F5	Center selected graphical objects horizontally.
CTRL+F7	Fn+^F7	Align the selected objects to the right.
CTRL+F4	Fn+^F4	Align the selected graphical objects to the top.
CTRL+F6	Fn+^F6	Center selected graphical objects vertically.
CTRL+F8	Fn+^F8	Align the selected graphical objects to the bottom.
CTRL+H	^H	Distribute the selected objects evenly horizontally.
CTRL+E	^E	Distribute the selected graphical objects evenly vertically.
F6	Fn+F6	Rotate clockwise selected object(s). To current rotation angle 90 degrees will be added.
SHIFT+F6	Fn+^F6	Rotate counter clockwise selected object(s). From current rotation angle 90 degrees will be subtracted.
ALT+W	ALT+W	Create a new screen in the project.
CTRL+SHIFT+R	SHIFT+^R	Create a new Modbus RTU server.
CTRL+SHIFT+M	SHIFT+^M	Create a new Modbus TCP(UDP) server.
CTRL+SHIFT+I	SHIFT+^I	Create a new Siemens server.
CTRL+SHIFT+A	SHIFT+^A	Create a new AllenBradley server.
CTRL+SHIFT+O	SHIFT+^O	Create a new OPC UA server.
CTRL+SHIFT+Q	SHIFT+^Q	Create a new MQTT server.

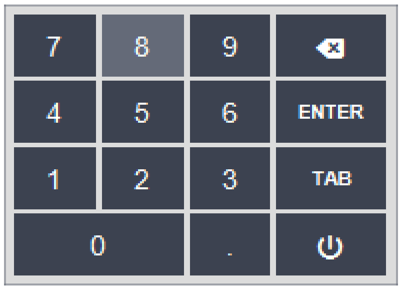
Keyboard shortcut Windows and Linux	MacOS	Function
CTRL+SHIFT+N	SHIFT+^N	Create a new Omron server.
ALT+S	ALT+S	Create a new script in the project.
ALT+T	ALT+T	Create a new tag in the project.
ALT+U	ALT+U	Create a new user in the project.
ALT+R	ALT+R	Create a new recipe in the project.
ALT+O	ALT+O	Add a new graphical object in the project.
CTRL+F11	Fn+^F11	Run simulation of the project.
CTRL+F12	Fn+^F12	Stop simulation of the project.
CTRL+F10	Fn+^F10	Logout and Login new user.
ALT+P	ALT+P	Open project properties window.

ST script editor

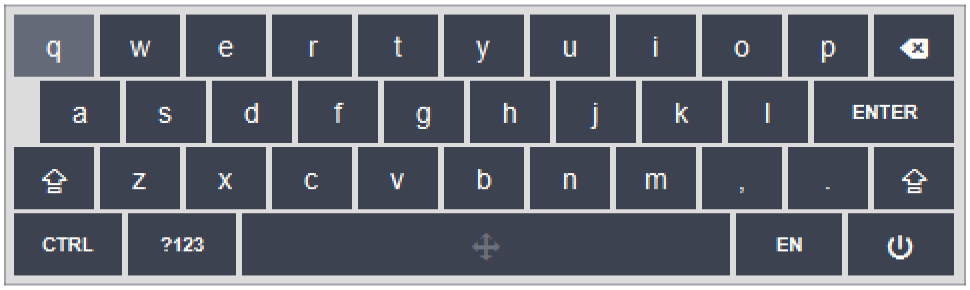
Keyboard shortcut Windows and Linux	MacOS	Function
CTRL+Z	^Z	Undo the last action.
CTRL+SHIFT+Z	SHIFT+^Z	Redo the undone action.
CTRL+SHIFT+->	CMD+SHIFT+->	Select the code to the right of the cursor.
CTRL+SHIFT+<-	CMD+SHIFT+<-	Select the code to the left of the cursor.
CTRL+X	CMD+X	Cut selected code.
CTRL+C	CMD+C	Copy selected code.
CTRL+V	CMD+V	Paste selected code.
CTRL+F11	Fn+^F11	Compile script.
Home/End		Move cursor to start / end of line.
CTRL+Home/ CTRL+End		Move cursor to start / end of script.
Shift + Home / Shift + End		Move cursor to start / end of line with selection.

Sensor screen

By checking menu item **Project** 67 **->Virtual keyboard** you can enter values on sensor screens. If it is checked, then when you click on an object available for entering numeric values, a numeric keypad will be displayed on the screen:



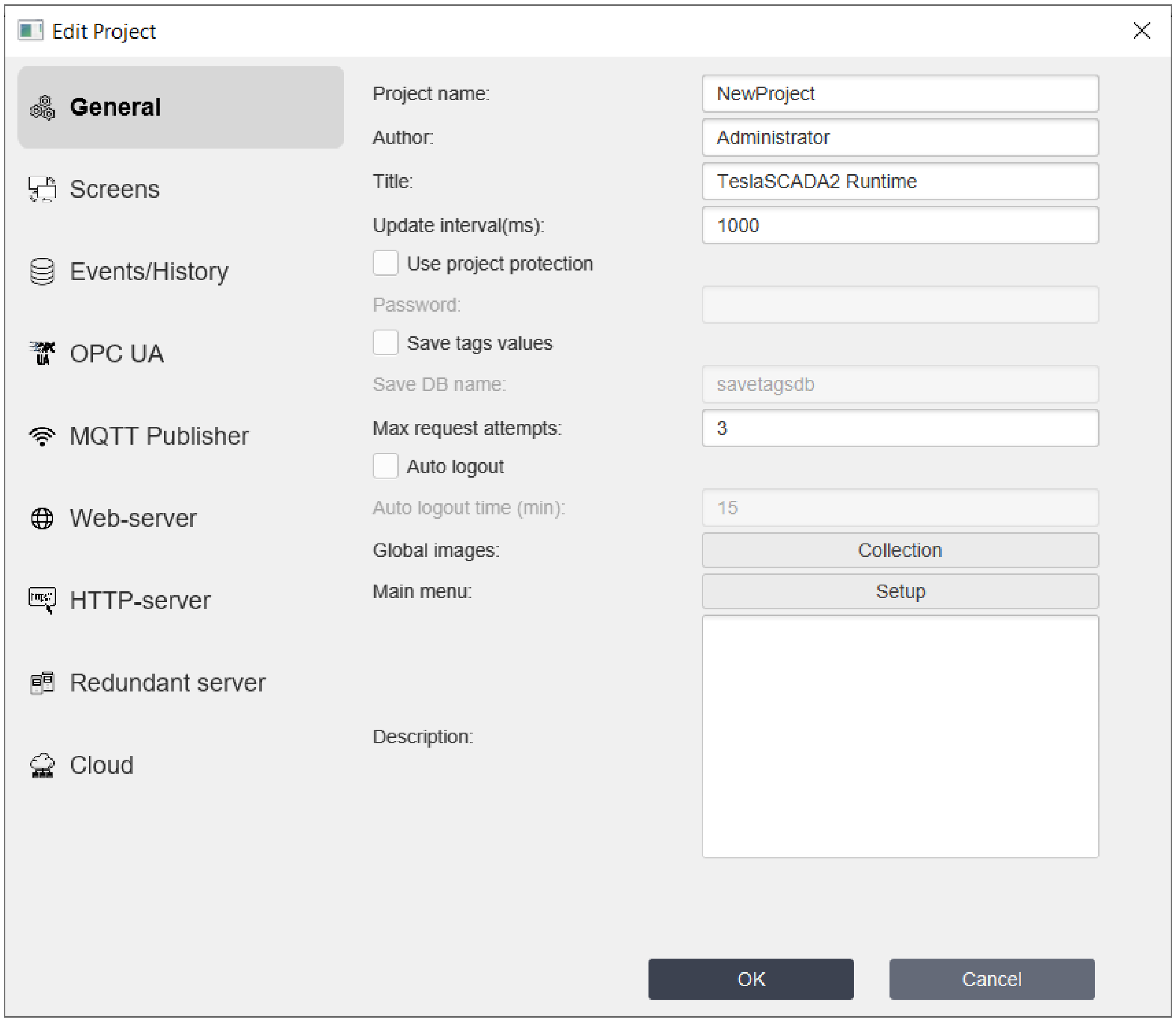
If you need to enter "-" or "," you have to long touch (or long click) on the virtual button "." and choose symbol you want. When you click on an object available for entering characters, a symbolic keyboard with support for Russian, English and special characters will be displayed on the screen:



6 Project

Create Project

To create a new project TeslaSCADA IDE must be started. Click on the **New** 70 **icon** in the toolbar or click **menu item New** from the **main menu** **File** 62. You'll see the project properties 102 window:


Edit Project

Project name:	NewProject
Author:	Administrator
Title:	TeslaSCADA2 Runtime
Update interval(ms):	1000
Use project protection	
Password:	
Save tags values	
Save DB name:	savetagsdb
Max request attempts:	3
Auto logout	
Auto logout time (min):	15
Global images:	Collection
Main menu:	Setup
Description:	

Save project

To save project:

- Click on the **Save** 70 or **Save as...** 70 icon on the toolbar or select the menu item **File** 62 and **Save** or **Save as...**. The ?rst time you save a new project, you will be asked for a location.
- Now select the location and click the button Save (TeslaSCADA project extension .tsp2).

Open project

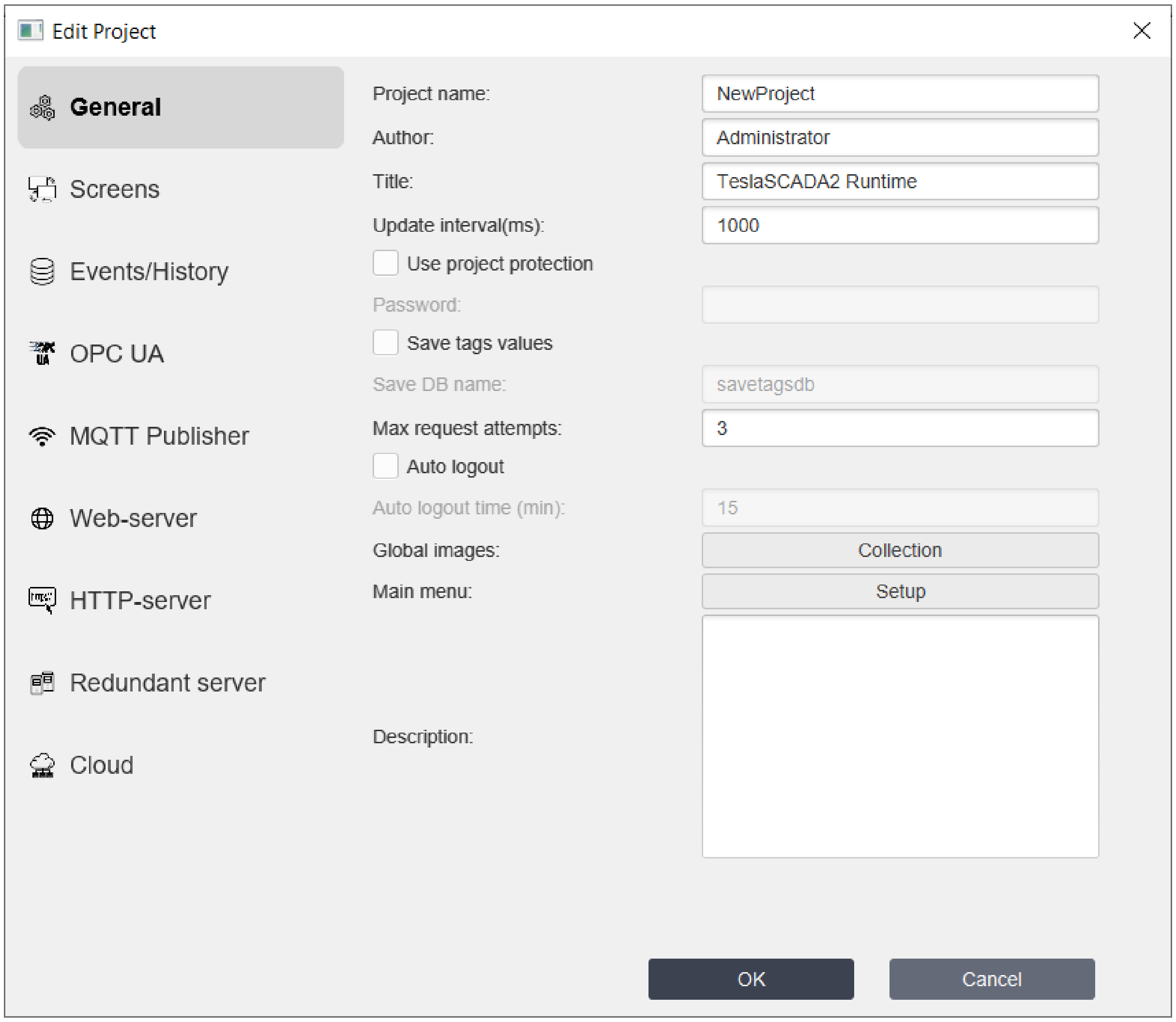
To open project:

1. Click on the **Open** 70 icon on the toolbar or select the menu item **File** 62 and **Open**.
2. Now select the project and click Open (TeslaSCADA project extension .tsp2).

Open project properties

To open project properties 102:
1. Click on the **Properties** 70 icon on the toolbar or select the menu item **Project** 67 and **Properties**.

6.1 Project properties



Project name:	NewProject
Author:	Administrator
Title:	TeslaSCADA2 Runtime
Update interval(ms):	1000
Use project protection	☐
Password:	
Save tags values	☐
Save DB name:	savetagsdb
Max request attempts:	3
Auto logout	☐
Auto logout time (min):	15
Global images:	Collection
Main menu:	Setup
Description:	

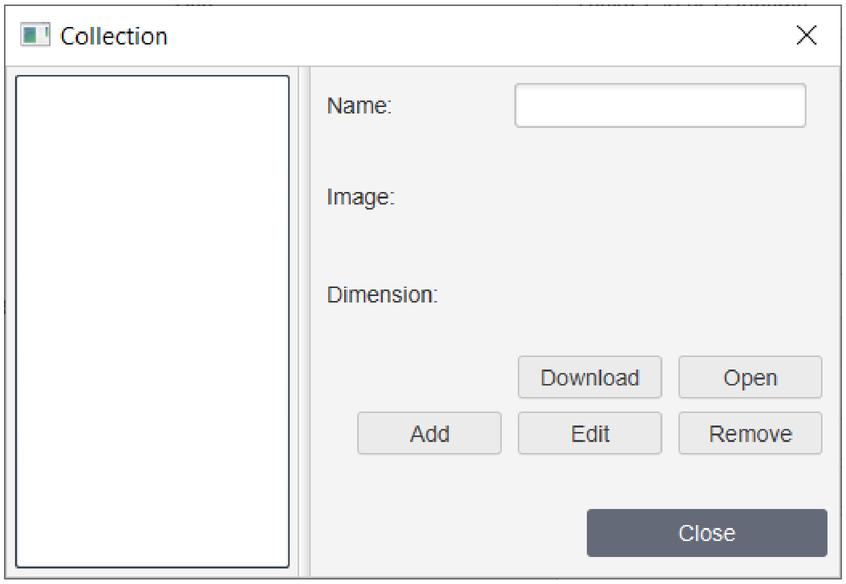
Project properties are grouped in several tabs:
- General 103,
- Screens 108,
- Events/History 110,
- OPC UA 126,
- MQTT Publisher 129,
- Web-server 131,
- HTTP-server 131,

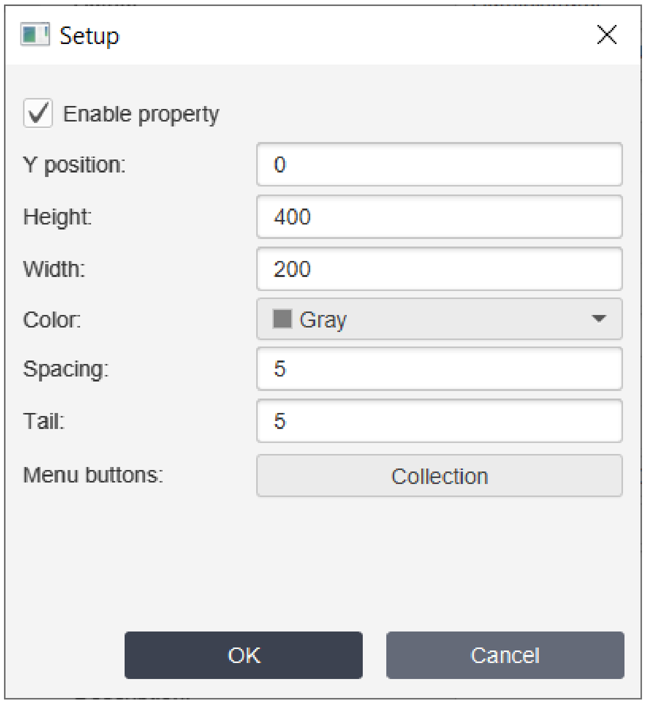
- Redundant server 135,
- Cloud 136.

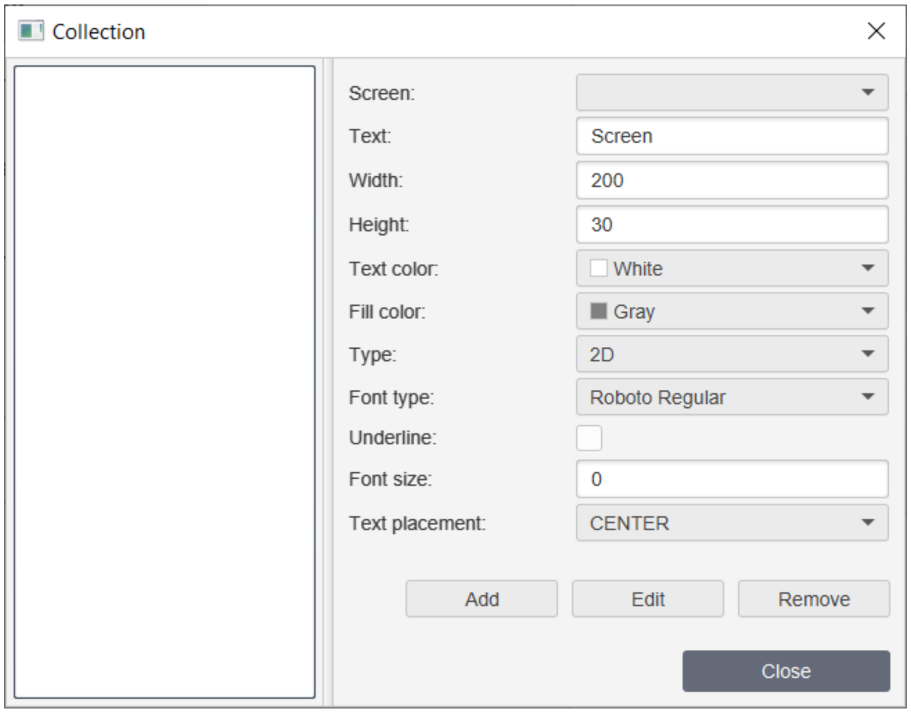
6.1.1 General tab

General tab contains general properties for the project.

Property	Description
Project name	Name of the project.
Author	Author of the project.
Title	Title of the project. We'll be shown instead of TeslaSCADA_Runtime caption.
Update interval	Update interval of the project. It’s an interval for updating (redrawing) graphical objects of the current screen. Also with this interval scripts will be executed if "every cycle" is checked for ST script. For scripts with execution type "OnDataChange" scripts will be executed if tag's values is changed, if this tag is used in this script.
Use project protectio n	If you want to protect your project from opening and editing by non-authorised person check use project protection.
Password	Password for protecting your project.
Save tags values	Check if you want to save all tag’s values when you close application and load them when you open your project.
Save DB name	Name of the database where tag’s values will be saved.
Max request attempts	Number of maximum server requests before determining that the connection with the server has been lost.
Auto logout	If you want current user auto logout in setup minutes after login you have to check this property.
Auto logout time(min)	Time in minutes before auto logout happens.
Global images	Since 2.46 version all images of the project are stored in one global library. It needs to beneath size of the project. To edit global images library click **Collection** button. You'll see the window:

Property	Description
	 Collection Name: Image: Dimension: Download Open Add Edit Remove Close where: • **Name** - name of the image. • **Image** - selected image. • **Download** - download selected image to disk. • **Open** - open new image file. • **Add** - add image to the collection. • **Edit** - edit image in the collection. • **Remove** - remove image from the collection.
Main menu*	You can use Main menu in your project that helps you to navigate through general screens of the project. Click **Setup** button to configure main menu. After clicking you'll see the window:

Property	Description
	 Setup ✓ Enable property; Y position: 0; Height: 400; Width: 200; Color: Gray; Spacing: 5; Tail: 5; Menu buttons: Collection where: • **Y position** - Main menu is slid from the left. Y position of the menu you setup in this field. • **Height** - height of the main menu. • **Width** - width of the main menu. • **Color** - background color of the main menu. • **Spacing** - spacing between buttons of the main menu. • **Tail** - tail of the main menu that appears on the screen. • **Menu buttons** - collection of the main menu buttons. After clicking button you'll see the window: •

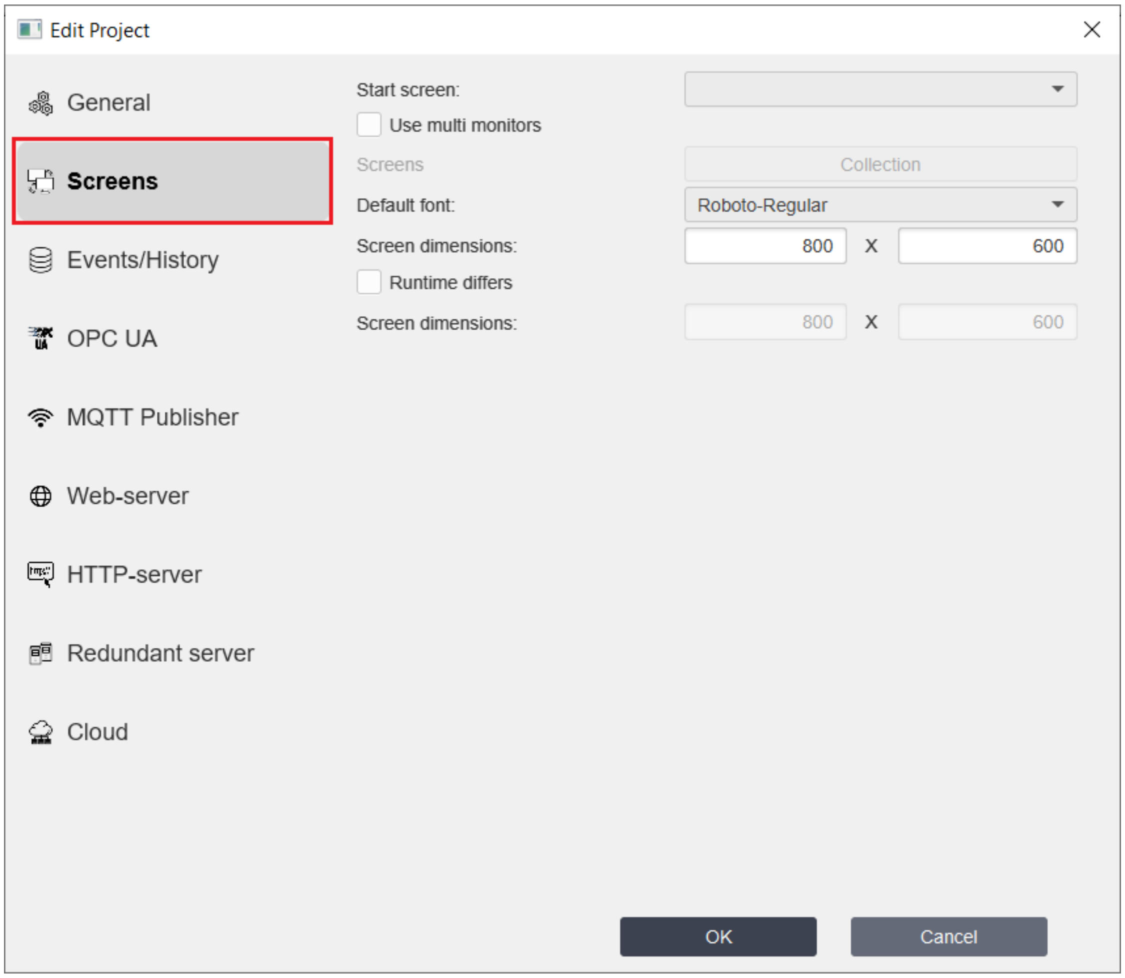
Property	Description
	 Screen: Text: Screen Width: 200 Height: 30 Text color: White Fill color: Gray Type: 2D Font type: Roboto Regular Underline: Font size: 0 Text placement: CENTER ghere: • **Screen** - screen you want to bind to the button. If you don't want to bind any screen left it empty. Other properties are the same like general properties 186 for the Button. Buttons **Add**, **Edit** and **Remove** let you change main menu buttons collection.
Description	Optionally, specify a meaningful description of your project.

*** Main menu works only on PC versions.**

Project properties. General tab.

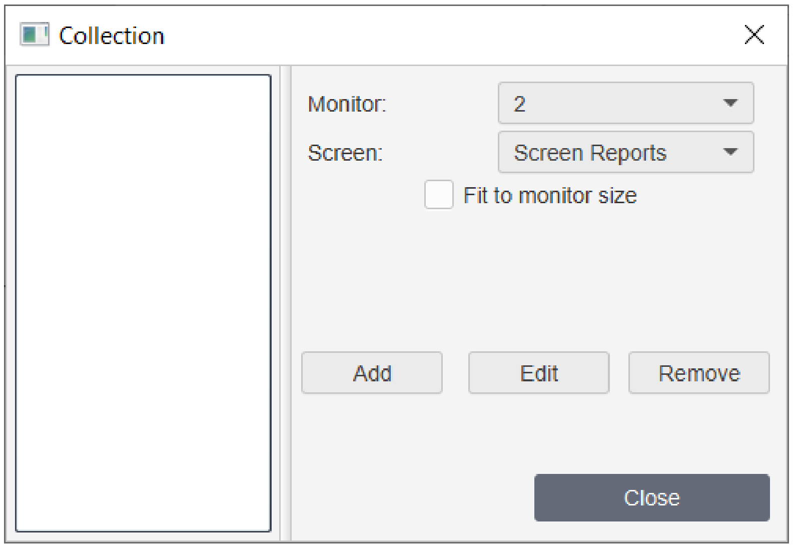
Project properties. General tab.

6.1.2 Screens tab



Start screen:
Use multi monitors
Screens: Collection
Default font: Roboto-Regular
Screen dimensions: 800 X 600
Runtime differs
Screen dimensions: 800 X 600

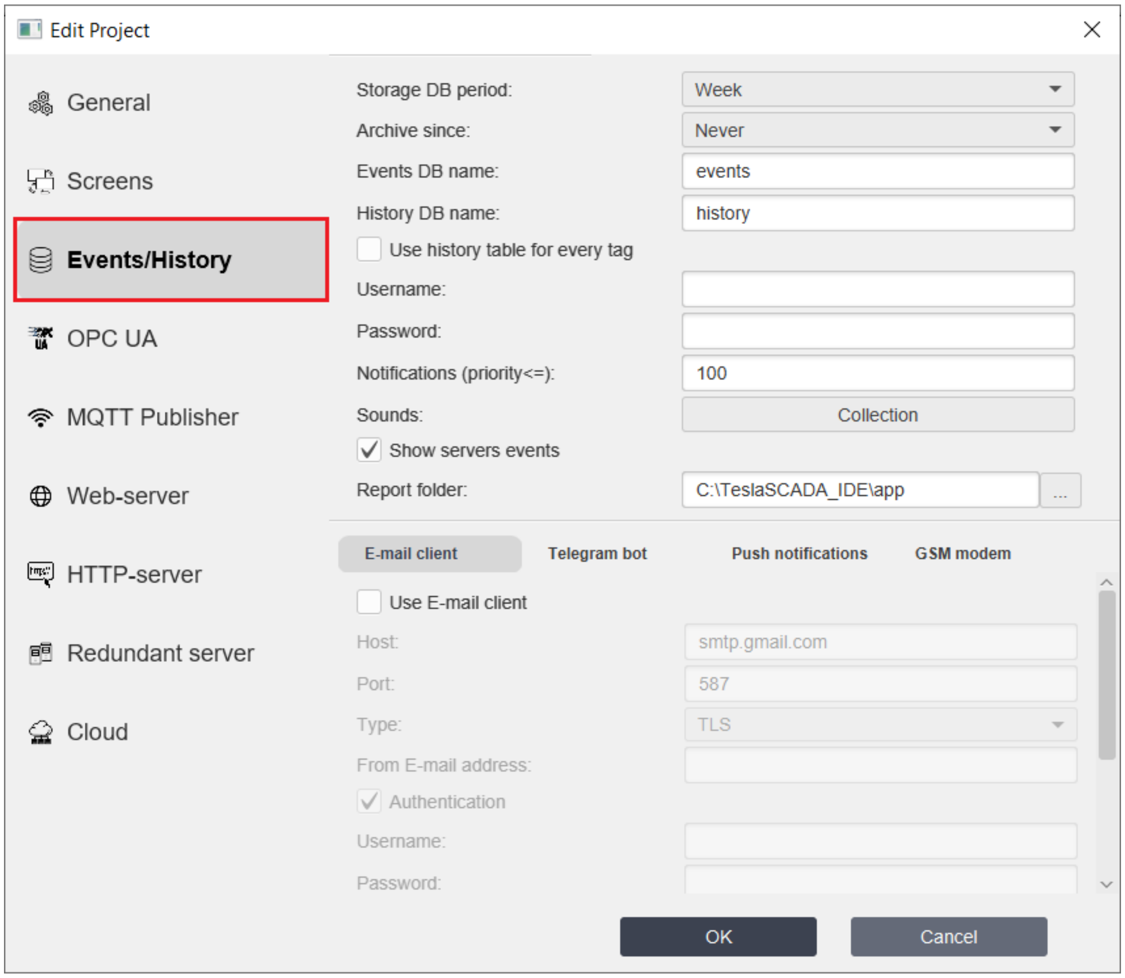
Property	Description
Start screen	Name of the start screen. When you create a new project the Start screen combobox is empty. You can choose the start screen after creating screens of the project.
Use multi monitors	If you want to use several monitors to display your project screens check this item.
Screens	To edit number of monitors to display screens of your project click button **Collection**. You'll see:

Property	Description
	 Monitor: 2 Screen: Screen Reports Fit to monitor size where: • **Monitor** - monitor's number • **Screen** - start screen for this monitor • **Fit to monitor size** - check if you want the screen is stretched to monitor's dimension.
Default font	Default font for all texts in the project. System font lets you use Chinese, Arabian and etc language symbols.
Screen dimensions	Default dimensions of your design screen in the screen dimensions ?elds. These values are also used for scaling your project. Be careful if these dimensions differs from the dimensions of the screens you develop, this may cause your project to display incorrectly on devices with different screen resolutions.
Runtime differs	If the screen dimensions of your target device differs check "runtime differs" and enter its screen dimensions.

Project properties. Screens tab.

6.1.3 Events/History tab

Events/History tab contains properties for general events and history databases, notification rules and sounds, report folder. Also it contains properties for E-mail client used for notifications by E-mail 114 and for Telegram bot 117.

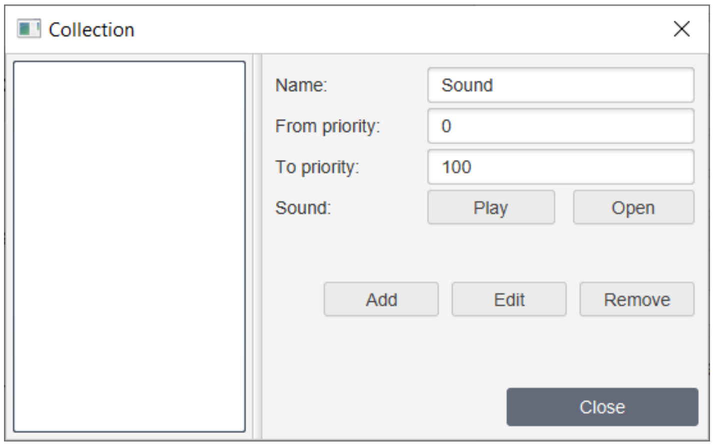


Storage DB period: Week
Archive since: Never
Events DB name: events
History DB name: history
[ ] Use history table for every tag
Username:
Password:
Notifications (priority<=): 100
Sounds: Collection
[✓] Show servers events
Report folder: C:\TeslaSCADA_IDE\app

[ ] Use E-mail client
Host: smtp.gmail.com
Port: 587
Type: TLS
From E-mail address:
[✓] Authentication
Username:
Password:

Property	Description
Storage DB period	Select the time period during which data will be stored in general event and history databases.
Archive since	Select an archive period. The data collected before the archive period is stored in the archive database. The data collected for the selected period is stored in the main database. This improves performance when querying the underlying database.
Events DB name	The name of the database that stores all information about events during project execution. • If you choose the simple name like events application will create SQLite database in the application directory 18. • If you choose names beginning with jdbc:mysql: like jdbc:mysql://192.168.0.104:3306/test, where test - name of the database, the application will connect to MySQL

Property	Description
	database and create events table. How to install and setup MySQL you can read in MySQL* 31 chapter. • if you choose names beginning with jdbc:sqlserver: like jdbc:sqlserver://192.168.1.17:1433;databaseName=test where test - name of the database you want to connect, the application will connect to MSSQL* 55 database and create events table. • if you choose names beginning with jdbc:postgresql: like jdbc:postgresql://192.168.1.17:5432/test where test name of the database you want to connect, the application will connect to PostgreSQL* 58 database and create events table. • if you choose names beginning with jdbc:ucanaccess: like jdbc:ucanaccess:///C:\Users\fatkh\Downloads\events.accdb where events.aacdb - name of the file you want to collect information, the application will connect to MS Access database and create events table.
History DB name	The name of the database that stores general history information during project execution. It's also possible to store history information in History databases. • If you choose the simple name like history application will create SQLite database in the application directory 18. • If you choose names beginning with jdbc:mysql: like jdbc:mysql://192.168.0.104:3306/test, where test - name of the database, the application will connect to MySQL database and create history table. How to install and setup MySQL you can read in MySQL* 31 chapter. • if you choose names beginning with jdbc:sqlserver: like jdbc:sqlserver://192.168.1.17:1433;databaseName=test where test - name of the database you want to connect, the application will connect to MSSQL* 55 database and create history table. • if you choose names beginning with jdbc:postgresql: like jdbc:postgresql://192.168.1.17:5432/test where test - name of the database you want to connect, the application will connect to PostgreSQL* 58 database and create history table. • if you choose names beginning with jdbc:ucanaccess: like jdbc:ucanaccess:history where history - name of the file you

Property	Description
	want to collect information, the application will connect to MS Access database and create history table.
Use history table for every tag	If you check this property, for every tag that collects history information table will be created. This is helpful for big project with a lot of history information.
Username	Username for database (except SQLite database)
Password	Password for database (except SQLite database)
Notifications (priority <)	Events with a priority lower than this value will be noti?ed about it by using the dialog box and sound. And also if E-mail client/ Telegram bot/ GSM modem/ Push are setup - by E-mail/Telegram/SMS/Push notifications.
Sounds	Click **Collection** to set up sounds of events noti?cations depending on priority. After clicking you'll see the window:  Name: Sound From priority: 0 To priority: 100 where: • **Name** - name of the sound. • **From priority and To priority** - priority interval within which sound will play. • **Play** - play selected sound. • **Open** - open sound (wav) file. • **Add** - add sound to the collection. • **Edit** - edit sound. • **Remove** - remove sound from the collection.
Show servers events	Check if want to get notifications about disconnection, lost or restore servers. If you uncheck this property you'll not get notifications.

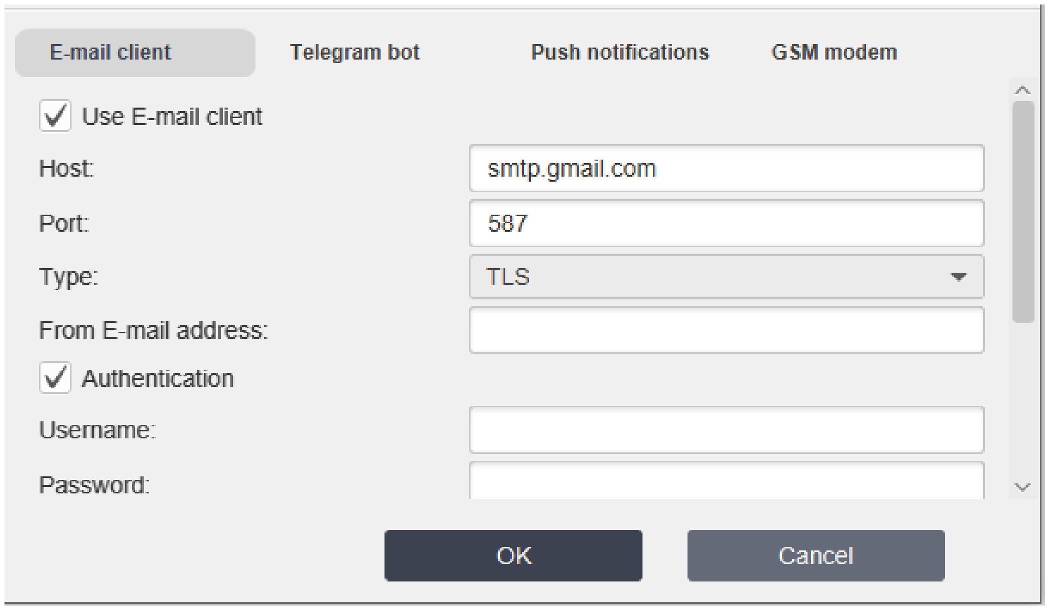
Property	Description
Report folder	The folder which all reports and screenshots.will be written to by default

*** for mobile version it is possible to use only SQLLite databases.**

Project properties. Events/History tab. Part 1.

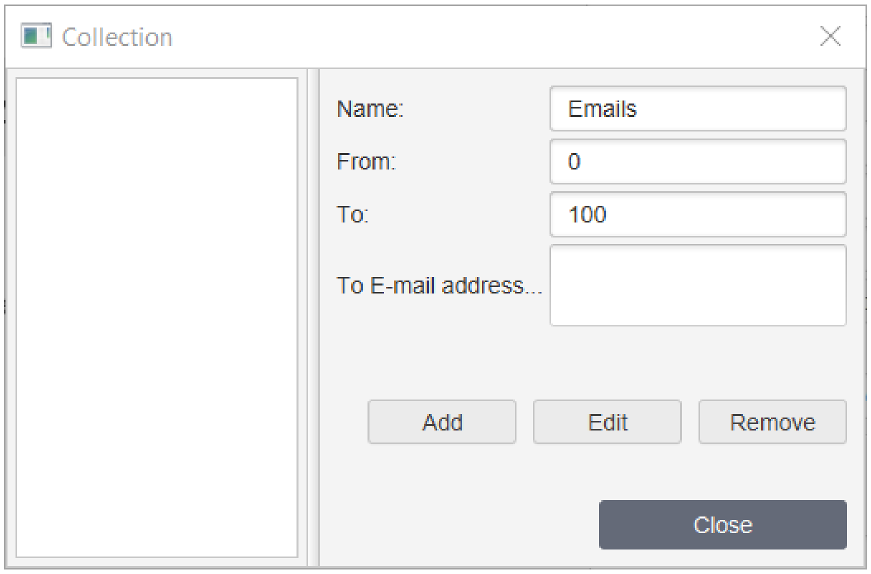
6.1.3.1 E-mail client

If you want to notify users by E-mail you have to setup E-mail client. Use default settings of Host, Port and Type if you use Gmail otherwise set parameters of your mail-service.



Use E-mail client: ✓
Host: smtp.gmail.com
Port: 587
Type: TLS
From E-mail address:
Authentication: ✓
Username:
Password:

Property	Description
Use E-mail client	Check if you want to use E-mail noti?cations about Alarms. All event messages that have priority less then Noti?cations(Priority<) 113 will be sent by E-mail. You can also use function sendemail in ST script.
Host	E-mail host information.
Port	E-mail port information.
Type	Type of the connection - TLS or SSL.
From E-mail address	Which E-mail address the mail will be sent from
Authenticati on	Check if you use Username and Password.
Username	Username of the E-mail account.
Password	Password of the E-mail account.
Subject	Subject of the E-mail. If you left it empty default subject will be used (it contains project name, tag name and other information). You can use keywords: **{name}** - name of the tag that send an alarm message. **{server}** - name of the PV input server. {**message}** - message is sent by tag's alarm. **{group}** - name of the tag's group. **{subgroup}** - name of tag's subgroup. **{description}** - tag's description.

Property	Description
	{value} - tag's value. **{priority}** - tag's message priority. **{datetime}** - current date and time (when alarm is happened). **{projectname}** - project name. **{projectdescription}** - project description.
Message	Message of the E-mail. If you left empty tag's message will be sent. You can use keywords: **{name}** - name of the tag that send an alarm message. **{server}** - name of the PV input server. **{message}** - message is sent by tag's alarm. **{group}** - name of the tag's group. **{subgroup}** - name of tag's subgroup. **{description}** - tag's description. **{value}** - tag's value. **{priority}** - tag's message priority. **{datetime}** - current date and time (when alarm is happened). **{projectname}** - project name. **{projectdescription}** - project description.
To E-mail addresses	Which E-mail addresses the mail will be sent to. Use commas to separate addresses.
Depends on priority	If you want to use E-mail addresses depending on priority check this property and setup E-mail addresses depending on priority values:  Name: Emails From: 0 To: 100 To E-mail address...: where:

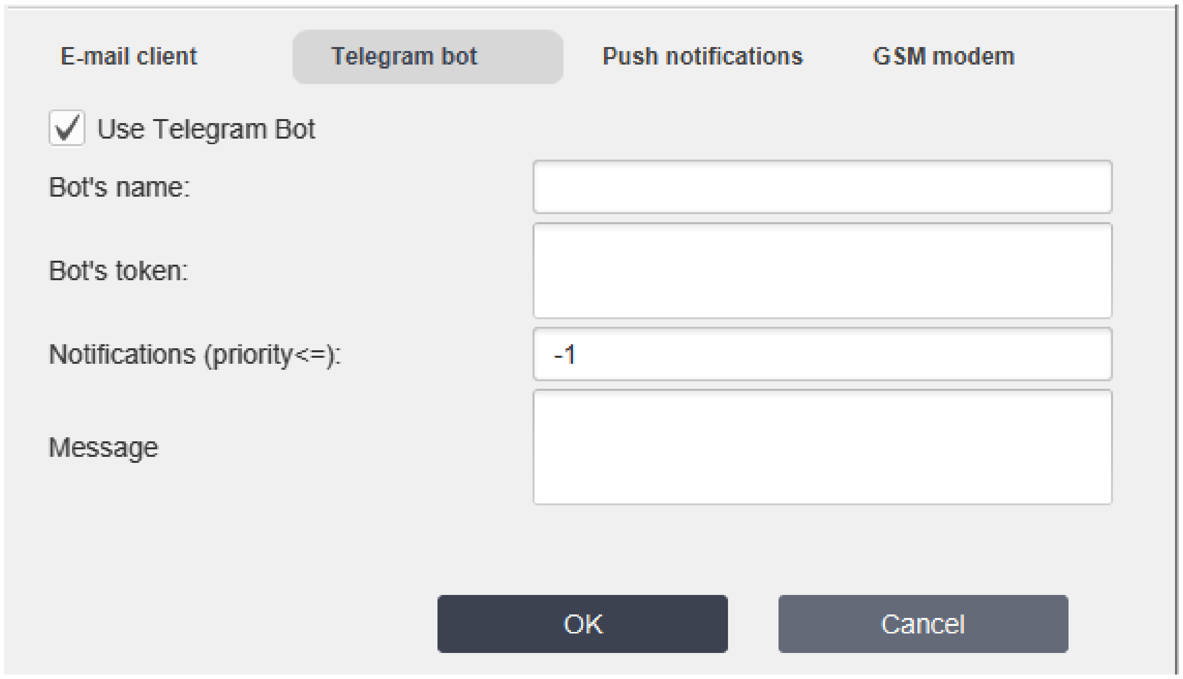
Property	Description
	• **Name** - name of the E-mail range. • **From** - begin priority of the range. • **To** - end priority of the range. • **To E-mail addresses** - E-mail addresses separated by commas.

In some accounts, for example, in Gmail you have to make some setups before it would be possible to send E-mails. Watch the video below how to setup Gmail account.

Project properties. Events/History Tab. Part 2 (E-mail

6.1.3.2 Telegram bot

If you want to notify users by Telegram you have to setup Telegram bot:



☑ Use Telegram Bot

Bot's name:

Bot's token:

Notifications (priority<=): -1

Message

Property	Description
Use Telegram Bot	Check If you want to use Telegram notification in your project. All event messages that have priority less then Noti?cations(Priority<) 113 will use Telegram Bot to notify users.
Bot's name	Name of the Telegram bot. You'll get Telegram Bot's name from BotFather when creating your bot.
Bot's token	Token of the Telegram bot. You'll get Telegram Bot's token from BotFather when creating your bot.
Notifications (priority <)	Events with priority lower than this value will be noti?ed about it by using Telegram bot. If the value is less than 0 common Notfications (priority<) 113 will be used.
Message	Message that will be sent to telegram bot. If this field is empty only tag message will be sent. If not empty this message will be sent. You can use keywords: **{name}** - name of the tag that sends an alarm message. **{server}** - name of the PV input server. **{message}** - message is sent by tag's alarm. **{group}** - name of the tag's group. **{subgroup}** - name of tag's subgroup. **{description}** - tag's description. **{value}** - tag's value.

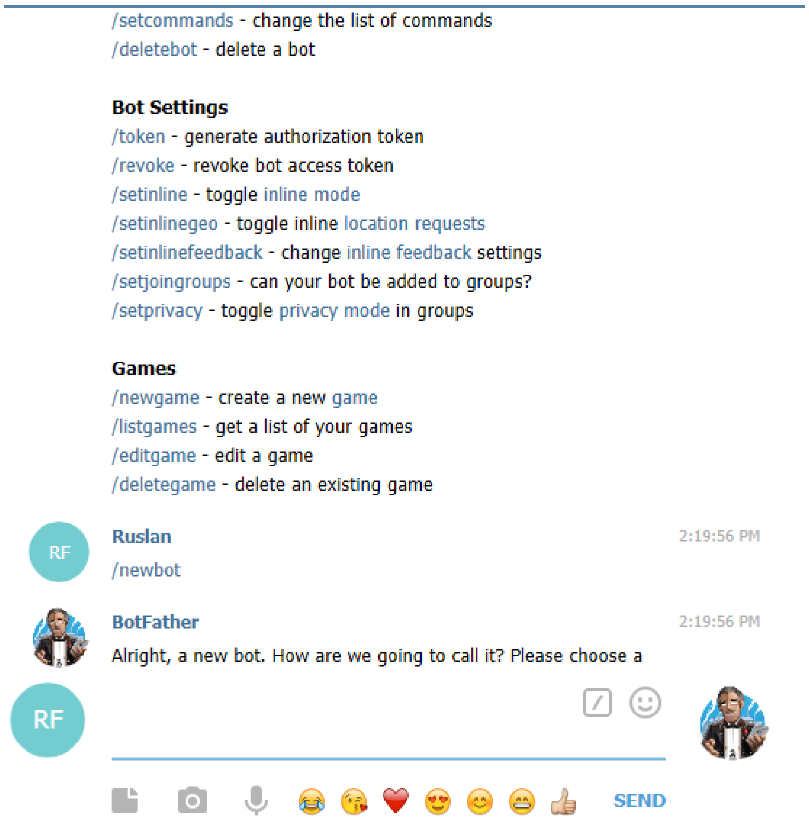
Property	Description
	{priority} - tag's message priority. **{datetime}** - current date and time (when alarm is happened). **{projectname}** - project name. **{projectdescription}** - project description.

Before using telegram for notifications you have to create telegram bot 119.

6.1.3.2.1 Create Telegram Bot

If you want to get events noti?cations from your project in TeslaSCADA2 Runtime you can use Telegram messenger for this purpose. To send messages via Telegram, you need to make a preliminary configuration.

1. First you need to create your own Telegram bot. To do this, you need to open the Telegram application, find a bot with the name "@BotFather", press the "Start" button and send the /newbot command to it:


/setcommands - change the list of commands
/deletebot - delete a bot

Bot Settings
/token - generate authorization token
/revoke - revoke bot access token
/setinline - toggle inline mode
/setinlinegeo - toggle inline location requests
/setinlinefeedback - change inline feedback settings
/setjoingroups - can your bot be added to groups?
/setprivacy - toggle privacy mode in groups

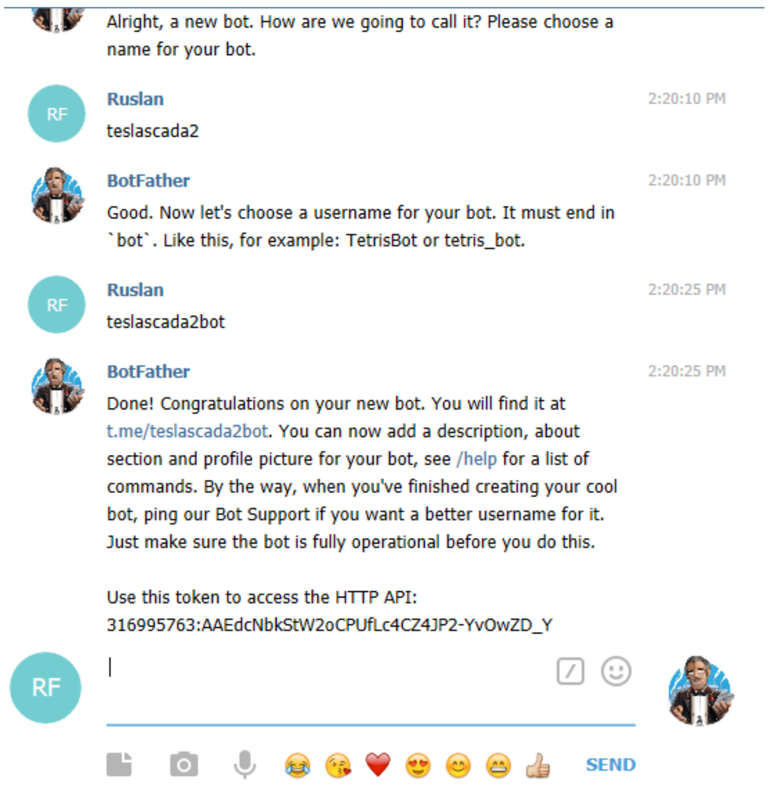
Games
/newgame - create a new game
/listgames - get a list of your games
/editgame - edit a game
/deletegame - delete an existing game

Ruslan 2:19:56 PM
/newbot

BotFather 2:19:56 PM
Alright, a new bot. How are we going to call it? Please choose a

2. Next, you need to come up with a bot name and username (must end with the word "bot").

3. After that, the Token will be received. Copy token



Alright, a new bot. How are we going to call it? Please choose a name for your bot.

Ruslan 2:20:10 PM
teslascada2

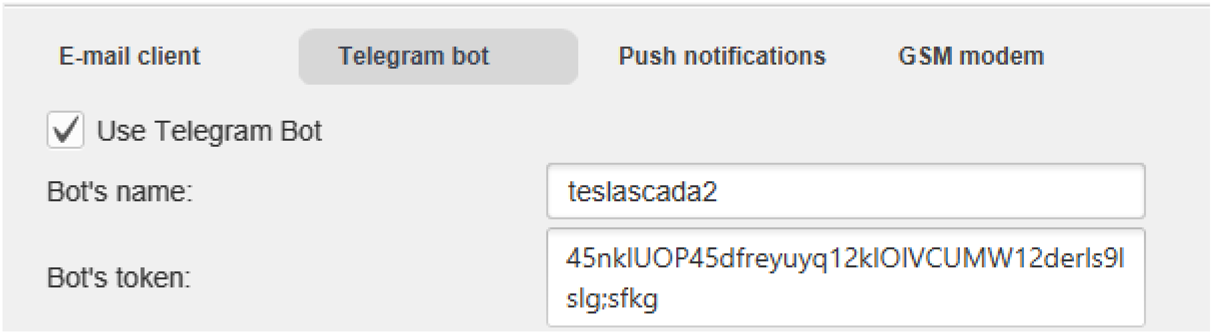
BotFather 2:20:10 PM
Good. Now let's choose a username for your bot. It must end in `bot`. Like this, for example: TetrisBot or tetris_bot.

Ruslan 2:20:25 PM
teslascada2bot

BotFather 2:20:25 PM
Done! Congratulations on your new bot. You will find it at t.me/teslascada2bot. You can now add a description, about section and profile picture for your bot, see /help for a list of commands. By the way, when you've finished creating your cool bot, ping our Bot Support if you want a better username for it. Just make sure the bot is fully operational before you do this.

Use this token to access the HTTP API:
316995763:AAEdcNbkStW2oCPUfLc4CZ4JP2-YvOwZD_Y

4. Next, in the **Project properties->Events/History tab**, check "Use Telegram Bot", enter bot's name and token:



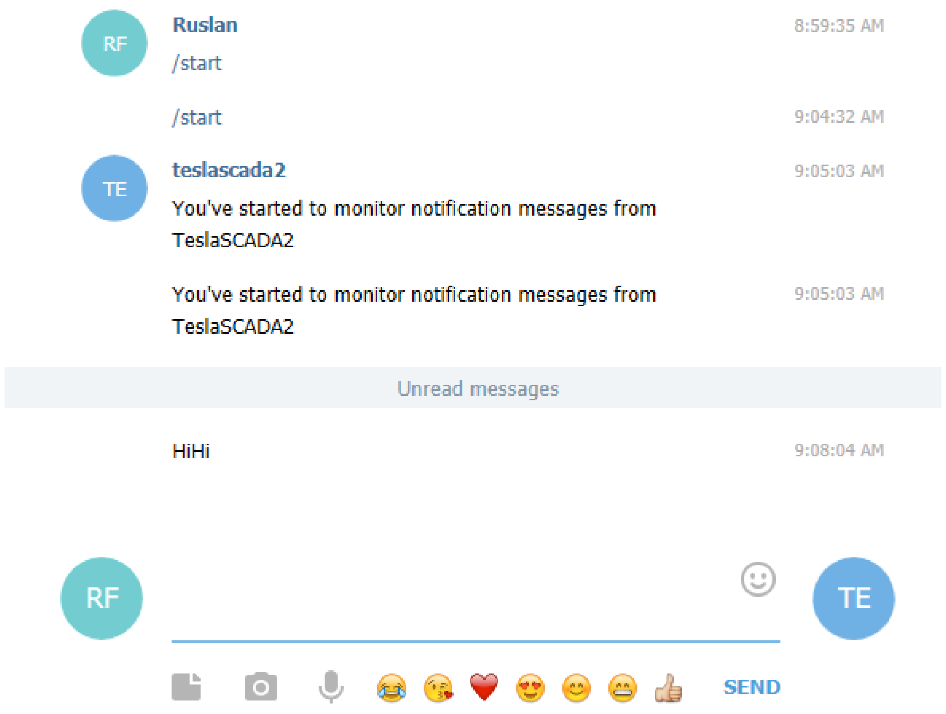
☑ Use Telegram Bot

Bot's name: teslascada2

Bot's token: 45nklUOP45dfreyuyq12klOIVCUMW12derls9lslg;sfkg

5. Then you have to start TeslaSCADA2 Runtime and run this project (in TeslaSCADA IDE telegram bot doesn't work). Don't ignore this step!

6. After that, users who want to receive notifications should find our bot in Telegram and write **/start**:



Ruslan 8:59:35 AM
/start

/start 9:04:32 AM

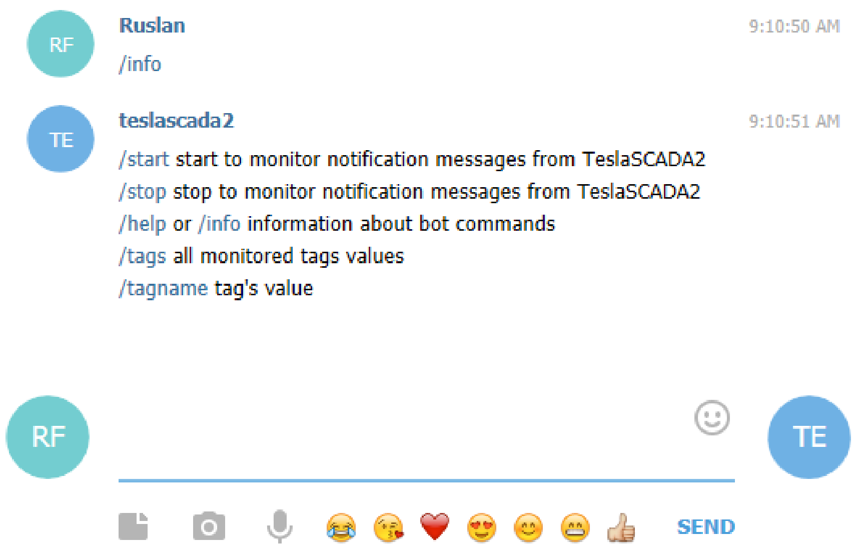
teslascada2 9:05:03 AM
You've started to monitor notification messages from TeslaSCADA2

You've started to monitor notification messages from TeslaSCADA2 9:05:03 AM

Unread messages

HiHi 9:08:04 AM

To stop getting noti?cation messages enter **/stop**. Also you can get some information from your project. To get possible command write **/info**:



Ruslan 9:10:50 AM
/info

teslascada2 9:10:51 AM
/start start to monitor notification messages from TeslaSCADA2
/stop stop to monitor notification messages from TeslaSCADA2
/help or /info information about bot commands
/tags all monitored tags values
/tagname tag's value

Enter **/tags** to get current values of tags.

Enter name of the tag used in your project. You'll get information about value of this tag and if this tag supports history you'll get trend for last hour. You can choose other period by clicking proper button.

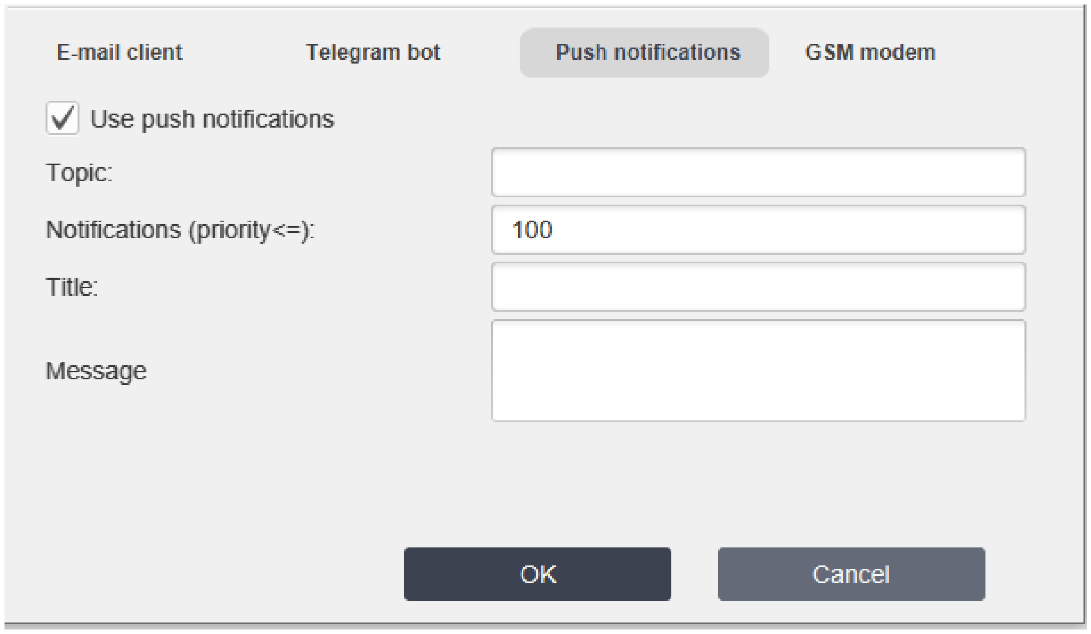
Important! Don't use underline in the name of the tags. Telegram have problems with working with this kind of names.

Important! At this moment you can use Telegram bot only on desktop versions of TeslaSCADA2 Runtime.

Project properties. Events.Part 3 (Telegram notification)

6.1.3.3 Push notifications

If you want to notify users by Push notifications messages you have to setup Push notifications and install TeslaSCADA2 Runtime mobile version on your Android or iOS devices.



[✓] Use push notifications

Topic:	
Notifications (priority<=):	100
Title:	
Message	

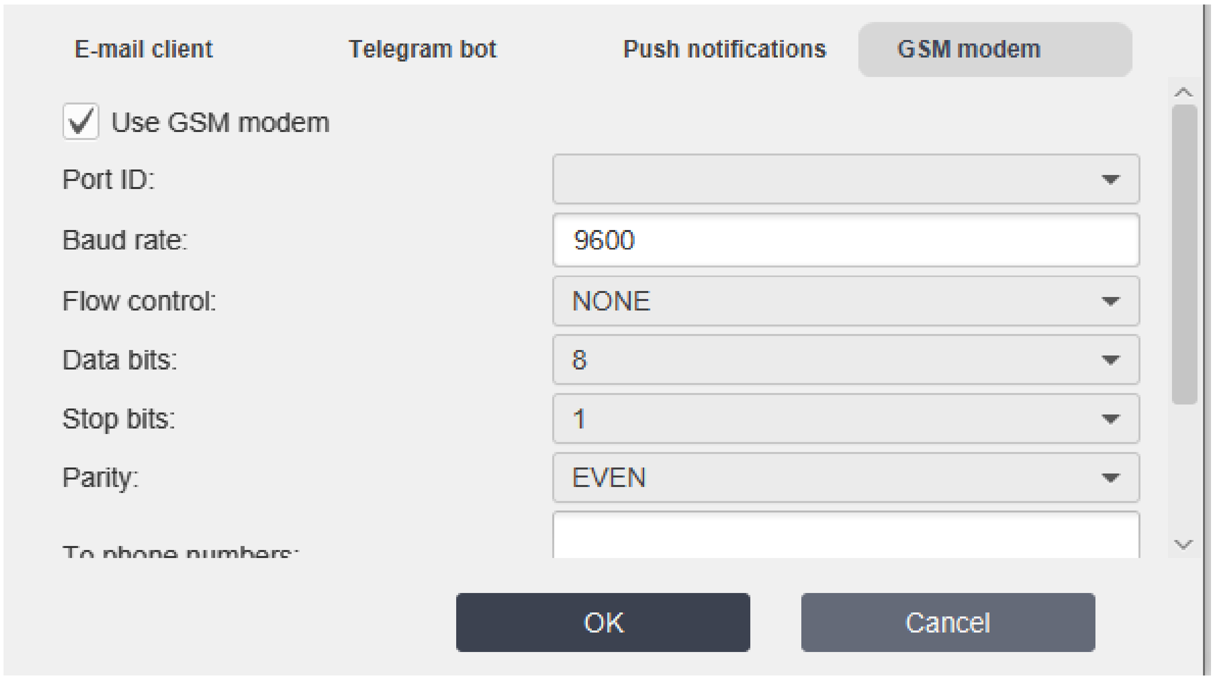
Property	Description
Use push notifications	Check if you want to use push notifications. All event messages that have priority less then Notifications(priority<=) will be sent as push notifications on mobile devices.
Topic	Topic is used to subscribe mobile devices and send to this subscription by PC.
Notifications (priority<=)	If priority of the event message below this value push notification will be sent.
Title	Title of the push notification. You can use keywords:

Property	Description
	{name} - name of the tag that send an alarm message. **{server}** - name of the PV input server. **{message}** - message is sent by tag's alarm. **{group}** - name of the tag's group. **{subgroup}** - name of tag's subgroup. **{description}** - tag's description. **{value}** - tag's value. **{priority}** - tag's message priority. **{datetime}** - current date and time (when alarm is happened). **{projectname}** - project name. **{projectdescription}** - project description.
Message	Message of the push notification You can use keywords: **{name}** - name of the tag that send an alarm message. **{server}** - name of the PV input server. **{message}** - message is sent by tag's alarm. **{group}** - name of the tag's group. **{subgroup}** - name of tag's subgroup. **{description}** - tag's description.

Property	Description
	{value} - tag's value. **{priority}** - tag's message priority. **{datetime}** - current date and time (when alarm is happened). **{projectname}** - project name. **{projectdescription}** - project description.

6.1.3.4 GSM-modem

If you want to notify users by SMS messages you have to setup GSM-modem:



☑ Use GSM modem

Port ID:	
Baud rate:	9600
Flow control:	NONE
Data bits:	8
Stop bits:	1
Parity:	EVEN
To phone numbers:	

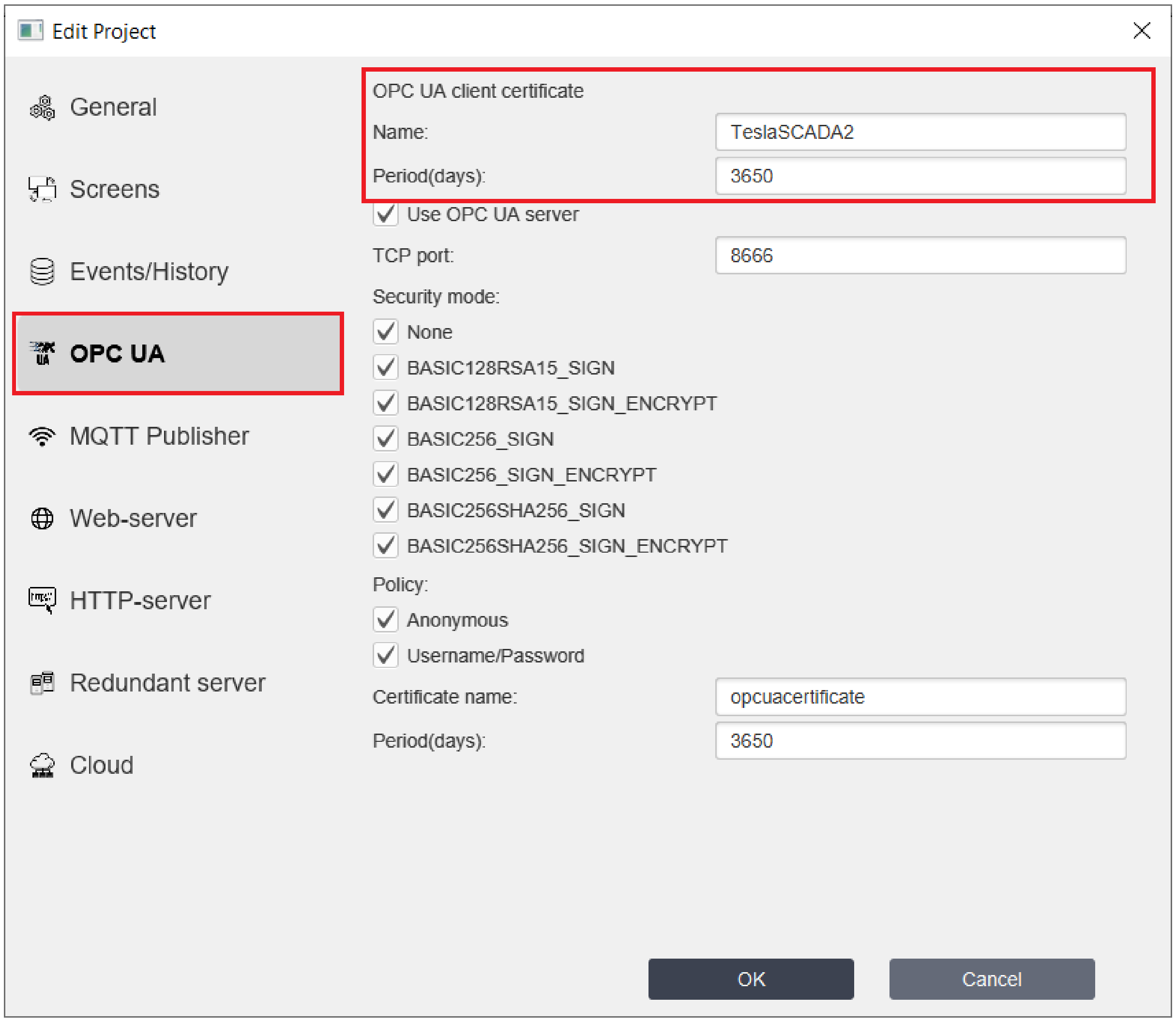
Property	Description
Use GSM modem	Check if you want to use SMS noti?cations about Alarms. All event messages that have priority less then Notifications(priority<=) will be sent by SMS.
Port ID	ID of the COM port. If this port can not be open in TeslaSCADA2 Runtime other port will be tried to ?nd and open.

Property	Description
Baud rate	Baud rate of the Common RTU server.
Flow control	Flow control of the port. It can be NONE, RTSCTS and XONXOF.
Data bits	Number of data bits. It can be 5, 6, 7 and 8.
Stop bits	Number of stop bits. It can be 1, 1.5 and 2.
Parity	Parity of the Common RTU. It can be NONE, EVEN, ODD, MARK and SPACE.
To phone numbers	Phone numbers separated by commas which SMS with alarms will be sent to.
Notifications (priority<=)	If priority of the event message below this value SMS will be sent. If this value <0 global Notifications (priority<=) will be used
Message	Message of the SMS. You can use keywords: **{name}** - name of the tag that send an alarm message. **{server}** - name of the PV input server. **{message}** - message is sent by tag's alarm. **{group}** - name of the tag's group. **{subgroup}** - name of tag's subgroup. **{description}** - tag's description. **{value}** - tag's value. **{priority}** - tag's message priority. **{datetime}** - current date and time (when alarm is happened). **{projectname}** - project name. **{projectdescription}** - project description.

6.1.4 OPC UA tab

OPC UA client settings

If you want to use OPC UA client certi?cate to connect to OPC UA servers in your project on the OPC UA tab enter Name of used/created certi?cate and Period(days) of validation if you create certi?cate:



OPC UA client certificate

Name: TeslaSCADA2

Period(days): 3650

✓ Use OPC UA server

TCP port: 8666

Security mode:

✓ None

✓ BASIC128RSA15_SIGN

✓ BASIC128RSA15_SIGN_ENCRYPT

✓ BASIC256_SIGN

✓ BASIC256_SIGN_ENCRYPT

✓ BASIC256SHA256_SIGN

✓ BASIC256SHA256_SIGN_ENCRYPT

Policy:

✓ Anonymous

✓ Username/Password

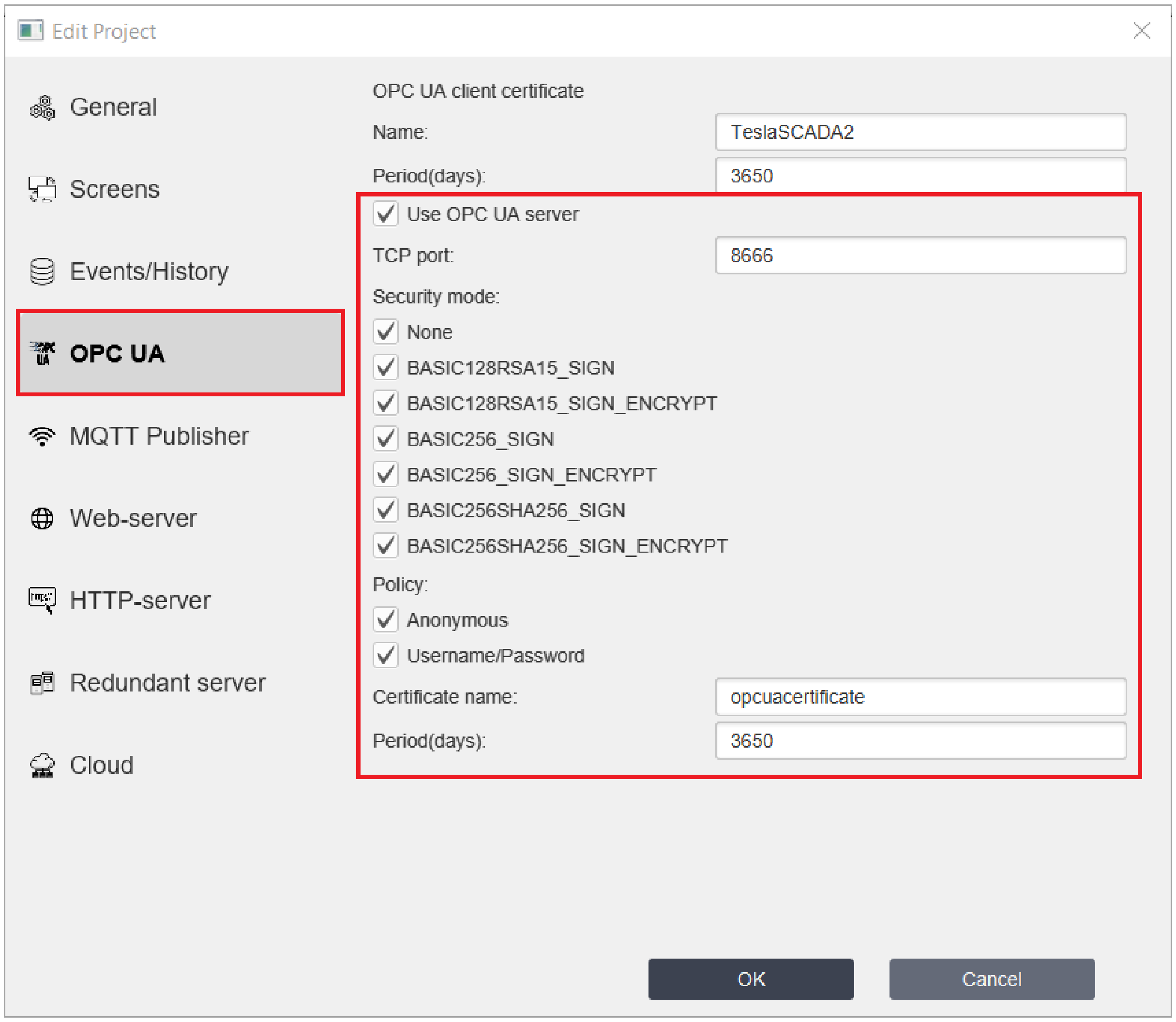
Certificate name: opcuacertificate

Period(days): 3650

The certi?cate is stored in the {app}/private 18 directory.

OPC UA server settings

If you want to use Client - Server architecture 12 in your system and use it with OPC UA server you have to check Use OPC UA sever:



OPC UA client certificate

Name: TeslaSCADA2

Period(days): 3650

✓ Use OPC UA server

TCP port: 8666

Security mode:

✓ None

✓ BASIC128RSA15_SIGN

✓ BASIC128RSA15_SIGN_ENCRYPT

✓ BASIC256_SIGN

✓ BASIC256_SIGN_ENCRYPT

✓ BASIC256SHA256_SIGN

✓ BASIC256SHA256_SIGN_ENCRYPT

Policy:

✓ Anonymous

✓ Username/Password

Certificate name: opcuacertificate

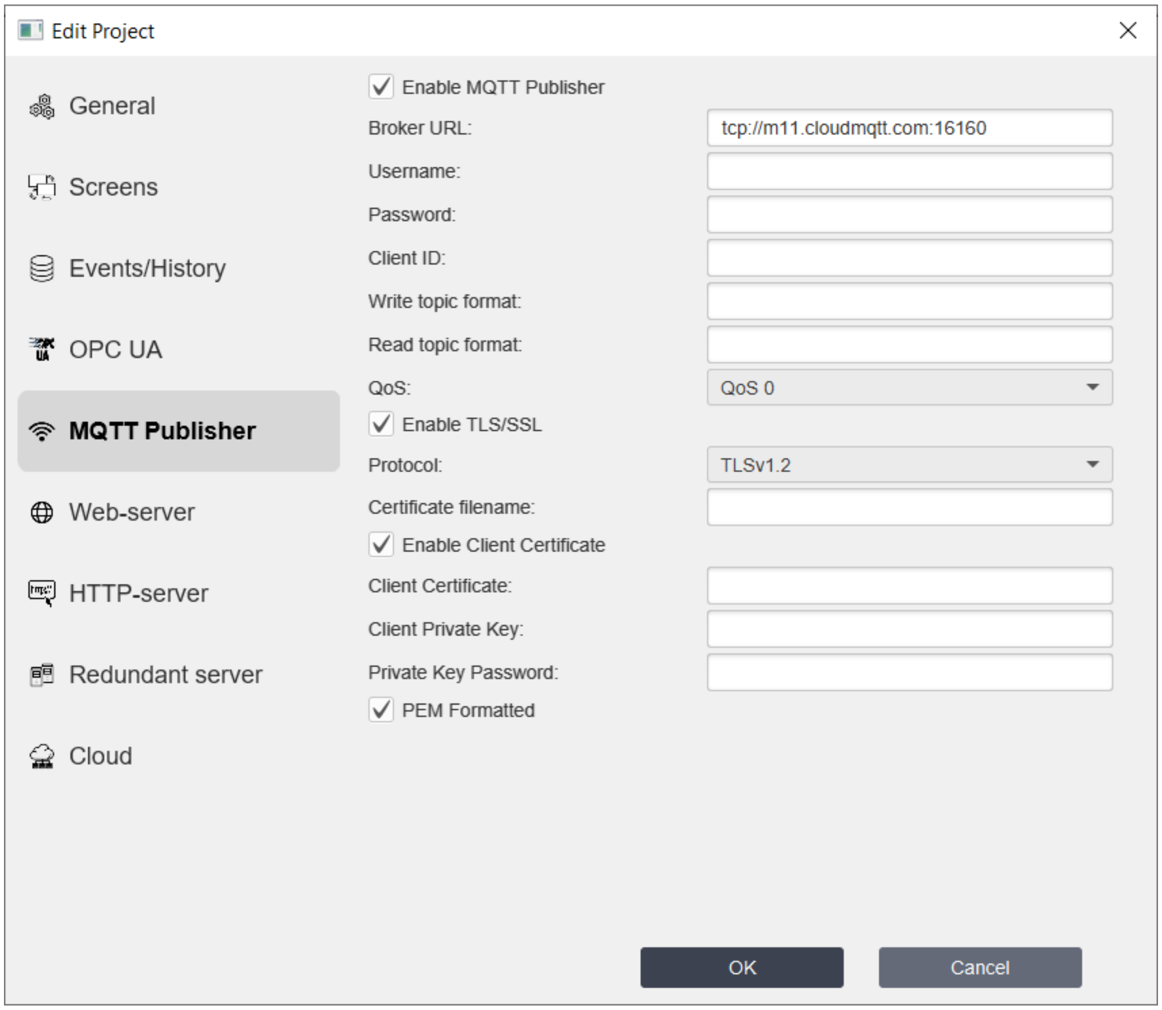
Period(days): 3650

Property	Description
Use OPC UA server	Check If you want to enable OPC UA server of TeslaSCADA2
TCP port	TCP port of your OPC UA server.
None	Check if you want to use None security mode in the server.
BASIC128RSA15_SIGN	Check if you want to use BASIC128RSA15_SIGN security mode in the server.
BASIC128RSA15_SIGN_ENCRYPT	Check if you want to use BASIC128RSA15_SIGN_ENCRYPT security mode in the server.
BASIC256_SIGN	Check if you want to use BASIC256_SIGN security mode in the server.

Property	Description
BASIC256_SIGN_ENCRYPT	Check if you want to use BASIC256_SIGN_ENCRYPT security mode in the server.
BASIC256SHA256_SIGN	Check if you want to use BASIC256SHA256_SIGN security mode in the server.
BASIC256SHA256_SIGN_ENCRYPT	Check if you want to use BASIC256SHA256_SIGN_ENCRYPT security mode in the server.
Anonymous	Check Anonymous if you want to use this policy in OPC UA server.
Username/Password	Check Username/Password if you want to use this policy in OPC UA server.
Certificate name	Certificate name of the OPC UA server.
Period(days)	The period during which the OPC UA server certificate will be valid.

6.1.5 MQTT Publisher tab

If you want to use Client - Server architecture 12 in your system and use it with MQTT broker you have to check Enable MQTT Publisher:



✓ Enable MQTT Publisher
Broker URL: tcp://m11.cloudmqtt.com:16160
Username:
Password:
Client ID:
Write topic format:
Read topic format:
QoS: QoS 0
✓ Enable TLS/SSL
Protocol: TLSv1.2
Certificate filename:
✓ Enable Client Certificate
Client Certificate:
Client Private Key:
Private Key Password:
✓ PEM Formatted

Property	Description
Enable MQTT Publisher	Check if you want to enable MQTT publisher.
Broker URL	Broker URL of the MQTT server.
Username	Username of the MQTT broker.
Password	Password of the MQTT broker.
Client ID	Some brokers need Client ID. If you left client ID unfilled publisher will generate ClienID itself.
Write topic format	Some cloud brokers need formatted topic. See IBM cloud example 607. You can left this field empty.
Read topic format	Some cloud brokers need formatted topic. See IBM cloud example 607. You can left this field empty.

Property	Description
QoS	Choose QoS of MQTT messages.
Enable TLS/SSL	Check Enable TLS/SSL if you want to use server certi?cate for encryption messages.
Certi? cate ? lename	Certi?cate ?lename. File should be placed in /private 18/ folder in the directory where TeslaSCADA2 is installed.
Enable Client Certi? cate	Check if you want to use client certi?cate for encryption messages.
Client certi? cate	Client certi?cate ?lename. File also should be placed in /private 18/ folder
Client Private key	Client private key ?lename. File also should be placed in /private 18/ folder
Private key password	Private key password.
PEM formatted	Check if your certi?cate and key ?les are PEM formatted.

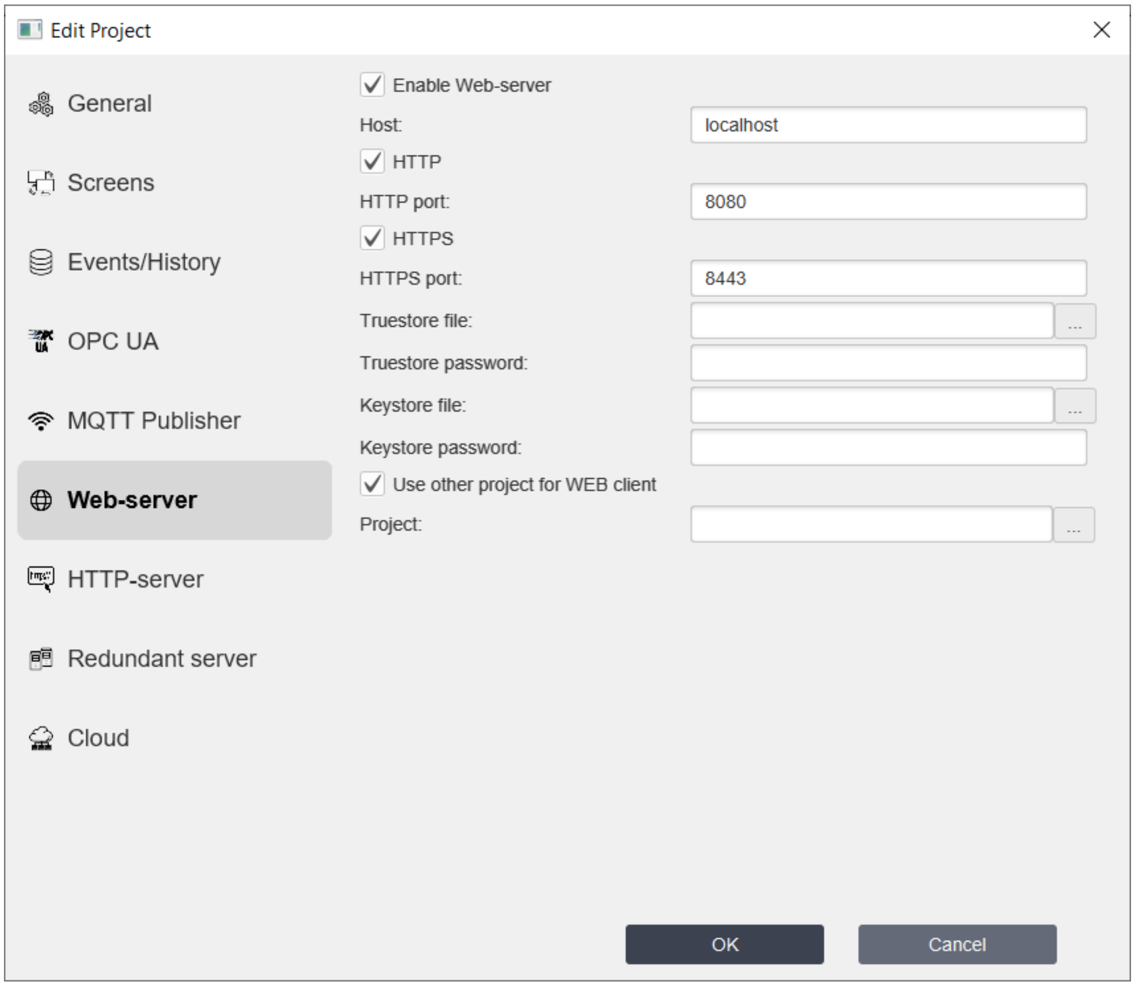
MQTT publisher will send tag's values collected during project running on MQTT broker you want. MQTT subscribers will collect this values and represent it on devices you want. If you don't use "Write topic format" and "Read topic format" fields publisher's topics consists of the «name of the project +/Tags/+tagname» for tags and «name of the project+/Events/+tagname» for events. If you use "Write topic format" and "Read topic format" tags replace {tagname} keyword.

6.1.6 Web-server tab

If you want to use Web-Server in your project click on the tab Web-Server and enable it. To have possibility to use Web-Server on the PC you want, Java 8(JRE) should be installed on it. For TeslaSCADA Runtime version below 2.41.2 Java version should be from 8.25 - 8.161. For TeslaSCADA Runtime starting from 2.41.2 version minimal Java version - 8.281. To check version of Java you have in command line write command java -version. In the response you'll get installed Java version. Also to have possibility to run Web-Server TeslaSCADA should be installed 14 in the path without white spaces. You can use any modern browser to access to the Web-Server. The most recommended browser - Google Chrome.

Important! If you use Mac OS Big Sur and have problems with running Web server delete /Library/Internet Plug-Ins/ folder on your disk and relogin.

Important! Web-Server is possible to use only in Evaluation version (project contains up to 16 tags) and in the Full version (if you activate a full license).



✓ Enable Web-server
Host: localhost
✓ HTTP
HTTP port: 8080
✓ HTTPS
HTTPS port: 8443
Truestore file:
Truestore password:
Keystore file:
Keystore password:
✓ Use other project for WEB client
Project:

Property	Description
Enable Web-server	Check if you want to enable Web-server.
Host	Host of the Web-Server. Usually it's an IP address of PC where installed TeslaSCADA2 Runtime and Run con?gured project.
HTTP	Check HTTP if you want to use unsecured HTTP protocol to connect to Web-Server.
HTTP port	HTTP port used by Web-Server.
HTTPS	Check HTTPS if you want to use secured HTTPS protocol to connect to Web-Server.
HTTPS port	HTTPS port used by Web-Server.
Truestore ?le	It's a ?le where stored validated certi?cates. It should be with .jks or .keystore format.

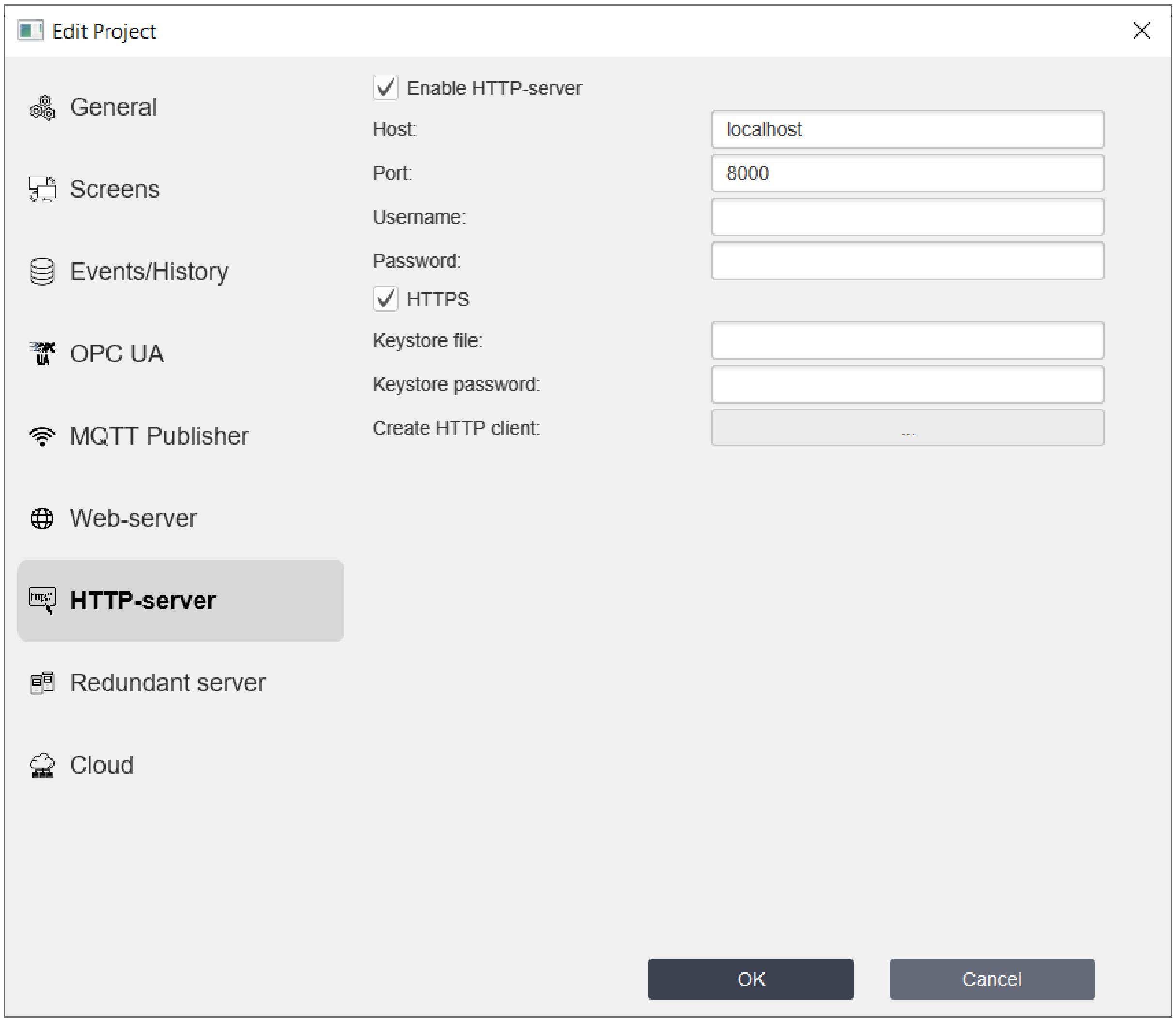
Property	Description
Truestore password	Truestore password to have access to truestore ?le.
Keystore ? le	It's a ?le where stored certi?cates of the server. It should be with .jks or .keystore format.
Keystore password	Keystore password to have access to keystore ?le.
Use other project for WEB client	If you want to use other project for WEB client check this field.
Project	Choose path to the project for WEB client.

If you want to use self-signed certi?cates in keystore you'll have problems in accessing to WebServer by using the most popular browsers. You have to use certi?cates signed by CA to exclude these problems.

Important! Web-server create another instance of TeslaSCADA2 Runtime application to connect to the servers and databases of the project. It's not possible to use its functionality if your server doesn't let multiple connection (for example Modbus RTU lets only one app connects to the port). And it's not possible to use SQLLite database at the same reason. To escape this problem use HTTP server and use HTTP client for WEB client. To do this check "Use other project for WEB client" and choose HTTP client project.

6.1.7 HTTP-server

If you want to use Client - Server architecture 12 in your system and use it with HTTP-server you have to check Enable HTTP-server:



☑ Enable HTTP-server

Host:	localhost
Port:	8000
Username:	
Password:	

☑ HTTPS

Keystore file:	
Keystore password:	
Create HTTP client:	...

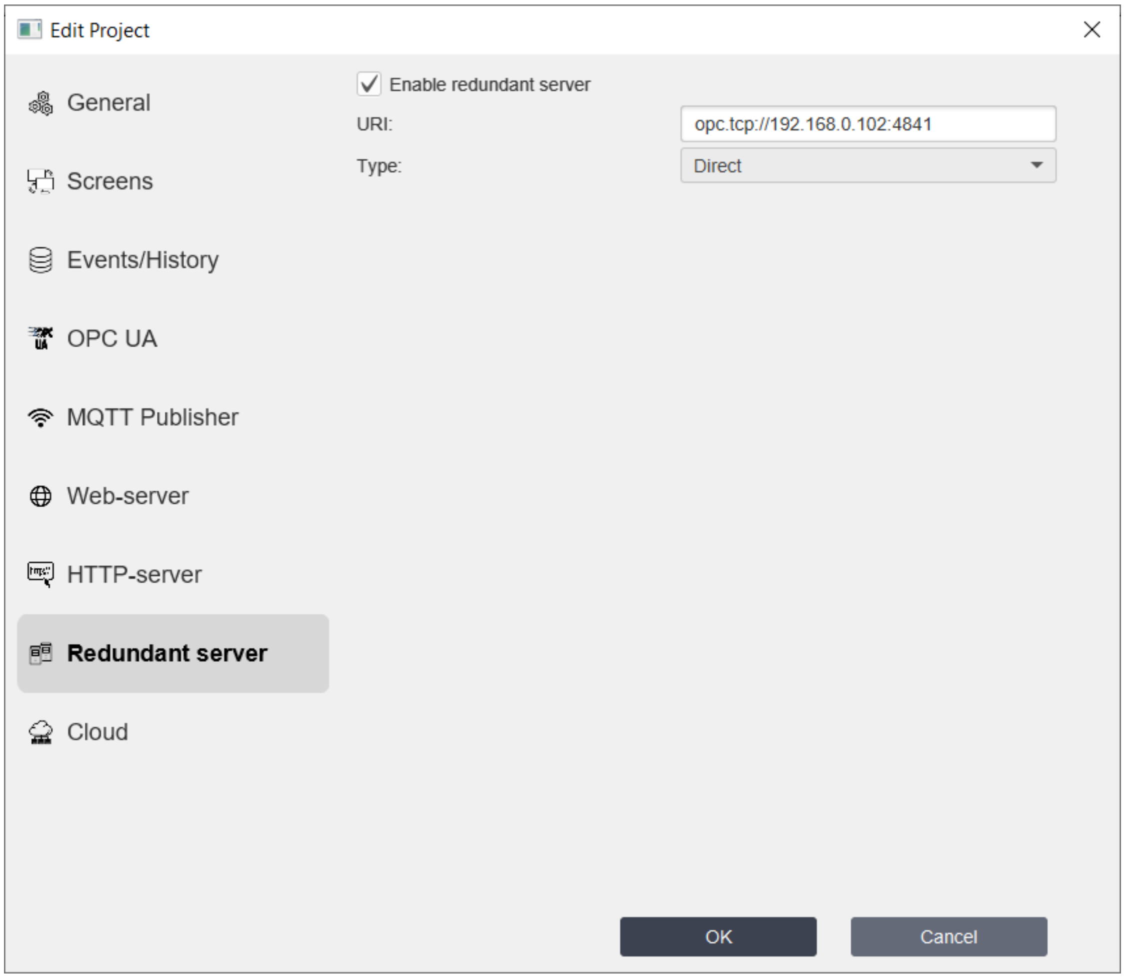
Below description of the properties:

Property	Description
Enable HTTP Server	Check if you want to enable HTTP server.
Host	Host or IP address of the HTTP server.
Username	Username of the HTTP server.
Password	Password of the HTTP server.
HTTPS	Check HTTPS if you want to use secured HTTPS protocol to connect to HTTP-server.
Keystore ? le	It's a ?le where stored certi?cates of the server. It should be with .jks or .keystore format. File placed in /private[18]/ folder
Keystore password	Keystore password to have access to keystore ?le.

Property	Description
Create HTTP client	If you want to create HTTP client for connecting to this HTTP-server click this button.

6.1.8 Redundant server

If you want to use Redundant server in your project check **Enable redundant server**. Redundant server is based on OPC UA client. Primary server should use OPC UA server 126 with Security mode is None and Anonymous policy:



☑ Enable redundant server
URI: opc.tcp://192.168.0.102:4841
Type: Direct

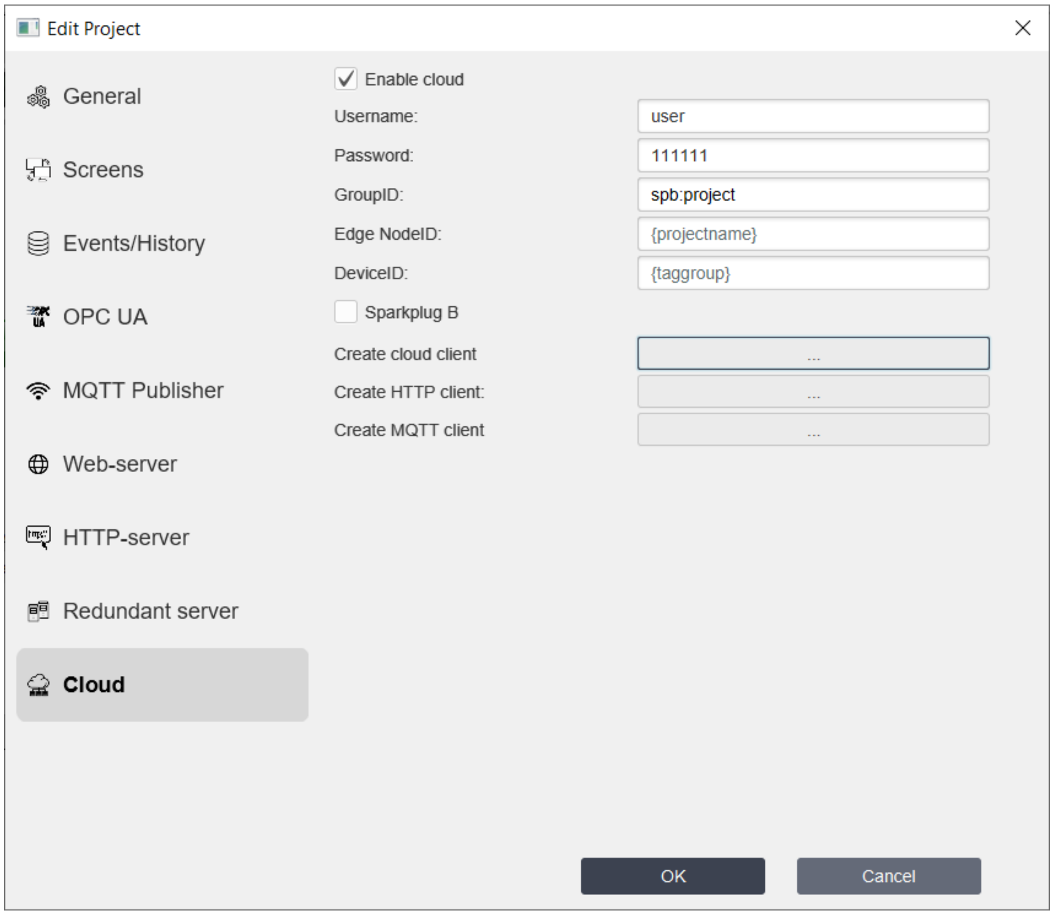
Below description of the properties:

Property	Description
Enable redundant server	Check if you want to enable redundant server.
URI	OPC UA URI of the primary server.
Type	Type of the redundant server:

Property	Description
	- Direct - redundant server uses servers like primary server to get tag's values of the project. - OPC UA - redundant server uses OPC UA server of the primary server to get tag's values of the project.

6.1.9 Cloud

If you want to use Tesla Cloud in your project check **Enable cloud (To use cloud you have opened 7000 and 7001 ports on your device)** . Cloud lets you provide tags information from your project on the Tesla Cloud by using desktop TeslaSCADA2 Runtime and read this information by using browser or TeslaSCADA2 Runtime for desktop or mobile (only Android at this moment):



☑ Enable cloud

Username:	user
Password:	111111
GroupID:	spb:project
Edge NodeID:	{projectname}
DeviceID:	{taggroup}

☐ Sparkplug B

Create cloud client	...
Create HTTP client:	...
Create MQTT client	...

Below description of the properties:

Property	Description
Enable cloud	Check if you want to enable Tesla Cloud.
Username	Username of the user of Tesla Cloud.

Property	Description
Password	Password of the user of Tesla Cloud.
GroupID*	It's GroupID for Sparkplug B emulator (you can left this field empty).
Edge NodeID*	It's Edge NodeID for Sparkplug B emulator (you can left this field empty). It's possible to use keywords: {taggroup}, {tagsubgroup}, {tagname}, {projectname}, {server}.
DeviceID*	It's DeviceID for Sparkplug B emulator (you can left this field empty). It's possible to use keywords: {taggroup}, {tagsubgroup}, {tagname}, {projectname}, {server}.
Sparkplug B	Check if you want to create Sparkplug B MQTT Client.
Create cloud client	If you want to create Cloud client for connecting to this Tesla Cloud click this button.
Create HTTP client	If you want to create HTTP client for TeslaCloud use this button.
Create MQTT client	If you want to create MQTT client for TeslaCloud use this button.

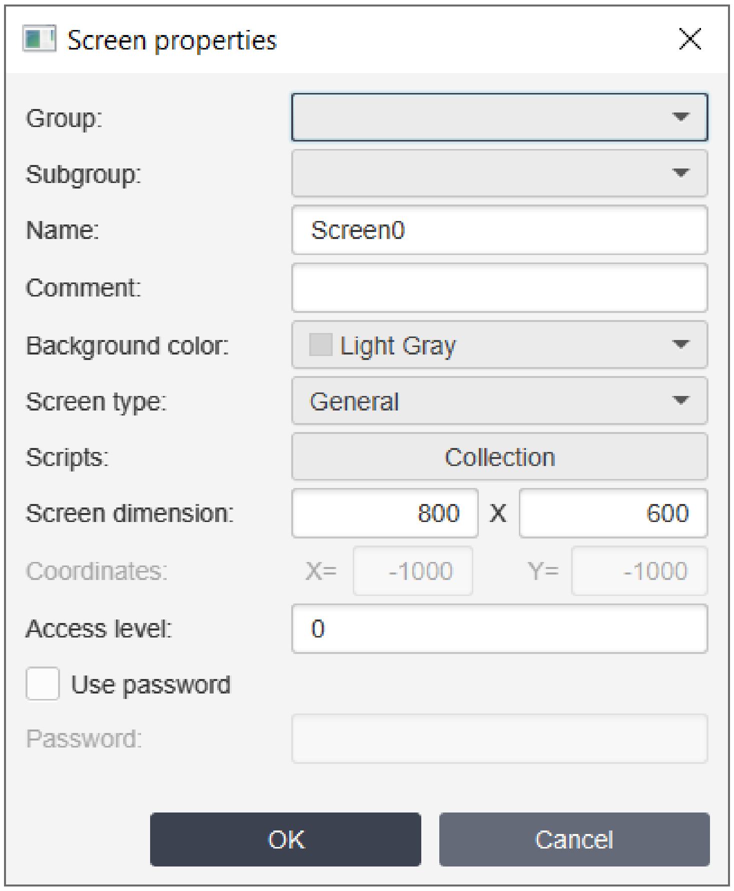
GroupID, Edge NodeID and DeviceID is used to create path for tags in the Cloud.

6.2 Screens

Create screen

To create a new screen select the menu item **Project** 67 **->** **New Screen** or choose **Screens** 108 on the Project Window, click right button on it and choose **New Screen** item.

You'll see the screen properties 139 window:



Group:	
Subgroup:	
Name:	Screen0
Comment:	
Background color:	Light Gray
Screen type:	General
Scripts:	Collection
Screen dimension:	800 X 600
Coordinates:	X= -1000 Y= -1000
Access level:	0
☐ Use password	
Password:	

Open screen

To open screen on **Screens** 108 tab of the Project window:

- Right click on the screen you want to open and choose **Open** item.

or

- Double click on the screen you want to open.

Copy screen

To copy screen on Screens 108 tab of the Project window right click on the screen you want to copy and choose **Copy** item.

Delete screen

To delete screen on Screens 108 tab of the Project window right click on the screen you want to delete and choose **Delete** item.

Open screen properties

To open screen properties 139 on Screens 108 tab of the Project window right click on the screen you want to open and choose **Screen properties** item.

Export screen

To export screen on Screens 108 tab of the Project window:

1. Right click on the screen you want to export and choose Export screen item.
2. Now select the location and click the button Save (TeslaSCADA2 screen extension .tsp2screen).

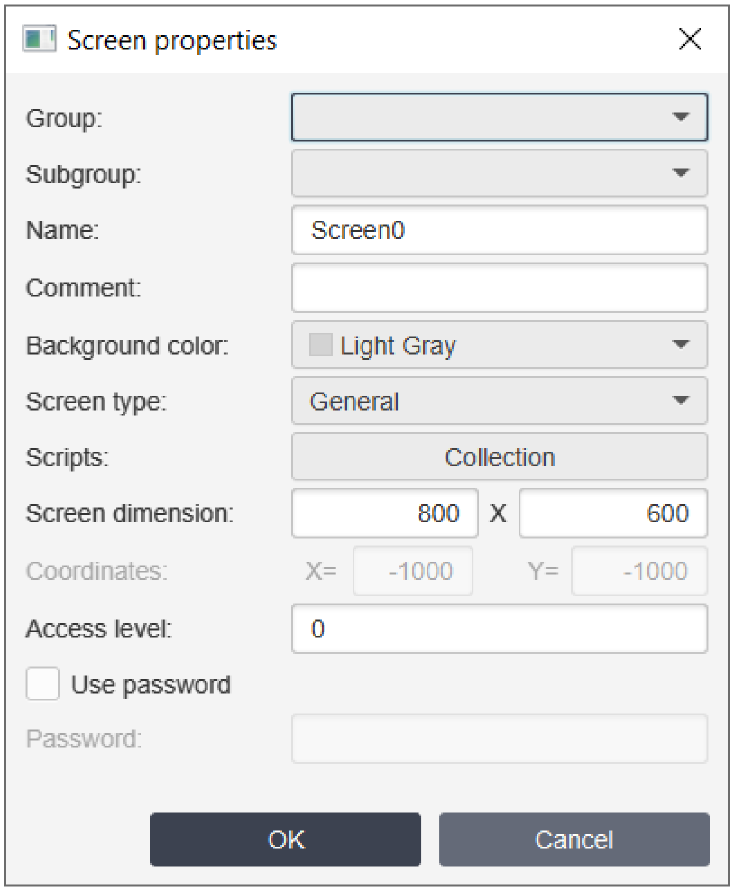
Import screen

To import screen on Screens 108 tab of the Project window:

1. Right click on the screen window and choose Import screen item.
2. Now select the screen ?le and click Open (TeslaSCADA screen extension .tsp2screen).

See **Project Window->Screens** 108 tab for more information about possible operation with screens.

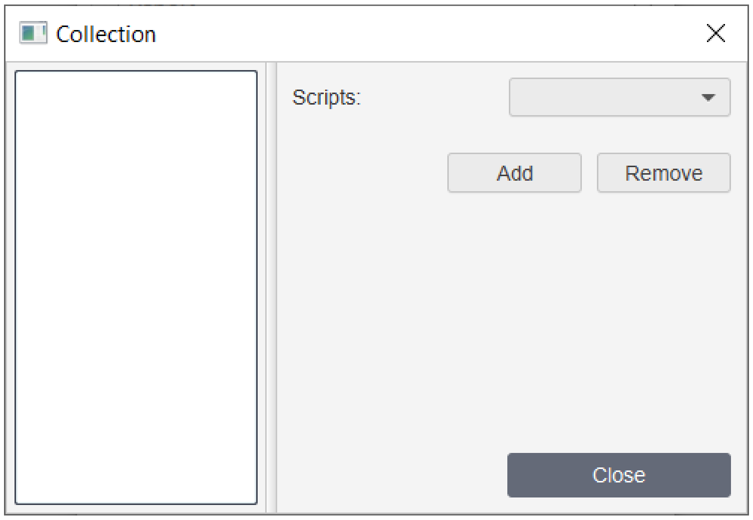
6.2.1 Screen properties



Group:
Subgroup:
Name: Screen0
Comment:
Background color: Light Gray
Screen type: General
Scripts: Collection
Screen dimension: 800 X 600
Coordinates: X= -1000 Y= -1000
Access level: 0
Use password
Password:

List of screen properties:

Property	Description
Group	Select group for the screen.
Subgroup	Select subgroup for the screen.

Property	Description
Name	Name of the screen.
Comment	Optionally specify a meaningful comment.
Background color	Background color of the screen.
Screen type	Select screen type of the screen - *General* or *Popup*.
Scripts	Click **Collection** to set up screen's scripts . After clicking you'll see the window:  where: • **Scripts** - list of available screen type scripts in the project. • **Add** - add script to the collection. • **Remove** - remove script from the collection.
Screen dimension	Width and height of the screen.
Coordinates	If you choose Popup screen you can enter position X and Y where this screen will be appeared. If you enter value < 0 the screen will appear at the center.
Access Level	Screen's access level. If this value greater then access level of the current user the screen couldn't be opened by this user.
Use password	Check if you want to use screen security.
Password	Only the user who knows the password will be able to open this window.

Screen design

6.2.2 Designing screen

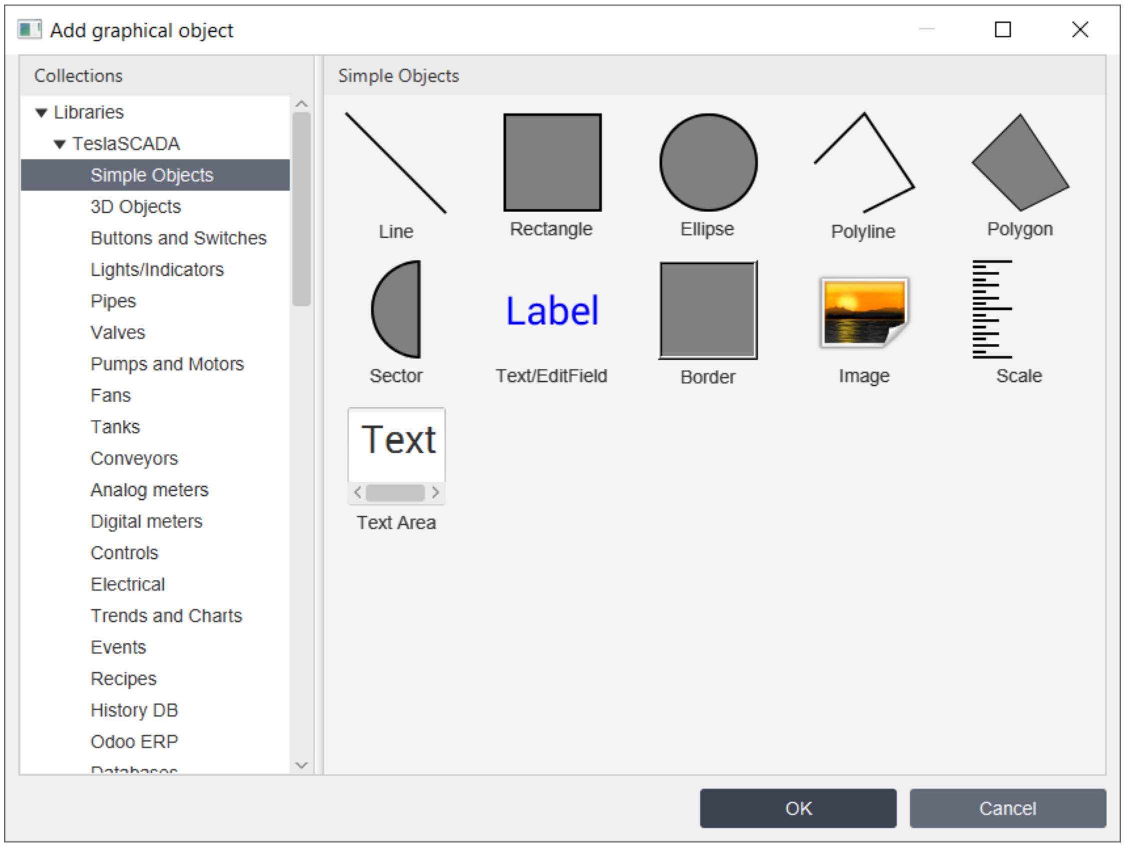
To start designing the screen you want, you need to double click on it or click right button on the Project window[73]->Screens and choose *Open screen* menu item.

Create graphical object

You can add new graphical object on the screen in several ways:

- Select the menu item **Project**[67] and **New Object**.
- Click **New Object**[70] button on the Toolbar.
- Click right button on the Screen window[94] and choose **New object** menu item.
- Click right button on the Canvas[92] and choose **New object** menu item.

You'll see the **Add graphical object** window:



Select library which object you want to use in your project (all libraries and their objects described below). Select object you can in several ways:

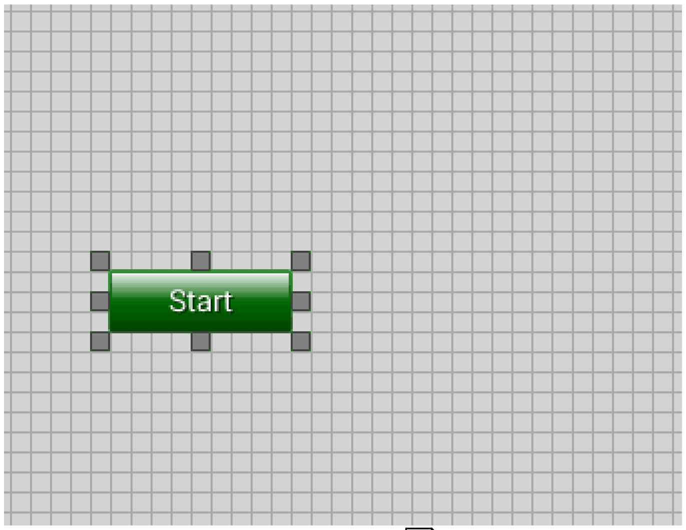
- By double clicking on the object.
- By clicking on the object (select rectangle will appear) and then clicking OK button.
- By clicking right button and choosing Select menu item.

Add graphical object window will disappear and you can select the location on the screen where you want to place the object.

Object information about its dimensions and coordinates you can ?nd in the status bar 96 on the right.

Resize graphical object

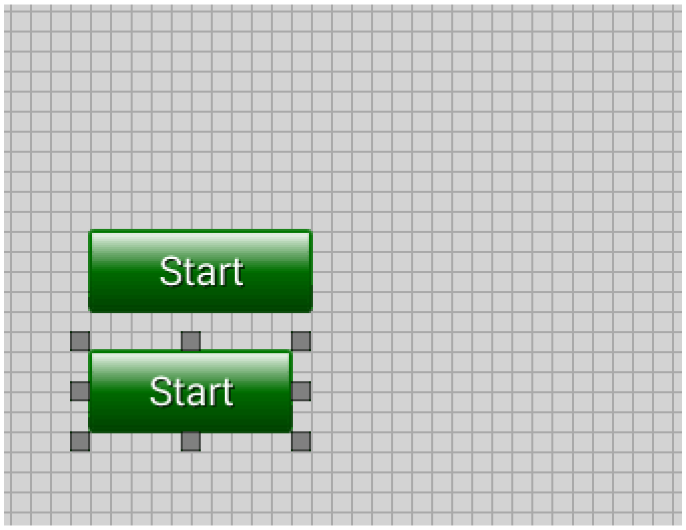
You can resize graphical object by clicking on it. Resize squares will appeare and you can change dimensions of the object as you want.



Also you can resize object by using arrow keys 96 on keyboard.

Select several objects

You can select several objects by using selecting rectangle or by clicking on objects you want to select and simultaneously holding CTRL key.



Move graphical object

You can move graphical objects by using Drag and Drop technology. You can also move objects by using arrow keys 96 on keyboard.

Open graphical object properties

You can open graphical object properties on the Screen Window 94 or on the Canvas 92.To open graphical object properties:

- Right click on the object you want to open and choose Object properties menu item.

or

- Double click on the object, properties which you want to open.

Copy graphical object

You can copy graphical object:

- Right click on the object you want to copy and choose **Copy** menu item of the context menu.
- Select the object you want to copy and choose **Edit** 63**->Copy** menu item on the main menu.
- Select the object you want to copy and click Copy 70 button on the Toolbar 70.
- Use corresponding hotkeys 98 for your operating system.

Cut graphical object

You can cut graphical object:

- Right click on the object you want to cut and choose Cut item of the context menu.
- Select the object you want to cut and choose Edit 63->Cut menu item on the main menu.
- Select the object you want to cut and click Cut 70 button on the Toolbar 70.
- Use corresponding hotkeys 98 for your operating system.

Paste graphical object

You can paste (before you have to cut or copy) graphical object:

- Right click on the Canvas 92 and choose Paste menu item of the context menu.
- Choose Edit 63->Paste menu item on the main menu.
- Click Paste 70 button on the Toolbar 70.
- Use corresponding hotkeys 98 for your operating system.

Erase graphical object

You can erase graphical object:

- Right click on the object you want to erase and choose Erase menu item of the context menu.
- Select the object you want to erase and choose Edit 63->Erase menu item on the main menu.
- Right click on the object in the Screen Window 94 and choose Delete object menu item.
- Use corresponding hotkeys 98 for your operating system.

Duplicate graphical object

You can duplicate graphical object:

- Right click on the object you want to duplicate and choose Duplicate menu item of the context menu.
- Select the object you want to duplicate and choose Edit 63->Duplicate menu item on the main menu.

- Use corresponding hotkeys 98 for your operating system.

Send to back graphical object

You can send to back graphical object relative to other objects of the screen:

- Right click on the object you want to send to back and choose Send to Back menu item of the context menu.
- Select the object you want to send to back and choose Arrange 64->Send to Back menu item on the main menu.
- Select the object you want to send to back and click Send to Back 71 button on the Toolbar 70.
- Use corresponding hotkeys 98 for your operating system.

Bring to front graphical object

You can bring to front graphical object relative to other objects of the screen:

- Right click on the object you want to bring to front and choose Bring to Front menu item of the context menu.
- Select the object you want to bring to front and choose Arrange 64->Bring to Front menu item on the main menu.
- Select the object you want to bring to front and click Bring to Front 71 button on the Toolbar 70.
- Use corresponding hotkeys 98 for your operating system.

Rotate clockwise graphical object

You can rotate clockwise graphical object clockwise:

- Select the object you want to rotate clockwise and click Rotate Clockwise 71 button on the Toolbar 70.
- Select the object you want to rotate clockwise and choose Arrange 64->Rotate Clockwise menu item on the main menu.
- Use corresponding hotkeys 98 for your operating system.

Rotate counterclockwise graphical object

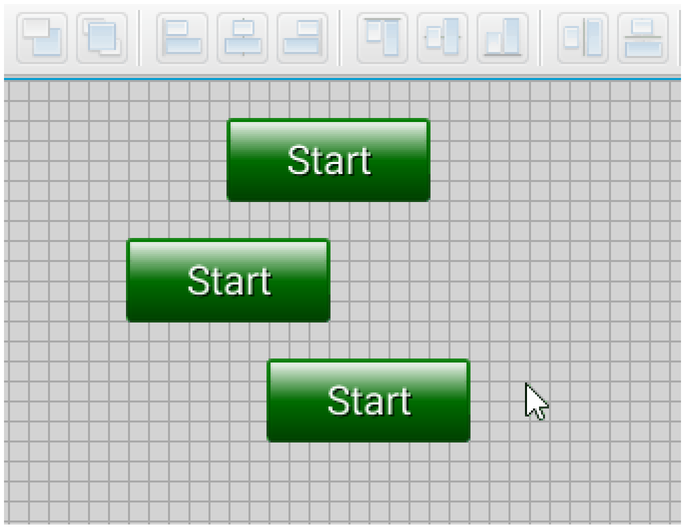
You can rotate counterclockwise graphical object clockwise:

- Select the object you want to rotate counterclockwise and click Rotate CounterClockwise 71 button on the Toolbar 70.
- Select the object you want to rotate counterclockwise and choose Arrange 64->Rotate CounterClockwise menu item on the main menu.
- Use corresponding hotkeys 98 for your operating system.

Align graphical objects

You can align objects relative to each other on the screen. Choose objects you want to align by selecting square or by clicking on objects you want to select and simultaneously holding CTRL key 143. And:

- Choose Arrange 64->Align menu items on the main menu.
- Click Align buttons 71 on the Toolbar 70.
- Right click on selecting square and choose Align menu item of the context menu.
- Use corresponding hotkeys 98 for your operating system.

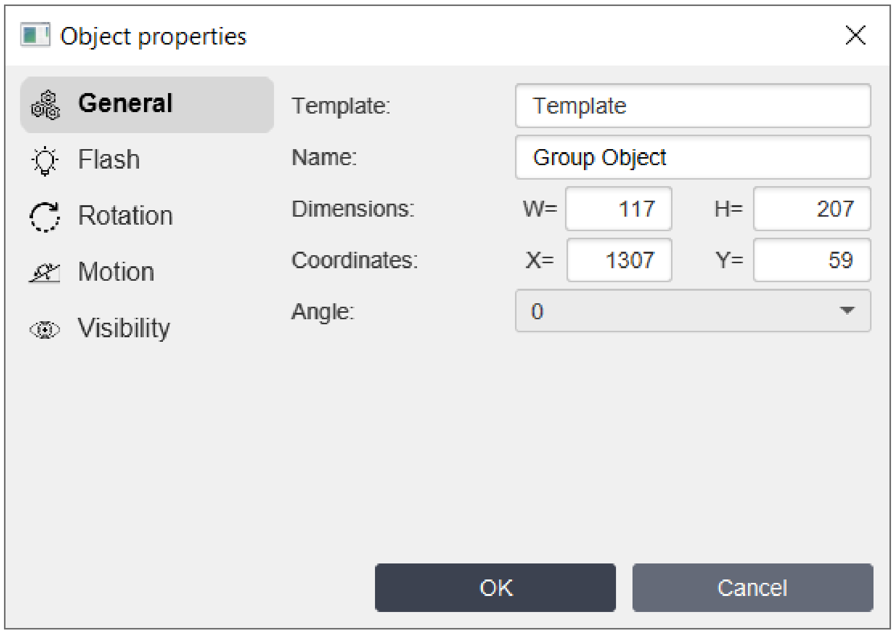


For more information about each alignment operation you can read above in section Start TeslaSCADA IDE ->Toolbar 71.

Group graphical objects

You can group objects. Choose objects you want to group by selecting square or by clicking mouse left button and simultaneously holding CTRL button 143. And:

- Select Arrange 64->Group objects menu item on the main menu.
- Click Group objects 71 button on the Toolbar 70.
- Right click on selecting square and choose Group objects menu item on the context menu.
- You can edit properties of this group object by double clicking or by choosing context menu properties menu item:



Template: Template
Name: Group Object
Dimensions: W= 117 H= 207
Coordinates: X= 1307 Y= 59
Angle: 0

You can change name of the group object, coordinates, dimensions and enter template name. Later you can apply changes for the template by clicking appropriate main menu item 63.

Ungroup graphical objects

You can ungroup objects. Choose group of objects you want to ungroup by clicking on it . And:

- Select Arrange 64->Ungroup objects menu item on the main menu.
- Click Ungroup objects 71 button on the Toolbar 70.
- Right click on selecting square and choose Ungroup objects menu item on the context menu.

Copy properties

You can copy properties of the object. This possibility lets to copy all properties of the object excluding General properties and place them into clipboard. You can do it by:

- Right clicking on the object which properties you want to copy and choose Copy properties menu item.

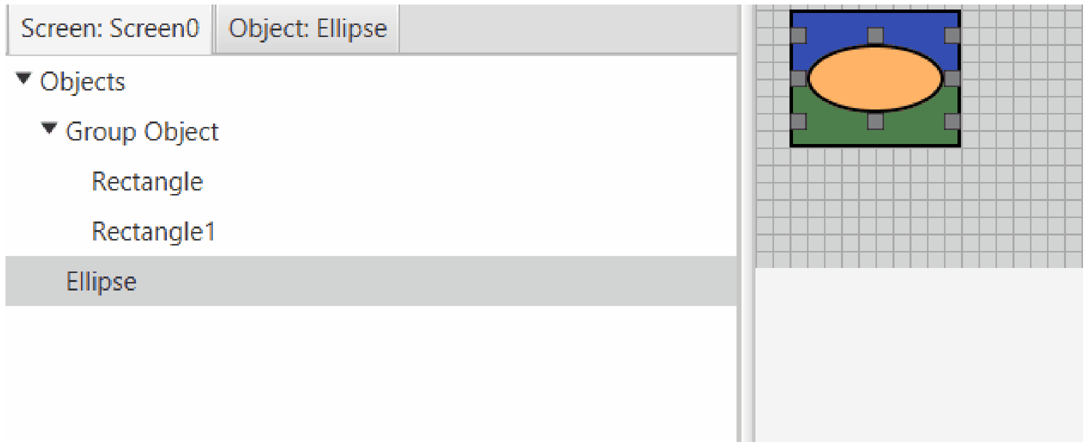
Paste properties

You can paste properties of the object. This possibility lets to paste all properties that were placed into the clipboard by using Copy properties. You can do it by:

- Right clicking on the object to which you want to copy the properties from the clipboard.

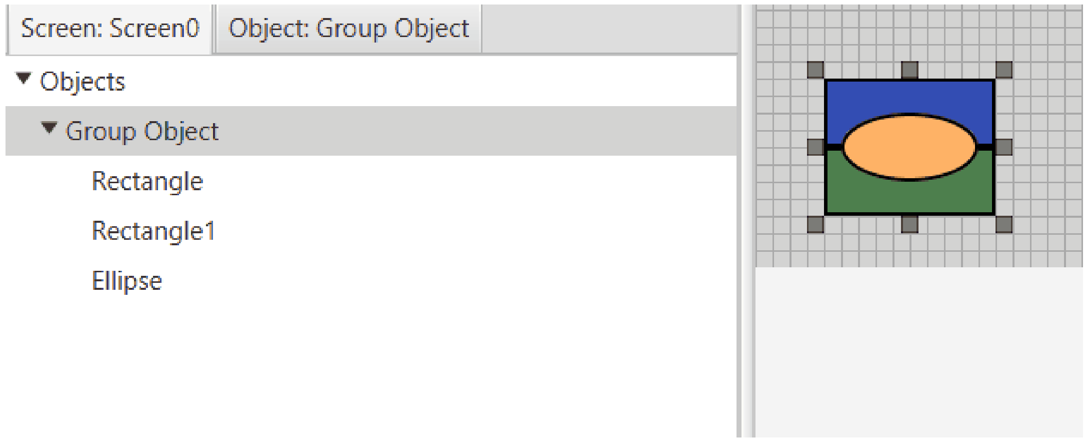
Add object into the Group

You can add selected object into the group of the objects:
1. Choose object you want to add into the group.
2. And in the screen window drag and drop object into the group object.



Remove object from the Group

You can remove object from the group of the objects:
1. Choose object you want to remove from the group in the screen window.
2. And in the screen window drag and drop object on the name of the group object.



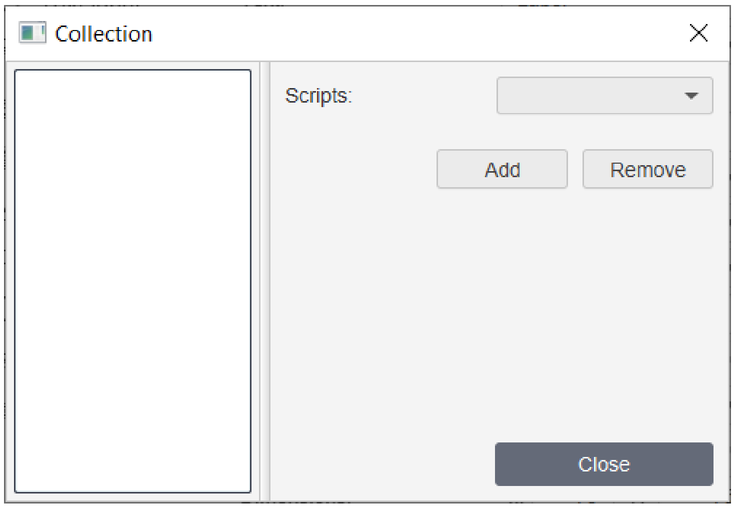
Virtual keyboard

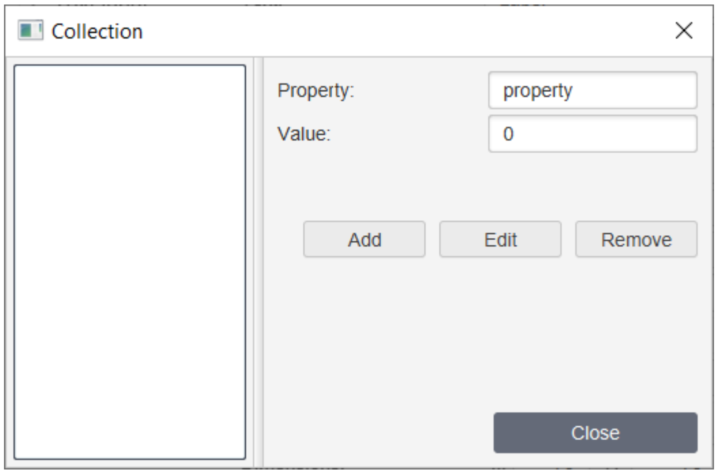
If you want to develop your project on Sensor screen[100] you can turn on virtual keyboard. You can do by checking Project[67]->Virtual keyboard menu item on the main menu.

6.2.3 Graphical objects

Every graphical object has several group of properties. All properties you can edit in Property sheet[93] or in Object settings window (you can get this window by double clicking on the object). The description of every group of properties you can ?nd below in the chapter - Properties 349. In this chapter we describe one group for every object - General.

This group is responsible for the appearance of the object, contains scripts and user-defined properties. Every object has the following properties:

Property	ST script field*	Description
Name	**name**	Name of the object. You can use indirect name by using group name. To do this use curve braces {}. For example, if group's name is "group" and you enter in the ?eld {group}name and you'll get name of the object is "groupname".
Dimensions	**width**	Dimensions of the graphical object. Enter width of the object in the W(width) ?eld and enter height of the object in the H(height) ?eld.
	height	
Coordinates	**posx**	Coordinates of the graphical object. Write x coordinates of the object in the X(posx) ?eld and enter y coordinates of the object in the Y(posy) ?eld.
	poxy	
Angle	**angle**	Select the rotation angle of the object (0, 90, 180, 270).
Type		Select the type of the object - 2D or 3D.
Scripts		Click **Collection** to add scripts for the Object. After clicking Collection button you'll see the following window:  where: ▪ **Scripts** 402 - list of object type scripts. ▪ **Add** - add script to the object.

Property	ST script field*	Description
		▪ **Remove** - remove script from the object.
User-Defined**		Click **Collection** to add user-defined properties for the Object. After clicking Collection button you'll see the following window:  where: ▪ **Property** - name of the user-defined property. ▪ **Value** - value of the user-defined property. ▪ **Add** - add user-defined property to the object. ▪ **Edit** - edit user-defined property of the object. ▪ **Remove** - remove user-defined property from the object.

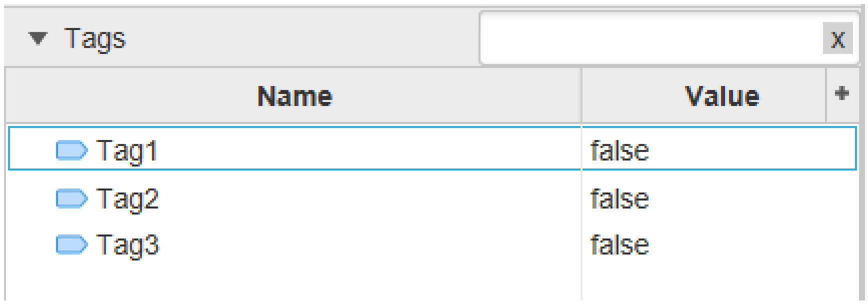
*** This field is used in ST scripts. For example: Objects.Button.width = 100. In this script command width of the object with name Button become 100.**

**** User-defined properties can be used in indirect properties tag names and in scripts. Below is described how to do it.**

User-defined properties

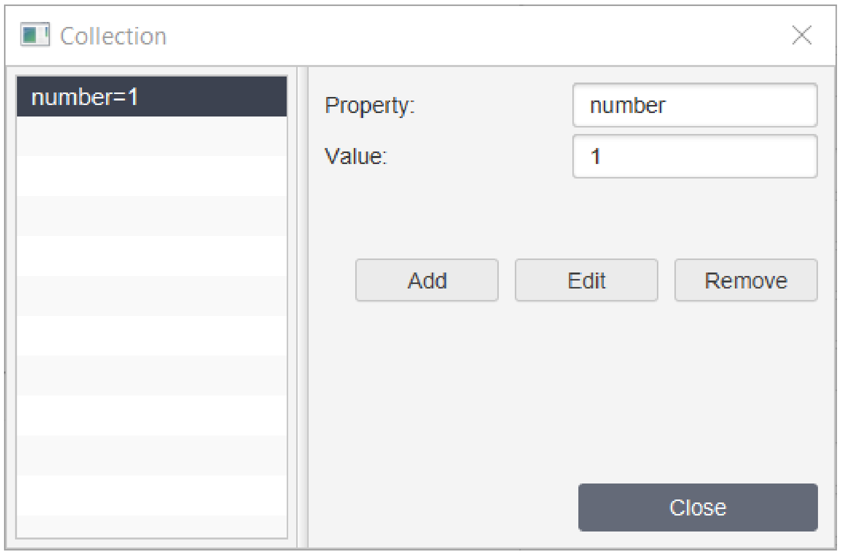
We have several same type objects, each object has one tag. We can setup only one object and then duplicate this object and correct only value of User-defined property in new objects. Look at the example.

Let's create several tags: (one for each object):



Name	Value
Tag1	false
Tag2	false
Tag3	false

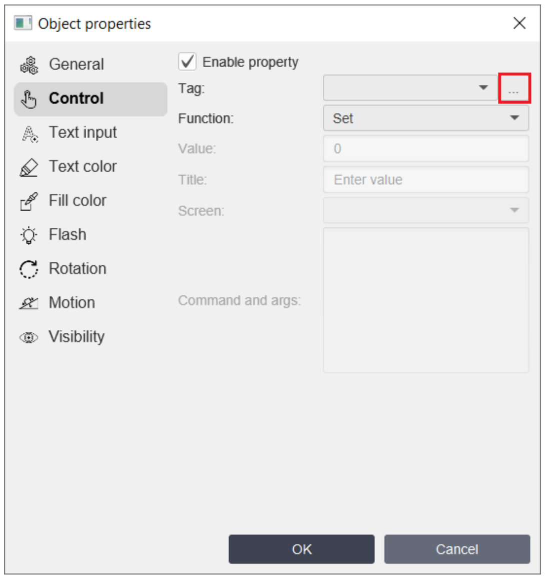
Let's create an object - Button, set user-defined property "number" and set its value "1" (because we want to bind this object to Tag1):

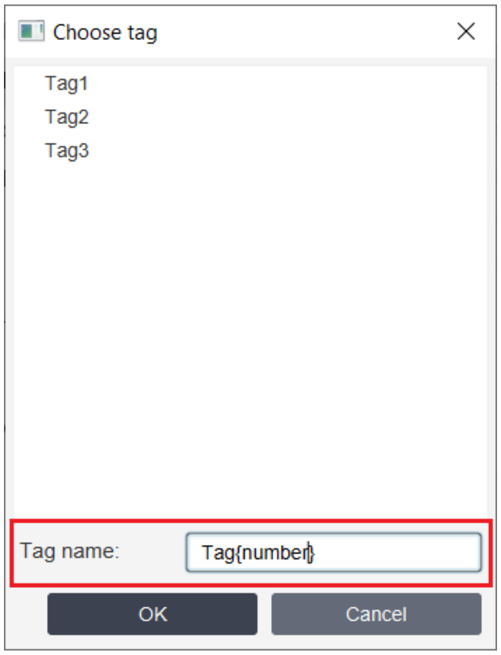


number=1

Property: number
Value: 1

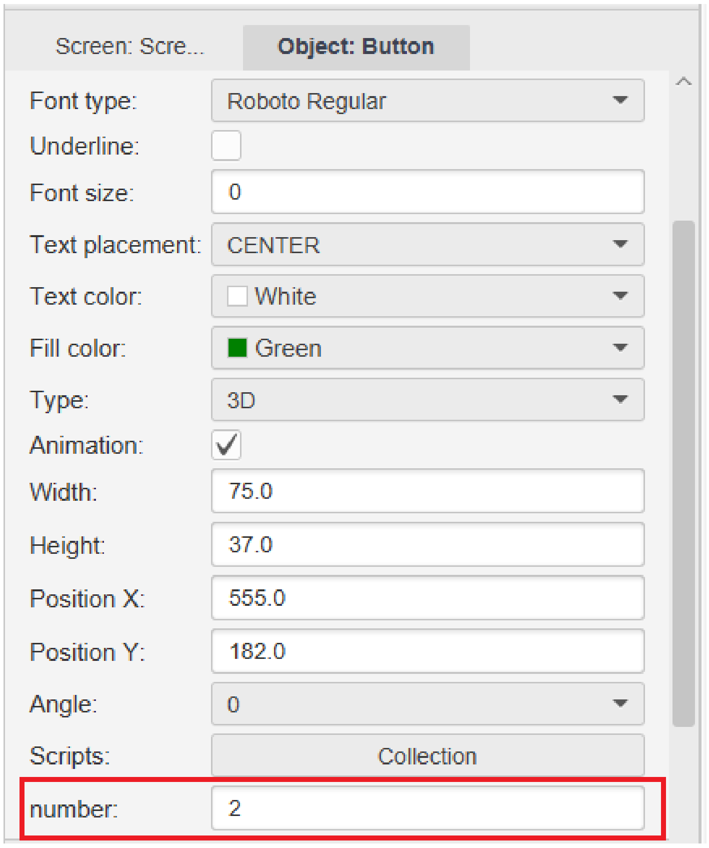
Then you have to close Collection window and click "OK" to close Object properties window add save this user-defined property for this object. Now open object properties window again to bind this object to the tag (or you can do it in Property sheet 93). Open Choose tag window for some of the property that bind to the tag:





You can use indirect Tag name by using user-defined property number we created and using curve braces {}. Tag name will be looked Tag{number}. For this object number equal 1. So the tag name will be Tag1. So we have a configured object.

Now we can copy this object (Button in our case) and change user-defined property number to bind these objects to other tags. The easiest way to do it change property number in Property sheet 93:



Font type:	Roboto Regular
Underline:	
Font size:	0
Text placement:	CENTER
Text color:	White
Fill color:	🟩 Green
Type:	3D
Animation:	✓
Width:	75.0
Height:	37.0
Position X:	555.0
Position Y:	182.0
Angle:	0
Scripts:	Collection
number:	2

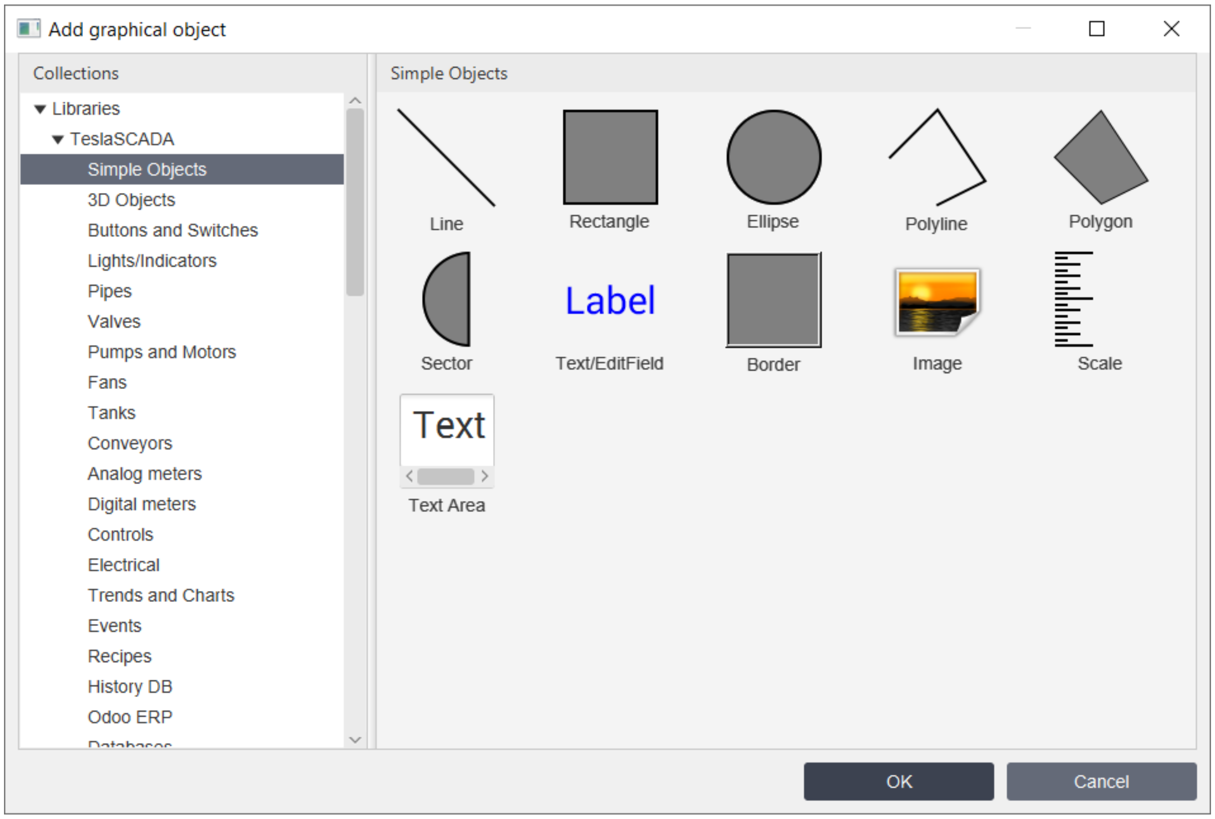
This is very helpful if you develop big project with similar objects and tags.

Also you can use user-defined property in ST scripts. For example, you have user-defined property "description" with some description of the object and want to display it on the screen with some Text object when, for example, you click on this object. You have to create ST script with execution type - OnClick and add this script to the object which description you want to display. Script code will look like below:

Objects.Text.text = Objects.this.description;

Important! If you change user-defined property in ST script it will not affect on the indirect tag name of the object's property.

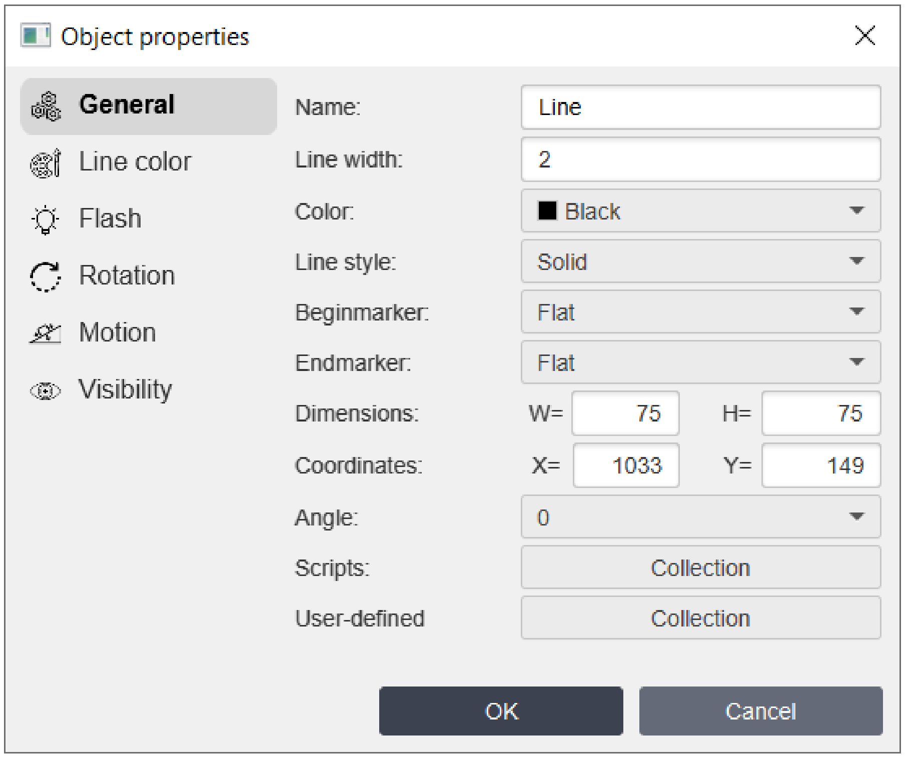
6.2.3.1 Simple objects library



Simple objects library contains the following objects:

- Line 155
- Rectangle 156
- Ellipse 157
- Polyline 158
- Polygon 161
- Sector 163
- Text/EditField 164
- Border 166
- Image 167
- Scale 168
- Text Area 170

6.2.3.1.1 Line



Name:	Line
Line width:	2
Color:	Black
Line style:	Solid
Beginmarker:	Flat
Endmarker:	Flat
Dimensions:	W= 75 H= 75
Coordinates:	X= 1033 Y= 149
Angle:	0
Scripts:	Collection
User-defined	Collection

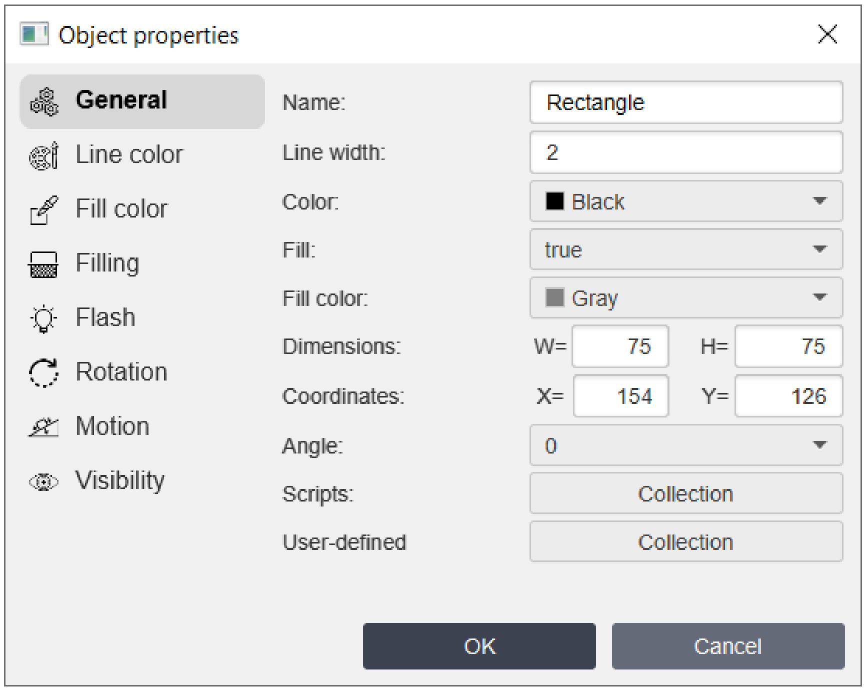
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Line width	**linewidth**	Width of the line.
Color	**color**	Color of the line.
Line style	**linestyle**	Style of the line: ▪ Solid ▪ Dash ▪ Dot ▪ DashDot
Beginmarker	**beginmarker**	Marker of the line's begin: ▪ Flat ▪ Arrow ▪ Square ▪ Circle

Property	ST script field	Description
Endmarker	**endmarker**	Marker of the line's end: ▪ Flat ▪ Arrow ▪ Square ▪ Circle

Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.1.2 Rectangle



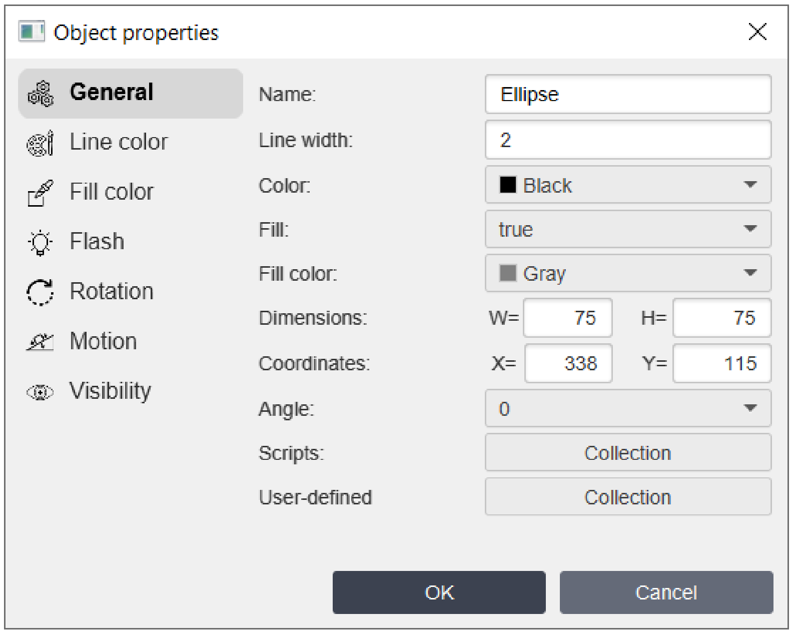
Name: Rectangle
Line width: 2
Color: Black
Fill: true
Fill color: Gray
Dimensions: W= 75 H= 75
Coordinates: X= 154 Y= 126
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Line width	**linewidth**	Width of the border's line.
Color	**color**	Color of the border's line.
Fill	**fill**	Select fill or not fill rectangle.
Fill color	**fillcolor**	Fill color of the rectangle.

Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Filling"** tab are described here 359.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.1.3 Ellipse



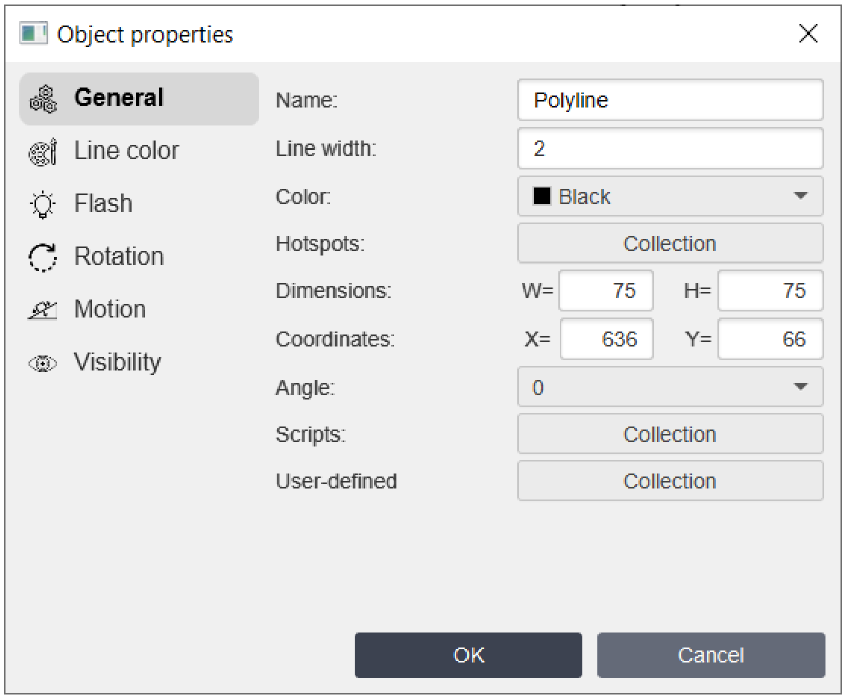
Name: Ellipse
Line width: 2
Color: Black
Fill: true
Fill color: Gray
Dimensions: W= 75 H= 75
Coordinates: X= 338 Y= 115
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Line width	**linewidth**	Width of the border's line.
Color	**color**	Color of the border's line.
Fill	**fill**	Select fill or not fill ellipse.
Fill color	**fillcolor**	Color of the ellipse's filling.

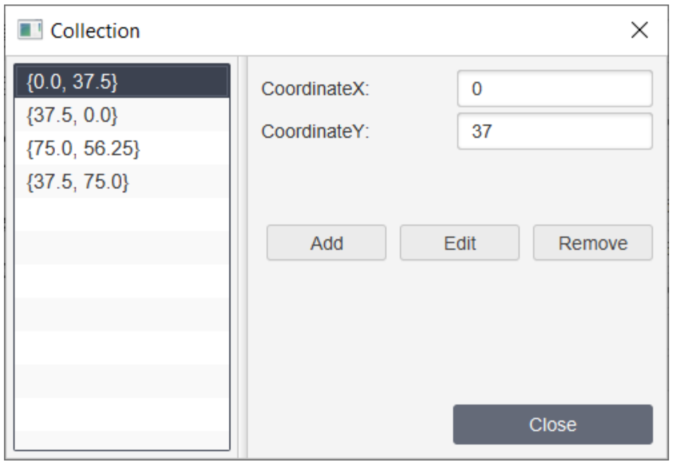
Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

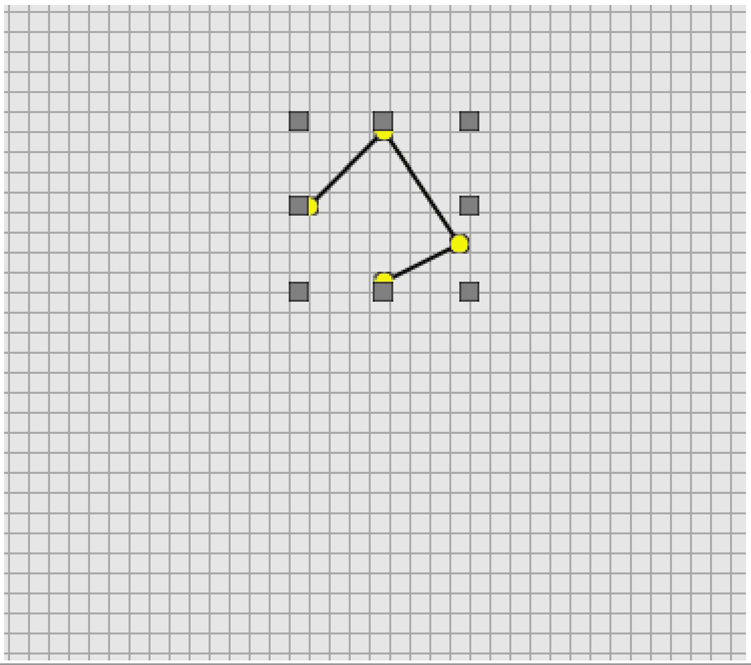
6.2.3.1.4 Polyline



Name:	Polyline
Line width:	2
Color:	Black
Hotspots:	Collection
Dimensions:	W= 75 H= 75
Coordinates:	X= 636 Y= 66
Angle:	0
Scripts:	Collection
User-defined	Collection

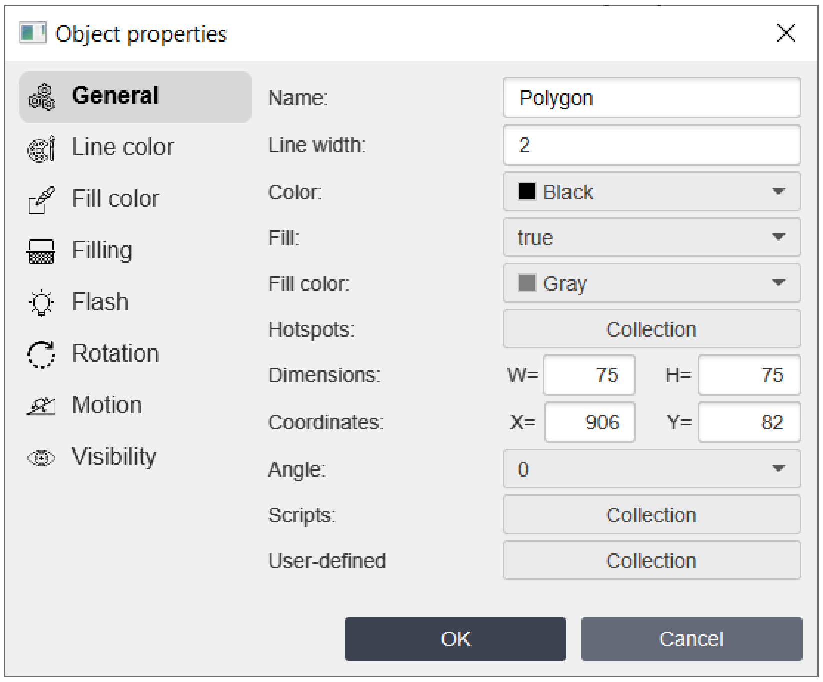
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Line width	**linewidth**	Width of the line.
Color	**color**	Color of the line.
Hotspots		When you click **Collection** button the Collection window will appear:  Collection {0.0, 37.5} {37.5, 0.0} {75.0, 56.25} {37.5, 75.0} CoordinateX: 0 CoordinateY: 37 where: ▪ **CoordinateX** - X coordinate of the polyline's node. ▪ **CoordinateY** - Y coordinate of the polyline's node. ▪ **Add** - add a new polyline's node. ▪ **Edit** - edit the polyline's node. ▪ **Remove** - remove the polyline's node. You can also edit polyline's nodes on the Canvas 92.

Property	ST script field	Description
		

Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

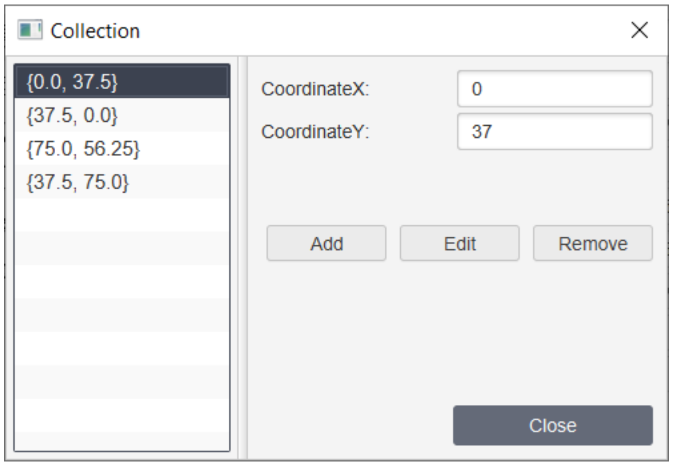
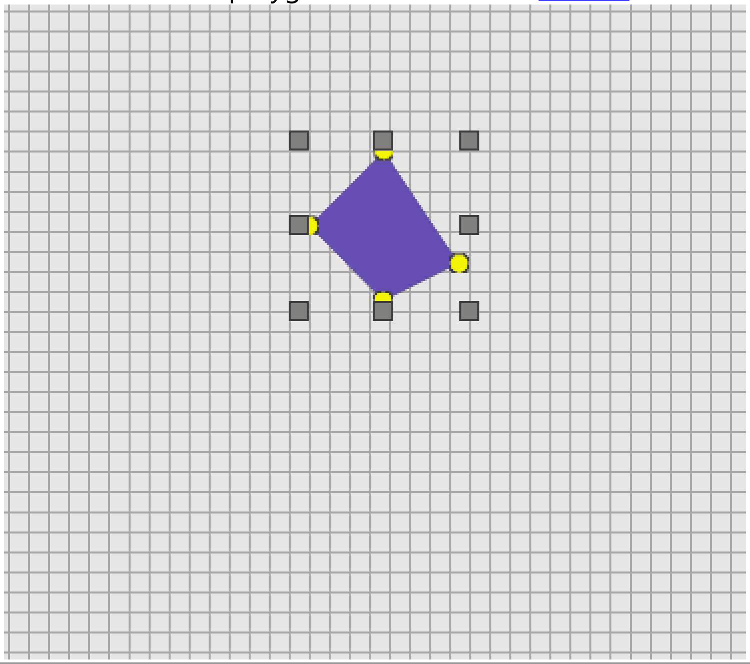
6.2.3.1.5 Polygon



Name: Polygon
Line width: 2
Color: Black
Fill: true
Fill color: Gray
Hotspots: Collection
Dimensions: W= 75 H= 75
Coordinates: X= 906 Y= 82
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

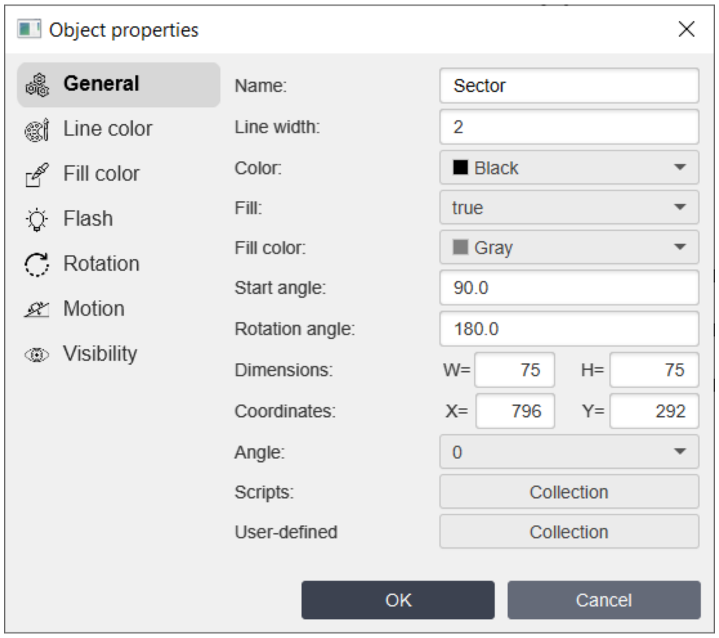
Property	ST script field	Description
Line width	**linewidth**	Width of the border's line.
Color	**color**	Color of the border's line.
Fill	**fill**	Select fill or not fill polygon.
Fill color	**fillcolor**	Color of the polygon's filling.
Hotspots		When you click **Collection** button the Collection window will appear:

Property	ST script field	Description
		 Collection {0.0, 37.5} {37.5, 0.0} {75.0, 56.25} {37.5, 75.0} CoordinateX: 0 CoordinateY: 37 Add Edit Remove Close where: ▪ **CoordinateX** - X coordinate of the polygon's node. ▪ **CoordinateY** - Y coordinate of the polygon's node. ▪ **Add** - add a new polygon's node. ▪ **Edit** - edit the polygon's node. ▪ **Remove** - remove the polygon's node. You can also edit polygon's nodes on the Canvas 92: 

Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Filling"** tab are described here 359.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.1.6 Sector



Name: Sector
Line width: 2
Color: ■ Black
Fill: true
Fill color: ■ Gray
Start angle: 90.0
Rotation angle: 180.0
Dimensions: W= 75 H= 75
Coordinates: X= 796 Y= 292
Angle: 0
Scripts: Collection
User-defined Collection

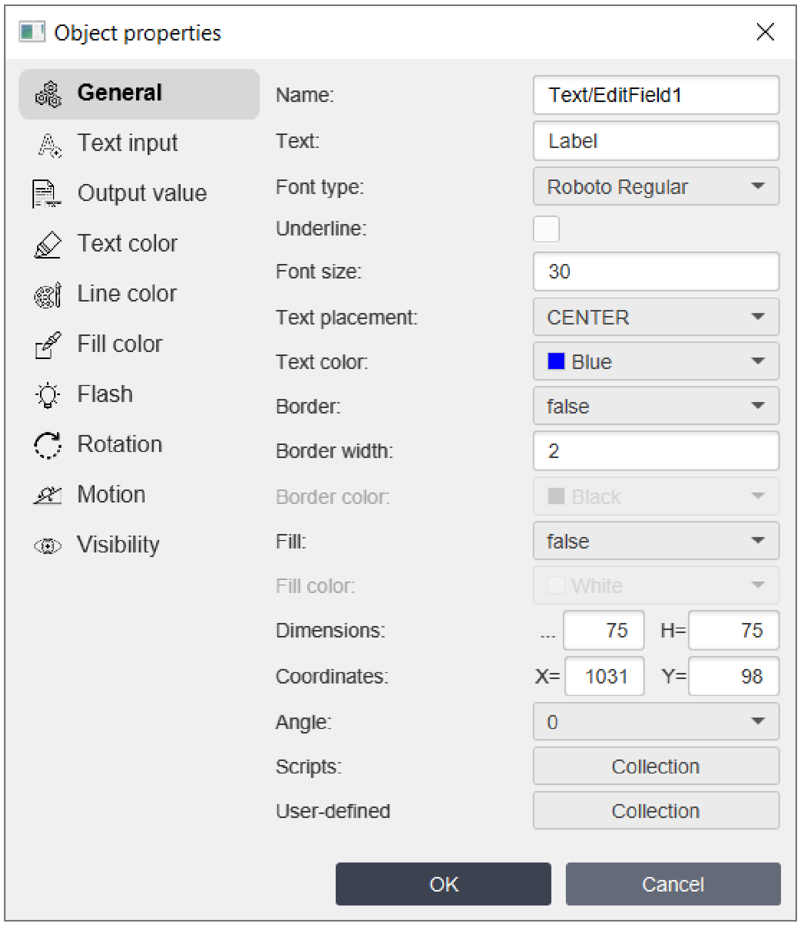
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Line width	**linewidth**	Width of the border's line.
Color	**color**	Color of the border's line.
Fill	**fill**	Select fill or not fill sector.
Fill color	**fillcolor**	Color of the sector's filling.
Start angle	**startangle**	Start angle of the sector. 0 degrees is the right middle point of the dimensions rectangle.
Rotation angle	**rotationangle**	Counterclockwise rotation angle of the sector.

Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.

Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.1.7 Text/EditField



Name: Text/EditField1
Text: Label
Font type: Roboto Regular
Underline: ☐
Font size: 30
Text placement: CENTER
Text color: Blue
Border: false
Border width: 2
Border color: Black
Fill: false
Fill color: White
Dimensions: ... 75 H= 75
Coordinates: X= 1031 Y= 98
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

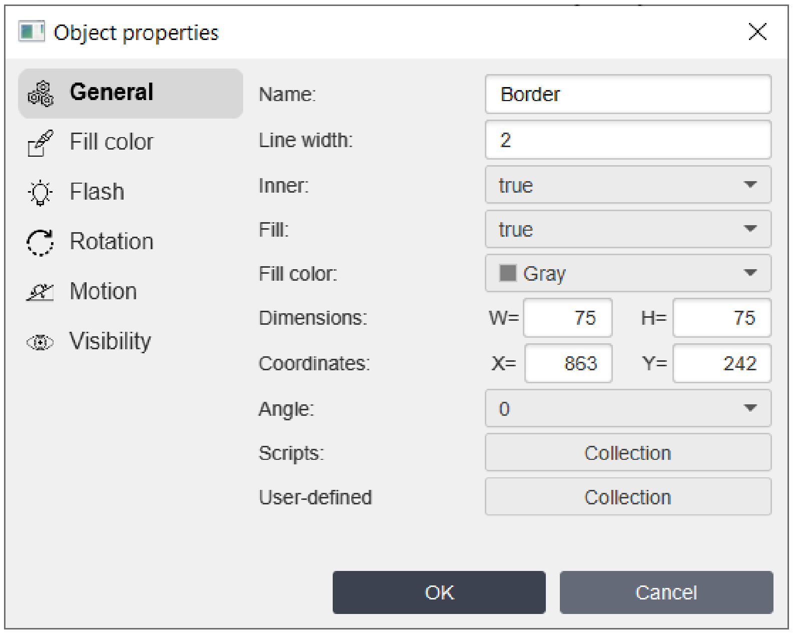
Property	ST script field	Description
Text	**text**	Text displayed on the screen by using this object.
Font type	**fonttype**	Type of the text's font.
Underline	**underline**	Check if you want to underline the text.
Font size	**fontsize**	Size of the text's font.
Text placement	**textplacement**	Placement of the text: ▪ Left ▪ Center ▪ Right

Property	ST script field	Description
Text color	**textcolor**	Color of the text.
Border	**useborder**	Select use or not use border for the text.
Border width	**linewidth**	Width of the border's line.
Border color	**bordercolor**	Color of the border's line.
Fill	**fill**	Select fill or not fill text's background.
Fill color	**fillcolor**	Color of the text's background.

Also for all text/editfield objects you can use fields in ST scripts:
- **textbefore** - text before the value.
- **textafter** - text after the value.
- **decimalpos** - decimal position for the value.Properties from the **"Line Color"** tab are described here 355.

Properties from the **"Text input"** tab are described here 364.
Properties from the **"Output value"** tab are described here 367.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.1.8 Border


Object properties

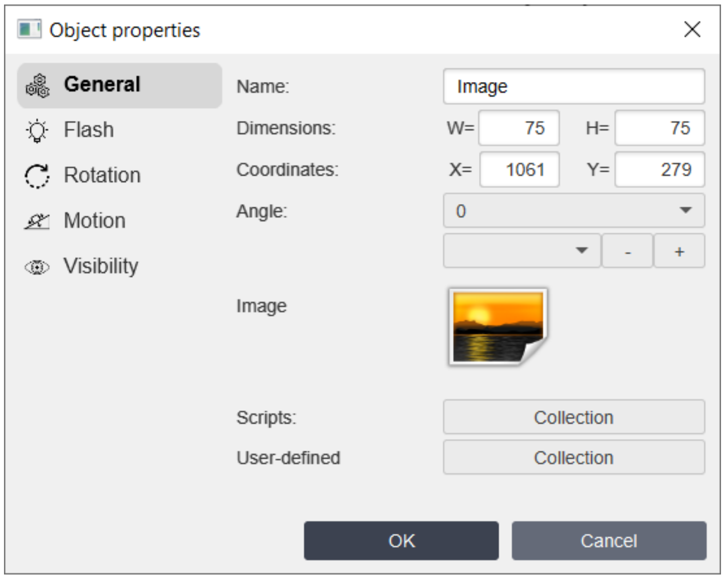
Name: Border
Line width: 2
Inner: true
Fill: true
Fill color: ■ Gray
Dimensions: W= 75 H= 75
Coordinates: X= 863 Y= 242
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Line width	**linewidth**	Width of the border.
Inner	**inner**	Select style of the border - Inner or not.
Fill	**fill**	Select fill or not fill the border.
Fill color	**fillcolor**	Color of the border.

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.1.9 Image


Object properties

- General
- Flash
- Rotation
- Motion
- Visibility

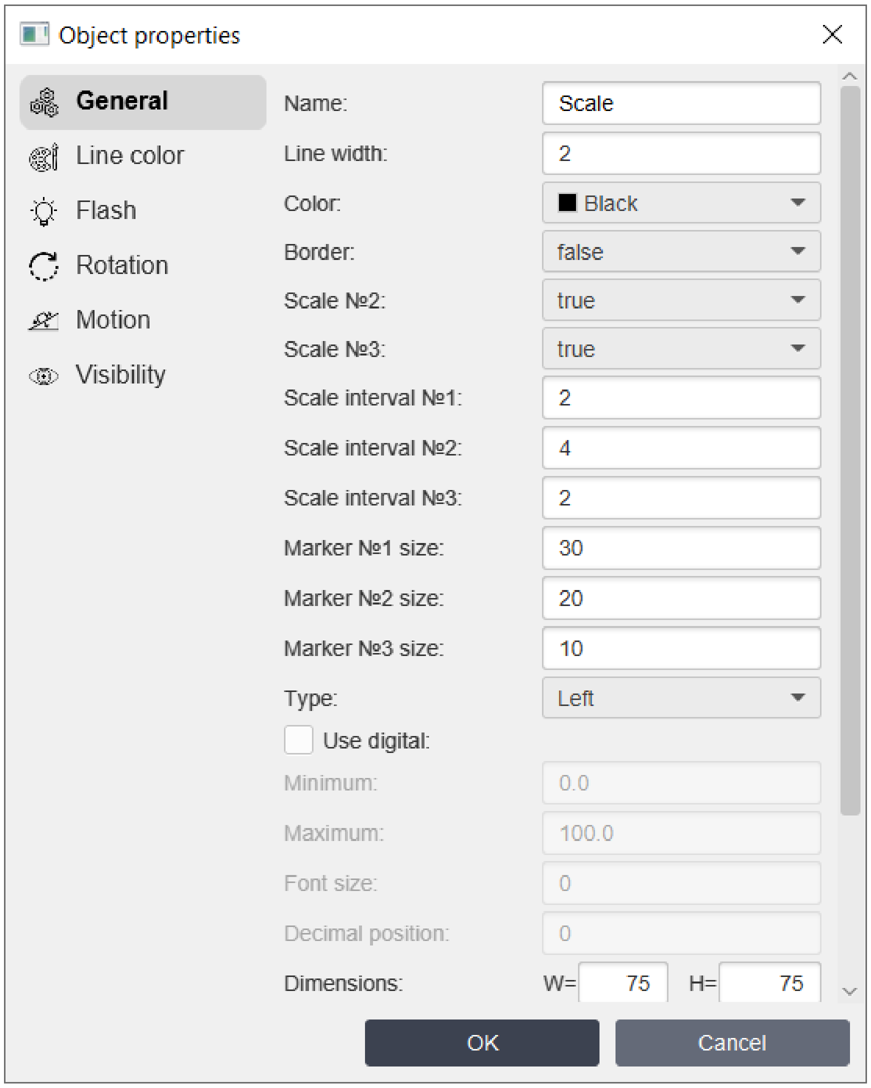
Name: Image
Dimensions: W= 75 H= 75
Coordinates: X= 1061 Y= 279
Angle: 0
Image
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Image		Select image you want to add to the project by clicking "+" button. File dialog will appeare. Choose ?le with image you want to add to the project and click Open button. You can use GIF files if you want.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.1.10 Scale



Name: Scale
Line width: 2
Color: ■ Black
Border: false
Scale №2: true
Scale №3: true
Scale interval №1: 2
Scale interval №2: 4
Scale interval №3: 2
Marker №1 size: 30
Marker №2 size: 20
Marker №3 size: 10
Type: Left
Use digital: ☐
Minimum: 0.0
Maximum: 100.0
Font size: 0
Decimal position: 0
Dimensions: W= 75 H= 75

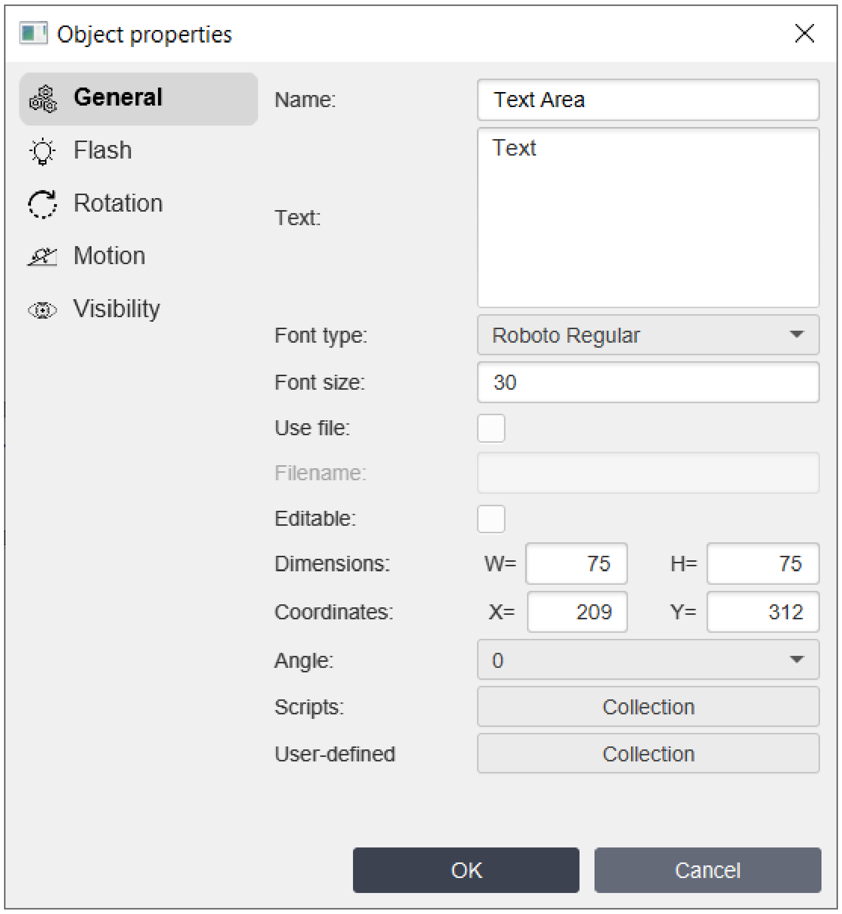
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Line width	**linewidth**	Width of the line.
Color	**color**	Color of the border and scale lines.
Border	**useborder**	Select use or not use border for the scale.
Scale ? 2	**scale2**	Select use or not second scale.
Scale ? 3	**scale3**	Select use or not third scale.

Property	ST script field	Description
Scale interval ? 1	**scaleinterval1**	Interval of the main scale.
Scale interval ? 2	**scaleinterval2**	Interval of the second scale.
Scale interval ? 3	**scaleinterval3**	Interval of the third scale.
Marker ? 1 size	**sizemarkers1**	Width of the main scale.
Marker ? 2 size	**sizemarkers2**	Width of the second scale.
Marker ? 3 size	**sizemarkers3**	Width of the third scale.
Type	**type**	Type of the scale: ▪ Left ▪ Right ▪ Top ▪ Bottom
Use digital	**usedigit**	Check if you want to bind numeration to the main scale.
Minimum	**min**	Minimum value for the main scale.
Maximum	**max**	Maximum value for the main scale.
Decimal position	**decimalpos**	Decimal position for the scale numbers.

Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.1.11 Text Area



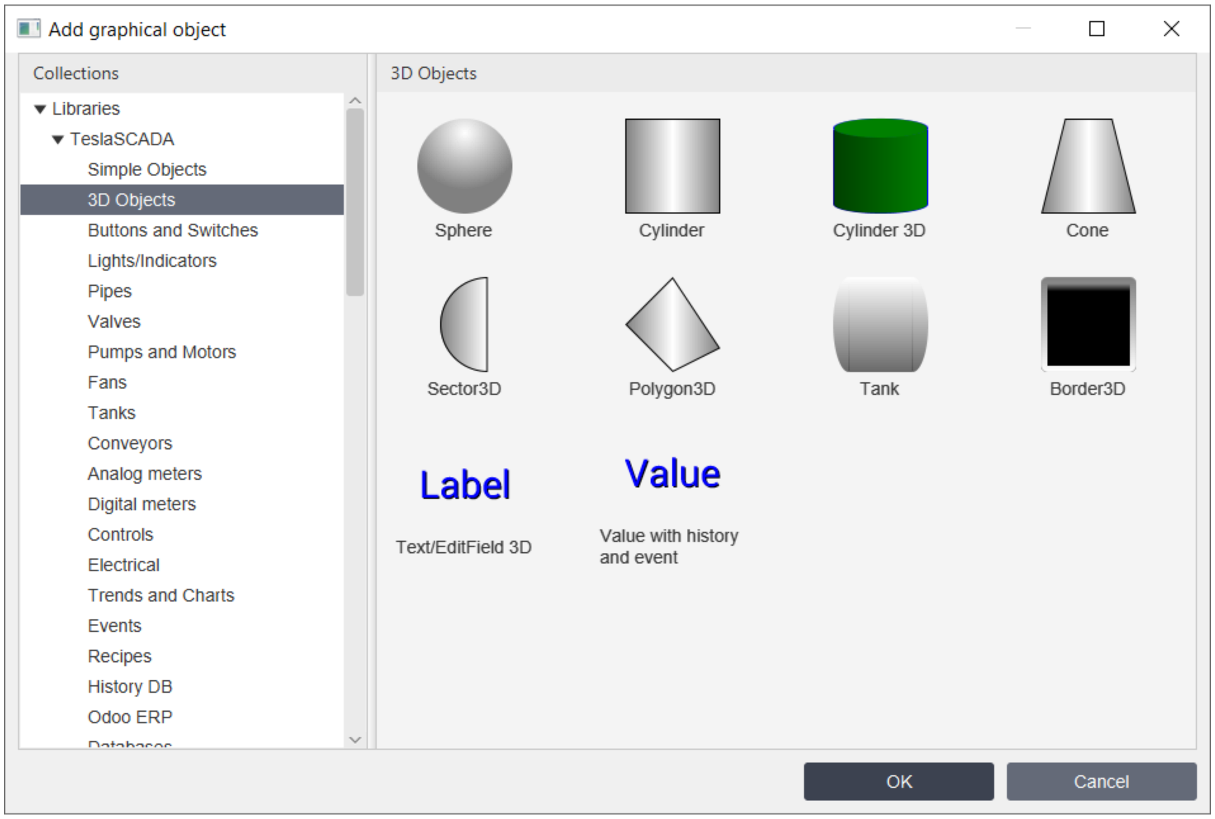
Name: Text Area
Text: Text
Font type: Roboto Regular
Font size: 30
Use file:
Filename:
Editable:
Dimensions: W= 75 H= 75
Coordinates: X= 209 Y= 312
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Text	**text**	Text displayed on the screen by using this object.
Font type	**fonttype**	Type of the text's font.
Font size	**fontsize**	Size of the text's font.
Use file	**usefile**	Use or not file to load it in the text area.
Filename	**filename**	Name of the file you want to load in the text area. If path contains "/" it means we use the full path. If path doesn't contain "/" the file will be created in DB 18 folder of the application.
Editable	**editable**	Check if you want to edit the text area.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

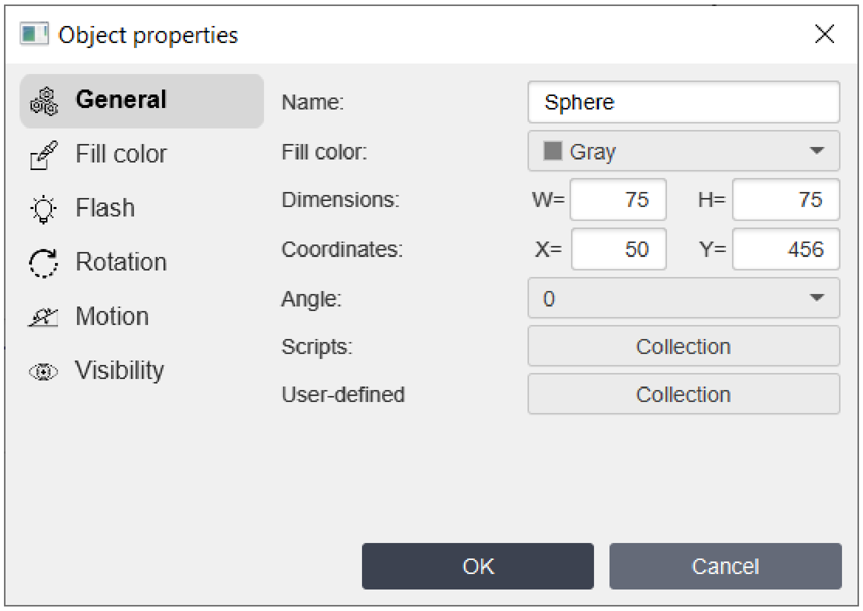
6.2.3.2 3D Objects library



3D objects library contains the following objects:

- Sphere 172
- Cylinder 173
- Cylinder 3D 173
- Cone 174
- Sector 3D 175
- Polygon 3D 176
- Tank 178
- Border 3D 179
- Text/EditField 3D 180
- Value with History and Event 182

6.2.3.2.1 Sphere



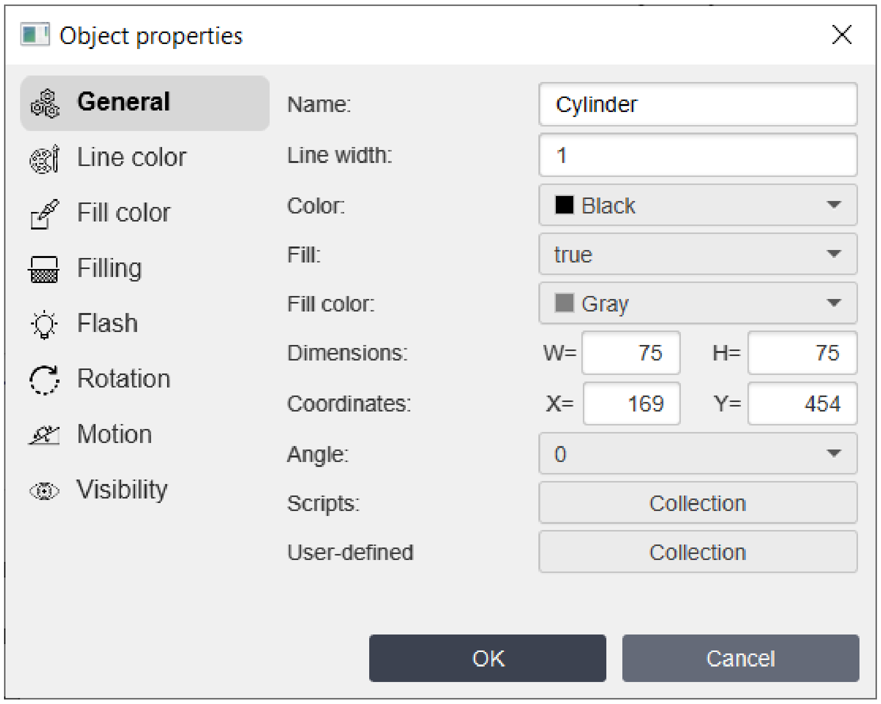
Name: Sphere
Fill color: Gray
Dimensions: W= 75 H= 75
Coordinates: X= 50 Y= 456
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Fill color	**fillcolor**	Color of the sphere.

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.2.2 Cylinder



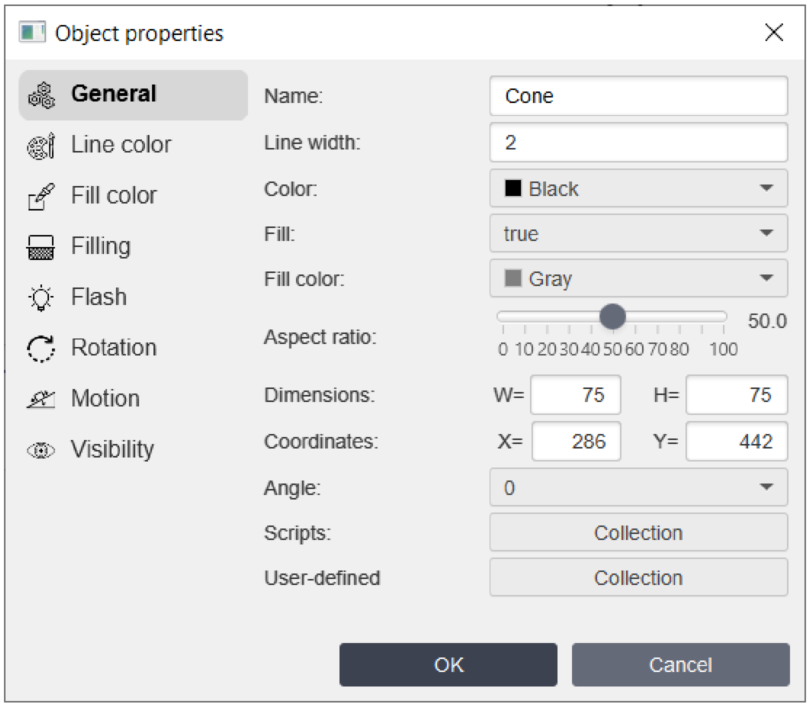
Name: Cylinder
Line width: 1
Color: Black
Fill: true
Fill color: Gray
Dimensions: W= 75 H= 75
Coordinates: X= 169 Y= 454
Angle: 0
Scripts: Collection
User-defined: Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Line width	**linewidth**	Width of the border's line.
Color	**color**	Color of the border's line.
Fill	**fill**	Select fill or not fill cylinder.
Fill color	**fillcolor**	Fill color of the cylinder.

Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Filling"** tab are described here 359.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.2.3 Cone



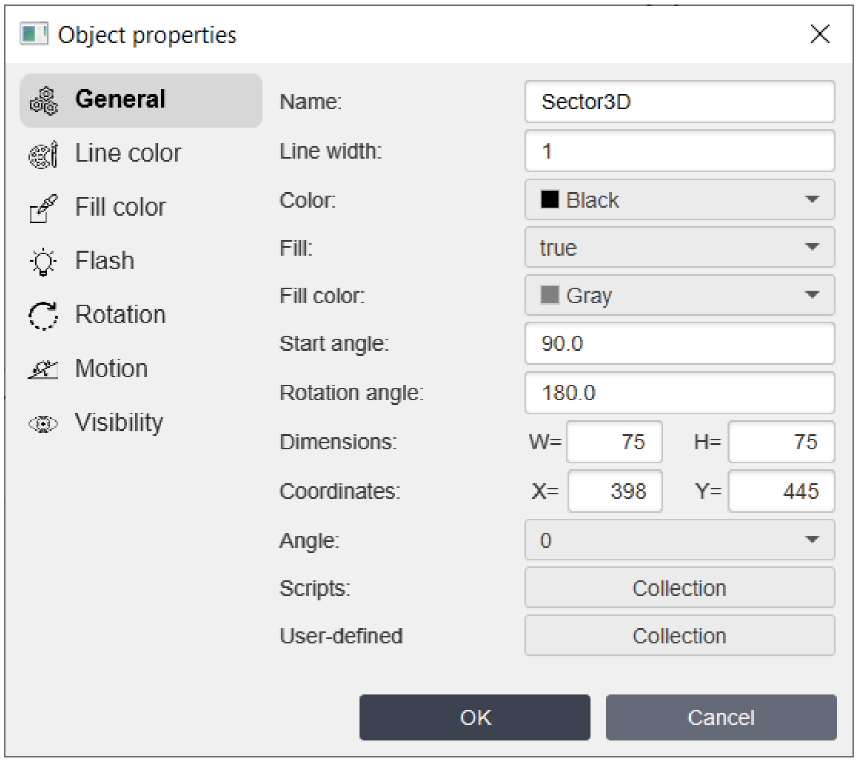
Name: Cone
Line width: 2
Color: Black
Fill: true
Fill color: Gray
Aspect ratio: 50.0
Dimensions: W= 75 H= 75
Coordinates: X= 286 Y= 442
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Line width	**linewidth**	Width of the border's line.
Color	**color**	Color of the border's line.
Fill	**fill**	Select fill or not fill cone.
Fill color	**fillcolor**	Fill color of the cone.
Aspect ratio	**aspectratio**	Aspect ratio of the cone.

Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Filling"** tab are described here 359.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.2.4 Sector 3D



Name: Sector3D
Line width: 1
Color: ■ Black
Fill: true
Fill color: ■ Gray
Start angle: 90.0
Rotation angle: 180.0
Dimensions: W= 75 H= 75
Coordinates: X= 398 Y= 445
Angle: 0
Scripts: Collection
User-defined Collection

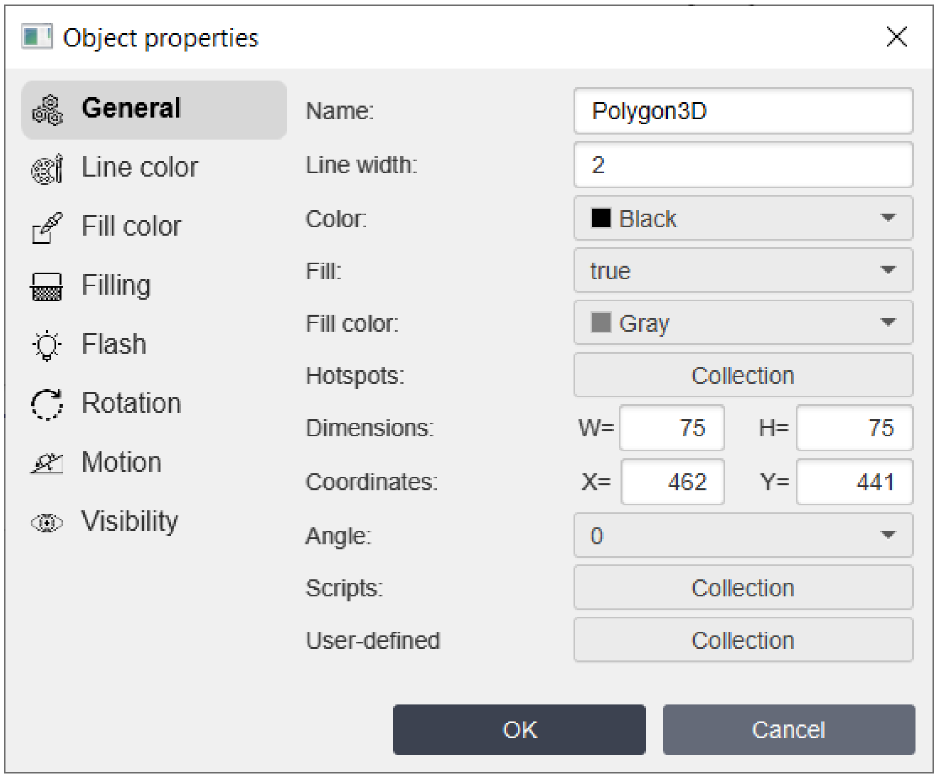
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Line width	**linewidth**	Width of the border's line.
Color	**color**	Color of the border's line.
Fill	**fill**	Select fill or not fill sector.
Fill color	**fillcolor**	Color of the sector's filling.
Start angle	**startangle**	Start angle of the sector. 0 degrees is the right middle point of the dimensions rectangle.
Rotation angle	**rotationangle**	Counterclockwise rotation angle of the sector.

Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.

Properties from the **"Visibility"** tab are described here 354.

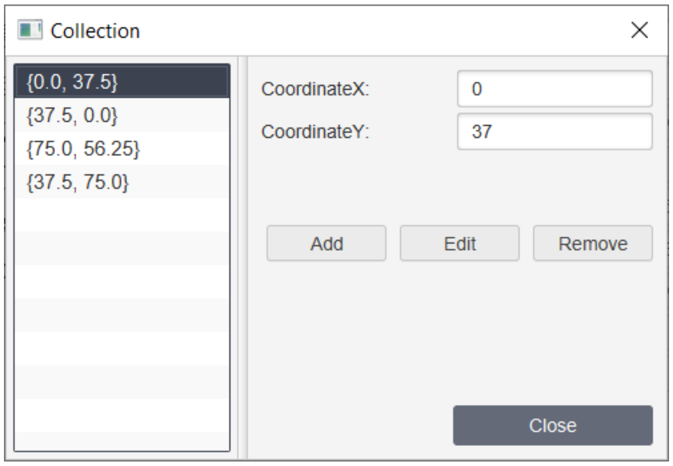
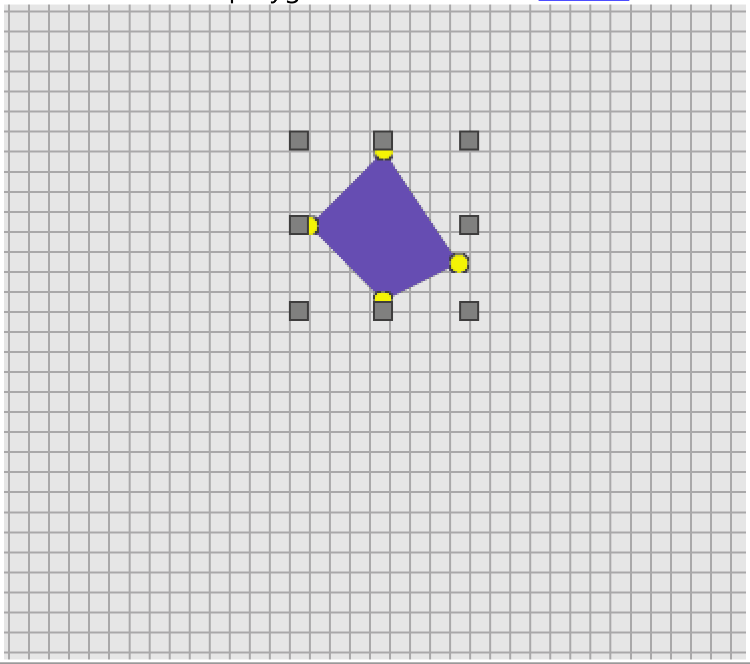
6.2.3.2.5 Polygon 3D



Name: Polygon3D
Line width: 2
Color: Black
Fill: true
Fill color: Gray
Hotspots: Collection
Dimensions: W= 75 H= 75
Coordinates: X= 462 Y= 441
Angle: 0
Scripts: Collection
User-defined: Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

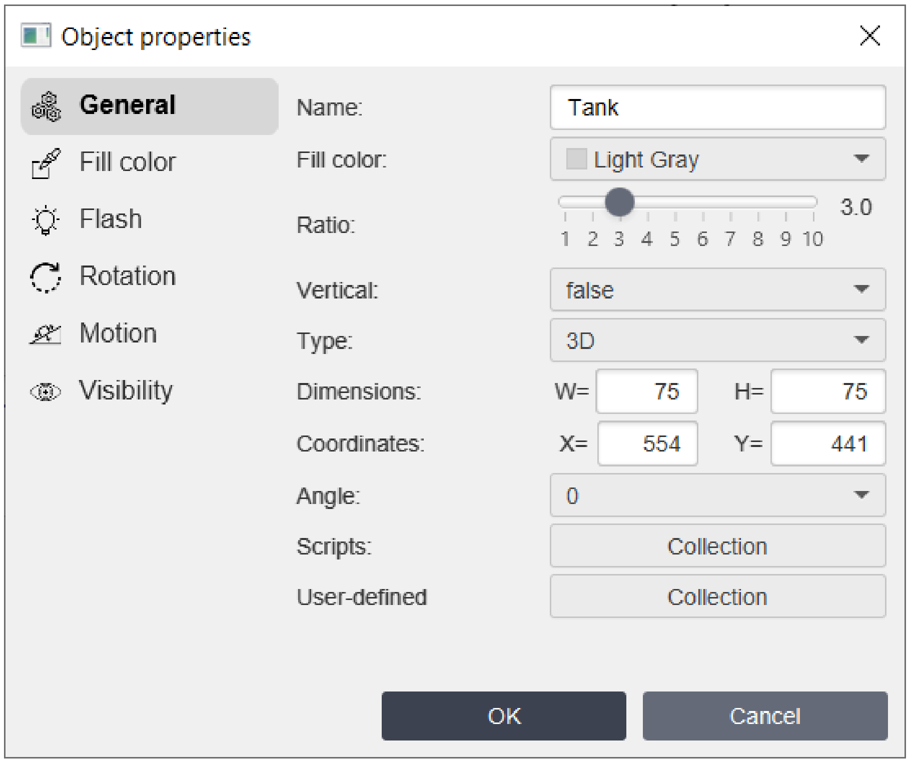
Property	ST script field	Description
Line width	**linewidth**	Width of the border's line.
Color	**color**	Color of the border's line.
Fill	**fill**	Select fill or not fill polygon.
Fill color	**fillcolor**	Color of the polygon's filling.
Hotspots		When you click **Collection** button the Collection window will appear:

Property	ST script field	Description
		 Collection {0.0, 37.5} {37.5, 0.0} {75.0, 56.25} {37.5, 75.0} CoordinateX: 0 CoordinateY: 37 Add Edit Remove Close where: • **CoordinateX** - X coordinate of the polygon's node. • **CoordinateY** - Y coordinate of the polygon's node. • **Add** - add a new polygon's node. • **Edit** - edit the polygon's node. • **Remove** - remove the polygon's node. You can also edit polygon's nodes on the Canvas 92: 

Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Filling"** tab are described here 359.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.2.6 Tank



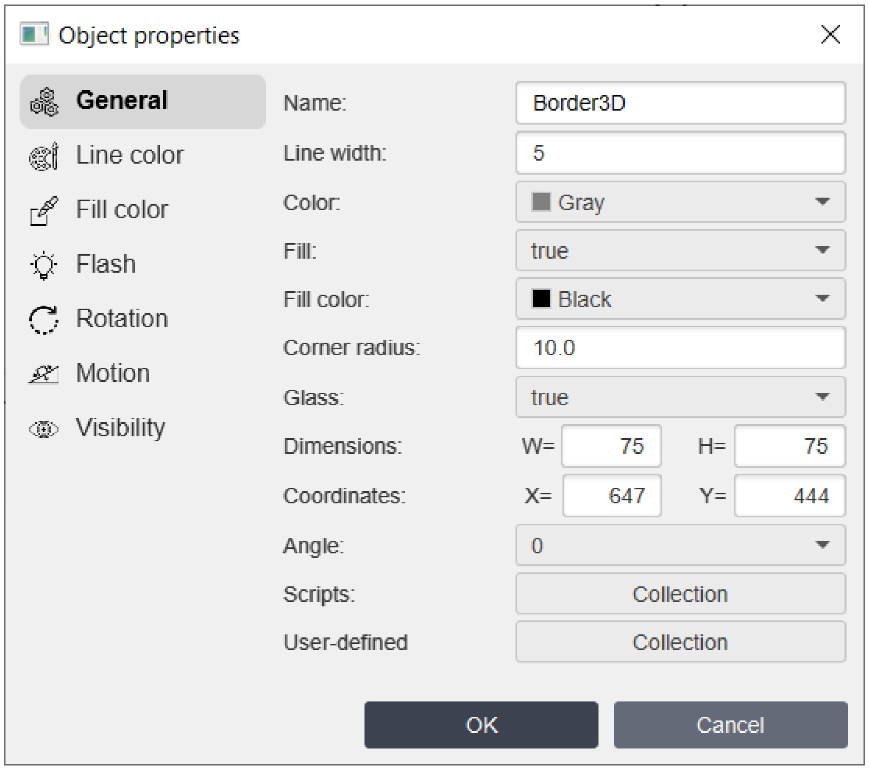
Name: Tank
Fill color: Light Gray
Ratio: 3.0 (1 2 3 4 5 6 7 8 9 10)
Vertical: false
Type: 3D
Dimensions: W= 75 H= 75
Coordinates: X= 554 Y= 441
Angle: 0
Scripts: Collection
User-defined: Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Fill color	**fillcolor**	Color of the tank.
Ratio	**ratio**	Ratio of the tank.
Vertical	**vertical**	Select vertical or horizontal tank's type.

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.2.7 Border 3D



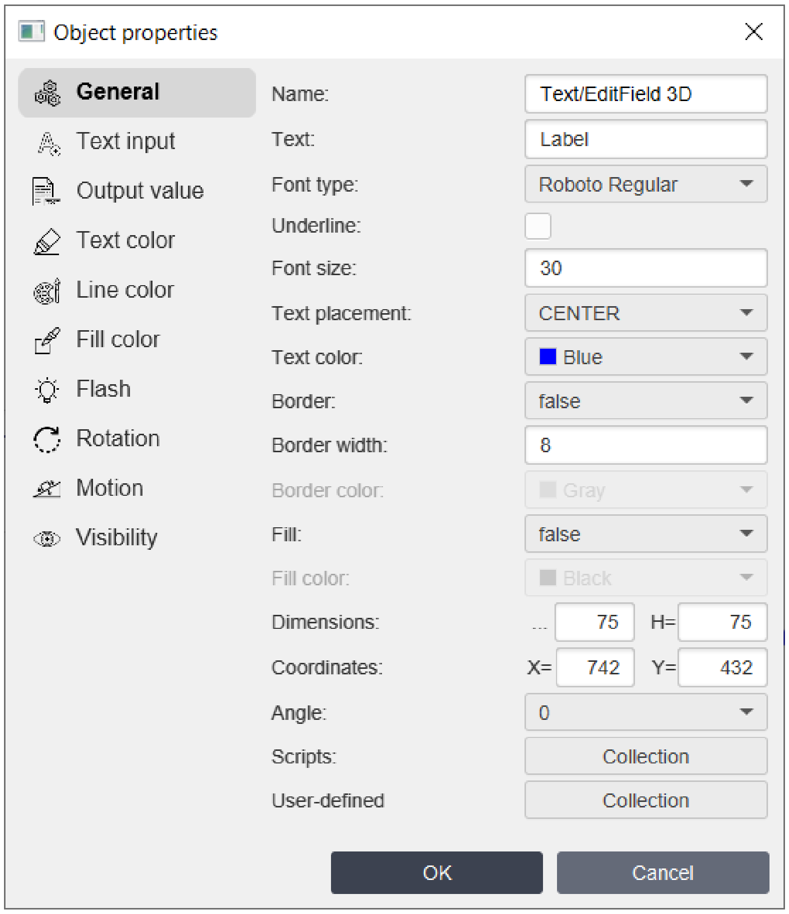
Name: Border3D
Line width: 5
Color: Gray
Fill: true
Fill color: Black
Corner radius: 10.0
Glass: true
Dimensions: W= 75 H= 75
Coordinates: X= 647 Y= 444
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Line width	**linewidth**	Width of the border.
Color	**color**	Color of the border.
Fill	**fill**	Select fill or not fill the border.
Fill color	**fillcolor**	Fill color of the border.
Corner radius	**cornerradius**	Radius of the border's corner.
Glass	**glass**	Select use or not glass effect.

Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.2.8 Text/EditField 3D



Name: Text/EditField 3D
Text: Label
Font type: Roboto Regular
Underline: ☐
Font size: 30
Text placement: CENTER
Text color: 🟦 Blue
Border: false
Border width: 8
Border color: Gray
Fill: false
Fill color: Black
Dimensions: ... 75 H= 75
Coordinates: X= 742 Y= 432
Angle: 0
Scripts: Collection
User-defined: Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Text	**text**	Text displayed on the screen by using this object.
Font type	**fonttype**	Type of the text's font.
Underline	**underline**	Check if you want to underline the text.
Font size	**fontsize**	Size of the text's font.
Text placement	**textplacement**	Placement of the text: ▪ Left ▪ Center ▪ Right
Text color	**textcolor**	Color of the text.

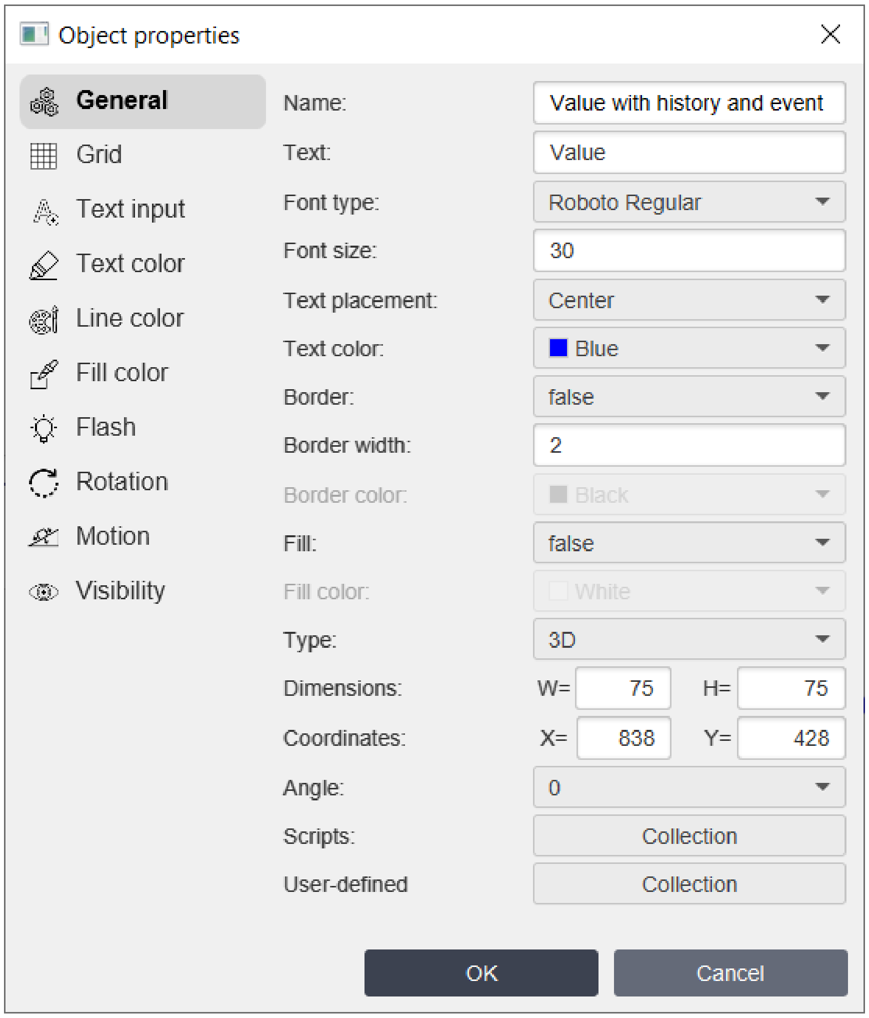
Property	ST script field	Description
Border	**useborder**	Select use or not use border for the text.
Border width	**linewidth**	Width of the border's line.
Border color	**bordercolor**	Color of the border's line.
Fill	**fill**	Select fill or not fill text's background.
Fill color	**fillcolor**	Color of the text's background.

Also for all text/editfield objects you can use fields in ST scripts:

- **textbefore** - text before the value.
- **textafter** - text after the value.
- **decimalpos** - decimal position for the value.

Properties from the **"Text input"** tab are described here 364.
Properties from the **"Output value"** tab are described here 367.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.2.9 Value with history and event



Name: Value with history and event
Text: Value
Font type: Roboto Regular
Font size: 30
Text placement: Center
Text color: Blue
Border: false
Border width: 2
Border color: Black
Fill: false
Fill color: White
Type: 3D
Dimensions: W= 75 H= 75
Coordinates: X= 838 Y= 428
Angle: 0
Scripts: Collection
User-defined Collection

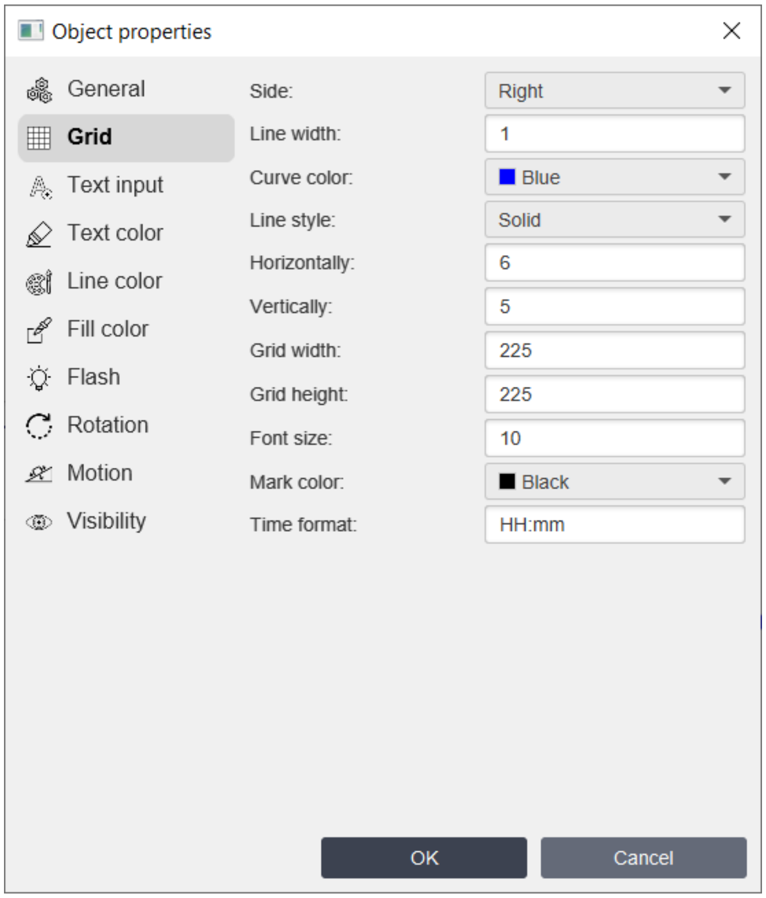
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Text	**text**	Text displayed on the screen by using this object.
Font type	**fonttype**	Type of the text's font.
Font size	**fontsize**	Size of the text's font.
Text placement	**textplacement**	Placement of the text: ▪ Left ▪ Center ▪ Right
Text color	**textcolor**	Color of the text.

Property	ST script field	Description
Border	**useborder**	Select use or not use border for the text.
Border width	**linewidth**	Width of the border's line.
Border color	**bordercolor**	Color of the border's line.
Fill	**fill**	Select fill or not fill text's background.
Fill color	**fillcolor**	Color of the text's background.

Properties from the **"Grid"** tab are described here 184.
Properties from the **"Text input"** tab are described here 364.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.2.9.1 Grid

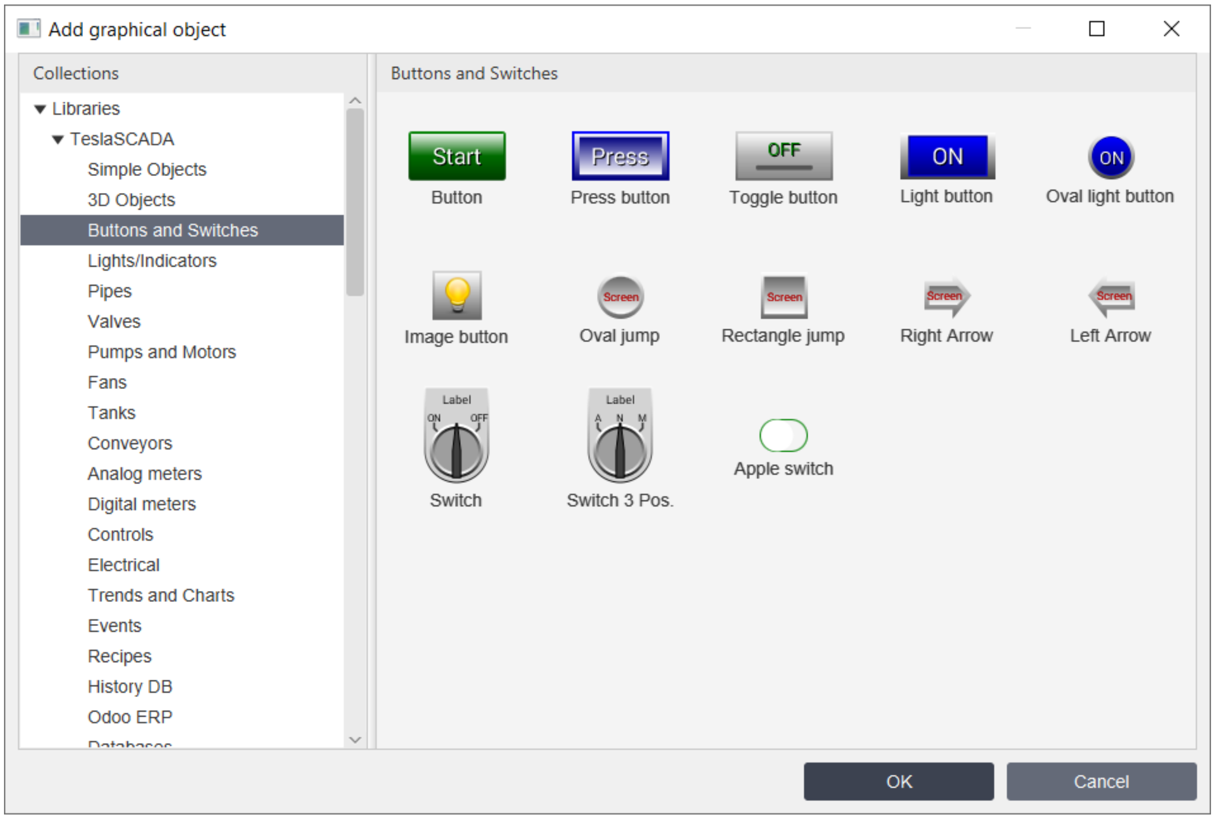


Side: Right
Line width: 1
Curve color: Blue
Line style: Solid
Horizontally: 6
Vertically: 5
Grid width: 225
Grid height: 225
Font size: 10
Mark color: Black
Time format: HH:mm

Property	ST script field	Description
Side	**side**	Choose side of placement of the trend and event table: ▪ Right ▪ Left ▪ Top ▪ Bottom ▪ RightTop ▪ LeftTop
Line width		Line width of the curve.
Curve color	**gridlinecolor**	Choose curve's color
Line style	**linestyle**	Style of the line: ▪ Solid ▪ Dash ▪ Dot

Property	ST script field	Description
		▪ DashDot
Horizontally	**horizontally**	Number of trend's horizontal grid lines.
Vertically	**vertically**	Number of trend's vertical grid lines.
Grid width	**gridwidth**	Width of the trend and event table.
Grid height	**gridheight**	Height of the trend and event table.
Font size	**fontsize**	Font size of the trend's marks.
Mark color	**markcolor**	Color of the marks.
Time format	**timeformat**	Time format of the trend's time.

6.2.3.3 Buttons and Switches library



Buttons and Switches library contains the following objects:

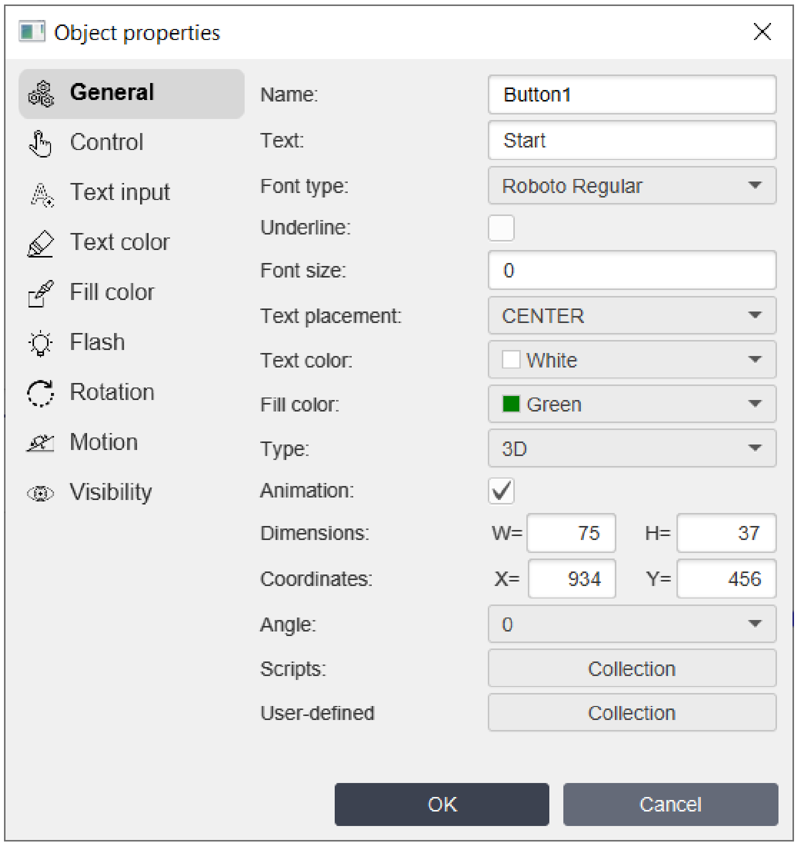
- Button 186
- Press button 186
- Toggle button 186
- Light button 186
- Oval light button 186
- Image button 188

- Oval jump button 186
- Rectangle jump button 186
- Right Arrow 186
- Left Arrow 186
- Switch 189
- Switch 3 Pos 191
- Apple switch 190

All Buttons and Arrows exept Image button have the same General group properties. Below we describe there only for 5 graphical objects - Button, Image button, Switch, Apple switch and Three position Switch.

6.2.3.3.1 Button

This section applies to the following objects: Button, Press button, Light button, Oval light button, Oval jump button , Rectangle jump button, Right Arrow, Left Arrow.



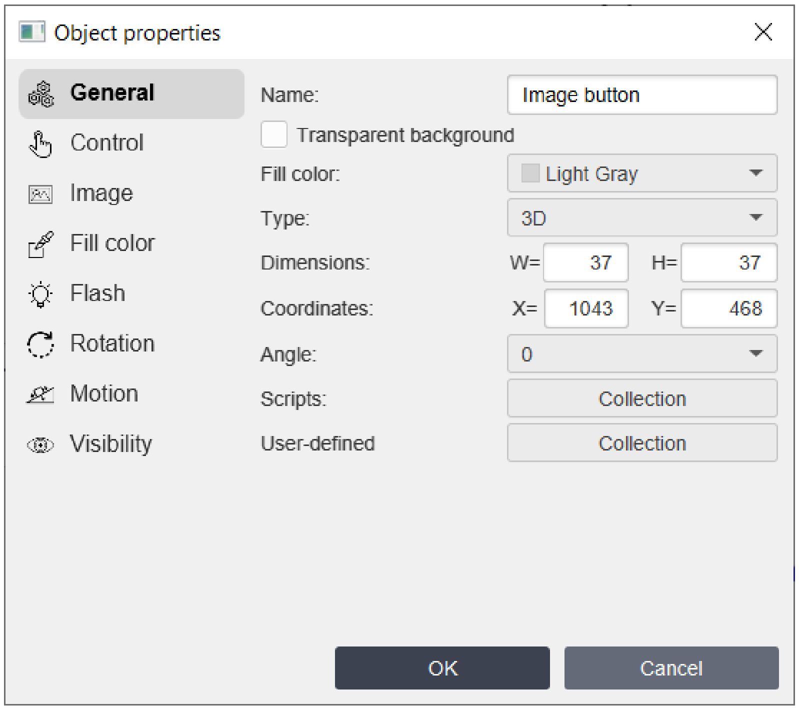
Name:	Button1
Text:	Start
Font type:	Roboto Regular
Underline:	☐
Font size:	0
Text placement:	CENTER
Text color:	White
Fill color:	🟩 Green
Type:	3D
Animation:	✓
Dimensions:	W= 75 H= 37
Coordinates:	X= 934 Y= 456
Angle:	0
Scripts:	Collection
User-defined	Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Text	**text**	Text displayed on the button.
Font type	**fonttype**	Type of the button text's font.
Underline	**underline**	Check if you want to underline the text.
Font size	**fontsize**	Size of the button text's font.
Text placement	**textplacement**	Placement of the button text: ▪ Left ▪ Center ▪ Right
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Color of the button.

Properties from the **"Control"** tab are described here 362.
Properties from the **"Text input"** tab are described here 364.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.3.2 Image button



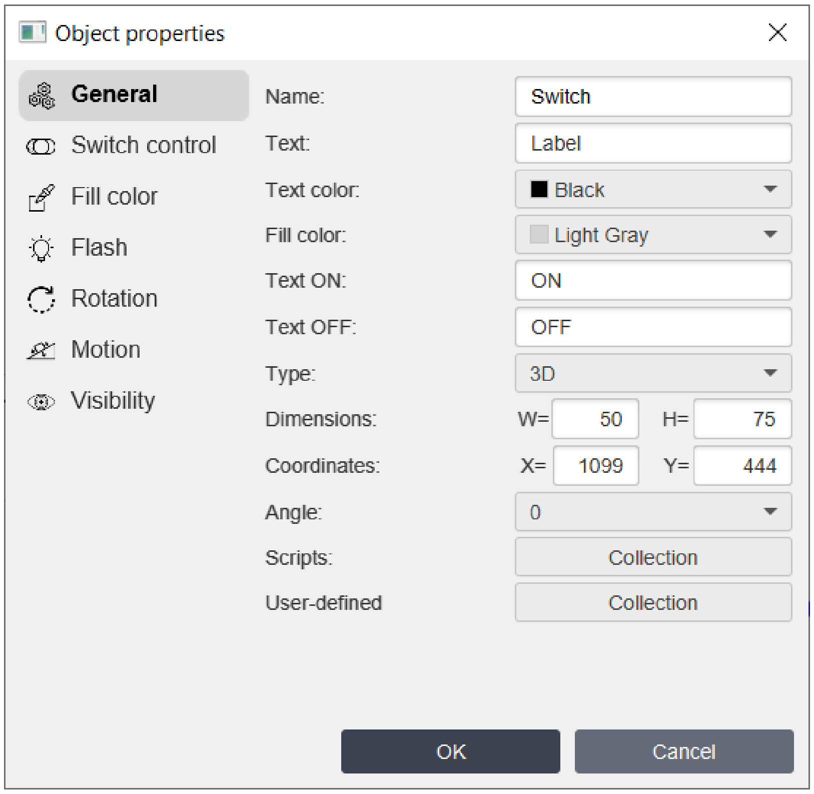
Name: Image button
Transparent background
Fill color: Light Gray
Type: 3D
Dimensions: W= 37 H= 37
Coordinates: X= 1043 Y= 468
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Transparent background		Make background transparent.
Fill color	**fillcolor**	Color of the button.

Properties from the **"Control"** tab are described here 362.
Properties from the **"Image"** tab are described here 369.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.3.3 Switch



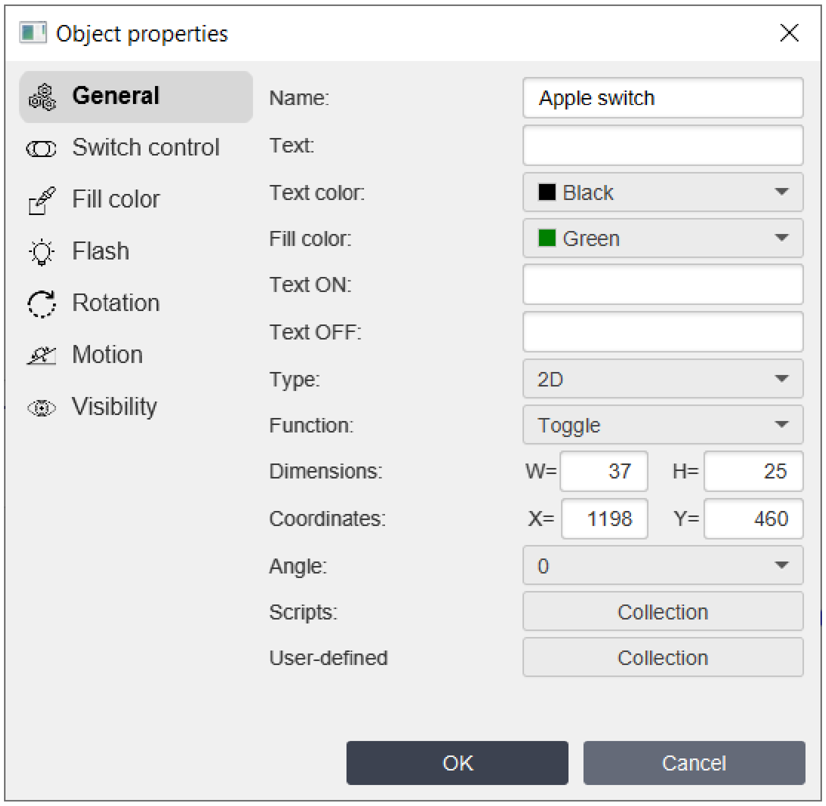
Name: Switch
Text: Label
Text color: Black
Fill color: Light Gray
Text ON: ON
Text OFF: OFF
Type: 3D
Dimensions: W= 50 H= 75
Coordinates: X= 1099 Y= 444
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Text	**text**	Text displayed on the switch.
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Color of the switch background.
Text ON	**texton**	Label for ON position of the switch.
Text OFF	**textoff**	Label for OFF position of the switch.

Properties from the **"Switch control"** tab are described here 377.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.3.4 Apple switch



Name: Apple switch
Text:
Text color: Black
Fill color: Green
Text ON:
Text OFF:
Type: 2D
Function: Toggle
Dimensions: W= 37 H= 25
Coordinates: X= 1198 Y= 460
Angle: 0
Scripts: Collection
User-defined Collection

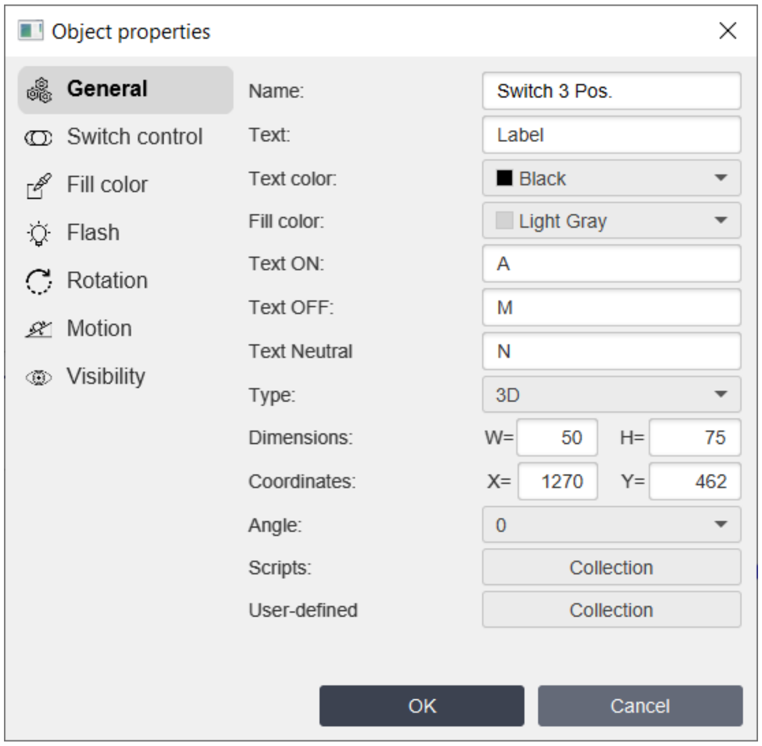
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Text	**text**	Text displayed on the switch.
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Color of the switch background.
Text ON	**texton**	Label for ON position of the switch.
Text OFF	**textoff**	Label for OFF position of the switch.
Function	**clicktype**	Choose Function type: ▪ Toggle ▪ Push

Properties from the **"Switch control"** tab are described here 377.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.

Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.3.5 Three position switch



Name: Switch 3 Pos.
Text: Label
Text color: Black
Fill color: Light Gray
Text ON: A
Text OFF: M
Text Neutral N
Type: 3D
Dimensions: W= 50 H= 75
Coordinates: X= 1270 Y= 462
Angle: 0
Scripts: Collection
User-defined Collection

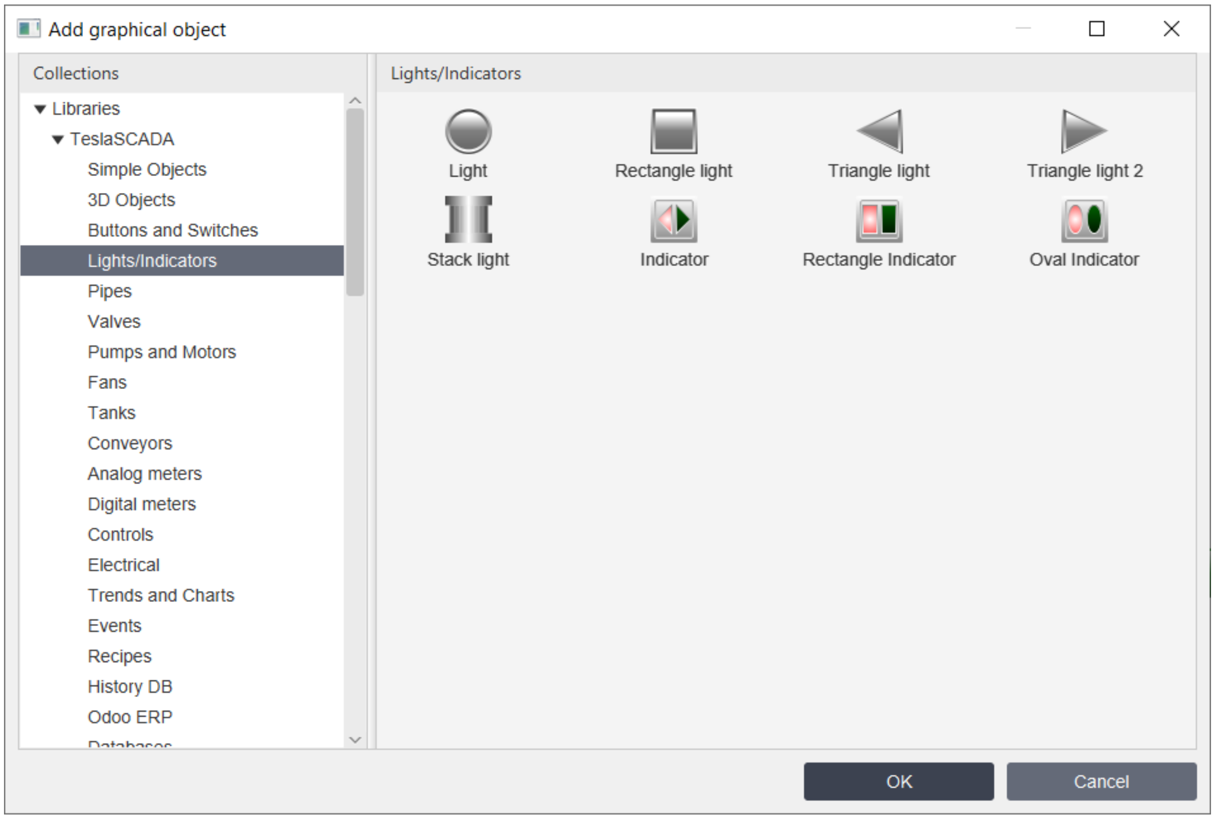
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Text	**text**	Text displayed on the switch.
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Color of the switch background.
Text ON	**texton**	Label for ON position of the switch.
Text OFF	**textoff**	Label for OFF position of the switch.
Text Neutral	**textneutral**	Label for Neutral position of the switch.

Properties from the **"Switch control"** tab are described here 378.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.

Properties from the **"Visibility"** tab are described here 354.

6.2.3.4 Lights/Indicators library

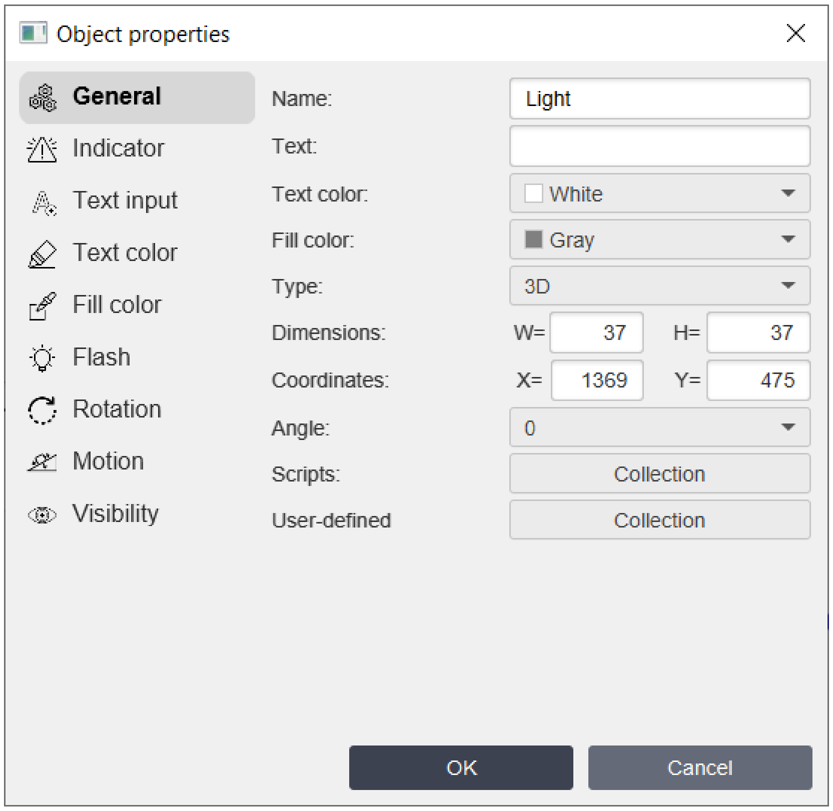


Lights/Indicators library contains the following objects:

- Light 193
- Rectangle light 193
- Triangle light 193
- Triangle light 2 193
- Stack light 193
- Indicator 194
- Rectangle Indicator 194
- Oval Indicator 194

All lights have the same General group properties and all indicators have the same General group properties. Below we'll describe them only for two graphical objects - Light and Indicator.

6.2.3.4.1 Light



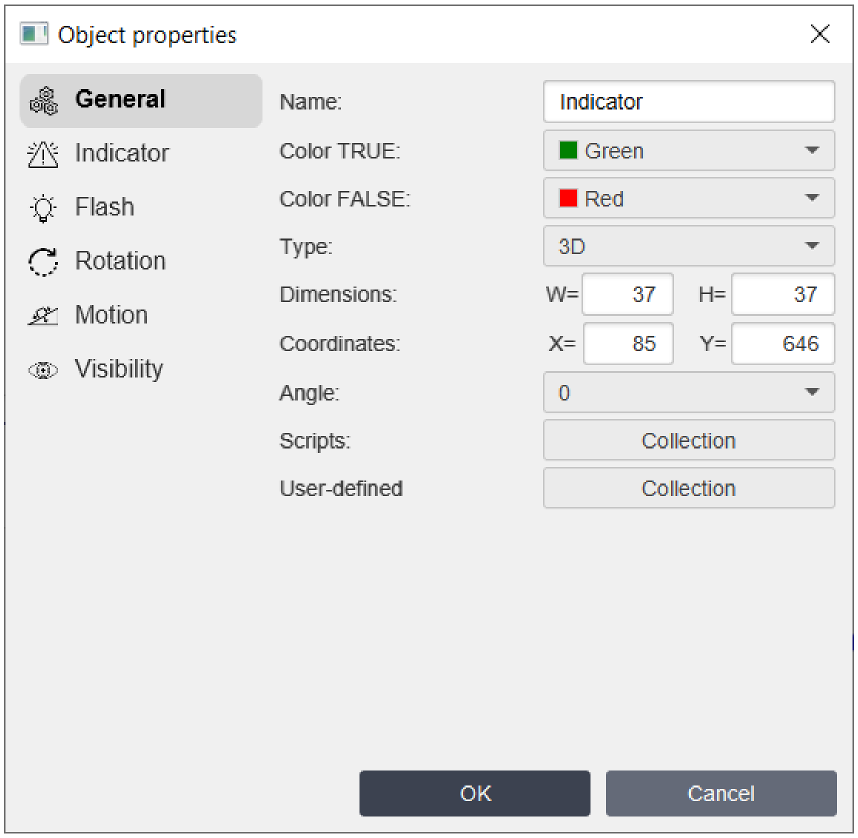
Name: Light
Text:
Text color: White
Fill color: Gray
Type: 3D
Dimensions: W= 37 H= 37
Coordinates: X= 1369 Y= 475
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Text	**text**	Text displayed on the light.
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Color of the light.

Properties from the **"Indicator"** tab are described here 367.
Properties from the **"Text input"** tab are described here 364.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.4.2 Indicator



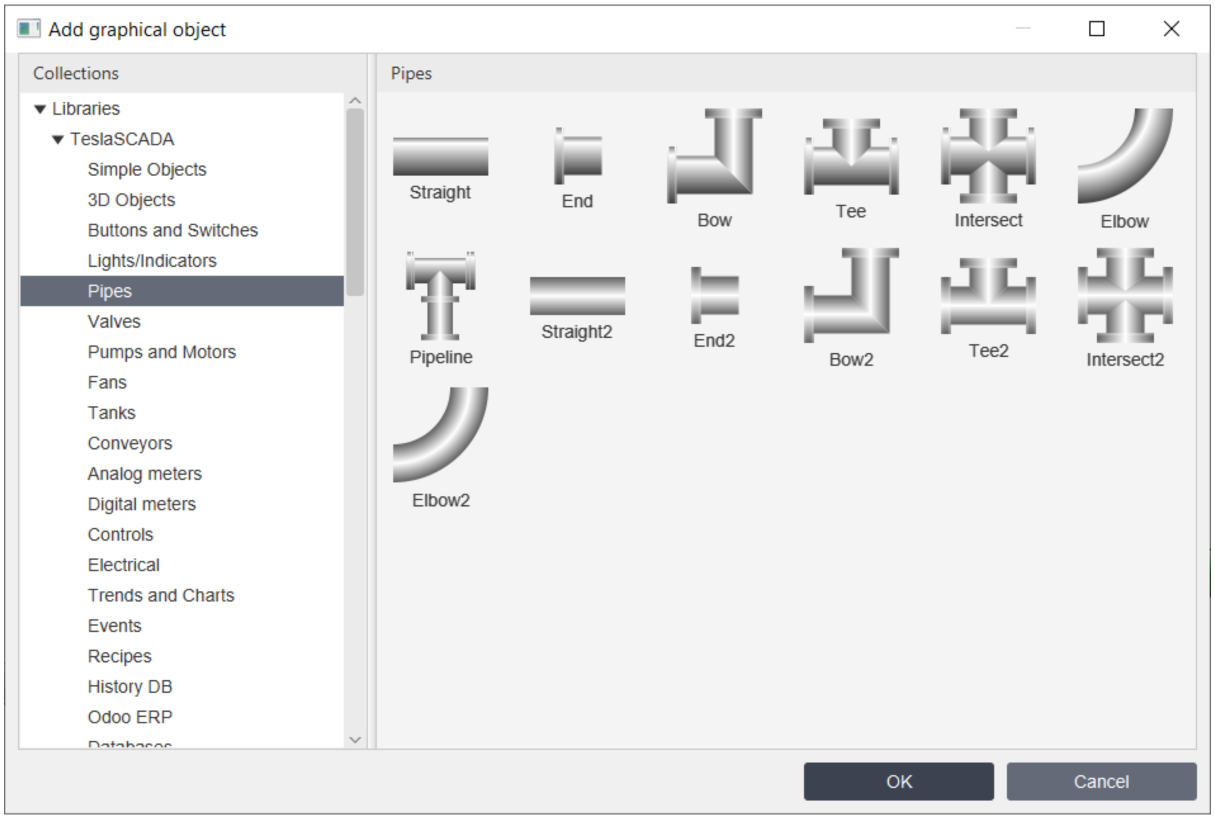
Name: Indicator
Color TRUE: 🟩 Green
Color FALSE: 🟥 Red
Type: 3D
Dimensions: W= 37 H= 37
Coordinates: X= 85 Y= 646
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Color TRUE	**truecolor**	Color TRUE of the indicator.
Color FALSE	**falsecolor**	Color FALSE of the indicator.

Properties from the **"Indicator"** tab are described here 367.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.5 Pipes library



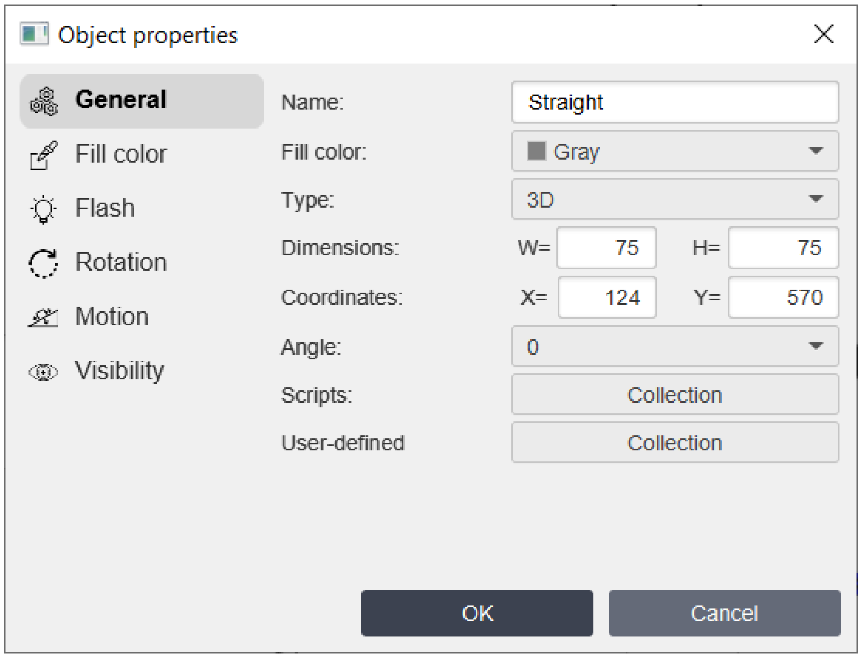
Pipes library contains the following pipes objects:

- Straight 196
- End 196
- Bow 196
- Tee 196
- Intersect 196
- Elbow 196
- Pipeline 197
- Straight2 196
- End2 196
- Bow2 196
- Tee2 196
- Intersect2 196
- Elbow2 196

All pipes have the same General group properties. Below we'll describe them only for two graphical objects - Straight and Pipeline .

6.2.3.5.1 Pipe

This section applies to the following objects: Straight, End, Bow, Tee, Intersect, Elbow, Straight2, End2, Bow2, Tee2, Intersect2, Elbow2.



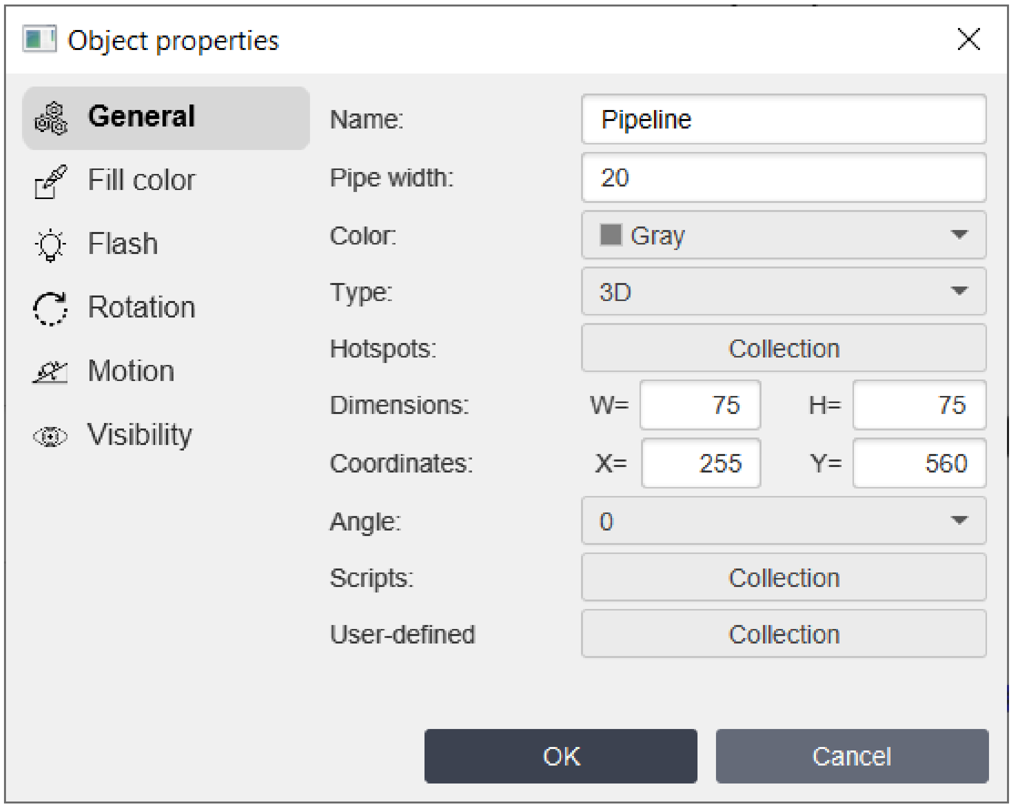
Name: Straight
Fill color: Gray
Type: 3D
Dimensions: W= 75 H= 75
Coordinates: X= 124 Y= 570
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	**ST script field**	Description
Fill color	**fillcolor**	Color of the pipe.

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

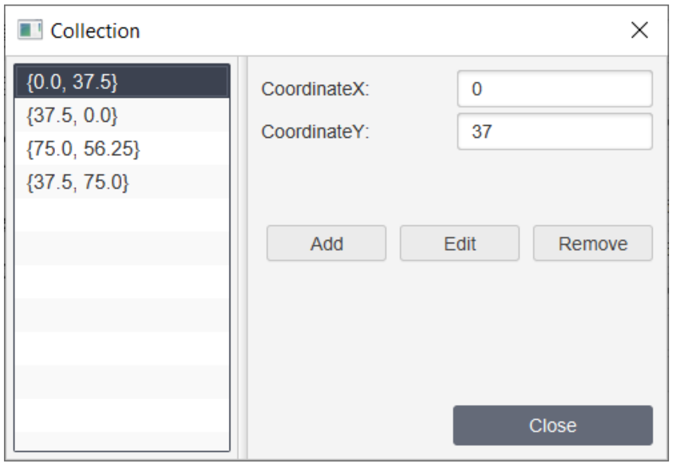
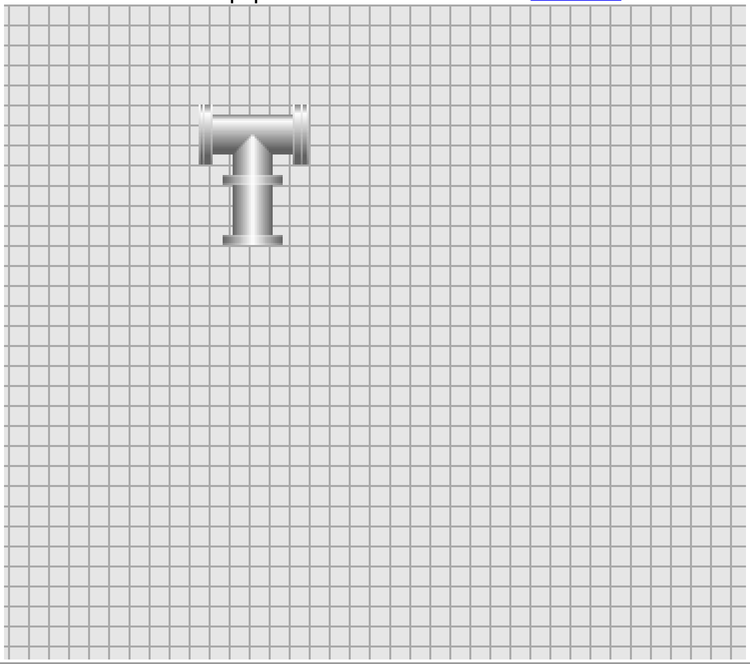
6.2.3.5.2 Pipeline



Name: Pipeline
Pipe width: 20
Color: Gray
Type: 3D
Hotspots: Collection
Dimensions: W= 75 H= 75
Coordinates: X= 255 Y= 560
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

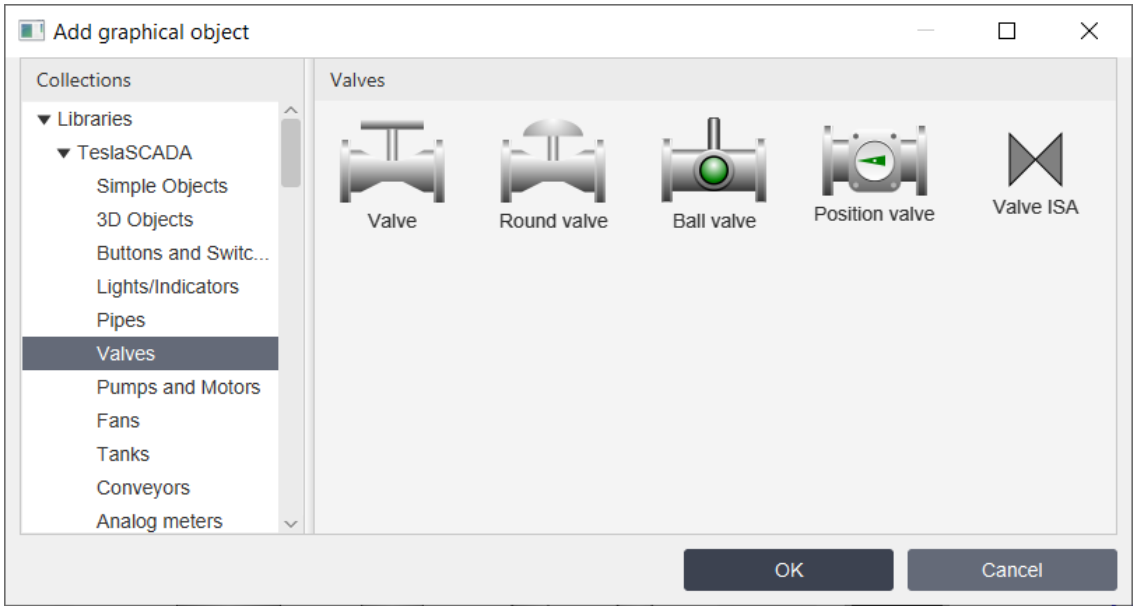
Property	ST script field	Description
Pipe width	**linewidth**	Pipe width of the pipeline.
Color	**fillcolor**	Color of the pipeline.
Hotspots		When you click **Collection** button the Collection window will appear:

Property	ST script field	Description
		 Collection: {0.0, 37.5}, {37.5, 0.0}, {75.0, 56.25}, {37.5, 75.0}; CoordinateX: 0; CoordinateY: 37 Where: ▪ **CoordinateX** - X coordinate of the pipeline's node. ▪ **CoordinateY** - Y coordinate of the pipeline's node. ▪ **Add** - add a new pipeline's node. ▪ **Edit** - edit the pipeline's node. ▪ **Remove** - remove the pipeline's node. You can also edit pipeline's nodes on the Canvas 92: 

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.

Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.6 Valves library



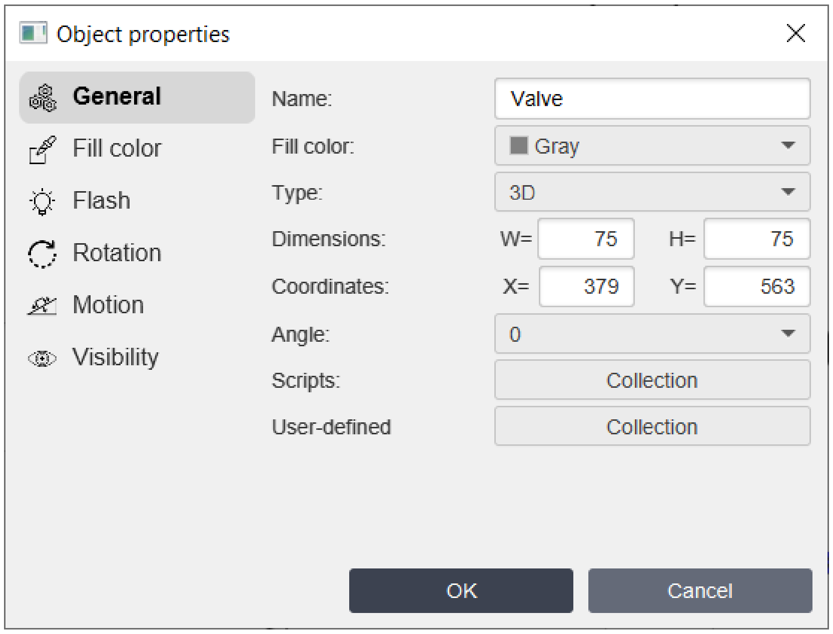
Valves library contains the following objects:

- Valve 199
- Round valve 199
- Ball valve 201
- Position valve 202
- Valve ISA 199

Valve, Round valve and Valve ISA have the same General properties.

6.2.3.6.1 Valve

This section applies to the following objects: Valve, Round valve and Valve ISA.


Object properties

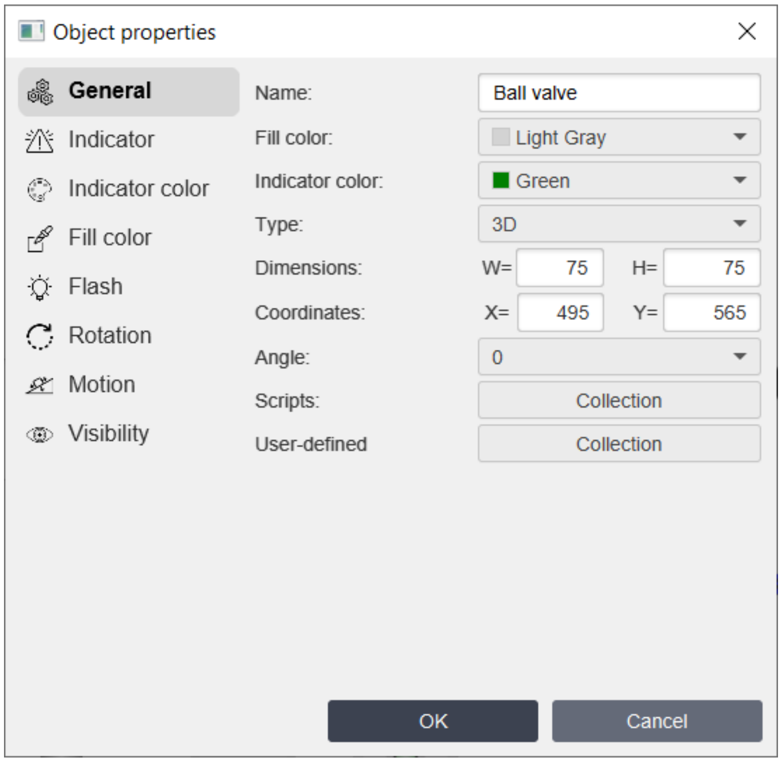
Name: Valve
Fill color: Gray
Type: 3D
Dimensions: W= 75 H= 75
Coordinates: X= 379 Y= 563
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Fill color	**fillcolor**	Color of the valve.

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.6.2 Ball valve



Name: Ball valve
Fill color: Light Gray
Indicator color: Green
Type: 3D
Dimensions: W= 75 H= 75
Coordinates: X= 495 Y= 565
Angle: 0
Scripts: Collection
User-defined: Collection

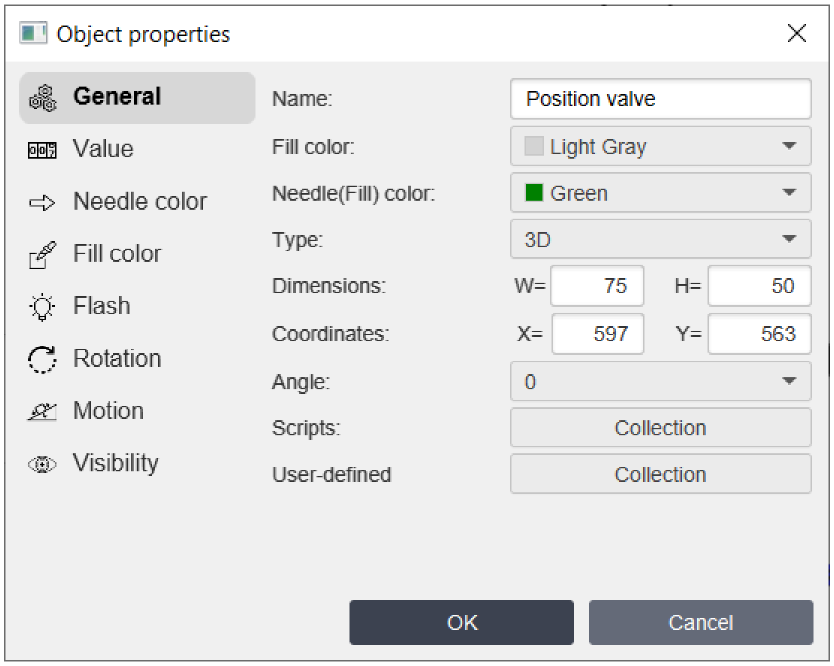
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Fill color	**fillcolor**	Color of the valve.
Indicator color	**indicatorcolor**	Color of the indicator (ball).

Indicator color property like other color properties.

Properties from the **"Indicator"** tab are described here 367.
Properties from the **"Indicator color"** tab are described here 371.
Properties from the **"Text input"** tab are described here 364.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.6.3 Position valve



Name: Position valve
Fill color: Light Gray
Needle(Fill) color: Green
Type: 3D
Dimensions: W= 75 H= 50
Coordinates: X= 597 Y= 563
Angle: 0
Scripts: Collection
User-defined: Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Fill color	**fillcolor**	Color of the valve.
Needle(fill) color	**indicatorcolor**	Color of the needle.

Properties from the **"Value"** tab are the same as for analog meters and described here 374.

Properties from the **"Needle color"** tab are described here 371.

Properties from the **"Fill Color"** tab are described here 357.

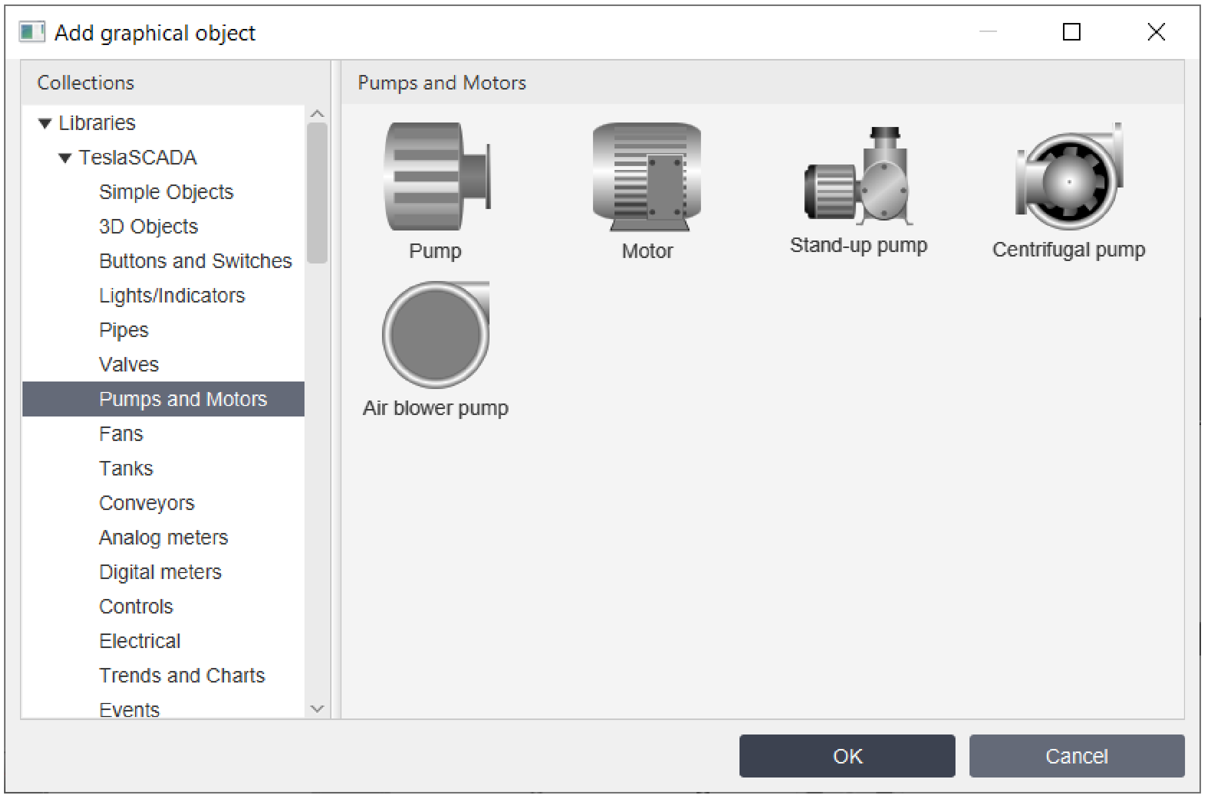
Properties from the **"Flash"** tab are described here 350.

Properties from the **"Rotation"** tab are described here 352.

Properties from the **"Motion"** tab are described here 353.

Properties from the **"Visibility"** tab are described here 354.

6.2.3.7 Pumps and Motors library



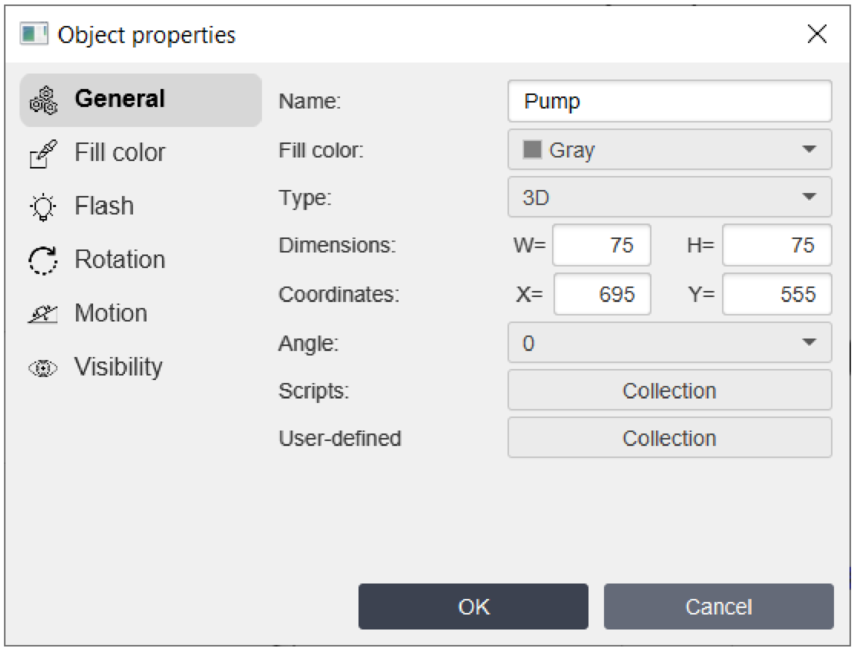
Pumps library contains the following objects:

- Pump 203
- Motor 203
- Stand-up pump 203
- Centrifugal pump 203
- Air blower pump 203

All pumps have the same General group properties. Below we'll describe only for one graphical object - Pump.

6.2.3.7.1 Pump

This section applies to the following objects: Pump, Motor, Stand-up pump, Centrifugal pump, Air blower pump.


Object properties

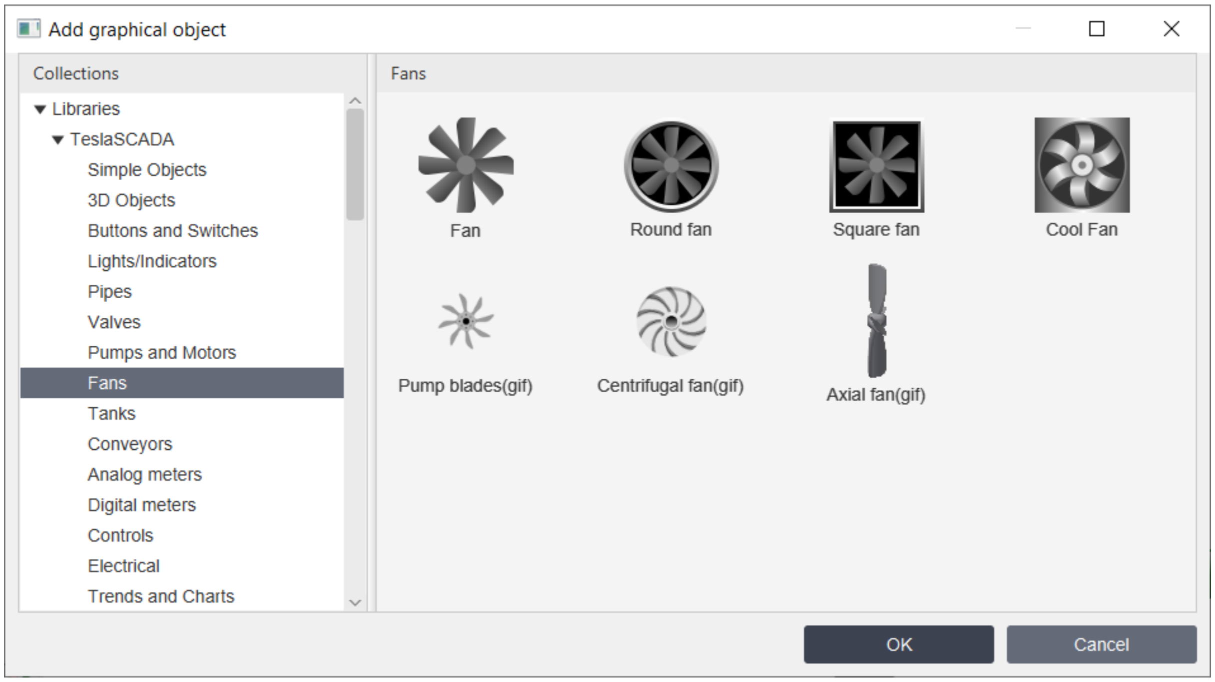
Name: Pump
Fill color: Gray
Type: 3D
Dimensions: W= 75 H= 75
Coordinates: X= 695 Y= 555
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Fill color	**fillcolor**	Color of the pump.

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.8 Fans library



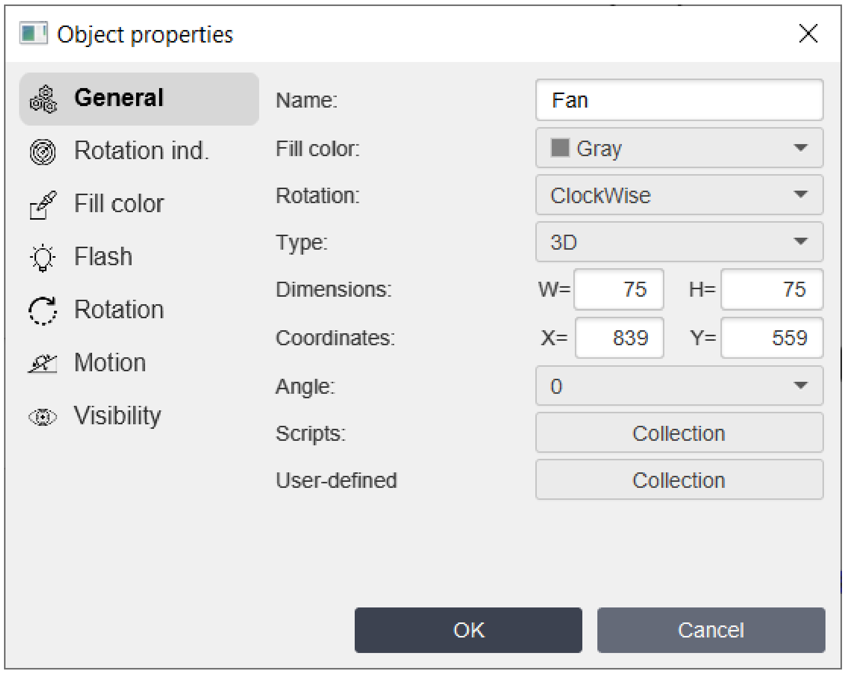
Fans library contains the following objects:

- Fan 205
- Round fan 205
- Square fan 205
- Cool fan 205
- Pump blades(gif) 205
- Centrifugal fan(gif) 205
- Axial fan(gif) 205

All fans have the same properties. (gif) means that non-vector graphics are used to draw this graphic object. That means you can't change fill color of this object. For animation use 'gif' files.

6.2.3.8.1 Fan

This section applies to the following objects: Fan, Round fan, Square fan, Cool fan, Pump blades(gif), Centrifugal fan(gif), Axial fan(gif).


Object properties

General | Rotation ind. | Fill color | Flash | Rotation | Motion | Visibility

Name: Fan
Fill color: Gray
Rotation: ClockWise
Type: 3D
Dimensions: W= 75 H= 75
Coordinates: X= 839 Y= 559
Angle: 0
Scripts: Collection
User-defined: Collection

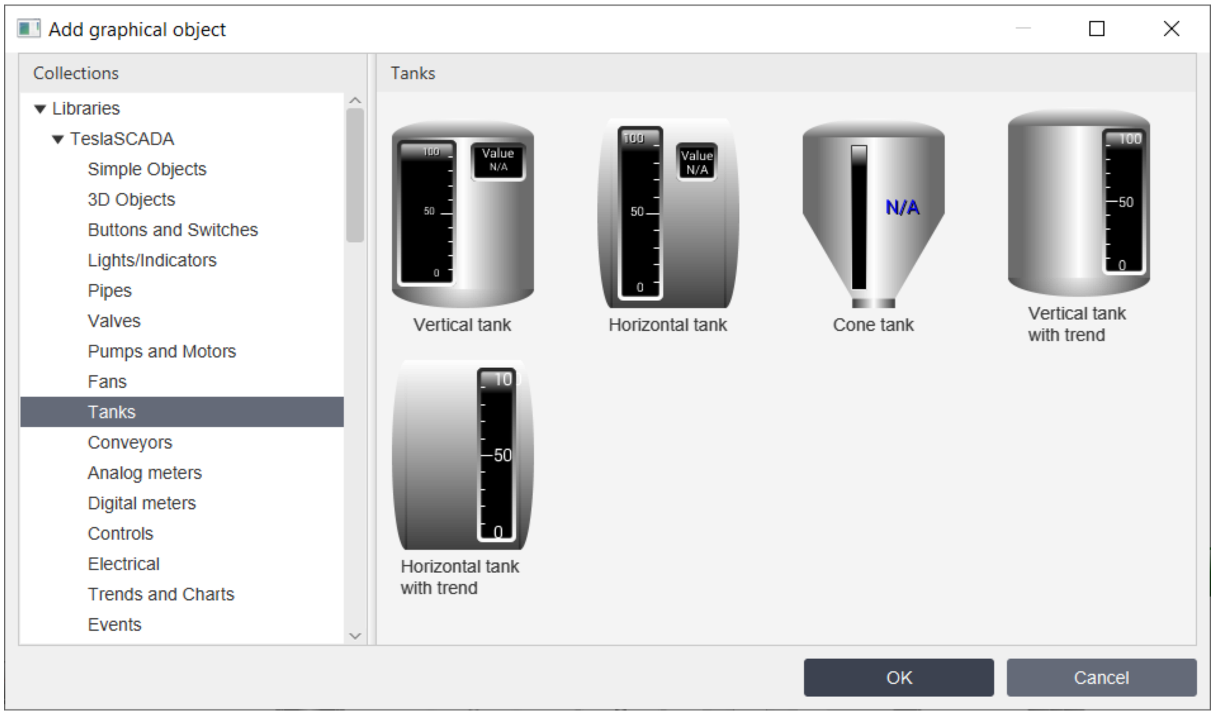
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Fill color	**fillcolor**	Color of the fan.
Rotation	**rotation**	Rotation of the fan - clockwise or counter clockwise.

Set up Rotation ind. properties to rotate fan. Also it's possible to use speed property in ST script for changing speed animation. For vector graphic it's changed proportional of the value. For 'gif' animation that depends on the value. For speed below 5000 used fast speed animation, for speed is equal 5000 used medium speed animation and for speed is greater than 5000 used slow speed animation.

Properties from the **"Rotarion indicator"** tab are described here 368.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.9 Tanks library



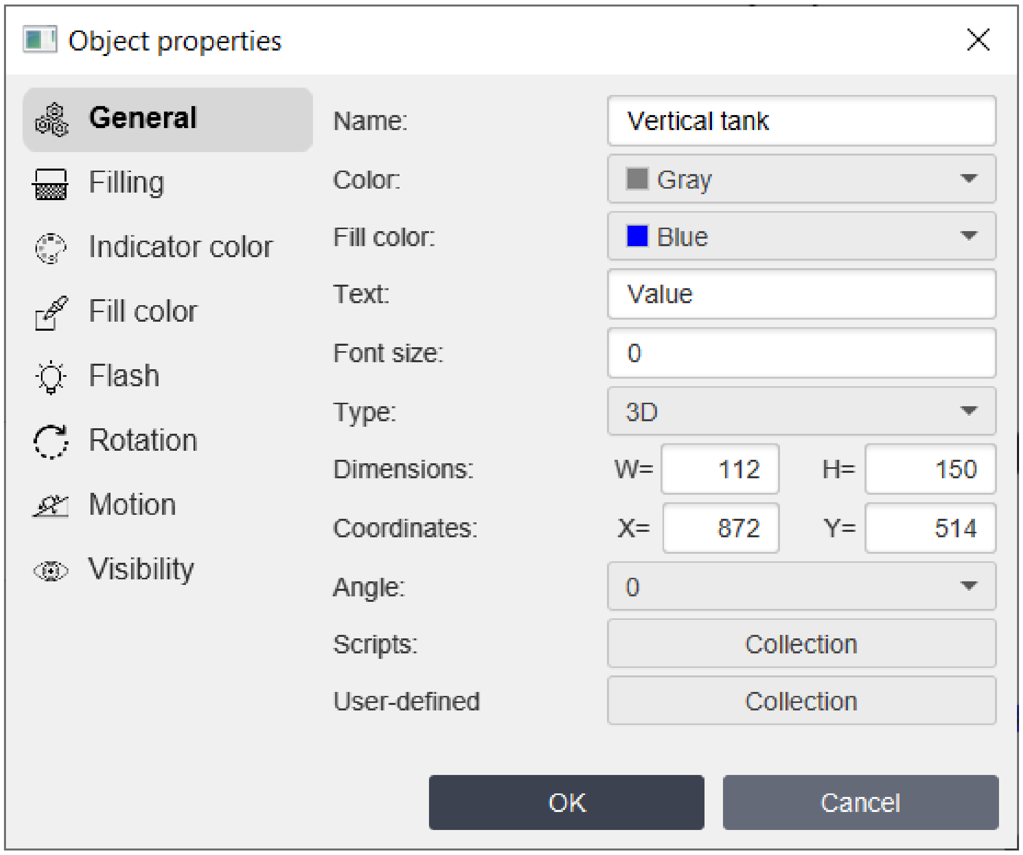
Tanks library contains the following objects:

- Vertical tank 207
- Horizontal tank 207
- Cone tank 207
- Vertical tank with trend 207
- Horizontal tank with trend 207

All tanks have the same General group properties. Below we'll describe them only for one graphical object - Vertical tank.

6.2.3.9.1 Vertical tank

This section applies to the following objects: Vertical tank, Horizontal tank, Cone tank, Vertical tank with trend, Horizontal tank with trend.



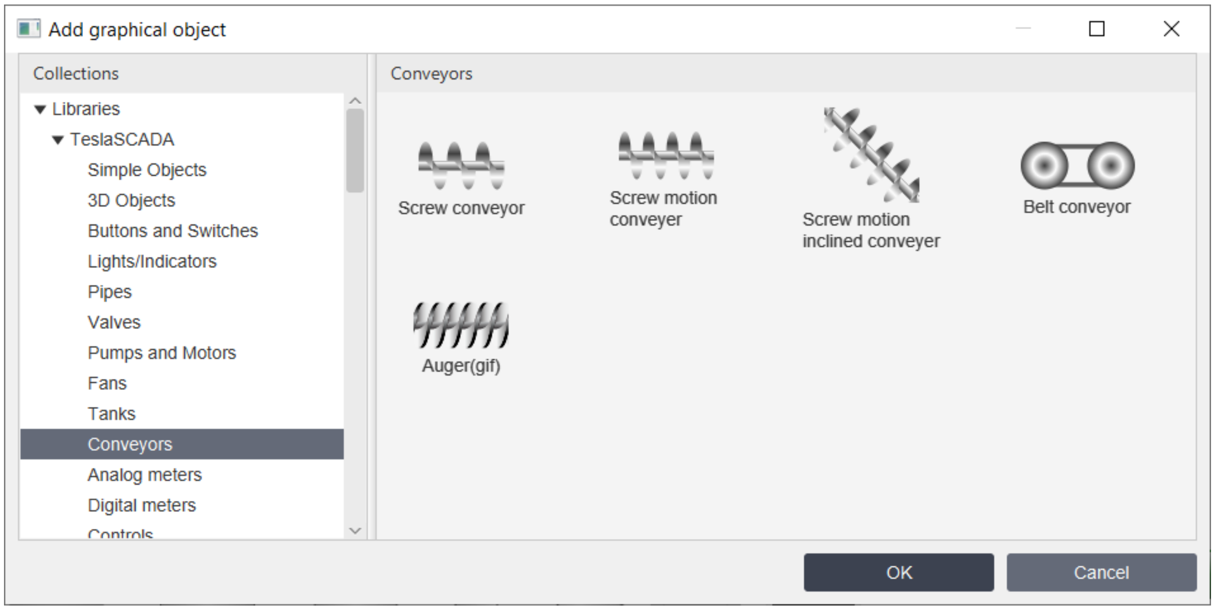
Name: Vertical tank
Color: Gray
Fill color: Blue
Text: Value
Font size: 0
Type: 3D
Dimensions: W= 112 H= 150
Coordinates: X= 872 Y= 514
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Color	**color**	Background color of the tank .
Fill color	**fillcolor**	Filling color of the tank.
Text	**text**	Text displayed on the tank.
Font size	**fontsize**	Size of the text's font.

Properties from the **"Filling"** tab are described here 359.
Properties from the **"Indicator color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.10 Conveyers library



Conveyers library contains the following objects:

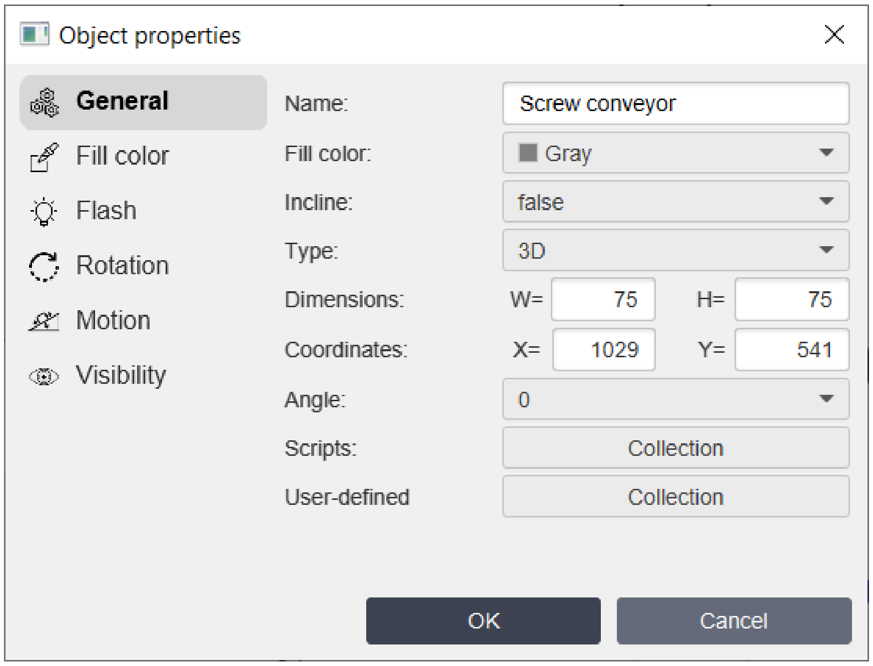
- Screw conveyer 209
- Screw motion conveyer 210
- Screw motion inclined conveyer 210
- Belt conveyer 209
- Auger(gif) 210

Screw conveyer and Belt conveyer have the same General group properties. Below we'll describe them only for one graphical object - Belt conveyer. Screw motion conveyer, Screw motion inclined conveyer and Auger(gif) have the same General group properties. Below we'll describe it only for one graphical object - Screw motion conveyer.

(gif) means that non-vector graphics are used to draw this graphic object. That means you can't change fill color of this object. For animation use gif files.

6.2.3.10.1 Belt conveyer

This section applies to the following objects: Screw conveyer and Belt conveyer.



Name: Screw conveyor
Fill color: Gray
Incline: false
Type: 3D
Dimensions: W= 75 H= 75
Coordinates: X= 1029 Y= 541
Angle: 0
Scripts: Collection
User-defined Collection

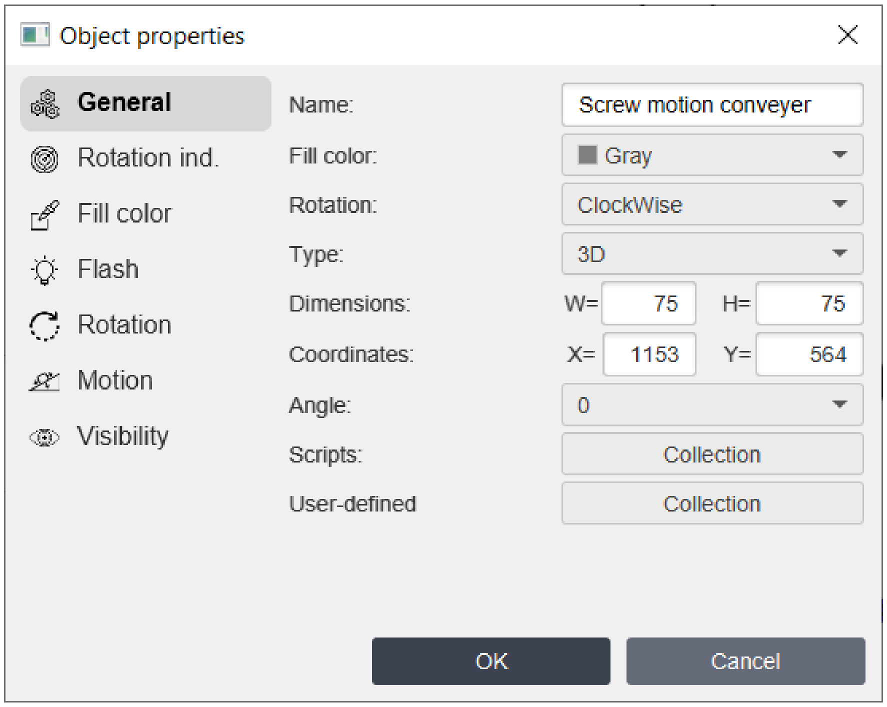
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Fill color	**fillcolor**	Color of the conveyer.
Incline	**inclined**	Choose incline or not conveyer.

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.10.2 Screw motion conveyer

This section applies to the following objects: Screw motion conveyer, Screw motion inclined conveyer and Auger(gif).


Object properties

Name: Screw motion conveyer
Fill color: Gray
Rotation: ClockWise
Type: 3D
Dimensions: W= 75 H= 75
Coordinates: X= 1153 Y= 564
Angle: 0
Scripts: Collection
User-defined Collection

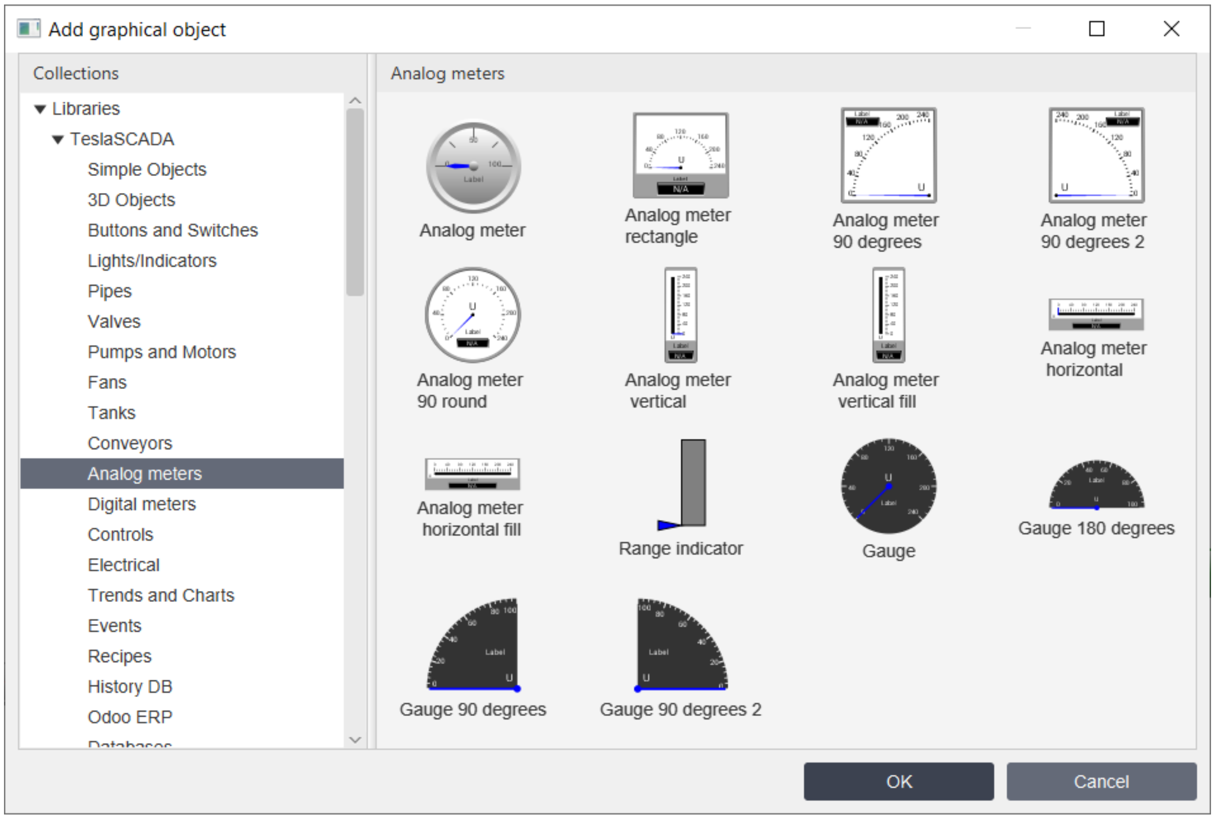
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148)

Property	ST script field	Description
Fill color	**fillcolor**	Color of the fan.
Rotation	**rotation**	Rotation(Motion) of the screw conveyer - right or left.

Set up Rotation ind. properties to rotate(movement) conveyer. Also it's possible to use speed property in ST script for changing speed animation. For vector graphic it's changed proportional of the value. For gif animation that depends on the value. For speed below 5000 used fast speed animation, for speed is equal 5000 used medium speed animation and for speed is greater than 5000 used slow speed animation.

Properties from the **"Rotarion indicator"** tab are described here 368.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.11 Analog meters library

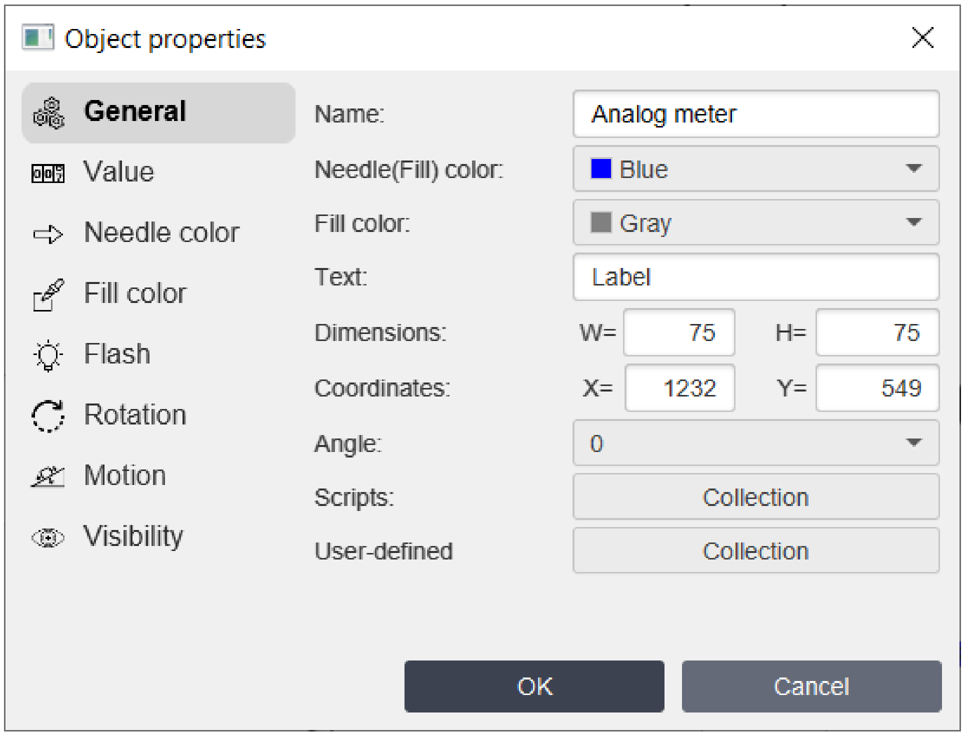


Analog meters library contains the following objects:

- Analog meter 213
- Analog meter rectangle 215
- Analog meter 90 degrees 215
- Analog meter 90 degrees 2 215
- Analog meter 90 round 215
- Analog meter vertical 215
- Analog meter vertical ?ll 215
- Analog meter horizontal 215
- Analog meter horizontal ?ll 215
- Range Indicator 214
- Gauge 215
- Gauge 180 degrees 215
- Gauge 90 degrees 215
- Gauge 90 degrees 2 215

Below you can find description 3 objects from analog meters library. The rest objects have the same properties.

6.2.3.11.1 Analog meter



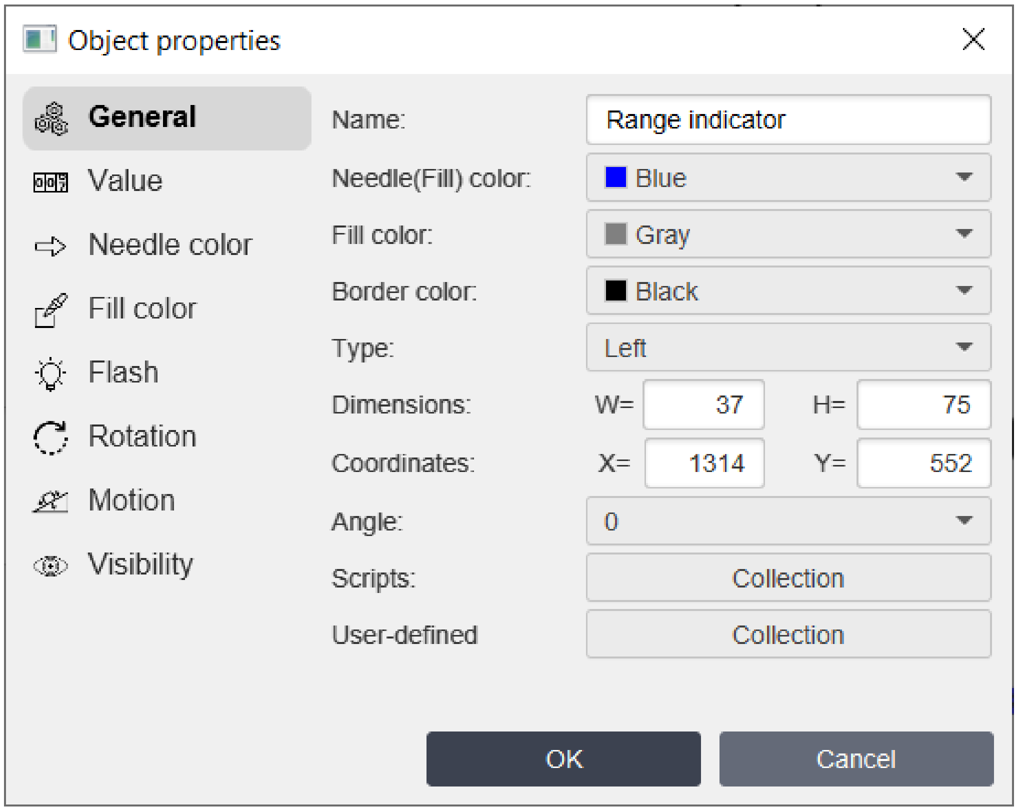
Name: Analog meter
Needle(Fill) color: Blue
Fill color: Gray
Text: Label
Dimensions: W= 75 H= 75
Coordinates: X= 1232 Y= 549
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Needle(fill) color	**color**	Color of the needle.
Fill color	**fillcolor**	Color of the meter.
Text	**text**	Text of the label.

Properties from the **"Value"** tab are described here 374.
Properties from the **"Needle color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.11.2 Range indicator



Name: Range indicator
Needle(Fill) color: Blue
Fill color: Gray
Border color: Black
Type: Left
Dimensions: W= 37 H= 75
Coordinates: X= 1314 Y= 552
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

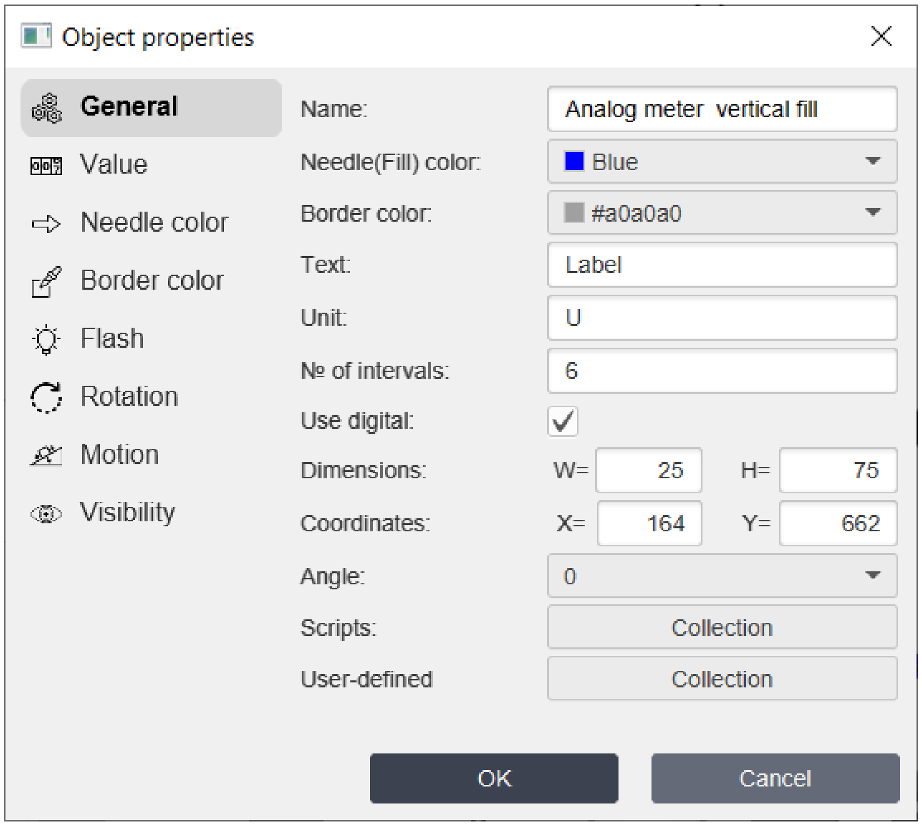
Property	ST script field	Description
Needle(fill) color	**color**	Color of the needle.
Fill color	**fillcolor**	Color of the range's background.
Border color	**bordercolor**	Color of the border.
Type	**type**	Type of the indicator: ▪ Left ▪ Right

Properties from the **"Value"** tab are described here 375.
Properties from the **"Needle color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.

Properties from the **"Visibility"** tab are described here[354].

6.2.3.11.3 Other analog meters

This section applies to the following objects: Analog meter, Analog meter rectangle, Analog meter 90 degrees, Analog meter 90 degrees 2, Analog meter 90 round, Analog meter vertical, Analog meter vertical ?ll, Analog meter horizontal, Analog meter horizontal ?ll, Gauge, Gauge 180 degrees, Gauge 90 degrees, Gauge 90 degrees 2.



Name:	Analog meter vertical fill
Needle(Fill) color:	Blue
Border color:	#a0a0a0
Text:	Label
Unit:	U
№ of intervals:	6
Use digital:	✓
Dimensions:	W= 25 H= 75
Coordinates:	X= 164 Y= 662
Angle:	0
Scripts:	Collection
User-defined	Collection

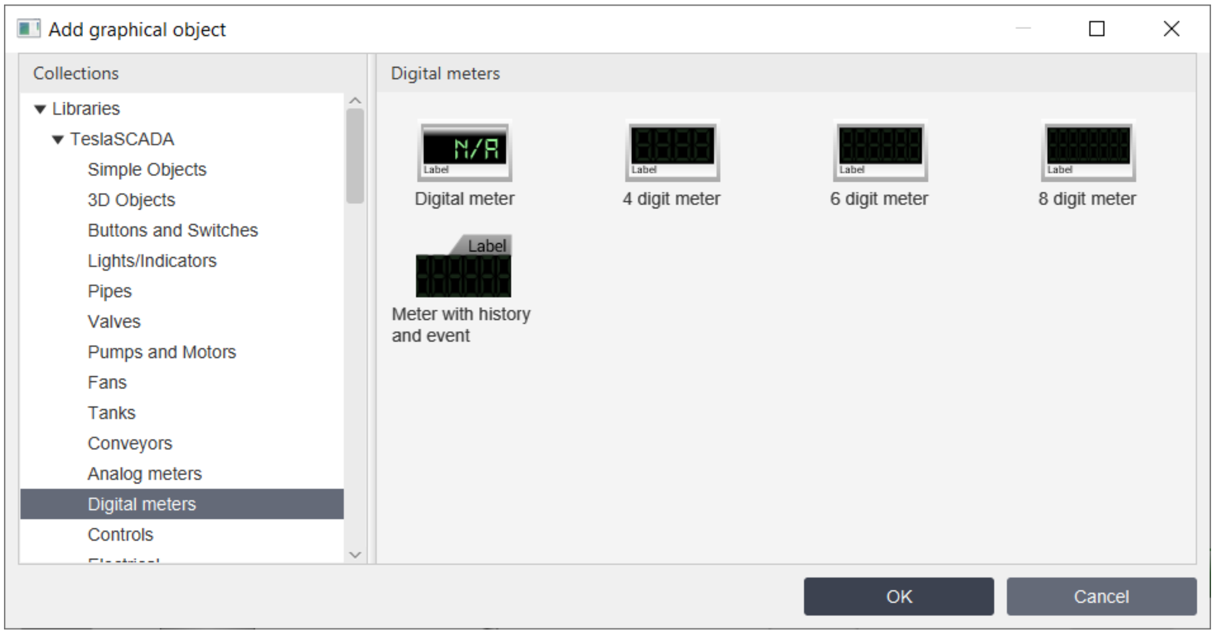
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here[148]).

Property	ST script field	Description
Color	**color**	Color of the needle.
Border color	**bordercolor**	Color of the border.
Text	**text**	Text of the label.
Unit	**unit**	Text of the measured value's unit.
? of intervals	**interval**	The number of meter's intervals.

Property	ST script field	Description
Use digital	**usedigital**	Check it if you want to use also digital meter.

Properties from the **"Value"** tab are described here 374 (for meters).
Properties from the **"Value"** tab are described here 375 (for gauges).
Properties from the **"Needle color"** tab are described here 371.
Properties from the **"Border color"** tab are described here 371.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.12 Digital meters library



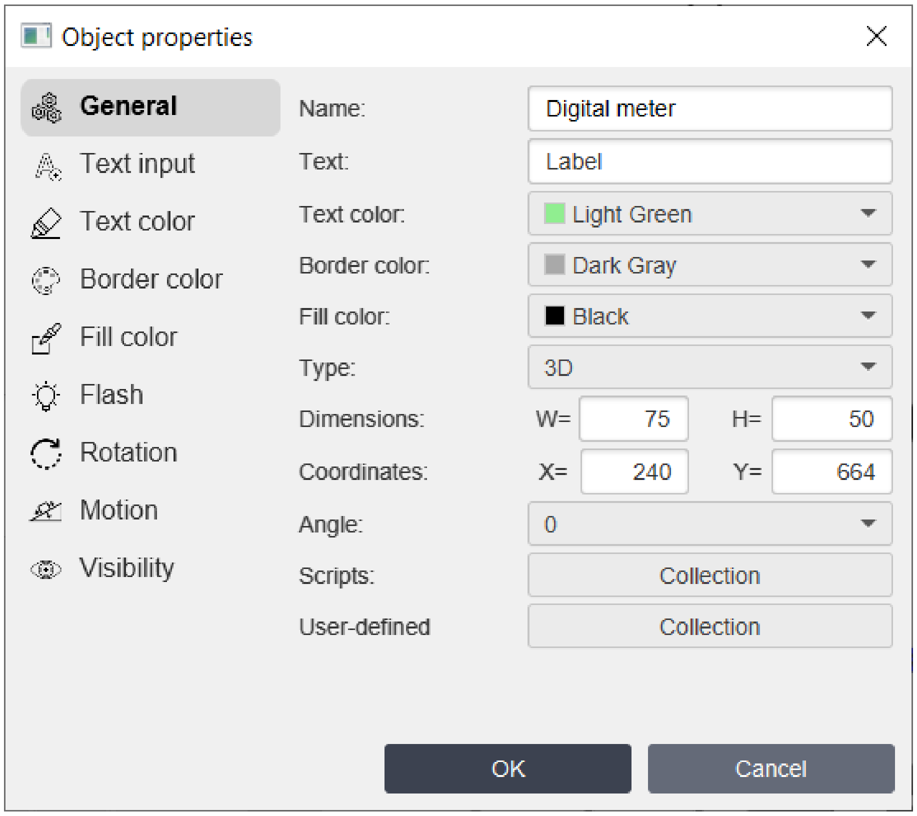
Digital meters library contains the following objects:

- Digital meter 216
- 4 digit meter 216
- 6 digit meter 216
- 8 digit meter 216
- Meter with history and event 216

All digital meters have the same general properties.

6.2.3.12.1 Digital meter

This section applies to the following objects: Digital meter, 4 digit meter, 6 digit meter, 8 digit meter, Meter with history and event.



Name: Digital meter
Text: Label
Text color: Light Green
Border color: Dark Gray
Fill color: Black
Type: 3D
Dimensions: W= 75 H= 50
Coordinates: X= 240 Y= 664
Angle: 0
Scripts: Collection
User-defined Collection

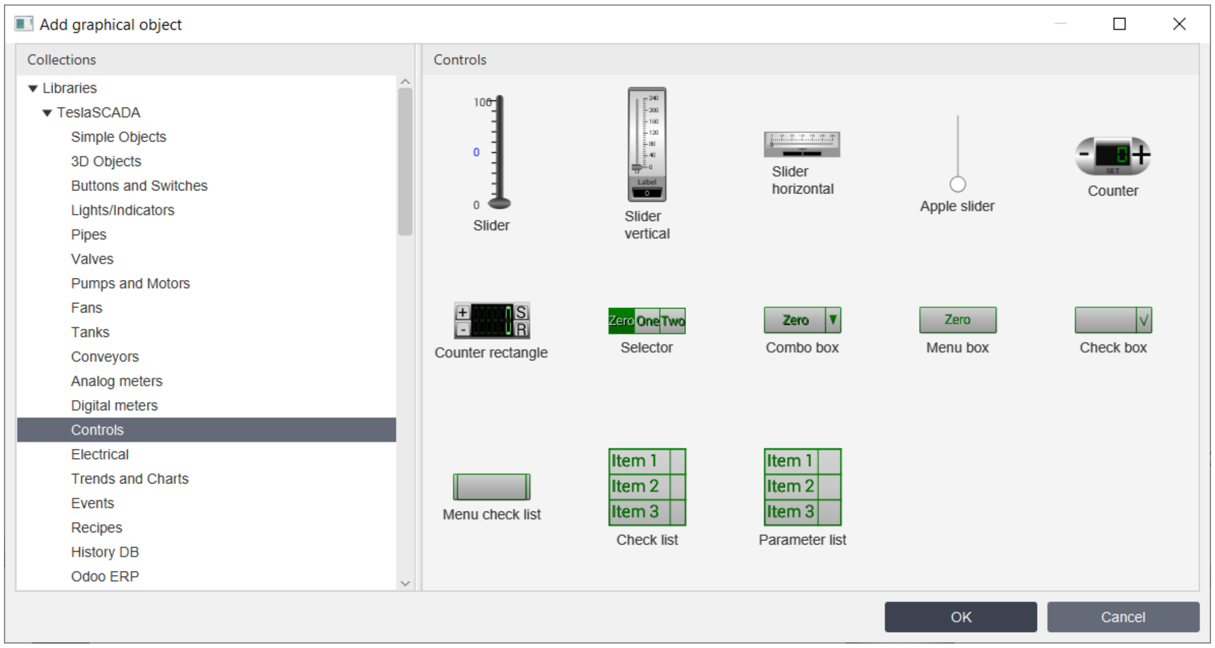
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Text	**text**	Text of the label.
Text color	**textcolor**	Color of the meter's digits.
Fill color	**fillcolor**	Color of the meter's background.
Border color	**bordercolor**	Color of the meter's border.
Side	**side**	This property only for Meter with history and event. You can choose where history trend or event table will appeare after clicking on meter.

Properties from the **"Text input"** tab are described here 364.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Border color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.

Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

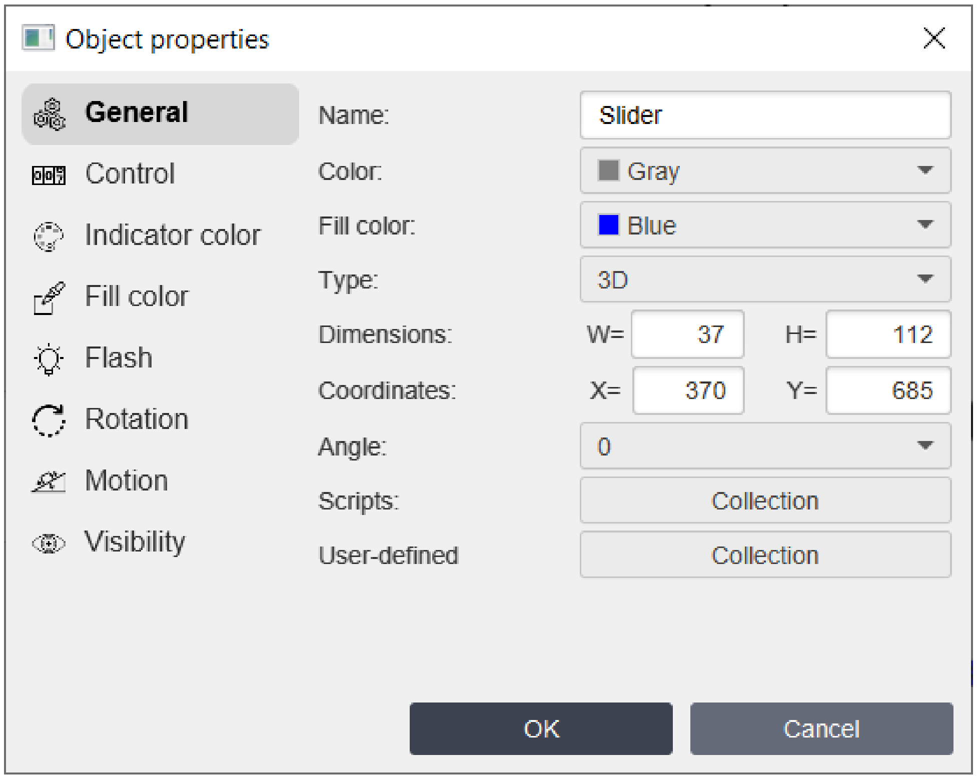
6.2.3.13 Controls library



Controls library contains the following objects:

- Slider 219
- Slider vertical 220
- Slider horizontal 220
- Counter 221
- Counter rectangle 221
- Apple slider 219
- Selector 222
- ComboBox 222
- MenuBox 223
- CheckBox 224
- MenuCheckList 226
- CheckList 224
- Parameter list 228

6.2.3.13.1 Slider and Apple slider



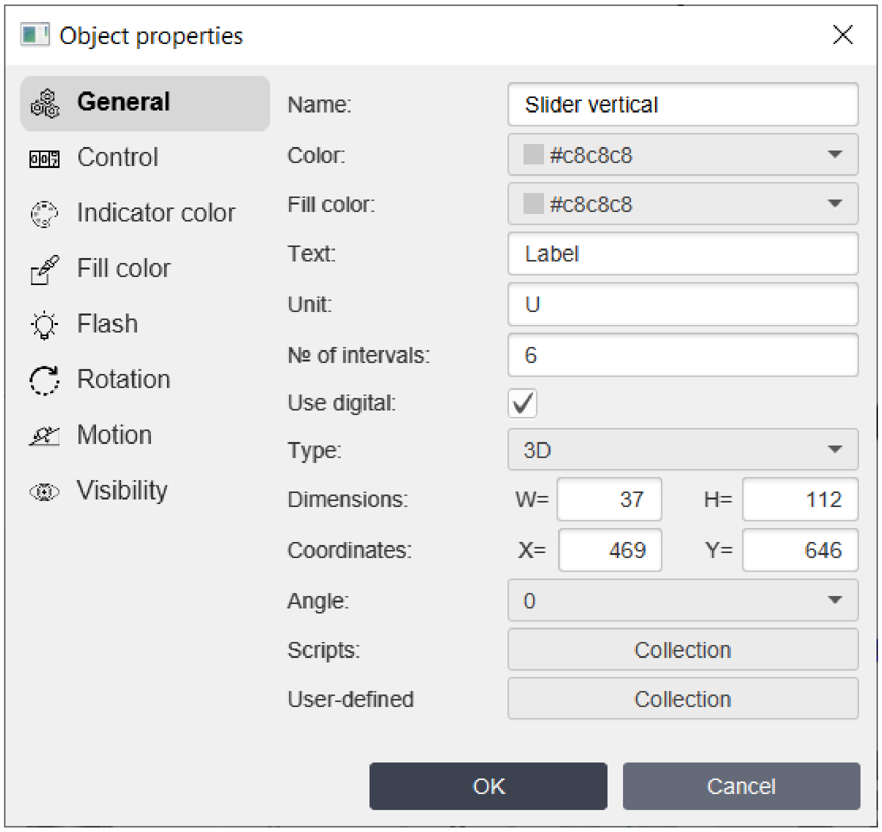
Name: Slider
Color: Gray
Fill color: Blue
Type: 3D
Dimensions: W= 37 H= 112
Coordinates: X= 370 Y= 685
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Color	**color**	Color of the slider's background.
Fill color	**fillcolor**	Color of the slider's filling.

Properties from the **"Control"** tab are described here 372.
Properties from the **"Indicator color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.13.2 Slider vertical and horizontal



Name: Slider vertical
Color: #c8c8c8
Fill color: #c8c8c8
Text: Label
Unit: U
№ of intervals: 6
Use digital: ✓
Type: 3D
Dimensions: W= 37 H= 112
Coordinates: X= 469 Y= 646
Angle: 0
Scripts: Collection
User-defined Collection

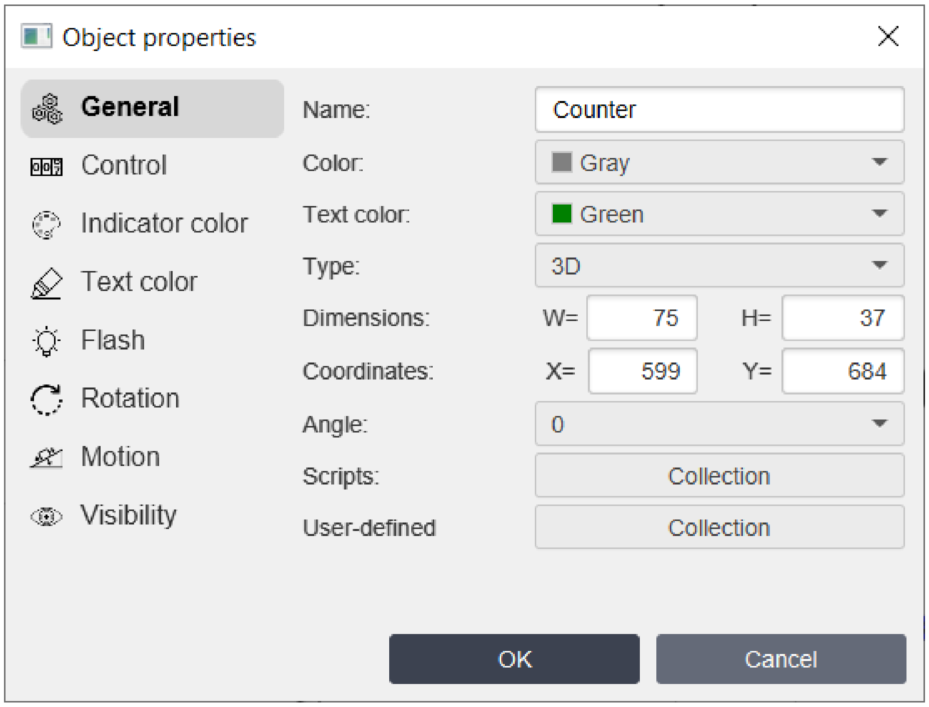
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Color	**color**	Color of the slider's background.
Fill color	**fillcolor**	Color of the slider's filling.
Text	**text**	Text of the label.
Unit	**unit**	Specify the unit of measure for the tag value
? of intervals	**interval**	The number of slider's intervals.
Use digital	**usedigital**	Check it if you want to use also digital meter.

Properties from the **"Control"** tab are described here 372.
Properties from the **"Indicator color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.

Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.13.3 Counter and Counter rectangle



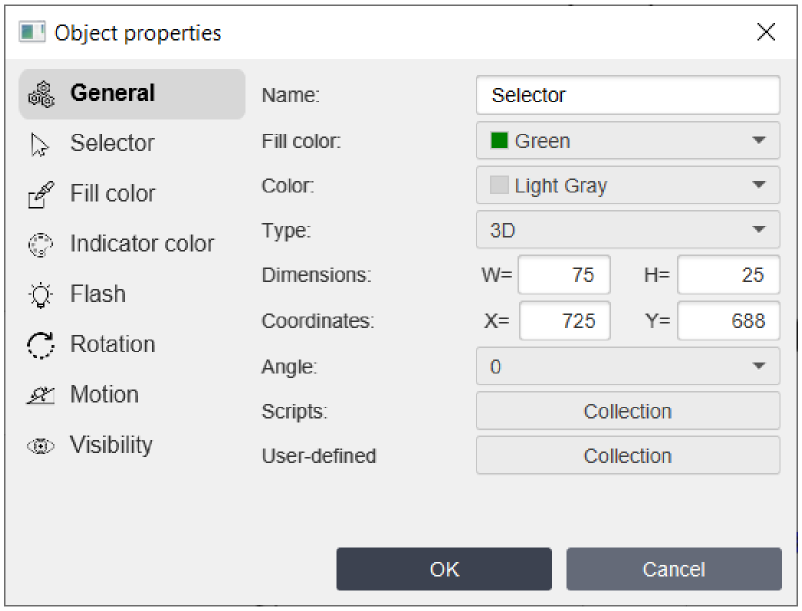
Name: Counter
Color: Gray
Text color: Green
Type: 3D
Dimensions: W= 75 H= 37
Coordinates: X= 599 Y= 684
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Color	**color**	Color of the counter's background.
Text color	**textcolor**	Color of the counter's digits.

Properties from the **"Control"** tab are described here 373.
Properties from the **"Indicator color"** tab are described here 371.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.13.4 Selector and Combo box



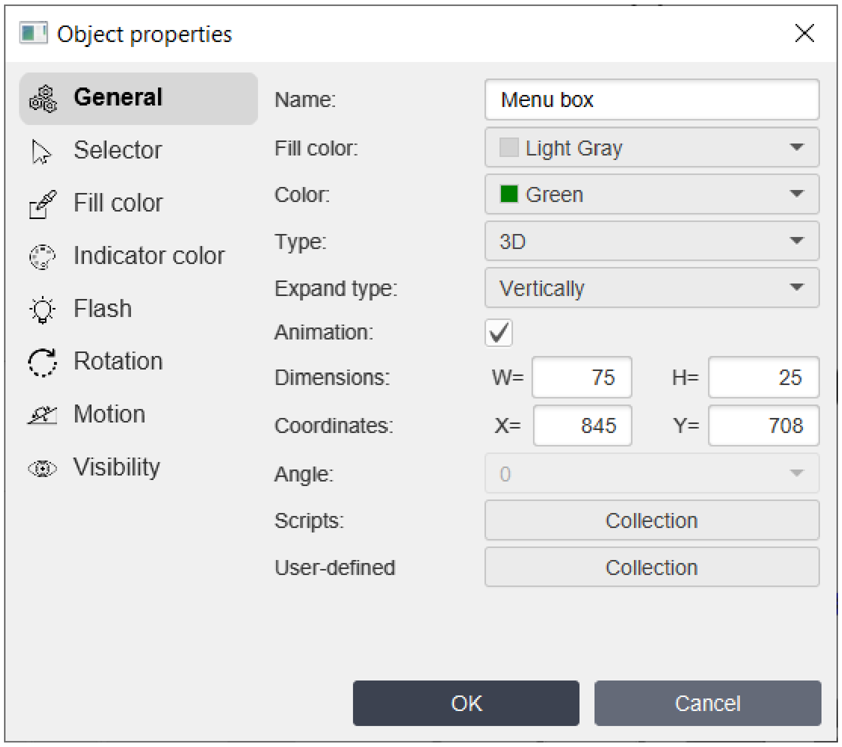
Name: Selector
Fill color: Green
Color: Light Gray
Type: 3D
Dimensions: W= 75 H= 25
Coordinates: X= 725 Y= 688
Angle: 0
Scripts: Collection
User-defined: Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Fill Color	**fillcolor**	Color of the selected object's item background .
Color	**color**	Color of the non-selected object's item background.

Properties from the **"Selector"** tab are described here 379.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Indicator color"** tab are described here 371.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.13.5 Menu box



Name: Menu box
Fill color: Light Gray
Color: Green
Type: 3D
Expand type: Vertically
Animation: ✓
Dimensions: W= 75 H= 25
Coordinates: X= 845 Y= 708
Angle: 0
Scripts: Collection
User-defined Collection

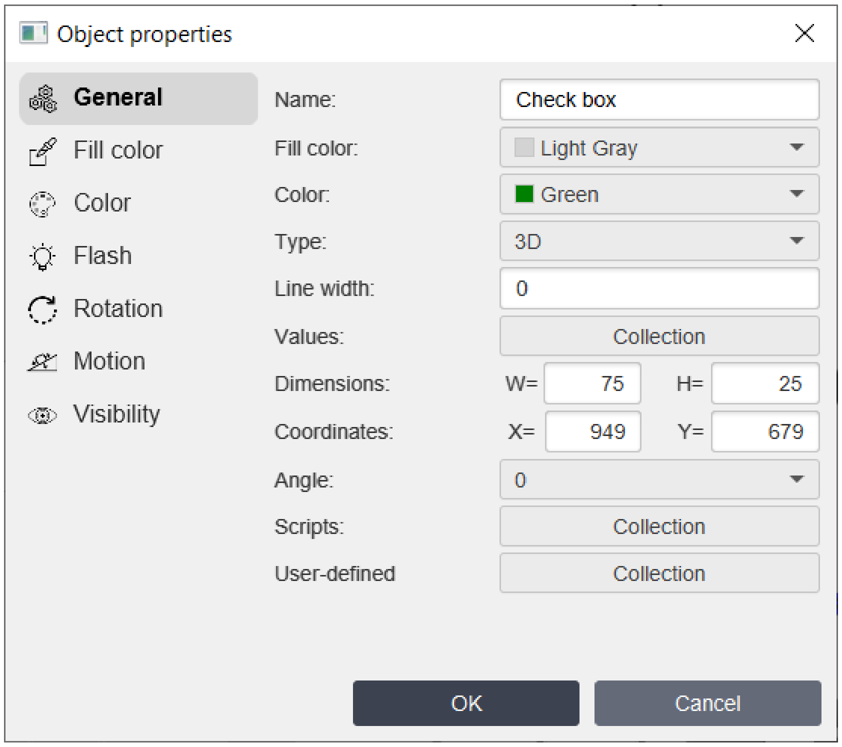
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Fill Color	**fillcolor**	Color of the selected object's item background .
Color	**color**	Color of the non-selected object's item background.
Expand type	**expandedtype**	Expanded type of the menu: ▪ horizontally ▪ vertically
Animation	**animation**	Check if you want to animate expanding of the menu.

Properties from the **"Selector"** tab are described here 379.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Indicator color"** tab are described here 371.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.

Properties from the **"Visibility"** tab are described here 354.

6.2.3.13.6 Check box and Check list

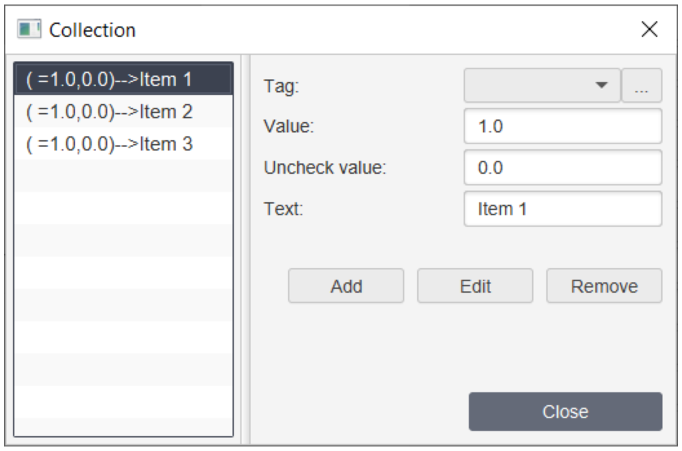


Object properties

Name: Check box
Fill color: Light Gray
Color: Green
Type: 3D
Line width: 0
Values: Collection
Dimensions: W= 75 H= 25
Coordinates: X= 949 Y= 679
Angle: 0
Scripts: Collection
User-defined: Collection

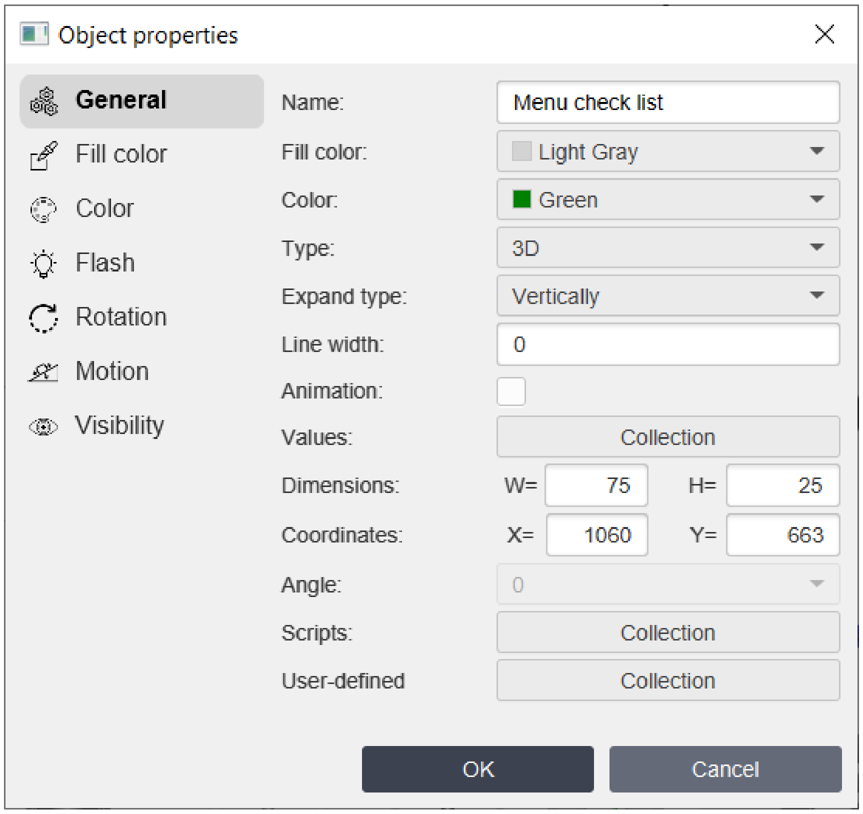
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Fill Color	**fillcolor**	Color of the selected object's item background .
Color	**color**	Color of the text.
Line width	**linewidth**	Width of the border's line.
Value		After clicking **Collection** you'll see window:

Property	ST script field	Description
		 Collection; (=1.0,0.0)-->Item 1; (=1.0,0.0)-->Item 2; (=1.0,0.0)-->Item 3; Tag: ; Value: 1.0; Uncheck value: 0.0; Text: Item 1 where: ▪ **Tag** - choose tag for the object's menu item. ▪ **Value** - value which will be written after selecting the item of the object's menu. ▪ **Uncheck value** - value which will be written after unselecting the item of the object's menu. ▪ **Text** - enter text for the object's menu item.

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Color"** tab are described here 371.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

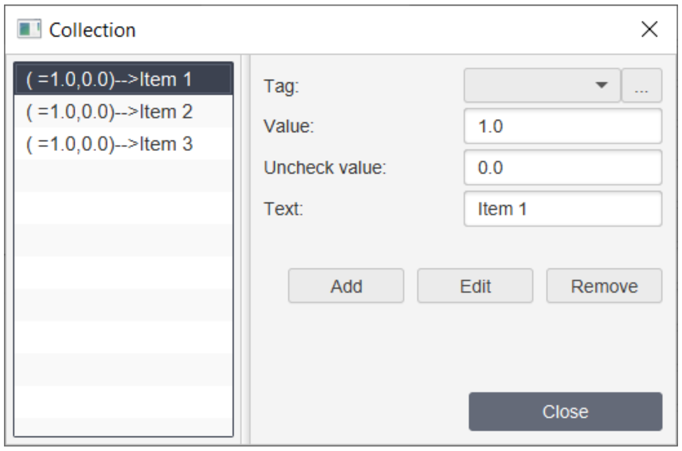
6.2.3.13.7 Menu check list



Name: Menu check list
Fill color: Light Gray
Color: Green
Type: 3D
Expand type: Vertically
Line width: 0
Animation:
Values: Collection
Dimensions: W= 75 H= 25
Coordinates: X= 1060 Y= 663
Angle: 0
Scripts: Collection
User-defined Collection

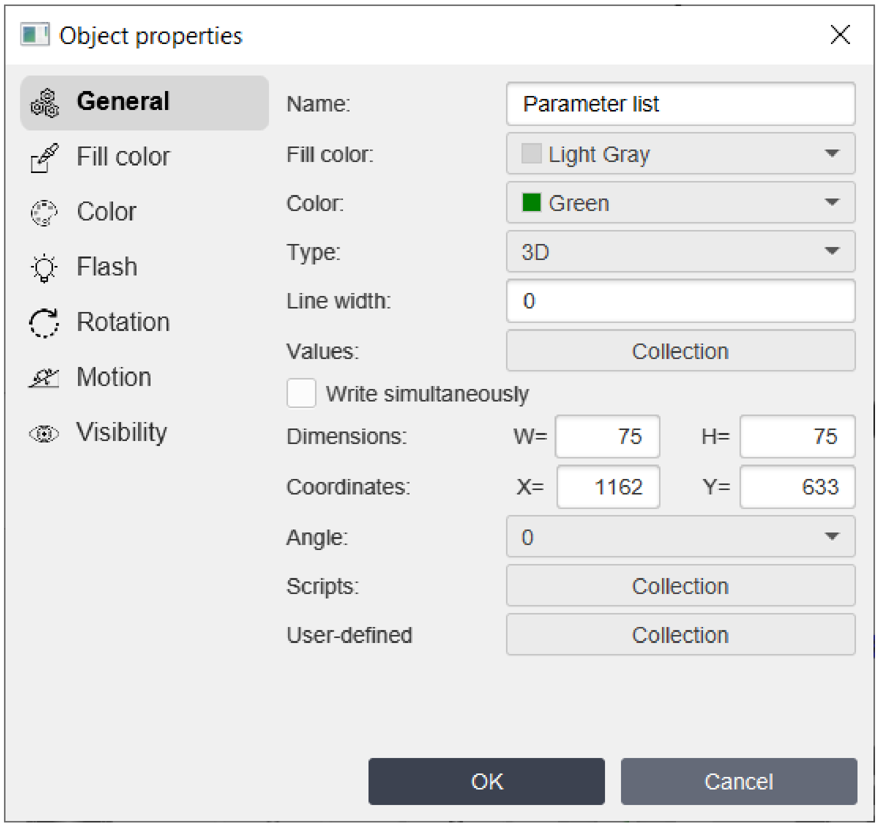
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Fill Color	**fillcolor**	Color of the selected object's item background .
Color	**color**	Color of the text.
Expand type	**expandedtype**	Expanded type of the menu: ▪ horizontally ▪ vertically
Animation	**animation**	Check if you want to animate expanding of the menu.
Line width	**linewidth**	Width of the border's line.
Value		After clicking **Collection** you'll see window:

Property	ST script field	Description
		 Collection: Tag: (empty); Value: 1.0; Uncheck value: 0.0; Text: Item 1. Items: (=1.0,0.0)-->Item 1; (=1.0,0.0)-->Item 2; (=1.0,0.0)-->Item 3. Buttons: Add, Edit, Remove, Close. where: ▪ **Tag** - choose tag for the object's menu item. ▪ **Value** - value which will be written after selecting the item of the object's menu. ▪ **Uncheck value** - value which will be written after unselecting the item of the object's menu. ▪ **Text** - enter text for the object's menu item.

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Color"** tab are described here 371.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

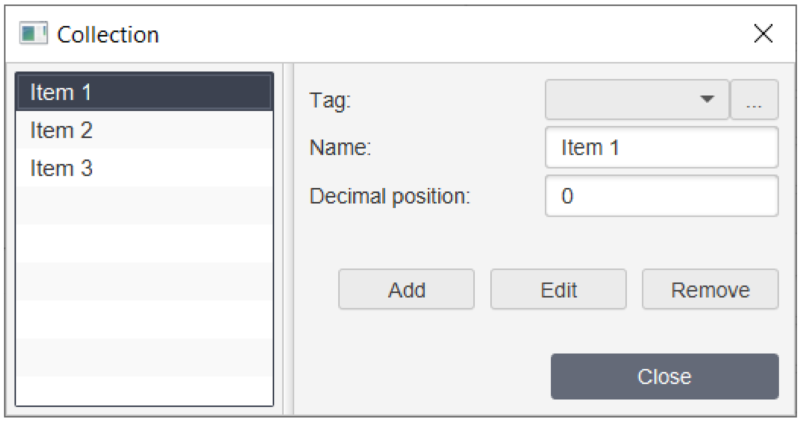
6.2.3.13.8 Parameter list



Name: Parameter list
Fill color: Light Gray
Color: Green
Type: 3D
Line width: 0
Values: Collection
Write simultaneously
Dimensions: W= 75 H= 75
Coordinates: X= 1162 Y= 633
Angle: 0
Scripts: Collection
User-defined Collection

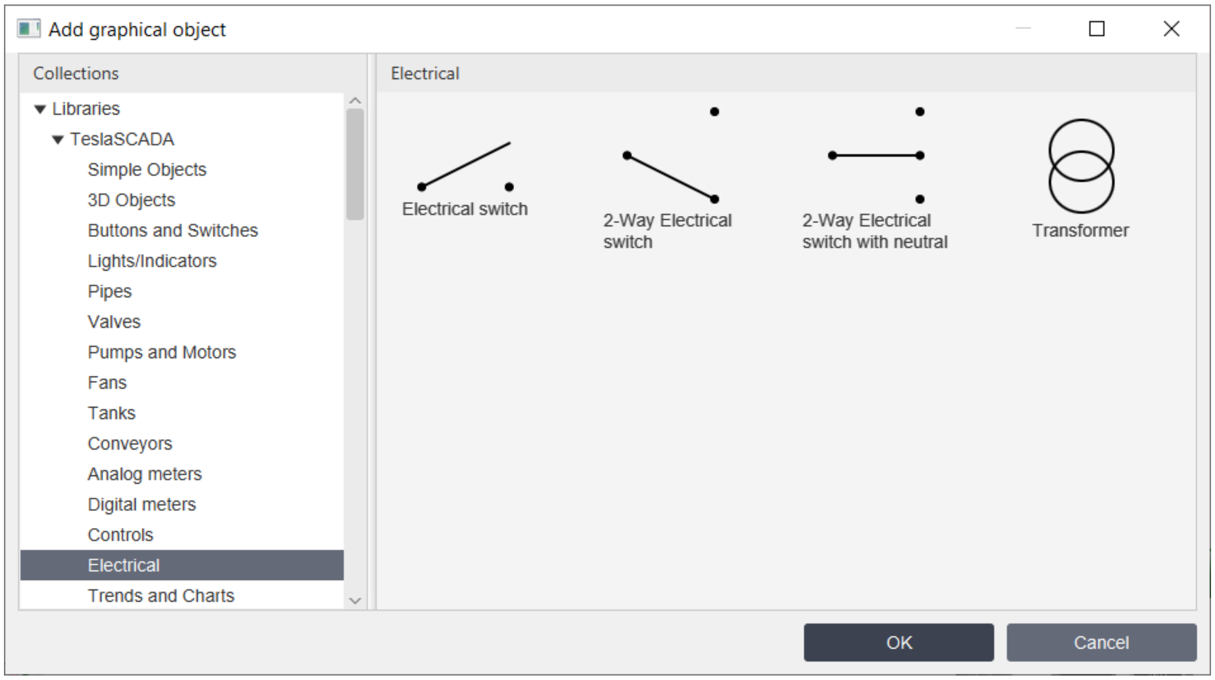
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Fill Color	**fillcolor**	Color of the selected object's item background .
Color	**color**	Color of the text.
Line width	**linewidth**	Width of the border's line.
Value		After clicking **Collection** you'll see window:

Property	ST script field	Description
		 Collection; Item 1; Item 2; Item 3; Tag: ; Name: Item 1; Decimal position: 0; Add; Edit; Remove; Close where: ▪ **Tag** - choose tag for the parameter list item. ▪ **Name** - name of the parameter list item. ▪ **Decimal position** - decimal position for the parameter list item's values.
Write simultaneously	**simultaneosly**	Check to enter values simultaneously in tags.

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Color"** tab are described here 371.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.14 Electrical library



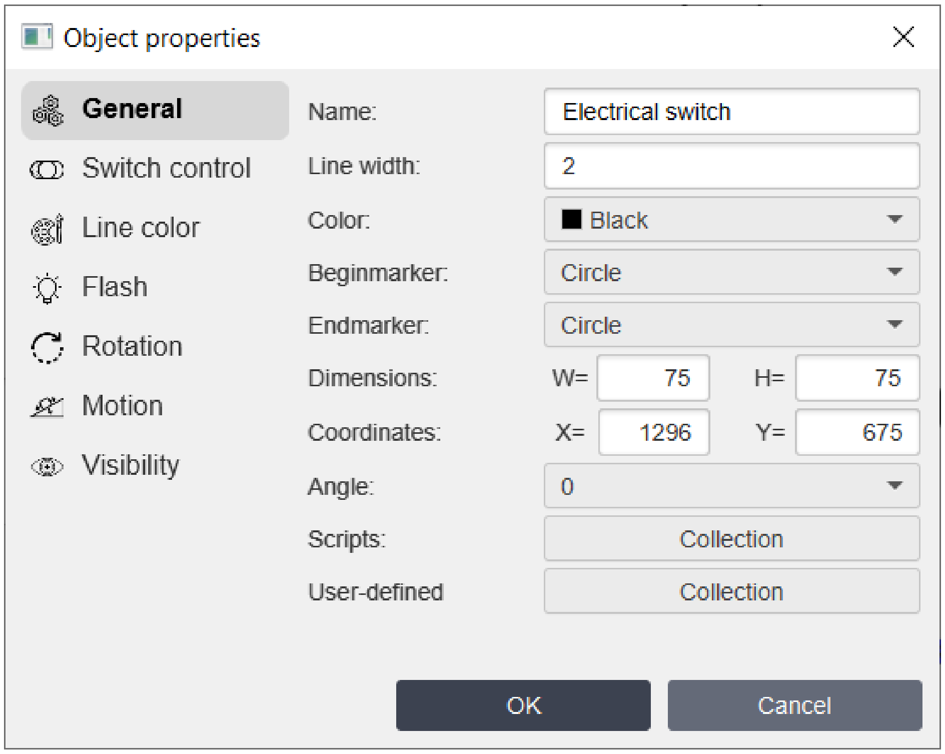
Electrical library contains the following objects:

- Electrical switch 230
- 2-Way Electrical switch 230
- 2-Way Electrical switch with neutral 230
- Transformer 232

Below description of the Electrical switch. All other switches have the same properties.

6.2.3.14.1 Electrical switch

This section applies to the following objects: Electrical switch, 2-Way Electrical switch, 2-Way Electrical switch with neutral.



Name: Electrical switch
Line width: 2
Color: Black
Beginmarker: Circle
Endmarker: Circle
Dimensions: W= 75 H= 75
Coordinates: X= 1296 Y= 675
Angle: 0
Scripts: Collection
User-defined Collection

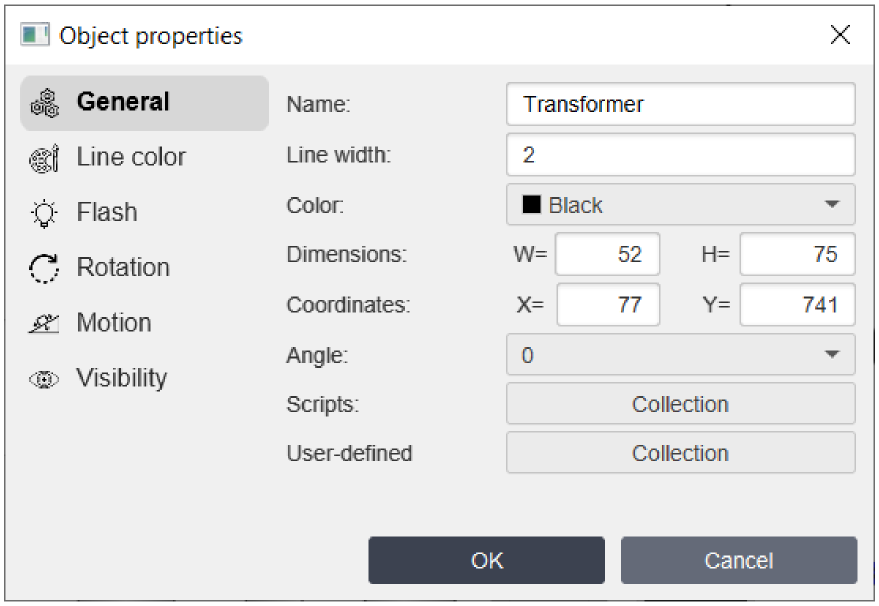
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Line width	**linewidth**	Width of the switch line.
Color	**color**	Color of the switch line.
Beginmarker	**beginmarker**	Marker of the switch line's begin: ▪ Flat ▪ Arrow ▪ Square ▪ Circle
Endmarker	**endmarker**	Marker of the switch line's end: ▪ Flat ▪ Arrow ▪ Square ▪ Circle

Properties from the **"Switch control"** tab are described here 377.
Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Flash"** tab are described here 350.

Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.14.2 Transformer



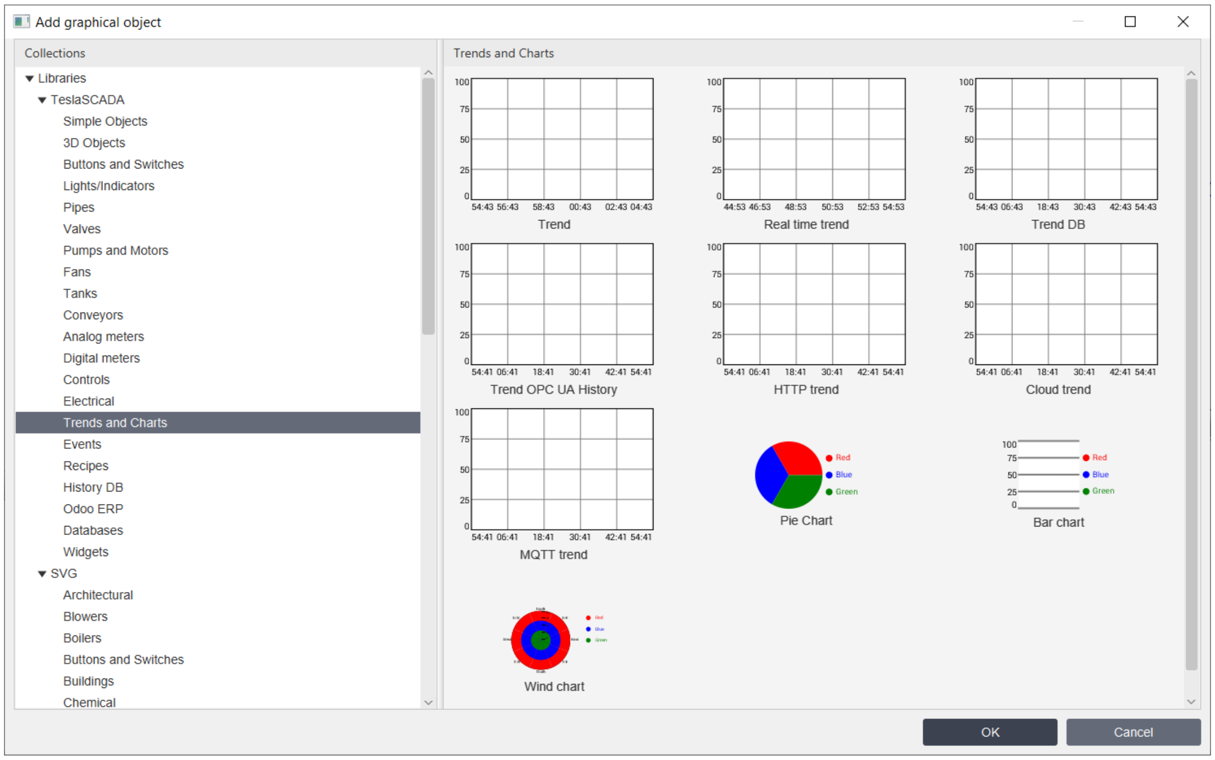
Name: Transformer
Line width: 2
Color: Black
Dimensions: W= 52 H= 75
Coordinates: X= 77 Y= 741
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Line width	**linewidth**	Width of the transformer's line.
Color	**color**	Color of the transformer's line.

Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.15 Trends and Charts library



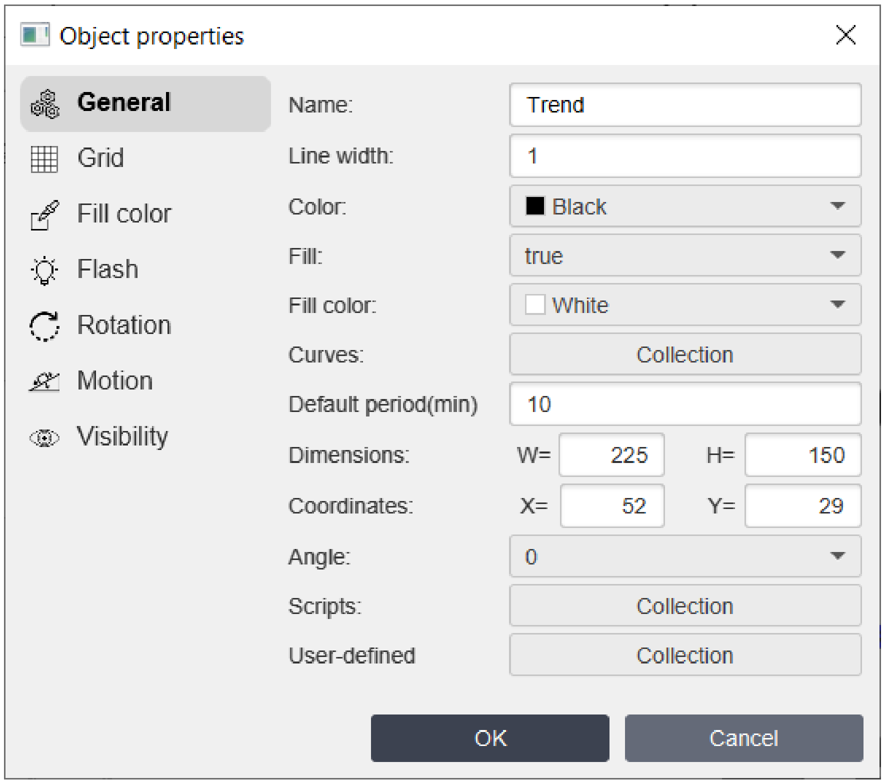
Trends library contains the following objects:

- Trend 233
- Real time trend 233
- Trend DB 233
- Trend OPC UA History 233
- HTTP trend 233
- Cloud trend 233
- MQTT trend 233
- Pie Chart 237
- Bar chart 239
- Wind chart 241

Trend and Real time trend draw curves based on tags that use history data collection (check Enable history 483 in Tags properties). Trend DB draws curves based on tags that use data stored in general database 110 (check Store in DB 483 in Tags properties). Trend OPC UA History draws curves based on tags that are binded to OPC UA nodes supported Historyzing property. All trends have the same General and Grid group properties. Below we'll describe them only for one graphical object - Trend.

6.2.3.15.1 Trend

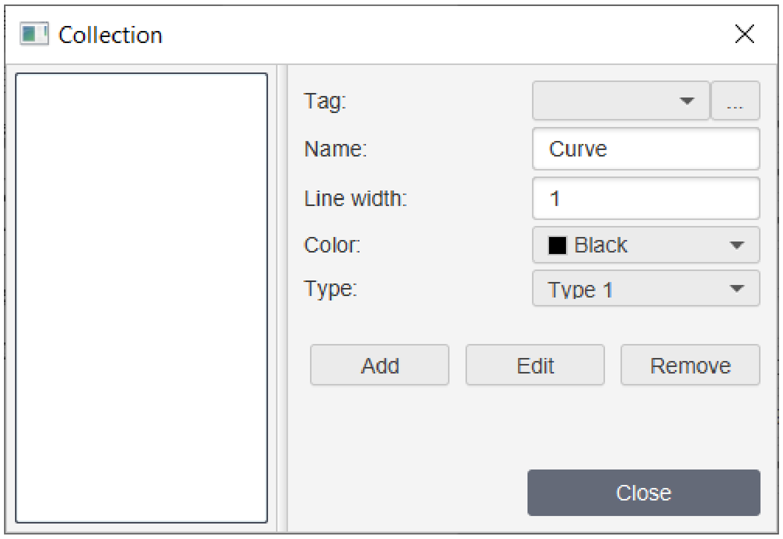
This section applies to the following objects: Trend, Real time trend, Trend DB, Trend OPC UA History, HTTP trend, Cloud trend, MQTT trend.



Name: Trend
Line width: 1
Color: Black
Fill: true
Fill color: White
Curves: Collection
Default period(min) 10
Dimensions: W= 225 H= 150
Coordinates: X= 52 Y= 29
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Propert y	ST script field	Description
Line width	**linewid th**	Width of the border's line.
Color	**color**	Color of the border's line.
Fill	**fill**	Select fill or not fill trend.
Fill color	**fillcolor**	Fill color of the trend.
Curves		After clicking **Collection** you'll see window:

Propert y	ST script field	Description
		 Collection; Tag: ; Name: Curve; Line width: 1; Color: ■ Black; Type: Type 1 where: ▪ **Tag** - tag that you want to bind to this curve. ▪ **Name** - name of the curve. ▪ **Line with** - curve's line width. ▪ **Color** - curve's line color. ▪ **Type** - line's type: ✓Type 1 - just draw the line. ✓Type 2 - draw line with ?lling till axis X. ✓Type 3 - draw a ladder line. ✓Type 4 - draw a ?lled ladder line.
Default period (min)	**default period**	Default time period of the trend (end time - begin time).
History DB *		History database name of the HTTP server for HTTP history DB trend.
Auto refresh *		Check it if you want to auto refresh HTTP history DB trend.

*** Available only in HTTP history DB trend.**

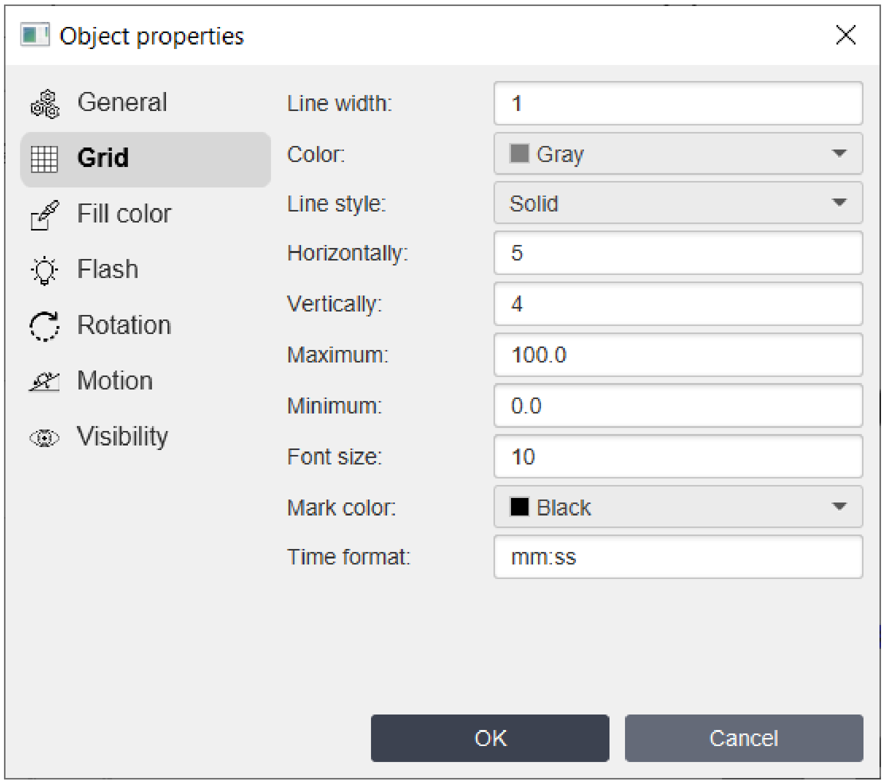
Also Trend object has several properties that you can't setup by using settings dialog window, but you can setup by using ST script:

- **begin** - start time for trend information. Time is represented in minutes from current period. (start time = current time - begin).

- **end** - ?nish time for trend information. Time is represented in minutes from current period. (?nish time = current time - end).
- **title** - title for the trend's report representation.
- **? lename** - name of the report's ?le.
- **number** - report's frequency of writing values.
- **savereport** - when this value become true trend's report will be created.
- **begindatetime** - start time for trend information. Time is represented in milliseconds from 1 January 1970.
- **enddatetime** - ?nish time for trend information. Time is represented in milliseconds from 1 January 1970.
- **disablesavereport** - disable "Save report" button in the dialog.
- **disableprint** - disable "Print" report button in the dialog.

Properties from the **"Grid"** tab are described here 236.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

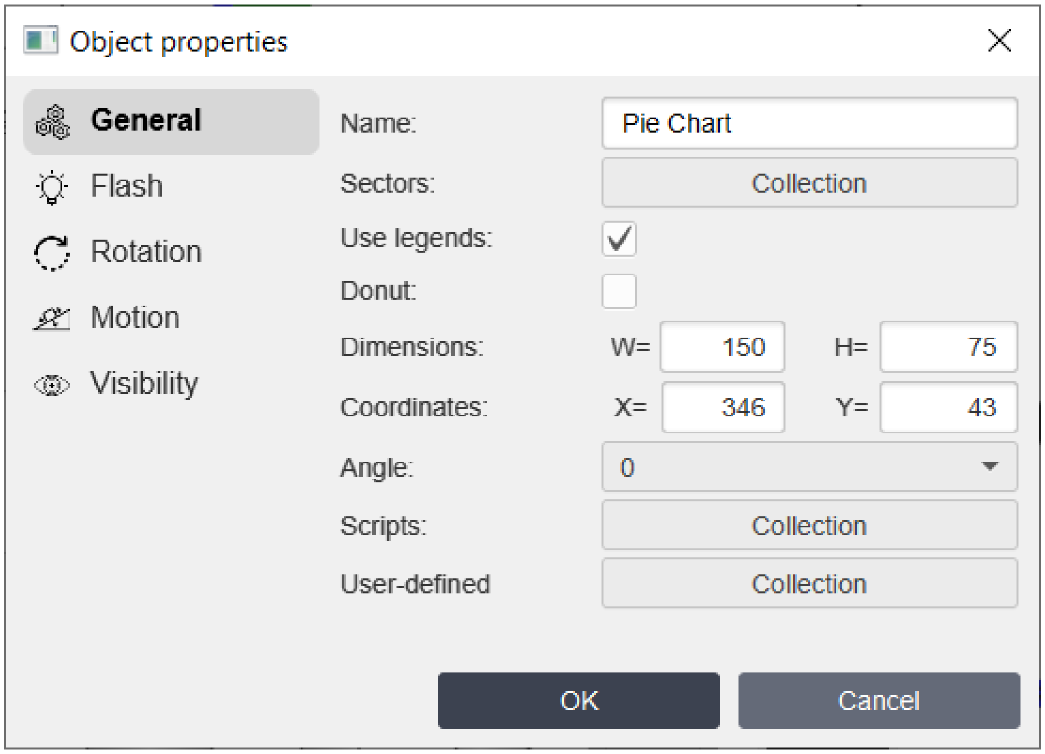
6.2.3.15.1.1 Grid



Line width: 1
Color: Gray
Line style: Solid
Horizontally: 5
Vertically: 4
Maximum: 100.0
Minimum: 0.0
Font size: 10
Mark color: Black
Time format: mm:ss

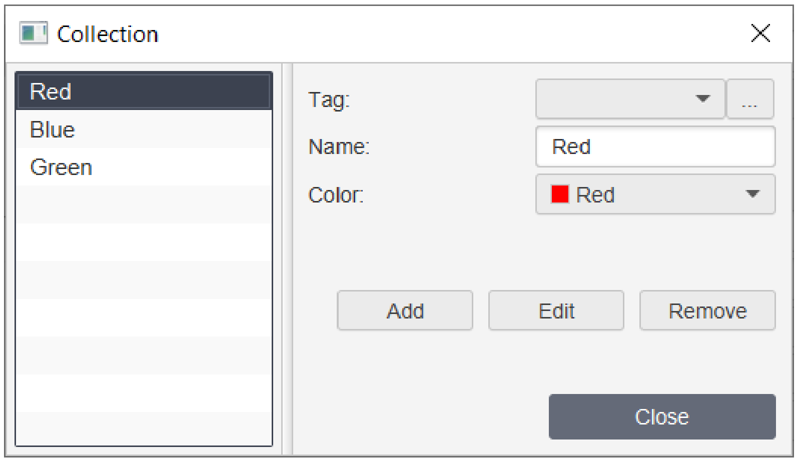
Property	ST script field	Description
Line width		Width of grid’s lines .
Color	**gridlinecolor**	Color of grid's lines.
Line style	**linestyle**	Style of the line: ▪ Solid ▪ Dash ▪ Dot ▪ DashDot
Horizontally	**horizontally**	Number of trend’s horizontal grid lines.
Vertically	**vertically**	Number of trend’s vertical grid lines.
Maximum	**maximum**	Maximum of the trend's value.
Minimum	**minimum**	Minimum of the trend's value.
Font size	**fontsize**	Font size of the trend's marks.
Mark color	**markcolor**	Color of the marks.
Time format	**timeformat**	Time format of the trend's time.

6.2.3.15.2 Pie chart



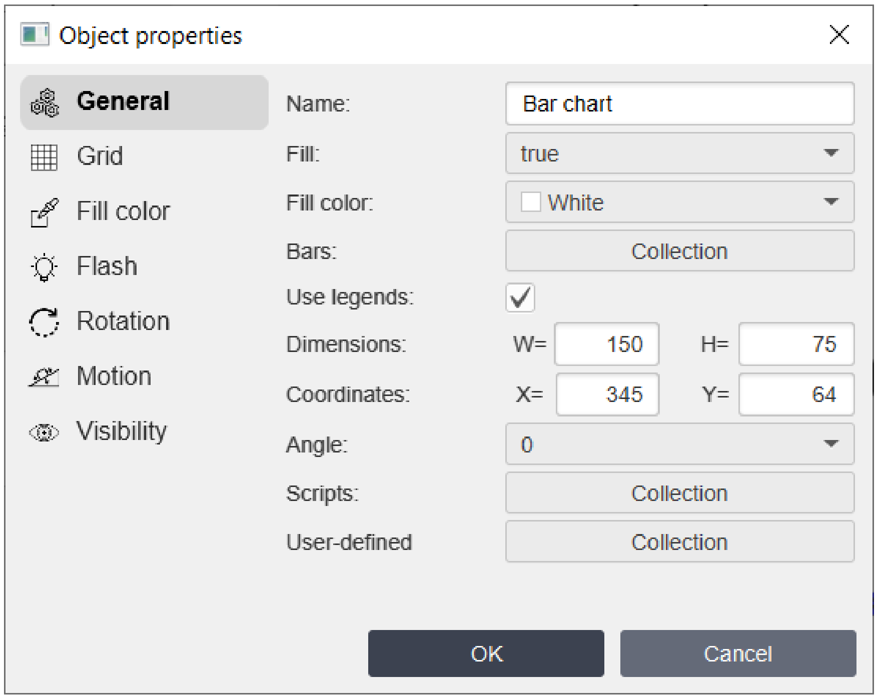
Name: Pie Chart
Sectors: Collection
Use legends: ✓
Donut: ☐
Dimensions: W= 150 H= 75
Coordinates: X= 346 Y= 43
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Proper ty	ST script field	Description
Sector s		After clicking **Collection** you'll see window:  Collection / Red / Blue / Green / Tag: / Name: Red / Color: 🟥 Red / Add / Edit / Remove / Close where: ▪ **Tag** - tag that you want to bind to this chart's sector. ▪ **Name** - name of the sector. ▪ **Color** - sector's color.
Use legend s	useleg ends	Check it if you want to add legends to the chart.
Donut	donut	Check it if you want to use ring type chart.

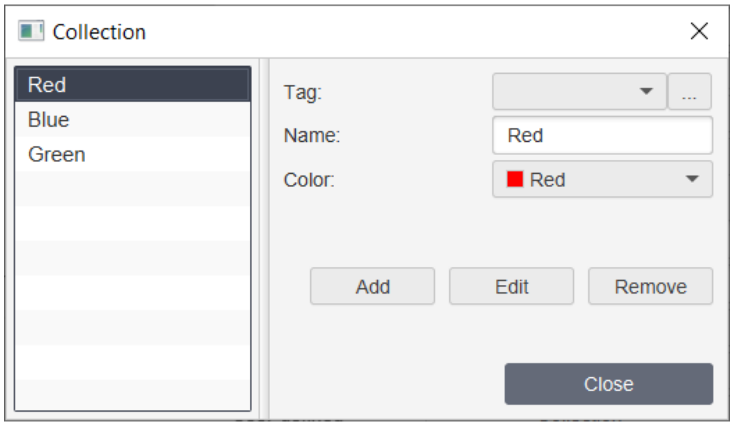
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.15.3 Bar chart


Object properties

Name: Bar chart
Fill: true
Fill color: White
Bars: Collection
Use legends: ✓
Dimensions: W= 150 H= 75
Coordinates: X= 345 Y= 64
Angle: 0
Scripts: Collection
User-defined Collection

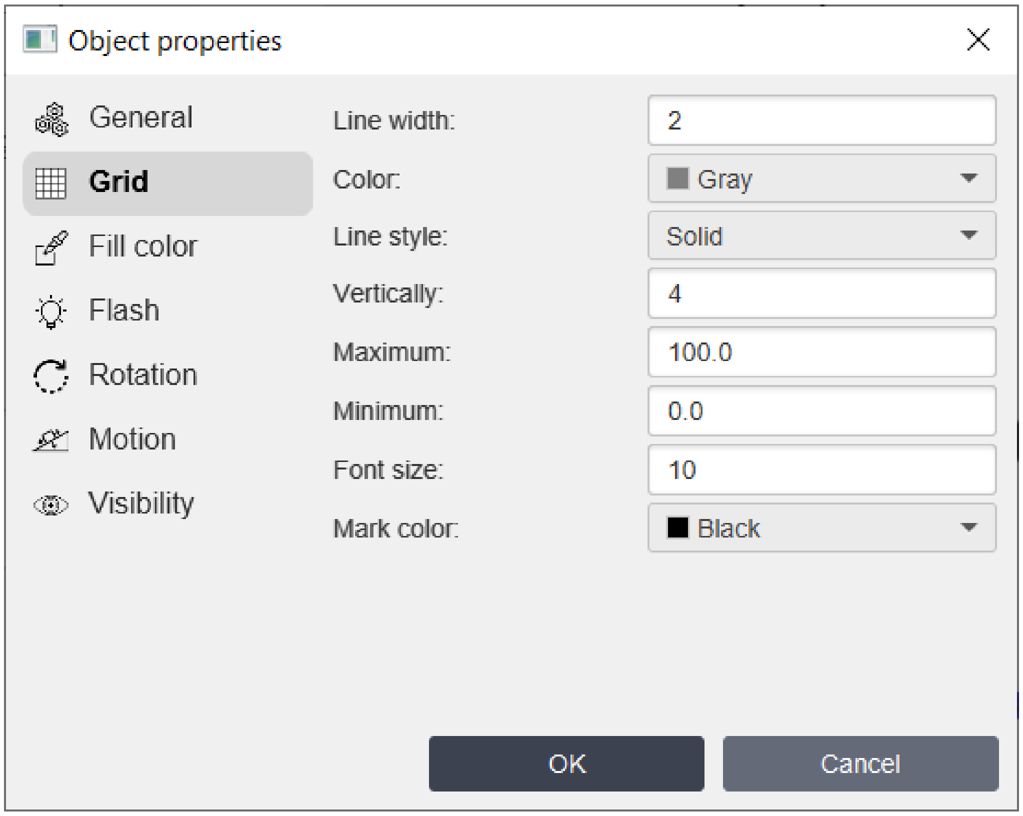
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Fill	**fill**	Select fill or not fill bar chart.
Fill color	**fillcolor**	Fill color of the bar chart.
Bars		After clicking **Collection** you'll see window:  Collection; Red; Blue; Green; Tag: ; Name: Red; Color: 🟥 Red; Add; Edit; Remove; Close where:

Property	ST script field	Description
		▪ **Tag** - tag that you want to bind to this bar. ▪ **Name** - name of the bar chart. ▪ **Color** - bar's color.
Use legends	**uselegends**	Check it if you want to add legends to the bar chart.

Properties from the **"Grid"** tab are described here 240.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.15.3.1 Grid

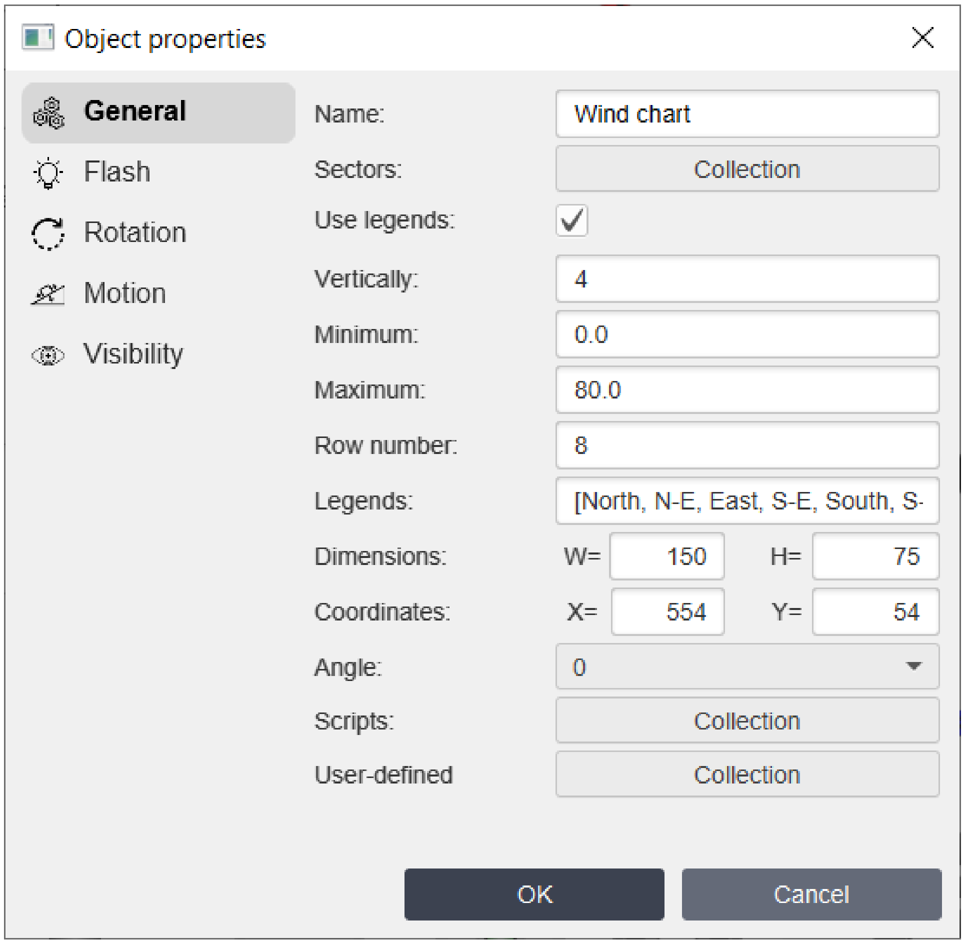


Line width: 2
Color: Gray
Line style: Solid
Vertically: 4
Maximum: 100.0
Minimum: 0.0
Font size: 10
Mark color: Black

Property	ST script field	Description
Line width		Width of grid’s lines .

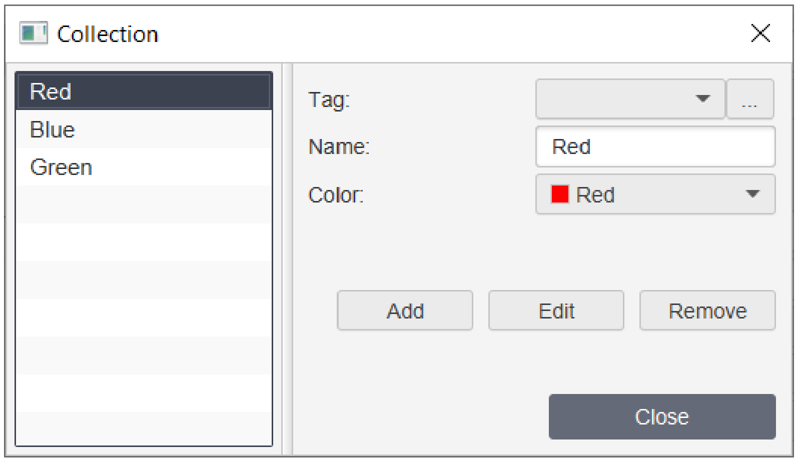
Property	ST script field	Description
Color		Color of grid's lines.
Line style	**linestyle**	Style of the line: ▪ Solid ▪ Dash ▪ Dot ▪ DashDot
Vertically	**vertically**	Number of trend's vertical grid lines.
Maximum	**maximum**	Maximum of the bar chart's value.
Minimum	**minimum**	Minimum of the bar chart's value.
Font size	**fontsize**	Font size of the trend's marks.
Mark color	**markcolor**	Color of the marks.

6.2.3.15.4 Wind chart



Name:	Wind chart
Sectors:	Collection
Use legends:	✓
Vertically:	4
Minimum:	0.0
Maximum:	80.0
Row number:	8
Legends:	[North, N-E, East, S-E, South, S-
Dimensions:	W= 150 H= 75
Coordinates:	X= 554 Y= 54
Angle:	0
Scripts:	Collection
User-defined	Collection

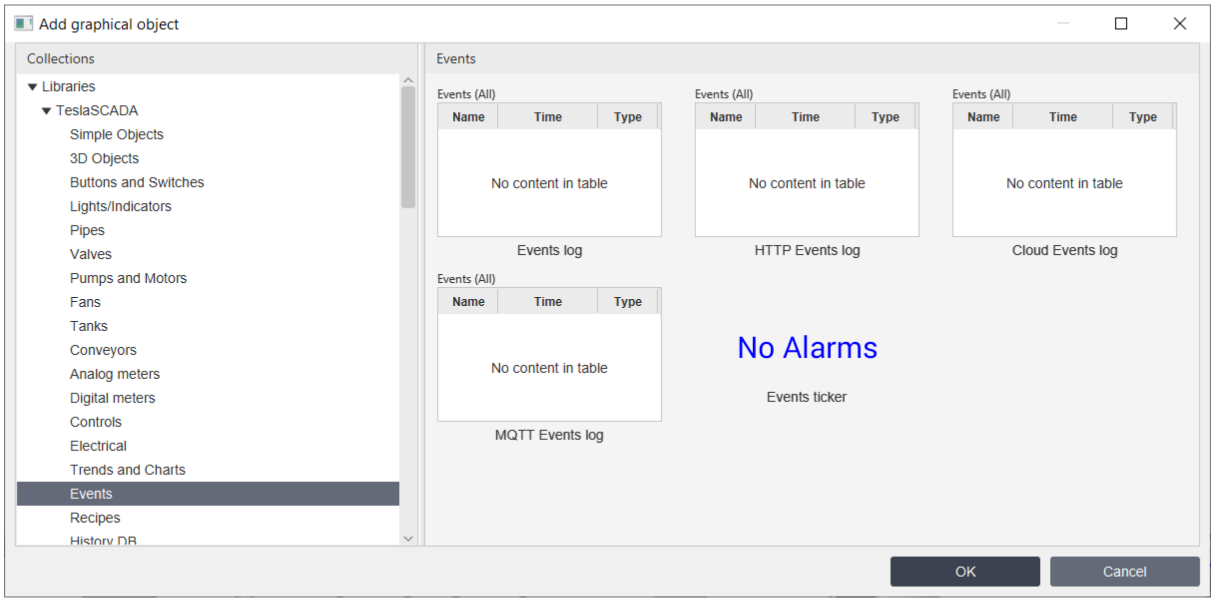
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Sectors		After clicking **Collection** you'll see window:  where: ▪ **Tag** - tag that you want to bind to this chart's sector. ▪ **Name** - name of the sector. ▪ **Color** - sector's color.
Use legends	**uselegends**	Check it if you want to add legends to the chart.
Vertically	**vertically**	Enter number of scale ticks.
Minimum	**minimum**	Minimum of chart's value.
Maximum	**maximum**	Maximum of chart's value.
Row number	**number**	Number of wing's directions.
Legends	**legends**	Legends for wing's directions.

Properties from the **"Flash"** tab are described here 350.

Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.16 Events library



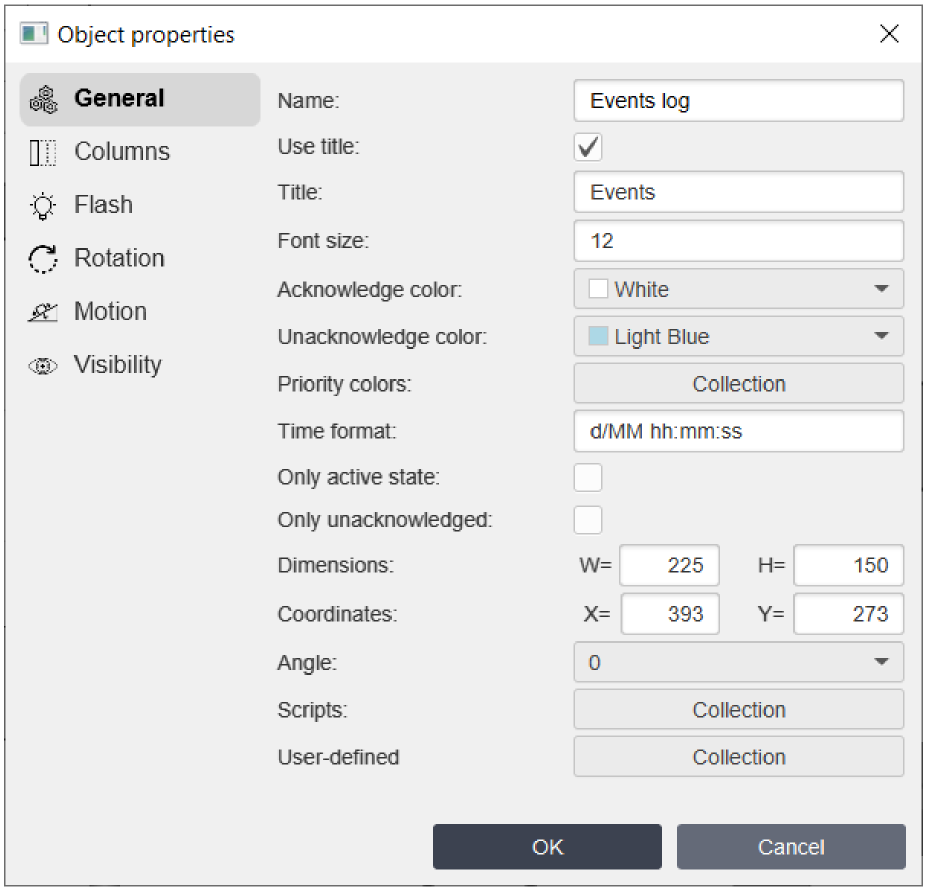
Events library contains the following object:

- Events log 243
- HTTP Events log 243
- Cloud Events log 243
- MQTT Events log 243
- Events ticker 248

Events log collects tag's events (check Enable alarms 482 and check events you want to collect in Tags properties). Events will be collected in events database. You can setup it in **Project properties->Events/History tab 110.**

6.2.3.16.1 Events log

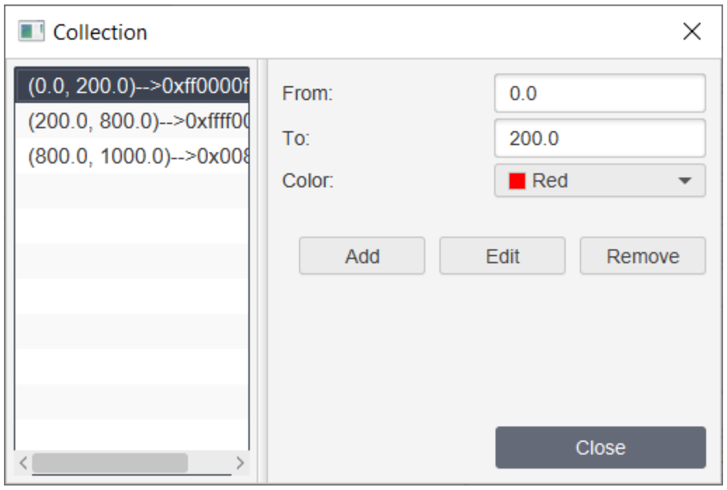
This section applies to the following objects: Events log, HTTP Events log, Cloud Events log, MQTT Events log.



Name: Events log
Use title: ✓
Title: Events
Font size: 12
Acknowledge color: White
Unacknowledge color: Light Blue
Priority colors: Collection
Time format: d/MM hh:mm:ss
Only active state:
Only unacknowledged:
Dimensions: W= 225 H= 150
Coordinates: X= 393 Y= 273
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Use title	**usetitle**	Use title for the table or not.
Title	**title**	Title of the table.
Font size	**fontsize**	Size of the text's font.
Acknowledge color	**ackcolor**	Row's background color of the acknowledged events
Unacknowledge color	**unackcolor**	Row's background color of not unacknowledged events
Priority colors		After clicking **Collection** button you'll see the window:

Property	ST script field	Description
		 Collection — (0.0, 200.0)-->0xff0000f; (200.0, 800.0)-->0xffff00; (800.0, 1000.0)-->0x008; From: 0.0; To: 200.0; Color: Red where: ▪ **From** - the priority 482 of the event from which is used this color. ▪ **To** - the priority 482 of the event to which is used this color. ▪ **Color** - color of the event text. ▪ **Add** - add a new color priority range. ▪ **Edit** - edit selected color priority range. ▪ **Remove** - remove selected color priority range.
Time format	**timeformat**	Time format of the text in time column.
Only active state	**onlyactivestate**	Display only active state of the events.
Only unacknowledged	**onlyunack**	Display only unacknowledged events.
HTTP server*		Choose HTTP server.

***Only for HTTP History DB table**

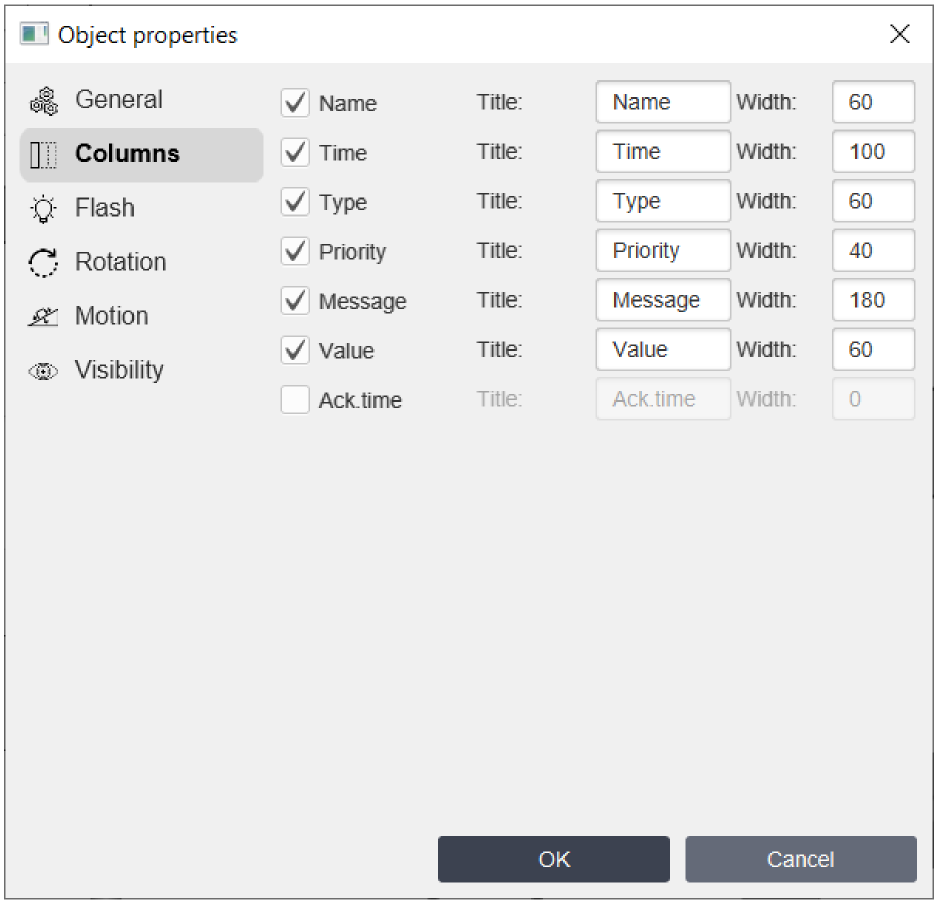
Also Event log object has several properties that you can't setup by using settings dialog box, but you can setup by using ST script:

- **begin** - start time for log information. Time represented in minutes from current period. (start time = current time - begin).
- **end** - ?nish time for log information. Time represented in minutes from current period. (?nish time = current time - end).

- **? lename** - name of the report’s ? le.
- **savereport** - when this value become true trend’s report will be created.
- **enbegin** - enable start time for the filter of the event log information.
- **enend** - enable finish time for the filter of the event log information.
- **enprbegin** - enable priority begin for the filter of the event log information.
- **enprend** - enable priority end for the filter of the event log information.
- **beginpriority** - begin priority for the filter of the event log information.
- **endpriority** - end priority for the filter of the event log information.
- **begindatetime** - start time for trend information. Time represented in milliseconds from 1 January 1970.
- **enddatetime** - ? nish time for trend information. Time represented in milliseconds from 1 January 1970.
- **disablesavereport** - disable "Save report" button in the dialog.
- **disableprint** - disable "Print" report button in the dialog.

Properties from the **"Columns"** tab are described here 247.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.16.1.1 Columns

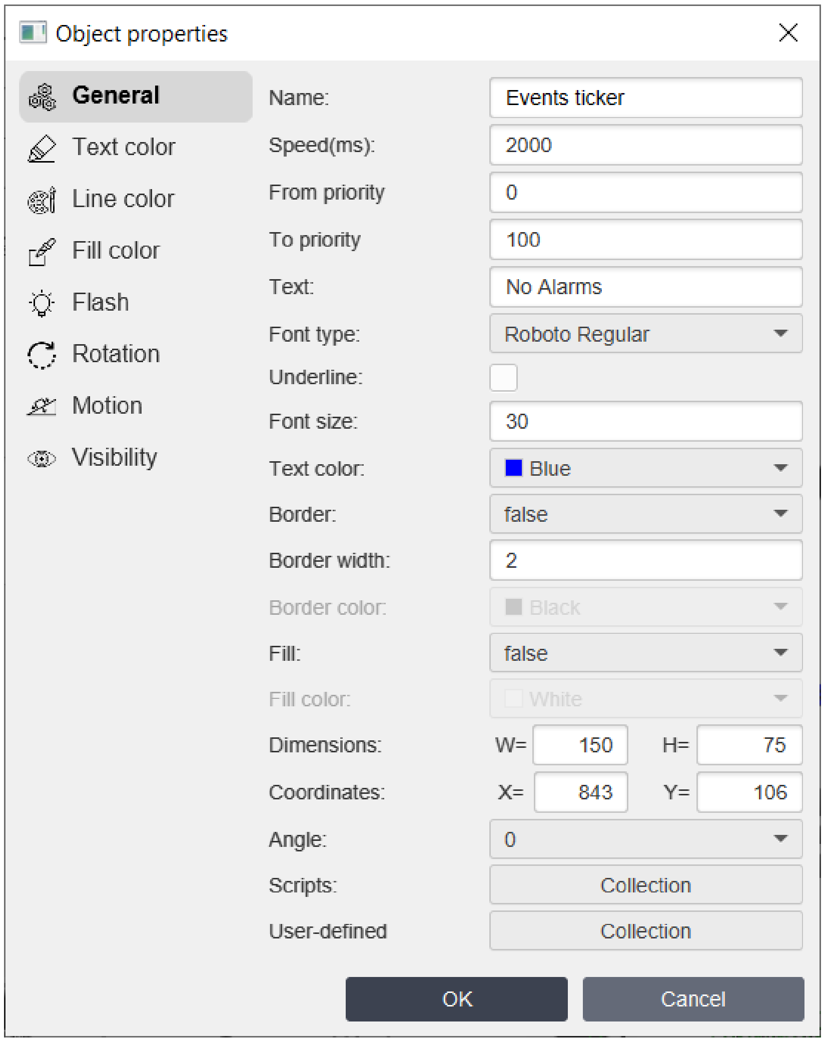


✓	Name	Title: Name	Width:	60
✓	Time	Title: Time	Width:	100
✓	Type	Title: Type	Width:	60
✓	Priority	Title: Priority	Width:	40
✓	Message	Title: Message	Width:	180
✓	Value	Title: Value	Width:	60
☐	Ack.time	Title: Ack.time	Width:	0

Property	ST script field	Description
Enable (not shown)		Enable or disable correspondent column: ▪ Name ▪ Time ▪ Type ▪ Priority ▪ Message ▪ Value ▪ Ack.time
Title	**nametitle timetitle typetitle prioritytitle messagetitle valuetitle acktimetitle**	Title of the corresponding column.

Property	ST script field	Description
Width	**namewidth timewidth typewidth prioritywidth messagewidt h valuewidth acktimewidt h**	Width of the corresponding column.

6.2.3.16.2 Events ticker



Name:	Events ticker
Speed(ms):	2000
From priority	0
To priority	100
Text:	No Alarms
Font type:	Roboto Regular
Underline:	☐
Font size:	30
Text color:	Blue
Border:	false
Border width:	2
Border color:	Black
Fill:	false
Fill color:	White
Dimensions:	W= 150 H= 75
Coordinates:	X= 843 Y= 106
Angle:	0
Scripts:	Collection
User-defined	Collection

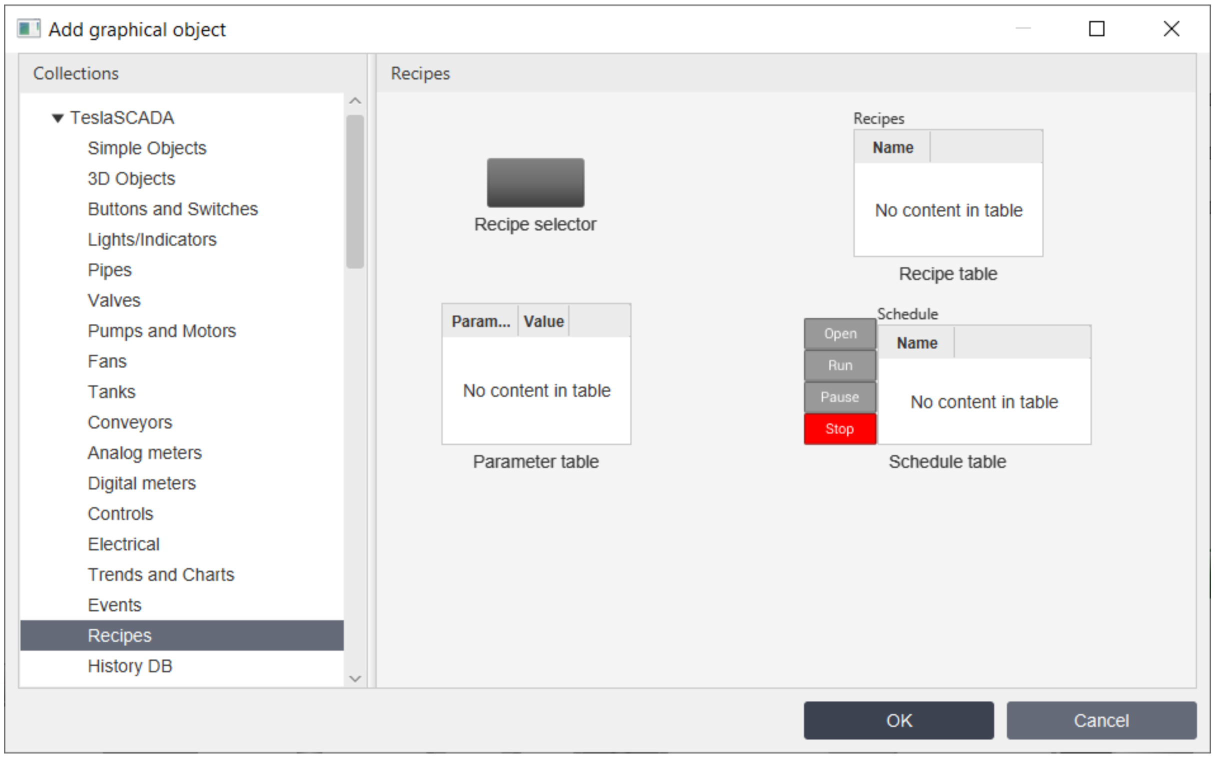
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Speed(ms)	**speed**	Speed of the running text.
From priority	**beginpriority**	Begin priority of the shown events.
To priority	**endpriority**	End priority of the shown events.
Text	**defaulttext**	Default text displayed. It's shown if events in selected priority range are not available.
Font type	**fonttype**	Type of the text's font.
Underline	**underline**	Check if you want to underline the text.
Font size	**fontsize**	Size of the text's font.
Text color	**textcolor**	Color of the text.
Border	**useborder**	Select use or not use border for the text.
Border width	**linewidth**	Width of the border's line.
Border color	**bordercolor**	Color of the border's line.
Fill	**fill**	Select fill or not fill text's background.
Fill color	**fillcolor**	Color of the text's background.

Also for all text/editfield objects you can use fields in ST scripts:
- **eventscount** - number of events are shown in the events ticker.

Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

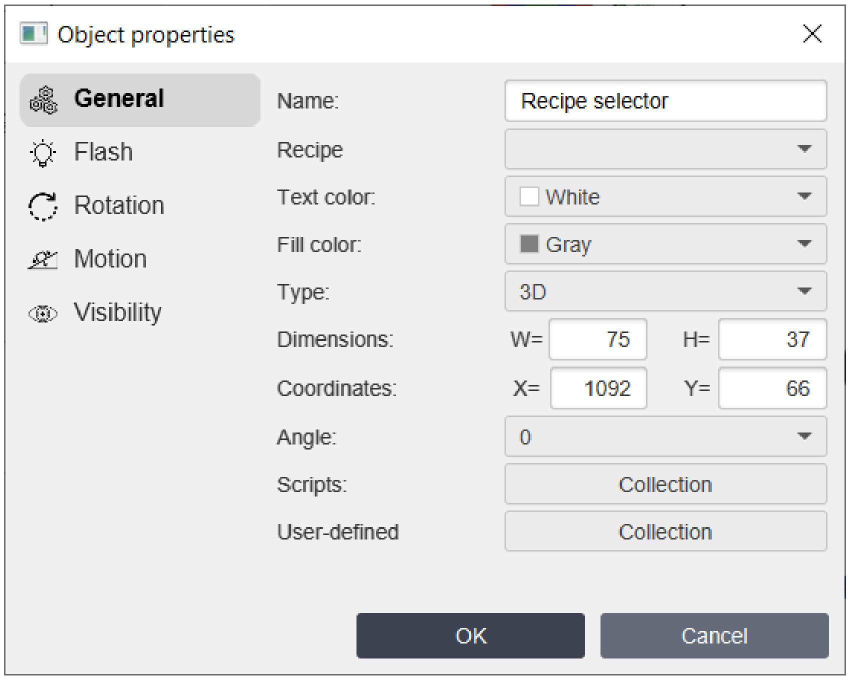
6.2.3.17 Recipes library



Recipes library contains the following objects that works with recipes 492 databases:

- Recipe table 252
- Recipe selector 251
- Parameter table 253
- Schedule table 255

6.2.3.17.1 Recipe selector



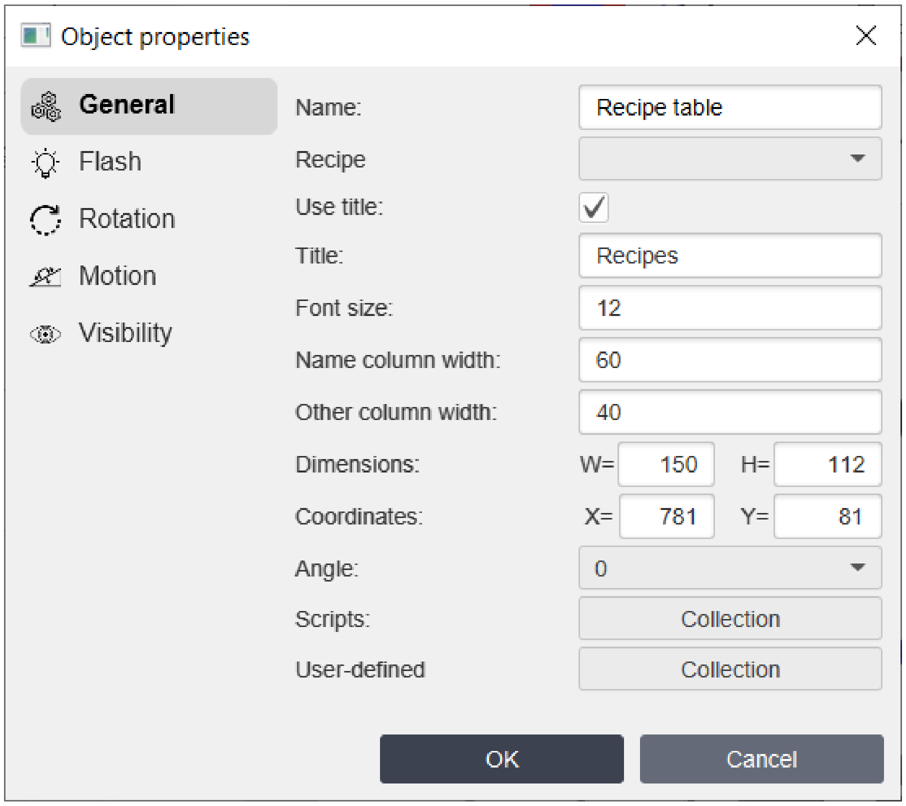
Name: Recipe selector
Recipe
Text color: White
Fill color: Gray
Type: 3D
Dimensions: W= 75 H= 37
Coordinates: X= 1092 Y= 66
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Recipe	recipename	Choose Recipe 492 you want to bind to the selector. During running you can select ?elds of the recipe database by clicking on the recipe selector.
Text color	textcolor	Color of the text.
Fill color	fillcolor	Color of the selector.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.17.2 Recipe table



Name: Recipe table
Recipe
Use title: ✓
Title: Recipes
Font size: 12
Name column width: 60
Other column width: 40
Dimensions: W= 150 H= 112
Coordinates: X= 781 Y= 81
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

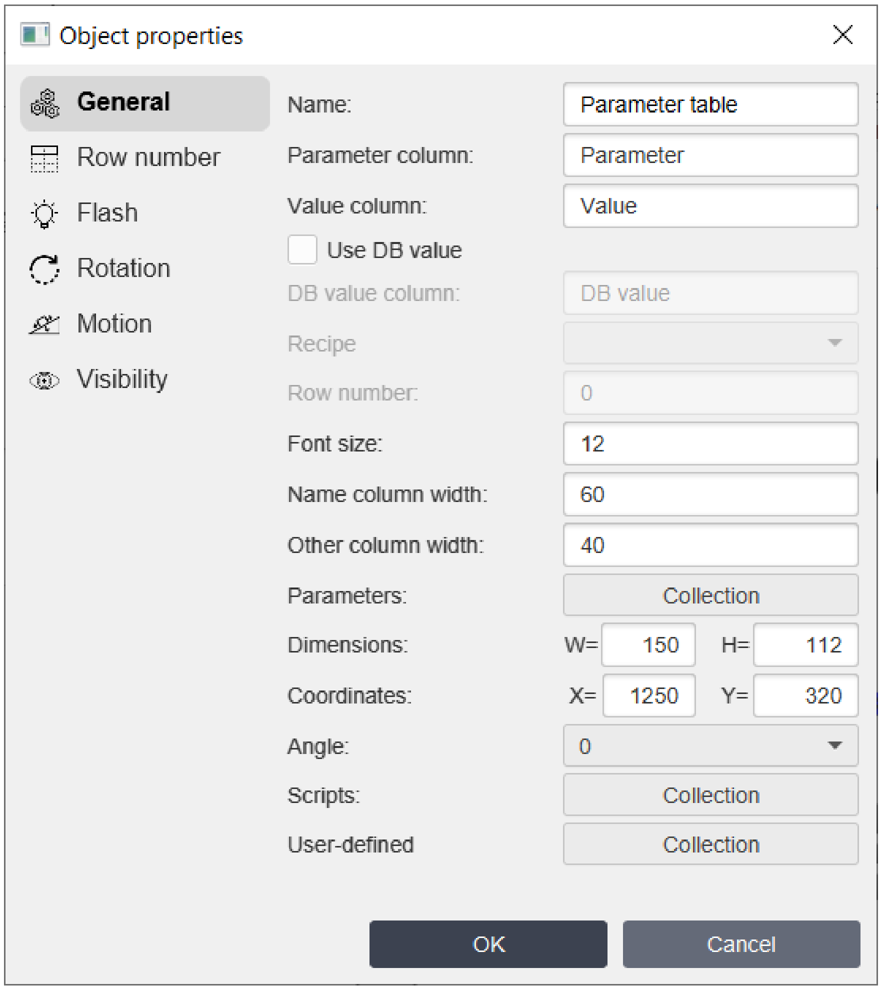
Property	ST script field	Description
Recipe	recipename	Choose Recipe 492 you want to bind to the table. During running you can add, edit and delete ?elds of the recipe database by clicking right button on the table and choosing operation.
Use title	usetitle	Use title for the table.
Title	title	Title of the table.
Font size	fontsize	Size of the text's font.
Name column width	namecolumn width	Set width of the name’s column.
Other column width	othercolumn width	Set width of other columns.

Also Recipe Table object has several properties that you can't setup by using settings dialog window, but you can setup by using ST script:

- **ownumber** - number of the row is choosen (clicked) by user.

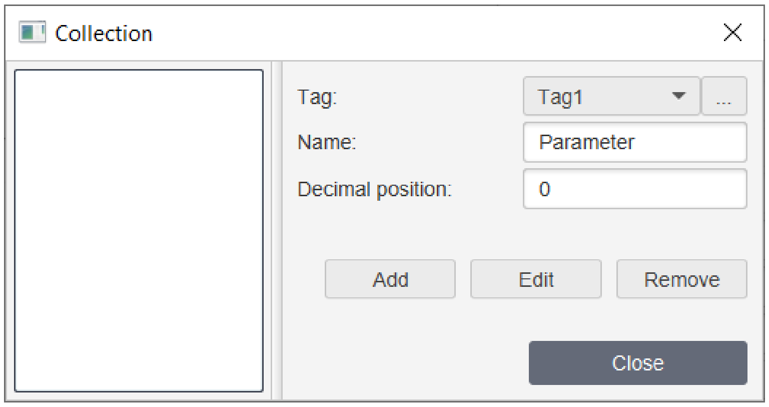
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.17.3 Parameter table



Name:	Parameter table
Parameter column:	Parameter
Value column:	Value
Use DB value	☐
DB value column:	DB value
Recipe	
Row number:	0
Font size:	12
Name column width:	60
Other column width:	40
Parameters:	Collection
Dimensions:	W= 150 H= 112
Coordinates:	X= 1250 Y= 320
Angle:	0
Scripts:	Collection
User-defined	Collection

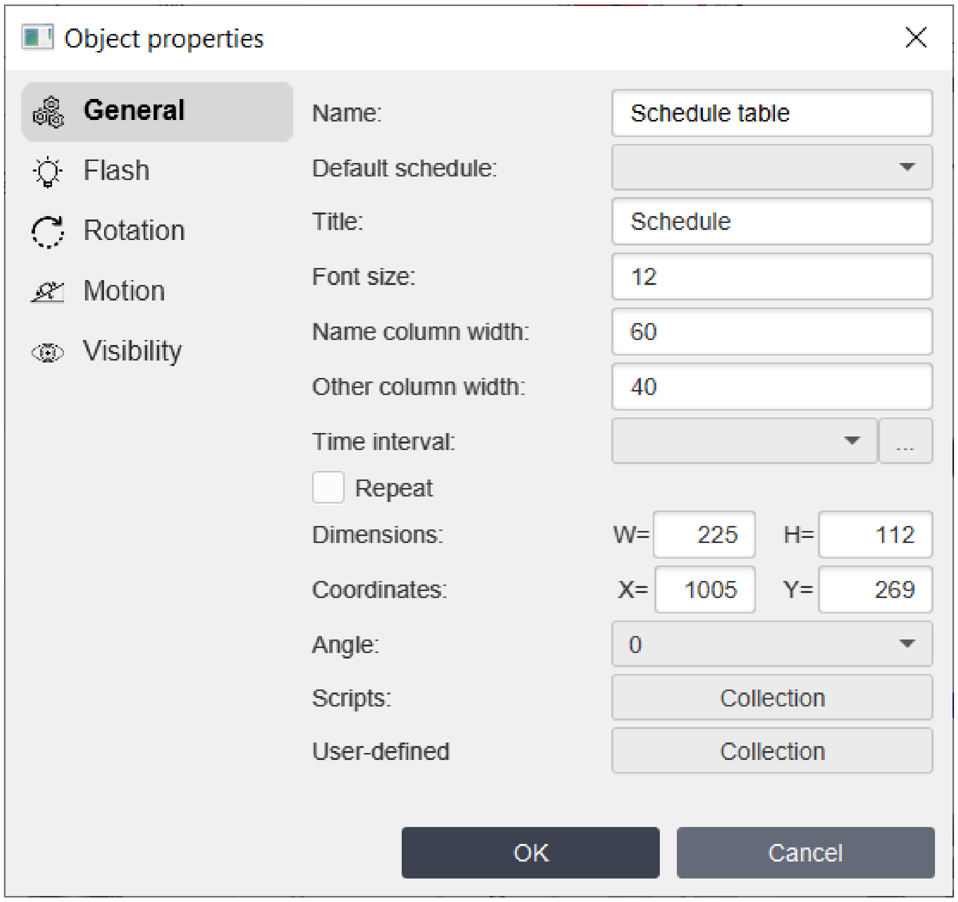
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Parameter column	**parametercolumn**	Parameter column name.
Value column	**valuecolumn**	Value column name.
Use DB value	**usedb**	Check it if you want to use DB value column.
DB value column	**dbcolumn**	DB value column name.
Recipe	**recipename**	Choose Recipe 492 you want to bind to the table
Row number	**rownumber**	Row number of the database which be used in DB value column.
Font size	**fontsize**	Size of the text's font.
Name column width	**namecolumnwidth**	Set width of the name’s column.
Other column width	**othercolumnwidth**	Set width of other columns.
Parameters		After clicking **Collection** button you’ll see the window:  Collection; Tag: Tag1; Name: Parameter; Decimal position: 0 where:

Propert y	ST script field	Description
		▪ **Tag** - tag you want to bind to the table's parameter. ▪ **Name** - name of the parameter. ▪ **Decimal position** - decimal position for the tag's value. ▪ **Add** - add parameter. ▪ **Edit** - edit parameter. ▪ **Remove** - remove parameter.

Properties from the **"Row number"** tab are described here 381.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.17.4 Schedule table



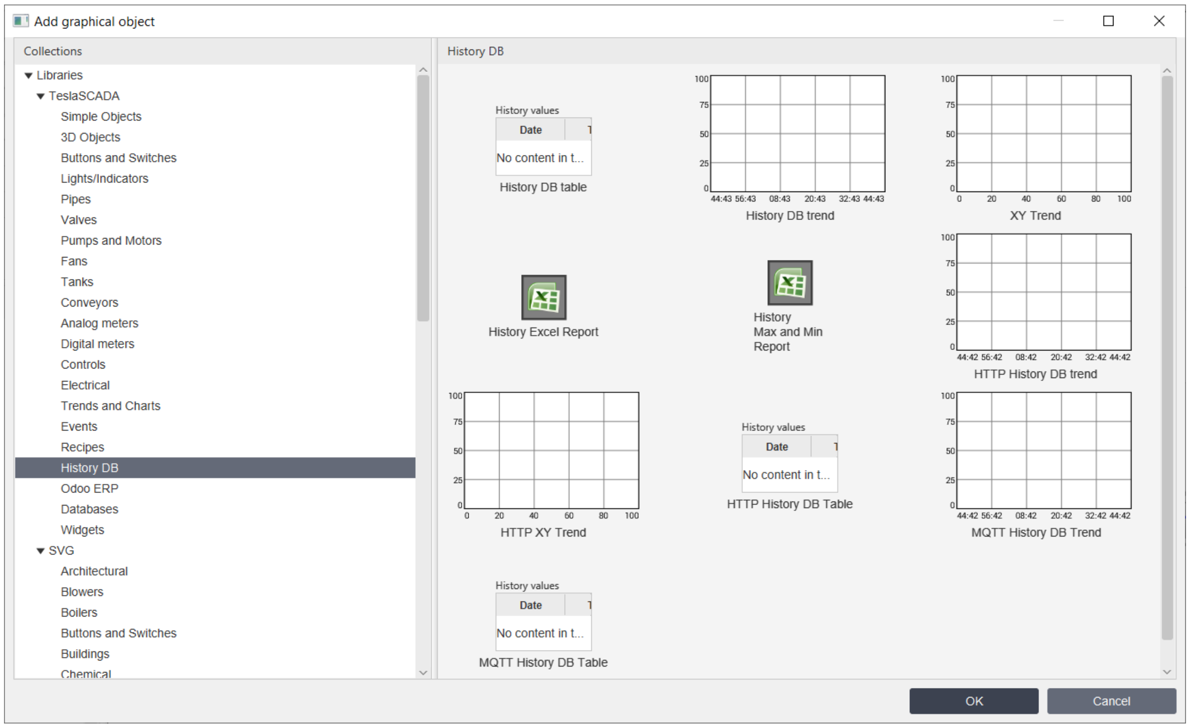
Name: Schedule table
Default schedule:
Title: Schedule
Font size: 12
Name column width: 60
Other column width: 40
Time interval: ...
Repeat
Dimensions: W= 225 H= 112
Coordinates: X= 1005 Y= 269
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Default schedule	**recipename**	Choose default schedule from Recipes 492 you want to bind to the table. During running you can add, edit and delete ?elds of the recipe database by clicking right button on the table and choosing operation
Title	**title**	Title of the table.
Font size	**fontsize**	Size of the text's font.
Name column width	**namecolumn width**	Set width of the name's column.
Other column width	**othercolumn width**	Set width of other columns.
Time interval	**timertagnam e**	Choose time interval tag. Depending of this tag's value will be duration of the next step(row) of the schedule table.
Repeat	**repeat**	Check it if you want to repeat all schedule steps (rows).

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.18 History DB library

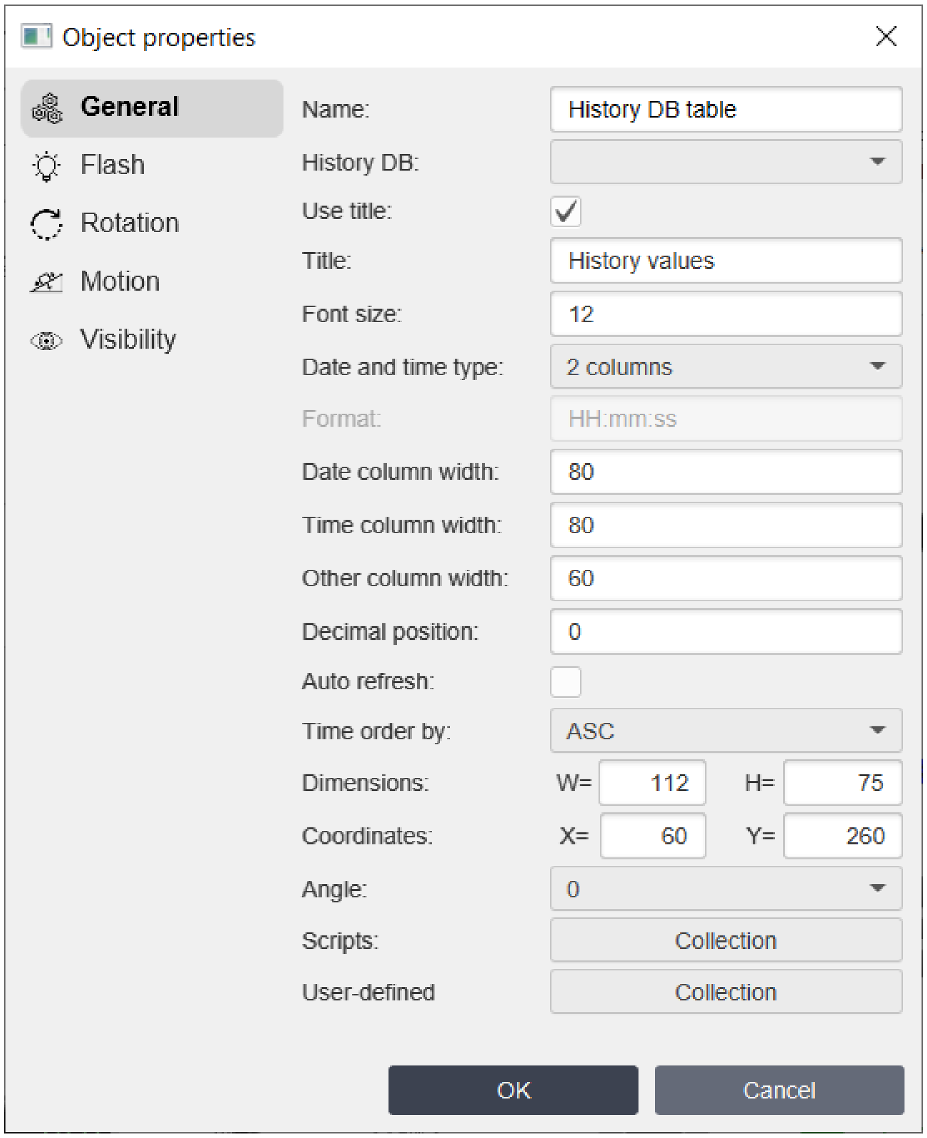


History DB library contains the following objects that works with History DB 494 databases:

- History DB table 257
- History DB trend 260
- XY Trend 263
- History Excel Report 268
- History Max and Min Report 268
- HTTP history DB trend 260
- HTTP XY Trend 263
- HTTP History DB table 257
- MQTT history DB trend 260
- MQTT History DB table 257

6.2.3.18.1 History DB table

This section applies to the following objects: History DB table, HTTP History DB table, MQTT History DB table.



Name: History DB table
History DB:
Use title: ✓
Title: History values
Font size: 12
Date and time type: 2 columns
Format: HH:mm:ss
Date column width: 80
Time column width: 80
Other column width: 60
Decimal position: 0
Auto refresh:
Time order by: ASC
Dimensions: W= 112 H= 75
Coordinates: X= 60 Y= 260
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
History DB	**historydbname**	Choose History DB 494 you want to bind to the table.
Use title	**usetitle**	Use title for the table or not.
Title	**title**	Title of the table.
Font size	**fontsize**	Size of the text's font.

Property	ST script field	Description
Date and Time type	**type**	Date and time type representation (2 columns or 1 column)
Format	**timeformat**	Date and time format
Date column width	**datecolumn width**	Set width of the date's column.
Time column width	**timecolumn with**	Set width of the time's column.
Other column width	**othercolumn width**	Set width of other columns.
Decimal position	**decimalpos**	Decimal position of tag's values entered in the table.
Auto refresh	**autorefresh**	Check it if you want to update table every time when new tag's value added into database.
Time order by	**orderby**	Choose time order by of the database rows: ▪ ASC ▪ DESC
***HTTP server**		Choose HTTP server

***Only for HTTP History DB table**

Also History DB Table object has several properties that you can't setup by using settings dialog window, but you can setup by using ST script:

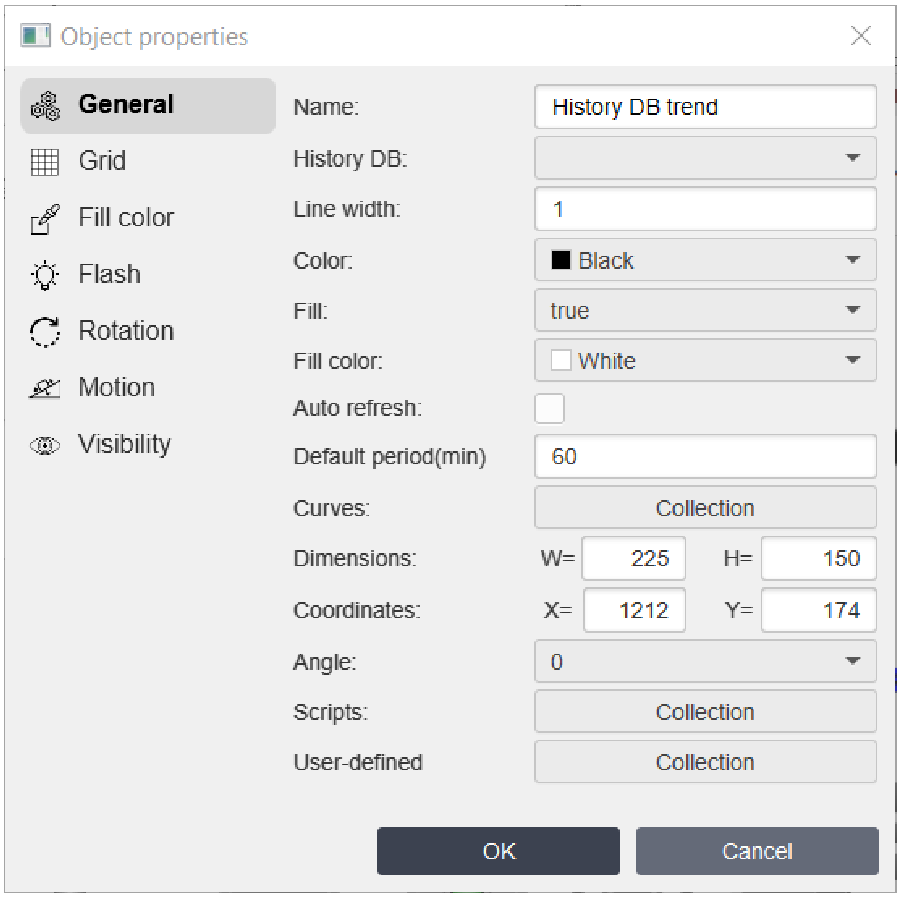
- **begin** - start time for table information. Time represented in minutes from current period. (start time = current time - begin).
- **end** - ?nish time for table information. Time represented in minutes from current period. (?nish time = current time - end).
- **? lename** - name of the report's ?le.
- **savereport** - when this value become true trend's report will be created.
- **begindatetime** - start time for trend information. Time represented in milliseconds from 1 January 1970.
- **enddatetime** - ?nish time for trend information. Time represented in milliseconds from 1 January 1970.
- **disablesavereport** - disable "Save report" button in the dialog.
- **disableprint** - disable "Print" report button in the dialog.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.

Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.18.2 History DB trend

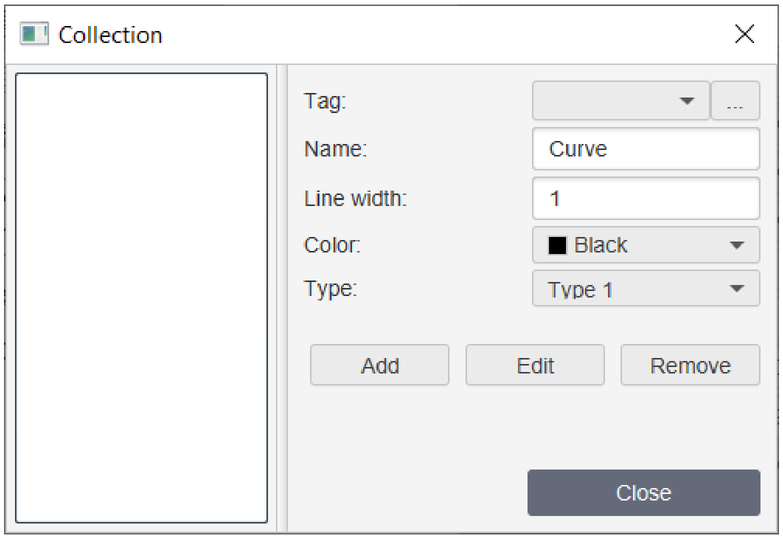
This section applies to the following objects: History DB trend, HTTP history DB trend, MQTT history DB trend.



Name: History DB trend
History DB:
Line width: 1
Color: Black
Fill: true
Fill color: White
Auto refresh:
Default period(min) 60
Curves: Collection
Dimensions: W= 225 H= 150
Coordinates: X= 1212 Y= 174
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
History DB	historydbname	Choose History DB 494 you want to bind to the trend.
Line width	linewidth	Width of the border's line.
Color	color	Color of the border's line.

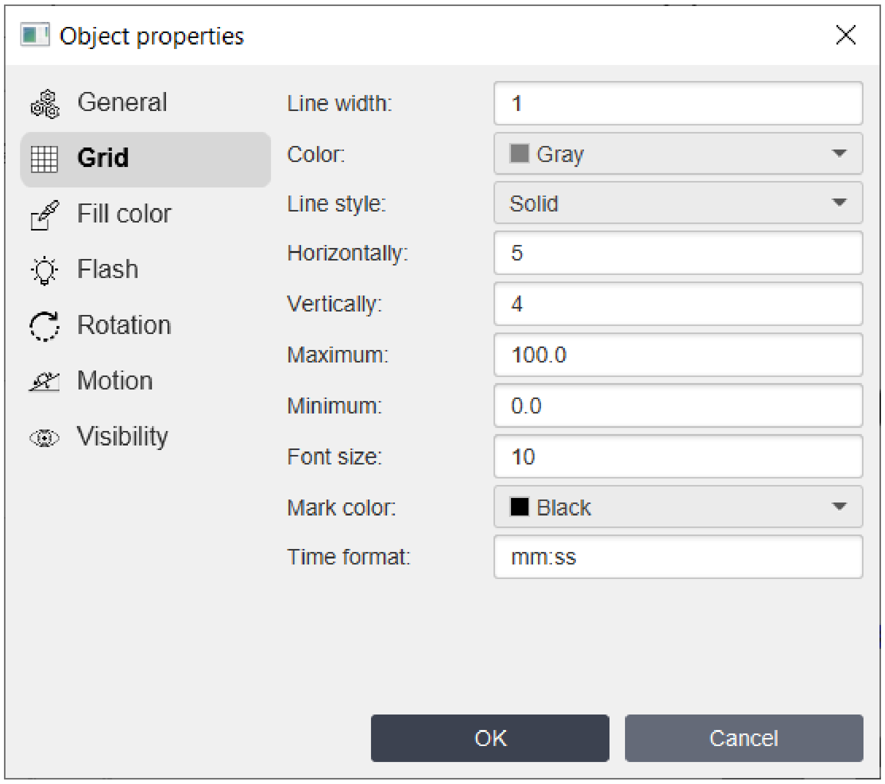
Propert y	ST script field	Description
Fill	**fill**	Select fill or not fill trend.
Fill color	**fillcolor**	Fill color of the trend.
Auto refresh	**autoref resh**	Check it if you want to update trend every time when new tag's value added into database.
Curves		After clicking **Collection** you'll see window:  Collection Tag: Name: Curve Line width: 1 Color: ■ Black Type: Type 1 Add Edit Remove Close where: ▪ **Tag** - tag that you want to bind to this curve. ▪ **Name** - name of the curve. ▪ **Line with** - curve's line width. ▪ **Color** - curve's line color. ▪ **Type** - line's type: ✓Type 1 - just draw the line. ✓Type 2 - draw line with ?lling till axis X. ✓Type 3 - draw a ladder line. ✓Type 4 - draw a ?lled ladder line.
Default period (min)	**default period**	Default time period of the trend (end time - begin time).

Also History DB Trend object has several properties that you can't setup by using settings dialog box, but you can setup by using ST script:

- **begin** - start time for trend information. Time represented in minutes from current period. (start time = current time - begin).
- **end** - ?nish time for trend information. Time represented in minutes from current period. (?nish time = current time - end).
- **? lename** - name of the report's ?le.
- **savereport** - when this value become true trend's report will be created.
- **begindatetime** - start time for trend information. Time is represented in milliseconds from 1 January 1970.
- **enddatetime** - ?nish time for trend information. Time is represented in milliseconds from 1 January 1970.
- **disablesavereport** - disable "Save report" button in the dialog.
- **disableprint** - disable "Print" report button in the dialog.
- **duration** - duration of the history time line in minutes. It works only when auto refresh is enabled. End time will be current time and begin time will be current time minus duration in minutes.

Properties from the **"Grid"** tab are described here 262.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.18.2.1 Grid



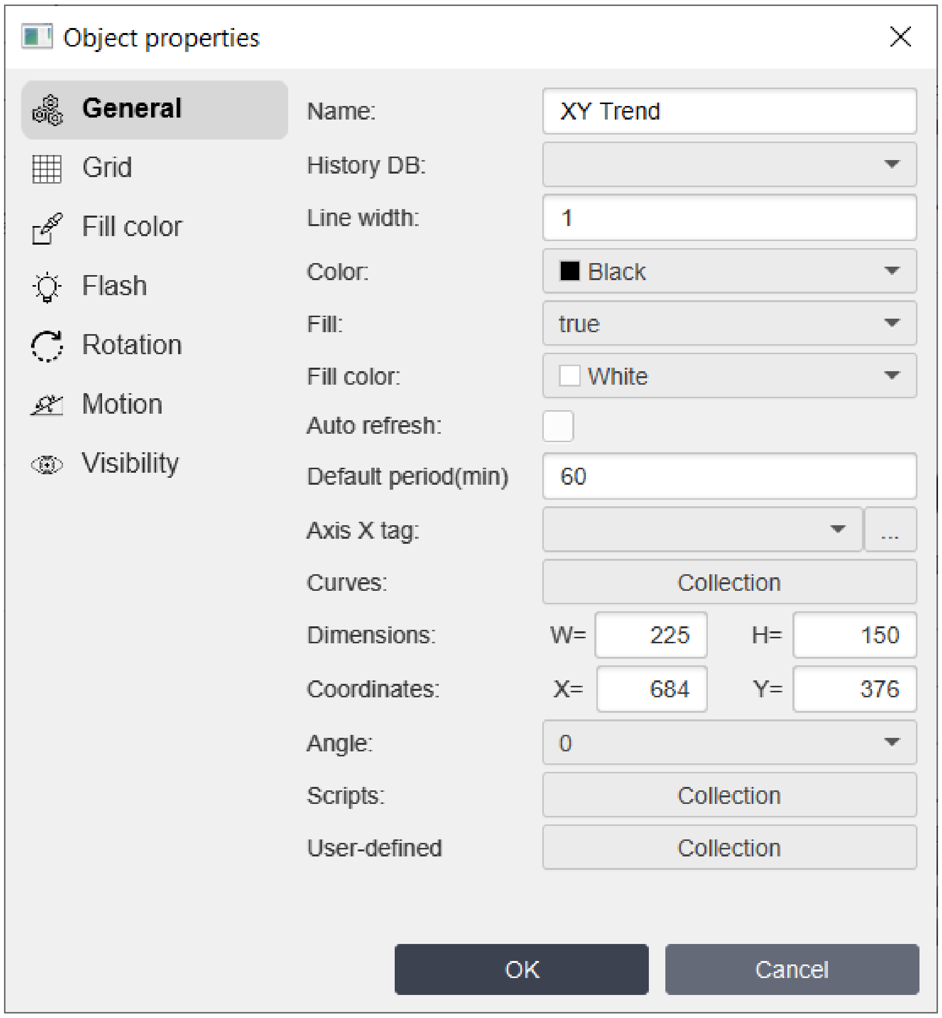
Line width: 1
Color: Gray
Line style: Solid
Horizontally: 5
Vertically: 4
Maximum: 100.0
Minimum: 0.0
Font size: 10
Mark color: Black
Time format: mm:ss

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Line width		Width of grid's lines .
Color		Color of grid's lines.
Line style	**linestyle**	Style of the line: ▪ Solid ▪ Dash ▪ Dot ▪ DashDot
Horizontally	**horizontally**	Number of trend's horizontal grid lines.
Vertically	**vertically**	Number of trend's vertical grid lines.
Maximum	**maximum**	Maximum of the trend's value.
Minimum	**minimum**	Minimum of the trend's value.
Font size	**fontsize**	Font size of the trend's marks.
Mark color	**markcolor**	Color of the marks.
Time format	**timeformat**	Time format of the trend's time.

6.2.3.18.3 XY Trend

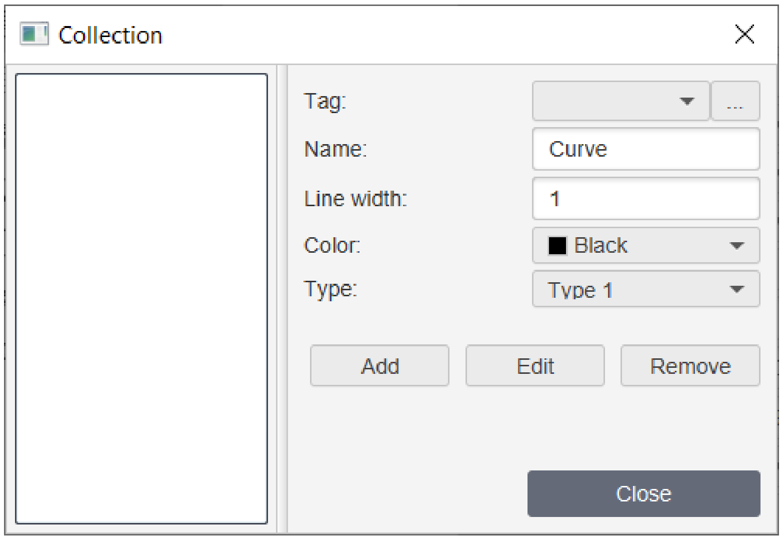
This section applies to the following objects: XY Trend, HTTP XY Trend.



Name: XY Trend
History DB:
Line width: 1
Color: Black
Fill: true
Fill color: White
Auto refresh:
Default period(min): 60
Axis X tag:
Curves: Collection
Dimensions: W= 225 H= 150
Coordinates: X= 684 Y= 376
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
History DB*	historydbname	Choose History DB 494 you want to bind to the trend.
Line width	linewidth	Width of the border's line.
Color	color	Color of the border's line.
Fill	fill	Select fill or not fill trend.

Propert y	ST script field	Description
Fill color	**fillcolor**	Fill color of the trend.
Auto refresh	**autoref resh**	Check it if you want to update trend every time when new tag's value added into database.
Curves		After clicking **Collection** you'll see window:  Tag: Name: Curve Line width: 1 Color: ■ Black Type: Type 1 where: ▪ **Tag** - tag that you want to bind to this curve. ▪ **Name** - name of the curve. ▪ **Line with** - curve's line width. ▪ **Color** - curve's line color. ▪ **Type** - line's type: ✓Type 1 - just draw the line. ✓Type 2 - draw line with ?lling till axis X. ✓Type 3 - draw a ladder line. ✓Type 4 - draw a ?lled ladder line.
Default period (min)	**default period**	Default time period of the trend (end time - begin time).
Axis X tag	**tagxna me**	Bind tag to axis X of the trend.

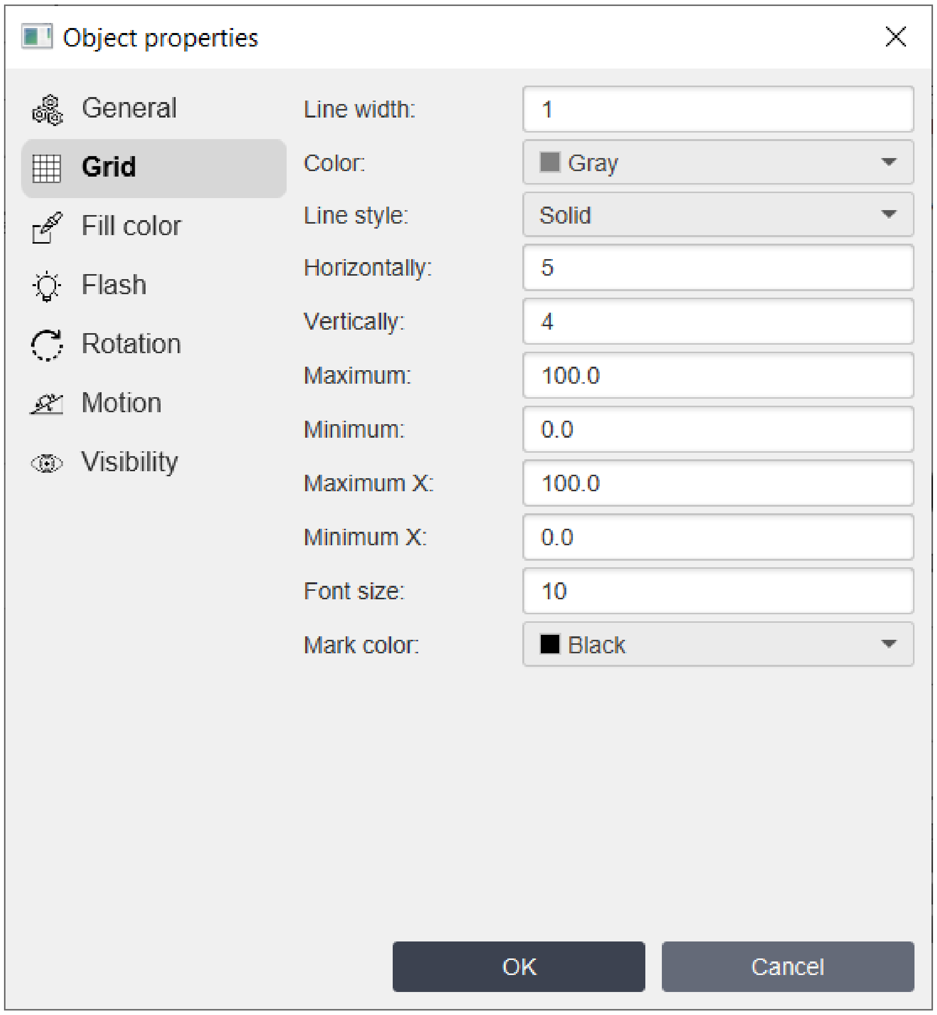
***For HTTP XY Trend you have to enter History DB manually.**

Also History DB Trend object has several properties that you can't setup by using settings dialog box, but you can setup by using ST script:

- **begin** - start time for trend information. Time represented in minutes from current period. (start time = current time - begin).
- **end** - ?nish time for trend information. Time represented in minutes from current period. (?nish time = current time - end).
- **? lename** - name of the report's ?le.
- **savereport** - when this value become true trend's report will be created.

Properties from the **"Grid"** tab are described here 266.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.18.3.1 Grid

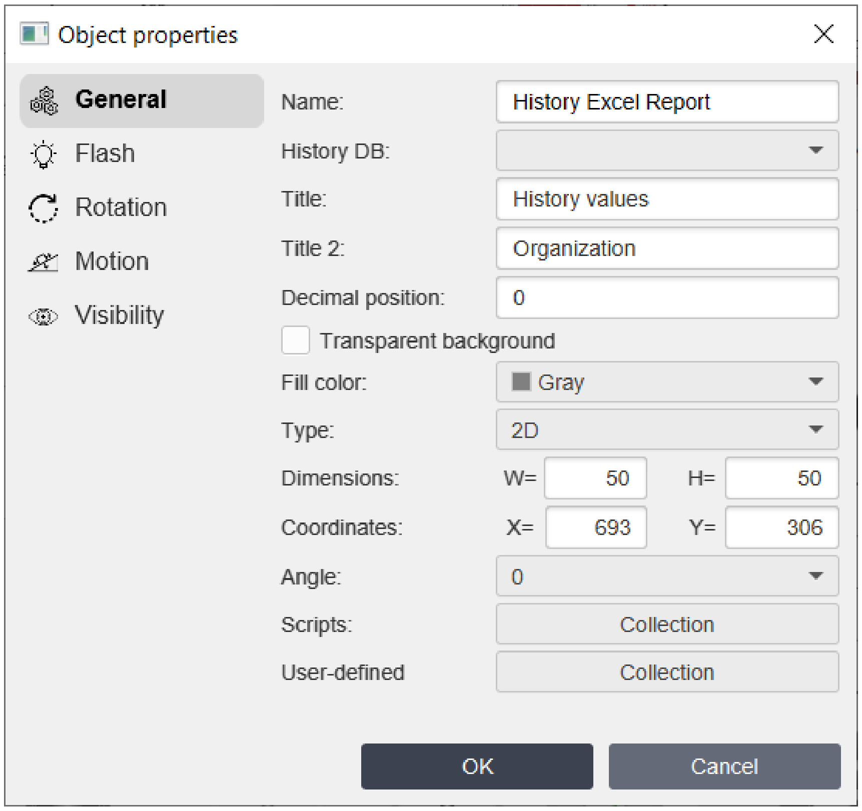


Line width:	1
Color:	Gray
Line style:	Solid
Horizontally:	5
Vertically:	4
Maximum:	100.0
Minimum:	0.0
Maximum X:	100.0
Minimum X:	0.0
Font size:	10
Mark color:	Black

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Line width		Width of grid's lines .
Color		Color of grid's lines.
Line style	**linestyle**	Style of the line: ▪ Solid ▪ Dash ▪ Dot ▪ DashDot
Horizontally	**horizontally**	Number of trend's horizontal grid lines.
Vertically	**vertically**	Number of trend's vertical grid lines.
Maximum	**maximum**	Maximum of the trend's value.
Minimum	**minimum**	Minimum of the trend's value.
Maximum X	**maximumx**	Maximum of the axis X trend's value.
Minimum X	**minimumx**	Minimum of the axis X trend's value.
Font size	**fontsize**	Font size of the trend's marks.
Mark color	**markcolor**	Color of the marks.
Time format	**timeformat**	Time format of the trend's time.

6.2.3.18.4 History Excel report and History Max and Min report



Name: History Excel Report
History DB:
Title: History values
Title 2: Organization
Decimal position: 0
Transparent background
Fill color: Gray
Type: 2D
Dimensions: W= 50 H= 50
Coordinates: X= 693 Y= 306
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

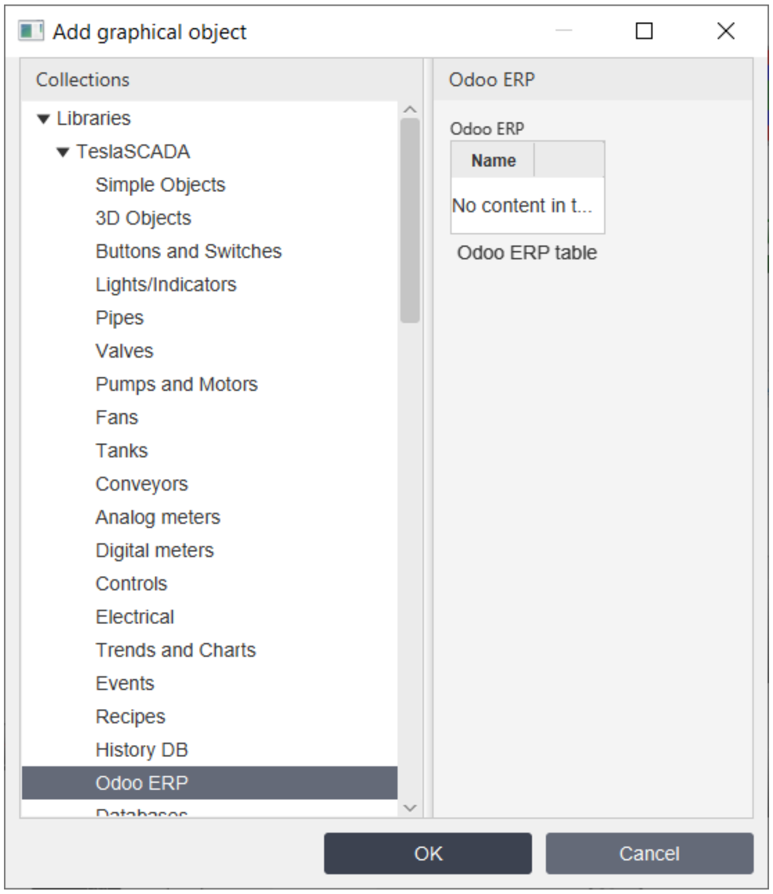
Property	ST script field	Description
History DB	**historydbname**	Choose History DB 494 you want to bind to the table.
Title	**title**	Title of the table of the report.
Title 2	**title2**	Second title of the table of the report.
Decimal position	**decimalpos**	Decimal position of tag's values entered in the report's table.
Transparent background	**transparent**	Check it if you want to make background of the button invisible.
Fill color	**fillcolor**	Fill color of the report's button.

Also reports object has several properties that you can't setup by using settings dialog window, but you can setup by using ST script:

- **begin** - start time for report information. Time is represented in minutes from current period. (start time = current time - begin).
- **end** - ?nish time for report information. Time is represented in minutes from current period. (?nish time = current time - end).
- **? lename** - name of the report's ?le.
- **savereport** - when this value becomes true trend's report will be created.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.19 Odoo ERP

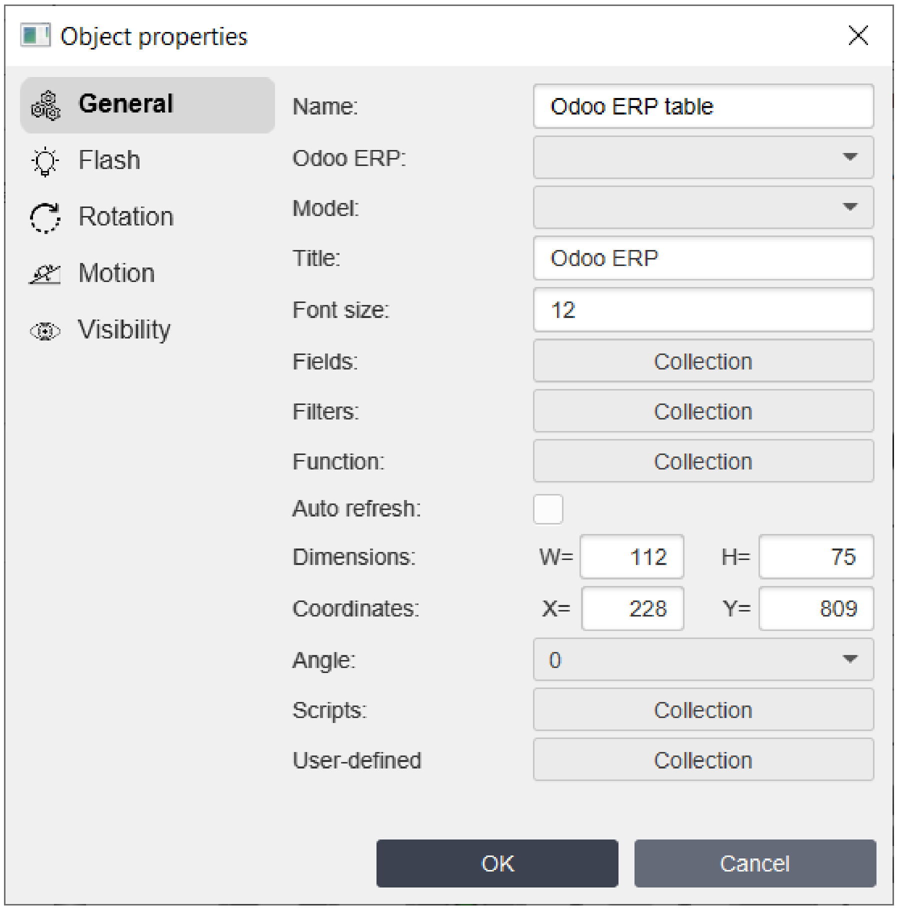


Odoo ERP library contains the following object:

- Odoo ERP table 270

Odoo ERP table collects rows of Odoo ERP.

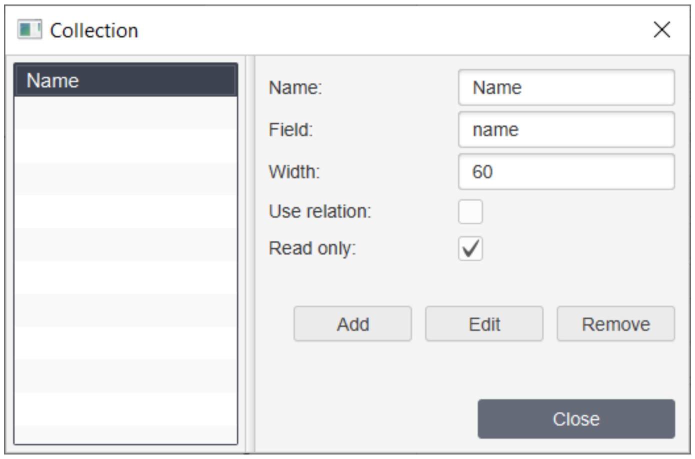
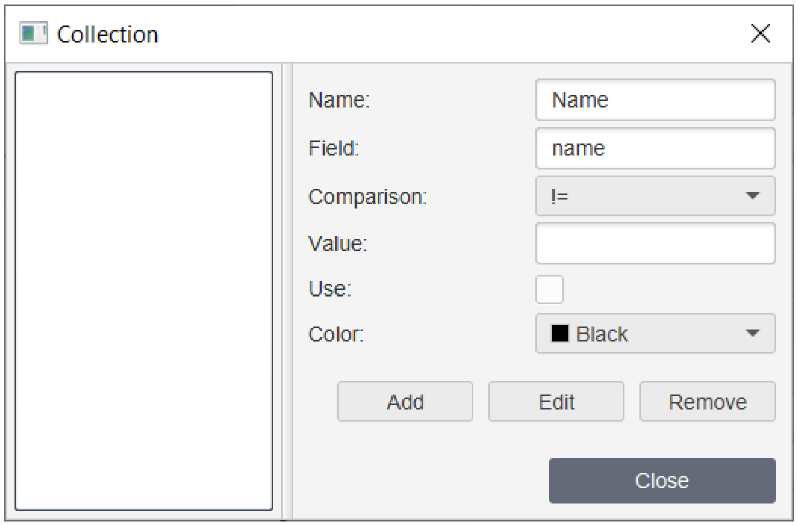
6.2.3.19.1 Odoo ERP table

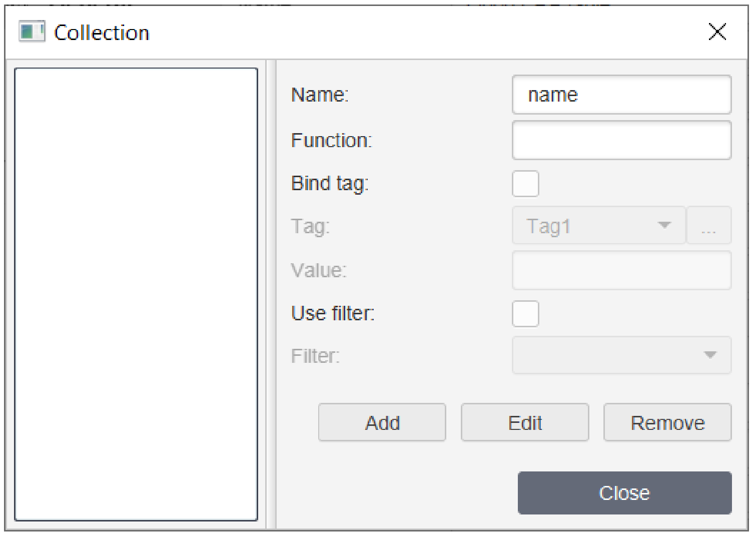


Name: Odoo ERP table
Odoo ERP:
Model:
Title: Odoo ERP
Font size: 12
Fields: Collection
Filters: Collection
Function: Collection
Auto refresh:
Dimensions: W= 112 H= 75
Coordinates: X= 228 Y= 809
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Odoo ERP	**odooerpname**	Choose Odoo ERP 497 bind to this table.
Model	**modelname**	Choose model of the Odoo ERP.
Title	**title**	Title of the table.
Font size	**fontsize**	Font size of the table's texts.
Fields		After clicking Fields **Collection** button you'll see the window:

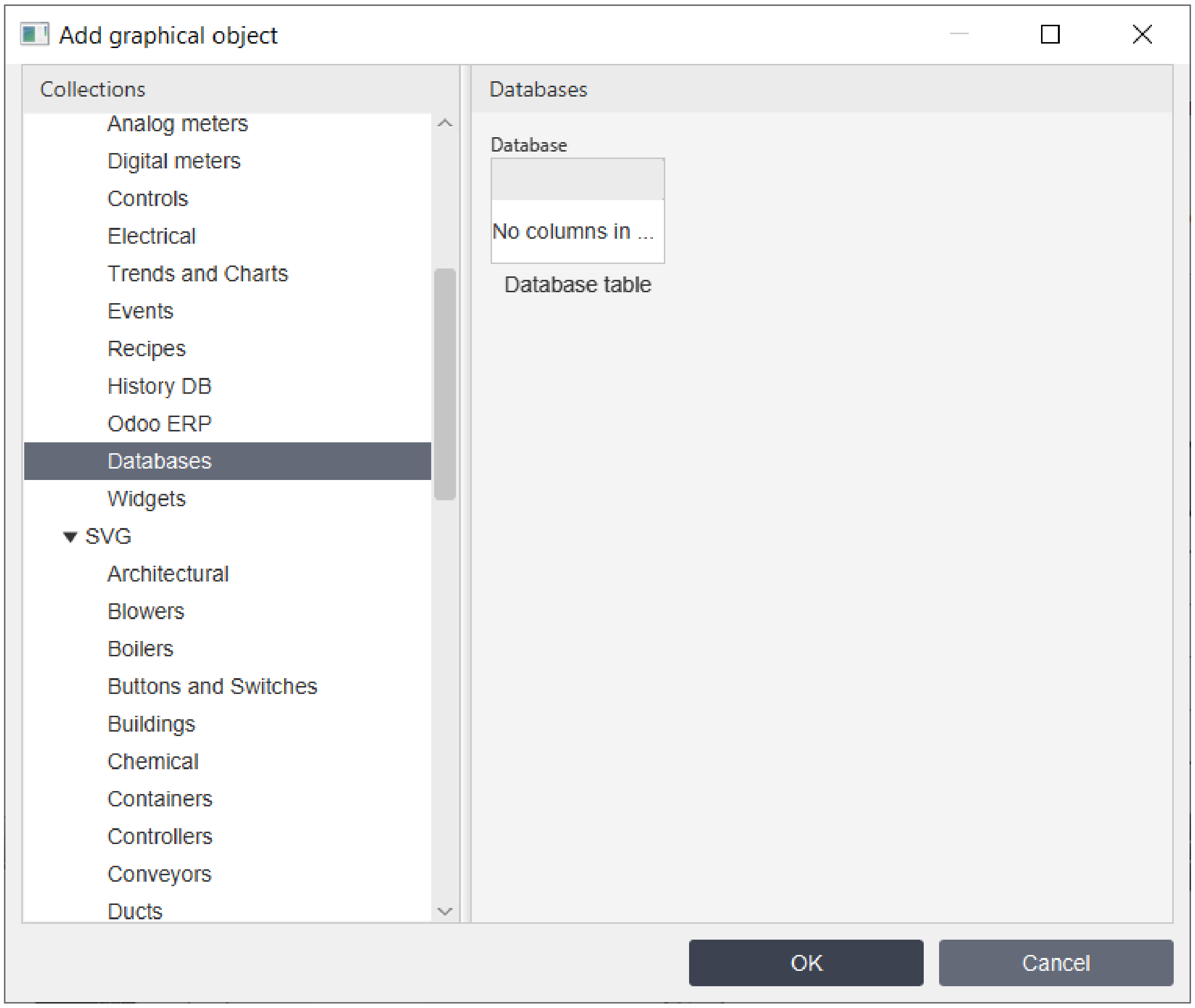
Property	ST script field	Description
		 Collection Name: Name Field: name Width: 60 Use relation: ☐ Read only: ✓ where: • **Name** - name of the ?eld. • **Field** - field of the Odoo ERP model. • **Width** - width of the ?eld's column. • **Use relation** - check it to get data from the relation model. • **Read only** - check it if you don't want to let change ?eld.
Filters		After clicking Filters **Collection** button you'll see the window:  Collection Name: Name Field: name Comparison: != Value: Use: ☐ Color: ■ Black where: ▪ **Name** - name of the ?lter. ▪ **Field** - field of the Odoo ERP model. ▪ **Comparison** - choose comparison operation for the ?lter. ▪ **Value** - value for the comparison.

Property	ST script field	Description
		▪ **Use** - check it if you want to use this ?lter for the table by default. ▪ **Color** - choose color for rows that ?ts for this ?lter conditions.
Functions		After clicking Functions **Collection** button you'll see the window:  Collection Name: name Function: Bind tag: Tag: Tag1 Value: Use filter: Filter: where: ▪ **Name** - name of the function. ▪ **Function** - function of the Odoo ERP model. ▪ **Bind tag** - check it if you want to bind the tag to the button. ▪ **Tag** - choose tag for the function. ▪ **Value** - value that will be written to the tag. ▪ **Use ?lter** - check it to bind button of the function to the ?lter (if check the button enable if ?lter condition is TRUE). ▪ **Filter** - choose filter bind to the function.
Auto refresh	**autorefresh**	Check it to refresh table automatically.

When you click on the row of the table you select the row and you can use it in the script by using ?elds: **selectrow?eld** and **selectrowvalue**. At ?rst you should select ?eld of the row and then get or set value of the row.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

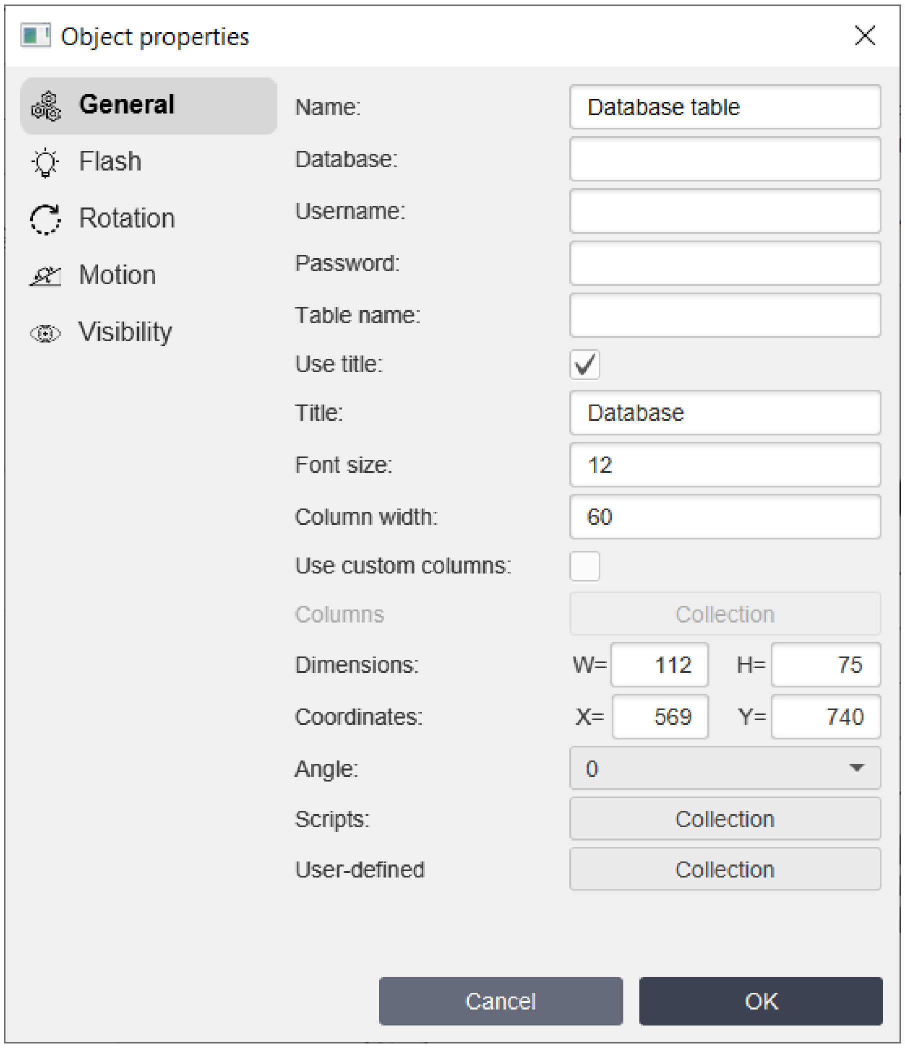
6.2.3.20 Databases library



Databases library contains the following object:

- Database table 274

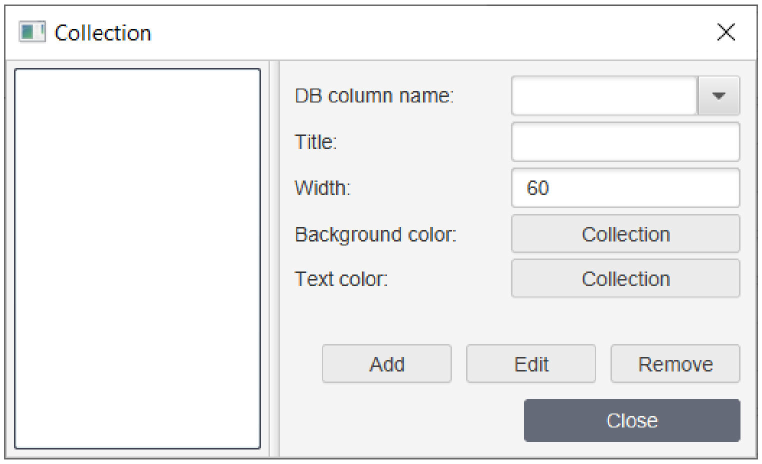
6.2.3.20.1 Database table



Name:	Database table
Database:	
Username:	
Password:	
Table name:	
Use title:	✓
Title:	Database
Font size:	12
Column width:	60
Use custom columns:	
Columns	Collection
Dimensions:	W= 112 H= 75
Coordinates:	X= 569 Y= 740
Angle:	0
Scripts:	Collection
User-defined	Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Propert y	ST script field	Description
Databas e	**databas ename**	Database name. If database name contains “jdbc:mysql” it means address of MySQL 31 database. If database name contains "jdbc:mssql" it means address of MSSQL 55 database. If database name contains "jdbc:postgresql" it means address of PostgreSQL 58 database. If database name doesn't contain "jdbc" it means address of SQLLite 29 database.

Property	ST script field	Description
Username	**username**	Username for MySQL 31 database.
Password	**password**	Password for MySQL 31 database.
Table name	**tablename**	Name of the table.
Use title	**usetitle**	Use title for the table or not.
Title	**title**	Title of the table.
Font size	**fontsize**	Size of the text's font.
Column width	**column width**	Set width of the columns.
Use custom columns		Check if you want to use custom columns.
Columns		 DB column name: Title: Width: 60 Background color: Collection Text color: Collection where: 1. **DB column name** - database column name of the DB you use for table. 2. **Title** - title you want to use for column. 3. **Width** - width of the column. 4. **Background color** - background color of the cell depending on value range. 5. **Text color** - text color of the cell depending on value range.

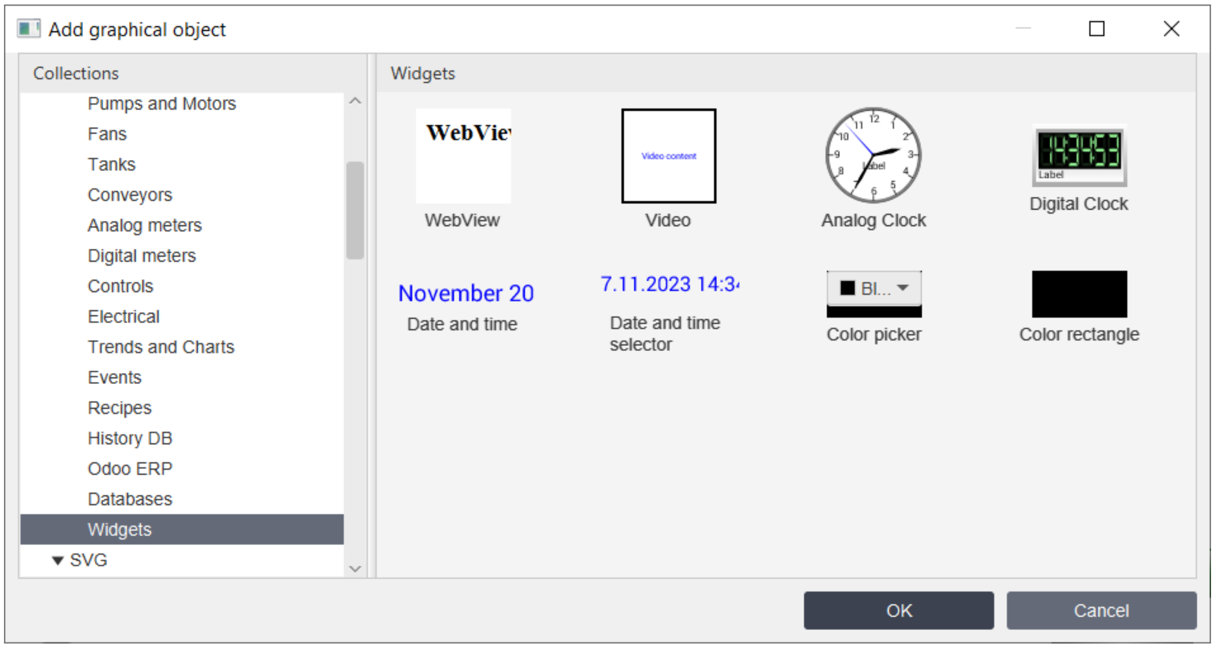
Also Database Table object has several properties that you can't setup by using settings dialog window, but you can setup by using ST script:

- **disablesavereport** - disable "Save report" menu item in the context menu.
- **disableprint** - disable "Print" menu item in the context menu.
- **columnwidtharray** - use this value to setup different column widths. Example: Objects.Databasetable.columnwidtharray = "[10, 150, 150, 200]";
- **rownumber** - number of the row is choosen (clicked) by user.
- **resultset*** - if you want to fill data from Result set 450, set name of the result set here.
- **csv*** - if you want to fill data from .csv file set name of the file here (if you use just name the file will be gotten from the DB 18 folder. You can use the full path also).

***resultset and csv don't works on iOS version.**

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.21 Widgets library

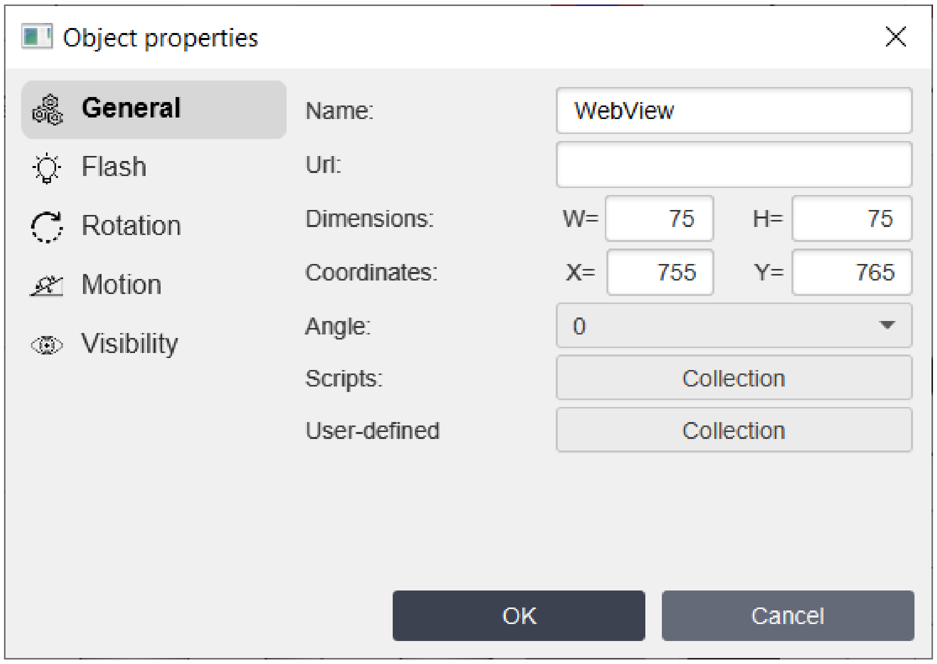


Widgets library contains the following object:

- WebView 277
- Video 278
- Analog Clock 280
- Digital Clock 281
- Date and time 282
- Date and time selector 284
- Color picker 283

- [Color rectangle](283)

6.2.3.21.1 WebView


Object properties

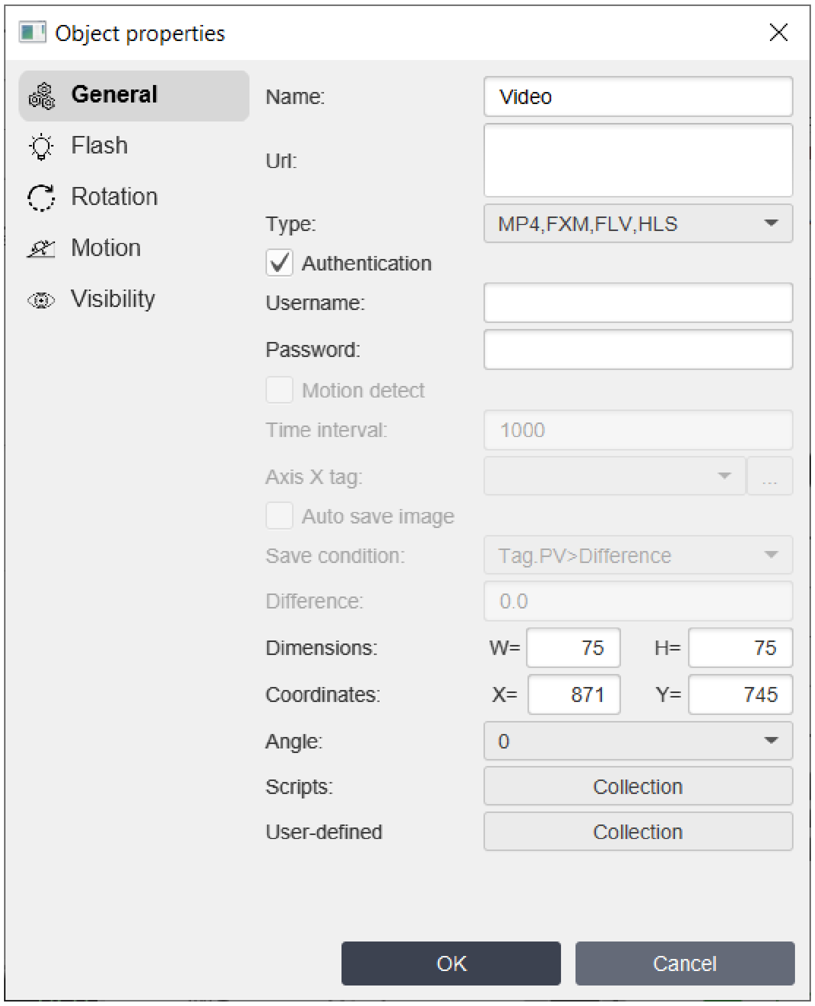
Name: WebView
Url:
Dimensions: W= 75 H= 75
Coordinates: X= 755 Y= 765
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Url	**url**	Url of the internet resource.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.21.2 Video



Name: Video
Url:
Type: MP4,FXM,FLV,HLS
✓ Authentication
Username:
Password:
Motion detect
Time interval: 1000
Axis X tag:
Auto save image
Save condition: Tag.PV>Difference
Difference: 0.0
Dimensions: W= 75 H= 75
Coordinates: X= 871 Y= 745
Angle: 0
Scripts: Collection
User-defined: Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Url	**url**	Url of the internet resource.
Type	**type**	Type of the video signal: ▪ MP4,FXM,FLV,HLS ▪ MJPEG ▪ JPEG ▪ RTSP*
Authentication	**security**	Check it if your video camera use username and password for login.
Username	**username**	Username of the authentication.

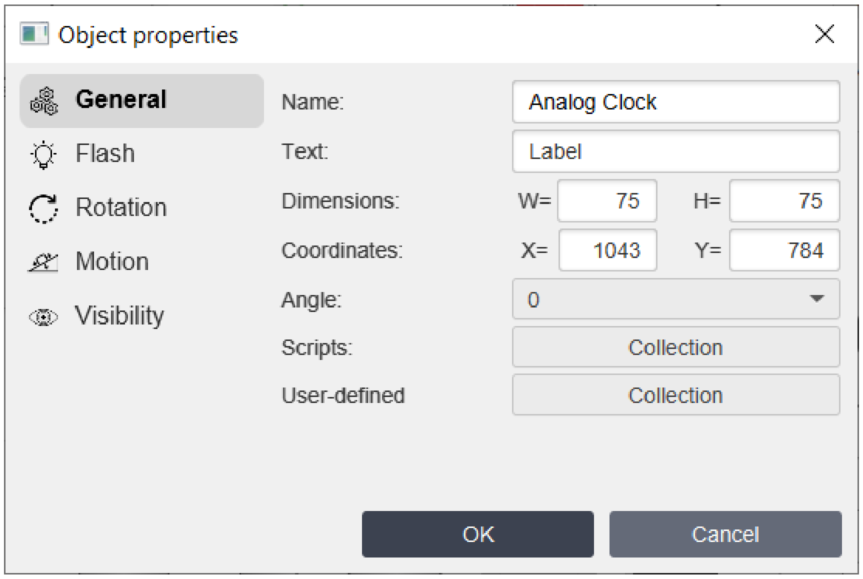
Property	ST script field	Description
Password	**password**	Password of the authentication.
Motion detect	**motiondetect**	Check it for detecting motion by using this camera.
Time interval	**interval**	Time interval in ms for comparing 2 frames.
Tag		Choose tag for writing the value of comparing 2 frames in %.
Auto save image	**autosaveimage**	Check it if you want to save images from video camera depending on the value of motion detect.
Save condition	**savecondition**	Choose save condition.
Difference	**diff**	Difference between 2 frames in % during motion detect.

Properties Authentication, Username, Password, Motion detect, Time interval, Tag, Auto save image, Save condition, Difference is used only PC versions. These features doesn't work on Android and iOS.

*** RTSP protocol can be used only on PC. You should install VLC media player for your OS to have possibility to use this protocol.**

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.21.3 Analog clock



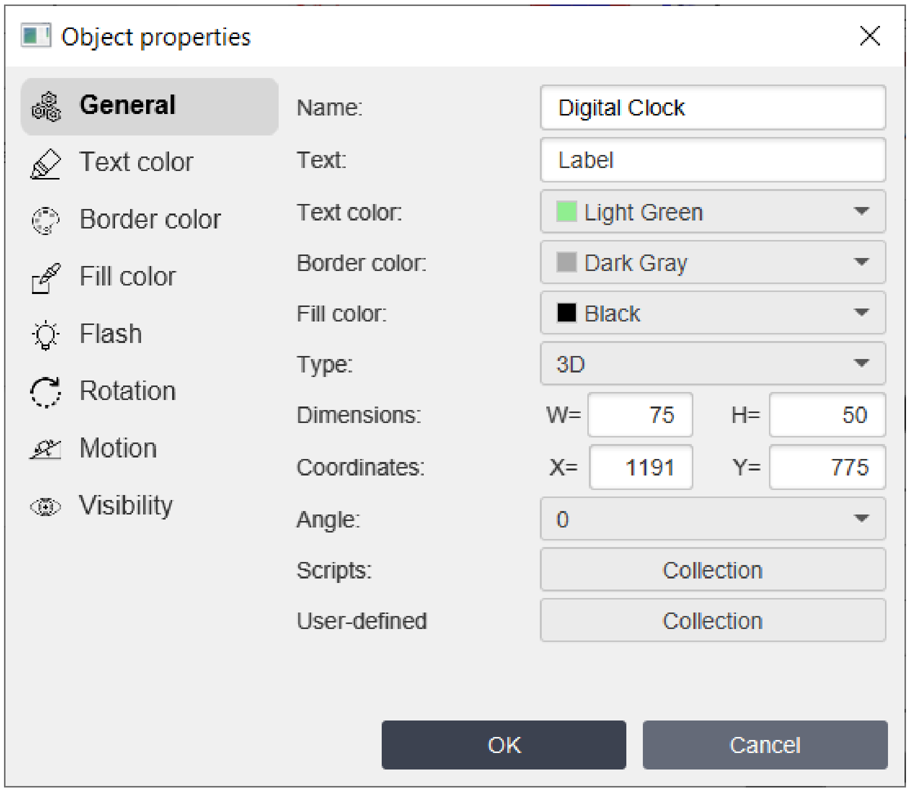
Name: Analog Clock
Text: Label
Dimensions: W= 75 H= 75
Coordinates: X= 1043 Y= 784
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Text	**text**	Text of the clock's label.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.21.4 Digital clock



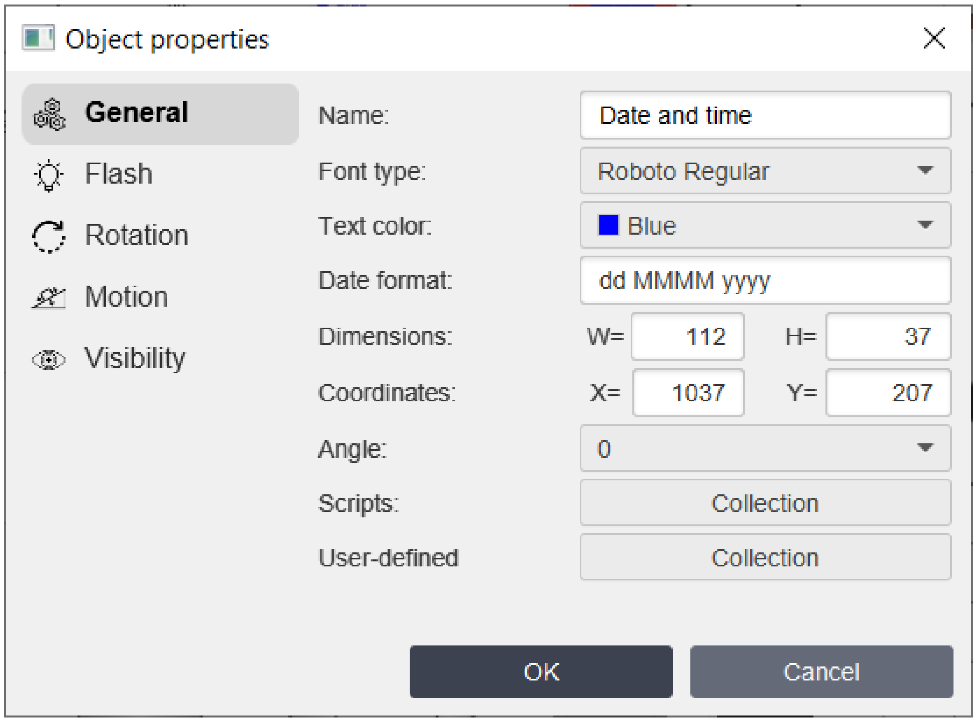
Name: Digital Clock
Text: Label
Text color: Light Green
Border color: Dark Gray
Fill color: Black
Type: 3D
Dimensions: W= 75 H= 50
Coordinates: X= 1191 Y= 775
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Text	**text**	Text of the label.
Text color	**textcolor**	Color of the clock's digits.
Fill color	**fillcolor**	Color of the clock's background.
Border color	**bordercolor**	Color of the clock's border.

Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Border color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.21.5 Date and time



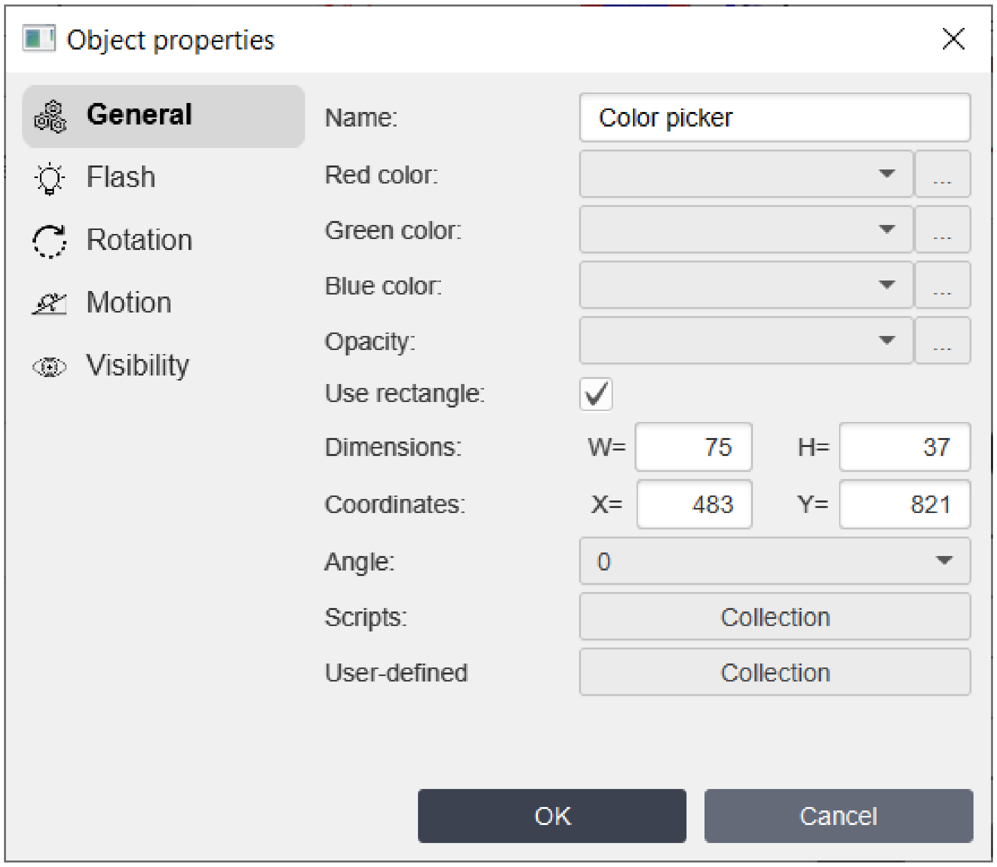
Name: Date and time
Font type: Roboto Regular
Text color: Blue
Date format: dd MMMM yyyy
Dimensions: W= 112 H= 37
Coordinates: X= 1037 Y= 207
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Font type	**fonttype**	Type of the text's font.
Text color	**textcolor**	Color of the text.
Date format	**timeformat**	Time format of the date and time object.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.21.6 Color picker and Color rectangle



Name: Color picker
Red color:
Green color:
Blue color:
Opacity:
Use rectangle: ✓
Dimensions: W= 75 H= 37
Coordinates: X= 483 Y= 821
Angle: 0
Scripts: Collection
User-defined Collection

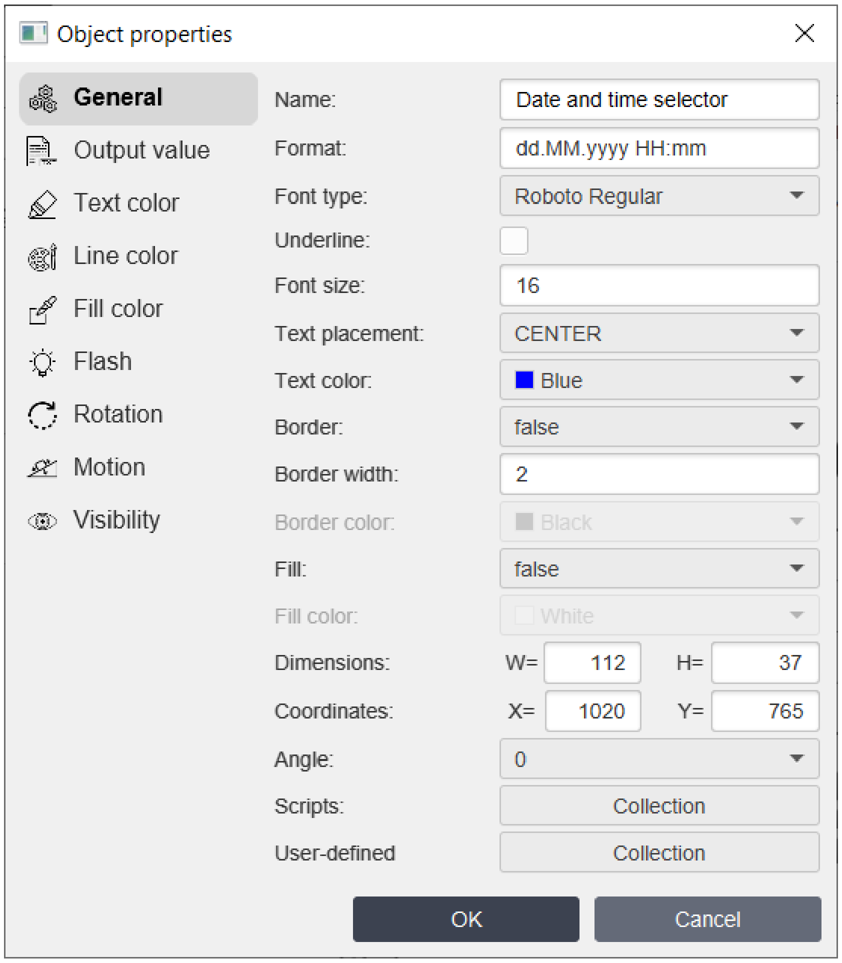
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Red color	**redcolortagstring**	Choose Red color tag.
Green color	**greencolortagstring**	Choose Green color tag.
Blue color	**bluecolortagstring**	Choose Blue color tag.
Opacity	**opacitycolortagstring**	Choose Opacity tag.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.

Properties from the **"Visibility"** tab are described here 354.

6.2.3.21.7 Date and time selector



Name: Date and time selector
Format: dd.MM.yyyy HH:mm
Font type: Roboto Regular
Underline:
Font size: 16
Text placement: CENTER
Text color: Blue
Border: false
Border width: 2
Border color: Black
Fill: false
Fill color: White
Dimensions: W= 112 H= 37
Coordinates: X= 1020 Y= 765
Angle: 0
Scripts: Collection
User-defined Collection

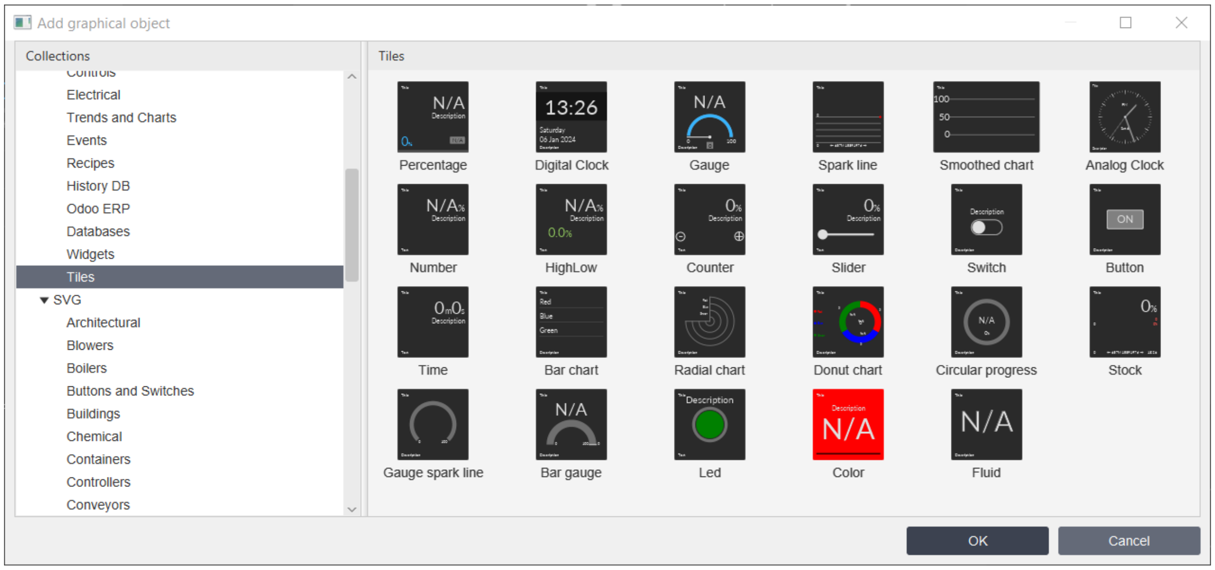
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Format	**text**	Date and time format of the selector.
Font type	**fonttype**	Type of the text's font.
Underline	**underline**	Check if you want to underline the text.
Font size	**fontsize**	Size of the text's font.
Text placement	**textplacement**	Placement of the text: ▪ Left ▪ Center ▪ Right

Property	ST script field	Description
Text color	**textcolor**	Color of the text.
Border	**useborder**	Select use or not use border for the text.
Border width	**linewidth**	Width of the border's line.
Border color	**bordercolor**	Color of the border's line.
Fill	**fill**	Select fill or not fill text's background.
Fill color	**fillcolor**	Color of the text's background.

Properties from the **"Output value"** tab are described here 367.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

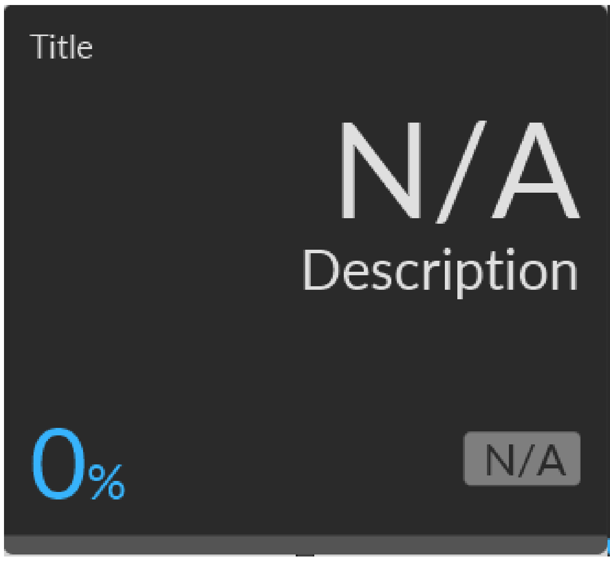
6.2.3.22 Tiles



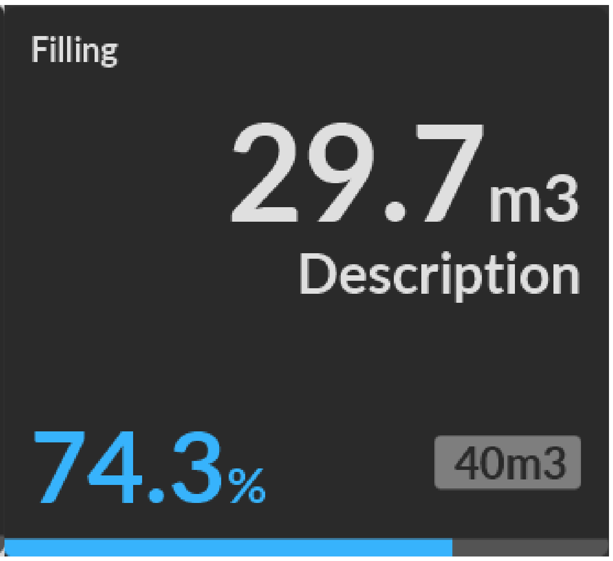
Tiles library contains the following object:

- Percentage 286
- Digital Clock 288
- Gauge 290
- Spark line 292
- Smoothed chart 295
- Analog Clock 299

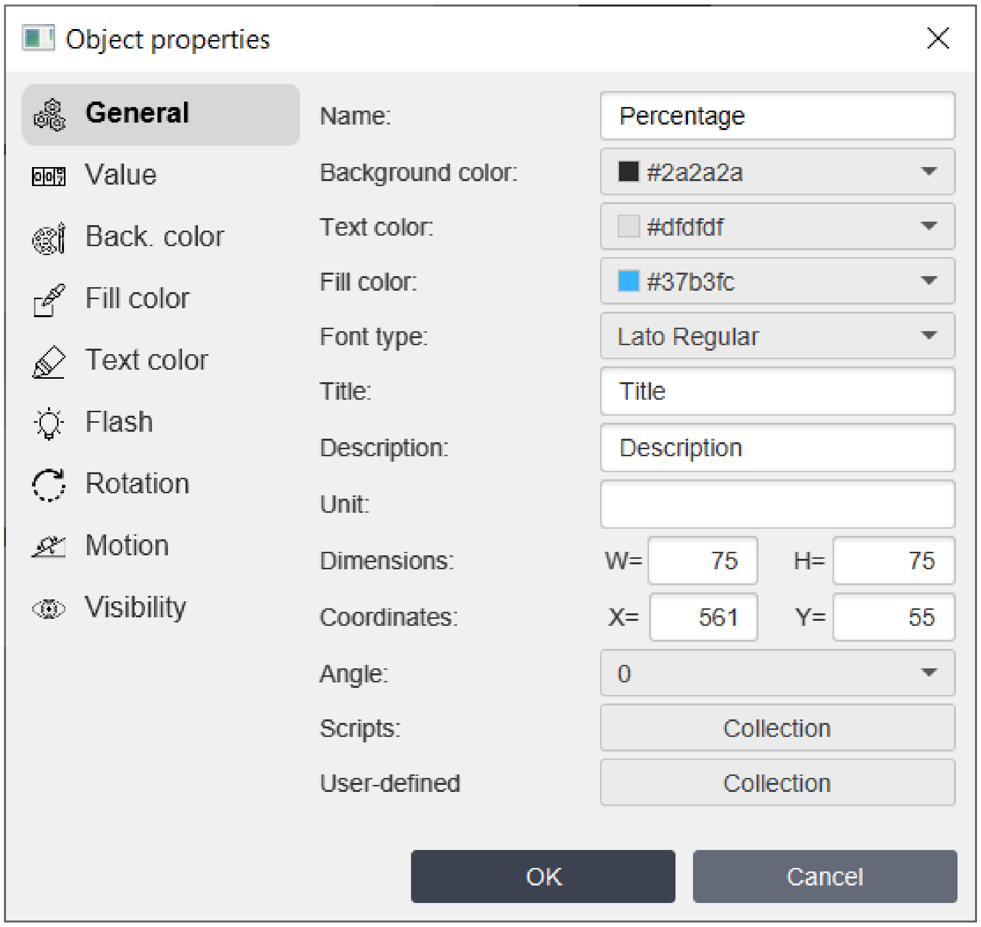
6.2.3.22.1 Percentage



pic. 1 - object image



pic. 2 - object image in a project



Object properties

Name:	Percentage
Background color:	#2a2a2a
Text color:	#dfdfdf
Fill color:	#37b3fc
Font type:	Lato Regular
Title:	Title
Description:	Description
Unit:	
Dimensions:	W= 75 H= 75
Coordinates:	X= 561 Y= 55
Angle:	0
Scripts:	Collection
User-defined	Collection

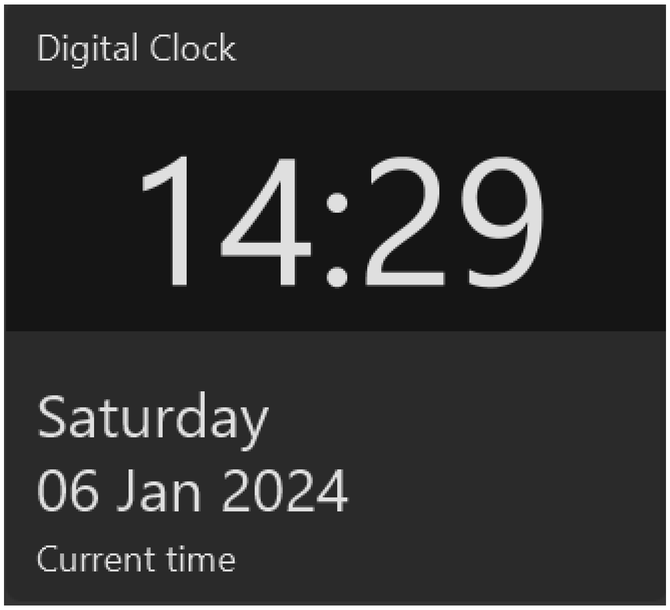
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

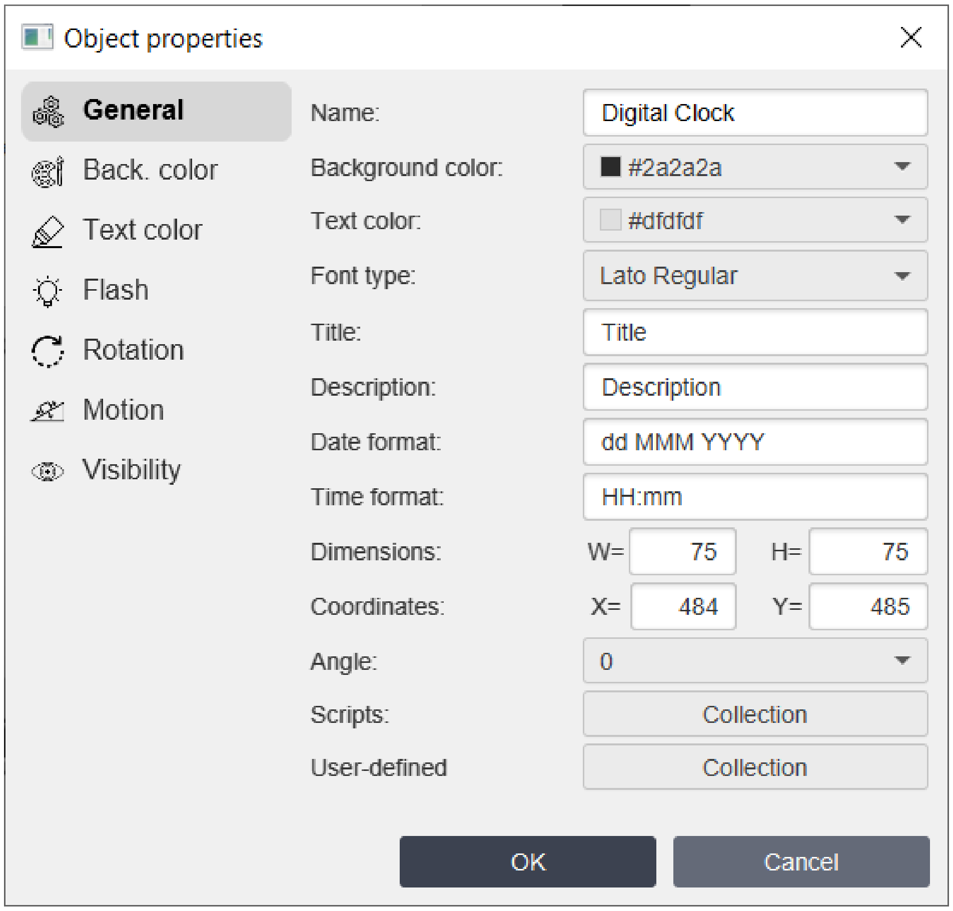
Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Specify the color of the percentage bar
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Description	**description**	Set tile's description if necessary
Unit	**unit**	Specify the unit of measure for the tag value

Properties from the **"Value"** tab are described here 374.
Properties from the **"Back. color"** tab are described here 371.

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.22.2 DigitalClockTile





Name: Digital Clock
Background color: #2a2a2a
Text color: #dfdfdf
Font type: Lato Regular
Title: Title
Description: Description
Date format: dd MMM YYYY
Time format: HH:mm
Dimensions: W= 75 H= 75
Coordinates: X= 484 Y= 485
Angle: 0
Scripts: Collection
User-defined Collection

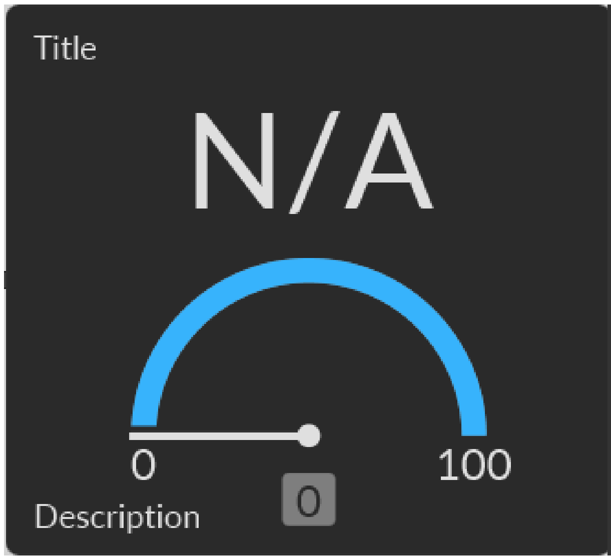
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Description	**description**	Set tile's description if necessary
Date format	**dateformat**	Specify date format
Time format	**timeformat**	Specify time format

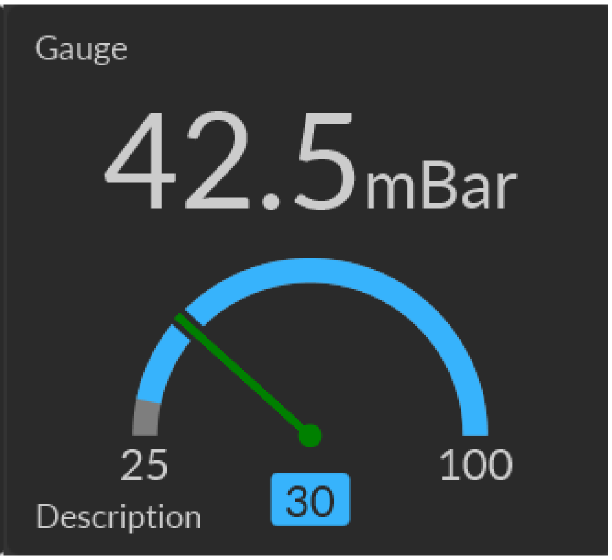
Properties from the **"Back. color"** tab are described here 371.

Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

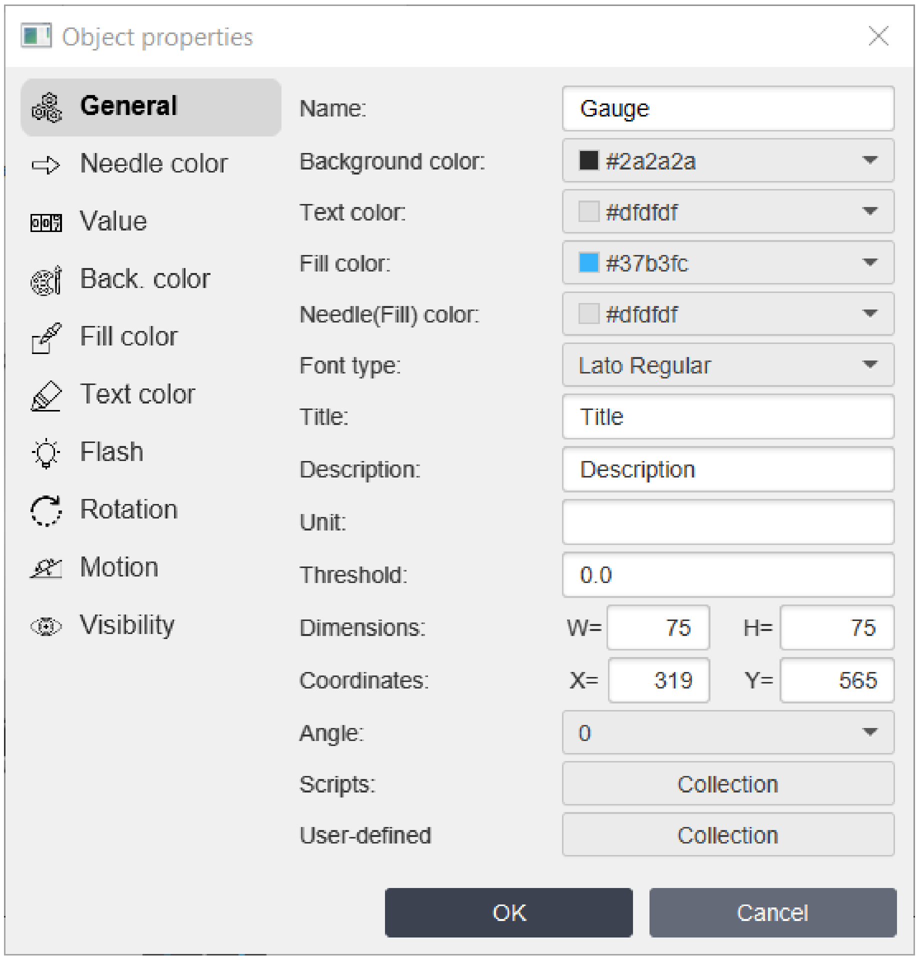
6.2.3.22.3 GaugeTile



pic. 1 - object image



pic. 2 - object image in a project



Name: Gauge
Background color: #2a2a2a
Text color: #dfdfdf
Fill color: #37b3fc
Needle(Fill) color: #dfdfdf
Font type: Lato Regular
Title: Title
Description: Description
Unit:
Threshold: 0.0
Dimensions: W= 75 H= 75
Coordinates: X= 319 Y= 565
Angle: 0
Scripts: Collection
User-defined Collection

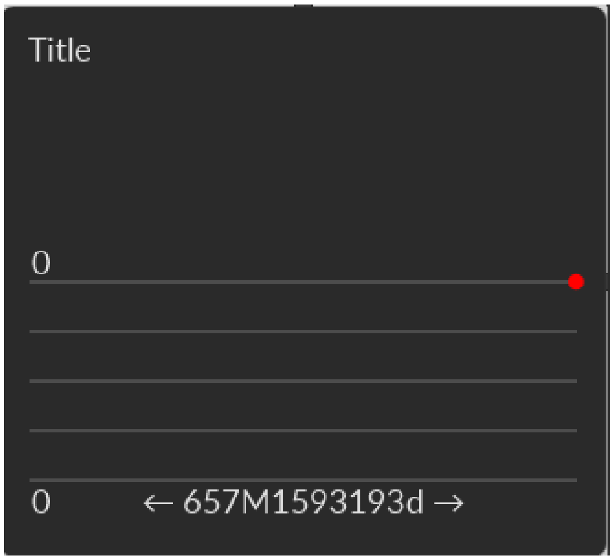
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Specify the color of the arc of the gauge
Needle(fill) color	**needlecolor**	Specify needle color
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Description	**description**	Set tile's description if necessary
Unit	**unit**	Specify the unit of measure for the tag value

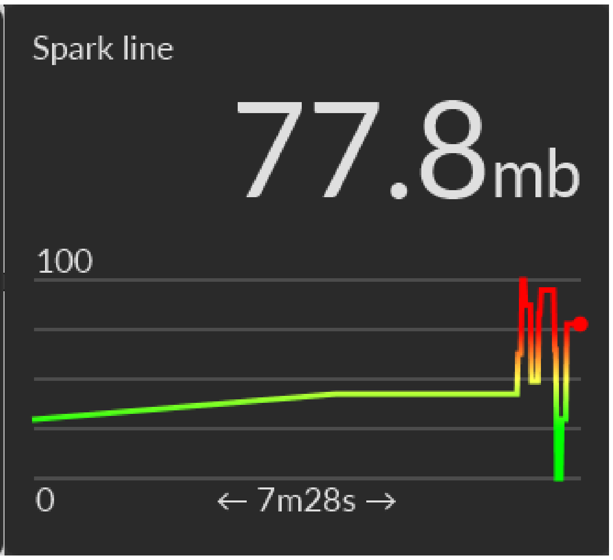
Property	ST script field	Description
Threshold	**threshold**	Specify the tag value up to which the arc color will be highlighted in a different color.

Properties from the **"Needle color"** tab are described here 371.
Properties from the **"Value"** tab are described here 375.
Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

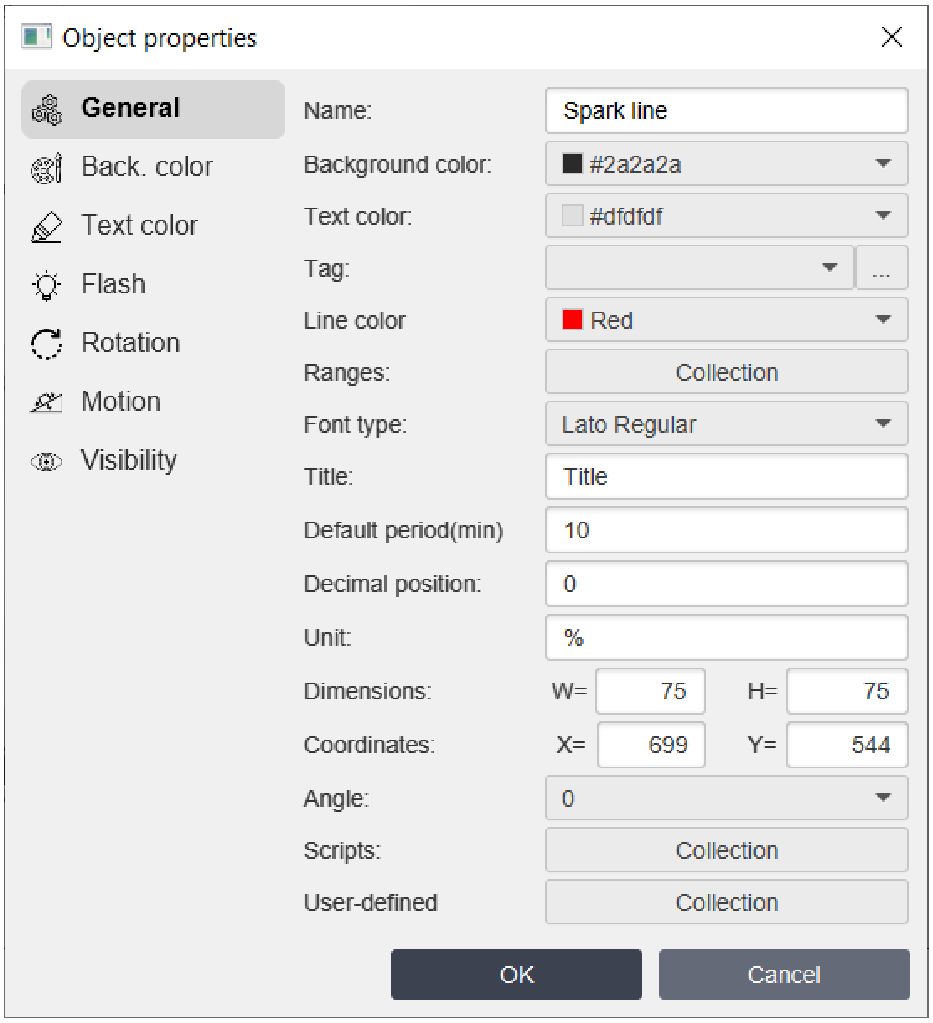
6.2.3.22.4 Sparkline



pic. 1 - object image



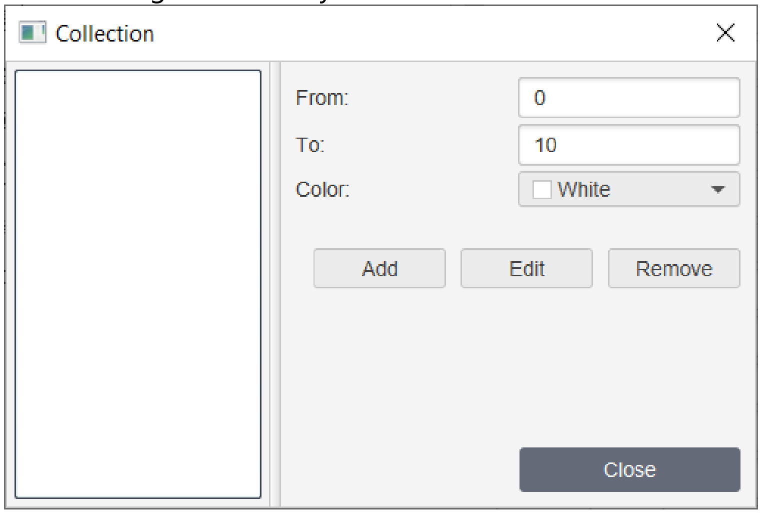
pic. 2 - object image in a project


Object properties

Name: Spark line
Background color: #2a2a2a
Text color: #dfdfdf
Tag:
Line color: Red
Ranges: Collection
Font type: Lato Regular
Title: Title
Default period(min): 10
Decimal position: 0
Unit: %
Dimensions: W= 75 H= 75
Coordinates: X= 699 Y= 544
Angle: 0
Scripts: Collection
User-defined: Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

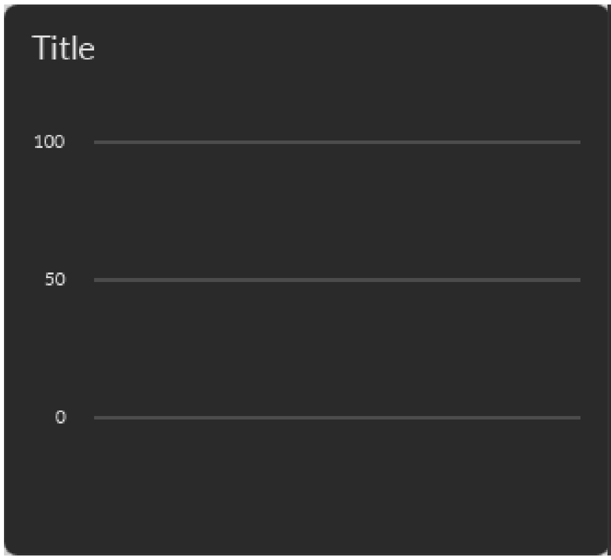
Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Tag	**tagname**	Enter tagname
Line color	**linecolor**	Specify the color of the line

Property	ST script field	Description
Ranges	---	After clicking **Collection** you'll see window:  From: 0 To: 10 Color: White where: • **From** - enter the value from which curve will have color of this range. • **To** - enter the value to which curve will have color of this range. • **Color** - choose color for this range.
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Description	**description**	Set tile's description if necessary
Default period (min)	**defaultperiod**	Default time period of the trend (end time - begin time).
Decimal position	**decimal pos**	Decimal position of tag's values
Unit	**unit**	Specify the unit of measure for the tag value

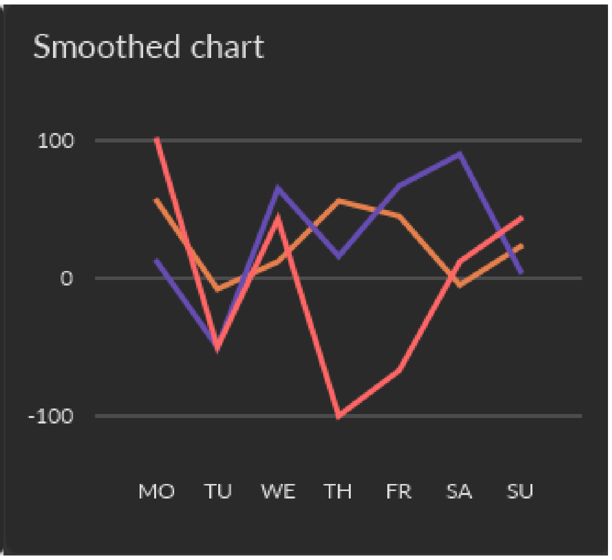
Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.

Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

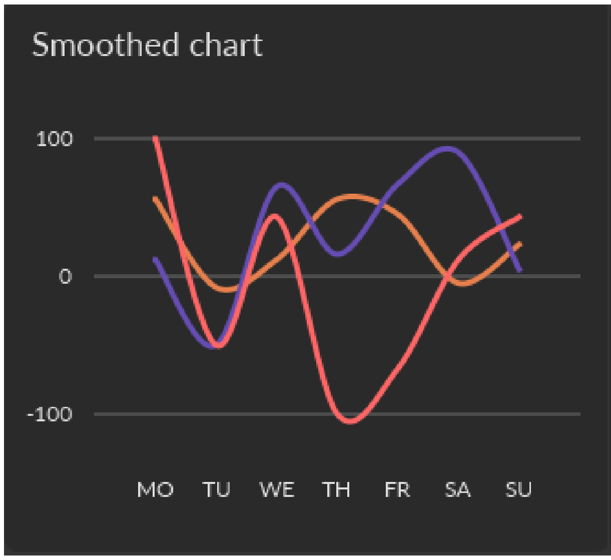
6.2.3.22.5 Smoothed chart



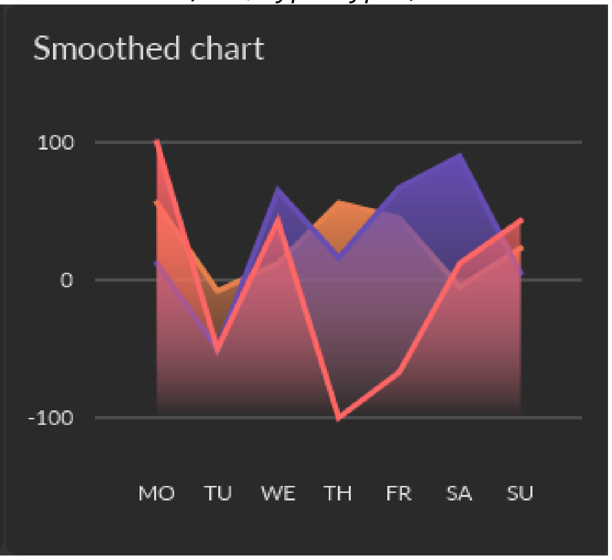
pic. 1 - object image



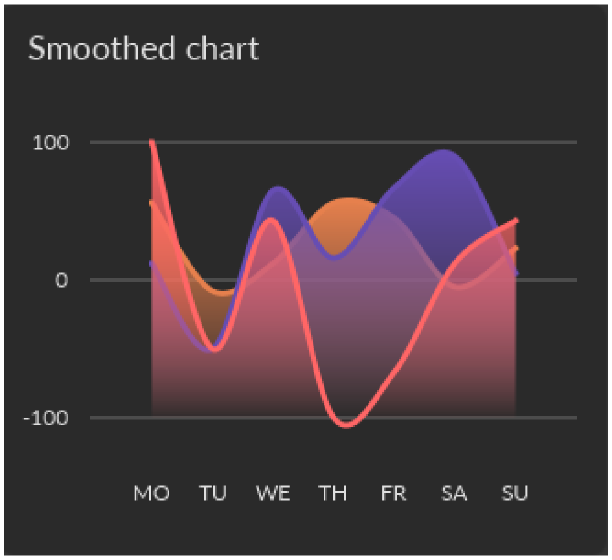
pic. 2 - object image in a project (Smoothing - false; Type -type1)



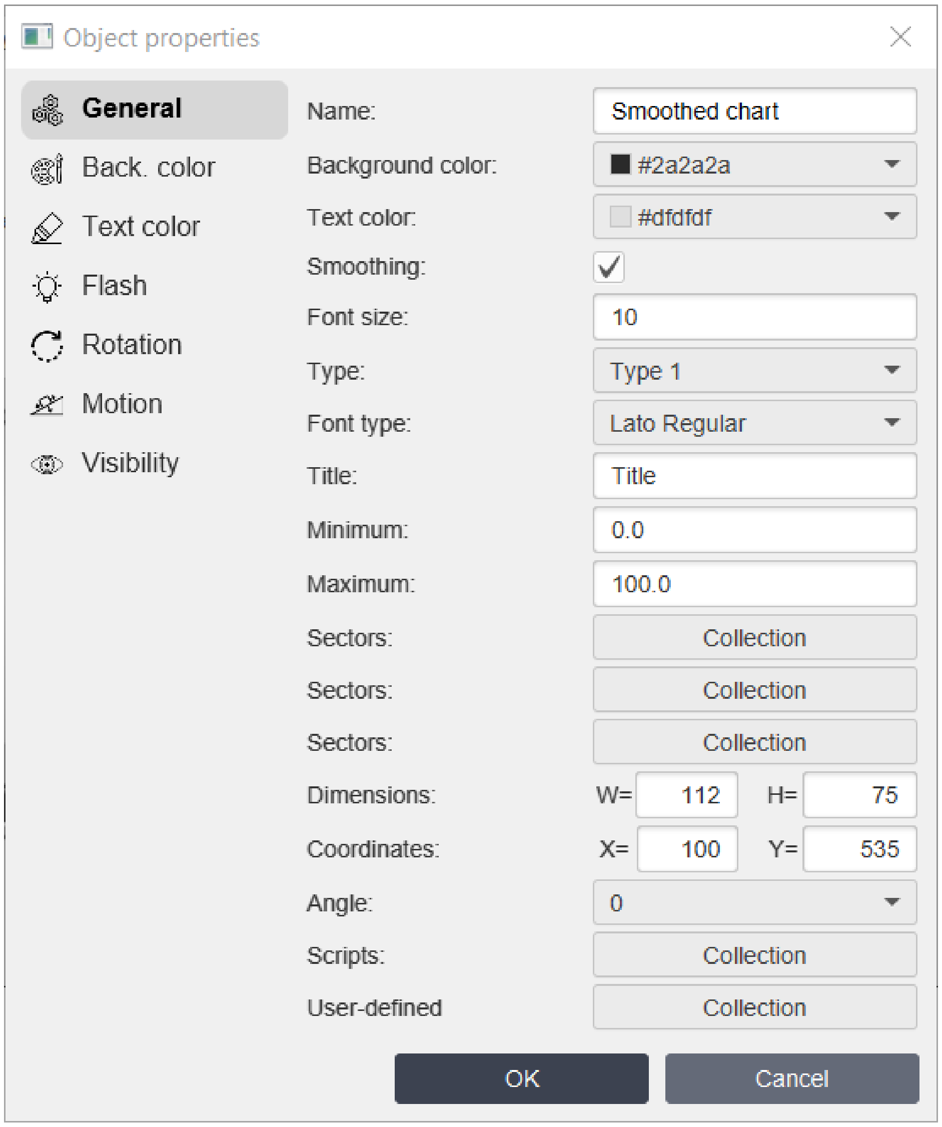
pic. 2 - object image in a project (Smoothing - true; Type -type1)



pic. 2 - object image in a project (Smoothing - false; Type -type2)



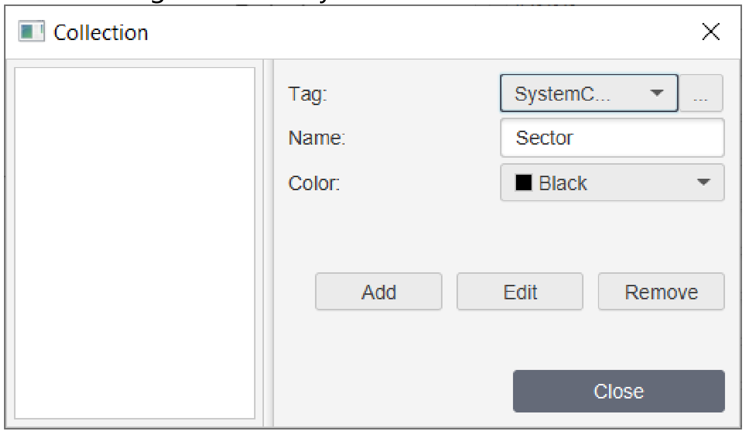
pic. 2 - object image in a project (Smoothing - true; Type -type2)



Name: Smoothed chart
Background color: #2a2a2a
Text color: #dfdfdf
Smoothing: ✓
Font size: 10
Type: Type 1
Font type: Lato Regular
Title: Title
Minimum: 0.0
Maximum: 100.0
Sectors: Collection
Sectors: Collection
Sectors: Collection
Dimensions: W= 112 H= 75
Coordinates: X= 100 Y= 535
Angle: 0
Scripts: Collection
User-defined Collection

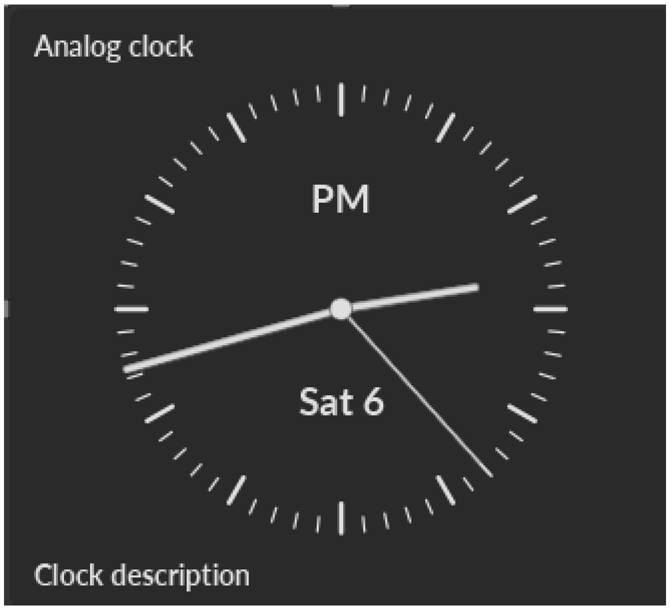
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

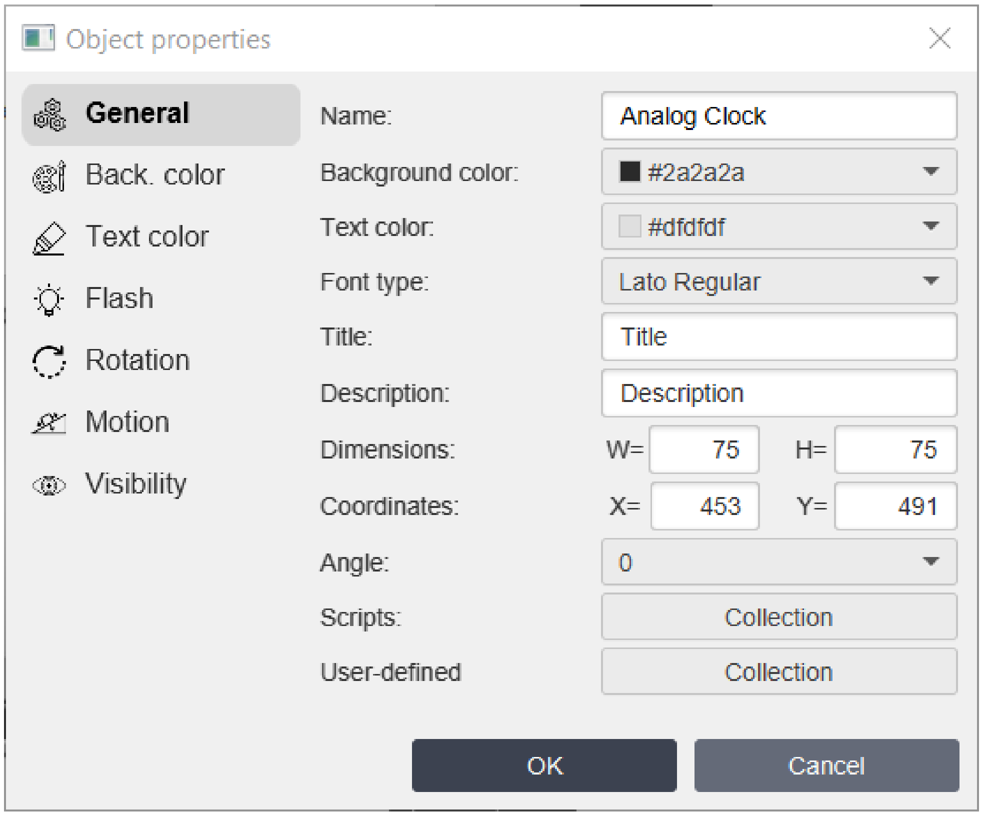
Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Smoothing	**smoothing**	Check if you want the line on the chart to be smooth

Property	ST script field	Description
Font size	**fontsize**	Specify font size
Type	**charttype**	Specify the chart type (type 1 - line, type 2 - area chart)
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Minimum	**minimum**	Specify the minimum value
Maximum	**maximum**	Specify the maximum value
Sectors	**---**	After clicking **Collection** you'll see window:  Tag: SystemC... Name: Sector Color: Black where: ▪ **Tag** - tag that you want to bind to this bar. ▪ **Name** - name of the bar chart sector. ▪ **Color** - bar's color.

Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.22.6 Analog clock





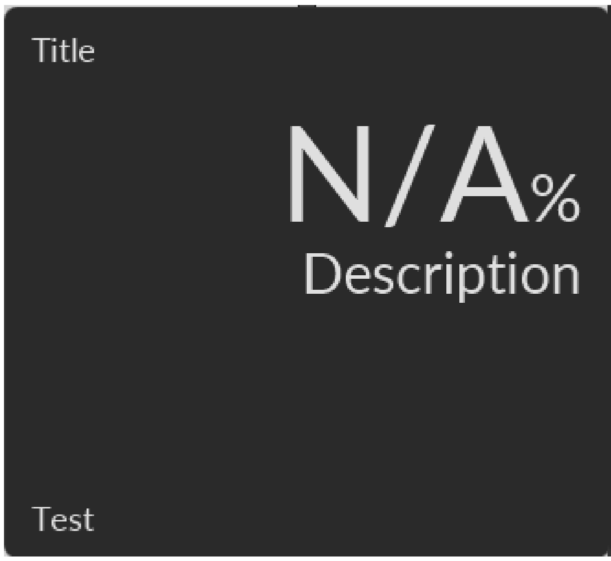
Name:	Analog Clock
Background color:	■ #2a2a2a
Text color:	□ #dfdfdf
Font type:	Lato Regular
Title:	Title
Description:	Description
Dimensions:	W= 75 H= 75
Coordinates:	X= 453 Y= 491
Angle:	0
Scripts:	Collection
User-defined	Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

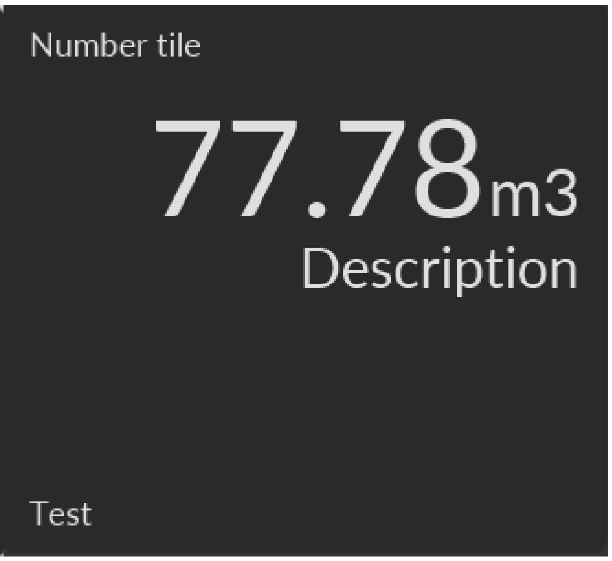
Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Description	**description**	Set tile's description if necessary

Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

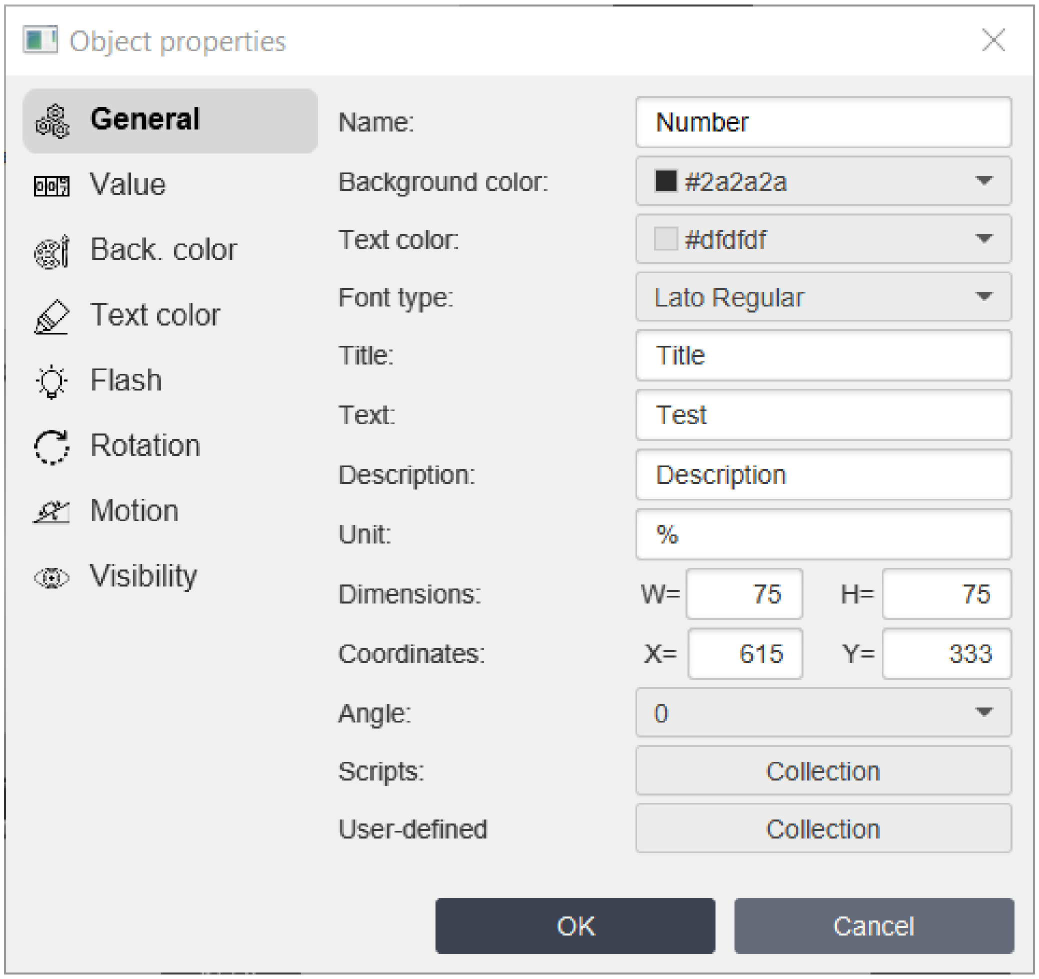
6.2.3.22.7 Number



pic. 1 - object image



pic. 2 - object image in a project



Name: Number
Background color: #2a2a2a
Text color: #dfdfdf
Font type: Lato Regular
Title: Title
Text: Test
Description: Description
Unit: %
Dimensions: W= 75 H= 75
Coordinates: X= 615 Y= 333
Angle: 0
Scripts: Collection
User-defined Collection

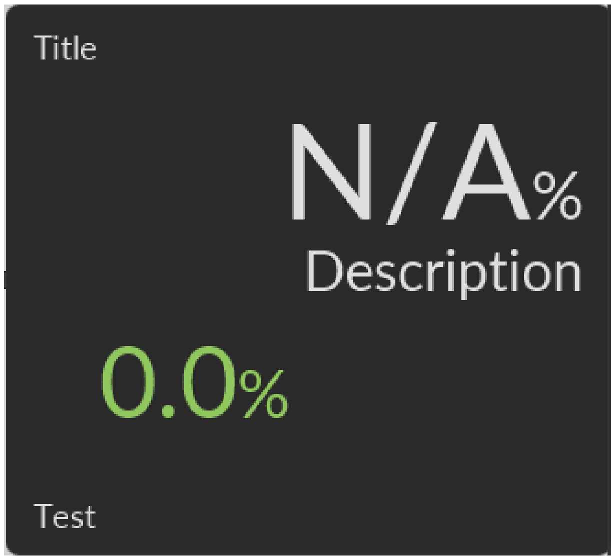
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Text	**text**	Set tile's text
Description	**description**	Set tile's description if necessary
Unit	**unit**	Specify the unit of measure for the tag value

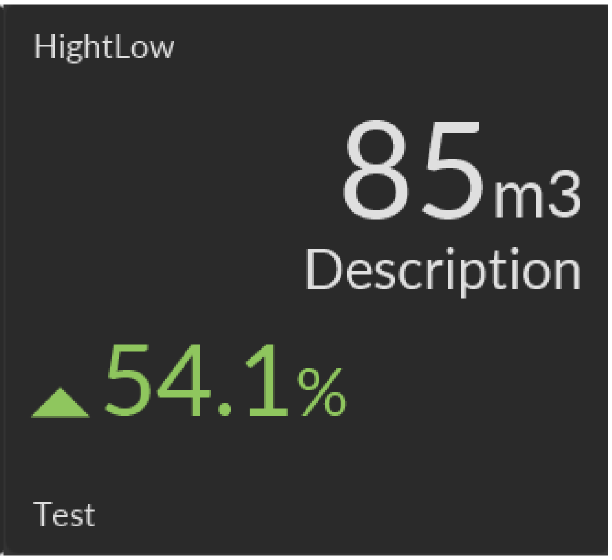
Properties from the **"Value"** tab are described here 374.

Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

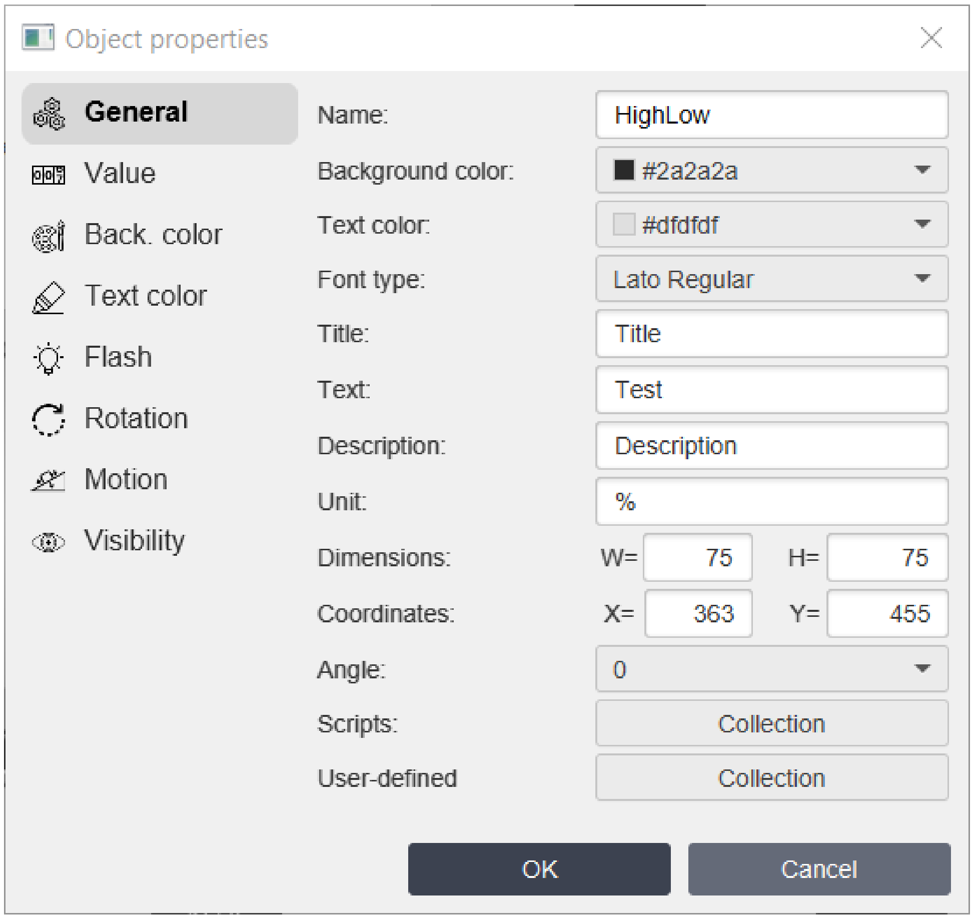
6.2.3.22.8 HighLow



pic. 1 - object image



pic. 2 - object image in a project



Name: HighLow
Background color: #2a2a2a
Text color: #dfdfdf
Font type: Lato Regular
Title: Title
Text: Test
Description: Description
Unit: %
Dimensions: W= 75 H= 75
Coordinates: X= 363 Y= 455
Angle: 0
Scripts: Collection
User-defined Collection

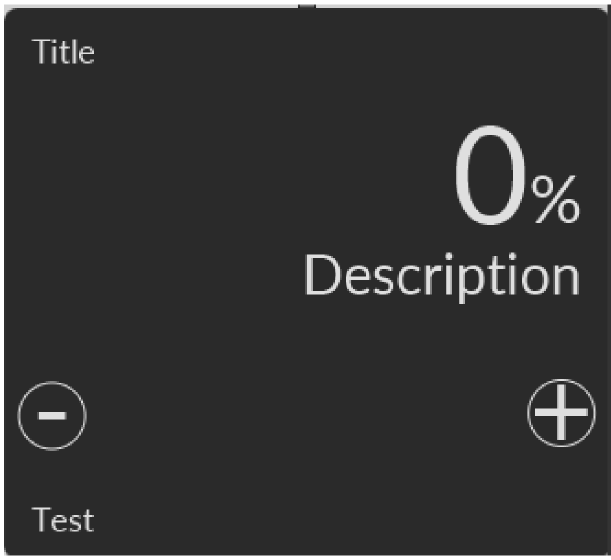
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Text	**text**	Set tile's text
Description	**description**	Set tile's description if necessary
Unit	**unit**	Specify the unit of measure for the tag value

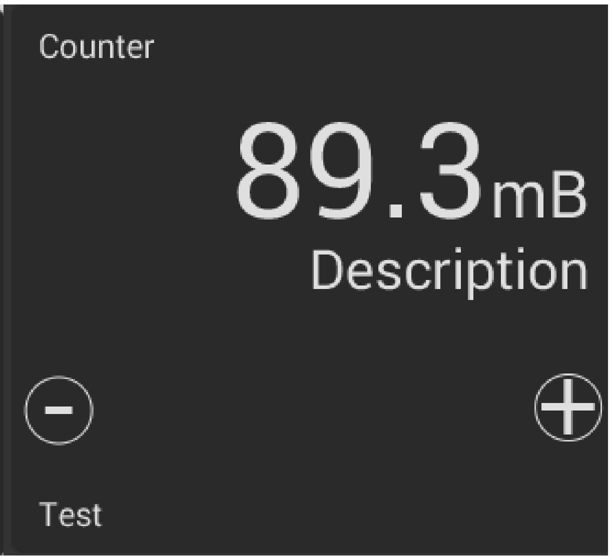
Properties from the **"Value"** tab are described here 374.
Properties from the **"Back. color"** tab are described here 371.

Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

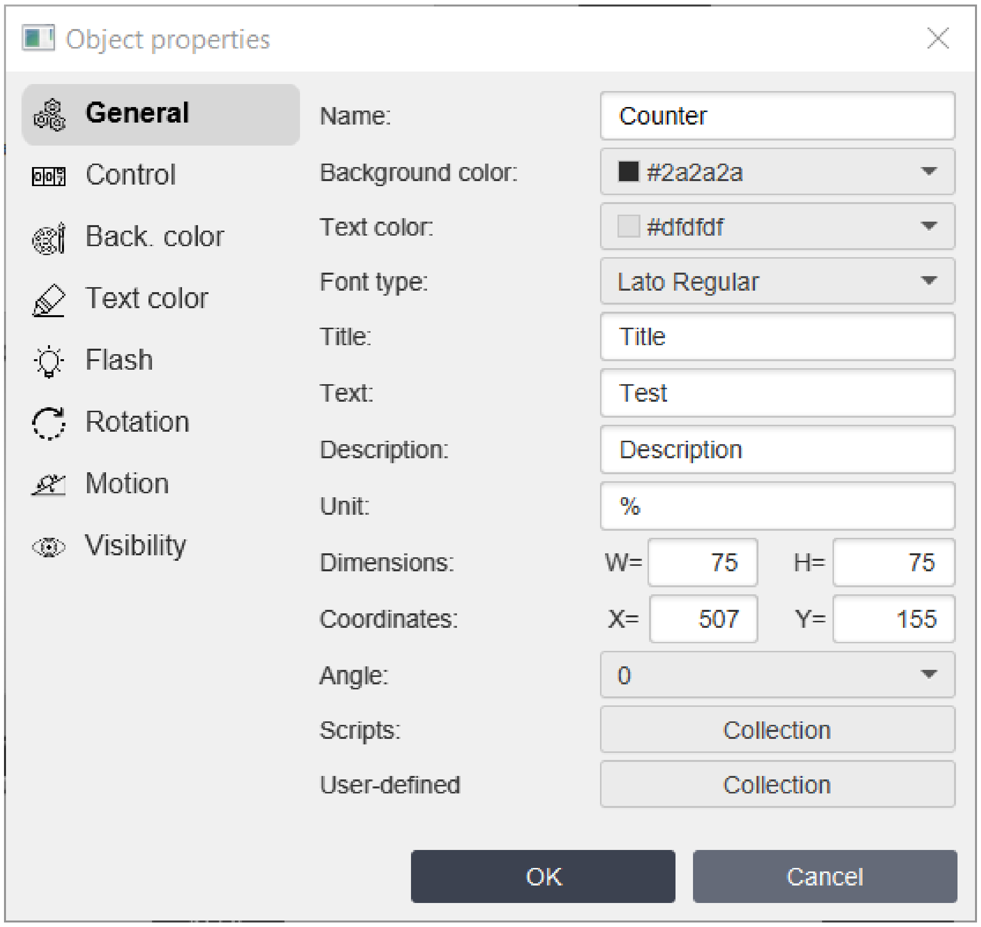
6.2.3.22.9 Counter



pic. 1 - object image



pic. 2 - object image in a project


Object properties

- General
- Control
- Back. color
- Text color
- Flash
- Rotation
- Motion
- Visibility

Name:	Counter
Background color:	#2a2a2a
Text color:	#dfdfdf
Font type:	Lato Regular
Title:	Title
Text:	Test
Description:	Description
Unit:	%
Dimensions:	W= 75 H= 75
Coordinates:	X= 507 Y= 155
Angle:	0
Scripts:	Collection
User-defined	Collection

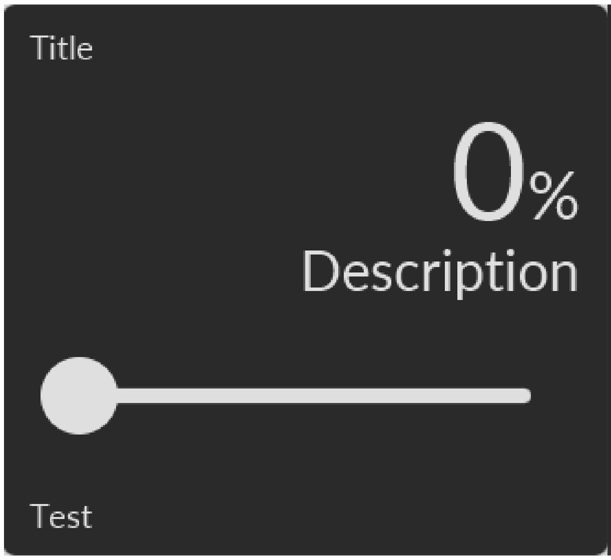
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Text	**text**	Set tile's text
Description	**description**	Set tile's description if necessary
Unit	**unit**	Specify the unit of measure for the tag value

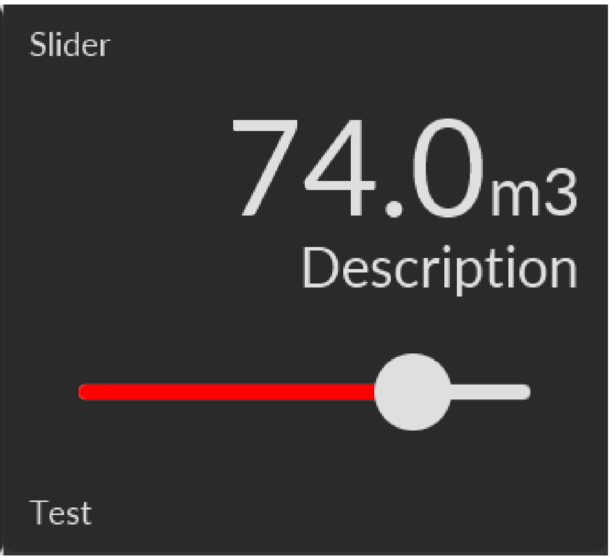
Properties from the **"Control"** tab are described here 373.
Properties from the **"Back. color"** tab are described here 371.

Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

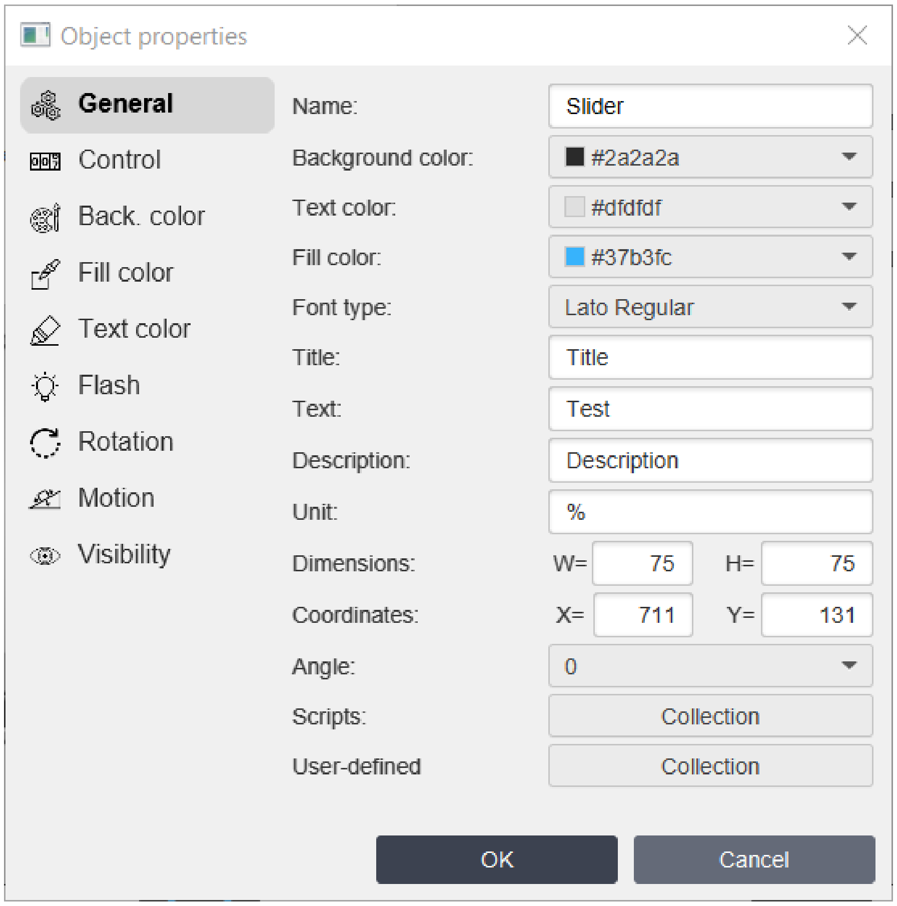
6.2.3.22.10 Slider



pic. 1 - object image



pic. 2 - object image in a project



Object properties

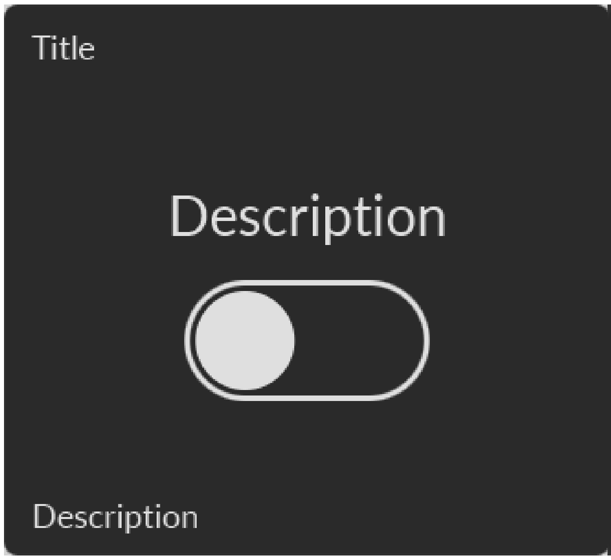
Name:	Slider
Background color:	#2a2a2a
Text color:	#dfdfdf
Fill color:	#37b3fc
Font type:	Lato Regular
Title:	Title
Text:	Test
Description:	Description
Unit:	%
Dimensions:	W= 75 H= 75
Coordinates:	X= 711 Y= 131
Angle:	0
Scripts:	Collection
User-defined	Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

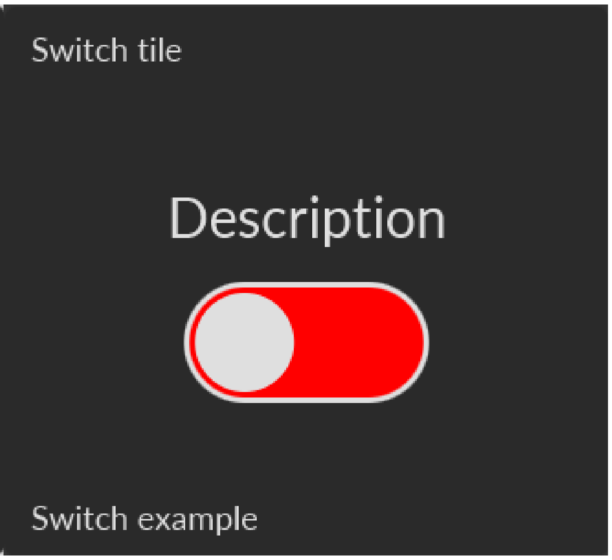
Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Specify the color of the bar that displays the tag value
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Text	**text**	Set tile's text
Description	**description**	Set tile's description if necessary
Unit	**unit**	Specify the unit of measure for the tag value

Properties from the **"Control"** tab are described here 372.
Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

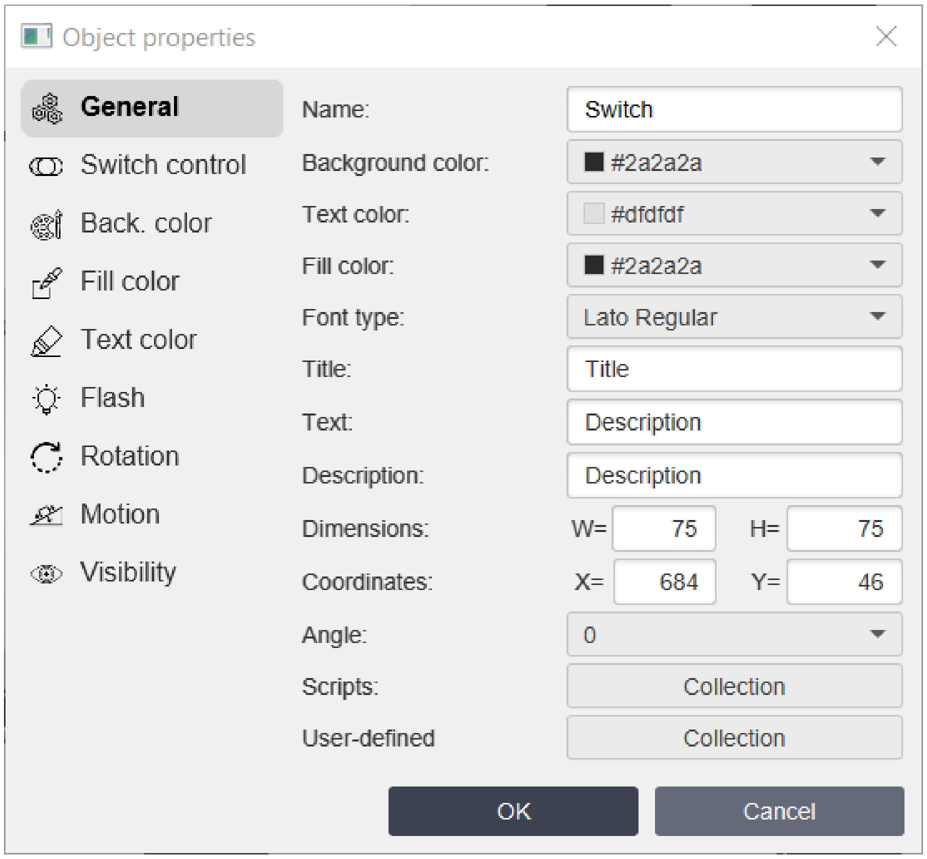
6.2.3.22.11 Switch



pic. 1 - object image



pic. 2 - object image in a project



Name: Switch
Background color: #2a2a2a
Text color: #dfdfdf
Fill color: #2a2a2a
Font type: Lato Regular
Title: Title
Text: Description
Description: Description
Dimensions: W= 75 H= 75
Coordinates: X= 684 Y= 46
Angle: 0
Scripts: Collection
User-defined: Collection

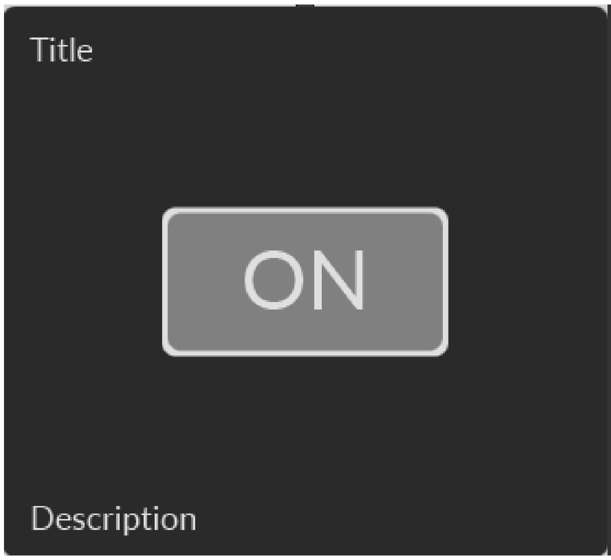
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Specify the color of the bar that displays the tag value
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Text	**text**	Set tile's text
Description	**description**	Set tile's description if necessary

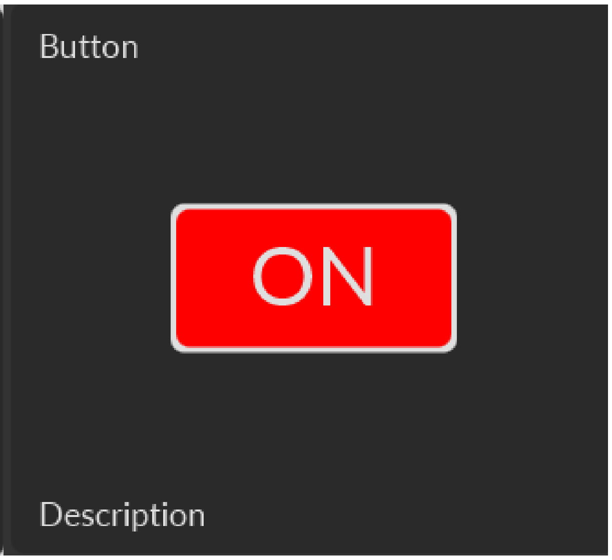
Properties from the **"Switch control"** tab are described here 377.
Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357.

Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

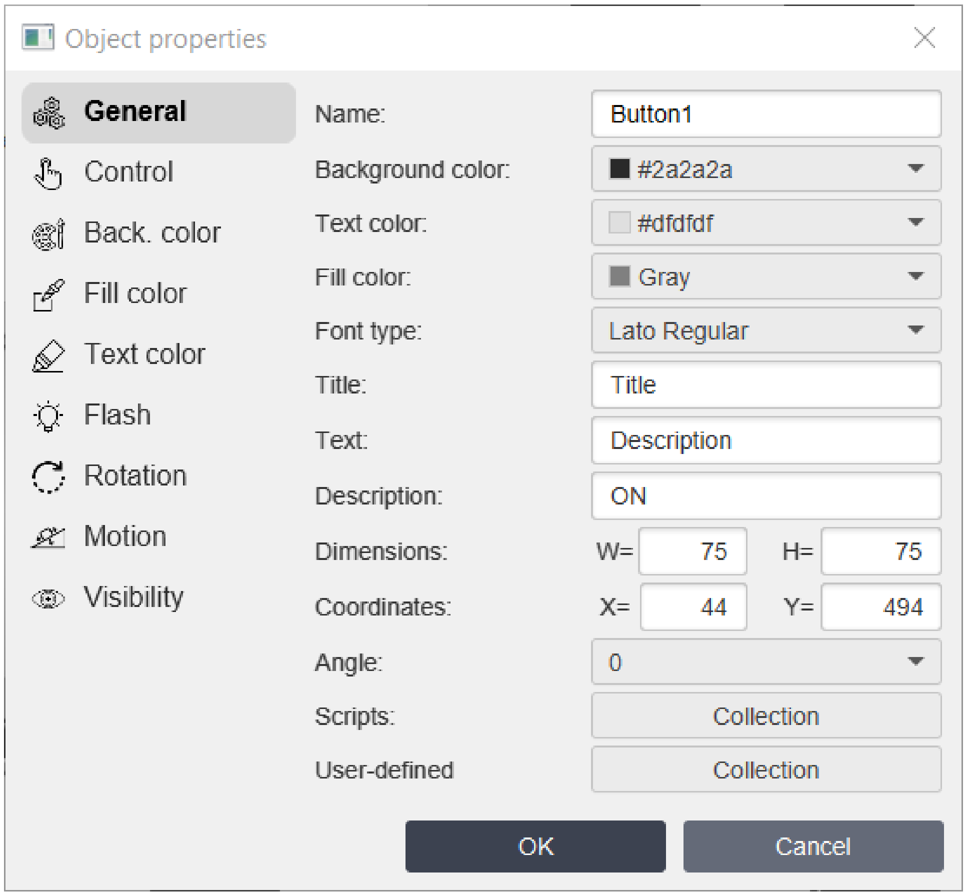
6.2.3.22.12 Button



pic. 1 - object image



pic. 2 - object image in a project



Object properties

General
Control
Back. color
Fill color
Text color
Flash
Rotation
Motion
Visibility

Name:	Button1
Background color:	■ #2a2a2a
Text color:	□ #dfdfdf
Fill color:	■ Gray
Font type:	Lato Regular
Title:	Title
Text:	Description
Description:	ON
Dimensions:	W= 75 H= 75
Coordinates:	X= 44 Y= 494
Angle:	0
Scripts:	Collection
User-defined	Collection

OK Cancel

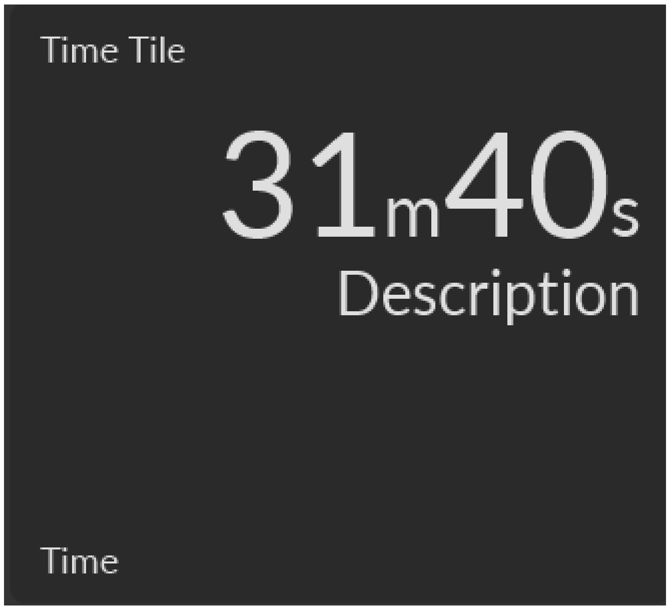
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

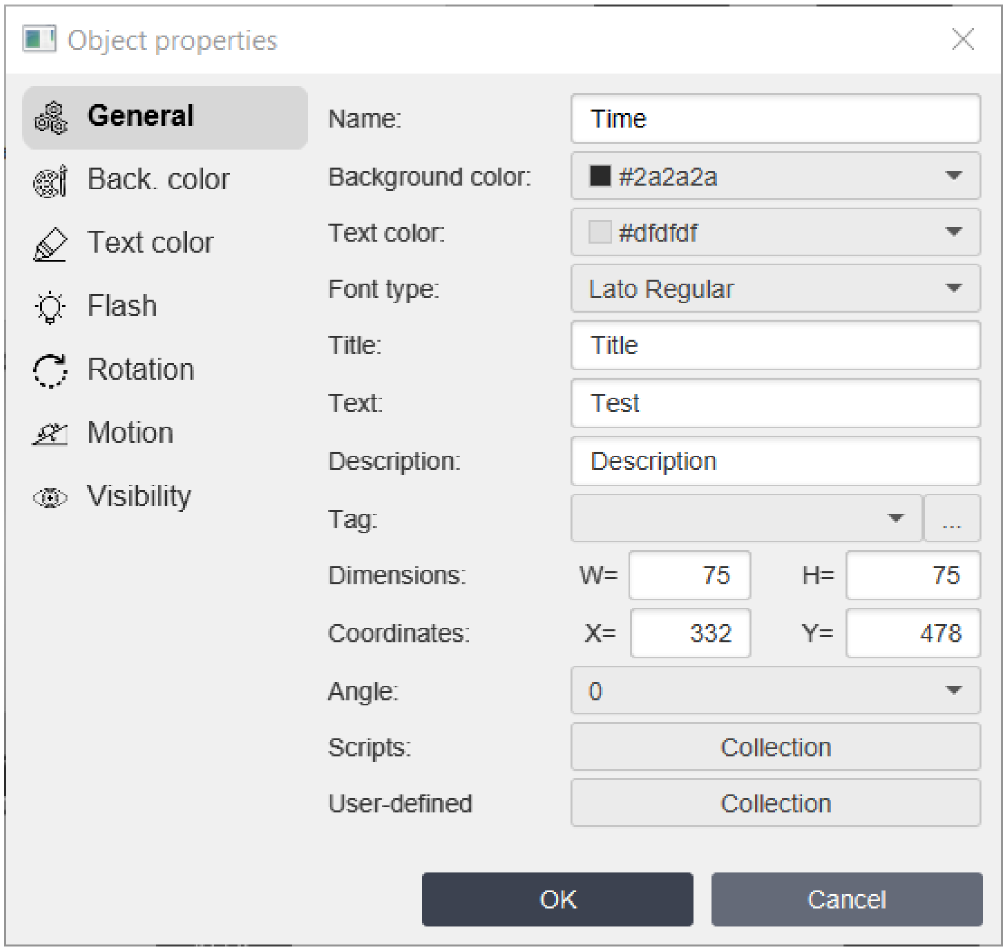
Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Specify the color of the bar that displays the tag value
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Text	**text**	Set tile's text
Description	**description**	Set tile's description if necessary

Properties from the **"Control"** tab are described here 362.
Properties from the **"Back. color"** tab are described here 371.

Properties from the **"Fill Color"** tab are described here 357
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.22.13 Time





Name: Time
Background color: #2a2a2a
Text color: #dfdfdf
Font type: Lato Regular
Title: Title
Text: Test
Description: Description
Tag:
Dimensions: W= 75 H= 75
Coordinates: X= 332 Y= 478
Angle: 0
Scripts: Collection
User-defined Collection

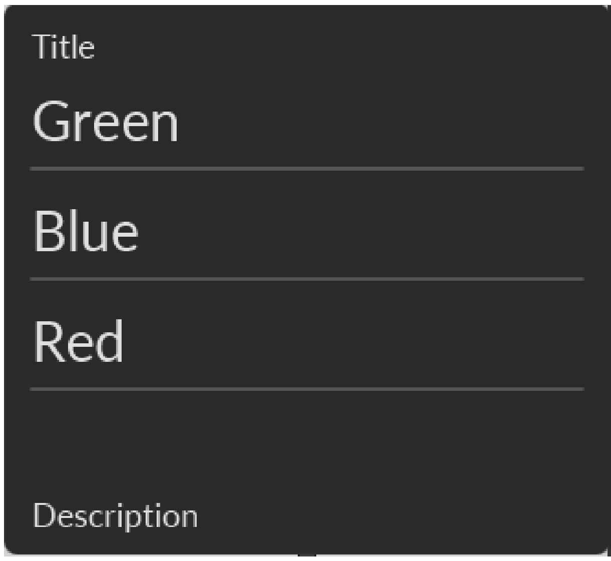
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Text	**text**	Set tile's text
Description	**description**	Set tile's description if necessary
Tag	**tagname**	Enter tagname

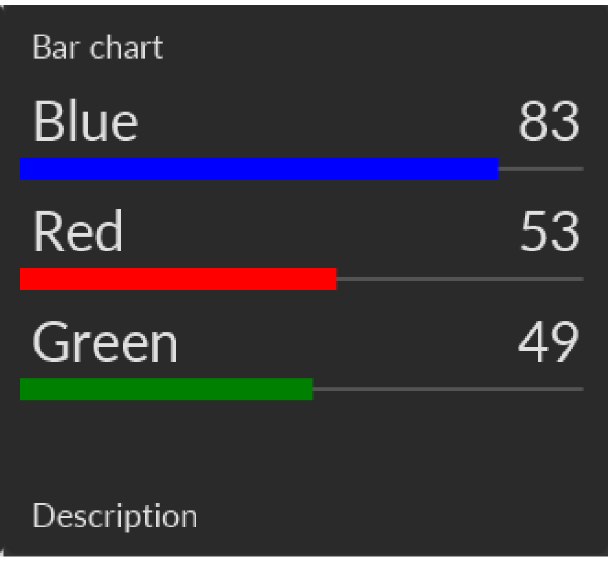
Properties from the **"Back. color"** tab are described here 371.

Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

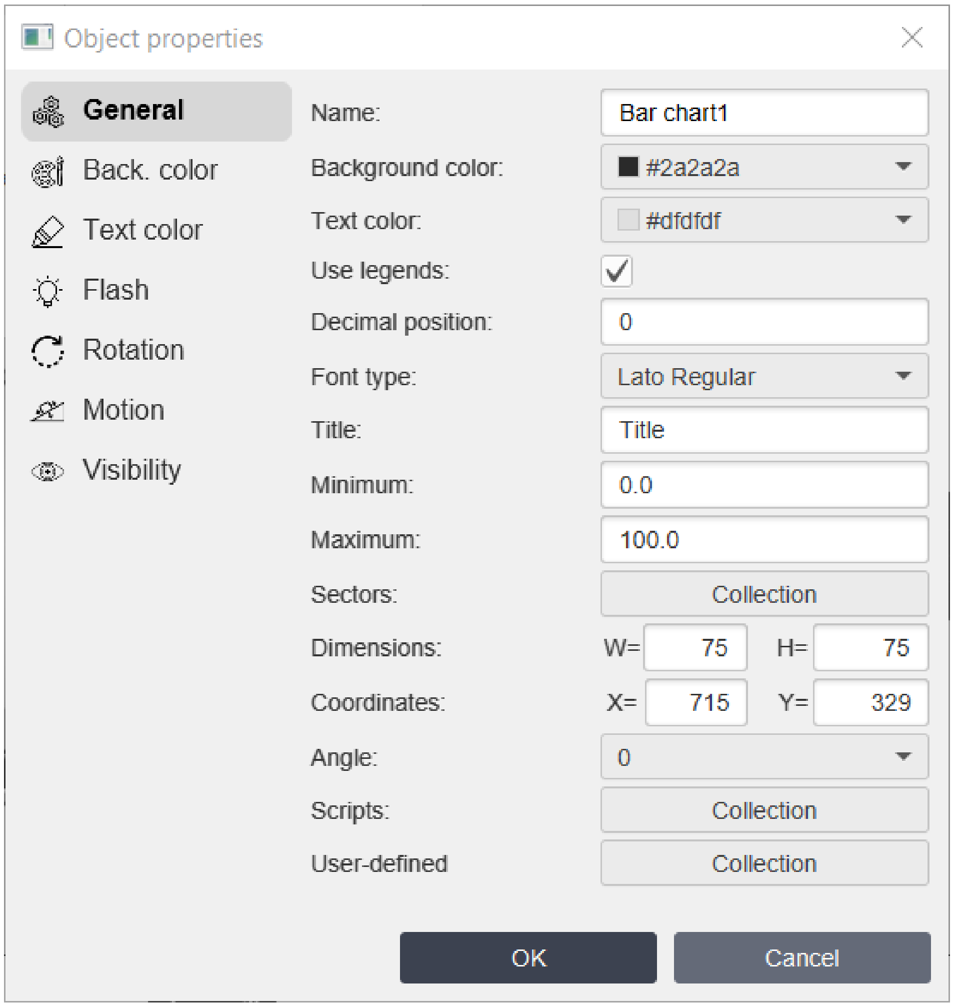
6.2.3.22.14 Bar chart



pic. 1 - object image



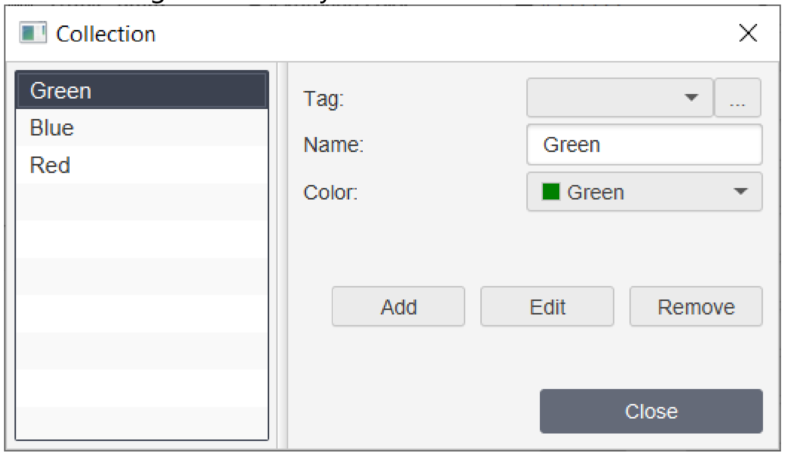
pic. 2 - object image in a project



Name: Bar chart1
Background color: #2a2a2a
Text color: #dfdfdf
Use legends: ✓
Decimal position: 0
Font type: Lato Regular
Title: Title
Minimum: 0.0
Maximum: 100.0
Sectors: Collection
Dimensions: W= 75 H= 75
Coordinates: X= 715 Y= 329
Angle: 0
Scripts: Collection
User-defined Collection

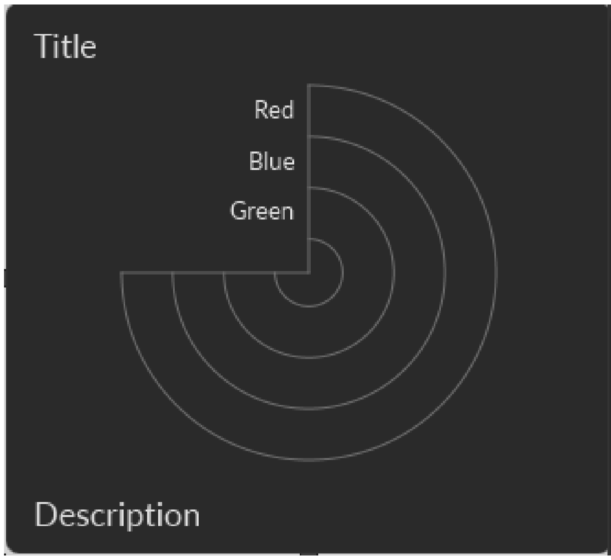
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Use legends	**uselegends**	Check it if you want to add legends to the bar chart.

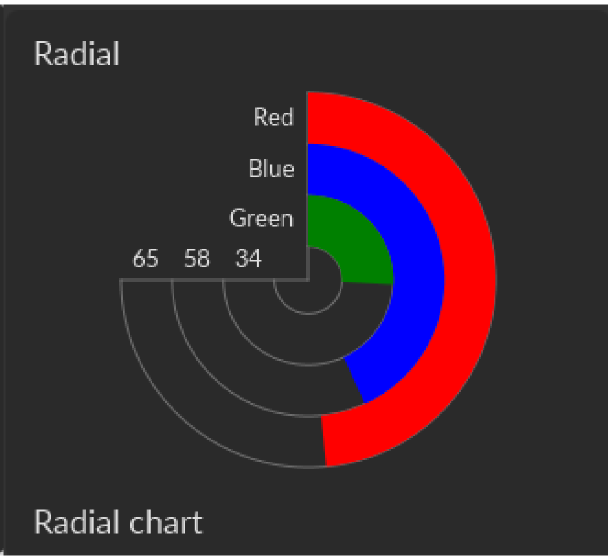
Property	ST script field	Description
Decimal position	**decimalpos**	Decimal position of tag’s values entered in the table.
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Minimum	**text**	Set tile's text
Maximum	**description**	Set tile's description if necessary
Sectors	**---**	After clicking **Collection** you’ll see window:  Collection; list: Green, Blue, Red; Tag: ; Name: Green; Color: Green; Add, Edit, Remove, Close where: ▪ **Tag** - tag that you want to bind to this bar. ▪ **Name** - name of the bar chart sector. ▪ **Color** - bar's color.

Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

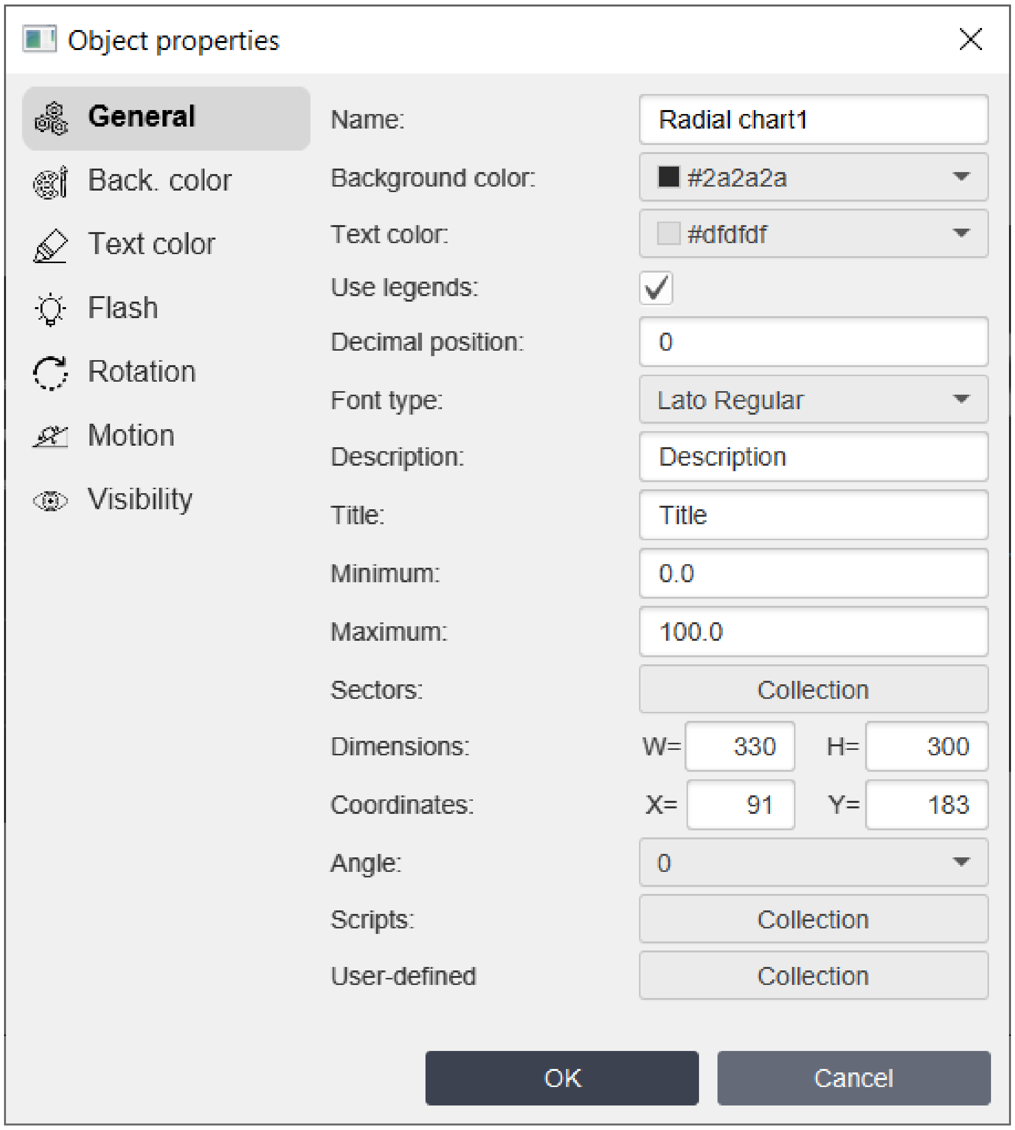
6.2.3.22.15 Radial chart



pic. 1 - object image



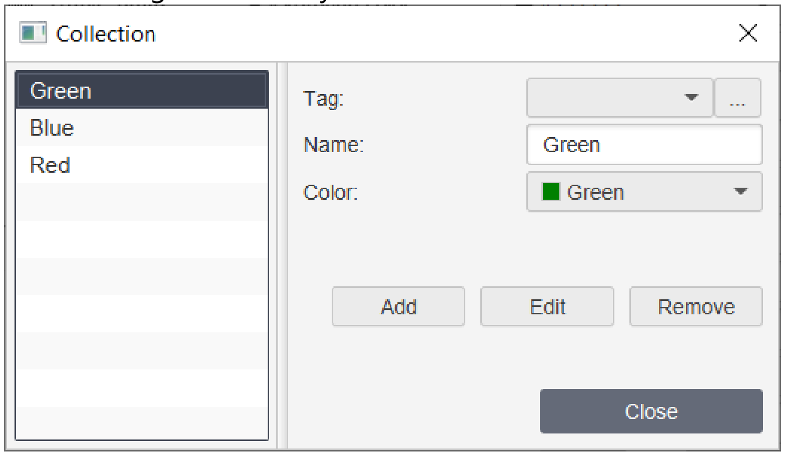
pic. 2 - object image in a project



Name: Radial chart1
Background color: #2a2a2a
Text color: #dfdfdf
Use legends: ✓
Decimal position: 0
Font type: Lato Regular
Description: Description
Title: Title
Minimum: 0.0
Maximum: 100.0
Sectors: Collection
Dimensions: W= 330 H= 300
Coordinates: X= 91 Y= 183
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

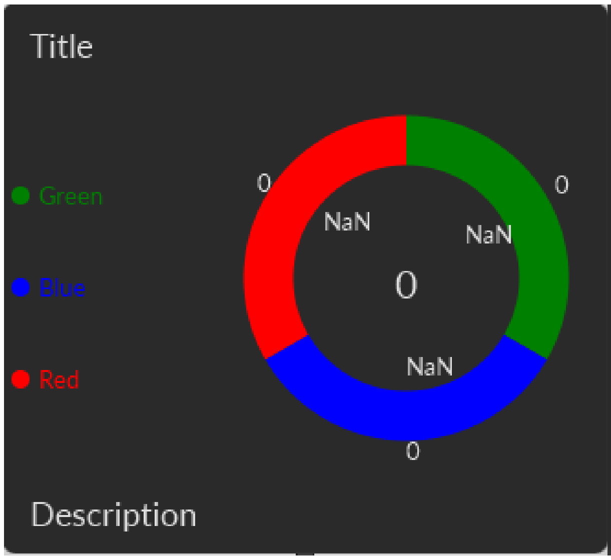
Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.

Propert y	ST script field	Description
Use legend s	uselege nds	Check it if you want to add legends to the bar chart.
Decima l positio n	decima lpos	Decimal position of tag's values entered in the table.
Font type	fonttyp e	Type of the text's font.
Descrip tion	descrip tion	Set tile's description if necessary
Title	title	Set tile's title
Minim um	text	Set tile's text
Maxim um	descrip tion	Set tile's description if necessary
Sectors	---	After clicking **Collection** you'll see window:  Collection; Green, Blue, Red; Tag: ; Name: Green; Color: 🟩 Green; Add, Edit, Remove, Close where: ▪ **Tag** - tag that you want to bind to this bar. ▪ **Name** - name of the bar chart sector. ▪ **Color** - bar's color.

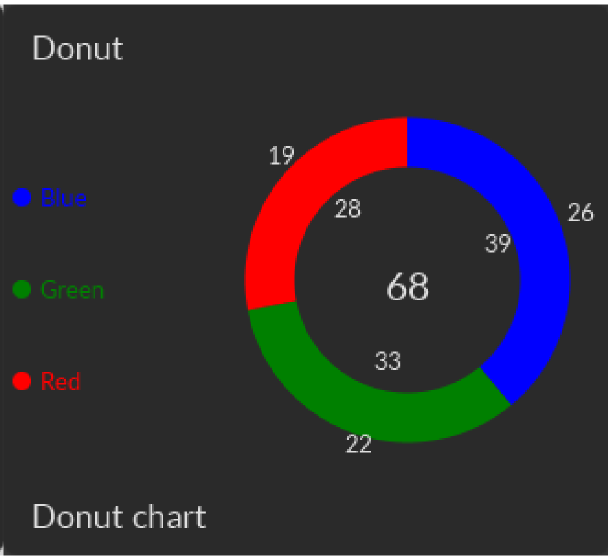
Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Text Color"** tab are described here 360.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

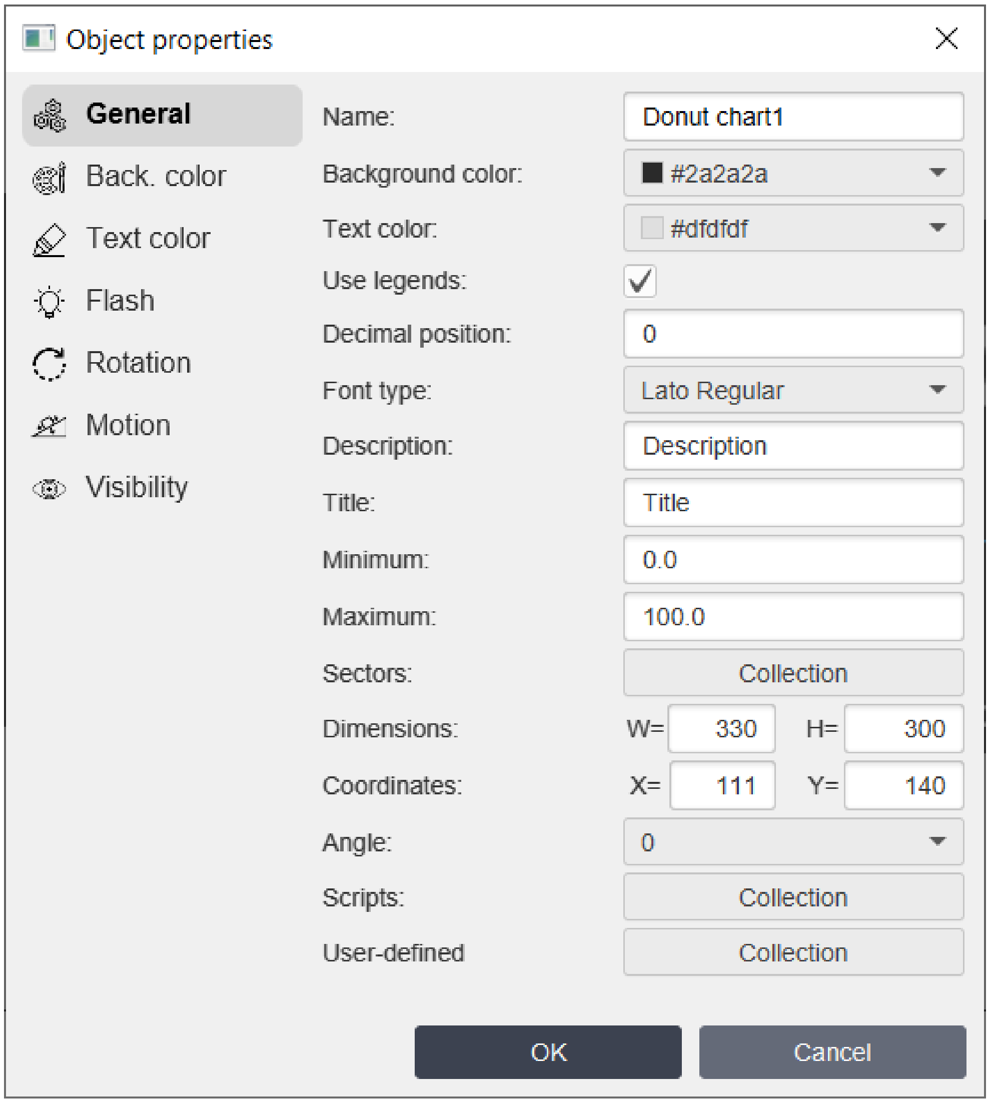
6.2.3.22.16 Donut chart



pic. 1 - object image



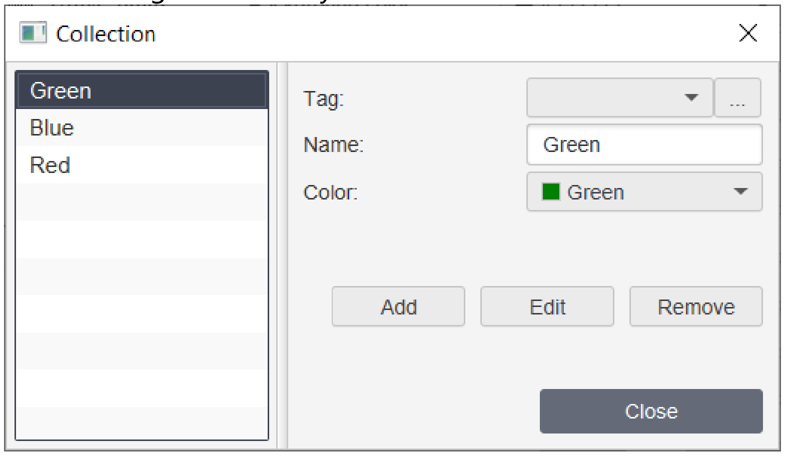
pic. 2 - object image in a project



Name: Donut chart1
Background color: ■ #2a2a2a
Text color: □ #dfdfdf
Use legends: ✓
Decimal position: 0
Font type: Lato Regular
Description: Description
Title: Title
Minimum: 0.0
Maximum: 100.0
Sectors: Collection
Dimensions: W= 330 H= 300
Coordinates: X= 111 Y= 140
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

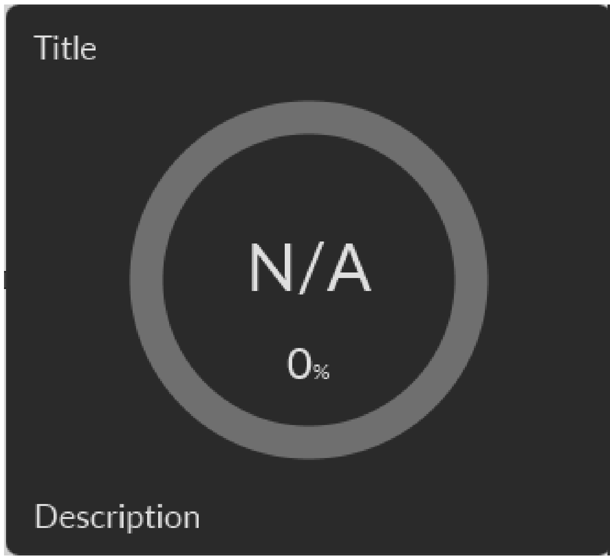
Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Use legend	**uselegends**	Check it if you want to add legends to the bar chart.

Property	ST script field	Description
s		
Decimal position	decimalpos	Decimal position of tag's values entered in the table.
Font type	fonttype	Type of the text's font.
Description	description	Set tile's description if necessary
Title	title	Set tile's title
Minimum	text	Set tile's text
Maximum	description	Set tile's description if necessary
Sectors	---	After clicking **Collection** you'll see window:  Collection; list: Green, Blue, Red; Tag: ; Name: Green; Color: Green; Add, Edit, Remove, Close. where: ▪ **Tag** - tag that you want to bind to this bar. ▪ **Name** - name of the bar chart sector. ▪ **Color** - bar's color.

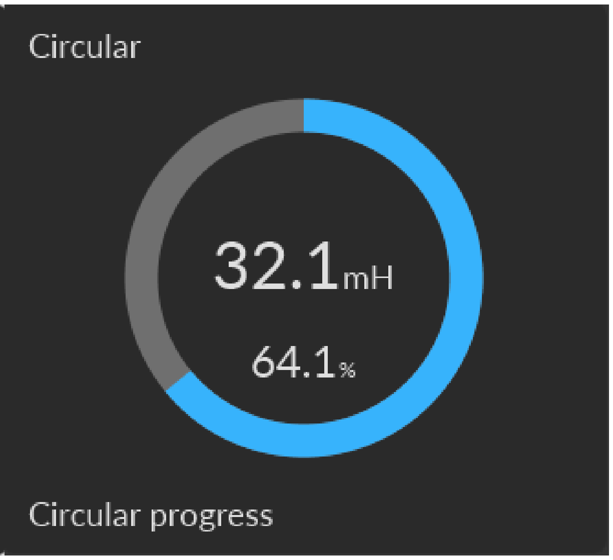
Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.

Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

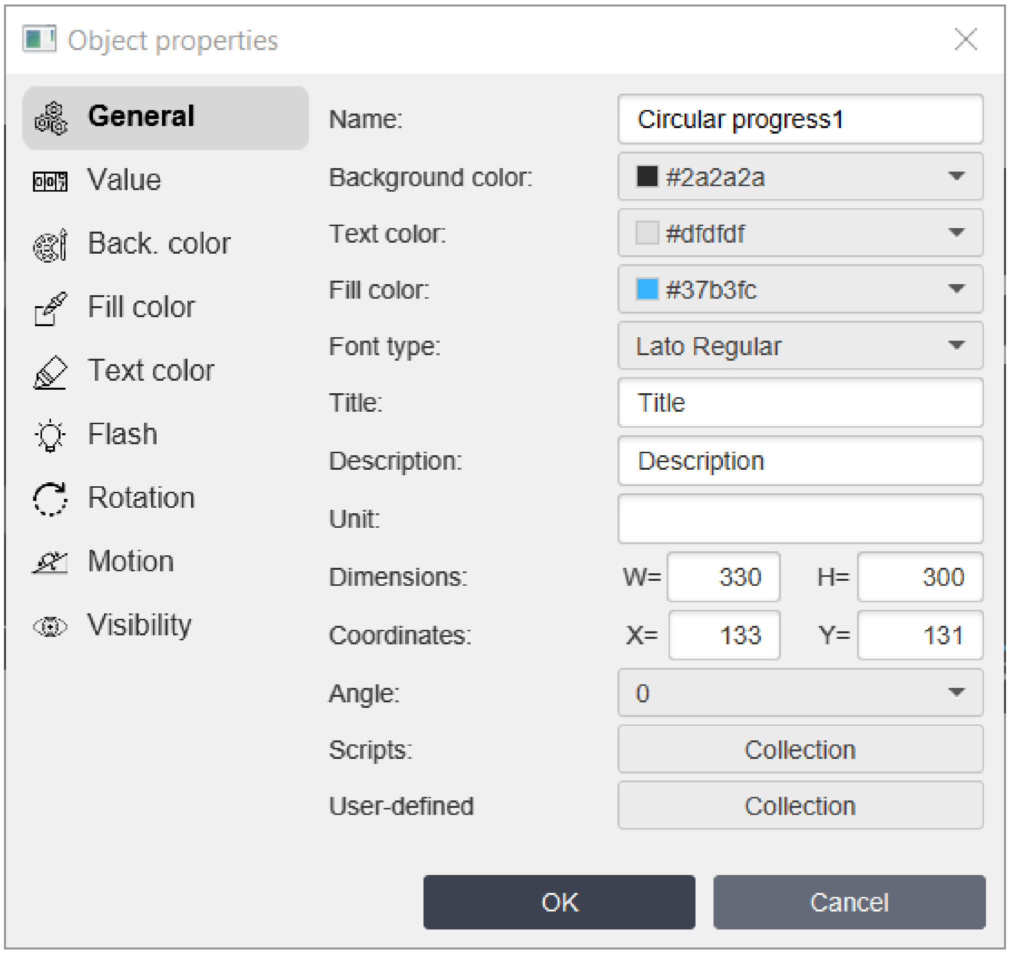
6.2.3.22.17 Circular progress



pic. 1 - object image



pic. 2 - object image in a project



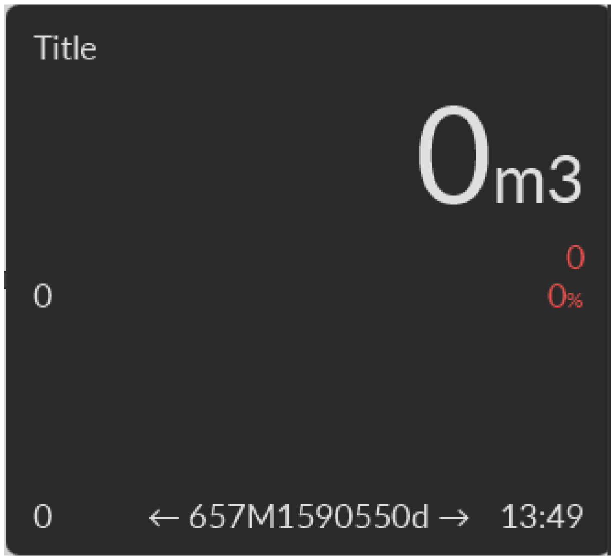
Name: Circular progress1
Background color: #2a2a2a
Text color: #dfdfdf
Fill color: #37b3fc
Font type: Lato Regular
Title: Title
Description: Description
Unit:
Dimensions: W= 330 H= 300
Coordinates: X= 133 Y= 131
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

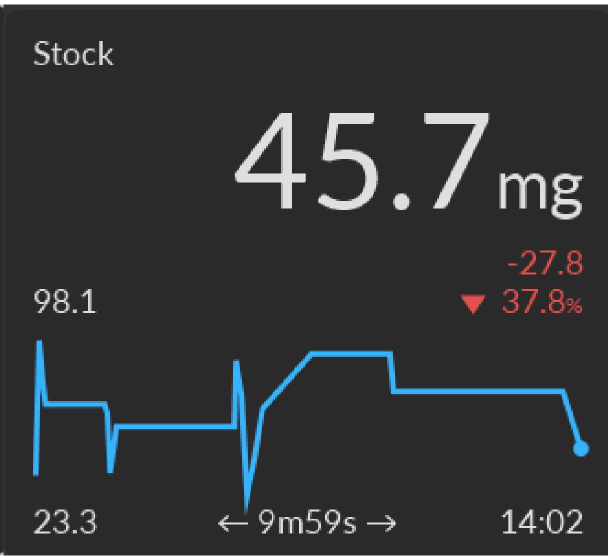
Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Specify the color of the arc of the object that shows tag value
Font type	**fonttype**	Type of the text's font.
Description	**description**	Set tile's description if necessary
Title	**title**	Set tile's title
Unit	**unit**	Specify the unit of measure for the tag value

Properties from the **"Value"** tab are described here 374.
Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

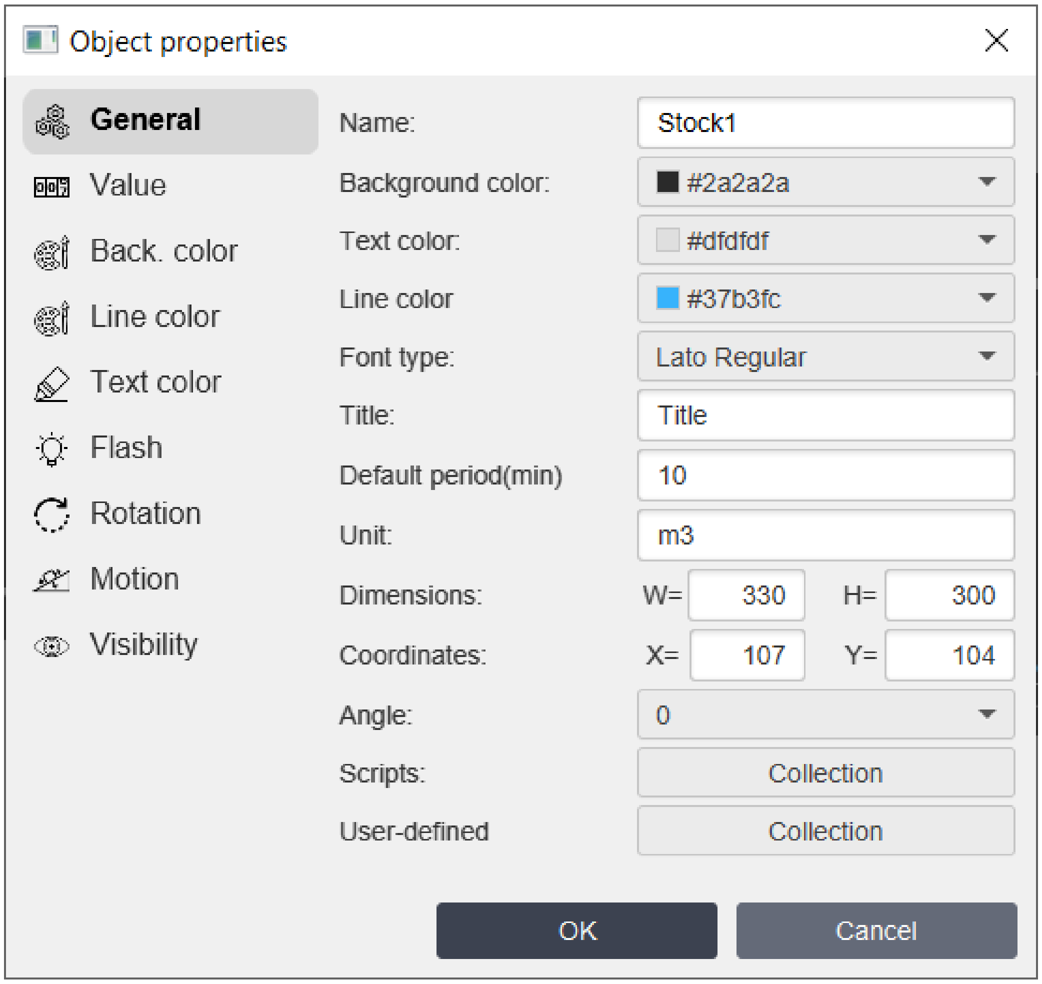
6.2.3.22.18 Stock



pic. 1 - object image



pic. 2 - object image in a project



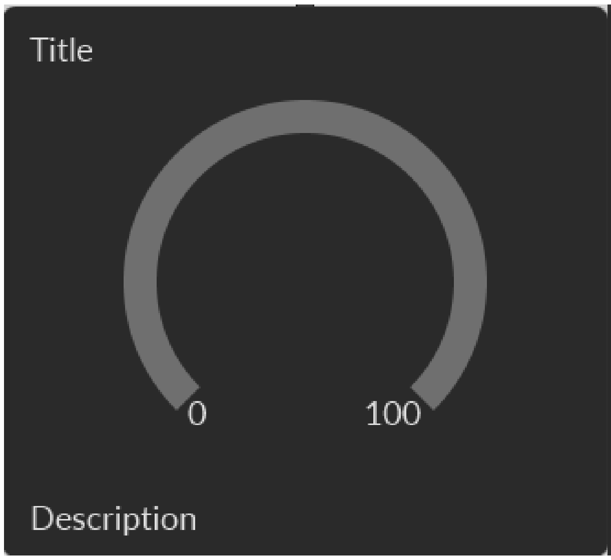
Name: Stock1
Background color: #2a2a2a
Text color: #dfdfdf
Line color #37b3fc
Font type: Lato Regular
Title: Title
Default period(min) 10
Unit: m3
Dimensions: W= 330 H= 300
Coordinates: X= 107 Y= 104
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

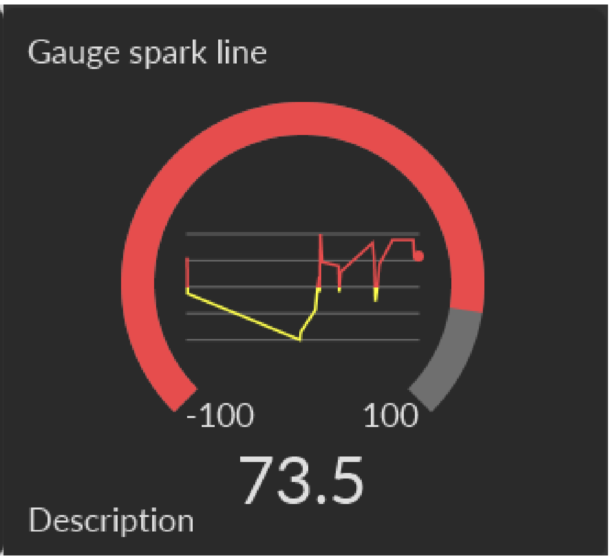
Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Line color	**linecolor**	Specify the color of the line
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Default period (min)	**defaultperiod**	Default time period of the trend (end time - begin time).
Unit	**unit**	Specify the unit of measure for the tag value

Properties from the **"Value"** tab are described here 374.
Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Line Color"** tab are described here 355.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

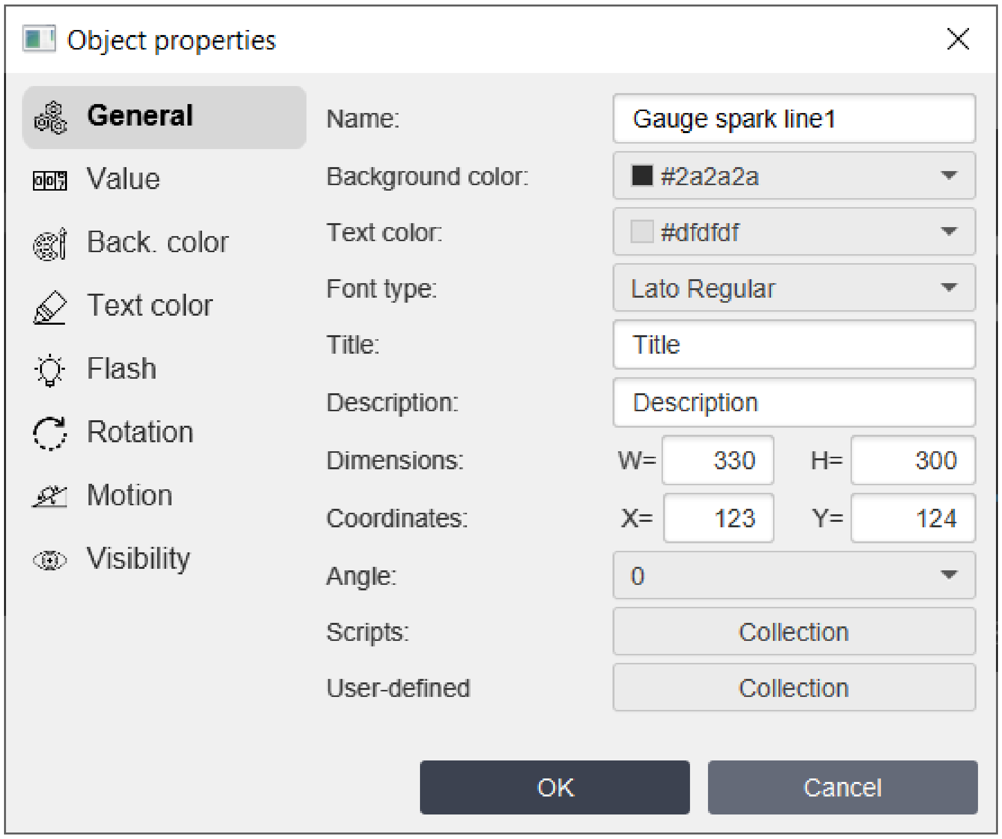
6.2.3.22.19 Gauge spark line



pic. 1 - object image



pic. 2 - object image in a project


Object properties

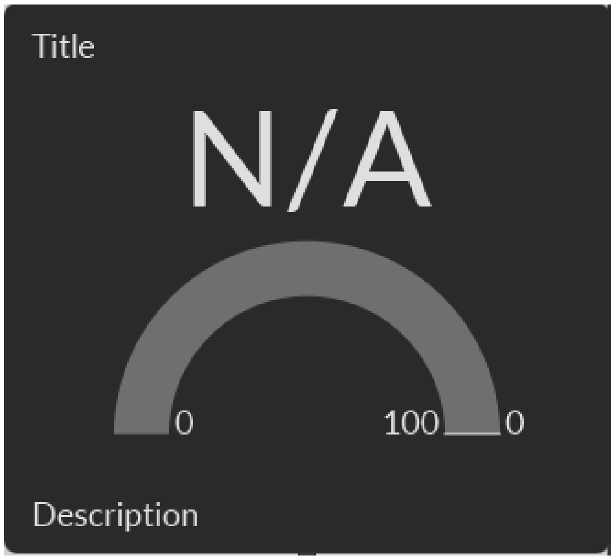
Name: Gauge spark line1
Background color: #2a2a2a
Text color: #dfdfdf
Font type: Lato Regular
Title: Title
Description: Description
Dimensions: W= 330 H= 300
Coordinates: X= 123 Y= 124
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

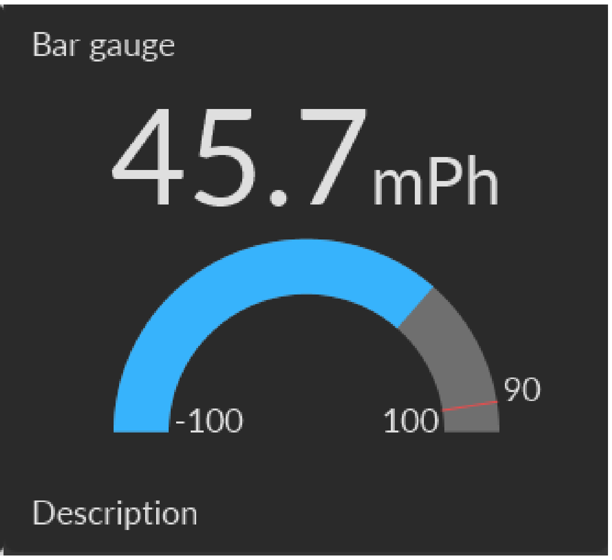
Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Description	**description**	Set tile's description if necessary

Properties from the **"Value"** tab are described here 375.
Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

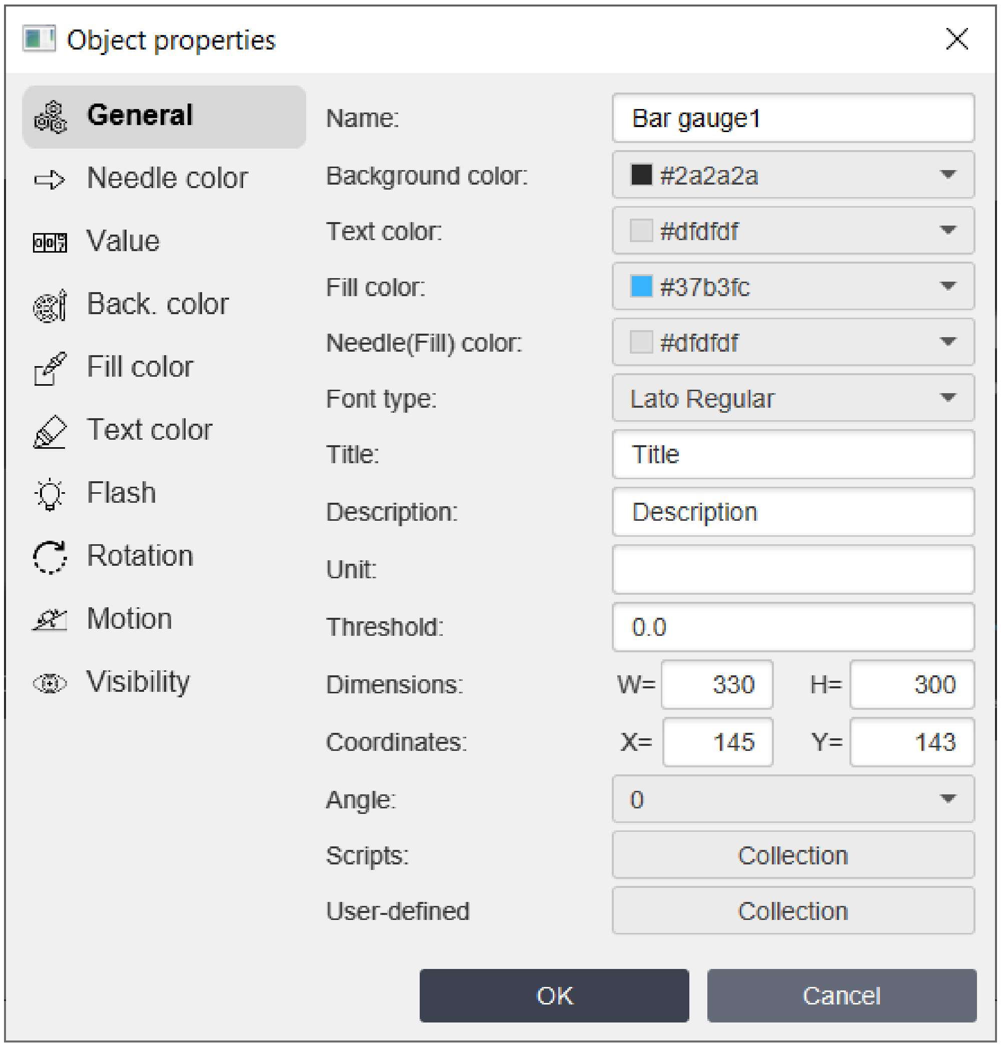
6.2.3.22.20 Bar gauge



pic. 1 - object image



pic. 2 - object image in a project



Name:	Bar gauge1
Background color:	#2a2a2a
Text color:	#dfdfdf
Fill color:	#37b3fc
Needle(Fill) color:	#dfdfdf
Font type:	Lato Regular
Title:	Title
Description:	Description
Unit:	
Threshold:	0.0
Dimensions:	W= 330 H= 300
Coordinates:	X= 145 Y= 143
Angle:	0
Scripts:	Collection
User-defined	Collection

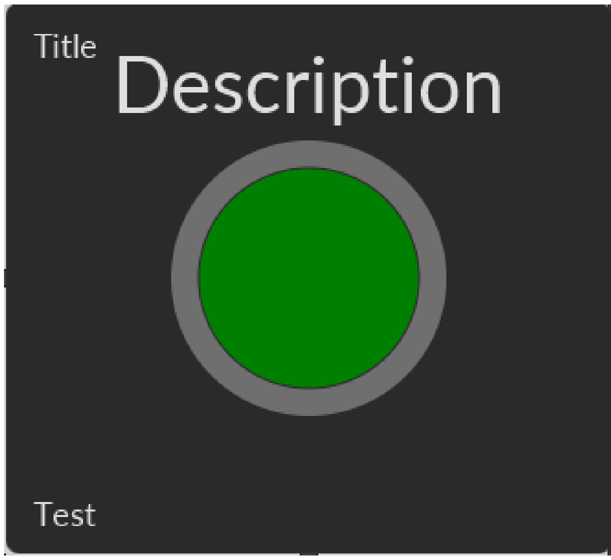
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Specify the color of the arc of the gauge
Needle(fill) color	**needlecolor**	Specify needle color
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title

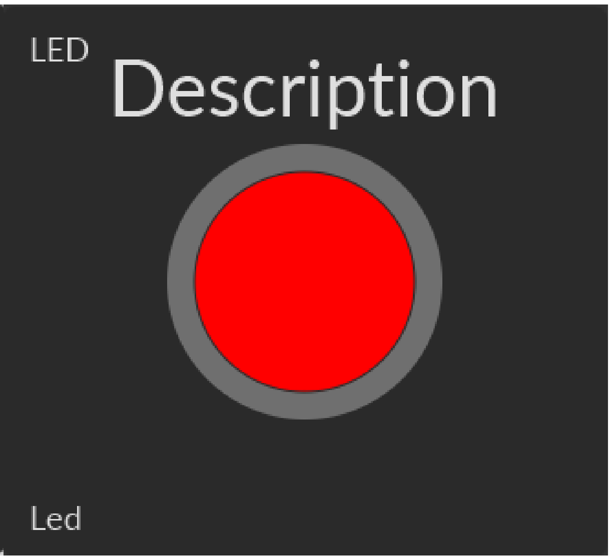
Property	ST script field	Description
Description	**description**	Set tile's description if necessary
Unit	**unit**	Specify the unit of measure for the tag value
Threshold	**threshold**	Specify the tag value up to which the arc color will be highlighted in a different color.

Properties from the **"Needle color"** tab are described here 371.
Properties from the **"Value"** tab are described here 374.
Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

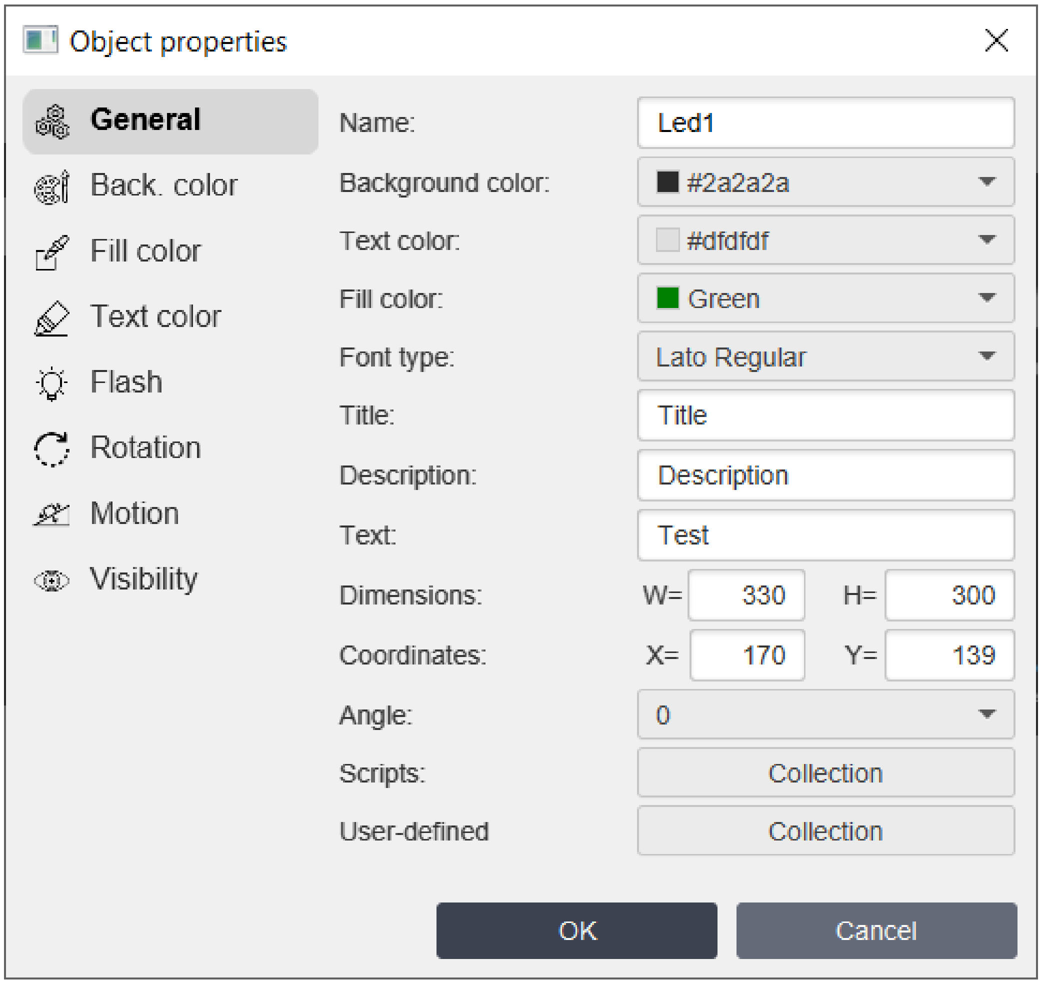
6.2.3.22.21 Led



pic. 1 - object image



pic. 2 - object image in a project



Name: Led1
Background color: #2a2a2a
Text color: #dfdfdf
Fill color: Green
Font type: Lato Regular
Title: Title
Description: Description
Text: Test
Dimensions: W= 330 H= 300
Coordinates: X= 170 Y= 139
Angle: 0
Scripts: Collection
User-defined Collection

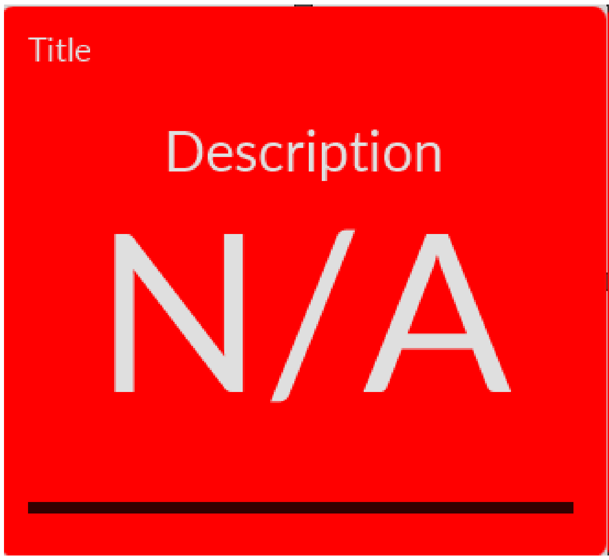
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Specify the color of the arc of the gauge
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Description	**description**	Set tile's description if necessary
Text	**text**	Text displayed on the object.

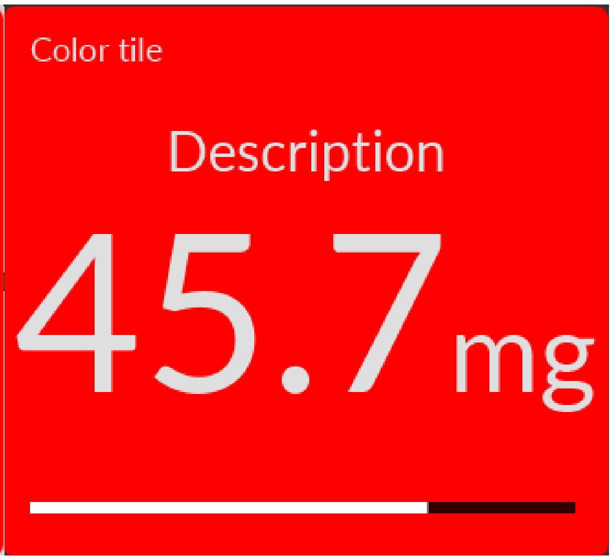
Properties from the **"Back. color"** tab are described here 371.

Properties from the **"Fill Color"** tab are described here 357.
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

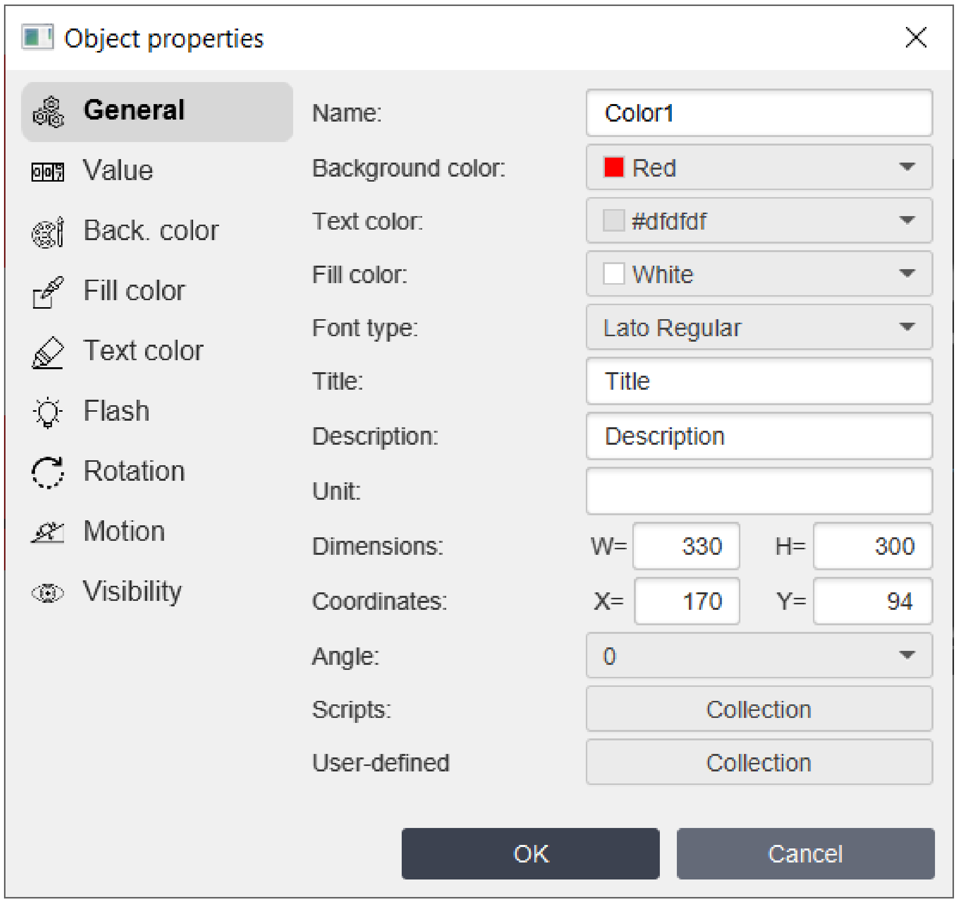
6.2.3.22.22 Color



pic. 1 - object image



pic. 2 - object image in a project


Object properties

Name: Color1
Background color: Red
Text color: #dfdfdf
Fill color: White
Font type: Lato Regular
Title: Title
Description: Description
Unit:
Dimensions: W= 330 H= 300
Coordinates: X= 170 Y= 94
Angle: 0
Scripts: Collection
User-defined Collection

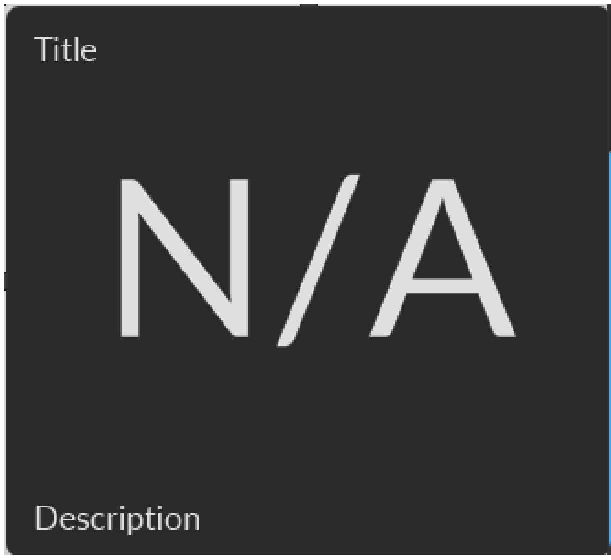
Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Specify the color of the line that shows tag value
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Description	**description**	Set tile's description if necessary
Unit	**unit**	Specify the unit of measure for the tag value

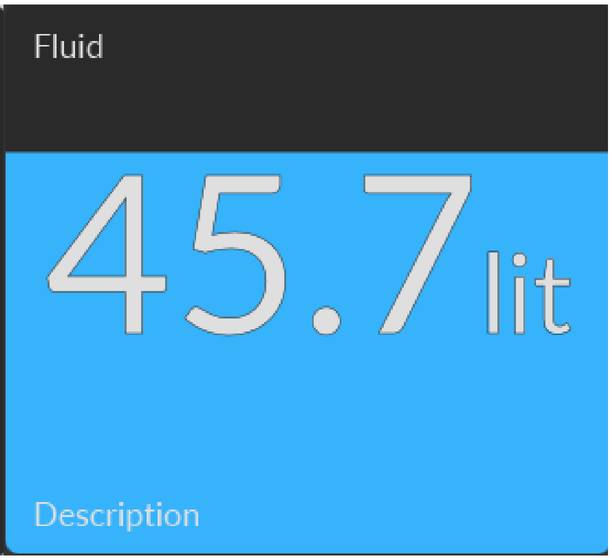
Properties from the **"Value"** tab are described here 374.
Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357

Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

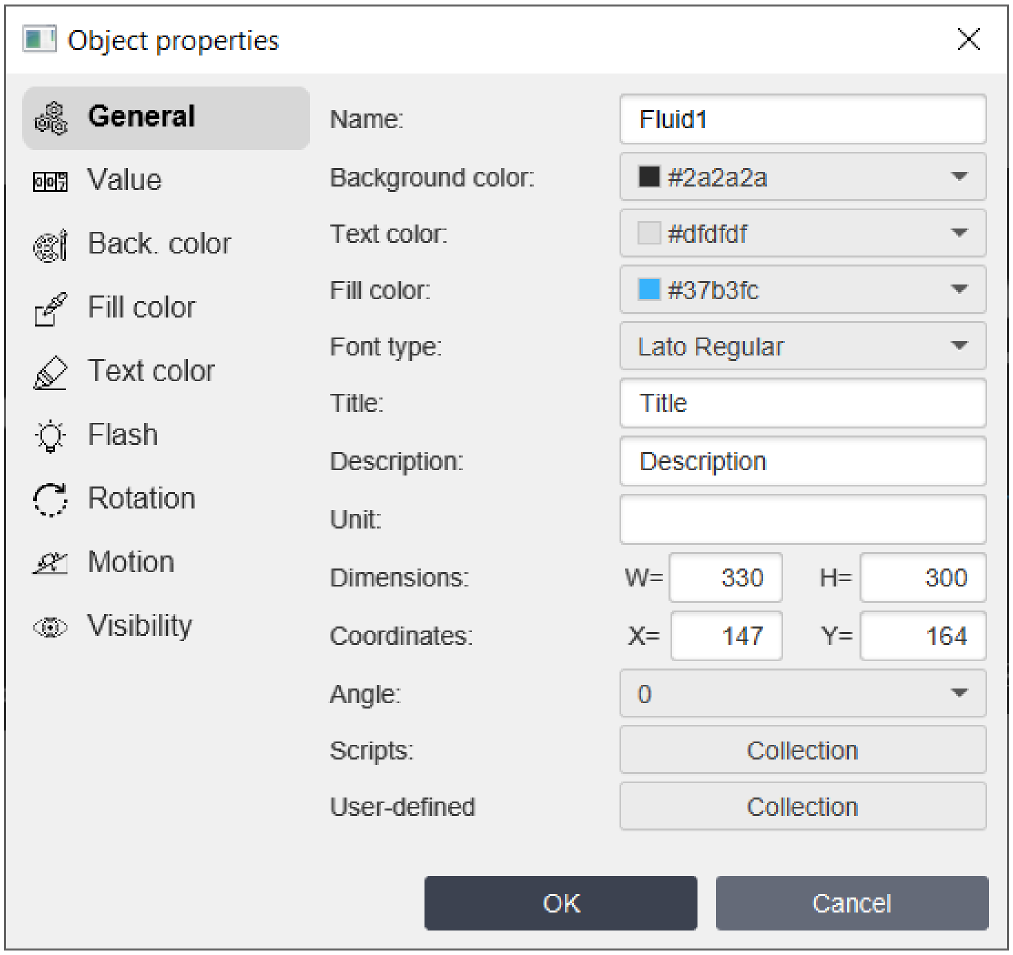
6.2.3.22.23 Fluid



pic. 1 - object image



pic. 2 - object image in a project



Name: Fluid1
Background color: #2a2a2a
Text color: #dfdfdf
Fill color: #37b3fc
Font type: Lato Regular
Title: Title
Description: Description
Unit:
Dimensions: W= 330 H= 300
Coordinates: X= 147 Y= 164
Angle: 0
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

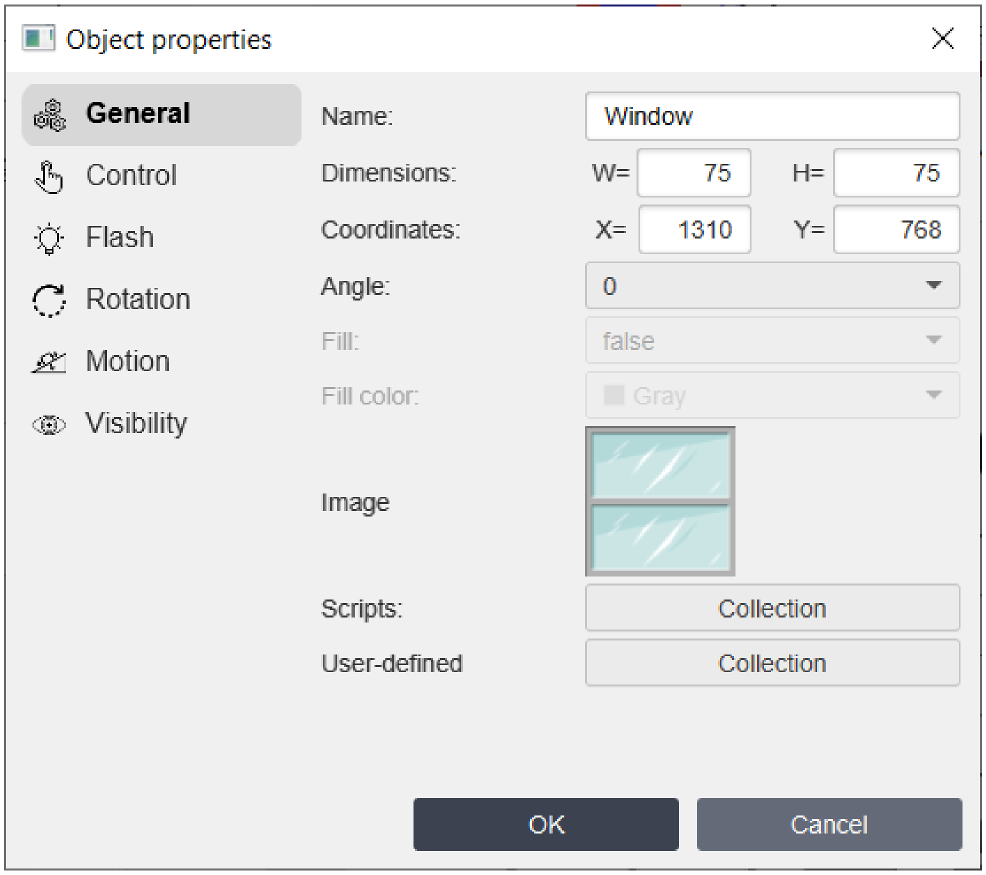
Property	ST script field	Description
Background color	**bgcolor**	Color of the background of the tile
Text color	**textcolor**	Color of the text.
Fill color	**fillcolor**	Specify the color of the line that shows tag value
Font type	**fonttype**	Type of the text's font.
Title	**title**	Set tile's title
Description	**description**	Set tile's description if necessary
Unit	**unit**	Specify the unit of measure for the tag value

Properties from the **"Value"** tab are described here 374.

Properties from the **"Back. color"** tab are described here 371.
Properties from the **"Fill Color"** tab are described here 357
Properties from the **"Text Color"** tab are described here 360.
Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

6.2.3.23 SVG objects library

All SVG library objects have similar properties except for the ability to change the fill color. Below is a description of these properties:



Name: Window
Dimensions: W= 75 H= 75
Coordinates: X= 1310 Y= 768
Angle: 0
Fill: false
Fill color: Gray
Image
Scripts: Collection
User-defined Collection

Let's look at the "General" properties of this object (properties not listed in the table are common to all objects, you can read about them here 148).

Property	ST script field	Description
Fill	**usefillcolor**	Select fill or not fill SVG.

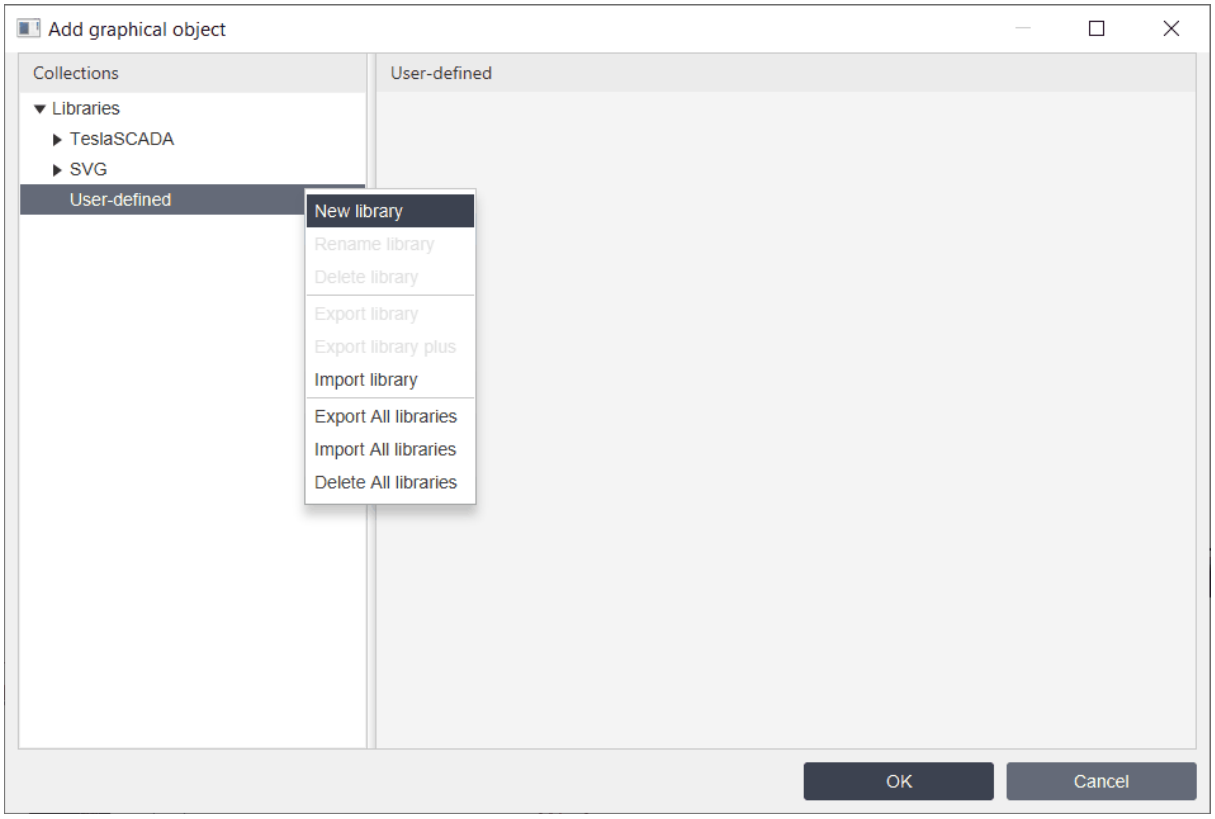
Property	ST script field	Description
Fill color	**fillcolor**	Fill color of the SVG object.
Image		This is only for demonstration purposes.

Properties from the **"Flash"** tab are described here 350.
Properties from the **"Rotation"** tab are described here 352.
Properties from the **"Motion"** tab are described here 353.
Properties from the **"Visibility"** tab are described here 354.

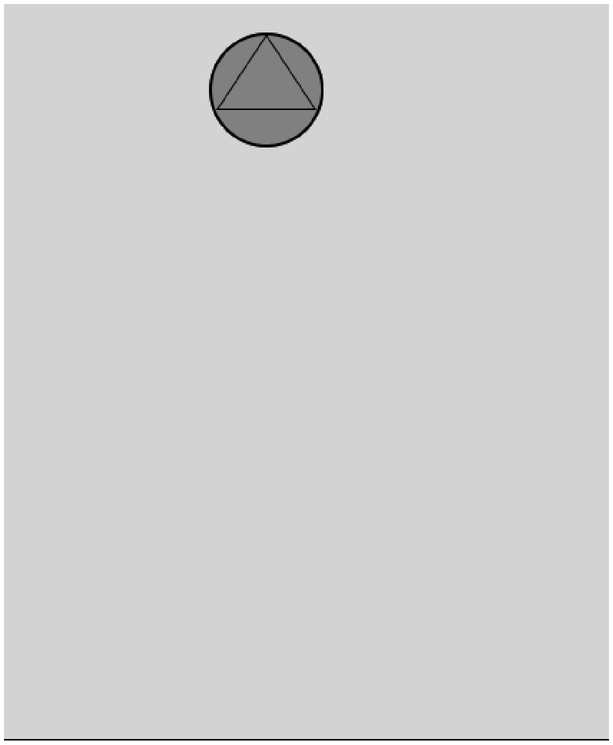
6.2.4 User-defined library

Create user-defined library

You can create your own library by clicking right button on User-defined section of the **Add graphical object** 141 window and choosing New library menu item:



You can add graphical object in your library by clicking right button on the object on Canvas 92 or Screen window 94 and choosing **Add to Library->You library** menu item:



You can Select, Rename or Delete created object in your library by clicking right button on it and selecting correspondent menu item.

Rename user-de? ned library

To rename library right click on the library you want to rename and choose Rename library menu item.

Delete user-de? ned library

To delete library right click on the library you want to delete and choose Delete library menu item.

Export user-de? ned library

To export library:

1. Right click on the library you want to export and choose **Export library** menu item.
2. Now select the location and click the button Save (TeslaSCADA library extension .tsp2lib).

Library with all objects will be exported in the the file. You can use this file to import library with all objects in a new project.

If you want to export your library with all objects and scripts that used these objects and also with screens that called from this object (for example button that call screen or popup screen) or with screens that called from the scripts bind to the object, you need to use **Export library plus** menu item. In this case in exported file you'll have object, scripts and screens.

Import user-de? ned library

To import library:

1. Right click on the User-defined section and choose Import library menu item.
2. Now select the library ? le and click Open (TeslaSCADA library extension .tsp2lib).

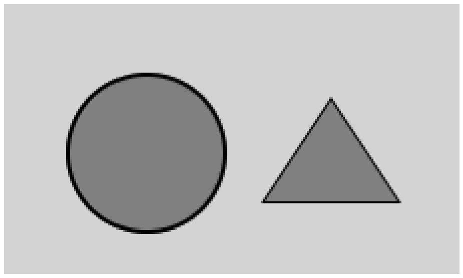
If exported files contains only objects (you use **Export library** menu item during exporting library) only library with objects are created in the Add graphical object. If exported file also contains script and/or screens (you use **Export library plus** menu item during exporting library) these scripts and screens are added in the project and you can see them in the Project window 73.

Below you can find example how to create complex object with script and screen are bound to it. And how to add this object to the user-defined library, how to export this library and how to import it in the new project.

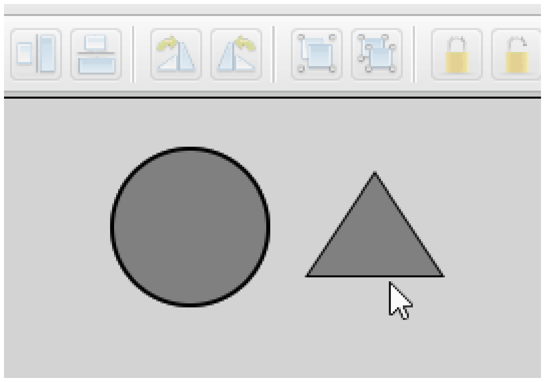
6.2.4.1 Example: How to create new graphical object

In this example, we will create a group graphic object (Ellipse 157 + Polygon 161), configure it so that when the tag value changes, the fill color of the ellipse changes, and also when you click on the ellipse, a pop-up window appears with information about the state and description of the object. And then we will add the configured object to the User-defined library. We export the object along with its settings in order to use it in other projects.

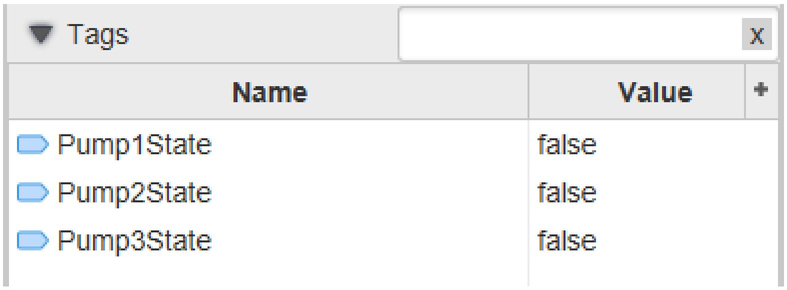
Let's create a pump object consisting of two simple objects: an Ellipse 157 and a Polygon 161:



Let's group these objects:



Let's add 3 tags to our project:



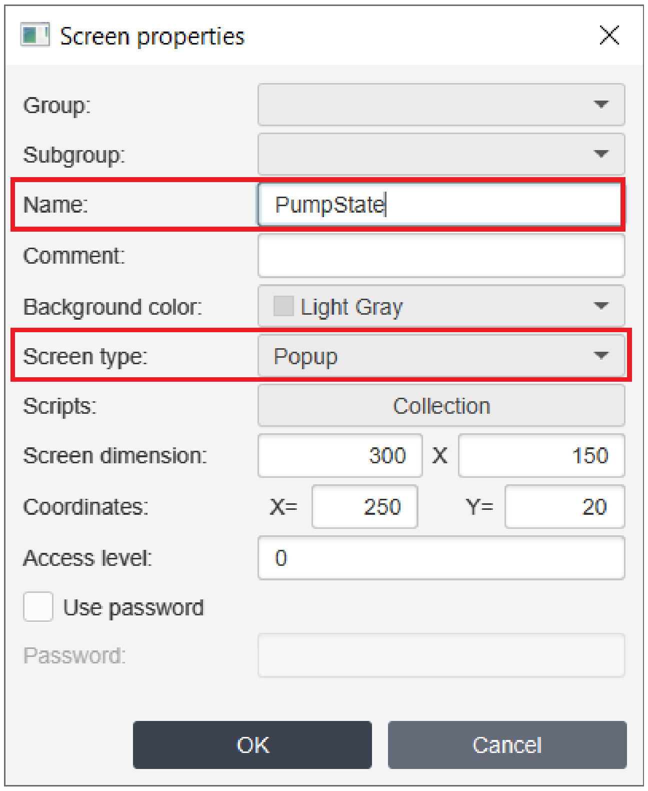
Tags

Name	Value
Pump1State	false
Pump2State	false
Pump3State	false

We want the color of the ellipse to be bound to a tag with the following name: *Pump{number}State*, where *{number}* is the number of the graphic object instance.

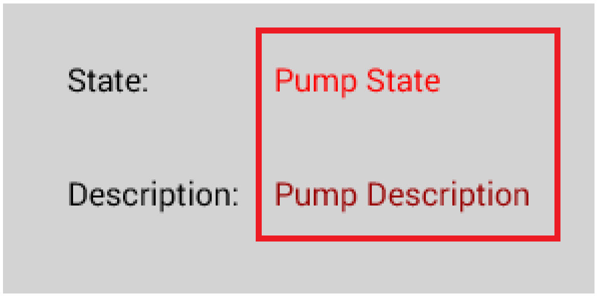
We want a popup window to appear with status information and a description when the user clicks on an object.

So let's create a pop-up window (screen):

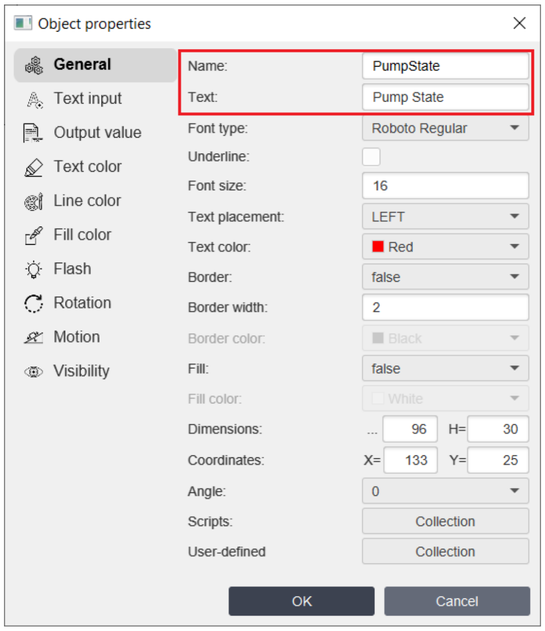

Screen properties

Group:	
Subgroup:	
Name:	PumpState
Comment:	
Background color:	Light Gray
Screen type:	Popup
Scripts:	Collection
Screen dimension:	300 X 150
Coordinates:	X= 250 Y= 20
Access level:	0
☐ Use password	
Password:	

Let's add graphic objects to the screen:

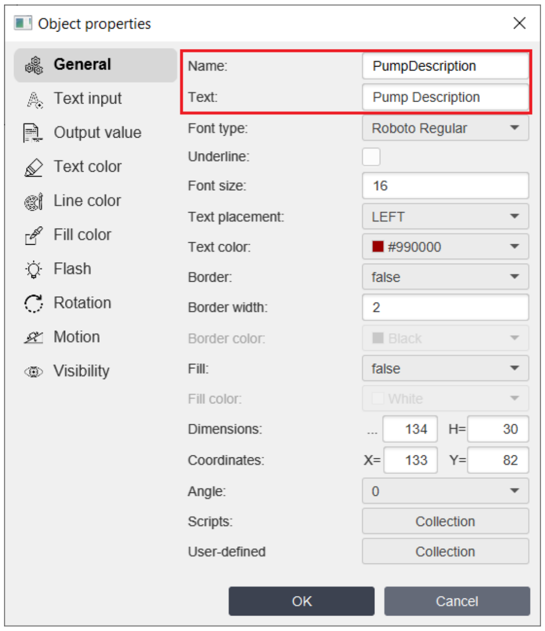


where objects named PumpState and PumpDescription will display information about the state of the pump and its description:



Object properties

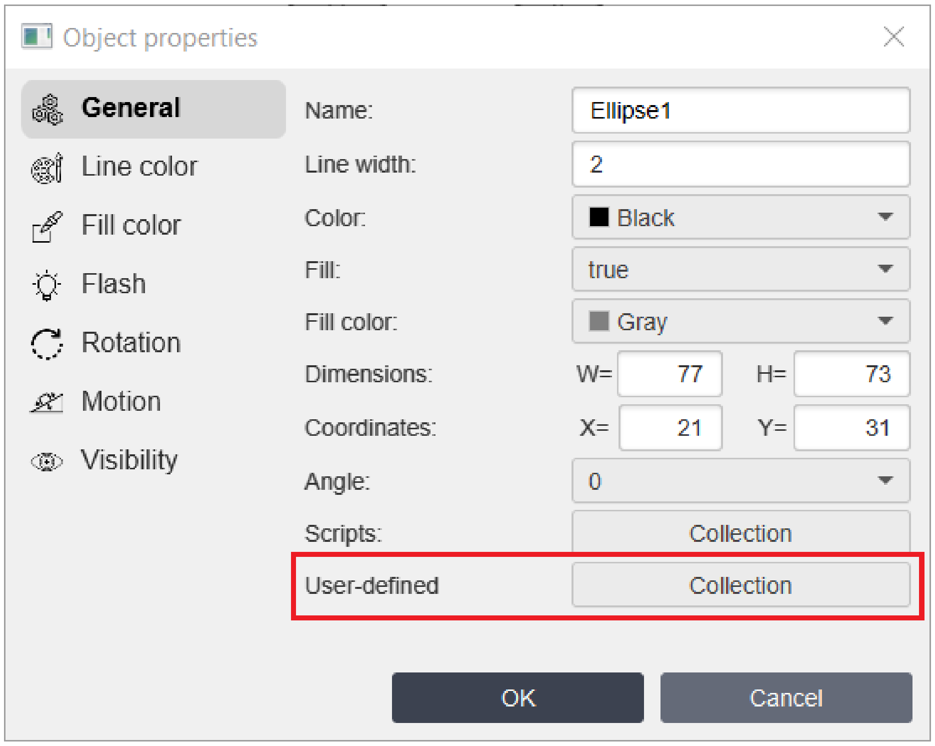
Name:	PumpState
Text:	Pump State
Font type:	Roboto Regular
Underline:	
Font size:	16
Text placement:	LEFT
Text color:	🟥 Red
Border:	false
Border width:	2
Border color:	Black
Fill:	false
Fill color:	White
Dimensions:	... 96 H= 30
Coordinates:	X= 133 Y= 25
Angle:	0
Scripts:	Collection
User-defined	Collection



Object properties

Name:	PumpDescription
Text:	Pump Description
Font type:	Roboto Regular
Underline:	
Font size:	16
Text placement:	LEFT
Text color:	🟥 #990000
Border:	false
Border width:	2
Border color:	Black
Fill:	false
Fill color:	White
Dimensions:	... 134 H= 30
Coordinates:	X= 133 Y= 82
Angle:	0
Scripts:	Collection
User-defined	Collection

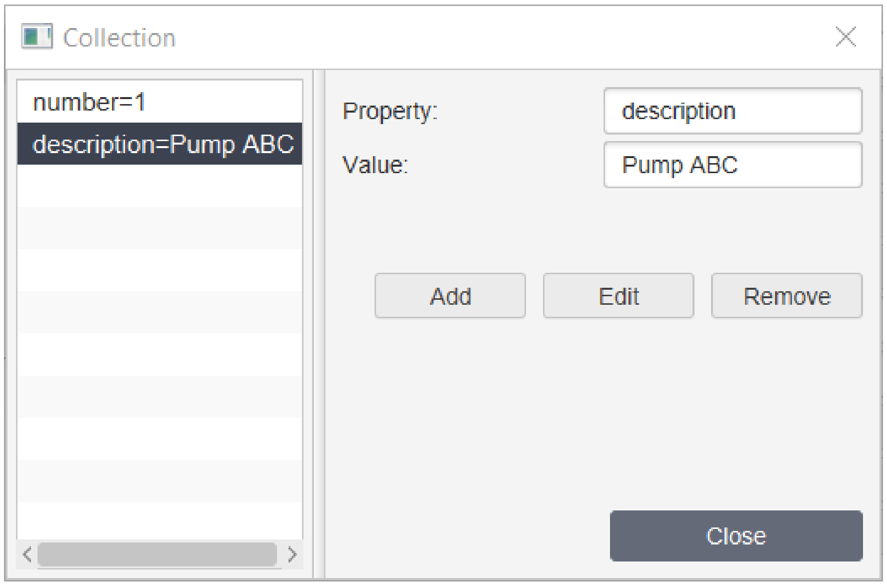
For the ellipse object, we will create user-defined properties - number and description. To do this, double-click on the Ellipse object. (or select the Object Properties menu item from the context menu) in the Screen window 94. The Object Properties window appears:



Object properties

Name:	Ellipse1
Line width:	2
Color:	■ Black
Fill:	true
Fill color:	■ Gray
Dimensions:	W= 77 H= 73
Coordinates:	X= 21 Y= 31
Angle:	0
Scripts:	Collection
User-defined	Collection

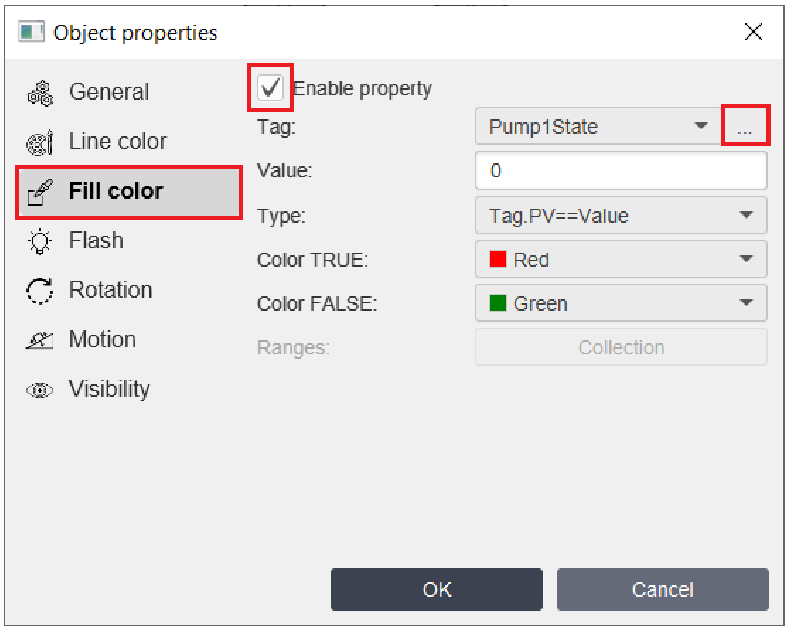
Click "**Collection**" properties "User-defined" and add our properties:


Collection

number=1
description=Pump ABC

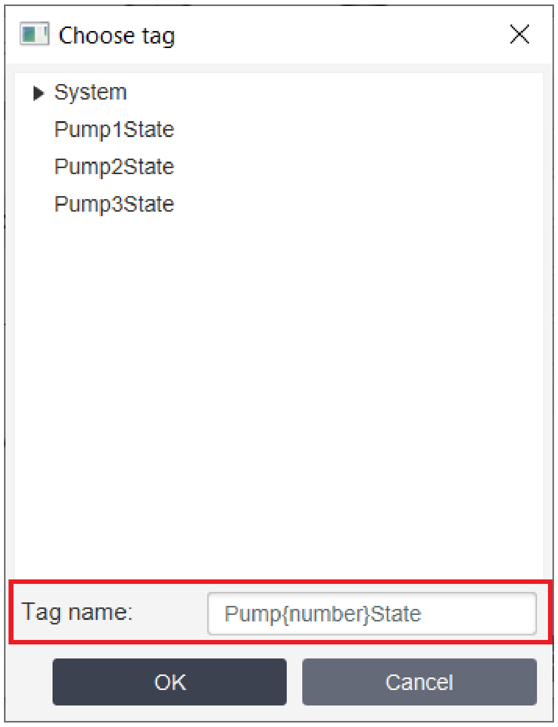
Property: description
Value: Pump ABC

Then close this window and the Object Properties window by clicking "OK" to confirm these changes. Then open the Ellipse properties window and open the Fill Color tab:


Object properties

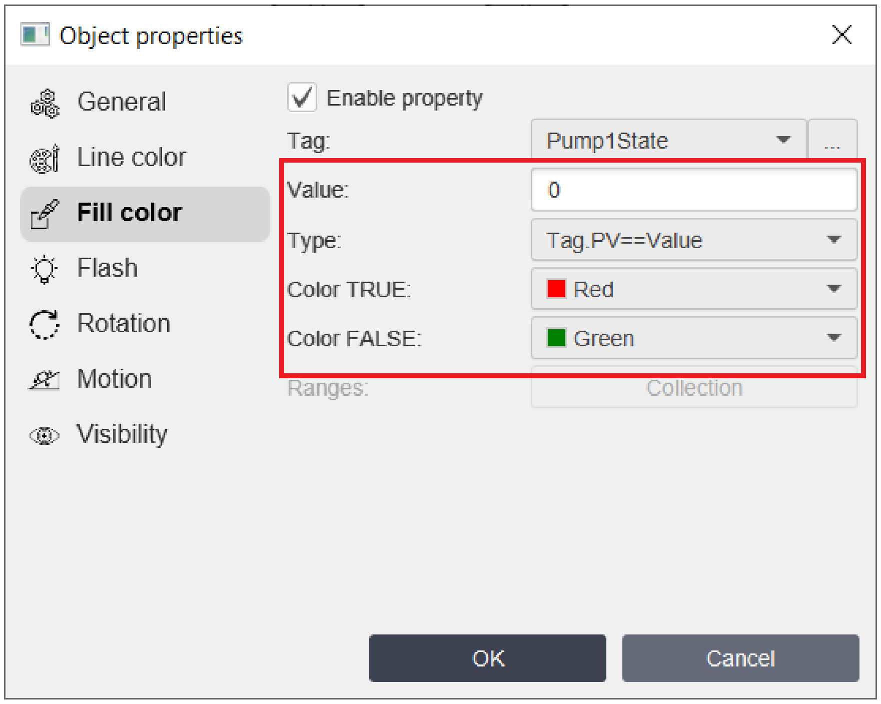
✓ Enable property
Tag: Pump1State ...
Value: 0
Type: Tag.PV==Value
Color TRUE: 🟥 Red
Color FALSE: 🟩 Green
Ranges: Collection

In order to bind a tag to this property, click "..." and write down Pump{number}State, where {number} is our custom property:



Tag name: Pump{number}State

Click "OK" and close the tag selection window. Because the custom property "number" is set to 1, the Fill Color property will be bound to the Pump1State tag. Leave the remaining parameters as default (Tag value = 0 (false) : red fill color; Tag value != 0 (true) : green fill color)



✓ Enable property

Tag: Pump1State

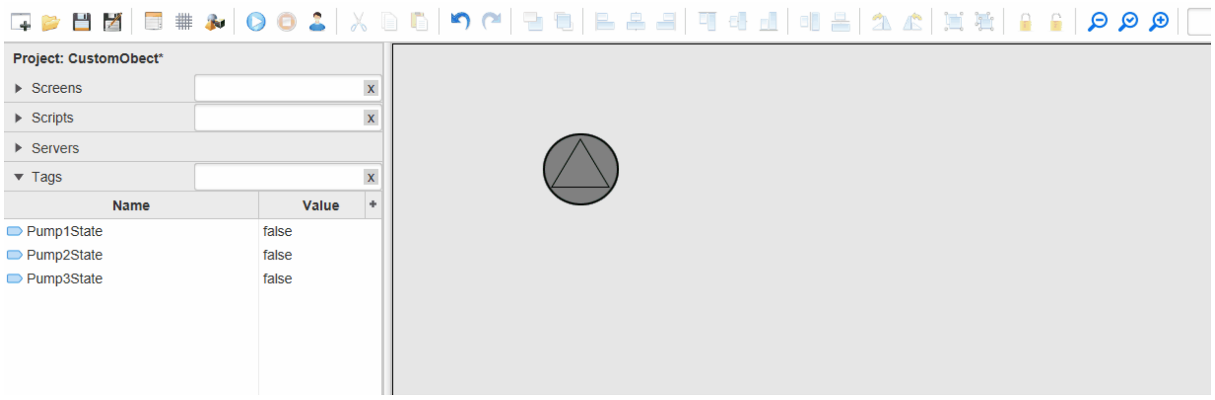
Value: 0

Type: Tag.PV==Value

Color TRUE: 🟥 Red

Color FALSE: 🟩 Green

Click "OK" to close the object properties window. Let's check the functionality. Run the simulation and change the value of the Pump1State tag from false to true:

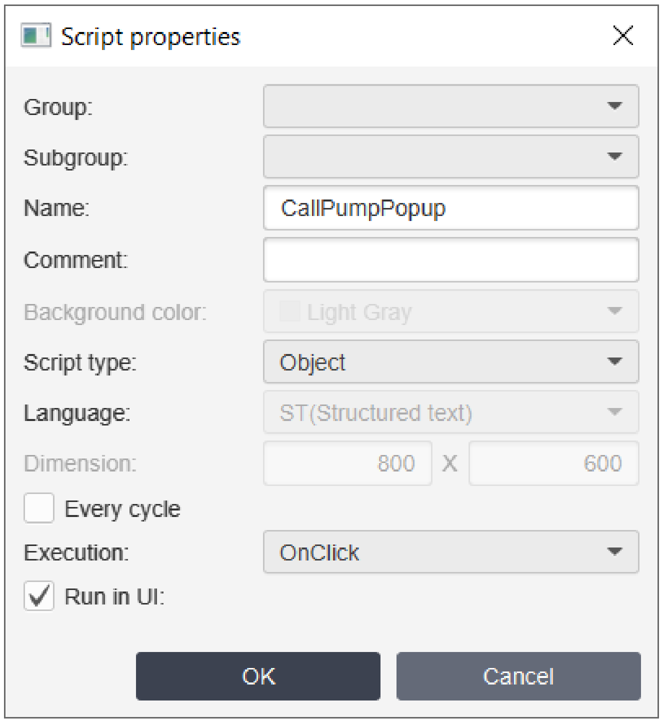


Project: CustomObect*

Screens
Scripts
Servers
Tags

Name	Value
Pump1State	false
Pump2State	false
Pump3State	false

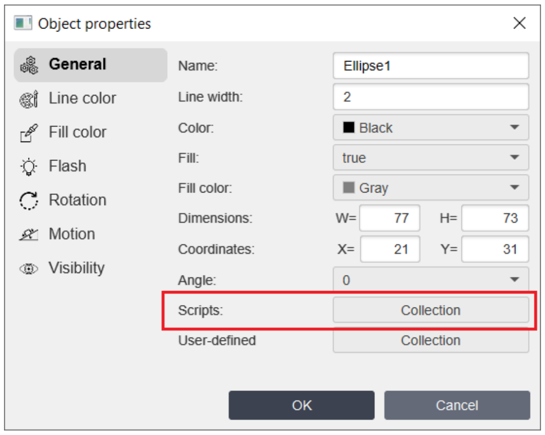
In order to trigger the popup window, let's create a script:



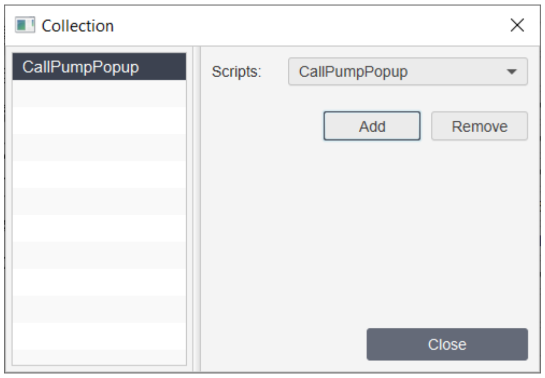
Script properties

Group:	
Subgroup:	
Name:	CallPumpPopup
Comment:	
Background color:	Light Gray
Script type:	Object
Language:	ST(Structured text)
Dimension:	800 X 600
Every cycle	☐
Execution:	OnClick
Run in UI:	✓

Let's add this script to the Ellipse object scripts:



Name:	Ellipse1
Line width:	2
Color:	Black
Fill:	true
Fill color:	Gray
Dimensions:	W= 77 H= 73
Coordinates:	X= 21 Y= 31
Angle:	0
Scripts:	Collection
User-defined	Collection



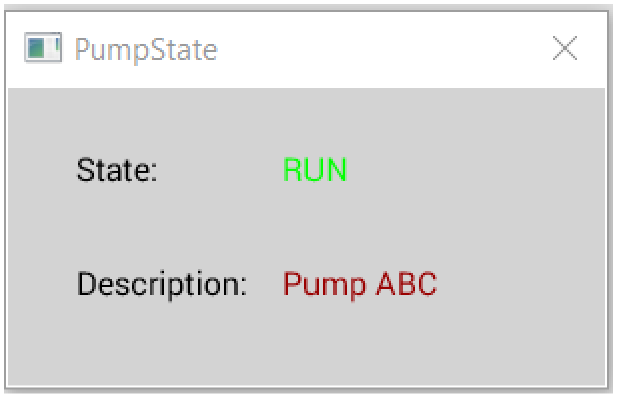
Scripts: CallPumpPopup

The script text looks like this:

```
string statetagname = "Pump" + Objects.this.number + "State";
bool state = gettagvalue(statetagname, "false");
if (state==1) {
        Objects.PumpState.text = "RUN";
        Objects.PumpState.textcolor = Color.GREEN;
}else{
        Objects.PumpState.text = "STOP";
        Objects.PumpState.textcolor = Color.RED;
}
Objects.PumpDescription.text = Objects.this.description;
callpopup("PumpState");
```

After you have recorded the script, be sure to launch it by clicking the button on the toolbar: ▶

Now when you click on the ellipse, you will see a pop-up window (depending on the tag value).



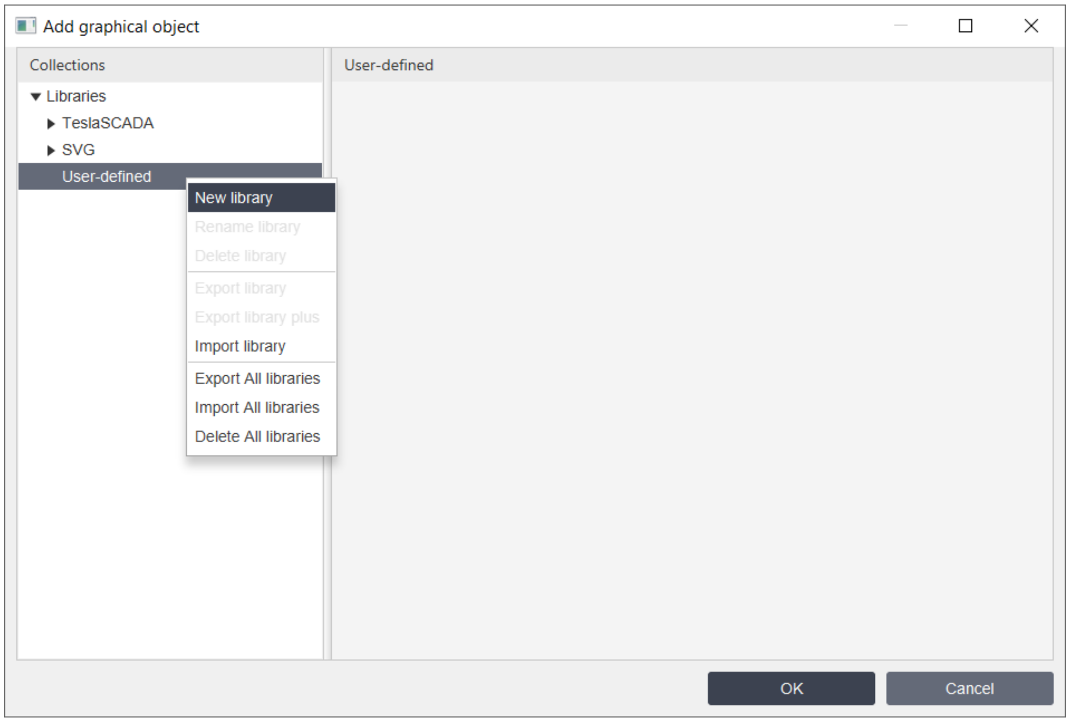
State: RUN

Description: Pump ABC

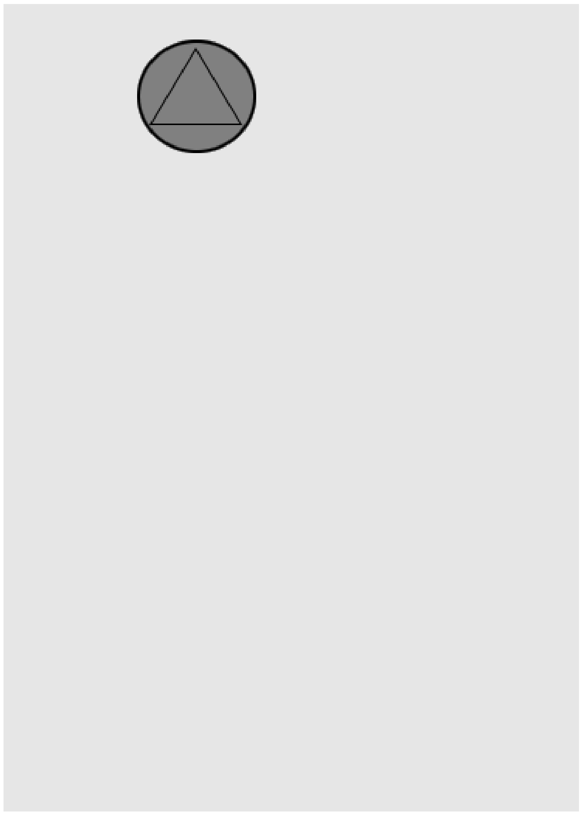
You can create another pump instance and change the number user-defined property to 2 or 3 to bind the pumps to the Pump2State and Pump3State tags. You can also change the description property for each pump ellipse:

Attention! It might be better to use Polygon to store user-defined properties and mouse click action because it is above Ellipse. Or, alternatively, you can use a transparent Button over the entire group object and use its OnClick action.

Now we can add this graphic object to our library. First you need to create a library: open the "Add Graphic Object" window, select "User-defined" and right-click on "New Library":



Give the library a name, for example "Pumps". Let's add an object to the library:



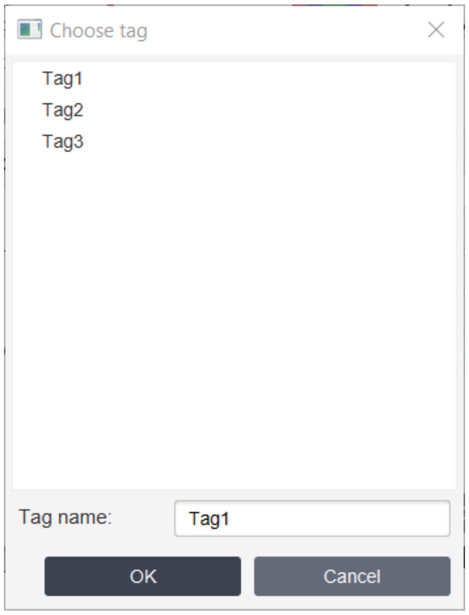
Now let’s export the library: open the Add graphic object window and find our library, right-click on it and select the “**Export library plus**” menu item. A file dialog box will appear, enter the name of the library and click "Save". This library will be saved with the object as well as the saved script that we created in this project and the popup. Now, if you want to use this object with this popup and script, just import it into another project.

Important! In the new project you need to create the same tag names.

You can download the example project here.

6.2.5 Properties

Every graphical object has several group of properties. To use property of the graphical object check **Enable Property**. You can select tag 79 to bind to the property by using ComboBox (you can choose it by beginning entering name of the tag when ComboBox focused) or use Button (...). Every object has **Flash, Rotation, Motion and Visibility** properties. Other properties depend on the object.

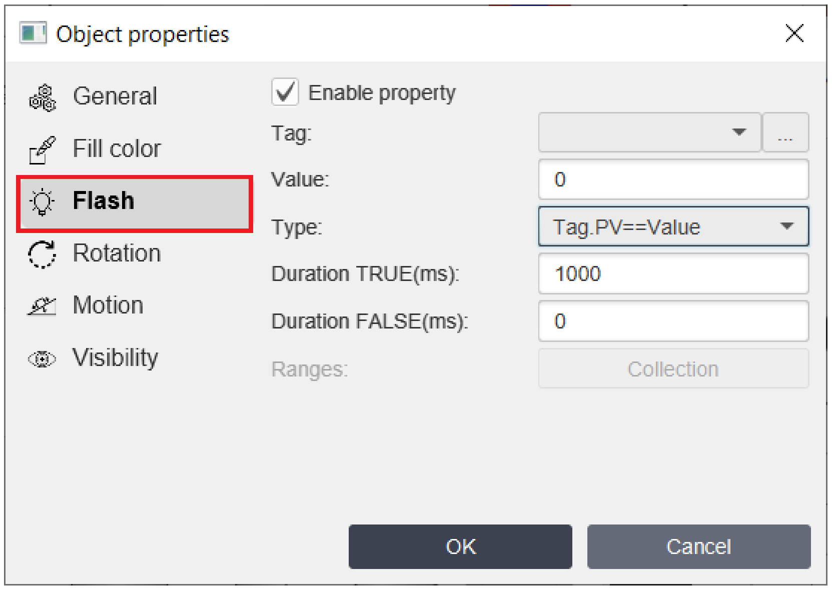


Tag name: Tag1

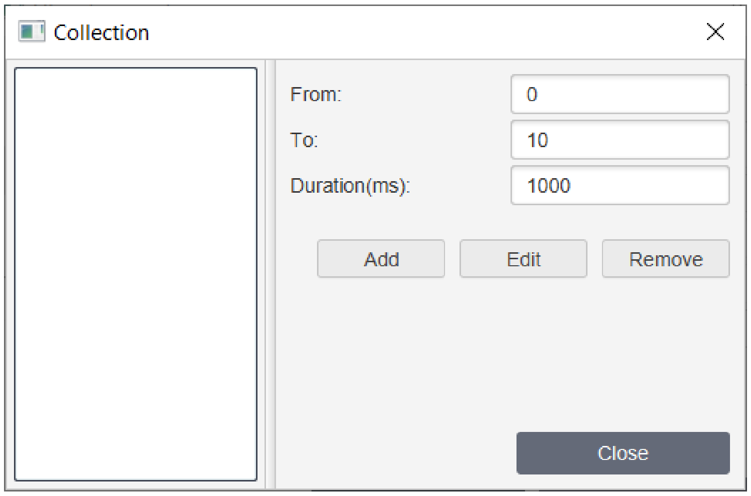
By clicking (...) when you bind tag to the property you'll get to the "Choose tag" dialog where you can choose tag from the hierarchy tree or enter its name in the ?eld "Tag name". In the ?eld you can use indirect names enclosed in curly braces {group}, {name} and {user-defined property} of the object. It's useful if you use many the same type objects and want to bind to the group of the same type tags.

6.2.5.1 Flash

The Flash property allows an object to ?ash when condition is TRUE or FALSE. To edit ?ash property click **Flash** tab on the object property window.



Enable property: ✓
Tag:
Value: 0
Type: Tag.PV==Value
Duration TRUE(ms): 1000
Duration FALSE(ms): 0
Ranges:

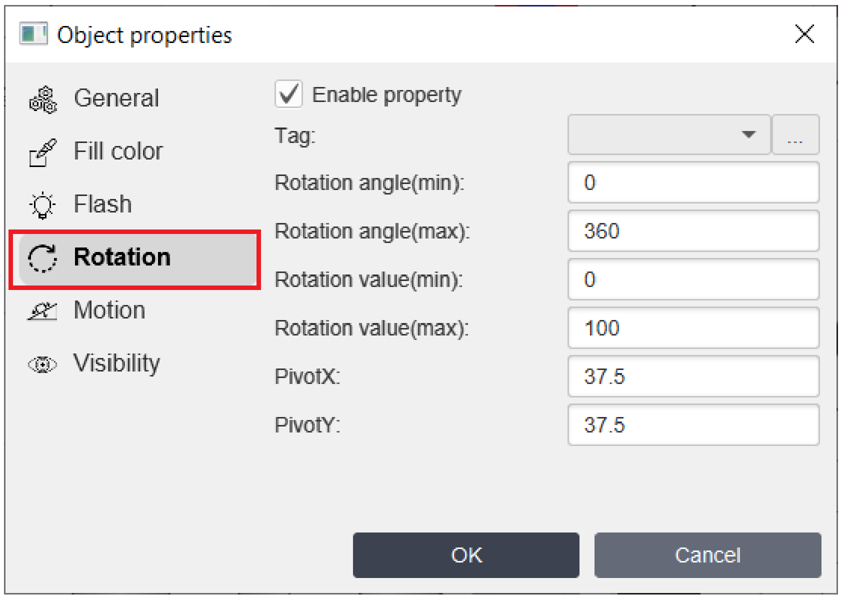
Property	Description
Tag	Select the tag which value will be compared.
Value	Enter the comparison value.
Type	Select type of comparison: ▪ **Tag.PV==Value** - tag's value is equal to the comparison value. ▪ **Tag.PV>=Value** - tag's value is equal to or greater than the comparison value. ▪ **Tag.PV<=Value** - tag's value is equal to or less that the comparison value. ▪ **Tag.PV>Value** - tag's value is greater than the comparison value. ▪ **Tag.PV<Value** - tag's value is less than the comparison value. ▪ **Tag.PV!=Value** - tag's value is not equal to the comparison value. ▪ **Tag.PV in the range** - tag's value compares to the values in the ranges. To setup ranges click Collection button.
Duration TRUE(ms)*	Write period's time in milliseconds of objects ?ashing if the comparison is true in the Duration TRUE(ms) ?eld. If you enter 0 the object will not ?ashing.
Duration FALSE(ms)*	Write period's time in milliseconds of objects ?ashing if the comparison is false in the Duration FALSE(ms) ?eld. If you enter 0 the object will not ?ashing.
Ranges	If you select **Tag.PV in the range** in the Type combobox and click Collection button. You'll see the window:  Collection From: 0 To: 10 Duration(ms): 1000

Property	Description
	where: • **From** - enter the value from which the object will ?ash with this periodicity in the ?eld. • **To** - enter the value to which the object will ?ash with this periodicity in the ?eld. • **Duration(ms)** - enter period of ?ashing in the ?eld. You can **Add**, **Edit** or **Remove** collection element of ?ashing conditions.

*** This properties you can use in ST scripts by using trueflashduration and falseflashduration property keywords. For example: Objects.Button.trueflashduration = 1000;**

6.2.5.2 Rotation

The Rotation property allows an object to rotate proportional to the value of the tag. To edit rotation property click Rotation tab on the object property window.



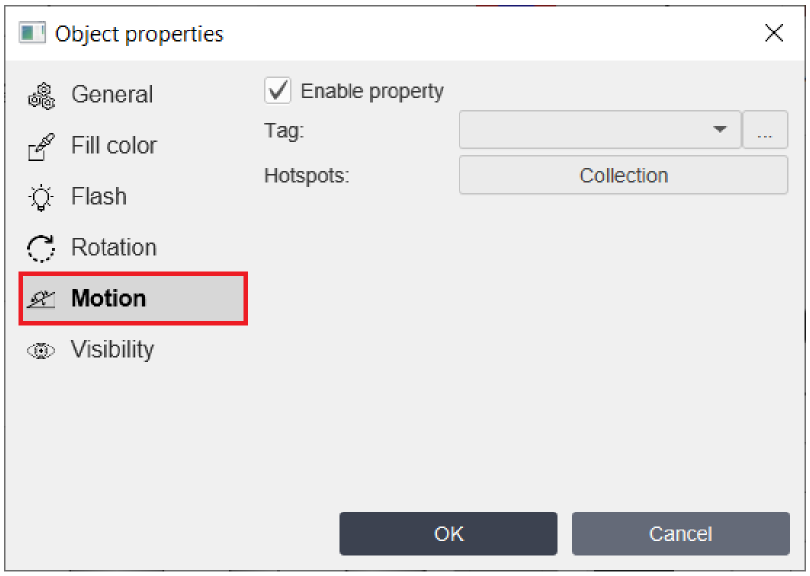
☑ Enable property
Tag:
Rotation angle(min): 0
Rotation angle(max): 360
Rotation value(min): 0
Rotation value(max): 100
PivotX: 37.5
PivotY: 37.5

Property	Description
Tag	Select the tag which value will be compared.
Rotation angle(min)	Enter the minimum of rotation angle in the ?eld.
Rotation angle(max)	Enter the maximum of rotation angle in the ?eld.

Property	Description
Rotation value(min)	Write the minimum of the tag's value in the field.
Rotation value(max)	Write the maximum of the tag's value in the field.
PivotX	Enter X coordinate of the pivot in the ?eld.
PivotY	Enter Y coordinate of the pivot in the ?eld.

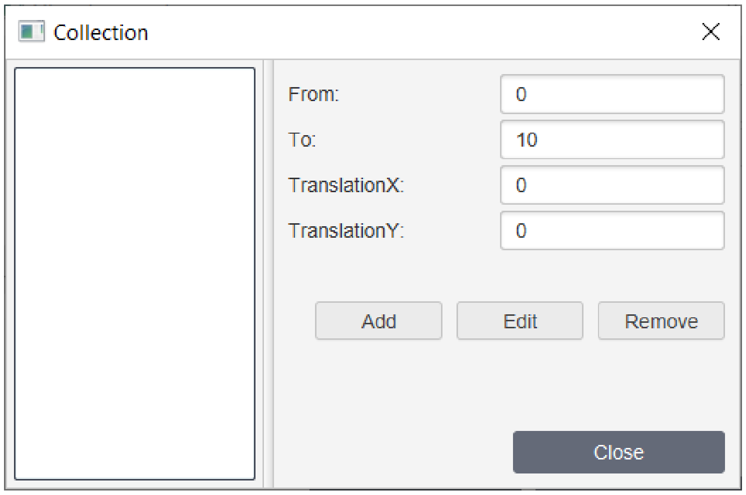
6.2.5.3 Motion

The Motion property allows an object to move depending on value of the tag. To configure the Motion property click **Motion** tab in the Object property window.



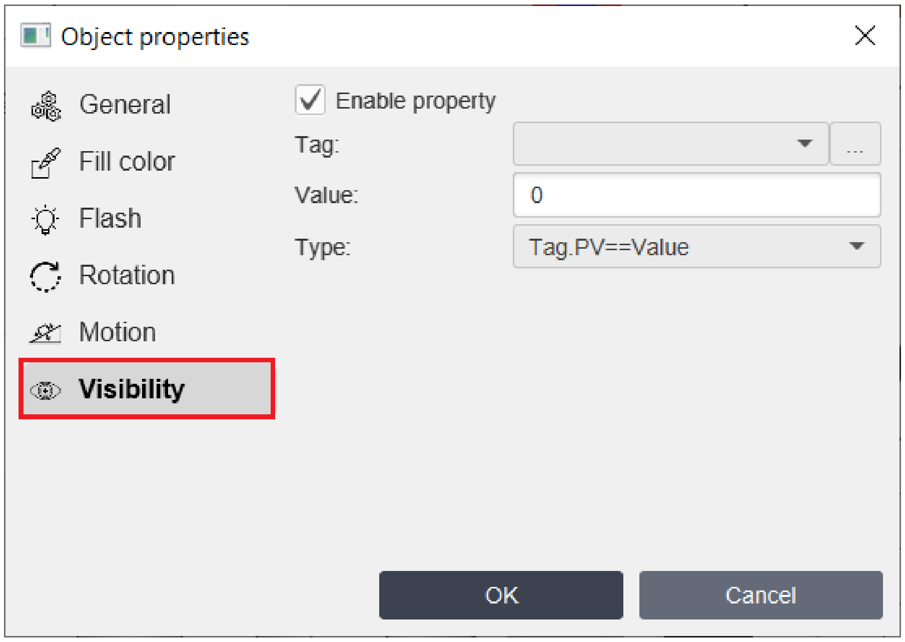
Enable property ✓
Tag:
Hotspots: Collection

Property	Description
Tag	Select the tag depending on which value the object will change location coordinates.
Hotspots	Click **Collection** button to edit move conditions coordinates. After clicking you'll see the window:

Property	Description
	 Collection From: 0 To: 10 TranslationX: 0 TranslationY: 0 where: ▪ **From** - enter the value from which the object will change coordinates in the ?eld. ▪ **To** - enter the value to which the object will change coordinates in the ?eld. ▪ **TranslationX** - write X coordinate (X offset of the object position on the screen). ▪ **TranslationY** - write Y coordinate (Y offset of the object position on the screen).

6.2.5.4 Visibility

Visibility property allows an object to to make visible or not depending on the tag’s value. To configure the Visibility property click Visibility tab in the Object property window.


Object properties

- General
- Fill color
- Flash
- Rotation
- Motion
- Visibility

✓ Enable property

Tag:

Value: 0

Type: Tag.PV==Value

OK Cancel

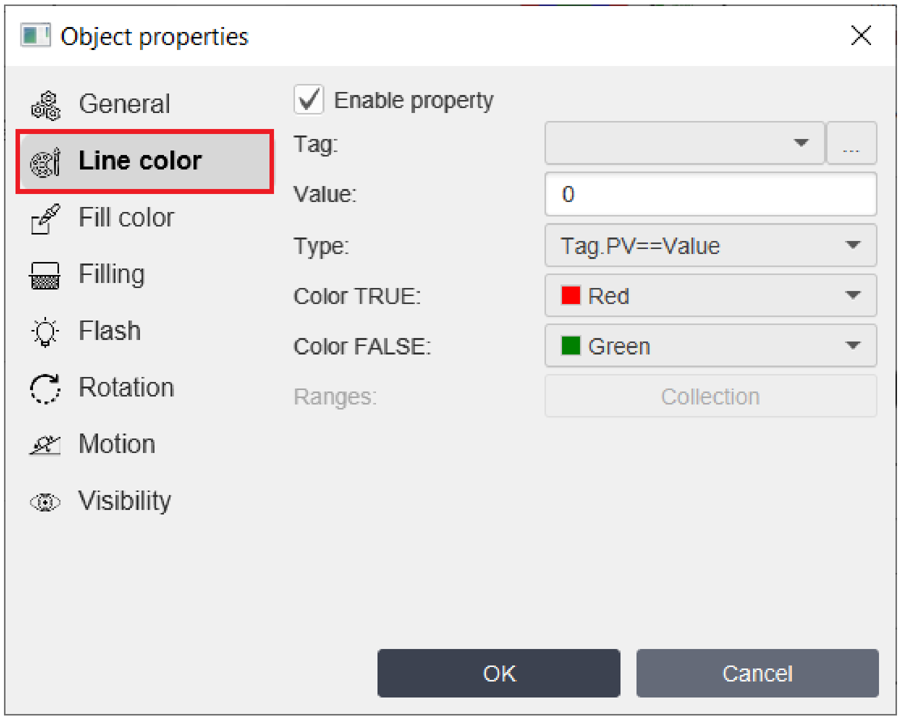
Property	Description
Tag	Select the tag which value will be compared.
Value*	Enter the comparison value.
Type	Select type of comparison: ▪ **Tag.PV==Value** - tag's value is equal to the comparison value. ▪ **Tag.PV>=Value** - tag's value is equal to or greater than the comparison value. ▪ **Tag.PV<=Value** - tag's value is equal to or less that the comparison value. ▪ **Tag.PV>Value** - tag's value is greater than the comparison value. ▪ **Tag.PV<Value** - tag's value is less than the comparison value. ▪ **Tag.PV!=Value** - tag's value is not equal to the comparison value.

*** This property you can use in ST scripts by using visibilityvalue property keyword. For example: Objects.Button.visibilityvalue = false;**

6.2.5.5 Line color

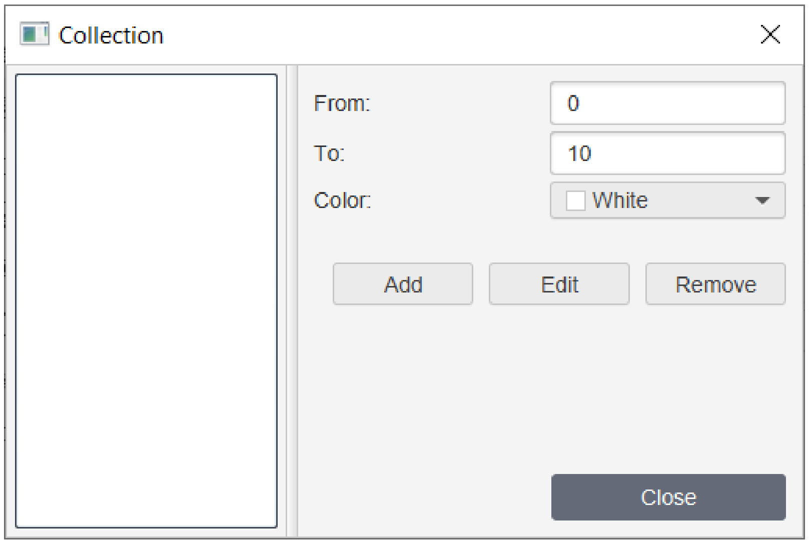
Not all objects have the Line color property!

The Line color property allows an object to change color of its line when condition is TRUE or FALSE. To configure Line color property click Line color tab in the Object property window.



✓ Enable property
Tag:
Value: 0
Type: Tag.PV==Value
Color TRUE: 🟥 Red
Color FALSE: 🟩 Green
Ranges: Collection

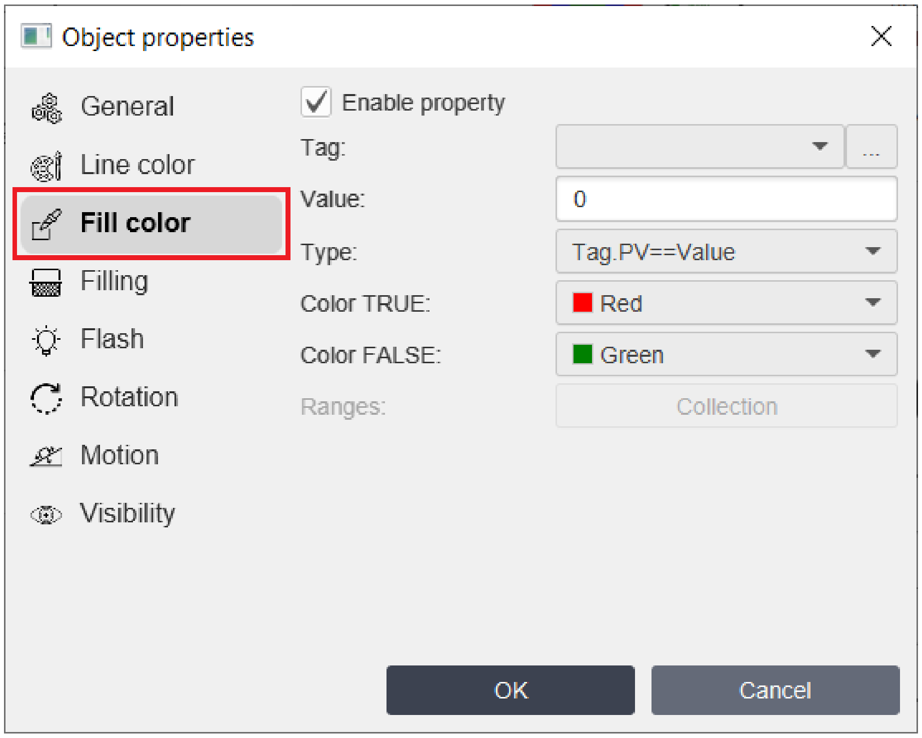
Property	Description
Tag	Select the tag which value will be compared.
Value	Enter the comparison value.
Type	Select type of comparison: ▪ **Tag.PV==Value** - tag's value is equal to the comparison value. ▪ **Tag.PV>=Value** - tag's value is equal to or greater than the comparison value. ▪ **Tag.PV<=Value** - tag's value is equal to or less that the comparison value. ▪ **Tag.PV>Value** - tag's value is greater than the comparison value. ▪ **Tag.PV<Value** - tag's value is less than the comparison value. ▪ **Tag.PV!=Value** - tag's value is not equal to the comparison value. ▪ **Tag.PV in the range** - tag's value compares to the values in the ranges. To setup ranges click Collection button.

Property	Description
Color TRUE	Choose a color that will result if the comparison is TRUE in this field.
Color FALSE	Choose a color that will result if the comparison is FALSE in this field.
Ranges	If you select **Tag.PV in the range** in the Type combobox and click **Collection** button. You'll see the window:  Collection From: 0 To: 10 Color: White where: • **From** - enter the value from which the object will change color in the ?eld. • **To** - enter the value to which the object will change color in the ?eld. • **Color** - choose color for this range. You can **Add**, **Edit** or **Remove** collection element of line color conditions.

6.2.5.6 Fill color

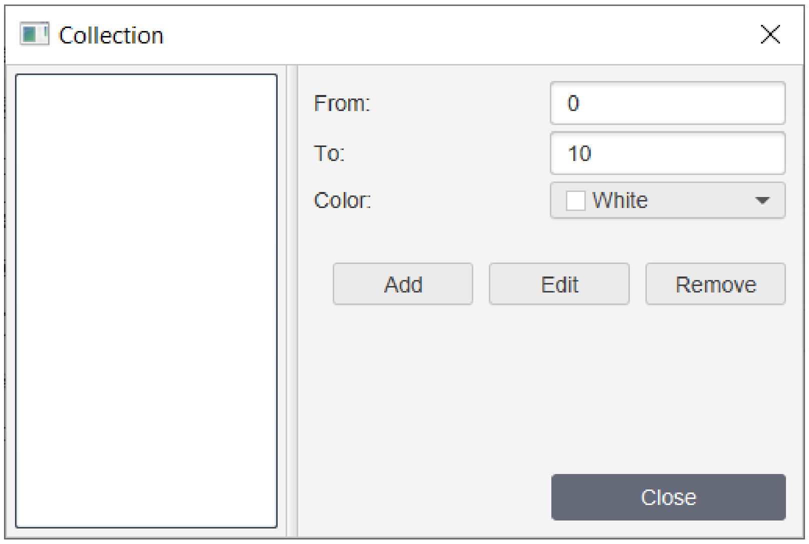
Not all objects have the Fill color property!

The Fill color property allows an object to change color of its ?lling when condition is TRUE or FALSE. To confrgutr the Fll color property click **Fill color** tab in the Object property window.



Enable property [✓]
Tag:
Value: 0
Type: Tag.PV==Value
Color TRUE: 🟥 Red
Color FALSE: 🟩 Green
Ranges: Collection

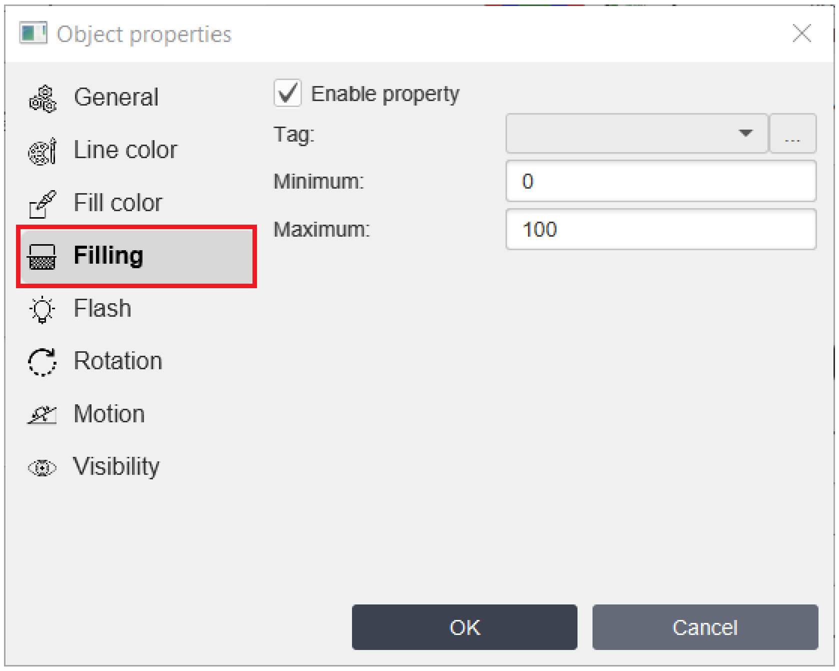
Property	Description
Tag	Select the tag which value will be compared.
Value	Enter the comparison value.
Type	Select type of comparison: ▪ **Tag.PV==Value** - tag's value is equal to the comparison value. ▪ **Tag.PV>=Value** - tag's value is equal to or greater than the comparison value. ▪ **Tag.PV<=Value** - tag's value is equal to or less that the comparison value. ▪ **Tag.PV>Value** - tag's value is greater than the comparison value. ▪ **Tag.PV<Value** - tag's value is less than the comparison value. ▪ **Tag.PV!=Value** - tag's value is not equal to the comparison value. ▪ **Tag.PV in the range** - tag's value compares to the values in the ranges. To setup ranges click Collection button.
Color TRUE	Choose a color that will result if the comparison is TRUE in this field.

Property	Description
Color FALSE	Choose a color that will result if the comparison is FALSE in this field.
Ranges	If you select **Tag.PV in the range** in the Type combobox and click Collection button. You'll see the window:  From: 0 To: 10 Color: White Where: • **From** - enter the value from which the object will change color in the ?eld. • **To** - enter the value to which the object will change color in the ?eld. • **Color** - choose color for this range. You can **Add**, **Edit** or **Remove** collection element of fill color conditions.

6.2.5.7 Filling

Not all objects have the Filling property!

The Filling property allows an object to control ?lling of the object depending on tag's value. To confrigure theF?lling property click Filling tab in the Object property window.



[✓] Enable property
Tag:
Minimum: 0
Maximum: 100

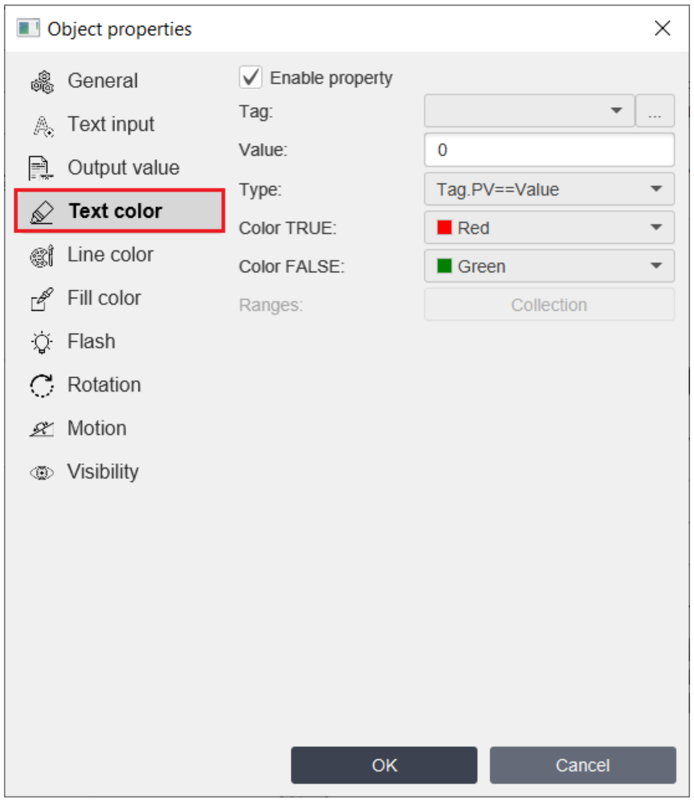
Property	Description
Tag	Select the tag which value will be used to control ?lling.
Minimum*	Enter minimum value of the object’s ?lling in the ?eld.
Maximum*	Enter maximum value of the object’s ?lling in the ?eld.

*** These properties you can use in ST scripts by using minimum or maximum properties keywords. For example, Objects.Rectangle.maximum = 200;**

6.2.5.8 Text color

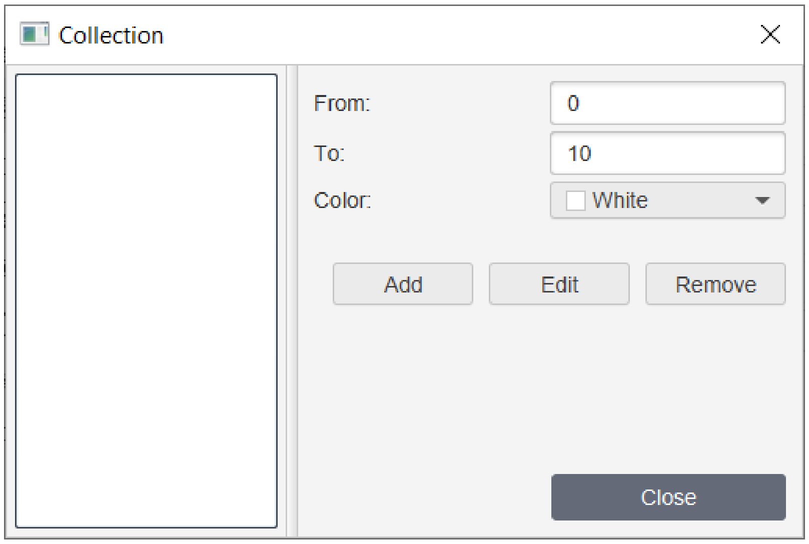
Not all objects have the Text color property!

The Text color property allows an object to change color of text when condition is TRUE or FALSE. To configure the Text color property click Text color tab in the Object property window.



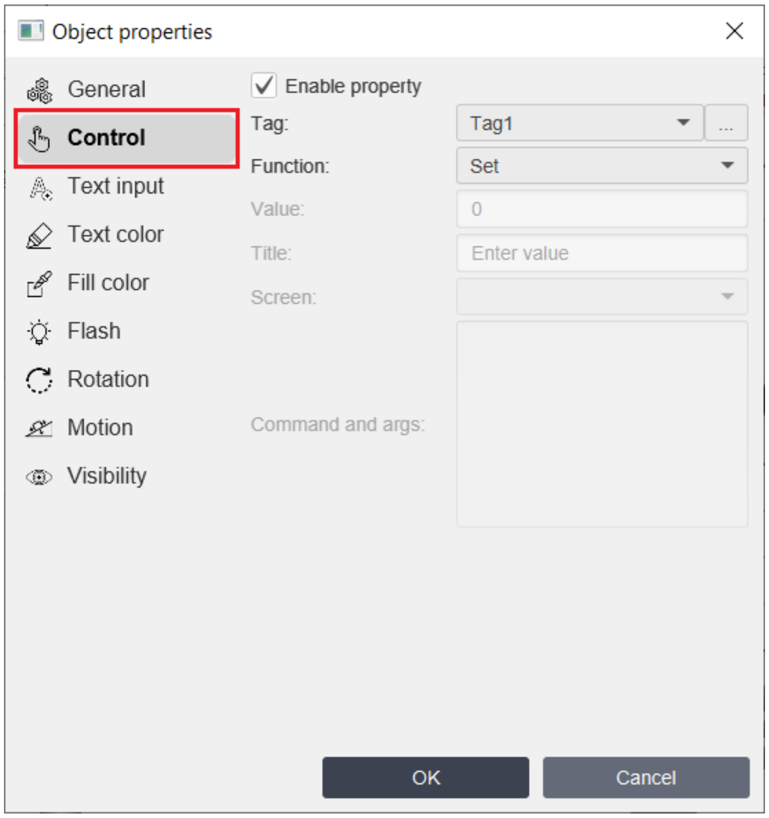
✓ Enable property
Tag:
Value: 0
Type: Tag.PV==Value
Color TRUE: 🟥 Red
Color FALSE: 🟩 Green
Ranges: Collection

Property	Description
Tag	Select the tag which value will be compared.
Value	Enter the comparison value.
Type	Select type of comparison: ▪ **Tag.PV==Value** - tag's value is equal to the comparison value. ▪ **Tag.PV>=Value** - tag's value is equal to or greater than the comparison value. ▪ **Tag.PV<=Value** - tag's value is equal to or less that the comparison value. ▪ **Tag.PV>Value** - tag's value is greater than the comparison value. ▪ **Tag.PV<Value** - tag's value is less than the comparison value. ▪ **Tag.PV!=Value** - tag's value is not equal to the comparison value. ▪ **Tag.PV in the range** - tag's value compares to the values in the ranges. To setup ranges click Collection button.

Property	Description
Color TRUE	Choose a color that will result if the comparison is TRUE
Color FALSE	Choose a color that will result if the comparison is FALSE
Ranges	If you select **Tag.PV in the range** in the Type combobox and click **Collection** button. You'll see the window:  Where: • **From** - enter the value from which the object will change color in the ?eld. • **To** - enter the value to which the object will change color in the ?eld. • **Color** - choose color for this range. You can **Add**, **Edit** or **Remove** collection element of text color conditions.

6.2.5.9 Control (for buttons)

The Control property allows you to write a value to a tag, call/close a screen/pop-up window, and perform other functions listed in the table below. To configure the Control property click Control tab in the Object property window.



✓ Enable property

Tag: Tag1

Function: Set

Value: 0

Title: Enter value

Screen:

Command and args:

Property	Description
Tag	Select the tag which value will be written.
Function	Select button's function: ▪ **Set** - write TRUE(1) to the tag. ▪ **Reset** - write FALSE(0) to the tag. ▪ **Toggle** - if current tag’s value TRUE(1) write FALSE(0), if currents tag’s value FALSE(0) write TRUE(1). ▪ **Push** - during pressing button write TRUE. ▪ **Set value** - write Value to the tag. ▪ **Enter value** - call dialog that lets you enter value to the tag. ▪ **Call screen** - call selected screen. ▪ **Call popup** - call selected popup screen. ▪ **Close popup** - close popup screen. ▪ **Call external software** - lets call external software by using command and arguments of OS. ▪ **Close application** - close application. ▪ **Build report** - build and show report of the project. ▪ **Login** - login user of the project.

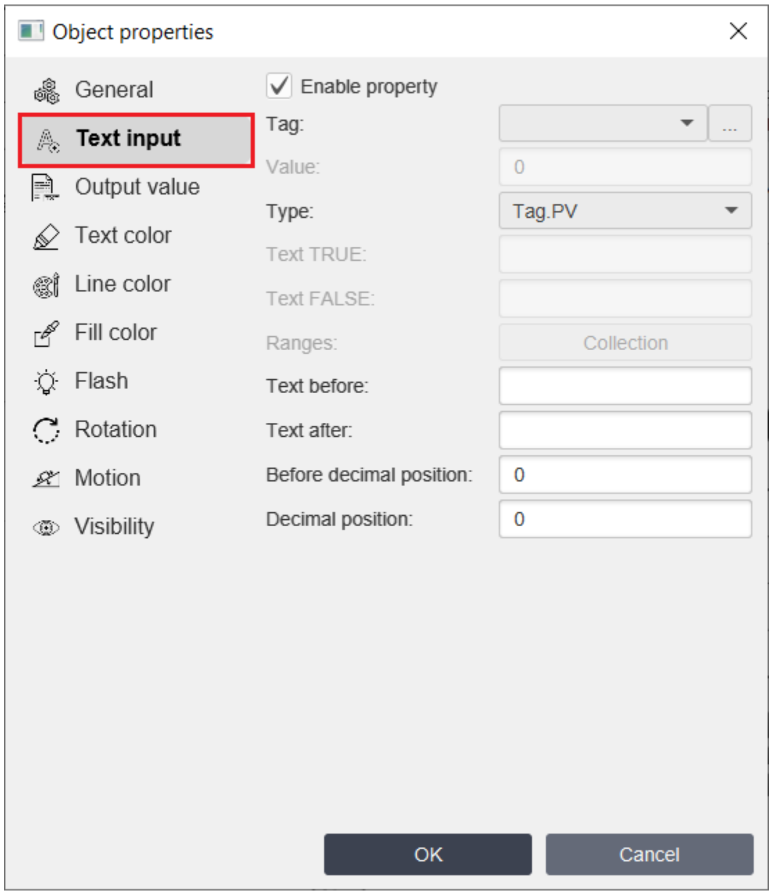
Property	Description
	▪ **Logout** - logout current user from the project. User with the less access level is login. ▪ **Show/hide main menu** - show/hide the main menu.
Value	When you select Set value function enter value that will be written to the tag.
Title	When you select Enter value function write title of the called dialog that lets you enter value.
Screen	When you select Call screen or Call popup function choose screen that will be called after clicking on the button. It's possible to bind button for calling Previous Screen.

Command and args	This field is used in 2 ways:
	1. When you select Call screen, Call popup or Close popup function this field is used to enter global arguments separated by semicolons. Example:
	name=pump; description=pump 1 description;
	It's useful if you want to use some arguments in ST scripts. You can get them by using **getglobalargument** script command. Example:
	string name = getglobalargument("name", "");
	string description = getglobalargument("description","");
	
	2. When you select Call external software function this field is used to enter OS commands and arguments to call external software. Example:
	▪ for MacOS: open /Applications/TextEdit.app
	▪ for Windows: C:/Progra~1/somesoftware.exe
	▪ for Android: opc.tesla.scada (name of the Android application package)
	▪ for iOS: http://www.youtube.com/watch?v=VIDEO_IDENTIFIER (youtube scheme for calling in iOS).

6.2.5.10 Text input

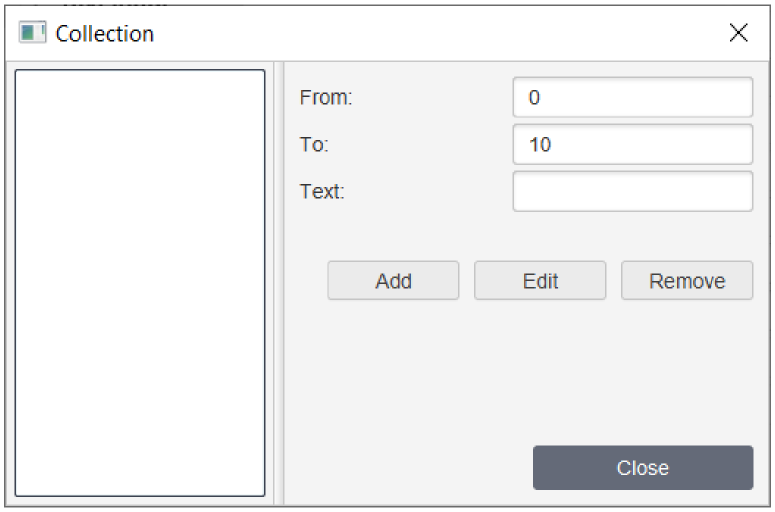
Not all objects have the Text input property!

The Text input property allows an object to display a tag value or text when condition is TRUE or FALSE. To configure text the Input property click Text input tab in the Object property window.



Enable property ✓
Tag:
Value: 0
Type: Tag.PV
Text TRUE:
Text FALSE:
Ranges: Collection
Text before:
Text after:
Before decimal position: 0
Decimal position: 0

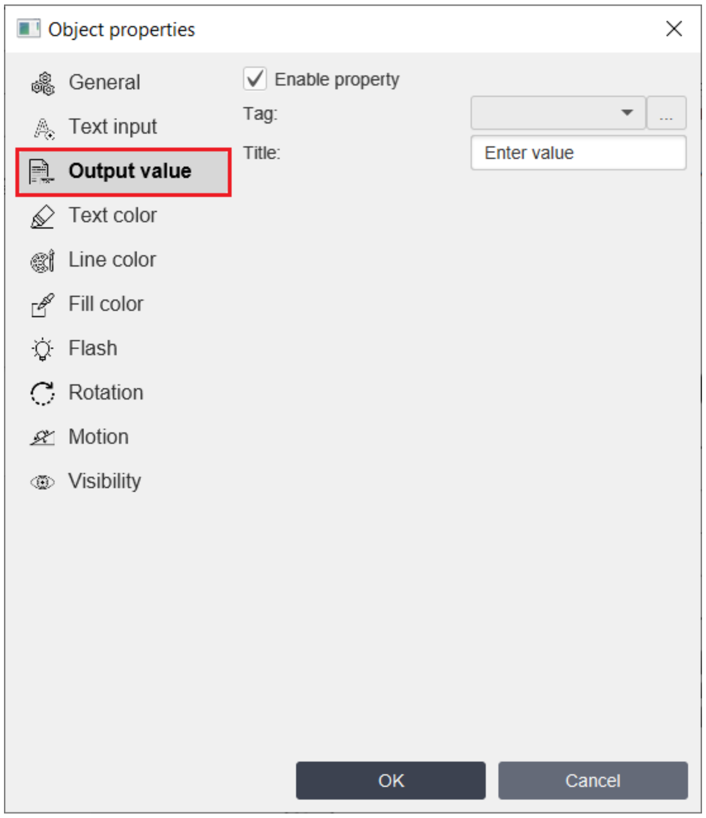
Property	Description
Tag	Select the tag which value will be compared.
Value	Enter the comparison value.
Type	Select type of comparison or displaying: ▪ **Tag.PV** - tag's value is displayed. ▪ **Tag.PV==Value** - tag's value is equal to the comparison value. ▪ **Tag.PV>=Value** - tag's value is equal to or greater than the comparison value. ▪ **Tag.PV<=Value** - tag's value is equal to or less that the comparison value. ▪ **Tag.PV>Value** - tag's value is greater than the comparison value. ▪ **Tag.PV<Value** - tag's value is less than the comparison value. ▪ **Tag.PV!=Value** - tag's value is not equal to the comparison value.

Property	Description
	▪ **Tag.PV in the range** - tag's value compares to the values in the ranges. To setup ranges click Collection button.
Text TRUE	Enter text that will be written if the comparison is TRUE(1)
Text FALSE	Enter text that will be written if the comparison is FALSE(0)
Ranges	If you select **Tag.PV in the range** in the Type combobox and click **Collection** button. You'll see the window:  Collection From: 0 To: 10 Text: Add Edit Remove Close where: • **From** - enter the value from which the object will change text in the ?eld. • **To** - enter the value to which the object will change text in the ?eld. • **Text** - enter text in the ?eld. You can **Add**, **Edit** or **Remove** collection element of input text conditions.
Text before	Write the text that will be displayed before the input text.
Text after	Write the text that will be displayed after the input text.
Before decimal position	If the input text is the numeric value of the tag enter number of digits before decimal position.
Decimal position	If the input text is the numeric value of the tag enter decimal position.

6.2.5.11 Output value

Not all objects have the Output value property!

The Output value property allows an object to write value to the tag. To configure the Output property click Output value tab in the Object property window.



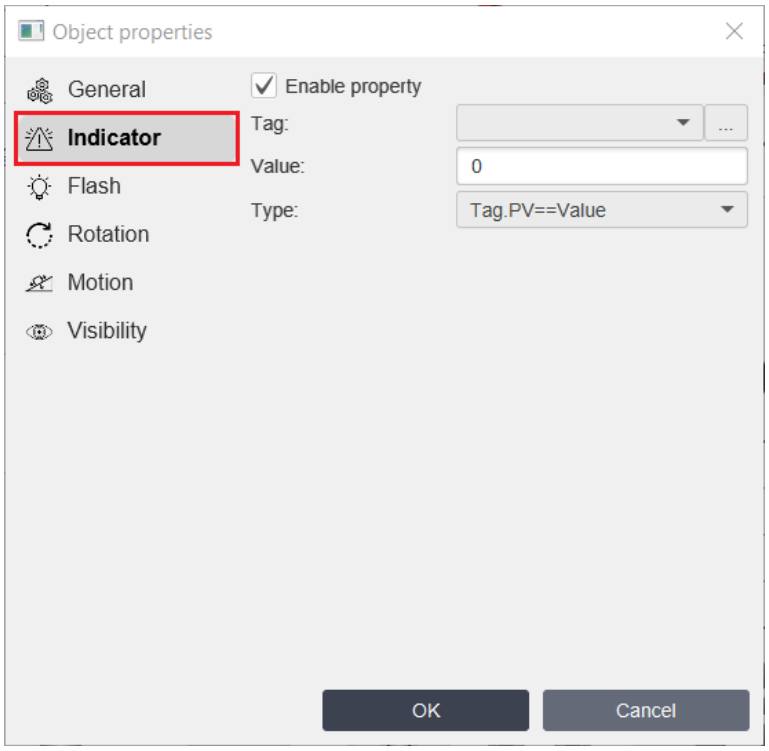
✓ Enable property
Tag:
Title: Enter value

Property	Description
Tag	Select the tag which value will be written.
Title	Enter title of the dialog that will be used to write value to the tag.

6.2.5.12 Indicator

Not all objects have the Indicator property!

The Indicator property allows you to control the object indicator depending on the tag value. To configure this property, click on the Indicator tab in the Object properties Window.



✓ Enable property

Tag:

Value: 0

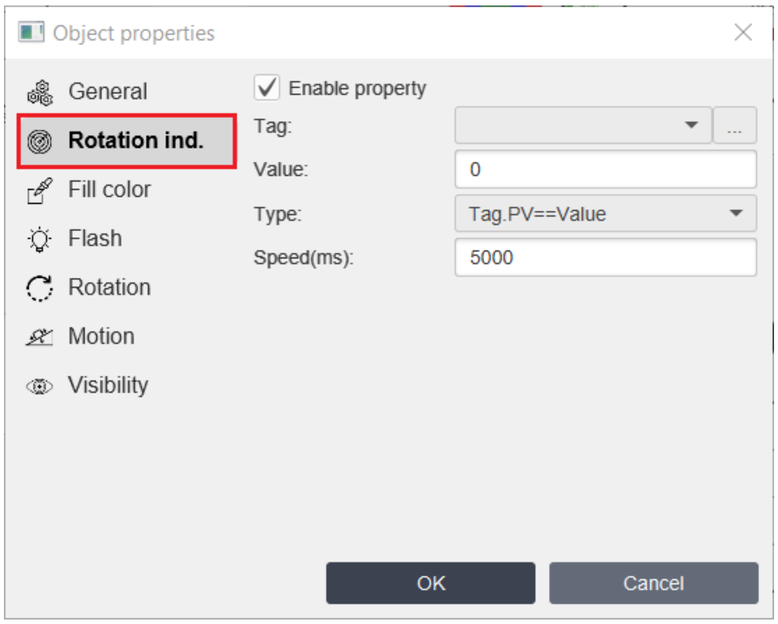
Type: Tag.PV==Value

Property	Description
Tag	Select the tag which value will be compared.
Value	Enter the comparison value.
Type	Select type of comparison: ▪ **Tag.PV==Value** - tag's value is equal to the comparison value. ▪ **Tag.PV>=Value** - tag's value is equal to or greater than the comparison value. ▪ **Tag.PV<=Value** - tag's value is equal to or less that the comparison value. ▪ **Tag.PV>Value** - tag's value is greater than the comparison value. ▪ **Tag.PV<Value** - tag's value is less than the comparison value. ▪ **Tag.PV!=Value** - tag's value is not equal to the comparison value.

6.2.5.13 Rotation indicator

Not all objects have the Rotation Indicator property!

The Rotation Indicator property allows an object to rotate around its center depending on value of the tag. To configure the indicator property click Rotation ind. tab in the Object property window.



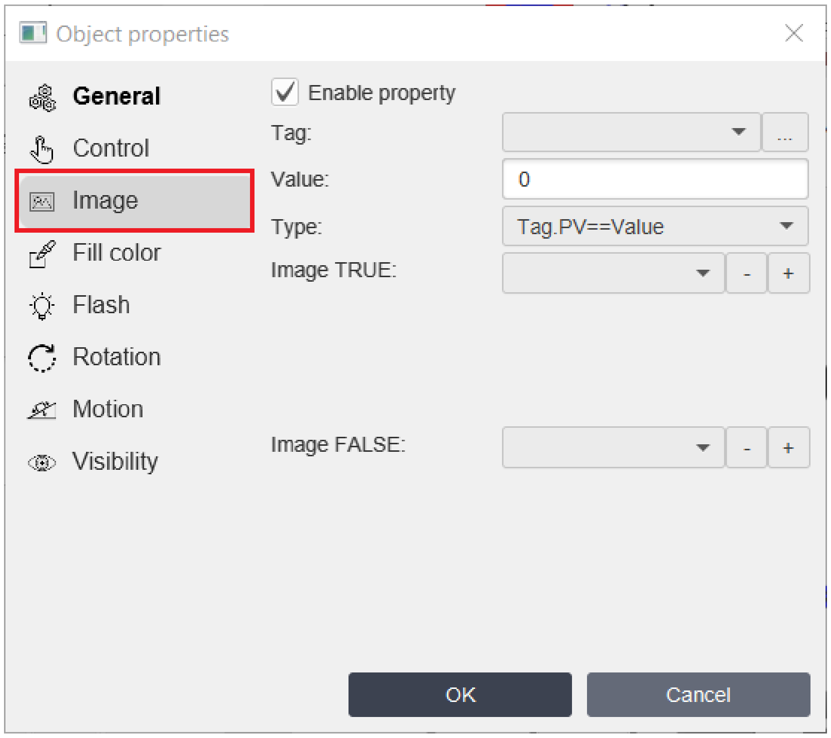
Enable property ✓
Tag:
Value: 0
Type: Tag.PV==Value
Speed(ms): 5000

Property	Description
Tag	Select the tag which value will be compared.
Value	Enter the comparison value.
Type	Select type of comparison: ▪ **Tag.PV==Value** - tag's value is equal to the comparison value. ▪ **Tag.PV>=Value** - tag's value is equal to or greater than the comparison value. ▪ **Tag.PV<=Value** - tag's value is equal to or less that the comparison value. ▪ **Tag.PV>Value** - tag's value is greater than the comparison value. ▪ **Tag.PV<Value** - tag's value is less than the comparison value. ▪ **Tag.PV!=Value** - tag's value is not equal to the comparison value.
Speed(ms)	Enter rotation speed

6.2.5.14 Image

Not all objects have the Image property!

The Image property allows an object to change image when condition is TRUE or FALSE. To configure the Image property click Image tab in the Object property window.



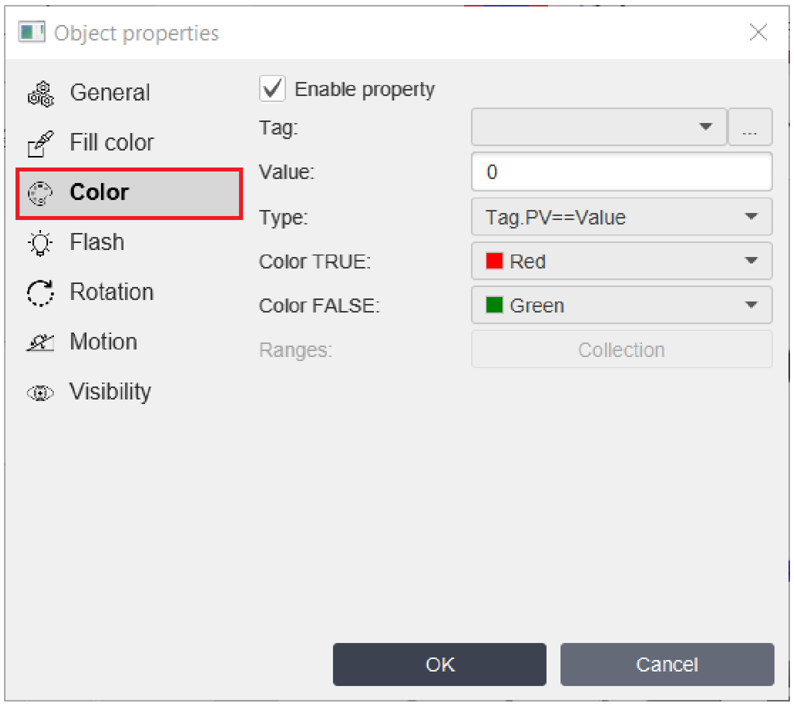
Enable property ✓
Tag:
Value: 0
Type: Tag.PV==Value
Image TRUE:
Image FALSE:

Property	Description
Tag	Select the tag which value will be compared.
Value	Enter the comparison value.
Type	Select type of comparison: ▪ **Tag.PV==Value** - tag's value is equal to the comparison value. ▪ **Tag.PV>=Value** - tag's value is equal to or greater than the comparison value. ▪ **Tag.PV<=Value** - tag's value is equal to or less that the comparison value. ▪ **Tag.PV>Value** - tag's value is greater than the comparison value. ▪ **Tag.PV<Value** - tag's value is less than the comparison value. ▪ **Tag.PV!=Value** - tag's value is not equal to the comparison value.
Image TRUE	Choose image that will be shown if the comparison is TRUE
Image FALSE	Choose image that will be shown if the comparison is FALSE

6.2.5.15 Color

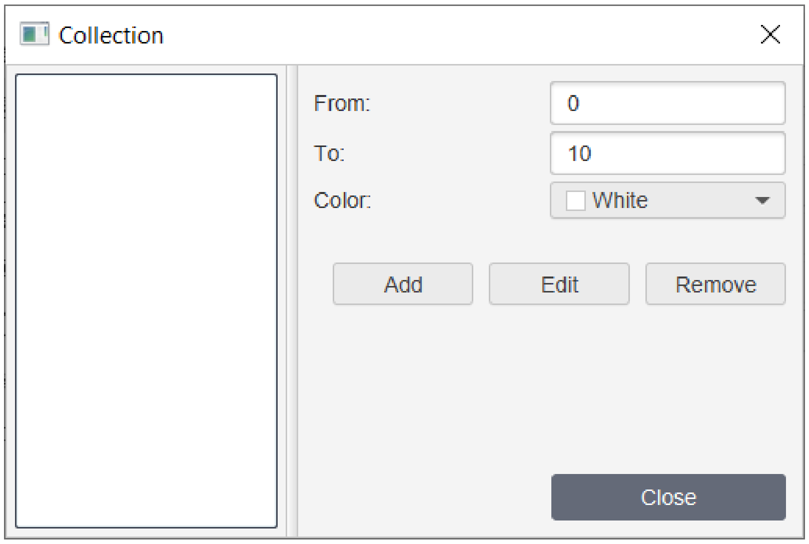
Not all objects have the Color property!

The Color property allows an object to change its color when condition is TRUE or FALSE. To configure the Color property click Color tab in the Object property window.



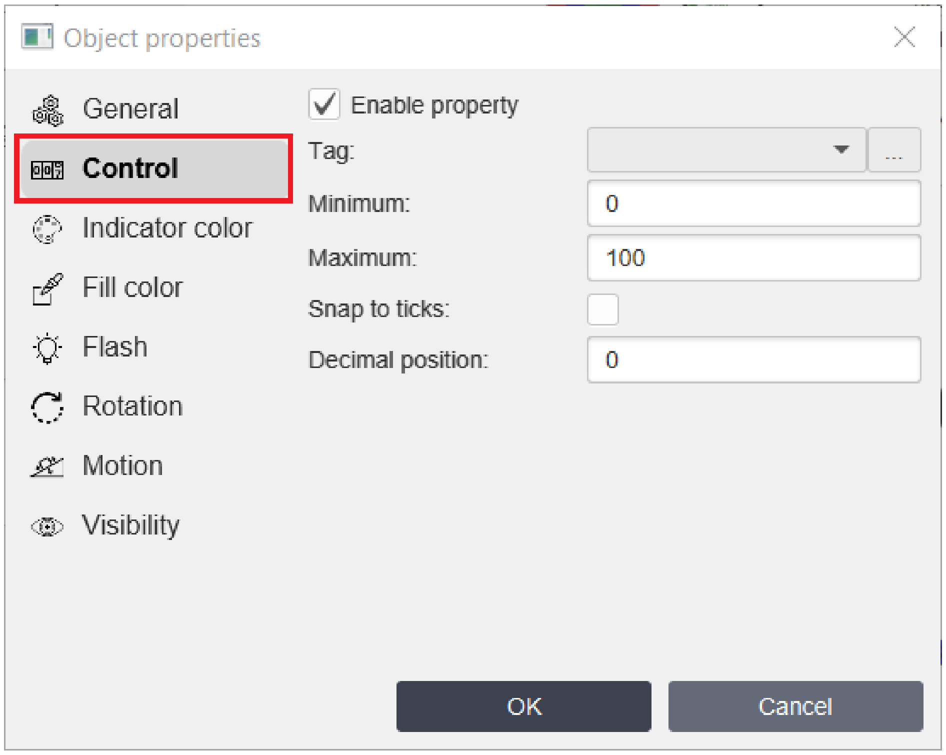
☑ Enable property
Tag:
Value: 0
Type: Tag.PV==Value
Color TRUE: 🟥 Red
Color FALSE: 🟩 Green
Ranges: Collection

Property	Description
Tag	Select the tag which value will be compared.
Value	Enter the comparison value.
Type	Select type of comparison: ▪ **Tag.PV==Value** - tag's value is equal to the comparison value. ▪ **Tag.PV>=Value** - tag's value is equal to or greater than the comparison value. ▪ **Tag.PV<=Value** - tag's value is equal to or less that the comparison value. ▪ **Tag.PV>Value** - tag's value is greater than the comparison value. ▪ **Tag.PV<Value** - tag's value is less than the comparison value. ▪ **Tag.PV!=Value** - tag's value is not equal to the comparison value.

Property	Description
	▪ **Tag.PV in the range** - tag's value compares to the values in the ranges. To setup ranges click Collection button.
Color TRUE	Choose a color that the object will have if the comparison is TRUE
Color FALSE	Choose a color that the object will have if the comparison is FALSE
Ranges	If you select **Tag.PV in the range** in the Type combobox and click **Collection** button. You'll see the window:  Collection; From: 0; To: 10; Color: White where: • **From** - enter the value from which the object will have color of this range. • **To** - enter the value to which the object will have color of this range. • **Color** - choose color for this range. You can **Add**, **Edit** or **Remove** collection element of color conditions.

6.2.5.16 Control (for sliders)

The Control property allows to write value to the tag of the object . To configure the Control property click Control tab in the Object property window.



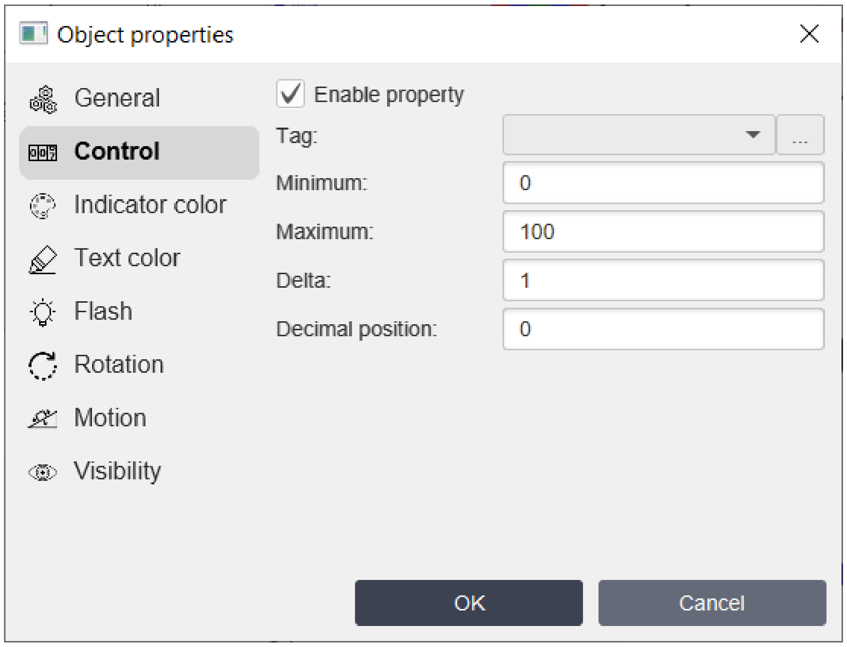
Enable property ✓
Tag:
Minimum: 0
Maximum: 100
Snap to ticks:
Decimal position: 0

Property	Description
Tag	Select the tag which value will be changed.
Minimum*	Enter minimum value of the object's control.
Maximum*	Enter maximum value of the object's control.
Snap to ticks	Check it if you want to bind control's value to scale ticks.
Decimal position	Enter decimal position of displayed numeric text.

*** These properties you can use in ST scripts by using minimum or maximum properties keywords. For example:**
Objects.Slider.maximum = 200;

6.2.5.17 Control (for counters)

The Control property allows to write value to the tag. To configure the Control property click Control tab in the Object property window.


Object properties

Enable property ✓

Tag:

Minimum: 0

Maximum: 100

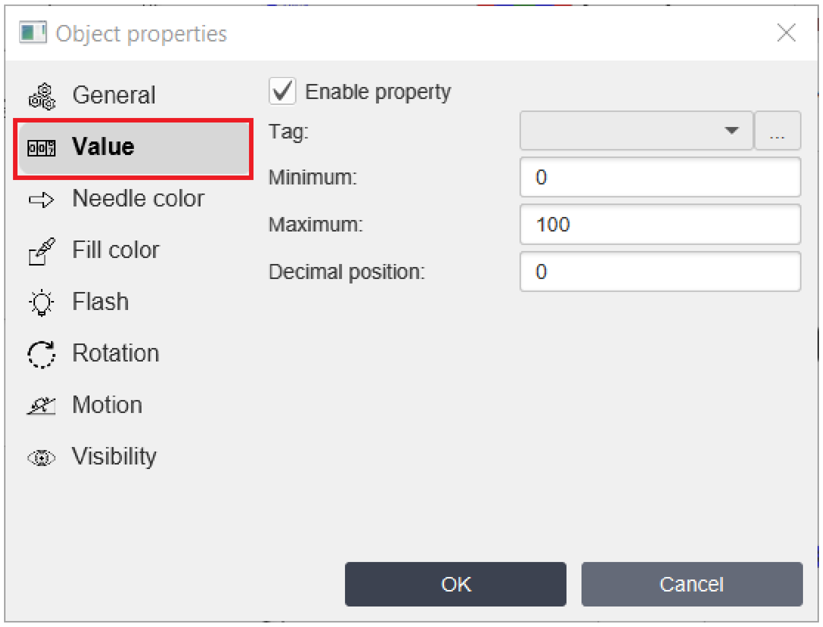
Delta: 1

Decimal position: 0

Property	Description
Tag	Select the tag which value will be changed.
Minimum*	Enter minimum value of the object’s control
Maximum*	Enter maximum value of the object’s control
Delta	This is the value by which the control value will change when the plus and minus buttons are pressed.
Decimal position	Enter decimal position of displayed numeric text in the ?eld.

6.2.5.18 Value (for meters)

The Value property allows an object to control values of analog and digital meters depending on tag's value. To configure the Value property click Value tab in the Object property window.



Enable property: ✓
Tag:
Minimum: 0
Maximum: 100
Decimal position: 0

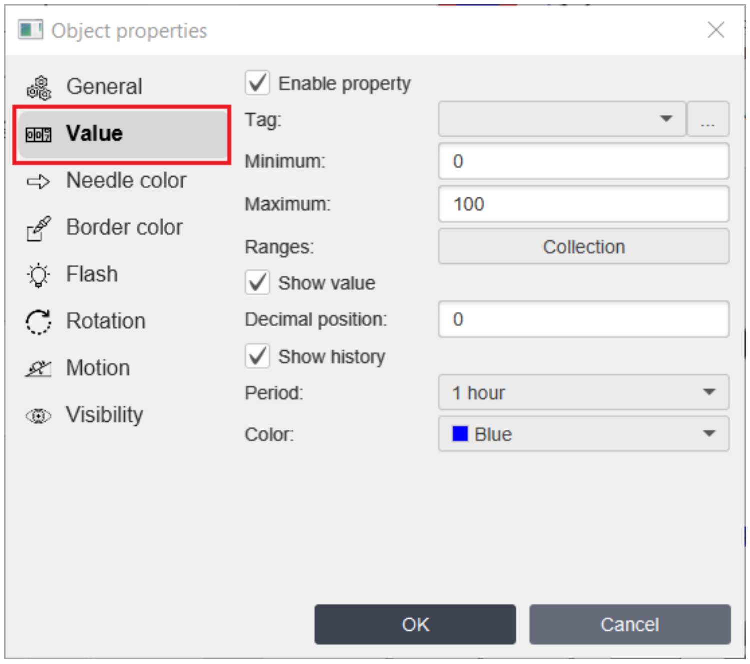
Property	Description
Tag	Select the tag which value will be changed.
Minimum*	Enter minimum value of the meter
Maximum*	Enter maximum value of the meter
Decimal position*	Enter decimal position of displayed numeric text in the ?eld.

*** These properties you can use in ST scripts by using minimum, maximum and decimalpos properties keywords. For example:**

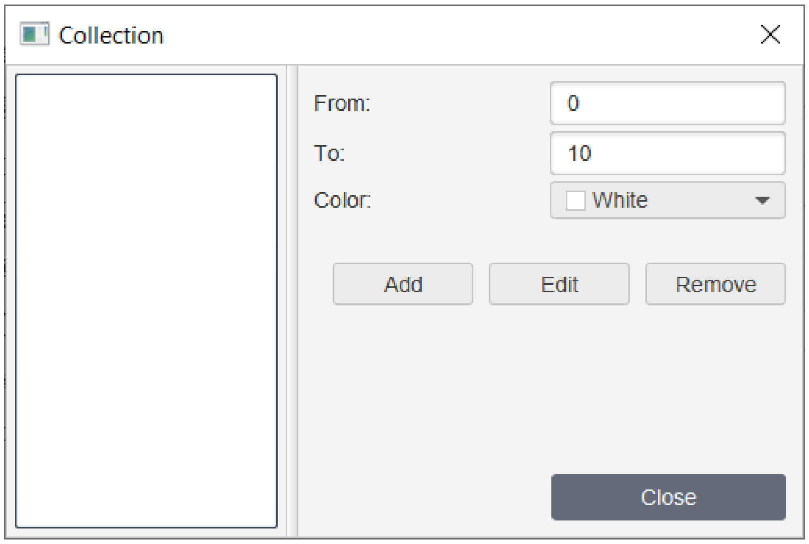
Objects.Meter.maximum = 200;

6.2.5.19 Value (for range indicators and gauges)

The Value property allows an object to display the value of a tag in an indicator. To configure the Value property click Value tab in the Object property window.



Enable property ✓
Tag:
Minimum: 0
Maximum: 100
Ranges: Collection
Show value ✓
Decimal position: 0
Show history ✓
Period: 1 hour
Color: Blue

Property	Description
Tag	Select the Tag which value will be used to display on the indicator or gauge.
Minimum*	Enter the minimum value of the indicator or gauge.
Maximum*	Enter maximum value of the indicator or gauge
Ranges	Click **Collection** button. You'll see the window:  From: 0 To: 10 Color: White where: • **From** - enter the value from which the object will have color of this range.

Property	Description
	• **To** - enter the value to which the object will have color of this range. • **Color** - choose color for this range. You can **Add**, **Edit** or **Remove** collection element of color conditions.
Show value	Check it if you want to make visible number representation.
Decimal position*	Enter decimal position of displayed numeric text in the ?eld.
Show history	Check if you want to make visible history information of the tag.
Period	Choose period of the history information.
Color	Choose color of the history information.

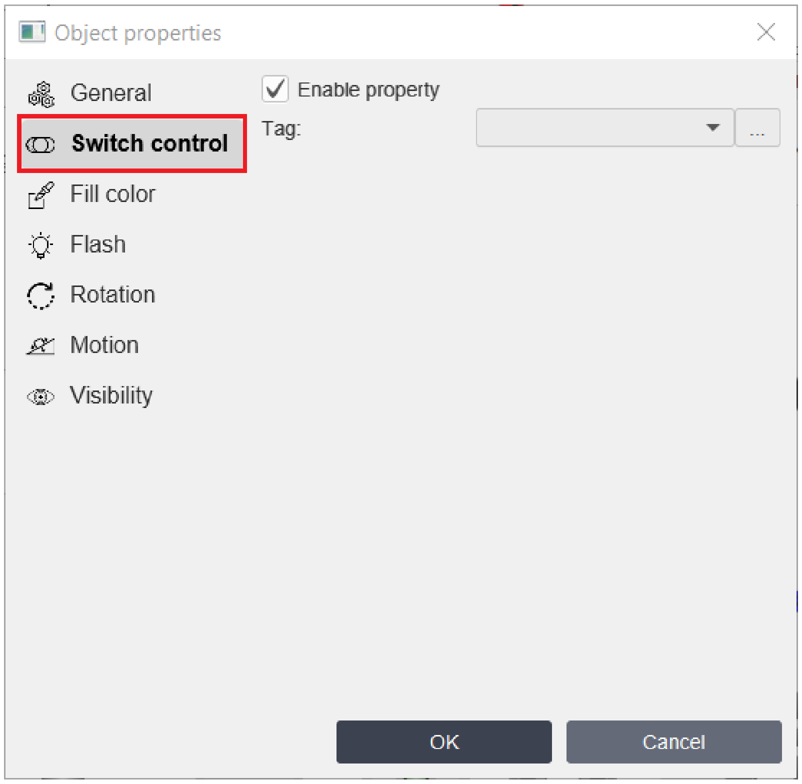
*** These properties you can use in ST scripts by using minimum, maximum and decimalpos properties keywords. For example:**

Objects.Gauge.maximum = 200;

6.2.5.20 Switch control

Not all objects have the Switch control property!

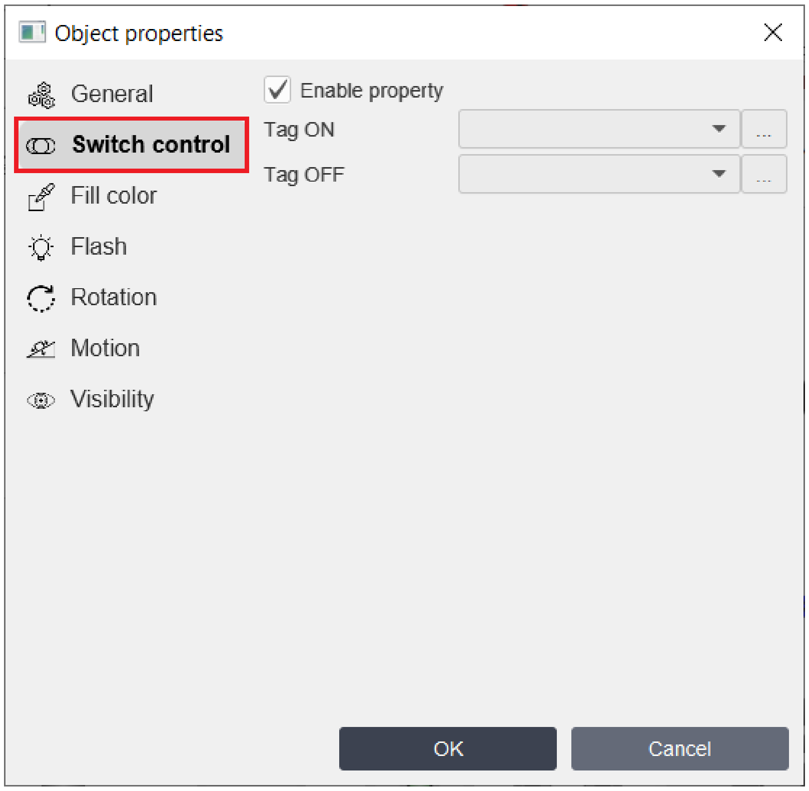
The Switch control property allows an object to switch boolean value of the tag. To configure the Switch control property click Switch control tab in the Object property window.



Property	Description
Tag	Select the tag which value will be controlled by the switch.

6.2.5.21 Switch control (for 3 position switch)

The Switch control property allows an object to switch boolean values of the tags. To configure the Switch control property click Switch control tab in the Object property window.



Enable property: ✓
Tag ON
Tag OFF

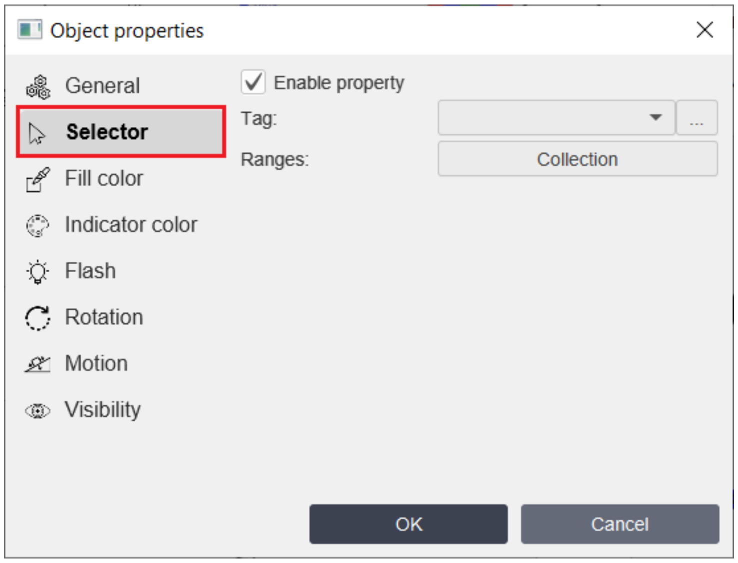
Property	Description
Tag ON	Select the Tag ON which value will be controlled by the switch.
Tag OFF	Select the Tag OFF which value will be controlled by the switch.

When the value of Tag ON is TRUE and the value of Tag OFF is FALSE the switch position will be ON. When the value of Tag ON is FALSE and the value of Tag OFF is TRUE the switch position will be OFF. In other situations the switch position will be Neutral. To switch click (or touch on mobile devices) on the position you want.

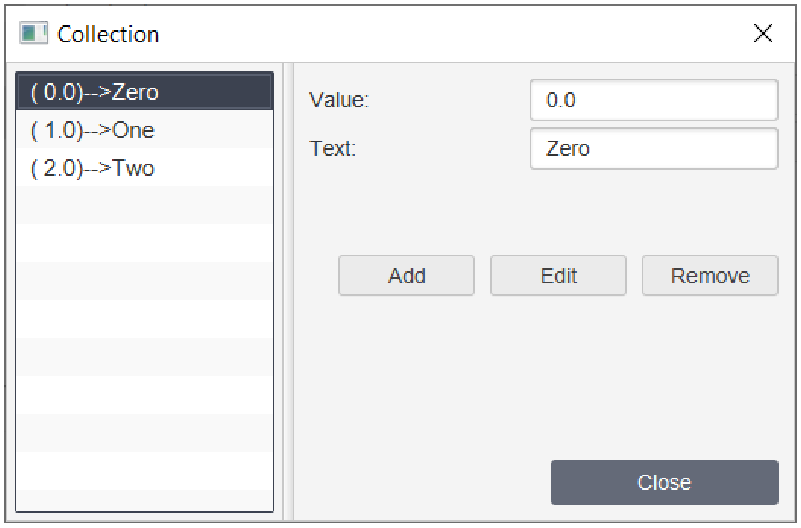
6.2.5.22 Selector

Not all objects have the Selector property!

The Selector property allows an object to enter values by clicking selector buttons. To configure the Selector property click Selector tab in the Object property window.



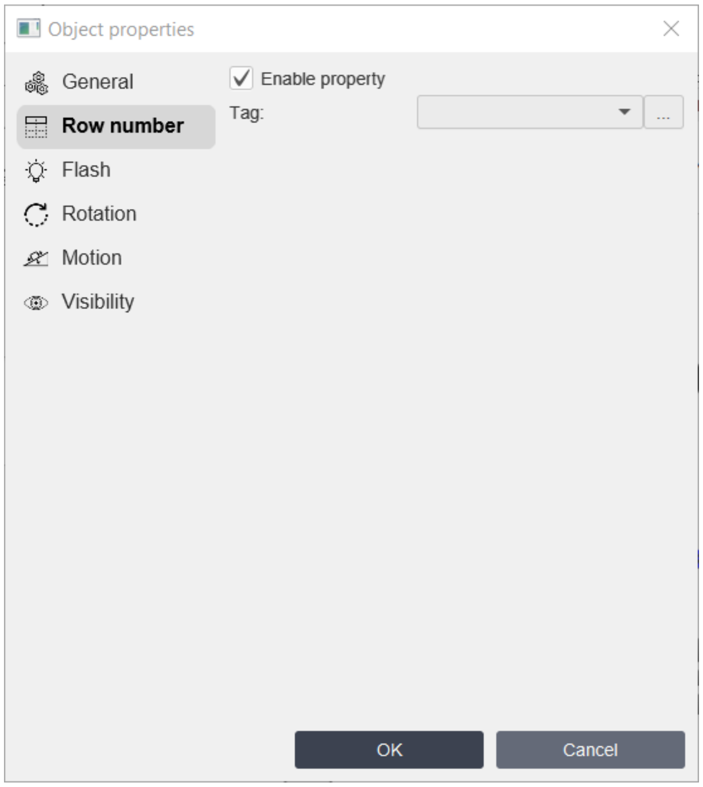
Enable property ✓
Tag:
Ranges: Collection

Property	Description
Tag	Select the tag which value will be controlled by the selector.
Ranges	Click **Collection** button. You'll see the window:  (0.0)-->Zero (1.0)-->One (2.0)-->Two Value: 0.0 Text: Zero where: • **Value** - enter the value which will be written after clicking the button of the selector. • **Text** - enter text of the selector's button. You can **Add**, **Edit** or **Remove** collection element of the selector buttons.

6.2.5.23 Row number

Not all objects have the Row number property!

The Row number property allows an object to choose row number of the Recipe 492 database in Parameter table 253 object. To configure this property click Row number tab in the Object property window.



Property	Description
Tag	Select the tag which value will choose row number of the Recipe 492 database.

6.3 Servers

Create server

To create a new server select the menu item **Project** 67 **->** **New Server** 69 **->Server** you want or choose **Servers** 77 tab on the Project Window, click right button on it and choose **New Server** 69 **->Server** you want item. List of servers:

- **Modbus RTU** 382 - create new Modbus RTU server and open window to edit its properties.
- **Modbus TCP(UDP)** 384 - create new Modbus TCP(UDP) server and open window to edit its properties.

- **Siemens** 386 - create new Siemens server and open window to edit its properties.
- **Allen Bradley** 387 - create new Allen Bradley server and open window to edit its properties.
- **OPC UA** 388 - create new OPC UA server and open window to edit its properties.
- **MQTT** 390 - create new MQTT server and open window to edit its properties.
- **Omron** 395 - create new Omron server and open window to edit its properties.
- **BACnet/IP** 397 - create new BACnet server and open window to edit its properties.
- **Common RTU** 398 - create new Common RTU server and open window to edit its properties.
- **Common TCP** 399 - create new Common TCP server and open window to edit its properties.
- **Raspberry GPIO** 400 - create new Raspberry GPIO server and open window to edit its properties.
- **Cloud** 401 -create new Cloud server and open window to edit its properties

Open server properties

To open server properties on Servers 77 tab:

- Double click on the server properties which you want to open.

or

- Right click on the server properties which you want to open and choose Server properties item.

Copy server

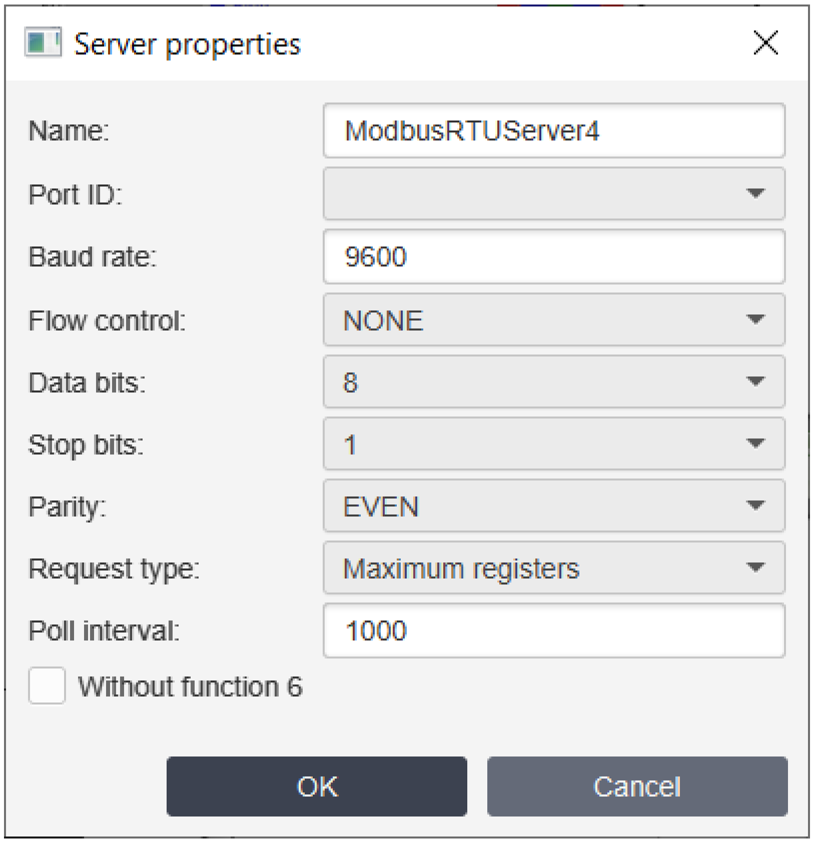
To copy server on Servers 77 tab right click on the server you want to copy and choose Copy server item.

Delete server

To delete server on Servers 77 tab right click on the server you want to delete and choose Delete server item.

6.3.1 Modbus RTU

To create a new Modbus RTU server select the menu item Modbus RTU. You'll see the following window:


Server properties

Name: ModbusRTUServer4

Port ID:

Baud rate: 9600

Flow control: NONE

Data bits: 8

Stop bits: 1

Parity: EVEN

Request type: Maximum registers

Poll interval: 1000

Without function 6 [ ]

List of properties:

Property	ST script field*	Description
Name		Name of the Modbus RTU server.
Port ID	**portid**	ID of the COM port. If this port can not be open in TeslaSCADA2 Runtime other port will be tried to ?nd and open.
Baud rate	**baudrate**	Baud rate of the Modbus RTU.
Flow control	**flowcontrol**	Flow control of the port. It can be NONE, RTSCTS and XONXOF.
Data bits	**databits**	Number of data bits. It can be 5, 6, 7 and 8.
Stop bits	**stopbits**	Number of stop bits. It can be 1, 1.5 and 2.
Parity	**parity**	Parity of the Modbus RTU. It can be NONE, EVEN, ODD, MARK and SPACE.
Request type	**requesttype**	Choose request type:

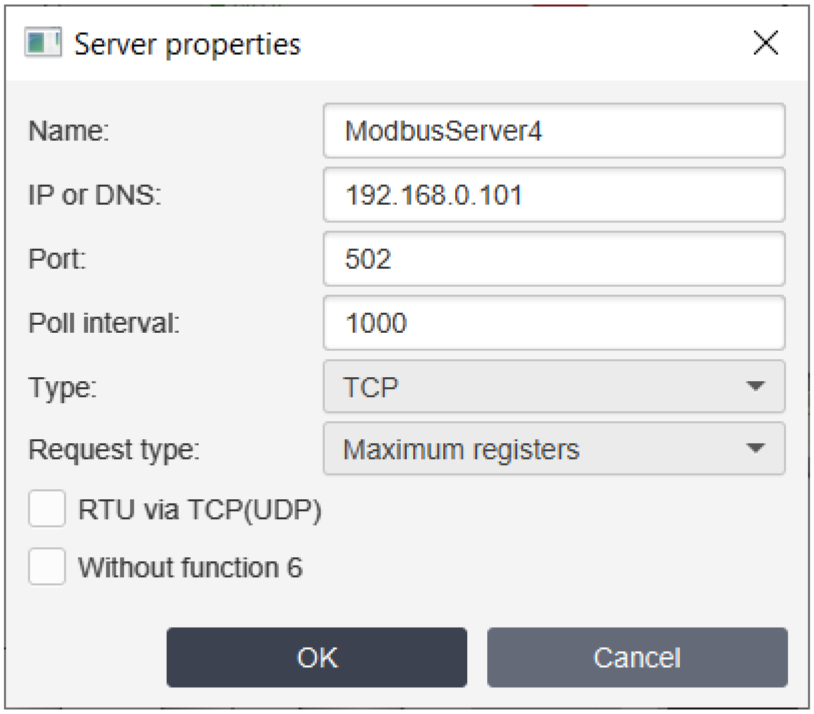
Property	ST script field*	Description
		- **Maximum registers** - if you choose this type the application during polling will send maximum modbus pointers in 1 polling request. - **Consecutive registers** - if you choose this type the application during polling will send only consecutive modbus pointers in 1 polling request. - **1 pointer registers** - if you choose this type the application during polling will send only registers used by 1 pointer in 1 polling request.
Without function 6	**withoutfun**	Check if your controller doesn't support Modbus writing function 6.

*** This field is used in ST scripts**. For example, Servers.Server1.requesttype = 0. In this script command request type of the Server1 become Maximum registers. Also for all servers you can use fields:

- **connect** - connect to the server.
- **connected** - check connection of the server.
- **lostconnection** - check lost or not connection of the server.

6.3.2 Modbus TCP

To create a new Modbus TCP(UDP) server select the menu item Modbus TCP(UDP). You'll see the following window:



Name: ModbusServer4
IP or DNS: 192.168.0.101
Port: 502
Poll interval: 1000
Type: TCP
Request type: Maximum registers
RTU via TCP(UDP)
Without function 6

List or properties:

Property	ST script field*	Description
Name		Name of the Modbus TCP server.
IP or DNS	ipaddress	IP address or DNS of the Modbus TCP server.
Port	port	Port of the Modbus TCP server.
Poll interval	interval	Polling interval (period) of the server's requests.
Type	type	Communication protocol of Modbus server - TCP or UDP.
Request type	requesttype	Choose request type: - **Maximum registers** - if you choose this type the application during polling will send maximum modbus pointers in 1 polling request. - **Consecutive registers** - if you choose this type the application during polling will send only consecutive modbus pointers in 1 polling request. - 1 **pointer registers** - if you choose this type the application during polling will

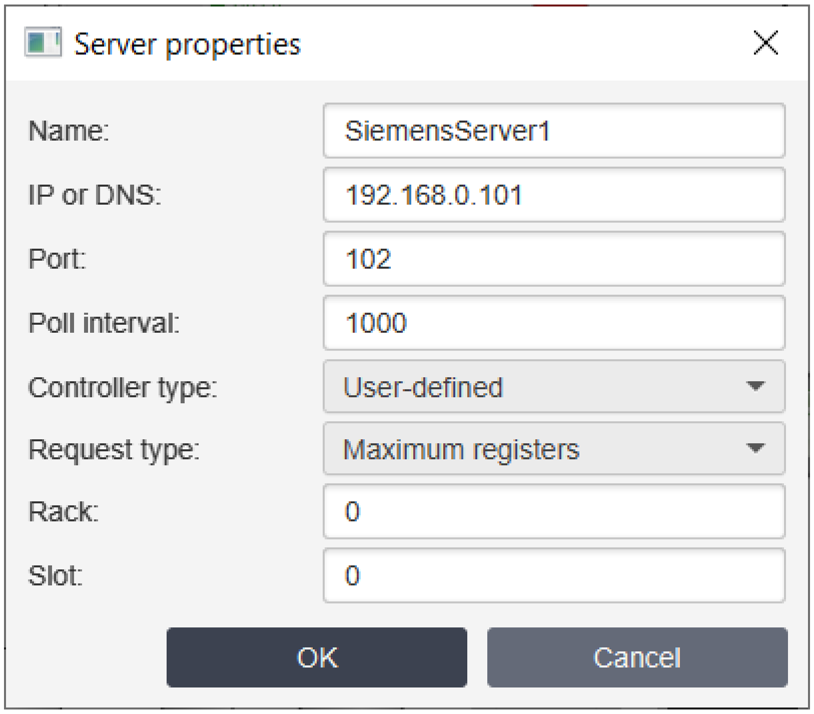
Property	ST script field*	Description
		send only registers used by 1 pointer in 1 polling request.
RTU via TCP(UDP)	rtuviatcp	Check if you use Modbus converter from serial into TCP(UDP) protocol.
Without function 6	withoutfun	Check if your controller doesn't support Modbus writing function 6.

*** This field is used in ST scripts.** For example: Servers.Server1.requesttype = 0. In this script command request type of the Server1 become Maximum registers. Also for all servers you can use fields:

- **connect** - connect to the server.
- **connected** - check connection.
- **lostconnection** - check lost or not connection.

6.3.3 Siemens

To create a new Siemens server select the menu item Siemens. You'll see the following window:



Name:	SiemensServer1
IP or DNS:	192.168.0.101
Port:	102
Poll interval:	1000
Controller type:	User-defined
Request type:	Maximum registers
Rack:	0
Slot:	0

List of properties:

Property	ST script field*	Description
Name		Name of the Siemens server.

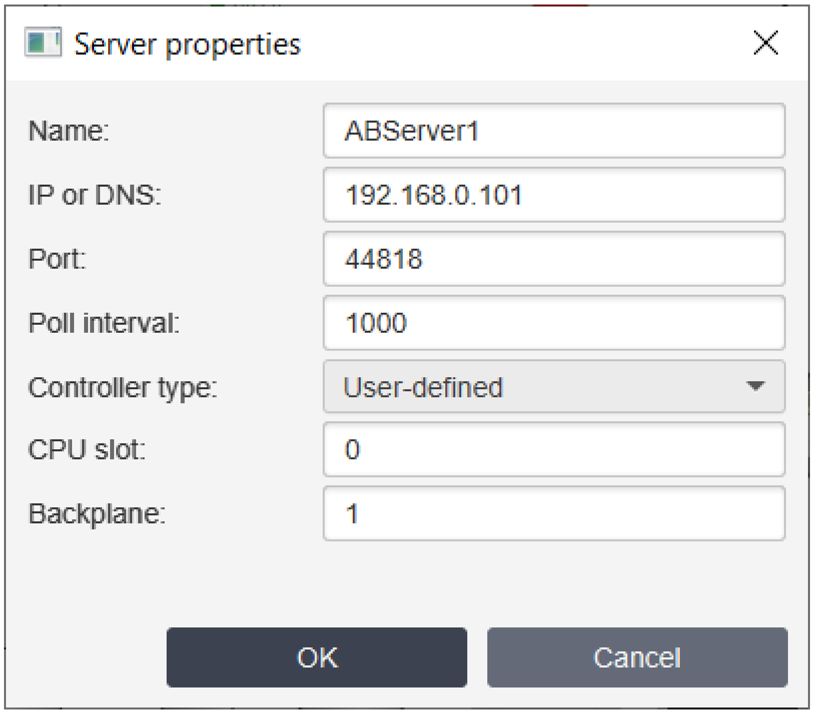
Property	ST script field*	Description
IP or DNS	**ipaddress**	IP address or DNS of the server.
Port	**port**	Port of the server.
Poll interval	**interval**	Polling interval (period) of the server's requests.
Controller type	**plctype**	Type of the Siemens PLC.
Request type	**requesttype**	Choose request type: - **Maximum registers** - if you choose this type the application during polling will send maximum modbus pointers in 1 polling request. - 1 **pointer registers** - if you choose this type the application during polling will send only registers used by 1 pointer in 1 polling request.
Rack	**rack**	Number of controller's rack
Slot	**slot**	Number of controller's slot

***This field is used in ST scripts**. For example, Servers.Server1.requesttype = 0. In this script command request type of the Server1 become Maximum registers. Also for all servers you can use fields:

- **connect** - connect to the server.
- **connected** - check connection.
- **lostconnection** - check lost or not connection.

6.3.4 Allen Bradley

To create a new Allen Bradley server select the menu item Allen Bradley. You'll see the following window:



Name: ABServer1
IP or DNS: 192.168.0.101
Port: 44818
Poll interval: 1000
Controller type: User-defined
CPU slot: 0
Backplane: 1

List or properties:

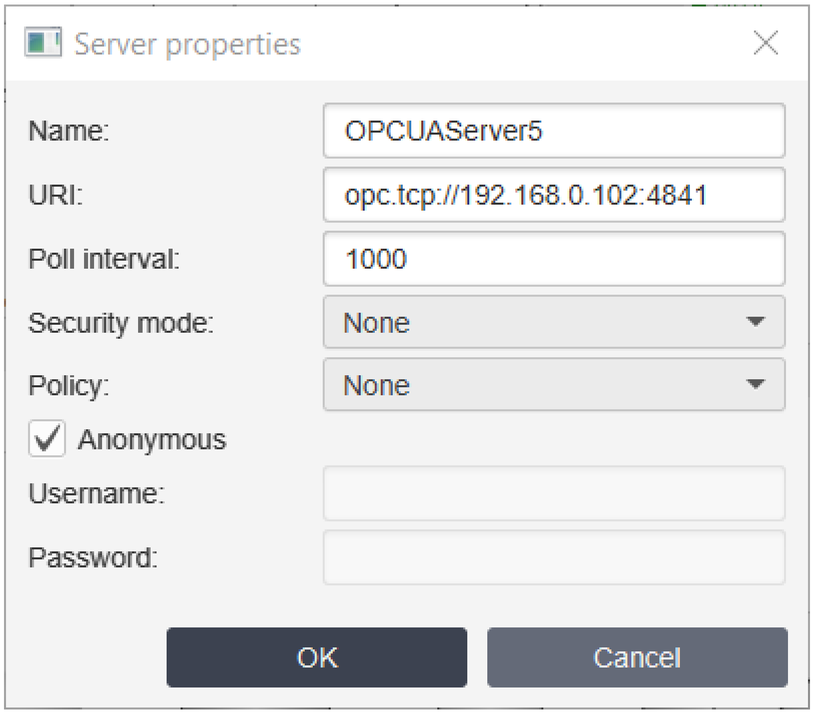
Property	ST script field*	Description
Name		Name of the Allen Bradley server.
IP or DNS	**ipaddress**	IP address or DNS of the server.
Port	**port**	Port of the server.
Poll interval	**interval**	Polling interval (period) of the server's requests.
Controller type	**plctype**	Type of the Allen Bradley PLC.
CPU slot	**cpuslot**	PLC’s cpu slot number.
Backplane	**ethernetslot**	PLC's backplane number.

***This field is used in ST scripts.** For example: Servers.Server1.interval = 2000. In this script command poll interval of the Server1 will be changed to 2000 ms. Also for all servers you can use fields:

- **connect** - connect to the server.
- **connected** - check connection.
- **lostconnection** - check lost or not connection.

6.3.5 OPC UA

To create a new OPC UA server select the menu item OPC UA. You’ll see the following window:



Name: OPCUAServer5
URI: opc.tcp://192.168.0.102:4841
Poll interval: 1000
Security mode: None
Policy: None
[✓] Anonymous
Username:
Password:

List of properties:

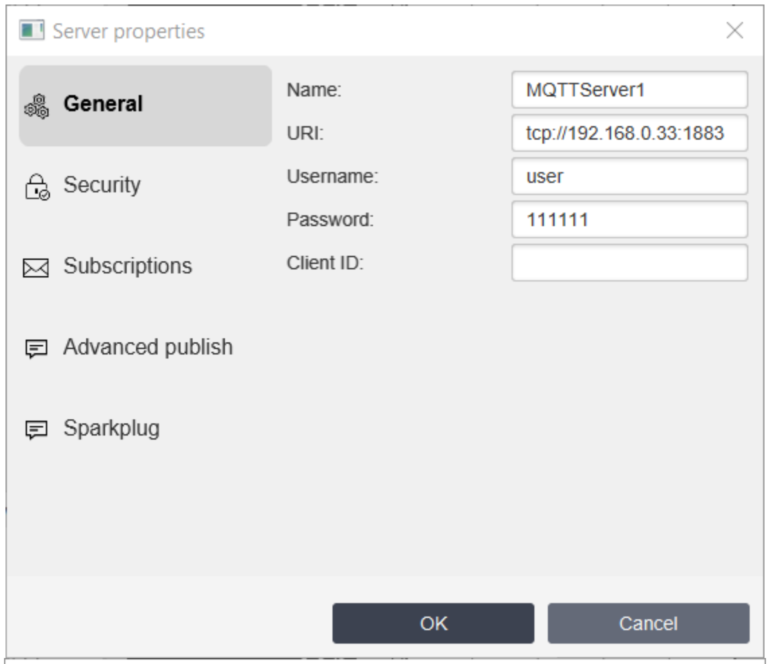
Property	ST script field*	Description
Name		Name of the OPC UA server.
URI	**uri**	OPC UA server address.
Poll interval	**interval**	Polling interval (period) of the server's requests.
Security mode	**mode**	Security mode of the OPC UA server - None, Sign, Sign and Encrypt.
Policy	**policy**	Security policy of the OPC UA server - Basic128RSA15, Basic256, Basic256SHA256
Anonymous	**anonymous**	Check if you don't want to use User's token.
Username	**username**	If you use user token enter username in this field.
Password	**password**	If you use user token enter password in this field.

***This field is used in ST scripts**. For example, Servers.Server1.interval = 2000. In this script command poll interval of the Server1 will be changed to 2000 ms. For OPC UA server you have to reconnect server. Also for all servers you can use fields:

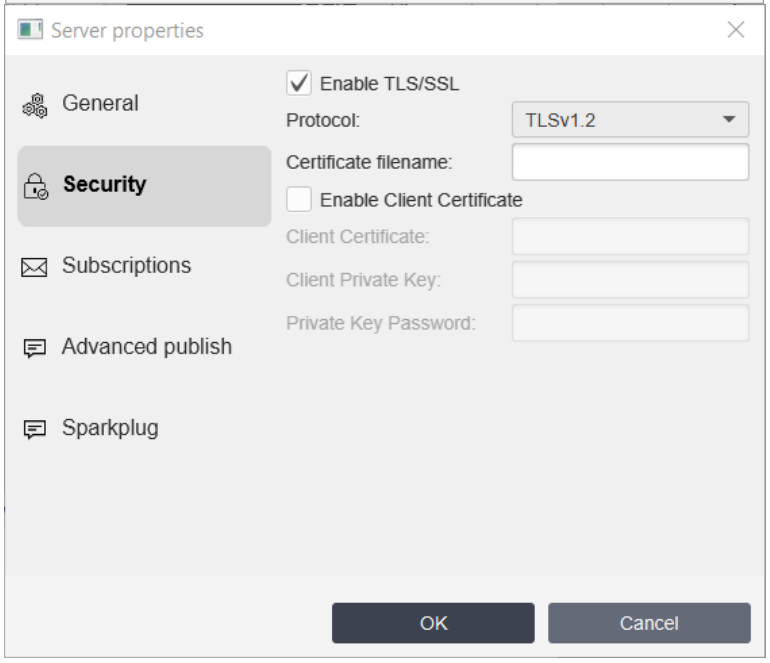
- **connect** - connect to the server.
- **connected** - check connection.
- **lostconnection** - check lost or not connection.

6.3.6 MQTT

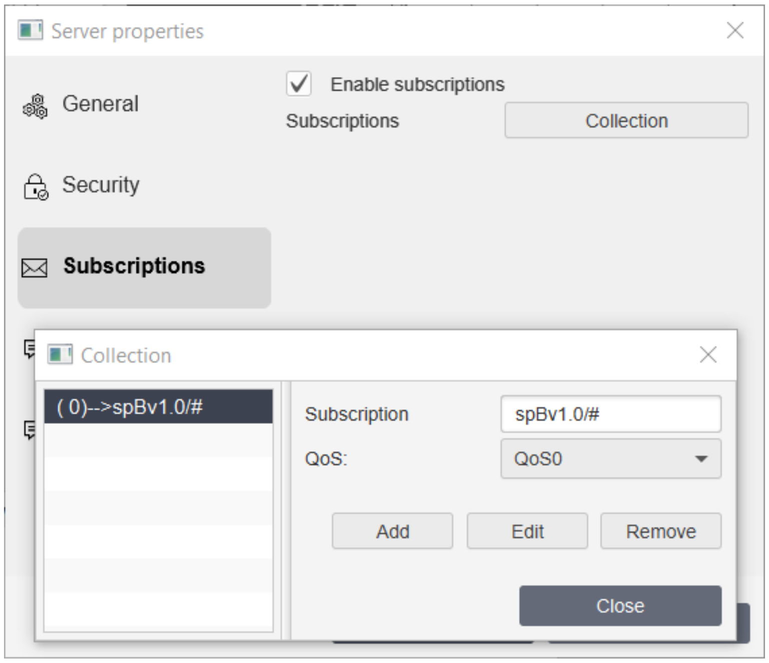
To create a new MQTT server select the menu item MQTT. You’ll see the following window:



Name: MQTTServer1
URI: tcp://192.168.0.33:1883
Username: user
Password: 111111
Client ID:



[✓] Enable TLS/SSL
Protocol: TLSv1.2
Certificate filename:
[ ] Enable Client Certificate
Client Certificate:
Client Private Key:
Private Key Password:



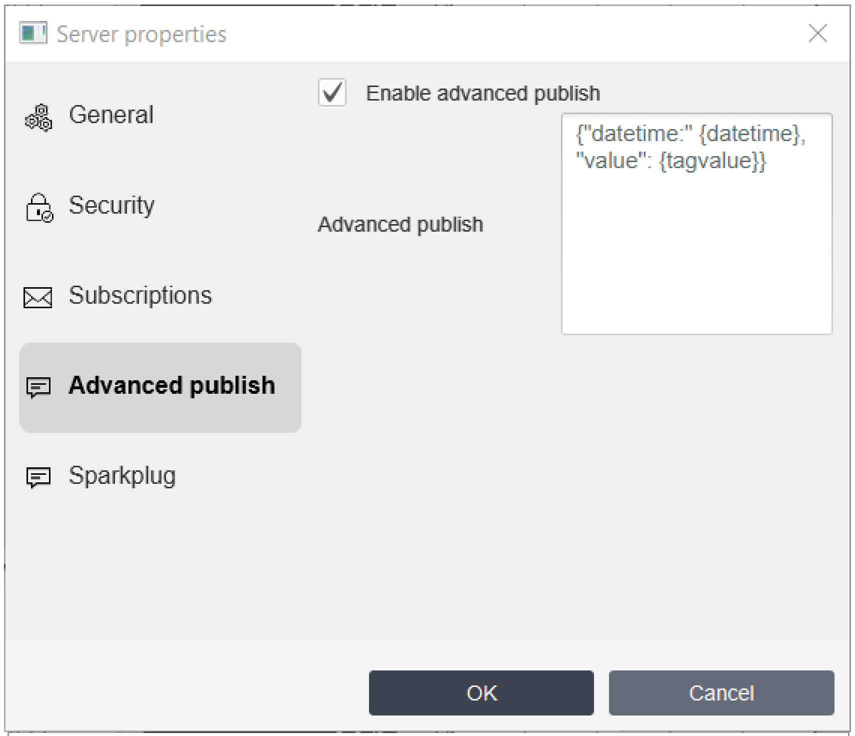
Enable subscriptions [✓]

Subscriptions: Collection

(0)-->spBv1.0/#

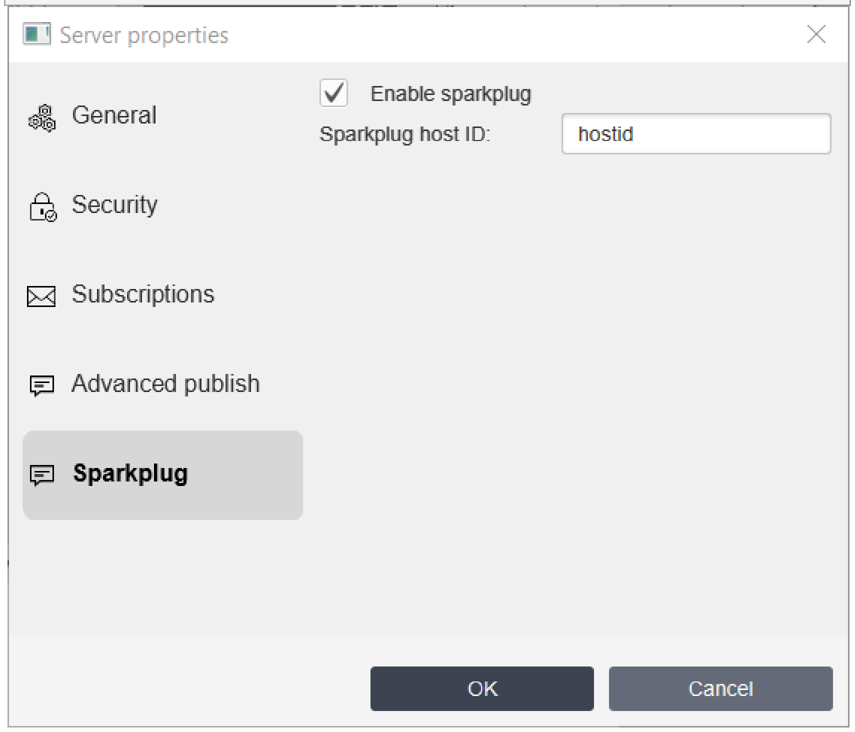
Subscription: spBv1.0/#

QoS: QoS0



Enable advanced publish [✓]

Advanced publish: {"datetime:" {datetime}, "value": {tagvalue}}



Enable sparkplug [✓]

Sparkplug host ID: hostid

List of properties:

Property	ST script field*	Description
Name		Name of the MQTT server.
URI	**uri**	MQTT server address.

Property	ST script field*	Description
Username	**username**	Username of the server.
Password	**password**	Password of the server.
Client ID		Client ID of the MQTT server. If you left this field empty server will generate it itself.
Enable TLS/SSL	**enablessl**	Check Enable TLS/SSL if you want to use server certi?cate for encryption messages.
Certi?cate ?lename	**sslfilename**	File should be placed in /private 18/ folder in the directory where TeslaSCADA2 installed.
Enable Client Certificate	**enableclientcert**	Check it if you want to use client certi?cate for encryption messages.
Client certificate**	**clientcertname**	File should be placed in /private 18/ folder in the directory where TeslaSCADA2 installed.
Client private key**	**clientprivatekey**	File should be placed in /private 18/ folder in the directory where TeslaSCADA2 installed.
Private key password**	**privatekeypassword**	Private key password.
PEM formatted**	**pem**	Check if your certi?cate and key ?les are PEM formatted
Enable subscriptions		Check if you want to add subscription for MQTT client.
Subscriptions		When you click **Collection** button you'll see window for adding new subscriptions for MQTT client
Enable advanced publish		Enable it if you want to use Advanced message to publish (JSON message for example).
Advances message		Enter advanced message that will send MQTT client. You can use keywords: {taggroup}, {tagsubgroup}, {tagname}, {projectname}, {tagvalue}, {datetime}.
Enable sparkplug		Check if you want the MQTT client to work using the Sparkplug B specification

Property	ST script field*	Description
Sparkplug host ID		MQTT client works like Host application. So you need to enter host ID.

***This field is used in ST scripts**. For example: Servers.Server1.username= Admin. In this script command user name of the Server1 will be changed to Admin. For OPC UA server you have to reconnect server. Also for all servers you can use fields:

- **connect** - connect to the server.
- **connected** - check connection.
- **lostconnection** - check lost or not connection.
- **reconnect** - when field's value become TRUE server is reconnected.

**** If you use this project for iOS (iPhone or iPad) you should use .p12 format for the ? le of the certi? cate.** To create .p12 ? le you should in openssl utility use this type of command:

openssl pkcs12 -export -out [your ? le name].p12 -in [your ? le name].crt -inkey [your ? le name].key

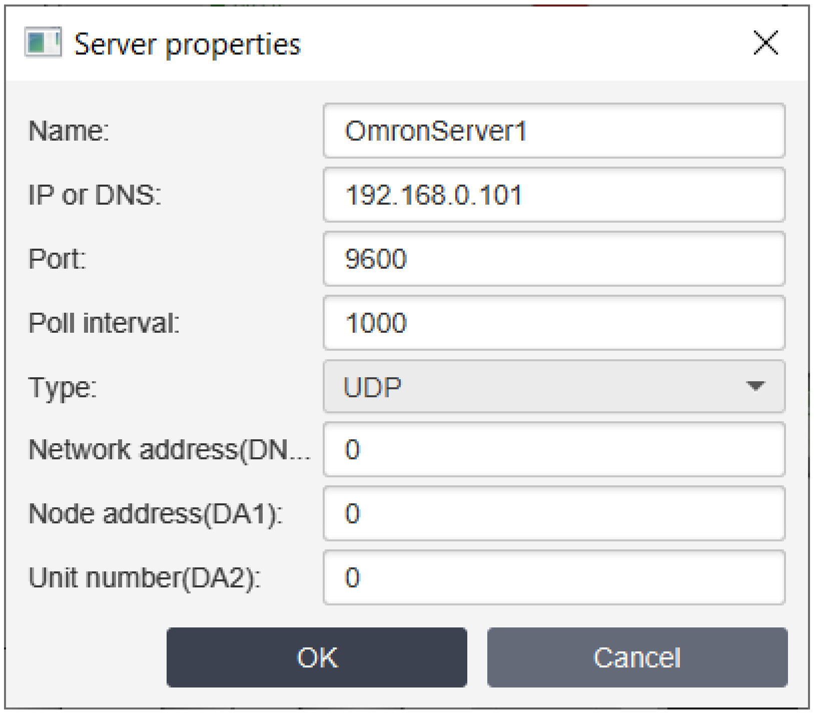
For example,

```
openssl pkcs12 -export -out  client.p12 -in client.crt -inkey client.key
```

The name of your .p12 you should place in the Client certi? cate ? eld (client.p12 in our example). Client Private Key you can left empty. In the Private key password you should enter password of the .p12 ? le. PEM formatted you can left unchecked. All .p12 ? les are PEM formatted.

6.3.7 Omron

To create a new Omron server select the menu item Omron . You'll see the following window:


Server properties

Name:	OmronServer1
IP or DNS:	192.168.0.101
Port:	9600
Poll interval:	1000
Type:	UDP
Network address(DN...	0
Node address(DA1):	0
Unit number(DA2):	0

List or properties:

Property	ST script field*	Description
Name		Name of the Omron server.
IP or DNS	**ipaddress**	IP address or DNS of the server.
Port	**port**	Port of the server.
Poll interval	**interval**	Polling interval (period) of the server's requests.
Type	**type**	Communication protocol of the server - TCP or UDP.
Network address (DNA)	**dna**	Network address of the server.
Node address (DA1)	**da1**	Node address of the server. For TCP protocol it will be chosen automatically during communication.
Unit number (DA2)	**da2**	Unit number.

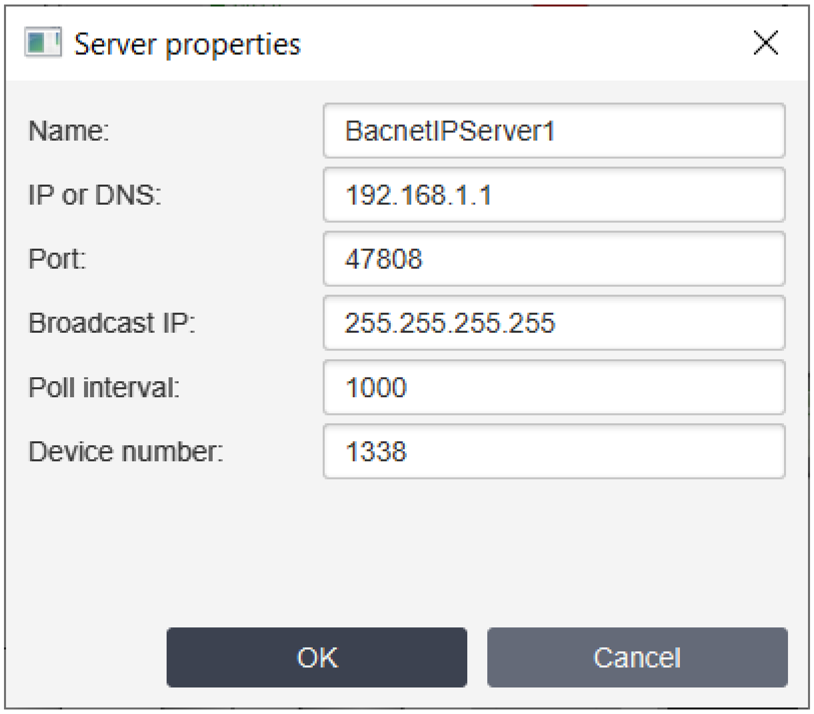
***This field is used in ST scripts**. For example: Servers.Server1.interval = 2000. In this script command poll interval of the Server1 will be changed to 2000 ms. Also for all servers you can use fields:

- **connect** - connect to the server.

- **connected** - check connection.
- **lostconnection** - check lost or not connection.

6.3.8 BACnet/IP

To create a new Bacnet/IP server select the menu item Bacnet/IP . You'll see the following window:



Name: BacnetIPServer1
IP or DNS: 192.168.1.1
Port: 47808
Broadcast IP: 255.255.255.255
Poll interval: 1000
Device number: 1338

List or properties:

Property	ST script field*	Description
Name		Name of the Bacnet server.
IP or DNS	**ipaddress**	IP address or DNS of the local device.
Port	**port**	Port of the server.
Broadcast IP	**broadcastip**	Broadcast IP address
Poll interval	**interval**	Polling interval (period) of the server's requests and discover devices.
Device number	**devicenum**	Device number in BACnet network.

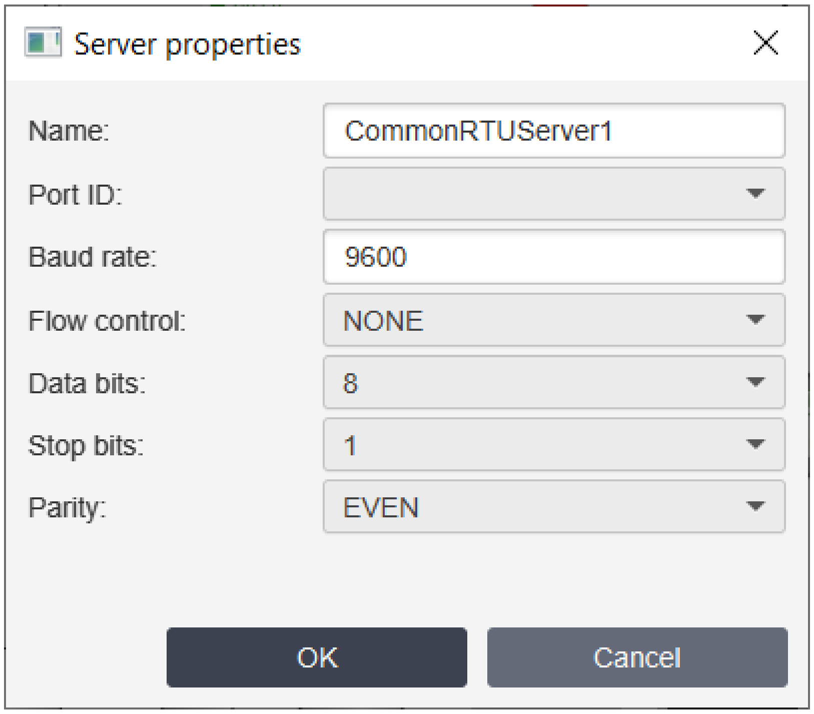
***This field is used in ST scripts**. For example: Servers.Server1.interval = 2000. In this script command poll interval of the Server1 will be changed to 2000 ms. Also for all servers you can use fields:

- **connect** - connect to the server.
- **connected** - check connection.

- **lostconnection** - check lost or not connection.

6.3.9 Common RTU Server

Common RTU server lets you implement user-defined protocol in your project. To create a new Common RTU server select the menu item Common RTU. You'll see the following window:



Name: CommonRTUServer1
Port ID:
Baud rate: 9600
Flow control: NONE
Data bits: 8
Stop bits: 1
Parity: EVEN

List of properties:

Property	ST script field*	Description
Name		Name of the Common RTU server.
Port ID	**portid**	ID of the COM port. If this port can not be open in TeslaSCADA2 Runtime other port will be tried to ?nd and open.
Baud rate	**baudrate**	Baud rate of the Common RTU server.
Flow control	**flowcontrol**	Flow control of the port. It can be NONE, RTSCTS and XONXOF.
Data bits	**databits**	Number of data bits. It can be 5, 6, 7 and 8.
Stop bits	**stopbits**	Number of stop bits. It can be 1, 1.5 and 2.

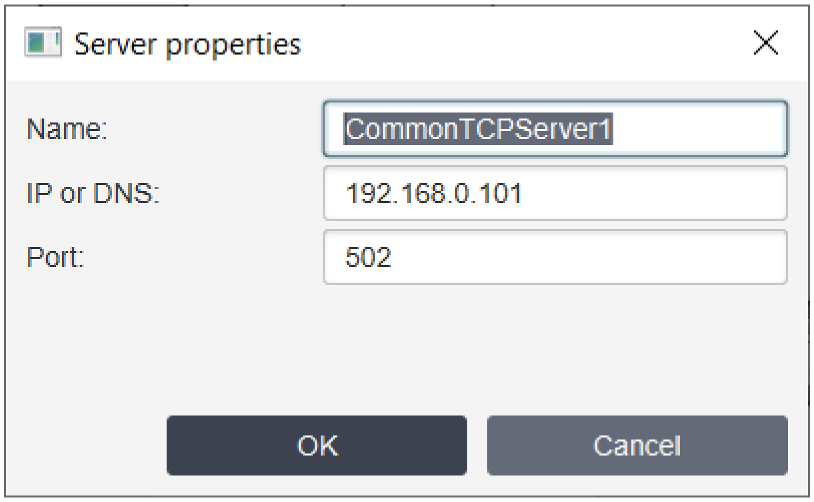
Property	ST script field*	Description
Parity	**parity**	Parity of the Common RTU. It can be NONE, EVEN, ODD, MARK and SPACE.

***This field is used in ST scripts**. For example, Servers.Server1.baudrate = 9600. In this script command server's baud rate is changed to 9600. Also for all servers you can use fields:

- **connect** - connect to the server.
- **connected** - check connection of the server.
- **lostconnection** - check lost or not connection of the server.

6.3.10 Common TCP Server

Common TCP server lets you implement user-defined protocol in your project. To create a new Common TCP server select the menu item Common TCP. You'll see the following window:



Name: CommonTCPServer1
IP or DNS: 192.168.0.101
Port: 502

List of properties:

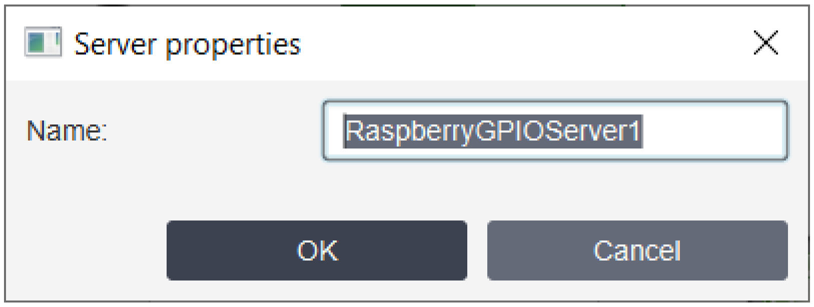
Property	ST script field*	Description
Name		Name of the Common TCP server.
IP or DNS	**ipaddress**	IP address or DNS of the Common TCP server.
Port	**port**	Port of the Common TCP server.

***This field is used in ST scripts**. For example, Servers.Server1.port = 502. In this script command server's port changed into 502. Also for all servers you can use fields:

- **connect** - connect to the server.
- **connected** - check connection of the server.
- **lostconnection** - check lost or not connection of the server.

6.3.11 Raspberry GPIO

Raspberry GPIO server lets you implement connection to GPIO of Raspberry PI. To create a new Raspberry GPIO server select the menu item Raspberry GPIO. You'll see the following window:


Server properties

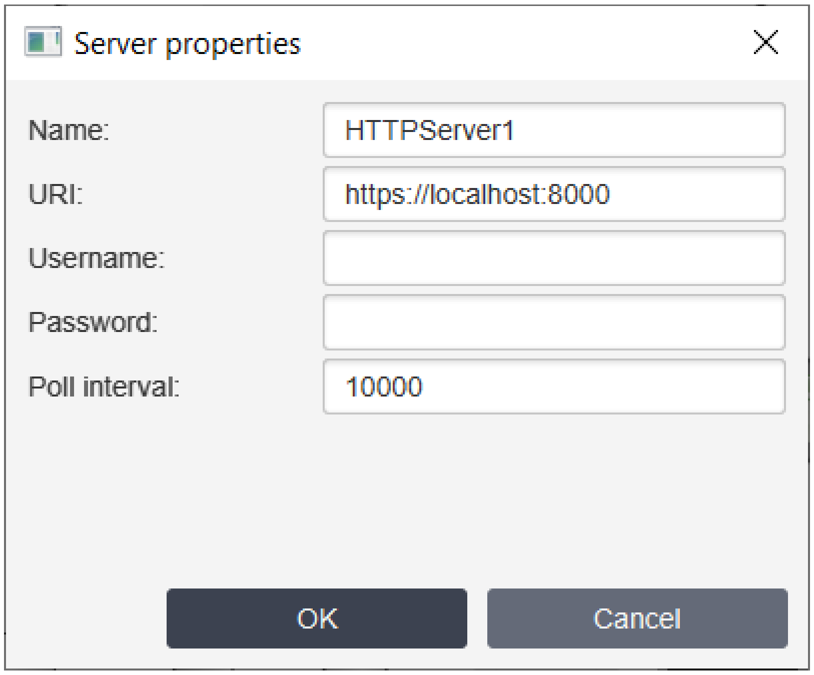
Name: RaspberryGPIOServer1

List of properties:

Property	ST script field*	Description
Name		Name of the Raspberry GPIO server.

6.3.12 HTTP-server

To create a new HTTP-server select the menu item HTTP-server . You'll see the following window:


Server properties

Name: HTTPServer1

URI: https://localhost:8000

Username:

Password:

Poll interval: 10000

List or properties:

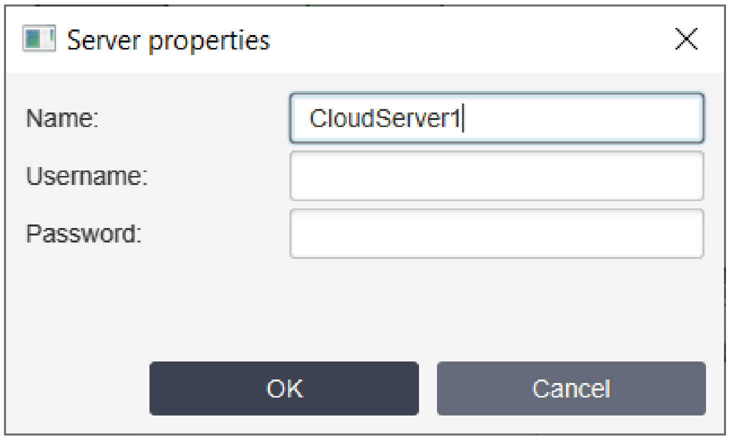
Property	ST script field*	Description
Name		Name of the HTTP server.
URI	**uri**	URI of the HTTP server.
Username	**username**	Username of the HTTP server.
Password	**password**	Password of the HTTP server
Poll interval	**interval**	Polling interval (period) of the server's requests .

*** This field is used in ST scripts**. For example: Servers.Server1.interval = 2000. In this script command poll interval of the Server1 will be changed to 2000 ms. Also for all servers you can use fields:

- **connect** - connect to the server.
- **connected** - check connection.
- **lostconnection** - check lost or not connection.

6.3.13 Cloud

To create a new Tesla Cloud client select the menu item Cloud . You'll see the following window:



Name: CloudServer1
Username:
Password:

List or properties:

Property	ST script field*	Description
Name		Name of the cloud server.
Username		Username of the Tesla Cloud user.
Password		Password of the Tesla Cloud user.

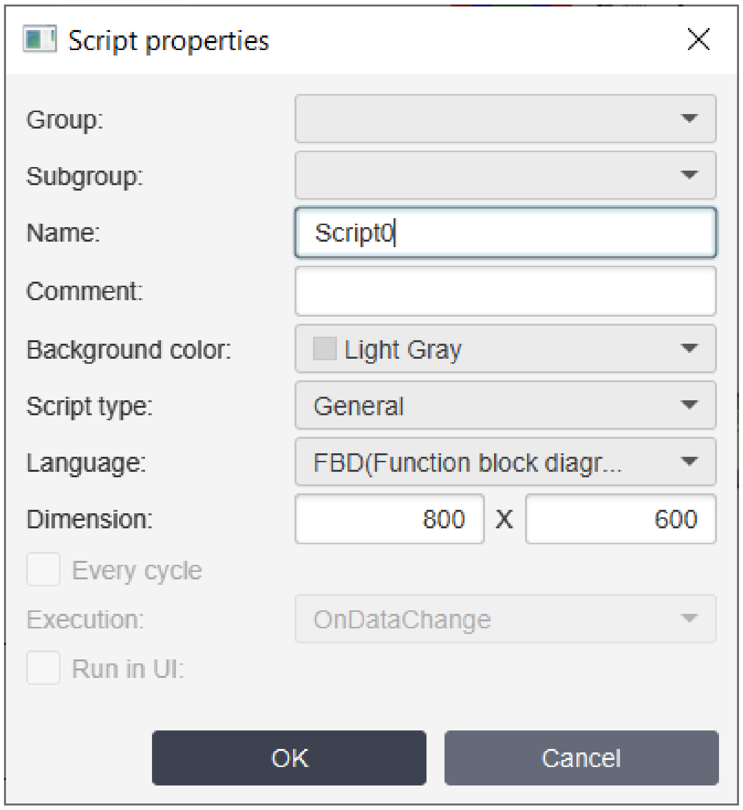
6.4 Scripts

At the moment in TeslaSCADA2 you can use two languages for writing scripts - FBD 405 (Functional Block Diagram) and ST 425 (Structured Text). They are similar to languages used in PLC programming. Depending on the task at hand, you can choose one or another language. For most tasks, it is better to use ST language as it is more functional. ST language script can be bound to an object or tag as opposed to FBD language and ST language scripts has more call options. FBD language script is called only when tag's values used in this script are changed. But FBD language is more descriptive and may be more familiar to PLC program developers. Also, FBD language has functions that are not available in ST language. These functions are mainly related to time management such as timers, multivibrators, etc. In any case, the choice of the language in which your scripts will be written is yours. Below will be described how to create a particular script and its properties.

Create script

To create a new script select the menu item **Project** 67 **-> New Script** or choose Scripts 74 in the Project Window, click right button on it and choose New Script item.

You'll see the script properties 404 window:


Script properties

Group:	
Subgroup:	
Name:	Script0
Comment:	
Background color:	Light Gray
Script type:	General
Language:	FBD(Function block diagr...
Dimension:	800 X 600
Every cycle	
Execution:	OnDataChange
Run in UI:	

Open script

To open script in Scripts 74 tab of the Project window:

- Right click on the script you want to open and choose **Open** script item.

or

- Double click on the script you want to open.

Copy script

To copy script on Scripts 74 tab of the Project window right click on the script you want to copy and choose **Copy** script item.

Delete script

To delete script on Scripts 74 tab of the Project window right click on the script you want to delete and choose **Delete** script item.

Edit script properties

To edit script properties on Scripts 74 tab of the Project window right click on the script you want to edit and choose **Script properties** item.

Export script

To export script on Scripts 74 tab of the Project window:

1. Right click on the script you want to export and choose **Export script** item.
2. Now select the location and click the button **Save** (TeslaSCADA2 screen extension .tsp2script).

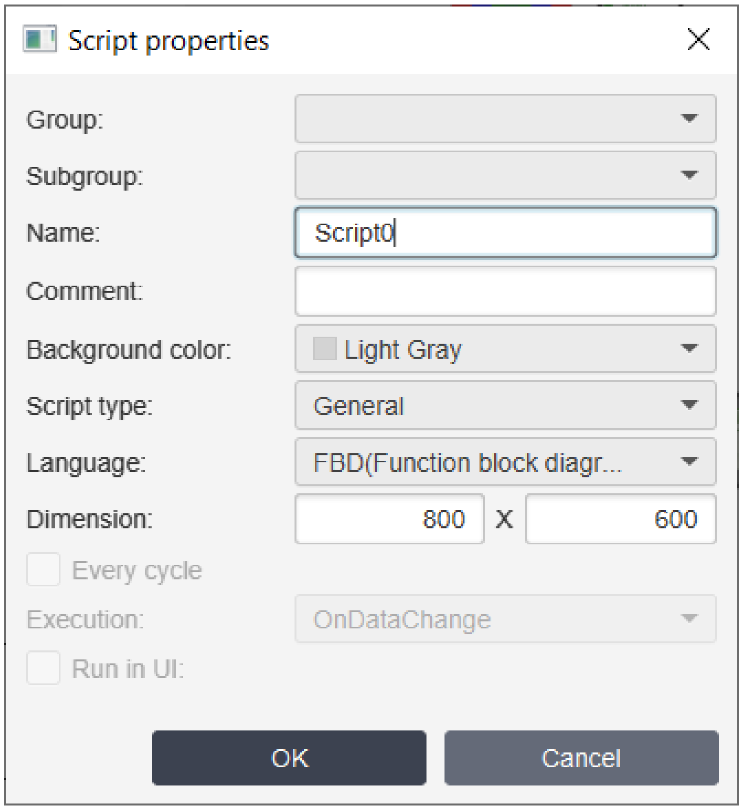
Import script

To import script on Scripts 74 tab of the Project window:

1. Right click on the script window and choose **Import script** item.
2. Now select the script ?le and click **Open** (TeslaSCADA script extension .tsp2script).

See **Project Window->Scripts** 74 **tab** for more information about possible operation with scripts.

6.4.1 Script properties



Group:	
Subgroup:	
Name:	Script0
Comment:	
Background color:	Light Gray
Script type:	General
Language:	FBD(Function block diagr...
Dimension:	800 X 600
Every cycle	
Execution:	OnDataChange
Run in UI:	

List of script properties:

Property	Description
Group	Select group for the script.
Subgroup	Select subgroup for the script.
Name	Name of the script.
Comment	Optionally specify a meaningful comment.
Background color	Background color of the screen for developing script using FBD language. It's not affect on script execution.
Script type	Select type of the script: ▪ **General** - is binded to the whole project. ▪ **Screen** - is binded to the screen. ▪ **Tag** - is executed depending on tag's value. ▪ **Object** - is binded to the object. ▪ **Report** - is binded to the report.
Language	Choose language for the script - FBD or ST. Description of the language you can find below in this tutorial.

Property	Description
Dimension	Screen's dimension for developing script using FBD language. It's not affect on script execution.
Every cycle	Check if you want this ST script to be executed every update period of the project. You can ?nd out this period in Project properties (Update interval 103 (ms)).
Execution	Choose if you want to use ST script and don't want it's executed every cycle: • **OnDataChange** - script is executed when tag's values used in this script are changed. • **OnStart (OnOpen, OnCreate)** - script is executed when project is started (for general script type) or screen is opened (for screen script type) or object is created (for object script type). • **OnStop (OnClose, OnDestroy)** - script is executed when project is stopped (for general script type) or screen is closed (for screen script type) or object is destroyed (for object script type). • **OnClick** - script executed when screen is clicked (for general and screen script types) or object is clicked (for object script type)
Run in UI	Check if you want to run this script in UI thread. It's helpful if you want to update graphical objects after executing this script.

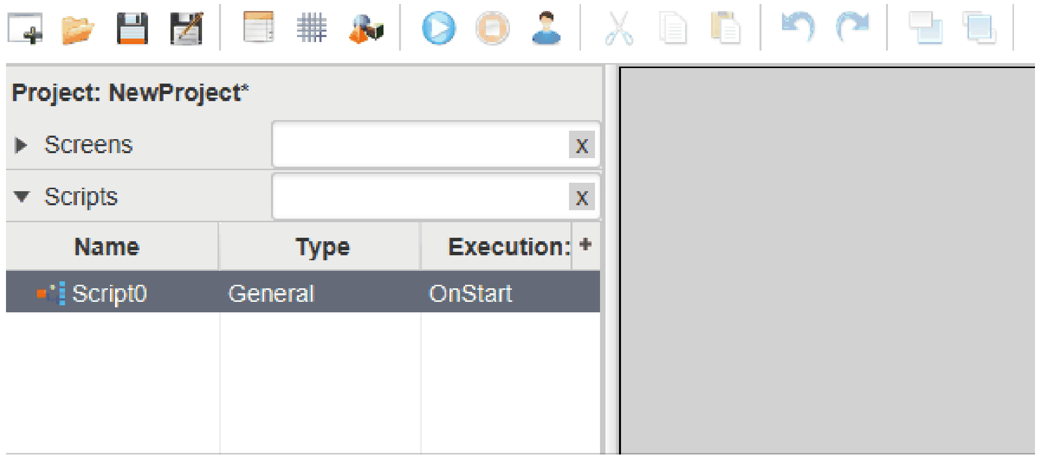
6.4.2 FBD language

Design FBD script

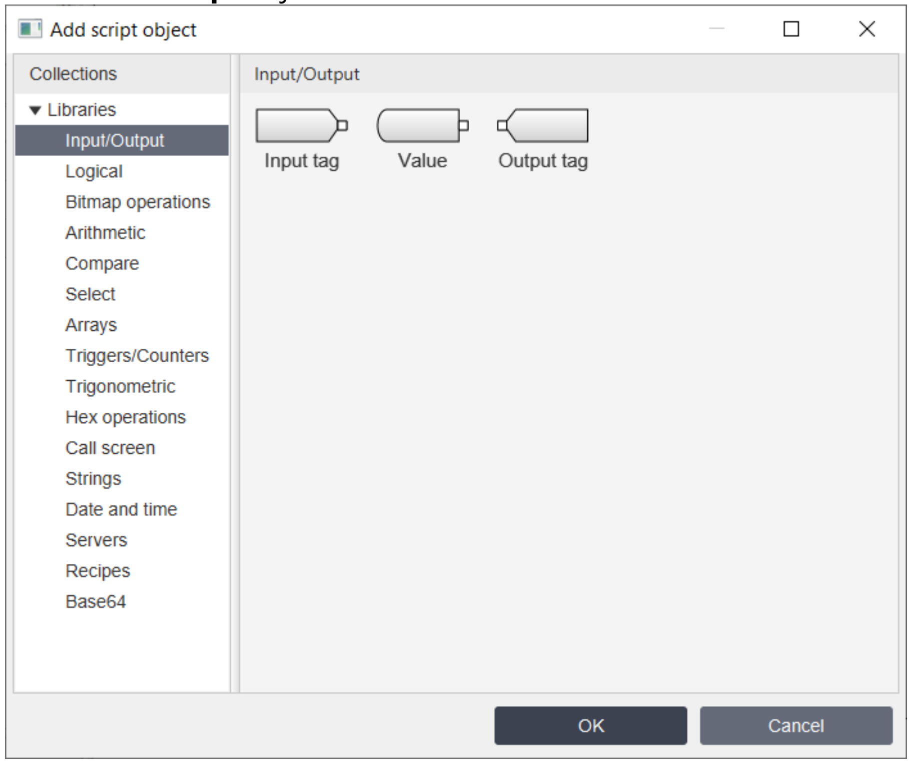
To start designing the script you want, you should double click on it or click right button on the **Project window** 73**->Scripts** 74 and choose **Open script** menu item. To develop a script in FBD language you should use FBD objects.

Create script object

Add new object to the screen you can in this way: click right button on the Canvas 92 and choose New object menu item:



You'll see the **Add script** object window:



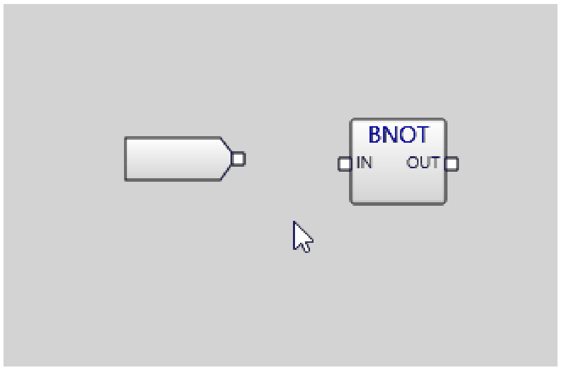
Select library which object you want to use in your project (all libraries and their objects described below). Object you can select in several ways:

1. By double clicking on the object.
2. By clicking on the object (select rectangle will appear) and then clicking OK button.
3. By clicking right button and choosing Select item.

Add script object window will disappear and you can select the location on the screen where you want to place an object.

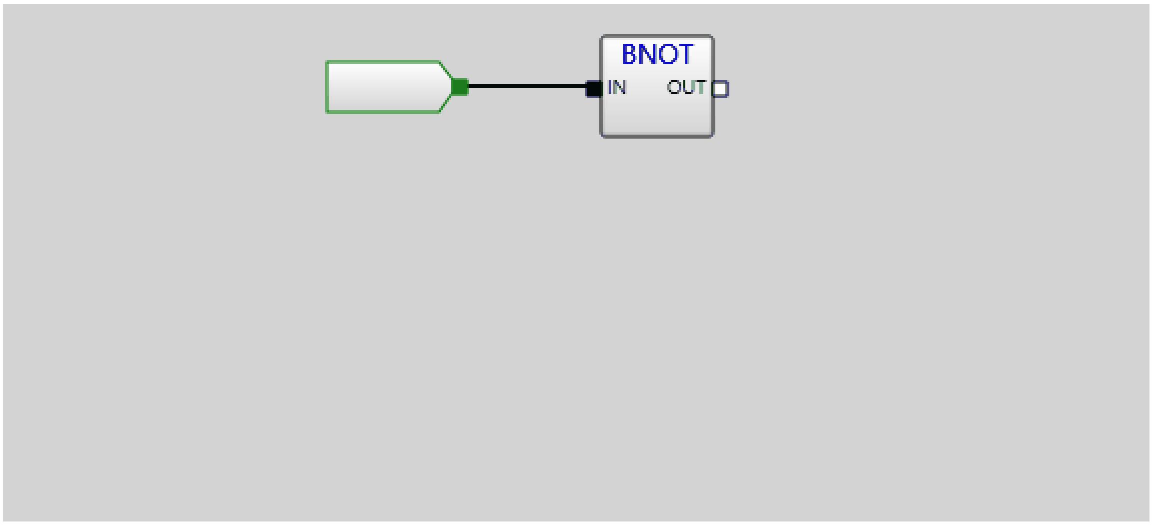
Connect script objects

To connect two objects, click the end of the ?rst (the end to paint over) and click start the second. This will bring up a line connection.



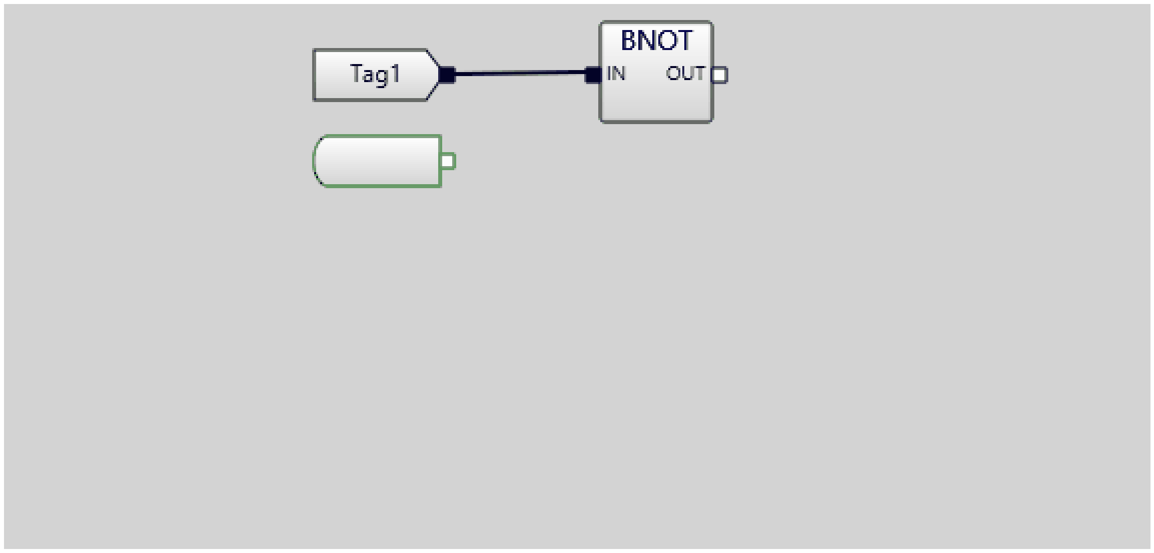
Bind script object to the tag

You can bind Input/Output script objects to the tag. To do this click on Input/Output script object, dialog will appear. Select tag you want to bind.



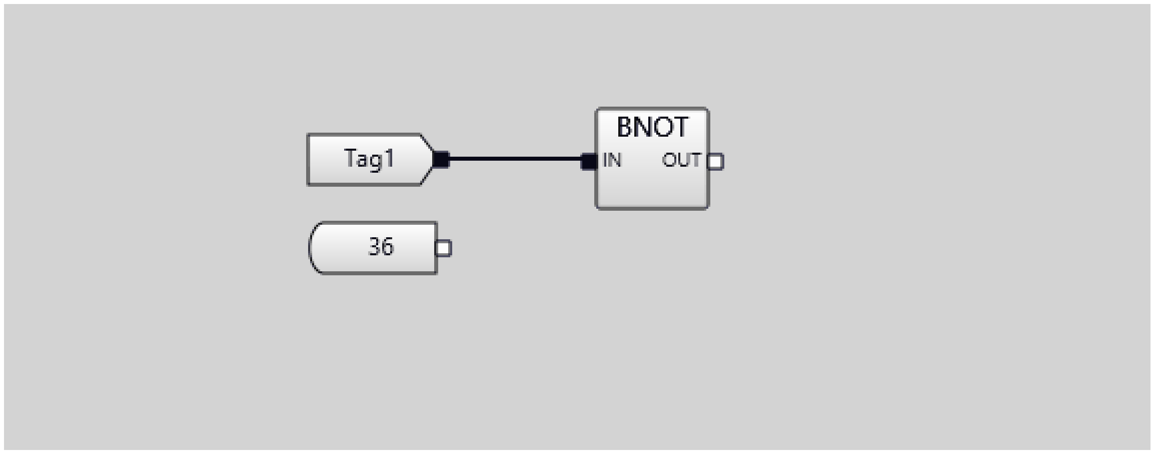
Enter value to the value script object

You can enter value to value script objects. To do this click on value script object, dialog will appear. Enter value you want to use with this object.



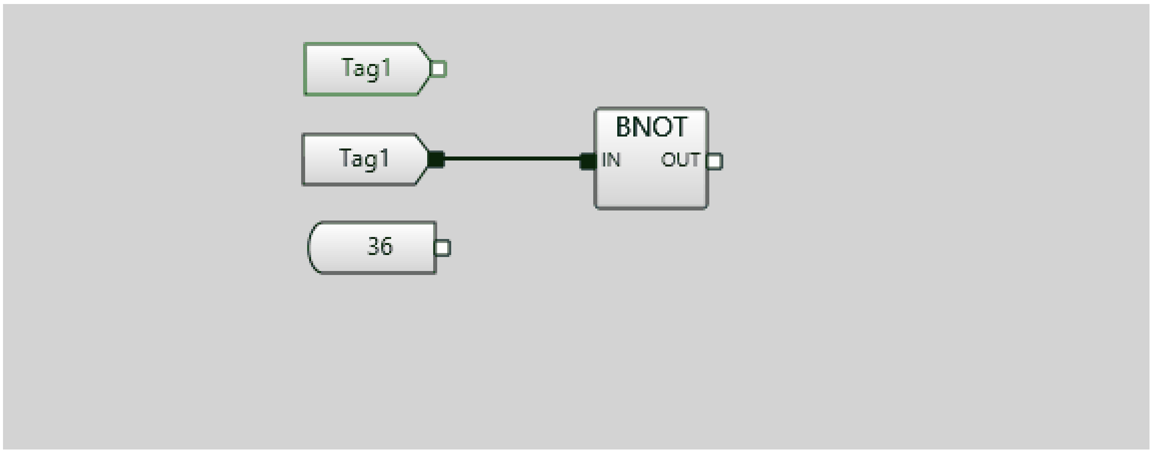
Duplicate script object

You can duplicate script object. Right click on the object you want to duplicate and select **Duplicate** menu item.



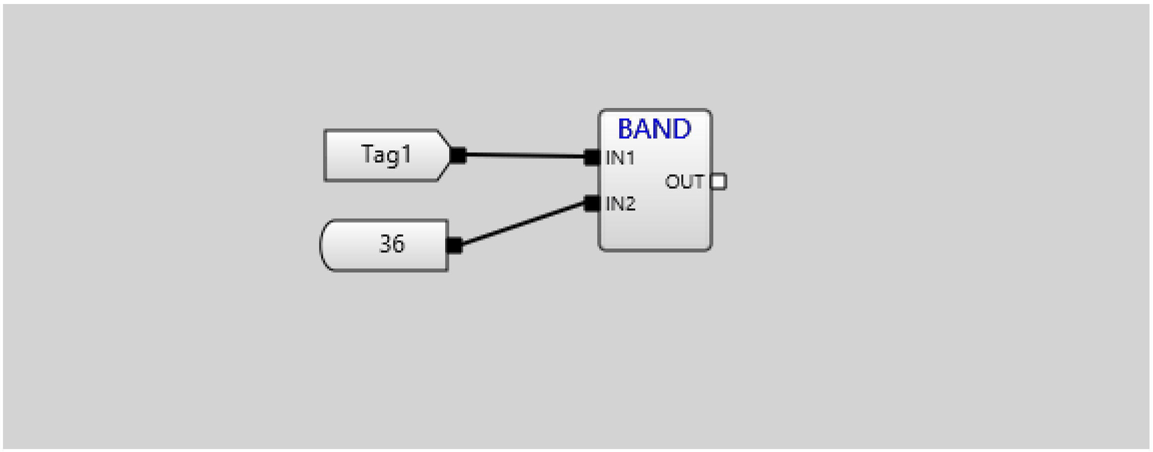
Erase script object

You can erase script object. Right click on the object you want to erase and select Erase menu item.



Erase connection line

You can erase connection line. Right click on the line you want to erase and select Erase menu item.



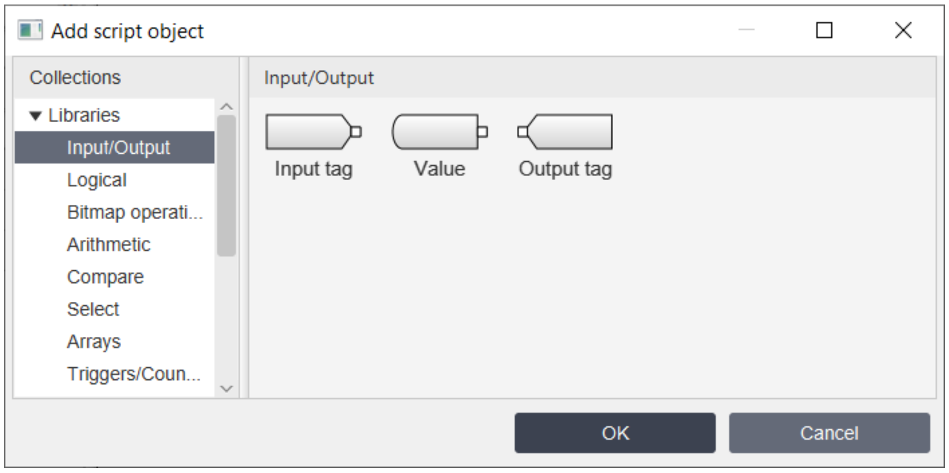
6.4.2.1 Script objects of FBD language

Below description of script libraries:

- **Input/Output library** 410 - allows you to bind tags and constant values to the script.
- **Logical library** 411 - contains objects for working with boolean logical operations.
- **Bitmap operations library** 412 - contains objects for working with bits inside integer variables.
- **Arithmetic library** 413 - contains objects for arithmetic operations.
- **Compare library** 414 - contains objects for comparison operations.
- **Select library** 415 - contains objects for selection operations.
- **Arrays library** 416 - contains objects for working with arrays.
- **Triggers/Counters library** 417 - contains objects for working with triggers and counters.
- **Trigonometric library** 418 - contains objects for trigonometric mathematical operations.

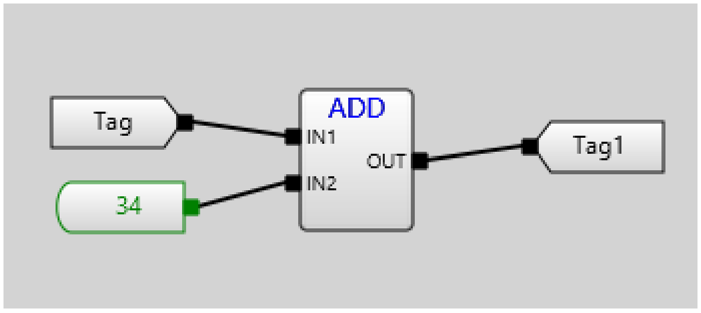
- **Hex operations library** 419 - contains objects for converting decimal numbers to hexadecimal and back.
- **Call screen library** 420 - contains objects for calling screens and popup screens.
- **Strings library** 421 - contains objects for working with strings.
- **Date and time library** 422 - contains object for getting date and time parts (year, day, hour, minute and etc).
- **Servers library** 423 - contains objects for working with servers in the project.
- **Recipes library** 250 - contains object for working with recipes.
- **Base64 library** 424 - contains objects for converting array to base64 string and back.

6.4.2.1.1 Input/Output library



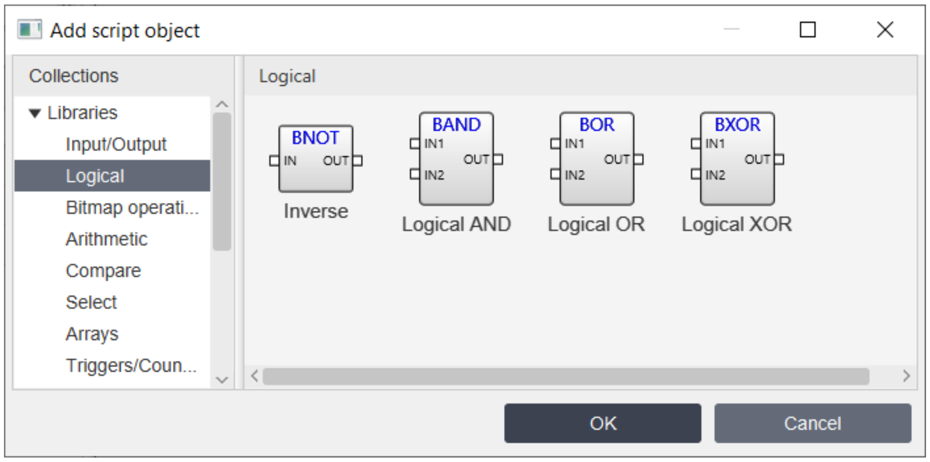
- **Input tag** - this script object used to bind input tag to the script.
- **Output tag** - this script object used to bind output tag to the script.
- **Value** - this script object used to bind input constant value to the script.

Example:



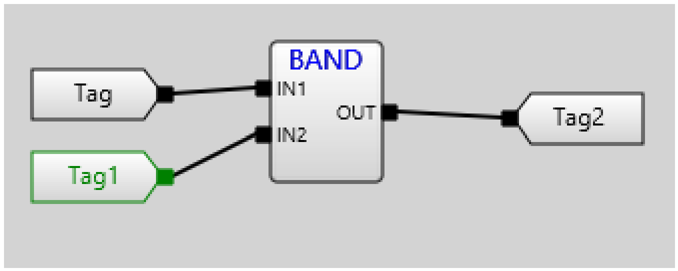
Tag1's value = Tag's value + 34;

6.4.2.1.2 Logical library



- **Inverse** - this script object used to inverse input boolean value (Output = ! Input).
- **Logical AND** - this script object used to logical operation AND for input boolean values (Output = Input & Input2).
- **Logical OR** - this script object used to logical operation OR for input boolean values (Output = Input || Input2).
- **Logical XOR** - this script object used to logical operation XOR for input boolean values (Output = Input XOR Input2).

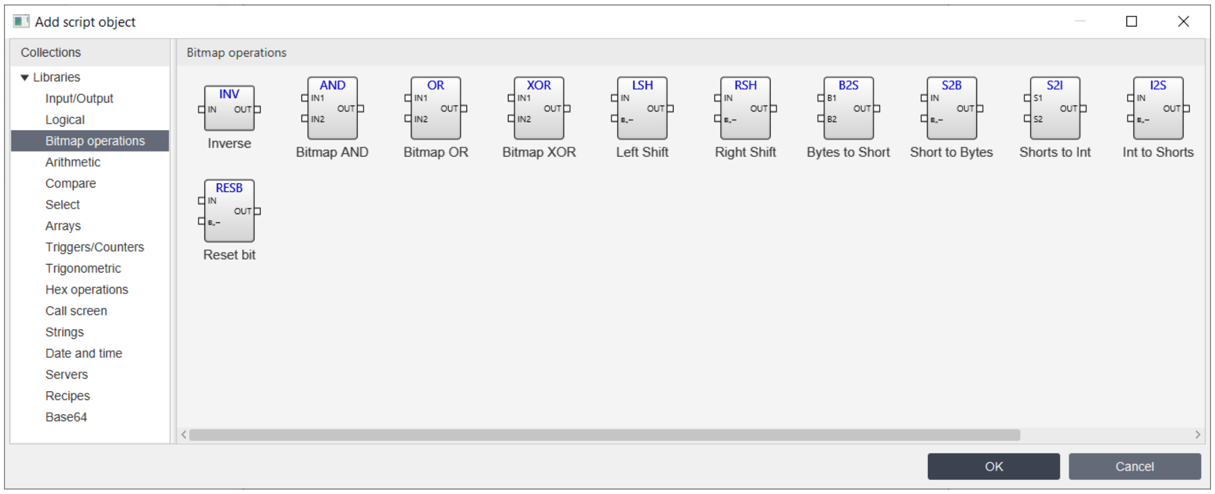
Example:



Tag2's value = Tag's value &(AND) Tag1's value;

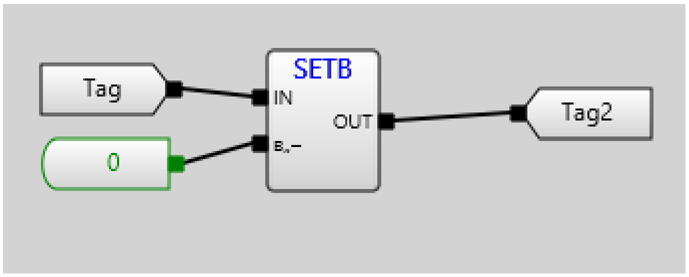
Tag	Tag1	Tag2
FALSE(0)	FALSE(0)	FALSE(0)
FALSE(0)	TRUE(1)	FALSE(0)
TRUE(1)	FALSE(0)	FALSE(0)
TRUE(1)	TRUE(1)	TRUE(1)

6.4.2.1.3 Bitmap operations library



- **Inverse** - this script object used to inverse input integer value (Output = ~ Input).
- **Bitmap AND** - this script object used to logical operation AND for input integer values (Output = Input & Input2).
- **Bitmap OR** - this script object used to logical operation OR for input integer values (Output = Input || Input2).
- **Bitmap XOR -** this script object used to logical operation XOR for input integer values (Output = Input XOR Input2).
- **Left Shift** - this script object used to left shift bits of input value (Output = Input << ? of bits).
- **Right Shift** - this script object used to right shift bits of input value (Output = Input >> ? of bits).
- **Bytes to Short** - this script object used to pack 2 bytes in the short (Output = Input<<8+Input2).
- **Short to Bytes** - this script object used to unpack short value in 2 bytes (Output = Input[Input2]).
- **Shorts to Int** - this script object used to pack 2 shorts in the int (Output = Input<<16+Input2).
- **Int to Shorts** - this script object used to unpack int value in 2 shorts (Output = Input[Input2]).
- **Read bit** - this script object used to read bit of the input value (Output = Input[Input2]).
- **Set bit** - this script object used to set bit of the input value (Output = Input | 1<<Input2).
- **Reset bit** - this script object used to reset bit of the input value (Output = Input & ~(1<<Input2)).

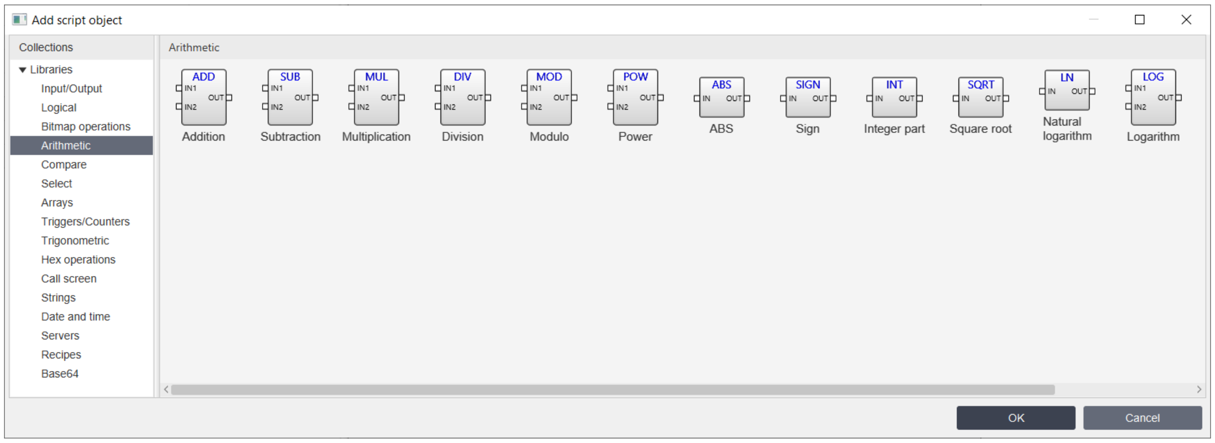
Example:



This operation set 0 bit of Tag's value and place result in Tag2's value.

Tag		Tag2
8	0	9

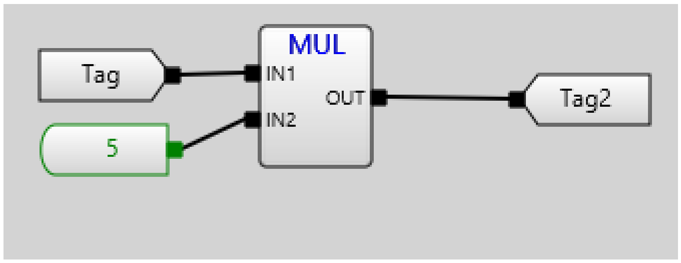
6.4.2.1.4 Arithmetic library



- **Addition** - this script object used to arithmetic operation addition for input values (Output = Input + Input2).
- **Subtraction** - this script object used to arithmetic operation subtraction for input values (Output = Input - Input2).
- **Multiplication** - this script object used to arithmetic operation multiplication for input values (Output = Input * Input2).
- **Division**- this script object used to arithmetic operation division for input values (Output = Input / Input2).
- **Modulo** - this script object used to arithmetic operation modulo for input values (Output = Input % Input2).
- **Power** - this script object used to arithmetic operation power for input values (Output = Input^Input2).
- **ABS** - this script object used to arithmetic operation absolute for input value (Output = |Input|).
- **Sign** - this script object used to arithmetic operation sign for input value (Output = -Input).
- **Int** - this script object used to arithmetic operation for getting integer part of the input value (Output = int(Input)).

- **Sqrt** - this script object used to arithmetic operation sqrt of the input value (Output = Math.Sqrt(Input)).
- **Ln**- this script object used to arithmetic operation ln (natural logarithm) of the input value (Output = Ln(Input)).
- **Log**- this script object used to arithmetic operation log (logarithm) of the input value (Output = LogInput2Input).

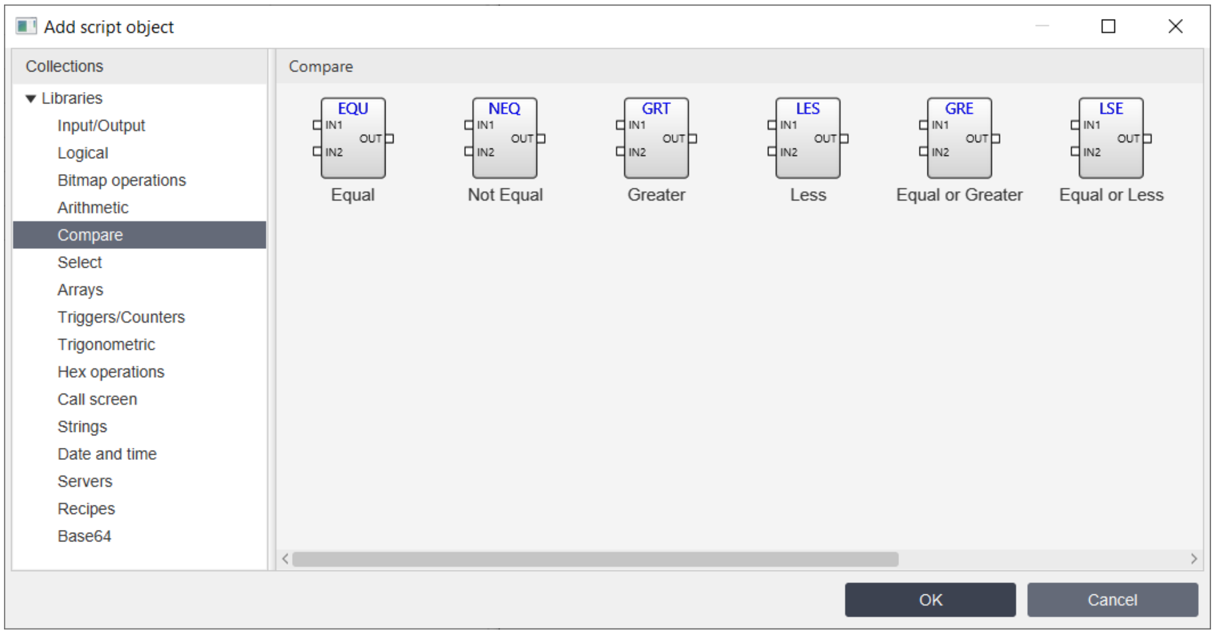
Example:



This operation multiply Tag's value by constant value 5 and place result in Tag2's value.

Tag		Tag2
2	5	10

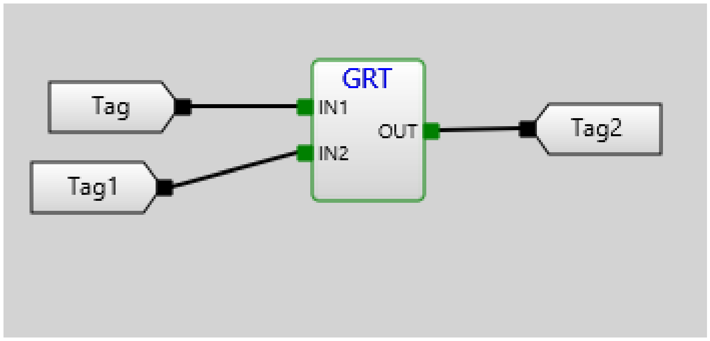
6.4.2.1.5 Compare library



- **Equal** - this script object used to comparison operation equal for input values (Output = Input == Input2).
- **Not Equal** - this script object used to comparison operation not equal for input values (Output = Input != Input2).

- **Greater** - this script object used to compare operation greater for input values (Output = Input > Input2).
- **Less** - this script object used to compare operation less for input values (Output = Input < Input2).
- **Equal or Greater** - this script object used to compare operation equal or greater for input values (Output = Input >= Input2).
- **Equal or Less** - this script object used to compare operation equal or less for input values (Output = Input <= Input2).

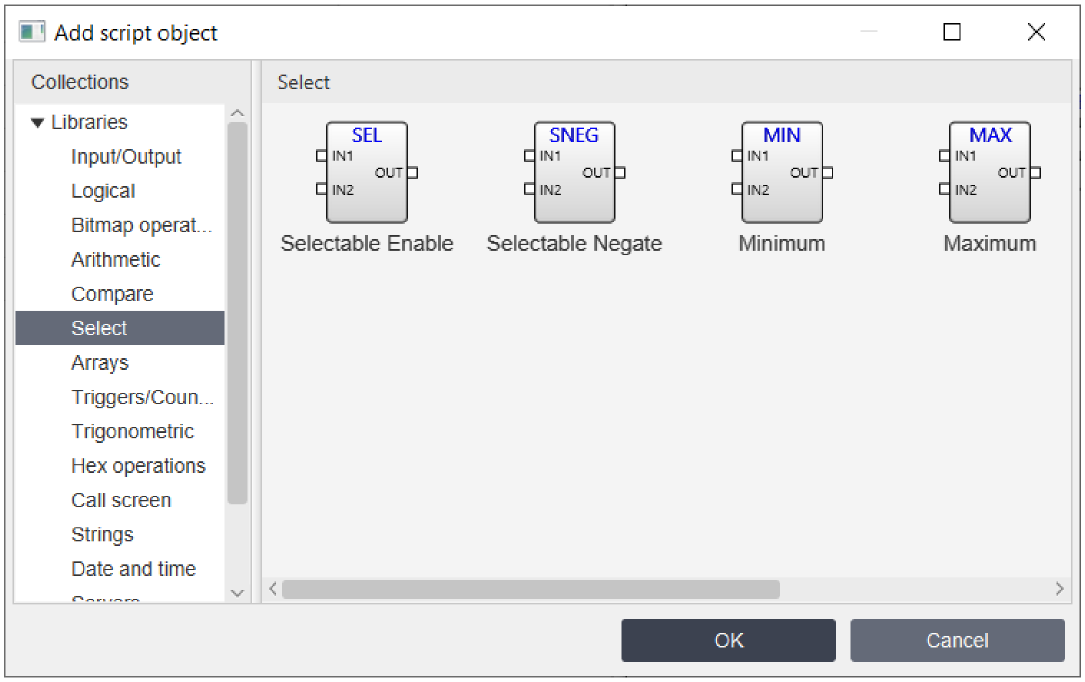
Example:



This operation compare Tag's value and Tag1's value and place result in Tag2's value. If Tag's value greater than Tag1's value Tag2's value equal TRUE(1).

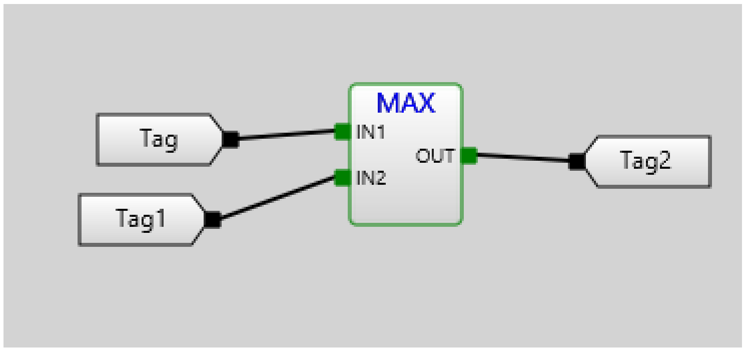
Tag	Tag1	Tag2
5	9	FALSE(0)
12	8	TRUE(1)

6.4.2.1.6 Select library



- **Selectable enable** - this script object used to select value form Input2 if Input1 is true (IF Input==true THEN Output=Input2).
- **Selectable negate** - this script object used to select value form Input2 if Input1 is false (IF Input==false THEN Output=Input2).
- **Minimum** - this script object used to select minimum value of Input2 and Input1 (Output=Min(Input, Input2)).
- **Maximum** - this script object used to select maximum value of Input2 and Input1 (Output=Max(Input, Input2)).

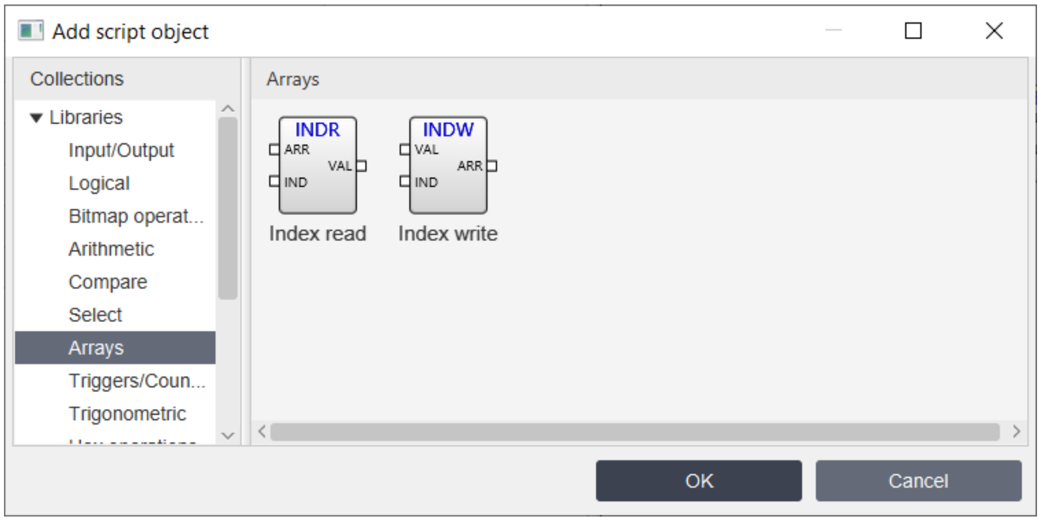
Example:



This operation compare Tag's value and Tag1's value and place result in Tag2's value. If Tag's value greater than Tag1's value, Tag2's value equal Tag's value.

Tag	Tag1	Tag2
5	9	9
12	8	12

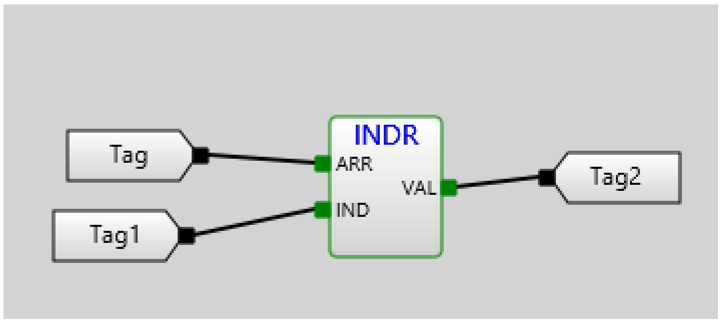
6.4.2.1.7 Arrays library



- **Index read -** this script object used to select array’s element. Input1 is an array. Input2 is index of element (Output = Input1[Input2]).

- **Index write** - this script object used to change array’s element. Input1 is an element. Input2 is index of element (Output[Input2] = Input1).

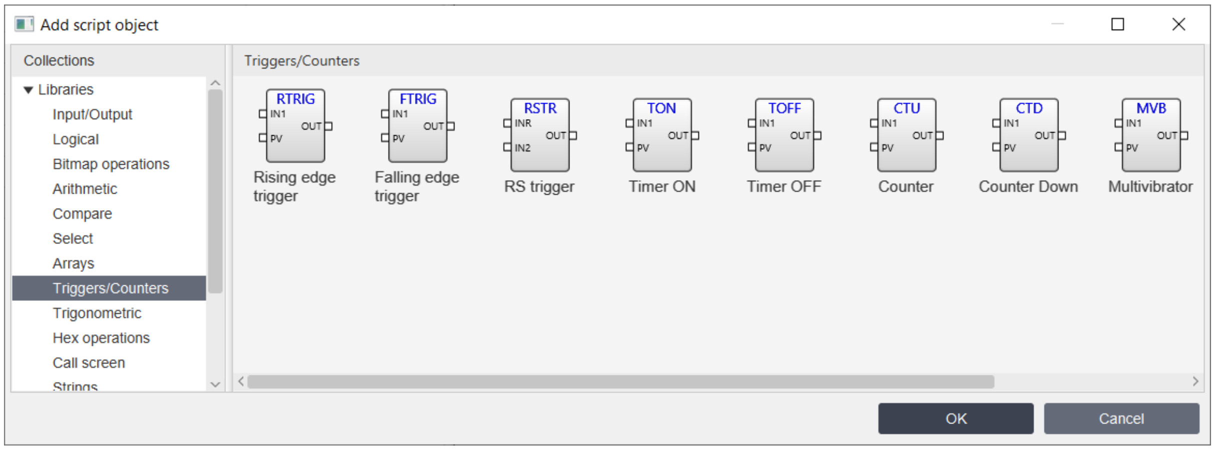
Example:



This operation get value from the array in Tag's value and index in Tag1's value and place result in Tag2's value.

Tag	Tag1	Tag2
[34, 23, 4, 7, 12]	0	34

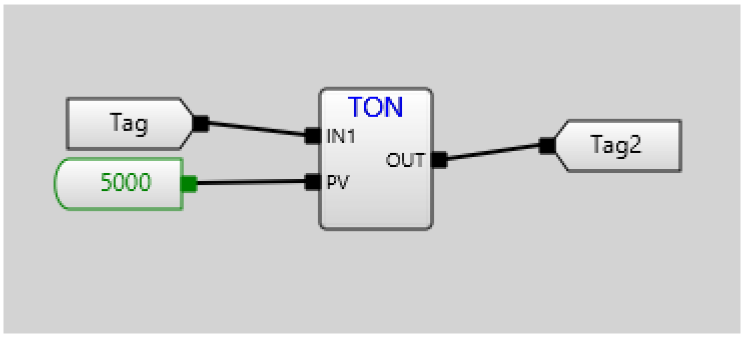
6.4.2.1.8 Triggers/Counters library



- **Rising edge trigger-** this script object used to generate rising impulse duration PV ms when Input1 get TRUE from FALSE.
- **Falling edge trigger-** this script object used to generate rising impulse duration PV ms when Input1 get FALSE from TRUE.
- **RS trigger-** this script object used to imitate RS trigger.
- **Timer ON-** this script object used for delay timer for the duration PV when Input1 get TRUE from FALSE.
- **Timer OFF-** this script object used for delay timer for the duration PV when Input1 get FALSE from TRUE.
- **Counter-** this script object used to count impulses of boolean value in Input1. Counter resets when Output become equal PV.

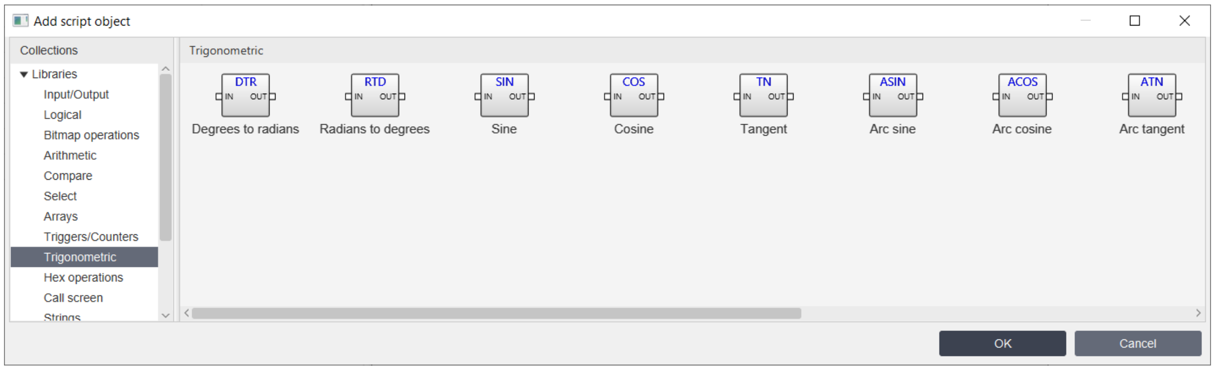
- **Counter Down-** this script object used to count impulses of boolean value in Input1. Counter starts from value PV. Counter resets when Output become equal 0.
- **Multivibrator - this script imitates impulse generator with PV period. It starts when IN1 changed from FALSE to TRUE.**

Example:



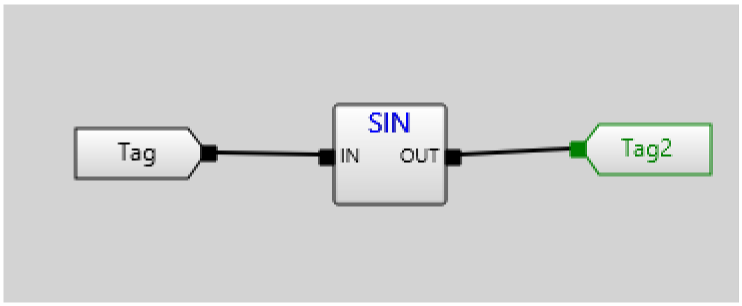
This operation set Tag2's value to TRUE(1) in 5000 ms when Tag's value become TRUE(1) from FALSE(0).

6.4.2.1.9 Trigonometric library



- **Degrees to radians** - this script object used to convert degrees to radians.
- **Radians to degrees** - this script object used to convert radians to degrees.
- **Sine** - this script object used to calculate sin of Input value. (Output = sin(Input)).
- **Cosine** - this script object used to calculate cos of Input value. (Output = cos(Input)).
- **Tangent** - this script object used to calculate tag of Input value. (Output = tag(Input)).
- **Arc Sine** - this script object used to calculate arc sin of Input value. (Output = arc sin(Input)).
- **Arc Cosine** - this script object used to calculate arc cos of Input value. (Output = arc cos(Input)).
- **Arc Tangent** - this script object used to calculate arc tag of Input value. (Output = arc tag(Input)).

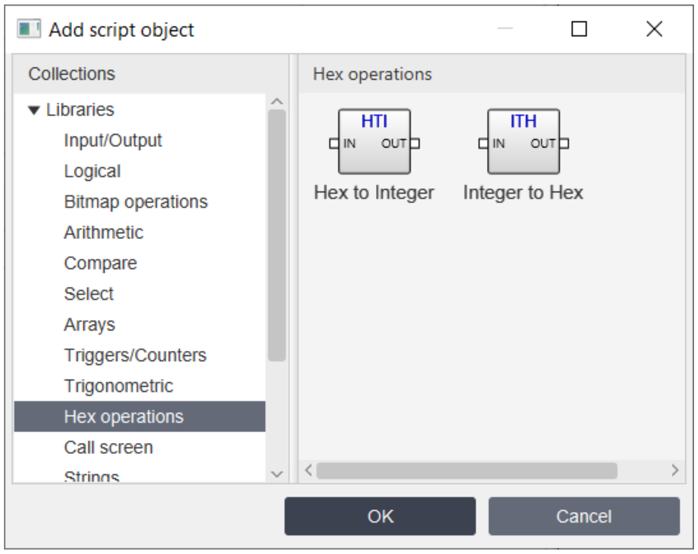
Example:



This operation counts sine of Tag's value and place result in Tag2's value.

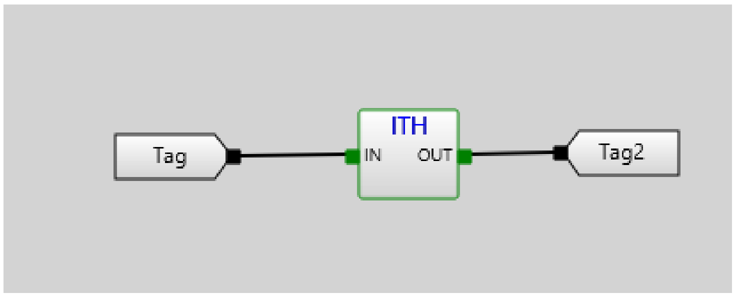
Tag	Tag2
1	0.841470984807896506652502321630 3

6.4.2.1.10 Hex operations library



- **Hex to Integer** - this script object converts hex value into integer.
- **Integer to Hex** - this script object converts integer value into hex.

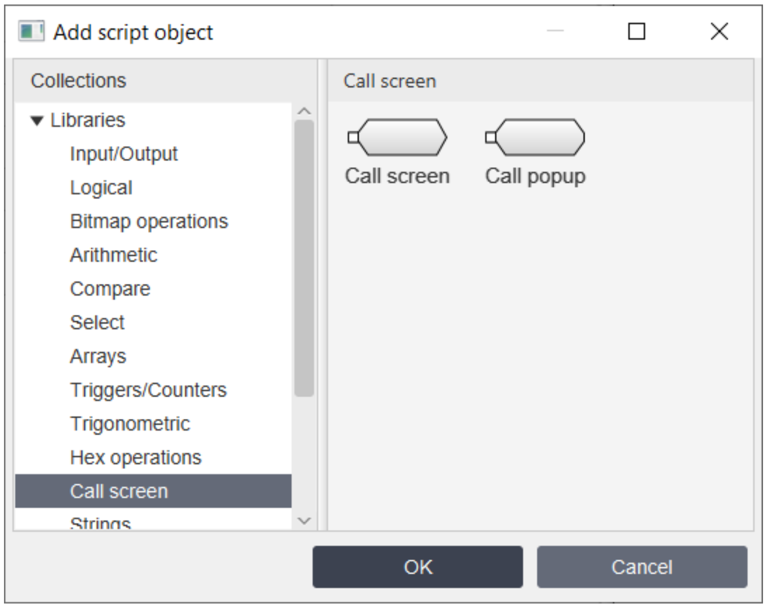
Example:



This operation converts Tag's value from decimal integer into hexadecimal and place result in Tag2's value.

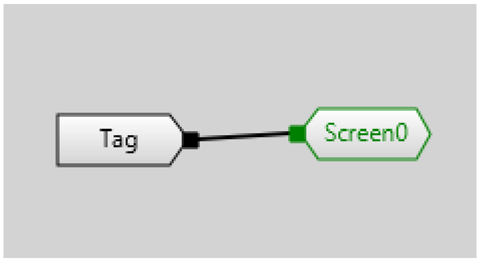
Tag	Tag2
255	0xFF

6.4.2.1.11 Call screen library



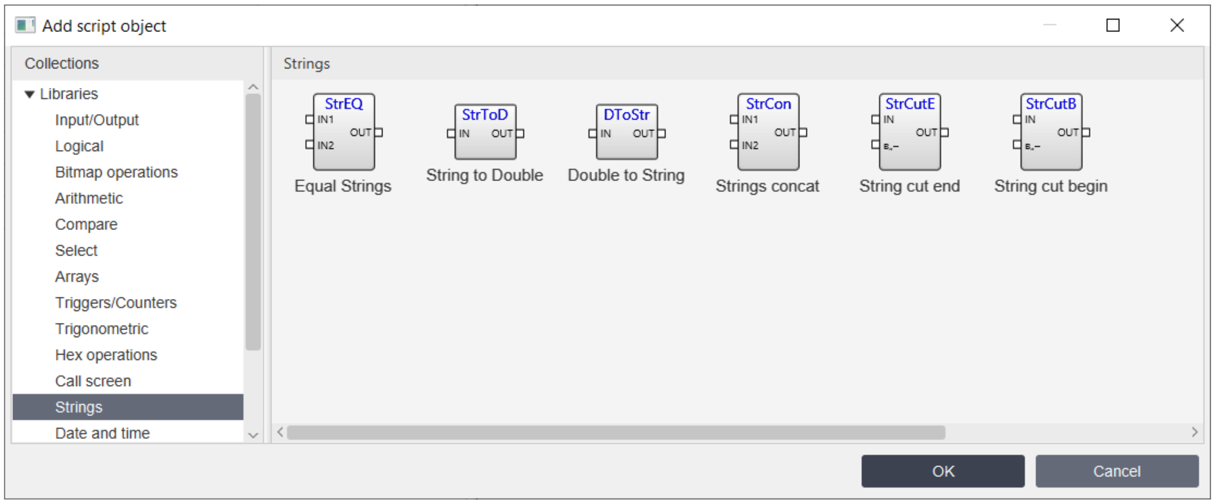
- **Call screen** - this script object used to call screen when Input's value turns from FALSE to TRUE.
- **Call popup** - this script object used to call popup screen when Input's value turns from FALSE to TRUE.

Example:



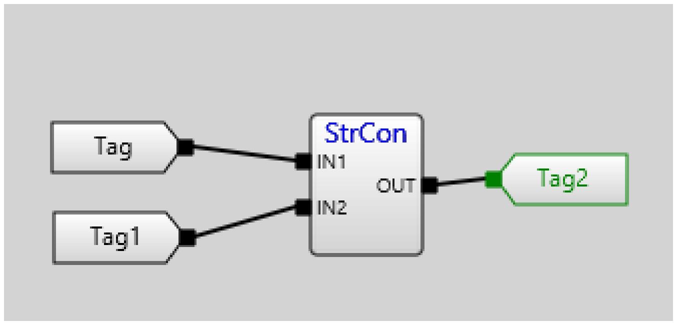
When Tag's value becomes TRUE from FALSE Screen0 will open.

6.4.2.1.12 Strings library



- **Equal Strings** - this script object compare two strings in Inputs and if their are equal it sets true into Output value.
- **String to Double** - this script object converts Input's string value into Output's double value.
- **Double to String** - this script object converts Input's double value into Output's string value.
- **Strings concat** - this script object concatenate Input's strings values into Output's string value. (Output = Input1+Input2).
- **String cut end** - this script object cuts end of Input's string value by the ? of characters and place result into Output's string value.
- **String cut begin** - this script object cuts begin of Input's string value by the ? of characters and place result into Output's string value.

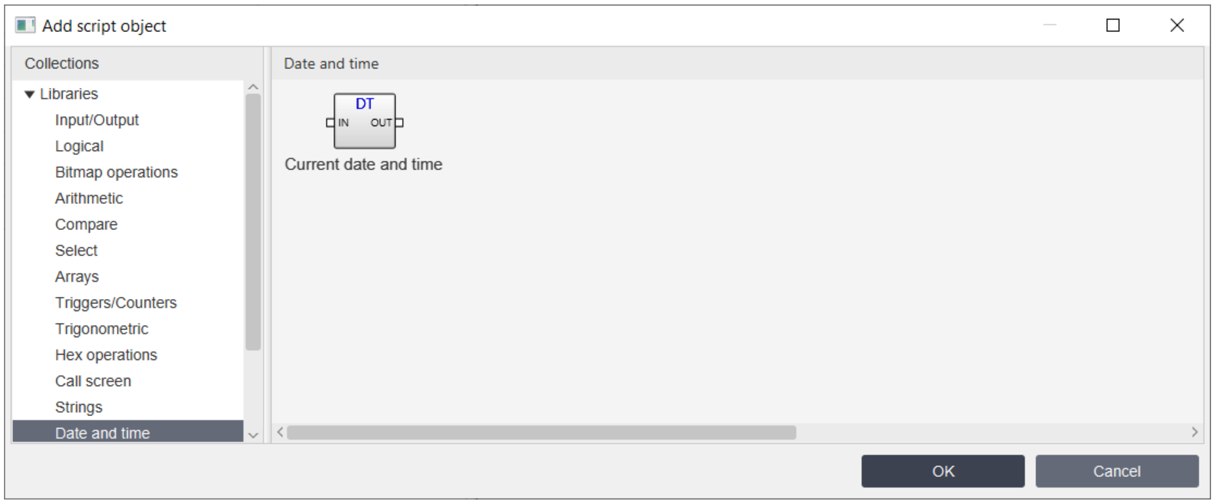
Example:



This operation concatenate Tag's value and Tag1's value and place result in Tag2's value.

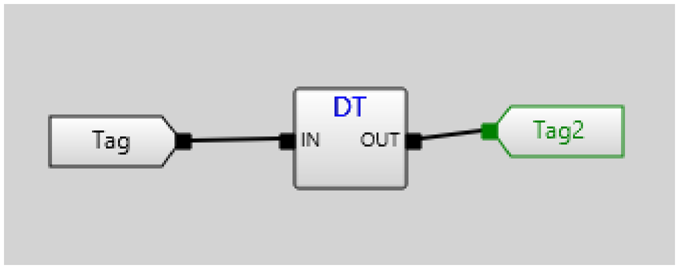
Tag	Tag1	Tag2
Hello	World	HelloWorld

6.4.2.1.13 Date and time library



- Current date and time - this script object used to get date and time components depending on Input value:
  0 - get seconds.
  1 - get minutes.
  2 - get hour of the day considering AM/PM.
  3 - get hour of the day.
  4 - get day of the week (1-Sunday, 2-Monday...).
  5 - get day of month.
  6 - get month (0 - January, 1 - February...).
  7 - get year.
  8 - get minutes of the day (hour*60 + minutes).

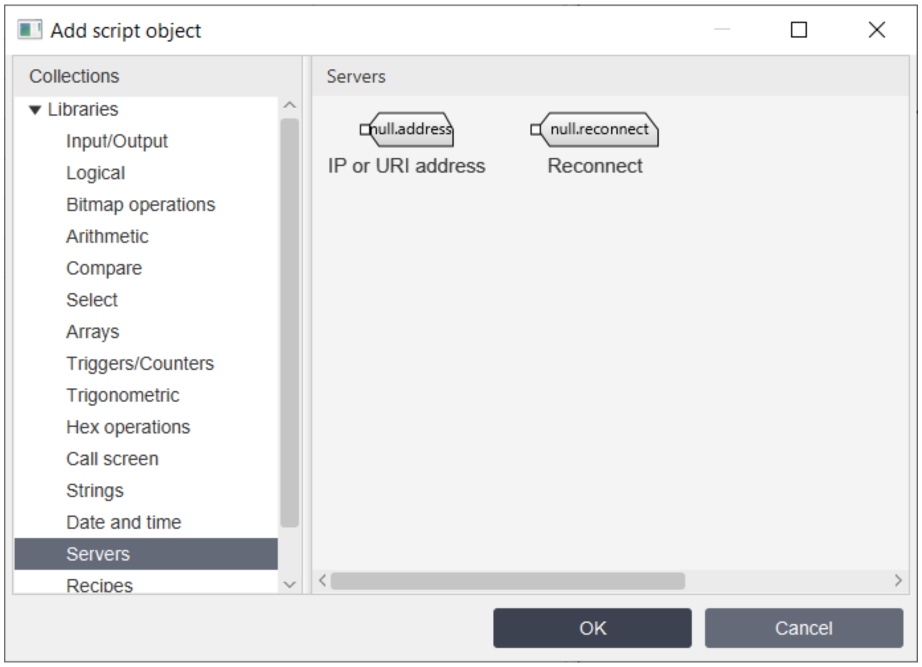
Example:



Depending on Tag's value place parameter of the current date and time.

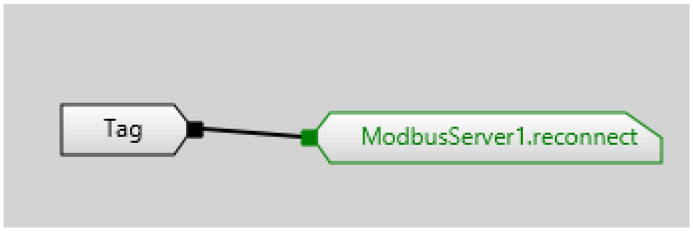
Tag	Tag2
7	2020

6.4.2.1.14 Servers library



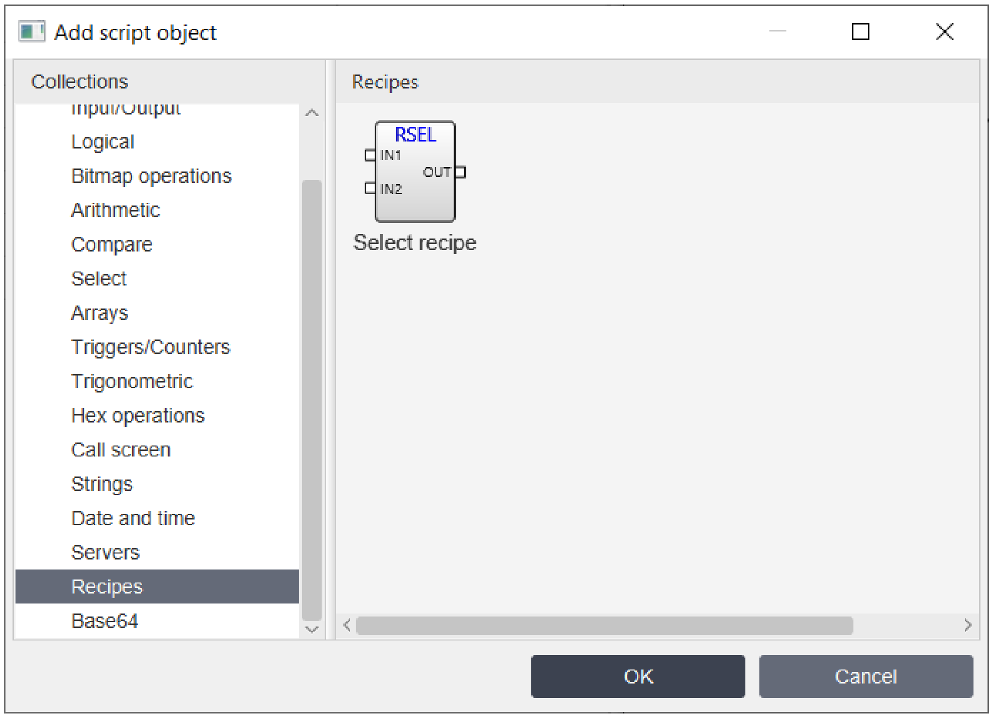
- **IP or URI address** - this script object used to change server's IP or URI address when Input's value changed.
- **Reconnect** - this script object used to reconnect server when Input's value turns from FALSE to TRUE.

Example:



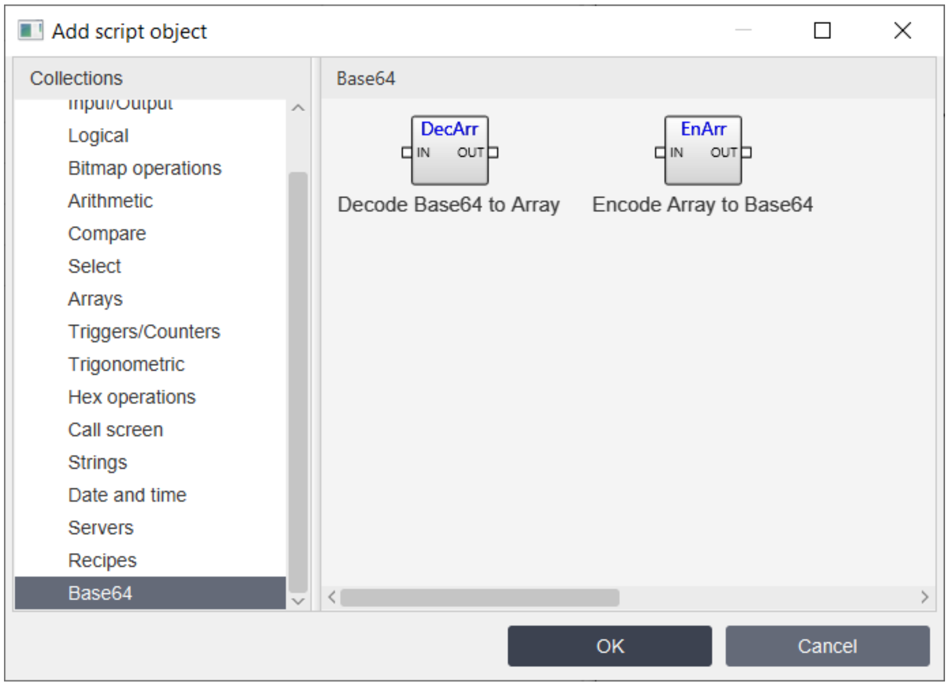
When Tag's value becomes TRUE from FALSE ModbusServer1 reconnect.

6.4.2.1.15 Recipes library



- **Select recipe** - this script object used to choose recipe row. Input2 is an input that contains name of the recipe. Input1 is number of the row (starting from 1). Output = true if recipe row is chosen.

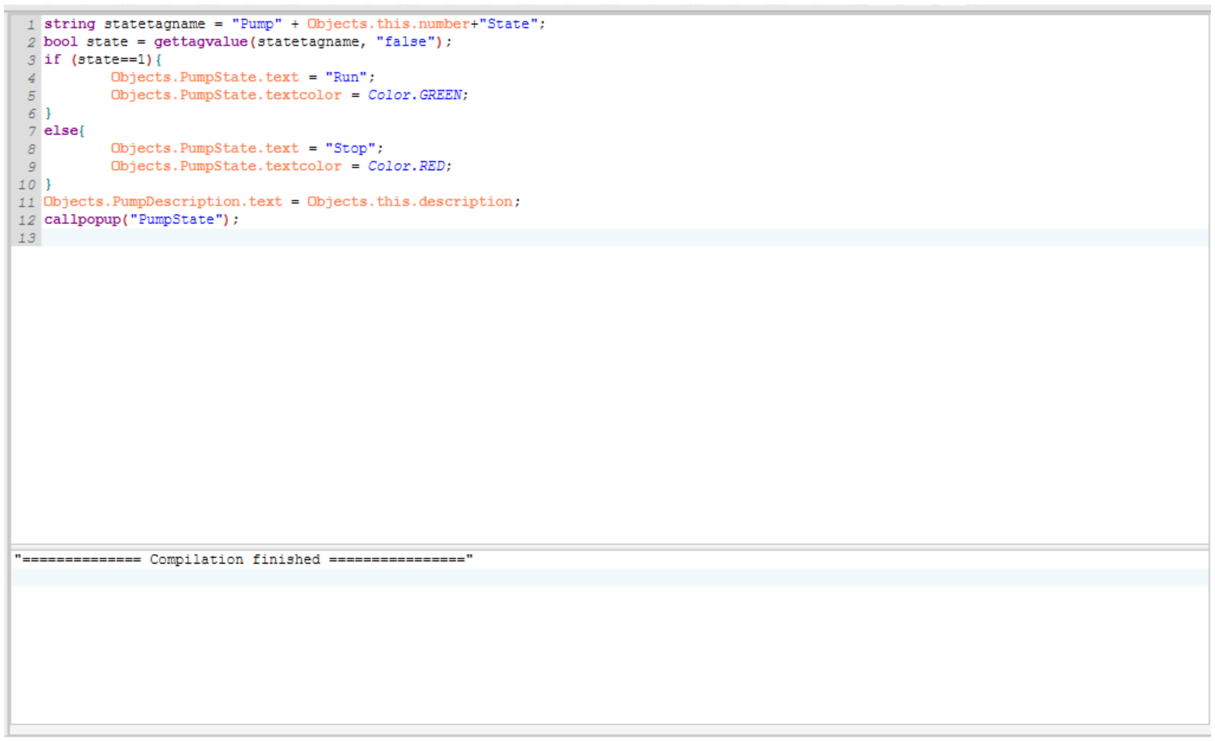
6.4.2.1.16 Base64 library



- **Decode Base64 to Array** - this script object used to decode Base64 string to byte array. Input contains base64 encoded string. In Output will be decoded byte array.
- **Encode Array to Base64** - this script object used to encode byte array to Base64 string. Input contains byte array. In Output will be encoded Base64 string.

6.4.3 ST language

When you choose ST (Structured text) language in script properties and open this script you’ll see two windows like in the picture:



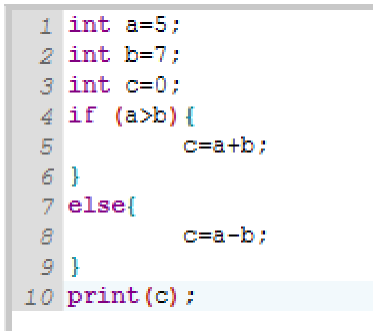
```
string statetagname = "Pump" + Objects.this.number+"State";
bool state = gettagvalue(statetagname, "false");
if (state==1){
        Objects.PumpState.text = "Run";
        Objects.PumpState.textcolor = Color.GREEN;
}
else{
        Objects.PumpState.text = "Stop";
        Objects.PumpState.textcolor = Color.RED;
}
Objects.PumpDescription.text = Objects.this.description;
callpopup("PumpState");
```

```
"============== Compilation finished ================"
```

Top window is a Code area and below window is a Debug(or log) area. You can enter your script program in the top window and compile this code by clicking Run 70 button on the Toolbar 70. All debug and log information you can see in the below window. Later in this chapter we will describe the rules of the ST language.

6.4.3.1 What is Structured Text Programming?

Structured Text for TeslaSCADA2 is different from PLC programming language de?ned by PLCOpen in IEC 61131-3. The programming language is text-based, compared to the graphicsbased Function Block Diagram. If you are already familiar with high-level programming languages like Java, PHP, Python and C, Structured Text will seem familiar to you. The syntax of Structured Text is developed to look like the syntax of a high-level programming language with loops, variables, conditions and operators. Before you read this tutorial I recommend that you take a brief look at this TeslaSCADA2 program written in Structured Text:



```
int a=5;
int b=7;
int c=0;
if (a>b){
        c=a+b;
}
else{
        c=a-b;
}
print(c);
```

Try to see if you can understand the function of this program. Does Structured Text look familiar to you?

6.4.3.2 Starting with the Syntax of Structured Text

The syntax of a programming language is the de?nition of how it is written. To be more precise, what symbols is used to give the language its form and meaning.As you can see in the example, Structured Text is full of colons, semicolons and other symbols. All these symbols has a meaning and is used to represent something. Some of them are operators, some are functions, statements or variables.All the details of the syntax will be explained as you move through this tutorial. But there are some general rules for the syntax of Structured Text you should know about. You don't have to memorize all the syntax rules for now, as you will when you get your hands into the programming:

All statements are divided by semicolons

Structured Text consists of statements and semicolons to separate them.

The language is case-sensitive

It is good practice to use upper- and lowercase for readability.

Spaces have no function

But they should be used for readability.

What's really important to understand here is that, when you write a TeslaSCADA2 program in IDE in Structured Text, your computer will translate that to a language the TeslaSCADA2 Runtime can understand. Before you use project that contains the Structured Text TeslaSCADA2 program to your TeslaSCADA2 Runtime, the IDE will compile your program. This means that it will translate the code to a sort of machine code which can be executed by the TeslaSCADA2 Runtime. The compiler uses the syntax of the programming language to understand your program. For example: Each time the compiler sees a semicolon, it will know that the end of the current statement is reached. The compiler will read everything until it reaches a semicolon, and then execute that statement.

Comment Syntax

In textual programming languages you have the ability to write text that doesn't get executed. This feature is used to make comments in your code.Comments are good, and as a beginner you should always comment your code. It makes it easier to understand your code later. In Structured Text you can make either one line comments or multiple line comments.

Single line comment:

//comment

Multiple line comment:

```
/* start comment
 ...
end comment */
```

6.4.3.3 Making Statements with Structured Text

So, Structured Text consists of statements. But what is statements? A statement tells the TeslaSCADA2 what to do. Let’s take the ?rst statement as an example:

bool x;

The compiler will read this as one statement, because when it reaches the semicolon, it knows that this is the end of that statement. Remember, statements are separated by semicolons. That’s the main syntax rule of this language. In this statement you are telling the TeslaSCADA2 to create a variable called X and that variable should be a BOOL type. By default value of the variable is false.

6.4.3.4 Types in Structured Text

Data types of Structured Text are similar to data types of TeslaSCADA2:

Data Type	Format	Range
bool	Boolean	FALSE(0)/TRUE(1)
byte	Byte	-128 ... 127
short	Short	-32768 ... 32767
int	Integer	-2^31 ... 2^31-1
long	Long Integer	-2^63 ... 2^63-1
float	Float	±3.40282347E+38F
double	Double	±1.79769313E+308
string	Character string	“My string”
array	Array	byte[], short[], int[], ?oat[]

Examples of variable initialisation:

```
bool x=false;
byte b = 2;
short s = 45;
int i = -4546;
long l = 394394832;
?oat f = 1.23;
double d = -545.64;
string str = “Hello”;
byte bytes[10] = [1,2,3,4,5,6,7,8,9,10];
```

6.4.3.5 Operators and Expressions in STL

The next thing you should know about is operators. Operators are used to manipulate data and is a part of almost any programming language. This leads us to the second thing you should know about – expressions. Just like operators, expressions are a crucial part of programming languages. An expression is a construct that, when evaluated, yields a value.This means that when the compiler compiles an expression, it will evaluate the expression and replace the statement with the result. Take this example with the two variables A and B. A contains the value 10 and B contains 8.

A+B

The result of this expression is 18. So instead of A+B, the compiler will put in the value 18. An expression are composed of operators and operands. So what are operators and operands? Since, you just saw an example of an expression, you just saw both an operator and two operands. A and B are both operands and the + is an operator. Remember that operators are used to manipulate data. That is exactly what the + is doing. It is taking the value of the variable A and adding it to the value in B. The + is also called the addition operator because the operation is addition.

6.4.3.5.1 Operators

There are several operators available in Structured Text language:

Operation	Symbol	Precedence
Parenthesization	(expression)	Highest
Negation Complement	- !	
Multiply Divide Modulo	* / %	
Add Subtract	+ -	
Left Shift Right Shift	<< >>	
Comparison	<, >, <=, >=,==,!=	
Boolean AND Boolean OR Boolean XOR	& || ^	Lowest

All the operators in the table above are sorted after precedence. This is also called order of operations, and you may know about if from mathematics.The order of operations is the order in which the operations are executed or calculated. Just take a look at this expression:

A + B * C

How will this expression be evaluated by the compiler? There are two operations left: multiply and addition. But since multiply has a higher precedence, that will be the ?rst to be evaluated. B * C comes ?rst and then the result is added to A. Every time an expression is evaluated, the evaluation follows the order of precedence as in the table above.

4 Types of Operators, 4 Types of Expressions

The operators used for expressions in Structured Text can be divided into four groups. Each group of operators will have its speci?c function and will yield a speci?c data type:

1. Arithmetic Operators 429
2. Relational Operators 429
3. Logical Operators 430
4. Bitwise Operators 430

6.4.3.5.1.1 Arithmetic Operators

All the arithmetic operators are often just called mathematical operators because they represent math. The result will always be the mathematical result of the expression.

- + (add)
- – (subtract/negate)
- * (multiply)
- / (divide)
- % (modulo divide)

Example:

15 % 4

Result:

3

6.4.3.5.1.2 Relational Operators

To compare or ?nd a relation between two values you can use one of the relational operators. They are used for comparison and the result will be a boolean value (BOOL type), either TRUE(1) or FALSE(0).

- == (equal)
- < (less than)
- <= (less than or equal)
- > (greater than)
- >= (greater than or equal)
- != (not equal)

Example:

TEMPERATURE = 93.9;

TEMPERATURE >= 100.0;

Result:

false

6.4.3.5.1.3 Logical Operators

If you want to compare boolean values (BOOL) and make some logic out of it, you have to use logical operators. These operators also yields a boolean value of TRUE(1) or FALSE(0) as a result of the expression.

- &&
- ||
- ^
- !

Example:

limitswitch1 = true;

limitswitch2 = false;

limitswitch1 || limitswitch2

Result:

true

6.4.3.5.1.4 Bitwise Operators

The last group of operators are called bitwise operators because the operations are performed bitwise. It simply means that a logic operation is performed for each bit of two numbers. The result is a new number – the total result of the bitwise operations.

- &
- |
- ^
- <<
- >>

Example:

15 & 8

Result:

8

Since this operation is bitwise the calculation will be per bit. So to understand what's going on here, you have to convert the numbers to binary values:

15 = 1111 8 = 1000

Now each bit in the number 1111 (15) can be used in a logical operation with the other number 1000 (8): 1111 AND 1000

Bit number	1111 (15)	1000 (8)	Result
0	1	0	0
1	1	0	0
2	1	0	0
3	1	1	1

6.4.3.5.2 Operators and Statements

So, in the previous section you learned that expressions evaluate. Meaning that all expressions will yield the result and the compiler will replace the expression with the result. But what if you want the TeslaSCADA2 (compiler) not to evaluate something, but to DO something? Statements are the answer. Let's take a look at the actions or statements that you can make in Structured Text.

6.4.3.5.2.1 Assignment Statement and Operator

There are several statements available in Structured Text. All of them represent an action or a condition. Beginning with actions, the most fundamental statement in Structured Text is the assignment statement. Here's how an assignment statement looks like:

A = B;

What does this statement tell the compiler to do? To take the value of the variable B and put it in the variable A. The TeslaSCADA2 is assigning a value to a variable. Here's an even simpler example:

A = 10;

This statement will take the value 10 and put it into the variable A. Or said in another way – the variable A will be assigned the value 10.Since the value of A is now 10, we can make another statement, but this time with an expression:

B = A + 2;

When this line of code is compiled, the expression A + 2 will be evaluated to 12. The compiler will replace the expression with the result 12. The statement will now look like this to the compiler:

B = 12;

What will happen now, is that the compiler will assign the value 12 to the variable B. The last thing is that the = symbol is called the assignment operator. You can have all sorts of expressions in your assignment statements, from simple values like numbers to variables and functions. Because all expressions will be evaluated ?rst, and then, the result of that evaluation will be used in the assignment statement.

6.4.3.5.2.2 Conditional Statements

The TeslaSCADA2 program is a piece of logic and therefore has to make some decisions. So in your TeslaSCADA2 program you need a way to make decisions. This brings us to conditional statements. Conditional statements are used for exactly that: To make decisions. There are one way of doing conditional statements in Structured Text: IF statement.

IF Statements

IF statements are decisions with conditions. There's a special syntax for IF statements. This means, that you have to write it in a certain way for the compiler to understand it. Because just like semicolons are used to end statements, there are special keywords to make an IF statement. Here's how the syntax for IF statements looks like in STL for TeslaSCADA2:

```
if (boolean expression) {
  <statement>;
}
else if (boolean expression){
  <statement>;
} else {
  <statement>;
}
```

Statement starts with keyword IF. Then parentheses. Between those two brackets are the condition, which is an expression. But not just any expression. A boolean expression.

6.4.3.5.3 Boolean and Numeric Expressions

You can divide expressions into two groups depending on what they yield.

Boolean expressions evaluates to a BOOL type value, TRUE or FALSE.

Here's an example of a boolean expression:

1 == 1

This expression will evaluate to or yield TRUE(1). A boolean expression could also look like this:

1 > 2

But this time the boolean expression will evaluate to FALSE(0), since 1 is not larger than 2.

Numeric expressions evaluates to an integer or a ? oating point number.

A numeric expression could look as simple as this one:

13.2 + 19.8

This expression will evaluate to the ?oating point number 33.0, and therefore is a numeric expression.

Boolean expressions are used in IF statements as conditions. IF the boolean expression evaluates to TRUE, then the following statements will be executed. The TeslaSCADA2 will only execute the statements after the open bracket {, if the expression evaluates to TRUE. This is illustrated by the following example:

```
A = 0;
IF (A == 0) {
B = 0;
}
```

Line number 3 will only be executed if A is equal to 0. In this case it will. A 0 is assigned to the variable A in a statement right before the IF statement. For now, you've seen a simple IF statement, where statements are only executed if an expression is TRUE. If that expression evaluates to FALSE the statements will simply not be executed. What to do if you want to use multiple conditions? Just like most other programming languages you can use the ELSE IF and ELSE keywords for multiple conditions in the same IF statement. Both ELSE IF and ELSE are optional in IF statements, but this is how the syntax looks like:

```
if (boolean expression) {
  <statement>;
}
else if (boolean expression){
  <statement>;
} else {
  <statement>;
}
```

If the boolean expression on line 1 is FALSE, the statements below will simply not be executed. Instead the compiler will check the boolean expression after the ELSE IF keyword.Here it works just like with the IF keyword: If the boolean expression after the keyword is true, the following statements will be executed.At last is the ELSE keyword. It works as a default option for your IF statement. If all the IF and ELSE IF boolean expressions are evaluated to FALSE, the statements after the ELSE keyword will be executed.

Combining Operators for Advanced Conditions

Beside making multiple conditions you can also expand your conditions to include multiple variables. You can combine multiple expressions, typically done with a logical operator, to get a larger expression.

What if you want not just 1 but 2 inputs to be TRUE before an output is set. The expression would look like this:

```
if (INPUT1 & INPUT2) {
  OUTPUT1 = TRUE;
}
```

Now the expression will evaluate to TRUE, only if INPUT1 and INPUT2 is TRUE.

6.4.3.5.4 Iteration with Repeating Loops

Probably one of the most powerful features in Structured Text is the ability to make loops that repeat lines of code. In relation to TeslaSCADA2 programming loops can be used for many different purposes. You might have a function or a set of statements that you want to execute a certain amount of times or until something stops the loop. In Structured Text for TeslaSCADA2 you will ?nd 2 different types of repeating loops:

- FOR 434
- WHILE 434

Common for all the types of loops is that they have a condition for either repeating or stopping the loop. The condition in FOR and WHILE loops decides whether the loop should repeat or not.

6.4.3.5.4.1 FOR Loops

The ?rst loop is the FOR loop and is used to repeat a speci?c number of times.This is the syntax of FOR loops in Structured Text for TeslaSCADA2:

for (count = initial_value; condition; increment){
<statement>;
}

Keyword that starts the **FOR** loop statement.

count = initial_value

This assignment operation is where you set the initial value you want to count from. Count is the variable name and initial_value is the value you want to start counting from.

;

Semicolon before condition statement.

condition of the loop's continuation.

;

Semicolon before incremental statement.

increment statement.

Usually used to increment initial value - count in this case. Then you place statements between {} that will execute during loops.

6.4.3.5.4.2 While Loops

The while loop is a little different from the FOR loop, because it is used to repeat the loop as long as some conditions are TRUE. A WHILE loop will repeat as long as a boolean expression evaluates to TRUE.Here's the syntax of WHILE loops:

while (boolean expression){
<statement>;
}

Between the parentheses are the boolean expression. If that boolean expression evaluates to TRUE, all the statements between braces {}will be executed. When } is reached, the boolean expression will be evaluated again. This will happen over and over again until the expression doesn't evaluate to TRUE. But to make the loop stop at one point, you have to change a value in the boolean expression. Only in that way can the boolean expression go from TRUE to FALSE. Here's an example of a WHILE loop in Structured Text:

```
counter = 0;
while (counter < 10){
  counter = counter + 1;
  machine_status = counter * 10;
}
```

If you look at the third line you will see how the loop will eventually stop repeating. The boolean expression uses the counter variable and checks if its value is less than 10. But since the value of counter is set to 0 right before the WHILE loop, the boolean expression will be TRUE unless counter is changed. That is what's happening in line 3. This is the ?rst statement in the WHILE loop, and with the other statements, are executed each time the loop repeats. In the third line the value of the counter variable is increased by 1. You can say that the incremental value is 1. In the example above, the loop will repeat 10 times. When the value of count reaches 10, the boolean expression will be evaluated to FALSE (because 10 is not less than 10) and the loop will stop.

You can also use the BREAK keyword in the WHILE loop to stop repeating the loop before the boolean expression is FALSE. The syntax is an IF statement with the BREAK keyword in. Place it anywhere between braces {}.

```
if  (boolean expression) {
  break;
}
```

6.4.3.6 User-de?ned functions

Also you can use user-de?ned functions in Structured Text language for TeslaSCADA2. You can ?nd example below:

```
function fun(a,b){
int c;
if (a>b){
 c=a+b;
}
else{
 c=b-a;
}
return c;
}
int d = fun(13,17);
print(d);
```

In this example user function starts with key word **function**. Then name of the function. Then in parentheses arguments are listed. Inside braces {} statements of the function. User-de?ned function must be announced before main program. In this example program text of function **fun** is in the beginning. And only after statements of **fun** function, text of the main program. Results of this script will be **4** in the log window.

6.4.3.7 Using Tags in Structured Text

Of course for our purposes we need to use Tags in our scripts written in Structured Text language. How to do that? You can include Tags in your project’s scripts by using keyword **Tags**. Then type dot (.) and name of your Tag. For possibility to compile this code the name of the tag should contain only English letters without white spaces and any signs.

Example:

```
int var = 10;
Tags.Tag1 = var;
```

In this example value of the variable **var** will be assigned to tag's value with name Tag1.

Other Example:

?oat f = Tags.Float1;

In this example value of the tag with name Float1 will be assigned to variable **f**.

Array Example:

byte bytes[10] = Tags.Array;

In this example value of the array tag with name Array will be assigned to the bytes array.

And you can use every element of the array for other operations. Like this:

```
for (int i=0;i<10;i++){
  print(bytes[i]);
}
```

6.4.3.8 Using Object property ?elds in Structured Text

You can include Object property ?elds in your project's scripts by using keyword **Objects**. Then type dot (.), name of your Object (for object type you can use keyword - **this**), again type dot (.) and name of property ?eld. For possibility to compile this code the name of the object and object property ?elds should contain only English letters without white spaces and any signs.

Example:

```
int width = 100;
Objects.Rectangle.width = var;
```

In this example value of the variable **var** will be assigned to Object with name **Rectangle** and ?eld property name **width**. Name of the property ?elds you can ?nd out in parentheses of object and property descriptions above.

Other Example:

```
Objects.this.?llcolor="0x66AA00FF";
```

Change color of the current object to which the script is attached. Color is represented in RGBA format. Where:

0x - Hex format of the color.

66 - Red color;

AA - Green color;

00 - Blue color;

FF - Transparency.

Also it's possible to use standard colours by using keyword **Color**.

Example:

```
Objects.Button.?llcolor=Color.BLUE;
```

List of colours:

Color	Code
Color.RED	"0xFF0000FF"
Color.BROWN	"0xA52A2AFF"
Color.GREEN	"0x00FF00FF"
Color.BLUEVIOLET	"0x8A2BE2FF"

Color	Code
Color.BLUE	"0x0000FFFF"
Color.CORAL	“0xFF7F50FF"
Color.AQUA	“0x00FFFFFF"
Color.CYAN	“0x00FFFFFF"
Color.AQUAMARINE	"0x7FFFD4FF"
Color.DARKBLUE	“0x00008BFF"
Color.AZURE	“0xF0FFFFFF"
Color.DARKCYAN	“0x008B8BFF"
Color.BLACK	“0x000000FF”
Color.DARKGREY	“0xA9A9A9FF"
Color.DARKGREEN	“0x006400FF"
Color.DARKORANGE	“0xFF8C00FF"
Color.DARKRED	“0x8B0000FF"
Color.DARKVIOLET	“0x9400D3FF"
Color.GOLD	“0xFFD700FF"
Color.GREY	“0x808080FF"
Color.INDIGO	“0x4B0082FF"
Color.IVORY	“0xFFFFF0FF"
Color.KHAKI	“0xF0E68CFF"
Color.LIGHTBLUE	“0xADD8E6FF"
Color.LIGHTCORAL	“0xF08080FF"
Color.LIGHTCYAN	“0xE0FFFFFF"
Color.LIGHTGREEN	“0x90EE90FF"
Color.LIGHTGREY	“0xD3D3D3FF"
Color.MAROON	“0x800000FF"
Color.NAVY	“0x000080FF"
Color.OLIVE	“0x808000FF"
Color.ORANGE	“0xFFA500FF"
Color.PINK	“0xFFC0CBFF"
Color.PURPLE	“0x800080FF"
Color.SILVER	“0xC0C0C0FF"
Color.VIOLET	“0xEE82EEFF"
Color.WHEAT	“0xF5DEB3FF"
Color.WHITE	“0xFFFFFFFF"
Color.YELLOW	“0xFFFF00FF”

6.4.3.9 Using Server parameter ?elds in Structured Text

You can include Server parameter ?elds in your project’s scripts by using keyword Servers. Then type dot (.), name of your Server, again type dot (.) and name of parameter ?eld. For possibility to compile this code the name of the server and server parameter ?elds should contain only English letters without white spaces and any signs.

Example:

Servers.ModbusServer.ipaddress = “192.168.0.102”;

In this example value “192.168.0.102” will be assigned to the server with name **ModbusServer** and ?eld property name **ipaddress**. Name of the property ?elds you can ?nd out in parentheses of server and parameter descriptions above. Also for parameters are written in descriptions you can use: **lostconnection**, **connect** and **connected**.

6.4.3.10 Using User parameter ?elds in Structured Text

You can include User parameter ?elds in your project’s scripts by using keyword **Users**. Then type dot (.), name of your User or you can use key word **current** for choosing current user, again type dot (.) and name of parameter ?eld. For possibility to compile this code the name of the user and user parameter ?elds should contain only English letters without white spaces and any signs.

Example:

Users.Operator.controlfunctions = true;

In this example value true will be assigned to the user with name **Operator** and ?eld property name **controlfunctions**. Name of the property ?elds you can ?nd out in parentheses of user and parameter descriptions above.

6.4.3.11 Embedded functions

In the Structured Text language for TeslaSCADA2 there are number of embedded functions. We grouped all functions in libraries:

- Print 439
- Arithmetic 439
- Bitmap operations 439
- Select 441
- Trigonometric 441
- Strings 441
- Hex operations 442
- Base64 442
- Date and time 443
- Server 444
- Recipes 445
- E-mail 446
- Odoo ERP 447
- Excel and screenshot 448
- Database 450
- HTTP 456
- Global arguments 457
- Tag properties 457
- Dialog box 460
- Trend's curve 460

- Screen 461
- Files 461
- Common RTU 468
- Call external software 469
- User 469
- Push 470

6.4.3.11.1 Print library

print(Input) - print *input* in the log.

Example:
print("Some message");
This function will print "Some message" in Debug window in TeslaSCADA IDE and in the log in TeslaSCADA2 Runtime.

6.4.3.11.2 Arithmetic library

sqrt(Input) - arithmetic operation square root of the input value.
pow(Input1, Input2) - arithmetic operation power for input values. output = Input1^Input2.
log(Input1, Input2) - arithmetic operation logarithm of the input value (Output = $\mathrm{Log}_{\mathrm{Input2}}$Input).
ln(Input1) - arithmetic operation ln(natural logarithm) of the input value (Output = Ln(Input)).
abs(Input) - used to arithmetic operation absolute for input value (Output = |Input|).
sign(Input) - used to arithmetic operation sign for input value (Output = -Input).
int(Input) - used to arithmetic operation for getting integer part of the input value (Output = int(Input)).
random(Input1, Input2) - arithmetic operation for generating random values in the range between Input1 and Input2.

Example:
int a = pow(5, 2);
print(a);
Response:
a = 25;

6.4.3.11.3 Bitmap operations library

bytestoshort(Input1, Input2) - used to pack 2 bytes into the short (Output = Input1<<8+Input2).

bytestoint(Input1, Input2, Input3, Input4) - used to pack 4 bytes into the int (Output = Input1<<24+Input2<<16+Input3<<8+Input4).

bytestofloat(Input1, Input2, Input3, Input4) - used to pack 4 bytes into the float (Output = IntToFloat(Input1<<24+Input2<<16+Input3<<8+Input4)).

bytestolong(Input1, Input2, Input3, Input4, Input5, Input6, Input7, Input8) - used to pack 8 bytes into the long (Output = Input1<<56+Input2<<48+Input3<<40+Input4<<32+Input5<<24+Input6<<16+Input7<<8+Input8).

bytestodouble(Input1, Input2, Input3, Input4, Input5, Input6, Input7, Input8) - used to pack 8 bytes into the double (Output = LongToDouble (Input1<<56+Input2<<48+Input3<<40+Input4<<32+Input5<<24+Input6<<16+Input7<<8+Input8)).

shortstoint(Input1, Input2) - used to pack 2 shorts in the int (Output = Input<<16+Input2).

inttoshort(Input1,Input2) - used to unpack int value into 2 shorts (Output = Input[Input2]).

inttobyte(Input1,Input2) - used to unpack int value into 4 bytes (Output = Input[Input2]).

floattobyte(Input1,Input2) - used to unpack float value into 4 bytes (Output =(int) Input[Input2]).

longtobyte(Input1,Input2) - used to unpack long value into 8 bytes (Output = Input[Input2]).

doubletobyte(Input1,Input2) - used to unpack double value into 8 bytes (Output =(long) Input[Input2]).

readbit(Input1, Input2) - used to read bit of the input value (Output = Input[Input2]).

setbit(Input1, Input2) - used to set bit of the input value (Output = Input | 1<<Input2).

resetbit(Input1,Input2) - used to reset bit of the input value (Output = Input & ~(1<<Input2)).

Example:
```
int a = setbit(6, 0);
print(a);
```
Response:
```
a = 7;
```

6.4.3.11.4 Select library

min(Input1, Input2) - used to select minimum value of Input2 and Input1 (Output=Min(Input, Input2)).
max(Input1, Input2) - used to select maximum value of Input2 and Input1 (Output=Max(Input, Input2)).

Example:
```
int a = max(6, 12);
print(a);
```
Response:
```
a = 12;
```

6.4.3.11.5 Trigonometric library

toradians(Input) - used to convert degrees to radians.
todegrees(Input) - used to convert radians to degrees.
sin(Input) - used to calculate sin of Input value. (Output = sin(Input)).
cos(Input) - used to calculate cos of Input value. (Output = cos(Input)).
tan(Input) - used to calculate tag of Input value. (Output = tag(Input)).
asin(Input) - used to calculate arc sin of Input value. (Output = arc sin(Input)).
acos(Input) - used to calculate arc cos of Input value. (Output = arc cos(Input)).
atan(Input) - used to calculate arc tag of Input value. (Output = arc tag(Input)).

Example:
```
double angle = toradians(30);
double a = sin(angle);
print(a);
```
Response:
```
a = 0.5;
```

6.4.3.11.6 Strings library

stringsequals(Input1, Input) - compare two strings in Inputs and if there are equals it returns true.

stringtodouble(Input) - converts Input's string value into double value.

doubletostring(Input) -converts Input's double value into string value.

stringtoint(Input) - converts Input's string value into integer value.

inttostring(Input) - converts Input's integer value into string value.

substring(Input1, Input2, Input3) - used to cut begin and end of Input1's string value by the ? of characters de?ned in Input2 and Input3.

cutbeginstring(Input1, Input2) - used to cut begin of Input1's string value by the ? of characters de?ned in Input2.

cutendstring(Input1, Input2) - used to cut end of Input1's string value by the ? of characters de?ned in Input2.

split(Input1, Input2, Input3) - used to split string in Input1 to string array. Input2 contains split regular expression; Input3 contains number of elements in array (if this number greater then number of elements that we get during operation, they will be ?lled by "")

Example:

```
split("hello;world", ";", 3);
```

Response:

```
string strarr[3] = ["hello", "world", ""];
```

Other Example:

```
string str = substring("Hello world", 2, 5);
print(str);
```

Response:

```
str ="llo";
```

6.4.3.11.7 Hex operations library

hextoint(Input) - converts hex value into integer.
inttohex(Input) - converts integer value into hex.

Example:

```
string a = inttohex(255);
print(a);
```

Response:

```
a = "ff";
```

6.4.3.11.8 Base64 library

base64decode(Input) - used to decode Base64 string to byte array. Input contains base64 encoded string. In Output will be decoded byte array.
base64encode(Input) - used to encode byte array to Base64 string. Input contains byte array. In Output will be encoded Base64 string.

Example:

```
int arr[5] = [1,2,3,4,5];
string a = base64encode(arr);
print(a);
```

Response:
a = "AQIDBAU=";

6.4.3.11.9 Date and time library

datetime(Input) - used to get date and time components depending on Input value:
0 - get seconds.
1 - get minutes.
2 - get hour of the day considering AM/PM.
3 - get hour of the day.
4 - get day of the week (1-Sunday, 2-Monday...).
5 - get day of month.
6 - get month (0 - January, 1 - February...).
7 - get year.
8 - get minutes of the day (hour*60 + minutes).

Example:
```
int a = datetime(7);
print(a);
```
Response:
a = 2020;

---

currentdatetime(Input1) - used to get current date and time in string format. Input1 contains format of the date and time. Function returns formatted current date and time.

Example:
```
string date = currentdatetime(“yyyy-MM-dd HH:mm:ss“);
```
Response:
date = "2020-09-15 14:22:12"

---

currentdatetimeinmil() - used to get current date and time in milliseconds from 1 January 1970.

Example:
```
long date = currentdatetimeinmil();
```
Response:
date = 1627475044148

---

datetimefrom(Input1, Input2) - used to convert date time in milliseconds since 1 January 1970 into string format. Input1 contains format of the date and time. Input2 contains date time in milliseconds since 1 January 1970. Function returns formatted date and time in string.

Example:
string date = datetimefrom(“yyyy-MM-dd HH:mm:ss”, 1603713302140);
Response:
date = "2020-10-26 11:22:52"

---

datetimeto(Input1, Input2) - used to convert date time in string format into milliseconds since 1 January 1970. Input1 contains format of the date and time. Input2 contains date time in string format. Function returns time in milliseconds since 1 January 1970.

Example:
long date = datetimeto(“yyyy-MM-dd HH:mm:ss”, "2020-10-26 11:22:52");
Response:
date = 1603713302140

---

sleep(Input1) - used to make pause. Input1 contains time of the pause in milliseconds.

Example:
sleep(1000); //script sleeps 1000 ms.

6.4.3.11.10 Server library

reconnect(Input1,Input2) - used to reconnect to server with name from Input1 to IP address from Input2.

Example:
reconnect("ModbusServer1", "192.168.0.1");
Response:
Reconnect server with name **ModbusServer1** to IP address **192.168.0.1**.

---

opcuareadattribute(Input1, Input2, Input3) - used to read attribute of the OPC UA server node. Input1 contains name of the server; Input2 contains name of the tag with de?ned NodeId; Input3 contains number of the attribute. List of the attributes:

?	Attribute
1	NodeId
2	NodeClass
3	BrowseName
4	DisplayName
5	Description
6	WriteMask
7	UserWriteMask

?	Attribute
8	IsAbstract
9	Symmetric
10	InverseName
11	ContainsNoLoops
12	EventNoti?er
13	Value
14	DataType
15	ValueRank
16	ArrayDimensions
17	AccessLevel
18	UserAccessLevel
19	MinimumSamplingInterval
20	Historizing
21	Executable
22	UserExcecutable

Example:
string description = opcuareadattribute(“OPCUAServer”, “tagname”, 5);

---

connect(Input1) - used to connect to server with name from Input1.

Example:
connect("ModbusServer1");

---

disconnect(Input1) - used to disconnect to server with name from Input1.

Example:
disconnect("ModbusServer1");

6.4.3.11.11 Recipes library

selrecipe(Input1, Input2) - used to choose recipe row. Input2 is an input that contains name of the recipe. Input1 is number of the row (starting from 1). Output = true if recipe row is chosen.

Example:
selrecipe(2, "Recipe1");
Response:
Select row number **2** from recipe with name **Recipe1**.

exportrecipestocsv(recipename, filename) - used to export recipe database content with the **recipename** to CSV file with the name **filename**.

Example:
exportrecipestocsv("Recipe1", "file.csv");

importrecipesfromcsv(recipename,recipefile) - used to import recipe from CSV file to recipe database.

Example:
importrecipesfromcsv("Recipe1", "file.csv");

6.4.3.11.12 E-mail library

sendemail(Input1, Input2) - send email (if it setup in Project properties 114) with subject from Input1 and message from Input2.

Example:
sendemail("Alarm", "Tag's alarm message");
Response:
Send E-mail to the addresses setup in project properties with subject "Alarm" and with body "Tag's alarm message".

---

setemailsubject(Input1) - set E-mail subject (if it setup in Project properties 114) from Input1.

Example:
setemailsubject("Alarm");

---

setnotificationpriority(Input1) - set notification priority from Input1. All event messages that have priority less then Noti?cations(Priority<) 113 will be sent by E-mail, GSM modem, Telegram bot and arise alarm box.

Example:
setnotificationpriority(100);

---

setemailaddresses(Input1) - set E-mail addresses (if it setup in Project properties 114) from Input1. To which E-mail addresses the mail will be sent. Use commas to separate addresses.

Example:
setemailaddresses("email1@gmail.com , email2@gmail.com");

---

addemailrange(Input1, Input2, Input3, Input4) - add E-mail range for the client (if it setup in Project properties 114) and if "Depends on priority" is checked. Input1 contains name of the range. Input2 contains value of the range's start priority. Input3 contains value of the range's end priority. To which E-mail addresses the mail will be sent is placed in Input4. Use commas to separate addresses.

Example:
addemailrange("Emails" , 0, 100, "pochta@gmail.com);

---

removeemailrange(Input1) - remove E-mail range from the client (if it setup in Project properties 114) and if "Depends on priority" is checked. Input1 contains name of the range

Example:
removeemailrange("Emails");

---

addemailtorange(Input1, Input2) - add E-mail address to the range of the client (if it setup in Project properties 114) and if "Depends on priority" is checked. Input1 contains name of the range. Input2 contains E-mail address.

Example:
addemailtorange("Emails" , "pochta@gmail.com);

---

removeemailfromrange(Input1, Input2) - remove E-mail address from the range of the client (if it setup in Project properties 114) and if "Depends on priority" is checked. Input1 contains name of the range. Input2 contains E-mail address.

Example:
removeemailfromrange("Emails" , "pochta@gmail.com);

6.4.3.11.13 Odoo ERP library

odoogetmodelcount(Input1, Input2, Input3) - used is to get number of rows that you get from Odoo ERP with name in Input1 (Example: “OdooERP0”) and model with name in Input2 (Example: “mrp.workorder”) that ?ts the ?lter in Input3. Filter is consisted with name of ?eld, comparison and value to compare separated by commas (Example:”state,=,cancel” get rows where state == cancel).

Example:
Tags.orderscount = odoogetmodelcount("OdooERP0", “mrp.workorder","state,=,cancel");

---

odooreadmodel?eld(Input1, Input2, Input3, Input4, Input5) - used to read value of row's ?eld that you get from Odoo ERP with name in Input1 (Example: "OdooERP0") and model with name in Input2 (Example: "mrp.workorder") that ?ts the ?lter in Input3. Filter is consisted with name of the ?eld, comparison and value to compare separated by commas (Example:"state,=,cancel" get rows where state == cancel). Name of the ?eld you have to enter in Input4 (Example:"production_id"). In Input5 you have to enter row position you want to read (Example:1).

Example:
Tags.Field = odooreadmodel?eld("OdooERP0","mrp.workorder", "", "production_id",1);

---

odoowritemodel?eld(Input1, Input2, Input3, Input4, Input5, Input6) - used to write value to the row's ?eld that you get from Odoo ERP with name in Input1 (Example: "OdooERP0") and model with name in Input2 (Example: "mrp.workorder") that ?ts the ?lter in Input3. Filter is consisted with name of the ?eld, comparison and value to compare separated by commas (Example:"state,=,cancel" get rows where state == cancel). Name of the ?eld you have to enter in Input4 (Example:"production_id"). In Input5 you have to enter row position you want to read (Example:1). And in Input6 you have to enter value should be written (Example:"20"). If write is successful function return TRUE.

Example:
odoowritemodel?eld("OdooERP0","product.product", "id,=,2","list_price",0,Tags.Price);

---

odoocallfunction(Input1, Input2, Input3, Input4) - used to call function in Odoo ERP with name in Input1 (Example: "OdooERP0") and model with name in Input2 (Example: "mrp.workorder") with name in Input3 (Example:"action_toggle_is_locked"), and with parameter in Input4 (Example: 1). If call is successful function return TRUE.

Example:
odoocallfunction("OdooERP0","mrp.production","action_toggle_is_locked",Tags.ID);

6.4.3.11.14 Excel and screenshot library

saverecipeexcelreport(Input1, Input2, Input3, Input4) - used to save recipe report in Excel format bind to row. Input2 is an input that contains name of the recipe. Input1 is number of the row (starting from 1). Input3 contains ?le name of the report. Input4 contains title name. Output = true if recipe row is saved in Excel format. Report is saved in the folder you setup in Project properties->Report folder 114.

Example:
saverecipeexcelreport(1,"RecExcel","streport","Title");

---

excelopenworkbook(Input1) - used to open excel workbook. Input1 contains name of the Excel file. Excel file is in the folder you setup in Project properties->Report folder 114.

Example:
excelopenworkbook("reportfilename");

---

excelcreateworkbook() - this function create workbook for Excel ?le;

---

excelsaveworkbook(Input1) - used to save workbook in the Excel with name in Input1. Report is saved in the folder you setup in Project properties->Report folder 114.

Example:
excelsaveworkbook("?lename");

---

excelcreatesheet(Input1) - create sheet in the workbook of Excel ?le with name in Input1.

Example:
excelcreatesheet("sheetname");

---

excelsetcolumnwidth(Input1, Input2, Input3) - set column width with name of the sheet in Input1, number of the column in Input2 and width in Input3.

Example:
excelsetcolumnwidth("sheetname", 0, 5000);

---

excelcreatestyle(Input1, Input2, Input3, Input4, Input5) - set cell style with name of the style in Input1, horizontal type in Input2 (can be "CENTER", "LEFT", "RIGHT"), vertical type in Input3 (can be "CENTER", "TOP", "BOTTOM"), font size in Input4 and bold or not in Input5.

Example:
excelcreatestyle("stylename","CENTER", "CENTER", 14, false);

---

excelcreatecolorstyle(Input1, Input2, Input3, Input4, Input5, Input6) - set cell style with name of the style in Input1, horizontal type in Input2 (can be "CENTER", "LEFT", "RIGHT"), vertical type in Input3 (can be "CENTER", "TOP", "BOTTOM"), font size in Input4, bold or not in Input5 and color of the background in Input6 (can be "GREY", "GREEN", "RED", "BLUE", "YELLOW").

Example:
excelcreatecolorstyle("stylename","CENTER", "CENTER", 14, false,"GREY");

---

excelcreatecell(Input1, Input2, Input3, Input4, Input5) - create cell with name of the sheet in Input1, number of the row in Input2 and position of the cell in Input3, style name in Input4 and text of the cell in Input5.

Example:
excelcreatecell("sheetname", 0, 0, "stylename","Text");

---

excelreadcell(Input1, Input2, Input3) - read cell from the sheet with name in Input1, number of the row in Input2 and position of the cell in Input3.

Example:
String cellvalue = excelreadcel("sheetname", 0, 0);

---

excelcreatenumbercell(Input1, Input2, Input3, Input4, Input5, Input6) - create cell with name of the sheet in Input1, number of the row in Input2 and position of the cell in Input3, style name in Input4, numeric value in Input5 and decimal position for numeric value in Input6.

Example:
excelcreatenumbercell("sheetname", 0, 0, "stylename",Tags.Value, 2);

---

excelmergecells(Input1, Input2, Input3, Input4, Input5) - merge cells with name of the sheet in Input1, start row in Input2 and end row in Input3, start column in Input4 and end column in Input5.

Example:
excelmergecells("sheetname",0,1,0,1);

---

makescreenshot(Input1) - used to save screenshot with name in Input1. Screenshot is saved in the folder you setup in Project properties->Report folder 114.

Example:
makescreenshot("?lename");

6.4.3.11.15 Database library

createdbsqlliteconnection(Input1) - used to create create connection to SQLLite database with name in Input1. Database file is created in DB 18 folder.

Example:
createdbsqlliteconnection("?lename");

---

createdbconnection(Input1, Input2, Input3) - used to create connection to database with name in Input1, with username in Input2 and password in Input3.

Example:
createdbconnection("jdbc:mysql://192.168.0.76:3306/test", "username", "password"); in this example MySQL 31 database is created. ("jdbc:mysql" in the beginning means that MySQL connection is created).

---

closedbconnection(Input1) - used to close database connection with name in Input1.

Example:
closedbconnection("?lename");

---

createdbtable(Input1, Input2, Input3) - used to create table in database with name of database in Input1, table name in Input2 and columns in Input3 (columns should be separated by commas, every table has auto incremented column "_id").

Example:
createdbtable("databasename", "tablename", "title, parameter1, parameter2");

---

insertvaluesintodb(Input1, Input2, Input3) - used to insert row into database with name of database in Input1, table name in Input2 and values in Input3 (values should be separated by commas).

Example:
insertvaluesintodb("databasename", "tablename", "Title, 10, 20");

---

readvaluefromdb(Input1, Input2, Input3, Input4) - used to read value from database with name of database in Input1, table name in Input2, name of the read column in Input3 and condition of read row in Input4 (if several rows ?t to condition ?rst row is read).

Example:
string parameter = readvaluefromdb("databasename", "tablename", "parameter1","_id=1");

---

readvaluefromdbinpos(Input1, Input2, Input3, Input4, Input5) - used to read value from database with name of database in Input1, table name in Input2, name of the read column in Input3, condition of read row in Input4 and position of the row in Input5.

Example:
string parameter = readvaluefromdbinpos("databasename", "tablename", "parameter1","title = Title", 1);

---

updatevalueindb(Input1, Input2, Input3, Input4, Input5) - used to update value in database with name of database in Input1, table name in Input2, name of the updated column in Input3, condition of the updated row in Input4 and updated value in Input5 (if several rows ?t to condition all rows values are changed)

Example:
updatevalueindb("databasename", "tablename", "parameter1","title = Title", "10");

---

deleterowindb(Input1, Input2, Input3) - used to delete row(s) in database with name of database in Input1, table name in Input2 and condition that should ?t the row(s) in Input3.

Example:
deleterowindb("databasename", "tablename", "_id=1");

---

readvaluefromhistorydb(Input1, Input2, Input3, Input4, Input5) - used to read value from history database with name of history database in Input1, begin time in Input2, end time in Input3 (begin and end time in milliseconds since 1 January 1970 year, Input4 database name of the parameter to read, Input5 decimal position of the read value. If several rows ?t to time condition ?rst row is read.

Example:
string parameter = readvaluefromhistorydb("History DB0", 1636367879810, 1636367979810,"pressure", 2);

---

runsql(Input1, Input2) - used to execute SQL request with name of database in Input1 and SQL query in Input2.

Example:
runsql("databasename", "create table if not exists param (_id INTEGER PRIMARY KEY AUTOINCREMENT, temperature, pressure, humidity");

---

runsqlquery(Input1, Input2, Input3) - used to execute SQL request with name of database in Input1 and SQL query in Input2. Input3 contains name of the Result set (table). This Result set is place into global map where key is the name of the result set from the Input3.

Example:
runsqlquery(“databasename”, “select * from param”, "resultname");

---

rsfirst(Input1) - used to move cursor of the result set (table) to the first row. Input1 contains name of result set. Return TRUE if the moving is successful**. This function doesn't work for SQL lite database**.

Example:
rsfirst("resultname");

---

rslast(Input1) - used to move cursor of the result set (table) to the last row. Input1 contains name of result set. Return TRUE if the moving is successful. **This function doesn't work for SQL lite database.**

Example:
rslast("resultname");

---

rsnext(Input1) - used to move cursor of the result set (table) to the next row. Input1 contains name of result set. Return TRUE if the moving is successful.

Example:
rsnext("resultname");

---

rsisempty(Input1) - used to check availability of the data in result set (table). Input1 contains name of result set. Return TRUE if the result set is empty. **This function doesn't work for SQL lite database.**

Example:
rsfempty("resultname");

---

rsmove(Input1, Input2) - used to move the cursor to position. Input1 contains name of result set. Input2 contains position value. Return TRUE if the moving is successful.

Example:
rsmove("resultname",3);

---

rsbeforefirst(Input1) - used to move cursor of the result set (table) to the position before the first row. Input1 contains name of result set. Return TRUE if the moving is successful. **This function doesn't work for SQL lite database**.

Example:
rsbeforefirst("resultname");

---

rsafterlast(Input1) - used to move cursor of the result set (table) to the position after last row. Input1 contains name of result set. Return TRUE if the moving is successful. **This function doesn't work for SQL lite database.**

Example:
rsafterlast("resultname");

---

rspos(Input1) - used to return the position of the cursor . Input1 contains name of result set. This function doesn't work for SQL lite database.

Example:
int pos = rspos("resultname");

---

rsreadstring(Input1, Input2) - used to read string value from the current cursor. Input1 contains name of result set. Input2 contains name of the column.

Example:
string name = rsreadstring("resultname","name");

---

rsreadstringnum(Input1, Input2) - used to read string value from the current cursor. Input1 contains name of result set. Input2 index of the column.

Example:
string name = rsreadstringnum("resultname",2);

---

rsreaddouble(Input1, Input2) - used to read double value from the current cursor. Input1 contains name of result set. Input2 contains name of the column.

Example:
double value = rsreaddouble("resultname","value");

---

rsreaddoublenum(Input1, Input2) - used to read double value from the current cursor. Input1 contains name of result set. Input2 index of the column.

Example:
double value = rsreaddoublenum("resultname",2);

---

rsreadint(Input1, Input2) - used to read int value from the current cursor. Input1 contains name of result set. Input2 contains name of the column.

Example:

```
int value = rsreadint("resultname","value");
```

---

rsreadintnum(Input1, Input2) - used to read int value from the current cursor. Input1 contains name of result set. Input2 index of the column.

Example:

```
int value = rsreadintnum("resultname",2);
```

---

rsreadbool(Input1, Input2) - used to read bool value from the current cursor. Input1 contains name of result set. Input2 contains name of the column.

Example:

```
bool value = rsreadbool("resultname","value");
```

---

rsreadboolnum(Input1, Input2) - used to read bool value from the current cursor. Input1 contains name of result set. Input2 index of the column.

Example:

```
bool value = rsreadboolnum("resultname",2);
```

---

rsgetcolnum(Input1) - used to get number of columns. Input1 contains name of result set.

Example:

```
int num = rsgetcolnum("resultname");
```

---

rsgetcol(Input1, Input2) - used to get column name from the result set. Input1 contains name of result set. Input2 index of the column. **This function doesn't work for SQL lite database.**

Example:

```
string name = rsgetcol("resultname",2);
```

---

rsremove(Input1) - used to remove result set from the global map memory. Input1 contains name of result set.

Example:
rsremove("resultname");

6.4.3.11.16 HTTP library

iftttrigger(Input1, Input2, Input3, Input4, Input5) - used to send trigger event ifttt.com service. Input1 contains key; Input2 contains event trigger name; Input3, Input4, Input5 contain value1, value2 and value3 for ifttt.com service.

Example:
iftttrigger("yourkey", “tag_trigger", "Tag is become true", Tags.Tag_2, “current value");

---

httppostcreate(Input1, Input2) - used to create HTTP post request. Input1 contains name of the request; Input2 contains url address.

Example:
httppostcreate("namehttppost",
"https://hooks.zapier.com/hooks/catch/zapkey/otherzap/");

---

httppostaddvalue(Input1, Input2, Input3) - used to add value into HTTP post request. Input1 contains name of the request; Input2 contains name of the value; Input3 contains value.

Example:
httppostaddvalue("namehttppost", “valuename”, “value”);

---

httppostexecute(Input1) - used to execute HTTP post request. Input1 contains name of the request. Function returns HTTP post response.

Example:
httppostexecute(“namehttppost");

---

httppostgetvalue(Input1, Input2) - used to get value from the HTTP post response. Input1 contains response string; Input2 contains name of response value. Function returns value from the HTTP post response.

Example:
string value = httppostgetvalue(“{valuename: value}”, “valuename”);

6.4.3.11.17 Global arguments library

TeslaSCADA IDE project has storage is RAM of the device with global arguments. You can add and get arguments by using control property 364 of the button and functions described below:

getglobalargument(Input1, Input2) - used to get value from the global storage of the software. Input1 contains name of the value; Input2 contains default value, if the value is not available in the storage.

Example:
getglobalargument(“value”, “1”);

---

putglobalargument(Input1, Input2) - used to put value into the global storage of the software. Input1 contains name of the value; Input2 contains value that will be written in the storage.

Example:
putglobalargument(“value”, “1”);

6.4.3.11.18 Tag properties library

gettagvalue(Input1, Input2) - used to get value of the tag. Input1 contains name of the tag; Input2 contains default value, if the tag is not exist.

Example:
string value = gettagvalue(“value”, “1”);

---

gettagvalueorerror(Input1, Input2) - used to get value of the tag. Input1 contains name of the tag; Input2 contains name of the error tag. If tag with name in Input1 doesn't exist TRUE is placed in the tag with name in Input2.

Example:
string value = gettagvalueorerror(“value”, “errortag”);

---

settagvalue(Input1, Input2) - used to set value of the tag. Input1 contains name of the tag; Input2 contains value.

Example:
settagvalue(“value”, “1”);

---

gettagdescription(Input1, Input2) - used to get description of the tag. Input1 contains name of the tag; Input2 contains default description, if the tag is not exist.

Example:
string description = gettagdescription(“value”, “description”);

---

settagdescription(Input1, Input2) - used to set description of the tag. Input1 contains name of the tag; Input2 contains description.

Example:
settagdescription(“value”, “1”);

---

gettagenablealarms(Input1) - used to get tag information about enable or not alarms. Input1 contains name of the tag.

Example:
bool enablealarm = gettagenablealarms(“tagname”);

---

settagenablealarms(Input1, Input2) - used to enable or disable alarms for the tag. Input1 contains name of the tag; Input2 contains value (true for enable or false for disable).

Example:
settagenablealarms(“tagname”, “true”);

---

settagalarm(Input1, Input2, Input3) - used to enable or disable alarm for the tag. Input1 contains name of the tag; Input2 contains alarm’s type(“hihi”, “hi”, “lolo”, “lo”, “normal”); Input3 contains value (true for enable or false for disable).

Example:
settagalarm(“tagname”, “hihi”, “true”);

---

settagalarmlimit(Input1, Input2, Input3) - used to set alarm limit of the tag. Input1 contains name of the tag; Input2 contains alarm’s type(“hihi”, “hi”, “lolo”, “lo”); Input3 contains limit’s value.

Example:
settagalarmlimit(“tagname”, “hihi”, 500);

---

settagalarmpriority(Input1, Input2, Input3) - used to set alarm priority of the tag. Input1 contains name of the tag; Input2 contains alarm’s type(“hihi”, “hi”, “lolo”, “lo”,”normal”); Input3 contains priority’s value.

Example:
settagalarmpriority(“tagname”,“hihi”, 500);

---

settagalarmmessage(Input1, Input2, Input3) - used to set tag’s alarm message. Input1 contains name of the tag; Input2 contains alarm’s type(“hihi”, “hi”, “lolo”, “lo”,”normal”); Input3 contains message value.

Example:
settagalarmmessage(“tagname”, ”hihi”, “Value is to high”);

---

settagalarmdeadband(Input1, Input2) - used to set tag’s alarm deadband. Input1 contains name of the tag; Input2 contains deadband’s value.

Example:
settagalarmdeadband(“tagname”, 0.5);

---

settagenablehistory(Input1, Input2) - used to enable or disable tag’s history. Input1 contains name of the tag; Input2 contains value (true for enable or false for disable).

Example:
settagenablehistory(“tagname”, “true”);

---

settagstorageperiod(Input1, Input2) - used to set tag’s storage period. Input1 contains name of the tag; Input2 contains storage period’s value.

Example:
settagstorageperiod(“tagname”, 1000);

---

settagstoreindb(Input1, Input2) - used to enable or disable tag’s storage value in DB. Input1 contains name of the tag; Input2 contains value (true for enable or false for disable).

Example:
settagstoreindb(“tagname”, “true”);

---

settaghistorydeadband(Input1, Input2) - used to set tag’s history deadband. Input1 contains name of the tag; Input2 contains history deadband's value.

Example:
settaghistorydeadband(“tagname”, 1.0);

6.4.3.11.19 Dialog box library

infodialogbox(Input1, Input2) - used to call information dialog. Input1 contains title of the dialog box; Input2 contains message.

Example:
infodialogbox(“Title”, “Some message here”);

---

setdialogbox(Input1, Input2, Input3, Input4) - used to call set tag’s value dialog box. Input1 contains title of the dialog box; Input2 contains message, Input3 tag’s name, Input4 contains value to set.

Example:
setdialogbox("Value set", "Set value", "FanStartRotation", "true");

6.4.3.11.20 Trend's curve library

addcurve(Input1, Input2, Input3, Input4, Input5, Input6, Input7, Input8) - used to add curve in the trend. Input1 contains name of the trend; Input2 contains name of the curve; Input3 contains name of the tag; Input4 contains line width of the curve; Input5 red part of the curve’s color (0-255); Input6 green part of the curve’s color (0-255); Input7 blue part of the curve’s color (0-255); Input8 contain curve’s type (0-3).

Example:
addcurve("Trend", “curve”, “tagname”, 2, 255, 255, 0, 1);

---

removecurve(Input1, Input2) - used to remove curve from the trend. Input1 contains name of the trend; Input2 contains name of the curve;

Example:
removecurve("Trend", “curve”);

---

hidecurve(Input1, Input2, Input3) - used to hide or show curve on the trend. Input1 contains name of the trend; Input2 contains name of the curve; Input3 contains information about hide or not the curve in the trend.

Example:
hidecurve("Trend", “curve”, true);

6.4.3.11.21 Screen library

callpopup(Input1) - used to call popup screen. Input1 contains name of the popup screen.

Example:
callpopup(“Screen1").

---

callscreen(Input1) - used to call screen. Input1 contains name of the screen.

Example:
callscreen(“Screen1").

---

closepopup() - used to close popup screen.

Example:
closepopup().

---

currentscreenname() - used to get current screen name.

Example:
string screenname = currentscreenname().

---

previousscreenname() - used to get previous screen name.

Example:
string screenname = previousscreenname().

6.4.3.11.22 Files library

createfile(Input1) - used to create file. Input1 contains path to the file. If path contains "/" it means we use the full path. If path doesn't contain "/" the file will be created in DB 18 folder of the application. The function returns TRUE if the file is created.

Example:
bool created = createfile(“filename.txt”);
Response:
File is created in the DB 18 folder of the application.

Example:
bool created = createfile(“D:/filename.txt”);
Response:
File is created in the root of storage D.

deletefile(Input1) - used to delete file. Input1 contains path to the file. If path contains "/" it means we use the full path. If path doesn't contain "/" the file will be created in DB 18 folder of the application. The function returns TRUE if the file is deleted.

Example:
bool created = deletefile(“filename.txt”);
Response:
File is deleted from the DB 18 folder of the application.

---

fileexists(Input1) - used to check file exist or not. Input1 contains path to the file. If path contains "/" it means we use the full path. If path doesn't contain "/" the file will be created in DB 18 folder of the application. The function returns TRUE if the file is exist.

Example:
bool exist = fileexist(“filename.txt”);
Response:
Check the file with name "filename.txt" exist or not in the DB 18 folder of the application.

---

filedatetime(Input1) - used to get time of the file creation. Input1 contains path to the file. If path contains "/" it means we use the full path. If path doesn't contain "/" the file will be created in DB 18 folder of the application. The function returns time of the file creation in milliseconds since 1 January 1970.

Example:
Tags.datetime = datetimefrom("yyyy-MM-dd HH:mm:ss",filedatetime(Tags.filename));
Response:
In the tag with name **datetime** we'll get date time of the file creation with name in the tag with name **filename**. (For example: "2020-10-26 12:12:34").

---

renamefile(Input1, Input2) - used to rename file. Input1 contains path to the file you want to rename. Input2 contains new path with new name of the file. If path contains "/" it means we use the full path. If path doesn't contain "/" the file will be created in DB 18 folder of the application. The function returns TRUE if the file is renamed successfully.

Example:
renamefile(“filename.txt”,"D:/newfilename.txt");

---

copyfile(Input1, Input2) - used to copy file. Input1 contains path to the file you want to copy. Input2 contains path where you want to copy file. If path contains "/" it means we use the full path. If path doesn't contain "/" the file will be created in DB 18 folder of the application. The function returns TRUE if the file is copied successfully.

Example:
renamefile(“filename.txt”,"D:/filename.txt");

---

openfile(Input1) - used to open file. Input1 contains path to the file you want to open. If path contains "/" it means we use the full path. If path doesn't contain "/" the file will be created in DB 18 folder of the application. The function returns TRUE if the file is opened successfully.

Example:
openfile(“filename.txt”);

---

closefile() - used to close file. File opened by **openfile** command is closed.

Example:
closefile();

---

checkeof() - used to check end of file. File opened by **openfile** command is checked. Check the cursor at the end of file or not.

Example:
checkeof();

---

writeline(Input1) - used to write line into the file opened by **openfile** command. Input1 contains line is going to be written.

Example:
writeline(“The line is written”);

---

readline() - used to read line from the file opened by **openfile** command. The function returns line in string format.

Example:
string line = readline();

---

writebool(Input1) - used to write boolean value into the file opened by **openfile** command. Input1 contains boolean value is going to be written.

Example:
writebool(true);

---

readbool() - used to read boolean value from the file opened by **openfile** command. The function returns boolean value.

Example:
bool b = readbool();

---

writebyte(Input1) - used to write byte value into the file opened by **openfile** command. Input1 contains byte value is going to be written.

Example:
writebyte(-34);

---

readbyte() - used to read byte value from the file opened by **openfile** command. The function returns byte value.

Example:
byte b = readbyte();

---

writeshort(Input1) - used to write short value into the file opened by **openfile** command. Input1 contains short value is going to be written.

Example:
writeshort(934);

---

readshort() - used to read short value from the file opened by **openfile** command. The function returns short value.

Example:
short b = readshort();

---

writeint(Input1) - used to write int value into the file opened by **openfile** command. Input1 contains int value is going to be written.

Example:
writeint(-45934);

---

readint() - used to read int value from the file opened by **openfile** command. The function returns int value.

Example:
```
int b = readint();
```

---

writelong(Input1) - used to write long value into the file opened by **openfile** command. Input1 contains long value is going to be written.

Example:
```
writelong(8745934);
```

---

readlong() - used to read long value from the file opened by **openfile** command. The function returns long value.

Example:
```
long b = readlong();
```

---

writefloat(Input1) - used to write float value into the file opened by **openfile** command. Input1 contains float value is going to be written.

Example:
```
writefloat(8.34);
```

---

readfloat() - used to read float value from the file opened by **openfile** command. The function returns float value.

Example:
```
float b = readfloat();
```

---

writedouble(Input1) - used to write double value into the file opened by **openfile** command. Input1 contains double value is going to be written.

Example:
```
writedouble(9.14);
```

---

readdouble() - used to read double value from the file opened by **openfile** command. The function returns double value.

Example:

```
double b = readdouble();
```

---

writestring(Input1) - used to write string value into the file opened by **openfile** command. Input1 contains string value is going to be written.

Example:

```
writestring("Hello world");
```

---

readstring() - used to read string value from the file opened by **openfile** command. The function returns string value.

Example:

```
string str = readstring();
```

---

seek(Input1) - used to move cursor's position in the file opened by **openfile** command. Input1 contains offset of the cursor from the beginning.

Example:

```
seek(10);
```

---

getfilepos() - used to get cursor's position in the file opened by **openfile** command. The function returns cursor's position.

Example:

```
long pos = getfilepos();
```

---

filelength() - used to get length of the file opened by **openfile** command. The function returns length of the file in bytes.

Example:

```
long len = filelength();
```

---

saveproject(Input1) - used to save project to the file. Input1 contains name of the file (works only on desktop versions).

Example:

```
saveproject(“filename.tsp2”);
```

6.4.3.11.23 Report library

reporttopdf(Input1, Input2) - used to save report to PDF format file. Input1 contains name of the report. Input2 contains name of the pdf file. Report is saved in the folder you setup in Project properties->Report folder 114.

Example:
reporttopdf("Report1","reportfile");

---

reporttoxls(Input1, Input2) - used to save report to Excel format file. Input1 contains name of the report. Input2 contains name of the Excel file. Report is saved in the folder you setup in Project properties->Report folder 114.

Example:
reporttoxls("Report1","reportfile");

---

reporttofile(Input1, Input2) - used to save report to any format file. Input1 contains name of the report. Input2 contains name of the file. Report is saved in the folder you setup in Project properties->Report folder 114. Possible formats: pdf, xls, html, docx, csv, jpg, png, gif, rtf, pptx, ods, odt

Example:
reporttofile("Report1","reportfile.jpg");

---

reportsendbyemail(Input1, Input2, Input3, Input4) - used to send report by email. Input1 contains name of the report. Input2 contains name of the file saved and then send by e-mail. Report is saved in the folder you setup in Project properties->Report folder 114. Possible formats: pdf, xls, html, docx, csv, jpg, png, gif, rtf, pptx, ods, odt. Input3 contain subject of the E-mail message. Input4 body of the E-mail message. You E-mail client 114 should be setup correctly.

Example:
reportsendbyemail("Report1","reportfile.jpg", "Report title", "Here's report from TeslaSCADA");

---

mergepdffiles(Input1, Input2, Input3, Input4, Input5) - used to merge several pdf files. Input1 contains name of the destination file. Input2-Input5 contain name of files to merge. Left "" if you need to merge less then 4 files.

Example:
mergepdffiles("Report","Report1", "Report2", "Report3", "Report4");

mergexlsfiles(Input1, Input2, Input3, Input4, Input5) - used to merge several xls files. Input1 contains name of the destination file. Input2-Input5 contain name of files to merge. Left "" if you need to merge less then 4 files.

Example:
mergexlsfiles(”Report","Report1", "Report2", "Report3", "Report4");

6.4.3.11.24 Common RTU and TCP library

commonserverwrite(Input1, Input2) - used to write byte to the common server. Input1 contains name of the server. Input2 contains value to write.

Example:
commonserverwrite(”CommonServer", 1);

commonserverwritearray(Input1, Input2) - used to write byte array to the common server. Input1 contains name of the server. Input2 contains array to write.

Example:
byte bytes[8] = [01,04,00,01,00,02,32,11];
commonserverwritearray(”CommonServer", bytes);

commonserverwritestring(Input1, Input2) - used to write string to the common server. Input1 contains name of the server. Input2 contains string to write.

Example:
commonserverwritestring(”CommonServer", "Hello");

commonserverread(Input1) - used to read byte from the common server. Input1 contains name of the server.

Example:
int value = commonserverread(”CommonServer");

commonserverreadarray(Input1) - used to read byte array from the common server. Input1 contains name of the server.

Example:
byte bytes[8] = [00,00,00,00,00,00,00,00];

bytes = commonserverreadarray(”CommonServer");

---

commonserverreadstring(Input1, Input2) - used to read string from the common server. Input1 contains name of the server.
If Input2 is true ENTER (/r/n) value is excluded.
Example:
string text = commonserverreadstring(”CommonServer". true);

6.4.3.11.25 Call external software

callexternalsoftware(Input1) - used to call external software. Input1 contains command for calling external software. It depends on OS.

Examples:

- for MacOS: **callexternalsoftware**("*open /Applications/TextEdit.app*");
- for Windows: **callexternalsoftware**("*C:/Progra~1/somesoftware.exe*");
- for Android: **callexternalsoftware**("*opc.tesla.scada*"); *(name of the Android application package)*
- for iOS: **callexternalsoftware**("*http://www.youtube.com/watch?v=VIDEO_IDENTIFIER*"); *(youtube scheme for calling in iOS)*

---

callexternalsoftware2(Input1,Input2) - used to call external software. Input1 contains command for calling external software. Input2 separator for commands. It depends on OS.

Example:

- for Windows: **callexternalsoftware2**("*C:/Progra~1/somesoftware.exe*",";");

6.4.3.11.26 User library

adduser(Input1, Input2, Input3, Input4, Input5) - used to add User to the project. Input1 contains name of the user. Input2 contains password of the user. Input3 contains priority of the user. Input4 contains access level of the use. Input5 contains other (boolean) user properties. Input5 represented in Integer format, every bit of which is bound to property:
0 - Control functions.
1 - Acknowledge events.
2 - Delete events.
3 - Insert events.
4 - Insert history.
5 - Settings.
6 - Edit recipes.
7 - Save control operations.
8 - Can close.

9 - Can stop.

Example:
adduser("Operator", "111", 950, 200, 1023);

---

removeuser(Input1) - used to remove user from the project.

Example:
removuser("Operator");

6.4.3.11.27 Push library

sendpush(Input1, Input2) - send push notifications (Push notifications 122 should be enabled and topic should be setup). Input1 contains title of the notification, Input2 contains message of the notification.

Example:
sendpush("Alarm", "Temperature is too hight");

6.5 Tags

Create tag

To create a new tag select the menu item **Project** 67 **->New tag** or choose Tags 79 tab on the Project Window, click right button on it and choose New tag item.

You'll see the tag properties window on tabs:

- General 471 - general properties of the tag.
- Scaling 481 - properties to setup scaling parameters.
- Alarms 482 - properties to setup tag's alarms.
- History 483 - properties to setup history parameters for collecting tag's value.
- Script 486 - properties if you want to bind script to this tag.
- Cloud 487 - properties for TeslaCloud tag representation.

Copy tag

To copy tag on Tags 79 tab right click on the tag you want to copy and choose **Copy** tag item.

Delete tag

To delete tag on Tags 79 tab right click on the tag you want to delete and choose **Delete** tag item.

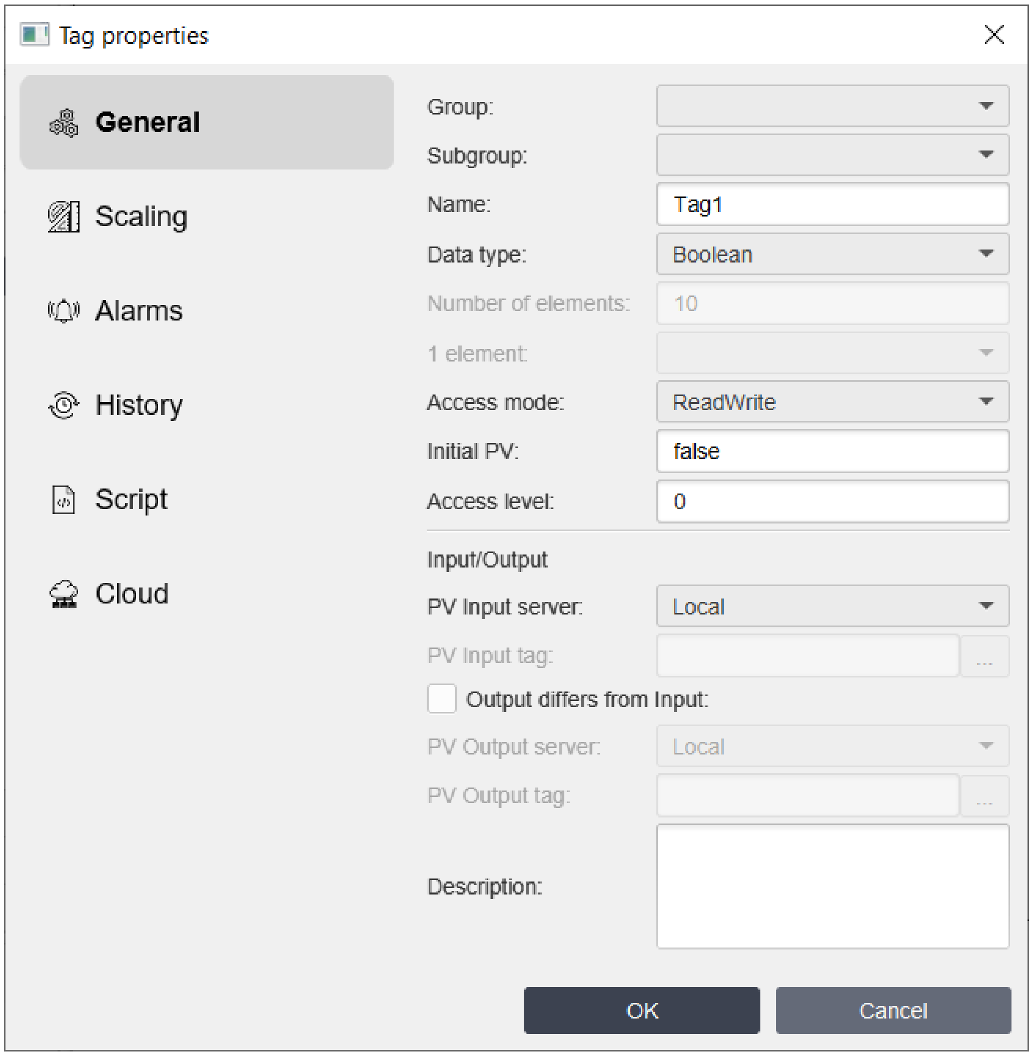
Open tag properties

To open tag properties on Tags 79 tab:

1. Double click on the tag properties which you want to open.
or
2. Right click on the tag properties which you want to open and choose **Tag properties** item.

See **Project Window->Tags** 79 tab for more information about possible operation with tags.

6.5.1 General tab


Tag properties

General
Scaling
Alarms
History
Script
Cloud

Group:
Subgroup:
Name: Tag1
Data type: Boolean
Number of elements: 10
1 element:
Access mode: ReadWrite
Initial PV: false
Access level: 0

Input/Output
PV Input server: Local
PV Input tag:
Output differs from Input:
PV Output server: Local
PV Output tag:
Description:

OK
Cancel

List of properties:

Property	Description
Group	Select group for the tag.
Subgroup	Select subgroup for the tag.

Property	Description
Name	Name of the tag. The name should be unique for the project. You can use indirect name by using group and subgroup names. To do this use curve braces {}. For example if group's name is “group” and subgroup’s name is “1” you can enter {group}{subgroup}name and you’ll get name of the tag is “group1name”.
Data type	The user tells the program in what form to store information. When declaring a new variable, you must specify its type depending on the range of possible values ?that it can take. It is especially important to specify the correct data types in very large projects, as this will have a significant impact on performance. For example, for a variable that stores integer values ?from 0 to 100, correctly specify the Byte type instead of Integer. Although the program will work with both types, in the case of using the Byte type the variable will occupy 8 bits in memory, instead of 32 bits when using the Integer type.

Data type	Memory	Description	Range
Boolean	1 bit	Boolean True (1) or False (0) values	0...1
Byte	8 bit	Signed integers	-128...127
Short	16 bit	Signed integers	-32768... 32767
Int	32 bit	Signed integers	-2147483648... 2147483647
Long	64 bit	Signed integers	-9223372036854775808... 9223372036854775807

Data type	Memory	Description	Range
Float	32 bit	Floating point numbers	1.18 x 10E-38...3.4 x 10E38
Double	64 bit	Floating point numbers	2.23 x 10E-308 ... 1.79 x 10E308
String	-	String	
Array	-	Array of elements (Byte, Short, Int, Float).	

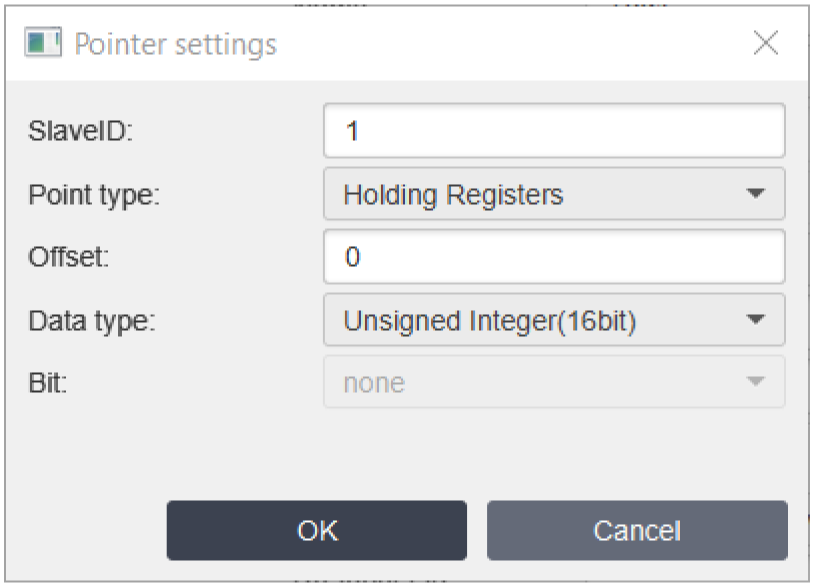
Property	Description
Number of elements	If you select String or Array data types enter number of elements (letters).
1 element	If you select String or Array data types choose data type of 1 element (letter).
Access mode	Select access mode for the tag: Read, Write or ReadWrite.
Initial PV	Enter default tag's value into Initial PV. In the Initial PV ?eld you can also use indirect values:{group}, {subgroup} and {name}.
Access level	If tag's access level greater then access level of the current user the value couldn't be written to the current tag by this user.
Input/Output	In the Input/Output section bind tag to the server's tag. In the PV Input server choose server you want to bind. Then click «...» button to set up server's tag settings or enter it into the PV Input tag. In the PV input tag you can use indirect values {group}, {subgroup} and {name}.
Output differs from input	If the output server's tag differs from the input server's tag check Output differs from input and select PV Output server and enter PV Output tag. In the PV output tag you can use indirect values {group}, {subgroup} and {name}. When you check this property, you can force data to be written to the tag even when it does not differ from the previous one.

Property	Description
Description	Description of the tag. In the description you can use indirect values {group}, {subgroup} and {name}.

Depending on the type of PV Input server or PV Output server you'll see different server's tag (pointer) settings window:

- Modbus tag settings. 474
- Siemens tag settings 475.
- Allen Bradley tag settings 476.
- Micrologix tag settings 477.
- OPC UA tag settings. 477
- MQTT tag settings 478.
- Omron tag settings. 479
- BACnet tag settings. 479
- Raspberry GPIO settings 480.

6.5.1.1 Modbus tag settings


Pointer settings

SlaveID: 1

Point type: Holding Registers

Offset: 0

Data type: Unsigned Integer(16bit)

Bit: none

List of properties:

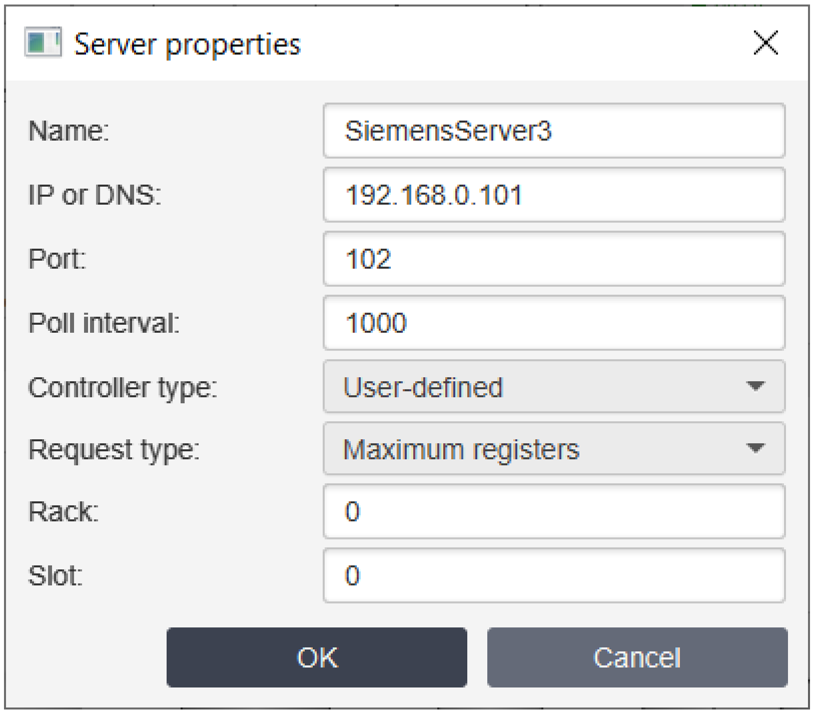
Property	Description
SlaveID	SlaveID of Modbus device.
Point type	Point type of the register.
Offset	Offset of the Modbus register.
Data type	Data type of the Modbus pointer. The tag's data type overrides the data type of Modbus pointer during using in

Property	Description
	project.
Bit	Choose number of bit if the data type of the pointer is binary.

After clicking OK you'll get pointer settings in **PV Input tag** encoded in String like:
s=1;pt=3;o=0;dt=2;
where:

- **s** - SlaveID.
- **pt** - Point type.
- **o** - Offset.
- **dt** - Data type.

6.5.1.2 Siemens tag settings


Server properties

Name:	SiemensServer3
IP or DNS:	192.168.0.101
Port:	102
Poll interval:	1000
Controller type:	User-defined
Request type:	Maximum registers
Rack:	0
Slot:	0

List of properties:

Property	Description
Storage area	Choose storage area of the siemens tag: I,Q,M or DB.
DB?	Write DB number in the DB? ?eld if you choose DB storage area.
Data type	Data type of the Siemens pointer. The tag's data type overrides the data type of Siemens pointer during using in project.

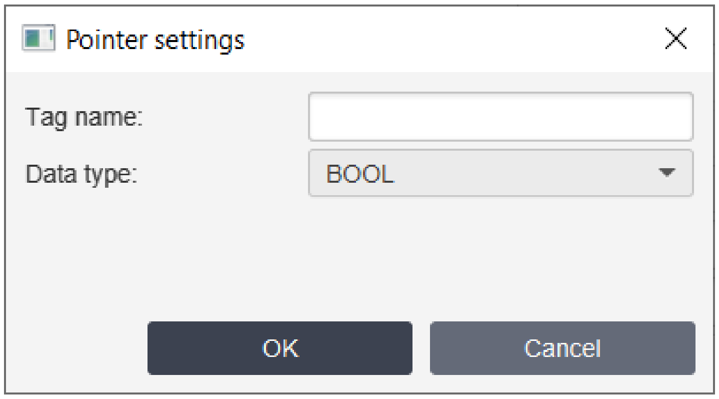
Property	Description
Byte?	Enter byte number of the area into Byte? ?eld.
Bit	Choose number of bit if the data type of the pointer is Bit.

After clicking OK you'll get pointer settings in **PV Input tag** encoded in String like:
I0.0 [a=0;db=0;dt=0;bn=0;b=0;]
where:

- **a** - Storage area.
- **db** - DB? .
- **dt** - Data type.
- **bn** - Byte? .
- **b** - Bit

(I0.0 - its just for Siemens users and it's not used in encoding)

6.5.1.3 Allen Bradley tag settings


Pointer settings
Tag name:
Data type: BOOL

List of properties:

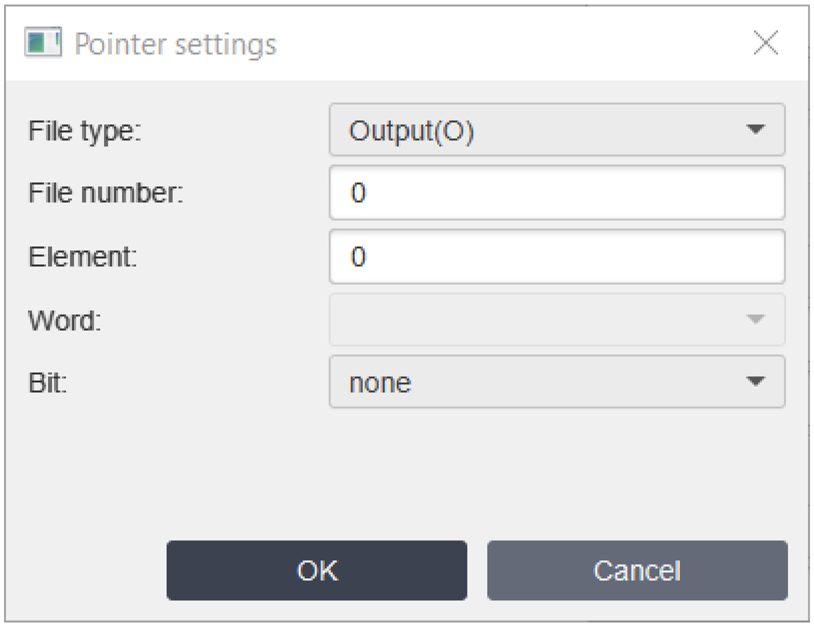
Property	Description
Tag name	Enter tag name.
Data type	Data type of the Allen Bradley pointer. The tag's data type overrides the data type of AB pointer during using in project.

After clicking OK you'll get pointer settings in **PV Input tag** encoded in String like:
type=0;name=Tag
where:

- **type** - Data type.
- **name** - Tag name.

6.5.1.3.1 Micrologix tag settings

If you choose Micrologix or SLC500 controller type in the Allen Bradley server settings you'll see the following window:



File type: Output(O)
File number: 0
Element: 0
Word:
Bit: none

List of properties:

Property	Description
File type	Choose file type of the server's tag.
File number	Write file number in the ?eld.
Element	Enter element of the servers tag.
Word	Choose word for some ?le types.
Bit	Choose number of bit.

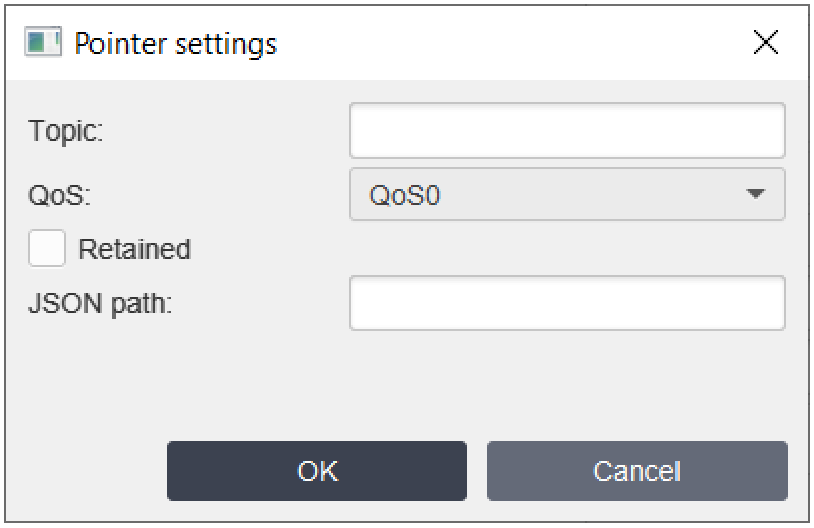
After clicking OK you'll get pointer settings in **PV Input tag** encoded in String like:
O0:0
where:

- **O** - File type.
- **0** - File number.
- **0** - Element.

6.5.1.4 OPC UA tag settings

After clicking «...» button when you choose OPC UA server you'll get into the Address Space window. Browse through the address space by double clicking on the nodes and choose the tag(node) you need by clicking right button on it and choosing Select menu item on the popup window. You'll get NodeID in PV Input Tag.

6.5.1.5 MQTT tag settings



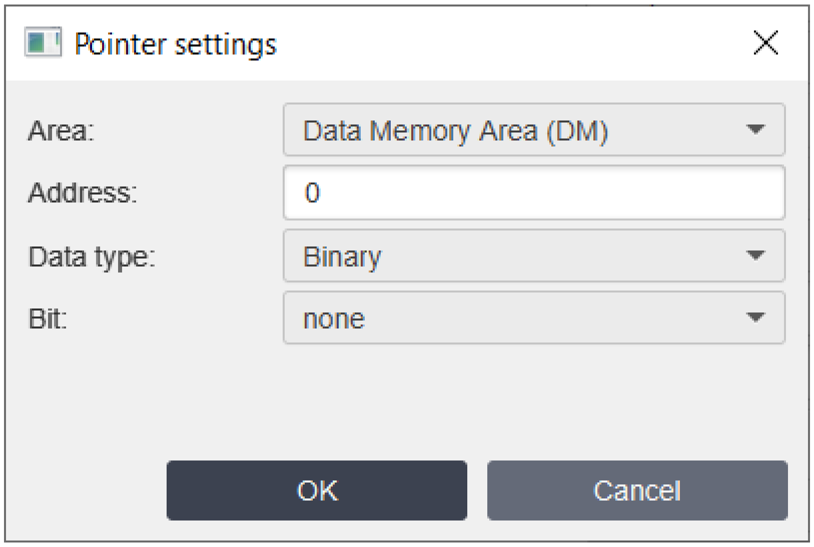
List of properties:

Property	Description
Topic	Topic of the MQTT server.
QoS	Choose QoS of the MQTT tag.
Retained	Check retained if you want to use this property.
JSON path	If MQTT response contains JSON array enter JSON path to parse the value. For example if response is: «{foo: bar, lat: 0.23443, long: 12.3453245}» to get long value enter «long» in the ?eld. If response is not JSON format left ?eld empty. If response contains multi dimension JSON format, separate keys by commas without blank spaces.

After clicking OK you'll get pointer settings in **PV Input tag** encoded in String like:
t=temperature;qos=0;r=1;json=
where:

- **t** - Topic.
- **qos** - QoS.
- **r** - Retained.
- **json** - JSON path.

6.5.1.6 Omron tag settings


Pointer settings

Area: Data Memory Area (DM)

Address: 0

Data type: Binary

Bit: none

List of properties:

Property	Description
Area	Choose address area.
Address	Address of the tag.
Data type	Data type of the Omron pointer. The tag's data type overrides the data type of Omron pointer during using in project.
Bit	Choose number of bit if the data type of the pointer is binary.

After clicking OK you'll get pointer settings in **PV Input tag** encoded in String like:
D00000 [a=0;ad=0;dt=16;]
where:

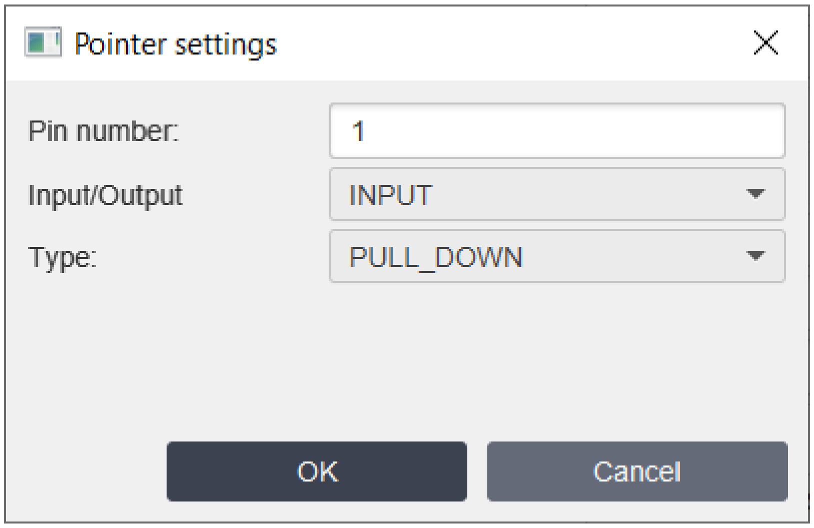
- **a -** Area**.**
- **ad** - Address.
- **dt** - Data type.
- **b** - Bit.

(D0000 - its just for Omron users and it's not used in encoding)

6.5.1.7 BACnet tag settings

After clicking «...» button when you choose BACnet server you'll get into the Address Space window. Browse through the address space by clicking on the remote devices and choose the object you need by clicking right button on it and choosing Select menu item on the popup window. You'll get obect identifier in PV Input Tag.

6.5.1.8 Raspberry GPIO tag settings



Pin number: 1
Input/Output: INPUT
Type: PULL_DOWN

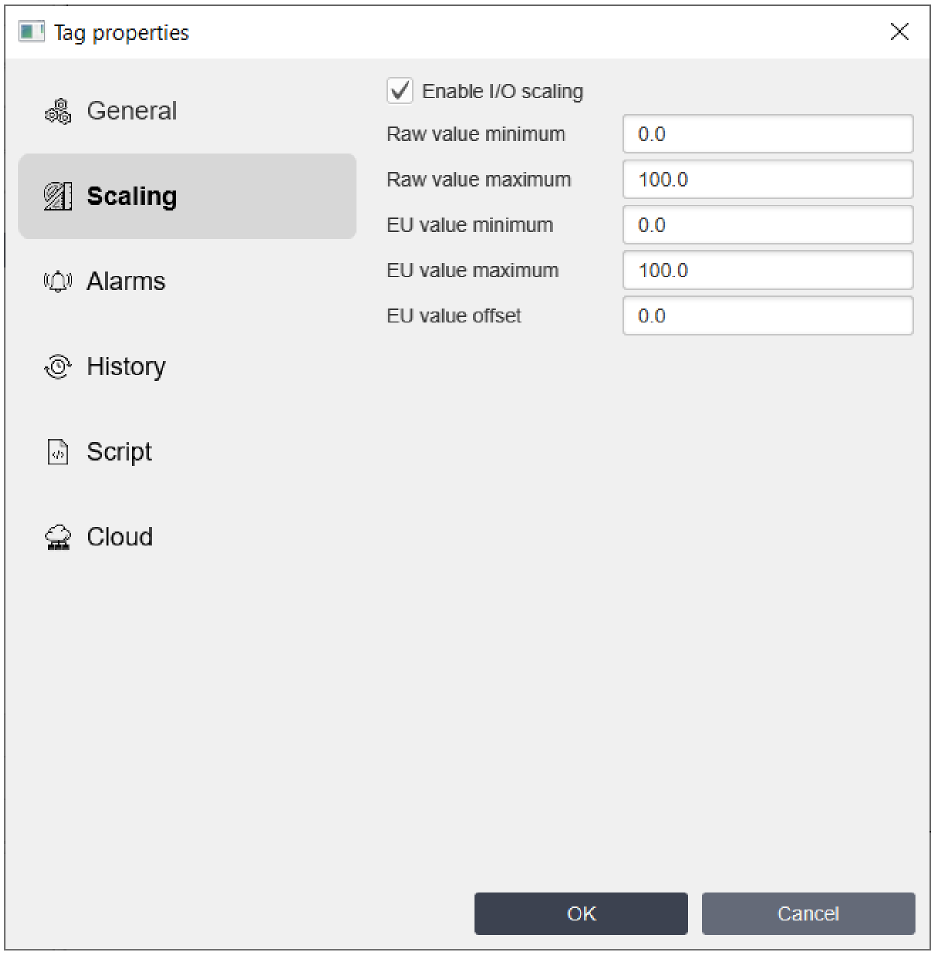
List of properties:

Property	Description
Pin number	Pin number of Raspberry PI GPIO.
Input/Output	Use contact as Input or Output.
Type	Type of the Input.

After clicking OK you'll get pointer settings in **PV Input tag** encoded in String like:
pin=3;o=0;t=1;
Where:

- **pin** - Pin number.
- **o** - Output or Input.
- **t** - Type.

6.5.2 Scaling tab



☑ Enable I/O scaling

Raw value minimum	0.0
Raw value maximum	100.0
EU value minimum	0.0
EU value maximum	100.0
EU value offset	0.0

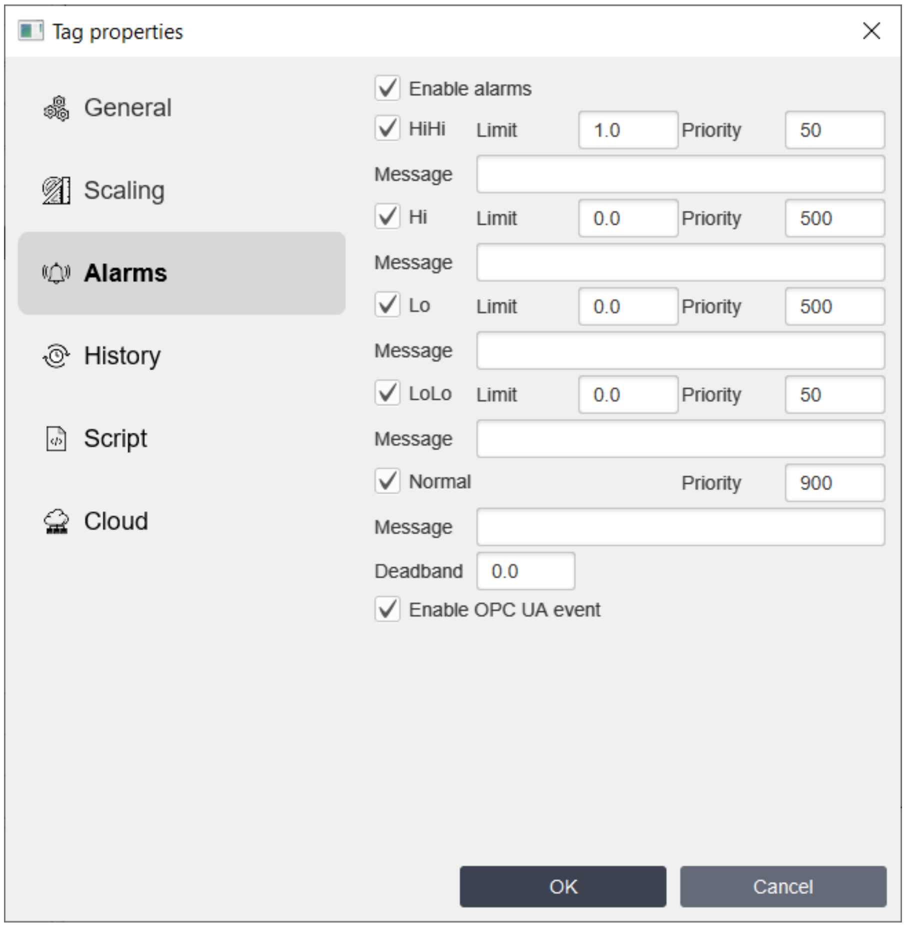
List of properties:

Property	Description
Enable I/O scaling	Check it if you want to scale a value get from the server field.
Raw value minimum	Enter minimum server tag's value into this property field.
Raw value maximum	Enter maximum server tag's value into this property field.
EU value minimum	Enter minimum tag's value in engineer units into this property field.
EU value maximum	Enter maximum tag's value in engineer units into this property field.
EU value offset	Write tag's value offset in this property field.

When you get some value from the server application use this formula:

value = (value-rawmin)*(eumax-eumin)/ (rawmax-rawmin)+eumin + offset

6.5.3 Alarms tab



☑ Enable alarms

☑ HiHi Limit 1.0 Priority 50

Message

☑ Hi Limit 0.0 Priority 500

Message

☑ Lo Limit 0.0 Priority 500

Message

☑ LoLo Limit 0.0 Priority 50

Message

☑ Normal Priority 900

Message

Deadband 0.0

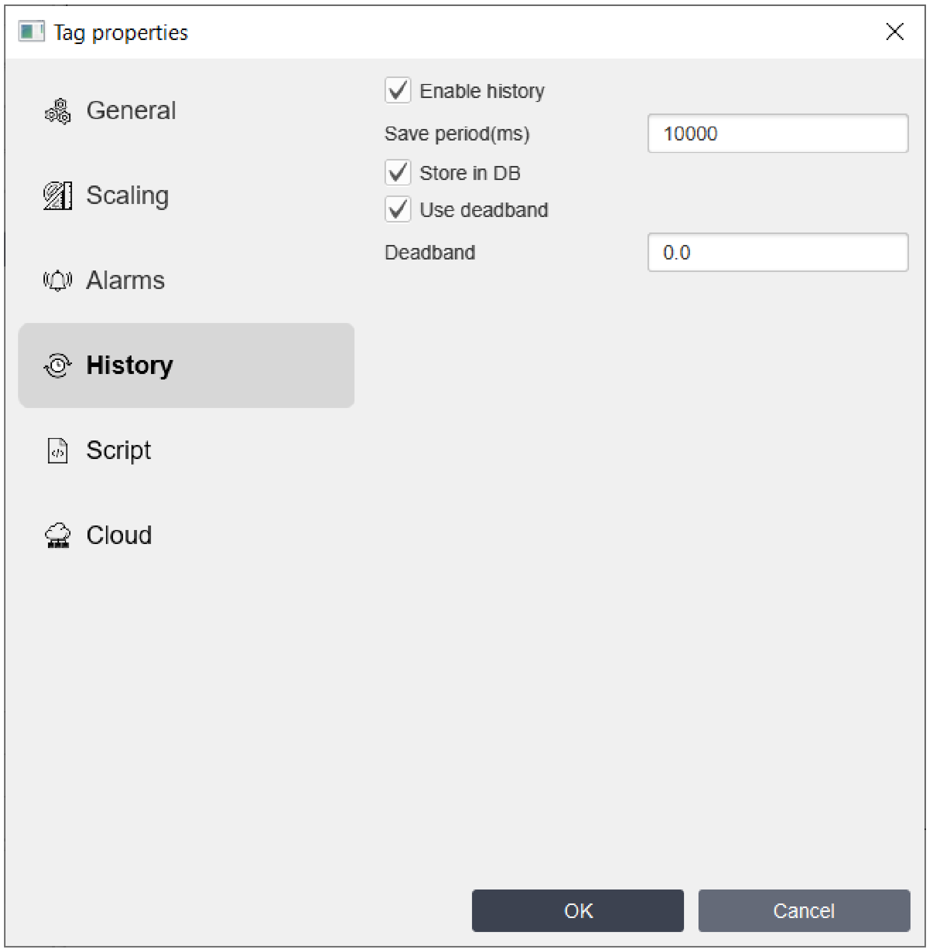
☑ Enable OPC UA event

List of properties:

Property	Description
Enable alarms	Check this property if you want to use alarms for this tag.
HiHi, Hi, Lo, LoLo, Normal	Check HiHi, Hi, Lo, LoLo or Normal if you want to use the correspondent alarm(event).
Limit	Write this property for the correspondent alarm(event). If the value of the tag plus Deadband will be more than HiHi or Hi limit the correspondent alarm will be called and be written into Events database 110. If the value of the tag minus Deadband will be less than LoLo or Lo limit the correspondent alarm will be raised and be written into Events database 110.
Priority	Enter this property for the correspondent alarm(event). If the priority of the alarm(event) is less than value of

Property	Description
	Noti?cations(Priority<) 113 you set in the project properties the noti?cation dialog will be called.
Message	Enter this property for the correspondent alarm(event). In the message you can use indirect values {group}, {subgroup}, {name} and {description}. Also you can use keyword {value} for displaying current value.
Deadband	Hysteresis to avoid triggering an alarms when the tag value fluctuates slightly.
Enable OPC UA event	Check this property if you bind this tag to the OPC UA server tag(node) and you want to use EventNoti?er of this tag(node).

6.5.4 History tab



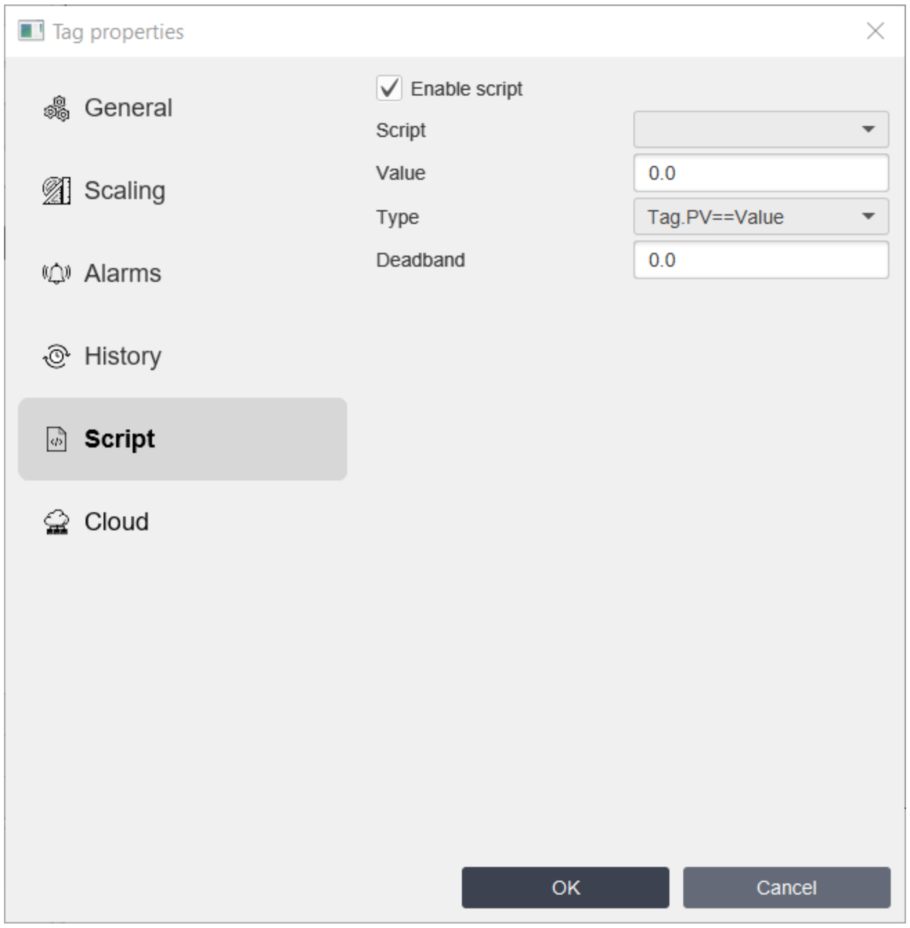
☑ Enable history
Save period(ms) 10000
☑ Store in DB
☑ Use deadband
Deadband 0.0

List of properties:

Property	Description
Enable history	Check this property if you want to use history for this tag.
Storage period(ms)	Enter period of saving values in operating memory or in general database that you can setup in Project properties->Events/History tab 110. For History DB 494 that are configured in Databases 86 tab it doesn't work. For History DB 494 you setup period of storage in its properties.
Store in DB	Check this property if you want to store data in general history database that you can setup in Project properties->Events/History tab 110. For History DB 494 that are configured in Databases 86 tab you have to add this tag in the Collection. To have possibility to add tag in the Collection of History DB you no need to check "Store in DB" property.
Use deadband	Check this property if you want to use

Property	Description
	hysteresis for storage history information. If the tag's value minus the last saved tag's value less than value set in Deadband property the tag's value will not be saved in the general database. This property works only for general database that you can setup in Project properties->Events/History tab 110. For History DB it doesn't work.
Deadband	This property contains deadband (hysteresis) value.

6.5.5 Script tab



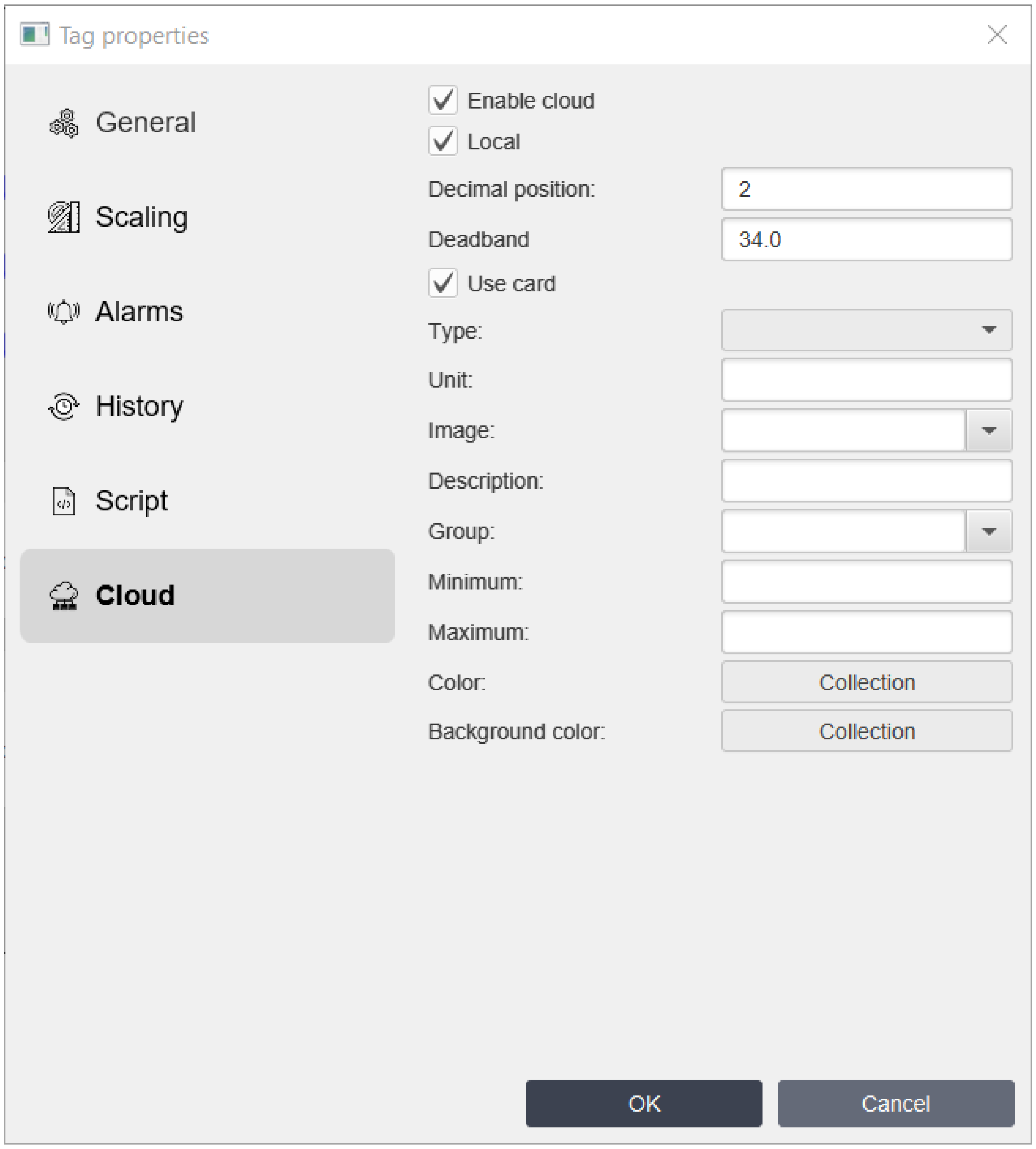
☑ Enable script

Script	
Value	0.0
Type	Tag.PV==Value
Deadband	0.0

List of properties:

Property	Description
Enable script	Check this property if you want to use script bind to this tag's value.
Script	Choose script you want to bind to this tag’s value.
Value	Enter value you want to compare with current tag's value.
Type	Choose type of the compare operation. Script is executed when condition becomes TRUE from FALSE.
Deadband	Hysteresis for compare operation. If tag's value plus/minus deadband greater/less Value (depends on type of the compare operation) script will be executed.

6.5.6 Cloud



☑ Enable cloud
☑ Local

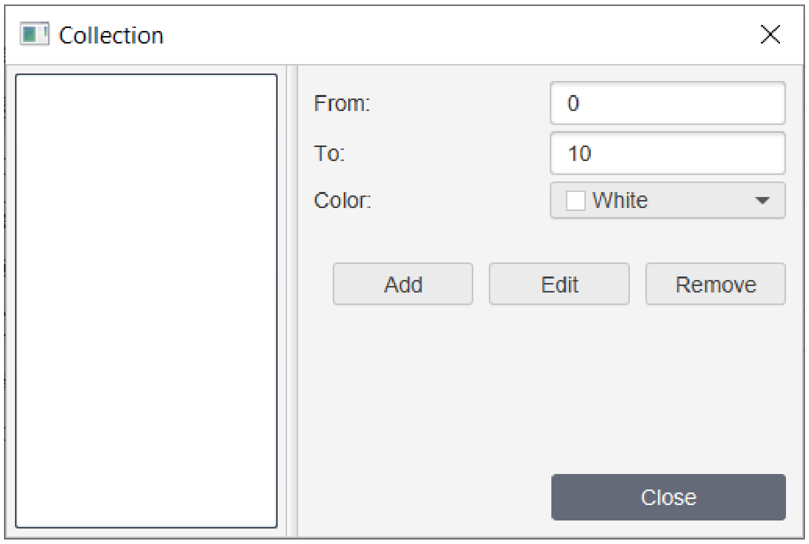
Decimal position:	2
Deadband	34.0

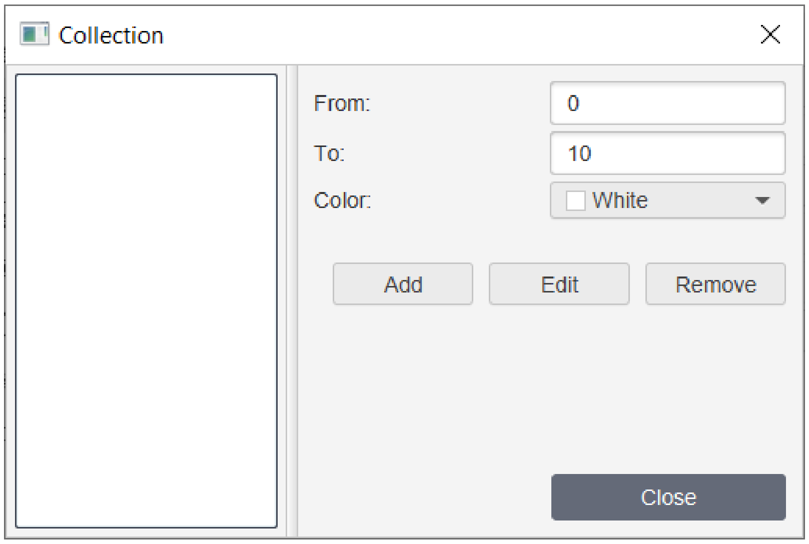
☑ Use card

Type:	
Unit:	
Image:	
Description:	
Group:	
Minimum:	
Maximum:	
Color:	Collection
Background color:	Collection

List of properties:

Property	Description
Enable cloud	Check this property if you want to use this tag on the cloud.
Local	Check if you want to use this tag locally and don't send value changes on the cloud.
Decimal position	Decimal position of the tag's value.
Deadband	Deadband for the tag's value. If the tag's value minus the last sent to the cloud tag's value less than value set in Deadband property the tag's value will not be sent.

Property	Description
Use card	Check if you want to use card for this tag.
Type	Type of the tag's card to represent this tag's value.
Unit	Unit of the tag's value.
Image	Icon image for the tag's card. You can choose it from the list or enter name from Material icons list.
Description	Description of the tag's card.
Group	Group of the tags. You can sort tags by these groups on the dashboard.
Minimum	Minimum of the tag's value. It's useful for some tag's cards.
Maximum	Maximum of the tag's value. It's useful for some tag's cards.
Color	Color of the tag's card elements on the dashboard: If you click **Collection** button. You'll see the window:  Collection From: 0 To: 10 Color: White Add Edit Remove Close where: • **From** - enter the value from which the object will have the color of the range. • **To** - enter the value to which the object will have the color of the range. • **Color** - choose color for this range. You can **Add**, **Edit** or **Remove** collection element of color conditions.
Background color	Color of the tag's card background on the dashboard: If you click **Collection** button. You'll see the window:

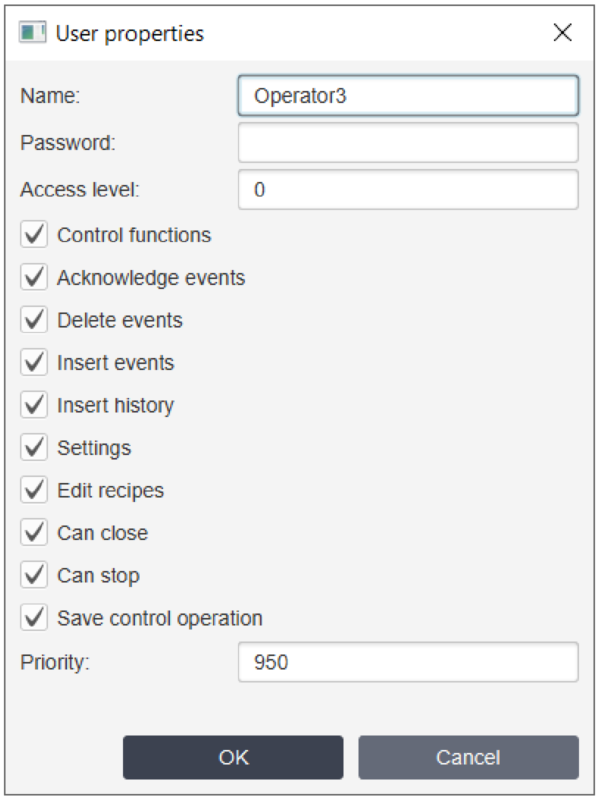
Property	Description
	 Collection From: 0 To: 10 Color: White where: • **From** - enter the value from which the object will have the color of the range. • **To** - enter the value to which the object will have the color of the range. • **Color** - choose color for this range. You can **Add**, **Edit** or **Remove** collection element of color conditions.

6.6 Users

Create user

User is not a mandatory element of the project. You can use or not use in it. To create a new user select the menu item **Project** 67 **->** **New User** or choose Users in the Project Window->Users 84, click right button on it and choose New User item.

You'll see the following window:


User properties

Name: Operator3

Password:

Access level: 0

☑ Control functions

☑ Acknowledge events

☑ Delete events

☑ Insert events

☑ Insert history

☑ Settings

☑ Edit recipes

☑ Can close

☑ Can stop

☑ Save control operation

Priority: 950

List of properties:

Property	ST script field*	Description
Name	**name**	Name of the user.
Password	**password**	Write password for the current user.
Access level	**accesslevel**	Access level of the current user. Depending of this user can be restricted on writing values in some tag and opening some screens.
Control functions	**controlfunctions**	Check if you want the user can write values into the server's tags.
Acknowledge events	**acknowledge events**	Check if you want the user can acknowledge events in events database 110.
Delete events	**deleteevents**	Check if you want the user can delete events from events database 110.
Insert events	**insertevents**	Check if you want that during running application events are inserted into events database 110 when the user is logged in.
Insert history	**inserthistory**	Check if you want that during running application history information is inserted into

Property	ST script field*	Description
		history database 110 when the user is logged in.
Settings	**settings**	Check if you want the user can enter Settings menu of TeslaSCADA2 Runtime application.
Edit recipes	**editrecipes**	Check if you want the user can Add, Edit and Delete recipes ?elds.
Save control operation	**savecontrolo perations**	Check if you want to save this user control operations in events database 110. (it will be saved if you check Enable alarms in Tag properties)
Can stop	**canstop**	Check if you want to let this user to stop execution of the project.
Can close	**canclose**	Check if you want to let this user to close application - TeslaSCADA2 IDE or TeslaSCADA2 Runtime
Priority	**priority**	Priority of the user control operations events that will be save in event database 110.

*** This field is used in ST scripts. For example: Users.Operator0.controlfunctions = 0. After this script command is executed user with name Operator0 can't write values in the tag.**

Open user properties

To open user properties on Users 84 tab:

1. Double click on the user properties which you want to open.

or

2. Right click on the user properties which you want to open and choose **User properties** item.

Copy user

To copy user on Users 84 tab right click on the user you want to copy and choose **Copy user** item.

Delete user

To delete user on Users 84 tab right click on the user you want to delete and choose **Delete user** item.

6.7 Databases

Create database

Database is not a mandatory element of the project. You can use or not use it in the project. Database consists of 3 types:

- Recipe 492.
- History 494.
- Odoo ERP 497.

Open database properties

To open database properties on Databases 86 tab:

1. Double click on the database properties which you want to open.

or

2. Right click on the database properties which you want to open and choose **Database properties** item.

Copy database

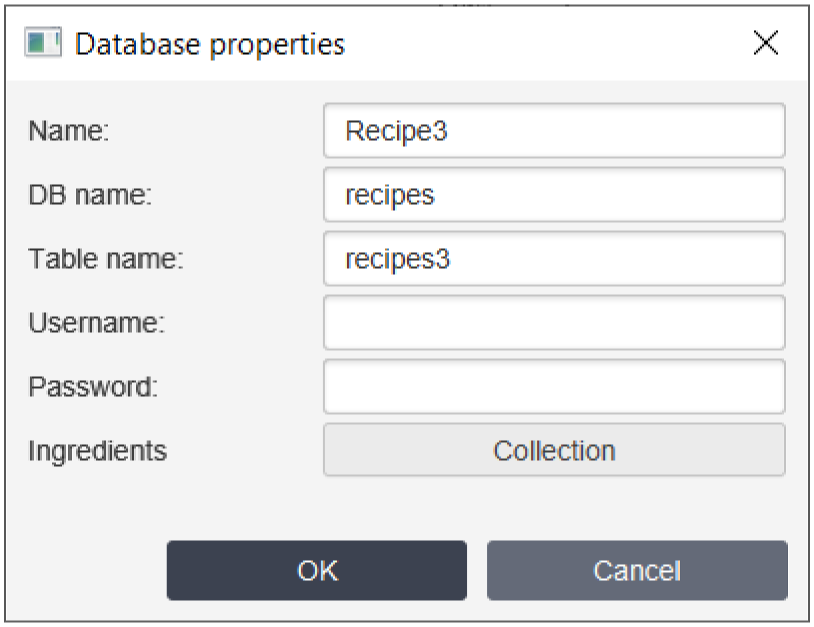
To copy database on Databases 86 tab right click on the database you want to copy and choose **Copy database** item.

Delete database

To delete database on Databases 86 tab right click on the database you want to delete and choose **Delete database** item.

6.7.1 Recipe

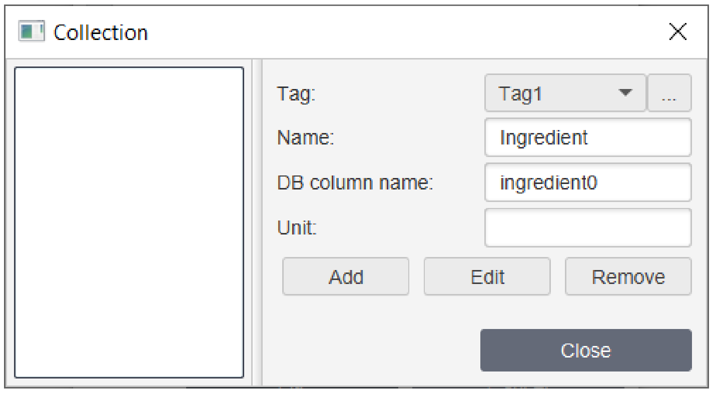
To create a new recipe select the menu item **Project** 67 **and New Database** 69 **->Recipe** or choose Databases 86 on the Project Window, click right button on it and choose **New Database>Recipe** item. You'll see the following window:


Database properties

Name:	Recipe3
DB name:	recipes
Table name:	recipes3
Username:	
Password:	
Ingredients	Collection

List of properties:

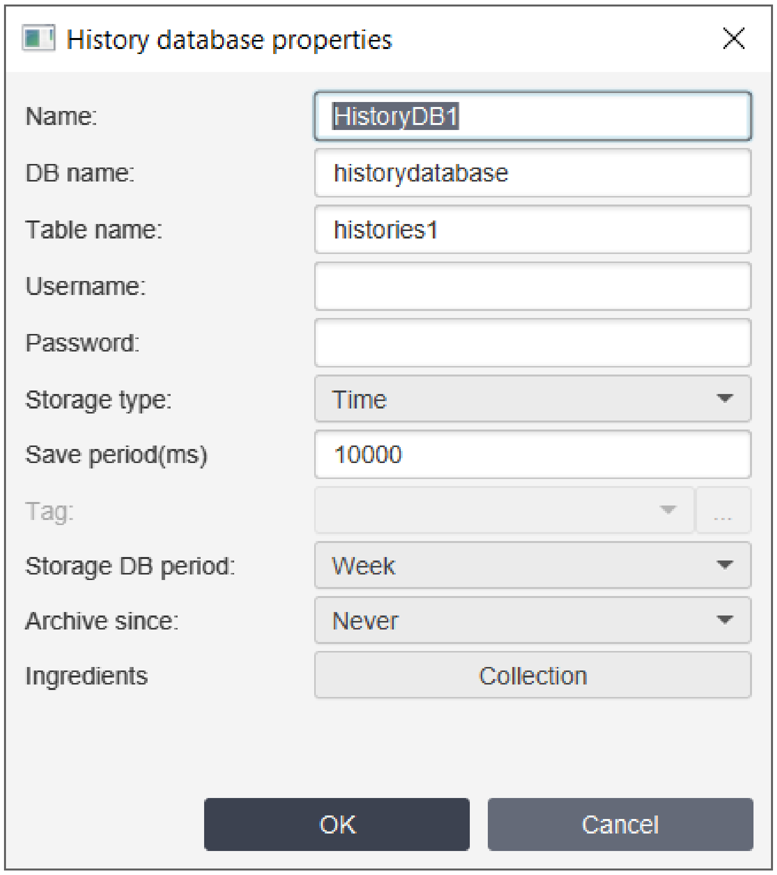
Property	Description
Name	Name of the recipe.
DB name	Write name of the database for the current recipe. If you enter the simple name like recipes for example you will connect to the SQLLite database. The SQLLite database ?le .db will be created in /DB/ 18 folder. If you choose names beginning with jdbc:mysql: like jdbc:mysql://192.168.0.104:3306/test the application will connect to MySQL* 31 database. if you choose names beginning with jdbc:sqlserver: like jdbc:sqlserver://192.168.1.17:1433;databaseName=test where test name of the database you want to connect. The application will connect to MSSQL* 55 database. If you choose names beginning with jdbc:postgresql: like jdbc:postgresql://192.168.1.17:5432/test where test name of the database you want to connect. The application will connect to PostgreSQL* 58 database.
Table name	Write table name of the database for the recipe.
Username	Username if needed for MySQL databases.
Password	Password if needed for MySQL database.
Ingredients	Click **Collection** to ?ll up ingredients of the recipe. After clicking Collection button you'll see the following window:

Property	Description
	 Collection Tag: Tag1 Name: Ingredient DB column name: ingredient0 Unit: where: 1. Choose **Tag** you want to bind to the ingredient. 2. Enter **Name** of the ingredient. 3. Enter **DB** column name for the database. 4. Enter **Unit** of the DB ingredient.

*** for mobile device is possible to use only SQLLite databases.**

6.7.2 History DB

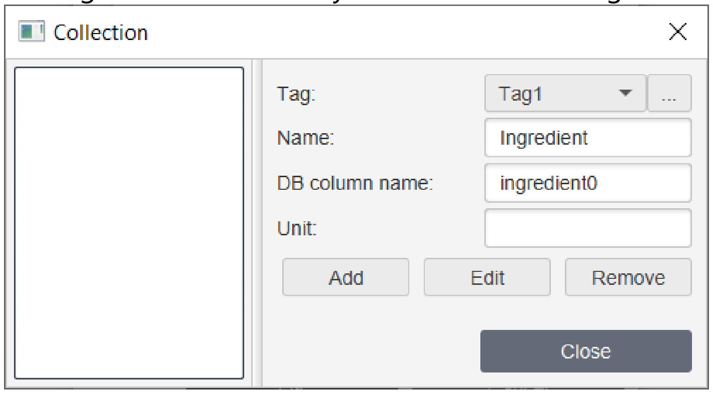
To create a new history db select the menu item **Project** 67 **and New Database** 69 **->History** or choose Databases 86 on the Project Window, click right button on it and choose **New Database>History** item. You'll see the following window:


History database properties

Name:	HistoryDB1
DB name:	historydatabase
Table name:	histories1
Username:	
Password:	
Storage type:	Time
Save period(ms)	10000
Tag:	
Storage DB period:	Week
Archive since:	Never
Ingredients	Collection

List of properties:

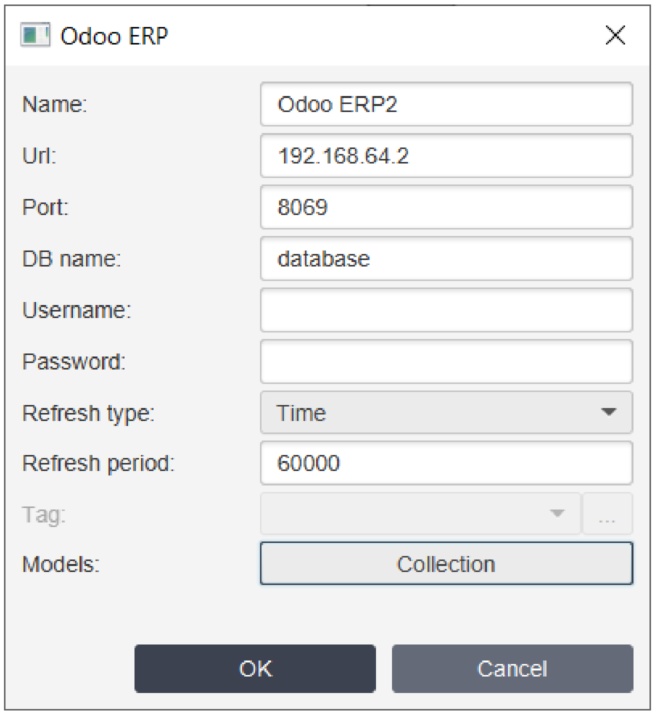
Property	Description
Name	Name of the history database.
DB name	Write name of the database for the current history. If you enter the simple name like hisstory for example you will connect to the SQLLite database. The SQLLite database ?le .db will be created in /DB/ 18 folder. If you choose names beginning with jdbc:mysql: like jdbc:mysql://192.168.0.104:3306/test the application will connect to MySQL* 31 database.if you choose names beginning with jdbc:sqlserver: like jdbc:sqlserver://192.168.1.17:1433;databaseName=test where test name of the database you want to connect. The application will connect to MSSQL* 55 database. If you choose names beginning with jdbc:postgresql: like jdbc:postgresql://192.168.1.17:5432/test where test name of the database you want to connect. The application will connect to PostgreSQL* 58 database.

Property	Description
Table name	Write table name of the database for the recipe.
Username	Username if needed for MySQL databases.
Password	Password if needed for MySQL database.
Storage type	Choose storage type - Time or Tag. If you chose Time every Save period values of tags included in Ingredients will be saved into history database. If you choose Tag values of tags will be saved when Tag's value become True(1).
Archive since	Select an archive period. The data collected before the archive period is stored in the archive database. The data collected for the selected period is stored in the main database. This improves performance when querying the underlying database.
Save Period(ms)	Time interval of saving Ingredients tag values into history database. This property used when you choose Time Storage type.
Tag	Choose Tag dependent on which value (when value become True(1)) Ingredients tag values will be saved in history database.
Ingredients	Click Collection to ?ll up ingredients of the history. After clicking Collection button you'll see the following window:  Tag: Tag1 Name: Ingredient DB column name: ingredient0 Unit: Where: 1. Choose Tag you want to bind to the ingredient. 2. Enter Name of the ingredient. 3. Enter DB column name for the database. 4. Enter Unit of the DB ingredient.

*** for mobile device is possible to use only SQLLite databases**.

6.7.3 Odoo ERP

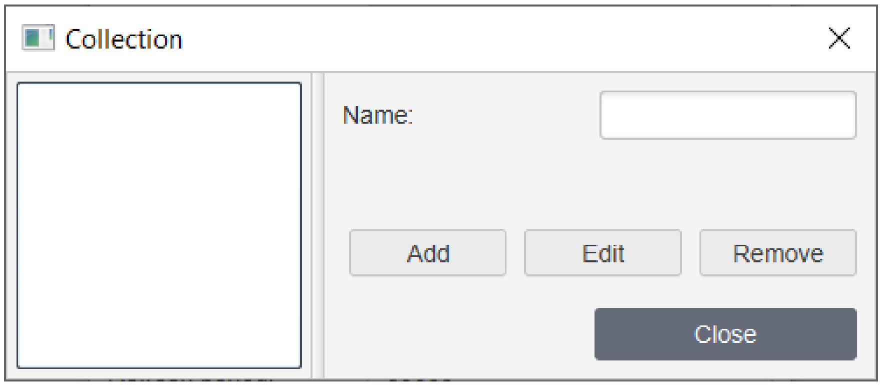
To create a new Odoo ERP connection (**we've tested it only with Odoo 12 and Odoo14 version. To work with new versions Odoo (13, 14) you have to use TeslaSCADA2 starting from version 2.45.1**) select the menu item Project 67 and New Database 69 ->Odoo ERP or choose Databases 86 on the Project Window, click right button on it and choose New Database>Odoo ERP item. You'll see the following window:



Name:	Odoo ERP2
Url:	192.168.64.2
Port:	8069
DB name:	database
Username:	
Password:	
Refresh type:	Time
Refresh period:	60000
Tag:	
Models:	Collection

List of properties:

Property	Description
Name	Name of the Odoo ERP connection.
Url	Url of the Odoo ERP.
Port	Port of the Odoo ERP.
DB name	Name of the Odoo ERP database.
Username	Username for connecting to the Odoo ERP databases.
Password	Password for connecting to the Odoo ERP database.
Refresh type	Choose Refresh type to renew data information.
Refresh period(ms)	Refresh period of Odoo ERP information.

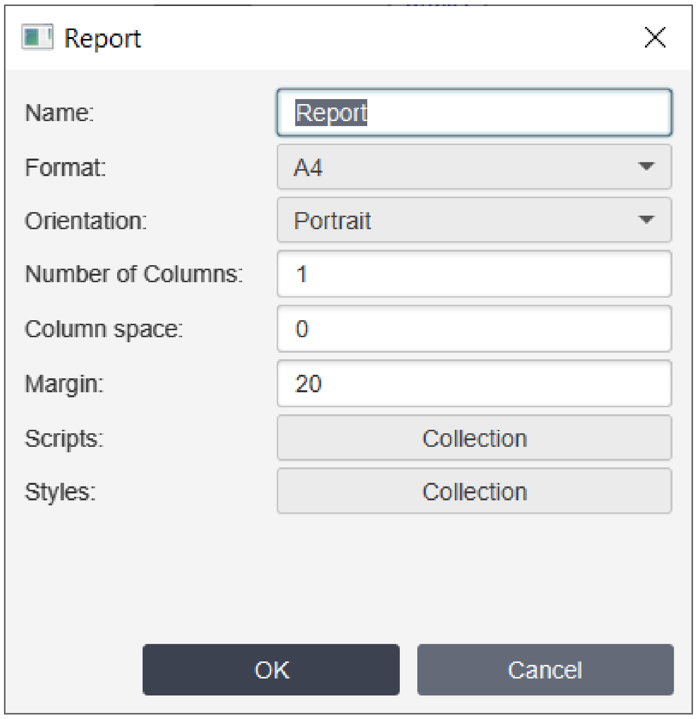
Property	Description
Tag	Choose Tag dependent on which value (when value become True(1)) Odoo ERP information is refreshed.
Models	Click **Collection** to ?ll up model names of the Odoo ERP. After clicking Collection button you'll see the following window:  where: 1. **Name** of the model.

6.8 Reports

Create report

To create a new report select the menu item **Project** 67 **->** **New Report** or choose Reports 88 on the Project Window, click right button on it and choose **New Report** item.

You'll see the report properties 500 window:


Report

Name:	Report
Format:	A4
Orientation:	Portrait
Number of Columns:	1
Column space:	0
Margin:	20
Scripts:	Collection
Styles:	Collection

Open report

To open report on Reports 88 tab of the Project window:

- Right click on the report you want to open and choose **Open** item.

or

- Double click on the report you want to open.

Copy report

To copy report on Reports 88 tab of the Project window right click on the report you want to copy and choose **Copy** item.

Delete report

To delete report on Reports 88 tab of the Project window right click on the report you want to delete and choose **Delete** item.

Open report properties

To open report properties 500 on Reports 88 tab of the Project window right click on the report you want to open and choose **Report properties** item.

Export report

To export report on Reports 88 tab of the Project window:

1. Right click on the report you want to export and choose **Export report** item.

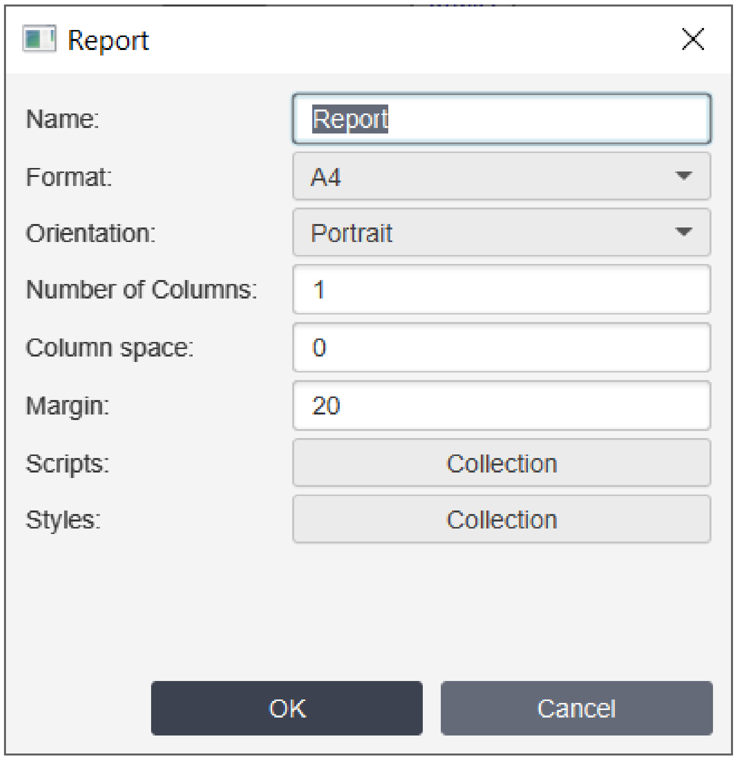
2. Now select the location and click the button **Save** (TeslaSCADA2 screen extension .tsp2report).

Import report

To import report on Reports 88 tab of the Project window:
1. Right click on the report window and choose **Import report** item.
2. Now select the report ?le and click **Open** (TeslaSCADA script extension .tsp2report).

See **Project Window->Reports** 88 tab for more information about possible operation with reports.

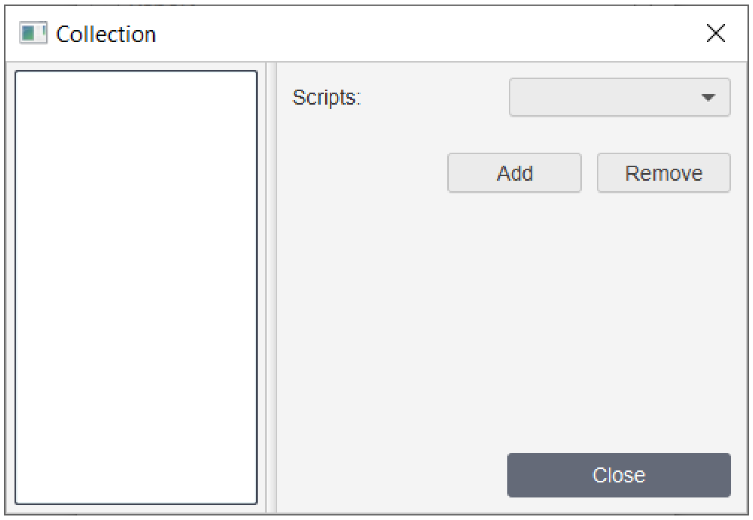
6.8.1 Report properties

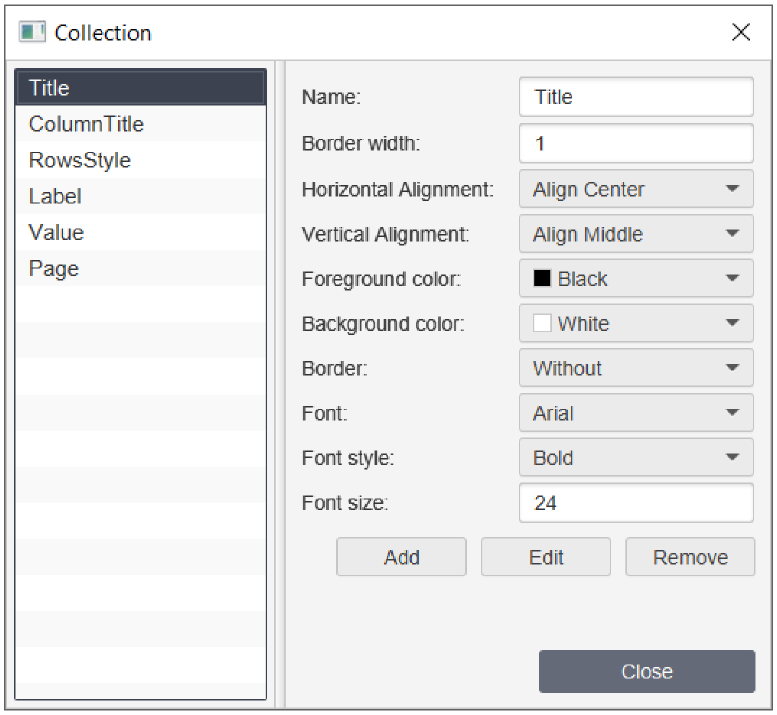

Report

Name:	Report
Format:	A4
Orientation:	Portrait
Number of Columns:	1
Column space:	0
Margin:	20
Scripts:	Collection
Styles:	Collection

List of report properties:

Property	Description
Name	Enter name of the report. It should be unique.
Format	Select format of the report's pages (A5, A4, A3, A2, A1).
Orientation	Orientation of the page - Landscape or Portrait.
Number of Columns	Number of columns of the report's table.
Column space	Space between columns of the report's table.

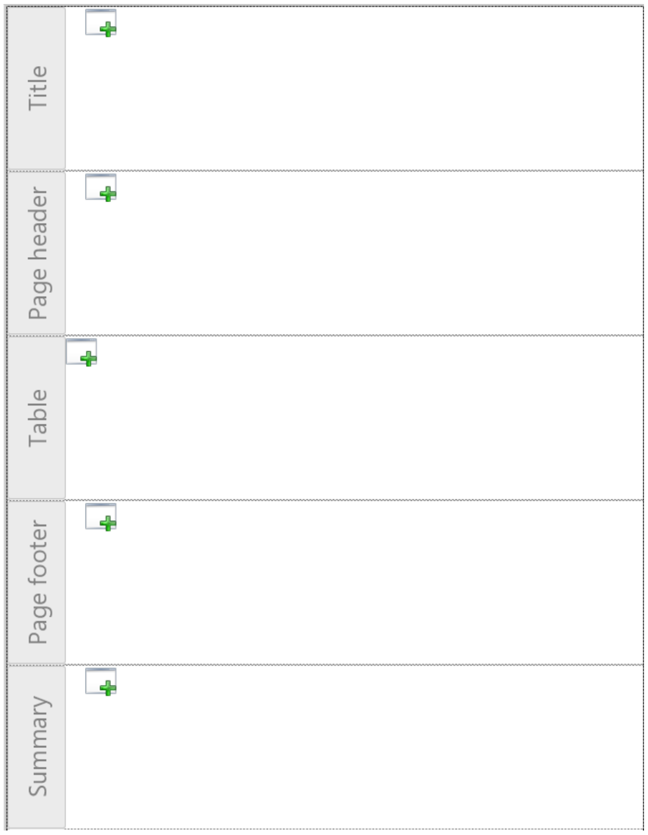
Property	Description
Margin	Page margins of the report.
Scripts	Click **Collection** to set up report's scripts . After clicking you'll see the window:  where: • **Scripts** - list of available report type scripts in the project. • **Add** - add script to the collection. • **Remove** - remove script from the collection.
Styles	Click **Collection** to set up report's styles. After clicking you'll see the window:

Property	Description
	 Collection: Title, ColumnTitle, RowsStyle, Label, Value, Page. Name: Title; Border width: 1; Horizontal Alignment: Align Center; Vertical Alignment: Align Middle; Foreground color: ■ Black; Background color: □ White; Border: Without; Font: Arial; Font style: Bold; Font size: 24. where: • **Name** - name of the style. • **Border width** - border width of the report object. • **Horizontal Alignment** - horizontal alignment of the report object. • **Vertical Alignment** - vertical alignment of the report object. • **Foreground color** - foreground color (text color, border and etc). • **Background color** - background color of the report object. • **Border** - border of the report object (Without, Left, Right...). • **Font** - name of the report object's font. • **Font style** - style of the font (Bold, Italic...). • **Font size** - size of the font.

6.8.2 Design report

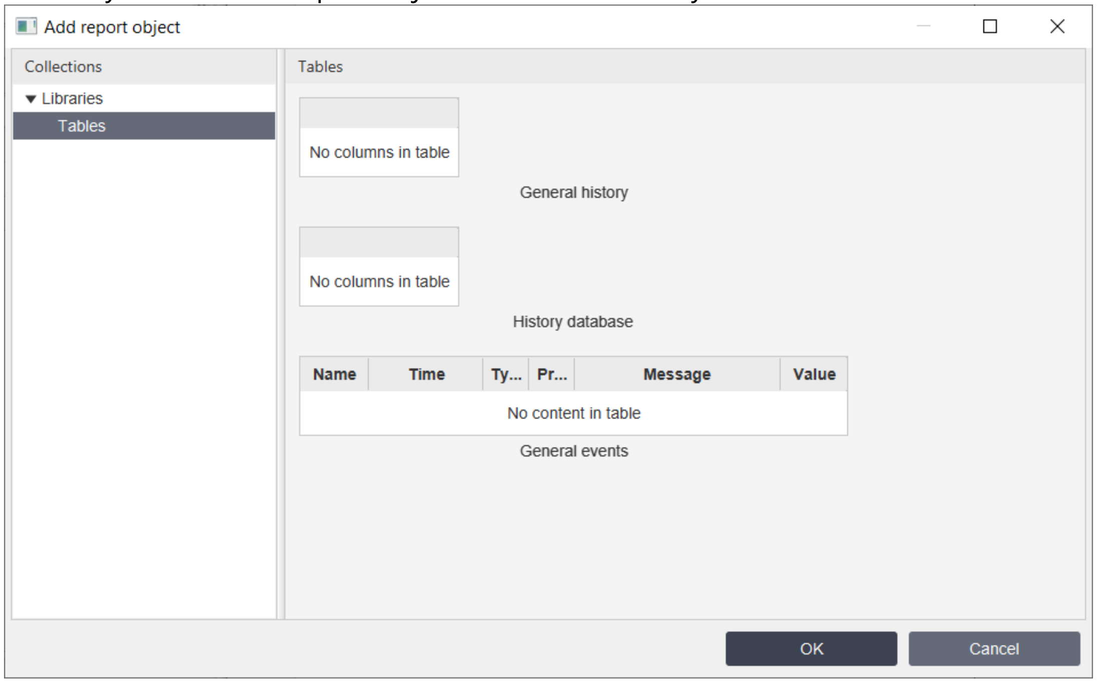
To start designing the report you want, you need to double click on it or click right button on the Project window 73->Reports and choose Open report menu item.

You'll see report design window:



Create report object

You can add new report object on the page by clicking button. Depending on the page's zone you'll see Add report object. In the table zone you'll see window with tables:



No columns in table

General history

No columns in table

History database

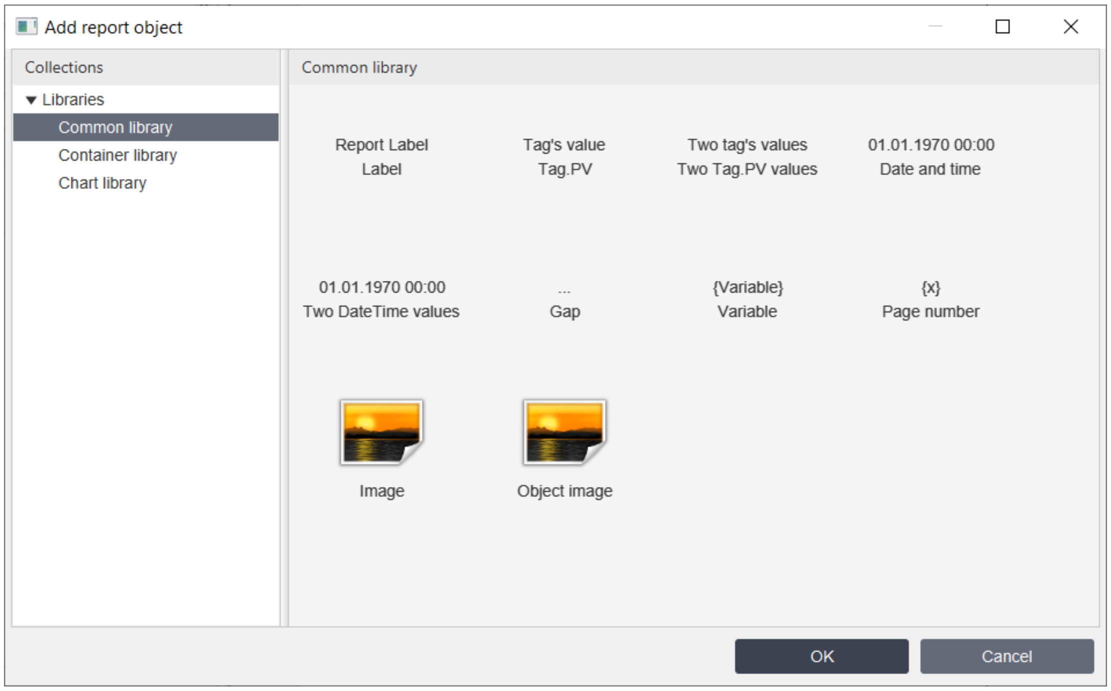
Name	Time	Ty...	Pr...	Message	Value

No content in table

General events

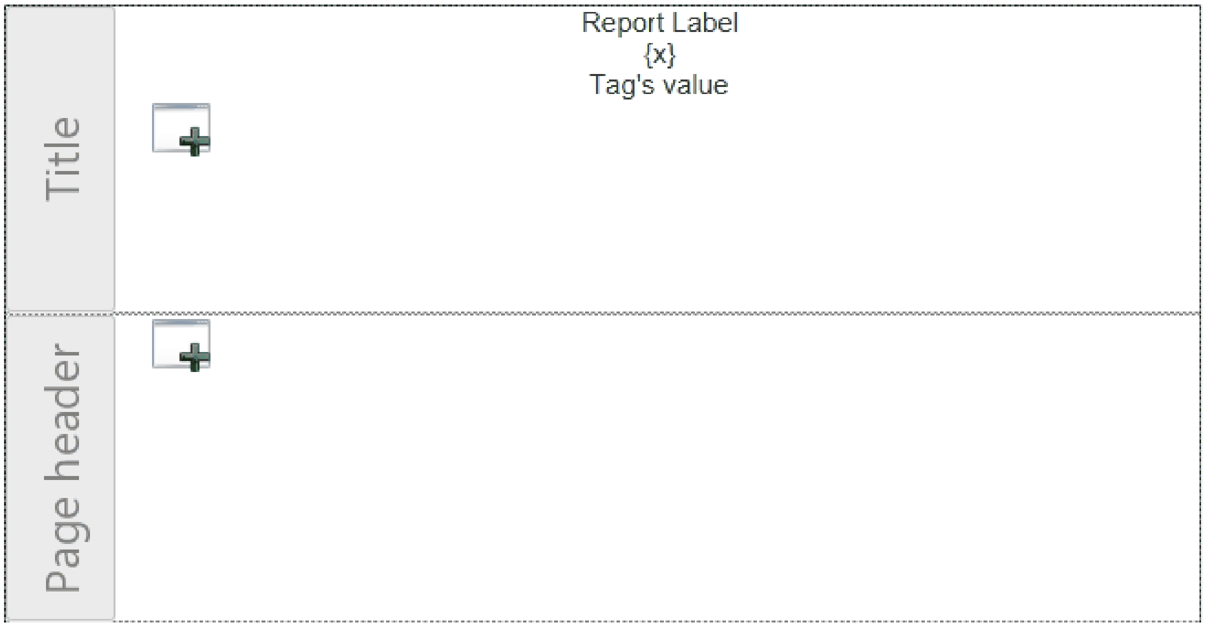
`

In other zones you'll window:



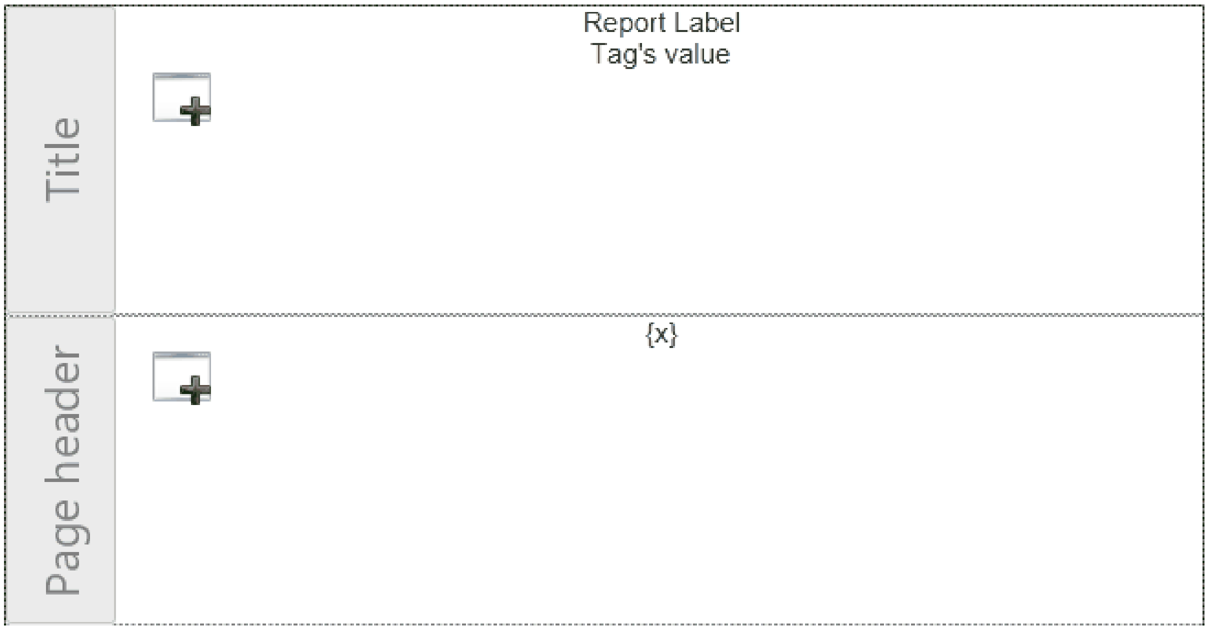
Move report object

You can move report objects by using Drag and Drop technology. You can also move objects by using context menu and choose direction.



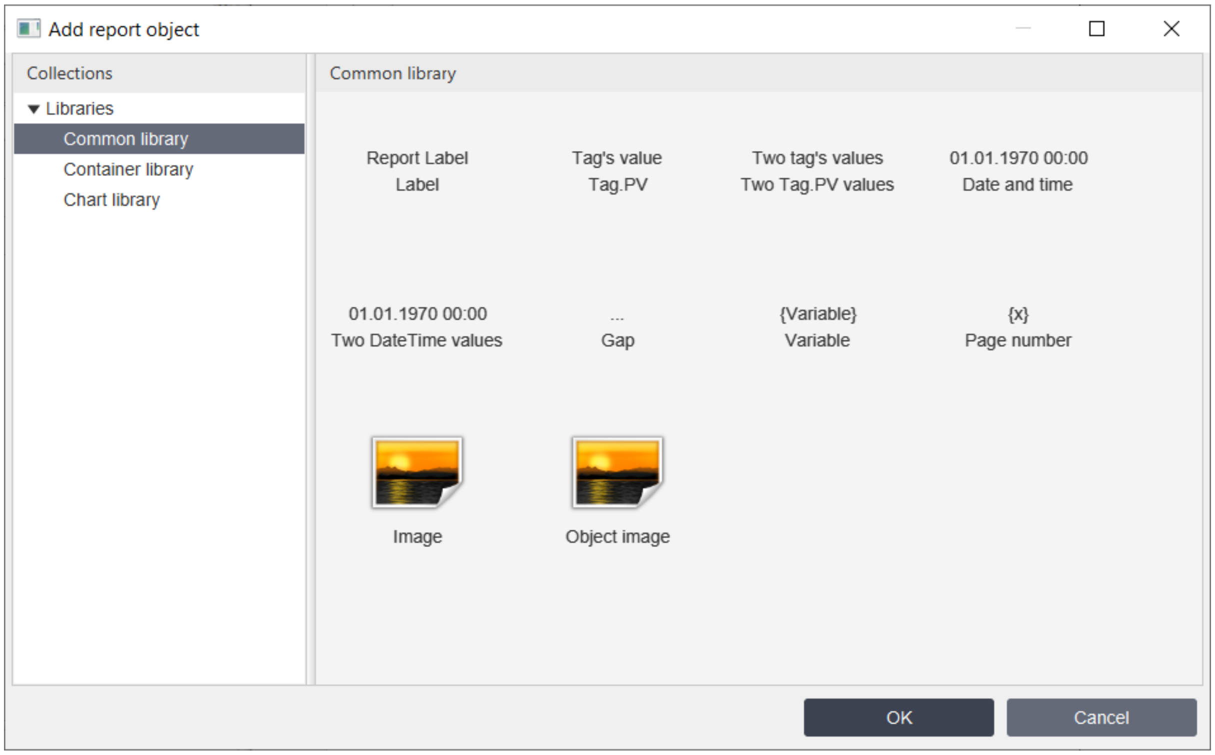
<u>Erase report object</u>

You can erase report objects by using context menu and choose Erase menu item.



6.8.3 Other report objects

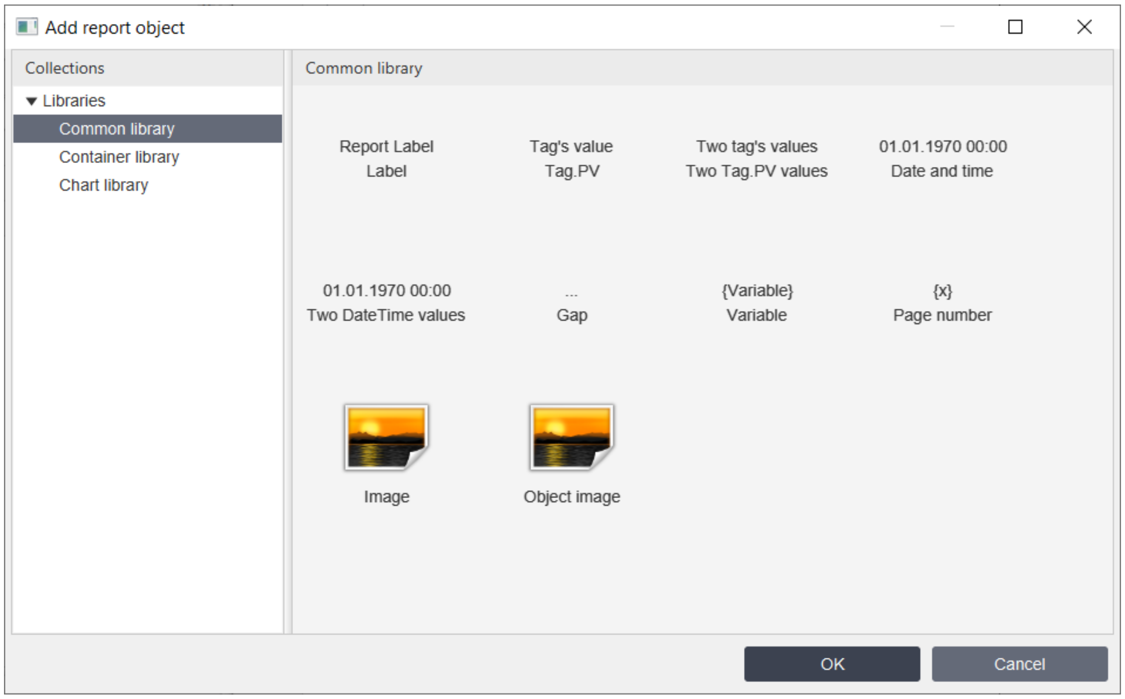
You can add new report objects on the other (not table) zones of the page by clicking button. You'll see window:



Every report object has the following properties:

Property	Description
Name	Name of the report object.
Style	Style of the report object.

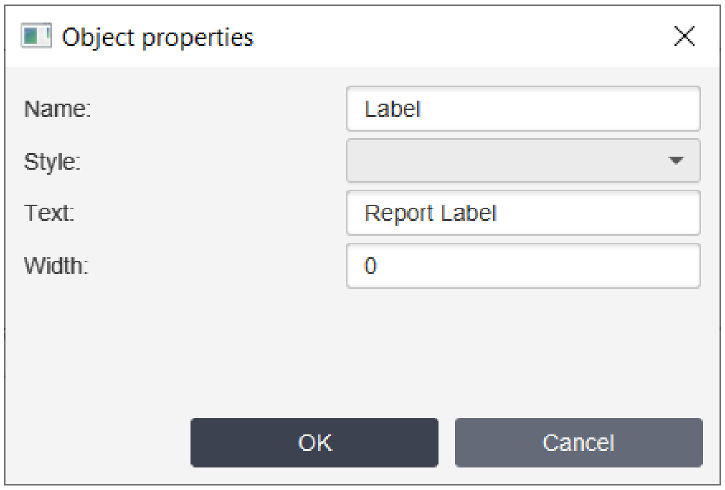
6.8.3.1 Common report library



Report common library contains:

- Label 508
- Tag.PV 508
- Two Tag.PV values 509
- Date and time 510
- Two DateTime values 511
- Gap 512
- Variable 512
- Page number 513
- Image 514
- Object image 514

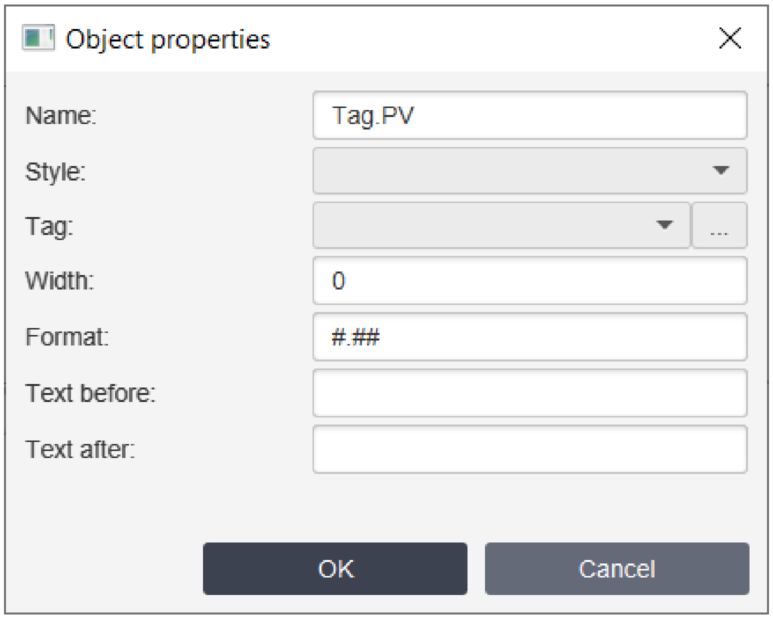
6.8.3.1.1 Label



Name: Label
Style:
Text: Report Label
Width: 0

Property	Description
Text	Text of the label.
Width	Width of the label.

6.8.3.1.2 Tag.PV

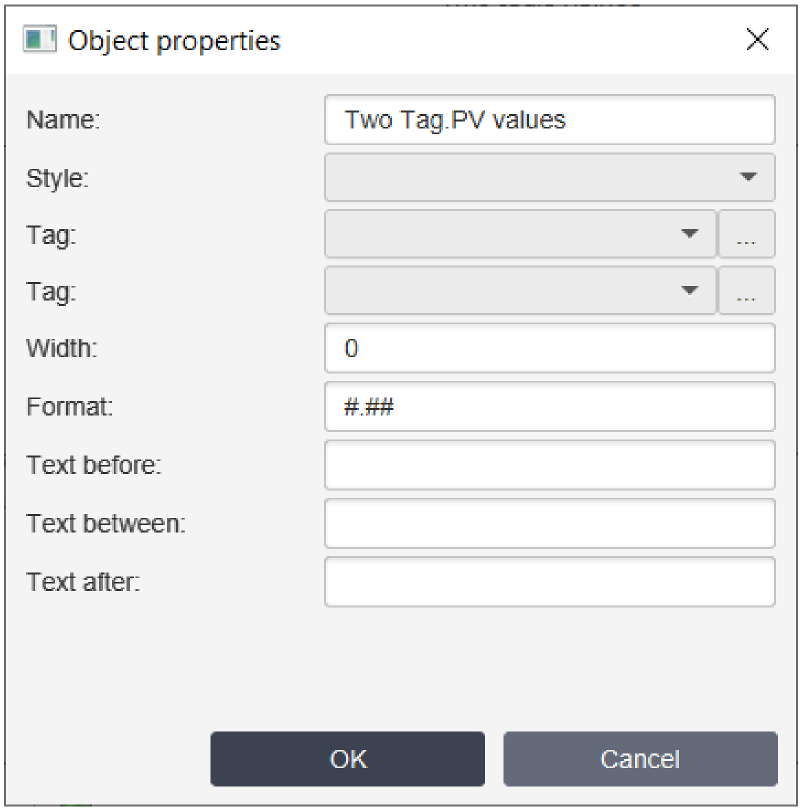


Name: Tag.PV
Style:
Tag:
Width: 0
Format: #.##
Text before:
Text after:

Property	Description
Tag	Choose tag you want to bind to the object.
Width	Width of the object.
Format	Format of tag's value.

Property	Description
Text before	Text before tag's value.
Text after	Text after tag's value.

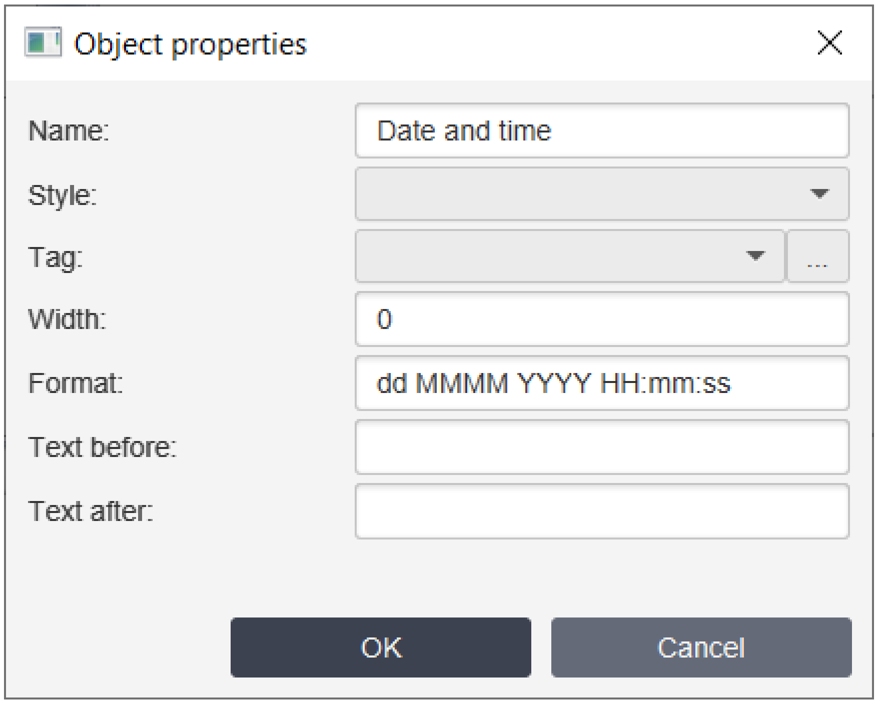
6.8.3.1.3 Two Tag.PV values



Name:	Two Tag.PV values
Style:	
Tag:	
Tag:	
Width:	0
Format:	#.##
Text before:	
Text between:	
Text after:	

Property	Description
Tag	Choose tag you want to bind to the object.
Tag	Choose second tag you want to bind to the object.
Width	Width of the object.
Format	Format of tag's values.
Text before	Text before tag's values.
Text between	Text between tag's values
Text after	Text after tag's values.

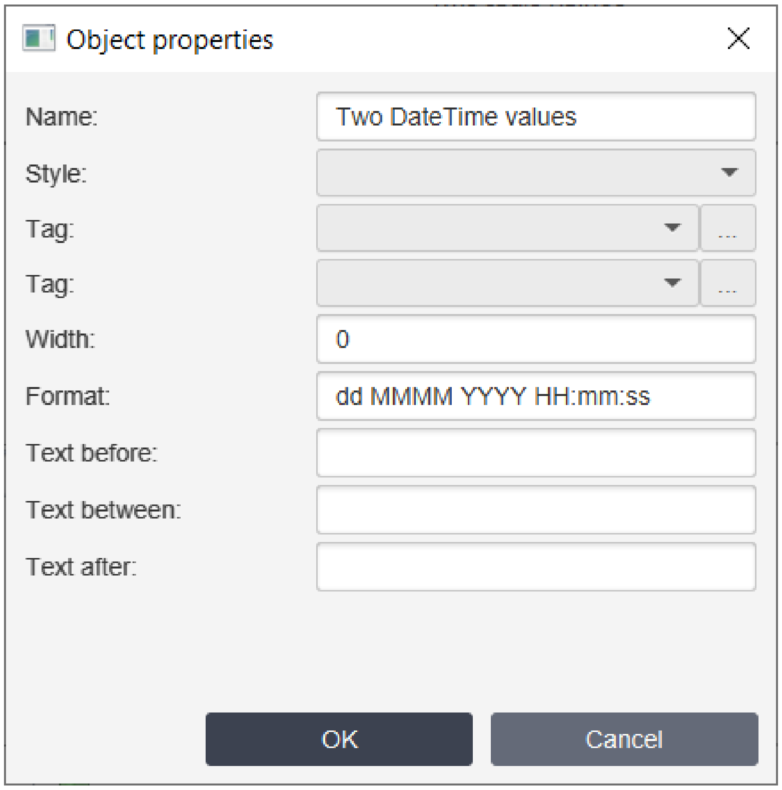
6.8.3.1.4 Date and time



Name: Date and time
Style:
Tag:
Width: 0
Format: dd MMMM YYYY HH:mm:ss
Text before:
Text after:

Property	Description
Tag	Choose date time tag you want to bind to the object.
Width	Width of the object.
Format	Format of tag's value.
Text before	Text before tag's value.
Text after	Text after tag's value.

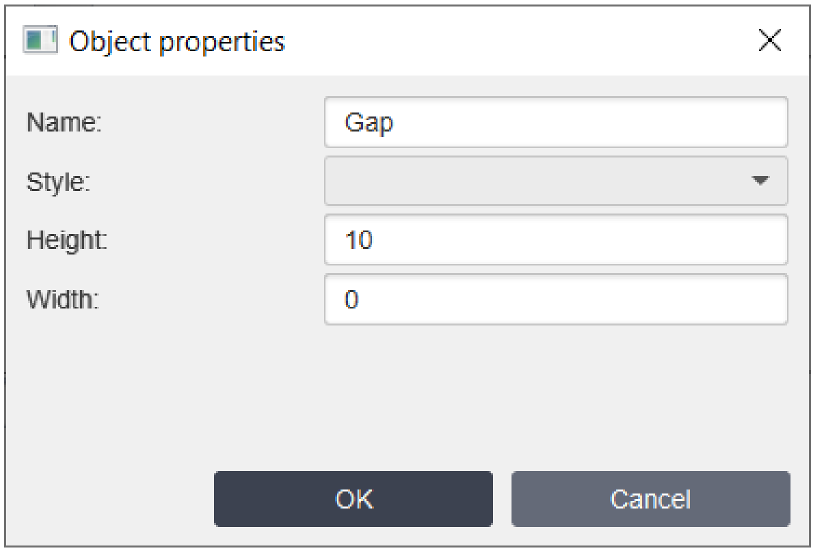
6.8.3.1.5 Two DateTime values


Object properties

Name:	Two DateTime values
Style:	
Tag:	
Tag:	
Width:	0
Format:	dd MMMM YYYY HH:mm:ss
Text before:	
Text between:	
Text after:	

Property	Description
Tag	Choose datetime tag you want to bind to the object.
Tag	Choose second datetime tag you want to bind to the object.
Width	Width of the object.
Format	Format of tag's values.
Text before	Text before tag's values.
Text between	Text between tag's values
Text after	Text after tag's values.

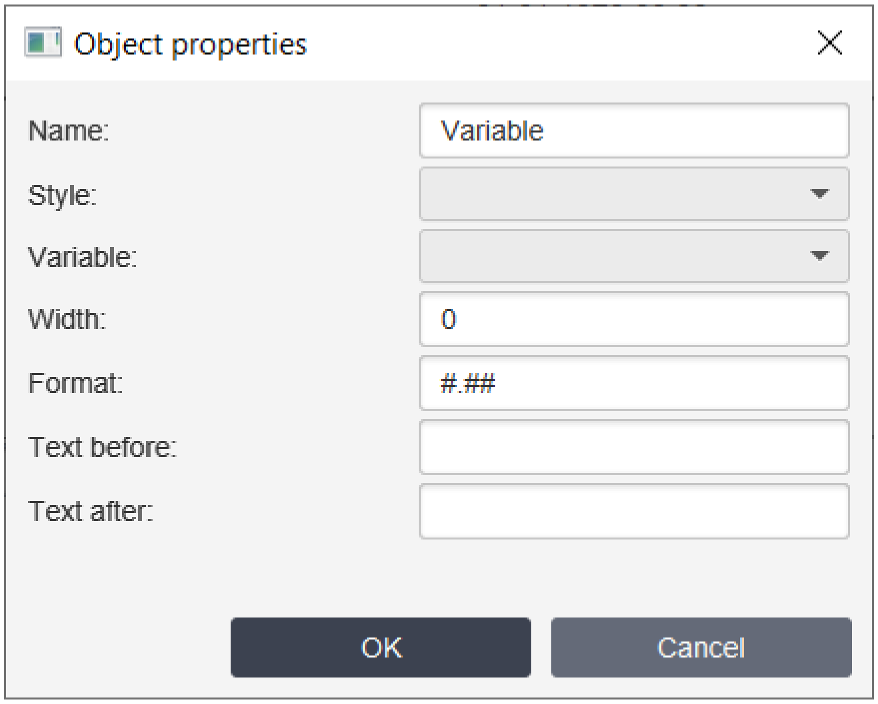
6.8.3.1.6 Gap



Name: Gap
Style:
Height: 10
Width: 0

Property	Description
Height	Height of the gap.
Width	Width of the gap.

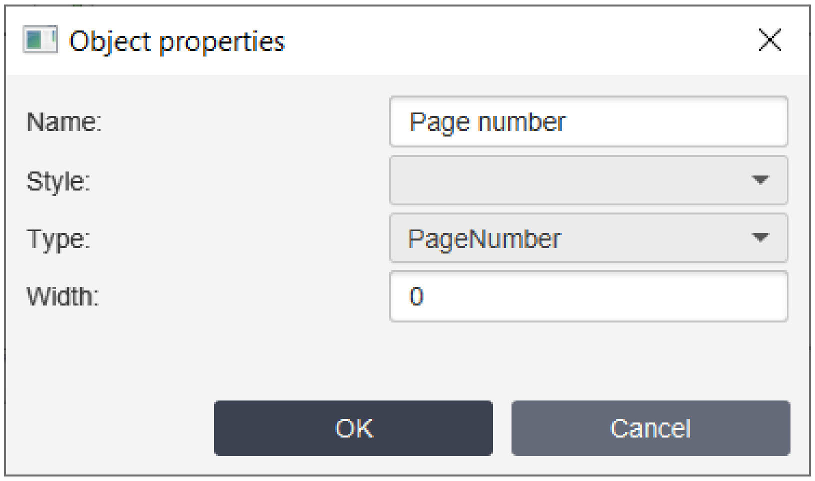
6.8.3.1.7 Variable



Name: Variable
Style:
Variable:
Width: 0
Format: #.##
Text before:
Text after:

Property	Description
Variable	Choose variable you want to bind to the object.
Width	Width of the object.
Format	Format of variable's value.
Text before	Text before variable's value.
Text after	Text after variable's value.

6.8.3.1.8 Page number


Object properties

Name: Page number

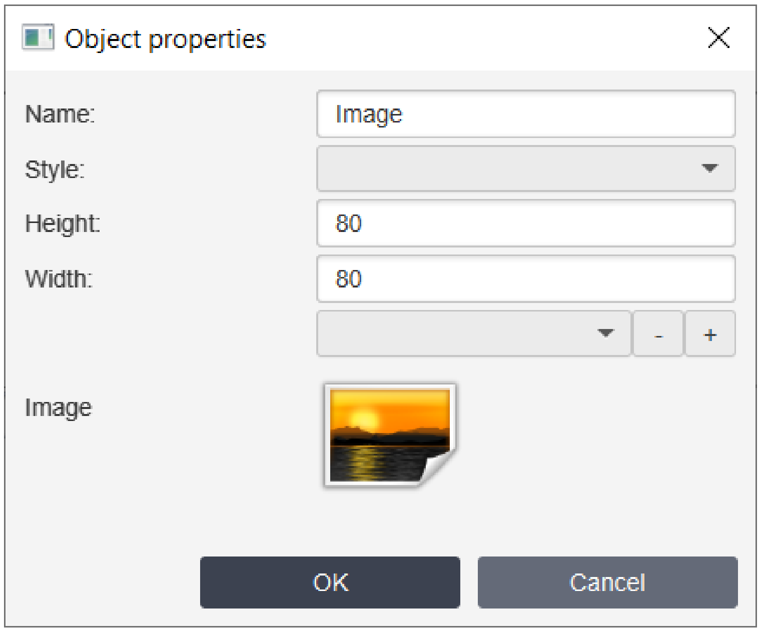
Style:

Type: PageNumber

Width: 0

Property	Description
Type	Type of the page number.
Width	Width of the object.

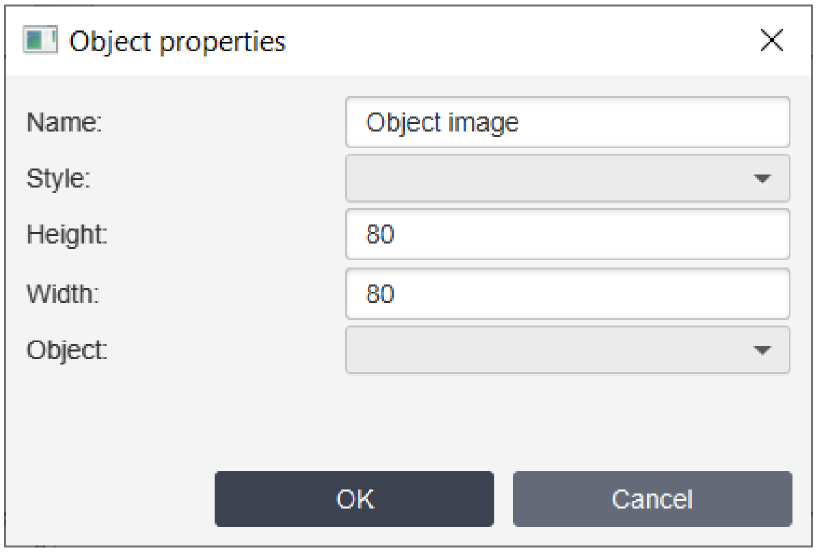
6.8.3.1.9 Image



Name: Image
Style:
Height: 80
Width: 80
Image

Property	Description
Height	Height of the image.
Width	Width of the image.
Image	Choose image of the report object.

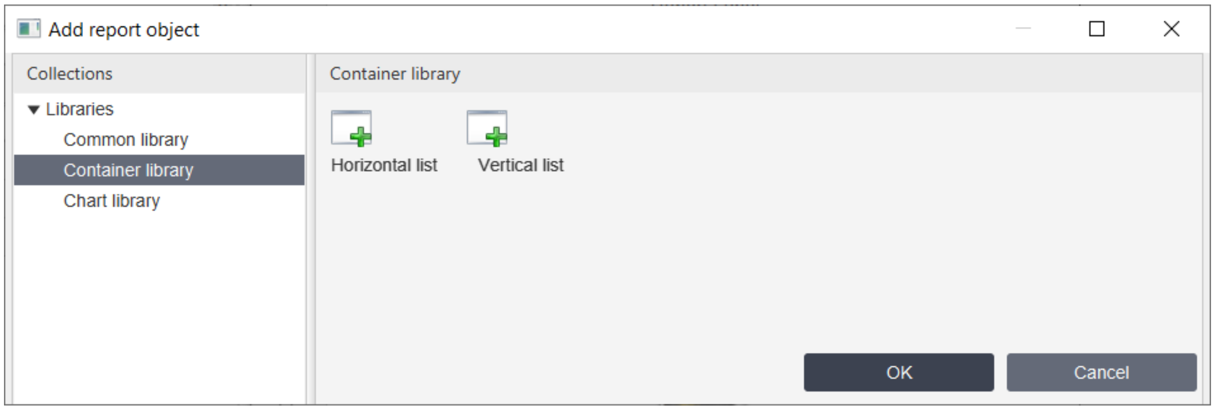
6.8.3.1.10 Object image



Name: Object image
Style:
Height: 80
Width: 80
Object:

Property	Description
Height	Height of the image.
Width	Width of the image.
Object	Choose object you want to display in the report. Useful for trends.

6.8.3.2 Container library



Container library contains two objects that lets you add other report objects in Vertical and Horizontal lists.

6.8.3.3 Chart library

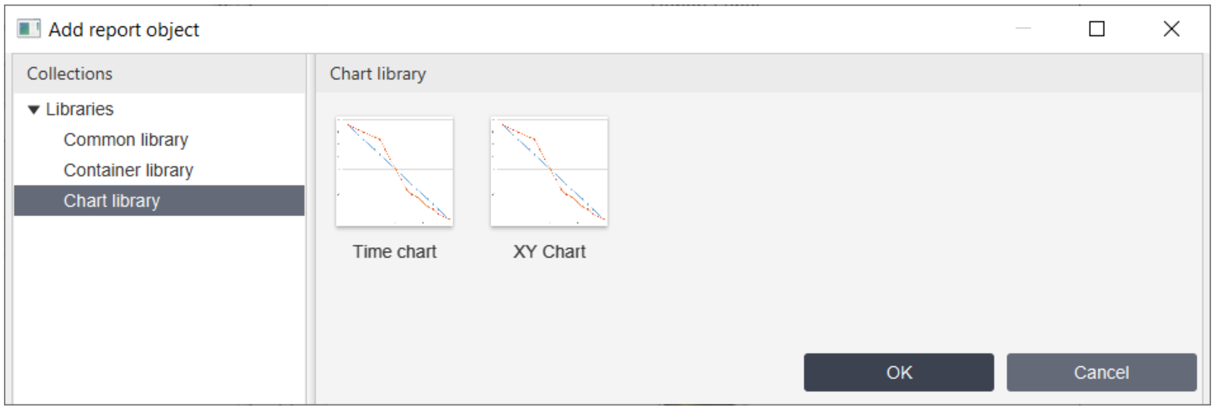
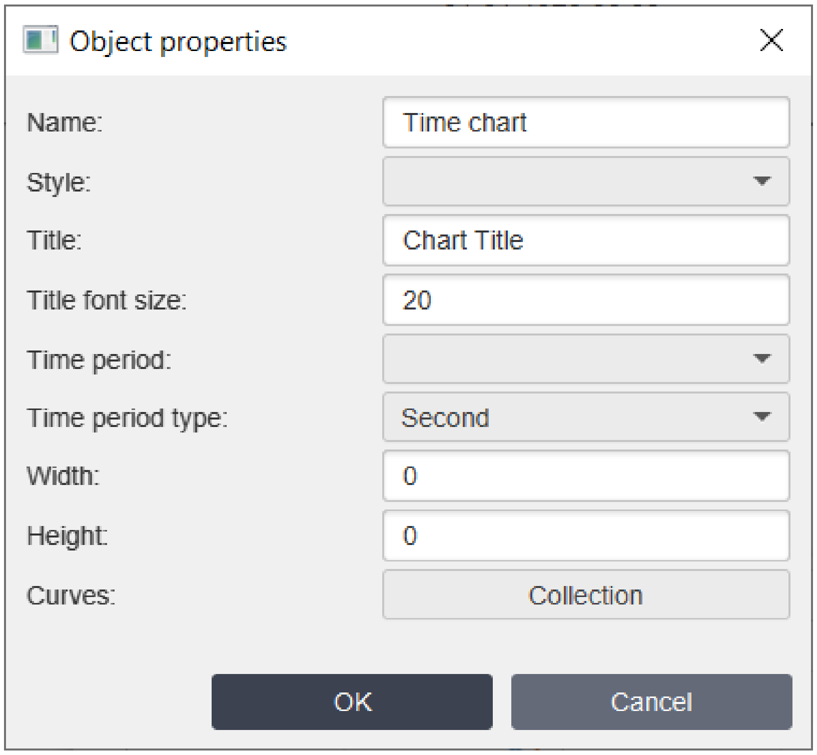


Chart library objects contains objects:

- Time chart 516.
- XY chart 517

6.8.3.3.1 Time chart



Object properties

Name: Time chart

Style:

Title: Chart Title

Title font size: 20

Time period:

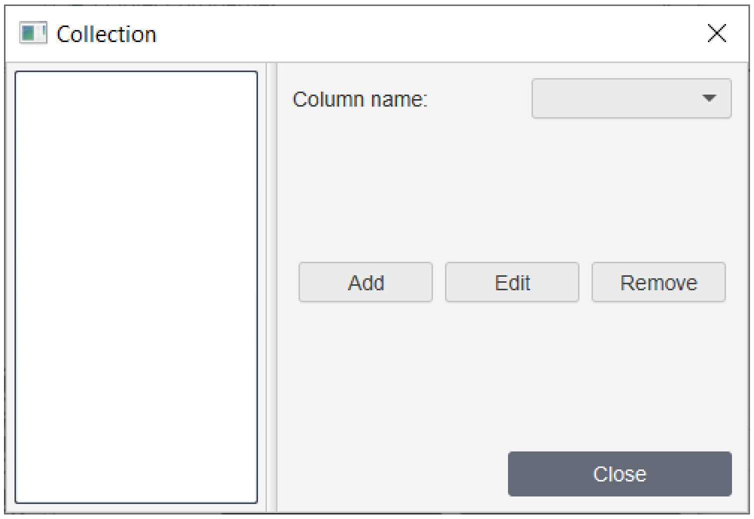
Time period type: Second

Width: 0

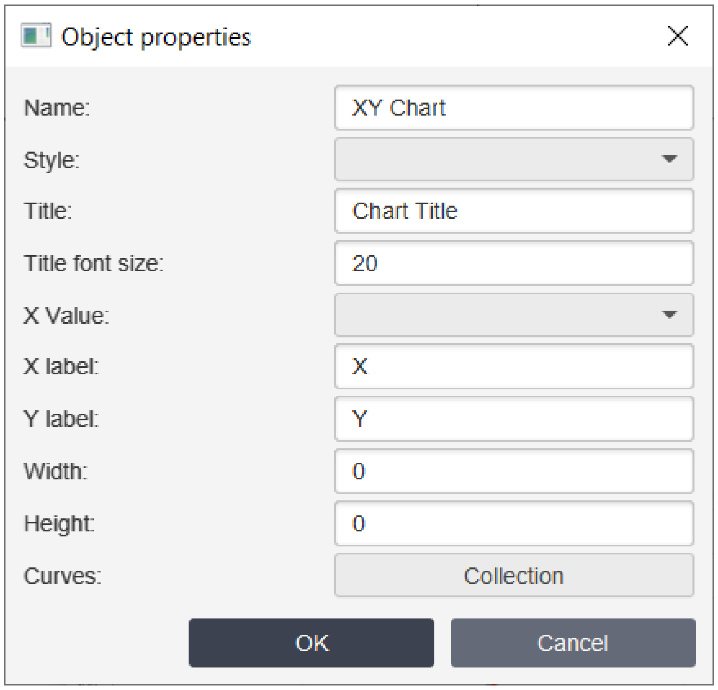
Height: 0

Curves: Collection

Property	Description
Title	Title of the chart.
Title font size	Font size of the title's text.
Time period	Choose column for time axis.
Time period type	Choose period of the time. (Second, Minute, Hour....).
Height	Height of the chart.
Width	Width of the chart.
Curves	Click **Collection** to set up chart's curves. After clicking you'll see the window:

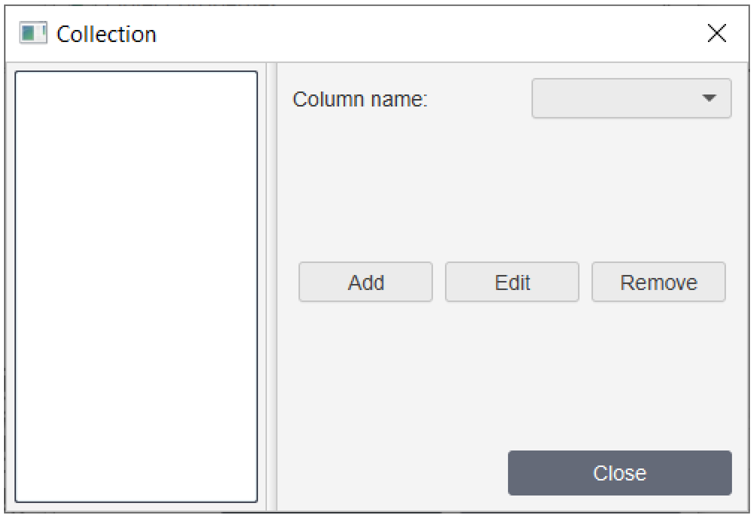
Property	Description
	 Collection Column name: where: ▪ **Column name** - name of the column bind to the curve.

6.8.3.3.2 XY chart


Object properties

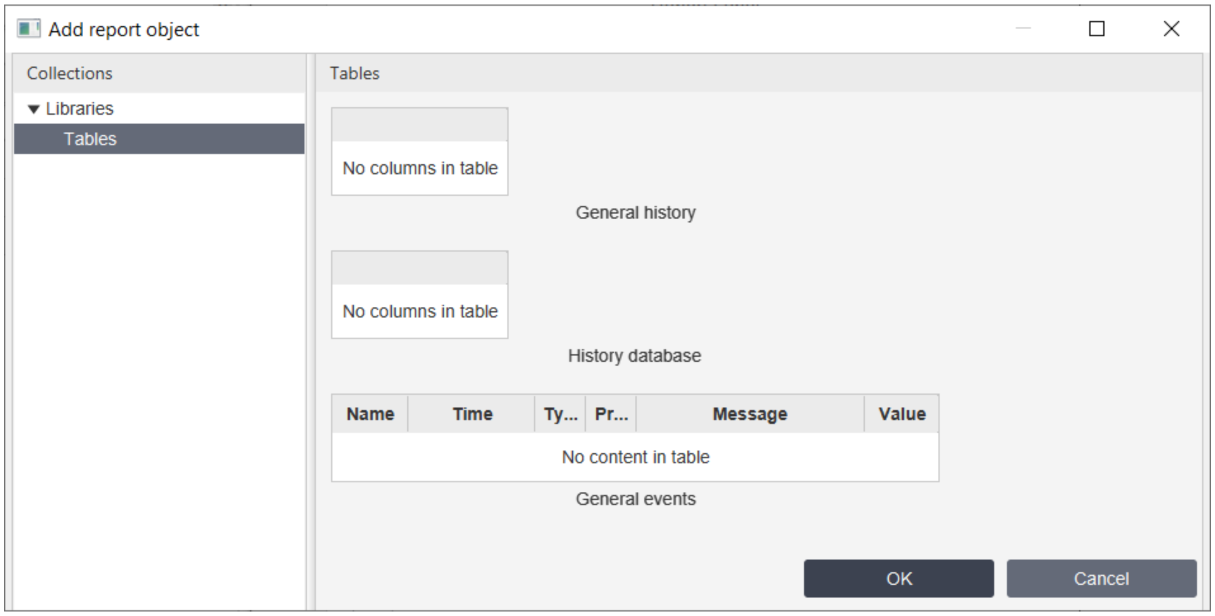
Name:	XY Chart
Style:	
Title:	Chart Title
Title font size:	20
X Value:	
X label:	X
Y label:	Y
Width:	0
Height:	0
Curves:	Collection

Property	Description
Title	Title of the chart.
Title font size	Font size of the title's text.
X value	Choose column for X axis.

Property	Description
X label	Enter label for X axis.
Y label	Enter label for Y axis.
Height	Height of the chart.
Width	Width of the chart.
Curves	Click **Collection** to set up chart's curves. After clicking you'll see the window:  Collection Column name: Add Edit Remove Close where: ▪ **Column name** - name of the column bind to the curve.

6.8.4 Table report objects

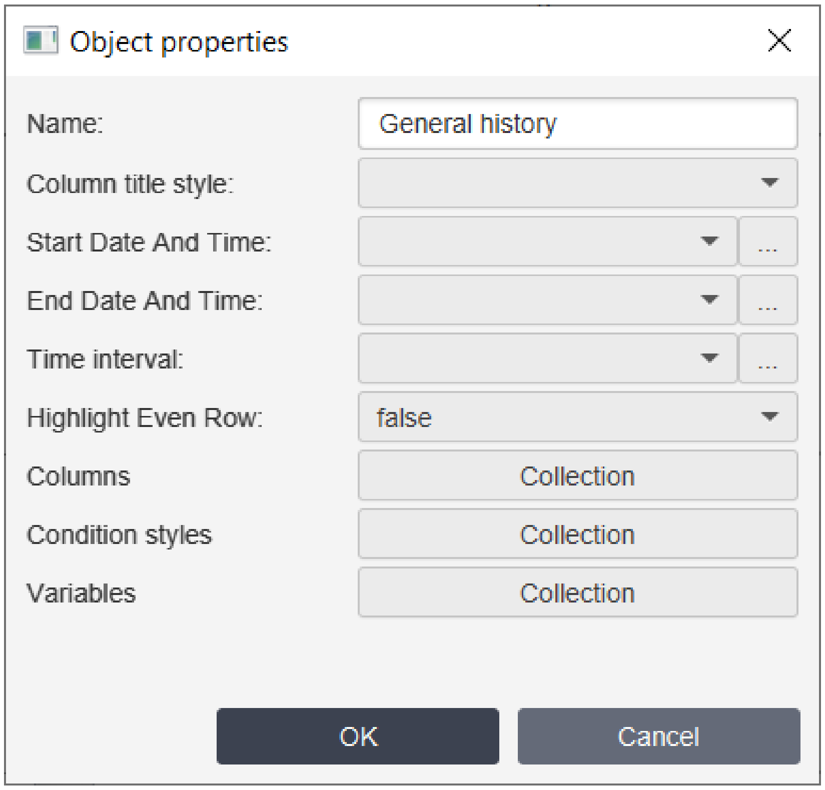
You can add new table report object on the table's zone of the page by clicking button. You'll see window:



Every table object has the following properties:

Property	Description
Name	Name of the report table object.
Column title style	Style of the column titles.
Start Date and Time	Initial time of data taken from the database.
End Date and Time	End time of data taken from the database.
Highlight Even Row	Highlight even rows of the table.

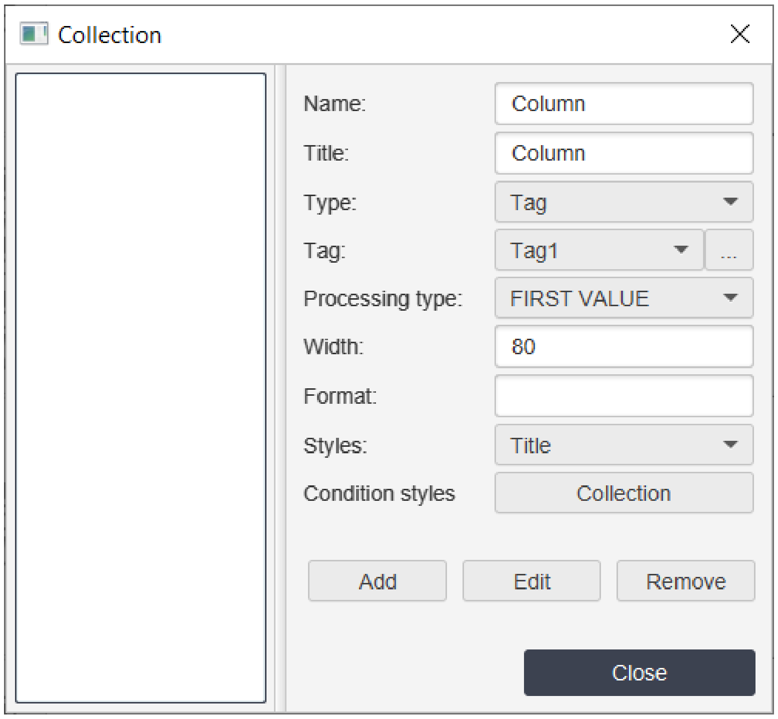
6.8.4.1 General history table

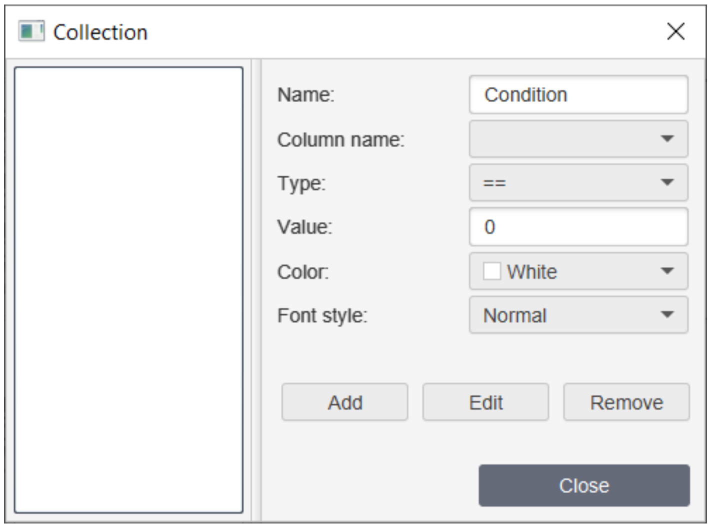
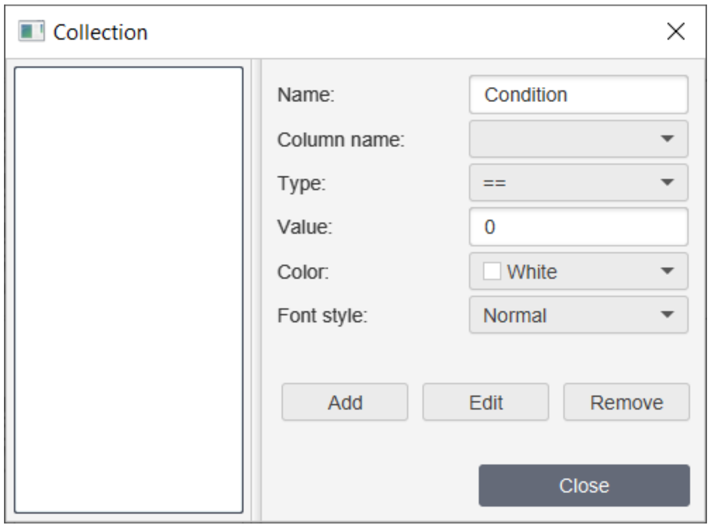

Object properties

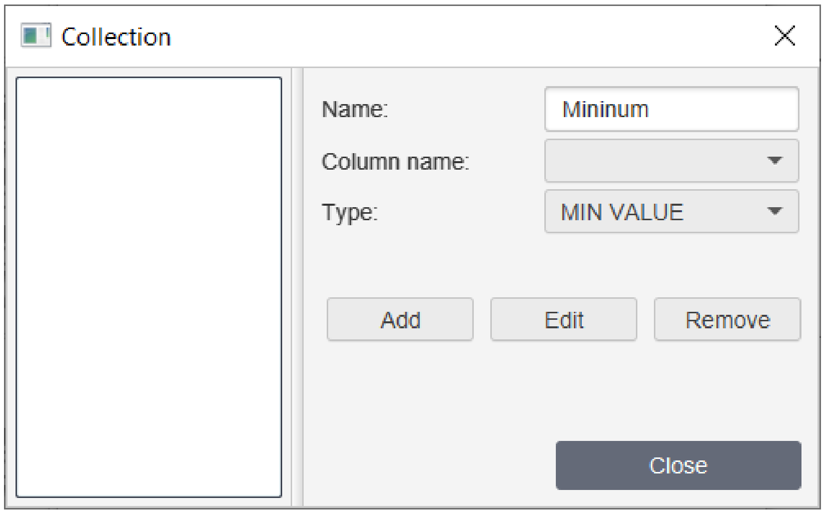
Name:	General history
Column title style:	
Start Date And Time:	
End Date And Time:	
Time interval:	
Highlight Even Row:	false
Columns	Collection
Condition styles	Collection
Variables	Collection

General history report table get data from the general history database 110.

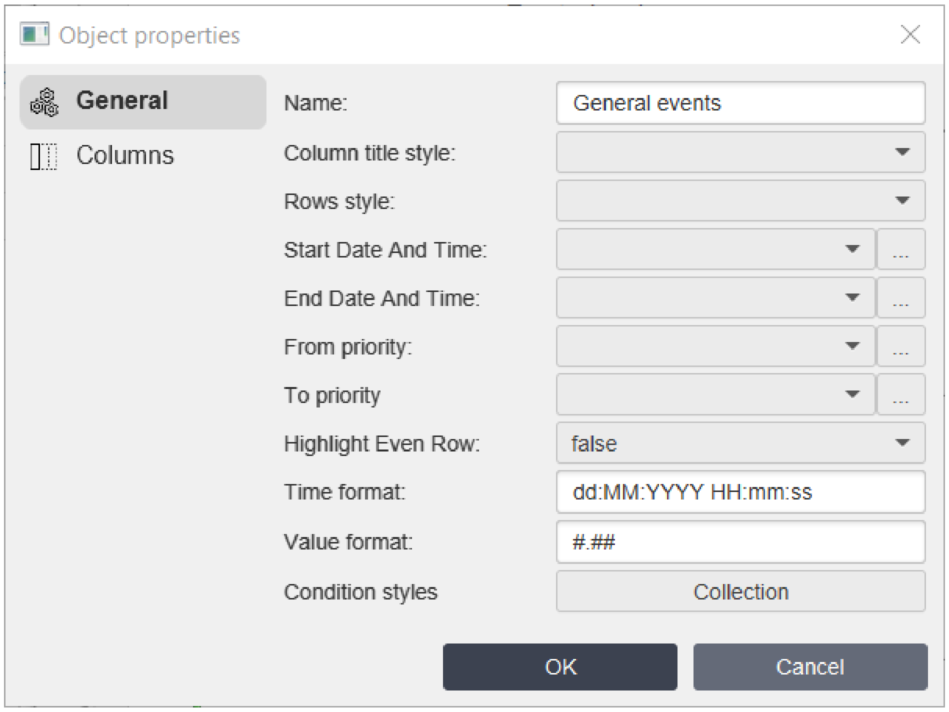
Property	Description
Time interval	Time interval with which data is taken from the database.
Columns	Click Collection to set up report's columns . After clicking you'll see the window:

Property	Description
	 Collection Name: Column Title: Column Type: Tag Tag: Tag1 Processing type: FIRST VALUE Width: 80 Format: Styles: Title Condition styles: Collection Add Edit Remove Close where: • **Name** - name of the column. • **Title** - title of the column. • **Type** - type of the column (Tag, DateTime, Row number). • **Tag** - choose tag you want to bind to this column. • **Processing type** - processing tag's columns values in interval. ✓ FIRST VALUE - take first value from the interval. ✓ LAST VALUE - take last value from the interval. ✓ MIN VALUE - take minimum value from the interval. ✓ MAX VALUE - take maximum value from the interval. ✓ AVG VALUE - take average value from the interval. • **Width** - width of the column. • **Format** - how to format value in the column. • **Styles** - choose style for the column. • **Condition styles** - condition styles. You can setup it by clicking **Collection**:

Property	Description
	 Name: Condition Column name: Type: == Value: 0 Color: White Font style: Normal where: • **Name** - name of the condition style. • **Column name** - name of the column. • **Type** - type of the comparison. • **Value** - value to the comparison. • **Color** - color of the cell when the condition is right. • **Font style** - text's font style of the cell when the condition is right.
Condition styles	Click **Collection** to set up condition styles . After clicking you'll see the window:  Name: Condition Column name: Type: == Value: 0 Color: White Font style: Normal where: • **Name** - name of the condition style. • **Column name** - name of the column.

Property	Description
	• **Type** - type of the comparison. • **Value** - value to the comparison. • **Color** - color of the row when the condition is right. • **Font style** - text's font style of the row's cells when the condition is right.
Variables	Click **Collection** to set up variables. After clicking you'll see the window:  Collection Name: Mininum Column name: Type: MIN VALUE where: • **Name** - name of the variable. • **Column name** - name of the column. • **Type** - type of the variable. ✓MIN VALUE - minimum value in the column. ✓MAX VALUE - maximum value in the column. ✓AVG VALUE - average value in the column. ✓SUM VALUE - summary value in the column.

6.8.4.2 General events table

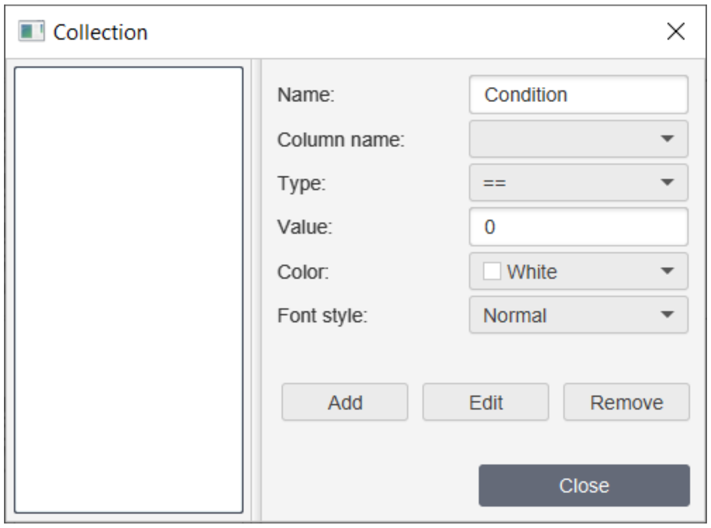

Object properties

General | Columns

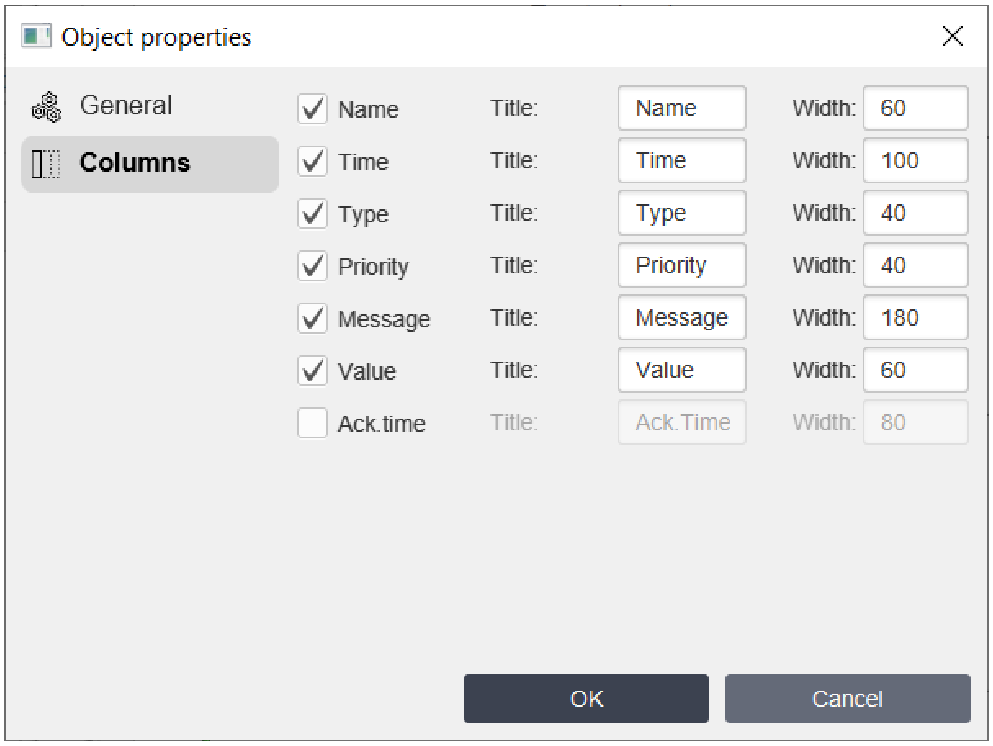
Name:	General events
Column title style:	
Rows style:	
Start Date And Time:	
End Date And Time:	
From priority:	
To priority	
Highlight Even Row:	false
Time format:	dd:MM:YYYY HH:mm:ss
Value format:	#.##
Condition styles	Collection

General events report table get data from the general events database 110.

Property	Description
Rows style	Style of the table's rows.
From priority	The tag's value is used to determine the initial priority.
To priority	The tag's value is used to determine the end priority.
Time format	Format of the time displayed in the column.
Value format	Format of the value displayed in the column.
Condition styles	Click **Collection** to set up condition styles . After clicking you'll see the window:

Property	Description
	 Collection Name: Condition Column name: Type: == Value: 0 Color: White Font style: Normal where: • **Name** - name of the condition style. • **Column name** - name of the column. • **Type** - type of the comparison. • **Value** - value to the comparison. • **Color** - color of the row when the condition is right. • **Font style** - text's font style of the row's cells when the condition is right.

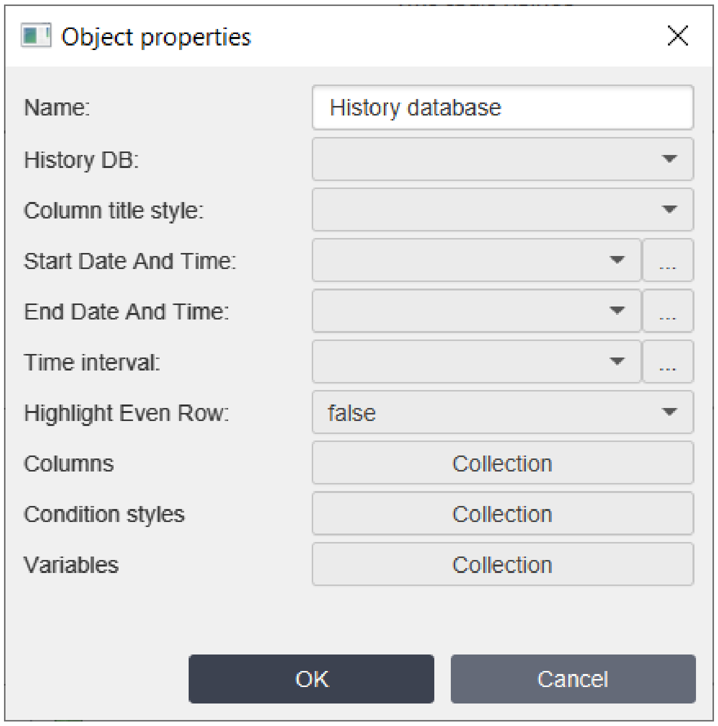
6.8.4.2.1 Columns



✓	Name	Title: Name	Width:	60
✓	Time	Title: Time	Width:	100
✓	Type	Title: Type	Width:	40
✓	Priority	Title: Priority	Width:	40
✓	Message	Title: Message	Width:	180
✓	Value	Title: Value	Width:	60
	Ack.time	Title: Ack.Time	Width:	80

Property	Description
Enable (not shown)	Enable or disable correspondent column: ▪ Name ▪ Time ▪ Type ▪ Priority ▪ Message ▪ Value ▪ Ack.time
Title	Title of the corresponding column.
Width	Width of the corresponding column.

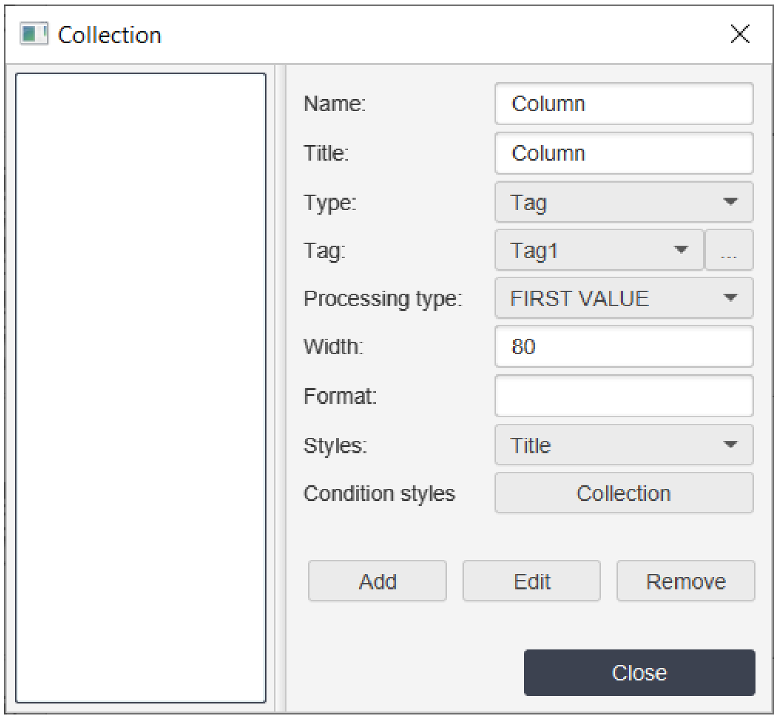
6.8.4.3 History database table

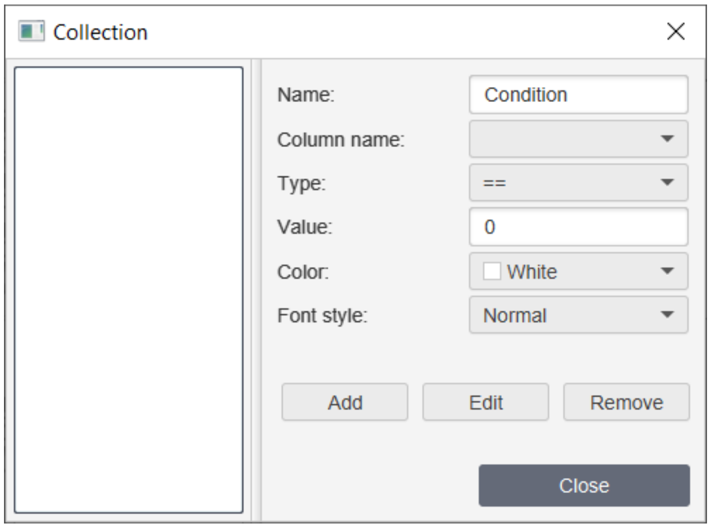
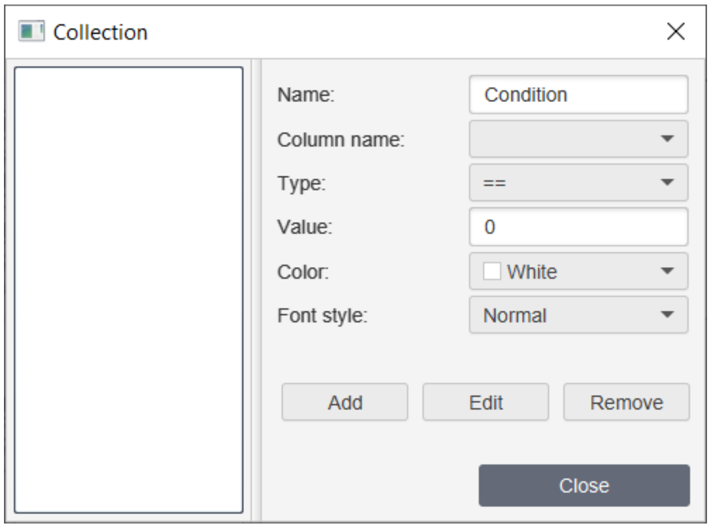

Object properties

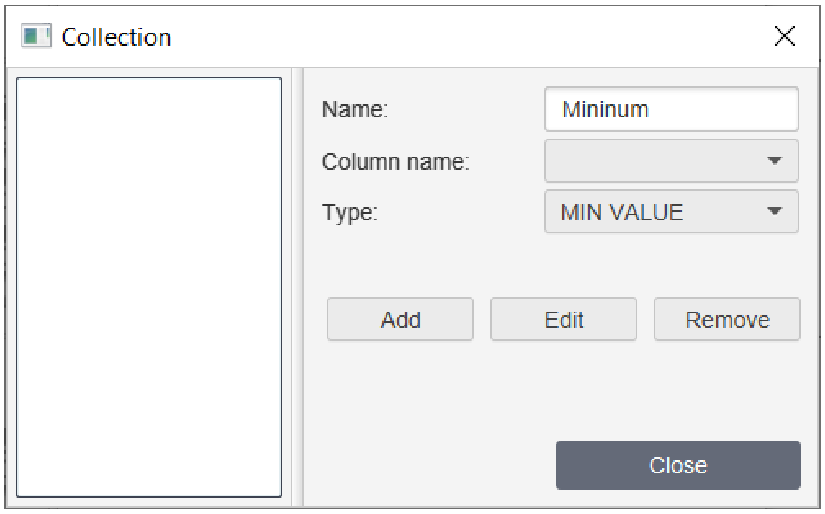
Name:	History database
History DB:	
Column title style:	
Start Date And Time:	
End Date And Time:	
Time interval:	
Highlight Even Row:	false
Columns	Collection
Condition styles	Collection
Variables	Collection

History database report table get data from the history database 494.

Property	Description
History DB	Choose History DB you want to bind this history report table.
Time interval	Time interval with which data is taken from the database.
Columns	Click **Collection** to set up report's columns . After clicking you'll see the window:

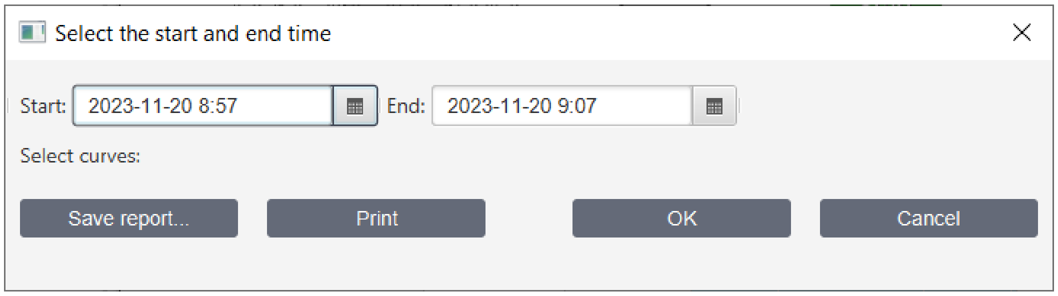
Property	Description
	 Collection Name: Column Title: Column Type: Tag Tag: Tag1 Processing type: FIRST VALUE Width: 80 Format: Styles: Title Condition styles: Collection where: • **Name** - name of the column. • **Title** - title of the column. • **Type** - type of the column (Tag, DateTime, Row number). • **Tag** - choose tag you want to bind to this column. • **Processing type** - processing tag's columns values in interval. ✓FIRST VALUE - take first value from the interval. ✓LAST VALUE - take last value from the interval. ✓MIN VALUE - take minimum value from the interval. ✓MAX VALUE - take maximum value from the interval. ✓AVG VALUE - take average value from the interval. • **Width** - width of the column. • **Format** - how to format value in the column. • **Styles** - choose style for the column. • **Condition styles** - condition styles. You can setup it by clicking **Collection**:

Property	Description
	 Collection Name: Condition Column name: Type: == Value: 0 Color: White Font style: Normal Add Edit Remove Close where: • **Name** - name of the condition style. • **Column name** - name of the column. • **Type** - type of the comparison. • **Value** - value to the comparison. • **Color** - color of the cell when the condition is right. • **Font style** - text's font style of the cell when the condition is right.
Condition styles	Click **Collection** to set up condition styles . After clicking you'll see the window:  Collection Name: Condition Column name: Type: == Value: 0 Color: White Font style: Normal Add Edit Remove Close where: • **Name** - name of the condition style. • **Column name** - name of the column.

Property	Description
	• **Type** - type of the comparison. • **Value** - value to the comparison. • **Color** - color of the row when the condition is right. • **Font style** - text's font style of the row's cells when the condition is right.
Variables	Click **Collection** to set up variables. After clicking you'll see the window:  Collection Name: Mininum Column name: Type: MIN VALUE where: • **Name** - name of the variable. • **Column name** - name of the column. • **Type** - type of the variable. ✓ MIN VALUE - minimum value in the column. ✓ MAX VALUE - maximum value in the column. ✓ AVG VALUE - average value in the column. ✓ SUM VALUE - summary value in the column.

6.8.5 Reports from trend's and event's dialog boxes

For some graphical objects like Events log 243, History trends 233, Recipe table 252 and others you can create Reports during running project. You can create 2 types of Reports - Excel reports and report for printing. See example window:

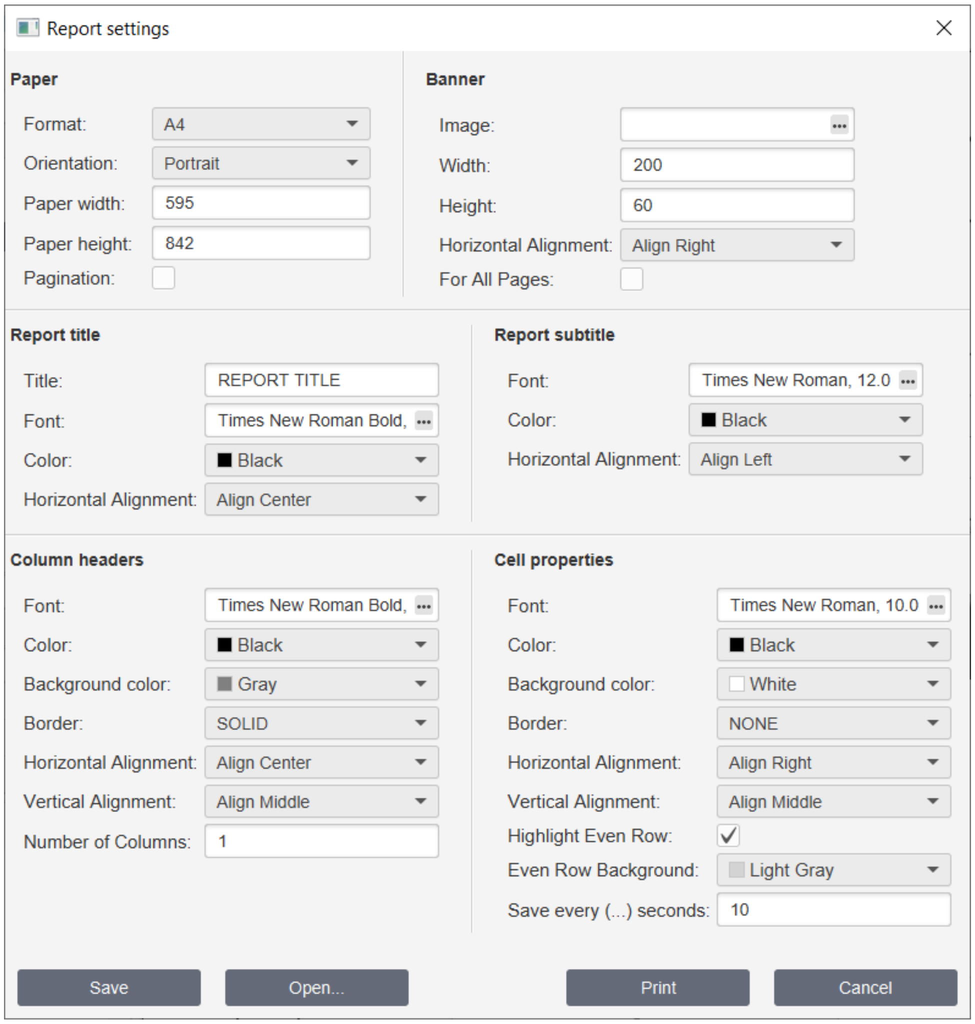


Start: 2023-11-20 8:57 End: 2023-11-20 9:07

Select curves:

To get Excel report you have to click **Save report...** . Then choose ?le to save Excel report and make some other settings like Title.

To get report for printing you have to click Print button. You'll see Report settings window:



Paper

Format:	A4
Orientation:	Portrait
Paper width:	595
Paper height:	842
Pagination:	☐

Banner

Image:	
Width:	200
Height:	60
Horizontal Alignment:	Align Right
For All Pages:	☐

Report title

Title:	REPORT TITLE
Font:	Times New Roman Bold,
Color:	■ Black
Horizontal Alignment:	Align Center

Report subtitle

Font:	Times New Roman, 12.0
Color:	■ Black
Horizontal Alignment:	Align Left

Column headers

Font:	Times New Roman Bold,
Color:	■ Black
Background color:	■ Gray
Border:	SOLID
Horizontal Alignment:	Align Center
Vertical Alignment:	Align Middle
Number of Columns:	1

Cell properties

Font:	Times New Roman, 10.0
Color:	■ Black
Background color:	□ White
Border:	NONE
Horizontal Alignment:	Align Right
Vertical Alignment:	Align Middle
Highlight Even Row:	✓
Even Row Background:	□ Light Gray
Save every (...) seconds:	10

In Report settings you can setup some parameters of the report:

Paper, where:

- Format of the paper.

- Orientation of the paper.
- Paper width and Paper height.
- Set Pagination if you want to show page numbers.

Banner, where:

- Choose Image of the banner.
- Setup Width and Height of the banner.
- Setup Horizontal Alignment of the banner.
- Use banner For All Pages or not.

Report title, where:

- Title caption of the report.
- Font of the caption.
- Color of the caption.
- Horizontal Alignment of the caption.

Report subtitle, has the same Font, Color and Horizontal Alignment parameters like Report title. Column headers, has the same Font, Color and Horizontal Alignment parameters like Report title.

And has some other parameters, where:

- Background color of the caption.
- Border of the caption.
- Vertical Alignment of the caption.
- Number of columns using in report.
- Group by tag if you want to use report's grouping.

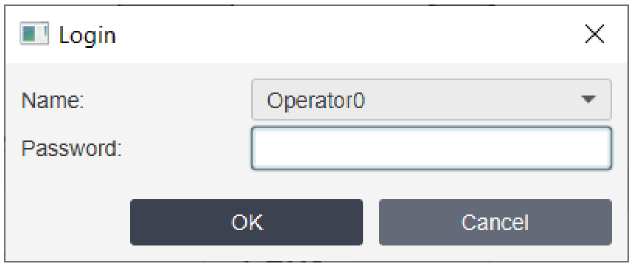
Cell properties, has the same Font, Color and Horizontal Alignment parameters like Report title and Background color, Border and Vertical Alignment parameters like Column headers. And has some other parameters, where:

- Check Highlight Even Row if you want to do it.
- Choose Even Row Background.
- Set up Save every (...) sec for trends reports for choosing save period.

You can Save this report settings template for this graphical object and then Open... it. To create report by using these settings click Print. You'll see Preparing report window. After some time you'll see your Report. You can print directly by choosing your printer or you can save this report in some format: pdf, html, csv and others.

6.9 Simulation

You can simulate behavior of you project. To start simulation select the menu item **Project->Run simulation** 67 or click button on the Toolbar 70. If you use users in your project Login dialog will appear:


Login

Name: Operator0

Password:

Select user and enter password in the ?eld. Now you can simulate your project.

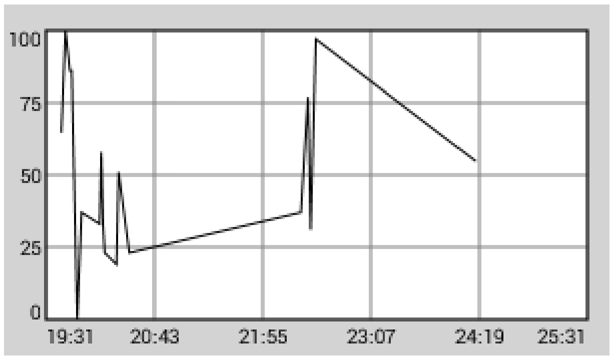
You can change value of the tag by double clicking on it in the **Project window** 73 ->**Tags** 79 or you can click by right button on the tag and select **Simulate->Set value** 81 menu item. Also you can simulate behavior of the tag:

1. Random value - periodically change the value of the tag randomly from 1 to 100.
2. Ramp value - periodically change the tag value from 1 to 100 by adding 1.

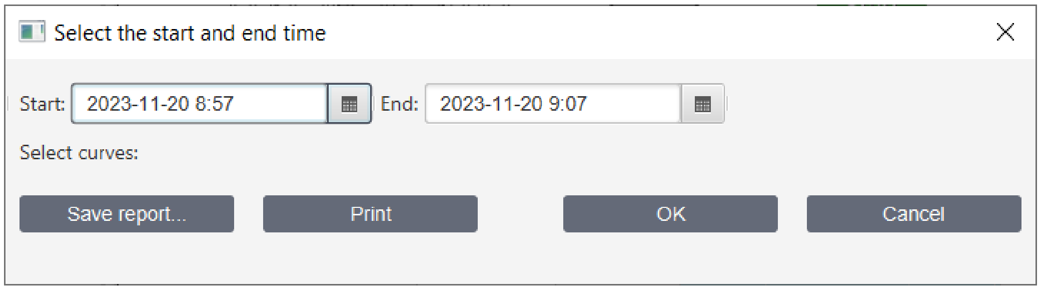
By selecting **Simulate->Cancel** 81 menu item you annul the task.

Also it's possible to change value of the tag using control graphical objects of your project like text 164, buttons 185, slider 219, counter 221 and etc. For example if you use Text object enable output property and bind to the tag you want to use. During simulation click on it and enter value you want.

Also you can simulate behavior of Trend 233 and Events log 243 objects. Place these objects on the Canvas 92. Set properties of the object as describe in previous chapters. During simulation trend will be look like this:



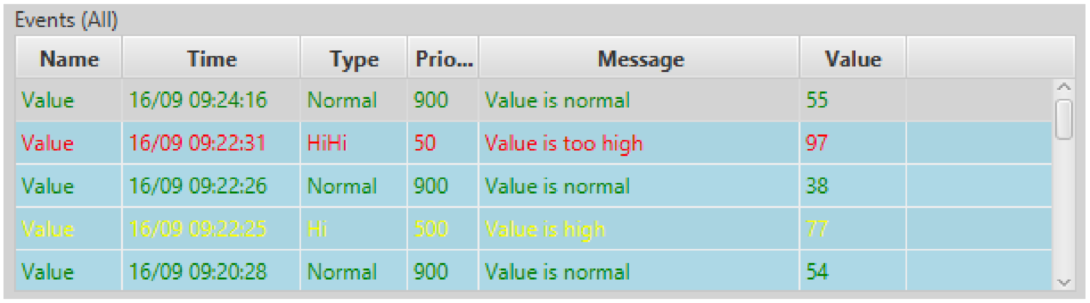
To select start and end time click on it. You'll see the following dialog. Select times and click OK.


Select the start and end time

Start: 2023-11-20 8:57 End: 2023-11-20 9:07

Select curves:

During simulation Events log will be look like this:

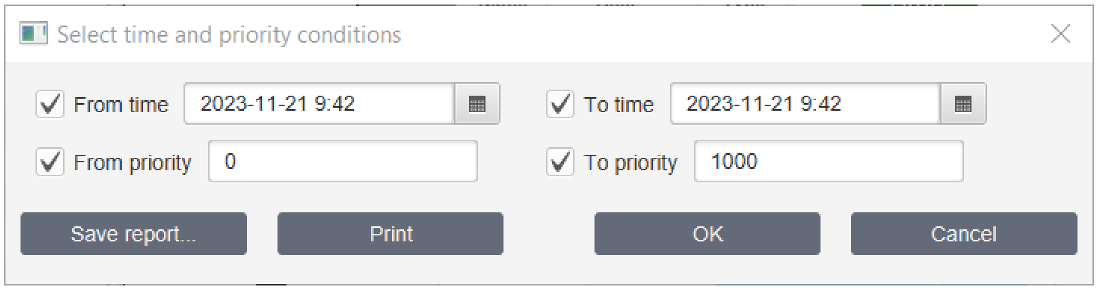


Events (All)

Name	Time	Type	Prio...	Message	Value
Value	16/09 09:24:16	Normal	900	Value is normal	55
Value	16/09 09:22:31	HiHi	50	Value is too high	97
Value	16/09 09:22:26	Normal	900	Value is normal	38
Value	16/09 09:22:25	Hi	500	Value is high	77
Value	16/09 09:20:28	Normal	900	Value is normal	54

1. To View message in the separate dialog double click on it or click right button on it and select View menu item.
2. To acknowledge record click by right button on it and select Acknowledge menu item.
3. To acknowledge all records on the table click by right button on the table and select Acknowledge All menu item.
4. To delete record click by right button on it and select Delete menu item.
5. To delete all records on the table click by right button on the table and select Delete All menu item.

You can select records that you want to see in the table. Click on the table's title. You'll see Select time and priority conditions dialog. Select start and end times of records displayed in the table. You can also set records with what priorities will be displayed.



Select time and priority conditions

✓ From time: 2023-11-21 9:42
✓ To time: 2023-11-21 9:42
✓ From priority: 0
✓ To priority: 1000

7 Load on Device

When project is created (screens, servers, tags, scripts and users), the project can be loaded on the mobile device or other PC. First, the corresponding TeslaSCADA Runtime mobile app on the Android device or PC apps on the Windows, Linux or MAC OS should be installed and started.

If the app has been installed on the mobile device or PC, there are 2 ways to load the project to the device:

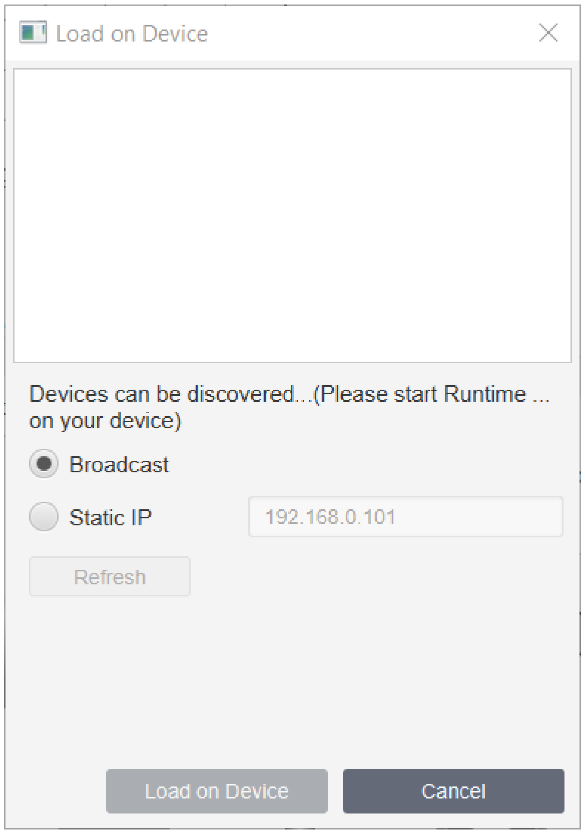
1. Network method.
2. Manual method.

Network method

Start the PC on which TeslaSCADA IDE is installed, and also start the mobile device or PC on which TeslaSCADA Runtime is installed, the devices must be on the same Wi-Fi network.

Procedure:

1. Enable WiFi on your mobile device or PC where TeslaSCADA Runtime is installed .
2. Start the TeslaSCADA2 Runtime app.
3. Open in the editor TeslaSCADA2 IDE the desired project to be transferred and select the menu item **File->Load on Device**.
4. The dialog "Load on Device" opens and it will search for mobile devices with the active TeslaSCADA2 Runtime. You can start a broadcast search and browse the entire network. However, since some routers do not forward broadcasts, there is also the possibility of a speci?c device search on the IP address. This search takes normally 5-10s. In individual cases it may happen that this search can take to 3 minutes. If you can't ?nd a device you can try to restart "Load on Device" dialog and TeslaSCADA2 Runtime application:



5. After a successful search in this dialog box all found mobile devices with active TeslaSCADA Runtime app will be shown.
6. Now select the desired target device and press the **Load on Device** button.
7. After a successful transfer, the target device with TeslaSCADA2 Runtime loads new project.

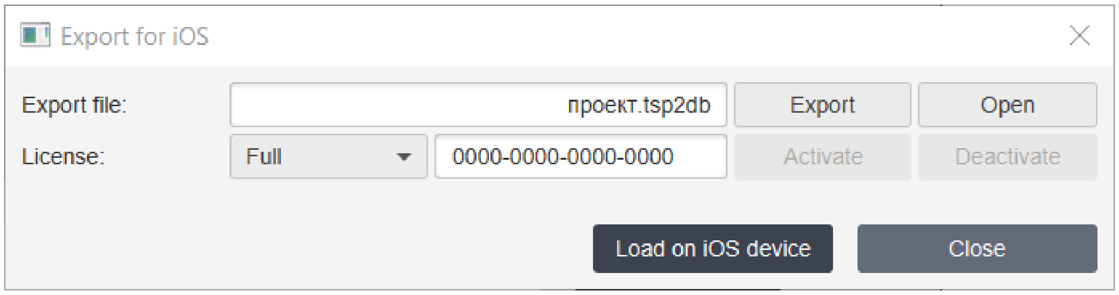
Manual method

Another way to load a project on the mobile device is a ?le explorer such as: the Android File Transfer. Once the TeslaSCADA Runtime installed mobile app and once started on the sd card, a folder called **Android/dat/tesla.scada2.android/files/Projects** is created.

Now the project, which is stored in a file with the .tsp2 extension from Windows, Linux or MacOS, can be manually copied to the SD card folder of the mobile device on which TeslaSCADA Runtime is installed. Now the project can be loaded manually by clicking the Open button on the TeslaSCADA Runtime main menu. Similarly, you can perform the above steps on a PC where TeslaSCADA Runtime is installed by copying the project file. You can use a local network, a flash drive, or any other portable storage device.

8 Export for iOS

When project is created, it can be exported for iOS mobile devices. To do export for iOS devices you should choose **File->Export for iOS** menu item. When you do it Export for iOS window will appear:



To do export, click the Export button, a file dialog will appear, enter a file name and click OK. The export file has the extension *.tsp2db. The file is based on a database in SQL format. You can open and check the data by opening it in any program that works with SQL databases. You can also open the exported file by clicking the Open button. The exported or opened file appears in the text field. To activate the project:

1. Choose license type.
2. Enter license number.
3. Click Activate button (it will change background color to green and «License available for activation» message will appear).
4. If you want to deactivate license click Deactivate button (it will change background color to green).
5. Load project on iOS device.
6. When loading of the project is completed on iOS device «Activation completed» message will appear (device should have an Internet access).

If TeslaSCADA2 Runtime is installed on your iOS device (iPhone or iPad), there are 2 ways to download the exported project to the device:

1. Network method.
2. Manual method.

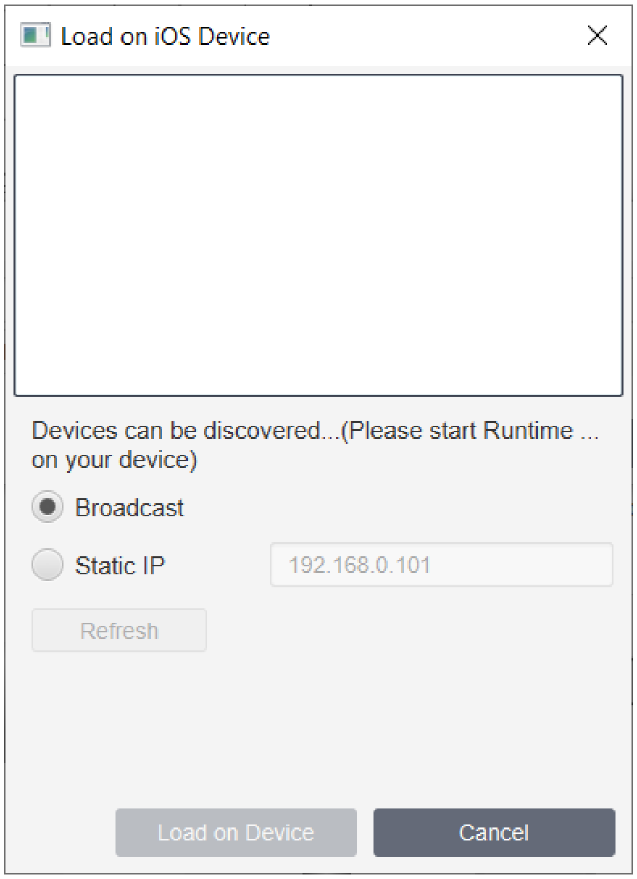
Click **Load on iOS device** to use Network method to load imported ?le on your iOS device.

Network method

In order to use this method, the PC on which TeslaSCADA IDE is installed must be turned on, and the iOS device on which TeslaSCADA2 Runtime is installed must be running, the devices must be on the same Wi-Fi network.

Perform the following steps in sequence:

1. Turn on WiFi on the mobile device on which TeslaSCADA2 Runtime is installed.
2. Launch TeslaSCADA2 Runtime.
3. Select the menu item File->Export for iOS into TeslaSCADA2 IDE.
4. Open the desired project to export. Click the Download button on your iOS device.
5. After this, a dialog box will open and the search for devices with active TeslaSCADA2 Runtime will begin. You can start searching for broadcast and explore the entire network. However, since some routers do not support broadcast, it is also possible to search for a specific device by IP address. Usually the search takes 5-10s. In some cases this can last up to 3 minutes. If you cannot find the device, you can re-launch the Download to iOS device and TeslaSCADA2 Runtime dialog box. After a successful search, all found devices with running TeslaSCADA2 Runtime applications will appear in the dialog box:



6. Now select the device you want to download the project to and click the **Download on Device** button.

7. After successful data transfer, TeslaSCADA2 Runtime will load a new project.

Manual method

Another way to download a project to an iOS mobile device is iTunes -> File Sharing.

Important! For newer versions of MacOS, you can download the project to your device using Finder.

1. Open iTunes on your Mac or PC.
2. Connect your iPhone or iPad to your computer using the USB cable that comes with the device.
3. Click on your device in iTunes.
4. In the side menu, click Apps. Then scroll to the File Sharing section at the bottom of the page.
5. Find the "TeslaSCADA2 Runtime" folder, copy the project file (*.tsp2db) to this folder.

9 Examples

This chapter provides examples of the most commonly used tasks.

Important! For all examples below we'll change properties in Object properties window, but you can do it in Property sheet 93 if you want.

9.1 Change the color of an object

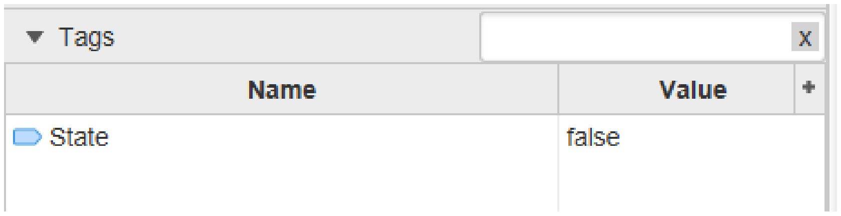
Let's consider the most common cases when you want to change the color of an object when the value of its associated variable changes. All of the examples below can be applied to different colors - fills, borders, text, etc. Below you can find out several examples from common to more complex with scripts:

- Common color change 539
- Common multiple color change 540
- Common multiple color change with scripts 542
- Complex color change 544
- Complex color change with scripts 548

9.1.1 Simple color change

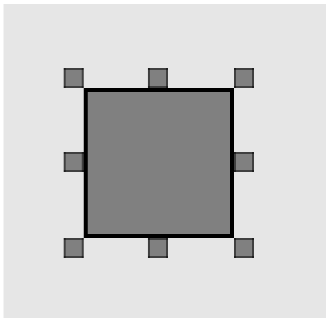
Let's assume that in our project there is a certain object that has two states: on, off. The object's state data is passed to the tag. We want the object's fill color to differ on the screen depending on the state of the object.

1. Let's create a tag named State, which is responsible for data about object's state (set the data type of the tag to Boolean and the default value to false):

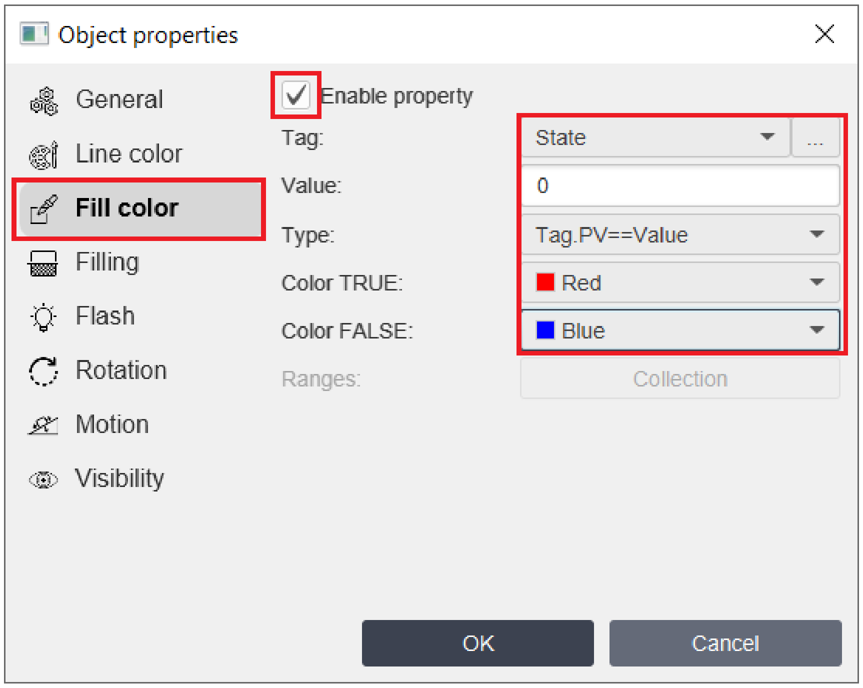


Name	Value
State	false

2. Now let's create a Rectangle object (choose the object that suits your specific case) and bind it to the State tag.



3. Let's set the "Fill Color" property. For example, we want to have red fill color if the object is turned off, and blue fill color if the object is turned on:



Object properties

[✓] Enable property

Tag: State

Value: 0

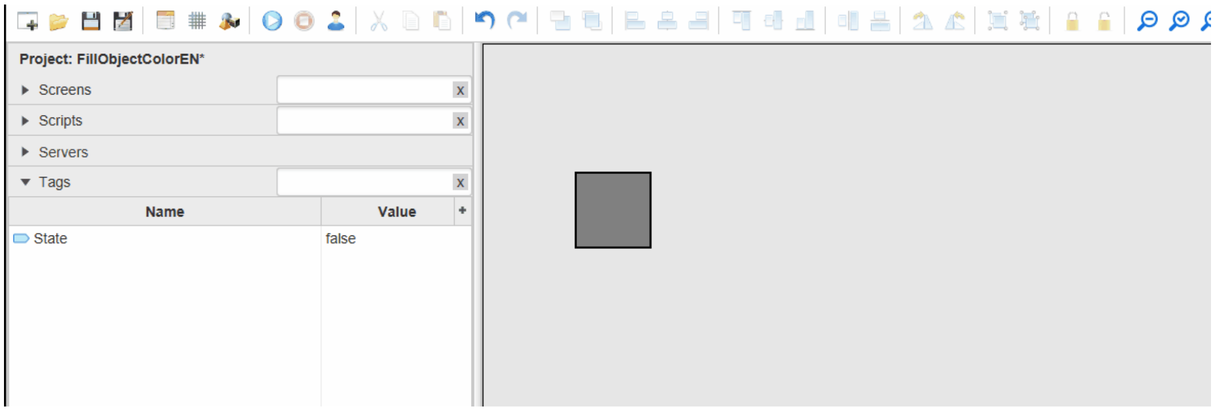
Type: Tag.PV==Value

Color TRUE: 🟥 Red

Color FALSE: 🟦 Blue

Ranges: Collection

4. Let's run the simulation to check the settings:



Project: FillObjectColorEN*

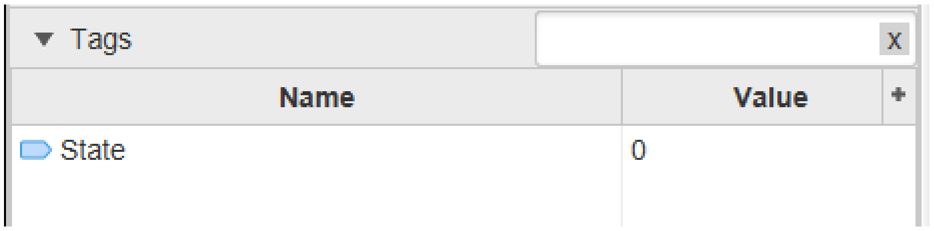
Name	Value
State	false

You can download this project here.

9.1.2 Simple multiple color change

Suppose we have a certain object (let there be a valve) that has several operating modes (open, closed, mode1, mode2). We want to display an object on the screen with a different color depending on the operating mode.

1. Let's create a State tag, which is responsible for the operating mode of the valve (select the data type - Byte (8bit), and the default value is 0):

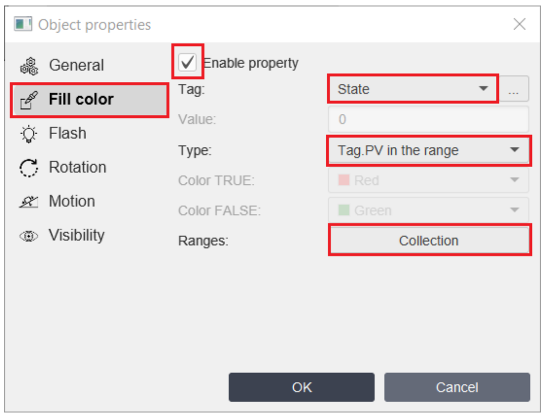


Name	Value
State	0

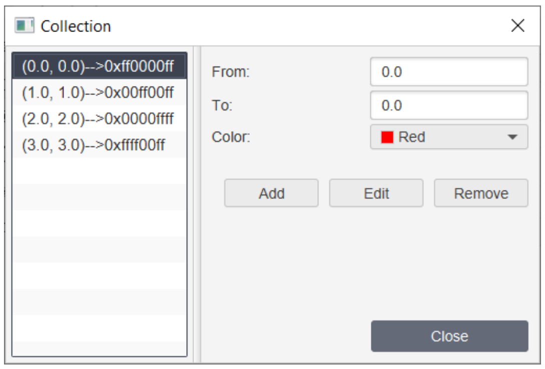
2. Let's create an object - Valve ISA 199 and set the "Fill Color" property depending on the tag value:

State	Color
0	RED
1	GREEN
2	BLUE
3	YELLOW

To do this, in the "Fill Color" tab, check the "Enable Property and select the **"Tag.PV in Range"** type, and then set the colors for each mode:



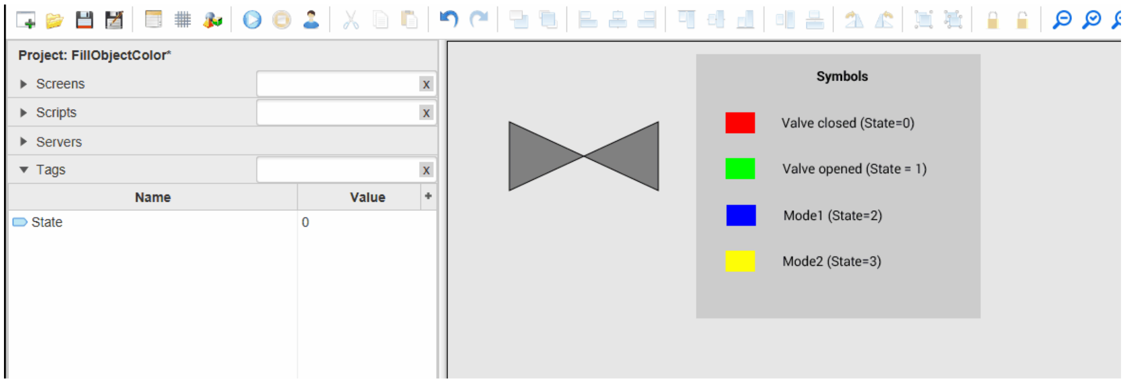
Enable property ✓
Tag: State
Value: 0
Type: Tag.PV in the range
Color TRUE: Red
Color FALSE: Green
Ranges: Collection



(0.0, 0.0)-->0xff0000ff
(1.0, 1.0)-->0x00ff00ff
(2.0, 2.0)-->0x0000ffff
(3.0, 3.0)-->0xffff00ff

From: 0.0
To: 0.0
Color: Red

3. Let's Run simulation 70 to check the settings:



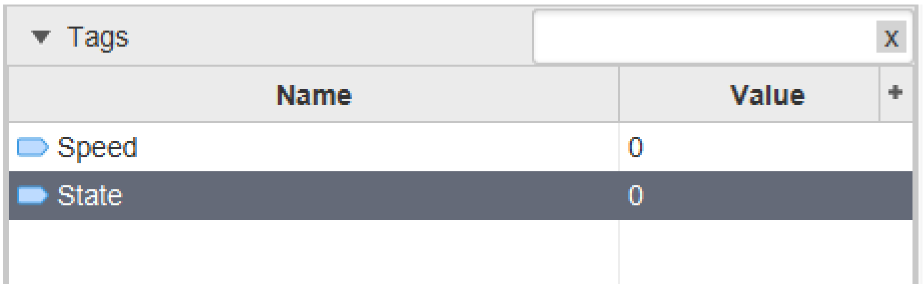
You can download this project here.

9.1.3 Simple multiple color change with scripts

If you need to change the color depending on several tags, you need to use scripts. For example, you have a Motor object that has 2 parameters - State and Speed, and you want to use fill color depending on the State and Speed values:

State	Speed	Fill color
0	Any	RED
1	0...500	GREEN
1	500...1000	YELLOW
1	>1000	BLUE

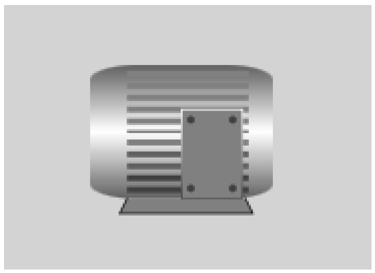
1. Create tags: Speed (set the data type - Short(16bit), initial PV - 0) and State (set the data type - Byte(8bit), initial PV - 0):



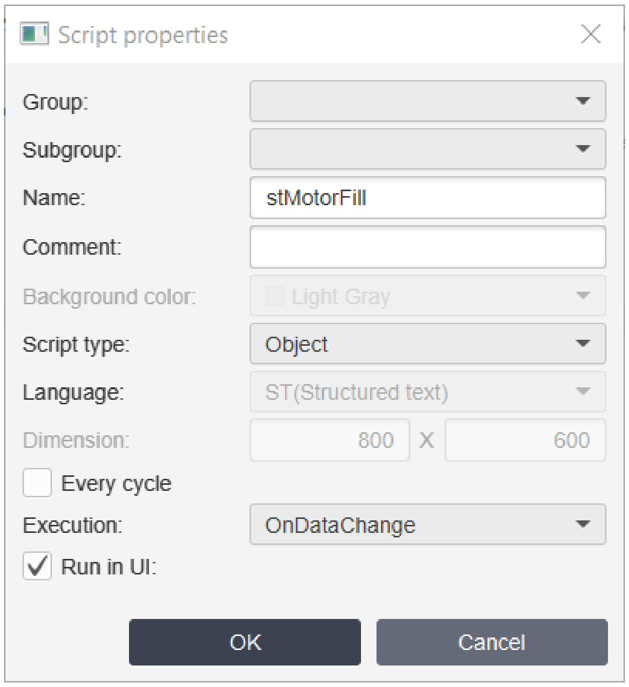
Tags

Name	Value
Speed	0
State	0

2. Let's create a graphical object - Motor for our example:

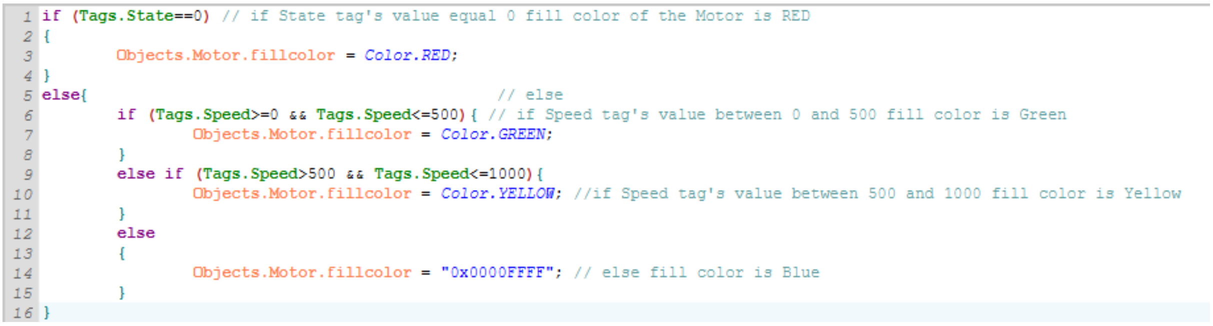


3. Create a script with the name stMotorFill, type - Object and execution type - OnDataChange:



Group:
Subgroup:
Name: stMotorFill
Comment:
Background color: Light Gray
Script type: Object
Language: ST(Structured text)
Dimension: 800 X 600
☐ Every cycle
Execution: OnDataChange
✓ Run in UI:

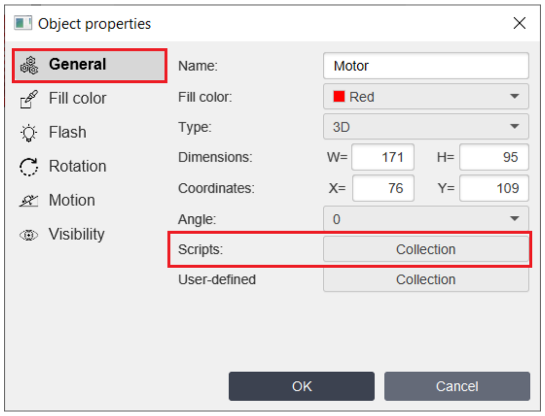
4. Let's write the script::



```
if (Tags.State==0) // if State tag's value equal 0 fill color of the Motor is RED
{
        Objects.Motor.fillcolor = Color.RED;
}
else{                                             // else
        if (Tags.Speed>=0 && Tags.Speed<=500){ // if Speed tag's value between 0 and 500 fill color is Green
                Objects.Motor.fillcolor = Color.GREEN;
        }
        else if (Tags.Speed>500 && Tags.Speed<=1000){
                Objects.Motor.fillcolor = Color.YELLOW; //if Speed tag's value between 500 and 1000 fill color is Yellow
        }
        else
        {
                Objects.Motor.fillcolor = "0x0000FFFF"; // else fill color is Blue
        }
}
```

After you have recorded the script, be sure to launch it by clicking the button on the toolbar:

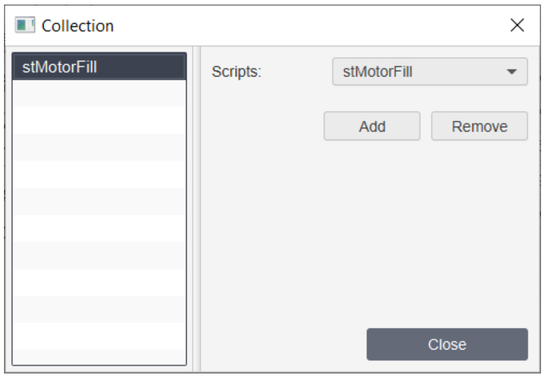
5. Now let's bind the script to our Motor object, go to the object's properties (General tab) and add our script to the "Scripts" field:



Object properties

General | Name: | Motor
Fill color | Fill color: | Red
Flash | Type: | 3D
Rotation | Dimensions: | W= 171 H= 95
Motion | Coordinates: | X= 76 Y= 109
Visibility | Angle: | 0

Scripts: Collection
User-defined: Collection

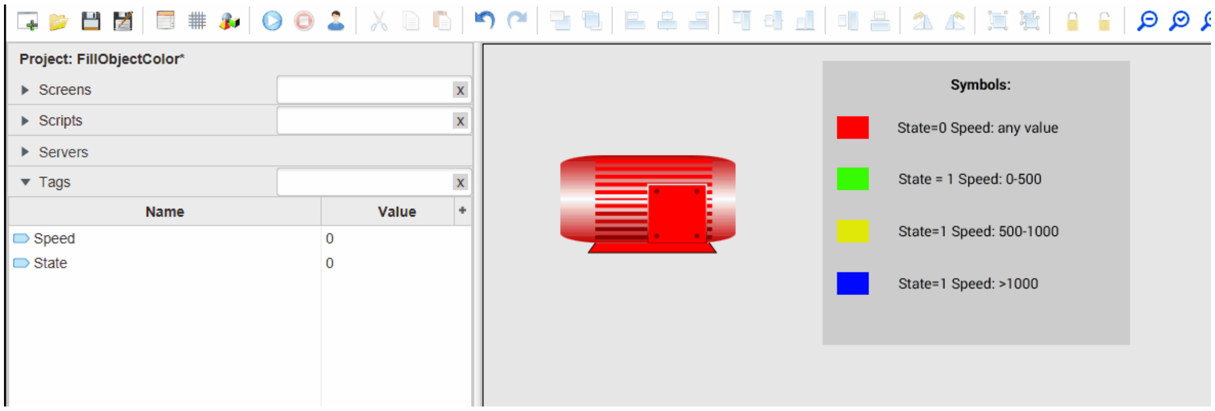


Collection

stMotorFill

Scripts: stMotorFill

6. Let's Run simulation 70 to check the settings:



Project: FillObjectColor*

Name	Value
Speed	0
State	0

Symbols:

🟥 State=0 Speed: any value
🟩 State = 1 Speed: 0-500
🟨 State=1 Speed: 500-1000
🟦 State=1 Speed: >1000

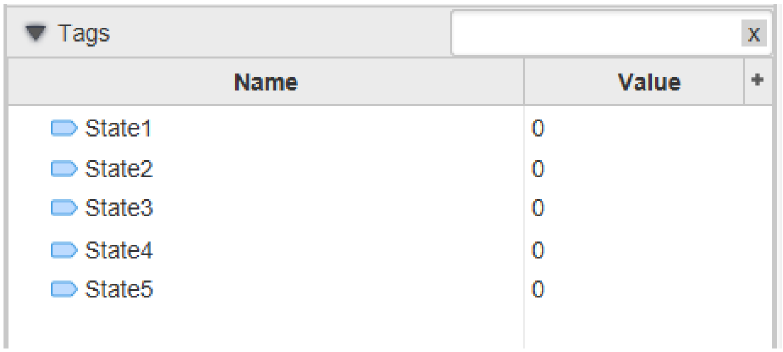
You can download this project here.

9.1.4 Complex color change

Consider the following example: you have large number of objects of the same type (motor), which have several operating modes (State), and you need to display the motor on the screen with color depending on the set operating mode.

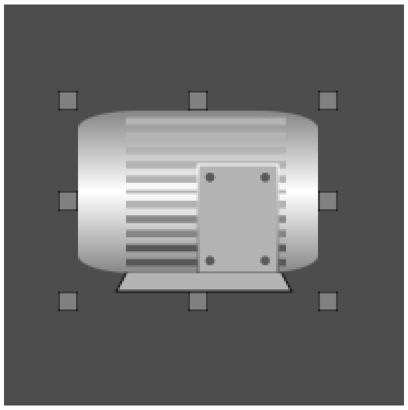
Because we have many objects of the same type, we will use indirect names to bind tags based on user-defined properties.

1 . First, let's create tags (by the number of objects).

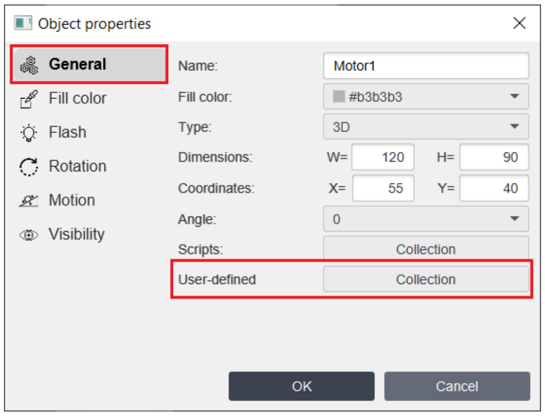


Name	Value
State1	0
State2	0
State3	0
State4	0
State5	0

2. Let’s create a graphical Motor object for our example:



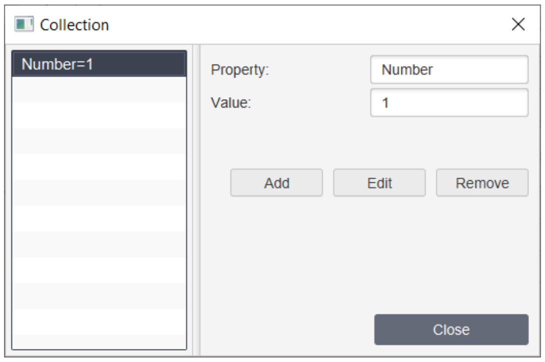
3. In the Object properties, set up the user-defined property "Number: and set its value “1“, because We will bind Motor1 to State1:



Object properties

General, Fill color, Flash, Rotation, Motion, Visibility

Name: Motor1
Fill color: #b3b3b3
Type: 3D
Dimensions: W= 120 H= 90
Coordinates: X= 55 Y= 40
Angle: 0
Scripts: Collection
User-defined: Collection



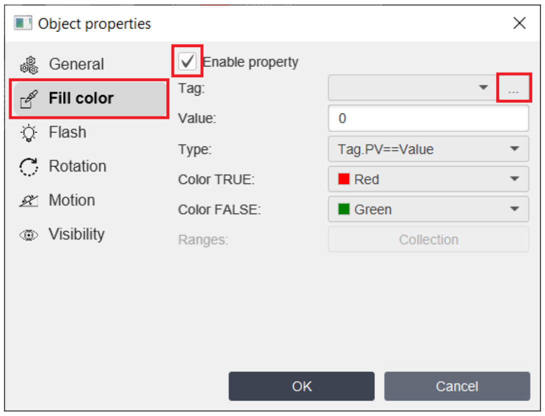
Collection

Number=1

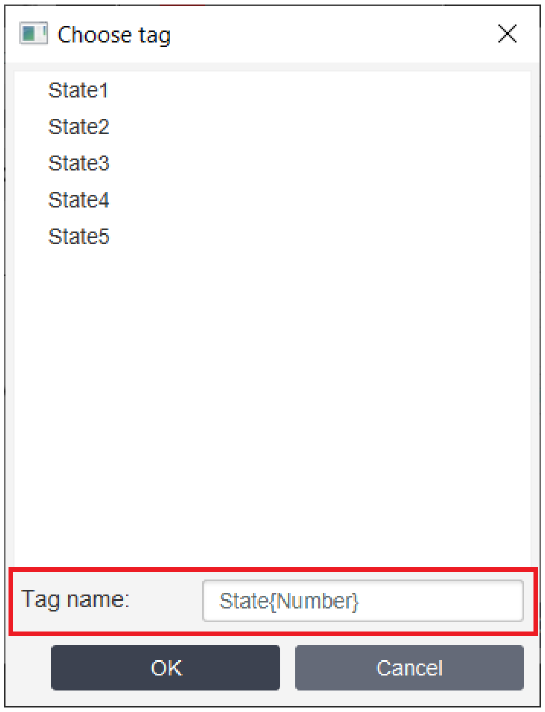
Property: Number
Value: 1

Click "OK" to save this user-defined property.

4. Next, bind the object to State1. Open the Object properties window again and select the “Fill Color” tab. Then in the “Tag” field (click on the “..." button) and in the window that opens in the “Tag Name” field we set State{Number} , where "Number" is our user-defind property (the value of which we set to “1” for the first object):



Enable property ✓
Tag:
Value: 0
Type: Tag.PV==Value
Color TRUE: 🟥 Red
Color FALSE: 🟩 Green
Ranges: Collection



State1
State2
State3
State4
State5

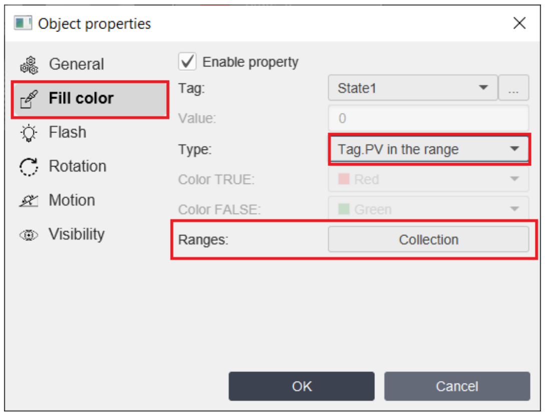
Tag name: State{Number}

5. Let's make sure that our object is bound to State1 (save the Object Properties by clicking "OK") and open the "Object Properties" window again.

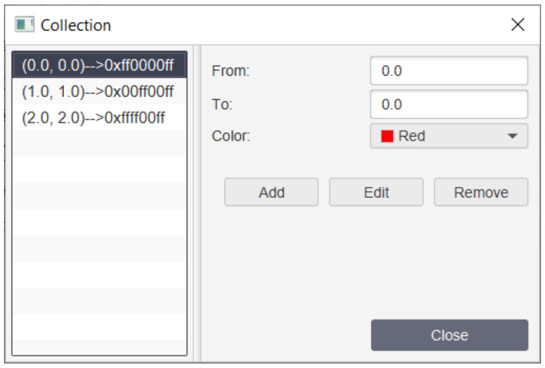
6. So, the "Fill Color" property is bound to the State1 tag. Now let's set the Color of the object depending on the value of this tag:

State1	Color
0	RED
1	GREEN
2	YELLOW

Select the Type **"TagPV in range"** and set the colors for the tag values:



Enable property ✓
Tag: State1
Value: 0
Type: Tag.PV in the range
Color TRUE: 🟥 Red
Color FALSE: 🟩 Green
Ranges: Collection



(0.0, 0.0)-->0xff0000ff
(1.0, 1.0)-->0x00ff00ff
(2.0, 2.0)-->0xffff00ff

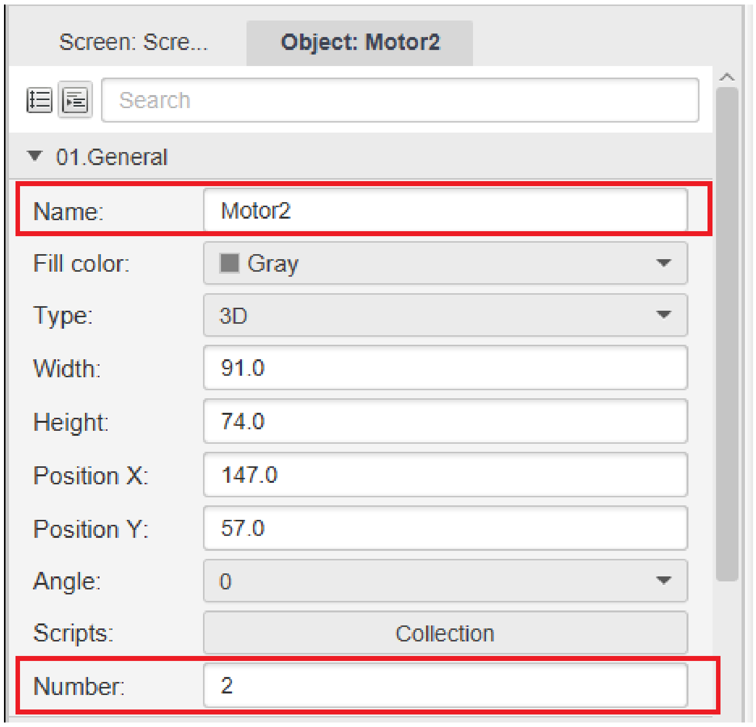
From: 0.0
To: 0.0
Color: 🟥 Red

Now we have a Motor -object with the Fill Color property set.

7. Now we need to create the same objects with the same settings. Because We used indirect names based on user-defined properties to bind tags, we do not need to set the Fill Color property for each new object (there is no need to set ranges for each object). We just need to duplicate the Motor ("Duplicate") and bind it to the tag by specifying the value of the Number user-defined property that corresponds to the tag. The fastest way to do this is in the Property Sheet

Confirm the changes and close the object properties window by clicking OK. .o copy this motor and bind the fill color property to the tags - State2 and State3 you don't need to configure the fill color property for each Motor, you only need to duplicate the Motor:

And change in the Property Sheet: the value of the user-defined property "Number" depending on which tag you want to bind the object to:



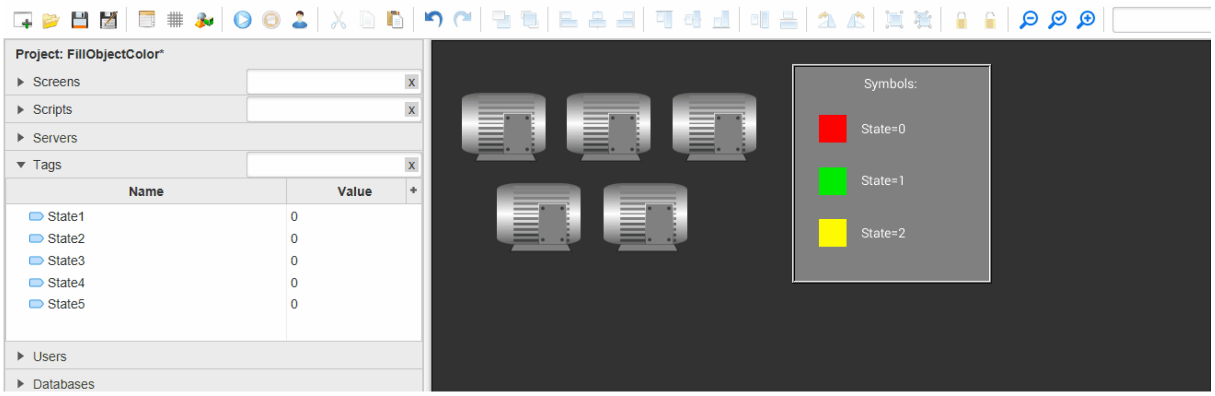
Screen: Scre... | Object: Motor2

Search

01.General

Name:	Motor2
Fill color:	Gray
Type:	3D
Width:	91.0
Height:	74.0
Position X:	147.0
Position Y:	57.0
Angle:	0
Scripts:	Collection
Number:	2

8. Let's Run simulation[70] to check the settings:



Project: FillObjectColor*

Screens

Scripts

Servers

Tags

Name	Value
State1	0
State2	0
State3	0
State4	0
State5	0

Users

Databases

Symbols:

🟥 State=0

🟩 State=1

🟨 State=2

You can download this project here.

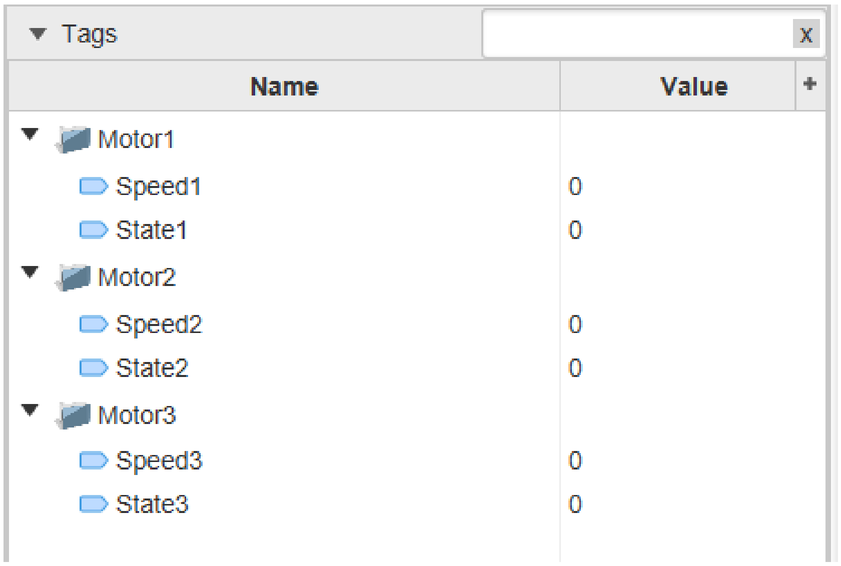
9.1.5 Complex color change with scripts

Suppose you have many objects (motors) of the same type, each of which has 2 parameters (state and speed). You need to change the color of an object depending on its state and speed.

We already know that if the color changes depending on the values of several tags, we need to use scripts; and if we use objects of the same type, in order to simplify the binding of duplicated objects to tags, we need to use indirect names based on user-defined properties.

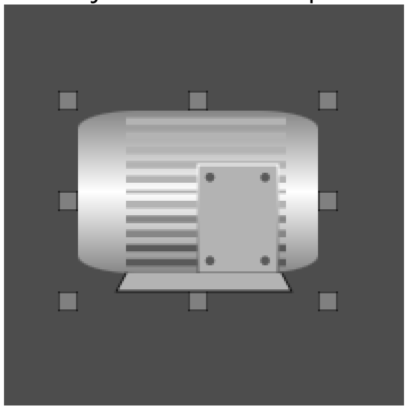
Let's look at an example.

1. Create 2 tags (State and Speed) for each Motor object. For convenience, we'll do this as a group, and then copy the group by the number of objects in the project:

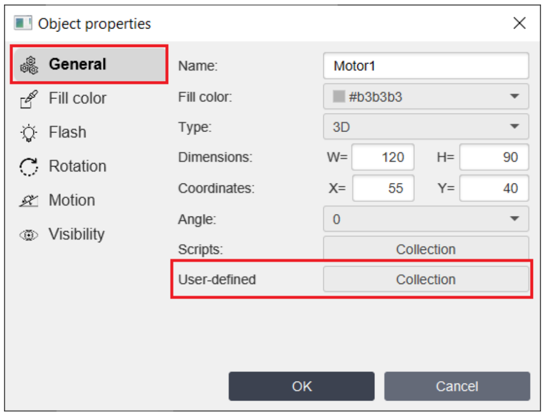


Name	Value
Motor1	
Speed1	0
State1	0
Motor2	
Speed2	0
State2	0
Motor3	
Speed3	0
State3	0

2. Let's create a graphical Motor object for our example:



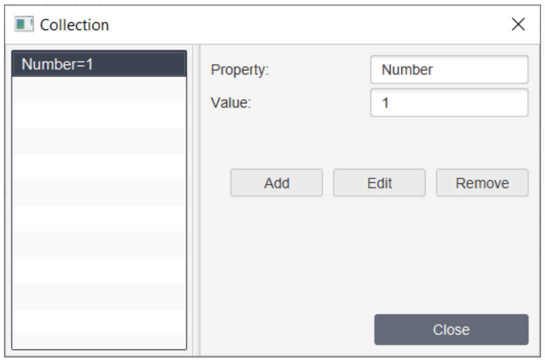
Let's open the Object properties window, create user-defined property - "Number" with the value "1", because We will bind this object to the State1 Speed1 tags:


Object properties

General | Fill color | Flash | Rotation | Motion | Visibility

Name: Motor1
Fill color: #b3b3b3
Type: 3D
Dimensions: W= 120 H= 90
Coordinates: X= 55 Y= 40
Angle: 0
Scripts: Collection
User-defined: Collection

OK | Cancel

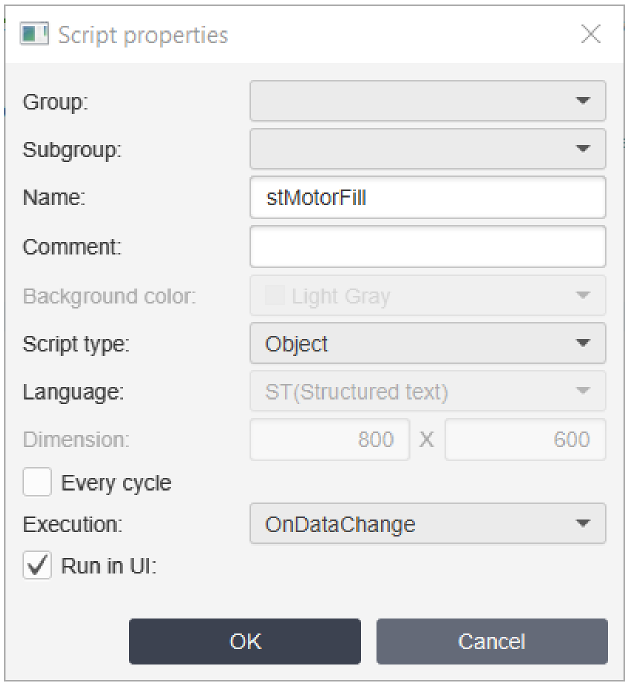

Collection

Number=1

Property: Number
Value: 1

Add | Edit | Remove | Close

3. Now we need to create a script for an object in the ST language with an execution type - OnDataChange:


Script properties

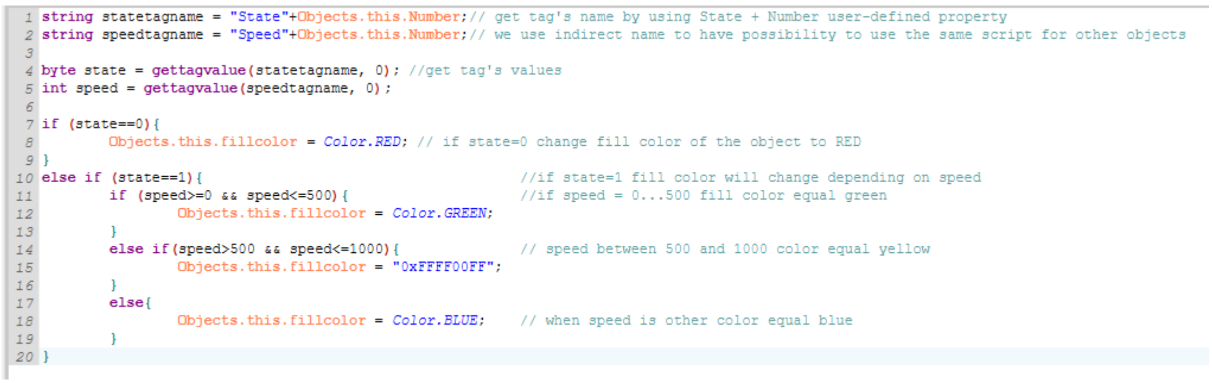
Group:
Subgroup:
Name: stMotorFill
Comment:
Background color: Light Gray
Script type: Object
Language: ST(Structured text)
Dimension: 800 X 600
☐ Every cycle
Execution: OnDataChange
☑ Run in UI:

OK | Cancel

Depending on tag's values for every Motor object use fill color:

State	Speed	Color
0	Any	RED
1	0...500	GREEN
1	500...1000	YELLOW
1	>1000	BLUE

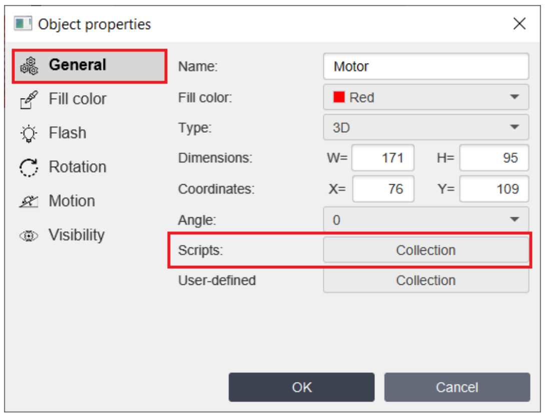
Let's write our script:



```
string statetagname = "State"+Objects.this.Number;// get tag's name by using State + Number user-defined property
string speedtagname = "Speed"+Objects.this.Number;// we use indirect name to have possibility to use the same script for other objects

byte state = gettagvalue(statetagname, 0); //get tag's values
int speed = gettagvalue(speedtagname, 0);

if (state==0){
        Objects.this.fillcolor = Color.RED; // if state=0 change fill color of the object to RED
}
else if (state==1){                                  //if state=1 fill color will change depending on speed
        if (speed>=0 && speed<=500){                 //if speed = 0...500 fill color equal green
                Objects.this.fillcolor = Color.GREEN;
        }
        else if(speed>500 && speed<=1000){           // speed between 500 and 1000 color equal yellow
                Objects.this.fillcolor = "0xFFFF00FF";
        }
        else{
                Objects.this.fillcolor = Color.BLUE;   // when speed is other color equal blue
        }
}
```

After you have recorded the script, be sure to launch it by clicking the button on the toolbar:

4. Let's bind our script to the object: open the properties of the Motor object, then - Scripts/Collection and bind our script:

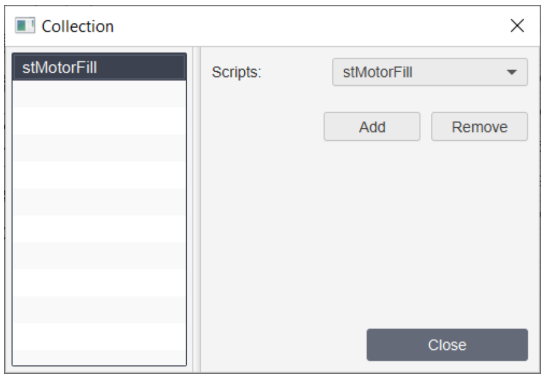


Object properties

General | Fill color | Flash | Rotation | Motion | Visibility

Name: Motor
Fill color: Red
Type: 3D
Dimensions: W= 171 H= 95
Coordinates: X= 76 Y= 109
Angle: 0
Scripts: Collection
User-defined: Collection

OK | Cancel



Collection

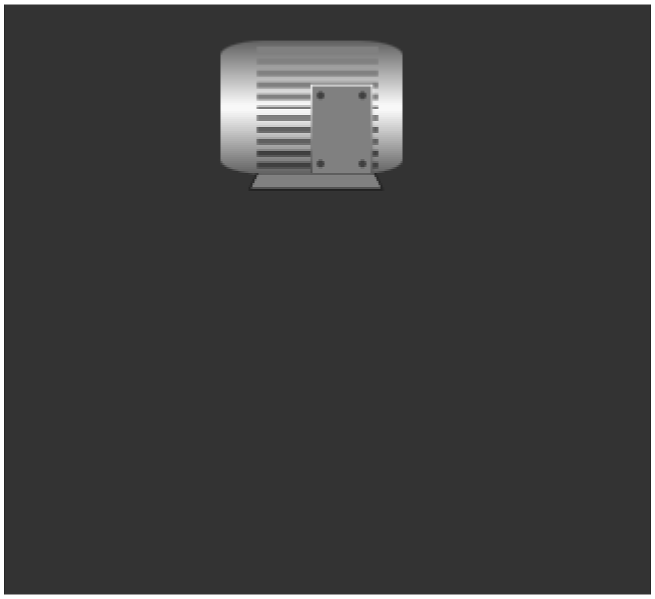
stMotorFill

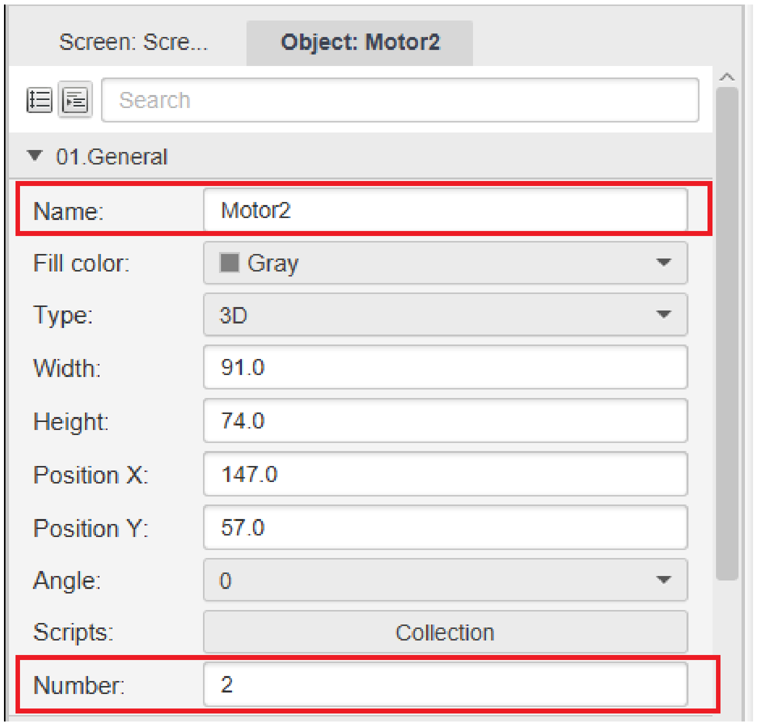
Scripts: stMotorFill

Add | Remove | Close

Now we have a Motor with the Fill Color property configured in the script.

5. Now let’s duplicate the object as many times as needed for the project. Because we used a custom property, we don't need to customize the script for each Motor. We only need to duplicate the Motor and change the value of the user-defined property in the Property sheet 93:



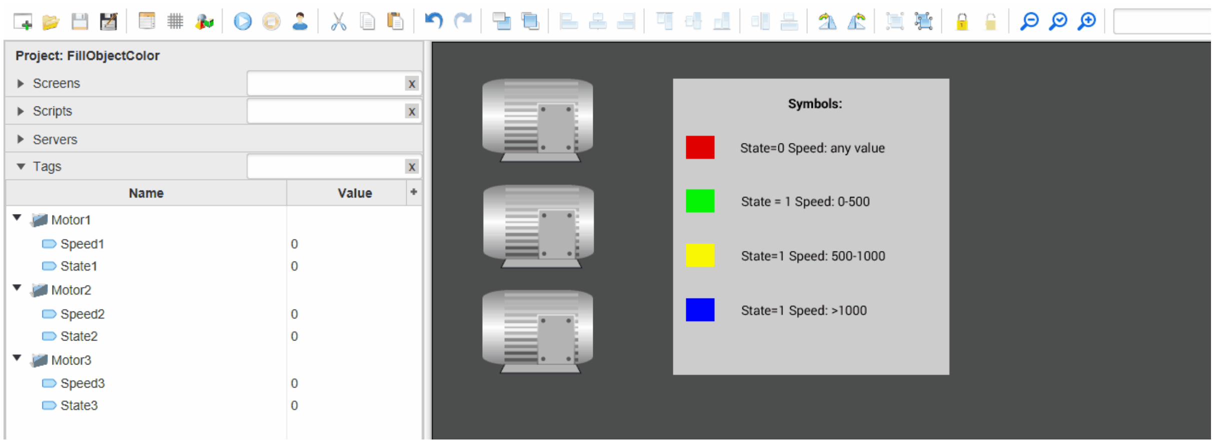

Screen: Scre... | Object: Motor2

Search

01.General

Name:	Motor2
Fill color:	Gray
Type:	3D
Width:	91.0
Height:	74.0
Position X:	147.0
Position Y:	57.0
Angle:	0
Scripts:	Collection
Number:	2

6. Let's Run simulation 70 to check the settings:


Project: FillObjectColor

Name	Value
Motor1	
Speed1	0
State1	0
Motor2	
Speed2	0
State2	0
Motor3	
Speed3	0
State3	0

Symbols:

🟥	State=0 Speed: any value
🟩	State = 1 Speed: 0-500
🟨	State=1 Speed: 500-1000
🟦	State=1 Speed: >1000

You can download this project here.

9.2 Object flashing

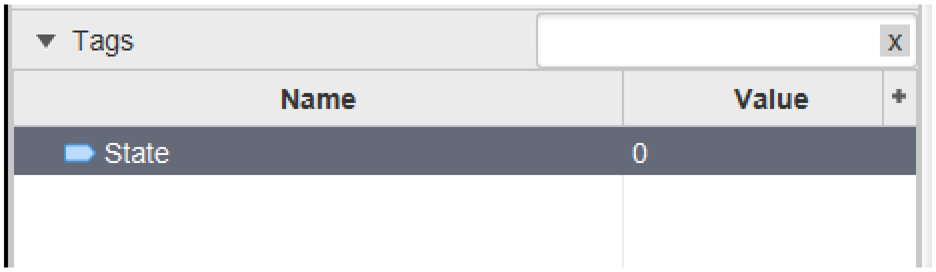
Let's look at the most common case, where you want an object to flash and change its frequency when the value of its associated variable changes. Below you can find several examples from simple to more complex with scripts:

- Simple flashing 553
- Simple multiple flashing 555
- Complex flashing with scripts 556

9.2.1 Simple flashing

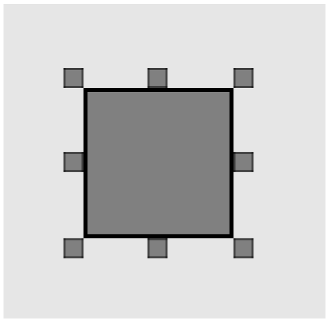
Let's assume that in our project there is a certain object with a certain parameter (tag). We want the object to flash at 1000ms if the tag value is not "0".

1. Create a tag named State:

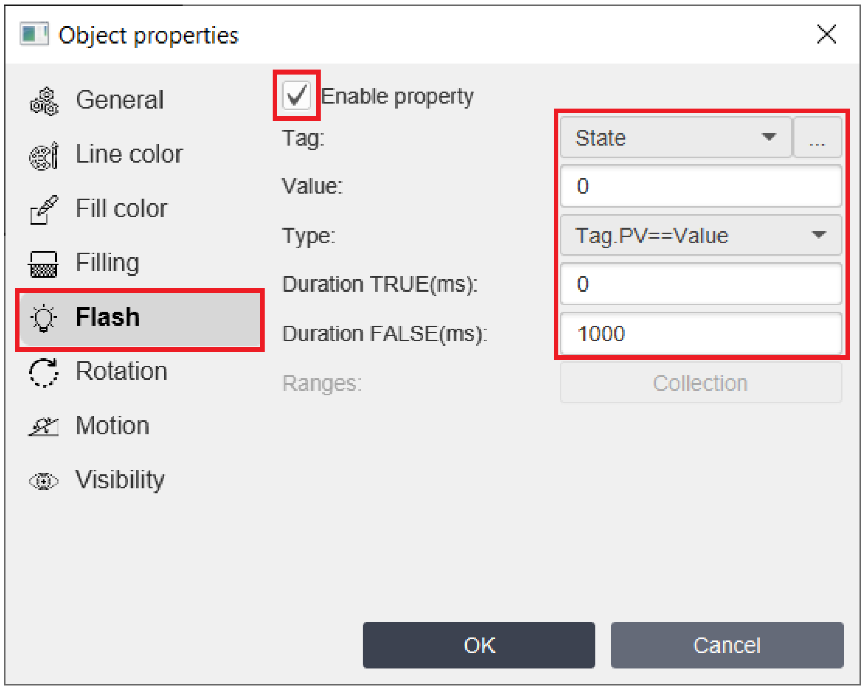


Name	Value
State	0

2. Let's create an object, let it be a rectangle (instead of a Rectangle there may be another object that is more suitable for your project):

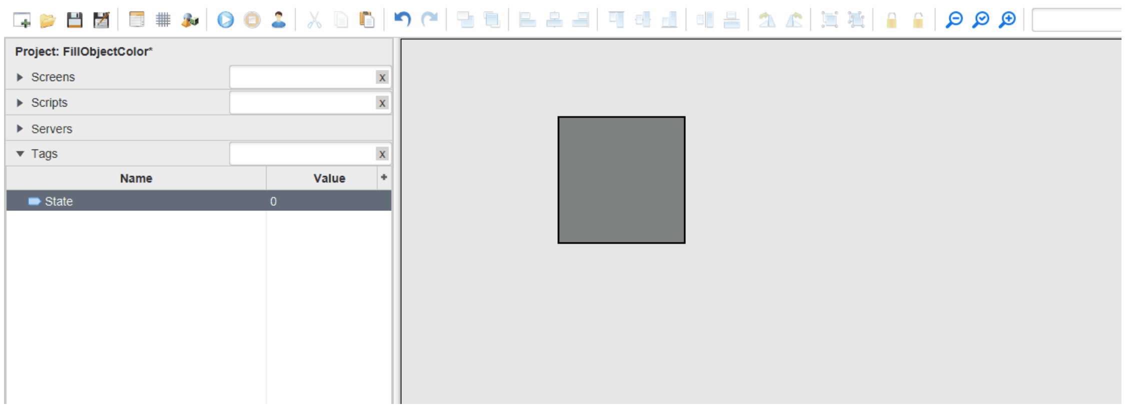


3. Now let’s set the Flash property. Let's open the Object properties, go to the "Flash" tab and configure it as we planned above (bind it to State1, set the tag value = 0, comparison type "Teg.PV==Value"). Now, if the State tag value ==0, the result comparison TRUE, set the flash duration =0 (the object does not flash). If the value of the State tag is !=0, the comparison result is FALSE, set the flash duration to 1000ms (the object flashes with a frequency of 1000ms):



Enable property ✓
Tag: State
Value: 0
Type: Tag.PV==Value
Duration TRUE(ms): 0
Duration FALSE(ms): 1000
Ranges:

4. Let's Run simulation 70 to check the settings:


Project: FillObjectColor*

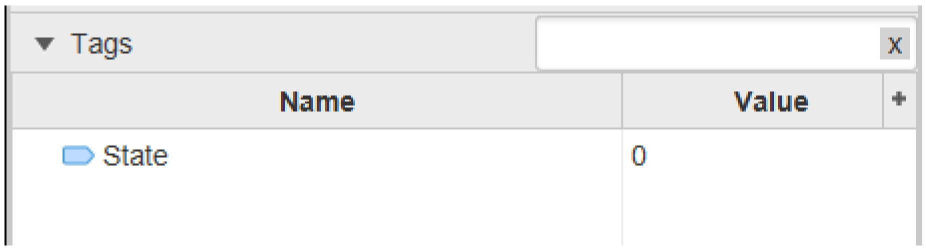
Name	Value
State	0

You can download this project here.

9.2.2 Simple multiple flashing

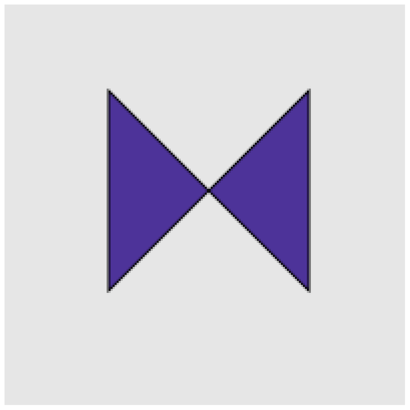
Let's assume we want an object to flash at multiple tag values and with different flash duration. In this case, we need to use the comparison type **"Tag.PV in range"**. Let's look at an example.

1. Create a tag - State, which is responsible for the operating mode of the valve:



Name	Value
State	0

2. Create an ISA Valve object:

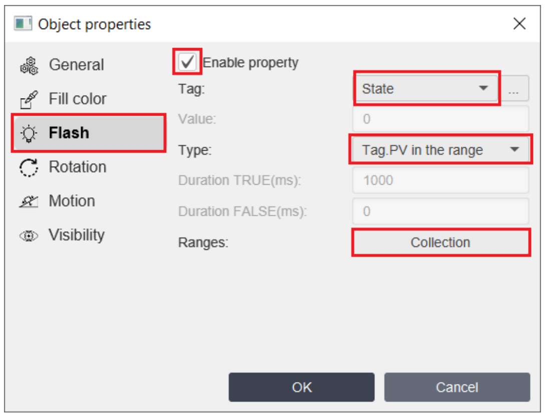


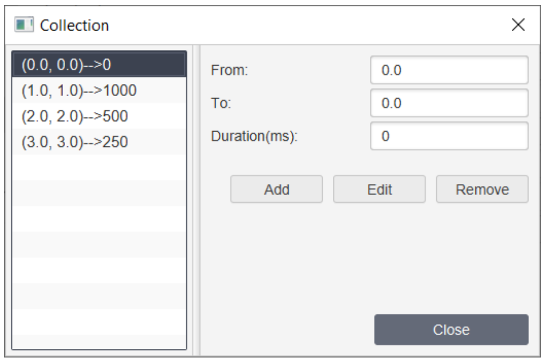
3. Set the Flash property as follows:

State	Flash
0	0

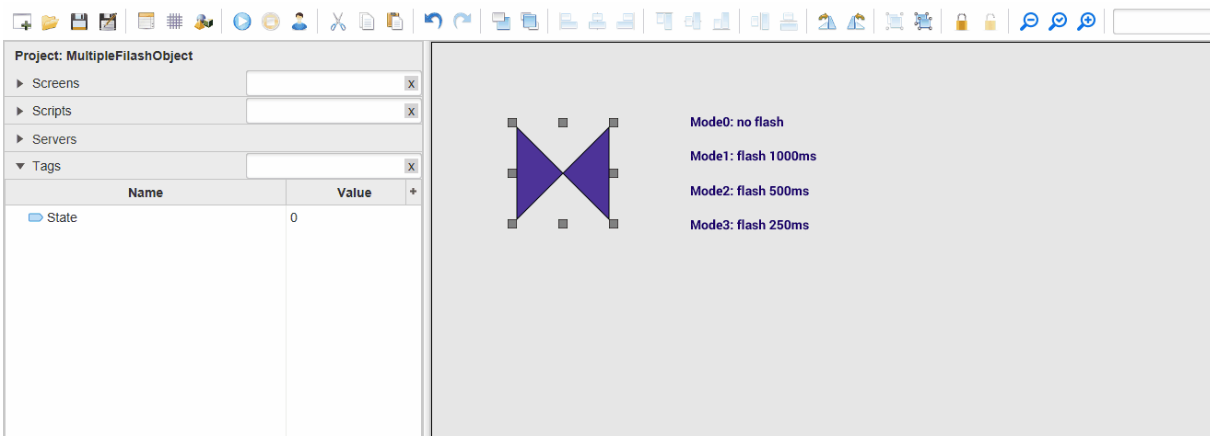
State	Flash
1	1000
2	500
3	250

To do this, open Object properties on the Flash tab and set the flash ranges:


Object properties
General
Fill color
Flash
Rotation
Motion
Visibility
✓ Enable property
Tag: State
Value: 0
Type: Tag.PV in the range
Duration TRUE(ms): 1000
Duration FALSE(ms): 0
Ranges: Collection
OK Cancel


Collection
(0.0, 0.0)-->0
(1.0, 1.0)-->1000
(2.0, 2.0)-->500
(3.0, 3.0)-->250
From: 0.0
To: 0.0
Duration(ms): 0
Add Edit Remove
Close

4. Let's Run simulation[70] to check the settings:


Project: MultipleFilashObject

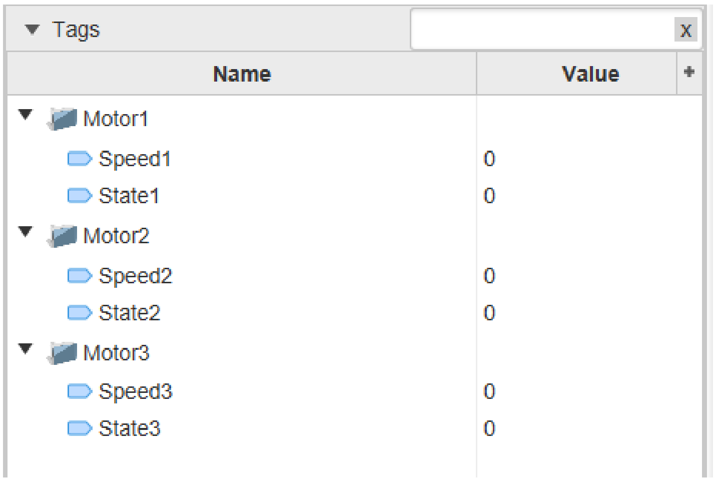
Name	Value
State	0

You can download this project here.

9.2.3 Complex flashing with scripts

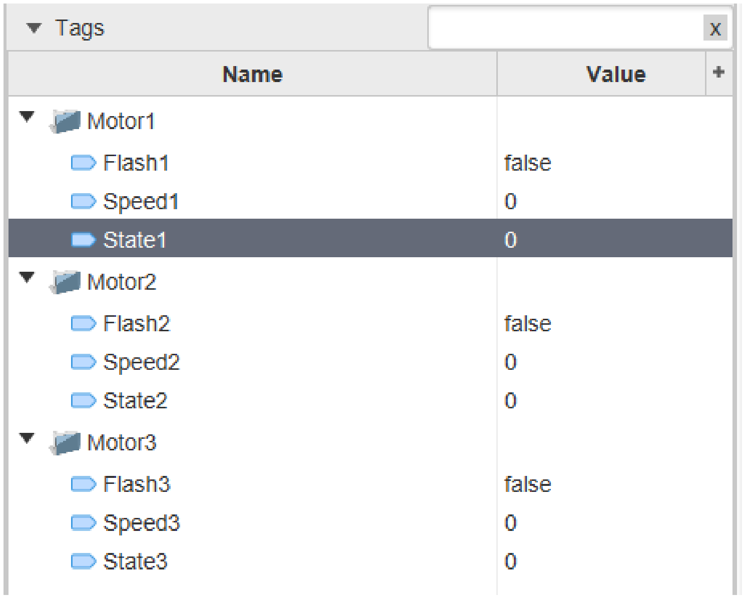
Let's assume that in our project we have many Motor objects of the same type, each of which has several State and Speed parameters, and depending on their values, we want the objects (Motor) to flash/not flash on the screen. Since in this case there is a dependence of flashing on several tags, it is necessary to use scripts. And since we have several objects of the same type in our project, it is more convenient to use indirect names to bind tags to an object.

1. First, let’s create tags for each object - State and Speed (we’ll arrange them as a group):



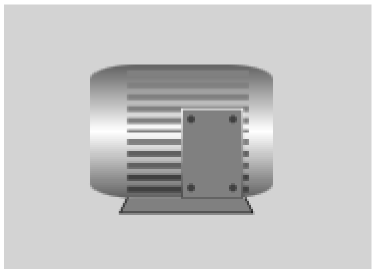
Name	Value
Motor1	
Speed1	0
State1	0
Motor2	
Speed2	0
State2	0
Motor3	
Speed3	0
State3	0

2. In this case, we need intermediate tags to enable or disable the flashing of an object. - Flash1, Flash2 and Flash3, let's create them:

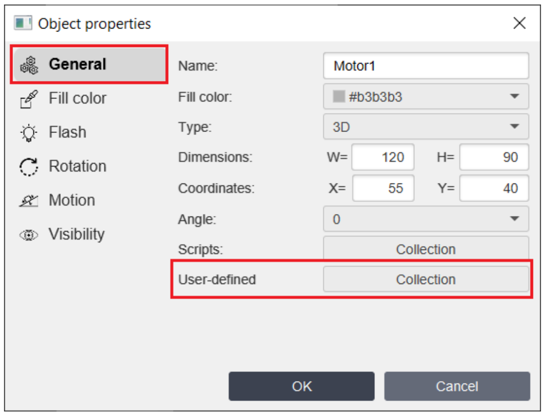


Name	Value
Motor1	
Flash1	false
Speed1	0
State1	0
Motor2	
Flash2	false
Speed2	0
State2	0
Motor3	
Flash3	false
Speed3	0
State3	0

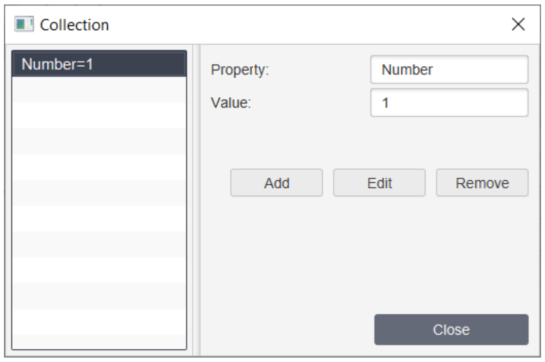
3. Let’s create a graphical Motor object for our example:



In the Object properties in the "General" tab, create a user-defined property "Number" and set its value "1", because we will bind this object to the Flash**1** tag:


Object properties

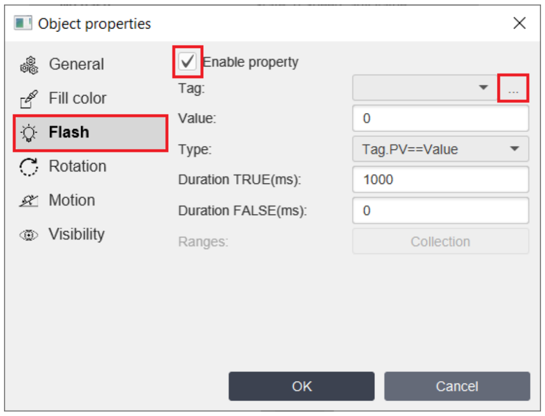
Name: Motor1
Fill color: #b3b3b3
Type: 3D
Dimensions: W= 120 H= 90
Coordinates: X= 55 Y= 40
Angle: 0
Scripts: Collection
User-defined: Collection


Collection

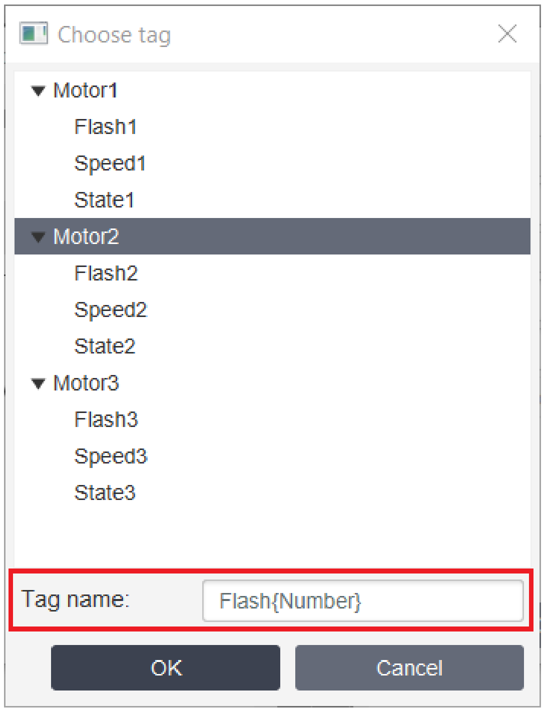
Number=1

Property: Number
Value: 1

4. Close the "Collections" window and click "OK" in the Object Properties Window to save the changes. Now let’s open the Object Properties again and configure the Flash property: bind the tag by specifying the indirect name: Flash{Number}:


Object properties

Enable property: ✓
Tag:
Value: 0
Type: Tag.PV==Value
Duration TRUE(ms): 1000
Duration FALSE(ms): 0
Ranges: Collection


Choose tag

Motor1
Flash1
Speed1
State1
Motor2
Flash2
Speed2
State2
Motor3
Flash3
Speed3
State3

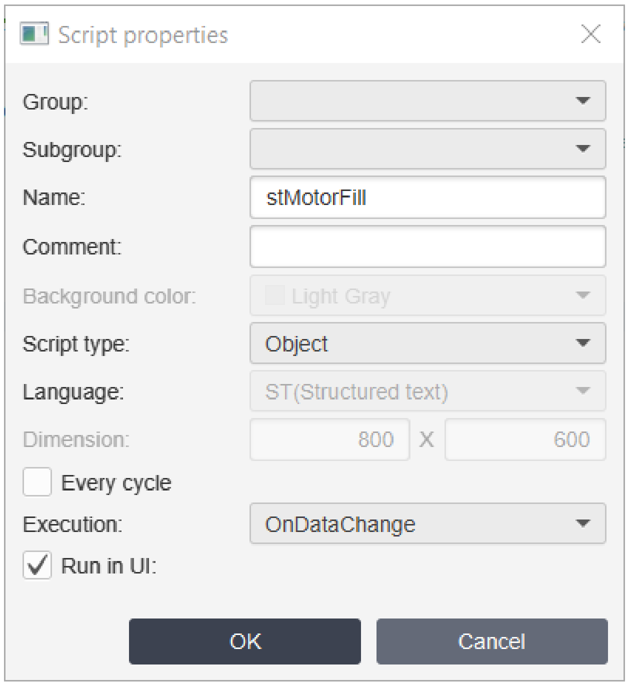
Tag name: Flash{Number}

5. Depending on the tag values for each Motor object, we will use the frequency:

State	Speed	Flash frequency
0	Any	Not flashing
1	0...500	1000

State	Speed	Flash frequency
1	500...1000	500
1	>1000	250

6. Let's create a script for an object in the ST language with the execution type - OnDataChange:


Script properties

Group:

Subgroup:

Name: stMotorFill

Comment:

Background color: Light Gray

Script type: Object

Language: ST(Structured text)

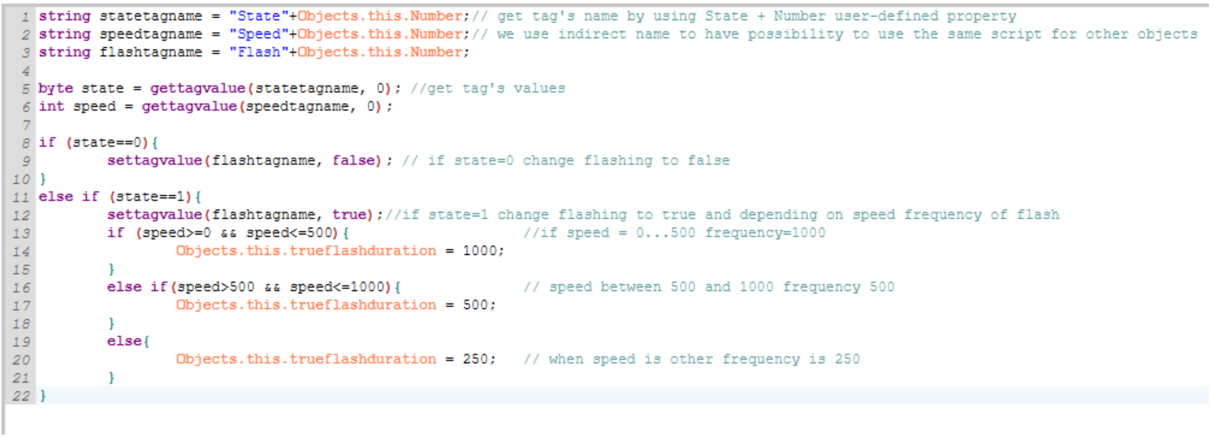
Dimension: 800 X 600

Every cycle: ☐

Execution: OnDataChange

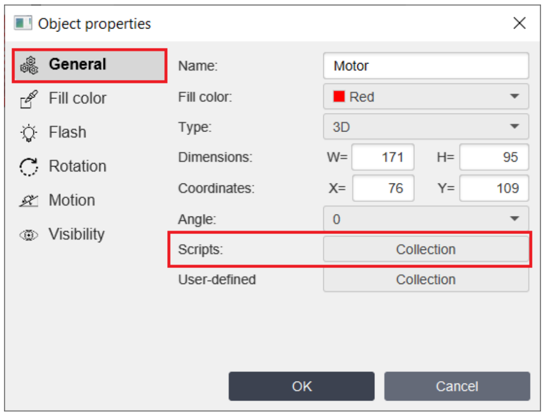
Run in UI: ✓

Let's write a script:


```
string statetagname = "State"+Objects.this.Number;// get tag's name by using State + Number user-defined property
string speedtagname = "Speed"+Objects.this.Number;// we use indirect name to have possibility to use the same script for other objects
string flashtagname = "Flash"+Objects.this.Number;

byte state = gettagvalue(statetagname, 0); //get tag's values
int speed = gettagvalue(speedtagname, 0);

if (state==0){
        settagvalue(flashtagname, false); // if state=0 change flashing to false
}
else if (state==1){
        settagvalue(flashtagname, true);//if state=1 change flashing to true and depending on speed frequency of flash
        if (speed>=0 && speed<=500){                    //if speed = 0...500 frequency=1000
                Objects.this.trueflashduration = 1000;
        }
        else if(speed>500 && speed<=1000){              // speed between 500 and 1000 frequency 500
                Objects.this.trueflashduration = 500;
        }
        else{
                Objects.this.trueflashduration = 250;   // when speed is other frequency is 250
        }
}
```

After you have recorded the script, be sure to launch it by clicking the button on the toolbar: ▶

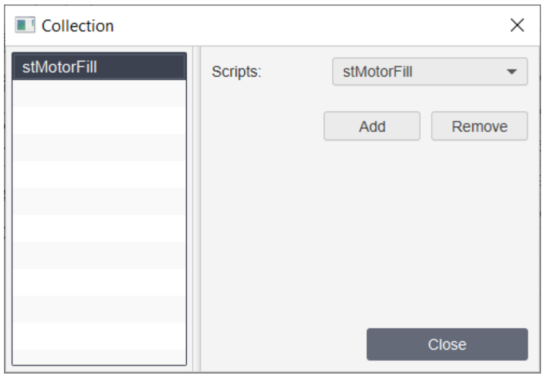
7. Now let’s bind the script to the object - open the properties of the object, select the “Main” tab and fill in the “Collection” in the “Scripts” field:


Object properties

General | Name: Motor
Fill color | Fill color: 🟥 Red
Flash | Type: 3D
Rotation | Dimensions: W= 171 H= 95
Motion | Coordinates: X= 76 Y= 109
Visibility | Angle: 0

Scripts: Collection

User-defined: Collection

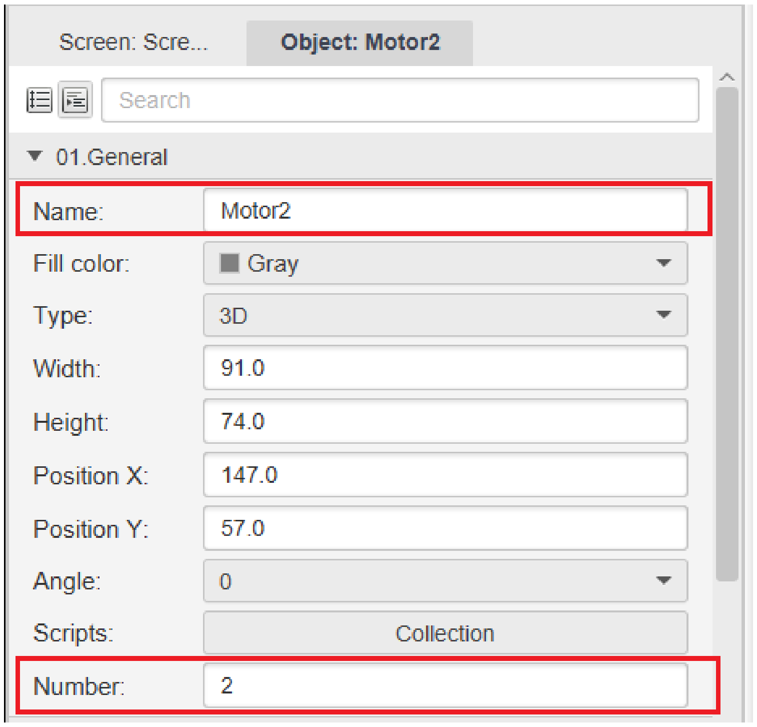

Collection

stMotorFill

Scripts: stMotorFill

So, we have a Motor with the Flash property set according to the script.

8. Now we need to duplicate the created Motor object as many times as needed in the project, and in each newly created object correct the value of the user-defined property "Number" ((most quickly, on the Property Sheet):

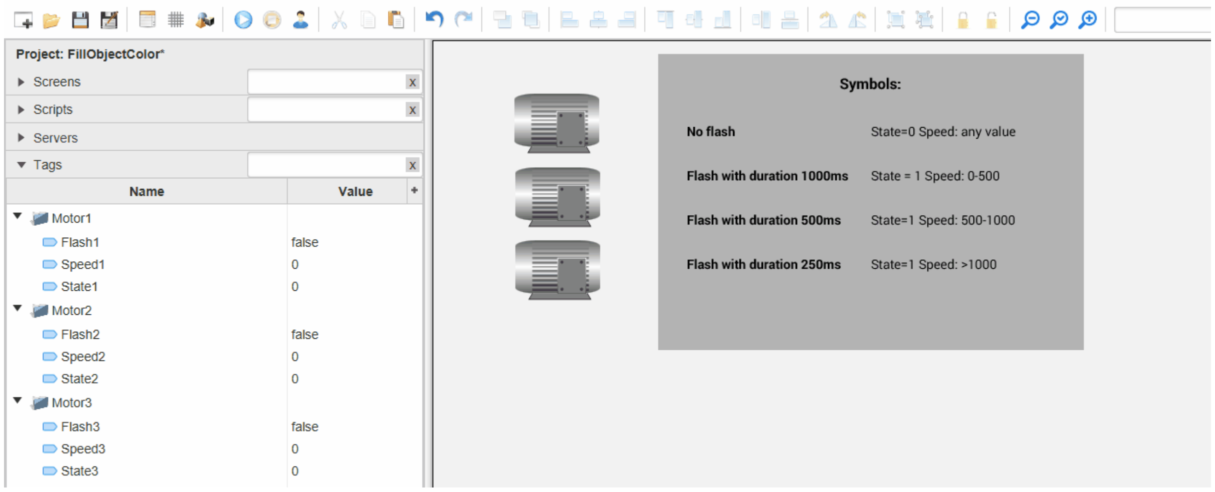

Screen: Scre... | Object: Motor2

Search

01.General

Name:	Motor2
Fill color:	Gray
Type:	3D
Width:	91.0
Height:	74.0
Position X:	147.0
Position Y:	57.0
Angle:	0
Scripts:	Collection
Number:	2

9. Let's Run simulation 70 to check the settings:


Project: FillObjectColor*

Screens
Scripts
Servers
Tags

Name	Value
Motor1	
Flash1	false
Speed1	0
State1	0
Motor2	
Flash2	false
Speed2	0
State2	0
Motor3	
Flash3	false
Speed3	0
State3	0

Symbols:

No flash	State=0 Speed: any value
Flash with duration 1000ms	State = 1 Speed: 0-500
Flash with duration 500ms	State=1 Speed: 500-1000
Flash with duration 250ms	State=1 Speed: >1000

You can download this project here.

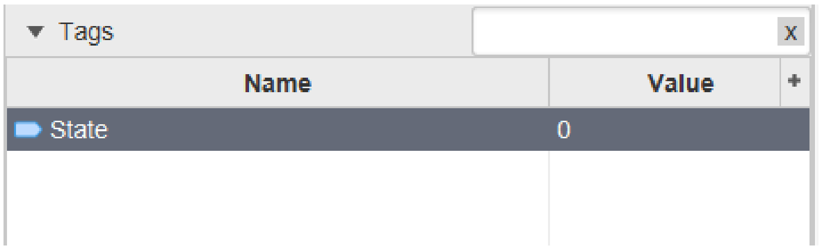
9.3 Object visibility

Let's look at the most common cases when you need to adjust the visibility of an object (make an object visible/invisible) if the value of a variable associated with it changes. Below you can find several examples from simple to more complex with scripts:

9.3.1 Simple visibility

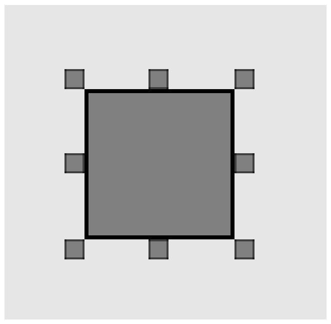
Let's assume that in our project there is a certain object with a certain parameter (tag). We want the object to be invisible unless the tag value is "0".

1. Create a tag named State:

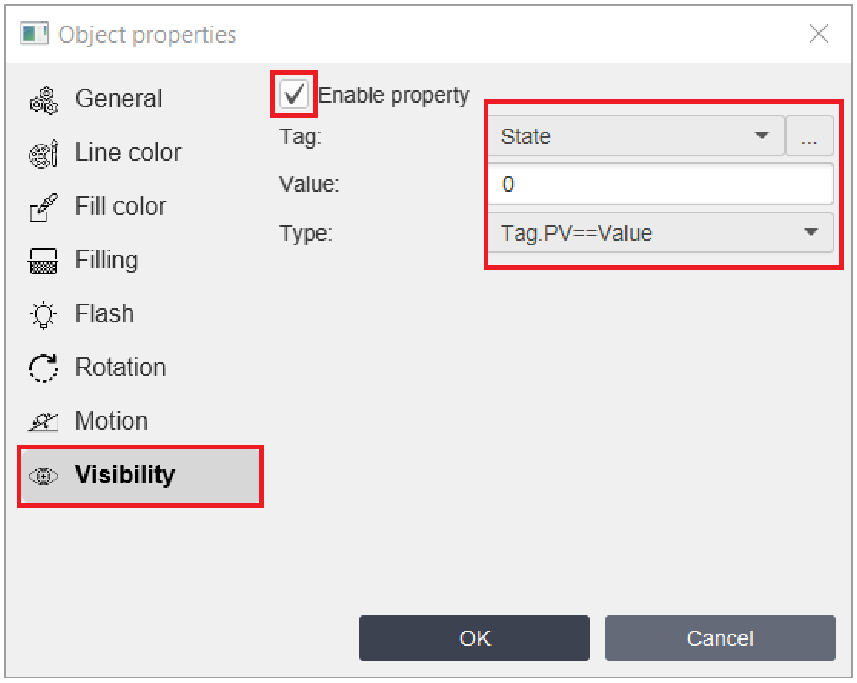


Name	Value
State	0

2. Create a Rectangle object (there may be other objects instead of a Rectangle):



3. Set up the “Visibility” property (enable the property, bind the State tag, the value of which determines the visibility of the object, set the tag value to “0” and the comparison type “Tag.PV==Value”). The object will be visible if the value of our State tag is 0, and invisible if the tag value is not 0:



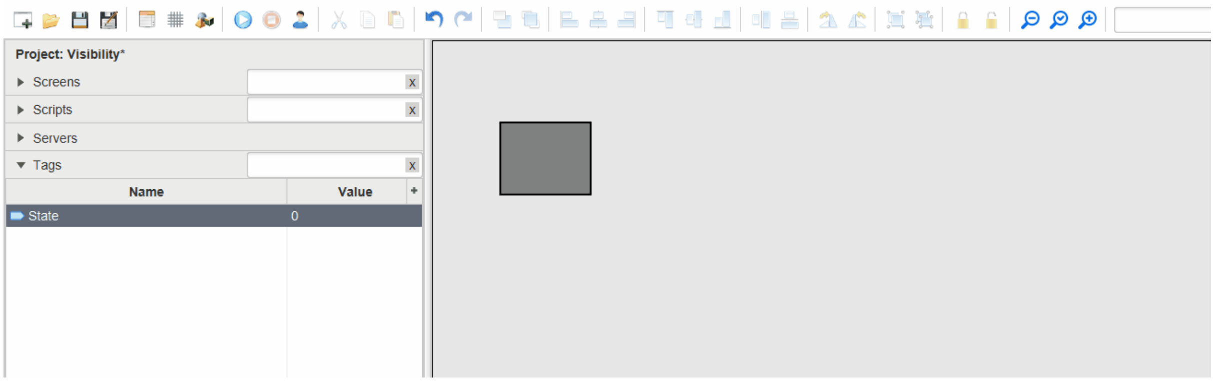
Enable property ✓

Tag: State

Value: 0

Type: Tag.PV==Value

4. Let's Run simulation[70] to check the settings:



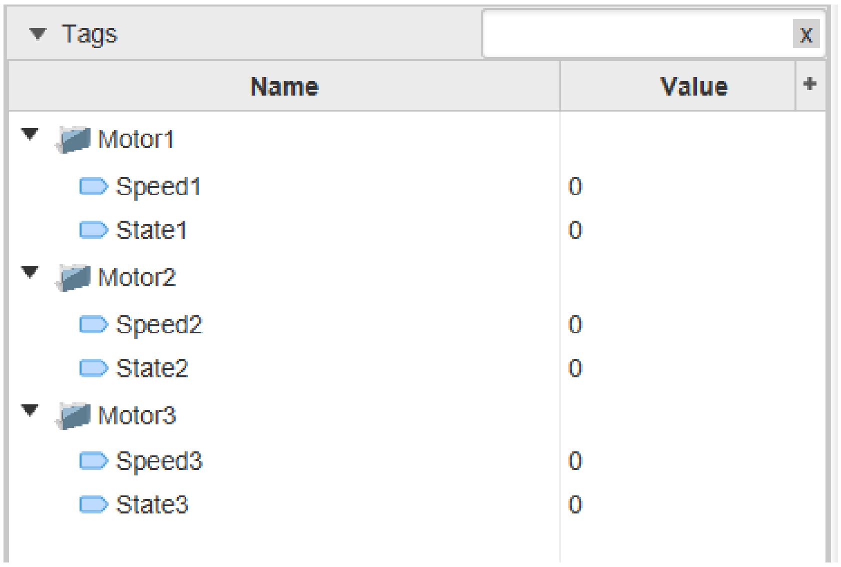
Name	Value
State	0

You can download this project here.

9.3.2 Complex visibility with scripts

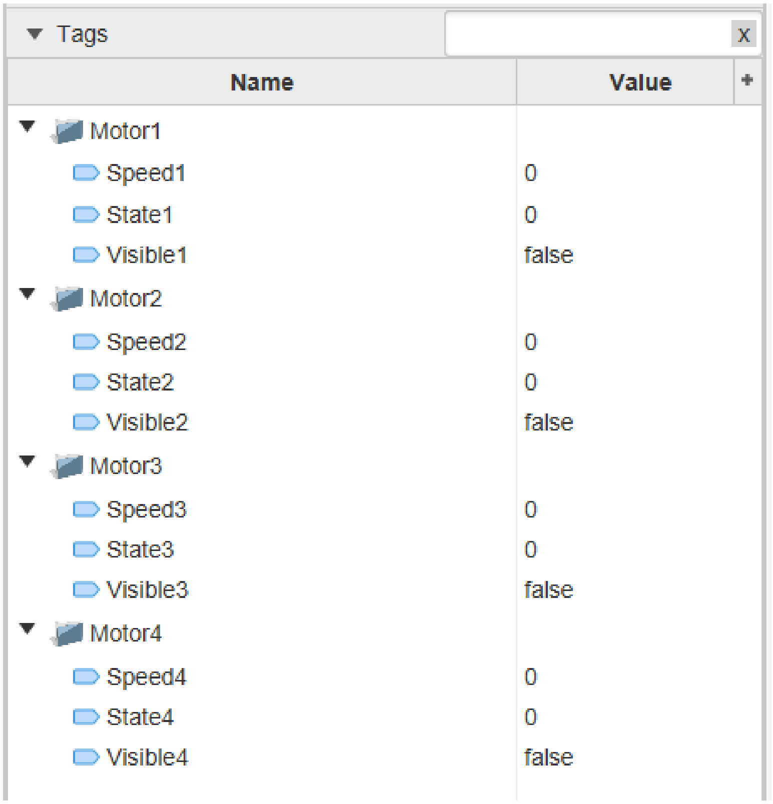
Let's assume that in our project we have many Motor objects of the same type, each of which has several State and Speed parameters, and depending on their values, we want the objects to be visible/not visible on the screen. Since in this case there is a dependence of Visibility on several tags, it is necessary to use scripts. And since we have several objects of the same type in our project, it is more convenient to use indirect names to bind tags to an object.

1. Let's create tags for each object - State and Speed (use grouping):



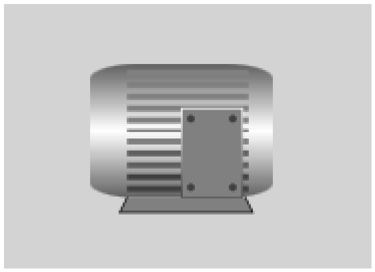
Name	Value
Motor1	
Speed1	0
State1	0
Motor2	
Speed2	0
State2	0
Motor3	
Speed3	0
State3	0

2. In this case, we need intermediate tags to enable or disable the visibility of an object - Visible1, Visible2 and Visible3, let's create them:

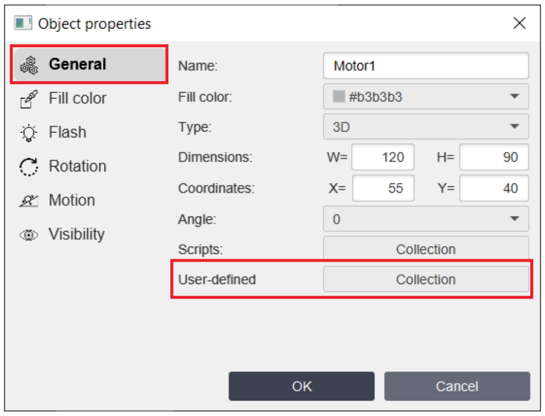


Name	Value
Motor1	
Speed1	0
State1	0
Visible1	false
Motor2	
Speed2	0
State2	0
Visible2	false
Motor3	
Speed3	0
State3	0
Visible3	false
Motor4	
Speed4	0
State4	0
Visible4	false

3. Create a Motor object:

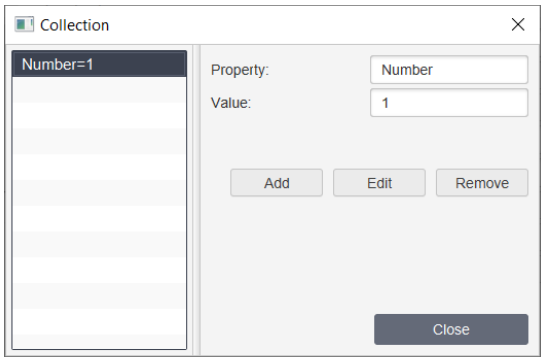


Let's create a user-defined property - Number and set its value to "1", because We will bind the first object to the Visibility1 tag:



Object properties

Name:	Motor1
Fill color:	#b3b3b3
Type:	3D
Dimensions:	W= 120 H= 90
Coordinates:	X= 55 Y= 40
Angle:	0
Scripts:	Collection
User-defined	Collection

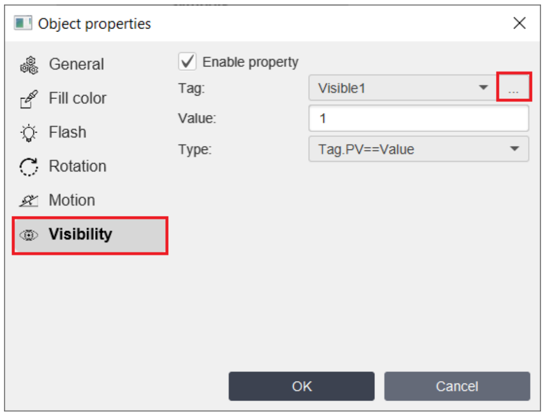


Collection

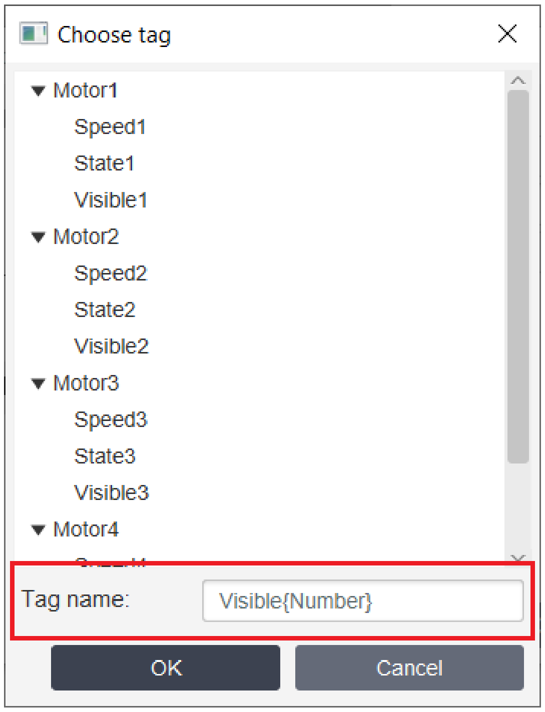
Number=1

Property:	Number
Value:	1

4. Close the "Collections" window and click "OK" in the Object Properties Window to save the changes. Now let's open the Object Properties again and set up the Visibility property: enable the property, set the value = 1, type "Tag.PV==value", bind the tag by specifying an indirect name: Visible{Number}:



Enable property: ✓
Tag: Visible1
Value: 1
Type: Tag.PV==Value

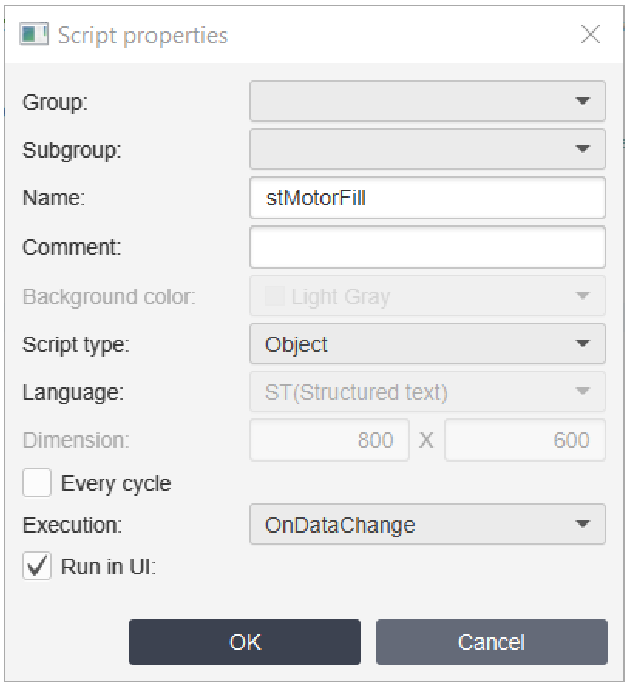


Tag name: Visible{Number}

5. We will set visibility depending on the tag values for each Motor object:

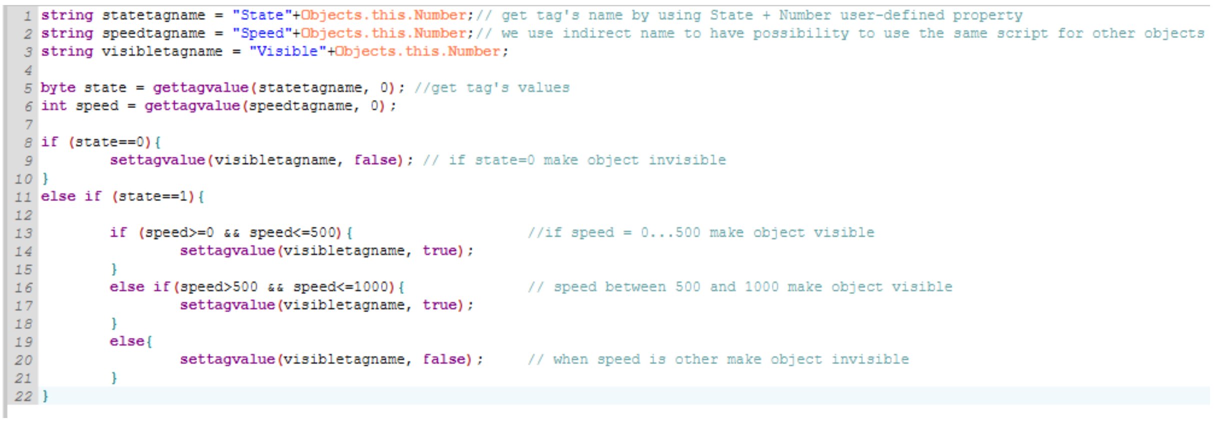
State	Speed	Visibility
0	Any	Not visible
1	0...500	Visible
1	500...1000	Visible
1	>1000	Not visible

6. Now let’s create a script with type "object" in the ST language with the execution type - OnDataChange:



Group:
Subgroup:
Name: stMotorFill
Comment:
Background color: Light Gray
Script type: Object
Language: ST(Structured text)
Dimension: 800 X 600
Every cycle
Execution: OnDataChange
[✓ Run in UI:]

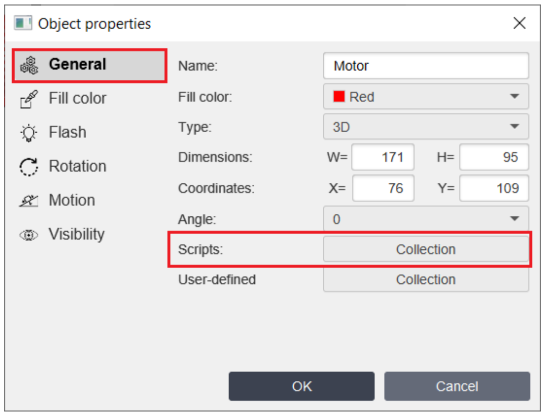
Let's write a script:



```
string statetagname = "State"+Objects.this.Number;// get tag's name by using State + Number user-defined property
string speedtagname = "Speed"+Objects.this.Number;// we use indirect name to have possibility to use the same script for other objects
string visibletagname = "Visible"+Objects.this.Number;

byte state = gettagvalue(statetagname, 0); //get tag's values
int speed = gettagvalue(speedtagname, 0);

if (state==0){
        settagvalue(visibletagname, false); // if state=0 make object invisible
}
else if (state==1){

        if (speed>=0 && speed<=500){                    //if speed = 0...500 make object visible
                settagvalue(visibletagname, true);
        }
        else if(speed>500 && speed<=1000){              // speed between 500 and 1000 make object visible
                settagvalue(visibletagname, true);
        }
        else{
                settagvalue(visibletagname, false);     // when speed is other make object invisible
        }
}
```

After you have recorded the script, be sure to launch it by clicking the button on the toolbar:

7. Now let's bind the script to the object - open the properties of the object, select the "General" tab and fill in the "Collection" in the "Scripts" field:

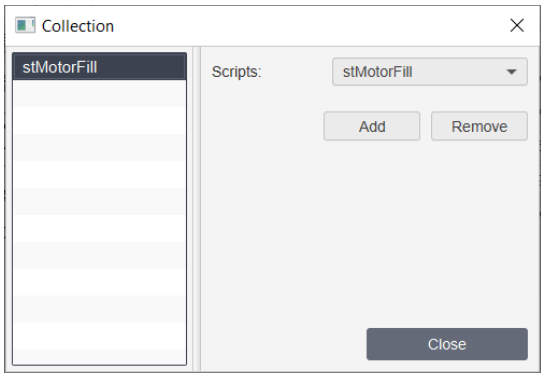


Object properties

General
Fill color
Flash
Rotation
Motion
Visibility

Name:	Motor
Fill color:	🟥 Red
Type:	3D
Dimensions:	W= 171 H= 95
Coordinates:	X= 76 Y= 109
Angle:	0
Scripts:	Collection
User-defined	Collection

OK Cancel



Collection

stMotorFill

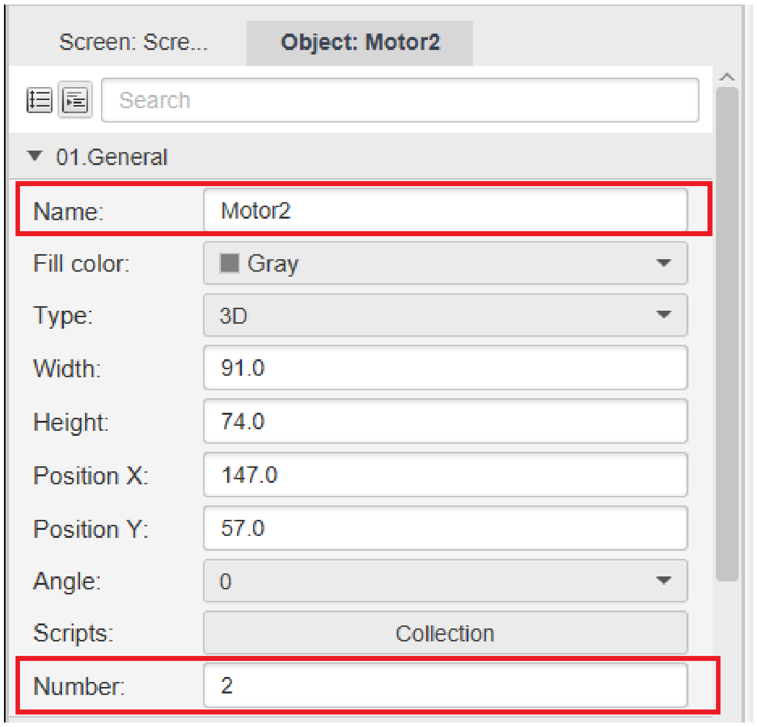
Scripts: stMotorFill

Add Remove

Close

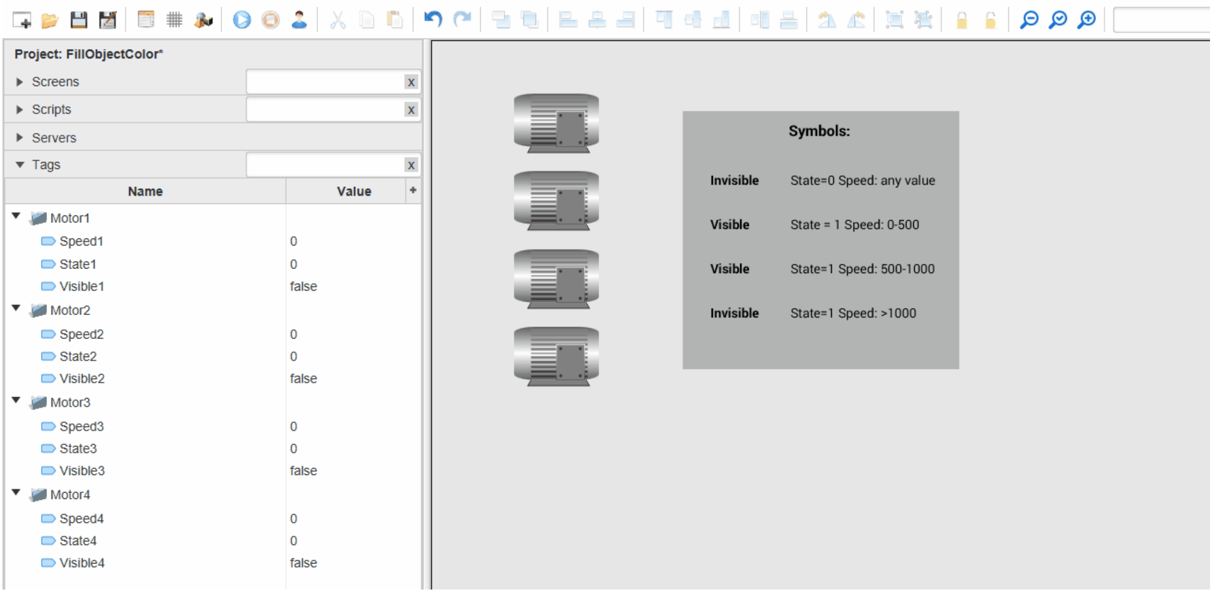
So, we have a Motor with the visibility property set by script.

8. Now we need to duplicate the created Motor object as many times as needed in the project, and in each newly created object correct the value of the "Number" user-defined property in the Property Sheet:



Name: Motor2
Fill color: Gray
Type: 3D
Width: 91.0
Height: 74.0
Position X: 147.0
Position Y: 57.0
Angle: 0
Scripts: Collection
Number: 2

9. Let's Run simulation 70 to check the settings:



Name	Value
Motor1	
Speed1	0
State1	0
Visible1	false
Motor2	
Speed2	0
State2	0
Visible2	false
Motor3	
Speed3	0
State3	0
Visible3	false
Motor4	
Speed4	0
State4	0
Visible4	false

Symbols:

Invisible	State=0 Speed: any value
Visible	State = 1 Speed: 0-500
Visible	State=1 Speed: 500-1000
Invisible	State=1 Speed: >1000

You can download this project here.

9.4 Change the text of an object

Let's look at the most common cases when you need to change the text of an object, depending on the value of the variable associated with it. We will use the properties

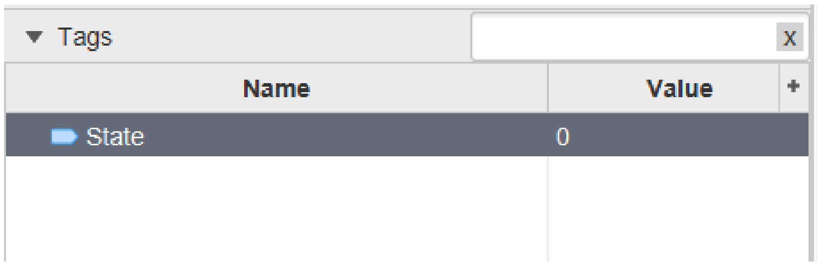
"Output text", "Input value"). Below you can find several examples from simple to more complex with scripts:

- Simple text change 570 (based on the Text Input property);
- Simple multiple text change 571 (based on the Text Input property);
- Display tag's value 573 (based on the Text Input property);
- Enter tag's value 575 (based on the Output value property);
- Complex text change with scripts 577

9.4.1 Simple text change

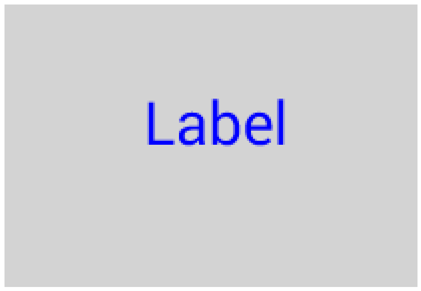
Let's assume we have an object containing some text, and we want the text to change depending on the value of the tag. In this way we can display inscriptions about the operating mode or state of the tag.

1. Create a tag named State:

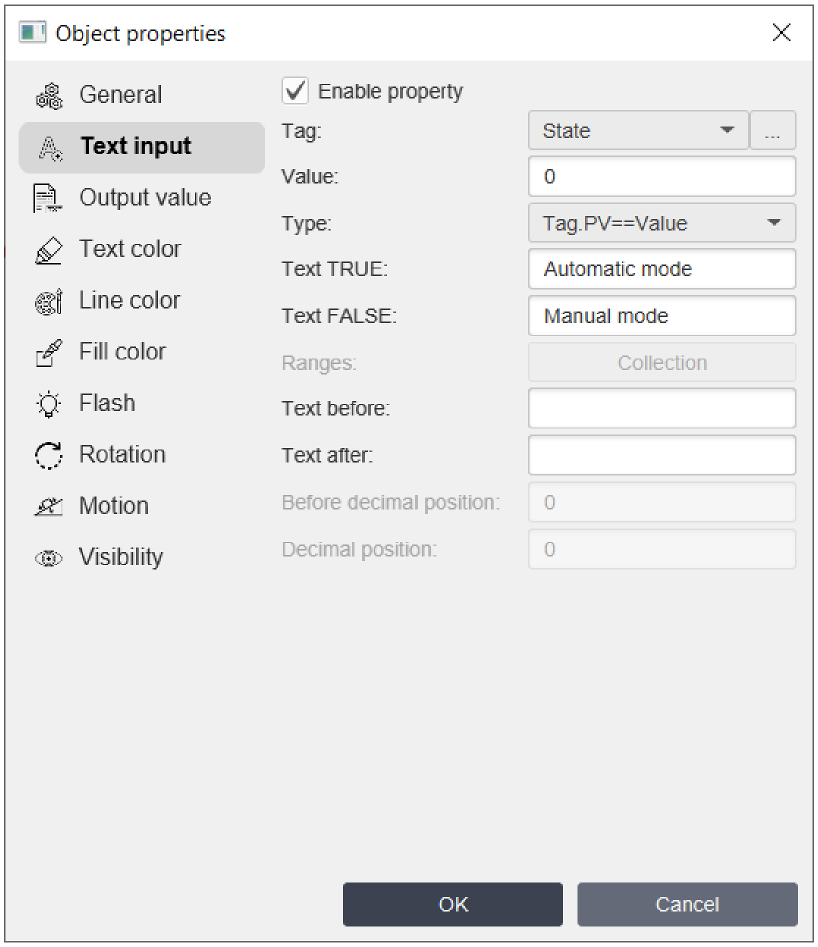


Name	Value
State	0

2. Create a Text/EditField object (other objects with the Text Input property can be used):

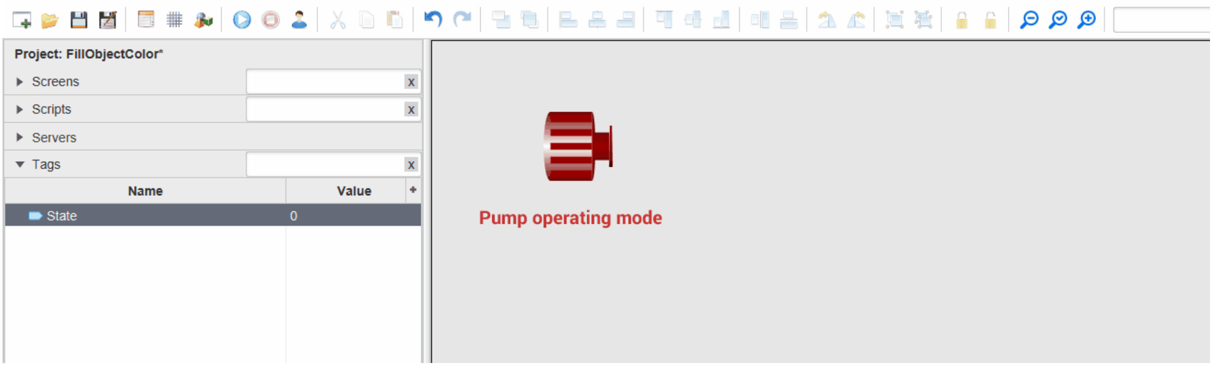


3. Set up the "Text Input" property. For example, we want to have the text "Automatic Mode" if the tag value (State) is 0, and the text "Manual Mode" if the tag value is not 0. In the Object Properties window, go to the "Text Input" tab, enable the property, bind the tag, set the value to "0", comparison type "TagPV==Value", fill the text with TRUE and FALSE:


Object properties

✓ Enable property	
Tag:	State
Value:	0
Type:	Tag.PV==Value
Text TRUE:	Automatic mode
Text FALSE:	Manual mode
Ranges:	Collection
Text before:	
Text after:	
Before decimal position:	0
Decimal position:	0

4. Let's Run simulation[70] to check the settings:


Project: FillObjectColor*

Name	Value
State	0

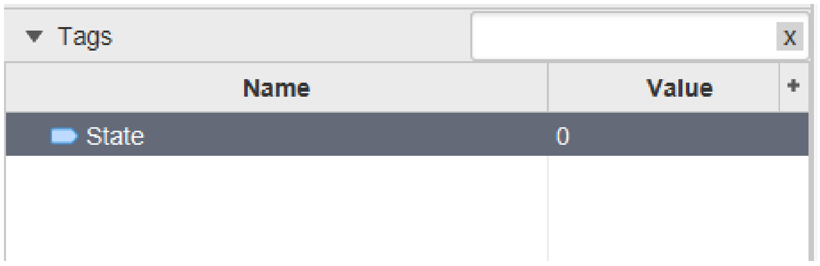
Pump operating mode

You can download this project here.

9.4.2 Simple multiple text change

Suppose we have some text that, depending on the value of the tag, should have different content. In this case, you need to select the "**Tag.PV in range**" type in the "Text Input" property.

1. Let's create a tag - State, which is responsible for the state of a certain device:



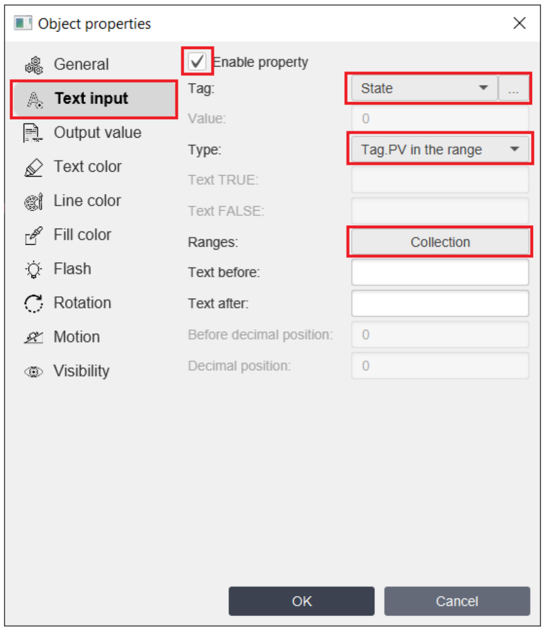
Name	Value
State	0

2. Create a Text/EditField object (other objects with the Text Input property can be used):

3. Let the “Text Input” property have the following conditions::

State	Text
0	The Pump is not working
1	The Pump is working
2	The Pump is working uncorrectly
3	Pump operation accident

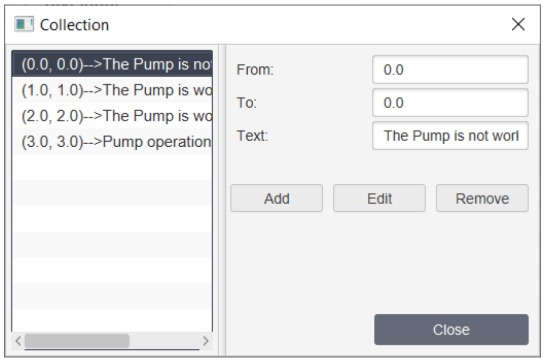
In the Object properties, go to the "Text Input" tab, enable the property, bind a tag, select the comparison type "**Tag.PV in a range**" and fill the ranges in the "Collections":


Object properties

- General
- Text input
- Output value
- Text color
- Line color
- Fill color
- Flash
- Rotation
- Motion
- Visibility

✓ Enable property	
Tag:	State
Value:	0
Type:	Tag.PV in the range
Text TRUE:	
Text FALSE:	
Ranges:	Collection
Text before:	
Text after:	
Before decimal position:	0
Decimal position:	0

OK Cancel

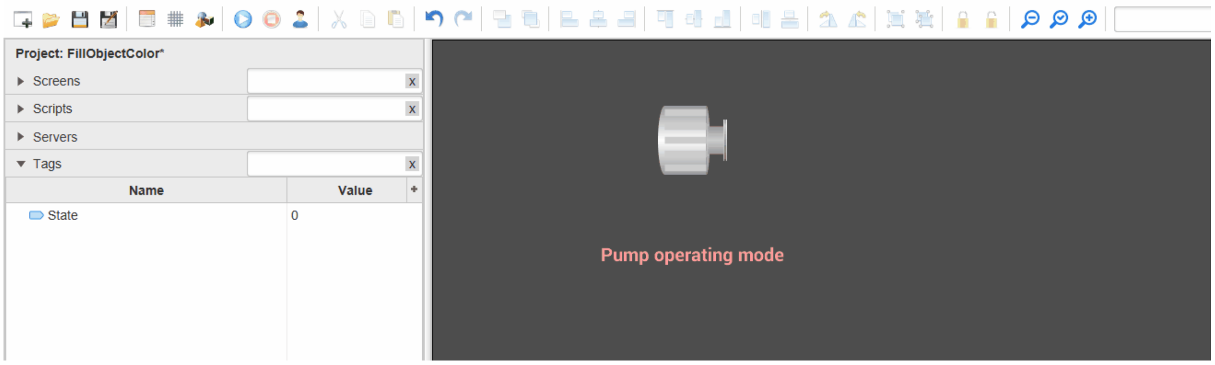

Collection

(0.0, 0.0)-->The Pump is no
(1.0, 1.0)-->The Pump is wo
(2.0, 2.0)-->The Pump is wo
(3.0, 3.0)-->Pump operation

From:	0.0
To:	0.0
Text:	The Pump is not worl

Add Edit Remove Close

4. Let's Run simulation [70] to check the settings:


Project: FillObjectColor*

- Screens
- Scripts
- Servers
- Tags

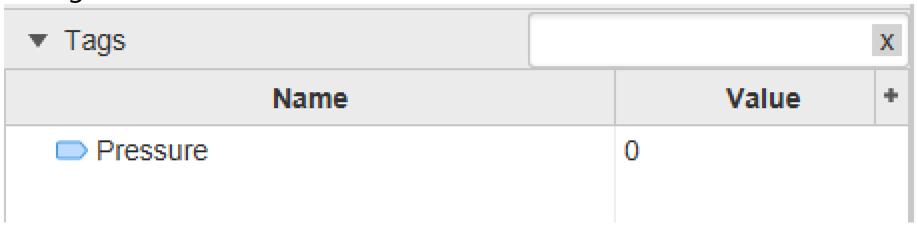
Name	Value
State	0

You can download this project here.

9.4.3 Display tag's value

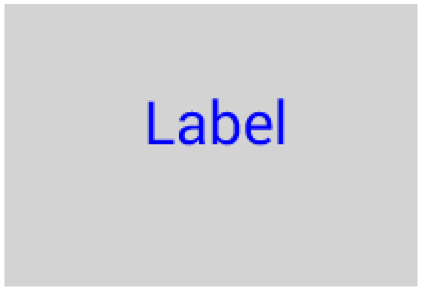
Let's assume we want to display the value of some tag on the screen (the pressure level in the tank).

1. Create a tag named Pressure:

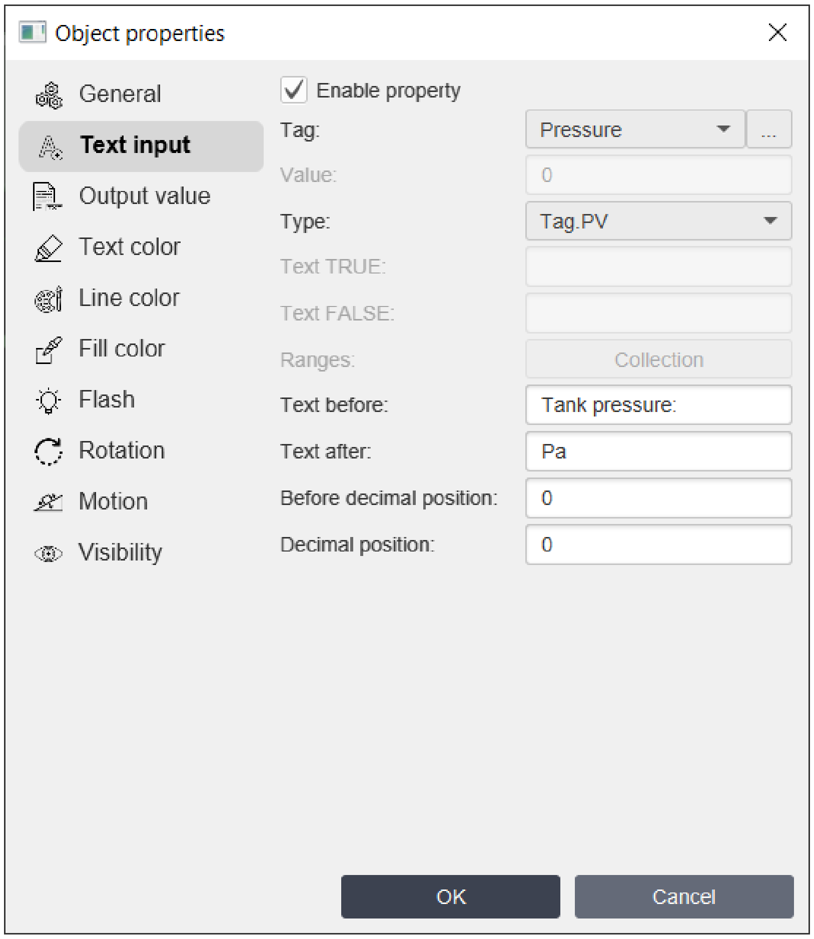

Tags

Name	Value
Pressure	0

2. Create a Text/EditField object (other objects with the Text Input property can be used):



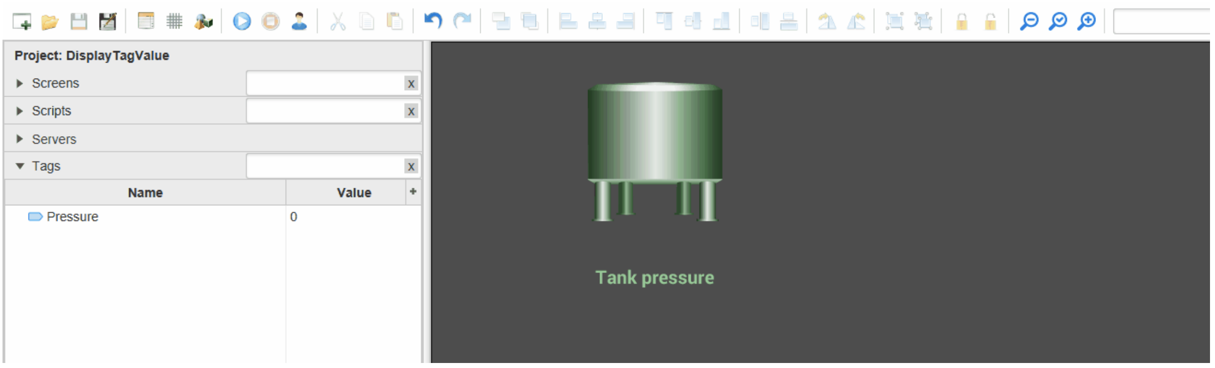
3. Set up the “Text Input” property, bind the Pressure tag, select the “**Tag Value**” type, fill in the “Text before” and “Text after” fields::



☑ Enable property

Tag:	Pressure
Value:	0
Type:	Tag.PV
Text TRUE:	
Text FALSE:	
Ranges:	Collection
Text before:	Tank pressure:
Text after:	Pa
Before decimal position:	0
Decimal position:	0

4. Let's Run simulation 70 to check the settings:


Project: DisplayTagValue

- Screens
- Scripts
- Servers
- Tags

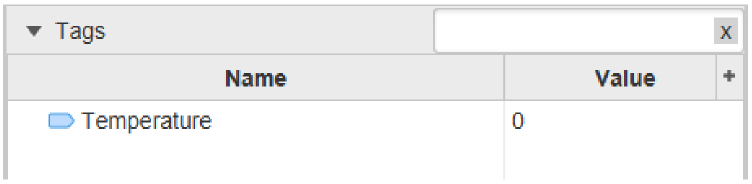
Name	Value
Pressure	0

You can download this project here.

9.4.4 Enter tag's value

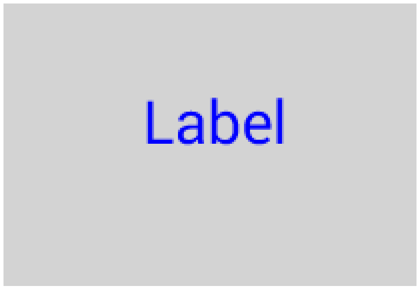
In this example, we want to show how we can set the value of a tag using the Output Value property, and display the specified value on the screen using the Text Intput property.

1. Create a tag named Temperature:

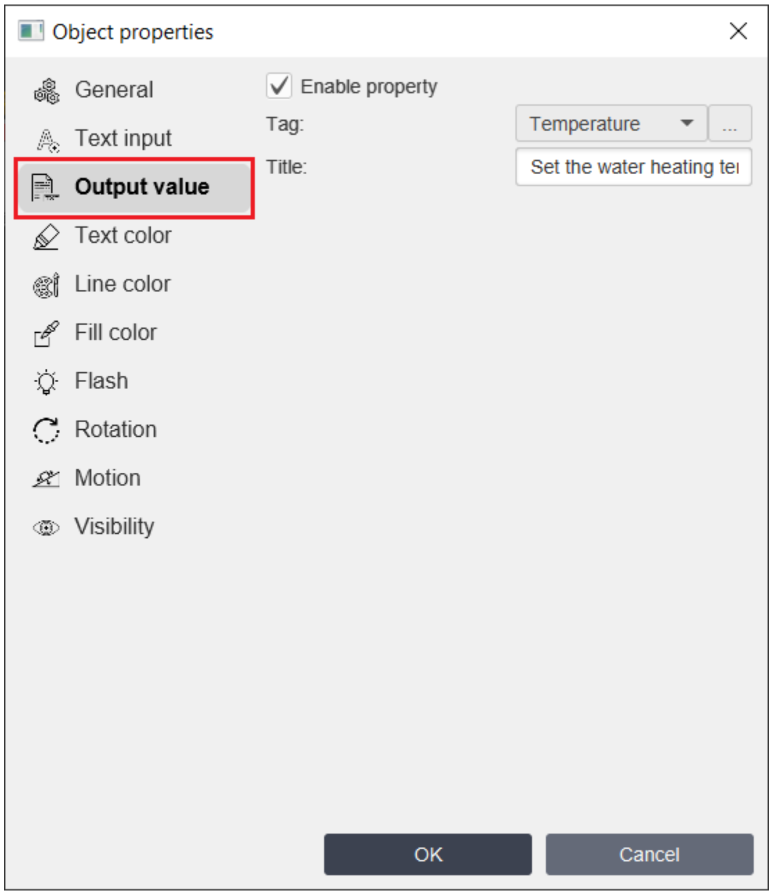

Tags

Name	Value
Temperature	0

2. Create a Text/EditField object (you can use other objects that have the "Output Value" property):

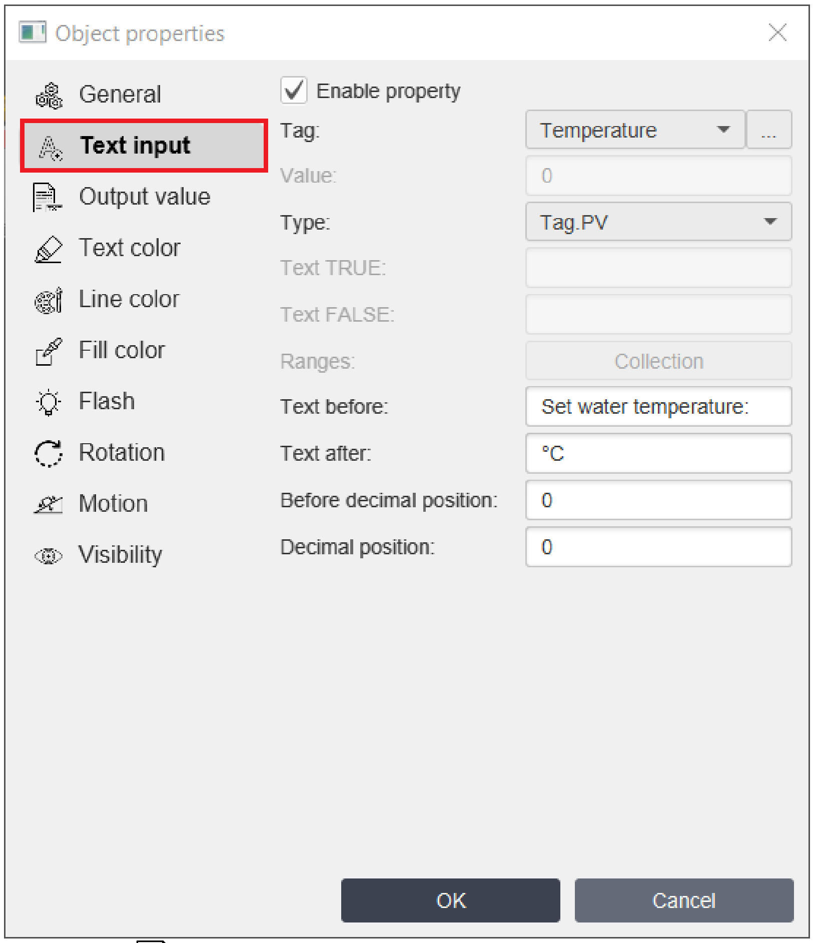


3. Set up the Output value property. Open the Object properties, go to the "Output value" tab, bind the tag to which we will set the value, and enter a Title for the dialog box:



Enable property: ✓
Tag: Temperature
Title: Set the water heating te

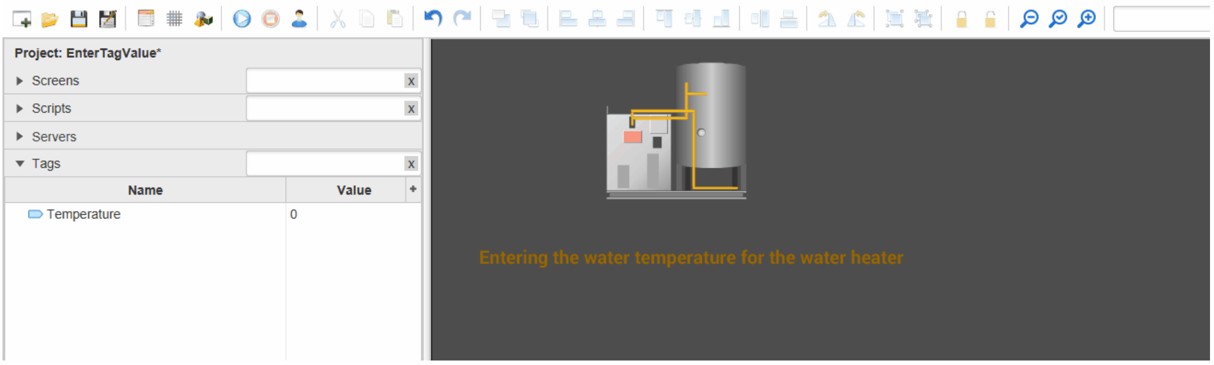
4. Using this object, we will immediately display the specified value for the tag; to do this, we will configure the “Text Input” property:


Object properties

☑ Enable property

Tag:	Temperature
Value:	0
Type:	Tag.PV
Text TRUE:	
Text FALSE:	
Ranges:	Collection
Text before:	Set water temperature:
Text after:	°C
Before decimal position:	0
Decimal position:	0

5. Let's Run simulation [70] to check the settings:



Name	Value
Temperature	0

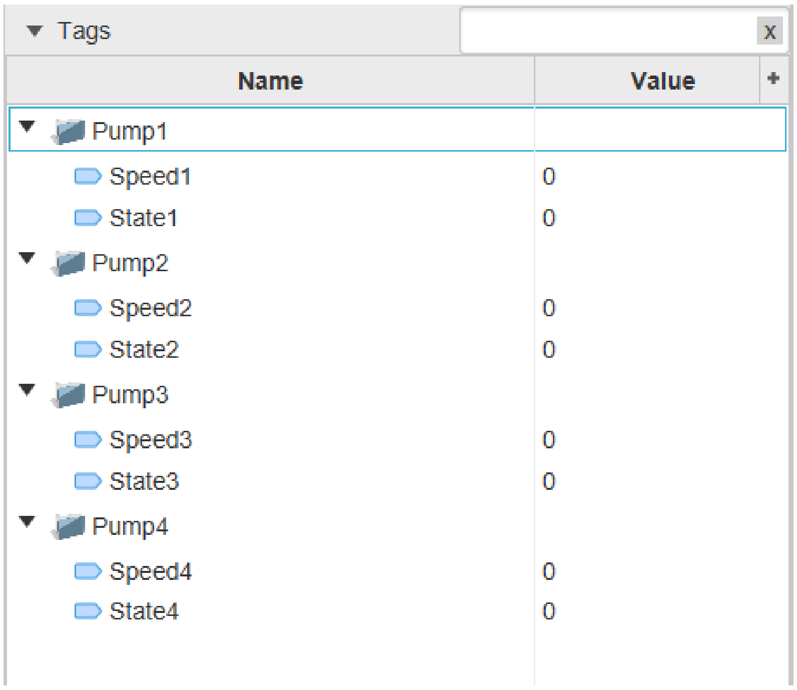
Entering the water temperature for the water heater

You can download this project here.

9.4.5 Complex text change with scripts

If you need to change text depending on multiple tags, you need to use scripts. Assume we have several objects of the same type (Pump), each of which has two parameters (tags) - State and Speed, and we want to display text about the operation of the pump depending on tags' values.

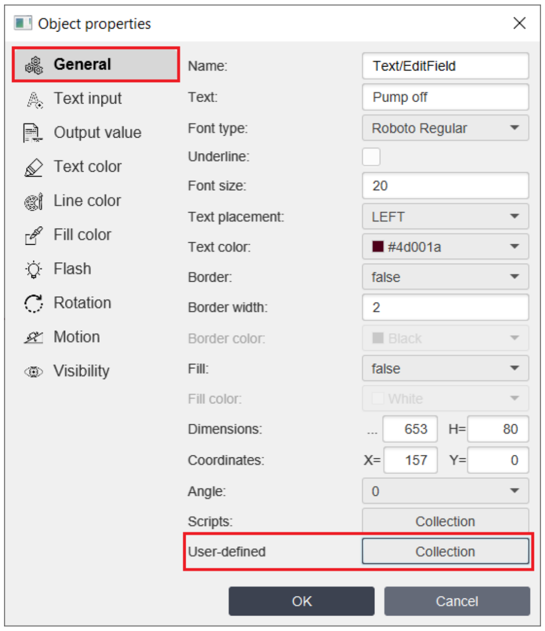
1. Create tags for each object - State and Speed:



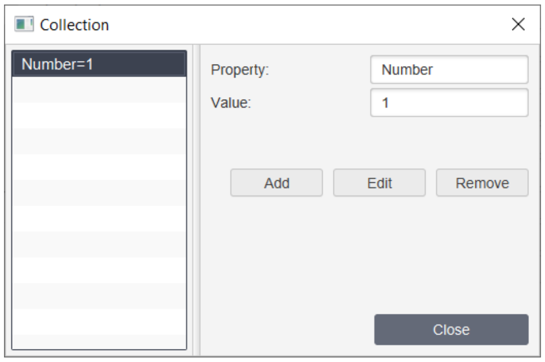
Name	Value
Pump1	
Speed1	0
State1	0
Pump2	
Speed2	0
State2	0
Pump3	
Speed3	0
State3	0
Pump4	
Speed4	0
State4	0

2. Create a Text/EditField object:

3. Create a user-defined property - "Number" and set its value to "1", because we will bind to the State1 and Speed1 tags:


Object properties

Name: Text/EditField
Text: Pump off
Font type: Roboto Regular
Underline:
Font size: 20
Text placement: LEFT
Text color: #4d001a
Border: false
Border width: 2
Border color: Black
Fill: false
Fill color: White
Dimensions: ... 653 H= 80
Coordinates: X= 157 Y= 0
Angle: 0
Scripts: Collection
User-defined: Collection


Collection

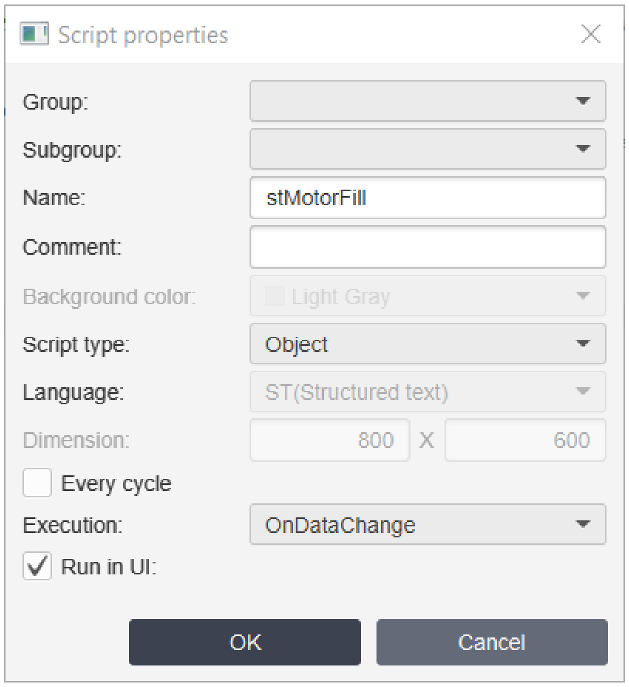
Number=1

Property: Number
Value: 1

4. Let the Text/EditField object display texts depending on the tag values::

State	Speed	Text
0	Any	Pump off
1	0...500	Pump speed within normal limits: PV
1	500...1000	Pump speed is high: PV
1	>1000	Attention! Pump speed too high!

Next, we will create a script with type "object" in the ST language with the execution type - OnDataChange:


Script properties

Group:

Subgroup:

Name: stMotorFill

Comment:

Background color: Light Gray

Script type: Object

Language: ST(Structured text)

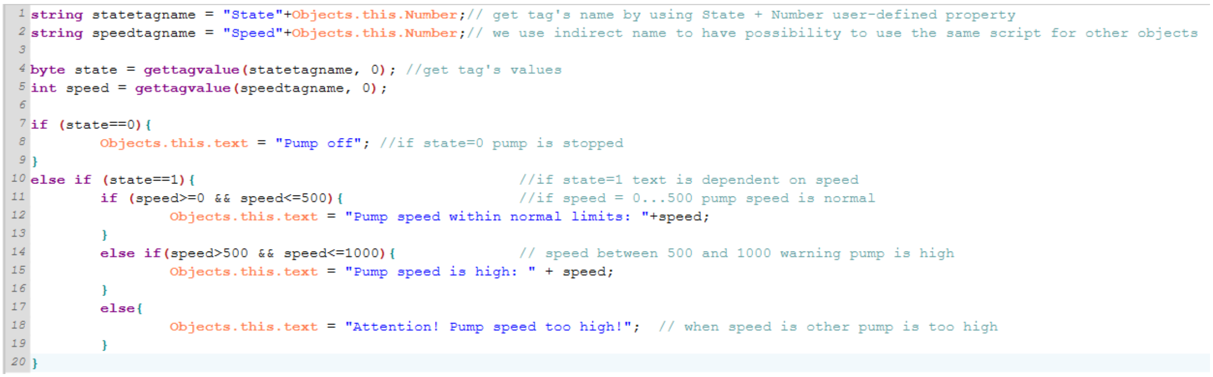
Dimension: 800 X 600

☐ Every cycle

Execution: OnDataChange

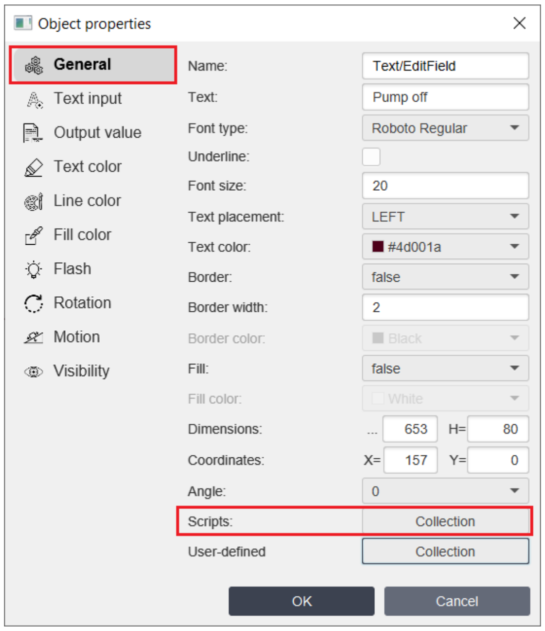
✓ Run in UI:

And let's write a script::

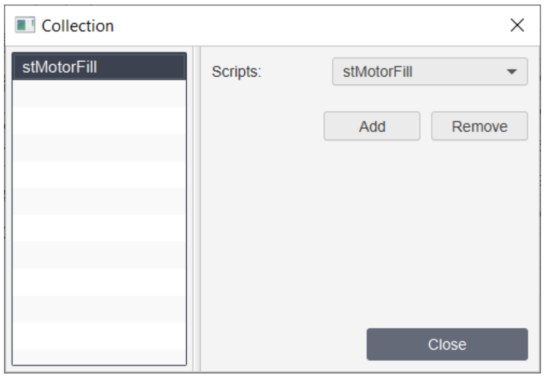

```
string statetagname = "State"+Objects.this.Number;// get tag's name by using State + Number user-defined property
string speedtagname = "Speed"+Objects.this.Number;// we use indirect name to have possibility to use the same script for other objects

byte state = gettagvalue(statetagname, 0); //get tag's values
int speed = gettagvalue(speedtagname, 0);

if (state==0){
        Objects.this.text = "Pump off"; //if state=0 pump is stopped
}
else if (state==1){                                     //if state=1 text is dependent on speed
        if (speed>=0 && speed<=500){                    //if speed = 0...500 pump speed is normal
                Objects.this.text = "Pump speed within normal limits: "+speed;
        }
        else if(speed>500 && speed<=1000){              // speed between 500 and 1000 warning pump is high
                Objects.this.text = "Pump speed is high: " + speed;
        }
        else{
                Objects.this.text = "Attention! Pump speed too high!";  // when speed is other pump is too high
        }
}
```

After you have recorded the script, be sure to launch it by clicking the button on the toolbar: ▶

5. Now let’s bind the script to the object - open the Object Properties, the “General” tab, the “Scripts” field and fill in the “Collections”:


Object properties

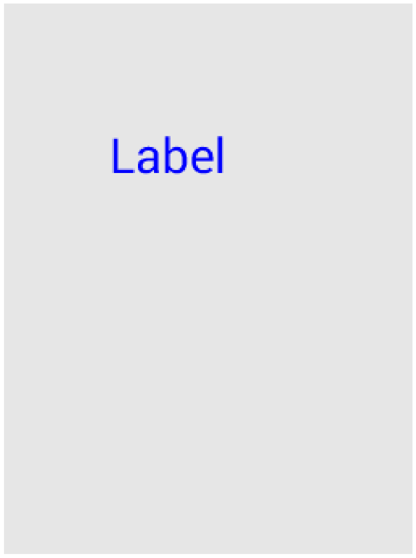
Name:	Text/EditField
Text:	Pump off
Font type:	Roboto Regular
Underline:	
Font size:	20
Text placement:	LEFT
Text color:	#4d001a
Border:	false
Border width:	2
Border color:	Black
Fill:	false
Fill color:	White
Dimensions:	... 653 H= 80
Coordinates:	X= 157 Y= 0
Angle:	0
Scripts:	Collection
User-defined	Collection

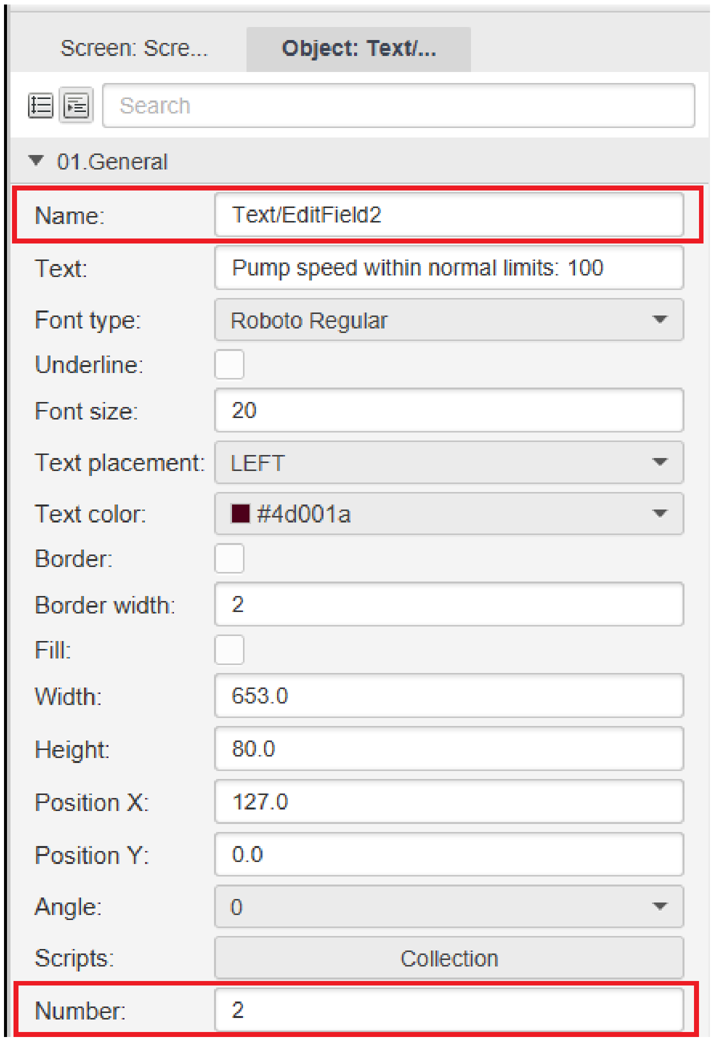

Collection

stMotorFill

Scripts: stMotorFill

6. So, we have a Text object with the Text Input property set by script . To copy this object and bind the Text Output property to the tags - State2, Speed2, State3, Speed3, State4, Speed4, we don't need to set up a script for each Text object, we only need to duplicate the object and change the user-defined Number property of the new object on the Property Sheet:





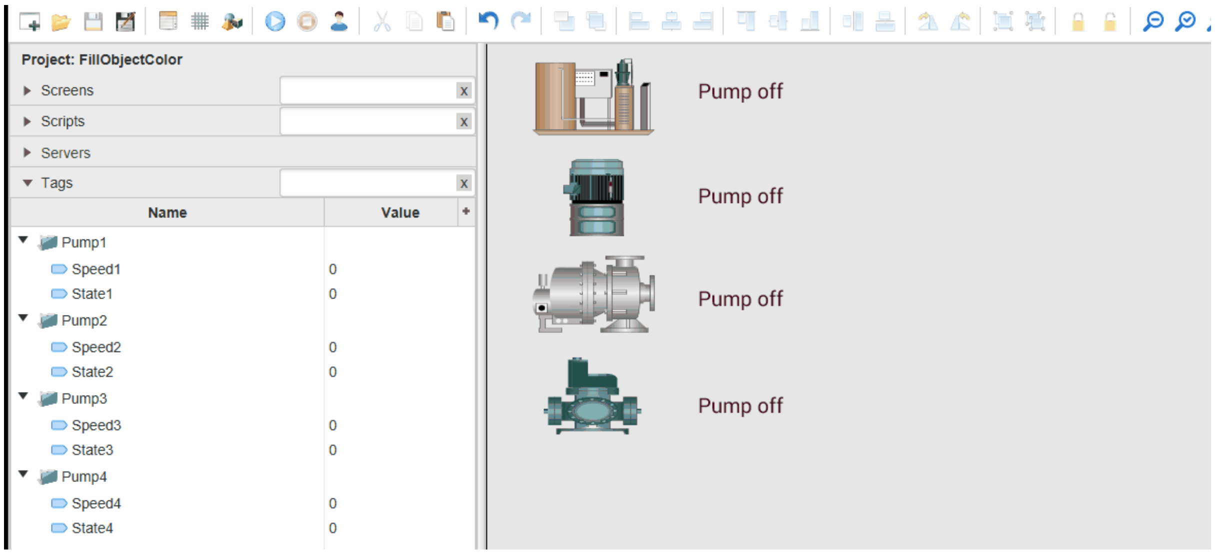
Screen: Scre... | Object: Text/...

Search

01.General

Name:	Text/EditField2
Text:	Pump speed within normal limits: 100
Font type:	Roboto Regular
Underline:	☐
Font size:	20
Text placement:	LEFT
Text color:	■ #4d001a
Border:	☐
Border width:	2
Fill:	☐
Width:	653.0
Height:	80.0
Position X:	127.0
Position Y:	0.0
Angle:	0
Scripts:	Collection
Number:	2

7. Let's Run simulation 70 to check the settings:



Project: FillObjectColor

Screens
Scripts
Servers
Tags

Name	Value
Pump1	
Speed1	0
State1	0
Pump2	
Speed2	0
State2	0
Pump3	
Speed3	0
State3	0
Pump4	
Speed4	0
State4	0

Pump off

Pump off

Pump off

Pump off

You can download this project here.

9.5 Call popup

This chapter contains examples of project to call popup windows:

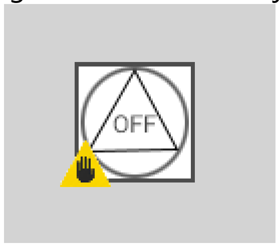
- Complex call popup with scripts 583

9.5.1 Complex call popup with scripts

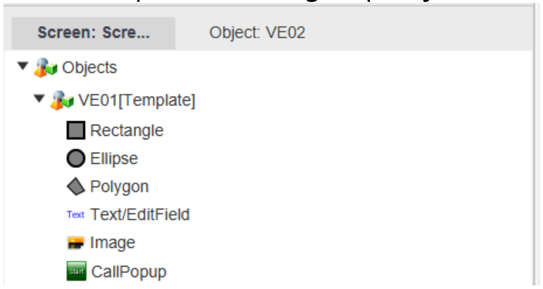
Suppose we have several objects of the same type on the screen, each object has several parameters. When we click on an object, we want to see a popup window with information about the state (value) of the tags and be able to set values for some tags directly in the pop-up window.

1. Let's create a complex group object, let's call it VE01, which consists of primitive objects - Rectangle 156, Ellipse 157, Polygon 161, Image 167, Text/EditField 164 and on top of these objects we placed a transparent Button 186 - CallPopup:

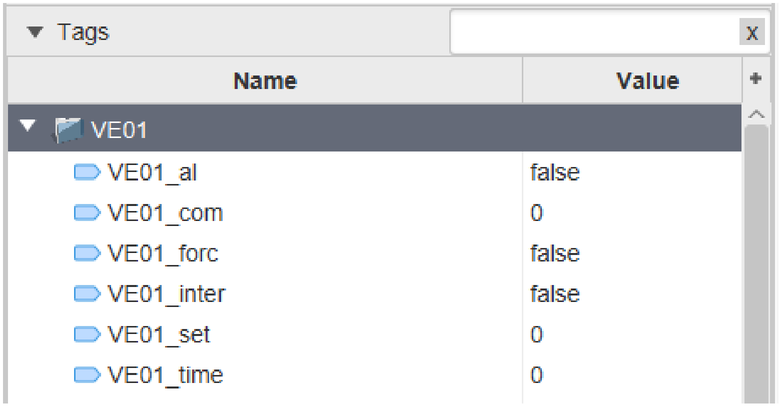
Image of the finished object



Composition of a group object

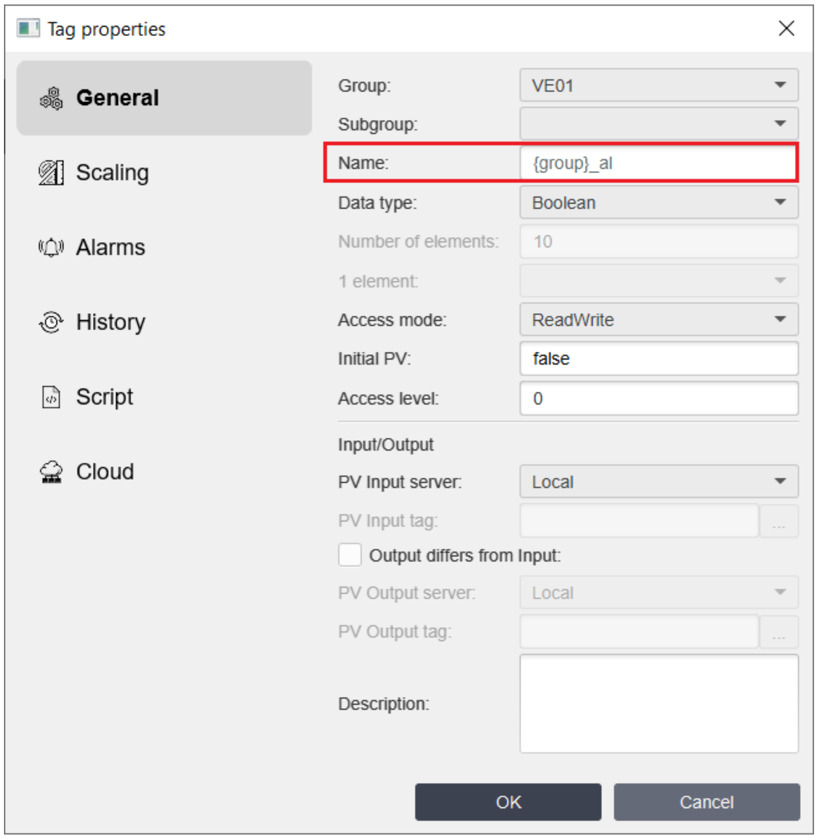


2. Let’s create tags and bind them to objects from the group:



Name	Value
VE01	
VE01_al	false
VE01_com	0
VE01_forc	false
VE01_inter	false
VE01_set	0
VE01_time	0

To make it easier to scale this project and be able to quickly copy this group of tags to the next similar object, we associated the name of the tags with the group using the {group} keyword. Example:


Tag properties

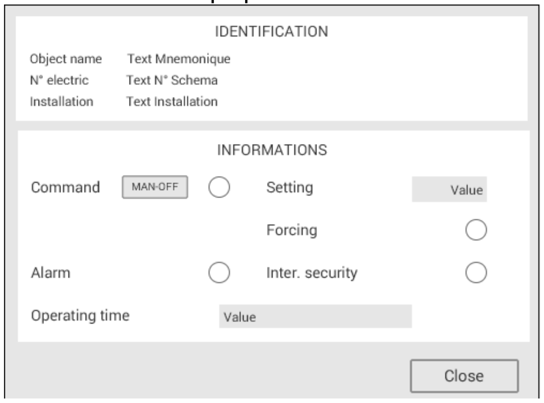
Group: VE01
Subgroup:
Name: {group}_al
Data type: Boolean
Number of elements: 10
1 element:
Access mode: ReadWrite
Initial PV: false
Access level: 0
Input/Output
PV Input server: Local
PV Input tag:
Output differs from Input:
PV Output server: Local
PV Output tag:
Description:

3. We want to call a popup screen by clicking on this group object (by clicking on the transparent button - CallPopup, to be precise) and display all the properties in the corresponding fields.

Let's create a popup window named FbMotorAOVentil (to do this you need to create a new screen and specify the screen type - "Pop-up"), which is also a group object.

Popup window

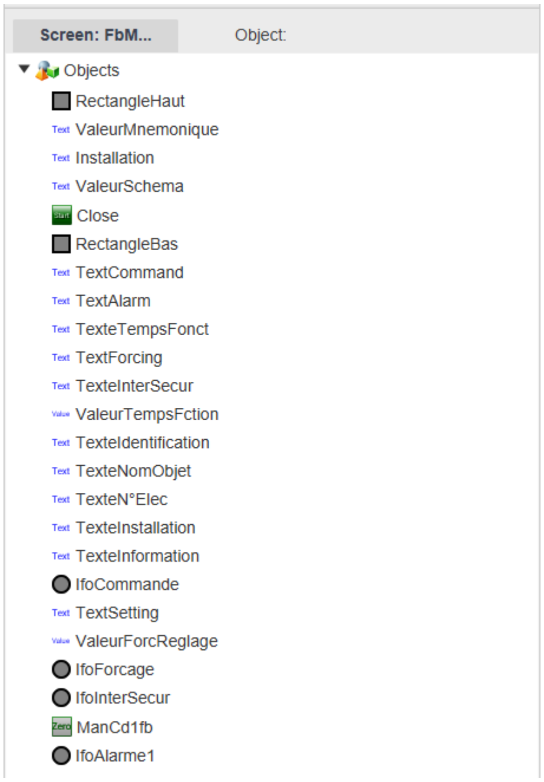
Popup Composition


IDENTIFICATION

Object name Text Mnemonique
N° electric Text N° Schema
Installation Text Installation

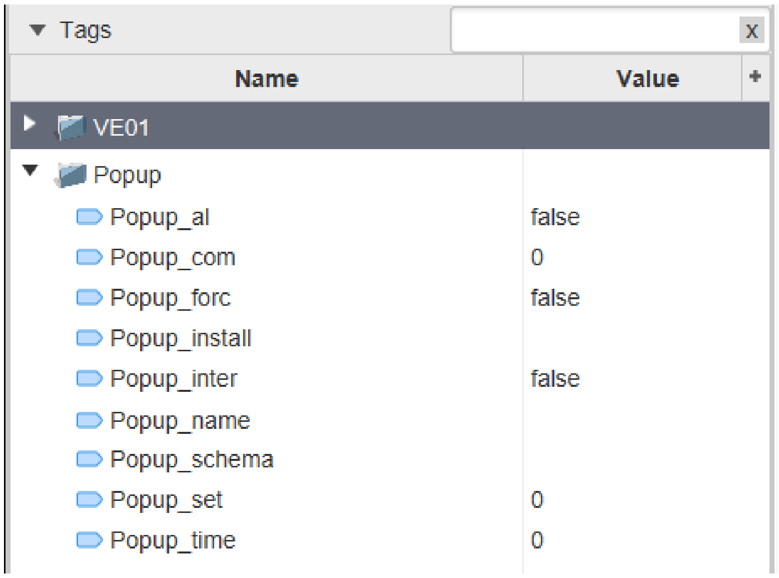
INFORMATIONS

Command MAN-OFF
Setting Value
Forcing
Alarm
Inter. security
Operating time Value


Screen: FbM... Object:

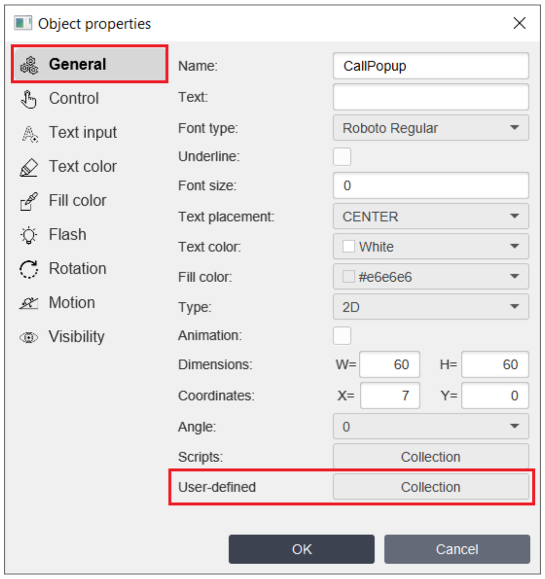
- Objects
  - RectangleHaut
  - ValeurMnemonique
  - Installation
  - ValeurSchema
  - Close
  - RectangleBas
  - TextCommand
  - TextAlarm
  - TexteTempsFonct
  - TextForcing
  - TexteInterSecur
  - ValeurTempsFction
  - TexteIdentification
  - TexteNomObjet
  - TexteN°Elec
  - TexteInstallation
  - TexteInformation
  - IfoCommande
  - TextSetting
  - ValeurForcReglage
  - IfoForcage
  - IfoInterSecur
  - ManCd1fb
  - IfoAlarme1

4. Let's create tags for this pop-up window:

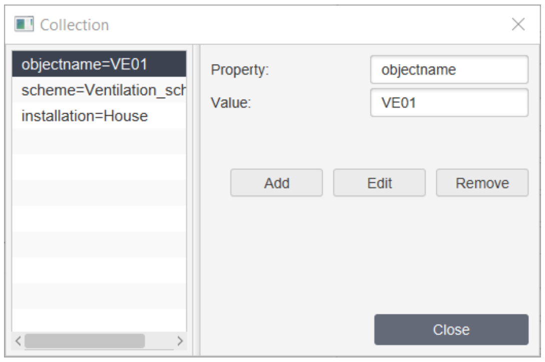

Tags

Name	Value
VE01	
Popup	
Popup_al	false
Popup_com	0
Popup_forc	false
Popup_install	
Popup_inter	false
Popup_name	
Popup_schema	
Popup_set	0
Popup_time	0

5. In order to have possibility to send some information from the group object to the pop-up window, let’s create user-defined properties (we set user-defined properties for the “Button” object, which causes the pop-up window):



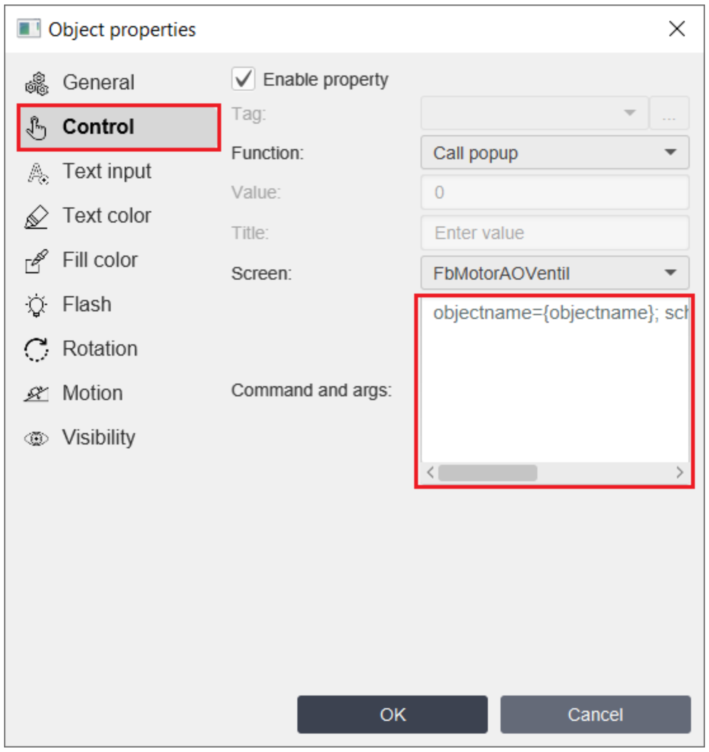
Name:	CallPopup
Text:	
Font type:	Roboto Regular
Underline:	
Font size:	0
Text placement:	CENTER
Text color:	White
Fill color:	#e6e6e6
Type:	2D
Animation:	
Dimensions:	W= 60 H= 60
Coordinates:	X= 7 Y= 0
Angle:	0
Scripts:	Collection
User-defined	Collection



objectname=VE01
scheme=Ventilation_sch
installation=House

Property: objectname
Value: VE01

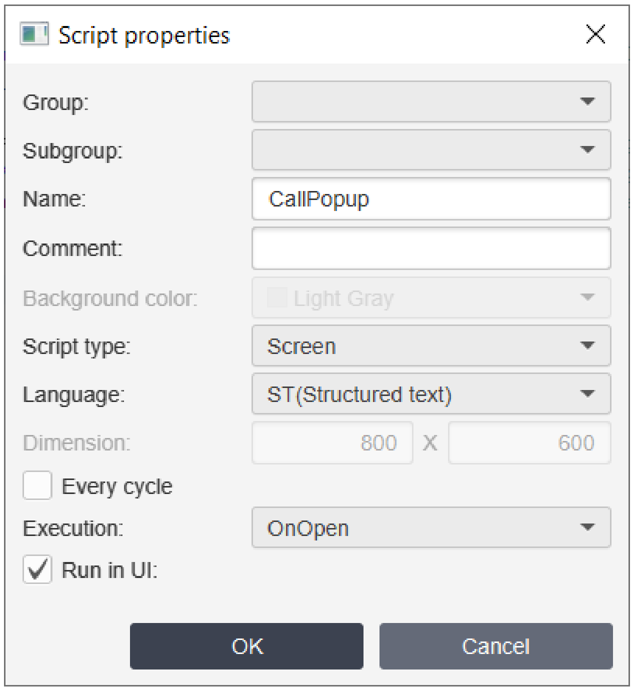
6. Now, let’s configure the pop-up window call. In the Properties of the “Button”, which causes a pop-up window in the “Control” tab, in the “Commands and Arguments” field we will pass the arguments (which we set as user-defined properties in the paragraph above):



Enable property ✓

Tag:	
Function:	Call popup
Value:	0
Title:	Enter value
Screen:	FbMotorAOVentil
Command and args:	objectname={objectname}; scl

7. Now let's create a script that will use the arguments that we wrote down in the paragraph above and which will be used when opening our popup window. Create a script called CallPopup with type "Screen" in ST language and execution "onOpen":


Script properties

Group:

Subgroup:

Name: CallPopup

Comment:

Background color: Light Gray

Script type: Screen

Language: ST(Structured text)

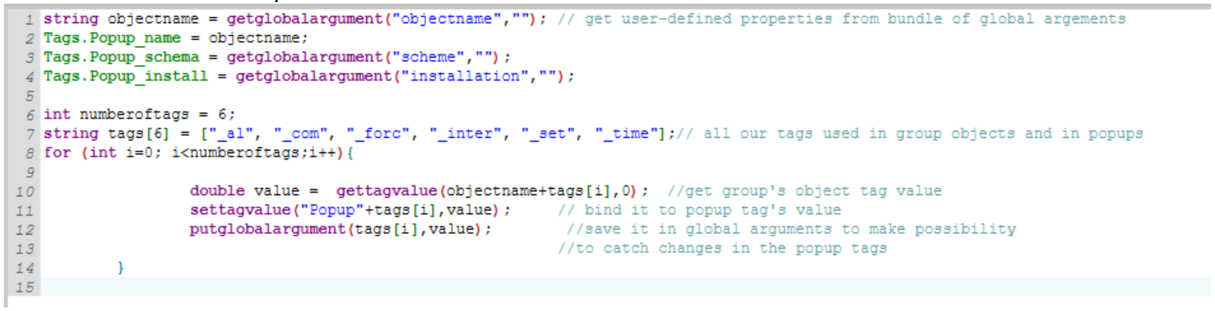
Dimension: 800 X 600

[ ] Every cycle

Execution: OnOpen

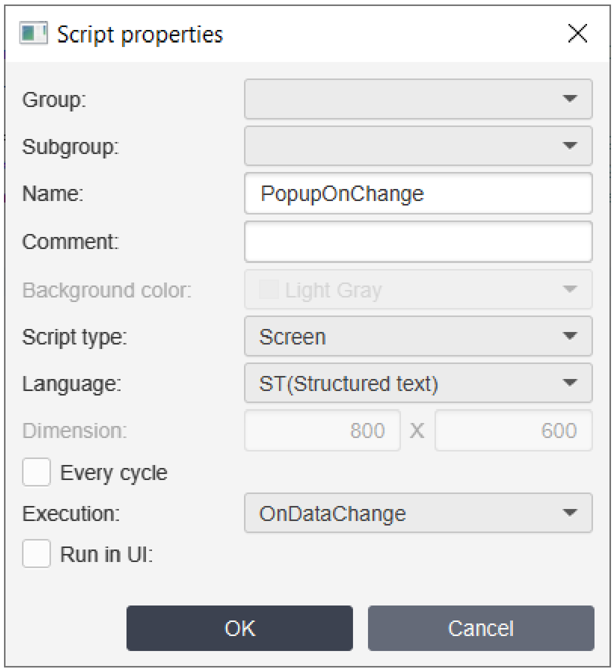
[✓] Run in UI:

Let's write a script:


```
string objectname = getglobalargument("objectname",""); // get user-defined properties from bundle of global argements
Tags.Popup_name = objectname;
Tags.Popup_schema = getglobalargument("scheme","");
Tags.Popup_install = getglobalargument("installation","");

int numberoftags = 6;
string tags[6] = ["_al", "_com", "_forc", "_inter", "_set", "_time"];// all our tags used in group objects and in popups
for (int i=0; i<numberoftags;i++){

                double value =  gettagvalue(objectname+tags[i],0);  //get group's object tag value
                settagvalue("Popup"+tags[i],value);     // bind it to popup tag's value
                putglobalargument(tags[i],value);        //save it in global arguments to make possibility
                                                        //to catch changes in the popup tags
        }

```

After you have recorded the script, be sure to launch it by clicking the button on the toolbar: ▶

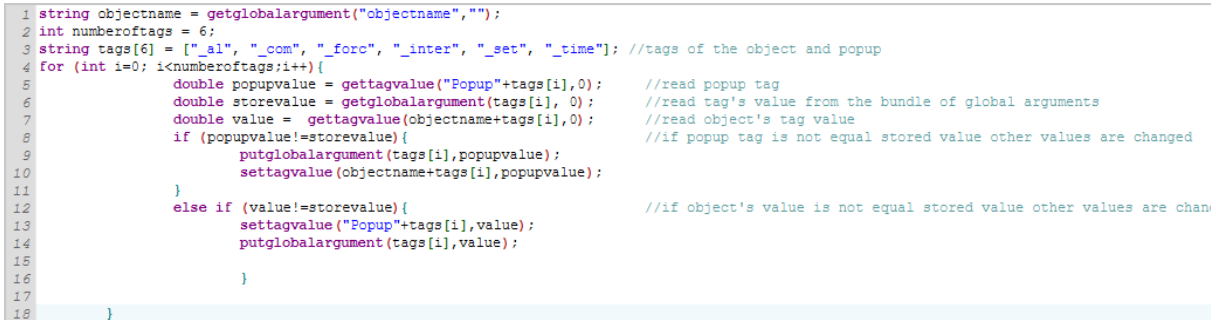
8. Let's create another script to pass changes in the pop-up tags to the tags of the group object (if we change the tag value in the pop-up window, then it will be transferred to the object tag), and vice versa, to catch changes in the tag value of the group object and set the value of the pop-ups tags (if the value of an object's tag changes while the popup is open, the value in the popup will also change):



Script properties

Group:	
Subgroup:	
Name:	PopupOnChange
Comment:	
Background color:	Light Gray
Script type:	Screen
Language:	ST(Structured text)
Dimension:	800 X 600
Every cycle	☐
Execution:	OnDataChange
Run in UI:	☐

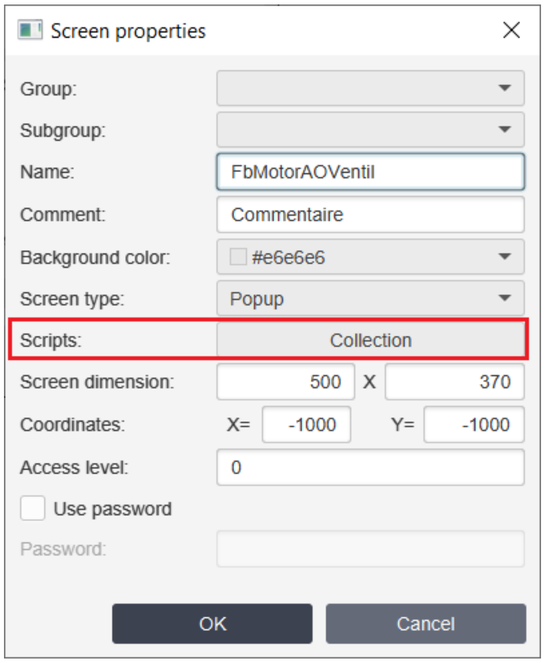
Let's write a script:



```
string objectname = getglobalargument("objectname","");
int numberoftags = 6;
string tags[6] = ["_al", "_com", "_forc", "_inter", "_set", "_time"]; //tags of the object and popup
for (int i=0; i<numberoftags;i++){
                double popupvalue = gettagvalue("Popup"+tags[i],0);     //read popup tag
                double storevalue = getglobalargument(tags[i], 0);      //read tag's value from the bundle of global arguments
                double value =  gettagvalue(objectname+tags[i],0);      //read object's tag value
                if (popupvalue!=storevalue){                            //if popup tag is not equal stored value other values are changed
                        putglobalargument(tags[i],popupvalue);
                        settagvalue(objectname+tags[i],popupvalue);
                }
                else if (value!=storevalue){                            //if object's value is not equal stored value other values are chan
                        settagvalue("Popup"+tags[i],value);
                        putglobalargument(tags[i],value);

                        }

        }
```

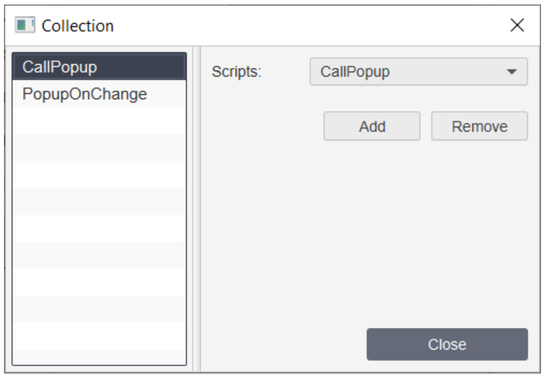
After you have recorded the script, be sure to launch it by clicking the button on the toolbar:

9. Let’s bind the scripts to our pop-up window:



Screen properties

Group:	
Subgroup:	
Name:	FbMotorAOVentil
Comment:	Commentaire
Background color:	#e6e6e6
Screen type:	Popup
Scripts:	Collection
Screen dimension:	500 X 370
Coordinates:	X= -1000 Y= -1000
Access level:	0
Use password	☐
Password:	



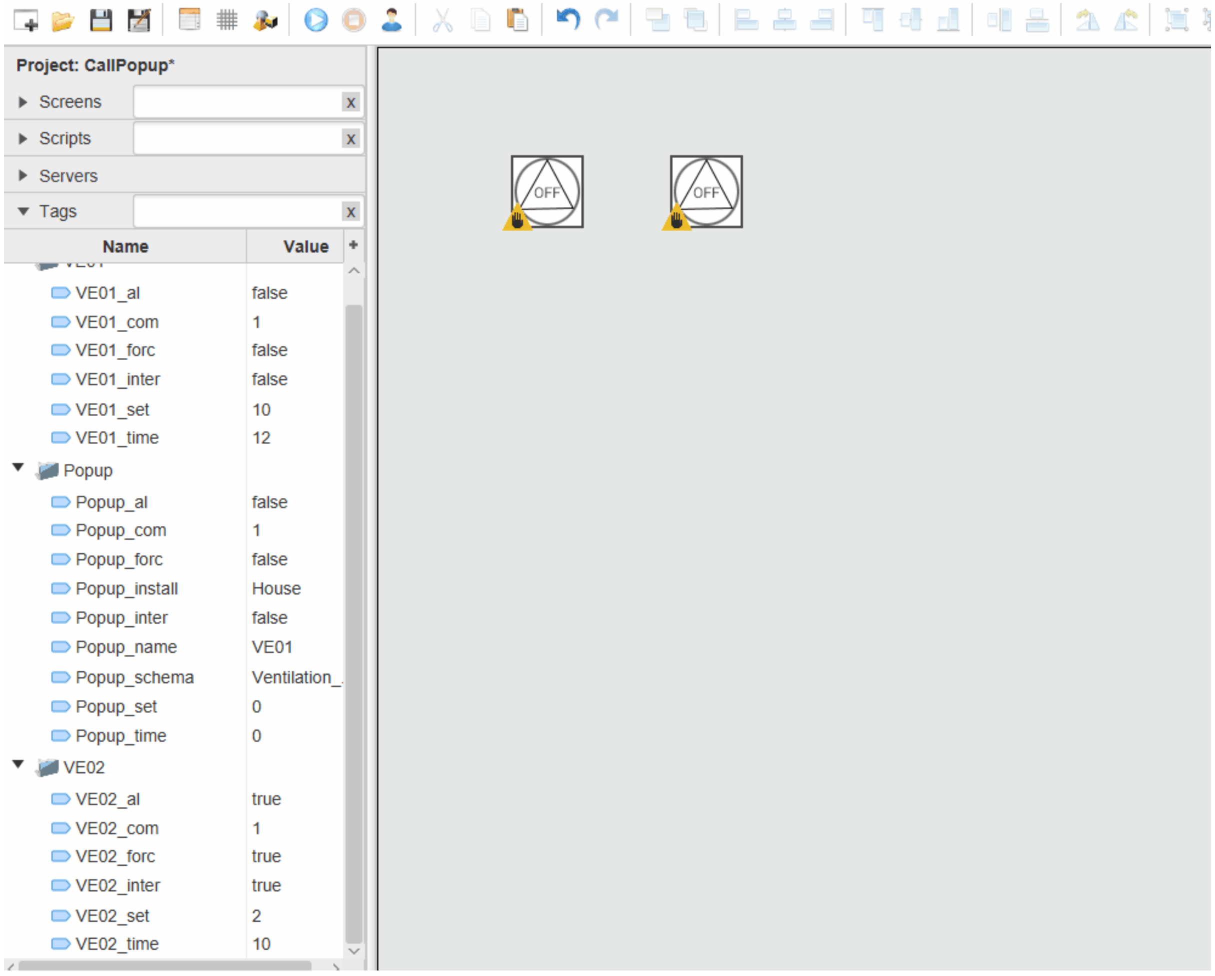
Collection

CallPopup
PopupOnChange

Scripts: CallPopup

10. So, we have created a pop-up window (One for all objects), into which the tag values are transferred and from which you can change the tag values for the object. We also configured the group object VE01 using custom properties. Now let's duplicate the object as many times as we need and change the values in the custom properties.

11. Let's Run simulation 70 to check the settings:



Name	Value
VE01_al	false
VE01_com	1
VE01_forc	false
VE01_inter	false
VE01_set	10
VE01_time	12
Popup	
Popup_al	false
Popup_com	1
Popup_forc	false
Popup_install	House
Popup_inter	false
Popup_name	VE01
Popup_schema	Ventilation_
Popup_set	0
Popup_time	0
VE02	
VE02_al	true
VE02_com	1
VE02_forc	true
VE02_inter	true
VE02_set	2
VE02_time	10

You can download this project here.

9.6 HTTP requests

In TeslaSCADA2 you can send HTTP POST/GET requests to third party servers to read data from them. Below are examples of retrieving data from some popular HTTP servers. To use these features, you can look into the HTTP library. Below are examples of working with this library:

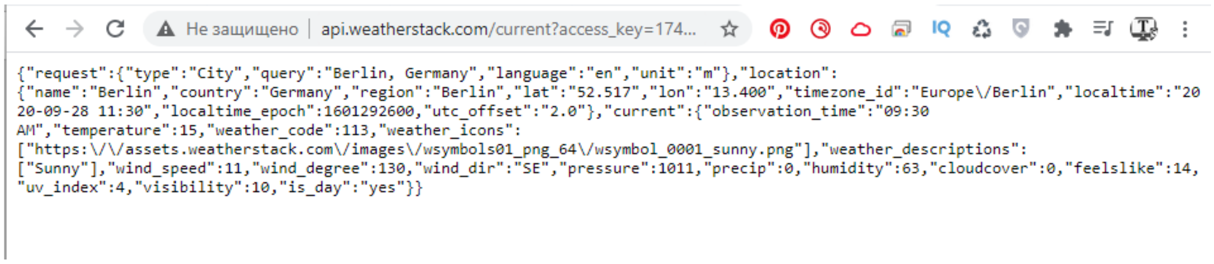
- Weather from weatherstack.com 590

9.6.1 Weather from weatherstack.com

weatherstack.com has a convenient API for reading weather data. After registering on the site, you will receive a unique access key (API Access Key), which must be used in GET requests to obtain weather data. In the weatherstack documentation you can look at examples of requests and create a request, for example, for Berlin it should be like this:

http://api.weatherstack.com/current?access_key=API_ACCESS_KEY&query=Berlin

Instead of API_ACCESS_KEY, you need to insert the access key received during registration. Please note that if you need to pass a parameter containing a space, for example "New York", then the space must be replaced with "%20", that is, "New%20York". You can check the validity of the request by pasting it into the address bar of your browser:

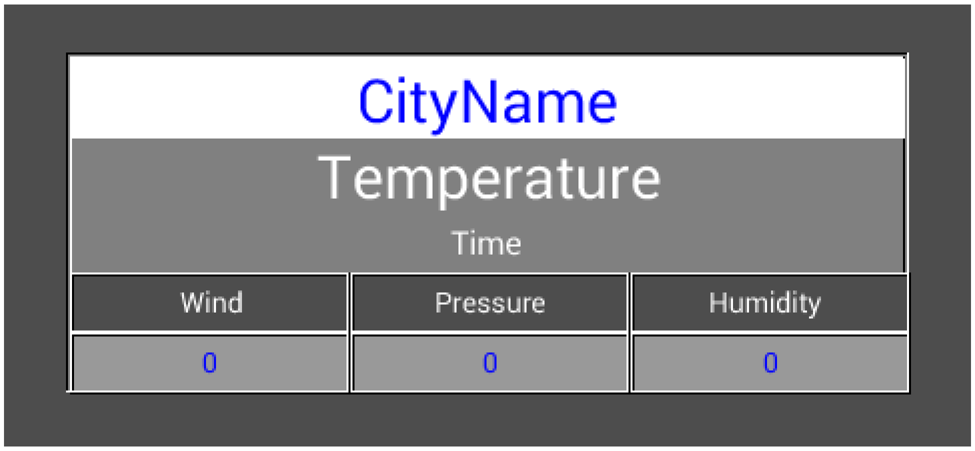

Не защищено | api.weatherstack.com/current?access_key=174...

```
{"request":{"type":"City","query":"Berlin, Germany","language":"en","unit":"m"},"location":
{"name":"Berlin","country":"Germany","region":"Berlin","lat":"52.517","lon":"13.400","timezone_id":"Europe\/Berlin","localtime":"20
20-09-28 11:30","localtime_epoch":1601292600,"utc_offset":"2.0"},"current":{"observation_time":"09:30
AM","temperature":15,"weather_code":113,"weather_icons":
["https:\/\/assets.weatherstack.com\/images\/wsymbols01_png_64\/wsymbol_0001_sunny.png"],"weather_descriptions":
["Sunny"],"wind_speed":11,"wind_degree":130,"wind_dir":"SE","pressure":1011,"precip":0,"humidity":63,"cloudcover":0,"feelslike":14,
"uv_index":4,"visibility":10,"is_day":"yes"}}
```

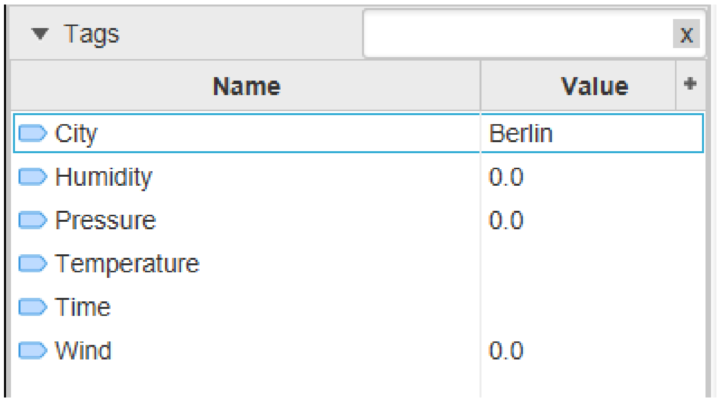
The browser displayed a response with the correct data, indicating that the request was made correctly. As you can see, the response is sent in JSON format, later we will extract the properties we need from it.

Now we can start solving the problem in TeslaSCADA2.

1. First, let's create an interface in the project. Temperature, pressure, wind, humidity and local time will be displayed using Text/EditField 164 objects. In the CityName field we activate the Output value 367 property to be able to change the name of the city. The image below shows the created interface and the names we gave to the components:

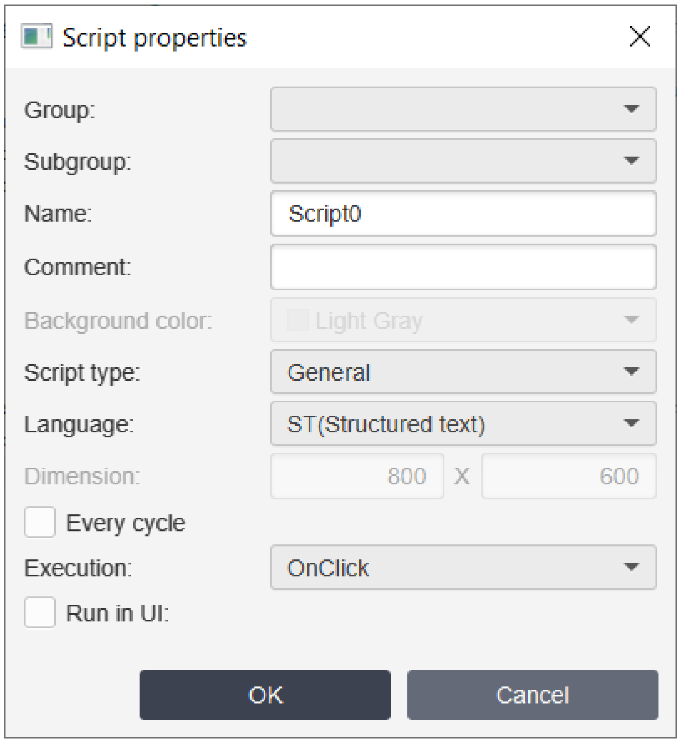


2. Create tags for each text object and bind them:



Name	Value
City	Berlin
Humidity	0.0
Pressure	0.0
Temperature	
Time	
Wind	0.0

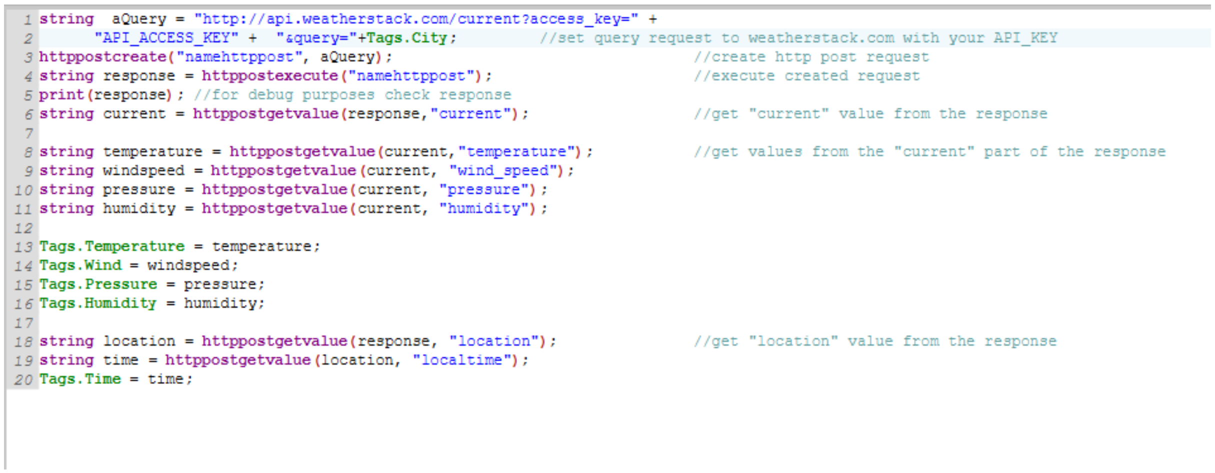
3. Now let's create a script in ST language that will be executed when you click on the screen:



Script properties

Group:	
Subgroup:	
Name:	Script0
Comment:	
Background color:	Light Gray
Script type:	General
Language:	ST(Structured text)
Dimension:	800 X 600
Every cycle	☐
Execution:	OnClick
Run in UI:	☐

The text of ST script below:

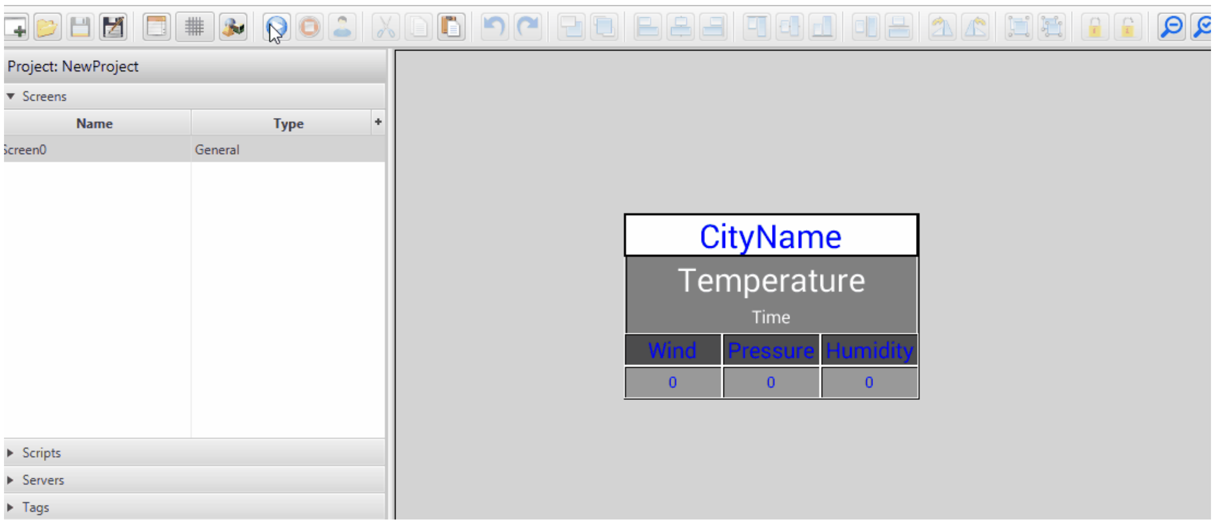


```
string  aQuery = "http://api.weatherstack.com/current?access_key=" +
       "API_ACCESS_KEY" +  "&query="+Tags.City;          //set query request to weatherstack.com with your API_KEY
httppostcreate("namehttppost", aQuery);                                   //create http post request
string response = httppostexecute("namehttppost");                        //execute created request
print(response); //for debug purposes check response
string current = httppostgetvalue(response,"current");                    //get "current" value from the response

string temperature = httppostgetvalue(current,"temperature");             //get values from the "current" part of the response
string windspeed = httppostgetvalue(current, "wind_speed");
string pressure = httppostgetvalue(current, "pressure");
string humidity = httppostgetvalue(current, "humidity");

Tags.Temperature = temperature;
Tags.Wind = windspeed;
Tags.Pressure = pressure;
Tags.Humidity = humidity;

string location = httppostgetvalue(response, "location");                 //get "location" value from the response
string time = httppostgetvalue(location, "localtime");
Tags.Time = time;
```

Change API_ACCESS_KEY to your key that you get from site.

After you have recorded the script, be sure to launch it by clicking the button on the toolbar:

4. Let's Run simulation 70 to check the settings:



You can download this project here.

9.7 Trends

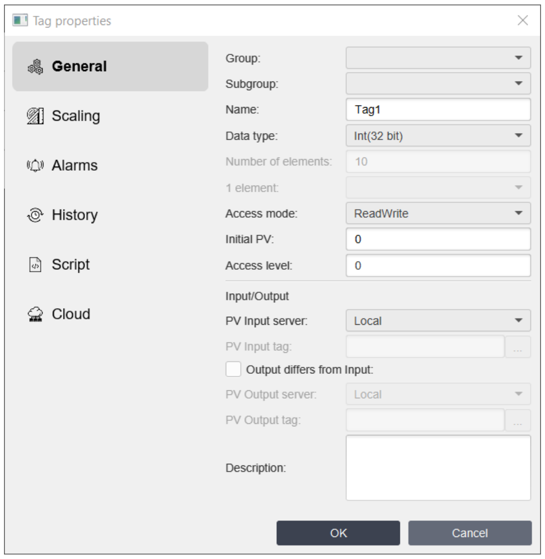
Below are examples for working with history and trends:

- Simple trend example 594
- Trend example with Y axis change 596
- Add and remove curve to/from trend dynamically 599

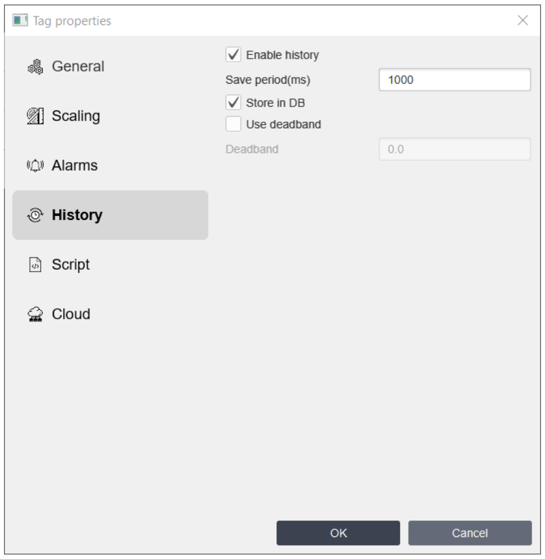
9.7.1 Simple trend example

Quite often you need to look at the dynamics of the values of certain parameters (tags). We can display this data on a chart using graphical objects; in the example below we will use the Trend DB.

1. Suppose we want to look at the dynamics of values for a certain tag Tag1, the values of which will be collected in the general SQLLite database 29:

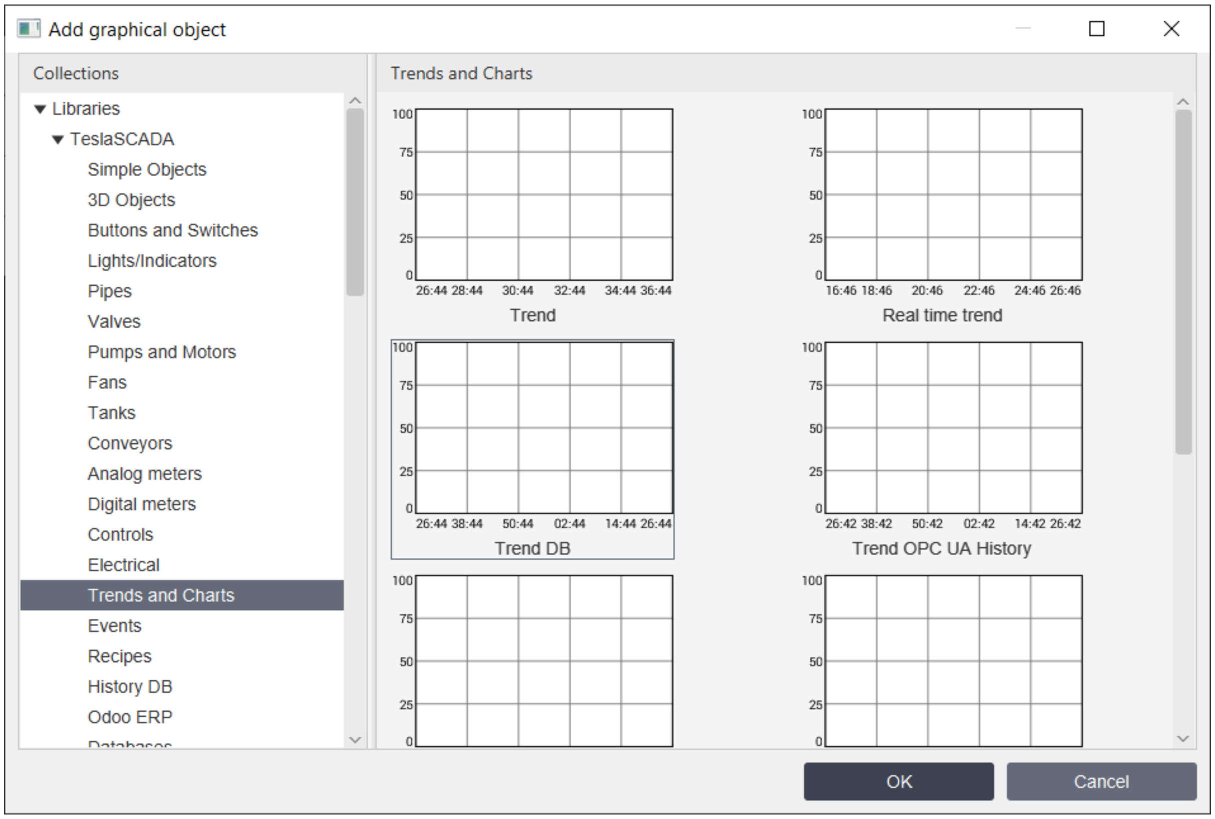


Group:	
Subgroup:	
Name:	Tag1
Data type:	Int(32 bit)
Number of elements:	10
1 element:	
Access mode:	ReadWrite
Initial PV:	0
Access level:	0
Input/Output	
PV Input server:	Local
PV Input tag:	
☐ Output differs from Input:	
PV Output server:	Local
PV Output tag:	
Description:	

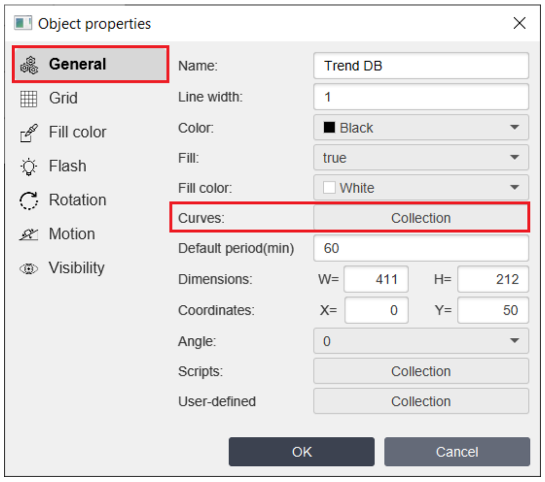


✓ Enable history	
Save period(ms)	1000
✓ Store in DB	
☐ Use deadband	
Deadband	0.0

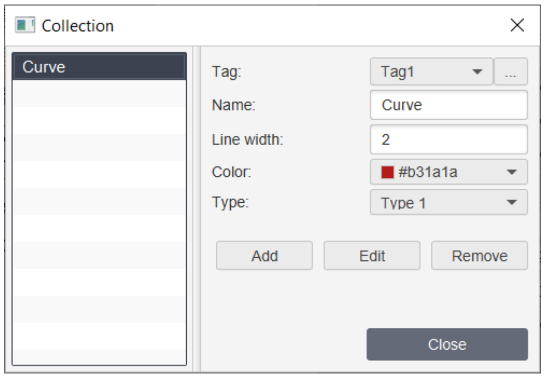
2. We want to display history information about Tag1 values on the Trend DB . Let's place the Trend DB 233 object on the screen:



3. Bind the tag to our trend. To do this, open the properties of the Trend DB and fill in the "Collection" in the "Curves" field:

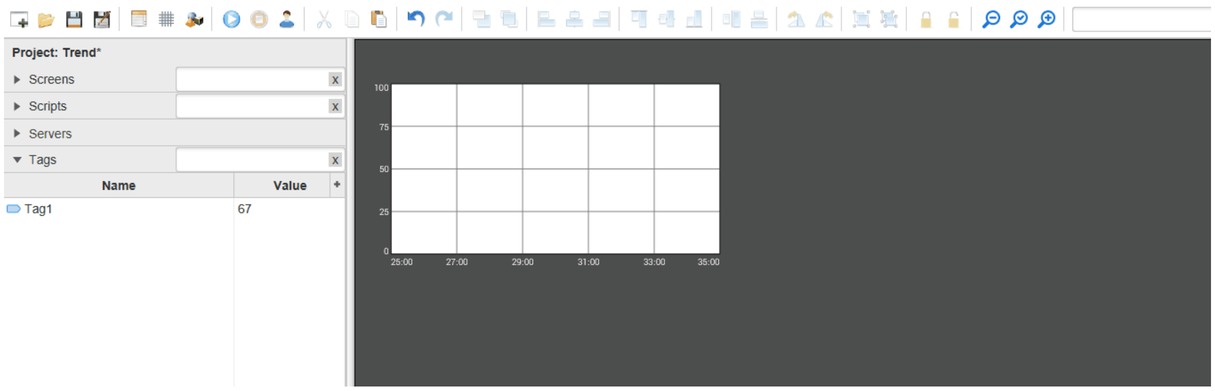


Name: Trend DB
Line width: 1
Color: Black
Fill: true
Fill color: White
Curves: Collection
Default period(min) 60
Dimensions: W= 411 H= 212
Coordinates: X= 0 Y= 50
Angle: 0
Scripts: Collection
User-defined Collection



Tag: Tag1
Name: Curve
Line width: 2
Color: #b31a1a
Type: Type 1

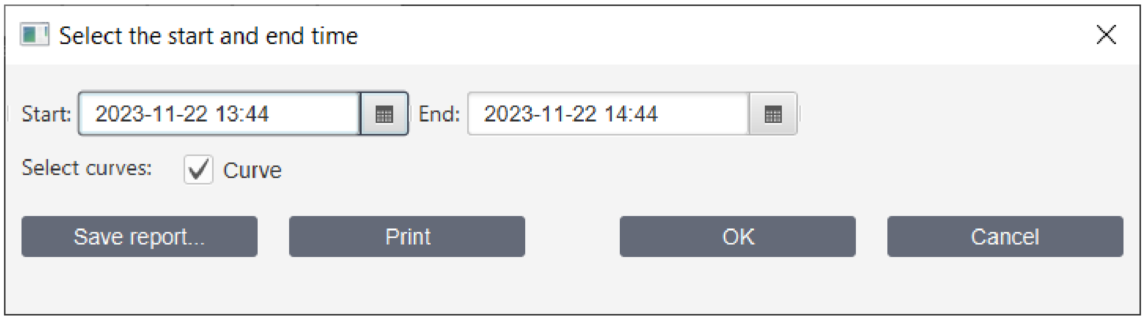
4. Run simulation[70] to check the settings. Within a few minutes, set different tag values to keep the information in the database. Then, by clicking on the trend, we will select the period for which we want to obtain data. In our example, we will select data from the previous few minutes when we recorded data.



You can download this project here.

9.7.2 Trend example with Y axis change

In the previous example, we could set the trend time range (X-axis) arbitrarily by clicking on it with the mouse and specifying the "Start" and "End" of the period in the pop-up window:


Select the start and end time

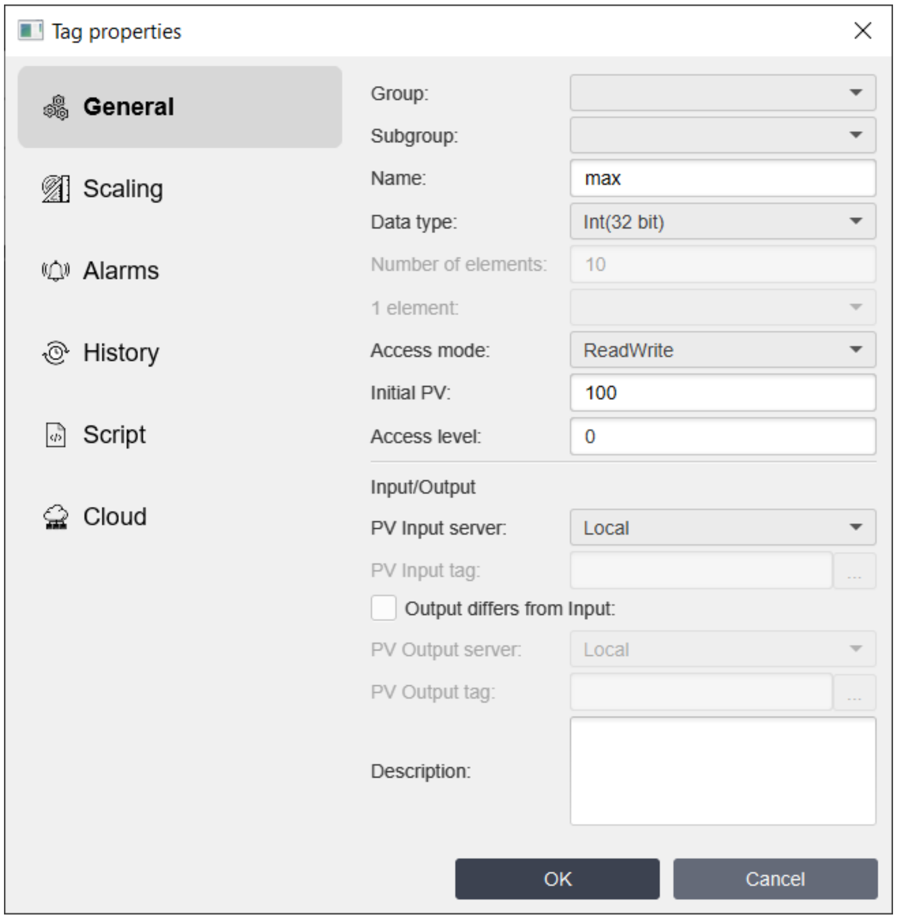
Start: 2023-11-22 13:44 End: 2023-11-22 14:44

Select curves: ✓ Curve

If we want to change the range of the Y axis we need to use a script.

Let's take the project from our previous example as a basis, where a tag and a graphic object have already been created and configured.

1. Let's create an intermediate tag named max, which will change the maximum trend range (Y-axis) through a script:

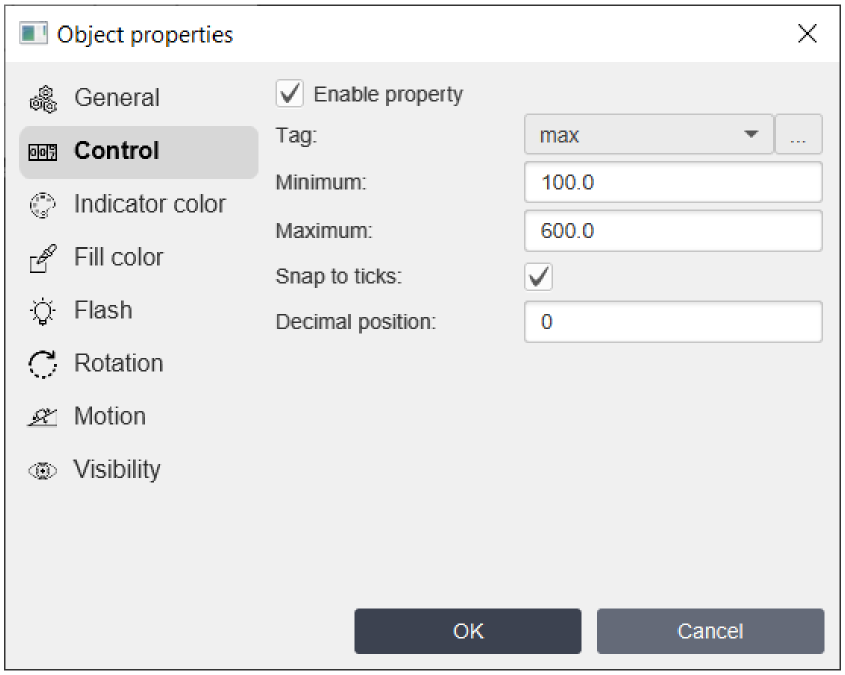


Group:	
Subgroup:	
Name:	max
Data type:	Int(32 bit)
Number of elements:	10
1 element:	
Access mode:	ReadWrite
Initial PV:	100
Access level:	0

Input/Output

PV Input server:	Local
PV Input tag:	
Output differs from Input:	☐
PV Output server:	Local
PV Output tag:	
Description:	

2. To set the value for the Y axis of the Trend DB, place a Slider 219 on the screen and bind the max tag to it through the “Control” property:



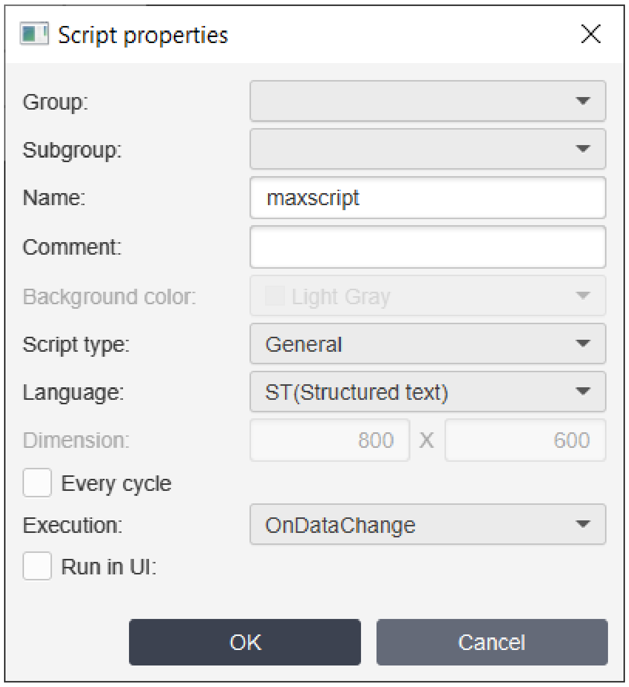
Object properties

General
Control
Indicator color
Fill color
Flash
Rotation
Motion
Visibility

[✓] Enable property
Tag: max
Minimum: 100.0
Maximum: 600.0
Snap to ticks: [✓]
Decimal position: 0

OK Cancel

3. We will also bind the value of the max tag to the maximum property of the Trend using the ST script. Let's create a script that will be called when the value of the max tag changes:

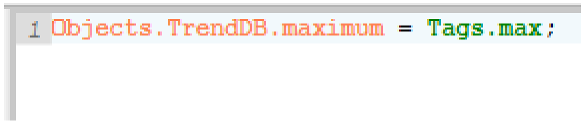


Script properties

Group:
Subgroup:
Name: maxscript
Comment:
Background color: Light Gray
Script type: General
Language: ST(Structured text)
Dimension: 800 X 600
[ ] Every cycle
Execution: OnDataChange
[ ] Run in UI:

OK Cancel

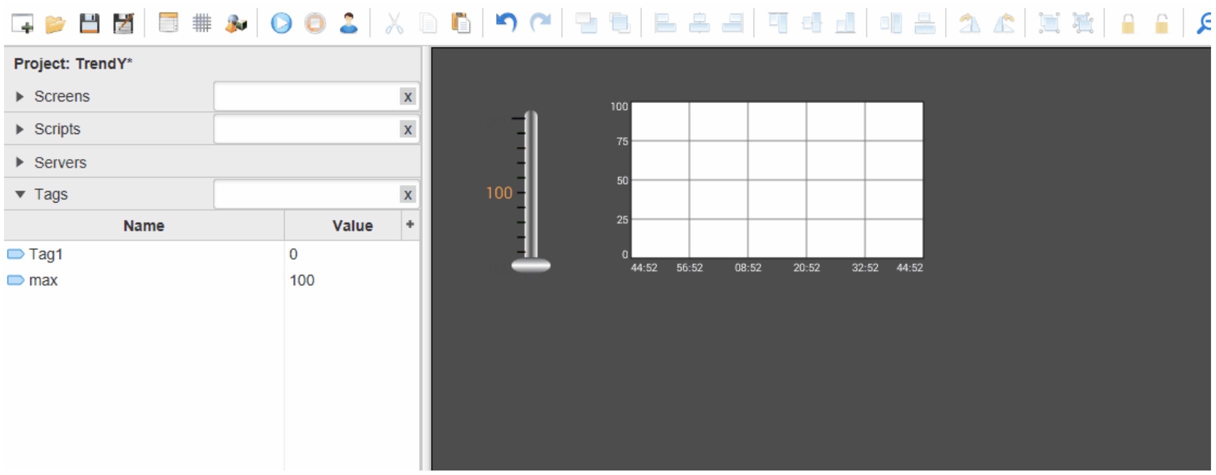
Let's write a script:



```
Objects.TrendDB.maximum = Tags.max;
```

After you have recorded the script, be sure to launch it by clicking the button on the toolbar:

4. Let’s Run simulation 70 to check the settings (using the slider we will set the value for the Y-axis of the Trend):



Name	Value
Tag1	0
max	100

You can download this project here.

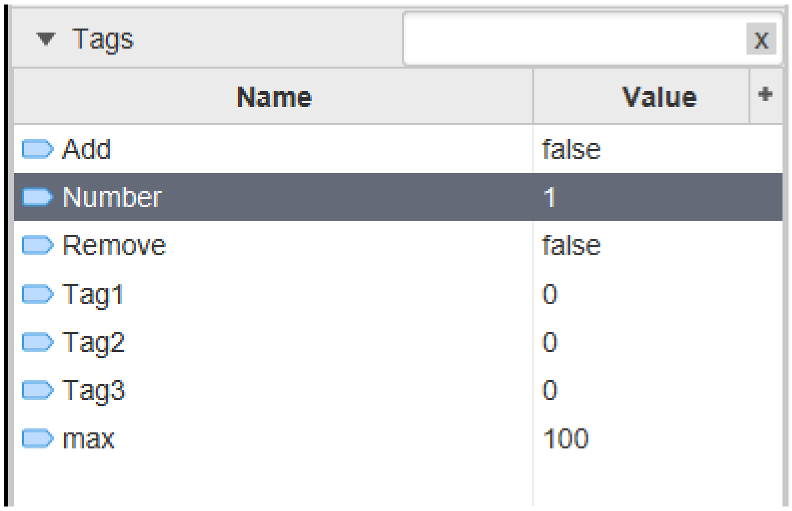
9.7.3 Add and remove curve to/from trend dynamically

If you want to add or remove curves to/from a trend dynamically, you should use scripts. Let's look at an example how to do this. Let's take the project from the previous example as a basis, where we have already created and configured tags and graphic objects.

1. Suppose we want to see the dynamics of two more parameters on the same trend. In this case, having copied Tag1, we will additionally create Tag2 and Tag3,

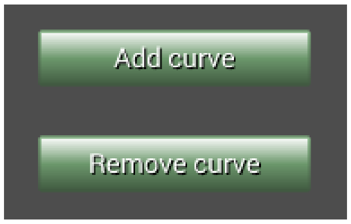
2. Let's create 2 intermediate tags - Add and Remove. When the values of these tags change from FALSE to TRUE, we will add or remove a curve.

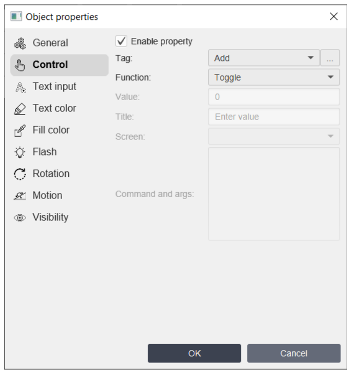
3. Let's create an intermediate tag Number, it will contain information about which tag we want to add or remove. All our tags look like below:


Tags

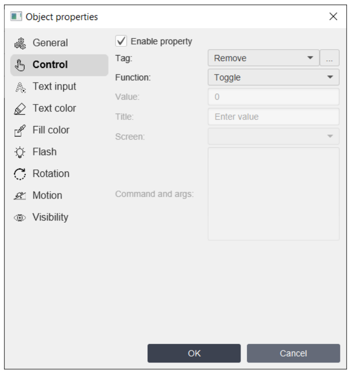
Name	Value
Add	false
Number	1
Remove	false
Tag1	0
Tag2	0
Tag3	0
max	100

2. Create 2 Buttons 186 “Add curve” and “Remove curve” and bind them to the Add and Remove tags, respectively, through the Control Property:



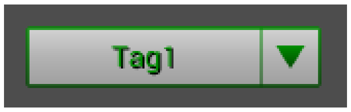


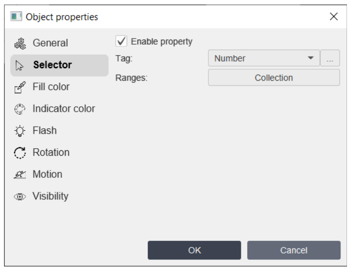
✓ Enable property
Tag: Add
Function: Toggle
Value: 0
Title: Enter value
Screen:
Command and args:



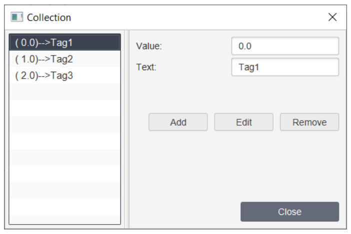
✓ Enable property
Tag: Remove
Function: Toggle
Value: 0
Title: Enter value
Screen:
Command and args:

3. Create a ComboBox object and bind the Number tag to it through the “Selector” property and fill the “Collection” with tag names:



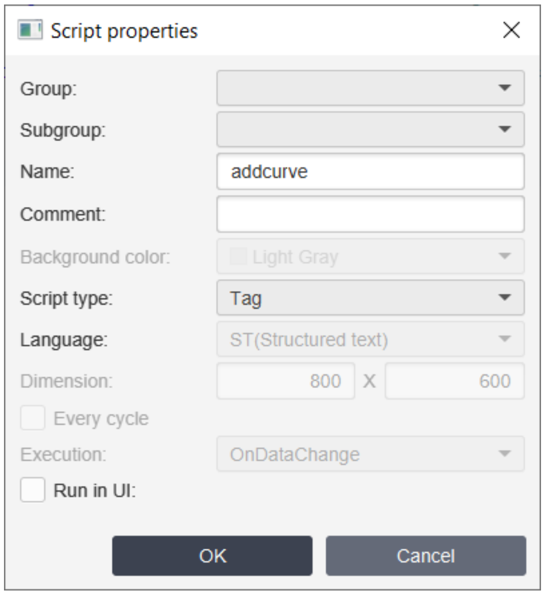


✓ Enable property
Tag: Number
Ranges: Collection

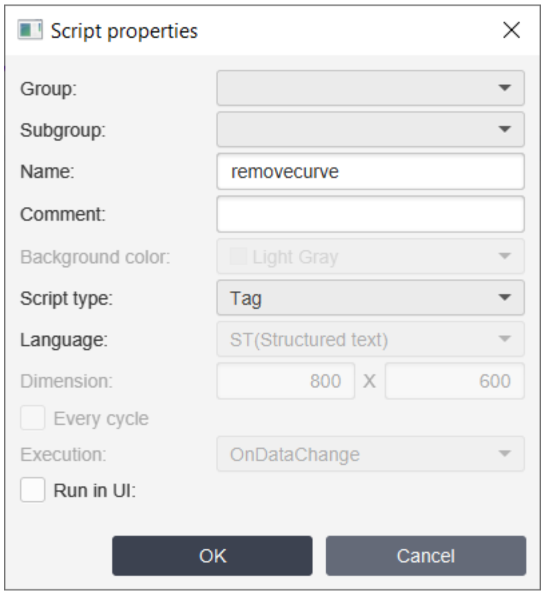


(0.0)-->Tag1
(1.0)-->Tag2
(2.0)-->Tag3
Value: 0.0
Text: Tag1

4. Now let's create 2 scripts to add and remove a curve:



Script properties
Group:
Subgroup:
Name: addcurve
Comment:
Background color: Light Gray
Script type: Tag
Language: ST(Structured text)
Dimension: 800 X 600
Every cycle
Execution: OnDataChange
Run in UI:



Script properties
Group:
Subgroup:
Name: removecurve
Comment:
Background color: Light Gray
Script type: Tag
Language: ST(Structured text)
Dimension: 800 X 600
Every cycle
Execution: OnDataChange
Run in UI:

Let's write a script to add a curve using the addcurve function from the Trend's curve library 460:

```
if (Tags.Number==0){
        addcurve("TrendDB","curve1","Tag1",2,255,0,0,1);// add curve1 for Tag1 with Red color
}
else if (Tags.Number==1){
        addcurve("TrendDB","curve2","Tag2",2,0,255,0,1);// add curve2 for Tag2 with Green color
}
else if (Tags.Number==2){
        addcurve("TrendDB","curve3","Tag3",2,0,0,255,1);// add curve3 for Tag3 with Blue color
}
Tags.Add=false; //reset Add tag
Objects.TrendDB.update=true; //update trend to redraw it after adding
```

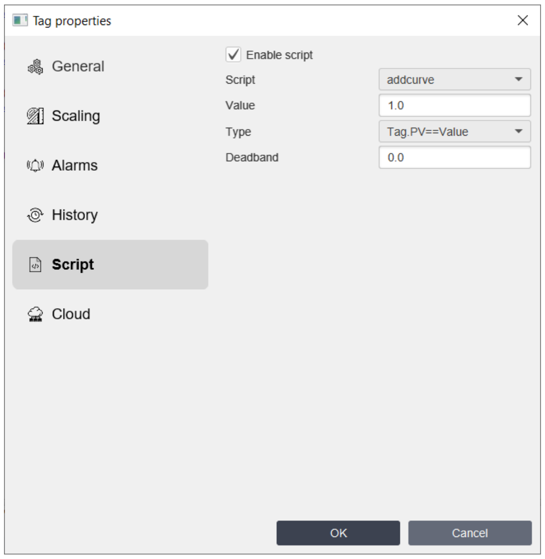
After you have recorded the script, be sure to launch it by clicking the button on the toolbar:

Let's write a script to delete a curve using the removecurve function from the Trend's curve library 460:

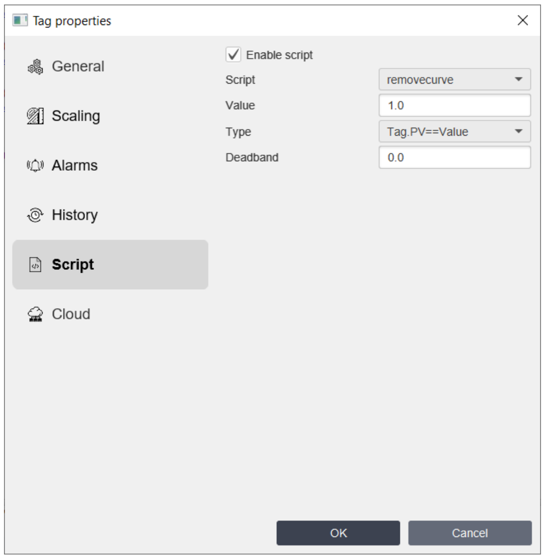
```
if (Tags.Number==0){
        removecurve("TrendDB","curve1"); //remove curve1 from the trend
}
else if (Tags.Number==1){
        removecurve("TrendDB","curve2"); //remove curve2 from the trend
}
else if (Tags.Number==2){
        removecurve("TrendDB","curve3");//remove curve3 from the trend
}
Tags.Remove=false;
Objects.TrendDB.update=true; //update trend to redraw it after removing
```

After you have recorded the script, be sure to launch it by clicking the button on the toolbar:

5. Link the scripts to the tags - Add and Remove:



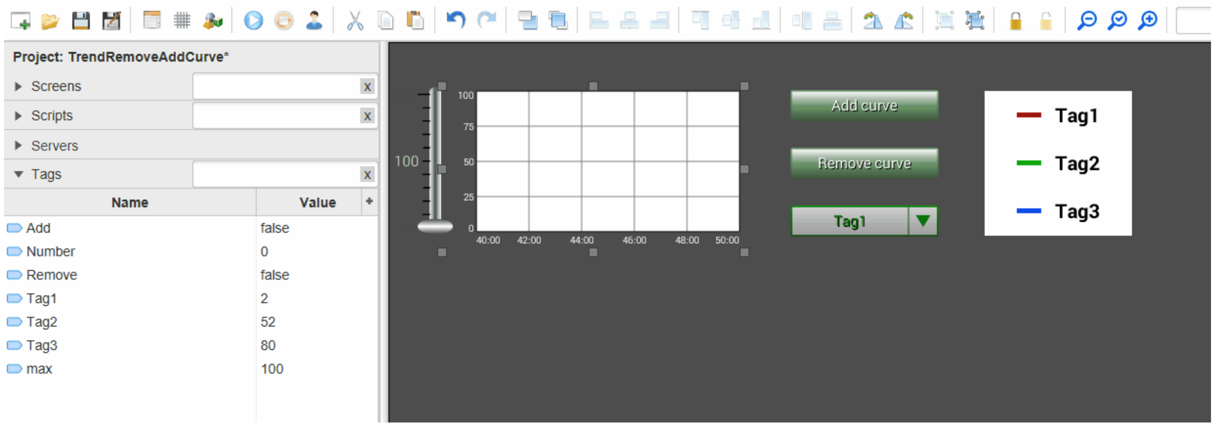
Enable script: ✓
Script: addcurve
Value: 1.0
Type: Tag.PV==Value
Deadband: 0.0



Enable script: ✓
Script: removecurve
Value: 1.0
Type: Tag.PV==Value
Deadband: 0.0

Now when we click the Add and Remove buttons we call the corresponding scripts.

6. Run simulation 70 to check the settings:



Name	Value
Add	false
Number	0
Remove	false
Tag1	2
Tag2	52
Tag3	80
max	100

You can download this project here.

9.8 Change tag's value

The easiest way to change the value of a tag is to use Buttons via the Control property. You can also use Text/Input Field. The example you can find here 575. You can also use objects from Controls library 218. For more complex task you could use scripts:

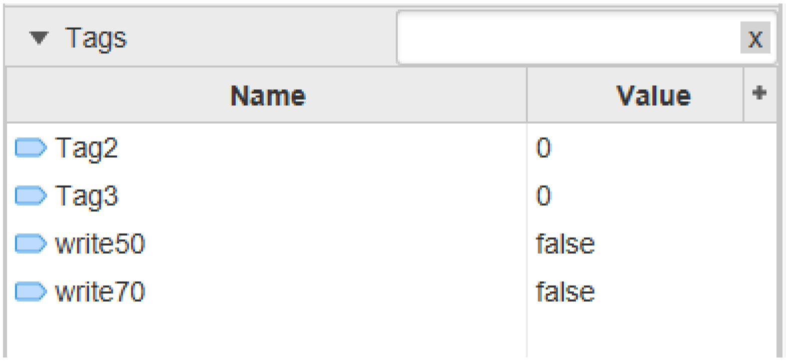
- Change values of 2 tags by one click 603
- Write value when screen is opened and closed 604

9.8.1 Change values of 2 tags by one click

In this example, we'll show you how to change the values of two tags with one click. Suppose we have two containers with liquid that needs to be heated to either 50°C or 70°C. By pressing one button we will set the temperature in both containers - 50°C, and by pressing the other - 70°C.

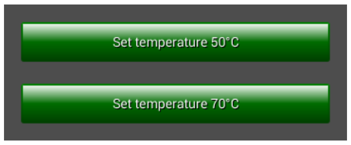
Let's create two tags - Tag2 and Tag3. We will change the values of these tags simultaneously by pressing the buttons. These buttons will toggle the intermediate tags - write50 and write70.

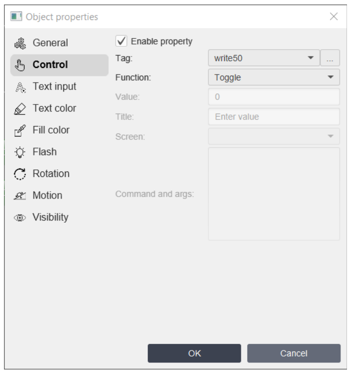
1. Let's create Tags:



Name	Value
Tag2	0
Tag3	0
write50	false
write70	false

2. Create buttons and bind write50 and write70 tags to two buttons:



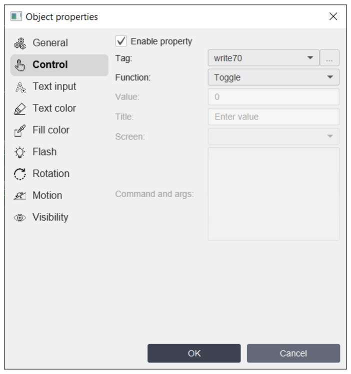


Object properties

General, Control, Text input, Text color, Fill color, Flash, Rotation, Motion, Visibility

✓ Enable property
Tag: write50
Function: Toggle
Value: 0
Title: Enter value
Screen:
Command and args:

OK Cancel



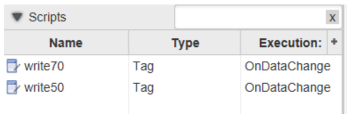
Object properties

General, Control, Text input, Text color, Fill color, Flash, Rotation, Motion, Visibility

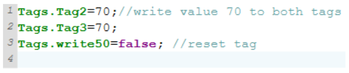
✓ Enable property
Tag: write70
Function: Toggle
Value: 0
Title: Enter value
Screen:
Command and args:

OK Cancel

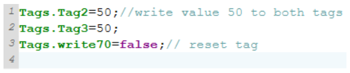
3. Now let's create 2 scripts that will be called when the values of these two tags are switched from FALSE to TRUE:



Name	Type	Execution:
write70	Tag	OnDataChange
write50	Tag	OnDataChange



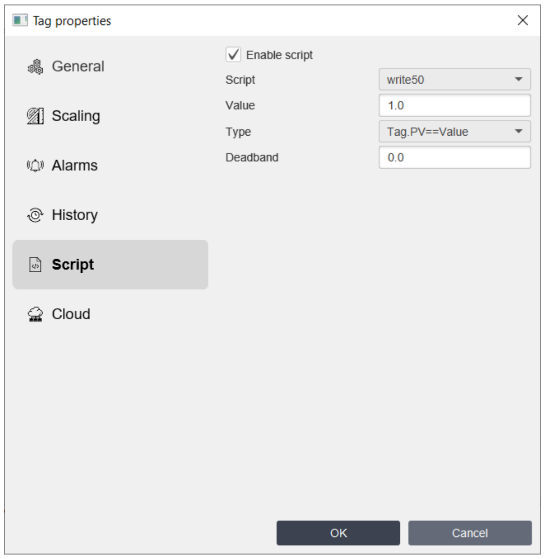
```
Tags.Tag2=70;//write value 70 to both tags
Tags.Tag3=70;
Tags.write50=false; //reset tag

```



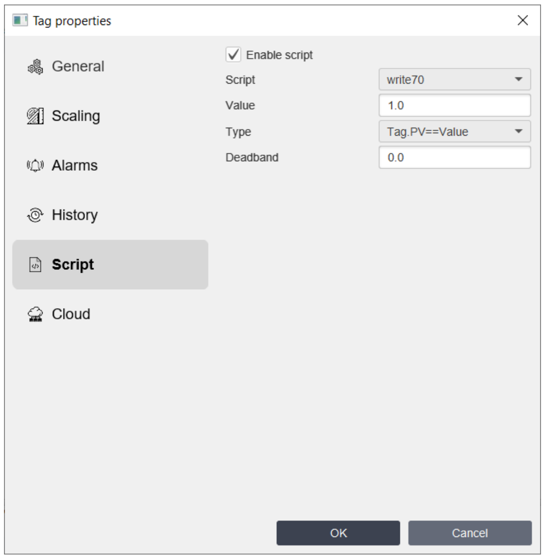
```
Tags.Tag2=50;//write value 50 to both tags
Tags.Tag3=50;
Tags.write70=false;// reset tag

```

After you have recorded the script, be sure to launch it by clicking the button on the toolbar:

4. And let's bind these 2 scripts to tags - write50 and write70:



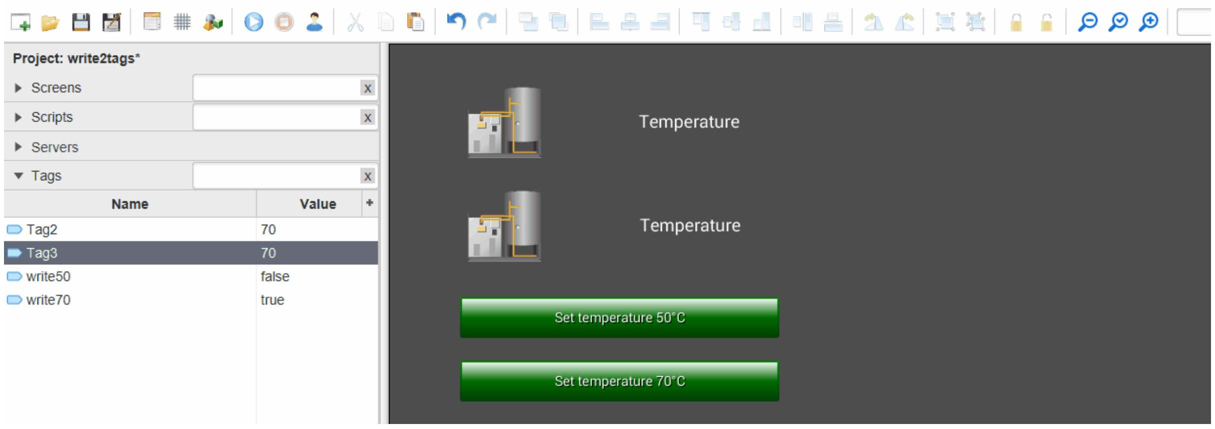
Enable script ✓
Script: write50
Value: 1.0
Type: Tag.PV==Value
Deadband: 0.0



Enable script ✓
Script: write70
Value: 1.0
Type: Tag.PV==Value
Deadband: 0.0

Now when tags write50 and write70 switch from FALSE to TRUE, the corresponding script is called.

5. Run simulation 70 to check the settings:



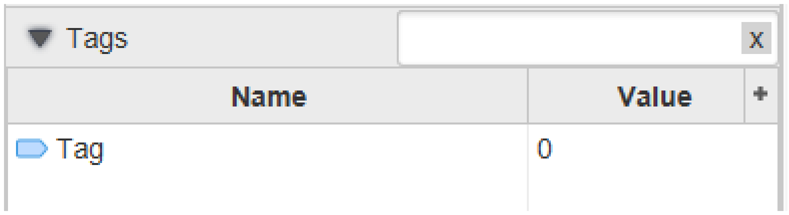
Name	Value
Tag2	70
Tag3	70
write50	false
write70	true

You can download this project here.

9.8.2 Write value when screen is opened and closed

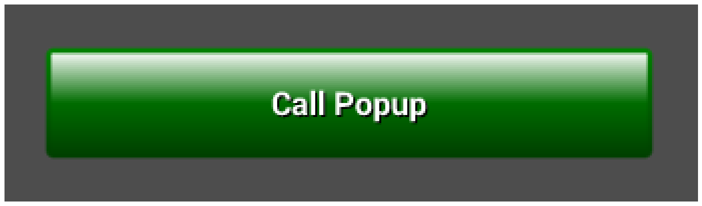
In this example, we'll show how to record a value when opening and closing a screen.

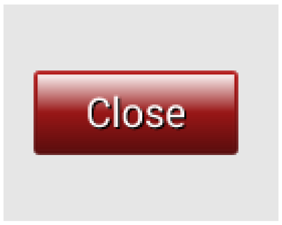
1. Create a tag named Tag:



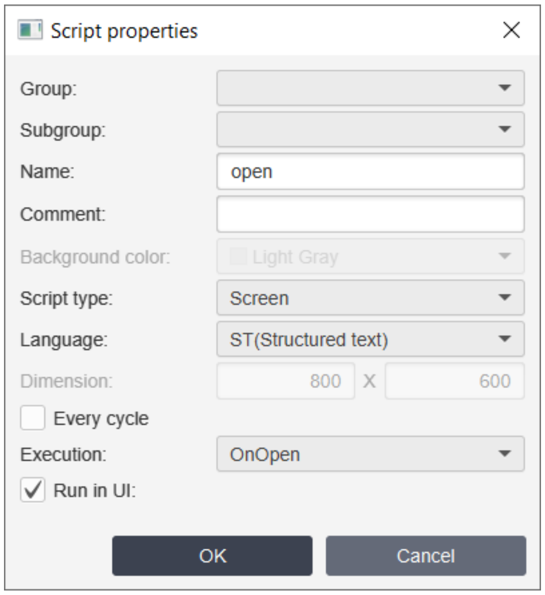
Name	Value
Tag	0

2. Let's create 2 screens - General and Popup. On the general screen we will place a button that will open the Pop-up screen and on the pop-up screen we will place a button to close the pop-up screen:



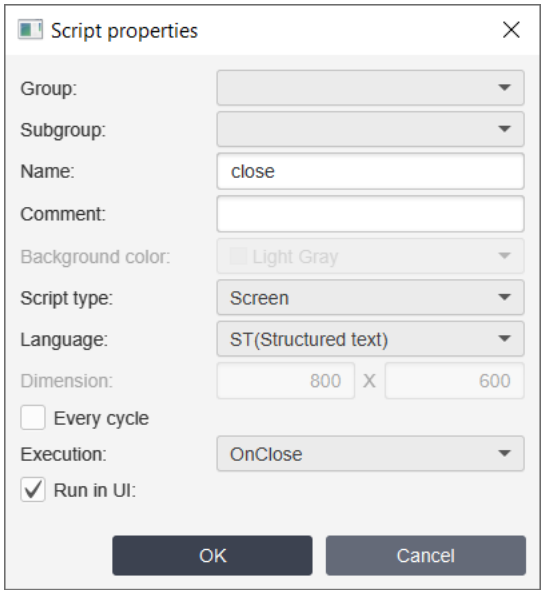


3. Let's create 2 scripts of the Screen type. One is executed when the popup screen opens. The second one is executed when the popup window is closed:



Script properties

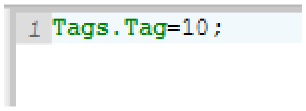
Group:	
Subgroup:	
Name:	open
Comment:	
Background color:	Light Gray
Script type:	Screen
Language:	ST(Structured text)
Dimension:	800 X 600
Every cycle	☐
Execution:	OnOpen
Run in UI:	✓



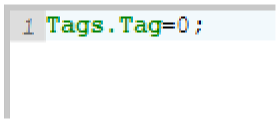
Script properties

Group:	
Subgroup:	
Name:	close
Comment:	
Background color:	Light Gray
Script type:	Screen
Language:	ST(Structured text)
Dimension:	800 X 600
Every cycle	☐
Execution:	OnClose
Run in UI:	✓

Let's write scripts:



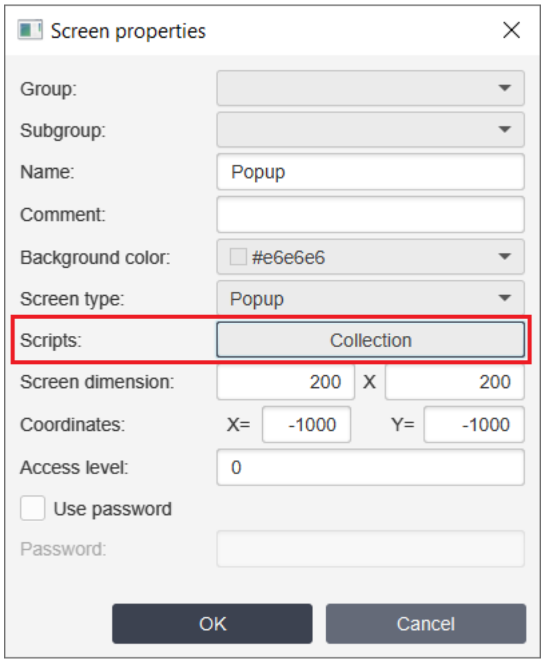
```
Tags.Tag=10;
```



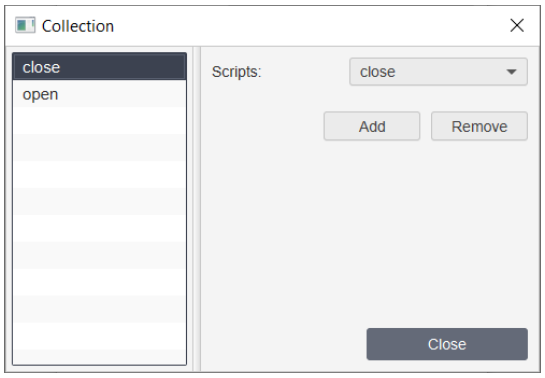
```
Tags.Tag=0;
```

After you have recorded the script, be sure to launch it by clicking the button on the toolbar:

4. Let's link these scripts to the pop-up screen:


Screen properties

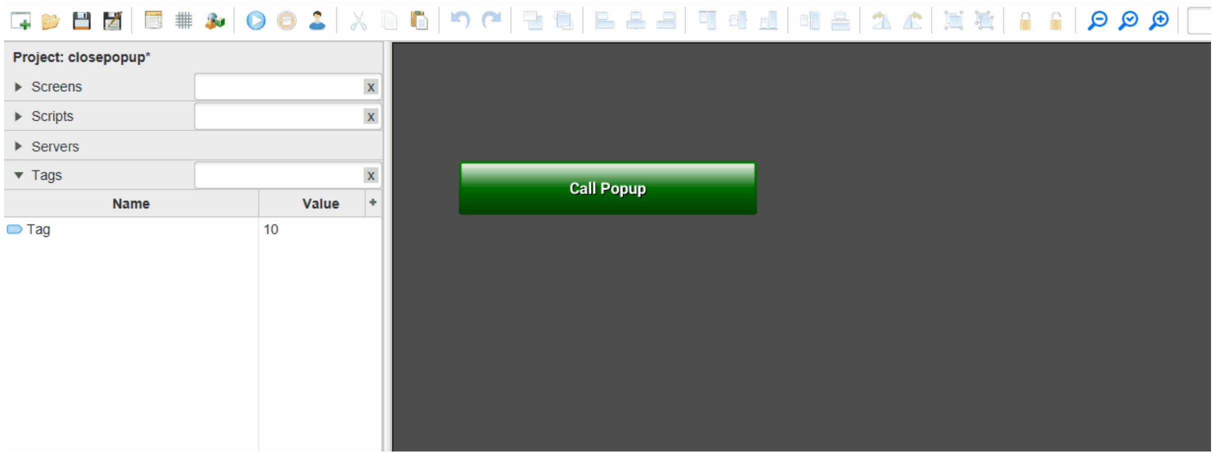
Group:	
Subgroup:	
Name:	Popup
Comment:	
Background color:	#e6e6e6
Screen type:	Popup
Scripts:	Collection
Screen dimension:	200 X 200
Coordinates:	X= -1000 Y= -1000
Access level:	0
Use password	
Password:	


Collection

close
open

Scripts: close

5. Run simulation 70 to check the settings:


Project: closepopup*

Name	Value
Tag	10

You can download this project here.

9.9 IOT clouds

Examples of working with clouds:
- IBM Watson IOT 607
- Yandex cloud 624

9.9.1 IBM Watson IOT

IBM Cloud is a variety of different services. In this example we'll require only one service - Watson IoT. In the given example TeslaSCADA2 Runtime reads data from Modbus device and sends them to IBM Cloud via MQTT protocol in JSON format by using MQTT publisher.

Free (Lite) plan of "Watson IoT" can be used for testing. It includes:

- up to 500 devices,
- up to 500 connections,
- monthly limits
  - up to 200 Mb of traffic,
  - up to 200 Mb of analized data
  - up to 200 MB of locally analized data (Edge).

More:

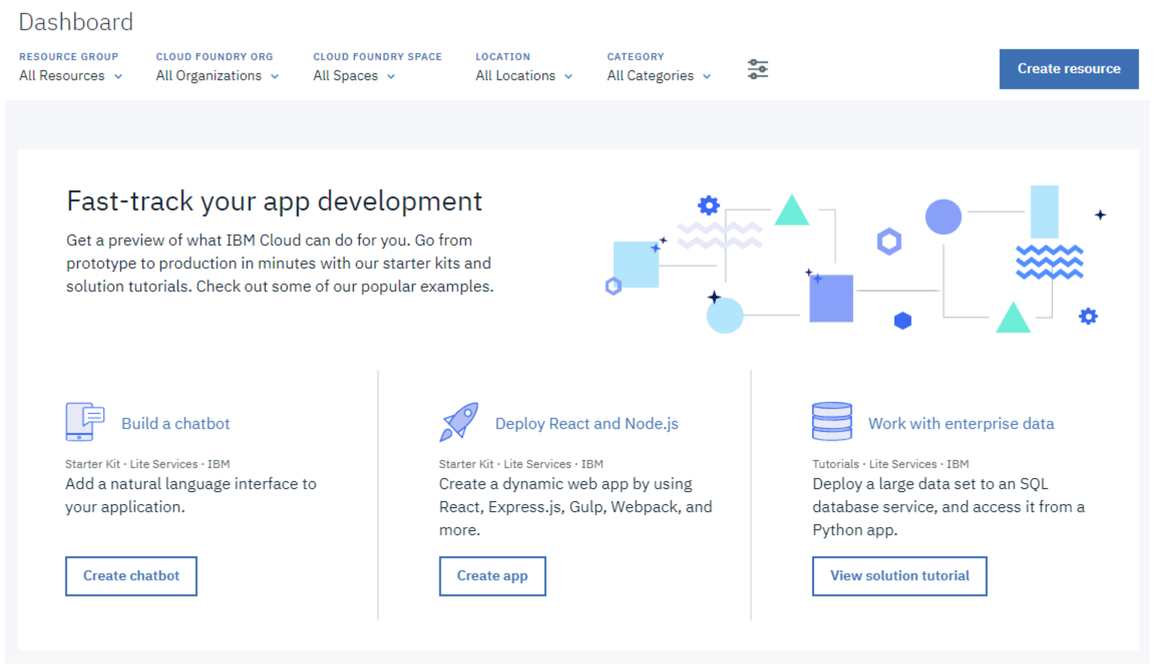
- Watson IoT (in English)

Setting IBM Watson IoT

To connect to IBM Watson IoT platform, it is required: to get IBM Cloud (IBMid) account.

Creating IBM Watson IoT instance

1. Enter your account and go to Dashboard. Click «Create Resource» button.



Fast-track your app development

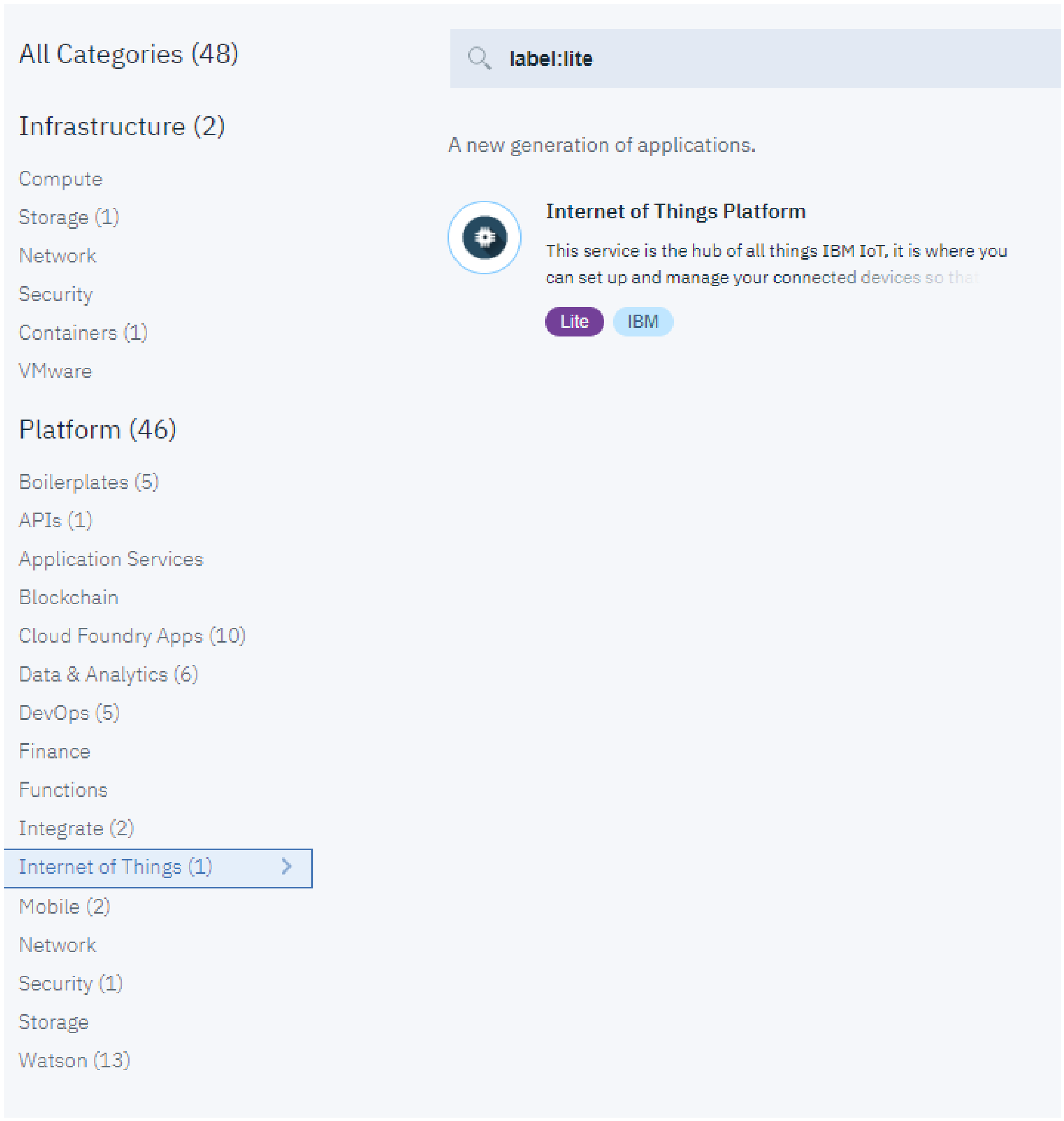
Get a preview of what IBM Cloud can do for you. Go from prototype to production in minutes with our starter kits and solution tutorials. Check out some of our popular examples.

Starter Kit · Lite Services · IBM
Add a natural language interface to your application.

Starter Kit · Lite Services · IBM
Create a dynamic web app by using React, Express.js, Gulp, Webpack, and more.

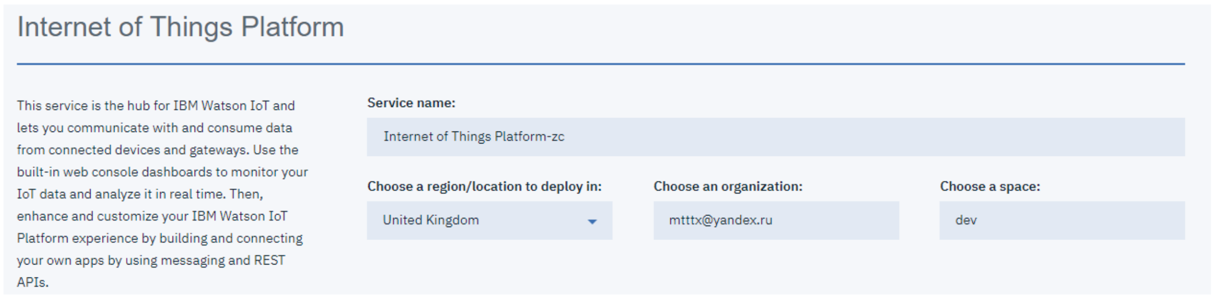
Tutorials · Lite Services · IBM
Deploy a large data set to an SQL database service, and access it from a Python app.

2. Select **Internet of Things** category and click **Internet of Things Platform**.



This service is the hub of all things IBM IoT, it is where you can set up and manage your connected devices so that

3. Select a region in the parameters, for example, US South (more functions are available for this region).



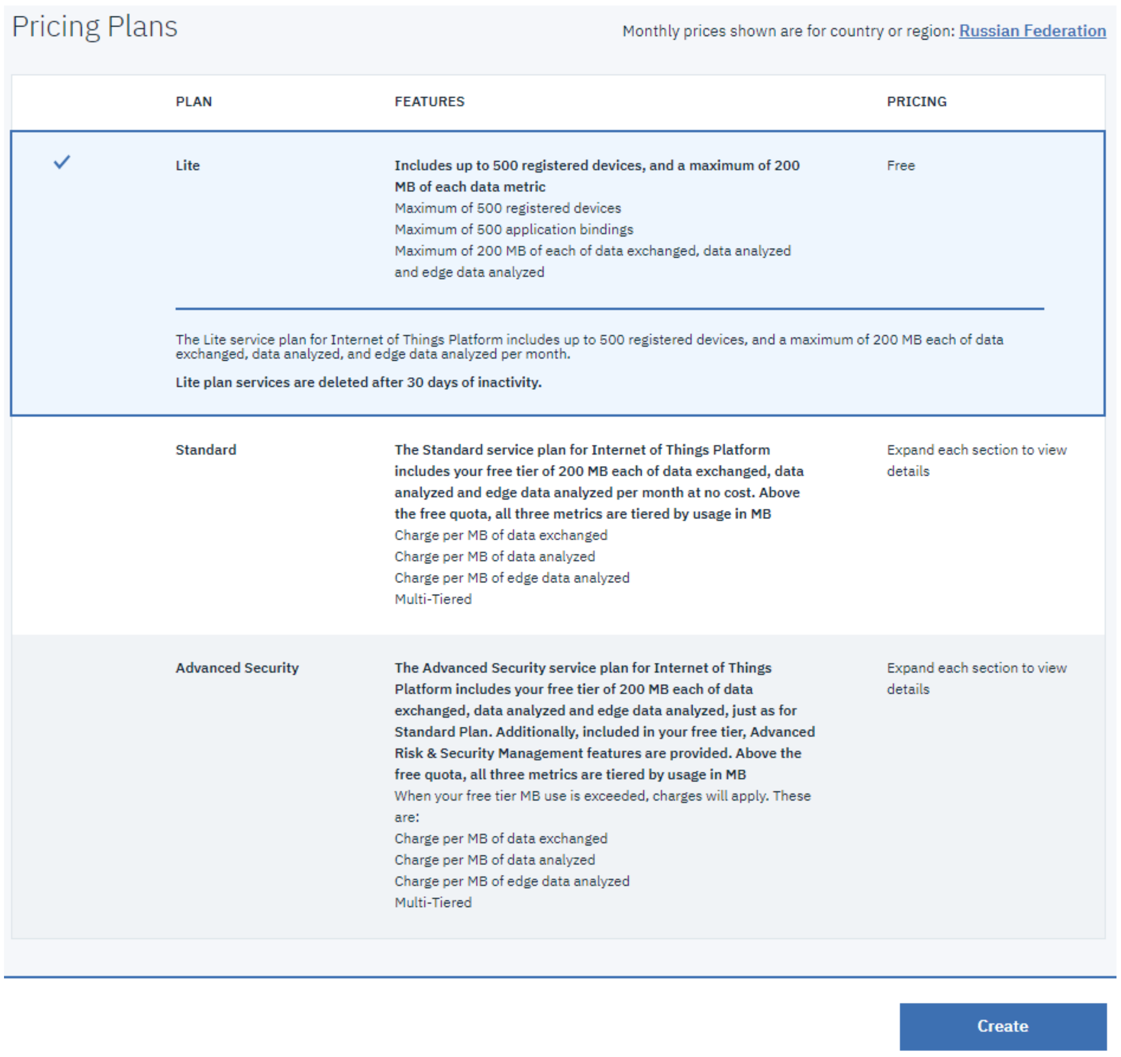
Internet of Things Platform

This service is the hub for IBM Watson IoT and lets you communicate with and consume data from connected devices and gateways. Use the built-in web console dashboards to monitor your IoT data and analyze it in real time. Then, enhance and customize your IBM Watson IoT Platform experience by building and connecting your own apps by using messaging and REST APIs.

Service name: Internet of Things Platform-zc

Choose a region/location to deploy in:	Choose an organization:	Choose a space:
United Kingdom	mtttx@yandex.ru	dev

4. Select buying plan (for example, Lite) and click «Create» button:

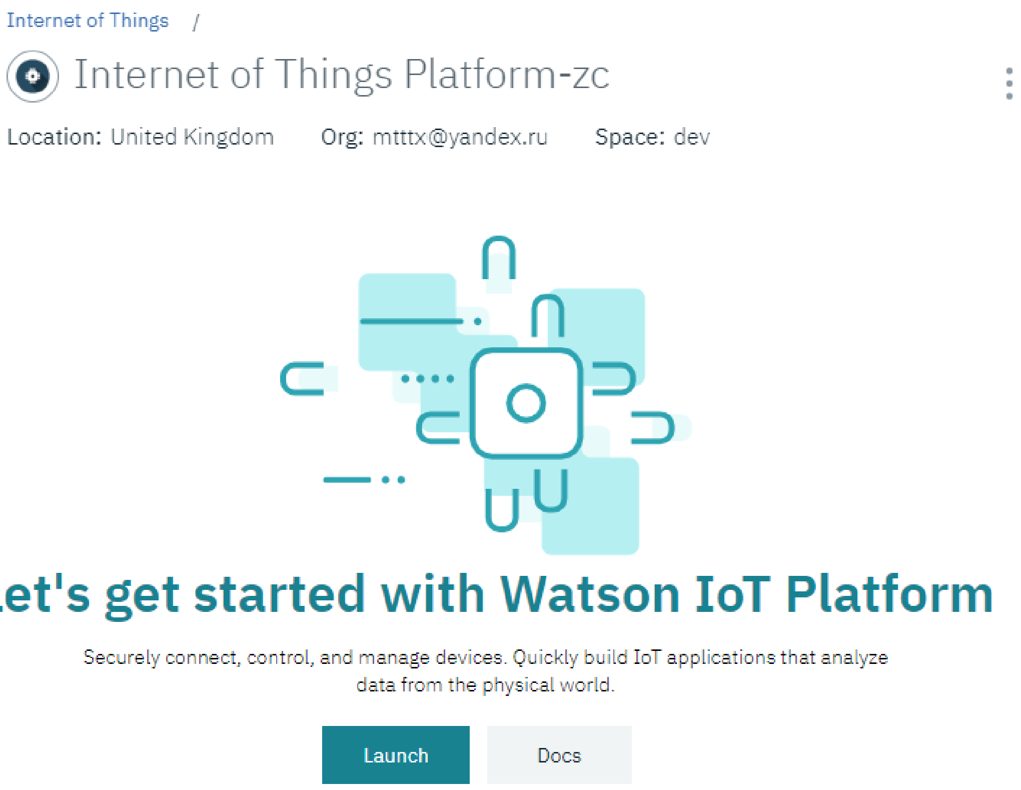


Pricing Plans

Monthly prices shown are for country or region: Russian Federation

	PLAN	FEATURES	PRICING
✓	Lite	**Includes up to 500 registered devices, and a maximum of 200 MB of each data metric** Maximum of 500 registered devices Maximum of 500 application bindings Maximum of 200 MB of each of data exchanged, data analyzed and edge data analyzed The Lite service plan for Internet of Things Platform includes up to 500 registered devices, and a maximum of 200 MB each of data exchanged, data analyzed, and edge data analyzed per month. **Lite plan services are deleted after 30 days of inactivity.**	Free
	Standard	**The Standard service plan for Internet of Things Platform includes your free tier of 200 MB each of data exchanged, data analyzed and edge data analyzed per month at no cost. Above the free quota, all three metrics are tiered by usage in MB** Charge per MB of data exchanged Charge per MB of data analyzed Charge per MB of edge data analyzed Multi-Tiered	Expand each section to view details
	Advanced Security	**The Advanced Security service plan for Internet of Things Platform includes your free tier of 200 MB each of data exchanged, data analyzed and edge data analyzed, just as for Standard Plan. Additionally, included in your free tier, Advanced Risk & Security Management features are provided. Above the free quota, all three metrics are tiered by usage in MB** When your free tier MB use is exceeded, charges will apply. These are: Charge per MB of data exchanged Charge per MB of data analyzed Charge per MB of edge data analyzed Multi-Tiered	Expand each section to view details

5. The added service is displayed in the list on the dashboard. Click «Launch» button in the window that appears.


Internet of Things /

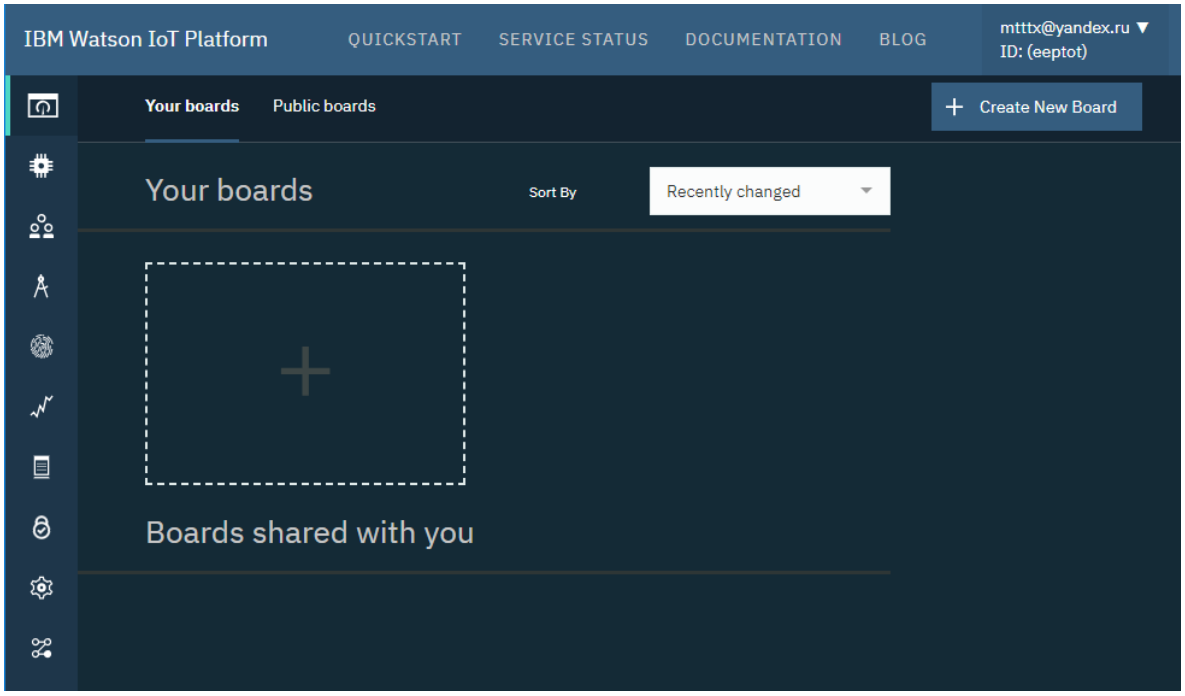
Internet of Things Platform-zc

Location: United Kingdom Org: mtttx@yandex.ru Space: dev

Let's get started with Watson IoT Platform

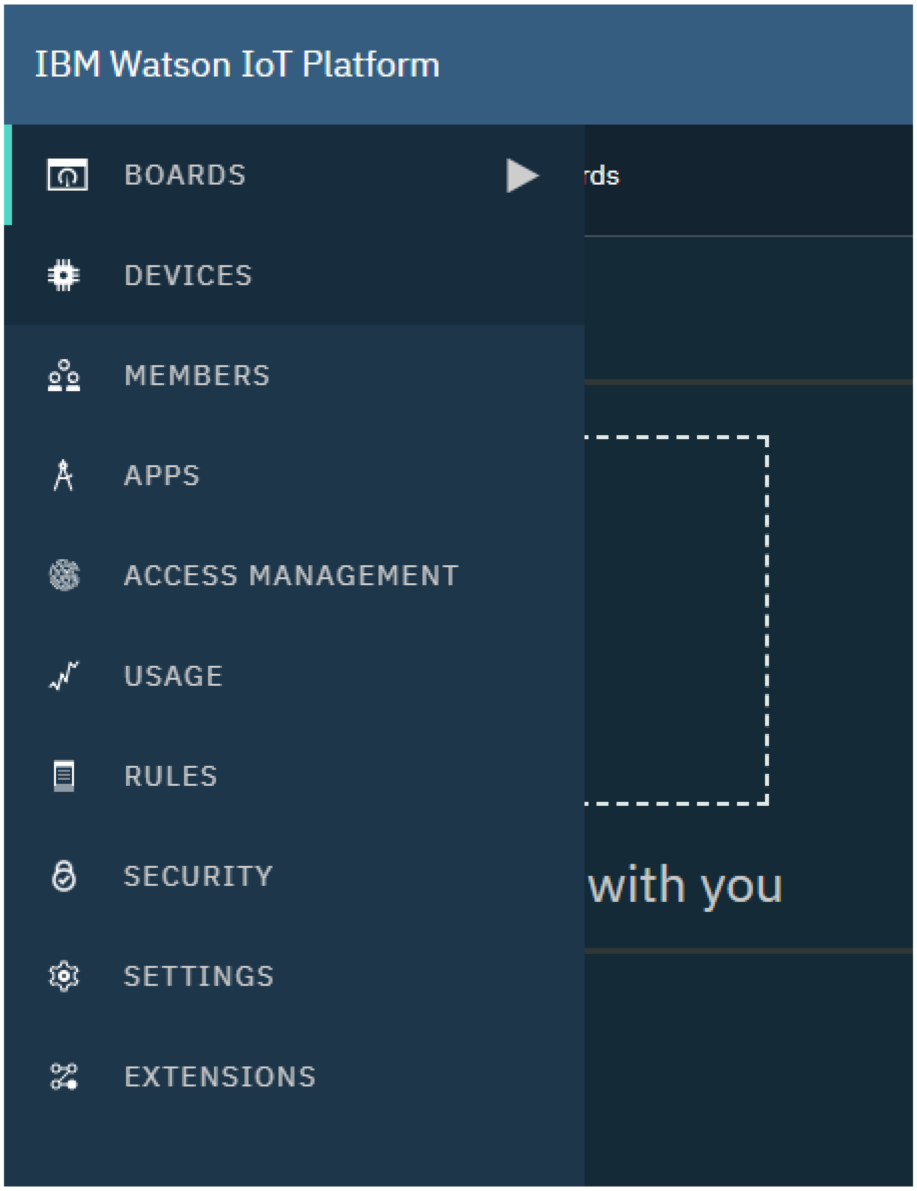
Securely connect, control, and manage devices. Quickly build IoT applications that analyze data from the physical world.

6. A panel to control IoT Platform opens in a new window.

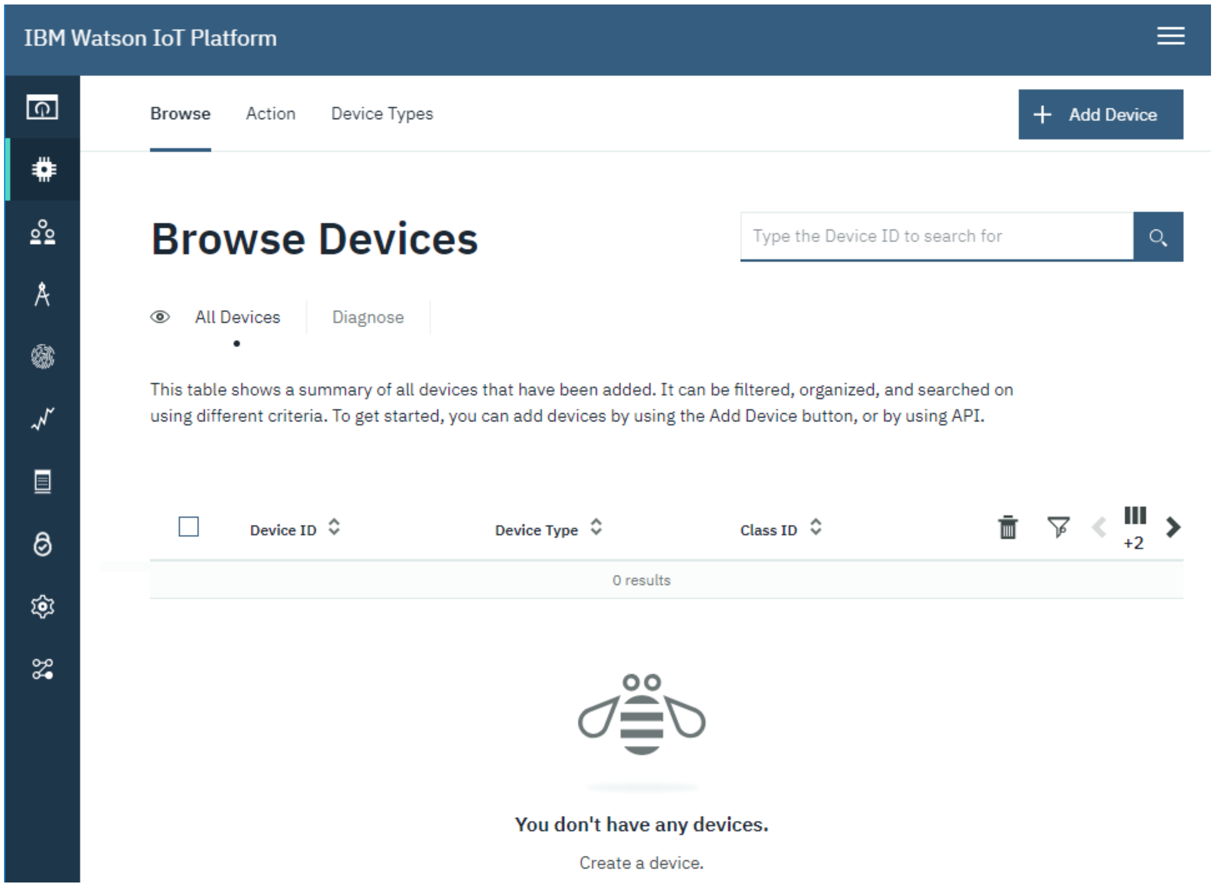


Adding devices

1. Go to Devices tab on the dashboard of IoT Platform.



2. Click «Add Device» buttom to add a device.


IBM Watson IoT Platform

Browse Action Device Types

Add Device

Browse Devices

Type the Device ID to search for

All Devices Diagnose

This table shows a summary of all devices that have been added. It can be filtered, organized, and searched on using different criteria. To get started, you can add devices by using the Add Device button, or by using API.

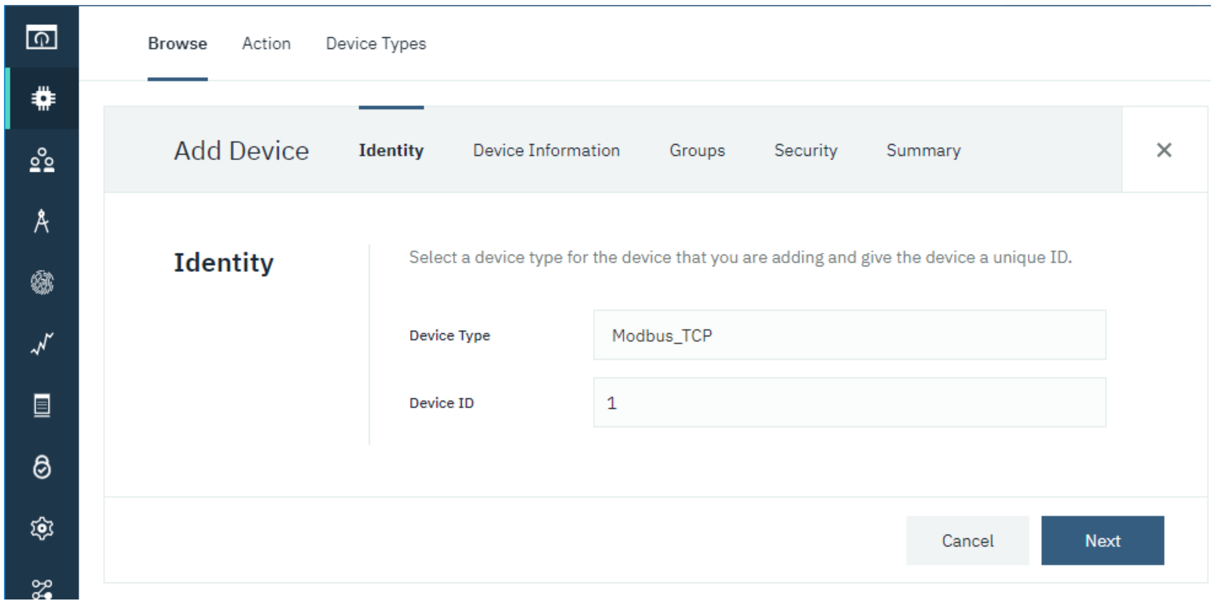
Device ID	Device Type	Class ID

0 results

You don't have any devices.

Create a device.

3. Set Device Type and Device ID in the window that appears and click «Next».


Browse Action Device Types

Add Device — Identity | Device Information | Groups | Security | Summary

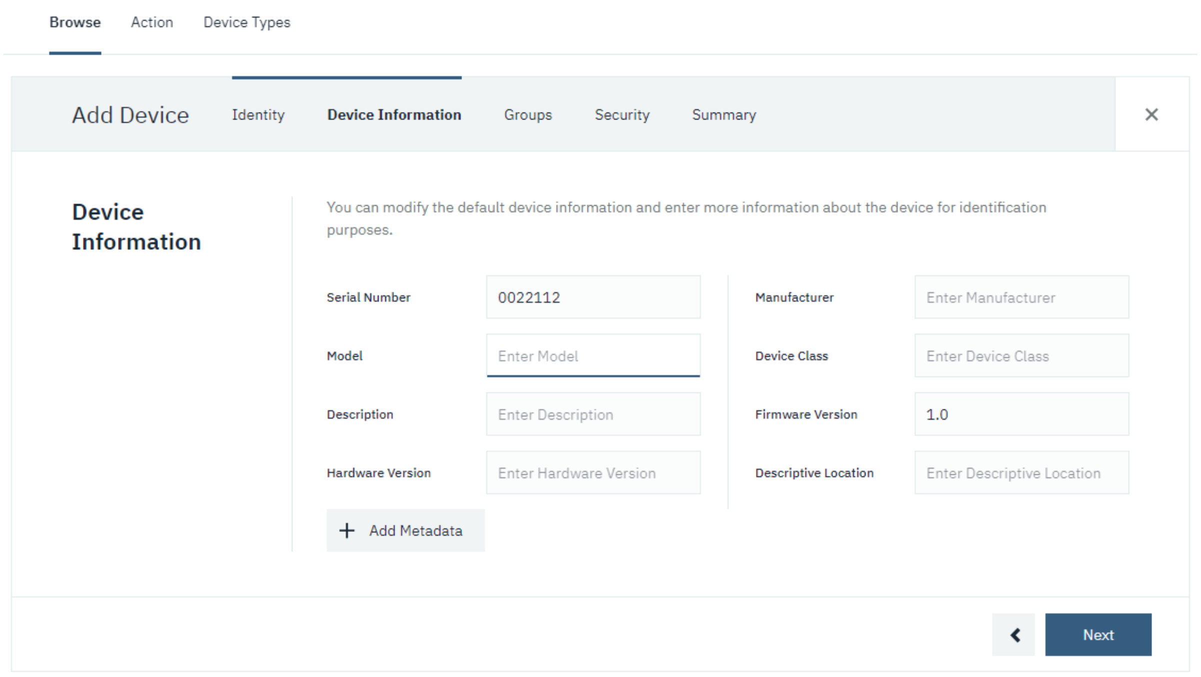
Identity

Select a device type for the device that you are adding and give the device a unique ID.

Device Type	Modbus_TCP
Device ID	1

Cancel Next

4. Enter information about the device and click «Next».

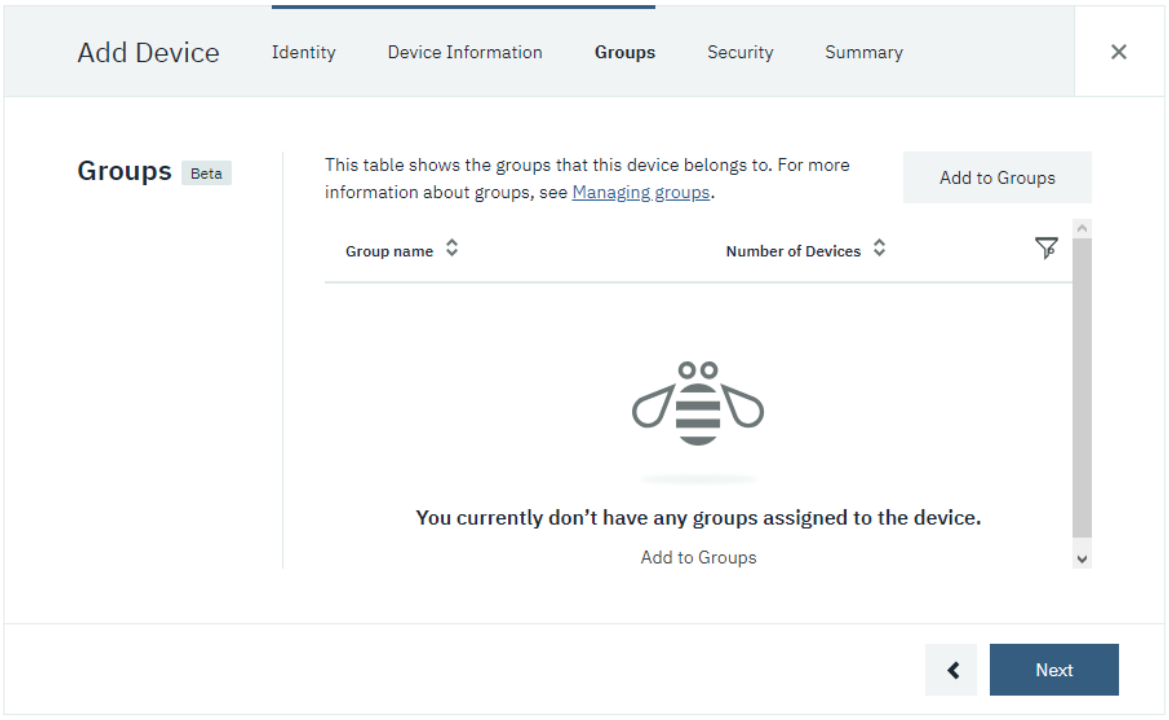


Device Information

You can modify the default device information and enter more information about the device for identification purposes.

Serial Number	0022112	Manufacturer	Enter Manufacturer
Model	Enter Model	Device Class	Enter Device Class
Description	Enter Description	Firmware Version	1.0
Hardware Version	Enter Hardware Version	Descriptive Location	Enter Descriptive Location

5. Add a group (you can skip this step), click «Next».

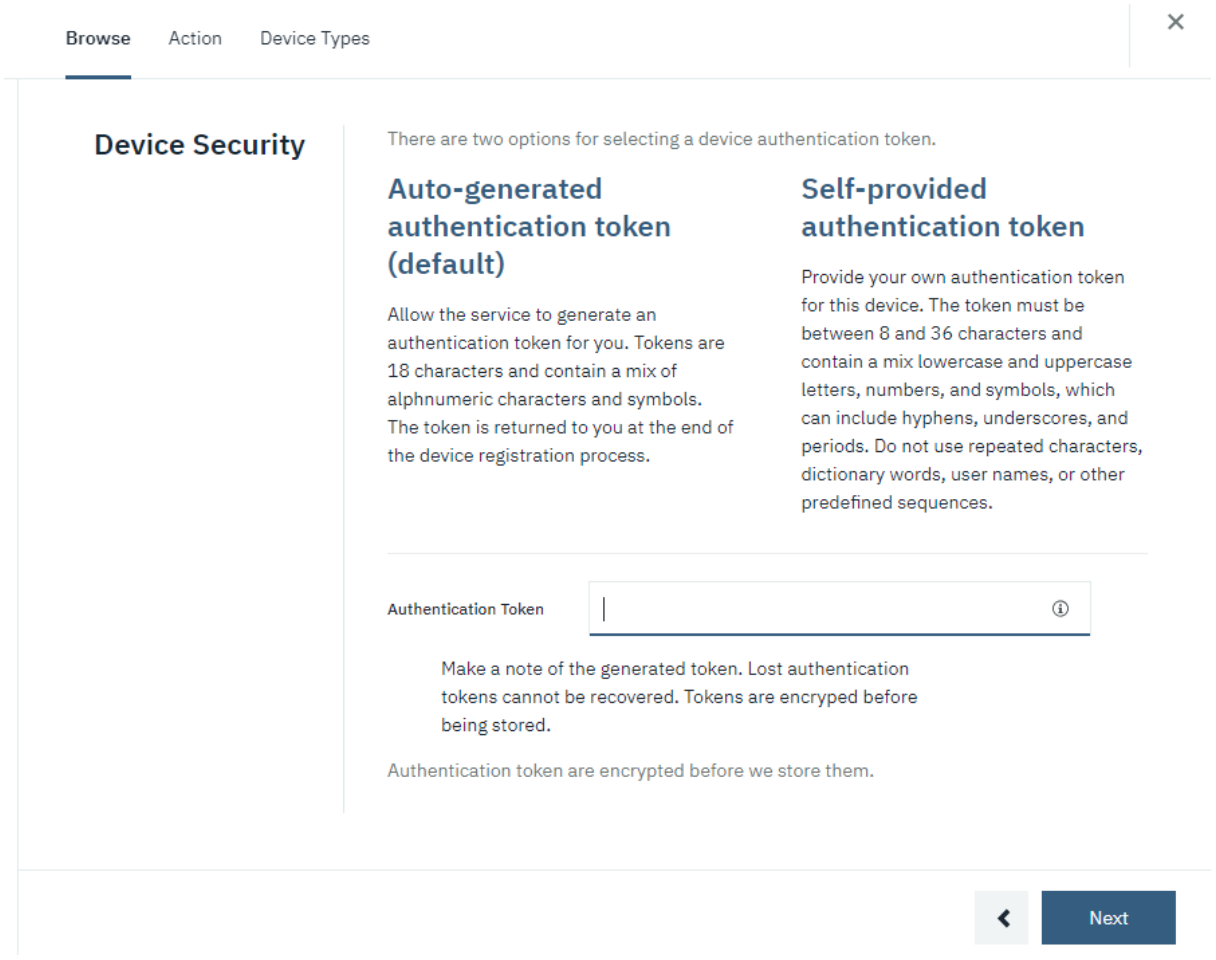


Groups Beta

This table shows the groups that this device belongs to. For more information about groups, see Managing groups.

You currently don’t have any groups assigned to the device.

6. Create a token in Security window for authentification (if the fields is left empty, the token is generated automatically). Click «Next».



Device Security

There are two options for selecting a device authentication token.

Auto-generated authentication token (default)

Allow the service to generate an authentication token for you. Tokens are 18 characters and contain a mix of alphnumeric characters and symbols. The token is returned to you at the end of the device registration process.

Self-provided authentication token

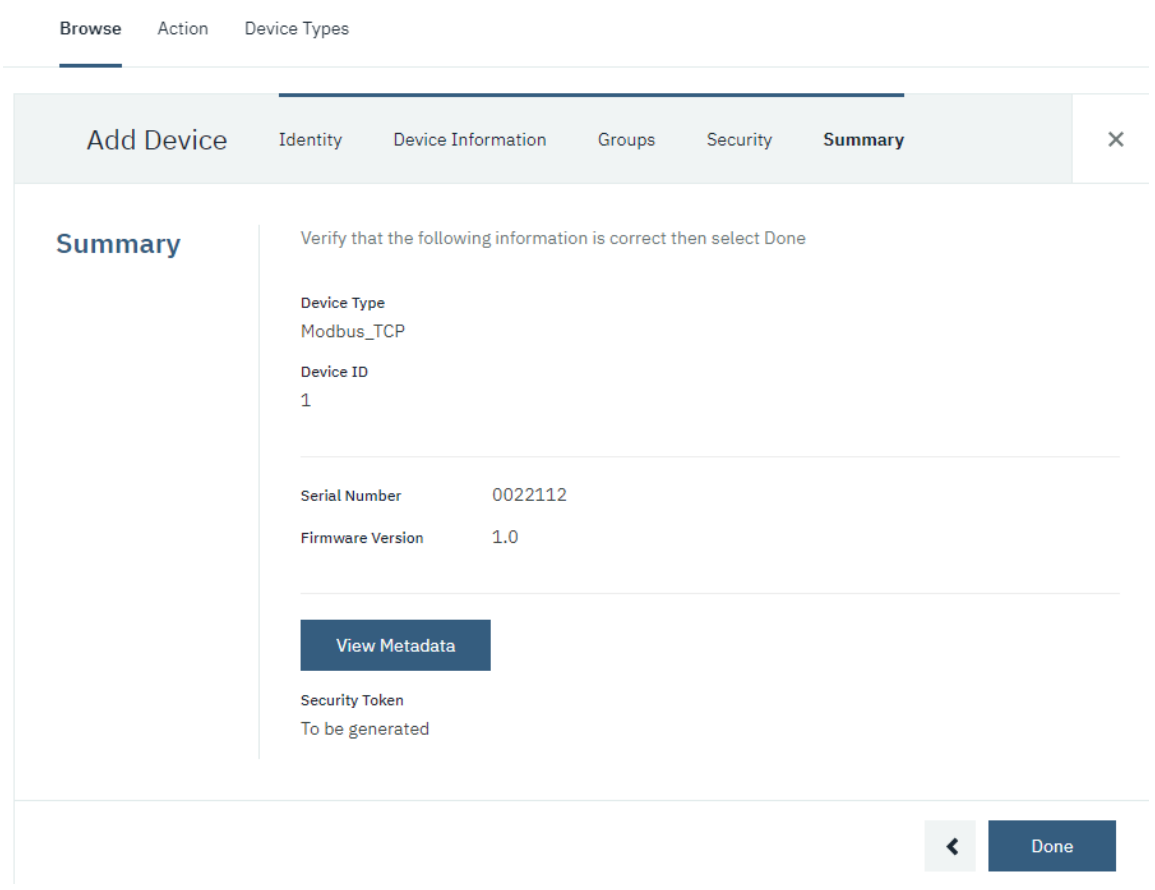
Provide your own authentication token for this device. The token must be between 8 and 36 characters and contain a mix lowercase and uppercase letters, numbers, and symbols, which can include hyphens, underscores, and periods. Do not use repeated characters, dictionary words, user names, or other predefined sequences.

Authentication Token

Make a note of the generated token. Lost authentication tokens cannot be recovered. Tokens are encryped before being stored.

Authentication token are encrypted before we store them.

7. See the result of creating a device and click «Done».



Summary

Verify that the following information is correct then select Done

Device Type
Modbus_TCP

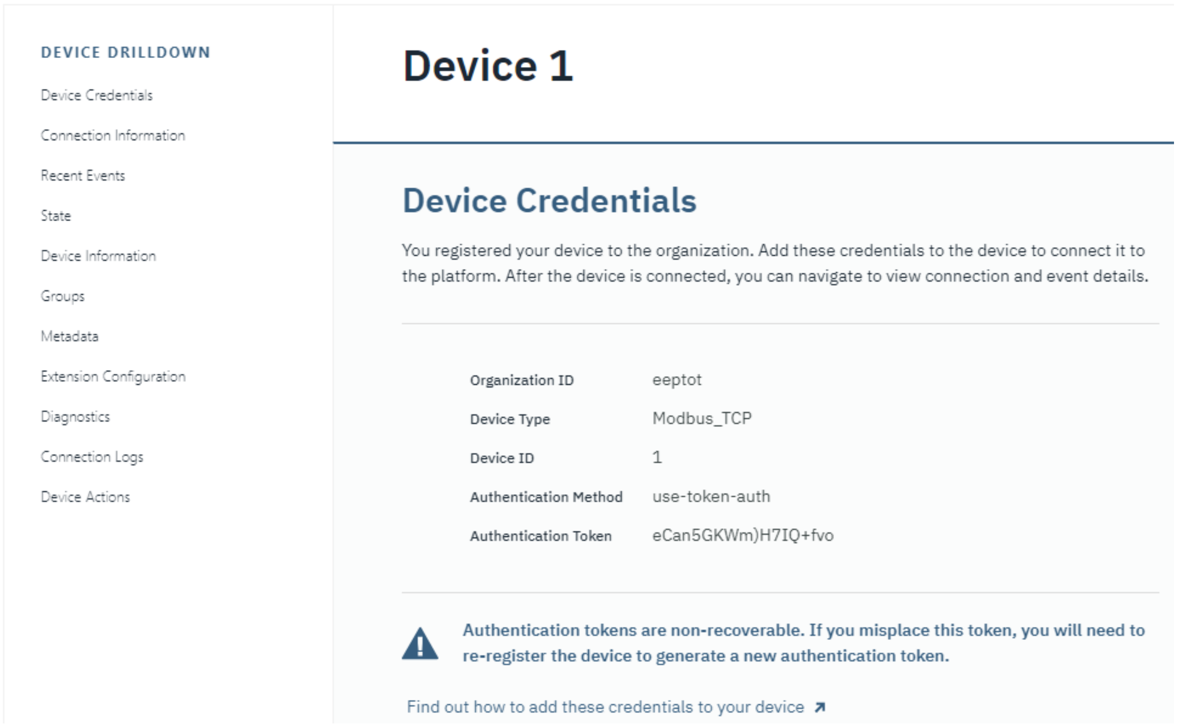
Device ID
1

Serial Number 0022112

Firmware Version 1.0

Security Token
To be generated

8. A message appears that a device was registered and you'll get information to connect the device to the platform. It the token field was left empty, you'll get an automatically generated token.



Device 1

Device Credentials

You registered your device to the organization. Add these credentials to the device to connect it to the platform. After the device is connected, you can navigate to view connection and event details.

Organization ID	eeptot
Device Type	Modbus_TCP
Device ID	1
Authentication Method	use-token-auth
Authentication Token	eCan5GKWm)H7IQ+fvo

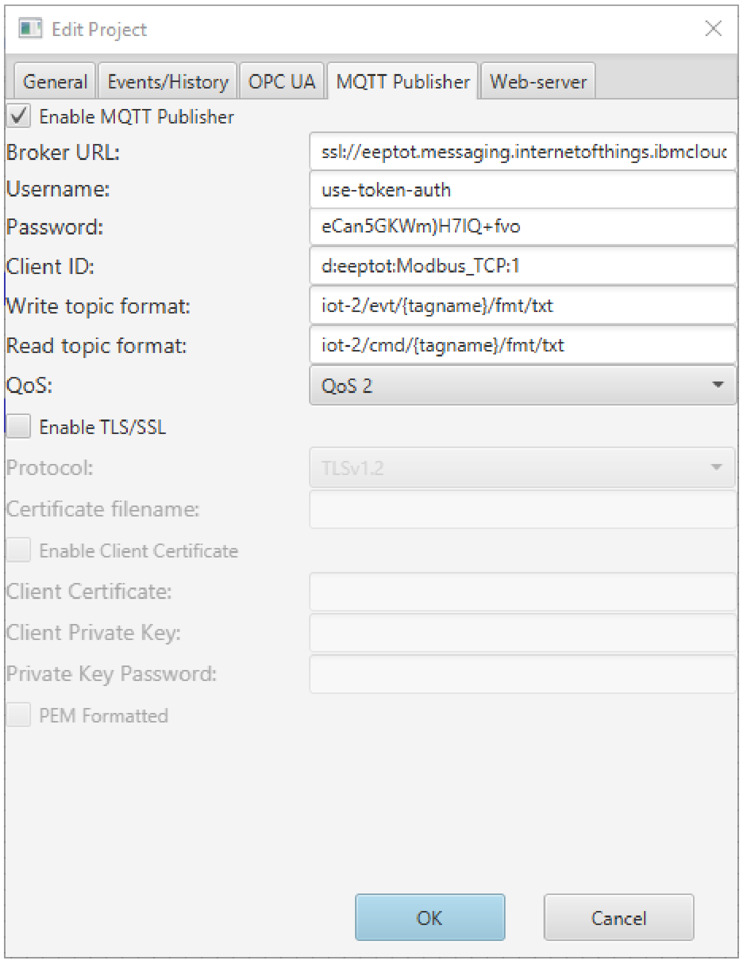
Authentication tokens are non-recoverable. If you misplace this token, you will need to re-register the device to generate a new authentication token.

Find out how to add these credentials to your device

Authentification token (password) is given only once. Save it.

<u>Setting MQTT publisher</u>

1. Enable MQTT publisher. And setup it:



[✓] Enable MQTT Publisher

Broker URL:	ssl://eeptot.messaging.internetofthings.ibmcloud
Username:	use-token-auth
Password:	eCan5GKWm)H7IQ+fvo
Client ID:	d:eeptot:Modbus_TCP:1
Write topic format:	iot-2/evt/{tagname}/fmt/txt
Read topic format:	iot-2/cmd/{tagname}/fmt/txt
QoS:	QoS 2

[ ] Enable TLS/SSL

Protocol:	TLSv1.2
Certificate filename:	

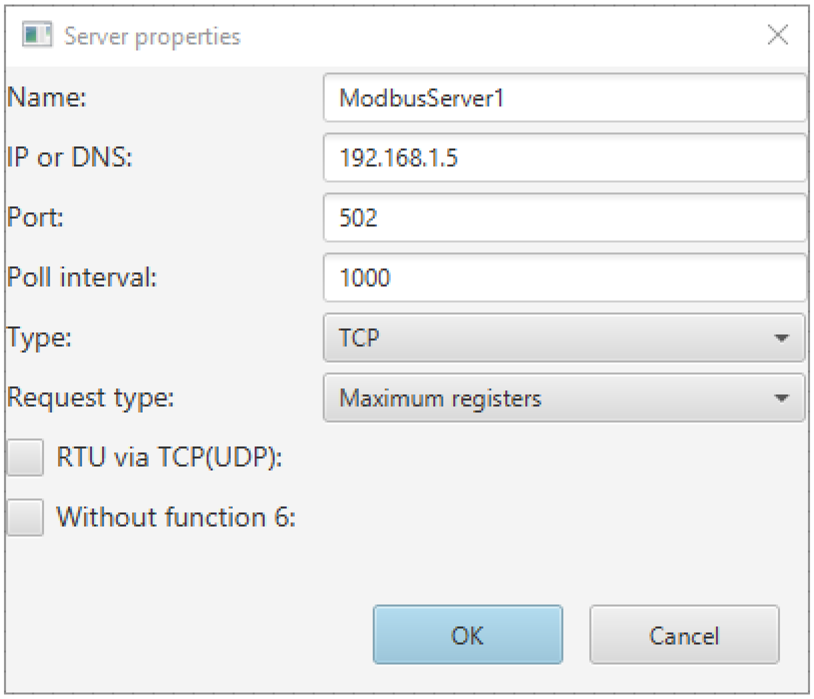
[ ] Enable Client Certificate

Client Certificate:	
Client Private Key:	
Private Key Password:	

[ ] PEM Formatted

- **Broker URL** - address and port of the IoT cloud interface, it is coded the following way: ssl://<your_orgID>.messaging.internetofthings.ibmcloud.com:8883
- **Username** - login, use-token-auth fixed value must be entered here
- **Password** - created or generated Authentication Token
- **Client ID** - client identificator is coded this way: d:<your_orgID>:<your_Type>:<your_Device>
- **Write topic format** - format of writing tags in the topic: iot-2/evt/{tagname}/fmt/txt , {tagname} - name of tags in your project.
- **Read topic format** - format of reading tags in the topic: iot-2/cmd/{tagname}/fmt/txt, {tagname} - name of tags in your project.
- **QoS** - type of the MQTT message.

2. Create Modbus server and setup it:


Server properties

Name: ModbusServer1

IP or DNS: 192.168.1.5

Port: 502

Poll interval: 1000

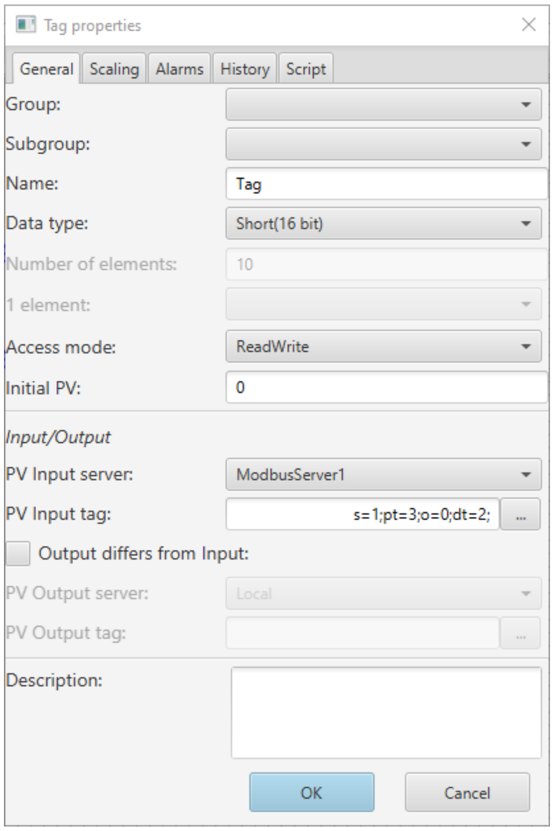
Type: TCP

Request type: Maximum registers

RTU via TCP(UDP):

Without function 6:

3. Create 2 tags and bind to 2 first registers.And setup it:


Tag properties

Group:

Subgroup:

Name: Tag

Data type: Short(16 bit)

Number of elements: 10

1 element:

Access mode: ReadWrite

Initial PV: 0

Input/Output

PV Input server: ModbusServer1

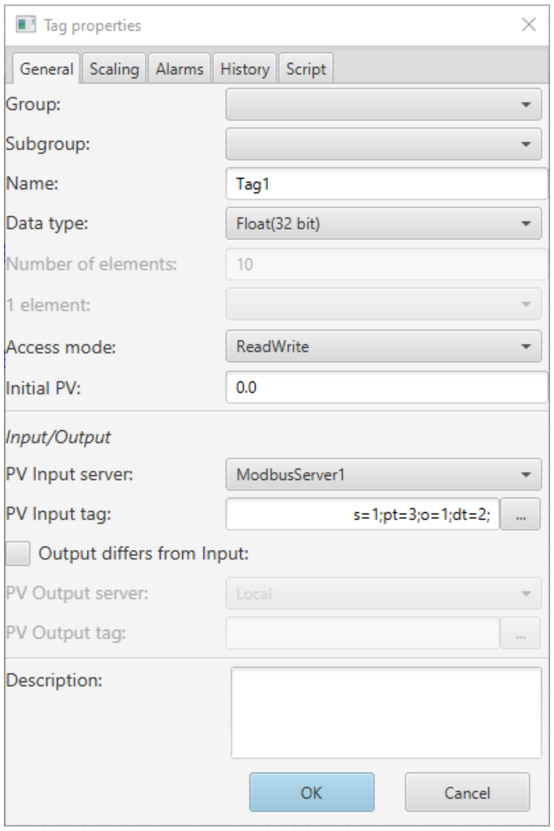
PV Input tag: s=1;pt=3;o=0;dt=2;

Output differs from Input:

PV Output server: Local

PV Output tag:

Description:


Tag properties

Group:

Subgroup:

Name: Tag1

Data type: Float(32 bit)

Number of elements: 10

1 element:

Access mode: ReadWrite

Initial PV: 0.0

Input/Output

PV Input server: ModbusServer1

PV Input tag: s=1;pt=3;o=1;dt=2;

Output differs from Input:

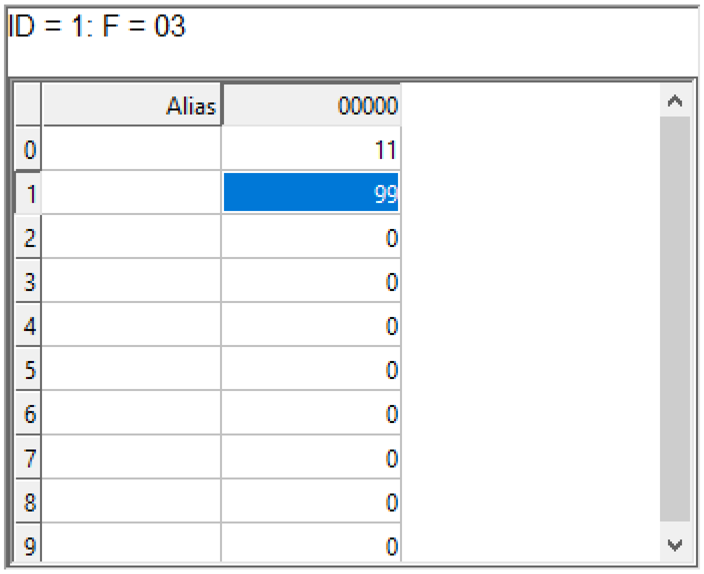
PV Output server: Local

PV Output tag:

Description:

Now when you run this project in TeslaSCADA2 Runtime. It's connecting to the cloud and publish tags values in the cloud:

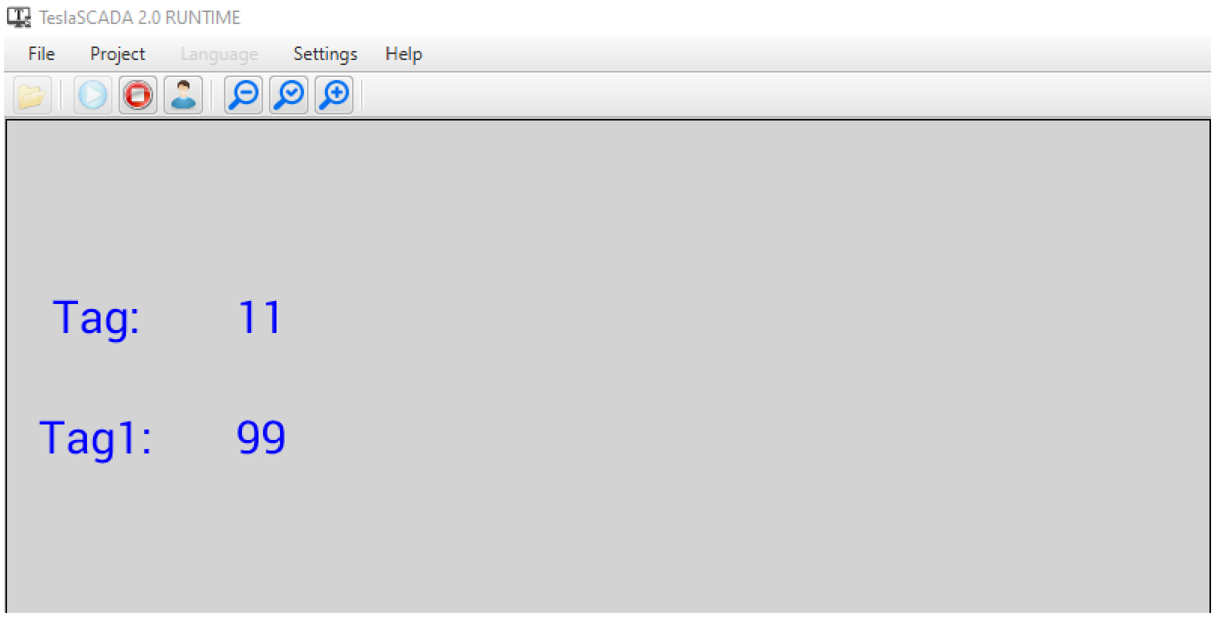
In the simulator:



ID = 1: F = 03

	Alias	00000
0		11
1		99
2		0
3		0
4		0
5		0
6		0
7		0
8		0
9		0

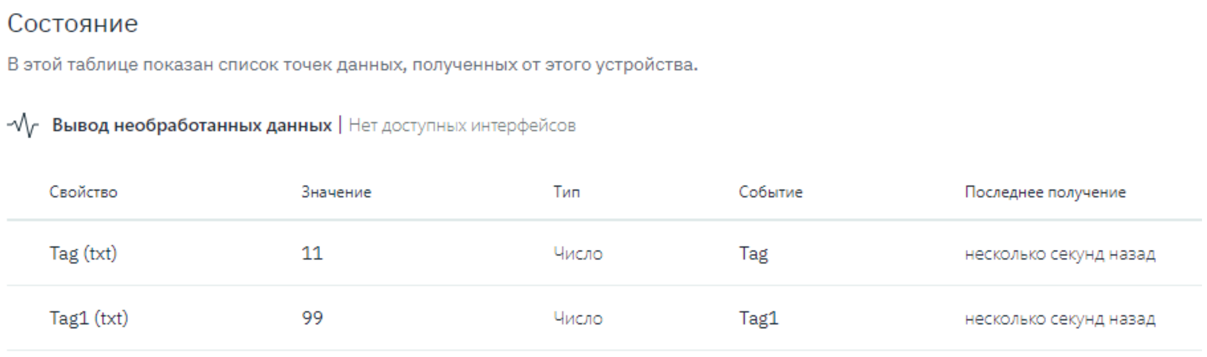
In the project:



Tag: 11

Tag1: 99

In the cloud:


Состояние

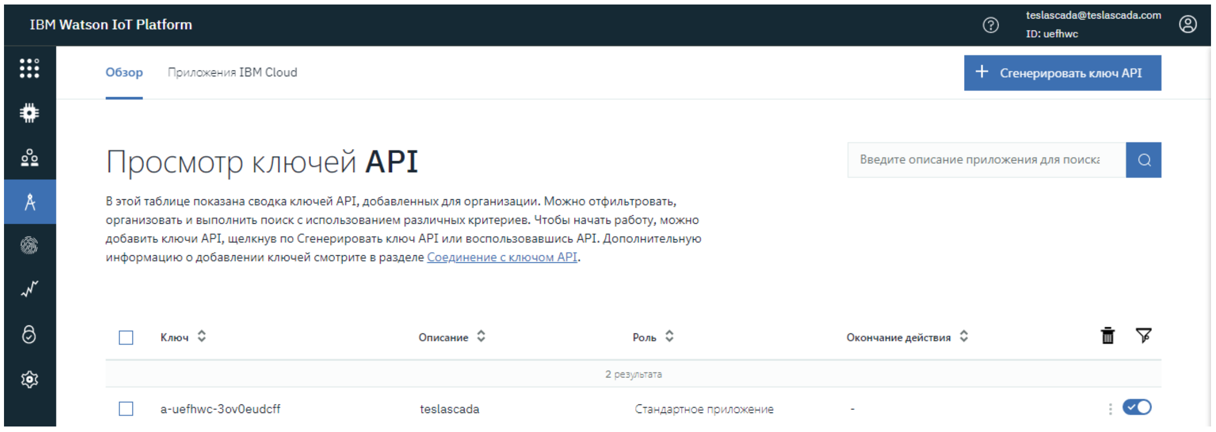
В этой таблице показан список точек данных, полученных от этого устройства.

Вывод необработанных данных | Нет доступных интерфейсов

Свойство	Значение	Тип	Событие	Последнее получение
Tag (txt)	11	Число	Tag	несколько секунд назад
Tag1 (txt)	99	Число	Tag1	несколько секунд назад

Setting MQTT server

1. For getting information from the cloud we have to create Application in IOT Watson (russian language):

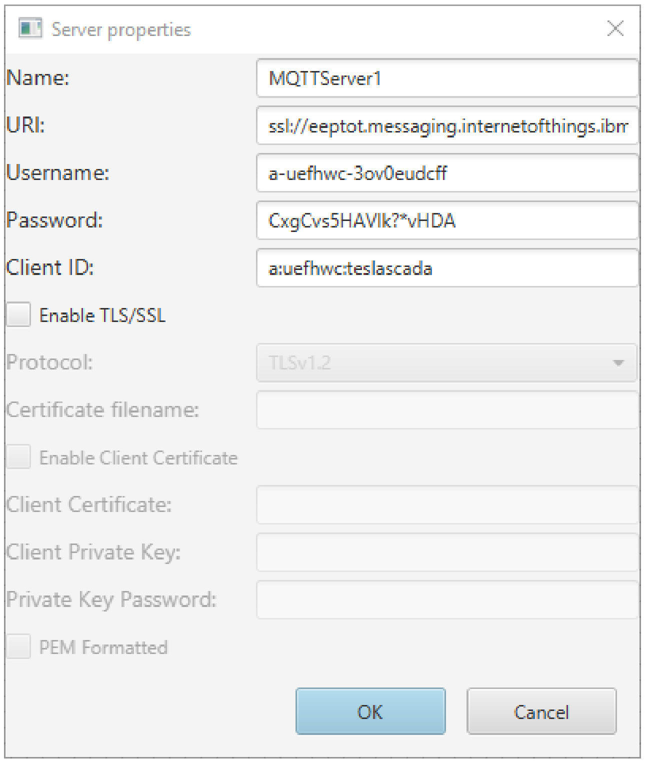


Просмотр ключей **API**

В этой таблице показана сводка ключей API, добавленных для организации. Можно отфильтровать, организовать и выполнить поиск с использованием различных критериев. Чтобы начать работу, можно добавить ключи API, щелкнув по Сгенерировать ключ API или воспользовавшись API. Дополнительную информацию о добавлении ключей смотрите в разделе Соединение с ключом API.

Ключ	Описание	Роль	Окончание действия
2 результата			
a-uefhwc-3ov0eudcff	teslascada	Стандартное приложение	-

2. Now we can create MQTT server in the new project:



Server properties

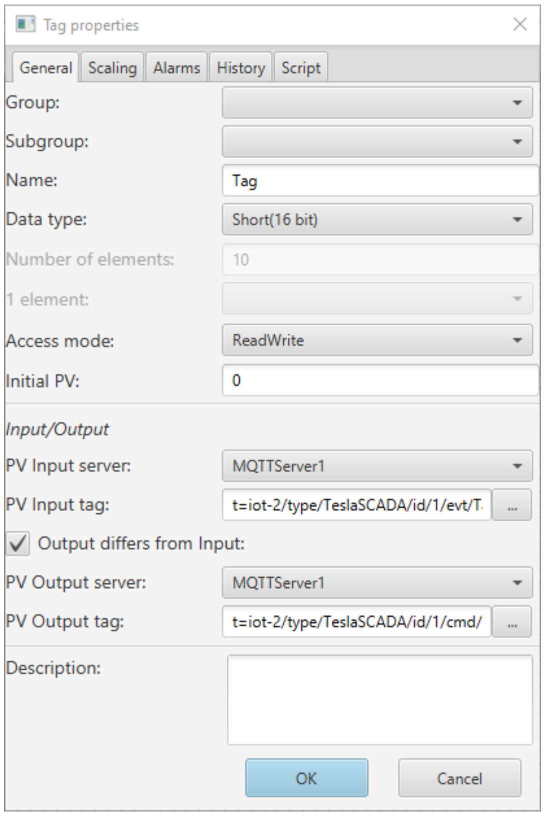
Name:	MQTTServer1
URI:	ssl://eeptot.messaging.internetofthings.ibm
Username:	a-uefhwc-3ov0eudcff
Password:	CxgCvs5HAVlk?*vHDA
Client ID:	a:uefhwc:teslascada
☐ Enable TLS/SSL	
Protocol:	TLSv1.2
Certificate filename:	
☐ Enable Client Certificate	
Client Certificate:	
Client Private Key:	
Private Key Password:	
☐ PEM Formatted	

- **URI** - address and port of the IoT cloud interface, it is coded the following way: ssl://<your_orgID>.messaging.internetofthings.ibmcloud.com:8883
- **Username** - login, It is coded in the following way:

{api key} - you can see it in the picture. It contains a -{your_orgID}-{code}. In the picture other {your_orgID}. Should be eeptot.

- **Password** - created or generated Authentication Token
- **Client ID** - client identificator is coded this way: d:<your_orgID>:<name of the application>

3.Create 2 tags for reading from the cloud:


Tag properties

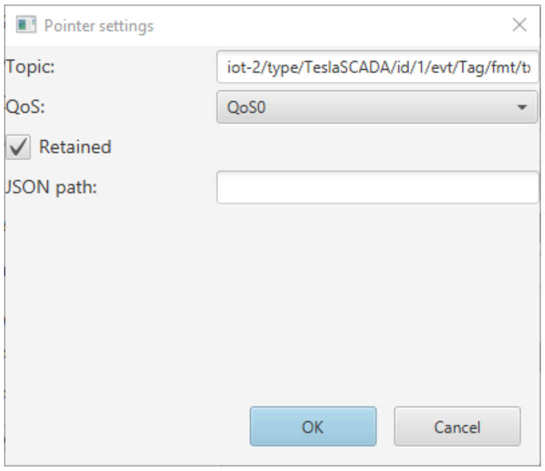
General | Scaling | Alarms | History | Script

Group:	
Subgroup:	
Name:	Tag
Data type:	Short(16 bit)
Number of elements:	10
1 element:	
Access mode:	ReadWrite
Initial PV:	0

Input/Output

PV Input server:	MQTTServer1
PV Input tag:	t=iot-2/type/TeslaSCADA/id/1/evt/T
✓ Output differs from Input:	
PV Output server:	MQTTServer1
PV Output tag:	t=iot-2/type/TeslaSCADA/id/1/cmd/
Description:	

OK Cancel


Pointer settings

Topic:	iot-2/type/TeslaSCADA/id/1/evt/Tag/fmt/t
QoS:	QoS0
✓ Retained	
JSON path:	

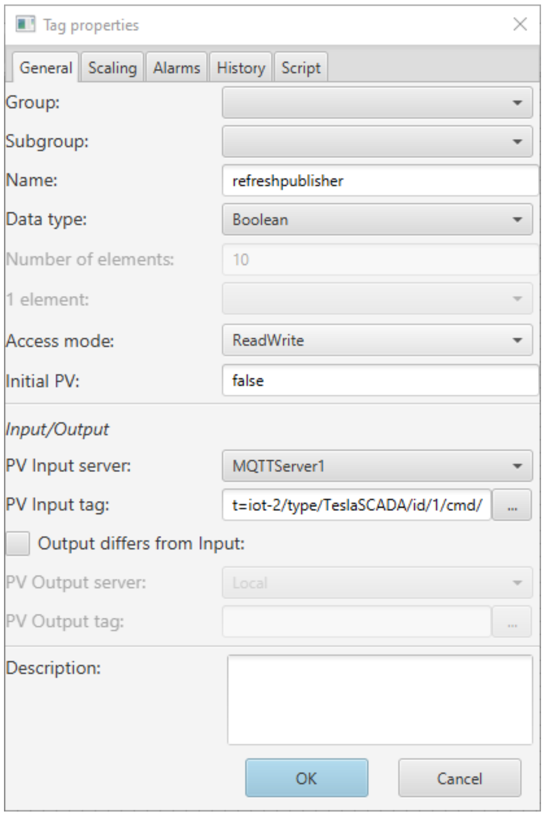
OK Cancel

The format of the topic is interesting for us:
iot-2/type/{device_type}/id/{device_id}/evt/{event_id}/fmt/{format_string}
device_type - type of the device
device_id - ID of the device
event_id - name of the Tag you setup in project with publisher.
format_string - format of the topic.(txt in our case).

For writing topic should like this:
iot-2/type/{device_type}/id/{device_id}/cmd/{cmd_id}/fmt/{format_string}

4. In some reasons when you connect to IBM cloud and subscribe to the topics values are not renew.

We create some possibility to renew values. You have to create tag in the MQTT to refresh publisher:


Tag properties

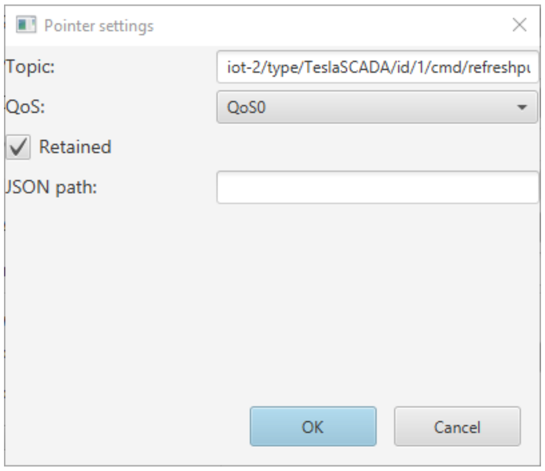
General | Scaling | Alarms | History | Script

Group:	
Subgroup:	
Name:	refreshpublisher
Data type:	Boolean
Number of elements:	10
1 element:	
Access mode:	ReadWrite
Initial PV:	false

Input/Output

PV Input server:	MQTTServer1
PV Input tag:	t=iot-2/type/TeslaSCADA/id/1/cmd/
Output differs from Input:	☐
PV Output server:	Local
PV Output tag:	
Description:	

OK Cancel

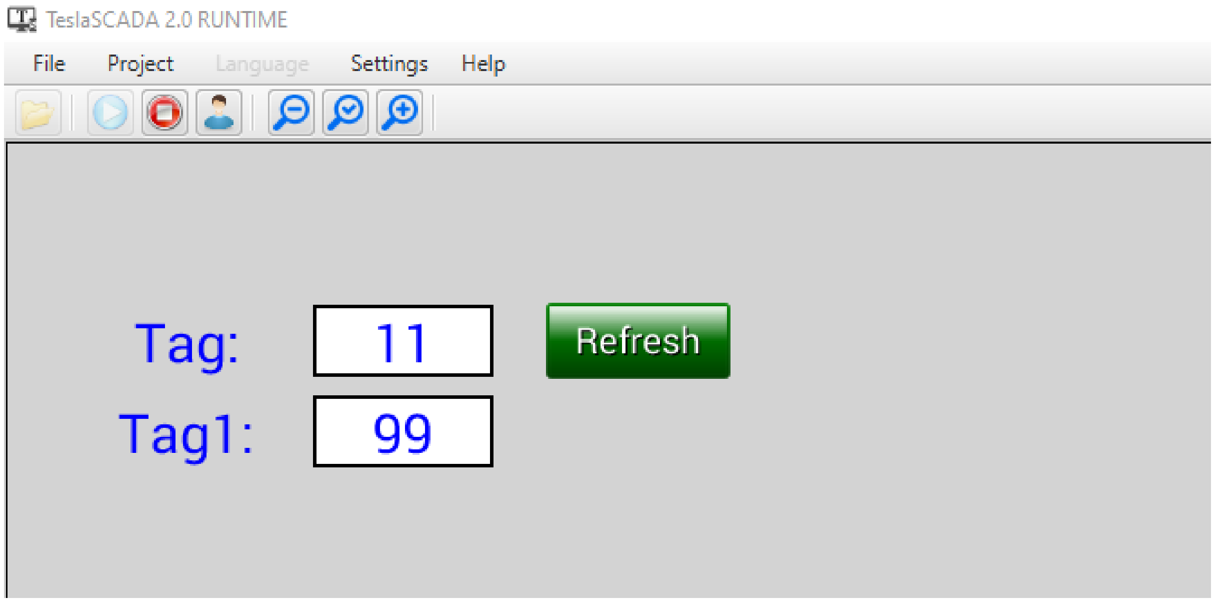

Pointer settings

Topic:	iot-2/type/TeslaSCADA/id/1/cmd/refreshpu
QoS:	QoS0
Retained	✓
JSON path:	

OK Cancel

Topic should look like this: **iot-2/type/TeslaSCADA/id/1/cmd/refreshpublisher/fmt/txt**
cmd_id - refreshpublisher

5. After starting project with MQTT client and refresh values we'll get:


TeslaSCADA 2.0 RUNTIME

Tag: 11
Tag1: 99

9.9.2 Yandex cloud

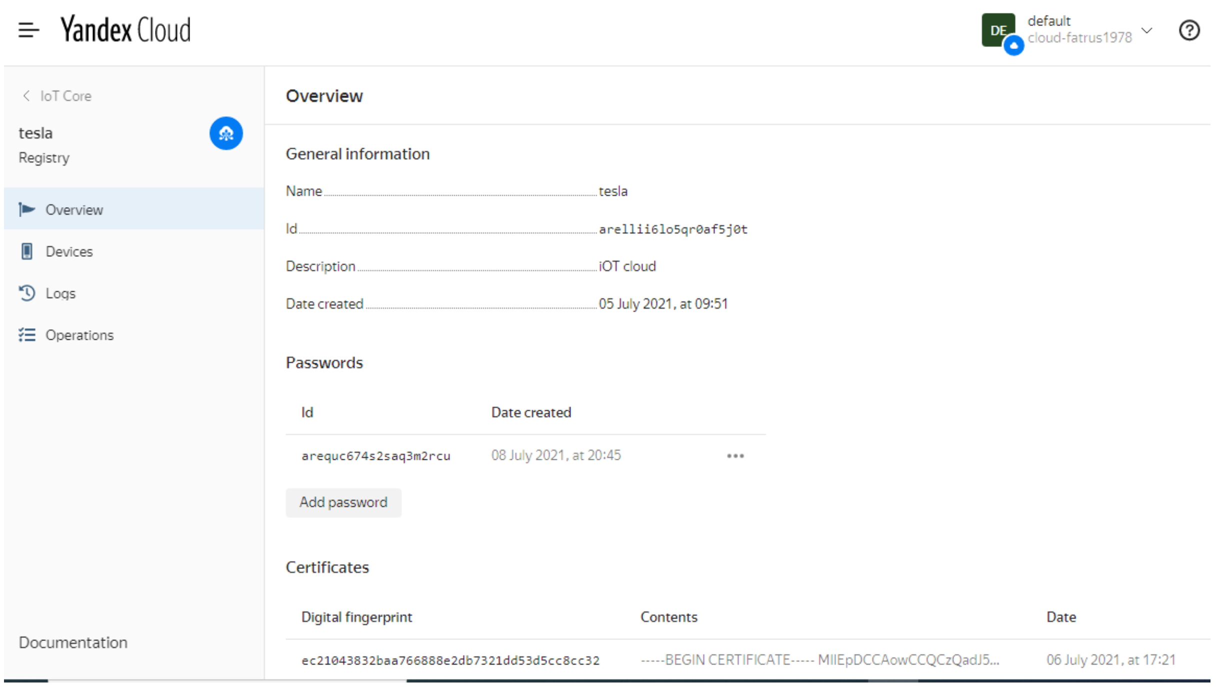
Yandex IoT Core is a cloud-based fail-safe MQTT broker that ensures secure two-way communication between devices and local or cloud resources.

Devices and registries interact using X.509 certificates:

- If you have a certificate, just add it to the device in the registry.
- If don't have one, you can create a certificate, for example, with OpenSSL:

```
openssl req -x509 \
-newkey rsa:4096 \
-keyout key.pem \
-out cert.pem \
-nodes \
-days 365 \
-subj '/CN=localhost'
```

Create registry



Overview

General information

Name	tesla
Id	arellii6lo5qr0af5j0t
Description	iOT cloud
Date created	05 July 2021, at 09:51

Passwords

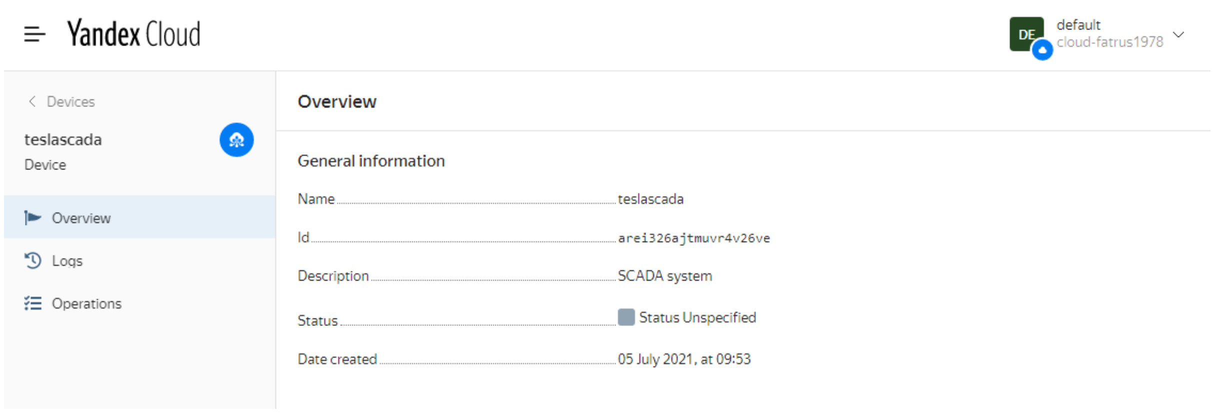
Id	Date created
arequc674s2saq3m2rcu	08 July 2021, at 20:45

Certificates

Digital fingerprint	Contents	Date
ec21043832baa766888e2db7321dd53d5cc8cc32	-----BEGIN CERTIFICATE----- MIIEpDCCAowCCQCzQadJ5...	06 July 2021, at 17:21

You also have to add certificate you created.

Create device

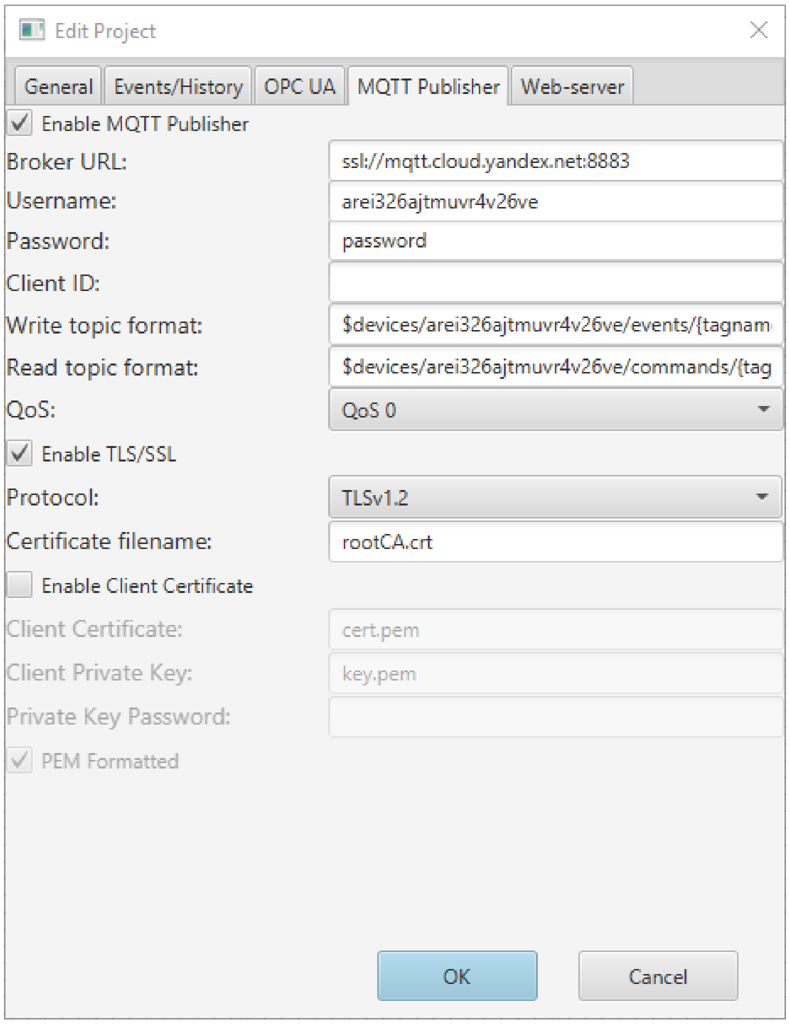


Overview

General information

Name	teslascada
Id	arei326ajtmuvr4v26ve
Description	SCADA system
Status	Status Unspecified
Date created	05 July 2021, at 09:53

Setup MQTT publisher



[✓] Enable MQTT Publisher

Broker URL:	ssl://mqtt.cloud.yandex.net:8883
Username:	arei326ajtmuvr4v26ve
Password:	password
Client ID:	
Write topic format:	$devices/arei326ajtmuvr4v26ve/events/{tagnam
Read topic format:	$devices/arei326ajtmuvr4v26ve/commands/{tag
QoS:	QoS 0

[✓] Enable TLS/SSL

Protocol:	TLSv1.2
Certificate filename:	rootCA.crt

[ ] Enable Client Certificate

Client Certificate:	cert.pem
Client Private Key:	key.pem
Private Key Password:	

[✓] PEM Formatted

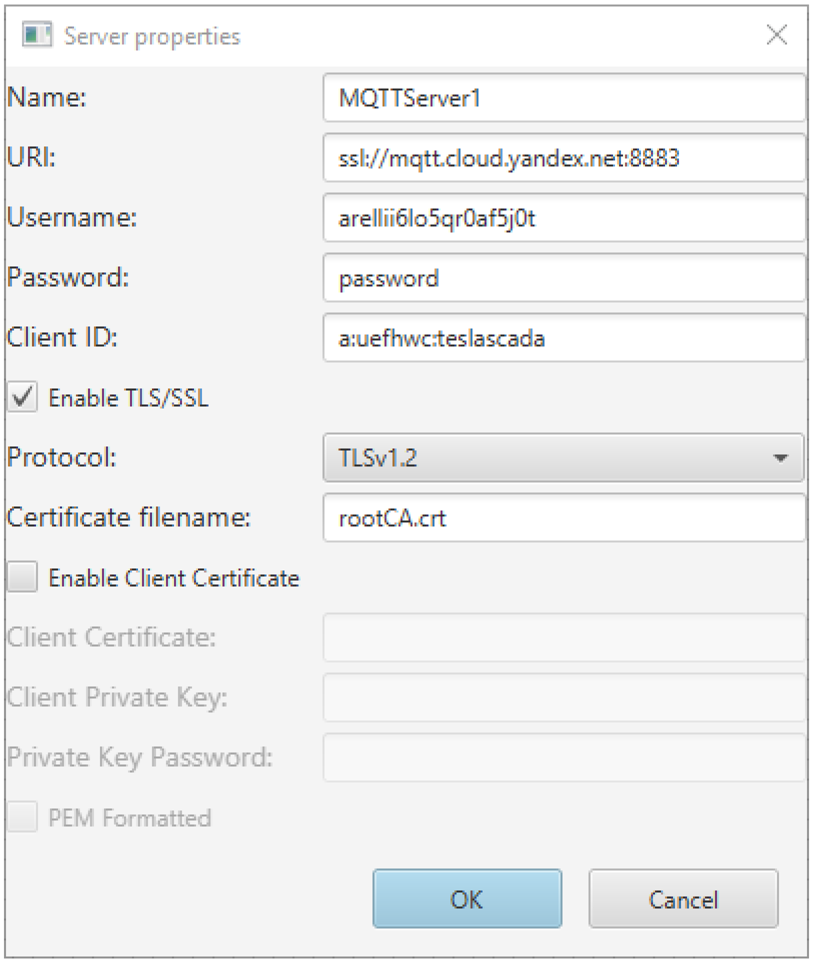
where:
Username - Device ID
Password - password of the device.
Write topic format - in our case $devices/arei326ajtmuvr4v26ve/events/{tagname}.

It contains ID of the device and keyword {tagname} for publishing tag's values.
Read topic format - in our case $devices/arei326ajtmuvr4v26ve/commands/{tagname}
It contains ID of the device and keyword {tagname} for subscribing to tag's values.
Certificate filename - you have to download certificate file from here:
https://cloud.yandex.com/en/docs/iot-core/concepts/mqtt-properties
And place this file in the folder private where installed TeslaSCADA2 Runtime.

Now when you run the project created with this MQTT publisher settings all tags values used in this project will be published in the broker.
The published values don't have retain properties.

Setup MQTT client

To read data from the Yandex IOT we create new project and setup MQTT server:



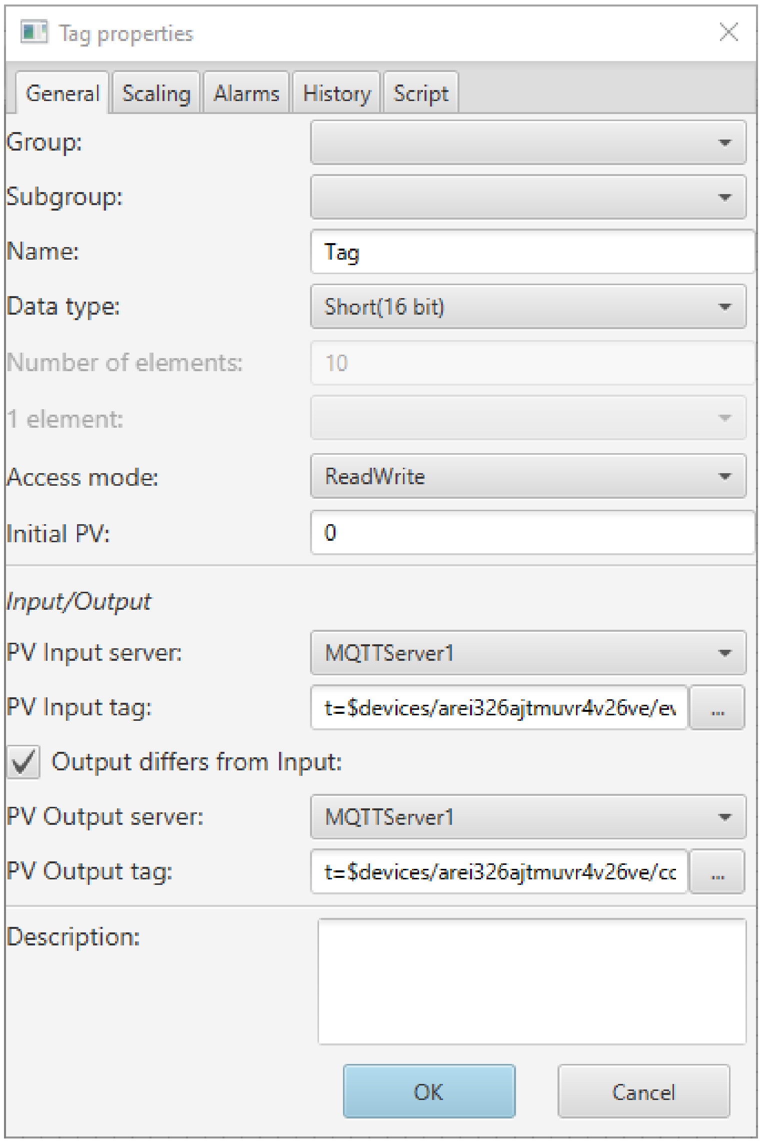
Server properties

Name:	MQTTServer1
URI:	ssl://mqtt.cloud.yandex.net:8883
Username:	arellii6lo5qr0af5j0t
Password:	password
Client ID:	a:uefhwc:teslascada
✓ Enable TLS/SSL	
Protocol:	TLSv1.2
Certificate filename:	rootCA.crt
☐ Enable Client Certificate	
Client Certificate:	
Client Private Key:	
Private Key Password:	
☐ PEM Formatted	

where:
Username - Registry ID
Password - password of the registry.
Certificate filename - you have to download certificate file from here:

https://cloud.yandex.com/en/docs/iot-core/concepts/mqtt-properties
And place this file in the folder private where installed TeslaSCADA2 Runtime.

Setup Tag


Tag properties

General | Scaling | Alarms | History | Script

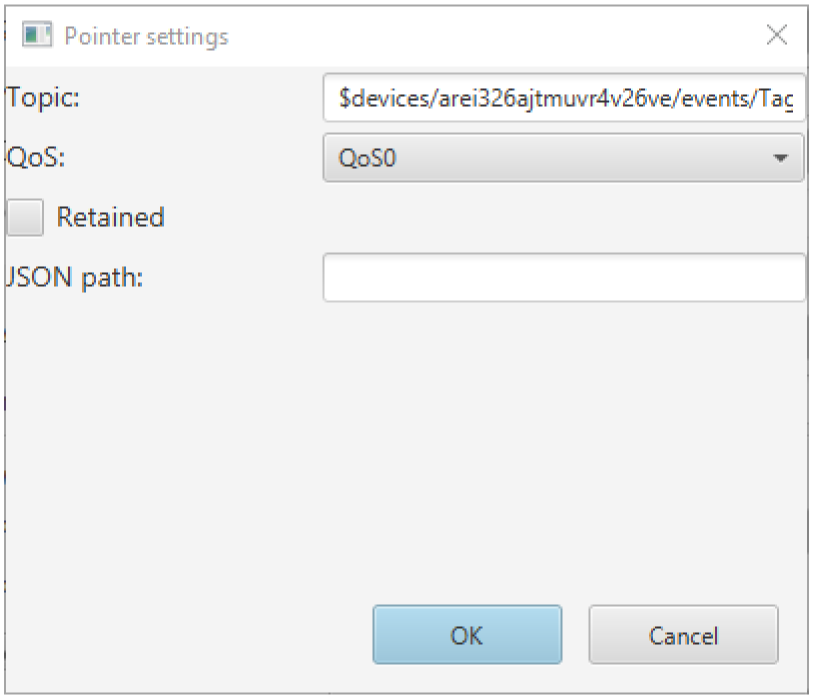
Group:	
Subgroup:	
Name:	Tag
Data type:	Short(16 bit)
Number of elements:	10
1 element:	
Access mode:	ReadWrite
Initial PV:	0

Input/Output

PV Input server:	MQTTServer1
PV Input tag:	t=$devices/arei326ajtmuvr4v26ve/ev
✓ Output differs from Input:	
PV Output server:	MQTTServer1
PV Output tag:	t=$devices/arei326ajtmuvr4v26ve/cc
Description:	

OK Cancel

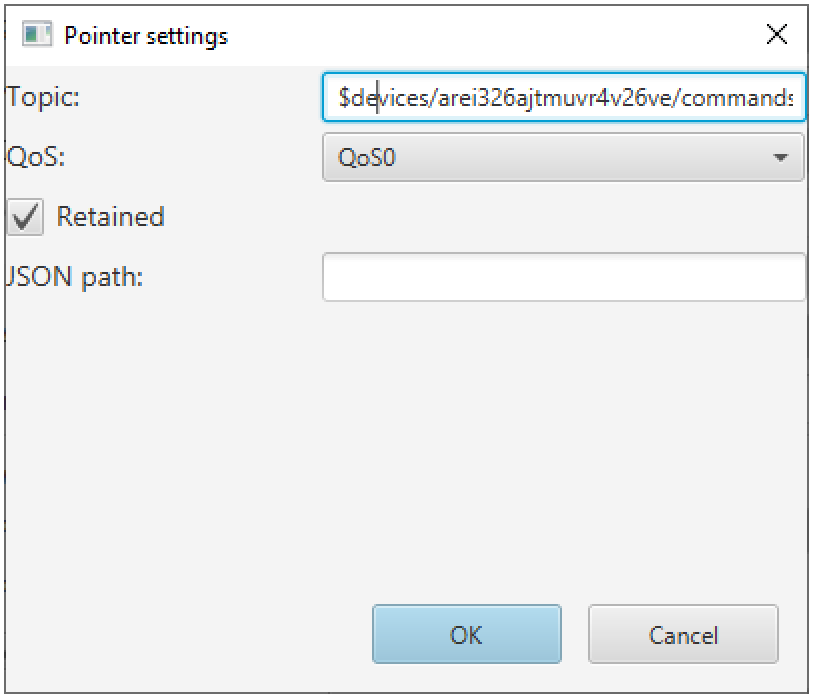
PV Input tag



Topic: $devices/arei326ajtmuvr4v26ve/events/Tag
QoS: QoS0
Retained
JSON path:

It contains ID of the device you setup in Yandex IOT core, keyword events and name of the tag you want to read from the publisher project.

PV Output tag



Topic: $devices/arei326ajtmuvr4v26ve/commands
QoS: QoS0
[✓ Retained]
JSON path:

It contains ID of the device you setup in Yandex IOT core, keyword commands and name of the tag you want to write to the publisher project.

Now you can read values from the Yandex cloud by using this project. And write commands also.