BKT SM4DC Freeware

User Manual

Version 0.13

Table of contents

1   INTRODUCTION

1.1   General information

This is the manual for BKT SM4DC Freeware (System Manager for data Center) designed to monitor devices of IT infrastructure. It enables periodic querying of devices for selected parameters and reporting defined irregularities to the user. The software is designed to support devices manufactured by BKT Elektronik, but it can also support devices from other manufacturers. The program uses the SNMP protocol version 1 and 2c for communicating with devices.

The specification is owned and copyrighted by BKT Elektronik Sp. z o.o. Information contained herein may be changed at owner's discretion without any notice. BKT Elektronik may not be held liable for any possible inaccuracies and discrepancies in this document.

1.2   Licence

PLEASE READ THE SOFTWARE LICENSE CAREFULLY. IF YOU DO NOT AGREE TO ALL OF ITS TERMS, YOU MAY NOT INSTALL OR USE THIS PRODUCT AND ARE THEREFORE NOT A LICENSEE UNDER THIS AGREEMENT.

1. BKT SM4DC Freeware (Product) is free software for both private and commercial use. You may copy the entire software package and transfer it to third parties in accordance with the terms of this license agreement.

2. License Agreement (Agreement). The company BKT Elektronik Sp. z o. o. (BKT) grants the Licensee the non-exclusive and non-transferable right to reproduce and use for personal or commercial purposes a version of the executable code of the Product, provided that each copy contains all original copyright notices. This license does not entitle the Licensee to receive paper documentation, technical support, telephone assistance, improvement or update of the Product. BKT may terminate this Agreement at any time and for any reason or no reason. BKT may also terminate this Agreement if the Licensee violates any of its terms and conditions. Upon termination, the Licensee shall delete and not use a copy of the Product.

3. Limitations. Without the prior written consent of BKT, the Licensee cannot:
3.1 Modify or create any derivative works of the Product or documentation, including adaptations, translations, etc;
3.2 Subject the Product to decompilation, disassembly, reverse engineering or any other attempt to obtain the source code of the Product;
3.3 Redistribute, encumber, sell, rent, lease, sub-license or otherwise transfer rights to the Product;
3.4 Remove or alter any trademarks, logos, copyrights or other proprietary notices, legends, symbols or labels in the Product;
3.5 Publish the results of benchmarking tests carried out on the Product to third parties.

4. Fees. There is no license fee for the Product. If the Licensee would like to receive the Product on a medium, then a small fee may be charged for the medium and shipping. The Licensee is responsible for the payment of all taxes.

5. Ownership. The title, ownership and intellectual property rights of the Product shall remain with BKT and/or its suppliers. The Product is protected by copyright and other intellectual property laws.

6. Warranty disclaimer. AS THE SOFTWARE IS LICENSED FREE OF CHARGE, IT IS NOT COVERED BY WARRANTY TO THE EXTENT PERMITTED BY APPLICABLE LAW. UNLESS OTHERWISE STATED IN WRITING, THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE SOFTWARE AS IS WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE SOFTWARE IS BORNE BY THE LICENSEE. IN THE EVENT THAT THE SOFTWARE PROVES DEFECTIVE, THE LICENSEE SHALL BEAR THE COST OF ALL NECESSARY SERVICE, REPAIR AND CORRECTION.

7. Disclaimer. EXCEPT AS OTHERWISE PROVIDED BY APPLICABLE LAW OR AS OTHERWISE AGREED IN WRITING, NO COPYRIGHT HOLDER OR OTHER PARTY MODIFYING AND/OR REDISTRIBUTING THE SOFTWARE IN ACCORDANCE WITH THE FOREGOING PERMISSIONS SHALL UNDER NO CIRCUMSTANCES BE LIABLE TO THE LICENSEE FOR DAMAGE, INCLUDING GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGE, ARISING OUT OF THE USE OR INABILITY TO USE THE SOFTWARE (INCLUDING, WITHOUT LIMITATION, FOR LOSS OF DATA OR PROVISION OF INACCURATE DATA, OR FOR LOSSES INCURRED BY THE LICENSEE OR THIRD PARTIES, OR THE FAILURE OF THE SOFTWARE TO WORK WITH OTHER SOFTWARE), EVEN IF THE OWNER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. BKT'S TOTAL LIABILITY UNDER ANY PROVISION

OF THIS AGREEMENT IS IN ANY EVENT LIMITED TO THE AMOUNT OF MONEY THAT THE LICENSEE HAS ACTUALLY PAID IN CONNECTION WITH THE LICENSE.

1.3   Basic program characteristics

This is a Windows based software, which allows:

- Monitoring the parameters of devices communicating with the SNMP protocol version 1 and 2c;
- Supporting for an unlimited number of devices. The only limitation is system performance (computer and network hardware);
- Reading an unlimited number of parameters from devices (voltage, temperature, humidity values, etc.);
- Creating device models with parameters for easy duplication in the system;
- Creating a tree structure of device location in the system, e.g. BuildingA-> Server room-> Cube1-> Cabinet01-> PDU1;
- An easy way to change the location of devices in the system tree structure by drag and drop;
- Easily move individual parameters in the tree structure of the system by drag and drop
- Reading numeric (voltage temperature, etc.) and text parameters (e.g. "normal", "battery operation", "failure" etc.)
- Reading device parameters with a defined interval from a minimum of 10 seconds;
- Saving the read values to the csv file database;
- Conversion of values of read numeric parameters according to the function $f(x) = ax + b$;
- Setting 4 alarm thresholds for each numerical parameter;
- Setting of alarm threshold hysteresis for each numerical parameter;
- Setting 2 alarm states for text parameters (eg UPS status "battery operation", "failure");
- Setting two categories of alarm thresholds: warning, failure;
- Displaying of current alarm states with a detailed description;
- Email notification of system alarms;
- Exporting alarm history to csv files for the selected period;
- Displaying on charts the value changes of any parameter over a selected period;
- Exporting the history of read parameter values to csv files from the selected period.

2   INSTALLING

2.1   Hardware and software requirements

The program is designed to work in the environment of Windows 8, 10, Windows Server 2008, 2012, 2016, 2019.
Computer requirements depend on the number of devices monitored. It is recommended to use minimum requirements only for up to several dozen monitored parameters.

	Minimal	Recommended
Computer	PC	PC
Operating system	Windows 8, 10; Windows Server 2008, 2012, 2016, 2019	Windows 10; Windows Server 2012, 2016, 2019
Processor	1 GHz	2,5 GHz Dual Core
RAM memory	4 GB	8 GB
Hard drive	64GB and additional for the database	512GB
Video card	DirectX 9 or later compatible with WDDM 1.0 driver	DirectX 9 or later compatible with WDDM 1.0 driver
Screen resolution	1920x1080	1920x1080
Network card	100Mbps	1Gbps
.NET Framework	version 4.6.2	version 4.6.2

2.2   Installation process

Installation requires .NET Framework version 4.6.2. The installer must have administrator rights in Windows. Run the program installer - file *BKT_SM4DC_Freeware_wersja_setup.exe*, then accept the license terms and continue the process according to the installer messages.

3 CONFIGURATION AND OPERATION

3.1 Opening / Closing / Saving the project

The project opens automatically when the program starts. At the first start, the program will find that the project file is missing and it will display the appropriate message. After accepting the intention to create a new project, the program will create a sm4dcproject.xml file in the *C:\ProgramData\BKT Elektronik\BKT SM4DC Freeware* directory. The project file contains the settings entered in the Settings window (see section *3.7 Application settings*) and data of all monitored objects defined in the program. The project is saved automatically when the program is closed. It is also possible to save the project to a file earlier by saving the Settings -> Save.

3.2 Main menu

Run/Stop	Starts / stops active polling of devices for defined parameters.
Dashboard	Opens a tab with current basic system statuses.
Objects	Opens a tab on which monitored devices and their parameters are configured.
Alarms	Opens a tab that displays current and historical alarms.
Settings	Opens a window with program settings.

3.3 Start and stop monitoring

Run	Monitoring is stopped. The program does not poll devices for current parameter values; does not write these values to the database.
Stop	Monitoring is active. The program periodically polls all devices. The progress bar shows the time to the next polling.

3.4 Dashboard
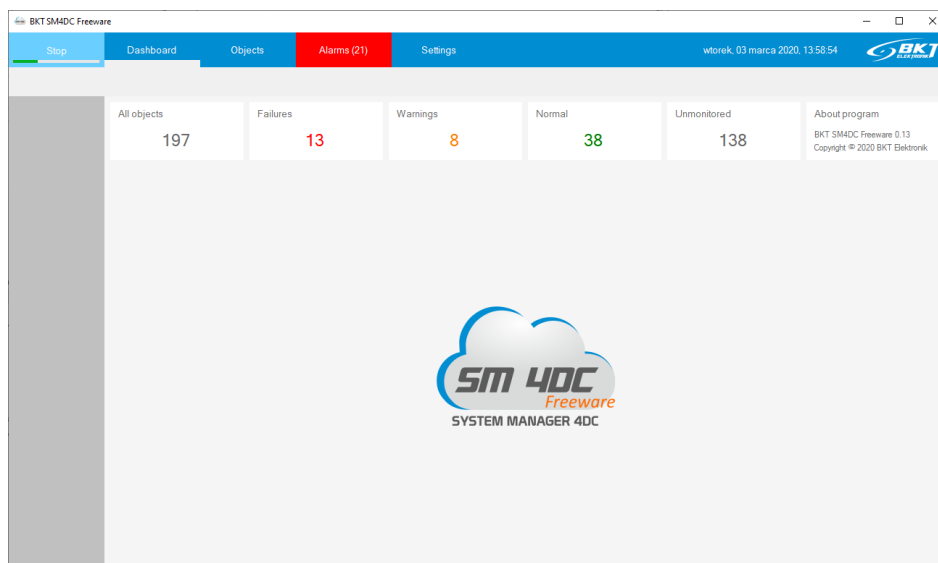
All objects	Displays the number of all device parameters (objects) defined in the program.
Failures	Displays the number of device parameters (object) that are in a failure state - they have exceeded the defined failure alert thresholds.
Warnings	Displays the number of device parameters (object) that are in the warning state - they have exceeded the defined warning alert thresholds.
Normal	Displays the number of device parameters (objects) that are in the normal state - have not exceeded the defined alarm thresholds.
Unmonitored	Displays the number of device parameters (objects) for which no alarm thresholds have been defined. The values of such parameters are saved only cyclically to the database.

3.5   Objects

The object is the device parameter. It can be temperature, humidity or any other parameter that the device can be polled for.
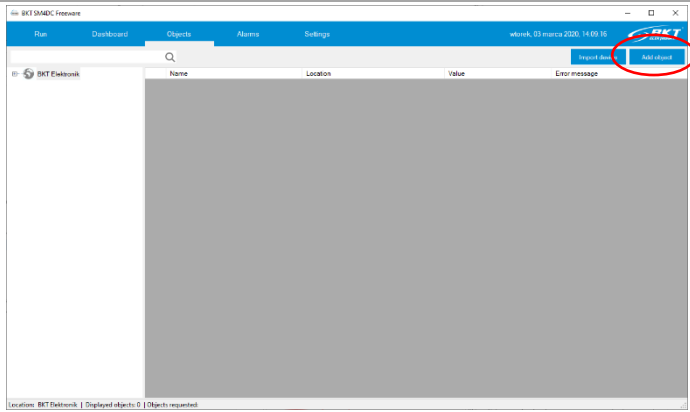

Search.
Searching for parameter.

Adding device.
Adding many parameters of defined devices.

Adding a single parameter.

Localization.
Tree structure of the monitored system. Each element is a location (folder) for the parameters on the right side of the window.

SNMP Objects.
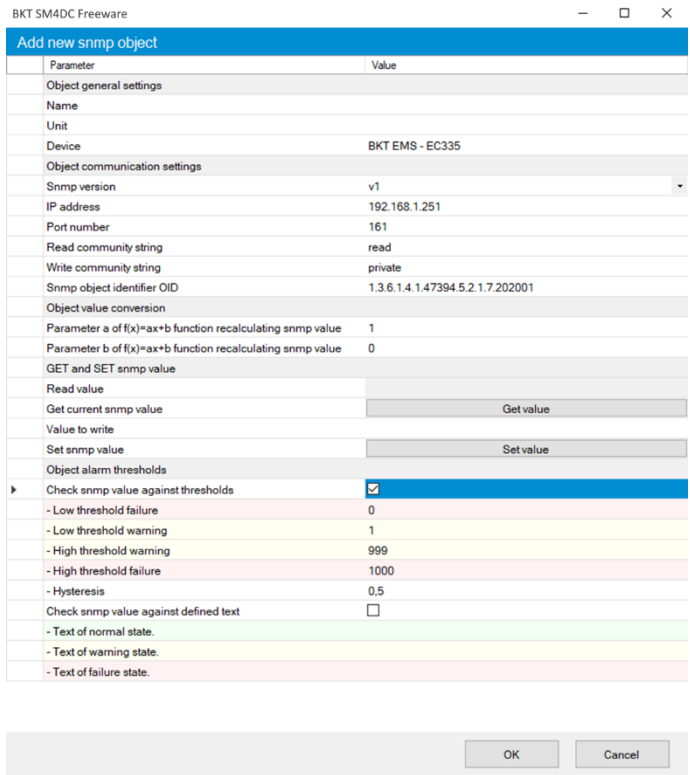List of parameters for individual devices.
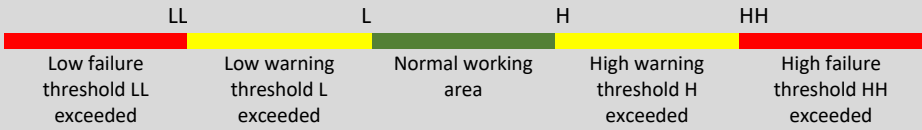
3.5.1 Adding a single SNMP object

Adding SNMP object

Click on *Add object*

Entering settings for a single SNMP object.

In the opened window, enter the object settings in accordance with the instructions of the device to be monitored. Then confirm by clicking *OK*. Description of individual lines is in the table below.

Object general settings	Basic SNMP parameter settings of the monitored device
Name	Name of the monitored object. The name must be unique in the current location.
Unit	Unit of the object, e.g. V (Volt), A (Ampere), etc.
Device	Name of device, which the parameter is monitored, for example UPS.
Object communication settings	They define the way of communication with the device in order to read the value of a given object
Snmp version	The version of the SNMP protocol used to communicate with the device. Possible settings version 1 or version 2c.
IP address	IP address of the monitored device.
Port number	SNMP communication port number. By default 161. Acceptable range (1-65535).
Read community string	Password enabling the parameter to be read from the device.
Write community string	Password for saving the parameter value to the device.
Snmp object identifier OID	Identifier of the monitored parameter in the device.

Object value conversion	It enables the conversion of the value read from the device into the value to be monitored. Of course, the read value must be numeric in order to convert it. The conversion is carried out in accordance with the linear function f (x) = ax + b. If the value is not to be converted, set the values of the following parameters to a = 1 and b = 0.
Parameter a of f(x)=ax+b function	Some devices provide only integer values, e.g. 2385 voltage, which should be divided by 10 to get the real voltage value of 238.5V. In this case, a = 0.1 will convert and display the correct voltage. Default value a = 1. Any numerical value is allowed.
Parameter b of f(x)=ax+b function	Sets the measurement offset from the real value. E.g. measured temperature t_m = 19.7 ° C, while real t_r = 18.9 ° C. In this case, b = -0.8 will convert and display the correct temperature. Default value b = 0. Any numerical value is allowed.
GET and SET snmp value	It allows checking entered settings, reading a parameter from the device as well as writing a new value to the device.
Read value	Value read from the device.
Get current snmp value	Clicking the button sends a query to the device for the parameter value that will be displayed in the cell above.
Value to write	The value to be saved to the device.
Set snmp value	Clicking the button sends the value from the above cell to be saved in the device.
Check snmp value against thresholds	Checking the box will cause that after each reading of the value from the device and its conversion according to the function f (x) = ax + b it will be compared with the defined alarm thresholds and the corresponding alarm will be signaled. The value must be numeric for this comparison to be possible. It is possible to set 4 alarm thresholds: two signaling low level and two signaling high level. In addition, warning and emergency conditions are distinguished as shown in the figure below. LL L H HH Low failure threshold LL exceeded | Low warning threshold L exceeded | Normal working area | High warning threshold H exceeded | High failure threshold HH exceeded
Low threshold failure	Specifies the LL value, the exceeding of which will be signaled as: "value below the failure threshold"
Low threshold warning	Specifies the L value, the exceeding of which will be signaled as: "value below the warning threshold"
High threshold warning	Specifies the H value, the exceeding of which will be signaled as: "value above the warning threshold"
High threshold failure	Specifies the HH value, the exceeding of which will be signaled as: "value above the failure threshold"
Hysteresis	Hysteresis is the value by which each threshold must be exceeded for the change of state to be signaled. Hysteresis prevents frequent changes of states when the value oscillates around the defined threshold.
Check snmp value against defined text	Checking the box will cause that after each reading of the value from the device it will be compared with the defined text values. This functionality is provided for parameters which values are not numerical. For example, some sensors send the text "ALARM" at the time of the alarm and the message "NORMAL" in normal operation. The logic comparing the texts is as follows: FAILURE ALARM, if read text = Text of failure state else WARNING ALARM, if read text = Text of warning state else NORMAL STATE, if read text = Text of normal state else FAILURE ALARM which means that if the read value is not the same as normal or warning text, it will always be a failure condition.
Text of normal state	If the read value is the same as with the text entered in this field, the normal state will be signaled, unless a warning or failure condition is already signaled.

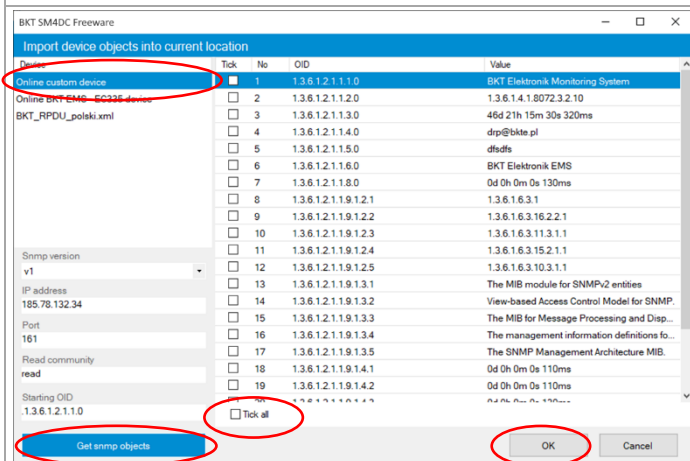| Text of warning state	If the read value is the same as the text entered in this field, a warning alarm will be signaled, regardless of the text in the "Text of normal state" field, unless failure state is already signaled.
Text of failure state	If the read value is the same as the text entered in this field, a failure alarm will be signaled, regardless of the text in the "Text of normal state" and "Text of warning state".

3.5.2   Adding group of SNMP object

The program allows you to add many device parameters at the same time. It is possible to add parameters from any type of device that supports SNMP version 1 or 2c or from previously defined devices.
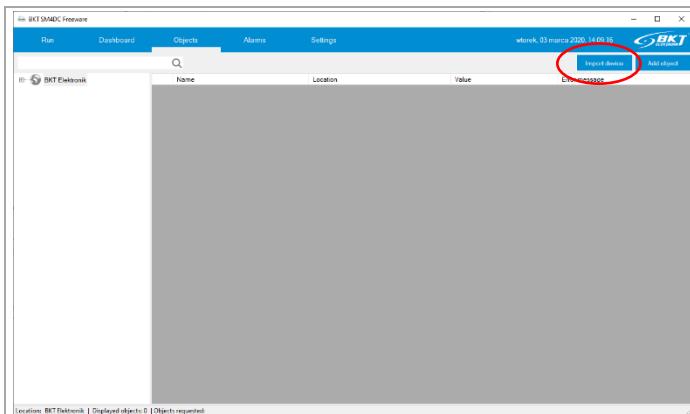
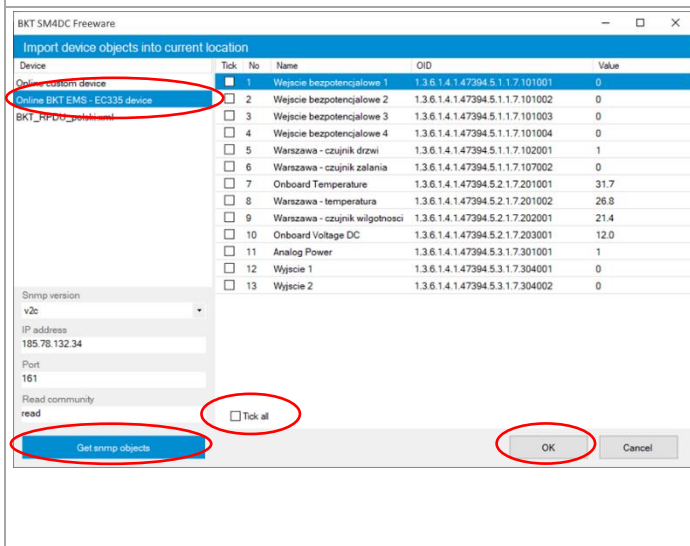|	
	Adding group of SNMP object Click on *Import device*
	Adding SNMP objects from any device. Select *Online custom device*. Make sure the device and the program are connected to the same network. Enter basic connection settings: - SNMP version 1 or 2c - device IP address - communication port - Read community (read access password) - OID, the identifier of the SNMP object, from which the program is to start reading the device with the SNMP Get Next command. The default values for these parameters are already entered, but may vary by device. Check the device manual. Click *Get snmp objects* to start the process of reading parameters from the device. Select the objects to be added or select all. Confirm by clicking *OK*.
	Adding EC335 SNMP objects The program supports the EC335 controller of the BKT EMS system for monitoring environmental conditions. Choose *Online BKT EMS - EC335 device*. This online gets the following parameters from the EC335 controller: - analog sensors connected to the controller and extension modules - 1-wire sensors connected to the controller - inputs for potential-free contacts of the controller and extension modules - controller and expansion module outputs Above parameters will have automatically assigned following attributes: - sensor names - alarm thresholds for analog sensors

Click *Get snmp objects* to start the process of reading parameters from the device. Select the objects to be added or select all. Confirm by clicking *OK*.
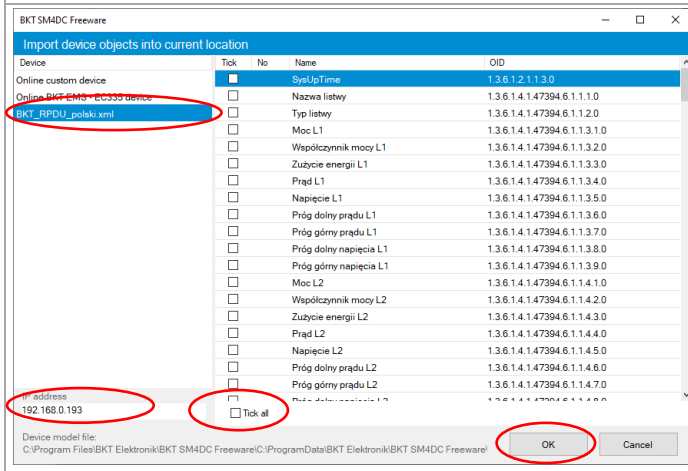
Adding SNMP objects from defined device models.

Files of defined device models are located in the *C:\ProgramData\BKT Elektronik\BKT SM4DC Freeware\Library* directory

Select the device model to be added to the system. Enter the machine's IP address if it is different from the factory default. Select the objects to be added or select all. Confirm by clicking *OK*.
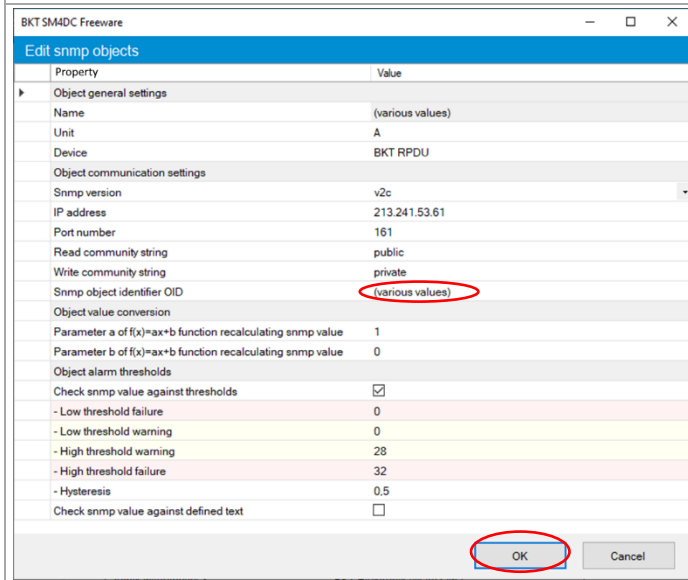
3.5.3   Editing SNMP objects
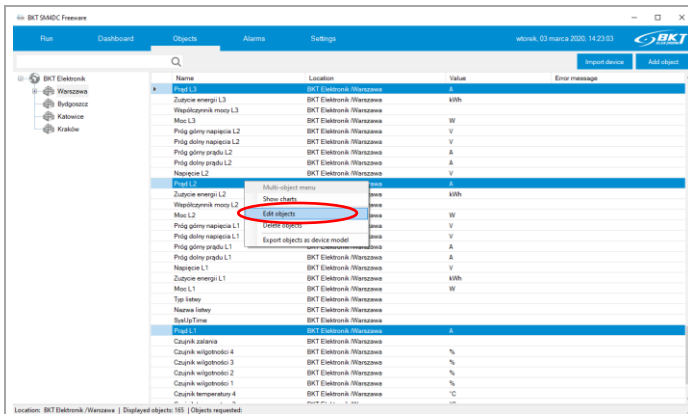
Editing SNMP objects

It is possible to edit a single or a group of selected objects. Select one or use CTRL or SHIFT to select the group of objects in the list that you want to edit.

Right click and select *Edit objects.*

In the opened window modify the properties and confirm by clicking *OK*. The change will be applied to all previously selected objects. The value (*various values*) means that not all selected objects had the same value of a given property. If (*various values*) remains unchanged, the given property will not be overwritten in any object.

ATTENTION

Because the stored measurement data of the SNMP object is related to its location and name, renaming the object causes that the existing measurement data (charts) will not be visible in the program. Visible will be only measurement data from the moment the object name was changed. However, historical data is still available with the old name of the object, but only in csv files located on the computer hard drive at *C:\ProgramData\BKT   Elektronik\BKT   SM4DC   Freeware\Data* directory.

3.5.4 Deleting SNMP objects
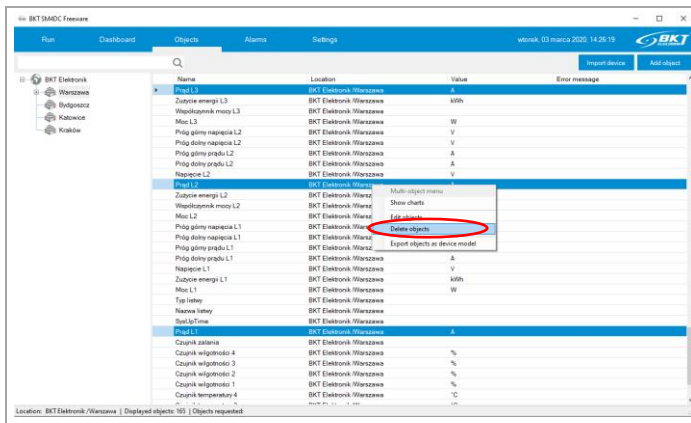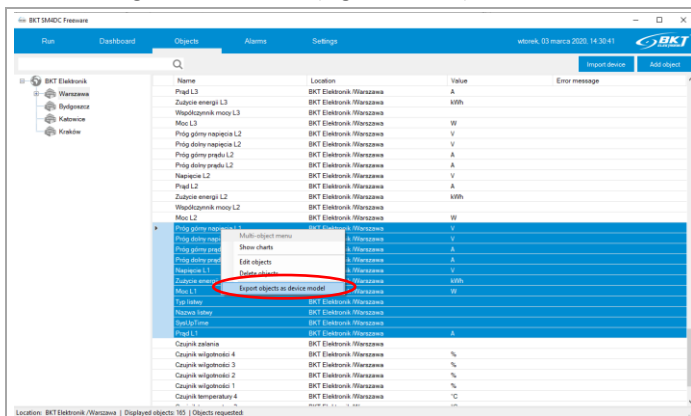

Deleting SNMP objects

It is possible to delete a single or a group of selected objects.

Select one or use CTRL or SHIFT to select the group of objects in the list that you want to remove from the system.

Right click, select *Delete objects* and confirm that you want to delete the objects.

3.5.5 Creating a device model

The program allows you to create a device template that will contain information about SNMP objects that can be monitored on a given device. Such objects can be pre-parameterized, i.e. have names, SNMP connection parameters, alarm thresholds and other values that can be given to the SNMP object. This device model can be used to duplicate devices in the system. Then it will only be necessary to update one parameter characterizing the new device - (e.g. IP address)

Preparing objects for export to the model

Configure the group of objects that will create the device model. Use the instructions in the chapters:

3.5.1 Adding a single SNMP object

3.5.3 Editing SNMP objects

Then select one or using CTRL or SHIFT keys select the group of objects on the list which are to create the device model.

Right click, select *Export objects as device model*.
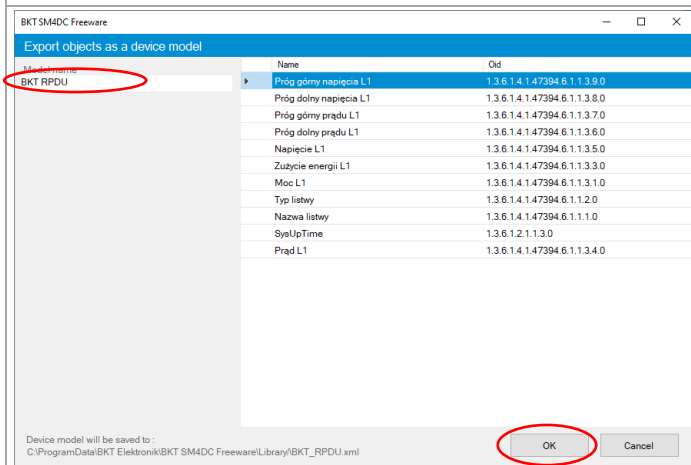
Name the model and save

In the opened window, enter the unique device model name and confirm by clicking *OK.* The device model will be saved to an xml file in the *C:\ProgramData\BKT Elektronik\BKT SM4DC Freeware\Library* directory. The model saved in this way will be visible in the models window when importing (see chapter *3.5.2 Adding group of SNMP object*).

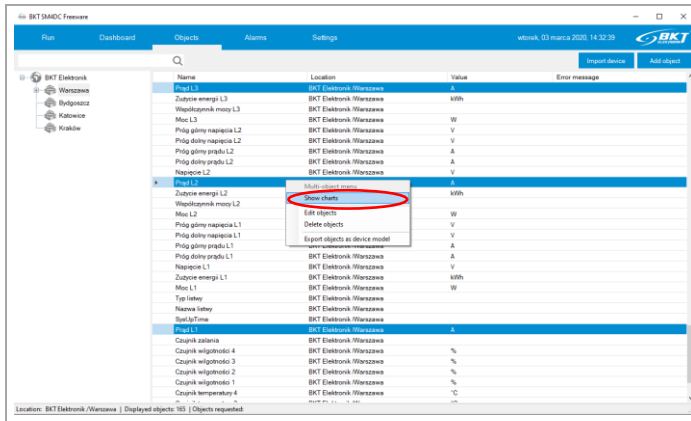## 3.5.6   Displaying values in charts

Displaying charts

It is possible to display in the chart a single or a group of selected objects. Select one or use CTRL or SHIFT to select the group of objects in the list that you want to display in the chart.

Right click, select *Show charts*.

Defined time range
Last hour, day, week and month.

Any time range
Freely definable time range with 1 day resolution.

Export to file
Saving the values visible on the chart to csv file and graphic files.

Numer of points
Number of all measuring points visible on the chart.

Scroll bar
The bar appears if the chart has been zoomed.

Point data
Available after moving the mouse over the measuring point on the chart.

Changing the zoom
Returns to the previous view.

### 3.5.7   Exporting measurement data to a csv file

Measurement data are saved in *.csv files and are available on the computer hard drive (see *3.8 Database*). In the displayed graphs window (see 3.5.6 Displaying values in charts) it is also possible to export the measurement data currently observed in the graph.

3.5.8   Adding / Deleting / Editing location

Location is a place where an object or a group of monitored objects are located. Thanks to this, it is possible to create a structure of relationships between individual devices. Location management is similar to managing folders in Windows. After creating the system tree and starting monitoring on the computer hard drive in the *C:\ProgramData\BKT Elektronik\BKT SM4DC Freeware\Data* directory, the measurement data will be saved. The directory structure on the computer hard drive will be identical to the structure of the built location tree, which facilitates navigation and user access to all data stored on the drive.

ATTENTION

When making modifications to the system tree structure, make sure that no folder with data saved in the *C:\ProgramData\BKT Elektronik\BKT SM4DC Freeware\Data* directory is currently open. In this case, the program may report no disk access.
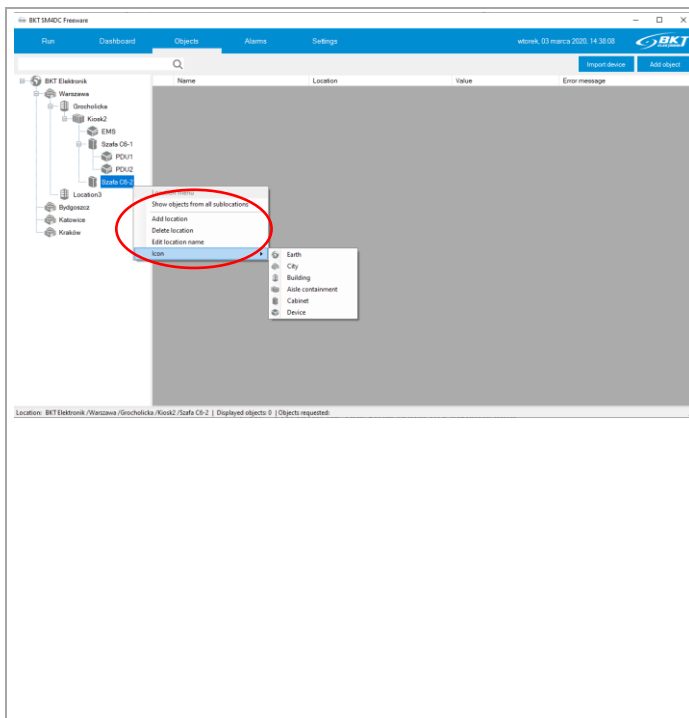
Adding new location
Right click on the location to which the new location should be added and then select *Add location*. Enter a new name. The name must be unique in the given location.

Deleting location
Right click on the location to be deleted, then select *Delete location* and confirm the intention to delete.
ATTENTION
Deleting the location will also delete the directory on the hard drive with the measurement data saved in the given location.

Editing location name
Right click on the location which name you want to change. Select *Edit location* and enter a new name. The directory name on the disk will also change.

Chnaging location icon
Right click on the location which icon should be changed. Select *Icon* from the menu and then select the image.

3.5.9   Moving objects between locations

The program allows you to move objects between locations by drag and drop. Using the same method, you can also change the system structure by dragging the location from one to the other. The changes will also be made to the computer disk in the subdirectory structure in the *C:\ProgramData\BKT Elektronik\BKT SM4DC Freeware\Data* directory.
ATTENTION
When making modifications to the system structure, make sure that no folder with data saved in the *C:\ProgramData\BKT Elektronik\BKT SM4DC Freeware\Data* directory is currently open. In this case, the program may report no disk access.
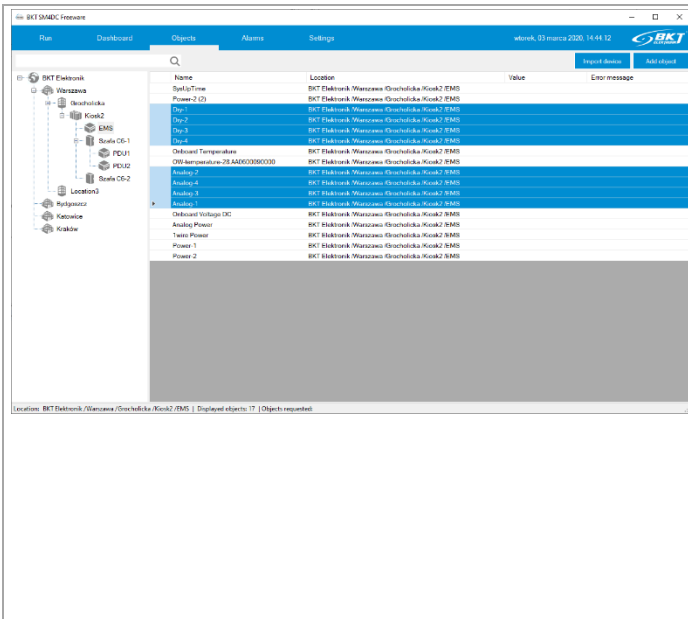
Moving SNMP object

Select one or use CTRL or SHIFT keys to select group of objects. Drag the selected objects using the CTRL key to the destination location and confirm the intention to move.

ATTENTION

Because the saved measurement data of the SNMP object are related to its location and name, moving objects causes that the existing measurement data (charts) will not be visible in the program. Visible will be only measurement data from the moment the location was moved. However, historical data is still available in the old location, but only in csv files on the computer hard drive in the *C:\ProgramData\BKT Elektronik\BKT SM4DC Freeware\Data* directory.

Moving location

Select the location to be moved and drag it to the new location. Moving locations retains all existing measurement data.

3.5.10 Displaying objects
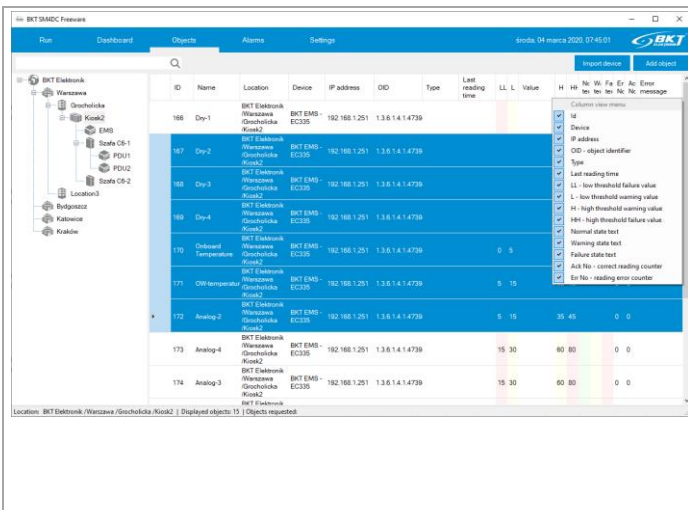
Displaying objects

The list of objects is displayed on the Objects tab in the right window.

Add columns to the list

Right-clicking on the list header allows you to display additional columns in the list.

Sorting objects

By left clicking on the column header it is possible to sort objects by the selected column.

Copying objects to Excel

By selecting objects and copying them CTRL + C, you can then paste CTRL + V into the Excel spreadsheet.
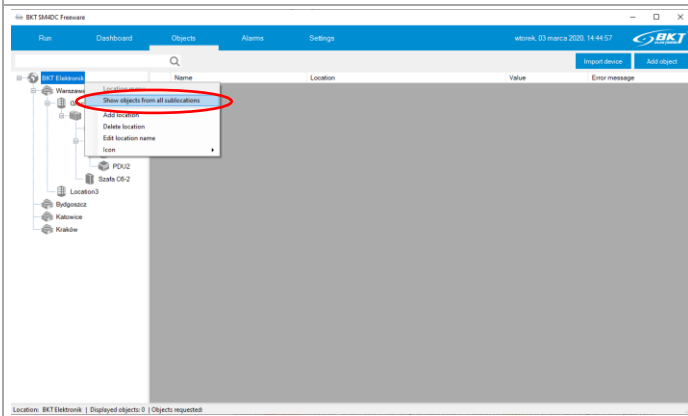
Displaying objects of chosen location

Left click on the location. The right window displays SNMP objects placed in the chosen location.

Displaying objects of chosen location and all sub-locations.

Right click on the location and then select *Show objects from all sublocations*.

3.5.11 Searching for objects

Searching for objects

It is possible to search for the desired object from the group of objects currently displayed in the right window.

As a search result will be displayed objects containing entered text in following fields:

  - the name of the object or
  - the full path of the location of the object or
  - device name assigned to the object or
  - IP address

The searching is not case sensitive.

3.6 Alarms

All exceedances of defined alarm thresholds are displayed on a separate tab - alarm tab. When clickinh on this tab, the currently active alarms are visible. Alarm threshold can be modified by editing the individual objects (see chapter 3.5.3 Editing SNMP objects).

3.6.1 Active alarms

Red colour means exceeding failure thresholds, and yellow exceeding warning thresholds.

Active alarms
Displaying currently active alarms.

Historical alarms
Displaying historical alarms.

Activation time
Alarm activation time

Value
Value of the object that triggered the alarm

Alarm threshold settings

Alarming object
Name of object (device parameter) that triggered the alarm

Location
Location of the object that triggered the alarm

Alarm type
The reason for the alarm. Describes the alarm threshold exceeded or offline alarm
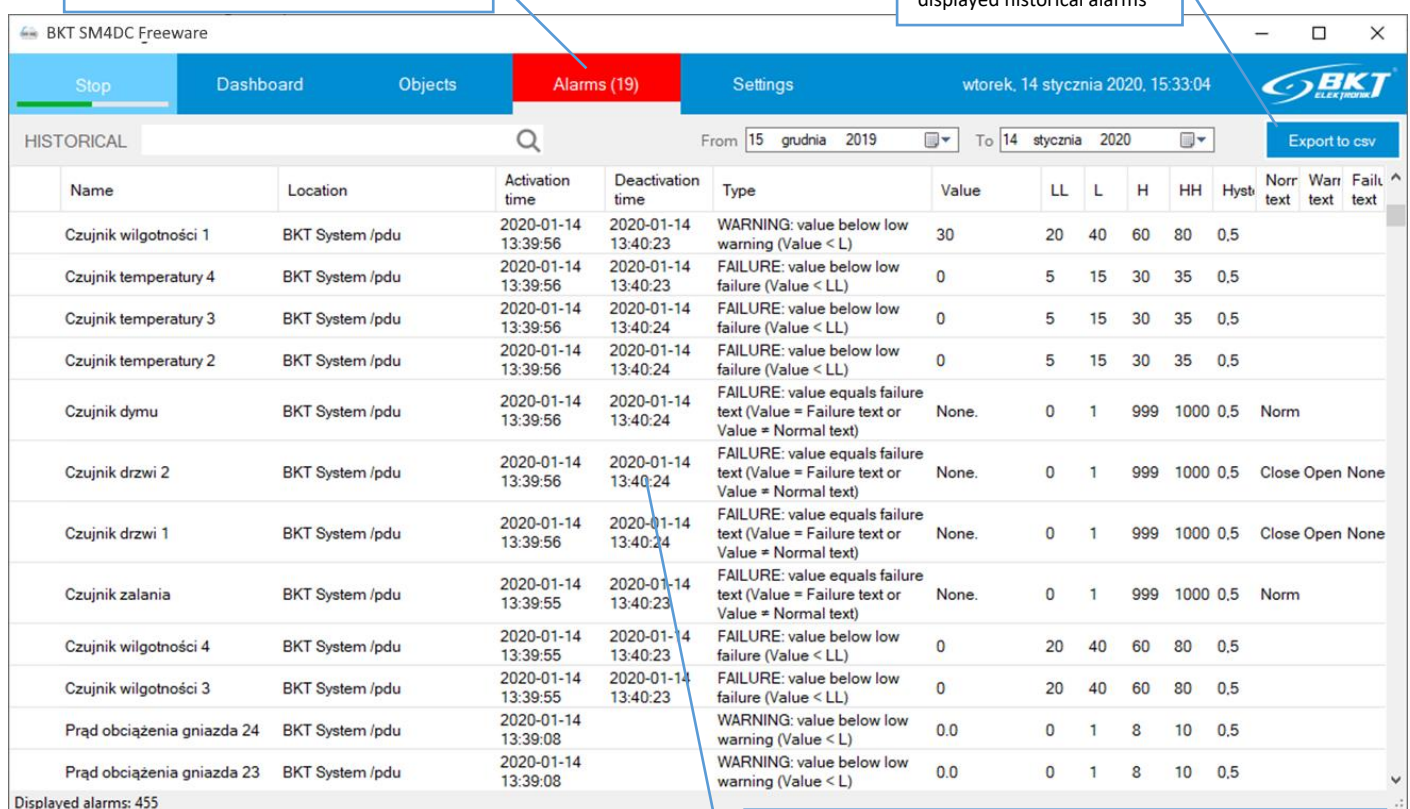
Alarm type	Description
FAILURE: object is offline	FAILURE. Object did not respond for 5 consecutive requests.
FAILURE: value below low failure (Value < LL)	FAILURE. The parameter value read from the device is below the set low failure threshold.
FAILURE: value above high failure (Value > HH)	FAILURE. The parameter value read from the device is above the set high failure threshold.
WARNING: value below low warning (Value < L)	WARNING. The parameter value read from the device is below the set lower warning threshold.
WARNING: value above high warning (Value > H)	WARNING. The parameter value read from the device is above the set high warning threshold.

3.6.2   Historical alarms

It is possible to view the alarm history, display only those within the specified time period and matching the search criteria. Then it is possible to export the currently displayed list to the csv file. The list view is similar to the view of list of active alarms.

Active alarms
Button to display active alarms

Alarms export
Export to csv file currently displayed historical alarms

Alarm deactivation time
Time when alarm stopped. If the field is empty, it means that it is an active alarm or that the program was shutted down before the alarm stopped.

3.6.3 Search for historical alarms
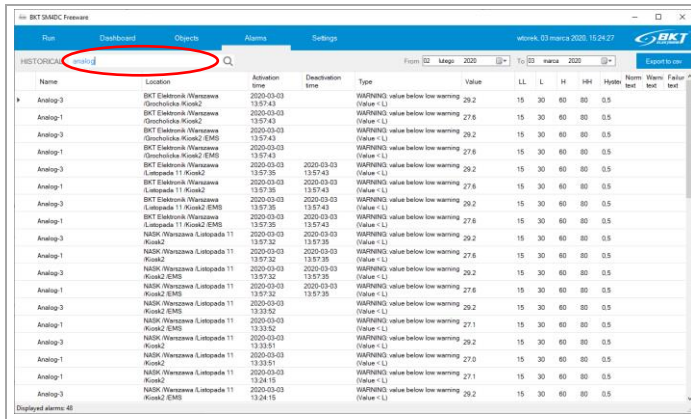
Search for historical alarms

It is possible to search for the required historical alarms from the list of currently displayed alarms.

As a search result will be displayed alarms containing entered text in following fields:
- the name of the object or
- the full path of the location of the object or
- type of alarm

The searching is not case sensitive.

3.7 Application settings
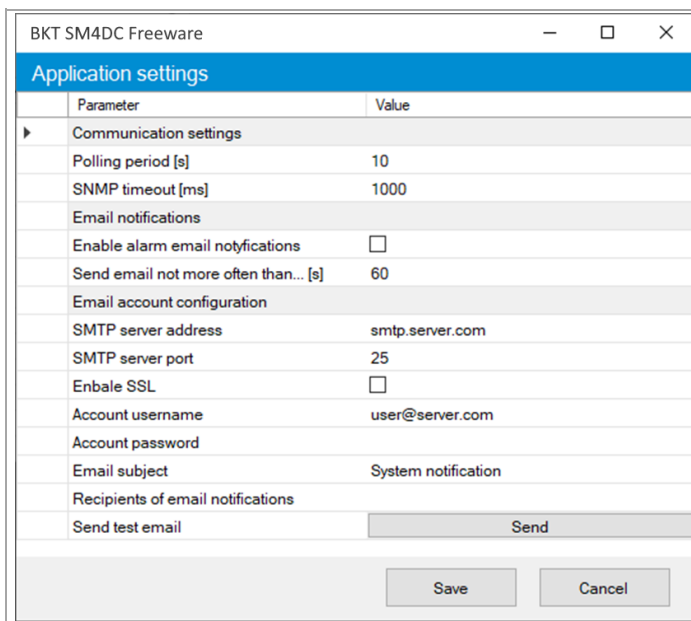
Main program settings

The application settings are available when clicking on *Settings* button. Enter the settings as described in the table below and save by clicking the *Save* button. These settings are saved to the project file (*3.1 Opening / Closing / Saving the project*).

| Communication settings	Define the way of communication with devices.
Polling period	The frequency with which the program will poll devices and save the results to the database. Value in seconds. By default every 10s. Acceptable range (10 - 3600s).
SNMP timeout	The time the program will wait for a response from the device. Value in milliseconds. The default is 1000 ms. Acceptable range (100-10000ms).
Email notifications	Define email alerts
Enable alarm email notofication	Checking will enable the service of notifying about alarm states in the whole system.
Send email not more often than …	Limits the number of email notifications in a defined period. In avalanche failure situations, when one failure causes a second, the number of notifications would exceed human perception. This parameter limits the number of emails to one for a defined time. If other alarms occur during this time, they will be reported to the next email. Value in seconds. Default 60s. Acceptable range (60-3600s).
Email account configuration	They define the email account settings used to generate notifications. These settings must match the settings of the mail server.
SMTP server address	The address of the mail server that supports SMTP.
SMTP server port	SMTP server port that supports connections.

Enable SSL	Checking will enable encrypted communication with the mail server.
Account username	Username of the email account.
Account password	Email account user password.
Email subject	Subject of the the message sent by the program. It can be e.g. the name of the monitored system.
Recipients of email notifications	Notification recipient email addresses separated by a semicolon.
Send test email	It allows checking entered e-mail server settings by sending a test email to defined recipients.

3.8 Database

3.8.1 Directory structure

Measurement data read from devices are saved to csv files in the *C:\ProgramData\BKT Elektronik\Data* directory. The folder structure in this directory reflects the location structure created in the program.
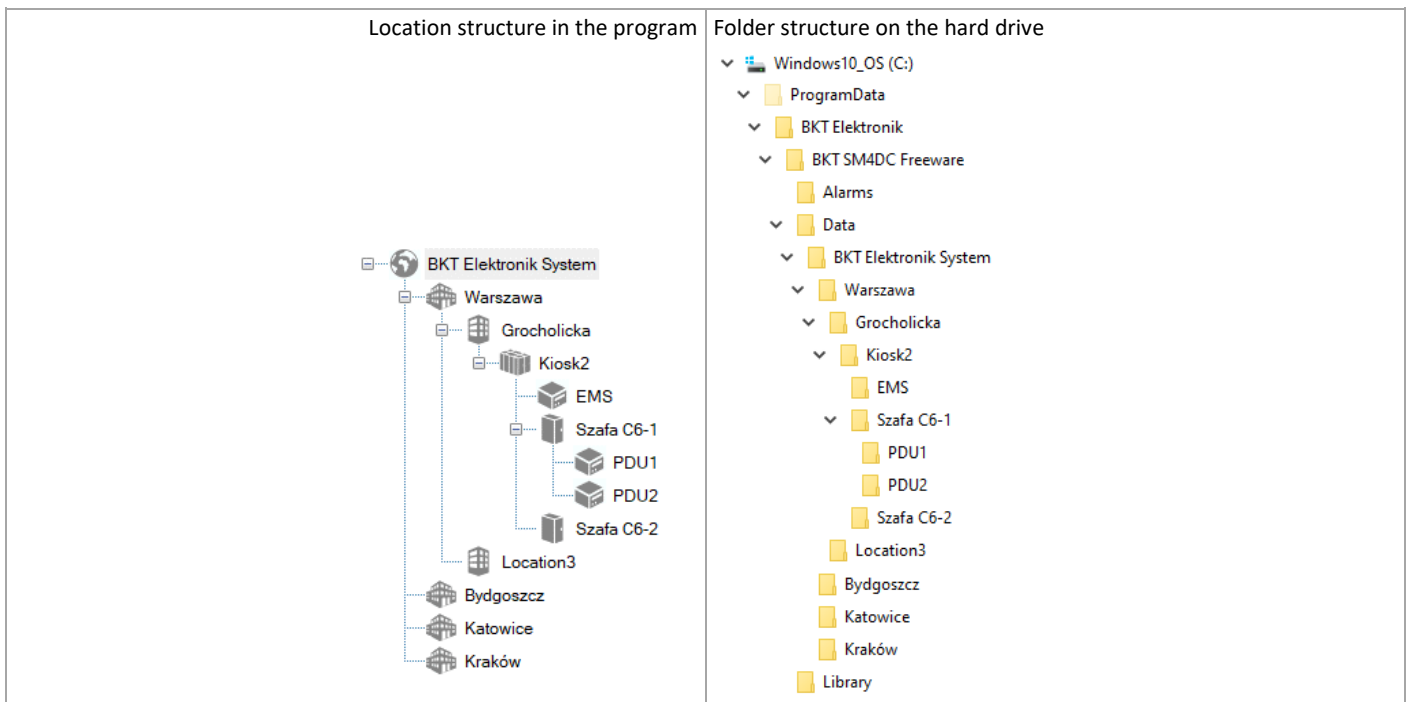
3.8.2 Measurement data files

Files with measurement data are located in folders in the *C:\ProgramData\BKT Elektronik\Data* directory. Each folder contains measurement data files of objects (parameters) assigned to a given location. Each file contains measurements from a maximum of one day of all objects (parameters) placed in a given location. The data in the file is separated by a comma. The program automatically deletes data older than 60 days.

Data files in the location folder

📄 2020-02-28_00-00-01.csv
📄 2020-02-29_00-00-02.csv
📄 2020-03-01_00-00-01.csv
📄 2020-03-02_00-00-01.csv
📄 2020-03-03_00-00-01.csv
📄 2020-03-04_00-00-01.csv

Sample content of the measurement data file opened in Notepad.

```
1   #BKT SM4DC Freeware - Data of Location: BKT Elektronik System /EMS
2   Time,Dry-1,Dry-2,Dry-3,Dry-4,Onboard Temperature,Cube1 Temperature1 1W,Cabinet1 Temperature A2,Cube1 Humidity2 A4,Cube1 Humidity1 A3,Cabinet1 Humidity A1,(
3   2020-03-12 12:50:51,,,,,,,,,,,,,,,,,
4   2020-03-12 12:50:57,0,0,0,0,28.9,24.6,23.4,37.0,30.7,31.8,12.1,on,on,off,on
5   2020-03-12 12:51:08,0,0,0,0,28.9,24.6,23.4,37.0,30.7,31.8,12.1,on,on,off,on
6   2020-03-12 12:51:15,0,0,0,0,28.9,24.5,23.4,37.1,30.7,31.8,12.1,on,on,off,on
7   2020-03-12 12:51:25,0,0,0,0,28.9,24.5,23.4,37.1,30.7,31.8,12.1,on,on,off,on
8   2020-03-12 12:51:35,0,0,0,0,28.9,24.5,23.4,37.1,30.7,31.8,12.1,on,on,off,on
9   2020-03-12 12:51:46,0,0,0,0,28.9,24.5,23.4,37.1,30.7,31.8,12.1,on,on,off,on
10  2020-03-12 12:51:55,0,0,0,0,28.9,24.5,23.4,37.1,30.7,31.8,12.1,on,on,off,on
```

The same file opened in Excel.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	#BKT SM4DC Freeware - Data of Location: BKT Elektronik System /EMS															
2	Time	Dry-1	Dry-2	Dry-3	Dry-4	Onboard Temperature	Cube1 Temperature1 1W	Cabinet1 Temperature A2	Cube1 Humidity2 A4	Cube1 Humidity1 A3	Cabinet1 Humidity A1	Onboard Voltage DC	Analog Power	1wire Power	Power-1	Power-2
3	2020-03-12 12:50:51															
4	2020-03-12 12:50:57	0	0	0	0	28.9	24.6	23.4	37.0	30.7	31.8	12.1	on	on	off	on
5	2020-03-12 12:51:08	0	0	0	0	28.9	24.6	23.4	37.0	30.7	31.8	12.1	on	on	off	on
6	2020-03-12 12:51:15	0	0	0	0	28.9	24.5	23.4	37.1	30.7	31.8	12.1	on	on	off	on
7	2020-03-12 12:51:25	0	0	0	0	28.9	24.5	23.4	37.1	30.7	31.8	12.1	on	on	off	on
8	2020-03-12 12:51:35	0	0	0	0	28.9	24.5	23.4	37.1	30.7	31.8	12.1	on	on	off	on
9	2020-03-12 12:51:46	0	0	0	0	28.9	24.5	23.4	37.1	30.7	31.8	12.1	on	on	off	on
10	2020-03-12 12:51:55	0	0	0	0	28.9	24.5	23.4	37.1	30.7	31.8	12.1	on	on	off	on

3.8.3 Files with alarm data

Historical alarms are saved to the sm4dc_alarms.csv file located in the *C:\Program Data\BKT Elektronik\Alarms* directory. The program automatically deletes data older than 60 days.

Sample contents of a file with historical alarms opened in Notepad.

```
1   #BKT SM4DC Freeware file - Alarm history
2   Name,Location,Activation time,Deactivation time,Type,Value,Thresholds enabled,ValueLL,ValueL,ValueH,ValueHH,Hysteresis,Text matching enabled,Normal text,M
3   Prąd obciążenia gniazda 23,BKT System /pdu,2020-01-13 08:55:09,,WARNING: Value < ValueL,0.0,True,0,1,8,10,0.5,False,,,
4   Prąd obciążenia gniazda 22,BKT System /pdu,2020-01-13 08:55:09,,WARNING: Value < ValueL,0.0,True,0,1,8,10,0.5,False,,,
5   Prąd obciążenia gniazda 21,BKT System /pdu,2020-01-13 08:55:09,,WARNING: Value < ValueL,0.0,True,0,1,8,10,0.5,False,,,
6   Prąd obciążenia gniazda 20,BKT System /pdu,2020-01-13 08:55:09,,WARNING: Value < ValueL,0.0,True,0,1,8,10,0.5,False,,,
7   Prąd obciążenia gniazda 19,BKT System /pdu,2020-01-13 08:55:10,,WARNING: Value < ValueL,0.0,True,0,1,8,10,0.5,False,,,
8   Prąd obciążenia gniazda 18,BKT System /pdu,2020-01-13 08:55:10,,WARNING: Value < ValueL,0.0,True,0,1,8,10,0.5,False,,,
9   Prąd obciążenia gniazda 17,BKT System /pdu,2020-01-13 08:55:10,,WARNING: Value < ValueL,0.0,True,0,1,8,10,0.5,False,,,
10  Prąd obciążenia gniazda 16,BKT System /pdu,2020-01-13 08:55:10,,WARNING: Value < ValueL,0.1,True,0,1,8,10,0.5,False,,,
```

The same file opened in Excel.

	Name	Location	Activation time	Deactivation time	Type	Value	Thresholds enabled	ValueLL	ValueL	ValueH	ValueHH	Hysteresis	Text matching enabled	Nor text
1	#BKT SM4DC Freeware file - Alarm history													
2	Name	Location	Activation time	Deactivation time	Type	Value	Thresholds enabled	ValueLL	ValueL	ValueH	ValueHH	Hysteresis	Text matching enabled	text
3	Prąd obciążenia gniazda 23	BKT System /pdu	2020-01-13 08:55:09		WARNING: Value < ValueL	0.0	True	0	1	8	10	0.5	False	
4	Prąd obciążenia gniazda 22	BKT System /pdu	2020-01-13 08:55:09		WARNING: Value < ValueL	0.0	True	0	1	8	10	0.5	False	
5	Prąd obciążenia gniazda 21	BKT System /pdu	2020-01-13 08:55:09		WARNING: Value < ValueL	0.0	True	0	1	8	10	0.5	False	
6	Prąd obciążenia gniazda 20	BKT System /pdu	2020-01-13 08:55:09		WARNING: Value < ValueL	0.0	True	0	1	8	10	0.5	False	
7	Prąd obciążenia gniazda 19	BKT System /pdu	2020-01-13 08:55:10		WARNING: Value < ValueL	0.0	True	0	1	8	10	0.5	False	
8	Prąd obciążenia gniazda 18	BKT System /pdu	2020-01-13 08:55:10		WARNING: Value < ValueL	0.0	True	0	1	8	10	0.5	False	
9	Prąd obciążenia gniazda 17	BKT System /pdu	2020-01-13 08:55:10		WARNING: Value < ValueL	0.0	True	0	1	8	10	0.5	False	
10	Prąd obciążenia gniazda 16	BKT System /pdu	2020-01-13 08:55:10		WARNING: Value < ValueL	0.1	True	0	1	8	10	0.5	False	

4 PROGRAM CHANGES

Version	Changes	Data
0.12	Initial version	January 2020
0.13	• General - protection against starting the second instance of the program • Settings - recipients' email; line wrap added when there are several email addresses • Desktop - a widget with the version number has been added • Database - data older than 60 days will be automatically deleted from the hard drive • Objects - double-clicking on an object opens a window with charts • Locations - icons added • Alarms - an offline alarm has been added when the object (device parameter) does not respond for 5 consecutive queries	March 2020

5 DOCUMENT REVISIONS

Version	Changes	Data
0.12	Initial version	January 2020
0.13	General upgrade to the new version	March 2020